Awaba Waste Management Facility

Annual Review 2022-2023

Lake Macquarie City Council

04 August 2023

→ **The Power of Commitment**

Project name		LMCC - Awaba Landfill AR					
Document title		Awaba Waste Management Facility | Annual Review 2022-2023					
Project number		12614665					
File name		12614665-REP_Rev B_Awaba Waste Management Facility Annual Review 2022-2023.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	E Strauss L Taylor	M Kiejda		M Kiejda		04/08/23

GHD Pty Ltd | ABN 39 008 488 373
Contact: Lachy Taylor, Scientist | GHD
GHD Tower, Level 3, 24 Honeysuckle Drive
Newcastle, New South Wales 2300, Australia
T +61 2 4979 9999 | **F** +61 2 9475 0725 | **E** ntlmail@ghd.com | **ghd.com**

Annual Review Title Block	
Name of Operation	Awaba Waste Management Facility
Name of Operator	Lake Macquarie City Council
Development Consent/Project Approval #	10_0139
Name of Holder of Project Approval	Lake Macquarie City Council
Annual Review Commencement Date	1 July 2022
Annual Review Completion Date	30 June 2023
I, Paul Collins, certify that this audit report is a true and accurate record of the compliance status of Awaba Waste Management Facility for the period 1 July 2022 to 30 June 2023 and that I am authorised to make this statement on behalf of Lake Macquarie City Council.	
Name of authorised reporting officer	Paul Collins
Title of authorised reporting officer	Manager Waste Services
Signature of authorised reporting officer	
Date	9 August 2022

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Appendices

1. Statement of compliance

This section details compliance with the conditions of project approval 10_0139 and any other licences and approvals as at the end of the reporting period (30 June 2023).

Table 1-1 identifies whether or not non-compliances occurred during the reporting period for each statutory approval. Where non-compliances are identified, further details are provided in Table 1-2. Non-compliances have been colour-coded in that table, in accordance with the risk level descriptions provided in Table 1-3.

Table 1-1 Statement of compliance

Approval	Were all conditions of the relevant approval(s) complied with during the reporting period?
Project Approval 10_0139	No
EPL 5873	No
Trade Waste Agreement (Consent no: 2014-1036/9)	Yes

Non-compliances recorded during the reporting period were generally in relation to monitoring results and frequency, incident reporting and administrative non-compliances. Several non-compliances identified in the IEA (undertaken in the previous reporting period) have not been closed out and are therefore reported as non-compliances in this annual review.

Table 1-2 Non-Compliances identified during reporting period

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
Project Approval 10_0139	Sch 3 C1	The Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or decommissioning of the Project.	**Non-compliant**	This condition is reported as a non-compliance due to the non-compliances outlined in this table.	Refer to other non-compliances
	Sch 3 C2	The Proponent shall carry out the Project generally in accordance with the: (a) EA and Response to Submissions Report; (b) Statement of Commitments (see Appendix 1); (c) site layout plans and drawings in the EA, (as shown in Appendix 2 to 8). (d) Modification Application (10_0139 MOD 1) with supporting documentation titled Environmental Assessment S75W Application to modify approved layout and staging of Awaba Waste management (e) conditions of this approval.	**Non-compliant**	This condition is reported as a non-compliance due to the non-compliances outlined in this table.	Refer to other non-compliances
	Sch 3 C6	Upon commencement of the development, or as otherwise agreed by the Director-General, the Proponent shall surrender the development consents identified in Table 1-1 in accordance with Sections 75YA and 104A of the EP&A Act.	**Non-compliant**	In the IEA undertaken in the previous reporting period, it was identified that the development consents outlined by this condition were not surrendered. LMCC are in the process of surrendering these development consents, which are anticipated to be surrendered shortly after the completion of the reporting period.	Section 9.1
	Sch 4 C6	Prior to commencement of operation, the Proponent shall ensure that a Trade Waste Agreement is in place with Hunter Water Corporation for the life of the Project.	**Non-compliant**	In the IEA undertaken in the previous reporting period, it was identified a Trade Waste Agreement for the life of the project had not been obtained. LMCC are working with Hunter Water to execute a permanent Trade Waste Agreement, however a non-compliance against this condition is still reported as this was not obtained prior to the completion of the reporting period.	Section 3.3, 9.1
	Sch 4 C16	The Proponent shall ensure that all licensed surface water discharges from the Site comply with discharge limits (volume and quality) set for the Project in any EPL or relevant provisions of the POEO Act.	**Non-compliant**	Exceedances of Condition L2 of EPL 5873 were recorded during the reporting period.	Section 6.1.5

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
	Sch 4 C19	The Proponent shall prepare and implement a Soil, Water and Leachate Management Plan for the Project. The Plan shall be prepared by a suitably qualified and experienced expert in consultation with LMCC, the NOW and the EPA and be submitted to the Director-General for approval prior to the commencement of Operations. The Plan shall include: (a) a Site water balance for the Project, that details – sources and security of water supply; – water use on Site; – water management on Site; (b) an erosion and sediment control plan that: – is consistent with the requirements of the latest version of the Blue Book Volume 1 and Volume 2B; – identifies activities on Site that could cause soil erosion and generate sediment; and – describes the measures that will be implemented to: i. minimise soil erosion and the transport of sediment to downstream waters, including the location, function and capacity of any erosion and sediment control structures and maintain these structures over time ii. ensure that any topsoil stockpiles on Site are suitably managed to ensure that the topsoil in these stockpiles can be beneficially used in the proposed revegetation and rehabilitation of the Site. (c) a leachate management plan that: – includes final detailed design specifications of the leachate management and collection system on Site; and – demonstrates how the requirements of Condition 18 of Schedule 4 have been addressed; (d) a stormwater management plan that: – is consistent with the guidance in the latest version of the Blue Book Volume 1 and Volume 2B; – includes final detailed design specifications for the stormwater management and collection system; and – demonstrates how the requirements of Condition 17 of Schedule 4 have been addressed;	**Non-compliant**	Exceedances of ANZECC criteria and Condition L2 of EPL 5873 were recorded in the reporting period.	Section 6.1.4, 6.1.5

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
		(e) a surface water, groundwater and leachate monitoring program that includes: – baseline data (including water flow and quality); – details off the proposed monitoring network; and – the parameters for testing and respective impact assessment criteria and trigger levels for action under the surface water, groundwater and leachate response plan. (f) a surface water, groundwater and leachate response plan that – includes a protocol for the investigation, notification and mitigation of any exceedances of the respective trigger levels; and – describes the measures that could be implemented to respond to any surface or groundwater contamination that may be caused by any development. The Plan shall be documented in the Landfill Environmental Management Plan.			
	Sch 4 C26	The Proponent shall develop and implement a Greenhouse Gas Management Plan prior to the commencement of operations of the new landfill cells. The Plan shall include, as a minimum: (a) proposed active landfill gas management system including flaring and / or combustion to reduce potential greenhouse gas emissions from the landfill; (b) energy saving measures to be implemented ; (c) detail greenhouse gas monitoring program; (d) a program to monitor the effectiveness of these measures; and (e) a protocol to periodically review the Plan The Plan shall be documented in the Landfill Environmental Management Plan (see Condition 3 in Schedule 5).	**Non-compliant**	Monitoring of surface gas was not undertaken for March and April 2023. This constitutes a non-compliance against this condition as monitoring under the Greenhouse Gas Management Plan is required to occur monthly.	Section 6.2.2

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
	Sch 4 C43	The Proponent shall prepare and implement an Emergency Response Plan for the Project to the satisfaction of the Director-General. The Plan shall: (a) be prepared and implemented by a suitably qualified and experienced person whose appointment has been approved by the Director-General; (b) be submitted for approval by the Director- General prior to commencement of operations; and (c) include a Bush Fire Emergency Evacuation Plan in accordance with the NSW Rural Fire Service document Guide for Developing a Bush Fire Emergency Evacuation Plan.	**Non-compliant**	In the IEA undertaken in the previous reporting period, the PIRMP was not prepared by a suitably qualified and experienced person endorsed by the Director General. LMCC have engaged a suitability qualified consultant to review and update the PIRMP, however this consultant as not approved by DPE. This plan has been submitted to DPE.	Section 9.1
	Sch 4 C45	The Proponent shall prepare and implement a Cultural Heritage Management Plan (CHMP) to the satisfaction of the Director-General. The Plan shall: (a) be prepared in consultation with the OEH by a suitably qualified and experienced expert; (b) be approved by the Director-General prior to the commencement of any ground disturbance or development works; (c) be implemented in consultation with the registered Aboriginal parties; (d) detail: • procedures for managing the Aboriginal cultural heritage values associated with the Project; • the involvement and responsibilities of the Aboriginal stakeholders in the implementation of all cultural heritage management actions; • the responsibilities of all other stakeholders; • all mitigation and management strategies (including monitoring program, further investigations etc); • procedures for the identification and management of previously unrecorded sites (including human remains); • an appropriate keeping place agreement with local Aboriginal community representatives for any Aboriginal objects salvaged through the development process;	**Non-compliant**	Section 3.5.1 of the approved CHMP states that where cultural heritage sites are fenced, fencing will carry signage. As identified in the IEA undertaken in the previous reporting period, no signage was identified around site 45-7-0331 (culturally modified tree). This site is fenced, however was not signposted by the conclusion of the reporting period. LMCC installed signage at the site in July 2023, and therefore have addressed this non-compliance with no further action required.	Section 6.8.2

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
	Sch 4 C51A	(a) Within 60 days of the commencement of vegetation clearance (other than for survey or conservation management purposes) under this Approval, a restriction on user burdening Lot 463 DP 1138964 retained to implement the Biodiversity Offset Strategy in Condition 50 shall be registered and inure in favour of the Minister for Planning and Infrastructure. (b) The instrument shall be in or to the effect of the Restrictive Covenant annexed to these conditions as Appendix 9 and will affect the area of land referred to in that Appendix. (c) It is a requirement that the restriction on user instrument not restrict or constrain the holder of an authority granted or renewed under the *Mining Act 1992* or any Act consolidating or replacing that Act from carrying out on the subject land prospecting, mining operations, mining purposes and related improvements and activities authorised by or under any such authority.	**Non-compliant**	Letter received from DPE on 16 May 2023 indicating that they do not consider the requirements of this condition to be addressed. LMCC are in the process of collating a response to DPE to address the requirements of this condition.	Section 9.1
	Sch 5 C6	The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the Project as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident.	**Non-compliant**	Following review of the 2021/2022 annual review, DPE requested that LMCC notify DPE of any incidents occurring as per the requirements of this condition. The following incidents were not reported to DPE in accordance with this condition: – Fire occurring 13 July 2022 – Fire occurring 16 January – Exceedances of Condition L2.4 of EPL 5873	Section 10

Relevant approval	REF	Condition description	Compliance status	Comment	Where addressed in Annual Review
	Sch 5 C10	From the commencement of the construction of the Project, the Proponent shall make the following information publicly available on its website as it is progressively required by the approval: a) a copy of all current statutory approvals; b) a copy of the current plans and programs required under this approval; c) a summary of the monitoring results of the Project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval; d) a complaints register, which is to be updated on a monthly basis; e) a copy of the Annual Reviews (over the last 5 years); f) a copy of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit; and any other matter required by the Director-General.	**Non-compliant**	The monthly gas accumulation and surface monitoring results for March, April, May and June were not on the website at the completion of the reporting period. A complaints register was also not uploaded onto the website at the completion of the reporting period. LMCC have updated the website in July 2023 to include the complaints register in a prominent position on the project website.	Section 10
EPL 5873	L2	Concentration limits	**Non-compliant**	LMCC recorded exceedances of Total Suspended Solids (TSS) over the reporting period. LMCC voluntarily reported lab analysis results above the ANZECC 95% Fresh Water Trigger Values under this condition in the EPA annual return, despite no criteria being applicable for analytes other than TSS on EPL 5873.	Section 6.1.5
EPL 5873	M2.1	For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns.	**Non-compliant**	LMCC did not undertake quarterly monitoring at all monitoring points over the reporting period.	Section 6.1.5
EPL 5873	R2.2	The licensee must provide written details of the notification to the EPA within 7 days of the date on which they became aware of the incident.	**Non-compliant**	Several exceedances of the ANZECC 95% Fresh Water Trigger Values were exceeded during the reporting period that were not reported to the EPA.	Section 6.1.5

Table 1-3 Compliance status key for Table 1.2

Risk Level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-complaint	Non-compliance with: – Potential for serious environmental consequences, but is unlikely to occur; or – Potential for moderate environmental consequences, but is likely to occur
Low	**Non-compliant**	Non-compliance with: – Potential for moderate environmental consequences, but is unlikely to occur; or – Potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2. Introduction

2.1 Operations overview

Lake Macquarie City Council (LMCC) operates the Awaba Waste Management Facility (AWMF) located off Wilton Road, Awaba. The site is situated around five kilometres (km) to the east of the village of Awaba and 20 km southwest of Newcastle. The AWMF received NSW Environment Protection Authority (EPA) approval and commenced landfilling operations in circa 1986. The AWMF first accepted general putrescible and non-putrescible waste and was situated within unlined cells. The site operations expanded to incorporate all waste within the Lake Macquarie local government area (LGA) in line with the gradual closure of all other landfill sites operated by LMCC, culminating with the closure of the Redhead landfill in 1994.

In 2010, LMCC lodged a major project application under the now-repealed Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for expansion of the AWMF. This project approval (Project Approval 10_0139) (PA), was granted by the NSW Planning Assessment Commission (PAC) in May 2013, allowing for the excavation of two additional landfill cells and continued emplacement over the existing landfill area, extending the lifespan of the landfill site by an estimated 20 years.

A modification (Mod 1) to the PA was granted in 2014, which made amendments to the PA in regard to the proposed staging of cell construction and landfilling, as well as leachate and stormwater management infrastructure.

Construction of the expansion project was completed in 2020 and operation of the expanded AWMF under the PA commenced on 11 August 2020.

As of July 2023, operations are being undertaken in both Cell 1 and Cell 2. Works to commission Cell 2 were completed in August 2022. Operations in Cell 2 commenced in Quarter 3 2022.

The AWMF operates in accordance with an approved Landfill Environmental Management Plan (LEMP), as required by Schedule 5, Condition 2 of the PA. The LEMP provides an overall framework for environmental management of the AWMF during operation.

The AWMF is licenced under Environment Protection Licence 5873 (EPL 5873) and currently accepts:

– General Waste:
    - Putrescible and non-putrescible.
– Special waste:
    - Asbestos, animals, quarantine waste and offensive waste.

Green waste is processed at the adjacent Lake Macquarie Organics Resource Recovery Facility (ORRF) operated by a third party (Remondis) under a separate approval and under a separate Environment Protection Licence 20949 (EPL 20949).

The AWMF has a 32.5 hectare (ha) site area and is located in a broad, deep, south-facing amphitheatre between two spurs of a north-westerly trending ridgeline. Prior to filling, the base of the amphitheatre contained a gully that drained towards the south. The surrounding land acts as a buffer zone and it contains approximately 10 ha of native bushland.

2.2 Awaba Waste Management Facility (AWMF) contacts

Table 2-1 AWMF Contacts

Position	Name	Contact
Manager Waste Services	Paul Collins	0436 935 440
Group Coordinator Waste Operations	Kieran Peter	0418 631 390
Waste Site Coordinator	Steven Merrett	0408 485 407
Environmental Officer	Ainslee Roser	0428 411 326

2.3 Purpose of this report

This Annual Review discusses the environmental performance of the AWMF, in relation to compliance with the conditions of the PA, and other relevant licences and approvals. It provides a summary of operational and environmental management activities undertaken at the AWMF during the reporting period (1 July 2022 to 30 June 2023) and provides a review against predicted impacts documented in the Additions to Awaba Waste Management Facility Environmental Assessment (EA) (Cardno, 2012). The Annual Review also covers community relations and addresses any rehabilitation undertaken during the reporting period.

The Annual Review has been prepared to satisfy the conditions of the PA (in particular Schedule 5, Condition 4). Key requirements of the approval are described in Table 2-2. A map illustrating the locality and project approval boundary is provided in Figure 2-1 while the site layout is shown in Figure 2-2.

Table 2-2 Annual Review requirements

Approval	Section Reference	Requirement	Reference in this report
Project Approval 10_0139	Schedule 5, Condition 4	**Annual Review** One year after the commencement of operations, and annually thereafter, the Proponent shall review the environmental performance of the Project to the satisfaction of the Director-General. The review shall: a. describe the operations that were carried out in the past year;	Section 4
		b. analyse the monitoring results and complaints records of the Project over the past year, which includes a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria; • monitoring results of previous years; and • relevant predictions in the EA;	Section 6 and 8.2.
		c. Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	Section 1 and 10
		d. Identify any trends in the monitoring data over the life of the Project; and	Section 6
		e. Describe what measures will be implemented over the next year to improve the environmental performance of the Project.	Section 6 and 11

2.4 Scope and limitations

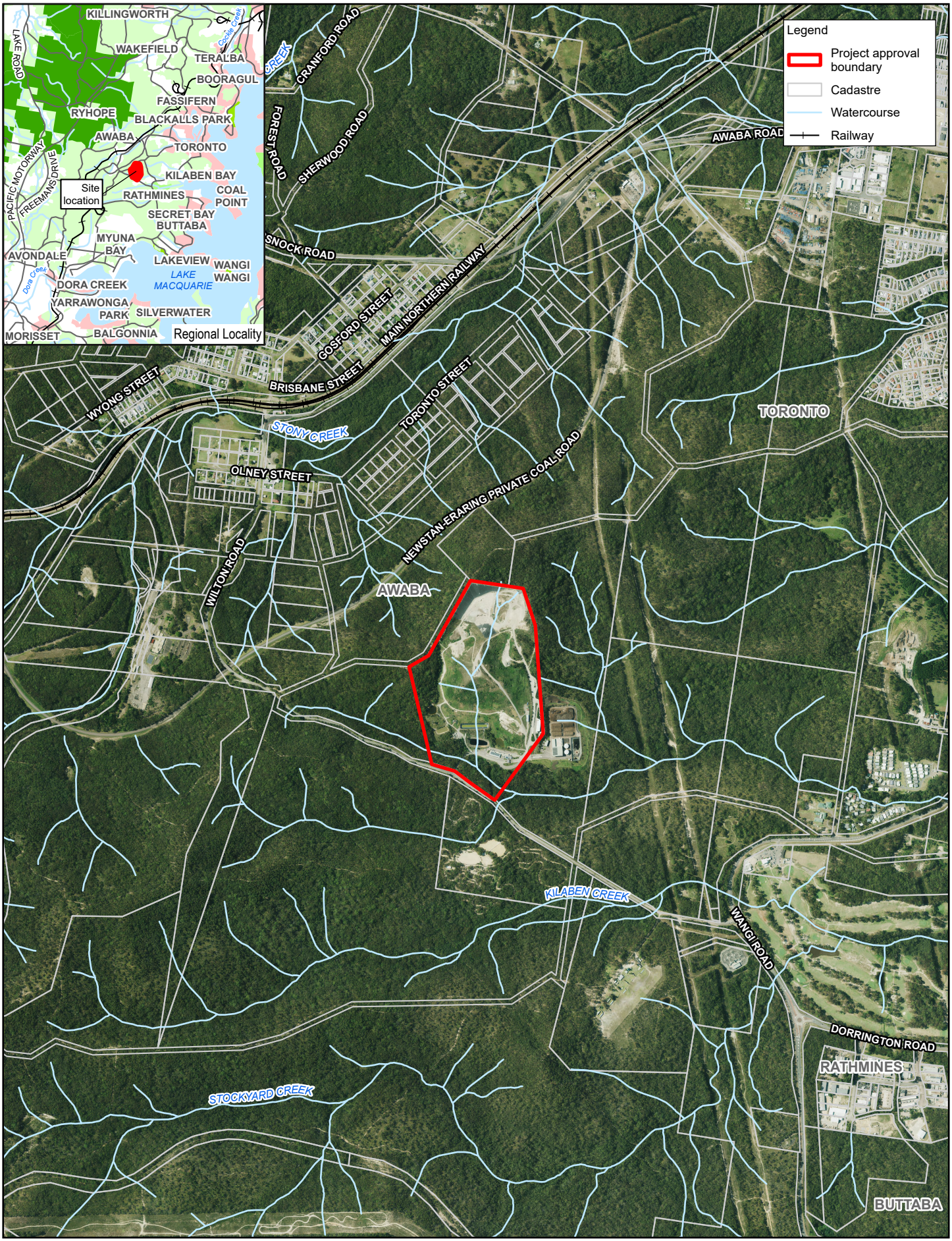
This report: has been prepared by GHD for Lake Macquarie City Council and may only be used and relied on by Lake Macquarie City Council for the purpose agreed between GHD and Lake Macquarie City Council as set out in this report.

GHD otherwise disclaims responsibility to any person other than Lake Macquarie City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Date **07/07/2023**

Locality map

FIGURE 2-1

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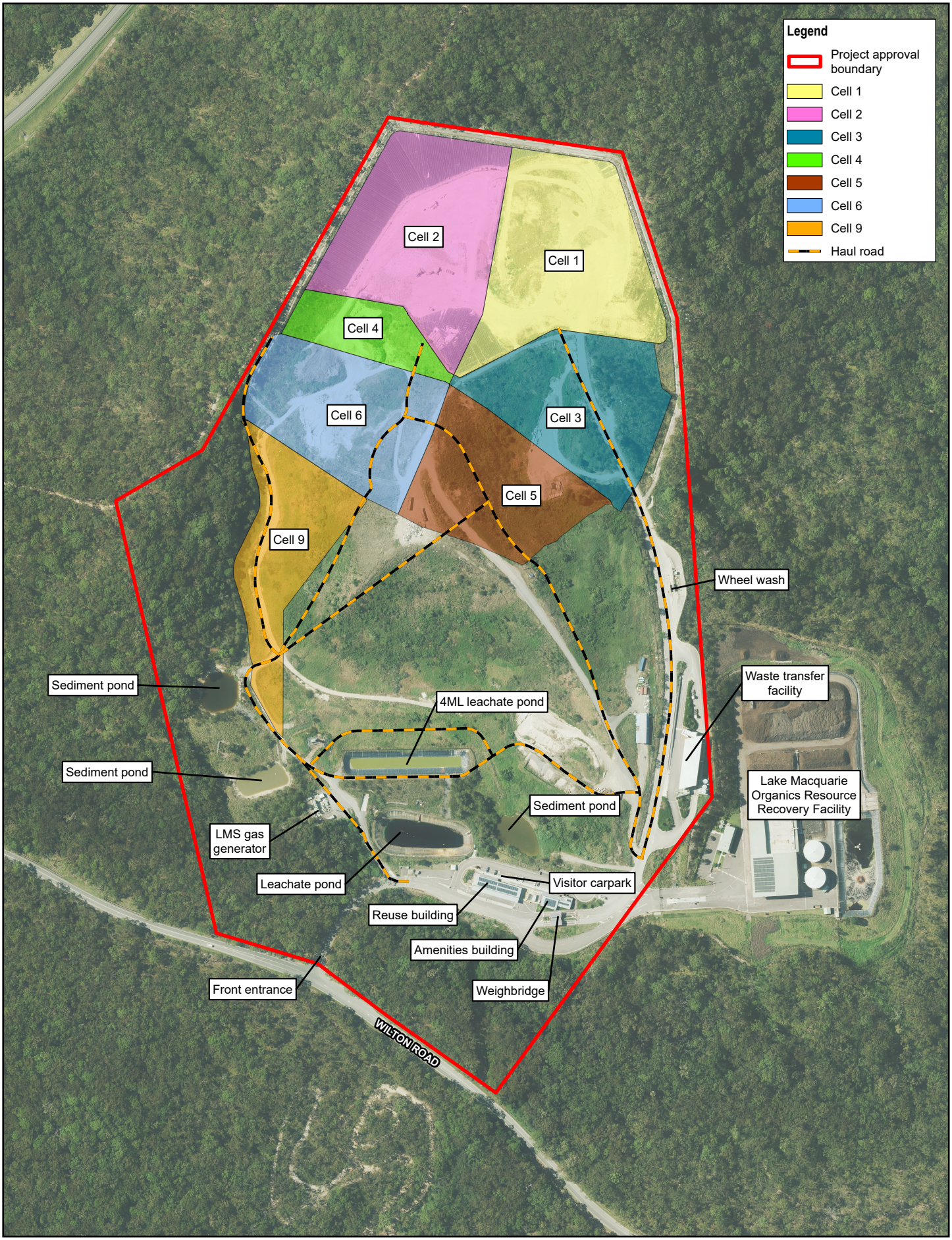
Data source: Geoscience Australia: 250k Topographic Data Series 3, 2006; LPI: DTDB / DCDB, 2017. MetroMap: Imagery (Date Exported: 07 July 2023; Imagery Date: 11 Feb 2023). Metromap Tile Service: . Created by: dbbanatin



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Map Projection: Transverse Mercator
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Lake Macquarie City Council
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Site layout

Project No. **12614665**
Revision No. **0**
Date **07/07/2023**

FIGURE 2-2

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Data source: LPI: DTDB / DCDB, 2017. MetroMap: Imagery (Date Exported: 07 July 2023; Imagery Date: 11 Feb 2023). Metromap Tile Service: . Created by: dbbanatin

3. Approvals and licences

3.1 Project Approval 10_0139

Project approval was granted on 8 May 2013 for the expansion of the AWMF.

A modification (Mod 1) to the PA was granted in 2014, which made amendments to the PA regarding the proposed staging of cell construction and landfilling, as well as leachate and stormwater management infrastructure.

No changes or modifications to the PA occurred during the current reporting period.

3.2 Environment Protection Licence (EPL) 5873

LMCC operates the AWMF under EPL 5873, with an anniversary date of 13 October. The AWMF operated under EPL 5873 prior to commencement of operations of the expansion of the AWMF under the PA. Variations to EPL 5873 have been granted by the NSW Environment Protection Authority (EPA) to incorporate the expansion of the AWMF, which continues to operate under EPL 5873. Monitoring results are reported to the EPA in accordance with the EPL and are published on the LMCC website.

Activities to which the EPL applies are 'composting and waste disposal by application to land'.

No variations to EPL 5873 occurred during the current reporting period.

3.3 Trade waste agreement

Prior to the expansion of the AWMF under the PA, a sewer connection was established to the Hunter Water Corporation (HWC) reticulated sewage system as a due diligence action pending the PA. Discharge to the sewer is governed by the concentration limits imposed by HWC through the Trade Waste Agreement (TWA) (Consent no: 2014-1036/9) granted on 23 March 2018.

An amendment was made to the TWA during the previous reporting period. The TWA was changed to permit an increase of ammonia discharge mass load to 27kg/day. The site currently operates under a temporary Trade Waste Agreement and LMCC is in ongoing communications with Hunter Water to finalise the Trade Waste Agreement. LMCC have also sought DPE approval for rolling annual licences for the life of the site.

4. Summary of operations

4.1 Operational activities

4.1.1 Waste handling and recovery

Acceptance of waste

The AWMF includes a landfilling operation, which is the main function of the site. The landfill is licensed to accept the following wastes for waste disposal by application to land:

– Asbestos waste.
– General solid waste (non-putrescible).
– General solid waste (putrescible).

Waste arrives at the AWMF from a variety of sources, including LMCC collection vehicles, waste collection contractors, and waste self-hauled by businesses and residents. Upon entering the AWMF, the waste is classified and charged based on the type and quantity of the waste to be disposed.

A waste transfer station located to the east of the main internal site road allows members of the public to drop off their mixed residual waste for landfilling, as well as specific materials for recovery, such as green waste, timber, concrete, mattresses or metals. Green waste is transferred to the ORRF and this process is further discussed below, which is unchanged from the previous reporting period.

Monitoring of waste is undertaken in accordance with the approved Waste Screening, Acceptance and Resource Monitoring Programme, which details the screening and acceptance procedures and the monitoring requirements for waste and resource recovery.

Special waste

The AWMF has additional acceptance requirements in relation to wastes classified by the AWMF as “special waste.” Waste is classified “special waste” if the site supervisor considers that the waste requires special handling by the operators at the tip face, and immediate covering to prevent possible environmental or occupational impacts (e.g. from dust or odour), or for confidential reasons.

These special wastes generally refer to asbestos, lead contaminated soil, dead animals, sewage sludge, and confidential documents.

The procedure for acceptance of these special wastes is as follows:

– The site supervisor is notified of the type and quantity of special waste. A date and time is scheduled for the disposal of the special waste. The special waste must arrive onsite before 12.00 pm Monday to Friday.
– The special waste is brought to the facility and then screened and weighed.
– The special waste is then disposed of in a safe manner usually in a designated area away from the tip face and covered immediately after disposal.

Community Recycling Centre

The Community Recycling Centre (CRC) provides the community with a safe way to dispose of problem household waste, free of charge. Problem household waste is accepted and disposed of via the NSW EPA’s contractor (Cleanaway). These wastes include:

– Paint - oil and water based (in liquid form only).
– Gas cylinders.
– Fire extinguishers.
– Fluorescent light globes and tubes.
– Household batteries.

– Motor oils.
– Other oils.
– Smoke detectors.

LMCC also receives the following waste items at the CRC:

– Co-mingled household recyclables.
– Electronic waste.
– Polystyrene.
– Vehicle batteries.
– X-rays.

Vehicle batteries are collected by LMCC which are sold for scrap metal content (lead). Other items consisting of non-ferrous metals may be processed onsite (not as part of the CRC operations) to ensure maximum value is achieved for scrap, including removal of ferrous fasteners and sorting of metal categories.

Food and garden organics

A contractor built and operated ORRF for Food Organics and Garden Organics (FOGO) processing has been constructed on a site adjacent to the AWMF. Source separated FOGO waste entering the facility is directed to the organic waste processing facility. The ORRF is operated and maintained by a third party (Remondis) under a separate approval and EPL and does not form part of the expanded AWMF under the PA.

Quantities and types of waste received

The AWMF is approved to accept no more than 150,000 tonnes of waste per annum. This limit may be exceeded only in accordance with extraordinary conditions outlined in the site EPL. The quantities and types of waste received during the reporting period are provided in Table 4-1.

Table 4-1 Summary of waste received during the reporting period

Waste	Approved limit	Previous reporting period	This reporting period (tonnes)
Municipal	Maximum of 150,000 tonnes in total of all waste types may be disposed per annum	56,228.36	52,837.10
Construction and demolition		8,766.66	10,595.48
Commercial and industrial		2,093.16	2,270.28
Recovered material from landfill for recycling		-1,263.50	-1,048.10
Landfill alternative cover material		63.82	84.60
Total		**65,887.82**	**65,702.86**

Resource recovery

The effectiveness of resource recovery at the AWMF is monitored in accordance with the approved Waste Screening, Acceptance and Resource Monitoring Programme. The effectiveness of resource recovery measures is analysed through benchmarking against previous years' recovery rates and reported annually.

The effectiveness of resource recovery measures at the AWMF up to the end of the 2022-2023 financial year is summarised in Table 4-2.

Table 4-2 Summary of waste diverted from landfill

	2007-2008	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Total waste received (t)	160,335	93,518	86,494	91,875	93,728	107,996	65,887.82	65,702.86
On-site use for operations (t)	32,040	5,338	3,110	5,337	3,924	4,831	2,853.92	3,990.80
Green waste and recyclables diverted from landfill (t)	10,105	27,742	26,643	23,696	39,758	40,451.5	64,979.47	39,989.68
Waste to Landfill (t) (excluding cover material)	118,190	84,557*	80,663*	85,740*	63,360*	62,245	70,538	64,654.76
ABS - revised resident population (ABS March 2019)		201,811	202,847	203,502	204,914	205,901	213,845	215,983
Waste to landfill generated per capita (kg)	615	419	398	421	309	302	308	304
Compared to 2007-2008 waste reduction baseline (615 kg per capita)	baseline	⇩31.87%	⇩35.28%	⇩31.60%	⇩49.75%	⇩50.89%	⇩50%	⇩50.57%

4.1.2 Landfill operations

The landfill operations are undertaken in accordance with the Fill-Out Plan, which forms part of the LEMP.

Landfill operations are carried out in accordance with Schedule 4, Condition 7 of the PA and Conditions O6 and O7 of EPL 5873, which includes the following:

– Minimise the exposed or cleared areas at the landfill.
– Progressively revegetate all completed areas of the landfill and stabilise any exposed areas that are not required for operational purposes for a period greater than 90 days.
– Minimise the tracking of mud and waste from the site on public roads.
– Fill the landfill cells in a systematic manner as detailed in the Fill-Out Plan.
– Maximise landfill compaction rates (≥0.75 t/m^3 required, goal of achieving 0.85 t/m^3).
– Cover the active landfill area at the end of daily waste disposal and compaction activities with either:
  - Minimum 150 millimetres (mm) of virgin excavated natural material (VENM) soil.
  - An EPA approved synthetic cover.
  - Biodegradable plastic sheeting.
– Progressively cap the landfill cells with a capping layer approved by the EPA.
– Revegetate the covered landfill cells following the capping of each cell once they reach their final design height.

All waste is compacted as it is tipped in the landfill. The working face is covered with alternative daily cover (spray cover) daily, as approved by the EPA.

Intermediate cover is used to provide a more effective barrier between refuse and the environment during extended periods of time. VENM soil is applied to a minimum depth of 250 mm (inclusive of any daily cover already in place) over all surfaces of the landfill that will be exposed for more than 90 days.

Intermediate cover includes a top layer of dredging materials which readily self-seeds providing vegetation protection from wind and water erosion.

Landfill cells are progressively capped during operations, and specifically when the level of waste reaches final heights within each landfill cell.

Final capping comprises five layers, including:

– Seal bearing surface.
– Gas drainage layer.
– Sealing layer.
– Infiltration layer.
– Revegetation layer.

The cap is graded to a degree to facilitate appropriate stormwater flow off site (clean water) or to a sedimentation pond, reducing the potential for ponding onsite (dirty water).

The vegetation layer is always maintained to ensure the cap remains in a working condition and stormwater is draining from the affected area.

During the previous reporting period, all landfilling operations in the original cell were completed. As of August 2022, all operations are being undertaken in Cell 1 and Cell 2. Operations in Cell 2 commenced in Quarter 3, 2022.

4.1.3 Hours of operation

The AWMF operates within the following hours in accordance with Schedule 4, Condition 30 of the PA:

– Monday to Friday – 8:00 am – 4:00 pm
– Weekend & Public Holidays – 8:00 am – 4:00 pm
– Christmas Day, New Years Day – Closed

4.1.4 Equipment

Sufficient and appropriate plant, equipment and machinery is used onsite and maintained to meet operational requirements. This includes equipment for:

– Dust suppression (i.e. water cart).
– Fire control and firefighting.
– Waste inspection.
– Waste handling.
– Environmental monitoring.
– The proper and efficient operation of the AWMF.

In accordance with Schedule 3, Condition 13 of the PA, LMCC ensure that all plant and equipment used for operation of the AWMF is:

– Maintained in a proper and efficient condition.
– Operated in a proper and efficient manner.

A list of updated key equipment used on site during the 2022-2023 reporting period is provided in Table 4-3.

Table 4-3 Equipment at AWMF during the reporting period

Description	Number on site
Traxcavators	2
Landfill Compactor	1
Alternate Daily Cover Vehicle / Water Cart	1
Steel Drum Roller	1

Description	Number on site
Gas Monitor	1
Flexi Drive Pumps	3
Diesel Pumps	2
2 Tonne Tipper	1
4 Wheel Drive dual cab utility	2
Portable handheld radios	11
Base Station Radio	1
Fire Extinguishers	20
Fire Hose Reels	2
Wash Down Hose Reels	8
Fire Blankets	3
Eyewash Stations	6
Avant 750 Loader	1
Hook Lift Trucks	2
Transfer Station Hook Lift Bins	7
Dirt Hook Lift Bins	2
Subaru Outback Wagon	1

4.1.5 Hazard and risk management

Chemicals, fuels and oils

All chemicals, fuels and oils used on site are stored in appropriately bunded areas in accordance with the requirements of all relevant Australia Standards, and the EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook.

Fire management

Fires are managed in accordance with the Fire Management Plan for the site, which includes measures to minimise the risk of fire onsite. Adequate firefighting capacity is maintained onsite to ensure that any fires are extinguished promptly.

LMCC record details of all fires at the site in accordance with Condition R4 of EPL 5873.

Two fires were recorded onsite during the reporting period. The details of the incidents are as follows:

– On 13 July 2022 a small fire occurred in the AWMF. The cause of the fire was due to the fusion welding of a poly pipe by a contractor. The fire occurred at 12:45 pm and was extinguished 12:50 pm by staff using a handheld fire extinguisher. This fire was not a waste fire within the landfill. The fire was reported to EPA 1:39 pm on the same day.
– On 16 January 2023 a fire was detected on the active tip face. The fire was noticed by staff at 2:20 pm. The ignition source of this fire is unknown. The fire was controlled by 2:25 pm by hosing with on-site water cart for around five minutes. Waste was then continued to be track-rolled, hosed, and compacted, to ensure there was no smouldering waste. Reported to the EPA 10:54 am 17 January 2023.

Incident and emergency response

Incidents and emergency response are managed in accordance with the Awaba Waste Pollution Incident and Emergency Response Plan, which forms Appendix F of the LEMP.

As part of LMCC's continuous improvements to safety and emergency response, the following training will be undertaken:

– Armed holdup training scheduled for first quarter 23/24 financial year.
– Breathing apparatus training scheduled for first quarter 23/24 financial year.

4.1.6 Construction activities

In order to more effectively manage leachate, a leachate bunding area for tankering was completed in July 2022.

5. Actions required from previous annual review

This is the third Annual Review completed by LMCC for the AWMF. As such, the status of outstanding activities from the 2021/22 reporting period is required to be provided in this Annual Review. In addition, several actions from the 2021 Independent Environmental Audit (IEA) were proposed to be completed in this reporting period.

Activities that were proposed for this Annual Review reporting period are detailed in Table 5-1.

Table 5-1 Activities proposed from previous Annual Review

Activities proposed during last reporting period	2021/2022 Target Completion Date	Status as of 2022/2023 reporting period
Commissioning of Cell 2	August 2022	Complete
Operation of Cell 2	After August 2022	Complete
Construction of a leachate tankering bunded area	Construction complete – likely to be operational by Quarter 3 2022.	Complete
Outstanding items from the 2021 IEA.		
Liaise with internal sub-contractors regarding oil and chemicals handling and storage practices	During 2022/2023 reporting period.	Ongoing internal, see Table 9-1
Complete a review of the Waste Education Program	During 2022/2023 reporting period	Complete, see Table 9-1
Update management plans	During 2022/2023 reporting period	Complete, see Table 6-1
Implementation of daily diary entry of litter inspections and clean-ups where appropriate	August 2022	Complete, see Table 9-1
Undertake biodiversity monitoring in accordance with Biodiversity Conservation Area Plan of Management	During 2022/2023 reporting period	Complete, see Table 6-1
Arborist inspection of culturally modified tree	During 2022/2023 reporting period	See Section 6.8.2
Weed, pest and vermin inspection	During 2022/2023 reporting period	See Section 6.6
Implementation of a compliance management system	During 2022/2023 reporting period	Not complete
A review of the site induction process	During 2022/2023 reporting period	Ongoing internal - see Table 9-1
Installation of a sign indicating presence of the culturally modified tree	During 2022/2023 reporting period	Fencing complete, see Table 9-1
Installation of water management infrastructure (if required) based on investigations and assessments completed by consultants	During 2022/2023 reporting period	See Section 6.1.3
Engagement with DPE regarding rolling annual licenses and HWC regarding future TWAs	During 2022/2023 reporting period	Temporary TWA, see Section 3.3
Completion of remaining IEA actions, as outlined in Table 9-1	During 2022/2023 reporting period	See Table 9-1

6. Environmental management and performance

Environmental management at the AWMF is undertaken in accordance with the site LEMP. This section details the implementation and effectiveness of the management measures identified in the LEMP and issue-specific-sub-plans.

The following issue-specific sub-plans are implemented under the over-arching LEMP:

– Soil, Water and Leachate Management Plan
– Greenhouse Gas Management Plan
– Air Quality and Odour Management Plan
– Operational Noise Management Plan
– Biodiversity Management Plan
– Biodiversity Conservation Area Plan of Management
– Cultural Heritage Management Plan

The LEMP also includes measures for the control of:

– Pests, vermin and noxious weeds.
– Litter.

The IEA conducted during the previous reporting period identified the need for several LEMP sub-plans to be reviewed and updated. Table 6-1 outlines the proposed staging of the review and their current status at the end of the 2022/2023 reporting period.

Table 6-1 Staging of sub-plans

Sub-plan	Schedule and condition	Status at end of 2022/23 reporting period	TRIM reference
Soil, Water and Leachate Management Plan	Schedule 4 condition 19	All subplans were reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The subplans have been submitted to DPE with LMCC currently working with DPE to rectify any updates required.	D10985256, D10984877
Air Quality and Odour Management Plan	Schedule 4 condition 25		D11013094, D10956428
Greenhouse Gas Management Plan	Schedule 4 condition 26		D10985198, D10984859
Operational Noise Management Plan	Schedule 4 condition 32		D11013096, D10985262, D10984877
Emergency Response Management Plan	Schedule 4 condition 43		D10985275 and D10984877
Cultural Heritage Management Plan	Schedule 4 condition 45		D10985168, D10984859
Biodiversity Conservation Area Management Plan	Schedule 4 condition 51		D10654541, D10984859
Vegetation and Fauna Management Plan	Schedule 4 condition 55		D10985202, D10984859
Landfill Environmental Management Plan	Schedule 5 condition 2		D11013094 F2022/00673

The following sections aim to provide:

– A comprehensive review of the monitoring results of the project over the past year, which includes a comparison of these results against the:
  - the relevant statutory requirements, limits or performance measures/criteria.
  - the monitoring results of previous years.
  - the relevant predictions in the EA.
– Trends in the monitoring data over the life of the project.
– Discrepancies between the predicted and actual impacts of the project and analyse the potential cause of any significant discrepancies.
– Measures which will be implemented over the next year to improve the environmental performance of the project.

6.1 Soil, water and leachate

6.1.1 Environmental management

Soil, water and leachate management at AWMF is undertaken in accordance with the approved Soil, Water and Leachate Management Plan (SWLMP), which has been prepared in accordance with the PA. The 2021 IEA identified the need for the SWLMP to be updated by 23 November 2022 in line with Schedule 4 Condition 19.

The updated SWLMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated SWLMP has been submitted to DPE with LMCC currently working with DPE to rectify any updates that are required.

The SWLMP acts as the overarching document governing water management at AWMF and includes the following subplans:

– Surface Water Management Plan (SWMP), including an Erosion and Sediment Control Plan (ESCP)
– Leachate Management Plan (LMP)
– Surface Water, Groundwater and Leachate Monitoring Program
– Surface Water, Groundwater and Leachate Response Plan

Stormwater is managed at the AWMF in accordance with the SWMP. The key objectives of stormwater management at AWMF are to:

– Minimise erosion and sediment generation at the source.
– Maintain discharge levels to pre-development values.
– Divert runoff from disturbed areas through sediment basins prior to discharge offsite.

These objectives are achieved through the following approach:

– Minimise the volume of clean surface water running onto the site from off site.
– Minimise the extent of disturbed areas.
– Minimise surface water from running onto disturbed areas of the site by staging operations and, where necessary, utilising surface water diversion drains and bunds for disposal and processing areas.
– The perimeter of landfilled areas must be contoured to mitigate stormwater running onto these surfaces in all rainfall events less than or equal to the 1 in 10 year 24 hour duration event.
– Minimise erosion of disturbed areas by utilising at source control measures.
– Ensure all surface water runoff from disturbed areas of the site is managed prior to reuse or discharge offsite.
– Ensure all erosion and sediment controls are properly maintained by implementing an inspection and monitoring schedule.
– Separate ‘clean’ and ‘dirty’ water, where possible.
– Fast-track rehabilitation of capped areas to expedite diversion off-site.

– Install retarding features for discharge offsite to control peak flow discharge.
– Provide surface water drainage in the trafficked impervious areas.
– Provide staff education and adopting strategies for early identification of potential surface water issues.

Erosion and sediment control at AWMF is guided by the ESCP and is consistent with the “Blue Book” – *Managing Urban Stormwater, Soils and Construction, Volume 1* (Landcom, 2004). The key objectives of erosion and sediment control at AWMF are to:

– Prevent soil erosion.
– Minimise generation of sediment laden water and prevent sediment laden water from discharge off site.
– Prevent surface water contamination by sediment.

These objectives are achieved through the following approach:

– Minimise stormwater (clean water) (volume and velocity) from running onto downstream works by appropriate staging of the work and, where necessary, utilising existing site or temporary stormwater diversion drains and bunds.
– Minimise erosion of disturbed areas by utilising erosion control measures, including:
    - Wheel wash.
    - Water carts.
    - Sediment fencing.
– Maximise the potential for stormwater runoff from disturbed areas of the site to be treated to an acceptable standard prior to reuse or discharge offsite, by utilising the following sediment control measures:
    - Diversion drains and rock check dams.
    - Sediment ponds.
    - Outlet energy dissipaters/level spreaders.
– Minimise the amount of stormwater runoff leaving the site by maximising reuse on-site.
– Manage all erosion and sediment controls so that they are properly maintained by implementing an inspection and monitoring schedule.
– Manage stockpiles so that they are appropriately constructed and managed to maximise reuse of topsoil.
– Provide stormwater devices in trafficked areas.

Leachate at AWMF is managed in accordance with the LMP. The key objectives of leachate management at AWMF are to:

– Prevent groundwater pollution by leachate.
– Prevent surface water pollution by leachate.
– Prevent amenity impacts to nearby waterways.

These objectives are achieved through the following approach:

– Minimise leachate generation through the following strategies:
    - The size of the active face and subsequent daily cover footprint is minimised as far as practical to reduce the portion of rainfall able to infiltrate through cover into the waste.
    - Final capping is installed once areas have reached final levels to reduce the portion of rainfall able to infiltrate through cover into the waste.
    - Landfill development is efficiently staged to maximise the amount of final capped areas in comparison to the landfill footprint.
    - Designing and commissioning new cells is staged in a manner which maximises the separation of stormwater and leachate for as long as possible.
    - Establishing perimeter diversion drains with each new cell, and maintaining those around existing cells, to direct site stormwater around the landfill areas.

– Effectively contain and collect leachate through the following strategies:
  - All future landfill cells will include a leachate barrier system and associated leachate collection system.
  - Leachate will continue to be collected from the unlined areas and quarry cell as they are progressively capped.
– Dispose of leachate via:
  - the sewer connection as per the Trade Waste Agreement with HWC.
  - Tankering leachate to HWC's Edgeworth Wastewater Treatment Works under an agreement with HWC. LMCC is continuing to engage with HWC regarding future TWA's. LMCC is undertaking water modelling to determine future capacity to dispose of all leachate via the sewer system. DPE are provided with updates of the modelling..
– Monitoring leachate quantities and quality.

Surface water, groundwater and leachate monitoring program

LMCC undertakes a Surface Water, Groundwater and Leachate Monitoring Program to implement the ongoing monitoring of potential environmental impacts of the AWMF on surface and ground water quality. The monitoring program allows LMCC to comply with regulatory requirements for monitoring, including the monitoring requirements of EPL 5873, identify and address potential issues based on performance trends and respond to unforeseen environmental incidents.

The locations of monitoring points as specified in Clause P1 of EPL 5873 are summarised in Table 6-2 and shown on Figure 6-1. These include five groundwater quality monitoring points, two wet weather discharge and surface water quality monitoring points, two other surface water quality monitoring points and one leachate quality monitoring point. In an attempt to better delineate the pollution plume in the groundwater, an additional five new groundwater monitoring wells have been installed during the reporting period.

Table 6-2 Discharge and monitoring point locations

EPA identification number	Type of monitoring/discharge point
1	Groundwater quality monitoring upgradient of the site
2 to 5	Groundwater quality monitoring downgradient of the site
6 and 7	Wet weather discharge Surface water quality monitoring
8 and 9	Surface water quality monitoring
10	Leachate quality monitoring

Groundwater, surface water and leachate samples are analysed for a broad chemical suite. Table 6-3 details the water quality indicator parameters tested for surface water, groundwater and leachate samples.

Table 6-3 Water quality testing parameters

Parameter	Monitoring point (MP) 2021	2022	2023	Frequency
Alkalinity (as calcium carbonate)	1, 2, 3, 4, 5, 7, 8, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10,	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Aluminium	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Ammonia	1, 2, 3, 4, 5, 7, 8, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10,	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Arsenic	1, 2, 3, 4, 5, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Barium	1, 2, 3, 4, 5, 7 ,8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Benzene	1, 2, 3, 4, 5, 8 ,10	6, 7, 8, 9, 10	10	Yearly
BOD	1, 2, 3, 4, 5, 7, 8, 10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10,	10	Yearly

Parameter	Monitoring point (MP) 2021	2022	2023	Frequency
Cadmium	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Calcium	1, 2, 3, 4, 5, 7, 8, 10	1, 2, 3, 4, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Quarterly
Chloride	1, 2, 3, 4, 5, 7, 8, 10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Quarterly
Chlorinated volatile compounds	1, 2, 3, 4, 5, 6, 7, 8 ,9	None	None	Yearly
Chromium (hexavalent)	1, 2, 3, 4, 5, 6, 7, 8 ,9	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Chromium (total)	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Cobalt	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Conductivity	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Copper	1, 2, 3, 4, 5, 7 ,8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Ethyl benzene	1, 2, 3, 4, 5, 7, 8	None	None	Yearly
Fluoride	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Iron	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9 10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Lead	1, 2, 3, 4, 5, 7,8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Magnesium	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9 10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Manganese	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9 10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Mercury	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly
Nitrate	1, 2, 3, 4, 5, 7,8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Organochlorine pesticides	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 8, 9,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Organophosphate pesticides	1, 2, 3, 4, 5, 7, 8	None	None	Yearly
PCBs	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9,10	None	Yearly
pH	1, 2, 3, 4, 5, 7 ,8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10,	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Phosphate	1, 2, 3, 4, 5, 7, 8	None	None	Yearly
Polycyclic aromatic hydrocarbons	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9,10	None	Yearly
Potassium	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Sodium	1, 2, 3, 4, 5, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Sulfate	All	1, 2, 3, 4, 5, 6, 7, 8, 9,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Toluene	1, 2, 3, 4, 5, 6, 7, 8,9,10	1, 2, 3, 4, 5, 6, 7, 8, 9,10	10	Yearly
Total dissolved solids	1, 2, 3, 4, 5, 6, 7, 8,9	6, 7, 8, 9, 10	None	Yearly

Parameter	Monitoring point (MP) 2021	2022	2023	Frequency
Total organic carbon	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	Quarterly
Total petroleum hydrocarbons	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	1, 2, 3, 4, 5, 6, 7, 8, 9 ,10	10	Yearly
Total Phenolics	1, 2, 3, 4, 5, 7, 8, 10	None	None	Quarterly
Total Suspended Solids	None	6, 7, 8, 9, 10	6, 7, 8, 9,10	Quarterly
Zinc	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9	None	Yearly

Paper Size ISO A4

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Lake Macquarie City Council
Awaba Waste Management Facility
Annual Review

Monitoring point locations

Project No. **12614665**
Revision No. **0**
Date **01/08/2023**

FIGURE 6-1

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Print date: 01 Aug 2023 - 14:11

Data source: City Project Surveyors: Monitoring locations, 2020; LPI: DTDB / DCDB, 2017. MetroMap: Imagery (Date Exported: 07 July 2023; Imagery Date: 11 Feb 2023). Metromap Tile Service: . Created by: dbbanatin

Water quality criteria

EPL 5873 restricts the discharge of surface water from the site to 50 mg/L of total suspended solids. This concentration limit is only permitted to be exceeded at the discharge point of the two final sedimentation dams (MP6 and MP7) for the duration of the overflow "whenever a wet weather overflow is occurring due to stormwater events greater than or equal to a 90th percentile 5 day rainfall duration".

No other criteria are specified in EPL 5873 or PA as environmental discharges are not permitted from the site. All groundwater and surface water results are benchmarked against ANZECC Guidelines for Freshwater 95% protection level trigger values (assessment criteria) in accordance with the approved SWLMP.

Quality of leachate is required to be monitored under EPL 5873 (at MP10 as shown on Figure 6-1), although environmental discharges are not permitted. For this reason, there are no benchmark levels that must be considered under EPL 5873.

6.1.2 Environmental performance

LMCC measures some analytes against ANZECC 95% freshwater guidelines. Results above the assessment criteria of these guidelines do not represent exceedances of license conditions. LMCC reports values above the ANZECC 95% fresh guidelines to the EPA as a precaution only. Only values above the EPL 5873 limit of 50 mg/L of total suspended solids are reportable exceedances of license conditions.

Historic monitoring

Surface water, groundwater and leachate quality monitoring in accordance with EPL 5873 has been undertaken at the AWMF since 2000 prior to the operation of the expansion project. This monitoring program has been continued for the expansion project and includes monitoring locations established to assess impacts associated with the existing operation of the AWMF prior to the operation of the expansion project. As such the results of the monitoring program during the reporting period represent the cumulative impacts of operation of both the existing AWMF and the expansion project under the PA.

In July 2020 LMCC commenced a review of the monitoring program, with the aim of investigating elevated ammonia concentrations in groundwater downgradient of the existing AWMF site (GHD, 2020). The review included a statistical summary of monitoring data from April 2012 to April 2020 (see Appendix A). This summary provides an indication of the historical range of water quality parameters detected at the AWMF prior to the commencement of operations of the expansion project under the PA, and therefore associated with existing operations rather than the expansion project. This data has been included to provide a comparison between monitoring data for the reporting period with existing conditions at the AWMF prior to operations of the expansion project under the PA commencing and will be referred to in the following sections. Data from the previous two reporting periods will also be used for comparison purposes. This comparison is provided below in Section 6.1.2.

Monitoring during the reporting period

Three monitoring events occurred during the reporting period on the following dates:

– 30 August 2022 (all sites except MP6/MP7), MP6 and MP7 were sampled on 6 July 2022.
– 12 October 2022 (all sites).
– 22 and 23 March 2023 (MP1 to MP5), 4 April 2023 (MP6 to MP10).

Under Condition M2.1 of EPL 5873, water monitoring is required to occur on a quarterly basis. Four rounds of monitoring were undertaken for the 2022 EPA annual return period (13 October 2021 to 12 October 2022). One quarter for the 2023 EPA annual return period has been missed. LMCC has scheduled in an additional round of monitoring so that four rounds of monitoring occur in the 2023 EPA annual return period.

Results of the monitoring program during the reporting period are provided in Appendix B, while time series graphs of quarterly monitored parameters with detections above the limit of reporting (LOR) are provided in Appendix C.

Groundwater monitoring was undertaken at locations MP1, MP2, MP3, MP4 and MP5 during the report period, in accordance with EPL requirements. A review of the groundwater monitoring results found the following:

– Groundwater at all monitoring locations was slightly acidic with pH ranging from 5.08 to 7.33 across all monitoring points. This is generally consistent with historical monitoring data.
– Electrical conductivity values detected during the reporting period were lower than the range of the historical monitoring data, ranging from 1110 to 1180 µS/cm at MP1, 618 to 1240 µS/cm at MP2, 999 to 1210 µS/cm at MP3, 611 to 1190 µS/cm at MP4 and 2800 to 4900 µS/cm at MP5.
– Concentrations of ammonia were above the assessment criteria (0.9 milligrams per litre (mg/L) at MP3 (range: 9.16 to 12.8mg/L), MP4 (range: 1.18 to 4.55 mg/L), at all monitoring events during the reporting period. Ammonia concentrations were below the assessment criteria at MP1, MP2 and MP5 throughout the reporting period. Historically, ammonia concentrations have been elevated at MP3 and to a lesser extent MP4, which is consistent with monitoring results from this reporting period.
– Nitrate concentrations were below the assessment criteria (0.7 mg/L) at all locations throughout the reporting period. Values have historically been elevated at MP4.
– Concentrations of metals were above the assessment criteria at several locations during the reporting period, including:
    - Zinc (assessment criteria: 0.008 mg/L) at MP1 (0.014 mg/L in August 2022, 0.0064mg/L in October 2022), MP2 (0.061mg/L in October 2022), MP3 (0.022mg/L in October 2022), MP4 (0.312mg/L in October 2022) and MP5 (0.098mg/L in October 2022).
    - Copper (assessment criteria: 0.0014 mg/L) at MP2 (0.003 mg/L in October 2022), MP3 (0.005 mg/L in October 2022), MP4 (0.062 mg/L in October 2021) and MP5 (MP2 (0.002 mg/L in October 2022).
    - Lead (assessment criteria: 0.001 mg/L): at MP1 (0.002 mg/L in October 2022), MP2 (0.008 mg/L in October 2022), MP3 (0.010 mg/L in October 2022), MP4 (0.157 mg/L in October 2021) and MP5 (0.003 mg/L in October 2022).
    - Aluminium (assessment criteria: 0.01 mg/L): at MP2 (0.02 mg/L in August 2022), MP3 (0.05 mg/L in August 2022) and MP4 (0.01 mg/L in August 2022) and at MP2 (0.18 mg/L in October 2022) and MP4 (0.06 mg/L in October 2022).
    - Chromium (assessment criteria: 0.001 mg/L): chromium values were recorded at the assessment criteria at MP3 (August and October 2022) and MP4 (August 2022). Values greater than the assessment criteria were recorded at MP4 (0.002 mg/L in October 2022).
– Metal concentrations have been historically high at all monitoring points, including MP1, which is located upgradient from the site. This suggests a background source of elevated metal concentrations in local groundwater.
– Major ions were generally consistent with historical monitoring data with the following exceptions:
    - Calcium concentrations: the historic maximum in the previous reporting period was 58 mg/L, this was exceeded in the previous reporting period. The historical maximum adopted for this reporting period is now 79 mg/L. This maximum was not exceeded.
    - Bicarbonate and total alkalinity: the historic maximum in the previous reporting period was 177 mg/L, this was exceeded in the previous reporting period. The historical maximum adopted for this reporting period is now 553 mg/L. This maximum was not approached or exceeded.
– Concentrations of total petroleum hydrocarbons (TPH) were below the LOR at all locations during the reporting period, with the exception of MP4. MP4 recorded values greater than the assessment criteria in October 2022.
– All other parameters were below the LOR during the reporting period.

Surface water monitoring was undertaken at locations MP6, MP7, MP8 and MP9 during the report period, in accordance with EPL requirements. A review of the surface water monitoring results found that:

– Surface water at MP6 (pH ranged from 7.43 to 7.9) and MP7 (7.41 to 7.63) was close to neutral. Surface water at MP8 (5.95 to 6.2) and MP9 (5.85 – 6.46) was slightly acidic. This is generally consistent with historical monitoring data.

- Electrical conductivity values at MP6 (338 µS/cm to 406 µS/cm) and MP7 (260 µS/cm to 490 µS/cm), were slightly lower than the range of the historical monitoring data at these locations during the reporting period. Electrical conductivity values MP8 (182 µS/cm to 322 µS/cm) and MP9 (210 µS/cm to 458 µS/cm) were slightly higher than the range of the historical monitoring data at these locations during the reporting period.
- Concentrations of total suspended solids exceeded the concentration limit of 50 mg/L prescribed in EPL 5873 at MP6 (286 mg/L in July 2022 and 139 mg/L in October 2022), MP7 (196 mg/L in July 2022 and 106 mg/L in October 2022). Elevated values for total suspended solids were also recorded at MP8 (362 mg/L in April 2023), MP9 (70mg/L in August 2022) and MP10 (68mg/L in October 2022), however the 50 mg/L criteria does not apply to these wells.
- Ammonia values were recorded above the assessment criteria (0.9mg/L) at MP7 (3.54 mg/L in July 2022, 3.7 mg/L in October 2022) and MP10 (1090 mg/L in August 2022, 421 mg/L in April 2022, 649 mg/L in October 2022). Historically, ammonia concentrations have been elevated at MP7, which is consistent with monitoring results in the reporting period.
- Nitrate concentrations were above the assessment criteria (0.7 mg/L) at MP7 (2.12 mg/L in July 2022, 2.04 mg/L in April 2023 and 1.71 mg/L in October 2022) and MP6 (0.94 mg/L in July 2022, 0.75 mg/L in October 2022). Nitrate concentrations have historically been elevated at all surface water monitoring locations.
- Concentrations of several metals were above the assessment criteria at the sites during the reporting period, including:
  - Zinc (assessment criteria: 0.008 mg/L) at MP8 (0.052 mg/L in August 2022 and 0.056 mg/L in October 2022) and MP7 (0.015 mg/L in July 2022 and 0.008 mg/L in October 2022).
  - Copper (assessment criteria: 0.0014 mg/L) at MP6 (0.005 mg/L in July 2022 and 0.006 mg/L in October 2022) and MP7 (0.005 mg/L in July 2022 and 0.007 mg/L in October 2022).
  - Chromium (assessment criteria: 0.001 mg/L): MP6 (0.001 mg/L in July 2022 and 0.001 mg/L in October 2022) and MP7 (0.004 mg/L in July 2022 and 0.002 mg/L in October 2022).
- Major ions were generally consistent with historical monitoring data with the following exceptions:
  - Sodium concentrations were lower than the historical range at MP6 across all three samplings, at MP7 in July 2022 (22 mg/L) and at MP8 in October 2022 (23 mg/L).
  - Potassium concentrations were lower than the historical range at MP7 in March 2023 (3 mg/L), MP8 and MP9 recorded potassium concentrations that were within the historical range throughout the reporting period.
  - Magnesium concentrations were lower than the historical range, or within this range, at all sites across all monitoring events in the reporting period.
  - Chloride concentrations were lower than the historical range at MP6 in July 2022 (27 mg/L), April 2023 (40 mg/L) and October 2022 (38 mg/L), MP7 in July 2021 (22 mg/L) and October 2022 (40 mg/L), MP8 in October 2021 (40 mg/L) and MP9 in October 2022 (44 mg/L).
  - Sulphate concentrations were lower than the historical range at MP7 in July 2022 (13 mg/L) and October 2022 (8 mg/L), at MP8 in August 2022 (3 mg/L), October 2022 (7 mg/L) and April 2022 (less than LOR) and at MP9 in October 2022 (13mg/L).
  - Bicarbonate and total alkalinity were lower than or within the historical range at all monitoring sites across the whole reporting period.
- All other parameters were below the LOR during the reporting period.

Leachate monitoring was undertaken at MP10 during the annual review period in accordance with EPL requirements. A review of the leachate (MP10) monitoring results found that:

- Leachate was slightly alkaline during the reporting period, with pH ranging from 8.04-8.28. at MP10. This is generally consistent with historical monitoring data.
- Ammonia concentrations ranged from 421 to 1090 mg/L at MP10 during the reporting period. This is higher than the range of historic monitoring data.
- Bicarbonate alkalinity was generally within the previous monitoring data at MP10 (ranging from 2280 mg/L in October 2022 to 3850 mg/L in August 2022).

– Nitrate concentrations ranged from <0.1 mg/L to 0.6 mg/L during the reporting period. This is higher than the range of historic monitoring data.
– All major ions were within the range of the historic monitoring data during the reporting period.
– TPH (C10-C36 total) ranged from 1060 to 2550 µg/L. This is consistent with the range of the historical monitoring data.
– BTEXN (benzene, toluene, ethylbenzene, xylenes and naphthalene) and organochlorine pesticides were below LOR throughout the reporting period.

Comparison to 2021/2022 results

The 2022/2023 monitoring results can be compared to the 2021/2022 monitoring period as well as the historical monitoring data.

Groundwater

– pH was slightly more alkaline, but generally in range with the previous monitoring period's results.
– Nitrate results were generally in range of the previous monitoring period's results.
– Zinc, Lead, Aluminium, Chromium and Copper results were all higher than the previous reporting period's results.
– Ammonia, Calcium and Bicarbonate and total alkalinity results were below previous range.
– TPH results were generally consistent with previous monitoring.

Surface water

– pH results were slightly more acidic than the previous reporting period but generally consistent with the previously reported ranges.
– Electrical conductivity values were lower across for MP6 and MP7 and higher for MP8 and MP9.
– Ammonia, Zinc, Copper, Chromium results were generally higher than previously reported values.
– Nitrate, Sodium, Potassium, Chloride, Sulphate and Bicarbonate results were lower than the last monitoring period.

Leachate

– Leachate values were recorded at MP10 in 2021, 2022 and 2023.
– pH values at MP10 were alkaline but were slightly more acidic than the previously recorded range.
– Ammonia and nitrate values recorded were slightly higher than the previous range.
– Bicarbonate and TPH values were generally consistent with the previously reported range.
– BTEXN results were consistent with previously reported results.

Stage 2 investigation

Five new groundwater monitoring sites were installed as part of the Stage 2 investigation. These monitoring wells are not included on EPL 5873 however are for the purposes of better tracking the delineation of groundwater quality. Two monitoring events for these wells occurred over the reporting period:

– February 2023 (GW2, GW3, GW4, GW5)
– June 2023 (GW1, GW2, GW3, GW4, GW5)

General trends observed over the reporting period were as follows:

– pH at GW2, GW3 and GW5 were below the ANZECC 95% freshwater guideline pH of 6.5 – 8.0.
– Ammonia concentrations were elevated above the ANZECC 95% freshwater guideline value of 0.9 at GW4 and GW5.
– Aluminium concentrations were elevated above the ANZECC 95% freshwater guideline value of 0.01 at GW2 and GW4 in the June sampling event.
– Arsenic concentrations were elevated above the ANZECC 95% freshwater guideline value of 0.001 at GW4 in the June sampling event.

These bores were installed in the previous reporting period, with monitoring first being undertaken in June 2022. Long term data is therefore not available for comparison.

6.1.3 Improvement and initiatives

Prior to operation of the expanded AWMF commencing under the PA, LMCC had identified the potential risk of leachate contaminated groundwater migrating offsite and has been proactively investigating this risk with the aim of implementing an effective solution.

Monitoring identified high ammonia concentrations in the western sediment ponds, indicating leachate seepage from the western slope of the landfill. LMCC constructed a sub-surface interception trench drain between the landfill and the sediment ponds. The trench drain intercepted sub-surface leachate flows and assists with dewatering of the landfill mass to reduce leachate levels. The trench drain provided a preferential pathway for leachate to move into instead of surcharging into surface water drainage and the sediment ponds. The effectiveness of this measure will be assessed through ongoing monitoring.

Historically, the AWMF disposed of leachate by spray irrigation over landfilled areas to facilitate evapotranspiration. Prior to the expansion of the AWMF, a sewer connection was constructed to allow for the discharge of leachate to sewer in accordance with a HWC Trade Waste Agreement TWA as a due diligence action pending the PA. LMCC has continued to discharge leachate to sewer and tanker to HWC's Edgeworth Wastewater Treatment Works to avoid the need to irrigate leachate onsite. LMCC is currently operating under a temporary TWA with Hunter Water and is in ongoing consultation with Hunter Water to finalise this TWA.

LMCC are currently investigating and implementing a number of initiatives to improve water and leachate management performance onsite.

Monitoring Improvements

LMCC undertook investigative work in 2020 (GHD, 2020) to determine the potential migration pathways for leachate from the site. Investigations aimed to identify potential options for improvements to the surface water and groundwater monitoring program and ultimately develop potential remediation options to address this issue. Stage 1 comprised of a desktop review investigating leachate migration, completed in June 2020.

– In 2022, GHD was engaged to conduct further investigation of leachate migration. The Stage 2 borehole investigation was undertaken between 24 February and 1 March 2022. The Stage 2 investigations involved the installation of additional groundwater monitoring wells and subsequent monitoring in order to better delineate the lateral and southern extension of leachate. The Stage 2 report was completed and submitted to LMCC in late June 2022 during the previous reporting period.
– Two rounds of sampling have been undertaken to gather data for the Stage 2 investigation. Once enough data has been gathered, this will be provided to relevant parties to inform future actions to mitigate the plume present.

6.1.4 Values above ANZECC criteria

The below values do not represent exceedances of license conditions. They were reported to the EPA as a precaution only.

On 29 September 2022 LMCC notified the EPA of water quality monitoring values above the criteria of the ANZECC 95% Fresh Water Trigger Values in accordance with Condition R2 of EPL 5873. These exceedances occurred from monitoring events completed on 6 July 2022 and 30 August 2022 for the following analytes and sites as detailed below:

pH (ANZECC 95% freshwater guideline pH 6.5 – 8.0)

– MP1 = 6.12
– MP2 = 5.11
– MP5 = 6.27
– MP8 = 6.49
– MP9 = 5.85

Ammonia (mg/L) (ANZECC 95% freshwater guideline 0.9 mg/L)

– MP3 = 12.8
– MP4 = 4.55
– MP7 = 3.54

Nitrate (mg/L) (ANZECC 95% freshwater guideline 0.7 mg/L)

– MP6 = 2.12
– MP7 = 0.94

Chromium (mg/L) (ANZECC 95% freshwater guideline 0.001 mg/L)

– MP7 = 0.004

Copper (mg/L) (ANZECC 95% freshwater guideline 0.0014 mg/L)

– MP6 = 0.005
– MP7 = 0.005

Zinc (mg/L) (ANZECC 95% freshwater guideline 0.008 mg/L)

– MP8 = 0.052

Aluminium (mg/L) (ANZECC 95% freshwater guideline 0.04 mg/L)

– MP8 = 0.13

On 6 December 2022, LMCC notified the EPA of water quality monitoring values above the criteria of the ANZECC 95% Fresh Water Trigger Values in accordance with Condition R2 of EPL These exceedances occurred from monitoring events completed on 12 October 2022 for the following analytes and sites as detailed below:

pH (ANZECC 95% freshwater guideline pH 6.5 – 8.0)

– MP1 = 6.80
– MP2 = 5.73
– MP8 = 6.20
– MP9 = 6.46

Ammonia (mg/L) (ANZECC 95% freshwater guideline 0.9 mg/L)

– MP3 = 11.9
– MP4 = 1.18
– MP7 = 3.70

Nitrate (mg/L) (ANZECC 95% freshwater guideline 0.7 mg/L)

– MP6 = 0.75
– MP7 = 1.71

Aluminium (mg/L) (ANZECC 95% freshwater guideline 0.04 mg/L)

– MP2 = 0.18
– MP4 = 0.06
– MP8 = 0.12
– MP9 = 0.13

Chromium (mg/L) (ANZECC 95% freshwater guideline 0.001 mg/L)

– MP4 = 0.002
– MP7 = 0.002

Copper (mg/L) (ANZECC 95% freshwater guideline 0.0014 mg/L)

– MP6 = 0.006
– MP7 = 0.005

Zinc (mg/L) (ANZECC 95% freshwater guideline 0.008 mg/L)

– MP1 = 0.024
– MP2 = 0.016
– MP5 = 0.045
– MP8 = 0.056

Upon review of the monitoring data, there were several other instances that exceedances of the ANZECC 95% freshwater guideline that were not reported to the EPA over the reporting period. These were as follows:

pH (ANZECC 95% freshwater guideline pH 6.5 – 8.0)

– MP1 = 6.16 on 23 March 2023
– MP2 = 5.08 on 22 March 2023
– MP3 = 6.1 on 22 March 2023
– MP8 = 5.95 on 4 April 2023
– MP9 = 5.98 on 4 April 2023
– MP10 = 8.16 on 4 April 2023

Ammonia (mg/L) (ANZECC 95% freshwater guideline 0.9 mg/L)

– MP3 = 9.16 on 22 March 2023
– MP4 = 3.6 on 22 May 2023
– MP10 = 1090 on 30 August 2022
– MP10 = 649 on 12 October 2022
– MP10 = 421 on 4 April 2023

Nitrate (mg/L) (ANZECC 95% freshwater guideline 0.7 mg/L)

– MP7 = 2.04 on 4 April 2023

Phenols (ANZECC 95% freshwater guideline 0.32 mg/L)

– MP10 = 9.6 on 12 October 2022

Zinc (mg/L) (ANZECC 95% freshwater guideline 0.008 mg/L)

– MP1 = 0.014 on 30 August 2022

Exceedances of several of the ANZECC 95% freshwater guidelines for Total Metals across all monitoring points throughout the reporting period have also been identified. These exceedances have not been reported to the EPA.
Exceedances of EPL

6.1.5 Values above EPL 5873 Criteria

EPL 5873 restricts the discharge of surface water from the site to 50 mg/L of total suspended solids. This concentration limit is only permitted to be exceeded at the discharge point of the two final sedimentation dams (MP6 and MP7) for the duration of the overflow “whenever a wet weather overflow is occurring due to stormwater events greater than or equal to a 90th percentile 5 day rainfall duration”.

The 50mg/L limit was exceeded four times during the reporting period at MP6 and MP7:

– MP6 286 mg/L (6/07/2022)
– MP7 196 mg/L (6/07/2022)
– MP6 139 mg/L (12/10/2022)
– MP7 106 mg/L (12/10/2022)

No further actions were required as a result of EPA review of the exceedances.

6.2 Greenhouse gases/landfill gas

6.2.1 Environmental management

Greenhouse gas (GHG) and landfill gas emissions are managed at the AWMF in accordance with the approved Greenhouse Gas Management Plan (GGMP). The 2021 IEA undertaken identified the need for the GGMP to be updated by 23 November 2022 in line with Schedule 4 Condition 26. The updated GGMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated GGMP has been submitted to DPE with LMCC and was approved on 14 February 2023.

Greenhouse gas management at AWMF aims to:

– Reduce potential greenhouse gas emissions from the operation of the facility.
– Continue to progressively apply existing landfill gas management measures across the existing and future landfill areas.

Greenhouse gas emission estimates for the AWMF from the EA (Cardno, 2012) suggest that landfill methane emissions are likely to constitute >99% of total GHG emission from the AWMF. Greenhouse gas management at the AWMF therefore focusses on the management of landfill gas. Landfill gas management measures at the AWMF include:

– Progressive installation and operation of a landfill gas collection and treatment system.
– Completion of a regular program for monitoring landfill gas.
– Daily and intermediate covering of the landfilled waste to minimise the rate of landfill gas generation and to minimise uncontrolled fugitive emissions to the atmosphere.
– Placement of only a limited quantity of waste below prevailing ground level to reduce the potential for lateral subsurface landfill gas emissions.
– All buildings on-site are designed and constructed to minimise the likelihood of landfill gas entering and accumulating within them.

Landfill gas generated at the AWMF is currently managed by an active landfill gas collection and treatment system that is designed, installed and operated by a specialist contactor, LMS Energy. Landfill gas is extracted from the waste mass using a fan (or blower), which directs the extracted gas to the treatment plant (flare or engine). Landfill gas treatment at the AWMF is predominately undertaken at the Awaba Renewable Energy Facility (REF) via combustion in a landfill gas fuelled reciprocating engine that drives a generator to create renewable electricity (which is ultimately exported to the electricity grid). During periods of engine downtime, or when otherwise required, landfill gas can be directed to a landfill gas flare located at the AWMF.

Greenhouse gas monitoring

Gas combustion at the Awaba Renewable Energy Facility (REF) and gas flare is reported under the *National Greenhouse and Energy Reporting Act 2007 (NGER Act) by LMS Energy.*

Landfill gas monitoring

LMCC implements a landfill gas monitoring program in accordance with the requirements of EPL 5873, including:

– Monitoring of landfill gas across areas of the AWMF where intermediate or final cover materials have been placed.
– Monitoring of landfill gas inside all buildings / structures.

Surface landfill gas emissions are monitored monthly in accordance with the landfill gas monitoring program. Monitoring is undertaken in accordance with the techniques identified within Benchmark Technique 17 of the *NSW EPA Environmental Guidelines: Solid Waste Landfills (1996)* to measure methane gas concentrations. Samples of the atmosphere are taken five centimetres (cm) above the landfill surface in any areas with intermediate or final cover and any new cells where cover material has been applied to a depth exceeding 300 mm.

For landfill gas surface emissions monitoring, the threshold for corrective action is methane concentrations exceeding 500 parts per million (ppm) at any point on the landfill surface for intermediate and finally-capped areas.

Landfill gas accumulation monitoring is implemented to demonstrate that gas is not accumulating at dangerous levels in enclosed spaces on or near the landfill. The gas accumulation monitoring program consists of monthly methane monitoring in all buildings and other enclosed structures within 250 metres (m) of the landfill. The threshold level for further investigation and corrective action is detection of methane at concentrations above 25 % of the lower explosive limit (LEL) or 12,500 ppm.

6.2.2 Environmental performance

Greenhouse gas monitoring

Landfill gas combustion monitoring results at the Awaba REF and gas flare during the reporting period year are provided in Table 6-4.

A total of 28,191.28tonnes of carbon dioxide equivalent (CO_2e) methane was combusted at the Awaba REF during the reporting period, generating 4,742,486 kilowatt hours (KWH) of renewable energy. An additional 3,616.76tonnes of CO_2e methane was combusted via the gas flare during the reporting period.

Table 6-4 Landfill gas combustion monitoring during the reporting period

Month	Volume of landfill gas flow (scm)			CO_2e (tonnes)		Exported KWH
	Flares	REF	Total	Flares	REF	
Jul 2022	66,362	284,411	350,773	581.22	2,522.19	436,206
Aug 2022	65,646	396,046	389,401	543.71	2,681.95	455,146
Sep 2022	83,887	272,487	350,928	789.02	2,276.72	359,246
Oct 2022	198,940	169,370	368,310	1,678.00	1,351.33	199,394
Nov 2022	111,525	220,542	332,067	N/A	1,701.71	307,352
Dec 2022	1,116	316,180	317,296	N/A	2,404.51	441,032
Jan 2023	3,102	330,884	333,986	24.81	2,538.41	418,438
Feb 2023	451	333,620	334,071	N/A	2,508.25	404,162
Mar 2023	2,739	361,192	363,931	N/A	2,789.91	463,498
Apr 2023	1,153	368,204	369,357	N/A	2,829.90	468,540
May 2023	20,921	296,196	317,117	N/A	2,304.87	383,252
June 2023	963	309,205	310,168	N/A	2,281.53	406,220
TOTALS	**556,805**	**3,586,046**	**4,142,851**	**3,616.76**	**28,191.28**	**4,742,486**

Landfill gas monitoring

Landfill gas surface emissions monitoring events for the reporting period were undertaken monthly in accordance with the GGMP. It is noted that that monitoring data is not available for March 2023 due to staff members contracting COVID-19. Results for April 2023 were also not available.

Results of landfill gas surface monitoring are placed on the LMCC website in accordance with EPL 5873. No reportable exceedances of the methane concentration threshold level (500 ppm) were recorded in the reporting period.

Results for the monthly landfill gas accumulation monitoring are placed on the LMCC website in accordance with EPL 5873. Methane concentrations for all enclosed spaces within 250 m of the landfill were negligible during the reporting period and therefore were below the prescribed detection threshold levels.

6.2.3 Improvements and initiatives

Ongoing repairs and maintenance to gas capture infrastructure are underway. This is managed by LMS.

6.3 Air quality and odour

6.3.1 Environmental management

Air quality and odour management at the AWMF is undertaken in accordance with the approved Air Quality and Odour Management Plan (AQOMP). The 2021 IEA identified the need for the AQOMP to be updated by 23 November 2022 in line with Schedule 4 Condition 25. The updated AQOMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated AQOMP has been submitted to DPE with LMCC currently working with DPE to rectify any updates that are required.

The objectives of the AQOMP are to:

– Prevent air pollution.
– Prevent amenity impacts from odour and dust.

These objectives are achieved through the implementation of a range of management measures aimed at reducing dust emissions, minimisation of combustion by-products and odour management.

Dust management strategies at the AWMF include:

– Designated vehicle routes to limit airborne dust generation.
– Wheel wash facility to prevent build-up of dust on sealed roads.
– Sealing of access roads and operational areas where practical.
– A water tanker is permanently located onsite to wet down unsealed roads and stockpiles as required.
– Soil stockpiles or intermediate landfill cover are managed to encourage grass cover to reduce the likelihood of wind erosion.

Combustion by-products at the AWMF include emissions from methane combustion for electricity generation or flaring and exhaust emissions from plant and equipment. Emissions from these sources are managed through the following strategies:

– Electricity generation and gas flaring plant and equipment is maintained to minimise undesirable combustion by-products.
– All plant and equipment used at the AWMF is maintained with pollution control equipment in good working order to manufacturer’s specification.
– Any plant or equipment observed to be producing excessive exhaust emissions is taken off-line until necessary repairs or modifications are completed.

Potential odour sources at the AWMF include waste at the active landfill tip-face, and leachate storage treatment and irrigation. Odours from these sources are managed through the following strategies:

– Minimising the active area of the tip-face to that required to accommodate anticipated vehicles tipping at any one time.
– Daily cover is used to temporarily cap the active tip face when not in active use.
– Aeration of leachate storage ponds to prevent anaerobic conditions which can increase potential for odours.
– Any leachate that has been stored in anaerobic conditions is not used for irrigated on site.

The AQOMP also includes several pre-emptive and reactive based measures to reduce the impact of dust and odours during adverse meteorological conditions and other extraordinary events.

No quantitative air quality monitoring is required by the PA or EPL. Air quality monitoring for TSP and PM10 will occur twice per year or in the event of a dust complaint as described by the updated AQOMP.

Complaints relating to dust and odour are investigated and actioned in accordance with Awaba Waste Management Facility / Green Waste Processing Facility – Complaints Management Procedure.

No air quality or odour complaints attributable to AWMF were received during the reporting period. Odour complaints to Remondis' ORRF were recorded and informal visits from EPA representatives took place.

6.3.2 Environmental performance

Potential air quality and odour impacts from the AWMF were assessed as part of the EA (PAE Holmes, 2012). The primary objective of the assessment was to assess the potential air quality and odour impacts from the expanded AWMF through:

– A quantitative assessment of the potential air quality and odour impacts of the project, including cumulative impacts.
– A demonstration that the ongoing operation of the AWMF is able to comply with the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) and *Protection of the Environment Operations (Clean Air) Regulation 2010*.

The assessment found that the bushland buffer surrounding the AWMF provides significant protection of receivers from dust and odour impacts. Modelling estimates that odour impact assessment criteria is not exceeded beyond 250 m from the facility and dust deposition will be minor beyond 100 m. No sensitive receivers were identified within these distances. The assessment determined that operational air quality and odour emissions are predicted to be well within acceptable criteria when current management practices are correctly applied. The predicted odour ground level concentrations are below the most stringent air quality goals at all residential receivers.

Based on a worst case assessment of the onsite power generation plant, air pollutant levels (as indicated by nitrogen dioxide (NO_2) concentrations) due to the gas turbines and excess flaring of landfill gas are predicted to be 12.5 µg/m^3 at the nearest residential receiver, which is well below the assessment criteria of 246 µg/m^3. Similarly, concentrations of carbon monoxide (CO), volatile organic compounds (VOCs) and sulphur dioxide (SO_2) are predicted to be negligible.

The maximum predicted 24-hour PM_{10} concentration at a residence is 7.1 µg/m^3 which is well below the assessment criteria of 50 µg/m^3. All annual average predictions are well below 1 µg/m^3, which is well below the assessment criteria of 30 µg/m^3. Dust deposition levels are predicted to be below 0.6 g/m^2/month, which is well below the assessment criteria of 2 g/m^2/month.

Dust levels during site operation are predicted to be low and controllable through good site environmental practice and commonly applied dust management measures as identified in Section 6.3.1.

No air quality or odour complaints attributable to AWMF were received during the reporting period. As such, the management measures identified in the AQOMP are considered to be effective and will continue to be employed during the next reporting period.

6.3.3 Improvement and initiatives

As in the previous reporting period, while not related to the performance of the expanded AWMF, LMCC provides operational assistance to Remondis to assist in managing the odour performance of the ORRF. This includes, receiving and investigating odour complaints, before forwarding to Remondis for action, and working cooperatively with Remondis and the EPA regarding odour complaint management and mitigation measures. This is an independent facility subject to a separate EPL.

6.4 Operational noise

6.4.1 Environmental management

Operational noise management at the AWMF is undertaken in accordance with the approved Operational Noise Management Plan (ONMP). The 2021 IEA identified the need for the ONMP to be updated by 23 November 2022 in line with Schedule 4 Condition 32. The updated ONMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated ONMP has been submitted to DPE with LMCC currently working with DPE to rectify any updates that are required.

The objective of the ONMP is to ensure that noise emissions from activities associated with the operation of the AWMF do not result in adverse impacts on neighbouring sensitive receivers by:

– Identifying legislative obligations and noise targets for environmental noise control.
– Identification of significant noise generating activities and surrounding sensitive noise receivers.
– Providing guidance on appropriate measures to reduced operational noise emissions.
– Providing a framework for noise complaint investigation and response.
– Identifying responsibilities for implementation of noise control measures.

Operational noise management measures identified in the ONMP and implemented at the AWMF include the following:

– Plant and equipment are selected for use on site with consideration to acoustic performance.
– Plant and equipment used on site has noise control devices always fitted.
– Plant and equipment used on site is maintained in good working order.
– Any equipment identified as being responsible for exceeding specified noise limits or resulting in a noise complaint is removed from service where maintenance and repair are required to prevent elevated noise emission.
– Truck drivers and plant operators are made aware of relevant noise minimisation practices including adherence to the site speed limit, minimising the use of engine brakes while descending the haul road, and observing operational time restrictions.
– Noisy activities outside typical operational practices that have potential to impact on nearby residences are only conducted for short durations and/or incorporate additional noise management practices such as additional muffling of equipment or installation of temporary noise barriers.
– Any significant construction works have a project specific Construction Noise Management Plan prepared prior to commencement.

Noise monitoring

Due to the appreciable buffer to the worst effected sensitive noise receiver regular acoustic measurements are not required as part of the ONMP to monitor the operational noise performance of the AWMF.

Performance is gauged by monitoring of complaint history and feedback from community engagement undertaken in line with the Community Education Program (see Section 8).

Any significant upward trend in noise complaints received by LMCC must initiate a review of noise management measures at the AWMF and update of ONMP as required.

Complaints regarding alleged noise from the AWMF are managed in line with LMCC's established customer service protocols and in line with LMCC's Customer Charter.

6.4.2 Environmental performance

The AWMF is bounded by a sizable bushland buffer however there are various commercial, industrial and residential land uses in the surrounding environment which are within the acoustic range of the facility.

Based on the nature of surrounding development, sensitive noise receivers identified in the ONMP that warrant consideration are limited to:

– Residential premises in Awaba township located approximately 800 m to the north.
– Toronto Adventist Primary School located approximately 1.3 km to the east.
– Leisure Life Caravan Village (manufactured homes estate) located approximately 1.3 km to the east.
– Toronto residential areas located approximately 1.7 km to the northeast.

The conditions of the PA specify that operational noise from the AWMF shall not exceed:

a. an LA10(15 minute) noise emission criterion of 45dB(A) (7am to 6pm) Monday to Sunday.
b. an LA10 (15 minute) noise emission criterion of 45 dB(A) during the evening (6pm to 10pm) Monday to Friday.
c. at all other times, an LA10 (15 minutes) noise emission criterion of 35dB(A), except as expressively provided by the EPL.

Operational noise of the expanded AWMF was assessed in the EA (Cardno, 2012). The assessment concluded that the operation of the expanded AWMF was not significantly different from the existing facility and would not result in any net increase in noise impact on surrounding receivers.

Routine noise generating activities at the AWMF include truck movements between the waste transfer station and the tip face, and heavy earth moving machinery and compaction of the active landfill cell.

Due to shielding of residential premises in Awaba by a ridgeline beyond the western boundary of the AWMF site, the most effected noise receivers are predicted to be the school and manufactured home estate located 1.3 km to the east.

Predicted sound power levels from heavy machinery used at the AWMF are shown in Table 6-5. This accounts for the highest level of noise generating activity during typical operation of the AWMF. These levels have not been updated from the last reporting period to this reporting period.

Table 6-5 Predicted equipment noise levels dB(A)

Plant type	Model	Indicative Sound Power Level – SWL dB(A)	Predicted Noise Level at 1300 m dB(A) (School & Manufactured Home Estate)
Traxcavator	Liebherr LR634	110	40
Compactor	Tana E520	110	40
Truck	Isuzu FX2 240 350 (23T GVM)	107	37
Combined level*			44

**assuming simultaneous operation of 1 compactor, 1 truck, and 1 traxcavator.

The predicted noise levels are derived from linear distance attenuation predictions, which do not account for various other losses including ground loss, vegetation and shielding topography that would reduce received noise levels further. Accordingly, the actual maximum noise levels at the nearest sensitive receivers are predicted to be significantly lower than shown in Table 6-5.

Additionally, the predicted levels represent maximum predicted noise levels, being more stringent than the regulatory noise targets which are based on an $L_{10\ (15\ min)}$ statistical calculation (noise level exceeded 10% of the time).

The predicted noise levels indicate that noise targets set out in the PA conditions for the AWMF will be achieved.

No complaints relating to operational noise were received during the reporting period. Management measures are identified in the ONMP, which has been updated, see Table 6-1, with ongoing communication between DPE and LMCC to finalise the updated ONMP.

Operational noise validation was undertaken in the 2021/2022 reporting period as required by Schedule 4, Condition 28 of the PA. As part of the works completed for operational noise validation, operator attended noise measurements were conducted on site as well as three (3) sensitive receiver locations surrounding the site on Thursday 11 November 2021. The operator attended operational noise monitoring showed that the noise contributions from the facility comply with the Project Approval 10_0139 noise criteria of 45 dBA $L_{A10(15\ minute)}$ at all monitoring locations.

An operational noise model of the facility was created and validated based on measurements taken on site. Using the noise model an operational noise assessment was undertaken based on a worst-case operating scenario, with all equipment operating and noise enhancing atmospheric conditions present. The results of the model indicated that noise levels associated with the operation of the facility are predicted comply with the Project Approval noise criterion of 45 dBA $L_{A10(15\ minute)}$ during the day at all nearby sensitive receivers.

LMCC undertakes regularly scheduled maintenance of equipment and machinery to ensure they are not producing excessive emissions or noise. Machinery is turned off instead of idling. Speed limits in place to deter unnecessary breaking or revving of vehicles.

6.5 Litter control

6.5.1 Environmental management

Litter control at the AWMF is undertaken in accordance with the approved LEMP and aims to:

– Prevent spread of litter off site to the environment.
– Prevent amenity impacts from litter.
– Maintain site visual appeal.

Measures to control litter onsite include:

– Cover and compact waste daily.
– Litter fences around part of the perimeter of the active landfill area.
– Signs to advise drivers of their responsibility to ensure material does not fall from their vehicles and litter public roads.
– Daily inspection and clearance (as resources permit) of the site (and if necessary, surrounding area) of litter resulting from the landfilling operations.

The 2021 IEA identified the need for the Litter section of the LEMP (Section 9.7.2) to be updated. The updated LEMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated LEMP has been submitted to DPE with LMCC currently working with DPE to make any updates that are required.

6.5.2 Environmental performance

During the reporting period, litter control performance was monitored daily through visual inspections and resources allocated to manual litter patrols on an as needs basis.

The IEA undertaken during the previous reporting period identified non-compliances relating to litter and breaches of NC-08 Schedule 4 Condition 9. In response to these breaches, LMCC was obligated to conduct a thorough litter clean-up and complete a daily litter record.

A warning letter concerning these breaches was issued from DPE during the last reporting period. A litter clean-up has been undertaken to address the issues raised by the warning letter. Additionally, LMCC has formalised their litter inspection process with the implementation of a litter inspection template that is completed and saved as part of their records management for accountability.

6.6 Pest, vermin and weeds

6.6.1 Environmental management

Pest, vermin and noxious weed management at the AWMF is undertaken in accordance with the approved LEMP and aims to:

– Minimise the sources of food and habitat for pests and vermin
– Use professional pest exterminators/controllers if an outbreak is detected
– Prevent spread of weeds off site to the surrounding areas

Measures to control pests, vermin and noxious weed onsite include:

– Cover and compact waste daily.
– Inspect the site on a regular basis to ensure that these measures are working effectively, and that pests, vermin or noxious weeds are not present on site in sufficient numbers to pose an environmental hazard or cause the loss of amenity in the surrounding area.
– Signs to advise drivers of their responsibility to ensure material does not fall from their vehicles and litter public roads.
– Control weeds using chemical herbicides and pesticides on an as needs basis (determined by the LMCC Vegetation and Pest Management Coordinator).

6.6.2 Environmental performance

Pests, vermin and noxious weed control performance have historically been monitored periodically through visual inspections during previous reporting periods with resources allocated to manage on an as needs basis.

In response to an identified non-compliance by the IEA undertaken in the previous reporting period (Section 9.1), the process for pest, vermin and weed management has been formalised. The inspection process will be undertaken quarterly with a dedicated location to save inspection/treatment records for the site.

To formalise biosecurity inspections, inspections are to be undertaken based on the Awaba Biodiversity Conservation Areas Plan of Management which addresses the following biosecurity factors:

– Weed management
– Maintaining biodiversity and threatened species
– Access and track management
– Bush fire management
– Feral animal management
– Governance, monitoring and reporting

No pest, vermin and noxious weed related incidents at AWMF were recorded during the reporting period. Two inspections were undertaken during the reporting period, in November 2022 and June 2023.

A Biosecurity inspection was completed for the site on 7 June 2023.

The result of the inspection are as follows:

– Priority weeds were found including Bitou Grass and Pampas Grass
– Previous known infestations of Groundsel Bush and Rattlepod were not found during the inspection.

6.7 Biodiversity

6.7.1 Environmental management

Biodiversity impacts at the AWMF are managed in accordance with the approved Biodiversity Management Plan (BMP). The 2021 IEA identified the need for the BMP to be updated by 23 November 2022 in line with Schedule 4 Condition 51.

The updated BMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated BMP has been submitted to DPE with LMCC currently working with DPE to rectify any updates that are required.

The BMP includes measures to manage biodiversity impacts during both construction and operation of the expanded AWMF. The updated BMP identifies specific plans and protocols required to manage flora and fauna impacts, in accordance with the conditions of the PA and includes incorporation of a Vegetation and Fauna Management Plan and a Translocation Plan.

The Vegetation and Fauna Management Plan and translocation plan apply for the operational life of the expanded AWMF, whereas the protocols relating to the construction stage only cease to have effect following the completion of construction.

LMCC has implemented a Biodiversity Offset Strategy (BOS) as detailed in Schedule 4, Condition 50 of the PA. In implementing the BOS, LMCC has established the Awaba Biodiversity Conservation Area to adequately compensate the project's impacts on biodiversity, ensuring compliance with the PA offset requirements. The Awaba Biodiversity Conservation Area also provides biodiversity offsets for two other LMCC development projects, the Lake Macquarie Transport Interchange (LMTI) and the Awaba Alternative Waste Treatment facility (now the ORRF, see Section 4.1.1). The Awaba Biodiversity Conservation Area and allocation of offset for the expanded AWMF is shown in Figure 6-2.


Legend
cadastre
Awaba Biodiversity Conservation Area (121.19 ha)
Offset for AWMF project (55.3 ha)
Offset for AWT project (34.1 ha)
Offset for LMTI project (31.7 ha)
0 100 200
Meters
N

The Awaba Biodiversity Conservation Area Plan of Management (ABCAPoM) was prepared in accordance with Schedule 4, Condition 51 of the PA. The ABCAPoM outlines how the land will be managed to protect and maintain its biodiversity offset values. Key roles of the plan are:

– To record the biodiversity offset strategy and to document biodiversity values of the land.
– To provide a framework for ongoing management of the land, by outlining key issues, objectives, management areas, actions and a budget.
– To identify requirements for monitoring and evaluation.
– To identify a process of stakeholder consultation in managing the land and revising the plan as required.

The ABCAPoM includes guidelines for the management of the land in relation to the following issues:

– Weed management
– Maintaining biodiversity and threatened species
– Access and track management
– Bush fire management
– Feral animal management
– Governance, monitoring and reporting

The ABCAPoM includes a flora and fauna survey and monitoring program, which is required to be reported on annually to evaluate the effectiveness of management measures at maintaining the biodiversity value of the land.

6.7.2 Environmental performance

Non-compliances relating to biodiversity were identified by the IEA undertaken in the previous reporting period. Progress against these non-compliances is presented in Section 9.1.

During the reporting period, LMCC undertook the following actions:

– Management and monitoring activities only have been undertaken, including Spring and Autumn monitoring of biodiversity habitat value.
– Pest track upgrades were made subject to a Project Management Plan by the Soil Conversation Service.
– LMCC installed a 100-metre post and cable fence along Wilton Road to prevent informal and illegal access to the site to minimise illegal dumping.
– In the next reporting period, LMCC has committed to formalise access tracks within the offset site.

No impacts to biodiversity outside of those predicted in the EA have occurred during the reporting period. No clearing of vegetation was undertaken onsite during the reporting period. The management strategies specified by the updated BMP and implemented across the site are considered adequate to address potential biodiversity impacts within the project approval boundary and will continue to be implemented during the next reporting period.

6.8 Heritage

6.8.1 Environmental management

Cultural heritage management at AWMF is undertaken in accordance with the approved Cultural Heritage Management Plan (CHMP), which has been prepared in accordance with the PA. The 2021 IEA identified the need for the CHMP to be updated by 23 November 2022 in line with Schedule 4 Condition 45.

The updated CHMP was reviewed by LMCC and Hunter Environmental Consulting Pty Ltd in January 2023. The updated CHMP has been submitted to DPE with LMCC currently working with DPE to rectify any updates that are required.

The objective of the CHMP is to provide guiding policies and principles for the management of Aboriginal heritage and cultural values and historic heritage, within the AWMF site. The CHMP provides the framework for the protection of cultural values throughout construction and operation of the expanded AWMF under the PA.

The CHMP includes a range of management measures to protect cultural heritage values during both construction and operation of the expanded AWMF, including:

– Incident and complaint management.
– Site inductions.
– Procedures for discovery of previously unknown heritage objects.
– Procedures for discovery of potential human remains.
– Protection of cultural heritage sites.
– Repatriation of salvaged sites.
– Procedures for any works within the biodiversity offset area.

No salvage occurred during construction, however one culturally modified tree (45-7-0331) was retained and protected onsite.

The CHMP requires ongoing monitoring of any repatriation location site protection measures to be undertaken by LMCC on an annual basis to ensure that any necessary repairs to fencing work is undertaken in a timely manner.

The CHMP also requires ongoing monitoring of 45-7-0331, including periodic inspection by an arborist to assess the health of the tree. LMCC are engaged in ongoing internal discussions to undertake annual inspections of this tree. Fencing around the tree has been erected within the reporting period. In July 2023, following the end of the reporting period, LMCC placed signage around on the fencing marking the tree as a heritage item.

6.8.2 Environmental performance

No consultation or salvage activities were undertaken during the reporting period, as no excavation or land clearing has occurred in previously undisturbed areas. Additionally, no areas have been disturbed outside of the approved project boundary and therefore no impacts to cultural heritage during the reporting period.

An IEA recommendation (ID30) identified the need for signage to be installed for the culturally modified tree (45-7-0331). Fencing around the tree has been erected during the reporting period. Signage was established in July 2023.

LMCC are engaged in ongoing internal discussions to undertake annual inspections of culturally modified tree.

7. Rehabilitation

Schedule 4, Conditions 57 and 58 of the PA require LMCC to prepare a Landfill Closure and Rehabilitation Management Plan for the expanded AWMF within 12 months of the commencement of the PA.

LMCC wrote to the DPE on 8 July 2021 to request clarification on this condition, given that the operational life of the AWMF is expected to be in the order of 30 years and the rehabilitation activities would not commence until closer to this time. Due to anticipated changes in legislation, technology and community expectation, any rehabilitation and closure management plan developed at this time would likely be subject to significant variation and redundancy in contrast to any plan developed closer to the end of the site's operational life.

LMCC has engaged a consultant to assist with the preparation of the Rehabilitation Management Plan. This Plan was completed and submitted to DPE on 5 August 2022.

Landfill areas awaiting 'piggy backing' of future cells have intermediate cover in the form of dredgings, with re-vegetation. As the site is anticipated to operate until 2041, no closure or final rehabilitation activities have been undertaken. The first stage of capping is anticipated to commence in 2026.

8. Community

8.1 Engagement activities or initiatives

LMCC prepared a Community Education Program in accordance with the Schedule 5, Condition 11 of the PA. The Community Education Program guided engagement actives to encourage use of the CRC and to promote resource recovery.

The following community engagement activities and initiatives were undertaken during the reporting period:

– During March and April 2022, a Bulk Waste Service Review survey sought community feedback. A total of 2274 people completed the survey. Community engagement for the transition included six community presentations.
– LMCC continues to promote the CRC through Hunter Joint Organisation. A series of videos showing how to use the CRC were rolled out through social media with some filming occurring at the site.
– A safe battery disposal campaign was developed “Take Charge of your Battery Waste” to encourage battery recycling at specific drop-off locations including the CRC.
– LMCC signed an agreement with plastics manufacturer Plasmar for a one year trial to take residential soft plastics as well as CDs and CD covers from residents at the CRC. Hard plastics will be recovered from general and bulk waste collection.
– There were 31 school waste workshops undertaken reaching 1407 students.
– There were 12 community tours undertaken at AWMF reaching 286 residents.
– Additional problem wastes collected at the CRC during the year included X-rays and printer cartridges.
– All waste campaigns were promoted through social media platforms, printed media, the LMCC website and City-wide newsletters.
– Other presentations occurred during the year when possible, including to schools and community organisations.

8.2 Complaints

Complaints handling and management at the AWMF is undertaken in accordance with the approved Complaints Handling and Investigation Procedure, which forms part of the LEMP. The purpose of the procedure is to manage complaints received by LMCC regarding the environmental performance of both the AWMF and the ORRF, which is operated by the third-party contractor, Remondis, under a separate approval and EPL. Both LMCC and Remondis have obligations under their respective EPL’s to record, investigate and report pollution incidents and complaints at the time they are identified.

Generally, the public assumes both facilities are operated by LMCC, and will forward inquiries to LMCC regarding the operations of both facilities. It is therefore important that initially the inquiry is assessed and assigned to the correct organisation, in a timely manner, to record, investigate, report and respond to such inquires.

Following receipt of a complaint an initial investigation is undertaken to determine the source of the complaint and to assign the complaint to either the AWMF, the ORRF or another relevant entity within LMCC.

Further investigation is then undertaken to:

– Determine the cause of the incident.
– Implement controls to manage the incident.
– Implement controls to reduce the risk of it occurring again.
– Consult with relevant LMCC staff.

The complainant is then updated regarding the outcome of the investigation.

Seven odour complaints were received over the reporting period, however these were attributed to the ORRF managed by Remondis.

Two community complaints were received that referenced AWMF during this reporting period compared to eight received in the previous period. Complaints received were relating to transactional interactions.

No complaints related to the environmental performance of the AWMF were received during the reporting period. Compared to last reporting period, the site has seen a reduction in complaints. No environmental actions are warranted in response to any complaints that have been received.

9. Independent audit

An IEA was completed in March 2022 by Umwelt Environmental and Social Consultants. A summary of the findings of the IEA was compiled in the 2021/2022 annual review. A number of non-compliances and actions were identified in the audit. The progress on these actions at the end of the 2022/2023 reporting period is summarised in Section 9.1.

9.1 Actions required from independent audit

The audit made several recommendations, which are outlined in Table 9-1 below. LMCC's responses to each recommendation and a current status of each response are also provided in the table.

Table 9-1 Actions required from the IEA

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
PA10_0139 (MOD 1)					
NC - 03 Schedule 3 Condition 6	ID1	LMCC should seek to engage with DPIE to confirm the status of the existing consents and if they have not been surrendered LMCC should surrender the development consents identified in Table 1-1 of the project approval as required.	Council will undertake this recommendation before the close of the next auditing period.	LMCC made contact with DPE during the reporting period to get clarity on the need for the surrendering of these development consents and will continue to liaise with them to reach an outcome. An application to surrender these consents was made shortly after the completion of the 2022/2023 reporting period on 10 July 2023. The outcomes of this submission will be discussed in the next Annual Report.	31 July 2023
Improvement Opportunity Schedule 3 Condition 13	ID2	It is recommended AWMF develop a system to regulate and alert management of plant and equipment issues and the relevant course of actions, timing and responsibilities are recorded.	Council considers the existing management systems in place are adequate to regulate and alert management of plant and equipment issues. Council's procedure for regulating non-compliance is via Council's Hazards Incidents and Non-conformance (HINC) system.	No further action required.	Complete
Improvement Opportunity Schedule 4 Condition 5	ID3	It is noted the Waste and Resource Recovery Monitoring Program included in the LEMP is labelled as a Draft. It is recommended the program be reviewed and a final copy be included in the LEMP.	Council will undertake this recommendation before the close of the next auditing period. See further references to document and compliance management system.	The LEMP has been revised and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC – 07 Schedule 4 Condition 6	ID4	It is recommended LMCC continue consultation with Hunter Water and reach an agreement for a new Trade Waste agreement which would cover the life of the Project or alternative seek DPIE's approval that rolling annual licences are acceptable.	Trade waste agreement is currently in place for defined terms. Council and HWC negotiate subsequent term agreements to ensure continuity of the agreement.	A temporary trade waste agreement is currently in place. LMCC and HWC negotiate subsequent term agreements to ensure continuity of the agreement. Council have sought DPE approval that rolling annual licences are acceptable, however formal acceptance has not been received as of the end of the reporting period.	Action is with DPE
NC - 08 Schedule 4 Condition 9	ID5	A thorough clean-up of all litter, focusing on offsite areas within the surrounding bushland environment needs to be undertaken as a matter of priority. Then daily inspections need to be implemented as required.	Council will undertake a clean-up of litter as resources permit. Daily record of litter inspections will be noted in the site daily operations diary.	Completed	Complete
	ID6	It is recommended Section 9.7.2 in the LEMP be revised and a litter monitoring/control program to be developed and implemented to control litter effectively across onsite and offsite.	LEMP section 9.7.2 will be revised to control litter more effectively.	The LEMP has been revised and submitted to DPE.	See Table 6-1
	ID7	It is also recommended a formal process documenting daily inspections be created and undertaken to show compliance with this condition.	Daily record of litter inspections will be noted in the site daily operations diary.	Completed	Complete
NC - 09 Schedule 4 Condition 10	ID8	A focused weed spraying program should be commissioned to bring current weed infestations at the site under control with a focus on areas surrounding the sites perimeter to prevent weeds spreading to nearby bushland areas as a matter of priority.	Council will commission a weed spraying program to bring weed infestations under control, with a focus on areas surrounding the landfilling area.	Completed	Complete

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
	ID9	It is recommended LMCC revise the LEMP to align with current operations and develop a formal reporting process for the inspection and management of pests, vermin and/or noxious weeds	LEMP will be revised to develop a formal reporting process for inspection and management of pests vermin and/or noxious weeds.	The LEMP has been revised and submitted to DPE.	See Table 6-1
NC - 12 Schedule 4 Condition 11	ID10	It is recommended the confirmation letter received from the Mine Subsidence Board confirming their approval of cell designs be submitted to the Director General and EPA for their records as required by this condition.	Council will supply the letter to the department.	Correspondence from DPE was received following the end of the 2022/2023 reporting period on 3 July 2023 advising that DPE has no comments to make on the letter.	3 July 2023
NC - 13 Schedule 4 Condition 18	ID11	LMCC should engage with DPIE in order to confirm if the ongoing regular trucking of leachate from AWMF to Hunter Water's Edgeworth WWTW is currently approved. If not, this activity should cease until appropriate approvals are in place.	Council seeks approval from DPE for trucking of leachate to an approved wastewater treatment facility if not already covered by existing conditions within the project approval.	DPE issued a warning letter to LMCC regarding the non-compliance for this condition on 9 December 2022. In this letter, DPE outlined that the SWLMP is required to be updated and that LMCC are required to submit an Action Plan regarding an action plan to upgrade the Rathmines No.6 Waste Water Pump Station. The updated SWLMP was submitted to DPE on 17 February 2023 and the Action Plan letter was submitted to DPE on 27 April 2023. DPE have not provided a response.	Awaiting DPE response
	ID12	It is recommended the transfer of leachate into trucks for disposal offsite only to occur in a bunded area	Bunded area constructed. Council will use the bunded area upon completion of pumping infrastructure. Expected completion during May 2022.	Bunding construction was completed prior to the reporting period.	Complete

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC - 14 Schedule 4 Condition 19	ID13	The Water Quantity and Quality Assessment prepared by Cardno dated December 2011 does not assess the current layout of the AWMF. It is recommended the assessment be revised or removed from the SWLMP as it is not considered to adequately assess the as built design.	Council will review the SWLMP. The Water Quantity and Quality Assessment dated December 2011 will be updated or removed.	Completed	See Table 6-1
	ID14	It is recommended the SWLMP and its respective plans be revised to reflect current operations and the Surface Water, Groundwater and Leachate Monitoring Program revised to include relevant EPL criteria.	Council will review the SWLMP to reflect current operations and the Surface Water, Groundwater and Leachate Monitoring Program revised to include relevant EPL criteria.	Completed	See Table 6-1
	ID15	LMCC should seek to engage with the EPA and DPIE with regard to the ongoing exceedances of groundwater criteria and undertake further investigations to determine the cause and develop effective mitigation measures to address.	Council is continuing to engage with NSW EPA regarding ongoing exceedances of groundwater criteria. Please indicate if DPE wishes to be included in correspondence in this regard.	Relining of leachate pond will be included as part of design of next stage of cell construction. The tender for the next stage of design has been issued. An estimated time of construction is not currently available. The EPA were advised of this during meeting 7 June 2023.	To be confirmed following next phase of design.

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC - 16 Schedule 4 Condition 22	ID16	It is suggested LMCC seek to engage with DPIE and EPA regarding the intent of this condition and either seek to have reference to the dust criteria removed or if required by DPIE/EPA undertake monitoring of dust in order to be able to demonstrate that the project does not exceed the criteria.	Monitoring has not been undertaken as no direction given under the approval to do so. Council has not received any dust complaints directed at the AWMF or other reason or trigger to believe these criteria are being exceeded.	Ongoing discussion with DPE regarding dust monitoring and criteria is being undertaken by LMCC. LMCC is in the process of undertaking dust monitoring to show there are no exceedances above the criteria in order to have this condition modified to only be required in the event that a valid dust complaint be received.	April – June 2024
Improvement Opportunity Schedule 4 Condition 25	ID17	It is recommended the Air Quality and Odour Management Plan be revised to include the relevant conditions of this approval and a protocol to periodically review the plan to ensure Air Quality and Odour Management Plan is kept up to date with current best practice.	Council will review the existing AQOMP to ensure it aligns with current best practice.	The AQOMP has been revised and submitted to DPE.	See Table 6-1
	ID18	It is recommended the management system for air quality and odour be clearly defined in the Air Quality and Odour Management Plan and include timing, roles and responsibilities of personnel	Council will review the existing AQOMP to ensure it aligns with current best practice.	The AQOMP has been revised and submitted to DPE.	See Table 6-1
NC - 17 Schedule 4 Condition 26	ID19	The Greenhouse Gas Management Plan should be subject to periodical review and revision as required.	Council will undertake this review before the close of the next auditing period.	The GGMP has been revised and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC - 18 Schedule 4 Condition 27	ID20	It is recommended noise monitoring be undertaken on a periodic basis to verify the development complies with the specified noise emission criteria. As required by this condition noise monitoring must be measured at any point within six (6) metres of the nearest effected residential receiver or other noise sensitive areas in the vicinity to determine compliance with this condition.	Operational noise validation undertaken by GHD and submitted to the department December 2021, and found site operations to be compliant with stated noise criteria. Additional noise monitoring can be undertaken in response to any complaint received (no complaints have been received) or following any substantial change in site operations.	Operational Noise Validation Report Completed in December 2021.	Completed

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC - 20 Schedule 4 Condition 29	ID21	It is recommended the Operational Noise Management Plan be revised to include mitigation measures in minimising noise impacts during adverse meteorological conditions, include mitigation measures for traffic impacts and to detail requirements for noise monitoring as required to demonstrate compliance with the monitoring requirements under Condition 27. Further the update should include all of the recommended mitigation measures included in the Operational Noise Validation Assessment prepared in December 2021.	The Operational Noise Management Plan will be updated to include mitigation measures to minimise noise impacts during adverse meteorological conditions and traffic impacts. The plan will also be updated to include measures noted in the Operational Noise Validation. Additional monitoring has not been undertaken. Council has not received any noise complaints directed at the AWMF or any other reason or trigger to believe noise criteria are being exceeded. Please confirm if DPE requires ongoing monitoring to be undertaken.	Operational Noise Management Plan has been revised and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC - 22 Schedule 4 Condition 32	ID22	It is recommended to effectively manage and ensure noise criteria is within limits, periodic noise monitoring is undertaken.	Please confirm if DPE requires ongoing monitoring to be undertaken.	The Operational Noise Validation Report completed in December 2021 identified that operational noise is compliant with the PA and the environmental assessment. Monitoring would only be required in the case of noise complaints.	No further action proposed
NC - 23 Schedule 4 Condition 37	ID23	LMCC should seek to confirm that the internal roads and parking areas have been constructed and maintained in accordance with the latest versions of AS 2890.1 and AS 2890.2 and keep a record of this for future audits.	Council will determine if roads have been constructed, and are being maintained in accordance with the latest versions of AS 2890.1 and AS 2890.2 and will keep a record of this for future audits.	Complete	Complete
NC - 25 Schedule 4 Condition 39	ID24	LMCC should seek to confirm that lighting associated with the project complies with the latest version of AS 4282(INT) - Control of Obtrusive Effects of Outdoor Lighting and keep a record of this for future audits.	Council will determine if lighting complies with the latest version of AS 4282(INT) - Control of Obtrusive Effects of Outdoor Lighting and will keep a record of this for future audits.	Assessment of project lighting is ongoing.	Ongoing
NC - 26 Schedule 4 Condition 41	ID25	It is recommended management procedures are revised to ensure all employees know all chemicals, oils should be located within a bunded area and that regular site inspections include relevant checks for appropriate management and storage of hydrocarbons.	It is understood the contractor operated LMS power station site was the area of concern identified in the IEA. Future site inspections will include the LMS power station and the contractor will be notified of chemicals, fuels and oils that are observed to not be	Action is ongoing at the site.	Ongoing

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
			contained appropriately. Oils and chemicals stored outside bunded areas are small quantities only, used for mowing equipment, pump/generator fuel etc. Council will review current storage practices to ensure they are managed in accordance with relevant Australian Standards and/or EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook.		
NC - 27 Schedule 4 Condition 43	ID26	It is recommended LMCC to seek approval from the Director General of a suitability qualified and experienced person to revise the Pollution Incident & Emergency Response Management Plan and that once revised the plan is provided to the Director General for approval. The revised plan should include the Bush Fire Emergency Evacuation Plan as required.	Pollution Incident & Emergency Response Management Plan (PIRMP) was submitted to DPE as LEMP Appendix F, under request for approval to commence operations on 6 July 2019 and Council was granted approval on the 04 October 2019.	The PIRMP has been revised and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Improvement Opportunity Schedule 4 Condition 44	ID27	It is recommended the Aboriginal stakeholders consultation log be updated to include all ongoing correspondence between LMCC and the Registered Aboriginal Parties that has occurred since the submission of the plan.	The Aboriginal stakeholder's consultation log will be updated to include all ongoing correspondence between LMCC and Registered Aboriginal Parties.	There have been no consultation log updates, as it is understood there has been no further correspondence required between Council and Registered Aboriginal Parties. There has been no activity beyond previously disturbed areas of the landfill site where a risk exists for damaging areas or items of aboriginal heritage since submission of the plan. The proposed future landfilling footprint is also within existing disturbed and landfilled areas of the site. Action is considered closed out.	Ongoing internal
NC 28 Schedule 4 Condition 45	ID28	It is recommended the CHMP is revised and updated to reflect changes and existing operations. As part of this review and revision a monitoring and collection protocol should be prepared in consultation with the RAPs and included the revised management plan. The revised CHMP should be sent to the Department for approval.	CHMP can be revised and updated to reflect changes and existing operations. A monitoring and collection protocol will be prepared in consultation with RAPS. The plan will be sent to the DEP for approval.	The CHMP has been revised and submitted to DPE.	See Table 6-1
	ID29	LMCC to confirm a report was prepared as part of the salvage for AWMF that detailed the methodology and results of the salvage of Aboriginal archaeological sites on the AWMF. This should be provided to relevant agencies and RAPs if not already distributed. If not prepared the report needs to be prepared.	It is understood a Salvage of Aboriginal Ecological Sites report was prepared; Council will confirm if a report was prepared in consultation with RAPs.	Salvage reports prepared for site 45-7-0331, 45-7-0333 and 45-7-0309. 45-7-0332 (D11108589) AHIMS photo matched with in field investigation by ALR.	Complete
	ID30	Signage should be installed at the culturally modified tree (Site 45-7-0331) and all other identified sites within the AWMF as required by the Cultural Heritage Management Plan	Signage will be installed at the culturally modified tree (Site 45-7-0331).	Fencing around the site was installed during the reporting period. Shortly following the completion of the reporting period, LMCC installed signage at the site.	31 July 2023

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC 30 Schedule 4 Condition 47	ID31	LMCC to confirm Aboriginal Site Impact Recording forms have been completed and submitted to AHIMS as required and a record of this be kept onsite.	Council will confirm if Aboriginal Site Impact Recording forms have been completed and submitted to AHIMS.	D10944230 - DPE letter advising the matter is closed and Council has satisfied requirements of Schedule 4 Condition 47.	Complete
NC 31 Schedule 4 Condition 50	ID32	It is recommended LMCC undertake all monitoring and management actions as required in the Biodiversity Conservation Area Plan of Management during the next reporting period and include a summary in the Annual Review.	Council will undertake the monitoring and management actions as required in the Biodiversity Conservation Area Plan of Management.	Complete.	Complete
NC 32 Schedule 4 Condition 51	ID34	It is recommended the Biodiversity Offset Management Plan be submitted to the Director General for review and approval.	Biodiversity Offset Management Plan and Biodiversity Conservation Area Plan of Management submitted to DPE as LEMP Appendix I – Biodiversity Management Plan, Appendix J – Biodiversity Conservation Area Plan of Management, under approval to request commencement of operations on 6 July 2019 and Council was granted approval on the 04 October 2019.	Complete.	Complete

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC 33 Schedule 4 Condition 51A EPBC 2011/5973 Condition 1	ID35	It is recommended a restrictive covenant be placed on Lot 463 DP 1138964 and include all of the requirements of Condition 51A.	Council will confirm whether a restrictive covenant has been placed on Lot 463 DP 1138964 including requirements of Condition 51A. Council will place the covenant on Lot 463 if not already complete.	LMCC wrote to DPE on 27 March 2023 providing an advisory letter regarding the restrictive covenant being placed on Lot 463 DP 1138964. DPE provided a response to LMCC on 16 May 2023 which stated that DPE does not consider that LMCC has completed all the required steps to place a restrictive covenant as required by Schedule 4 Condition 51A. DPE stated that LMCC is required to complete the necessary steps to finalise the restriction of use under Section 88D of the *Conveyancing Act 1919* to satisfy the requirements of the condition. Following completion of the reporting period, LMCC wrote to DPE on 13 July 2023 to request a month extension to the provision of information to DPE.	31 August 2023
Improvement Opportunity Schedule 4 Condition 54	ID36	It is recommended the translocation plan be revised and include contingency measures and reporting requirements of translocation *Tetratheca Juncea*	No further *Tetratheca Juncea* is expected to be disturbed within the footprint of the operations under the current approval. Expansion civil works have been completed and a new project approval, including revision of the translocation plan would be undertaken to manage risks associated with further site expansion where relevant.	Noted request in RAR for DPE to confirm if Council is required to undertake a review of the translocation plan. There has been no activity beyond previously disturbed areas of the landfill site where a risk exists for disturbing *Tetratheca Juncea*. The proposed future landfilling footprint is also within existing disturbed and landfilled areas of the site.	Ongoing internal

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC -34 Schedule 4 Condition 55	ID37	It is recommended monitoring of the biodiversity offset area be undertaken during the next reporting period and reported in the Annual Review.	Monitoring of the biodiversity offset area will be undertaken during the next reporting period.	Completed.	Complete
NC 35 Schedule 4 Condition 56	ID38	It is recommended the Vegetation Clearing Protocol within the Biodiversity Management Plan be revised and clearly detail location and type of vegetation to be retained and removed.	No further remnant vegetation is expected to be disturbed within the footprint of the current operations under the current approval. It is unclear how the Vegetation Clearing Protocol would be revised (designed to mitigate impacts during construction) given expansion works have been completed and a new approval would likely be required for vegetation clearing as part of further site expansion.	The Biodiversity Conservation Area Management Plan has been updated and submitted to DPE.	See Table 6-1
NC 36 and NC 37 Schedule 4 Condition 57 and 58	ID39	It is recommended LMCC continue to engage with DPIE in order to confirm the required timing of preparing the Landfill Closure and Rehabilitation Management Plan and provide this plan to DPIE for approval within the agreed timeframe.	Council currently undertaking work on the Landfill Closure and Rehabilitation Management Plan in accordance with advice from DPE.	Completed	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Improvement Opportunity Schedule 5 Condition 2	ID40	It is recommended the LEMP be updated to include a procedure outlining how complaints are received.	The LEMP will be updated to include further detail on how complaints are received.	The LEMP has been updated and submitted to DPE.	See Table 6-1
NC 39 Schedule 5 Condition 3	ID41	It is recommended LMCC include relevant findings from the Operational Noise Validation (including record of baseline) within the Operational Noise Management Plan.	Findings from the ONV will be included in the update to the Operational Noise Management Plan.	The ONMP has been updated and submitted to DPE.	See Table 6-1
	ID42	It is recommended the Air Quality and Odour Management Plan and the Biodiversity Management Plan be revised to include relevant statutory requirements of and include relevant limits or performance criteria as outlined in this approval.	The Air Quality and Odour Management Plan, as well as the Biodiversity Management Plan will be revised to ensure relevant statutory requirements and limits and performance criteria are included.	These plans have been updated and submitted to DPE.	See Table 6-1
	ID43	The Air Quality and Odour Management Plan, Biodiversity Management Plan and the Operational Noise Management Plan include a program to measure the impacts and effectiveness of environmental performance	Air Quality and Odour Management Plan, as well as the Biodiversity Management Plan will be revised to include a program to measure the impacts and effectiveness of environmental performance.	These plans have been updated and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
	ID44	It is recommended a contingency program to manage unpredicted impacts e.g. weed infestations be included within the Biodiversity Management Plan.	A review of the biodiversity management plan will include consideration of a contingency program in any revision.	The Biodiversity Management Plan has been updated and submitted to DPE.	See Table 6-1
	ID45	It is recommended Greenhouse Gas Management Plan, Biodiversity Management Plan and Biodiversity Conservation Area Management Plan be revised to include a protocol for reporting non-compliances and complaints.	The Greenhouse Gas Management Plan, Biodiversity Management Plan and Biodiversity Conservation Area Management Plan will be reviewed and will include consideration of inclusion of a protocol for reporting non-compliances and complaints.	These plans have been updated and submitted to DPE.	See Table 6-1
	ID46	It is recommended Air Quality and Odour Management Plan, the Biodiversity Management Plan and Soil, Water and Leachate Management Plan are updated to ensure appropriate review protocol is in place.	The Air Quality and Odour Management Plan, the Biodiversity Management Plan and Soil, Water and Leachate Management Plan will be reviewed and will include consideration of inclusion of a protocol for reporting non-compliances and complaints.	These plans have been updated and submitted to DPE.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
	ID47	It is recommended the Air Quality and Odour Management Plan and the Biodiversity Management Plan be revised to include a program to investigate improvements in environmental performance.	The Air Quality and Odour Management Plan and the Biodiversity Management Plan will be reviewed and will include a program to investigate improvements in environmental performance in any revision.	These plans have been updated and submitted to DPE.	See Table 6-1
	ID48	It is recommended a compliance system be created to ensure management plans are reviewed in accordance with their respective protocols.	Council will establish a compliance management system to ensure management plans are reviewed in accordance with their respective protocols, and will include protocols for ensuring regular review of management plans and programs.	Ongoing internal.	June 2024
	ID49	It is recommended all relevant management plans/programs required under this approval be subject to regular review and revision as required in order to reflect current operations and statutory requirements to ensure they remain current and effectively manage environmental risks.		Ongoing internal.	See Table 6-1
NC 40 Schedule 5 Condition 5	ID50	It is recommended all plans within the Soil, Water and Leachate Management Plan be revised as required to ensure consistent with the updates made to main document.	All plans within the Soil Water and Leachate Management Plan will be revised.	Ongoing internal.	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
NC 41 Schedule 5 Condition 6	ID51	LMCC should seek to engage with DPIE to provide them a briefing on the above incidents that have occurred and confirm if they require them to be reported retrospectively. If required incident report(s) should be provided to meet DPIE's requirements.	It is understood the department would be up to date with all AWMF reportable incidents, as referenced in the 2021 AWMF Annual Review.	These plans have been updated and submitted to DPE.	Complete
	ID52	It is recommended LMCC revise their reporting procedure and ensure relevant authorities including the DPIE are notified of all relevant incidents.	Previous practices allowed for reporting of incidents to NSW EPA (all incidents reported), current practice is to include DPE in relevant reportable incidents. Further consultation with DPE required as to what items are reportable incidents.	Completed.	See Table 6-1
NC 42 and NC 43 Schedule 5 Condition 7 and 10	ID53	It is recommended all missing data is uploaded to the website as required and that LMCC implement a procedure / process to ensure that all data as required be regularly uploaded to the LMCC website. The audit has identified the following documents that need to be uploaded to the LMCC website:	AWMF will work with Council IT support to ensure items referred to below, that have not already been updated are uploaded to the website, and that new items are uploaded to the website as required.		
		recent Project Approval (PA 10_0139 MOD 1 dated August 2014).		Completed.	Complete – see website
		EPBC Approval 2011/5973.		Completed.	Complete – see website
		EPL 5873.		Link to EPL to be added.	31 July 2023
		The Annual Review.		Completed.	Complete – see website

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
		Complaints Register		Register is being compiled and will be made publicly available.	31 July 2023
		All monitoring results.		Incomplete record from March due to Covid. EPBC monitoring records to be uploaded	31 July 2023
	ID54	The complaints line should also be made available and referenced clearly on the website so that members of the public understand how they can make complaints.	Council complaints line is available and clearly visible on the website. **https://www.lakemac.com.au/Venues/Awaba-Waste-Management-Facility.**	Completed.	Complete – see website
Improvement Opportunity Schedule 5 Condition 11	ID55	It is recommended that LMCC update the Waste Education Plan in the LEMP to confirm the scope of it is to continue to run during the operational phase of the project.	Council will review the Waste Education program to ensure relevance to current operations and revise where required.	Completed	See Table 6-1
Condition L2	ID56	LMCC should seek to engage with the EPA and DPIE with regard to the ongoing exceedances of groundwater criteria and undertake further investigations to determine the cause and develop effective mitigation measures to address.	Council is in regular contact with NSW EPA regarding ongoing works and investigations in relation into exceedances of groundwater monitoring criteria.	The SWLMP has been updated and submitted to DPE during the reporting period. LMCC also propose to reline the leachate pond during the next cell stage construction. The EPA were advised of this in a meeting on 7 June 2023.	Ongoing external
Condition L4	ID57	It is recommended that LMCC undertake noise monitoring as required under the EPL to demonstrate compliance with noise criteria.	Operational Noise validation undertaken 2021, compliant with relevant criteria.	Operational Noise Validation Report Completed in December 2021, finding that noise emitted from the AWMF is in compliance with the PA and environmental assessment.	Completed

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Condition 06.14	ID58	It is recommended management procedures are revised to ensure all employees know all chemicals, oils should be located within a bunded area and that regular site inspections include relevant checks for appropriate management and storage of hydrocarbons.	It is understood the contractor operated LMS power station site was the area of concern identified in the Audit. Future site inspections will include the LMS power station and the contractor will be notified of chemicals, fuels and oils that are observed to not be contained appropriately. Oils and chemicals stored outside bunded areas are small quantities only, used for mowing equipment, pump/generator fuel etc. Council will review current storage practices to ensure they are managed in accordance with relevant Australian Standards and/or EPA's Storing and Handling Liquids: Environmental Protection – Participants Handbook.	Completed	See Table 6-1

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Condition M1.3	ID59	Gas monitoring should record the time of sample and name of person who collects the sample as required. Water monitoring should record the time of sample as required.	Gas monitoring results will record time of each sample and the name of sampler. Water monitoring Chain of Custody sheets show time of sample collection. Sample times will also be recorded on the results spreadsheet.	Gas monitoring and water sampling sheets show the name of sample collector and time of collection. This action is therefore considered to be complete.	Complete
Condition M6	ID60	LMCC should confirm that a dedicated complaints line is available and that it is communicated to members of the community so they are informed how they can make complaints.	Council complaints line is available and clearly visible on the AWMF website. **https://www.lakemac.com.au/Venues/Awaba-Waste-Management-Facility.**	Completed.	Complete – see website
EPBC 2011/5973					
Condition 6	ID61	It is recommended a report addressing compliance of the conditions outlined in the EPBC approval be prepared, submitted to DAWE and published on the LMCC website.	It is understood this requirement was completed for agencies relevant at that time including consultation letters Appendix B and C of Biodiversity Management Plan 2015 AWMF, and consultation as noted in Appendix C and D of the Biodiversity Conservation Area Plan of Management 2015.	Complete.	Complete

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Environmental Performance					
Document Management	ID62	LMCC should review the document management system in place for the AWMF and ensure all relevant staff are trained in its use.	Council will review the document management system to ensure items required to be reviewed are captured in the system. Also refer to below.	TRIM is the document management system utilised for LMCC. Applicable staff are trained in it's use upon commencement at LMCC including direction on the types of documents and correspondence that requires storage. The waste services team has created a central location for AWMF environmental compliance documents and requirements to be stored (LINK23/0012).	Completed
Compliance Management	ID63	It is recommended that a compliance management system be developed for the AWMF to capture all compliance requirements for the site. The CMS should establish actions to be undertaken to maintain compliance, define responsibilities and required timeframes to complete and include a mechanism to keep records demonstrating that they have been completed as required.	Council will establish a compliance management system to capture the items referred to, including maintaining currency of management plans.	Ongoing internal.	Ongoing
Site Induction	ID64	It is recommended that the induction process be revised to include an overview of all relevant environmental management requirements as outlined in this approval PA 10_0139.	The site induction process can be amended to include further awareness of relevant environmental management requirements items as noted in the approval.	Ongoing internal.	Ongoing

Condition/ issue	ID	Recommendation	Council response to Auditor's recommendations	Progress against recommendation as of 2022/2023 reporting period	Due Date or complete
Environmental Inspections	ID65	LMCC develop an environmental management inspections procedure which captures all the site's environmental management and monitoring commitments (from approvals and management plans) and ensures that these are captured in routine inspections and findings and actions formally documented.	This item will be included in review current practice and as part of the compliance management system.	Completed	Completed
Monitoring of Clean Water Diversion	ID66	It is recommended a surface monitoring point be established and subject to routine monitoring at the clean water diversion drain outlet to monitor and verify no contamination occurs as a result of the drain running under the waste cells.	Council is currently working with consultant GHD, in consultation with NSW EPA on the water monitoring program for the site, as part of the larger project of improving site ground and surface water quality.	LMCC will engage with the EPA prior to the next stage of construction regarding an EPL variation and the requirement for surface water monitoring.	Late 2024

10. Incidents and non-compliances

As identified in Table 1-2 of the Statement of Compliance, low risk and administrative non-compliances occurred during the reporting period. These non-compliances generally related to actions identified in the IEA undertaken in the previous reporting period that have not been closed at the completion of this reporting period.

No penalty infringement notices have been issued during the reporting period.

10.1 Soil, water and leachate

In the 2022 EPA Annual Return, LMCC self-reported a non-compliance against condition L2 of EPL 5873. In addition, LMCC reported exceedances of ANZECC 95% Fresh Water Trigger Values to the EPA over the reporting period, also forming a non-compliance against Schedule 4 Condition 16 and Condition 19 of PA 10_0139 which relate to EPL compliance and operating the project under the SWLMP.

Monitoring requirements under EPL 5873 are outlined in Condition M2.1, which requires some parameters to be monitored quarterly. our rounds of monitoring were undertaken for the 2022 EPA annual return period (13 October 2021 to 12 October 2022). One quarter for the 2023 EPA annual return period has been missed. LMCC has scheduled in an additional round of monitoring so that four rounds of monitoring occur in the 2023 EPA annual return period.

10.2 Greenhouse Gas

The GGMP includes a monitoring schedule for surface gas monitoring as per Schedule 4 Condition 26 of PA 10_0139. The GGMP details that a monitoring for surface gas is required to occur monthly. LMCC generally completed these obligations over the reporting period, however monitoring of surface gas was not undertaken during March or April 2023.

10.3 Heritage

The AWMF contains several heritage sites as described in Section 6.8. The IEA undertaken in the previous reporting period identified that cultural heritage items should be fenced and sign posted as per the approved CHMP. LMCC have established fencing around site 45-7-0331 (culturally modified tree) however is not signposted as per Schedule 4 Condition 45 of PA 10_0139.

10.4 Emergency management

LMCC commissioned an update of the PIRMP during the reporting period as a response to the findings of the IEA undertaken in the previous reporting period. The PIRMP was updated by a suitably qualified and experienced professional. The approval of the author from DPE was not provided, which is a requirement of Schedule 4 Condition 43 of PA 10_0139.

10.5 Administrative conditions

The IEA in the previous reporting period identified that development consents required to be surrendered under Schedule 3 Condition 6 of PA 10_0139 had not been surrendered. LMCC are still in the process of surrendering these development consents. Shortly after the completion of the 2022/2023 reporting period on 10 July 2023, LMCC have made and application to surrender these development consents.

The IEA also identified that a permanent Trade Waste Agreement for the life of the project had not been obtained to fulfill the requirements of Schedule 4 Condition 6 of PA 10_0139. LMCC currently have a temporary Trade Waste Agreement with Hunter Water. LMCC are working with Hunter Water to execute permanent Trade Waste Agreement, however this has not been completed in the reporting period.

LMCC are required to register a restrictive covenant over Lot 463 DP 1138964 under Schedule 4 Condition 51A of PA 10_0139. The IEA undertaken in the previous reporting period identified that a restrictive covenant had not been placed over this lot. LMCC wrote to DPE on 27 March 2023 providing an advisory letter regarding the restrictive covenant being placed on Lot 463 DP 1138964. DPE provided a response to LMCC on 16 May 2023 which stated that DPE does not consider that LMCC had not completed all the required steps to place a restrictive covenant as required by Schedule 4 Condition 51A. LMCC are in the process of gathering the required information to send to DPE to address these requirements.

Schedule 5 Condition 6 requires LMCC to notify DPE of any incidents as soon as practicable of becoming aware of the incident. In feedback from DPE regarding the 2021/2022 Annual Review, DPE noted that LMCC are required to report incidents (including exceedances of EPL 5873) under this condition. LMCC did not notify DPE of the exceedances of EPL 5873 or the two fires occurring at the site over the reporting period.

Schedule 5 Condition 10 outlines the documents that LMCC is required to make publicly available. LMCC have generally uploaded these documents to the public website, however, the monthly gas accumulation and surface monitoring results for March, April, May and June were not on the website at the completion of the reporting period. A complaints register was also not uploaded onto the website at the completion of the reporting period.

10.6 Fire incidents

Two fires were recorded onsite during the reporting period. Details of each incident are as follows:

– On 13 July 2022 a small fire occurred in the AWMF. The cause of the fire was due to the fusion welding of a poly pipe by a contractor. The fire occurred at 12:45 pm and was extinguished by 12:50 pm by a staff member using a handheld fire extinguisher. This fire was not a waste fire. The fire was reported to EPA 1:39 pm on the same day.
– On 16 January 2023 a fire was detected on the active tip face. The fire was noticed by staff at 2:20 pm. The ignition source of this fire is unknown. The fire was controlled by 2:25 pm by hosing with on-site water cart for around five minutes. Waste was then continued to be track-rolled, hosed, and compacted, to ensure there was no smouldering waste. Reported to the EPA 10:54 am the next day.

10.7 Actions required by DPE

Of the 43 non-compliances identified by the IEA undertaken during the last reporting period, DPE determined to further investigate the following non-compliances identified below in Table 10-1. These non-compliances were issued with warning letters. Progress against each non-compliance is provided below in Table 10-1.

Table 10-1 Summary of warning letters received by the AWMF

Non-compliance	ID	Action taken by DPE	Progress against warning
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 3 condition 11	ID48, 63, 65	Warning letter issued 25 March 2022	Following the completion of the audit, LMCC have committed to improving record keeping practices to reduce the likelihood of future non-compliances with this condition.
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 4 condition 9	ID5, 6, 7	Warning letter issued 25 March 2022	Complete.

Non-compliance	ID	Action taken by DPE	Progress against warning
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 5 condition 6	ID51, 52	Warning letter issued 25 March 2022	Complete.
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 3 condition 12	ID48, 63, 65	Warning letter issued 25 March 2022	The demolition works occurred in 2018 and no incidents or known harm occurred as a result of the works having no evidence of being undertaken in accordance with the standard; and LMCC have committed to improving record keeping across the project to reduce the likelihood of similar non-compliances occurring.
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 4 condition 16	ID10	Correspondence received on 20/06/2022	No action to be taken.
Section 4.2 of the *Environmental Planning and Assessment Act 1979* Schedule 4 condition 18	ID11, 12	Notice to furnish information and records received on 16/06/22	Complete, awaiting DPE response.

11. Activities proposed for next reporting period

Activities proposed for the next reporting period are described in Table 11-1.

Table 11-1 Actions proposed for 2023/2024 reporting period

Activities proposed for next reporting period	Target completion date
Soft plastics trial: – A new plastics recycling initiative from 15 July 2022 was established to encourage Lake Mac residents to drop off their soft plastics and old CDs/DVDs, including the jewel cases, in special recycling bins at the Awaba Community Recycling Centre (CRC) in in partnership with Plasmar, a Sydney-based plastic products manufacturer who will receive the recovered soft and hard plastics. – The initiative will be initially trialled for 12 months. This was developed and prepared during this reporting period, with implementation in the next review period.	Expected to commence next reporting period
Construction of maintenance shelter	Second quarter of the 2023/2024 financial year
As part of LMCC's continuous improvements to safety and emergency response, the following training will be undertaken: – Armed holdup training.	First quarter of 2023/2024 financial year
As part of LMCC's continuous improvements to safety and emergency response, the following training will be undertaken: – Breathing apparatus training.	First quarter of 2023/2024 financial year

12. References

Cardno (2012), *Additions to Awaba Waste Management Facility Environmental Assessment*, prepared for Lake Macquarie City Council.

GHD (2020), *Awaba Waste Management Facility Investigation of leachate migration Stage 1: Desktop Review.*

GHD (2022). Awaba Waste Management Facility Stage 2 Investigation, Monitoring Well Installation Report.

Landcom (2004), Managing Urban Stormwater: Soils and Construction (the Blue Book) Volume 1.

PAE Holmes (2012), *Air Quality and Odour Assessment – Awaba Landfill Extension*. Report prepared for Cardno on behalf of Lake Macquarie City Council.

Umwelt (2022), *Independent Environmental Audit of Awaba Waste Management Facility, FINA.* Report prepared for Lake Macquarie City Council.

Appendices

Appendix A

Summary of historic water quality monitoring data

Table A.1 Statistical summary of groundwater quality monitoring data 2012 to 2020 (source: GHD, 2020)

Analytes	Units	MP1			MP2			MP3			MP4			MP5		
		Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median
Physio-chemical parameters			n(31)			n(33)			n(33)			n(26)			n(31)	
pH Value		5.91	6.48	6.23	4.96	5.82	5.29	6.52	7.17	6.71	5.78	6.5	6.19	5.9	6.36	6.03
Electrical Conductivity	µS/cm	1040	1450	1210	1660	9530	6030	566	5070	3480	1880	2320	2170	4510	8600	6820
Nutrients			n(31)			n(33)			n(33)			n(26)			n(31)	
Ammonia as N	mg/L	0.03	0.18	0.06	0.05	2.23	0.11	0.88	116	44.2	0.5	8.42	1.73	0.13	0.87	0.49
Nitrite as N	mg/L	0.01	1.07	0.04	0.01	0.18	0.03	0.02	3.06	0.04	0.01	0.06	0.02	0.01	0.21	0.02
Nitrate as N	mg/L	0.02	0.37	0.08	0.02	0.46	0.045	0.01	49.7	0.02	0.01	0.46	0.02	0.01	0.7	0.035
Nitrite + Nitrate as N	mg/L	0.03	1.35	0.08	0.02	0.46	0.055	0.01	52.8	0.03	0.01	0.47	0.02	0.01	0.7	0.04
Mayor Anions			n(31)			n(33)			n(33)			n(26)			n(31)	
Sodium	mg/L	111	199	148	314	1770	977	104	646	415	252	486	299	798	1510	1150
Potassium	mg/L	8	12	10	6	32	16	6	128	52	7	11	9	15	28	19
Calcium	mg/L	12	20	15	3	30	16	1	276	38	5	58	12	18	38	30
Magnesium	mg/L	32	48	39	22	212	120	3	119	66	37	54	46	89	174	143
Bicarbonate Alkalinity	mg/L	54	152	91	10	47	23	97	1540	567	23	177	110	125	208	145
Carbonate Alkalinity	mg/L	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chloride	mg/L	256	444	307	505	3220	1520	60	1170	734	469	690	604	1300	2530	1940
Sulphate	mg/L	11	35	28	134	321	239	1	127	13	3	225	16	163	279	213
Hydroxide Alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Alkalinity	mg/L	54	152	91	10	47	23	97	1540	567	23	177	110	125	208	145
Dissolved metals			n(31)			n(33)			n(33)			n(26)			n(31)	
Manganese	mg/L	1.1	2.8	1.8	0.1	0.9	0.5	0.0	1.5	0.5	0.1	0.6	0.2	0.3	0.7	0.5
Iron	mg/L	0.004	12.4	2.0	0.0	54.2	0.05	0.0	123.0	3.9	0.1	94.4	40.6	0.01	10.8	2.0
Total metals			n(7)			n(7)			n(7)			n(7)			n(6)	
Manganese	mg/L	2.02	2.29	2.16	0.42	0.88	0.65	0.89	1.07	0.98	0.26	0.30	0.28	0.49	0.53	0.51
Iron	mg/L	1.3	8.3	3.8	52.3	93.5	71.7	151.0	163.0	156.0	98.4	175.0	130.0	6.7	14.2	8.7
Aluminium	mg/L	0.12	0.23	0.13	0.002	66.1	33.1	0.00	31.1	20.8	13.5	175.0	17.7	6.0	20.2	10.2
Arsenic	mg/L	ND	ND	ND	0.023	0.056	0.032	0.01	0.015	0.014	0.006	0.031	0.010	0.002	0.008	0.005
Barium	mg/L	0.136	0.181	0.164	0.031	0.119	0.095	0.328	1.23	1.055	0.273	1.990	0.480	0.023	0.076	0.051
Cadmium	mg/L	0.0001	0.0001	0.0001	0.030	0.030	0.030	0.000	0.017	0.009	0.0001	0.0001	0.0001	0.020	0.020	0.020
Chromium	mg/L	0.001	0.001	0.001	0.018	0.049	0.033	0.002	0.030	0.021	0.012	0.135	0.014	0.005	0.017	0.009
Cobalt	mg/L	0.008	0.034	0.028	0.011	0.063	0.043	0.002	0.008	0.006	0.001	0.007	0.002	0.001	0.003	0.002
Copper	mg/L	0.005	0.009	0.007	0.013	0.023	0.016	0.012	0.027	0.021	0.008	0.056	0.009	0.005	0.006	0.006
Lead	mg/L	0.008	0.021	0.010	0.022	0.052	0.033	0.034	0.072	0.054	0.028	0.341	0.049	0.009	0.018	0.012
Mercury	mg/L	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
Zinc	mg/L	0.007	0.123	0.088	0.034	0.341	0.234	0.041	0.148	0.066	0.031	0.349	0.065	0.023	0.075	0.044

n(number): number of data per site and group of chemicals

Table A.2 Statistical summary of surface water and leachate quality monitoring data 2012 to 2020 (source: GHD, 2020)

Analytes	Units	MP6			MP7			MP8			MP9			MP10			Assessment Guidelines
		Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	Min	Max	Median	
Physio-chemical parameters			n(19)			n(11)			n(2)			n(31)			n(32[a],1[b])		ANZECC DGV
pH Value		8.03	8.99	8.25	7.09	8.6	8.1	7.12	7.24	7.18	5.78	7.23	5.94	7.51	8.46	8.11	6.5-8
Electrical Conductivity	µS/cm	1400	11800	3910	348	1620	933	396	1860	1128	286	1630	333	14900	14900	14900	
Nutrients			n(19)			n(11)			n(2)			n(31)			n(31)		
Ammonia as N	mg/L	0.06	74.3	1	0.03	27.5	1.55	0.4	0.69	0.545	0.06	3.2	1.63	1.34	1470	745	0.9
Nitrite as N	mg/L	0.05	6.28	0.92	0.01	2.37	0.12	0.02	0.13	0.075	0.2	0.2	0.2	0.05	628	54.4	0.7
Nitrate as N	mg/L	2.92	94.6	31	0.05	13.6	0.94	0.16	1.36	0.76	4.94	4.94	4.94	0.02	193	4.3	
Nitrite + Nitrate as N	mg/L	3.02	98.4	32	0.06	16	1.08	0.18	1.49	0.835	5.14	5.14	5.14	0.02	780	66.35	
Mayor Anions			n(19)			n(11)			n(2)			n(31)			n(31)		
Sodium	mg/L	193	2030	515	44	219	82	60	283	171.5	42	212	45	399	2540	1205	
Potassium	mg/L	84	877	223	9	104	20	19	66	42.5	4	52	4	215	1150	568.5	
Calcium	mg/L	31	140	59	18	60	46	7	26	16.5	3	24	5	55	158	105	
Magnesium	mg/L	27	148	56	10	31	24	6	31	18.5	7	28	8	47	142	98.5	
Bicarbonate Alkalinity	mg/L	239	1530	477	38	392	250	34	248	141	13	186	15	1080	6760	4040	
Carbonate Alkalinity	mg/L	1	357	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	92	550	100	
Chloride	mg/L	268	2870	736	42	309	131	76	422	249	65	317	70	190	2570	1820	
Sulphate	mg/L	2	40	17	27	87	46	15	15	15	13	30	15	1	82	10	
Hydroxide Alkalinity	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Total Alkalinity	mg/L	239	1880	486	38	392	250	34	248	141	13	186	15	1080	6760	4040	
Dissolved metals			n(19)			n(11)			n(2)			n(31)			n(31)		
Manganese	mg/L	0.01	8.09	0.08	0.02	0.40	0.11	0.01	0.25	0.13	0.03	0.28	0.07	0.028	0.727	0.472	1.9
Iron	mg/L	0.25	52.30	0.57	0.07	3.14	0.25	0.60	5.92	3.26	0.19	0.67	0.42	0.12	6760[c]	6.56	
Total metals			n(3)			n(2)			n(1)			n(1)			n(0)		
Manganese	mg/L	0.095	0.095	0.095	0.55	0.55	0.55	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Iron	mg/L	ND	ND	ND	0.57	0.89	0.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aluminium	mg/L	0.130	1.030	0.240	0.5	0.65	0.575	0.44	0.44	0.44	<00.1	<00.1	<00.1	ND	ND	ND	0.055
Arsenic	mg/L	0.007	0.027	0.009	0.005	0.008	0.007	0.004	0.004	0.004	<0.001	<0.001	<0.001	ND	ND	ND	0.013
Barium	mg/L	0.146	0.215	0.204	0.080	0.112	0.096	0.174	0.174	0.174	0.149	0.149	0.149	ND	ND	ND	
Cadmium	mg/L	0.000	0.001	0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	ND	ND	ND	0.0002
Chromium	mg/L	0.012	0.066	0.038	0.001	0.002	0.002	0.013	0.013	0.013	<0.001	<0.001	<0.001	ND	ND	ND	0.001
Cobalt	mg/L	0.012	0.042	0.023	0.001	0.002	0.002	0.009	0.009	0.009	0.023	0.023	0.023	ND	ND	ND	
Copper	mg/L	0.018	0.045	0.026	0.002	0.004	0.003	0.003	0.003	0.003	<0.001	<0.001	<0.001	ND	ND	ND	0.0014
Lead	mg/L	0.001	0.005	0.003	0.002	0.003	0.003	0.003	0.003	0.003	<0.001	<0.001	<0.001	ND	ND	ND	0.0034
Mercury	mg/L	<0.0001	<0.0001	<0.0001	0.550	0.550	0.550	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	ND	ND	ND	0.0006
Zinc	mg/L	0.052	0.118	0.069	0.012	0.084	0.048	0.011	0.011	0.011	0.019	0.019	0.019	ND	ND	ND	0.008

n(number): number of data per site and group of chemicals

Appendix B

Water quality monitoring data

Analyte	Units	LOR	ANZECC 95% fresh water guideline	Ground water																	
				MP1			MP2			MP3			MP4			MP5					
				30/08/2022	12/10/2022	22/03/2023	30/08/2022	12/10/2022	22/03/2023	30/08/2022	12/10/2022	22/03/2023	30/08/2022	12/10/2022	22/03/2023	12/10/2020	20/01/2021	30/06/2021	30/08/2022	12/10/2022	22/03/2023
Physiochemical parameters																					
pH	pH Unit	0.01	6.5 - 8.0	6.12	6.8	6.16	5.11	5.73	5.08	6.81	7.33	6.84	6.66	7.07	6.60	6.05	6.04	6.07	6.27	6.76	6.1
EC	µS/cm	1		1160	1110	1180	618	1240	857	1210	1100	999	1190	619	611	6620	5680	5990	2880	4760	4900
TSS	mg/L	1																			
TDS	mg/L	1		618	650		778	948		606	623		778	742		4180			1580	2800	
Major ions																					
Hydroxide Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1		114	92	97	9	11	4	343	329	326	358	249	207	166	152	146	87	126	133
Total Alkalinity as CaCO3	mg/L	1		114	92	97	9	11	4	343	329	326	358	249	207	166	152	146	87	126	133
Sulphate as SO_4^{2-}	mg/L	1		28	29	30	74	104	84	2	7	11	3	<10	<10	239	222	192	83	210	185
Chloride	mg/L	1		304	299	343	151	352	197	193	174	116	189	58	77	2130	1750	1600	855	1280	1280
Calcium	mg/L	1		16	15	15	<1	2	<1	43	42	44	70	36	38	28	24	26	13	20	20
Magnesium	mg/L	1		37	14	40	2	14	3	28	29	23	34	16	15	130	112	114	42	99	84
Sodium	mg/L	1		138	229	153	124	229	159	134	124	100	120	72	14	1150	1010	1050	491	831	828
Potassium	mg/L	1		10	12	10	2	5	3	31	35	28	18	14		18	15	18	15	19	17
Phosphate	mg/L	0.01														0.01					
Dissolved Manganese	mg/L	0.001	1.9	1.62	1.72	1.72	0.0076	0.0569	0.011	0.213	0.24	0.247	0.616	0.218	0.32	0.584	0.52	0.45	0.167	0.497	0.499
Dissolved Iron	mg/L	0.005		4.15	3.97	5.47	0.011	0.298	0.013	0.376	0.288	0.06	1.96	1.04	15.9	5.74	6.13	1.47	0.088	5.68	2.49
Fluoride	mg/L	0.1		0.3	0.3	0.3	0.1	0.4	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.7	0.6	0.6	0.3	0.6	0.6
Nutrients																					
Ammonia as N	mg/L	0.01	0.9	0.19	0.11	0.11	0.01	0.03	0.01	12.8	11.9	9.16	4.55	1.18	3.6	4.48	0.5	0.32	0.06	0.55	0.22
Nitrate as N	mg/L	0.01	0.7	0.01	0.12	0.03	0.05	0.04	0.09	0.02	<0.01	<0.1	<0.01	<0.01	<0.1	0.02	0.04	0.09	0.19	0.18	0.2
Total Organic Carbon	mg/L	1		2	2	5	6	4	6	25	20	22	48	44	80	5	1	5	3	8	8
BOD	mg/L	2		3	<2		<2	<2		3	<2		5	<2		3			5	<2	
Phenols (Total)	mg/L	0.05	0.32	<0.05	<0.05	<0.01	<0.05	<1	<0.01	<0.05	<1	<0.01	<0.05	<1	<0.01	0.05	0.05	0.05	<0.05	<1	<0.01
Metals																					
Aluminium	mg/L	0.01	0.055	0.24	0.17		25	10.6		5.91	5.43		16.3	95.2		0.01			0.62	2.4	
Arsenic	mg/L	0.001	0.013	<0.001	<0.001		0.014	0.008		0.012	0.01		0.034	0.039		0.001			0.003	0.002	
Barium	mg/L	0.001		0.183	0.175		0.05	0.033		0.381	<0.0001		0.343	0.625		0.024			0.015	0.03	
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	0.007		<0.0001	0.0005		0.0001			<0.0001	<0.0001	
Chromium	mg/L	0.001	0.001		<0.001			0.008			0.007			0.06		0.001				0.002	
Cobalt	mg/L	0.001		0.027	<0.001		0.005	0.008		0.002	0.002		0.004	0.06		0.002			<0.001	0.001	
Copper	mg/L	0.001	0.0014	<0.001	0.027		0.006	0.007		0.004	0.005		0.01	0.011		0.001			<0.001	0.002	
Lead	mg/L	0.001	0.0034	0.002	0.001		0.015	0.003		0.009	0.01		0.022	0.062		0.001			<0.001	0.003	
Mercury	mg/L	0.0001	0.0006	<0.0001	0.002		<0.0001	0.008		<0.0001	<0.00001		<0.0001	0.157		0.0001			<0.0001	<0.0001	
Zinc	mg/L	0.005	0.008	0.038	0.064		0.11	0.061		0.043	0.022		0.102	0.312		0.021			0.025	0.098	
Dissolved metals																					
Aluminium	mg/L	0.01	0.055	<0.01	<0.01		0.02	0.18		0.05	<0.01		0.01	0.06		0.01			<0.01	<0.01	
Arsenic	mg/L	0.001	0.013	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		0.002	0.005		0.001			<0.001	<0.001	
Barium	mg/L	0.001		0.143	0.146		0.005	0.013		0.169	0.168		0.11	0.079		0.024			0.012	0.018	
Cadmium	mg/L	0.0001	0.0002	<0.0001			<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		0.0001			<0.0001	<0.0001	
Chromium	mg/L	0.001	0.001	<0.001	<0.0001		<0.001	<0.001		0.001	0.001		0.001	0.002		0.001			<0.001	<0.001	
Cobalt	mg/L	0.001		0.022	<0.001		<0.001	0.004		0.001	0.001		0.001	0.001		0.002			<0.001	0.001	
Copper	mg/L	0.001	0.0014	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	0.001		0.001			<0.001	<0.001	
Lead	mg/L	0.001	0.0034	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		0.001			<0.001	<0.001	
Mercury	mg/L	0.0001	0.0006	<0.0001	<0.00001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		0.0001			<0.0001	<0.0001	
Zinc	mg/L	0.005	0.008	0.014	0.024		<0.005	0.016		<0.005	0.005		<0.005	<0.005		0.021			0.008	0.045	
Organochlorine Pesticides (OC)																					
alpha-BHC	µg/L	0.5														0.01	0.5	0.5			
Hexachlorobenzene (HCB)	µg/L	0.5														0.01	0.5	0.5			
beta-BHC	µg/L	0.5														0.01	0.5	0.5			
gamma-BHC	µg/L	0.5														0.01	0.5	0.5			
delta-BHC	µg/L	0.5														0.01	0.5	0.5			
Heptachlor	µg/L	0.5	0.09													0.005	0.5	0.5			
Aldrin	µg/L	0.5														0.01	0.5	0.5			
Heptachlor epoxide	µg/L	0.5														0.01	0.5	0.5			
trans-Chlordane	µg/L	0.5	0.08													0.01	0.5	0.5			
alpha-Endosulfan	µg/L	0.5														0.01	0.5	0.5			
cis-Chlordane	µg/L	0.5	0.08													0.01	0.5	0.5			
Dieldrin	µg/L	0.5														0.01	0.5	0.5			
4.4`-DDE	µg/L	0.5														0.01	0.5	0.5			
Endrin	µg/L	0.5	0.02													0.01	0.5	0.5			
beta-Endosulfan	µg/L	0.5														0.01	0.5	0.5			
4.4`-DDD	µg/L	0.5														0.01	0.5	0.5			
Endrin aldehyde	µg/L	0.5														0.01	0.5	0.5			
Endosulfan sulfate	µg/L	0.5	0.2													0.01	0.5	0.5			
4.4`-DDT	µg/L	2	0.01													0.01	2	2			
Endrin ketone	µg/L	0.5														0.01	0.5	0.5			
Methoxychlor	µg/L	2														0.01	2	2			
Total Chlordane (sum)	µg/L	0.5														0.01	0.5	0.5			
Sum of DDD + DDE + DDT	µg/L	0.5	0.03													0.01	0.5	0.5			
Sum of Aldrin + Dieldrin	µg/L	0.5														0.01	0.5	0.5			
BTEXN																					
Benzene	µg/L	1	950													1					
Toluene	µg/L	5														2					
Ethylbenzene	µg/L	2														2					
meta- & para -Xylene	µg/L	2														2					
ortho-Xlyene	µg/L	2														2					
Total Xylenes	µg/L	1														2					
Sum of BTEX	µg/L	1														1					
Naphthalene	µg/L	5	16													5					
Total Polychlorinated biphenyls	µg/L	1														1					
Monocyclic Aromatic Hydrocarbons																					
Styrene	µg/L	5														5					
Isopropylbenzene	µg/L	5														5					
n-Propylbenzene	µg/L	5														5					
1.3.5-Trimethylbenzene	µg/L	5														5					
sec-Butylbenzene	µg/L	5														5					
1.2.4-Trimethylbenzene	µg/L	5														5					
tert-Butylbenzene	µg/L	5														5					
p-Isopropyltoluene	µg/L	5														5					
n-Butylbenzene	µg/L	5														5					
Sulfonated Compounds																					
Carbon disulfide	µg/L	5														5					
Fumigants																					
2.2-Dichloropropane	µg/L	5														5					
1.2-Dichloropropane	µg/L	5														5					
cis-1.3-Dichloropropylene	µg/L	5														5					
trans-1.3-Dichloropropylene	µg/L	5														5					
1.2 Dibromoethane(EDB)	µg/L	5														5					
Oxygenated compounds																					
Vinyl Acetate	µg/L	50														50					
2- Butanone	µg/L	50														50					
4-Methyl-2-pentanone (MIBK)	µg/L	50														50					
2-Hexanone(MBK)	µg/L	50														50					
Total Petroleum Hydrocarbons																					
C6 - C9 Fraction	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		20			<20	<20	
C10 - C14 Fraction	µg/L	50		<50	<50		<50	<50		<50	<50		<50	<50		50			<50	<50	
C15 - C28 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	760		100			<100	<100	
C29 - C36 Fraction	µg/L	50		<50	<50		<50	<50		<50	<50		<50	100		50			<50	<50	
C10-C36 TOTAL	µg/L	50		<50	<50		<50	<50		<50	<50		<50	860		50			<50	<50	
C6 - C10 Fraction	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		20			<20	<20	
C6 - C10 Fraction minus BTEX	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		20			<20	<20	
C10 - C16 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		100			<100	<100	
C16 - C34 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	820		100			<100	<100	
C34 - C40 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		100			<100	<100	
C10 - C40 Fraction (Sum)	µg/L	100		<100	<100		<100	<100		<100	<100		<100	820		100			<100	<100	
C10-C16 Fraction minus Naphthalene	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		100			<100	<100	

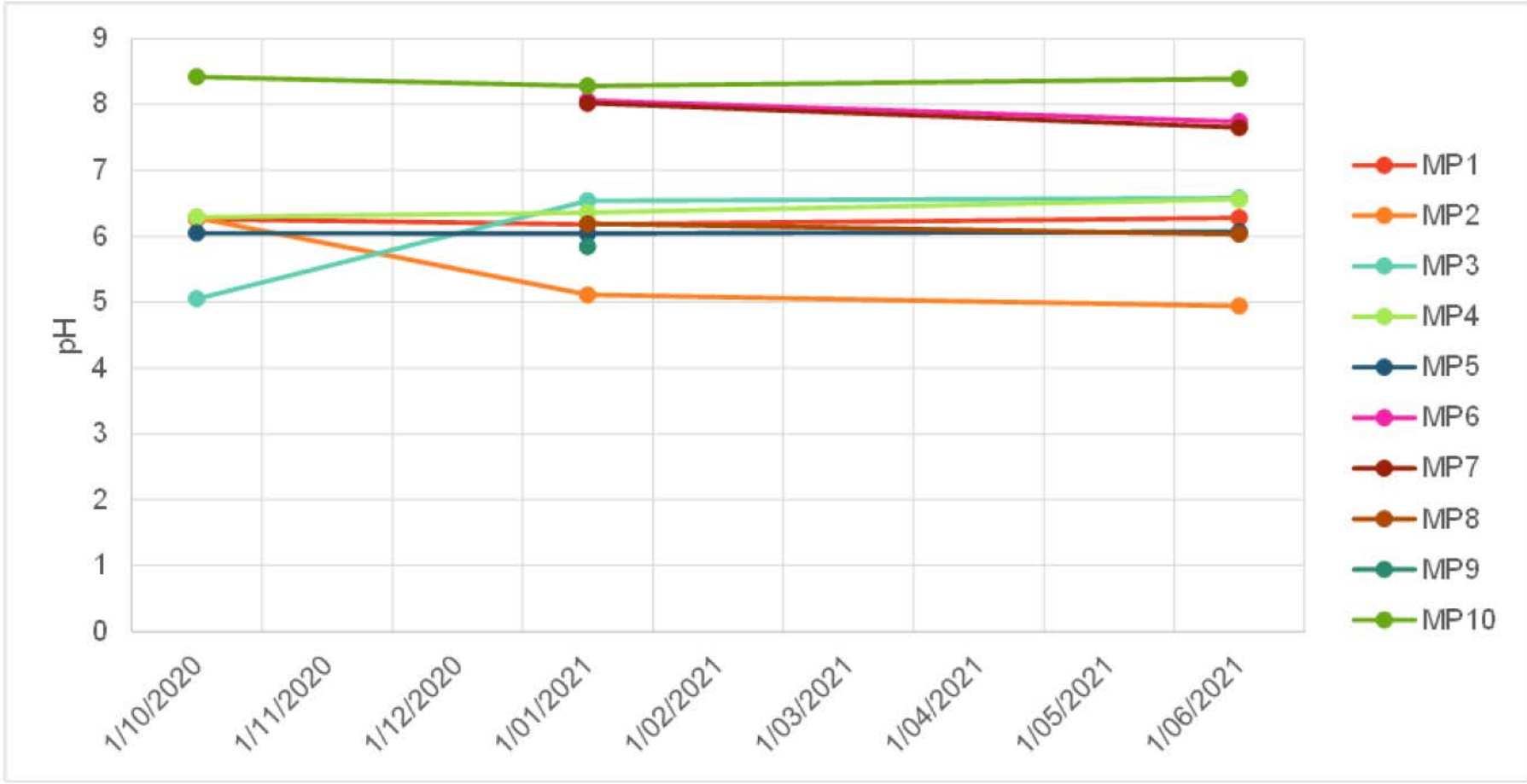
olynuclear Aromatic Hydrocarbons																					
Naphthalene	µg/L	1	16													1					
Acenaphthylene	µg/L	1														1					
Acenaphthene	µg/L	1														1					
Fluorene	µg/L	1														1					
Phenanthrene	µg/L	1														1					
Anthracene	µg/L	1														1					
Fluoranthene	µg/L	1														1					
Pyrene	µg/L	1														1					
Benz(a)anthracene	µg/L	1														1					
Chrysene	µg/L	1														1					
Benzo(b+j)fluoranthene	µg/L	1														1					
Benzo(k)fluoranthene	µg/L	1														1					
Benzo(a)pyrene	µg/L	0.5														0.5					
Indeno(1.2.3.cd)pyrene	µg/L	1														1					
Dibenz(a.h)anthracene	µg/L	1														1					
Benzo(g.h.i)perylene	µg/L	1														1					
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5														0.5					
Benzo(a)pyrene TEQ (zero)	µg/L	0.5														0.5					
)rganophosphorus Pesticides (OP)																					
Dichlorvos	µg/L	0.5														0.5					
Demeton-S-methyl	µg/L	0.5														0.5					
Monocrotophos	µg/L	2														2					
Dimethoate	µg/L	0.5														0.5					
Diazinon	µg/L	0.5														0.5					
Chlorpyrifos -methyl	µg/L	0.5														0.5					
Parathion-methyl	µg/L	2														2					
Malathion	µg/L	0.5														0.5					
Fenthion	µg/L	0.5														0.5					
Chlorpyrifos	µg/L	0.5	0.01													0.5					
Parathion	µg/L	2	0.004													2					
Pirimphos-ethyl	µg/L	0.5														0.5					
Chlorfenvinphos	µg/L	0.5														0.5					
Bromophos-ethyl	µg/L	0.5														0.5					
Fenamiphos	µg/L	0.5														0.5					
Prothiofos	µg/L	0.5														0.5					
Ethion	µg/L	0.5														0.5					
Carbophenothion	µg/L	0.5														0.5					
Azinphos Methyl	µg/L	0.5	0.02													0.5					
Hexavalent Chromium	mg/L	0.01	0.001													0.01					
Halogenated Aromatic Compounds																					
Chlorobenzene	µg/L	5														5					
Bromobenzene	µg/L	5														5					
2-Chlorotoluene	µg/L	5														5					
4-Chlorotoluene	µg/L	5														5					
1.3-Dichlorobenzene	µg/L	5														5					
1.4-Dichlorobenzene	µg/L	5														5					
1.2-Dichlorobenzene	µg/L	5														5					
1.2.4--Trichlorobenzene	µg/L	5														5					
1.2.3--Trichlorobenzene	µg/L	5														5					
Trihalomethanes																					
Chloroform	µg/L	5														5					
Bromodichloromethane	µg/L	5														5					
Dibromochloromethane	µg/L	5														5					
Bromoform	µg/L	5														5					
Halogenated Aliphatic Compounds																					
Dichlorodifluoromethane	µg/L	50														50					
Chloromethane	µg/L	50														50					
Vinyl chloride	µg/L	50														50					
Bromomethane	µg/L	50														50					
Chloroethane	µg/L	50														50					
Trichlorofluoromethane	µg/L	50														50					
1.1-Dichloroethene	µg/L	5														5					
Iodomethane	µg/L	5														5					
trans-1.2-Dichloroethene	µg/L	5														5					
1.1-Dichloroethane	µg/L	5														5					
cis-1.2-Dichloroethene	µg/L	5														5					
1.1.1-Trichloroethane	µg/L	5														5					
1.1-Dichloropropylene	µg/L	5														5					
Carbon Tetrachloride	µg/L	5														5					
1.2-Dichloroethane	µg/L	5														5					
Trichloroethene	µg/L	5														5					
Dibromomethane	µg/L	5														5					
1.1.2-Trichloroethane	µg/L	5	6500													5					
1.3-Dichloropropane	µg/L	5														5					
Tetrachloroethene	µg/L	5														5					
1.1.1.2-Tetrachloroethane	µg/L	5														5					
trans-1.4-Dichloro-2-butene	µg/L	5														5					
cis-1.4-Dichloro-2-butene	µg/L	5														5					
1.1.2.2-Tetrachloroethane	µg/L	5														5					
1.2.3-Trichloropropane	µg/L	5														5					
Pentachloroethane	µg/L	5														5					
1.2-Dibromo-3-chloropropane	µg/L	5														5					
Hexachlorobutadiene	µg/L	5														5					

Analyte	Units	LOR	ANZECC 95% fresh water guideline	Surface water												Leachate		
				MP6			MP7			MP8			MP9			MP10		
				6/07/2022	12/10/2022	4/04/2023	6/07/2022	12/10/2022	4/04/2023	30/08/2022	12/10/2022	4/04/2023	30/08/2022	12/10/2022	4/04/2023	30/08/2023	12/10/2022	4/04/2023
Physiochemical parameters																		
pH	pH Unit	0.01	6.5 - 8.0	7.9	7.55	7.43	7.63	7.62	7.41	6.49	6.2	5.95	5.85	6.46	5.98	8.28	8.04	8.18
EC	µS/cm	1		363	406	338	363	490	515	322	182	183	458	210	363			
TSS	mg/L	1		286	139	17	196	106	38	24	10	362	70	8	<5	19	68	21
TDS	mg/L	1		358	454		260	2320		226	147		256	160				
Major ions																		
Hydroxide Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1		<1			<1		<1	<1		<1	<1
Carbonate Alkalinity as CaCO3	mg/L	1		<1	<1	<1	<1		<1			<1		<1	<1		<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	1		97	129	83	116	<1	120		<1	10		13	12		2280	2750
Total Alkalinity as CaCO3	mg/L	1		97	129	83	116	<1	120		<1	10		13	12		2280	2750
Sulphate as SO_4^{2-}	mg/L	1		26	19	25	13	162	37		12	<10		13	19		<10	<10
Chloride	mg/L	1		27	38	40	22	162	72	71	12	44	115	44	97	1370	948	800
Calcium	mg/L	1		20	22	15	24	8	29		7							
Magnesium	mg/L	1		9	11	9	8	40	13		40							
Sodium	mg/L	1		27	36	34	22	29	56	8	3	2	8	2	9	76	83	142
Potassium	mg/L	1		17	18	16	10	14	19	11	4	4	14	4	10	62	48	57
Phosphate	mg/L	0.01						46		37	23	27	51	26	52	953	654	647
Dissolved Manganese	mg/L	0.001	1.9	0.001	1.4	0.041	1.1	0.095	0.033	0.399	0.065	0.079	0.052	0.0267	0.035	0.541	1.47	1.57
Dissolved Iron	mg/L	0.005		0.152	0.154	0.076	0.117	0.112	0.075	4.36	0.581	0.298	0.12	0.353	0.09	8.26	8.66	4.76
Fluoride	mg/L	0.1		0.2	0.2	0.2	0.3	0.2	0.2	0.1	<0.1	<0.01		0.1	<0.1	0.4	0.2	0.3
Nutrients																		
Ammonia as N	mg/L	0.01	0.9	0.51	0.02	0.06	3.54	3.7	0.26	0.04	0.01	0.04		0.04	<0.01	1090	649	421
Nitrate as N	mg/L	0.01	0.7	2.12	0.75	0.48	0.94	1.71	2.04	<0.01	0.02	<0.01	0.01	<0.01	0.56	<0.10	<0.10	0.6
Total Organic Carbon	mg/L	1		17	15	13	18	16	19	19	10	13	7	9	6	357	234	427
BOD	mg/L	2		4			6											
Phenols (Total)	mg/L	0.05	0.32	<1	<1	<1	<1	<1	<1	<0.05	<1	<1	<0.05	<1	<1	<0.05	9.6	<1
Metals																		
Aluminium	mg/L	0.01	0.055	7.14	5.98		3.86	3.52		0.91	1.59		0.66	2.2		NA	NA	
Arsenic	mg/L	0.001	0.013	0.005	0.004		0.004	0.004		0.002	<0.001		<0.001	<0.002				
Barium	mg/L	0.001		0.09	0.091		0.074	0.096		0.067	0.036		0.11	0.048				
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001				
Chromium	mg/L	0.001	0.001	0.009	0.006		0.001	0.006			0.001			0.002				
Cobalt	mg/L	0.001		0.002	0.0021		0.002	0.002		0.005	<0.001		0.02	<0.001				
Copper	mg/L	0.001	0.0014	0.012	0.012		0.013	0.013		<0.001	0.002		<0.001	<0.001				
Lead	mg/L	0.001	0.0034	0.01	0.01		0.008	0.008		<0.001	0.001		<0.001	0.001				
Mercury	mg/L	0.0001	0.0006	<0.0001	<0.0001		<0.0001	<0.0002		<0.00001	<0.0001		<0.0001	<0.0001				
Zinc	mg/L	0.005	0.008	0.06	0.052		0.068	0.057		0.094	0.07		0.01	0.008				
Dissolved metals																		
Aluminium	mg/L	0.01	0.055	0.02	0.02		0.02	<0.01		0.13	0.12		0.04	0.13				
Arsenic	mg/L	0.001	0.013	0.002	0.002		0.002	0.002		0.001	<0.001		<0.001	<0.001				
Barium	mg/L	0.001		0.04	0.045		0.039	0.06		0.052	0.03		0.095	0.037				
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001		<0.0001	<0.0001				
Chromium	mg/L	0.001	0.001	0.001	0.001		0.004	0.002		<0.001	<0.001		<0.001	<0.001				
Cobalt	mg/L	0.001		<0.001	<0.001		<0.001	<0.001		0.004	<0.001		0.001	<0.001				
Copper	mg/L	0.001	0.0014	0.005	0.006		0.005	0.007		<0.001	<0.001		<0.001	<0.001				
Lead	mg/L	0.001	0.0034	<0.001	<0.001		<0.001	<0.001		<0.001	<0.001		<0.001	<0.001				
Mercury	mg/L	0.0001	0.0006	<0.0001	<0.0002		<0.0001	<0.0002		<0.0001	<0.0001		<0.0001	<0.0001				
Zinc	mg/L	0.005	0.008	0.006	0.008		0.015	0.008		0.052	0.056		0.006	<0.005				
Organochlorine Pesticides (OC)																		
alpha-BHC	µg/L	0.5																
Hexachlorobenzene (HCB)	µg/L	0.5																
beta-BHC	µg/L	0.5																
gamma-BHC	µg/L	0.5																
delta-BHC	µg/L	0.5																
Heptachlor	µg/L	0.5	0.09															
Aldrin	µg/L	0.5																
Heptachlor epoxide	µg/L	0.5																
trans-Chlordane	µg/L	0.5	0.08															
alpha-Endosulfan	µg/L	0.5																
cis-Chlordane	µg/L	0.5	0.08															
Dieldrin	µg/L	0.5																
4.4`-DDE	µg/L	0.5																
Endrin	µg/L	0.5	0.02															
beta-Endosulfan	µg/L	0.5																
4.4`-DDD	µg/L	0.5																
Endrin aldehyde	µg/L	0.5																
Endosulfan sulfate	µg/L	0.5	0.2															
4.4`-DDT	µg/L	2	0.01															
Endrin ketone	µg/L	0.5																
Methoxychlor	µg/L	2																
Total Chlordane (sum)	µg/L	0.5																
Sum of DDD + DDE + DDT	µg/L	0.5	0.03															
Sum of Aldrin + Dieldrin	µg/L	0.5																
BTEXN																		
Benzene	µg/L	1	950															
Toluene	µg/L	5																
Ethylbenzene	µg/L	2																
meta- & para -Xylene	µg/L	2																
ortho-Xlyene	µg/L	2																
Total Xylenes	µg/L	1																
Sum of BTEX	µg/L	1																
Naphthalene	µg/L	5	16															
Total Polychlorinated biphenyls	µg/L	1																
Monocyclic Aromatic Hydrocarbons																		
Styrene	µg/L	5																
Isopropylbenzene	µg/L	5																
n-Propylbenzene	µg/L	5																
1.3.5-Trimethylbenzene	µg/L	5																
sec-Butylbenzene	µg/L	5																
1.2.4-Trimethylbenzene	µg/L	5																
tert-Butylbenzene	µg/L	5																
p-Isopropyltoluene	µg/L	5																
n-Butylbenzene	µg/L	5																
Sulfonated Compounds																		
Carbon disulfide	µg/L	5																
Fumigants																		
2.2-Dichloropropane	µg/L	5																
1.2-Dichloropropane	µg/L	5																
cis-1.3-Dichloropropylene	µg/L	5																
trans-1.3-Dichloropropylene	µg/L	5																
1.2 Dibromoethane(EDB)	µg/L	5																
Oxygenated compounds																		
Vinyl Acetate	µg/L	50																
2- Butanone	µg/L	50																
4-Methyl-2-pentanone (MIBK)	µg/L	50																
2-Hexanone(MBK)	µg/L	50																

Total Petroleum Hydrocarbons																		
C6 - C9 Fraction	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		<20	20	110
C10 - C14 Fraction	µg/L	50		<50	<50		<50	<50		<50	<50		<50	<50		310	340	1020
C15 - C28 Fraction	µg/L	100		<100	190		<100	190		<100	<100		<100	<100		940	720	1450
C29 - C36 Fraction	µg/L	50		<50	80		<50	80		<50	<50		<50	<50		80	<50	80
C10-C36 TOTAL	µg/L	50		<50	270		<50	270		<50	<50		<50	<50		1330	1060	2550
C6 - C10 Fraction	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		<20	20	100
C6 - C10 Fraction minus BTEX	µg/L	20		<20	<20		<20	<20		<20	<20		<20	<20		<20	<20	70
C10 - C16 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		440	430	1040
C16 - C34 Fraction	µg/L	100		<100	240		<100	240		<100	<100		<100	<100		860	620	1280
C34 - C40 Fraction	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		<100	<100	<100
C10 - C40 Fraction (Sum)	µg/L	100		<100	240		<100	240		<100	<100		<100	<100		1300	1050	2320
C10-C16 Fraction minus Naphthalene	µg/L	100		<100	<100		<100	<100		<100	<100		<100	<100		440	430	1040
olynuclear Aromatic Hydrocarbons																		
Naphthalene	µg/L	1	16															
Acenaphthylene	µg/L	1																
Acenaphthene	µg/L	1																
Fluorene	µg/L	1																
Phenanthrene	µg/L	1																
Anthracene	µg/L	1																
Fluoranthene	µg/L	1																
Pyrene	µg/L	1																
Benz(a)anthracene	µg/L	1																
Chrysene	µg/L	1																
Benzo(b+j)fluoranthene	µg/L	1																
Benzo(k)fluoranthene	µg/L	1																
Benzo(a)pyrene	µg/L	0.5																
Indeno(1.2.3.cd)pyrene	µg/L	1																
Dibenz(a.h)anthracene	µg/L	1																
Benzo(g.h.i)perylene	µg/L	1																
Sum of polycyclic aromatic hydrocarbons	µg/L	0.5																
Benzo(a)pyrene TEQ (zero)	µg/L	0.5																
Organophosphorus Pesticides (OP)																		
Dichlorvos	µg/L	0.5																
Demeton-S-methyl	µg/L	0.5																
Monocrotophos	µg/L	2																
Dimethoate	µg/L	0.5																
Diazinon	µg/L	0.5																
Chlorpyrifos -methyl	µg/L	0.5																
Parathion-methyl	µg/L	2																
Malathion	µg/L	0.5																
Fenthion	µg/L	0.5																
Chlorpyrifos	µg/L	0.5	0.01															
Parathion	µg/L	2	0.004															
Pirimphos-ethyl	µg/L	0.5																
Chlorfenvinphos	µg/L	0.5																
Bromophos-ethyl	µg/L	0.5																
Fenamiphos	µg/L	0.5																
Prothiofos	µg/L	0.5																
Ethion	µg/L	0.5																
Carbophenothion	µg/L	0.5																
Azinphos Methyl	µg/L	0.5	0.02															
Hexavalent Chromium	mg/L	0.01	0.001															
Halogenated Aromatic Compounds																		
Chlorobenzene	µg/L	5																
Bromobenzene	µg/L	5																
2-Chlorotoluene	µg/L	5																
4-Chlorotoluene	µg/L	5																
1.3-Dichlorobenzene	µg/L	5																
1.4-Dichlorobenzene	µg/L	5																
1.2-Dichlorobenzene	µg/L	5																
1.2.4--Trichlorobenzene	µg/L	5																
1.2.3--Trichlorobenzene	µg/L	5																
Trihalomethanes																		
Chloroform	µg/L	5																
Bromodichloromethane	µg/L	5																
Dibromochloromethane	µg/L	5																
Bromoform	µg/L	5																
Halogenated Aliphatic Compounds																		
Dichlorodifluoromethane	µg/L	50																
Chloromethane	µg/L	50																
Vinyl chloride	µg/L	50																
Bromomethane	µg/L	50																
Chloroethane	µg/L	50																
Trichlorofluoromethane	µg/L	50																
1.1-Dichloroethene	µg/L	5																
Iodomethane	µg/L	5																
trans-1.2-Dichloroethene	µg/L	5																
1.1-Dichloroethane	µg/L	5																
cis-1.2-Dichloroethene	µg/L	5																
1.1.1-Trichloroethane	µg/L	5																
1.1-Dichloropropylene	µg/L	5																
Carbon Tetrachloride	µg/L	5																
1.2-Dichloroethane	µg/L	5																
Trichloroethene	µg/L	5																
Dibromomethane	µg/L	5																
1.1.2-Trichloroethane	µg/L	5	6500															
1.3-Dichloropropane	µg/L	5																
Tetrachloroethene	µg/L	5																
1.1.1.2-Tetrachloroethane	µg/L	5																
trans-1.4-Dichloro-2-butene	µg/L	5																
cis-1.4-Dichloro-2-butene	µg/L	5																
1.1.2.2-Tetrachloroethane	µg/L	5																
1.2.3-Trichloropropane	µg/L	5																
Pentachloroethane	µg/L	5																
1.2-Dibromo-3-chloropropane	µg/L	5																
Hexachlorobutadiene	µg/L	5																

Appendix C

Water quality monitoring charts


9
8
7
6
5
4
3
2
1
0
pH
1/10/2020
1/11/2020
1/12/2020
1/01/2021
1/02/2021
1/03/2021
1/04/2021
1/05/2021
1/06/2021
MP1
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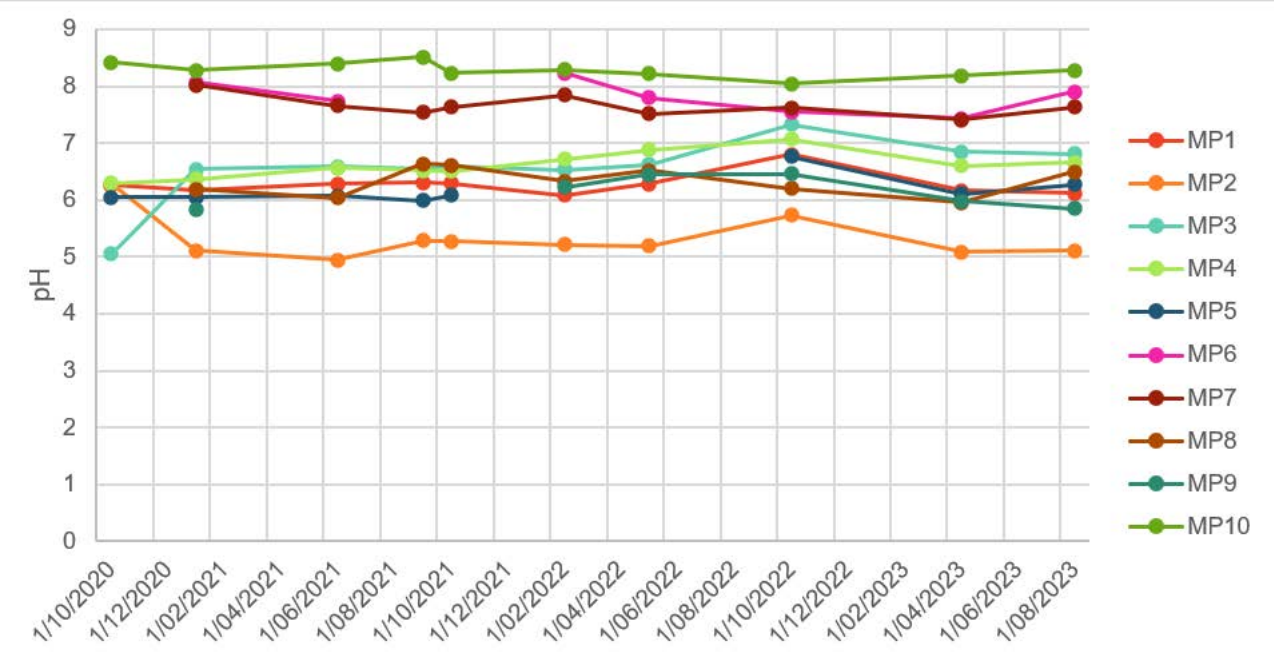
MP8
MP9
MP10


7000


pH
9
8
7
6
5
4
3
2
1
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
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1/06/2023
1/08/2023
MP1
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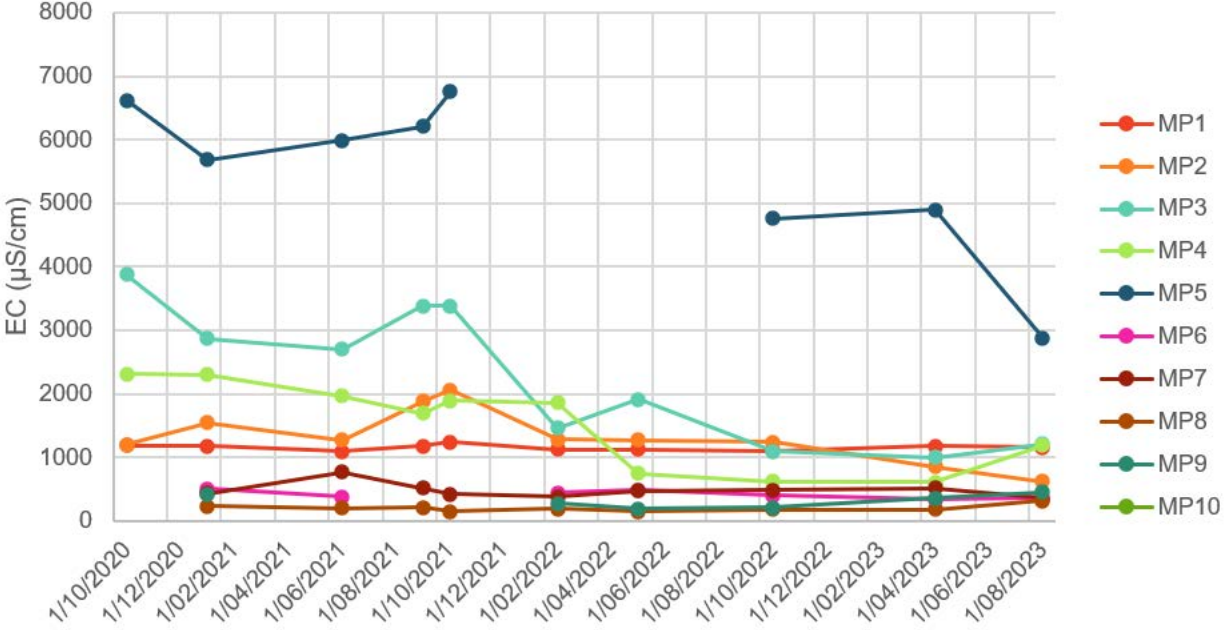
MP9
MP10


8000
7000
6000
5000
4000
3000
2000
1000
0
EC (µS/cm)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
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1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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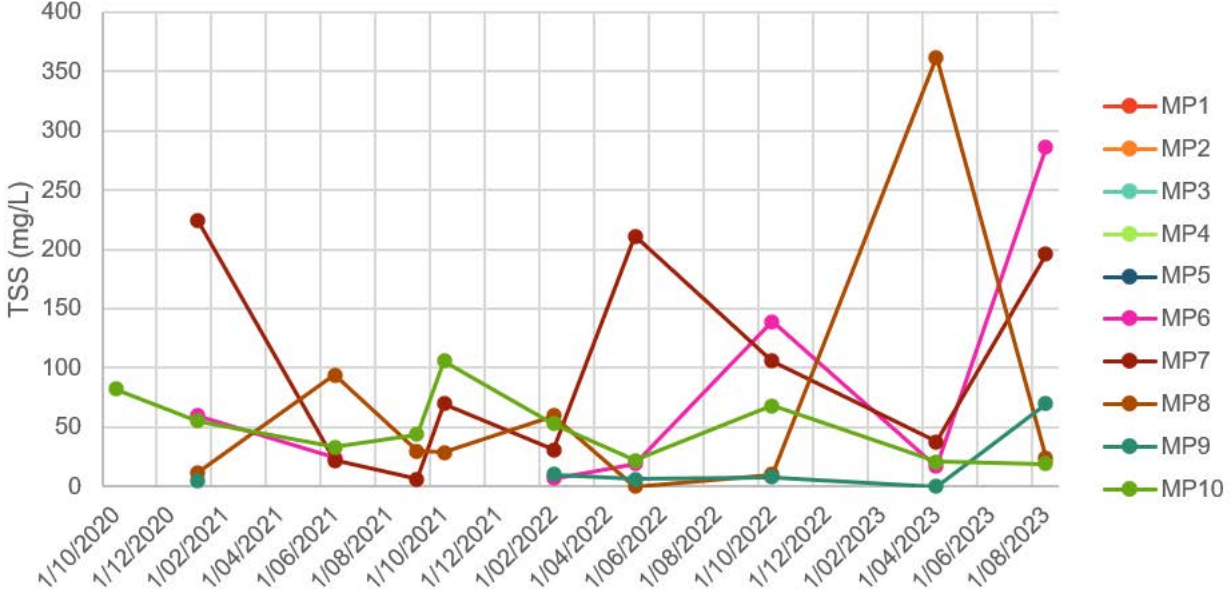
MP9
MP10


400
350
300
250
200
150
100
50
0
TSS (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
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1/06/2023
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MP1
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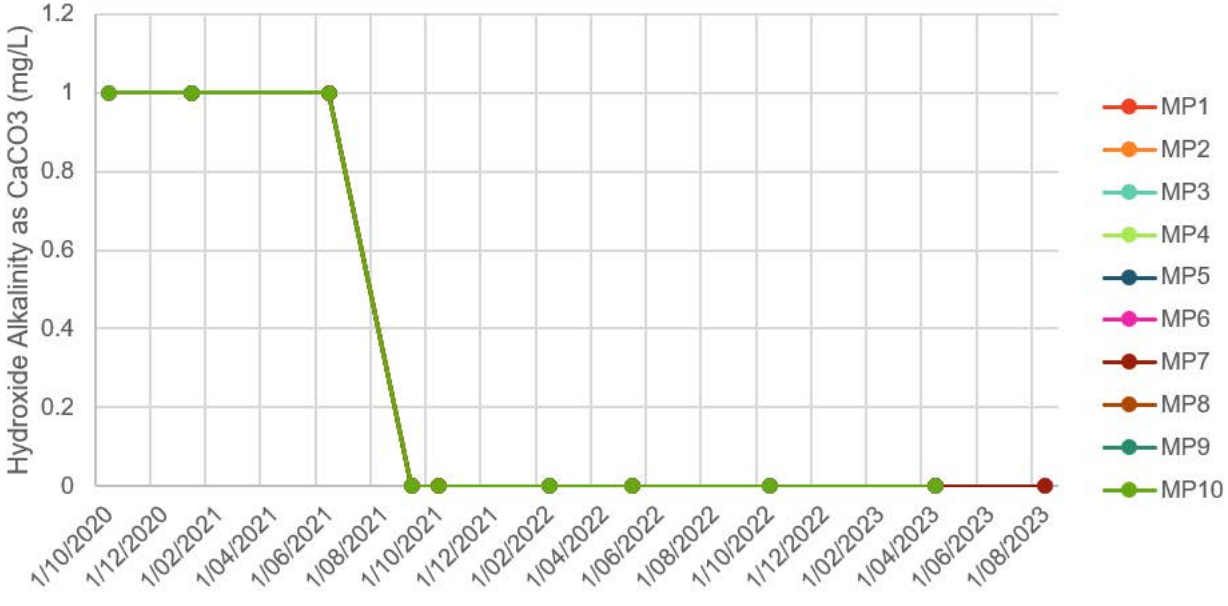
MP10


Hydroxide Alkalinity as CaCO3 (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
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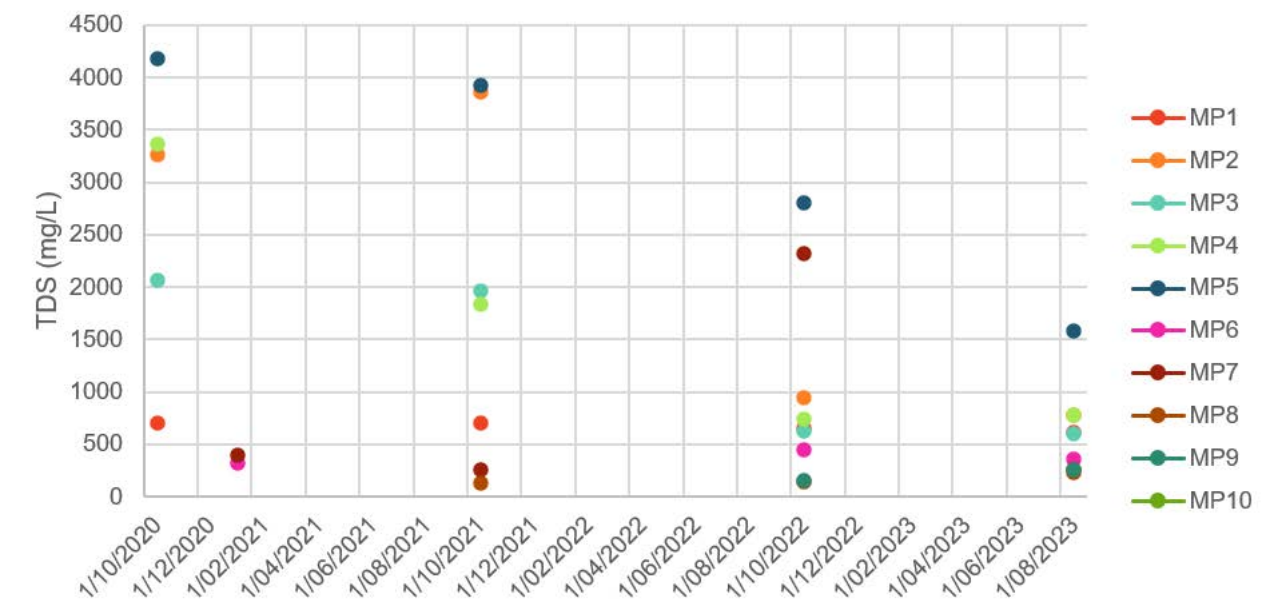
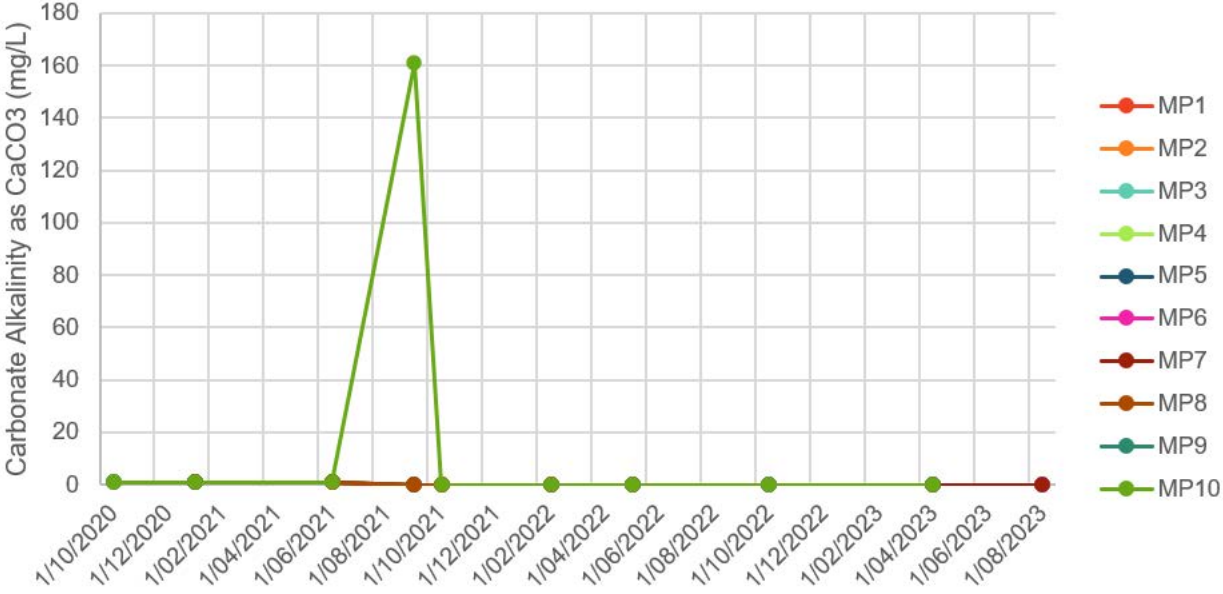
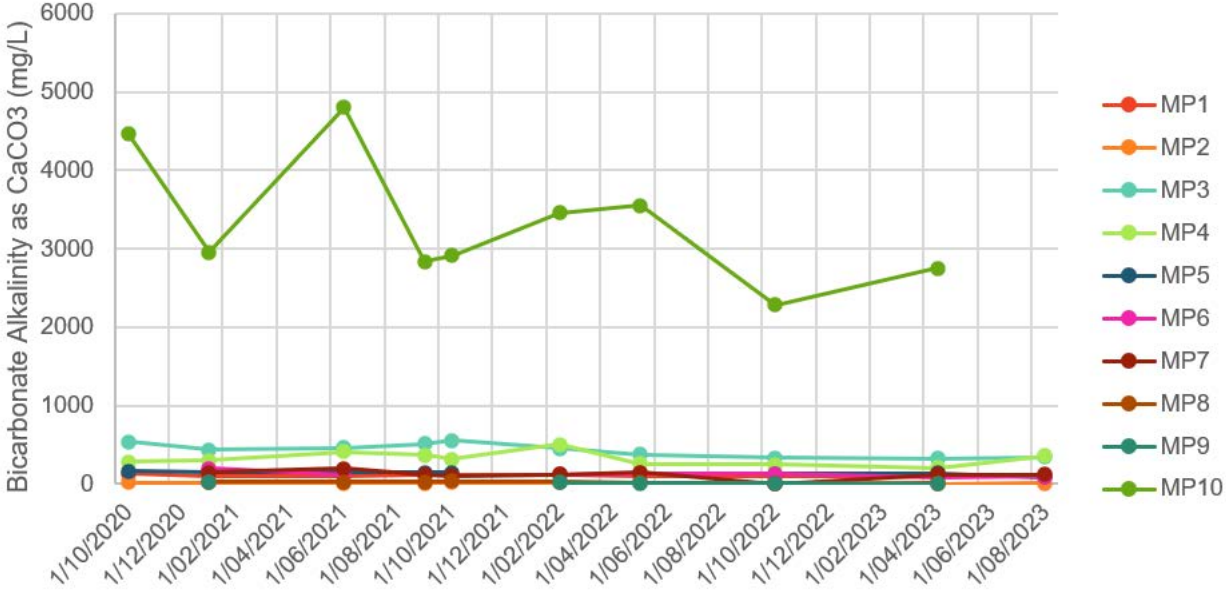
MP6
MP7
MP8
MP9
MP10


4500
4000
3500
3000
2500
2000
1500
1000
500
0
TDS (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
MP3
MP4
MP5
MP6
MP7
MP8
MP9
MP10


Carbonate Alkalinity as CaCO3 (mg/L)
180
160
140
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
MP3
MP4
MP5
MP6
MP7
MP8
MP9
MP10


Bicarbonate Alkalinity as CaCO3 (mg/L)
6000
5000
4000
3000
2000
1000
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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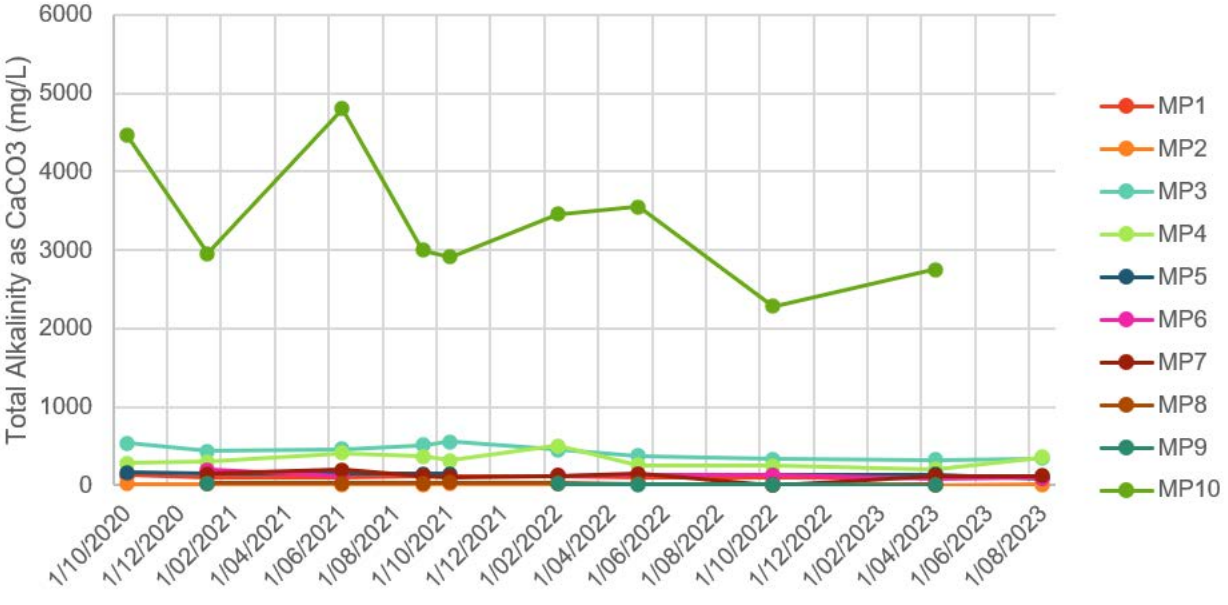
MP7
MP8
MP9
MP10


Total Alkalinity as CaCO3 (mg/L)
6000
5000
4000
3000
2000
1000
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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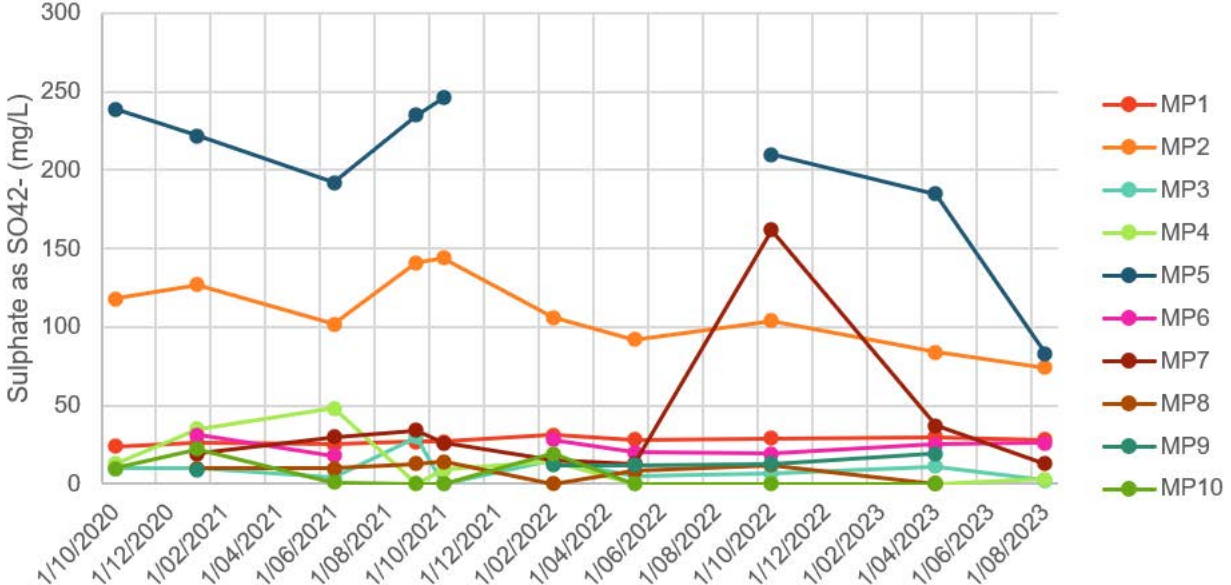
MP9
MP10


Sulphate as SO42- (mg/L)
300
250
200
150
100
50
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
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1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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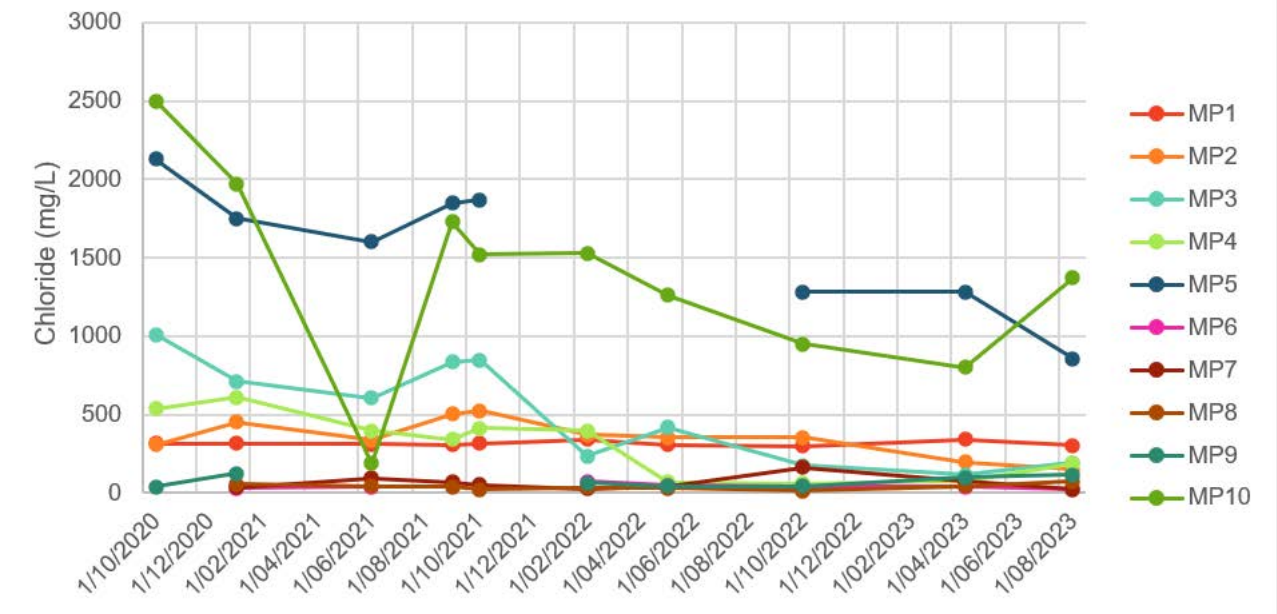
MP9
MP10


Chloride (mg/L)
3000
2500
2000
1500
1000
500
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
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1/06/2023
1/08/2023
MP1
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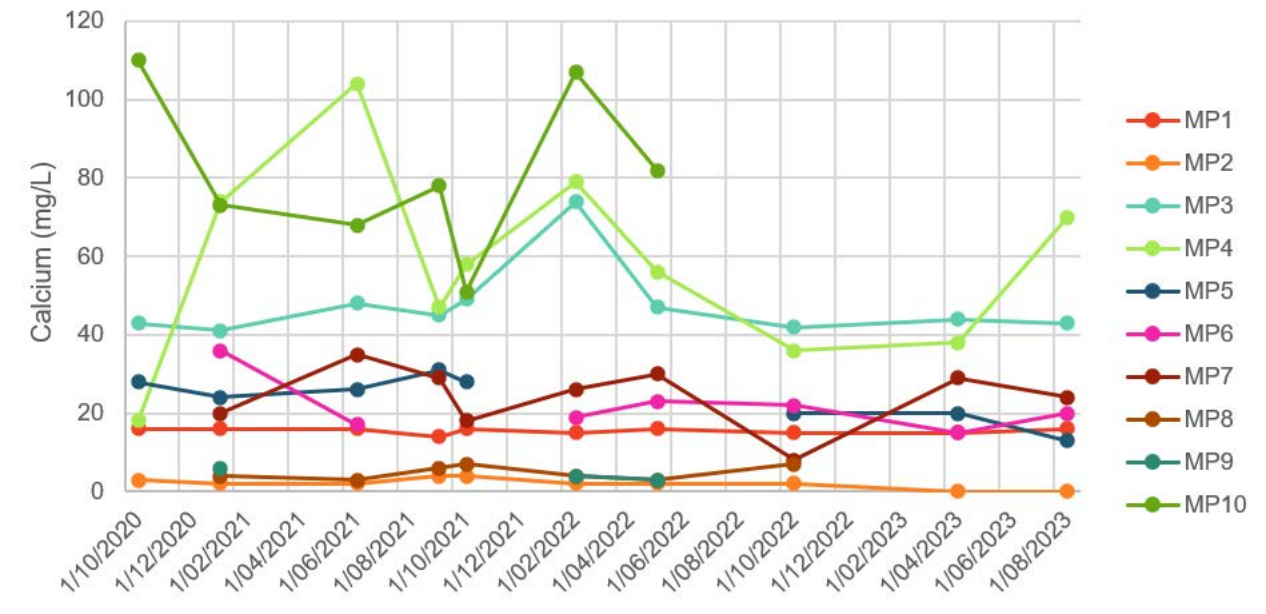
MP9
MP10


Calcium (mg/L)
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
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1/06/2023
1/08/2023
MP1
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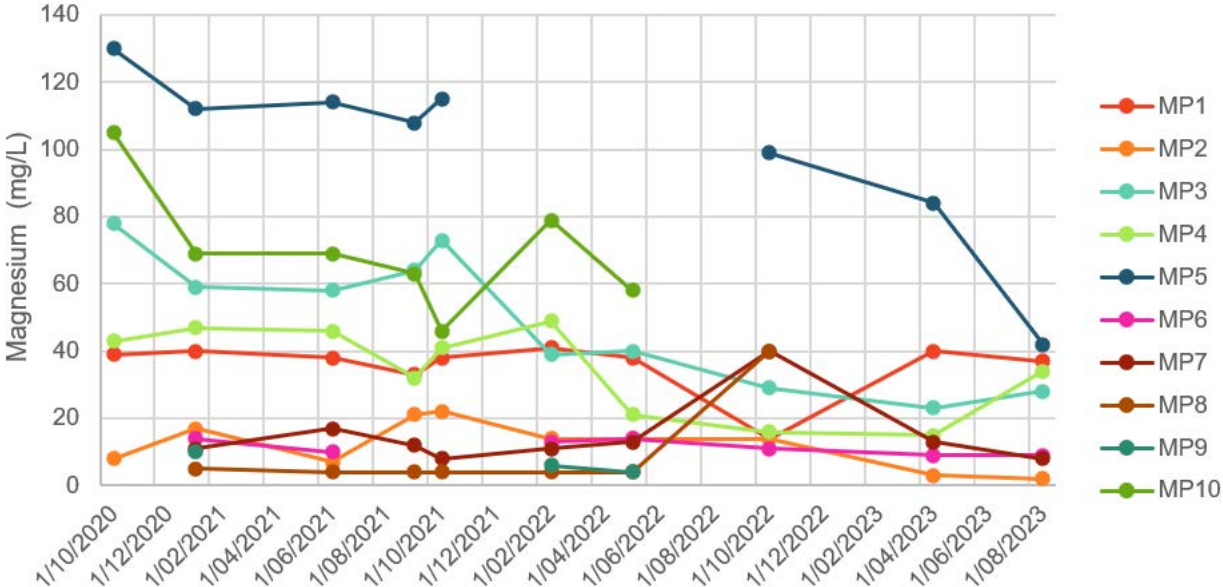
MP9
MP10


Magnesium (mg/L)
140
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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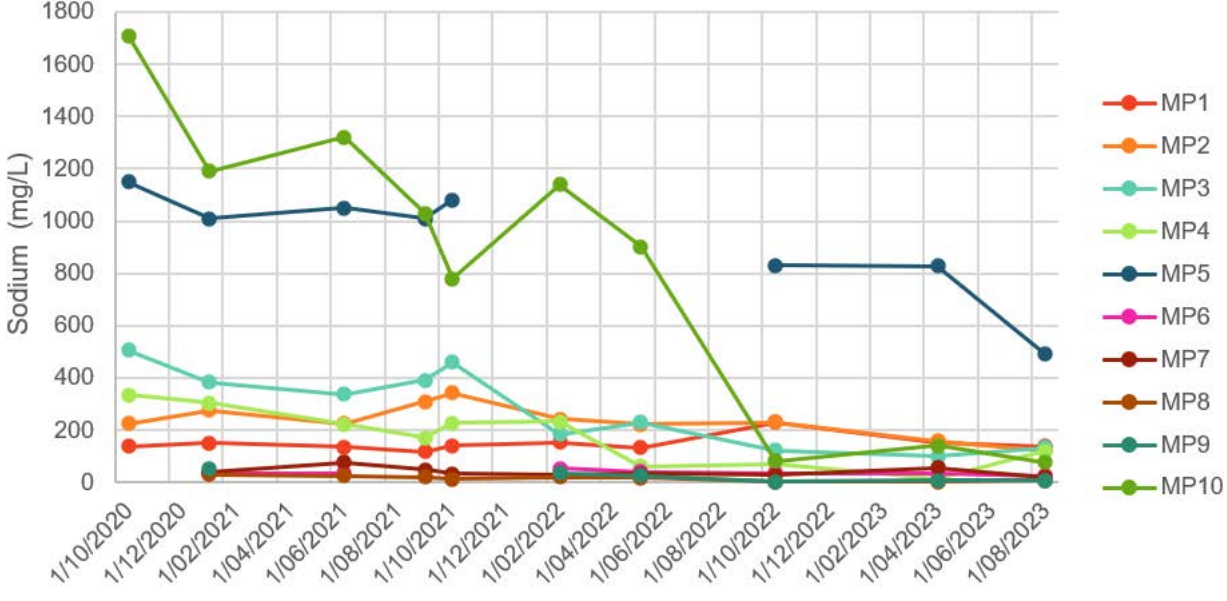
MP8
MP9
MP10


Sodium (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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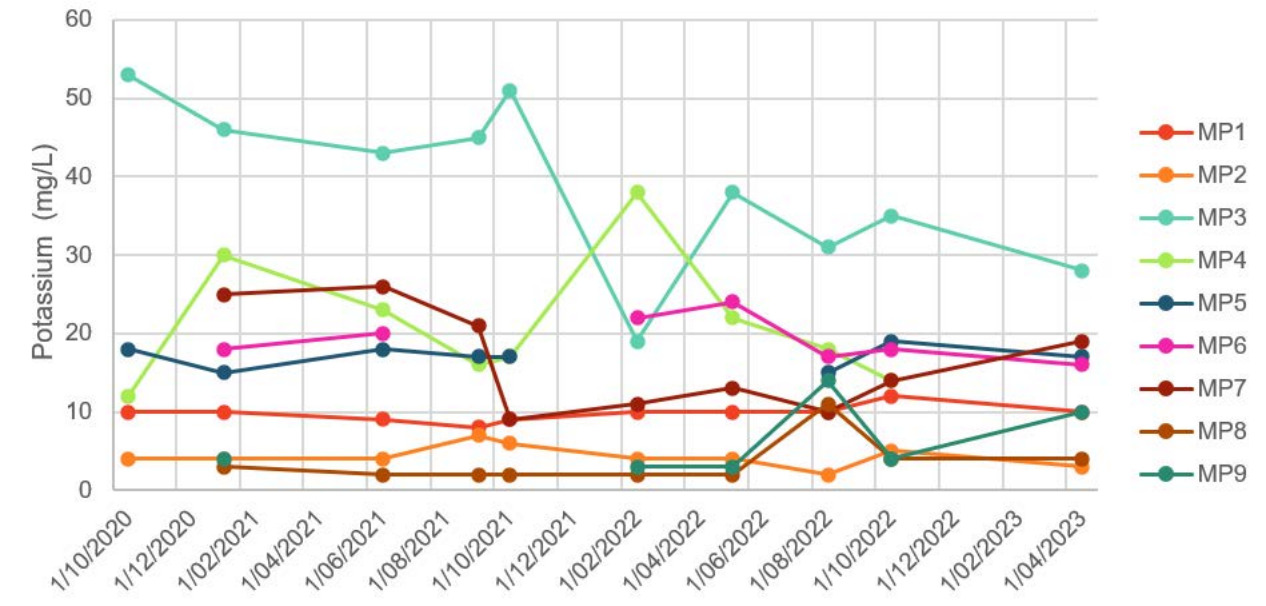
MP8
MP9
MP10


Potassium (mg/L)
60
50
40
30
20
10
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
MP1
MP2
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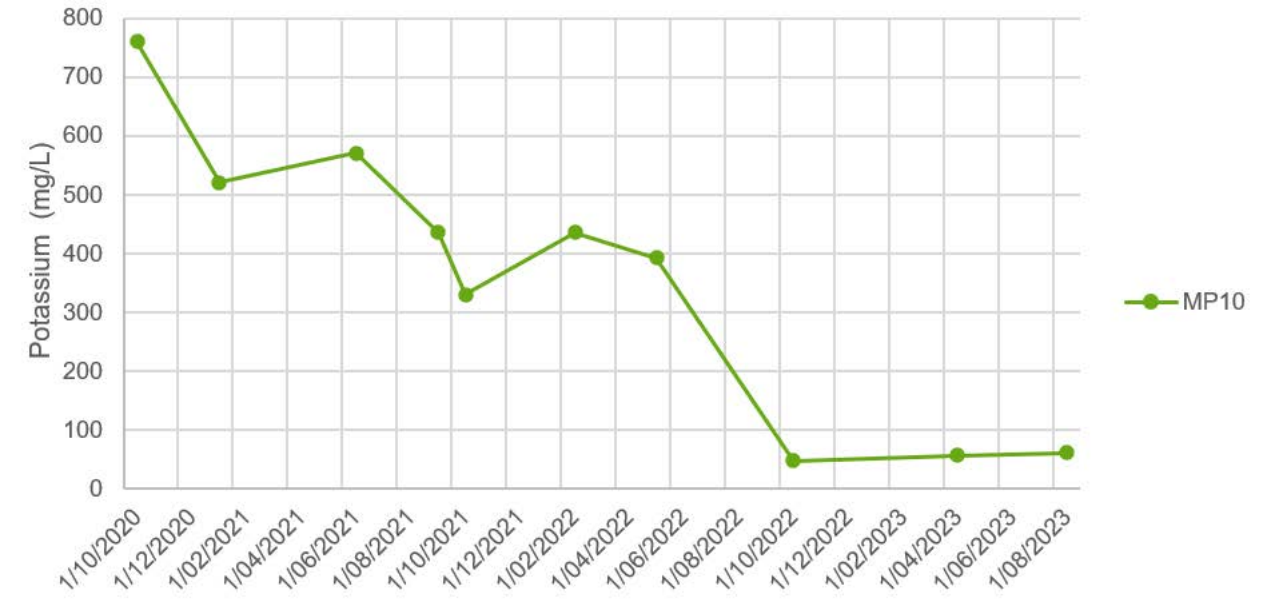
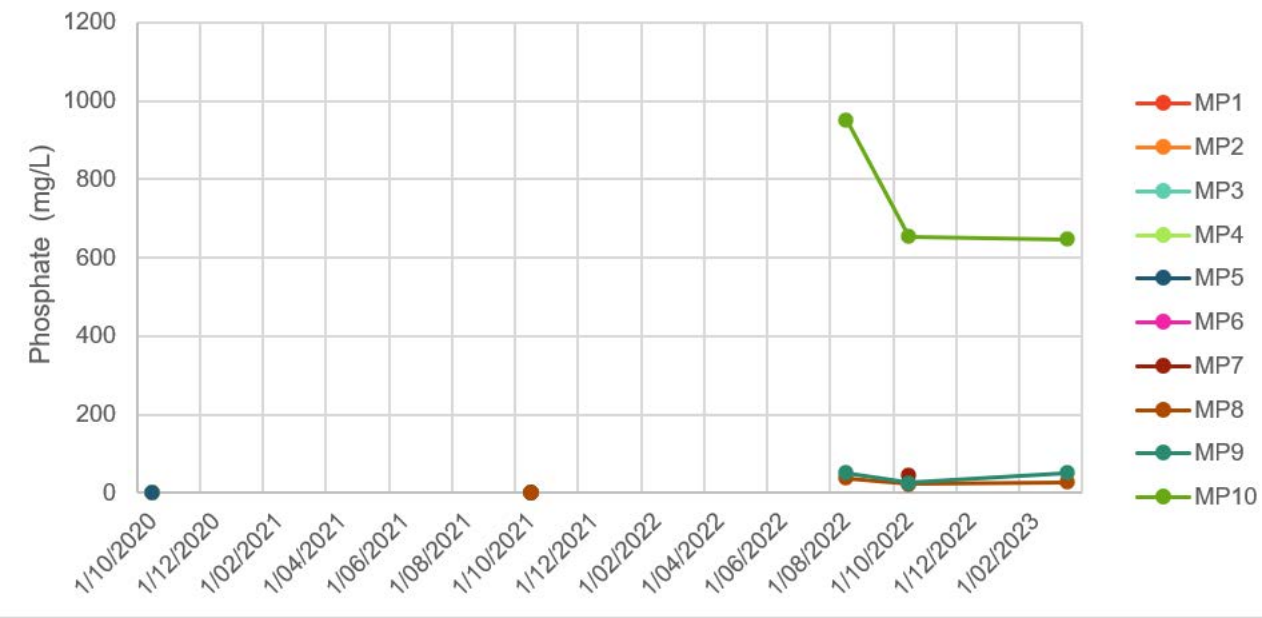
MP5
MP6
MP7
MP8
MP9


800
700
600
500
400
300
200
100
0
Potassium (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP10


1200
1000
800
600
400
200
0
Phosphate (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
MP1
MP2
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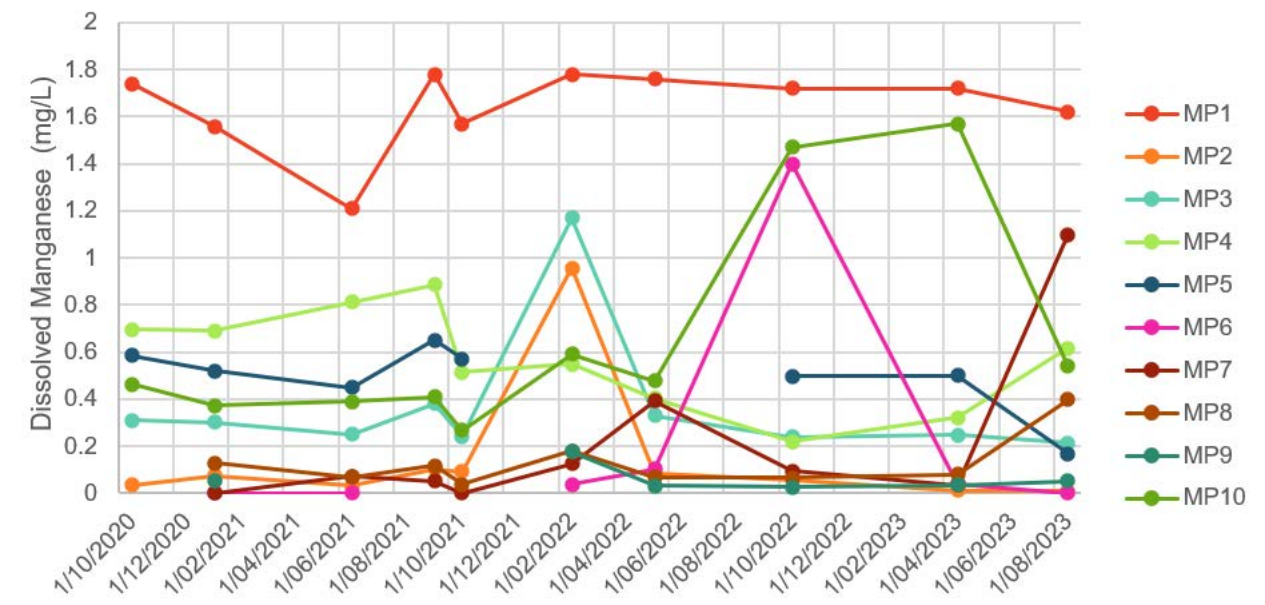
MP6
MP7
MP8
MP9
MP10


Dissolved Manganese (mg/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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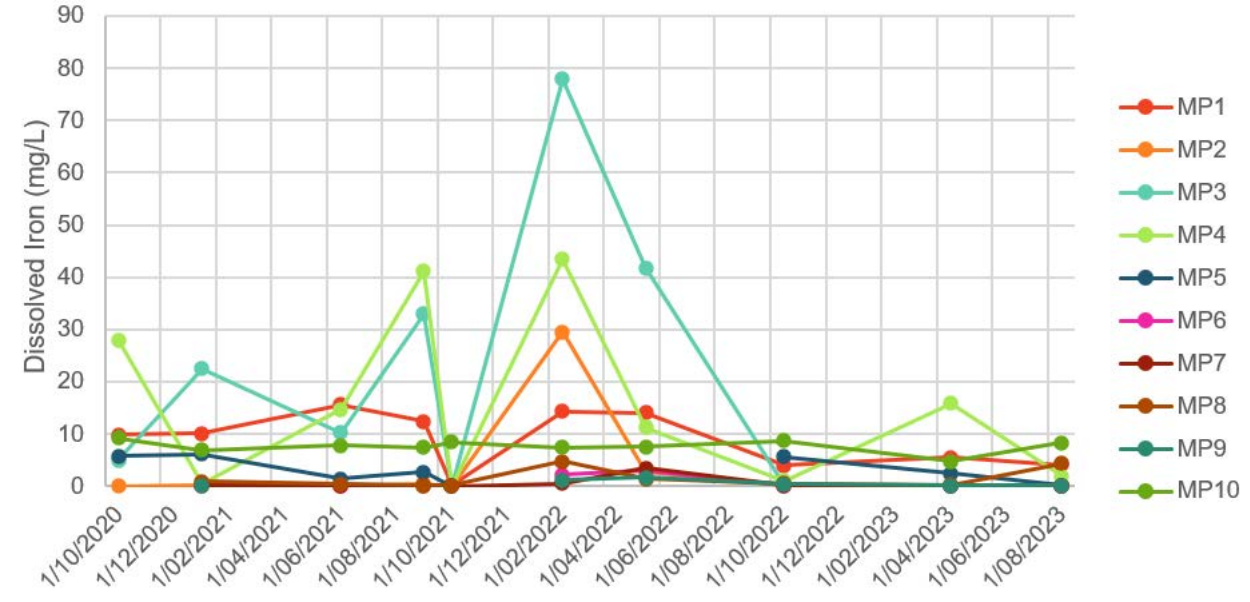
MP9
MP10


Dissolved Iron (mg/L)
90
80
70
60
50
40
30
20
10
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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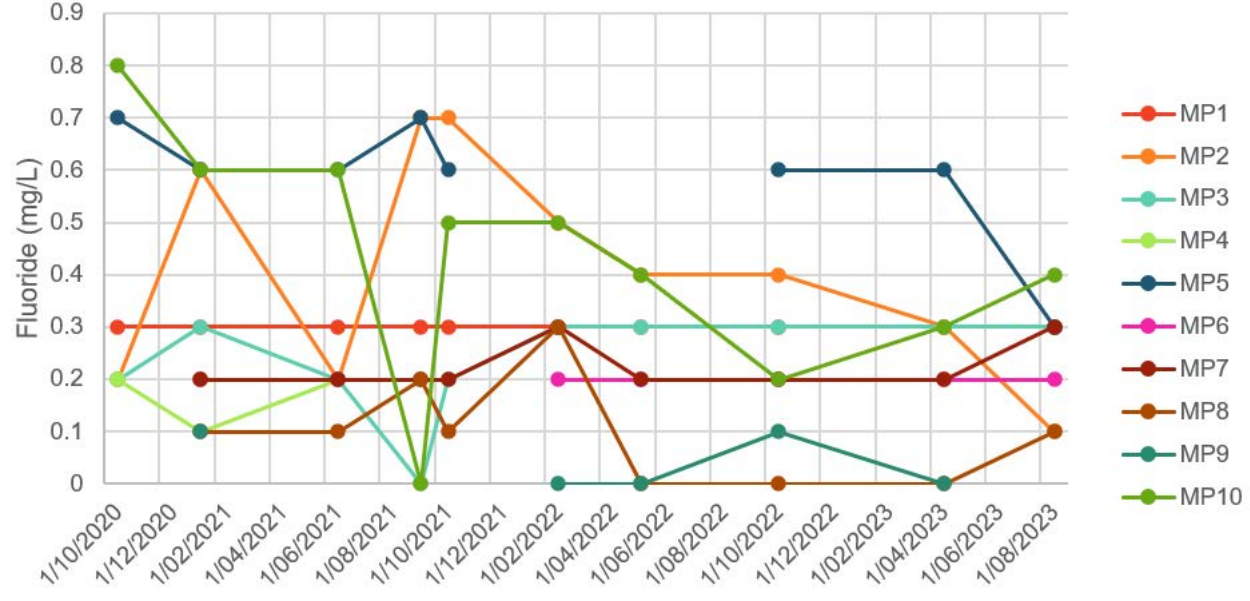
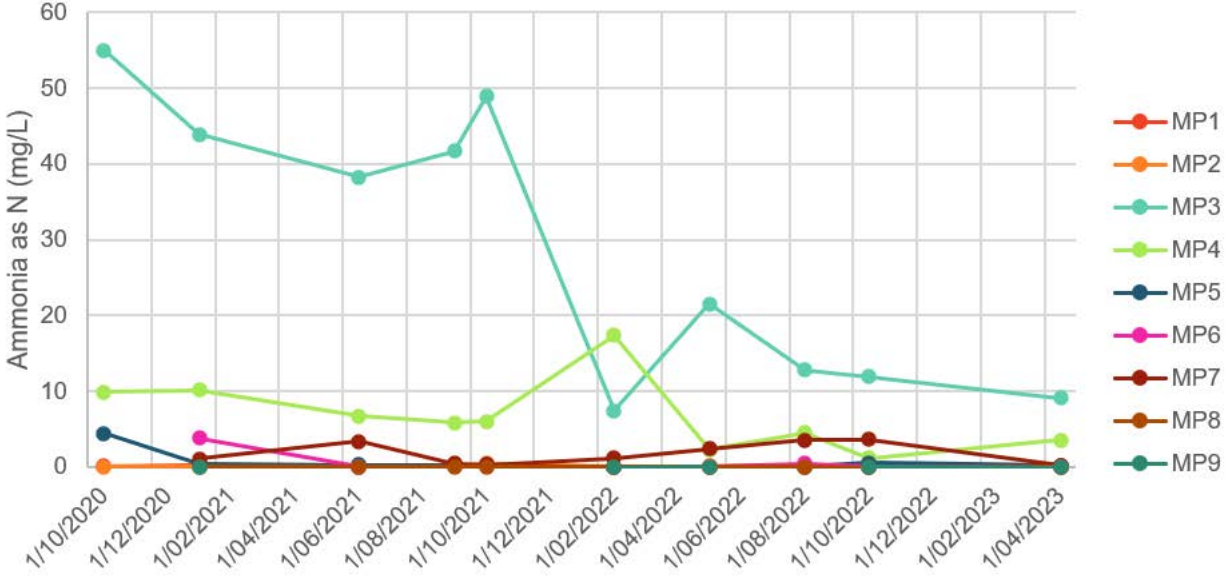
MP9
MP10


Fluoride (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
MP3
MP4
MP5
MP6
MP7
MP8
MP9
MP10


Ammonia as N (mg/L)
60
50
40
30
20
10
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
MP1
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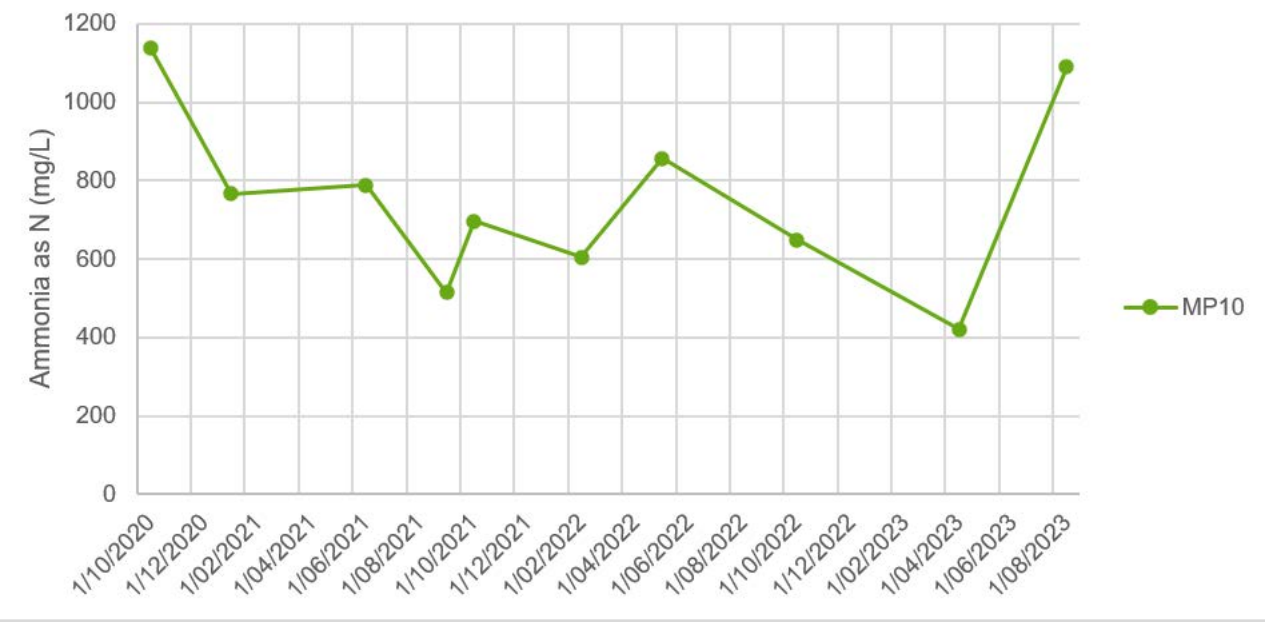
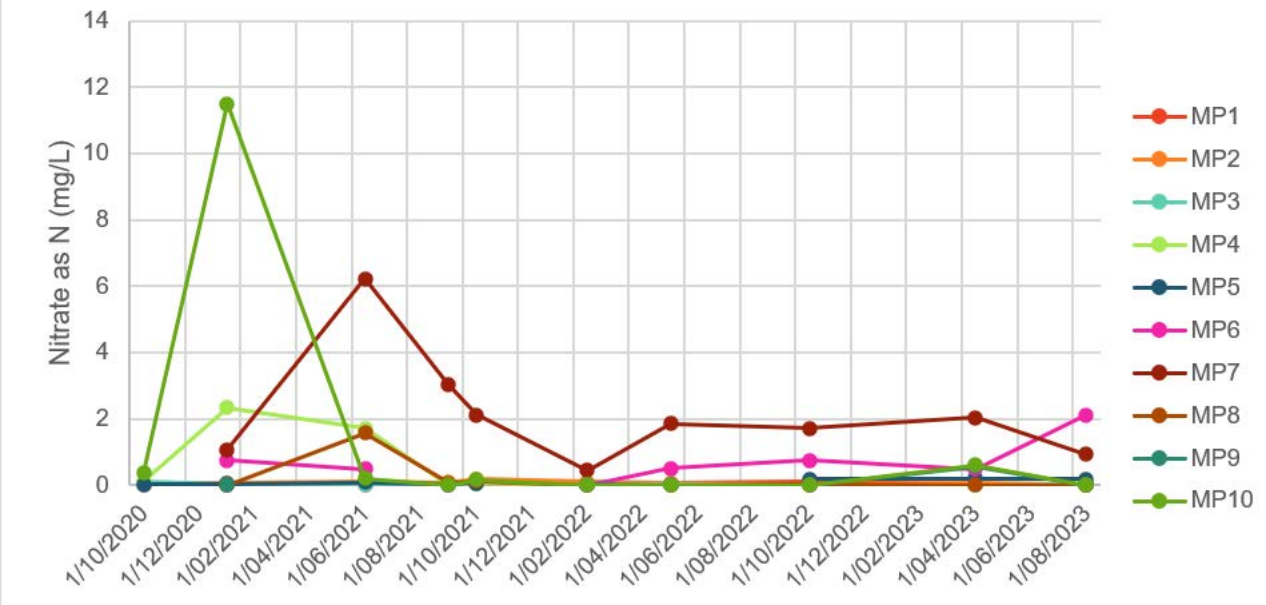
MP9


Ammonia as N (mg/L)
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP10


Nitrate as N (mg/L)
14
12
10
8
6
4
2
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
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1/06/2023
1/08/2023
MP1
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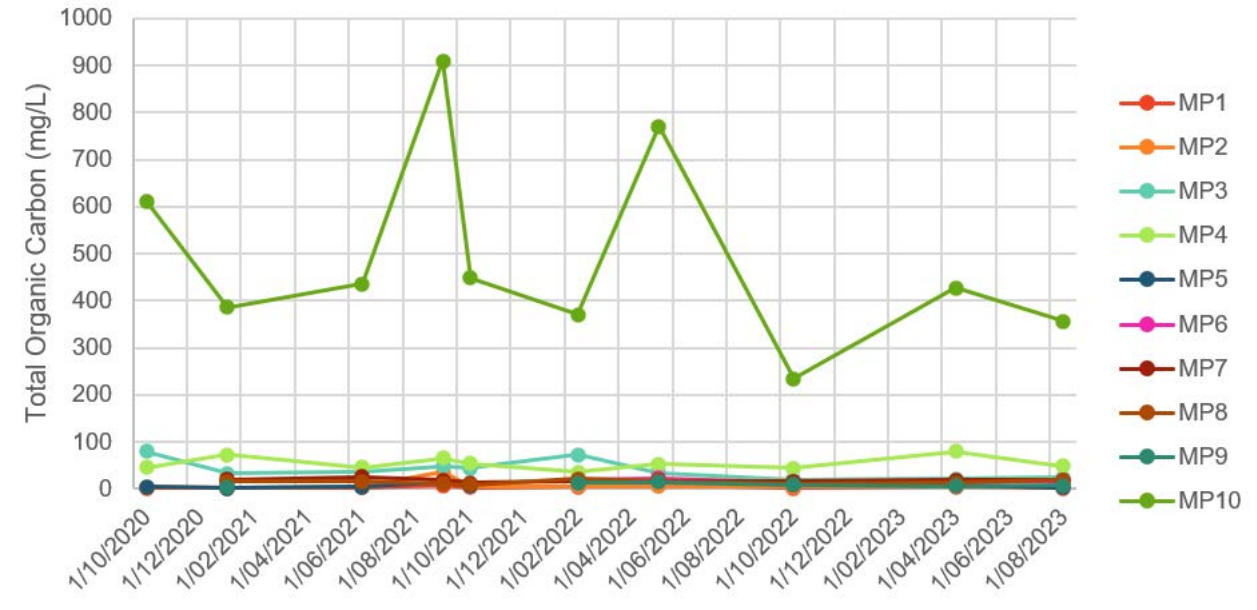
MP6
MP7
MP8
MP9
MP10


Total Organic Carbon (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
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1/08/2022
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1/08/2023
MP1
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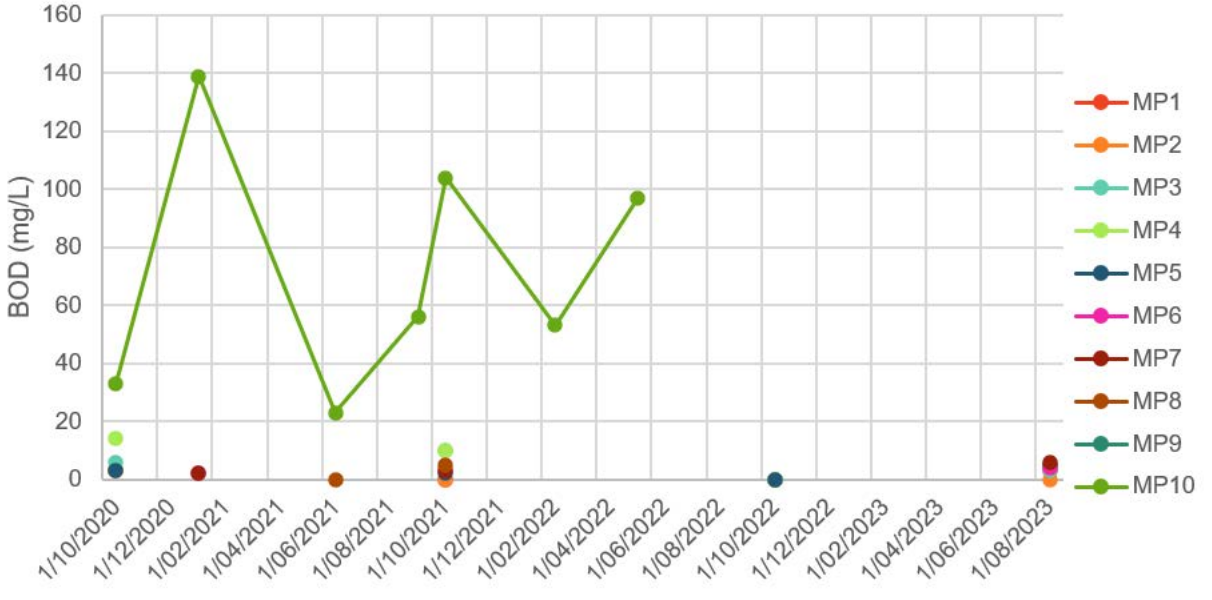
MP9
MP10


160
140
120
100
80
60
40
20
0
BOD (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
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1/04/2023
1/06/2023
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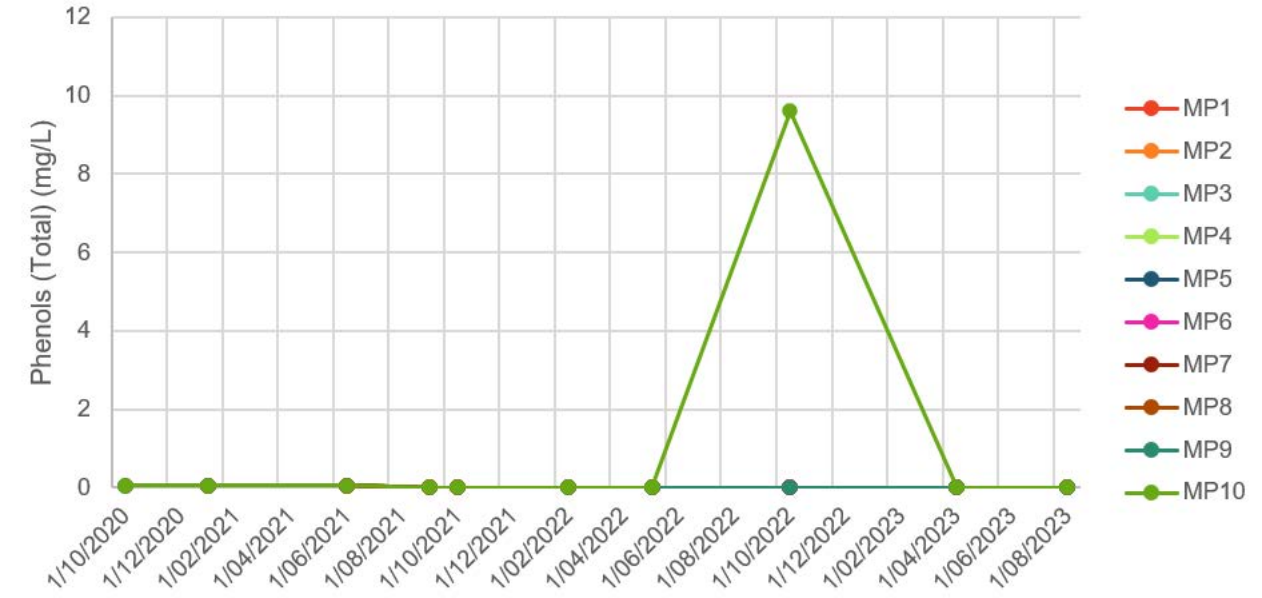
Phenols (Total) (mg/L)
12
10
8
6
4
2
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
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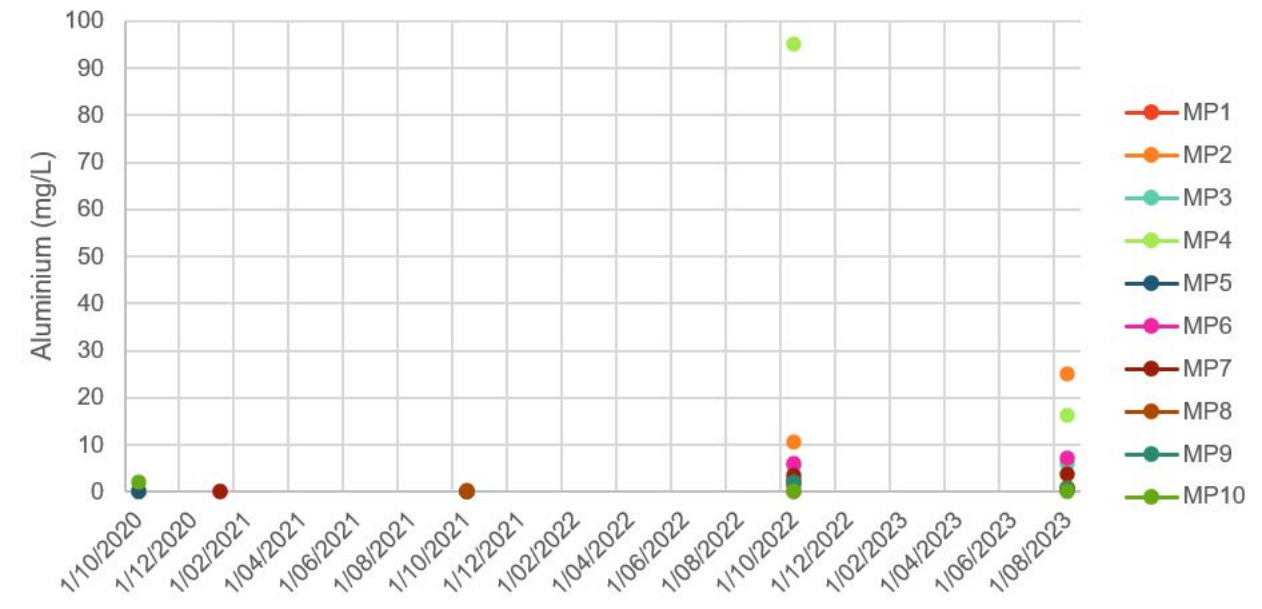
MP10


Aluminium (mg/L)
100
90
80
70
60
50
40
30
20
10
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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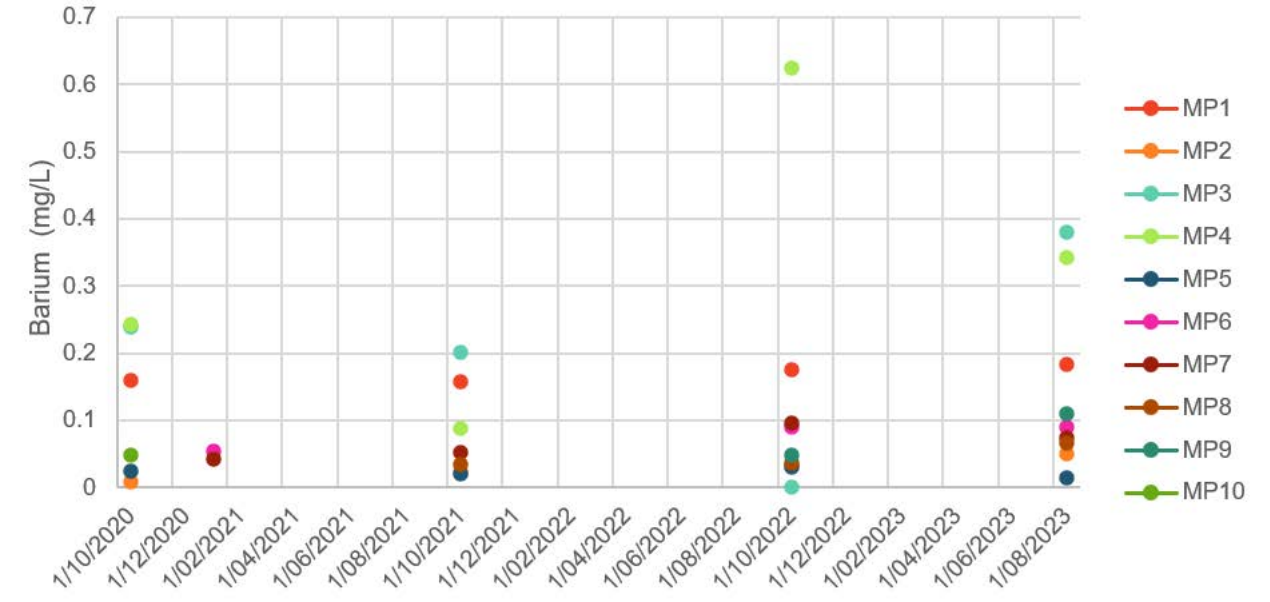
MP9
MP10


Barium (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
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1/12/2022
1/02/2023
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1/06/2023
1/08/2023
MP1
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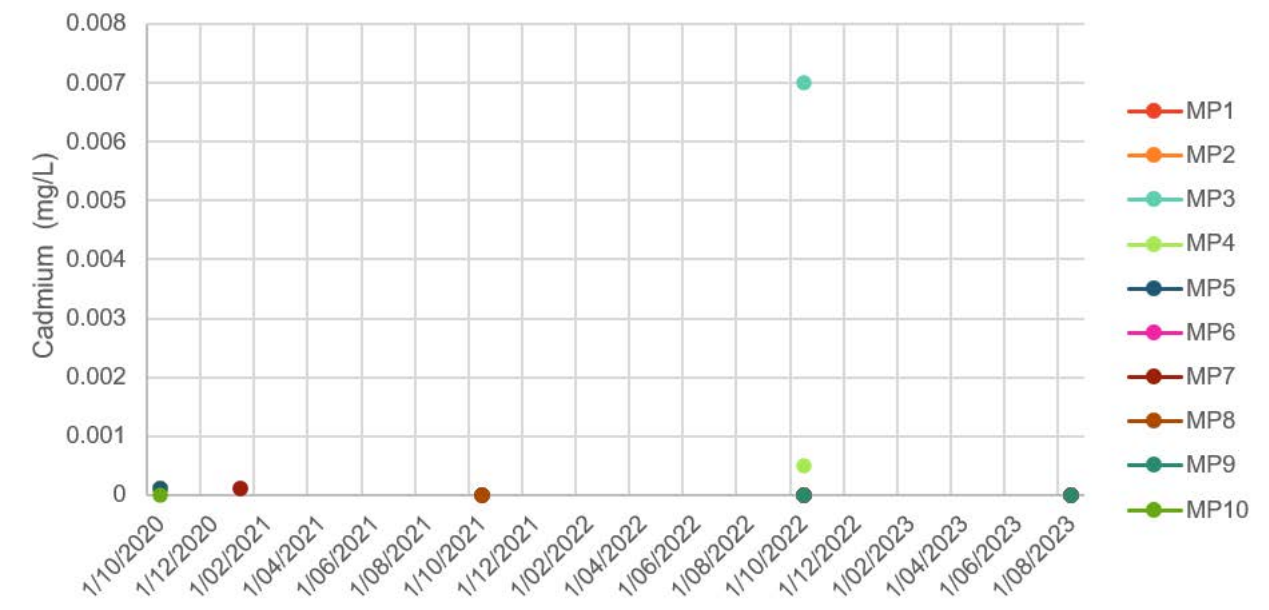
MP9
MP10


0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Cadmium (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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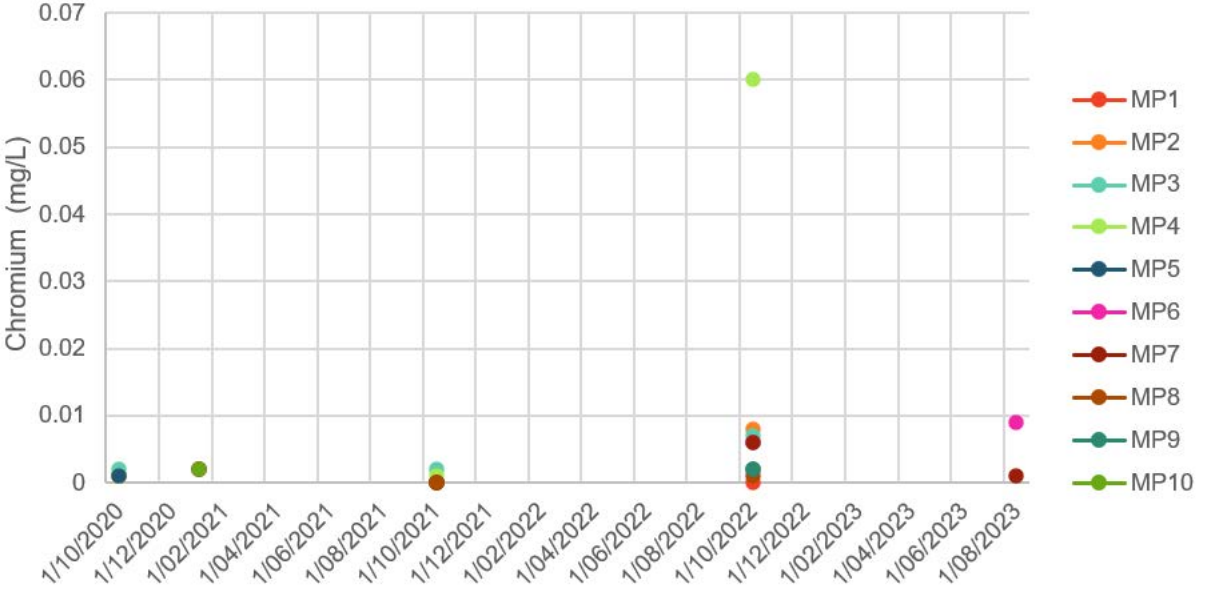
MP10


0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Chromium (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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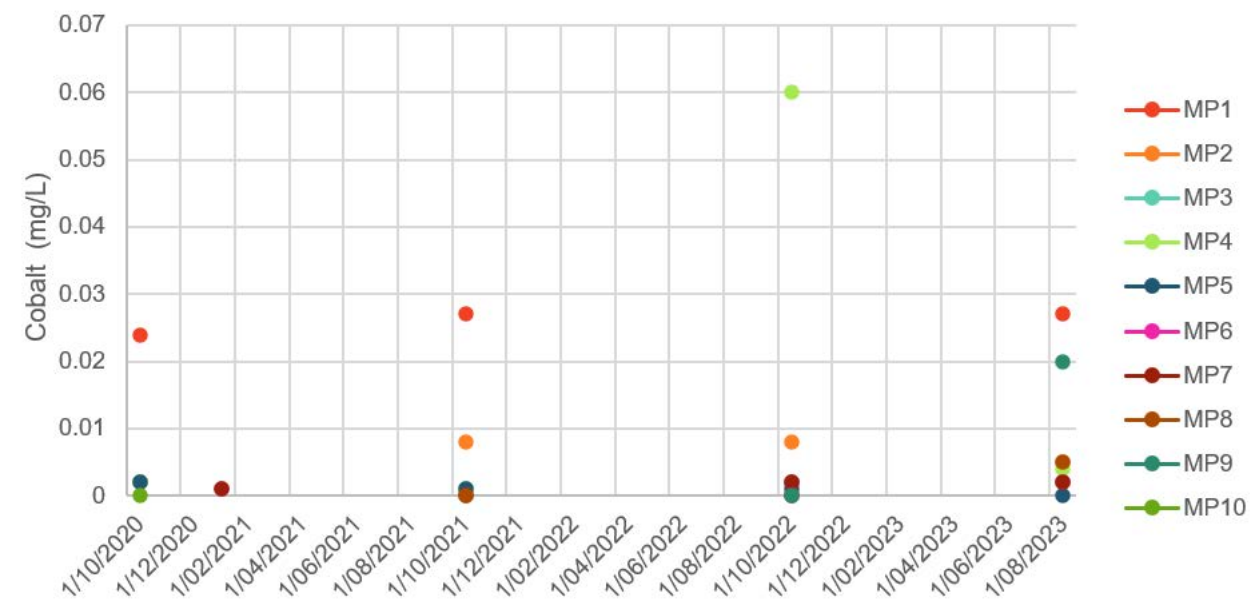
MP10


0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Cobalt (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
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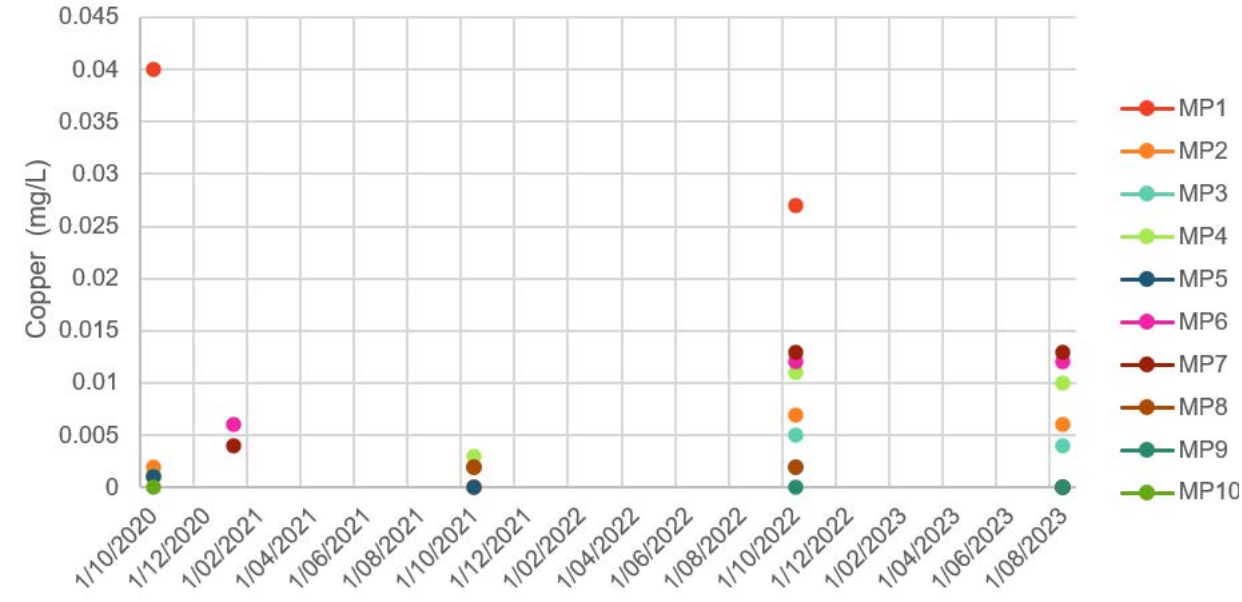
MP10


0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Copper (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
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1/02/2023
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MP1
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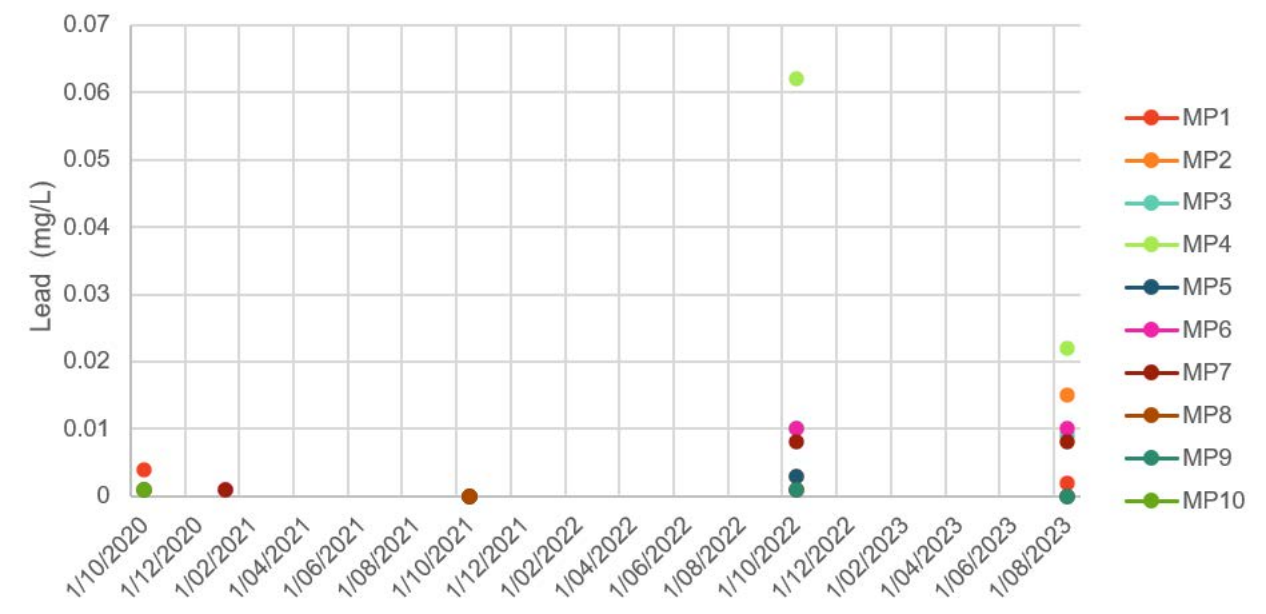
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Lead (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
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1/06/2023
1/08/2023
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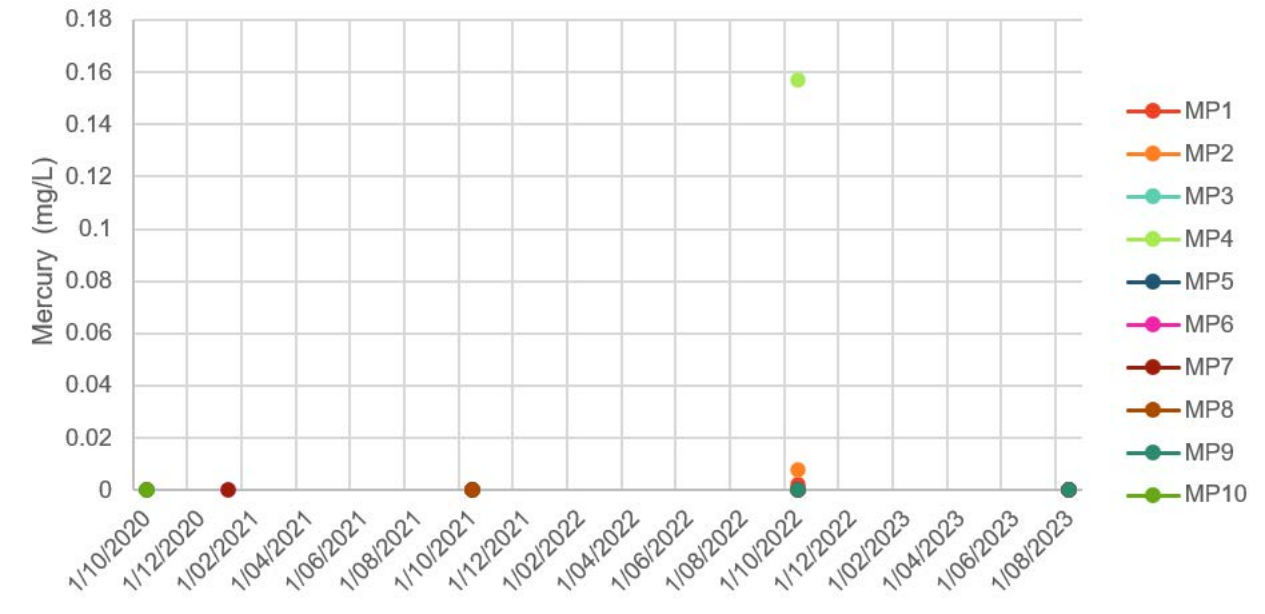
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Mercury (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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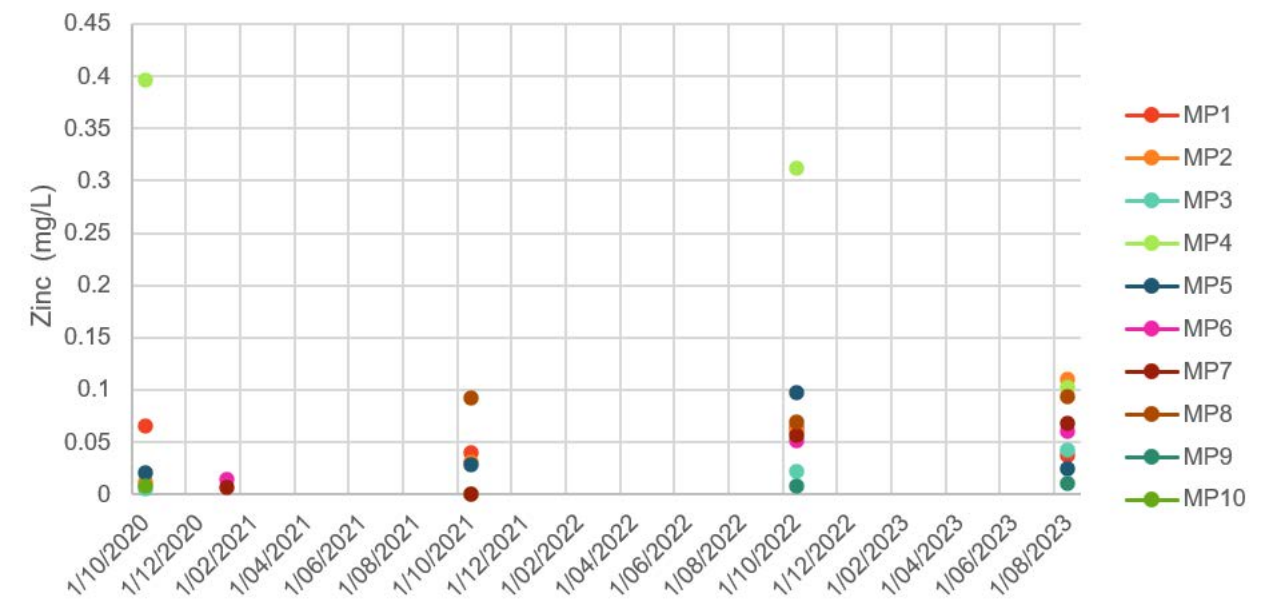
Zinc (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
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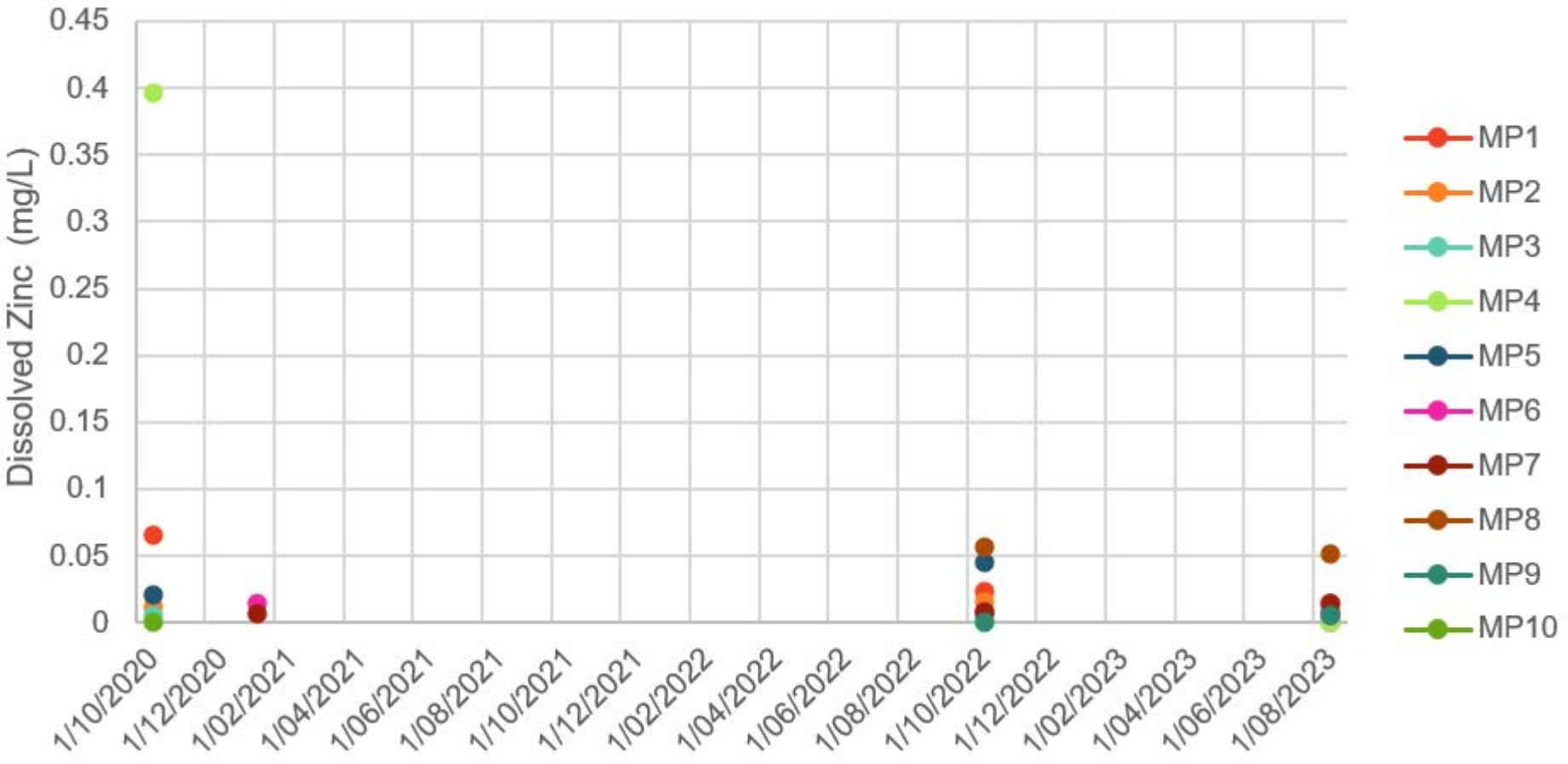
MP10


Dissolved Zinc (mg/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
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1/06/2023
1/08/2023
MP1
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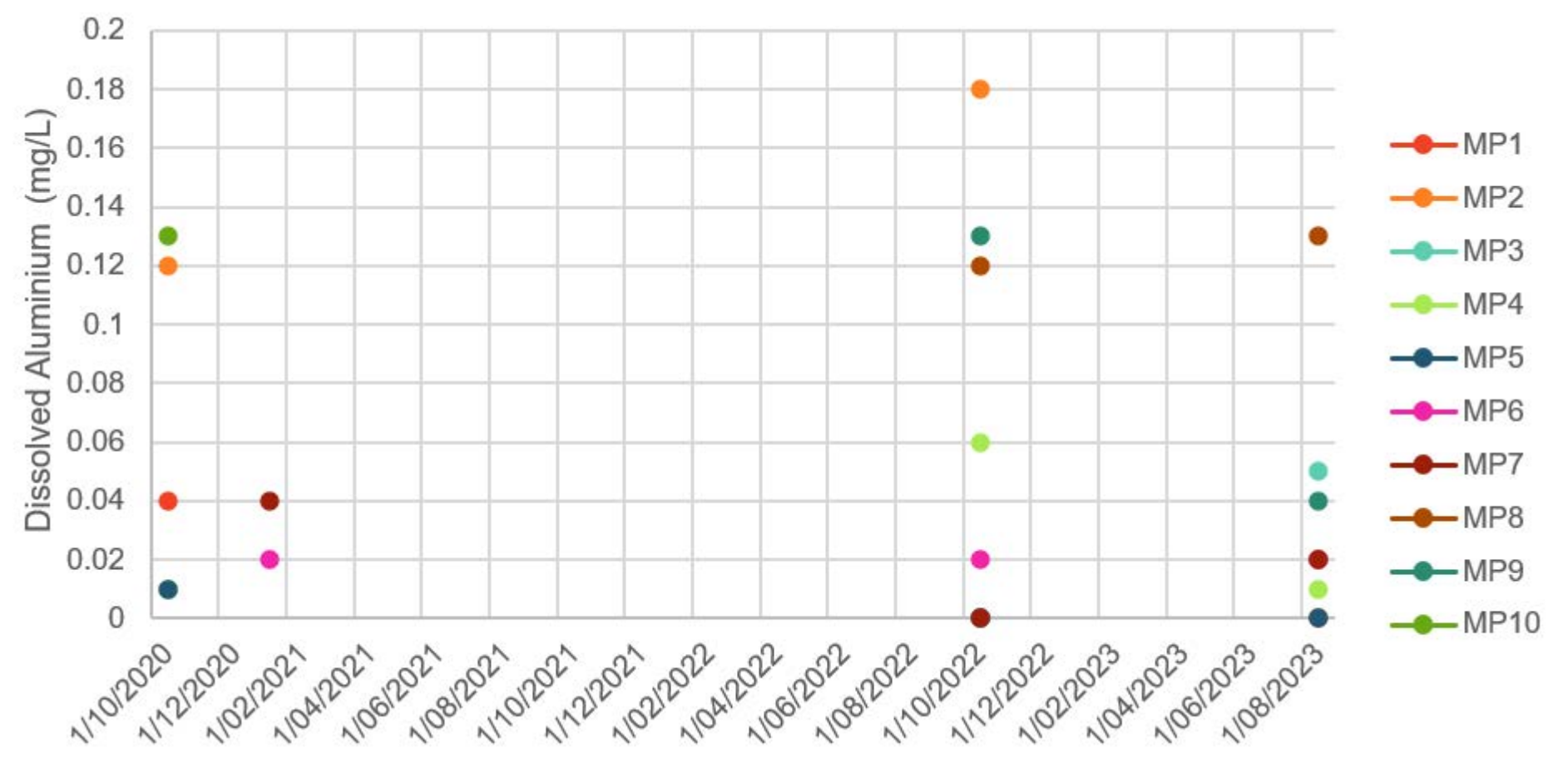
MP10


Dissolved Aluminium (mg/L)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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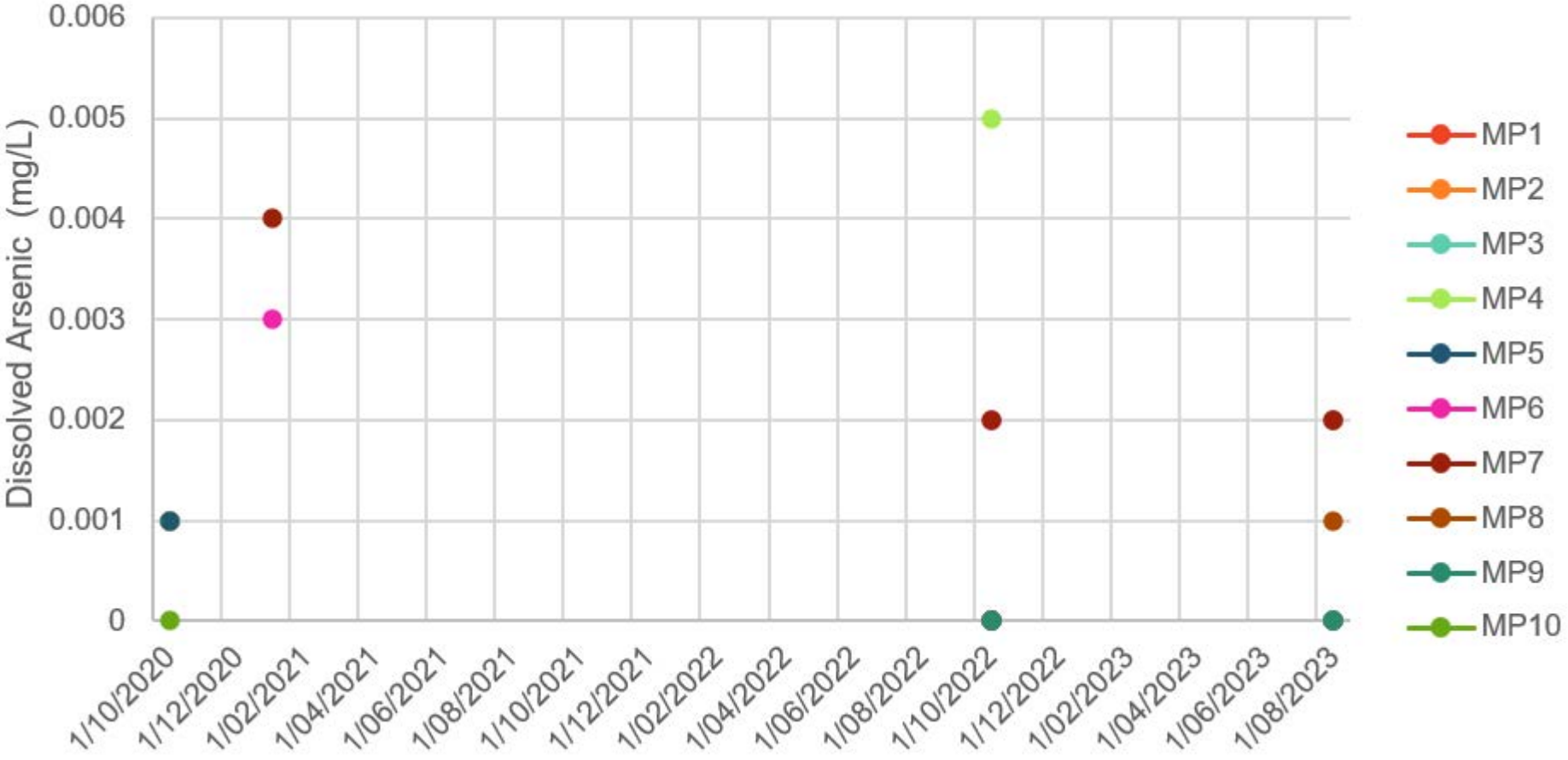
MP9
MP10


0.006
0.005
0.004
0.003
0.002
0.001
0
Dissolved Arsenic (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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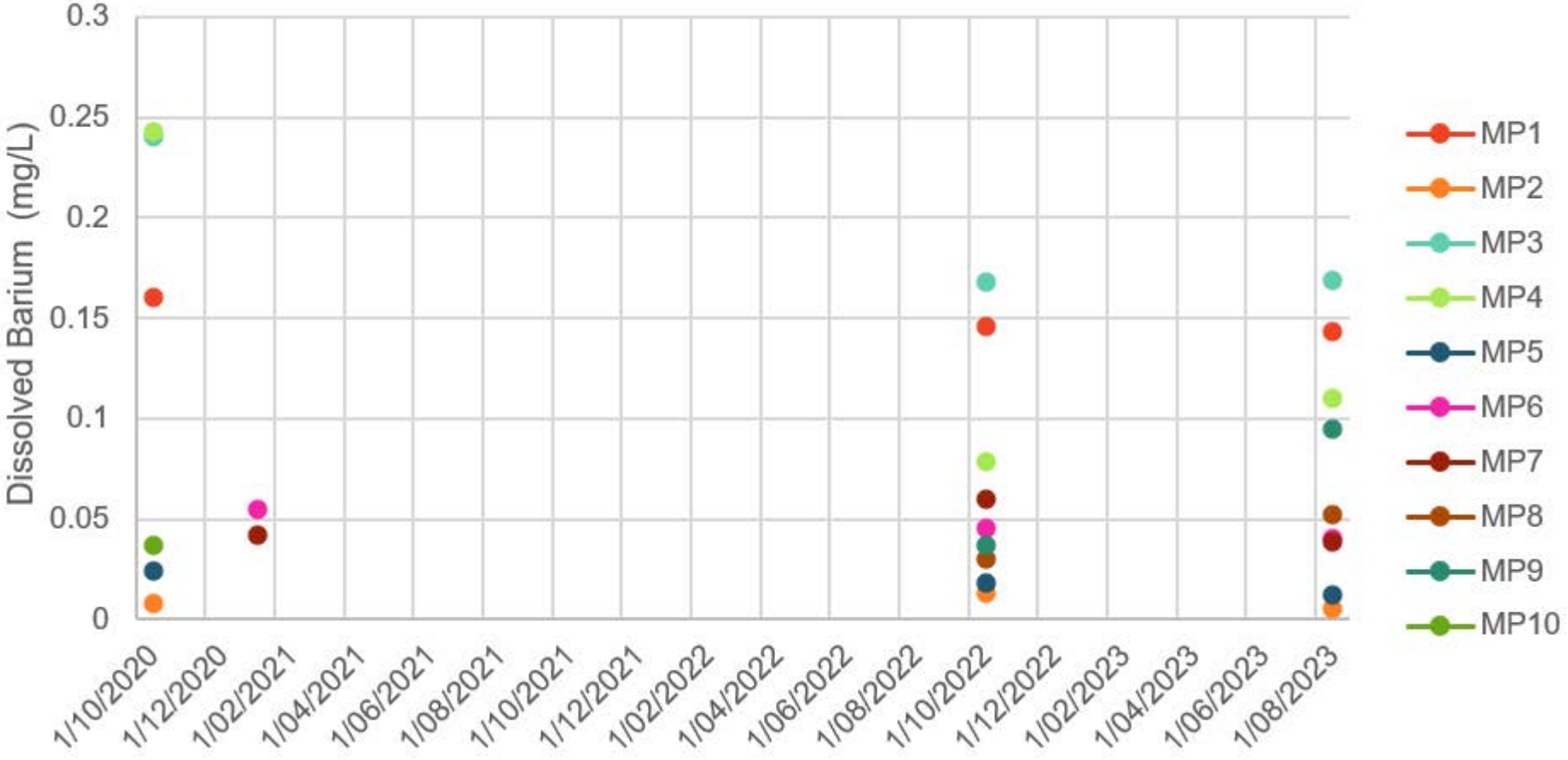
MP9
MP10


Dissolved Barium (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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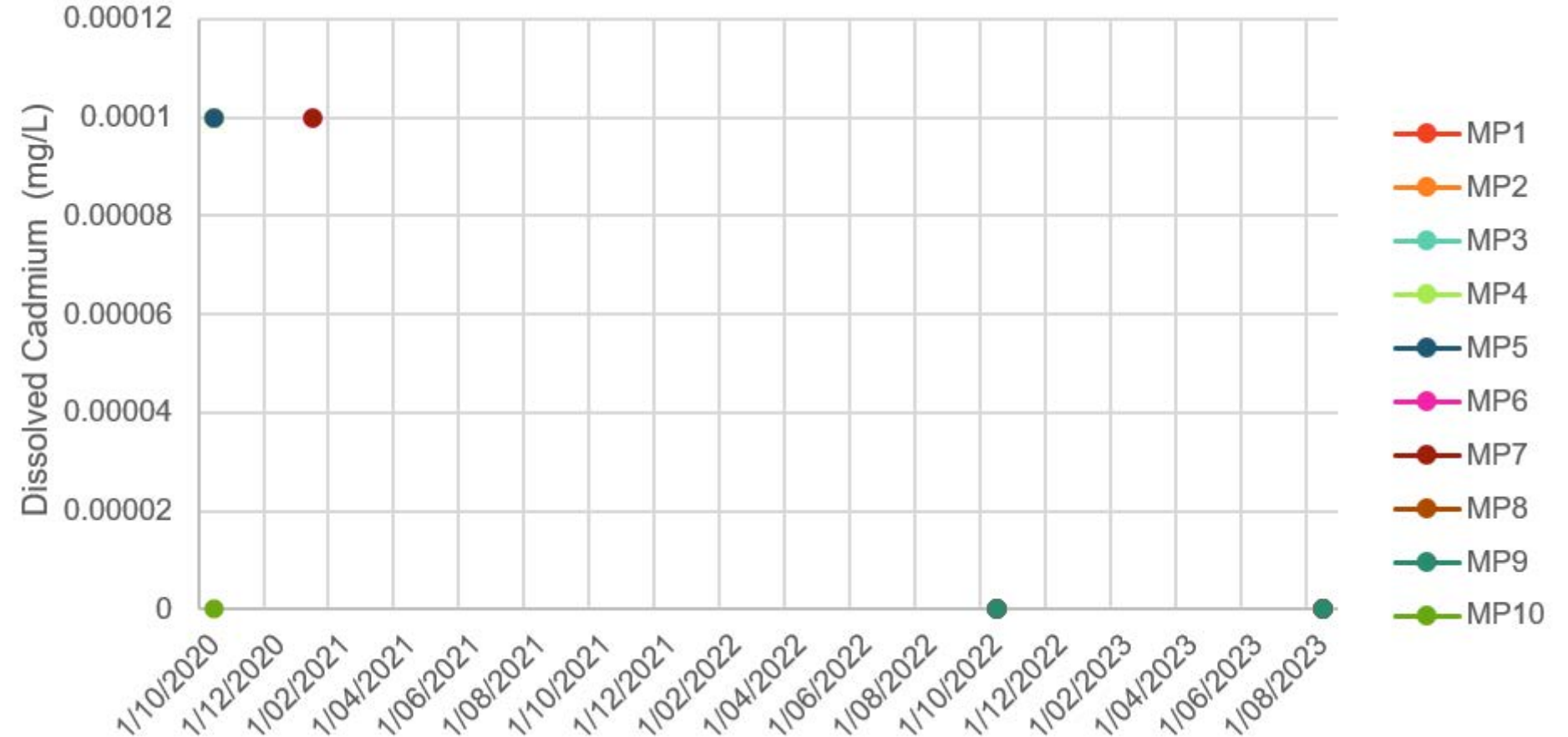
MP9
MP10


Dissolved Cadmium (mg/L)
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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MP6
MP7
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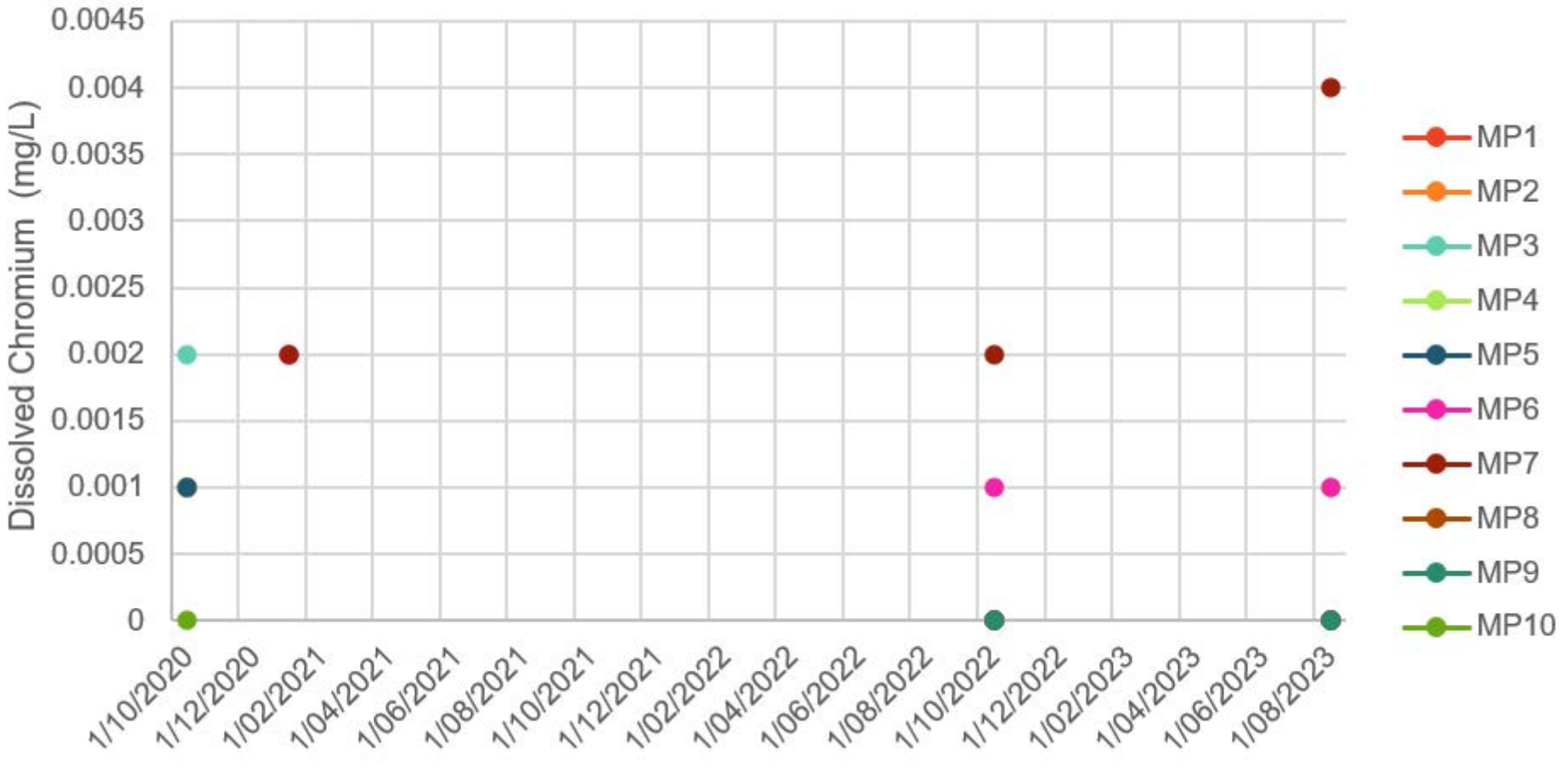
MP9
MP10


Dissolved Chromium (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
MP3
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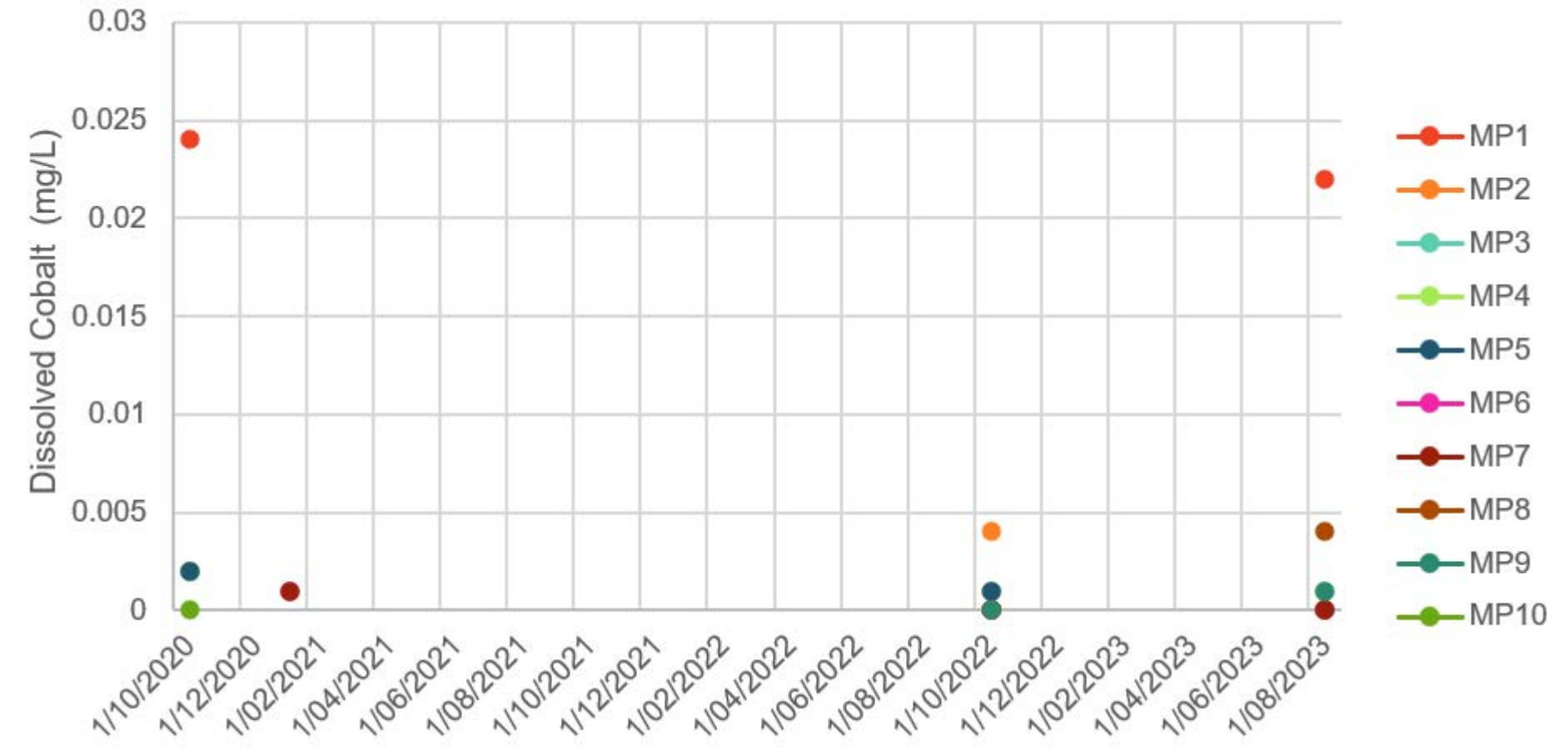
MP5
MP6
MP7
MP8
MP9
MP10


0.03
0.025
0.02
0.015
0.01
0.005
0
Dissolved Cobalt (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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MP3
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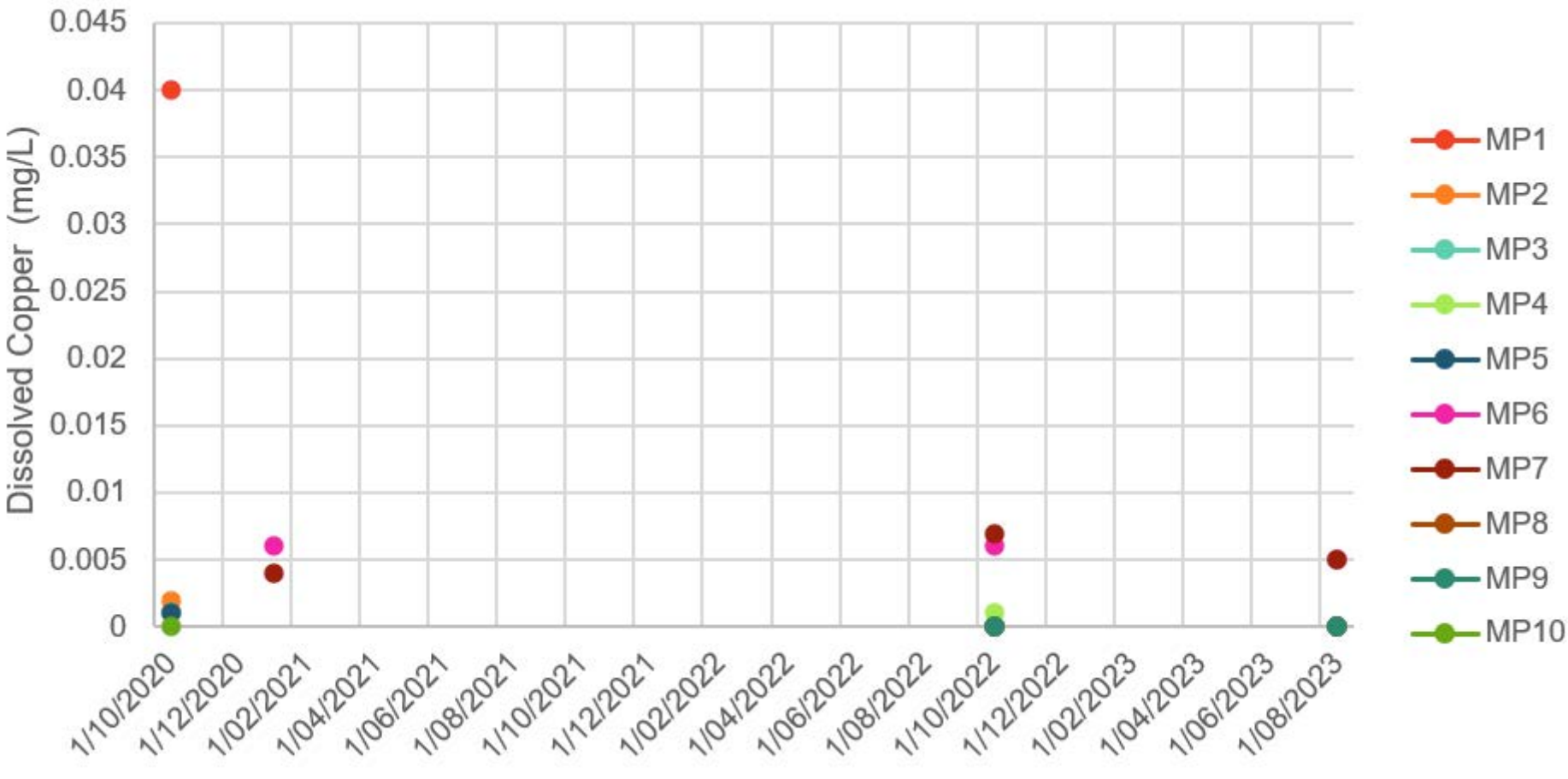
MP9
MP10


Dissolved Copper (mg/L)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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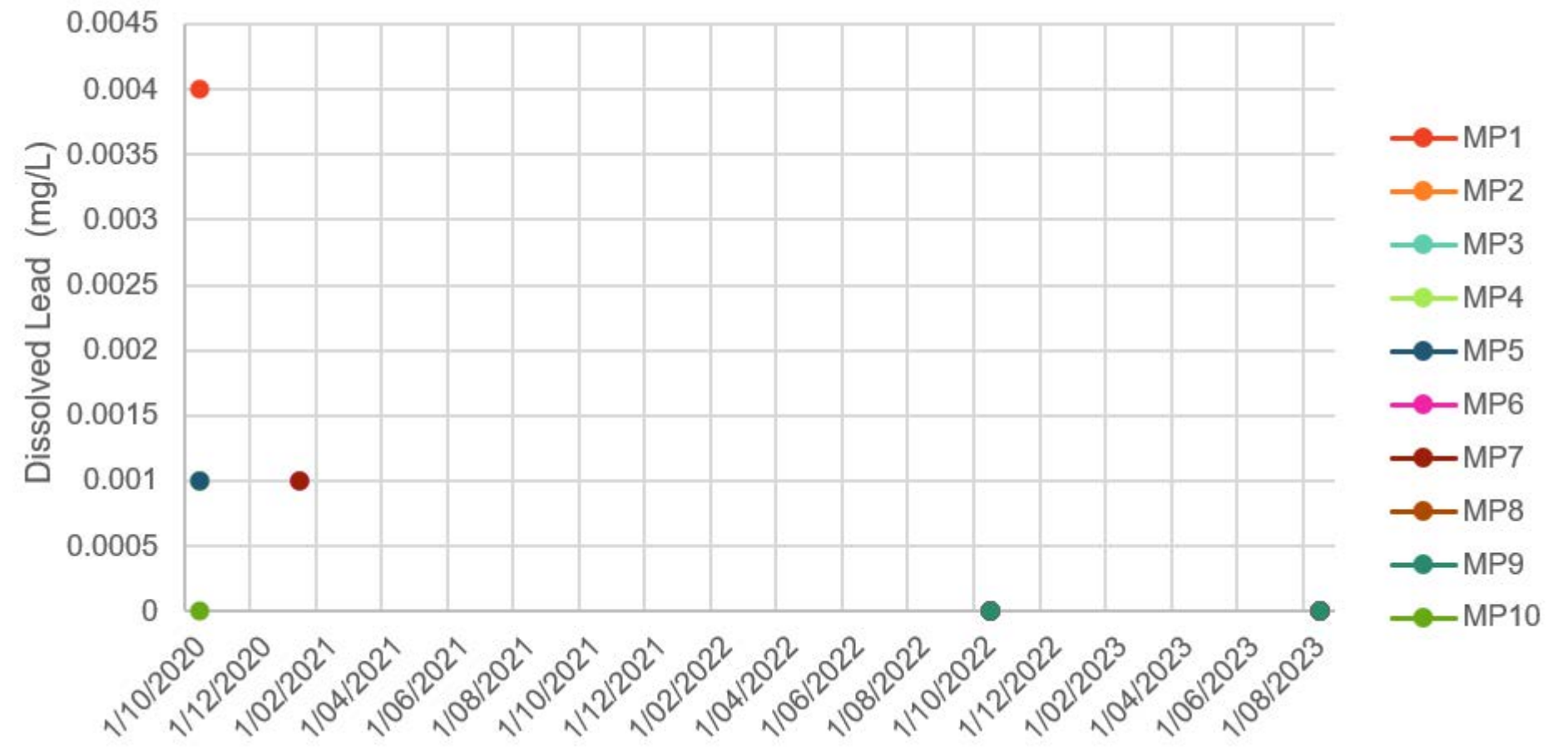
MP7
MP8
MP9
MP10


Dissolved Lead (mg/L)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
MP3
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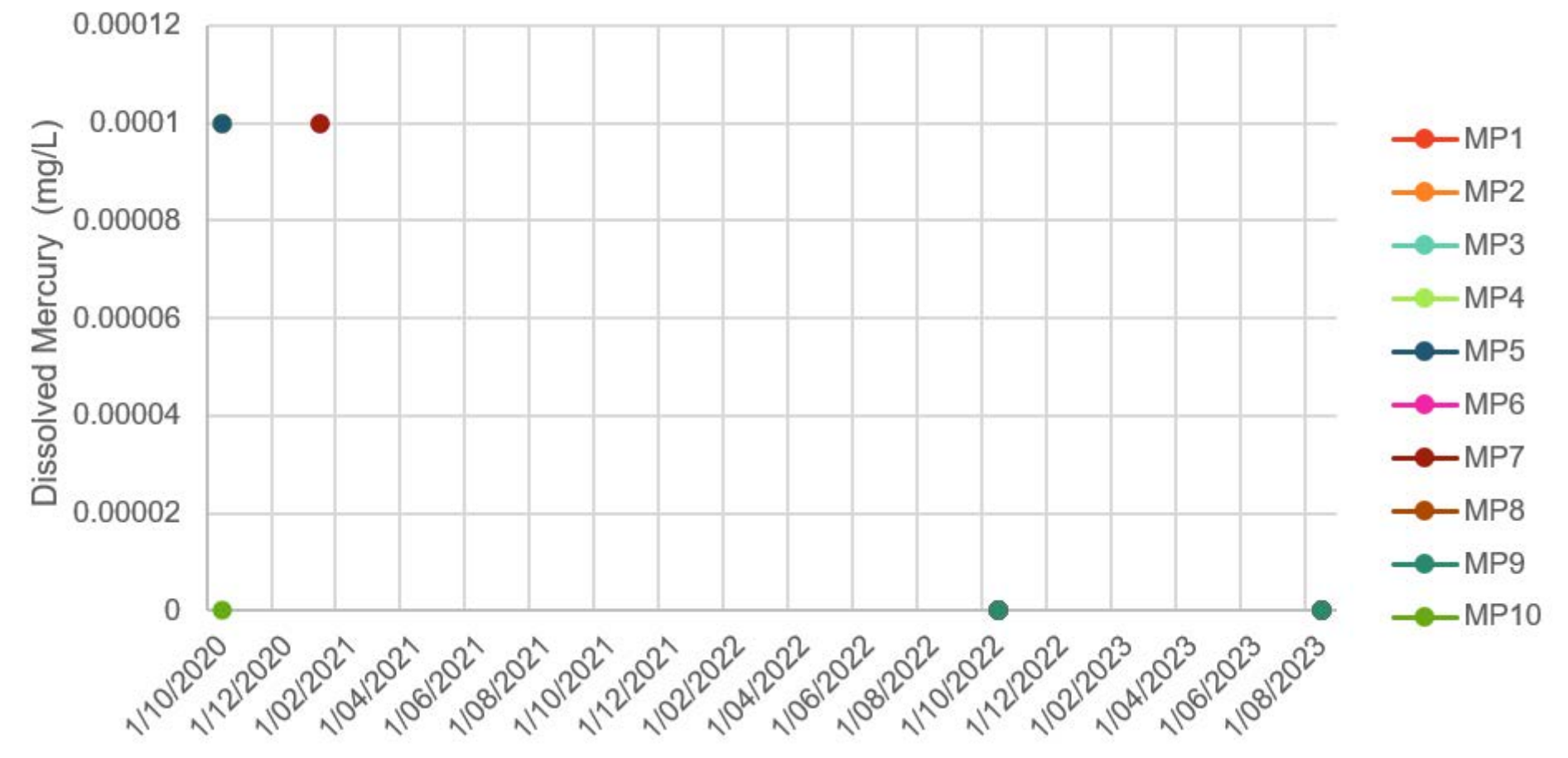
MP5
MP6
MP7
MP8
MP9
MP10


Dissolved Mercury (mg/L)
0.00012
0.0001
0.00008
0.00006
0.00004
0.00002
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
MP2
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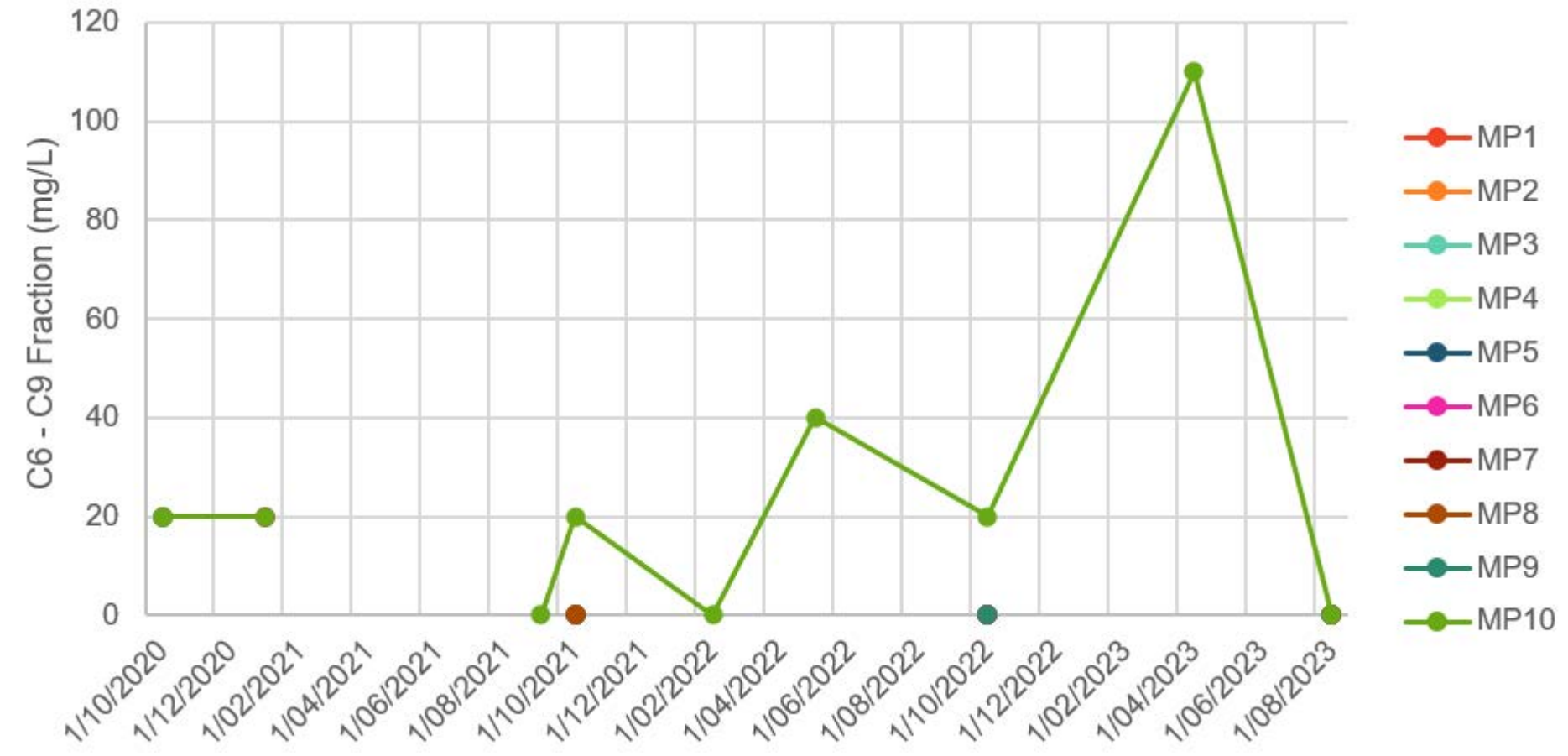
MP5
MP6
MP7
MP8
MP9
MP10


C6 - C9 Fraction (mg/L)
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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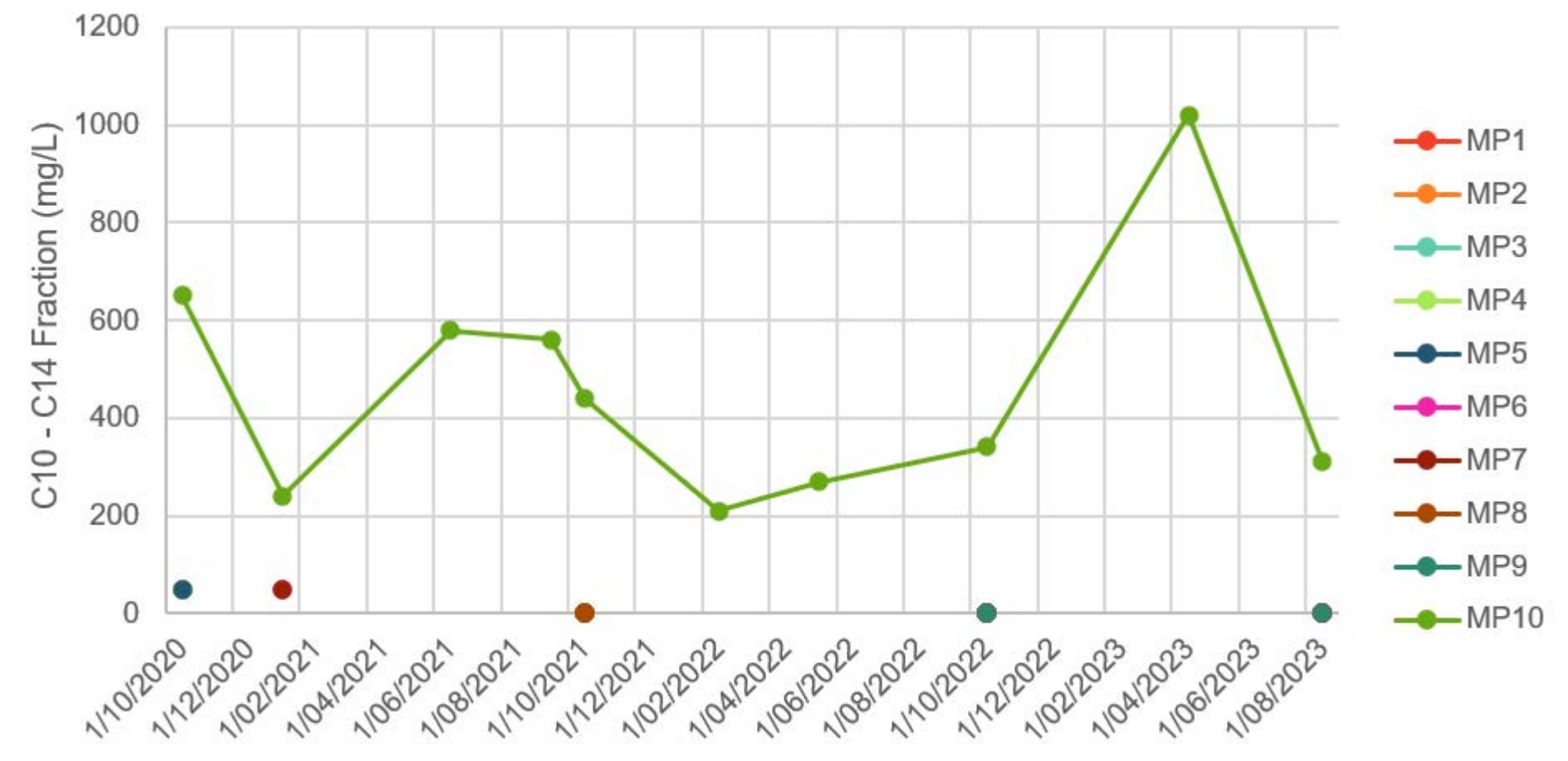
MP6
MP7
MP8
MP9
MP10


C10 - C14 Fraction (mg/L)
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
1/08/2022
1/10/2022
1/12/2022
1/02/2023
1/04/2023
1/06/2023
1/08/2023
MP1
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C15 - C28 Fraction (mg/L)
2500
2000
1500
1000
500
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
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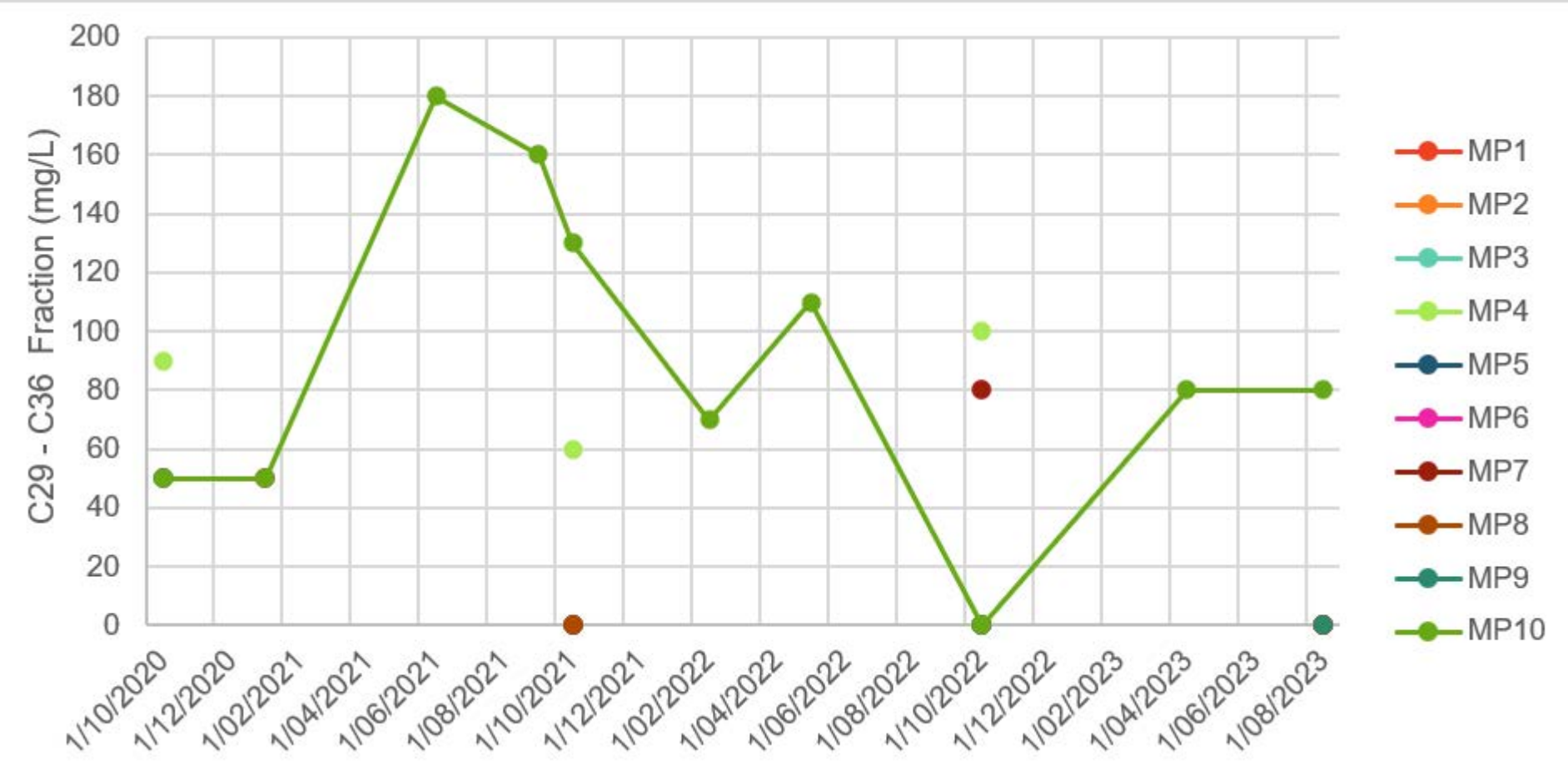
C29 - C36 Fraction (mg/L)
200
180
160
140
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
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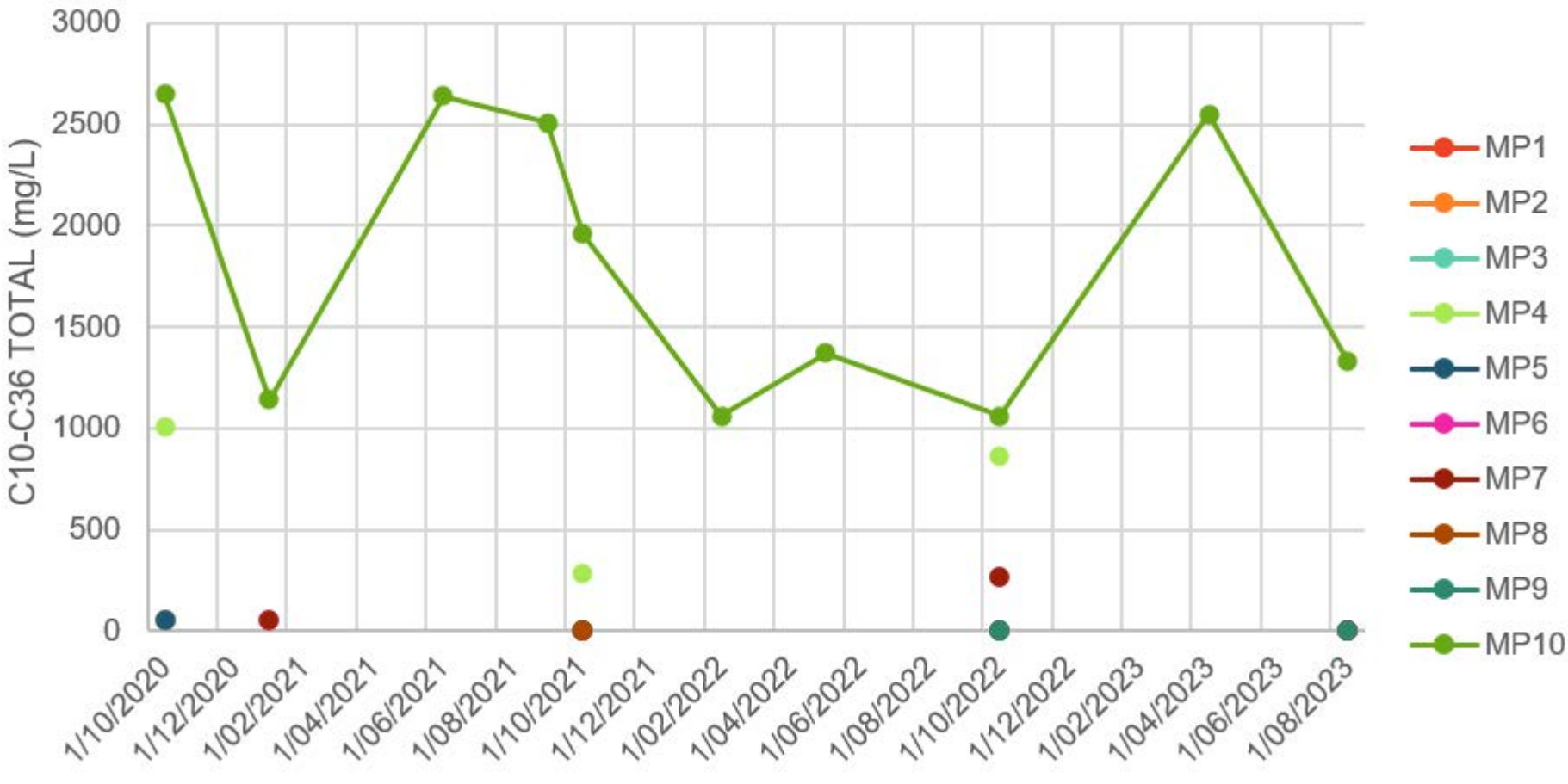
C10-C36 TOTAL (mg/L)
3000
2500
2000
1500
1000
500
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
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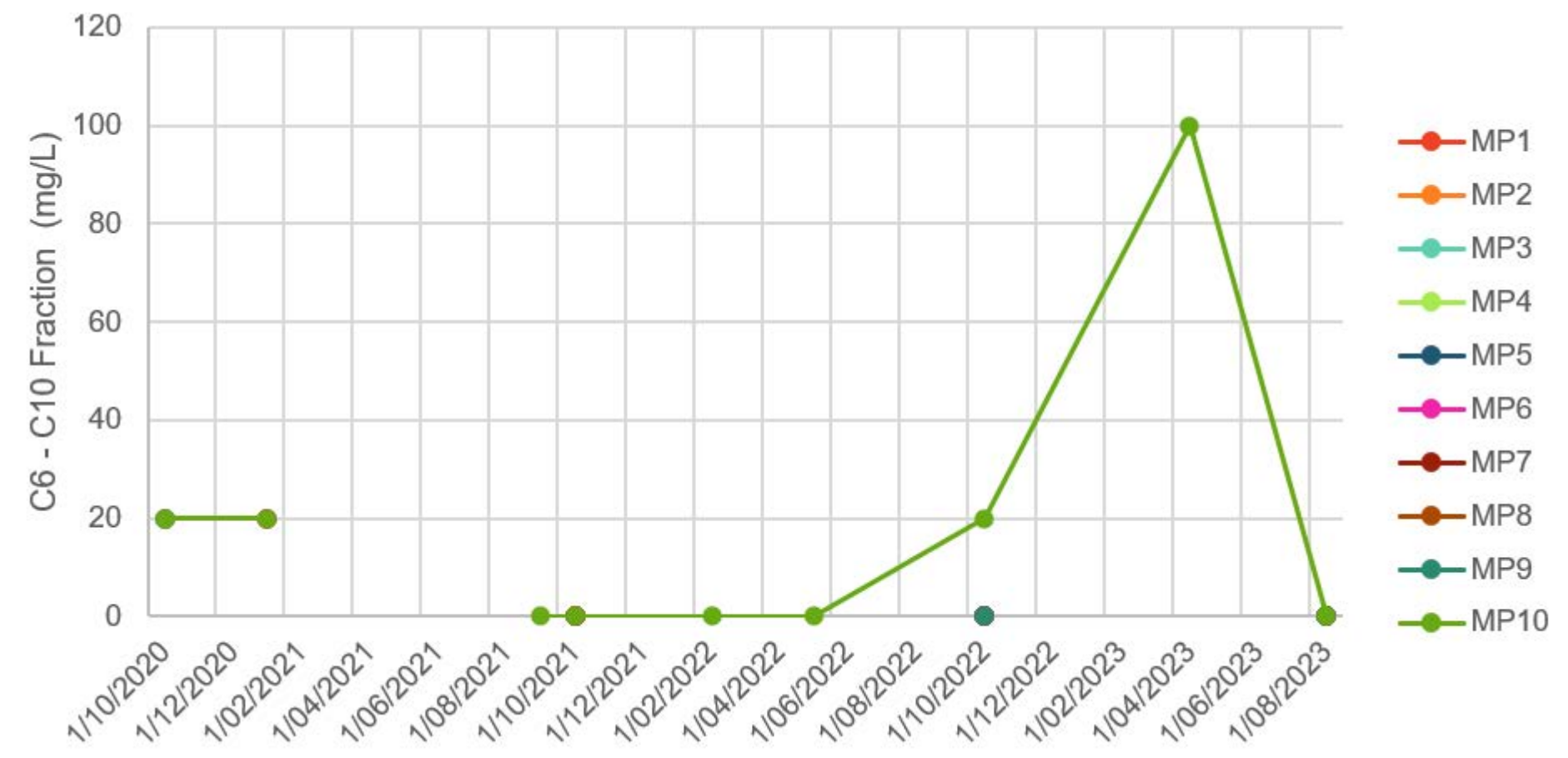
C6 - C10 Fraction (mg/L)
120
100
80
60
40
20
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
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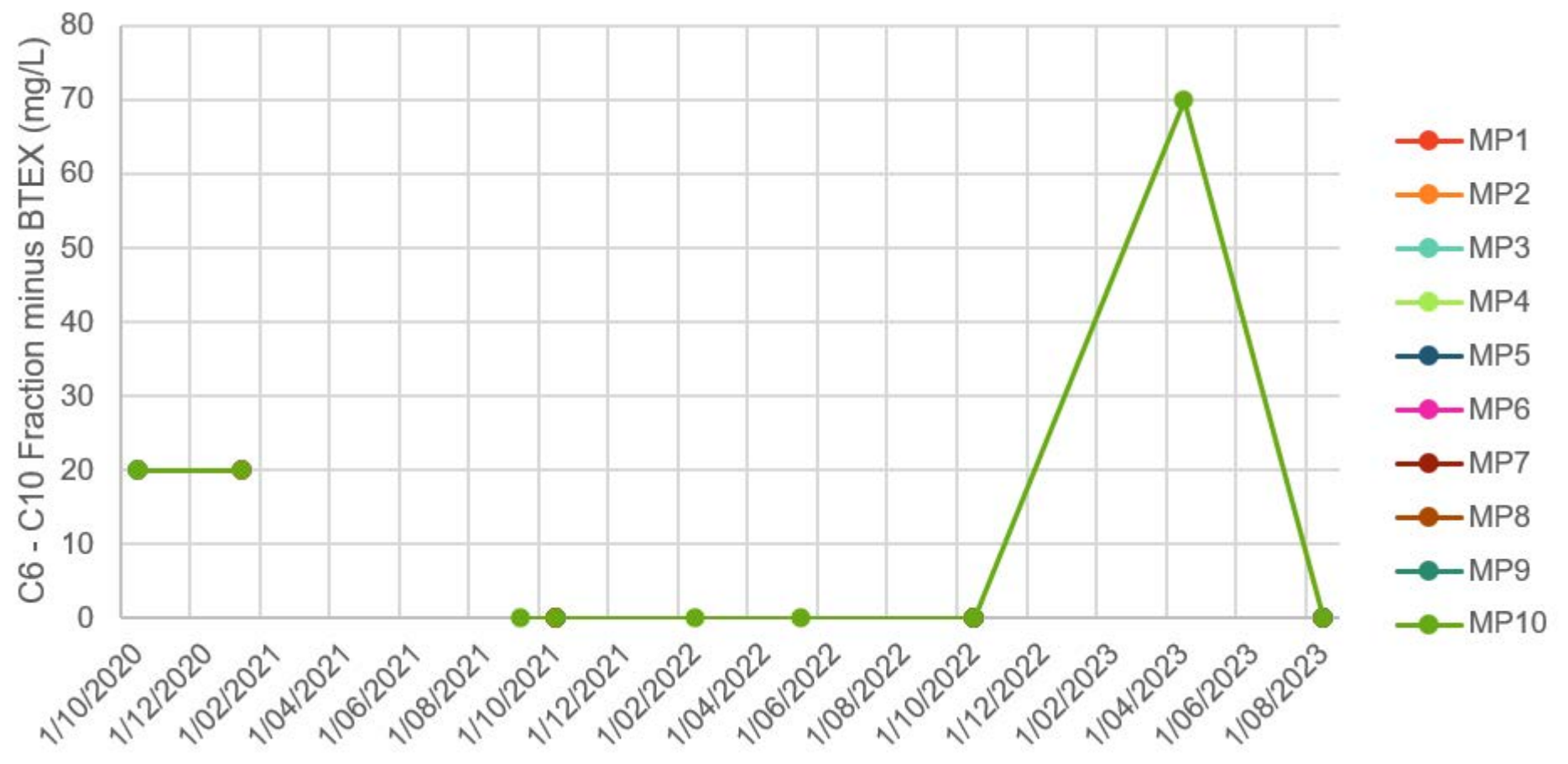
C6 - C10 Fraction minus BTEX (mg/L)
80
70
60
50
40
30
20
10
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
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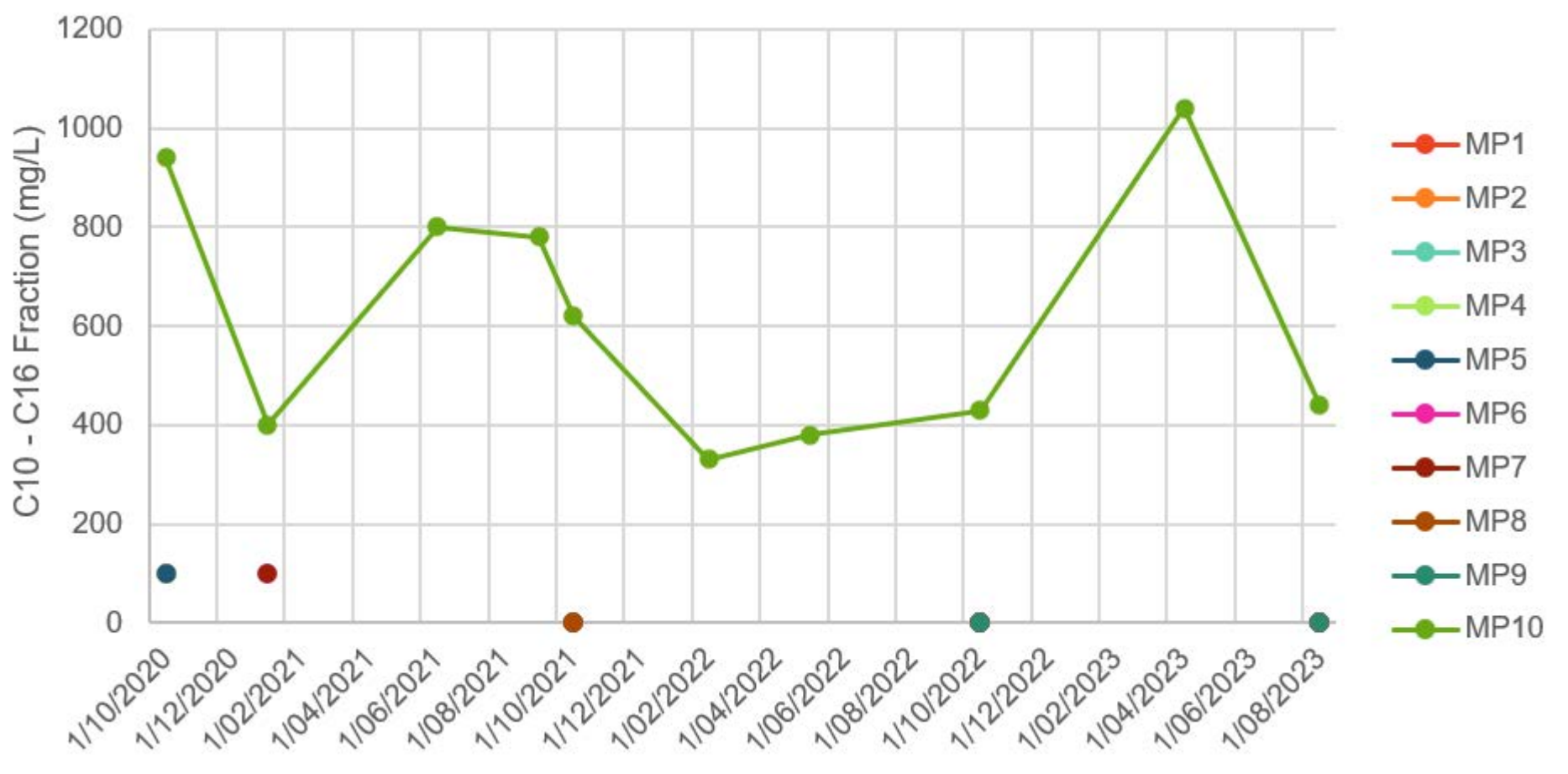
C10 - C16 Fraction (mg/L)
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
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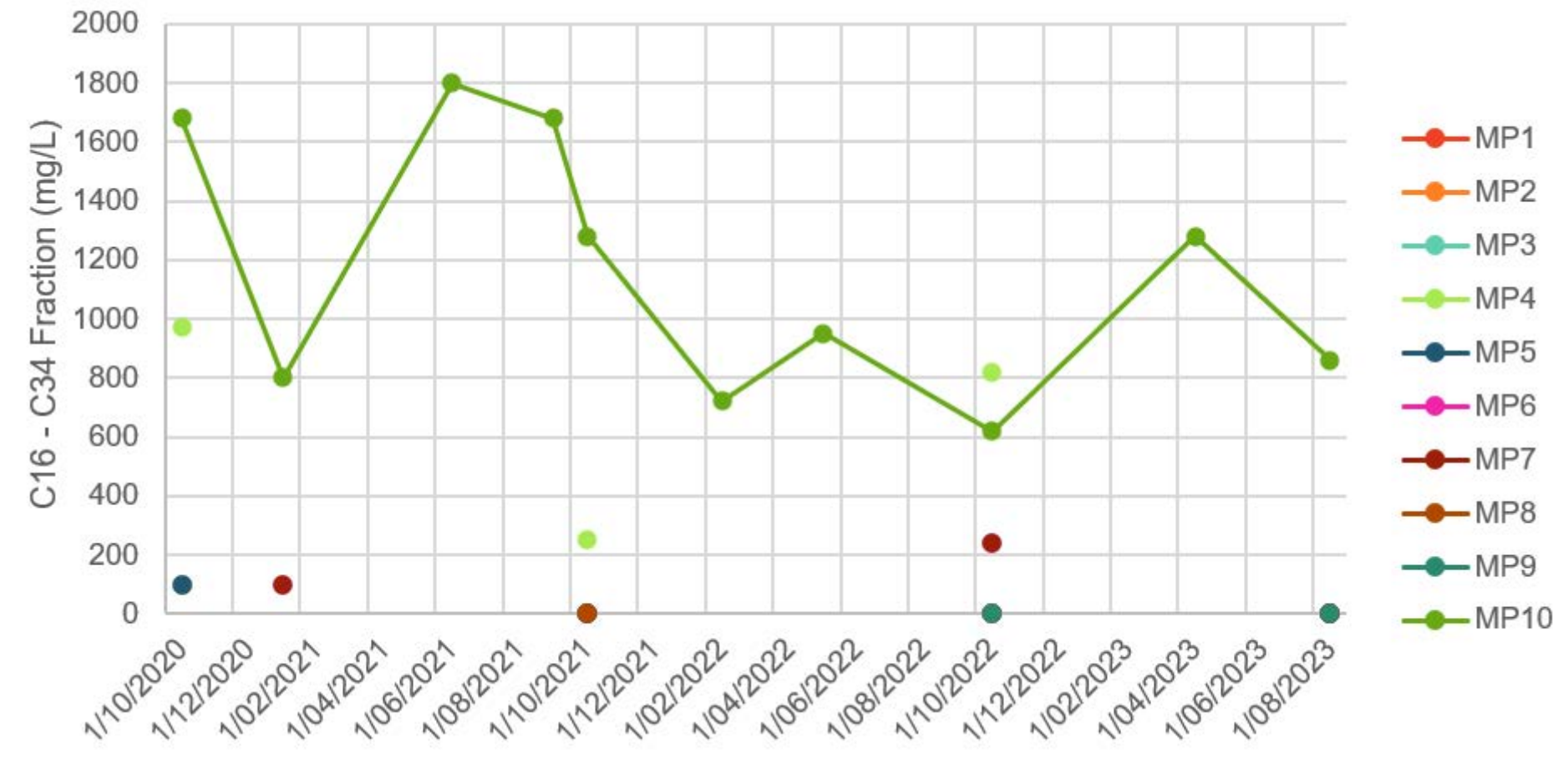
C16 - C34 Fraction (mg/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
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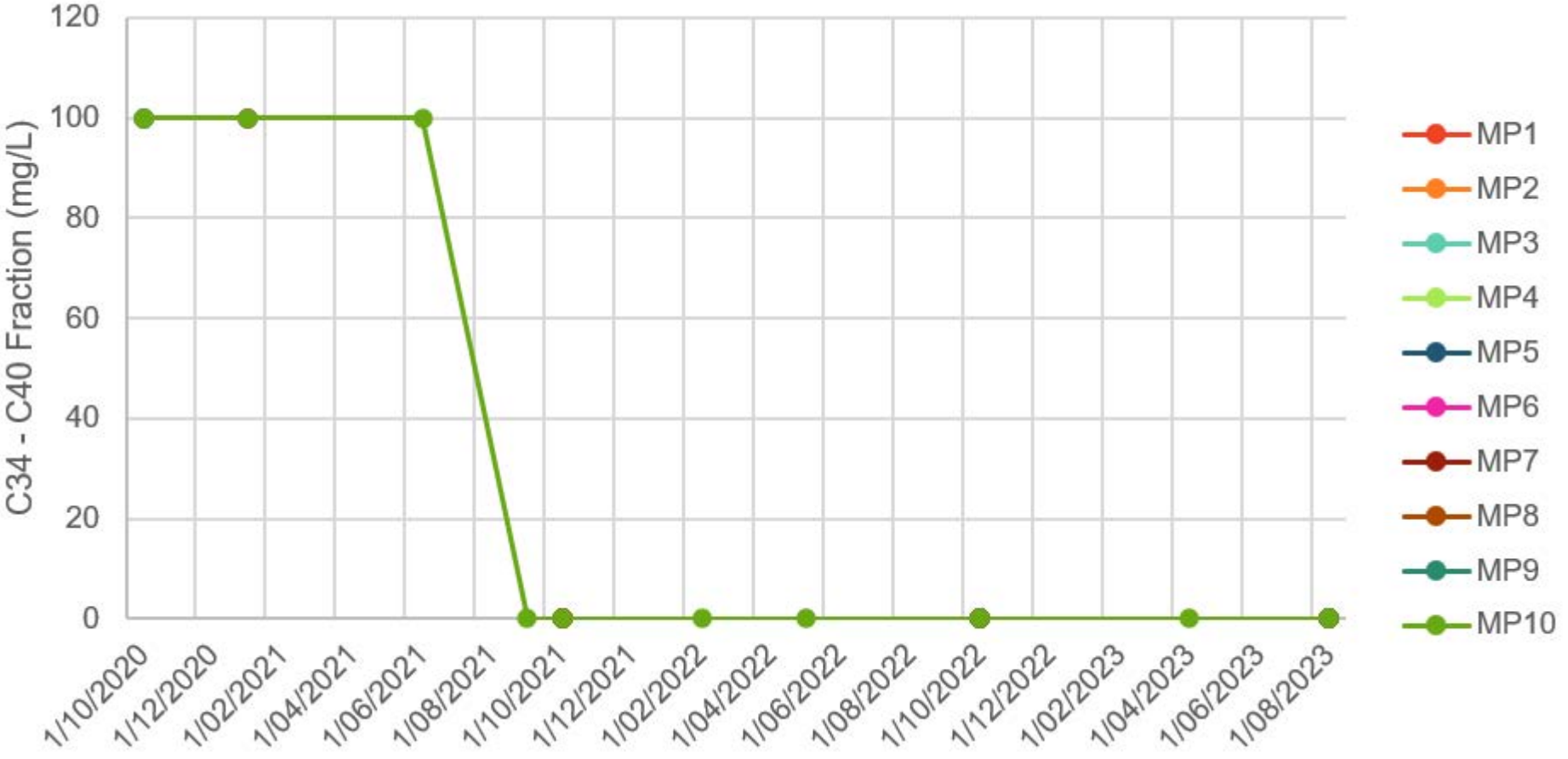
120
100
80
60
40
20
0
C34 - C40 Fraction (mg/L)
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
1/04/2022
1/06/2022
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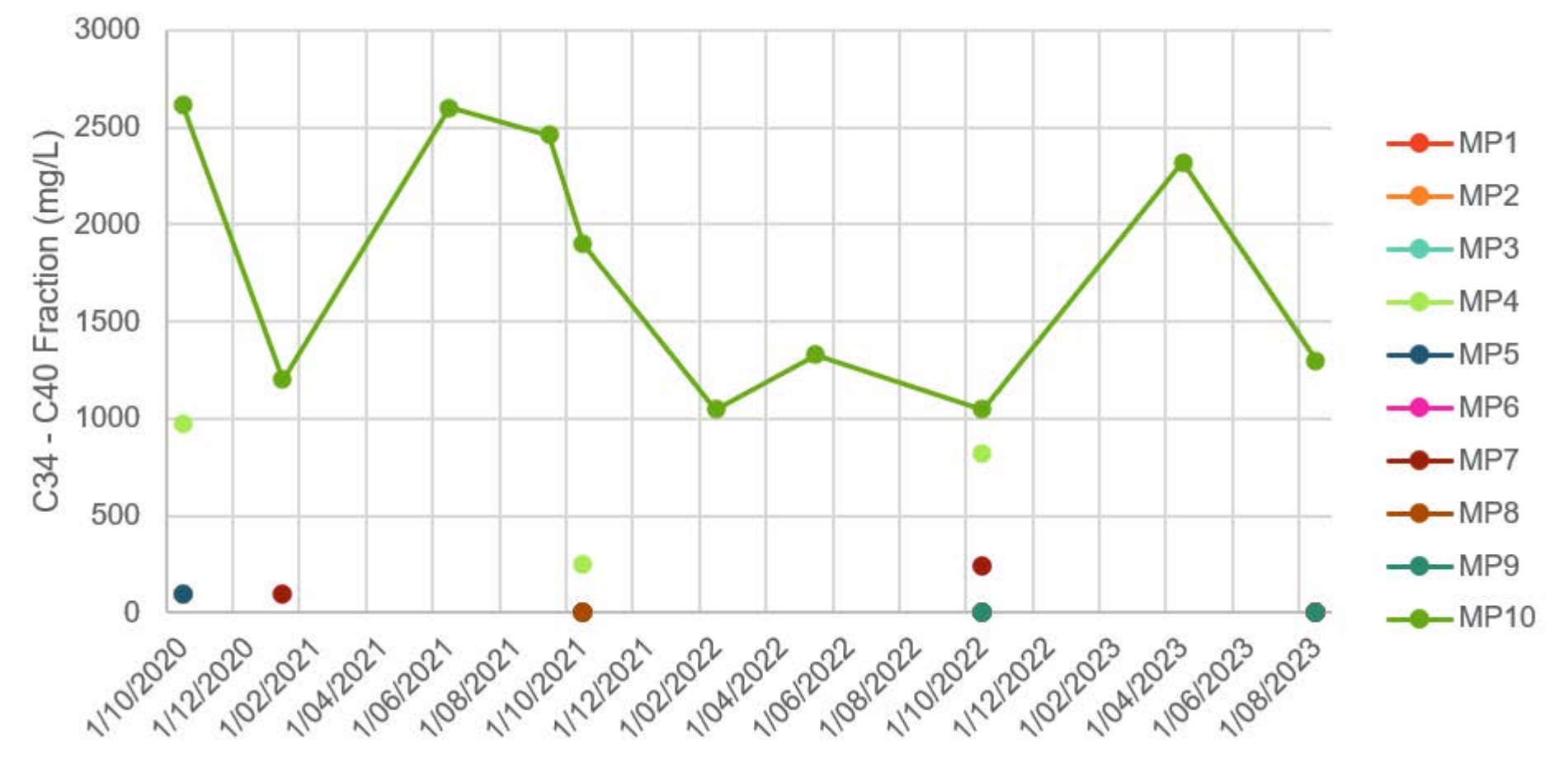
C34 - C40 Fraction (mg/L)
3000
2500
2000
1500
1000
500
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
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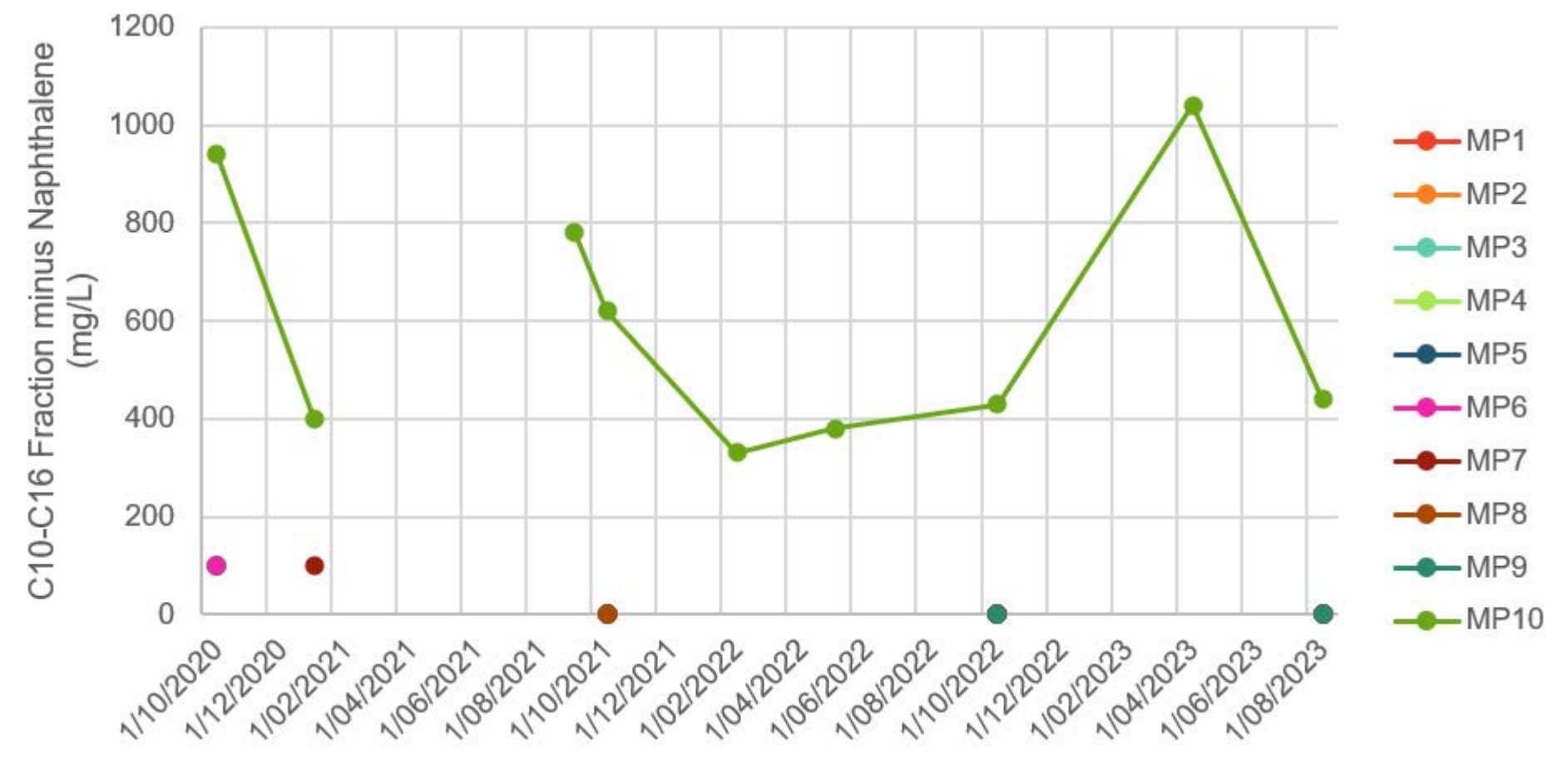
C10-C16 Fraction minus Naphthalene (mg/L)
1200
1000
800
600
400
200
0
1/10/2020
1/12/2020
1/02/2021
1/04/2021
1/06/2021
1/08/2021
1/10/2021
1/12/2021
1/02/2022
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