EPBC ACT ANNUAL COMPLIANCE REPORT 2022

Prepared for:

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SLR

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Stanmore Resources Limited (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.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
626.30101-R01-v1.2	8 September 2022	Eve Linton	Paul Tett (SLR)/ D. Mude (SRL)/ DM (Stanmore)	Paul Tett

EXECUTIVE SUMMARY

Introduction

Stanmore Resources Limited (Stanmore) engaged SLR Consulting Australia Pty. Ltd. (SLR) to prepare the Annual Compliance Report (the Report) for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Approval for Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*, (the Approval). The Report is required by Condition 17 of the Approval.

Description of Activities and EPBC Act Approval

The Isaac Plains Complex is located in Central Queensland, approximately 145 kilometres (km) southwest of Mackay and 7 km east of the Moranbah township. The Isaac Plains East (IPE) project is located adjacent to the east of the Isaac Plains Coal Mine (not active) and operations within IPE ceased in August 2021. In February 2022 the Dragline was transferred from IPEE to the Isaac Downs Open Cut operations. Coal from mining operations is processed at the Coal Handling and Preparation Plant (CHPP) which is located within the original Isaac Plains Mining Leases. Mining and processing activities throughout the period of the Report were initially managed by Golding and transitioned to EPSA in 2022.

The IPE Project is the subject of the Approval and was referred under the EPBC Act in late 2016.

The Approved Action is:

> *"To undertake the Isaac Plains East Project, developing five open cut coal pits over Lot 4 SP252740, Lot 17 SP261431 and Lot 5 GV132, adjoining the existing Isaac Plains Mine mining lease near Moranbah, Queensland (see EPBC Act referral 2016/7827)."*

The action subject to the Approval officially commenced on the 9th of June 2018, subsequently this report is the third report and covers the period of the 9th of June 2021 to the 8th of June 2022.

The Approval relates to the EPBC Act Controlling Provisions:

- Listed threatened species and communities (sections 18 & 18A); and
- Water resources/trigger (sections 24D & 24E).

Specifically, the Approval addresses:

- Clearing of habitat for Koala (*Phascolarctos cinereus*), Squatter Pigeon (Southern) (*Geophaps scripta scripta*), Greater Glider (*Petauroides volans*) and Ornamental Snake (*Denisonia maculata*); and
- Monitoring of surface water, groundwater, and riparian zone.

The Approval contains requirements for offsets under the *EPBC Act Environmental Offsets Policy*, including development of an Offset Area Management Plan (OAMP). The Approval also requires development of a Species Management Plan (SMP) outlining management and monitoring actions to minimise any impact to Listed threatened species under the EPBC Act.

EXECUTIVE SUMMARY

Habitat Impacts and Offset area

Offset areas are required by the Approval to compensate for the habitat clearing required for the Isaac Plains East Project and include impacted habitat for the Koala (125 ha), Greater Glider (125 ha) and Squatter Pigeon (74 ha).

An initial OAMP (Base 2018) for Isaac Plains East included suitable offset area. The initial proposed offset area identified was on Byrne Valley Station near Ayr in North Queensland. However, the negotiation process for securing this offset, undertaken during the period of previous Annual Compliance Reports, was unsuccessful. The Department was routinely engaged on the matter. Subsequent to the above, a variation to the Approval (14th of August 2020) was granted in order to allow sufficient time for securing the relevant offset in accordance with Condition 6 (see **Section 1.1**).

Negotiations to secure a new offset to address the above habitat impacts at Mt Spencer (approximately 23 km east of Nebo) were successfully completed within the period of the previous Annual Compliance Report. A new OAMP (BASE 2020) was developed to reflect Mt Spencer offset, signed by Stanmore and the Landholder prior to submission to the Department for approval. Approval of the OAMP was received on the 21st of May 2021. The offset areas for the separate Isaac Plains East Extension (IPEE) EPBC Approval (2019/8548) and the Isaac Downs Project EPBC Approval (2019/8413) are located adjacent to the IPE offset area at Mt Spencer. Legal Securing of the Offset Area commenced on the 15th of October 2021 and was completed on the 3rd of December 2021.

Audit Methods

The key site contact was Stanmore's, Acting Senior Advisor – Health, Safety, Environment and Community (HSEC), Dante Mude. The Audit was conducted by SLR Principal Consultant, Paul Tett. Paul has in excess of 30 years' experience as an environmental professional associated with the mining and industrial sectors.

A site visit to the Isaac Plains Complex was undertaken by the auditor on the 20th of July 2022 during which interviews and evidence gathering were undertaken. A site inspection of the Isaac Plains East disturbance footprint was undertaken as part of the site visit.

Compliance status for each Approval Condition was determined in accordance with the rankings C = Complaint, NC = Non-Compliant and NA = Not Applicable.

EXECUTIVE SUMMARY

Key Findings and Observations

For the period of the Annual Compliance Report, Stanmore was compliant (as qualified) with all relevant conditions of the Approval.

There were nine “Not Applicable” findings made during the audit.

No new environmental risks relative to the Approval were identified during the reporting period.

Staff interviewed throughout the audit process demonstrated sound understanding of the Approval requirements and the operational system controls required to ensure compliance with the conditions of the Approval. Management commitment to compliance with the Approval was evident.

Observations:

Condition 3 *- The EPSA Induction Package was sighted during the site visit and it was noted that it lacked reference to the EPBC MNES and site requirements (including weeds and pests, machinery washdown, roads & tracks significant fauna, etc.). It is suggested that relevant EPBC information from the Stanmore induction be included in the EPSA site induction.*

Condition 5 – *It is suggested that a Template is developed which includes all required Visual Observations of the OAMP Table 20 and use as a run sheet for quarterly Phone Meetings with the landholder.*

Detailed findings are presented (**Table 2**).

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1 Introduction

Stanmore IP Coal Pty Ltd (Stanmore) engaged SLR Consulting Australia Pty. Ltd. (SLR) to prepare the Annual Compliance Report (the Report) for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) *Approval for Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*, (the Approval). The Report is required by Condition 17 of the Approval, which states:

> *"Within three (3) months of every 12 month anniversary of the commencement of the action, the approval holder must publish a report (the Annual Compliance Report) on its website addressing compliance with each of the conditions of this approval, during the previous 12 months. Documentary evidence providing proof of the date of publication must be provided to the Department at the same time as the Annual Compliance Report is published. Reports must remain published for the life of the approval. The approval holder must continue to publish the Annual Compliance Report each year until such time as agreed to in writing by the Minister."*

The Report presents the findings of an audit which was undertaken to assess the compliance status of Stanmore's Isaac Plains East (IPE) operations against the Approval. The audit focused on each of the conditions contained in the Approval. The audit site visit was undertaken on the 20th of July 2022, with evidence gathering and reporting finalised throughout July to September 2022.

The report has been prepared in general accordance with the *Annual Compliance Report Guidelines, Commonwealth of Australia 2014*.

1.1 Description of Activities and EPBC Act Approval

The Isaac Plains Complex is located in Central Queensland, approximately 145 kilometres (km) southwest of Mackay and 7 km east of the Moranbah township (**Figure 1**). The Complex includes the original Isaac Plains Open Cut Mine, the adjoining Isaac Plains East Open Cut operations, the Isaac Plains East Extension (IPEE) Open Cut operations and the Isaac Downs Open Cut operations and the proposed Isaac Plains Underground Mine project. The IPE project (formerly Wotonga Project) was acquired by Stanmore in 2015. The project is located adjacent to the east of the Isaac Plains Coal Mine (not active) and operations within IPE ceased in August 2021. In February 2022 the Dragline was transferred from IPEE to the Isaac Downs Open Cut operations. Coal from mining operations is processed at the Coal Handling and Preparation Plant (CHPP) which is located within the original Isaac Plains Mining Leases. Mining and processing activities throughout the period of the Report were initially managed by Golding and transitioned to EPSA in 2022.

IPE is the subject of the Approval, which was referred under the EPBC Act in late 2016. The Referral Decision was issued on the 4th of January 2017, being Controlled Action Assessment Approach Preliminary Documentation, public notification of the Preliminary Documentation was undertaken on the 19th of July 2017. The initial Approval (EPBC 2016/7827) was issued to Stanmore IP Coal Pty Ltd (ABN: 79 606 244 615) on the 28th of February 2018. The Approved Action is:

> *"To undertake the Isaac Plains East Project, developing five open cut coal pits over Lot 4 SP252740, Lot 17 SP261431 and Lot 5 GV132, adjoining the existing Isaac Plains Mine mining lease near Moranbah, Queensland (see EPBC Act referral 2016/7827)."*

A variation to the Approval took effect on the 6th of August 2018. The subject of the variation was as below:

> *"Delete Attachment A attached to the approval and substitute with Attachment A specified over page."*

The variations to Attachment A included minor adjustments to the planned disturbance boundaries. The Project layout including the approved disturbance area is shown (**Figure 2**).

A further variation to the Approval took effect on the 14th of August 2020. The subject of the variation was as below:

> *"Delete condition 6 and replace it with condition 6 as specified below. Delete the definition of Squatter Pigeon (Southern) (Geophaps scripta scripta) habitat and replace it with the definition specified below."*

Conditions specific to the action 6.

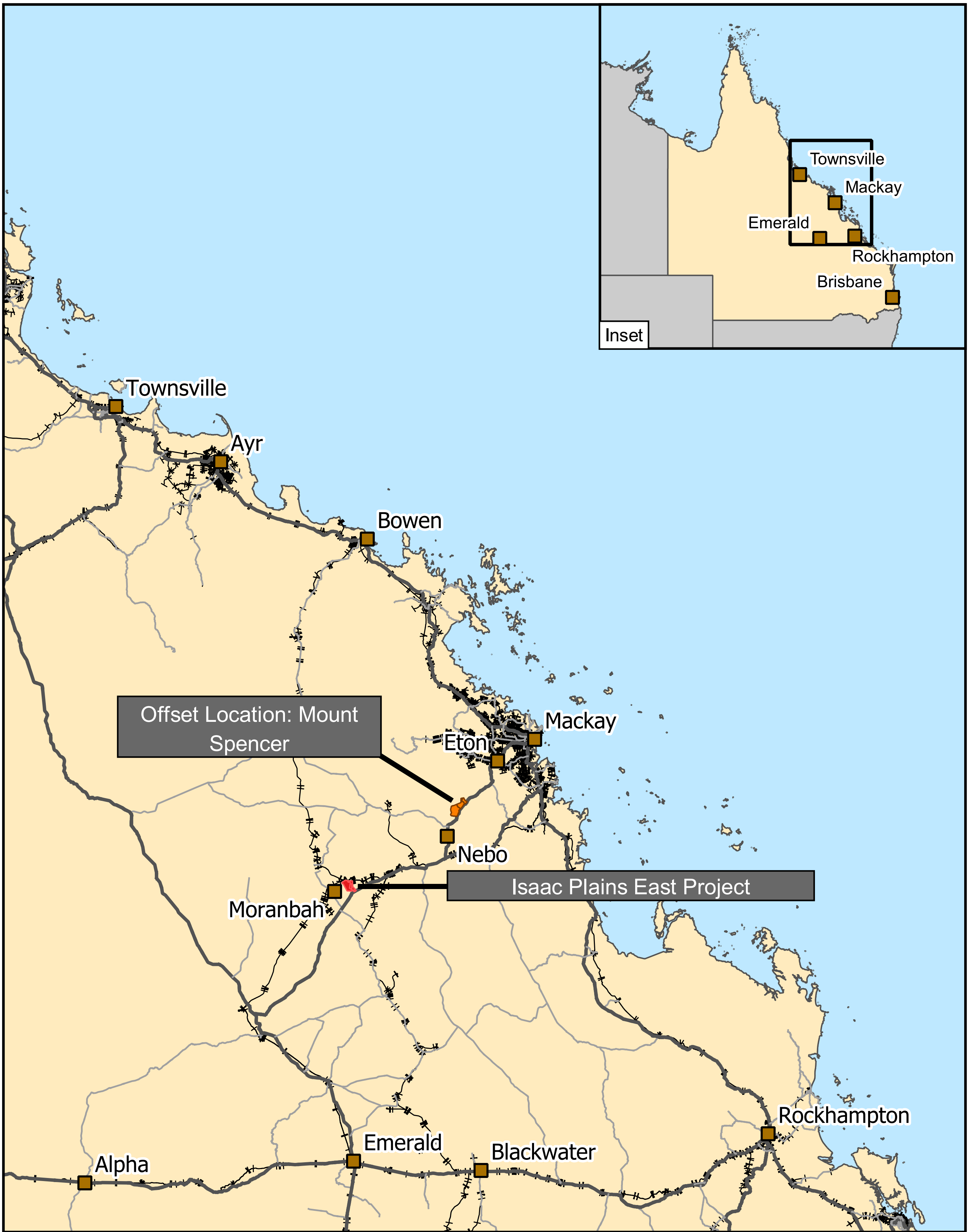
*"The approval holder must legally secure the environmental offset/s within three (3) years from the **commencement** of the **clearance** of **habitat suitable for the Koala (Phascolarctos cinereus) (combined populations of Qld, NSW and the ACT) and Greater Glider (Petauroides volans) and Squatter Pigeon (Southern) (Geophaps scripta scripta) habitat**.*

Definitions

***w. Squatter Pigeon (Southern) (Geophaps scripta scripta) habitat** means:*

i. *breeding habitat - Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including, but not limited to, areas mapped as Queensland land zones 3, 5 or 7) and where groundcover vegetation is less than 33% of the ground area, within 1 km of a suitable, permanent or seasonal waterbody;*

ii. *foraging habitat - Any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils (including, but not limited to, areas mapped as Queensland land zones 3, 5 or 7) and where groundcover vegetation is less than 33% of the ground area, within 3 km of a suitable, permanent or seasonal waterbody."*



0 30 60 km

Scale @ A3: 1 : 2500000
Date: 19/10/2020
Drawn: Josh T

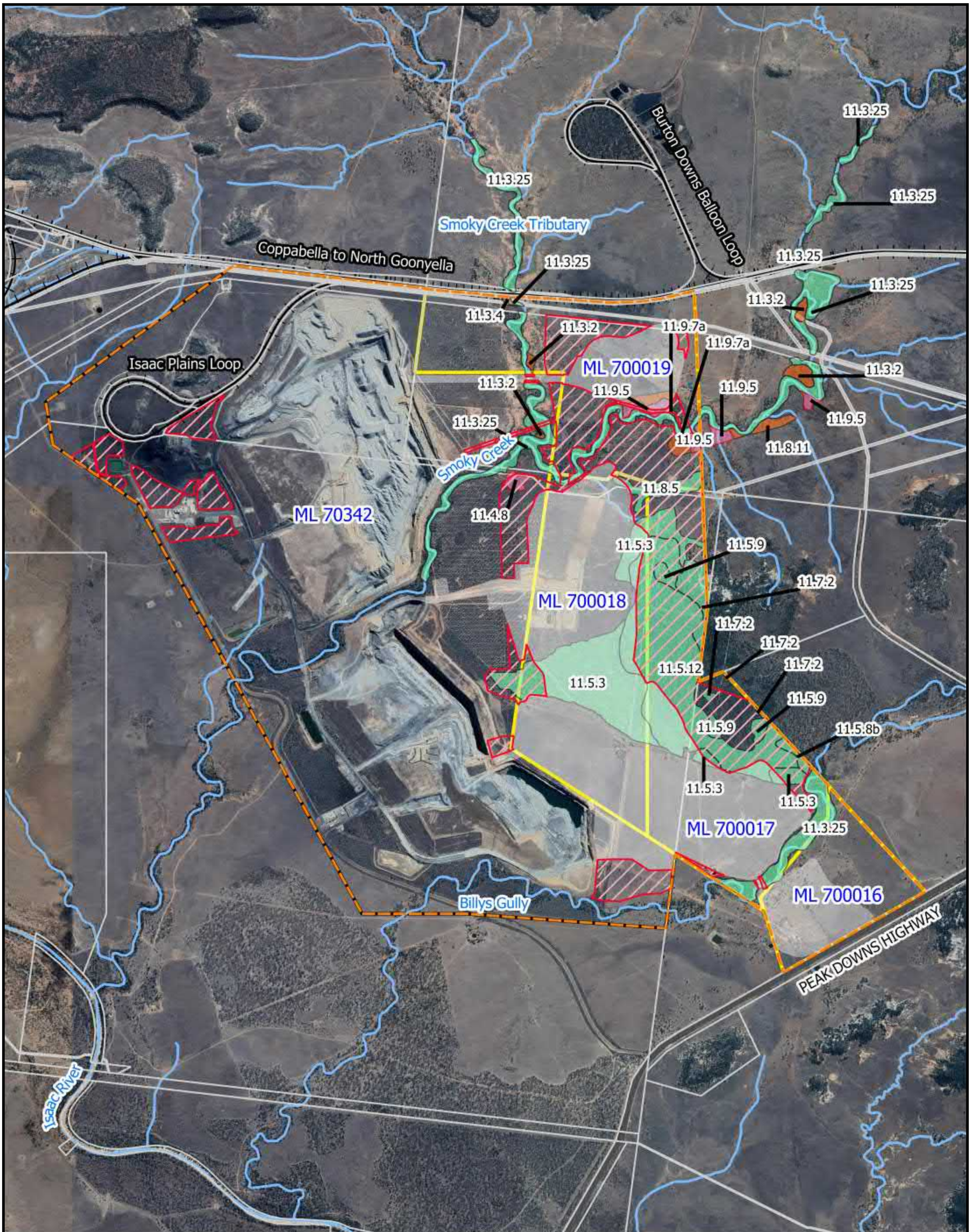
DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020; The State of Queensland (Department of Natural Resource and Mines) 2020;

Figure 1: Mine and Offset Site Context

Legend

- Towns
- Highways
- Roads
- Rail Network
- Isaac Plains East
- Mount Spencer (Lot 4SP277438)

BASE/



0 1 km

Scale @ A3: 1 : 40000
Date: 24/07/2020
Drawn: Josh T

DATA SOURCE
BASE CONSULTING GROUP 2020; QSPATIAL 2020
The State of Queensland (Department of Natural Resource and Mines) 2020

Figure 2: Regional Ecosystems Within The Disturbance Footprint

Legend

- Railway
- Watercourses
- Highways
- Isaac Plains Complex
- Existing Isaac Plains Mine
- IPE Mine Lease
- IPE Impact Area
- IPE Extension Project Area

Regional Ecosystem

- Remnant Vegetation: Least Concern
- Remnant Vegetation: Of Concern

High Value Regrowth

- Endangered

BASE/

The responsible Department for the Approval was the Commonwealth Department of Environment and Energy (Department), later renamed to the Department of Agriculture, Water and the Environment (DAWE) who were the responsible Department for the Period of the Report. Further references in this report use the term "Department" to describe the Department or DAWE. On the 1st of July 2022 (post the period of this Report) the responsible Department for EPBC Matters became the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Extension of the Isaac Plains East Project was undertaken and approved under the EPBC Act (EPBC 2019/8548) separate to the Approval being the subject of this Report.

The action subject to the Approval officially commenced on the 9th of June 2018, subsequently this report is the fourth report and covers the period of the 9th of June 2021 to the 8th of June 2022.

The Approval relates to the EPBC Act Controlling Provisions:

- Listed threatened species and communities (sections 18 & 18A); and
- Water resources/trigger (sections 24D & 24E).

Specifically, the Approval addresses:

- Clearing of habitat for Koala (*Phascolarctos cinereus*), Squatter Pigeon (Southern) (*Geophaps scripta scripta*), Greater Glider (*Petauroides volans*) and Ornamental Snake (*Denisonia maculata*); and
- Monitoring of surface water, groundwater and riparian zone.

The Approval contains requirements for offsets under the *EPBC Act Environmental Offsets Policy*, including development of a Species Management Plan (SMP) outlining management and monitoring actions to minimise any impact to Listed threatened species under the EPBC Act. The Approval also requires development of an Offset Area Management Plan (OAMP).

1.2 Habitat Impacts and Offset area

Offset areas are required by the Approval to compensate for the habitat clearing required for the Isaac Plains East Project and include impacted habitat for the Koala (125 ha), Greater Glider (125 ha) and Squatter Pigeon (74 ha).

An initial OAMP (Base 2018) for Isaac Plains East included suitable offset area. The initial proposed offset area identified was on Byrne Valley Station near Ayr in North Queensland. However, the negotiation process for securing this offset, undertaken during the period of previous Annual Compliance Reports, was unsuccessful. The Department was routinely engaged on the matter. Subsequent to the above, a variation to the Approval (14th of August 2020) was granted in order to allow sufficient time for securing the relevant offset in accordance with Condition 6 (see **Section 1.1**).

Negotiations to secure a new offset to address the above habitat impacts at Mt Spencer (approximately 23 km east of Nebo) were successfully completed within the period of the previous Annual Compliance Report. A new OAMP (BASE 2020) was developed to reflect Mt Spencer offset, signed by Stanmore and the Landholder prior to submission to the Department for approval. Approval of the OAMP was received on the 21st of May 2021. The offset areas for the separate Isaac Plains East Extension (IPEE) EPBC Approval (2019/8548) and the Isaac Downs Project EPBC Approval (2019/8413) are located adjacent to the IPE offset area at Mt Spencer. Legal Securing of the Offset Area commenced on the 15th of October 2021 and was completed on the 3rd of December 2021.

2 Audit Methods

The key site contact was Stanmore's, Acting Senior Advisor – Health, Safety, Environment and Community (HSEC), Dante Mude.

The Audit was conducted by SLR Principal Consultant, Paul Tett. Paul has in excess of 30 years' experience as an environmental professional associated with the mining and industrial sectors, including more than 11 years as a site based environmental practitioner, with the balance as a consultant focused primarily on mining and industrial projects. Paul is an experienced auditor having undertaken multiple compliance audits of mining and industrial operations. In addition, Paul has completed Environmental Management System (EMS) Auditor (ISO14001:2015) training, is a Member of the Australasian Institute of Mining and Metallurgy (AusIMM) and the Environment Institute of Australia and New Zealand (EIANZ). Paul is a Certified Environmental Practitioner (CEnvP) (Number 0638) and Queensland Commissioner for Declarations.

The audit was conducted through sourcing key site documents from Stanmore staff. The audit protocol was developed based on the conditions of the Approval and used as the primary basis for questioning and evidence gathering. Audit tables for the SMP and OAMP implementation are provided (**Appendix A**).

A site visit to the Isaac Plains Complex was undertaken by the auditor on the 20th of July 2022 during which interviews and evidence gathering were undertaken. A site inspection of the Isaac Plains East disturbance footprint was undertaken as part of the site visit.

The following staff were interviewed throughout the audit process:

- Dante Mude - Stanmore Acting Senior Advisor – Health, Safety, Environment and Community (HSEC);
- Justin See – Stanmore Site Superintendent;
- Andy Hadfield - Superintendent Mine Planning; and
- Todd Myers – Technical Services Manager, EPSA (Mining Contractor).

Selected photographs taken during the site visit are included in **Appendix B**.

Compliance status for each Approval Condition was determined in accordance with the rankings in **Table 1**.

Table 1: Audit Rankings

Rankings	Description
C - Compliant	Evidence and or actions completed, signifies compliance with the intent and/or requirement of the condition. Where applicable qualifying text is included.
NC – Non-Compliant	Evidence indicates that a specific requirement of the condition has not been met.
NA - Not Applicable	Requirement was not triggered within the period of the Annual Compliance Report, or the requirement was met prior to the reporting period.

2.1 Limitations

The Report reflects the audit findings based on preliminary questioning, visual inspections undertaken during the site visit, interview responses received during the site visit, follow up questioning post site visit and information contained in the verifying/supporting documentation provided.

2.2 Declaration of Accuracy

In making this declaration, I am aware that sections 490 and 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed

Full name (please print) Paul Tett (BSc (AES), Member AusIMM, Member EIANZ, CEnvP (0638))

Position (please print) Principal Consultant (Environmental Assessment and Management)

Organisation (please print including ABN/ACN if applicable) SLR Consulting Australia Pty. Ltd. (ABN: 29 001 584 612)

Date 8th of September 2022

3 Key Findings and Observations

For the period of the Annual Compliance Report, Stanmore was compliant (as qualified) with all relevant conditions of the Approval.

There were nine “Not Applicable” findings made during the audit.

No new environmental risks relative to the Approval were identified during the reporting period.

Staff interviewed throughout the audit process demonstrated sound understanding of the Approval requirements and the operational system controls required to ensure compliance with the conditions of the Approval. Management commitment to compliance with the Approval was evident.

Observations:

Condition 3 - T*he EPSA Induction Package was sighted during the site visit and it was noted that it lacked reference to the EPBC MNES and site requirements (including weeds and pests, machinery washdown, roads & tracks significant fauna, etc.). It is suggested that relevant EPBC information from the Stanmore induction be included in the EPSA site induction.*

Condition 5 - *It is suggested that a Template is developed which includes all required Visual Observations of the OAMP Table 20 and use as a run sheet for quarterly Phone Meetings with the landholder.*

4 Detailed Findings

Table 2 details the findings of the audit relative to each Approval condition.

Table 2: Detailed Audit Findings

Condition Number	Condition	Findings	Compliance Status
Conditions specific to the action			
Clearance limits			
1	The approval holder must undertake the action within the **Isaac Plains East Project Area**.	During the period applicable to this Compliance Report the action had been undertaken in the Isaac Plains East Project area and within the Project Disturbance Boundary and Additional Disturbance (pipelines and roads) areas shown in Attachment A of the Approval. During the site visit, limit of disturbance markers were observed and no disturbance beyond the limit of disturbance (inclusive of the IPEE approved disturbance) was identified. Mine plans showing the limits of disturbance were also observed. No incidence of clearing outside the approval areas had been recorded during the audit period. ***Evidence:*** Field inspections, limit of disturbance markers, fencing and pegging, Environmental Authority (EPML00932713 – 16th of June 2021), Mine plans showing limits of disturbance, PTD (167, 168, 169, 170, 171, 173, 175).	C
2	The approval holder must not clear more than: *a.* 125 hectares (ha) of habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans);* b. 74 ha of Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat; and c. 1.4 ha of Ornamental Snake *(Denisonia maculata)* habitat.	Mapping of habitat clearing areas within the Approval boundary for each of the listed species was reviewed and a small increase in clearing had been recorded during the Report period due to disturbance related to Permits to Disturb (PTD) 168 and 170. Site records at 28/02/2022 (post DPs 168 and 170) were as follows: • Koala and Greater Glider = 115.6 ha; • Squatter Pigeon = 71.8 ha; and	C

Condition Number	Condition	Findings	Compliance Status
		• Ornamental Snake habitat = 0 ha Field inspections by site environment staff were used to verify clearing had not taken place outside of approval constraints. Clearing limit boundaries were delineated as being flagging, fencing, and pegging. ***<u>Evidence:</u>*** *Field inspections, IPCM EPBC Land Clearing Email (13/03/2022 - Forwarded to P. Tett by D. Maude 20th of July 2022), PTDs (167, 168, 169, 170, 171, 173, 175).*	
Species Management Plan			
3	The approval holder must submit a Species Management Plan for the written approval of the **Minister**. The approved Species Management Plan must be implemented. The Species Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and include: a. measures that will be implemented to avoid, mitigate and manage **impacts** to **EPBC Act listed threatened species** and their habitat during vegetation **clearance**, construction, operation and decommissioning of the action; b. a program of monitoring and periodic evaluation of monitoring data to determine the effectiveness of management measures and inform adaptive implementation of the Species Management Plan for the duration of this approval; and c. details of how proposed management measures take into account relevant **approved conservation advices** and are consistent with the measures contained in relevant **recovery plans** and **threat abatement plans**.	The SMP was prepared by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). The SMP was prepared in accordance with the Department's Environmental Management Plan Guidelines. Sections 4.0 and 4.7 of the SMP include measures to avoid, mitigate and manage impacts to threatened species and their habitat throughout all stages of the Project - (a). Section 5.0 of the SMP provides a program of monitoring and evaluation to assess effectiveness of the management measures – (b). Section 4.0 and 4.7 of the SMP provide details of how management measures relate to approved conservation advices, recovery plans and treat abatement plans – (c). The initial version of the SMP (28/09/2018) approved by the Department remains current.	C

Condition Number	Condition	Findings	Compliance Status
		The SMP was implemented during the period of this Report (**Appendix A**). ***<u>Observation</u>*** *the EPSA Induction Package was sighted during the site visit and it was noted that it lacked reference to the EPBC MNES and site requirements (including weeds and pests, machinery washdown, roads & tracks significant fauna, etc.). It is suggested that relevant EPBC information from the Stanmore induction be included in the EPSA site induction.* *<u>Evidence</u>: SMP, copy of letter dated the 21st of November 2018 from the Department, CV of Dr Craig Streatfeild (suitably qualified person) who prepared the SMP, Site induction Packages and Department Environmental Management Plan Guidelines.*	
4	The approval holder must not **clear habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** or **Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat** or **Ornamental Snake *(Denisonia maculata)* habitat** until the **Minister** has approved the Species Management Plan.	The SMP was approved prior to clearing for the project. An additional 0.7 ha of Koala and Greater Glider Habitat and 0.4 ha of Squatter Pigeon habitat were cleared within the approval area during the period of the Report (see condition 2 finding). ***<u>Evidence:</u>*** PTDs *(167, 168, 169, 170, 171, 173, 175)*, IPE Offset Area Management Plan (EPBC 2016/7827), Species Management Plan approval clarification email, *IPCM EPBC Land Clearing Email (13/03/2022 - Forwarded to P. Tett by D. Mude 20/07/2022).*	C
Offset Management Plan			

Condition Number	Condition	Findings	Compliance Status
5	The approval holder must submit an Offset Management Plan for the written approval of the **Minister**. The approved Offset Management Plan must be implemented. The Offset Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and include: a. details of environmental offset/s to compensate for the habitat suitable for the Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) and Greater Glider (*Petauroides volans*) and Squatter Pigeon (Southern) (*Geophaps scripta scripta*) habitat to be cleared as identified in condition 2. b. details of how the proposed offset/s and Offset Management Plan meet the requirements of the **EPBC Act Environmental Offsets Policy**; c. a field validation survey and baseline description of the current condition (prior to any management activities) of the offset area/s, including existing vegetation, for **habitat suitable for the Koala (*Phascolarctos cinereus*) (combined populations of Qld, NSW and the ACT) and Greater Glider (*Petauroides volans*)** and **Squatter Pigeon (Southern) (*Geophaps scripta scripta*) habitat**; d. a description and map (including **shapefiles**) to clearly define the location and boundaries of the proposed offset area/s, accompanied by the **offset attributes**; e. information about how the proposed offset area/s provide connectivity with other relevant habitats and biodiversity corridors;	As discussed in Section 1.2, the initial OAMP became redundant during the 2020 Compliance reporting period. A new OAMP was prepared by BASE Consulting Group (19th of November 2020), submitted to the Department and approved by the Department on the 21st of May 2021. The new OAMP relates to the Mt Spencer Station Offset area. Offsets to address these requirements were pursued at Mt. Spencer (approximately 23 km east of Nebo). The Department was progressively informed of the circumstances surrounding the initial OAMP and development of the new OAMP. The OAMP was prepared by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). The OAMP was prepared in accordance with the Department's Environmental Management Plan Guideline. Section 4.3 of the OAMP addresses details of the offsets to compensate for MNES species habitat clearing – (a). Section 4.7 of the OAMP addresses the requirements of the EPBC Act Environmental Offsets Policy – (b). Sections 3.0 and 4.0 and Appendices B, C and D of the OAMP detail the field validation baseline survey for offset areas – (c). Sections 1.2 and 3.2 and Figures 3 to 7 of the OAMP describe and map proposed offset areas – (d). Section 4.3 of the OAMP provides information on habitat connectivity of the proposed offset areas relative to other habitat and corridors – (e).	C

Condition Number	Condition	Findings	Compliance Status
	f. a description of the management measures (including timing, frequency and duration) that will be implemented in each offset area/s; g. a discussion of how proposed management measures take into account relevant **approved conservation advices** and are consistent with the measures contained in relevant **recovery plans** and **threat abatement plans**; h. completion criteria and performance targets for evaluating the effectiveness of Offset Management Plan implementation, and criteria for triggering corrective actions; i. a program to monitor, report on and review the effectiveness of the Offset Management Plan; j. a description of potential risks to the successful implementation of the offset/s, and contingency measures that would be implemented to mitigate against these risks; and k. details of the mechanism to **legally secure** the environmental offset/s.	Sections 5.0 and 6.0 of the OAMP describe management measures to be implemented in offset areas – (f). Sections 4.0 and 5.0 of the OAMP discuss how management measures account for relevant approved conservation advices and are consistent with recovery plans and treat abatement plans – (g). Section 5.1 of the OAMP addresses completion criteria and performance targets for evaluating effectiveness of the OAMP implementation or triggering corrective actions – (h). Section 7.0 and 8.0 of the OAMP discuss monitoring and reporting to review OAMP effectiveness – (i). Sections 8.0 and 9.0 of the OAMP describes risks to the OAMP implementation and contingency measures to mitigate risks – (j). Sections 4.6 and 8.3 of the OAMP provides details of mechanisms for legally securing offsets – (k). Appendix A addresses compliance with the monitoring requirements of the OAMP (Table 20 of the OAMP). It is considered that Stanmore is compliant with this condition. ***<u>Observation</u>*** *<u>– It is suggested that a Template is developed which includes all required Visual Observations of the OAMP Table 20 and use as a run sheet for quarterly Phone Meetings with the landholder.</u>* *<u>Evidence</u>: OAMP, copy of letter dated 21st of November 2018 from the Department (DAWE 2021b), CV of Dr Craig Streatfeild (suitably qualified person) who prepared the OAMP, Department Environmental Management Plan Guidelines, Letter from Department approving the OAMP.*	

Condition Number	Condition	Findings	Compliance Status
6	The approval holder must **legally secure** the environmental offset/s within two (3) years from the **commencement** of the **clearance** of **habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** and **Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat.**	Three years from the commencement of clearing (the action) was the 25th of October 2021. DES (2022) states: "The *Environmental Offsets Act 2014* outlines that an environmental offset may be legally secured through any of the following mechanisms: • an environmental offset protection area under the *Environmental Offsets Act 2014;* • a voluntary declaration under the *Vegetation Management Act 1999* (VM Act)*;* • a protected area (including a nature refuge) under the *Nature Conservation Act 1992* • another mechanism specified under the regulation, (including a statutory covenant) under *the Land Act 1994* or *Land Title Act 1994;* • a fish habitat area under the *Fisheries Act 1994* or, • a highly protected zone of a marine park declared under the *Marine Parks Act 2004*."	C (qualified)

Condition Number	Condition	Findings	Compliance Status
		A voluntary declaration under the VM Act (Sections 19E to 19L) had been secured for the IPE Offset Area and a Notice of Declaration (2021/003927). The Declaration was issued on the 3rd of December 2021, which was outside the three year requirement of the condition for "legally securing". However, the Notice of Declaration (Section 1.2) notes Date Request Received as the 15th of October 2021 which was within three years of the commencement of the action. Whilst potentially technically not "legally secured" within three years of commencement of the action, the application was in regulatory process to achieve the required outcome at the 25th of October 2021. As there is no apparent statutory timeframes listed under Sections 19E to 19L of the VM Act, it is therefore considered that the intent of this condition has been complied with. The declaration includes the following documents: • Declared Area Map Declared area map DAM 2021/003927; and • Voluntary Declaration Management Plan – IPE offset area within Lot 4 SP277438 (13/7/2021) and associated Isaac Plains East – Offset Area Management Plan: EPBC 2016/7827 (Rev 6, 5 May 2021). <u>Evidence</u>: *Notice of Declaration (2021/003927) ss19E – 19L of the Vegetation Management Act 1999, Declared Area Map DAM 2021/003927 and Voluntary Declaration Management Plan for the IPE offset area within Lot 4 SP277438.*	
7	The approval holder must not **clear habitat suitable for the Koala *(Phascolarctos cinereus)* (combined populations of Qld, NSW and the ACT) and Greater Glider *(Petauroides volans)*** and **Squatter Pigeon (Southern) *(Geophaps scripta scripta)* habitat** until the **Minister** has approved the Offset Management Plan.	Not applicable to the period of this Annual Compliance Report – Found compliant in previous Annual Compliance Reports.	NA

Condition Number	Condition	Findings	Compliance Status
		<u>*Evidence*</u>*: 21st of November 2018 letter from Department to Stanmore Clarifying approval of OAMP as at 02 October 2018, Letter from DAWE approving revised OAMP (25 May 2021).*	
Surface water management			
8	In addition to the surface water quality monitoring requirements of the Environmental Authority issued for the action under the *Environmental Protection Act 1994* (Qld) (EP Act), the approval holder must construct, operate and monitor an additional surface water quality monitoring point at the Isaac River above the confluence with Smoky Creek prior to **commencement** of the action.	Construction - Not applicable to the period of this Annual Compliance Report – Found compliant in previous Annual Compliance Reports. During the Audit inspection, a field inspection of the automatic sampler above the smoky creek confluence was undertaken. This inspection confirmed the sampler was in sound operating order and monitoring records indicate ongoing maintenance. ***<u>Evidence:</u>*** *Environmental Authority (EA) for the site, Email correspondence re: water quality station installation 7th of May 2019 from Melanie Ballantine (Stanmore) to Chris Oats (Department Compliance Monitoring Team), Confirmation email from Melanie Ballantine to the Auditor 17th of July 2019, July 2022 field inspection by Auditor, Data Summary Reports for the reporting period(ALS).*	C
Groundwater monitoring and management			
9	The approval holder must publish annual groundwater monitoring data, required to be collected by the Environmental Authority for the action under the EP Act, in the Annual Compliance Report required under condition 17.	The relevant versions of the EA took effect on the 6th of June 2019 and as amended 26th of February 2020 and 16th of June 2021 (relevant to the period of this Compliance Report). Condition C40 of the relevant EA requires development of a Groundwater Management and Monitoring Program – Previous Compliance Reports state" *A Groundwater Management and Monitoring Program was developed in accordance with C40* [with reference to relevant condition of the applicable EA] *and provided to DES on the 29 June 2018."*	C

Condition Number	Condition	Findings	Compliance Status
		Condition C41 of the relevant EA requires collection and annual review of monitoring data (by an appropriately qualified person) in accordance with the EA condition. The annual review applicable to the period of this report was the C&R 2021 Annual Groundwater Review which includes data for the 2021 calendar year) (**Appendix C**). Further raw groundwater analysis data for 2022 are included (**Appendix D**) to address the balance of data for the reporting period required to be published. C&R Consulting prepared the equivalent monitoring data report for the period applicable to the previous Annual Compliance Report and the consultant was found to be suitably qualified. (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). ALS Environmental are a National Association of Testing Authorities (NATA) accredited laboratory for the analysis undertaken. Condition C42 of the relevant EA prescribes the groundwater monitoring locations, frequencies and parameters. The Groundwater Management and Monitoring Program addresses these requirements. The Annual Groundwater Review applicable to the previous Annual Compliance Report (**Appendix C** of this report) was published with the 2020/2021 Annual Compliance Report as it addressed the full period of that Compliance Report. ***Evidence:*** Environmental Authority (EPML00932713), Ground Water Monitoring data (26/1/2021 to 19/1/2022), **Appendix C** and **Appendix D**.	
Riparian zone monitoring			

Condition Number	Condition	Findings	Compliance Status
10	Prior to the **commencement** of **mining activities,** a **suitably qualified person** must undertake ecological surveys in accordance with the **Department's** survey guidelines to determine the extent (in hectares) and **habitat condition** for **EPBC Act listed threatened species** in the **riparian area.** The approval holder must report its findings in the first Annual Compliance Report required under condition 17.	Ecological surveys were undertaken in April (17th to 20th) 2018 by Ecological Survey and Management (EcoSM) to determine the extent and habitat condition for EPBC Act Listed threatened species within the riparian area. A specific report addressing the extent and condition of the riparian habitat relative to the EPBC Act listed threatened species was produced, *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018. The report was included as Appendix D in the first Annual Compliance Report. The ecological surveys predated the commencement of action notification date (9th of June 2018). Previous Annual Compliance Reports found that the ecological survey was completed by a suitably qualified person (*A suitably qualified person is a person who has professional qualifications, training or skills and at least five (5) years of experience relevant to the nominated subject matters to give authoritative assessment, advice and analysis about performance relevant to the subject matter using relevant protocols, standards, methods and/or literature.*). ***<u>Evidence</u>***: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018, first Annual Compliance Report (August 2019).	C
11	For the duration of this approval, the approval holder must maintain the extent and **habitat condition** for **EPBC Act listed threatened species** in the **riparian area,** as determined by the ecological surveys required under condition 10.	The proposed monitoring regime nominated in the *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018 will be implemented to monitor habitat condition against the baseline established. The monitoring frequency proposed is every two years, with the first monitoring event was completed in early March 2021 to account for seasonal conditions which should be considered for valid comparison (baseline monitoring conducted in April 2018).	C

Condition Number	Condition	Findings	Compliance Status
		No monitoring was required during the period of this Report, and the next monitoring is due to be undertaken in March/ April 2023. The 2021 monitoring found *"For all four species there is no significant difference between the habitat quality scores returned and 2018 and the current assessment.", (EcoSM 2021)*. *<u>Evidence</u>: Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018, *Riparian Monitoring Report April 2021 (EcoSM 2021c).*	
12	If it is determined that the **habitat condition** for **EPBC Act listed threatened species** in the **riparian area** has not been maintained, the approval holder must notify the **Department** within one (1) month of determining that the **habitat condition** has not been maintained.	Not Triggered as 2021 monitoring found no significant difference between the habitat quality scores in the 2018 Baseline and the March 2021 assessment. ***<u>Evidence</u>***: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018, *Riparian Monitoring Report April 2021 (EcoSM 2021c).*	NA
13	Within 12 months of notification in accordance with condition 12, the approval holder must submit an Offset Management Plan for the written approval of the **Minister.** The approved Offset Management Plan must be implemented. The Offset Management Plan must be prepared by a **suitably qualified person** in accordance with the **Department's Environmental Management Plan Guidelines** and include: a. details of the environmental offset/s to compensate for the extent and habitat condition for EPBC Act listed threatened species in the riparian area not maintained as required under condition 11;	Not Triggered as Condition 12 has also not been triggered. ***<u>Evidence</u>***: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018, *Riparian Monitoring Report April 2021 (EcoSM 2021c).*	NA

Condition Number	Condition	Findings	Compliance Status
	b. details of how the proposed offset/s and Offset Management Plan meet the requirements of the EPBC Act Environmental Offsets Policy; and c. details of the mechanism to legally secure the environmental offset/s.		
14	The approval holder must **legally secure** the environmental offset/s within two (2) years from the date that the **Department** was notified in accordance with condition 12.	Not Triggered as Condition 12 has also not been triggered. ***Evidence***: *Isaac Plains East Project EPBC Act Baseline Riparian Monitoring* – July 2018, *Riparian Monitoring Report April 2021 (EcoSM 2021c).*	NA
Standard administrative conditions			
Notification of date of commencement of the action			
15	Within 20 days after the **commencement** of the action, the approval holder must advise the **Department** in writing of the actual date of **commencement.**	The commencement date of the action (9th of June 2018) was notified to the Department on the 27th of May 2018. *Evidence : Action commencement notification Email 27 May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au. and 27 June 2018, letter from the Department to Richard Oldham (Stanmore) acknowledging commencement date.*	C

Condition Number	Condition	Findings	Compliance Status
16	The approval holder must maintain accurate records substantiating all activities associated with or relevant to the conditions of approval, including measures taken to implement management plans required by this approval, and make them available upon request to the **Department.** Such records may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act,** or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the **Department's** website. The results of audits may also be publicised through the general media.	Evidence was sighted of commencement correspondence, PTDs, Spotter catcher and fauna inspection records, OAMP and SMP actions (**Appendix A**), water quality records, monitoring equipment maintenance records, dust monitoring records. It is understood that no records were requested by Department officers during the period of this report. ***Evidence***: *Action commencement notification, PTDs, Offset Management Plan and Species Management Plan implementation records, records of monitoring equipment maintenance, machinery inspection and weed hygiene records, dust monitoring records (https://stanmore.net.au/assets/operations/), nest box inspection records (ECOSM 2021b), Spotter Catcher Letter (ECOSM 2021a).*	C
17	Within three (3) months of every 12 month anniversary of the **commencement** of the action, the approval holder must publish a report (the Annual Compliance Report) on its website addressing compliance with each of the conditions of this approval, during the previous 12 months. Documentary evidence providing proof of the date of publication must be provided to the **Department** at the same time as the Annual Compliance Report is published. Reports must remain published for the life of the approval. The approval holder must continue to publish the Annual Compliance Report each year until such time as agreed to in writing by the **Minister.**	This report was prepared and will be published to the Stanmore Website within the timeframe applicable to this condition (by 9th of September 2022). Notification will be provided to the Department confirming upload of this report to Stanmore Website. The previous Annual Compliance Report for the period was located on the Stanmore Web Site (https://stanmore.net.au/sustainability/sustainability-reports/) (Confirmed 16th of August 2022). Advice of Report upload to the Stanmore Website was given to the Department on 08/09/2021 and acknowledged by the Department.	C (Pending - for this report)

Condition Number	Condition	Findings	Compliance Status
		<u>Evidence:</u> *This Report (pending upload to the Stanmore Website and notification to the department), Previous Annual Reports published on the Stanmore Website, Email from the department confirming receipt of 2020/2021 Compliance Report and notification re. publishing of report.*	
18	The approval holder must report any potential or actual contravention of the conditions of this approval to the **Department** in writing within five (5) business days of the approval holder becoming aware of a contravention.	Relative to the period of this Compliance Report no potential or actual contravention of conditions was found. ***<u>Evidence:</u>*** This Report	C
19	Upon the direction of the **Minister,** the approval holder must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister.** The approval holder must not commence the audit until the **Minister** approves the independent auditor and audit criteria in writing. The audit report must address the criteria to the satisfaction of the **Minister.**	No such direction has been received from the Minister. ***<u>Evidence:</u>*** Verbal (Dante Mude)	C
20	The approval holder may choose to revise a management plan approved by the **Minister** under condition 3 without submitting it for approval under section 143A of the **EPBC Act,** if the taking of the action in accordance with the revised plan would not be likely to have a **new or increased impact.** If the approval holder makes this choice it must: a. notify the **Department** in writing that the approved plan has been revised and provide the **Department**, at least four (4) weeks before implementing the revised plan, with: i. an electronic copy of the revised plan; ii. an explanation of the differences between the revised plan and the approved plan; and	Not Triggered as: • The SMP has not been revised since approval by the Department on the 2nd of October 2018. • The initial approved OAMP was replaced due to a change to offset location and the new OAMP was Approved by the Minister on the 21st of May 2021. ***<u>Evidence</u>****: SMP, OAMP, copy of the letter dated 21st of November 2018 from the Department, Letter from Department approving the revised OAMP (25th May 2021).*	NA

Condition Number	Condition	Findings	Compliance Status
	iii. reasons the approval holder considers that the taking of the action in accordance with the revised plan would not be likely to have a **new or increased impact**.		
20A	The approval holder may revoke its choice under condition 20 at any time by notice to the **Department.** If the approval holder revokes the choice to implement a revised plan, without approval under section 143A of the **EPBC Act,** the plan approved by the **Minister** must be implemented.	Not Triggered as Condition 20 has also not been triggered. ***<u>Evidence</u>****: SMP, OAMP, copy of the letter dated 21st of November 2018 from the Department, Letter from Department approving the revised OAMP (25th May 2021).*	NA
20B	If the **Minister** gives a notice to the approval holder that the **Minister** is satisfied that the taking of the action in accordance with the revised plan would be likely to have a **new or increased impact,** then: a. condition 20 does not apply, or ceases to apply, in relation to the revised plan; and b. the approval holder must implement the plan approved by the Minister. To avoid any doubt, this condition does not affect any operation of conditions 20 and 20A in the period before the day the notice is given. At the time of giving the notice, the **Minister** may also notify that for a specified period of time condition 20 does not apply for one or more specified plans required under the approval.	Not Triggered as Condition 20 has also not been triggered. ***<u>Evidence</u>****: SMP, OAMP, copy of the letter dated 21st of November 2018 from the Department, Letter from Department approving the revised OAMP (25th May 2021).*	NA
20C	Conditions 20, 20A and 20B are not intended to limit the operation of section 143A of the **EPBC Act** which allows the approval holder to submit a revised plan to the **Minister** for approval.	Not Triggered as Condition 20 has also not been triggered. ***<u>Evidence</u>****: SMP, OAMP, copy of the letter dated 21st of November 2018 from the Department, Letter from Department approving the revised OAMP (25th May 2021).*	NA

Condition Number	Condition	Findings	Compliance Status
21	If, at any time after five (5) years from the date of this approval, the approval holder has not **commenced** the action, then the approval holder must not **commence** the action without the written agreement of the **Minister.**	Not Triggered as the action commenced within 5 years of the date of approval. *Evidence: The Approval and action commencement notification Email 27th of May 2018 from Richard Oldham (Stanmore) to postapproval@environmenta.gov.au. and 27th of June 2018, letter from the Department to Richard Oldham (Stanmore) acknowledging commencement date.*	NA
22	Unless otherwise agreed to in writing by the **Minister,** the approval holder must publish all management plans referred to in these conditions of approval on its website. Each management plan must be published on the website within one (1) month of being approved by the **Minister** or being submitted under condition 20. All management plans must remain on the website for the lifetime of the approval unless otherwise agreed to in writing by the **Minister.**	The SMP and OAMP were approved outside the period of this Annual Compliance Report. (*Note: Both SMP and OAMP were published as at the 16th of August 2022).* The publishing date of the current OAMP is relevant to this Annual Compliance Report period, being required to be published to the Stanmore Website by the 25th of June 2021. The previous Compliance Report found that the current OAMP was published as at the 20th of August 2021 and the request to Stanmore's web site manager for replacement of the superseded version with the current version was emailed on the 7th of June 2021 (*Email, R. Oldham to K. Devin*). *Evidence: Previous Compliance Report, Stanmore website (accessed 20th of August 2021 and 16th of August 2022, Email, R. Oldham to K. Devin 07 June 2021.*	C (SMP) C (OAMP)

5 Reviewed Documentation

ALS Environmental, December 2021. *Isaac Plains Coal Mine Environmental Monitoring Data Summary Report*.

ALS Environmental, February 2022. *Isaac Plains Coal Mine Environmental Monitoring Data Summary Report*.

ALS Environmental, July 2021. *Isaac Plains Coal Mine Environmental Monitoring Data Summary Report*.

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ALS Environmental, October 2021. *Isaac Plains Coal Mine Environmental Monitoring Data Summary Report*.

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ALS Environmental, September 2021. *Isaac Plains Coal Mine Environmental Monitoring Data Summary Report*.

ALS Environmental, 02 September 2021. *ALS Hosted Stanmore Dust Monitoring Portal*. Viewed 02 September 2022.

Ausecology, January 2022. *Mt Spencer Offset: Isaac Plains East -EPBC 2016/7827 Ecological Condition Report 2021*.

Australian Government Department of Environment and Energy (Department), 28 February 2018. *Letter RE: Approval - Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827).*

Australian Government Department of Environment and Energy (Department), 14 August 2020. Letter RE: *Variation to Conditions Attached To Approval - Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*

Australian Government Department of Environment and Energy (Department), 6 August 2020. Letter RE: *Variation to Conditions Attached To Approval - Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2016/7827)*

Australian Government Department of Environment and Energy (Department), 4 December 2020. *Letter RE: Approval - Extension to the existing Isaac Plains Mine, near Moranbah, Queensland (EPBC 2019/8548).*

Australian Government, 16th June 2021, *Environmental Authority (EPML00932713)*

Base, 8 June 2022. *Mt Spenser Greater Glider Nest Box Installation Report.*

Base, March 2021. *Voluntary Declaration Management Plan for the Isaac Plains East Extension area within Lot 4 SP277438.*

Base, September 2018. *Isaac Plains East – Matters of National Environmental Significance Species Management Plan.*

Carter Newell Lawyers, February 2021. *Call option Deed for Offsets*.

C&R Consulting, July 2021. *Isaac Plains Coal Mine Rehabilitation Inspection proposal [2022].*

C&R Consulting, July 2021. *Isaac Plains Coal Mine Rehabilitation Inspection [Report].*

C&R Consulting, September 2022. *Isaac Plains Coal Mine Annual Groundwater Review [2021].*

Department of Agriculture Water and Environment (DAWE 2021), 25 May 2021. *Letter - EPBC 2016/7827: Isaac Plains East – Offset Management Plan* (approving revised OAMP).

Department of Environment and Science Website (DES 2022). *Declaring land as an Environmental Offset Protection Area,* https://www.qld.gov.au/environment/pollution/management/offsets/delivering-legal-security#:~:text=To%20legally%20secure%20an%20environmental,with%20any%20mandatory%20supporting%20documentation, viewed 16 August 2022.

Ecological Survey and Management, 2nd of September 2021 (EcoSM 2021a) – *Letter RE: Fauna Spotter Catching Works Isaac Downs.*

Ecological Survey and Management, 12th of November 2021 (EcoSM 2021b) – *Letter RE: Nest box inspection Isaac Plains Mining Lease.*

Ecological Survey and Management, April 2021 (EcoSM 2021c). *Isaac Plains East Project EPBC Act Riparian Monitoring – 2021.*

Email, (7th of June 2021). *Email from richard.oldham@stanmore.com.au to Karen.Devin@stanmorecoal.com.au. OMP on website.*

Email, (8th of September 2021). *Email from EPBCMonitoring@awe.gov.au to B. Parfitt (Stanmore) RE: Stanmore IP Coal Pty Ltd | EPBC 2016/7827 | Annual Compliance Report [SEC=OFFICIAL].*

Stanmore, Dust Monitoring Charts *Isaac Plains Complex - https://stanmore.net.au/assets/operations/.* Viewed 16th of August 2022.

Stanmore, 30th of April 2018. *Retention of Infrastructure Post Mine Life agreement Letter and Map (signed by Stanmore and background landholder 30th of April 2018*.

Stanmore, HSE Training Package.

Stanmore, April to June 2022, *Offset Area #1, #2 and #3 – Lot 4, Mt Spencer Station Report*.

Stanmore, January to March 2022, *Offset Area #1 & #2 – Lot 4, Mt Spencer Station Report*.

Stanmore, July to September 2021, *Offset Area #1 – Lot 4, Mt Spencer Station Report*.

Stanmore, October 2020, *Fire Break Map*.

Stanmore, October to December 2021, *Offset Area #1 – Lot 4, Mt Spencer Station Report*.

Stanmore, *Automatic Water Quality Monitoring Results.*

WRM Water and Environment Pty Ltd, 23rd of March 2018. *Isaac Plains Complex Water Management Plan.*

WRM Water and Environment Pty Ltd, 31st of March 2022. *Isaac Plains Complex Water Management Plan Review 2021.*

ViridIFC, 18th of November 2021, *Isaac Plains Coal Mine Dust Management Review, Dust Management Review.*

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APPENDIX A

Species Management Plan and Offset Management Plan Implementation–
Audit Tables

Species Management Plan and Offset Management Plan Implementation– Audit Tables

DM = Dante Mude – Acting Senior Advisor – Health, Safety, Environment and Community (HSEC).

Species Management Plan - Table 7. Measures to avoid/mitigate impacts to EPBC Act listed threatened fauna.

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
Limit or avoid loss of MNES and/or habitat for MNES.	• Clearing of habitat for MNES does not occur outside of the approved disturbance limits and does not exceed the disturbance limits detailed in Table 1 of this SMP. • No net loss of habitat for the Koala and Greater Glider outside of the approved disturbance limits. • No loss of permanent water sources for the Squatter Pigeon outside of the approved disturbance limits. • Rehabilitation of disturbed areas will be rehabilitated in accordance with the Project's Rehabilitation Management Plan.	• Infrastructure will be sited in accordance with the State and Commonwealth approval conditions. • Areas requiring vegetation removal will be clearly delineated to ensure disturbance to areas being retained is avoided. Limits of clearing are to be delineated using barricading or temporary fencing and signage prior to works commencing. Exclusion areas are to be clearly shown and labelled on all operational and management drawings and plans. GIS shapefiles will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations. • Where exclusion fencing is required, consideration shall be given to fauna movement, current land uses and worker safety requirements. • Permanent water sources for retention such as farm dams outside of the disturbance limits will be clearly delineated and shown and labelled on all operational and management drawings and plans • Avoid where possible and within the constraints of the mining schedule, impacting on MNES habitat during breeding periods through timing of clearing and creek disturbance activities to avoid the main breeding season of impacted MNES (i.e. mid dry season to wet season for Squatter Pigeon. • Prior to entry to the Project area, all site personnel including contractors shall be made aware via toolbox talks and site information sheets, of the sensitive environs they will be working in and around and be advised of specific limitations to construction works being undertaken in or adjacent to threatened fauna habitat. All staff and contractors will be required to report sightings of SMP relevant fauna in the activity area to the EO immediately. • An internal 'Permit to Disturb' system will be used by the EO to ensure that all clearing activities are authorised prior to disturbance. Conditions listed in the Permit to Disturb must be implemented. • The EO or delegate will routinely inspect the disturbance limit boundaries to ensure that no clearing	• Clearing of MNES habitat exceeds the approved disturbance limits in Table 1 of this SMP and/or occurs outside of the Project footprint as outlined in Attachment A of EPBC Act approval. • No disturbance to permanent water sources, which may provide habitat for Squatter Pigeons and Ornamental Snakes, outside of the disturbance areas. • Rehabilitation and decommissioning fails to meet the objectives of the Rehabilitation Management Plan.	• Fauna Spotter will monitor and record clearing activities and all fauna encountered. • The Environmental Officer (EO) will monitor and record the total area of MNES habitat cleared every quarter and assess against the disturbance limits outlined in Table 1 of this SMP and the Project footprint as outlined in EPBC Act approval. • Auditing of the Permit to Disturb will be undertaken quarterly by the EO to ensure any disturbance has been undertaken in accordance with the requirements of the Permit to Disturb, this SMP and approval conditions and to ensure no unauthorised disturbance has occurred. • Rehabilitation monitoring will be undertaken in accordance with Rehabilitation Monitoring Plan that is required to be prepared in	• Should clearing of habitat for MNES exceeds the approved disturbance limits in Table 1 of this SMP and/or occurs outside of the Project footprint, clearing, works are to cease immediately and DotEE notified of the incident within five business days. The incident will be recorded in the Project's environmental and incident reporting system register. • Following clearing, the area will be assessed within 20 business days by a suitably qualified expert with corrective actions provided to the DotEE via a Corrective Action Contingency Plan. • The Plan will include a schedule to implement the corrective actions. • Should rehabilitation and decommissioning fail to meet the objectives and completion criteria of the Rehabilitation Management Plan and the schedule outlined in Table 19 of the Project's EA, the reasons of the failure will be investigated. **Corrective Actions:**	• Infrastructure as per approvals. (*Field Observations*). • Limits of disturbance marked with signage, fencing, pegging, and flagging. Barbed wire fencing retained where possible, fencing lower strand located higher than standard to reduce the impact to fauna movement, pegging delineation, signage and bunting to define no go areas and clearing limits. (*Field Observations, Disturbance Permits*). • Requirements SMP and OMP addressed in the permits to Disturb. (*Permits to Disturb*). • Permits to disturb prepared and signed off prior to clearing. Mine planners, supervisors and spotter catchers sign on to permits. Clear delineation of clearing boundaries in field evident. Post clearing field inspections undertaken by Belinda Parfitt (preceding DM tenure) to ensure permit requirements are observed (*Dante Mude*). • Limits of disturbance shown on operational drawings, dams defined in Water Management Plan. *(Operational drawings, Permits to Disturb, Water Management Plan and Water Management Plan Review).* • Water Infrastructure retention agreement and plan in place. *(Retention of Infrastructure Agreement).* • Timing of disturbance was generally outside breeding (Mid Dry to Wet) season for Squatter Pigeon. (*Disturbance Permits*).

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
		or disturbance of vegetation or habitat beyond the approved limits has taken place. • Temporary stockpile sites for soil and equipment, access routes, laydown areas and other associated infrastructure will be located in cleared areas and will not be situated in areas of MNES habitat. • Prior to construction activities commencing, signage, including speed limits, will be erected in the vicinity of exclusion areas to warn of the potential presence of threatened fauna in the area. • Pre-clearance surveys will be undertaken by a suitably qualified ecologist using approved State and Commonwealth survey guidelines within 48 hours before clearing activities commencing. • The pre-clearance survey will be undertaken in order to: • Record the location of all hollow bearing trees, log piles and nest using a GPS. Features of tree hollows (diameter, number and whether active/inactive) should be recorded in the Environmental Diary/Register; and • Relocate all captured non-breeding animals to suitable habitat adjacent to the disturbance area and within the Project Area. • A Fauna Spotter will be present for all clearing activities and will conduct a walk-through survey prior to commencement of clearing and prior to clearing works each day to check vegetation and other fauna habitats. • The Fauna Spotter will reinspect the area of cleared vegetation immediately after clearing to locate any potentially injured fauna that should then be taken to a wildlife carer or veterinarian. • Vegetation clearing will be undertaken progressively and trees will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat. • Hollow bearing trees will be clearly flagged and surrounding vegetation removed with the hollow bearing tree left standing for at least one night to encourage fauna to relocate of its own accord. Hollow bearing trees will be inspected to determine if hollows are occupied. • If after one night the resident fauna have not moved on, the hollow entrance will be blocked with a towel or		accordance with Condition F13 of the Project's EA (Appendix C).	• The Corrective Actions identified in the Corrective Action Contingency Plan and approved by DotEE will be implemented and may include additional rehabilitation or offsets or provision of additional permanent water sources for the Squatter Pigeon and/or Ornamental Snake prey. • Within 20 business days of a rehabilitation trigger being activated, a Contingency Plan will be developed by a suitably qualified expert to address the reason for the failure and identify appropriate Corrective Actions.	• The Environment and Community - Training Induction Package includes MNES considerations and injured fauna reporting. Information Sheets / Posters are routinely located in common gathering areas, including office areas such as the Technical Services Alerts Board. These posters are specifically distributed as clearing campaigns are initiated. (*HSEC Training Package, Information Posters, Green Guidelines Signs, Site Environmental Briefs*). • Permit to disturb system in use. (*Disturbance Permits*). • Spotter /catcher / Ecologist and (Clearing Contractor) attends site preclearing (24- 48 hours) and remains on site during clearing, they are provided with the GIS clearing boundaries and direct the clearing machinery. Boundaries are pegged and bunted. The Site Senior Advisor HSEC is routinely moving around the mine site and observes the cleared areas as a matter of course. (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing*). • Stockpiles are located outside of MNES habitat areas. (*Disturbance Permits, Field*). • The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*Field*). • Pre clearance surveys undertaken by qualified ecologist (EcoSM) prior to and concurrent with clearing. (EcoSM *Spotter catcher letter report 2nd of September 2021 addressing July and August 2021 clearing, Disturbance Permits).* • Hollow bearing tree locations, log piles and nests were recorded. (EcoSM

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		similar and the hollow removed by cutting below the hollow section. The hollow with the animal inside will then be installed in nearby similar and adjoining vegetation to be retained at a similar height and orientation with the entrance unblocked at dusk. • If the procedure described above is not possible for any reason, hollow-bearing trees will be felled using a tree grab or similar that can remove the tree in a controlled fashion. If possible and safe to do so, hollow trees will be felled at dusk to allow fauna the opportunity to disperse during their normal activity period. These trees will be felled away from hollow openings. The tree will be knocked at the base several times prior to felling to encourage fauna to relocate of their own accord. Once the tree is felled, it will be inspected for any fauna and any injured fauna rescued and taken to a wildlife carer or veterinarian. • Any fauna that is captured will be relocated into the adjacent habitat at least 200 m from the clearing area if clearing works are yet to be completed. • Where threatened fauna is identified and delaying the clearing of area is not feasible, (i.e. the clearing is critical to the activity schedule), a 50 m exclusion zone will be established and the area must not be disturbed for a minimum of 24 hours while clearing is undertaken around the exclusion zone. After 24 hours, a Fauna Spotter/Catcher may relocate the breeding animal to suitable habitat at least 200 m away from the disturbance area. Where survival of young or eggs is unlikely as a result of the disturbance, these are to be handed over to a previously identified wildlife carer or veterinarian.				*Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records*). • Animals were captured and relocated (and recorded) as required by Spotter catchers during clearing activities. (*EcoSM Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records*). • Spotter catchers undertook pre and post-clearing inspections. (EcoSM *Spotter catcher letter report EcoSM Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records*). • No injured native animals recorded at IPE during the period of the report). (*EcoSM Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing*). • Records show progressive clearing away from undisturbed habitat where possible. (*Disturbance Permits,* EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records, Field*). • Hollow bearing trees were flagged surrounding vegetation cleared and the tree left to stand overnight and inspected by the spotter catcher next day and any resident fauna relocated where possible prior to – felling in accordance with requirements. (*Disturbance Permits,* EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records, Field*). • Habitat trees were managed according to direction from ecologists. (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing*). • Fauna was relocated a minimum of 200 m away from clearing activities and locations recorded in the Fauna

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						Capture Records. (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records*). • No threatened fauna were identified during habitat clearing activities (outside the Approval boundaries). *(*EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing, Fauna Capture Records*). • Rehabilitation Monitoring was undertaken in June 2021 during the period applicable to this Compliance Report. A proposal for 2022 Rehabilitation Monitoring was sighted. (*C&R Consulting Monitoring Report- Draft - August 2021, C&R Consulting Proposal for 2022 Rehabilitation Inspection – July 2022*).
Prevent habitat degradation and a decline in habitat values within the retained habitat within the Project area.	Maintain habitat quality scores within the retained MNES habitat in relation to baseline habitat quality scores.	• Areas of MNES habitat adjacent to the disturbance footprint and within the Project area (i.e. mine lease), will be clearly delineated and shown and labelled on all operational and management drawings and plans. GIS shapefiles will be provided to clearing personnel and/or contractors prior to the commencement of clearing operations. • Site access is only to occur along designated site access tracks. No unauthorised access is permitted. • Prior to commencement of the action signage, including speed limits, will be erected to warn of the potential presence of threatened fauna in the area. • Posters will be developed and displayed in meeting areas that reminds staff and contractors about the MNES present in the Project area. • Prior to entry to the Project area, all site personnel including contractors shall be made aware via toolbox talks and site information sheets, of the sensitive environs they will be working in and around and be advised of specific limitations to construction and/or operational works being undertaken in or adjacent to threatened fauna habitat. All staff and contractors will be required to report sightings of MNES fauna to the EO immediately • Where tree hollows that are suspected as being used by Greater Gliders are identified from within the	The habitat quality score in areas of retained MNES are not maintained (e.g. habitat falls below the baseline habitat quality score).	• Habitat quality assessments will be undertaken annually for the first three (3) years then every two (2) years thereafter in retained vegetation that provides habitat for MNES including monitoring of the riparian area as required by Condition 10 of the EPBC Act approval. Monitoring will be undertaken in accordance with the Commonwealth survey guidelines and the State guidelines guide for determining terrestrial habitat quality. These methods are outlined in Appendix A and Appendix B.	• Where inadvertent disturbance to MNES habitat occurs, an investigation will be undertaken. • Should a decline in the habitat quality scores be observed, the cause will be investigated, and a Corrective Actions Contingency Plan will be developed by a suitably qualified ecologist within 20 business days of the decline being detected. The Plan will include appropriate corrective actions and an implementation schedule for those actions. The DotEE will be notified within 20 business days of the decline in habitat quality. **Corrective Actions:**	• Mine planning and Disturbance Permits files showing limits of disturbance and no go areas were prepared and provided to clearing contractors and spotter catchers. *(Disturbance Permits, Golding mine planning design*). • Environmental signage is located on main access roads. (Field). • The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*Field*). • Information Sheets / Posters are routinely located in common gathering areas, including office areas. These posters are specifically distributed as clearing campaigns are initiated. Custom bench seats have been constructed showing the MNES Species and are distributed around the administration and shift change bus stop areas (*Information Posters, Green Guidelines Signs, Site Environmental Briefs*). • Stanmore Induction (sighted during site visit) address designated tracks and roads, requirement for Disturbance Permits for development of new tracks or other disturbance and significant fauna. (*HSEC Training Package*).

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		disturbance area, they are to be salvaged to the greatest extent possible and relocated within retained vegetation. As far as practical, the site of the relocation is to be within retained vegetation and replicate the height and orientation of the original breeding or nesting structure. Sections of hollow branch or log will be secured in the new location by mechanical means deemed appropriate by the Fauna Spotter/Catcher (e.g. bolts, metal bands). Relocation is to be undertaken under the supervision of a spotter/catcher. • Selected trees and/or logs will be salvaged and reused as fauna habitat to enhance retained vegetation habitat values (e.g. within Smoky Creek and Billy's Gully). Trees and other habitat features to be salvaged will be identified and flagged by the Fauna Spotter/Catcher during the walk-through survey and/or clearance activities. • If an occupied tree hollow cannot be relocated the breeding habitat should be replaced nearby and in retained vegetation (but at least 200 m away from the disturbance area) in undisturbed habitat, with an artificial nesting structure at a ratio of 1:1 using current best practice nest box design. • Implementation of dust suppression techniques in accordance with the Dust Management Plan and the CMSHA and the CMSHR. • Maintenance of existing fences. • Pest animals and weeds will be managed in accordance with the Project's Weed and Pest Management Plan. • Light spill we be directed to the open cut pits to minimise light spill. • The use of low wattage lighting with list spill guards.			• Corrective actions identified in the Plan will be implemented within 30 days of the trigger being detected. Depending on the cause of the decline in habitat quality scores, potential corrective actions may include: ○ Rehabilitation of MNES habitat. ○ Additional environmental awareness training to workers regarding MNES. ○ Increasing pest animal and weed control measures or revising the type of measures implemented. ○ Increasing the frequency of dust suppression techniques. ○ Repair fences if damaged, or installation of new fencing. • Provision of additional offsets in accordance with the EPBC Act approval Condition 13.	***<u>Observation -</u>*** *the EPSA Induction Package was sighted during the site visit and it was noted that it lacked reference to the EPBC MNES and site requirements (including weeds and pests, machinery washdown, roads & tracks significant fauna, etc.). It is suggested that relevant EPBC information from the Stanmore induction be included in the EPSA site induction.* • To date no hollow trees associated with Greater Gliders have been recorded. (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing*, *Fauna Capture Records*). • Logs and hollows with habitat value have previously been salvaged during clearing campaigns. (*Field*). • 14 nest boxes have been installed in undisturbed habitat. (*Field, AusEcology 2018, Eco solutions and Management 2021)*. • Nest Box inspection was undertaken by a qualified ecologist during the reporting period (*Email - Michael O'Connor to Belinda Parfitt*). • Standard operating procedures require dust management in accordance with Dust management Plan and Health and Safety Legislation. (*Dust Management Plan*). • Fences are maintained in good order and the lower strand is located at approximately 600 mm above the ground to enhance fauna movement. (*Field*). • Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Weeds and Pests are managed according to the findings of rehabilitation monitoring, Weed and Pest Management Plan, and/or routine site inspections. This has included baiting for dogs and pigs and extensive spraying for Bellyache Bush. (*DM*).

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						• Light is directed towards operations which is generally away from undisturbed areas. (*Lighting plants field*).
Minimise risk of weed introduction and/or the spread of existing weed species in habitat area for MNES.	• No new weed species are established in areas of MNES habitat based on baseline data. • Spreading of weeds does not occur relative to baseline data.	• Weeds will be managed in accordance with the Project's Weed and Pest Management Plan. • The Plan will include the following: ○ A site induction program that provides weed management information to staff, contractors and visitors. ○ Detailed control measures aimed at eradicating where possible, or otherwise reducing the extent of weeds in accordance with the Queensland Department of Agriculture and Fisheries (DAF) guidelines and the requirements of the *Biosecurity Act 2014*. ○ Weed washdown procedures for all vehicles brought to site that will be traveling beyond the site office carpark. ○ Targeted weed control measures within the Project area.	• An increase in the average percent (%) cover score of weed species from baseline and/or previous monitoring events. • Detection of weed species not previously recorded in the Project area during baseline and/or previous monitoring events.	• Monitoring of weeds outside of the disturbance areas will be undertaken during the habitat quality assessment surveys using similar methodology to the baseline ecological survey (Appendix A) and the habitat quality assessment methodology (Appendix B) and will be undertaken annually for the first three (3) years then every two years (refer to Section 5.0 (of SMP)).	• Should an increase in weed cover or presence of new weed species be observed, an investigation will be undertaken to determine the cause. This will involve reviewing adherence to the Weed and Pest Management Plan and an assessment of the distribution of weeds within the Project area in relation to baseline to determine the cause of the incursions. • From the investigation, a Corrective Action Contingency Plan will be developed by a suitably qualified ecologist within 20 business days of the trigger being detected. The Contingency Plan will include appropriate corrective actions and an implementation schedule for those corrective actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected. • Potential corrective actions may include: ○ Increasing the frequency	• Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. Weeds and Pests are managed according to the findings of rehabilitation monitoring, Weed and Pest Management Plan, and/or routine site inspections. This has included baiting for dogs and pigs and extensive spraying for Bellyache Bush. (*DM*). • Stanmore Induction (sighted during site visit) address designated tracks and roads, requirement for Disturbance Permits for development of new tracks or other disturbance and significant fauna. (*HSEC Training Package*). ***Observation -*** *As Above.* • Machinery entering site is required to be clean and free from dirt. A Washbay is located onsite. (Heavy Vehicle Compliance Checklist, *Field (Washbay Inspection)*. • Weed treatment is undertaken as determined by site inspections and rehabilitation monitoring. (*DM)*. • Weeds and Pests are managed according to the findings of rehabilitation monitoring and or routine site inspections. (*DM).*

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
					and/or duration of weed control efforts. ○ Investigating and/or implementing alternate weed management control actions. ○ Amending weed hygiene practices. ○ Updating the Weed and Pest Management Plan.	
Reduce habitat degradation and potential predation on MNES by pest animals.	• No new pest animal species are established in areas of MNES habitat in comparison to baseline data. • Reduction in pest animal numbers in areas of habitat for MNES to below baseline levels.	• Pest animals will be managed in accordance with the Project's Weed and Pest Management Plan. • The Project's Weed and Pest Management Plan includes requirements for: ○ Appropriate waste management and waste disposal. ○ A reporting framework to ensure sightings of pest animals are recorded. ○ Site inductions to include information on pest animals including control requirements, importance of appropriate waste management and reporting requirements when pest animals are observed within the Project area during construction and operation activities. ○ Control of pest animals. • Pest management actions outlined in the Weed and Pest Management Plan will primarily focus on those pest animals identified within the Project area and include Cane Toads, Feral Cats, Wild Dogs, House Mice and European Rabbits and that have a potential to impact on MNES and their habitat. Additional pests will be included as necessary if identified as occurring within the Project area during the habitat quality monitoring program (European Foxes and Feral Pigs).	• Observed increase in sightings/signs and/or the relative abundance of pest animals in areas of retained MNES habitat above baseline levels. • Direct observation or signs of, a pest animal not identified as occurring within the Project area during the baseline surveys.	• Monitoring of pest animals in the retained MNES habitat will be undertaken using similar methodology (or an alternate methodology proposed by a suitably qualified ecologist) to the baseline ecological survey undertaken for the EPBC referral (Appendix A) as well as the habitat quality assessment methodology (Appendix B) and will be undertaken annually for the first three (3) years then every two (2) years thereafter (refer to Section 5.0(of SMP)). • Potential predation of MNES will also be assessed during the habitat quality	• Should evidence of pest animals show an increase compared to baseline, undertake an investigation to assess possible reasons for the increase (e.g. inappropriate waste management leading to increased pest animals). • Should predation of MNES be observed undertake an investigation to assess possible reasons for the incident(s). • Review adherence to the Project's Weed and Pest Management Plan. • From the investigation, a Corrective Actions Contingency Plan will be developed by a suitably qualified ecologist within 20 business days of the trigger being detected. The Contingency Plan will	• Stanmore Induction (sighted during site visit) address designated tracks and roads, requirement for Disturbance Permits for development of new tracks or other disturbance and significant fauna. (*HSEC Training Package*). ***<u>Observation -</u>*** *As Above.* • Weeds and Pests are managed according to the findings of rehabilitation monitoring, Weed and Pest Management Plan, and/or routine site inspections. This has included baiting for dogs and pigs and extensive spraying for Bellyache Bush. *(DM).*

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
		• Pest management will include a range of best management practice actions including shooting, trapping, fencing and baiting in and will be undertaken in accordance with site safety and health requirements, and DAF guidelines and the requirements of the *Biosecurity Act 2014* and as permitted under the SHMS.		scoring assessment and the riparian monitoring program (Appendix D) outlined above.	include appropriate corrective actions and an implementation schedule for those corrective actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected. • Potential corrective actions may include: ○ Increasing the frequency and/or duration of pest animal control efforts. ○ Investigating and/or implementing alternate pest animal control methods in consultation with DAF. ○ Updating the Weed and Pest Management Plan to include new species where relevant.	
Minimise impacts of dust deposition on habitat for MNES during construction and operation of the Project.	• Dust deposition does not exceed 120 mg per square metre per day, averaged over one month when measured at any sensitive receptor as outlined in	• Dust suppression will be undertaken in accordance with the Dust Management Plan and include the following actions: ○ Staging vegetation clearing to minimise areas of disturbed and bare ground. ○ Progressively rehabilitating disturbed areas. ○ Removal and dumping of overburden as soon as reasonably practical following blasting activities	• Dust deposition levels exceed 120 mg per square metre per day when averaged over one month at sensitive receptors. • Visual inspections of vegetation adjacent to the disturbance areas show visible	• Monitoring of dust deposition will be undertaken in accordance with Condition B2 and the Project's Dust Management Plan as required under Condition B5 of the Project's EA.	• In accordance with Conditions B3 and B4 of the Project's EA, if dust deposition monitoring exceed the trigger value of 120 mg per square metre averaged over one month, Stanmore must investigate whether the exceedance is a result of Project activities and notify the	• The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*Field*). • Dust monitoring is undertaken. *(Field).* • Standard operating procedures require dust management in accordance with Dust management Plan and Health and Safety Legislation. (*Dust Management Plan*). • Rehabilitation is being undertaken progressively, in accordance with

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	Condition B2 of the Project EA. • Dust is monitored in accordance with the Dust Management Plan which must be developed in accordance with Condition B5 of the Project's EA.	○ Regular watering of haul roads and access tracks in accordance with the CMSHR. ○ Dust suppression spraying of stockpiles. ○ Limiting grading and/or dozing in high dust generating areas. ○ Limiting overburden drilling. ○ Enforcing speed limits in accordance with the requirements of the CMSHA and CMSHR.	signs of dust deposition.	• Existing monitoring includes visual inspections of vegetation adjacent to the disturbance areas.	administering authority within seven days of the exceedance occurring. • Should an exceedance of dust deposition levels be attributed to Project activities Stanmore will implement dust abatement measures. **Corrective Actions:** • Corrective actions identified in the Dust Management plan will be implemented within 10 days of the trigger being detected.	legislative requirements. *(Field observations).* • Vegetation Clearing is conducted progressively to minimise bare areas. (*Field, Disturbance Permits*). • Rehabilitation is undertaken progressively in accordance with legislative requirements. *(Field observation of active rehabilitation*).
Minimise noise and vibration impacts in areas of MNES habitat.	When measured, noise and vibration levels do not exceed criteria set out in Tables 15 and 16 of the Project EA at sensitive receptors.	• Regularly maintaining and servicing all plant equipment to minimise machinery noise. • All engine covers will be kept closed while equipment is operating. • Blasting will only occur between 9am and 7pm.	• When measured at sensitive receptors noise and vibration levels exceed criteria set out in Table 15, Table 16 and Table 17 of the Project's EA. • When blasting occurs outside of the approved blast times.	• Noise and vibration monitoring will be undertaken in accordance with monitoring Conditions outlined in Section D of the Project's EA.	• In accordance with Conditions under Section D of the Project's EA, if noise and vibration monitoring exceed the trigger values outlined, Stanmore must investigate whether the exceedances are the result of the mining activities and notify the administering authority within seven days of the exceedance occurring. • Should exceedance levels be attributed to mining activities, noise and vibration abatement measures will be implemented. **Corrective Actions:** • Corrective actions identified during investigations will be implemented within 10 days of the trigger being detected.	• Machinery is maintained and operated appropriately; no uncharacteristically noisy plant was noted during the site visit. (*Field*).

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Minimise degradation of habitat for MNES from an increased risk of fire due resulting from Project activities.	No uncontrolled fires within the Project area resulting from Project related activities.	• Fire management for coal mining operations in Queensland is governed by the CMSHA and the CMSHR with the CMSHR prescribing management of fires for coal mines. • Section 37 of the CMSHR prescribes that the coal mines Safety and Health Management System (SHMS) must include standard operating procedures for action to be taken when a fire is discovered at the mine. • Buffers will be maintained around potential ignition sources such as plant and machinery, haul roads and mine infrastructure areas. • Prior to site entry, all relevant site personnel, including contractors, will be made aware of fire safety and risks. • Fuel loads will be minimised and managed through the weed control measures outlined in the Weed and Pest Management Plan.	• An uncontrolled fire occurs within the Project area that is due to mining activities. • Weed cover exceeds baseline levels and groundcover biomass (e.g. vegetation) exceeds benchmark levels.	• Compliance with the SHMS will be monitored in accordance with the requirements of the CMSHA and CMSHR. • Monitoring of biomass (groundcover including organic litter) for fire management will be undertaken during the habitat quality assessments that will occur annually for the first three (3) years then every two (2) years thereafter (refer to Section (refer to Section 5.0(of SMP)).	• Should an uncontrolled fire occur within the Project area, the Project's Emergency Response Plan will be enacted. Should any corrective actions and changes to fire management be required, they will be done in accordance with the CMSHA and CMSHR and incorporated into the SHMS. • Should biomass monitoring indicate that there is a risk of an uncontrolled fire occurring, biomass control measures will be assessed by a suitably qualified ecologist within 20 business days and Corrective Actions suggested. Biomass control measures aimed at reducing fuel loads may include controlled burns, strategic grazing or modified weed management measures. **Corrective Actions:** Any corrective actions identified will be implemented within 30 days of the trigger being detected.	• Fire management on site is in accordance with Health and Safety Legislation. Bush fire break plans are maintained (Fire Break Map). • Weeds and Pests are managed according to the findings of rehabilitation monitoring, Weed and Pest Management Plan, and/or routine site inspections. This has included baiting for dogs and pigs and extensive spraying for Bellyache Bush. (*DM, Previous Audit findings*).
Minimise alteration of Squatter Pigeon, Ornamental Snake and the riparian habitat from changes to water quality and hydraulic activity.	• Water quality does not exceed trigger levels and at any of the monitoring sites listed in the Tables in Condition C – Water.	• Site stormwater management will be undertaken in accordance with the management plans and programs required by the Project's EA including a Receiving Environment Monitoring Program (REMP) required under Condition C22, Water Management Plan (WMP) required under Condition C31 and an ESCP required under Condition C38. • The site specific WMP, REMP and ESCP as well as other water management requirements outlined in Section C	• Water quality monitoring exceeds the approved receiving environment trigger levels outlined in the REMP and in Table 7 of the Projects EA and mine affected water quality levels exceed the trigger levels	• Water quality monitoring will be undertaken in accordance with the REMP as required by Conditions C22 and C23 of the Project's EA. • Monitoring of the effectiveness of the	• In accordance with Condition C21 of the Project's EA, if water quality characteristics of the downstream monitoring point exceed trigger levels outlined in Table 7 of the EA, and these levels are higher than upstream monitoring locations,	• Water management is undertaken in accordance with the Water Management Plan and subsequent reviews. (*Water Management Plan and Review 2021, Field*). • The machinery wash-bay is a closed system and does not discharge offsite. (*Field (Washbay Inspection*).

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
	• Water quality monitoring is undertaken in accordance with the Receiving Environment Monitoring Program which must be developed in accordance with Condition C22 of the Project EA. • Erosion and sediment control is undertaken in accordance with the Erosion and Sediment Control Plan (ESCP) as required by Condition C38 of the Project EA.	of the Project's EA will be prepared by a suitably qualified person. • Required management plans will be developed with the aim of minimising alterations to receiving environment water quality erosion, minimising mobilisation of sediments and minimising erosion related disturbances to the current hydrological regime. • The maintenance and cleaning of any vehicles, plant or equipment must not be carried out in areas from which contaminants can be released into any receiving waters. • Spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or receiving waters.	outlined in Table 3 of the Project's EA. • Visual inspections of water management infrastructure show signs of failure.	erosion and sediment control devices and the water management will be undertaken in accordance with Conditions C32 of the Project's EA.	Stanmore must investigate the exceedance and the potential for environmental harm and provide a written report to the administering authority as part of the Project's Annual Return. • Should an exceedance of water quality trigger levels be attributed to Project activities, an assessment on the effectiveness of the WMP and REMP will be undertaken and appropriate Corrective Actions included in Plan revisions and the Annual reports as required under Conditions C24 and C33 of the Project's EA. **Corrective Actions:** • Corrective actions identified will be implemented within 10 days of the trigger being detected.	• Spill response and clean-up procedures and equipment are in place at site. (*Field).*
Minimise potential for mortality or injury to MNES from Project activities (e.g. habitat clearing, vehicle strikes etc.).	No mortality of, or injuries to, MNES as a result of Project activities (e.g. from clearing activities, vehicle strikes etc.).	• Environmental awareness training will be provided to all workers as part of site induction and will include specific topics on MNES, risks and protective measures, and identification of the MNES. • Pre-clearance surveys will be undertaken within 48 hours of clearing activities to assess the presence of MNES within the disturbance area to be cleared. • At least one qualified Fauna Spotter/Catcher will be present during clearing activities. • A wildlife carer will be called to collect any injured fauna. • Speed limits of 60 km/hour will be set and enforced on all internal roads including haul roads	Injury or mortality to an MNES	• All personnel will be required to be report any interactions between vehicles and/or /machinery and MNES in the Project area. • Visual observations during normal working hours. • Incidental observations during habitat quality assessments.	• Should an injury to, or mortality of, an MNES, an investigation will be undertaken to ascertain the cause of the injury or mortality. • Should the injury or mortality be attributed to mining activities, a Contingency Plan will be developed by a suitably qualified ecologist within 20 business days and will include Corrective Actions and an implementation	• Stanmore Induction (sighted during site visit) address designated tracks and roads, requirement for Disturbance Permits for development of new tracks or other disturbance and significant fauna. (*HSEC Training Package*). ***<u>Observation -</u>*** *As Above.* • The maximum site speed limit is 60 km\hr and signage is located throughout the site. (*Field*). • Spotter /catcher / Ecologist and (Clearing Contractor) attends site pre clearing (24- 48 hours) and remains on site during clearing, they are provided with the GIS clearing boundaries and direct the clearing machinery.

Habitat Management objectives	Performance criteria	Management and mitigation measures	Trigger for further action	Monitoring	Corrective actions	Audit Comments SLR July 2022 (Evidence)
		• Vehicles must abide by vehicle speed limits and access to any restricted areas or exclusion zones must be limited to critical site-specific activities to minimise threats to MNES. • All injured fauna encountered during the construction and operation of the activity will be taken to a wildlife carer/facility or veterinarian within 24 hours. • Where injured fauna is encountered, and it is unsafe to handle the animals, the following should be undertaken; ○ The location of the injured animal will be identified so it can be located again ○ The species of animal will be identified if possible and its sex and approximate size determined ○ The type of injury sustained will be identified if possible ○ The EO shall immediately contact Queensland's Department of Environment and Science (DES) and report the animal and arrange for its capture and transportation to a wildlife carer or veterinarian.			schedule for the Corrective Actions. **Corrective Actions:** • Corrective actions identified in the contingency plan will be implemented within 30 days of the trigger being detected.	Boundaries are pegged and bunted. The Site Senior Advisor HSEC is routinely moving around the mine site and observes the cleared areas as a matter of course. (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing)*. • Injured (none at IPE during report period) wildlife is directed to carers as required and record noted in Fauna Register (EcoSM *Spotter catcher letter report 2nd of September 2022 addressing July and August 2021 clearing)*.

Offset Management Plan (V5) - Table 20: Proposed monitoring schedule of offset area

Habitat Quality surveys undertaken by suitably qualified ecologists					Audit Comments SLR July 2022
Monitoring Type	**Monitoring Attributes**	**Monitoring Frequency**	**Monitoring Method**	**Monitoring Locations**	
Initial habitat quality assessment	Site condition, site context and species stocking rates as outlined in this OAMP.	Initial and baseline assessment was completed in July and October 2020.	Visual inspections and detailed habitat quality assessment as per the Guide and as outlined in this OAMP.	Assessment sites outlined in Section 7.2 (of OAMP).	Completed as part of OAMP
Ecological Condition	Recruitment of woody perennial species in the ecologically dominant layer (EDL)	Year 1 (following approval of this OAMP and securing the offset area), then every 5 years until the end of the approval.	As per the methods outlined in the Guide and in Section 4.1 (of OAMP). Visual observations and, where relevant, methods outlined in the Guide to determining terrestrial habitat quality and with reference to interim criteria as per Table 17 for the relevant RE and AU being monitored.		The OAMP was approved on the 21st of May 2021, however, the Offset was legally secured (Notice of Declaration) on the 3rd of December 2021. Therefore, the Ecological Condition Monitoring would be required by 3rd of December 2022. An Ecological Condition Report was completed for the IPE offset in January 2022 (*AusEcology 2022*).
	Native plant species richness – trees				
	Native plant species richness – shrubs				
	Native plant species richness – grasses				
	Native plant species richness – forbs				
	Tree canopy height				
	Tree canopy cover				
	Shrub canopy cover				

	Native perennial grass cover				
	Organic litter				
	Large trees				
	Course woody debris				
	Non-native plant cover (i.e. weeds)				
	Quality and availability of food and foraging habitat (e.g. tree canopy height and cover, organic litter, tree and shrub species richness).				
	Quality and availability of shelter (e.g. presence of tree hollows).				
Site context	Threats to species (e.g. lack of EDL recruitment, presence of feral animals and weeds etc.).				As above
	Threats to mobility capacity.				
Species stocking rates /targeted fauna surveys for the MNES	Presence/absence of MNES. MNES abundance and density (where relevant).	Every five (5) years until the completion criteria have been achieved. The survey frequency is justified as changes to vegetation communities and ecosystems and the fauna that inhabit those communities takes time and is generally a relatively slow process.	Refer to 4.1 (of OAMP).	Refer to 4.1 (of OAMP).	Due May 2026.
Nest boxes	Presence of Greater Gliders and functionality of each box.	Twice yearly for the first 5 years then yearly until the end of the approval.	Refer to Section 7.4 (of OAMP).	At nest box locations.	Not triggered - Nest Boxes were installed in March 2022 (Nest Box installation Report) and the first round of twice annual monitoring had yet to occur. (*Nest Box installation Report*).
Visual inspection surveys undertaken by the landowner or authorised landowner representative and targeted weed and feral animal surveys undertaken by suitably qualified ecologists.					
Photo points	General vegetation condition and vegetation cover.	Year 1 (following approval of this OAMP and securing the offset area), then every 5 years until the end of the approval.	Photographs of offset area to be taken from the same location and direction for each monitoring event.	Assessment sites outlined in Section 7.2 (of OAMP).	Undertaken routinely as part of land management activities throughout the year following approval of the OAMP (21st of May 2021). Quarterly land manager notes were reviewed (*July to Sept 2021, Oct to Dec 2021, Jan to March 2022 & March to June 2022*). Information on most of the required items was available in the notes. However, stocking rates were not noted in any of the notes. ***<u>Observation –</u>*** *<u>It is suggested that a Template is developed which includes all required Visual Observations of the OAMP Table 20 and use as a run sheet for quarterly Phone Meetings with the landholder.</u>*
Grazing	Stocking rates, ground cover and fencing.	Stocking rates will be routinely monitored until the end of the approval. Biomass will be monitored annually in the early dry season. Fencing will be monitored during routine land management of the offset area and at least quarterly.	Assessments of the offset area will be undertaken by the landowner/land manager or authorised representative to observe and record grass cover, presence of weeds and pest animals, evidence of fire and evidence of unauthorised access. Fire break and fence maintenance activities will be recorded for inclusion in the annual report. Any unplanned fires will also be recorded as well as monitoring results for any planned cool or mosaic burns on habitat. Weed cover will be recorded as per the Level 2B methodology described in the Land Manager's Monitoring Guide (DERM, 2010) (or any subsequent published version of this document or similar	Throughout the offset Area.	
Fire	Presence of fire and extent of burning. Condition of fire breaks.	At least quarterly and following known fire events. Biomass will be monitored annually in the early dry season.			
Feral animals	Presence of pest animals, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management.			

		Year 1 (following approval of this OAMP and securing the offset area), then every 5 years until the end of the approval.	recognised methods). This methodology is suitable for landowners to rapidly assess whether weed management measures need to be conducted within the offset area. Detailed assessments as outlined in Section 7.0 will also be undertaken in conjunction with the habitat quality assessments.		
Weeds/ pest plants	Presence of weeds, control measures undertaken and success of the control measures.	Visual inspections undertaken during routine land management. Year 1 (following approval of this OAMP and securing the offset area), then every 5 years until the end of the approval.			
Fencing and site access	Condition of fencing and access tracks.	Visual inspections undertaken during routine land management.			
Unauthorised impacts to vegetation from activities such as illegal harvesting and illegal access.	Unauthorised clearing or disturbances.	Visual inspections undertaken during routine land management and undertaken at least quarterly.	Observe and record accessibility to the offset site (i.e. condition of fencing), evidence and location of illegal clearing, fire and/or pest animal incursion.	Throughout the offset area and particularly along and adjacent to the road licence easement and the boundary to the Epsom State Forest.	Noted in Quarterly land manager notes.
Cyclone events	Condition and damage to vegetation and any dead or injured fauna.	Following cyclones or large tropical rainfall events.	Visual throughout the offset area.	Throughout the offset area.	Not relevant to the period of this compliance report.

APPENDIX B

Site Visit and Evidence Photos

Observed location	Field Image		
Automatic Water Quality Station			
Isaac River Access Point			

Approved Limit of disturbance markers and fencing	  
MNES Species Bench Seats	 

Groundwater dependent ecosystems monitoring location	 
MNES Species Habitat	 

Environmental Signage	 

APPENDIX C

Isaac Plains Complex 2021 Annual Groundwater Review – September 2022

C&R CONSULTING

Geochemical & Hydrobiological Solutions Pty Ltd

ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
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ISAAC PLAINS COMPLEX

2021 Annual Groundwater Review

REPORT PREPARED FOR:

stanmore IP Coal

Date: September 2022

IMPORTANT NOTE

Dr Chris Cuff	Dr Cecily Rasmussen
Director	Director
08/09/2022	08/09/2022
Date	Date

IMPORTANT INFORMATION

1. This report is prepared and written in the context of the proposals stated in the introduction to this report and its contents should not be used out of context. Furthermore new information, developing practices and changes in legislation may necessitate revised interpretation of the report after its original submission.
2. The copyright in the written materials shall remain the property of C&R Consulting but with a royalty-free perpetual licence to the client deemed to be granted on payment in full to C&R Consulting by the client of the outstanding amounts.
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4. Where data have been supplied by the client or other sources, including data from previous site audits or investigations, it has been assumed that the information is correct, but no warranty is given to that effect. While reasonable care and skill has been applied in review of these data, no responsibility can be accepted by C&R Consulting for inaccuracies in the data supplied.
5. This report contains only available factual data obtained for the site/s from the sources described in the text. These data were related to the site/s on the basis of the location information made available to C&R Consulting by the client.
6. The assessment of the site/s is based on information supplied by the client, and on-site inspections by C&R Consulting.
7. The report reflects both the information provided to C&R Consulting in documents made available for review and the results of observations and consultations by C&R Consulting staff.

SUMMARY OF RELEVANT INFORMATION

Project Title	2021 Annual Groundwater Review
Property Location	Isaac Plains Complex
Property Description	Open-cut coal mine
Project Purpose	Review the groundwater management and monitoring plan and the data collected in accordance with environmental authority Condition C41
Project Number	21096
Client's Details	
Nominated Representative	Dante Mude
Title/Position	Acting Senior Advisor (HSEC)
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Experience	9+ years
Affiliations	International Association of Hydrogeologists

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1. INTRODUCTION

1.1 OBJECTIVES

This document provides a review of the groundwater monitoring results from the Isaac Plains Complex (IPC) over the 2021 reporting period (2021 calendar year), as per the current environmental authority (EA; EPML00932713), effective from 16 June 2021.

The EA states that:

Condition C40: Monitoring and reporting

A Groundwater Management and Monitoring Program for all stages of the authorised mining activities on site must be developed, certified and implemented by a suitably qualified person;

a) have all determinations of groundwater quality monitoring and groundwater biological monitoring be performed by a suitably qualified person; and

b) be able to detect a change in groundwater quality values and levels due to activities that are part of the authorised mining activities.

***Condition C41**:*

The Groundwater Management and Monitoring Program required by Condition C40 and the data collected must be reviewed on an annual basis by a suitably qualified person. The review must:

a) include the assessment of groundwater levels and quality data;

b) assess the suitability of the groundwater monitoring network, including an assessment of whether groundwater parameter trigger values for compliance bores are required for all groundwater aquifers potentially impacted by the authorised mining activities; and

c) be in a report submitted to the administering authority within twenty-eight (28) days of receiving annual groundwater data.

***Condition C42**:*

Groundwater must be monitored at the locations and frequencies defined in Table 11: Groundwater monitoring locations frequency for the standing water levels and the parameters identified in Table 12: Groundwater contaminant triggers. Results and analysis of groundwater monitoring must be submitted annually to the administering authority with the report required by Condition C41(c).

Table 1: EA Table 11 – Groundwater monitoring locations and frequency.

Monitoring Point	Location		Surface RL	Hydro stratigraphic Unit	Screening interval (mbgl)	Monitoring frequency
	Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)				
Burton Coal Bore 2	620383	7573599	240.8	Rewan Group	30.3 – 34.6	Quarterly
Swamp Bore 1 (referred to as Swamp Bore 2 in the EA)	621518	7568790	245.9	Rewan Group	24.0 – 55.1	Quarterly
MB1	618793	7572214	236.4	Rangal Coal Measures	22.5 – 28.4	Quarterly
MB2	619074	7573137	242.7	Rangal Coal Measures	48.7 – 51.6	Quarterly
MB3	619047	7568473	253.0	Rangal Coal Measures	49.7 – 52.6	Quarterly
MB4a	620351	7567479	237.6	Quaternary Colluvium / Tertiary Sediments	7.8 – 10.7	Quarterly
MB4b	619740	7567253	233.9	Rangal Coal Measures	9.4 – 12.4	Quarterly
MB8	619105	7571149	245.9	Rangal Coal Measures	117.3 – 120.3	Quarterly
MB9	620368	7568049	239.5	Rangal Coal Measures	77.5 – 80.5	Quarterly
MB10	620368	7568046	239.5	Tertiary Basalt	21.0 – 27.0	Quarterly
MB11	618832	7571924	232.3	Tertiary Sediments	3.0 – 4.0	Quarterly
MB12	619210	7572000	239.5	Rangal Coal Measures	126.0 – 128.0	Quarterly
MB13	619367	7571035	249.7	Rangal Coal Measures	95.0 – 97.0	Quarterly
MB14	620263	7571132	257.3	Tertiary Basalt	20.0 – 23.0	Quarterly
MB15	620633	7568080	242.9	Rangal Coal Measures	115.0 – 119.0	Quarterly
MB16	620670	7568599	245.6	Tertiary Sediments	8.0 – 11.0	Quarterly

Table 2: EA Table 12 – Groundwater contaminant triggers.

Parameter	Unit	Trigger Values – Swamp Bore 1 (referred to as Swamp Bore 2 in the EA)	Trigger Values – Burton Coal Bore 2	Limit Type
Aluminum	µg/L	10	10	Maximum
Antimony	µg/L	1	1	Maximum
Arsenic	µg/L	2	4	Maximum
Calcium	mg/L	580	195	Maximum
Chloride	mg/L	3,500	2,050	Maximum
Carbonate	mg/L	1	7	Maximum
Total Dissolved Solids	mg/L	7,585	4,500	Maximum
Electrical Conductivity	µS/cm	9,500	7,320	Maximum
Bicarbonate	mg/L	94	820	Maximum
Iron	µg/L	1,000	230	Maximum
Magnesium	mg/L	165	265	Maximum
Mercury	µg/L	0.1	0.1	Maximum
Molybdenum	µg/L	1	1.0	Maximum
Total Petroleum Hydrocarbons C6-C9	µg/L	20	20	Maximum
Total Petroleum Hydrocarbons C10-C36	µg/L	50	50	Maximum
pH	–	7.1 – 7.8	7.0 – 8.3	Minimum / Maximum
Potassium	mg/L	25	8	Maximum
Selenium	µg/L	10	10	Maximum
Silver	µg/L	1	1	Maximum
Sulfate	mg/L	150	130	Maximum
Sodium	mg/L	1275	990	Maximum
Suspended Solids (Total)	mg/L	37	52	Maximum

1.2 Mine Location and Design

IPC is located within the Isaac Regional Council on both freehold and state leasehold land in Central Queensland, approximately 10 km to the north-east of Moranbah and 140 km south-west of Mackay (Figure 1). The project is situated immediately north of the Peak Downs Highway, between Moranbah and Coppabella, and has a rail loop off the south of the Goonyella Branch rail line (Figure 1).

IPC was placed in care and maintenance by Vale S. A. and Sumitomo Corporation in December 2014. In July 2015, ownership of the mine was transferred from Vale S. A. and Sumitomo Corporation to Stanmore IP Coal Pty Ltd (Stanmore), with mining operations recommencing in January 2016.

The original IPC mining lease (ML70342) comprises pits N1, N2, S1, S2 and S3. These pits are north of the Isaac River and upstream of the Isaac River-Smoky Creek confluence, with Smoky Creek bisecting the ML70342 lease area. Most mining at IPC is open-cut and based on a strip-mining technique, with waste removed by a combination of cast blasting, dozing, dragline spoiling and/or truck and excavator removal.

In 2018, Stanmore was granted the approval to commence additional open-cut operations in mining leases located to the east of the original ML70342 mining lease. This expansion of IPC operations into leases ML700016, ML700017, ML700018 and ML700019 commenced in the second half of 2018, and is referred to as Isaac Plains East (IPE).

Isaac Plains East Extension (IPEE) was granted Environment Protection and Biodiversity Conservation (EPBC) approval on 4 Dec 2020, including further land on leases ML700016, ML700017, ML700018 and ML700019. Operations commenced in these new areas in December 2020.

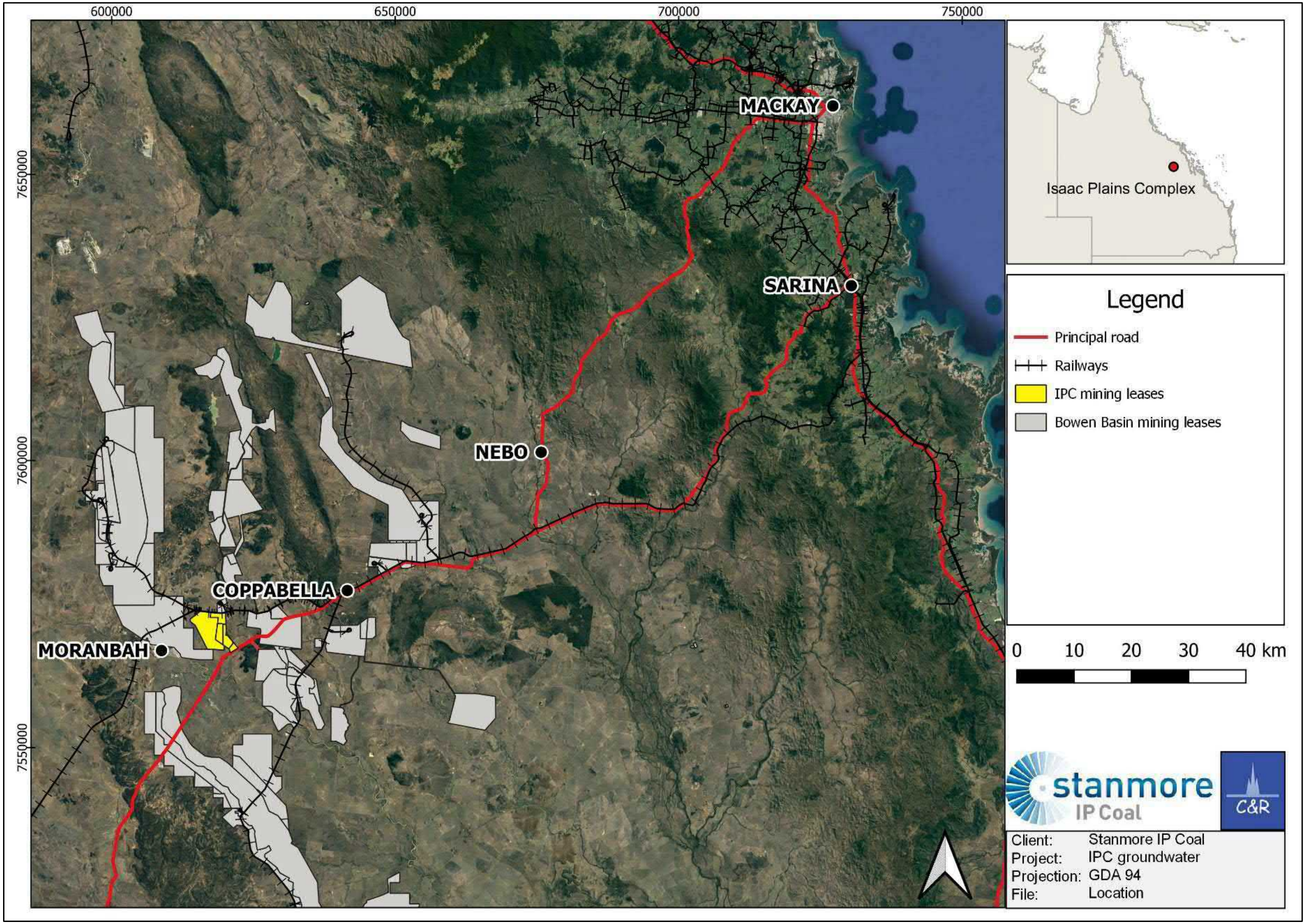

Figure 1: IPC location and mining leases.

2. SITE CONDITIONS

2.1 CLIMATE

The climate in Central Queensland is seasonally arid. Rainfall in the area is notoriously unreliable in its intensity and duration, both temporally and spatially. Intense rainfall events throughout the summer months (wet season) dominate the climate cycle (Figure 2; rainfall data from Isaac Plains AWS 332404). Most of these rainfall events occur in distinct, spatially separated cells across the landscape. Intense rainfall events are typically associated with tropical cyclone activity on the coast, and the remnant low pressure systems that move inland.

Far less rainfall is experienced throughout the dry season, with less than 35% of total rain typically falling in the winter months (May to October). Evaporation tends to exceed rainfall for almost all days of the year except during intense rainfall events, as indicated by the monthly rainfall and pan evaporation totals (Figure 2; evaporation data from the SILO database; https://www.longpaddock.qld.gov.au/silo).

The extended dry season causes baking and crusting of surface soils. These processes lead to greatly reduced infiltration through surface soils unless suitable pre-wetting is provided by gentle rain prior to the wet season. If pre-wetting rains have not occurred, more than 90% of rainfall can eventuate as runoff throughout catchments, altering stage-discharge relationships within waterways.

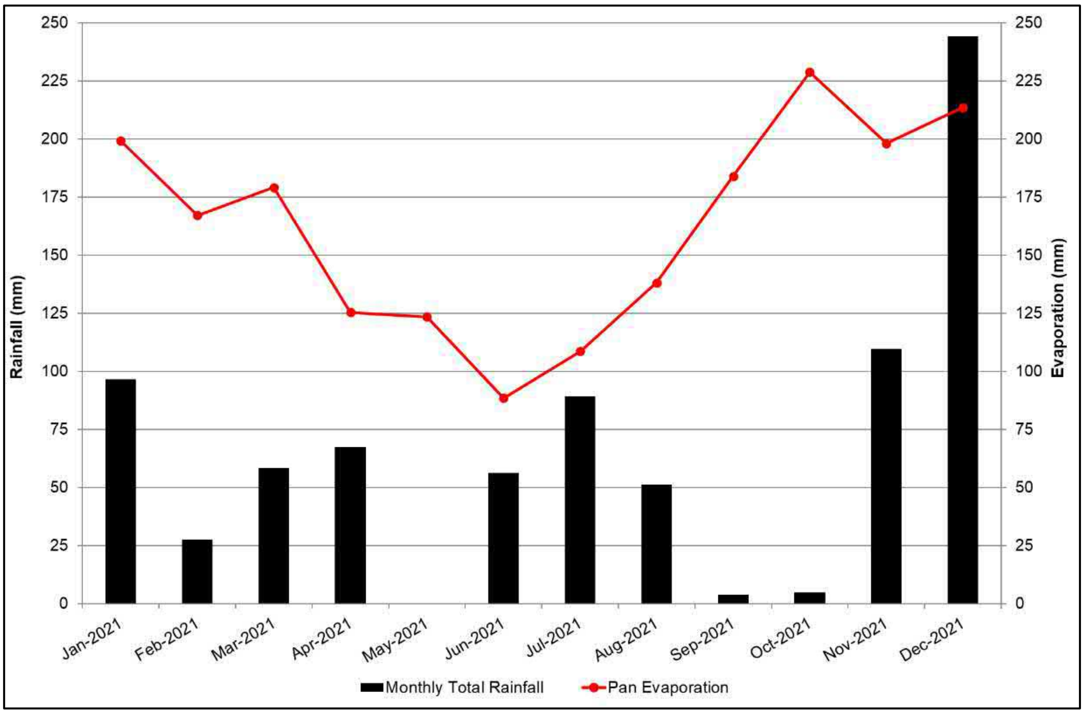

Figure 2: Monthly rainfall (Isaac Plains AWS) and pan evaporation (SILO) totals.

Rainfall data from the Bureau of Meteorology (BoM) stations at the Moranbah water treatment plant (station 34038; April 1972 to January 2012) and the Moranbah airport (station 34035; February 2012 to present) are displayed in Figure 3. Application of a 5-year running mean (centred on the averaging period) shows a cyclicity of wet and dry phases over the last 50 years, with the cycle appearing to peak every 10-15 years. Over the most recent years (since 2010), the region has remained within a dry period.

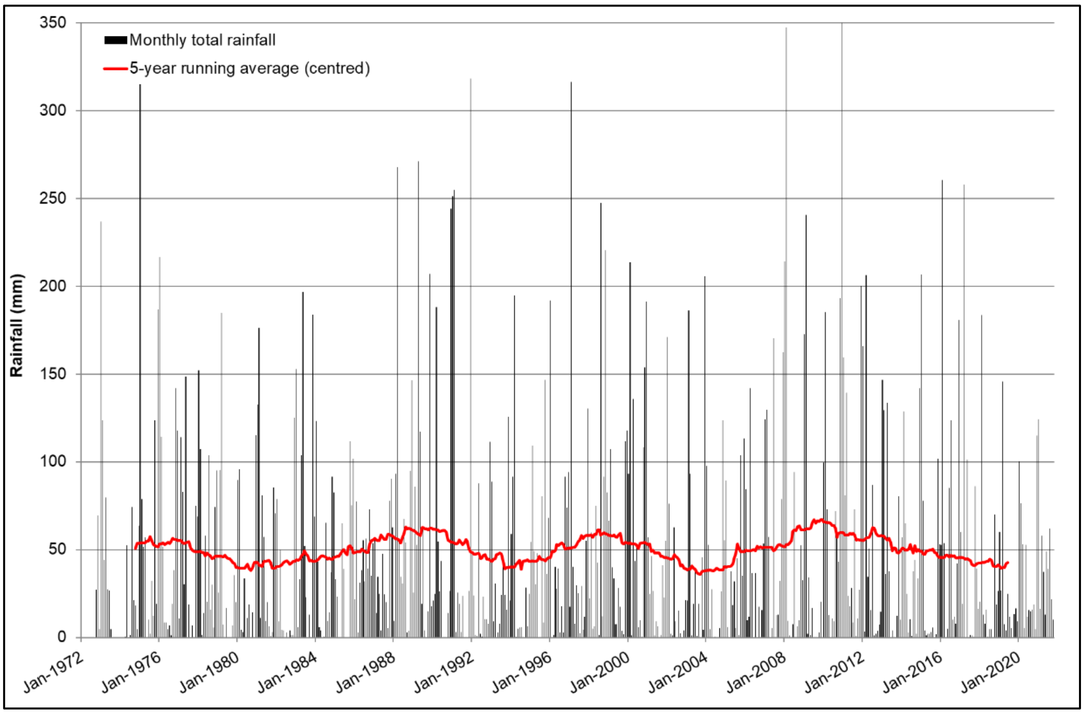

Figure 3: Monthly rainfall totals and 5-year running average (data from BoM, 2022).

2.2 Soils

Several soil types are located within the IPC mining leases. These are described in the *Integrated Isaac Plains Project Amalgamated Environmental Impact Statement* (Matrix+, 2009) and include:

- A1 Alluvial sandy duplex soil.
- A2 Red duplex with thin, sandy clay loam overlying hard, coarse-structured, brown clay.
- B1 Uniform grey/brown clays with areas of gilgai on flat to gently undulating plains.
- B2 Sandy uniform clay or thin red/brown duplex soils overlying weathered shale/mudstone on undulating plains. Sandy surface is often gravelly.
- B3 Crusting and often gravely sand clays associated with mesa scree slopes.
- B4 Melon-holed clay lowlands.
- B5 Hard-setting, gravely, brown clay.
- E1 Sandy duplex on undulating plains.
- R1 Residual low hill of lateritised basalt.

These soil types can be grouped into the following three broad categories under the Australian Soil Classification system (Ashton and McKenzie, 2001): brown Sodosols, red Chromosols and Vertisols.

2.2.1 Sodosols (A1 B5 E1)

This soil type occupies older alluvial plains associated with the Isaac River. It occurs on flat plains and is susceptible to occasional flooding. Soils are uniform, silty clays and mostly clear of vegetation. Nutrient levels are strong within the surface 30-40 cm layer. However, levels decrease below this depth. The surface structure is fine, sandy clay over a silty clay profile with substantial rooting depth. The soil is not reactive, although the stratified, alluvial nature of the medium is such that it should not be used for water holding structures. Material below 30 cm with the B2 horizon may be slightly sodic and should therefore be avoided.

2.2.2 CHROMOSOLS (A2 B2 B3)

This soil occupies mid- to upper-slope positions within undulating lands. The surface structure is firm and sandy, with ironstone gravel common. These soils have fairly hard-structured, light clay subsoils over weathered material, but appear to be well drained to at least 40 cm in most instances. Problems are associated with subsoil sodicity and salinity below 30 cm depth, with its coarse structure not assisting.

2.2.3 VERTISOLS (B1 & B4)

The soils are brown to grey, moderately well structured, generally non-cracking clays that support abundant buffel pasture. Saline and sodic conditions prevail immediately below 20 cm depth. Some of the area may include shallow (up to 15 cm deep) gilgai of brown, sandy clay interspersed with grey clay depressions. The surface structure is sandy and firm, with areas of ironstone gravel. In most instances, drainage is not impeded to 40 cm.

2.3 GEOLOGY

Most of the land surface is made up of deeply weathered profiles of Permian-Triassic rock, with *in situ* weathering, soil development and minor alluvium that, for the most part, conceal these rocks across the lease.

Tertiary-aged, poorly consolidated sandstone forms part of an earlier, thin sequence that covered much of the district. This sequence and older lithologies were eroded down to a flat surface (peneplain) that is capped with duricrust (ferricrete) or carbonate laterites. Locally, the sequence has been eroded back to a table top to the north, leaving behind mesas of sandstone on and around the lease.

Prior to and during this erosion period in the Tertiary, volcanic activity produced widespread basaltic lava flows. At least two basalt flows have taken advantage of an earlier deep river, passing down the eastern length of the lease. Remnants of the lava flows persist in mesas east of the lease and part of the northern table top, while the remainder has been weathered down to the current alluvial flat developing across the site.

Thin coal beds exist as layers in packages of sedimentary beds called ‘coal measures’ which reflect the fact that coal seams split, thicken and thin, and are interfingered with other sediments at their time of formation. These sediments can include relatively porous sandstones conducive to groundwater flow. The coal beds themselves are frequently significant conduits to groundwater and provide local aquifer systems.

The economic coal measures at Isaac Plains are the Rangal Coal Measures and Fort Cooper Coal Measures. Both are part of the late Permian Blackwater Group. This group of rocks extends throughout the western half of the Bowen Basin.

2.4 HYDROGEOLOGY

There are five principal hydrostratigraphic units within the IPC tenement areas:

1. Quaternary alluvium/colluvium;
2. Tertiary sediments;
3. Tertiary basalt;

4. Triassic Rewan Group; and
5. Late Permian Rangal Coal Measures and Fort Cooper Coal Measures.

The Quaternary alluvium/colluvium and Tertiary sediments are associated with channel deposits of Smoky Creek and the Isaac River (Table 3 and Figure 4). In 2018, Klohn Crippen Berger (KCB) completed field investigations to assess the extent of the alluvium in relation to Smoky Creek. This followed instruction from the Department of Environment and Science (DES) that a monitoring bore must be installed to monitor the alluvium. However, when drilling adjacent to Smoky Creek for the monitoring bore, no alluvium was found to be present. The selection of this monitoring bore location was based on the mapped alluvium presented in the Mount Coolon 1:250,000 map sheet (where the alluvium is mapped as having an extent of up to about 500 m adjacent to Smoky Creek). As per the findings of the field investigation, KCB (2018) reported:

The extent of the sediments was identified to be limited to the water course channel as the channel is deeply incised, with the creek banks comprising weathered bedrock. Furthermore, outcrops of weathered bedrock occur within the channel of Smoky Creek, identifying the limited depth of unconsolidated sediments.

Tertiary basalt flows outcrop to the north-east of tenement ML70342, and some of these basalt flows constitute aquifers in several surrounding areas. Confinement of the late Permian strata is variable locally, depending on pressure distribution and depth. Stratigraphic descriptions for each unit are provided in Table 3. Surface distribution of each unit is complicated by numerous regional structures, including at least one syncline and several thrust faults truncating the eastward-dipping target beds. The aquifers of the Isaac Plains area are described in the following sections (Sections 2.4.1 to 2.4.3), with reference made to aquifer characteristics, groundwater flow and groundwater quality for each unit.

Table 3: Stratigraphic units of the Isaac Plains region.

Map Symbols#	Age	Group	Name/Formation	Short Description
Cza	Quaternary		Alluvium / Colluvium	Alluvium: mud, sand, minor gravel. Colluvium and residual soil: mud, sand, gravel##.
Czb	Cenozoic		Tertiary basalt	Basalt flows.
Czs*			Suttor Formation*	Sandstone, mudstone, claystone.
Ki*	Cretaceous		Unnamed*	Intrusives: granodiorite, diorite, gabbro.
TRr	Triassic	Rewan Group	Rewan Formation	Green lithic sandstone, green and red sandstone and mudstone.
Pwj	Late Permian	Blackwater Group	Rangal Coal Measures	Lithic sandstone, coal, siltstone, carbonaceous shale, mudstone (locally cherty), rare pebbly sandstone.
Pwt			Fort Cooper Coal Measures	Medium to coarse-grained volcanolithic sandstone, conglomerate, tuff, tuffaceous mudstone, coal, shale.
Pwb*			Moranbah Coal Measures*	Lithic sandstone, siltstone, shale, coal, mudstone, conglomerate.
Pb*		Back Creek Group*		Marine sandstone, siltstone, shale.

*Formation/unit is present outside the lease area and is not discussed at length in the text.

#Map symbols as per 1:100,000 geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (Geological Survey of Queensland [GSQ], 2014; see Figure 4).

##Several generations of alluvium and colluvium exist, but only the older, more substantive one is mapped in Figure 4.

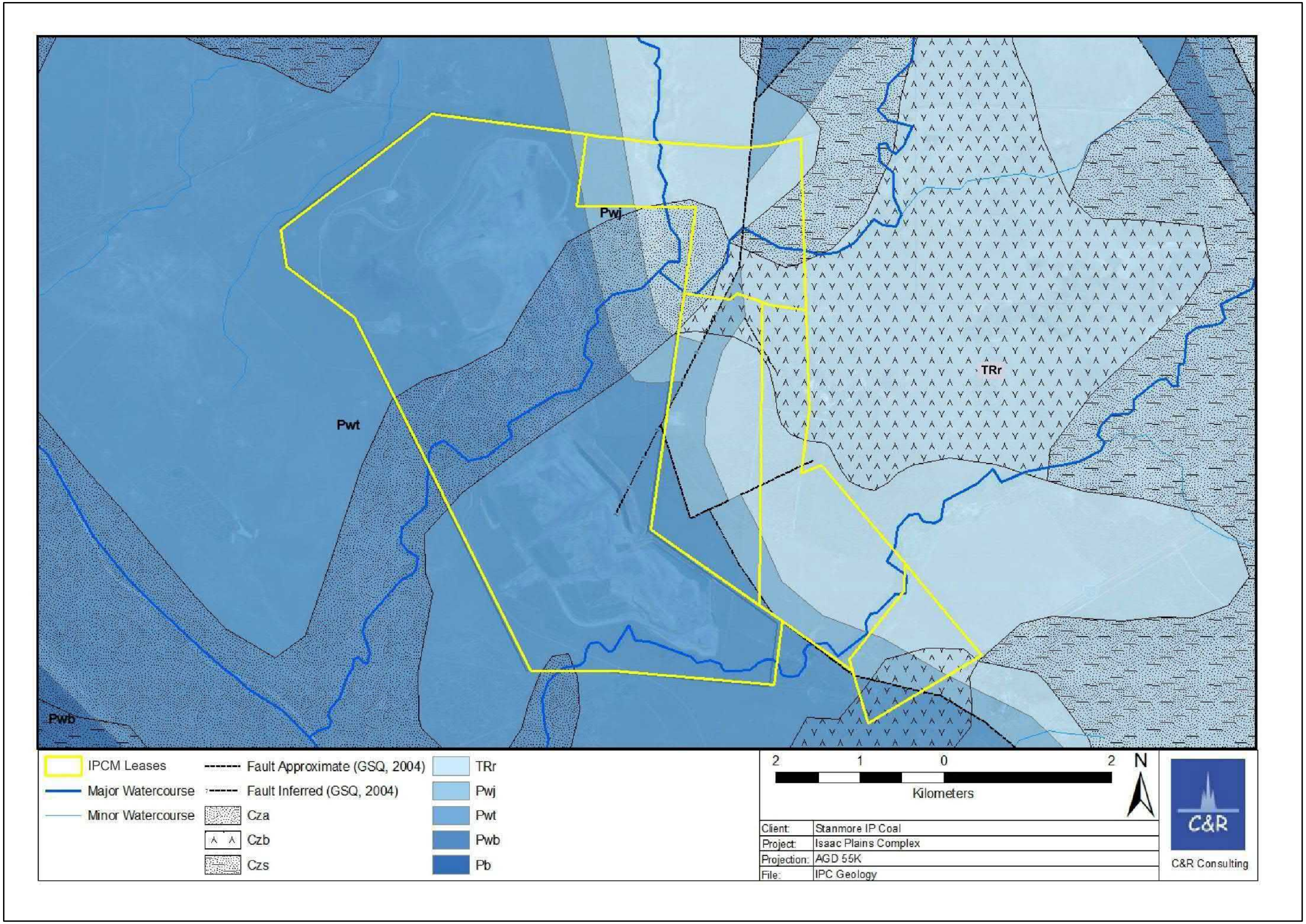

Figure 4: Major geological units for IPC.

2.4.1 Quaternary Deposits

2.4.1.1 *Lithology*

Several generations of Quaternary palaeochannel sediment deposition resulted in a complex distribution of alluvial aquifers across the region. There are at least three Quaternary units present (Geological Survey of Queensland [GSQ], 2004):

1. Younger Quaternary alluvium;
2. Quaternary colluvium; and
3. Older Quaternary alluvium.

Of these, only the older Quaternary alluvium/colluvium, comprising a relatively thick deposit along the Isaac River and Smoky Creek, is shown in Figure 4 (map symbol Cza; see also Table 3). KCB (2018) found the extent of the Quaternary alluvium/colluvium was identified to be limited to the Smoky Creek watercourse channel, as the channel is deeply incised, with the creek banks comprising weathered bedrock. Furthermore, outcrops of weathered bedrock occur within the channel of Smoky Creek, identifying the limited depth of unconsolidated sediments.

The alluvial/colluvial deposits have very heterogeneous lithology, reflecting the depositional environment. In the area surrounding IPC, the alluvial/colluvial deposits of the Isaac River mainly consist of upward-fining packages of gravel, sand, silt and clay (Matrix+, 2009). The grainsize and textural variation of these sediments mean that hydraulic properties are extremely variable, but sandy units are generally of high hydraulic conductivity. The potential resource within these deposits is unknown and groundwater use from them is expected to be only for environmental purposes. The impacts from mining activities on these aquifers is expected to be limited to water quality impacts from discharge of excess waters from on-site dams.

2.4.1.2 *Quaternary Alluvium/Colluvium Aquifer Properties*

Typical thicknesses of the alluvial/colluvial aquifers in the IPC mining area range from 5 m to 19 m. However, monitoring bores indicate that the saturated thickness of the alluvial/colluvial aquifer is generally about 3 m (corresponding to an average water-table elevation of approximately 188 m AHD). Most exploration holes drilled into alluvial/colluvial sediments associated with the Isaac River, did not encounter significant groundwater supplies. Results from hydraulic testing of the alluvial/colluvial aquifer show a local hydraulic conductivity of 2.3 to 3.6 m/day.

2.4.1.3 *Groundwater Flow in Quaternary Alluvium/Colluvium Aquifers*

The alluvial/colluvial groundwater is typically recharged by flows in contemporary waterways during peak flows or floods (SKM, 2009), and/or from direct infiltration through overlying soil profiles during rainy months. Consequently, the rate of groundwater flow and height of the water table in these alluvial/colluvial aquifers are variable and annual recharge is not consistent.

Alluvial/colluvial groundwater quality found at a regional scale (e.g. the Isaac River catchment) suggests some mixing with groundwater from the underlying Late Permian strata (rather than regular recharge via direct rainfall or river flow), with electrical conductivity (EC) often greater than 10,000 µS/cm. The regional flow of groundwater within the Quaternary sediments is expected to be southwards and south-eastward, congruent with surface drainage. Groundwater discharge occurs mainly via evapotranspiration. However, it may also occur locally through baseflow to streams during dry periods. During peak river flow in the wet months, “gaining stream” conditions are precluded, meaning that baseflow does not occur (SKM, 2009).

2.4.1.4 *Groundwater Quality in the Quaternary Alluvium/Colluvium*

Groundwater of the alluvium/colluvium has variable quality, reflecting the highly localised flow paths that dominate this system. At a regional scale, (e.g. the Isaac River catchment), the alluvial/colluvial groundwater EC ranges from below 500 µS/cm to over 10,000 µS/cm (SKM, 2009).

At IPC, the groundwater quality of the alluvium/colluvium is not well constrained. This is due to the fact that the alluvium is quite discrete (refer to Section 2.4) and no groundwater-bearing alluvium has been found to date at IPC. Groundwater is measured in colluvial sediments at IPC, although sampling occurs at the contact with Tertiary sediments and is reflective of a mixture of Quaternary/Tertiary groundwater.

2.4.2 TERTIARY BASALT

2.4.2.1 *Lithology*

Cenozoic volcanic rocks (Czb), also referred to as Tertiary basalt, outcrop to the east of the Isaac Plains Mine, near the Wotonga homestead (Matrix+, 2009). These volcanics probably represent the most southerly extent of basalt flows from the Nebo Province (Stephenson *et al*., 1980) and are predominantly mafic (basaltic) but also include trachyte, rhyolite, tuff and high level intrusives mapped outside of the lease area (PW Baker & Associates, 2011). The volcanics mostly overlie the late Permian succession of the Bowen Basin and have an inverted topography associated with tributary drainage that is locally occupying an ancestral watercourse of the Isaac River. At least nine basalt flows are observed in GSQ drilling. These are encountered in the Drake and Grosvenor boreholes. The Tertiary basalt regionally underlies Quaternary sediments of the Suttor and Isaac River catchments, except where partially exhumed by weathering (Stephenson et al., 1980).

2.4.2.2 *Basalt Aquifer Properties*

The Tertiary basalt flows across the region constitute shallow fractured rock aquifers that are known to be used for local supplies of stock and domestic water (SKM, 2009). Typically, basalt aquifers are characterised by a network of cooling fractures that are often not well connected (exhibiting anisotropy of hydraulic conductivity), so the resultant groundwater yield is unpredictable. There is a productive Tertiary basalt aquifer to the north-east of IPC, adjacent to the Broadlea Mine, which hosts a large volume of groundwater (refer to Section 2.4.2.4). Apart from this distant basalt aquifer (adjacent to Broadlea Mine), the hydraulic characteristics of the basalt flows proximal to the Isaac Plains Mine area are not yet quantified.

2.4.2.3 *Groundwater Flow in Basalt*

As the lateral extents of the basalt flows of the region are not completely known, and they are not spatially contiguous over large areas, groundwater flow in this Tertiary basalt unit is likely localised rather than regional. Further, much of the thickness of basalt flows are close to the surface and may be unsaturated, or only saturated when the watertable rises in response to recharge periods. Ephemeral and local flow, mainly via sub-vertical recharge and discharge, is expected to be the dominant flow mechanism in the Tertiary basalt.

2.4.2.4 *Groundwater Quality in Basalt*

Fractures within a basalt flow proximal to the Broadlea Mine are anticipated to contain about 11,000 ML of relatively good quality water, with EC ranging between 760 µS/cm and 5,300 µS/cm. However, the lateral extent of the reservoir is not known. Apart from the Broadlea basalt flow, the utility of the basalt aquifer in other areas is usually associated with relatively low yields and poor water quality.

2.4.3 Late Permian Coal Measures

2.4.3.1 *Lithology*

The two main late Permian units in the region are the older Fort Cooper Coal Measures and the younger Rangal Coal Measures (Figure 4 and Table 3). The late Permian stratigraphy described in this section is relevant to the entire area, but pertains directly to rocks intercepted by drilling and mining at IPC.

Coal mining at IPC targets the Leichhardt seam of the Rangal Coal Measures, which comprises interbedded units of lithic sandstone, coal, siltstone, carbonaceous shale, mudstone and pebbly sandstone. Within the IPC lease, the Leichhardt seam is found between 60 m and 230 m below ground level, and is approximately 3.5 m thick as a whole (as it splits to an upper and lower seam in the northern part of the lease). Strata dip of the Rangal Coal Measures in the IPC lease is approximately 6° to 7° to the east.

2.4.3.1.1 Sandstone and Siltstone Above Target Coal

The regional late Permian sedimentary rock succession is extensive and underlies the Quaternary alluvium/colluvium and Tertiary basalt cover (PW Baker & Associates, 2011). The late Permian succession comprises sandstone, siltstone, mudstone, shale and coal (PW Baker & Associates, 2011). Both the Rangal Coal Measures and the Fort Cooper Coal Measures are dominated by lithic sandstones. However, the Fort Copper Coal Measures can be distinguished from the Rangal Coal Measures due to the presence of significant volcanolithic content (tuff and tuffaceous mudstone).

2.4.3.1.2 Target Coal Seam

The Leichardt coal seam, the target of IPC mining, may arguably be considered an aquifer, given the characteristics referred to in Section 2.4.3.4. The coal seam is generally 3.5 m thick and dips to the east across the site.

2.4.3.1.3 Lithic Sandstone Below Target Coal

The typical units that underlie the Leichardt seam are late Permian fine to medium, quartz-lithic sandstone interbedded with siltstone and carbonaceous mudstone. The sandstone beds are typically carbonate-cemented, with moderate to high porosity.

2.4.3.2 *Late Permian Aquifer Properties*

The late Permian coal measures provide modest groundwater supplies for livestock and agricultural uses in the region (Matrix+, 2009), where extraction rates are generally limited to approximately 0.5 L/s (PW Baker & Associates, 2011). Borehole logs reveal that V-notch flow rates from sandstones range between 0.15 L/s (78 m depth in bore E7550027R) and 5.0 L/s (126 m depth in bore E7550050R). Logs from monitoring bores, installed in 2004, penetrating the Leichardt seam indicate that it had yields ranging from moderate (2.17 L/s at 126 m in E755273P-C4) to very poor (0.03 L/s at 42 m in E755272P-C3).

Permeability of the late Permian units is hindered by the intercalation of sandstone with mudstone and siltstone, in contrast to the more permeable alluvium/colluvium and basalt aquifers (Matrix+, 2009). Generally, coal seams form high hydraulic conductivity zones within these systems, as the bedding planes, fractures, joints and cleats allow faster water movement compared to the surrounding sandstone and siltstone. The Leichardt seam has a hydraulic conductivity in the vicinity of 0.0005 m/day, about five times higher than that of the late Permian host rocks.

2.4.3.3 *Groundwater Flow in Late Permian Aquifers*

The regional flow patterns, recharge and discharge mechanisms of the Late Permian units of the Isaac River region are not well known or constrained. Considering the groundwater flow patterns in the overlying alluvium/colluvium and basalt, recharge to the late Permian rocks is expected to be restricted to wet periods, with several sequential wet periods required for effective recharge. In a previous groundwater review, C&R Consulting (C&R) surmised that a two-month cumulative rainfall total of approximately 400 mm is needed for recharge to occur in the nearby, overlying sandstone of the Triassic Rewan Formation (C&R, 2013). Recharge may occur through direct infiltration in areas where the late Permian rocks are exposed or close to the surface, and/or through inter-aquifer flow if vertical hydraulic gradients allow.

Very little is known about the variation of potentiometric water levels in the region with depth. However, there are available data that can constrain some details of vertical flow, as there is evidence for upward vertical gradients during winter to the south of IPC (Matrix+, 2009, their Section 7, Table 7-1). This indicates that some discharge may occur as upward flow from late Permian units into the overlying alluvium (or other sediment) and this may support baseflow to streams in winter months. A similar pattern may also exist near some creek reaches in the IPC area.

Given the aquifer characteristics, lateral flow within the coal measures is likely to be slow. Flow is assumed to be approximately south-eastward and southward, in keeping with the catchment orientation and the direction of Isaac River drainage. This is consistent with an interpolated map of groundwater levels in the region (Matrix+, 2009, their Section 7, page 13) and the data relevant to this review. Generally, groundwater ingress into the pits at Isaac Plains is minimal, confirming the slow-flow anticipated by the low permeability.

2.4.3.4 *Groundwater quality in Late Permian Aquifers*

Groundwater from the late Permian coal measures south of IPC is known to be of sodium-chloride-bicarbonate type and there is a trend of increasing solute concentration heading southwards (Matrix+, 2009, their Section 7, page 12). This confirms the assumption of regional groundwater flow from north to south, whereby length of residence time and degree of water-rock interaction increase along the flow path. The EC of groundwater in the late Permian aquifers ranges from 11,000 µS/cm to 41,000 µS/cm, with an average EC of 21,000 µS/cm (Matrix+, 2009, their Section 7, page 12).

The Leichardt coal seam may be termed an aquifer. However, the quality of the groundwater is generally poor, with an EC of 8,000 µS/cm to 20,000 µS/cm. Based on the observed ECs, combined with poor to moderate flow rates and a thin expression (about 2 m thick), the Leichardt seam is an unusable aquifer (PW Baker & Associates, 2011; E3 Consulting Australia Pty Ltd, 2011).

2.5 GROUNDWATER-DEPENDENT ECOSYSTEMS

Groundwater-dependent ecosystems (GDEs) are defined by the Department of Environment and Energy (DoEE) as '*natural ecosystems that require access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services*' (Richardson et al., 2011).

The broad types of GDEs are:

- Ecosystems dependent on surface expression of groundwater;
- Ecosystems dependent on subsurface presence of groundwater; and
- Subterranean ecosystems.

A review of the potential for GDEs in the vicinity of IPC was undertaken by Ecological Survey & Management (EcoSM) as part of the terrestrial ecology assessment to support the *Environmental Assessment Report – Isaac Plains East Project* (Hansen Bailey, 2016). EcoSM identified that the GDE mapping provided in the GDE atlas produced by the Australian Bureau of Meteorology is not consistent with the hydrogeological setting of the Isaac Plains area. EcoSM also states that the IPE area does not contain a suitable, shallow groundwater supply and, therefore, concludes that there are no GDEs within the vicinity of the project area.

In December 2020, Stanmore gained approval from the Australian Government Department of Agriculture, Water and the Environment to proceed with the Isaac Plains East Extension (IPEE). As part of the approvals process, 3d Environmental (2020b) – on behalf of Stanmore – completed further studies into potential GDEs and subsequent impacts within the project area. Smoky Creek and Billy's Gully GDEs were found to be at low to insignificant risk for all potential impact pathways resulting from the IPEE project. However, Stanmore has implemented mitigation measures under the groundwater-dependent ecosystem management and monitoring plan (GDEMMP; 3d Environmental, 2020a). Four shallow bores, constructed in November 2020, target the alluvium beside Billy's Gully. The measured seasonality of these bores indicate that these sites are likely to only produce water during flow events in the wet season. The GDEMMP states that the imperatives of GDE monitoring bores are to:

- Confirm linkages between recharge of the alluvial aquifer and surface flows.
- Establish the period of saturation, including saturated thickness of the alluvial aquifer and lags in recharge following surface water flows.
- Identify natural groundwater quality parameters to provide a baseline dataset for comparison to water quality of surface flows.
- Identify the degree to which the alluvial aquifer is utilised by vegetation (typically through analysis of stable isotopes) on a seasonal basis.
- Identify ecological response to aquifer recharge, including correlations between alluvial aquifer recharge, leaf area index, leaf water potential, normalised difference vegetation index and climate data.

3. GROUNDWATER MONITORING NETWORK

Previous to gaining environmental approval to mine the eastern mining leases at IPC (ML700016, ML700017, ML700018 and ML700019), only two groundwater bores (Burton Coal Bore 2 and Swamp Bore 1) were monitored as a requirement of the existing EA.

Following the approval of an EA amendment (24 January 2018) for the mining activities on the additional leases, a more extensive monitoring network has been developed, targeting various aquifer systems present within the eastern mining leases. The monitoring network was expanded in 2020 and 2021 to account for the replacement of existing monitoring bores that are due to be decommissioned.

EA Table 11 indicates that a minimum of nine designated reference bores are required to provide ongoing groundwater monitoring data during mine operations at IPC. Therefore, to maintain this number of designated reference bores, all decommissioned reference bores either have been or will be replaced. The current monitoring network at IPC consists of thirteen reference bores and six observation bores.

For the current IPC bore network, bore assessments were completed on Burton Coal Bore 2 and Swamp Bore 1 in June 2018, including downhole camera surveys to confirm bore construction details. The construction details of monitoring bores MB1, MB2, MB4a, MB4b, MB7, MB8, MB9, MB10, MB11, MB12, MB14 and MB16 were sourced from QLD Government '*Groundwater Information Bore Reports*'.

Construction details of GDEMB1, GDEMB2, GDEMB3 and GDEMB4 were obtained from C&R, who recently installed these shallow (<5 m deep) observation bores that are not formally included in the groundwater management and monitoring plan (GMMP). The shallow GDE bores will be monitored as per the GDEMMP (3d Environmental, 2020a).

At IPC, there are currently naming inconsistencies between the EA tables (Tables 11, 12, and 13), the GMMP and the field data. For instance:

- All field data referenced as MB9b refers to the bore stated within the EA as MB10.
- Swamp Bore 1 has been misnamed in the EA as Swamp Bore 2. Field verification has confirmed this.
- The hydrostratigraphic unit of MB4b is incorrectly referred to as the Rangal Coal Measures in the EA, although this shallow bore has been screened in the Quaternary sediments as per the bore report.

It is imperative that IPC amend all documents to align with a consistent naming convention for each monitoring bore to improve the integrity and reporting of the collected groundwater data.

Installation of monitoring bore MB11 was a requirement of Condition C42 of the IPC EA. Based on the regional geological mapping of the 1:250,000 Mount Coolon geology map sheet, the location of MB11 (identified in the EA) was anticipated to target the Quaternary alluvium. However, during the drilling of this bore, no alluvium was encountered. To date, no data have been captured for this bore because it has remained dry since installation (and, therefore, throughout the reporting period).

The details of the bores included in the current IPC groundwater monitoring programme are summarised in Table 4, with their spatial distribution shown in Figure 5.

Table 4: Groundwater monitoring bores at IPC.

Monitoring Point	Aquifer Type	Easting (GDA 94)	Northing (GDA 94)	Surface RL (mAHD)	Monitoring Purpose
IPC Reference Bores (EA Table 11)					
Burton Coal Bore 2	Rewan Group	620383	7573599	240.8	Monitoring groundwater trigger levels as per EA C43 and EA C44
Swamp Bore 1 (referred to as Swamp Bore 2 in the EA)	Rewan Group	621518	7568790	245.9	Monitoring groundwater trigger levels as per EA C43 and EA C44
MB1	Rangal Coal Measures	618793	7572214	236.4	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB2	Rangal Coal Measures	619074	7573137	242.7	Monitoring groundwater in the target coal seam
MB4a	Quaternary Colluvium / Tertiary Sediments	620351	7567479	237.6	*To be decommissioned.* Used for monitoring groundwater in the Quaternary / Tertiary sediments. Insufficient water, replaced by MB4b
MB4b	Quaternary Colluvium / Tertiary Sediments	619740	7567253	233.9	*To be decommissioned.* Used for monitoring groundwater in the Quaternary / Tertiary sediments
MB8	Rangal Coal Measures	619105	7571149	245.9	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB9	Rangal Coal Measures	620368	7568049	239.5	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB10 (referred to in field notes as MB9b)	Tertiary Basalt	620368	7568046	239.5	*To be decommissioned.* Used for monitoring groundwater in the Tertiary basalt
MB11	Tertiary Sediments / Weathered Rewan Group	618832	7571924	232.3	Monitoring groundwater in the Tertiary sediments / weathered Rewan Group. Insufficient water (dry)
MB12	Rangal Coal Measures	619210	7572000	239.5	*Replacement for MB1* to monitor groundwater in the target coal seam

Monitoring Point	Aquifer Type	Easting (GDA 94)	Northing (GDA 94)	Surface RL (mAHD)	Monitoring Purpose
MB14	Tertiary Basalt	620263	7571132	257.3	_Replacement for MB10_ to monitor groundwater trigger levels as per EA C44
MB16 (referred to in field notes as MB16b)	Tertiary Sediments	620670	7568599	245.6	_Replacement for MB4b_ to monitor trigger levels as per EA C44
IPC To-Be-Commissioned Reference Bores (EA Table 11)					
MB13	Rangal Coal Measures	619367	7571035	249.7	_Replacement for MB8_ to monitor groundwater in the target coal seam
MB15	Rangal Coal Measures	620633	7568080	242.9	_Replacement for MB9_ to monitor groundwater in the target coal seam
IPC Designated Observation Bores					
MB7	Rangal Coal Measures	617537	7569064	237.4	Monitoring groundwater in advance of mine operations
MB16a	Tertiary Sediments	620670	7568599	245.6	Monitoring groundwater in the Tertiary sediments. Insufficient water, replaced by MB16b
GDEMB01	Quaternary Alluvium	621780	7569179	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB02	Quaternary Alluvium	620436	7568168	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB03	Quaternary Alluvium	620022	7567230	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB04	Quaternary Alluvium	619754	7567165	To be advised	Monitoring groundwater-dependent ecosystems
IPC Decommissioned Reference Bores (EA Table 11)					
MB3	Rangal Coal Measures	619047	7568473	253.0	Monitoring groundwater in advance of mine operations
IPC Decommissioned Observation Bores					
MB5	Rangal Coal Measures	618507	7570878	241.8	Monitoring groundwater in advance of mine operations
MB6	Tertiary Basalt	619374	7567545	235.7	Monitoring groundwater in the Tertiary basalt
C1	Rangal Coal Measures	616545	7571999	235.7	Monitoring groundwater in advance of mine operations
AC1	Rangal Coal Measures	616573	7571997	235.8	Monitoring groundwater in advance of mine operations
BC095	Rangal Coal Measures	616507	7571995	236.7	Monitoring groundwater in advance of mine operations

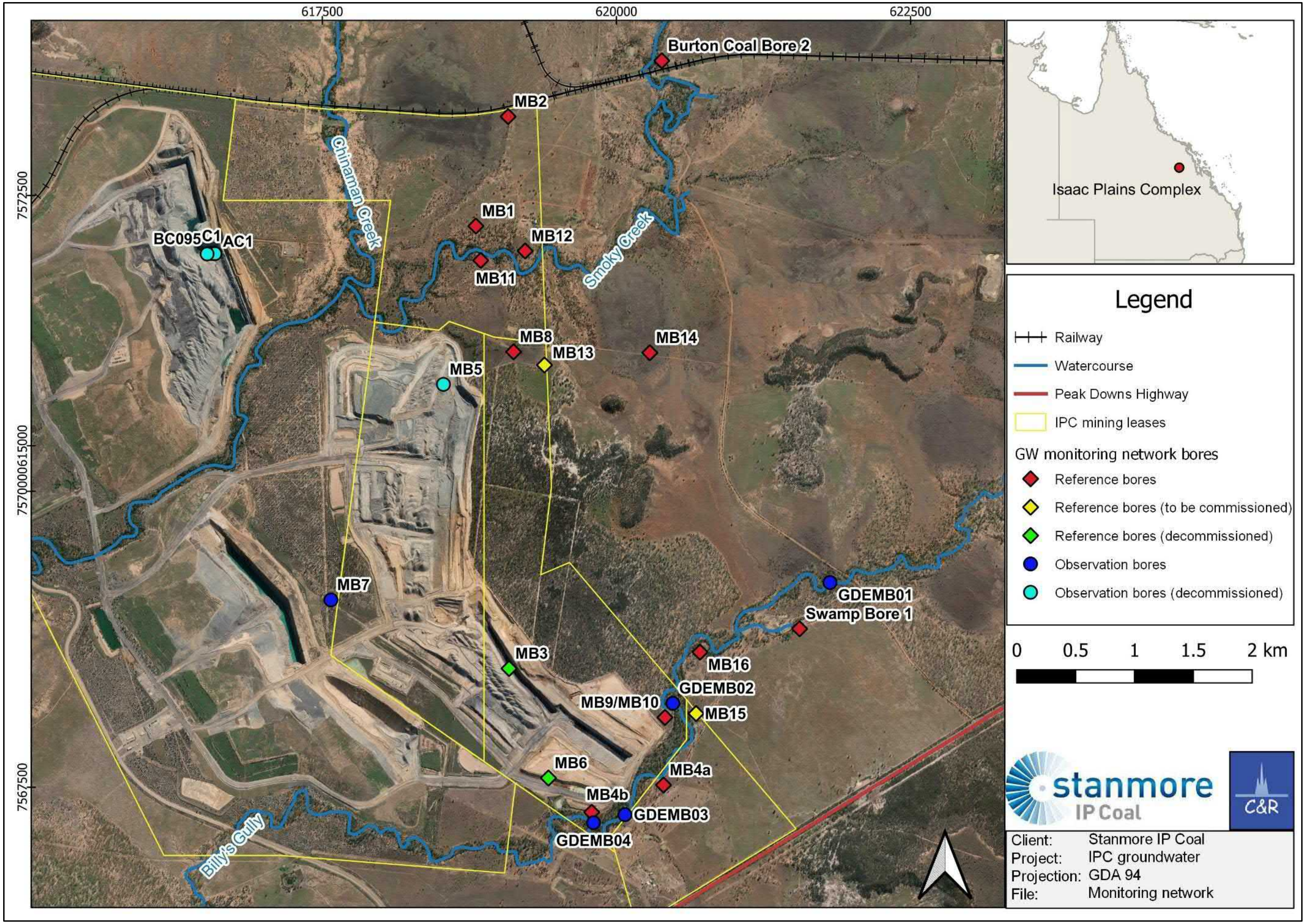

Figure 5: IPC groundwater monitoring network.

4. GROUNDWATER LEVELS

In accordance with EA Condition C40, IPC implemented the GMMP on 29 June 2019.

Standing water levels are measured as part of the groundwater monitoring procedure prior to undertaking water quality sampling. The measurement of standing water levels provides an insight into the nature of the aquifer systems (recharge and discharge points) and any potential impacts of mining activities. Standing water levels are captured by measuring the depth to water that is then subtracted from the reference datum height of the monitoring bore casing. This calculation provides the ability to gain a relative level in metres with respect to the Australian Height Datum (m AHD).

The reporting period for this annual review includes standing water levels measured during the 2021 calendar year, with results displayed in Figure 6. Figure 6 demonstrates that a decrease in the standing water levels was observed in all groundwater monitoring bores during the reporting period.

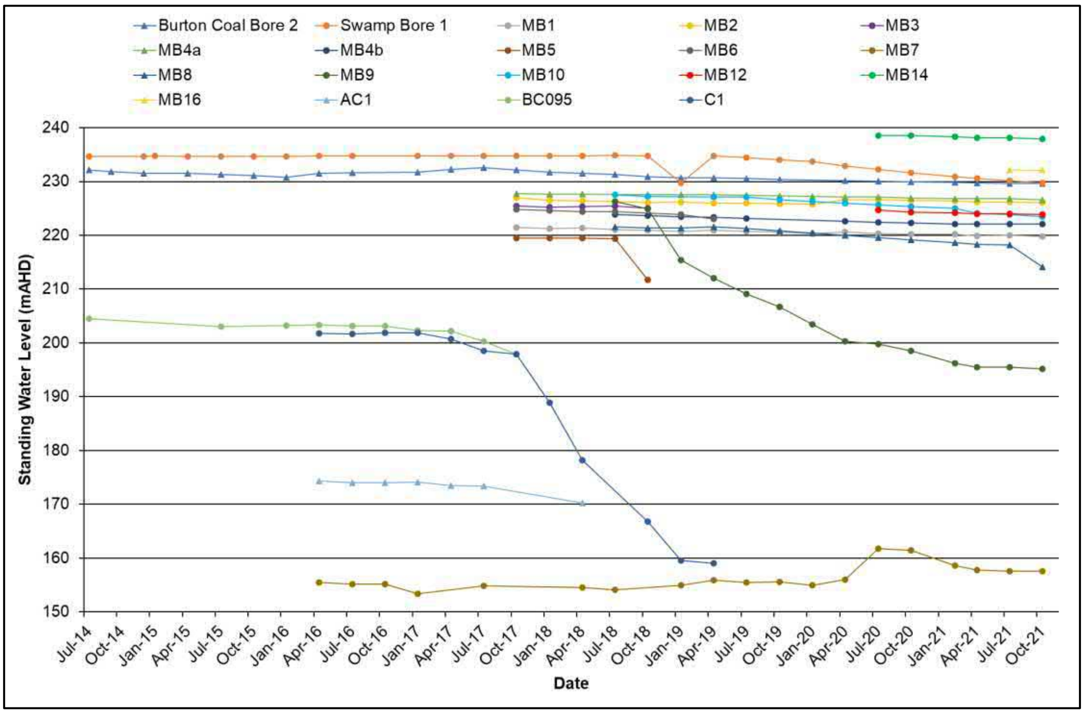

Figure 6: Standing water level variation across the groundwater monitoring network.

4.1 REWAN FORMATION

Burton Coal Bore 2 and Swamp Bore 1 are screened within the Rewan Formation and are situated to the northeast and east of IPC mining operations, respectively (Figure 5). Groundwater flow direction within the aquifer system suggests that these bores are considered upstream of any potential groundwater impact that could be attributed to the IPC operation.

Throughout the reporting period, Burton Coal Bore 2 has remained relatively stable, with very little variation in standing water level (Figure 6). In comparison, Swamp Bore 1 displays a steady downward trend over the reporting period, with the standing water level decreasing by 1.17 m (Figure 6). The downward trend in Swamp Bore 1 is likely to be caused by the dry period between 2018 and 2021, as well as groundwater extraction from the adjacent farmer's bore (<5 m away) that sources groundwater for stock-drinking water.

4.2 Rangal Coal Measures

The IPC monitoring bores screened within the Rangal Coal Measures show a substantial variation in standing water level behaviour between monitoring bores (Figure 6). This variation is mainly attributed to the advancement of mining operations and the proximity of some bores to the open-cut voids.

Five bores, decommissioned prior to the current reporting period, displayed a significant drawdown in standing water levels (before being decommissioned). These bores include BC095, AC1, C1, MB3 and MB5 (Figure 6). Two operating reference bores, MB8 and MB9, displayed drawdowns of 4.47 m and 1.08 m, respectively, during the reporting period. These standing water level decreases, in all of the aforementioned bores, can be attributed to a zone of depressurisation occurring around the mining voids that has consequently altered the flow direction of the coal seam aquifer. The presence of this zone of depressurisation around the mining voids is further evidenced by the reasonably steady standing water levels recorded in up-gradient monitoring bores MB1, MB2, MB12 and MB14. These bores are positioned further away from the open-cut voids (Figure 5).

Observation bore MB7 is located close to the highwall of the southern open-cut voids (Figure 5). The southern voids ceased full mining operations in 2018, whereby MB7 historically displayed steady standing water levels until April 2020, when the water level started to increase (Figure 6). The rise continued for a few months – responding to the increasing accumulation of stored water within the adjacent southern voids – until around October 2020, when the standing water level started to decline. The standing water level in bore MB7 is still above historical levels. However, during the reporting period, the standing water level has decreased by 1.01 m.

Note: MB8 and MB9 are respectively referred to as MB8b and MB9a within all field and analysis documentation.

4.3 Tertiary Basalt

IPC currently monitor two bores that target the Tertiary basalt aquifer. MB10 and MB14 are located south-east of mining operations and proximate to Billy's Gully (Figure 5). A third monitoring bore (MB6) was monitored between October 2017 and April 2019 before being decommissioned.

While operational, MB6 showed a steady decline in standing water level, with a total decrease of 1.72 m associated with the progression of mining towards this down-gradient bore. Further, MB10 recorded a 1.57 m drawdown during the reporting period, also indicating a mining-induced water level decrease. MB14 was installed during the second quarter of 2020 and has only had six field measurements recorded so far, four of these during the reporting period. During the reporting period, the standing water level in MB14 has decreased by 0.43 m, indicating that the bore is quite stable (Figure 6).

Note: MB10 is referred to as MB9b within all field and analysis documentation.

4.4 Quaternary Colluvium / Tertiary Sediments

MB4a and MB4b are screened within the boundary between the Quaternary colluvium and Tertiary sediments. The drawdown on MB4a is minor (0.21 m), indicating that this site is not strongly affected by mining, although the bore is currently dry. MB4b is also dry, which it has remained during the reporting period. Because both bores are screened in shallow, unconsolidated sediments, the observed drawdown in MB4a and the lack of water in both bores is more likely attributable to rainfall (given the dry period between 2018 and 2021). Monitoring bore MB11 is screened in the Tertiary sediments (and weathered Rewan Group) and has no standing water level data because this bore was dry during commissioning (June 2018) and has remained so ever since.

Four shallow (<5 m deep) bores (GDEMB01, GDEMB02, GDEMB03 and GDEMB04) were constructed and screened in the Quaternary alluvium during November/December 2020 to monitor GDEs. These bores were dry during construction and have remained so during the reporting period.

Note: The hydrostratigraphic unit for MB4b is incorrectly labelled as the Rangal Coal Measures in EA Table 11.

5. GROUNDWATER CHARACTERISTICS

The IPC groundwater monitoring network currently targets four different aquifer systems across and surrounding the mining operations at IPC, with a major focus on activities within the eastern mining leases. Each aquifer system (i.e. Rangal Coal Measures, Rewan Group, Tertiary basalt, Quaternary alluvium/colluvium) displays different groundwater quality. The variation in groundwater quality characteristics can be attributed to the aquifer depth, locality, geology and the nature of its recharge.

The reporting period for this 2021 annual review includes groundwater samples collected during the 2021 calendar year, with the number of samples collected from each bore/aquifer presented in Table 5. Refer to Appendix A for all certificates of analyses referred to within this report.

Table 5: Number of samples collected per bore during the reporting period.

Monitoring Point	Aquifer Type	Number of Samples
EA Table 11 – Reference Bores		
Burton Coal Bore 2	Rewan Group	4
Swamp Bore 1	Rewan Group	4
MB1	Rangal Coal Measures	4
MB2	Rangal Coal Measures	4
MB4a	Quaternary Colluvium / Tertiary Sediments	3
MB4b	Quaternary Colluvium / Tertiary Sediments	0
MB8	Rangal Coal Measures	4
MB9	Rangal Coal Measures	4
MB10	Tertiary Basalt	4
MB11	Tertiary Sediments / Weathered Rewan Group	0
MB12	Rangal Coal Measures	2
MB14	Tertiary Basalt	4
MB16b	Tertiary Sediments	2
IPC Designated Observation Bores		
MB7	Rangal Coal Measures	4
MB16a	Tertiary Sediments	0
GDEMB01	Quaternary Alluvium	0
GDEMB02	Quaternary Alluvium	0
GDEMB03	Quaternary Alluvium	0
GDEMB04	Quaternary Alluvium	0

5.1 Rewan Formation

The two monitoring bores (Burton Coal Bore 2 and Swamp Bore 1) that target the Rewan Formation display very similar water quality characteristics in terms of pH, EC and total dissolved solids (TDS), substantiated by the low standard deviation (SD) and coefficient of variance (c_v; Table 6). Generally, the dissolved metal concentrations for both bores are similar, with most results below the limit of reporting (LOR).

Historically, Burton Coal Bore 2 has displayed a more diluted TDS concentration than Swamp Bore 1. However, over recent years (2017-2021), the geochemical difference has decreased, with the average divergence marginally above 700 mg/L over the current reporting period. During the reporting period, the lowest observed TDS value was 5,320 mg/L (Table 6) measured from Burton Coal Bore 2 in January 2021. Consequently, both Swamp Bore 1 and Burton Coal Bore 2 do not meet the TDS livestock drinking water guideline value (<4,000 mg/L) stipulated within the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ; ANZECC and ARMCANZ, 2000).

5.2 Rangal Coal Measures

The largest portion of the groundwater monitoring network (six monitoring bores) targets the Rangal Coal Measures within the IPC leases. Across the six monitoring bores, there is a large variation of screen depths, ranging from the shallowest (MB1) at 22.5 m depth to the deepest (MB12) starting at 126 m depth. This variation in screen depths (and depth of coal) is recognised as a significant influence of the varying water quality characteristics observed within the monitoring network, substantiated by the relatively high SD and c_v values (Table 6).

Generally, the water quality in the Rangal Coal Measures decreases below about 50 m, whereby the shallowest bore (MB1, screened at 22 m) has an average reporting period TDS value around 2,200 mg/L, whereas the second shallowest bore (MB2, screened at 48 m) has an average TDS value of around 4,400 mg/L. All of the deeper bores (MB7, MB8, MB9 and MB12) have average TDS values ranging between approximately 6,200 mg/L and 16,400 mg/L over the reporting period. The highest reporting period TDS average (15,000 mg/L) is in the equally deepest bore (MB7), screened at 126 m.

Figure 7 displays the ionic composition variation within the Rangal Coal Measures, with MB1 and MB2 distinctly different from the other monitoring bores within the same aquifer. The total cation and anion levels recorded in MB1 and MB2 are consistently less than levels in the rest of the Rangal Coal Measures bores. MB1 and MB2 are both quite shallow, screened at 22 m and 48 m, respectively. Therefore, it is likely that the ionic composition is influenced by rainwater in these two bores, which is why they are different to the deeper bores. This observation that rainwater is influencing the bores is further substantiated by the fact that carbonate levels are elevated in both MB1 and MB2, whereas they are quite low in the other bores (Figure 7). Regardless of this geochemical difference, of all the Rangal Coal Measures monitoring bores, only MB1 meets the TDS livestock drinking water guideline value (<4,000 mg/L) stipulated within ANZECC and ARMCANZ (2000).

Note: MB8 and MB9 are referred to as MB8b and MB9a, respectively, within all field and analysis documentation.

Table 6: Groundwater characteristics from each formation monitored over the reporting period.

Aquifer System		pH	Electrical Conductivity	Chloride	Sulphate	Calcium	Magnesium	Sodium	Potassium	TDS @180°C	Suspended Solids	Bicarbonate	Carbonate
	Unit		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	0.01	1	1	1	1	1	1	1	10	5	1	1
Rewan Group	Count	8	8	8	8	8	8	8	8	8	8	8	8
	Minimum	7.52	7,630	2,400	102	218	137	955	6	5,320	2.5	53	0.5
	Mean	7.68	8,371	2,840	119	379	244	1,089	13	5,833	20	342	0.5
	Maximum	7.97	9,190	3,230	134	542	369	1,260	21	6,420	86	659	0.5
	Standard Deviation	0.14	588	334	13	150	110	89	8	414	28	301	0
	Coefficient of Variance	2%	7%	12%	11%	40%	45%	8%	57%	7%	142%	88%	0%
Rangal Coal Measures	Count	24	24	24	24	24	24	24	24	24	24	24	24
	Minimum	7.48	1,300	867	0.5	84	104	487	3	1,850	2.5	88	0.5
	Mean	7.84	10,683	3,851	146	279	235	1,926	15	7,384	35	362	0.5
	Maximum	8.09	22,600	8,320	480	657	594	4,680	25	16,400	2631	775	0.5
	Standard Deviation	0.18	5,841	2,153	155	153	144	1,050	8	4,142	58	231	0
	Coefficient of Variance	2%	55%	56%	106%	55%	61%	55%	49%	56%	168%	64%	0%
Quaternary Colluvium / Tertiary Sediments	Count	5	5	4	4	4	4	4	4	4	4	5	5
	Minimum	7.63	6,510	1,860	89	108	191	1,060	2	4,030	24	346	0.5
	Mean	7.87	33,906	11,263	533	417	1,163	5,925	3	23,715	1,071	447	0.5
	Maximum	8.19	52,700	21,300	971	772	2,350	11,600	4	43,600	2,260	575	0.5
	Standard Deviation	0.27	24,916	10,853	497	351	1,116	5,625	1	22,616	1,126	113	0
	Coefficient of Variance	3%	73%	96%	93%	84%	96%	95%	38%	95%	105%	25%	0%
Tertiary Basalt	Count	8	8	8	8	8	8	8	8	8	8	8	8
	Minimum	8.06	1,960	298	46	27	40	389	5	1,190	11	308	0.5
	Mean	8.30	3,361	862	108	60	119	509	10	1,995	86	422	14
	Maximum	8.54	4,300	1,220	122	73	159	659	13	2,590	232	547	42
	Standard Deviation	0.18	732	287	26	14	36	116	3	427	86	76	16
	Coefficient of Variance	2%	22%	33%	24%	24%	30%	23%	26%	21%	100%	18%	116%

Table 6 continued: Groundwater characteristics from each formation monitored at IPC over the reporting period.

Aquifer System		Dissolved Aluminium	Dissolved Antimony	Dissolved Arsenic	Dissolved Molybdenum	Dissolved Selenium	Dissolved Silver	Dissolved Iron	Dissolved Mercury	C6 - C9 Fraction	C10 - C36 Fraction (sum)
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L
	LOR	0.01	0.001	0.001	0.001	0.01	0.001	0.05	0.0001	20	50
Rewan Group	Count	8	8	8	8	8	8	8	8	8	8
	Minimum	0.005	0.0005	0.0005	0.0005	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.005	0.0005	0.0015	0.0009	0.005	0.0005	0.058	0.00005	10	25
	Maximum	0.005	0.0005	0.0030	0.0020	0.005	0.0005	0.120	0.00005	10	25
	Standard Deviation	0	0	0.0009	0.0005	0	0	0.038	0	0	0
	Coefficient of Variance	0%	0%	59%	53%	0%	0%	67%	0%	0%	0%
Rangal Coal Measures	Count	24	24	24	24	24	24	24	24	24	24
	Minimum	0.005	0.0005	0.0005	0.0005	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.007	0.0007	0.0093	0.0039	0.007	0.0007	0.604	0.00005	10	25
	Maximum	0.025	0.0025	0.0340	0.0500	0.025	0.0025	2.150	0.00005	10	25
	Standard Deviation	0.006	0.0006	0.0101	0.0099	0.006	0.0006	0.578	0	0	0
	Coefficient of Variance	85%	83%	108%	253%	85%	85%	96%	0%	0%	0%
Quaternary Colluvium / Tertiary Sediments	Count	5	5	5	5	5	5	5	5	5	5
	Minimum	0.005	0.0005	0.0005	0.0025	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.018	0.0017	0.0018	0.0027	0.017	0.0024	0.258	0.00009	10	260
	Maximum	0.025	0.0025	0.0025	0.0030	0.025	0.0060	1.190	0.00025	10	1,040
	Standard Deviation	0.010	0.0011	0.0010	0.0003	0.011	0.0022	0.521	0.00009	0	438
	Coefficient of Variance	54%	64%	54%	10%	64%	94%	202%	99%	0%	168%
Tertiary Basalt	Count	8	8	8	8	8	8	8	8	8	8
	Minimum	0.005	0.0005	0.0010	0.0010	0.005	0.0005	0.025	0.00005	10	25
	Mean	0.005	0.0005	0.0035	0.0060	0.005	0.0005	0.028	0.00005	10	25
	Maximum	0.005	0.0005	0.0070	0.0130	0.005	0.0005	0.050	0.00005	10	25
	Standard Deviation	0	0	0.0022	0.0052	0	0	0.009	0	0	0
	Coefficient of Variance	0%	0%	63%	87%	0%	0%	31%	0%	0%	0%

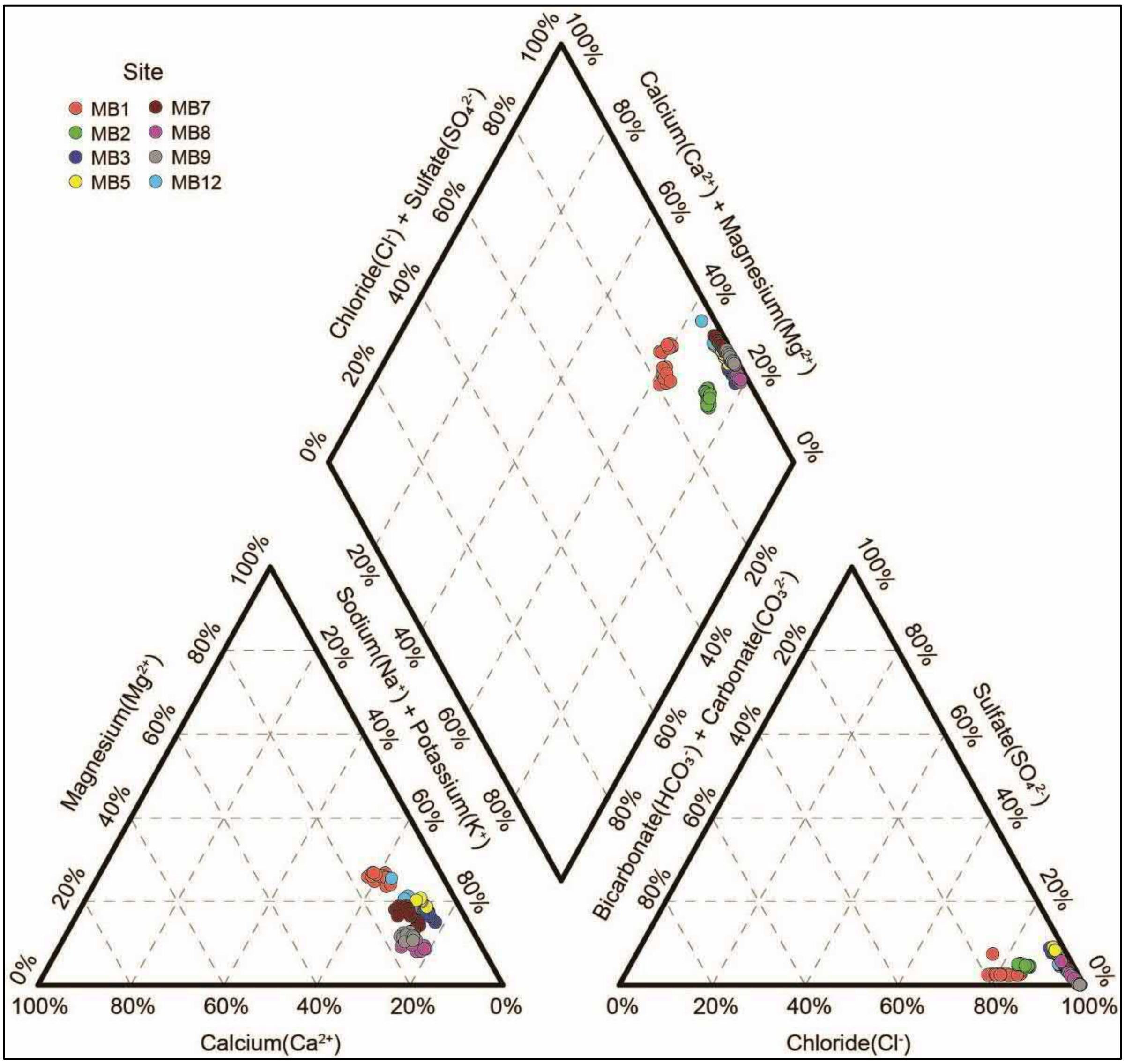

Figure 7: Difference in ionic composition of monitoring bores within the Rangal Coal Measures.

5.3 QUATERNARY COLLUVIUM / TERTIARY SEDIMENTS

Although there are nine monitoring bores in the Quaternary colluvium / Tertiary sediments at IPC, only two of these bores (MB4a and MB16b) actually contained water during the 2021 reporting period. Consequently, six samples were taken in total (four from MB4a and two from MB16b). The two monitoring bores display similar water quality characteristics in terms of pH, substantiated by the low SD and c_v values (Table 6). Generally, the dissolved metal concentrations for both bores are similar, with most results below the LOR.

The two bores (MB4a and MB16b) demonstrate very different EC and TDS quality characteristics. MB4a displayed an average EC and TDS of 52,100 µS/cm and 43,300 mg/L respectively, over the reporting period. In contrast, the average EC and TDS for MB16b are 6,615 µS/cm and 4,130 mg/L, respectively. This difference in water quality between the two bores is due to the limited water column existing in MB4a (<10 cm), where it is recognised that sampling is occurring in the small amount of water that remains at the base of the screen.

The insufficient water available in MB4a has had the effect of concentrating salts in the remnant water column, hence the high EC and TDS measurements.

MB4a recorded hydrocarbon concentrations above the LOR on one occasion during the reporting period. In April 2021, MB4a recorded 700 µg/L within the C15-C28 fraction and 340 µg/L in the C29-C36 fraction, resulting in a (sum) C10-C36 fraction of 1,040 µg/L. This hydrocarbon concentration is considered to be below the level of concern – and considering the sample has been taken at the base of the screen in stagnant water – it is expected that the measurement is attributed to the decomposition of organic matter.

The water quality within the Quaternary/Tertiary sediments is generally poor, with the TDS ranging between 4,030 mg/L (MB16b) and 43,600 mg/L (MB4a) during the reporting period. Therefore, neither bore meets the TDS livestock drinking water guideline value (<4,000 mg/L) stipulated within ANZECC and ARMCANZ (2000).

5.4 TERTIARY BASALT

The Tertiary basalt aquifer contains the best-quality groundwater across the IPC leases, with an average TDS of 1,995 mg/L (Table 6). Two monitoring bores (MB10 and MB14) target the basalt aquifer, with respective screen intervals of 21-27 m and 20-23 m. These two monitoring bores display similar water quality characteristics in terms of pH, EC and TDS, substantiated by the low SD and c_v values (Table 6). Generally, the dissolved metal concentrations for both bores are similar, with most results below the LOR. The hydrocarbon concentrations in both bores, during the reporting period, were below the LOR.

The water quality within the Tertiary basalt is better than all of the other aquifers at IPC, with TDS during the reporting period ranging between approximately 1,200 mg/L and 2,500 mg/L. Therefore, both MB10 and MB14 meet the TDS livestock drinking water guideline value (<4,000 mg/L) stipulated within the ANZECC and ARMCANZ (2000).

Note: MB10 is referred to as MB9b within all field and analysis documentation.

6. EA COMPLIANCE

6.1 GROUNDWATER LEVELS

The IPC EA requires standing water level to be measured on a quarterly basis. Condition C44 states:

If groundwater levels for the bores identified in ***Table 13: Groundwater level monitoring*** *exceed any of the trigger level thresholds identified in* ***Table 13: Groundwater level monitoring*** *the environmental authority holder must:*

a) notify the administering authority via WaTERS or the pollution hotline within seven (7) days of receiving the analysis results;

b) complete an investigation into the potential for environmental harm.

The compliance assessment against triggers stipulated within **Error! Not a valid bookmark self-reference.** only takes into consideration standing water levels measured in the 2021 reporting period (2021 calendar year; Figure 8). Burton Coal Bore 2, Swamp Bore 1, MB14 and MB16 fluctuated by 0.22 m, 1.17 m, 0.43 m and 0.04 m, respectively. Therefore, in accordance with EA Condition C44, IPC did not exceed the fluctuation trigger thresholds for any of the mandated monitoring bores (Figure 8).

Table 7: Groundwater level fluctuation trigger threshold (EA Table 13).

Monitoring Location	Trigger Level Threshold (m)	Monitored Unit
Burton Coal Bore 2	2	Rewan Group
Swamp Bore 1[1]	5	Rewan Group
MB14	1	Tertiary Basalt
MB16	5	Tertiary Sediments

[1] Swamp Bore 1 is referred to as Swamp Bore 2 in EA Table 13.

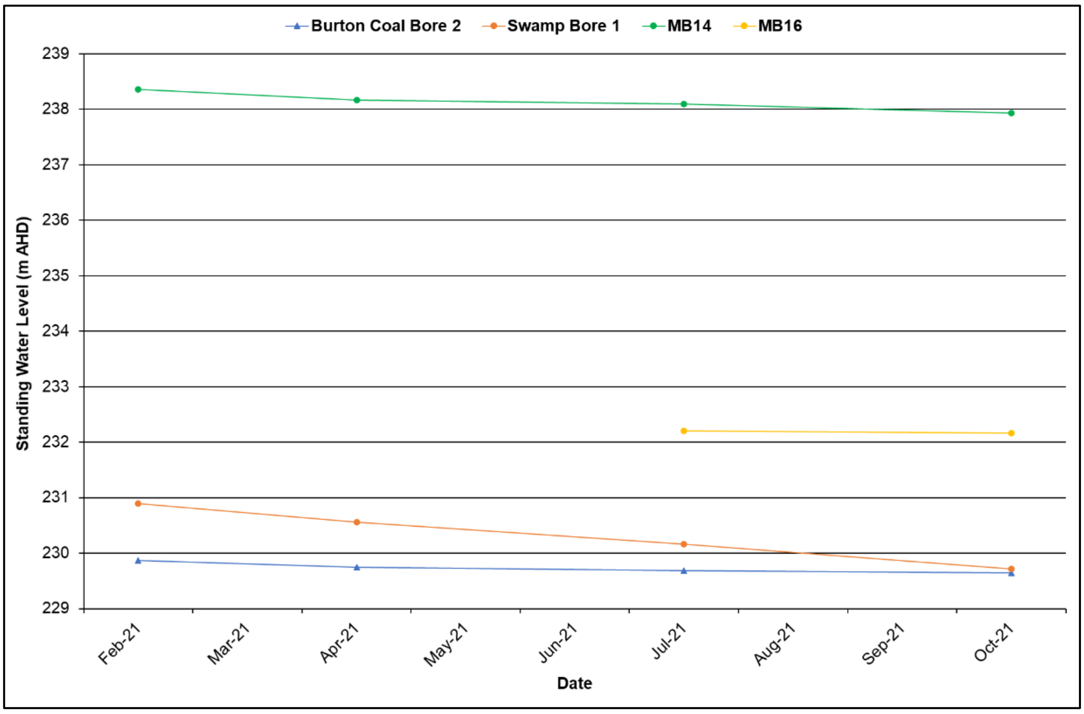

Figure 8: Groundwater level fluctuations for applicable monitoring bores.

6.2 GROUNDWATER CHARACTERISTICS

The IPC EA requires groundwater quality characteristics to be determined on a quarterly basis. Condition C43 states:

*If groundwater quality characteristics in Burton Coal Bore 2 or Swamp Bore 1 exceed any of the trigger levels identified in **Table 12: Groundwater contaminant triggers** the environmental authority holder must:*

a) notify the administering authority via WaTERS or the pollution hotline within seven (7) days of receiving the analysis results;

b) complete an investigation into the potential for environmental harm.

The compliance assessment against triggers stipulated in Table 8 and Table 9 only takes into consideration groundwater quality characteristics measured in the 2021 reporting period (2021 calendar year).

Table 8: Burton Coal Bore 2 water quality and compliance with EA Table 12. Exceedances are highlighted in red and bold font.

Parameter	Unit	LOR	EA Contaminant Trigger	26/01/2021	28/04/2021	27/07/2021	27/10/2021
pH	–	0.01	7.0 < > 8.3	7.59	7.67	7.65	7.97
EC	µS/cm	1	7320	**7,810**	**7,630**	**8,200**	**7,790**
Chloride	mg/L	1	2050	**2,750**	**2,460**	**2,610**	**2,400**
Sulphate	mg/L	1	130	111	107	109	102
Calcium	mg/L	1	195	**252**	**218**	**247**	**242**
Magnesium	mg/L	1	265	**369**	**313**	**355**	**343**
Sodium	mg/L	1	990	**1,130**	955	**1,040**	**1,030**
Potassium	mg/L	1	8	6	6	7	6
TDS @180°C	mg/L	10	4500	**5,320**	**5,370**	**5,560**	**5,660**
TSS	mg/L	5	52	8	5	**86**	BLOR
Bicarbonate	mg/L	1	820	616	659	599	616
Carbonate	mg/L	1	7	BLOR	BLOR	BLOR	BLOR
Aluminum	mg/L	0.01	0.01	BLOR	BLOR	BLOR	BLOR
Antimony	mg/L	0.001	0.001	BLOR	BLOR	BLOR	BLOR
Arsenic	mg/L	0.001	0.004	0.002	BLOR	0.001	BLOR
Molybdenum	mg/L	0.001	0.001	0.001	**0.002**	BLOR	BLOR
Selenium	mg/L	0.01	0.01	BLOR	BLOR	BLOR	BLOR
Silver	mg/L	0.001	0.001	BLOR	BLOR	BLOR	BLOR
Iron	mg/L	0.05	0.23	BLOR	BLOR	0.09	BLOR
Mercury	mg/L	0.0001	0.0001	BLOR	BLOR	BLOR	BLOR
C6 - C9 Fraction	µg/L	20	20	BLOR	BLOR	BLOR	BLOR
C10 - C36 Fraction (sum)	µg/L	50	50	BLOR	BLOR	BLOR	BLOR

BLOR = Below the limit of reporting.

Table 9: Swamp Bore 1 water quality and compliance with EA Table 12. Exceedances are highlighted in red and bold font.

Parameter	Unit	LOR	EA Contaminant Trigger	22/02/2021	28/04/2021	26/07/2021	27/10/2021
pH	–	0.01	7.1 < > 7.8	7.52	7.62	7.64	7.78
EC	µS/cm	1	9500	8,870	8,730	9,190	8,750
Chloride	mg/L	1	3500	3,200	3,140	3,230	2,930
Sulphate	mg/L	1	150	134	130	132	125
Calcium	mg/L	1	580	515	505	542	514
Magnesium	mg/L	1	165	141	138	152	137
Sodium	mg/L	1	1275	1,100	1,090	1,260	1,110
Potassium	mg/L	1	25	21	20	21	20
TDS @180°C	mg/L	10	7585	6,050	6,420	6,280	6,000
TSS	mg/L	5	37	10	BLOR	32	14
Bicarbonate	mg/L	1	94	53	74	54	62
Carbonate	mg/L	1	1	BLOR	BLOR	BLOR	BLOR
Aluminum	mg/L	0.01	0.01	BLOR	BLOR	BLOR	BLOR
Antimony	mg/L	0.001	0.001	BLOR	BLOR	BLOR	BLOR
Arsenic	mg/L	0.001	0.002	**0.003**	0.002	0.002	0.001
Molybdenum	mg/L	0.001	0.001	BLOR	0.001	0.001	0.001
Selenium	mg/L	0.01	**0.01**	BLOR	BLOR	BLOR	BLOR
Silver	mg/L	0.001	0.001	BLOR	BLOR	BLOR	BLOR
Iron	mg/L	0.05	**1.00**	0.09	0.12	0.06	BLOR
Mercury	mg/L	0.0001	0.0001	BLOR	BLOR	BLOR	BLOR
C6 - C9 Fraction	µg/L	20	20	BLOR	BLOR	BLOR	BLOR
C10 - C36 Fraction (sum)	µg/L	50	50	BLOR	BLOR	BLOR	BLOR

BLOR = Below the limit of reporting.

6.2.1 BURTON COAL BORE 2

The water quality of Burton Coal Bore 2 has been assessed against the groundwater contaminant trigger levels stipulated within EA Table 12 (Table 8). Numerous groundwater contaminant limits have been exceeded during the reporting period, with values surpassing designated limits (Table 8). It can be established that all exceedances – apart from the singular dissolved molybdenum and total suspended solids (TSS) exceedances – are inter-related and associated with natural processes and climatic conditions (increased evapotranspiration / decreased rainfall), and are not a result of mining impacts (Appendix B).

In recent years, the TDS within Burton Coal Bore 2 has been steadily increasing, with concentrations at 2,160 mg/L in October 2017 and at 5,660 mg/L in October 2021, an overall increase of 3,500 mg/L (Figure 9). This increase in TDS is an indication of a change within the cation and anion balance within the groundwater supplying Burton Coal Bore 2. The progression of this concentration can be tracked through the use of the Piper diagram (Figure 10), with data points separated into the year of collection.

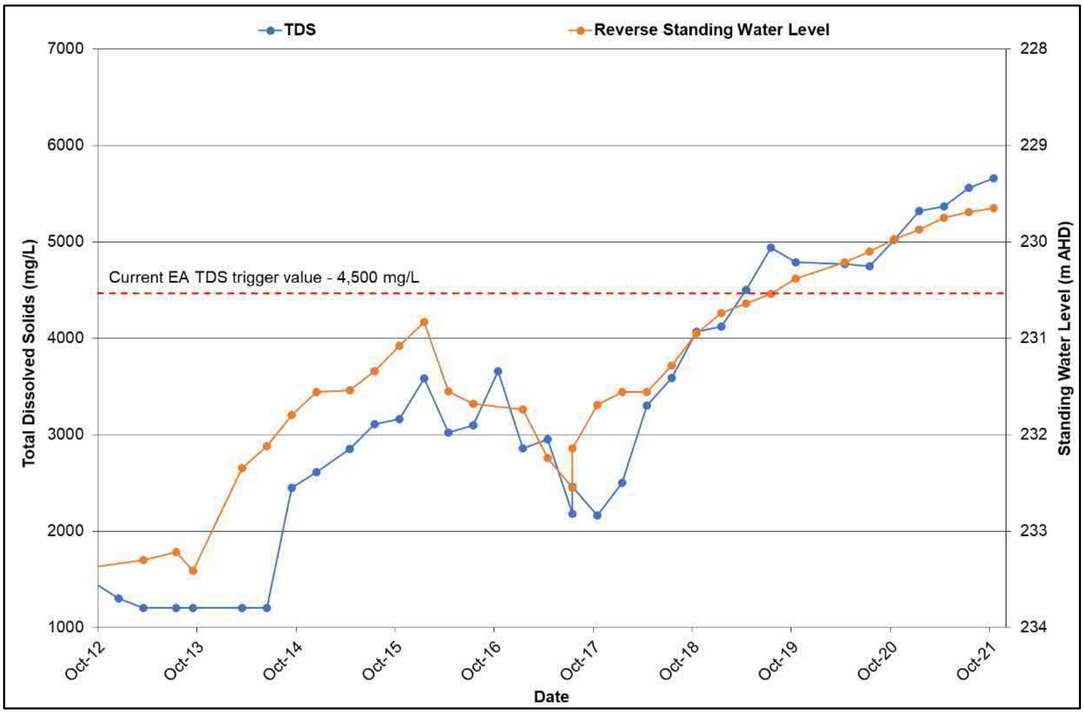

Figure 9: Total dissolved solids and reverse standing water level in Burton Coal Bore 2.

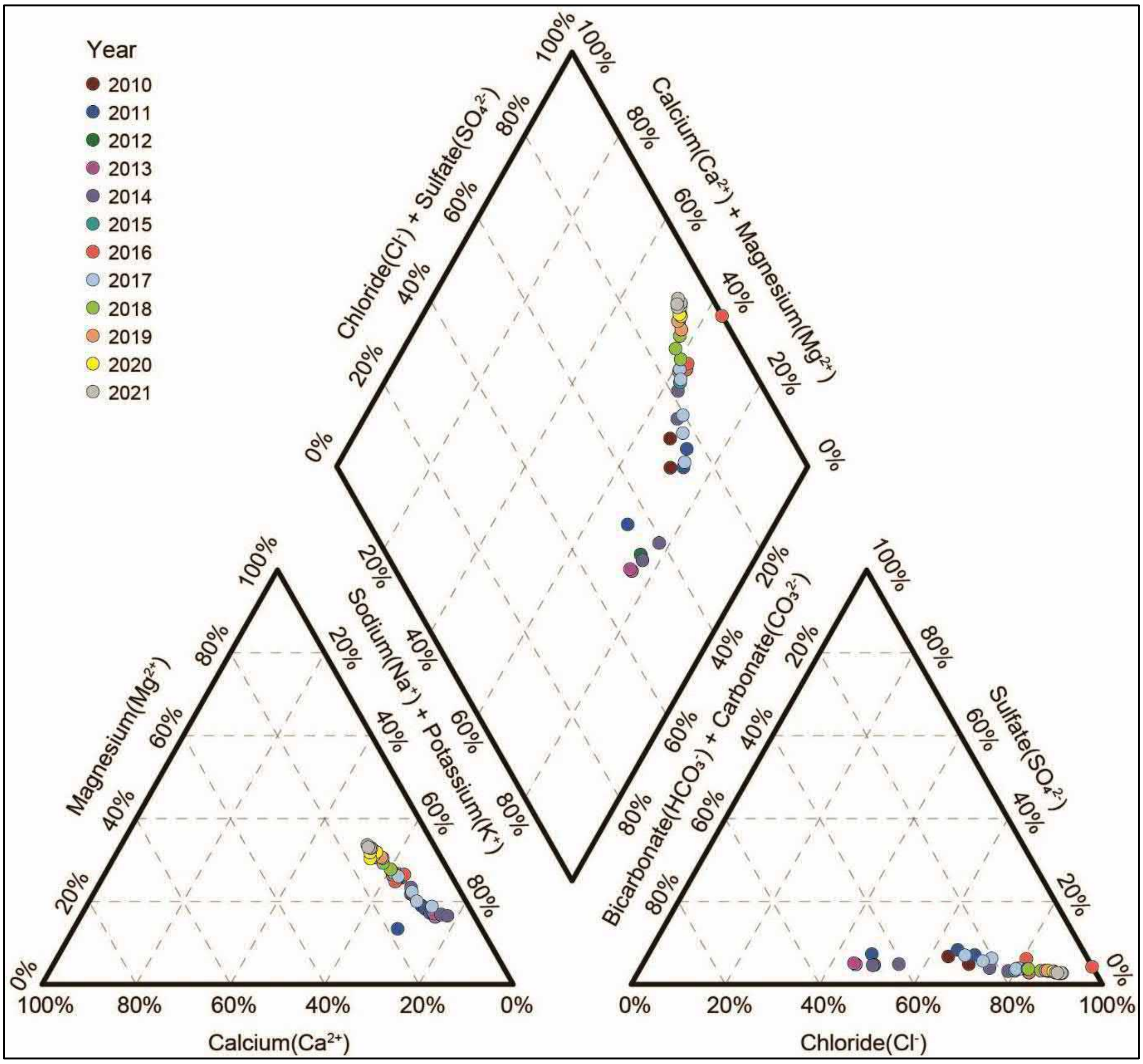

Figure 10: Ionic composition variation within Burton Coal Bore 2.

Figure 10 shows that the Burton Coal Bore 2 is consistent with a sodium-chloride water type, although the ratio of these two elements has altered between 2010 and 2021. Water quality analyses performed in the initial years of IPC display similar concentrations of sodium and chloride. However, the composition has altered in recent years, displaying a chloride-dominated system, with sodium providing a lesser share of the ionic balance. Therefore, it is not unusual that the majority of recent exceedances in the Burton Coal Bore 2 (Table 8) all relate to increases in TDS, EC, cation and anion levels.

Results from a Pearson correlation analysis reveal that the observed trends in TDS are significantly and inversely correlated to the standing water levels ($r = -0.94$, $n = 36$, $p < 0.001$). This correlation is evident in Figure 9, showing a clear relationship between the TDS and standing water level (note: standing water level increments were reversed for visual purposes). Given this correlation, it is expected that the recent dry period (2018–2021) has had the effect of concentrating the dissolved solids in the aquifer system. The increasing trend of TDS concentrations indicates that water is being lost from the system (confirmed by the SWL decline), whilst dissolved salts remain and are more concentrated due to reduced dilution.

The observed trends in TDS, EC, ionic concentrations and standing water level are highly indicative of evapotranspiration processes (sum of evaporation and plant transpiration).

Burton Coal Bore 2 is located within the riparian corridor of Smoky Creek, surrounded by remnant vegetation consisting of large, deep-rooted trees. Standing water levels in the bore are known to be relatively shallow, with water levels as shallow as 7.27 m below ground level. The combination of deep tree roots and capillary action can draw water from depths (accounting for the water loss), in turn lowering the zone of saturation and concentrating salts.

The current increasing trend in TDS, EC, cation and anion levels is therefore inferred to be an expression of the climatic conditions in the area, and not a result of IPC mining activities. The groundwater contaminant limits for Burton Coal Bore 2 need to be recalculated to allow for such natural variations.

A single dissolved molybdenum exceedance of 0.002 mg/L occurred in April 2021. This measurement is marginally above the dissolved molybdenum LOR of 0.001 mg/L that also corresponds with the EA trigger level. Given that this exceedance is only slightly above the LOR, it is still within the limits of analytical uncertainty. Therefore, this dissolved molybdenum exceedance is not of environmental concern because it is the only recent exceedance (Figure 11) and potentially represents an anomaly in the individual analysis.

A single TSS exceedance of 86 mg/l occurred in July 2021. This TSS measurement was accompanied by an increase in total aluminium (2.82 mg/L) and total iron (4.0 mg/L) levels, whilst the dissolved concentrations for both of these metals were below 0.1 mg/L. This indicates that the TSS exceedance is associated with an increase of colloidal aluminium and iron in the sample, implying that the sample contained sediment. This sediment has most likely been introduced during the sampling process because this is only the second suspended solids exceedance in the past ten years (Figure 12). Therefore, this exceedance is not of environmental concern.

No other parameters exceeded the contaminant trigger values for Burton Coal Bore 2 during the reporting period (Table 8).

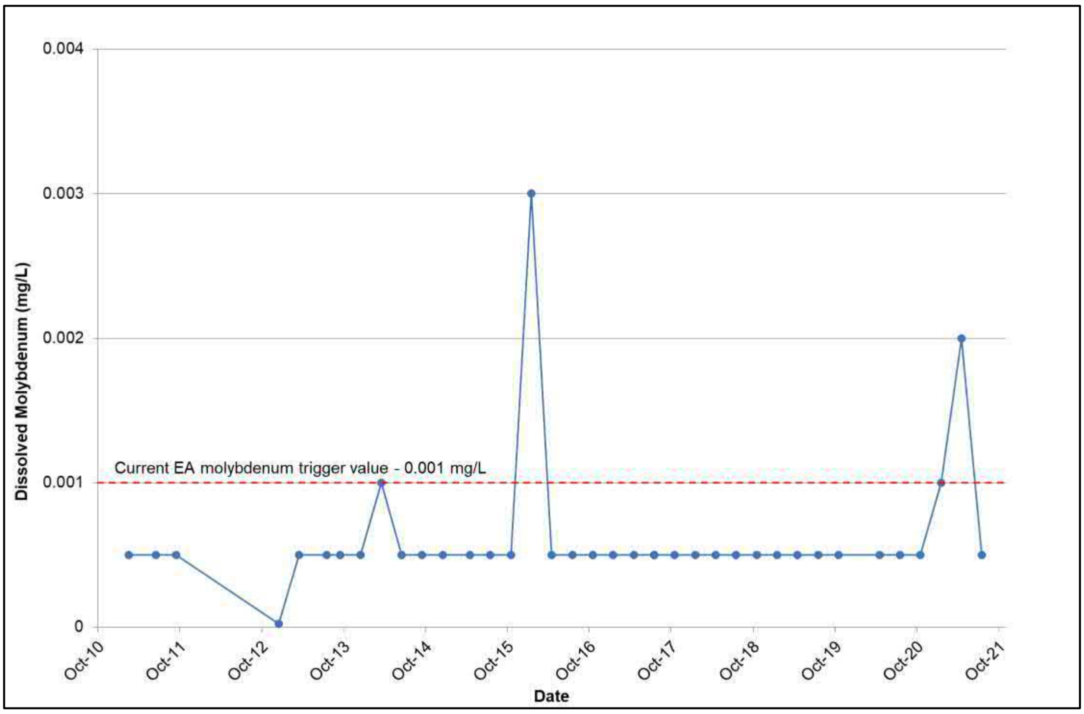

Figure 11: Dissolved molybdenum in Burton Coal Bore 2.

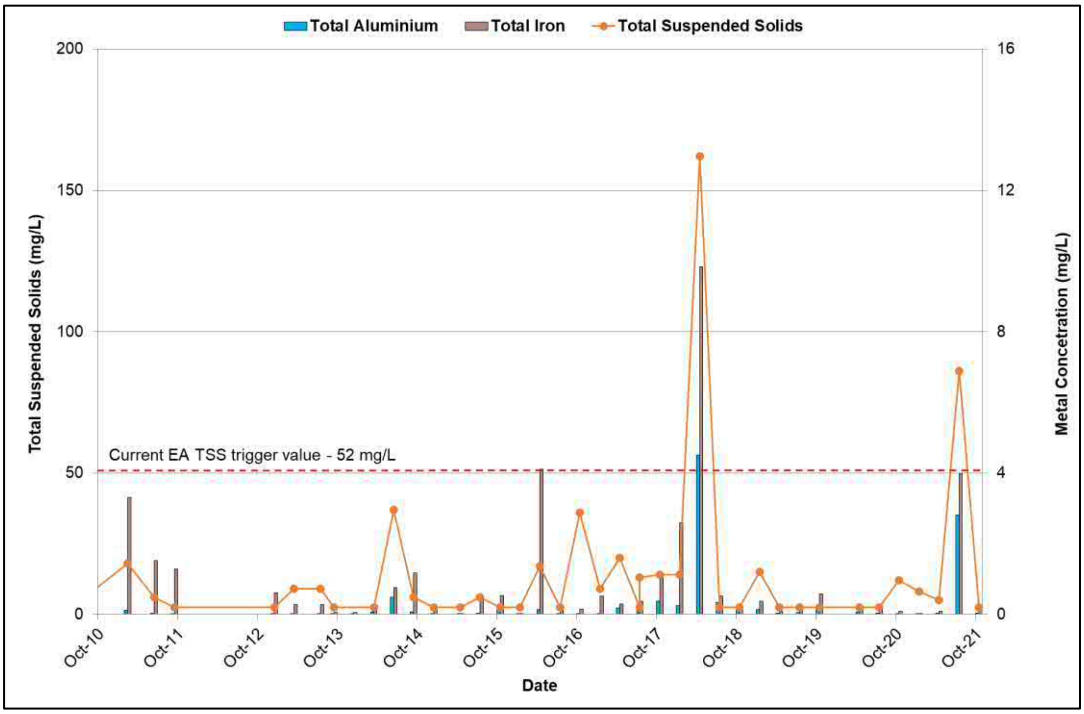

Figure 12: Total suspended solids, total aluminium and total iron in Burton Coal Bore 2.

6.2.2 SWAMP BORE 1

The water quality of Swamp Bore 1 has been assessed against the groundwater contaminant trigger levels stipulated for the bore in EA Table 12 (Table 9**Error! Reference source not found.**). A single groundwater contaminant limit was exceeded during the reporting period: dissolved arsenic in February 2021. This exceedance (0.003 mg/L) is only marginally above the EA dissolved arsenic trigger level (0.002 mg/L) and is the only arsenic exceedance reported since monitoring began in 2010 (Figure 13). Therefore, it is assumed that the exceedance is a natural variation within the groundwater and not a result of mining impacts.

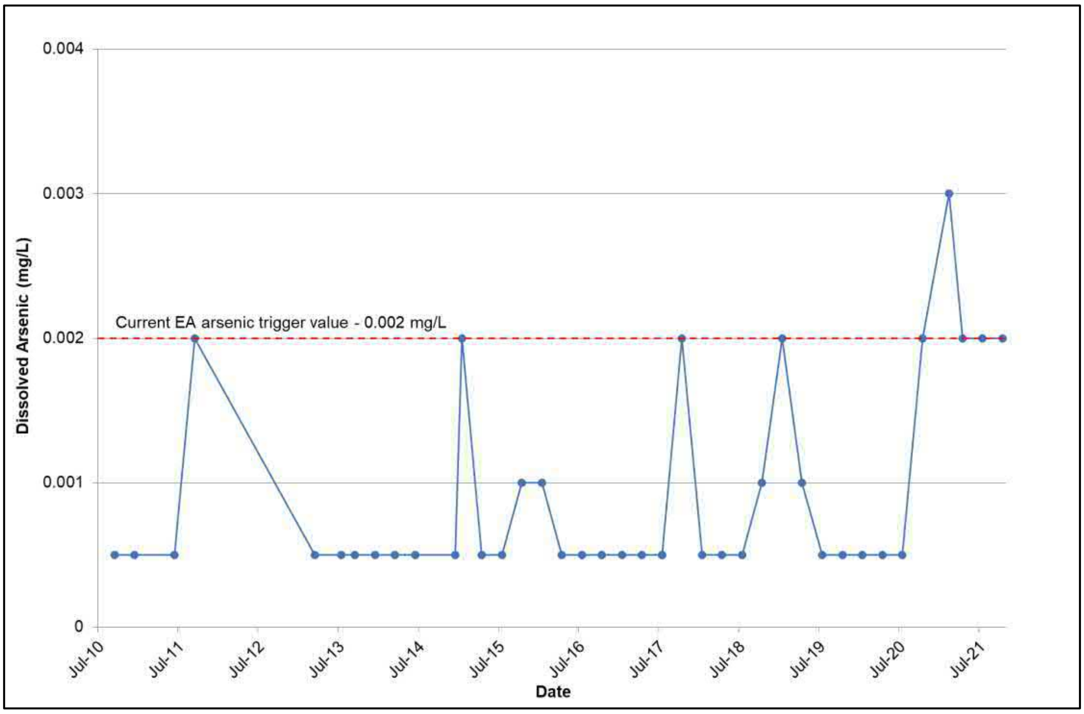

Figure 13: Dissolved arsenic in Swamp Bore 1.

No other parameters exceeded the contaminant trigger values for Swamp Bore 1 during the reporting period (Table 9).

7. GROUNDWATER TRIGGER VALUES

The current EA *Table 12: Groundwater contaminant triggers* was developed for Swamp Bore 1 and Burton Coal Bore 2 from historical data collected between September 2013 and April 2019. The trigger values were determined by calculating the 80th percentile plus one standard deviation, and then rounding the result to the nearest significant figure. Subsequent monitoring has been able to provide an additional ten data points for Swamp Bore 1, with a total sample size of 33 data points. Nine additional data points were obtained for Burton Coal Bore 2, with a total sample size of 32 data points.

The historical water composition within Swamp Bore 1 remains in a tight cluster (Figure 14), demonstrating that the bore is not trending. Therefore it is recommended that the water quality results for Swamp Bore 1 should be analysed and assessed – in line with the Queensland DES guideline *Using monitoring data to assess groundwater quality and potential environmental impacts* (DES, 2021) – in order to update to bore-specific assessment criteria. However, until this occurs, it is deemed that the current Swamp Bore 1 EA triggers levels are appropriate.

Burton Coal Bore 2 continues to display an increasing trend in TDS, EC and associated cations and anions. This trend can be attributed to climatic conditions and natural processes (refer to Section 6.2.1). It is recommended that the EA groundwater trigger levels be amended to account for these changes in Burton Coal Bore 2.

The DES (2021) guidelines cannot be applied to Burton Coal Bore 2 because the bore water quality continues to change compositionally (Figure 10). Therefore, the proposed EA amendments provided in Table 10 have been determined by calculating the 80th percentile plus one standard deviation for the 32 Burton Coal Bore 2 data points (from September 2013 to October 2021), with the resulting value rounded to the nearest significant figure. It is recommended that these proposed EA amendments (Table 10) be adopted while Stanmore continues to mine at IPC. However, upon cessation of mining activities, it is advised that Burton Coal Bore 2 be removed from the monitoring network and replaced with the more relevant and compositionally consistent MB1 (Figure 15).

Table 10: Proposed updates to EA *Table 12 Groundwater contaminant triggers*. Changes are highlighted in blue and bold font.

Parameter	Unit	LOR	Burton Coal Bore 2	
			Current Trigger Values	Amended Trigger
pH	–	0.01	7.0 < > 8.3	7.0 < > 8.3
EC	µS/cm	1	7320	**9310**
Chloride	mg/L	1	2050	**3000**
Sulphate	mg/L	1	130	130
Calcium	mg/L	1	195	**290**
Magnesium	mg/L	1	265	**390**
Sodium	mg/L	1	990	**1170**
Potassium	mg/L	1	8	8
TDS @180°C	mg/L	10	4500	**6110**
TSS	mg/L	5	52	52
Bicarbonate	mg/L	1	820	820
Carbonate	mg/L	1	7	7
Aluminum	mg/L	0.01	0.01	0.01
Antimony	mg/L	0.001	0.001	0.001
Arsenic	mg/L	0.001	0.004	0.004
Molybdenum	mg/L	0.001	0.001	0.001
Selenium	mg/L	0.01	0.01	0.01
Silver	mg/L	0.001	0.001	0.001
Iron	mg/L	0.05	0.23	0.23
Mercury	mg/L	0.0001	0.0001	0.0001
C6 - C9 Fraction	µg/L	20	20	20
C10 - C36 Fraction (sum)	µg/L	50	50	50

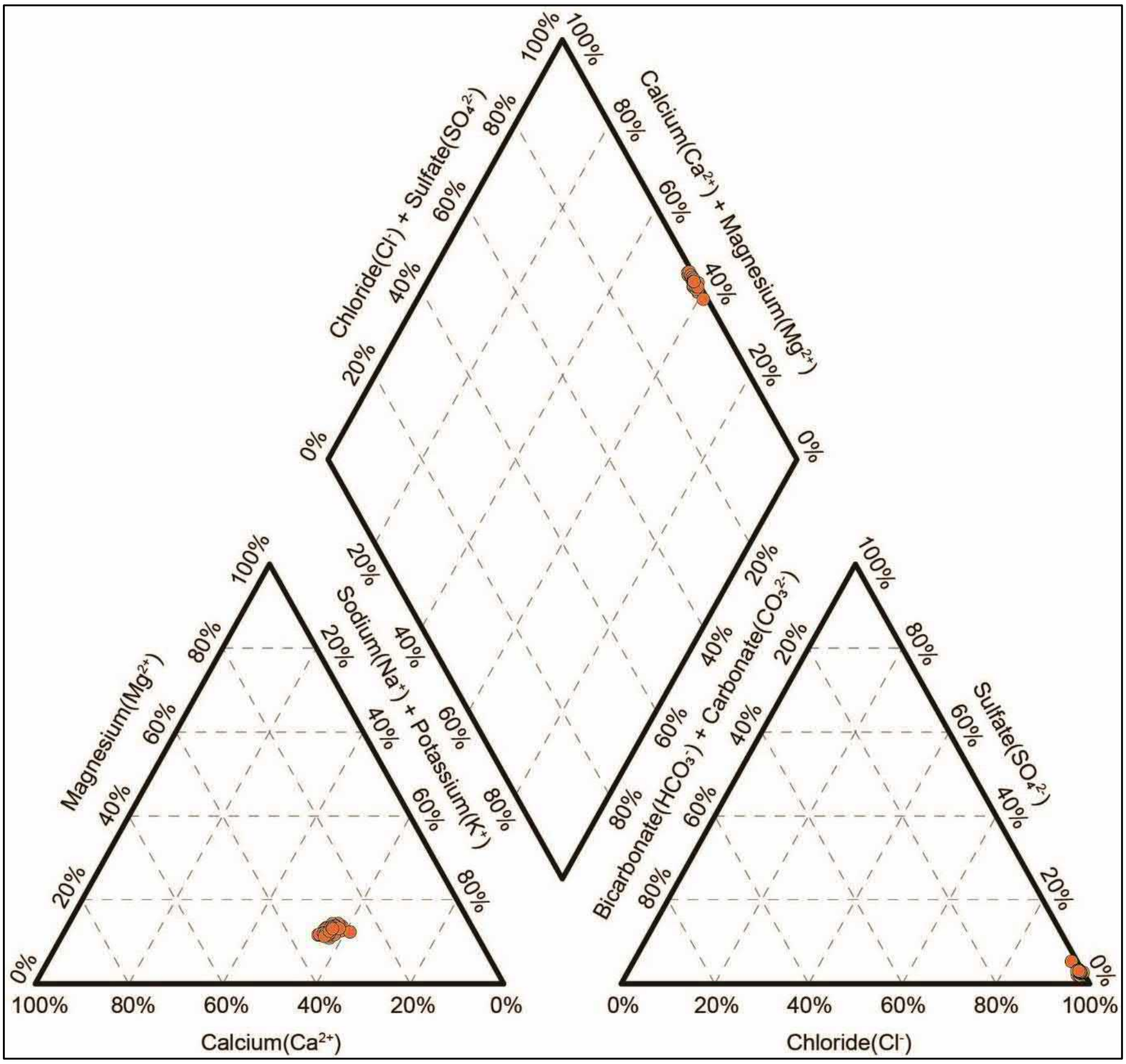

Figure 14: Ionic composition of Swamp Bore 1.

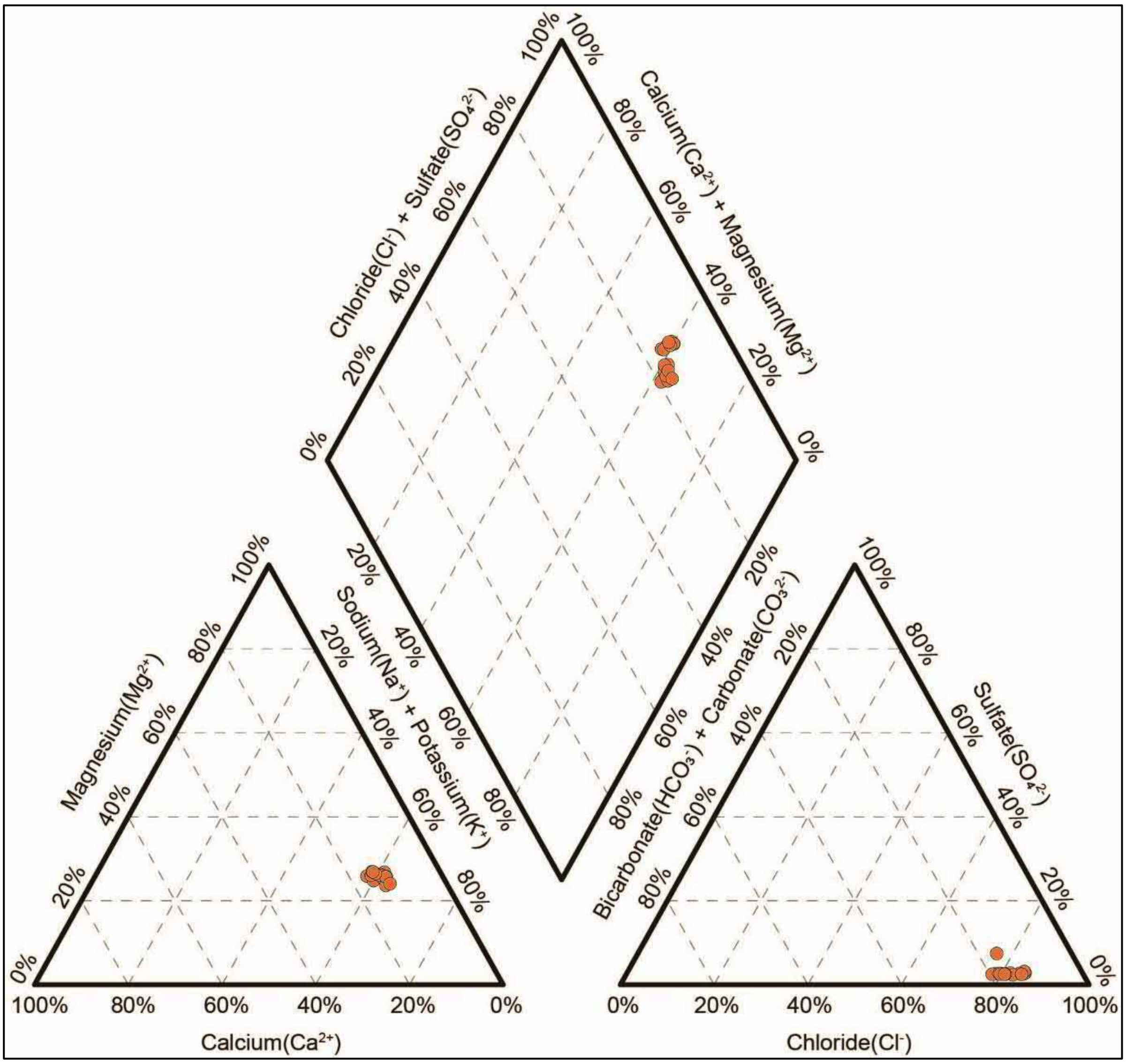

Figure 15: Ionic composition of MB1.

8. CLOSURE MONITORING NETWORK

C&R understand that Stanmore will cease mining operations at IPC during 2022, after which the mine will enter closure activities. In preparation for the mine closure, C&R recommend that the current EA monitoring network be reviewed (for its effectiveness) and amended as necessary when considering the post-mining risks.

Each bore in the monitoring network has been assessed (Table 11), with recommendations and reasoning for inclusion/exclusion in the closure monitoring network also provided.

In summary, the aim of the recommended closure monitoring network (Table 12 and Figure 16) is to:

- Replace reference Burton Coal Bore 2 with MB1, which is more relevant, has better water quality and the DES (2021) guidelines for groundwater contaminant limits can be applied;
- Apply DES (2021) guidelines to groundwater contaminant limits for Swamp Bore 1;
- Add MB7 to the monitoring network because it identifies change in the southern voids;
- Apply groundwater contaminant limits to MB14 and MB16 once sufficient data have been obtained (i.e. 18 individual contaminant data points, reported over a minimum period of 12 months);
- Replace decommissioned or irrelevant bores; and
- Remove numerous dry bores from the network (MB4a, MB4b, MB11, MB16a, GDEMB01, GDEMB02, GDEMB03 and GDEMB04).

Table 11: Assessment of current groundwater monitoring network at IPC.

Monitoring Point	Aquifer Type	Status	Recommendation	Reasoning
Burton Coal Bore 2	Rewan Group	EA reference bore with groundwater level and contaminant trigger limits	• Remove from monitoring network • Replace this bore with MB1	• >2 km from mine • Hydraulically up-gradient of mine • Naturally changing (compositionally) • Inadequate data to apply DES (2021) guidelines in relation to contaminant limits • Groundwater is not of environmental value
MB1	Rangal Coal Measures	EA reference bore to be decommissioned	• Do not decommission • Maintain in monitoring network • Apply groundwater level and contaminant trigger limits	• <1 km from mine • Representative of Rangal Coal Measures at shallow depths (better quality) • Consistent composition • Adequate data to apply DES (2021) guidelines in relation to contaminant limits • Groundwater is of environmental value
Swamp Bore 1 (referred to as Swamp Bore 2 in the EA)	Rewan Group	EA reference bore with groundwater level and contaminant trigger limits	• Maintain in monitoring network • Reassess groundwater contaminant trigger limits	• <2 km from mine • Consistent composition • Adequate data to apply DES (2021) guidelines in relation to contaminant limits
MB2	Rangal Coal Measures	EA reference bore to be decommissioned	• Remove from monitoring network • Replace this bore with MB12	• >2 km from mine • Hydraulically up-gradient of mine
MB3	Rangal Coal Measures	EA reference bore to be decommissioned	• Remove from monitoring network	• Decommissioned in 2018
MB4a	Quaternary Colluvium / Tertiary Sediments	EA reference bore to be decommissioned	• Remove from monitoring network	• Bore is dry • Recorded poorest water quality of all bores
MB4b	Quaternary Colluvium / Tertiary Sediments	EA reference bore	• Remove from monitoring network • Replace this bore with MB16b	• Bore is dry • Recorded second poorest water quality of all bores
MB7	Rangal Coal Measures	Observation bore (not listed in the EA)	• Continue monitoring • List in the EA as a reference bore but do not apply groundwater level and contaminant trigger limits	• <1 km from mine • Hydraulically down-gradient • Water level varies with – and reflects – the activity of the southern voids

Monitoring Point	Aquifer Type	Status	Recommendation	Reasoning
MB8	Rangal Coal Measures	EA reference bore to be decommissioned	• Remove from monitoring network • Replace this bore with MB13	• <1 km from mine • Adversely affected by mining – standing water level suddenly dropped in late 2021
MB9	Rangal Coal Measures	EA reference bore to be decommissioned	• Remove from monitoring network • Replace this bore with MB15	• <1 km from mine • Adversely affected by mining – standing water level drawdown >25 m (starting in early 2019)
MB10 (referred to in field notes as MB9b)	Tertiary Basalt	EA reference bore to be decommissioned	• Do not decommission • Maintain in monitoring network	• <1 km from mine • Starting to show drawdown effects of mining because it relates to the basalt aquifer • Groundwater is of environmental value
MB11	Tertiary Sediments / Weathered Rewan Group	EA reference bore that is dry	• Remove from monitoring network	• Bore has always been dry
MB12	Rangal Coal Measures	EA reference bore	• Maintain in monitoring network • Stand-alone bore – do not use as a replacement for MB1	• <1 km from mine • Representative of Rangal Coal Measures at deeper depths (poorer quality) • Not the same water type as MB1
MB13	Rangal Coal Measures	EA reference bore to be commissioned	• Commission bore and maintain in monitoring network	• Replacement bore for MB8
MB14	Tertiary Basalt	EA reference bore with groundwater level trigger limits	• Maintain in monitoring network • Apply groundwater contaminant trigger limits (once sufficient dataset has been obtained)	• <2 km from mine • Consistent composition • Groundwater is of environmental value • At this time, there are insufficient data to apply DES (2021) guidelines in relation to contaminant limits (bore was only recently commissioned)
MB15	Rangal Coal Measures	EA reference bore to be commissioned	• Commission bore and maintain in monitoring network	• Replacement bore for MB9
MB16a	Tertiary Sediments	Observation bore that is dry	• Remove from monitoring network	• Bore has always been dry
MB16 (referred to in field notes as MB16b)	Tertiary Sediments	EA reference bore with groundwater level trigger limits	• Maintain in monitoring network • Apply groundwater contaminant trigger limits (once sufficient dataset has been obtained)	• <2 km from mine • Consistent composition • At this time, there are insufficient data to apply DES (2021) guidelines in relation to contaminant limits (bore was only recently commissioned)

Monitoring Point	Aquifer Type	Status	Recommendation	Reasoning
GDEMB01	Quaternary Alluvium	Observation bore that is dry	• Remove from monitoring network	• Bore has always been dry
GDEMB02	Quaternary Alluvium	Observation bore that is dry	• Remove from monitoring network	• Bore has always been dry
GDEMB03	Quaternary Alluvium	Observation bore that is dry	• Remove from monitoring network	• Bore has always been dry
GDEMB04	Quaternary Alluvium	Observation bore that is dry	• Remove from monitoring network	• Bore has always been dry

Table 12: Recommended groundwater monitoring network for closure activities at IPC.

Monitoring Point	Location		Surface RL	Hydro stratigraphic Unit	Screening interval (mbgl)	Monitoring frequency
	Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)				
Swamp Bore 1	621518	7568790	245.9	Rewan Group	24.0 – 55.1	Quarterly
MB1	618793	7572214	236.4	Rangal Coal Measures	22.5 – 28.4	Quarterly
MB7	617423	7568883	236.91	Rangal Coal Measures	126.0 – 132.0	Quarterly
MB10	620368	7568046	239.5	Tertiary Basalt	21.0 – 27.0	Quarterly
MB12	619210	7572000	239.5	Rangal Coal Measures	126.0 – 128.0	Quarterly
MB13	619367	7571035	249.7	Rangal Coal Measures	95.0 – 97.0	Quarterly
MB14	620263	7571132	257.3	Tertiary Basalt	20.0 – 23.0	Quarterly
MB15	620633	7568080	242.9	Rangal Coal Measures	115.0 – 119.0	Quarterly
MB16	620670	7568599	245.6	Tertiary Sediments	8.0 – 11.0	Quarterly

In order to obtain suitable groundwater contaminant limits to recommended bores – Swamp Bore 1, MB1, MB14 and MB16 – the Queensland DES guideline *Using monitoring data to assess groundwater quality and potential environmental impacts* (DES, 2021) has been applied. At this time, no groundwater contaminant limits can be set for recently developed bores MB14 and MB16 because there are insufficient data to apply the guidelines. Given that the current EA has only two bores with groundwater contaminant limits, it is assumed that closure activities can be undertaken with only two bores (MB1 and Swamp Bore 1) being monitored with respect to contaminant limits, with the other two bores (MB14 and MB16) added once sufficient data are obtained (i.e. they should be included in the EA with limits set as 'to be advised' – TBA).

Table 13 and Table 14 present the recommended EA groundwater contaminant limits for Swamp Bore 1 and MB1.

The undertaken data analysis– in order to provide the recommended EA groundwater contaminant limits – is outlined in Appendix C.

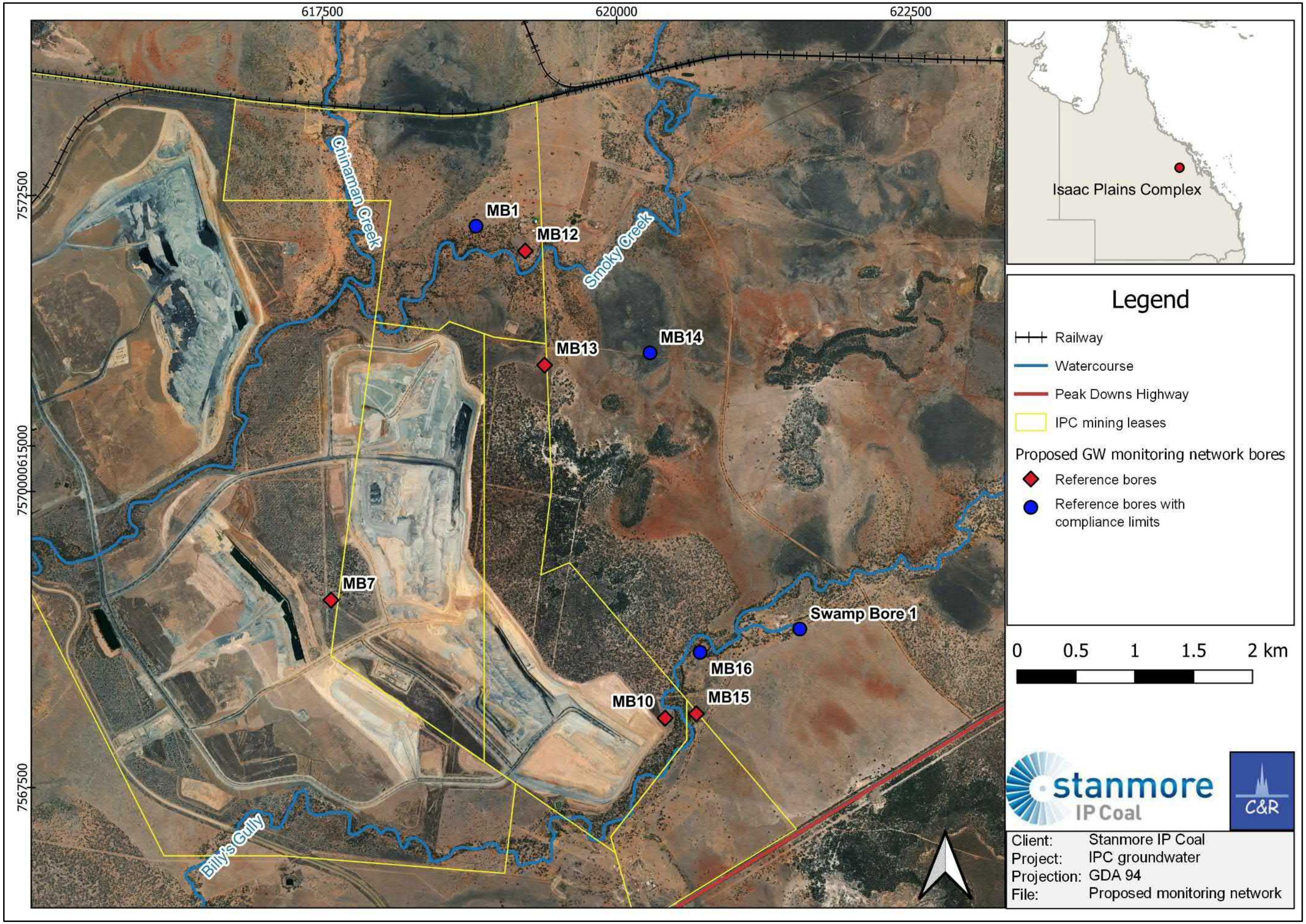

Figure 16: **Recommended IPC groundwater monitoring network for closure activities.**

Table 13: Proposed Swamp Bore 1 contaminant limits for closure activities at IPC.

Parameter	Unit	LOR	Current Trigger Values	Limit Type	Amended Trigger Value – Limit A[1]	Amended Trigger Value – Limit B[2]	Comment
pH	–	0.01	7.1 < > 7.8	Range	7.36 < > 7.63	7.19 < > 7.72	
EC	µS/cm	1	9500	Maximum	9,096	9,244	
Chloride	mg/L	1	3500	Maximum	3,200	3,308	
Sulphate	mg/L	1	150	Maximum	132	144	
Calcium	mg/L	1	580	Maximum	544	598	
Magnesium	mg/L	1	165	Maximum	148	154	
Sodium	mg/L	1	1275	Maximum	1,176	1,230	
Potassium	mg/L	1	25	Maximum	22	23	
TDS @180°C	mg/L	10	7585	Maximum	6,486	7,144	
TSS	mg/L	5	37	Maximum	17	30	
Bicarbonate	mg/L	1	94	Maximum	75	87	
Carbonate	mg/L	1	1	Maximum	-	1	Entire dataset is BLOR
Dissolved Aluminum	mg/L	0.01	0.01	Maximum	-	0.01	94% of dataset is BLOR
Dissolved Antimony	mg/L	0.001	0.001	Maximum	-	0.001	Entire dataset is BLOR
Dissolved Arsenic	mg/L	0.001	0.002	Maximum	0.0016	0.0020	
Dissolved Molybdenum	mg/L	0.001	0.001	Maximum	0.0010	0.0014	
Dissolved Selenium	mg/L	0.01	0.01	Maximum	-	0.01	Entire dataset is BLOR
Dissolved Silver	mg/L	0.001	0.001	Maximum	-	0.001	97% of dataset is BLOR
Dissolved Iron	mg/L	0.05	1.00	Maximum	0.49	0.93	
Dissolved Mercury	mg/L	0.0001	0.0001	Maximum	-	0.0001	Entire dataset is BLOR
C6 - C9 Fraction	µg/L	20	20	Maximum	-	20	Entire dataset is BLOR
C10 - C36 Fraction (sum)	µg/L	50	50	Maximum	-	50	Entire dataset is BLOR

[1]Exceedances of Limit A are regarded as five consecutive samples exceeding the Limit A value.
[2]Exceedances of Limit B are regarded as three consecutive samples exceeding the Limit B value.

Table 14: Proposed MB1 contaminant limits for closure activities at IPC.

Parameter	Unit	LOR	Limit Type	Amended Trigger Value – Limit A[1]	Amended Trigger Value – Limit B[2]	Comment
pH	–	0.01	Range	7.45 < > 7.96	7.34 < > 8.11	
EC	µS/cm	1	Maximum	4,064	4,373	
Chloride	mg/L	1	Maximum	1,130	1,213	
Sulphate	mg/L	1	Maximum	49	64	
Calcium	mg/L	1	Maximum	121	135	
Magnesium	mg/L	1	Maximum	131	143	
Sodium	mg/L	1	Maximum	569	622	
Potassium	mg/L	1	Maximum	-	4	80^{th} and 95^{th} percentile values are the same
TDS @180°C	mg/L	10	Maximum	2,416	2,579	
TSS	mg/L	5	Maximum	14	26	
Bicarbonate	mg/L	1	Maximum	525	546	
Carbonate	mg/L	1	Maximum	-	1	Representative dataset is all BLOR
Dissolved Aluminum	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Antimony	mg/L	0.001	Maximum	-	0.001	Representative dataset is at or below the LOR
Dissolved Arsenic	mg/L	0.001	Maximum	0.0076	0.0080	
Dissolved Molybdenum	mg/L	0.001	Maximum	0.0020	0.0059	
Dissolved Selenium	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Silver	mg/L	0.001	Maximum	-	0.001	Representative dataset is all BLOR
Dissolved Iron	mg/L	0.05	Maximum	0.21	0.39	
Dissolved Mercury	mg/L	0.0001	Maximum	-	0.0001	Representative dataset is all BLOR
C6 - C9 Fraction	µg/L	20	Maximum	-	20	Representative dataset is all BLOR
C10 - C36 Fraction (sum)	µg/L	50	Maximum	-	50	Representative dataset is all BLOR

[1]Exceedances of Limit A are regarded as five consecutive samples exceeding the Limit A value.
[2]Exceedances of Limit B are regarded as three consecutive samples exceeding the Limit B value.

MB1 will also require a groundwater monitoring level trigger threshold (none is currently set). It is recommended that an annual fluctuation of >2 m be adopted. The recommended closure EA groundwater trigger level thresholds are presented in Table 15.

Table 15: Proposed groundwater level monitoring for closure activities at IPC.

Monitoring Location	Trigger Level Threshold (m)	Monitored Unit
Swamp Bore 1	5	Rewan Group
MB1	2	Rangal Coal Measures
MB14	1	Tertiary Basalt
MB16	5	Tertiary Sediments

9. CONCLUSION AND RECOMMENDATIONS

The 2021 IPC groundwater review incorporates all groundwater data during the 2021 calendar year. This groundwater review is based on the existing groundwater network, incorporating thirteen reference bores and six observation bores, targeting multiple aquifer systems, including the Rangal Coal Measures, Rewan Group, Tertiary basalt, Tertiary sediments and Quaternary alluvium/colluvium.

Groundwater level monitoring was conducted in all bores, exposing a steady decline in standing water level in all bores (refer to Section 4). This general decline is attributed to the ongoing dry period (2018-2021). Groundwater level triggers referenced in the IPC EA only apply to four bores. These include Swamp Bore 1, Burton Coal Bore 2, MB14 and MB16. IPC did not exceed the fluctuation trigger threshold for any of these EA-mandated water level monitoring bores (refer to Section 6.1).

Monitoring of groundwater quality characteristics was conducted in all bores, targeting multiple aquifer systems, with the best-quality water contained within the Tertiary basalt. The Tertiary basalt is the only system that meets the TDS livestock drinking water guideline value (<4,000 mg/L) stipulated within ANZECC and ARMCANZ (2000).

The highest TDS (and, consequently, EC) is contained within the Quaternary colluvium / Tertiary sediments, with a reporting period average of approximately 23,800 mg/L. Therefore, the water quality is considered poor. In addition, one of the Quaternary colluvium / Tertiary sediment monitoring bores (MB4a) recorded hydrocarbon concentrations above the LOR during April 2021, resulting in a (sum) C10-C36 fraction value of 1,040 µg/L. This hydrocarbon concentration is deemed to be below the level of concern and – considering that the sample has been taken from stagnant water at the bottom of MB4a – it is expected that the measurement is attributable to the decomposition of organic matter.

Trigger levels of groundwater quality characteristics, referenced in the IPC EA, apply to only two bores (Swamp Bore 1 and Burton Coal Bore 2), both of which are screened within the Rewan Group. Swamp Bore 1 recorded only a single exceedance of the EA trigger thresholds during the reporting period – for dissolved arsenic (February 2021). This exceedance is only marginal and assumed to be a natural variation within the groundwater. The elevated value is thus not of environmental concern (refer to Section 6.2.2). The second bore, Burton Coal Bore 2, recorded numerous exceedances of trigger values associated with TDS, EC and ionic concentrations. These particular exceedances are all interrelated and are associated with the natural decline in standing water level in Burton Coal Bore 2, due to current climatic conditions (refer to Section 6.2.1).

Burton Coal Bore 2 also recorded a single molybdenum exceedance in April 2021. This measurement is marginally above the dissolved molybdenum LOR of 0.001 mg/L that also corresponds with the EA trigger level. Because this dissolved molybdenum exceedance is still within the limits of analytical uncertainty and is the only recent exceedance (Figure 11), it is not of environmental concern. A single TSS exceedance of 86 mg/l occurred in Burton Coal Bore 2 during July 2021. This TSS measurement was accompanied by an increase in total aluminium and total iron levels (Figure 12). This indicates that the July TSS exceedance is associated with an increase of colloidal aluminium and iron in the sample – implying that the sample contained sediment – most likely introduced during the sampling process. Therefore, this TSS exceedance is not of environmental concern.

The groundwater contaminant limits for Burton Coal Bore 2 need to be recalculated to allow for the aforementioned natural processes. Updated groundwater contaminant limits have been ascertained for Burton Coal Bore 2, adopting the same method utilised for the original values (80^{th} percentile plus one standard deviation, rounded to the nearest significant figure). These updates to the contaminant limits were calculated using a larger, more representative dataset, containing an additional 32 months of results (nine data points) from 2019-2021. Although the dataset is more representative, the calculation methodology used for the trigger values remains stringent and, consequently, IPC may continue to exceed the site-specific limits. It is recommended that, for consistency, Burton Coal Bore continues to be monitored during IPC mining operations. However, upon cessation of mining activities (mid-2022), it is advised that Burton Coal Bore 2 be replaced with MB1, and the entire monitoring network and EA trigger thresholds be reviewed and updated as per Section 8 of this report and in line with Queensland DES guideline *Using monitoring data to assess groundwater quality and potential environmental impacts* (DES, 2021).

Although unrelated to EA compliance, it must be noted that the current monitoring network nomenclature is not aligned across the relevant documentation, including the EA, GMMP and third-party groundwater sample reports (refer to Section 3). To maintain the integrity of the collected data, it is highly recommended that the naming conventions be addressed immediately and aligned within all relevant documentation.

The IPC groundwater monitoring network extensively covers the aquifer systems that may be potentially impacted by mining operations and therefore meets the requirements stipulated in EA Condition C40.

10. REFERENCES

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Appendix A – Laboratory Certificates of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2102469**	Page	: 1 of 6
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Anna Riddell
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61 7 4952 5795
Project	: IPCM	Date Samples Received	: 29-Jan-2021 08:41
Order number	: P1002091	Date Analysis Commenced	: 01-Feb-2021
C-O-C number	: ----	Issue Date	: 05-Feb-2021 18:31
Sampler	: LIAM HAMERSVELD		
Site	: Isaac Plains		
Quote number	: TV/005/19 v5		
No. of samples received	: 5		
No. of samples analysed	: 5		

NATA

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
- Surrogate Control Limits

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Thomas Donovan		Brisbane Organics, Stafford, QLD

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 Contact 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.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- 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.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised for sample MB4A (EB2102469-003) due to matrix interference.
- EG020-T (Total Metals): LOR raised for samples MB4A (EB2102469-003) due to matrix interference.
- It is recognised that EG020T (Total Metals) is less than EG020F (Dissolved Metals) for sample MB4A (EB2102469-003). However, the difference is within experimental variation of the methods.
- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	BC2 Burton Coal Bore 2	MB2 Groundwater	MB4A Groundwater	Field Blank	Trip Blank
Sampling date / time				26-Jan-2021 08:20	26-Jan-2021 09:50	27-Jan-2021 08:20	28-Jan-2021 08:30	22-Jan-2021 14:00
				EB2102469-001	EB2102469-002	EB2102469-003	EB2102469-004	EB2102469-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.59**	**7.77**	**7.73**	**6.67**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**7810**	**7140**	**51800**	<1	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5320**	**4320**	**43600**	<10	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**8**	**10**	**1800**	<5	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**616**	**738**	**378**	**2**	----
Total Alkalinity as CaCO3	----	1	mg/L	**612**	**738**	**378**	**2**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**111**	**163**	**971**	<1	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2750**	**1980**	**20000**	<1	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**252**	**107**	**665**	<1	----
Magnesium	7439-95-4	1	mg/L	**369**	**156**	**1880**	<1	----
Sodium	7440-23-5	1	mg/L	**1130**	**1260**	**9920**	<1	----
Potassium	7440-09-7	1	mg/L	**6**	**7**	**4**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.034**	<0.005	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.143**	**0.125**	**0.204**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	**0.002**	<0.005	<0.001	----
Rubidium	7440-17-7	0.001	mg/L	**0.014**	**0.013**	**0.009**	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	**0.006**	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**6.82**	**4.24**	**24.3**	<0.001	----
Iron	7439-89-6	0.05	mg/L	<0.05	**0.07**	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BC2 Burton Coal Bore 2	MB2 Groundwater	MB4A Groundwater	Field Blank	Trip Blank
			Sampling date / time	26-Jan-2021 08:20	26-Jan-2021 09:50	27-Jan-2021 08:20	28-Jan-2021 08:30	22-Jan-2021 14:00
Compound	CAS Number	LOR	Unit	EB2102469-001	EB2102469-002	EB2102469-003	EB2102469-004	EB2102469-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.07**	**4.43**	<0.01	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.034**	<0.005	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.146**	**0.139**	**0.214**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	**0.003**	<0.005	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**7.25**	**4.38**	**25.7**	<0.001	----
Iron	7439-89-6	0.05	mg/L	<0.05	**0.40**	**8.14**	<0.05	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.4**	**0.2**	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.03**	**0.08**	<0.01	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**92.1**	**74.0**	**592**	**0.04**	----
ø Total Cations	----	0.01	meq/L	**92.2**	**73.2**	**620**	<0.01	----
ø Ionic Balance	----	0.01	%	**0.07**	**0.56**	**2.28**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

			Sample ID	BC2 Burton Coal Bore 2	MB2 Groundwater	MB4A Groundwater	Field Blank	Trip Blank
			Sampling date / time	26-Jan-2021 08:20	26-Jan-2021 09:50	27-Jan-2021 08:20	28-Jan-2021 08:30	22-Jan-2021 14:00
Compound	CAS Number	LOR	Unit	EB2102469-001	EB2102469-002	EB2102469-003	EB2102469-004	EB2102469-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	103	101	108	99.2	101
Toluene-D8	2037-26-5	2	%	98.8	99.0	96.3	97.5	99.1
4-Bromofluorobenzene	460-00-4	2	%	109	109	111	107	108

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	*Recovery Limits (%)* High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2105277**	Page	: 1 of 10
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Anna Riddell
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61 7 4952 5795
Project	: IPCM	Date Samples Received	: 25-Feb-2021 08:40
Order number	: P1002091	Date Analysis Commenced	: 26-Feb-2021
C-O-C number	: ----	Issue Date	: 03-Mar-2021 16:04
Sampler	: LIAM HAMERSVELD		
Site	: ----		
Quote number	: TV/005/19 v5		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

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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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Thomas Donovan		Brisbane Organics, Stafford, QLD

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 Contact 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.

- EK067G (Total Phosphorus as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for sample MB14 (EB2105277-008) and IPCM GW Duplicate (EB2105277-009). However, the difference is within experimental variation of the methods.
- 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.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 Groundwater	MB1 Groundwater	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater
Sampling date / time				22-Feb-2021 17:30	22-Feb-2021 12:10	23-Feb-2021 08:10	22-Feb-2021 15:30	23-Feb-2021 11:40
				EB2105277-001	EB2105277-002	EB2105277-003	EB2105277-004	EB2105277-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.52	7.66	7.48	7.60	7.63
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	8870	3320	22600	11200	11000
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6050	1850	16400	7270	7180
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	10	<5	<5	15	263
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	53	507	388	89	88
Total Alkalinity as CaCO3	----	1	mg/L	53	507	388	89	88
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	134	36	480	2	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3200	876	8320	4130	4040
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	515	84	554	320	296
Magnesium	7439-95-4	1	mg/L	141	107	538	132	147
Sodium	7440-23-5	1	mg/L	1100	487	3940	1870	1840
Potassium	7440-09-7	1	mg/L	21	3	21	15	21
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	0.003	0.003	0.001	0.008	<0.001
Barium	7440-39-3	0.001	mg/L	0.203	0.356	0.375	8.38	9.42
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	0.034	0.004	0.039	0.024	0.035
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	8.21	2.13	48.8	16.5	14.7
Iron	7439-89-6	0.05	mg/L	0.09	<0.05	0.43	0.44	0.53
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 Groundwater	MB1 Groundwater	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater
			Sampling date / time	22-Feb-2021 17:30	22-Feb-2021 12:10	23-Feb-2021 08:10	22-Feb-2021 15:30	23-Feb-2021 11:40
Compound	CAS Number	LOR	Unit	EB2105277-001	EB2105277-002	EB2105277-003	EB2105277-004	EB2105277-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	<0.01	**0.05**	**0.22**	**3.14**
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	**0.004**	**0.003**	**0.001**	**0.010**	**0.004**
Barium	7440-39-3	0.001	mg/L	**0.203**	**0.366**	**1.56**	**8.67**	**10.1**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	<0.001	**0.005**	<0.001	**0.001**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**8.71**	**2.33**	**51.9**	**17.0**	**15.8**
Iron	7439-89-6	0.05	mg/L	**0.22**	<0.05	**0.45**	**0.74**	**6.19**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.5**	<0.1	**0.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	<0.01	<0.05	<0.05	**0.08**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**94.1**	**35.6**	**252**	**118**	**116**
ø Total Cations	----	0.01	meq/L	**85.7**	**34.2**	**244**	**108**	**107**
ø Ionic Balance	----	0.01	%	**4.69**	**1.91**	**1.73**	**4.30**	**3.71**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 Groundwater	MB1 Groundwater	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater
Sampling date / time				22-Feb-2021 17:30	22-Feb-2021 12:10	23-Feb-2021 08:10	22-Feb-2021 15:30	23-Feb-2021 11:40
				EB2105277-001	EB2105277-002	EB2105277-003	EB2105277-004	EB2105277-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**106**	**103**	**99.8**	**103**	**101**
Toluene-D8	2037-26-5	2	%	**95.8**	**96.3**	**96.2**	**96.0**	**96.2**
4-Bromofluorobenzene	460-00-4	2	%	**109**	**109**	**110**	**108**	**109**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB9B Groundwater	MB12 Groundwater	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater
Sampling date / time				23-Feb-2021 10:30	22-Feb-2021 13:40	22-Feb-2021 16:20	23-Feb-2021 00:00	23-Feb-2021 08:30
				EB2105277-006	EB2105277-007	EB2105277-008	EB2105277-009	EB2105277-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.06**	**7.55**	**8.06**	**7.45**	**6.29**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**4300**	**13000**	**3090**	**22600**	<1
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**2430**	**8170**	**1710**	**15800**	<10
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**47**	**11**	**162**	<5	<5
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	**308**	**351**	**445**	**388**	<1
Total Alkalinity as CaCO3	----	1	mg/L	**308**	**351**	**445**	**388**	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**122**	**299**	**120**	**478**	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1220**	**4560**	**790**	**8320**	<1
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**73**	**286**	**59**	**551**	<1
Magnesium	7439-95-4	1	mg/L	**131**	**338**	**137**	**532**	<1
Sodium	7440-23-5	1	mg/L	**659**	**2090**	**418**	**3910**	<1
Potassium	7440-09-7	1	mg/L	**10**	**24**	**12**	**21**	<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	**0.003**	**0.015**	**0.006**	**0.001**	<0.001
Barium	7440-39-3	0.001	mg/L	**0.154**	**0.552**	**0.287**	**0.372**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.010**	**0.006**	**0.002**	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L	**0.019**	**0.036**	**0.018**	**0.040**	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**1.65**	**15.3**	**1.26**	**49.7**	<0.001
Iron	7439-89-6	0.05	mg/L	<0.05	**1.33**	<0.05	**0.48**	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB9B Groundwater	MB12 Groundwater	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater
			Sampling date / time	23-Feb-2021 10:30	22-Feb-2021 13:40	22-Feb-2021 16:20	23-Feb-2021 00:00	23-Feb-2021 08:30
Compound	CAS Number	LOR	Unit	EB2105277-006	EB2105277-007	EB2105277-008	EB2105277-009	EB2105277-010
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.92**	**0.05**	**0.06**	**0.06**	<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**	**0.018**	**0.006**	**0.002**	<0.001
Barium	7440-39-3	0.001	mg/L	**0.180**	**0.870**	**0.322**	**1.53**	<0.001
Molybdenum	7439-98-7	0.001	mg/L	**0.013**	**0.006**	**0.001**	**0.005**	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**1.81**	**16.8**	**1.35**	**53.9**	<0.001
Iron	7439-89-6	0.05	mg/L	**1.52**	**1.57**	**0.14**	**0.45**	<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
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.2**	<0.1	<0.1	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.10**	<0.05	**0.03**	<0.05	<0.01
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**43.1**	**142**	**33.7**	**252**	<0.01
ø Total Cations	----	0.01	meq/L	**43.3**	**134**	**32.7**	**242**	<0.01
ø Ionic Balance	----	0.01	%	**0.27**	**3.00**	**1.46**	**2.13**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB9B Groundwater	MB12 Groundwater	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater
			Sampling date / time	23-Feb-2021 10:30	22-Feb-2021 13:40	22-Feb-2021 16:20	23-Feb-2021 00:00	23-Feb-2021 08:30
Compound	CAS Number	LOR	Unit	EB2105277-006	EB2105277-007	EB2105277-008	EB2105277-009	EB2105277-010
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	99.4	102	103	100	102
Toluene-D8	2037-26-5	2	%	95.6	95.0	95.2	96.3	94.0
4-Bromofluorobenzene	460-00-4	2	%	110	108	110	114	108

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	IPCM Trip Blank Groundwater	----	----	----	----
Sampling date / time				19-Feb-2021 15:00	----	----	----	----
				EB2105277-011	--------	--------	--------	--------
				Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**101**	----	----	----	----
Toluene-D8	2037-26-5	2	%	**97.3**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**110**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2109215**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Anna Riddell
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61 7 4952 5795
Project	: IPCM	Date Samples Received	: 30-Apr-2021 11:45
Order number	: P1002091	Date Analysis Commenced	: 04-May-2021
C-O-C number	: ----	Issue Date	: 11-May-2021 15:43
Sampler	: JACK PARKER		
Site	: Isaac Plains		
Quote number	: TV/005/19 v5		
No. of samples received	: 20		
No. of samples analysed	: 14		

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
- Surrogate Control Limits

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Morgan Lennox	2IC Organic Chemist	Brisbane Organics, Stafford, QLD

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 Contact 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.

- EK067G (Total Phosphorus as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- It is recognised that EG020T (Total Metals) is less than EG020F (Dissolved Metals) for some samples. However, the difference is within experimental variation of the methods.
- EG035F (Filtered Mercury): Limit of reporting raised for sample MB4A(EB2109215-005) due to matrix interference.
- EG035T (Total Mercury): Positive mercury results have been confirmed by re-extraction and re-analysis.
- 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.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 Groundwater	BC2 Groundwater	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
			Sampling date / time	28-Apr-2021 17:00	28-Apr-2021 08:40	28-Apr-2021 11:50	28-Apr-2021 10:30	27-Apr-2021 13:30
				EB2109215-001	EB2109215-002	EB2109215-003	EB2109215-004	EB2109215-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.62	7.67	7.83	7.98	7.63
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	8730	7630	4390	7160	51800
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6420	5370	2800	4420	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	5	<5	12	----
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	74	659	540	775	346
Total Alkalinity as CaCO3	----	1	mg/L	74	659	540	775	346
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	130	107	49	158	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3140	2460	1230	1950	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	505	218	123	111	----
Magnesium	7439-95-4	1	mg/L	138	313	141	160	----
Sodium	7440-23-5	1	mg/L	1090	955	598	1260	----
Potassium	7440-09-7	1	mg/L	20	6	4	7	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Arsenic	7440-38-2	0.001	mg/L	0.002	<0.001	0.002	0.031	<0.005
Barium	7440-39-3	0.001	mg/L	0.186	0.212	0.189	0.174	0.245
Molybdenum	7439-98-7	0.001	mg/L	0.001	0.002	0.001	0.005	<0.005
Rubidium	7440-17-7	0.001	mg/L	0.030	0.011	0.005	0.012	0.006
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Strontium	7440-24-6	0.001	mg/L	8.52	6.75	3.48	4.48	23.3
Iron	7439-89-6	0.05	mg/L	0.12	<0.05	<0.05	1.10	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	SB1 Groundwater	BC2 Groundwater	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
			Sampling date / time	28-Apr-2021 17:00	28-Apr-2021 08:40	28-Apr-2021 11:50	28-Apr-2021 10:30	27-Apr-2021 13:30
			Sample ID	EB2109215-001	EB2109215-002	EB2109215-003	EB2109215-004	EB2109215-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.06**	**0.03**	<0.01	**0.04**	**374**
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.006**
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.032**	**0.160**
Barium	7440-39-3	0.001	mg/L	**0.203**	**0.230**	**0.202**	**0.184**	**3.34**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.001**	**0.002**	**0.006**	**0.009**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	**0.020**
Strontium	7440-24-6	0.001	mg/L	**8.50**	**6.69**	**3.47**	**4.47**	**27.3**
Iron	7439-89-6	0.05	mg/L	**0.40**	**0.09**	**0.07**	**1.27**	**590**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	**0.0035**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.2**	**0.5**	**0.5**	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.01**	<0.01	<0.01	**0.02**	**18.4**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**92.8**	**84.8**	**46.5**	**73.8**	----
ø **Total Cations**	----	0.01	meq/L	**84.5**	**78.3**	**43.8**	**73.7**	----
ø **Ionic Balance**	----	0.01	%	**4.67**	**3.96**	**2.93**	**0.06**	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	**700**
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	**340**
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	**1040**
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	**300**
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	**710**
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	**150**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 Groundwater	BC2 Groundwater	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
			Sampling date / time	28-Apr-2021 17:00	28-Apr-2021 08:40	28-Apr-2021 11:50	28-Apr-2021 10:30	27-Apr-2021 13:30
Compound	CAS Number	LOR	Unit	EB2109215-001	EB2109215-002	EB2109215-003	EB2109215-004	EB2109215-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	**1160**
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	**300**
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**106**	**109**	**104**	**102**	**87.9**
Toluene-D8	2037-26-5	2	%	**100**	**97.8**	**101**	**101**	**96.8**
4-Bromofluorobenzene	460-00-4	2	%	**104**	**101**	**102**	**102**	**108**

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12 Groundwater
			Sampling date / time	27-Apr-2021 12:00	28-Apr-2021 14:20	27-Apr-2021 15:25	27-Apr-2021 15:25	28-Apr-2021 13:00
				EB2109215-007	EB2109215-008	EB2109215-009	EB2109215-010	EB2109215-012
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.64**	**7.75**	**7.84**	**8.28**	**7.76**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**20800**	**10900**	**10600**	**4170**	**12700**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**15500**	**7480**	**7440**	**2590**	**9090**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**12**	**43**	<5	**232**	**18**
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	**348**	**103**	**117**	**337**	**409**
Total Alkalinity as CaCO3	----	1	mg/L	**348**	**103**	**117**	**337**	**409**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**350**	**3**	**3**	**114**	**296**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**7560**	**4020**	**3870**	**1190**	**4480**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**508**	**308**	**272**	**70**	**260**
Magnesium	7439-95-4	1	mg/L	**437**	**127**	**144**	**119**	**343**
Sodium	7440-23-5	1	mg/L	**3610**	**1780**	**1710**	**638**	**1930**
Potassium	7440-09-7	1	mg/L	**20**	**15**	**20**	**10**	**23**
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**	**0.010**	<0.001	**0.001**	**0.008**
Barium	7440-39-3	0.001	mg/L	**0.526**	**8.60**	**8.28**	**0.637**	**0.334**
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	**0.005**	**0.011**	**0.004**
Rubidium	7440-17-7	0.001	mg/L	**0.037**	**0.022**	**0.033**	**0.018**	**0.032**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**52.0**	**16.7**	**14.3**	**1.65**	**14.3**
Iron	7439-89-6	0.05	mg/L	**0.49**	**0.71**	**0.21**	<0.05	**1.44**
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12 Groundwater
			Sampling date / time	27-Apr-2021 12:00	28-Apr-2021 14:20	27-Apr-2021 15:25	27-Apr-2021 15:25	28-Apr-2021 13:00
Compound	CAS Number	LOR	Unit	EB2109215-007	EB2109215-008	EB2109215-009	EB2109215-010	EB2109215-012
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.24**	**0.51**	**0.07**	**6.81**	**0.15**
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	**0.002**	**0.012**	**0.001**	**0.002**	**0.011**
Barium	7440-39-3	0.001	mg/L	**2.21**	**8.74**	**8.44**	**0.769**	**1.77**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.001**	**0.005**	**0.012**	**0.005**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**51.7**	**16.6**	**14.0**	**1.68**	**14.6**
Iron	7439-89-6	0.05	mg/L	**1.23**	**1.33**	**0.32**	**10.9**	**2.28**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	<0.01	<0.01	**0.56**	**0.02**
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**227**	**116**	**112**	**42.7**	**141**
ø **Total Cations**	----	0.01	meq/L	**219**	**104**	**100**	**41.3**	**126**
ø **Ionic Balance**	----	0.01	%	**1.94**	**5.42**	**5.31**	**1.64**	**5.62**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12 Groundwater
			Sampling date / time	27-Apr-2021 12:00	28-Apr-2021 14:20	27-Apr-2021 15:25	27-Apr-2021 15:25	28-Apr-2021 13:00
Compound	CAS Number	LOR	Unit	EB2109215-007	EB2109215-008	EB2109215-009	EB2109215-010	EB2109215-012
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**105**	**106**	**108**	**104**	**101**
Toluene-D8	2037-26-5	2	%	**98.2**	**102**	**101**	**98.7**	**98.5**
4-Bromofluorobenzene	460-00-4	2	%	**99.3**	**104**	**102**	**101**	**102**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater	IPCM Trip Blank	----
			Sampling date / time	28-Apr-2021 15:55	27-Apr-2021 01:00	27-Apr-2021 01:00	27-Apr-2021 00:00	----
Compound	CAS Number	LOR	Unit	EB2109215-013	EB2109215-018	EB2109215-019	EB2109215-020	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.20**	**7.74**	**6.30**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3100**	**21000**	<1	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1980**	**15600**	<10	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**15**	**12**	<5	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**486**	**359**	**2**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**486**	**359**	**2**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**120**	**367**	<1	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**787**	**7720**	<1	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**59**	**506**	<1	----	----
Magnesium	7439-95-4	1	mg/L	**127**	**435**	<1	----	----
Sodium	7440-23-5	1	mg/L	**408**	**3610**	<1	----	----
Potassium	7440-09-7	1	mg/L	**11**	**20**	<1	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.001**	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.150**	**0.534**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	<0.001	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.017**	**0.036**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**1.38**	**52.3**	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	**0.40**	<0.05	----	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater	IPCM Trip Blank	----
			Sampling date / time	28-Apr-2021 15:55	27-Apr-2021 01:00	27-Apr-2021 01:00	27-Apr-2021 00:00	----
Compound	CAS Number	LOR	Unit	EB2109215-013	EB2109215-018	EB2109215-019	EB2109215-020	--------
				Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.24**	**0.31**	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.002**	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.215**	**2.49**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.001**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**1.38**	**52.9**	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	**0.61**	**1.44**	<0.05	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.07**	<0.05	<0.01	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**34.4**	**232**	**0.04**	----	----
ø Total Cations	----	0.01	meq/L	**31.4**	**218**	<0.01	----	----
ø Ionic Balance	----	0.01	%	**4.53**	**3.10**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14 Groundwater	IPCM GW Duplicate Groundwater	IPCM GW Field Blank Groundwater	IPCM Trip Blank	----
			Sampling date / time	28-Apr-2021 15:55	27-Apr-2021 01:00	27-Apr-2021 01:00	27-Apr-2021 00:00	----
Compound	CAS Number	LOR	Unit	EB2109215-013	EB2109215-018	EB2109215-019	EB2109215-020	--------
				Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**104**	**104**	**104**	**102**	----
Toluene-D8	2037-26-5	2	%	**101**	**101**	**99.6**	**100**	----
4-Bromofluorobenzene	460-00-4	2	%	**101**	**101**	**102**	**102**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2120113**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Anna Riddell
Address	: ALS MACKAY 78 HARBOUR ROAD MACKAY QUEENSLAND 4740	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61 7 4952 5795
Project	: IPCM	Date Samples Received	: 29-Jul-2021 11:45
Order number	: P1002091	Date Analysis Commenced	: 30-Jul-2021
C-O-C number	: ----	Issue Date	: 05-Aug-2021 15:02
Sampler	: JACK PARKER		
Site	: Isaac Plains		
Quote number	: TV/005/19 v5		
No. of samples received	: 22		
No. of samples analysed	: 15		

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
- Surrogate Control Limits

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*
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Morgan Lennox	2IC Organic Chemist	Brisbane Organics, Stafford, QLD

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 Contact 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.

- EK067G (Total Phosphorus as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- 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.
- EG035T (Total Mercury): Positive mercury result has been confirmed by re-extraction and re-analysis.
- EG020-T (Total Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- It is recognised that EG020-T (Total Metals by ICP-MS): is less than EG020-F (Dissolved Metals by ICP-MS): for some samples. However, the difference is within experimental variation of the method.
- EG020-F (Dissolved Metals by ICP-MS): Limit of reporting raised due to matrix interference.
- 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.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
Sampling date / time				26-Jul-2021 13:40	27-Jul-2021 07:30	27-Jul-2021 09:05	27-Jul-2021 08:20	26-Jul-2021 14:10
				EB2120113-001	EB2120113-002	EB2120113-003	EB2120113-004	EB2120113-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.64**	**7.65**	**8.08**	**8.05**	**7.65**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**9190**	**8200**	**4080**	**7580**	**52700**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**6280**	**5560**	**2490**	**4390**	**43000**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**32**	**86**	**14**	**50**	**2260**
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	**54**	**599**	**482**	**714**	**372**
Total Alkalinity as CaCO3	----	1	mg/L	**54**	**599**	**482**	**714**	**372**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**132**	**109**	**44**	**157**	**956**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**3230**	**2610**	**1100**	**2200**	**21300**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**542**	**247**	**135**	**139**	**772**
Magnesium	7439-95-4	1	mg/L	**152**	**355**	**153**	**202**	**2350**
Sodium	7440-23-5	1	mg/L	**1260**	**1040**	**632**	**1530**	**11600**
Potassium	7440-09-7	1	mg/L	**21**	**7**	**4**	**9**	**4**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.001**	**0.004**	**0.023**	<0.005
Barium	7440-39-3	0.001	mg/L	**0.409**	**0.130**	**0.181**	**0.141**	**0.221**
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	<0.001	**0.002**	**0.003**	<0.005
Rubidium	7440-17-7	0.001	mg/L	**0.034**	**0.012**	**0.004**	**0.014**	**0.008**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Strontium	7440-24-6	0.001	mg/L	**8.42**	**6.81**	**2.92**	**4.64**	**24.4**
Iron	7439-89-6	0.05	mg/L	**0.06**	**0.09**	**0.28**	**1.16**	**1.19**
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
			Sampling date / time	26-Jul-2021 13:40	27-Jul-2021 07:30	27-Jul-2021 09:05	27-Jul-2021 08:20	26-Jul-2021 14:10
			Sample ID	EB2120113-001	EB2120113-002	EB2120113-003	EB2120113-004	EB2120113-005
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.32**	**2.82**	**0.25**	**0.76**	**46.0**
Antimony	7440-36-0	0.001	mg/L	**0.007**	<0.001	<0.001	<0.001	<0.005
Arsenic	7440-38-2	0.001	mg/L	**0.002**	**0.004**	**0.005**	**0.023**	**0.026**
Barium	7440-39-3	0.001	mg/L	**0.438**	**0.150**	**0.182**	**0.174**	**0.416**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.003**	<0.005
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Strontium	7440-24-6	0.001	mg/L	**8.26**	**6.87**	**2.83**	**4.19**	**20.9**
Iron	7439-89-6	0.05	mg/L	**0.81**	**4.00**	**0.58**	**1.72**	**82.5**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	**0.0002**
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.2**	**0.4**	**0.4**	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.06**	**0.03**	**0.04**	**1.42**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**94.9**	**87.9**	**41.6**	**79.6**	**628**
ø Total Cations	----	0.01	meq/L	**94.9**	**87.0**	**46.9**	**90.3**	**737**
ø Ionic Balance	----	0.01	%	**0.02**	**0.52**	**6.04**	**6.32**	**7.94**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB4A Groundwater
Sampling date / time				26-Jul-2021 13:40	27-Jul-2021 07:30	27-Jul-2021 09:05	27-Jul-2021 08:20	26-Jul-2021 14:10
				EB2120113-001	EB2120113-002	EB2120113-003	EB2120113-004	EB2120113-005
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**113**	**115**	**113**	**115**	**123**
Toluene-D8	2037-26-5	2	%	**99.5**	**97.9**	**95.8**	**97.3**	**96.4**
4-Bromofluorobenzene	460-00-4	2	%	**87.4**	**88.4**	**85.7**	**89.1**	**90.3**

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12
			Sampling date / time	26-Jul-2021 10:00	27-Jul-2021 12:15	26-Jul-2021 12:45	26-Jul-2021 12:00	27-Jul-2021 10:00
				EB2120113-007	EB2120113-008	EB2120113-009	EB2120113-010	EB2120113-012
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.87	7.72	7.93	8.45	7.96
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	22300	11200	11200	3680	12800
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	16300	7200	7260	2020	8450
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	18	28	65	162	20
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	26	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	364	92	100	408	386
Total Alkalinity as CaCO3	----	1	mg/L	364	92	100	434	386
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	441	2	2	99	298
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	8230	4080	4070	954	4500
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	657	346	281	61	299
Magnesium	7439-95-4	1	mg/L	594	148	147	103	414
Sodium	7440-23-5	1	mg/L	4680	2040	1800	642	2180
Potassium	7440-09-7	1	mg/L	25	16	19	8	25
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.05	<0.01	<0.01	<0.01	<0.01
Antimony	7440-36-0	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.005	0.011	<0.001	0.002	0.018
Barium	7440-39-3	0.001	mg/L	0.433	8.51	8.98	0.077	0.377
Molybdenum	7439-98-7	0.001	mg/L	<0.005	<0.001	<0.001	0.013	0.002
Rubidium	7440-17-7	0.001	mg/L	0.039	0.028	0.037	0.018	0.037
Selenium	7782-49-2	0.01	mg/L	<0.05	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	49.4	17.0	15.5	2.85	14.5
Iron	7439-89-6	0.05	mg/L	0.29	1.02	0.29	<0.05	2.15
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12
Sampling date / time				26-Jul-2021 10:00	27-Jul-2021 12:15	26-Jul-2021 12:45	26-Jul-2021 12:00	27-Jul-2021 10:00
				EB2120113-007	EB2120113-008	EB2120113-009	EB2120113-010	EB2120113-012
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.07**	**0.36**	**3.83**	**3.84**	**0.02**
Antimony	7440-36-0	0.001	mg/L	**0.008**	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L	<0.005	**0.010**	**0.004**	**0.002**	**0.017**
Barium	7440-39-3	0.001	mg/L	**1.86**	**8.71**	**9.51**	**0.252**	**1.08**
Molybdenum	7439-98-7	0.001	mg/L	<0.005	<0.001	**0.001**	**0.015**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.05	<0.01	<0.01	<0.01	<0.01
Silver	7440-22-4	0.001	mg/L	<0.005	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L	**51.3**	**15.8**	**14.7**	**2.69**	**13.7**
Iron	7439-89-6	0.05	mg/L	**0.67**	**1.36**	**4.64**	**5.57**	**1.90**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.2**	**0.2**	**0.3**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	**0.02**	**0.08**	**0.26**	<0.05
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**249**	**117**	**117**	**37.6**	**141**
ø Total Cations	----	0.01	meq/L	**286**	**118**	**105**	**39.6**	**144**
ø Ionic Balance	----	0.01	%	**6.97**	**0.69**	**5.39**	**2.60**	**1.26**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB7 Groundwater	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12
Sampling date / time				26-Jul-2021 10:00	27-Jul-2021 12:15	26-Jul-2021 12:45	26-Jul-2021 12:00	27-Jul-2021 10:00
				EB2120113-007	EB2120113-008	EB2120113-009	EB2120113-010	EB2120113-012
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	123	115	117	118	116
Toluene-D8	2037-26-5	2	%	95.6	96.5	94.8	97.9	96.8
4-Bromofluorobenzene	460-00-4	2	%	80.2	85.6	84.2	86.9	85.5

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank
			Sampling date / time	27-Jul-2021 11:30	26-Jul-2021 14:50	26-Jul-2021 01:00	26-Jul-2021 01:00	23-Jul-2021 15:00
Compound	CAS Number	LOR	Unit	EB2120113-013	EB2120113-015	EB2120113-020	EB2120113-021	EB2120113-022
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.37**	**8.19**	**7.91**	**6.54**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3340**	**6720**	**22700**	**1**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**2020**	**4230**	**16400**	<10	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**34**	**24**	**16**	<5	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	**17**	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**428**	**566**	**367**	**3**	----
Total Alkalinity as CaCO3	----	1	mg/L	**444**	**566**	**367**	**3**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**122**	**89**	**458**	<1	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**846**	**1890**	**8320**	<1	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**67**	**122**	**665**	<1	----
Magnesium	7439-95-4	1	mg/L	**159**	**230**	**580**	<1	----
Sodium	7440-23-5	1	mg/L	**475**	**1120**	**4520**	**3**	----
Potassium	7440-09-7	1	mg/L	**13**	**2**	**25**	<1	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.01**	<0.05	<0.01	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.004**	**0.001**	<0.005	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.049**	**0.089**	**0.460**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	**0.003**	<0.005	<0.001	----
Rubidium	7440-17-7	0.001	mg/L	**0.020**	**0.004**	**0.038**	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**1.48**	**3.25**	**49.7**	**0.002**	----
Iron	7439-89-6	0.05	mg/L	**0.05**	<0.05	**0.36**	<0.05	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.52**	**0.39**	**0.07**	<0.01	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank
			Sampling date / time	27-Jul-2021 11:30	26-Jul-2021 14:50	26-Jul-2021 01:00	26-Jul-2021 01:00	23-Jul-2021 15:00
Compound	CAS Number	LOR	Unit	EB2120113-013	EB2120113-015	EB2120113-020	EB2120113-021	EB2120113-022
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	**0.006**	<0.001	----
Arsenic	7440-38-2	0.001	mg/L	**0.006**	**0.001**	<0.005	<0.001	----
Barium	7440-39-3	0.001	mg/L	**0.082**	**0.096**	**1.75**	<0.001	----
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	**0.003**	<0.005	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.05	<0.01	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.005	<0.001	----
Strontium	7440-24-6	0.001	mg/L	**1.42**	**3.01**	**49.2**	<0.001	----
Iron	7439-89-6	0.05	mg/L	**0.85**	**0.40**	**0.64**	<0.05	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.4**	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.05**	**0.03**	<0.05	<0.01	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**35.3**	**66.5**	**252**	**0.06**	----
ø **Total Cations**	----	0.01	meq/L	**37.4**	**73.8**	**278**	**0.13**	----
ø **Ionic Balance**	----	0.01	%	**2.95**	**5.21**	**5.02**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L	<50	**110**	<50	<50	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	**110**	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L	<100	**160**	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	**160**	<100	<100	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB14	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank
			Sampling date / time	27-Jul-2021 11:30	26-Jul-2021 14:50	26-Jul-2021 01:00	26-Jul-2021 01:00	23-Jul-2021 15:00
Compound	CAS Number	LOR	Unit	EB2120113-013	EB2120113-015	EB2120113-020	EB2120113-021	EB2120113-022
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	119	119	119	123	120
Toluene-D8	2037-26-5	2	%	97.7	98.3	98.5	99.2	98.2
4-Bromofluorobenzene	460-00-4	2	%	88.0	85.3	86.9	86.8	86.5

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

CERTIFICATE OF ANALYSIS

Work Order	: **EB2129521**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Nikita Sutton
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 02-Nov-2021 09:00
Order number	: P1002091	Date Analysis Commenced	: 03-Nov-2021
C-O-C number	: ----	Issue Date	: 09-Nov-2021 16:22
Sampler	: JACK PARKER		
Site	: Isaac Plains		
Quote number	: TV/005/19 v7		
No. of samples received	: 22		
No. of samples analysed	: 14		

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
- Surrogate Control Limits

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Thomas Donovan	Senior Organic Chemist - PFAS	Brisbane Organics, Stafford, QLD
Timothy Creagh	2IC Organic Chemist	Brisbane Organics, Stafford, QLD

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 Contact 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.

- EK067G (Total Phosphorus as P): Sample EB2129521_001 (SB1 (Swamp Bore 1)) was diluted due to matrix interference. LOR adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020-F (Dissolved Metals): LOR raised for samples MB7 (EB2129521-007) due to matrix interference.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for sample MB1 (EB2129521-003). However, the difference is within experimental variation of the methods.
- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
Compound	CAS Number	LOR	Unit	EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.78**	**7.97**	**8.07**	**8.09**	**7.90**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**8750**	**7790**	**3390**	**7540**	**19000**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**6000**	**5660**	**1920**	**4410**	**11800**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**14**	<5	<5	**90**	**6**
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	**62**	**616**	**508**	**727**	**266**
Total Alkalinity as CaCO3	----	1	mg/L	**62**	**616**	**508**	**727**	**266**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**125**	**102**	**36**	**155**	**210**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2930**	**2400**	**867**	**2110**	**6480**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**514**	**242**	**86**	**125**	**471**
Magnesium	7439-95-4	1	mg/L	**137**	**343**	**104**	**172**	**310**
Sodium	7440-23-5	1	mg/L	**1110**	**1030**	**519**	**1350**	**3260**
Potassium	7440-09-7	1	mg/L	**20**	**6**	**4**	**8**	**18**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.005
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.004**	**0.021**	<0.005
Barium	7440-39-3	0.001	mg/L	**0.605**	**0.174**	**0.145**	**0.149**	**0.575**
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	<0.001	**0.001**	**0.002**	**0.050**
Rubidium	7440-17-7	0.001	mg/L	**0.030**	**0.011**	**0.004**	**0.013**	**0.034**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Strontium	7440-24-6	0.001	mg/L	**7.68**	**6.36**	**2.20**	**4.34**	**44.8**
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	**0.21**	**0.43**
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
Compound	CAS Number	LOR	Unit	EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.06**	**0.04**	**0.24**	**0.89**	**0.11**
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	**0.002**	<0.001	**0.005**	**0.024**	**0.002**
Barium	7440-39-3	0.001	mg/L	**0.656**	**0.198**	**0.194**	**0.182**	**1.69**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.003**	**0.066**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**8.05**	**6.69**	**2.31**	**4.62**	**47.7**
Iron	7439-89-6	0.05	mg/L	**0.24**	**0.13**	**0.39**	**0.84**	**0.70**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.2**	**0.5**	**0.5**	**0.1**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	**0.02**	**0.02**	**0.04**	<0.05
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**86.5**	**82.1**	**35.4**	**77.3**	**192**
ø Total Cations	----	0.01	meq/L	**85.7**	**85.3**	**35.5**	**79.3**	**191**
ø Ionic Balance	----	0.01	%	**0.45**	**1.87**	**0.24**	**1.31**	**0.31**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
Compound	CAS Number	LOR	Unit	EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**90.6**	**90.6**	**89.2**	**92.7**	**94.2**
Toluene-D8	2037-26-5	2	%	**97.8**	**98.9**	**97.0**	**96.0**	**98.6**
4-Bromofluorobenzene	460-00-4	2	%	**100**	**100**	**97.6**	**97.8**	**101**

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
Sampling date / time				28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
				EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.95	8.03	8.54	7.96	8.40
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	10800	10800	1960	12600	3250
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6830	6190	1190	8060	2020
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	131	11	8	24
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	42	<1	21
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	98	102	547	388	418
Total Alkalinity as CaCO3	----	1	mg/L	98	102	588	388	439
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	<1	46	312	120
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3760	3730	298	4270	813
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	326	302	27	304	63
Magnesium	7439-95-4	1	mg/L	129	140	40	348	136
Sodium	7440-23-5	1	mg/L	1920	1860	389	2070	445
Potassium	7440-09-7	1	mg/L	16	20	5	23	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	0.004	<0.001	0.001	0.019	0.007
Barium	7440-39-3	0.001	mg/L	6.37	8.91	0.751	1.30	0.147
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.001	0.009	0.002	0.001
Rubidium	7440-17-7	0.001	mg/L	0.025	0.032	0.007	0.031	0.018
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	15.7	13.8	1.00	14.4	1.62
Iron	7439-89-6	0.05	mg/L	0.28	<0.05	<0.05	1.54	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
			Sampling date / time	28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
Compound	CAS Number	LOR	Unit	EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.09**	**1.81**	**0.56**	**0.02**	**0.70**
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	**0.005**	**0.003**	**0.002**	**0.022**	**0.009**
Barium	7440-39-3	0.001	mg/L	**7.02**	**9.90**	**0.843**	**1.87**	**0.515**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.002**	**0.010**	**0.002**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**15.9**	**14.4**	**1.05**	**15.2**	**1.73**
Iron	7439-89-6	0.05	mg/L	**0.46**	**2.68**	**0.96**	**1.82**	**1.65**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.2**	**0.4**	**0.2**	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	**0.06**	**0.05**	<0.05	**0.06**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**108**	**107**	**21.1**	**135**	**34.2**
ø Total Cations	----	0.01	meq/L	**111**	**108**	**21.7**	**134**	**34.0**
ø Ionic Balance	----	0.01	%	**1.24**	**0.35**	**1.34**	**0.10**	**0.30**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
			Sampling date / time	28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
				EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**92.6**	**95.0**	**89.8**	**87.0**	**93.4**
Toluene-D8	2037-26-5	2	%	**96.2**	**98.1**	**98.4**	**101**	**98.3**
4-Bromofluorobenzene	460-00-4	2	%	**97.0**	**101**	**98.6**	**97.3**	**99.5**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
			Sampling date / time	27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
Compound	CAS Number	LOR	Unit	EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.14	7.98	6.22	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	6510	10800	<1	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	4030	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	6460	<10	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	199	123	<5	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	575	103	2	----	----
Total Alkalinity as CaCO3	----	1	mg/L	575	103	2	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	117	<1	<1	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1860	3790	<1	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	108	302	<1	----	----
Magnesium	7439-95-4	1	mg/L	191	143	<1	----	----
Sodium	7440-23-5	1	mg/L	1060	1870	<1	----	----
Potassium	7440-09-7	1	mg/L	2	20	<1	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	0.074	9.02	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	0.003	0.001	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	0.003	0.032	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	2.75	13.9	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Compound	CAS Number	LOR	Unit	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
Sampling date / time				27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
				EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**2.48**	**2.13**	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	**0.003**	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.104**	**9.72**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.002**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**3.01**	**14.2**	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	**3.66**	**3.04**	<0.05	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.2**	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.13**	**0.09**	<0.01	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**66.4**	**109**	**0.04**	----	----
ø Total Cations	----	0.01	meq/L	**67.3**	**109**	<0.01	----	----
ø Ionic Balance	----	0.01	%	**0.65**	**0.13**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	**100**	<50	<50	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	**100**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	**130**	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
			Sampling date / time	27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
Compound	CAS Number	LOR	Unit	EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**130**	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**91.2**	**90.5**	**94.1**	**93.8**	----
Toluene-D8	2037-26-5	2	%	**96.5**	**103**	**99.8**	**99.7**	----
4-Bromofluorobenzene	460-00-4	2	%	**99.2**	**129**	**99.2**	**103**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

Appendix B – IPC Exceedance Investigations

C&R CONSULTING
Geochemical & Hydrobiological Solutions Pty Ltd
ABN 72 077 518 784

Underground Coal Gasification / Coal Seam Gas Investigations
Mineralogical, Geological, Petrographic and Soils Services
Hydrogeomorphic and Palaeogeomorphic Evaluations
Terrestrial and Aquatic Fauna and Flora Surveys
Climate History and Extreme Events Analysis
Contaminated Site and Mine Water Analysis
Environmental Compliance and Monitoring
Estuarine and Marine Water Assessments
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ISAAC PLAINS COMPLEX

Groundwater Exceedance Investigation

Report Prepared for:

stanmore IP Coal

Date: February 2022

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4/02/2022

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04/02/2022

Date

IMPORTANT INFORMATION

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6. The assessment of the site/s is based on information supplied by the client, and on-site inspections by C&R Consulting.
7. The report reflects both the information provided to C&R Consulting in documents made available for review and the results of observations and consultations by C&R Consulting staff.

SUMMARY OF RELEVANT INFORMATION

Project Title	Groundwater Exceedance Investigation
Property Location	Isaac Plains Complex
Property Description	Open-cut coal mine
Project Purpose	Undertake an investigation into the potential for environmental harm in accordance with EA Condition C43
Project Number	21095
Client's Details	
Nominated Representative	Belinda Parfitt
Title/Position	Senior Advisor (HSEC)
Company	Stanmore IP Coal
Telephone	0437 931 172
Email	Belinda.Parfitt@stanmorecoal.com.au
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Qualifications	Graduate Diploma of Science (Groundwater Hydrology) Master of Environmental Management
Experience	8+ years
Affiliations	International Association of Hydrogeologists

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Appendix A – October 2021 COA 26

1. INTRODUCTION

Stanmore IP Coal Pty Ltd (Stanmore) operates the Isaac Plains Complex (IPC) under environmental authority (EA) EPML00932713, dated 16 June 2021. The IPC includes both the Isaac Plains Mine (IPM) and Isaac Plains East (IPE) open-cut coal projects.

In accordance with EA Condition C42, IPC monitor groundwater levels and water quality on a quarterly basis from a network of nineteen groundwater monitoring bores within close proximity to the mining leases. Two of the monitoring bores, Burton Coal Bore 2 and Swamp Bore 1, are assessed against groundwater contaminant triggers (GCTs) defined in EA Table 12.

During the October 2021 quarterly groundwater quality monitoring, results from Burton Coal Bore 2 exceeded multiple GCTs. These exceedances were reported to the Department of Environment and Science (DES) *Water Tracking and Electronic Reporting System* (WaTERS) as event identification 7242. It is noted that exceedances were also reported for Swamp Bore 1, although these have since been reclassified which will be discussed further in Section 4.2.

In accordance with EA Condition C43, Stanmore have enlisted C&R Consulting Pty Ltd (C&R) to investigate the potential for environmental harm resulting from the exceedances.

1.1 SCOPE

This investigation will examine the potential for environmental harm from the October 2021 groundwater exceedances through:

- Statistical analysis of the standing water levels and water quality of Burton Coal Bore 2 and Swamp Bore 1;
- Examination of the climatic conditions influencing groundwater levels and quality; and
- Assessment of the impact of mining activities on groundwater levels and quality.

If/as required, this investigation will also make recommendations for appropriate actions to prevent further exceedances.

2. BACKGROUND

2.1 MINE DETAILS AND LOCATION

IPC is located within the Isaac Regional Council area on both freehold and state leasehold land in central Queensland, approximately 10 km to the northeast of Moranbah and 140 km southwest of Mackay (Figure 1). The project is situated immediately north of the Peak Downs Highway between Moranbah and Coppabella, and has a rail loop off the south of the Goonyella branch rail line (Figure 1).

IPC was placed in care and maintenance by Vale S. A. and Sumitomo Corporation in December 2014. In July 2015, ownership of the mine was transferred from Vale S. A. and Sumitomo Corporation to Stanmore, with mining operations recommencing in January 2016.

The original IPC mining lease (ML70342) comprised pits N1, N2B, S1, S2 and S3. These pits are north of the Isaac River and upstream of the Isaac River / Smoky Creek confluence, with Smoky Creek bisecting the ML70342 lease area. Most mining at IPC is open-cut and based on a strip-mining technique, with waste removed by a combination of cast blasting, dozing, dragline spoiling and/or truck and excavator removal.

In 2018, Stanmore was granted the approval to commence additional open-cut operations in mining leases located to the east of the original ML70342 mining lease. This expansion of IPC operations into leases ML700016, ML700017, ML700018 and ML700019 commenced in the second half of 2018 – and is referred to as Isaac Plains East (IPE).

Isaac Plains East Extension (IPEE) was granted Environment Protection and Biodiversity Conservation (EPBC) approval on 4 December 2020. IPEE includes further land on leases ML700016, ML700017, ML700018 and ML700019. Operations commenced in these new areas in December 2020.

Historically, IPC operations have been conducted on ML70342, separated into five primary pits: the N1, N2, S1, S2 and S3 pits. The N pits are north of Smoky Creek, which bisects the mining lease area. The three S pits are south of this watercourse, with the S2 pit currently acting as the main water storage for the site.

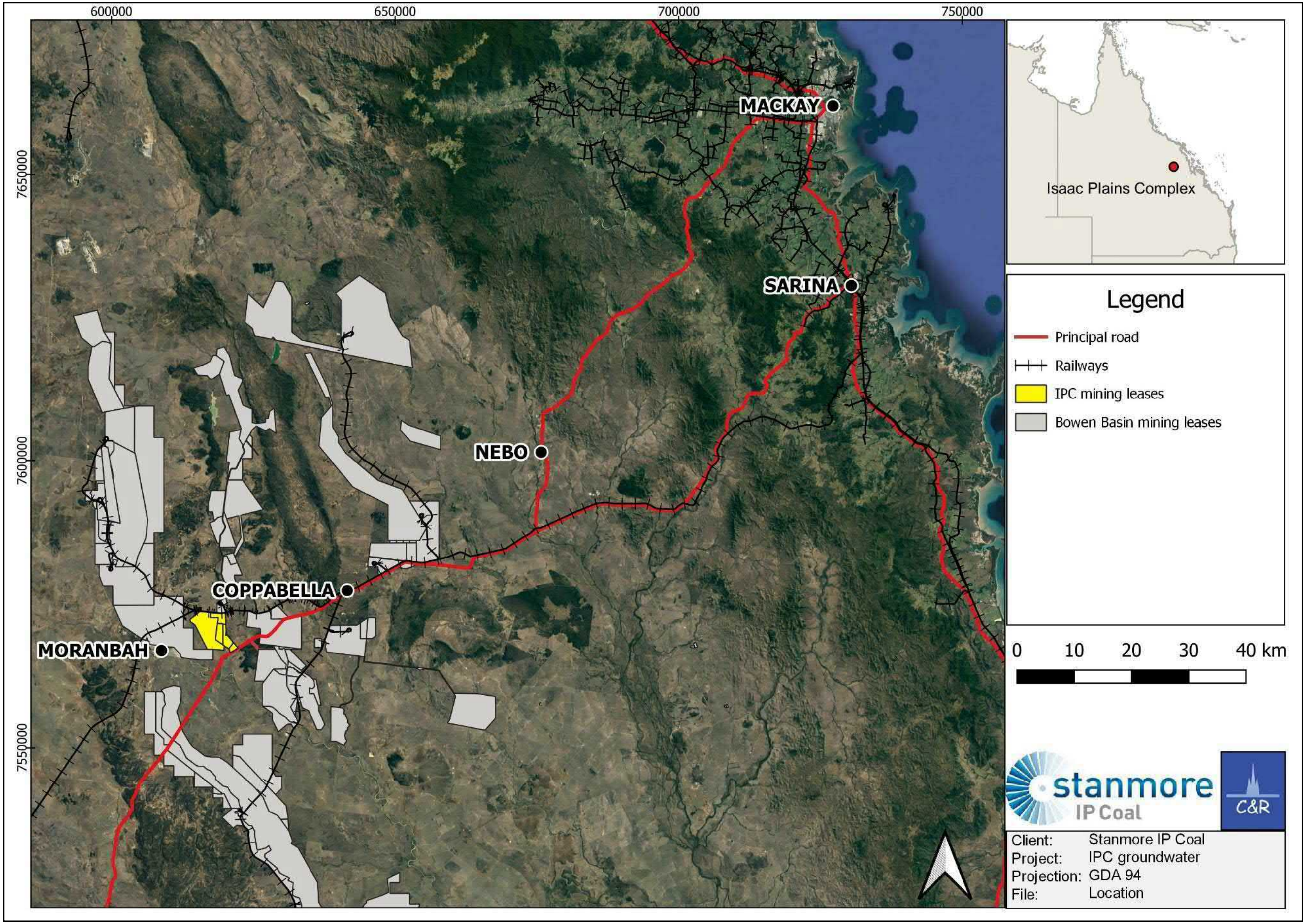

Figure 1: IPC location within central Queensland.

2.2 CLIMATE

The climate in central Queensland is seasonally arid. Rainfall in the area is notoriously unreliable in its intensity and duration, both temporally and spatially. Intense rainfall events throughout the summer months (wet season) dominate the climate cycle (Figure 2; rainfall data from Isaac Plains AWS 332404). Most of these rainfall events occur in distinct, spatially separated cells across the landscape. Intense rainfall events are typically associated with tropical cyclone activity on the coast and the remnant low-pressure systems that move inland.

Far less rainfall is experienced throughout the dry season, with less than 35% of total rain typically falling in the winter months (May to October). Evaporation tends to exceed rainfall for almost all days of the year except during intense rainfall events, as indicated by the monthly rainfall and pan evaporation totals (Figure 2; evaporation data from the SILO database; https://www.longpaddock.qld.gov.au/silo/).

The extended dry season causes baking and crusting of surface soils. These processes lead to greatly reduced infiltration through surface soils unless suitable pre-wetting is provided by gentle rain prior to the wet season. If pre-wetting rains have not occurred, more than 90% of rainfall can eventuate as runoff throughout catchments, altering stage-discharge relationships within waterways.

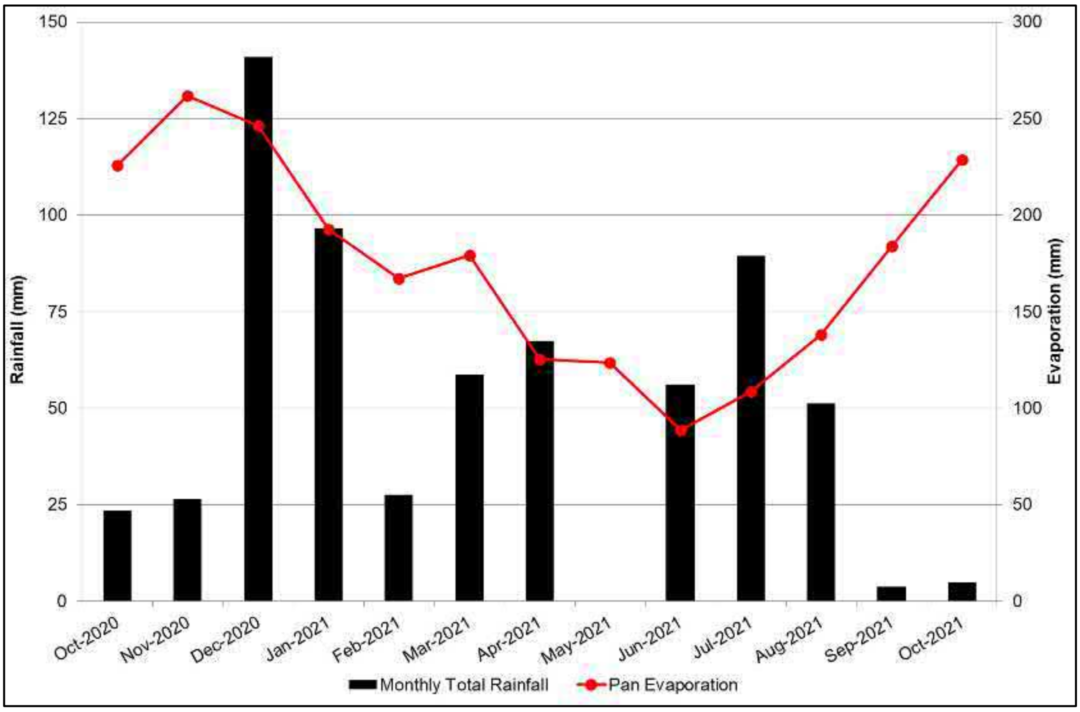

Figure 2: Monthly rainfall (Isaac Plains AWS) and pan evaporation (SILO) totals.

Rainfall data from the Bureau of Meteorology (BoM) stations at the Moranbah water treatment plant (station 34038; April 1972 to January 2012) and the Moranbah airport (station 34035; February 2012 to present) are displayed in Figure 3. Application of a 5-year running mean (centred on the averaging period) shows a cyclicity of wet and dry phases over the last 50 years, with the cycle appearing to peak every 10-15 years. Over the most recent years (since 2010), the region has remained within a dry period.

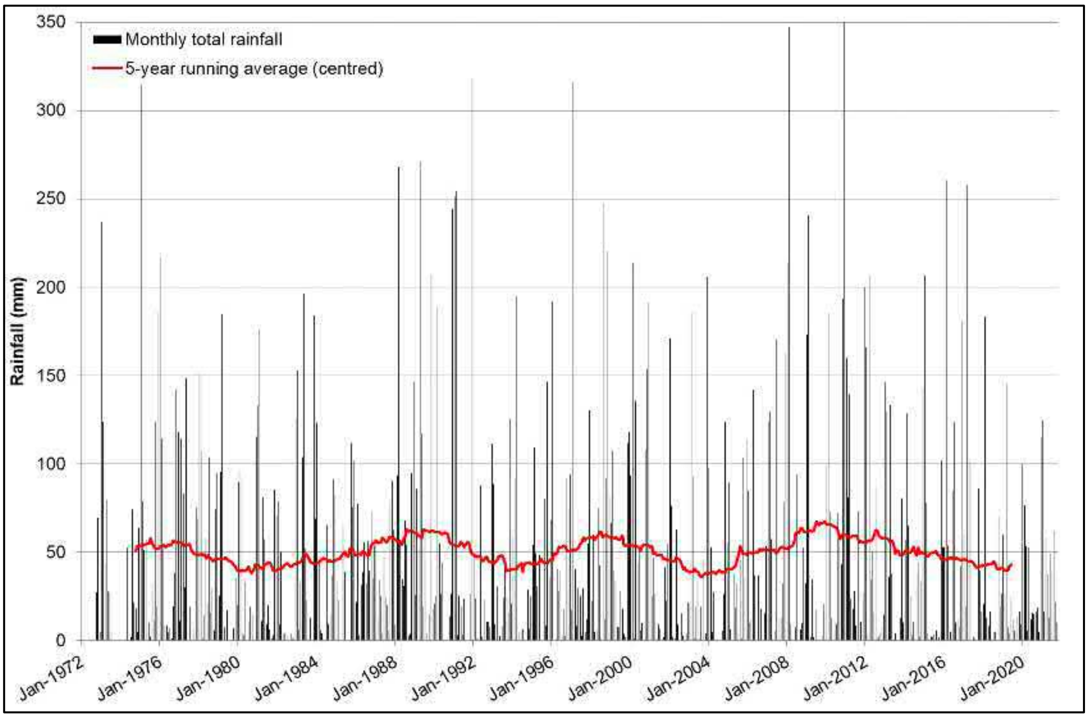

Figure 3: Monthly rainfall totals and 5-year running average (data from BoM, 2022).

2.3 REGIONAL HYDROGEOLOGY

There are five principal hydrostratigraphic units within the IPC tenement areas:

1. Quaternary alluvium/colluvium;
2. Tertiary sediments;
3. Tertiary basalt;
4. Triassic Rewan Group; and
5. Late Permian Rangal Coal Measures and Fort Cooper Coal Measures.

The Quaternary alluvium/colluvium and Tertiary sediments are associated with channel deposits of Smoky Creek and the Isaac River. Tertiary basalt flows outcrop to the northeast of tenement ML70342, and some of these basalt flows constitute aquifers in several surrounding areas. Confinement of the Triassic and Permian strata is variable locally, depending on pressure distribution and depth. Stratigraphic descriptions for each unit are provided in Table 1.

The surface distribution of each unit is complicated by numerous regional structures, including at least one syncline and several thrust faults truncating the eastward-dipping target beds. Klohn Crippen Berger (KCB, 2016) describe the aquifers of the Isaac Plains area in detail, with reference made to aquifer characteristics, groundwater flow and groundwater quality for each unit.

Table 1: Stratigraphic units of the Isaac Plains region.

Map Symbols[#]	Age	Group	Name/Formation	Short Description
Cza	Quaternary		Alluvium / Colluvium	Alluvium: mud, sand, minor gravel. Colluvium and residual soil: mud, sand, gravel[##].
Czb	Cenozoic		Tertiary basalt	Basalt flows.
Czs*			Suttor Formation*	Sandstone, mudstone, claystone.
Ki*	Cretaceous		Unnamed*	Intrusives: granodiorite, diorite, gabbro.
TRr	Triassic	Rewan Group	Rewan Formation	Green lithic sandstone, green and red sandstone and mudstone.
Pwj	Late Permian	Blackwater Group	Rangal Coal Measures	Lithic sandstone, coal, siltstone, carbonaceous shale, mudstone (locally cherty), rare pebbly sandstone.
Pwt			Fort Cooper Coal Measures	Medium to coarse-grained volcanolithic sandstone, conglomerate, tuff, tuffaceous mudstone, coal, shale.
Pwb*			Moranbah Coal Measures*	Lithic sandstone, siltstone, shale, coal, mudstone, conglomerate.
Pb*		Back Creek Group*		Marine sandstone, siltstone, shale.

[#] Map symbols as per 1:100,000 geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (Geological Survey of Queensland [GSQ], 2004).

[##] Several generations of alluvium and colluvium exist, but only the older, more substantive one is mapped in 1:100,000 geological maps Harrybrandt (8554) and Grosvenor Downs (8553) (GSQ, 2004).

* Formation/unit is present outside of the lease area and is not discussed at length in the text.

3. GROUNDWATER MONITORING NETWORK

Previous to gaining environmental approval to mine the eastern mining leases at IPC (ML700016, ML700017, ML700018 and ML700019), only two groundwater bores (Burton Coal Bore 2 and Swamp Bore 1) were monitored as a requirement of the existing EA.

Following the approval of an EA amendment (24 January 2018) for the mining activities on the additional leases, a more extensive monitoring network has been developed, targeting various aquifer systems present within the eastern mining leases. The monitoring network was expanded in 2020 to account for the replacement of existing monitoring bores that are due to be decommissioned.

EA Table 11 indicates that a minimum of nine designated reference bores are required to provide ongoing groundwater monitoring data during mine operations at IPC. Therefore, to maintain this number of designated reference bores, all decommissioned reference bores either have been or will be replaced. The current monitoring network at IPC consists of thirteen reference bores and six observation bores.

The details of the bores included in the current IPC groundwater monitoring programme are summarised in Table 2, with their spatial distribution shown in Figure 4.

Table 2: Groundwater monitoring bores at IPC.

Monitoring Point	Aquifer Type	Easting (GDA 94)	Northing (GDA 94)	Surface RL (mAHD)	Monitoring Purpose
IPC Reference Bores (EA Table 11)					
Burton Coal Bore 2	Rewan Group	620383	7573599	240.8	Monitoring groundwater trigger levels as per EA C43 and EA C44
Swamp Bore 1 (referred to as Swamp Bore 2 in the EA)	Rewan Group	621518	7568790	245.9	Monitoring groundwater trigger levels as per EA C43 and EA C44
MB1	Rangal Coal Measures	618793	7572214	236.4	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB2	Rangal Coal Measures	619074	7573137	242.7	Monitoring groundwater in the target coal seam
MB4a	Quaternary Colluvium / Tertiary Sediments	620351	7567479	237.6	*To be decommissioned.* Used for monitoring groundwater in the Quaternary / Tertiary sediments. Insufficient water, replaced by MB4b
MB4b	Quaternary Colluvium / Tertiary Sediments[1]	619740	7567253	233.9	*To be decommissioned.* Used for monitoring groundwater in the Quaternary / Tertiary sediments
MB8	Rangal Coal Measures	619105	7571149	245.9	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB9	Rangal Coal Measures	620368	7568049	239.5	*To be decommissioned.* Used for monitoring groundwater in the target coal seam
MB10 (referred to in field notes as MB9b)	Tertiary Basalt	620368	7568046	239.5	*To be decommissioned.* Used for monitoring groundwater in the Tertiary basalt
MB11	Tertiary Sediments / Weathered Rewan Group	618832	7571924	232.3	Monitoring groundwater in the Tertiary sediments / weathered Rewan Group. Insufficient water (dry)
MB12	Rangal Coal Measures	619210	7572000	239.5	*Replacement for MB1* to monitor groundwater in the target coal seam

Monitoring Point	Aquifer Type	Easting (GDA 94)	Northing (GDA 94)	Surface RL (mAHD)	Monitoring Purpose
MB14	Tertiary Basalt	620263	7571132	257.3	*Replacement for MB10* to monitor groundwater trigger levels as per EA C44
MB16 (referred to in field notes as MB16b)	Tertiary Sediments	620670	7568599	245.6	*Replacement for MB4b* to monitor trigger levels as per EA C44
IPC To Be Commissioned Reference Bores (EA Table 11)					
MB13	Rangal Coal Measures	619367	7571035	249.7	*Replacement for MB8* to monitor groundwater in the target coal seam
MB15	Rangal Coal Measures	620633	7568080	242.9	*Replacement for MB9* to monitor groundwater in the target coal seam
IPC Designated Observation Bores					
MB7	Rangal Coal Measures	617537	7569064	237.4	Monitoring groundwater in advance of mine operations
MB16a	Tertiary Sediments	620670	7568599	245.6	Monitoring groundwater in the Tertiary sediments. Insufficient water, replaced by MB16b
GDEMB01	Quaternary Alluvium	621780	7569179	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB02	Quaternary Alluvium	620436	7568168	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB03	Quaternary Alluvium	620022	7567230	To be advised	Monitoring groundwater-dependent ecosystems
GDEMB04	Quaternary Alluvium	619754	7567165	To be advised	Monitoring groundwater-dependent ecosystems
IPC Decommissioned Reference Bores (EA Table 11)					
MB3	Rangal Coal Measures	619047	7568473	253.0	Monitoring groundwater in advance of mine operations
IPC Decommissioned Observation Bores					
MB5	Rangal Coal Measures	618507	7570878	241.8	Monitoring groundwater in advance of mine operations
MB6	Tertiary Basalt	619374	7567545	235.7	Monitoring groundwater in the Tertiary basalt
C1	Rangal Coal Measures	616545	7571999	235.7	Monitoring groundwater in advance of mine operations
AC1	Rangal Coal Measures	616573	7571997	235.8	Monitoring groundwater in advance of mine operations
BC095	Rangal Coal Measures	616507	7571995	236.7	Monitoring groundwater in advance of mine operations

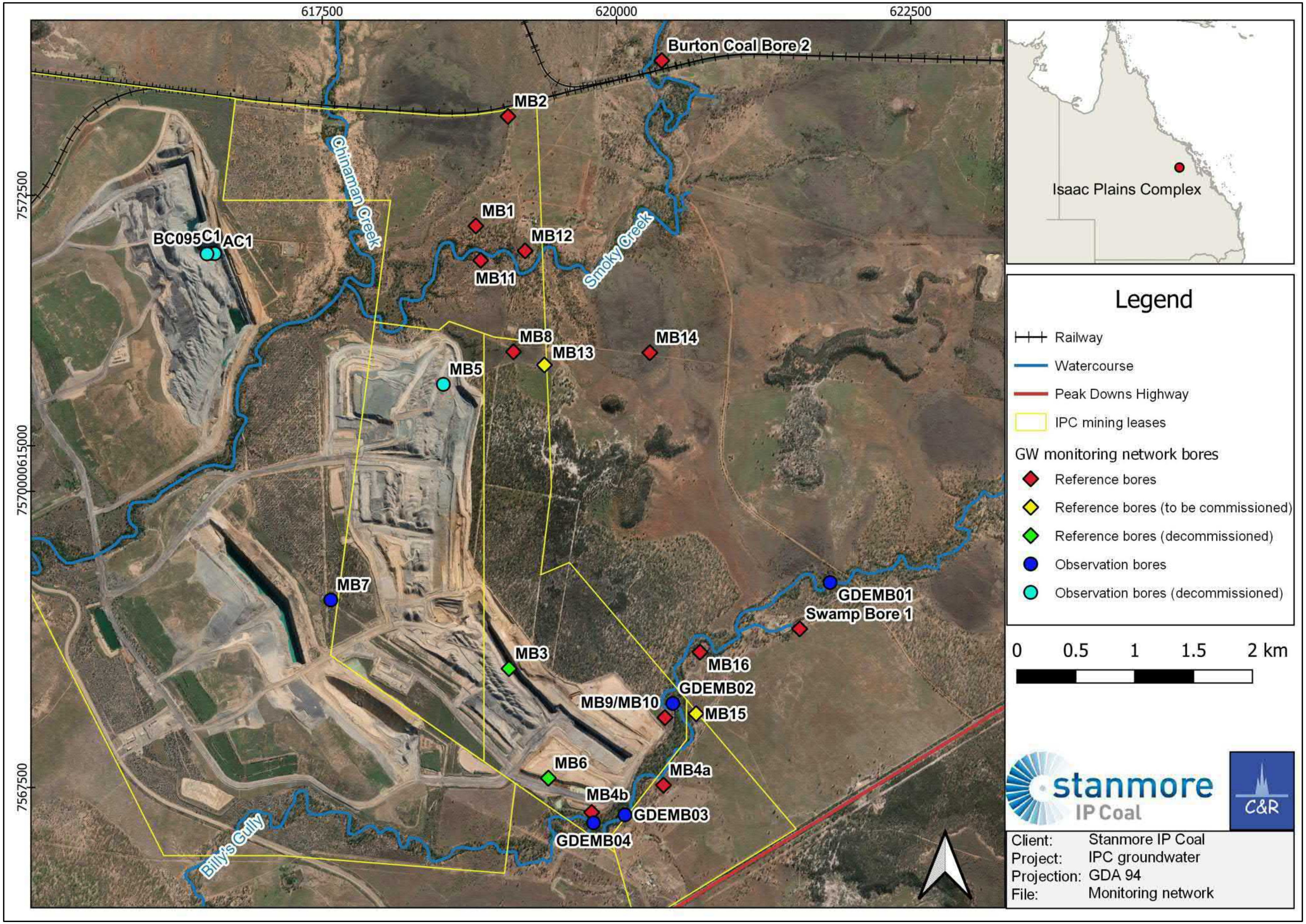

Figure 4: **Groundwater monitoring network at IPC.**

4. EXCEEDANCE INVESTIGATION

Data supplied to C&R for the purpose of this investigation included Microsoft Excel spreadsheets, laboratory certificates of analysis and groundwater field sheets. Before data analysis was undertaken, laboratory results below the limit of reporting (LOR) were entered into the database as half the LOR value, in line with the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ) *Australian Guidelines for Water Quality Monitoring and Reporting* (2000). Data analysis incorporated the generation of time series charts for each exceeding parameter – to identify the potential for trending results.

4.1 Burton Coal Bore 2

Groundwater in the vicinity of the IPC generally follows surface topography in a southwest direction (KCB, 2016). Burton Coal Bore 2 is positioned hydraulically up-gradient of mining at the IPC, adjacent to Smoky Creek and the Goonyella rail system.

The bore targets the Rewan Group stratigraphic unit, characterised by saline water quality associated with the low hydraulic conductivity and long residence time of the groundwater (KCB, 2016). The aquifer is recharged via rainfall infiltration in areas where the unit outcrops, as well as from seepage from the overlying stratigraphic units.

Burton Coal Bore 2 is not currently used as a water supply.

4.1.1 Exceeded Groundwater Contaminant Triggers

Multiple exceedances with Burton Coal Bore 2 were noted in the October 2021 round of groundwater monitoring (Table 3).

Table 3: Burton Coal Bore 2 exceedance values October 2021.

Parameter	Unit	EA Trigger Value	October 2021
Calcium	mg/l	195	242
Chloride	mg/l	2,050	2,400
Total Dissolved Solids	mg/l	4,500	5,660
Electrical Conductivity	µS/cm	7,320	7,790
Magnesium	mg/l	265	343
Sodium	mg/l	990	1,030

The GCTs stipulated within the EA for metals/metalloids do not specifically state whether the thresholds are applicable to dissolved or total metal concentrations. If applied against total concentrations, there would also be an exceedance for aluminium. However, it is recognised that the EA threshold values are derived from the ANZECC and ARMCANZ (2000) freshwater ecosystem guidelines that apply dissolved concentrations for all metals/metalloids thresholds (except for selenium), suggesting that GCTs should be applied against dissolved concentrations. Therefore, C&R have applied the EA threshold values against dissolved concentrations for all metals/metalloids (apart from selenium) and found no exceedances.

All of the October 2021 (Burton Coal Bore 2) exceedances can be attributed to limited rainfall and subsequent recharge of the aquifer system. Below-average wet seasons have had the effect of concentrating the total dissolved solids (TDS), electrical conductivity (EC) and major ions in the aquifer system. This effect has been compounded by the fact that the region is currently within an extended dry cycle (refer to Section 2.2, Figure 3).

Standing water levels have been recorded for Burton Coal Bore 2 since June 2008. When the standing water levels are overlayed with local rainfall (Figure 5), the bore appears to be highly influenced by rain (or lack thereof), supporting the understanding that the aquifer is recharged via rainfall infiltration.

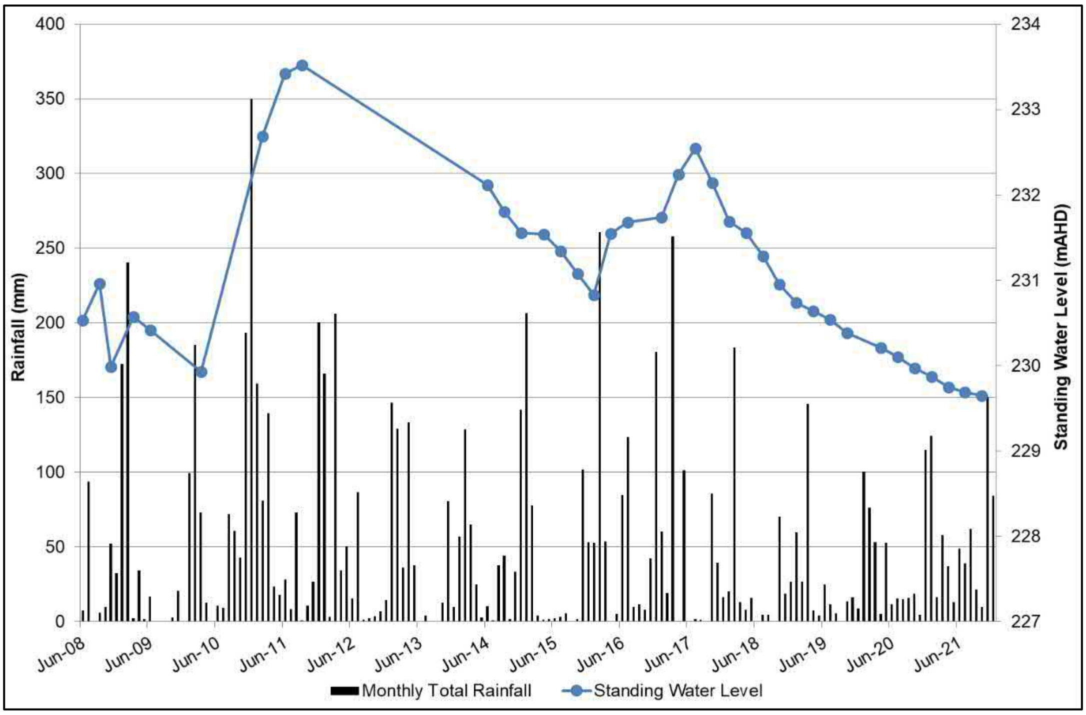

Figure 5: Monthly rainfall totals (data from BoM, 2022) and standing water level in Burton Coal Bore 2.

The decline (due to lack of rainfall) of the standing water level in Burton Coal Bore 2 has inversely impacted the TDS (Figure 6), EC (Figure 7), calcium (Figure 8), chloride (Figure 9), magnesium (Figure 10) and sodium (Figure 11) concentrations. Specifically, evapotranspiration processes are lowering the zone of saturation in the aquifer system and concentrating the salts (due to reduced dilution). Therefore, the aforementioned Burton Coal Bore 2 exceedances are inferred to be an expression of climatic conditions and not a product of mining impacts.

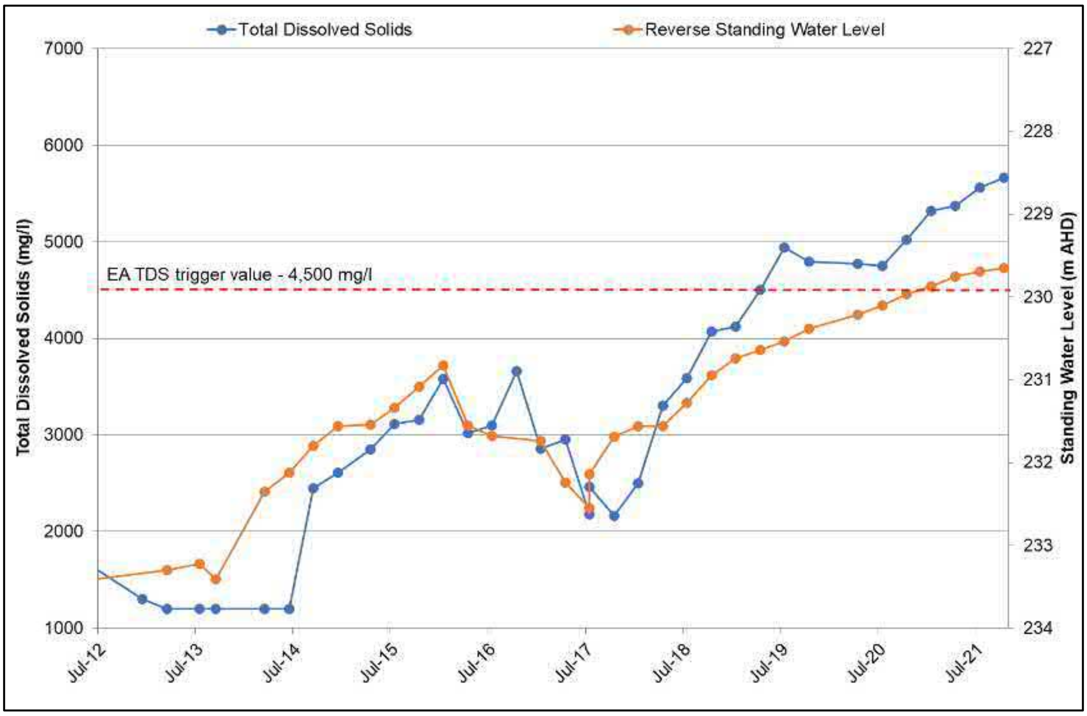

Figure 6: **Total dissolved solids and reverse standing water level in Burton Coal Bore 2.**

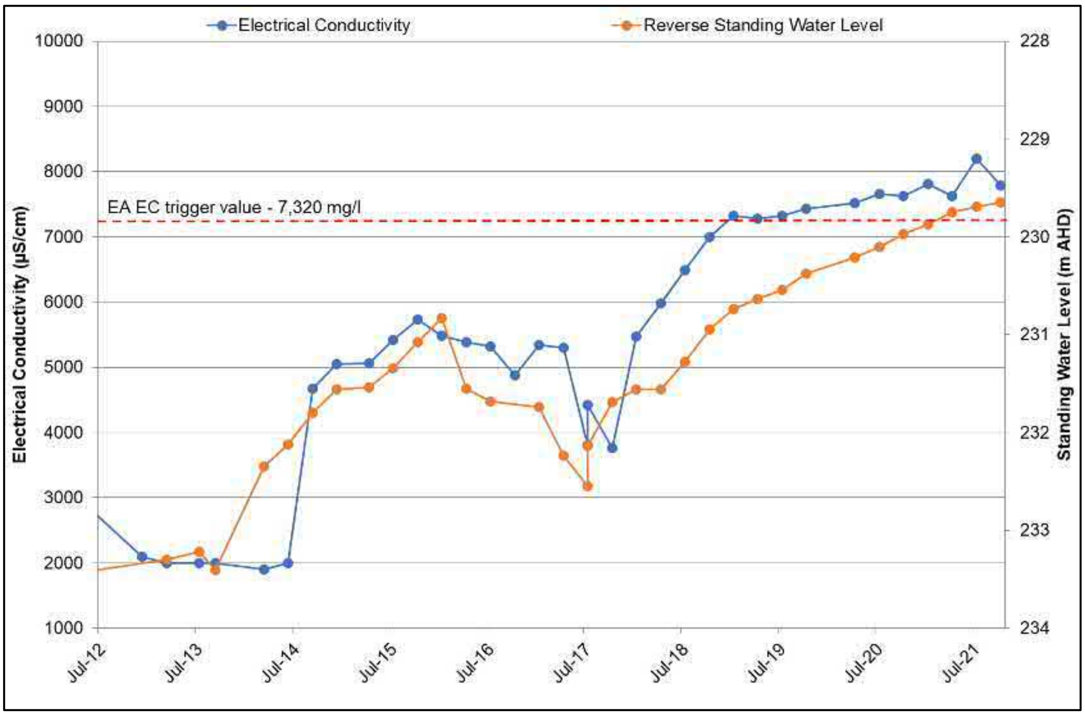

Figure 7: **Electrical conductivity and reverse standing water level in Burton Coal Bore 2.**

Figure 8: Calcium and reverse standing water level in Burton Coal Bore 2.

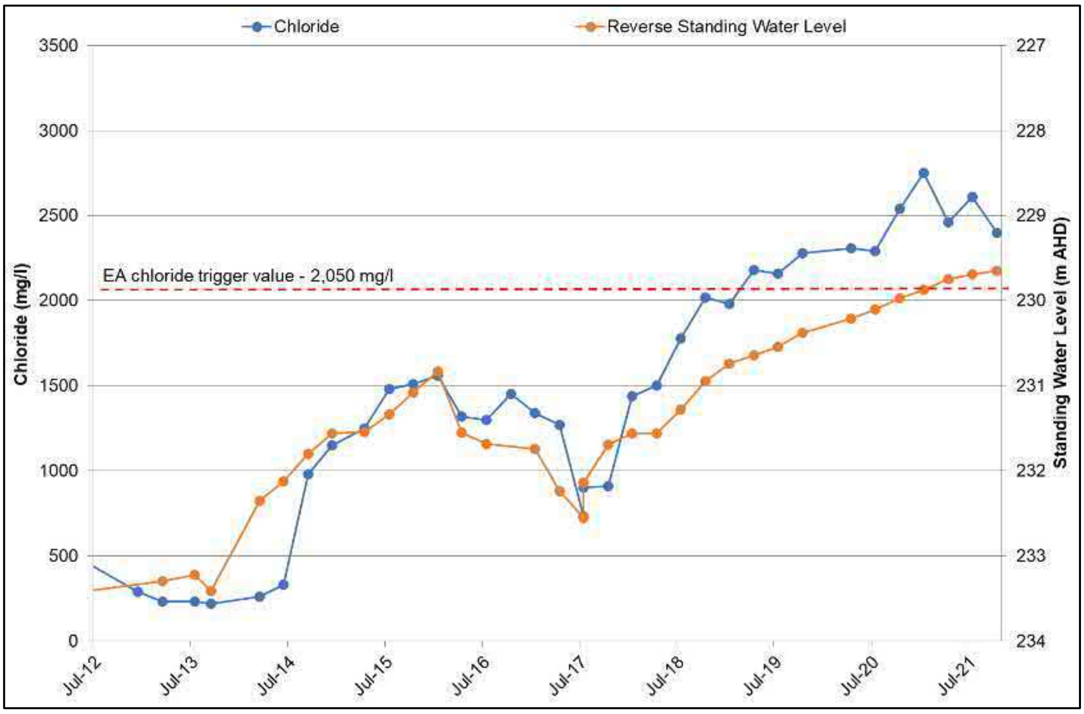

Figure 9: Chloride and reverse standing water level in Burton Coal Bore 2.

Figure 10: Magnesium and reverse standing water level in Burton Coal Bore 2.

Figure 11: Sodium and reverse standing water level in Burton Coal Bore 2.

4.2 SWAMP BORE 1

Groundwater in the vicinity of the IPC generally follows surface topography in a southwest direction (KCB, 2016). Swamp Bore 1 is positioned hydraulically up-gradient of mining at the IPC and is within close proximity to Billy's Gully. The bore targets the Rewan Group stratigraphic unit, characterised by saline water quality associated with the low hydraulic conductivity and long residence time of the groundwater (KCB, 2016). Swamp Bore 1 is not currently used as a water supply, although it is positioned less than 5 m from a farmer's bore that is utilised for stock-drinking water.

4.2.1 EXCEEDED GROUNDWATER CONTAMINANT TRIGGERS

No exceedances were detected for Swamp Bore 1 during the October 2021 round of groundwater monitoring (**Error! Reference source not found.**).

The GCTs stipulated within the EA for metals/metalloids do not specifically state whether the thresholds are applicable to dissolved or total metal concentrations. If applied against total concentrations, there would also be small exceedances in aluminium and molybdenum.

However, it is recognised that the EA threshold values are derived from the ANZECC and ARMCANZ (2000) freshwater ecosystem guidelines that apply dissolved concentrations for all metals/metalloids thresholds (except for selenium). Therefore, C&R have applied the EA threshold values against dissolved concentrations for all metals/metalloids (apart from selenium) and found no exceedances.

It is noted that during the initial notification via WaTERS, arsenic was reported to have exceeded the contaminant limit. However, upon review, arsenic concentrations were found to be equal to the contaminant limit of 0.002 mg/L and therefore classified as compliant.

5. CONCLUSIONS AND RECOMMENDATIONS

In accordance with IPC EA condition C43, various GCT exceedances were reported for Burton Coal Bore 2 during the October 2021 groundwater monitoring rounds. These exceedances were reported to the DES WaTERS website as event identification 7242. All exceedances occurred in Burton Coal Bore 1. Elevated levels at Swamp Bore 1 were limited to total metals (aluminium and molybdenum).

Both Burton Coal Bore 2 and Swamp Bore 1 are positioned hydraulically up-gradient of mining at the IPC. These bores target the Rewan Group stratigraphic unit, which is characterised by saline water quality resulting from the low hydraulic conductivity and long residence time of the groundwater (KCB, 2016). The associated aquifer is recharged via rainfall infiltration in areas where the unit outcrops, as well as from seepage from the overlying stratigraphic units.

Examination of local rainfall data dating back to 1972 has identified a 10- to 15-year cyclical trend of wet and dry periods. Since 2010, an extended dry period has been observed.

5.1 Burton Coal Bore 2

Climatic conditions appear to have adversely affected the groundwater in Burton Coal Bore 2. The standing water level in the bore has shown a downward trend (Figure 5) in the recent years of below-average rainfall totals. This standing water level decline in Burton Coal Bore 2 has inversely impacted the TDS, EC, calcium, chloride, magnesium and sodium concentrations, resulting in numerous exceedances during 2021. Specifically, evapotranspiration processes are lowering the zone of saturation in the aquifer system and concentrating the salts. Therefore, these aforementioned Burton Coal Bore 2 exceedances are inferred to be an expression of climatic conditions and not a product of mining impacts.

The October 2021 exceedances in Burton Coal Bore 2 are all attributed to the current climatic conditions. Therefore, these exceedances are not a product of mining impacts and do not represent potential environmental harm.

5.2 Swamp Bore 1

Elevated values at Swamp Bore 1 are limited to total metals (aluminium and molybdenum) during October 2021. These are not considered exceedances because it is assumed that the GCTs for metals/metalloids stipulated within the EA are applicable to dissolved metal concentrations.

5.3 Discussion

The exceedances in Burton Coal Bore 2 are attributed to the current, ongoing dry period (Section 4.1.1). Without sufficient rainfall, this bore will continue to exceed GCTs for TDS, EC and various major ions in each monitoring round. These exceedances are reflecting the natural groundwater conditions and are not indicative of potential environmental harm. It is recommended that IPC complete a review and update current GCT compliance calculations (if applicable) to current best-practice methods (i.e. DES, 2021 – *Using monitoring data to assess groundwater quality and potential environmental impacts*).

The GCTs stipulated within the EA for metals/metalloids do not specifically state whether the thresholds are applicable to dissolved or total metal concentrations. If applied against total concentrations, there would also be exceedances aluminium and molybdenum. However, it is recognised that the EA threshold values are derived from the ANZECC and ARMCANZ (2000) freshwater ecosystem guidelines that apply dissolved concentrations for all metals/metalloids thresholds (except for selenium). Therefore, C&R have applied the EA threshold values against dissolved concentrations for all metals/metalloids (apart from selenium). C&R recommends amending EA Table 12: Groundwater contaminant triggers to specify the applicable metal concentration (i.e. total or dissolved).

The current monitoring network nomenclature is not aligned across the relevant documentation – including the EA, groundwater monitoring and management plan and third-party groundwater field/laboratory reports (e.g. Swamp Bore 1 is referred to in the EA as Swamp Bore 2). Consequently, C&R recommend aligning naming conventions across all relevant documentation, including EA Table 11 (*Groundwater monitoring locations and frequency*).

6. REFERENCES

ANZECC and ARMCANZ (2000). *Australian guidelines for water quality monitoring and reporting.* National Water Quality Management Strategy no. 7.

BOM (2022). *Climate Data Online*. http://www.bom.gov.au/climate/data/, accessed 31 January 2022.

DES (2021). *Using monitoring data to assess groundwater quality and potential environmental impacts*. Version 2. Queensland Government, Brisbane.

GSQ (2004). *Geological Survey of Queensland (GSQ) Geoscience Data 1:100,000 Sheet areas Harrybrandt (8554) and Grosvenor Downs (8553)*, compiled by Natural Resource Sciences – GSQ.

KCB (2016). *Isaac Plains East Project – Groundwater Report.* Prepared for: Stanmore IP Coal Pty Ltd.

Appendix A– October 2021 COA

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2129521**	Page	: 1 of 12
Client	: **STANMORE IP COAL PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: BELINDA PARFITT	Contact	: Nikita Sutton
Address	: GPO BOX 2602 BRISBANE QLD 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: 07 4816 7444	Telephone	: +61-7-3243 7222
Project	: IPCM	Date Samples Received	: 02-Nov-2021 09:00
Order number	: P1002091	Date Analysis Commenced	: 03-Nov-2021
C-O-C number	: ----	Issue Date	: 09-Nov-2021 16:22
Sampler	: JACK PARKER		
Site	: Isaac Plains		
Quote number	: TV/005/19 v7		
No. of samples received	: 22		
No. of samples analysed	: 14		

ilac-MRA NATA

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
- Surrogate Control Limits

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*
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Thomas Donovan	Senior Organic Chemist - PFAS	Brisbane Organics, Stafford, QLD
Timothy Creagh	2IC Organic Chemist	Brisbane Organics, Stafford, QLD

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 Contact 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.

- EK067G (Total Phosphorus as P): Sample EB2129521_001 (SB1 (Swamp Bore 1)) was diluted due to matrix interference. LOR adjusted accordingly.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG020-F (Dissolved Metals): LOR raised for samples MB7 (EB2129521-007) due to matrix interference.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for sample MB1 (EB2129521-003). However, the difference is within experimental variation of the methods.
- 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.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
Compound	CAS Number	LOR	Unit	EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.78**	**7.97**	**8.07**	**8.09**	**7.90**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**8750**	**7790**	**3390**	**7540**	**19000**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**6000**	**5660**	**1920**	**4410**	**11800**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**14**	<5	<5	**90**	**6**
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	**62**	**616**	**508**	**727**	**266**
Total Alkalinity as CaCO3	----	1	mg/L	**62**	**616**	**508**	**727**	**266**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**125**	**102**	**36**	**155**	**210**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2930**	**2400**	**867**	**2110**	**6480**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**514**	**242**	**86**	**125**	**471**
Magnesium	7439-95-4	1	mg/L	**137**	**343**	**104**	**172**	**310**
Sodium	7440-23-5	1	mg/L	**1110**	**1030**	**519**	**1350**	**3260**
Potassium	7440-09-7	1	mg/L	**20**	**6**	**4**	**8**	**18**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.005
Arsenic	7440-38-2	0.001	mg/L	**0.001**	<0.001	**0.004**	**0.021**	<0.005
Barium	7440-39-3	0.001	mg/L	**0.605**	**0.174**	**0.145**	**0.149**	**0.575**
Molybdenum	7439-98-7	0.001	mg/L	**0.001**	<0.001	**0.001**	**0.002**	**0.050**
Rubidium	7440-17-7	0.001	mg/L	**0.030**	**0.011**	**0.004**	**0.013**	**0.034**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.05
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.005
Strontium	7440-24-6	0.001	mg/L	**7.68**	**6.36**	**2.20**	**4.34**	**44.8**
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	**0.21**	**0.43**
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
Compound	CAS Number	LOR	Unit	EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.06**	**0.04**	**0.24**	**0.89**	**0.11**
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	**0.002**	<0.001	**0.005**	**0.024**	**0.002**
Barium	7440-39-3	0.001	mg/L	**0.656**	**0.198**	**0.194**	**0.182**	**1.69**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.003**	**0.066**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**8.05**	**6.69**	**2.31**	**4.62**	**47.7**
Iron	7439-89-6	0.05	mg/L	**0.24**	**0.13**	**0.39**	**0.84**	**0.70**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	<0.1	**0.2**	**0.5**	**0.5**	**0.1**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	**0.02**	**0.02**	**0.04**	<0.05
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**86.5**	**82.1**	**35.4**	**77.3**	**192**
ø **Total Cations**	----	0.01	meq/L	**85.7**	**85.3**	**35.5**	**79.3**	**191**
ø **Ionic Balance**	----	0.01	%	**0.45**	**1.87**	**0.24**	**1.31**	**0.31**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	SB1 (Swamp Bore 1) Groundwater	BC2 Burton Coal Bore 2	MB1 Groundwater	MB2 Groundwater	MB7 Groundwater
			Sampling date / time	27-Oct-2021 12:10	27-Oct-2021 13:30	27-Oct-2021 15:10	27-Oct-2021 14:15	28-Oct-2021 08:50
				EB2129521-001	EB2129521-002	EB2129521-003	EB2129521-004	EB2129521-007
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**90.6**	**90.6**	**89.2**	**92.7**	**94.2**
Toluene-D8	2037-26-5	2	%	**97.8**	**98.9**	**97.0**	**96.0**	**98.6**
4-Bromofluorobenzene	460-00-4	2	%	**100**	**100**	**97.6**	**97.8**	**101**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
			Sampling date / time	28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
Compound	CAS Number	LOR	Unit	EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.95	8.03	8.54	7.96	8.40
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	10800	10800	1960	12600	3250
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6830	6190	1190	8060	2020
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	131	11	8	24
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	42	<1	21
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	98	102	547	388	418
Total Alkalinity as CaCO3	----	1	mg/L	98	102	588	388	439
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	<1	46	312	120
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3760	3730	298	4270	813
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	326	302	27	304	63
Magnesium	7439-95-4	1	mg/L	129	140	40	348	136
Sodium	7440-23-5	1	mg/L	1920	1860	389	2070	445
Potassium	7440-09-7	1	mg/L	16	20	5	23	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	0.004	<0.001	0.001	0.019	0.007
Barium	7440-39-3	0.001	mg/L	6.37	8.91	0.751	1.30	0.147
Molybdenum	7439-98-7	0.001	mg/L	0.002	0.001	0.009	0.002	0.001
Rubidium	7440-17-7	0.001	mg/L	0.025	0.032	0.007	0.031	0.018
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	15.7	13.8	1.00	14.4	1.62
Iron	7439-89-6	0.05	mg/L	0.28	<0.05	<0.05	1.54	<0.05
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
			Sampling date / time	28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
Compound	CAS Number	LOR	Unit	EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**0.09**	**1.81**	**0.56**	**0.02**	**0.70**
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	**0.005**	**0.003**	**0.002**	**0.022**	**0.009**
Barium	7440-39-3	0.001	mg/L	**7.02**	**9.90**	**0.843**	**1.87**	**0.515**
Molybdenum	7439-98-7	0.001	mg/L	**0.002**	**0.002**	**0.010**	**0.002**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
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	**15.9**	**14.4**	**1.05**	**15.2**	**1.73**
Iron	7439-89-6	0.05	mg/L	**0.46**	**2.68**	**0.96**	**1.82**	**1.65**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	**0.2**	**0.4**	**0.2**	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	**0.06**	**0.05**	<0.05	**0.06**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**108**	**107**	**21.1**	**135**	**34.2**
ø Total Cations	----	0.01	meq/L	**111**	**108**	**21.7**	**134**	**34.0**
ø Ionic Balance	----	0.01	%	**1.24**	**0.35**	**1.34**	**0.10**	**0.30**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ C10 - C36 Fraction (sum)	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB8B Groundwater	MB9A Groundwater	MB9B Groundwater	MB12	MB14
			Sampling date / time	28-Oct-2021 09:50	27-Oct-2021 09:40	27-Oct-2021 10:40	28-Oct-2021 10:30	28-Oct-2021 12:10
Compound	CAS Number	LOR	Unit	EB2129521-008	EB2129521-009	EB2129521-010	EB2129521-012	EB2129521-013
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**92.6**	**95.0**	**89.8**	**87.0**	**93.4**
Toluene-D8	2037-26-5	2	%	**96.2**	**98.1**	**98.4**	**101**	**98.3**
4-Bromofluorobenzene	460-00-4	2	%	**97.0**	**101**	**98.6**	**97.3**	**99.5**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
			Sampling date / time	27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
Compound	CAS Number	LOR	Unit	EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.14**	**7.98**	**6.22**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**6510**	**10800**	<1	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**4030**	----	----	----	----
Total Dissolved Solids @180°C	----	10	mg/L	----	**6460**	<10	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**199**	**123**	<5	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**575**	**103**	**2**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**575**	**103**	**2**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**117**	<1	<1	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1860**	**3790**	<1	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**108**	**302**	<1	----	----
Magnesium	7439-95-4	1	mg/L	**191**	**143**	<1	----	----
Sodium	7440-23-5	1	mg/L	**1060**	**1870**	<1	----	----
Potassium	7440-09-7	1	mg/L	**2**	**20**	<1	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.074**	**9.02**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.003**	**0.001**	<0.001	----	----
Rubidium	7440-17-7	0.001	mg/L	**0.003**	**0.032**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**2.75**	**13.9**	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG020T: Total Metals by ICP-MS								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
			Sampling date / time	27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
Compound	CAS Number	LOR	Unit	EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EG020T: Total Metals by ICP-MS - Continued								
Aluminium	7429-90-5	0.01	mg/L	**2.48**	**2.13**	<0.01	----	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.001**	**0.003**	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.104**	**9.72**	<0.001	----	----
Molybdenum	7439-98-7	0.001	mg/L	**0.005**	**0.002**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**3.01**	**14.2**	<0.001	----	----
Iron	7439-89-6	0.05	mg/L	**3.66**	**3.04**	<0.05	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.5**	**0.2**	<0.1	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.13**	**0.09**	<0.01	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**66.4**	**109**	**0.04**	----	----
ø **Total Cations**	----	0.01	meq/L	**67.3**	**109**	<0.01	----	----
ø **Ionic Balance**	----	0.01	%	**0.65**	**0.13**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	**100**	<50	<50	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	**100**	<50	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	----	----
>C16 - C34 Fraction	----	100	µg/L	**130**	<100	<100	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MB16B	IPCM GW Duplicate	IPCM GW Field Blank	IPCM Trip Blank	----
			Sampling date / time	27-Oct-2021 11:10	27-Oct-2021 01:00	27-Oct-2021 01:00	22-Oct-2021 15:30	----
Compound	CAS Number	LOR	Unit	EB2129521-015	EB2129521-020	EB2129521-021	EB2129521-022	--------
				Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ >C10 - C40 Fraction (sum)	----	100	µg/L	**130**	<100	<100	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L	<100	<100	<100	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L	<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L	<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**91.2**	**90.5**	**94.1**	**93.8**	----
Toluene-D8	2037-26-5	2	%	**96.5**	**103**	**99.8**	**99.7**	----
4-Bromofluorobenzene	460-00-4	2	%	**99.2**	**129**	**99.2**	**103**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	CAS Number	Recovery Limits (%) Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	66	138
Toluene-D8	2037-26-5	79	120
4-Bromofluorobenzene	460-00-4	74	118

Appendix C – Groundwater Contaminant Limit Data Analysis

C.1 Swamp Bore 1 Data Analysis

Table C.1: Swamp Bore 1 details.

Monitoring Point	Location		Surface RL (mAHD)	Total Depth (m)	Casing Diameter (mm)	Hydro stratigraphic Unit	Screening interval (mbgl)	Monitoring frequency
	Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)						
Swamp Bore 1	621517.972	7568789.727	244.989	59	150	Rewan Group	24.0 – 55.1	Quarterly

Table C.2: Swamp Bore 1 EA-related environmental values and proposed limits.

Parameter	Unit	LOR	Limit Type	Trigger Value – Limit A[1]	Trigger Value – Limit B[2]	Comment
pH	–	0.01	Range	7.36 < > 7.63	7.19 < > 7.72	
EC	µS/cm	1	Maximum	9,096	9,244	
Chloride	mg/L	1	Maximum	3,200	3,308	
Sulphate	mg/L	1	Maximum	132	144	
Calcium	mg/L	1	Maximum	544	598	
Magnesium	mg/L	1	Maximum	148	154	
Sodium	mg/L	1	Maximum	1,176	1,230	
Potassium	mg/L	1	Maximum	22	23	
TDS @180°C	mg/L	10	Maximum	6,486	7,144	
TSS	mg/L	5	Maximum	17	30	
Bicarbonate	mg/L	1	Maximum	75	87	
Carbonate	mg/L	1	Maximum	-	1	Representative dataset is all BLOR
Dissolved Aluminum	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Antimony	mg/L	0.001	Maximum	-	0.001	Representative dataset is all BLOR
Dissolved Arsenic	mg/L	0.001	Maximum	0.0016	0.0020	
Dissolved Molybdenum	mg/L	0.001	Maximum	0.0010	0.0014	
Dissolved Selenium	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Silver	mg/L	0.001	Maximum	-	0.001	Representative dataset is all BLOR
Dissolved Iron	mg/L	0.05	Maximum	0.49	0.93	
Dissolved Mercury	mg/L	0.0001	Maximum	-	0.0001	Representative dataset is all BLOR
C6 - C9 Fraction	µg/L	20	Maximum	-	20	Representative dataset is all BLOR
C10 - C36 Fraction (sum)	µg/L	50	Maximum	-	50	Representative dataset is all BLOR

[1]Exceedances of Limit A are regarded as five consecutive samples exceeding the Limit A value.
[2]Exceedances of Limit B are regarded as three consecutive samples exceeding the Limit B value.

Table C.3: Swamp Bore 1 descriptive statistics.

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
pH	–	0.01	Sep-2013 to Oct-2021	33	7.47	7.10	7.78	7.46	7.19	7.36	7.63	7.72	
Electrical Conductivity	µS/cm	1	Sep-2013 to Oct-2021	33	8,902	7,800	9,330	8,910	8,536	8,780	9,096	9,244	
Chloride	mg/L	1	Sep-2013 to Oct-2021	33	3,096	2,200	3,600	3,110	2,878	3,030	3,200	3,308	
Fluoride	mg/L	0.1	Apr-2017 to Oct-2021	20	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Sulphate	mg/L	1	Sep-2013 to Oct-2021	33	127	113	170	126	114	119	132	144	
Calcium	mg/L	1	Sep-2013 to Oct-2021	33	531	486	608	520	498	512	544	598	
Magnesium	mg/L	1	Sep-2013 to Oct-2021	33	132	109	160	132	116	119	148	154	
Sodium	mg/L	1	Sep-2013 to Oct-2021	33	1,117	997	1,300	1,100	1,020	1,060	1,176	1,230	
Potassium	mg/L	1	Sep-2013 to Oct-2021	33	21	18	24	21	20	20	22	23	
Total Anions	meq./L	0.01	Dec-2014 to Oct-2021	29	92.02	86.50	97.50	92.00	87.72	89.58	94.52	96.82	
Total Cations	meq./L	0.01	Dec-2014 to Oct-2021	29	85.85	78.60	94.90	85.70	79.04	82.20	88.74	93.34	
Ionic Balance	%	0.01	Dec-2014 to Oct-2021	29	3.66	0.02	9.04	3.64	0.20	0.79	5.79	8.28	
Total Phosphorous	mg/L	0.01	Apr-2017 to Oct-2021	20	0.05	BLOR	0.43	0.03	BLOR	0.02	0.05	0.12	Four results were BLOR
Total Dissolved Solids	mg/L	10	Sep-2013 to Oct-2021	33	6,189	4,600	7,920	6,280	5,308	5,704	6,486	7,144	
Suspended Solids	mg/L	5	Sep-2013 to Oct-2021	33	11	BLOR	34	10	BLOR	BLOR	17	30	Nine results were BLOR
Hydroxide	mg/L	1	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Carbonate	mg/L	1	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Bicarbonate	mg/L	1	Sep-2013 to Oct-2021	33	66	49	114	64	51	55	75	87	
Total Alkalinity	mg/L	1	Sep-2013 to Oct-2021	33	66	49	114	64	51	55	75	87	
Dissolved Aluminum	mg/L	0.01	Sep-2013 to Oct-2021	33	BLOR	BLOR	0.04	BLOR	BLOR	BLOR	BLOR	BLOR	Thirty-one results were BLOR
Dissolved Antimony	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Dissolved Arsenic	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	0.0030	BLOR	BLOR	BLOR	0.0016	0.0020	Twenty-one results were

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
Dissolved Barium	mg/L	0.001	Apr-2017 to Oct-2021	20	0.284	0.179	0.703	0.214	0.186	0.203	0.301	0.610	
Dissolved Molybdenum	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	0.0020	BLOR	BLOR	BLOR	0.0010	0.0014	Nineteen results were BLOR
Dissolved Rubidium	mg/L	0.001	Apr-2017 to Oct-2021	20	0.031	0.028	0.036	0.030	0.029	0.030	0.032	0.034	
Dissolved Selenium	mg/L	0.01	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Dissolved Silver	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	0.001	BLOR	BLOR	BLOR	BLOR	BLOR	Thirty-one results were BLOR
Dissolved Strontium	mg/L	0.001	Apr-2017 to Oct-2021	20	8.367	7.560	9.820	8.330	7.674	7.960	8.554	9.307	
Dissolved Iron	mg/L	0.05	Sep-2013 to Oct-2021	33	0.31	BLOR	1.16	0.23	BLOR	BLOR	0.49	0.93	Nine results were BLOR
Dissolved Mercury	mg/L	0.0001	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Aluminum	mg/L	0.01	Sep-2013 to Oct-2021	33	0.060	BLOR	0.320	0.050	BLOR	0.020	0.082	0.132	Four results were BLOR
Total Antimony	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	0.007	BLOR	BLOR	BLOR	BLOR	BLOR	Thirty-two results were BLOR
Total Arsenic	mg/L	0.001	Sep-2013 to Oct-2021	33	0.0012	BLOR	0.0040	0.0010	BLOR	BLOR	0.0020	0.0020	Twelve results were BLOR
Total Barium	mg/L	0.001	Apr-2017 to Oct-2021	20	0.292	0.192	0.701	0.218	0.202	0.206	0.326	0.658	
Total Molybdenum	mg/L	0.001	Sep-2013 to Oct-2021	33	0.0010	BLOR	0.0020	0.0010	BLOR	BLOR	0.0020	0.0020	Sixteen results were BLOR
Total Selenium	mg/L	0.01	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Silver	mg/L	0.001	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Strontium	mg/L	0.001	Apr-2017 to Oct-2021	20	8.42	7.60	9.13	8.43	7.91	8.04	8.74	8.97	
Total Iron	mg/L	0.05	Sep-2013 to Oct-2021	33	0.66	0.05	3.37	0.40	0.07	0.16	1.01	2.06	
Total Mercury	mg/L	0.0001	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C6 - C9 Fraction	µg/L	20	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C10 – C14 Fraction	µg/L	50	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C15 – C28 Fraction	µg/L	100	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C29 – C36 Fraction	µg/L	50	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C10 - C36 Fraction (sum)	µg/L	50	Sep-2013 to Oct-2021	33	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
1.2-Dichloroethane-D4	%	2	Dec-2014 to Oct-2021	9	71	47	104	57	48	51	93	101	
Toluene-D8	%	2	Sep-2013 to Oct-2021	12	78	42	107	91	45	50	102	105	
4-Bromofluorobenzene	%	2	Sep-2013 to Oct-2021	12	76	38	109	85	44	49	100	105	
TRH C6 – C10 Fraction	µg/L	20	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH C6 – C10 Fraction minus BTEX (F1)	µg/L	20	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C16 Fraction	µg/L	100	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C16 – C34 Fraction	µg/L	100	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C34 – C40 Fraction	µg/L	100	Sep-2013 to Oct-2021	32	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C40 Fraction (sum)	µg/L	100	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C16 Fraction minus Naphthalene (F2)	µg/L	100	Sep-2013 to Oct-2021	22	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Benzene	µg/L	1	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Toluene	µg/L	2	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Ethylbenzene	µg/L	2	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
meta- and para-Xylene	µg/L	2	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
ortho-Xylene	µg/L	2	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Xylenes	µg/L	2	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Sum of BTEX	µg/L	1	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Naphthalene	µg/L	5	Dec-2014 to Oct-2021	29	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR

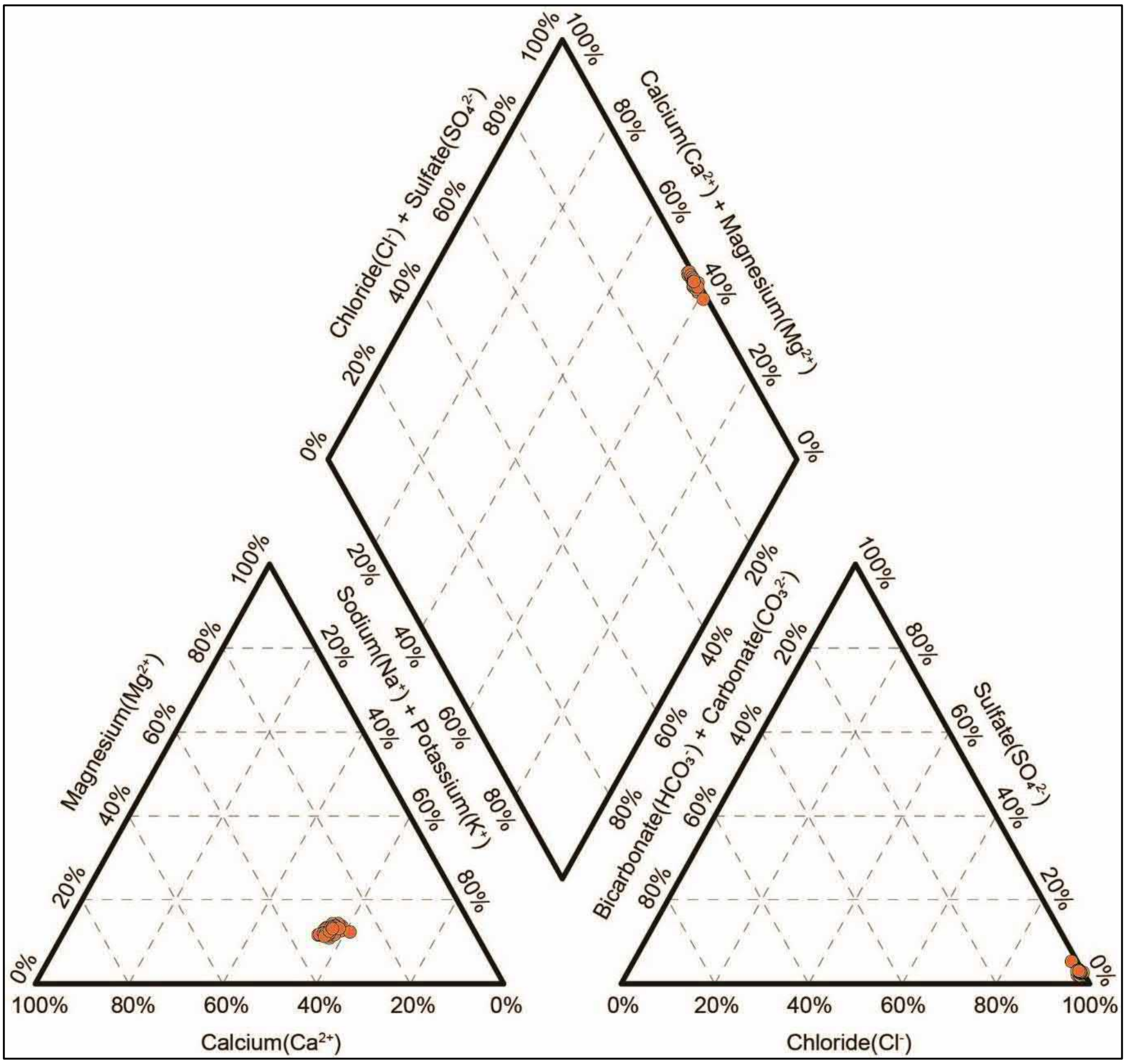

Figure C.1: Ionic composition of Swamp Bore 1.

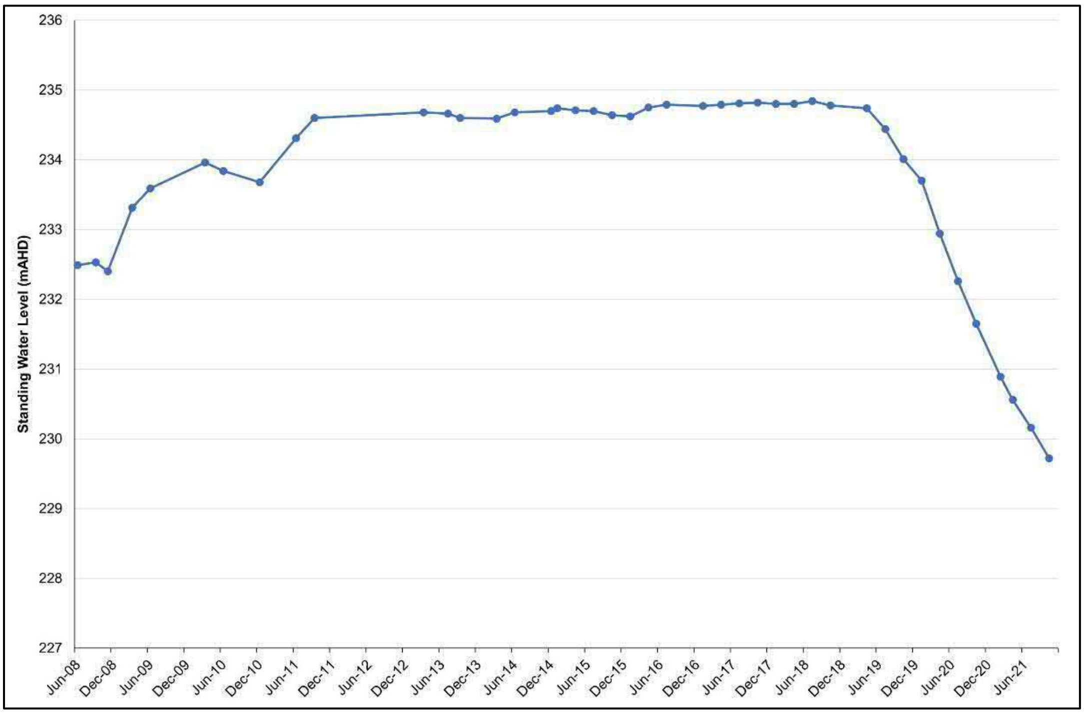

Figure C.2: Swamp Bore 1 standing water level time series plot.

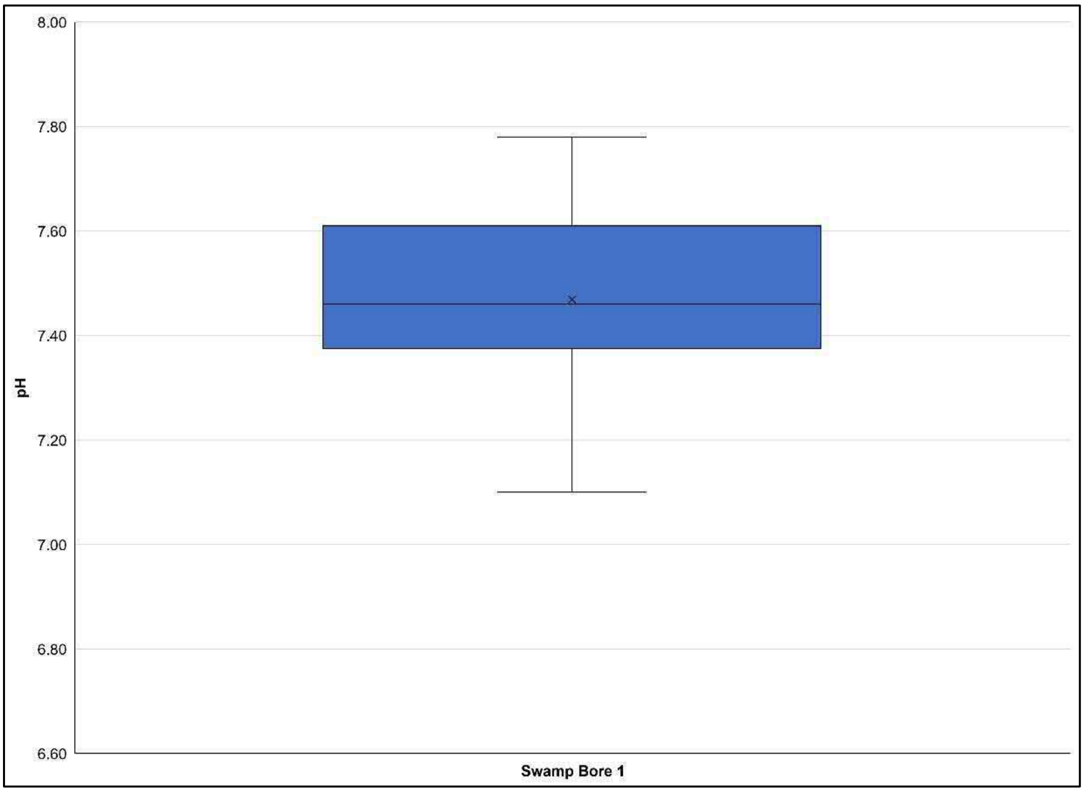

Figure C.3: Swamp Bore 1 pH box plot.

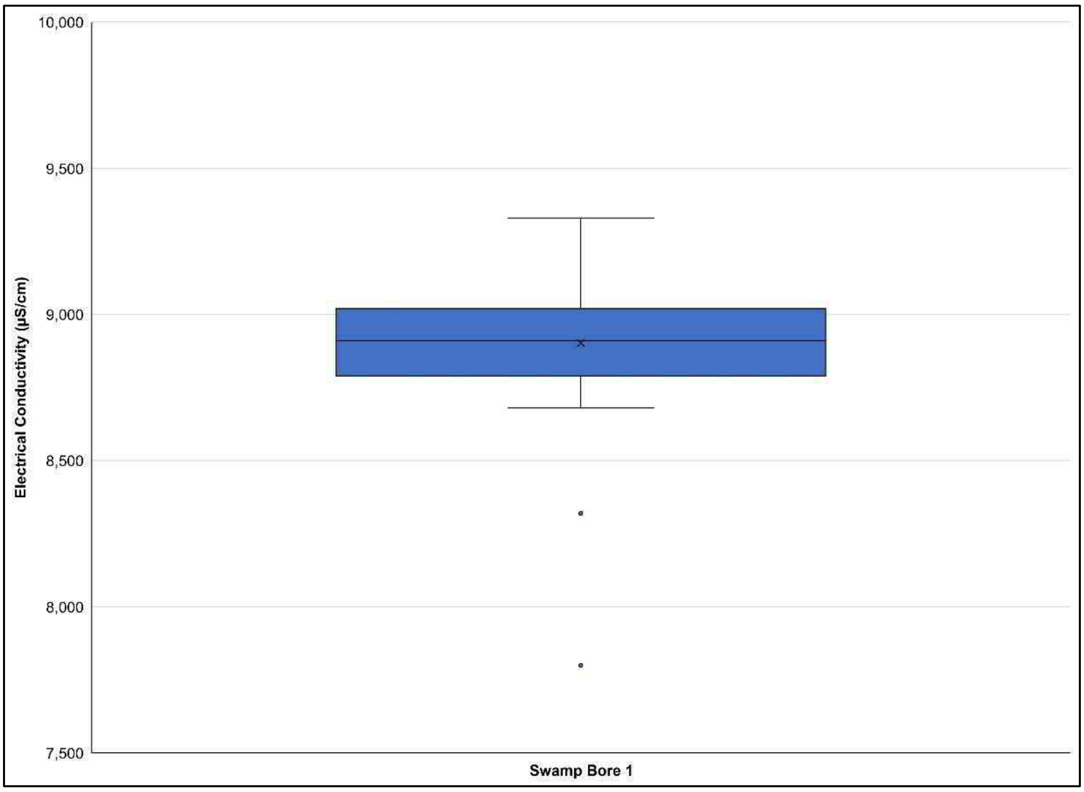

Figure C.4: Swamp Bore 1 EC box plot.

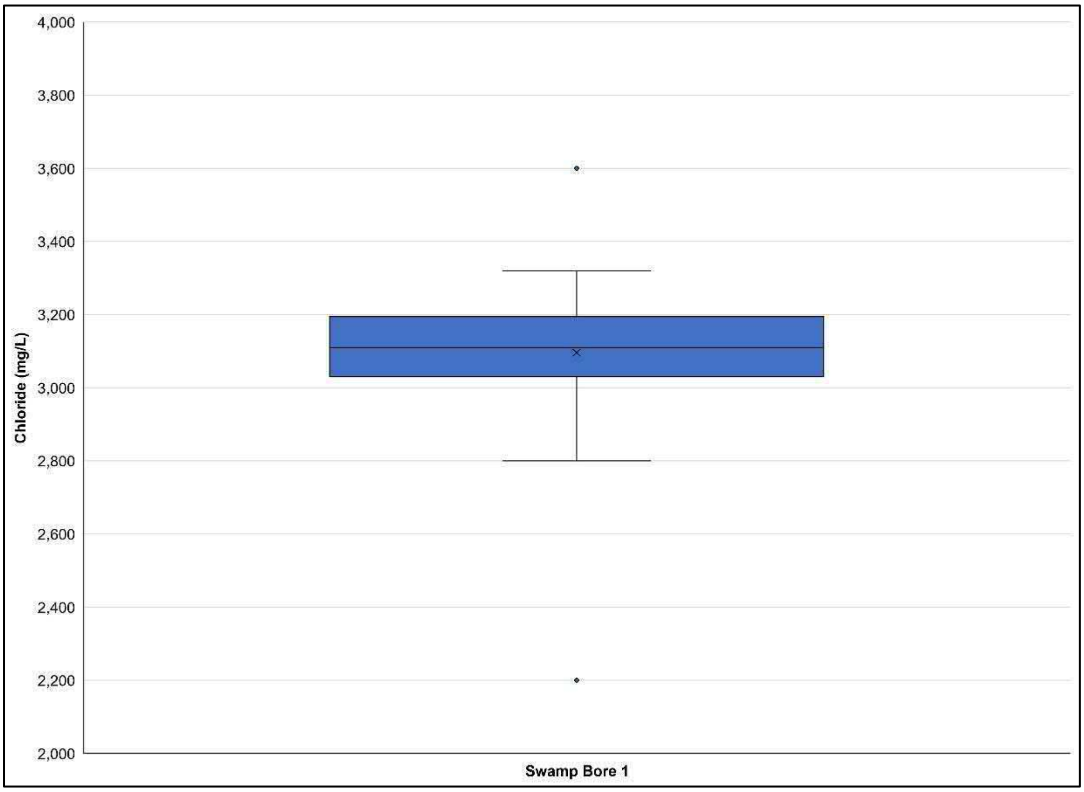

Figure C.5: Swamp Bore 1 chloride box plot.

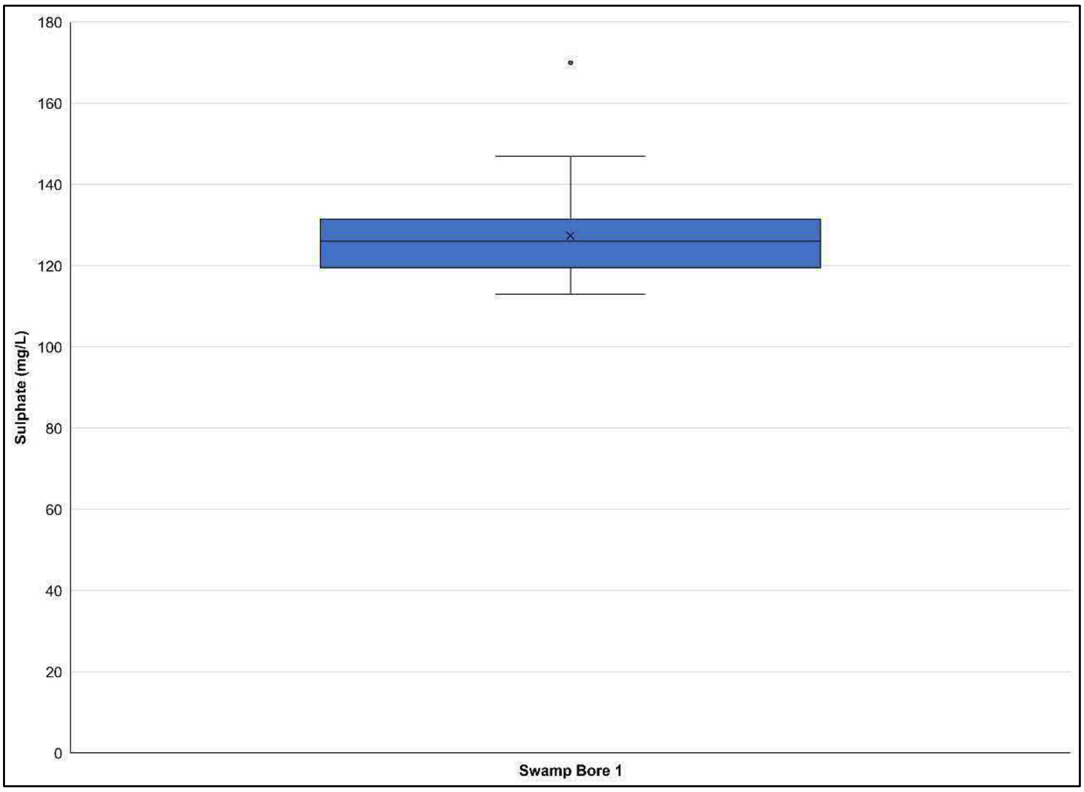

Figure C.6: Swamp Bore 1 sulphate box plot.

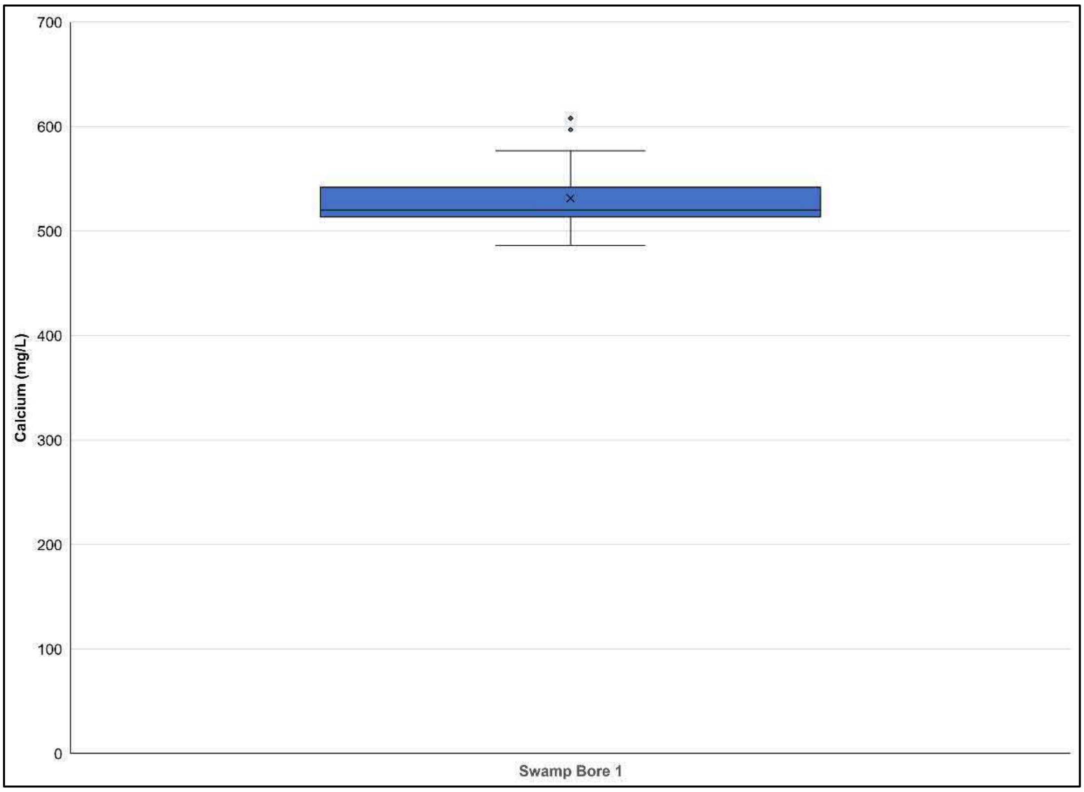

Figure C.7: Swamp Bore 1 calcium box plot.

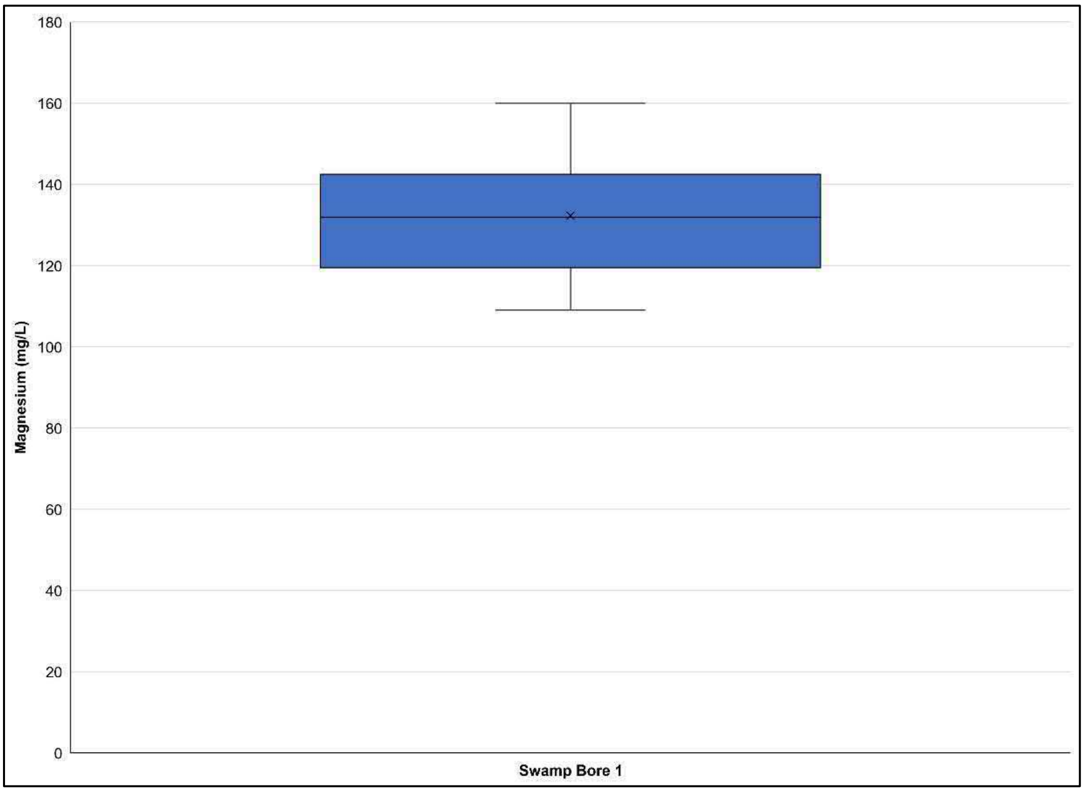

Figure C.8: Swamp Bore 1 magnesium box plot.

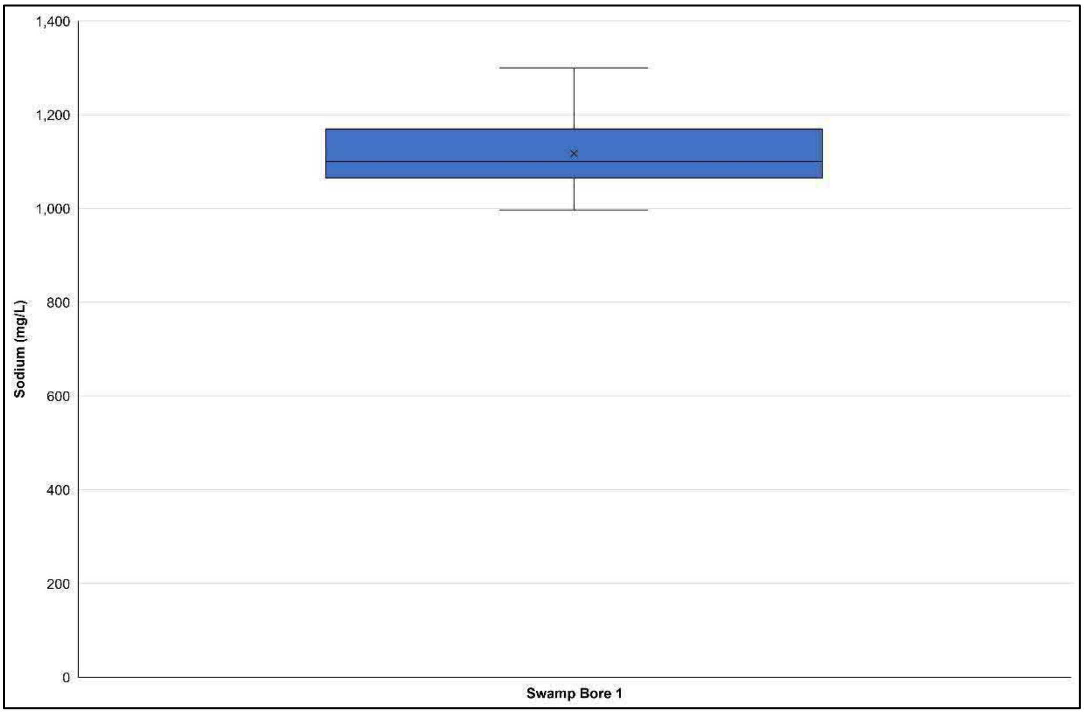

Figure C.9: Swamp Bore 1 sodium box plot.

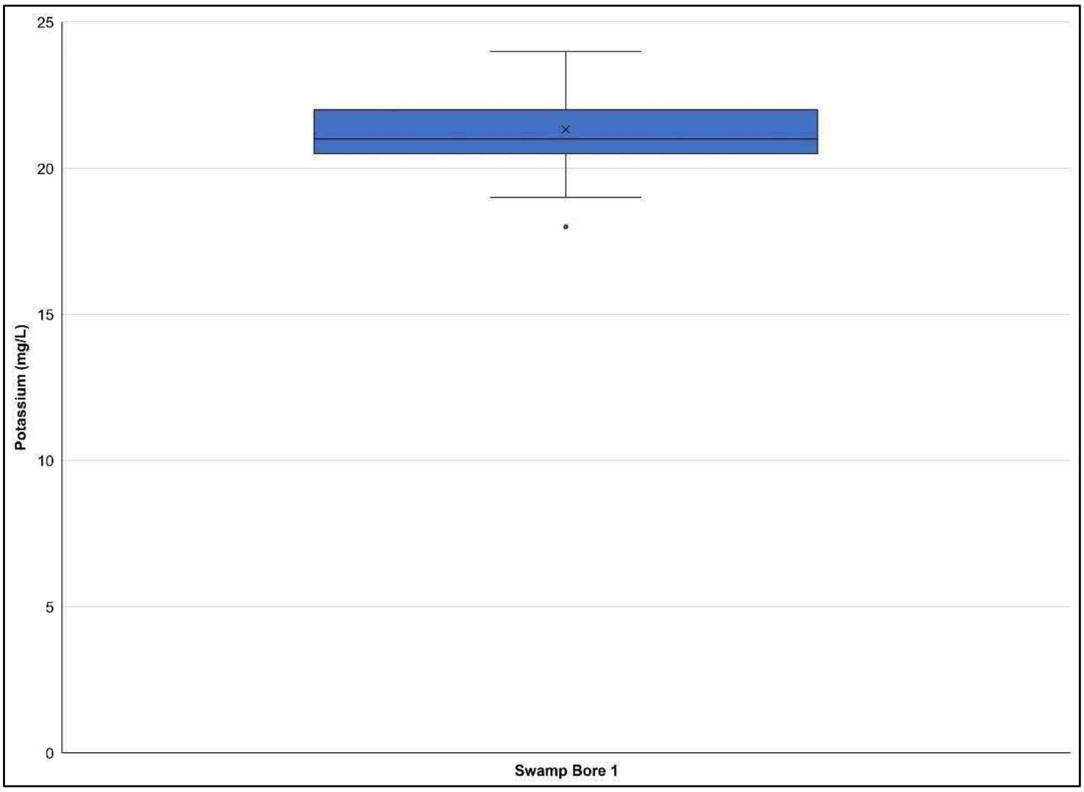

Figure C.10: Swamp Bore 1 potassium box plot.

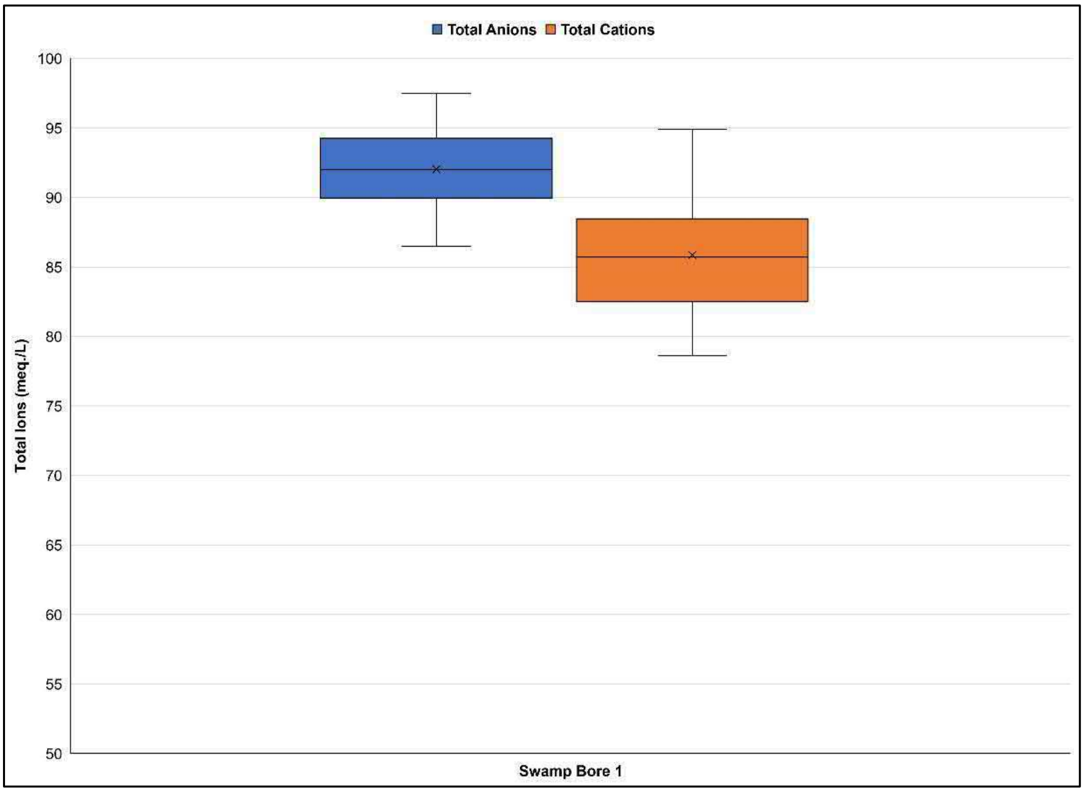

Figure C.11: Swamp Bore 1 total ions box plot.

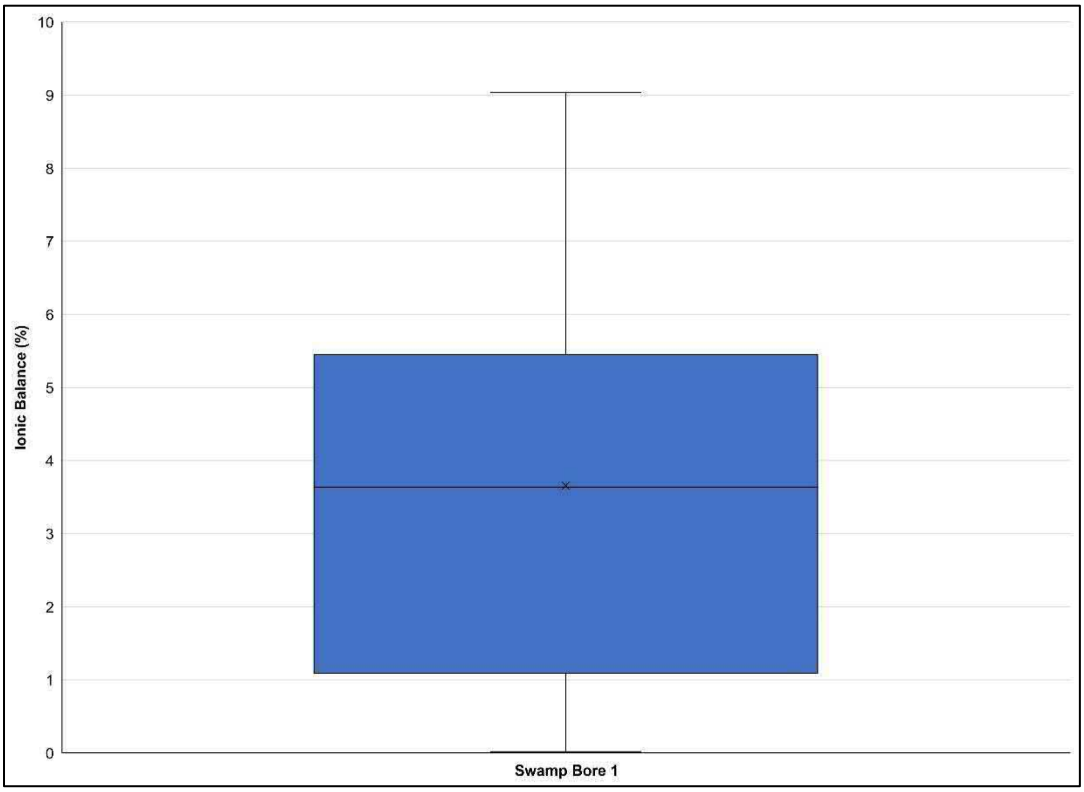

Figure C.12: Swamp Bore 1 ionic balance box plot.

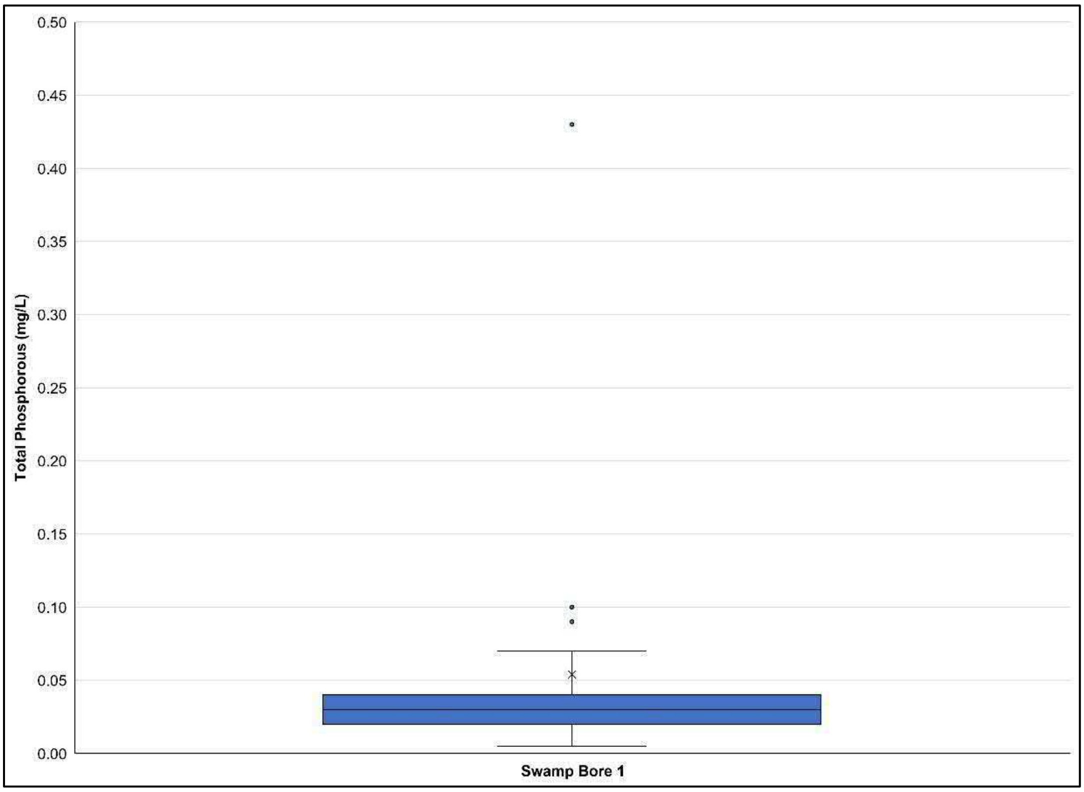

Figure C.13: Swamp Bore 1 total phosphorous box plot.

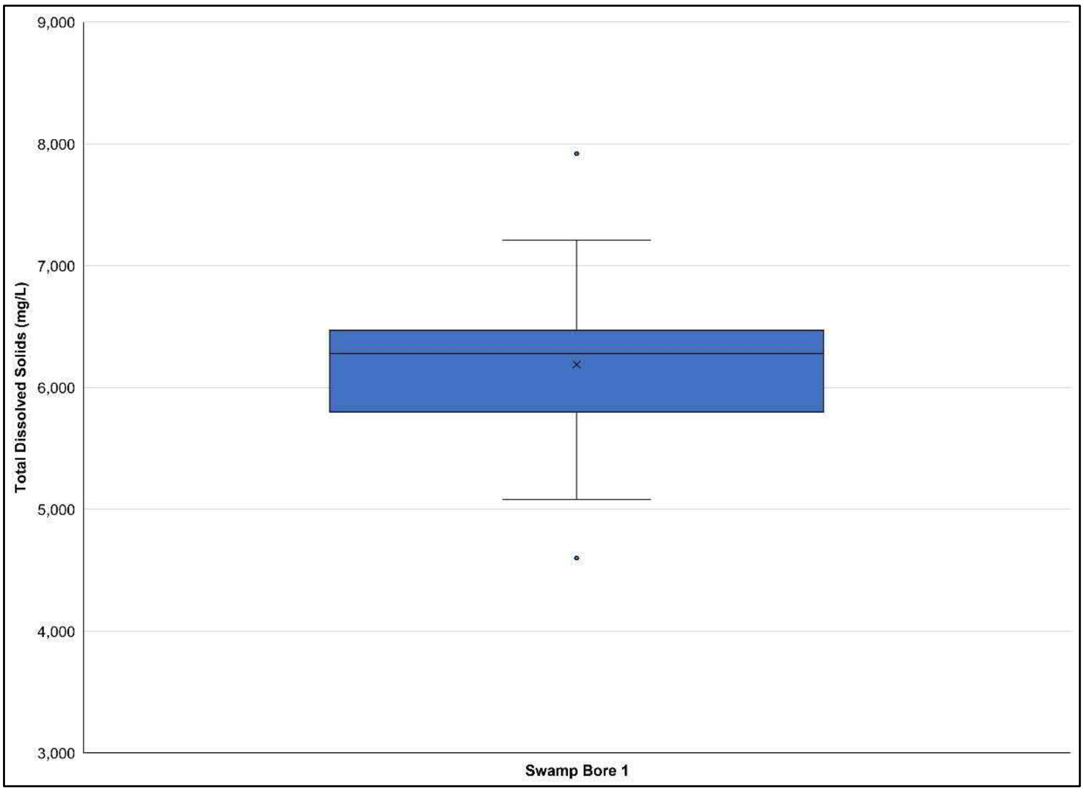

Figure C.14: Swamp Bore 1 total dissolved solids box plot.

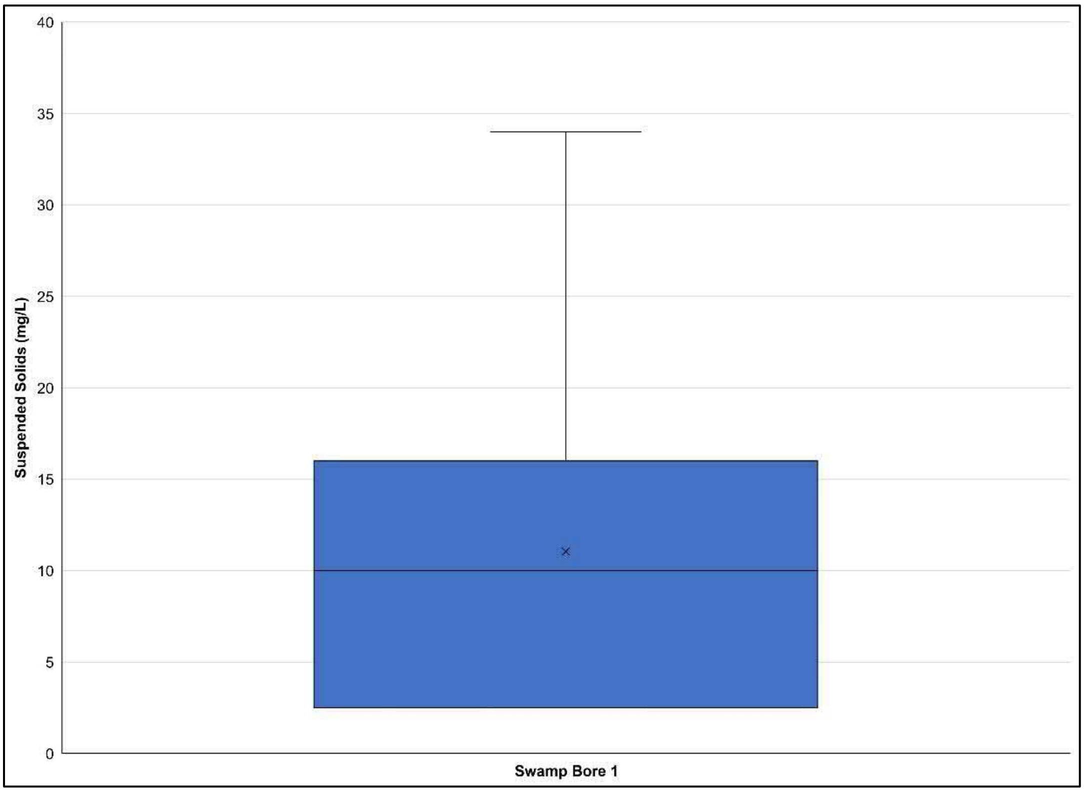

Figure C.15: Swamp Bore 1 suspended solids box plot.

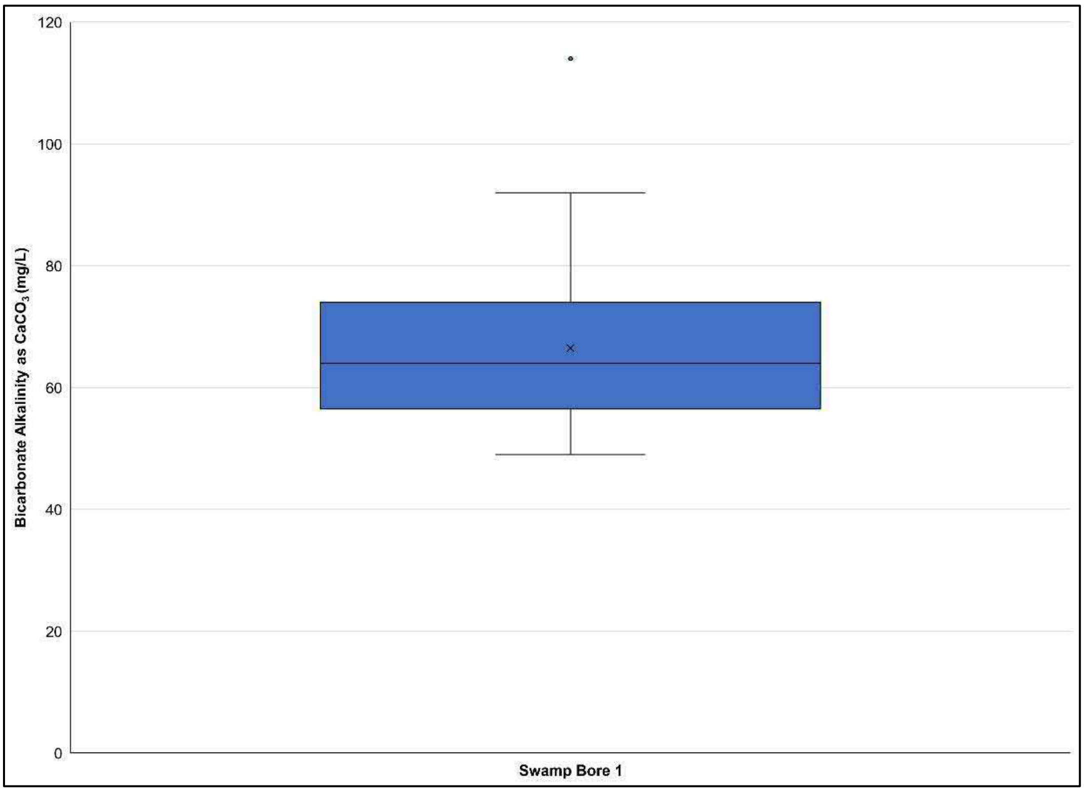

Figure C.16: Swamp Bore 1 bicarbonate alkalinity box plot.

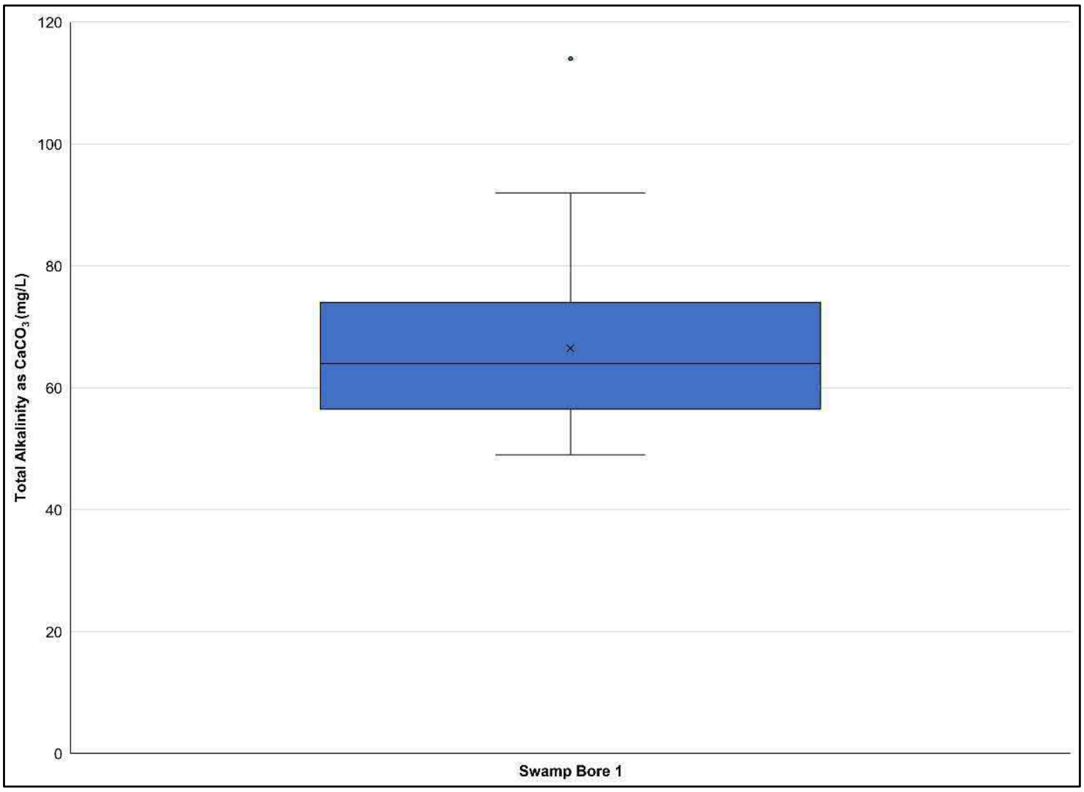

Figure C.17: Swamp Bore 1 total alkalinity box plot.

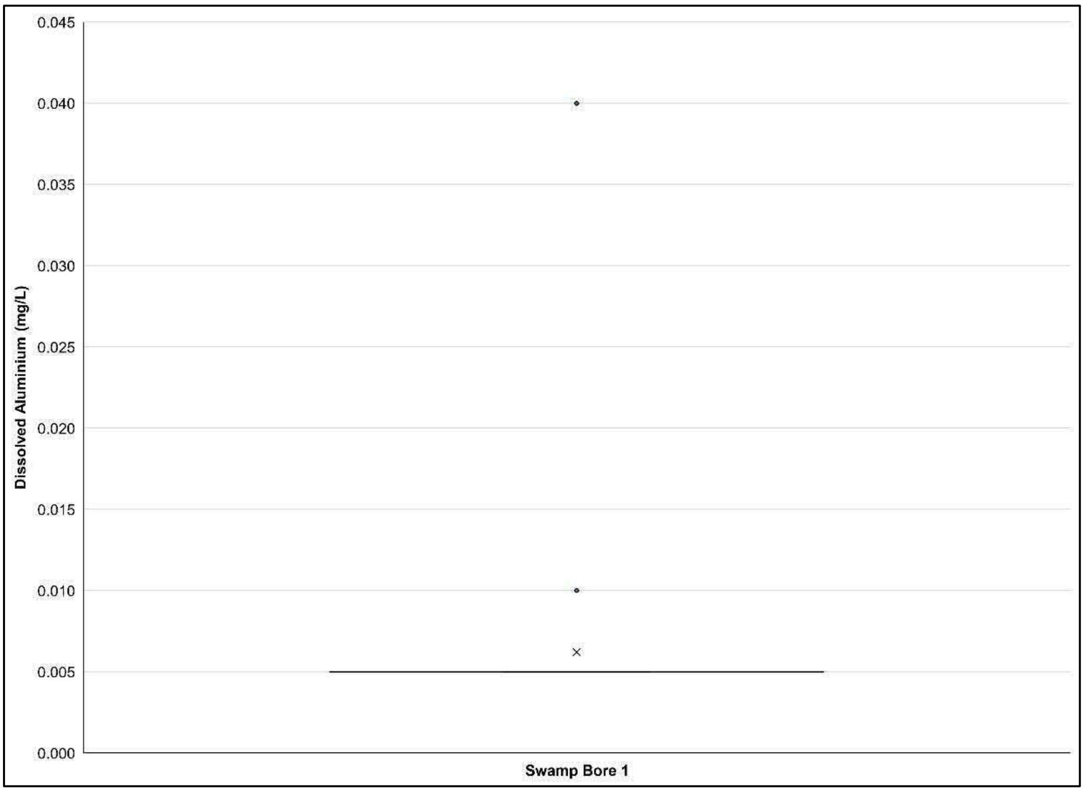

Figure C.18: Swamp Bore 1 dissolved aluminium box plot.

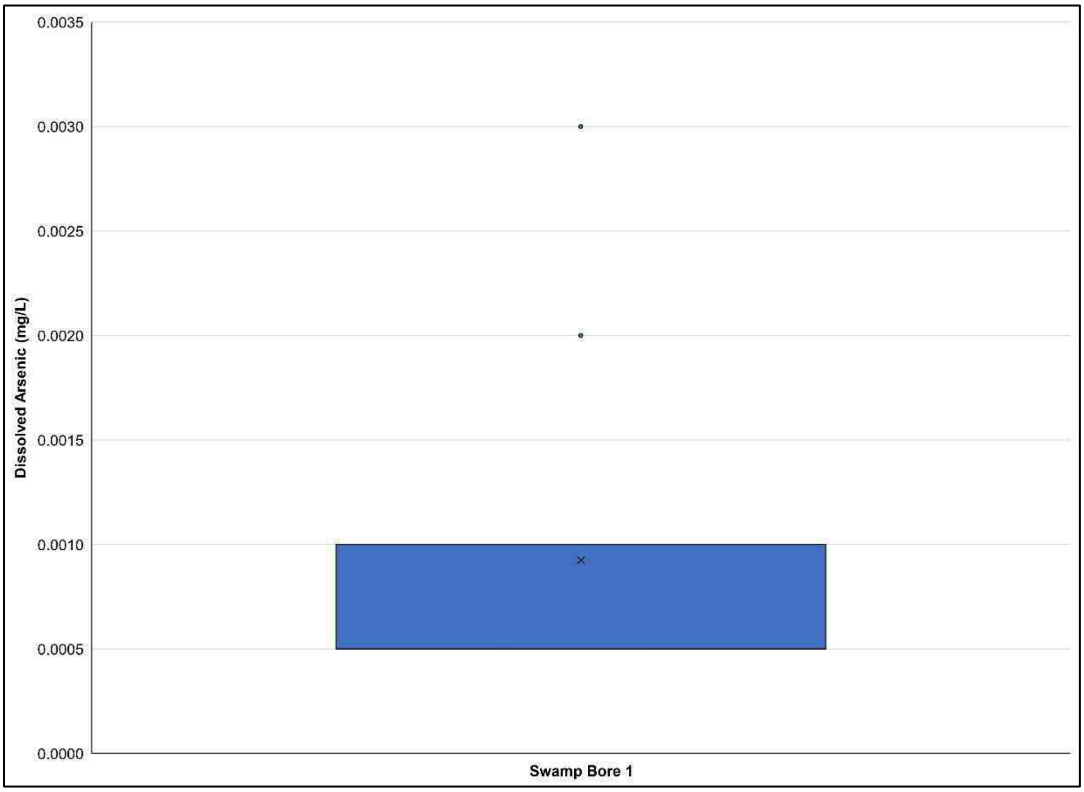

Figure C.19: Swamp Bore 1 dissolved arsenic box plot.

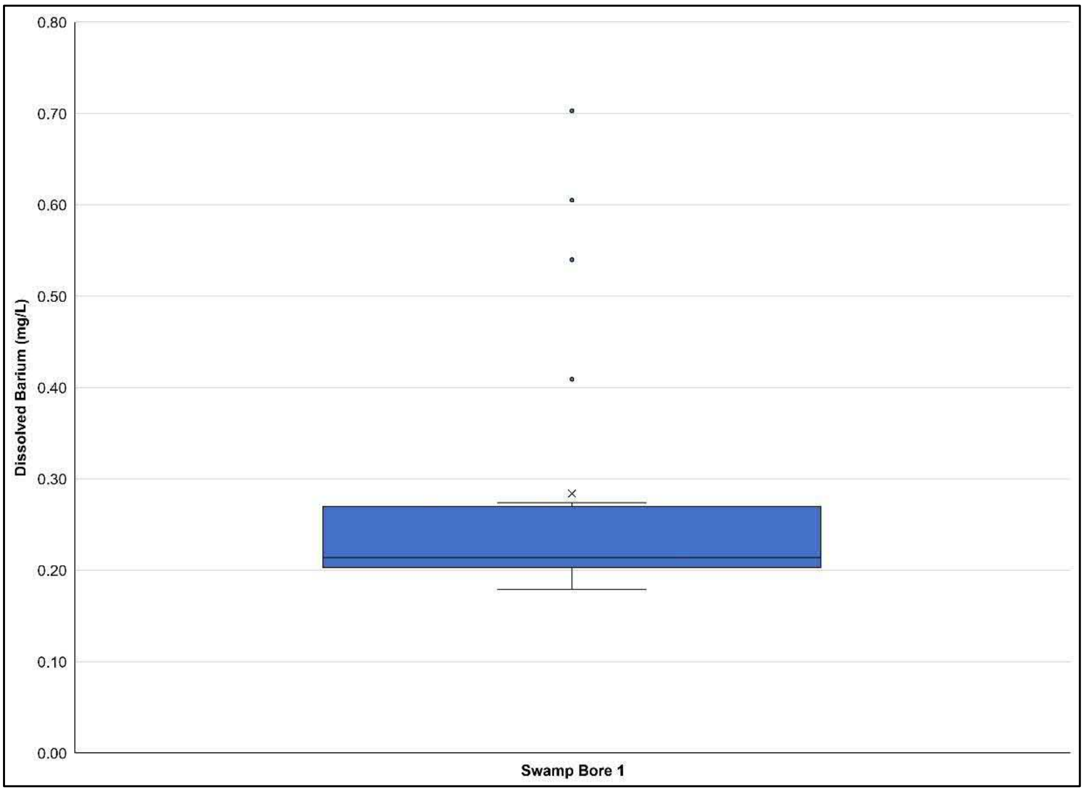

Figure C.20: Swamp Bore 1 dissolved barium box plot.

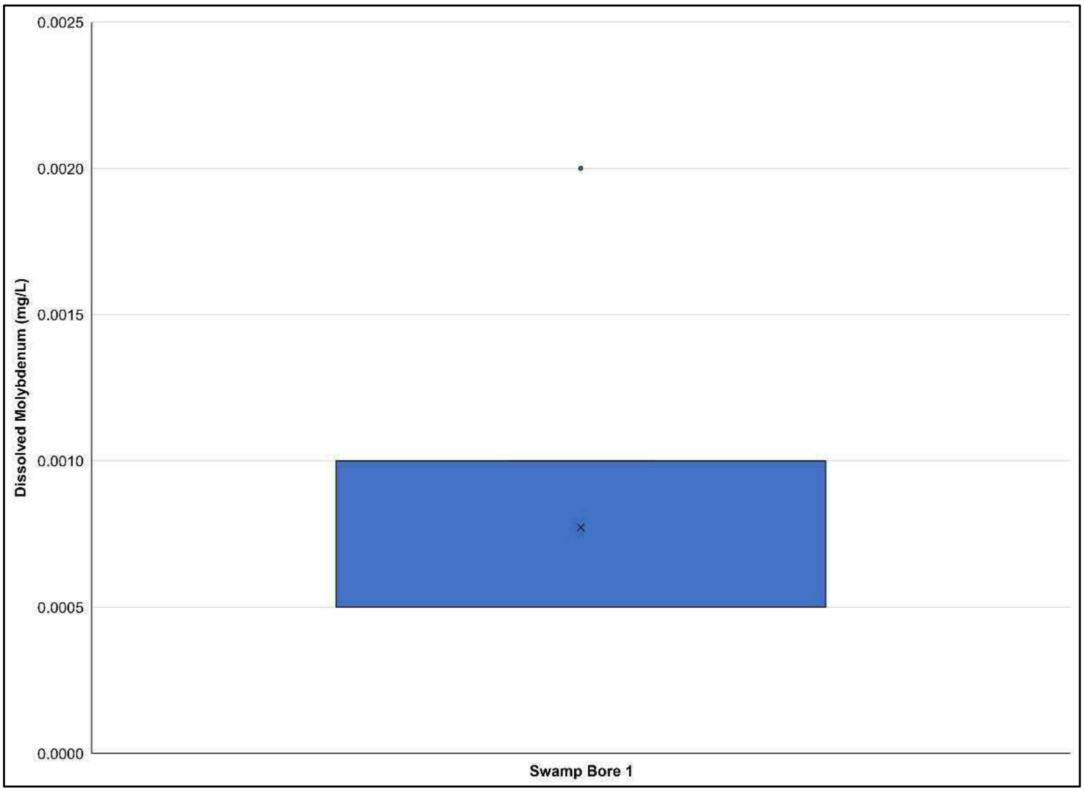

Figure C.21: Swamp Bore 1 dissolved molybdenum box plot.

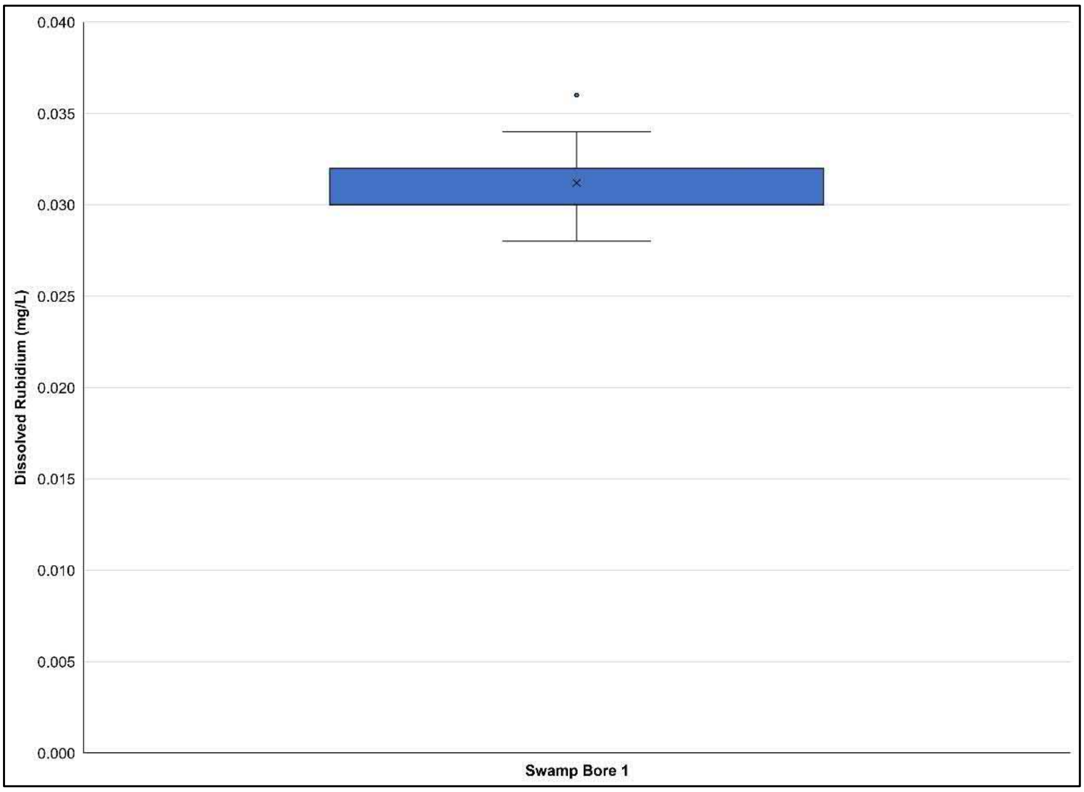

Figure C.22: Swamp Bore 1 dissolved rubidium box plot.

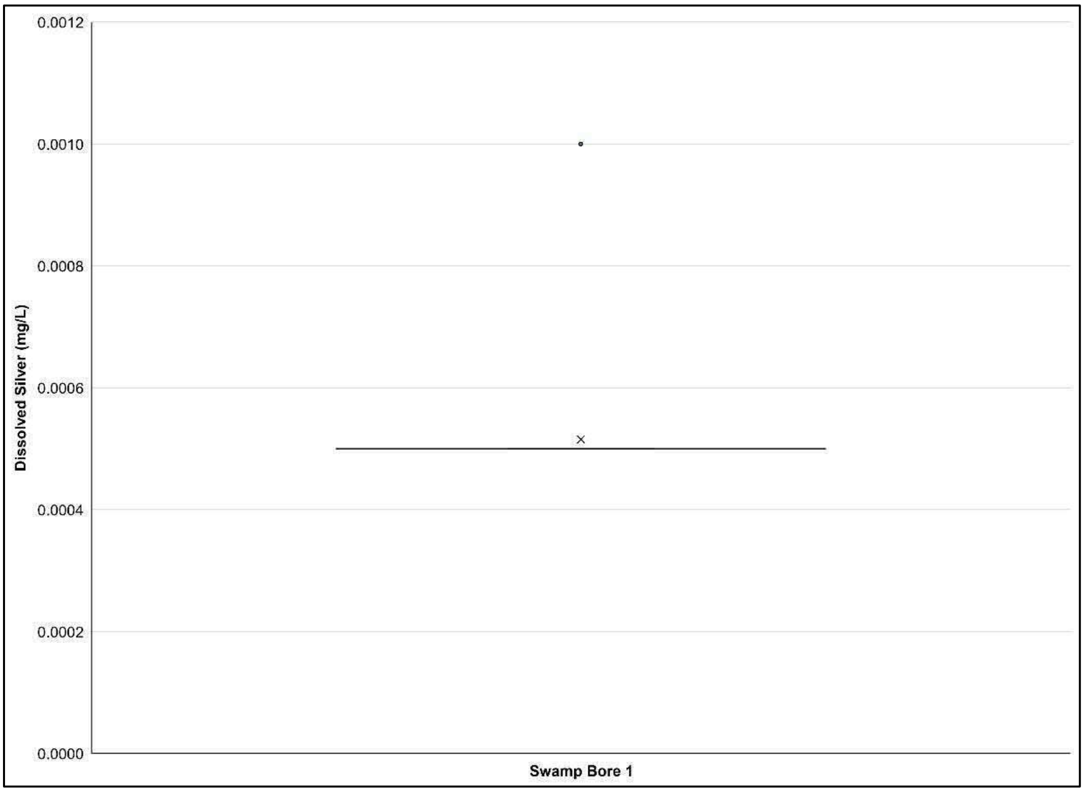

Figure C.23: Swamp Bore 1 dissolved silver box plot.

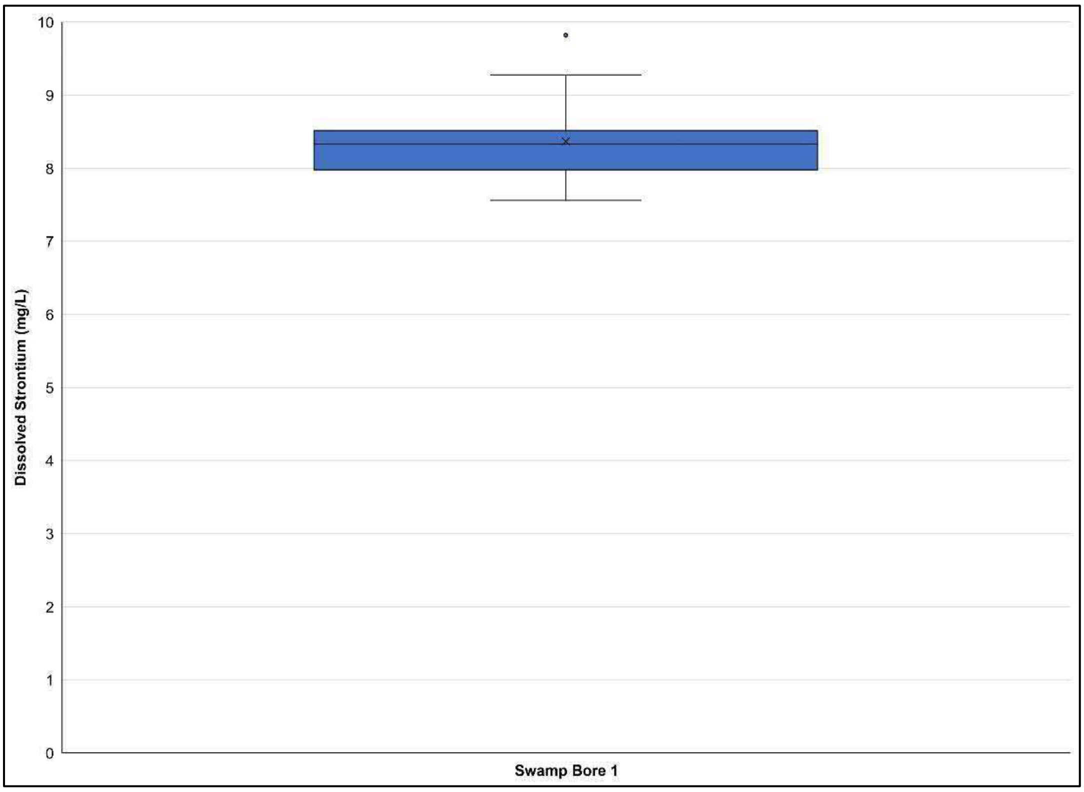

Figure C.24: Swamp Bore 1 dissolved strontium box plot.

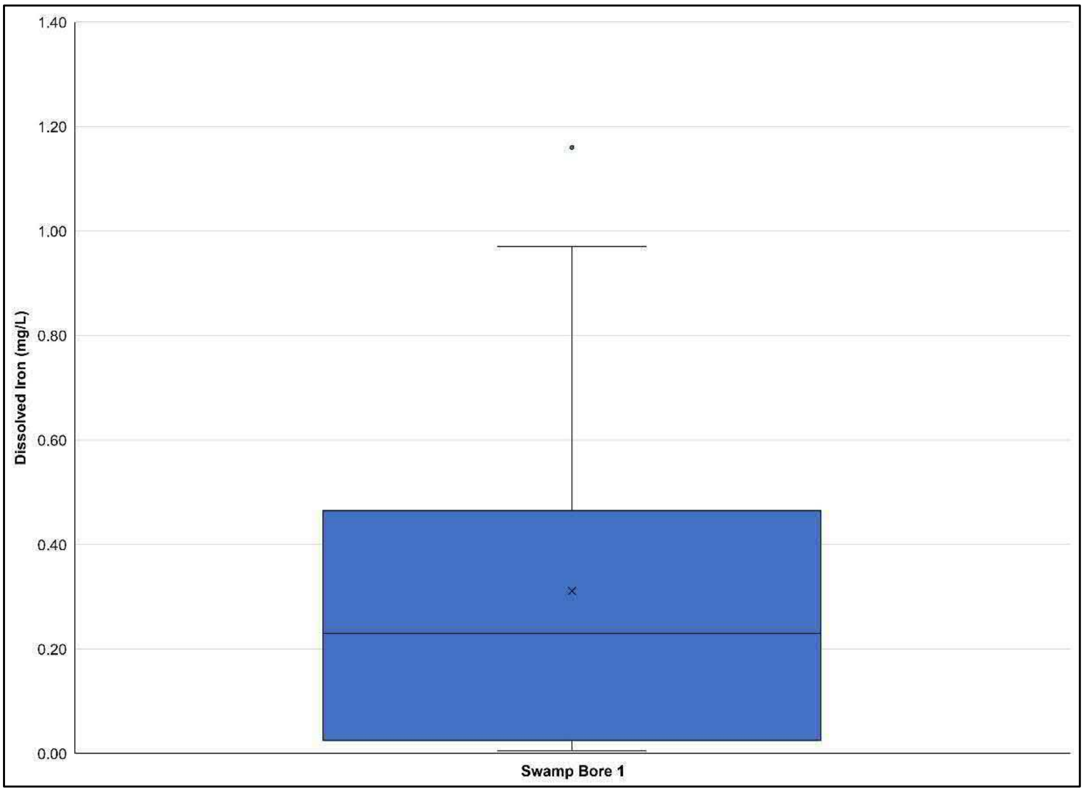

Figure C.25: Swamp Bore 1 dissolved iron box plot.

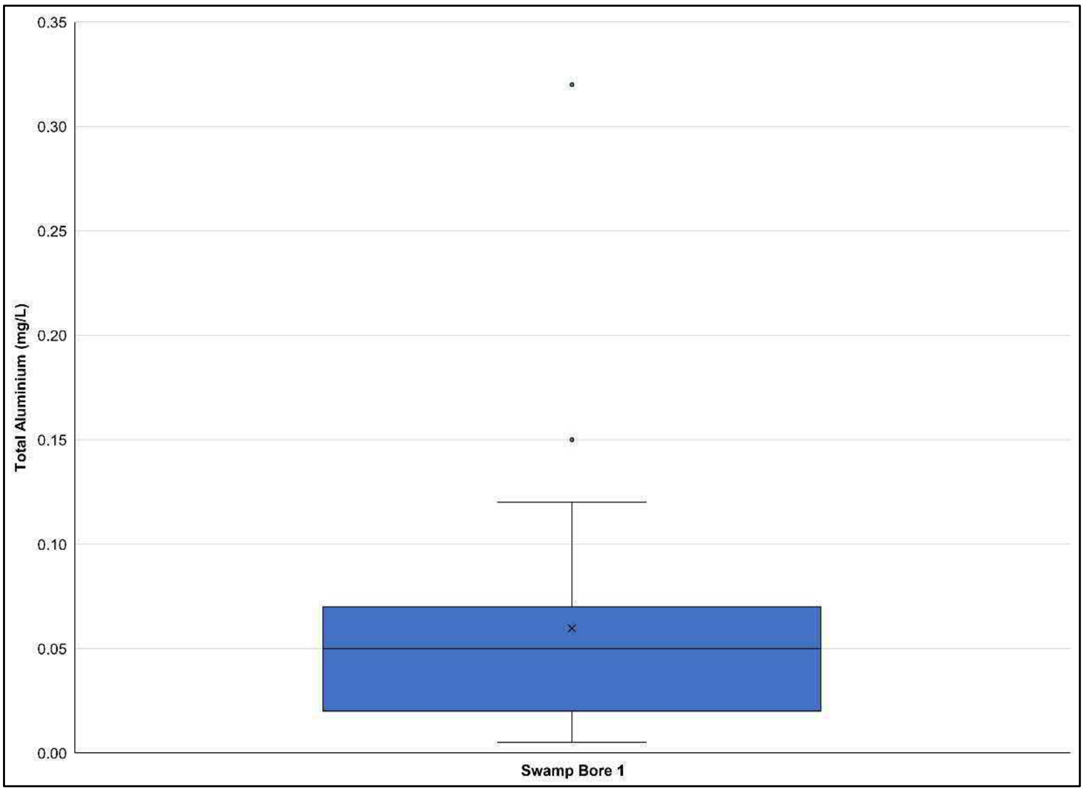

Figure C.26: Swamp Bore 1 total aluminium box plot.

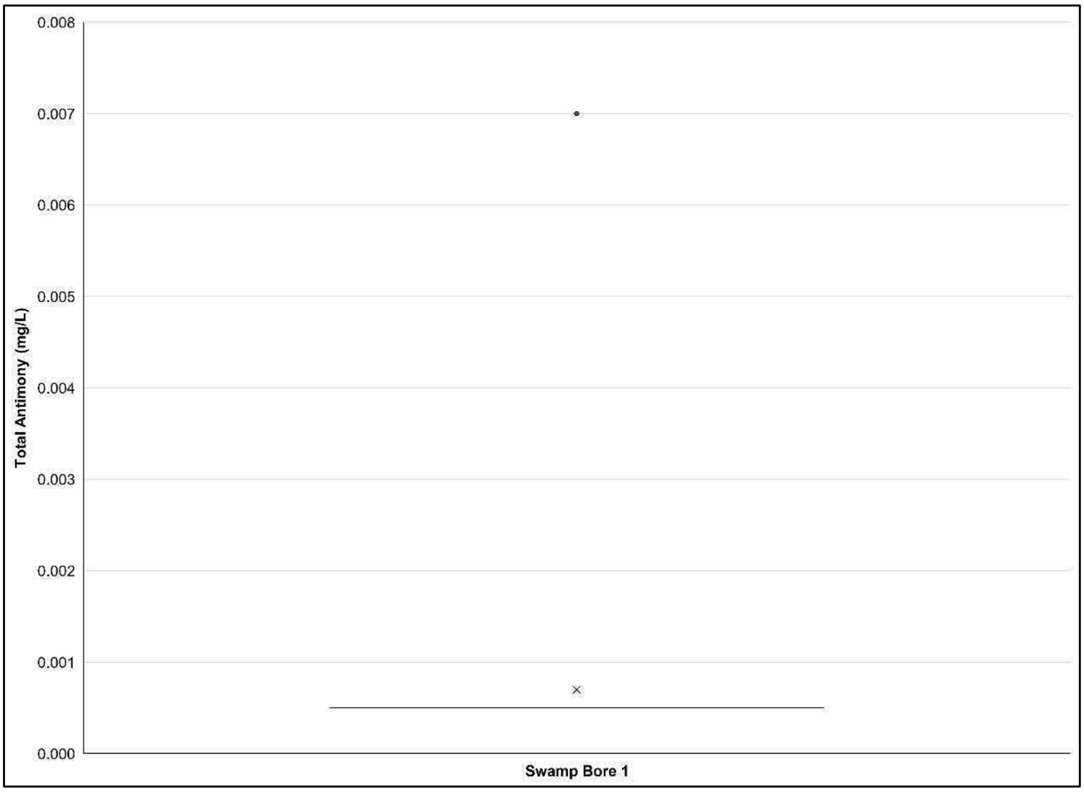

Figure C.27: Swamp Bore 1 total antimony box plot.

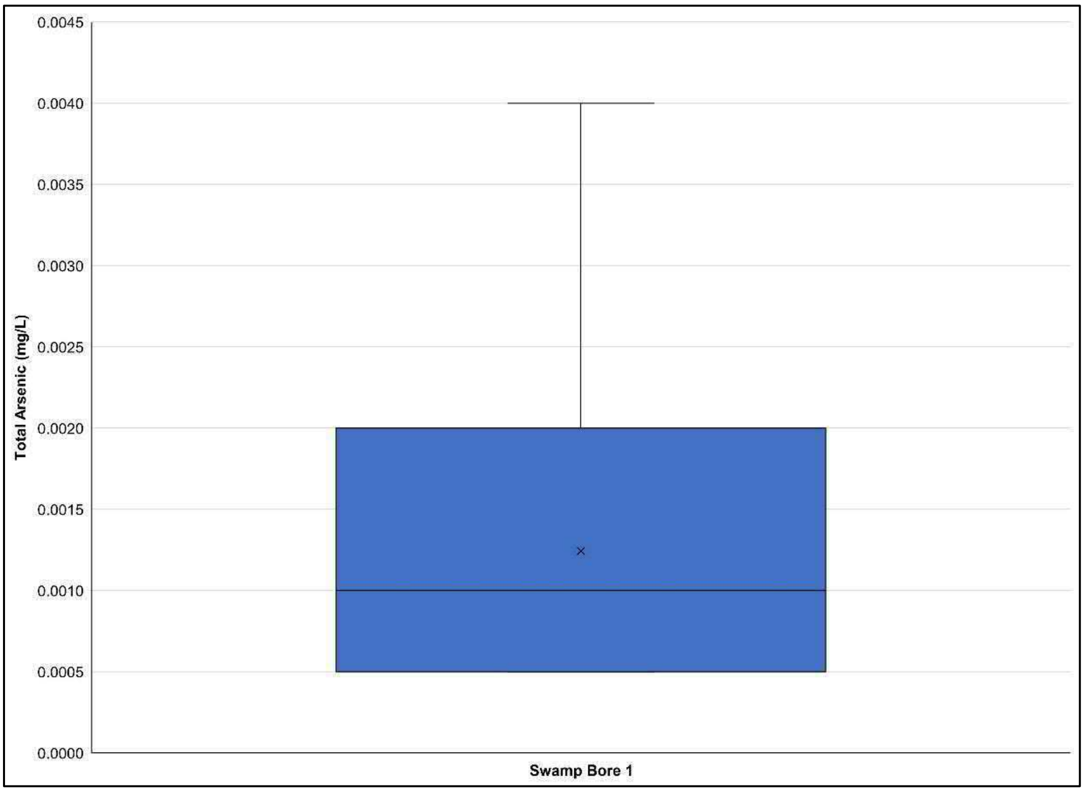

Figure C.28: Swamp Bore 1 total arsenic box plot.

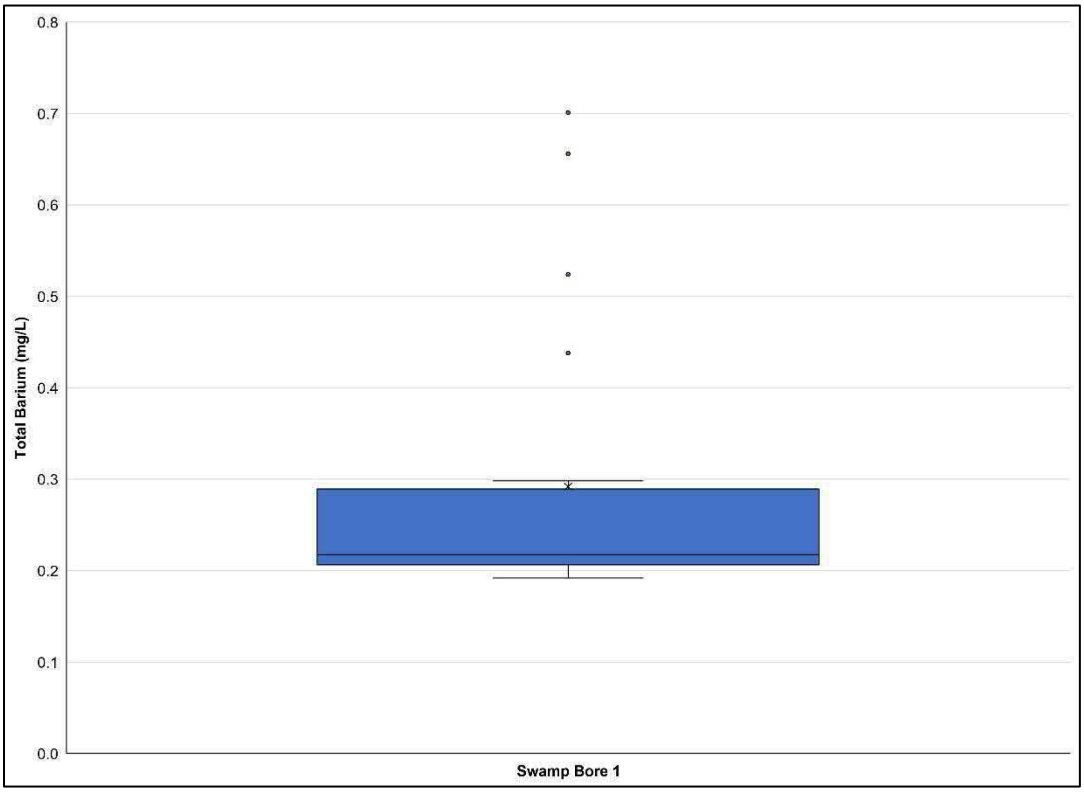

Figure C.29: Swamp Bore 1 total barium box plot.

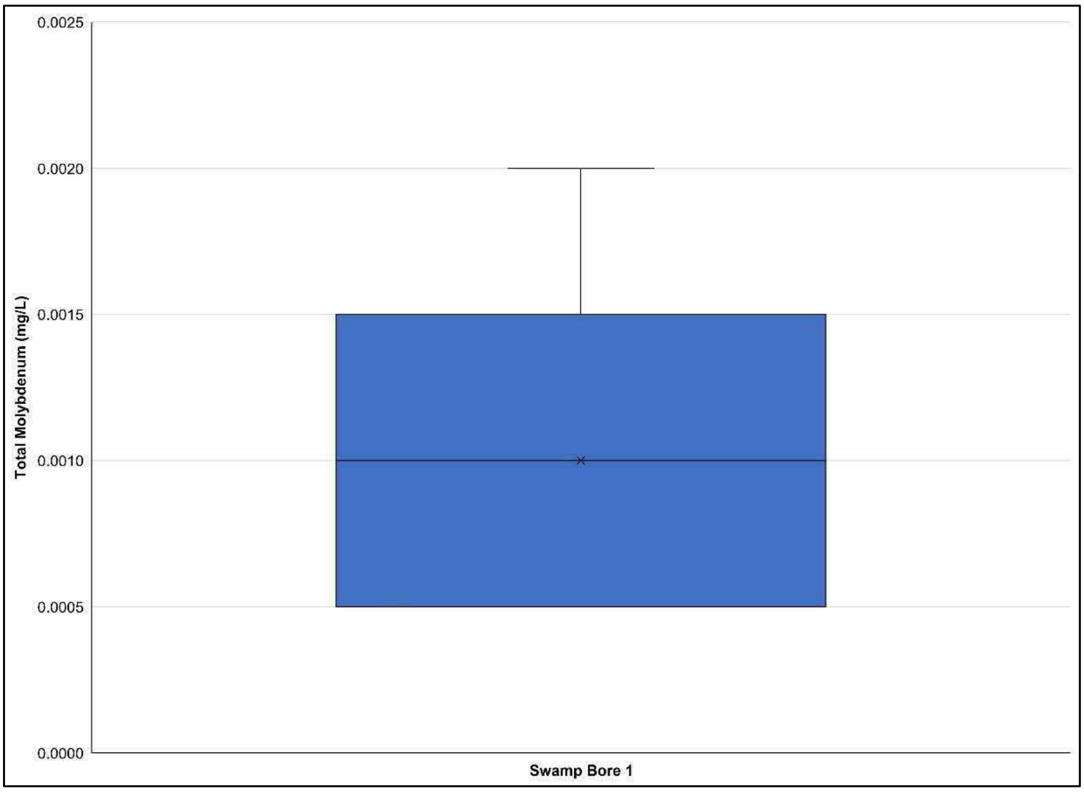

Figure C.30: Swamp Bore 1 total molybdenum box plot.

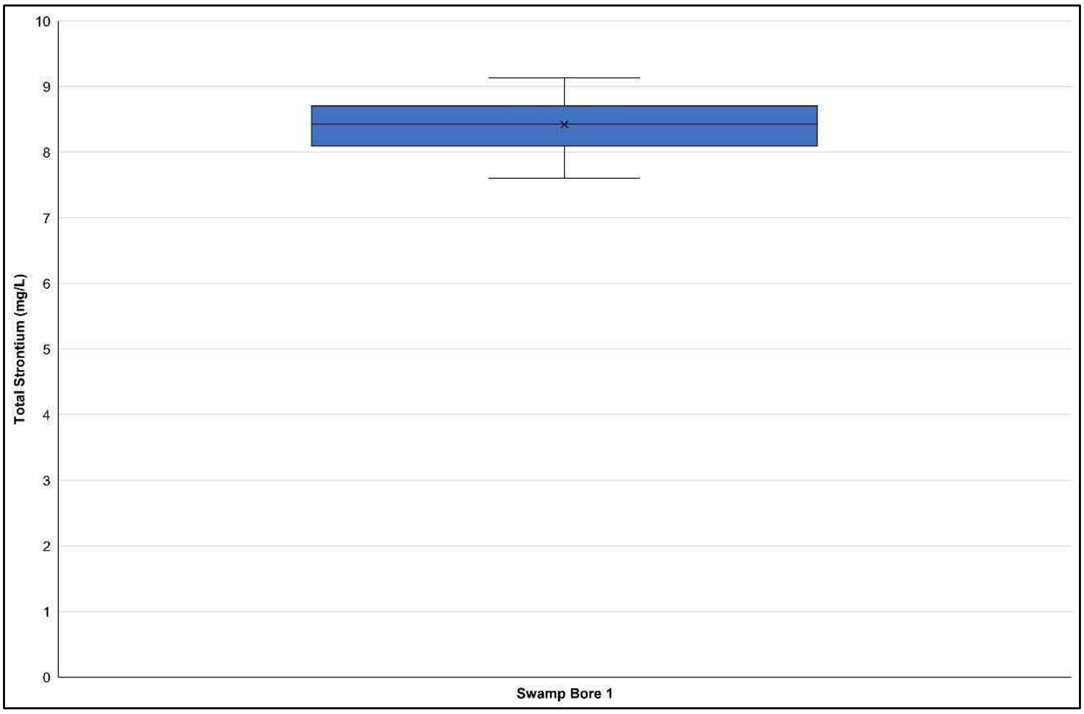

Figure C.31: Swamp Bore 1 total strontium box plot.

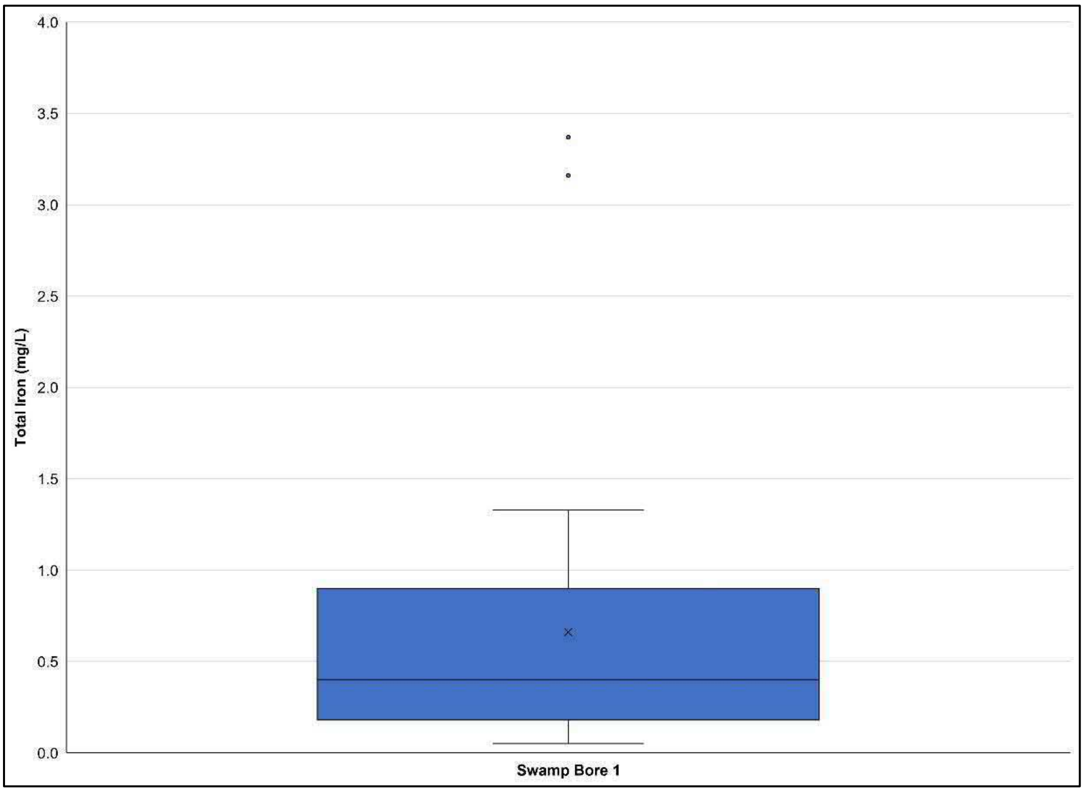

Figure C.32: Swamp Bore 1 total iron box plot.

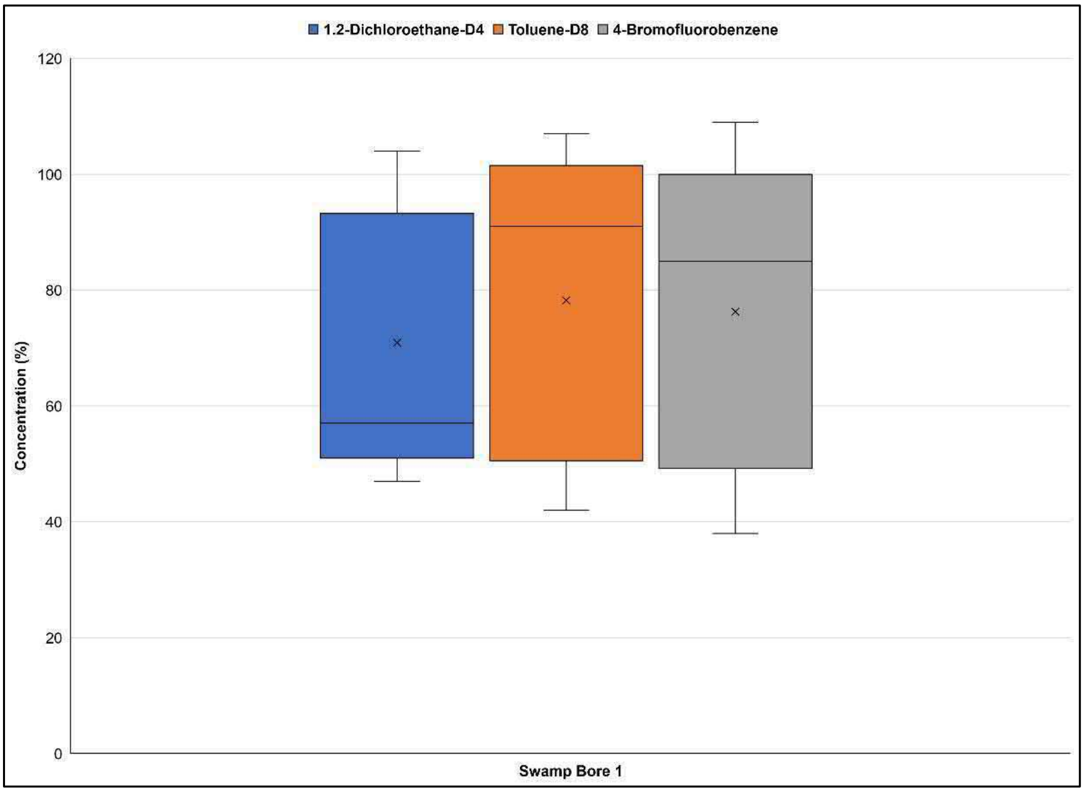

Figure C.33: Swamp Bore 1 1.2-dichloroethane-D4, toluene-D8 and 4-bromofluorobenzene box plot.

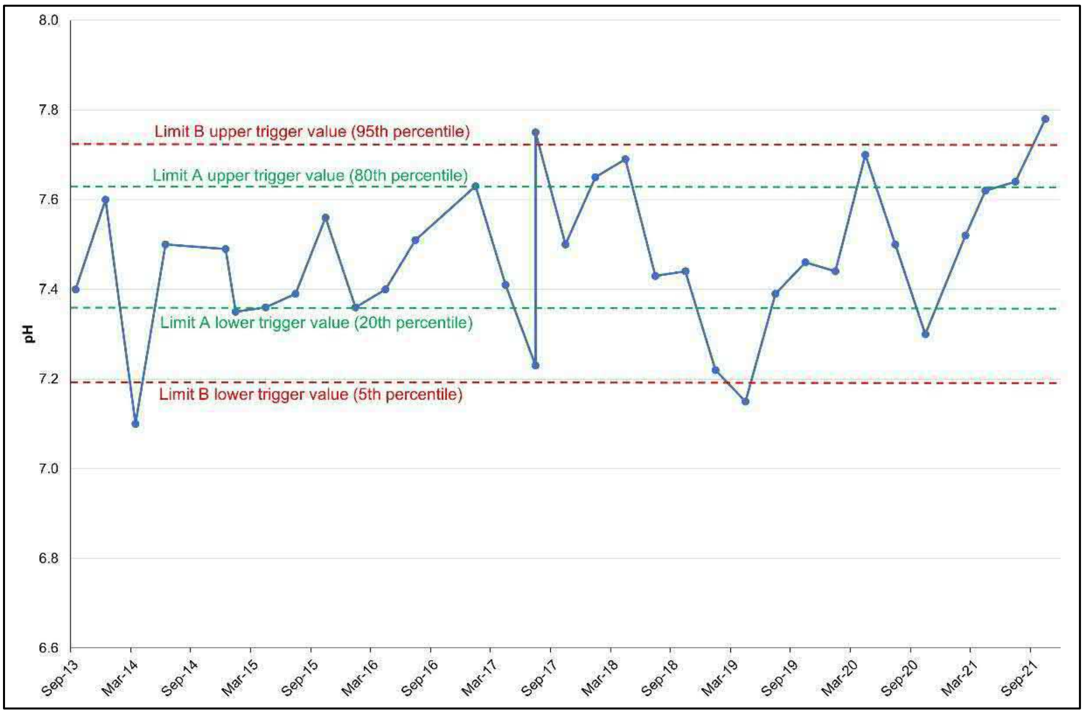

Figure C.34: Swamp Bore 1 pH time series plot.

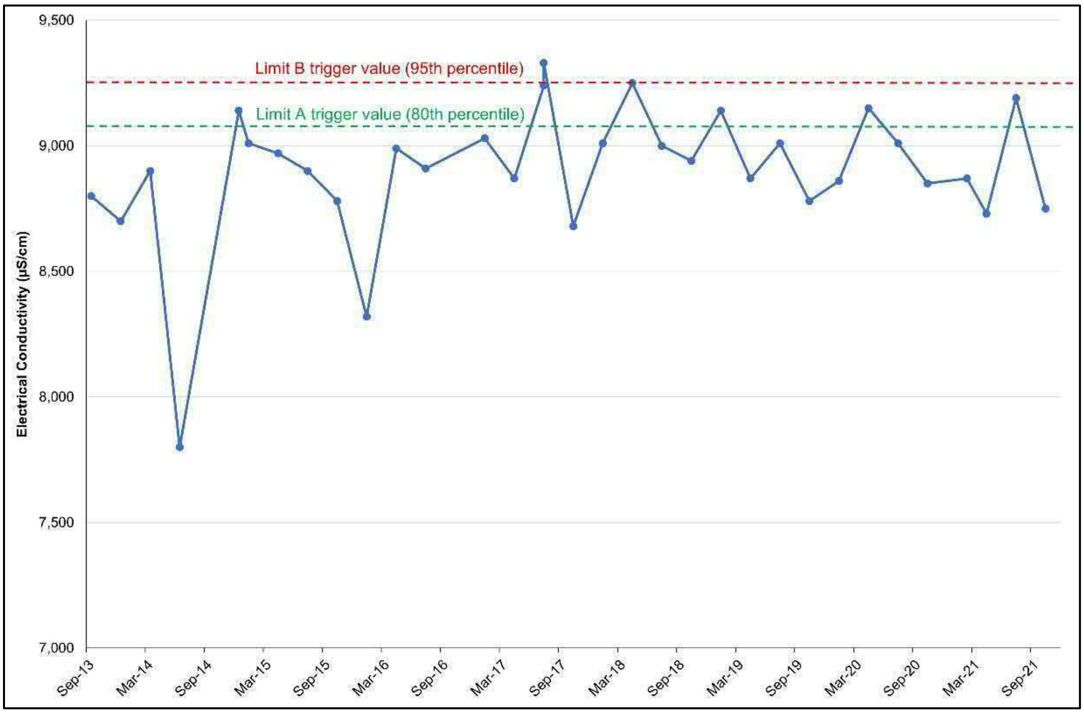

Figure C.35: Swamp Bore 1 electrical conductivity time series plot.

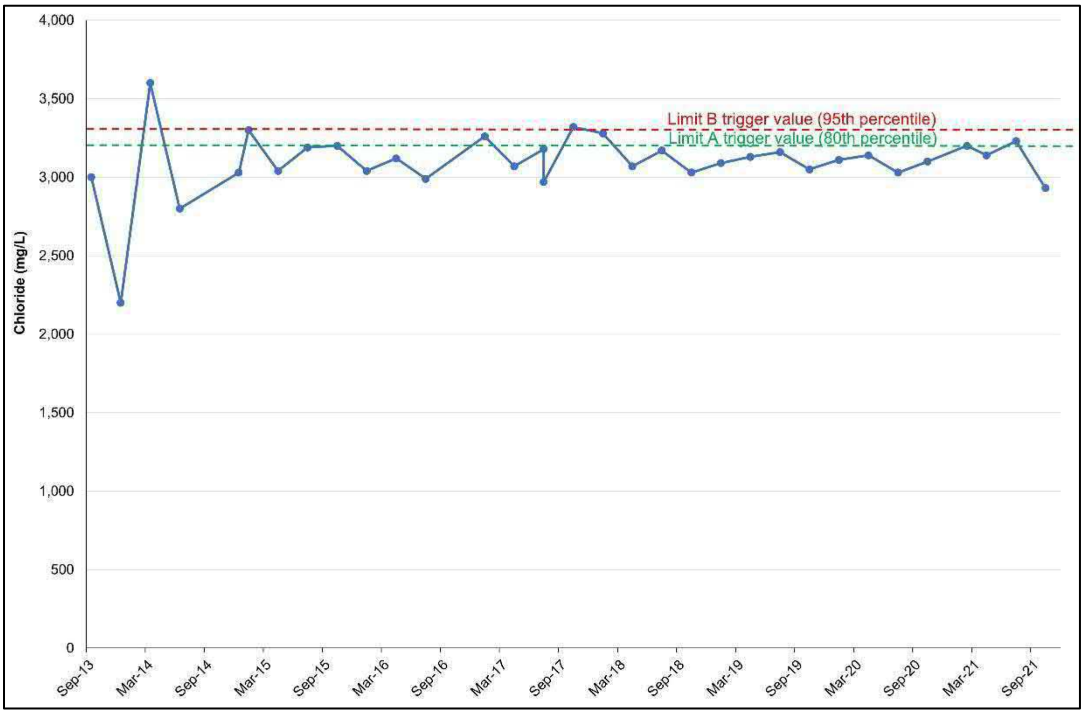

Figure C.36: Swamp Bore 1 chloride time series plot.

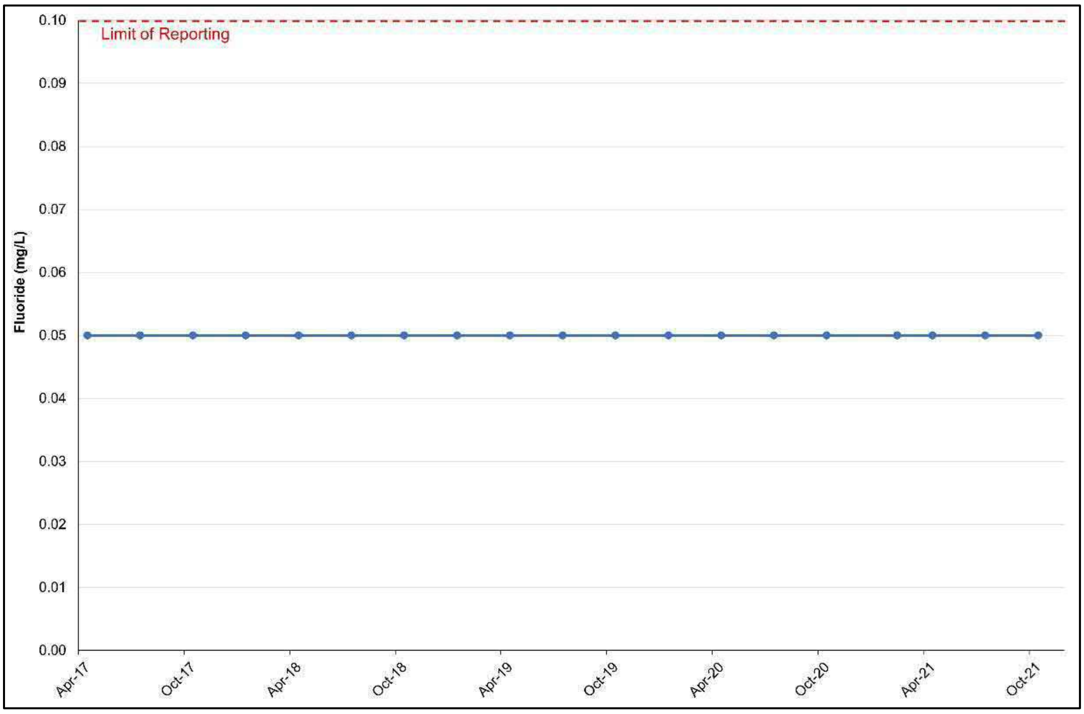

Figure C.37: Swamp Bore 1 fluoride time series plot.

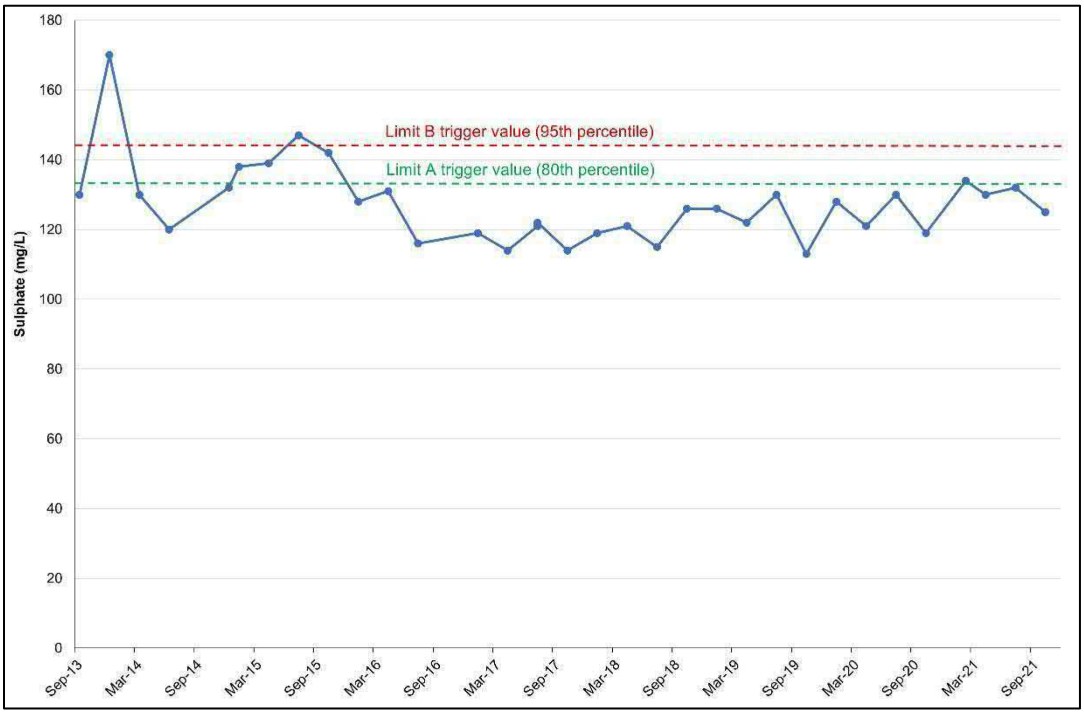

Figure C.38: Swamp Bore 1 sulphate time series plot.

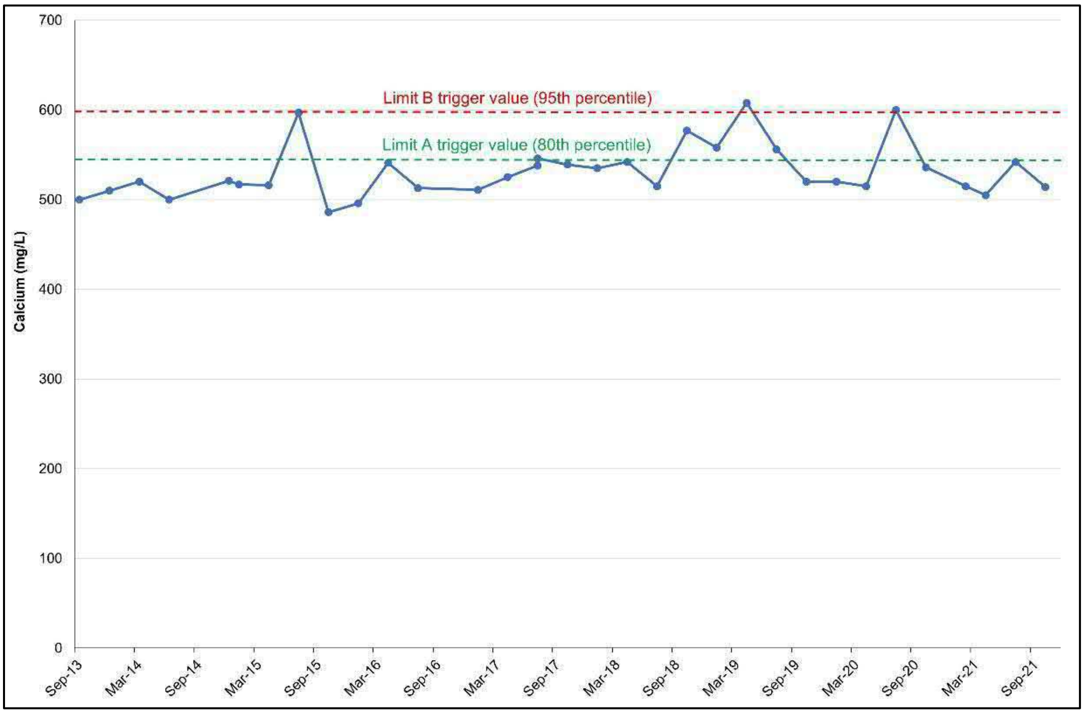

Figure C.39: Swamp Bore 1 calcium time series plot.

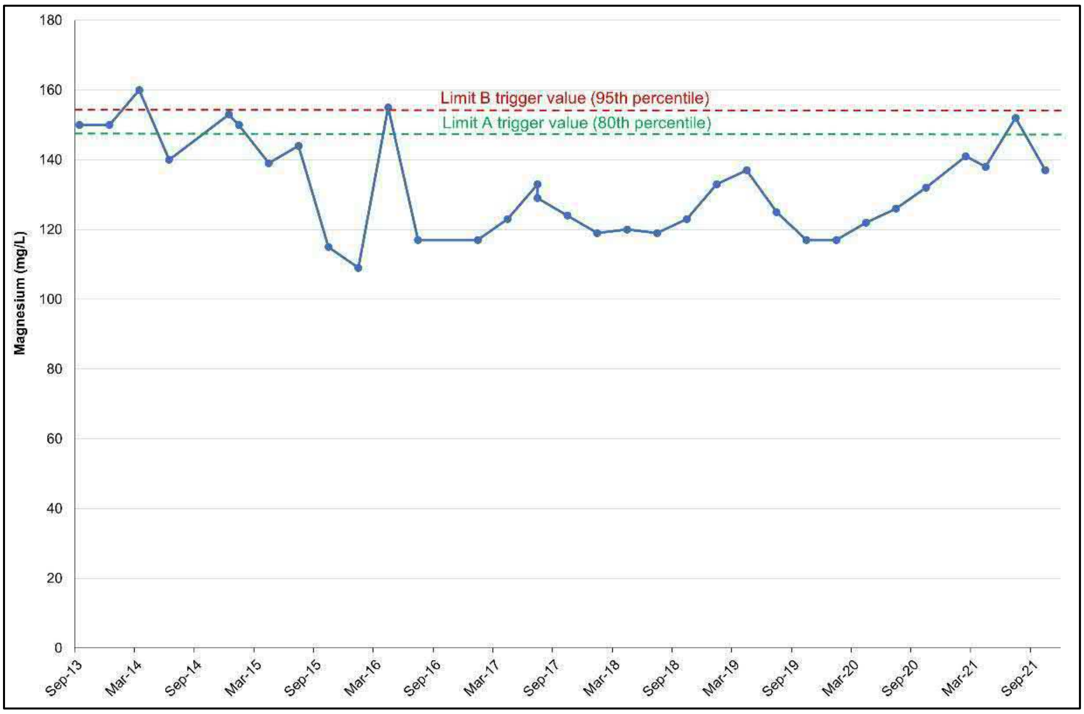

Figure C.40: Swamp Bore 1 magnesium time series plot.

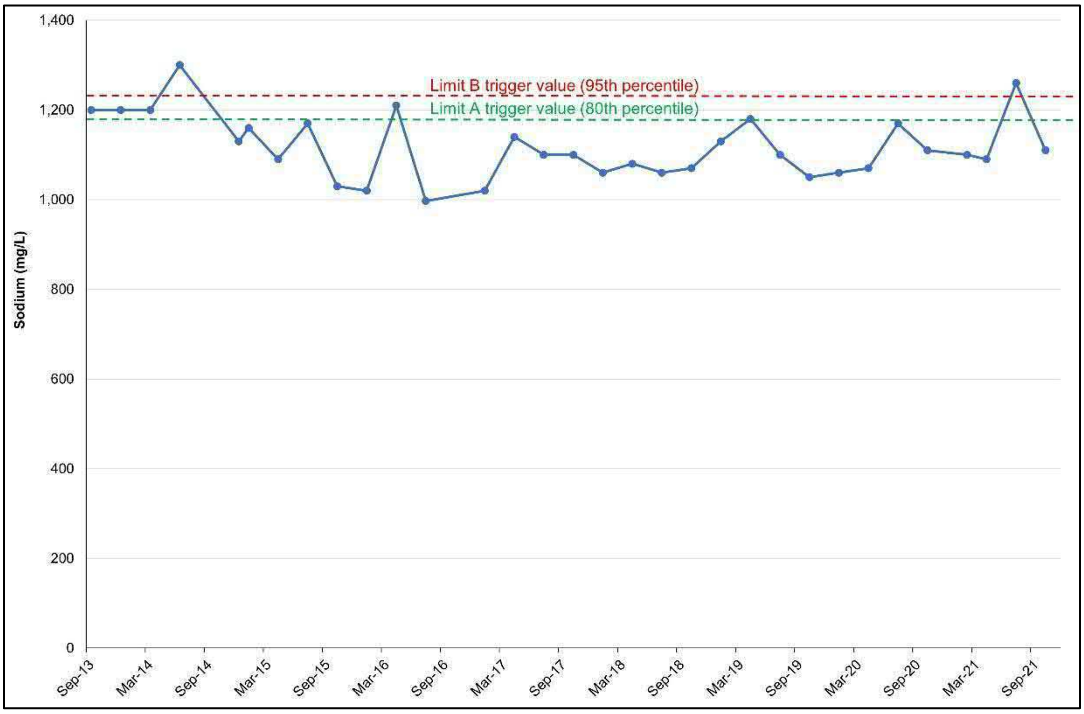

Figure C.41: Swamp Bore 1 sodium time series plot.

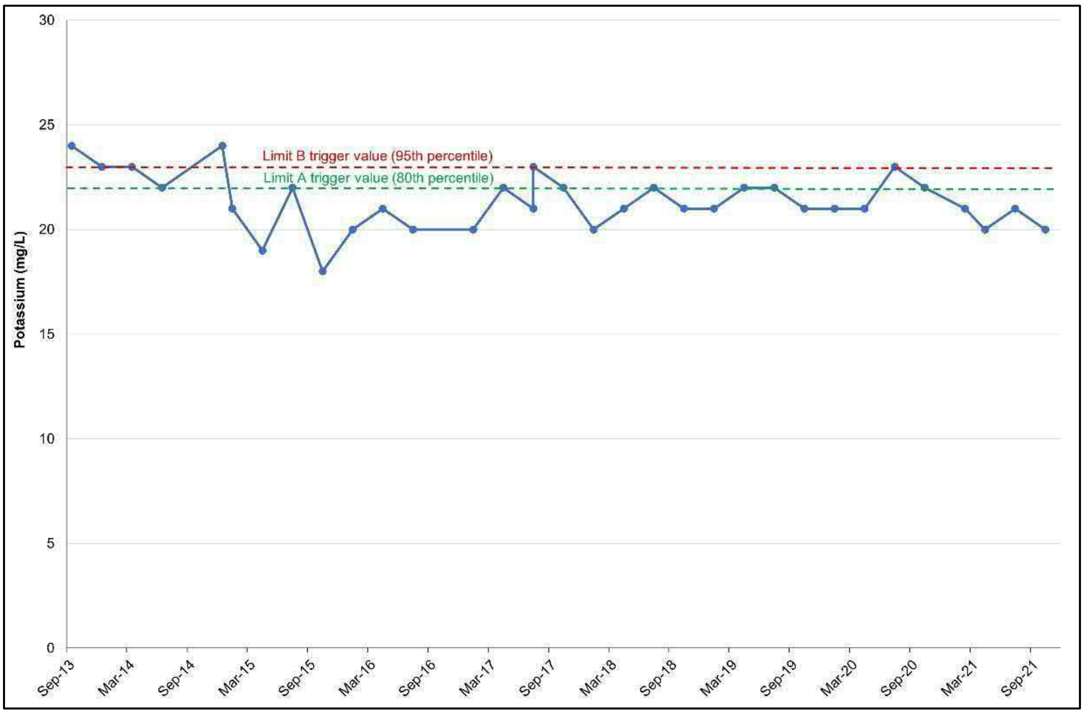

Figure C.42: Swamp Bore 1 potassium time series plot.

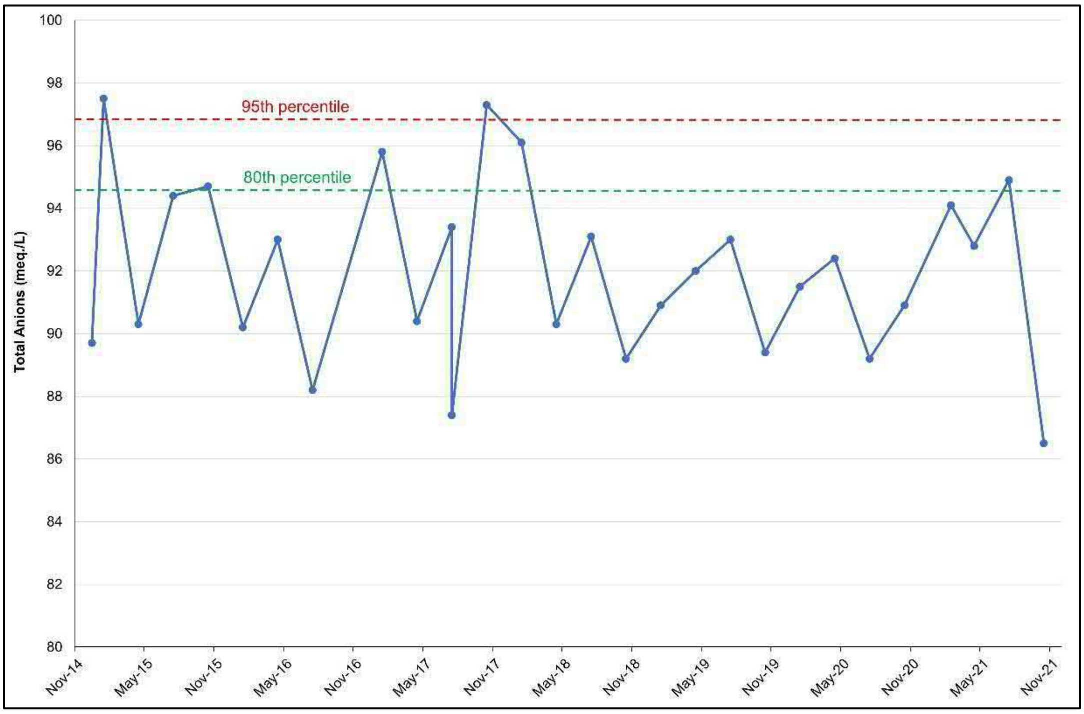

Figure C.43: Swamp Bore 1 total anions time series plot.

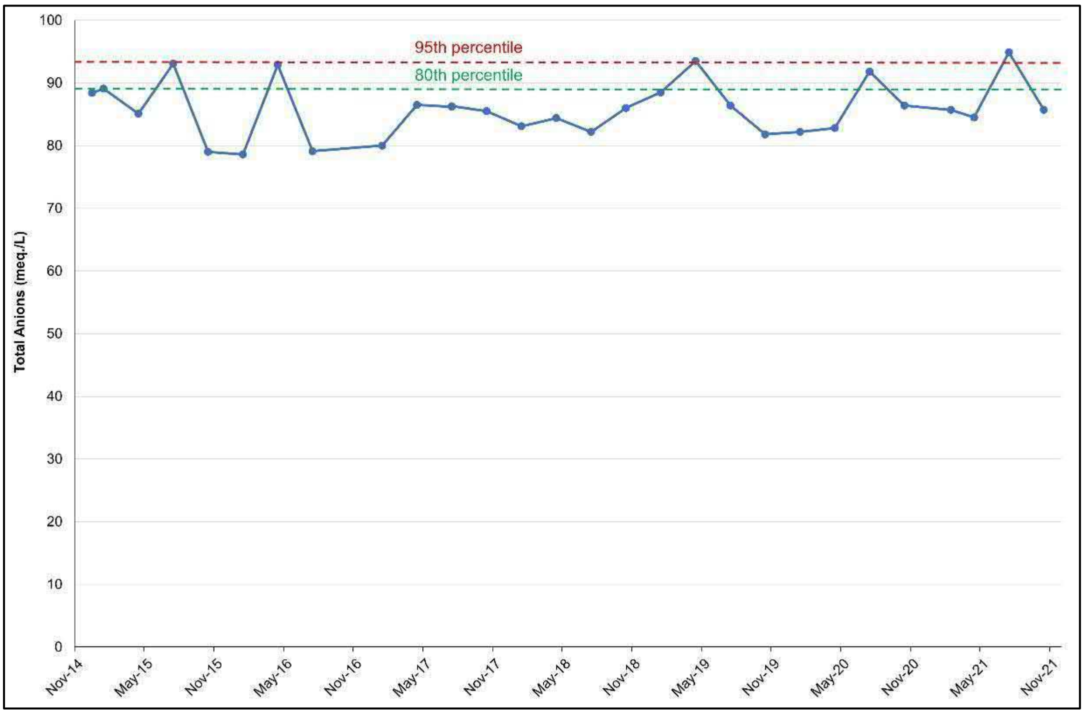

Figure C.44: Swamp Bore 1 total cations time series plot.

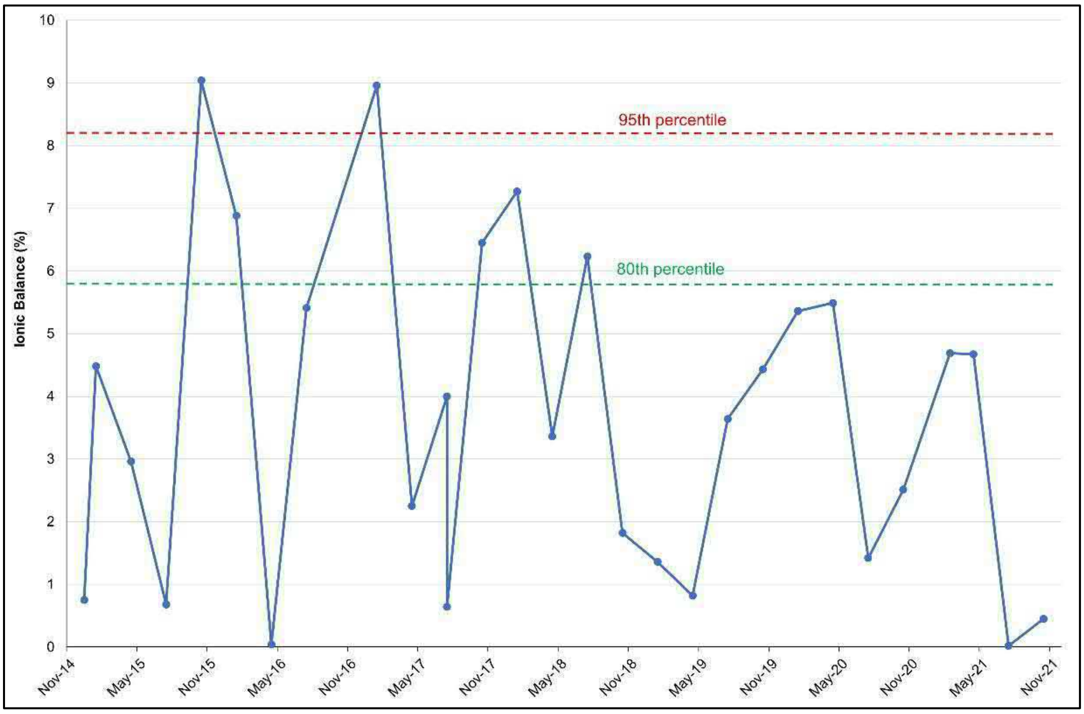

Figure C.45: Swamp Bore 1 ionic balance time series plot.

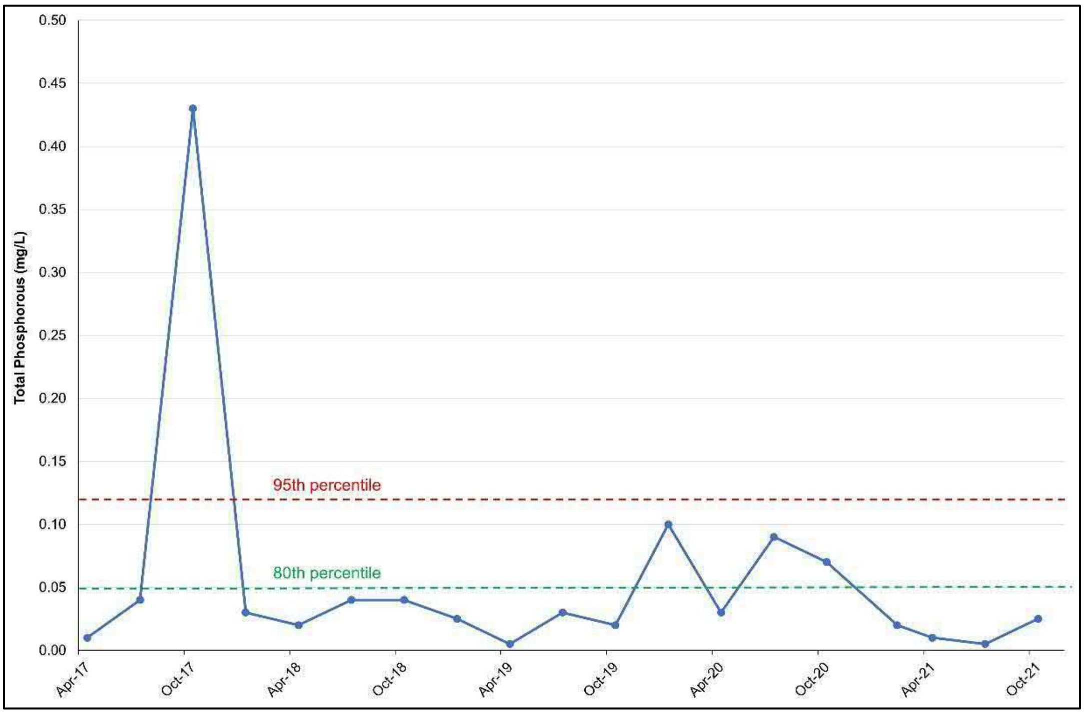

Figure C.46: **Swamp Bore 1 total phosphorous time series plot.**

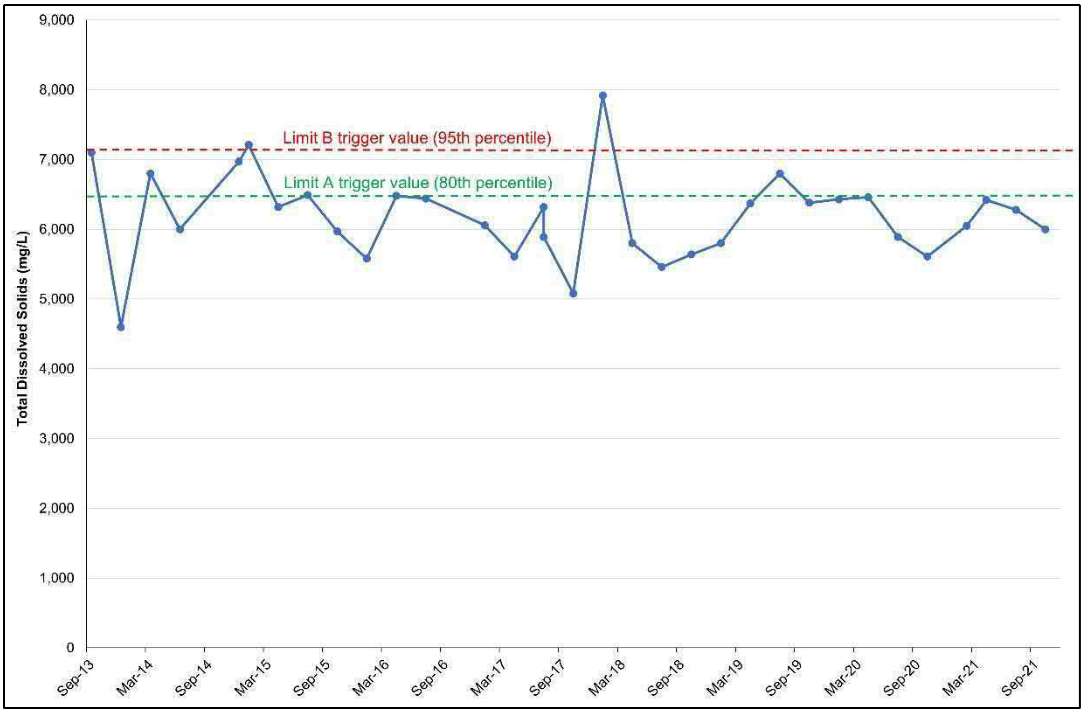

Figure C.47: **Swamp Bore 1 total dissolved solids time series plot.**

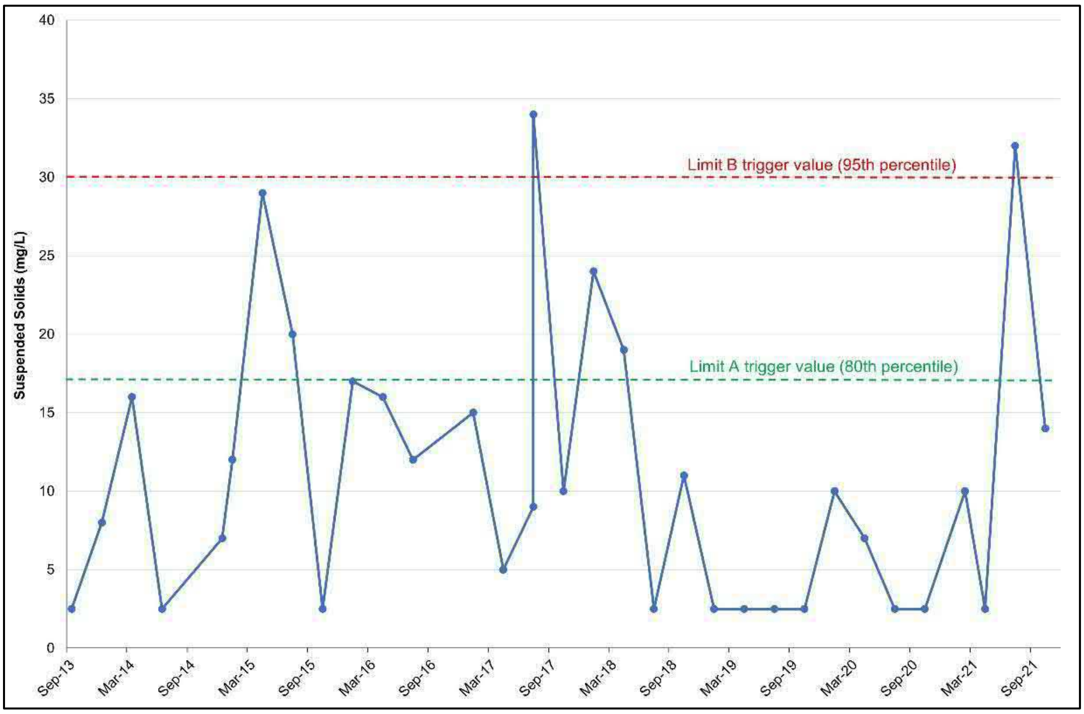

Figure C.48: **Swamp Bore 1 suspended solids time series plot.**

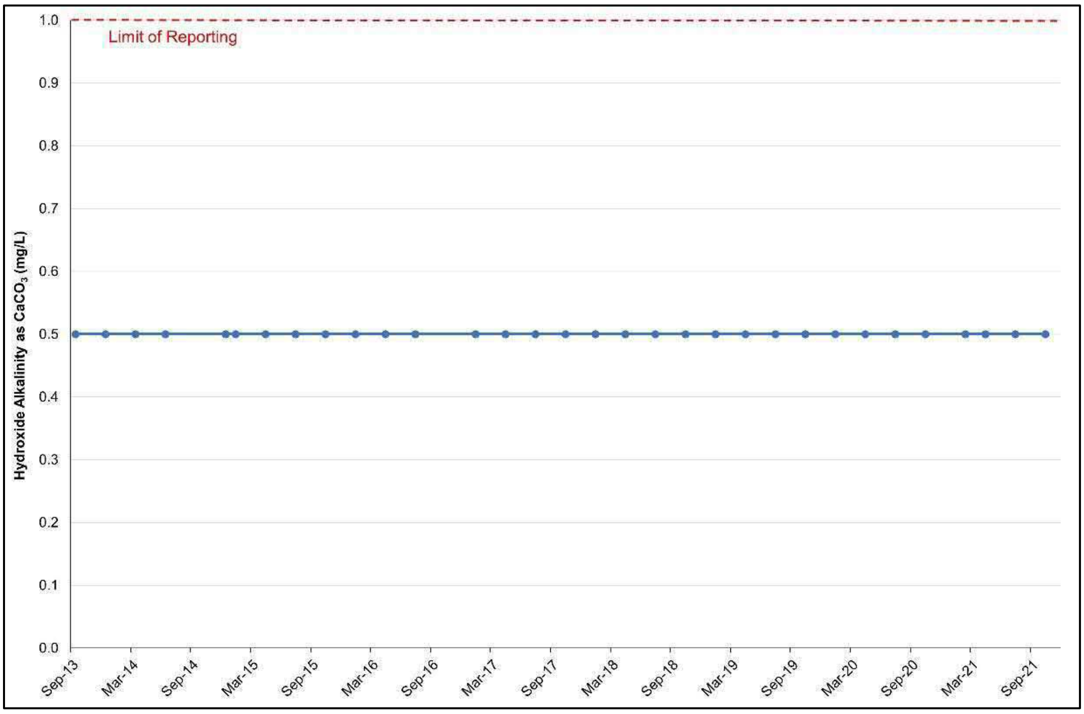

Figure C.49: **Swamp Bore 1 hydroxide alkalinity time series plot.**

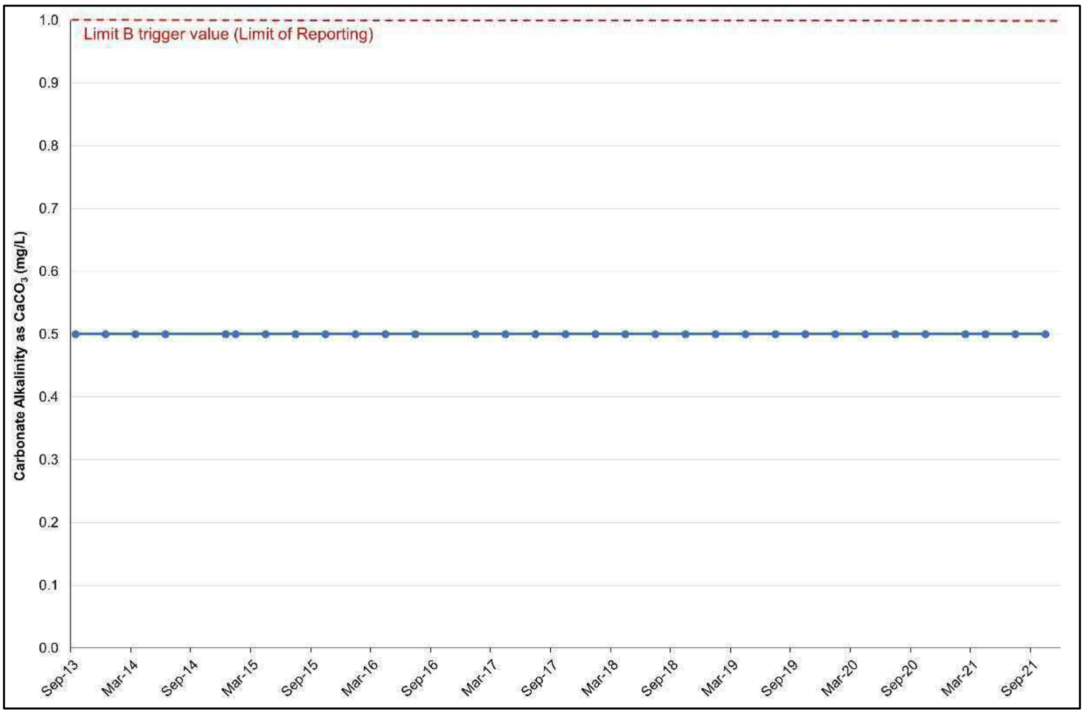

Figure C.50: **Swamp Bore 1 carbonate alkalinity time series plot.**

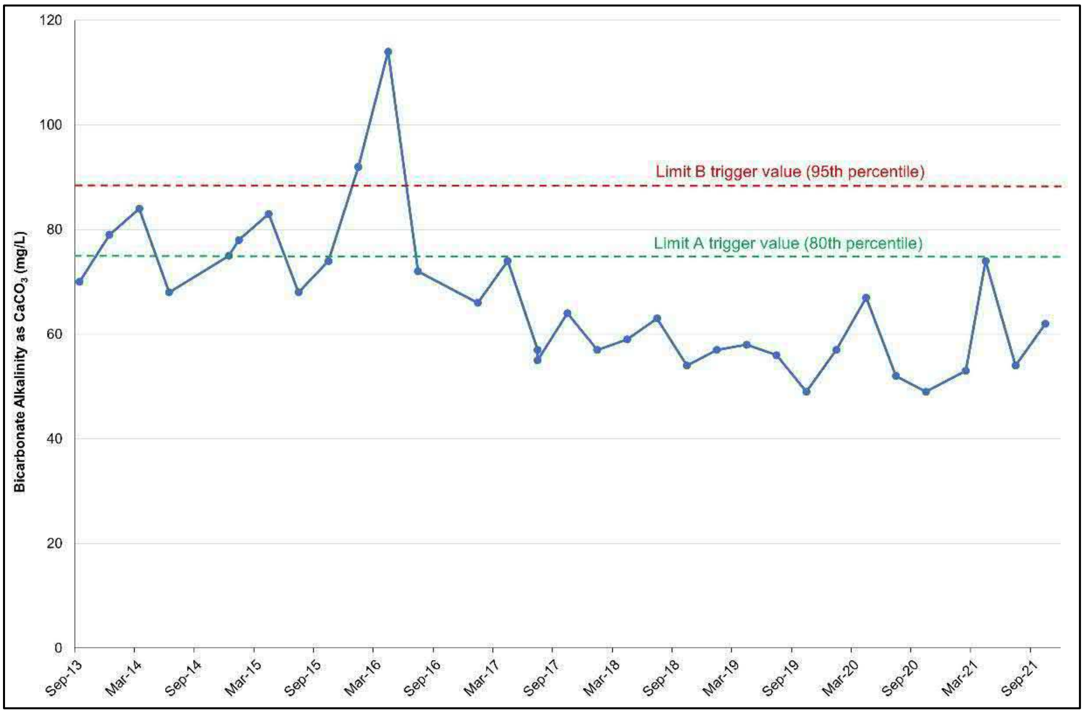

Figure C.51: **Swamp Bore 1 bicarbonate alkalinity time series plot.**

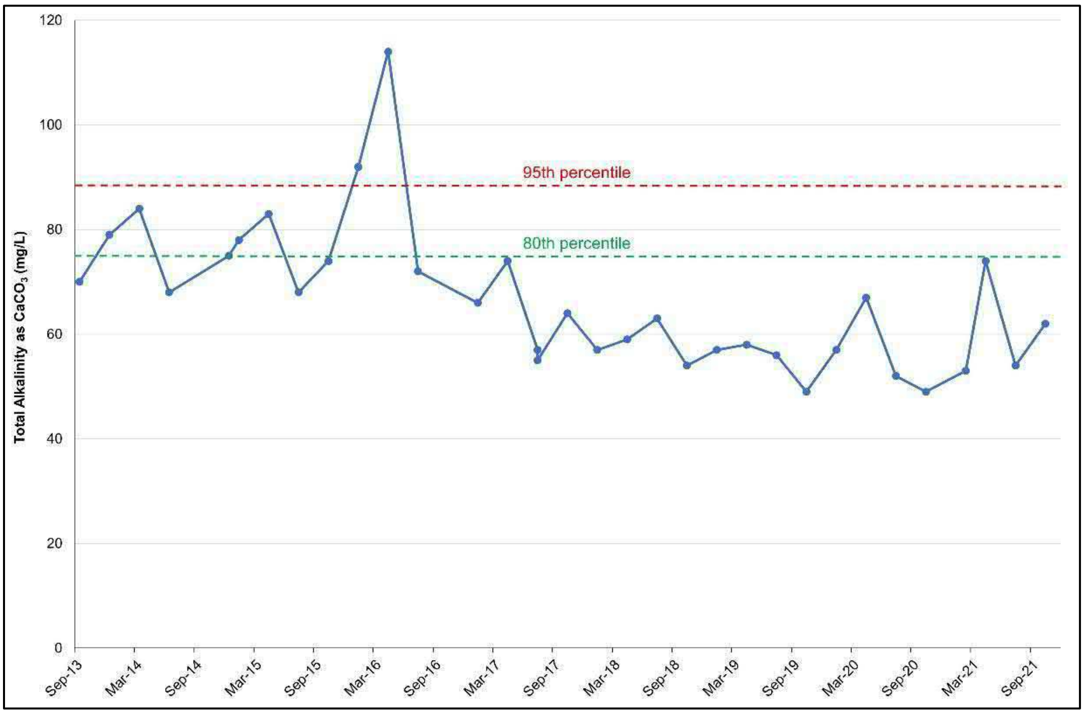

Figure C.52: **Swamp Bore 1 total alkalinity time series plot.**

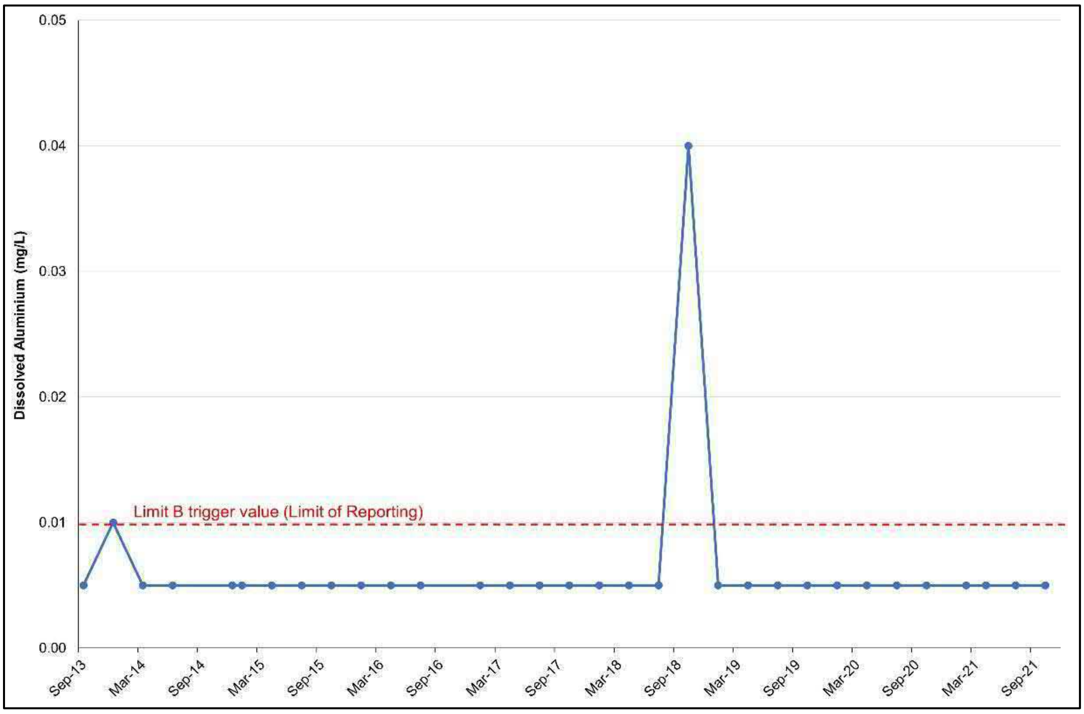

Figure C.53: **Swamp Bore 1 dissolved aluminium time series plot.**

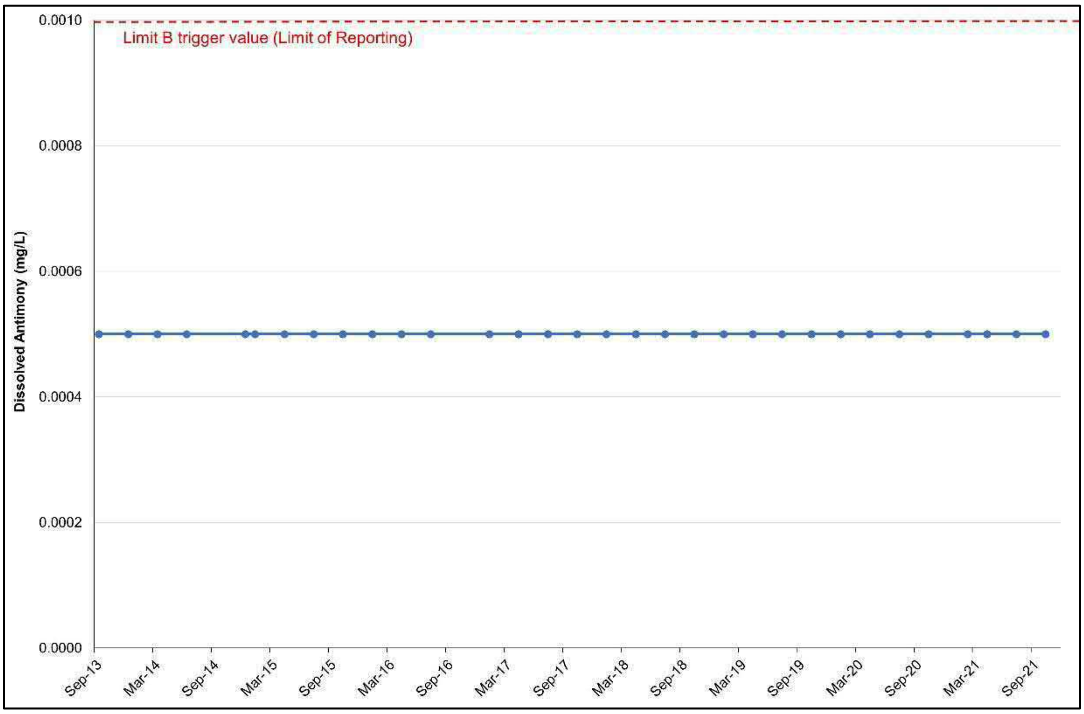

Figure C.54: **Swamp Bore 1 dissolved antimony time series plot.**

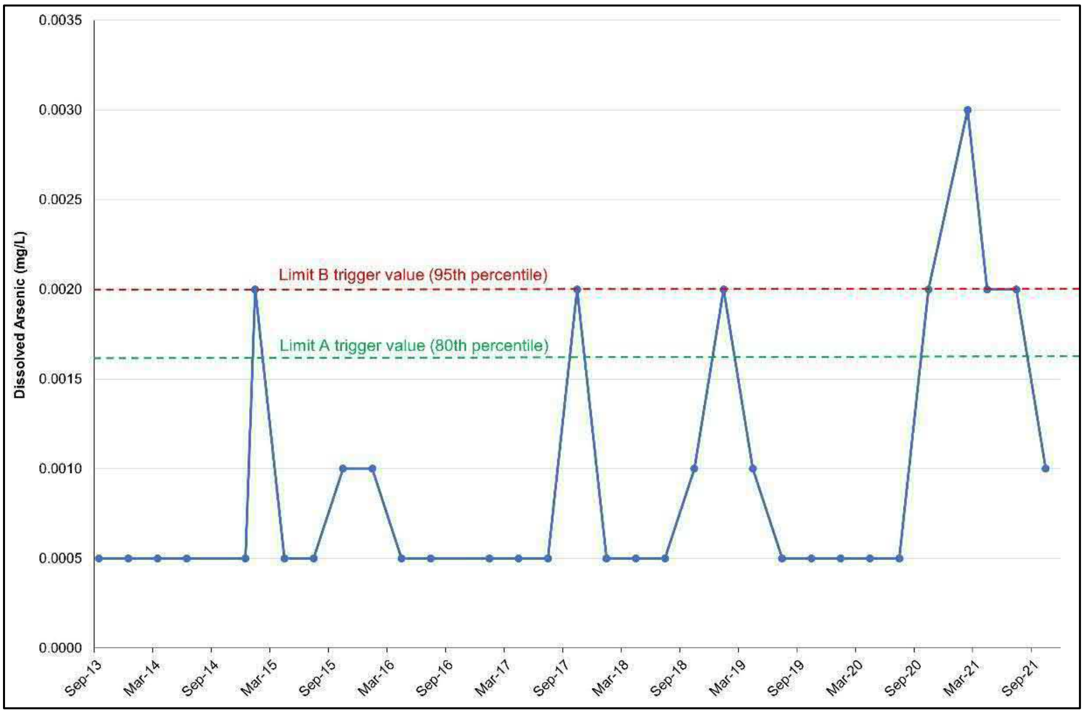

Figure C.55: **Swamp Bore 1 dissolved arsenic time series plot.**

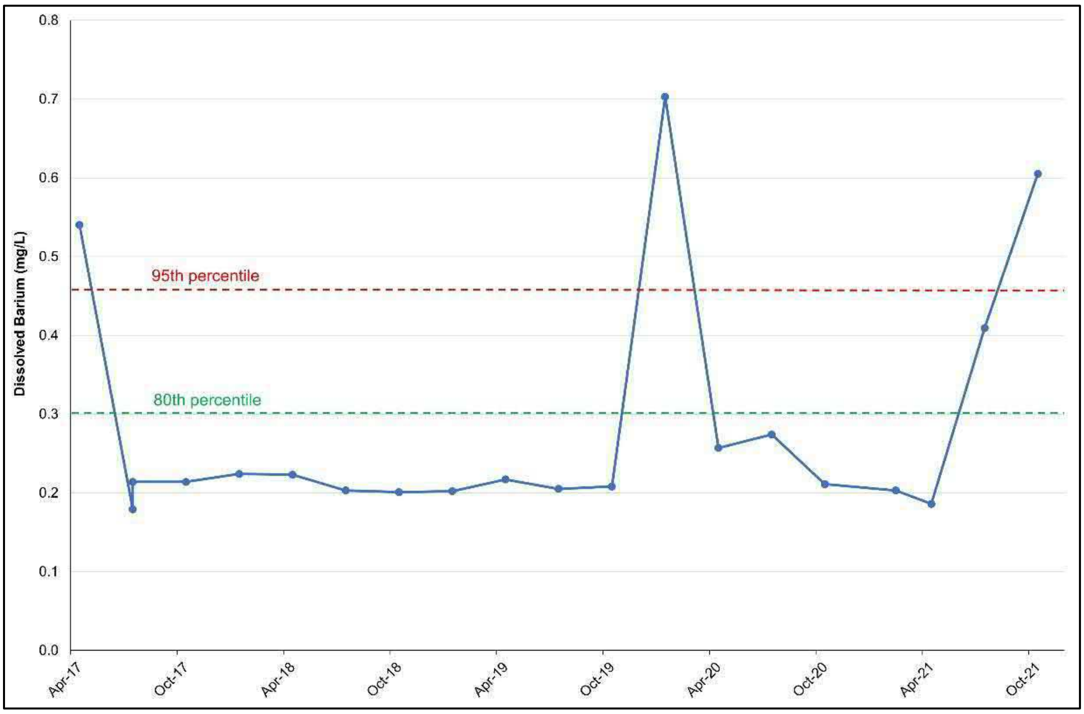

Figure C.56: **Swamp Bore 1 dissolved barium time series plot.**

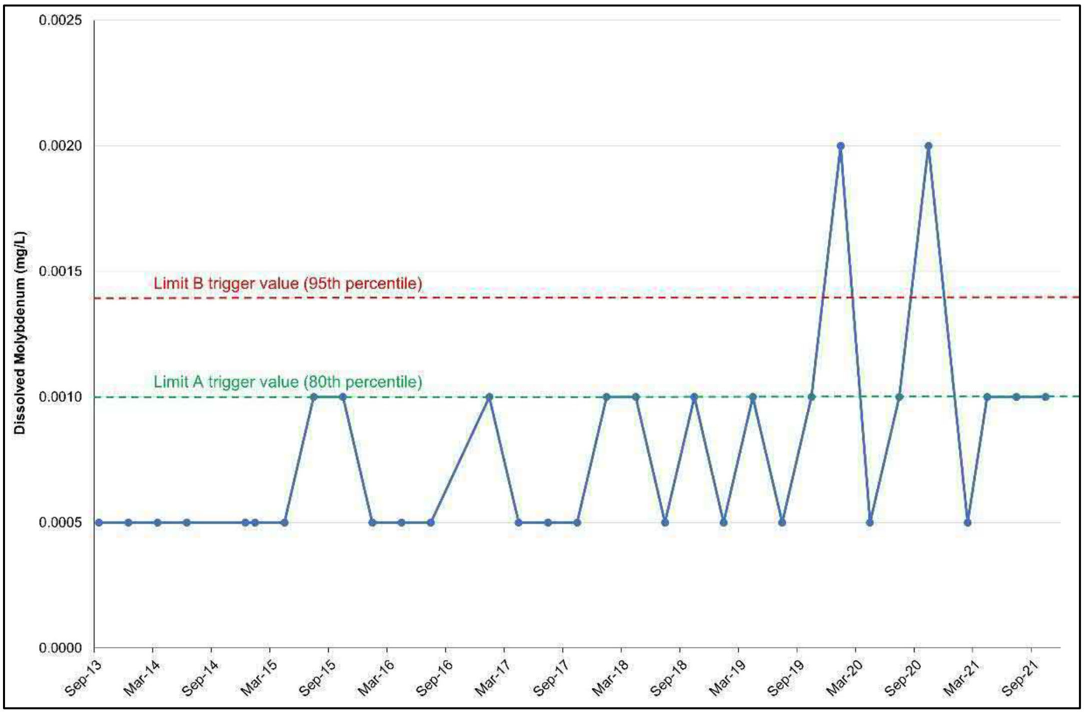

Figure C.57: **Swamp Bore 1 dissolved molybdenum time series plot.**

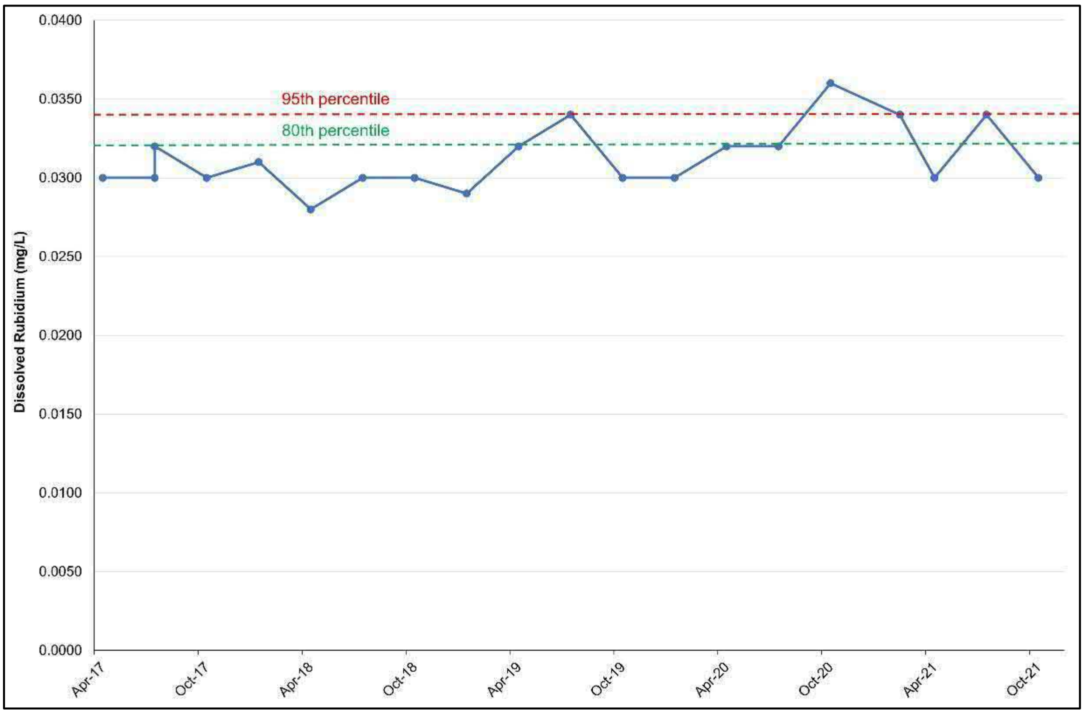

Figure C.58: **Swamp Bore 1 dissolved rubidium time series plot.**

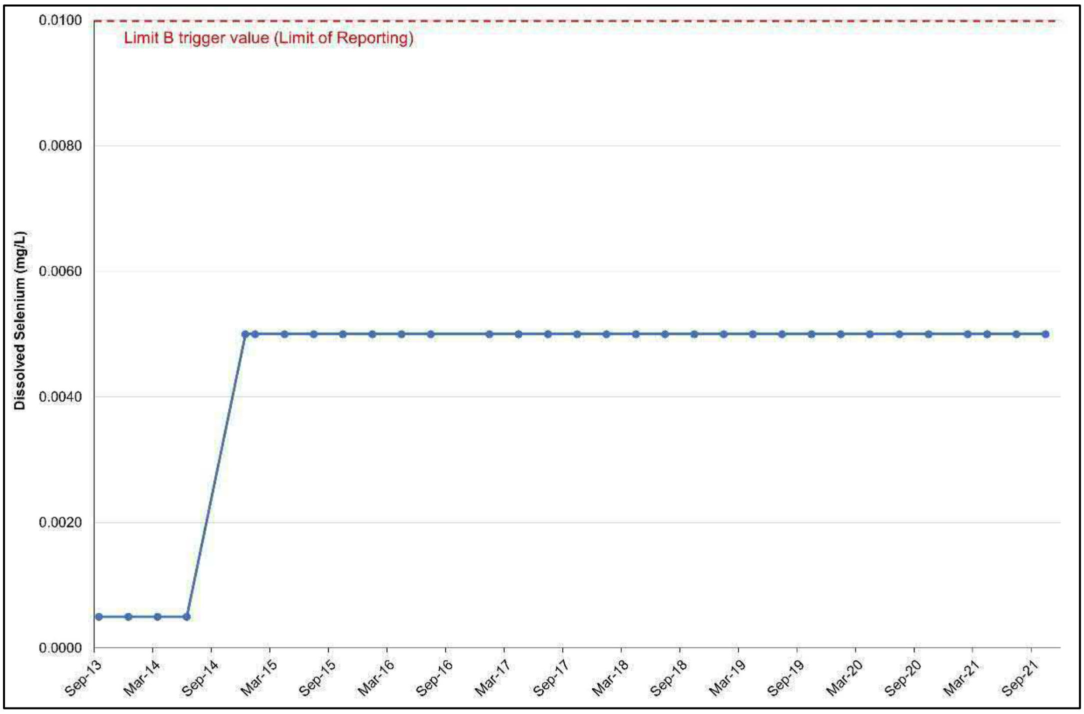

Figure C.59: **Swamp Bore 1 dissolved selenium time series plot.**

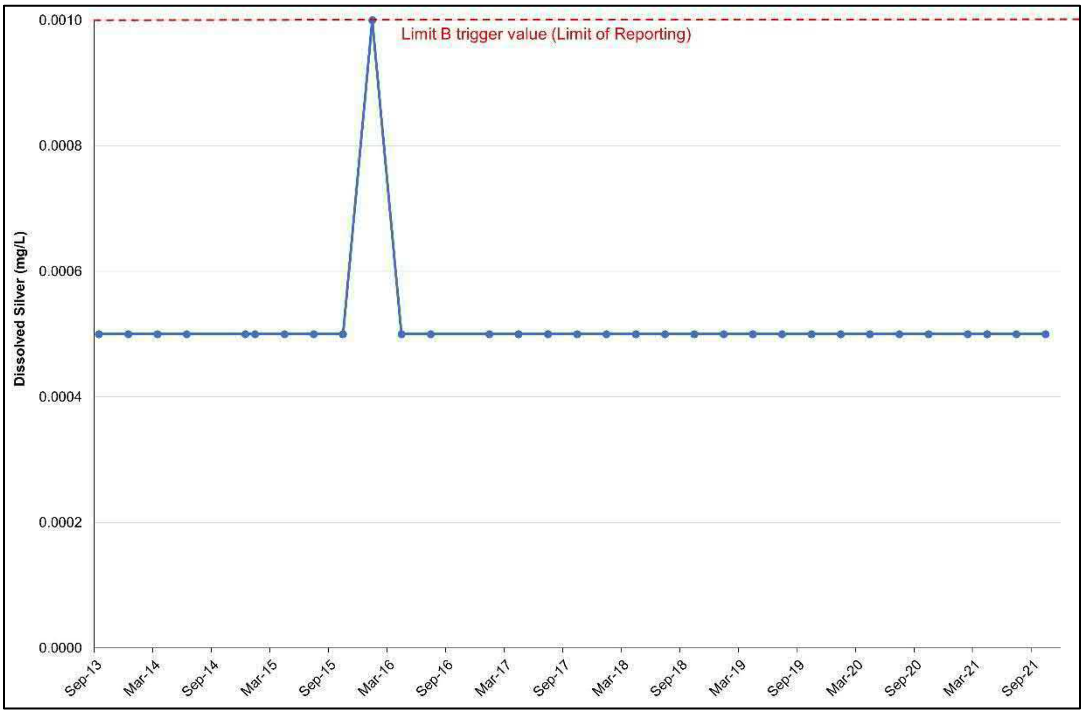

Figure C.60: **Swamp Bore 1 dissolved silver time series plot.**

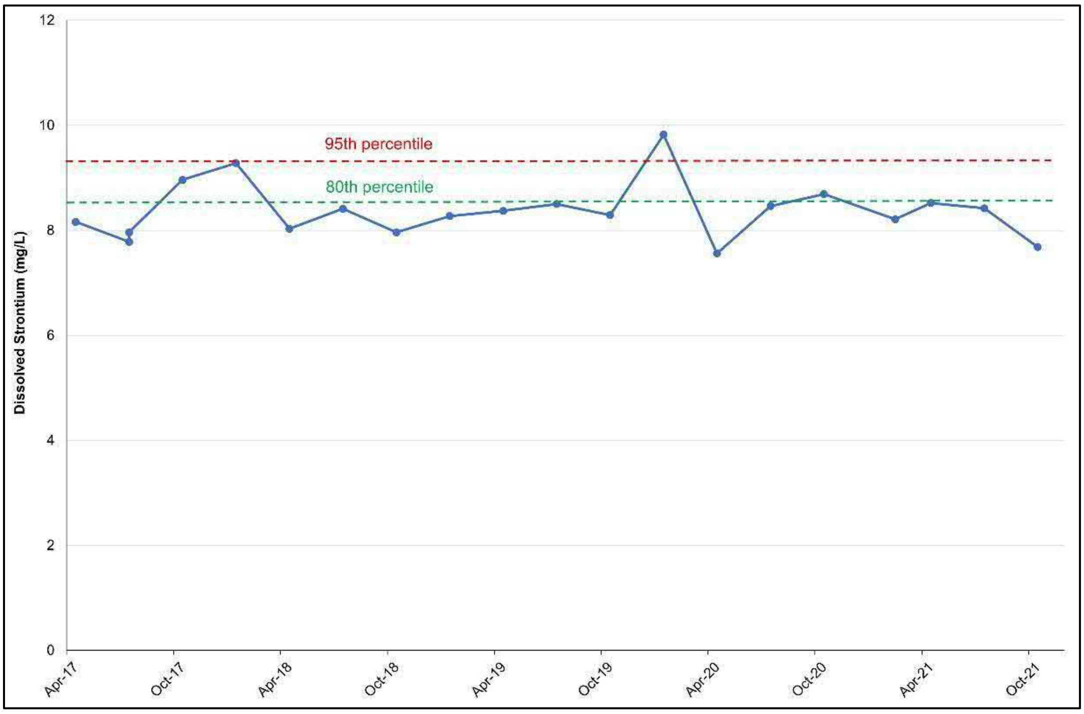

Figure C.61: **Swamp Bore 1 dissolved strontium time series plot.**

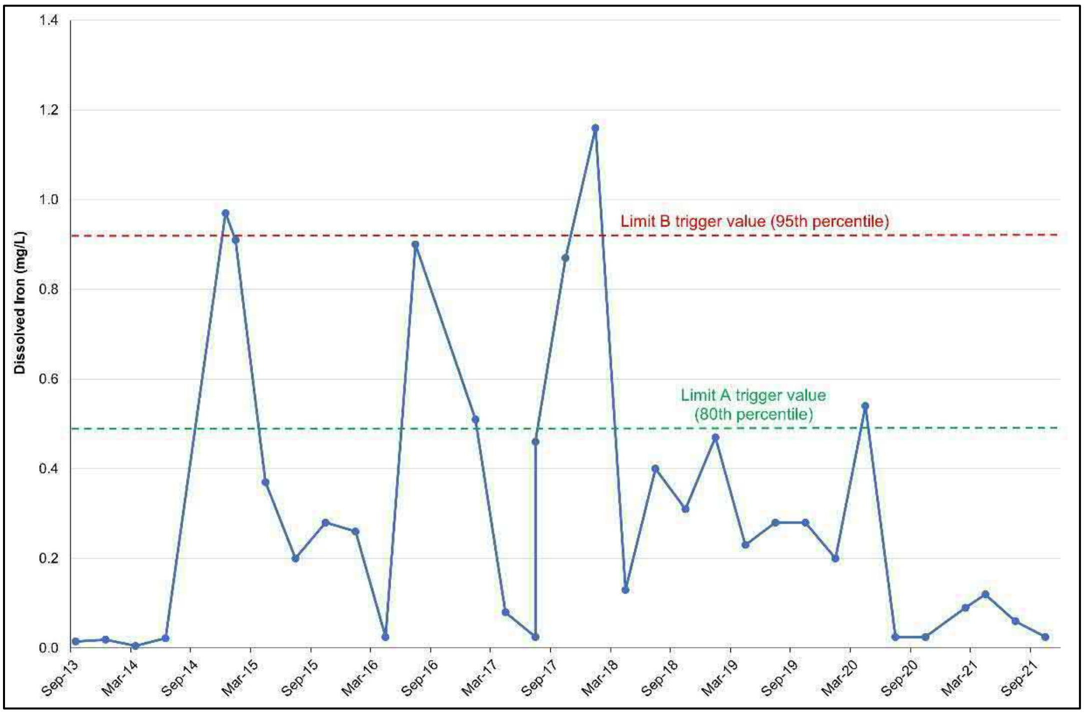

Figure C.62: Swamp Bore 1 dissolved iron time series plot.

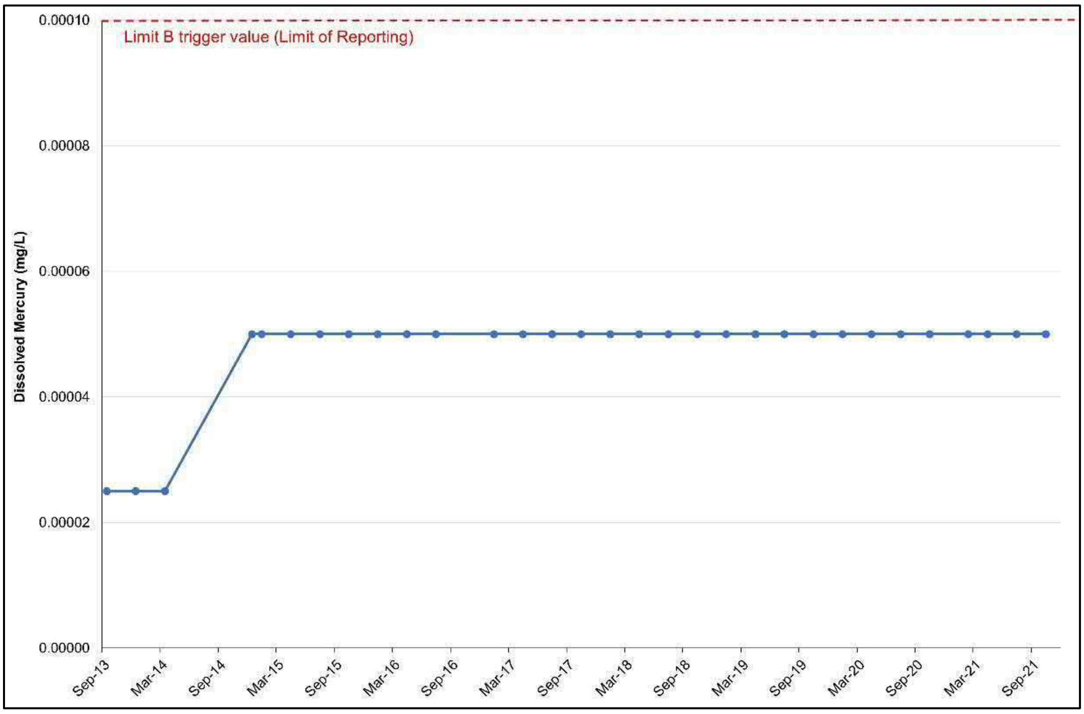

Figure C.63: Swamp Bore 1 dissolved mercury time series plot.

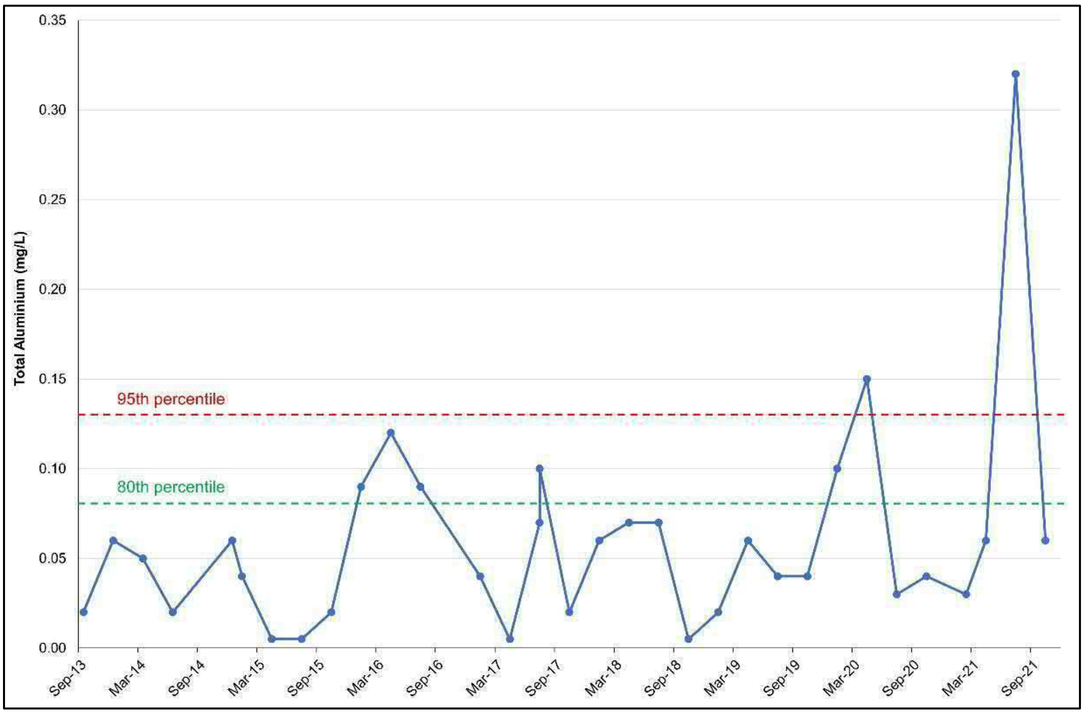

Figure C.64: Swamp Bore 1 total aluminium time series plot.

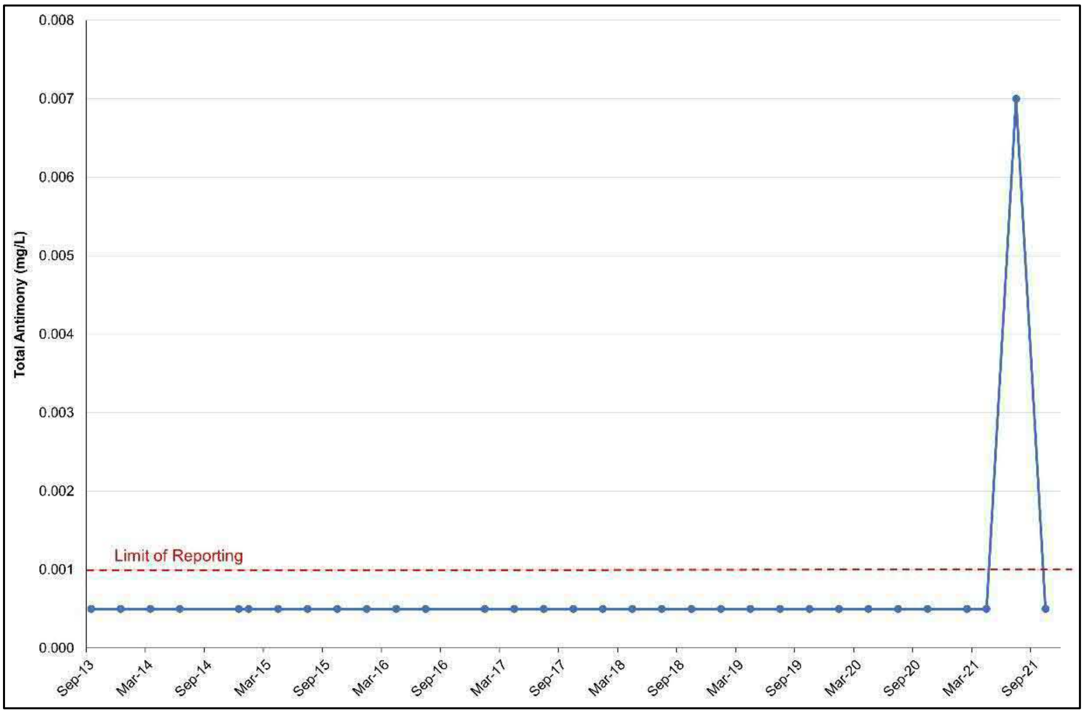

Figure C.65: Swamp Bore 1 total antimony time series plot.

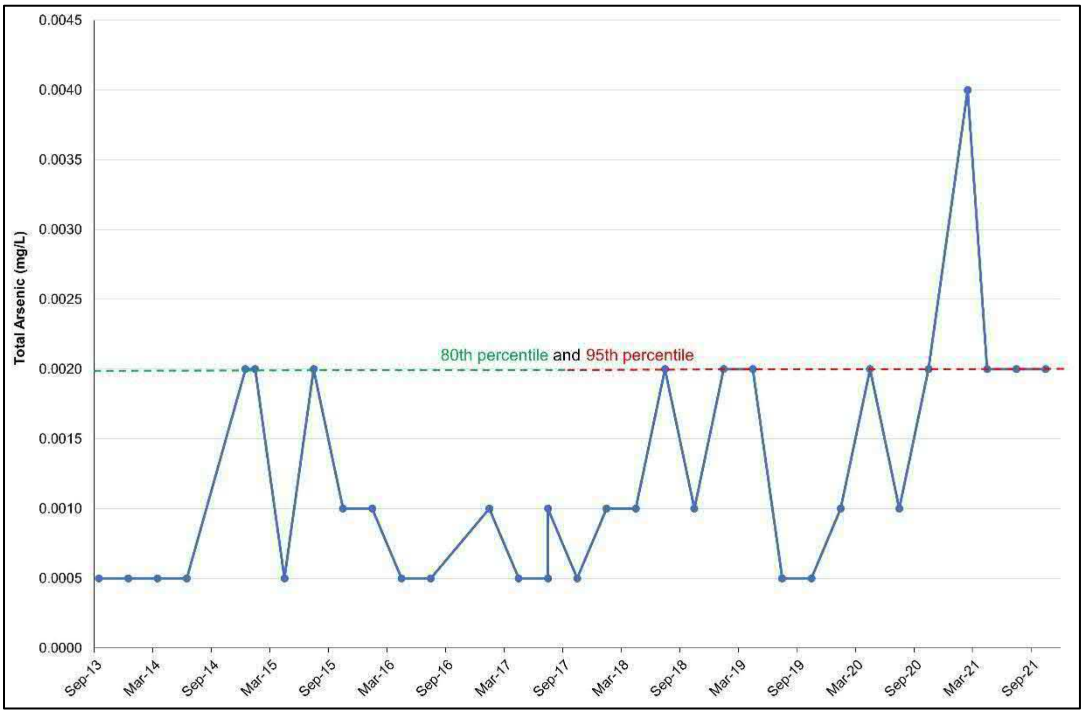

Figure C.66: **Swamp Bore 1 total arsenic time series plot.**

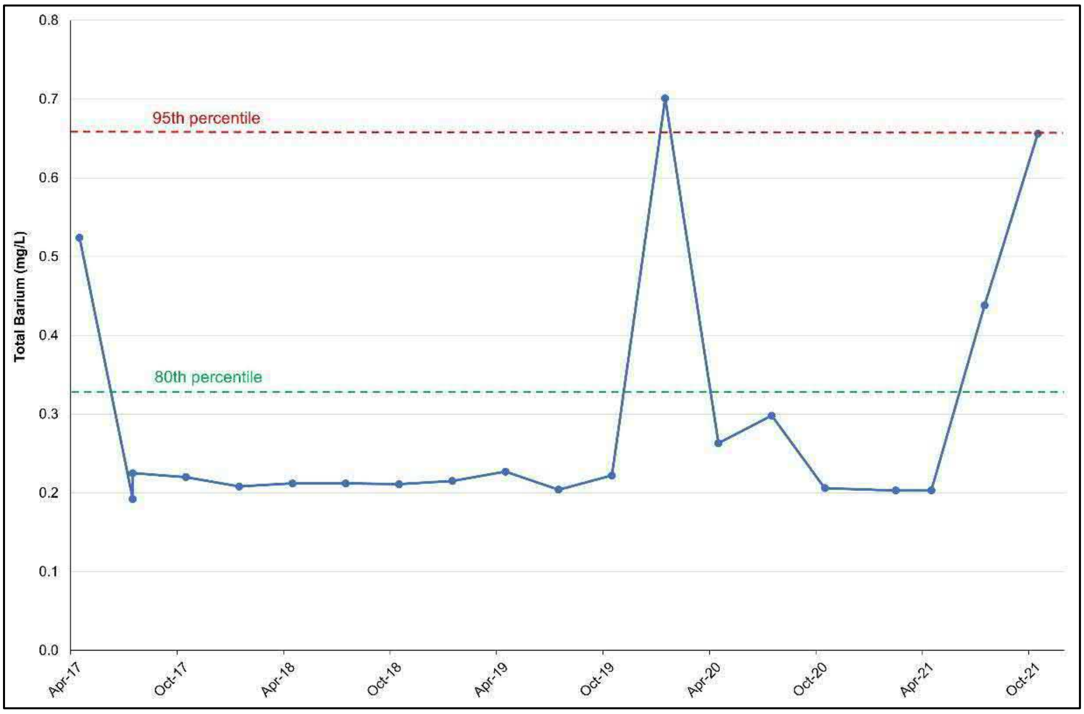

Figure C.67: **Swamp Bore 1 total barium time series plot.**

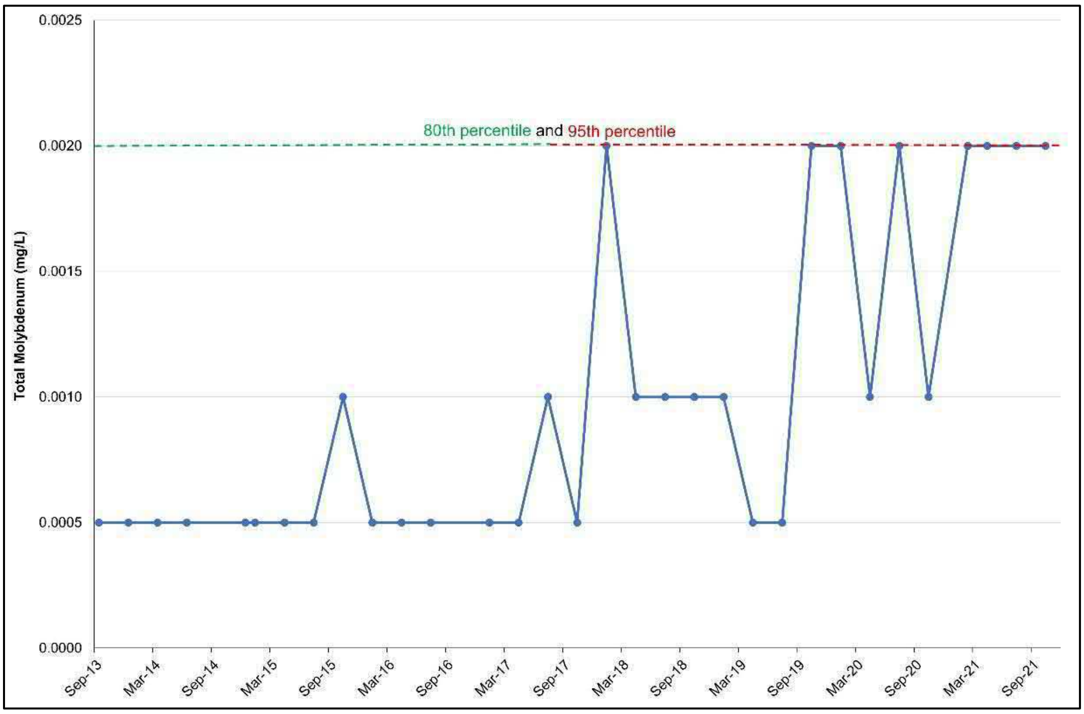

Figure C.68: Swamp Bore 1 total molybdenum time series plot.

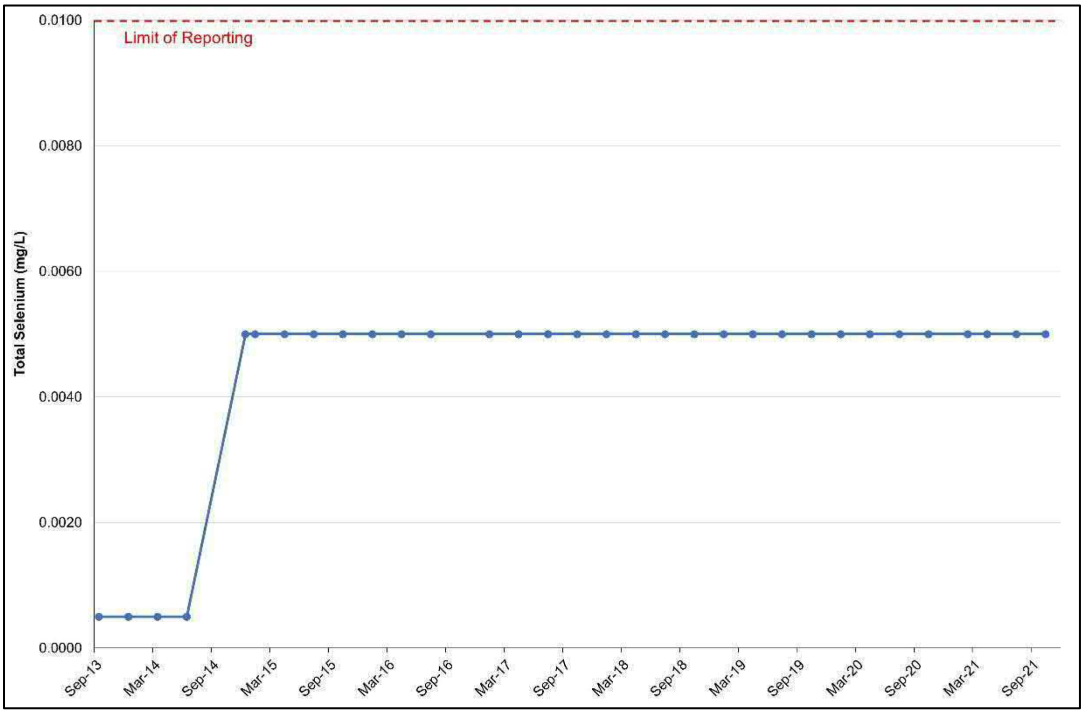

Figure C.69: Swamp Bore 1 total selenium time series plot.

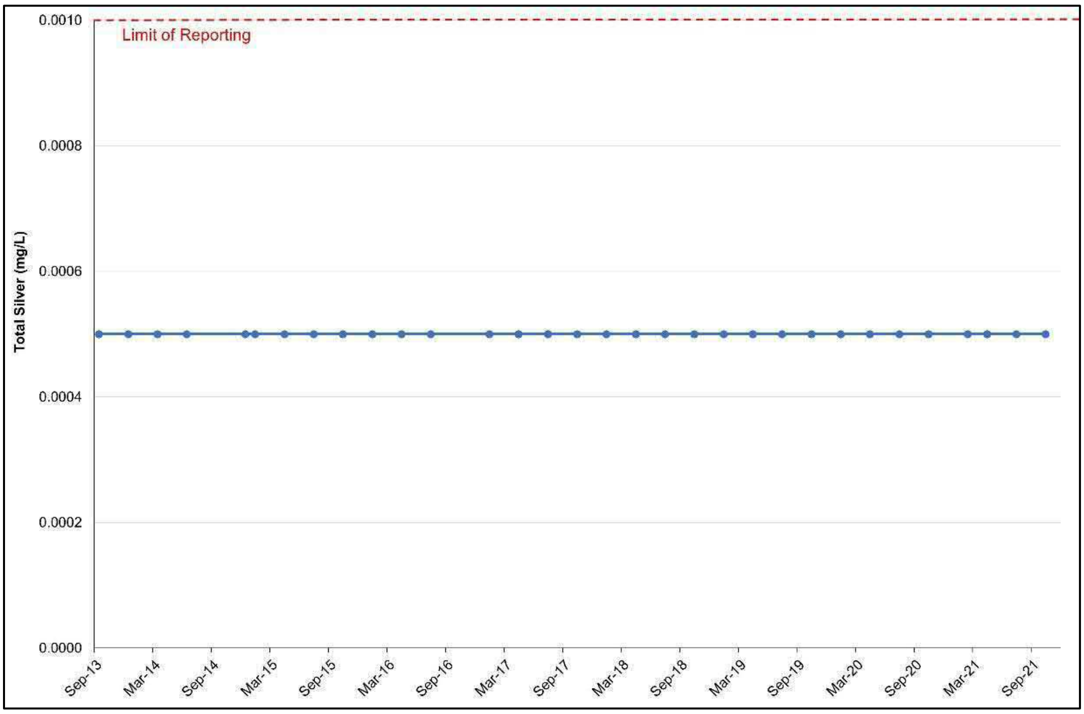

Figure C.70: **Swamp Bore 1 total silver time series plot.**

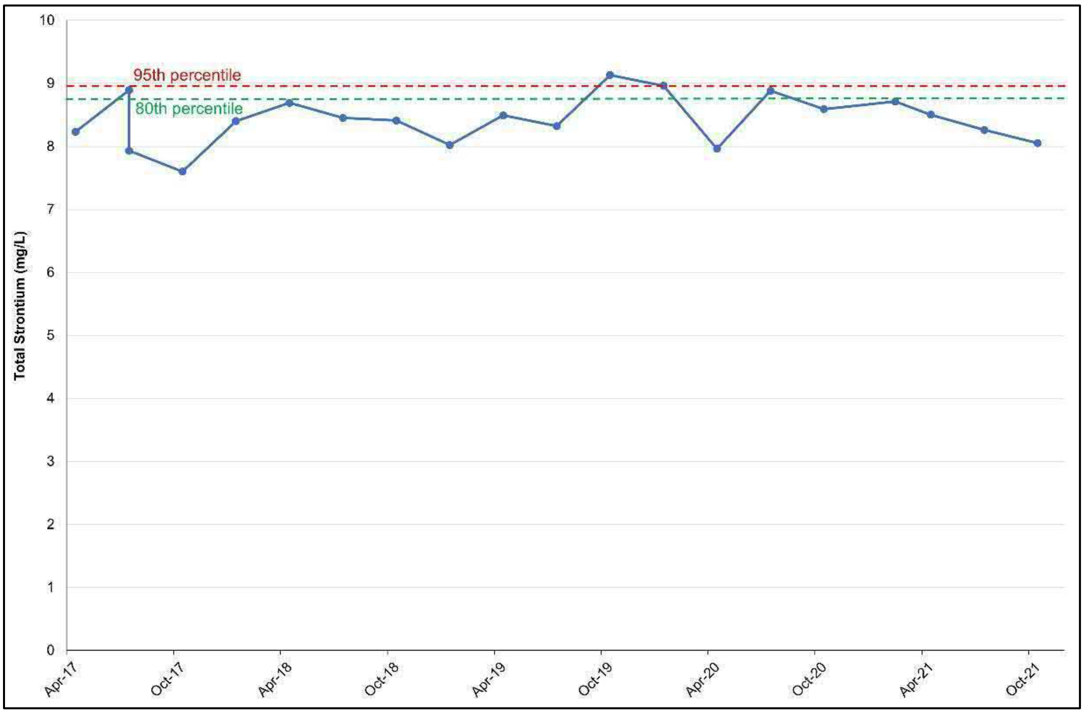

Figure C.71: **Swamp Bore 1 total strontium time series plot.**

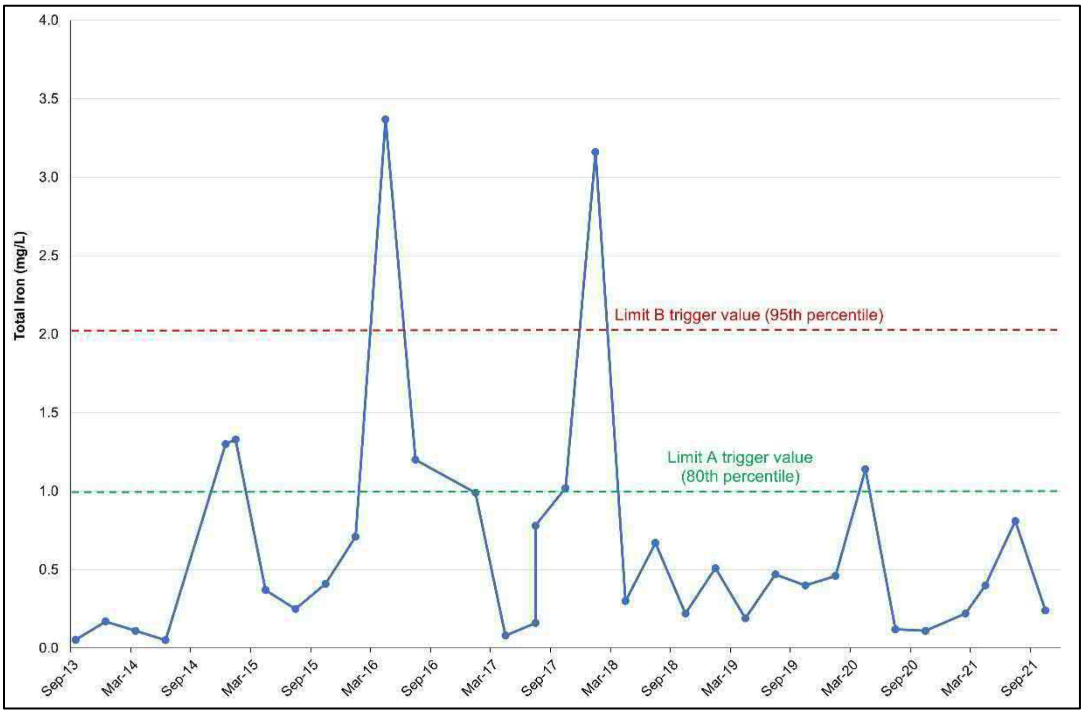

Figure C.72: **Swamp Bore 1 total iron time series plot.**

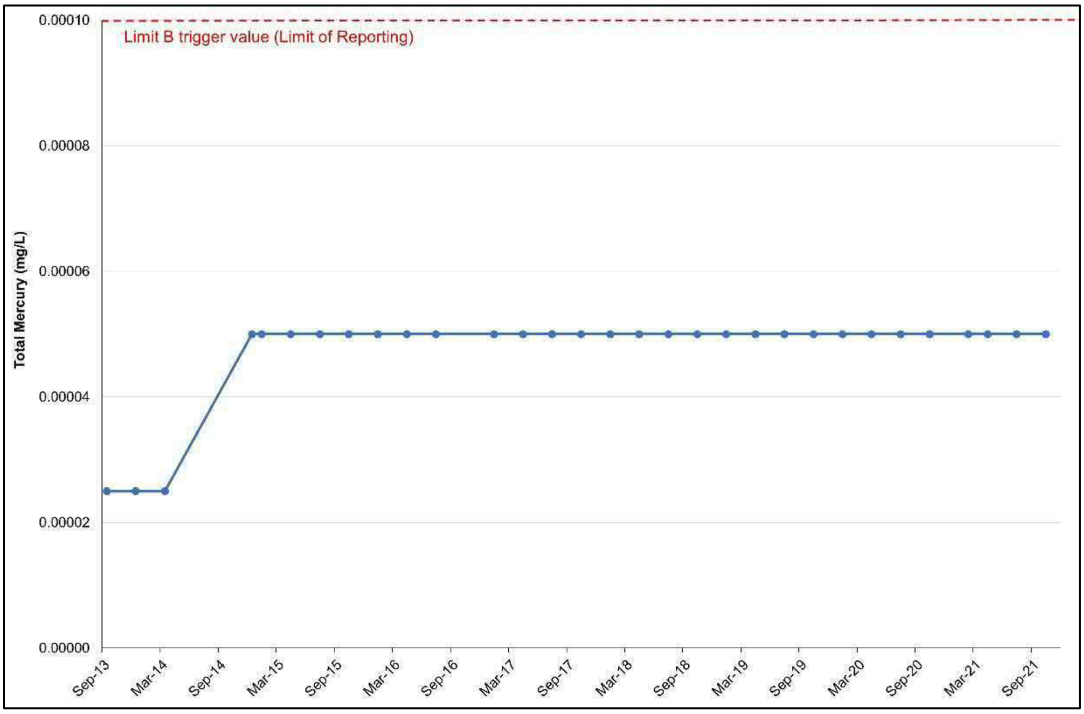

Figure C.73: **Swamp Bore 1 total mercury time series plot.**

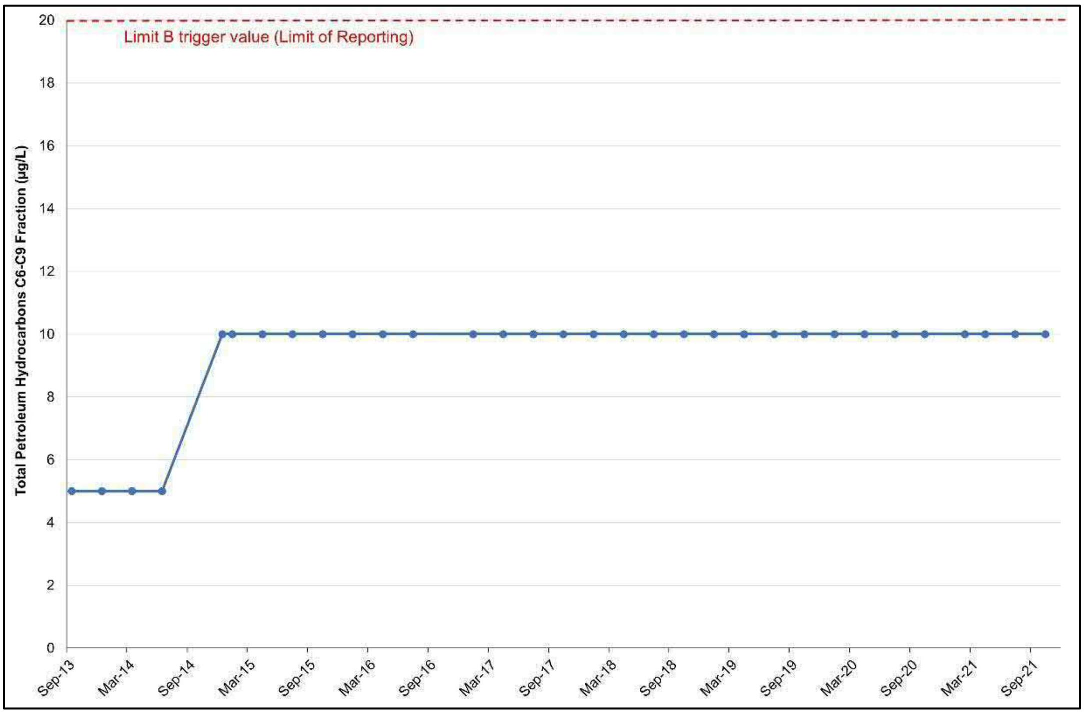

Figure C.74: Swamp Bore 1 total petroleum hydrocarbons C6-C9 fraction time series plot.

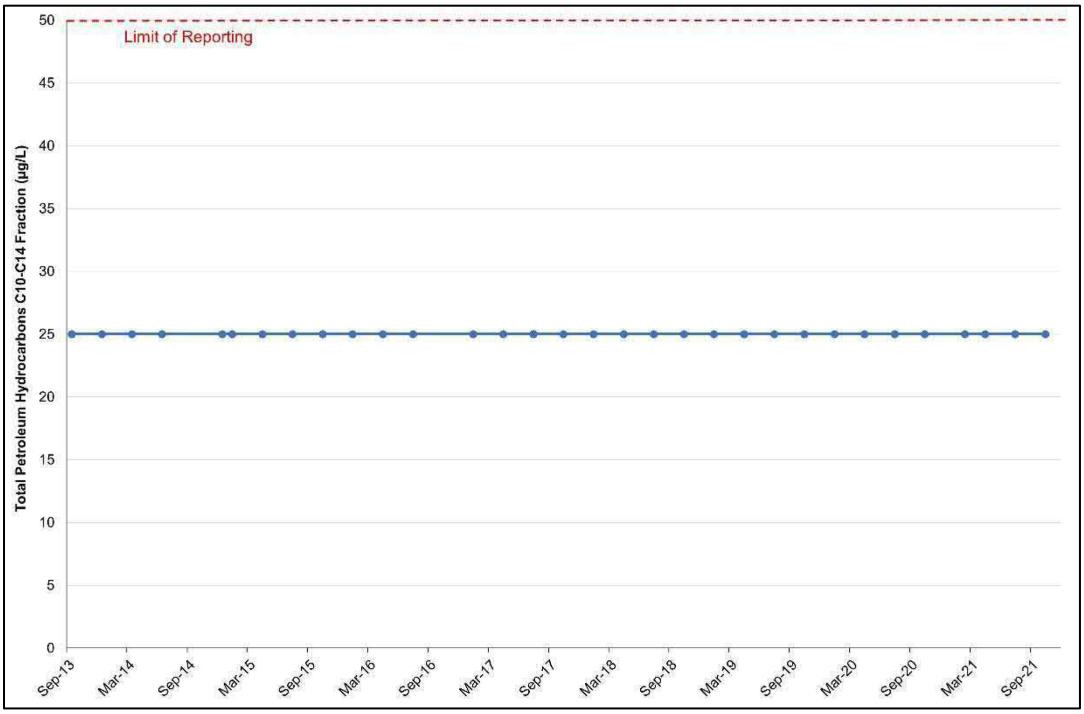

Figure C.75: Swamp Bore 1 total petroleum hydrocarbons C10-C14 fraction time series plot.

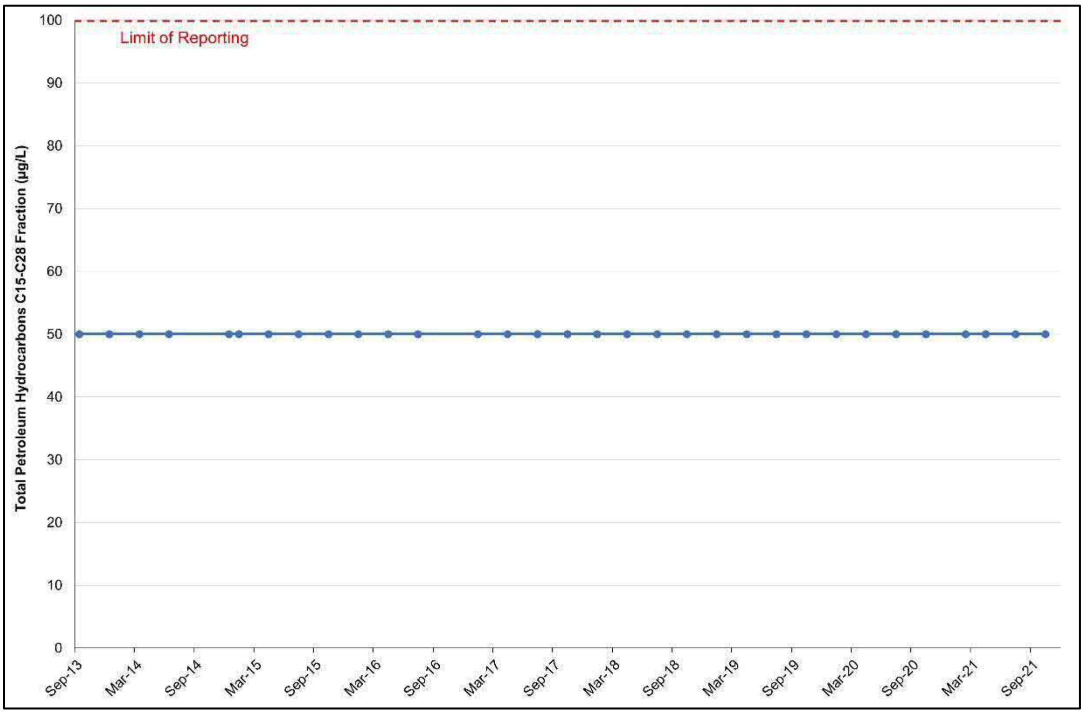

Figure C.76: Swamp Bore 1 total petroleum hydrocarbons C15-C28 fraction time series plot.

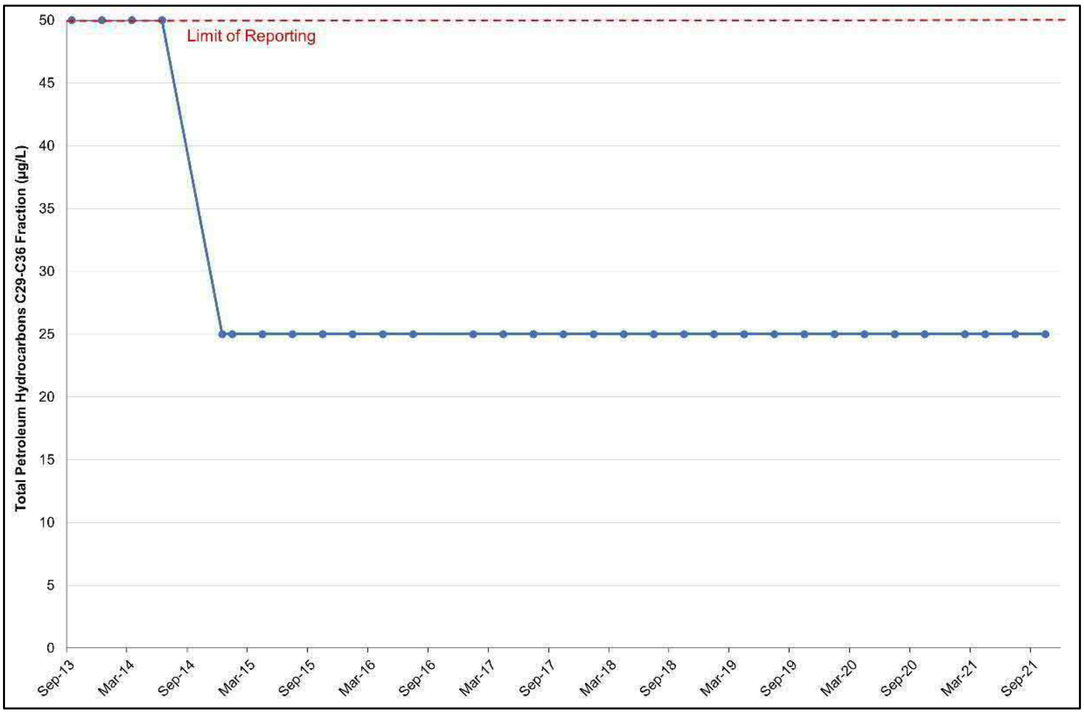

Figure C.77: Swamp Bore 1 total petroleum hydrocarbons C29-C36 fraction time series plot.

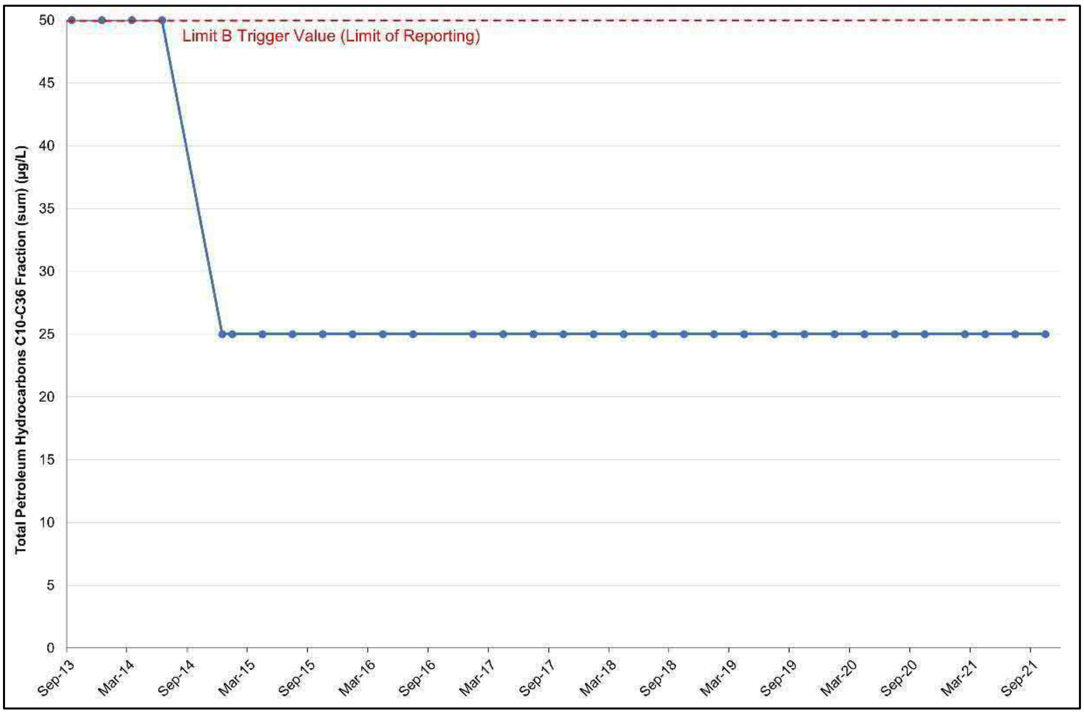

Figure C.78: Swamp Bore 1 total petroleum hydrocarbons C10-C36 fraction (sum) time series plot.

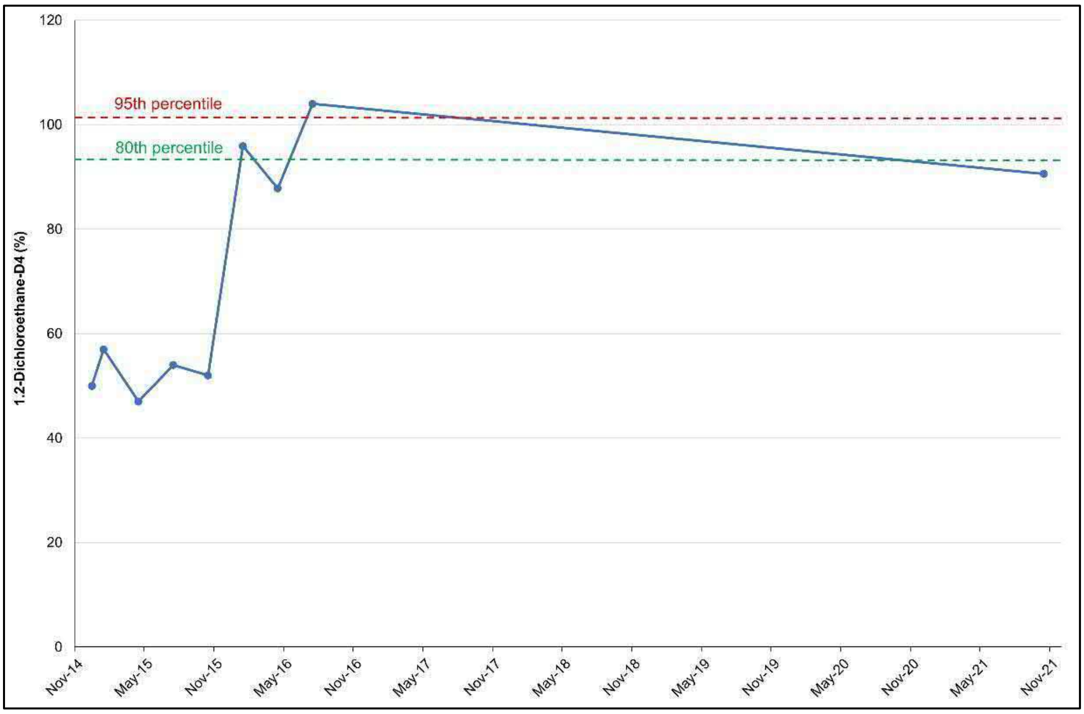

Figure C.79: Swamp Bore 1 1.2-dichloroethane-D4 time series plot.

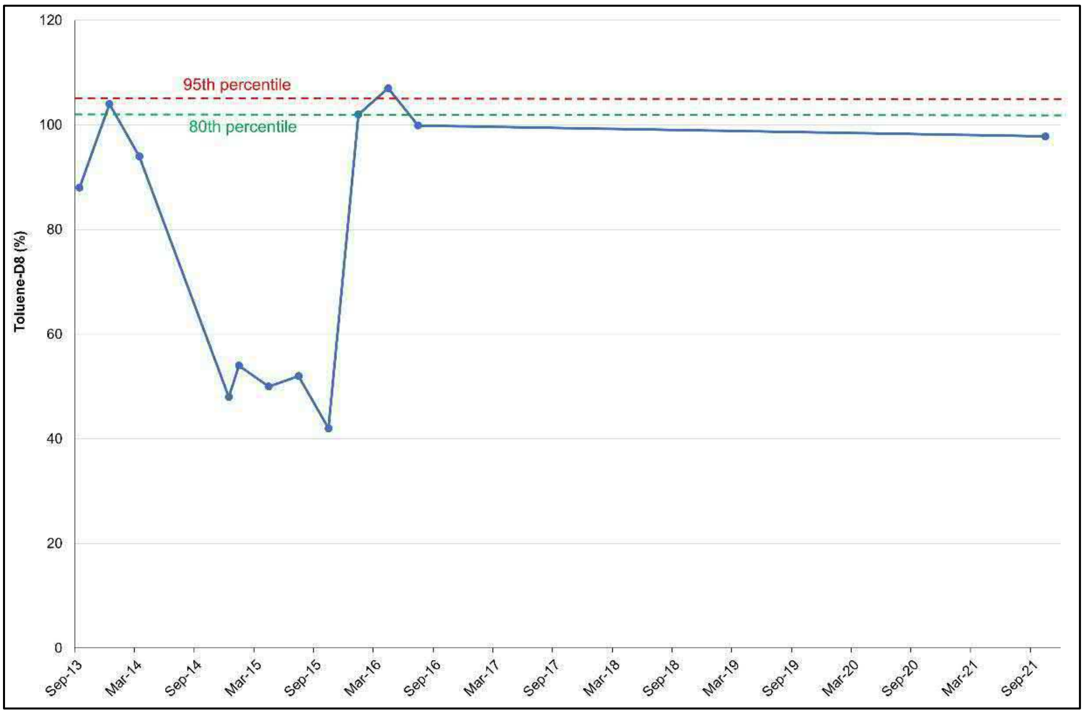

Figure C.80: Swamp Bore 1 toluene-D8 time series plot.

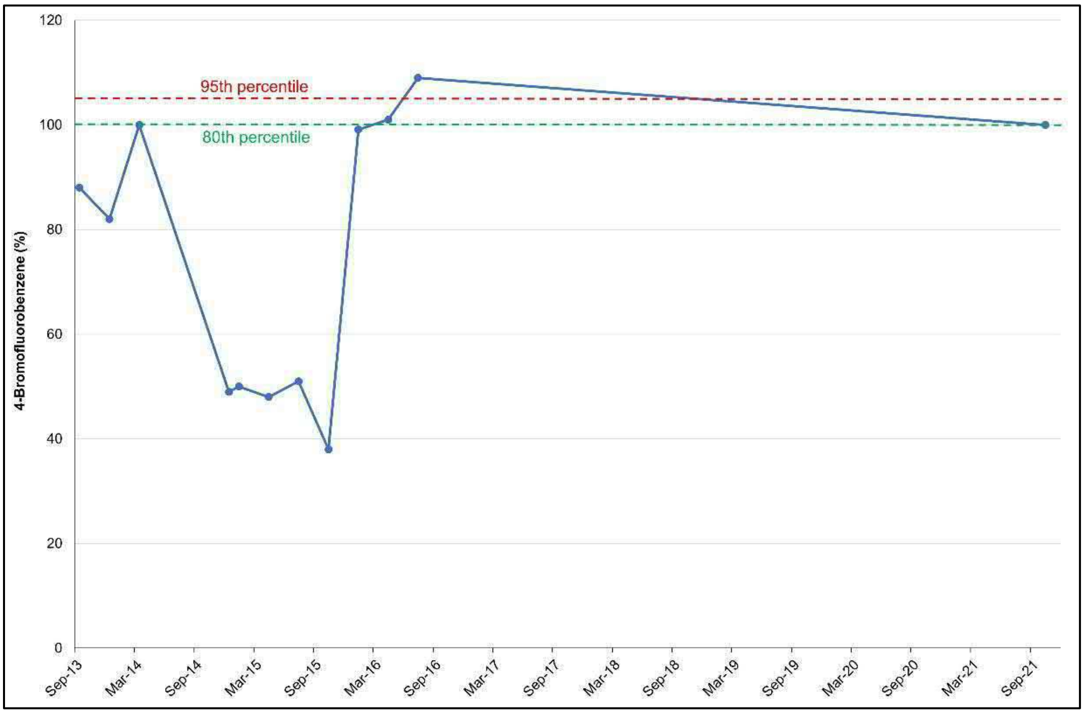

Figure C.81: Swamp Bore 1 4-bromofluorobenzene time series plot.

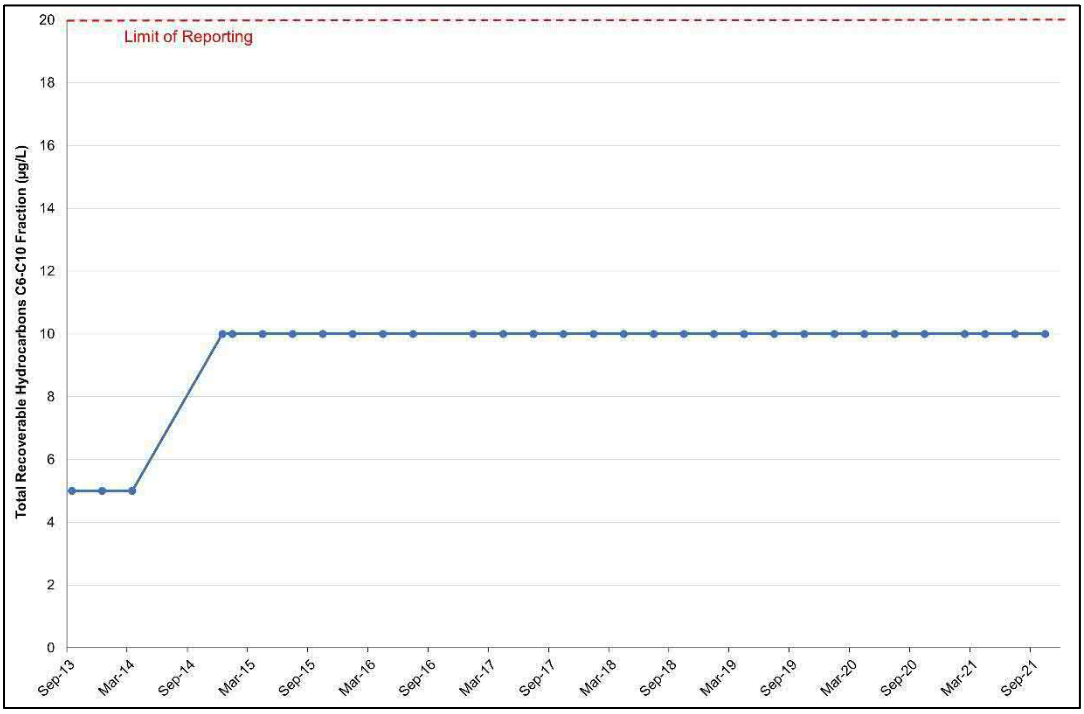

Figure C.82: Swamp Bore 1 total recoverable hydrocarbons C6-C10 fraction time series plot.

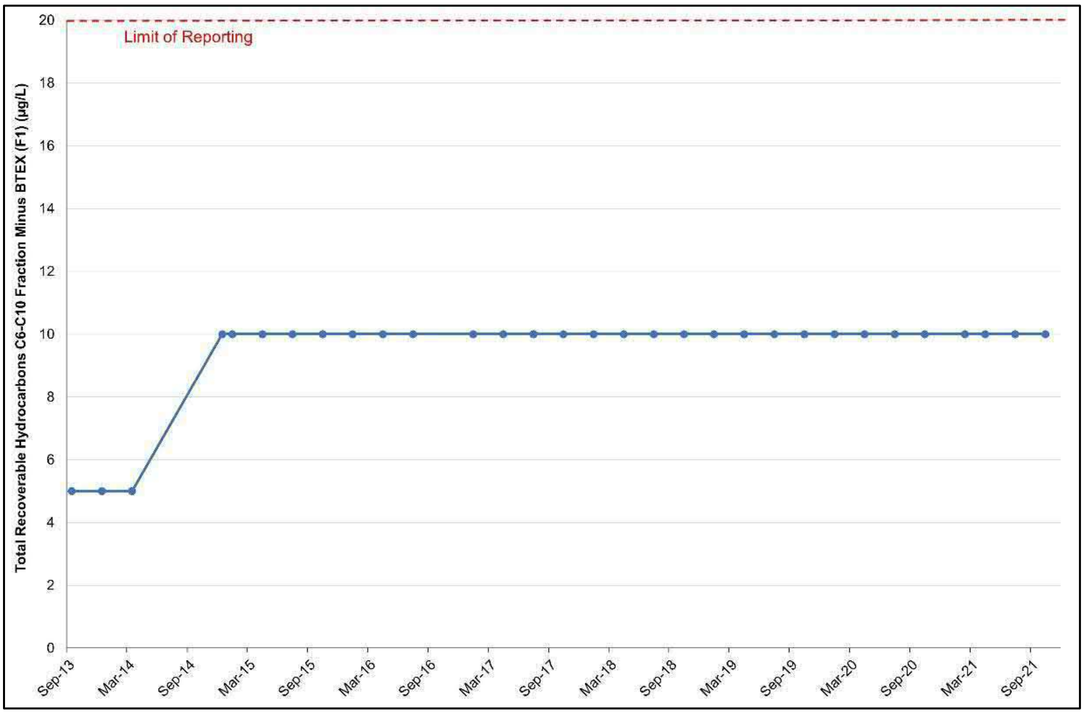

Figure C.83: Swamp Bore 1 total recoverable hydrocarbons C6-C10 fraction minus BTEX (F1) time series plot.

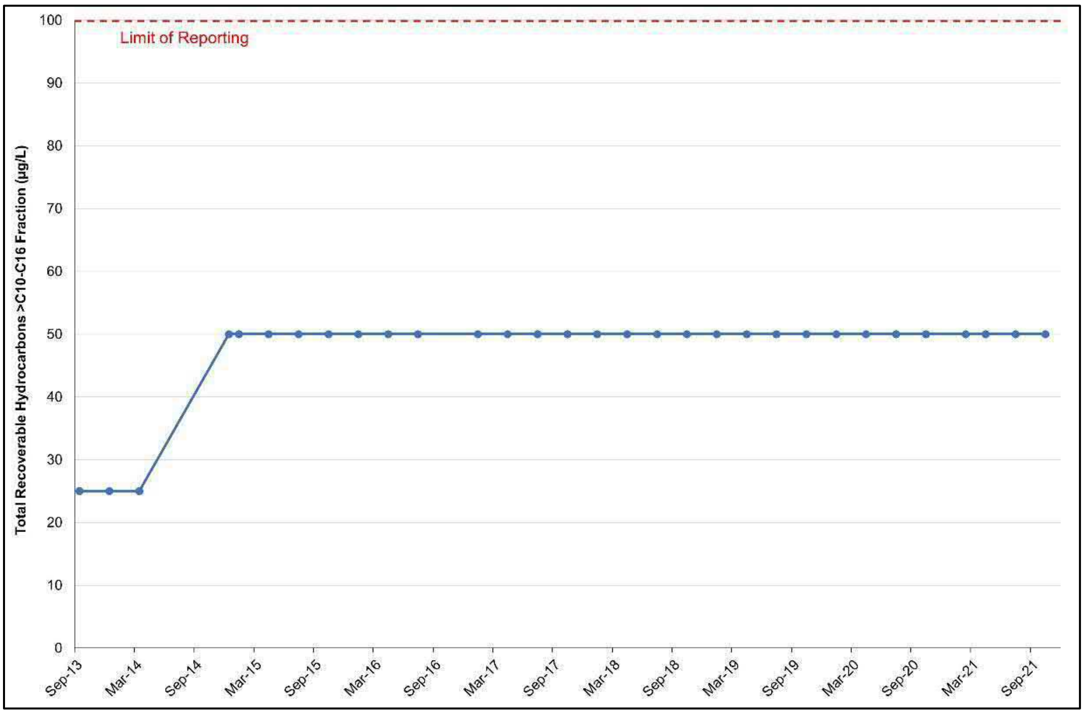

Figure C.84: Swamp Bore 1 total recoverable hydrocarbons >C10-C16 fraction time series plot.

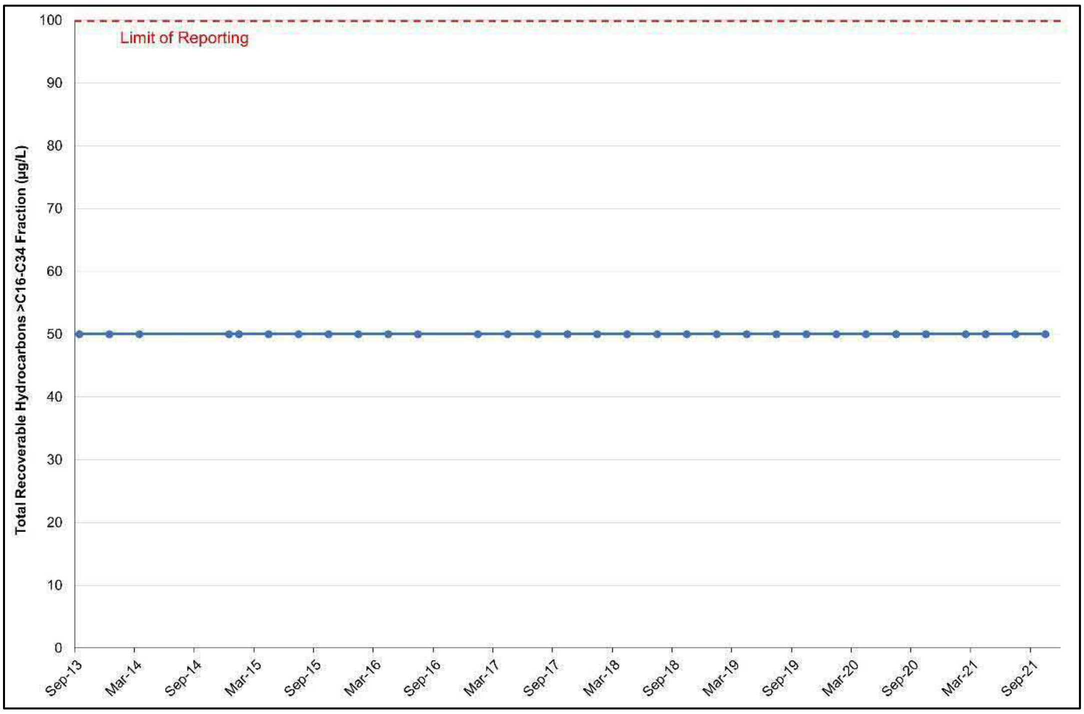

Figure C.85: Swamp Bore 1 total recoverable hydrocarbons >C16-C34 fraction time series plot.

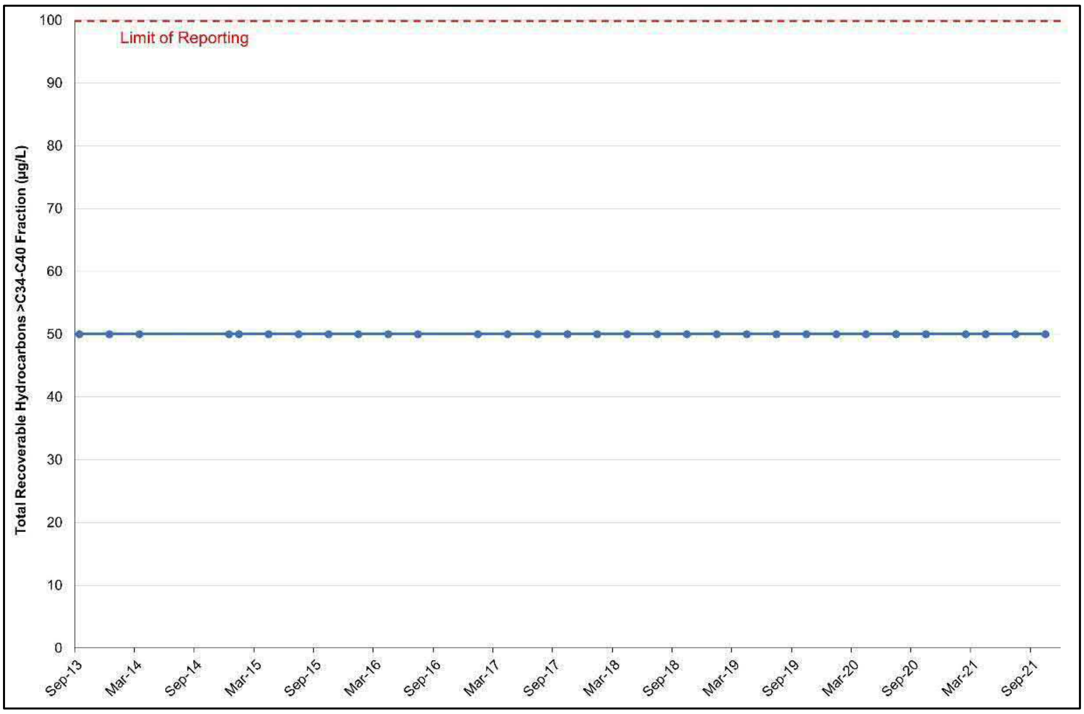

Figure C.86: Swamp Bore 1 total recoverable hydrocarbons >C34-C40 fraction time series plot.

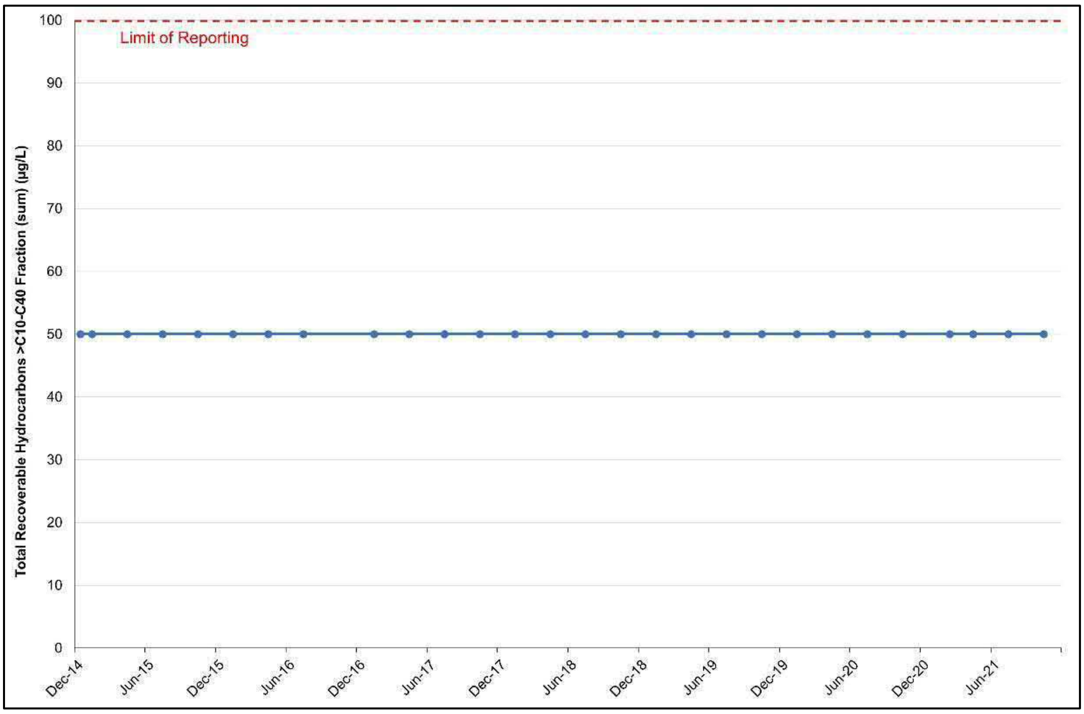

Figure C.87: Swamp Bore 1 total recoverable hydrocarbons >C10-C40 fraction (sum) time series plot.

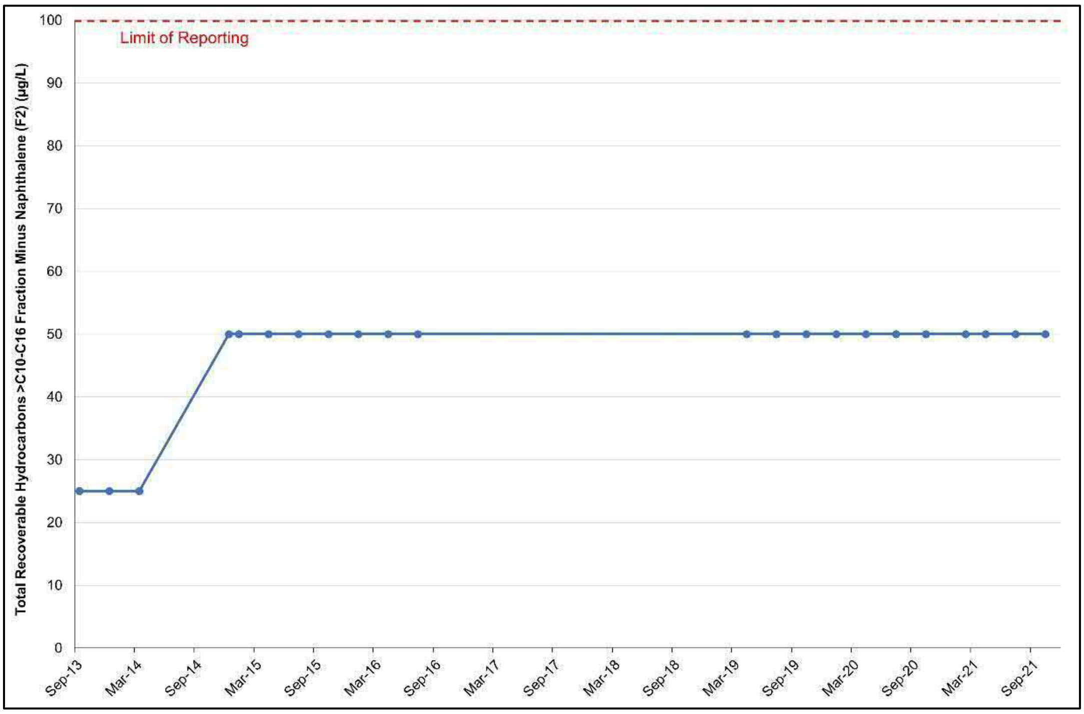

Figure C.88: Swamp Bore 1 total recoverable hydrocarbons >C10-C16 fraction minus naphthalene (F2) time series plot.

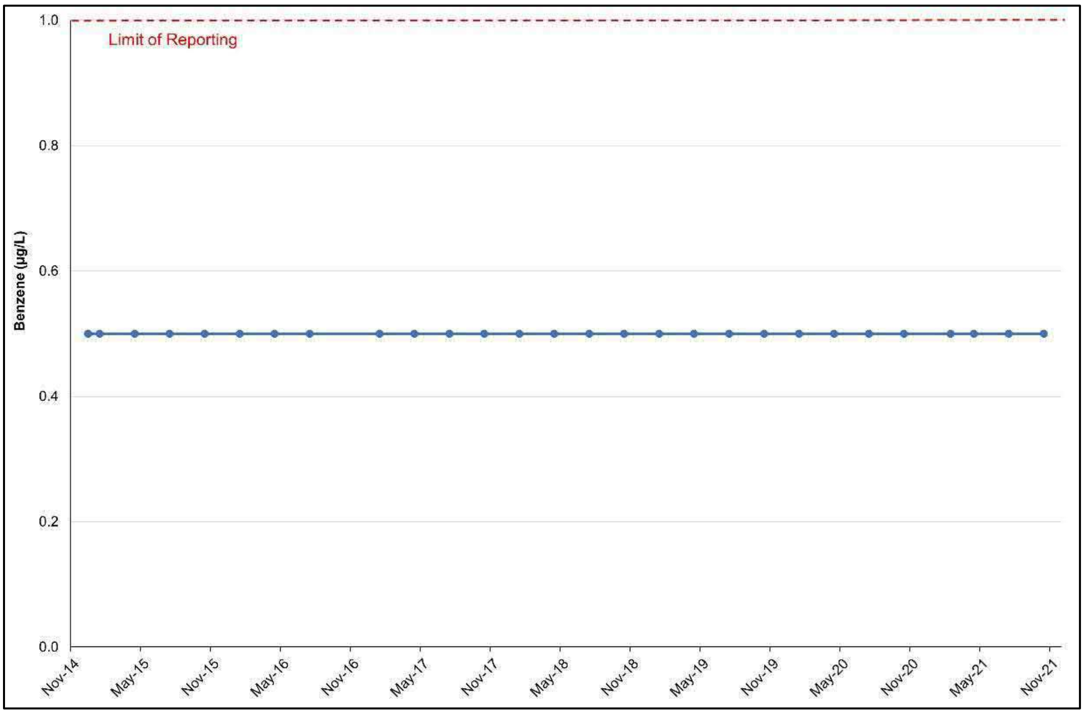

Figure C.89: Swamp Bore 1 benzene time series plot.

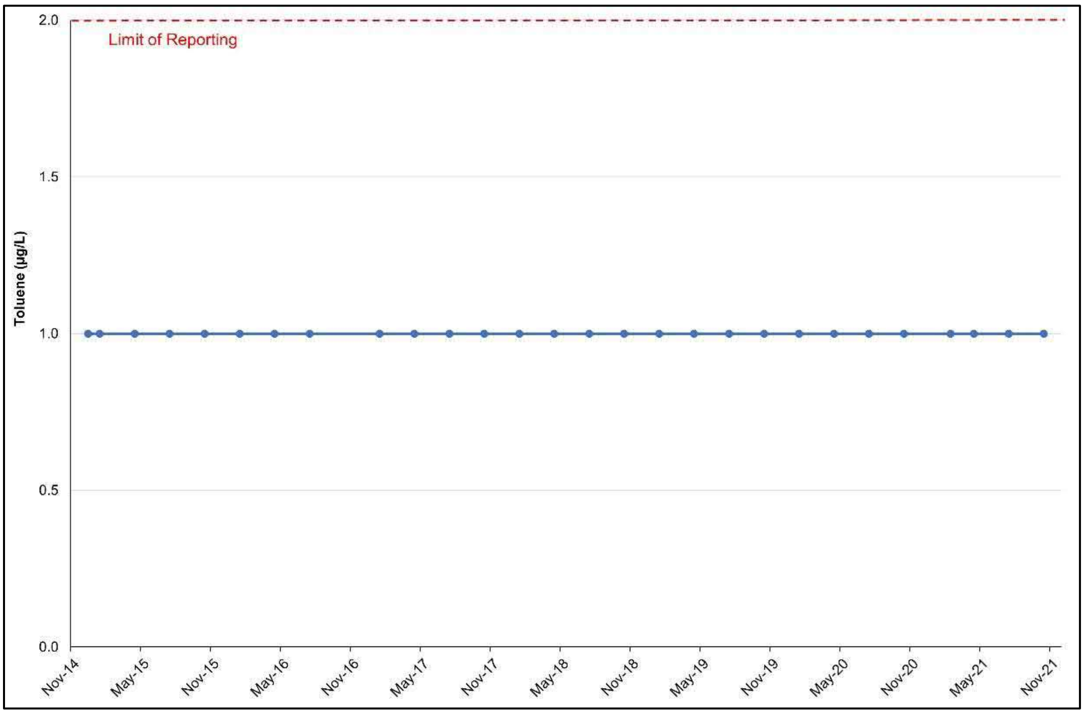

Figure C.90: Swamp Bore 1 toluene time series plot.

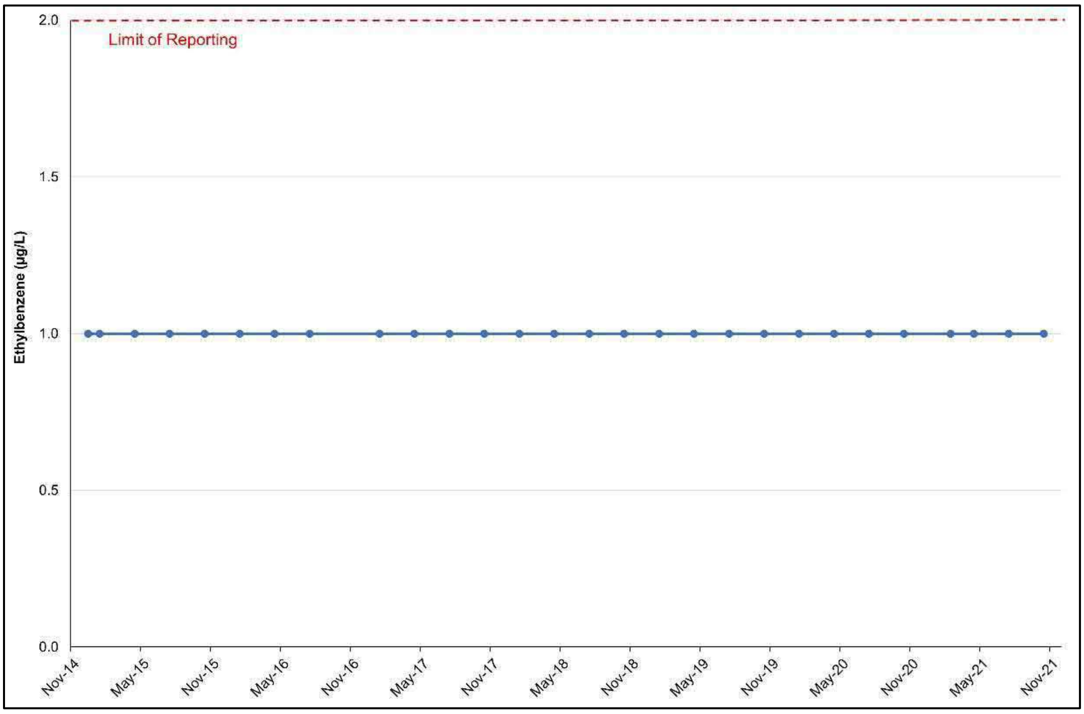

Figure C.91: Swamp Bore 1 ethylbenzene time series plot.

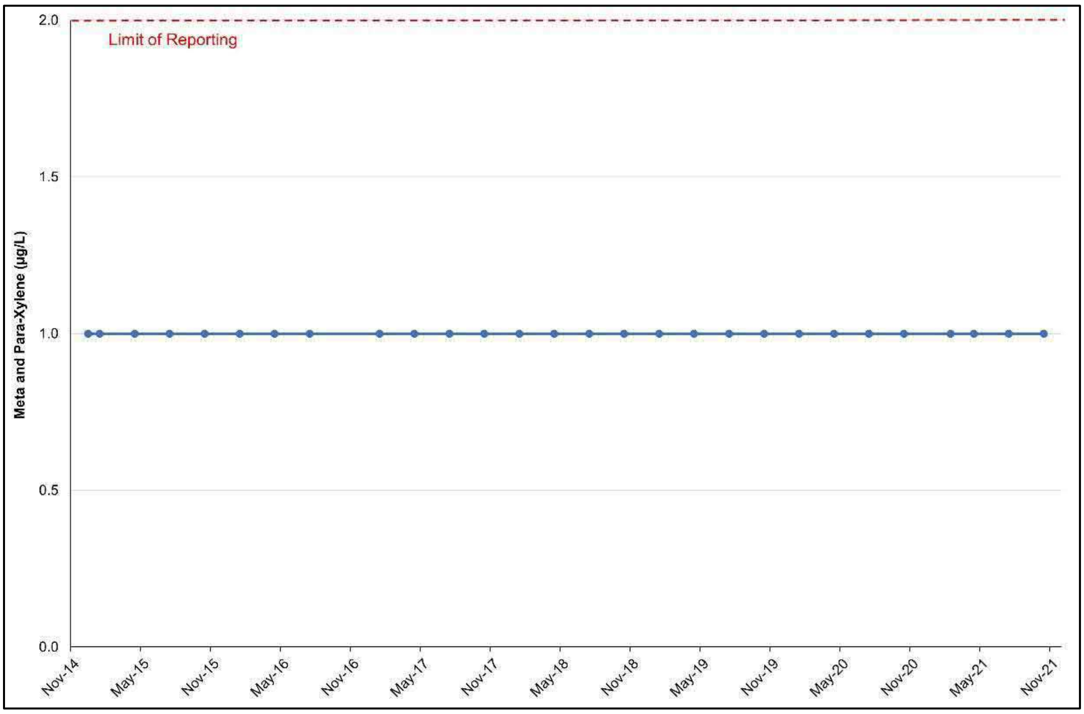

Figure C.92: Swamp Bore 1 meta- and para-xylene time series plot.

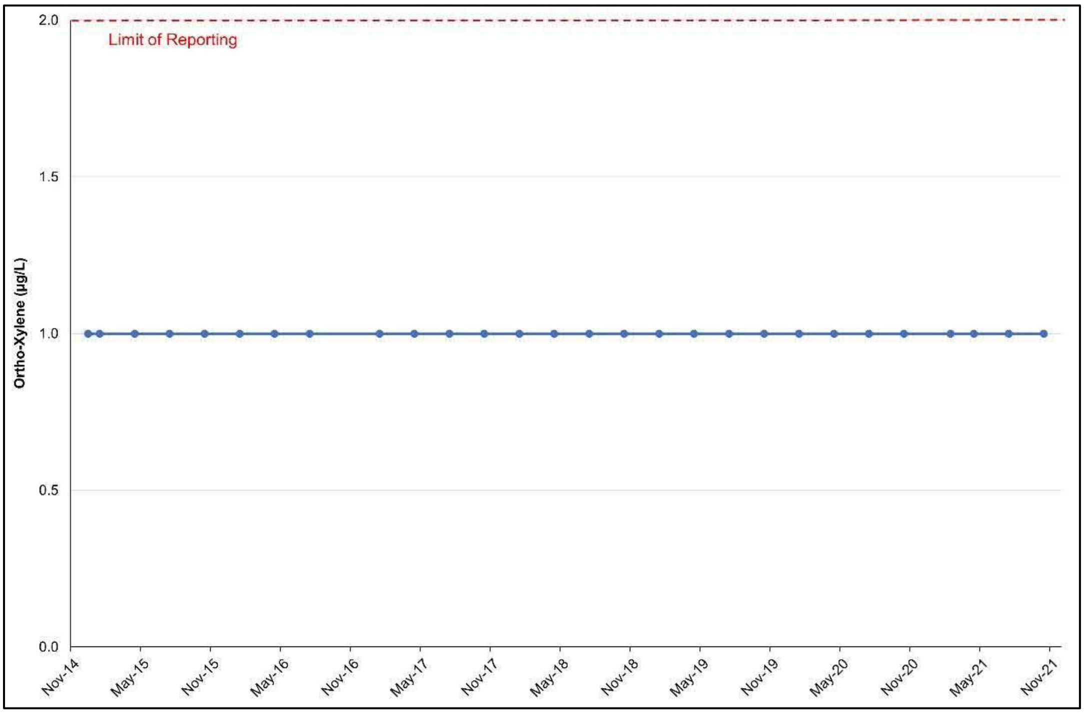

Figure C.93: Swamp Bore 1 ortho-xylene time series plot.

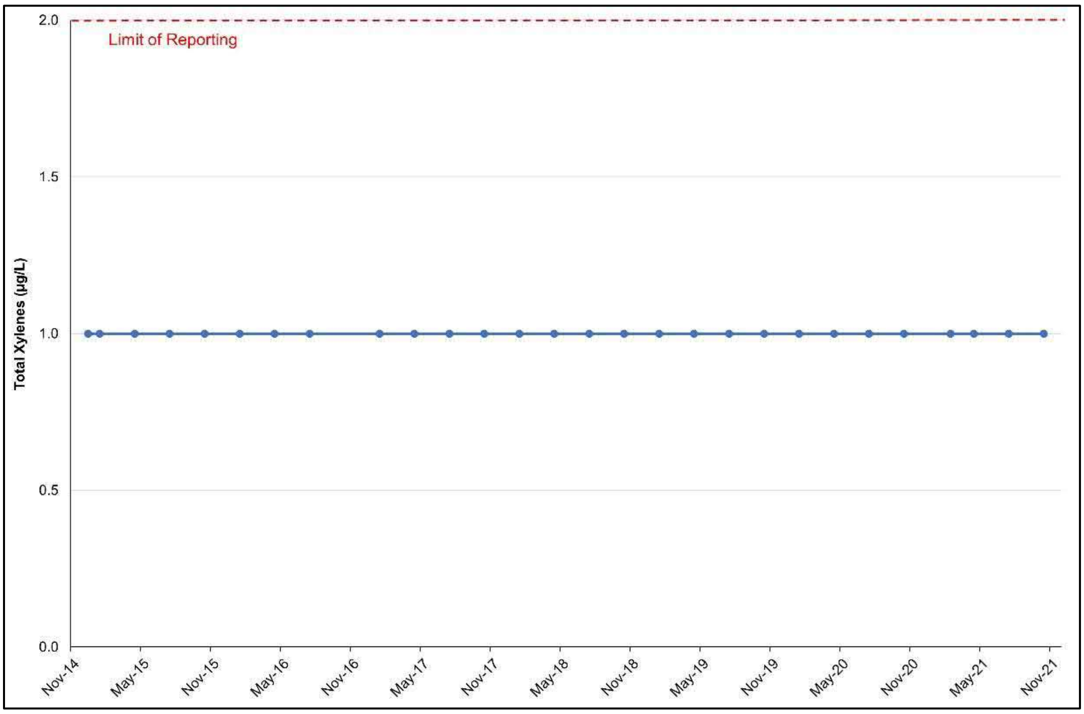

Figure C.94: Swamp Bore 1 total xylenes time series plot.

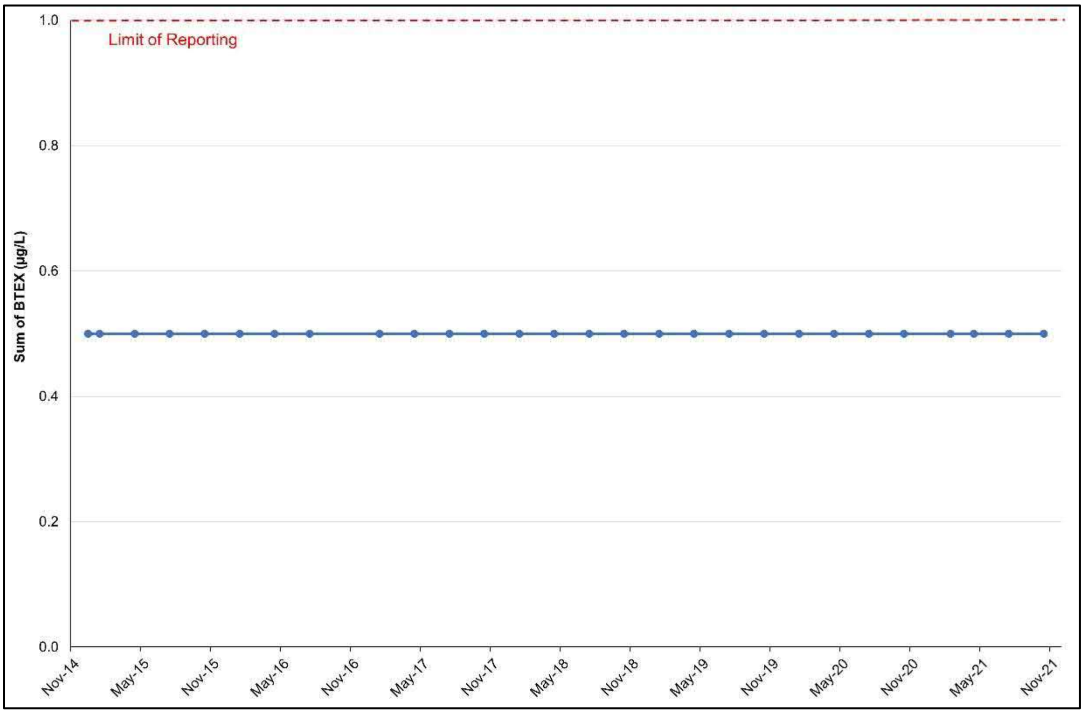

Figure C.95: Swamp Bore 1 sum of BTEX time series plot.

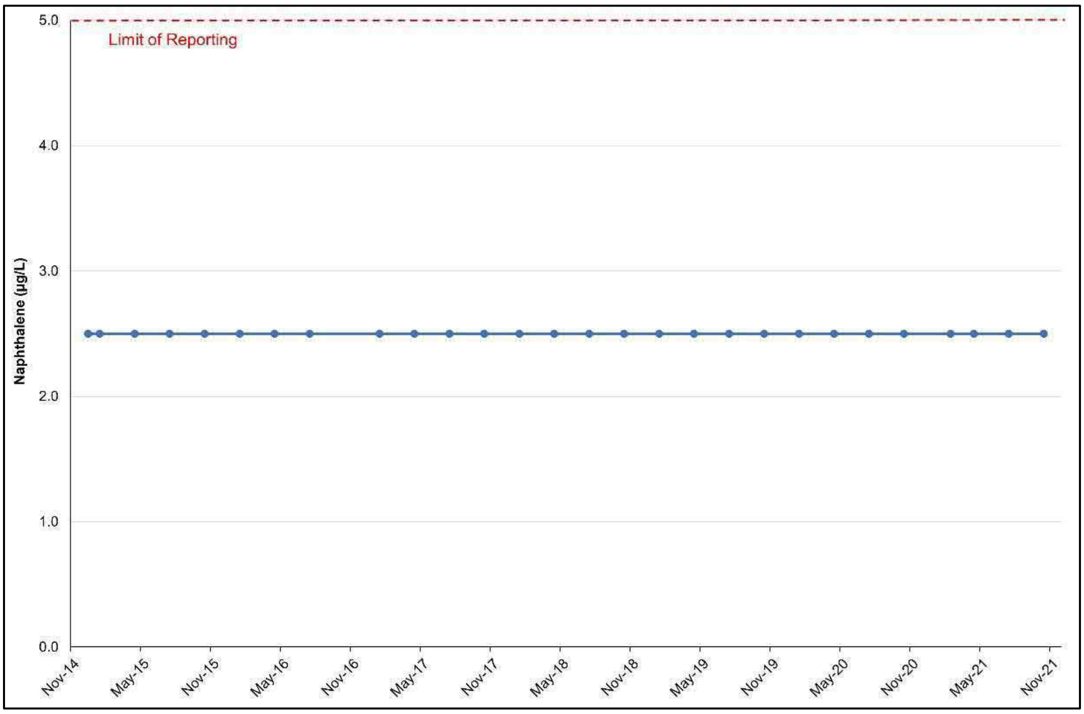

Figure C.96: Swamp Bore 1 sum of naphthalene time series plot.

C.2 MB1 DATA ANALYSIS

Table C.4: MB1 details.

Monitoring Point	Location		Surface RL (mAHD)	Total Depth (m)	Casing Diameter (mm)	Hydro stratigraphic Unit	Screening interval (mbgl)	Monitoring frequency
	Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)						
MB1	618792.842	7572213.928	236.376	28.50	50	Rangal Coal Measures	22.50 – 28.50	Quarterly

Table C.5: MB1 EA-related environmental values and proposed limits.

Parameter	Unit	LOR	Limit Type	Trigger Value – Limit A[1]	Trigger Value – Limit B[2]	Comment
pH	–	0.01	Range	7.45 < > 7.96	7.34 < > 8.11	
EC	µS/cm	1	Maximum	4,064	4,373	
Chloride	mg/L	1	Maximum	1,130	1,213	
Sulphate	mg/L	1	Maximum	49	64	
Calcium	mg/L	1	Maximum	121	135	
Magnesium	mg/L	1	Maximum	131	143	
Sodium	mg/L	1	Maximum	569	622	
Potassium	mg/L	1	Maximum	4	4	
TDS @180°C	mg/L	10	Maximum	2,416	2,579	
TSS	mg/L	5	Maximum	12	16	
Bicarbonate	mg/L	1	Maximum	525	546	
Carbonate	mg/L	1	Maximum	-	1	Representative dataset is all BLOR
Dissolved Aluminum	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Antimony	mg/L	0.001	Maximum	-	0.001	Representative dataset is all BLOR
Dissolved Arsenic	mg/L	0.001	Maximum	0.0076	0.0080	
Dissolved Molybdenum	mg/L	0.001	Maximum	0.0020	0.0059	
Dissolved Selenium	mg/L	0.01	Maximum	-	0.01	Representative dataset is all BLOR
Dissolved Silver	mg/L	0.001	Maximum	-	0.001	Representative dataset is all BLOR
Dissolved Iron	mg/L	0.05	Maximum	0.21	0.39	
Dissolved Mercury	mg/L	0.0001	Maximum	-	0.0001	Representative dataset is all BLOR
C6 - C9 Fraction	µg/L	20	Maximum	-	20	Representative dataset is all BLOR
C10 - C36 Fraction (sum)	µg/L	50	Maximum	-	50	Representative dataset is all BLOR

[1]Exceedances of Limit A are regarded as five consecutive samples exceeding the Limit A value.
[2]Exceedances of Limit B are regarded as three consecutive samples exceeding the Limit B value.

Table C.6: MB1 descriptive statistics.

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
pH	–	0.01	Feb-2017 to Oct-2021	18	7.70	7.33	8.30	7.63	7.34	7.45	7.96	8.11	
Electrical Conductivity	µS/cm	1	Feb-2017 to Oct-2021	18	3,675	3,140	4,390	3,430	3,200	3,354	4,064	4,373	
Chloride	mg/L	1	Feb-2017 to Oct-2021	18	952	756	1,230	872	800	821	1,130	1,213	
Fluoride	mg/L	0.1	Feb-2017 to Oct-2021	18	0.47	0.40	0.60	0.50	0.40	0.40	0.50	0.52	
Sulphate	mg/L	1	Feb-2017 to Oct-2021	18	44	35	99	38	35	36	49	64	
Calcium	mg/L	1	Feb-2017 to Oct-2021	18	102	69	138	97	78	84	121	135	
Magnesium	mg/L	1	Feb-2017 to Oct-2021	18	117	94	153	117	95	104	131	143	
Sodium	mg/L	1	Feb-2017 to Oct-2021	18	518	405	632	517	414	483	569	622	
Potassium	mg/L	1	Feb-2017 to Oct-2021	18	4	3	5	4	3	3	4	4	
Total Anions	meq./L	0.01	Feb-2017 to Oct-2021	18	37.83	32.20	46.50	35.65	33.14	34.44	42.38	45.23	
Total Cations	meq./L	0.01	Feb-2017 to Oct-2021	18	37.32	28.90	46.90	36.80	29.84	33.94	41.54	45.46	
Ionic Balance	%	0.01	Feb-2017 to Oct-2021	18	3.01	0.24	6.06	2.65	0.31	1.91	4.76	6.04	
Total Phosphorous	mg/L	0.01	Feb-2017 to Oct-2021	18	0.02	BLOR	0.10	0.02	BLOR	BLOR	0.04	0.07	Six results were BLOR
Total Dissolved Solids	mg/L	10	Feb-2017 to Oct-2021	18	2,112	1,740	2,800	1,945	1,825	1,872	2,416	2,579	
Suspended Solids	mg/L	5	Feb-2017 to Oct-2021	18	7	BLOR	30	BLOR	BLOR	BLOR	12	16	Twelve results were BLOR
Hydroxide	mg/L	1	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Carbonate	mg/L	1	Feb-2017 to Oct-2021	18	BLOR	BLOR	4	BLOR	BLOR	BLOR	BLOR	BLOR	Seventeen results were BLOR
Bicarbonate	mg/L	1	Feb-2017 to Oct-2021	18	504	444	581	501	464	480	525	546	
Total Alkalinity	mg/L	1	Feb-2017 to Oct-2021	18	504	444	581	501	464	480	525	546	
Dissolved Aluminum	mg/L	0.01	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Dissolved Antimony	mg/L	0.001	Feb-2017 to Oct-2021	18	BLOR	BLOR	0.001	BLOR	BLOR	BLOR	BLOR	BLOR	Seventeen results were BLOR
Dissolved Arsenic	mg/L	0.001	Feb-2017 to Oct-2021	18	0.0047	0.0020	0.0080	0.0040	0.0020	0.0030	0.0076	0.0080	

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
Dissolved Barium	mg/L	0.001	Feb-2017 to Oct-2021	18	0.161	0.062	0.356	0.146	0.088	0.110	0.211	0.242	
Dissolved Molybdenum	mg/L	0.001	Feb-2017 to Oct-2021	18	0.0020	BLOR	0.0110	0.0020	BLOR	0.0010	0.0020	0.0059	Three results were BLOR
Dissolved Rubidium	mg/L	0.001	Feb-2017 to Oct-2021	18	0.004	0.003	0.008	0.004	0.003	0.003	0.004	0.005	
Dissolved Selenium	mg/L	0.01	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Dissolved Silver	mg/L	0.001	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Dissolved Strontium	mg/L	0.001	Feb-2017 to Oct-2021	18	2.457	1.880	3.480	2.240	2.025	2.114	2.974	3.234	
Dissolved Iron	mg/L	0.05	Feb-2017 to Oct-2021	18	0.14	BLOR	0.55	0.09	BLOR	BLOR	0.21	0.39	Five results were BLOR
Dissolved Mercury	mg/L	0.0001	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Aluminum	mg/L	0.01	Feb-2017 to Oct-2021	18	0.098	BLOR	0.730	0.040	BLOR	0.010	0.092	0.322	Two results were BLOR
Total Antimony	mg/L	0.001	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Arsenic	mg/L	0.001	Feb-2017 to Oct-2021	18	0.0046	BLOR	0.0090	0.0045	0.0018	0.0030	0.0070	0.0073	One result was BLOR
Total Barium	mg/L	0.001	Feb-2017 to Oct-2021	18	0.168	0.060	0.366	0.159	0.087	0.107	0.212	0.275	
Total Molybdenum	mg/L	0.001	Feb-2017 to Oct-2021	18	0.0029	BLOR	0.0120	0.0020	BLOR	0.0014	0.0030	0.0077	Two results were BLOR
Total Selenium	mg/L	0.01	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Silver	mg/L	0.001	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Strontium	mg/L	0.001	Feb-2017 to Oct-2021	18	2.45	2.04	3.47	2.29	2.04	2.11	2.87	3.05	
Total Iron	mg/L	0.05	Feb-2017 to Oct-2021	18	0.34	BLOR	1.54	0.22	0.06	0.09	0.49	0.81	One result was BLOR
Total Mercury	mg/L	0.0001	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C6 - C9 Fraction	µg/L	20	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C10 – C14 Fraction	µg/L	50	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C15 – C28 Fraction	µg/L	100	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C29 – C36 Fraction	µg/L	50	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TPH C10 - C36 Fraction (sum)	µg/L	50	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR

Parameter	Unit	LOR	Date Range	Count	Mean	Minimum	Maximum	Median	5th Percentile	20th Percentile	80th Percentile	95th Percentile	Comment
1.2-Dichloroethane-D4	%	2	Oct-2021	1	89.2	89.2	89.2	89.2	89.2	89.2	89.2	89.2	
Toluene-D8	%	2	Oct-2021	1	97.0	97.0	97.0	97.0	97.0	97.0	97.0	97.0	
4-Bromofluorobenzene	%	2	Oct-2021	1	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	
TRH C6 – C10 Fraction	µg/L	20	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH C6 – C10 Fraction minus BTEX (F1)	µg/L	20	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C16 Fraction	µg/L	100	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C16 – C34 Fraction	µg/L	100	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C34 – C40 Fraction	µg/L	100	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C40 Fraction (sum)	µg/L	100	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
TRH >C10 – C16 Fraction minus Naphthalene (F2)	µg/L	100	Apr-2019 to Oct-2021	11	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Benzene	µg/L	1	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Toluene	µg/L	2	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Ethylbenzene	µg/L	2	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
meta- and para-Xylene	µg/L	2	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
ortho-Xylene	µg/L	2	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Total Xylenes	µg/L	2	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Sum of BTEX	µg/L	1	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR
Naphthalene	µg/L	5	Feb-2017 to Oct-2021	18	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	BLOR	All results were BLOR

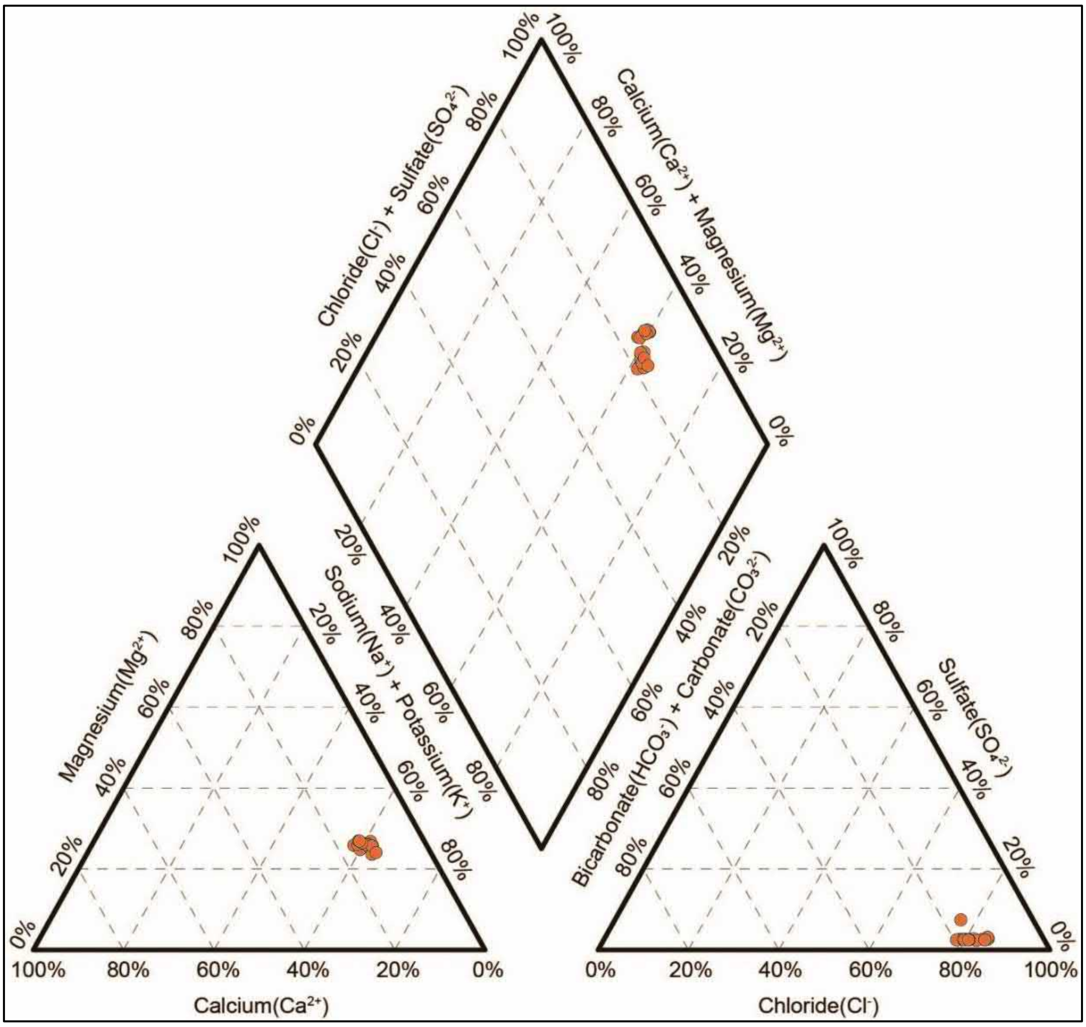

Figure C.97: Ionic composition of MB1.

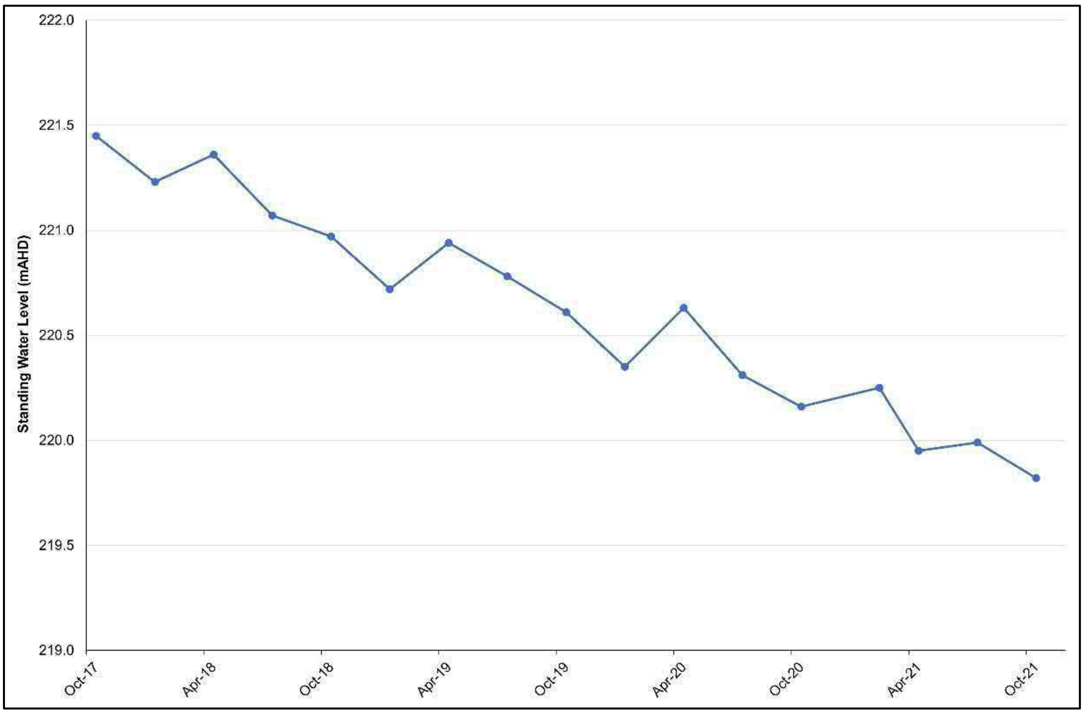

Figure C.98: MB1 standing water level time series plot.

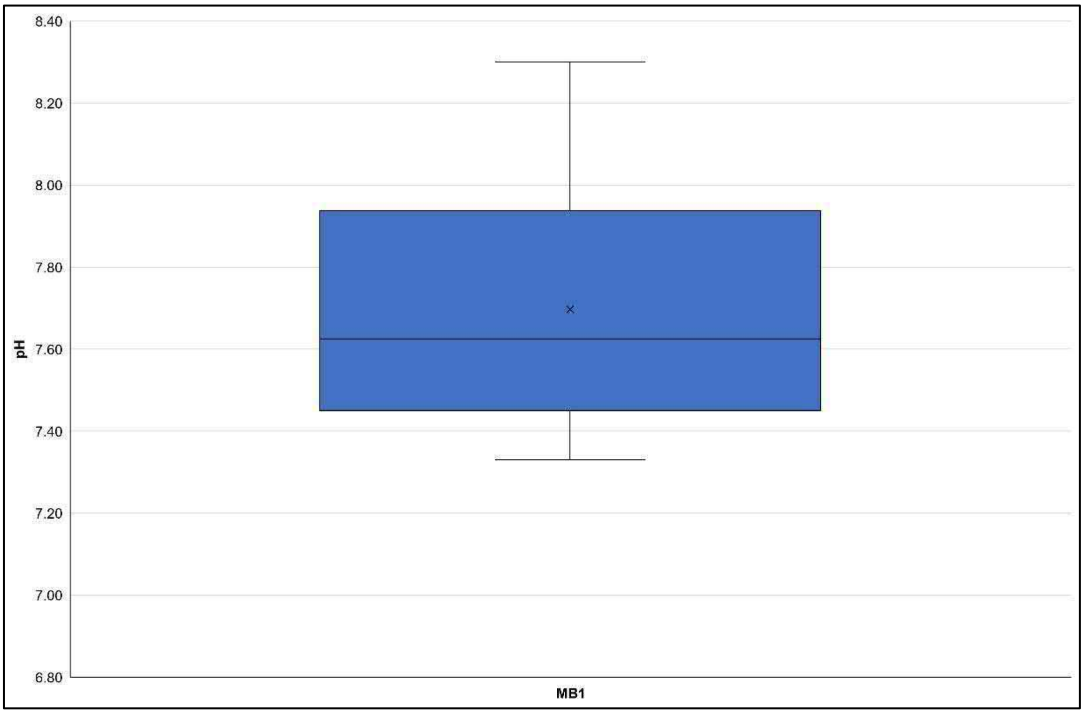

Figure C.99: MB1 pH box plot.

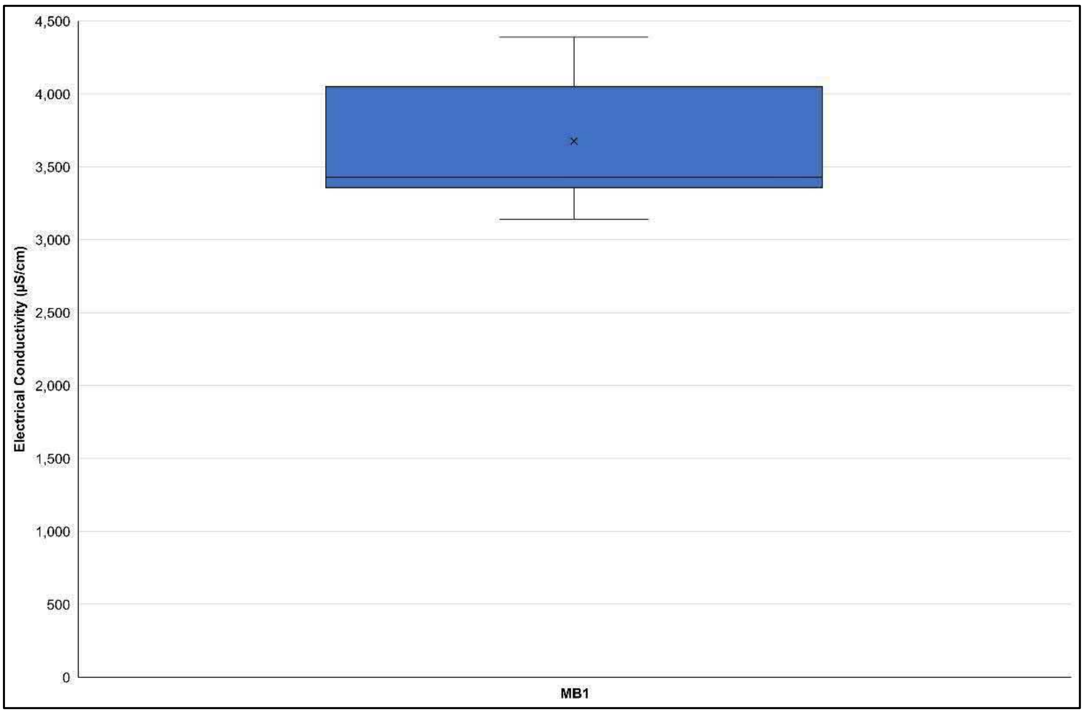

Figure C.100:MB1 EC box plot.

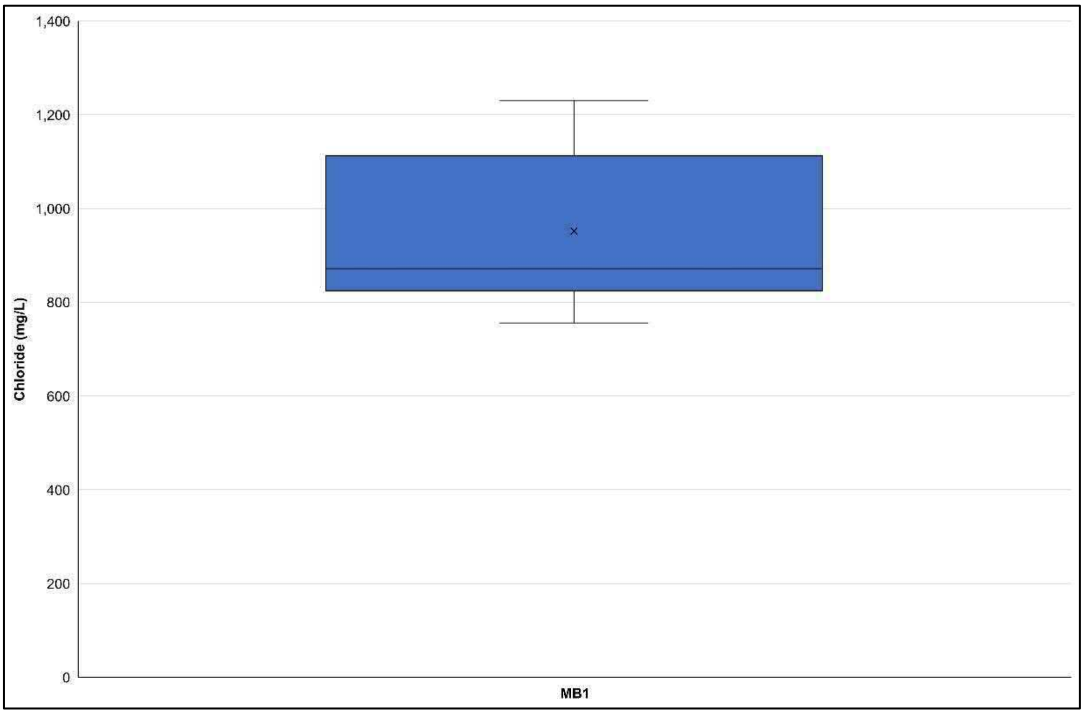

Figure C.101: **MB1 chloride box plot.**

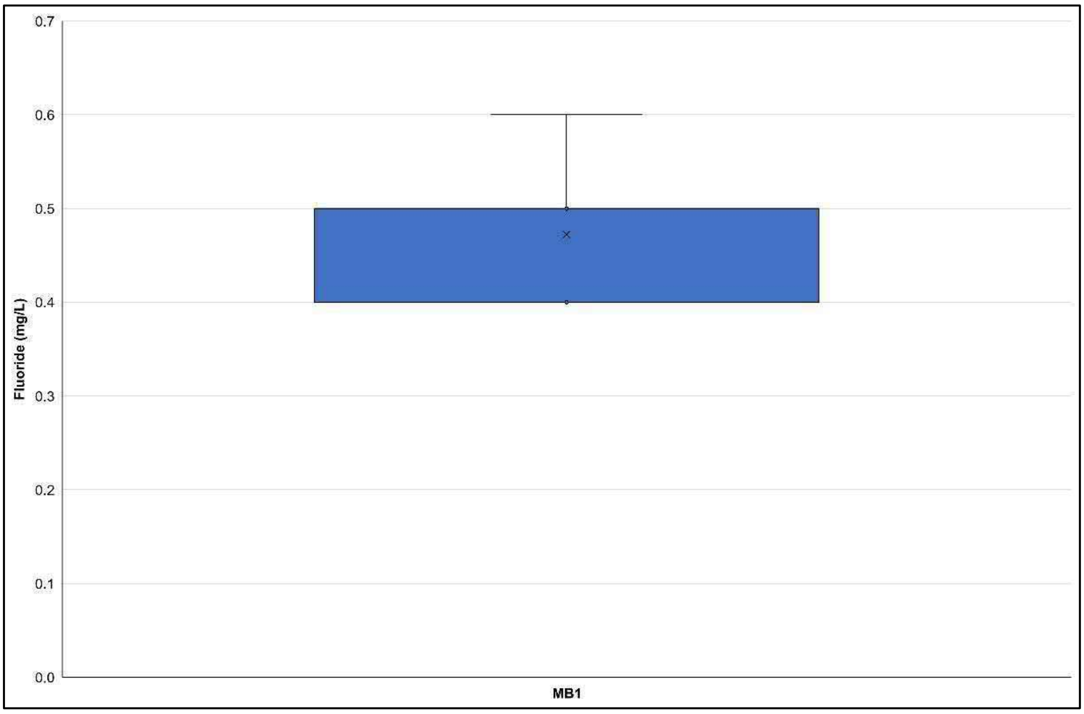

Figure C.102: **MB1 fluoride box plot.**

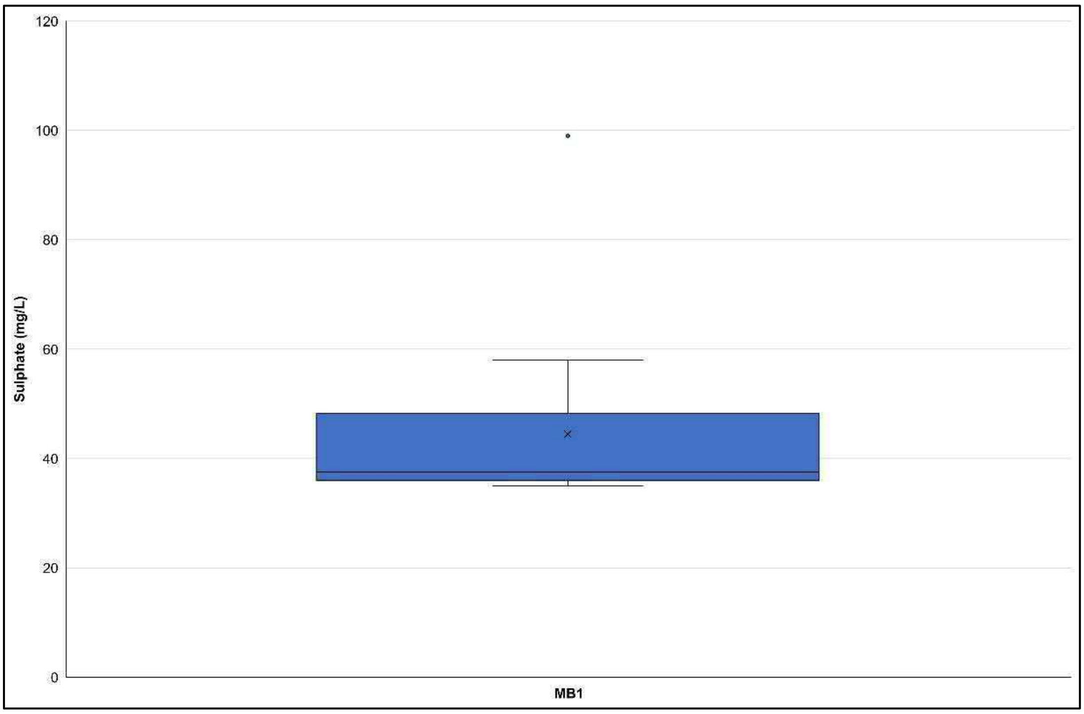

Figure C.103: MB1 sulphate box plot.

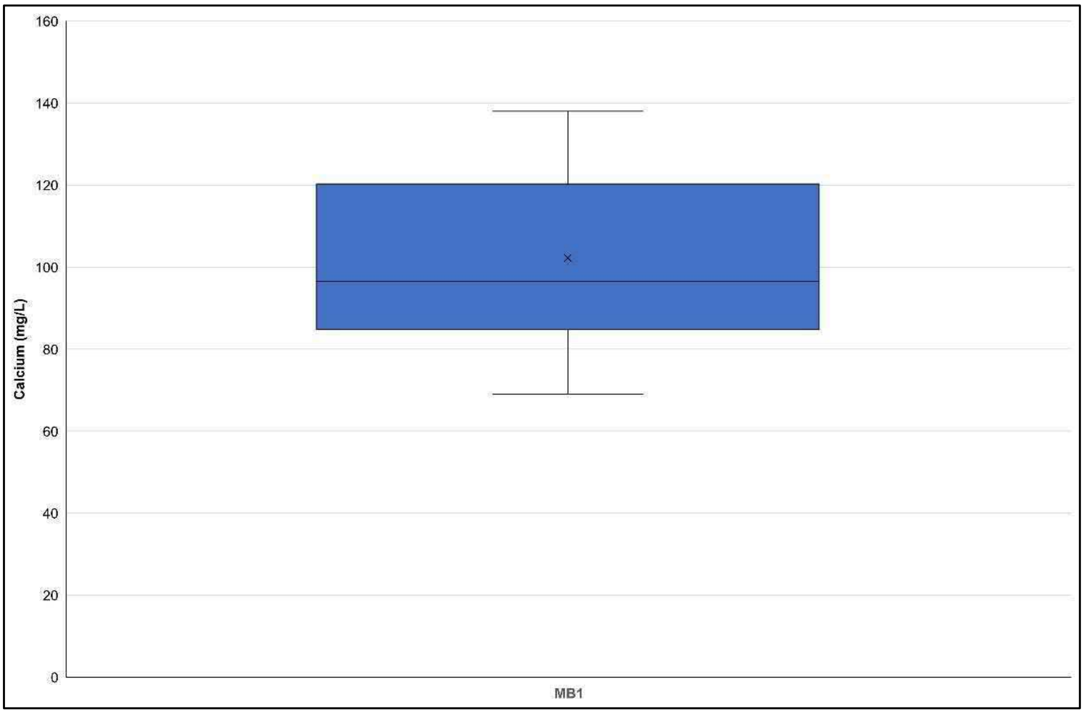

Figure C.104: MB1 calcium box plot.

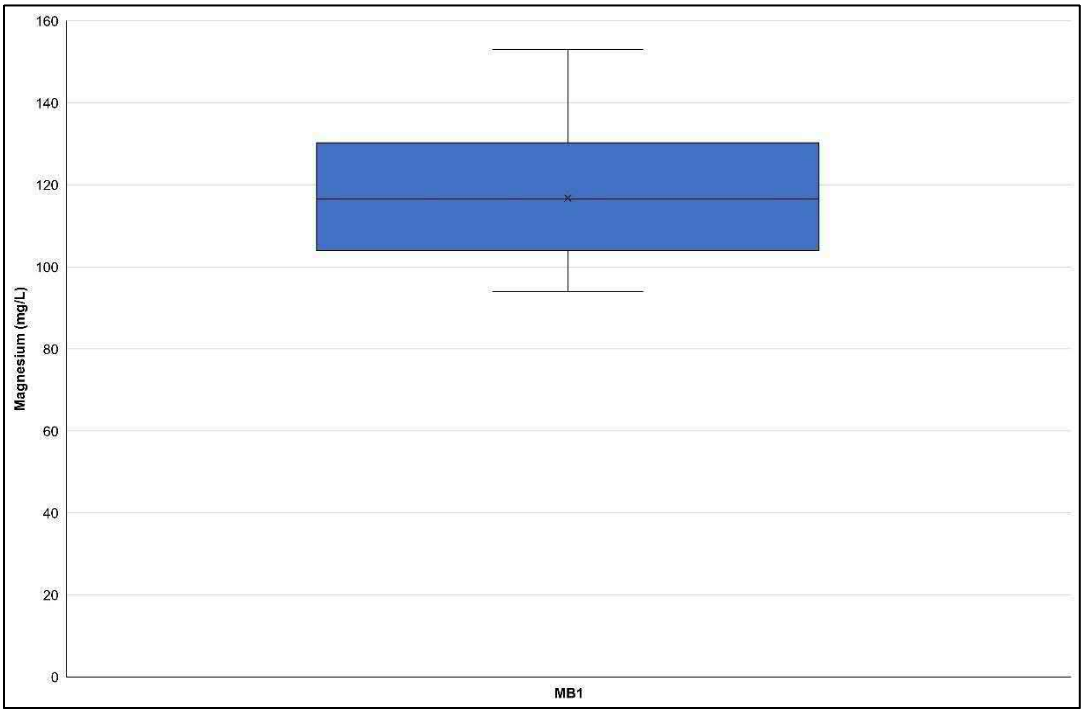

Figure C.105: MB1 magnesium box plot.

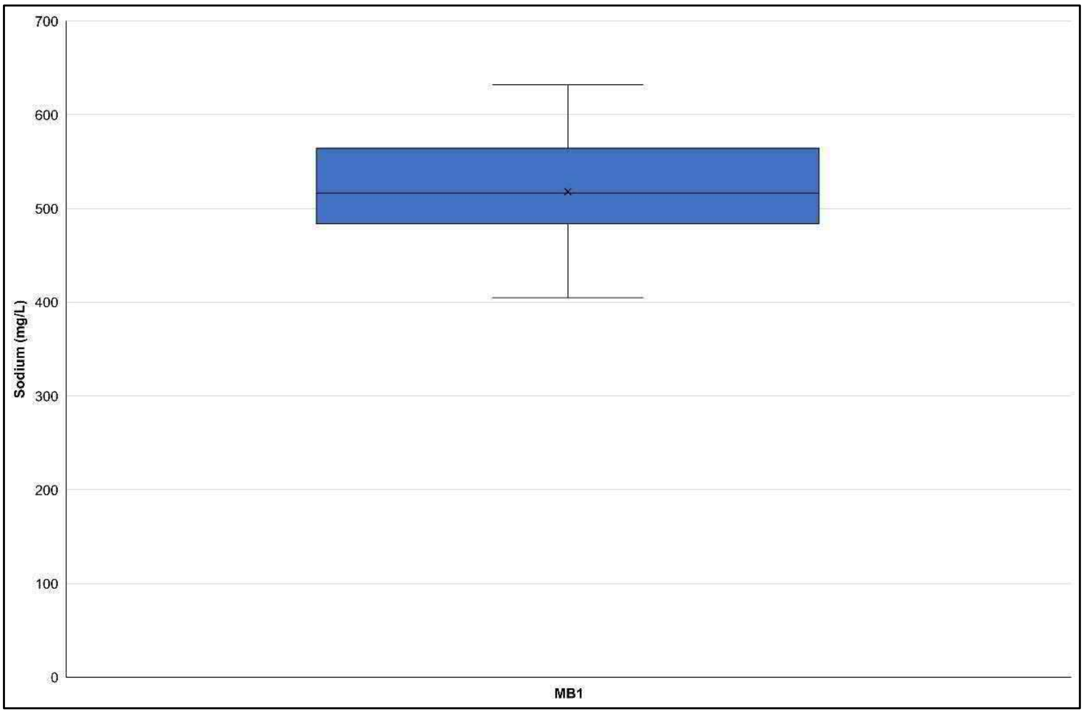

Figure C.106: MB1 sodium box plot.

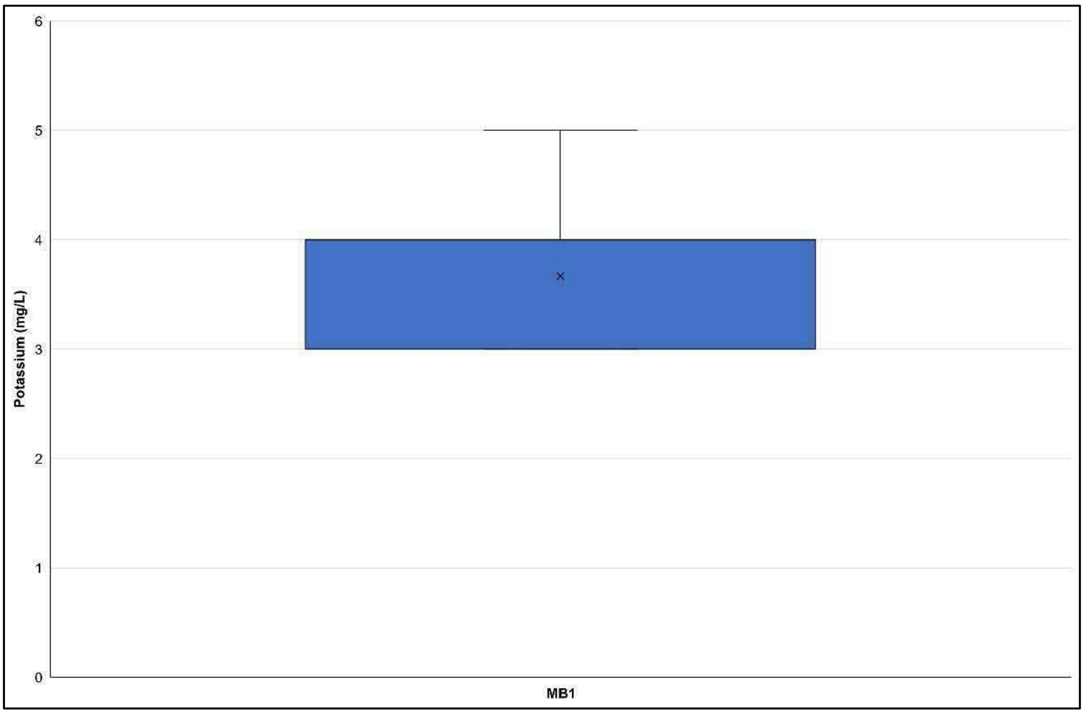

Figure C.107: MB1 potassium box plot.

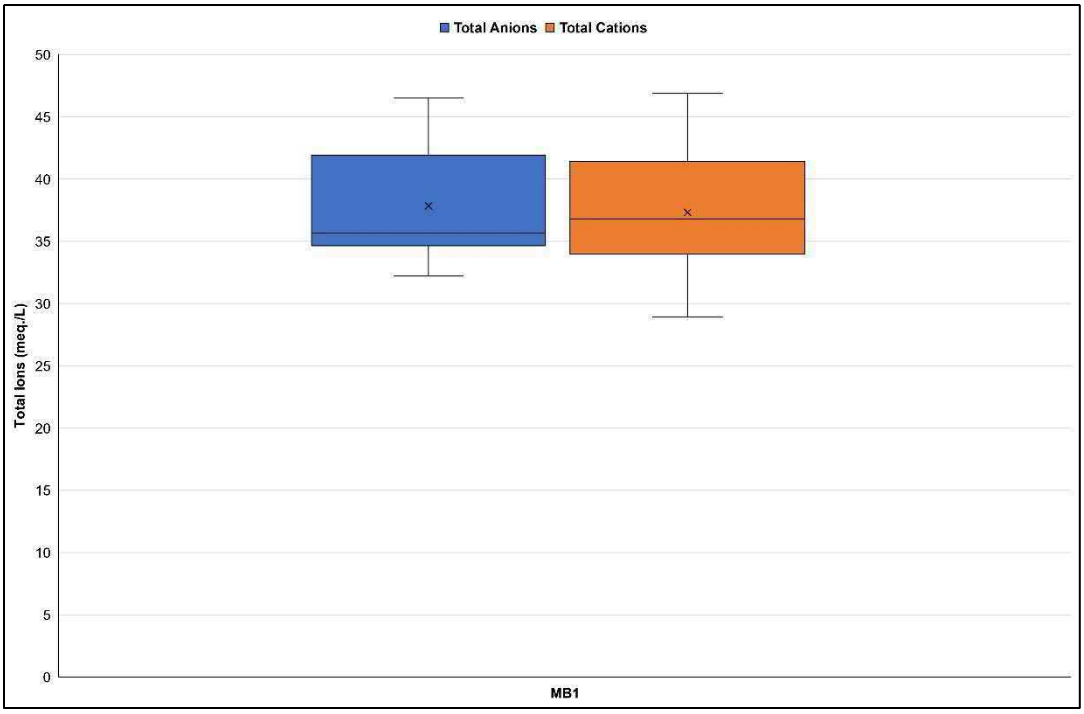

Figure C.108: MB1 total ions box plot.

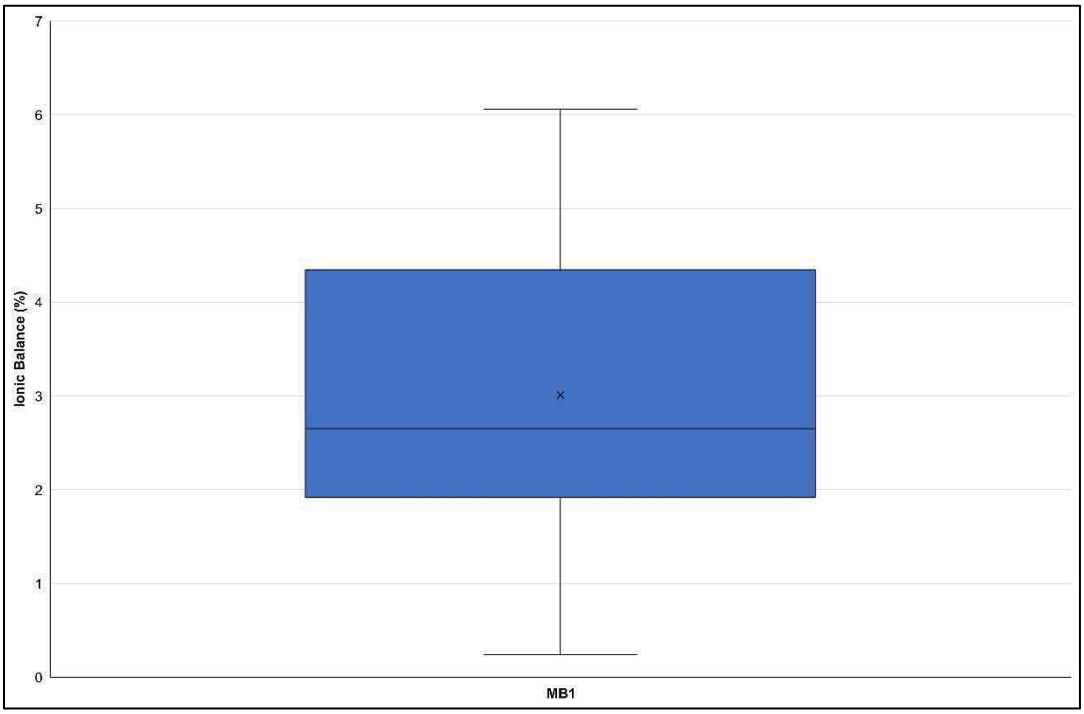

Figure C.109: MB1 ionic balance box plot.

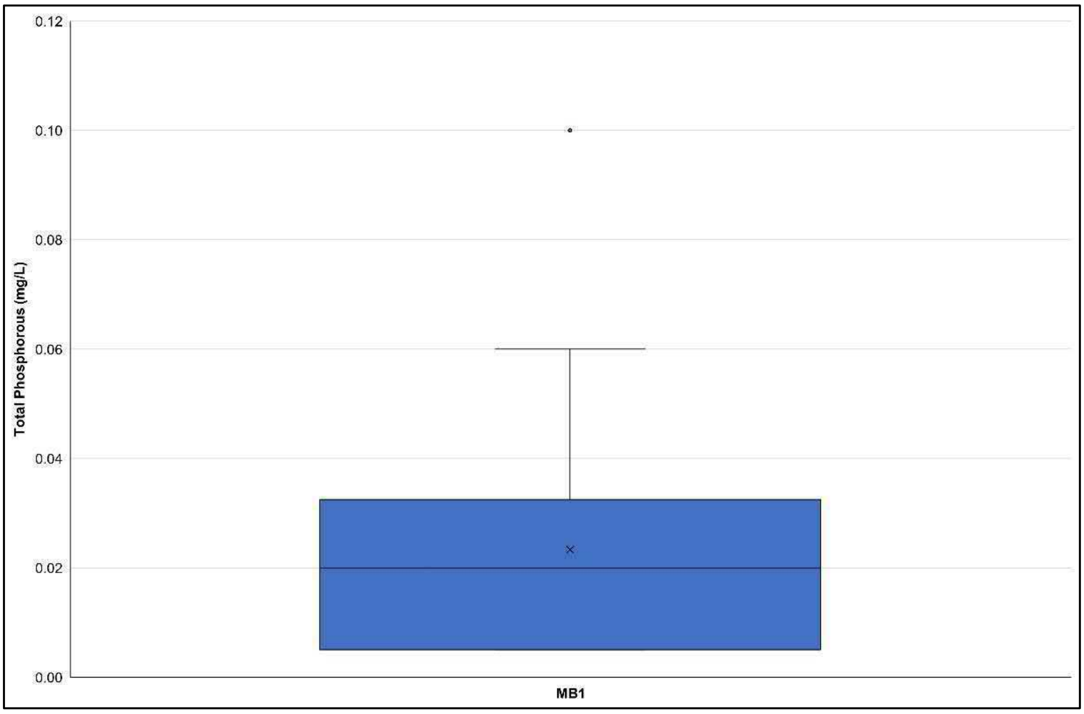

Figure C.110: MB1 total phosphorous box plot.

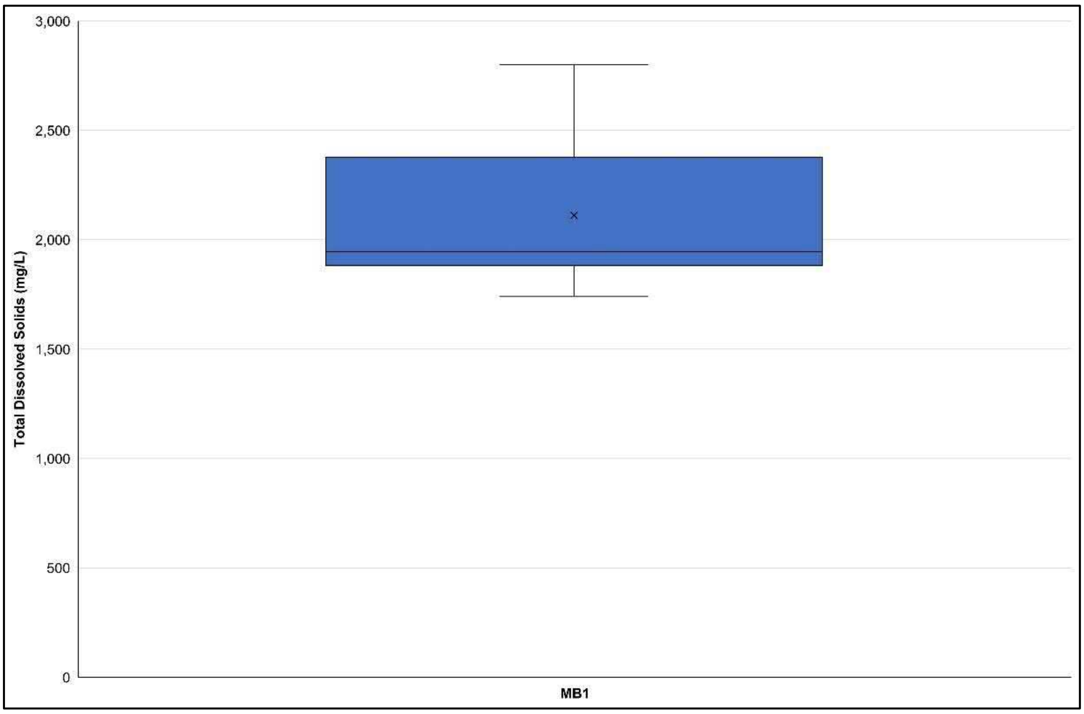

Figure C.111: MB1 total dissolved solids box plot.

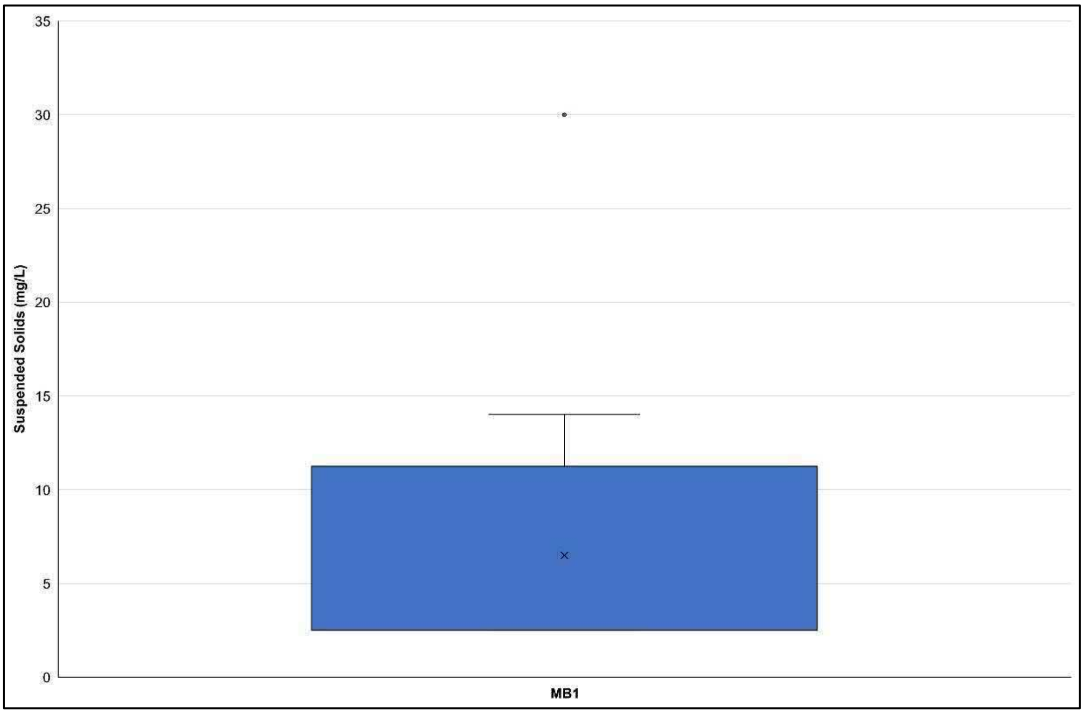

Figure C.112: MB1 suspended solids box plot.

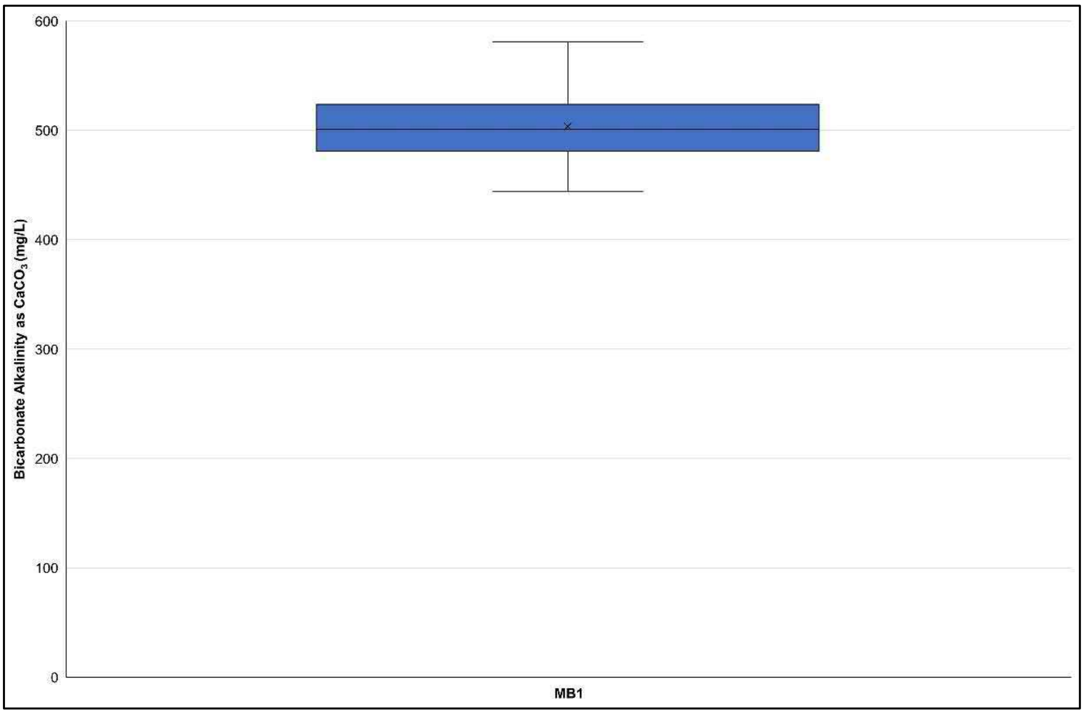

Figure C.113: MB1 bicarbonate alkalinity box plot.

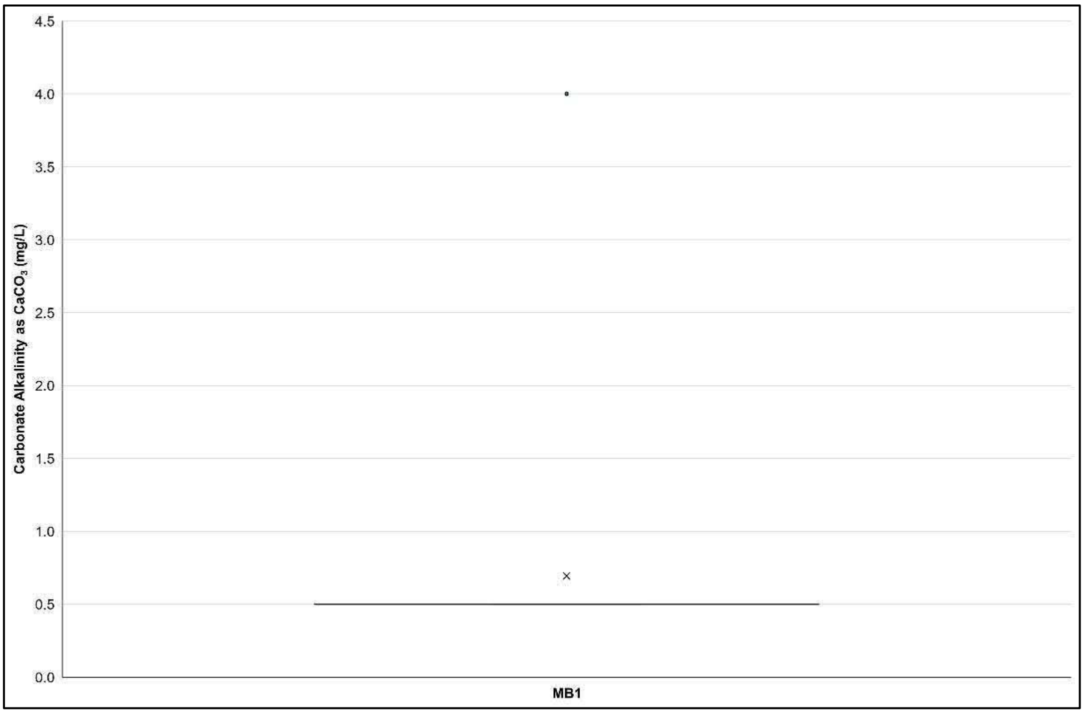

Figure C.114: MB1 carbonate alkalinity box plot.

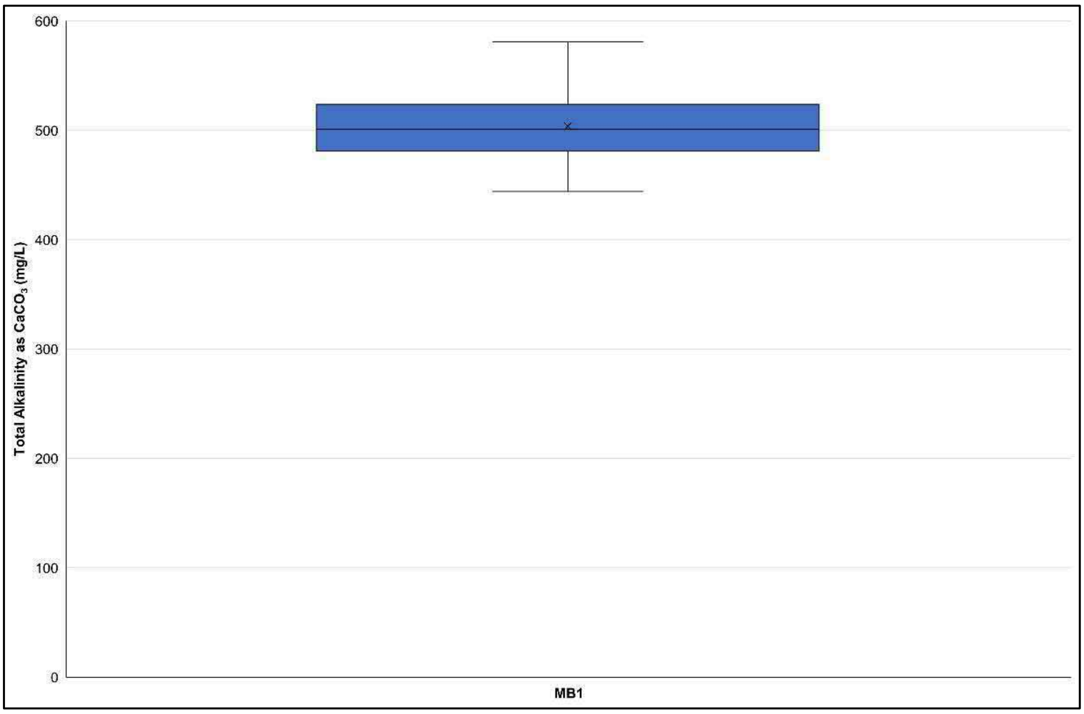

Figure C.115: MB1 total alkalinity box plot.

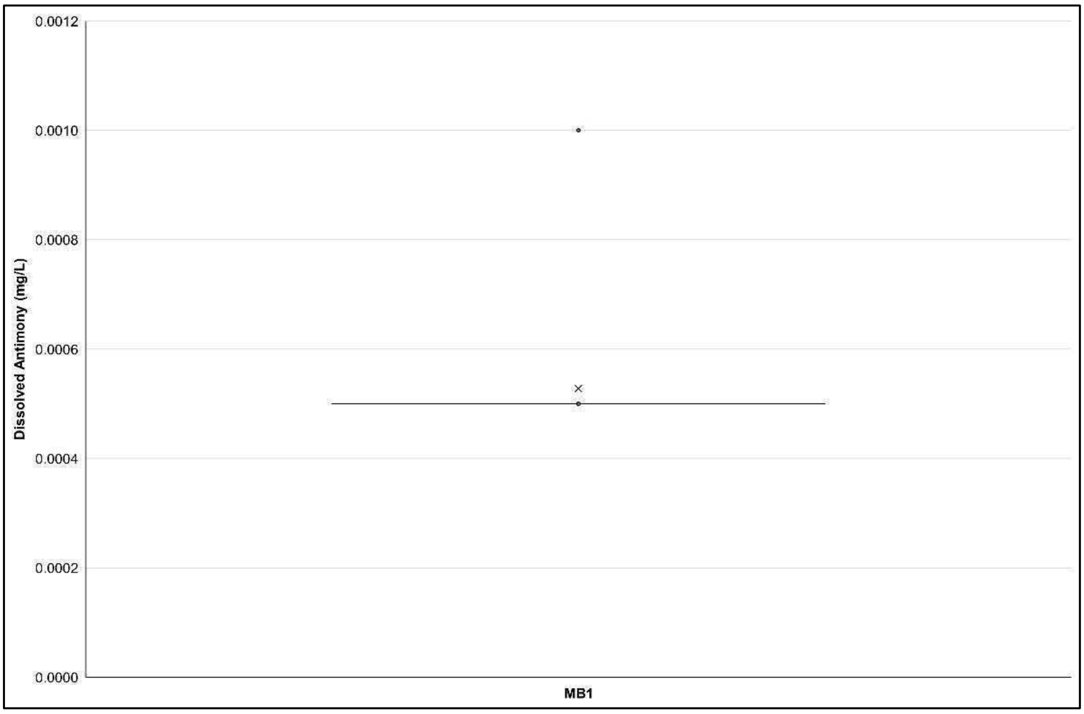

Figure C.116: MB1 dissolved antimony box plot.

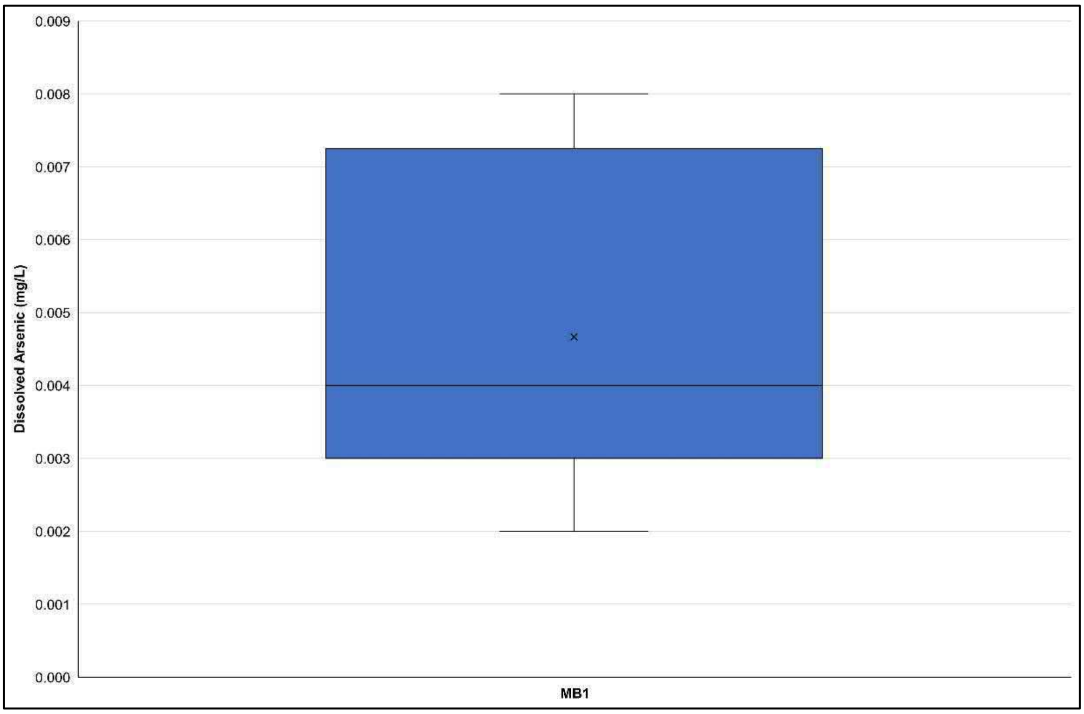

Figure C.117: MB1 dissolved arsenic box plot.

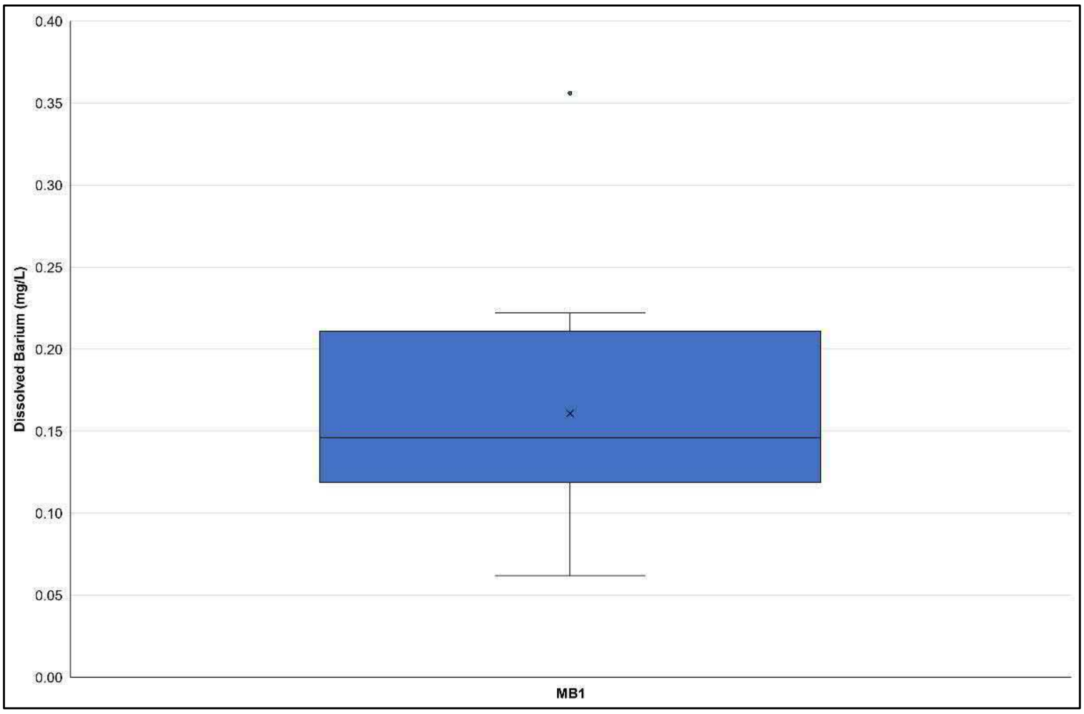

Figure C.118: MB1 dissolved barium box plot.

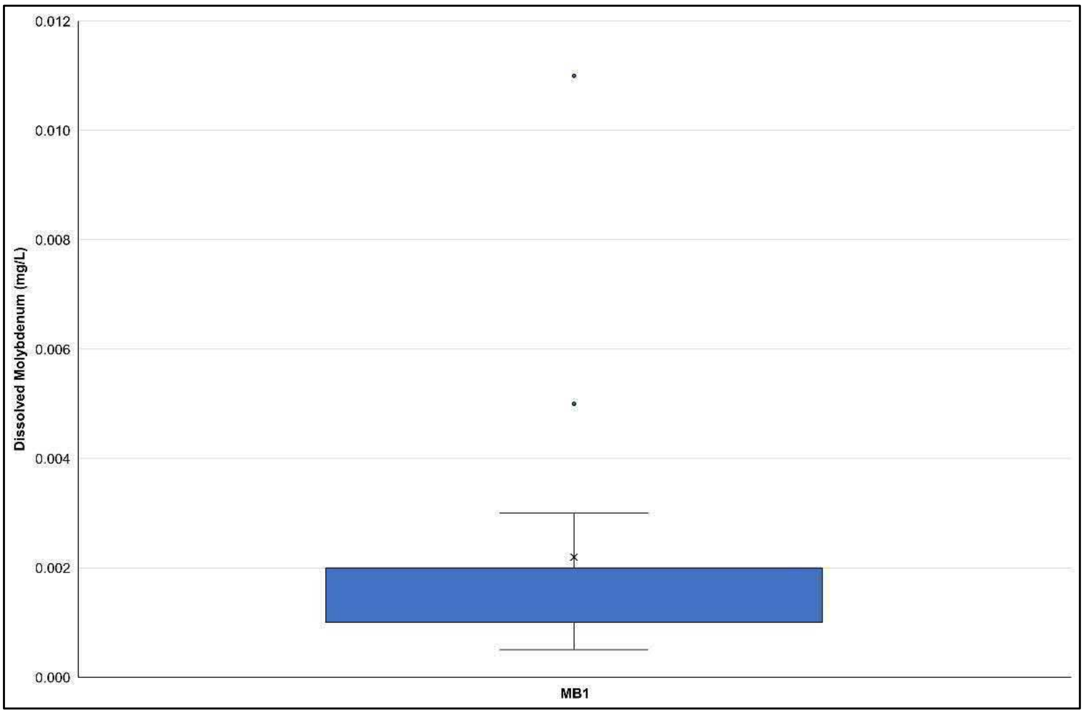

Figure C.119: MB1 dissolved molybdenum box plot.

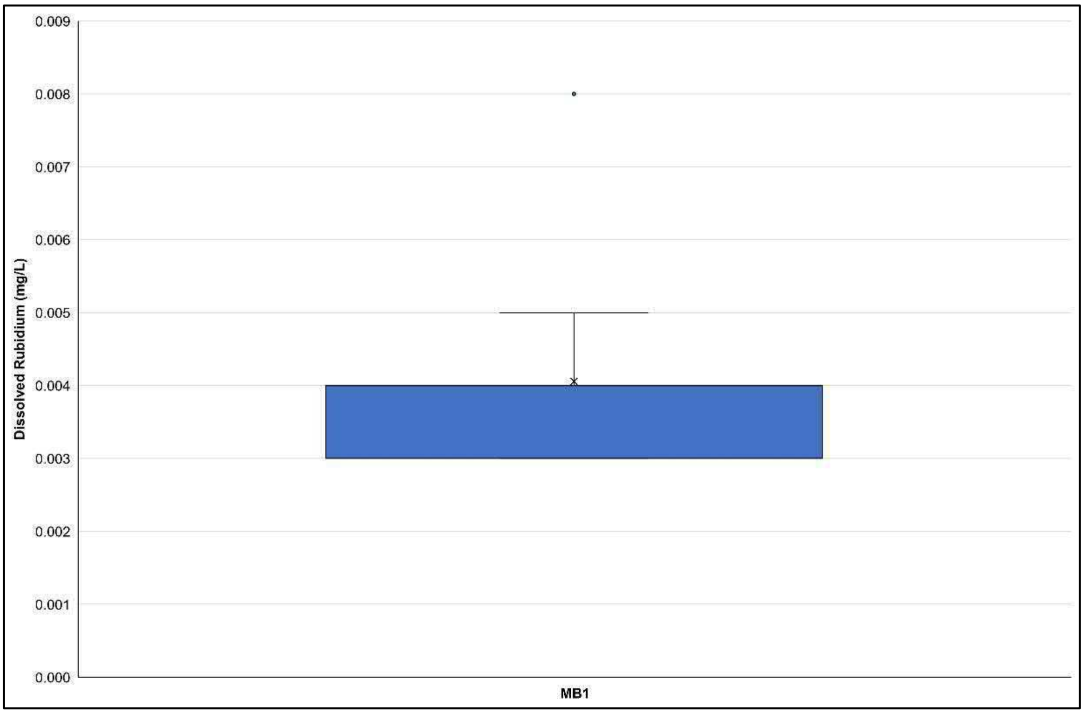

Figure C.120: MB1 dissolved rubidium box plot.

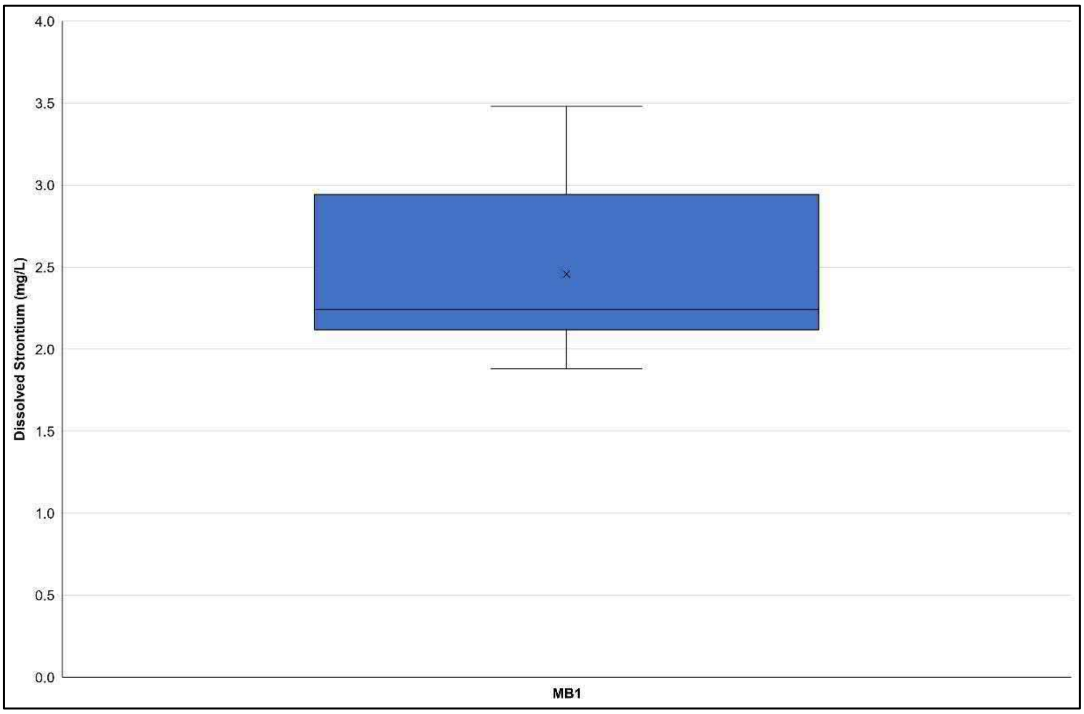

Figure C.121: MB1 dissolved strontium box plot.

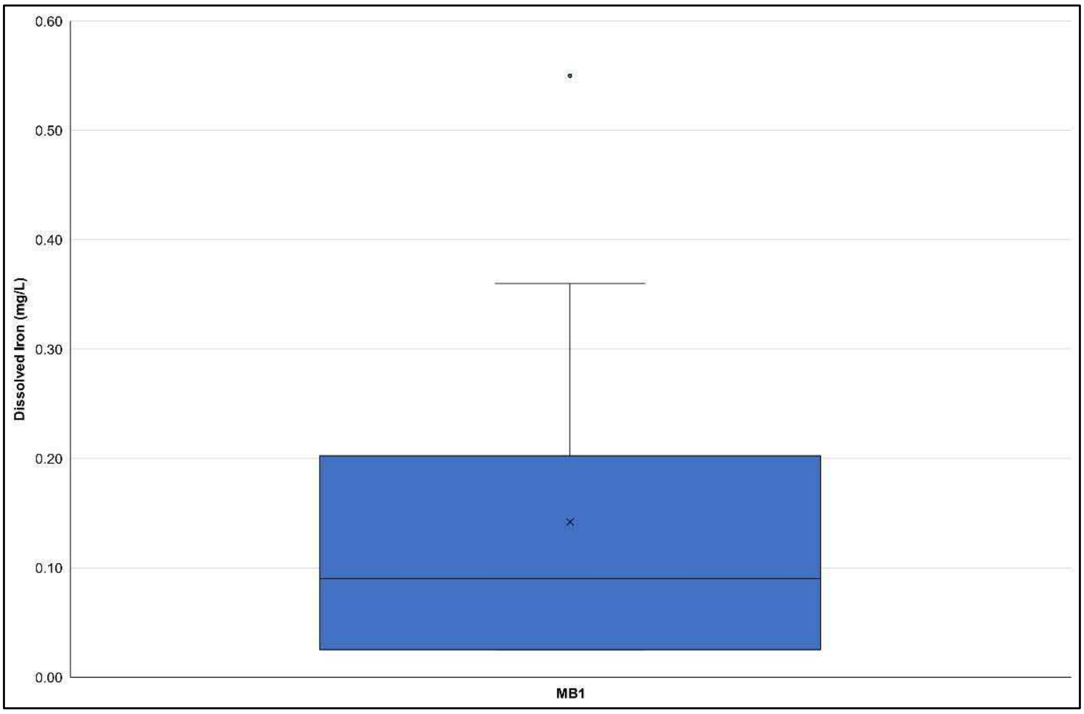

Figure C.122: MB1 dissolved iron box plot.

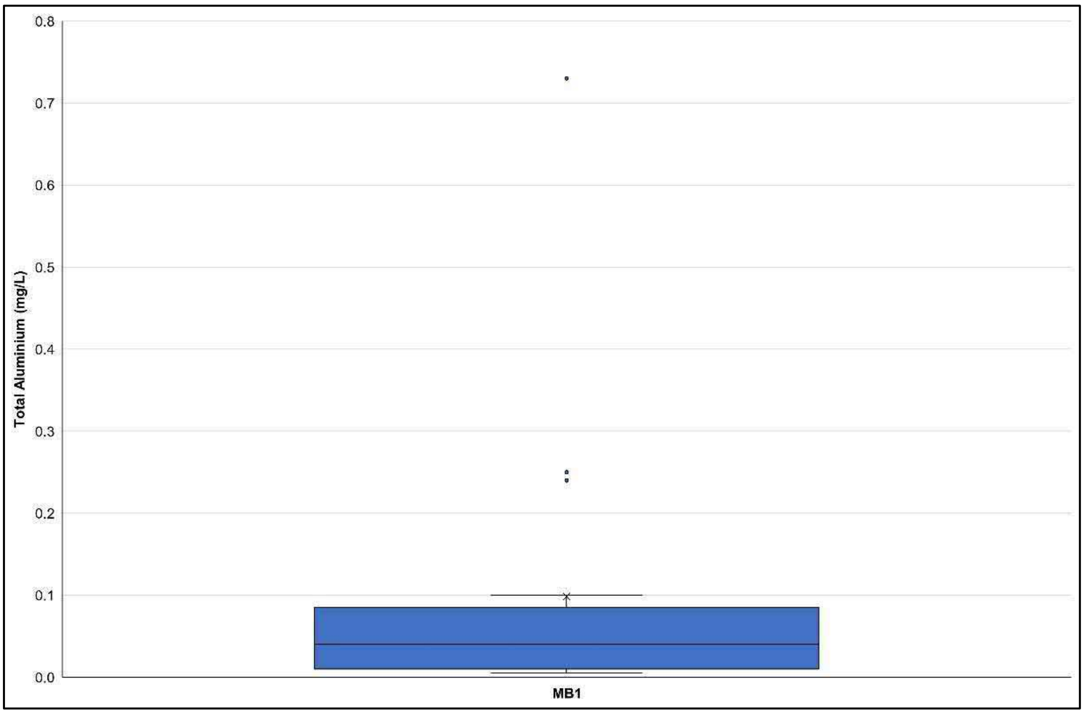

Figure C.123: MB1 total aluminium box plot.

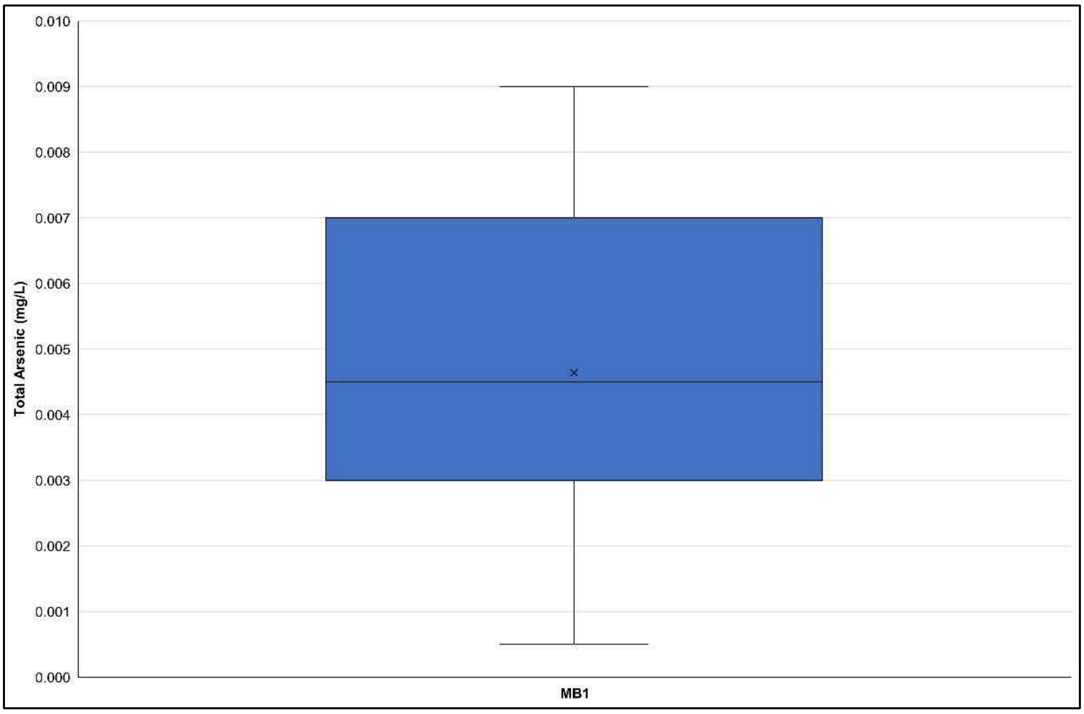

Figure C.124: MB1 total arsenic box plot.

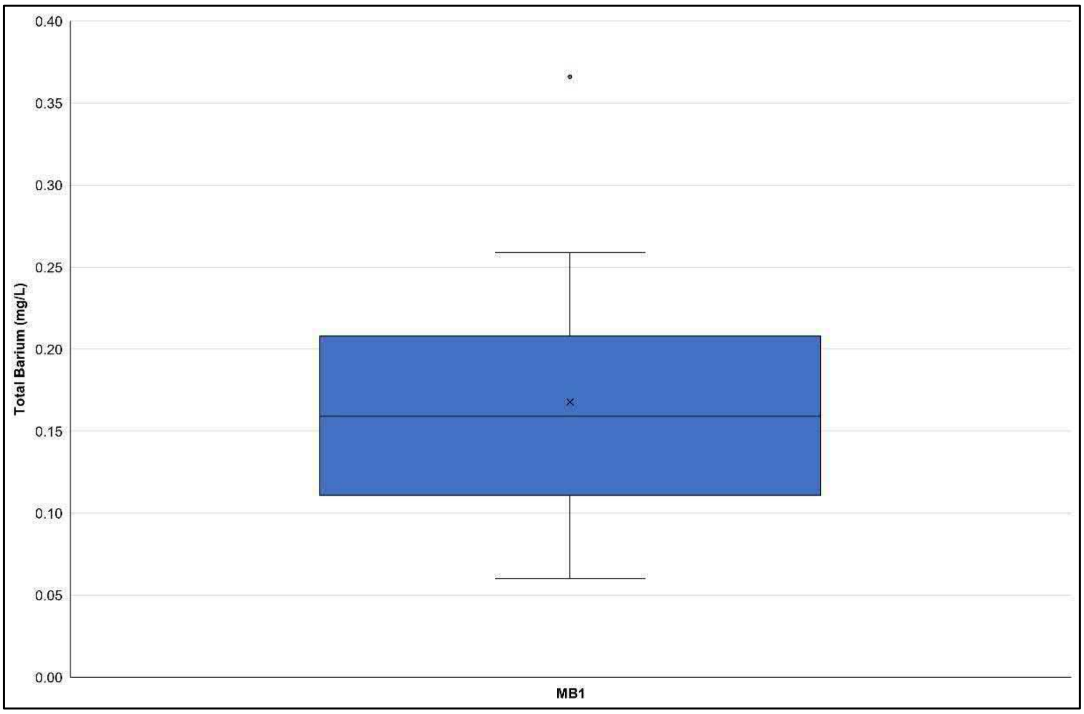

Figure C.125: MB1 total barium box plot.

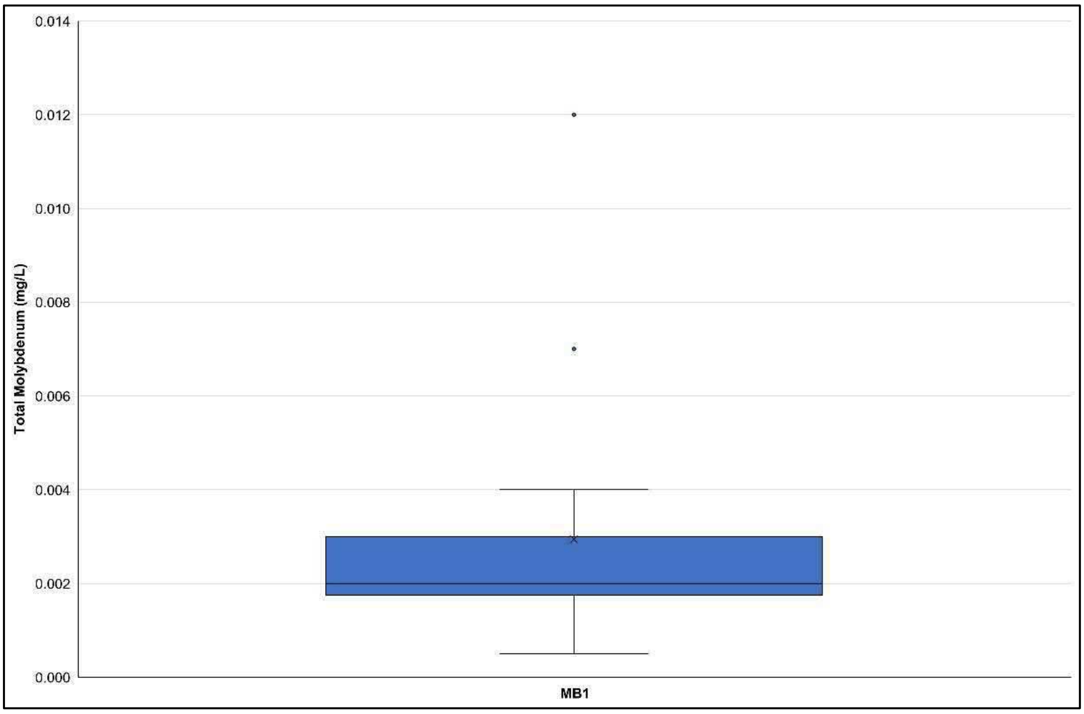

Figure C.126: MB1 total molybdenum box plot.

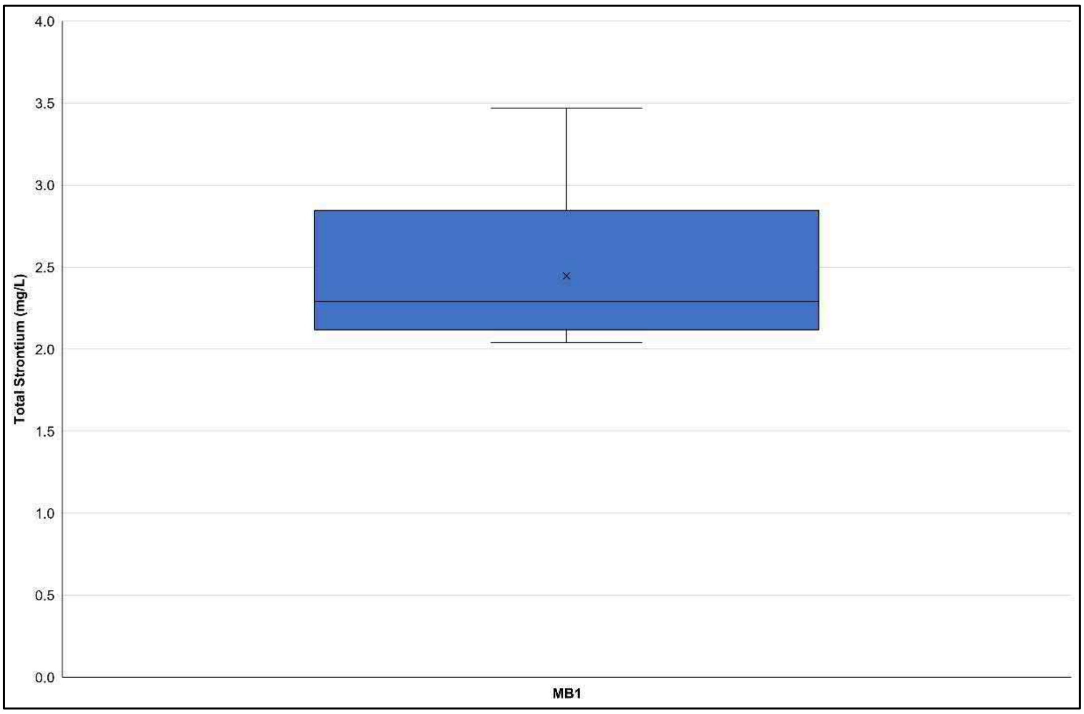

Figure C.127: MB1 total strontium box plot.

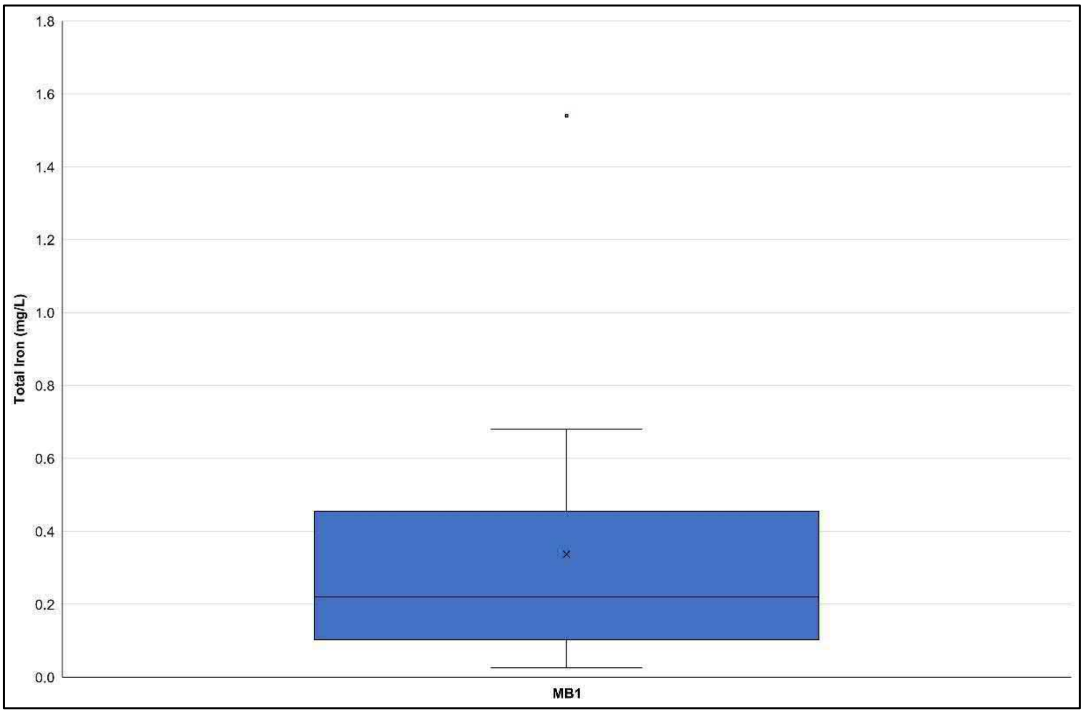

Figure C.128: MB1 total iron box plot.

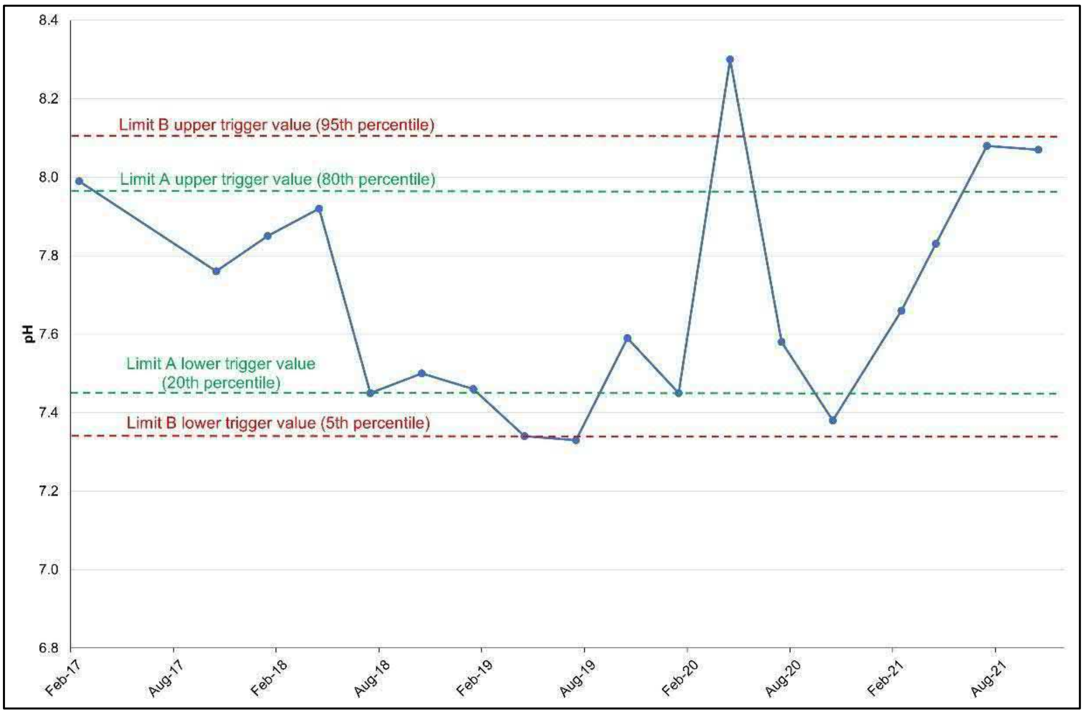

Figure C.129: **MB1 pH time series plot.**

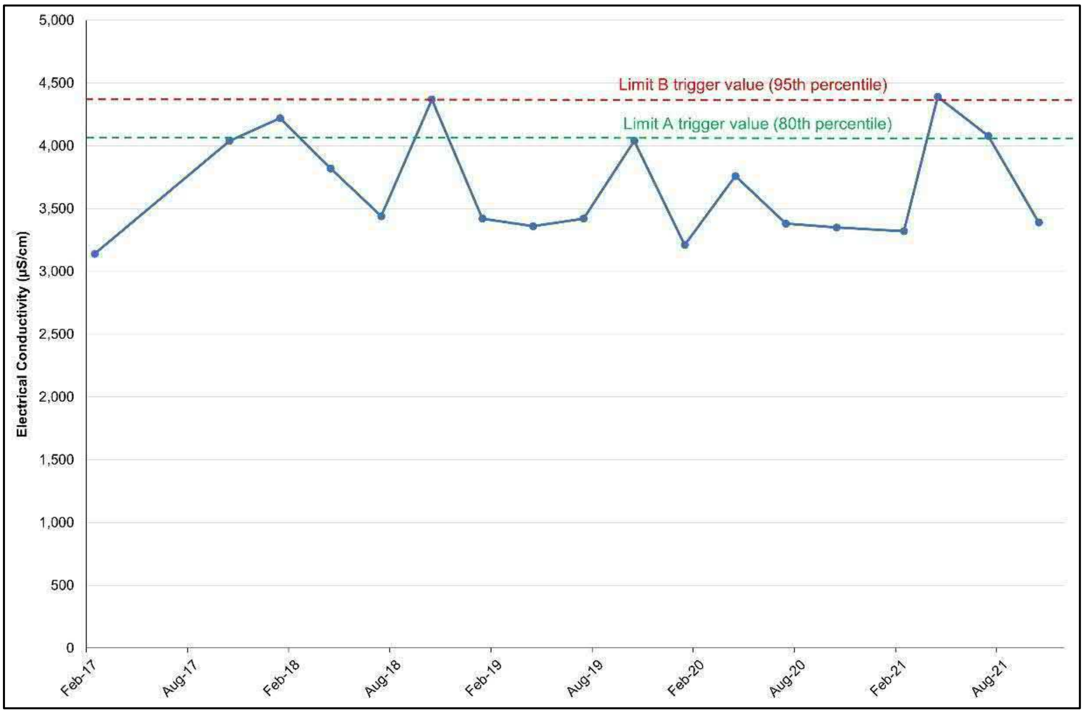

Figure C.130: **MB1 electrical conductivity time series plot.**

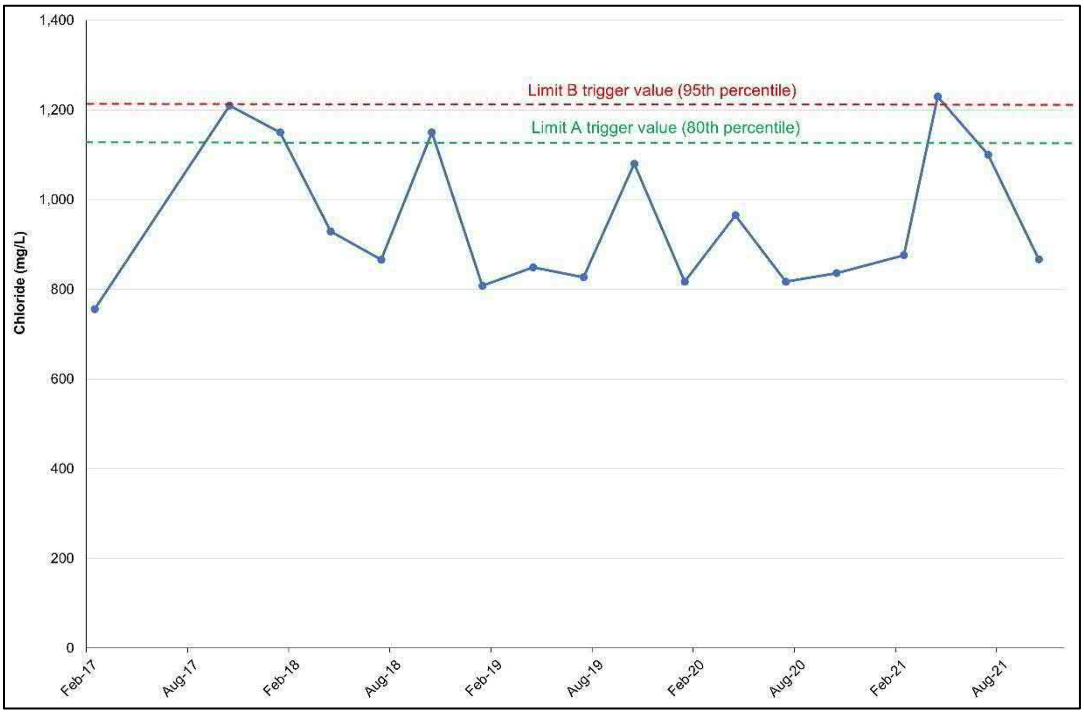

Figure C.131: MB1 chloride time series plot.

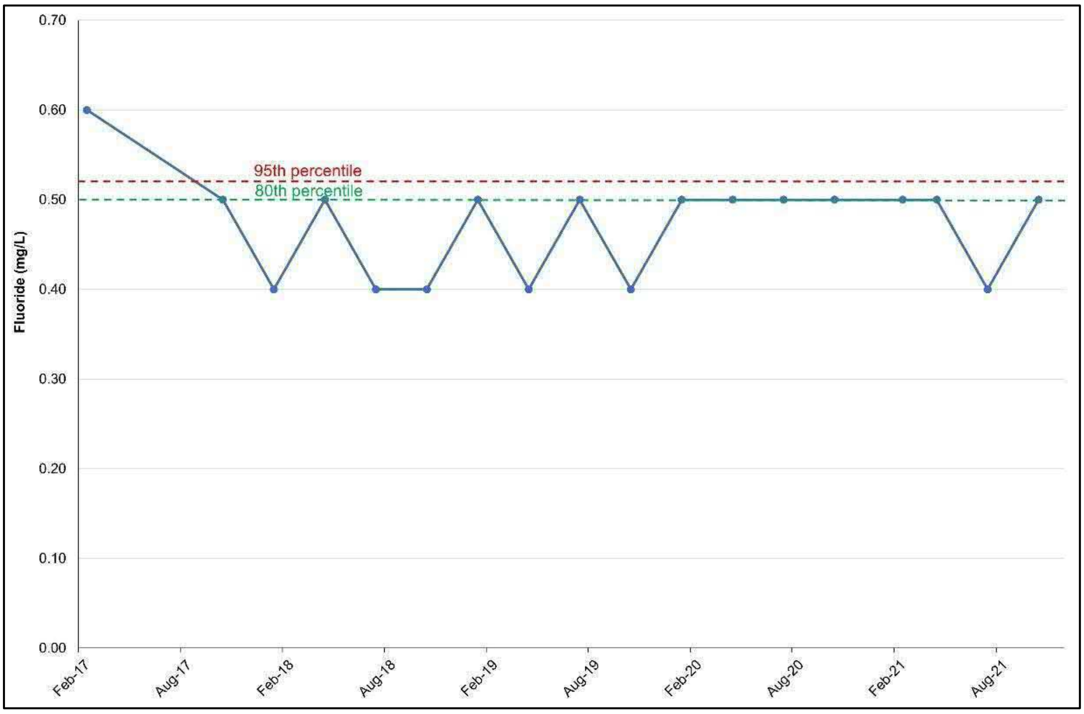

Figure C.132: MB1 fluoride time series plot.

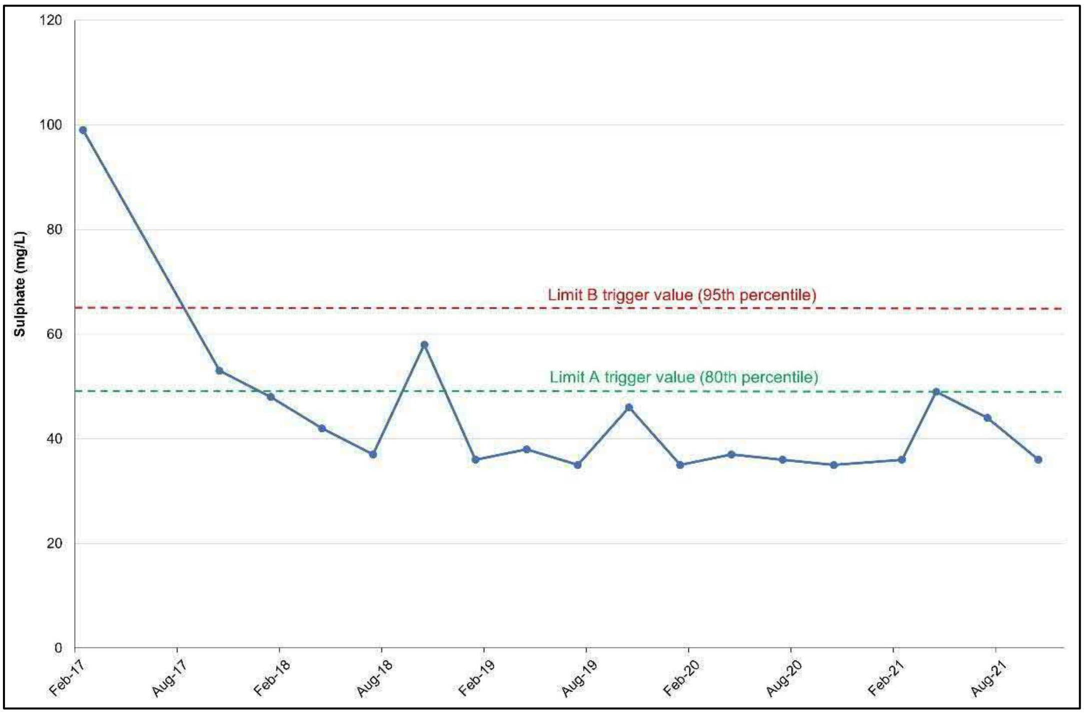

Figure C.133: MB1 sulphate time series plot.

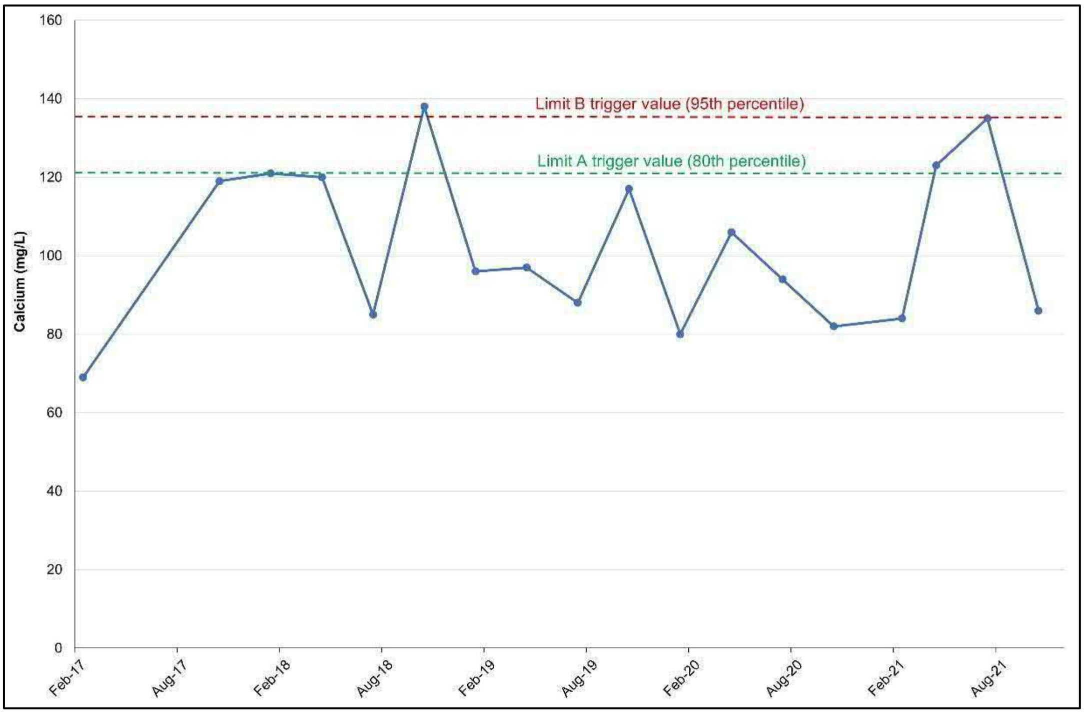

Figure C.134: MB1 calcium time series plot.

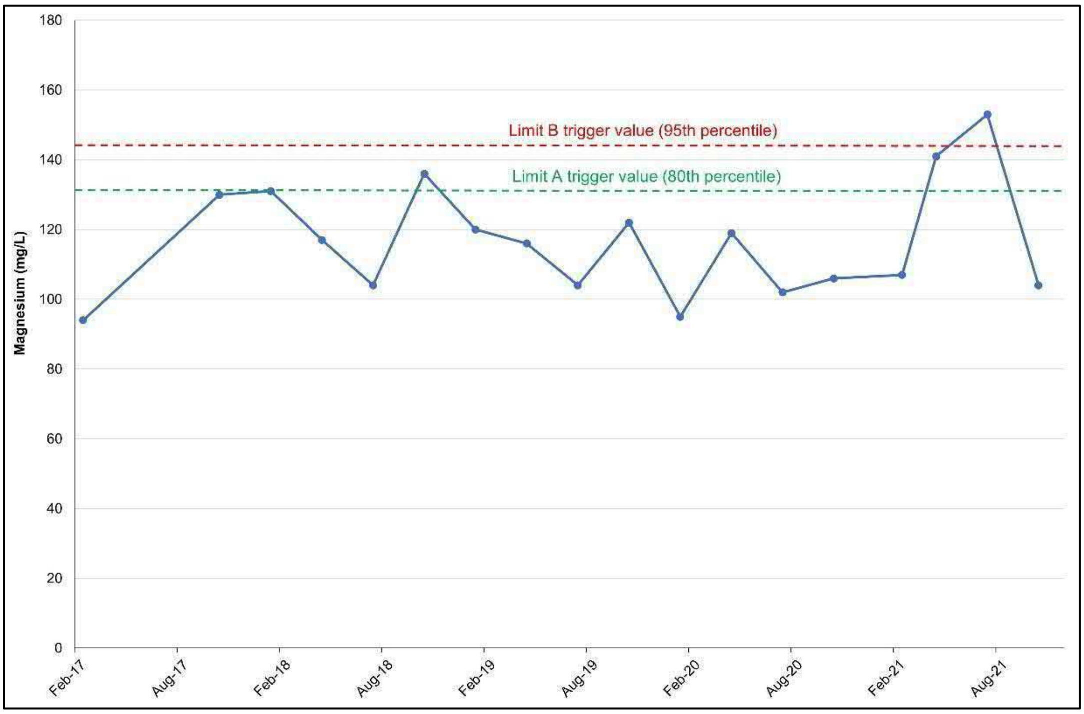

Figure C.135: MB1 magnesium time series plot.

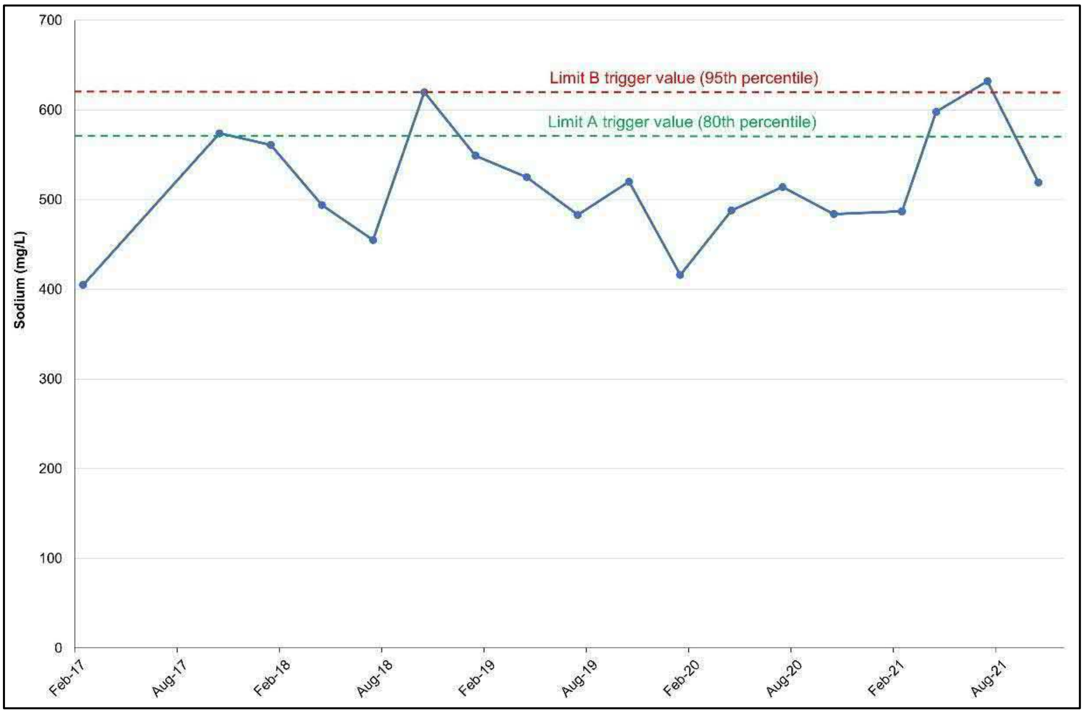

Figure C.136: MB1 sodium time series plot.

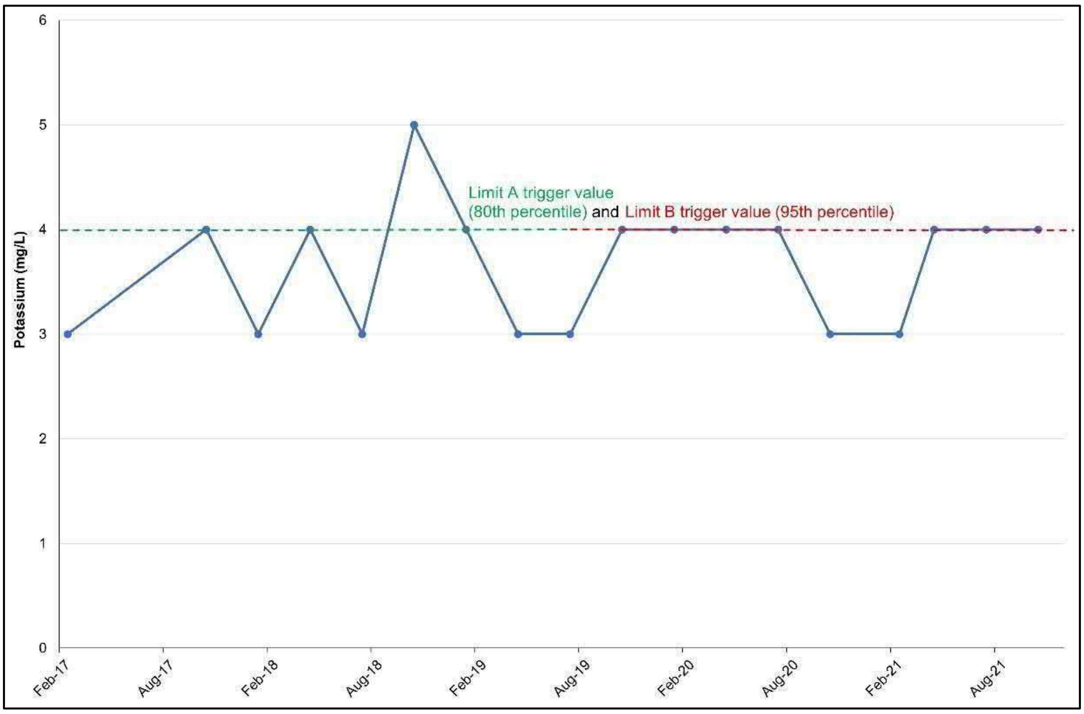

Figure C.137: **MB1 potassium time series plot.**

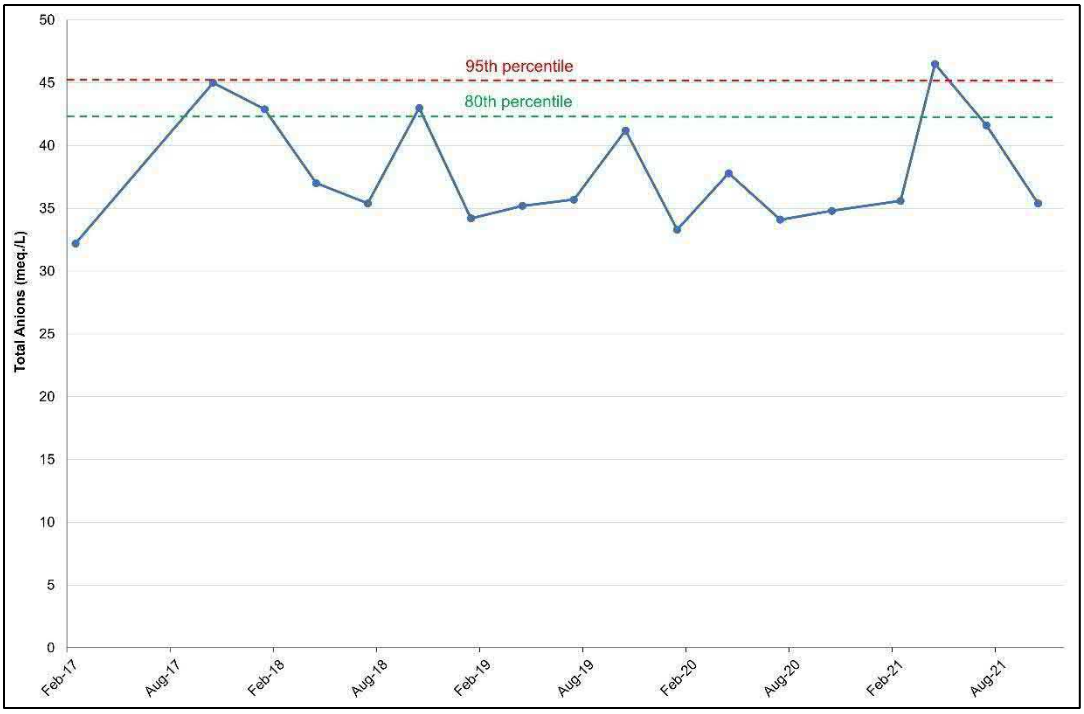

Figure C.138: **MB1 total anions time series plot.**

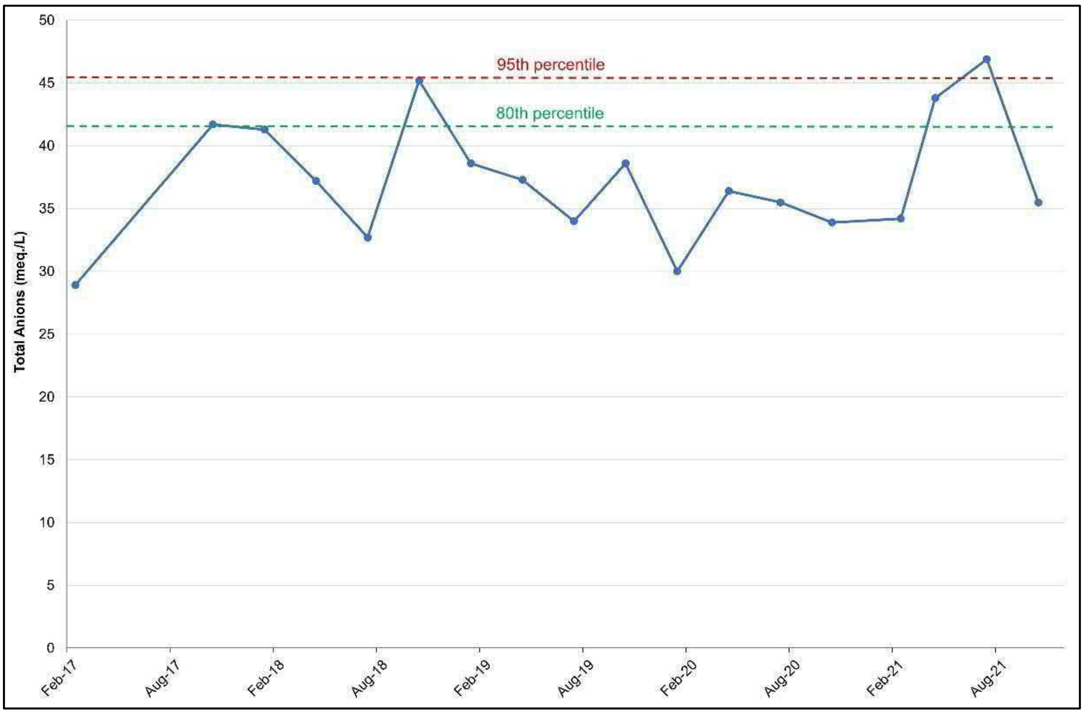

Figure C.139: MB1 total cations time series plot.

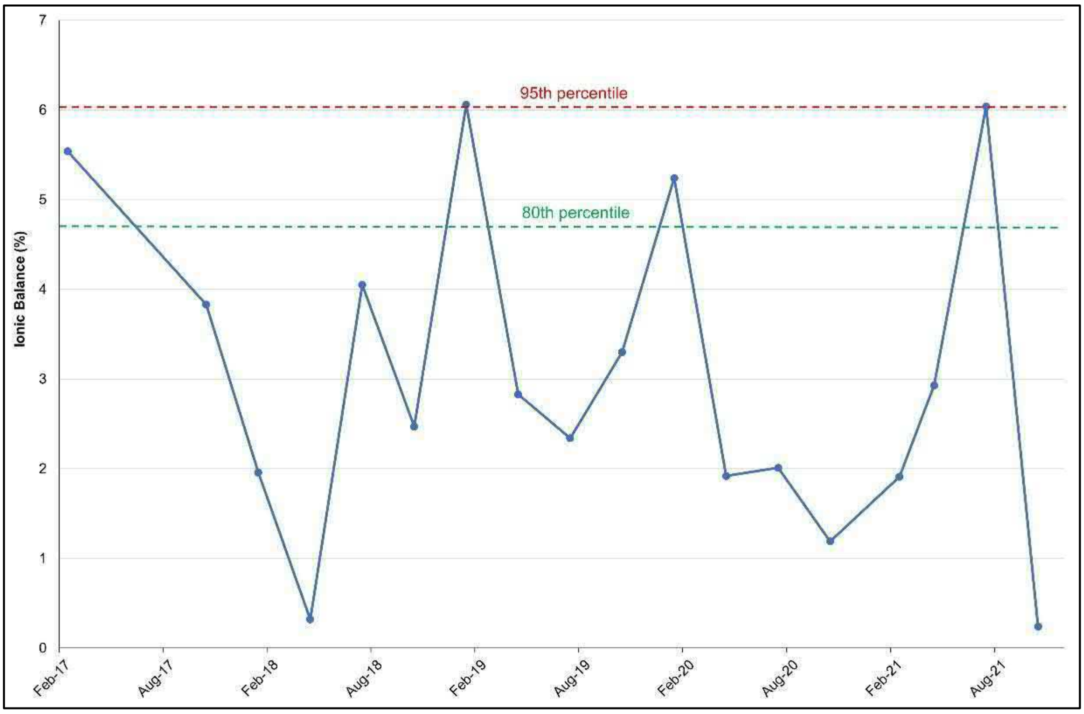

Figure C.140: MB1 ionic balance time series plot.

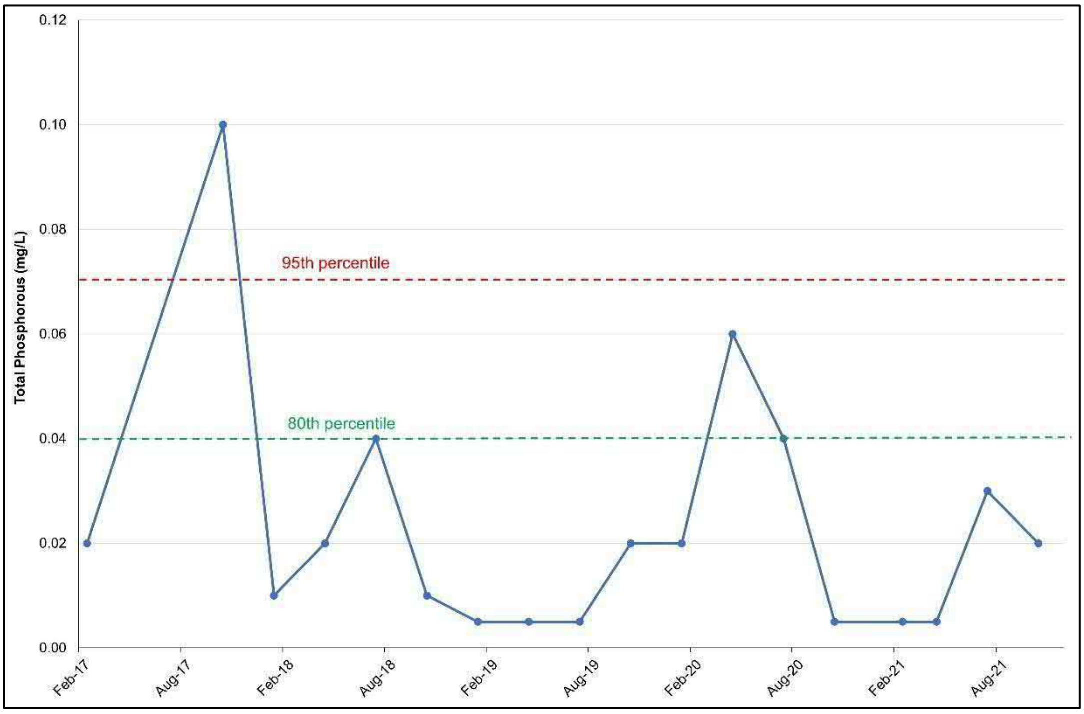

Figure C.141: **MB1 total phosphorous time series plot.**

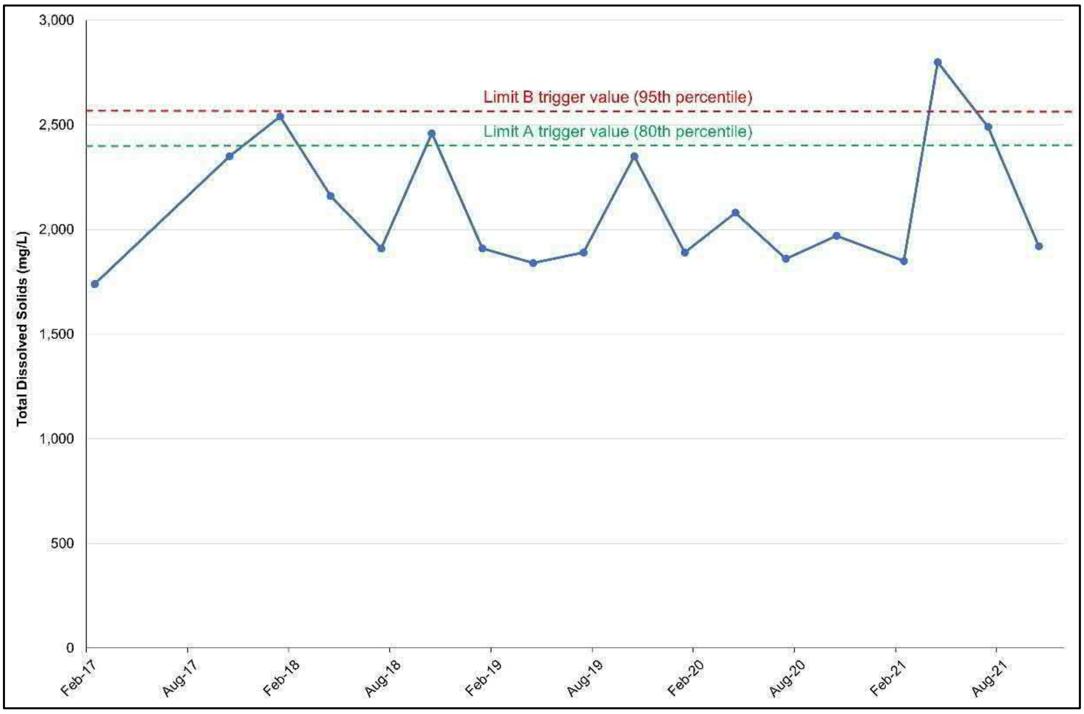

Figure C.142: **MB1 total dissolved solids time series plot.**

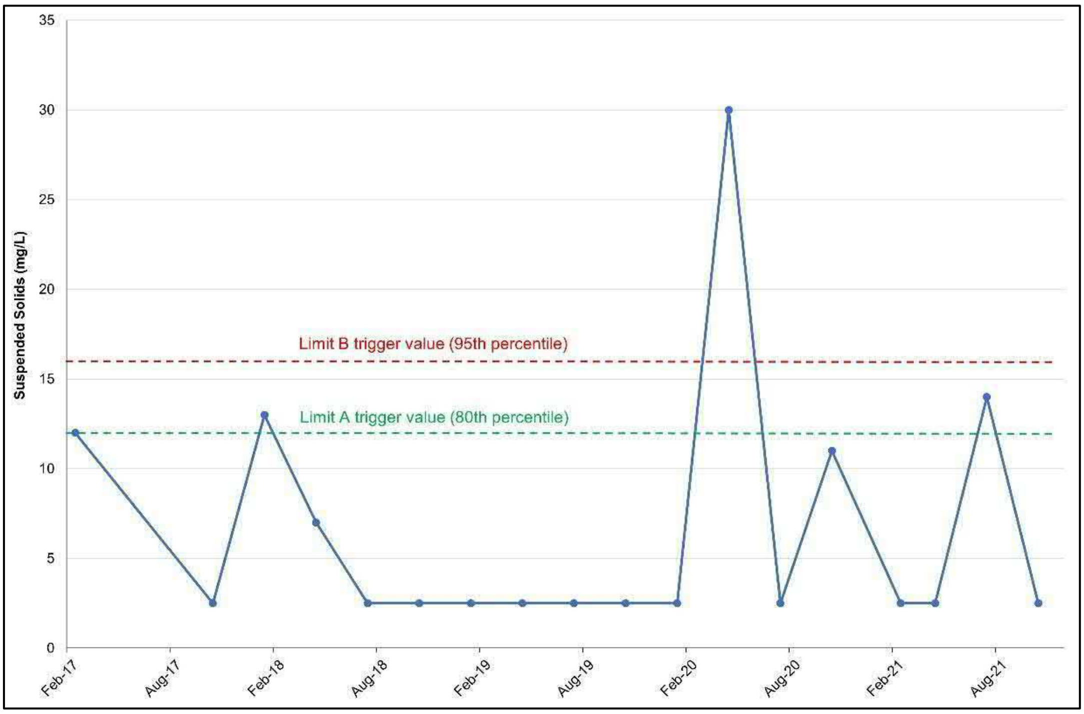

Figure C.143: **MB1 suspended solids time series plot.**

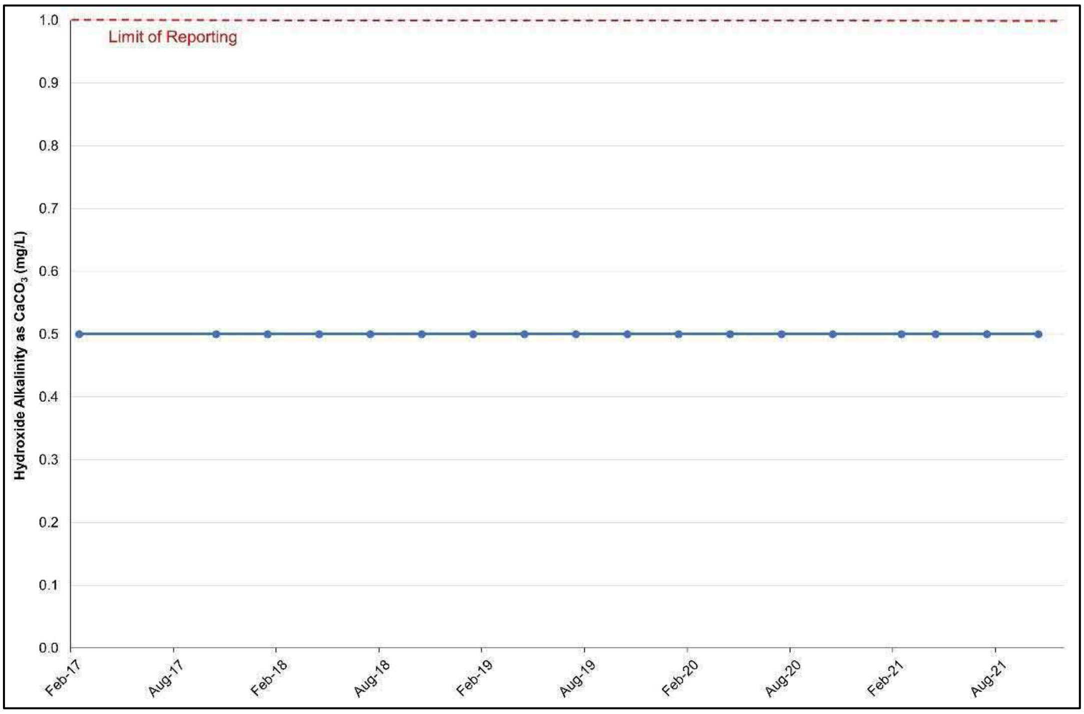

Figure C.144: **MB1 hydroxide alkalinity time series plot.**

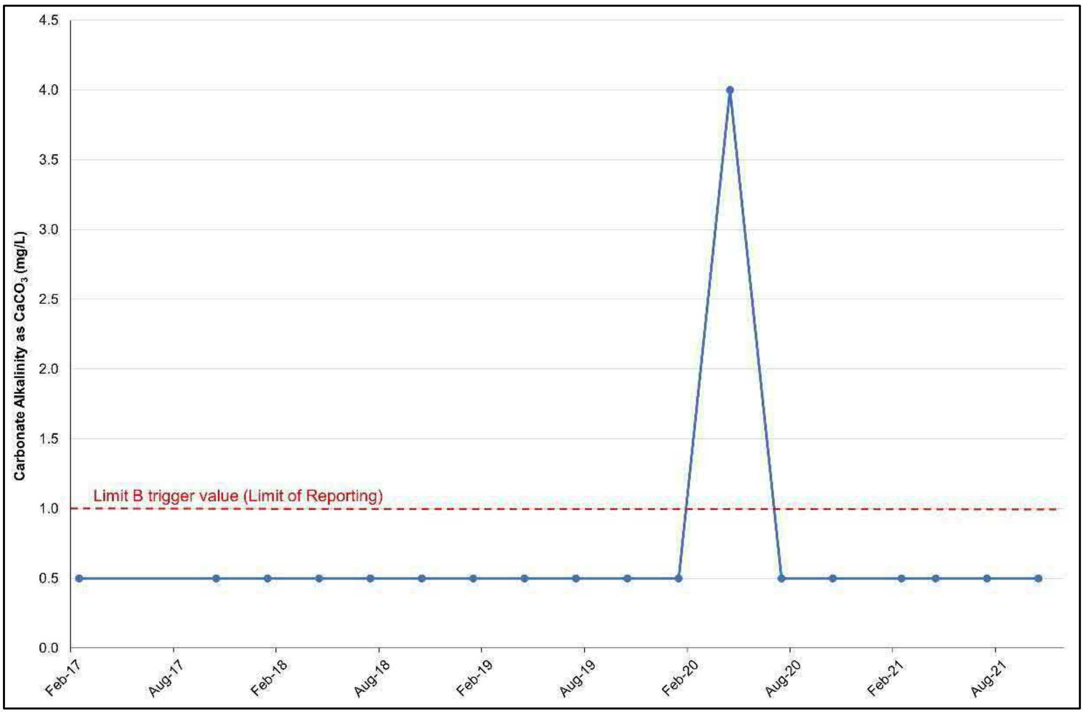

Figure C.145: **MB1 carbonate alkalinity time series plot.**

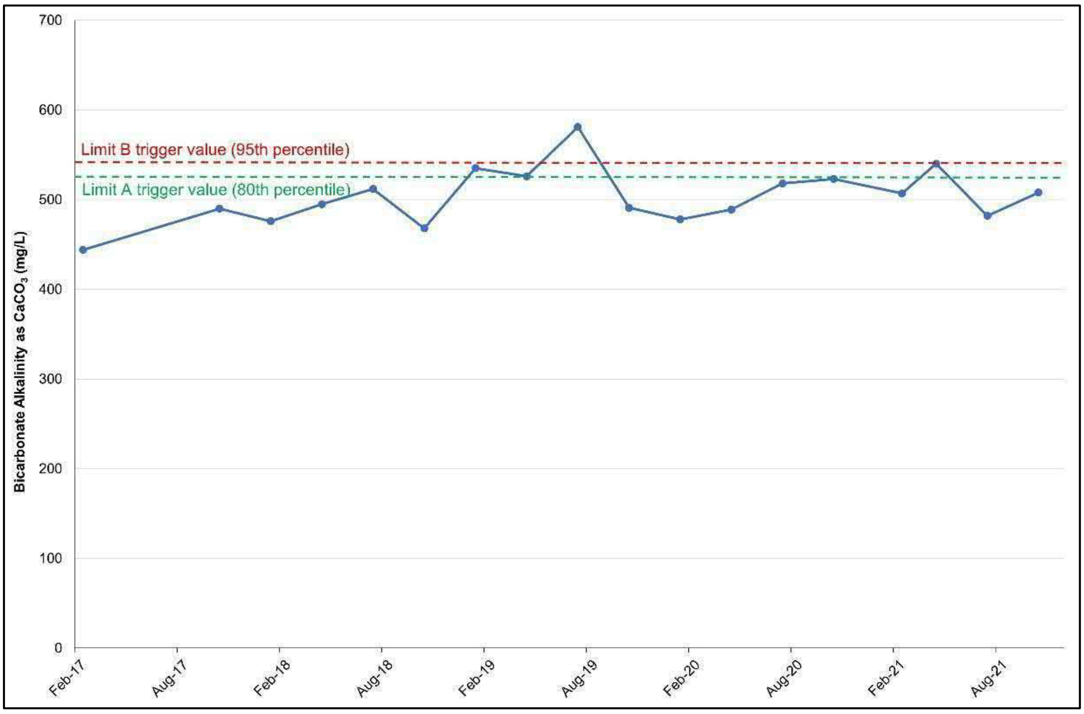

Figure C.146: **MB1 bicarbonate alkalinity time series plot.**

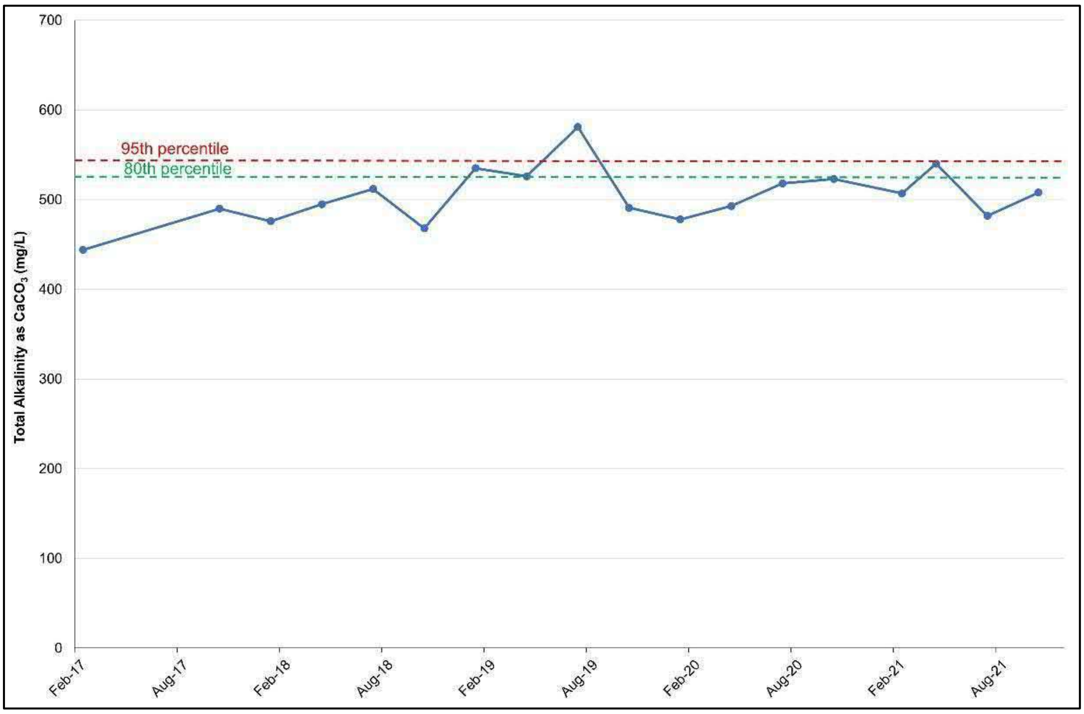

Figure C.147: MB1 total alkalinity time series plot.

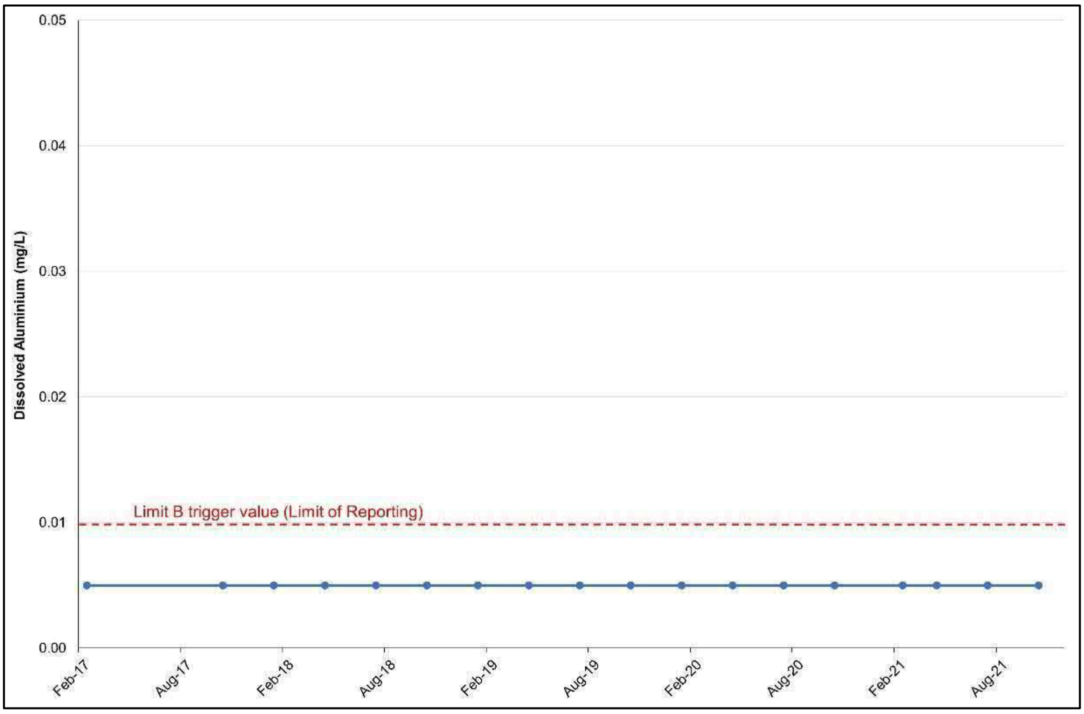

Figure C.148: MB1 dissolved aluminium time series plot.

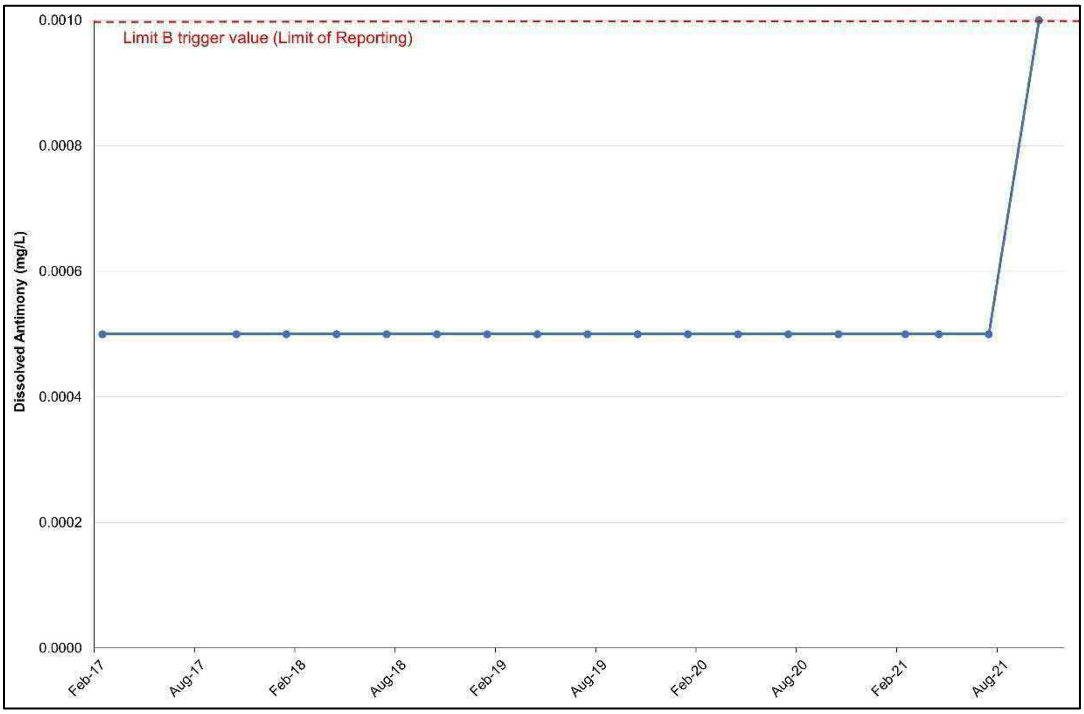

Figure C.149: MB1 dissolved antimony time series plot.

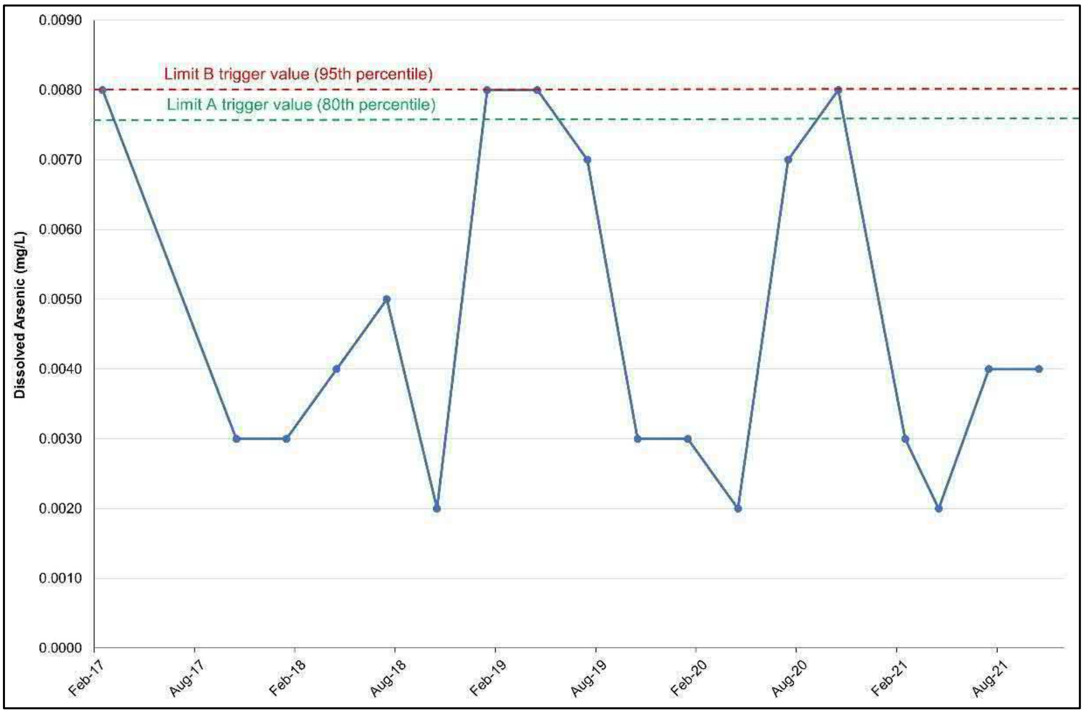

Figure C.150: MB1 dissolved arsenic time series plot.

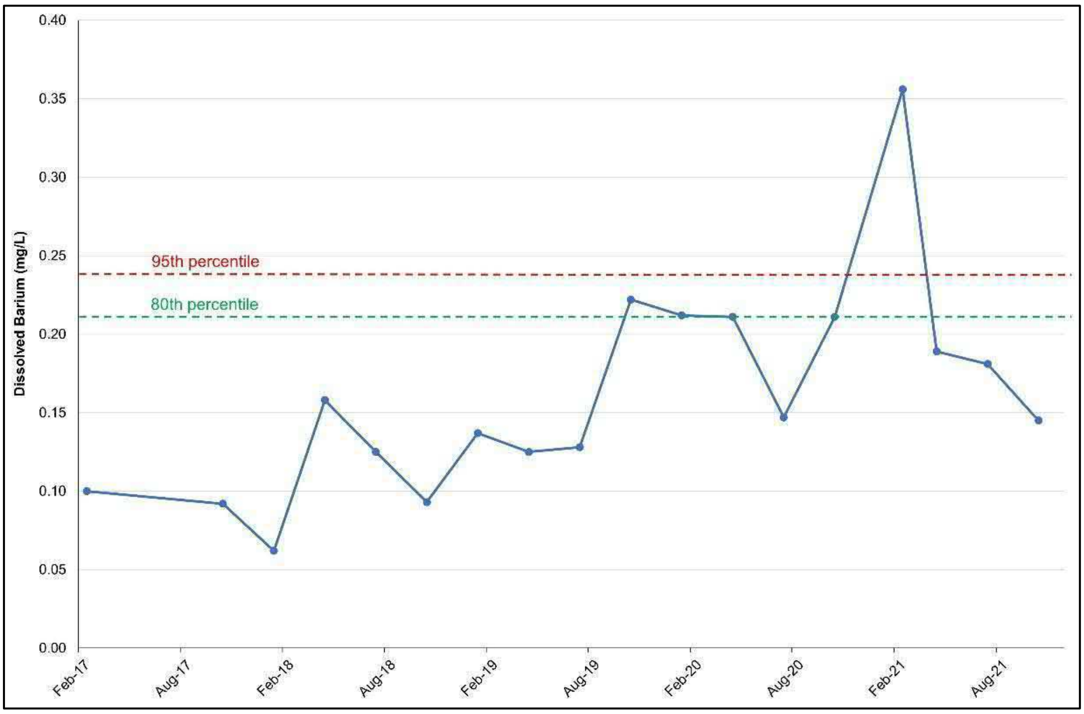

Figure C.151: **MB1 dissolved barium time series plot.**

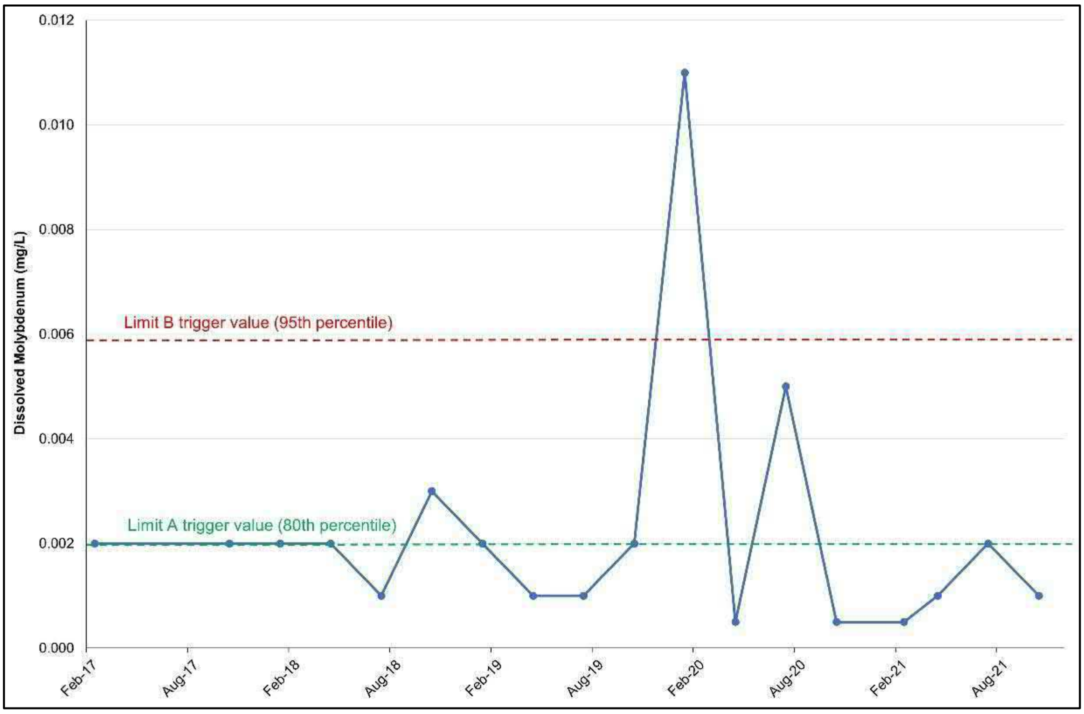

Figure C.152: **MB1 dissolved molybdenum time series plot.**

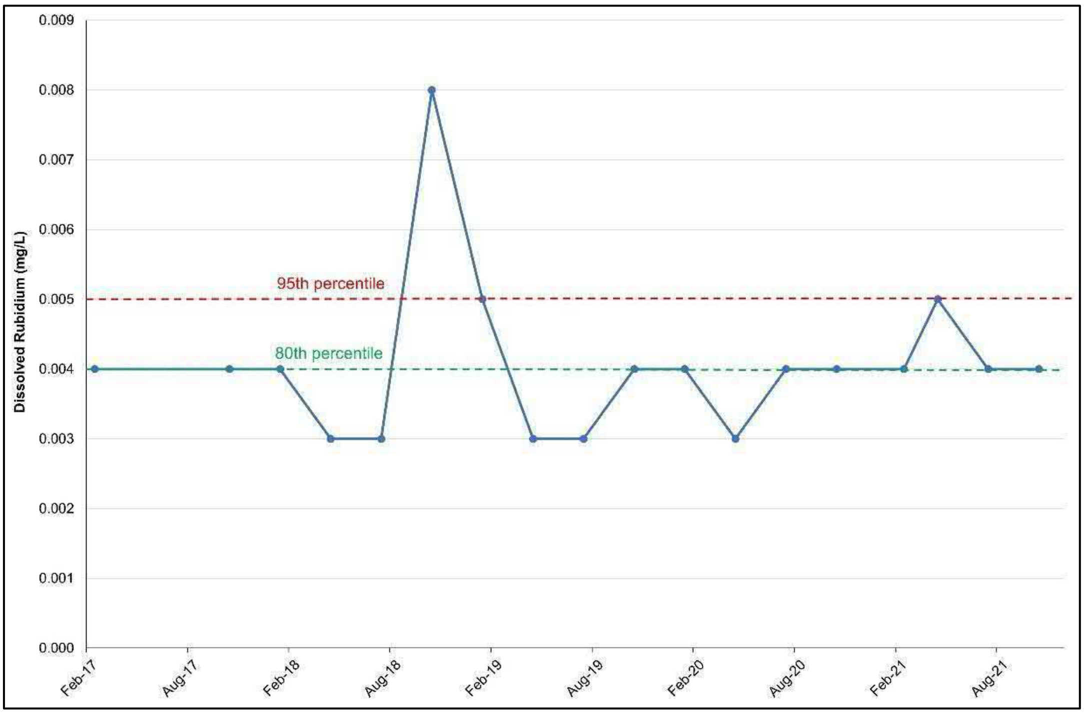

Figure C.153: **MB1 dissolved rubidium time series plot.**

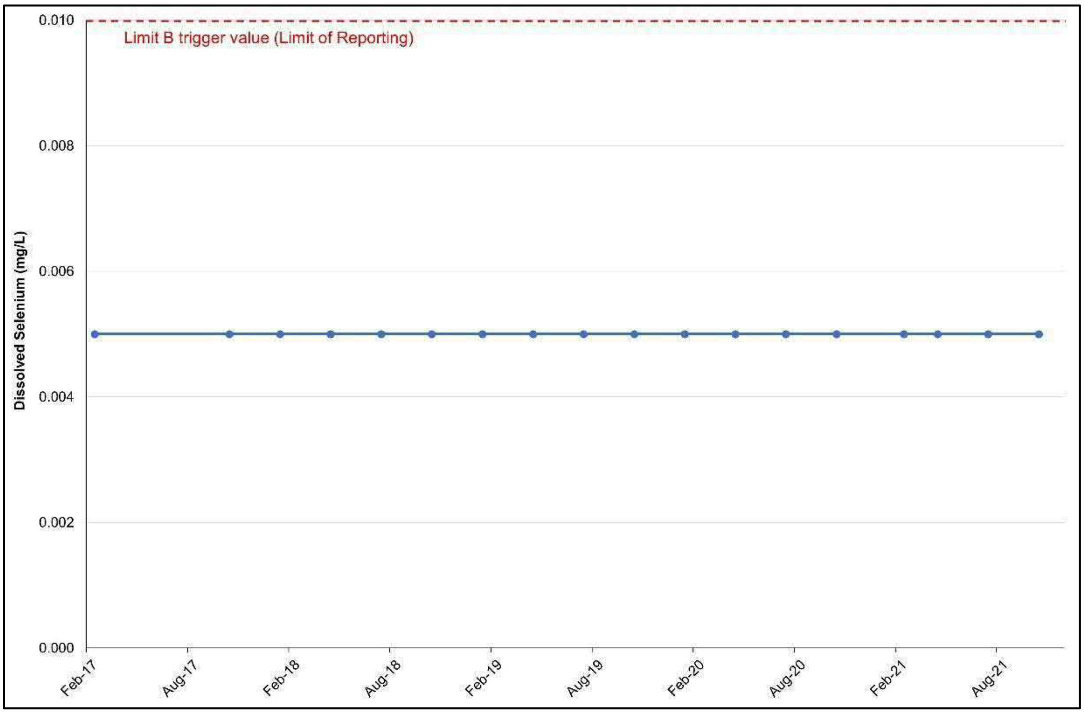

Figure C.154: **MB1 dissolved selenium time series plot.**

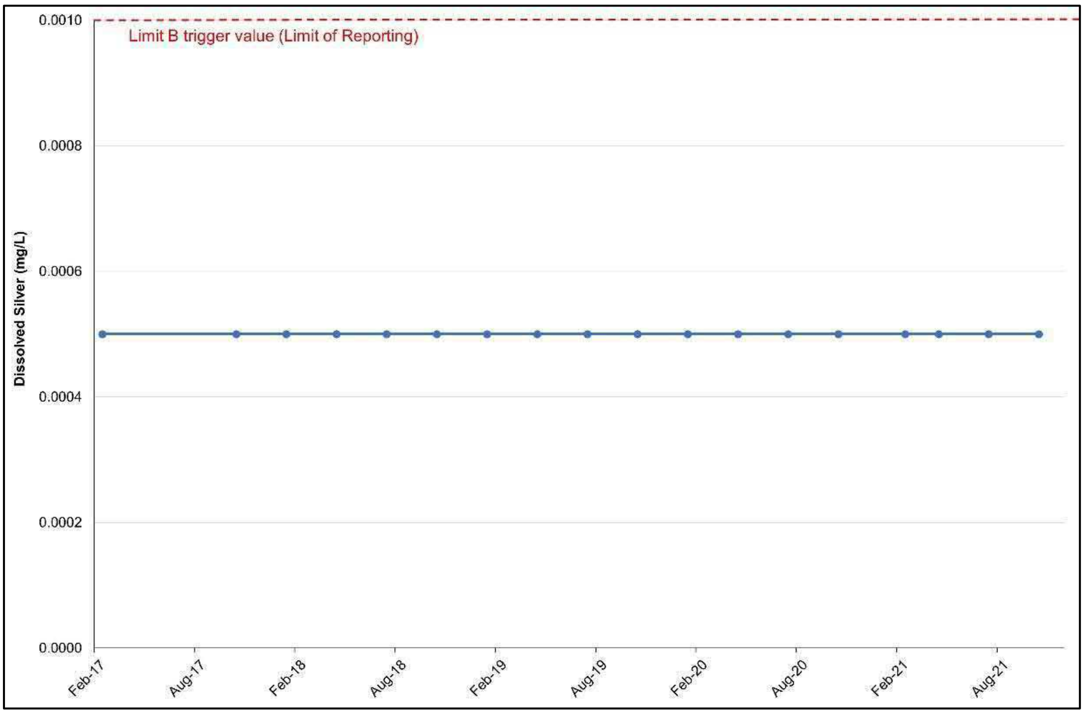

Figure C.155: **MB1 dissolved silver time series plot.**

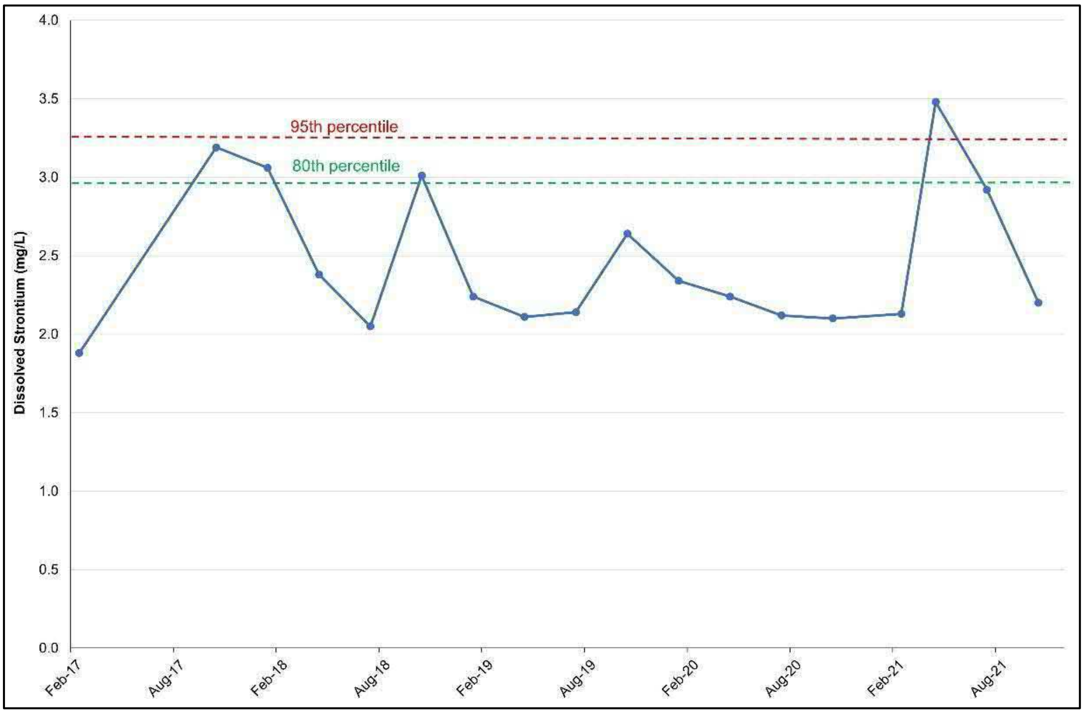

Figure C.156: **MB1 dissolved strontium time series plot.**

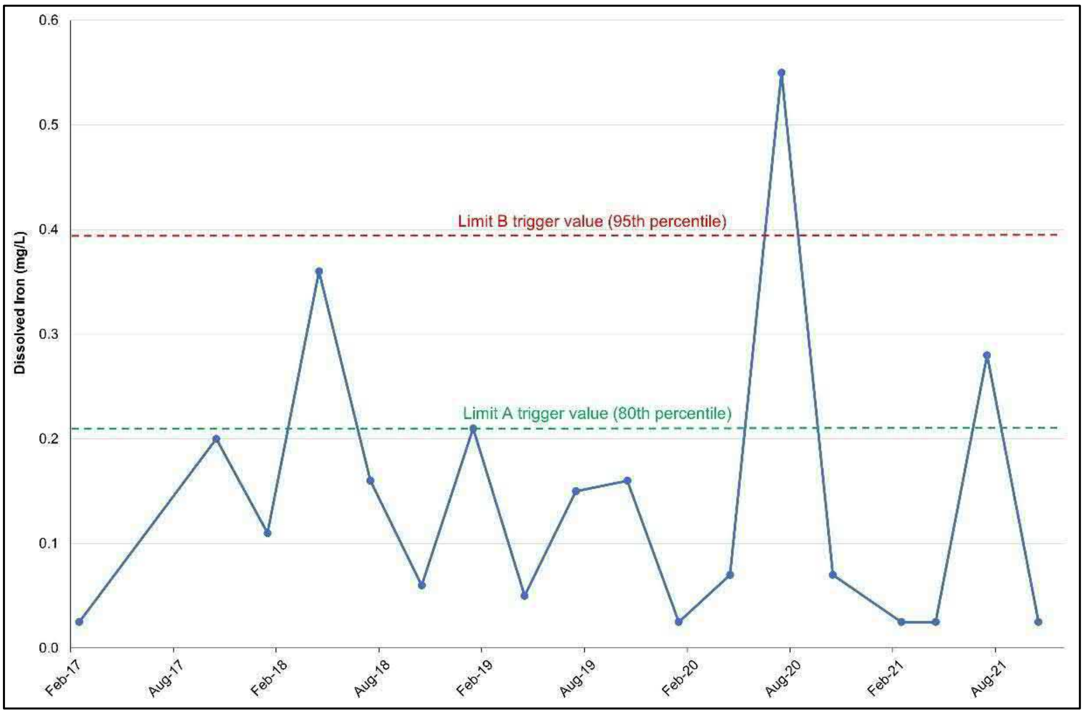

Figure C.157: **MB1 dissolved iron time series plot.**

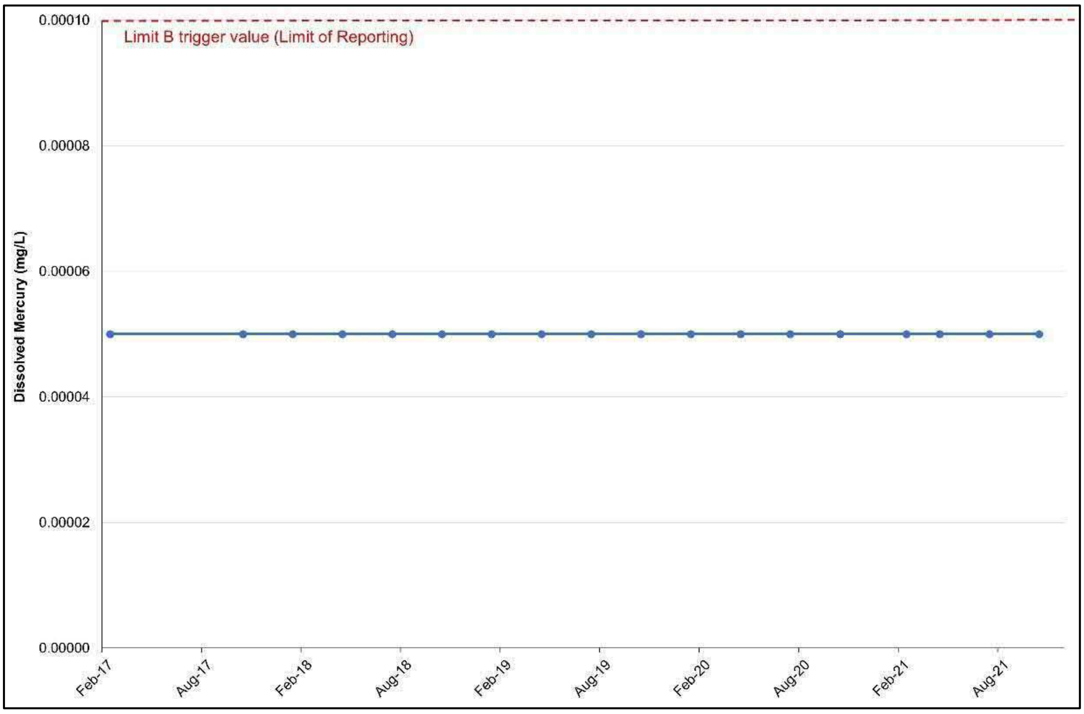

Figure C.158: **MB1 dissolved mercury time series plot.**

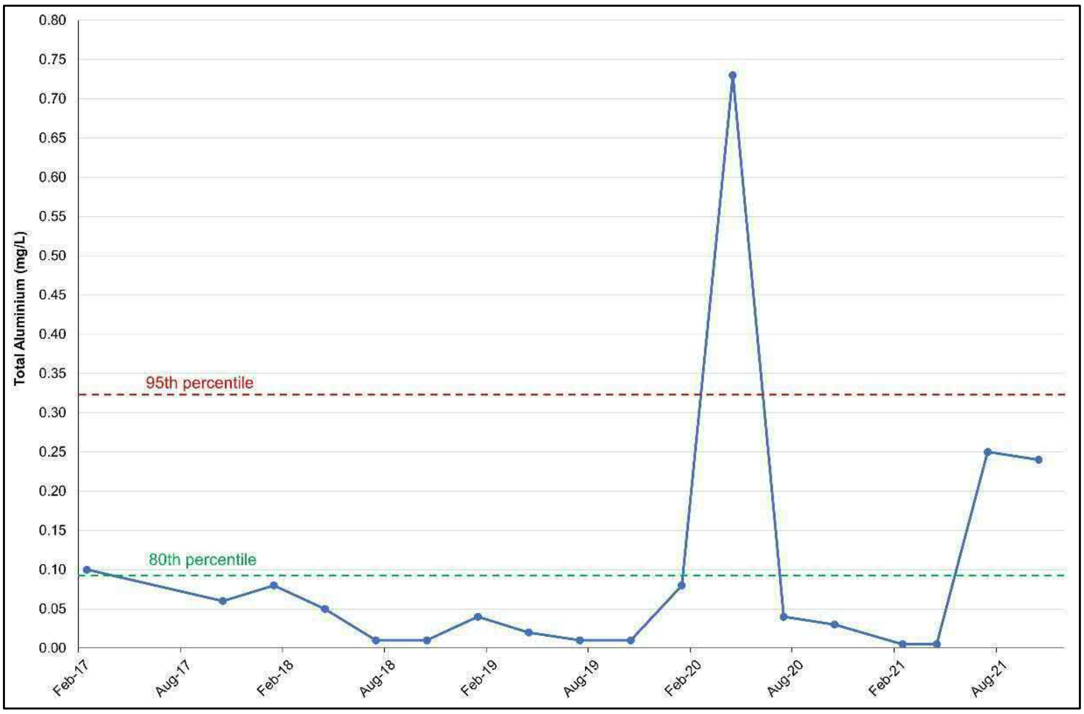

Figure C.159: MB1 total aluminium time series plot.

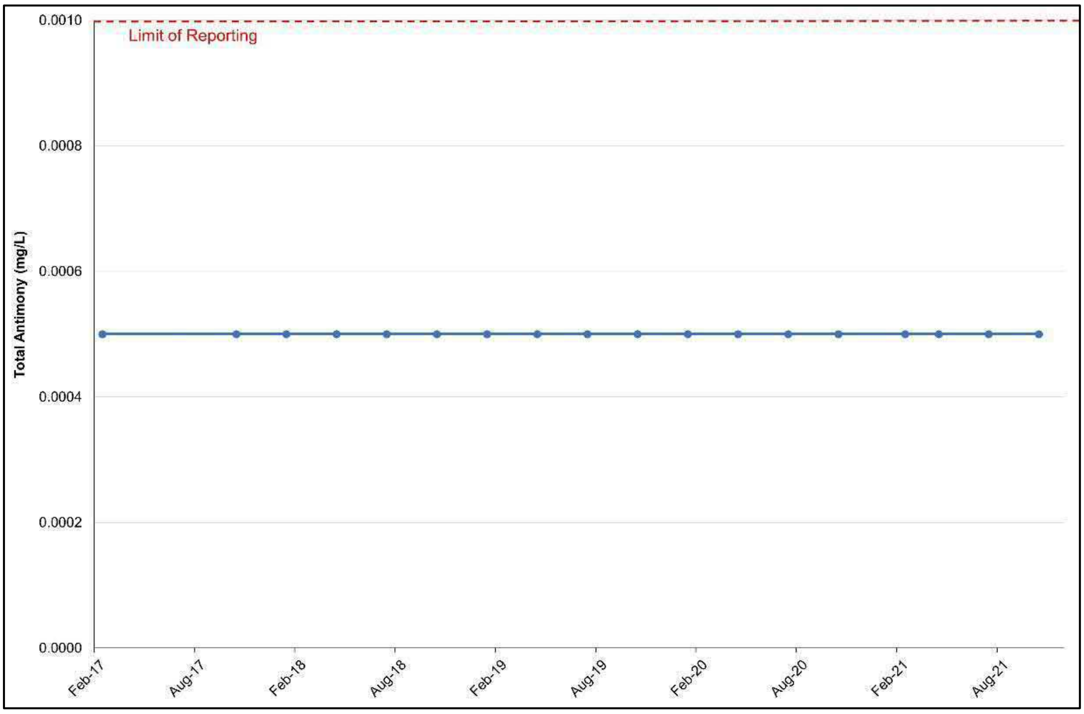

Figure C.160: MB1 total antimony time series plot.

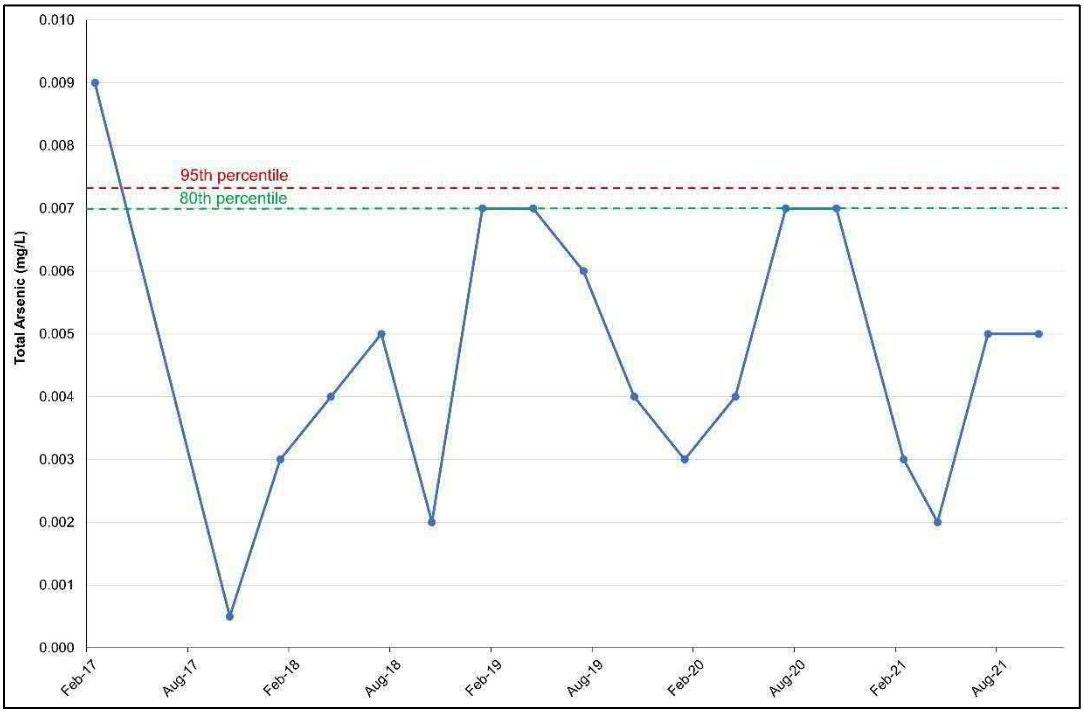

Figure C.161: MB1 total arsenic time series plot.

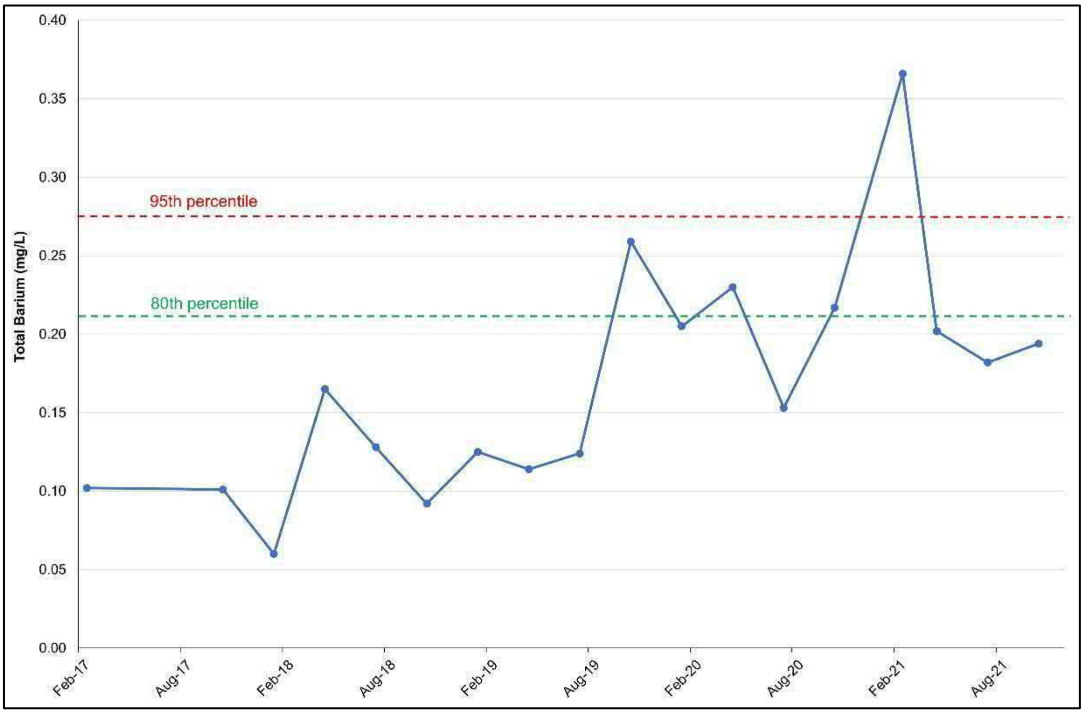

Figure C.162: MB1 total barium time series plot.

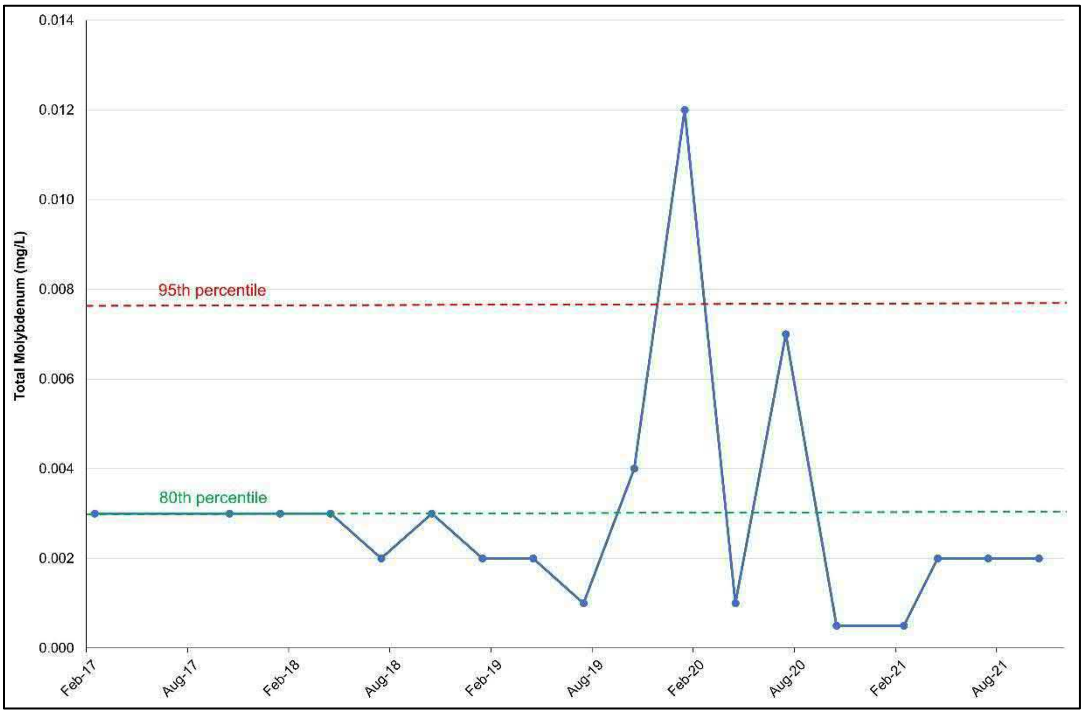

Figure C.163: MB1 total molybdenum time series plot.

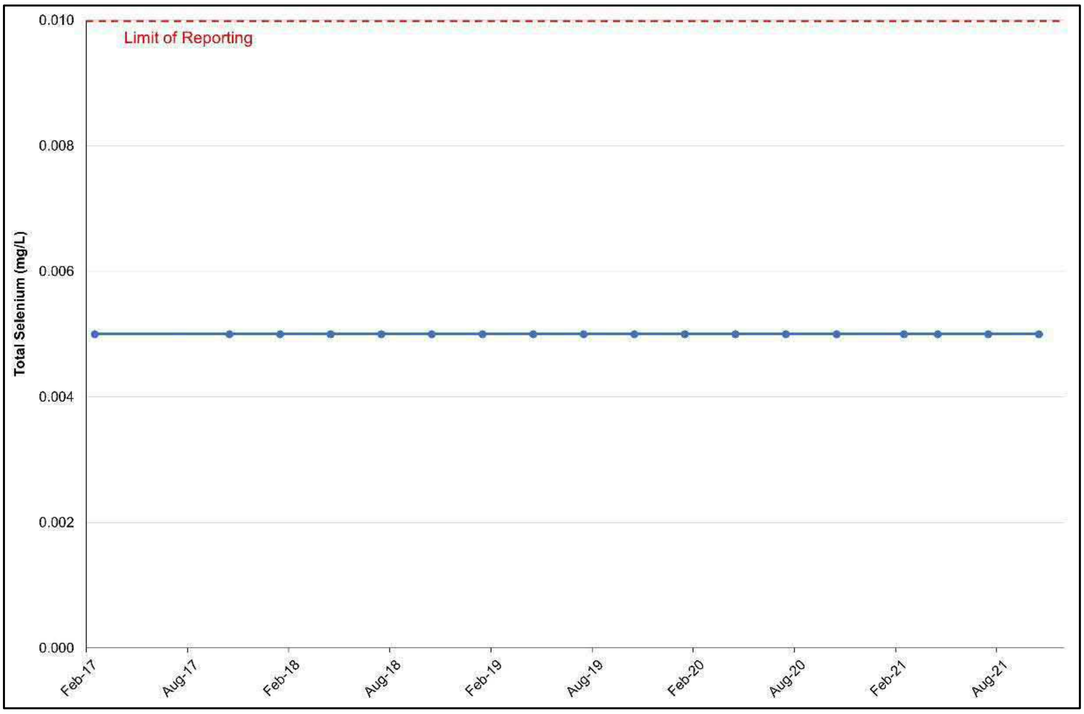

Figure C.164: MB1 total selenium time series plot.

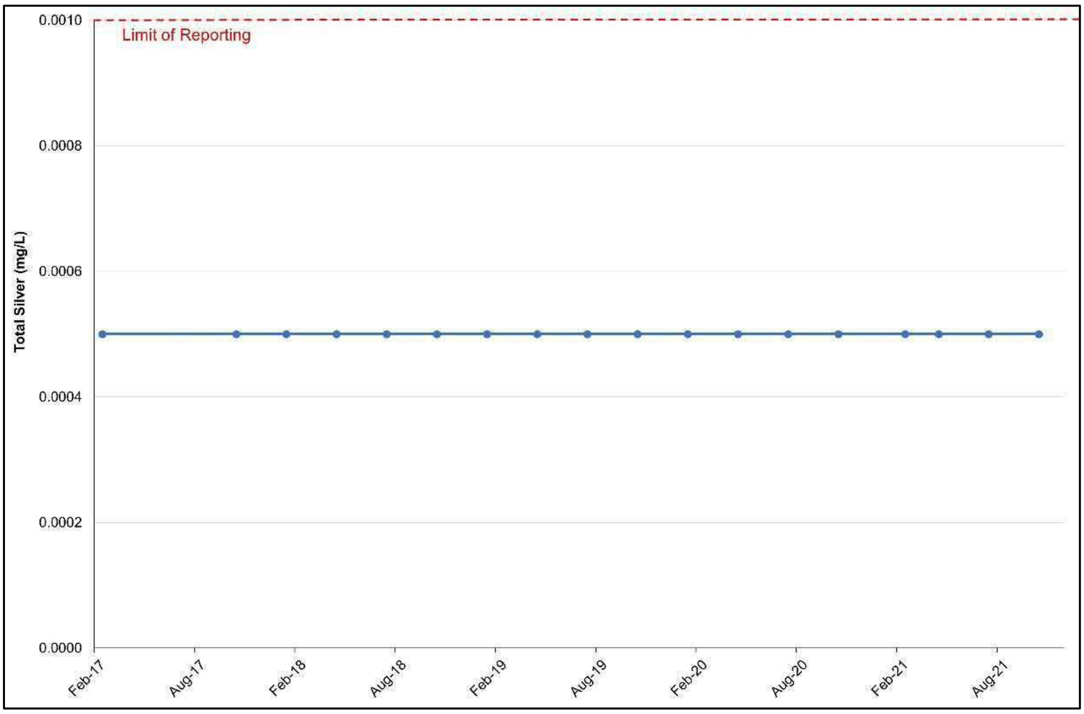

Figure C.165: MB1 total silver time series plot.

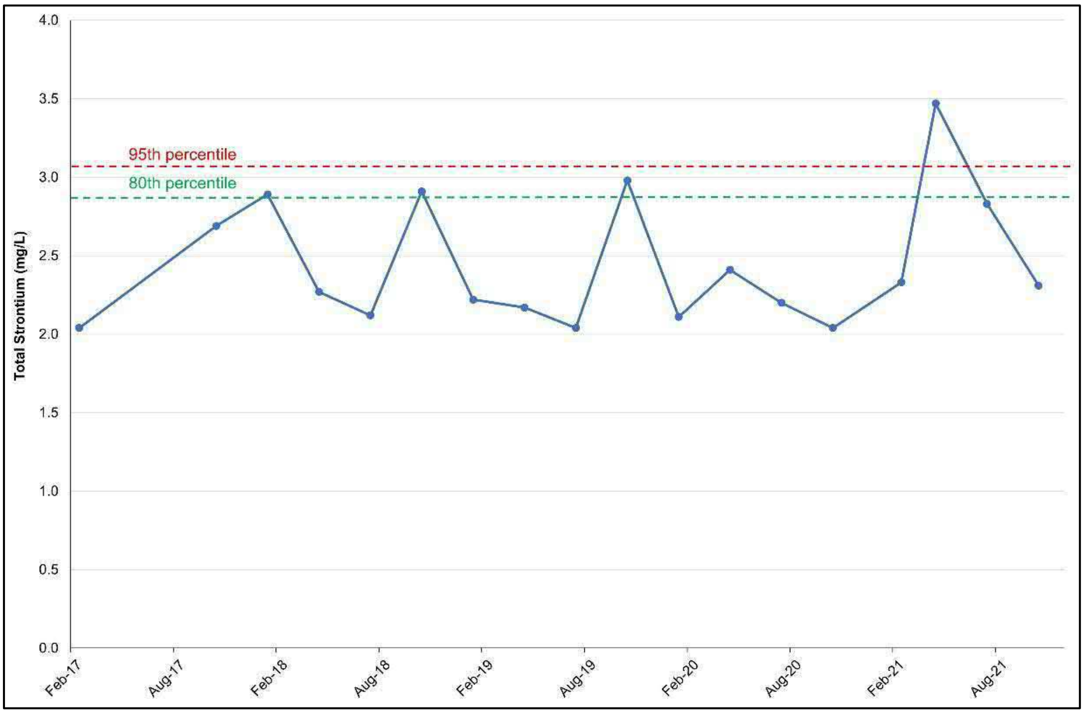

Figure C.166: MB1 total strontium time series plot.

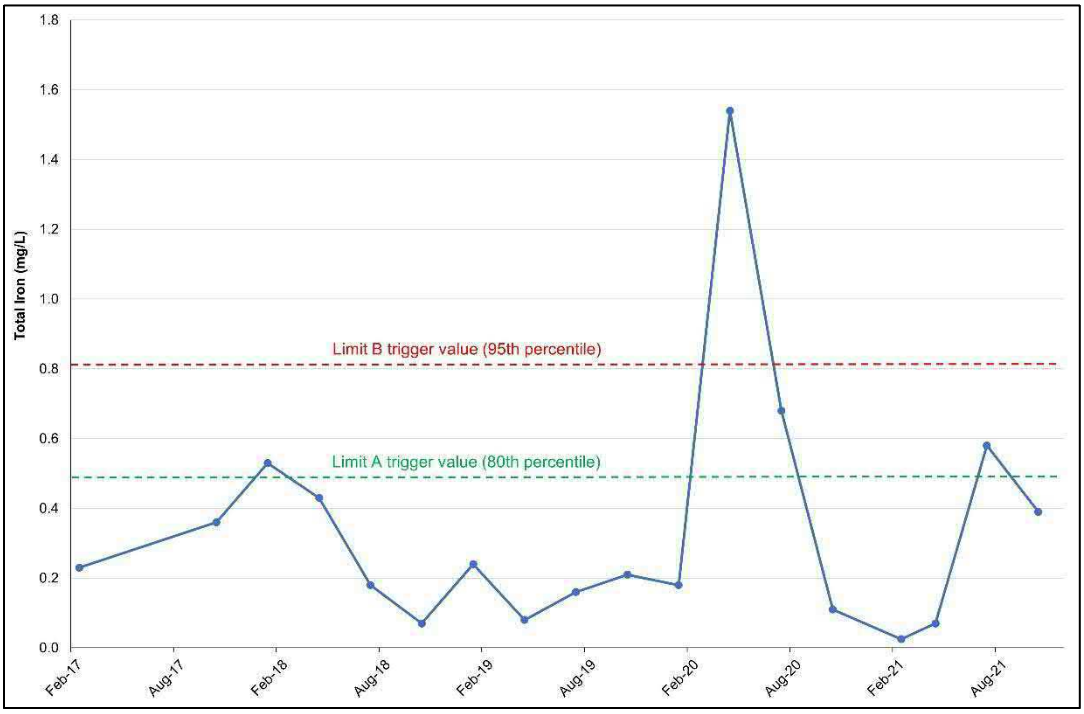

Figure C.167: MB1 total iron time series plot.

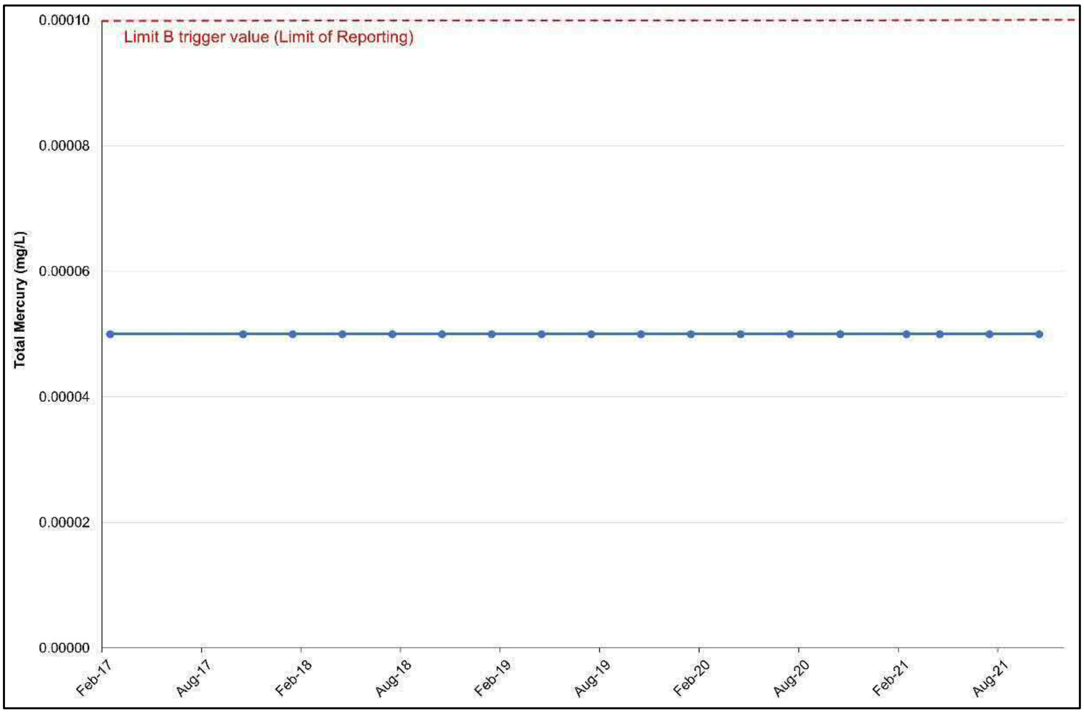

Figure C.168: MB1 total mercury time series plot.

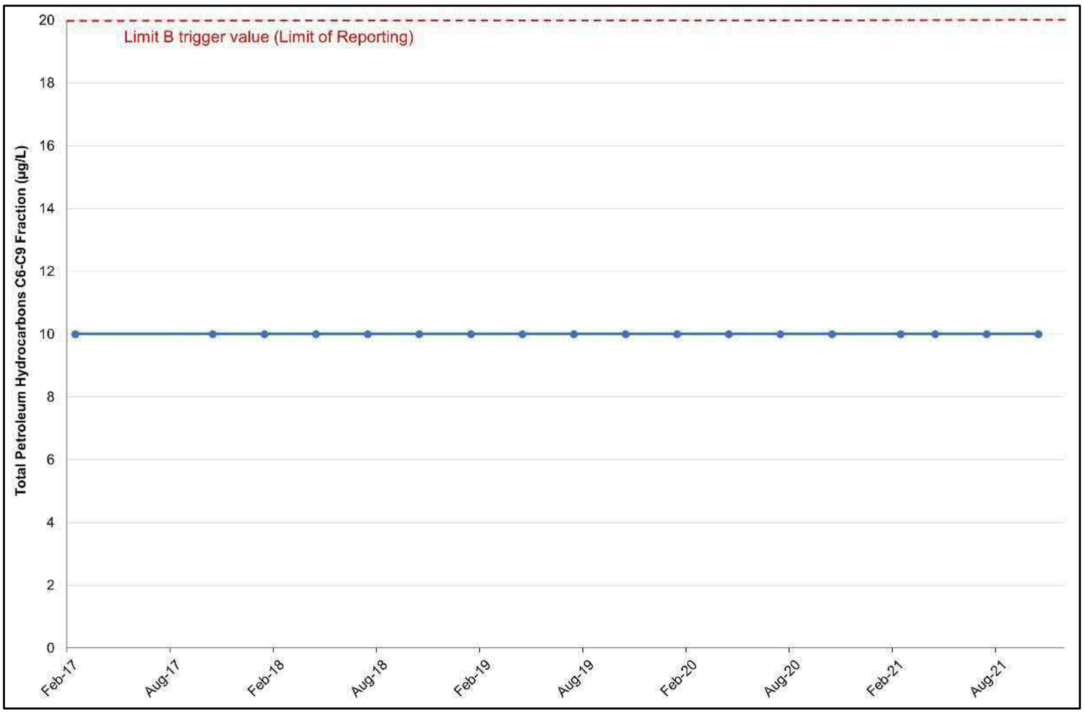

Figure C.169: MB1 total petroleum hydrocarbons C6-C9 fraction time series plot.

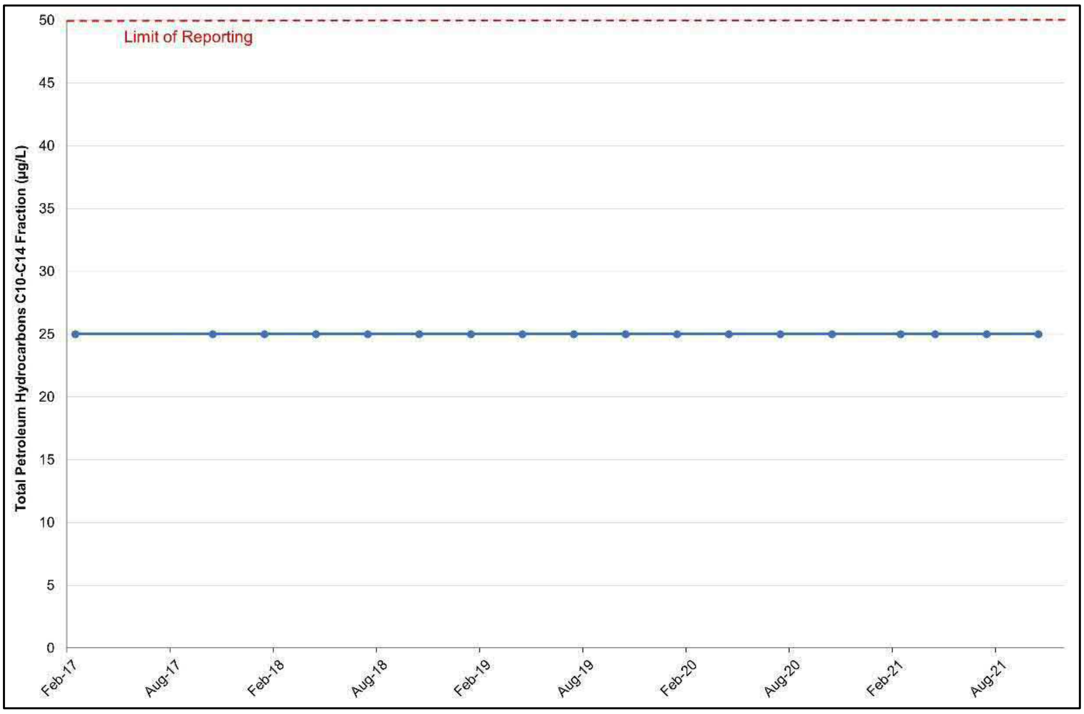

Figure C.170: MB1 total petroleum hydrocarbons C10-C14 fraction time series plot.

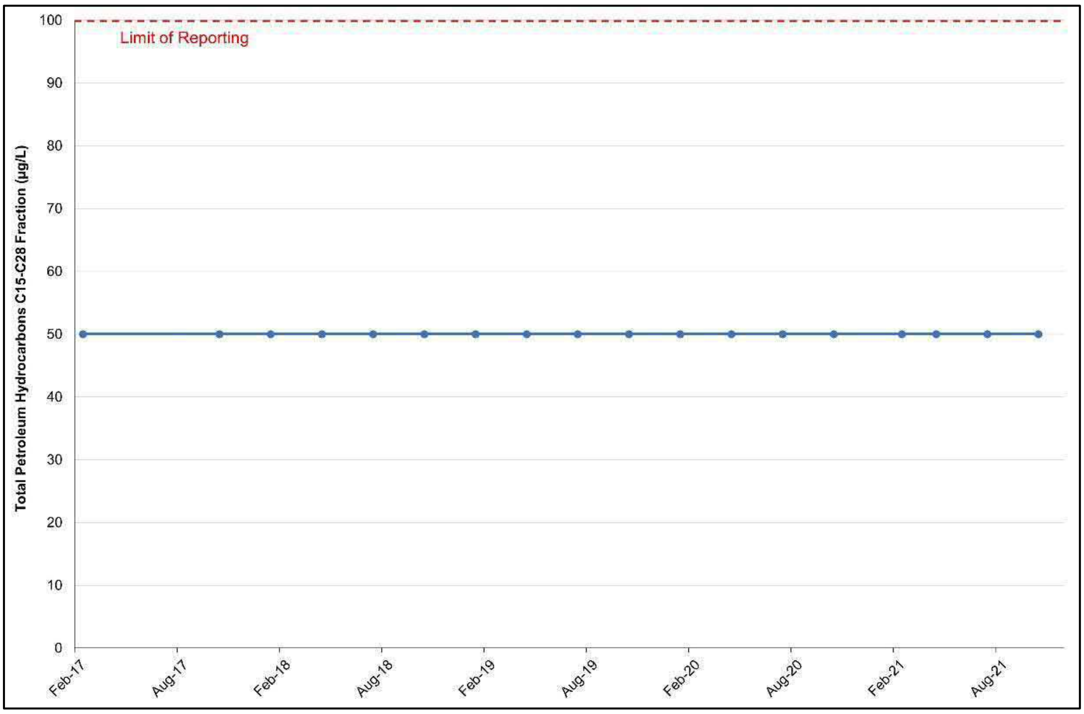

Figure C.171: **MB1 total petroleum hydrocarbons C15-C28 fraction time series plot.**

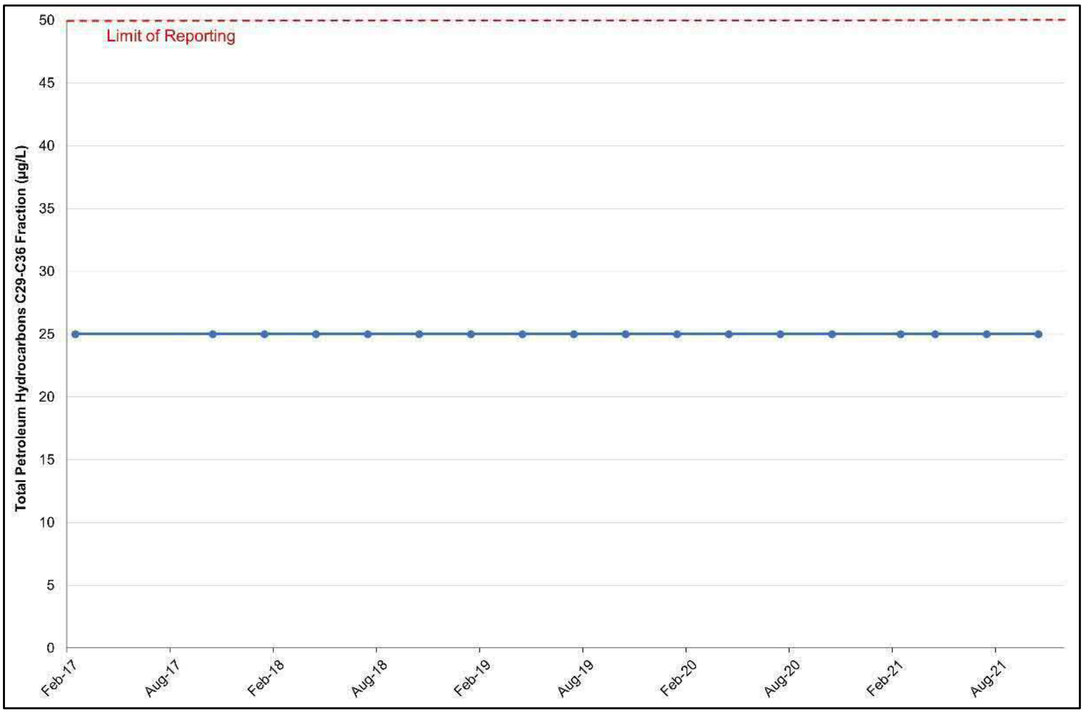

Figure C.172: **MB1 total petroleum hydrocarbons C29-C36 fraction time series plot.**

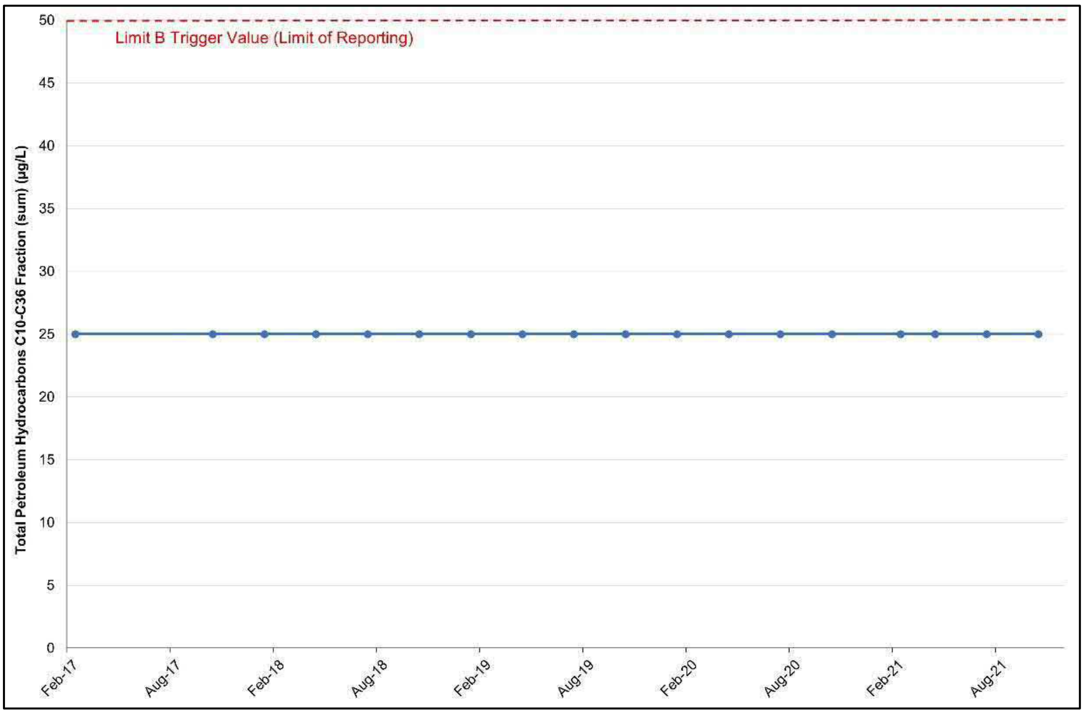

Figure C.173: MB1 total petroleum hydrocarbons C10-C36 fraction (sum) time series plot.

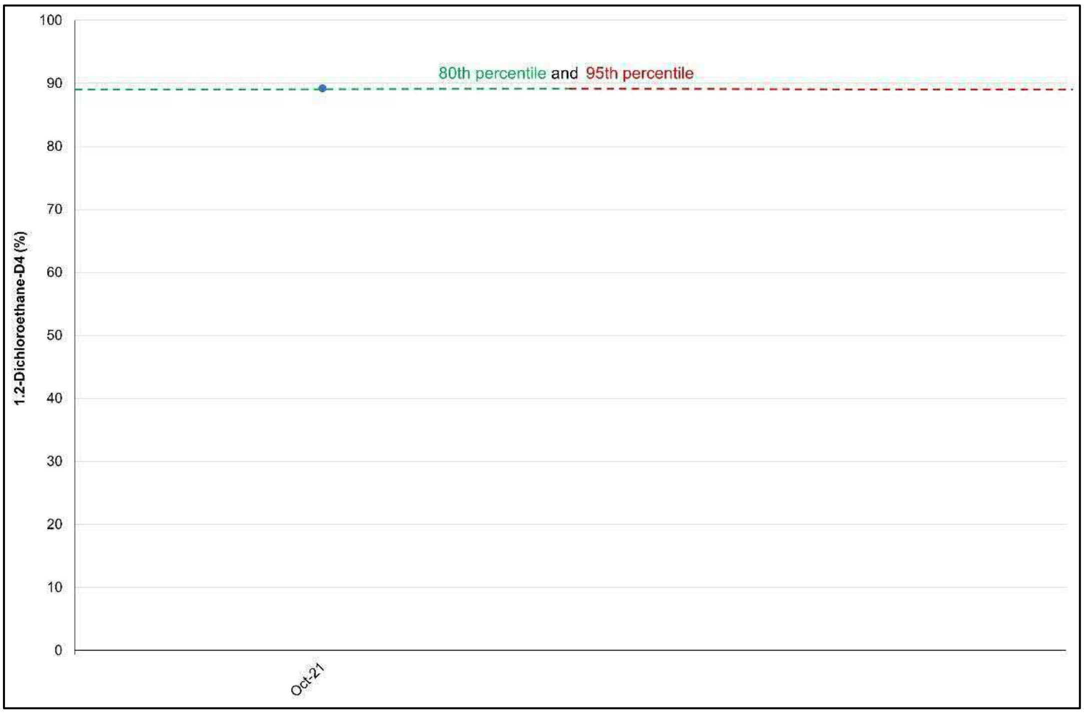

Figure C.174: MB1 1.2-dichloroethane-D4 time series plot.

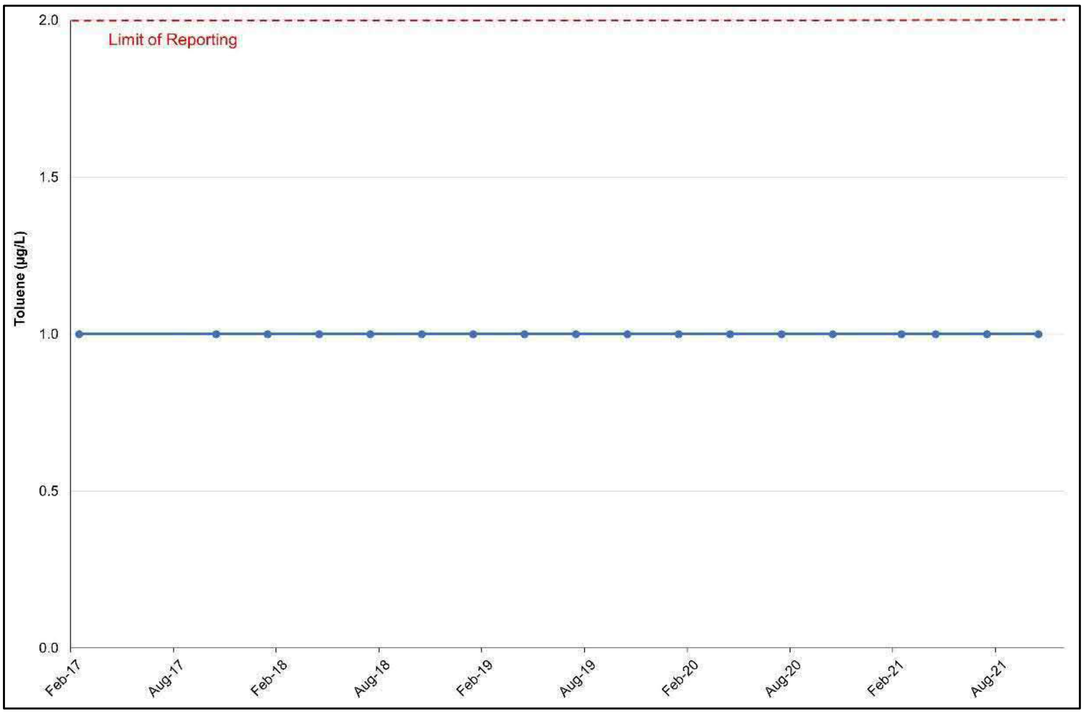

Figure C.175: MB1 toluene-D8 time series plot.

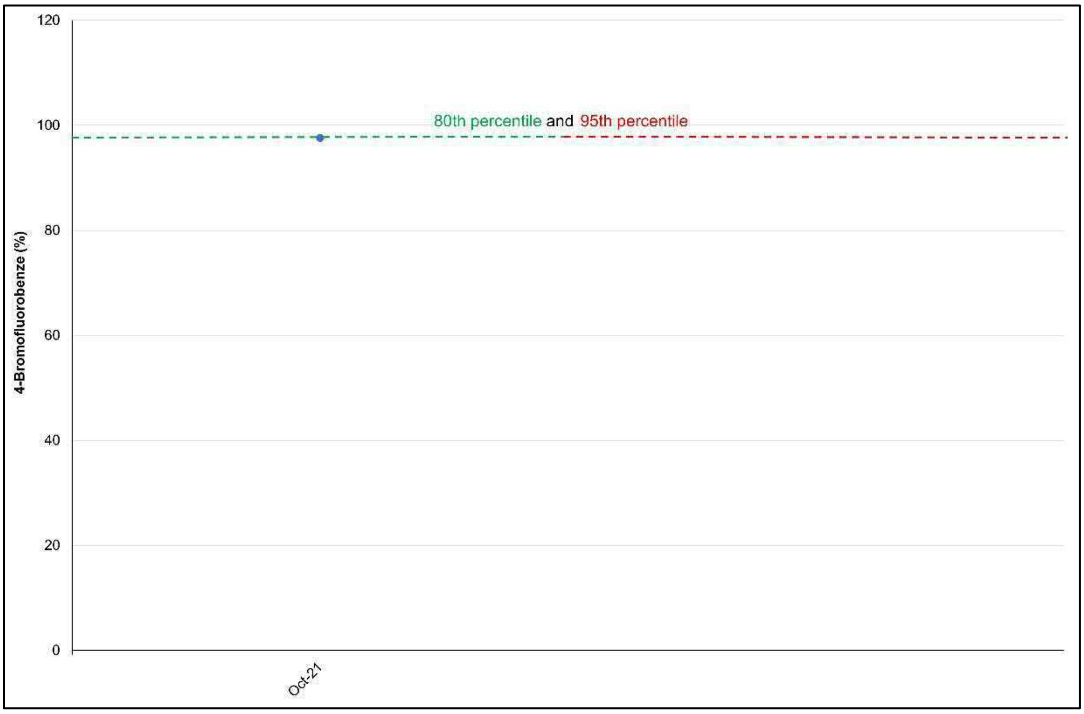

Figure C.176: MB1 4-bromofluorobenzene time series plot.

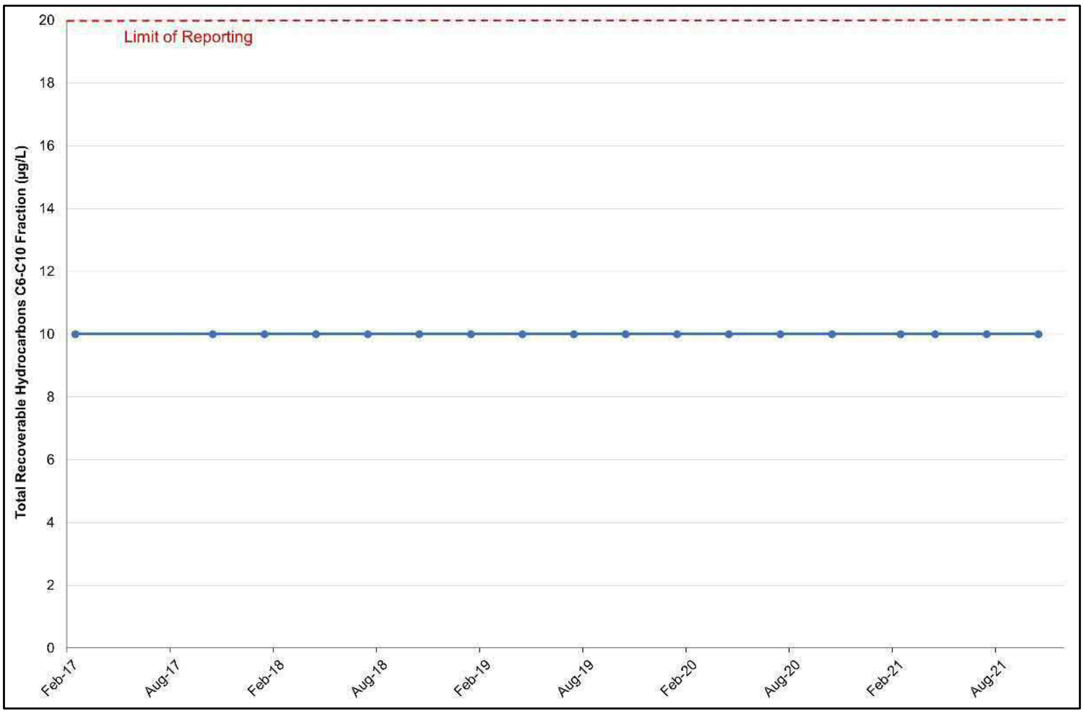

Figure C.177: MB1 total recoverable hydrocarbons C6-C10 fraction time series plot.

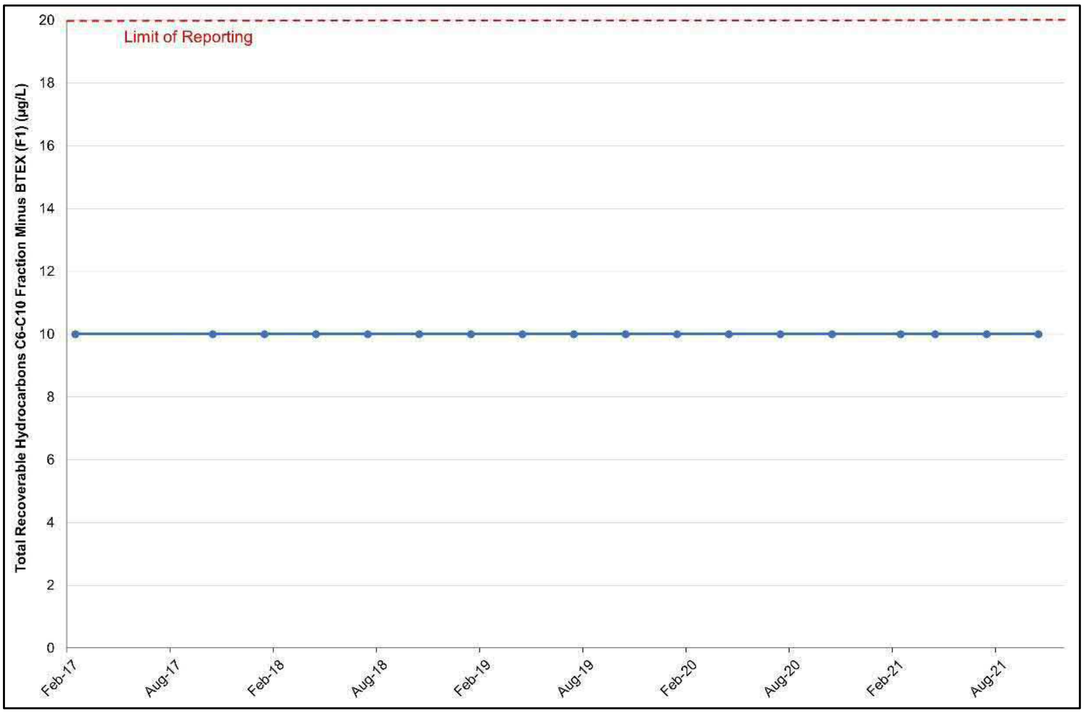

Figure C.178: MB1 total recoverable hydrocarbons C6-C10 fraction minus BTEX (F1) time series plot.

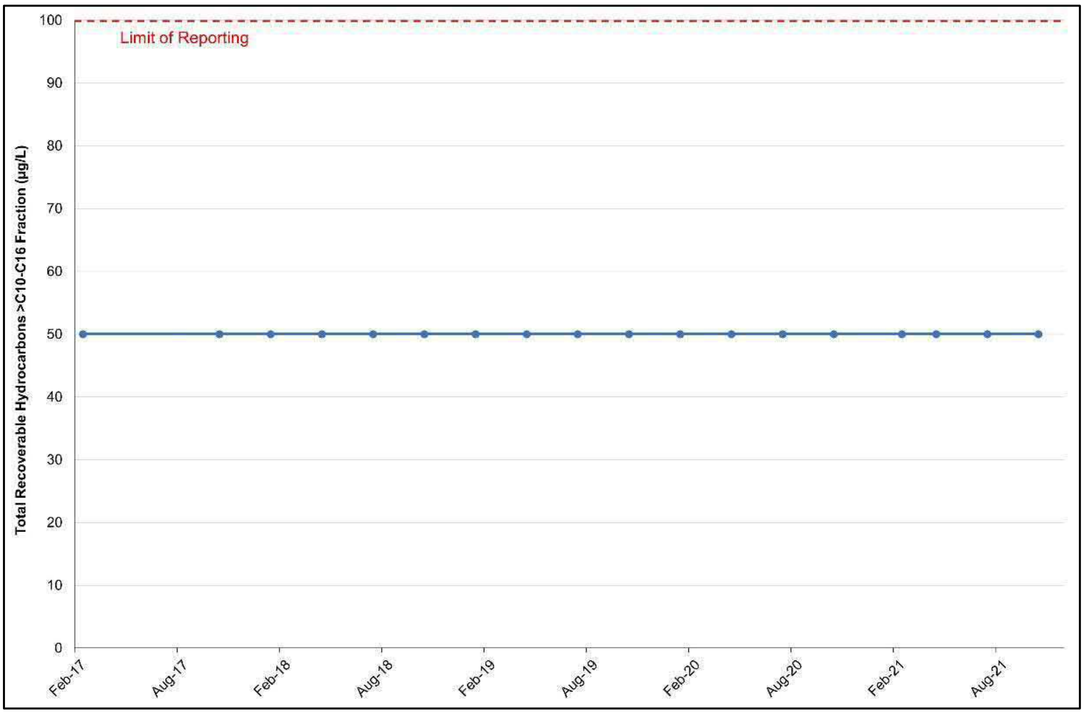

Figure C.179: MB1 total recoverable hydrocarbons >C10-C16 fraction time series plot.

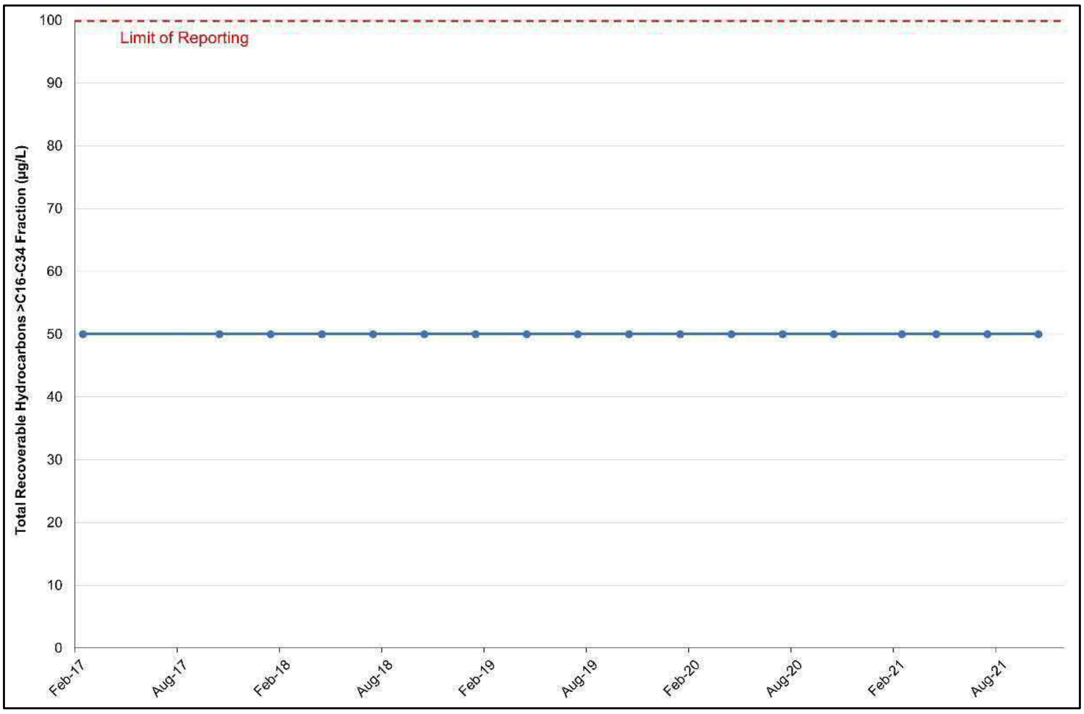

Figure C.180: MB1 total recoverable hydrocarbons >C16-C34 fraction time series plot.

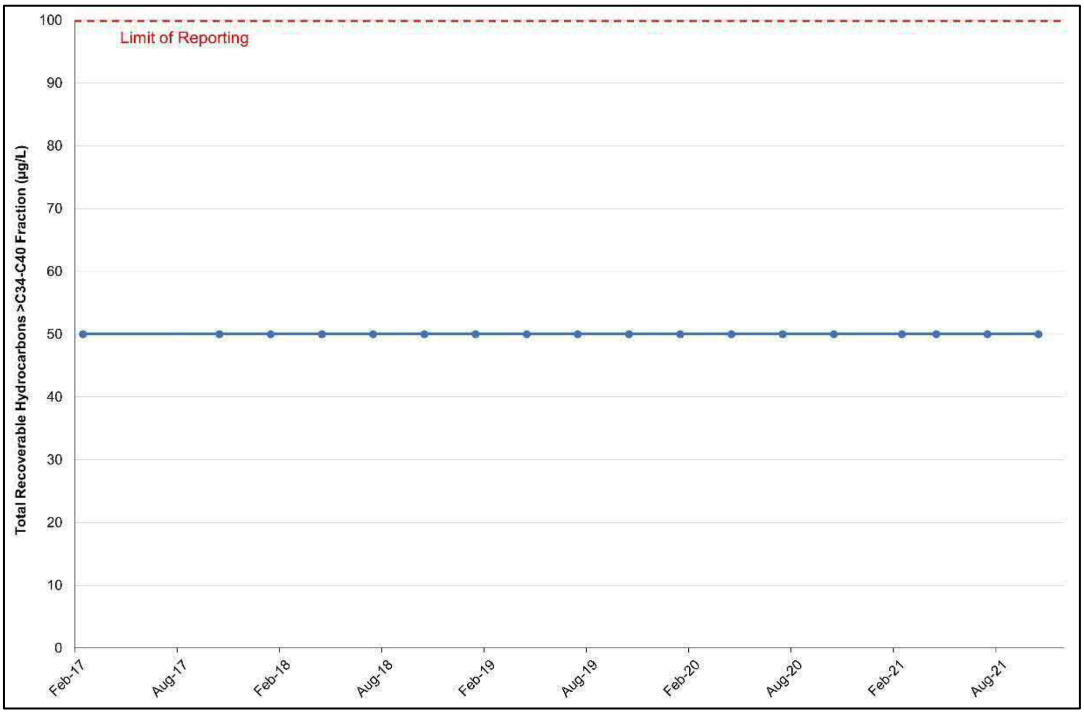

Figure C.181: MB1 total recoverable hydrocarbons >C34-C40 fraction time series plot.

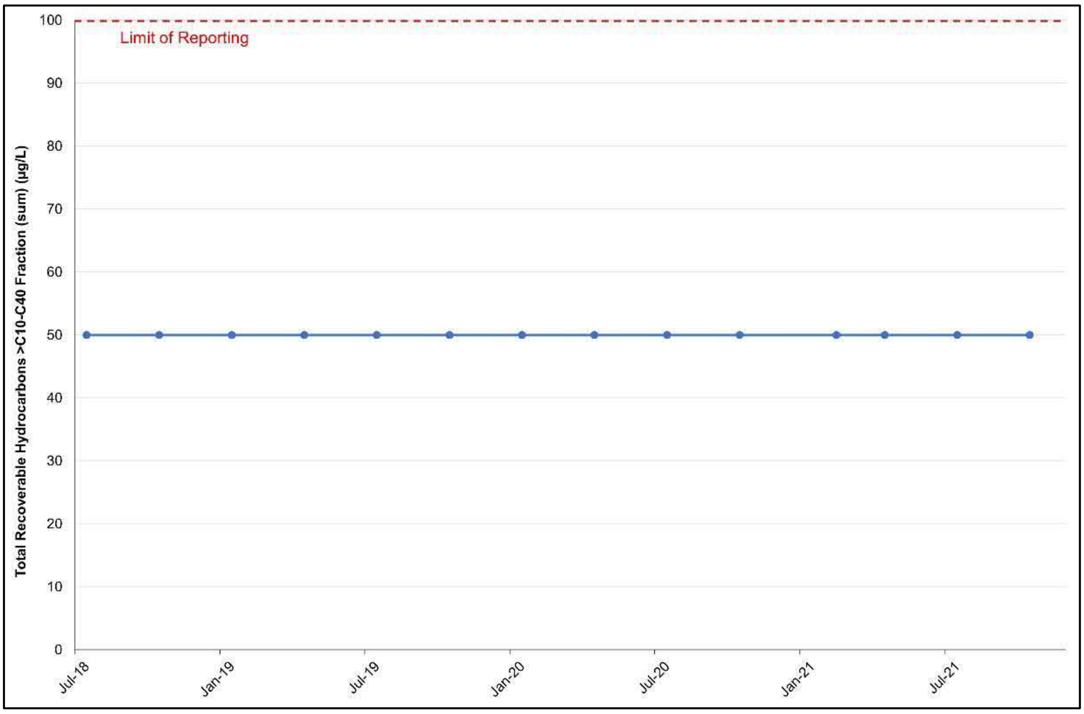

Figure C.182: MB1 total recoverable hydrocarbons >C10-C40 fraction (sum) time series plot.

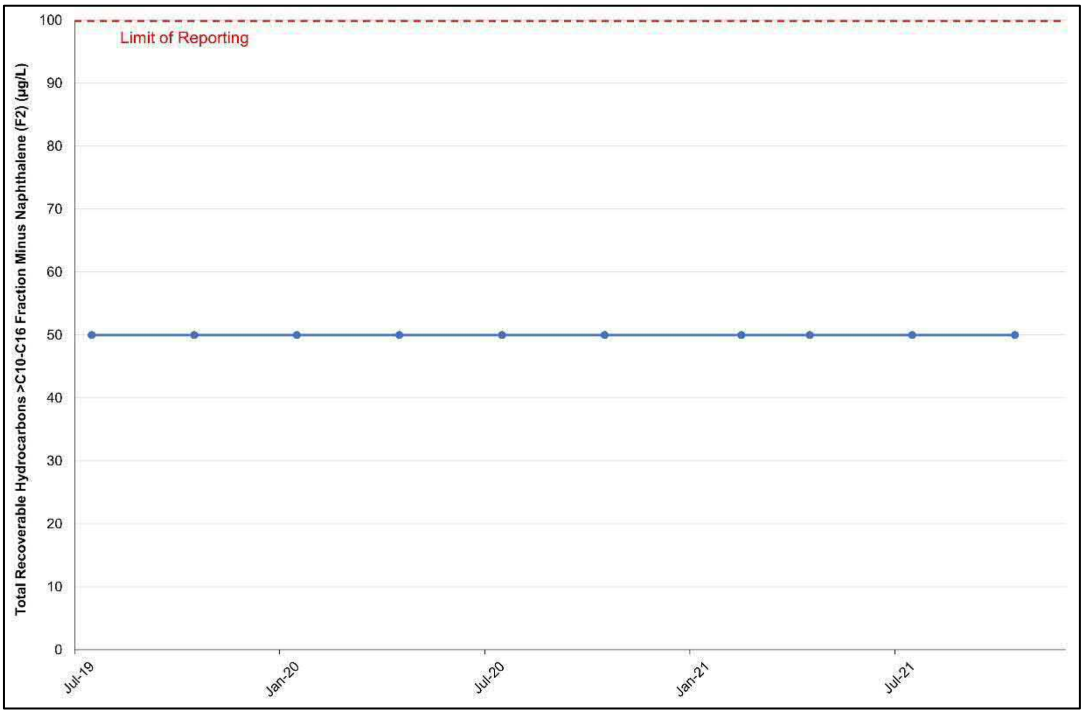

Figure C.183: MB1 total recoverable hydrocarbons >C10-C16 fraction minus naphthalene (F2) time series plot.

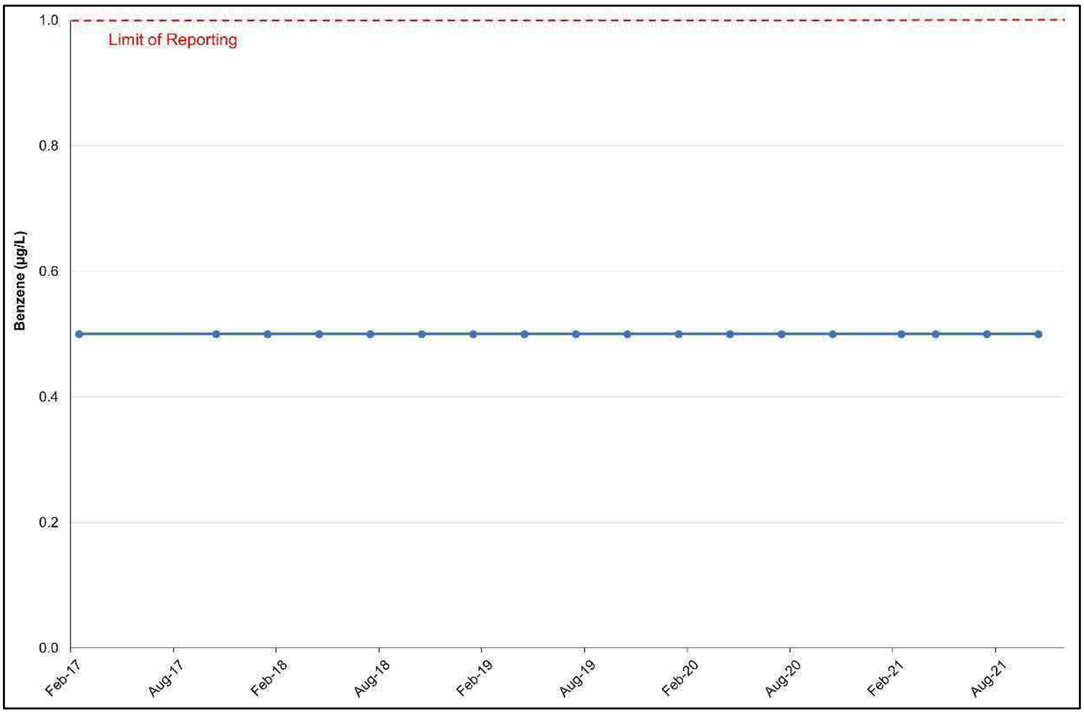

Figure C.184: MB1 benzene time series plot.

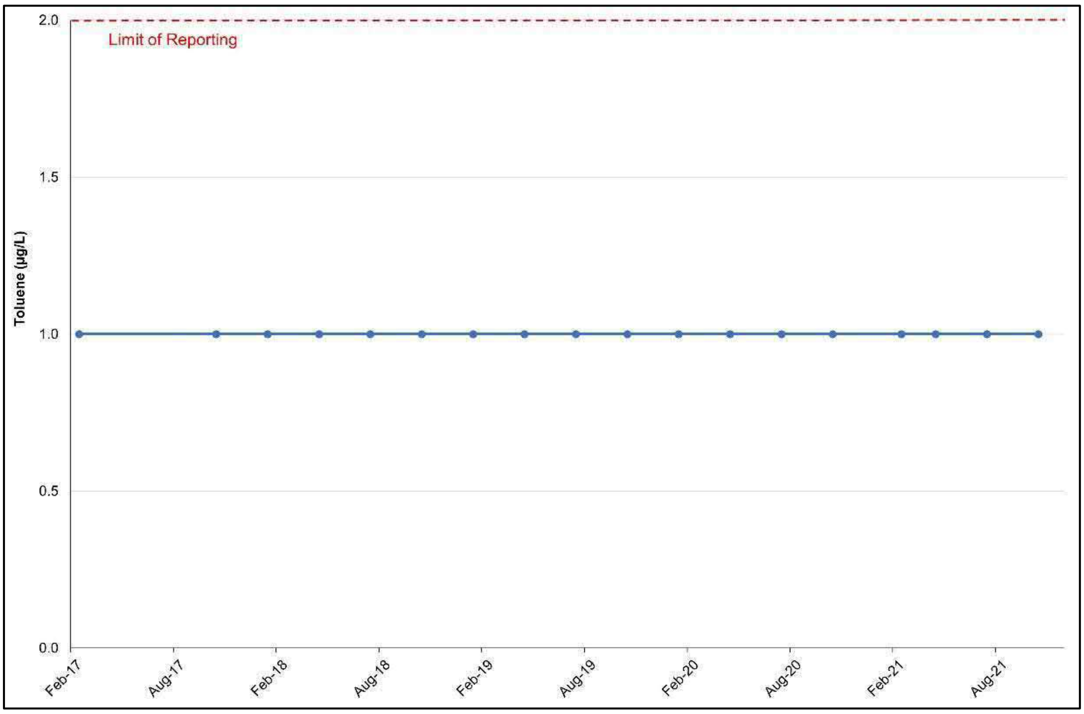

Figure C.185: **MB1 toluene time series plot.**

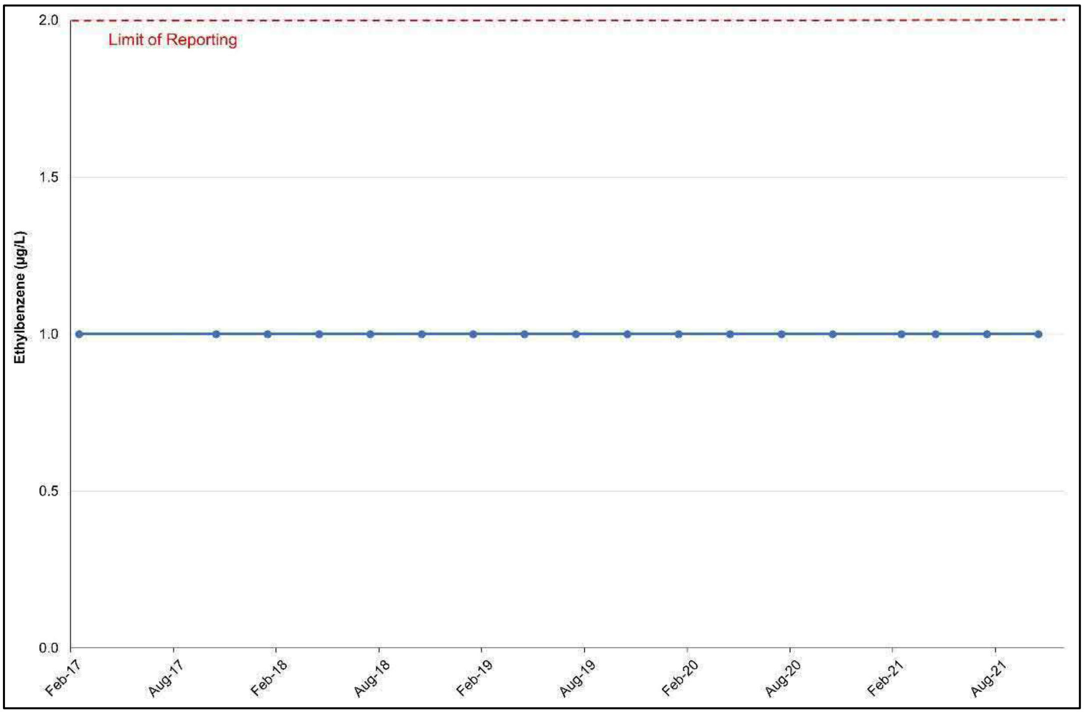

Figure C.186: **MB1 ethylbenzene time series plot.**

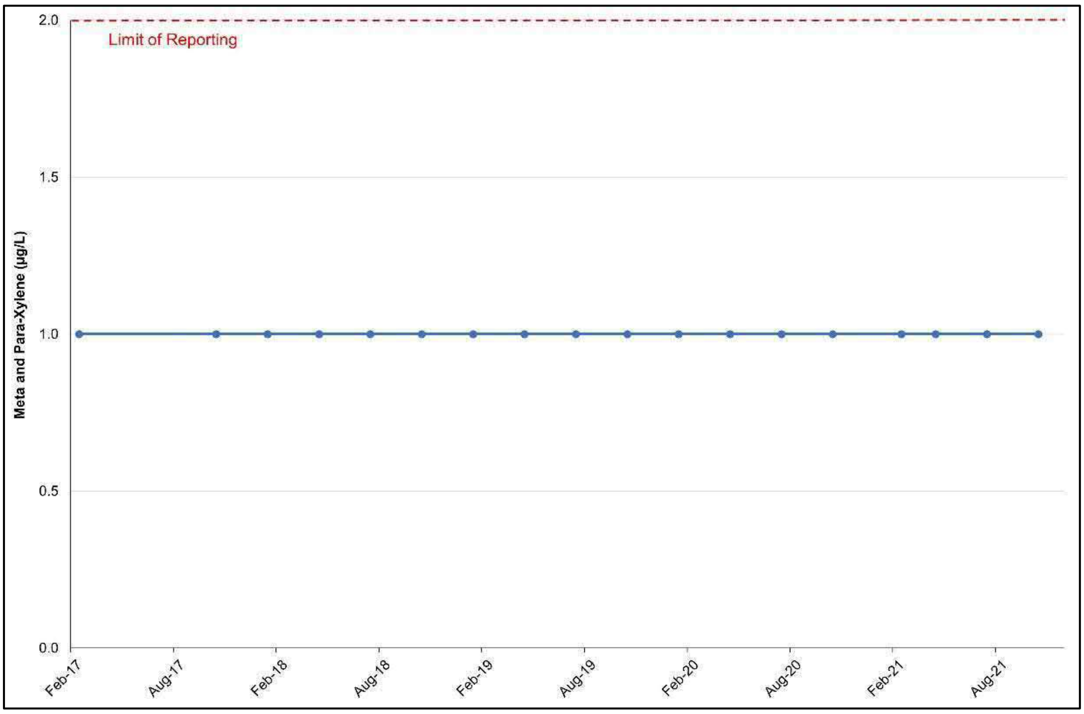

Figure C.187: MB1 meta- and para-xylene time series plot.

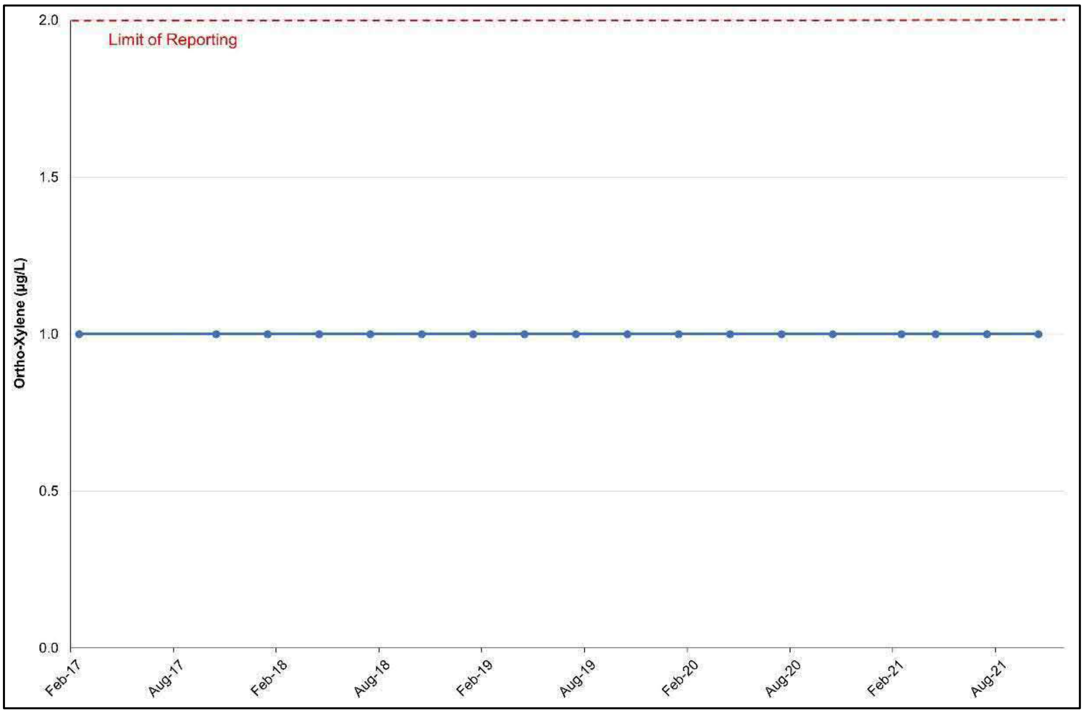

Figure C.188: MB1 ortho-xylene time series plot.

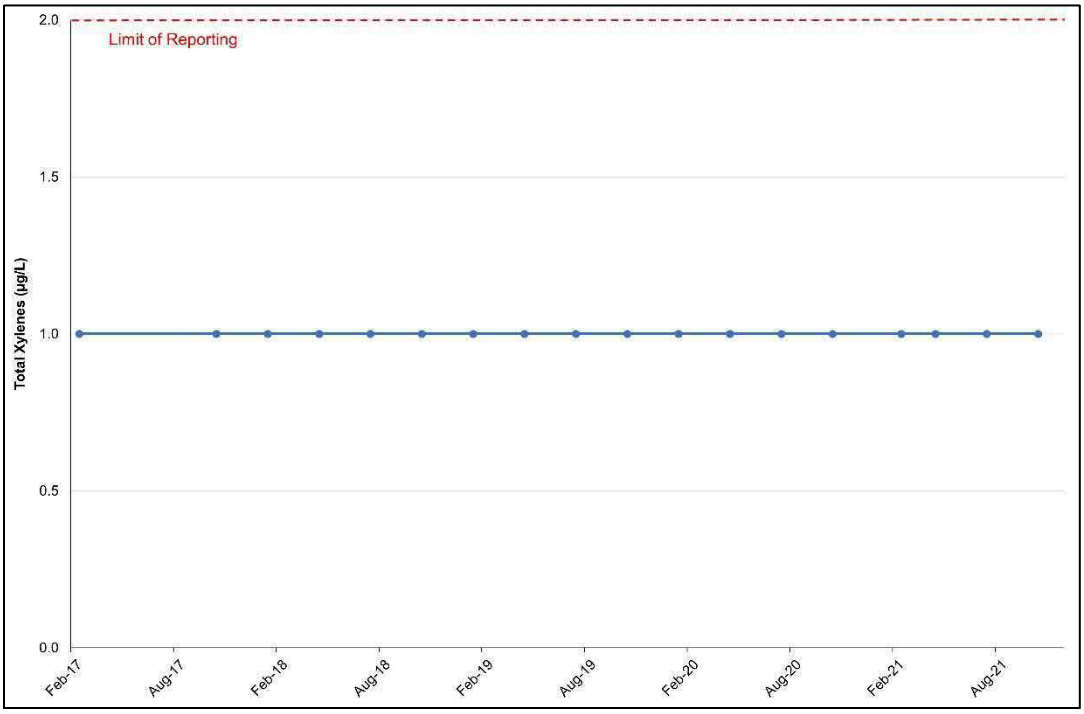

Figure C.189: MB1 total xylenes time series plot.

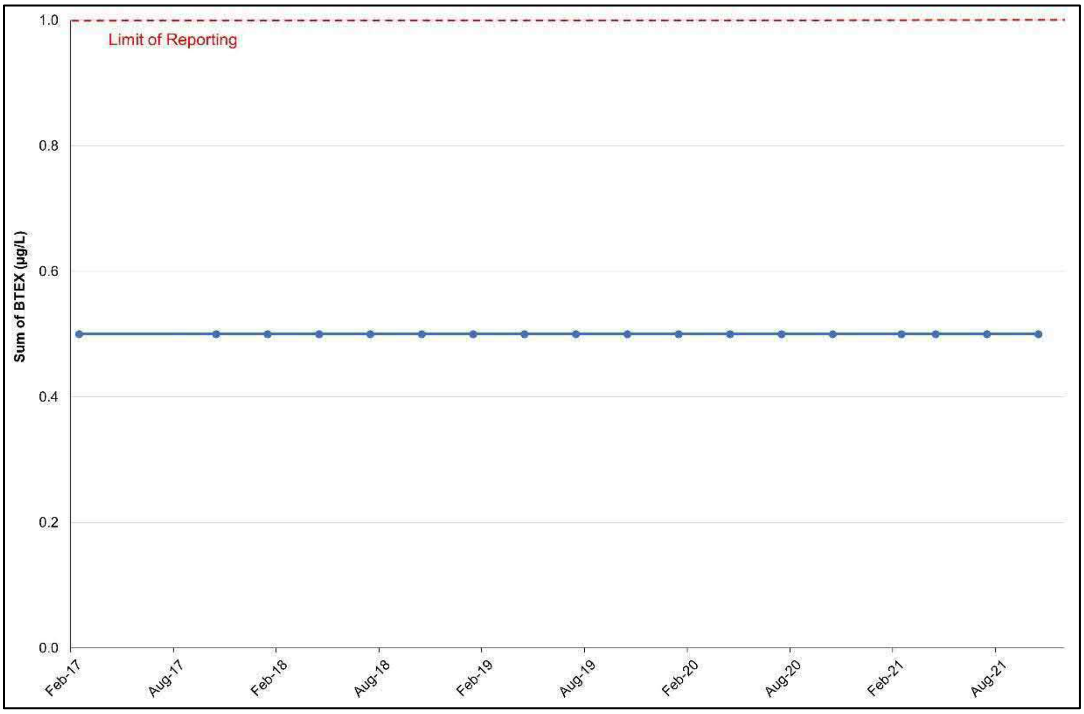

Figure C.190: MB1 sum of BTEX time series plot.

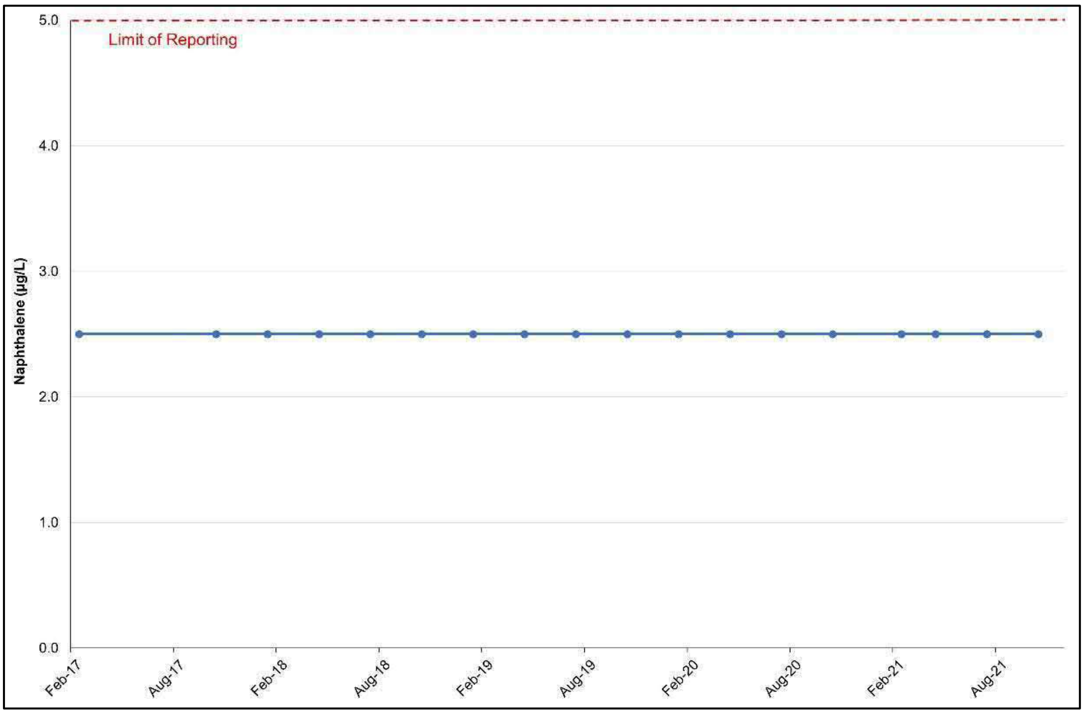

Figure C.191: MB1 sum of naphthalene time series plot.

APPENDIX D

Isaac Plains Complex Groundwater Sampling Results January to June 2022

		BTEX								TRH							Field						
		Naphthalene (BTEX)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6-C10	C6-C10 (F1 minus BTEX)	C10-C16	C10-C16 (F2 minus Naphthalene)	C16-C34	C34-C40	C10-C40 (Sum of total)	Temp (Field)	EC (field)	pH (Field)	pH (Lab)	Electrical Conductivity (Lab)	Turbidity	TSS
		mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	oC	µS/cm	-	-	µS/cm	NTU	mg/L
EQL		0.005	1	2	2	2	2	2	1	20	20	100	100	100	100	100				0.01	1	0.1	5
Location Code	Date /Time																						
BC2	19-01-2022 14:30		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.69	7,230		40
MB1	19-01-2022 12:45		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.85	4,330		<5
MB1	22-06-2022 10:00	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.88	3,500		<5
MB2	19-01-2022 13:34		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.77	7,370		34
MB2	22-06-2022 8:40	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.88	7,510		52
MB7	19-01-2022 15:50		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.53	22,300		16
MB8B	19-01-2022 17:00		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.67	10,500		7
MB8B	20-06-2022 18:00	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				9.85	8,020		45
MB9A	20-01-2022 8:00		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.73	10,600		289
MB9A	21-06-2022 14:15	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.92	11,300		345
MB9B	20-01-2022 8:45		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				8.21	3,980		437
MB9B	21-06-2022 15:40	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				8.38	2,840		271
MB12	19-01-2022 11:30		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.72	11,900		8
MB12	22-06-2022 11:10	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.80	12,800		14
MB14	19-01-2022 10:30		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				8.10	3,520		<5
MB14	22-06-2022 13:00	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				8.15	3,780		<5
MB16b	18-01-2022 14:50		<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.68	6,460		392
MB16b	22-06-2022 14:30	<0.005	<1	<2	<2	<2	<2	<2	<1	<20	<20	<100	<100	<100	<100	<100				7.93	7,270		132

		Inorganics																					
		Total Phosphorus as P (Organic Phosphate as P)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Chloride	Fluoride	Sulfate as SO4 - Turbidimetric (filtered)	Sodium	Sodium (filtered)	Anions Total	Cations Total	Ionic Balance	TDS	Aluminium	Aluminium (filtered)	Antimony	Antimony (filtered)	Arsenic	Arsenic (filtered)	Barium	Barium (filtered)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL		0.01	1	1	1	1	1	0.1	1	1	1	0.01	0.01	0.01	10	0.01	0.01	0.001	0.001	0.001	0.001	0.001	0.001
Location Code	Date /Time																						
BC2	19-01-2022 14:30	0.02	605	<1	<1	605	2,550	0.2	109		1,020	86.3	81.5	2.87	5,200	1.76	<0.01	<0.001	<0.001	0.007	0.004	0.246	0.235
MB1	19-01-2022 12:45	<0.01	450	<1	<1	450	1,250	0.5	51		690	45.3	48.5	3.38	2,790	0.01	<0.01	<0.001	<0.001	0.002	0.002	0.252	0.237
MB1	22-06-2022 10:00	0.02	491	<1	<1	491	832	0.4	37		483	34.0	33.7	0.56	2,040	0.04	<0.01	<0.001	<0.001	0.008	0.008	0.246	0.239
MB2	19-01-2022 13:34	0.02	705	<1	<1	705	2,250	0.5	161		1,360	80.9	79.4	0.94	4,810	0.56	<0.01	<0.001	<0.001	0.025	0.023	0.305	0.215
MB2	22-06-2022 8:40	0.05	728	<1	<1	728	1,790	0.5	149		1,330	68.1	76.5	5.76	4,390	0.31	<0.01	<0.001	<0.001	0.029	0.023	0.577	0.370
MB7	19-01-2022 15:50	<0.01	388	<1	<1	388	8,120	0.1	490		3,910	247	241	1.15	17,200	0.10	0.02	<0.001	<0.001	0.002	0.002	2.84	0.431
MB8B	19-01-2022 17:00	0.01	124	<1	<1	124	3,900	0.2	18		1,900	113	110	1.51	7,770	0.07	<0.01	<0.001	<0.001	0.006	0.005	7.60	7.71
MB8B	20-06-2022 18:00	0.36	<1	125	12	137	2,570	0.2	75		1,590	76.8	74.4	1.55	4,470	1.14	0.04	0.002	0.004	0.017	0.015	0.872	0.464
MB9A	20-01-2022 8:00	0.17	94	<1	<1	94	4,060	0.2	3		1,900	116	110	2.70	7,610	3.70	<0.01	<0.001	<0.001	0.004	<0.001	9.56	9.13
MB9A	21-06-2022 14:15	0.19	102	<1	<1	102	3,860	0.1	1		1,920	111	112	0.51	8,240	5.17	<0.01	0.002	<0.001	0.006	<0.001	9.76	9.57
MB9B	20-01-2022 8:45	1.38	375	<1	<1	375	1,170	0.2	81		740	42.2	44.9	3.13	2,390	15.4	0.02	<0.001	<0.001	0.003	0.002	1.96	1.75
MB9B	21-06-2022 15:40	0.48	470	21	<1	492	601	0.2	57		449	28.0	26.4	2.89	1,630	6.46	<0.01	<0.001	<0.001	0.002	0.002	1.01	0.859
MB12	19-01-2022 11:30	<0.01	382	<1	<1	382	4,400	0.2	329		1,990	139	132	2.33	8,990	0.02	<0.01	<0.001	<0.001	0.003	0.003	0.655	0.293
MB12	22-06-2022 11:10	0.05	393	<1	<1	393	4,220	0.1	332		2,000	134	134	0.05	8,470	0.03	<0.01	<0.001	<0.001	0.005	0.001	1.32	0.309
MB14	19-01-2022 10:30	<0.01	414	<1	<1	414	980	<0.1	127		519	38.6	40.0	1.78	2,350	0.01	<0.01	<0.001	<0.001	0.002	0.002	0.259	0.257
MB14	22-06-2022 13:00	0.03	436	<1	<1	436	890	<0.1	152		475	37.0	38.7	2.25	2,470	0.03	<0.01	<0.001	<0.001	0.002	<0.001	0.068	0.046
MB16b	18-01-2022 14:50	0.16	548	<1	<1	548	1,930	0.5	88		1,050	67.2	69.1	1.39	4,430	1.86	<0.01	<0.001	<0.001	0.001	<0.001	0.113	0.091
MB16b	22-06-2022 14:30	0.10	579	<1	<1	579	1,860	0.4	88		1,170	65.9	75.5	6.80	4,190	0.84	<0.01	<0.001	<0.001	0.001	<0.001	0.122	0.076

		Metals																					
		Cadmium	Cadmium (filtered)	Calcium (filtered)	Chromium (III+VI)	Chromium (III+VI) (filtered)	Cobalt	Cobalt (filtered)	Copper	Copper (filtered)	Iron	Iron (filtered)	Lead	Lead (filtered)	Magnesium (filtered)	Mercury	Mercury (filtered)	Molybdenum	Molybdenum (filtered)	Nickel	Nickel (filtered)	Potassium (filtered)	Selenium
		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	mg/L	mg/L
EQL		0.0001	0.0001	1	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.05	0.001	0.001	1	0.0001	0.0001	0.001	0.001	0.001	0.001	1	0.01
Location Code	Date /Time																						
BC2	19-01-2022 14:30			221							2.19	0.09			315	<0.0001	<0.0001	<0.001	<0.001			6	<0.01
MB1	19-01-2022 12:45			130							<0.05	<0.05			144	<0.0001	<0.0001	0.002	0.006			5	<0.01
MB1	22-06-2022 10:00			84							0.23	0.13			102	<0.0001	<0.0001	0.001	<0.001			3	<0.01
MB2	19-01-2022 13:34			118							0.96	0.45			172	<0.0001	<0.0001	0.002	0.002			8	<0.01
MB2	22-06-2022 8:40			92							1.10	0.12			168	<0.0001	<0.0001	0.002	<0.001			8	<0.01
MB7	19-01-2022 15:50			554							0.63	0.42			524	<0.0001	<0.0001	0.002	0.001			21	<0.01
MB8B	19-01-2022 17:00			309							0.75	0.56			134	<0.0001	<0.0001	<0.001	<0.001			16	<0.01
MB8B	20-06-2022 18:00			87							2.68	<0.05			<1	<0.0001	<0.0001	0.152	0.151			37	<0.01
MB9A	20-01-2022 8:00			305							6.49	0.22			145	<0.0001	<0.0001	0.002	<0.001			21	<0.01
MB9A	21-06-2022 14:15			312							8.54	<0.05			151	<0.0001	<0.0001	0.007	0.004			22	<0.01
MB9B	20-01-2022 8:45			86							28.0	<0.05			99	<0.0001	<0.0001	0.013	0.015			11	<0.01
MB9B	21-06-2022 15:40			40							9.94	<0.05			57	<0.0001	<0.0001	0.011	0.010			7	<0.01
MB12	19-01-2022 11:30			261							0.65	0.57			390	<0.0001	<0.0001	0.002	0.003			24	<0.01
MB12	22-06-2022 11:10			255							1.21	<0.05			408	<0.0001	<0.0001	0.002	0.001			25	<0.01
MB14	19-01-2022 10:30			119							0.05	<0.05			135	<0.0001	<0.0001	0.001	0.001			13	<0.01
MB14	22-06-2022 13:00			72							0.11	<0.05			171	<0.0001	<0.0001	0.001	<0.001			14	<0.01
MB16b	18-01-2022 14:50			116							2.79	<0.05			214	<0.0001	<0.0001	0.001	0.001			2	<0.01
MB16b	22-06-2022 14:30			104							1.31	<0.05			235	<0.0001	<0.0001	0.003	0.002			2	<0.01

									Other	PAH	TPH				
		Selenium (filtered)	Silver	Silver (filtered)	Strontium	Strontium (filtered)	Zinc	Zinc (filtered)	Rubidium (filtered)	Naphthalene	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Sum of total)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.01	0.001	0.001	0.001	0.001	0.005	0.005	0.001	5	20	50	100	50	50
Location Code	Date /Time														
BC2	19-01-2022 14:30	<0.01	<0.001	<0.001	6.80	6.48			0.011	<5	<20	<50	<100	<50	<50
MB1	19-01-2022 12:45	<0.01	<0.001	<0.001	3.86	3.93			0.007	<5	<20	<50	<100	<50	<50
MB1	22-06-2022 10:00	<0.01	<0.001	<0.001	2.34	2.06			0.004		<20	<50	<100	<50	<50
MB2	19-01-2022 13:34	<0.01	<0.001	<0.001	4.69	4.58			0.013	<5	<20	<50	<100	<50	<50
MB2	22-06-2022 8:40	<0.01	<0.001	<0.001	4.33	4.14			0.014		<20	<50	<100	<50	<50
MB7	19-01-2022 15:50	<0.01	<0.001	<0.001	51.8	49.8			0.038	<5	<20	<50	<100	<50	<50
MB8B	19-01-2022 17:00	<0.01	<0.001	<0.001	16.2	16.2			0.024	<5	<20	<50	<100	<50	<50
MB8B	20-06-2022 18:00	<0.01	<0.001	<0.001	5.19	5.27			0.097		<20	70	<100	<50	70
MB9A	20-01-2022 8:00	<0.01	<0.001	<0.001	15.2	14.5			0.031	<5	<20	<50	<100	<50	<50
MB9A	21-06-2022 14:15	<0.01	<0.001	<0.001	14.5	15.4			0.035		<20	<50	<100	<50	<50
MB9B	20-01-2022 8:45	<0.01	<0.001	<0.001	3.23	3.15			0.017	<5	<20	<50	<100	<50	<50
MB9B	21-06-2022 15:40	<0.01	<0.001	<0.001	1.32	1.10			0.011		<20	<50	<100	<50	<50
MB12	19-01-2022 11:30	<0.01	<0.001	<0.001	12.3	11.7			0.031	<5	<20	<50	<100	<50	<50
MB12	22-06-2022 11:10	<0.01	<0.001	<0.001	12.0	12.0			0.034		<20	<50	<100	<50	<50
MB14	19-01-2022 10:30	<0.01	<0.001	<0.001	2.43	2.39			0.019	<5	<20	<50	<100	<50	<50
MB14	22-06-2022 13:00	<0.01	<0.001	<0.001	1.69	1.72			0.022		<20	<50	<100	<50	<50
MB16b	18-01-2022 14:50	<0.01	<0.001	<0.001	3.44	3.23			0.003	<5	<20	<50	<100	<50	<50
MB16b	22-06-2022 14:30	<0.01	<0.001	<0.001	3.50	3.52			0.003		<20	<50	<100	<50	<50

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