Environmental Monitoring Report – Water Management and Monitoring 2022/23

Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project

27 September 2023

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Environmental Monitoring Report – Water Management and Monitoring 2022/23

Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project

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Acronyms and Abbreviations

Name	Description
EMR	Environmental Monitoring Report
AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment Conservation Council
ANZG	Australia and New Zealand Guidelines
BCA	Brine conditioned ash
CSP	Coal Settling Pond
DPE	NSW Department of Planning and Environment
EC	Electrical conductivity
EnergyAustralia	EnergyAustralia NSW Pty Limited
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
FHP	Final Holding Pond
ha	Hectares
LCC	Lithgow City Council
LDP	Licenced Discharge Point
LMP	Licenced Monitoring Point
LNAR	Lamberts North Ash Repository
LOR	Limit of Reporting
m AHD	metres Australia Height Datum (m AHD).
MF	Micro Filtration
mg/L	milligrams per litre
ML	Mega litre
MPAR	Mt Piper Ash Repository
MPPS	Mt Piper Power Station
Nalco	Nalco Water – Ecolab
NFR	Non-filterable Residue, also referred to as Turbidity.

Name	Description
NSW	New South Wales
OEMP	Operational Environmental Management Plan
POEO Act	Protection of the Environment Operations Act (NSW) 1997
QA/QC	Quality Assurance and Quality Control
QC	Quality Control
RL	Relative Level
RO	Reverse Osmosis
SWTP	Springvale Water Treatment Plant
TARPs	Trigger Action Response Plans
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
WCA	Water Conditioned Ash
WMP	Water Management and Monitoring Plan
µg/L	micrograms per litre
µS/cm	microSiemens per centimetre

Report Terminology

The Project - the Mt Piper Brine Conditioned Fly Ash Co-Placement Project approved under the conditions of development consent DA80/10060 (Mt Piper Consent).

The Mt Piper Consent – originally granted under the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act) on 1 April 1982 and has since been modified on eight occasions. The Mt Piper Consent, as currently modified (Modification 8, dated 24 July 2019), authorises the MPPS and ancillary activities, including the Mt Piper Ash Repository (MPAR).

The WMP – the Water Management and Monitoring Plan approved for the Project, prepared by ERM and dated 28 February 2020 (the WMP).

The EMR – this report which has been developed in relation to water management and monitoring aspects of the Project in order to satisfy Conditions 44 and 45 of the Mt Piper Consent, and the relevant reporting requirements of the Water Management and Monitoring Plan approved for the Project (the WMP).

The Ash Repositories – the MPAR and the LNAR are together referred to as the Ash Repositories.

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by EnergyAustralia NSW Pty Limited (EnergyAustralia) to prepare an annual Environmental Monitoring Report (EMR) for the Mt Piper Brine Conditioned Fly Ash Co-Placement Project (the Project). The Project is located at the Mount Piper Power Station (MPPS), 350 Boulder Road, Portland, New South Wales (NSW) (the site). Refer to Figure 1 showing the location of the site.

The Project is operated under the conditions of development consent DA80/10060 (Mt Piper Consent). The Mt Piper Consent was originally granted under the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act) on 1 April 1982 and has since been modified on eight occasions. The Mt Piper Consent, as currently modified (Modification 8, dated 24 July 2019), authorises the MPPS and ancillary activities, including the Mt Piper Ash Repository (MPAR).

This EMR has been developed in relation to water management and monitoring aspects of the Project in order to satisfy Conditions 44 and 45 of the Mt Piper Consent, and the relevant reporting requirements of the Water Management and Monitoring Plan approved for the Project (the WMP). It has been developed in general accordance with the requirements of the NSW Department of Planning and Environment (DPE), formerly the NSW Department of Planning, Industry and Environment (DPIE) post approval compliance reporting requirements (DPIE, 2020). Appendix A presents a summary of the requirements of the Mt Piper Consent and the WMP, and where they are addressed in this EMR. Consistent with feedback from the DPE on the 2021/22 EMR, Table 1 provides a statement of compliance as at the end of the reporting period and based on the information in this EMR.

Table 1: Statement of Compliance

Were all conditions of the relevant approval complied with?		
DC DA80/10060 (Mt Piper Consent)	Conditions 44 and 45, the annual Environmental Monitoring Report (EMR)	YES

This EMR reports on the water monitoring carried out for the Project from July 2022 to June 2023 (the reporting period) in accordance with the conditions of the Mt Piper Consent. It will be provided to the Secretary, the NSW Environment Protection Authority (EPA), the Water Division within the NSW DPE, WaterNSW, and Lithgow City Council (LCC).

This report should be read in conjunction with the Statement of Limitations presented in Section 10.

1.1 Project Background

The MPPS is located in the western coalfields of NSW about 18 kilometres north-west of Lithgow. The MPPS is owned and operated by EnergyAustralia. The MPPS is regulated by a number of separate development consents and planning approvals under the EP&A Act, including the Mt Piper Consent. The MPPS is also regulated under the conditions of Environment Protection Licence 13007 (EPL) granted under the Protection of the Environment Operations Act 1997 (NSW) (the POEO Act). Table 2 lists the approvals that apply to the Project and form the subject of this EMR.

Table 2: Summary of Approvals

Approval/ Licence	Details/Comments
Mt Piper Consent	Granted by Minister for Planning under the EP&A Act as currently modified. The WMP was approved under the conditions of the Mt Piper Consent.
EPL No. 13007	EPL held by EnergyAustralia for the MPPS, including the Project.

The Project incorporates brine management and storage facilities on the footprint of the MPPS and the ash emplacement area within the former Western Main Open Cut void adjacent to the operational power generation area.

The ash placement area is comprised of the MPAR, which is authorised under the Mt Piper Consent, and the separately approved Lamberts North Ash Repository (LNAR). The MPAR and the LNAR are together referred to as the Ash Repositories. However, this EMR is limited to the MPAR which was approved under the Mt Piper Consent.

The separately approved Springvale Water Treatment Project (SWTP) is also located on the MPPS footprint but outside of the EPL premises. Both the SWTP and the MPPS contribute brine to the MPAR. The SWTP also contributes solid mixed salts to the MPAR. Key features of the Project area are presented in Figure 2.

The Mt Piper Consent was modified on 3 April 2000 to authorise the co-placement of brine conditioned ash (BCA) in the existing MPAR placement area. This Stage 1 BCA co-placement activity was approved as Modification 4 to the Mt Piper Consent. As required by the conditions imposed as part of Modification 4, an early Water Management Plan was developed and implemented. Due to space limitations in the Stage 1 approval area and to provide for increased brine production due to the upgrade of generating capacity (authorised as Modification 6 to the Mt Piper Consent), a Stage 2 extension to the BCA co-placement area at the MPAR was approved on 23 March 2008 (authorised as Modification 7 to the Mt Piper Consent). A Water Management Plan (Mt Piper Power Station Brine Conditioned Flyash Co-Placement Extension Water Management and Monitoring Plan prepared by Connell Wagner and dated 26 September 2008) was prepared and implemented under the conditions of the Mt Piper Consent for the MPAR. This is referred to in this report as the "Prior WMP."

Following the approval of Modification 8 to the Mt Piper Consent (Condition 43A), the Prior WMP was updated to account for construction and operation of a new 60 Mega Litres (ML) pond (Settling Pond D) at the MPPS. The current WMP was prepared by ERM and is dated 28 February 2020 (ERM, 2020) (the WMP).

It is noted that a separate and broader investigation of surface and groundwater conditions in the vicinity of the Ash Repositories, including the Mt Piper Brine in Ash Co-Placement area has recently been completed in line with the contingency measures identified in the WMP (the independent groundwater investigation). Based on findings from the independent groundwater investigation, a modification application for the Mt Piper Consent is pending. The proposed modification to the Mt Piper Consent is intended to enable a mitigation strategy, as the MPAR transitions to a decommissioned facility.

1.1.1 Relationship to Other Approvals and Plans

While the MPAR is approved under the Mt Piper Consent, the LNAR is separately approved by Project approval 09_0186 granted under Part 3A of the EP&A Act on 16 February 2012 (LNAR Project Approval). The conditions of the LNAR Project Approval require:

- Implementation of a separately approved Operational Environmental Management Plan. The currently approved plan is the Lamberts North Ash Placement Project Operational Environmental Management Plan (Revision 6) originally prepared by CDM Smith in 2013 and last revised by EnergyAustralia in May 2022 (LNAR Operations Environment Management Plan (OEMP)). The LNAR OEMP includes a Groundwater Management Plan and a Surface Water Management Plan; and
- The carrying out of groundwater and surface water monitoring programs as specified in the LNAR OEMP. The results of the LNAR monitoring are reported in a separate EMR prepared in accordance with the conditions of the LNAR Project Approval.

As the LNAR is operated in accordance with the separately approved LNAR OEMP under the conditions of the LNAR Project Approval, this EMR does not cover water management, monitoring and reporting aspects required under the LNAR OEMP.

In addition, the SWTP was separately approved under development consent number SSD-7592 (SWTP Consent) granted under the EP&A Act in 2017.

1.2 Objectives

The objectives of the EMR are to meet the reporting requirements of the Mt Piper Consent and the WMP for the reporting period (July 2022 to June 2023).

This includes the requirements of Condition 45 of the Mt Piper Consent which requires that the EMR include:

- A summary and discussion of all available results and analyses from Water Monitoring Programs (i.e., those contained in the WMP);
- A discussion of the aims of the WMP and to what degree these aims have been attained in the context of results and analyses of the Water Monitoring Programs; and
- Actions taken, or intended to be taken, if any, to mitigate any adverse environmental impacts and to meet the reasonable requirements of the Secretary, EPA, DPE Water, WaterNSW or the LCC.

The WMP requires that the EMR is to involve the following scope of works:

- Review of surface water and groundwater quality data;
- Review of long-term trends in surface water and groundwater concentrations, with reference to statistical assessment of concentration trends and triggers;
- Assessment of the data to evaluate potential interactions with Wangcol Creek water quality;
- Reporting when the Environmental Goals have not been achieved;
- An interpretation and discussion of results;
- Update on the contingency measures currently being implemented in accordance with the WMP; and
- Preparation of this report in accordance with the WMP and the Mt Piper Consent.

It is noted that other reporting requirements, including provision of water quality data, form part of the EPL annual return reporting process; the data presented in this EMR will also be published online as required by regulation. The reporting requirements under the EPL will be provided separately to this EMR.

1.3 Contact

The contact details for the key personnel responsible for the environmental management of the Project are listed in Table 3.

Table 3: Contact Details

Contact Person	Organisation	Position	Telephone
Mr Ben Eastwood	EnergyAustralia	NSW Environment Leader	(02) 6354 8111

1.4 Scope of Works

In order to meet the objectives of the EMR, the following works have been implemented:

- Import of environmental monitoring data provided by EnergyAustralia to the existing database for the site;
- Export of summary tables for available water quality and weather data collected by EnergyAustralia from the monitoring conducted in accordance with the WMP;
- Preparation of selected graphs of environmental monitoring data collected by EnergyAustralia from the monitoring conducted in accordance with the WMP;
- Review of surface water (seven locations), groundwater (25 locations) and leak detection (two locations) monitoring data at the Project area for the reporting period;

- Review of changes in water quality data including long-term trends in surface water and groundwater concentrations and water levels;
- Assessment of the groundwater data to evaluate potential interactions with Wangcol Creek water quality; and
- Preparation of this EMR to
  - Present an overview of Project operations, including ash placement activities,
  - Present findings of the water quality monitoring, including interpretation and discussion of results, in accordance with the WMP,
  - Present outcomes of the statistical assessment of water quality data that exceeded Environmental Goals during the reporting period, including a discussion of trigger, action, response plans (TARPs) where implemented,
  - Provide an update on the contingency measures currently being implemented at the site in accordance with the WMP, and
  - Provide a summary of recommended actions to be taken, if any, to mitigate adverse environmental impacts, and to meet the requirements of the relevant government authorities and the WMP.

This EMR has been developed with consideration of the independent investigation of groundwater and surface water conditions in the vicinity of both the MPAR and the LNAR (the independent investigation). Refer to Section 7.4 for further details.

2. OPERATIONS SUMMARY

All ash placement operations for MPPS, including those within the Project area, are undertaken by the contracted specialist in ash placement. ServiceStream is the current service provider for EnergyAustralia in all aspects of ash and dust management in relation to the Project, which is currently managed under an ‘operate and maintain’ contract with EnergyAustralia. Refer to Figure 2 for a site layout plan that presents key features of the Project area.

2.1 Site Water Discharge

During the reporting period, water discharged from the Coal Settling Pond (CSP) via the Licenced Discharge Point (LDP12) under EPL 13007 was estimated to be 64.7 ML and complied with the water quality criteria under EPL13007 Condition L3.8.

Following high rainfall and greater than 56mm over five consecutive days, LDP12 was subject to overtopping for three days (on 4/07/2022 and in the period from 09/10/2022 to 10/10/2022) during the reporting period. The discharge of water during these periods complied with EPL13007 condition L3.11. Records of discharge flows at LDP12 during the reporting period are provided in Appendix B.

Discharge from LDP12 enters the Western Drain, which is part of the upstream Wangcol Creek catchment, before flowing into the Final Holding Pond (FHP). The FHP holds stormwater from the clean water diversions from around the MPPS and has gates that can be closed in the event of an environmental incident to limit the likelihood of adverse impacts to the downstream surface water environment. The FHP was constructed within Wangcol Creek, and it operates as the final pollution control structure for surface water associated with the MPPS. Surface water monitoring location LMP01 is the sampling location on Wangcol Creek downstream of the FHP and is representative of instream conditions downstream of the FHP and upstream of the Ash Repositories.

A data summary for water quality in LDP12 (representative of discharge) is presented in this EMR. . Figure 2 presents the locations of the Coal Settling Pond (CSP) and the FHP. Figure 5 presents the locations of LDP12 and monitoring point LMP01. These locations are included as surface water monitoring points in the WMP.

2.2 Ash Placement and Geometry

The MPAR is located within the former Western Main Open Cut mine void in the eastern area of the MPPS facility, which is discussed further in Section 3.2.

The MPPS commenced operations in 1993 and since that time water conditioned ash (WCA) has been placed at the MPAR. WCA and BCA have been placed at the MPAR since 2000, with placement of BCA limited to approved areas, as described below. In accordance with the WMP, the conditioning of the ash occurs at the MPPS, and the conditioned ash is then transferred via conveyors or trucks to the MPAR for placement.

The MPAR has approval for development up to a Relative Level (RL) of 980 m Australian Height Datum (AHD), with the upper surface of the ash to be finished with 1 m of WCA, following the contours of the placement plan approved by the LCC in 1990, as replicated in Figure 3. Further, condition 38A of the Mt Piper Consent requires that the placement of BCA may only occur between the levels of RL 946 metres Australia Height Datum (m AHD) and RL 980 m AHD in approved BCA placement areas (Stage 1 and Stage 2 approval areas). Refer to Figure 2 and Figure 3 for representation of the approved MPAR placement area and schematic of external batter placement.

With reference to the Ash Repository Survey (Appendix C) and Figure 4, BCA continued to be deposited across Stage 1 and Stage 2 approval areas for the Project over the reporting period, with some areas of the MPAR having reached the approved height of 980 m AHD. It is noted that the provided survey was conducted in December 2022 and amended in February 2023. An updated survey is currently being undertaken but will not be completed before submission of this report.

Based on information supplied by EnergyAustralia, a total of 125,900 tonnes (t) of BCA was placed in the MPAR over the reporting period. Refer to Table 4 for a summary of the Project operations for the reporting period, with comparison to the previous reporting period.

Table 4: Operations Summary for the Project

Activity	Previous Reporting Period (2021-2022)	Current Reporting Period (2022-2023)
Ash delivered (T)	460,973[1]	373,247[1]
WCA placed (T)	236,573	197,483
BCA placed (T)[2]	224,400	125,900
Total ash footprint (ha)	71.2	71.2
Area of repository capped (ha)[2]	42.65	42.65

[1] = Refers to MPAR and LNAR combined
[2] = Refers to MPAR only
T = tonnes, ha = hectares

2.3 Brine Composition

Brine from MPPS is derived from the evaporative cooling process in the cooling towers. As water evaporates from the cooling towers, the concentration of salts contained in the circulating water increases, which would eventually impact upon the operation of the cooling system. A portion of the salty water is therefore regularly blown down and replaced with fresh “make up” water.

In addition, the separately approved SWTP produces brine from the treatment of mine water from dewatering facilities related to mining operations in the region (Figure 1). The separately approved brine and solid mixed salts from the SWTP are integrated with the MPPS water management system, and brine from the SWTP is transferred to the MPPS for use in conditioning ash prior to its placement in the MPAR.

During the reporting period, blow down water from the cooling towers was transferred to the Mine Water Buffer Pond for treatment by the SWTP or to the EnergyAustralia Reverse Osmosis (RO) brine concentrators and micro filtration (MF) infrastructure. The EnergyAustralia RO and MF system removes salts from the cooling water system and recycles distillate back into the cooling water cycle. The SWTP brine crystalliser system produces a mixed salt and a dewatered lime salt. Both the EnergyAustralia RO and MF system and the SWTP transfer the brine stream to Brine Waste Pond A and Brine Waste Pond B for temporary storage. This brine is used to condition the ash that is placed in approved BCA placement areas.

Brine from the EnergyAustralia brine concentrators is typically transferred to Brine Waste Pond A, while brine from the SWTP is typically transferred to Brine Waste Pond B. Brine in Waste Pond B can overtop to Brine Waste Pond A in order to manage stored brine volumes between the ponds. The brine composition depends on the source of water being treated (e.g., inputs from the SWTP and EnergyAustralia RO and MF system). Additionally, ERM understands that further treatment of the brine has been occurring through the EnergyAustralia RO and MF system. This has been implemented as a means of minimising the volume of brine requiring co-placement at the MPAR. Brine composition data has been used to inform the discussion of surface water and groundwater results below.

An average of the historical brine composition reported from Brine Waste Pond A and Brine Waste Pond B are provided in Appendix D.

The sample frequency for Brine Waste Pond A is monthly and Brine Waste Pond B is weekly. It is noted that during the current reporting period there was no sample collected on 22 July due to construction work on the boat ramp into the Brine Waste Pond.

During the reporting period the average concentrations of key parameters in brine stored in Brine Waste Pond A and Brine Waste Pond B were reported as follows:

- Alkalinity concentrations reported from Brine Waste Pond A averaged 14,243 mg/L while those in Brine Waste Pond B averaged 19,708 mg/L;
- Silver concentrations from Brine Waste Pond A and Brine Waste Pond B were generally reported as below the LOR; however, the LOR varied from 1 to 21 µg/L;
- Chromium concentrations reported from Brine Waste Pond A averaged 26 µg/L while concentrations from Brine Waste Pond B averaged 53 µg/L;
- Iron concentrations reported from Brine Waste Pond A averaged 172 µg/L while concentrations from Brine Waste Pond B averaged 234 µg/L;
- Barium concentrations reported from Brine Waste Pond A averaged 136 µg/L while concentrations from Brine Waste Pond B averaged 11 µg/L;
- Boron concentrations reported from Brine Waste Pond A averaged 6.90 mg/L while concentrations from Brine Waste Pond B averaged 3.61 mg/L;
- Manganese concentrations reported from Brine Waste Pond A averaged 639 µg/L while concentrations from Brine Waste Pond B averaged 20 µg/L; and
- Nickel concentrations reported from Brine Waste Pond A averaged 808 µg/L while concentrations from Brine Waste Pond B averaged 455 µg/L.

Note, metals are reported as total (unfiltered) concentrations.

3. ENVIRONMENTAL SETTING

Details of the environmental site setting are presented in the following sections to provide context to the surface water and groundwater assessments presented below.

3.1 Climate

The climate data below was provided by EnergyAustralia and is sourced from a weather station on site at MPPS (see Figure 2). A summary of the climate data is presented in Table 5 and a copy of the data is presented in Appendix E. Rainfall data is graphed in the hydrographs included in Appendix F.

Table 5: Local Climate Data for 2022/2023

Month	Rainfall Total (mm)	Min. Temperature (°C)	Max. Temperature (°C)
July 2022	106.4	1.5	9.4
August 2022	83.7	1.9	11.1
September 2022	131.0	4.4	13.0
October 2022	157.8	7.8	16.0
November 2022	110.0	6.2	17.7
December 2022	15.6	8.0	21.8
January 2023	108.6	12.6	24.5
February 2023	28.4	12.2	24.9
March 2023	83.6	11.0	23.0
April 2023	70.2	6.5	16.2
May 2023	5.2	0.8	12.5
June 2023	30.0	1.5	10.6
TOTAL / MIN / MAX	**930.5**	**0.8**	**24.9**

Data from MPPS Weather Station provided by EnergyAustralia

The total rainfall for the reporting period was 930.5 mm. This is lower than the total reported rainfall of 1,191.4 mm for the 2021/22 reporting period, but higher than the 607.0 mm recorded during the 2020/21 reporting period and the 513.1 mm recorded for 2019/20 reporting period.

The total rainfall for the reporting period, 930.5 mm, is slightly higher than the average annual rainfall between 2012 and 2017, which was reported by Aurecon (2017) to be 756.5 mm/year. However, slightly lower than the higher-than-average periods of rain from December 2020 and March 2021, which broke the period of relative drought experienced at the site, and more broadly within NSW, between 2017 and 2020.

The 2022/23 reporting period was characterised by slightly higher than average rainfall, although the monthly rainfall data shows fluctuations throughout the reporting period. November 2022 was the month that recorded the highest rainfall (110.0 mm), and May 2023 recorded the lowest rainfall (5.2 mm).

3.2 Geology and Hydrogeology

The site is located on the western margin of the Sydney Basin, and the geology is characterised by eastward dipping sedimentary deposits. The sedimentary deposits extend approximately 130 km east towards the NSW coast. Structurally, the western margin of the Sydney Basin is not complex, and no significant faulting or folding structures are present in the region surrounding the site (CDM Smith, 2012).

The site is located at an outcrop of the Illawarra Coal Measures, which have been mined throughout the region. The Narrabeen Group, comprised of sandstones, overlies the Illawarra Coal Measures in the vicinity of the site, forming the surrounding hillsides. The Illawarra Coal Measures host the coal seams that were previously mined out in the vicinity of the site and overlie the Shoalhaven Group. Some characteristics of these units are listed in Table 6

Table 6: Local Geological Units

Narrabeen Group	Illawarra Coal Measures	Shoalhaven Group
■ Sandstones, shale and claystone. ■ Up to approximately 800 m thick in parts, although generally absent in the immediate vicinity of the Ash Repositories. ■ Deposition in estuarine/alluvial, fluvial, and fluvial-deltaic environments. ■ Unconformably overlies Illawarra Coal Measures (Danis et al., 2011).	■ Interbedded shale, sandstone, conglomerate, and coal. ■ Dips 1-2 degrees to the east. ■ Outcrops extensively just east of Portland, exposing the Lidsdale and Lithgow coal seams close to the surface with approximately 15-20 m of sandstone overburden (CDM Smith, 2012).	■ Siltstones, lithic sandstones and conglomerate. ■ Marine sediments. ■ Berry Siltstone / Formation (earlier) & Snapper Point Formation (later). ■ Contains sulfide-bearing material and is acid generating in places where exposed via rock cuttings (SKM, 2010).

Groundwater beneath the site is present within the Illawarra Coal Measures, with a regional groundwater flow direction generally to the east / south-east in the vicinity of the site (Figure 6a to Figure 6b). The natural stratigraphy of the Illawarra Coal Measures in the vicinity of the site is generally as follows:

- Bunnyong Sandstone (Long Swamp Formation) – massive sandstone;
- Lidsdale Coal Seam – interbedded high ash coal and shale;
- Blackmans Flat Conglomerate – coarse sandstone and conglomerate;
- Lithgow Coal Seam; and
- Marrangaroo Conglomerate – massive sandstone and conglomerate.

Prior to the placement of ash in the former Western Main Open Cut mine void (now occupied by the MPAR), the bottom of the mine void was covered with mine spoil to a minimum level of 908 m AHD. This was to facilitate groundwater flow from the adjacent areas of the unmined Lithgow coal seam aquifer and mine goaf areas surrounding the Western Main Open Cut mine void (Connell Wagner, 2007). The background groundwater level (water table elevation) prior to the filling of the mine voids and placement of ash was reported to be approximately 910 m AHD.

Historically, groundwater seepage from beneath the MPAR was collected in the Groundwater Collection Basin that was previously located to the east of MPAR (SKM, 2010). In 2012, this basin was filled in with mine spoil and compacted as part of the construction of the adjacent LNAR; the footprint of the former Groundwater Collection Basin is located beneath the LNAR (refer to Figure 2).

The area surrounding the Ash Repositories is characterised by former open cut and below ground coal mining. The below ground mined out areas are variably filled in with goaf, or in some areas remain as voids. Former open cut mines remain as ponds, including within the alignment of Wangcol Creek to the north of MPAR, or have been filled in.

Long term groundwater monitoring at the site indicates that the water table occurs variably in the former below ground mined out areas and open cuts and, away from the Ash Repositories, predominantly in the overlying Bunnyong Sandstone. Over the monitoring period, the water table elevation ranged from approximately 903.4 m AHD (D2) in the south-east up to 918.7 m AHD (MPGM/D4) in the north-east of the Ash Repositories (refer to Figure 6a and 6b). Perched water is present in the southern part of the MPAR.

3.3 Hydrology

The Project site is within the catchment of Wangcol Creek, a tributary of the Coxs River. The site itself sits on the eastern edge of the Great Dividing Range and includes the headwaters of Wangcol Creek.

Locally, Wangcol Creek is present to the north and north-east of the MPAR, approximately 250 m from the active ash placement area at its closest point. Wangcol Creek flows to the east and south-east and joins the Coxs River approximately 3.2 km east of the site.

Clean water diversion structures divert surface waters around the operational areas of the MPPS, where possible (see Figure 2). Stormwater within the operational area of the MPPS is directed to water management and storage infrastructure for use at the Project site.

4. WATER MONITORING AND MANAGEMENT PLAN

The aim of the WMP is to minimise the effect of ash placement at the MPAR on local natural surface waters and groundwater. The WMP addresses water cycle management associated with the Project. It includes a surface water and groundwater monitoring program, a requirement for an annual water quality report, and associated TARPs, contingency and strategies for brine reduction as appropriate for the reporting period.

The WMP approved under the Mt Piper Consent outlines the following key elements:

- Water cycle management plan describing the management of surface water run off at the ash repository;
- Brine cycle management including brine minimisation strategies and future mine disposal strategies;
- Water cycle management including the potential uses of multipurpose lined water storages present at the MPPS; and
- Water monitoring program, including surface water and groundwater monitoring, and the Environmental Goals to be adopted.

4.1 Environmental Goals

The Environmental Goals for groundwater and surface water monitoring in the WMP are consistent with those applied to monitoring of the LNAR, as approved in the LNAR OEMP. The Environmental Goals were developed by Aurecon (2009) to account for hardness corrected guideline values and were presented by CDM Smith (2013).

The Environmental Goals utilise the 95% ecosystem protection values, stock watering, irrigation water or drinking water values based on the Australian and New Zealand Guidelines (ANZG, 2018) water quality guidelines (formerly Australia and New Zealand Environment Conservation Council, ANZECC, 2000), in combination with 90th percentile pre-brine placement local environmental (groundwater/surface water) data, whichever is greater. The local guideline values incorporated into the Environmental Goals are based upon the 90th percentile pre-ash placement water quality results, as measured at surface water quality point WX22 (for surface water) or the former Groundwater Collection Basin (for groundwater).

It is noted that, where the Environmental Goals for groundwater are based on the ANZG (2018) water quality guidelines, these guidelines are applicable to receiving waters and not to groundwater. However, they form an appropriate basis for undertaking a conservative initial screening assessment.

The Environmental Goals adopted for this assessment are presented with the surface water and groundwater data in Appendix G and Appendix H respectively.

5. SURFACE WATER ASSESSMENT

5.1 Objective

The objective of the surface water monitoring program is to identify water quality changes at an early stage so that potential causes can be investigated and, if necessary, effects mitigated. The surface water data is compared between locations and to the established Environmental Goals to assess changes in water quality and to assess whether the TARPs or contingency measures should be considered and/or implemented.

5.2 Surface Water Monitoring Locations and Frequency

A summary of the surface water monitoring site locations under the WMP is described in Table 7 and the locations are shown on Figure 5.

Table 7: Surface Water Monitoring Locations

Site ID	Position	Location Description	Frequency	No. of Samples in 2022/23
CSP	Upstream	Monitor the stormwater in the CSP and discharge from the CSP. Sampling of the CSP is conducted routinely at times when discharge is not occurring. These samples are differentiated as CSP (not discharging) and LDP12 (when discharge is occurring). The data from LDP12 and CSP is not representative of instream surface water conditions. Data from LDP12 is not regulated by the Environmental Goals and is provided in this report for comparison only.	As required during discharge[1]	29 (CSP)
LDP12	Upstream			12 (LDP12)
LMP01	Upstream	This monitoring point is located north-west of the MPAR and immediately downstream of the FHP. It is located in an upstream position relative to the Ash Repositories and is the location where water from the headwaters of Wangcol Creek flows out from the MPPS operational area, downstream of the FHP.	Quarterly	12
NC01	Mid-stream	Located midstream in the monitored area of Wangcol Creek, upstream to the Ash Repositories.	Monthly	12
SW_C	Mid-stream	Located within Wangcol Creek, the monitoring location is located midstream of the monitored area of Wangcol Creek and near groundwater monitoring bore D107.	Quarterly	12
SW_E	Mid-stream	Located within Wangcol Creek, downstream of former open cuts "Area D" and "Area E" between the locations of groundwater monitoring bores D9 and D105.	Quarterly	12
WX22 / SW_F	Downstream	Located in Wangcol Creek at a stream gauge to the east/downstream of the Ash Repositories. Also serves as WaterNSW monitoring point 212055.	Monthly	12
SW_G	Downstream	Located within the downstream portion of Wangcol Creek, and downstream of WX22, within a former open cut mine working and in the vicinity of groundwater monitoring bore D103.	Quarterly	12

[1]*Selected field parameters monitored more regularly*

The frequency of sampling conducted during the reporting period is considered adequate to meet the requirements of the WMP.

5.3 Surface Water Monitoring Methodology

Surface water quality monitoring was undertaken by Nalco Water – Ecolab (Nalco) on behalf of EnergyAustralia. Details regarding the Nalco sampling method and quality assurance and quality control (QA/QC) program are presented in Appendix I.

5.4 Surface Water Quality Dataset

Surface water samples were obtained by Nalco for field and/or laboratory analysis for the following parameters, in accordance with the monitoring and analysis schedule outlined within the WMP:

- Electrical conductivity (EC - μS/cm, field measured);
- pH (field measured);
- Total Dissolved Solids (TDS);
- Cations and anions (calcium, chloride, fluoride, magnesium, potassium, sodium, sulfate) i.e., major and minor ions;
- Alkalinity (total alkalinity, bicarbonate alkalinity, phenolphthalein alkalinity);
- Total and dissolved metals (aluminium, arsenic, boron, copper, iron, manganese, nickel, vanadium ,and zinc) – field filtered at 0.45 μm for dissolved analysis;
- Non-filterable residue (NFR, turbidity or TSS);
- Total phosphorus; and
- Nitrogen, nitrate, nitrite, total Kjeldahl nitrogen (TKN).

The trace metals in surface water samples were reported as both total (unfiltered) and dissolved (filtered) samples, except for antimony, arsenic, barium, beryllium, cadmium, chromium, speciated chromium, cobalt, lead, magnesium, mercury, molybdenum, selenium, silver and strontium, which were reported as total sample concentrations only.

Evidence of the collection of field quality control (QC) samples (i.e., rinsate, trip blanks or trip spikes) during the field-based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, internal duplicates, method blanks or spike data were also not presented for review during compilation of this EMR.

5.5 Surface Water Results

The surface water field and analytical results obtained for the reporting period are presented alongside the Environmental Goals for surface water in Appendix G and Figure 7. Graphs of concentrations over the last 10 years for selected analytes (boron, chloride, manganese, nickel, sulfate and TDS), considered to be indicators of potential changing conditions resulting from the Project, are provided in Appendix J.

5.5.1 Upstream Monitoring Results

LDP12 is the licenced discharge point for the MPPS under EPL 13007. The licenced discharge point is located at the CSP, which is a sediment basin for the coal stockpile area. Samples from the CSP are routinely collected monthly and prior to planned discharge events however are presented in this report (in accordance with the WMP).

Discharge via LDP12 occurs as required following confirmation by laboratory analysis that the water quality is within the approved EPL discharge limits. Samples of the discharge are collected from the discharge point, and these are presented as LDP12. Location LDP12 is not considered to be representative of upstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

Discharge from LDP12 enters the western stormwater drain, which is part of the upstream Wangcol Creek catchment, before flowing into the FHP. The FHP holds stormwater from the clean water diversions from around the MPPS and can be closed in the event of an environmental incident to limit the likelihood of adverse impacts to the downstream surface water environment. The FHP was constructed within Wangcol Creek, and it operates as a pollution control structure downstream from the operational areas of the MPPS. LMP01 is the sampling location within Wangcol Creek downstream of the FHP.

LDP12 and LMP01 are located upstream of the MPAR and water quality at these locations is not considered to be influenced by activities at the Ash Repositories. However, other aspects of the Project (e.g., brine transfer pipelines and brine waste holding ponds) are located within the catchment upstream of these sampling locations.

Data for LDP12 (discharging) is presented in the following written sections of this report, in Figure 7, and in Table 2, Appendix G; however, assessment of trends and statistical assessment of LDP12 has not been conducted as this location is not considered to be representative of in-stream conditions. Assessment of trends at LMP01, which receives flow from LDP12 and other upstream portions of the Wangcol Creek catchment, has been conducted as it is considered most appropriate for assessment of potential impacts from the Project on the upstream section of Wangcol Creek. Graphs showing the concentrations of key analytes over time are presented in Appendix J.

5.5.1.1 Field Parameters

Field parameters monitored at LDP12 and LMP01 for the reporting period are summarised as follows:

- pH values (field measured) of surface water samples from LMP01 ranged from 6.8 to 8.5. The pH at LMP01 was marginally outside of the range (more alkaline) of the Environmental Goal (6.5 to 8.0) during a single sampling event in June 2023 (8.5) of the reporting period. LDP12 pH values ranged from 7.3 to 7.8, all within the range of the Environmental Goal;
- Field EC values obtained from LMP01 ranged from 130 µS/cm to 505 µS/cm. Field EC measured at LDP12 ranged from 127 µS/cm to 361 µS/cm. The reported field EC values were consistent with the laboratory TDS concentrations (where analysed). Reported EC and TDS values throughout the reporting period were below the Environmental Goals for surface water; (2,200 µS/cm for EC and 1,500 mg/L for TDS); and
- Graphs of concentrations over the last 10 years show TDS concentrations at LMP01 have fluctuated, peaking in 2019 (Appendix J). Concentrations during the current reporting period remained within historical ranges and below the Environmental Goal and showed a slightly decreasing trend towards the end of the reporting period until an increase in June 2023.

5.5.1.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions for which there are Environmental Goals (chloride, sulfate and fluoride) at LDP12 and LMP01 were below the relevant Environmental Goals for surface water.

Graphs of concentrations over the last 10 years for LMP01 (Appendix J) show fluctuations of sulfate and chloride over time, however, the concentrations in the current reporting period appeared generally steady, within the historical range and below the Environmental Goals for surface water. High sulfate and chloride results relative to the historical dataset were reported intermittently from July 2019 to January 2020. The spikes in concentrations were attributed to a brine leak event that occurred in 2019 (ERM, 2020a); these were notified to the EPA and the liner was repaired in 2019.

5.5.1.3 Metals

Throughout the reporting period copper, iron, and lead were identified on one or more occasions at concentrations above the relevant Environmental Goals for surface water at LMP01, as presented in Appendix G and summarised in Figure 7.

Speciated chromium (hexavalent and trivalent), selenium, and silver had LORs above the Environmental Goals on one or more occasions.

The LOR of total chromium was below the Environmental Goal. LMP01 reported chromium concentrations above the Environmental Goal for one event (July 2022) during the reporting period. Lowering the LOR for speciated chromium would help assess if Environmental Goals are met for trivalent and hexavalent chromium impacts related to MPAR.

Selenium was reported marginally above the 0.2 µg/L LOR for most monitoring events. However, surface water samples collected from LMP01 during the July, August, and September events had a laboratory LOR of 10 µg/L, which exceeded the Environmental Goal of 5 µg/L. The raised laboratory LOR above the Environmental Goal was related to sample matrix interference, as confirmed by EnergyAustralia.

ERM understands that a laboratory LOR that is lower than the Environmental Goal for silver (0.05 µg/L) is unachievable by the laboratory. Based on the results of previous monitoring, including concentrations of silver in brine (<10 µg/L for most samples during 2021/22 and below the LOR for most samples for the current reporting period), and <1 µg/L in groundwater, silver is not considered to represent a primary constituent of concern for monitoring in accordance with the WMP.

Graphs of concentrations over the last 10 years for LMP01 (Appendix J) show fluctuations of manganese and nickel over time, however the concentrations measured during the current reporting period were below the Environmental Goals and were generally consistent and within the historical ranges. Concentrations of boron show a spike in concentrations in June 2023 (70 µg/L), the highest concentrations since September 2020; however, this concentration is within the historic range and is below the Environmental Goal.

5.5.2 Midstream Monitoring Results

Locations NC01, SW_C and SW_E are considered to represent midstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

Locations NC01 and SW_C are located north of the MPAR along an area of Wangcol Creek that is not known to have been subject to open cut mining operations. SW_E is located further downstream of NC01 and SW_C, to the east of the MPAR and immediately downstream from an area of Wangcol Creek that was historically subject to open cut mining activities.

The surface water field and analytical results obtained from sample points NC01, SW_C and SW_E, for the reporting period are presented in Table 1, Appendix G and summarised in Figure 7. Graphs showing the concentrations of key analytes over time are presented in Appendix J.

A brief discussion of results is presented in the following subsections.

5.5.2.1 Field Parameters

Field parameters monitored at NC01, SW_C and SW_E for the reporting period are summarised as follows:

- pH (field) values were 6.3 to 7.6, with one result (SW_C, September 2022) reported outside of the Environmental Goal range (6.5 to 8.0) for surface water;
- Field EC values reported at NC01, SW_C and SW_E ranged from 101 µS/cm to 1,440 µS/cm. Field EC values were generally consistent with laboratory TDS results, and results were not reported outside of the Environmental Goals for either EC or TDS (2,200 µS/cm for EC and 1,500 mg/L for TDS);
- Graphs of concentrations over the last 10 years show TDS concentrations at NC01 and SW_C have remained low and stable. TDS at SW_E showed a spike in concentrations during the 2019/20 reporting period, but TDS concentrations have subsequently returned to within the historical range and have not been reported above the Environmental Goals since January 2020; and

- EC and TDS values at SW_E were generally higher compared to those further upstream at NC01 and SW_C.

5.5.2.2 Major and Minor Ions

Throughout the reporting period, major and minor ions including chloride, sulfate, and fluoride were reported at NC01, SW_C and SW_E at concentrations below the Environmental Goals for surface water.

Graphs of concentrations over the last 10 years for chloride and sulfate are consistent with the trends identified for TDS concentrations and show chloride and sulfate concentrations at NC01 and SW_C have remained low and stable. Consistent with the trend of increased TDS and EC values, concentrations of chloride and sulfate in SW_E spiked during 2019/20 but returned to concentrations below the Environmental Goals during the 2020/21 reporting period; concentrations remained below the Environmental Goal for the current reporting period, although chloride and sulfate concentrations at SW_E increased from October 2022, but remained within historic ranges and below the Environmental Goals.

Consistent with trends identified from EC and TDS, chloride and sulfate concentrations at SW_E were elevated compared to those further upstream at NC01 and SW_C.

5.5.2.3 Metals

Throughout the reporting period cadmium, chromium, copper, iron, lead, manganese, mercury and nickel were identified on one or more occasions at concentrations above the relevant Environmental Goals for surface water at NC01, SW_C and/or SW_E, as presented in Appendix G and summarised in Figure 7.

Speciated chromium (hexavalent and trivalent), selenium, and silver had LORs above the Environmental Goals for one or more sample events.

For surface water monitoring locations NC01, SW_C and SW_E, the selenium laboratory LOR was <10 µg/L for the July, August and September (only SW_E) sampling events, which exceeded the Environmental Goal (5.0 µg/L). Selenium was reported at/or above the Environmental Goal for SW_C and NC01 in September.

For all samples throughout the reporting period silver concentrations were reported below the laboratory LOR (<1 µg/L) which exceeded the Environmental Goal for silver (0.05 µg/L). The LOR for speciated chromium was also above the Environmental Goal for both hexavalent (1.0 µg/L) and trivalent (3.3 µg/L) chromium. No results were reported above the LORs for speciated chromium. Total chromium concentrations were at (NC01 and SW_E) or above (NC01) the Environmental Goal (2.0 µg/L) in a total of five sampling events.

Refer to Section 5.5.1.3 for commentary relating to the laboratory LORs versus the Environmental Goals for silver and speciated chromium in surface water.

Iron (total) was reported at concentrations above the Environmental Goal for all sampling events except SW_C in August. Filtered iron concentrations were reported above the Environmental Goal on fewer occasions, with the majority of exceedances reported from SW_E (eight out of 12 events).

Graphs of concentrations over the last 10 years for boron, manganese and nickel (Appendix J) show trends consistent with TDS, specifically that concentrations of these selected metals at NC01 and SW_C have remained low and stable. Boron, manganese and nickel concentrations at SW_E spiked during the 2019/20 reporting period but decreased to within the historical range during the 2020/21 reporting period and remained low and stable during the 2021/22 reporting period. Graphs of boron, manganese and nickel (Appendix J) show that concentrations in SW_E have increased since January 2022.

Concentrations of boron (both total and filtered) remained below the relevant Environmental Goals throughout the current reporting period, although concentrations at SW_E show a slight increase from January, slightly decreasing and stabilising between the March and April events then continuing to increase and peaking in June. The maximum concentration recorded during this reporting period is consistent with the concentrations in 2019.

Similar to the trend seen with boron, manganese concentrations also increased during this reporting period. Although concentrations remained below the historical concentrations reported in the 2019/20 reporting period, concentrations at SW_E exceeded the Environmental Goal from February to June 2023 for total manganese and March to June 2023 for filtered manganese. Historically, total manganese and filtered manganese have not exceeded the Environmental Goal since November 2019.

Similar to the trends identified from major ion concentrations (TDS and EC values) nickel concentrations (total and filtered) were higher at SW_E than at NC01 and SW_C, with most events reporting nickel concentrations above the Environmental Goal at SW_E. Nickel concentrations at SW_E were reported above the Environmental Goal for nine out of the 12 sampling events. Both total and filtered nickel concentrations increased slightly from January, decreased and stabilised slightly between March and April and continued to increase to June, consistent with the other selected metals. Nickel concentrations at NC01 and SW_C remained below the Environmental Goals throughout the current reporting period.

The increase in metal concentrations is considered to be due to the drier conditions experienced during this reporting period, after the period of heavy rain experienced over the last reporting period (2021/22).

5.5.3 Downstream Monitoring Results

Locations WX22 (SW_F) and SW_G are considered to represent downstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

Both WX22 and SW_G are located east of the MPAR along an area of Wangcol Creek that is downstream of and, in the case of SW_G, has been subject to open cut mining operations.

The surface water field and analytical results obtained from sample points WX22 (SW_F) and SW_G for the reporting period are presented in Table 1, Appendix G, and summarised in Figure 7. Graphs showing the concentrations of key analytes over time are presented in Appendix J.

A brief discussion of results is presented in the following subsections.

5.5.3.1 Field Parameters

Field parameters monitored at WX22 and SW_G for the reporting period are summarised as follows:

- Field pH values ranged from 6.7 to 7.6 and were within the Environmental Goal range (6.5 to 8.0) for pH in surface water;
- Field measured EC values ranged from 167 µS/cm to 1,930 µS/cm and were generally consistent with the laboratory determined TDS values. EC and TDS were reported below the respective Environmental Goals for surface water (2,200 µS/cm for EC and 1,500 mg/L for TDS) at both locations during the reporting period; and
- Graphs of concentrations over the last 10 years (Appendix J) for WX22 and SW_G show TDS has fluctuated over time. Concentrations of TDS have typically increased during summer months, but only exceeded the Environmental Goal once at SW_G during July 2018. The trends at SW_G are similar to those described for WX22; however, monitoring data at SW_G has only been collected since May 2018. TDS has remained below the Environmental Goal for surface water since January 2020. For WX22 and SW_G in the current reporting period, the typical summer peak was observed later than historically observed, with concentrations increasing from December 2022 and peaking in June 2023 at concentrations below the Environmental Goal.

5.5.3.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions including chloride, sulfate and fluoride were reported below the relevant Environmental Goals at WX22 and SW_G.

Graphs of concentrations over the last 10 years for WX22 and SW_G (Appendix I) show chloride and sulfate concentrations have fluctuated over time and are generally consistent with TDS trends (i.e., typically increase during and following summer months). Similar to historic TDS concentrations, chloride and sulfate concentrations were highest during February 2014, February 2018 and January 2020. For the current reporting period, concentrations of sulfate and chloride increased from January to the June sampling event, during which the peak concentrations for the reporting period were recorded. Concentrations for chloride and sulfate remained below the Environmental Goals throughout the reporting period.

5.5.3.3 Metals

Throughout the reporting period, chromium, copper, iron, lead, manganese, and nickel were identified on one or more occasions at concentrations above the Environmental Goal for surface water at WX22 and/or SW_G, as presented in Appendix G, and summarised in Figure 7.

Speciated chromium (hexavalent and trivalent), selenium, and silver had LORs above the Environmental Goals for one or more sample events. No detections (concentrations above the LOR) were reported for these analytes during the reporting period. Refer to Section 5.5.1.3 for commentary relating to the laboratory LORs versus the Environmental Goals for speciated chromium, selenium, and silver in surface water.

Graphs of concentrations over the last 10 years for WX22 and SW_G (Appendix J) show boron, manganese and nickel concentrations have fluctuated over time.

Boron concentrations were reported below the Environmental Goal for surface water during the current reporting period, although, similar to TDS concentrations, boron concentrations at both WX22 and SW_G increased above the current reporting period range in March and June (highest) 2023.

Concentrations of nickel fluctuated and exceeded the Environmental Goal for most sampling rounds throughout the reporting period. Similar to TDS, nickel concentrations increased during and following the summer months, peaking in June.

For this reporting period, manganese (both total and filtered) the highest concentrations were reported in March, when concentrations exceeded the Environmental Goal for total manganese at WX22. Manganese concentrations at SW_G remained below the Environmental Goal. Unlike boron and nickel, manganese concentrations did not increase towards the end of the reporting period.

5.5.4 Summary

During the reporting period, LMP01 reported concentrations of pH, chromium, copper, iron, and lead above the Environmental Goals on one or more occasions. Concentrations at LDP12 were below the Environmental Goals throughout the reporting period, noting that the LORs for silver and selenium were above the Environmental Goals.

Results from midstream monitoring locations NC01, SW_C and SW_E were typically below the Environmental Goals for surface water, except for iron which consistently exceeded the Environment Goal for surface water throughout the monitoring period at NC01, SW_C and SW_E. pH, cadmium, chromium, copper, lead, mercury, and selenium were reported above the Environmental Goals on one or more occasions from at least one of these locations. Manganese and nickel concentrations at SW_E exceeded the Environmental Goals consistently throughout the reporting period, but were below the Environmental Goals at NC01 and SW_C, both located upstream of SW_E. Mercury was reported above the Environmental Goal for surface water at SW_E and NC01 on a total of two occasions during the reporting period, however concentrations above the Environmental Goal were not reported in other upstream or downstream samples.

Surface water quality at the midstream locations showed a summer peak in concentrations generally similar to last reporting period (2021/22); however, a second increasing trend towards the end of this reporting period (June 2023) was identified. This is considered to be related to the drier conditions for the months leading up to June compared to last reporting period.

At the downstream monitoring locations (WX22 and SW_G), concentrations of iron and nickel in surface water frequently exceeded the relevant Environmental Goals during the reporting period. The concentrations of iron and nickel were similar at the midstream monitoring location SW_E and downstream locations WX22 and SW_G. Copper was reported above the Environmental Goal for surface water on one occurrence at each downstream monitoring location. Periodic exceedances of chromium, copper, lead, and manganese were identified throughout the reporting period.

The surface water quality at downstream locations WX22 and SW_ G generally showed an upward trend in concentrations towards the end of the reporting period, although concentrations did not exceed 2019 peaks or the Environmental Goals, with the exception of nickel at both locations on multiple occasions, and manganese at WX22 in March 2023. This upward trend is consistent with the midstream surface water locations and is likely related to the drier conditions experienced during the months leading up to June.

Iron and nickel concentrations consistently exceeded the Environmental Goals at midstream and downstream monitoring locations. Iron concentrations are related to background conditions in the local environment as a result of the mining history and disturbed geology. Nickel concentrations in surface water are considered to be influenced by interaction between groundwater and the surface water of Wangcol Creek. The periodic exceedances of Environmental Goals for pH in upstream surface water were generally not observed to extend to midstream surface water sample locations, except for one occurrence in September 2022 at SW_C. Overall, surface water quality was comparable to the 2021/22 reporting period until early to mid-2023, after which increasing concentrations were identified at mid-stream and downstream surface water monitoring locations. This is considered to be a reflection of the drier conditions experienced during the months leading up to June, after an extended period of higher-than-average rainfall recorded during the last reporting period.

6. GROUNDWATER

6.1 Objective

The objective of the groundwater monitoring program is to identify water quality changes at an early stage so that potential causes can be investigated and, if necessary, effects mitigated. The groundwater data is compared; between locations, to historical data, and to the established Environmental Goals to assess changes in groundwater quality and the extent to which changes may be related to activities associated with the Project.

6.2 Groundwater Monitoring Locations and Frequency

A summary of the groundwater monitoring locations is presented in Table 8 and Figure 5.

Table 8: Groundwater Monitoring Network

Bore ID	Location Description	Screened Material	Frequency	No. of Samples in 2022/23
Upgradient of MPAR (background)				
MPGM4/D4	Background groundwater monitoring location, north-west (upgradient) of the MPAR	Fill	Quarterly	4
MPGM4/D5	Background groundwater monitoring location, north-west (upgradient) of the MPAR	Mudstone/ Sandstone and coal	Quarterly	4
Within MPAR and the Mine Disturbance Area East of MPAR				
B5	Within the MPAR	Fill	Quarterly	0 (blocked)
SW3-D	Within the south-east portion of the MPAR	Fill – clay/silty clay	Quarterly	0 (dry)
MPGM4/D23	Adjacent (south) of the MPAR	Sandstone	Quarterly	0 (destroyed)
MPGM4/D10	East (downgradient) of the MPAR, and adjacent to LN Pond 2	Fill / mine spoil	Quarterly	4
MPGM4/D11	Within the eastern extent of the MPAR (decommissioned Feb 2023)	Fill beneath the ash	Quarterly	3
MPGM4/D19	East (downgradient) of the Ash Repositories	Fill / mine spoil	Quarterly	4
D113	East (downgradient) of the Ash Repositories. Nested (deeper) with D19	Siltstone	Quarterly	4
Within mine disturbance area – south and south-east of MPAR				
MPGM4/D15	South of the Ash Repositories	Sandstone and/or shale	Quarterly	4
MPGM4/D16 replaced with D16A	South of the Ash Repositories	Sandstone and/or shale	Quarterly	0
MPGM4/ D16A	South of the Ash Repositories (commissioned in October 2022 to replace D16)	Sandstone and/or shale	Quarterly	3

Bore ID	Location Description	Screened Material	Frequency	No. of Samples in 2022/23
MPGM4/D17	South of the Ash Repositories	Sandstone and/or shale	Quarterly	4
MPGM4/D18	South of the Ash Repositories	Sandstone and/or shale	Quarterly	4
Adjacent to MPAR – to the north				
MPGM4/D3	Background groundwater monitoring location, north (cross gradient) of the MPAR	Sandstone and/or siltstone	Quarterly	4
D107	North (cross gradient) of MPAR and adjacent Wangcol Creek	Siltstone and/or shale	Quarterly	4
D106	North (cross gradient) of MPAR and adjacent Wangcol Creek	Weathered sandstone and/or Shale	Quarterly	4
Adjacent MPAR and Downgradient				
MPGM4/D1	North-east (downgradient) of the MPAR	Mudstone, sandstone and coal	Quarterly	4
MPGM4/D9	North-east (downgradient) of the MPAR and adjacent to Wangcol Creek	Alluvial deposits	Quarterly	4
D102	North-east (downgradient) of the MPAR and adjacent to Wangcol Creek. Nested (deeper) with D9	Siltstone	Quarterly	4
D105	East (downgradient) of the MPAR and adjacent Wangcol Creek	Coal	Quarterly	4
MPGM4/D8	East (downgradient) of the MPAR and adjacent to the northern side of Wangcol Creek	Alluvial deposits	Quarterly	4
D104	East (downgradient) of the MPAR and adjacent Wangcol Creek	Sandstone	Quarterly	4
D103	East (downgradient) of the MPAR and adjacent Wangcol Creek	Coal and/or siltstone	Quarterly	4
MPGM4/D2	East (downgradient) of the MPAR and adjacent Wangcol Creek	Not known	Quarterly	4
Brine Waste Pond Leak Detection Bores				
MPGM5/D5	Adjacent (downgradient) Brine Waste Pond A	Not known	Quarterly	6
MPGM5/D6	Adjacent (downgradient) Brine Waste Pond B	Not known	Quarterly	7
MPGM/24 and MPGM/25	Adjacent Settling Pond D (north-west)	Not known	Quarterly	0 (dry)
MPGM/26 and MPGM/27	Adjacent Settling Pond D (south-east)	Not known	Quarterly	0 (dry)

Some bores were sampled and results reported more frequently than the planned quarterly monitoring. In those cases, all available data has been considered in this assessment. Information from EnergyAustralia provided the following clarifications as to why some bores were not sampled as frequently as required. Bores B5, SW3-D and MPGM4/D23 were not sampled during the reporting period because they were blocked (B5), recorded as dry (SW3-D), or damaged and unable to be sampled (MPGM4/D23). Considerations are being made to remove B5 from the WMP. D16 has been decommissioned and bore D16A was installed as its replacement.

6.3 Groundwater Monitoring Methodology

Groundwater quality monitoring was undertaken by Nalco on behalf of EnergyAustralia. Details regarding the Nalco sampling method and QA/QC program are presented in Appendix I.

6.4 Groundwater Quality Dataset

Nalco collected groundwater samples from 23 groundwater monitoring bores throughout the reporting period. Samples were obtained for field and laboratory analysis in accordance with the following monitoring and analysis schedule:

- Depth to water (in m AHD - prior to purging);
- EC (µS/cm, field measured);
- pH (field measured);
- TDS;
- Cations and anions (calcium, chloride, fluoride, potassium, sodium, sulfate);
- Alkalinity (total alkalinity, bicarbonate alkalinity, phenolphthalein alkalinity); and
- Total and dissolved metals (aluminium, arsenic, boron, copper, iron, manganese, nickel, vanadium, zinc) – field filtered at 0.45 µm for dissolved metals.

The trace metals in groundwater samples were reported as both total (unfiltered) and dissolved (filtered) samples except for antimony, barium, beryllium, cadmium, chromium, speciated chromium, cobalt, lead, magnesium, mercury, molybdenum, selenium, silver and strontium, which were reported as total concentrations only.

Evidence of the collection of field QC samples (i.e., rinsate, trip blanks or trip spikes) during the field-based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, internal duplicates, method blanks or spike data were also not provided for review during compilation of this EMR.

6.5 Groundwater Results

For the purpose of this discussion, the groundwater data review has considered the groundwater monitoring locations (see Figure 5) in five monitoring zones:

- Bores upgradient of MPAR (background): MPGM4/D4, MPGM4/D5;
- Bores within MPAR and the Mine Disturbance Area East of MPAR: MPGM4/D10, MPGM4/D11, D113, MPGM4/D19;
- Bores within the Mine Disturbance Area south and south-east of MPAR: MPGM4/D15, MPGM4/D16A, MPGM4/D17, MPGM4/D18;
- Bores adjacent to MPAR to the north: MPGM4/D3, D107, D106;
- Adjacent to and downgradient of MPAR: MPGM4/D1, D102, D103, D104, D105, MPGM4/D2, MPGM4/D8, MPGM4/D9; and
- Brine Waste Pond Leak Detection Bores: MPGM5/D5, MPGM5/D6).

Graphs of concentrations over the last 10 years for selected analytes (boron, chloride, manganese, nickel, sulfate and TDS) that are considered to be indicators of potential changing conditions resulting from Project activities are provided in Appendix K.

6.5.1 Groundwater Elevations and Inferred Flow Direction

Hydrographs showing groundwater elevations for each bore have been grouped by monitoring zone, as outlined in Section 6.5 (Appendix F). The hydrographs show that groundwater levels were generally stable and decreased slightly (increased depth to groundwater) compared to the last reporting period (2021/22). This is consistent with the decrease in total rainfall this reporting period compared to last reporting period. It is noted that as groundwater elevations were not all measured at the same time, groundwater levels between bores may not be directly comparable.

The decline in groundwater elevations towards the end of the reporting period was relatively consistent throughout the bore network, with a maximum decrease of approximately 2 m, except for bores adjacent to MPAR and downgradient which exhibited lower decreases (maximum of 1 m) towards the end of the reporting period.

The groundwater elevation at D11 differed from the general trend and increased from November 2022 to March 2023, although the remaining bores within the group (within MPAR / mine disturbance area east of MPAR) showed generally decreasing groundwater elevations.

Consistent with 2019/20, 2020/21, 2021/22 monitoring results, the groundwater elevations at bore D18 did not correlate with other nearby groundwater monitoring bores throughout the reporting period, indicating a stable to slightly increasing trend. These observations are considered to indicate that the construction of this bore may be compromised.

No groundwater elevation data was available for B5 (blocked), SW3-D (dry), and D16 (decommissioned). For the current reporting period, only three measurements were provided for D23, which has been noted as destroyed.

Due to previously observed artesian (above ground surface) flow at bore D107, additional casing (stick up) was added, and groundwater elevation was not measured from October 2021 to October 2022. Groundwater elevation measurements from October 2022 onwards were provided and indicated a similar trend as other bores within the same location group except for May 2023 during which groundwater elevation at D107 increased while groundwater elevations in other bores in the location group declined.

Survey data is not available for bores MPGM5-D5 and MPGM5-D6. As such the groundwater levels from these bores are reported as metres below a point of reference (m below top of casing, m btoc), rather than as groundwater elevation (m AHD). The presence of water in these bores is not inferred to reflect the regional groundwater table as these bores are installed to approximately 5 m above the water bearing zone targeted by other nearby monitoring bores. Depth to water measured from MPGM5-D6 generally decreased (indicating shallower water levels) until August 2022 then stabilised, increasing slightly in April 2023). Water levels at MPGM5-D5 have fluctuated but steadily increased from November 2021 until April 2022; since then, groundwater levels at MPGM5-D5 have gradually increased (decreasing depth to water).

While groundwater elevations in most bores, particularly those to the north / north-west of MPAR, decreased slightly towards the end of the reporting period, groundwater elevation contours indicate that regional groundwater flow beneath the MPAR is generally toward the east, consistent with previously inferred groundwater flow directions. Although groundwater elevation fluctuated throughout the reporting period, the inferred groundwater flow directions have remained relatively consistent throughout the reporting period, as indicated in the seasonal groundwater flow contours from in October 2022 and May 2023 presented in Figure 6a and Figure 6b, respectively. Seasonal groundwater flow contours (October 2022 and May 2023) from this current reporting period were generally consistent with the seasonal groundwater flow contours (October 2021 and May 2022) of the previous reporting period, with the bores to the north and east of MPAR indicating an inferred flow to the east while a south-eastern flow is inferred from the bores to the south-east of MPAR.

6.5.2 Groundwater Quality Upgradient of MPAR (background)

Data obtained from bores MPGM4/D4 and MPGM4/D5 located to the north-west and hydraulically upgradient (background) of the MPAR, is outlined below and compared to the Environmental Goals for groundwater. Bores MPGM4/D4 and MPGM4/D5 are considered to represent background groundwater conditions in the area and based on their location up hydraulic gradient of MPAR, are not considered to have been affected by activities at MPAR. Groundwater monitoring data for the current reporting period is presented in Appendix H and summarised in Figure 8a. Graphs of concentrations over the last 10 years are provided in Appendix K.

6.5.2.1 Field Parameters

Field parameters monitored at these bores for the reporting period are summarised as follows:

- pH values for groundwater from MPGM4/D4 and MPGM4/D5 ranged from 3.5 to 6.0. The pH from bore D4 has been consistently acidic, varying from 3.4 to 3.5 during the reporting period, consistent with the 2021/22 reporting period, and prior monitoring events. Throughout the reporting period the measured pH was generally stable from this group of bores, and consistently more acidic than the Environmental Goal range for groundwater (6.5 to 8.0); and
- EC values obtained from field measurements were 710 µS/cm to 1,220 µS/cm and were generally stable throughout the reporting period. TDS values were generally consistent with the field EC measurements. EC and TDS values did not exceed the Environmental Goals for groundwater (2,200 µS/cm for EC and 1,500 mg/L for TDS) during the reporting period.

Graphs of concentrations over the last 10 years for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of TDS in groundwater have been stable and below the Environmental Goal for groundwater throughout the historical dataset.

6.5.2.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, sulfate and fluoride were reported below the relevant Environmental Goals for bores MPGM4/D4 and MPGM4/D5.

Graphs of concentrations over the last 10 years for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of chloride and sulfate follow trends consistent with TDS and have been stable and below the Environmental Goals for groundwater throughout the historical dataset.

6.5.2.3 Metals

Throughout the reporting period arsenic, copper, iron, lead, and manganese were identified on one or more occasions at concentrations above the Environmental Goal for groundwater at bores MPGM4/D4 and/or MPGM4/D5, as presented in Appendix H and summarised in Figure 8a.

LORs for speciated chromium (hexavalent and trivalent), selenium, and silver were above the Environmental Goals for one or more sample events.

The LOR of total chromium was below the Environmental Goal. Total chromium concentrations were below the Environmental Goal for MPGM4/D4 and MPGM4/D5 during the reporting period.

Selenium was reported marginally above the 0.2 µg/L LOR in groundwater samples collected from MPGM4/D4 and MPGM4/D5 on three occasions. July and September monitoring events for both bores had a laboratory LOR of 10 µg/L, exceeding the Environmental Goal of 5 µg/L.

ERM understands that a laboratory LOR lower than the Environmental Goal for silver (0.05 µg/L) is unachievable by the laboratory. Based on the results of previous monitoring, including concentrations of silver in brine (<10 µg/L for most samples during 2021/22 and below the LOR for most samples for the current reporting period) silver is not considered to represent a primary constituent of concern for groundwater monitoring in accordance with the WMP.

Concentrations of metals were generally higher in groundwater from bore MPGM4/D4 (particularly arsenic, iron and lead) when compared to concentrations in groundwater from bore MPGM4/D5, noting the low pH values in groundwater from bore MPGM4/D4. However, manganese concentrations were higher in groundwater from MPGM4/D5 compared to concentrations from MPGM4/D4 and exceeded the Environmental Goal for manganese throughout the reporting period, consistent with the historic dataset.

Graphs of concentrations over the last 10 years (Appendix K) for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of boron and nickel have remained stable and below the Environmental Goal for groundwater throughout the historical dataset.

6.5.3 Groundwater Quality within MPAR and the Mine Disturbance Area East of MPAR

Data obtained from groundwater bores situated within the MPAR or in the mine disturbance area immediately to the east (D10, D11, D19, and D113) are summarised below and compared to the Environmental Goals for groundwater. Bores D23, SW3-D and B5 are located within this area, but have been destroyed (D23), are blocked (B5) or are dry / have insufficient water to sample (SW3-D), and as such no groundwater quality data was available for these bores during this reporting period.

Groundwater monitoring data for the current reporting period is presented in Appendix H, and summarised in Figure 8b. Graphs of concentrations over the last 10 years showing concentrations versus time for key analytes are provided in Appendix K.

6.5.3.1 Field Parameters

Field parameters monitored from bores within MPAR or in the mine disturbance area immediately to the east for the reporting period are summarised as follows:

- pH values of groundwater in this area were slightly acidic, ranging from 5.85 to 6.54 throughout the reporting period. pH values measured during the reporting period remained generally stable and similar to those reported in 2021/22. pH values were consistently more acidic than the Environmental Goal range (6.5 to 8.0) for groundwater, except for D11 on two occasions; and
- EC values obtained from field measurements ranged from 2,070 µS/cm to 10,460 µS/cm, with values remaining generally consistent with the previous reporting period. TDS concentrations ranged from 1,460 mg/L to 9,030 mg/L. Both EC and TDS values in groundwater from these bores were consistently above the Environmental Goals for groundwater (2,200 µS/cm for EC and 1,500 mg/L for TDS) during the reporting period, except for D19 on two occasions.

Graphs of concentrations over the last 10 years for data from bores within this area show concentrations of TDS in groundwater have fluctuated over time, with a general increase in concentrations to above the Environmental Goal for groundwater occurring prior to 2013. TDS concentrations within these bores have generally remained above the Environmental Goal since 2013. TDS concentrations in groundwater from bores D10, D19 and D113 generally reported decreasing concentrations since mid-2018, before concentrations spiked in late 2019. Since early 2020, stable to slightly decreasing concentrations have been apparent at D19 and D113. Although concentrations fluctuate, a slight increase in TDS concentrations from late 2020, continuing to mid-2023 is noted in D10, noting that concentrations in groundwater from bore D10 remained within the historic range.

6.5.3.2 Major and Minor Ions

Throughout the reporting period, major and minor ions including chloride, sulfate and fluoride were analysed in groundwater from bores D10, D11, D19, and D113. Sulfate concentrations generally exceeded the Environmental Goal for groundwater throughout the reporting period in groundwater from these four bores, except for D19 on two occasions. Chloride concentrations in groundwater from bore D11 were consistently above the Environmental Goal as were chloride concentration in groundwater from bore D10 in March and June 2023.

During the reporting period, fluoride concentrations were consistently below the Environmental Goal and generally below the LOR in groundwater from the four bores within this area.

Graphs of concentrations over the last 10 years for bores within this area show chloride and sulfate concentrations have fluctuated over time. Chloride and sulfate concentrations increased from approximately 2010 to approximately 2017. Since 2017, chloride concentrations at D19 and D10 generally decreased until concentrations started to increase from March 2023. Concentrations remained within the historical range and were below the Environmental Goal for chloride except for groundwater from bore D10 in March and June 2023. Similarly, sulfate concentrations generally decreased from mid-2019, with a slight increase from mid to late 2022 through to the end of the reporting period. Sulfate concentrations in groundwater from these bores have been consistently above the Environmental Goal except for bore D19 in August, September, and November 2022 when sulfate concentrations were below the Environmental Goal.

6.5.3.3 Metals

Throughout the reporting period boron, chromium (D113, D19), copper (D11), iron, lead (D10, D19), manganese, molybdenum (D10), and nickel (D10, D11) were measured on one or more occasions at concentrations above the Environmental Goals for groundwater from bores D10, D11, D19 and/or D113. These results are presented in Appendix H, and summarised in Figure 8b. The Environmental Goals for groundwater for boron and iron were exceeded in all samples collected during the reporting period.

LORs for speciated chromium (hexavalent and trivalent), selenium, and silver were above the Environmental Goals for one or more sampling events. Commentary about the raised LORs is included in Section 6.5.2.3.

Chromium was reported above the Environmental Goals for three out of the four sampling events in groundwater from bores D113 and D19. Copper (D11) and molybdenum (D10) were reported above the Environmental Goals on one occasion throughout the reporting period. Lead was above the Environmental Goal in groundwater from bores D19 and D10 for one monitoring event each.

Graphs of concentrations over the last 10 years for bores within this area show boron, manganese, and nickel concentrations have fluctuated over time. These selected metals were reported at concentrations above the Environmental Goals for groundwater before 2010. Concentrations have remained consistently above the Environmental Goals for boron in groundwater for all bores within the area, and for manganese and nickel in groundwater from bore D11. Boron, manganese, and nickel concentrations fluctuate but have been generally decreasing in groundwater from other bores in this area since mid-2019. An increase in boron and nickel concentrations was noted at the end of the reporting period in groundwater from bore D10. Concentrations in groundwater from bore D113 were generally stable, and those in groundwater from D11 and D19 decreased slightly towards the end of the current reporting period.

6.5.4 Groundwater Quality within Mine Disturbance Area South and South-east of MPAR

Data obtained from groundwater bores that are considered to be situated within the mine disturbance area to the south and south-east of the MPAR is summarised below and compared to the groundwater Environmental Goals. Bores in this area include D15, D16A, D17 and D18. D16 was replaced by D16A, which was sampled from December 2022; however, the two are considered to represent different data sets, therefore discussion of historical concentrations at D16 relative to D16A is not provided. Groundwater monitoring data for the current reporting period is presented in Appendix H, and summarised in Figure 8c. Graphs of concentrations over the last 10 years showing concentrations versus time for key analytes are provided in Appendix K.

6.5.4.1 Field Parameters

Field parameters monitored at these bores, which are situated within the MPAR and mine spoil disturbance area, are summarised as follows for the reporting period:

- pH values were consistently more acidic than the Environmental Goal range for groundwater at D15 and D17 although values were generally stable ranging between 5.26 and 6.16. pH values at D18 and D16A were generally stable, between 6.68 and 6.81, and within the Environmental Goal range (6.5 to 8.0); and
- EC values obtained from field measurements were 670 µS/cm to 2,790 µS/cm, and generally consistent with laboratory TDS concentrations of 343 mg/L to 2,220 mg/L. EC and TDS were above the Environmental Goals for groundwater (2,200 µS/cm for EC and 1,500 mg/L for TDS) from bore D17 for two out of the four monitoring events for the reporting period. Values in groundwater from the other bores within this area were below the Environmental Goals.

Graphs of concentrations over the last 10 years for bores within this area show concentrations of TDS in groundwater from bores D15 and D17 increased over time and were above the groundwater Environmental Goal from at least mid-2013. However, since mid-2021, TDS concentrations in these bores have declined, with concentrations in groundwater from D15 decreasing below the Environmental Goal from late 2022. Concentrations of TDS in groundwater from bore D18 appear stable and remained below the Environmental Goals for groundwater. During the current reporting period, TDS concentrations in groundwater from bore D16A were relatively stable and consistently below the Environmental Goal.

6.5.4.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions including chloride, sulfate and fluoride were reported for groundwater from bores D15, D17, D16A and D18. Fluoride was consistently below the Environmental Goals in groundwater from all four bores. Concentrations of sulfate were generally higher in groundwater from bores D15 and D17; however, only sulfate concentrations in groundwater from bore D17 were above the Environmental Goal in this reporting period. For this reporting period, chloride concentrations were below the Environmental Goal in groundwater from all the bores in this area.

Graphs of concentrations over the last 10 years for bores within this area show concentrations of chloride and sulfate in groundwater that are consistent with the trends observed from TDS concentrations. Concentrations of chloride and sulfate increased in groundwater from bores D15 and D17 from about 2013 to 2019 followed by a decreasing trend, which continued throughout the current reporting period. Chloride and sulfate concentrations at D18 have remained stable and low. During the current reporting period, chloride and sulfate concentrations in groundwater from bore D16A were consistently below the Environmental Goals.

6.5.4.3 Metals

Throughout the reporting period arsenic, barium, chromium, copper, iron, and lead were identified on one or more occasions at concentrations above the Environmental Goals in groundwater from bores D15, D16A, D17 and/or D18. Results are presented in Appendix H, and summarised in Figure 8c. Bore D15 accounts for the majority of exceedances in this area, consistent with the previous reporting periods.

LORs for speciated chromium (hexavalent and trivalent), selenium, and silver were above the Environmental Goals for one or more sample events. Commentary about the raised LORs is included in Section 6.5.2.3.

Graphs of concentrations over the last 10 years for bores within this area show that the concentration trends for manganese and nickel generally follow similar decreasing trends to those noted for TDS, chloride and sulfate.

Boron concentrations appear to have remained relatively stable throughout the last 10 years, fluctuating within a similar concentration range at each monitoring bore in this area. The exception is for intermittent spikes in boron concentrations at D15 throughout the early historical dataset (before 2018). Concentrations of boron in groundwater from D15 and the other bores in this area remained below the Environmental Goal for groundwater throughout the reporting period.

Concentrations of manganese in several bores in this area have varied although indicate consistent trends since 2019. The highest manganese concentrations were reported in groundwater from D15 and D17. These were similar in magnitude to each other, and higher than concentrations reported in groundwater from bore D18 and D16A. Manganese concentrations in groundwater from bores D15 and D17 have, overall, declined since approximately mid-2019. This trend is seen to continue into the current reporting period. Manganese concentrations in groundwater from all bores in this area remained below the Environmental Goal for groundwater throughout the historical dataset and the reporting period.

Concentrations of nickel appear stable, except in groundwater from bore D15, since at least 2014. Concentrations in groundwater from bore D15 were higher than the other bores in this area and were above the Environmental Goal from late 2017 until early 2022. However, nickel concentrations in groundwater from D15 have, overall, decreased since 2019 and continued to decrease during the current reporting period. Throughout the reporting period, nickel concentrations in groundwater from bore D15 were below the Environmental Goal for groundwater. Concentrations of nickel in groundwater from D17 and D18 appear generally stable since at least 2014 and have remained below the Environmental Goal for groundwater throughout the historical dataset and the reporting period. Nickel concentrations in groundwater from bore D16A have remained below the Environmental Goal for this reporting period.

6.5.5 Groundwater Quality Adjacent to MPAR – to the North

Groundwater data obtained from groundwater bores MPGM4/D3, D106 and D107 adjacent and to the north of the MPAR (cross gradient) are summarised with reference to the Environmental Goals for groundwater below. Groundwater monitoring data for the current reporting period is presented in Appendix H and summarised in Figure 8a. Graphs of concentrations over the last 10 years are provided in Appendix K.

6.5.5.1 Field Parameters

Field parameters monitored at bores adjacent and to the north of the MPAR (cross gradient) for the reporting period are summarised as follows:

- pH values measured from the bores in this area were between 5.47 and 6.2, indicating slightly acidic groundwater conditions, and were consistently more acidic than the Environmental Goal range for groundwater (6.5 to 8.0) throughout the reporting period; and
- EC values obtained from field measurements ranged from 269 µS/cm to 15,560 µS/cm and were generally consistent with laboratory TDS values reported between 134 mg/L and 13,600 mg/L. EC and TDS values were consistently above the Environmental Goals for groundwater (2,200 µS/cm for EC and 1,500 mg/L for TDS) in groundwater from bores D106 and D107, however values in groundwater from bore MPGM4/D3 remained below the Environmental Goals throughout the reporting period.

Graphs of TDS concentrations over the last 10 years show concentrations from bore MPGM4/D3 have been stable and below the Environmental Goal for groundwater throughout the historical dataset, including the reporting period. This is consistent with data from up gradient (background) bores MPGM4/D4 and MPGM4/D5.

Graphs of concentrations since 2018 for bores D106 and D107 show higher and more variable concentrations of TDS in groundwater and concentrations have remained above the Environmental Goal since September 2018, when these bores were first sampled.

6.5.5.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, sulfate, and fluoride were reported for groundwater from MPGM4/D3, D106 and D107. Concentrations of these ions were higher in groundwater from bores D106 and D107 when compared to data from bore MPGM4/D3. Sulfate and chloride concentrations have consistently been above the Environmental Goals for groundwater from bores D106 and D107 since they were first sampled in 2018, while concentrations in groundwater from bore MPGM4/D3 have remained below the Environmental Goals for groundwater. Fluoride concentrations in groundwater from each of these bores were below the Environmental Goal for groundwater, noting that the LOR was raised to <2 mg/L, which is above the Environmental Goal of 1.5 mg/L, during November, January, and May events.

Consistent with the trends identified from TDS, graphs of concentrations over the last 10 years of chloride and sulfate concentrations in groundwater from bore MPGM4/D3 indicate that concentrations have been stable and below the Environmental Goals throughout the historical dataset. This is consistent with up gradient (background) bores MPGM4/D4 and MPGM4/D5.

Also consistent with trends identified from TDS, chloride and sulfate concentrations in groundwater from bores D107 and D106 have been higher than MPGM4/D3 and have remained above the Environmental Goals for groundwater since September 2018 when these bores were first sampled. Concentrations of sulfate and chloride measured at D106 and D107 fluctuate between monitoring events.

6.5.5.3 Metals

Throughout the reporting period boron, copper, iron, lead, manganese, mercury, nickel and silver were identified on one or more occasions at concentrations above the Environmental Goals in groundwater from bores MPGM4/D3, D106 and/or D107. Results are presented in Appendix H, and summarised in Figure 8a.

LORs for speciated chromium (hexavalent and trivalent), selenium, and silver were above the Environmental Goals for one or more sampling events. Commentary about the raised LORs is included in Section 6.5.2.3.

Similar to TDS and major and minor ions, concentrations in groundwater from bore MPGM4/D3, located further upstream, were generally lower than concentrations in groundwater from bores D106 and D107. Bores D106 and D107 accounted for the majority of monitoring events recording concentrations above the Environmental Goals.

Graphs of concentrations over the last 10 years for bores MPGM4/D3, D106 and D107 (installed in 2018) show that trends in concentrations of boron, manganese and nickel are generally consistent with trends exhibited by the TDS concentrations. Concentrations in groundwater from bore MPGM4/D3 were stable and consistently below the Environmental Goals whereas concentrations of boron, nickel and manganese in groundwater from bores D106 and D107 were above the Environmental Goals. Graphs of concentrations over the last 10 years for bore MPGM4/D3 show concentrations of these selected metals have been stable and below the Environmental Goals for groundwater through the historical dataset. This is consistent with upgradient (background) bores MPGM4/D4 and MPGM4/D5.

Graphs of concentrations for bores D107 and D106 since their installation in 2018 show concentrations of boron, manganese, and nickel in groundwater are higher than MPGM4/D3 and have been above the Environmental Goals for groundwater since the bores were first sampled. During the current reporting period, concentrations in groundwater from bores D106 and D107 period fluctuated but were generally within the historical range for the selected metals, except for nickel in groundwater from bore D106 in October.

6.5.6 Groundwater Quality Adjacent to MPAR and Downgradient

Groundwater data obtained from groundwater bores MPGM4/D1, MPGM4/D9, D102, D105, MPGM4/D8, D104, D103, MPGM4/D2 located adjacent to and hydraulically downgradient of the MPAR is summarised below, with reference to the Environmental Goals for groundwater. Groundwater monitoring data for the current reporting period is presented in Appendix H, and summarised in Figure 8d. Graphs of concentrations over the last 10 years are provided in Appendix K.

6.5.6.1 Field Parameters

Field parameters monitored at bores located adjacent to and hydraulically downgradient of the MPAR for the reporting period are summarised as follows:

- pH values in groundwater from these bores ranged from 5.06 to 8.61, with most results indicating slightly acidic groundwater conditions throughout the reporting period. pH levels remained generally stable; however, most values were more acidic 5.06 to 6.49 than the Environmental Goal range (6.5 to 8.0), except for one occurrence at D102 (8.61); and
- EC values obtained from field measurements were 206 µS/cm to 12,370 µS/cm. The EC results were comparable to laboratory TDS values reported at 163 mg/L to 11,000 mg/L. Over the reporting period, EC and TDS values were consistently above the Environmental Goals (2,200 µS/cm for EC and 1,500 mg/L for TDS) in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105. No exceedances of the EC and TDS Environmental Goals for groundwater were reported in groundwater from bores MPGM4/D2, D104 and MPGM4/D8.

Concentrations graphs for the last 10 years show that TDS concentrations in groundwater from most of these bores have increased over time, with concentrations from MPGM4/D1, MPGM4/D9 and MPGM4/D2 reported above the Environmental Goal since before 2013. TDS concentrations in groundwater from MPGM4/D1 increased consistently from before 2013 to 2018, and again from 2019 to 2021; since 2021 they have been relatively stable but remain above the Environmental Goal for groundwater. TDS concentrations in groundwater from MPGM4/D9 increased from 2018 through 2020; since then, concentrations have been relatively stable but remain above the Environmental Goal.

Concentrations graphs for bores D102, D103 and D105 show the concentrations of TDS in groundwater from these bores have remained above the Environmental Goal for groundwater since September 2018 when these bores were first sampled. Concentrations have fluctuated over time, but a slight decreasing trend is noted for TDS in groundwater from D102, D103 and D105. Concentration graphs for groundwater from bores D104 and MPGM4/D8 show fluctuating TDS concentrations over time, although concentrations have been consistently below the Environmental Goal throughout the historical dataset and the current reporting period.

The previously increasing TDS concentrations at MPGM4/D1, MPGM4/D2, D102, D103 and D105 have become generally stable to decreasing over the current reporting period. MPGM4/D9 shows a slight increase towards the end of the current reporting period, but concentrations remain within the historical range.

6.5.6.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, sulfate and fluoride were reported in groundwater from bores MPGM4/D1, MPGM4/D2, MPGM4/D8, MPGM4/D9, D102, D103, D104 and D105, with concentrations of chloride and sulfate exceeding the Environmental Goals for groundwater throughout the reporting period for groundwater from bores MPGM4/D1, D102, and MPGM4/D9 (chloride), and from bores MPGM4/D1, D102, MPGM4/D9, D103, and D105 (sulfate). Except for one occasion (MPGM4/D1 in November, raised LOR), fluoride concentrations in groundwater from these bores were consistently below the Environmental Goal for groundwater.

Concentrations of major and minor ions were lower and below the Environmental Goals in groundwater from bores MPGM4/D2, MPGM4/D8 and D104 when compared to concentrations in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105. The difference in groundwater quality between these locations is considered likely to be due to the spatial distribution of these locations relative to the MPAR and related groundwater flow paths.

Sulfate was reported at concentrations above the Environmental Goal consistently throughout the reporting period from bores MPGM4/D1, D102, MPGM4/D9, D103 and D105. No exceedances of the sulfate Environmental Goal for groundwater were reported at bores MPGM4/D2, MPGM4/D8 and D104 during the reporting period.

Chloride was reported at concentrations that were consistently above the Environmental Goal in groundwater from bores MPGM4/D1, D102 and MPGM4/D9. No exceedances of the chloride Environmental Goal were reported in groundwater from bores MPGM4/D2, MPGM4/D8, D103, D104 and D105.

Graphs of concentrations over the last 10 years for bores within this area show concentrations of chloride and sulfate in groundwater are consistent with the trends exhibited by TDS concentrations. Concentrations of selected major and minor ions have increased. Sulfate has consistently been reported above the Environmental Goals in groundwater from MPGM4/D1 and MPGM4/D9 since before 2013, while chloride has consistently been reported at concentrations above the Environmental Goals for groundwater from MPGM4/D1 since early 2015 and MPGM4/D9 since August 2018. During the current reporting period sulfate and chloride concentrations fluctuated at MPGM4/D1 with the historical maximum for sulfate recorded in November 2022.

Chloride concentrations in groundwater from MPGM4/D2 generally increased, although concentrations fluctuated, until January 2020 when concentrations started to decline. Similar trends are apparent in sulfate concentrations in groundwater from MPGM4/D2 although sulfate concentrations increased above the Environmental Goal in 2013 and started to decrease below the Environmental Goal from January 2020. Sulfate and chloride concentrations have been stable in groundwater from MPGM4/D2 since decreasing in early 2020 and remained below the Environmental Goals for groundwater throughout the reporting period.

Graphs of concentrations over the last 10 years for bore D103 show the concentration of sulfate has generally declined, although remaining above the Environmental Goal, since September 2018 when the bore was first sampled. Concentrations of chloride in groundwater from D103 have declined since monitoring commenced and have remained below the Environmental Goal for groundwater since October 2019.

Sulfate concentrations in groundwater from D105 appear to be relatively stable and have remained above the Environmental Goal for groundwater. Chloride concentrations in groundwater from D105 also appear to be relatively stable and have remained below the Environmental Goal for groundwater.

Graphs of concentrations over the last 10 years for bores D104 and MPGM4/D8 show generally stable chloride and sulfate concentrations over time, with concentrations of these analytes consistently remaining below the Environmental Goals for groundwater throughout the historical dataset and current reporting period.

6.5.6.3 Metals

Throughout the reporting period boron, chromium, copper, iron, lead, manganese, mercury, and nickel were identified on one or more occasions at concentrations above the relevant Environmental Goals for groundwater at the bores located downgradient of MPAR. Results are presented in Appendix H and summarised in Figure 8d.

LORs for speciated chromium (hexavalent and trivalent), selenium, and silver were above the Environmental Goals for one or more sampling events. Commentary about the raised LORs is included in Section 6.5.2.3.

Concentrations of metals were generally lower in groundwater from bores MPGM4/D2, MPGM4/D8, D104, and D105 with concentrations higher in groundwater from bores MPGM4/D1, MPGM4/D9, D102, and D103.

Graphs of concentrations over the last 10 years show concentrations of boron, manganese and nickel are generally consistent with the trends exhibited by the TDS values. Concentrations of nickel, manganese and boron have remained generally stable and below the Environmental Goals in groundwater from MPGM4/D8 and D104. In groundwater from MPGM4/D2, concentrations previously fluctuated near the Environmental Goal for groundwater but have decreased since early 2020 and have since been stable and below the Environmental Goals for boron, manganese, and nickel.

Graphs of concentrations over the last 10 years show that concentrations of boron, manganese and nickel in groundwater have increased over time at MPGM4/D1 and MPGM4/D9 to concentrations that remain above the Environmental Goals for groundwater. Concentrations decreased towards the end of last reporting period, increased from September to November 2022 of this reporting period, then decreased through to the end of this reporting period, except for D9 which increased towards the end of the reporting period.

Graphs of concentrations in groundwater from bores D102, D103 and D105 show relatively stable concentrations of boron, manganese, and nickel that have generally been above the Environmental Goals for groundwater since September 2018, when these bores were first sampled. Nickel concentrations for bore D105 in 2023 were below the Environmental Goal for groundwater for the first time since it was first sampled. For boron, concentrations appear to be stable with no identifiable trend throughout the reporting period except for a slight decrease in groundwater from D102.

6.5.7 Brine Waste Pond Leak Detection Bores

Water quality results from monitoring bores MPGM5/D5 and MPGM5/D6, adjacent to the Brine Waste Holding Ponds (to the west and upgradient of the MPAR, but downgradient of the Brine Waste Holding Ponds) are summarised with reference to the Environmental Goals for groundwater in the sections below. These bores are installed to approximately 10 m below ground level and were constructed for the purpose of leak detection from the Brine Waste Holding Ponds. Therefore, the presence of water at these locations is not inferred to reflect the regional groundwater table. Water monitoring data for the current reporting period is presented in Appendix H and summarised in Figure 8e. Graphs of concentration vs time for available data over the last ten years are provided in Appendix K.

6.5.7.1 Field Parameters

Field parameters monitored at bores adjacent to the Brine Waste Holding Ponds for the reporting period are summarised as follows:

- pH values were 6.41 to 8.0, with most values indicating slightly acidic groundwater conditions throughout the reporting period except for one value of a pH of 8.0 in water from MPGM5/D6. The majority of the pH values were within the Environmental Goal range (6.5 to 8.0). For MPGM5/D5 three out of six values were more acidic than the Environmental Goal and for MPGM5/D6 two were outside of the range, with one more acidic and one more basic than the Environmental Goal range; and
- EC values obtained from field measurements at MPGM5/D5 and MPGM5/D6 were between 200 µS/cm and 36,390 µS/cm, and this was generally consistent with laboratory TDS values reported at 5,860 mg/L to 37,400 mg/L, though TDS was not analysed for five of the monitoring events. EC and TDS values consistently exceeded the Environmental Goals (2,200 µS/cm for EC and 1,500 mg/L for TDS) for groundwater at bores MPGM5/D5 and MPGM5/D6, except for EC on one occasion for MPGM5/D6 in July 2022 (200 µS/cm). Given the discrepancy between the July 2022 event, the previous result (also July 2022) and the rest of the results from this current reporting period, this measurement is considered to be erroneous. Laboratory TDS and major ions were not reported for this monitoring event.

Graphs of concentrations over the last 10 years show that TDS had remained below or within the range of the Environmental Goals at both bores until approximately October 2019, when a leak was detected in the liner of Brine Waste Bond A, which is closest to MPGM5/D5. The 2019 leak was repaired during the 2019/20 reporting period and notified to the EPA (ERM, 2020a).

Since the repairs, TDS concentrations in water from MPGM5/D5 and MPGM5/D6 had declined, with concentrations at MPGM5/D6 below the Environmental Goal. However, TDS concentrations at MPGM5/D5 have been increasing since February 2021 and MPGM5/D6 since January 2023, with concentrations above the Environmental Goal in water from both bores throughout the reporting period. The recently increasing TDS concentrations are considered to be related to the rising groundwater elevations remobilising residual impact related to the 2019 leak. This is discussed further in Section 6.6.6.

6.5.7.2 Major and Minor Ions

Concentrations of major and minor ions, including chloride, sulfate and fluoride were reported at concentrations above the Environmental Goals in water from bores MPGM5/D5 and MPGM5/D6 throughout the reporting period. Chloride and sulfate concentrations were generally within the historic range for MPGM5/D5; however, concentrations in water from MPGM5/D6, increased to concentrations above the Environmental Goals from early 2022. For chloride in MPGM5/D6, concentrations increased from May 2022 to the end of the reporting period, with the maximum recorded concentrations reported in January 2023. Sulfate concentrations increased from May 2022, but remained within the historic range. Similar to TDS, the recently increasing sulfate and chloride concentrations are considered to be related to the rising water levels remobilising residual impact related to the 2019 leak. This is discussed further in Section 6.6.6.

The LOR (between <2 mg/L and <5 mg/L) for fluoride was above the Environmental Goal (1.5 mg/L) at both MPGM5/D5 and MPGM5/D6 for all events during the reporting period, except for one occasion for MPGM5/D6 in July 2022 when the LOR was below the Environmental Goal. Fluoride was also not recorded for two events for MPGM5/D5 and three events for MPGM5/D6.

6.5.7.3 Metals

Throughout the reporting period boron, cadmium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium and zinc were identified on one or more occasions at concentrations above the relevant Environmental Goals for groundwater from bores MPGM5/D5 and MPGM5/D6. Results are presented in Appendix H and summarised in Figure 8e.

Chromium, speciated chromium (hexavalent and trivalent), copper, lead, selenium, and silver had LORs above the Environmental Goals for one or more sample events. Commentary about the raised LORs is included in Section 6.5.2.3.

Bore MPGM5/D5 accounts for the majority of exceedances from the leak detection bores, with concentrations generally higher than MPGM5/D6, apart from iron which had higher concentrations from MPGM5/D6 during the reporting period.

Graphs of concentrations over the last 10 years show a similar trend for boron, manganese and nickel as for TDS, i.e., a spike in concentrations in 2019 at both bores, with subsequently decreasing concentrations toward pre-tear levels or below the Environmental Goals (mostly for MPGM5/D6) until early 2021. Concentrations of these analytes have fluctuated and appeared to have been slightly increasing at MPGM5/D5 and MPGM5/D6 until mid to late 2021 but seem to have generally stabilised in the current reporting period, apart from nickel. The recently increasing concentrations of select metals is considered to be related to the rising groundwater elevations remobilising residual impact related to the 2019 leak. This is discussed further in Section 6.6.6.

6.6 Summary

6.6.1 Groundwater Quality Upgradient of MPAR (background)

Acidic groundwater and concentrations of metals including arsenic, copper, iron, lead and manganese elevated above the Environmental Goals were identified in groundwater from background bores MPGM4/D4 and MPGM4/D5. As these bores are located up hydraulic gradient, and away from the MPAR, the reported results are not considered to be related to the Project activities.

The area surrounding the MPAR has been highly disturbed by historical mining activities, and the low pH in this area is reported to have resulted from the oxidation of iron sulfide (Connell Wagner, 2007). The elevated metals concentrations are likely associated with this oxidation and acidification mobilising metals into groundwater. Graphs of concentrations over the last 10 years presented in Appendix K for key analytes in groundwater including TDS, chloride, sulfate, boron, manganese and nickel show that the concentrations of these analytes have remained relatively stable in this area historically, as well as over the reporting period, consistent with the representation of background conditions.

6.6.2 Groundwater Quality within MPAR and the Mine Disturbance Area East of MPAR

pH values in groundwater both within and east of the MPAR were typically below (more acidic than) the Environmental Goal for groundwater. The lower pH values are considered to be consistent with background conditions in the area and may be a result of historical mine disturbance and/or be related to the regional groundwater quality. On this basis, the pH of groundwater in this area will continue to be monitored, consistent with the WMP, but is not discussed further.

Elevated EC and TDS values as well as concentrations of sulfate, chloride (D10 and D11) and metals including boron, chromium (D11 and D113), iron, lead (D10 and D19), manganese, molybdenum (D1) and nickel (D10 and D11) were identified at concentrations at or above the Environmental Goals in groundwater from bores within the MPAR and the mine disturbance area to the east (D10, D11, D19 and D113).

Concentrations of iron, lead and manganese in groundwater from the bores at and downgradient of the MPAR were a similar order of magnitude to those in groundwater from the background monitoring bores (MPGM4/D4 and MPGM4/D5). These concentrations are considered to be related to background groundwater conditions.

The reported TDS, EC, sulfate, chloride, boron, chromium and nickel concentrations in groundwater from bores in this area are considered elevated relative to upgradient locations. Connell Wagner (2007) reported elevated levels of sulfate, boron, nickel, zinc, manganese and iron previously in this area based on pre-placement ash data from bore B904 (operational between 1997 and 2000), which may have been influenced by goaf underground mine workings to the south of this area. However, concentrations of sulfate, chloride, boron, nickel and zinc and potentially the other metals indicate a different composition relative to the background bores and pre-placement groundwater data from historical bore B904 (from Aurecon, 2017).

In consideration of the brine composition (refer to Section 2.3 and Appendix D), which also contains elevated concentrations of these constituents, groundwater in this area has been influenced by leaching of BCA placed in the MPAR to the underlying water table. The leaching of constituents from the BCA placement area to the underlying groundwater formed part of the recently completed independent investigation.

During this reporting period a slight increase was noted for TDS, chloride, sulfate, boron, manganese and nickel in groundwater from D10, D19 and D113 towards the end of the reporting period (June 2023). This is thought to be related to the drier conditions experienced in the months leading up to June after a period of higher-than-average rainfall experienced during the previous reporting period (2021/22).

6.6.3 Groundwater Quality within Mine Disturbance Area South and Southeast of MPAR

Concentrations of analytes including sulfate, chloride and metals were typically lower in groundwater from D18 than in the surrounding bores in this area (D15, D16A and D17). D18 results were also lower than when compared to background concentrations in groundwater from bores MPGM4/D4 and MPGM4/D5. D18 also had barium concentrations an order of magnitude above the surrounding bores in the area.

Based on this information, the integrity of bore D18 may have been compromised, allowing fresh water to enter the bore from the surface or may be directly connected through a mine void or fill to surface water. Groundwater elevations in bore D18 have historically been more variable than in nearby bores, with more rapid responses to rainfall. During this reporting period, the groundwater elevation measured from D18 were not consistent with trends in the surrounding bores. Based on this information, water quality in bore D18 is not considered to represent groundwater quality in the area.

Elevated concentrations of iron were consistent in groundwater from bores within this area, except at D18, and were comparable to or slightly lower than those reported in groundwater from background bores MPGM4/D4 and MPGM4/D5. These iron concentrations, which exceeded the Environmental Goal, are considered to be consistent with background groundwater conditions.

EC, TDS and sulfate concentrations were higher in groundwater from bores D15 and D17, and TDS for D16A, than in the background bores MPGM4/D4 and MPGM4/D5. Concentrations of EC, TDS and sulfate generally exceeded the Environmental Goals for groundwater from D15 and D17. Metal concentrations recorded above the Environmental Goals, apart from iron, were mostly recorded from D15. Concentrations of chromium, copper, and lead exceeded the Environmental Goals in groundwater from bore D15 on one or more occasions.

Concentrations of target analytes in groundwater from bore D15 that exceed Environmental Goals are considered to be influenced by activities at the MPAR. Bore D15 appears to be located cross-gradient, rather than directly down hydraulic gradient of the MPAR, however the presence of preferential flow paths associated with former mine workings and other water management activities are likely to be factors in the apparent distribution of the analytes in groundwater. The seepage of constituents from the BCA placement area to underlying and adjacent groundwater has been assessed as part of the independent investigation.

6.6.4 Groundwater Quality Adjacent to MPAR – to the North

Groundwater quality at bore D3, which is the furthest up hydraulic gradient of the bores adjacent to MPAR was similar to the background groundwater conditions identified at background bores MPGM4/D4 and MPGM4/D5. Iron concentrations were within an order of magnitude of concentrations in the background bores, and the low pH values were also comparable to those in groundwater from MPGM4/D5.

Concentrations of EC, TDS, chloride, sulfate, boron, copper (D107), iron, lead, manganese, mercury, and nickel exceeded the Environmental Goals in groundwater from bores D106 and D107, located to the north-east of the MPAR. The iron and a component of the manganese concentrations are considered to be related to background water quality in the area, based on concentrations in groundwater from the background bores MPGM4/D4 and MPGM4/D5, in which concentrations were a similar order of magnitude. However, the EC, TDS, chloride, sulfate, boron and nickel concentrations in groundwater from bores D106 and D107 are considered to represent changes to water quality and are not primarily related to background and pre-ash placement conditions. These analytes are present at elevated concentrations in the brine and in groundwater beneath and immediately downgradient of the MPAR. Therefore, concentrations of analytes in groundwater from bores D106 and D107 are considered to be related to BCA placement activities at the MPAR. The seepage of constituents from the BCA placement area to underlying and adjacent groundwater has been assessed as part of the independent investigation.

6.6.5 Groundwater Quality Adjacent to MPAR and Downgradient

Some exceedances of the Environmental Goals for iron were reported in groundwater from bores D2 and D104. These concentrations are considered likely to be related to the background water quality in the area, based on concentrations in groundwater from the background bores MPGM4/D4 and MPGM4/D5, which were higher.

Concentrations of TDS, EC, sulfate, chloride, boron, iron, nickel and/or manganese that exceeded the Environmental Goals were reported in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103, and D105, located down hydraulic gradient of the MPAR.

pH values were also generally more acidic than the Environmental Goal range for groundwater. The elevated iron and manganese concentrations and the acidic pH values are considered to represent background groundwater conditions in the area.

The concentrations of EC and TDS, chloride, sulfate, boron and nickel that were above the Environmental Goals are considered to represent changes to water quality and are not primarily related to background and pre-ash placement conditions. These analytes are present at elevated concentrations in the brine used to condition the BCA, and in groundwater beneath and immediately downgradient of the MPAR. Concentrations of these analytes in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105 are considered to be related to BCA placement activities at the MPAR. This was considered as part of the independent investigation.

The concentrations of these key analytes (TDS, chloride, sulfate, boron, manganese, and nickel) in groundwater from MPGM4/D2 during the current reporting period have been generally stable apart from a slight increasing trend seen in October 2022, but then decreased towards the end of the current reporting period. This increase is considered to be consistent with the drier conditions experienced during the current reporting period after a higher-than-average period of rainfall experienced from 2021/22.

Except for iron and pH consistently and copper and lead on one occasion, the concentrations of key analytes were at or below the Environmental Goal for MPGM4/D2 during the current reporting period. Given the location and the hydraulic setting of the area, this bore is considered to be representative of background groundwater conditions in the area.

The intermittent and irregular exceedances of the Environmental Goals for chromium, copper, lead and mercury in groundwater from bores D1, D102, D103, D104, D105 and MPGM4/D2 that occurred during the previous reporting periods were noted again during the current reporting period.

6.6.6 Groundwater Quality Adjacent to Brine Waste Holding Ponds

Concentrations of EC, TDS, chloride, boron and nickel have continued to increase slightly in water from MPGM5/D5 for the current reporting period; however, concentrations have remained below historical peak concentrations recorded in 2019 which were associated with the tear in the liner at Brine Waste Pond A. The tear was repaired during the 2019/20 period and notified to the EPA. The suspected reason for the continued increasing trend for these analytes is outlined below. Manganese and sulfate concentrations in MPMG/D5 have stabilised and have started to slightly decrease towards the end of this reporting period.

The suspected source of increasing concentrations in water from MPGM5/D5 in in 2021 and 2022 was subject to review by ERM (2022), and the following conclusions have been made:

- The results do not indicate a new or recent leak that would have led to the changes in water quality observed at bore MPGM5/D5 in 2021 and 2022. The recent composition of water from this bore is generally consistent with the composition and water quality observed from the 2019 leak from Brine Waste Pond A;
- It is likely that the observed increase in concentrations at bore MPGM5/D5 during 2021 and 2022 are associated with residual brine from the 2019 leak that has remained in the ground near the ponds, and that is being mobilised by higher water levels following higher rainfall, particularly in late 2021 and into 2022; and
- The groundwater impacts associated with the original 2019 leak from Brine Waste Pond A are delineated downgradient of bore MPGM5/D5 based on the field survey of EC conducted by ERM in March 2022.

During this reporting period MPGM5/D6 exhibited relatively stable TDS, chloride, sulfate concentrations after a period of increase from early to mid-2022, which was considered to be associated with rising groundwater levels remobilising the elevated concentrations associated with the tear identified in the liner at Brine Waste Pond A.

Boron has remained low and stable, below Environmental Goal. Manganese has fluctuated around the Environmental Goal but appears generally stable. Nickel has increased above Environmental Goal in the current reporting period, which is also considered to be associated with rising groundwater levels remobilising concentrations from the 2019 leak.

7. EARLY WARNING ASSESSMENT

In addition to comparing results with the Environmental Goals for surface water and groundwater, an early warning assessment of the groundwater and surface water monitoring data is required as part of the WMP. This includes assessment of concentration plots through time, as described in Sections 5.5 and 6.5.2, and statistical analysis where appropriate, as described below.

7.1 Trend Assessment Approach

Trends in target analyte concentrations in groundwater and surface water were assessed through a combination of graphical and statistical tools.

Firstly, graphs of concentrations over the last 10 years were created for target analyte concentrations for individual monitoring locations to evaluate temporal trends of solute concentrations. A description of historical concentrations over the last ten years (since 2013) and Environmental Goals are provided in Section 0 (for surface water) and Section 6 (for groundwater). The graphs of concentrations over the last 10 years also include adopted Environmental Goals for comparison. As discussed in Section 5.5 and Section 6.5, graphs of concentrations over the last 10 years from July 2013 to June 2023 are presented for surface water and groundwater in Appendix J and Appendix K respectively.

7.2 Statistical Assessment of Trends

For both groundwater and surface water, the last two years of data (covering the last two reporting periods) was adopted for the statistical assessment. Statistical tools were applied and included the use of the Mann-Kendall method (groundwater data) and linear regressions (surface water data) to evaluate trends in target analyte concentrations in groundwater and surface water from each individual monitoring location. Statistical trend plots from the statistical assessment for surface water and groundwater are presented in Appendix L and Appendix M, respectively. Further details of the ERM Mann-Kendall and the data assessment methodology are provided in Appendix N.

7.2.1 Surface water

Surface water statistical trend plots (linear regression graphs) comparing concentrations in surface water vs time, were generated for each individual monitoring location for selected analytes reported and are included in Appendix L. Where surface water concentrations were reported below the laboratory LOR, a half laboratory LOR concentration value was adopted for the statistical trend assessment.

Due to the seasonal variability within the data set for surface water, linear regression graphs were identified to be the most appropriate statistical assessment tool for the current two-year dataset. The outputs in Appendix L include data from the beginning of the 2021/22 reporting period and the linear regression trend assessment. For the purposes of this assessment a trend was considered a strong positive trend (increasing trend) when the R was reported between 0.5 and 1, and a strong negative trend (decreasing trend) when the R was reported between -0.5 and -1.

For the surface water trends, the R^2 value presented in the surface water statistical trend plots evaluates the scatter of the data points around a fitted regression line (presented as a solid blue line on the trend graphs). The R^2 value is reported between -1 and 1, where a larger R^2 value, or one that is closer to 1 or -1, indicates a stronger trend, with less variability.

Table 9presents a summary from the statistical assessment of trends assessed for all locations and analytes reported above the relevant Environmental Goal during the reporting period.

7.2.2 Groundwater

Groundwater statistical trend plots (concentrations in groundwater and groundwater elevations vs time) were generated for each individual monitoring location for selected analytes by the ERM Mann Kendall application which was developed by ERM's Data Science and Visualisation Group to facilitate Mann-Kendall trend analysis and reporting. Plots are included in Appendix M.

The outputs include data from the beginning of the 2021/22 reporting period, and the statistical trend assessment. For the groundwater trends, the p-value presented in the trend plots indicates the level of statistical significance that can be attributed to the trend. A p-value of less than 0.05 relates to a statistical significance of 95%, i.e., if a trend has a p-value of less than 0.05 there is a 95% level of confidence that the data presents an actual trend and not a random distribution of data. The 95% confidence level has been adopted by ERM as an indicator of statistical significance in trends, and trends with these characteristics are shown in a solid black line; those that are not statistically significant do not include a solid black line.

Where no p-value is provided on the graphical outputs, a sufficient number of data points were not available to evaluate the significance of trends through the Mann-Kendall test. Concentrations both above and below the LOR and with respect to the relevant adopted background concentration (where available) are shown.

A minimum of four data points above the LOR and a threshold of 50% of data points above the LOR was set for the Mann-Kendall analysis. Parameters of the analysis are detailed in Appendix N.

Further details on the Mann-Kendall procedure are presented in the Western Australia Department of Environment's guidance document entitled *Use of Monitored Natural Attenuation for Groundwater Remediation* (2004).

Table 9: Summary of Statistical Assessment for Target Analytes

Monitoring Location	As	B	Cd	Cl	Cr	Cu	F	Fe	Pb	Mn	Hg	Mo	Ni	Se	SO_4	Zn	TDS	EC
Surface Water																		
LMP01	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	^	NT	NT	NT	NT
NC01	NT	NT	NT	NT	NT	NT	Up	Up	Up	NT	NT	Up	NT	^	NT	NT	Up	NT
S_C	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	^	NT	NT	NT	NT
SW_E	NT	Up	NT	Up	NT	NT	NT	Up	NT	Up	NT	NT	Up	^	Up	NT	Up	Up
WX22	NT	Up	NT	Up	NT	NT	NT	NT	NT	NT	NT	NT	Up	^	Up	NT	Up	Up
SW_G	NT	Up	NT	Up	NT	NT	NT	NT	NT	NT	NT	NT	Up	^	Up	NT	Up	Up
Groundwater																		
Within MPAR / mine disturbance area – east of MPAR																		
B5	Not sampled in current reporting period (blocked)																	
SW3-D	Not sampled in current reporting period (dry)																	
D23	Not sampled in current reporting period (destroyed)																	
D10	NT	Up	-	NT	-	-	-	NT	NT	NT	-	NT	Up	^	NT	Up	NT	NT
D11	NT	NT	-	NT	-	-	-	NT	-	NT	-	-	NT	^	NT	NT	NT	NT
D19	NT	NT	Up	NT	NT	-	-	NT	NT	NT	-	NT	NT	^	NT	NT	NT	NT
D113	NT	NT	NT	NT	NT	NT	-	NT	Down	NT	-	-	NT	^	NT	Down	NT	NT
Within MPAR / mine disturbance area – south / southeast of MPAR																		
D15	NT	NT	NT	Down	NT	-	-	Down	NT	Down	-	NT	Down	^	Down	Down	Down	Down
D16A	Insufficient data available to perform statistical assessment (< 8 data points) due to commissioning in October 2022																	
D17	-	Down	-	Down	-	-	-	NT	-	Down	-	-	Down	^	Down	NT	Down	Down
D18	NT	Down	-	NT	-	-	NT	NT	-	Down	-	Down	Down	^	Down	NT	NT	Down

Monitoring Location	As	B	Cd	Cl	Cr	Cu	F	Fe	Pb	Mn	Hg	Mo	Ni	Se	SO_4	Zn	TDS	EC
Background and Adjacent MPAR – north																		
MPGM4/D3	-	Down	-	Up	-	-	-	Up	-	NT	-	-	Up	^	NT	NT	NT	NT
MPGM4/D4	NT	-	NT	NT	NT	Up	-	NT	Down	NT	-	-	NT	^	Down	NT	NT	Down
MPGM4/D5	NT	Down	-	NT	-	-	-	NT	-	NT	-	-	Up	^	NT	Up	NT	NT
D106	NT	NT	NT	NT	-	-	-	NT	NT	NT	NT	-	NT	^	NT	NT	NT	NT
D107	NT	NT	NT	NT	-	-	-	Down	NT	NT	NT	-	NT	^	NT	NT	NT	NT
Adjacent MPAR – downgradient																		
MPGM4/D1	NT	NT	-	NT	-	-	-	NT	-	NT	-	-	NT	^	NT	NT	NT	NT
MPGM4/D2	-	NT	-	NT	-	NT	NT	NT	NT	NT	-	-	NT	^	NT	NT	NT	NT
MPGM4/D8	-	-	-	NT	-	NT	-	NT	-	NT	-	-	Up	^	NT	Up	NT	NT
MPGM4/D9	NT	NT	-	NT	NT	-	-	NT	NT	NT	NT	NT	Up	^	NT	NT	NT	NT
D102	-	Down	-	NT	Down	-	-	NT	-	NT	-	-	Down	^	NT	Down	Down	Down
D103	NT	NT	-	Down	NT	-	-	Down	-	Down	-	-	Down	^	Down	Down	Down	Down
D104	Up	NT	-	Down	-	NT	-	NT	-	NT	-	-	Up	^	NT	NT	NT	NT
D105	NT	NT	-	Down	-	-	-	Down	-	Down	-	-	Down	^	Down	NT	Down	Down
Brine waste pond leak detection bores																		
MPGM5/D5	NT	NT	NT	Up	-	NT	-	NT	NT	Down	NT	-	NT	^	NT	NT	NT	NT
MPGM5/D6	NT	-	Up	Up	-	NT	-	Down	NT	NT	-	Up	Up	^	Up	Up	Up	Up

NT = No statistically significant trend apparent

Up = Statistically significant increasing trend (upward black trend line presented on graph)

Down = Statistically significant decreasing trend (downward black trend line presented on graph)

- = Mann Kendall trend analysis not conducted, insufficient data points with concentrations above the LOR (> 50% data points below LOR)

^ = Raised LOR reported, interfering with the trend assessment; therefore, has been excluded from statistical analysis

7.3 Trend Assessment Summary

7.3.1 Surface Water

Last reporting period (2021/22), two increasing trends were identified for boron at SW_E and manganese at SW_C. Decreasing trends were noted for boron, cadmium, chlorine, fluorine, and molybdenum.

Statistically significant decreasing trends were not identified for the surface water dataset during the current reporting period. Increasing trends were reported for boron (SW_E, WX22, SW_G), chloride (SW_E, WX22, SW_G), fluoride (NC01), iron (NC01, SW_E), lead (NC01), manganese (SW_E), molybdenum (NC01), nickel (SW_E, WX22, SW_G), sulfate (SW_E, WX22, SW_G), TDS (NC01, SW_E, WX22, SW_G), and EC (SW_E, WX22, SW_G).

Several increasing trends were identified from the data collected from the last two years; however, it is noted that the last reporting period (2021/22) had higher than average rainfall, which is considered to have resulted in lower concentrations of monitored analytes in surface water. The decrease in rainfall over this reporting period, and particularly towards the months leading up to June, is considered to account for the increasing trends identified by the linear regression trend assessment. Concentrations of the monitored analytes have generally remained below Environmental Goals, except for nickel and manganese towards the end of this reporting period. For nickel and manganese, concentrations remained below the historical peaks recorded in 2020. As such the increasing trends identified in this reporting period are interpreted as a return to historical concentrations after a period of heavy rains.

7.3.2 Groundwater

For bores background to MPAR, nickel and zinc were identified as increasing over the dataset from the past two years in groundwater from MPGM4/D5, together with a decreasing trend in boron. Results for monitored analytes in groundwater from bore MPGM4/D4 did not indicate increasing trends, except for copper. These bores are hydraulically upgradient of MPAR and concentrations are considered to represent background conditions, unrelated to site activities.

Increasing trends were identified for chloride, iron, and nickel in groundwater from MPGM4/D3, adjacent to MPAR to the north; a decreasing trend was identified for boron. Results for monitored analytes in groundwater from bores D106 and D107 did not indicate increasing trends, and the trend for iron in groundwater from bore D107 was decreasing.

Within MPAR / mine disturbance area east of MPAR, increasing trends were reported for boron, nickel and zinc for D10, and cadmium for D19. Decreasing trends were reported for lead and zinc in groundwater from bore D113.

No increasing trends were reported for the bores within MPAR / mine disturbance area south / south-east of the MPAR, with most analytes reporting a decreasing trend and the remaining analytes reporting no trend. This is consistent with the trends identified from this group of bores during the last reporting period. It is noted that D16A did not have sufficient data points to conduct a trend assessment, as monitoring at D16A commenced in December 2022.

Hydraulically downgradient of MPAR, an increasing trend was identified for nickel and zinc in MPGM4/D8, nickel in MPGM4/D9, and nickel and arsenic in D104. For bores D102, D103 and D105, all identified trends were decreasing. No trends were identified for data from MPGM4/D1 and MPGM4/D2. D104 was the only bore in the entire dataset that reported an increasing trend for arsenic.

Generally, for these downgradient bores, the overall trends were similar to those in 2021/22, with the majority of trends identified as decreasing. Two increasing trends were identified during the last reporting period (boron at MPGM4/D9, selenium at MPGM4/D2); however, these trends were not repeated in this reporting period (boron in MPGM4/D9: no trend; selenium in MPGM4/D2: raised LOR).

Within the brine waste pond leak detection bores, two decreasing trends were identified for iron (MPGM4/D6) and manganese (MPGM4/D5). The only increasing trend reported for MPGM4/D5 was chloride. For MPGM4/D6, eight out of the 18 monitored analytes were reported with an increasing trend. Trends identified differed from the last reporting period in which most of the increasing trends were identified from groundwater sampled from MPGM5/D5. Section 6.6.6 includes a discussion of ERM (2022) data review in relation to the brine waste pond leak detection bores.

Elevated levels of the monitored analytes in groundwater from bores adjacent to and downgradient from the MPAR are considered to be from the leaching of the BCA placed in the MPAR, and subsequent transport of solutes within the regional groundwater. The increasing trends identified during the current reporting period are considered to be indicative of concentrations returning to within historical conditions, before the higher-than-average rainfall experienced over the 2021/22 reporting period.

7.4 Implementation of Contingency and Mitigation Measures

Where increasing trends have been identified, these have been recognised as triggers for action in accordance with the TARPs.

In the case of groundwater to the north, east and hydraulically downgradient of the MPAR, the recently completed independent groundwater investigation has identified controls to mitigate further leaching of BCA that is placed in the MPAR.

Based on findings from the independent groundwater investigation, a modification application for the Mt Piper Consent is pending. The proposed modification to the Mt Piper Consent is intended to enable a mitigation strategy as the MPAR transitions to a decommissioned facility.

Planning for implementation of these controls at MPAR is currently underway.

8. CONCLUSIONS

Based on the review of the surface water and groundwater quality data for the Project obtained in accordance with the WMP for the 2022/2023 reporting period, it is considered that the objectives of the EMR have been met, and the following conclusions are drawn:

- Concentrations of target analytes in groundwater have been reported above the Environmental Goal for groundwater at monitoring locations within and immediately downgradient to the east of the MPAR. Elevated levels of key analytes including chloride, sulfate, boron and nickel, are considered to be due to the leaching of these analytes from the BCA placed in MPAR and subsequent transport of solutes with the regional groundwater. During the latter part of the current reporting period concentrations in groundwater from several bores increased, however they remained generally within historical range;
- Impacted groundwater is migrating from the vicinity of the MPAR toward the alignment of Wangcol Creek, as indicated by the groundwater quality results reported to the north at D106 and D107, to the east at MPGM4/D1, MPGM4/D9, D102 and to a lesser extent at D105 and D103. These locations in particular have reported concentrations of target analytes in groundwater above the Environmental Goals for groundwater in areas downgradient of the MPAR. Increasing trends in target analytes were reported for relatively fewer bores within MPAR / mine disturbance east of MPAR and bores adjacent and downgradient of MPAR than in 2021/22; decreasing trends were identified in several bores. These changes in trends are considered to relate to the period of higher-than-average rainfall from 2021 to early 2022, noting that concentrations in groundwater from several bores increased in the latter part of the current reporting period, as drier conditions returned;
- Potential interaction of this impacted groundwater with the surface water of Wangcol Creek was identified during the 2019/20 reporting period (ERM, 2020a). During the current reporting period, several sample events reported values above the Environmental Goals for surface water, particularly for iron and nickel concentrations at SW_E, WX22 and SW_G. Intermittent exceedances were reported for pH, cadmium, chromium, copper, lead, manganese, mercury, and selenium throughout the Wangcol Creek monitoring network. Overall, surface water quality trends identified increasing concentrations of target analytes, with boron, chloride, nickel, sulfate, TDS, and EC all consistently increasing for the mid to downstream monitoring locations (SW_E, WX22 and SW_G). Increasing trends were also identified at NC01 (midstream) for fluoride, iron, lead, molybdenum, and TDS. Concentrations typically remained within historical ranges for each monitoring location. No trends were identified for LMP01 and SW_C. Similar to groundwater quality for this reporting period, the increasing trends identified from the surface water dataset are considered to be reflective of the drier conditions experienced towards the end of the current reporting period and represent the instream concentrations returning to concentrations prior to the period of higher-than-average rainfall (2021/22);
- Concentrations of key target analytes at MPGM5/D5 and MPGM5/D6 increased in 2019. This was related to a leak from Brine Waste Pond A, which was subsequently repaired and reported to the EPA. Groundwater conditions had improved at MPGM5/D5 and MPGM5/D6 toward pre-tear levels or below the Environmental Goals until early 2021. From early 2021, concentrations of key target analytes increased in water from MPGM5/D5. From early 2022, concentrations of key target analytes increased in water from MPGM5/D6. Concentrations from both MPGM5/D5 and MPGM5/D6 appear to have stabilised since early 2023. The suspected source of increasing concentrations in groundwater from MPGM5/D5 in 2021 and 2022 was subject to review by ERM, and the following conclusions have been made:
    - The results do not indicate a new or recent leak that would have led to the changes in water quality observed at bore MPGM5/D5 in 2021 and 2022. The recent composition of water from this bore is generally consistent with the composition and water quality observed from the 2019 leak from Brine Waste Pond A;

- It is likely that the observed increase in concentrations at bore MPGM5/D5 during 2021 and 2022 are associated with residual brine from the 2019 leak that has remained in the ground near the ponds, and that is being mobilised by shallower groundwater levels following higher rainfall, particularly in late 2021 and into 2022;
- The groundwater impacts associated with the original 2019 leak of brine from Waste Pond A are delineated downgradient of bore MPGM5/D5 based on the field survey of EC conducted by ERM in March 2022;
- Since the leak is considered to be associated with historic impacts in groundwater around Brine Waste Pond A and impacts to groundwater are localised (as indicated via the field survey), no further remediation, beyond the repair of the identified liner tear in 2019, is recommended as long as water quality data remains consistent or improves; and
- Monitoring of water levels and water quality in leak detection bore MPGM5/D5 will continue in accordance with the WMP.

Results of the groundwater and surface water monitoring program indicate that groundwater quality in the vicinity of the MPAR and the Brine Waste Ponds is influenced by Project activities. In portions of Wangcol Creek, surface water quality has historically been shown to be affected, primarily through the flow of groundwater into the creek during periods of low rainfall. The increasing trends identified within the downstream surface water monitoring points in mid-2023 are considered to be reflective of the drier conditions experienced towards the end of the reporting period. As such, the concentrations of the monitored analytes are returning to historical range after a period of lower concentrations due to the higher-than-average period of rainfall experienced in 2021/22.

Where increasing trends have been identified, these have been recognised as triggers for action in accordance with the TARP. In the case of groundwater to the north, east and down hydraulic gradient of MPAR, and historically surface water, the independent groundwater investigation informed potential mitigation measures. Based on findings from the independent groundwater investigation, a modification application for the Mt Piper Consent is pending. The proposed modification to the Mt Piper Consent is intended to enable a mitigation strategy, as the MPAR transitions to a decommissioned facility.

Consistent with the 2019/20, 2020/21, and 2021/22 reporting periods, due to bore construction appearing to have been compromised, permanently blocked, or bores repeatedly being dry or inaccessible, it is recommended that monitoring of bores B5, D23 and SW3D be removed from the monitoring program, and these bores be decommissioned if damaged.

As presented in Table 1, and consistent with the information presented in Table A.1, as at the end of the 2022/23 reporting period the operation was compliant with the relevant approval conditions, Conditions 44 and 45, of the Mt Piper Consent (DA80/10060).

9. REFERENCES

9.1 Project

Aurecon, 2009. Mt Piper Brine Conditioned Fly Ash Co-Placement Environmental Monitoring Report, Annual Environmental Monitoring Report 2008/09, Revision 2, 10 July 2009.

Aurecon, 2017. Mt Piper Brine Conditioned Fly Ash Co-Placement Environmental Monitoring Report, Annual Environmental Monitoring Report 2016/17, Revision 3, 25 September 2017.

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Danis, A., Danis, C., Lackie, M., O’Neil, C., & Twigg, L. (2011) Deep 3D structure of the Sydney Basin using gravity modelling, Australian Journal of Earth Sciences, 58:5, 517-542, DOI: 10.1080/08120099.2011.565802.

ERM 2020, Water Management and Monitoring Plan – Update for 60 ML Dam, Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan, EnergyAustralia NSW Pty Ltd, Final, 28 February 2020.

ERM 2020a, Annual Environmental Monitoring Report – Water Management and Monitoring, Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project, 29 September 2020.

ERM, 2021, Annual Environmental Monitoring Report – Water Management and Monitoring 2020/21, Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project, 28 September 2021.

ERM, 2022, Mt Piper Power Station - response to potential leak at the brine waste ponds, Letter to EnergyAustralia dated 29 August 2022 (DRAFT)

ERM, 2022a, Annual Environmental Monitoring Report – Water Management and Monitoring 2021/22, Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project, 28 September 2022.

Sinclair Knight Mertz (SKM) (2010) Mt Piper Power Station Ash Placement Project, Appendix D, Hydrology and Water Quality, 2010.

9.2 General

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) National Water Quality Management Strategy. Paper No. 4. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines (Chapter 1-7).

Australian and New Zealand Governments (ANZG) (2018), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, available at www.waterquality.gov.au/anz-guidelines

Western Australia Department of Environment, 2004: Use of Monitored Natural Attenuation for Groundwater Remediation.

10. STATEMENT OF LIMITATIONS

This report is based solely on the scope of work described in our proposal P0533074 dated 20/3/20 and confirmed via email on 24/4/20 (Scope of Work) and performed by Environmental Resources Management Australia Pty Ltd (ERM) for EnergyAustralia NSW Pty Ltd (the Client). The Scope of Work was governed by a contract between ERM and the Client (Contract).

No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.

The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.

This report was prepared between July 2023 and September 2023 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.

Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.

This report is based on one or more site inspections conducted by ERM personnel, the sampling and analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:

- Did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
- Assumes no responsibility or liability for errors in data obtained from; and
- The Client, any third parties or external sources (including regulatory agencies).

Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.

Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:

- The suitability of the site(s) for any purpose or the permissibility of any use;
- The presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
- The presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.

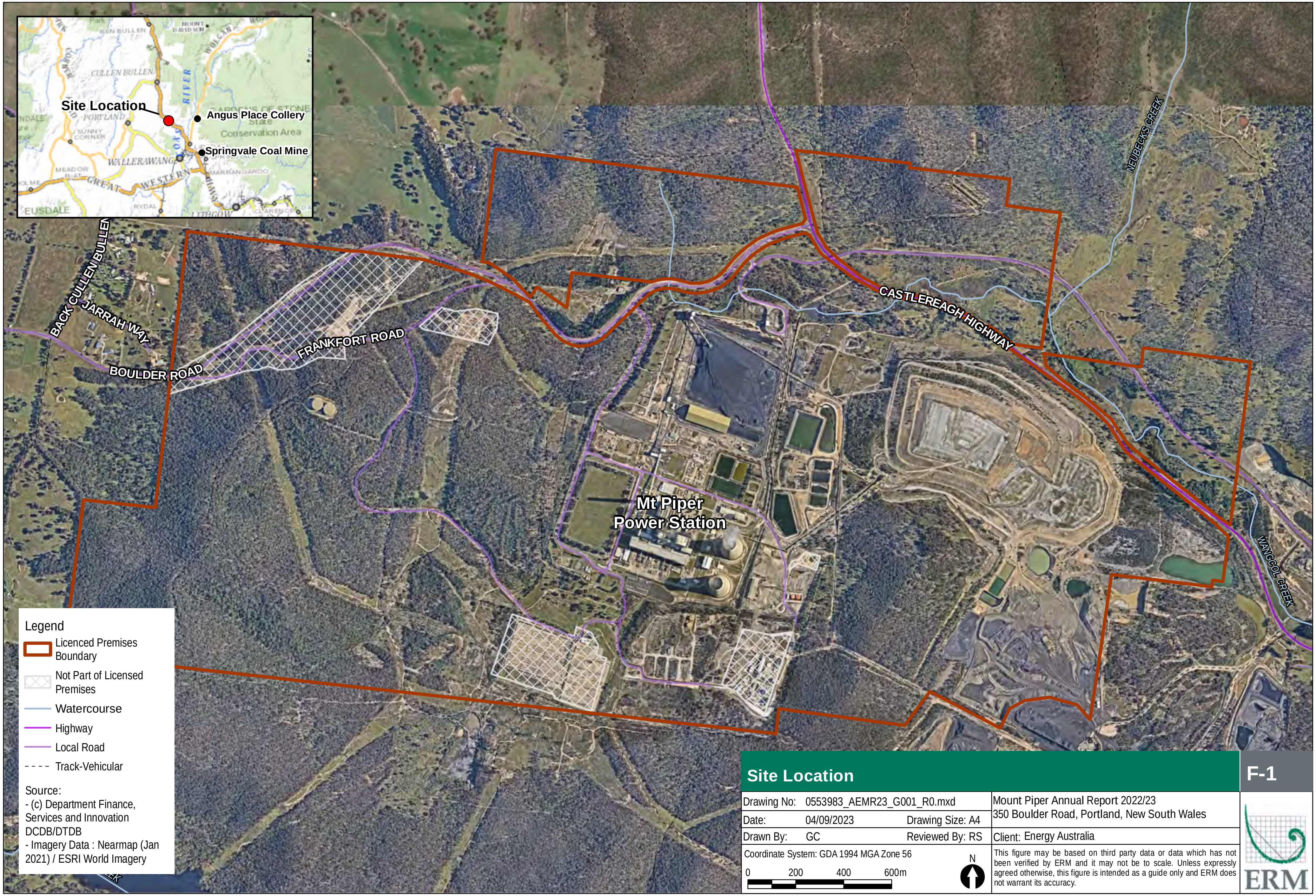
The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.

This report should be read in full, and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.

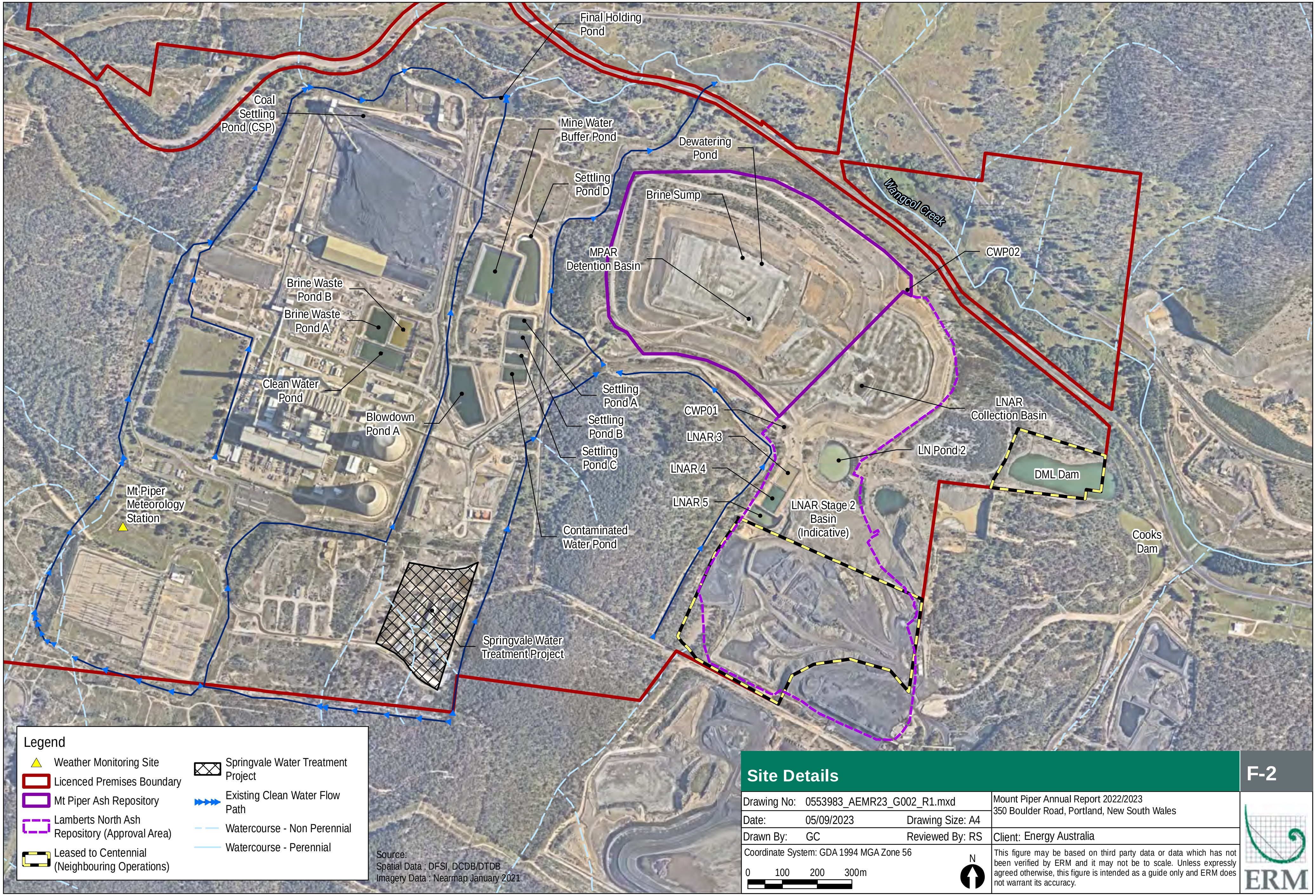
Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:

- Has been prepared and is intended only for the exclusive use of the Client;
- Must not to be relied upon or used by any other party;
- Has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;
- Does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
- Does not purport to provide, nor should be construed as, legal advice.

FIGURES



Site Location
Angus Place Collery
Springvale Coal Mine
BEN BULLEN
CULLEN BULLEN
PORTLAND
SUNNY CORNER
WALLERAWANG
GREAT WESTERN
RIVER
Conservation Area
MEADOW FLAT
RYDAL
EUSDALE
LITHGOW
BACK CULLEN BULLEN
JARRAH WAY
BOULDER ROAD
FRANKFORT ROAD
CASTLEREAGH HIGHWAY
NEUBECKS CREEK
WANGCOL CREEK
Mt Piper
Power Station
Legend
Licenced Premises Boundary
Not Part of Licensed Premises
Watercourse
Highway
Local Road
Track-Vehicular
Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB
- Imagery Data : Nearmap (Jan 2021) / ESRI World Imagery
Site Location
F-1
Drawing No: 0553983_AEMR23_G001_R0.mxd
Date: 04/09/2023
Drawing Size: A4
Drawn By: GC
Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56
0
200
400
600m
N
Mount Piper Annual Report 2022/23
350 Boulder Road, Portland, New South Wales
Client: Energy Australia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Legend

- Weather Monitoring Site
- Licenced Premises Boundary
- Mt Piper Ash Repository
- Lamberts North Ash Repository (Approval Area)
- Leased to Centennial (Neighbouring Operations)
- Springvale Water Treatment Project
- Existing Clean Water Flow Path
- Watercourse - Non Perennial
- Watercourse - Perennial

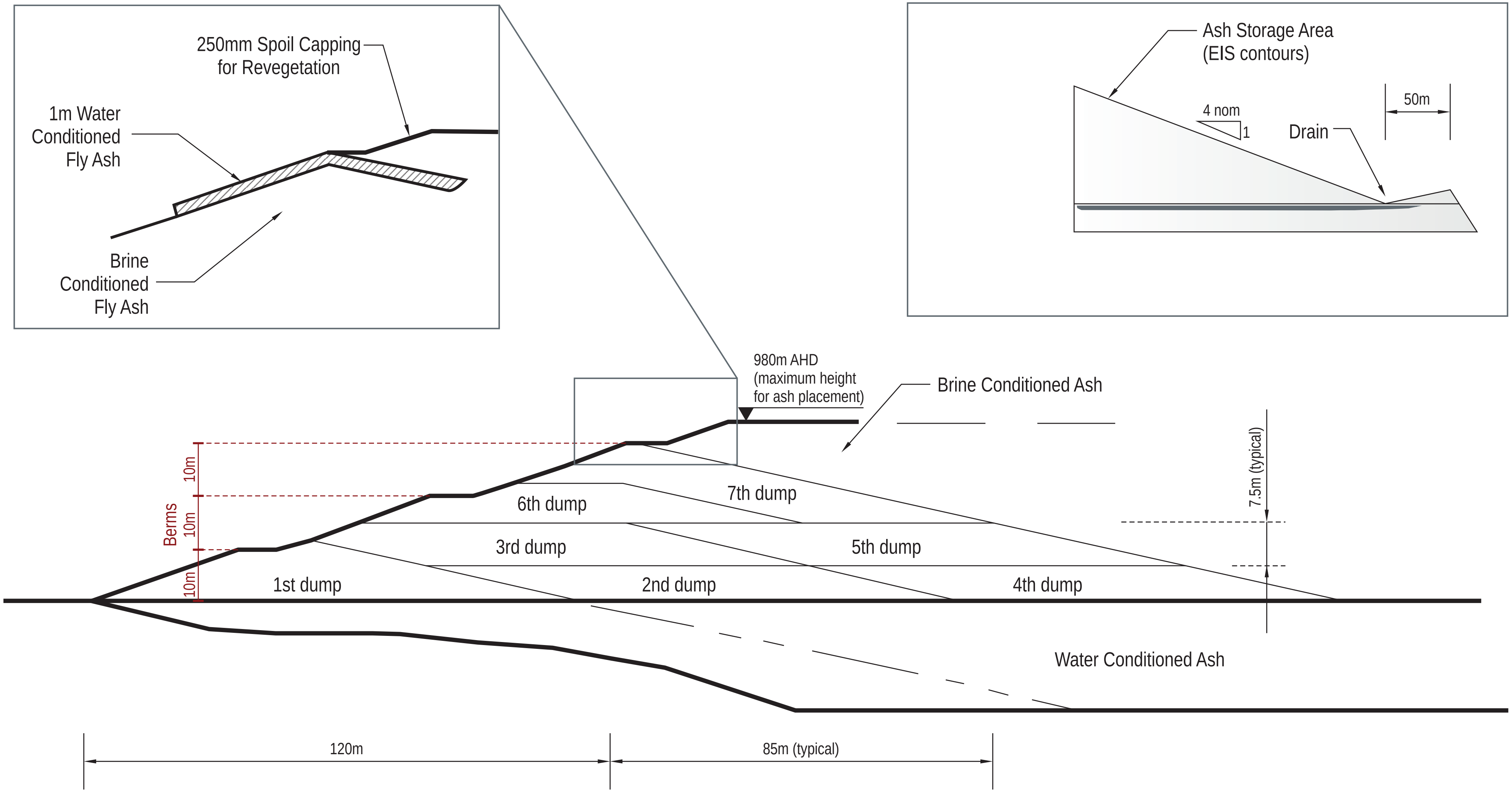
Source:
Spatial Data : DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Site Details

F-2

Drawing No:	0553983_AEMR23_G002_R1.mxd		Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date:	05/09/2023	Drawing Size: A4	
Drawn By:	GC	Reviewed By: RS	Client: Energy Australia
Coordinate System: GDA 1994 MGA Zone 56	0 100 200 300m	N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Notes:

Details shown are diagrammatical only.

Source:

Connell and Wagner, 2008. Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan. Prepared for Delta Electricity, September 2008.

Schematic of External Batter Placement

F-3

Drawing No: 0553983_AEMR23_C001_R0.cdr		Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date: 18/08/2023	Drawing size: A4	
Drawn by: GC	Reviewed by: RS	Client: Energy Australia
Drawing Not to Scale		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Ash Placement Plan

F-4

Drawing No:	0553983_AEMR23_G004_R0.mxd	
Date:	05/09/2023	Drawing Size: A4
Drawn By:	GC	Reviewed By: RS

Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales

Client: Energy Australia

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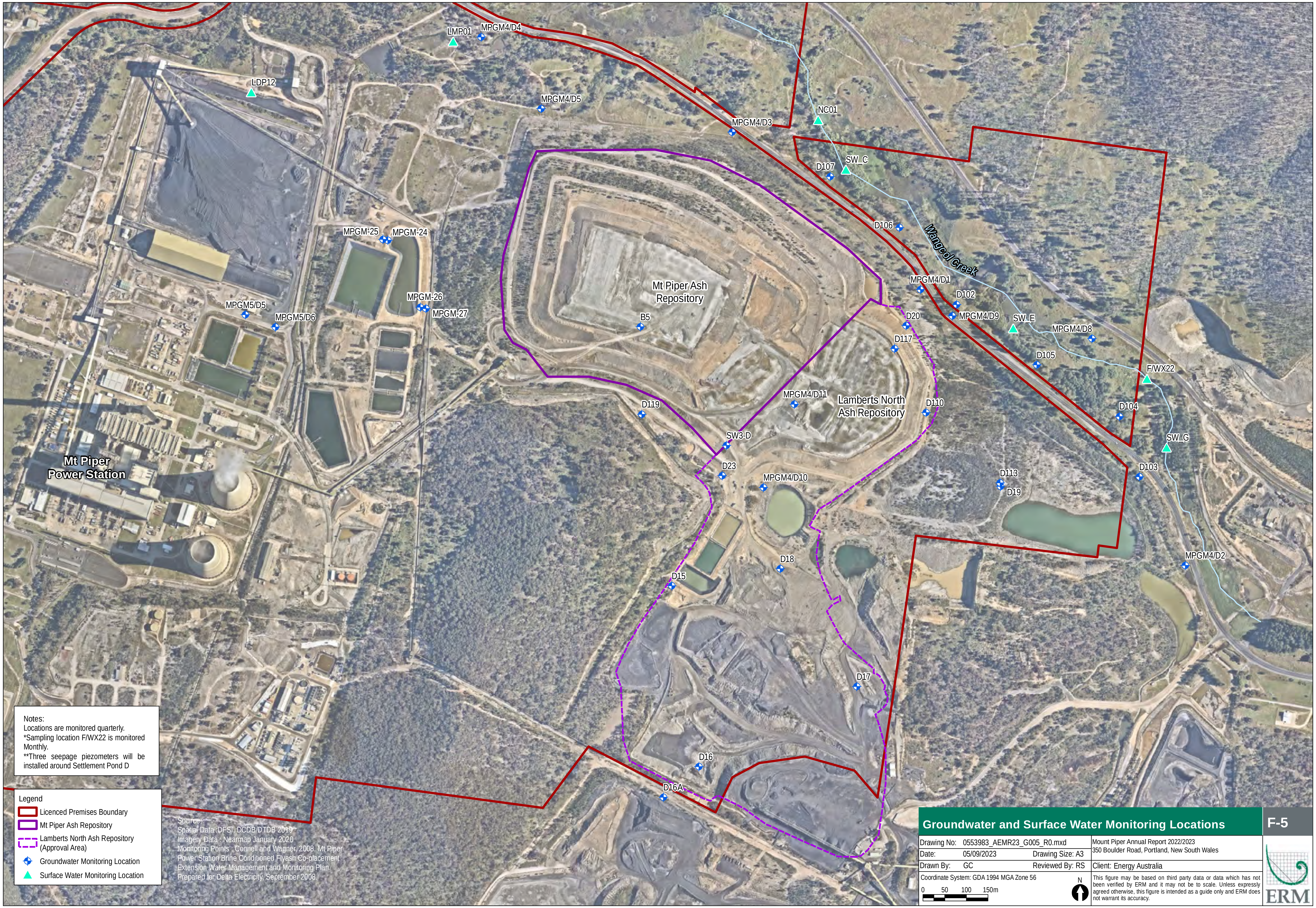
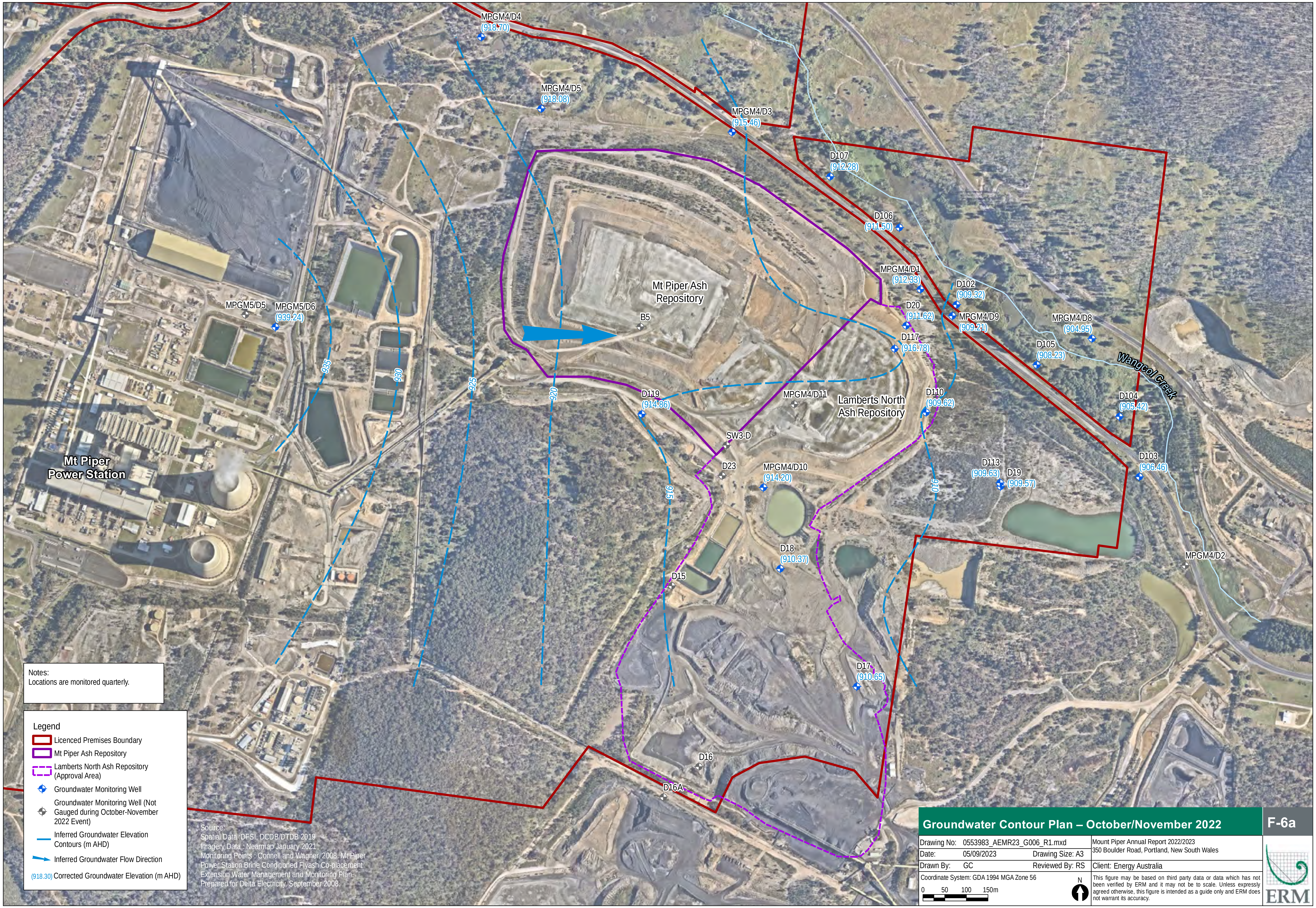


Groundwater and Surface Water Monitoring Locations — F-5

Drawing No: 0553983_AEMR23_G005_R0.mxd		Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date: 05/09/2023	Drawing Size: A3	
Drawn By: GC	Reviewed By: RS	Client: Energy Australia
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



Notes:
Locations are monitored quarterly.

Legend
- Licenced Premises Boundary
- Mt Piper Ash Repository
- Lamberts North Ash Repository (Approval Area)
- Groundwater Monitoring Well
- Groundwater Monitoring Well (Not Gauged during October-November 2022 Event)
- Inferred Groundwater Elevation Contours (m AHD)
- Inferred Groundwater Flow Direction
- (918.30) Corrected Groundwater Elevation (m AHD)

Source:
Spatial Data :DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap January 2021
Monitoring Points : Connell and Wagner, 2008. Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan. Prepared for Delta Electricity, September 2008.

Groundwater Contour Plan – October/November 2022 F-6a

Drawing No: 0553983_AEMR23_G006_R1.mxd
Date: 05/09/2023 Drawing Size: A3
Drawn By: GC Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56
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Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales
Client: Energy Australia

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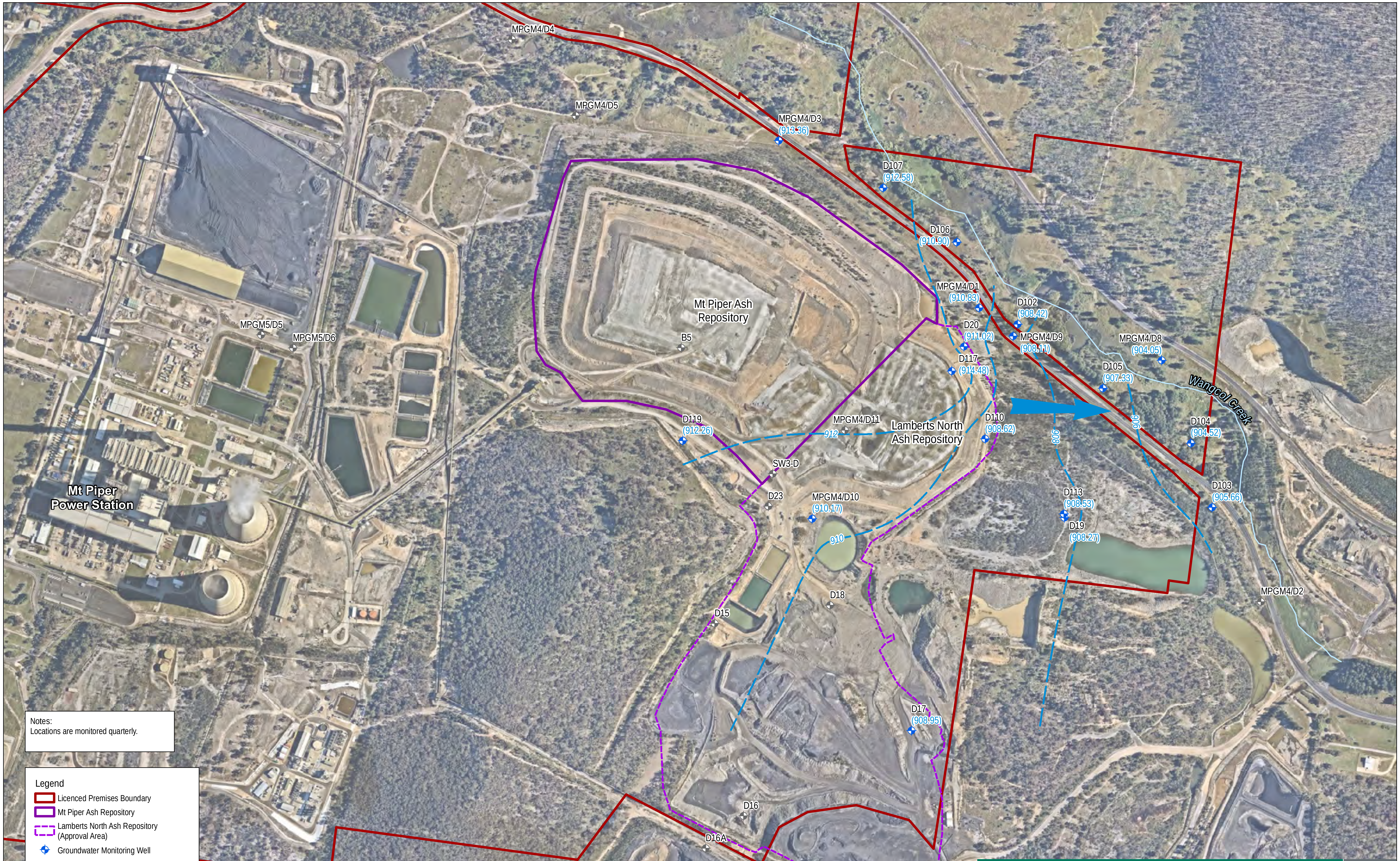
ERM



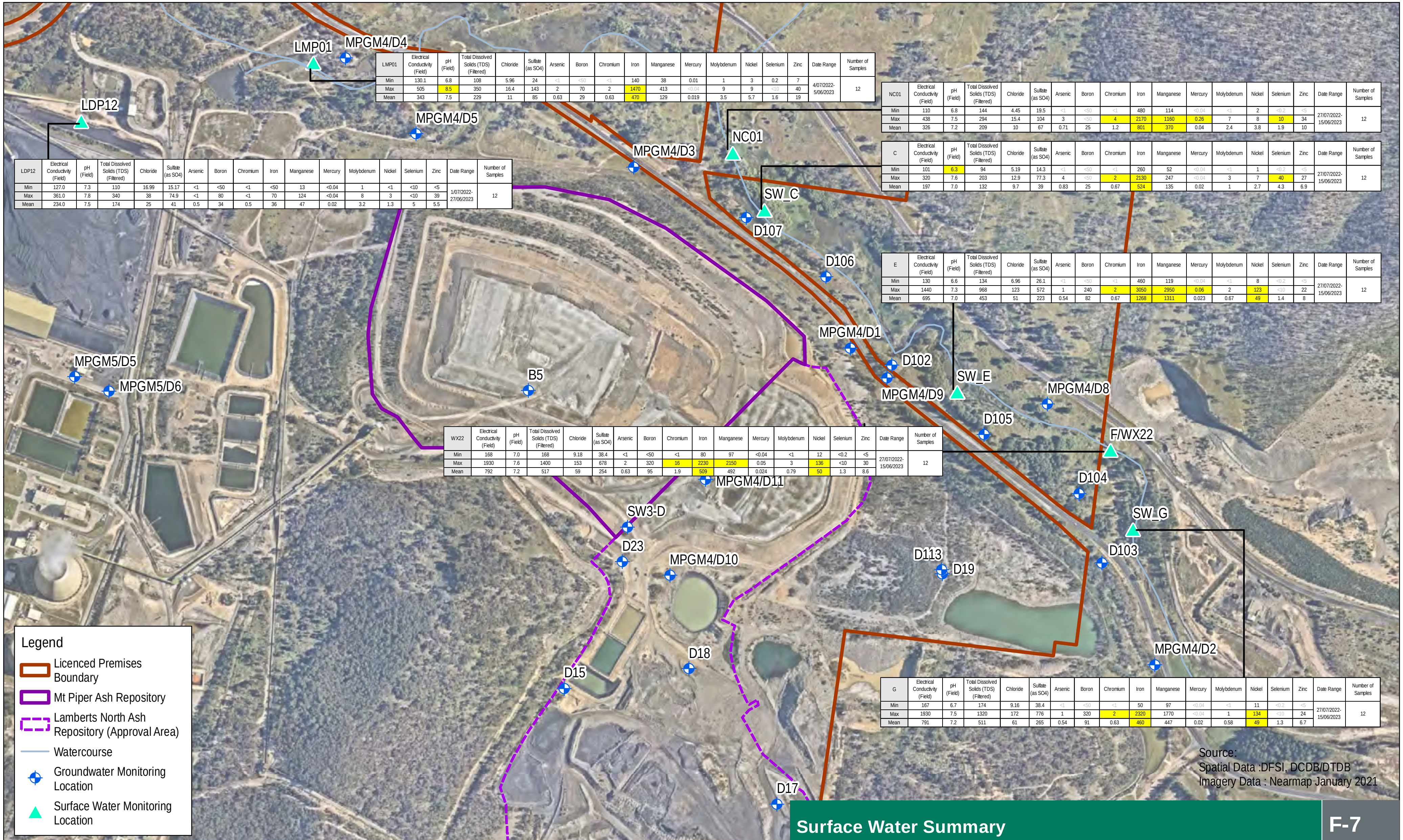
Groundwater Contour Plan – May/June 2023

F-6b

Drawing No:	0553983_AEMR23_G007_R1.mxd		Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date:	05/09/2023	Drawing Size: A3	
Drawn By:	GC	Reviewed By: RS	Client: Energy Australia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



LMP01	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	130.1	6.8	108	5.96	24	<1	<50	<1	140	38	0.01	1	3	0.2	7	4/07/2022-5/06/2023	12
Max	505	8.5	350	16.4	143	2	70	2	1470	413	<0.04	9	9	<10	40		
Mean	343	7.5	229	11	85	0.63	29	0.63	470	129	0.019	3.5	5.7	1.6	19		

NC01	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	110	6.8	144	4.45	19.5	<1	<50	<1	480	114	<0.04	<1	2	<0.2	<5	27/07/2022-15/06/2023	12
Max	438	7.5	294	15.4	104	3	<50	4	2170	1160	0.26	7	8	10	34		
Mean	326	7.2	209	10	67	0.71	25	1.2	801	370	0.04	2.4	3.8	1.9	10		

C	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	101	6.3	94	5.19	14.3	<1	<50	<1	260	52	<0.04	<1	1	<0.2	<5	27/07/2022-15/06/2023	12
Max	320	7.6	203	12.9	77.3	4	<50	2	2130	247	<0.04	3	7	40	27		
Mean	197	7.0	132	9.7	39	0.83	25	0.67	524	135	0.02	1	2.7	4.3	6.9		

LDP12	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	127.0	7.3	110	16.99	15.17	<1	<50	<1	<50	13	<0.04	1	<1	<10	<5	1/07/2022-27/06/2023	12
Max	361.0	7.8	340	38	74.9	<1	80	<1	70	124	<0.04	8	3	<10	39		
Mean	234.0	7.5	174	25	41	0.5	34	0.5	36	47	0.02	3.2	1.3	5	5.5		

E	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	130	6.6	134	6.96	26.1	<1	<50	<1	460	119	<0.04	<1	8	<0.2	<5	27/07/2022-15/06/2023	12
Max	1440	7.3	968	123	572	1	240	2	3050	2950	0.06	2	123	<10	22		
Mean	695	7.0	453	51	223	0.54	82	0.67	1268	1311	0.023	0.67	49	1.4	8		

WX22	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	168	7.0	168	9.18	38.4	<1	<50	<1	80	97	<0.04	<1	12	<0.2	<5	27/07/2022-15/06/2023	12
Max	1930	7.6	1400	153	678	2	320	16	2230	2150	0.05	3	136	<10	30		
Mean	792	7.2	517	59	254	0.63	95	1.9	509	492	0.024	0.79	50	1.3	8.6		

G	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Samples
Min	167	6.7	174	9.16	38.4	<1	<50	<1	50	97	<0.04	<1	11	<0.2	<5	27/07/2022-15/06/2023	12
Max	1930	7.5	1320	172	776	1	320	2	2320	1770	<0.04	1	134	<10	24		
Mean	791	7.2	511	61	265	0.54	91	0.63	460	447	0.02	0.58	49	1.3	6.7		

Environmental Goal - Surface Water

Electrical Conductivity (uS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Chromium (µg/L)	Iron (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2200	6.5-8	1500	350	1000	24	370	2	300	1900	0.06	10	17	5	116

350 Highlighted cells indicate an exceedance of the Surface Water Environmental Goal.

Surface Water Summary

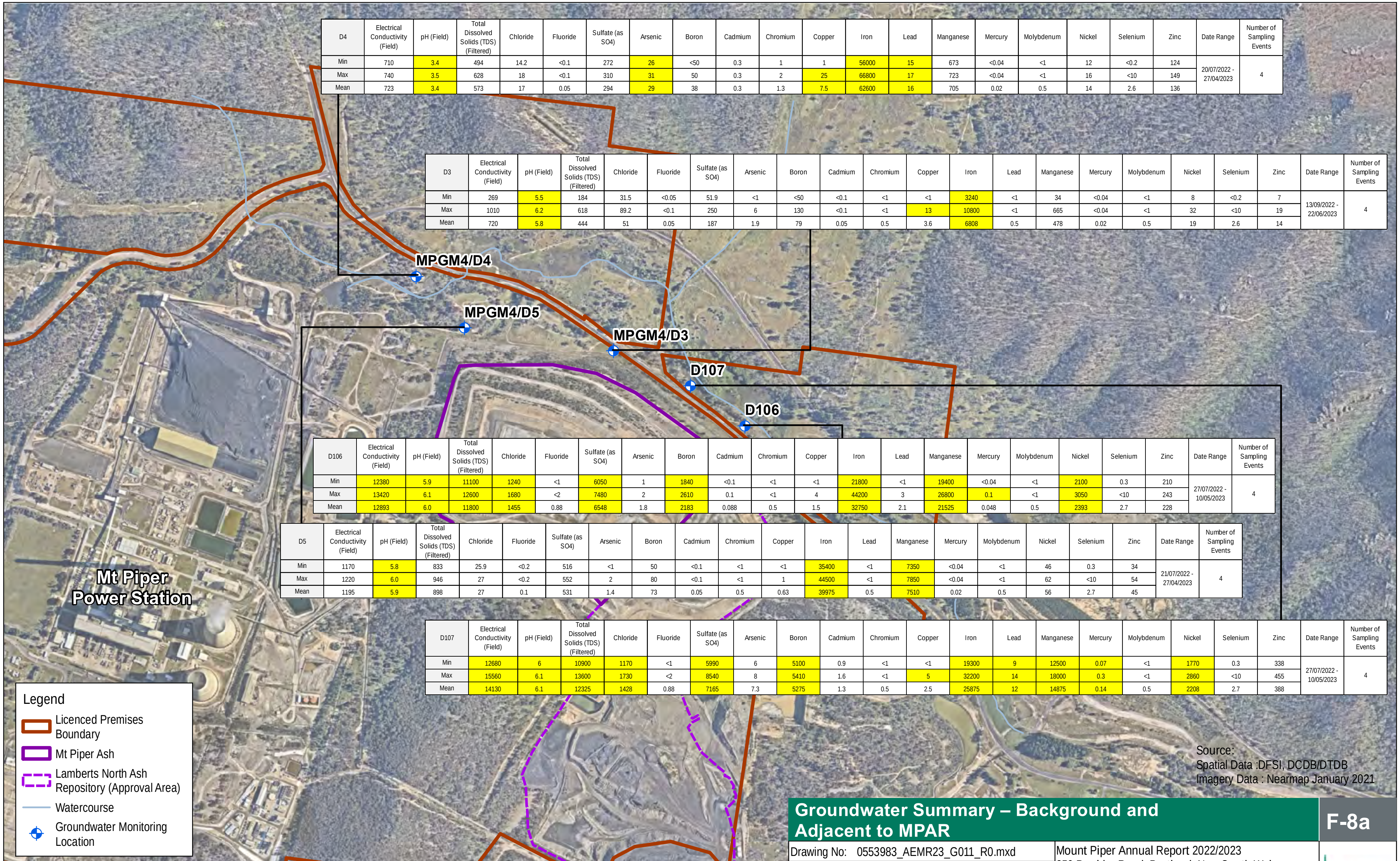
F-7

Drawing No: 0553983_AEMR23_G008_R1.mxd		Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date: 05/09/2023	Drawing Size: A4	
Drawn By: GC	Reviewed By: GP	Client: EnergyAustralia
Coordinate System: GDA 1994 MGA Zone 56		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 100 200 300m

N

ERM



D4	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	710	3.4	494	14.2	<0.1	272	26	<50	0.3	1	1	56000	15	673	<0.04	<1	12	<0.2	124	20/07/2022 - 27/04/2023	4
Max	740	3.5	628	18	<0.1	310	31	50	0.3	2	25	66800	17	723	<0.04	<1	16	<10	149		
Mean	723	3.4	573	17	0.05	294	29	38	0.3	1.3	7.5	62600	16	705	0.02	0.5	14	2.6	136		

D3	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	269	5.5	184	31.5	<0.05	51.9	<1	<50	<0.1	<1	<1	3240	<1	34	<0.04	<1	8	<0.2	7	13/09/2022 - 22/06/2023	4
Max	1010	6.2	618	89.2	<0.1	250	6	130	<0.1	<1	13	10800	<1	665	<0.04	<1	32	<10	19		
Mean	720	5.8	444	51	0.05	187	1.9	79	0.05	0.5	3.6	6808	0.5	478	0.02	0.5	19	2.6	14		

D106	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	12380	5.9	11100	1240	<1	6050	1	1840	<0.1	<1	<1	21800	<1	19400	<0.04	<1	2100	0.3	210	27/07/2022 - 10/05/2023	4
Max	13420	6.1	12600	1680	<2	7480	2	2610	0.1	<1	4	44200	3	26800	0.1	<1	3050	<10	243		
Mean	12893	6.0	11800	1455	0.88	6548	1.8	2183	0.088	0.5	1.5	32750	2.1	21525	0.048	0.5	2393	2.7	228		

D5	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	1170	5.8	833	25.9	<0.2	516	<1	50	<0.1	<1	<1	35400	<1	7350	<0.04	<1	46	0.3	34	21/07/2022 - 27/04/2023	4
Max	1220	6.0	946	27	<0.2	552	2	80	<0.1	<1	1	44500	<1	7850	<0.04	<1	62	<10	54		
Mean	1195	5.9	898	27	0.1	531	1.4	73	0.05	0.5	0.63	39975	0.5	7510	0.02	0.5	56	2.7	45		

D107	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	12680	6	10900	1170	<1	5990	6	5100	0.9	<1	<1	19300	9	12500	0.07	<1	1770	0.3	338	27/07/2022 - 10/05/2023	4
Max	15560	6.1	13600	1730	<2	8540	8	5410	1.6	<1	5	32200	14	18000	0.3	<1	2860	<10	455		
Mean	14130	6.1	12325	1428	0.88	7165	7.3	5275	1.3	0.5	2.5	25875	12	14875	0.14	0.5	2208	2.7	388		

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Background and Adjacent to MPAR

F-8a

Drawing No: 0553983_AEMR23_G011_R0.mxd
Date: 05/09/2023 Drawing Size: A4
Drawn By: GC Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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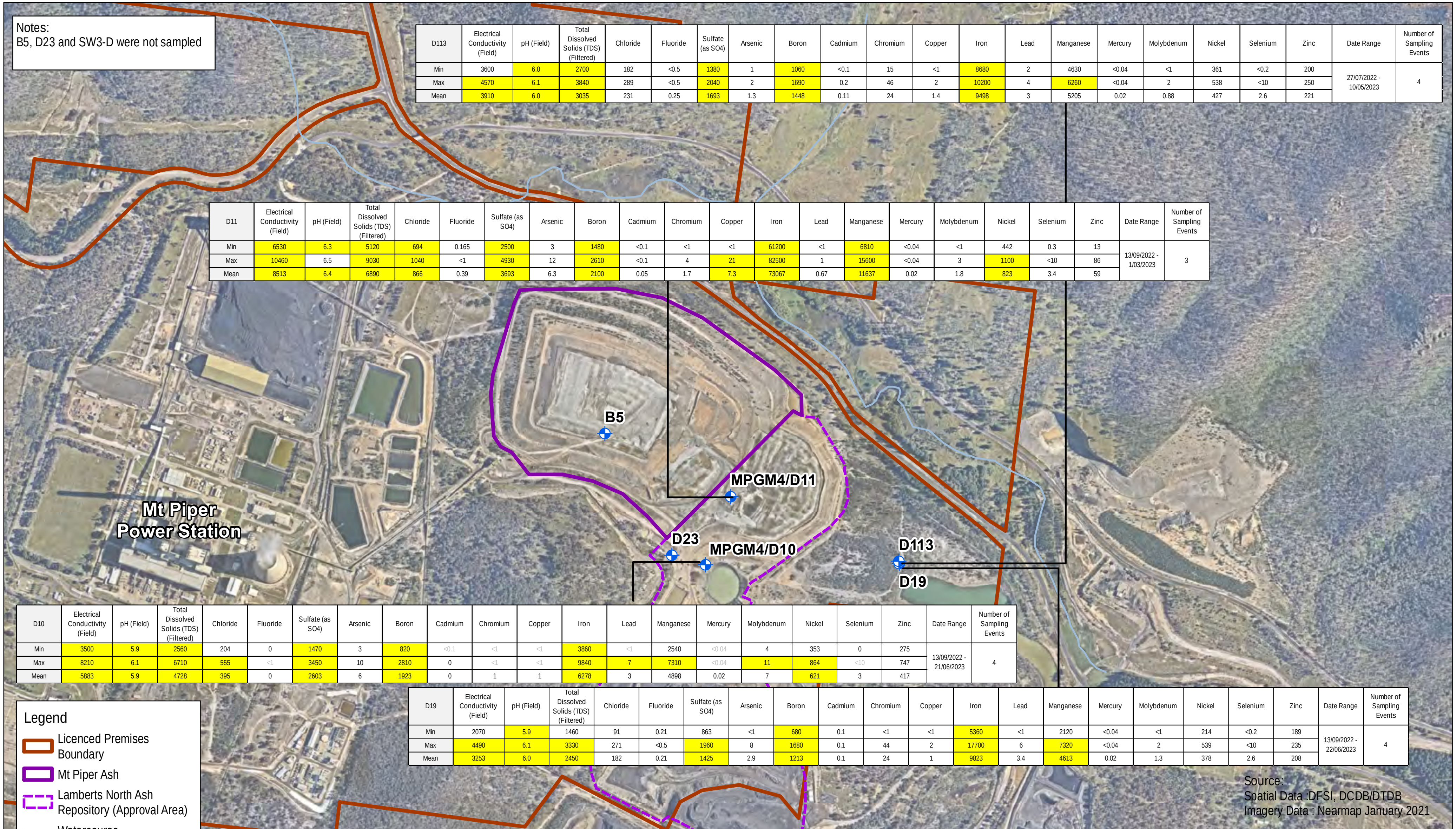

D113	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3600	6.0	2700	182	<0.5	1380	1	1060	<0.1	15	<1	8680	2	4630	<0.04	<1	361	<0.2	200	27/07/2022 - 10/05/2023	4
Max	4570	6.1	3840	289	<0.5	2040	2	1690	0.2	46	2	10200	4	6260	<0.04	2	538	<10	250		
Mean	3910	6.0	3035	231	0.25	1693	1.3	1448	0.11	24	1.4	9498	3	5205	0.02	0.88	427	2.6	221		

D11	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	6530	6.3	5120	694	0.165	2500	3	1480	<0.1	<1	<1	61200	<1	6810	<0.04	<1	442	0.3	13	13/09/2022 - 1/03/2023	3
Max	10460	6.5	9030	1040	<1	4930	12	2610	<0.1	4	21	82500	1	15600	<0.04	3	1100	<10	86		
Mean	8513	6.4	6890	866	0.39	3693	6.3	2100	0.05	1.7	7.3	73067	0.67	11637	0.02	1.8	823	3.4	59		

D10	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3500	5.9	2560	204	0	1470	3	820	<0.1	<1	<1	3860	<1	2540	<0.04	4	353	0	275	13/09/2022 - 21/06/2023	4
Max	8210	6.1	6710	555	<1	3450	10	2810	0	<1	<1	9840	7	7310	<0.04	11	864	<10	747		
Mean	5883	5.9	4728	395	0	2603	6	1923	0	1	1	6278	3	4898	0.02	7	621	3	417		

D19	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	2070	5.9	1460	91	0.21	863	<1	680	0.1	<1	<1	5360	<1	2120	<0.04	<1	214	<0.2	189	13/09/2022 - 22/06/2023	4
Max	4490	6.1	3330	271	<0.5	1960	8	1680	0.1	44	2	17700	6	7320	<0.04	2	539	<10	235		
Mean	3253	6.0	2450	182	0.21	1425	2.9	1213	0.1	24	1	9823	3.4	4613	0.02	1.3	378	2.6	208		

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Within MPAR and the Mine Disturbance Area East of MPAR

F-8b

Drawing No: 0553983_AEMR23_G009_R0.mxd
Date: 05/09/2023 Drawing Size: A4
Drawn By: GC Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56

0 100 200 300m

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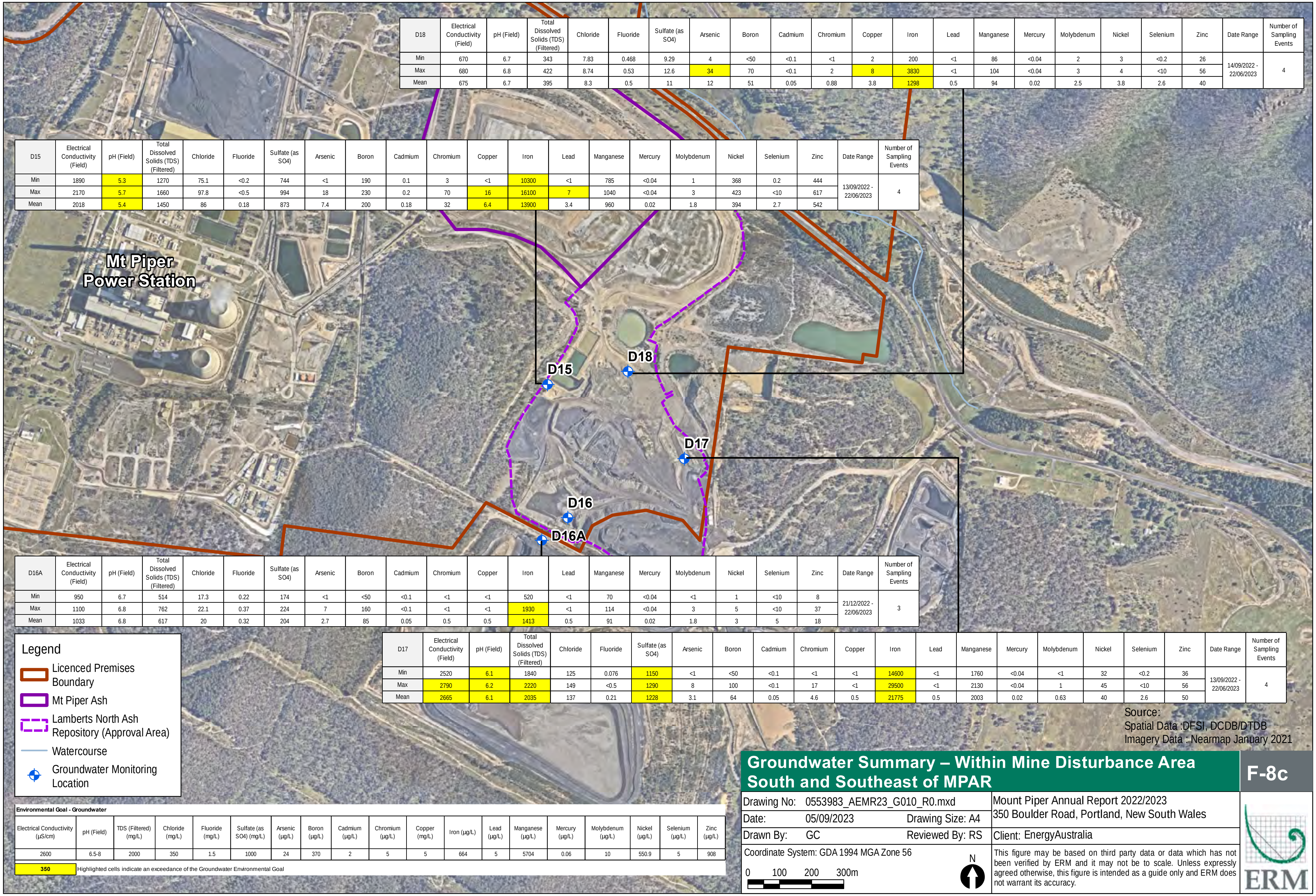
Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



D18	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	670	6.7	343	7.83	0.468	9.29	4	<50	<0.1	<1	2	200	<1	86	<0.04	2	3	<0.2	26		
Max	680	6.8	422	8.74	0.53	12.6	34	70	<0.1	2	8	3830	<1	104	<0.04	3	4	<10	56	14/09/2022 - 22/06/2023	4
Mean	675	6.7	395	8.3	0.5	11	12	51	0.05	0.88	3.8	1298	0.5	94	0.02	2.5	3.8	2.6	40		

D15	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	1890	5.3	1270	75.1	<0.2	744	<1	190	0.1	3	<1	10300	<1	785	<0.04	1	368	0.2	444		
Max	2170	5.7	1660	97.8	<0.5	994	18	230	0.2	70	16	16100	7	1040	<0.04	3	423	<10	617	13/09/2022 - 22/06/2023	4
Mean	2018	5.4	1450	86	0.18	873	7.4	200	0.18	32	6.4	13900	3.4	960	0.02	1.8	394	2.7	542		

D16A	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	950	6.7	514	17.3	0.22	174	<1	<50	<0.1	<1	<1	520	<1	70	<0.04	<1	1	<10	8		
Max	1100	6.8	762	22.1	0.37	224	7	160	<0.1	<1	<1	1930	<1	114	<0.04	3	5	<10	37	21/12/2022 - 22/06/2023	3
Mean	1033	6.8	617	20	0.32	204	2.7	85	0.05	0.5	0.5	1413	0.5	91	0.02	1.8	3	5	18		

D17	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	2520	6.1	1840	125	0.076	1150	<1	<50	<0.1	<1	<1	14600	<1	1760	<0.04	<1	32	<0.2	36		
Max	2790	6.2	2220	149	<0.5	1290	8	100	<0.1	17	<1	29500	<1	2130	<0.04	1	45	<10	56	13/09/2022 - 22/06/2023	4
Mean	2665	6.1	2035	137	0.21	1228	3.1	64	0.05	4.6	0.5	21775	0.5	2003	0.02	0.63	40	2.6	50		

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Groundwater Summary – Within Mine Disturbance Area South and Southeast of MPAR

F-8c

Drawing No: 0553983_AEMR23_G010_R0.mxd
Date: 05/09/2023 Drawing Size: A4
Drawn By: GC Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56

0 100 200 300m

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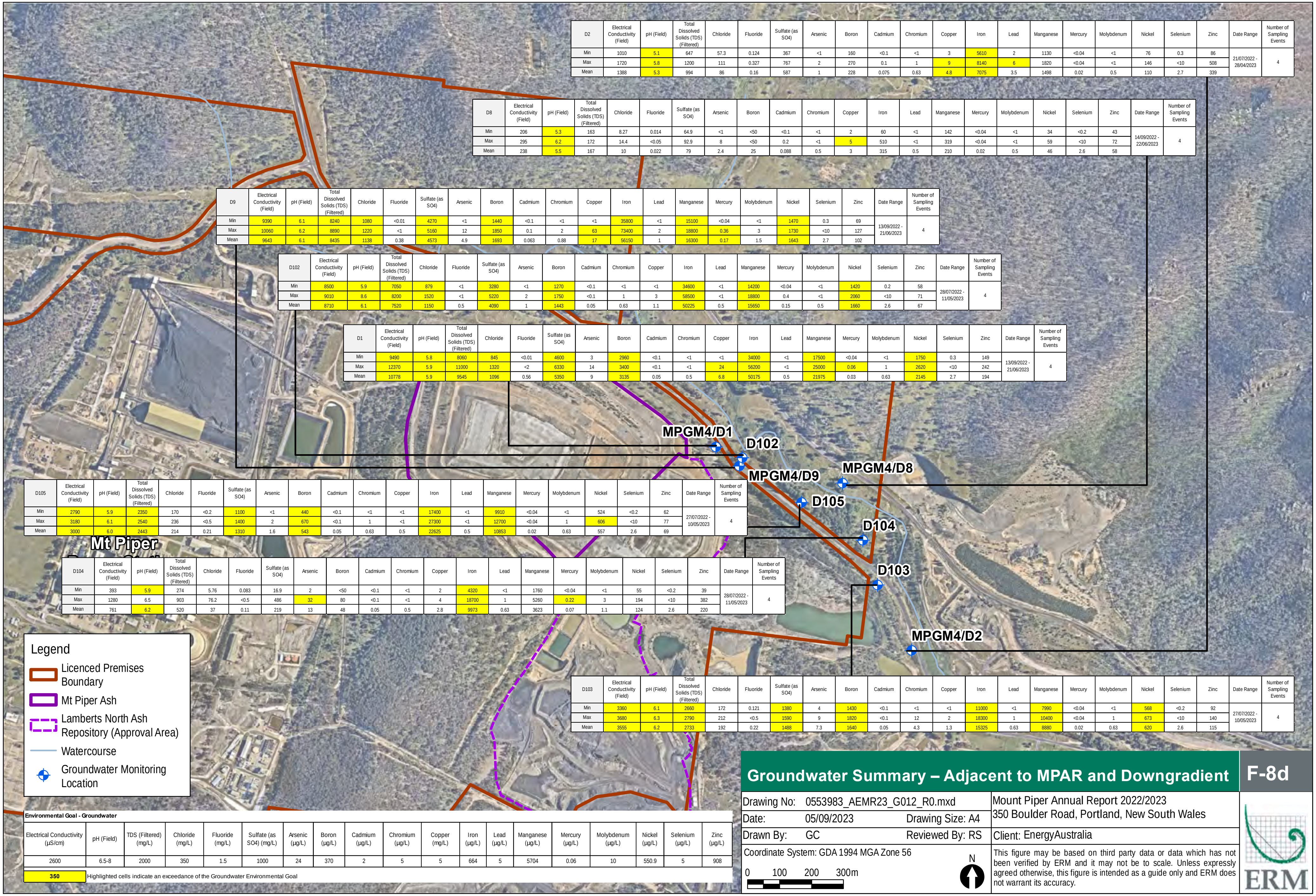
Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



D2	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	1010	5.1	647	57.3	0.124	367	<1	160	<0.1	<1	3	5610	2	1130	<0.04	<1	76	0.3	86	21/07/2022 - 28/04/2023	4
Max	1720	5.8	1200	111	0.327	767	2	270	0.1	1	9	8140	6	1820	<0.04	<1	146	<10	508		
Mean	1388	5.3	994	86	0.16	587	1	228	0.075	0.63	4.8	7075	3.5	1498	0.02	0.5	110	2.7	339		

D8	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	206	5.3	163	8.27	0.014	64.9	<1	<50	<0.1	<1	2	60	<1	142	<0.04	<1	34	<0.2	43	14/09/2022 - 22/06/2023	4
Max	295	6.2	172	14.4	<0.05	92.9	8	<50	0.2	<1	5	510	<1	319	<0.04	<1	59	<10	72		
Mean	238	5.5	167	10	0.022	79	2.4	25	0.088	0.5	3	315	0.5	210	0.02	0.5	46	2.6	58		

D9	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	9390	6.1	8240	1080	<0.01	4270	<1	1440	<0.1	<1	<1	35800	<1	15100	<0.04	<1	1470	0.3	69	13/09/2022 - 21/06/2023	4
Max	10060	6.2	8890	1220	<1	5160	12	1850	0.1	2	63	73400	2	18800	0.36	3	1730	<10	127		
Mean	9643	6.1	8435	1138	0.38	4573	4.9	1693	0.063	0.88	17	56150	1	16300	0.17	1.5	1643	2.7	102		

D102	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	8500	5.9	7050	879	<1	3280	<1	1270	<0.1	<1	<1	34600	<1	14200	<0.04	<1	1420	0.2	58	28/07/2022 - 11/05/2023	4
Max	9010	8.6	8200	1520	<1	5220	2	1750	<0.1	1	3	58500	<1	18800	0.4	<1	2060	<10	71		
Mean	8710	6.1	7520	1150	0.5	4090	1	1443	0.05	0.63	1.1	50225	0.5	15650	0.15	0.5	1660	2.6	67		

D1	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	9490	5.8	8060	845	<0.01	4600	3	2960	<0.1	<1	<1	34000	<1	17500	<0.04	<1	1750	0.3	149	13/09/2022 - 21/06/2023	4
Max	12370	5.9	11000	1320	<2	6330	14	3400	<0.1	<1	24	56200	<1	25000	0.06	1	2620	<10	242		
Mean	10778	5.9	9545	1096	0.56	5350	9	3135	0.05	0.5	6.8	50175	0.5	21975	0.03	0.63	2145	2.7	194		

D105	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	2790	5.9	2350	170	<0.2	1100	<1	440	<0.1	<1	<1	17400	<1	9910	<0.04	<1	524	<0.2	62	27/07/2022 - 10/05/2023	4
Max	3180	6.1	2540	236	<0.5	1400	2	670	<0.1	1	<1	27300	<1	12700	<0.04	1	606	<10	77		
Mean	3000	6.0	2443	214	0.21	1310	1.6	543	0.05	0.63	0.5	22625	0.5	10853	0.02	0.63	557	2.6	69		

D104	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	393	5.9	274	5.76	0.083	16.9	2	<50	<0.1	<1	2	4320	<1	1760	<0.04	<1	55	<0.2	39	28/07/2022 - 11/05/2023	4
Max	1280	6.5	903	76.2	<0.5	486	32	80	<0.1	<1	4	18700	1	5260	0.22	3	194	<10	382		
Mean	761	6.2	520	37	0.11	219	13	48	0.05	0.5	2.8	9973	0.63	3623	0.07	1.1	124	2.6	220		

D103	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3360	6.1	2660	172	0.121	1380	4	1430	<0.1	<1	<1	11000	<1	7990	<0.04	<1	568	<0.2	92	27/07/2022 - 10/05/2023	4
Max	3680	6.3	2790	212	<0.5	1590	9	1820	<0.1	12	2	18300	1	10400	<0.04	1	673	<10	140		
Mean	3555	6.2	2733	192	0.22	1488	7.3	1640	0.05	4.3	1.3	15325	0.63	8880	0.02	0.63	620	2.6	115		

Legend

- Licenced Premises Boundary
- Mt Piper Ash
- Lamberts North Ash Repository (Approval Area)
- Watercourse
- Groundwater Monitoring Location

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 — Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Adjacent to MPAR and Downgradient

F-8d

Drawing No: 0553983_AEMR23_G012_R0.mxd
Date: 05/09/2023 Drawing Size: A4
Drawn By: GC Reviewed By: RS
Coordinate System: GDA 1994 MGA Zone 56

0 100 200 300m

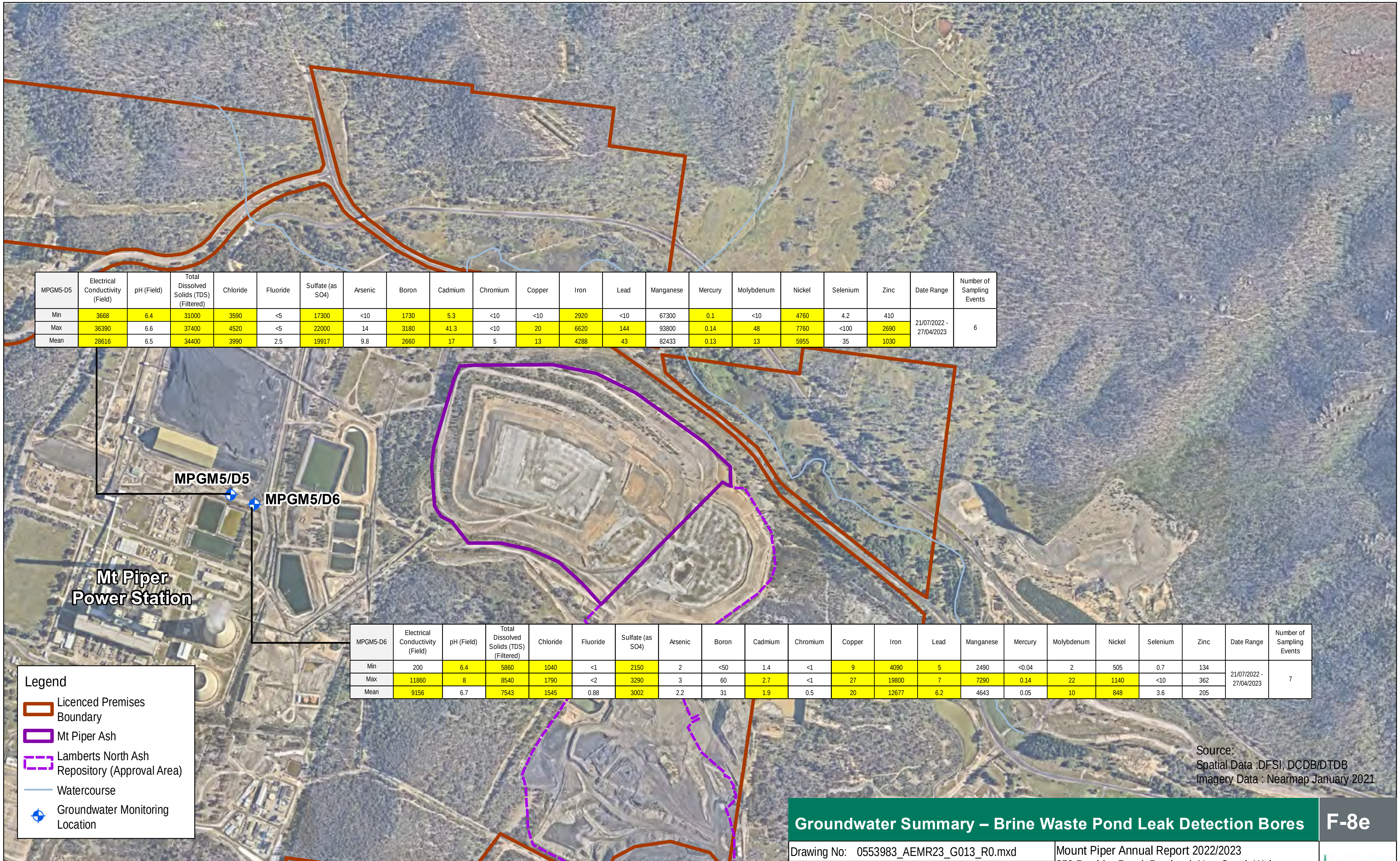
N

Mount Piper Annual Report 2022/2023
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



MPGM5-D5	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3668	6.4	31000	3590	<5	17300	<10	1730	5.3	<10	<10	2920	<10	67300	0.1	<10	4760	4.2	410	21/07/2022 - 27/04/2023	6
Max	36390	6.6	37400	4520	<5	22000	14	3180	41.3	<10	20	6620	144	93800	0.14	48	7760	<100	2690		
Mean	28616	6.5	34400	3990	2.5	19917	9.8	2660	17	5	13	4288	43	82433	0.13	13	5955	35	1030		

MPGM5-D6	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS) (Filtered)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	200	6.4	5860	1040	<1	2150	2	<50	1.4	<1	9	4090	5	2490	<0.04	2	505	0.7	134	21/07/2022 - 27/04/2023	7
Max	11860	8	8540	1790	<2	3290	3	60	2.7	<1	27	19800	7	7290	0.14	22	1140	<10	362		
Mean	9156	6.7	7543	1545	0.88	3002	2.2	31	1.9	0.5	20	12677	6.2	4643	0.05	10	848	3.6	205		

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (Filtered) (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Brine Waste Pond Leak Detection Bores

F-8e

Drawing No: 0553983_AEMR23_G013_R0.mxd	Mount Piper Annual Report 2022/2023 350 Boulder Road, Portland, New South Wales
Date: 05/09/2023 Drawing Size: A4	
Drawn By: GC Reviewed By: RS	Client: EnergyAustralia
Coordinate System: GDA 1994 MGA Zone 56 0 100 200 300m N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX A MT PIPER CONSENT REQUIREMENTS

Table A1: Summary of Mt Piper Consent and WMP Requirements

Project Approval Document	Condition	Consent Requirements	How addressed by this EMR	Compliance Status
Mt Piper Consent (Modification 8, dated 24 July 2019)	38A	38A. Notwithstanding the provisions of Condition No. 38, the brine and ash co-placement area may be extended and shall be undertaken generally in accordance with the Statement of Environmental Effects: Mount Piper Power Station Extension of Brine Conditioned Ash Placement Area, prepared by Connell Wagner Pty Ltd and dated June 2007. This includes: (i) The extended area must lie within the existing ash placement area; (ii) Co-placement activities in the proposed extended area must use existing facilities and methods; (iii) The placement of brine conditioned ash may only occur between the levels of RL 946 metres (the endpoint of the water conditioned ash layer) and RL 980 metres.	Refer to Appendix C and Section 2 of this report.	Compliant
	38B	38B. The groundwater and surface water monitoring programs required by Condition No. 40 and 41 apply to the extension of the brine and ash co-placement area, permitted by Condition 38 A.	Refer to relevant conditions below.	Compliant
	38C	38C. The Applicant must update the Water Management Plan (WMP) required by Condition No. 43, and obtain the approval of the Secretary for the update, prior to undertaking any works permitted by Condition No. 38 A. In determining whether to grant approval, the Secretary must consult with the BCD, WaterNSW, DPIE Water, and Council.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.	Compliant
	40	40. The Applicant shall, at least one month prior to the first placement of brine-conditioned flyash, consult with the EPA, DPIE Water and WaterNSW to establish the requirements for Water Monitoring Programs for groundwater and surface water. The Water Monitoring Programs shall: (i) be based on the monitoring programs presented in the Statement of Environmental Effects for this modification; (ii) include water quality testing at a minimum frequency of every three months; (iii) be at the expense of the Applicant.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.	Compliant
	41	41. The Applicant shall expand the groundwater and surface water monitoring programs, including, if so required, the establishment of additional groundwater monitoring bores and surface water sampling points, in accordance with any reasonable requirements of the EPA, DPIE Water or WaterNSW.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1	Compliant

Project Approval Document	Condition	Consent Requirements	How addressed by this EMR	Compliance Status
			and Section 4 to Section 8 of this report.	
Mt Piper Consent	43	43. At least one month prior to the placement of brine-conditioned flyash, or within such further period as the Secretary may agree, the Applicant shall prepare and submit for the approval of the EPA, WaterNSW, DPIE Water, Council, and the Secretary, a Water Management Plan (WMP) which shall include, but not be limited to: (a) Details of the monitoring programs for surface water and groundwater required under conditions 40 and 41. (b) Details of measures to be employed to control surface water run-off from the site. (c) Contingency plans for the mitigation of environmental impacts should run-off or leachate from the site be found to be negatively impacting on natural surface water or groundwater. (d) Brine management objectives and strategies, with specific reference to measures aimed at reducing the volume of brine produced at the Mount Piper Power Station.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.	Compliant
	43A	43A. The Applicant must update the Water Management Plan required by Condition 43 to the satisfaction of the Secretary, prior to commissioning the storage pond associated with Modification 8. The Applicant must implement the approved Water Management Plan.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.	Compliant
	44	44. The Applicant shall provide to the Secretary, EPA, DPIE Water, WaterNSW and Council, an Environmental Monitoring Report (EMR) on a yearly basis, with the first EMR to be submitted no later than six months after the first placement of brine-conditioned flyash onsite. The Applicant shall agree to Council making the Environmental Monitoring Reports available on request for public inspection.	Condition is met by the development of this report in its entirety.	Compliant
	45	45. The Environmental Monitoring Report shall include, but not be limited to: (a) a summary and discussion of all available results and analyses from Water Monitoring Programs; (b) a discussion of the aims of the Water Management Plan and to what degree these aims have been attained in the context of results and analyses of the Water Monitoring Programs; (c) actions taken, or intended to be taken, if any, to mitigate any adverse environmental impacts; and to meet the reasonable requirements of the Secretary, EPA, DPIE Water, WaterNSW or Council.	Refer to Section 4 to Section 8, along with Appendix B to Appendix L of this report.	Compliant

Project Approval Document	Condition	Consent Requirements	How addressed by this EMR	Compliance Status
The WMP (ERM, 2020)		Section 5.1 – Environmental Goals The results of all surface water and groundwater monitoring are intended to be assessed relative to the Environmental Goals	Refer to Section 0 (surface water) and Section 6 (groundwater), along with Appendix F to Appendix J of this report.	Compliant
		Section 5.1.1 – Early Warning Assessment In addition to comparing results with the Environmental Goals for surface water and groundwater an early warning assessment will be conducted. This assessment will include a review of concentration trends through time at each location, including statistical assessment.	Refer to Section 7, along with Appendix H to Appendix L of this report.	Compliant
		Section 6.1 – Monitoring Locations	Refer to Section 5.2 and Section 6.2 of this report.	Compliant
		Section 6.2 – Monitoring Frequency	Refer to Section 5.2 and Section 6.2 of this report.	Compliant
		Section 6.3 – Monitoring Method	Refer to Section 5.3 and Section 6.3 of this report.	Compliant. Minor non-conforming laboratory LORs were reported for silver and selenium as described in Section 6.5 of this report. These non-conforming laboratory LORs do not impact upon the conclusions of this report, as these are not

Project Approval Document	Condition	Consent Requirements	How addressed by this EMR	Compliance Status
				considered to represent primary constituents of concern for groundwater monitoring in accordance with the WMP.
		Section 6.4 – Monitored Parameters	Refer to Section 1.1 and Section 6.4 of this report.	Compliant
		Section 6.5 – Data Management and Assessment The monitoring data is compared with the existing historical dataset for an assessment of trends related to potential influence of the brine management and BCA placement activities on surface water and groundwater.	Refer to Section 5.5, Section 5.5.4, Section 6.5, Section 6.6 and Section 0 of this report.	Compliant
		Section 6.6 – Reporting Requirements The reporting requirements of the WMP form the objectives of this EMR.	Refer to Section 1.2, Section 0 to Section 8 of this report.	Compliant
		Section 7.1 – Performance Criteria The key aim of TARPs is the mitigation and control of impacts, ideally through early detection. Therefore, TARPs for groundwater and surface water quality are based on the Environmental Goals for the monitoring program. In addition, long-term trends in surface and groundwater concentrations are assessed using the routine monitoring data and with reference to a statistical assessment of water quality data. Should concentrations at a given location indicate a statistically significant increasing concentration trend in groundwater or surface water, or exceed the relevant Environmental Goal, the triggers are considered to have been exceeded and actions are to be implemented.	Refer to Section 7 of this report.	Compliant

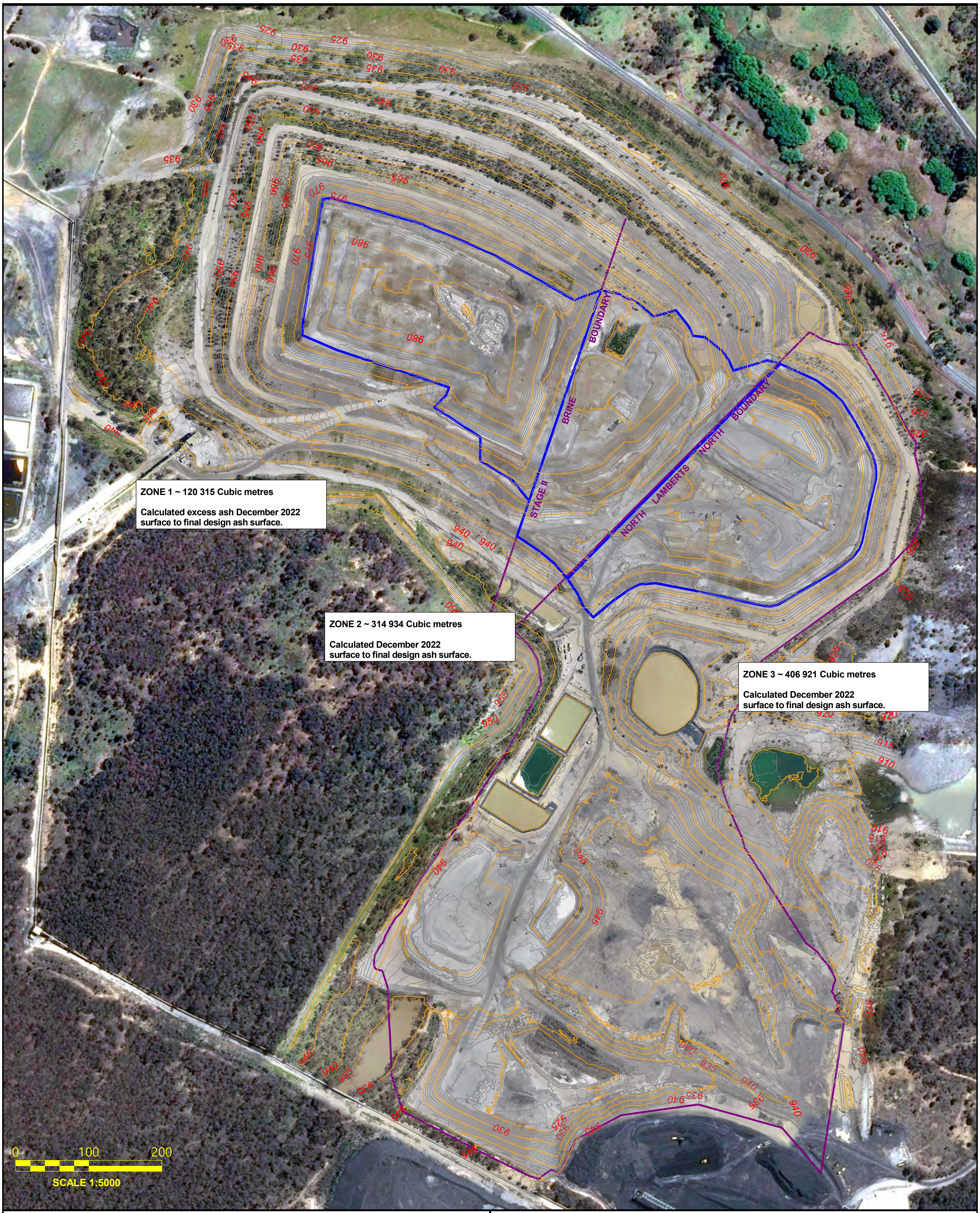
Project Approval Document	Condition	Consent Requirements	How addressed by this EMR	Compliance Status
The WMP (ERM, 2020)		Section 7.2 – Incident Response An impact to groundwater or surface water is considered to be present when concentrations of a monitoring parameter are recorded above the Environmental Goals. In the event of an impact to groundwater or surface water that is considered to be potentially associated with brine management and/or handling/placement of BCA at MPAR, the WMP outlines an incident response procedure. It is noted that the EPL 13007 outlines separate incident response requirements. The reporting requirements of the EPL will be provided to the regulators separately to this EMR.	Refer to Section 7.4 of this report.	Compliant
		Section 7.3 – Contingency Measures Should routine monitoring data suggest that further changes in water quality are being caused by brine management (e.g., brine waste ponds) or other BCA placement and related activities at the MPPS, the WMP outlines contingency items that may be implemented.	Refer to Section 7.4 of this report.	Compliant

APPENDIX B STORMWATER FLOW VOLUME DATA

Mt Piper Power Station - LDP12 (formerly LDP01) discharge volumes

Date	Kilolitres / day	Start Pump (hh.mm)	Cease Pumping (hh.mm)	Pump Duration (hrs)	Pump Rate (L/sec)
1/07/2022	2042.40	940	1330	3.8	148.0
4/07/2022	Overtopping	-	-	-	-
10/08/2022	807.18	1200	1600	4.0	36.0
11/08/2022	2835.90	1015	1700	6.9	115.0
11/08/2022	502.20	1045	1200	1.6	90.0
12/08/2022	2901.60	905	1525	6.2	130.0
19/08/2022	2394.00	845	1545	7.0	95.0
30/08/2022	3113.28	935	1740	8.1	110.0
31/08/2022	1391.34	730	1758	10.3	70.0
1/09/2022	180.60	800	842	0.4	70.0
14/09/2022	232.56	940	1030	0.9	76.0
20/09/2022	1707.24	1139	1725	586.0	82.0
21/09/2022	2673.60	700	1616	9.2	80.0
26/09/2022	2070.54	933	1742	8.1	71.0
27/09/2022	2738.40	700	1721	10.2	70.0
5/10/2022	2939.28	933	1503	5.7	148.0
9/10/2022	Overtopping	-	-		
10/10/2022	Overtopping	-	-		
11/10/2022	2160.00	1500	1900	4.0	150.0
11/10/2022	900.00	1530	1800	2.5	100.0
12/10/2022	3578.40	600	1300	7.0	142.0
12/10/2022	2880.00	600	1300	7.0	100.0
13/10/2022	1268.82	903	1141	2.4	133.0
26/10/2022	549.12	1137	1241	1.0	143.0
15/11/2022	2530.02	1309	1751	4.4	149.0
16/11/2022	6767.58	730	2007	12.8	149.0
17/11/2022	926.10	735	919	1.8	147.0
4/04/2023	1747.20	1047	1430	3.8	130.0
5/04/2023	2316.60	1253	1749	5.0	130.0
6/04/2023	2407.92	746	1301	5.6	127.0
18/04/2023	2400.00	1140	1659	5.2	125.0
19/04/2023	614.88	551	714	1.6	122.0
4/05/2023	2647.50	1115	1707	5.9	125.0
5/05/2023	2447.76	831	1359	5.3	124.0
TOTAL	**64672**	**-**	**-**	-	-

APPENDIX C ASH REPOSITORY SURVEY



SERVICESTREAM

MOUNT PIPER - ASH PLACEMENT
SURVEY : 6th DECEMBER 2022

SCALE - 1:5000 (A3 SHEET) DATUM: MGA (ZONE56)

GRID NORTH

CEH SURVEY
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
"Astrolabe" 1 Rutherford Lane, LITHGOW 2790
ABN: 68 056 544 551 Office: (02) 6351 2281
Email: survey@ceh.com.au Website: www.ceh.com.au

DATE	06-12-2022
AMENDED	16/02/2023
SURVEYOR	TH/BN
DRAWN	TH/GM
CHECKED	

DRAWING No:
MPA1222
(as surveyed)

CCAD6 JOB & DWG:
MPA1222 - MPA1222 as survey(b)

APPENDIX D BRINE COMPOSITION DATA

Parameter	Values from 1999 SEE Average[b]	2003 – 2006 Average[b]	July 2017 - Dec 2017 Average[a]	July 2019 – June 2020 Average[c]	July 2020 – June 2021 Average[d]	July 2021 – June 2022 Average Waste Pond A[e]	July 2021 – June 2022 Average Waste Pond B[e]	July 2022 – June 2023 Average Waste Pond A[f]	July 2022 – June 2023 Average Waste Pond B[f]
pH	7.9	8.1	7.9	9.3	8.75	10	10	10	9.82
Cond (us/cm)	63,664	127,982	88,556	61,320	73,196	58,797	51,302	68,118	67,757
TDS (mg/L)	116,650	137,170	118,500	64,257	89,948	61,111	51,341	75,264	75,000
Alk (CaCO3)	1,360	1,346	976	14,735	6,067	11,836	22,943	14,243	19,708
Cl (mg/L)	19,864	23,889	10,390	7,776	8,270	10,298	7,905	9,700	8,887
F	21.178*	125.66	64.65	55.40	72.63	38.00	48.00	46.00	72.00
SO_4 (mg/L)	49,670	66,767	67,378	28,302	47,395	19,172	7,943	12,934	10,602
Na (mg/L)	25,678	30,103	37,400	23,475	28,694	19,797	17,305	26,418	28,685
K (mg/L)	4,258	7,362	3,460	1,721	2,518	1,738	1,498	2,380	2,045
Ca (mg/L)	645	606	780	696	458	146	29	164	22
Mg (mg/L)	5,480	9,010	4,010	1,540	2,541	88	57	194	71
					ug/L				
As	409^^^	143	438	522	199	209	209	225	255
Ag	1.4^^	<50	10	<1	<1	4.7	6.6	5.5	5.7
Ba	272*	30	1,000	6.43	116	95	5.9	136	11
Be	17^	5.8	-	<10	<10	5	5	5.5	5.7
B	73,560*	115,000	35,800	41,500	9,570	4,738	2,847	6,897	3,612
Cd	19+	42	5.3	2.3	3.58	4	2.7	4.5	4.1
Cr ***	49+	<50	1,050	50	40.4	34	48	26	53
Cu	7,858*	7,197	12,400	5,991	4,626	764	237	1,746	245
Fe	833*	-	1,580	151	340	884	201	172	234
Hg	1.35^^	-	0.04	0.11	0.23	0.23	0.23	0.19	0.14
Mn	17,530*	34,000	7,210	5,170	231	427	17	639	20
Mo	2,600^^	-	-	2,625	2,490	5,146	4,877	8,505	8,602
Ni	4,187*	4,017	3,880	348	1,570	492	309	808	455
Pb	6^^	-	10	<10	11.6	7.2	5	25	6.1
Se	245*	-	130	115	114	99	50	166	68
Zn	2,020*	-	1,050	2,180	1,373	1,477	223	3,679	336

a. Brine composition data provided by EnergyAustralia on 01 August 2018;
b. Connell Wagner (2007). Statement of Environmental Effects, Mount Piper Power Station, Extension of Brine Conditions Ash Placement Area. Prepared by Environmental Services, Pacific Power International for Delta Electricity, 21 June 2007.
c. data based on Nalco monitoring point reference 1050, EA BC Waste Pond
Notations relate to Average Trace element values, from 1999 Statement of Environmental Effects including:
* mostly 10 – 15 analyses (sources Hodgson, 1999) – AWT, 1996
** EPA (1999a) ^ one analysis ^^ 3 analyses ^^^ 5 analyses + 6 analyses
*** Total chromium reported (CrVI <25ug/l)
d. Brine composition data provided by EnergyAustralia in July 2021 – combined data of BC Waste Pond A & B.
e. Brine composition data provided by EnergyAustralia in August 2022 – averages of data for BC Waste Pond A & BC Pond B.
f. Brine composition data provided by EnergyAustralia on July 2023 – averages of data for BC Waste Pond A & BC Pond B.

APPENDIX E SITE WEATHER DATA

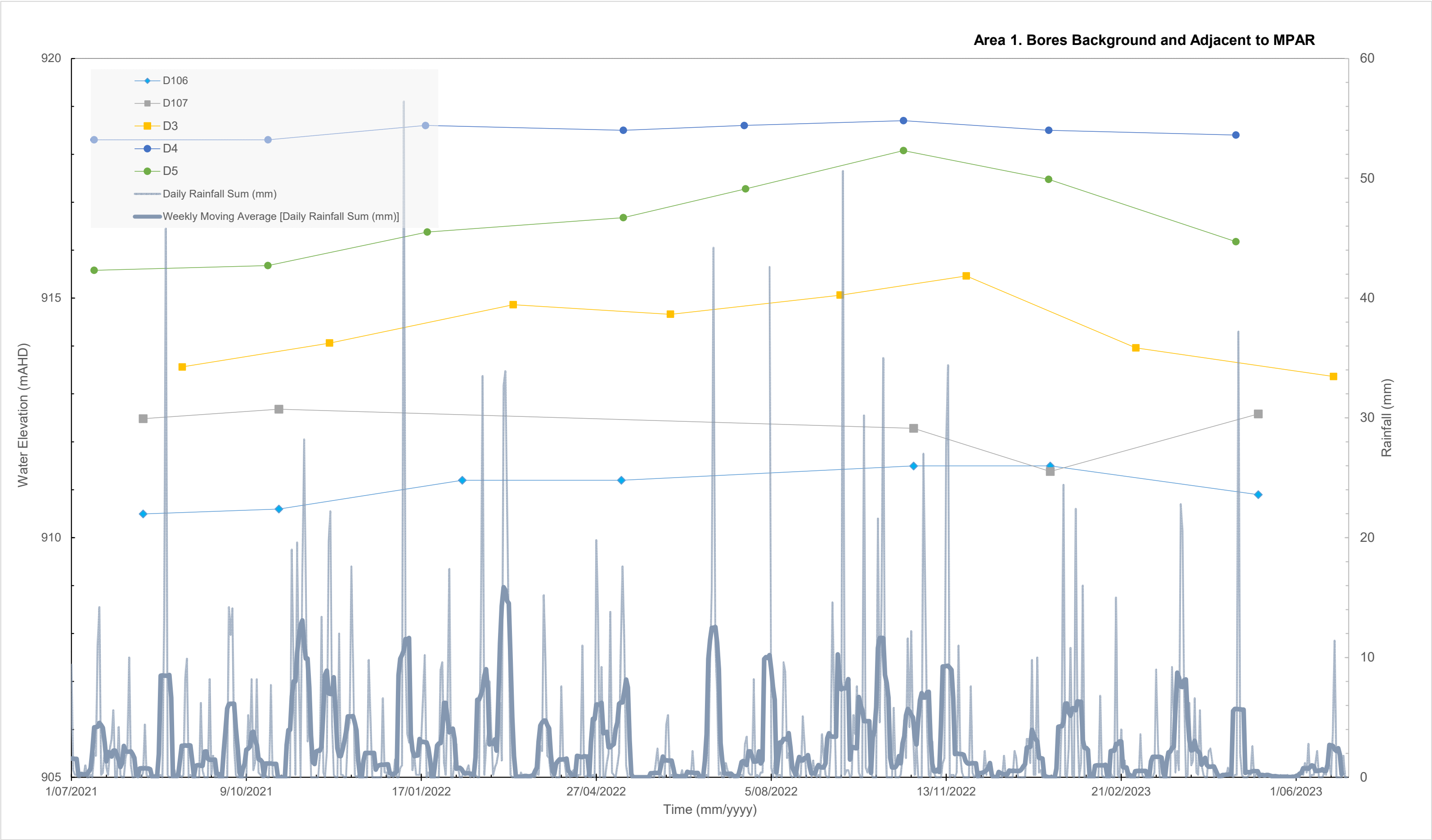
Month	Jul-22			Aug-22			Sep-22			Oct-22			Nov-22			Dec-22		
Measurement	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	4.2	6.3	9.2	-0.9	10.4	6.0	3.8	15.0	0.2	5.2	11.0	0.4	3.3	16.1	15	10.1	16.0	0
2	5.9	8.5	15.6	-	-	-	3.0	12.0	0	2.5	14.8	0	1.4	7.7	4.4	9.4	15.9	0
3	7.5	9.3	44.2	-	-	-	3.3	7.0	3.6	-0.1	15.2	0	4.1	12.5	0.2	5.3	22.3	0
4	7.1	9.3	11	11.0	13.7	42.6	4.4	9.1	1.8	1.3	17.8	0	5.4	14.3	0	8.2	24.2	0
5	7.0	8.3	7.2	7.1	13.4	0.8	-0.8	12.5	0.2	8.0	10.3	21.6	6.8	17.7	3	7.5	25.5	2.2
6	6.8	9.7	0.2	4.9	9.8	0.0	3.3	11.2	0	8.9	12.4	4.6	5.7	18.4	0.4	7.1	22.6	0.2
7	3.5	11.5	0.4	-0.4	9.4	1.6	4.8	12.7	0	9.8	14.4	14.4	8.7	19.1	0	-	-	-
8	2.2	4.6	0	-2.9	10.7	0.0	6.9	14.1	2.6	8.7	16.0	35	8.4	18.9	0	-	-	-
9	-1.5	8.4	0	-3.8	9.2	0.2	7.3	13.0	14.6	3.4	13.6	5.8	4.6	19.4	0	-	-	-
10	-2.3	8.3	1.2	-0.2	11.8	0.2	7.1	11.4	6.6	2.1	13.3	0	7.2	20.9	0	-	-	-
11	1.7	9.4	0.6	3.2	10.9	0.0	3.1	12.1	0	7.7	14.7	0	6.3	17.5	1.2	-	-	-
12	2.4	10.1	0	5.6	8.9	9.6	1.9	11.5	0	5.1	15.2	0	6.7	23.5	1.6	-	-	-
13	1.5	6.1	0	3.0	9.9	8.8	4.4	12.7	0	9.2	16.6	0	12.3	19.5	27.6	3.5	18.4	0
14	-2.2	9.4	0.2	3.0	6.6	1.6	3.4	12.2	0	7.1	13.5	5.8	11.9	17.1	34.4	3.4	14.2	0
15	-6.0	11.6	0.2	3.8	8.7	2.0	6.4	9.2	50.6	4.9	17.9	0	5.2	15.5	0	3.1	17.9	0
16	-5.3	11.9	0	2.2	9.0	0.2	7.1	14.7	0.2	3.2	16.7	0	2.8	9.7	0.2	6.3	17.3	1.8
17	-	-	-	-2.4	13.7	0.0	4.5	12.3	0.6	9.1	14.3	0	1.0	15.5	0.2	4.1	18.2	0
18	-	-	-	-	-	-	4.1	13.2	0.6	9.1	16.3	0.2	3.1	17.7	0	8.1	17.2	0
19	-5.1	7.8	0.2	-	-	-	0.5	12.9	0	11.5	18.7	1.6	6.2	21.5	0.4	7.5	17.3	0
20	4.4	9.7	0	2.2	9.4	0.4	-2.0	16.1	0.2	12.8	16.0	4.8	9.6	16.3	11	5.0	19.2	0
21	5.5	8.6	2.8	0.1	12.1	0.0	4.7	13.7	5.2	14.1	18.9	1.6	4.5	12.5	1.8	4.6	21.9	0
22	6.0	9.4	3.4	-1.1	11.7	0.2	10.1	12.3	3.6	12.9	19.1	11.6	3.4	11.9	0.4	6.9	18.0	2.2
23	4.5	11.6	0.4	0.3	12.5	5.1	9.5	15.0	7.6	12.5	18.9	4.2	6.8	17.1	0	12.0	25.9	1.6
24	-0.4	12.7	0.2	-1.0	8.5	2.8	5.4	15.0	0.4	11.6	17.0	12.2	5.8	21.0	0	12.7	27.7	0
25	0.7	13.7	0.2	1.8	10.9	0.0	1.3	16.3	0	10.1	19.1	4	5.0	20.9	0	11.4	28.7	0
26	2.9	9.0	8.2	-	-	-	0.6	15.1	0	12.4	18.6	0.2	5.8	22.7	0	10.4	29.0	0
27	1.4	8.7	0	-	-	-	7.4	16.6	30.2	10.7	16.9	2.8	12.1	25.3	7.6	8.1	27.9	0
28	3.9	10.8	0.2	2.9	15.2	0.0	4.5	13.5	0.8	8.7	14.6	0	8.4	19.5	0.4	8.0	29.4	0
29	-4.0	9.7	0	2.1	11.9	1.4	4.1	14.8	0.4	8.0	15.8	0	6.2	21.3	0	11.0	24.6	3.2
30	-6.1	9.5	0.4	6.1	15.2	0.2	7.2	12.2	1	3.6	18.4	0	8.5	19.0	0.2	14.3	21.4	3.2
31	-3.6	9.8	0.4	0.1	15.1	0.0				8.4	19.1	27				12.0	23.7	1.2
Min	-6.1	4.6	0.0	-3.8	6.6	0.0	-2.0	7.0	0.0	-0.1	10.3	0.0	1.0	7.7	0.0	3.1	14.2	0.0
Max	7.5	13.7	44.2	11.0	15.2	42.6	10.1	16.6	50.6	14.1	19.1	35.0	12.3	25.3	34.4	14.3	29.4	3.2
Average	1.5	9.4		1.9	11.1		4.4	13.0		7.8	16.0		6.2	17.7		8.0	21.8	
Total			106.4			83.7			131.0			157.8			110.0			15.6

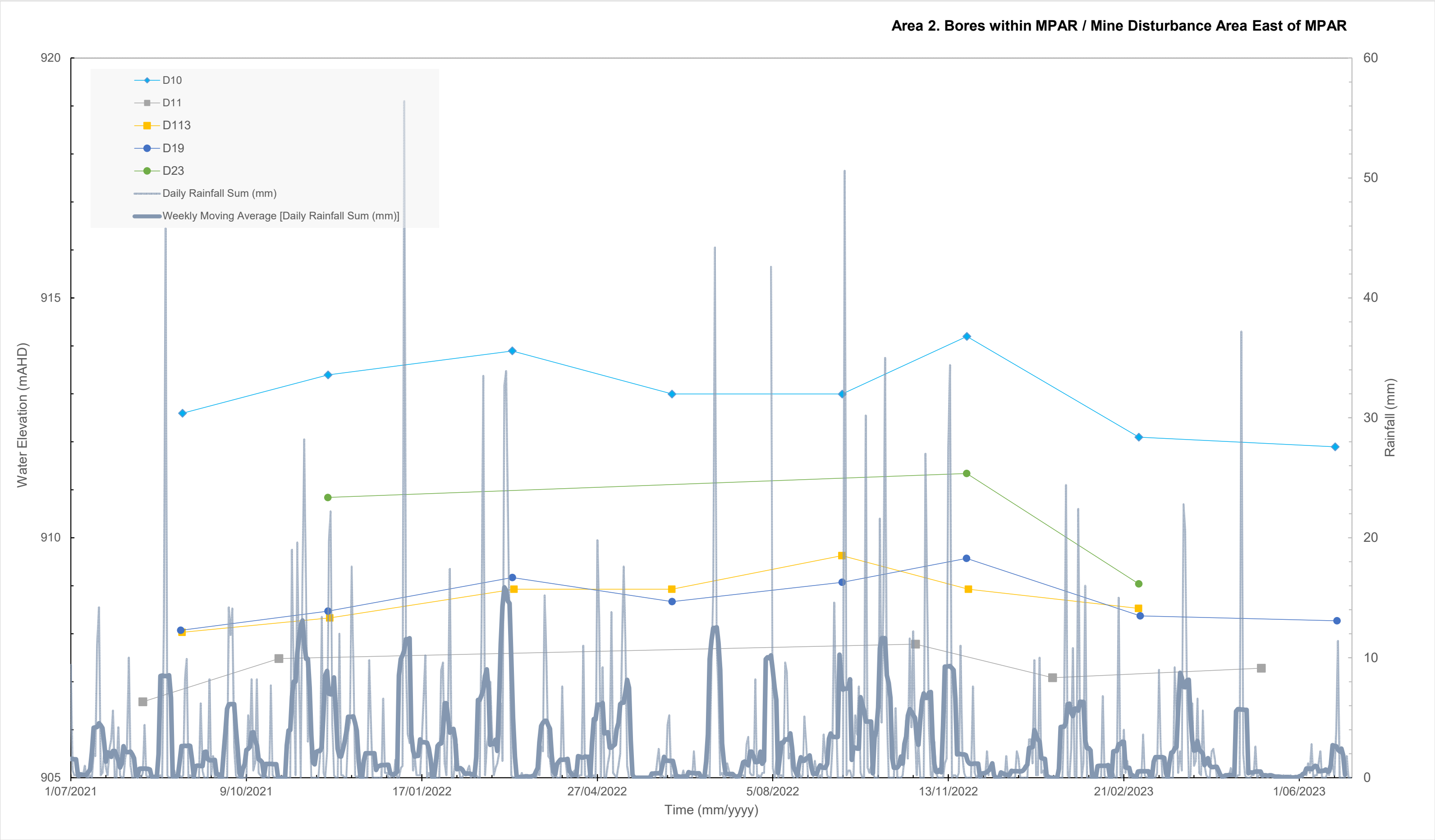
Note:
- signifies data not provided

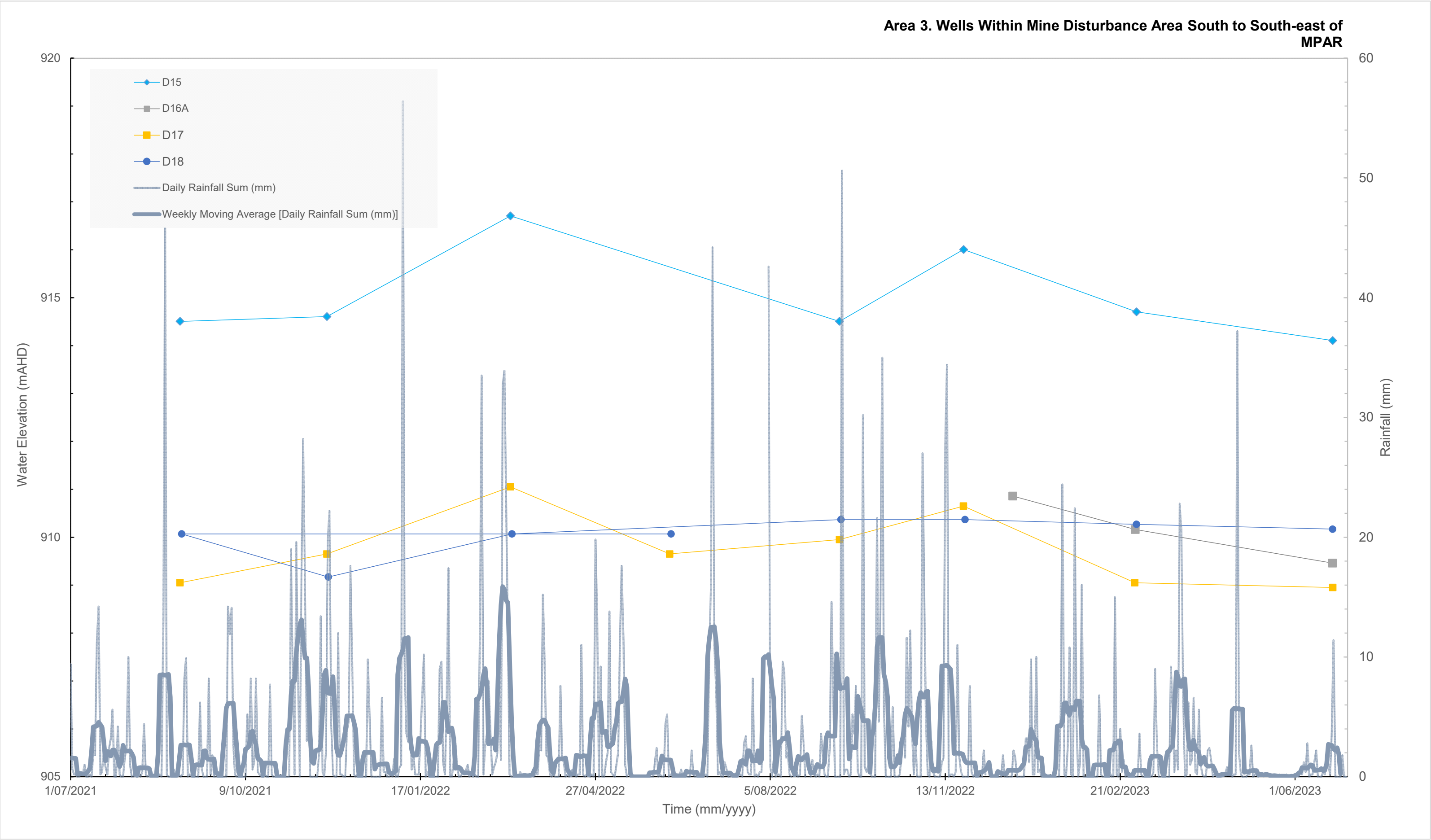
Month	Jan-23			Feb-23			Mar-23			Apr-23			May-23			Jun-23		
Measurement	AT 2M 1Hr Min	AT 2M 1Hr Max	Rain	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall	AT 2M 1Hr Min	AT 2M 1Hr Max	Rainfall
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	15.3	24.2	9.8	14.5	27.4	0	9.4	25.2	0	3.6	17.1	6.2	0.8	9.9	0.2	3.2	15.7	0
2	14.3	26.9	0.2	14.0	26.3	0	15.0	24.6	0	9.2	13.9	1.0	7.6	13.4	0	1.3	16.5	0.2
3	14.1	30.0	0.2	8.8	19.4	0	10.4	23.6	0	11.1	17.7	1.4	6.8	14.0	0	3.1	16.6	0
4	13.5	25.1	10	7.3	18.6	0	14.8	21.4	3.6	8.6	17.7	6.6	2.5	14.6	0	7.9	10.9	0.6
5	10.4	14.7	0.4	9.6	27.5	0	10.8	27.8	0.2	8.4	19.9	0.4	-1.3	15.2	0.2	7.0	10.5	0.2
6	9.1	14.5	0.6	12.5	28.8	0	14.1	31.0	0	7.1	18.0	0.2	-1.4	13.8	0.2	6.1	14.1	1.2
7	10.6	18.6	0	15.6	26.3	0	11.3	27.0	0	8.1	18.6	5.6	-0.7	7.3	2.6	5.9	15.8	0.4
8	10.1	25.5	0	14.6	22.8	0	8.4	23.5	0	10.0	13.3	1.0	-0.3	7.4	0	5.5	9.9	2.8
9	7.0	29.4	0	13.8	20.9	6.8	7.2	21.3	0	7.0	10.6	0.2	0.0	11.5	0.2	2.3	9.8	0
10	8.0	27.9	0	9.2	26.4	0.2	5.2	25.5	0	3.4	10.3	0.0	-2.1	15.2	0.4	-2.2	10.3	0.2
11	13.7	27.3	0	11.5	30.0	0	9.4	26.8	0	4.8	16.0	0.0	0.3	15.3	0	-4.7	12.6	0.2
12	14.5	28.9	0	16.3	28.0	0	13.5	25.2	0.4	3.3	15.1	2.2	0.1	15.7	0.2	-2.5	11.7	1.2
13	15.3	24.9	0	14.0	20.5	0	13.9	16.4	9	8.0	16.5	2.4	0.3	15.0	0.2	3.8	12.4	2.2
14	14.8	25.6	0	14.0	18.5	0	12.8	19.4	2.6	7.6	16.6	1.4	3.7	14.8	0.2	4.2	8.4	0
15	11.1	30.6	0	13.2	23.7	0.4	11.6	25.0	0	4.7	19.0	0.0	-	-	-	3.2	8.1	0
16	15.6	23.9	0	9.1	29.0	0	9.3	28.8	0	7.8	17.1	0.2	-	-	-	-2.0	11.2	0
17	14.1	26.2	0	10.2	30.7	0	8.5	28.5	0	2.4	17.8	0.2	-	-	-	-4.4	12.0	0.4
18	9.9	29.3	5.2	12.8	32.7	15	13.1	31.0	0	6.3	17.3	0.0	-0.1	10.7	0.2	-3.1	9.6	0.2
19	11.3	16.7	24.4	11.9	25.9	0.2	9.0	34.3	0	6.5	17.9	0.0	-4.0	11.4	0.2	0.5	7.4	2
20	11.5	16.1	0.2	15.5	28.5	0	11.6	22.2	0	10.4	14.0	0.0	3.4	8.2	0	-5.0	7.3	1
21	9.4	20.1	0	13.6	28.4	4	12.6	16.0	0	3.9	15.6	0.2	5.4	8.7	0	-7.5	10.8	0.2
22	12.0	15.5	2.4	12.0	15.0	0.4	12.4	17.8	9.2	2.8	16.0	0.2	-2.8	14.8	0	-0.9	9.8	3.8
23	11.8	21.9	10.8	11.2	17.7	1.4	13.0	21.9	5.4	6.1	16.5	0.8	-2.5	17.9	0.2	4.5	8.6	11.4
24	13.1	25.3	0.2	11.3	20.1	0	9.5	20.9	0.4	6.9	16.4	0.2	-4.9	16.9	0	4.2	11.1	0
25	9.9	28.0	0	7.4	24.1	0	13.4	17.2	2.2	8.3	18.6	0.2	-2.3	14.7	0	-1.4	10.4	0
26	12.3	31.2	22.4	8.3	27.0	0	13.5	18.5	0.6	5.6	17.1	0.0	-0.1	11.3	0	4.0	9.0	0
27	14.2	26.8	4.6	13.4	28.4	0	14.1	21.0	22.8	6.0	18.3	0.2	-4.6	8.8	0.2	4.6	8.4	0
28	16.2	30.2	0	14.9	25.6	0	11.9	19.2	20.6	3.5	18.9	0.2	3.0	7.8	0	3.3	5.8	1.8
29	16.0	29.3	1.2				11.7	18.6	6.4	9.0	12.4	37.2	6.3	10.7	0	1.9	6.3	0
30	16.1	19.2	16				7.4	15.1	0	4.8	11.6	2	1.7	11.9	0	1.7	6.6	0
31	14.6	24.3	0				3.7	16.8	0.2				7.8	13.5	0			
Min	7.0	14.5	0.0	7.3	15.0	0.0	3.7	15.1	0.0	2.4	10.3	0.0	-4.9	7.3	0.0	-7.5	5.8	0.0
Max	16.2	31.2	24.4	16.3	32.7	15.0	15.0	34.3	22.8	11.1	19.9	37.2	7.8	17.9	2.6	7.9	16.6	11.4
Average	12.6	24.5		12.2	24.9		11.0	23.0		6.5	16.2		0.8	12.5		1.5	10.6	
Total			108.6			28.4			83.6			70.2			5.2			30.0

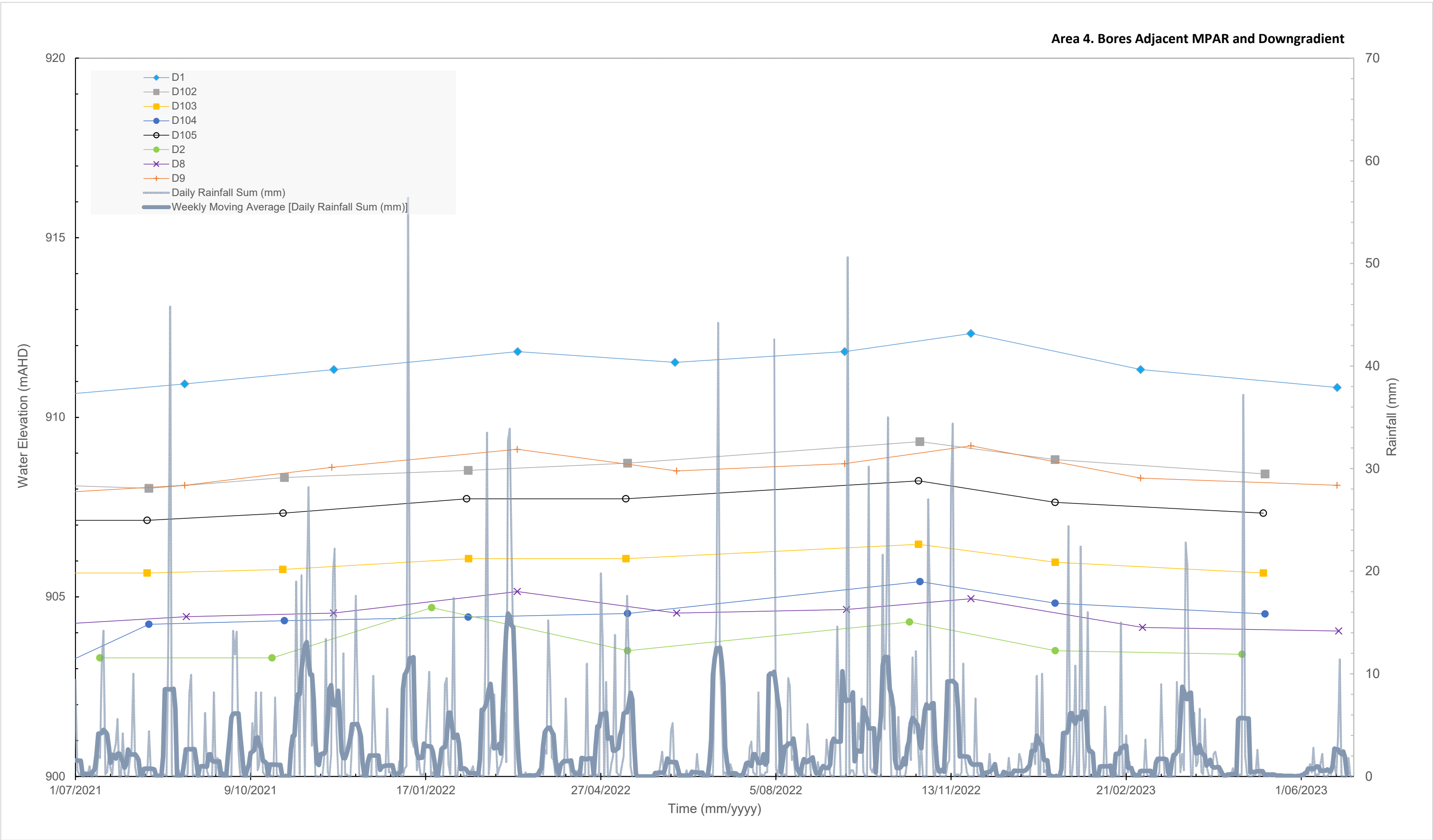
Note:
- signifies data not provided

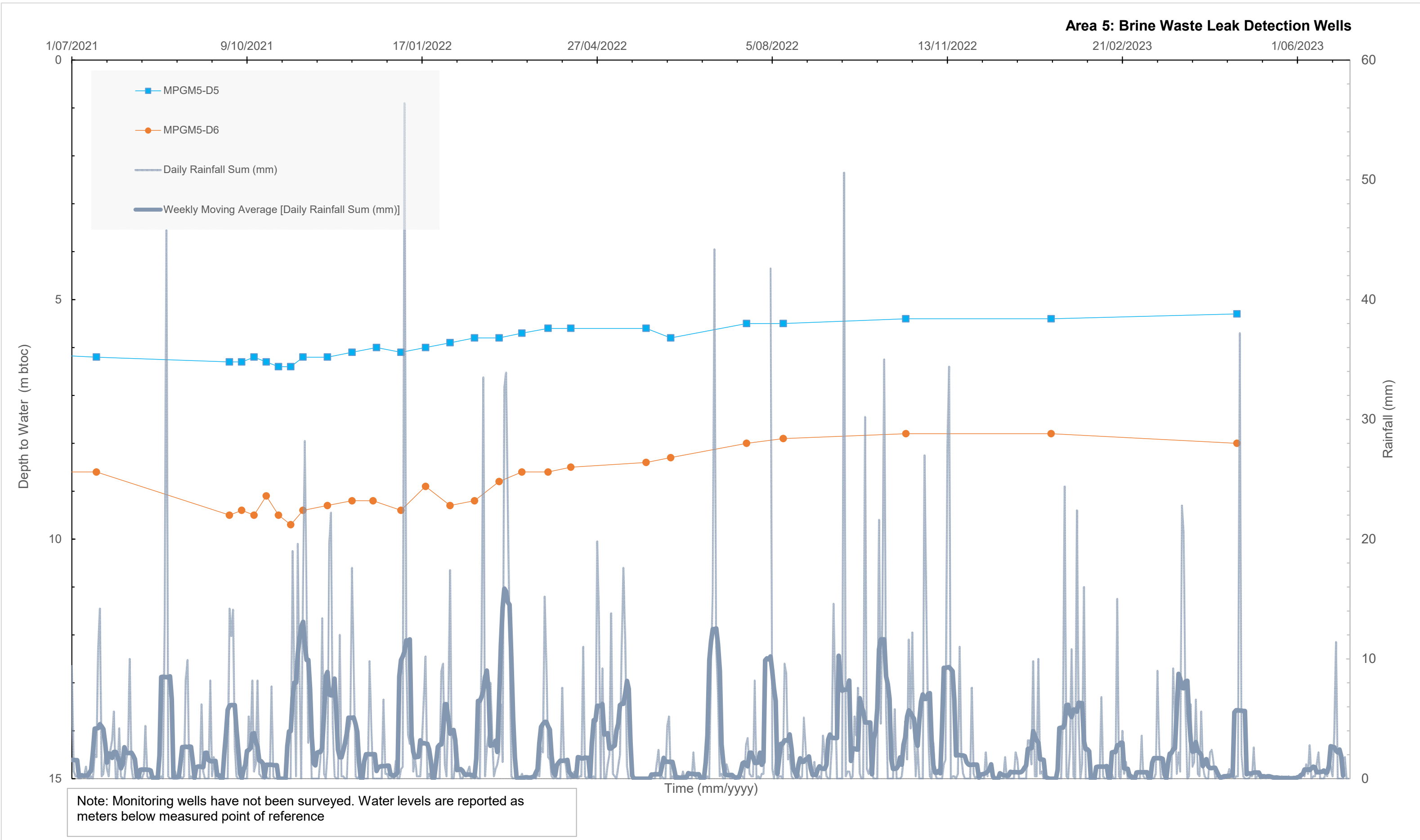
APPENDIX F HYDROGRAPHS


Area 1. Bores Background and Adjacent to MPAR
D106
D107
D3
D4
D5
Daily Rainfall Sum (mm)
Weekly Moving Average [Daily Rainfall Sum (mm)]
Water Elevation (mAHD)
920
915
910
905
Rainfall (mm)
60
50
40
30
20
10
0
1/07/2021
9/10/2021
17/01/2022
27/04/2022
5/08/2022
13/11/2022
21/02/2023
1/06/2023
Time (mm/yyyy)


Area 2. Bores within MPAR / Mine Disturbance Area East of MPAR
D10
D11
D113
D19
D23
Daily Rainfall Sum (mm)
Weekly Moving Average [Daily Rainfall Sum (mm)]
Water Elevation (mAHD)
920
915
910
905
Rainfall (mm)
60
50
40
30
20
10
0
1/07/2021
9/10/2021
17/01/2022
27/04/2022
5/08/2022
13/11/2022
21/02/2023
1/06/2023
Time (mm/yyyy)


Area 3. Wells Within Mine Disturbance Area South to South-east of MPAR
D15
D16A
D17
D18
Daily Rainfall Sum (mm)
Weekly Moving Average [Daily Rainfall Sum (mm)]
Water Elevation (mAHD)
Rainfall (mm)
Time (mm/yyyy)
920
915
910
905
60
50
40
30
20
10
0
1/07/2021
9/10/2021
17/01/2022
27/04/2022
5/08/2022
13/11/2022
21/02/2023
1/06/2023


Area 4. Bores Adjacent MPAR and Downgradient
D1
D102
D103
D104
D105
D2
D8
D9
Daily Rainfall Sum (mm)
Weekly Moving Average [Daily Rainfall Sum (mm)]
Water Elevation (mAHD)
920
915
910
905
900
Rainfall (mm)
70
60
50
40
30
20
10
0
1/07/2021
9/10/2021
17/01/2022
27/04/2022
5/08/2022
13/11/2022
21/02/2023
1/06/2023
Time (mm/yyyy)


Area 5: Brine Waste Leak Detection Wells
1/07/2021
9/10/2021
17/01/2022
27/04/2022
5/08/2022
13/11/2022
21/02/2023
1/06/2023
MPGM5-D5
MPGM5-D6
Daily Rainfall Sum (mm)
Weekly Moving Average [Daily Rainfall Sum (mm)]
Depth to Water (m btoc)
Rainfall (mm)
Time (mm/yyyy)
0
5
10
15
60
50
40
30
20
10
0
Note: Monitoring wells have not been surveyed. Water levels are reported as meters below measured point of reference

APPENDIX G TABULATED SURFACE WATER DATA

				Field Parameters				Major Anions and Cations												Nutrients								Physical Parameters			
				Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Redox (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Hydroxide Alkalinity (as CaCO3)	Fluoride	Magnesium	Phenolphthalein Alkalinity	Potassium	Sodium	Sulfate (as SO4)	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS) (Filtered)	Total Suspended Solids (TSS)	Turbidity
				mg/L	uS/cm	pH units	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
ANZECC (2000) or Local Guidelines - Surface Water					2200	6.5-8						350		1.5					1000									1500	1500		
Purpose	**Field_ID**	**LocCode**	**Sampled_Date**																												
Upstream	Wangcol Creek Weir	LMP01	4/07/2022	7.7	130.1	6.8	218.2	-	37.81	9.22	37.81	6.04	-	0.064	4.59	0	4.91	10.6	24	60	8	210	<10	0.21	1.8	2	0.16	204	204	158	291
Upstream	Wangcol Creek Weir	LMP01	1/08/2022	9.9	399	7.9	176.1	-	91.54	31.5	91.54	11.8	-	0.085	23.4	0	6.69	23	109	<10	38	140	<10	0.14	0.3	0.4	0.02	261	261	24.33	40.7
Upstream	Wangcol Creek Weir	LMP01	5/09/2022	8.2	405	7.8	201.7	-	88.56	27.6	88.56	13.2	-	0.08	20.7	0	6.03	24.7	101	20	34	240	<10	0.24	0.2	0.4	<0.01	-	253	8	11.8
Upstream	Wangcol Creek Weir	LMP01	4/10/2022	8.6	374	7.8	384.8	<1	56	26.7	56	13.7	-	0.095	19.8	<1	6.41	23	107	<10	34	310	10	0.32	0.3	0.6	0.01	-	246	6	10.8
Upstream	Wangcol Creek Weir	LMP01	7/11/2022	6.7	355	7.3	196.5	<1	62	23.7	62	13.1	-	0.125	18	<1	5.9	18.9	91.9	<10	29	350	<10	0.35	0.3	0.6	0.02	-	224	<5	9.3
Upstream	Wangcol Creek Weir	LMP01	5/12/2022	4.5	434	7.7	191.4	<1	79	35.1	79	13.5	-	0.101	28.8	<1	7.56	25	126	<10	46	130	<10	0.13	0.3	0.4	0.05	-	264	<5	6.8
Upstream	Wangcol Creek Weir	LMP01	3/01/2023	5.3	386	7.6	164.1	<1	78	26.8	78	10.4	-	0.09	18.7	<1	4.94	17.3	90.4	<10	30	60	10	0.07	0.5	0.6	0.06	-	225	28	43.2
Upstream	Wangcol Creek Weir	LMP01	6/02/2023	6.8	297	7.6	154.3	<1	80	24.1	80	7.34	-	0.142	14.1	<1	4.72	14.5	53.6	70	18	80	<10	0.08	0.6	0.7	0.04	-	204	36	25
Upstream	Wangcol Creek Weir	LMP01	6/03/2023	6.4	398	7.7	131.2	<1	100	29.1	100	11.2	-	0.202	19.1	<1	5.17	17.5	94.9	10	28	70	<10	0.07	0.2	0.3	<0.01	-	242	5	8.4
Upstream	Wangcol Creek Weir	LMP01	3/04/2023	7.7	250	7.6	135.4	<1	67	18.2	67	6.58	-	0.095	9.53	<1	3.88	12	45.9	20	14	150	<10	0.15	0.5	0.6	0.04	-	163	20	39.4
Upstream	Wangcol Creek Weir	LMP01	1/05/2023	8	179.7	7.6	200.2	<1	43	12.2	43	5.96	-	0.119	6.64	<1	3.63	9.93	34	20	11	100	<10	0.1	0.3	0.4	0.04	-	108	11	27.3
Upstream	Wangcol Creek Weir	LMP01	5/06/2023	8.4	505	8.5	134.7	<1	96	31.9	96	16.4	-	0.115	20.6	<1	5.76	33.5	143	<10	41	60	<10	0.06	0.2	0.3	0.02	-	350	-	4.3
			Min.	4.5	130.1	6.8	131.2	<1	37.81	9.22	37.81	5.96	-	0.064	4.59	0	3.63	9.93	24	<10	8	60	<10	0.06	0.2	0.3	<0.01	204	108	<5	4.3
			Max.	9.9	505	8.5	384.8	<1	100	35.1	100	16.4	-	0.202	28.8	<1	7.56	33.5	143	70	46	350	10	0.35	1.8	2	0.16	261	350	158	291
			Average	7.4	343	7.5	191	0.5	73	25	73	11	-	0.11	17	0.38	5.5	19	85	19	28	158	5.8	0.16	0.46	0.61	0.039		229	27	43
Mid-stream	Wangcol Ck Surface Water_C	C	27/07/2022	11.1	229	7.34	103.8	<1	45	14	45	10.5	<1	<0.05	10.3	<1	4.35	14.1	52.3	40	16	50	<10	0.05	0.2	0.2	<0.01	135	135	7	10.2
Mid-stream	Wangcol Ck Surface Water_C	C	25/08/2022	10.5	212	7.17	93.6	<1	38	12.9	38	9.99	<1	0.03	9.45	<1	3.92	14	45.5	<10	15	50	<10	0.05	0.3	0.4	<0.01	144	144	<5	5.8
Mid-stream	Wangcol Ck Surface Water_C	C	28/09/2022	10.1	101	6.28	220.5	<1	22	8.07	22	5.19	-	0.057	4.2	<1	3.73	6.64	17.1	210	5	70	<10	0.07	1.2	1.3	0.15	-	135	82	133
Mid-stream	Wangcol Ck Surface Water_C	C	26/10/2022	7.6	196	7.16	96.9	<1	41	13.5	41	9.1	-	0.074	8.7	<1	4.15	11.6	40	<10	12	60	<10	0.06	0.4	0.5	0.05	-	150	7	14.5
Mid-stream	Wangcol Ck Surface Water_C	C	17/11/2022	10.8	192	6.56	194.7	<1	39	10.8	39	11.7	-	<0.05	7.65	<1	3.55	15.2	41.1	<10	12	180	<10	0.18	0.2	0.4	<0.01	-	138	6	7.6
Mid-stream	Wangcol Ck Surface Water_C	C	13/12/2022	9.4	234	7.4	174.4	<1	47	13.4	47	10.4	-	0.052	10.7	<1	3.73	13.1	50.8	20	18	20	<10	0.02	0.4	0.4	0.02	-	131	7	7.5
Mid-stream	Wangcol Ck Surface Water_C	C	11/01/2023	8	157	7.6	31.3	<1	39	9.69	39	8.52	-	0.044	6.8	<1	2.6	11.4	27.1	<10	9	<10	<10	<0.01	0.2	0.2	<0.01	-	101	8	7.2
Mid-stream	Wangcol Ck Surface Water_C	C	9/02/2023	6.9	127	7.01	175.6	<1	36	8.23	36	7.03	-	0.045	5.14	<1	2.34	9.55	14.3	<10	5	<10	<10	<0.01	0.3	0.3	0.01	-	94	10	9.1
Mid-stream	Wangcol Ck Surface Water_C	C	15/03/2023	7.1	220	7.19	152.4	<1	56	15.2	56	10.5	-	0.06	9.91	<1	3.74	14	37.8	<10	13	<10	<10	<0.01	0.2	0.2	0.01	-	134	6	9.5
Mid-stream	Wangcol Ck Surface Water_C	C	4/04/2023	6.4	178	7.21	167.8	<1	43	11.7	43	8.4	-	0.077	6.67	<1	3.03	10.1	28.4	<10	9	10	10	0.02	0.3	0.3	0.02	-	114	8	13.8
Mid-stream	Wangcol Ck Surface Water_C	C	10/05/2023	9.8	195	7.55	16.9	<1	42	10.5	42	12.3	-	0.073	6.32	<1	2.83	15.1	37.1	<10	11	40	<10	0.04	0.1	0.1	0.01	-	102	<5	5.2
Mid-stream	Wangcol Ck Surface Water_C	C	15/06/2023	10.7	320	7.46	188.3	<1	58	20.9	58	12.9	-	0.06	13.4	<1	4.2	20.8	77.3	100	25	50	<10	0.05	0.2	0.2	0.01	-	203	-	4.4
			Min.	6.4	101	6.3	16.9	<1	22	8.07	22	5.19	<1	0.03	4.2	<1	2.34	6.64	14.3	<10	5	<10	<10	<0.01	0.1	0.1	<0.01	135	94	<5	4.4
			Max.	11.1	320	7.6	220.5	<1	58	20.9	58	12.9	<1	0.077	13.4	<1	4.35	20.8	77.3	210	25	180	10	0.18	1.2	1.3	0.15	144	203	82	133
			Average	9	197	7.0	135	0.5	42	12	42	9.7		0.052	8.3	0.5	3.5	13	39	34	13	45	5.4	0.046	0.33	0.38	0.025		132	13	19
Mid-stream	Wangcol Ck Surface Water_E	E	27/07/2022	11.2	405	7.07	32.5	<1	48	20.6	48	23.5	<1	<0.1	16.8	<1	5.74	32.8	115	<10	36	40	<10	0.04	0.2	0.2	0.02	242	242	<5	5.8
Mid-stream	Wangcol Ck Surface Water_E	E	25/08/2022	10.3	381	6.94	52.3	<1	41	17.8	41	22	<1	0.034	14.5	<1	4.91	31	99.9	<10	31	30	<10	0.03	0.3	0.3	<0.01	236	236	<5	3.8
Mid-stream	Wangcol Ck Surface Water_E	E	28/09/2022	9.4	130	6.98	166.6	<1	26	9.23	26	6.96	-	0.063	5.3	<1	4.04	10	26.1	<10	8	60	<10	0.06	0.8	0.9	0.08	-	134	64	135
Mid-stream	Wangcol Ck Surface Water_E	E	26/10/2022	6.7	257	7.12	39.5	<1	45	15.4	45	12.6	-	0.07	10.8	<1	4.75	20.5	51.7	<10	18	30	<10	0.03	0.3	0.3	0.04	-	174	<5	9
Mid-stream	Wangcol Ck Surface Water_E	E	18/11/2022	10.7	307	6.63	142.3	<1	44	15.9	44	19.7	-	<0.05	12.3	<1	4.25	25.6	81.6	<10	24	140	<10	0.14	0.2	0.3	<0.01	-	371	<5	4.5
Mid-stream	Wangcol Ck Surface Water_E	E	13/12/2022	9.9	528	7.26	106.6	<1	54	25	54	31.7	-	<0.1	22.6	<1	5.7	43.4	154	10	44	20	<10	0.02	0.4	0.4	0.01	-	296	<5	4.2
Mid-stream	Wangcol Ck Surface Water_E	E	11/01/2023	6.6	940	7.07	14	<1	77	38.7	77	72.6	-	<0.1	36.3	<1	8.35	98.6	308	20	96	20	<10	0.02	0.3	0.3	0.01	-	596	<5	5.2
Mid-stream	Wangcol Ck Surface Water_E	E	9/02/2023	7.2	950	7.03	83.4	<1	92	38.9	92	74.6	-	<0.2	34.7	<1	8.28	101	316	<10	95	<10	<10	<0.01	0.3	0.3	0.06	-	625	<5	5.4
Mid-stream	Wangcol Ck Surface Water_E	E	15/03/2023	7.7	890	7.14	45.3	<1	112	38.6	112	67.1	-	<0.2	33.8	<1	7.87	93.3	256	10	81	40	<10	0.04	0.2	0.2	0.02	-	554	<5	6.8
Mid-stream	Wangcol Ck Surface Water_E	E	4/04/2023	7.8	820	7.12	-13.9	<1	87	31.2	87	59.4	-	0.073	27.5	<1	7.35	78.3	234	<10	71	<10	10	0.01	0.2	0.2	<0.01	-	464	<5	5.8
Mid-stream	Wangcol Ck Surface Water_E	E	10/05/2023	11.4	1290	7	75.6	<1	77	43.6	77	102	-	<0.2	42.5	<1	10.8	138	462	80	131	<10	<10	<0.01	0.2	0.2	0.01	-	778	<5	16.9
Mid-stream	Wangcol Ck Surface Water_E	E	15/06/2023	10.4	1440	6.96	41	<1	63	54.3	63	123	-	<0.2	51	<1	12.8	164	572	140	161	90	<10	0.09	0.3	0.4	0.01	-	968	-	24.1
			Min.	6.6	130	6.6	-13.9	<1	26	9.23	26	6.96	<1	0.034	5.3	<1	4.04	10	26.1	<10	8	<10	<10	<0.01	0.2	0.2	<0.01	236	134	<5	3.8
			Max.	11.4	1440	7.3	166.6	<1	112	54.3	112	123	<1	<0.2	51	<1	12.8	164	572	140	161	140	10	0.14	0.8	0.9	0.08	242	968	64	135
			Average	9.1	695	7.0	65	0.5	64	29	64	51		0.068	26	0.5	7.1	70	223	25	66	40	5.4	0.041	0.31	0.33	0.023		453	8.1	19

				Field Parameters				Major Anions and Cations												Nutrients								Physical Parameters			
				Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Redox (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Hydroxide Alkalinity (as CaCO3)	Fluoride	Magnesium	Phenolphthalein Alkalinity	Potassium	Sodium	Sulfate (as SO4)	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS) (Filtered)	Total Suspended Solids (TSS)	Turbidity
				mg/L	uS/cm	pH units	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
ANZECC (2000) or Local Guidelines - Surface Water					2200	6.5-8						350		1.5					1000									1500	1500		
Purpose	**Field_ID**	**LocCode**	**Sampled_Date**																												
Mid-stream	Wangcol Creek NC01	NC01	27/07/2022	10.6	390	7.26	91.5	<1	82	28.7	82	11.7	<1	<0.1	20.7	<1	6.28	21.6	95.3	20	32	110	<10	0.11	0.3	0.4	0.01	231	231	11	18
Mid-stream	Wangcol Creek NC01	NC01	25/08/2022	10.4	358	7.31	95.1	<1	65	25.7	65	11.8	<1	0.046	17.6	<1	5.2	19.3	82.9	10	27	100	<10	0.1	0.4	0.5	<0.01	216	216	<5	9.9
Mid-stream	Wangcol Creek NC01	NC01	28/09/2022	9.7	110	7.26	210.3	<1	27	9.32	27	4.45	-	0.07	4.64	<1	3.87	6.61	19.5	40	6	90	<10	0.09	1.2	1.3	0.09	-	189	133	177
Mid-stream	Wangcol Creek NC01	NC01	26/10/2022	7.7	281	7.26	109.5	<1	61	21.3	61	7.17	-	0.082	13.3	<1	5.25	14.5	48.1	50	18	100	<10	0.1	0.6	0.7	0.06	-	211	12	21.8
Mid-stream	Wangcol Creek NC01	NC01	17/11/2022	10.6	284	6.83	174.4	<1	73	19.4	73	13.2	-	0.062	12.7	<1	4.55	19.1	55.7	20	16	120	<10	0.12	0.4	0.5	<0.01	-	198	6	8.8
Mid-stream	Wangcol Creek NC01	NC01	13/12/2022	7	416	7.54	148.5	<1	84	28.5	84	12.6	-	0.11	22.7	<1	5.88	20.6	104	10	31	<10	10	0.01	0.4	0.4	0.02	-	233	6	8.9
Mid-stream	Wangcol Creek NC01	NC01	11/01/2023	4	397	7.47	44.1	<1	108	29.8	108	9.78	-	0.144	20.2	<1	4.85	20.3	78.7	20	25	<10	<10	<0.01	0.4	0.4	0.02	-	232	10	7.6
Mid-stream	Wangcol Creek NC01	NC01	9/02/2023	3.7	285	7.18	188.9	<1	100	23.6	100	6.42	-	0.143	13.7	<1	4.14	14.8	38.8	10	12	<10	<10	<0.01	0.5	0.5	0.02	-	170	29	11.8
Mid-stream	Wangcol Creek NC01	NC01	15/03/2023	4.3	400	7.27	159.7	<1	111	32.7	111	11.5	-	0.125	20.7	<1	5.69	20.6	79.3	10	28	20	<10	0.02	0.4	0.4	0.04	-	233	10	8.9
Mid-stream	Wangcol Creek NC01	NC01	4/04/2023	5	272	7.02	228	<1	79	20.6	79	7.71	-	0.106	11.5	<1	4.44	13	46.8	10	15	20	<10	0.02	0.4	0.4	0.02	-	154	16	16.6
Mid-stream	Wangcol Creek NC01	NC01	10/05/2023	8.5	276	7.45	40.5	<1	67	16.3	67	13.8	-	0.121	9.44	<1	3.79	20.8	53.2	20	16	20	<10	0.02	0.3	0.3	0.02	-	144	15	9.1
Mid-stream	Wangcol Creek NC01	NC01	15/06/2023	8.5	438	7.36	195.1	<1	83	30.4	83	15.4	-	<0.1	19.4	<1	5.93	27.7	98.4	40	35	40	<10	0.04	0.2	0.2	0.02	-	294	-	7.4
			Min.	3.7	110	6.8	40.5	<1	27	9.32	27	4.45	<1	0.046	4.64	<1	3.79	6.61	19.5	10	6	<10	<10	<0.01	0.2	0.2	<0.01	216	144	<5	7.4
			Max.	10.6	438	7.5	228	<1	111	32.7	111	15.4	<1	0.144	22.7	<1	6.28	27.7	104	50	35	120	10	0.12	1.2	1.3	0.09	231	294	133	177
			Average	7.5	326	7.2	140	0.5	78	24	78	10		0.092	16	0.5	5	18	67	22	22	53	5.4	0.053	0.46	0.5	0.028		209	23	25
Downstream	Wangcol Ck Surface Water_G	G	27/07/2022	10.7	454	7.08	50.8	<1	43	22.9	43	27.8	<1	<0.1	18.6	<1	5.95	37.2	138	<10	44	40	<10	0.04	0.1	0.1	<0.01	275	275	<5	3.4
Downstream	Wangcol Ck Surface Water_G	G	25/08/2022	10.4	412	7.1	88	<1	41	20.9	41	24.3	<1	0.035	16.8	<1	5.44	34.7	114	<10	37	40	<10	0.04	0.2	0.2	<0.01	260	260	<5	3
Downstream	Wangcol Ck Surface Water_G	G	28/09/2022	9.4	167	7	194	<1	28	10.9	28	9.16	-	0.071	6.71	<1	4.18	13.5	38.4	20	12	80	<10	0.08	0.6	0.7	0.09	-	174	104	173
Downstream	Wangcol Ck Surface Water_G	G	26/10/2022	6.8	307	7.15	78.4	<1	45	17.8	45	17.3	-	0.079	12.6	<1	5.18	24.6	79.7	<10	24	100	<10	0.1	0.3	0.4	0.04	-	228	6	12.1
Downstream	Wangcol Ck Surface Water_G	G	16/11/2022	9.9	269	6.65	227.3	<1	40	15.3	40	16	-	0.051	10.6	<1	4.34	20.7	72	20	21	90	<10	0.09	0.4	0.5	<0.01	-	189	7	13.7
Downstream	Wangcol Ck Surface Water_G	G	13/12/2022	9.4	680	7.49	197.1	<1	57	31.6	57	44.7	-	<0.1	29.2	<1	6.44	59.1	209	<10	67	10	<10	0.01	0.3	0.3	0.02	-	401	<5	2.5
Downstream	Wangcol Ck Surface Water_G	G	11/01/2023	6.7	970	7.54	64.6	<1	73	42.2	73	76.1	-	<0.1	37.6	<1	8.16	97.5	329	20	100	10	<10	0.01	0.4	0.4	<0.01	-	614	<5	1.7
Downstream	Wangcol Ck Surface Water_G	G	9/02/2023	7.7	1060	7.44	134.2	<1	89	45.7	89	88.3	-	<0.2	39.4	<1	9.28	113	378	<10	112	10	<10	0.01	0.3	0.3	0.01	-	688	<5	1.5
Downstream	Wangcol Ck Surface Water_G	G	15/03/2023	7.8	1610	7.49	112.5	<1	113	66	113	136	-	<0.2	62.2	<1	13.7	185	556	10	176	<10	<10	<0.01	0.2	0.2	<0.01	-	1100	<5	1.5
Downstream	Wangcol Ck Surface Water_G	G	4/04/2023	8.1	750	7.52	91.8	<1	75	30	75	55.7	-	<0.1	25.7	<1	7.4	70.3	212	<10	65	10	<10	0.01	0.2	0.2	0.02	-	397	<5	1.7
Downstream	Wangcol Ck Surface Water_G	G	10/05/2023	11.8	880	7.4	118	<1	68	33.8	68	67.1	-	<0.1	29.7	<1	7.72	89.3	279	120	87	30	<10	0.03	0.2	0.2	0.01	-	486	<5	1.3
Downstream	Wangcol Ck Surface Water_G	G	15/06/2023	11.3	1930	7.39	100.8	<1	63	76.3	63	172	-	<0.5	71.4	<1	16.5	224	776	220	228	40	<10	0.04	0.3	0.3	0.01	-	1320	-	0.7
			Min.	6.7	167	6.65	50.8	<1	28	10.9	28	9.16	<1	0.035	6.71	<1	4.18	13.5	38.4	<10	12	<10	<10	<0.01	0.1	0.1	<0.01	260	174	<5	0.7
			Max.	11.8	1930	7.54	227.3	<1	113	76.3	113	172	<1	<0.5	71.4	<1	16.5	224	776	220	228	100	<10	0.1	0.6	0.7	0.09	275	1320	104	173
			Average	9.2	791	7.2	121	0.5	61	34	61	61		0.078	30	0.5	7.9	81	265	37	81	39	5	0.039	0.29	0.32	0.019		511	12	18
Downstream	Wangcol Ck_F/Stream Gauge	WX22	27/07/2022	10.2	467	7.1	59.3	<1	45	24.2	45	28.4	<1	<0.1	19.8	<1	6.35	39.1	142	20	46	40	<10	0.04	0.3	0.3	0.01	276	276	<5	3.5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	25/08/2022	10.6	419	7.1	87.6	<1	38	24.9	38	25.1	<1	0.038	19	<1	6.08	38.3	115	<10	44	40	<10	0.04	0.3	0.3	<0.01	262	262	10	3.3
Downstream	Wangcol Ck_F/Stream Gauge	WX22	28/09/2022	9.6	168	7.03	193.5	<1	28	11.1	28	9.18	-	0.071	6.79	<1	4.45	13.7	38.4	<10	12	80	<10	0.08	0.9	1	0.11	-	168	110	167
Downstream	Wangcol Ck_F/Stream Gauge	WX22	26/10/2022	6.9	306	7.13	70.7	<1	45	17.7	45	15.5	-	0.087	12.5	<1	5.17	24.4	77.7	<10	24	30	<10	0.03	0.3	0.3	0.04	-	212	19	11.6
Downstream	Wangcol Ck_F/Stream Gauge	WX22	16/11/2022	10	269	7.02	201	<1	39	15.9	39	15.9	-	<0.05	11	<1	4.58	21.3	71.4	<10	22	100	<10	0.1	0.4	0.5	0.01	-	194	5	13.3
Downstream	Wangcol Ck_F/Stream Gauge	WX22	13/12/2022	8	680	7.46	191.3	<1	57	30.8	57	44.6	-	<0.1	28.7	<1	6.44	58.4	209	10	64	30	<10	0.03	0.2	0.2	0.01	-	392	<5	1.8
Downstream	Wangcol Ck_F/Stream Gauge	WX22	11/01/2023	6.3	980	7.56	67	<1	72	42.7	72	73.6	-	<0.1	38	<1	8.31	97.6	316	10	101	20	<10	0.02	0.3	0.3	0.02	-	590	<5	1.6
Downstream	Wangcol Ck_F/Stream Gauge	WX22	9/02/2023	6.6	1060	7.39	137.3	<1	86	44.6	86	84.4	-	<0.2	38.6	<1	9.01	111	358	<10	110	<10	<10	<0.01	0.3	0.3	<0.01	-	692	<5	1.6
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/03/2023	7.8	1590	7.43	114.5	<1	113	66	113	131	-	0.078	62.7	<1	14	188	528	20	176	<10	<10	<0.01	0.2	0.2	<0.01	-	1080	<5	1.9
Downstream	Wangcol Ck_F/Stream Gauge	WX22	4/04/2023	7.7	750	7.48	88.2	<1	77	28.5	77	57.6	-	<0.1	24.4	<1	7.21	62.6	221	<10	63	10	<10	0.01	0.2	0.2	0.04	-	428	<5	1.8
Downstream	Wangcol Ck_F/Stream Gauge	WX22	10/05/2023	10.5	880	7.4	114.4	<1	68	33.4	68	69.5	-	<0.1	29.4	<1	7.63	88.8	290	10	96	<10	<10	<0.01	0.2	0.2	0.01	-	509	<5	4
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/06/2023	10.4	1930	7.39	97.7	<1	64	76.9	64	153	-	<0.5	72.3	<1	16.7	226	678	80	231	10	<10	0.01	0.2	0.2	0.02	-	1400	-	1.3
			Min.	6.3	168	7.02	59.3	<1	28	11.1	28	9.18	<1	0.038	6.79	<1	4.45	13.7	38.4	<10	12	<10	<10	<0.01	0.2	0.2	<0.01	262	168	<5	1.3
			Max.	10.6	1930	7.56	201	<1	113	76.9	113	153	<1	<0.5	72.3	<1	16.7	226	678	80	231	100	<10	0.1	0.9	1	0.11	276	1400	110	167
			Average	8.7	792	7.2	119	0.5	61	35	61	59		0.075	30	0.5	8	81	254	15	82	31	5	0.031	0.32	0.33	0.024		517	15	18

				Metals																																	
				Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Arsenic III	Arsenic V	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)	Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water							24	24	24	13	700	100	370	370	0.85	2	1	3.3		3.5	3.5	300	300	5	1900	1900	0.06	10	17	17	5	0.05				116	116
Purpose	Field_ID	LocCode	Sampled_Date																																		
Upstream	Wangcol Creek Weir	LMP01	4/07/2022	1650	50	<1	2	<1	<1	<1	23	<1	<50	<50	0.2	2	<10	<10	1	9	3	1470	170	6	77	24	<0.04	4	8	5	<10	<1	0.027	<10	<10	40	13
Upstream	Wangcol Creek Weir	LMP01	1/08/2022	440	10	<1	<1	<1	<1	<1	23	<1	<50	<50	<0.1	<1	<10	<10	<1	3	2	344	41	<1	66	44	<0.04	3	6	5	<10	<1	0.094	<10	<10	18	7
Upstream	Wangcol Creek Weir	LMP01	5/09/2022	320	60	<1	<1	<1	<1	<1	22	<1	<50	<50	<0.1	<1	<10	<10	<1	1	1	280	<50	<1	56	32	<0.04	4	3	7	<10	<1	0.084	<10	<10	16	14
Upstream	Wangcol Creek Weir	LMP01	4/10/2022	240	60	<1	<1	<1	<1	<1	22	<1	<50	<50	<0.1	<1	<10	<10	<1	3	1	380	90	<1	100	57	<0.04	4	8	7	0.5	<1	0.079	<10	<10	22	14
Upstream	Wangcol Creek Weir	LMP01	7/11/2022	220	90	<1	<1	<1	<1	<1	21	<1	<50	<50	<0.1	<1	<10	<10	<1	3	2	280	110	<1	73	41	<0.04	1	9	8	0.6	<1	0.07	<10	<10	18	13
Upstream	Wangcol Creek Weir	LMP01	5/12/2022	170	<10	<1	<1	<1	<1	<1	23	<1	<50	<50	<0.1	<1	<10	<10	<1	2	<1	240	<50	<1	102	9	<0.04	2	6	6	0.4	<1	0.09	<10	<10	14	<5
Upstream	Wangcol Creek Weir	LMP01	3/01/2023	180	<10	<1	<1	<1	<1	<1	19	<1	<50	<50	<0.1	<1	<10	<10	<1	4	2	330	<50	<1	102	4	<0.04	2	4	4	0.3	<1	0.077	<10	<10	20	7
Upstream	Wangcol Creek Weir	LMP01	6/02/2023	460	10	1	<1	<1	<1	<1	25	<1	<50	70	<0.1	<1	<10	<10	1	5	3	570	<50	<1	413	2	0.01	5	7	4	0.4	<1	0.072	<10	<10	24	5
Upstream	Wangcol Creek Weir	LMP01	6/03/2023	120	<10	<1	<1	<1	<1	<1	24	<1	<50	<50	<0.1	<1	<10	<10	<1	2	1	280	<50	<1	267	1	<0.04	3	5	2	0.6	<1	0.091	<10	<10	11	<5
Upstream	Wangcol Creek Weir	LMP01	3/04/2023	540	30	<1	<1	<1	<1	<1	18	<1	<50	<50	<0.1	<1	<10	<10	<1	2	<1	700	90	<1	194	39	<0.04	3	4	4	0.3	<1	0.043	<10	<10	18	7
Upstream	Wangcol Creek Weir	LMP01	1/05/2023	680	60	<1	<1	<1	<1	<1	15	<1	<50	<50	<0.1	<1	<10	<10	<1	4	2	620	100	<1	38	9	<0.04	2	4	2	0.2	<1	0.037	<10	<10	18	6
Upstream	Wangcol Creek Weir	LMP01	5/06/2023	40	<10	<1	<1	<1	<1	<1	26	<1	70	<50	<0.1	<1	<10	<10	<1	<1	<1	140	<50	<1	63	27	<0.04	9	4	4	0.4	<1	0.094	<10	<10	7	6
			Min.	40	<10	<1	<1	<1	<1	<1	15	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	140	41	<1	38	1	0.01	1	3	2	0.2	<1	0.027	<10	<10	7	<5
			Max.	1650	90	1	2	<1	<1	<1	26	<1	70	70	0.2	2	<10	<10	1	9	3	1470	170	6	413	57	<0.04	9	9	8	<10	<1	0.094	<10	<10	40	14
			Average	422	33	0.54	0.63	0.5	0.5	0.5	22	0.5	29	29	0.063	0.63	5	5	0.58	3.2	1.5	470	63	0.96	129	24	0.019	3.5	5.7	4.8	1.6	0.5	0.072	5	5	19	8.1
Mid-stream	Wangcol Ck Surface Water_C	C	27/07/2022	290	50	<1	<1	<1	<1	<1	24	<1	<50	<50	<0.1	1	<10	<10	<1	<1	1	315	81	<1	79	65	<0.04	1	3	2	<10	<1	0.051	<10	<10	6	<5
Mid-stream	Wangcol Ck Surface Water_C	C	25/08/2022	180	50	<1	<1	<1	<1	<1	23	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	260	80	<1	62	55	<0.04	3	2	2	<10	<1	0.048	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_C	C	28/09/2022	1960	300	<1	4	<1	<1	<1	25	3	<50	<50	1.1	2	<10	<10	1	6	2	2130	330	4	101	62	<0.04	<1	7	5	40	<1	0.027	<10	<10	27	6
Mid-stream	Wangcol Ck Surface Water_C	C	26/10/2022	230	160	<1	<1	<1	<1	<1	21	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	2	390	200	<1	76	65	<0.04	<1	4	3	0.2	<1	0.043	<10	<10	6	6
Mid-stream	Wangcol Ck Surface Water_C	C	17/11/2022	240	90	<1	1	<1	<1	<1	20	<1	<50	<50	<0.1	<1	<10	<10	<1	2	1	300	120	<1	52	46	<0.04	<1	3	3	0.6	<1	0.04	<10	<10	8	5
Mid-stream	Wangcol Ck Surface Water_C	C	13/12/2022	210	30	<1	<1	<1	<1	<1	26	<1	<50	<50	<0.1	<1	<10	<10	<1	2	1	320	60	1	138	104	<0.04	2	4	2	<0.2	<1	0.055	<10	<10	10	<5
Mid-stream	Wangcol Ck Surface Water_C	C	11/01/2023	250	80	<1	<1	<1	<1	<1	26	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	340	100	<1	137	98	<0.04	<1	1	1	<0.2	<1	0.035	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_C	C	9/02/2023	300	70	<1	<1	<1	<1	<1	25	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	480	110	<1	168	116	<0.04	<1	1	2	<0.2	<1	0.034	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_C	C	15/03/2023	210	60	<1	<1	<1	<1	<1	29	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	440	100	<1	247	154	<0.04	1	2	2	<0.2	<1	0.051	<10	<10	7	<5
Mid-stream	Wangcol Ck Surface Water_C	C	4/04/2023	440	30	<1	<1	<1	<1	<1	24	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	600	100	<1	227	133	<0.04	1	2	2	<0.2	<1	0.041	<10	<10	6	<5
Mid-stream	Wangcol Ck Surface Water_C	C	10/05/2023	60	30	<1	<1	<1	<1	<1	18	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	360	160	<1	128	137	<0.04	<1	1	2	0.3	<1	0.034	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_C	C	15/06/2023	70	20	<1	<1	<1	<1	<1	25	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	350	110	<1	201	197	<0.04	1	2	<1	<0.2	<1	0.056	<10	<10	<5	<5
			Min.	60	20	<1	<1	<1	<1	<1	18	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	260	60	<1	52	46	<0.04	<1	1	<1	<0.2	<1	0.027	<10	<10	<5	<5
			Max.	1960	300	<1	4	<1	<1	<1	29	3	<50	<50	1.1	2	<10	<10	1	6	2	2130	330	4	247	197	<0.04	3	7	5	40	<1	0.056	<10	<10	27	6
			Average	370	81	0.5	0.83	0.5	0.5	0.5	24	0.71	25	25	0.14	0.67	5	5	0.54	1.2	0.88	524	129	0.83	135	103	0.02	1	2.7	2.2	4.3	0.5	0.043	5	5	6.9	3.3
Mid-stream	Wangcol Ck Surface Water_E	E	27/07/2022	80	20	<1	<1	<1	<1	<1	21	<1	<50	<50	<0.1	<1	<10	<10	3	<1	<1	610	379	<1	348	325	<0.04	<1	20	18	<10	<1	0.087	<10	<10	5	<5
Mid-stream	Wangcol Ck Surface Water_E	E	25/08/2022	50	20	<1	<1	<1	<1	<1	19	<1	<50	<50	<0.1	1	<10	<10	2	<1	<1	600	380	<1	285	271	<0.04	2	19	18	<10	<1	0.084	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_E	E	28/09/2022	2000	210	<1	1	<1	<1	<1	23	<1	<50	<50	<0.1	2	<10	<10	1	6	2	1630	260	4	119	123	<0.04	<1	8	6	<10	<1	0.033	<10	<10	22	6
Mid-stream	Wangcol Ck Surface Water_E	E	26/10/2022	170	80	<1	<1	<1	<1	<1	18	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	2	460	250	<1	123	119	<0.04	<1	9	9	<0.2	<1	0.055	<10	<10	6	<5
Mid-stream	Wangcol Ck Surface Water_E	E	18/11/2022	110	50	<1	<1	<1	<1	<1	20	<1	<50	<50	<0.1	<1	<10	<10	1	2	1	470	270	<1	174	166	<0.04	<1	12	12	0.4	<1	0.067	<10	<10	10	7
Mid-stream	Wangcol Ck Surface Water_E	E	13/12/2022	30	<10	<1	<1	<1	<1	<1	24	<1	<50	70	<0.1	<1	<10	<10	3	1	<1	580	260	<1	502	418	<0.04	1	28	26	<0.2	<1	0.116	<10	<10	13	<5
Mid-stream	Wangcol Ck Surface Water_E	E	11/01/2023	20	<10	<1	<1	<1	<1	<1	26	<1	110	140	<0.1	<1	<10	<10	8	<1	<1	1130	550	<1	1380	1280	<0.04	<1	71	71	<0.2	<1	0.188	<10	<10	6	8
Mid-stream	Wangcol Ck Surface Water_E	E	9/02/2023	30	<10	<1	<1	<1	<1	<1	26	<1	100	100	<0.1	<1	<10	<10	7	<1	<1	1250	660	<1	2150	1840	<0.04	<1	79	72	<0.2	<1	0.21	<10	<10	8	<5
Mid-stream	Wangcol Ck Surface Water_E	E	15/03/2023	20	<10	<1	<1	<1	<1	<1	36	<1	110	100	<0.1	<1	<10	<10	6	<1	<1	1310	570	<1	2950	2720	<0.04	<1	62	71	<0.2	<1	0.188	<10	<10	8	5
Mid-stream	Wangcol Ck Surface Water_E	E	4/04/2023	20	<10	<1	<1	<1	<1	<1	32	<1	90	110	<0.1	<1	<10	<10	6	<1	<1	1530	1100	<1	2290	2200	0.06	<1	59	58	<0.2	<1	0.164	<10	<10	<5	<5
Mid-stream	Wangcol Ck Surface Water_E	E	10/05/2023	<10	<10	<1	<1	<1	<1	<1	30	<1	180	190	<0.1	<1	<10	<10	12	<1	<1	2590	2800	<1	2570	2680	<0.04	<1	102	112	<0.2	<1	0.238	<10	<10	<5	10
Mid-stream	Wangcol Ck Surface Water_E	E	15/06/2023	<10	<10	<1	<1	<1	<1	<1	37	<1	240	250	<0.1	<1	<10	<10	14	<1	<1	3050	950	<1	2840	2620	<0.04	<1	123	126	<0.2	<1	0.282	<10	<10	11	<5
			Min.	<10	<10	<1	<1	<1	<1	<1	18	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	460	250	<1	119	119	<0.04	<1	8	6	<0.2	<1	0.033	<10	<10	<5	<5
			Max.	2000	210	<1	1	<1	<1	<1	37	<1	240	250	<0.1	2	<10	<10	14	6	2	3050	2800	4	2950	2720	0.06	2	123	126	<10	<1	0.282	<10	<10	22	10
			Average	212	35	0.5	0.54	0.5	0.5	0.5	26	0.5	82	90	0.05	0.67	5	5	5.3	1.1	0.79	1268	702	0.79	1311	1230	0.023	0.67	49	50	1.4	0.5	0.14	5	5	8	4.5

				Metals																	
				Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Arsenic III	Arsenic V	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)	Cobalt	Copper	Copper (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water							24	24	24	13	700	100	370	370	0.85	2	1	3.3		3.5	3.5
Purpose	**Field_ID**	**LocCode**	**Sampled_Date**																		
Mid-stream	Wangcol Creek NC01	NC01	27/07/2022	380	20	<1	<1	<1	<1	<1	23	<1	<50	<50	<0.1	2	<10	<10	<1	1	4
Mid-stream	Wangcol Creek NC01	NC01	25/08/2022	210	30	<1	<1	<1	<1	<1	21	<1	<50	<50	<0.1	1	<10	<10	<1	2	3
Mid-stream	Wangcol Creek NC01	NC01	28/09/2022	2370	380	2	3	<1	<1	<1	25	<1	<50	<50	0.4	3	<10	<10	1	8	3
Mid-stream	Wangcol Creek NC01	NC01	26/10/2022	400	120	<1	<1	<1	<1	<1	20	<1	<50	<50	<0.1	<1	<10	<10	<1	2	3
Mid-stream	Wangcol Creek NC01	NC01	17/11/2022	390	80	<1	<1	<1	<1	<1	19	<1	<50	<50	<0.1	4	<10	<10	<1	3	2
Mid-stream	Wangcol Creek NC01	NC01	13/12/2022	170	<10	<1	<1	<1	<1	<1	25	<1	<50	60	<0.1	<1	<10	<10	<1	2	2
Mid-stream	Wangcol Creek NC01	NC01	11/01/2023	110	<10	<1	<1	<1	<1	<1	33	<1	<50	60	<0.1	<1	<10	<10	<1	<1	<1
Mid-stream	Wangcol Creek NC01	NC01	9/02/2023	340	<10	1	<1	<1	<1	<1	33	<1	<50	<50	<0.1	<1	<10	<10	<1	3	<1
Mid-stream	Wangcol Creek NC01	NC01	15/03/2023	90	<10	<1	<1	<1	<1	<1	31	<1	<50	50	<0.1	<1	<10	<10	<1	<1	<1
Mid-stream	Wangcol Creek NC01	NC01	4/04/2023	390	<10	<1	<1	<1	<1	<1	20	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
Mid-stream	Wangcol Creek NC01	NC01	10/05/2023	80	10	<1	<1	<1	<1	<1	15	<1	<50	<50	<0.1	<1	<10	<10	<1	1	<1
Mid-stream	Wangcol Creek NC01	NC01	15/06/2023	50	<10	<1	<1	<1	<1	<1	27	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
			Min.	50	<10	<1	<1	<1	<1	<1	15	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
			Max.	2370	380	2	3	<1	<1	<1	33	<1	<50	60	0.4	4	<10	<10	1	8	4
			Average	415	56	0.67	0.71	0.5	0.5	0.5	24	0.5	25	33	0.079	1.2	5	5	0.54	2	1.7
Downstream	Wangcol Ck Surface Water_G	G	27/07/2022	60	20	<1	<1	<1	<1	<1	17	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	25/08/2022	70	20	<1	<1	<1	<1	<1	15	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	28/09/2022	2140	360	<1	1	<1	<1	<1	24	<1	<50	<50	<0.1	2	<10	<10	2	7	2
Downstream	Wangcol Ck Surface Water_G	G	26/10/2022	150	70	<1	<1	<1	<1	<1	17	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	1
Downstream	Wangcol Ck Surface Water_G	G	16/11/2022	390	160	<1	<1	<1	<1	<1	19	<1	<50	<50	<0.1	<1	<10	<10	<1	2	1
Downstream	Wangcol Ck Surface Water_G	G	13/12/2022	20	<10	<1	<1	<1	<1	<1	21	<1	<50	90	<0.1	<1	<10	<10	<1	<1	2
Downstream	Wangcol Ck Surface Water_G	G	11/01/2023	10	<10	<1	<1	<1	<1	<1	21	<1	100	120	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	9/02/2023	30	<10	<1	<1	<1	<1	<1	21	<1	120	120	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	15/03/2023	<10	<10	<1	<1	<1	<1	<1	32	<1	220	250	<0.1	<1	<10	<10	1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	4/04/2023	30	<10	<1	<1	<1	<1	<1	14	<1	80	100	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	10/05/2023	<10	<10	<1	<1	<1	<1	<1	16	<1	100	110	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck Surface Water_G	G	15/06/2023	<10	<10	<1	<1	<1	<1	<1	34	<1	320	320	<0.1	<1	<10	<10	1	<1	<1
			Min.	<10	<10	<1	<1	<1	<1	<1	14	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
			Max.	2140	360	<1	1	<1	<1	<1	34	<1	320	320	<0.1	2	<10	<10	2	7	2
			Average	243	55	0.5	0.54	0.5	0.5	0.5	21	0.5	91	103	0.05	0.63	5	5	0.71	1.2	0.83
Downstream	Wangcol Ck_F/Stream Gauge	WX22	27/07/2022	60	20	<1	<1	<1	<1	<1	17	<1	<50	<50	0.1	16	<10	<10	1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	25/08/2022	90	20	<1	<1	<1	<1	<1	17	<1	<50	<50	<0.1	<1	<10	<10	<1	2	1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	28/09/2022	2450	180	<1	2	<1	<1	<1	26	<1	<50	<50	<0.1	2	<10	<10	2	8	2
Downstream	Wangcol Ck_F/Stream Gauge	WX22	26/10/2022	180	70	<1	<1	<1	<1	<1	16	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	2
Downstream	Wangcol Ck_F/Stream Gauge	WX22	16/11/2022	390	160	<1	<1	<1	<1	<1	20	<1	<50	<50	<0.1	<1	<10	<10	<1	2	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	13/12/2022	30	<10	<1	<1	<1	<1	<1	22	<1	<50	110	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	11/01/2023	10	<10	<1	<1	<1	<1	<1	21	<1	120	120	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	9/02/2023	20	<10	<1	<1	<1	<1	<1	21	<1	120	110	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/03/2023	150	<10	<1	<1	<1	<1	<1	38	<1	240	220	<0.1	<1	<10	<10	2	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	4/04/2023	20	<10	<1	<1	<1	<1	<1	14	<1	80	100	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	10/05/2023	<10	<10	<1	<1	<1	<1	<1	16	<1	110	120	<0.1	<1	<10	<10	<1	<1	<1
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/06/2023	<10	<10	<1	<1	<1	<1	<1	34	<1	320	340	<0.1	<1	<10	<10	1	<1	<1
			Min.	<10	<10	<1	<1	<1	<1	<1	14	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1
			Max.	2450	180	<1	2	<1	<1	<1	38	<1	320	340	0.1	16	<10	<10	2	8	2
			Average	284	40	0.5	0.63	0.5	0.5	0.5	22	0.5	95	104	0.054	1.9	5	5	0.83	1.4	0.79

				Metals															
				Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water				300	300	5	1900	1900	0.06	10	17	17	5	0.05				116	116
Purpose	**Field_ID**	**LocCode**	**Sampled_Date**																
Mid-stream	Wangcol Creek NC01	NC01	27/07/2022	601	157	<1	259	243	<0.04	2	4	4	<10	<1	0.084	<10	<10	10	<5
Mid-stream	Wangcol Creek NC01	NC01	25/08/2022	610	120	<1	306	284	<0.04	7	4	4	<10	<1	0.084	<10	<10	8	6
Mid-stream	Wangcol Creek NC01	NC01	28/09/2022	2170	350	5	114	46	<0.04	2	8	4	10	<1	0.028	<10	<10	34	10
Mid-stream	Wangcol Creek NC01	NC01	26/10/2022	710	230	<1	227	198	<0.04	1	5	5	0.4	<1	0.062	<10	<10	10	9
Mid-stream	Wangcol Creek NC01	NC01	17/11/2022	480	170	<1	399	361	<0.04	1	5	5	0.8	<1	0.069	<10	<10	16	12
Mid-stream	Wangcol Creek NC01	NC01	13/12/2022	540	80	<1	281	234	<0.04	4	4	2	0.4	<1	0.097	<10	<10	10	<5
Mid-stream	Wangcol Creek NC01	NC01	11/01/2023	690	120	<1	568	328	<0.04	3	3	3	<0.2	<1	0.091	<10	<10	<5	<5
Mid-stream	Wangcol Creek NC01	NC01	9/02/2023	1280	100	<1	1160	420	<0.04	3	3	3	0.2	<1	0.075	<10	<10	12	<5
Mid-stream	Wangcol Creek NC01	NC01	15/03/2023	630	80	<1	510	288	<0.04	3	3	3	0.2	<1	0.098	<10	<10	6	<5
Mid-stream	Wangcol Creek NC01	NC01	4/04/2023	850	120	<1	363	282	0.26	2	2	2	0.3	<1	0.064	<10	<10	8	<5
Mid-stream	Wangcol Creek NC01	NC01	10/05/2023	490	120	<1	119	68	<0.04	<1	2	2	0.5	<1	0.046	<10	<10	<5	<5
Mid-stream	Wangcol Creek NC01	NC01	15/06/2023	560	80	<1	137	139	<0.04	<1	2	1	<0.2	<1	0.083	<10	<10	<5	<5
			Min.	480	80	<1	114	46	<0.04	<1	2	1	<0.2	<1	0.028	<10	<10	<5	<5
			Max.	2170	350	5	1160	420	0.26	7	8	5	10	<1	0.098	<10	<10	34	12
			Average	801	144	0.88	370	241	0.04	2.4	3.8	3.2	1.9	0.5	0.073	5	5	10	4.8
Downstream	Wangcol Ck Surface Water_G	G	27/07/2022	331	106	<1	142	129	<0.04	<1	20	19	<10	<1	0.098	<10	<10	9	<5
Downstream	Wangcol Ck Surface Water_G	G	25/08/2022	320	120	<1	105	93	<0.04	1	18	17	<10	<1	0.094	<10	<10	<5	<5
Downstream	Wangcol Ck Surface Water_G	G	28/09/2022	2320	310	4	252	41	<0.04	<1	11	3	<10	<1	0.042	<10	<10	24	8
Downstream	Wangcol Ck Surface Water_G	G	26/10/2022	510	180	<1	97	61	<0.04	<1	12	12	<0.2	<1	0.068	<10	<10	6	<5
Downstream	Wangcol Ck Surface Water_G	G	16/11/2022	660	280	<1	100	74	<0.04	<1	12	11	0.3	<1	0.067	<10	<10	8	<5
Downstream	Wangcol Ck Surface Water_G	G	13/12/2022	270	80	<1	447	350	<0.04	1	41	36	<0.2	<1	0.151	<10	<10	7	6
Downstream	Wangcol Ck Surface Water_G	G	11/01/2023	200	50	<1	509	510	<0.04	<1	59	63	<0.2	<1	0.194	<10	<10	<5	<5
Downstream	Wangcol Ck Surface Water_G	G	9/02/2023	200	<50	<1	847	732	<0.04	<1	72	66	<0.2	<1	0.228	<10	<10	9	6
Downstream	Wangcol Ck Surface Water_G	G	15/03/2023	210	<50	<1	1770	1650	<0.04	<1	117	123	<0.2	<1	0.353	<10	<10	5	<5
Downstream	Wangcol Ck Surface Water_G	G	4/04/2023	260	100	<1	405	374	<0.04	<1	42	42	<0.2	<1	0.15	<10	<10	<5	<5
Downstream	Wangcol Ck Surface Water_G	G	10/05/2023	190	70	<1	381	421	<0.04	<1	50	54	<0.2	<1	0.163	<10	<10	<5	8
Downstream	Wangcol Ck Surface Water_G	G	15/06/2023	50	<50	<1	305	317	<0.04	<1	134	148	<0.2	<1	0.383	<10	<10	<5	<5
			Min.	50	<50	<1	97	41	<0.04	<1	11	3	<0.2	<1	0.042	<10	<10	<5	<5
			Max.	2320	310	4	1770	1650	<0.04	1	134	148	<10	<1	0.383	<10	<10	24	8
			Average	460	114	0.79	447	396	0.02	0.58	49	50	1.3	0.5	0.17	5	5	6.7	4
Downstream	Wangcol Ck_F/Stream Gauge	WX22	27/07/2022	338	118	1	150	138	<0.04	<1	22	20	<10	<1	0.102	<10	<10	9	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	25/08/2022	360	140	<1	109	96	<0.04	1	19	18	<10	<1	0.096	<10	<10	8	5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	28/09/2022	2230	210	5	240	123	0.04	<1	12	6	<10	<1	0.043	<10	<10	30	7
Downstream	Wangcol Ck_F/Stream Gauge	WX22	26/10/2022	550	190	<1	134	62	<0.04	<1	13	12	<0.2	<1	0.067	<10	<10	<5	6
Downstream	Wangcol Ck_F/Stream Gauge	WX22	16/11/2022	660	270	<1	97	72	0.05	<1	12	11	0.3	<1	0.066	<10	<10	7	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	13/12/2022	280	90	<1	473	371	<0.04	3	40	38	<0.2	<1	0.156	<10	<10	9	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	11/01/2023	220	60	<1	530	500	<0.04	<1	61	58	<0.2	<1	0.2	<10	<10	<5	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	9/02/2023	210	<50	<1	888	751	<0.04	<1	72	66	<0.2	<1	0.23	<10	<10	<5	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/03/2023	700	<50	<1	2150	1650	<0.04	1	119	124	<0.2	<1	0.364	<10	<10	22	10
Downstream	Wangcol Ck_F/Stream Gauge	WX22	4/04/2023	270	100	<1	401	403	<0.04	<1	44	43	<0.2	<1	0.149	<10	<10	<5	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	10/05/2023	210	60	<1	403	420	<0.04	<1	50	53	<0.2	<1	0.163	<10	<10	<5	<5
Downstream	Wangcol Ck_F/Stream Gauge	WX22	15/06/2023	80	<50	<1	334	322	<0.04	<1	136	144	<0.2	<1	0.395	<10	<10	6	<5
			Min.	80	<50	<1	97	62	<0.04	<1	12	6	<0.2	<1	0.043	<10	<10	<5	<5
			Max.	2230	270	5	2150	1650	0.05	3	136	144	<10	<1	0.395	<10	<10	30	10
			Average	509	109	0.92	492	409	0.024	0.79	50	49	1.3	0.5	0.17	5	5	8.6	4

Purpose	LocCode	Sampled_Date-Time	Field Parameters				Major Anions and Cations											
			Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Redox (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Calcium (Filtered)	Carbonate Alkalinity (as CaCO3)	Chloride	Fluoride	Magnesium	Phenolphthalein Alkalinity	Potassium	Sodium	Sulfate (as SO4)
			mg/L	uS/cm	pH units	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Surface Water				2200	6.5-8							350	1.5					1000
EPL Discharge Limits for LDP12				500	6.5-8.5													
Upstream	LDP12	1/07/2022	8.6	216	7.7	180.9	-	53.73	7.03	-	53.73	19.2	<0.05	2.6	0	4.5	36.3	37.9
Upstream	LDP12	10/08/2022	8.5	208	7.48	153.6	-	43.78	3.31	-	43.78	16.99	0.112	1.22	0	3.41	39	36.15
Upstream	LDP12	19/08/2022	8.1	127	7.26	187.6	<1	37	3.96	-	-	17.3	0.06	1.51	-	3.43	40.8	43.2
Upstream	LDP12	30/08/2022	7.7	266	7.75	145.3	-	47.76	4.88	-	47.76	25.1	<0.05	1.9	0	4.19	45.2	48.3
Upstream	LDP12	20/09/2022	6.7	177.8	7.43	485	-	35.82	2.18	-	35.82	23.74	0.097	0.941	0	2.96	32	15.17
Upstream	LDP12	26/09/2022	8.4	207	7.49	181.6	-	36.82	2.69	-	36.82	25.72	0.083	1.22	0	3.63	34.4	31.18
Upstream	LDP12	5/10/2022	6.8	190.2	7.6	198.5	-	37.81	2.87	-	37.81	20.77	0.116	1.26	0	3.36	34.3	19.01
Upstream	LDP12	15/11/2022	6.2	148.2	7.49	43.5	-	33.17	1.07	-	33.17	21.3	0.056	0.551	0	2.89	28.1	17.4
Upstream	LDP12	4/04/2023	6.7	352	7.53	120.4	-	32.71	8.54	-	32.71	35.9	0.06	3.09	0	5.4	40.2	67.8
Upstream	LDP12	18/04/2023	7.3	361	7.7	106.3	-	35	9.76	-	35	38	0.059	3.82	0	6.98	47.8	74.9
Upstream	LDP12	4/05/2023	7.9	242	7.34	190.6	-	31	4.66	-	31	23.4	0.14	1.97	0	4.46	37	47.4
Upstream	LDP12	27/06/2023	8.9	307	7.55	103.6	-	48.5	5.14	-	48.5	30.7	0.082	1.96	0	4.75	47.6	57.8
		Min.	6.2	127.0	7.3	43.5	<1	31.0	1.1	-	31.0	17.0	<0.05	0.6	0.0	2.9	28.1	15.2
		Max.	8.9	361.0	7.8	485.0	<1	53.7	9.8	-	53.7	38.0	0.1	3.8	0.0	7.0	47.8	74.9
		Average	7.7	234.0	7.5	175.0		39.0	4.7		40.0	25.0	0.1	1.8	0.0	4.2	39.0	41.0

Purpose	LocCode	Sampled_Date-Time	NA		Nutrients											
			Dissolved Organic Carbon (mg/L) (Filtered)	Oil & Grease	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Total Phosphate (PO4)	Total Phosphate (PO4) (Filtered)	Phosphorus	Phosphorus (Filtered)
			mg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Surface Water															
EPL Discharge Limits for LDP12															
Upstream	LDP12	1/07/2022	-	<5	210	12	400	30	0.43	0.3	0.7	<0.1	<0.1	0.02	<0.01
Upstream	LDP12	10/08/2022	-	<5	160	12	320	<10	0.32	0.3	0.6	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	19/08/2022	-	<5	370	14	330	<10	0.33	0.4	0.7	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	30/08/2022	-	<5	150	16	380	<10	0.38	0.3	0.7	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	20/09/2022	-	<5	150	8	220	<10	0.22	0.7	0.9	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	26/09/2022	-	<5	190	10	220	<10	0.22	0.4	0.6	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	5/10/2022	-	<5	170	10	220	10	0.23	0.4	0.6	<0.1	<0.1	0.01	<0.01
Upstream	LDP12	15/11/2022	-	<5	110	5	130	<10	0.13	0.2	0.3	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	4/04/2023	-	<5	1700	21	360	<10	0.36	2.5	2.9	<0.1	<0.1	0.02	0.02
Upstream	LDP12	18/04/2023	-	<5	1190	22	350	<10	0.35	1.3	1.6	<0.1	<0.1	0.02	0.03
Upstream	LDP12	4/05/2023	-	<5	400	15	310	20	0.33	0.5	0.8	<0.1	<0.1	<0.01	<0.01
Upstream	LDP12	27/06/2023	-	<5	110	18	590	<10	0.59	0.3	0.9	<0.1	<0.1	<0.01	<0.01
		Min.	-	<5	110	5	130	<10	0.1	0.2	0.3	<0.1	<0.1	<0.01	<0.01
		Max.	-	<5	1700	22	590	30	0.6	2.5	2.9	<0.1	<0.1	0.0	0.0
		Average		2.5	409	14	319	9	0.3	0.6	0.9	0.1	0.1	0.0	0.0

([Sampled_Date-Time] Between #1 Jul 2022 09:25:00# AND #29 Jun 2023 08:20:00# AND

Matrix_Type In('Surf.Water' , 'WATER') AND

Field_ID In('Coal Settling Pond' , 'Coal Settling Pond_LDP12 (when flow)'))

Purpose	LocCode	Sampled_Date-Time	Physical Parameters: Total Dissolved Solids (TDS) (Filtered)	Total Suspended Solids (TSS)	Turbidity	Metals: Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Arsenic III	Arsenic V	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)
			mg/L	mg/L	NTU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface V			1500						24	24	24	13	700	100	370	370	0.85	2	1	3.3
EPL Discharge Limits for LDP12				50	25															
Upstream	LDP12	1/07/2022	124	11.67	6.88	1000	<10	<1	<1	<1	<1	<1	7	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	10/08/2022	186	5.667	9.6	220	<10	<1	<1	<1	<1	<1	5	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	19/08/2022	127	5	11	360	<10	<1	<1	<1	<1	<1	6	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	30/08/2022	130	8.333	12.8	120	<10	<1	<1	<1	<1	<1	6	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	20/09/2022	190	5.667	10.2	90	<10	<1	<1	<1	<1	<1	4	<1	80	<50	<0.1	<1	<10	<10
Upstream	LDP12	26/09/2022	264	7.667	10.21	540	<10	<1	<1	<1	<1	<1	4	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	5/10/2022	110	8.2	7.4	1120	10	<1	<1	<1	<1	<1	4	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	15/11/2022	122	9.2	10.4	1730	30	<1	<1	<1	<1	<1	4	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	4/04/2023	196	11.2	5.73	2020	160	<1	<1	<1	<1	<1	10	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	18/04/2023	340	3.4	3.49	480	20	1	<1	<1	<1	<1	11	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	4/05/2023	168	10	12.8	280	<10	<1	<1	<1	<1	<1	5	<1	<50	<50	<0.1	<1	<10	<10
Upstream	LDP12	27/06/2023	132	-	10.2	2980	20	<1	<1	<1	<1	<1	6	<1	80	100	<0.1	<1	<10	<10
		Min.	110	3	3	90	<10	<1	<1	<1	<1	<1	4	<1	<50	<50	<0.1	<1	<10	<10
		Max.	340	12	13	2980	160	1	<1	<1	<1	<1	11	<1	80	100	<0.1	<1	<10	<10
		Average	174	8	9	912	23	1	1	1	1	1	6	1	34	31	0.1	1	5	5

Purpose	LocCode	Sampled_Date-Time	Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface V				3.5	3.5	300	300	5	1900	1900	0.06	10	17	17	5	0.05				116	116
EPL Discharge Limits for LDP12																					
Upstream	LDP12	1/07/2022	<1	1	<1	<50	<50	<1	47	47	<0.04	2	2	1	<10	<1	0.024	<10	<10	39	12
Upstream	LDP12	10/08/2022	<1	<1	<1	<50	<50	<1	36	33	<0.04	3	1	<1	<10	<1	0.008	<10	<10	<5	<5
Upstream	LDP12	19/08/2022	<1	<1	<1	60	<50	<1	36	37	<0.04	2	<1	<1	<10	<1	0.011	<10	<10	<5	<5
Upstream	LDP12	30/08/2022	<1	<1	<1	70	<50	<1	41	37	<0.04	3	<1	<1	<10	<1	0.016	<10	<10	<5	<5
Upstream	LDP12	20/09/2022	<1	<1	<1	<50	<50	<1	26	23	<0.04	2	<1	1	<10	<1	0.006	<10	<10	<5	<5
Upstream	LDP12	26/09/2022	<1	<1	<1	<50	<50	<1	27	24	<0.04	2	<1	<1	<10	<1	0.007	<10	<10	<5	<5
Upstream	LDP12	5/10/2022	<1	<1	<1	<50	<50	<1	39	36	<0.04	1	1	1	<10	<1	0.007	<10	<10	<5	<5
Upstream	LDP12	15/11/2022	<1	<1	<1	50	<50	<1	13	11	<0.04	3	<1	<1	<10	<1	0.004	<10	<10	<5	<5
Upstream	LDP12	4/04/2023	<1	<1	<1	<50	<50	<1	52	59	<0.04	2	2	2	<10	<1	0.02	<10	<10	<5	<5
Upstream	LDP12	18/04/2023	<1	<1	<1	<50	<50	<1	124	127	<0.04	6	3	3	<10	<1	0.026	<10	<10	<5	<5
Upstream	LDP12	4/05/2023	<1	<1	<1	50	<50	<1	49	47	<0.04	4	2	2	<10	<1	0.012	<10	<10	<5	<5
Upstream	LDP12	27/06/2023	<1	<1	<1	<50	<50	<1	73	62	<0.04	8	2	2	<10	<1	0.015	<10	<10	<5	<5
		Min.	<1	<1	<1	<50	<50	<1	13	11	<0.04	1	<1	<1	<10	<1	0.00	<10	<10	<5	<5
		Max.	<1	1	<1	70	<50	<1	124	127	<0.04	8	3	3	<10	<1	0.03	<10	<10	39	12
		Average	1	1	1	36	25	1	47	45	0.02	3	1	1	5	1	0.01	5	5	6	3

([Sampled_Date-Time] Between #1 Jul 2022 09:25:00# AND #29 Jun 2023 08:20:00# AND

Matrix_Type In('Surf.Water' , 'WATER') AND

Field_ID In('Coal Settling Pond' , 'Coal Settling Pond_LDP12 (when flow)'))

APPENDIX H TABULATED GROUNDWATER DATA

Purpose	LocCode	Sampled_Date	Standing Water Level (Field)	Dissolved Oxygen (Field) (Filtered)	Electrical Conductivity (Field)	pH (Field)	Purge Volume	Redox (Field)	Carbonate (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Calcium	Carbonate Alkalinity (as CaCO3)	Chloride	Hydroxide Alkalinity (as CaCO3)	Fluoride	Magnesium	Phenolphthalein Alkalinity	Potassium	Sodium	Sulfate (as SO4)	Silica, Molybdate Reactive (Dissolved)	Ammonia	Sulfur	Nitrate	Nitrite (as NO2-)	Nitrite + Nitrate (as N)	Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS) (Filtered)
			Standing Water Level	Field Parameters					Major Anions and Cations												Minor Anions	Nutrients					Physical Parameters	
			m AHD	mg/L	uS/cm	pH units	L	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Groundwater					2600	6.5-8							350		1.5					1000							2000	2000
Within MPAR / Mine Disturbance Area East of MPAR	D10	13/09/2022	912.996	1.7	4700	6.0	181	47.5	<1	156	160	156	306	-	<0.5	139	<1	87.4	734	2080	-	320	680	10	<10	0.01	-	3690
Within MPAR / Mine Disturbance Area East of MPAR	D10	23/11/2022	914.196	0.7	3500	5.9	200	73.8	<1	154	129	154	204	-	<0.5	103	<1	62.5	516	1470	-	250	483	<10	<10	<0.01	-	2560
Within MPAR / Mine Disturbance Area East of MPAR	D10	1/03/2023	912.096	1	7120	5.9	168	70.2	<1	134	220	134	516	-	0.363	228	<1	125.0	1120	3410	-	360	1130	<10	<10	<0.01	-	5950
Within MPAR / Mine Disturbance Area East of MPAR	D10	21/06/2023	911.896	0.8	8210	6.1	165	51.6	<1	199	243	199	555	-	<1	252	<1	178.0	1320	3450	-	370	1220	<10	<10	<0.01	-	6710
		Min.	911.9	0.7	3500	5.9	165	47.5	<1	134	129	134	204	-	0	103	<1	62.5	516	1470	-	250	483	<10	<10	<0.01	-	2560
		Max.	914.2	1.7	8210	6.1	200	73.8	<1	199	243	199	555	-	<1	252	<1	178.0	1320	3450	-	370	1220	10	<10	0	-	6710
		Average	-	1.1	5883	5.9	179	61.0	0.5	161	188	161	395	-	0	181	1	113.0	923	2603	-	325	878	6	5	0	-	4728
Within MPAR / Mine Disturbance Area East of MPAR	D11	13/09/2022	907.283	1	6530	6.5	54	-81.9	<1	398	350	398	694	-	<1	253	<1	78.5	866	2500	-	390	824	<100	<100	<0.1	-	5120
Within MPAR / Mine Disturbance Area East of MPAR	D11	24/11/2022	908.383	1.1	10,460	6.3	70	-47	<1	196	521	196	1040	-	<1	448	<1	108.0	1770	4930	-	1050	1610	<100	<100	<0.1	-	9030
Within MPAR / Mine Disturbance Area East of MPAR	D11	1/03/2023	909.083	1.2	8550	6.5	81	-74.2	<1	398	368	398	864	-	0.165	315	<1	100.0	1270	3650	-	1100	1240	<10	<10	<0.01	-	6520
		Min.	907.3	1.0	6530	6.3	54	-81.9	<1	196	350	196	694	-	0	253	<1	78.5	866	2500	-	390	824	<10	<10	<0.01	-	5120
		Max.	909.1	1.2	10460	6.5	81	0.0	<1	398	521	398	1040	-	<1	448	<1	108.0	1770	4930	-	1100	1610	<100	<100	<0.1	-	9030
		Average	-	1.1	8513	6.4	68	-68.0	0.5	331	413	331	866	-	0	339	1	96.0	1302	3693	-	847	1225	35	35	0	-	6890
Within MPAR / Mine Disturbance Area East of MPAR	D113	27/07/2022	-	1	3780	6.1	58	46.9	<1	172	130	172	228	<1	<0.5	112	<1	60.8	534	1660	8710	240	495	<10	<10	<0.01	2830	2830
Within MPAR / Mine Disturbance Area East of MPAR	D113	25/10/2022	909.629	1	3690	6.0	61	56.2	<1	168	128	168	182	-	<0.5	113	<1	63.6	535	1380	-	240	495	<10	<10	<0.01	-	2700
Within MPAR / Mine Disturbance Area East of MPAR	D113	12/01/2023	908.929	0.7	3600	6.1	57	30	<1	183	148	183	226	-	<0.5	124	<1	65.7	506	1690	-	250	524	30	<10	0.03	-	2770
Within MPAR / Mine Disturbance Area East of MPAR	D113	10/05/2023	908.529	1	4570	6.0	55	46.5	<1	158	180	158	289	-	<0.5	147	<1	71.2	668	2040	-	300	657	<10	<10	<0.01	-	3840
		Min.	908.5	0.7	3600	6.0	55	30.0	<1	158	128	158	182	-	<0.5	112	<1	60.8	506	1380	8710	240	495	<10	<10	<0.01	2830	2700
		Max.	909.6	1.0	4570	6.1	61	56.2	<1	183	180	183	289	-	<0.5	147	<1	71.2	668	2040	8710	300	657	30	<10	0	2830	3840
		Average	-	0.9	3910	6.0	58	45.0	0.5	170	147	170	231	-	0	124	1	65.0	561	1693		258	543	11	5	0		3035
Within MPAR / Mine Disturbance Area East of MPAR	D19	13/09/2022	909.071	3.3	2350	5.9	21	82.3	<1	99	87.9	99	117	-	<0.25	72.1	<1	43.2	306	996	-	140	313	80	10	0.09	-	1730
Within MPAR / Mine Disturbance Area East of MPAR	D19	23/11/2022	909.571	3.8	2070	6.0	25	126.8	<1	101	85.1	101	91	-	<0.5	66	<1	35.7	266	863	-	120	275	50	<10	0.05	-	1460
Within MPAR / Mine Disturbance Area East of MPAR	D19	2/03/2023	908.371	1.7	4100	6.1	17	73.2	<1	172	162	172	250	-	0.21	143	<1	63.6	571	1880	-	260	602	<10	<10	<0.01	-	3280
Within MPAR / Mine Disturbance Area East of MPAR	D19	22/06/2023	908.271	0.5	4490	6.0	17	39	<1	166	172	166	271	-	<0.5	148	<1	68.0	605	1960	-	360	654	<10	<10	<0.01	-	3330
		Min.	908.3	0.5	2070	5.9	17	39.0	<1	99	85	99	91	-	0	66	<1	35.7	266	863	-	120	275	<10	<10	<0.01	-	1460
		Max.	909.6	3.8	4490	6.1	25	126.8	<1	172	172	172	271	-	<0.5	148	<1	68.0	605	1960	-	360	654	80	10	0	-	3330
		Average	-	2.3	3253	6.0	20	80.0	0.5	135	127	135	182	-	0	107	1	53.0	437	1425	-	220	461	35	6	0	-	2450
Within Mine Disturbance Area S & SE of MPAR	D15	13/09/2022	914.506	2.6	2170	5.3	25	131.6	<1	29	108	29	97.8	-	<0.2	48.6	<1	29.7	271	994	-	470	313	<10	<10	<0.01	-	1660
Within Mine Disturbance Area S & SE of MPAR	D15	23/11/2022	916.006	2.6	2110	5.4	34	144.8	<1	31	112	31	89.5	-	<0.5	49.4	<1	27.6	279	948	-	380	314	<10	<10	<0.01	-	1510
Within Mine Disturbance Area S & SE of MPAR	D15	2/03/2023	914.706	3.1	1900	5.7	26	142.8	<1	59	92.4	59	75.1	-	<0.2	40.2	<1	23.6	243	805	-	360	263	<10	<10	<0.01	-	1360
Within Mine Disturbance Area S & SE of MPAR	D15	22/06/2023	914.106	12.5	1890	5.5	23	129.9	<1	48	84.2	48	80.4	-	<0.5	37.1	<1	23.9	234	744	-	430	261	<10	<10	<0.01	-	1270
		Min.	914.1	2.6	1890	5.3	23	129.9	<1	29	84	29	75.1	-	<0.2	37	<1	23.6	234	744	-	360	261	<10	<10	<0.01	-	1270
		Max.	916.0	12.5	2170	5.7	34	144.8	<1	59	112	59	97.8	-	<0.5	49	<1	29.7	279	994	-	470	314	<10	<10	<0.01	-	1660
		Average	-	5.2	2018	5.4	27	137.0	0.5	42	99	42	86.0	-	0	44	1	26.0	257	873	-	410	288	5	5	0	-	1450
Within Mine Disturbance Area S & SE of MPAR	D16A	21/12/2022	910.860	1.5	1100	6.7	140	14.1	<1	326	119	326	22.1	-	0.357	42.3	<1	20.5	28.4	224	-	270	74	<10	<10	<0.01	-	762
Within Mine Disturbance Area S & SE of MPAR	D16A	1/03/2023	910.160	1.1	1050	6.8	136	-31.2	<1	363	117	363	20.0	-	0.37	40.8	<1	20.8	29.2	213	-	300	65	<10	<10	<0.01	-	514
Within Mine Disturbance Area S & SE of MPAR	D16A	22/06/2023	909.460	2.3	950	6.8	132	9.7	<1	294	108	294	17.3	-	0.22	37	<1	19.5	29.1	174	-	230	62	80	<10	0.08	-	574
		Min.	909.5	1.1	950	6.7	132	-31.2	<1	294	108	294	17.3	-	0	37	<1	19.5	28	174	-	230	62	<10	<10	<0.01	-	514
		Max.	910.9	2.3	1100	6.8	140	14.1	<1	363	119	363	22.1	-	0	42	<1	20.8	29	224	-	300	74	80	<10	0	-	762
		Average	-	1.6	1033	6.8	136	-2.5	0.5	328	115	328	20.0	-	0	40	1	20.0	29	204	-	267	67	30	5	0	-	617
Within Mine Disturbance Area S & SE of MPAR	D17	13/09/2022	909.950	2.6	2790	6.1	41	16	<1	132	200	132	149	-	<0.5	116	<1	21.8	245	1290	-	330	394	<10	<10	<0.01	-	2220
Within Mine Disturbance Area S & SE of MPAR	D17	23/11/2022	910.650	1.2	2780	6.1	46	12.8	<1	116	215	116	143	-	<0.5	123	<1	21.1	265	1270	-	120	417	<10	<10	<0.01	-	2100
Within Mine Disturbance Area S & SE of MPAR	D17	1/03/2023	909.050	0.6	2570	6.1	36	11.4	<1	137	183	137	131	-	0.076	105	<1	18.9	236	1200	-	190	382	<10	<10	<0.01	-	1980
Within Mine Disturbance Area S & SE of MPAR	D17	22/06/2023	908.950	0.7	2520	6.2	35	4.1	<1	137	178	137	125	-	<0.5	100	<1	19.0	212	1150	-	310	357	20	<10	0.02	-	1840
		Min.	909.0	0.6	2520	6.1	35	4.1	<1	116	178	116	125	-	0	100	<1	18.9	212	1150	-	120	357	<10	<10	<0.01	-	1840
		Max.	910.7	2.6	2790	6.2	46	16.0	<1	137	215	137	149	-	<0.5	123	<1	21.8	265	1290	-	330	417	20	<10	0	-	2220
		Average	-	1.3	2665	6.1	40	11.0	0.5	131	194	131	137	-	0	111	1	20.0	240	1228	-	238	388	9	5	0	-	2035
Within Mine Disturbance Area S & SE of MPAR	D18	14/09/2022	910.368	2.9	680	6.8	15	132.7	<1	341	78.8	341	8.7	-	0.506	28.2	<1	18.7	17.4	12.6	-	120	4	90	10	0.1	-	420
Within Mine Disturbance Area S & SE of MPAR	D18	24/11/2022	910.368	3.8	670	6.7	15	191.6	<1	358	84.4	358	7.8	-	0.53	30	<1	17.8	16.8	9.29	-	160	4	50	<10	0.05	-	422
Within Mine Disturbance Area S & SE of MPAR	D18	2/03/2023	910.268	2	680	6.7	15	27.1	<1	358	78	358	8.1	-	0.498	28.2	<1	17.4	16.8	10.9	-	230	4	<10	20	0.02	-	396
Within Mine Disturbance Area S & SE of MPAR	D18	22/06/2023	910.168	1.4	670	6.8	23	69.6	<1	337	76	337	8.7	-	0.468	27	<1	17.0	16.2	10.6	-	180	4	50	<10	0.05	-	343
		Min.	910.2	1.4	670	6.7	15	27.1	<1	337	76	337	7.8	-	0	27	<1	17.0	16	9	-	120	4	<10	<10	0	-	343
		Max.	910.4	3.8	680	6.8	23	191.6	<1	358	84	358	8.7	-	1	30	<1	18.7	17	13	-	230	4	90	20	0	-	422
		Average	-	2.5	675	6.7	17	105.0	0.5	349	79	349	8.3	-	1	28	1	18.0	17	11	-	173	4	49	10	0	-	395
Background and Adjacent to MPAR	D106	27/07/2022	-	2.3	12,380	6.0	-	55.3	<1	188	554	188	1,490	<1	<1	633	<1	88.2	2030	6460	9530	400	2020	<10	<10	<0.01	11,100	11,100
Background and Adjacent to MPAR	D106	25/10/2022	911.497	2.4	13,420	5.9	-	65.2	<1	179	573	179	1,240	-	<2	681	<1	122.0	2080	6050	-	340	2150	<100	<100	<0.1	-	12,100
Background and Adjacent to MPAR	D106	11/01/2023	911.497	1.7	13,100	6.1	-	1.2	<1	216	568	216	1,680	-	<2	690	<1	119.0	2090	7480	-	360	2290	<10	<10	<0.01	-	12,600
Background and Adjacent to MPAR	D106	10/05/2023	910.897	1.1	12,670	6.0	25	37.9	<1	186	497	186	1,410	-	<2	616	<1	93.2	2130	6200	-	360	1980	<10	<10	<0.01	-	11,400
		Min.	910.9	1.1	12380	5.9	25	1.2	<1	179	497	179	1,240	-	<1	616	<1	88.2	2030	6050	9530	340	1980	<10	<10	<0.01	11100	11100
		Max.	911.5	2.4	13420	6.1	25	65.2	<1	216	573	216	1,680	-	<2	690	<1	122.0	2130	7480	9530	400	2290	<100	<100	<0.1	11100	12600
		Average	-	1.9	12893	6.0		40.0	0.5	192	548	192	1,455	-	1	655	1	106.0	2083	6548		365	2110	16	16	0		11800
Background and Adjacent to MPAR	D107	27/07/2022	-	1.4	15,560	6.0	-	61.2	<1	228	446	228	1,640	<1	<1	684	<1	318.0	2970	7920	8120	450	2650	<10	<10	<0.01	13,600	13,600
Background and Adjacent to MPAR	D107	25/10/2022	912.282	2.8	15,560	6.1	-	66.1	<1	223	433	223	1,170	-	<2	650	<1	344.0	2690	5990	-	400	2470	<100	<100	<0.1	-	13,600
Background and Adjacent to MPAR	D107	11/01/2023	911.382	1	12,720	6.1	-	7.5	<1	268	382	268	1,730	-	<2	544	<1	269.0	2110	8540	-	390	2130	<10	<10	<0.01	-	11,200
Background and Adjacent to MPAR	D107	10/05/2023	912.582	1.3	12,680	6.1	58	14.3	<1	238	373	238	1,170	-	<2	497	<1	273.0	2320	6210	-	420	1950	<10	<10	<0.01	-	10,900
		Min.	911.4	1.0	12680	6.0	58	7.5	<1	223	373	223	1,170	-	<1	497	<1	269.0	2110	5990	8120	390	1950	<10	<10	<0.01	13600	10900
		Max.	912.6	2.8	15560	6.1	58	66.1	<1	268	446	268	1,730	-	<2	684	<1	344.0	2970	8540	8120	450	2650	<100	<100	<0.1	13600	13600
		Average	-	1.6	14130	6.1		37.0	0.5	239	409	239	1,428	-	1	594	1	301.0	2523	7165		415	2300	16	16	0		12325
Background and Adjacent to MPAR	D3	13/09/2022	915.062	2.5	269	5.5	264	188.4	<1	29	12.4	29	31.5	-	<0.05	9.98	<1	2.5	24.4	51.9	-	<10	16	20	<10	0.02	-	184
Background and Adjacent to MPAR	D3	24/11/2022	915.462	1.3	730	5.8	274	57	<1	78	56.5	78	43.3	-	<0.1	33.5	<1	6.3	39.8	219	-	60	77	<10	<10	<0.01	-	444
Background and Adjacent to MPAR	D3	1/03/2023	913.962	1.8	1010	6.2	239	26.9	<1	168	70.5	168	89.2	-	0.076	45	<1	7.8	56.9	227	-	80	71	30	<10	0.03	-	618
Background and Adjacent to MPAR	D3	22/06/2023	913.362	0.7	870	6.1	245	22.6	<1	129	70.2	129	40.2	-	<0.1	38.6	<1	8.8	39.1	250	-	120	80	20	<10	0.02	-	530
		Min.	913.4	0.7	269	5.5	239	22.6	<1	29	12	29	31.5	-	<0.05	10	<1	2.5	24	52	-	<10	16	<10	<10	<0.01	-	184
		Max.	915.5	2.5	1010	6.2	274	188.4	<1	168	71	168	89.2	-	<0.1	45	<1	8.8	57	250	-	120	80	30	<10	0	-	618
		Average	-	1.6	720	5.8	256	74.0	0.5	101	52	101	51.0	-	0	32	1	6.3	40	187	-	66	61	19	5	0	-	444
Background and Adjacent to MPAR	D4	20/07/2022	-	0.9	740	3.5	133	307.1	<1	<1	13.8	<1	18.0	<1	<0.1	8.2	<1	9.3	22.2	310	105,000	210	88	10	<10	0.01	581	581
Background and Adjacent to MPAR	D4	19/10/2022	918.701	1.1	720	3.4	135	301.3	<1	<1	13.2	<1	16.9	-	<0.1	6.34	<1	8.2	<0.01	300	-	170	91	<10	<10	<0.01	-	494
Background and Adjacent to MPAR	D4	10/01/2023	918.501	0.8	710	3.5	131	287.8	<1	<1	14.9	<1	17.2	-	<0.1	8.07	<1	8.5	23.6	295	-	420	95	<10	<10	<0.01	-	628
Background and Adjacent to MPAR	D4	27/04/2023	918.401	2	720	3.4	129	278.3	<1	<1	14.3	<1	14.2	-	<0.1	7.88	<1	8.6	21.3	272	-	200	95	<10	<10	<0.01	-	590
		Min.	918.4	0.8	710	3.4	129	278.3	<1	<1	13	<1	14.2	-	<0.1	6	<1	8.2	<0.01	272	105000	170	88	<10	<10	<0.01	581	494
		Max.	918.7	2.0	740	3.5	135	307.1	<1	<1	15	<1	18.0	-	<0.1	8	<1	9.3	24	310	105000	420	95	10	<10	0	581	628
		Average	-	1.2	723	3.4	132	294.0	0.5	1	14	1	17.0	-	0	8	1	8.6	17	294		250	92	6	5	0		573
Background and Adjacent to MPAR	D5	21/07/2022		1	1180	5.9	306	1.7	<1	79	92	79	25.9	<1	<0.2	66.9	<1	11.7	34.8	521	8400	140	174	<10	<10	<0.01	906	906
Background and Adjacent to MPAR	D5	19/10/2022	918.078	1	1210	5.8	325	19.1	<1	72	96.4	72	27.0	-	<0.2	64.9	<1	10.1	8.79	552	-	160	168	<10	<10	<0.01	-	833
Background and Adjacent to MPAR	D5	10/01/2023	917.478	0.7	1170	5.9	311	20.9	<1	102	104	102	26.7	-	<0.2	69.4	<1	11.1	37.1	516	-	460	175	<10	<10	<0.01	-	946
Background and Adjacent to MPAR	D5	27/04/2023	916.178	2.1	1220	6.0	281	8.2	<1	80	101	80	26.5	-	<0.2	66.9	<1	10.7	32.7	535	-	420	173	<100	<100	<0.1	-	908
		Min.	916.2	0.7	1170	5.8	281	1.7	<1	72	92	72	25.9	-	<0.2	65	<1	10.1	9	516	8400	140	168	<10	<10	<0.01	906	833
		Max.	918.1	2.1	1220	6.0	325	20.9	<1	102	104	102	27.0	-	<0.2	69	<1	11.7	37	552	8400	460	175	<100	<100	<0.1	906	946
		Average	-	1.2	1195	5.9	306	12.0	0.5	83	98	83	27.0	-	0	67	1	11.0	28	531		295	173	16	16	0		898
Adjacent to MPAR and Downgradient	D1	13/09/2022	911.831	1.1	11,130	5.9	148	43.5	<1	174	534	174	1,190	-	<1.5	560	<1	110.0	1650	5620	-	250	1800	<100	<100	<0.1	-	10,300
Adjacent to MPAR and Downgradient	D1	24/11/2022	912.331	1	12,370	5.8	156	22.7	<1	154	593	154	1,320	-	<2	619	<1	124.0	2060	6330	-	480	2140	<100	<100	<0.1	-	11,000
Adjacent to MPAR and Downgradient	D1	1/03/2023	911.331	1	10,120	5.9	141	44.2	<1	161	411	161	1,030	-	<0.01	427	<1	105.0	1500	4850	-	420	1540	<100	<100	<0.1	-	8820
Adjacent to MPAR and Downgradient	D1	21/06/2023	910.831	0.9	9490	5.9	134	32.8	<1	175	417	175	845	-	<1	420	<1	129.0	1440	4600	-	870	1460	<10	<10	<0.01	-	8060
		Min.	910.8	0.9	9490	5.8	134	22.7	<1	154	411	154	845	-	<0.01	420	<1	105.0	1440	4600	-	250	1460	<10	<10	<0.01	-	8060
		Max.	912.3	1.1	12370	5.9	156	44.2	<1	175	593	175	1,320	-	<2	619	<1	129.0	2060	6330	-	870	2140	<100	<100	<0.1	-	11000
		Average	-	1.0	10778	5.9	145	36.0	0.5	166	489	166	1,096	-	1	507	1	117.0	1663	5350	-	505	1735	39	39	0	-	9545
Adjacent to MPAR and Downgradient	D102	28/07/2022	-	2.3	9010	6.0	16	30.8	<1	101	525	101	1,130	<1	<1	458	<1	67.6	1130	4000	7010	340	1300	<10	<10	<0.01	7640	7640
Adjacent to MPAR and Downgradient	D102	26/10/2022	909.322	2.6	8720	5.9	15	50.7	<1	89	526	89	879	-	<1	465	<1	66.6	1030	3280	-	340	1250	<100	<100	<0.1	-	7190
Adjacent to MPAR and Downgradient	D102	11/01/2023	908.822	1.9	8610	8.6	60	13.1	<1	104	522	104	1,520	-	<1	475	<1	71.1	1060	5220	-	300	1340	<10	<10	<0.01	-	8200
Adjacent to MPAR and Downgradient	D102	11/05/2023	908.422	2.2	8500	6.1	14	61.7	<1	70	512	70	1,070	-	<1	452	<1	64.9	1090	3860	-	340	1160	<100	<100	<0.1	-	7050
		Min.	908.4	1.9	8500	5.9	14	13.1	<1	70	512	70	879	-	<1	452	<1	64.9	1030	3280	7010	300	1160	<10	<10	<0.01	7640	7050
		Max.	909.3	2.6	9010	8.6	60	61.7	<1	104	526	104	1,520	-	<1	475	<1	71.1	1130	5220	7010	340	1340	<100	<100	<0.1	7640	8200
		Average	-	2.3	8710	6.1	26	39.0	0.5	91	521	91	1,150	-	1	463	1	68.0	1078	4090		330	1263	28	28	0		7520
Adjacent to MPAR and Downgradient	D103	27/07/2022	-	2	3680	6.2	41	32.7	<1	206	153	206	212	<1	<0.5	149	<1	26.6	480	1590	7270	190	499	<10	<10	<0.01	2780	2780
Adjacent to MPAR and Downgradient	D103	25/10/2022	906.464	1.8	3620	6.1	43	46.3	<1	206	152	206	172	-	<0.5	158	<1	29.9	488	1380	-	300	504	<10	<10	<0.01	-	2700
Adjacent to MPAR and Downgradient	D103	11/01/2023	905.964	1.4	3560	6.3	40	-16.1	<1	232	158	232	205	-	<0.5	154	<1	29.7	457	1570	-	240	557	40	<10	0.04	-	2790
Adjacent to MPAR and Downgradient	D103	10/05/2023	905.664	2	3360	6.3	38	42.5	<1	239	143	239	180	-	0.121	133	<1	24.6	438	1410	-	160	450	<10	<10	<0.01	-	2660
		Min.	905.7	1.4	3360	6.1	38	-16.1	<1	206	143	206	172	-	0	133	<1	24.6	438	1380	7270	160	450	<10	<10	<0.01	2780	2660
		Max.	906.5	2.0	3680	6.3	43	46.3	<1	239	158	239	212	-	<0.5	158	<1	29.9	488	1590	7270	300	557	40	<10	0	2780	2790
		Average	-	1.8	3555	6.2	41	26.0	0.5	221	152	221	192	-	0	149	1	28.0	466	1488		223	503	14	5	0		2733
Adjacent to MPAR and Downgradient	D104	28/07/2022	-	5.3	621	6.2	10	68.1	<1	69	48.2	69	34.4	<1	<0.1	23.2	<1	4.4	35.6	190	18,800	40	57	20	<10	0.02	416	416
Adjacent to MPAR and Downgradient	D104	26/10/2022	905.423	5.3	393	6.2	10	119.6	<1	159	51.4	159	5.8	-	0.083	10	<1	2.7	22	16.9	-	<10	7	<10	<10	<0.01	-	274
Adjacent to MPAR and Downgradient	D104	11/01/2023	904.823	1.4	750	6.5	8	-59.3	<1	140	68.3	140	31.3	-	<0.1	27.5	<1	5.0	49.8	184	-	200	60	<10	<10	<0.01	-	486
Adjacent to MPAR and Downgradient	D104	11/05/2023	904.523	1.9	1280	5.9	15	49	<1	65	104	65	76.2	-	<0.5	57.4	<1	7.6	80.5	486	-	100	160	20	<10	0.02	-	903
		Min.	904.5	1.4	393	5.9	8	-59.3	<1	65	48	65	5.8	-	0	10	<1	2.7	22	17	18800	<10	7	<10	<10	<0.01	416	274
		Max.	905.4	5.3	1280	6.5	15	119.6	<1	159	104	159	76.2	-	<0.5	57	<1	7.6	81	486	18800	200	160	20	<10	0	416	903
		Average	-	3.5	761	6.2	11	44.0	0.5	108	68	108	37.0	-	0	30	1	4.9	47	219		86	71	13	5	0		520
Adjacent to MPAR and Downgradient	D105	27/07/2022	-	1	3180	6.0	35	43.1	<1	130	163	130	230	<1	<0.5	158	<1	20.3	302	1400	7870	130	425	<10	<10	<0.01	2440	2440
Adjacent to MPAR and Downgradient	D105	25/10/2022	908.231	1	2790	5.9	37	50.7	<1	140	148	140	170	-	<0.5	152	<1	20.2	285	1100	-	310	385	<100	<100	<0.1	-	2350
Adjacent to MPAR and Downgradient	D105	11/01/2023	907.631	1	2960	6.1	37	16.5	<1	158	164	158	236	-	<0.5	158	<1	21.9	294	1400	-	260	422	<10	<10	<0.01	-	2540
Adjacent to MPAR and Downgradient	D105	10/05/2023	907.331	1.1	3070	6.0	32	28.6	<1	140	164	140	221	-	<0.2	151	<1	20	310	1340	-	280	423	<10	<10	<0.01	-	2440
		Min.	907.3	1.0	2790	5.9	32	16.5	<1	130	148	130	170	-	<0.2	151	<1	20.0	285	1100	7870	130	385	<10	<10	<0.01	2440	2350
		Max.	908.2	1.1	3180	6.1	37	50.7	<1	158	164	158	236	-	<0.5	158	<1	21.9	310	1400	7870	310	425	<100	<100	<0.1	2440	2540
		Average	-	1.0	3000	6.0	35	35.0	0.5	142	160	142	214	-	0	155	1	21.0	298	1310		245	414	16	16	0		2443
Adjacent to MPAR and Downgradient	D2	21/07/2022	-	2.8	1460	5.3	53	243.5	<1	9	70.7	9	89.0	<1	<0.2	70.7	<1	15.6	117	637	14,000	80	203	<10	<10	<0.01	1050	1050
Adjacent to MPAR and Downgradient	D2	20/10/2022	904.300	2.3	1720	5.1	70	187.8	<1	5	84.6	5	111.0	-	0.327	84.4	<1	16	123	767	-	60	238	<10	<10	<0.01	-	1200
Adjacent to MPAR and Downgradient	D2	11/01/2023	903.500	1.8	1360	5.5	55	39.5	<1	1	65.8	1	88.2	-	<0.2	62	<1	14.2	122	577	-	80	184	<10	<10	<0.01	-	1080

LocCode	Sampled_Date	Aluminium	Aluminium (Filtered)	Antimony	Arsenic	Arsenic (Filtered)	Barium	Beryllium	Boron	Boron (Filtered)	Cadmium	Chromium	Chromium (Hexavalent)	Chromium (Trivalent)	Cobalt	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Nickel	Nickel (Filtered)	Selenium	Silver	Strontium	Vanadium	Vanadium (Filtered)	Zinc	Zinc (Filtered)
		Metals																															
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Groundwater					24	24	700	100	370	370	2	5	1	3.3		5	5	664	664	5	5704	5704	0.06	10	550.9	550.9	5	0.05				908	908
D10	13/09/2022	50	40	<1	6	6	24	<1	1440	1440	<0.1	<1	<10	<10	149	<1	2	5220	4440	3	3410	3230	<0.04	7	456	444	<10	<1	1.54	<10	<10	324	316
D10	23/11/2022	40	30	<1	3	2	18	<1	820	770	<0.1	<1	<10	<10	116	<1	<1	3860	3510	3	2540	2540	<0.04	4	353	303	<10	<1	1.18	<10	<10	323	283
D10	1/03/2023	100	80	<1	10	3	21	<1	2620	3040	0.3	<1	<10	<10	269	<1	2	9840	8890	7	7310	6860	<0.04	6	864	810	0.5	<1	3.64	<10	<10	747	774
D10	21/06/2023	40	40	<1	4	5	22	<1	2810	2650	<0.1	<1	<10	<10	206	<1	<1	6190	5460	<1	6330	5960	<0.04	11	810	823	0.4	<1	3.42	<10	<10	275	296
	Min.	40	30	<1	3	2	18	<1	820	770	<0.1	<1	<10	<10	116	<1	<1	3860	3510	<1	2540	2540	<0.04	4	353	303	0	<1	1.18	<10	<10	275	283
	Max.	100	80	<1	10	6	24	<1	2810	3040	0	<1	<10	<10	269	<1	2	9840	8890	7	7310	6860	<0.04	11	864	823	<10	<1	3.64	<10	<10	747	774
	Average	58	48	1	6	4	21	1	1923	1975	0	1	5	5	185	1	1	6278	5575	3	4898	4648	0.02	7	621	595	3	1	2.40	5	5	417	417
D11	13/09/2022	70	<10	<1	3	3	192	<1	1480	1470	<0.1	<1	<10	<10	34	<1	<1	75,500	31,500	<1	6810	6650	<0.04	3	442	439	<10	<1	2.33	<10	<10	13	9
D11	24/11/2022	<10	<10	<1	4	2	82	<1	2610	2660	<0.1	<1	<10	<10	160	<1	<1	61,200	44,600	<1	15,600	14,500	<0.04	<1	1100	932	<10	<1	4.68	<10	<10	78	61
D11	1/03/2023	150	<10	<1	12	3	451	<1	2210	2620	<0.1	4	<10	<10	150	21	<1	82,500	65,300	1	12,500	12,000	<0.04	2	926	881	0.3	<1	4.46	<10	<10	86	51
	Min.	<10	<10	<1	3	2	82	<1	1480	1470	<0.1	<1	<10	<10	34	<1	<1	61200	31500	<1	6810	6650	<0.04	<1	442	439	0	<1	2.33	<10	<10	13	9
	Max.	150	<10	<1	12	3	451	<1	2610	2660	<0.1	4	<10	<10	160	21	<1	82500	65300	1	15600	14500	<0.04	3	1100	932	<10	<1	4.68	<10	<10	86	61
	Average	75	5	1	6	3	242	1	2100	2250	0	2	5	5	115	7	1	73067	47133	1	11637	11050	0.02	2	823	751	3	1	3.80	5	5	59	40
D113	27/07/2022	340	<10	<1	2	1	14	<1	1350	1270	0.2	46	<10	<10	132	2	<1	9630	7700	4	4760	3870	<0.04	2	435	364	<10	<1	1.16	<10	<10	233	209
D113	25/10/2022	170	10	<1	1	1	14	<1	1060	1190	<0.1	19	<10	<10	114	2	<1	9480	9100	3	5170	5360	<0.04	<1	374	371	<10	<1	1.42	<10	<10	200	201
D113	12/01/2023	190	<10	<1	1	<1	14	<1	1690	1310	0.1	16	<10	<10	114	1	<1	8680	7140	3	4630	4110	<0.04	<1	361	312	<0.2	<1	1.13	<10	<10	200	162
D113	10/05/2023	50	<10	<1	1	<1	11	<1	1690	1620	0.1	15	<10	<10	157	<1	<1	10,200	7310	2	6260	5990	<0.04	<1	538	494	<0.2	<1	1.43	<10	<10	250	237
	Min.	50	<10	<1	1	<1	11	<1	1060	1190	<0.1	15	<10	<10	114	<1	<1	8680	7140	2	4630	3870	<0.04	<1	361	312	<0.2	<1	1.13	<10	<10	200	162
	Max.	340	10	<1	2	1	14	<1	1690	1620	0	46	<10	<10	157	2	<1	10200	9100	4	6260	5990	<0.04	2	538	494	<10	<1	1.43	<10	<10	250	237
	Average	188	6	1	1	1	13	1	1448	1348	0	24	5	5	129	1	1	9498	7813	3	5205	4833	0.02	1	427	385	3	1	1.30	5	5	221	202
D19	13/09/2022	100	<10	<1	1	<1	12	<1	980	990	0.1	16	<10	<10	65	1	<1	5530	4700	3	2590	2510	<0.04	<1	233	221	<10	<1	0.62	<10	<10	189	183
D19	23/11/2022	150	20	<1	2	<1	13	<1	680	600	0.1	35	<10	<10	53	2	<1	5360	3520	4	2120	2150	<0.04	2	214	174	<10	<1	0.57	<10	<10	201	180
D19	2/03/2023	220	<10	<1	8	2	16	<1	1680	1780	0.1	44	<10	<10	161	<1	<1	17,700	14,800	6	7320	6770	<0.04	2	539	480	0.2	<1	1.50	<10	<10	235	230
D19	22/06/2023	<10	<10	<1	<1	1	11	<1	1510	1440	0.1	<1	<10	<10	150	<1	<1	10,700	12,300	<1	6420	6030	<0.04	<1	525	531	<0.2	<1	1.51	<10	<10	205	221
	Min.	<10	<10	<1	<1	<1	11	<1	680	600	0	<1	<10	<10	53	<1	<1	5360	3520	<1	2120	2150	<0.04	<1	214	174	<0.2	<1	0.57	<10	<10	189	180
	Max.	220	20	<1	8	2	16	<1	1680	1780	0	44	<10	<10	161	2	<1	17700	14800	6	7320	6770	<0.04	2	539	531	<10	<1	1.51	<10	<10	235	230
	Average	119	9	1	3	1	13	1	1213	1203	0	24	5	5	107	1	1	9823	8830	3	4613	4365	0.02	1	378	352	3	1	1.00	5	5	208	204
D15	13/09/2022	860	50	<1	5	2	27	<1	190	180	0.2	23	<10	<10	289	4	<1	15,600	14,400	3	1040	992	<0.04	1	405	391	<10	<1	0.44	<10	<10	617	616
D15	23/11/2022	410	30	<1	6	2	16	<1	230	150	0.2	32	<10	<10	294	5	<1	13,600	11,900	3	1020	1030	<0.04	2	423	347	<10	<1	0.46	<10	<10	591	527
D15	2/03/2023	1410	10	<1	18	1	26	<1	190	150	0.2	70	<10	<10	246	16	<1	16,100	13,600	7	996	930	<0.04	3	378	324	0.6	<1	0.43	<10	<10	517	508
D15	22/06/2023	10	20	<1	<1	<1	12	<1	190	130	0.1	3	<10	<10	215	<1	<1	10,300	12,100	<1	785	791	<0.04	1	368	345	0.2	<1	0.34	<10	<10	444	488
	Min.	10	10	<1	<1	<1	12	<1	190	130	0	3	<10	<10	215	<1	<1	10300	11900	<1	785	791	<0.04	1	368	324	0	<1	0.34	<10	<10	444	488
	Max.	1410	50	<1	18	2	27	<1	230	180	0	70	<10	<10	294	16	<1	16100	14400	7	1040	1030	<0.04	3	423	391	<10	<1	0.46	<10	<10	617	616
	Average	673	28	1	7	1	20	1	200	153	0	32	5	5	261	6	1	13900	13000	3	960	936	0.02	2	394	352	3	1	0.42	5	5	542	535
D16A	21/12/2022	260	<10	<1	<1	<1	32	<1	160	<50	<0.1	<1	<10	<10	<1	<1	<1	1930	990	<1	70	57	<0.04	2	1	<1	<10	<1	0.63	<10	<10	8	<5
D16A	1/03/2023	20	<10	<1	7	<1	30	<1	<50	<50	<0.1	<1	<10	<10	10	<1	<1	1790	1580	<1	88	76	<0.04	<1	3	2	<10	<1	0.65	<10	<10	9	6
D16A	22/06/2023	20	<10	<1	<1	<1	29	<1	70	<50	<0.1	<1	<10	<10	1	<1	<1	520	450	<1	114	102	<0.04	3	5	4	<10	<1	0.48	<10	<10	37	27
	Min.	20	<10	<1	<1	<1	29	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	520	450	<1	70	57	<0.04	<1	1	<1	<10	<1	0.48	<10	<10	8	<5
	Max.	260	<10	<1	7	<1	32	<1	160	<50	<0.1	<1	<10	<10	10	<1	<1	1930	1580	<1	114	102	<0.04	3	5	4	<10	<1	0.65	<10	<10	37	27
	Average	100	5	1	3	1	30	1	85	25	0	1	5	5	4	1	1	1413	1007	1	91	78	0.02	2	3	2	5	1	0.58	5	5	18	12
D17	13/09/2022	20	<10	<1	2	2	12	<1	100	100	<0.1	<1	<10	<10	8	<1	<1	23,600	20,000	<1	2120	2040	<0.04	<1	38	39	<10	<1	0.75	<10	<10	56	54
D17	23/11/2022	60	<10	<1	2	<1	15	<1	70	<50	<0.1	<1	<10	<10	8	<1	<1	19,400	5290	<1	2130	2160	<0.04	<1	43	35	<10	<1	0.81	<10	<10	52	26
D17	1/03/2023	<10	<10	<1	8	<1	18	<1	<50	60	<0.1	17	<10	<10	16	<1	<1	29,500	23,500	<1	2000	1860	<0.04	1	45	35	<0.2	<1	0.80	<10	<10	56	54
D17	22/06/2023	<10	<10	<1	<1	<1	14	<1	60	50	<0.1	<1	<10	<10	5	<1	<1	14,600	14,100	<1	1760	1660	<0.04	<1	32	33	<0.2	<1	0.65	<10	<10	36	35
	Min.	<10	<10	<1	<1	<1	12	<1	<50	50	<0.1	<1	<10	<10	5	<1	<1	14600	5290	<1	1760	1660	<0.04	<1	32	33	<0.2	<1	0.65	<10	<10	36	26
	Max.	60	<10	<1	8	2	18	<1	100	100	<0.1	17	<10	<10	16	<1	<1	29500	23500	<1	2130	2160	<0.04	1	45	39	<10	<1	0.81	<10	<10	56	54
	Average	23	5	1	3	1	15	1	64	59	0	5	5	5	9	1	1	21775	15723	1	2003	1930	0.02	1	40	36	3	1	0.75	5	5	50	42
D18	14/09/2022	60	<10	<1	5	1	629	<1	70	70	<0.1	<1	<10	<10	<1	2	<1	511	11	<1	87	83	<0.04	3	4	4	<10	<1	0.40	<10	<10	28	21
D18	24/11/2022	30	<10	<1	4	<1	667	<1	50	<50	<0.1	2	<10	<10	<1	3	<1	650	<50	<1	86	89	<0.04	2	4	3	<10	<1	0.43	<10	<10	26	17
D18	2/03/2023	80	<10	<1	34	23	747	<1	<50	60	<0.1	<1	<10	<10	7	8	1	3830	1300	<1	104	79	<0.04	2	3	3	<0.2	<1	0.45	<10	<10	56	28
D18	22/06/2023	10	<10	1	4	5	604	<1	60	<50	<0.1	<1	<10	<10	1	2	<1	200	360	<1	98	95	<0.04	3	4	3	0.4	<1	0.37	<10	<10	50	45
	Min.	10	<10	<1	4	<1	604	<1	<50	<50	<0.1	<1	<10	<10	<1	2	<1	200	11	<1	86	79	<0.04	2	3	3	<0.2	<1	0.37	<10	<10	26	17
	Max.	80	<10	1	34	23	747	<1	70	70	<0.1	2	<10	<10	7	8	1	3830	1300	<1	104	95	<0.04	3	4	4	<10	<1	0.45	<10	<10	56	45
	Average	45	5	1	12	7	662	1	51	45	0	1	5	5	2	4	1	1298	424	1	94	87	0.02	3	4	3	3	1	0.41	5	5	40	28
D106	27/07/2022	20	<10	<1	2	1	22	<1	2170	1730	0.1	<1	<10	<10	357	<1	<1	33,200	28,000	2	19,900	17,500	0.05	<1	2220	2020	<10	<1	3.56	<10	<10	226	206
D106	25/10/2022	<10	<10	2	2	<1	24	<1	2110	2290	<0.1	<1	<10	<10	485	<1	<1	44,200	39,500	3	26,800	26,100	<0.04	<1	3050	2920	<10	<1	5.22	<10	<10	231	215
D106	11/01/2023	50	<10	<1	2	<1	22	<1	2610	2230	0.1	<1	<10	<10	332	1	<1	31,800	25,100	3	20,000	17,800	0.10	<1	2100	1890	0.3	<1	3.70	<10	<10	243	200
D106	10/05/2023	20	<10	<1	1	<1	17	<1	1840	1900	0.1	<1	<10	<10	328	4	3	21,800	15,600	<1	19,400	18,800	<0.04	<1	2200	2000	0.3	<1	3.34	<10	<10	210	193
	Min.	<10	<10	<1	1	<1	17	<1	1840	1730	<0.1	<1	<10	<10	328	<1	<1	21800	15600	<1	19400	17500	<0.04	<1	2100	1890	0	<1	3.34	<10	<10	210	193
	Max.	50	<10	2	2	1	24	<1	2610	2290	0	<1	<10	<10	485	4	3	44200	39500	3	26800	26100	0.10	<1	3050	2920	<10	<1	5.22	<10	<10	243	215
	Average	24	5	1	2	1	21	1	2183	2038	0	1	5	5	376	2	1	32750	27050	2	21525	20050	0.05	1	2393	2208	3	1	4.00	5	5	228	204
D107	27/07/2022	200	<10	<1	8	6	22	<1	5240	4610	1.6	<1	<10	<10	411	<1	<1	32,200	25,300	14	15,900	13,400	0.07	<1	2410	2170	<10	<1	4.80	<10	<10	455	407
D107	25/10/2022	270	<10	1	8	5	23	<1	5100	5390	1.4	<1	<10	<10	478	4	3	30,600	25,100	13	18,000	17,900	0.30	<1	2860	2900	<10	<1	5.95	<10	<10	420	412
D107	11/01/2023	30	<10	<1	7	4	20	<1	5410	4550	1.1	<1	<10	<10	304	<1	<1	21,400	15,500	10	13,100	12,000	0.07	<1	1790	1610	0.3	<1	3.68	<10	<10	338	279
D107	10/05/2023	<10	<10	<1	6	2	16	<1	5350	5210	0.9	<1	<10	<10	304	5	4	19,300	11,100	9	12,500	12,400	0.11	<1	1770	1650	0.4	<1	3.61	<10	<10	340	317
	Min.	<10	<10	<1	6	2	16	<1	5100	4550	1	<1	<10	<10	304	<1	<1	19300	11100	9	12500	12000	0.07	<1	1770	1610	0	<1	3.61	<10	<10	338	279
	Max.	270	<10	1	8	6	23	<1	5410	5390	2	<1	<10	<10	478	5	4	32200	25300	14	18000	17900	0.30	<1	2860	2900	<10	<1	5.95	<10	<10	455	412
	Average	126	5	1	7	4	20	1	5275	4940	1	1	5	5	374	3	2	25875	19250	12	14875	13925	0.14	1	2208	2083	3	1	4.50	5	5	388	354
D3	13/09/2022	100	<10	<1	<1	<1	62	<1	90	100	<0.1	<1	<10	<10	<1	<1	<1	3240	33	<1	34	25	<0.04	<1	20	20	<10	<1	0.10	<10	<10	17	12
D3	24/11/2022	40	<10	<1	<1	<1	67	<1	130	<50	<0.1	<1	<10	<10	<1	<1	<1	6600	4810	<1	558	562	<0.04	<1	32	28	<10	<1	0.29	<10	<10	19	15
D3	1/03/2023	10	<10	<1	6	<1	85	<1	70	<50	<0.1	<1	<10	<10	10	13	5	10,800	9360	<1	665	607	<0.04	<1	16	13	<0.2	<1	0.42	<10	<10	11	8
D3	22/06/2023	<10	<10	<1	<1	<1	28	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	6590	7620	<1	655	627	<0.04	<1	8	7	<0.2	<1	0.30	<10	<10	7	<5
	Min.	<10	<10	<1	<1	<1	28	<1	<50	<50	<0.1	<1	<10	<10	<1	<1	<1	3240	33	<1	34	25	<0.04	<1	8	7	<0.2	<1	0.10	<10	<10	7	<5
	Max.	100	<10	<1	6	<1	85	<1	130	100	<0.1	<1	<10	<10	10	13	5	10800	9360	<1	665	627	<0.04	<1	32	28	<10	<1	0.42	<10	<10	19	15
	Average	39	5	1	2	1	61	1	79	44	0	1	5	5	3	4	2	6808	5456	1	478	455	0.02	1	19	17	3	1	0.28	5	5	14	9
D4	20/07/2022	8470	8020	<1	28	28	13	1	<50	<50	0.3	1	<10	<10	4	1	<1	66,800	62,900	17	705	686	<0.04	<1	12	12	<10	<1	0.07	<10	<10	124	122
D4	19/10/2022	9840	9020	<1	26	23	15	2	<50	<50	0.3	1	<10	<10	4	2	1	56,000	56,400	16	723	709	<0.04	<1	14	13	<10	<1	0.08	<10	<10	143	130
D4	10/01/2023	8840	7430	<1	29	26	14	2	50	<50	0.3	2	<10	<10	4	2	<1	61,700	49,100	15	719	583	<0.04	<1	13	10	0.3	<1	0.08	<10	<10	128	102
D4	27/04/2023	8630	8420	<1	31	33	14	2	50	<50	0.3	1	<10	<10	4	25	24	65,900	62,400	15	673	655	<0.04	<1	16	17	<0.2	<1	0.07	<10	<10	149	162
	Min.	8470	7430	<1	26	23	13	1	<50	<50	0	1	<10	<10	4	1	<1	56000	49100	15	673	583	<0.04	<1	12	10	<0.2	<1	0.07	<10	<10	124	102
	Max.	9840	9020	<1	31	33	15	2	50	<50	0	2	<10	<10	4	25	24	66800	62900	17	723	709	<0.04	<1	16	17	<10	<1	0.08	<10	<10	149	162
	Average	8945	8223	1	29	28	14	2	38	25	0	1	5	5	4	8	7	62600	57700	16	705	658	0.02	1	14	13	3	1	0.08	5	5	136	129
D5	21/07/2022	70	100	<1	<1	1	16	1	50	50	<0.1	<1	<10	<10	22	<1	<1	41,800	40,500	<1	7350	7160	<0.04	<1	46	44	<10	<1	0.38	<10	<10	34	31
D5	19/10/2022	150	100	<1	1	<1	20	2	80	70	<0.1	<1	<10	<10	26	1	<1	35,400	32,700	<1	7850	7740	<0.04	<1	56	52	<10	<1	0.46	<10	<10	54	40
D5	10/01/2023	120	50	<1	2	1	19	2	80	<50	<0.1	<1	<10	<10	29	<1	<1	38,200	31,200	<1	7410	6270	<0.04	<1	62	54	0.5	<1	0.42	<10	<10	46	37
D5	27/04/2023	120	90	<1	2	2	18	2	80	60	<0.1	<1	<10	<10	27	<1	<1	44,500	40,900	<1	7430	6970	<0.04	<1	60	61	0.3	<1	0.41	<10	<10	45	40
	Min.	70	50	<1	<1	<1	16	1	50	<50	<0.1	<1	<10	<10	22	<1	<1	35400	31200	<1	7350	6270	<0.04	<1	46	44	0	<1	0.38	<10	<10	34	31
	Max.	150	100	<1	2	2	20	2	80	70	<0.1	<1	<10	<10	29	1	<1	44500	40900	<1	7850	7740	<0.04	<1	62	61	<10	<1	0.46	<10	<10	54	40
	Average	115	85	1	1	1	18	2	73	51	0	1	5	5	26	1	1	39975	36325	1	7510	7035	0.02	1	56	53	3	1	0.42	5	5	45	37
D1	13/09/2022	30	<10	<1	9	9	27	<1	3040	3000	<0.1	<1	<10	<10	420	<1	<1	55,400	54,100	<1	23,200	22,600	<0.04	<1	2200	2230	<10	<1	3.35	<10	<10	209	214
D1	24/11/2022	320	<10	<1	10	3	33	<1	2960	3010	<0.1	<1	<100	<100	489	2	<1	56,200	38,700	<1	25,000	24,000	<0.04	<1	2620	2220	<10	<1	4.01	<10	<10	242	187
D1	1/03/2023	30	<10	1	14	6	23	<1	3140	3660	<0.1	<1	<100	<100	369	24	18	55,100	49,100	<1	22,200	22,000	0.06	1	2010	1960	0.3	<1	3.48	<10	<10	177	178
D1	21/06/2023	<10	<10	<1	3	2	20	<1	3400	2600	<0.1	<1	<10	<10	326	<1	<1	34,000	35,600	<1	17,500	16,200	<0.04	<1	1750	1670	0.3	<1	2.70	<10	<10	149	148
	Min.	<10	<10	<1	3	2	20	<1	2960	2600	<0.1	<1	<10	<10	326	<1	<1	34000	35600	<1	17500	16200	<0.04	<1	1750	1670	0	<1	2.70	<10	<10	149	148
	Max.	320	<10	1	14	9	33	<1	3400	3660	<0.1	<1	<100	<100	489	24	18	56200	54100	<1	25000	24000	0.06	1	2620	2230	<10	<1	4.01	<10	<10	242	214
	Average	96	5	1	9	5	26	1	3135	3068	0	1	28	28	401	7	5	50175	44375	1	21975	21200	0.03	1	2145	2020	3	1	3.40	5	5	194	182
D102	28/07/2022	210	<10	<1	1	<1	26	<1	1750	1450	<0.1	1	<10	<10	263	3	<1	57,900	45,100	<1	15,300	12,900	0.17	<1	1660	1490	<10	<1	3.29	<10	<10	71	53
D102	26/10/2022	30	<10	<1	2	1	29	<1	1270	1380	<0.1	<1	<10	<10	245	<1	<1	58,500	48,100	<1	18,800	17,500	0.40	<1	2060	1840	<10	<1	4.23	<10	<10	68	52
D102	11/01/2023	40	<10	<1	<1	<1	24	<1	1390	1120	<0.1	<1	<10	<10	229	<1	<1	49,900	34,100	<1	14,300	12,700	<0.04	<1	1500	1350	0.2	<1	3.27	<10	<10	58	38
D102	11/05/2023	20	<10	<1	<1	<1	21	<1	1360	1140	<0.1	<1	<10	<10	211	<1	<1	34,600	28,200	<1	14,200	13,700	<0.04	<1	1420	1350	0.2	<1	3.18	<10	<10	70	48
	Min.	20	<10	<1	<1	<1	21	<1	1270	1120	<0.1	<1	<10	<10	211	<1	<1	34600	28200	<1	14200	12700	<0.04	<1	1420	1350	0	<1	3.18	<10	<10	58	38
	Max.	210	<10	<1	2	1	29	<1	1750	1450	<0.1	1	<10	<10	263	3	<1	58500	48100	<1	18800	17500	0.40	<1	2060	1840	<10	<1	4.23	<10	<10	71	53
	Average	75	5	1	1	1	25	1	1443	1273	0	1	5	5	237	1	1	50225	38875	1	15650	14200	0.15	1	1660	1508	3	1	3.50	5	5	67	48
D103	27/07/2022	1150	<10	<1	8	4	25	<1	1820	1540	<0.1	4	<10	<10	184	2	<1	16,500	11,900	1	8780	7270	<0.04	<1	673	584	<10	<1	0.79	<10	<10	140	101
D103	25/10/2022	220	<10	<1	8	3	19	<1	1430	1620	<0.1	12	<10	<10	169	2	<1	18,300	13,100	<1	10,400	11,000	<0.04	1	632	623	<10	<1	0.73	<10	<10	112	98
D103	11/01/2023	920	<10	<1	9	2	24	<1	1670	1310	<0.1	<1	<10	<10	167	<1	<1	15,500	8090	<1	8350	7060	<0.04	<1	606	528	0.2	<1	0.76	<10	<10	117	83
D103	10/05/2023	60	<10	<1	4	<1	14	<1	1640	1500	<0.1	<1	<10	<10	156	<1	<1	11,000	2880	<1	7990	7260	<0.04	<1	568	510	<0.2	<1	0.65	<10	<10	92	67
	Min.	60	<10	<1	4	<1	14	<1	1430	1310	<0.1	<1	<10	<10	156	<1	<1	11000	2880	<1	7990	7060	<0.04	<1	568	510	<0.2	<1	0.65	<10	<10	92	67
	Max.	1150	<10	<1	9	4	25	<1	1820	1620	<0.1	12	<10	<10	184	2	<1	18300	13100	1	10400	11000	<0.04	1	673	623	<10	<1	0.79	<10	<10	140	101
	Average	588	5	1	7	2	21	1	1640	1493	0	4	5	5	169	1	1	15325	8993	1	8880	8148	0.02	1	620	561	3	1	0.73	5	5	115	87
D104	28/07/2022	640	120	<1	2	<1	45	<1	80	50	<0.1	<1	<10	<10	26	3	2	4320	2770	<1	1760	1480	0.22	<1	55	48	<10	<1	0.22	<10	<10	39	27
D104	26/10/2022	340	140	<1	6	5	112	<1	60	<50	<0.1	<1	<10	<10	59	4	4	7400	4240	<1	5260	5260	<0.04	<1	124	120	<10	<1	0.20	<10	<10	361	333
D104	11/01/2023	210	20	<1	32	23	154	<1	<50	120	<0.1	<1	<10	<10	49	2	<1	18,700	13,300	1	3890	3310	<0.04	3	124	107	0.4	<1	0.27	<10	<10	96	22
D104	11/05/2023	180	<10	<1	11	3	178	<1	<50	100	<0.1	<1	<10	<10	55	2	<1	9470	700	<1	3580	3060	<0.04	<1	194	171	<0.2	<1	0.40	<10	<10	382	331
	Min.	180	<10	<1	2	<1	45	<1	<50	<50	<0.1	<1	<10	<10	26	2	<1	4320	700	<1	1760	1480	<0.04	<1	55	48	<0.2	<1	0.20	<10	<10	39	22
	Max.	640	140	<1	32	23	178	<1	80	120	<0.1	<1	<10	<10	59	4	4	18700	13300	1	5260	5260	0.22	3	194	171	<10	<1	0.40	<10	<10	382	333
	Average	343	71	1	13	8	122	1	48	74	0	1	5	5	47	3	2	9973	5253	1	3623	3278	0.07	1	124	112	3	1	0.27	5	5	220	178
D105	27/07/2022	50	<10	<1	2	1	18	<1	670	560	<0.1	<1	<10	<10	166	<1	<1	23,900	18,800	<1	10,600	9220	<0.04	<1	606	548	<10	<1	0.73	<10	<10	69	56
D105	25/10/2022	20	<10	<1	2	1	23	<1	440	510	<0.1	1	<10	<10	149	<1	<1	27,300	24,200	<1	12,700	11,900	<0.04	1	556	501	<10	<1	0.63	<10	<10	66	56
D105	11/01/2023	30	<10	<1	2	<1	18	<1	540	440	<0.1	<1	<10	<10	143	<1	<1	21,900	16,700	<1	9910	8530	<0.04	<1	524	453	<0.2	<1	0.64	<10	<10	62	48
D105	10/05/2023	<10	<10	<1	<1	<1	16	<1	520	580	<0.1	<1	<10	<10	148	<1	<1	17,400	9060	<1	10,200	9500	<0.04	<1	541	494	<0.2	<1	0.62	<10	<10	77	58
	Min.	<10	<10	<1	<1	<1	16	<1	440	440	<0.1	<1	<10	<10	143	<1	<1	17400	9060	<1	9910	8530	<0.04	<1	524	453	<0.2	<1	0.62	<10	<10	62	48
	Max.	50	<10	<1	2	1	23	<1	670	580	<0.1	1	<10	<10	166	<1	<1	27300	24200	<1	12700	11900	<0.04	1	606	548	<10	<1	0.73	<10	<10	77	58
	Average	26	5	1	2	1	19	1	543	523	0	1	5	5	152	1	1	22625	17190	1	10853	9788	0.02	1	557	499	3	1	0.65	5	5	69	55
D2	21/07/2022	1160	470	<1	<1	<1	62	<1	160	150	0.1	1	<10	<10	95	3	2	7170	1680	3	1610	1540	<0.04	<1	110	105	<10	<1	0.42	<10	<10	398	390
D2	20/10/2022	1420	960	<1	<1	<1	57	2	270	240	0.1	<1	<10	<10	129	3	1	5610	3140	2	1820	1810	<0.04	<1	146	139	<10	<1	0.60	<10	<10	508	473
D2	11/01/2023	910	600	<1	1	<1	37	1	230	190	<0.1	<1	<10	<10	88	4	1	7380	5070	3	1430	1220	<0.04	<1	106	90	0.3	<1	0.38	<10	<10	365	286

Adjacent to MPAR and Downgradient	D2	28/04/2023	903.400	1.7	1010	5.8	62	75	<1	13	42.6	13	57.3	-	0.124	35.7	<1	10.8	94.1	367	-	70	123	10	<10	0.01	-	647	1150	870	<1	2	2	27	<1	250	210	<0.1	<1	<10	<10	44	9	7	8140	6580	6	1130	1090	<0.04	<1	76	78	0.3	<1	0.22	<10	<10	86	82
		Min.	903.4	1.7	1010	5.1	53	39.5	<1	1	43	1	57.3	-	0	36	<1	10.8	94	367	14000	60	123	<10	<10	<0.01	1050	647	910	470	<1	<1	<1	27	<1	160	150	<0.1	<1	<10	<10	44	3	1	5610	1680	2	1130	1090	<0.04	<1	76	78	0	<1	0.22	<10	<10	86	82
		Max.	904.3	2.8	1720	5.8	70	243.5	<1	13	85	13	111.0	-	0	84	<1	16.0	123	767	14000	80	238	10	<10	0	1050	1200	1420	960	<1	2	2	62	2	270	240	0	1	<10	<10	129	9	7	8140	6580	6	1820	1810	<0.04	<1	146	139	<10	<1	0.60	<10	<10	508	473
		Average	-	2.2	1388	5.3	60	136.0	0.5	7	66	7	86.0	-	0	63	1	14.0	114	587		73	187	6	5	0		994	1160	725	1	1	1	46	1	228	198	0	1	5	5	89	5	3	7075	4118	4	1498	1415	0.02	1	110	103	3	1	0.41	5	5	339	308
Adjacent to MPAR and Downgradient	D8	14/09/2022	904.649	6.7	227	5.6	50	181.6	<1	11	16.7	11	8.3	-	<0.05	12.1	<1	1.8	6.24	81.5	-	<10	25	20	<10	0.02	-	172	480	180	<1	<1	<1	29	<1	<50	<50	<0.1	<1	<10	<10	2	3	2	441	106	<1	166	130	<0.04	<1	34	34	<10	<1	0.09	<10	<10	46	39
Adjacent to MPAR and Downgradient	D8	24/11/2022	904.949	6.2	206	6.2	50	66.9	<1	13	14.2	13	8.3	-	0.025	9.79	<1	1.76	8.22	64.9	-	<10	20	10	<10	0.01	-	164	520	180	<1	<1	<1	35	<1	<50	<50	<0.1	<1	<10	<10	2	5	2	510	150	<1	142	136	<0.04	<1	34	28	<10	<1	0.08	<10	<10	43	29
Adjacent to MPAR and Downgradient	D8	2/03/2023	904.149	4.3	224	5.3	43	154.8	<1	9	14.9	9	10.3	-	0.014	11.1	<1	1.82	6.43	77	-	90	24	20	<10	0.02	-	163	220	20	<1	8	<1	40	<1	<50	<50	0.2	<1	<10	<10	17	2	2	250	<50	<1	319	254	<0.04	<1	59	53	<0.2	<1	0.09	<10	<10	72	62
Adjacent to MPAR and Downgradient	D8	22/06/2023	904.049	5.6	295	5.3	30	101.7	<1	10	18.2	10	14.4	-	<0.05	13.4	<1	2.14	11.4	92.9	-	20	32	30	<10	0.03	-	170	80	20	<1	<1	<1	36	<1	<50	<50	<0.1	<1	<10	<10	2	2	<1	60	<50	<1	211	202	<0.04	<1	57	49	<0.2	<1	0.10	<10	<10	71	65
		Min.	904.0	4.3	206	5.3	30	66.9	<1	9	14	9	8.3	-	0	10	<1	1.8	6	65	-	<10	20	10	<10	0	-	163	80	20	<1	<1	<1	29	<1	<50	<50	<0.1	<1	<10	<10	2	2	<1	60	<50	<1	142	130	<0.04	<1	34	28	<0.2	<1	0.08	<10	<10	43	29
		Max.	904.9	6.7	295	6.2	50	181.6	<1	13	18	13	14.4	-	<0.05	13	<1	2.1	11	93	-	90	32	30	<10	0	-	172	520	180	<1	8	<1	40	<1	<50	<50	0	<1	<10	<10	17	5	2	510	150	<1	319	254	<0.04	<1	59	53	<10	<1	0.10	<10	<10	72	65
		Average	-	5.7	238	5.5	43	126.0	0.5	11	16	11	10.0	-	0	12	1	1.9	8	79	-	30	25	20	5	0	-	167	325	100	1	2	1	35	1	25	25	0	1	5	5	6	3	2	315	77	1	210	181	0.02	1	46	41	3	1	0.09	5	5	58	49
Adjacent to MPAR and Downgradient	D9	13/09/2022	908.707	4.4	9420	6.1	21	53.2	<1	141	565	141	1,100	-	<1	470	<1	71.7	1180	4270	-	560	1380	<100	<100	<0.1	-	8300	680	<10	<1	4	3	38	<1	1750	1730	0.1	2	<10	<10	225	5	<1	59,100	48,300	2	15,100	15,000	0.20	3	1470	1490	<10	<1	3.06	<10	<10	127	74
Adjacent to MPAR and Downgradient	D9	24/11/2022	909.207	3.2	9700	6.2	24	-33.2	<1	118	624	118	1,150	-	<1	504	<1	74.2	1380	4440	-	290	1440	<100	<100	<0.1	-	8310	250	<10	<1	3	<1	35	<1	1440	1630	<0.1	<1	<10	<10	240	1	<1	56,300	22,500	1	15,600	14,800	<0.04	<1	1670	1420	<10	<1	3.47	<10	<10	92	38
Adjacent to MPAR and Downgradient	D9	1/03/2023	908.307	2	9390	6.1	19	45.4	<1	109	536	109	1,080	-	<0.01	448	<1	66.5	1200	4420	-	320	1440	<10	<10	<0.01	-	8240	430	<10	<1	12	2	36	<1	1730	1840	<0.1	<1	<10	<10	260	63	35	73,400	45,100	<1	18,800	17,800	0.36	2	1700	1610	0.4	<1	3.99	<10	<10	118	78
Adjacent to MPAR and Downgradient	D9	21/06/2023	908.107	2.3	10,060	6.1	17	68.8	<1	126	564	126	1,220	-	<1	477	<1	81.4	1350	5160	-	300	1510	10	<10	0.01	-	8890	<10	<10	<1	<1	<1	28	<1	1850	1690	<0.1	<1	<10	<10	236	<1	<1	35,800	34,600	<1	15,700	14,600	0.08	<1	1730	1700	0.3	<1	3.56	<10	<10	69	65
		Min.	908.1	2.0	9390	6.1	17	-33.2	<1	109	536	109	1,080	-	<0.01	448	<1	66.5	1180	4270	-	290.0	1380	<10	<10	<0.01	-	8240	<10	<10	<1	<1	<1	28	<1	1440	1630	<0.1	<1	<10	<10	225	<1	<1	35800	22500	<1	15100	14600	<0.04	<1	1470	1420	0	<1	3.06	<10	<10	69	38
		Max.	909.2	4.4	10060	6.2	24	68.8	<1	141	624	141	1,220	-	<1	504	<1	81.4	1380	5160	-	560.0	1510	<100	<100	<0.1	-	8890	680	<10	<1	12.0	3	38	<1	1850	1840	0	2	<10	<10	260	63	35	73400	48300	2	18800	17800	0.36	3	1730	1700	<10	<1	3.99	<10	<10	127	78
		Average	-	3.0	9643	6.1	20	34.0	0.5	124	572	124	1,138	-	0	475	1	73.0	1278	4573	-	368.0	1443	29	28	0	-	8435	341	5	1	4.9	2	34	1	1693	1723	0	1	5	5	240	17	9	56150	37625	1	16300	15550	0.17	2	1643	1555	3	1	3.50	5	5	102	64
Brine waste pond leak detection bores	MPGM5-D5	21/07/2022	-	1.5	3668	6.4	33	69.6	<1	1820	461	1820	3,930	-	<5	840	<1	459	9620	22,000	-	4860	6700	<10	<10	<0.01	-	36,400	140	130	<10	12	16	47	<10	3180	2820	7	<10	<10	<10	1360	<10	<10	3,510	2,680	16	93,800	91,100	0.14	<10	6310	6130	<100	<10	1.74	<100	<100	561	521
Brine waste pond leak detection bores	MPGM5-D5	11/08/2022	-	-	35,070	6.4	45	-	<1	1840	459	1840	3,790	-	-	786	<1	405	9200	20,700	-	-	-	-	-	-	-	-	240	-	<10	14	-	44	<10	3130	-	7.4	<10	-	-	1240	20	-	3,990	-	14	82,000	-	0.14	<10	5980	-	<100	<10	1.71	<100	-	531	-
Brine waste pond leak detection bores	MPGM5-D5	5/10/2022	-	-	31,400	6.5	-	-	-	1831	426	1831	3,590	-	-	753	0	345	8320	19,500	-	-	-	-	-	-	-	-	340	-	<10	<10	-	52	<10	2510	-	8.1	<10	-	-	1020	14	-	3,580	-	12	79,400	-	0.10	48	5350	-	<100	<10	1.58	<100	-	468	-
Brine waste pond leak detection bores	MPGM5-D5	20/10/2022	-	2.7	32,250	6.5	35	83.4	<1	1570	467	1570	3,620	-	<5	809	<1	383	8970	19,800	-	4110	5940	<10	<10	<0.01	-	31,000	160	<100	<10	11	<10	47	<10	1730	1580	5.3	<10	<10	<10	901	14	10	2,920	2,150	<10	67,300	65,000	0.12	<10	4760	4620	<100	<10	1.49	<100	<100	410	387
Brine waste pond leak detection bores	MPGM5-D5	11/01/2023	-	1.2	32,920	6.6	33	89.7	<1	1710	444	1710	4,490	-	<5	757	<1	381	8720	20,200	-	910	6150	<10	<10	<0.01	-	32,800	220	<100	<10	12	<10	58	<10	2710	2160	32.1	<10	<10	<10	3000	<10	<10	5,110	4,200	68	85,400	79,600	0.14	11	5570	5260	5.6	<10	1.61	<100	<100	1520	1480
Brine waste pond leak detection bores	MPGM5-D5	27/04/2023	-	1.4	36,390	6.5	34	43.8	<1	1630	489	1630	4,520	-	<5	901	<1	450	10,000	17,300	-	4730	6070	<10	<10	<0.01	-	37,400	360	<100	<10	<10	<10	245	<10	2700	2470	41.3	<10	<10	<10	4370	18	<10	6,620	5,830	144	86,700	81,200	0.11	<10	7760	7120	4.2	<10	1.88	<100	<100	2690	2480
		Min.	-	1.2	3668	6.4	33	43.8	<1	1570	426	1570	3,590	-	<5	753	0	345	8320	17300	-	910.0	5940	<10	<10	<0.01	-	31000	140	<100	<10	<10	<10	44	<10	1730	1580	5	<10	<10	<10	901	<10	<10	2,920	2,150	<10	67300	65000	0.10	<10	4760	4620	4	<10	1.49	<100	<100	410	387
		Max.	-	2.7	36390	6.6	45	89.7	<1	1840	489	1840	4,520	-	<5	901	<1	459	10000	22000	-	4860.0	6700	<10	<10	<0.01	-	37400	360	130	<10	14.0	16	245	<10	3180	2820	41	<10	<10	<10	4370	20	10	6,620	5,830	144	93800	91100	0.14	48	7760	7120	<100	<10	1.88	<100	<100	2690	2480
		Average	-	1.7	28616	6.5	36	72.0	0.5	1734	458	1734	3,990	-	3	808	0	404	9138	19917	-	3653.0	6215	5	5	0	-	34400	243	70	5	9.8	8	82	5	2660	2258	17	5	5	5	1982	13	6	4,288	3,715	43	82433	79225	0.13	13	5955	5783	35	5	1.70	50	50	1030	1217
Brine waste pond leak detection bores	MPGM5-D6	21/07/2022	-	1.9	7800	6.4	6	-20.4	<1	1,190	150	1,190	1,040	-	<1	364	<1	30.4	1290	2150	-	830	707	350	<10	0.35	-	5860	220	<10	<1	2	1	62	<1	<50	<50	1.5	<1	<10	<10	184	21	14	15,800	4,630	6	3740	3610	<0.04	2	505	491	<10	<1	0.71	<10	<10	134	125
Brine waste pond leak detection bores	MPGM5-D6	26/07/2022	-	-	200	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brine waste pond leak detection bores	MPGM5-D6	11/08/2022	-	-	10,700	6.6	15	-	<1	1,830	196	1,830	1,470	-	-	410	<1	33.9	1890	2940	-	-	-	-	-	-	-	-	140	-	<1	2	-	61	<1	<50	-	2	<1	-	-	269	27	-	19,800	-	5	5280	-	0.14	5	829	-	<10	<1	0.93	<10	-	157	-
Brine waste pond leak detection bores	MPGM5-D6	5/10/2022	-	-	11,860	6.7	-	-	-	2,338	183	2,338	1,670	-	-	422	0	40.8	2530	3290	-	-	-	-	-	-	-	-	240	-	2	3	-	56	<1	<50	-	2.7	<1	-	-	234	25	-	8,070	-	6	3400	-	<0.04	10	933	-	<10	<1	0.78	<10	-	193	-
Brine waste pond leak detection bores	MPGM5-D6	20/10/2022	-	1.7	11,230	6.7	8	-24.8	<1	1,930	152	1,930	1,580	-	<2	358	<1	38.2	2370	3090	-	650	938	260	<10	0.26	-	7910	120	<10	<1	2	2	68	<1	<50	<50	2.5	<1	<10	<10	218	24	16	4,090	3,470	7	2490	2980	0.08	14	711	826	<10	<1	0.57	<10	<10	214	172
Brine waste pond leak detection bores	MPGM5-D6	11/01/2023	-	1.4	11,210	6.7	9	-25.5	<1	1,930	163	1,930	1,790	-	<2	383	<1	36.4	2200	3280	-	1100	991	360	<10	0.36	-	8540	110	<10	<1	2	2	57	<1	<50	<50	1.4	<1	<10	<10	171	12	6	15,000	17,500	7	5660	5750	<0.04	8	971	922	0.9	<1	0.74	<10	<10	169	151
Brine waste pond leak detection bores	MPGM5-D6	27/04/2023	-	1.8	11,090	6.6	9	-23	<1	1,680	184	1,680	1,720	-	<2	424	<1	32.2	2150	3260	-	1070	1010	700	20	0.72	-	7860	140	<10	<1	2	2	49	<1	60	<50	1.5	<1	<10	<10	140	9	5	13,300	11,100	6	7290	7000	<0.04	22	1140	1190	0.7	<1	0.74	<10	<10	362	371
		Min.	-	1.4	200	6.4	6	-25.5	<1	1,190	150	1,190	1,040	-	<1	358	0	30.4	1,290	2,150	-	650.0	707	260	<10	0	-	5860	110	<10	<1	2.0	1	49	<1	<50	<50	1	<1	<10	<10	140	9	5	4,090	3,470	5	2490	2980	<0.04	2	505	491	1	<1	0.57	<10	<10	134	125
		Max.	-	1.9	11,860	8.0	15	0.0	<1	2,338	196	2,338	1,790	-	<2	424	<1	40.8	2,530	3,290	-	1100.0	1010	700	20	1	-	8540	240	<10	2	3.0	2	68	<1	60	<50	3	<1	<10	<10	269	27	16	19,800	17,500	7	7290	7000	0.14	22	1140	1190	<10	<1	0.93	<10	<10	362	371
		Average	-	1.7	9,156	6.7	9	-23.0	0.5	1,816	171	1,816	1,545	-	1	394	0	35.0	2,072	3,002	-	913.0	912	418	9	0	-	7543	162	5	1	2.2	2	59	1	31	25	2	1	5	5	203	20	10	12,677	9,175	6	4643	4835	0.05	10	848	857	4	1	0.75	5	5	205	205

APPENDIX I NALCO

Unit 12, 2 Eden Park Drive
Macquarie Park 2113
Phone: +61 (0) 2 8870 8434

ABN: 41 000 424 788

Ecolab | Nalco Water - Global Analytical & Microbiology

Quality assurance/quality control program (2023)

The laboratory's Quality assurance/quality control program ensures that sampling activities and analytical data is accurate, reliable and acceptable.

The Quality assurance/quality control program consists of both internal and external measures.

Internal

- Laboratory instrumentation and field equipment are calibrated at the correct intervals, as prescribed in the relevant NATA 'General equipment table'.
- Regular preventative maintenance is carried out on all key laboratory instrumentation and field equipment.
- Trip blanks (where appropriate) are supplied to monitor contamination.
- Certified reference materials are analysed routinely.
- Duplicate analysis is conducted to check precision.
- Laboratory blanks are analysed to monitor contamination.
- Quality control checks on media are performed.
- All records and subsequent reports are systematically checked.
- Quality control charts are used to statistically monitor trends in data.
- The laboratory is regularly internally audited.

External

- Ecolab Global Analytical & Microbiology laboratory participates in regular chemical and microbiological external proficiency testing programs as well as NATA audits as per their surveillance program.

Sampling and Data Collection

- All sampling is performed by trained personnel in accordance with procedure A-2.18 and relevant parts of Australian Standard 5667, for which NATA accreditation is held.
- Site measurements (Dissolved Oxygen, pH, Turbidity, Temperature and Conductivity) and sampling observations (water depth) are recorded and reported in accordance with procedure CA12125.

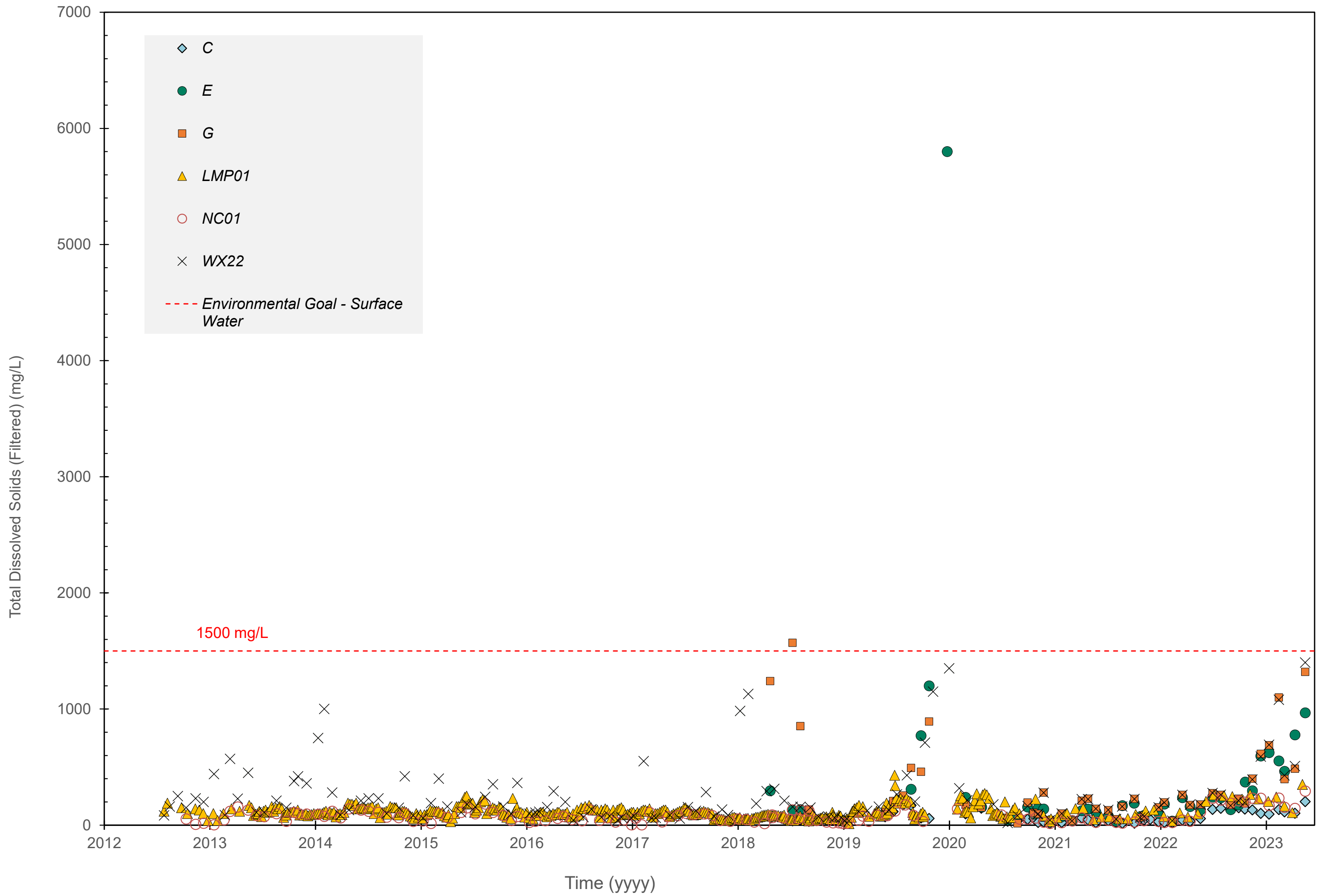
Sample Bottles

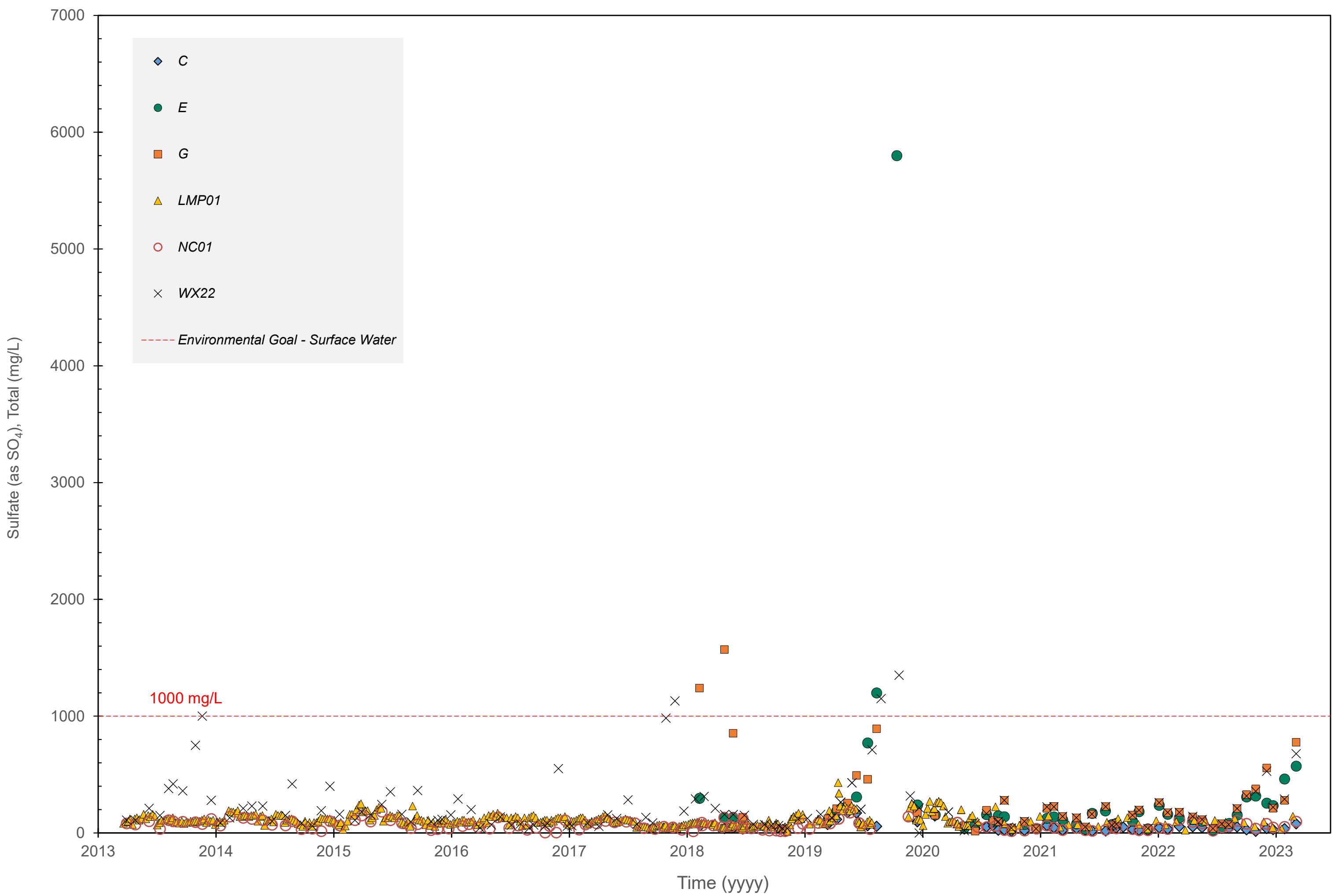
- Pre-labeled sample containers are used for routine sampling and testing.
- The sample bottles are prepared so that samples are preserved in accordance with Australian Standard 5667.1:1998 and Standard Methods for the Examination of Water and Wastewater, 22^{nd} Edition (APHA).

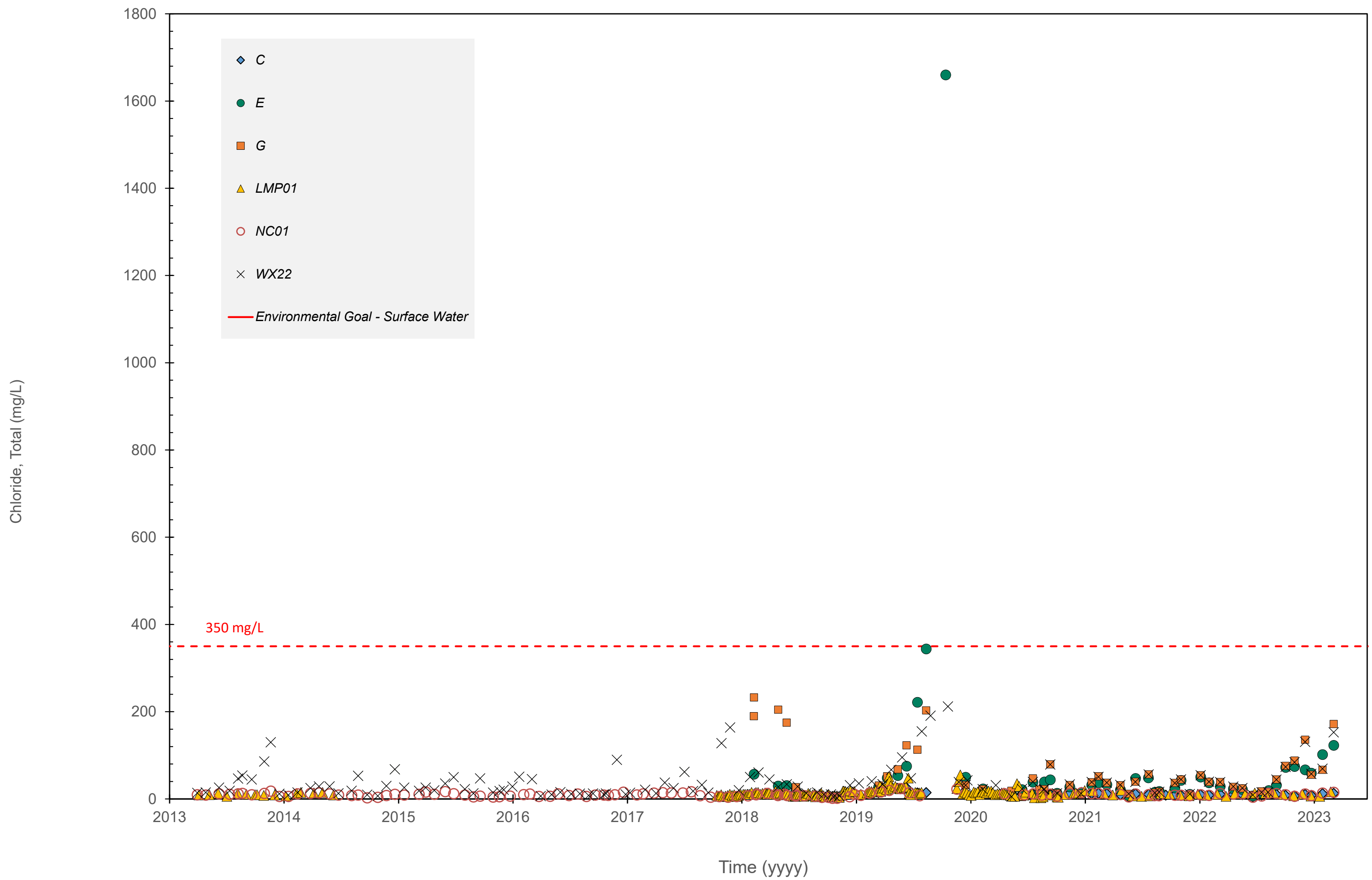
Delivery of Samples

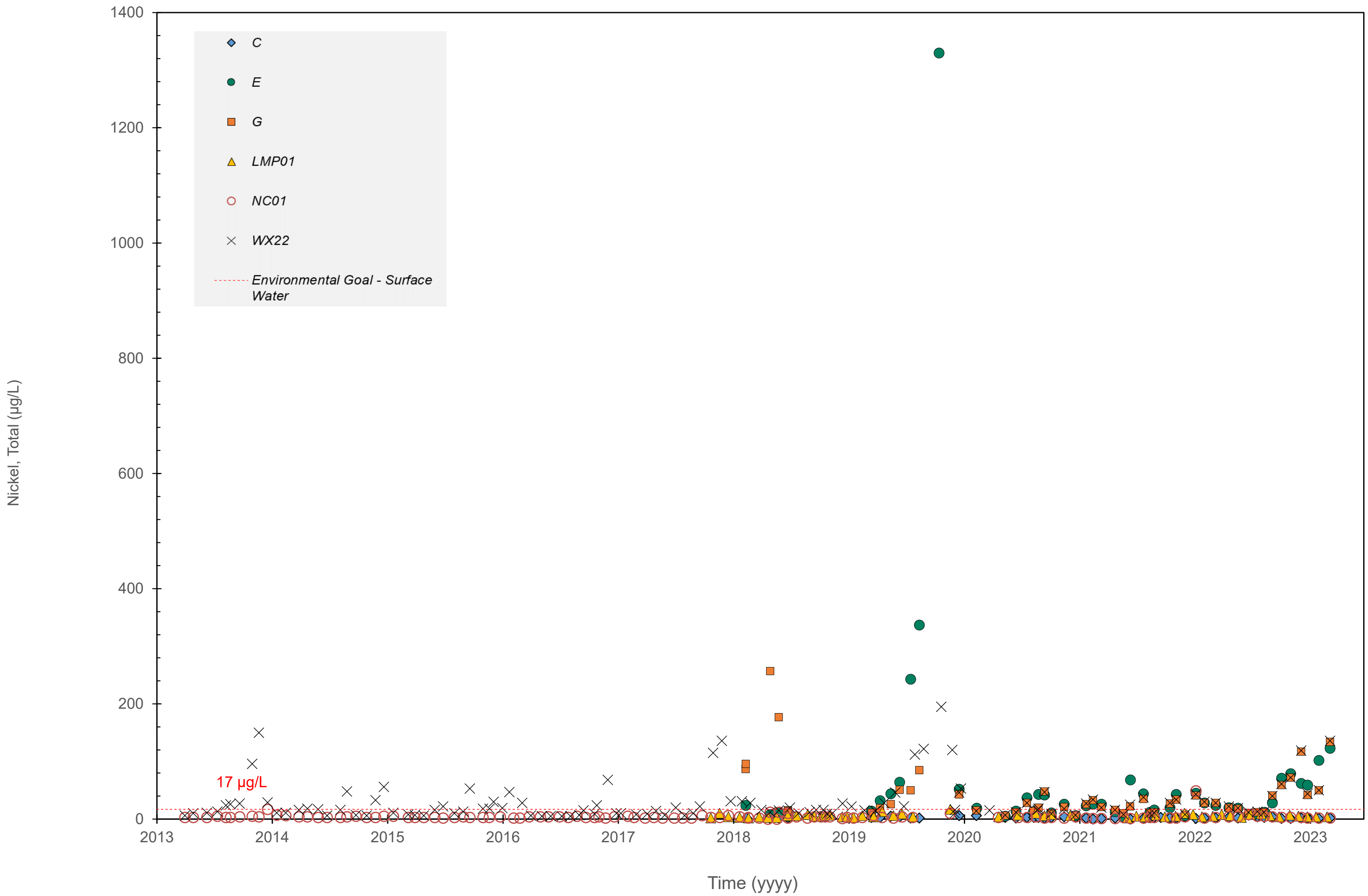
- Eskies and freezer packs are used to maintain the integrity of the samples during transport from the sampling sites to our Global Analytical & Microbiology laboratory (Sydney).

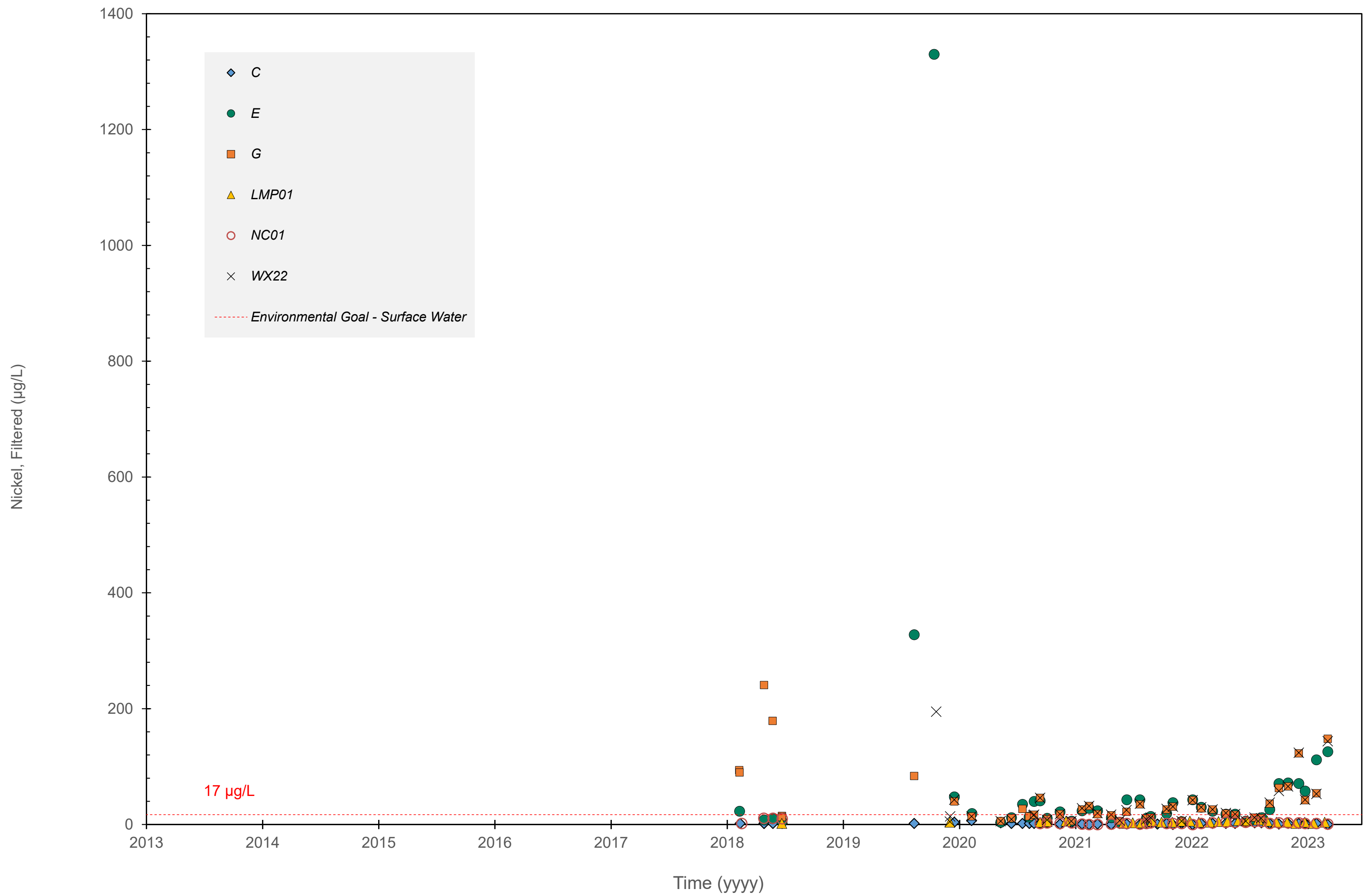
APPENDIX J SURFACE WATER TRENDS

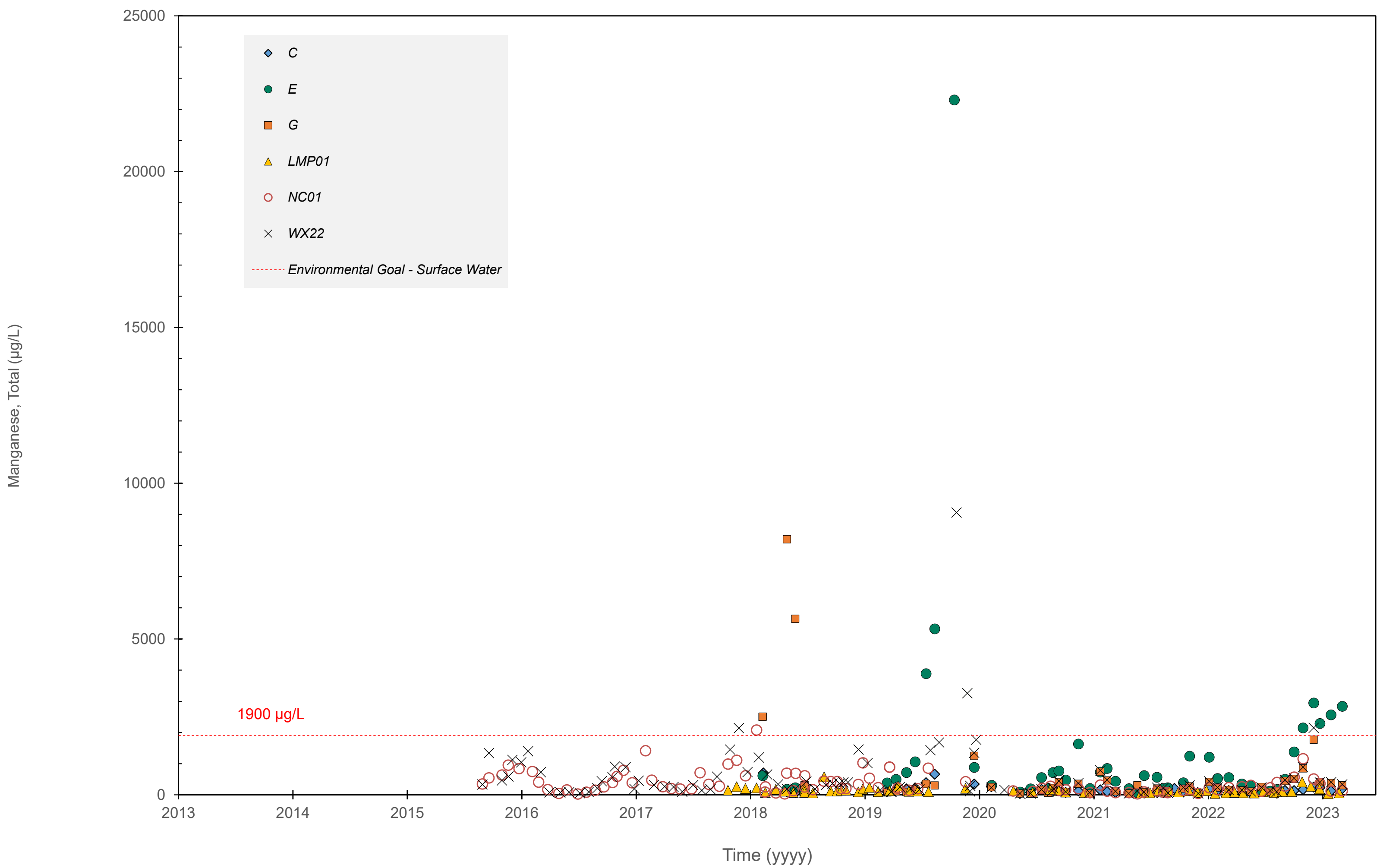

7000
6000
5000
4000
3000
2000
1000
0
Total Dissolved Solids (Filtered) (mg/L)
C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
1500 mg/L
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

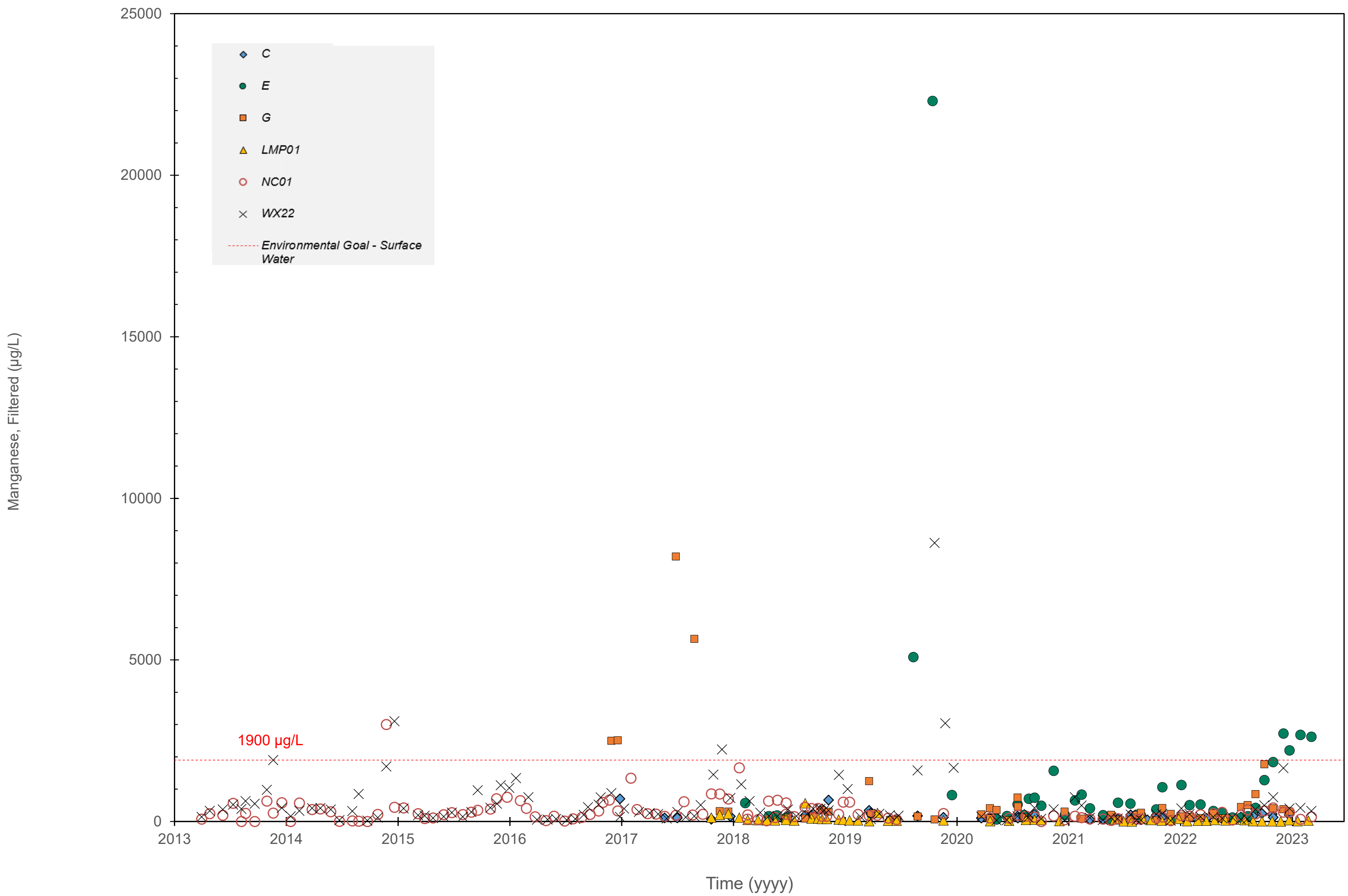

C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
1000 mg/L
Sulfate (as SO4), Total (mg/L)
Time (yyyy)
0
1000
2000
3000
4000
5000
6000
7000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

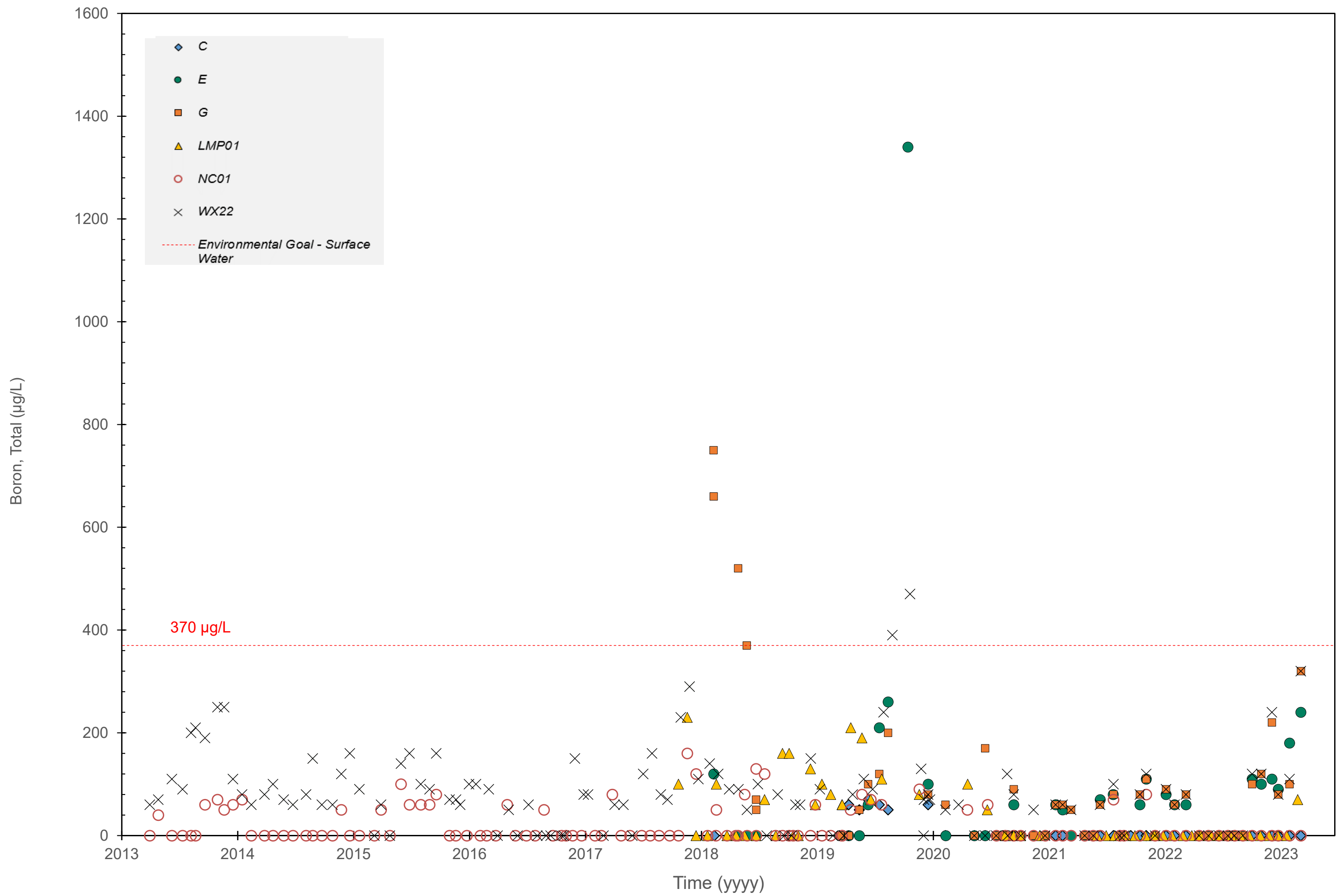

C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
350 mg/L
Chloride, Total (mg/L)
Time (yyyy)
1800
1600
1400
1200
1000
800
600
400
200
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

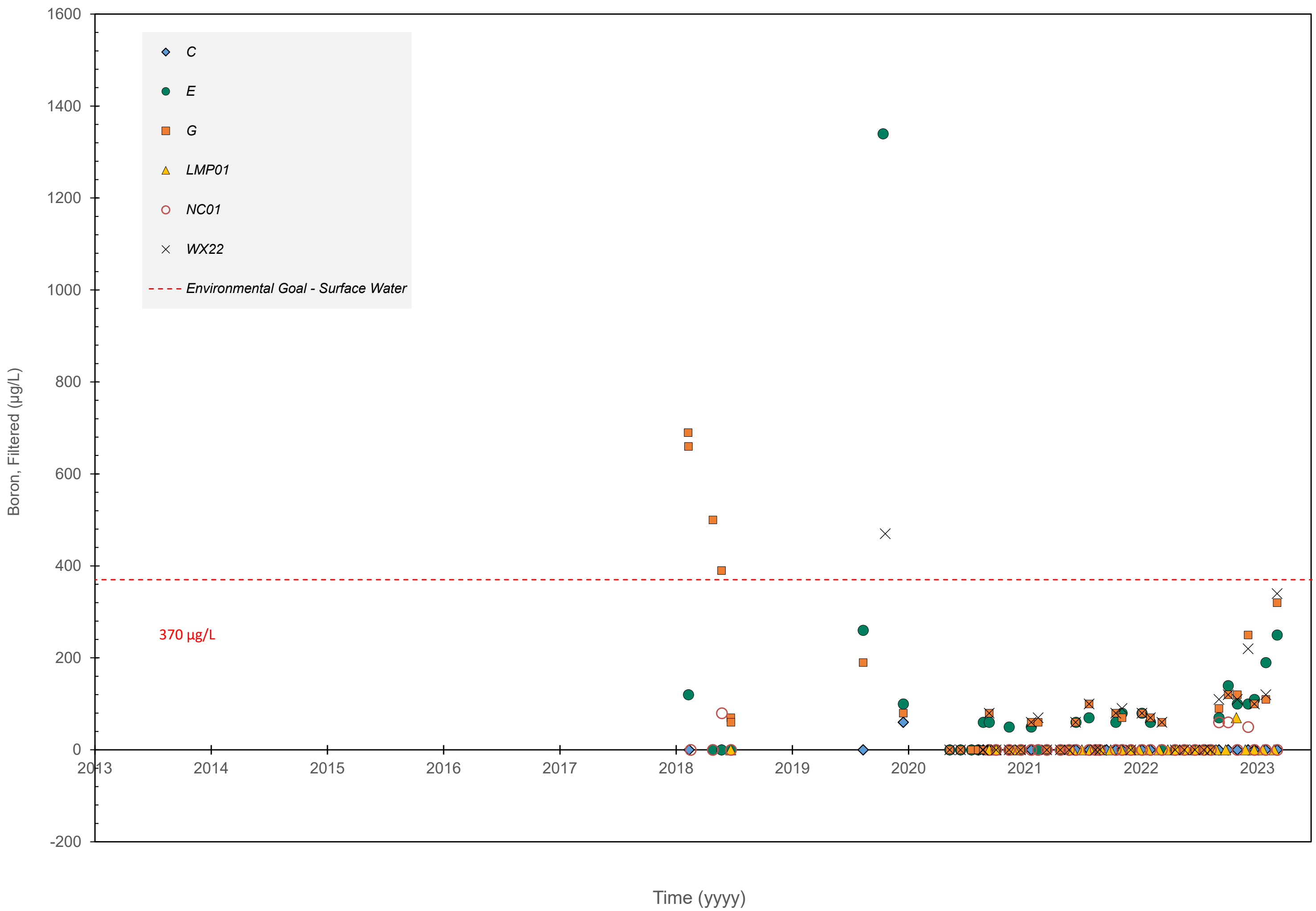

C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
17 µg/L
Nickel, Total (µg/L)
Time (yyyy)
0
200
400
600
800
1000
1200
1400
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
17 µg/L
Nickel, Filtered (µg/L)
Time (yyyy)
0
200
400
600
800
1000
1200
1400
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

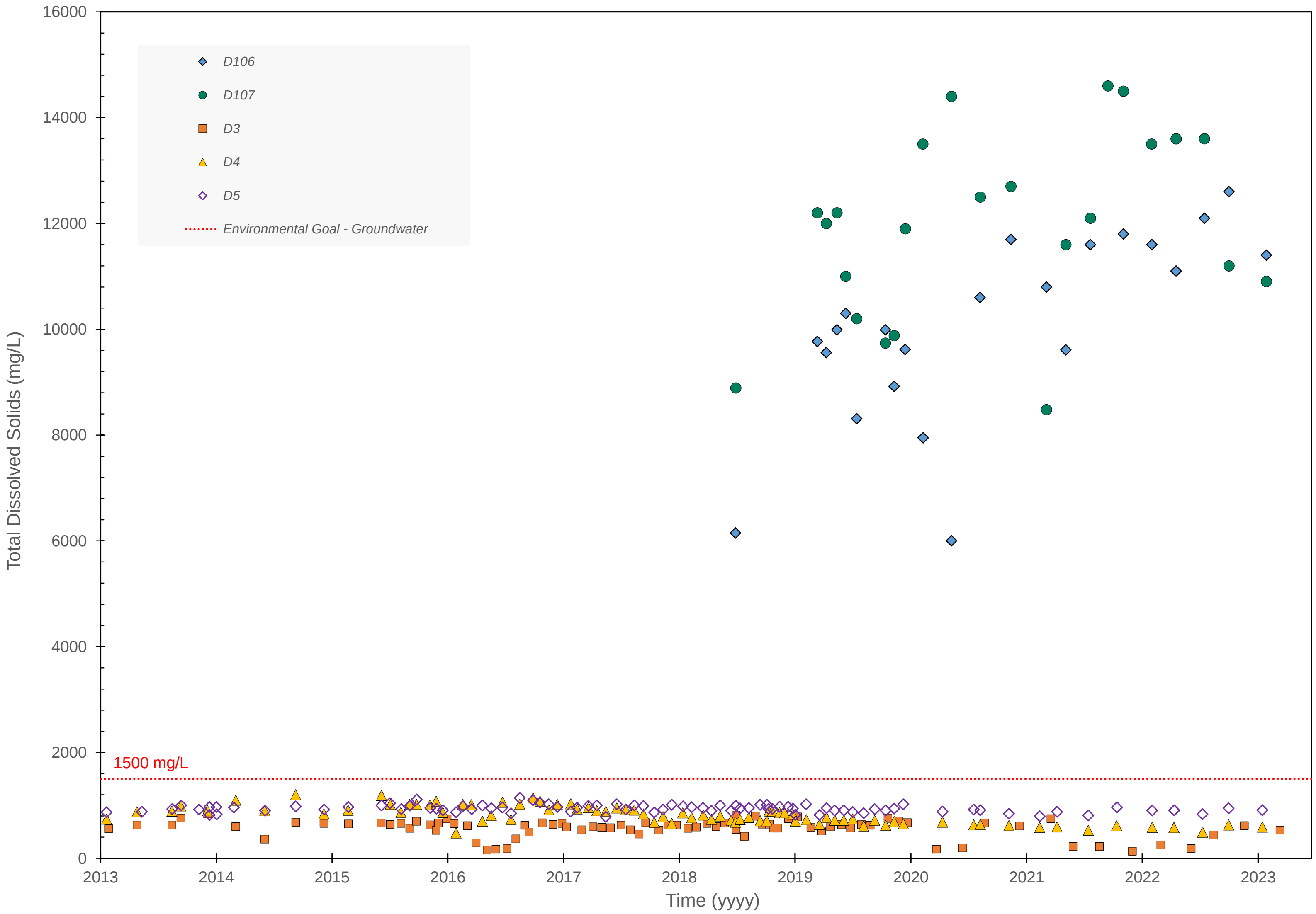

C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
1900 µg/L
25000
20000
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Manganese, Total (µg/L)
Time (yyyy)

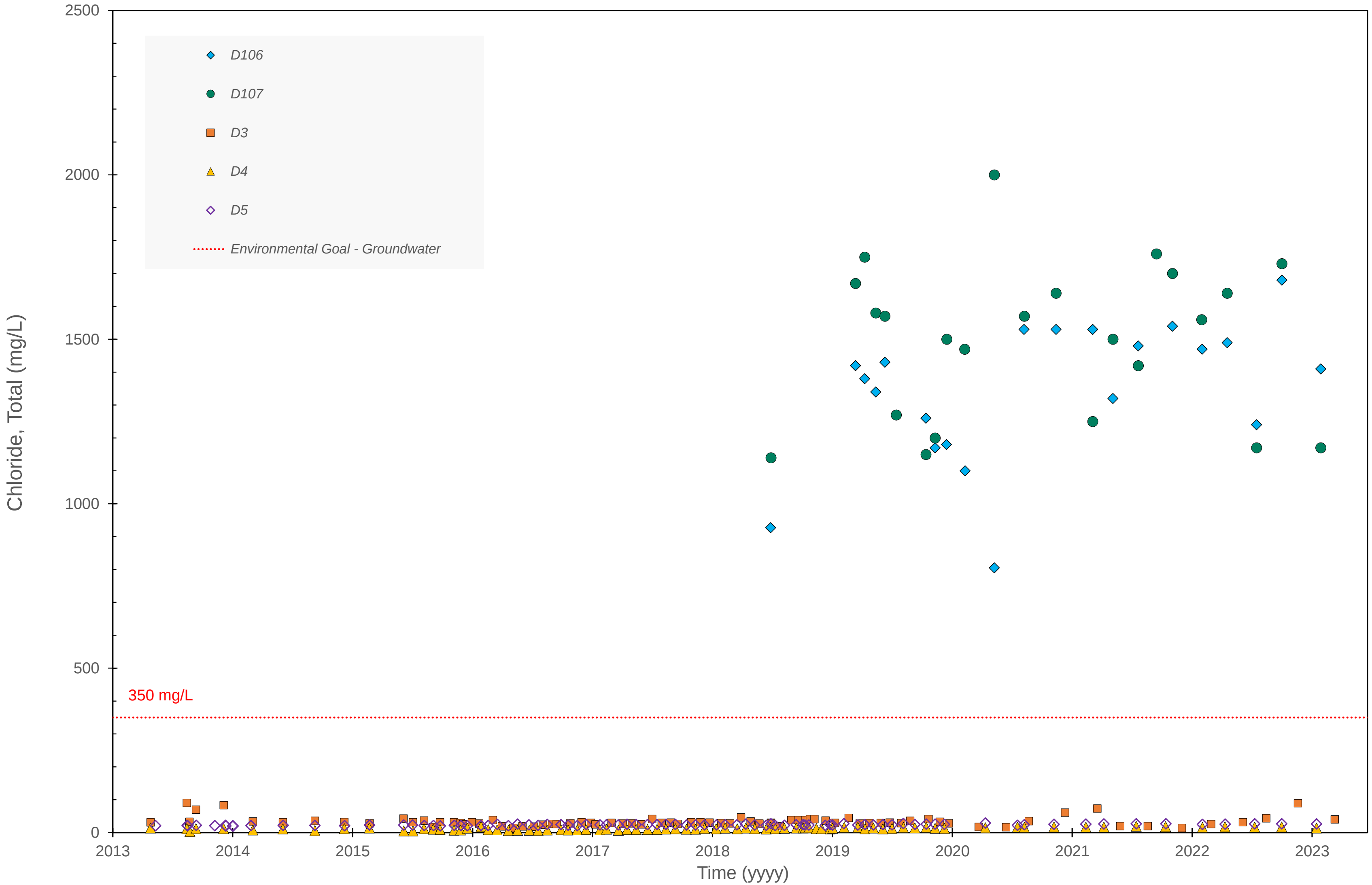

25000
20000
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Manganese, Filtered (µg/L)
Time (yyyy)
C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
1900 µg/L

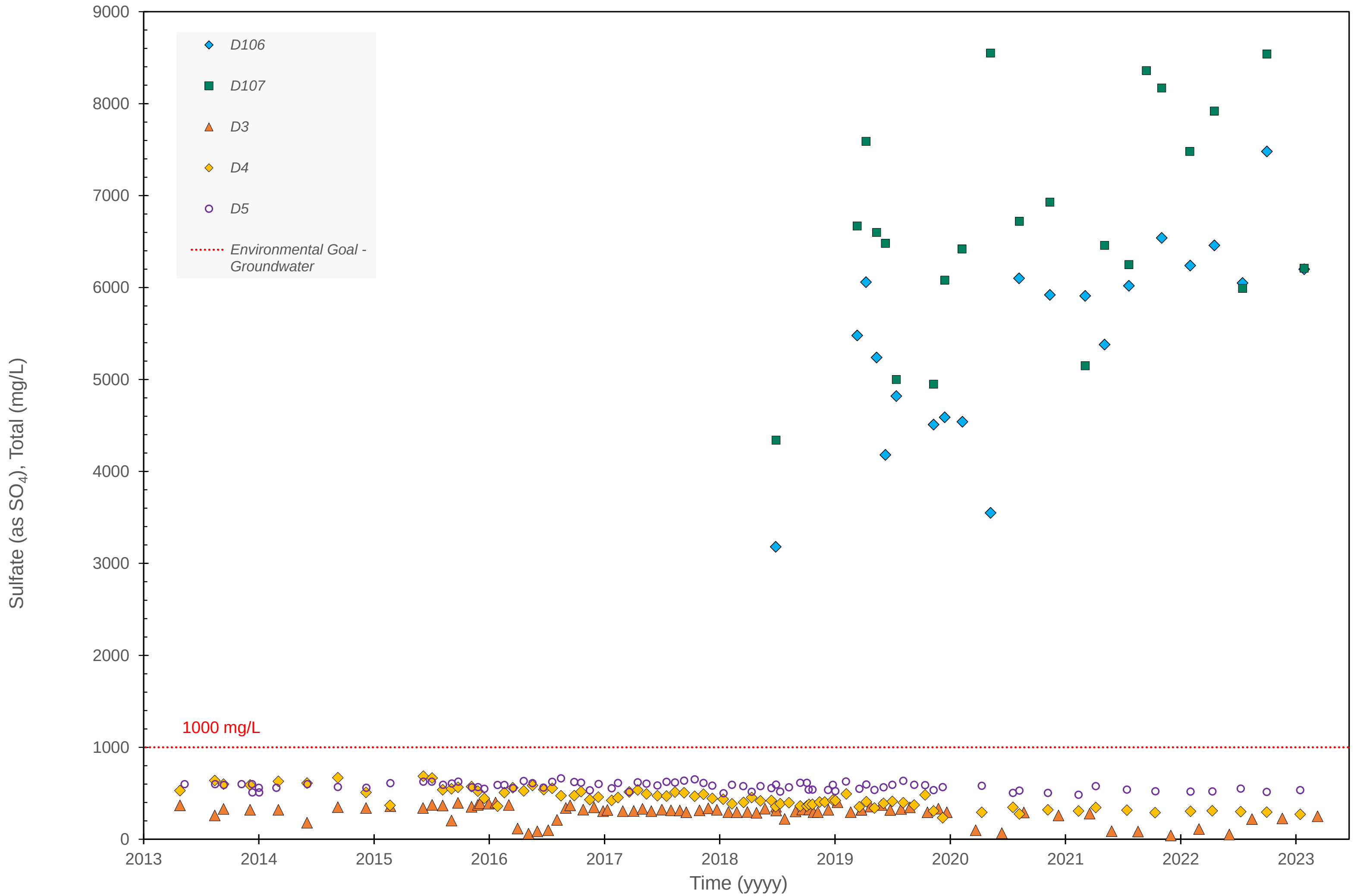

1600
1400
1200
1000
800
600
400
200
0
Boron, Total (µg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
370 µg/L

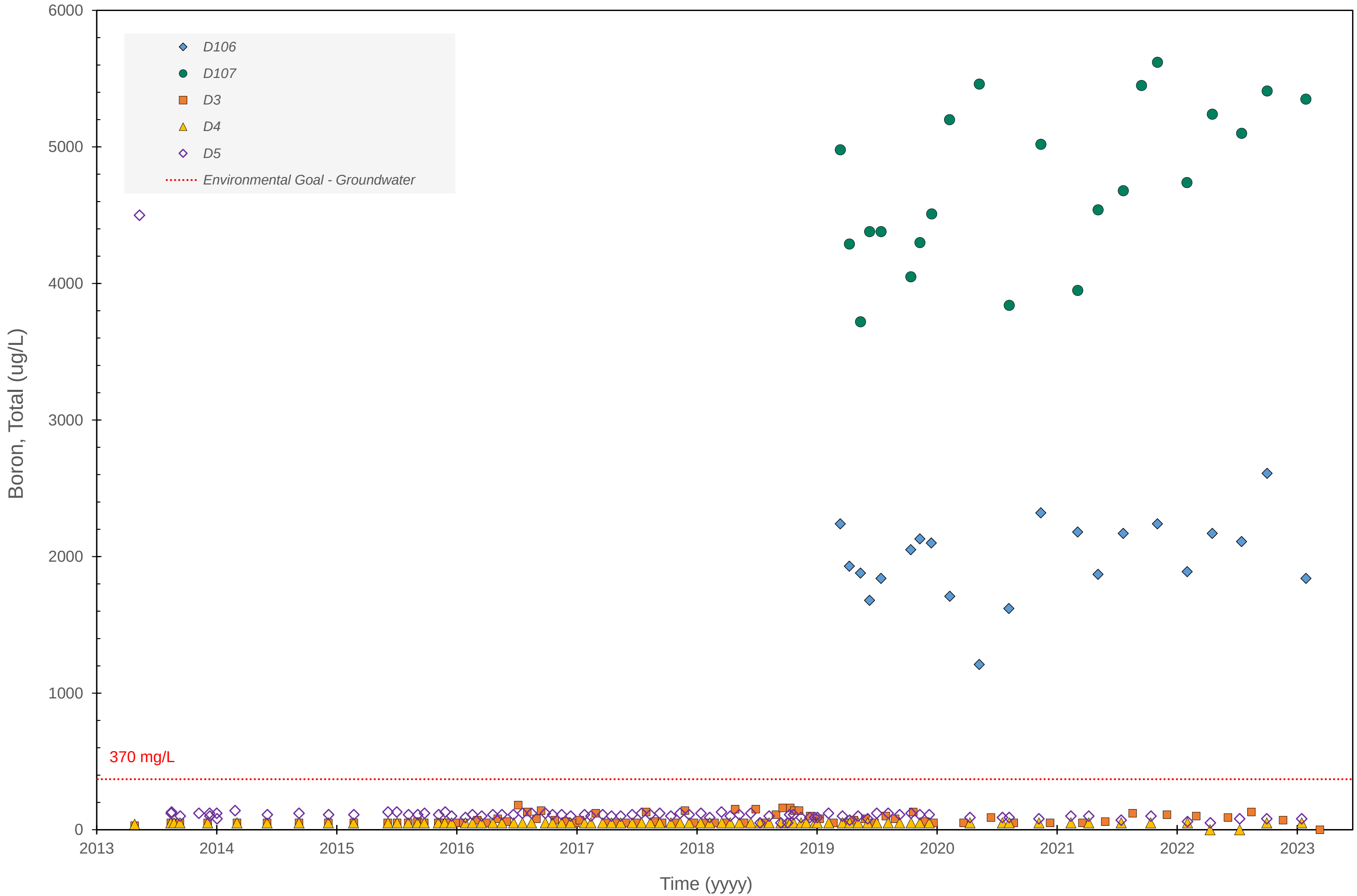

C
E
G
LMP01
NC01
WX22
Environmental Goal - Surface Water
370 µg/L
Boron, Filtered (µg/L)
1600
1400
1200
1000
800
600
400
200
0
-200
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

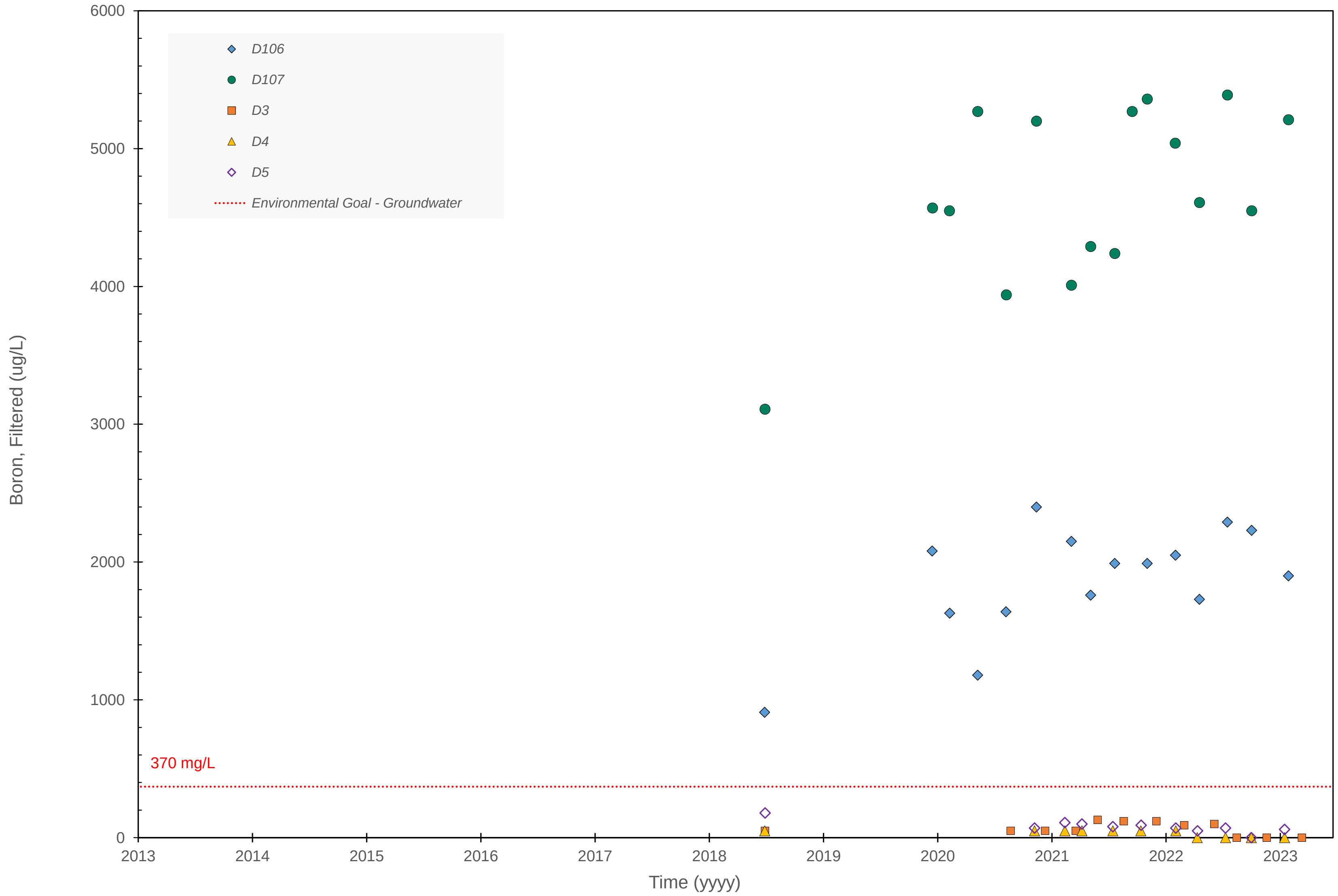
APPENDIX K GROUNDWATER TRENDS

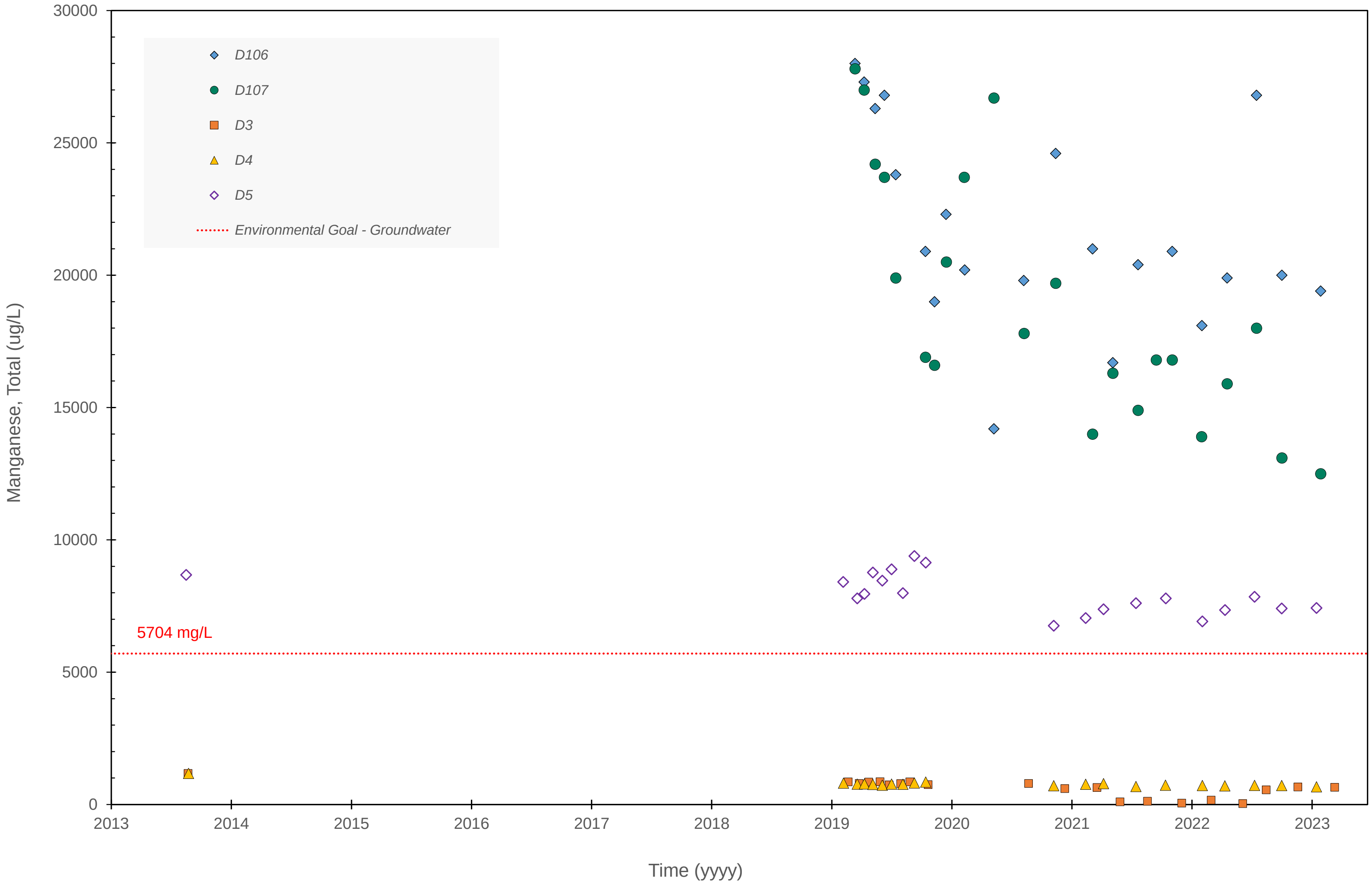

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
1500 mg/L
Total Dissolved Solids (mg/L)
0
2000
4000
6000
8000
10000
12000
14000
16000
Time (yyyy)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

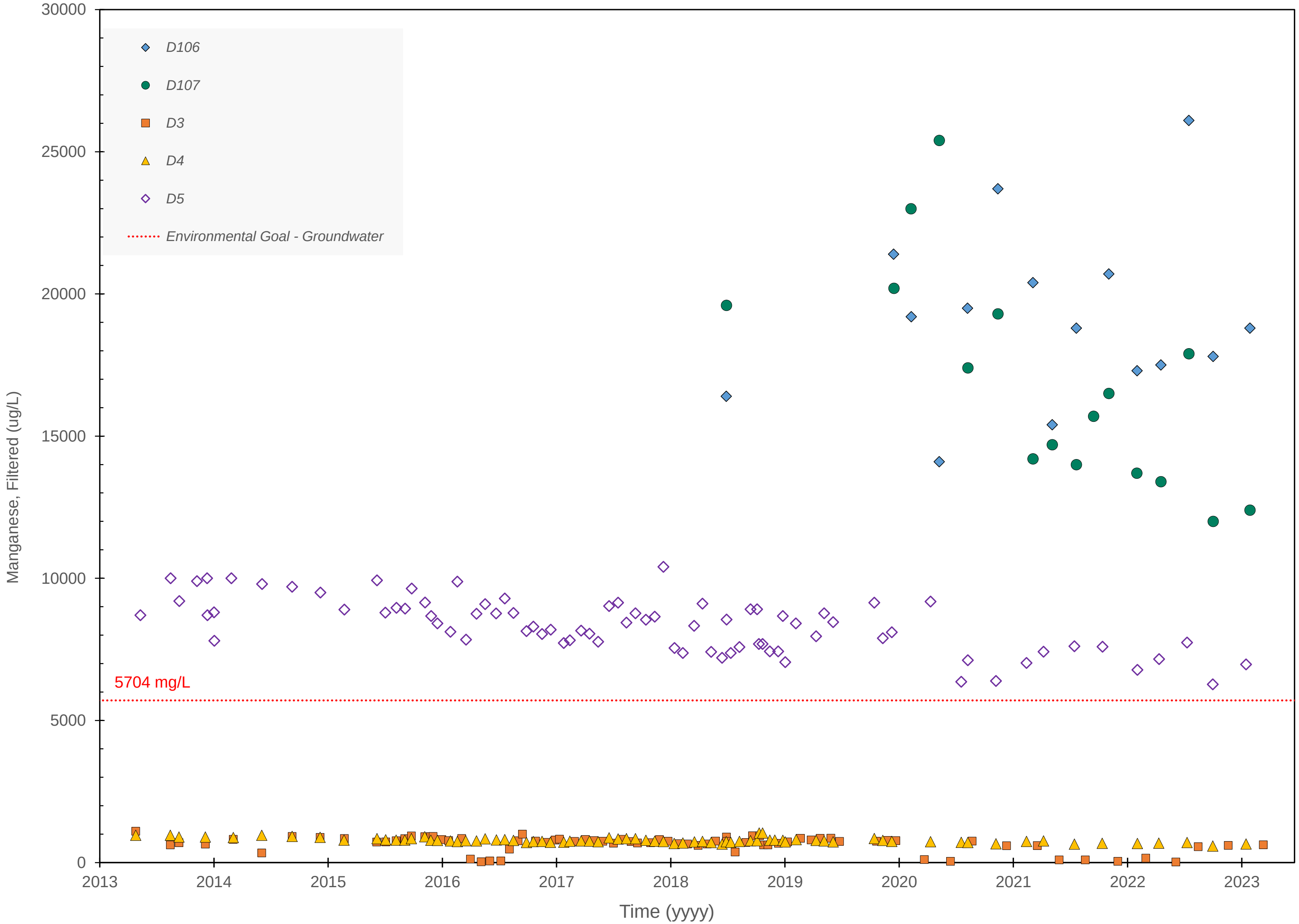

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
350 mg/L
Chloride, Total (mg/L)
0
500
1000
1500
2000
2500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

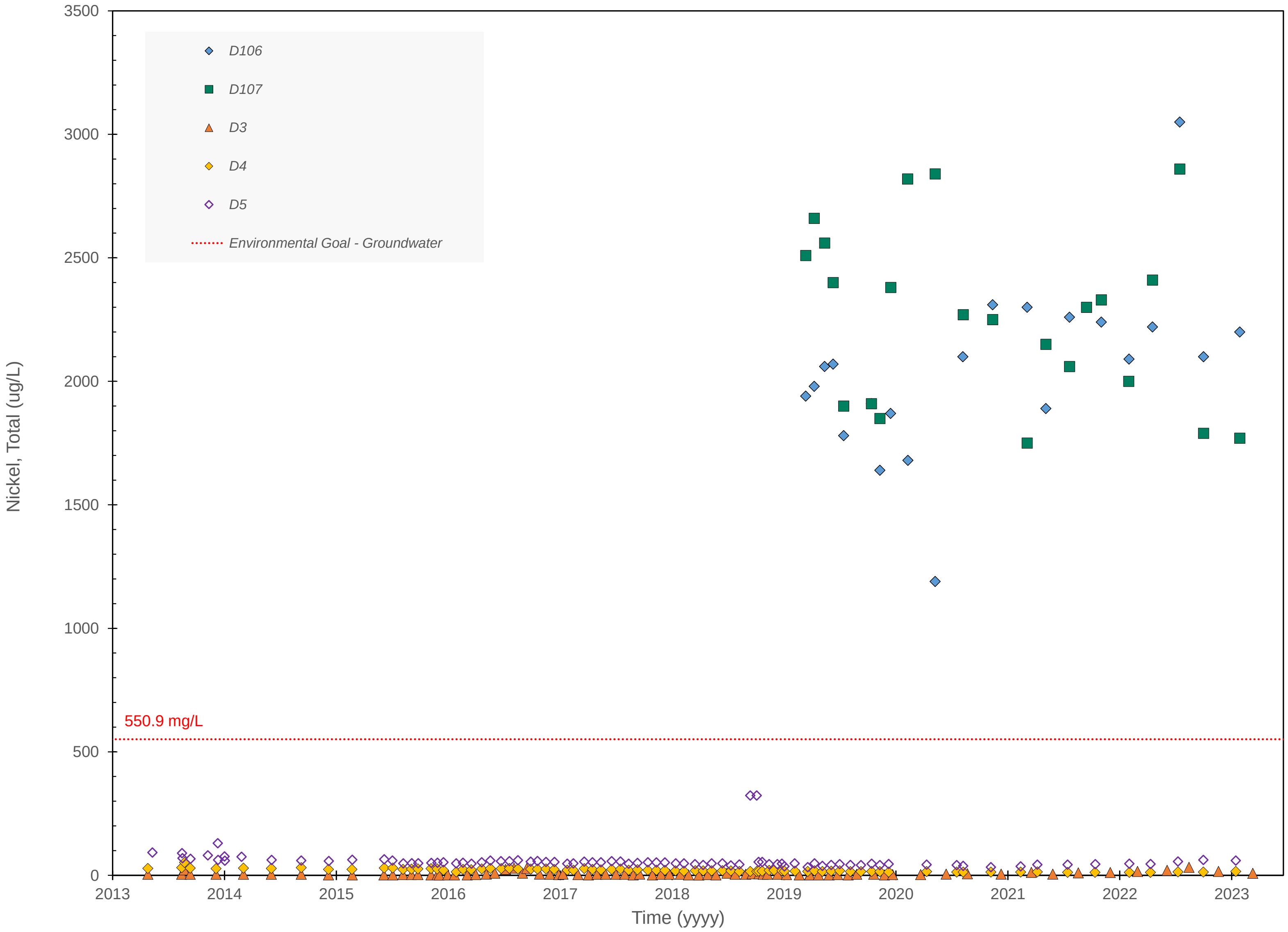

9000
8000
7000
6000
5000
4000
3000
2000
1000
0
D106
D107
D3
D4
D5
Environmental Goal - Groundwater
1000 mg/L
Sulfate (as SO4), Total (mg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

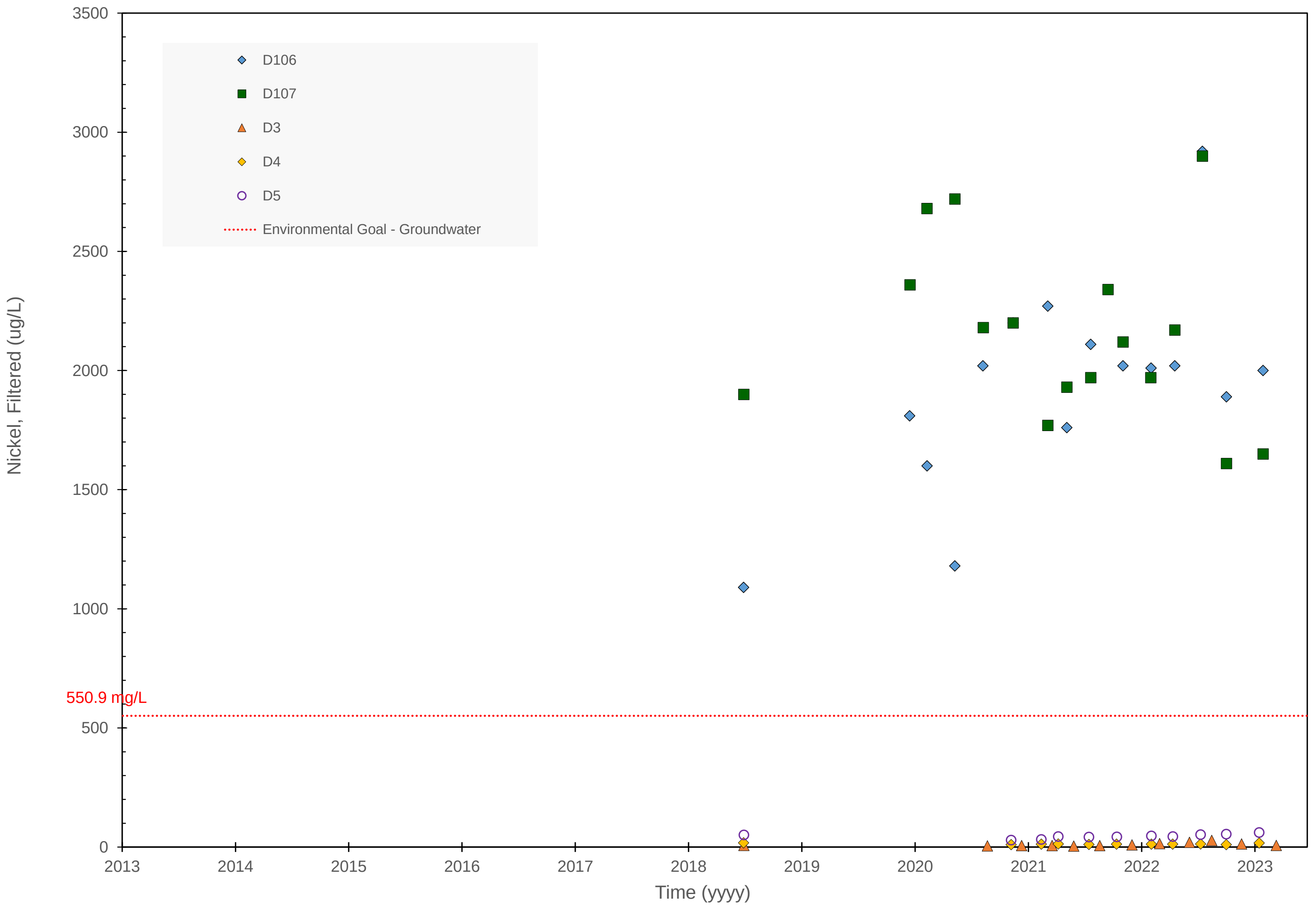

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
370 mg/L
Boron, Total (ug/L)
Time (yyyy)
0
1000
2000
3000
4000
5000
6000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

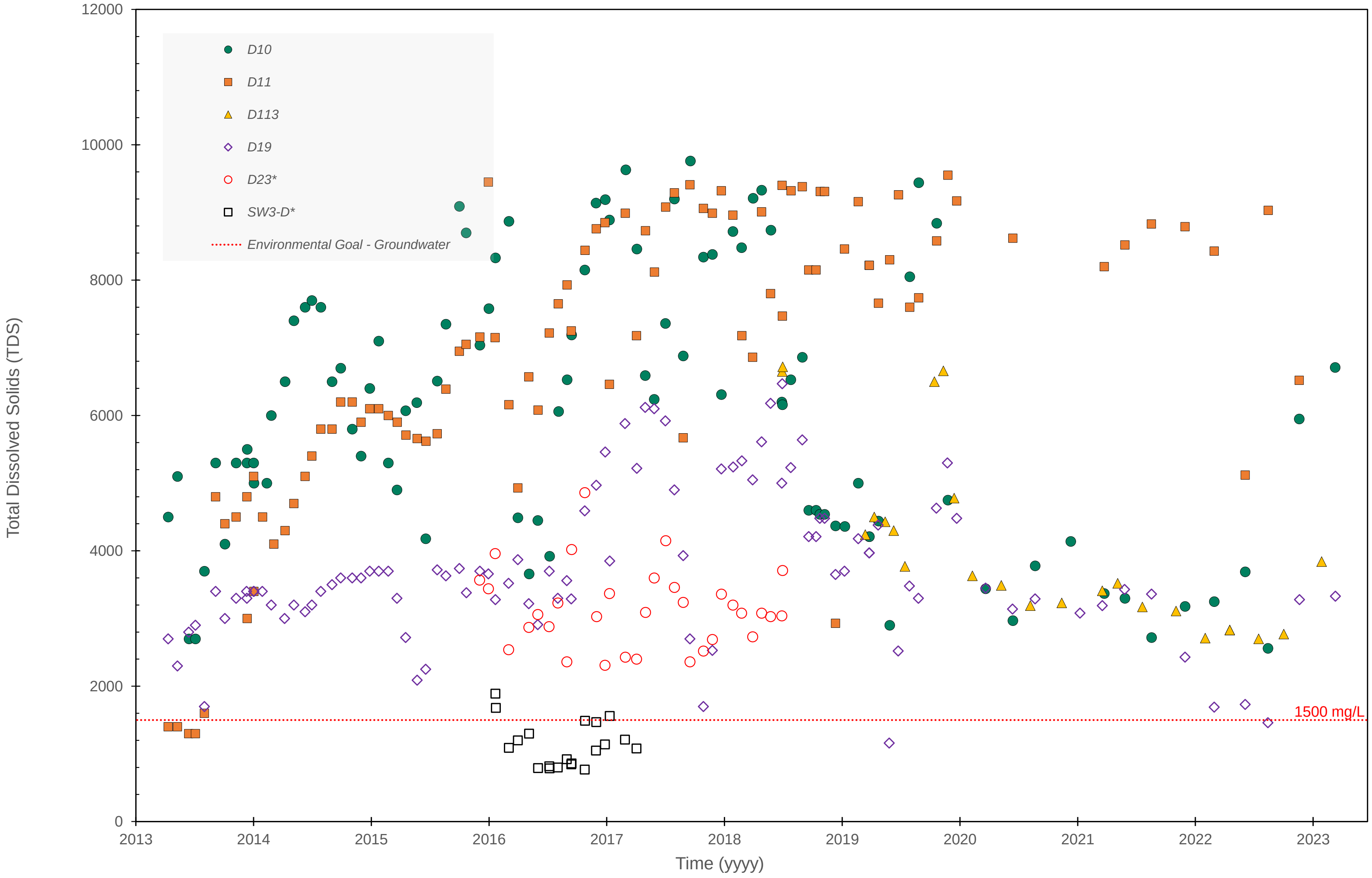

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
370 mg/L
Boron, Filtered (ug/L)
Time (yyyy)
0
1000
2000
3000
4000
5000
6000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


30000
25000
20000
15000
10000
5000
0
Manganese, Total (ug/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
D106
D107
D3
D4
D5
Environmental Goal - Groundwater
5704 mg/L

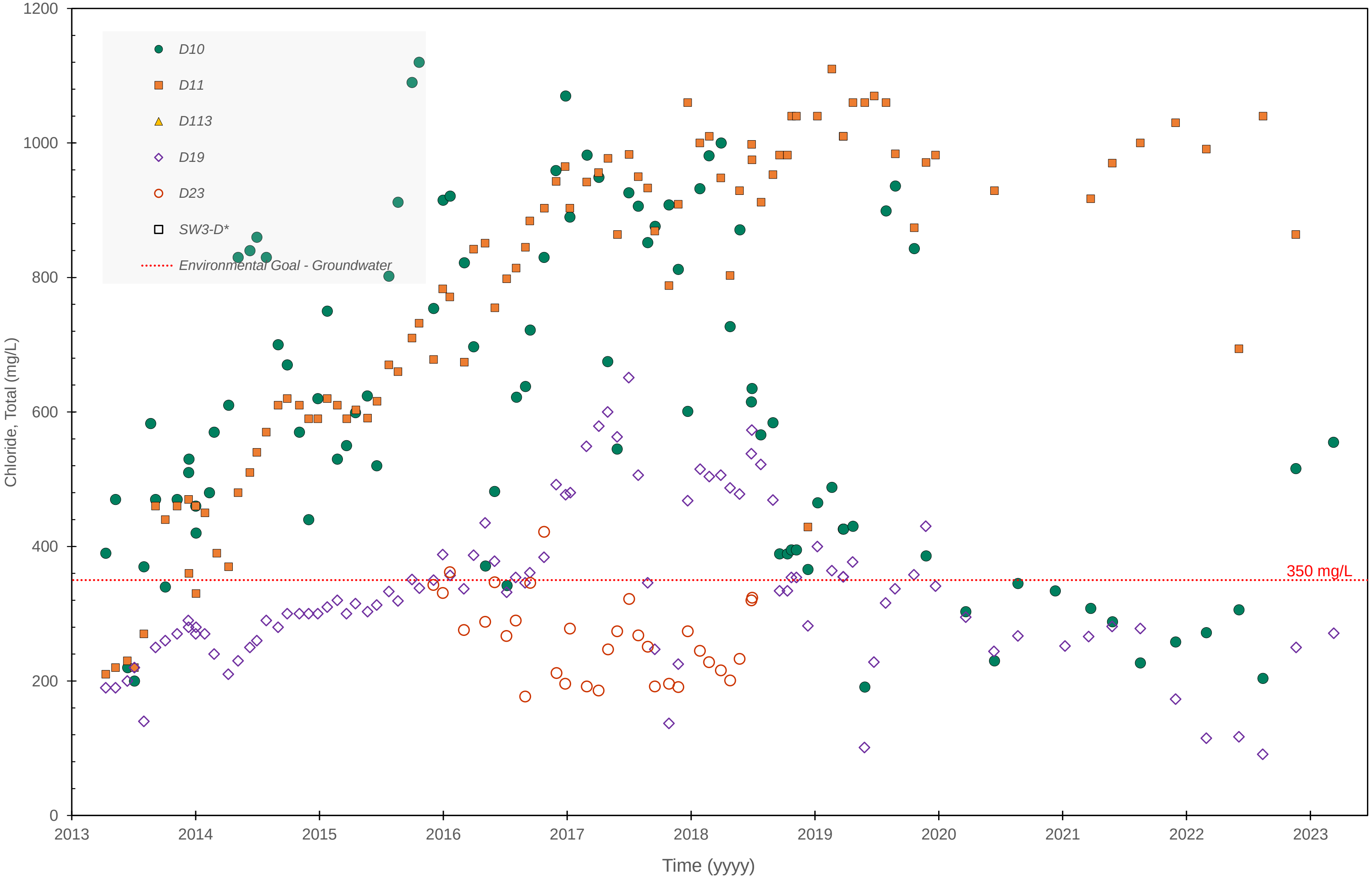

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
5704 mg/L
Manganese, Filtered (ug/L)
30000
25000
20000
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)


D106
D107
D3
D4
D5
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Total (ug/L)
0
500
1000
1500
2000
2500
3000
3500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

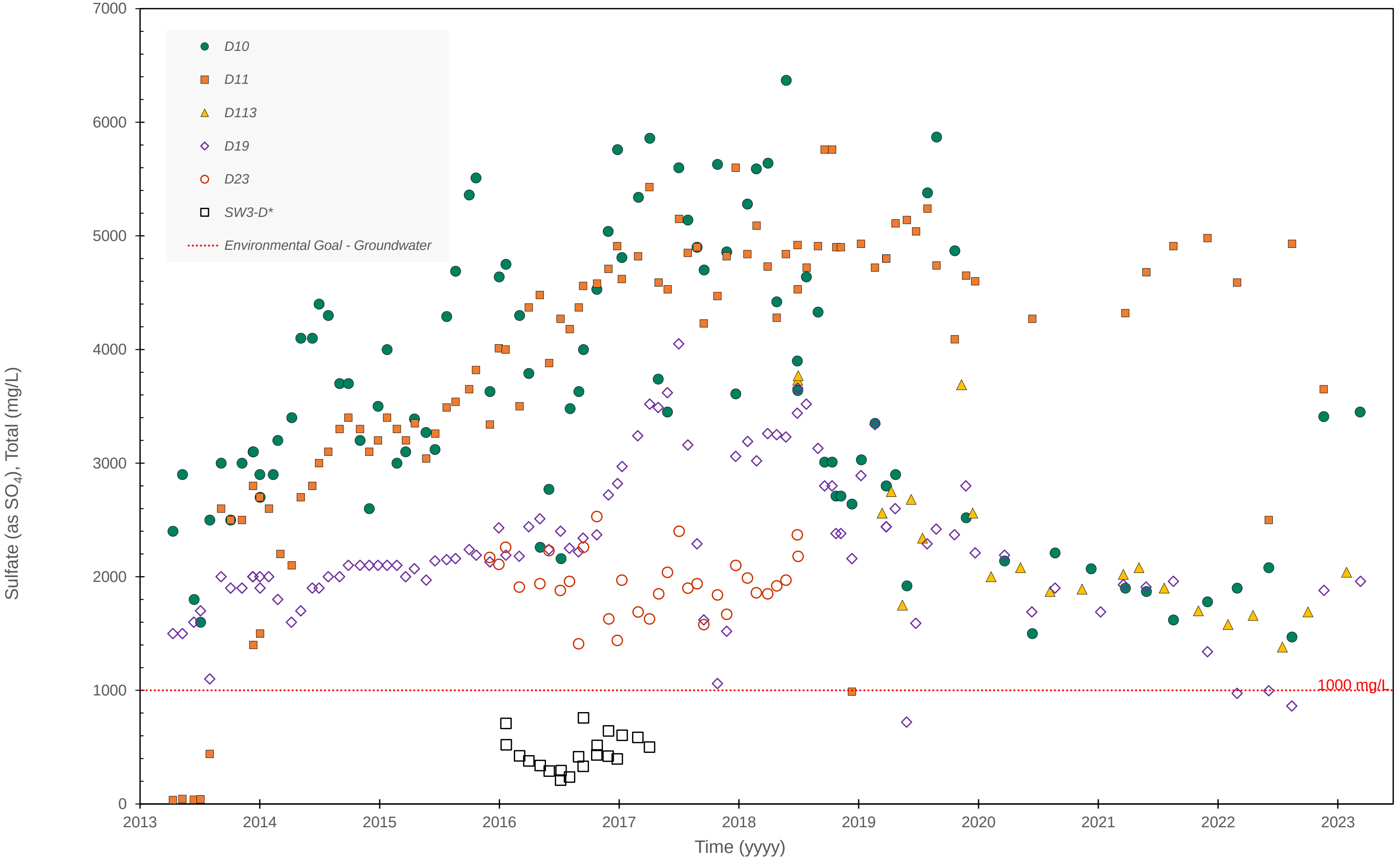

D106
D107
D3
D4
D5
Environmental Goal - Groundwater
3500
3000
2500
2000
1500
1000
500
0
550.9 mg/L
Nickel, Filtered (ug/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)



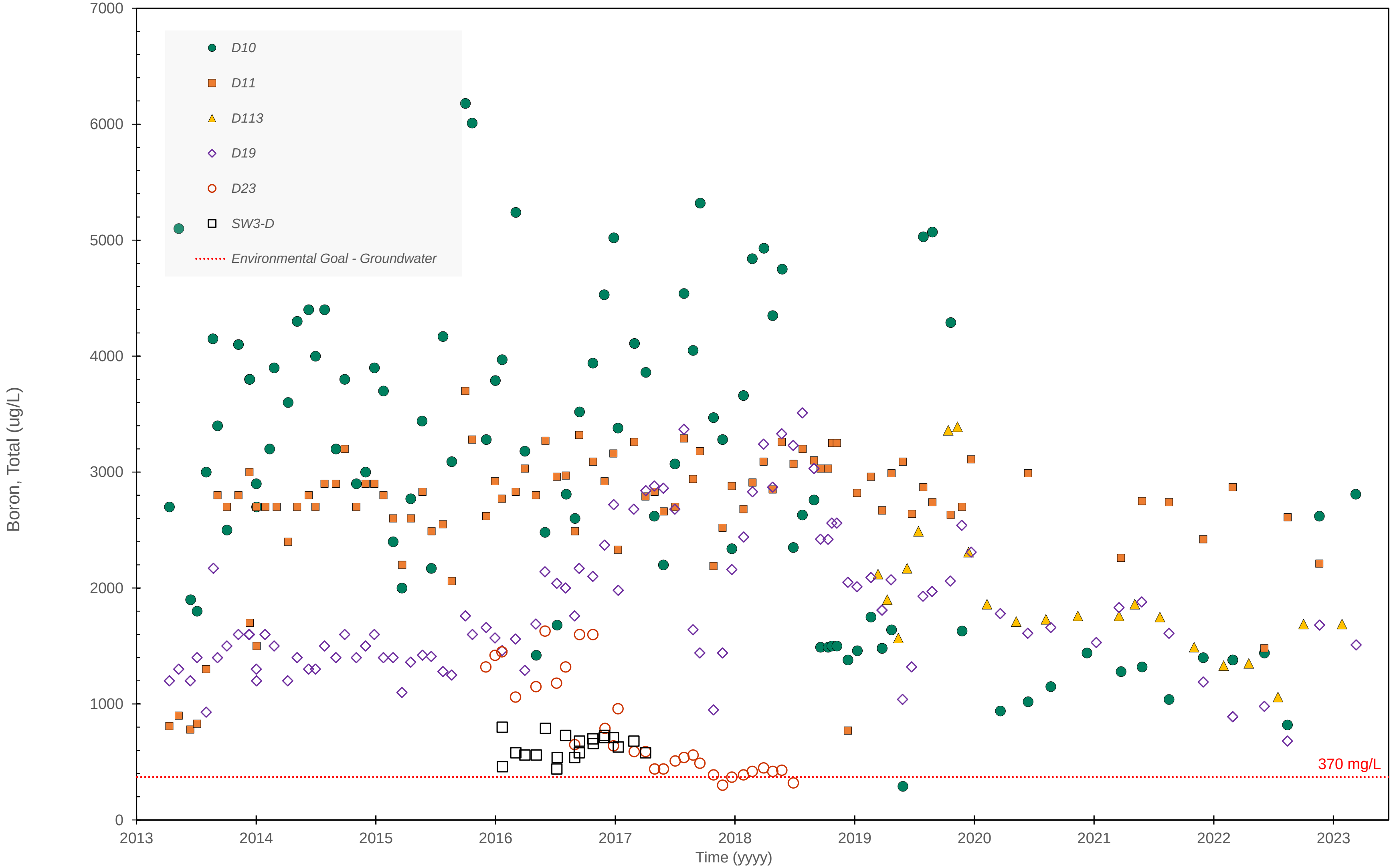
*Data for B5 and SWD-3 has not been supplied by EnergyAustralia since 2017 due to wells reported as either blocked or dry.



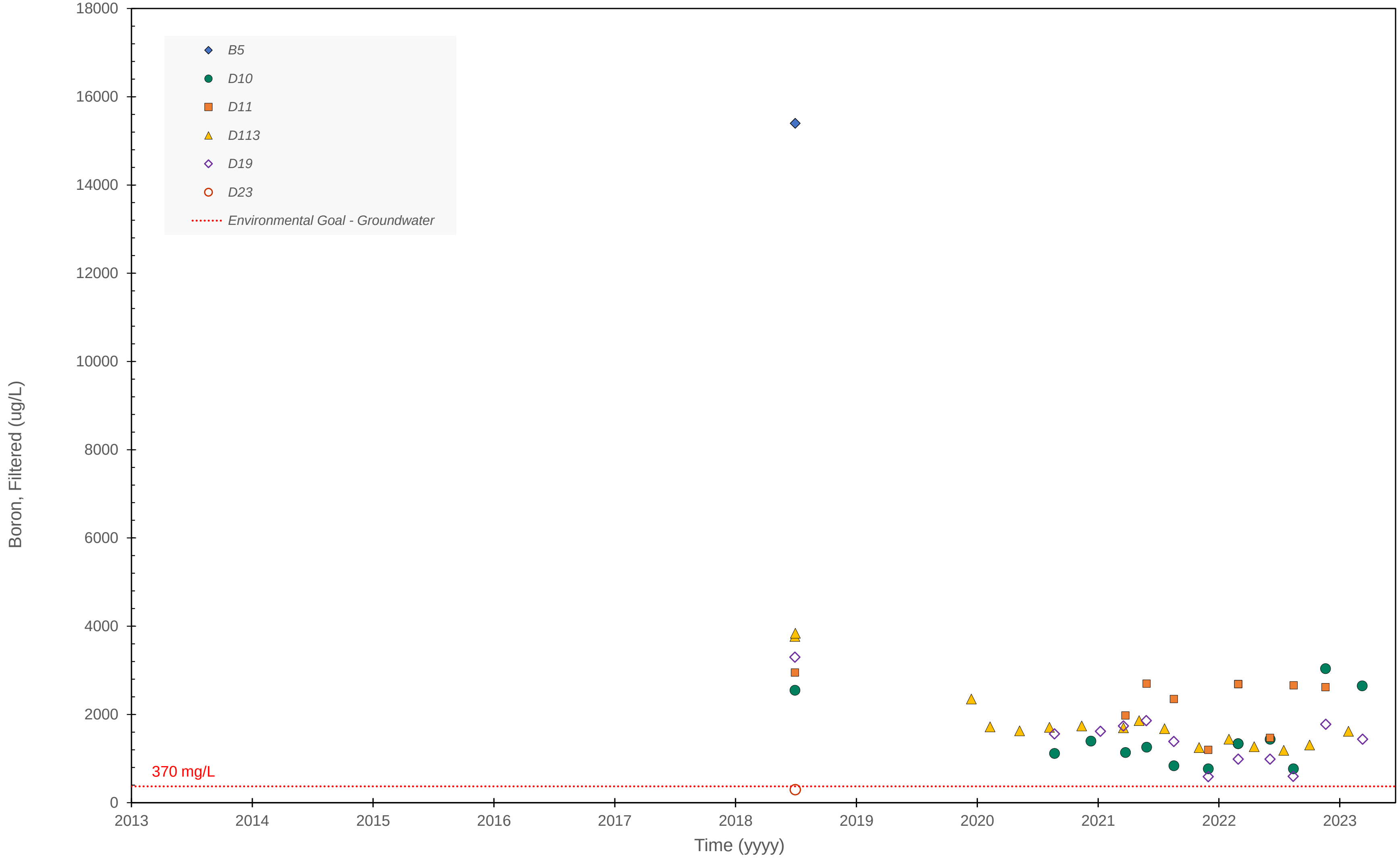
*Data for B5 and SWD-3 has not been supplied by EnergyAustralia since 2017 due to wells reported as either blocked or dry.



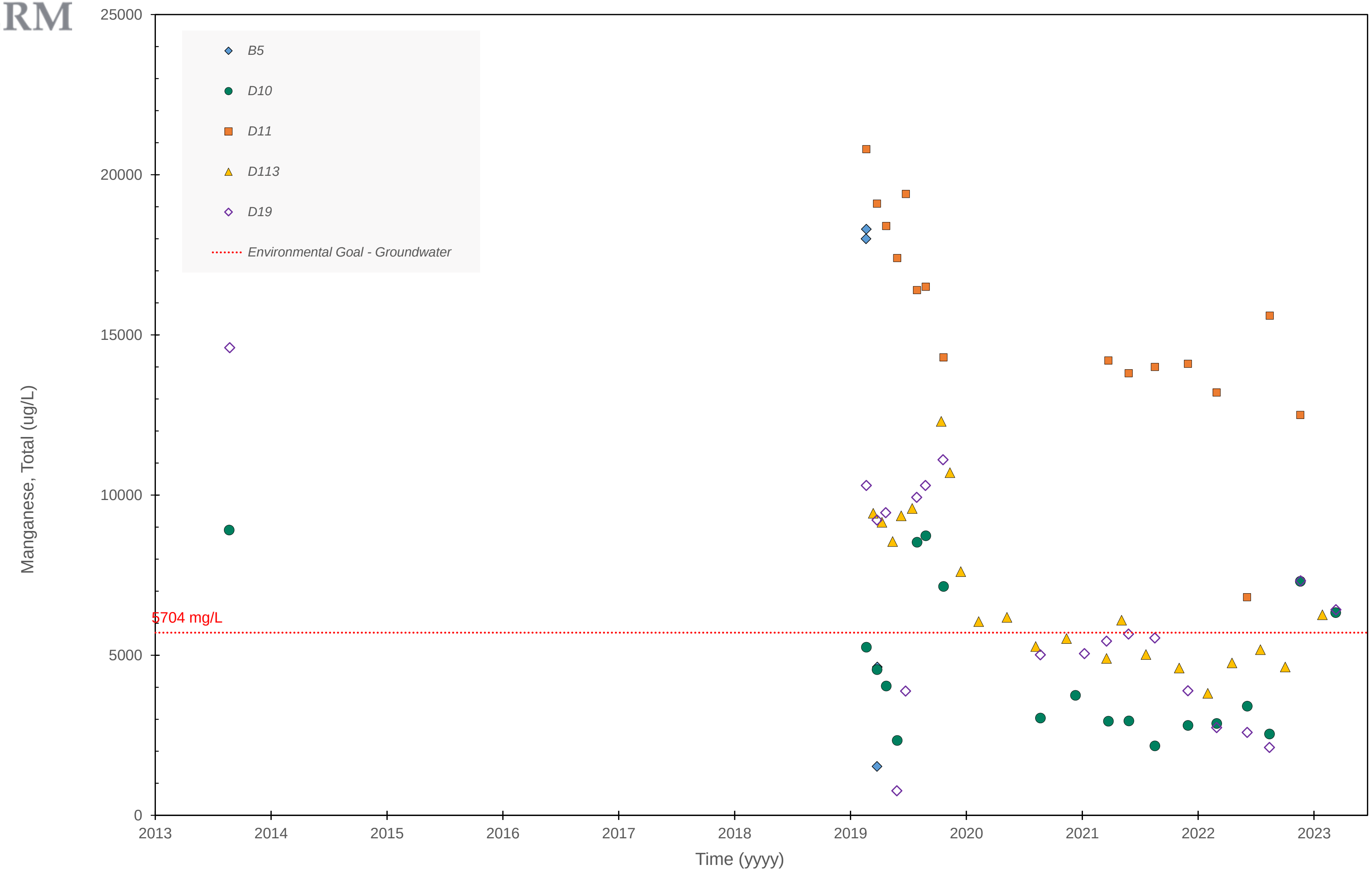
*Data for B5 and SWD-3 has not been supplied by EnergyAustralia since 2017 due to wells reported as either blocked or dry.

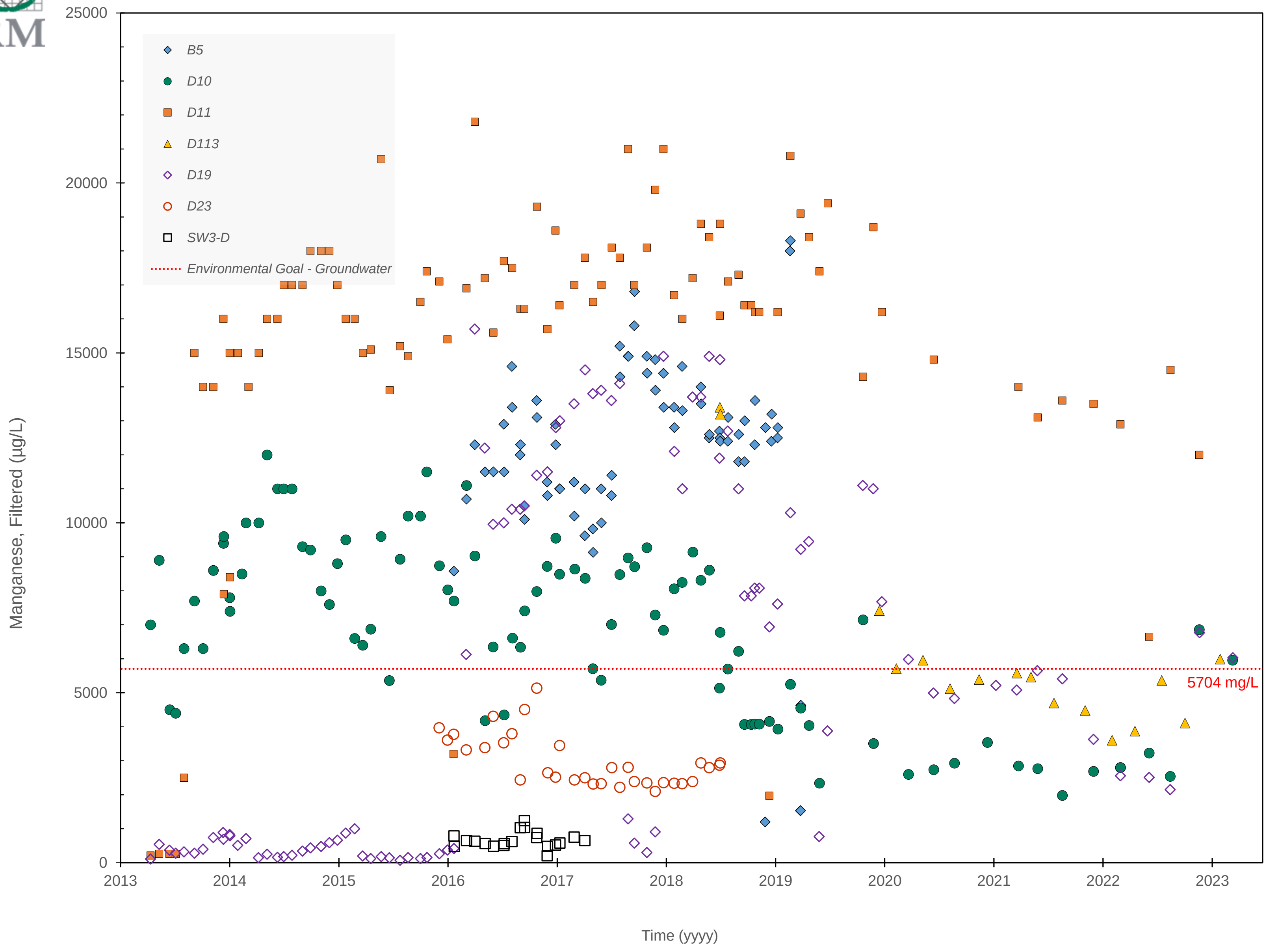


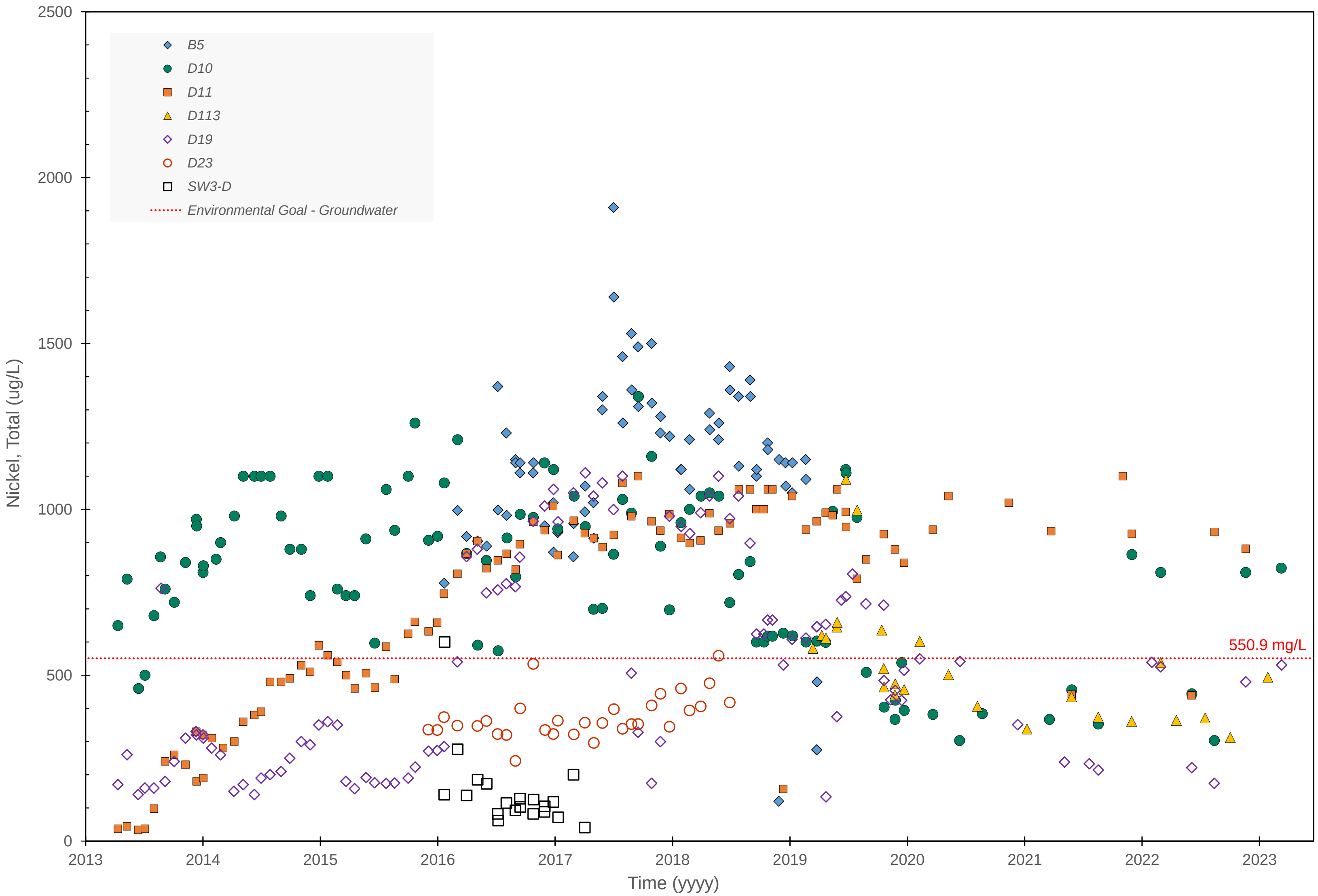
*Data for B5 and SWD-3 has not been supplied by EnergyAustralia since 2017 due to wells reported as either blocked or dry.

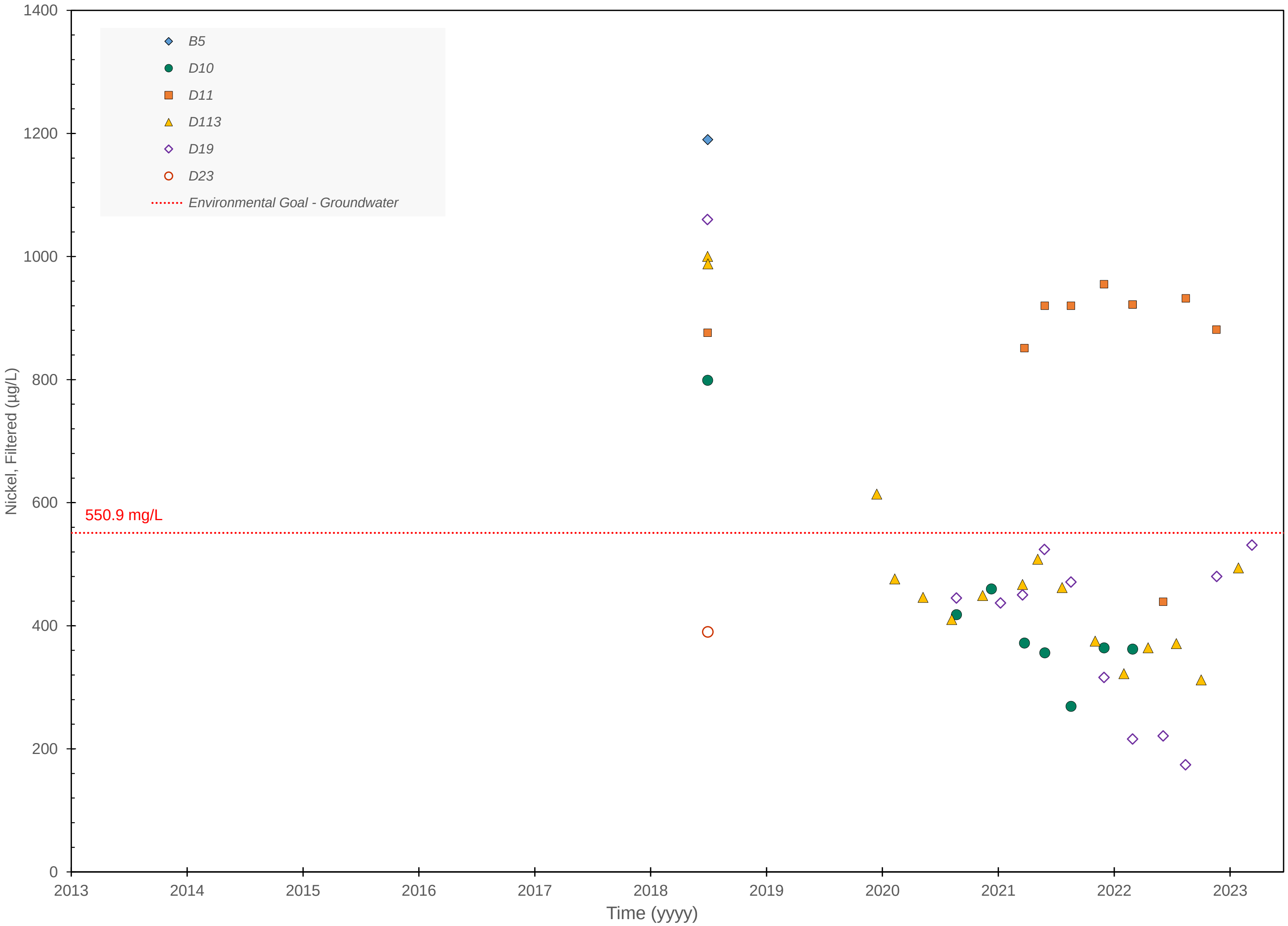


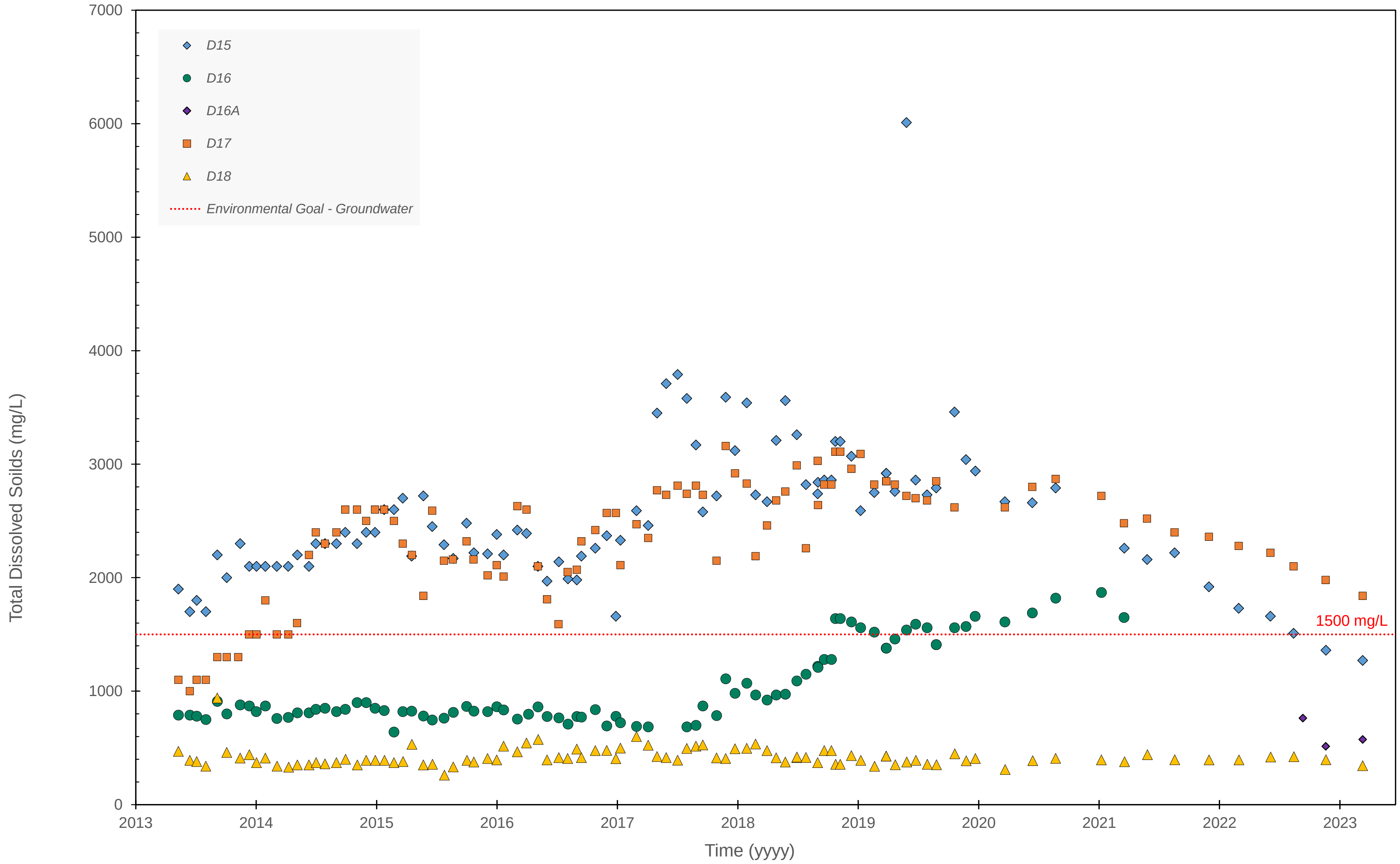
*Data for B5 and SWD-3 has not been supplied by EnergyAustralia since 2017 due to wells reported as either blocked or dry.

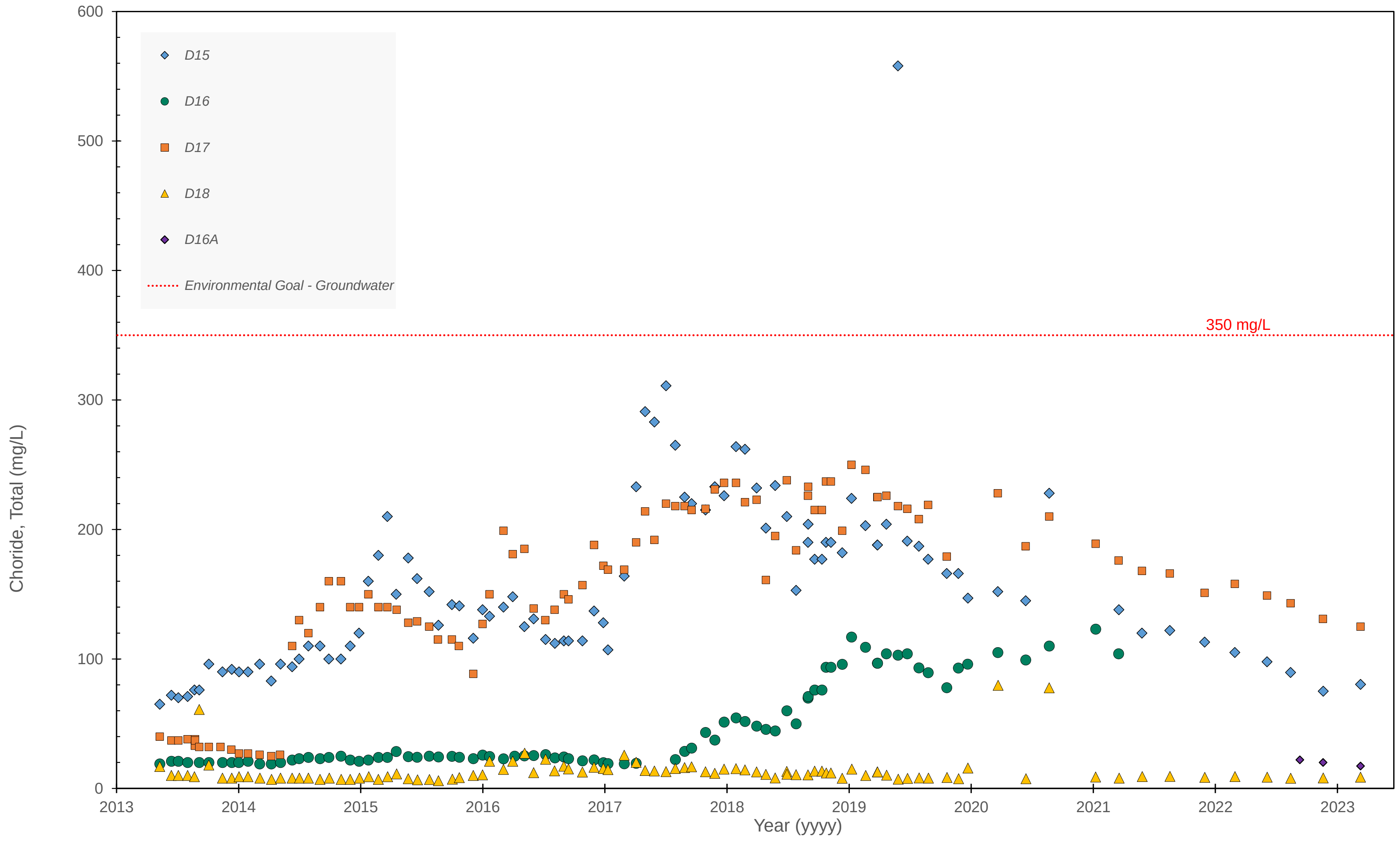

B5
D10
D11
D113
D19
Environmental Goal - Groundwater
5704 mg/L
Manganese, Total (ug/L)
0
5000
10000
15000
20000
25000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

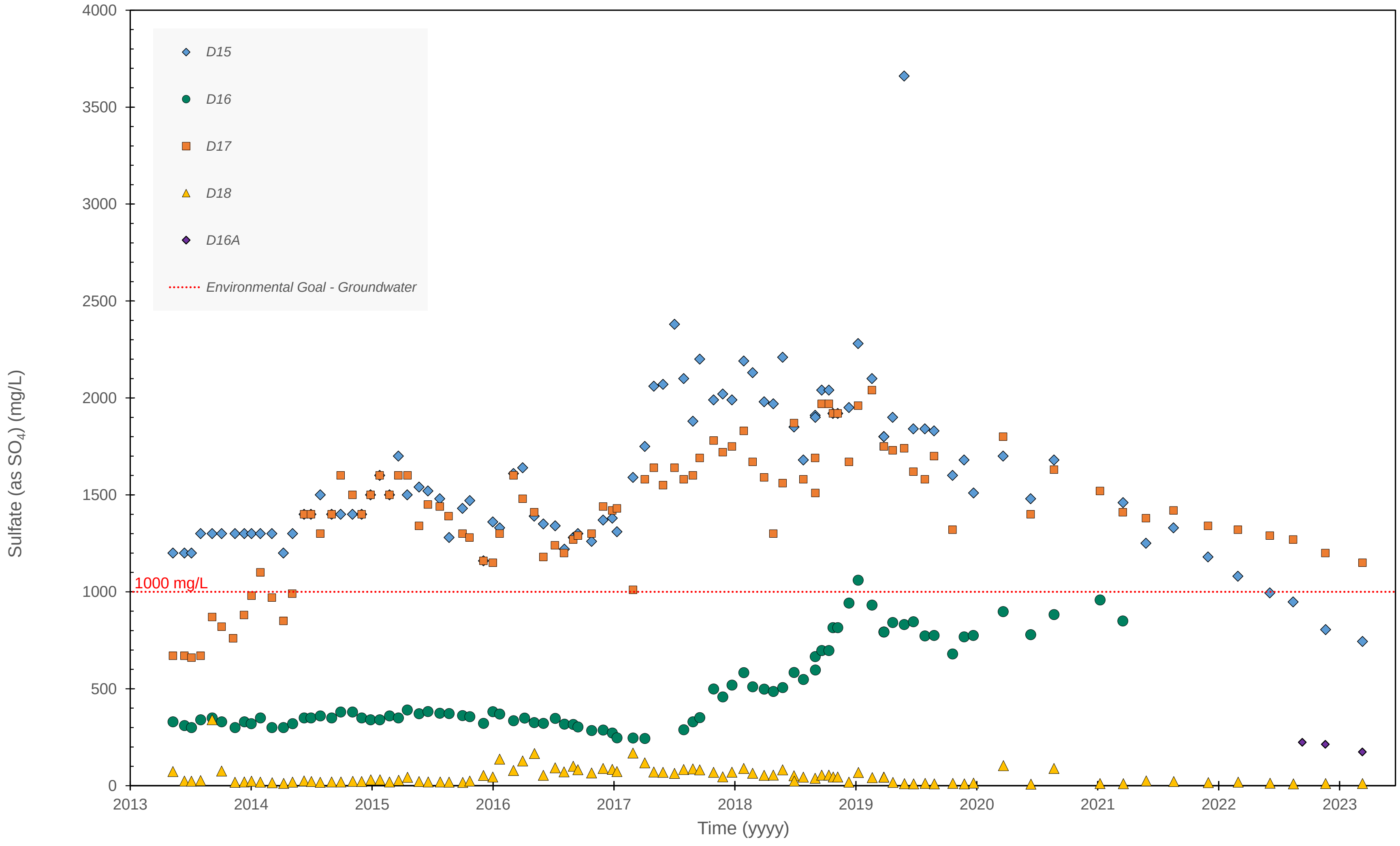

Manganese, Filtered (µg/L)
25000
20000
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
B5
D10
D11
D113
D19
D23
SW3-D
Environmental Goal - Groundwater
5704 mg/L

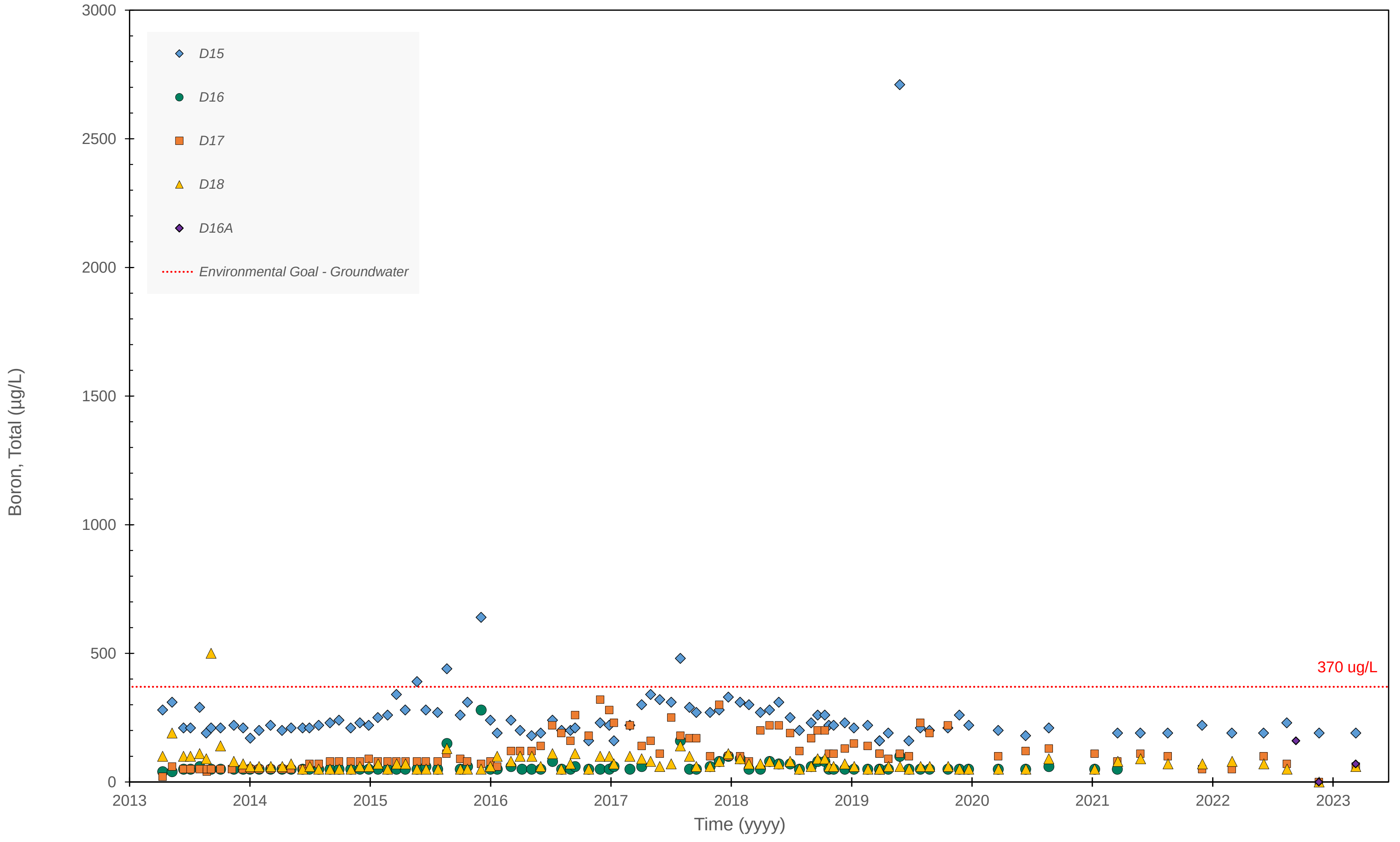

B5
D10
D11
D113
D19
D23
SW3-D
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Total (ug/L)
Time (yyyy)
0
500
1000
1500
2000
2500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

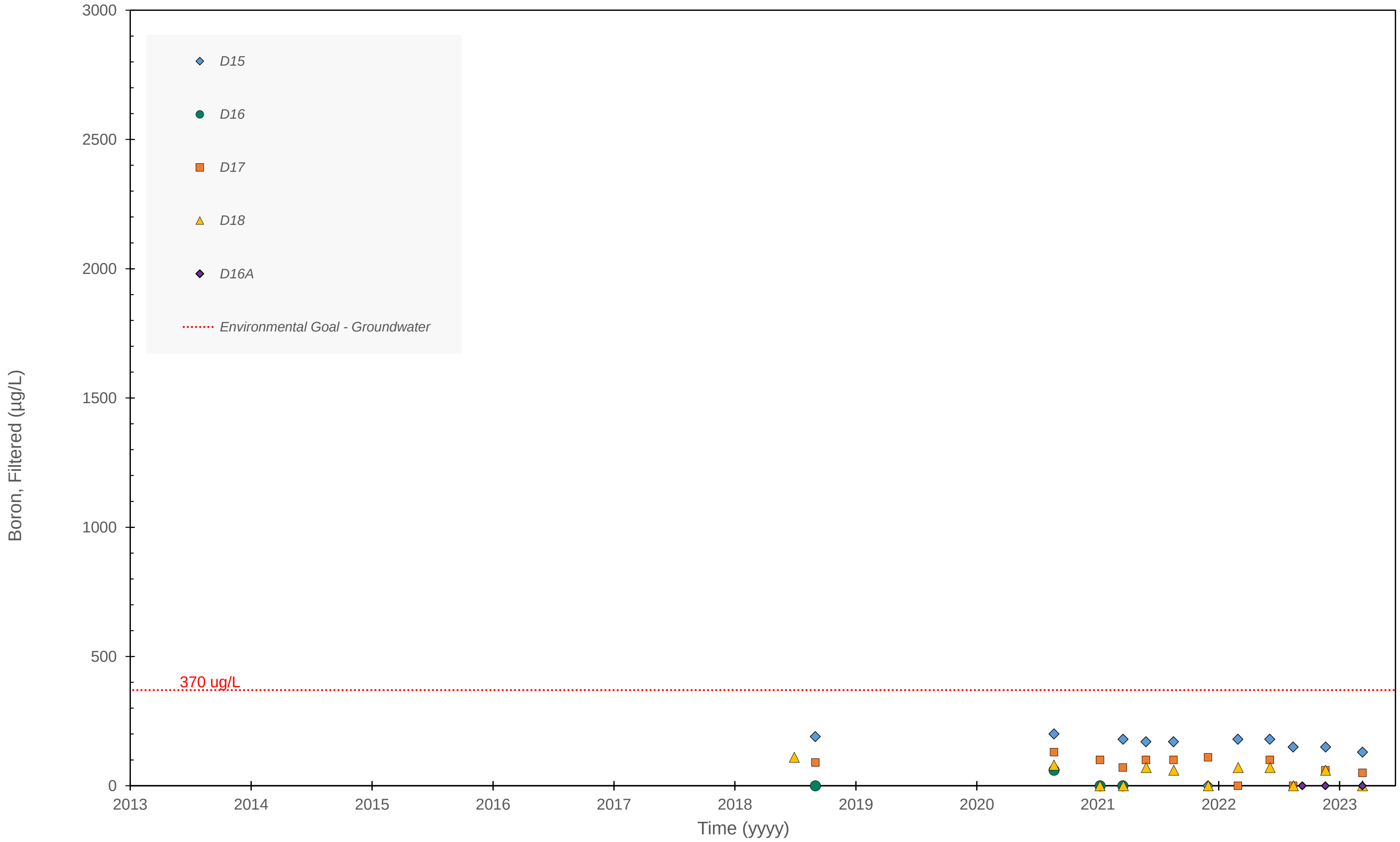

B5
D10
D11
D113
D19
D23
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Filtered (µg/L)
0
200
400
600
800
1000
1200
1400
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

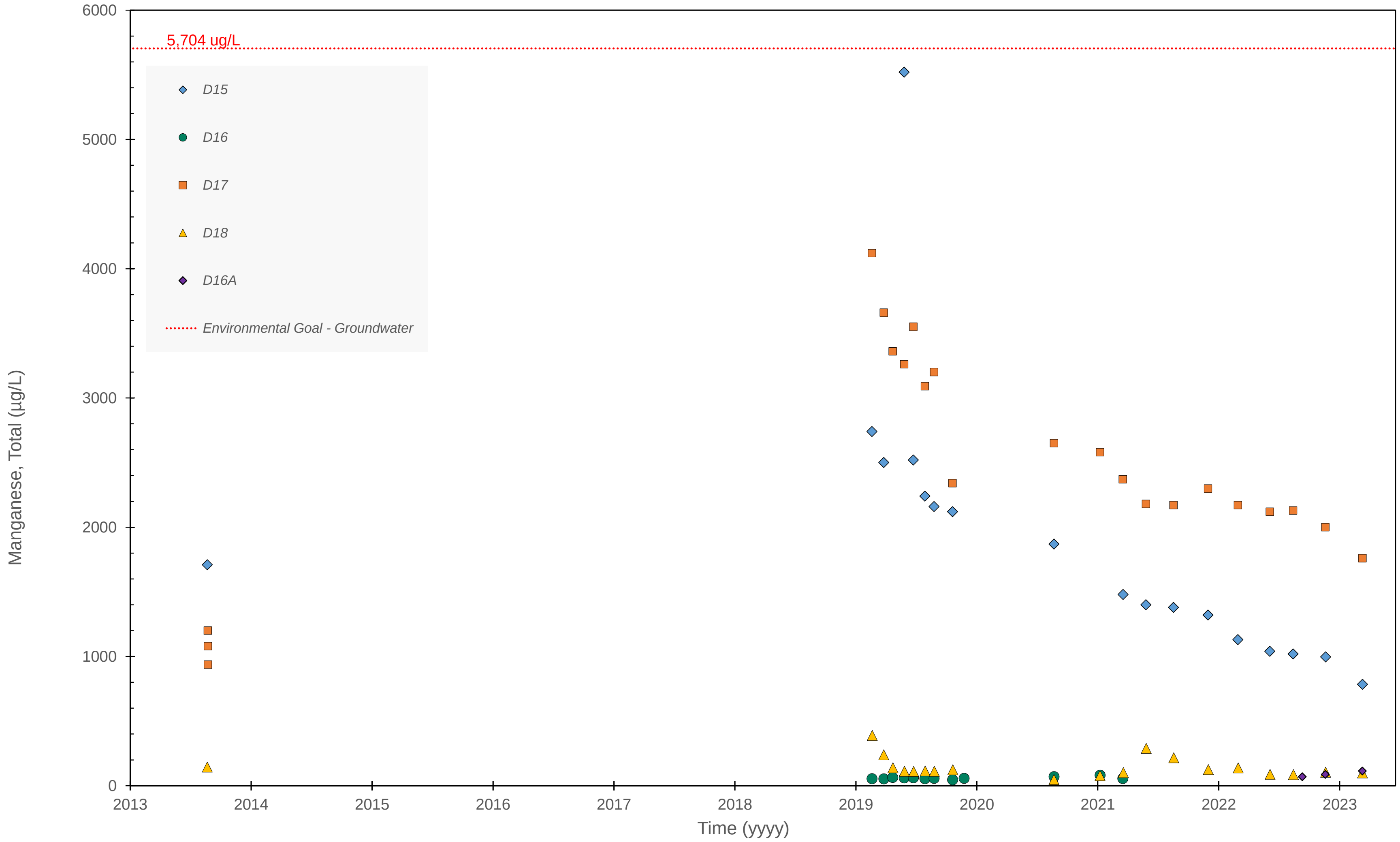

7000
6000
5000
4000
3000
2000
1000
0
Total Dissolved Soilds (mg/L)
D15
D16
D16A
D17
D18
Environmental Goal - Groundwater
1500 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

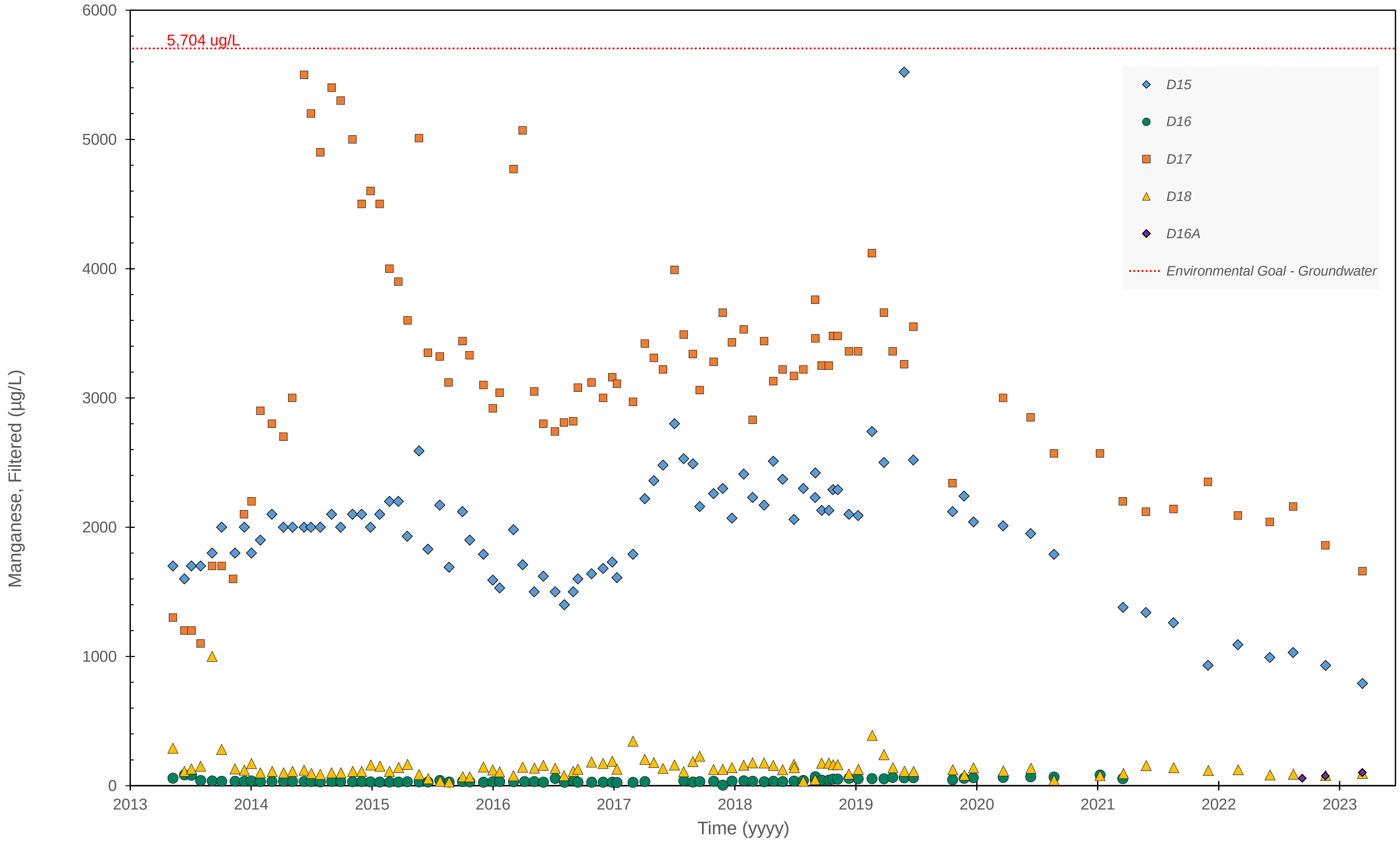

D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
350 mg/L
Choride, Total (mg/L)
Year (yyyy)
0
100
200
300
400
500
600
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

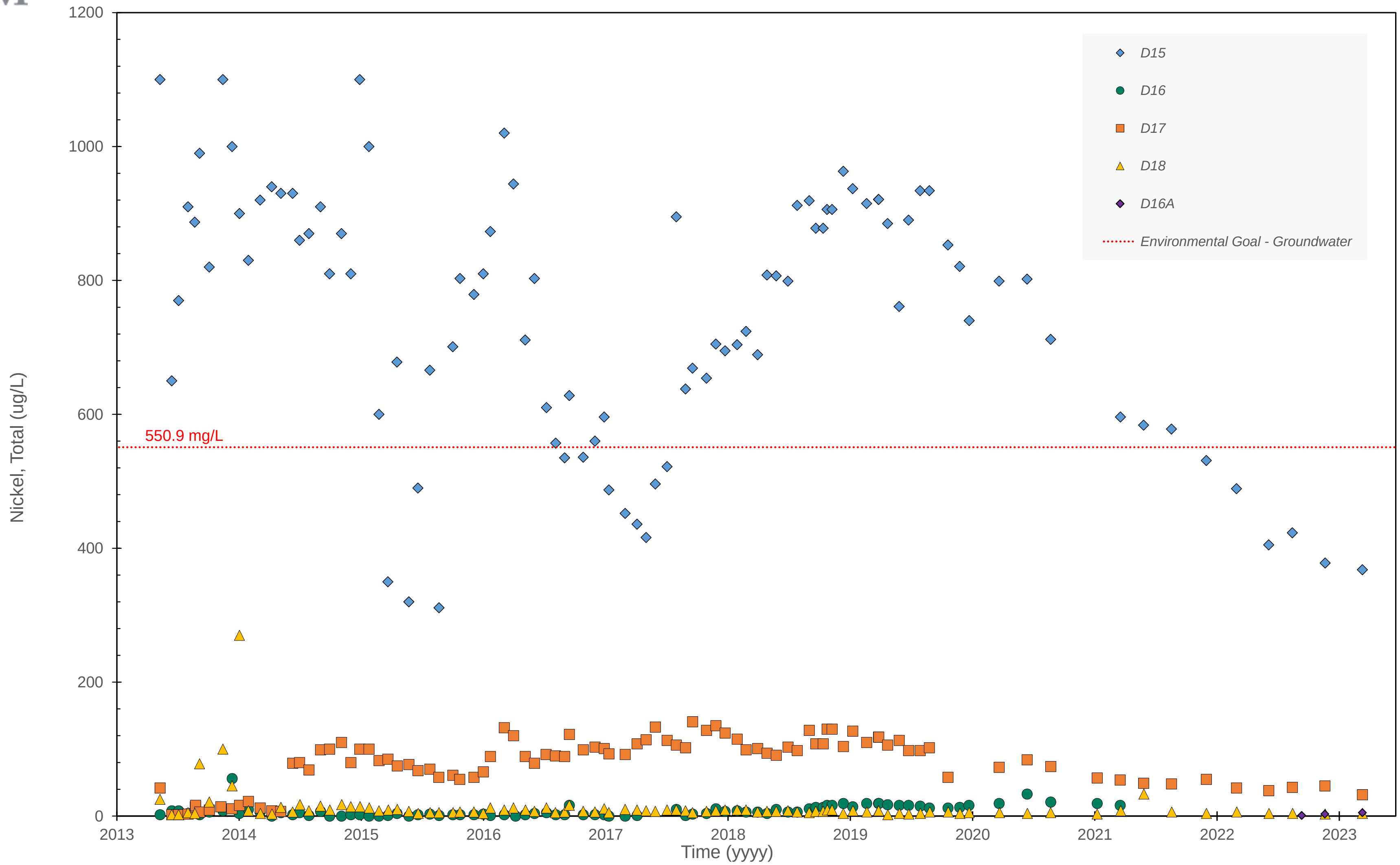

D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
1000 mg/L
Sulfate (as SO4) (mg/L)
Time (yyyy)
0
500
1000
1500
2000
2500
3000
3500
4000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

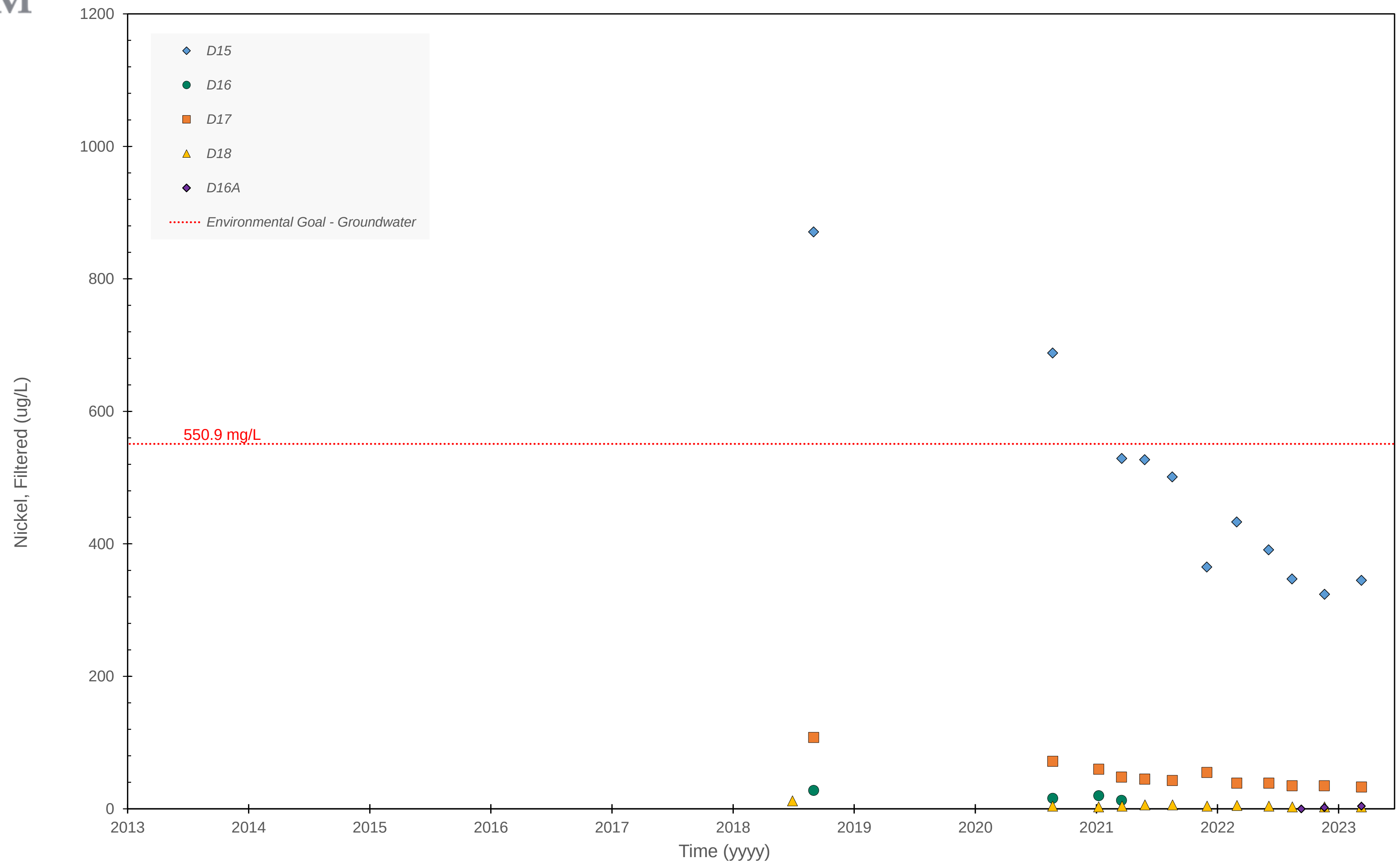

D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
370 ug/L
Boron, Total (µg/L)
Time (yyyy)
0
500
1000
1500
2000
2500
3000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

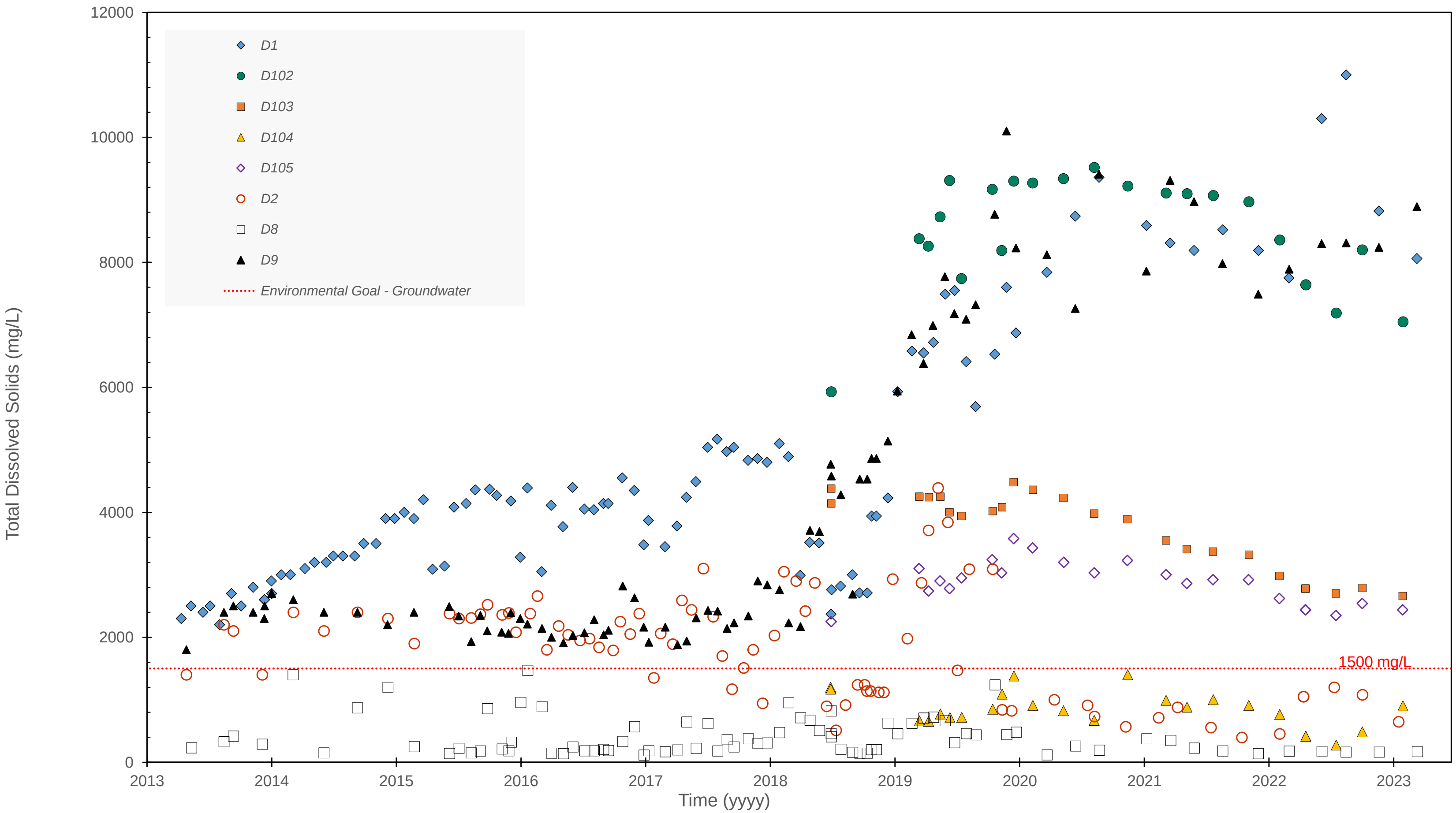

3000
2500
2000
1500
1000
500
0
Boron, Filtered (µg/L)
D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
370 ug/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

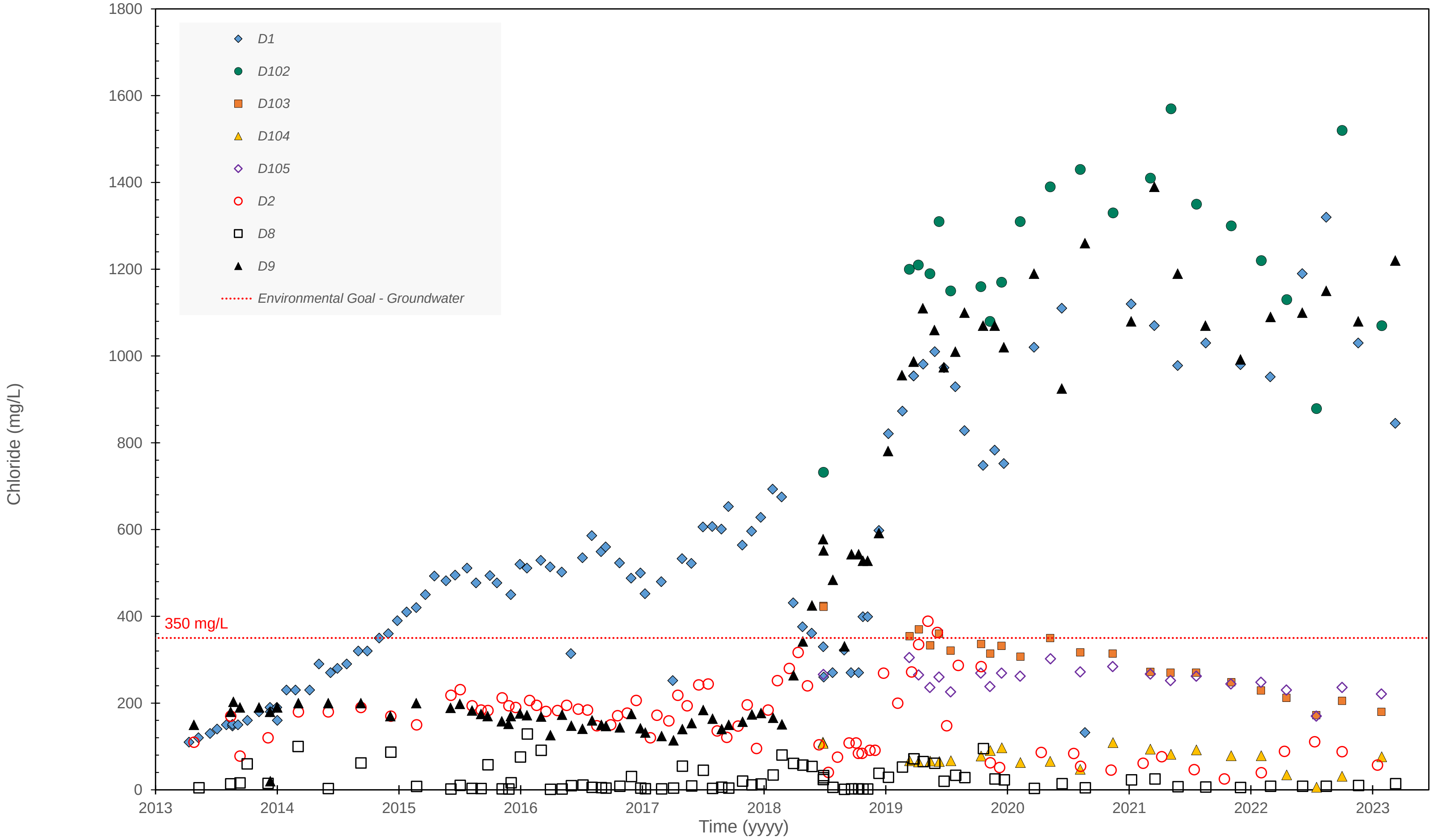

5,704 ug/L
D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
Manganese, Total (µg/L)
Time (yyyy)
6000
5000
4000
3000
2000
1000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

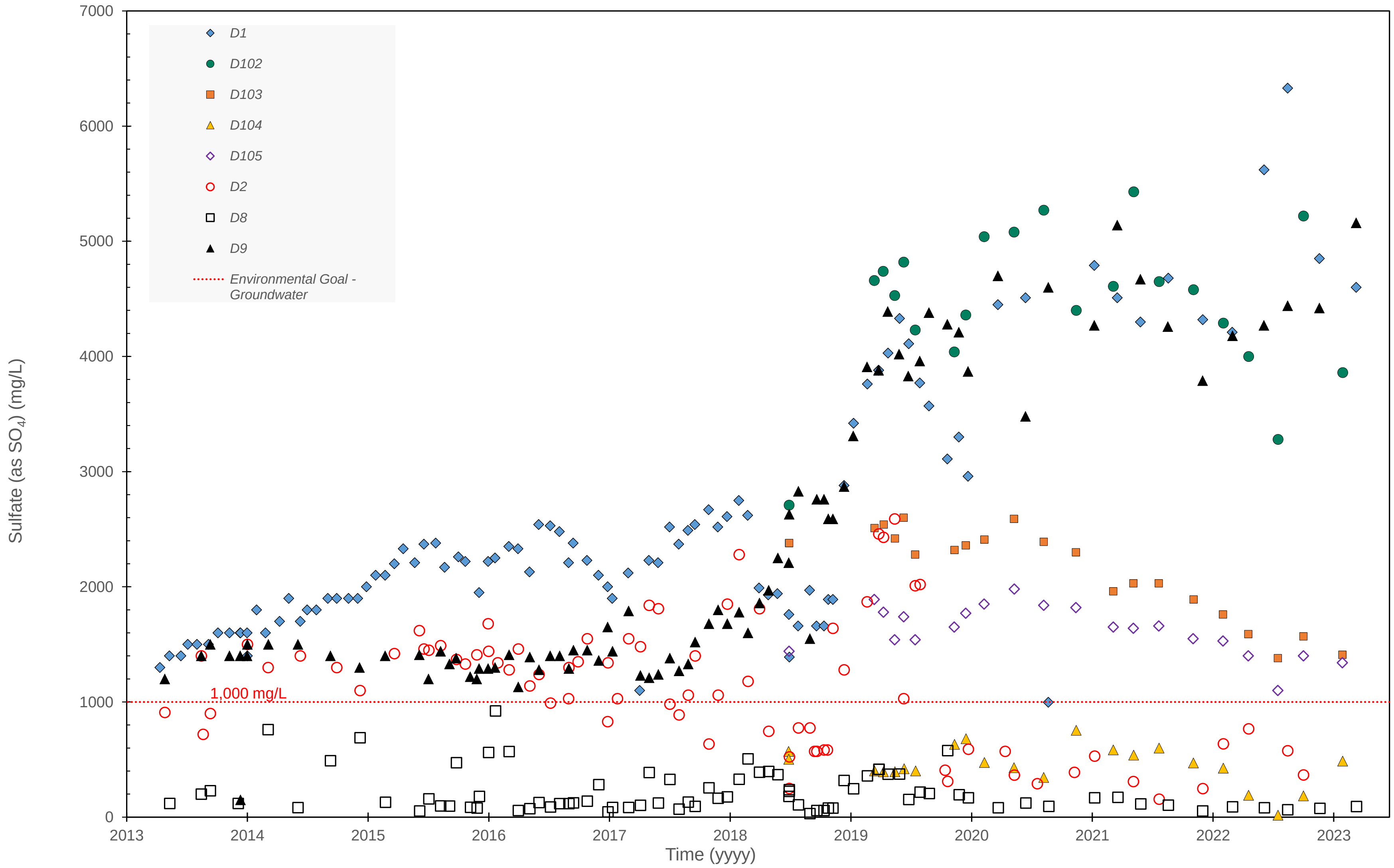

6000
5000
4000
3000
2000
1000
0
5,704 ug/L
Manganese, Filtered (µg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
D15
D16
D17
D18
D16A
Environmental Goal - Groundwater

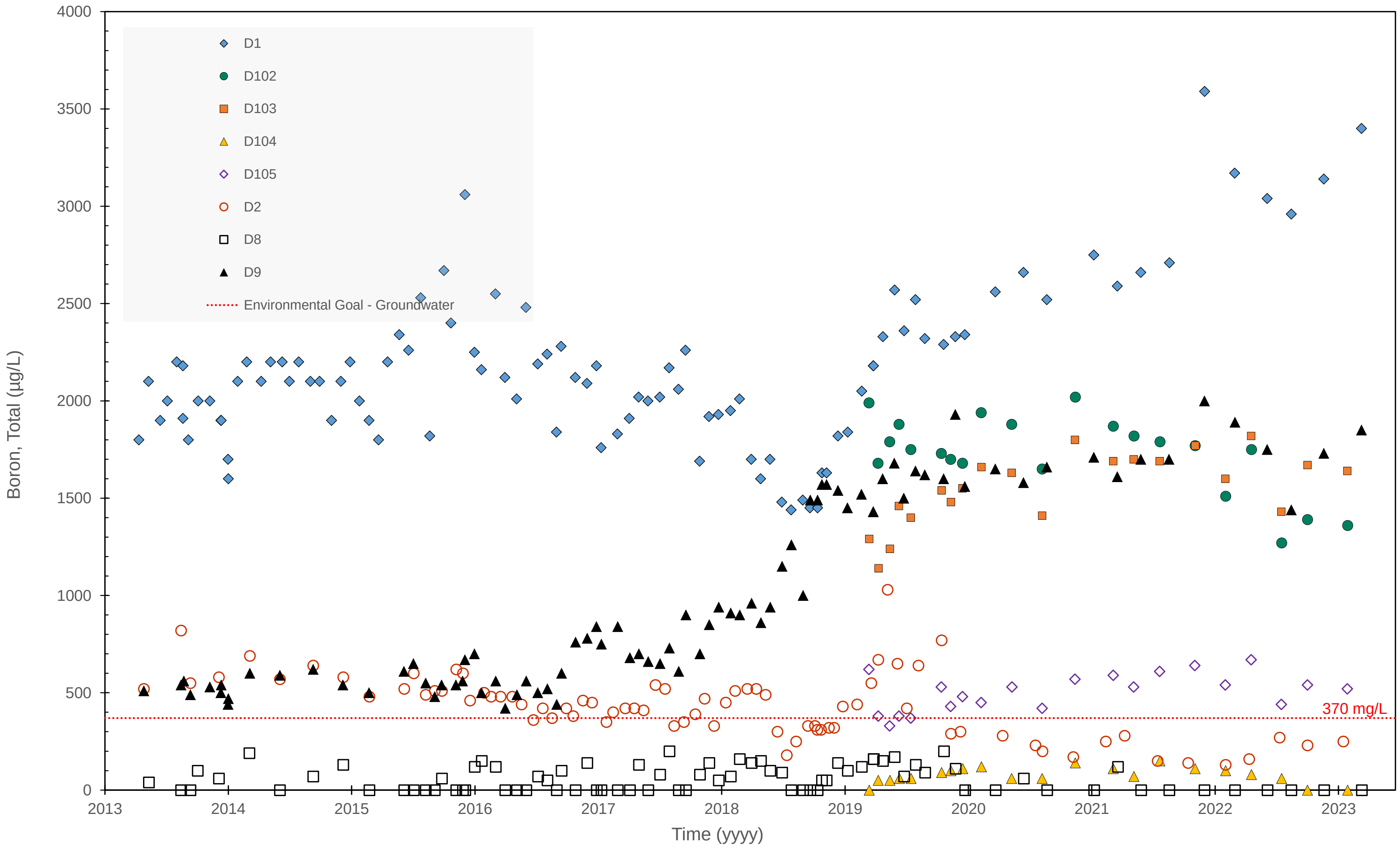

1200
1000
800
600
400
200
0
Nickel, Total (ug/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
550.9 mg/L
D15
D16
D17
D18
D16A
Environmental Goal - Groundwater

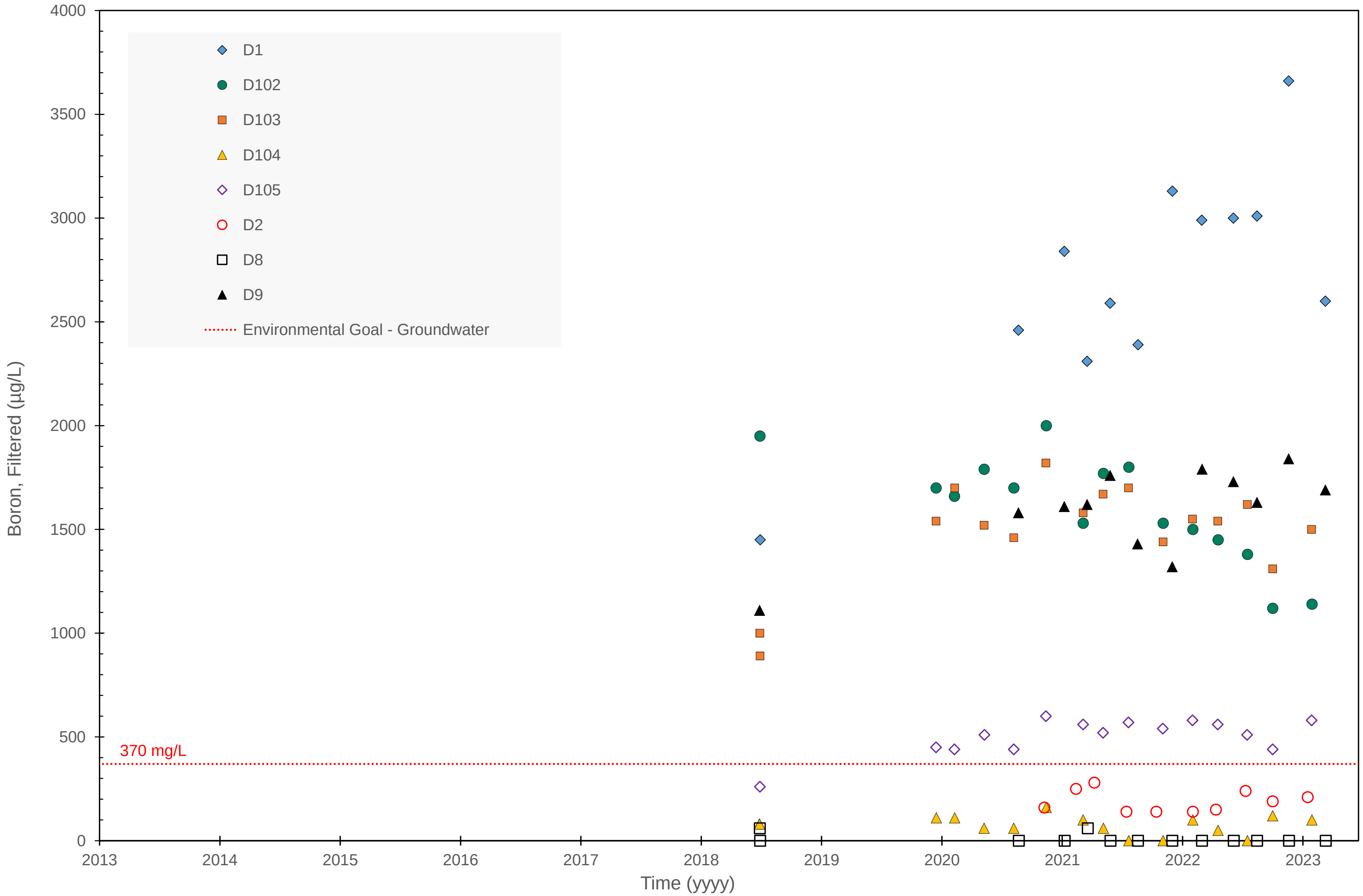

D15
D16
D17
D18
D16A
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Filtered (ug/L)
Time (yyyy)
0
200
400
600
800
1000
1200
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

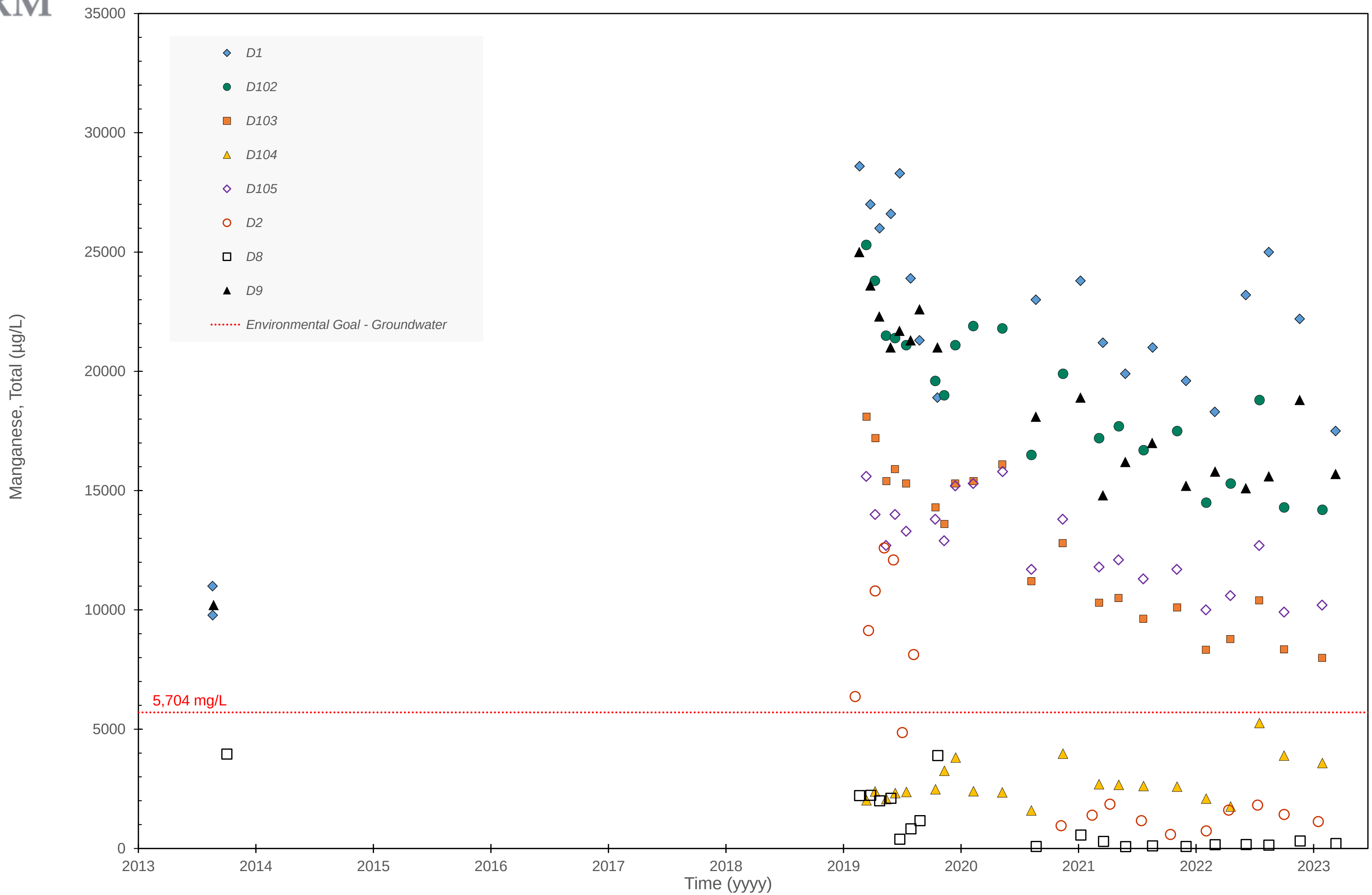

12000
10000
8000
6000
4000
2000
0
Total Dissolved Solids (mg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
1500 mg/L

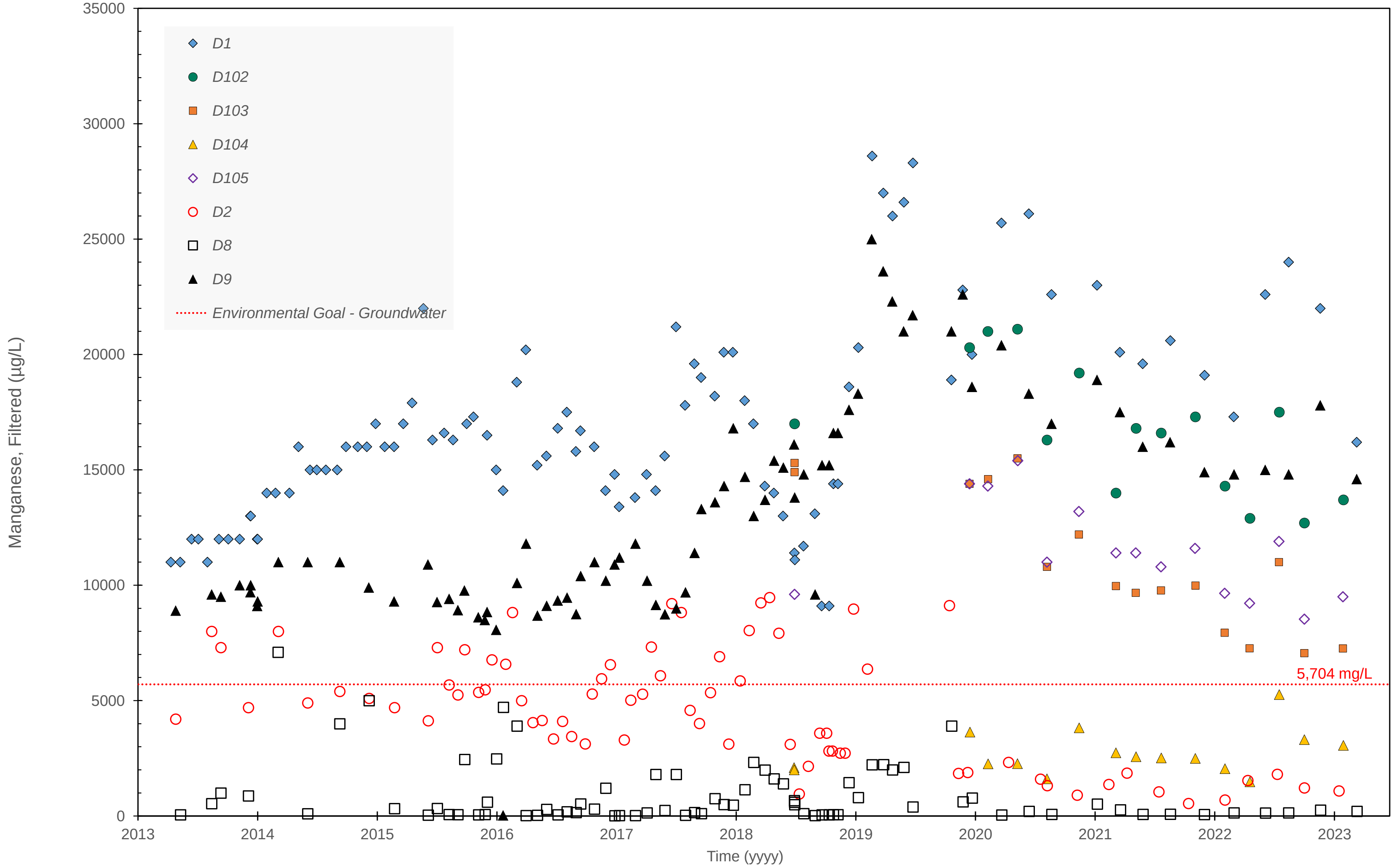

D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
350 mg/L
Chloride (mg/L)
Time (yyyy)
0
200
400
600
800
1000
1200
1400
1600
1800
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

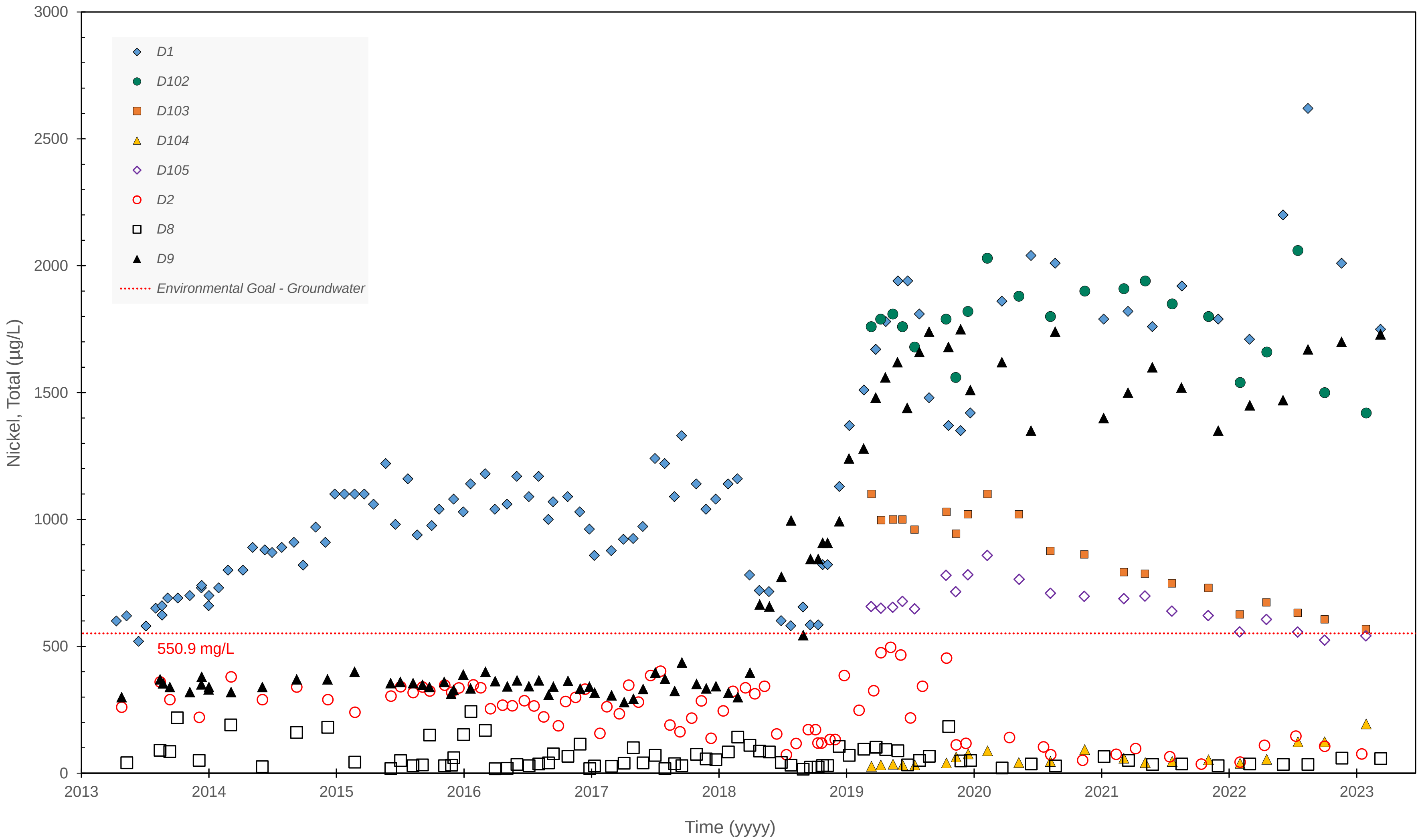

7000
6000
5000
4000
3000
2000
1000
0
Sulfate (as SO4) (mg/L)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
1,000 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

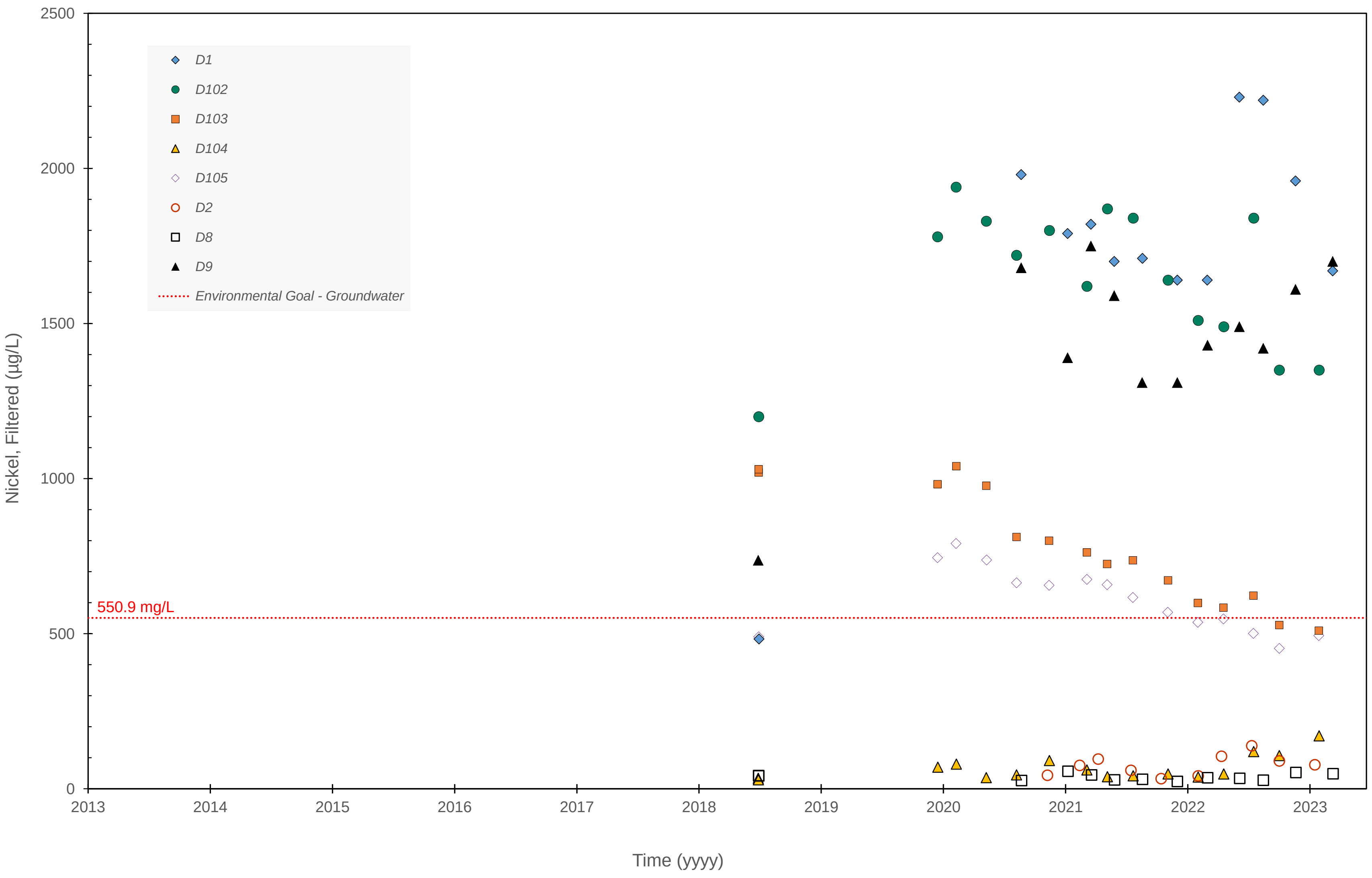

D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
370 mg/L
Boron, Total (µg/L)
Time (yyyy)
0
500
1000
1500
2000
2500
3000
3500
4000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

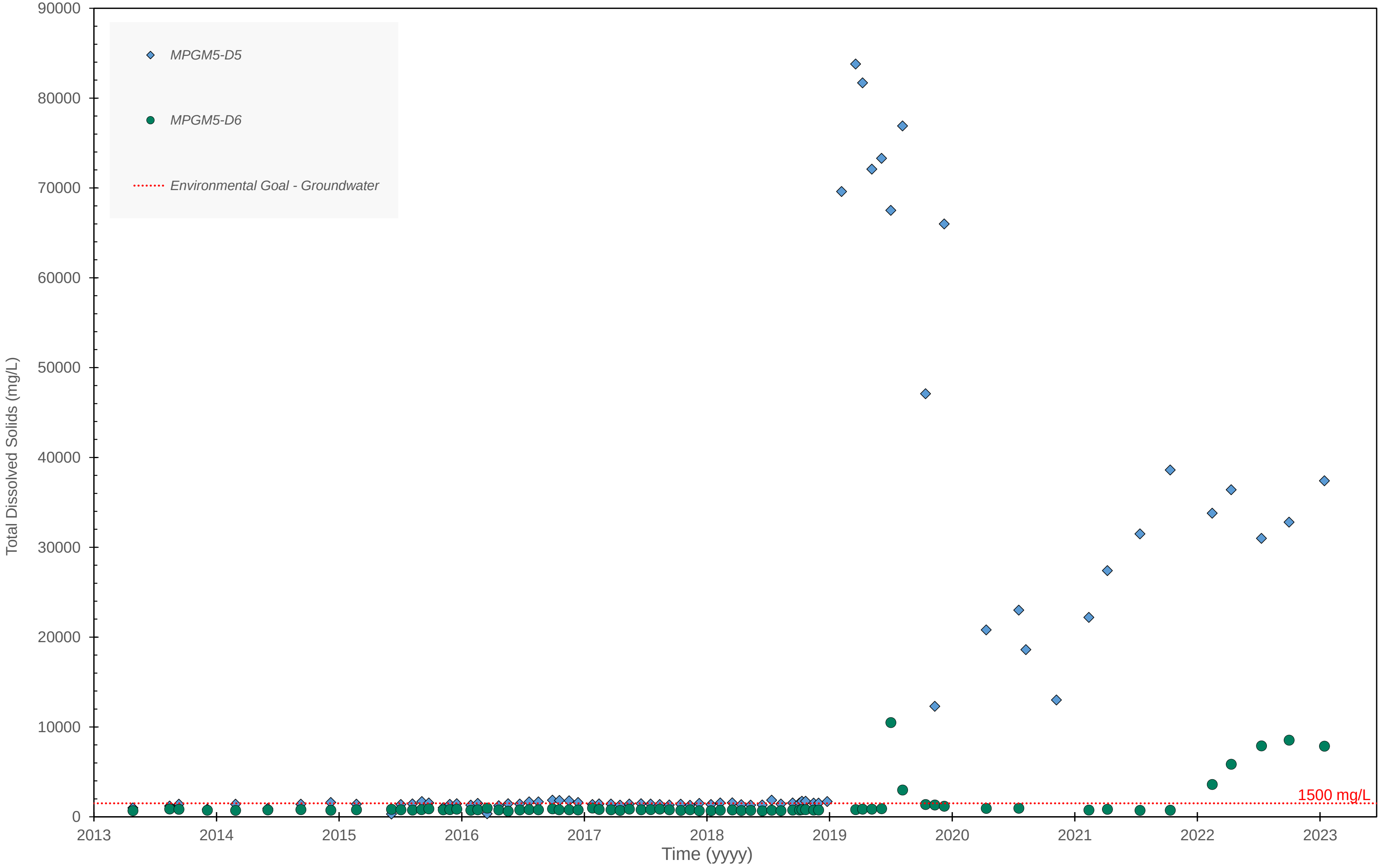

4000
3500
3000
2500
2000
1500
1000
500
0
Boron, Filtered (µg/L)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
370 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

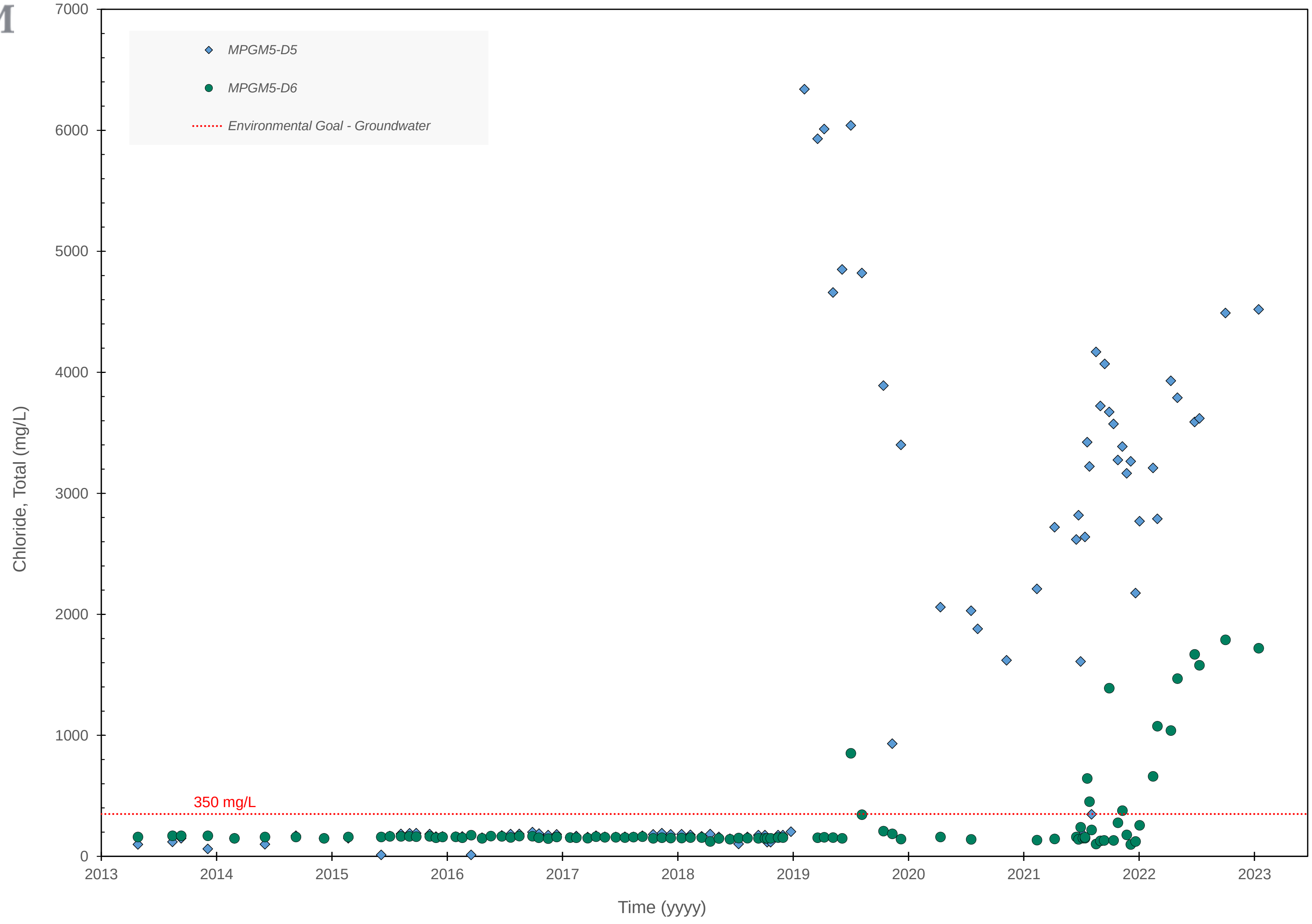

35000
30000
25000
20000
15000
10000
5000
0
Manganese, Total (µg/L)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
5,704 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

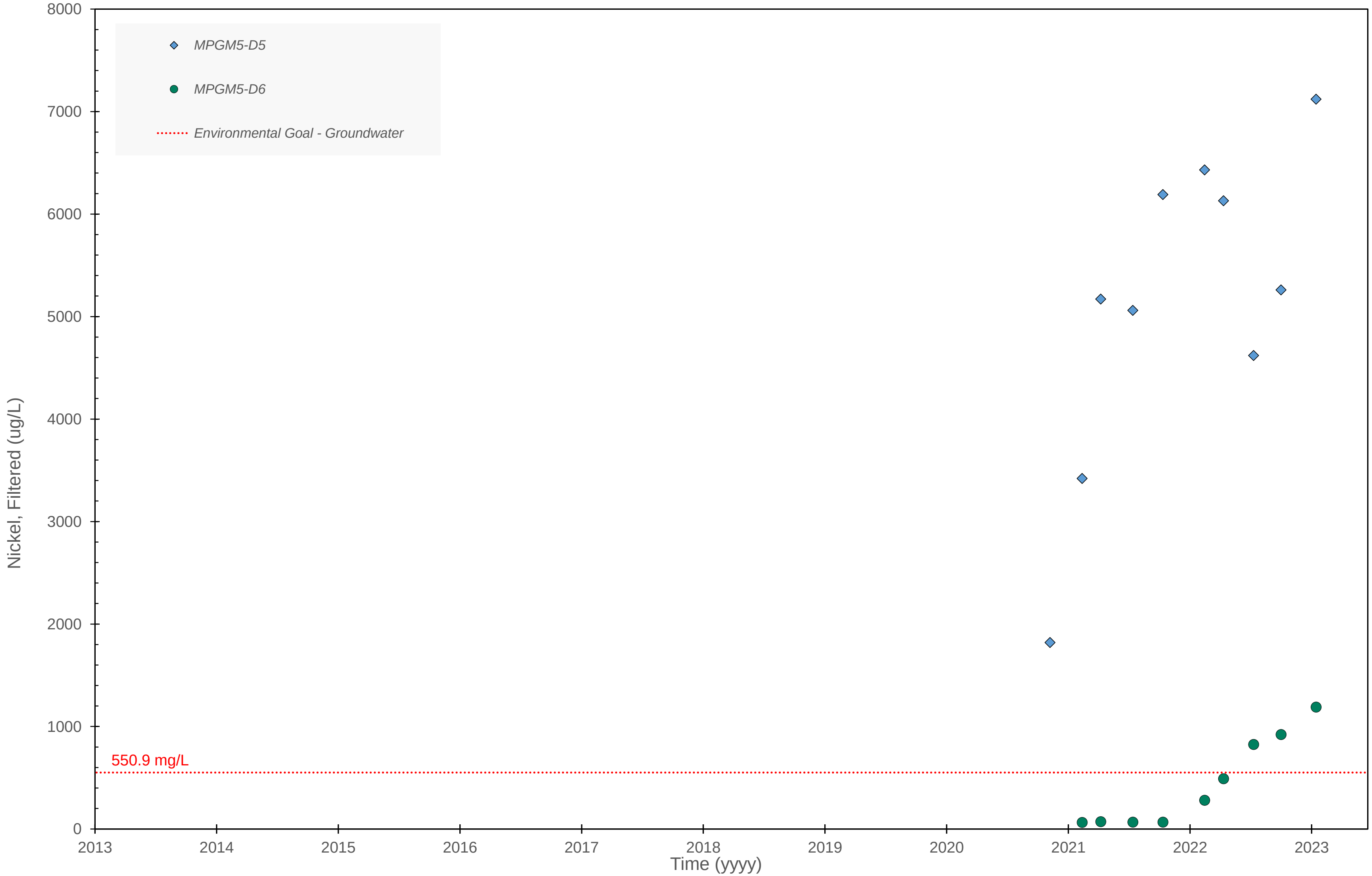

35000
30000
25000
20000
15000
10000
5000
0
Manganese, Filtered (µg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
5,704 mg/L

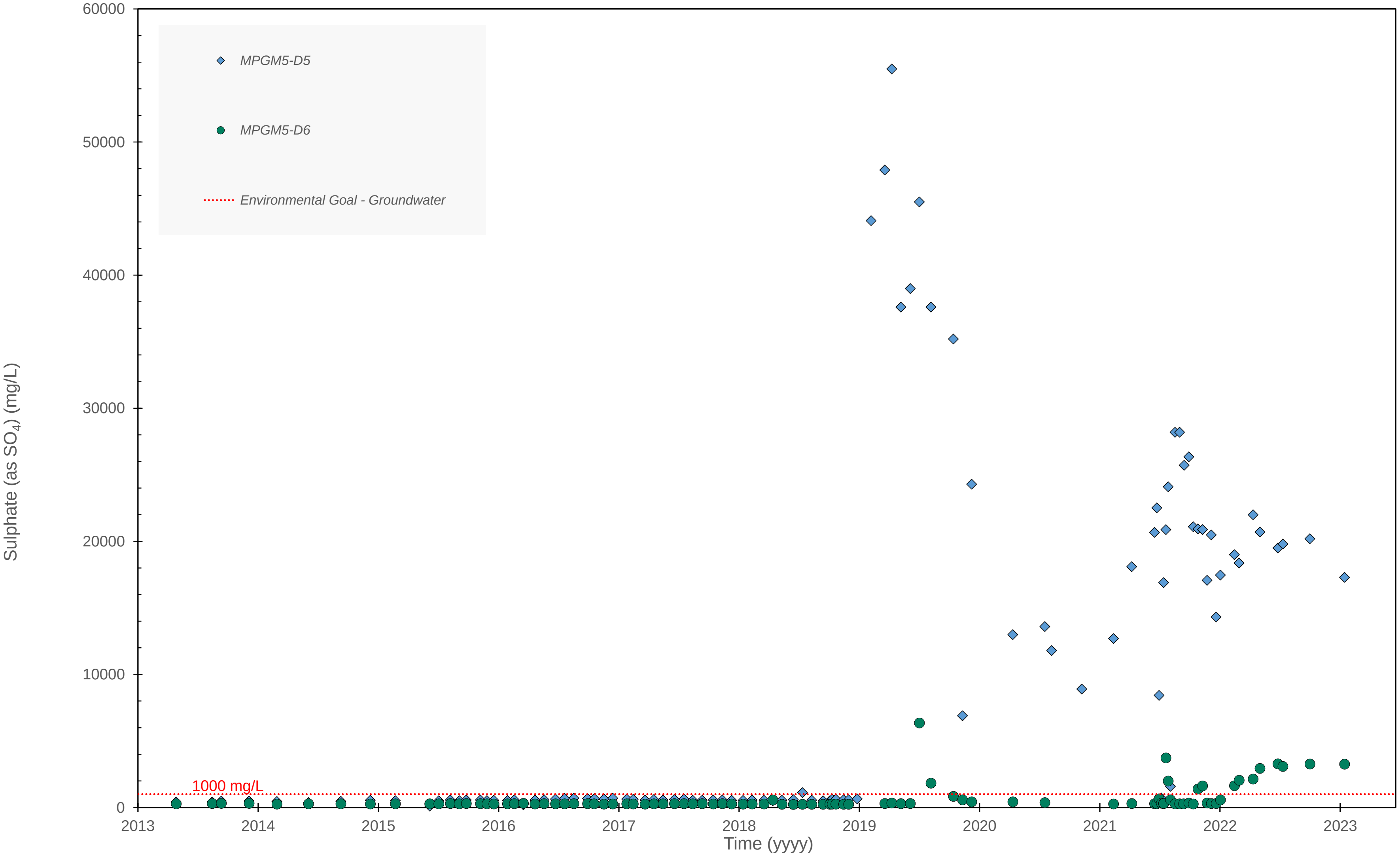

D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Total (µg/L)
Time (yyyy)
0
500
1000
1500
2000
2500
3000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

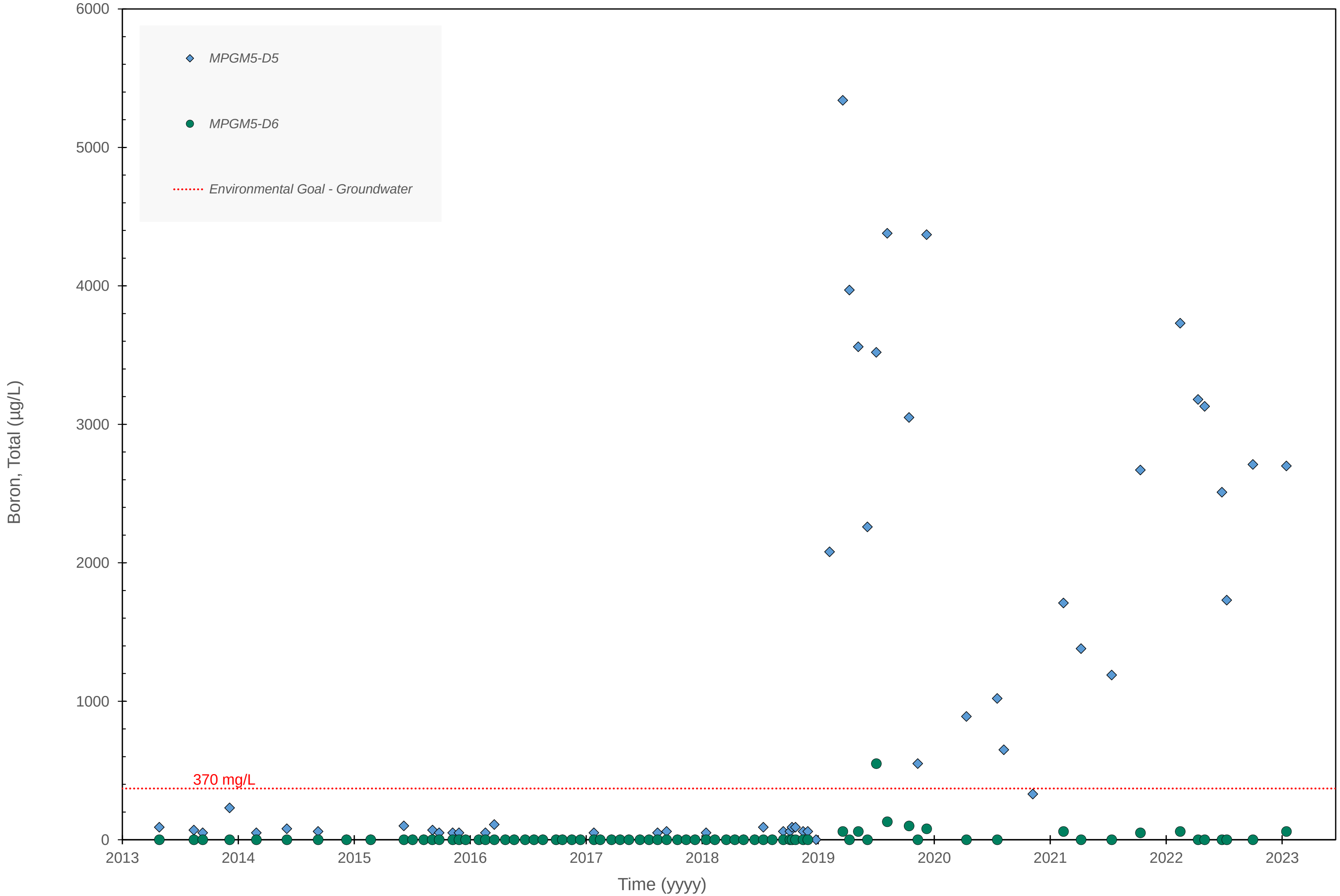

2500
2000
1500
1000
500
0
Nickel, Filtered (µg/L)
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal - Groundwater
550.9 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

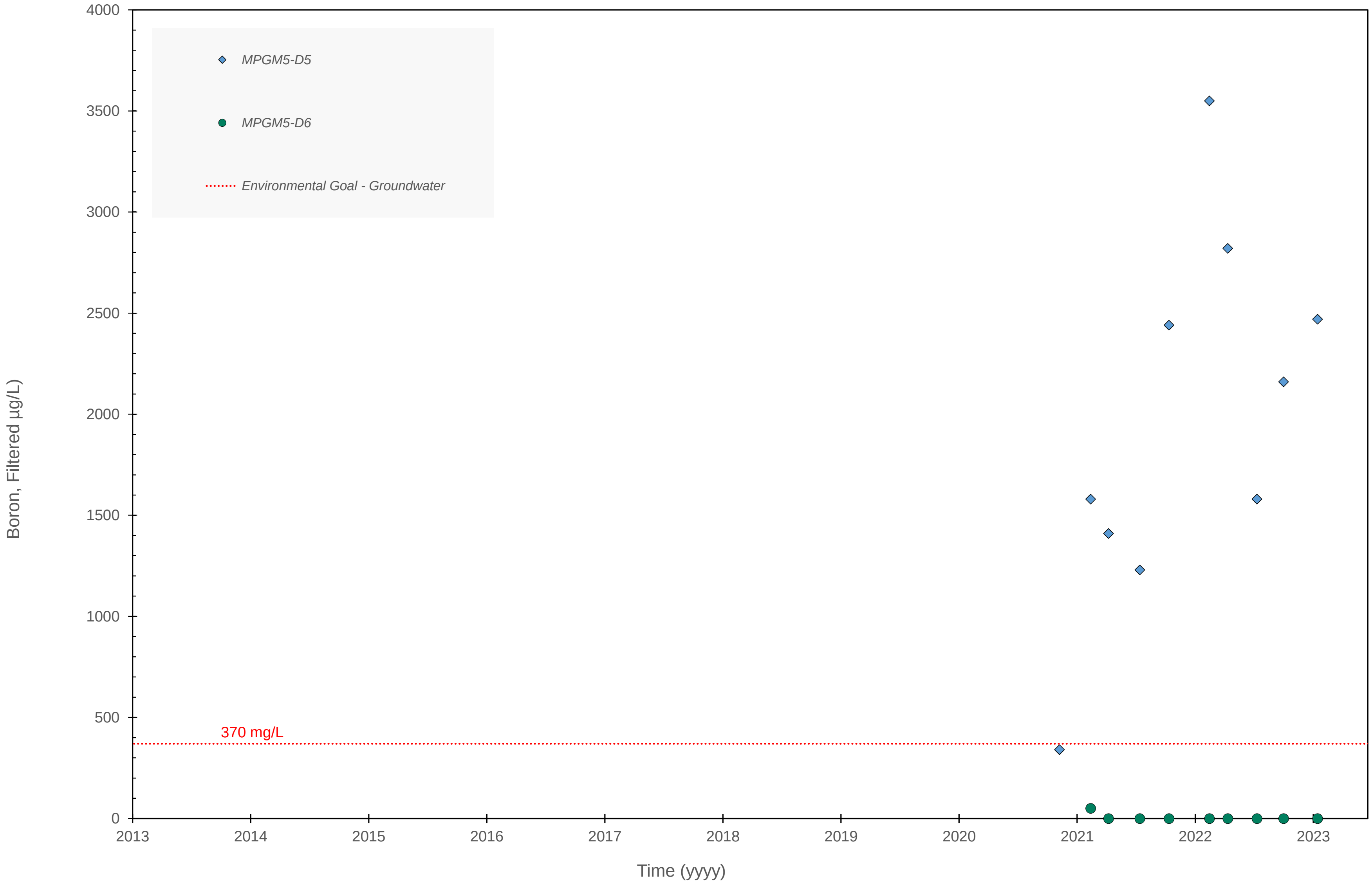

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
1500 mg/L
Total Dissolved Solids (mg/L)
Time (yyyy)
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

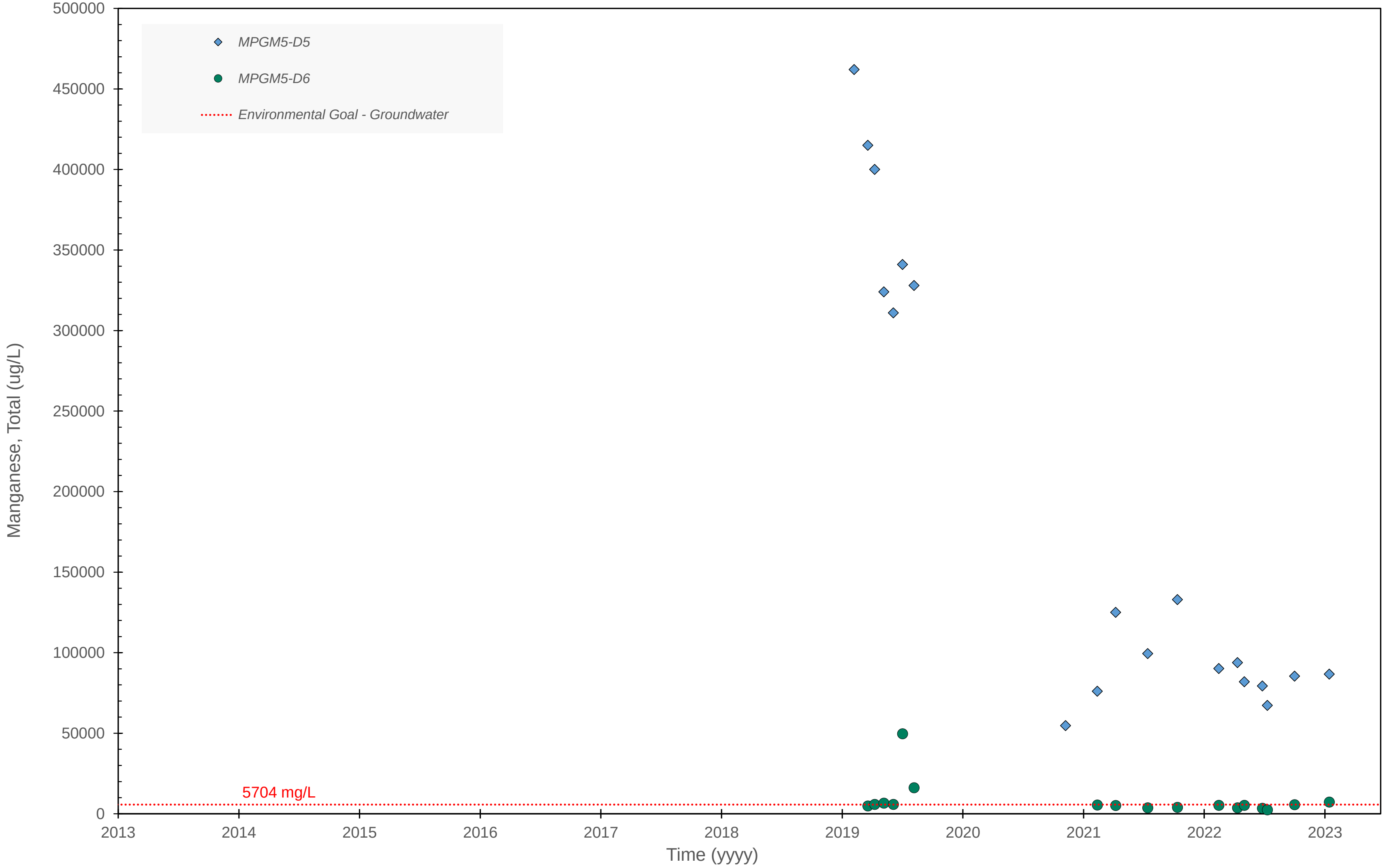

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
350 mg/L
Chloride, Total (mg/L)
Time (yyyy)
0
1000
2000
3000
4000
5000
6000
7000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

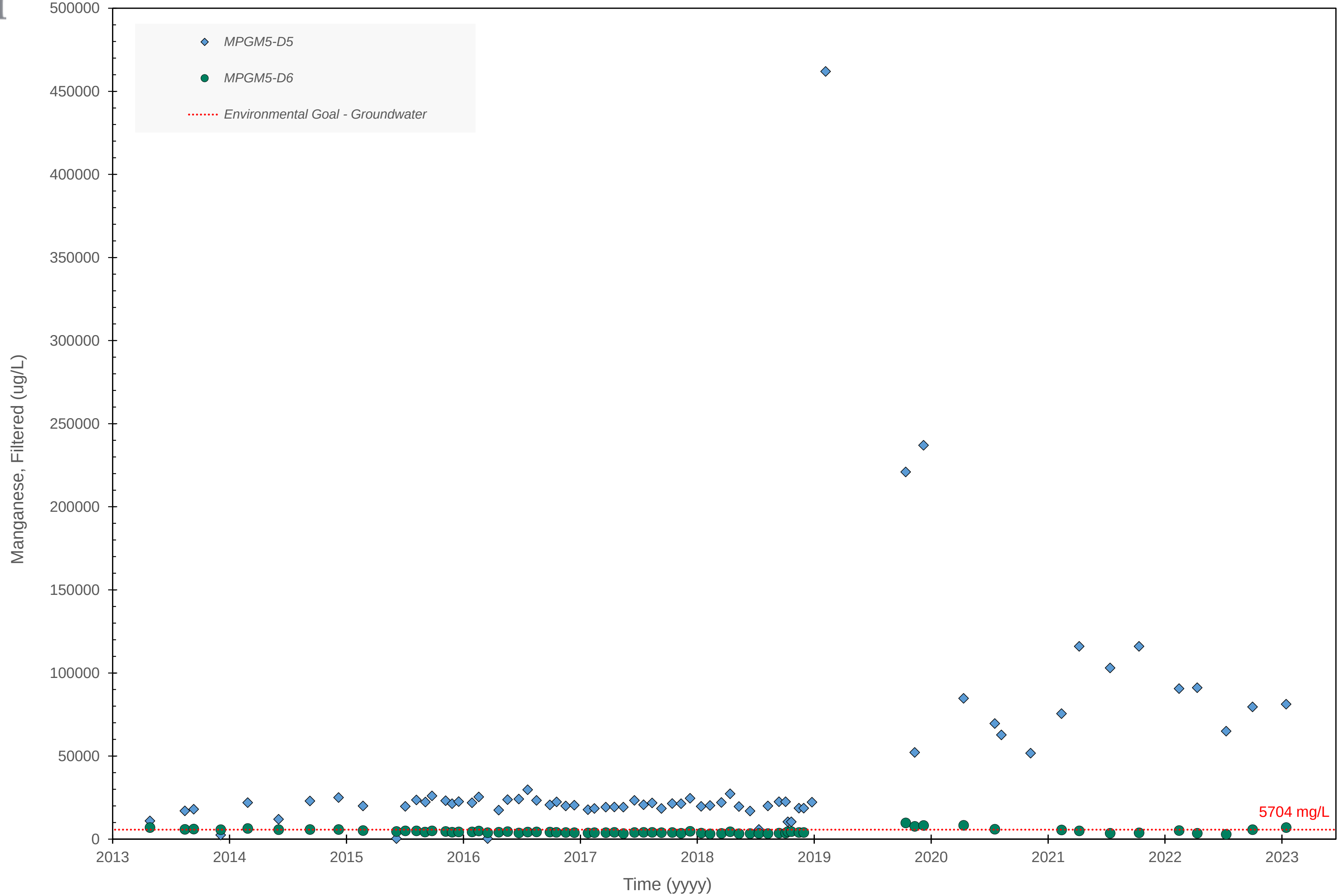

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Filtered (ug/L)
0
1000
2000
3000
4000
5000
6000
7000
8000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

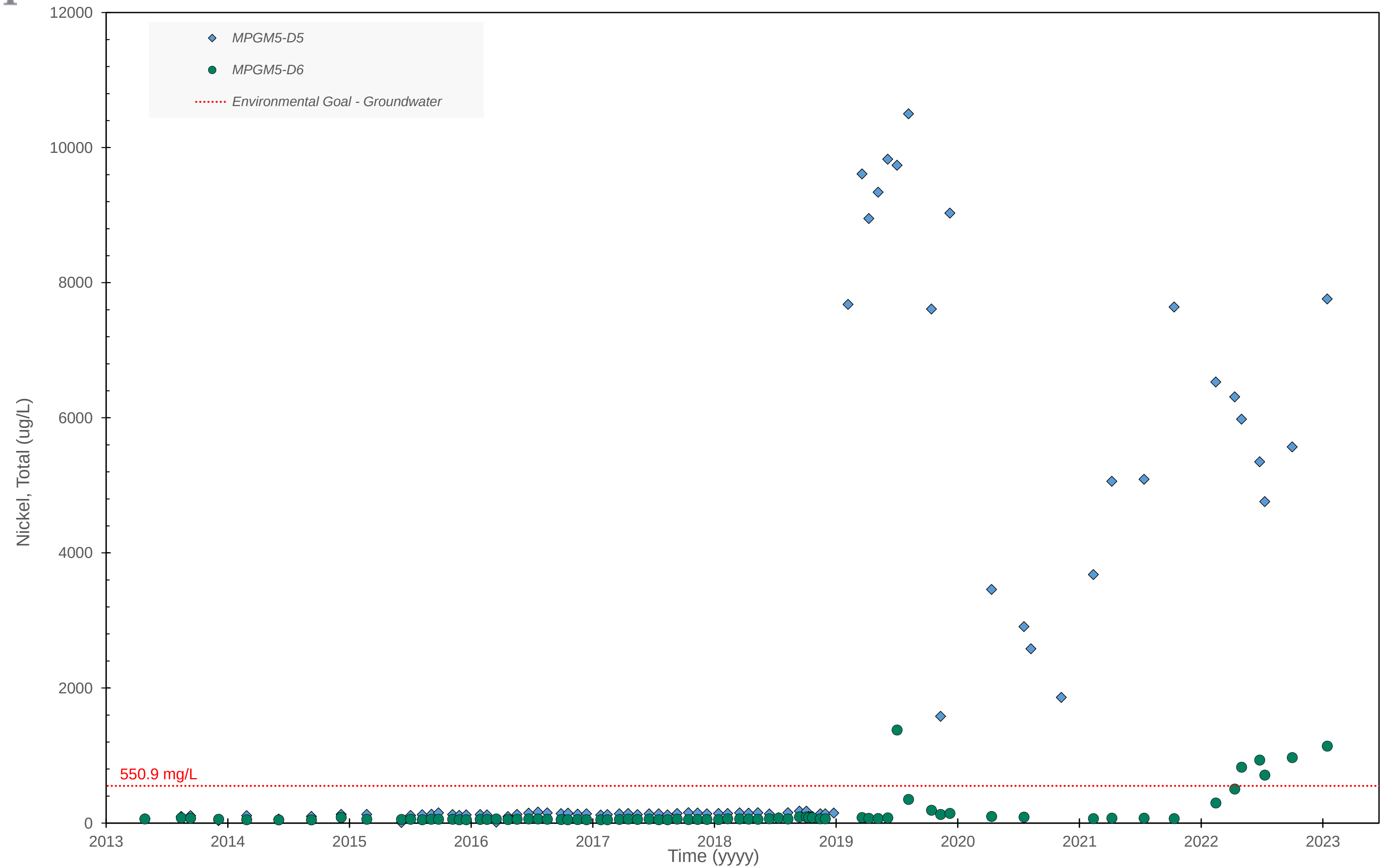

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
1000 mg/L
Sulphate (as SO_4) (mg/L)
60000
50000
40000
30000
20000
10000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)


MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
370 mg/L
Boron, Total (µg/L)
Time (yyyy)
0
1000
2000
3000
4000
5000
6000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
370 mg/L
Boron, Filtered (µg/L)
Time (yyyy)
0
500
1000
1500
2000
2500
3000
3500
4000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

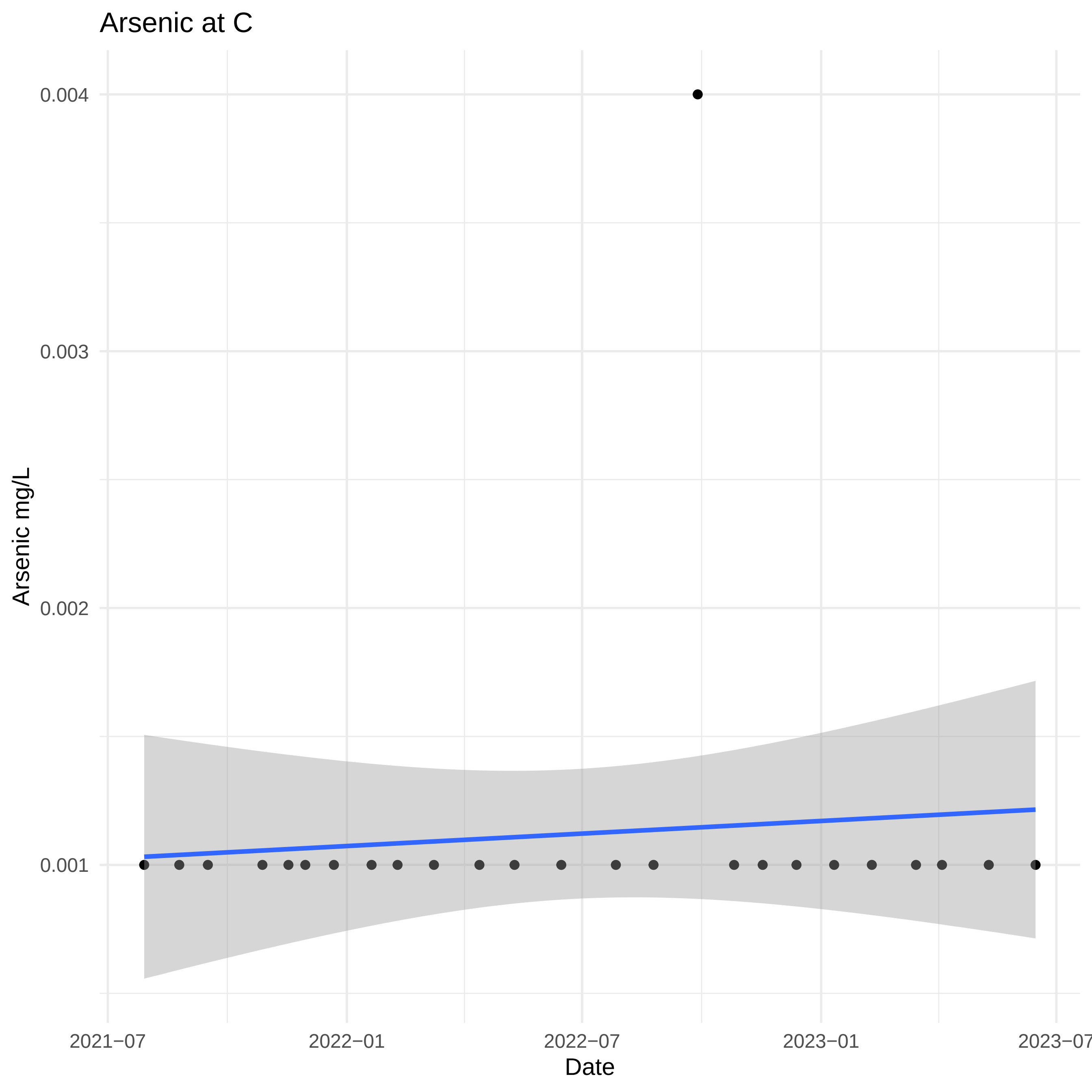

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
Manganese, Total (ug/L)
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
5704 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)


MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
Manganese, Filtered (ug/L)
5704 mg/L
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Time (yyyy)

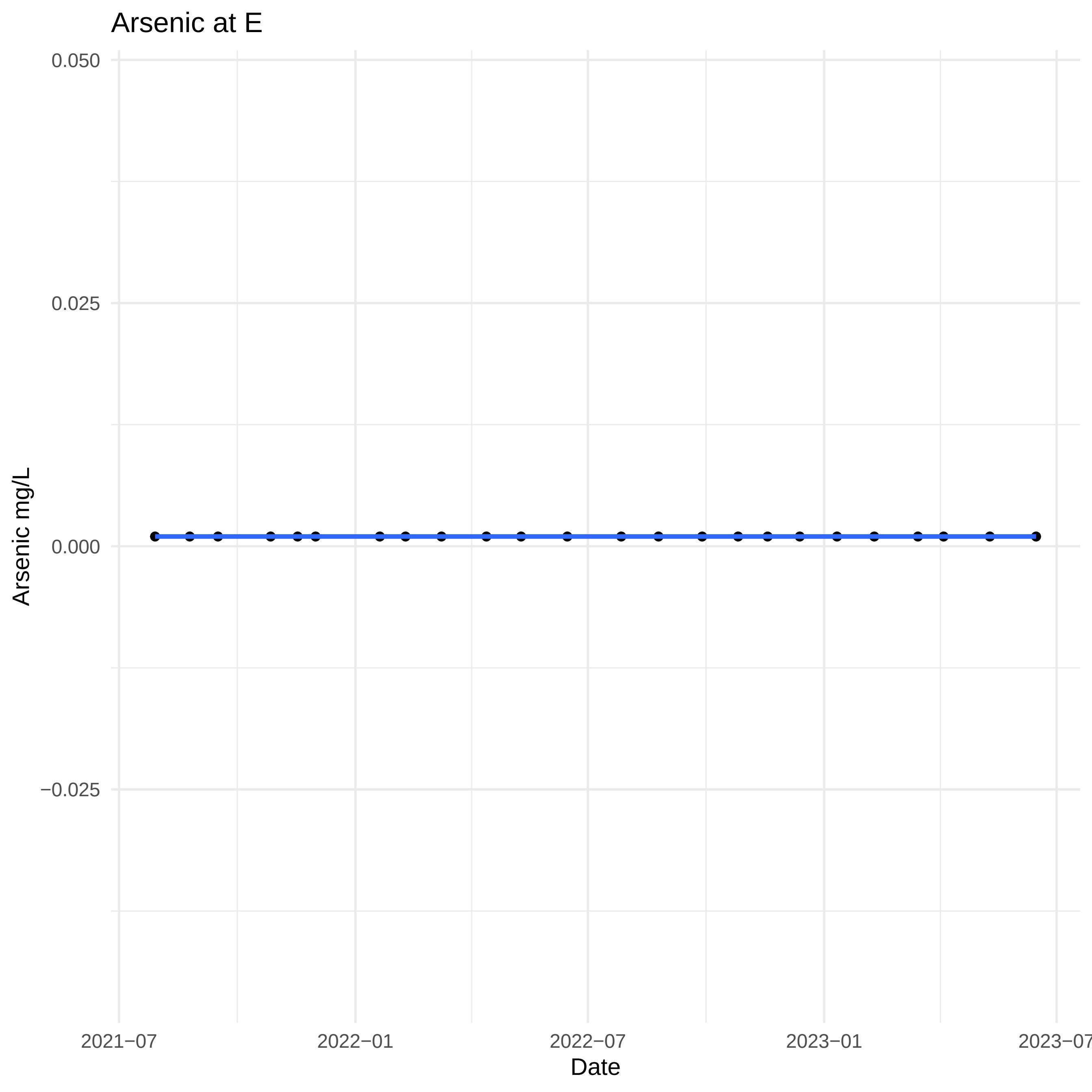

MPGM5-D5
MPGM5-D6
Environmental Goal - Groundwater
550.9 mg/L
Nickel, Total (ug/L)
Time (yyyy)
0
2000
4000
6000
8000
10000
12000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023

APPENDIX L SURFACE WATER STATISTICAL ANALYSIS

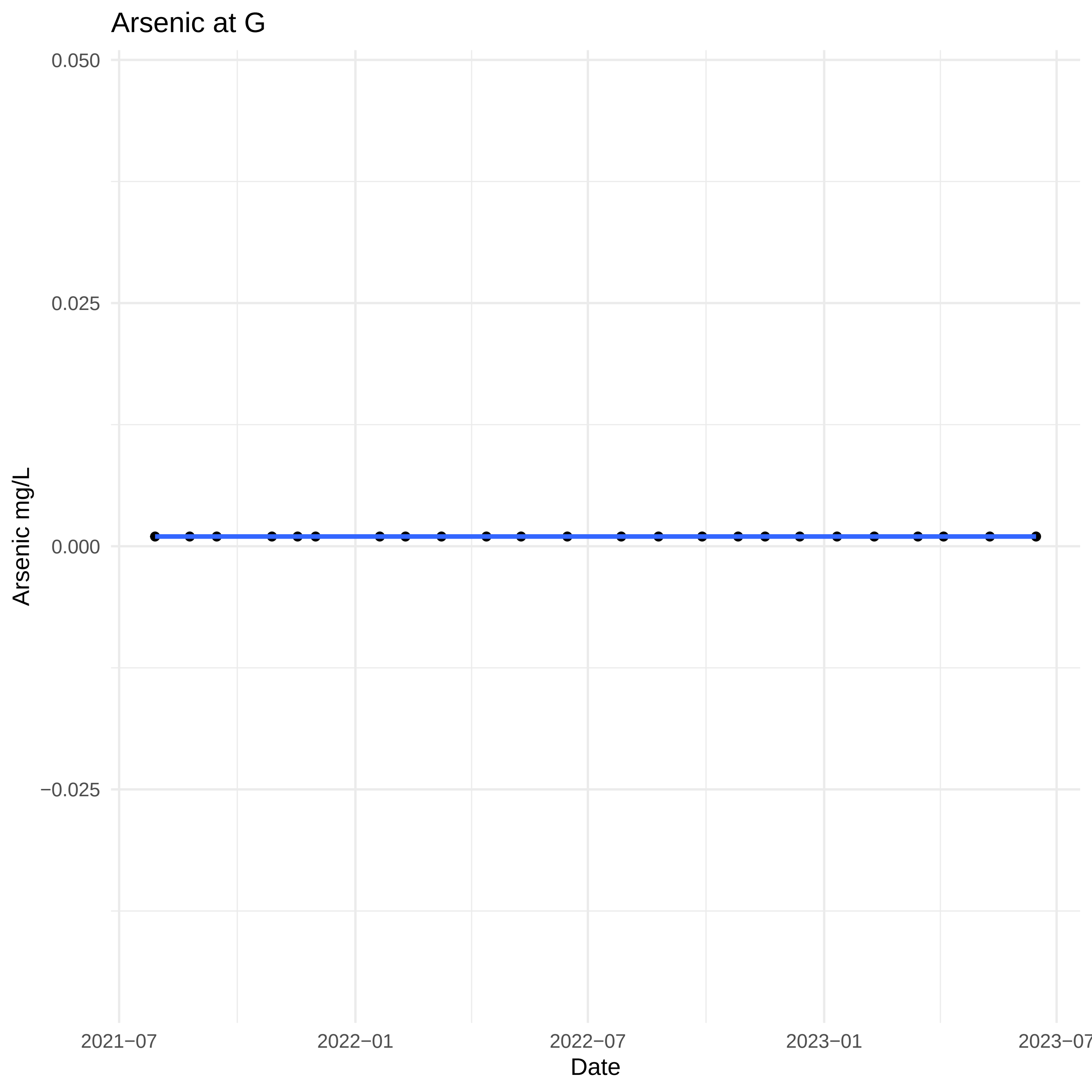
Location	Stats	Arsenic	Boron	Cadmium	Chloride	Chromium	Copper	Fluoride	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Sulphate as SO4	Zinc	Dissolved Solids, Total	Electrical Conductivity Field
C	R	0.09	0.00	0.09	0.30	0.09	-0.19	-0.16	-0.19	-0.04	0.35	-0.15	0.13	0.03	0.08	0.22	-0.14	0.18	0.19
	R2	0.01	0.00	0.01	0.09	0.01	0.04	0.03	0.04	0.00	0.13	0.02	0.02	0.00	0.01	0.05	0.02	0.03	0.04
E	R	0.00	0.61	0.00	0.61	0.09	-0.03	0.07	0.55	0.05	0.69	-0.15	0.05	0.58	0.01	0.62	-0.19	0.62	0.60
	R2	0.00	0.38	0.00	0.37	0.01	0.00	0.00	0.30	0.00	0.47	0.02	0.00	0.34	0.00	0.39	0.03	0.38	0.36
G	R	0.00	0.56	0.00	0.58	0.09	-0.12	0.18	-0.16	-0.01	0.50	0.00	0.00	0.63	0.01	0.58	0.06	0.53	0.56
	R2	0.00	0.32	0.00	0.34	0.01	0.01	0.03	0.02	0.00	0.25	0.00	0.00	0.40	0.00	0.34	0.00	0.28	0.32
LDP01	R	0.16	0.41	0.00	0.22	0.04	0.12	0.05	0.15	0.10	0.19	-0.21	0.21	0.34	0.00	0.18	0.23	0.52	-0.35
	R2	0.03	0.17	0.00	0.05	0.00	0.01	0.00	0.02	0.01	0.04	0.04	0.04	0.11	0.00	0.03	0.05	0.27	0.13
LMP01	R	-0.02	0.43	-0.02	0.06	-0.02	-0.20	-0.13	0.01	-0.10	0.28	-0.23	0.01	0.03	-0.51	0.10	-0.09	0.06	0.12
	R2	0.00	0.18	0.00	0.00	0.00	0.04	0.02	0.00	0.01	0.08	0.05	0.00	0.00	0.26	0.01	0.01	0.00	0.01
NC01	R	0.09	-0.26	0.09	0.34	0.17	0.02	0.58	0.63	0.66	0.09	0.03	0.54	0.28	0.36	-0.04	0.11	0.52	0.12
	R2	0.01	0.07	0.01	0.12	0.03	0.00	0.34	0.40	0.44	0.01	0.00	0.29	0.08	0.13	0.00	0.01	0.27	0.01
WX22	R	0.09	0.57	0.00	0.59	0.03	0.11	0.14	0.12	0.06	0.48	0.14	0.16	0.63	0.01	0.59	0.22	0.55	0.57
	R2	0.01	0.32	0.00	0.34	0.00	0.01	0.02	0.01	0.00	0.23	0.02	0.03	0.39	0.00	0.35	0.05	0.30	0.32



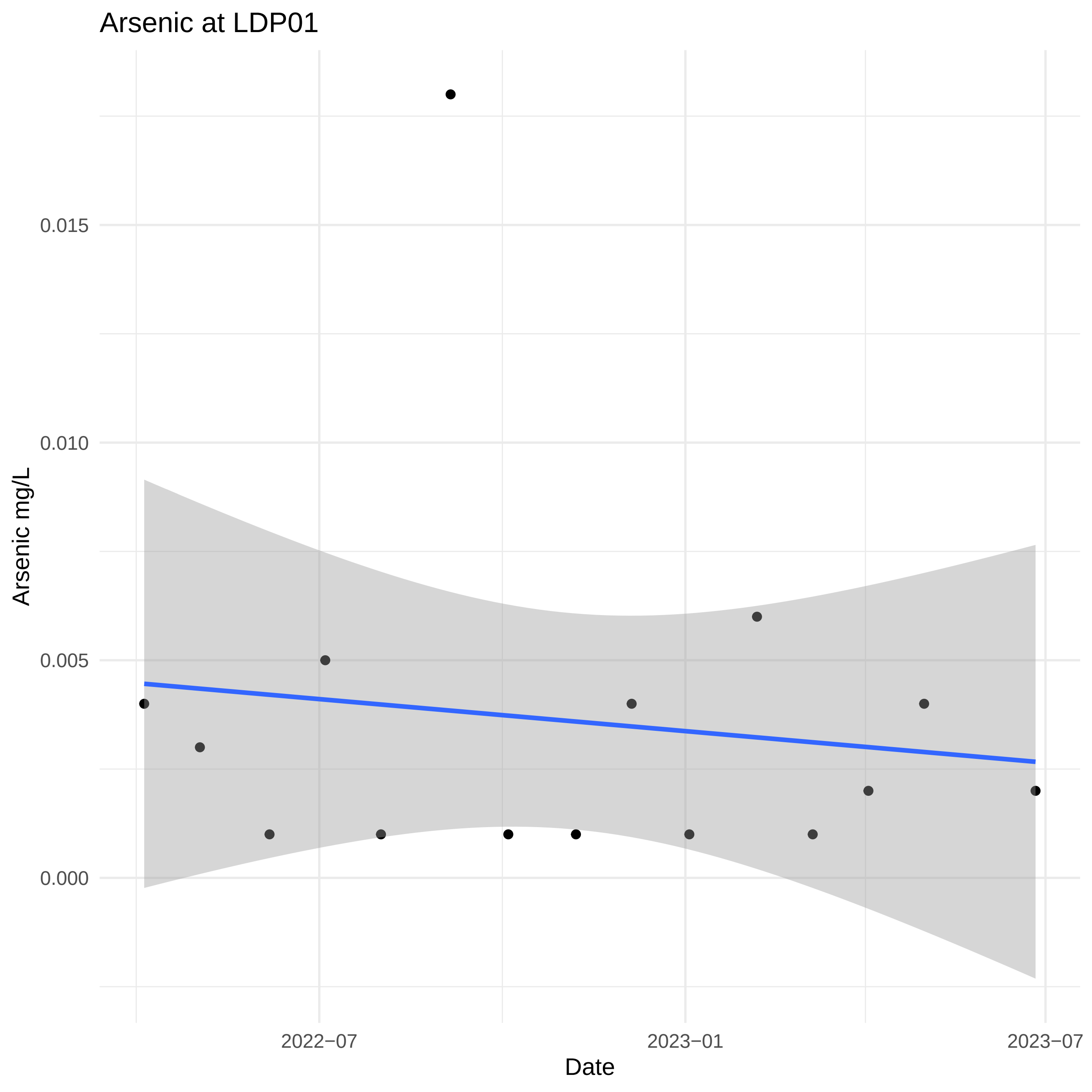
Arsenic at C
0.004
0.003
0.002
0.001
Arsenic mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

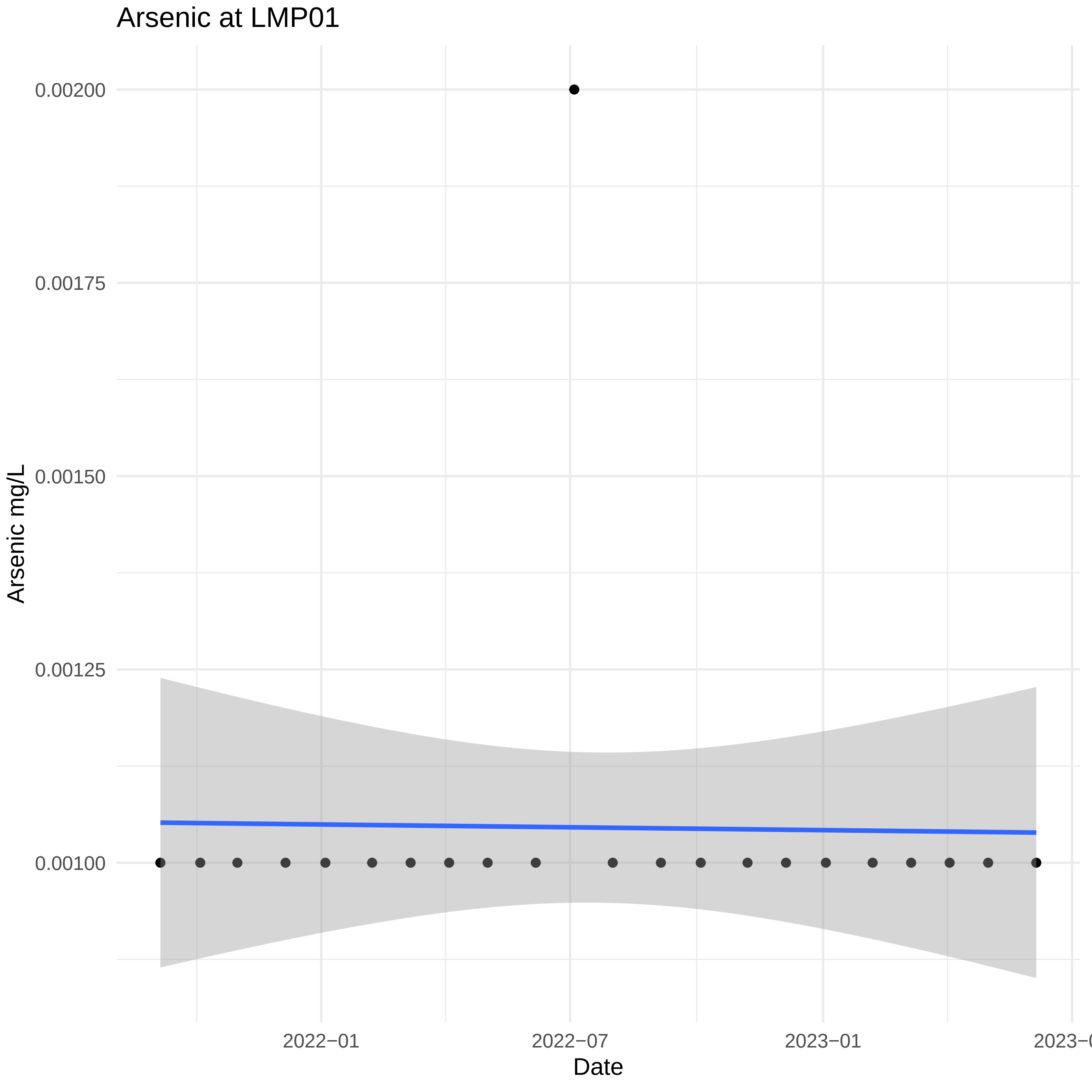


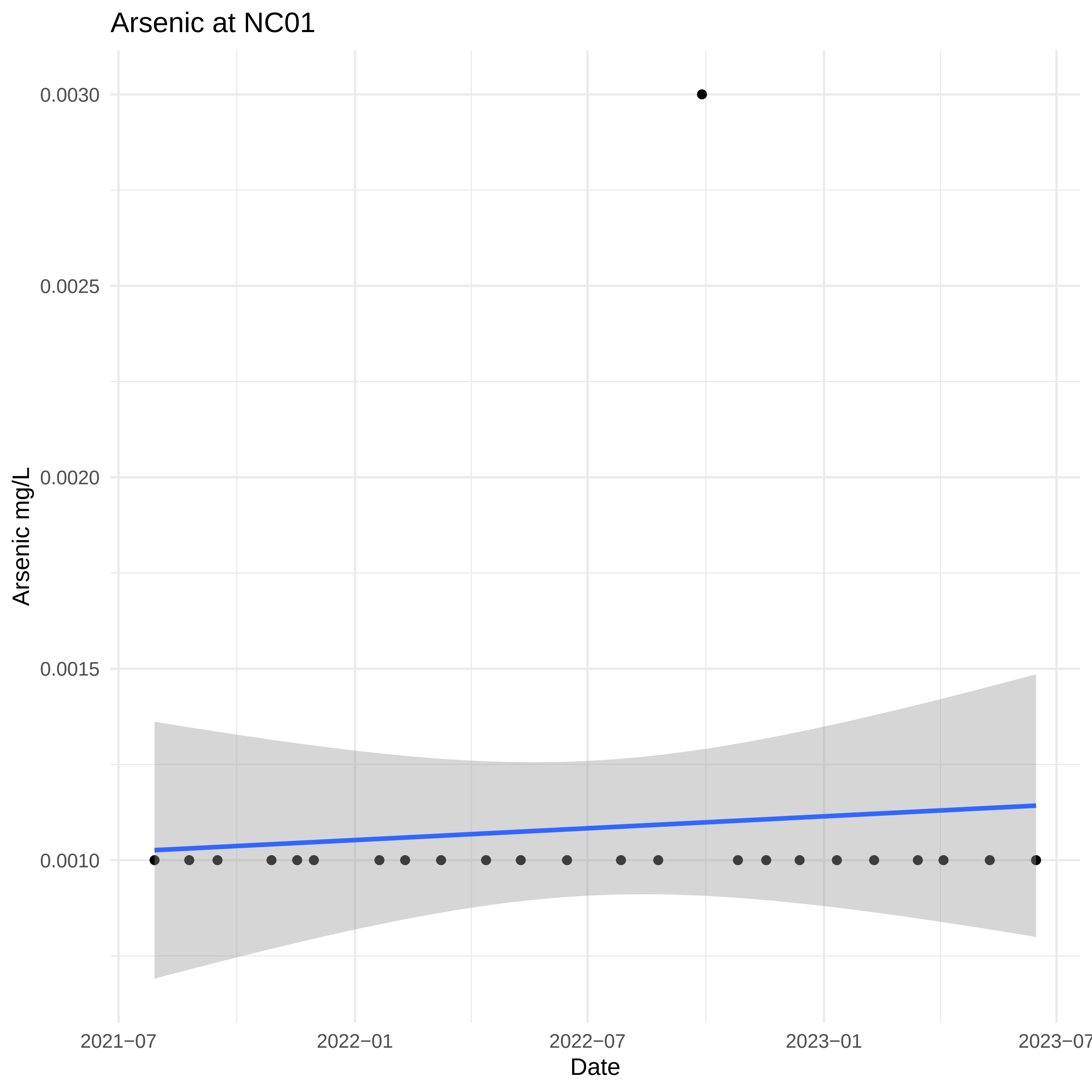
Arsenic at E
0.050
0.025
0.000
−0.025
Arsenic mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



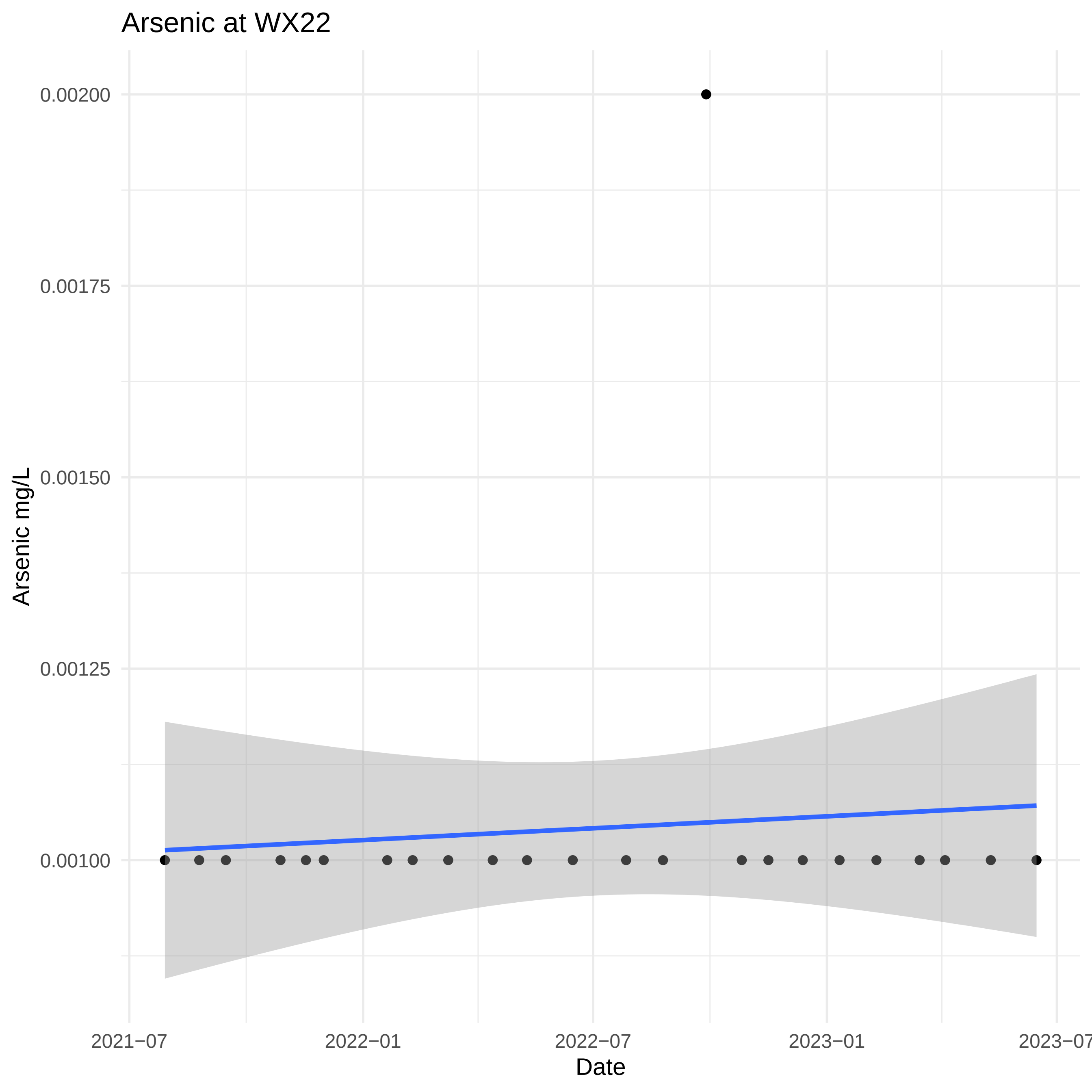
Arsenic at G
0.050
0.025
0.000
−0.025
Arsenic mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Arsenic at LDP01
0.015
0.010
0.005
0.000
Arsenic mg/L
2022−07
2023−01
2023−07
Date

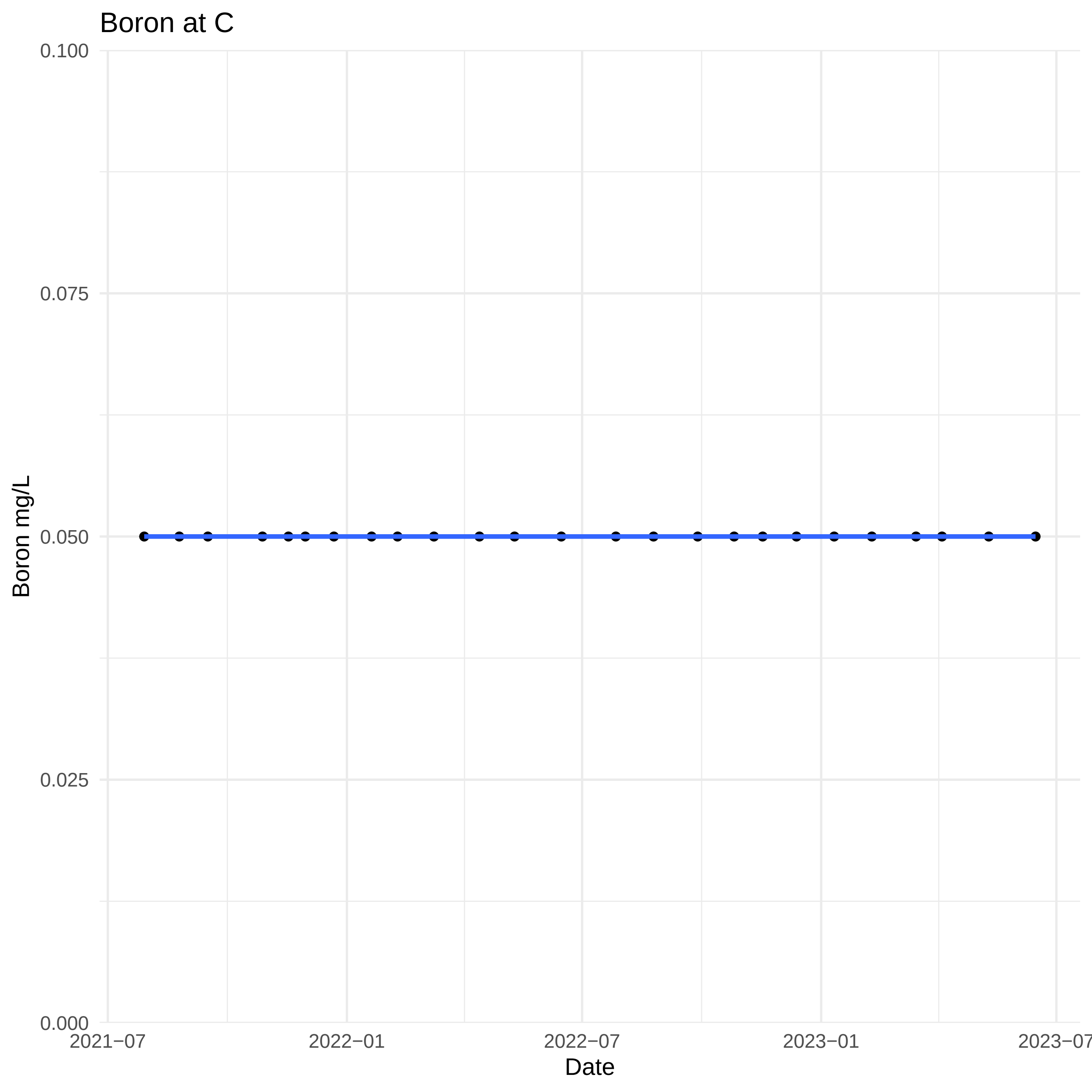

Arsenic at LMP01
Arsenic mg/L
0.00200
0.00175
0.00150
0.00125
0.00100
2022−01
2022−07
2023−01
2023−0
Date

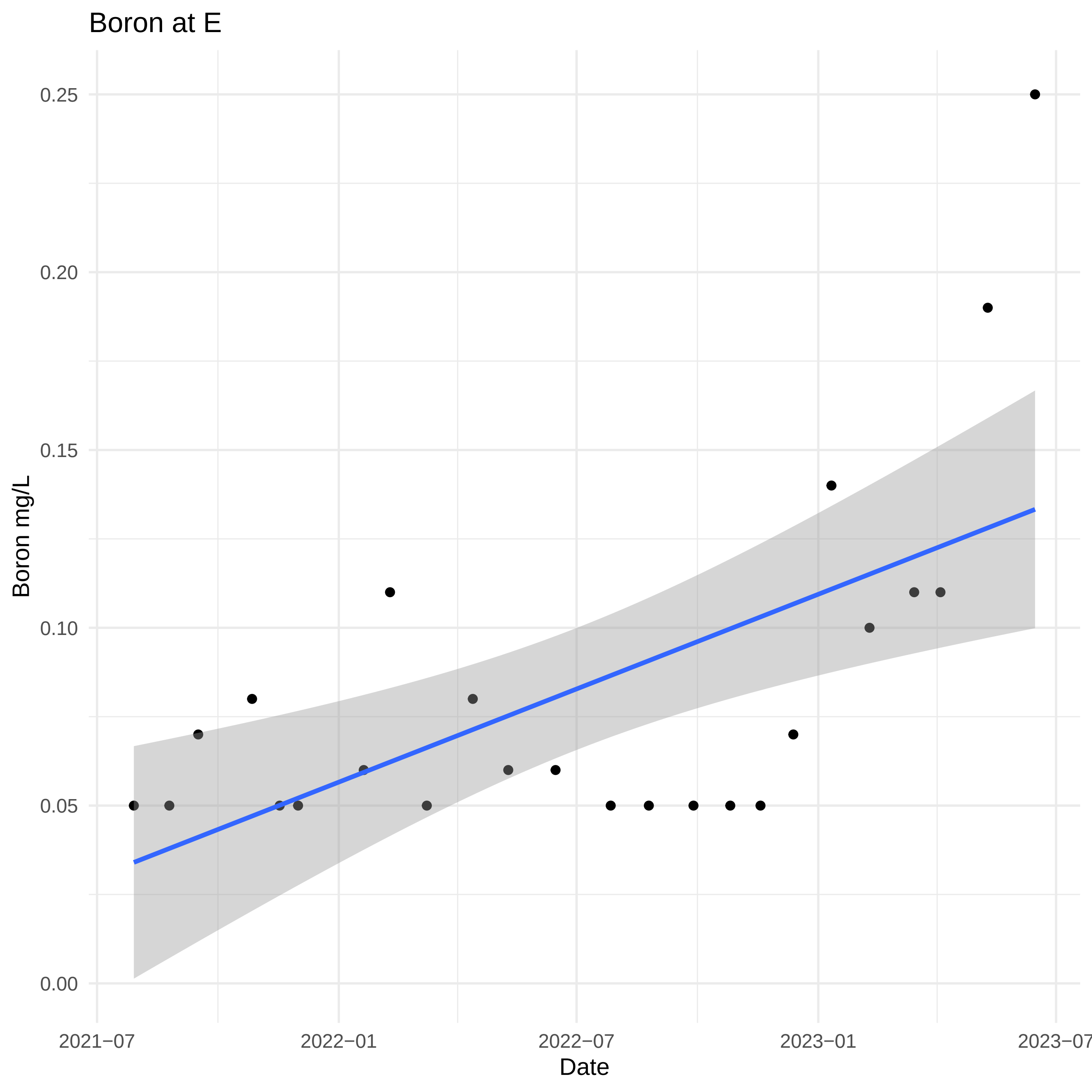


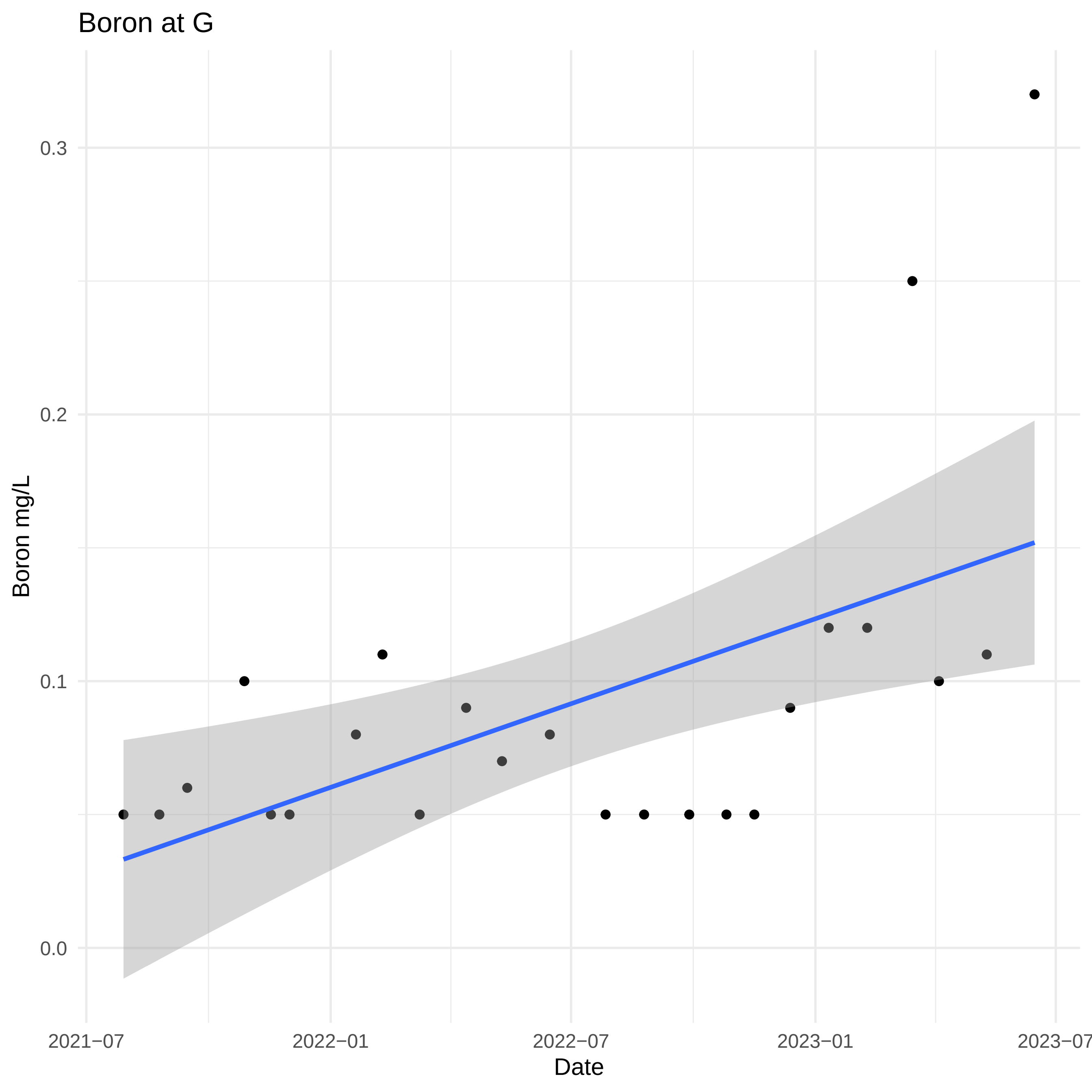
Arsenic at NC01
0.0030
0.0025
0.0020
0.0015
0.0010
Arsenic mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



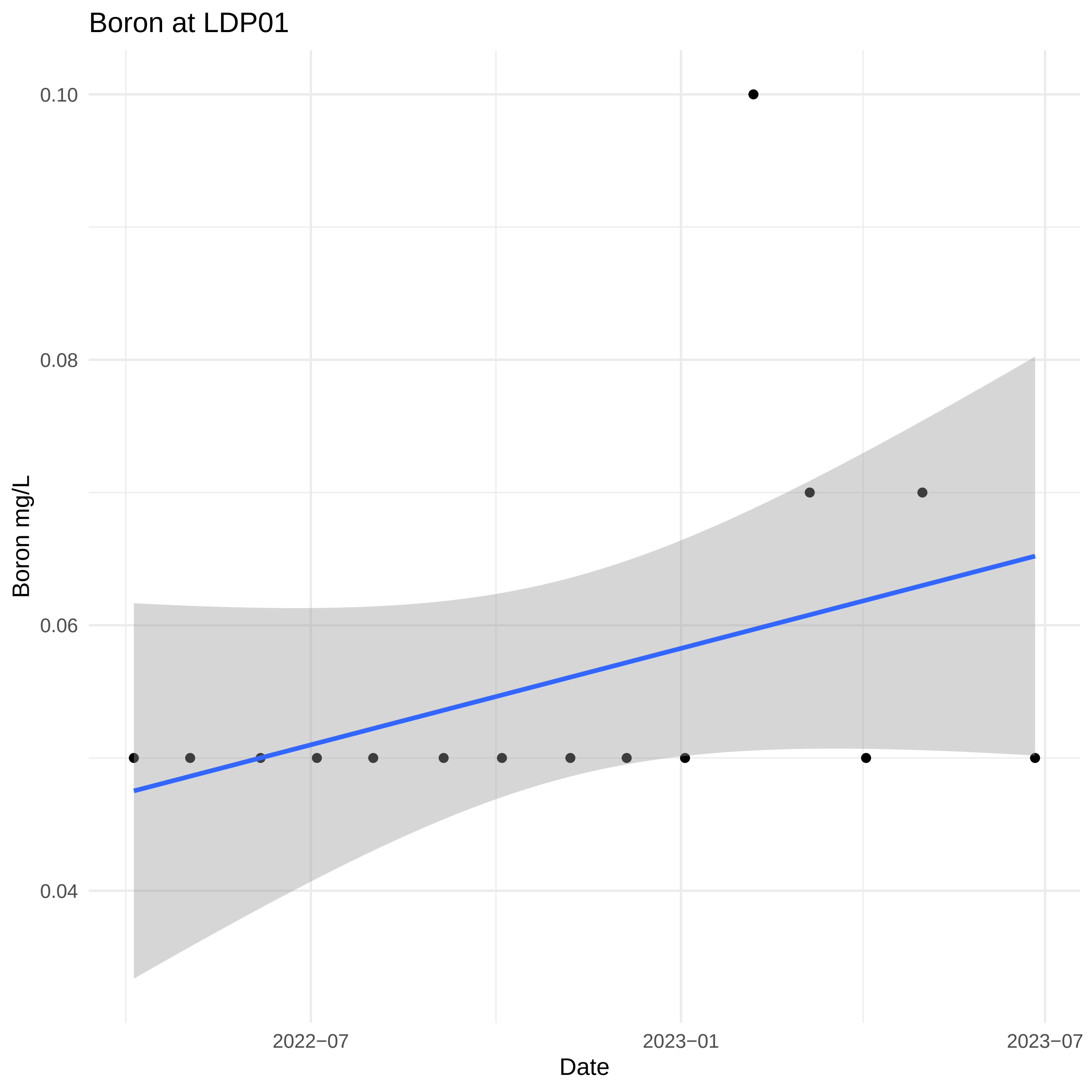
Arsenic at WX22
0.00200
0.00175
0.00150
0.00125
0.00100
Arsenic mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Boron at C
0.100
0.075
0.050
0.025
0.000
Boron mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

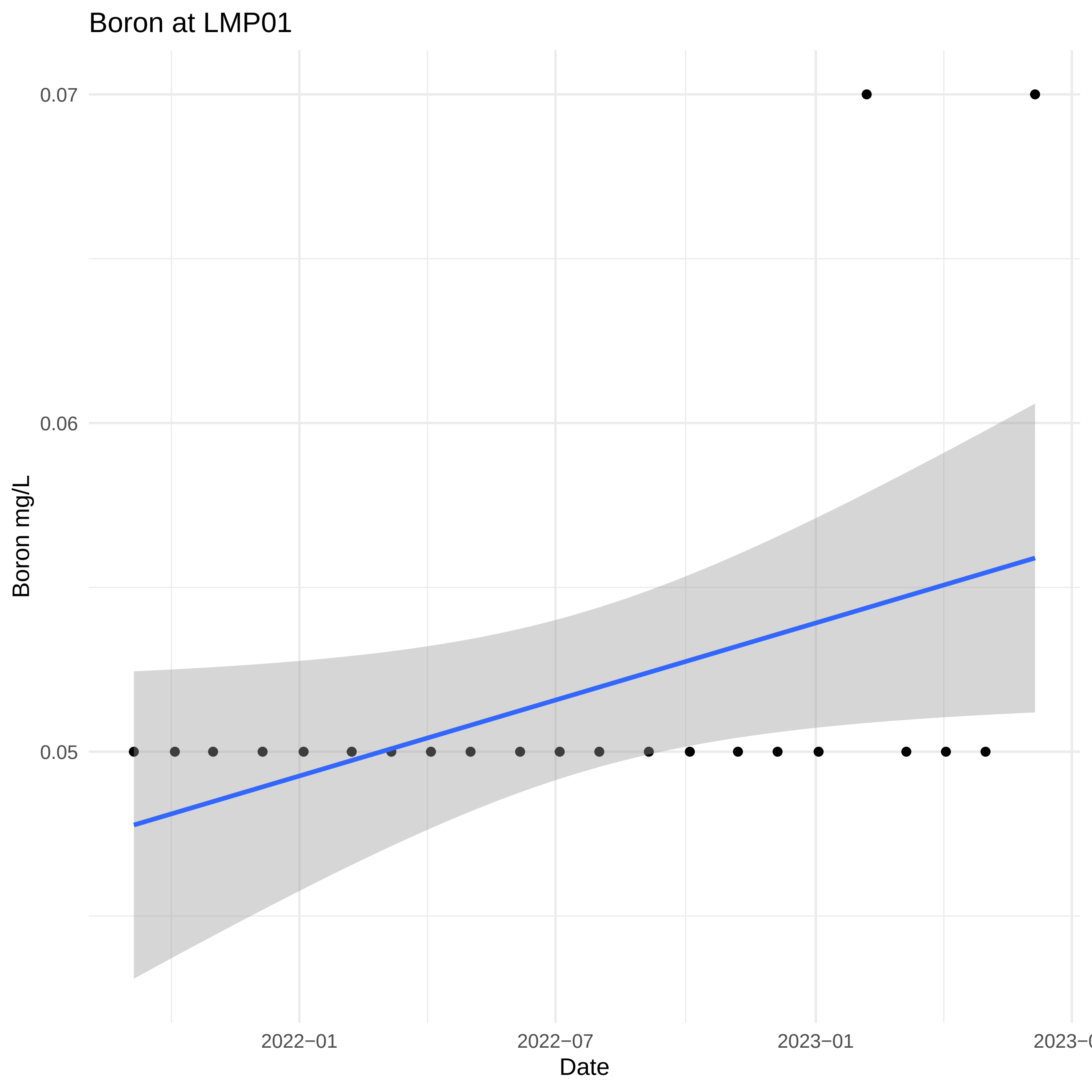

Boron at E
Boron mg/L
0.25
0.20
0.15
0.10
0.05
0.00
2021−07
2022−01
2022−07
2023−01
2023−07
Date



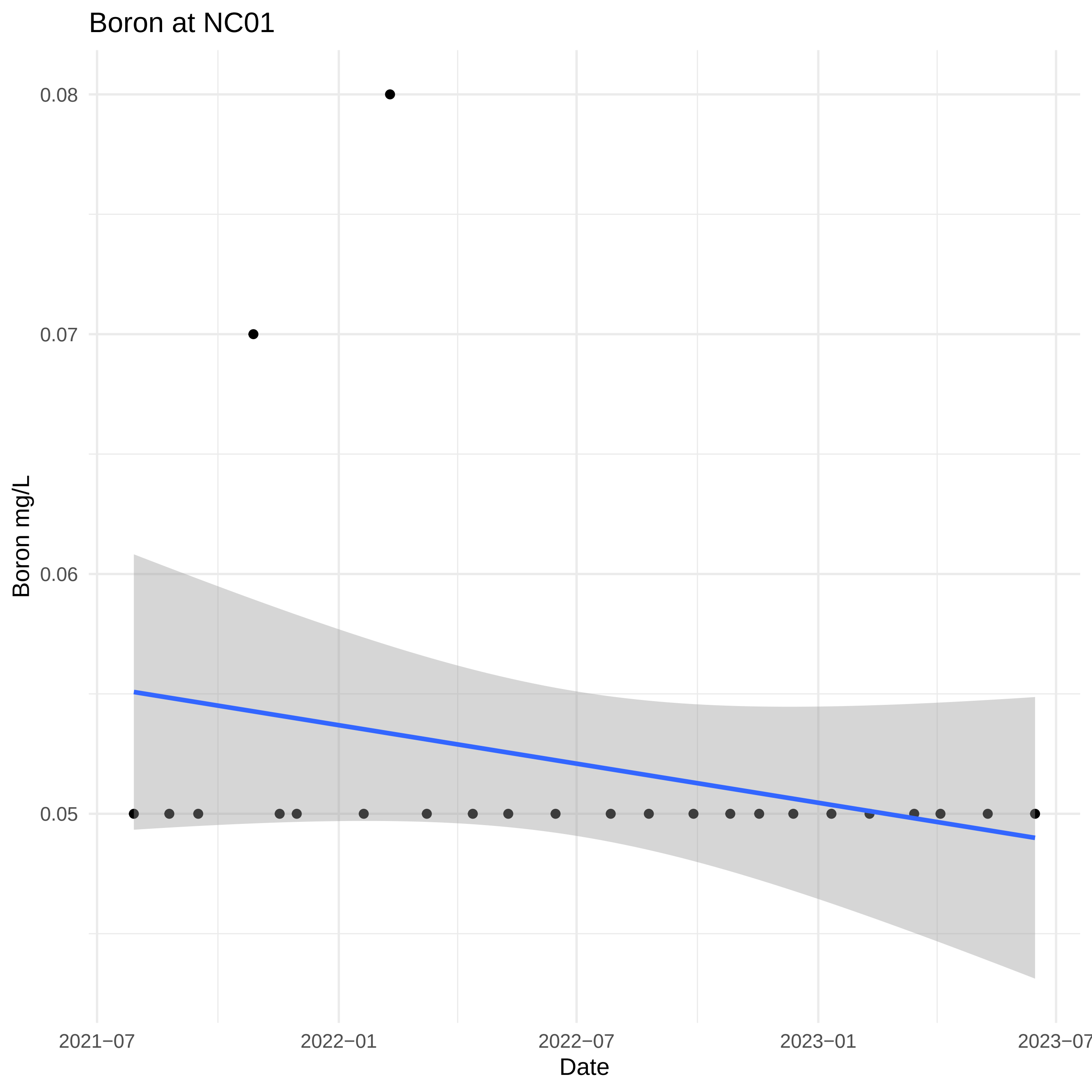
Boron at G
Boron mg/L
0.3
0.2
0.1
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

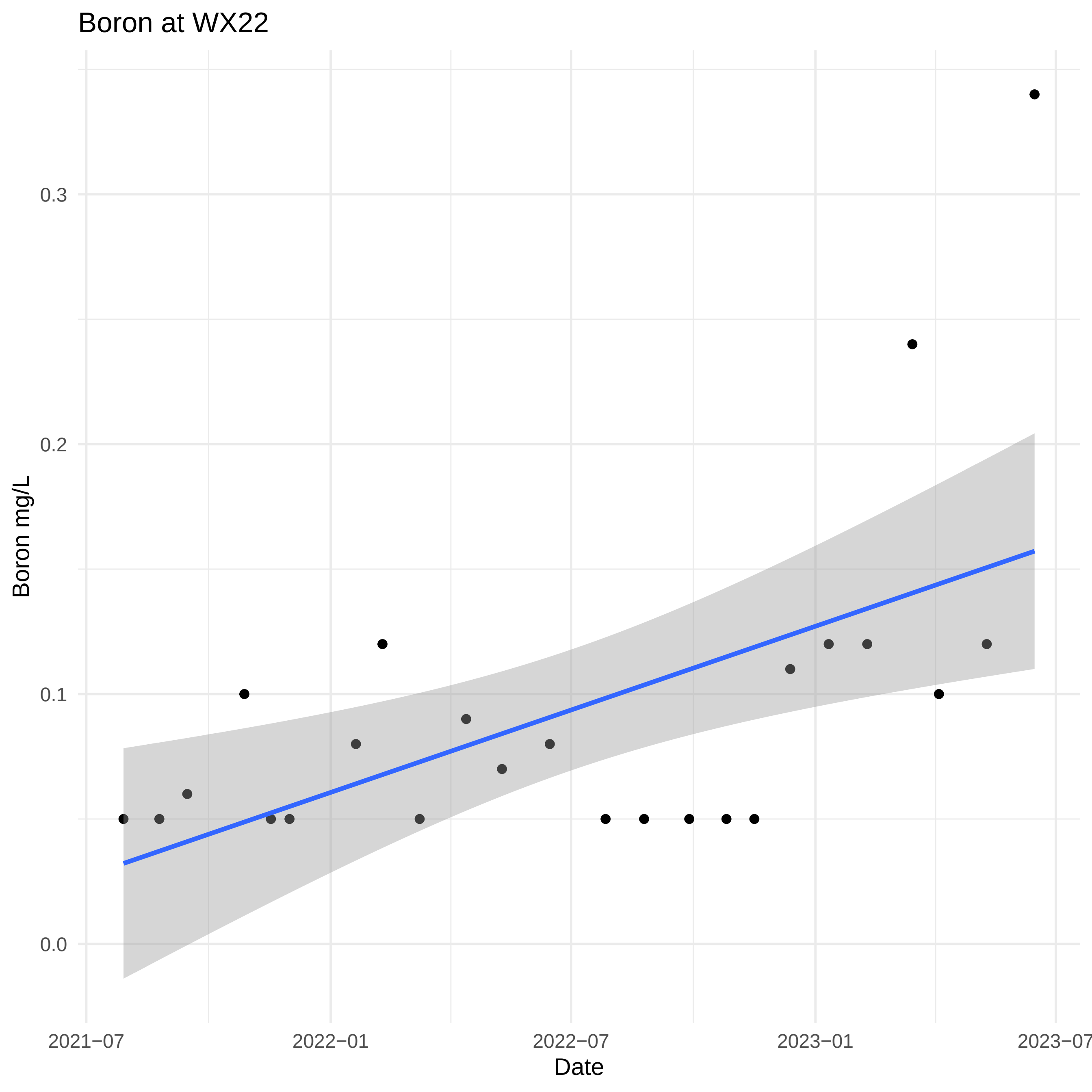


Boron at LDP01
0.10
0.08
0.06
0.04
Boron mg/L
2022−07
2023−01
2023−07
Date

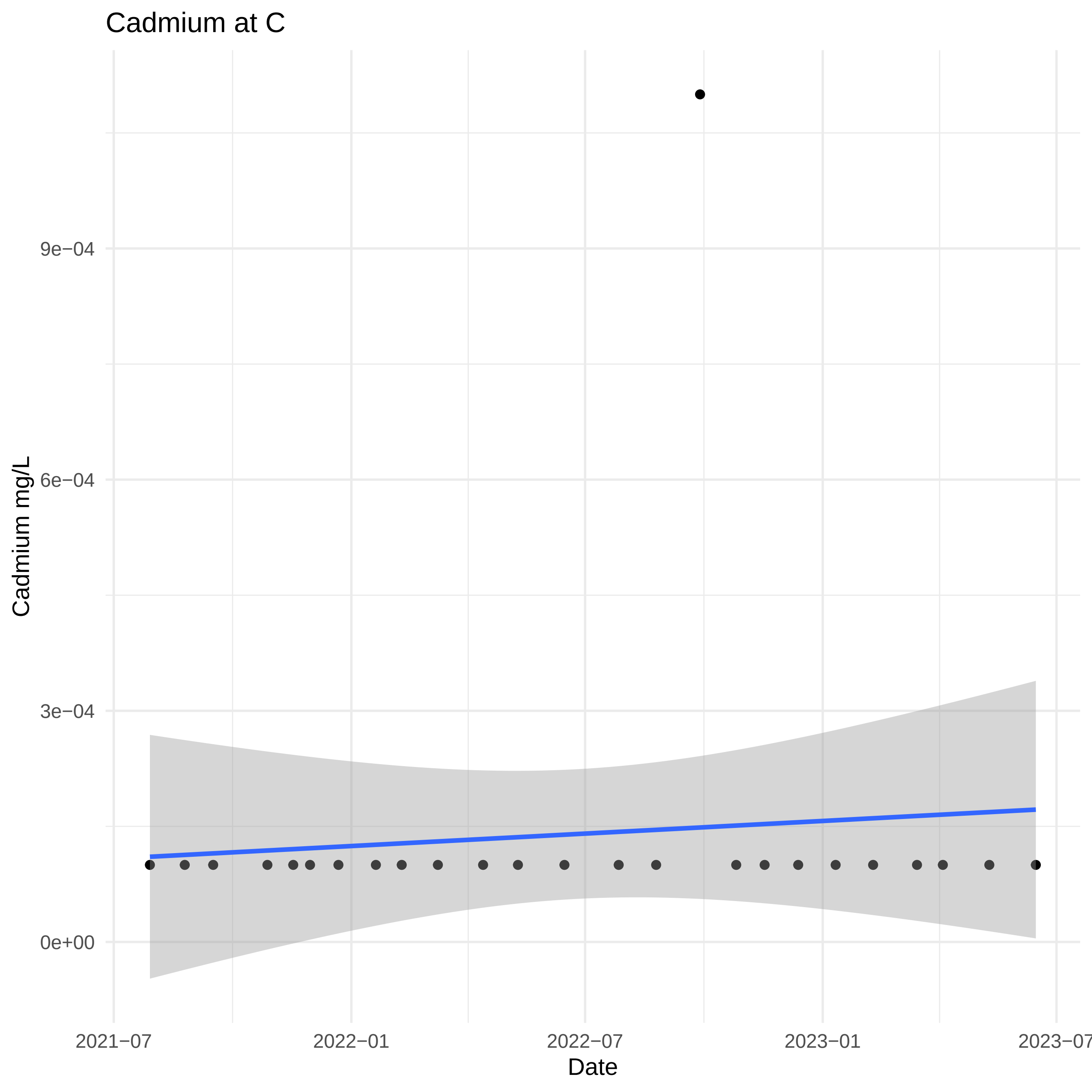


Boron at LMP01
0.07
0.06
0.05
Boron mg/L
2022−01
2022−07
2023−01
2023−0
Date

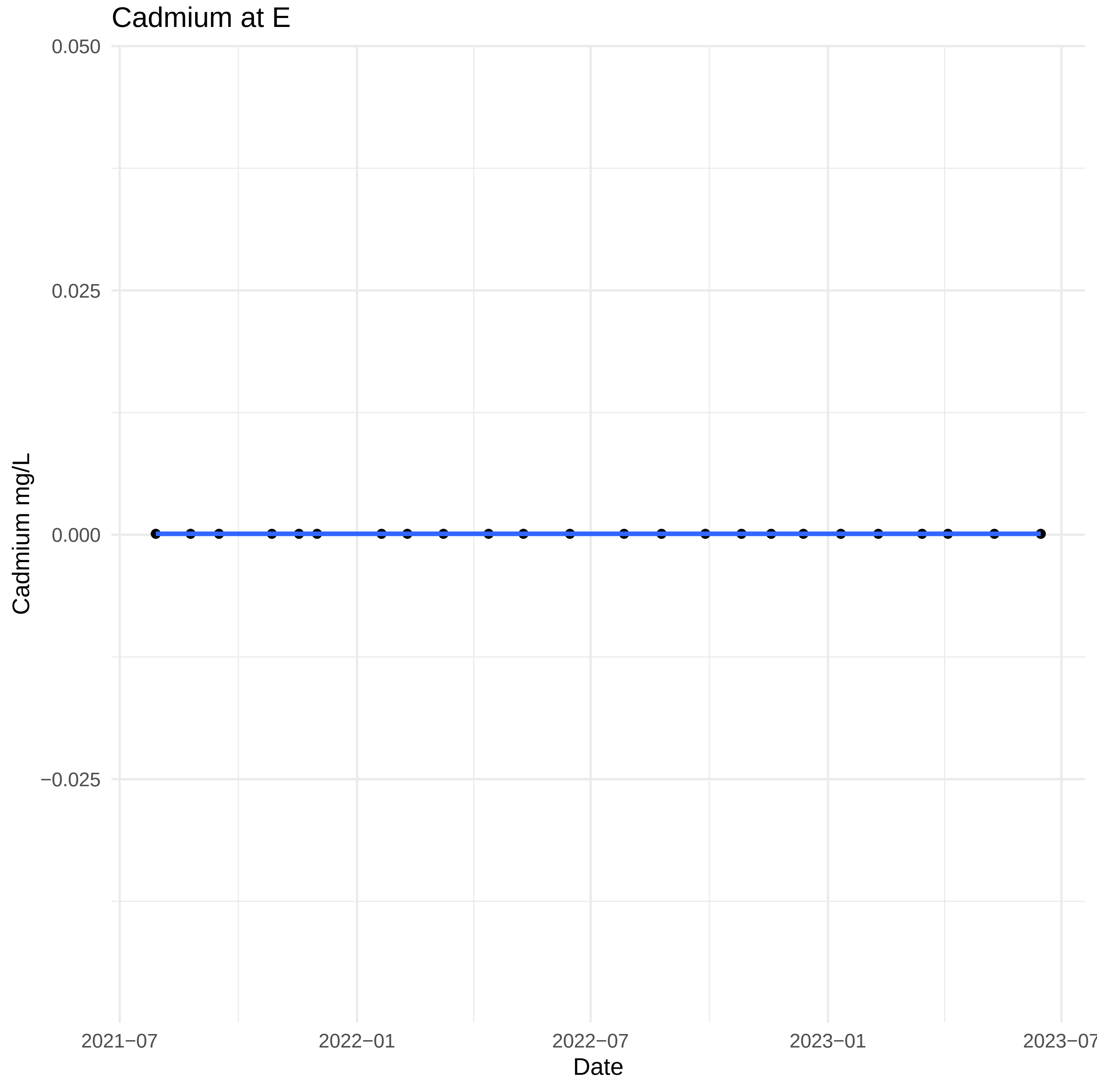

Boron at NC01
0.08
0.07
0.06
0.05
Boron mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



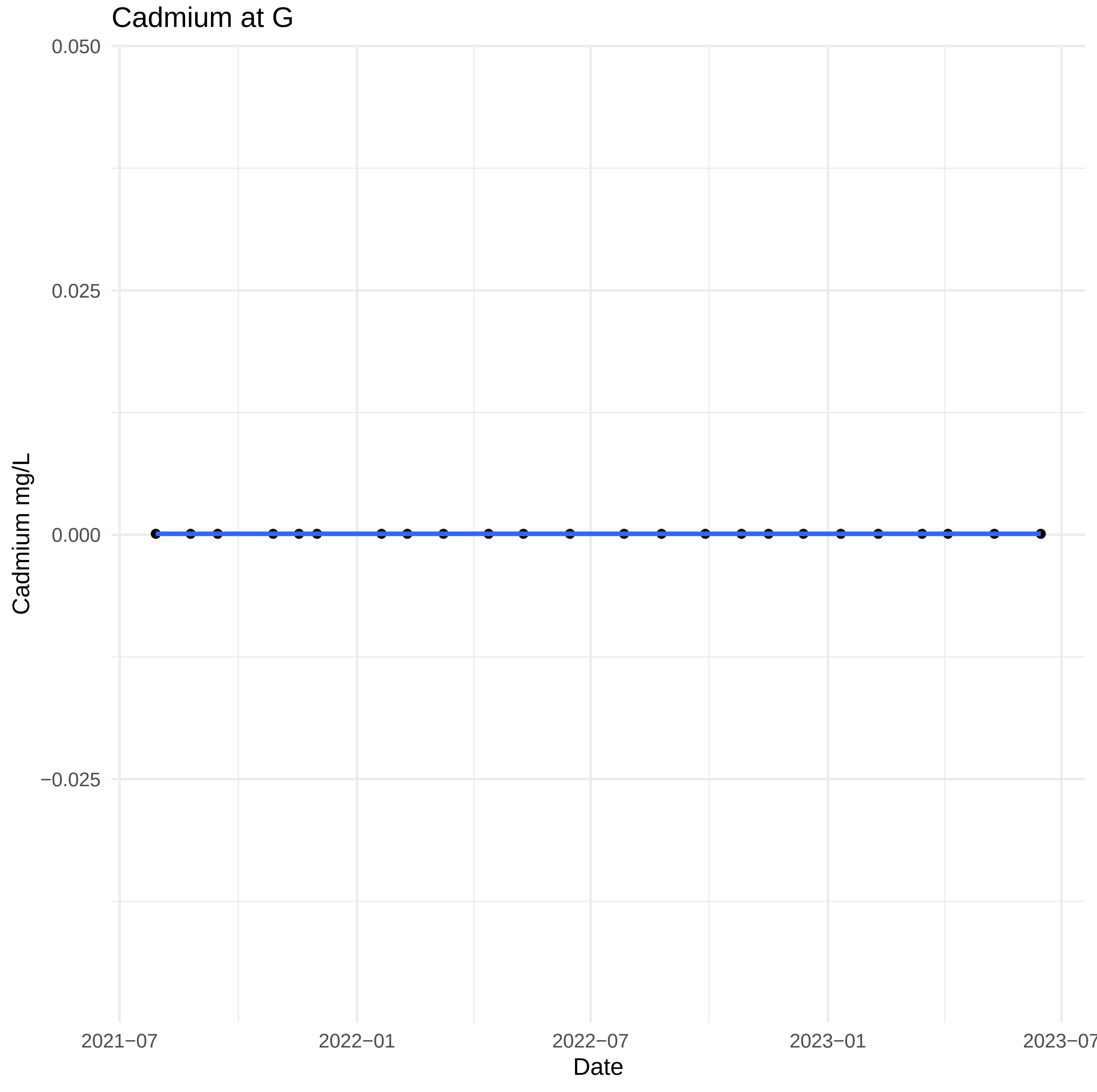
Boron at WX22
0.3
0.2
0.1
0.0
Boron mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



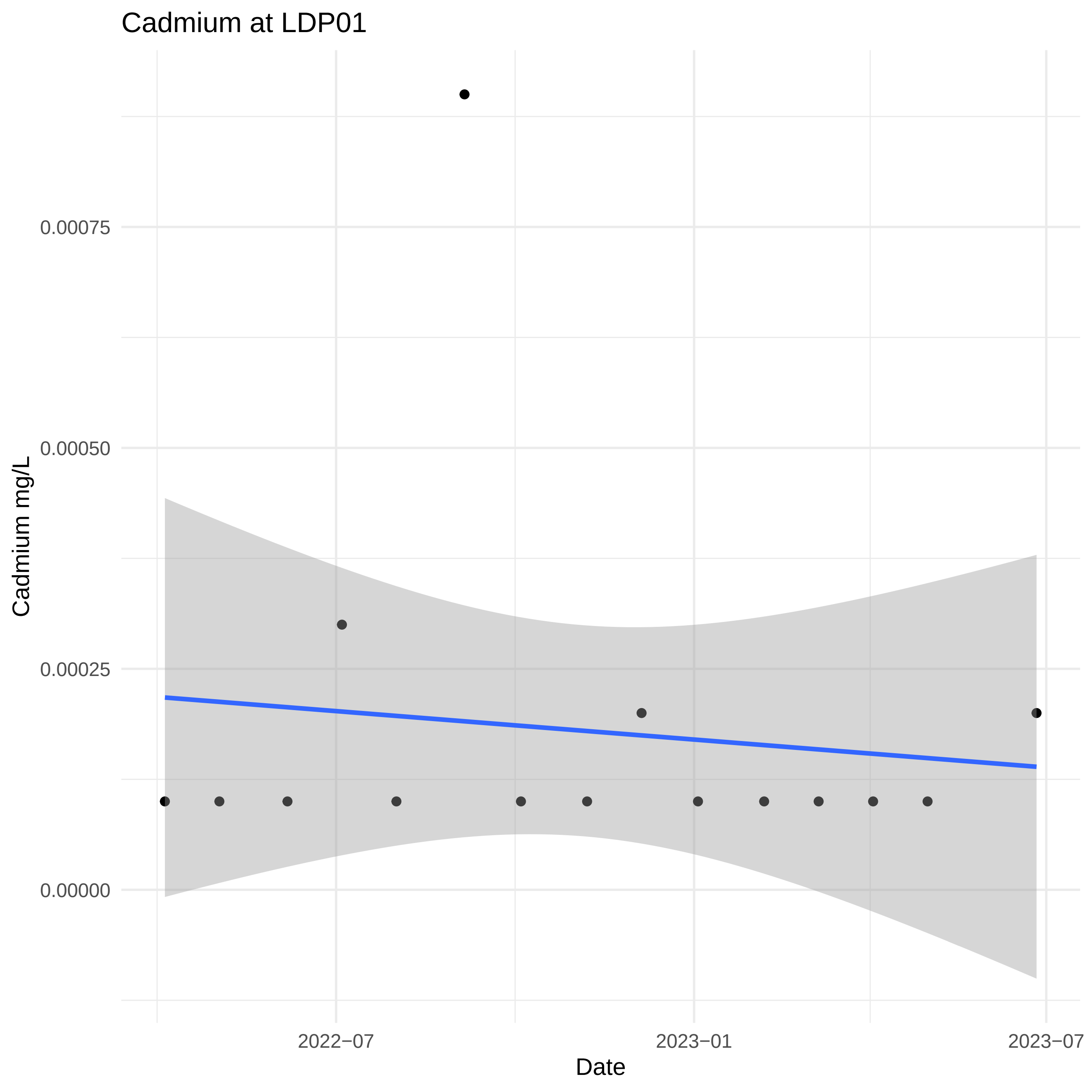
Cadmium at C
Cadmium mg/L
9e−04
6e−04
3e−04
0e+00
2021−07
2022−01
2022−07
2023−01
2023−07
Date



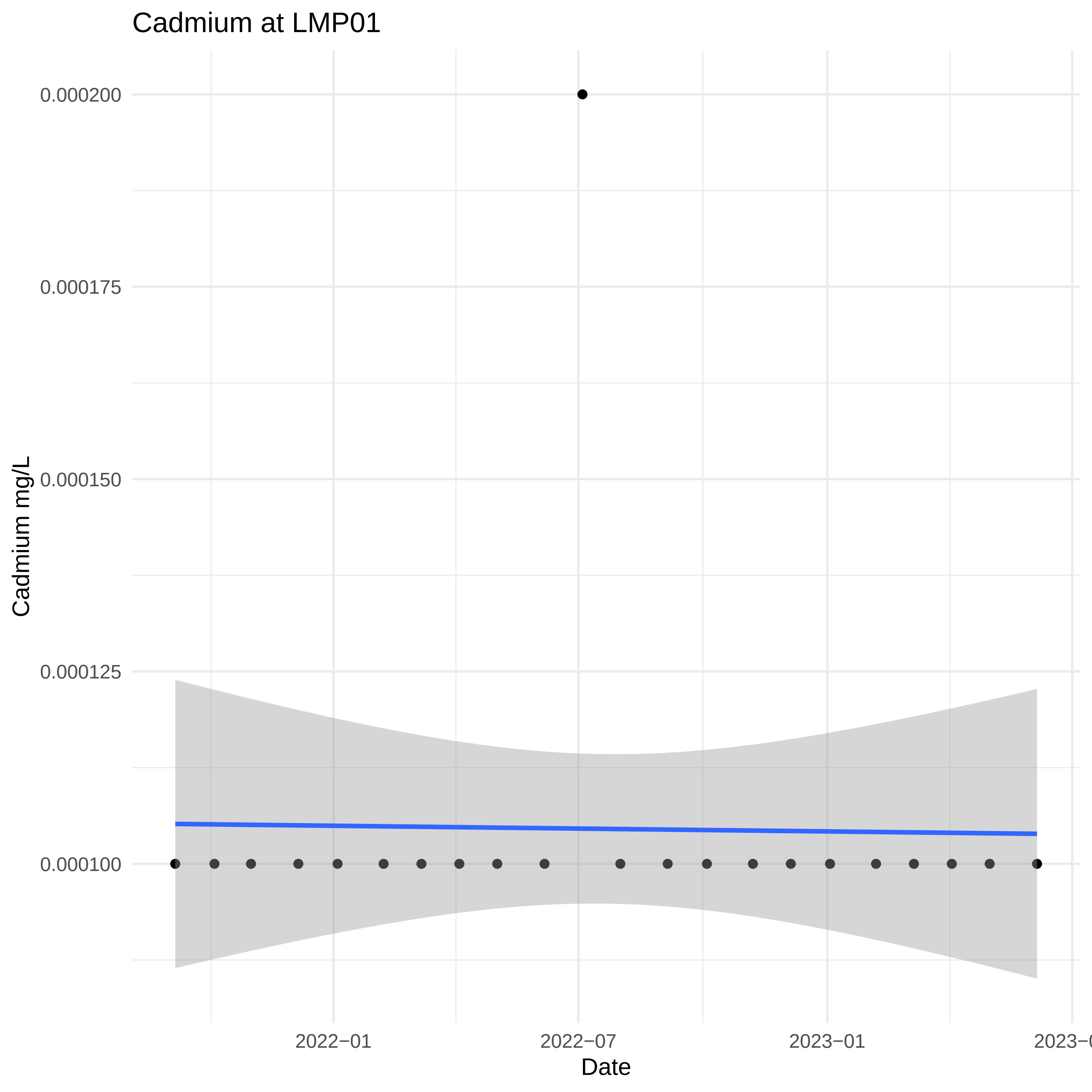
Cadmium at E
0.050
0.025
0.000
−0.025
Cadmium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



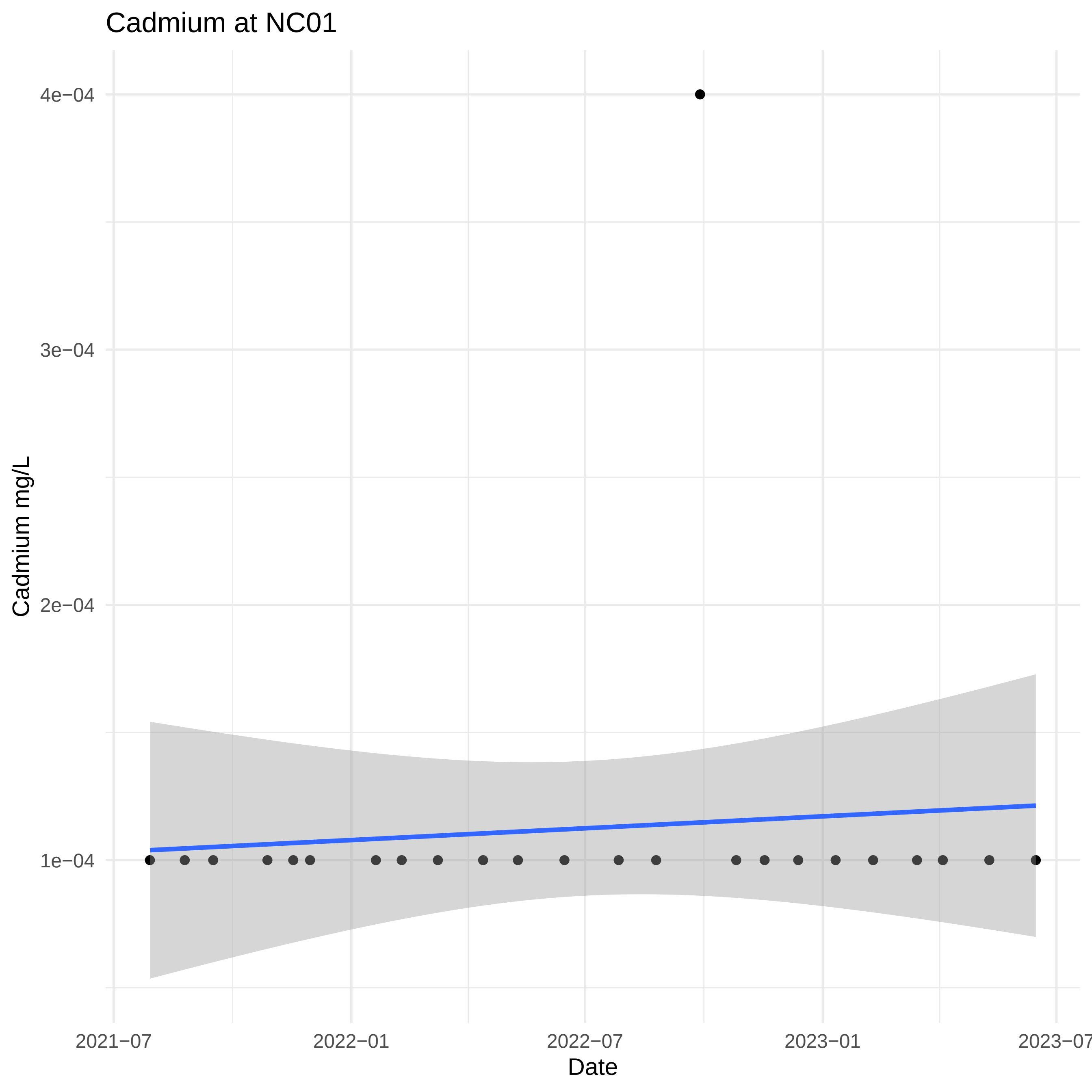
Cadmium at G
0.050
0.025
0.000
−0.025
Cadmium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



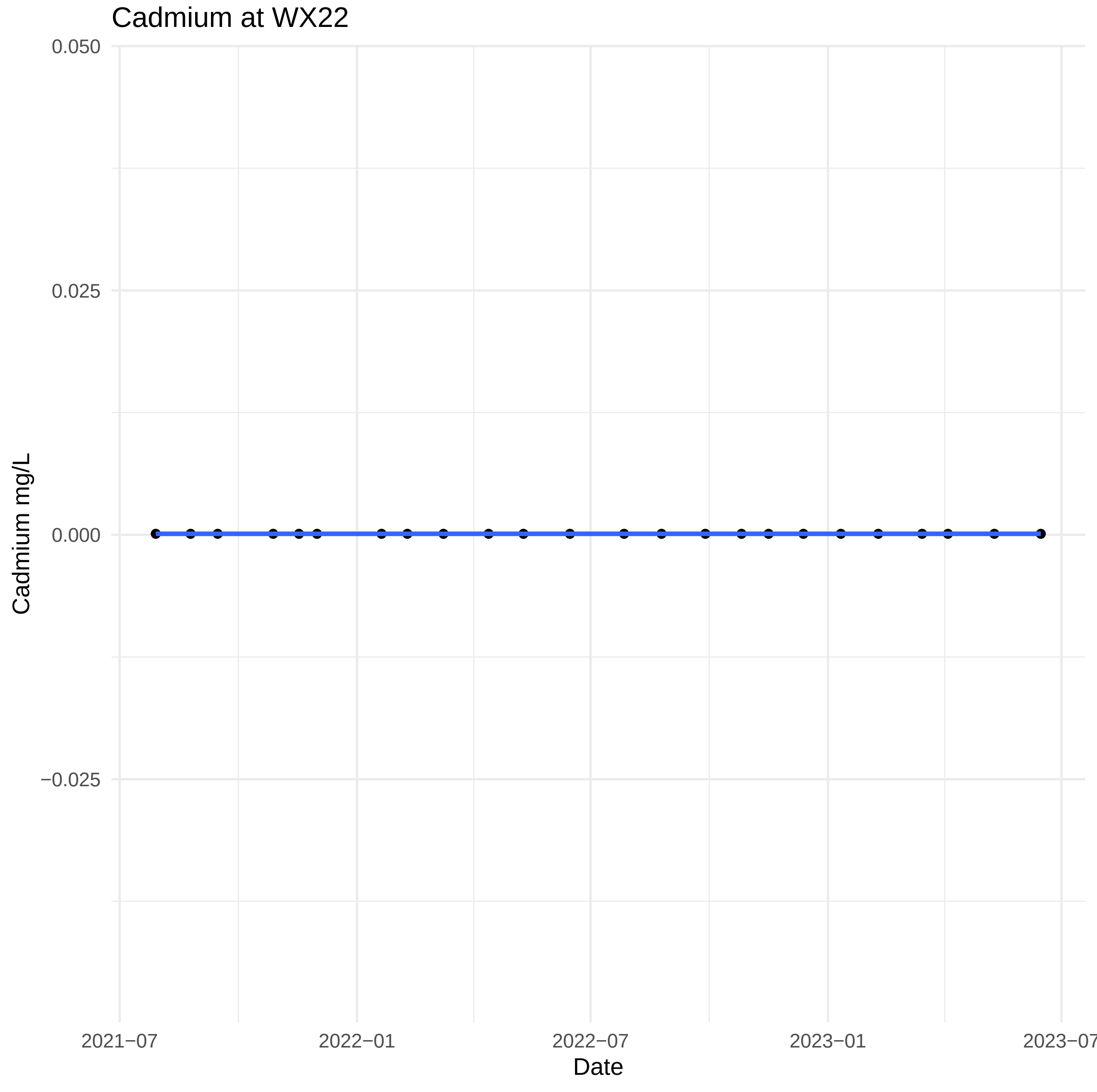
Cadmium at LDP01
0.00075
0.00050
0.00025
0.00000
Cadmium mg/L
2022−07
2023−01
2023−07
Date



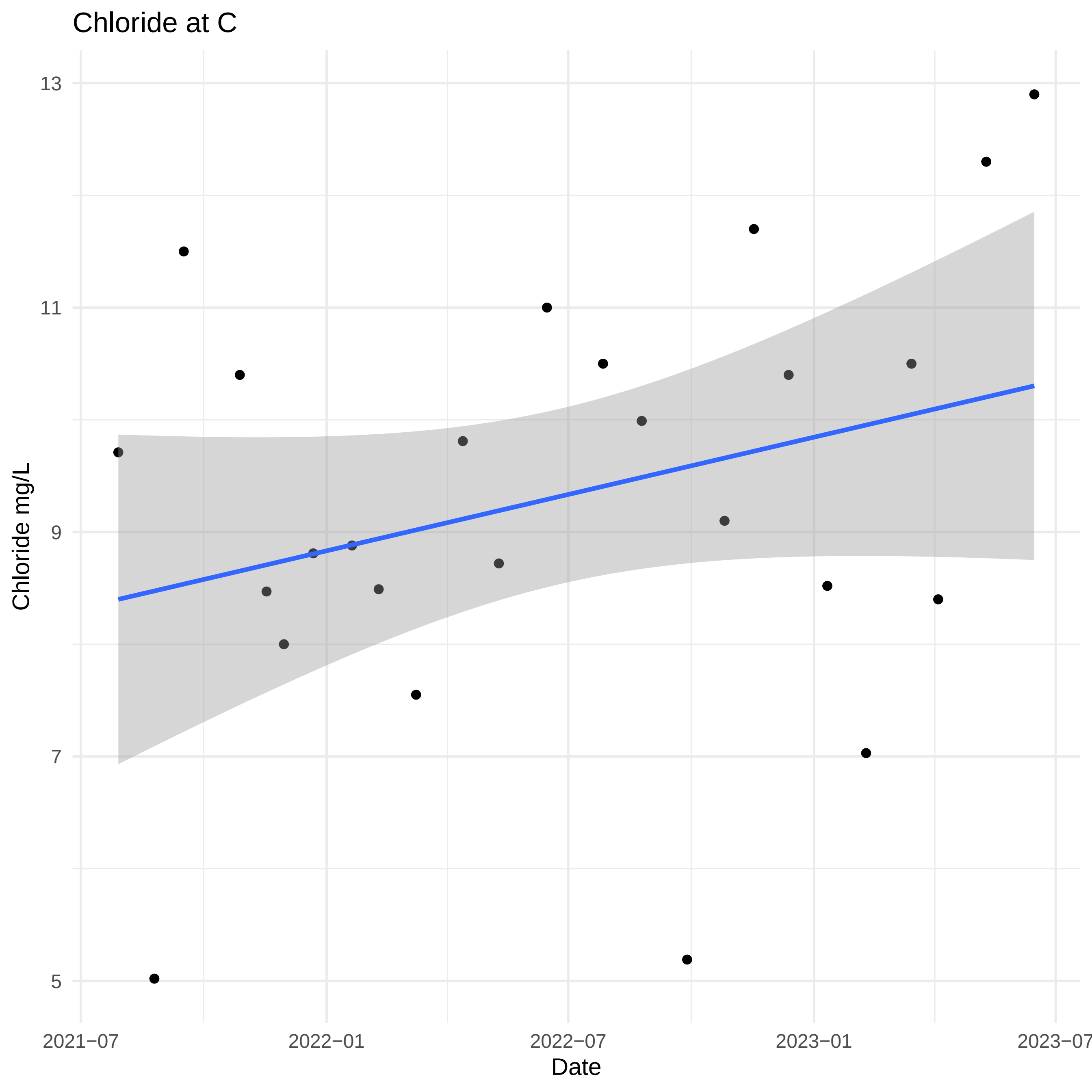
Cadmium at LMP01
0.000200
0.000175
0.000150
0.000125
0.000100
Cadmium mg/L
2022−01
2022−07
2023−01
2023−0
Date



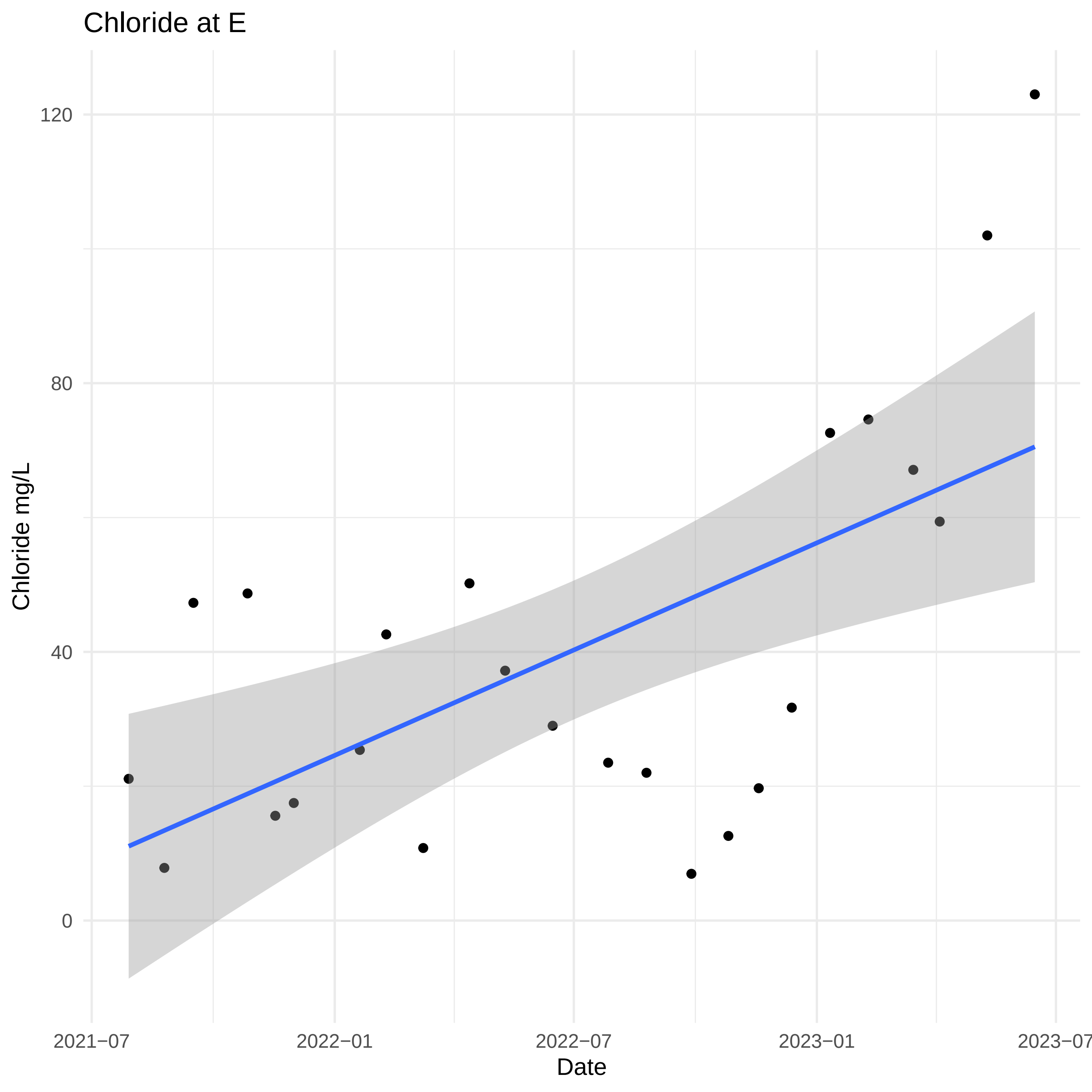
Cadmium at NC01
4e−04
3e−04
2e−04
1e−04
Cadmium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



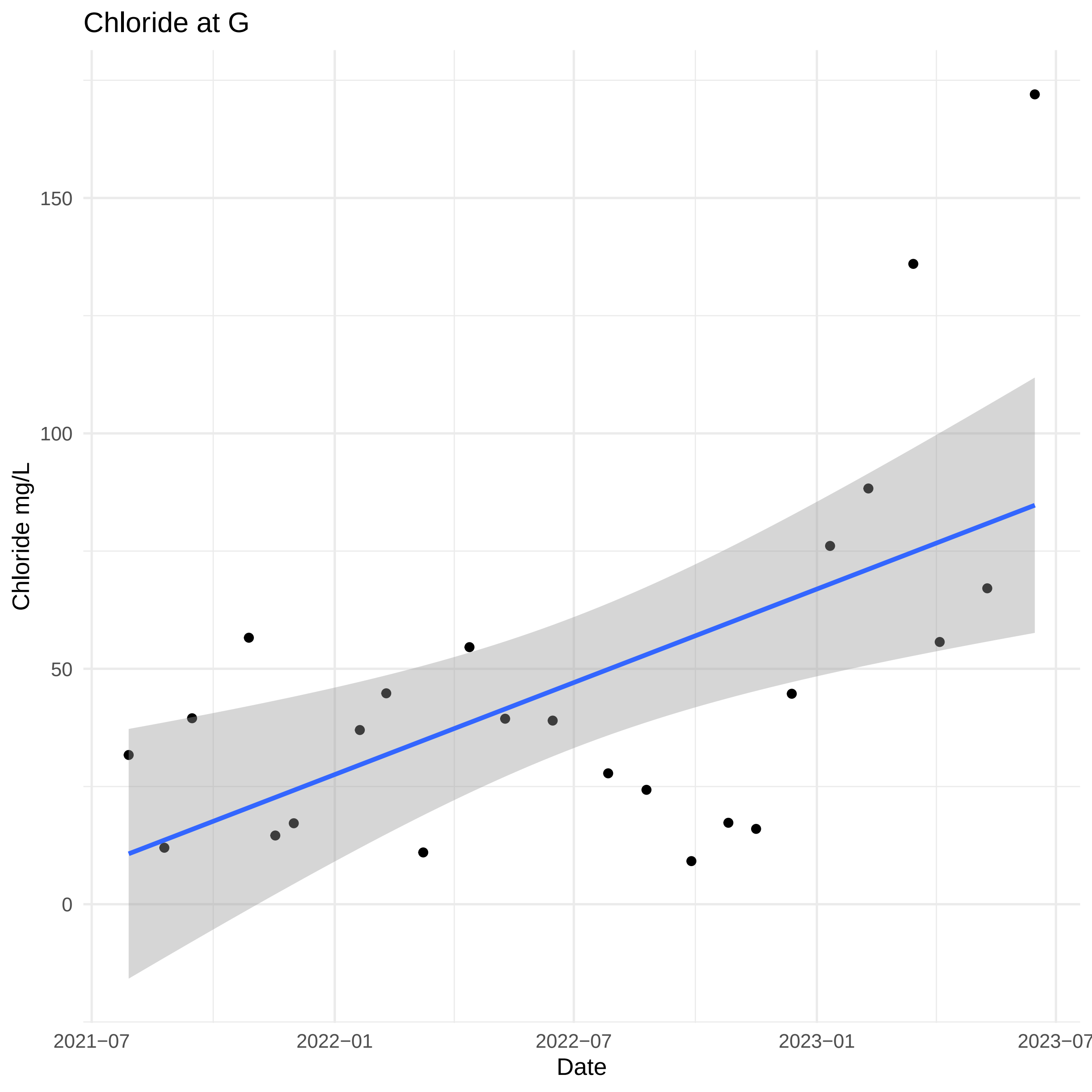
Cadmium at WX22
0.050
0.025
0.000
−0.025
Cadmium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



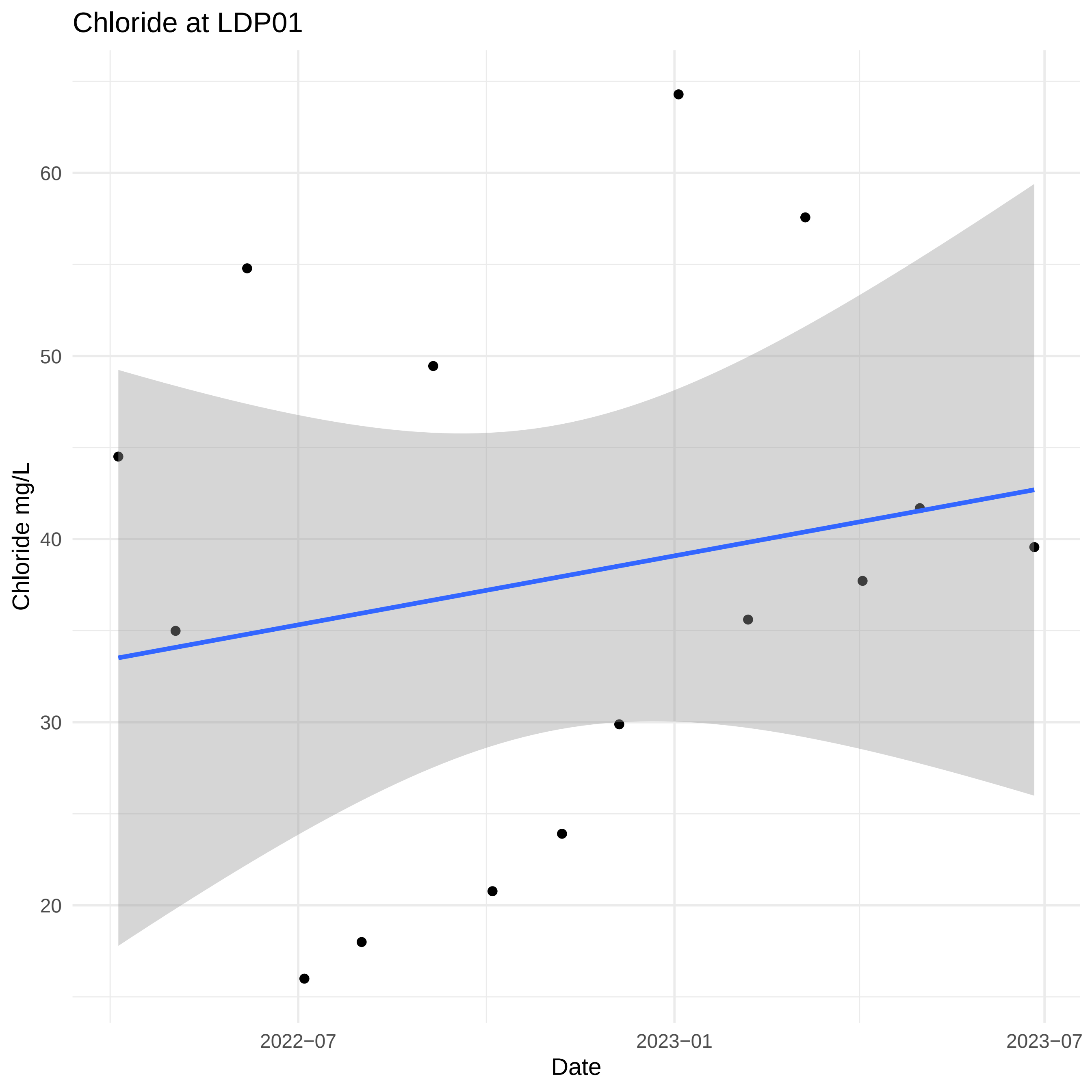
Chloride at C
Chloride mg/L
Date
13
11
9
7
5
2021−07
2022−01
2022−07
2023−01
2023−07



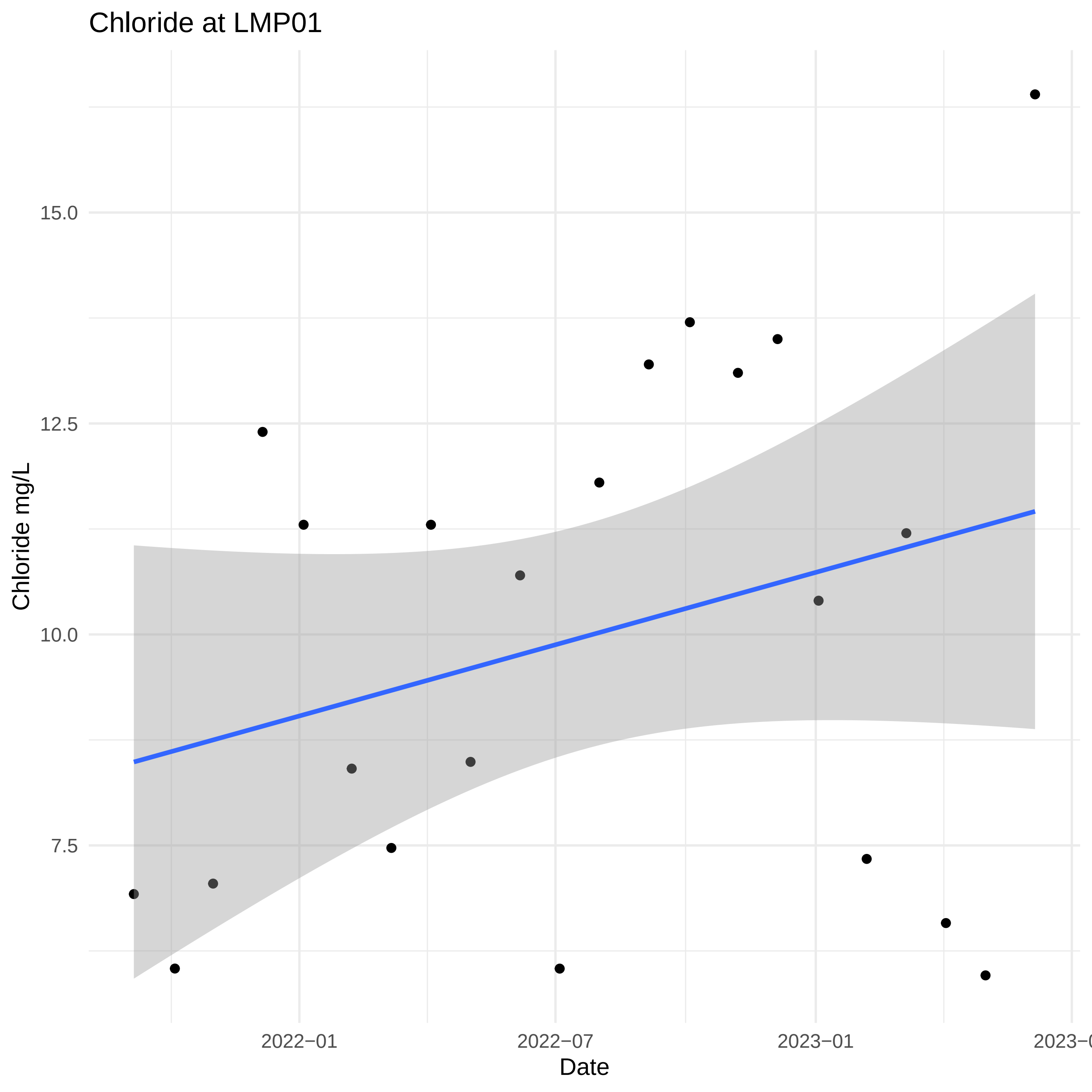
Chloride at E
Chloride mg/L
120
80
40
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

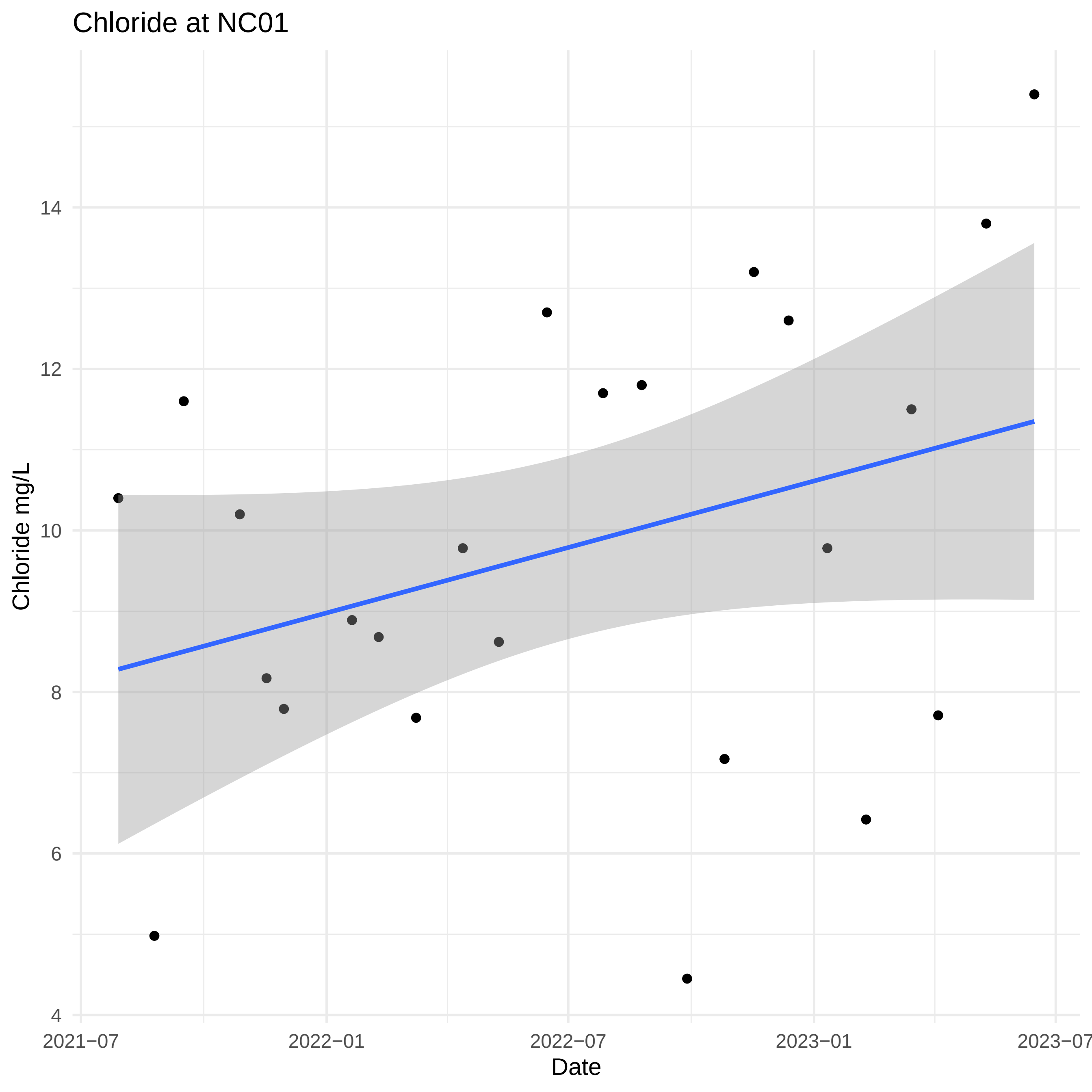


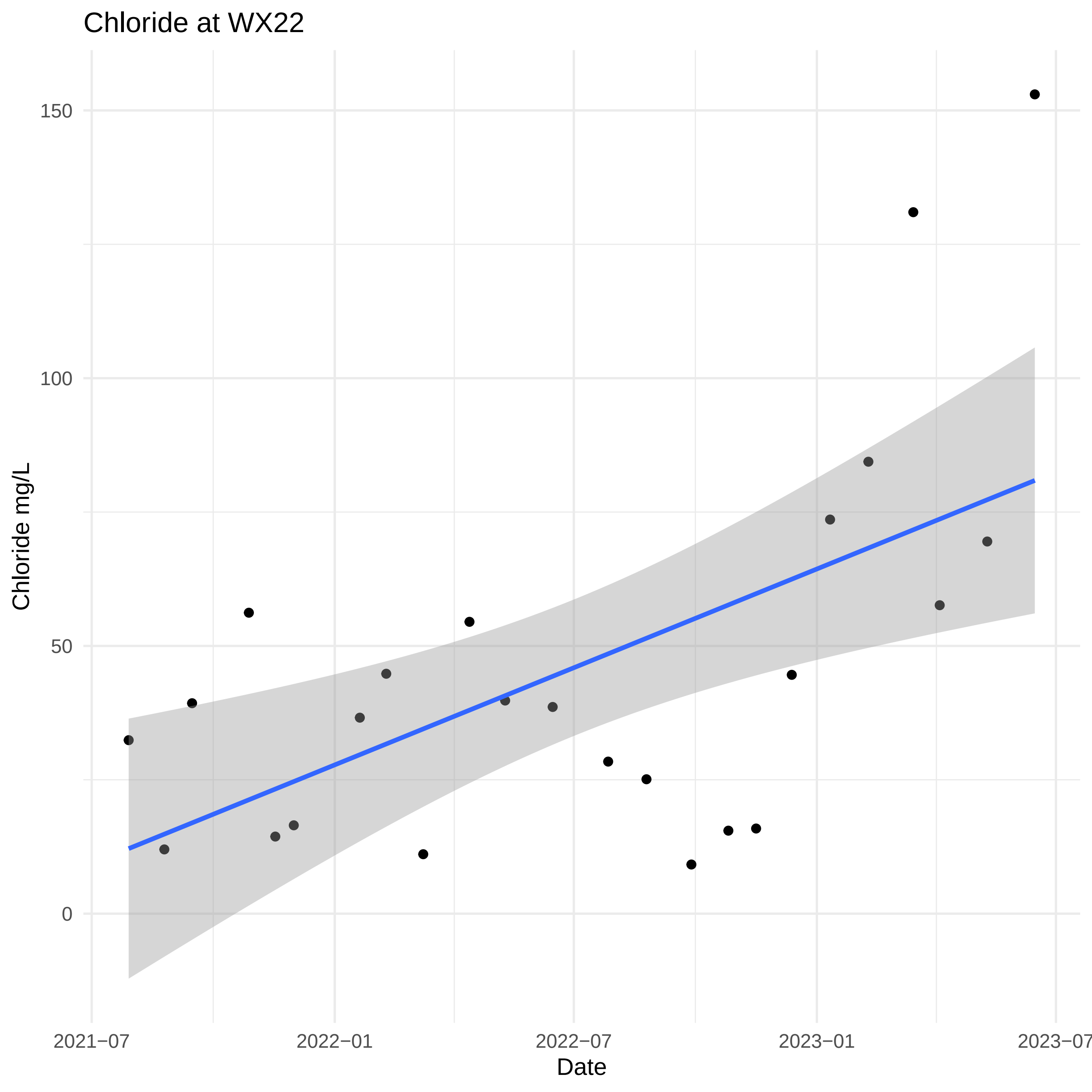
Chloride at G
Chloride mg/L
150
100
50
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



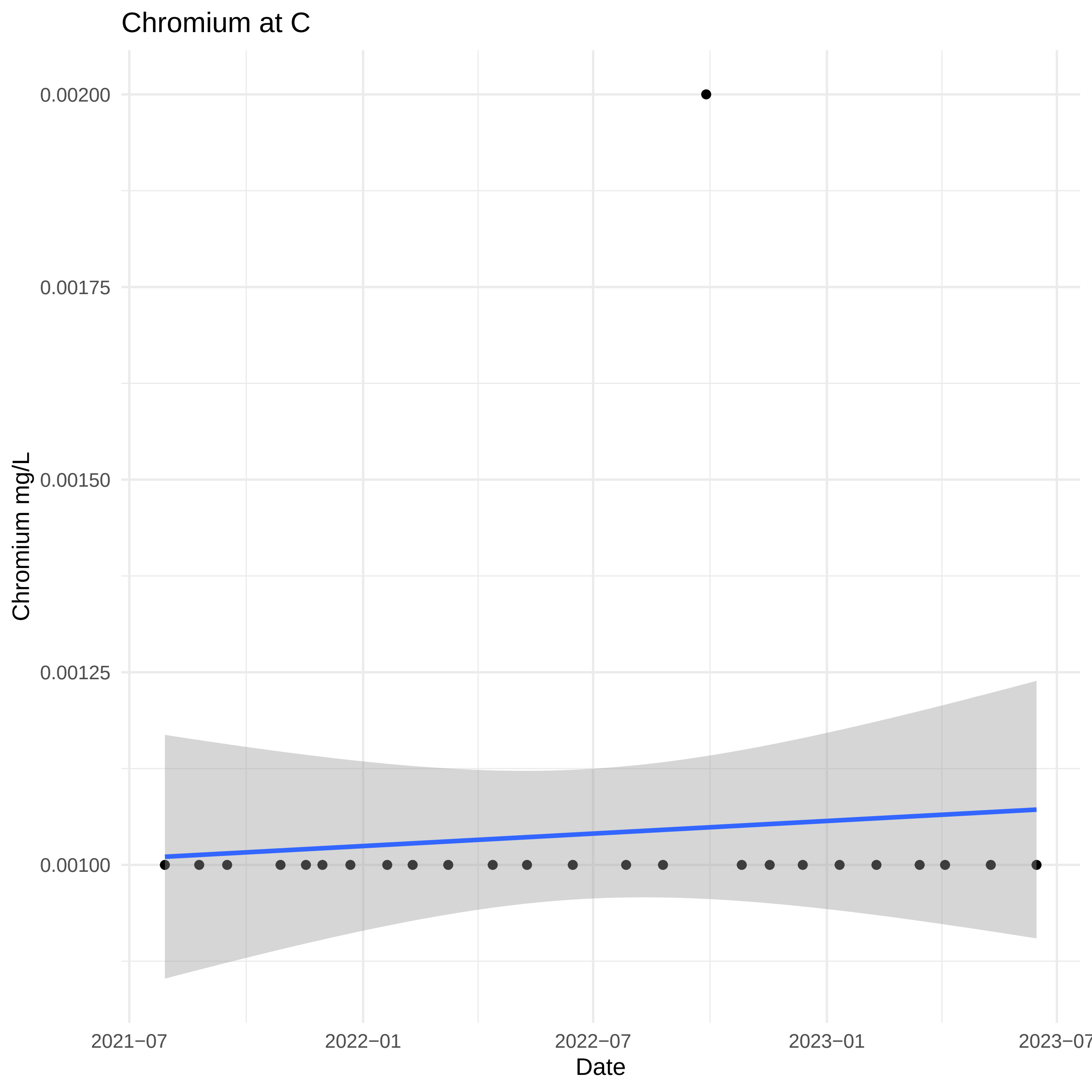
Chloride at LDP01
Chloride mg/L
60
50
40
30
20
2022−07
2023−01
2023−07
Date


Chloride at LMP01
15.0
12.5
10.0
7.5
Chloride mg/L
2022−01
2022−07
2023−01
Date

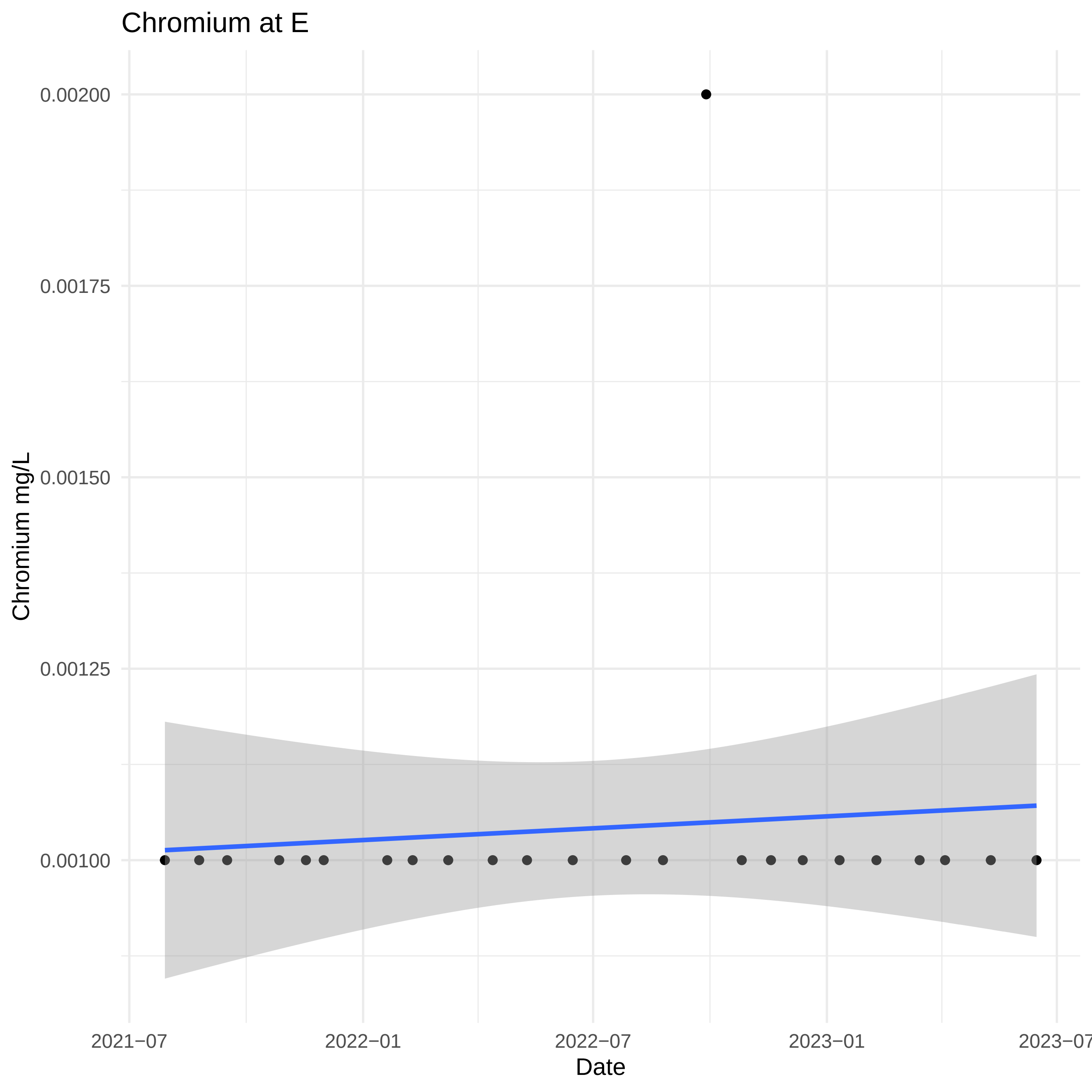

Chloride at NC01
Chloride mg/L
14
12
10
8
6
4
2021−07
2022−01
2022−07
2023−01
2023−07
Date



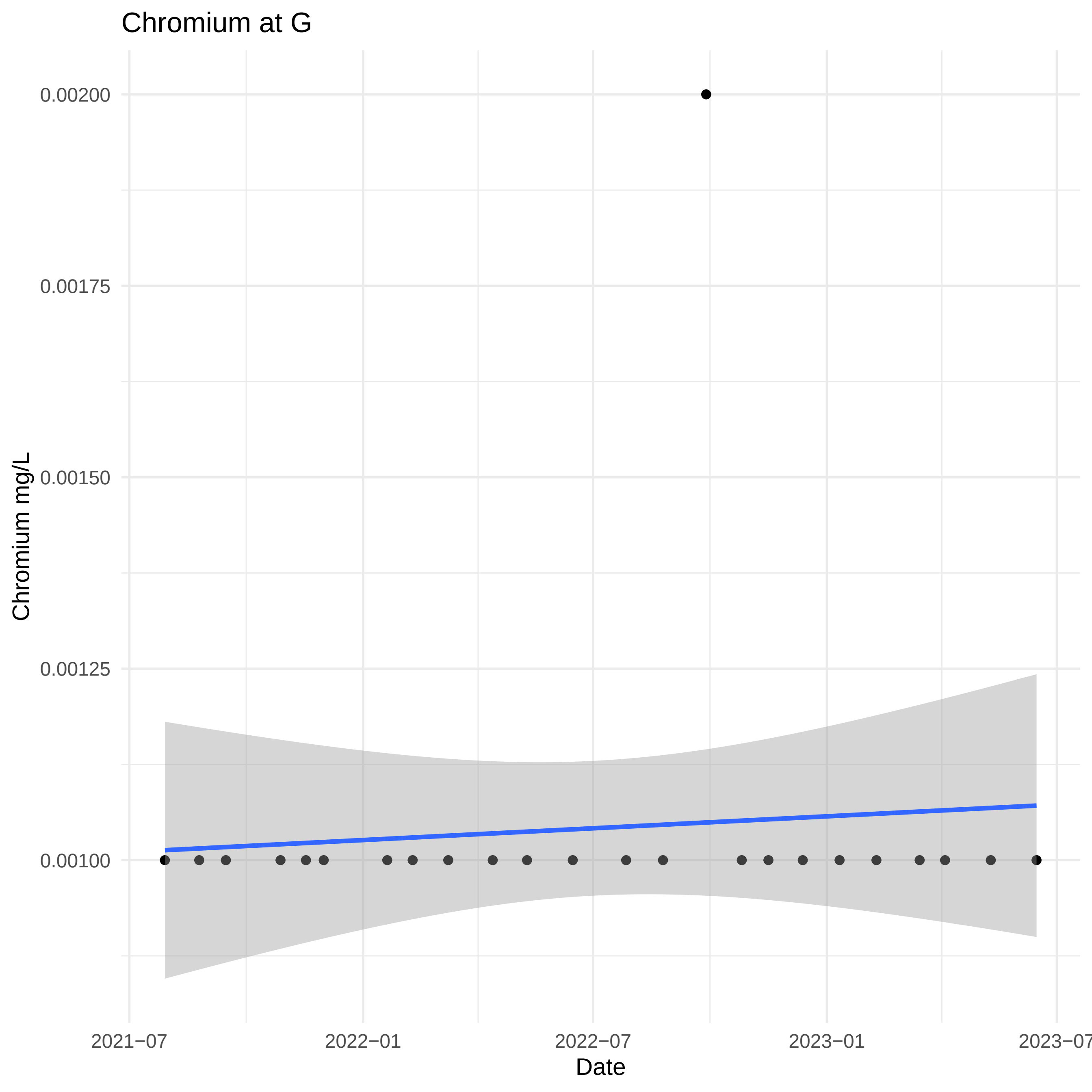
Chloride at WX22
Chloride mg/L
150
100
50
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



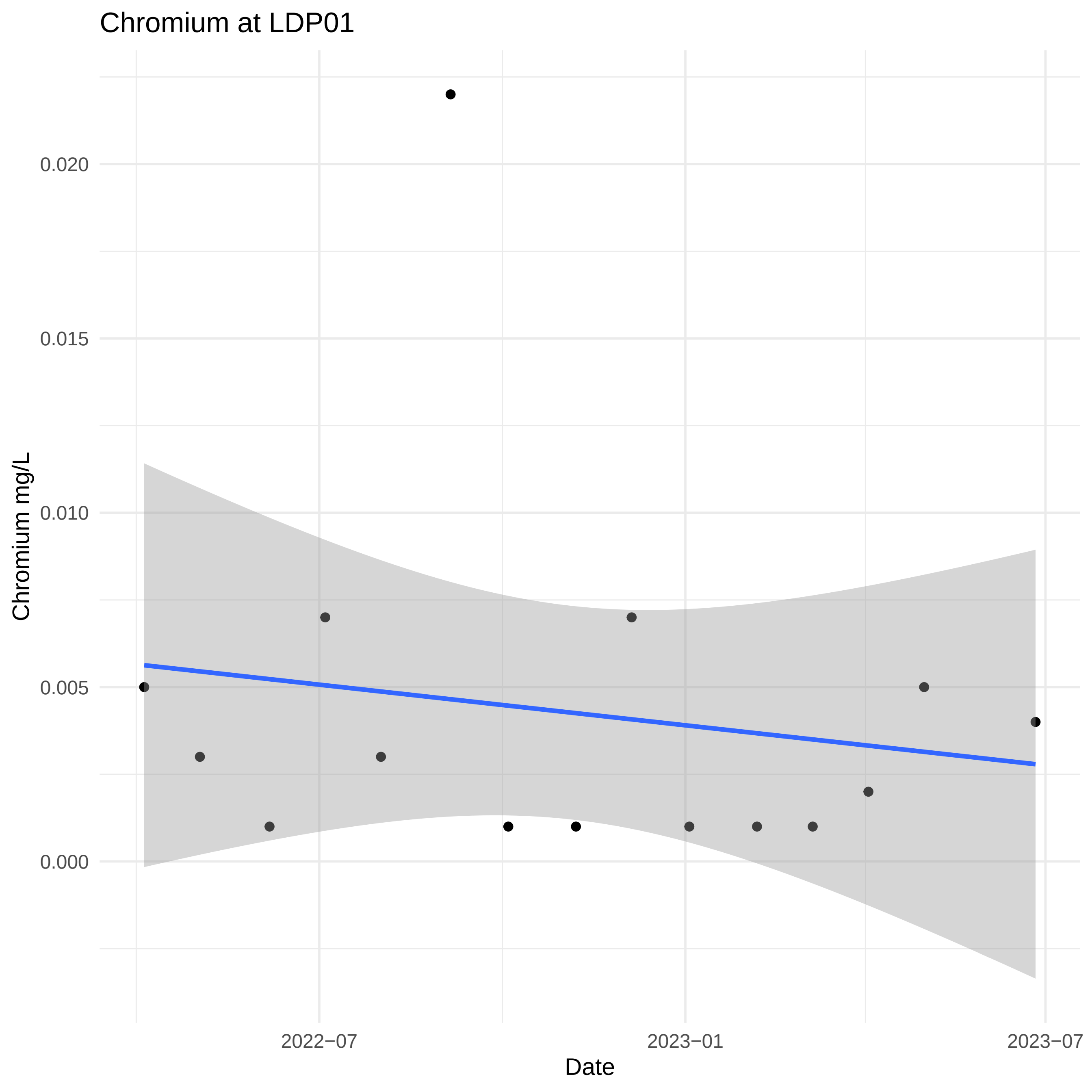
Chromium at C
0.00200
0.00175
0.00150
0.00125
0.00100
Chromium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



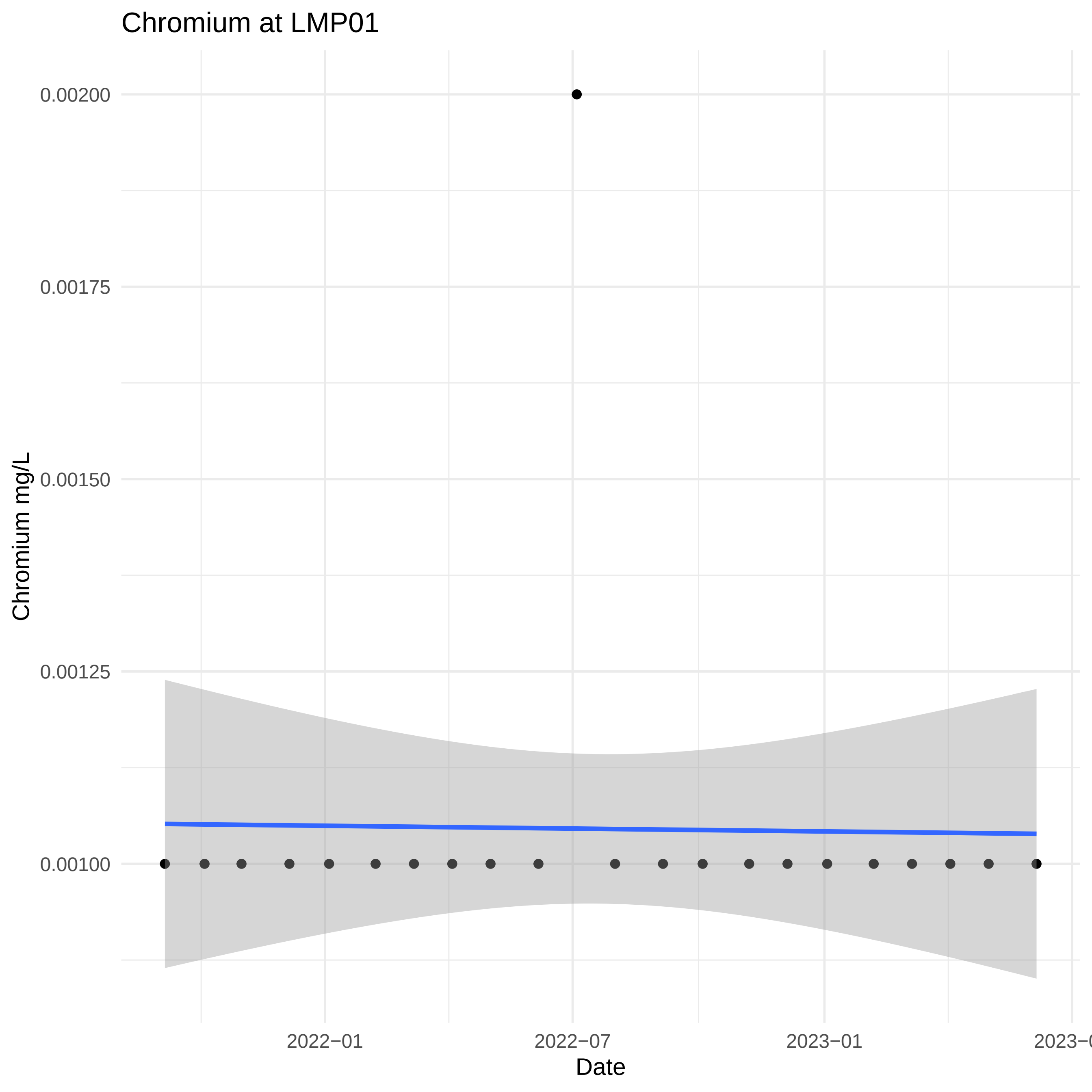
Chromium at E
Chromium mg/L
0.00200
0.00175
0.00150
0.00125
0.00100
2021−07
2022−01
2022−07
2023−01
2023−07
Date

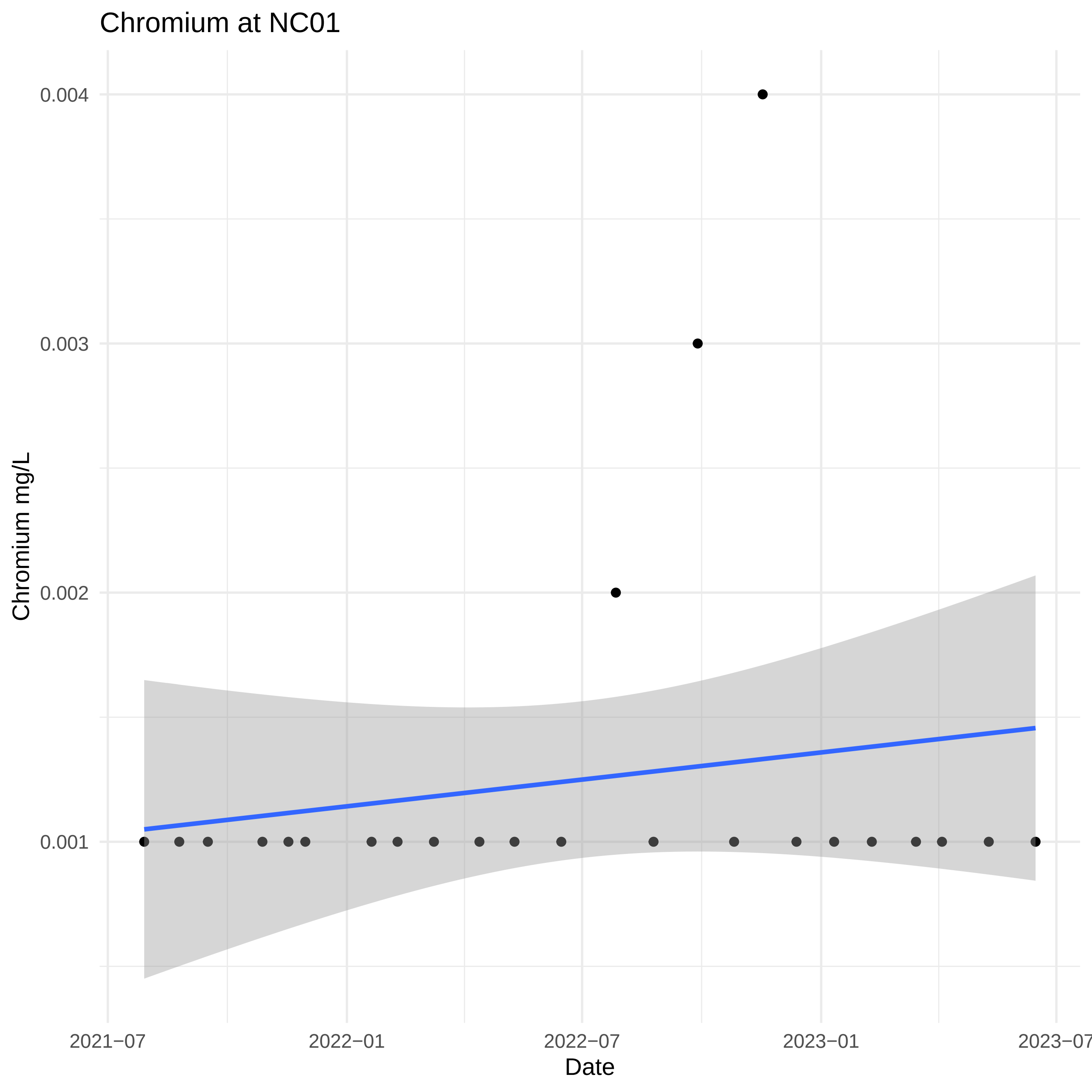


Chromium at G
0.00200
0.00175
0.00150
0.00125
0.00100
Chromium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

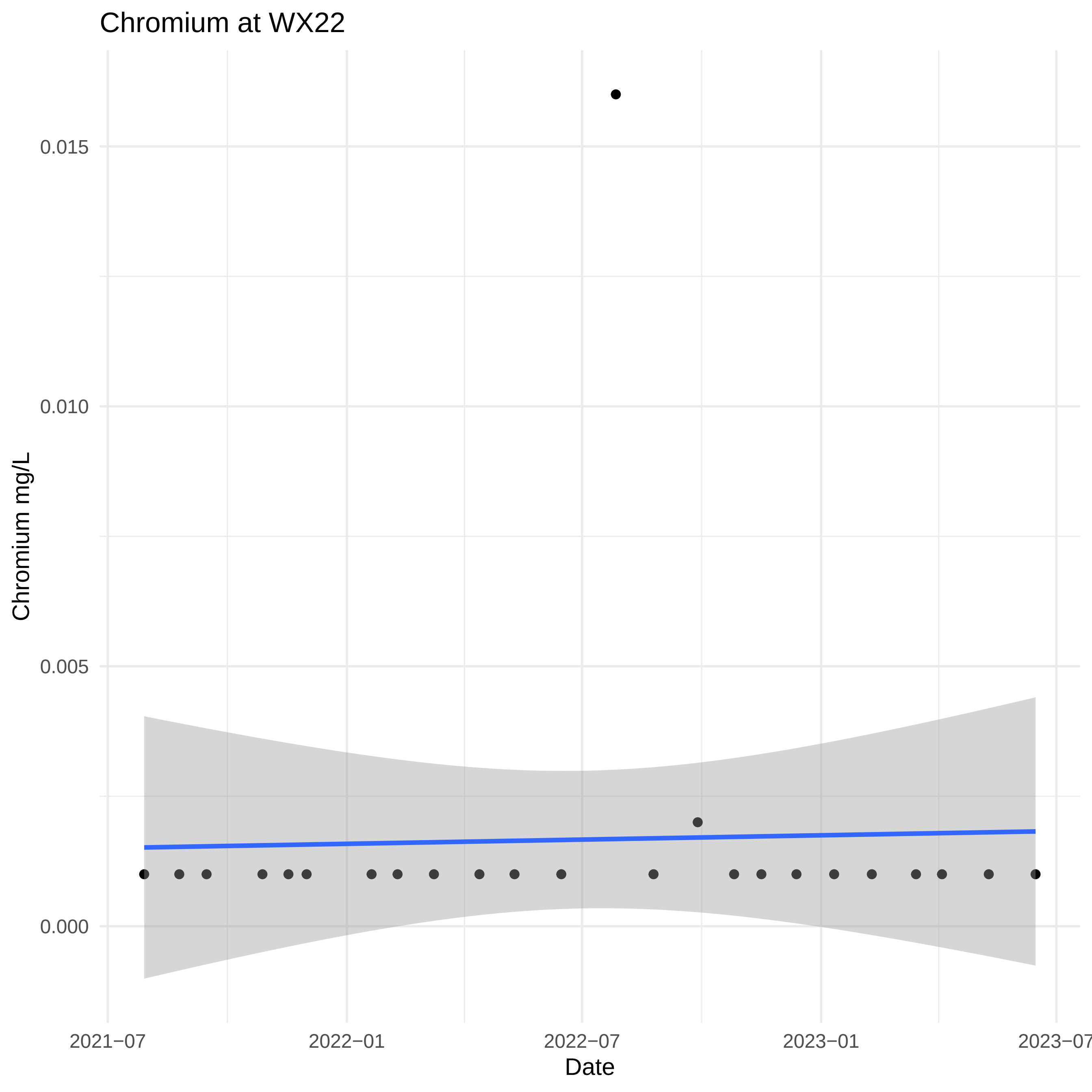


Chromium at LDP01
Chromium mg/L
0.020
0.015
0.010
0.005
0.000
2022−07
2023−01
2023−07
Date

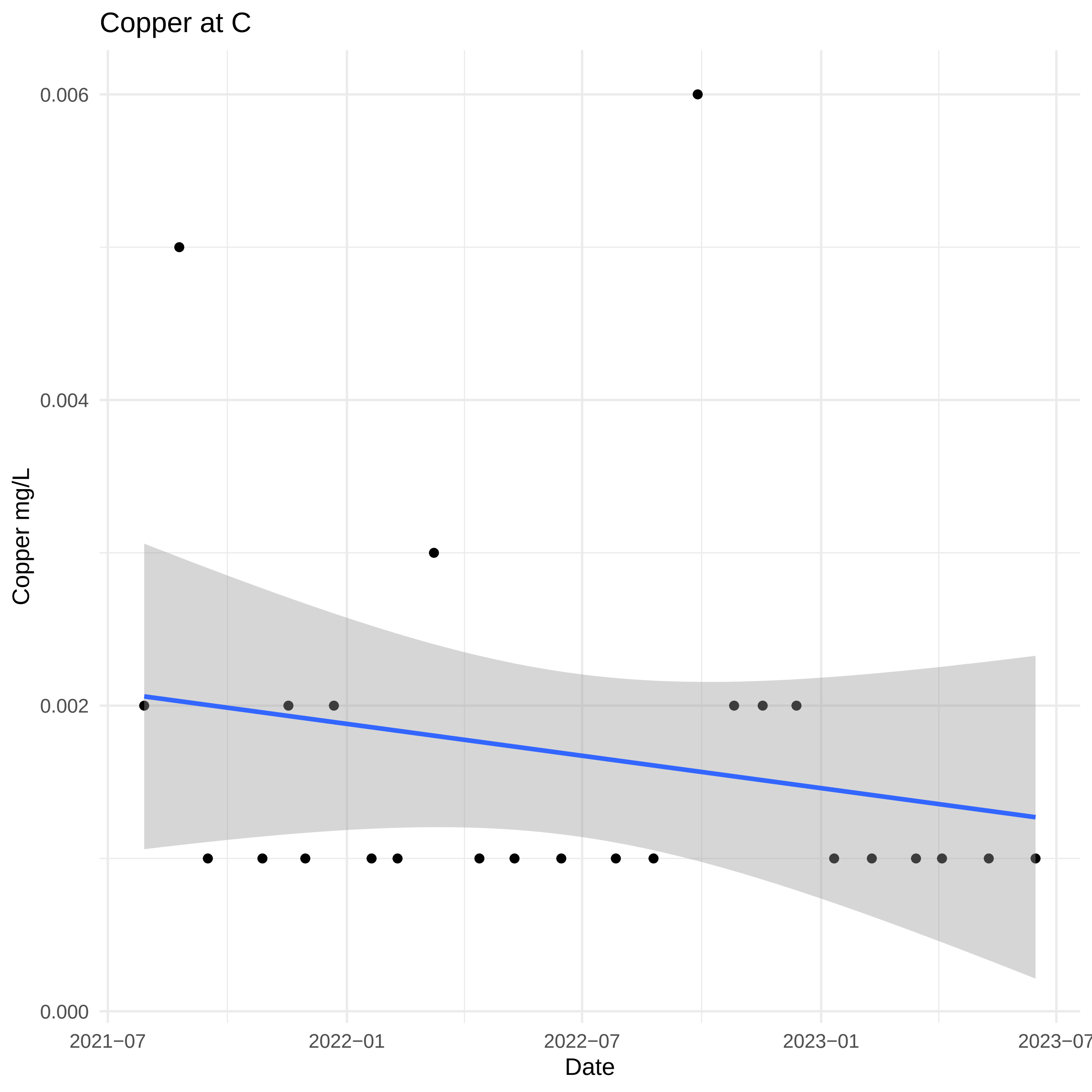

Chromium at LMP01
0.00200
0.00175
0.00150
0.00125
0.00100
Chromium mg/L
2022−01
2022−07
2023−01
Date



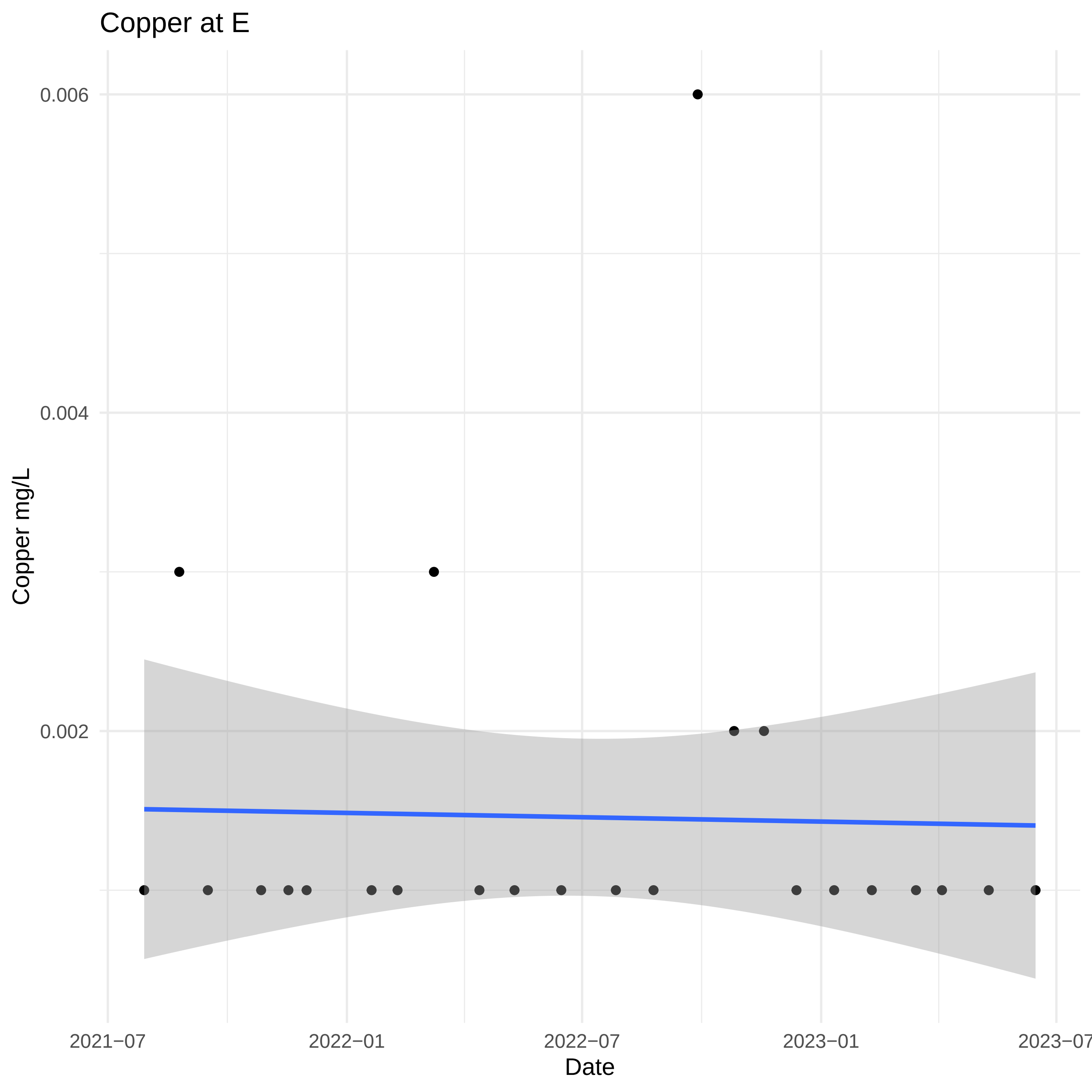
Chromium at NC01
Chromium mg/L
0.004
0.003
0.002
0.001
2021−07
2022−01
2022−07
2023−01
2023−07
Date



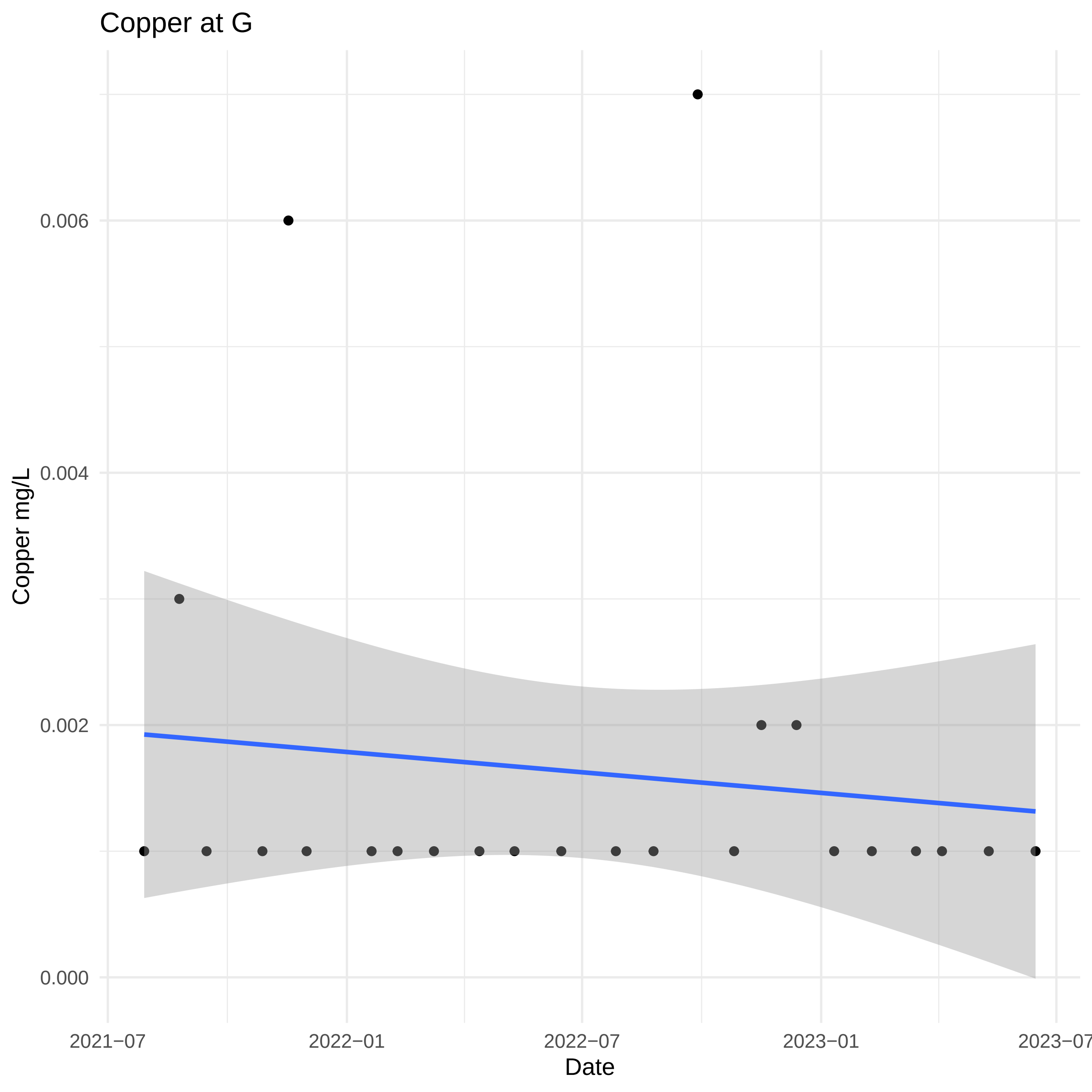
Chromium at WX22
Chromium mg/L
0.015
0.010
0.005
0.000
2021−07
2022−01
2022−07
2023−01
2023−07
Date



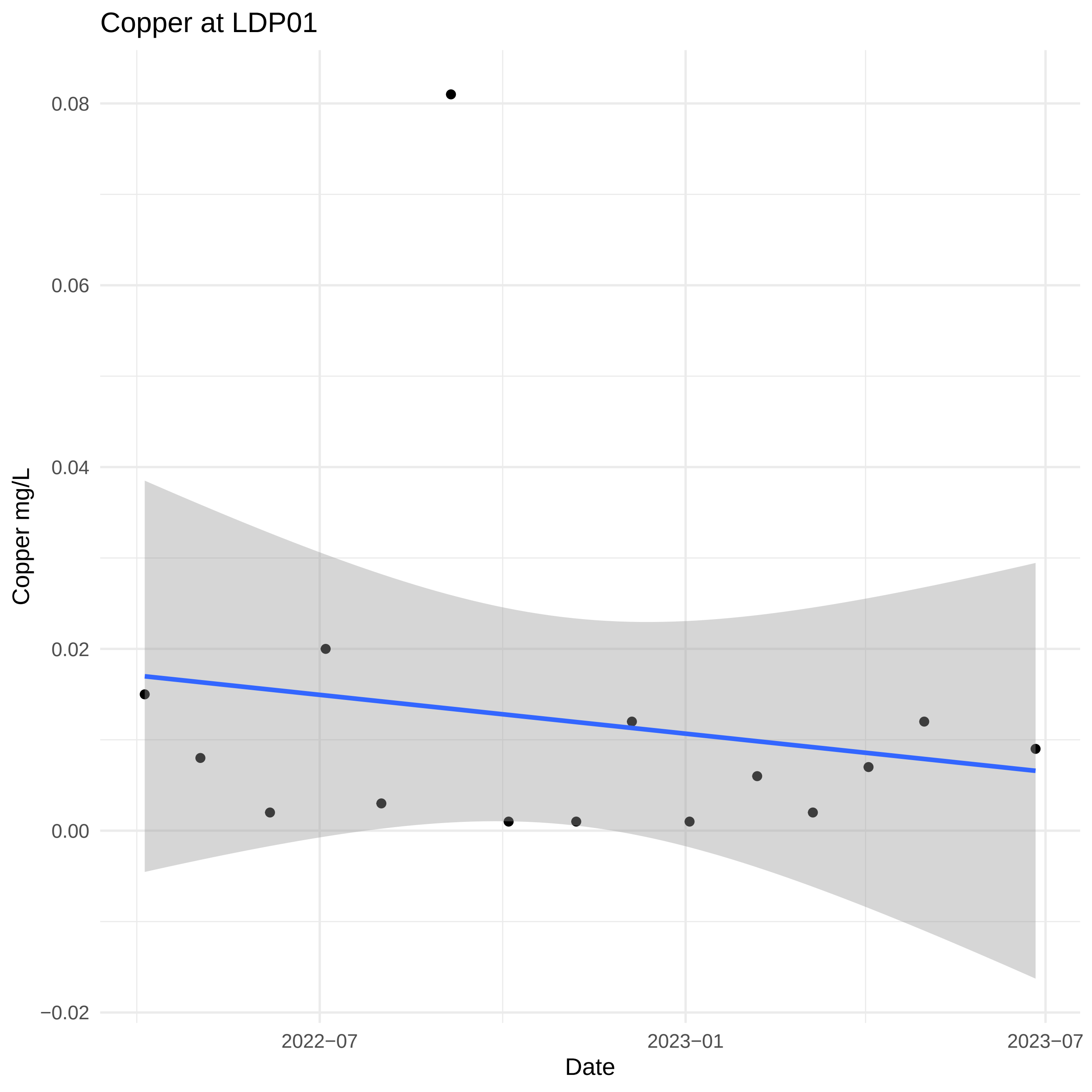
Copper at C
Copper mg/L
0.006
0.004
0.002
0.000
2021−07
2022−01
2022−07
2023−01
2023−07
Date

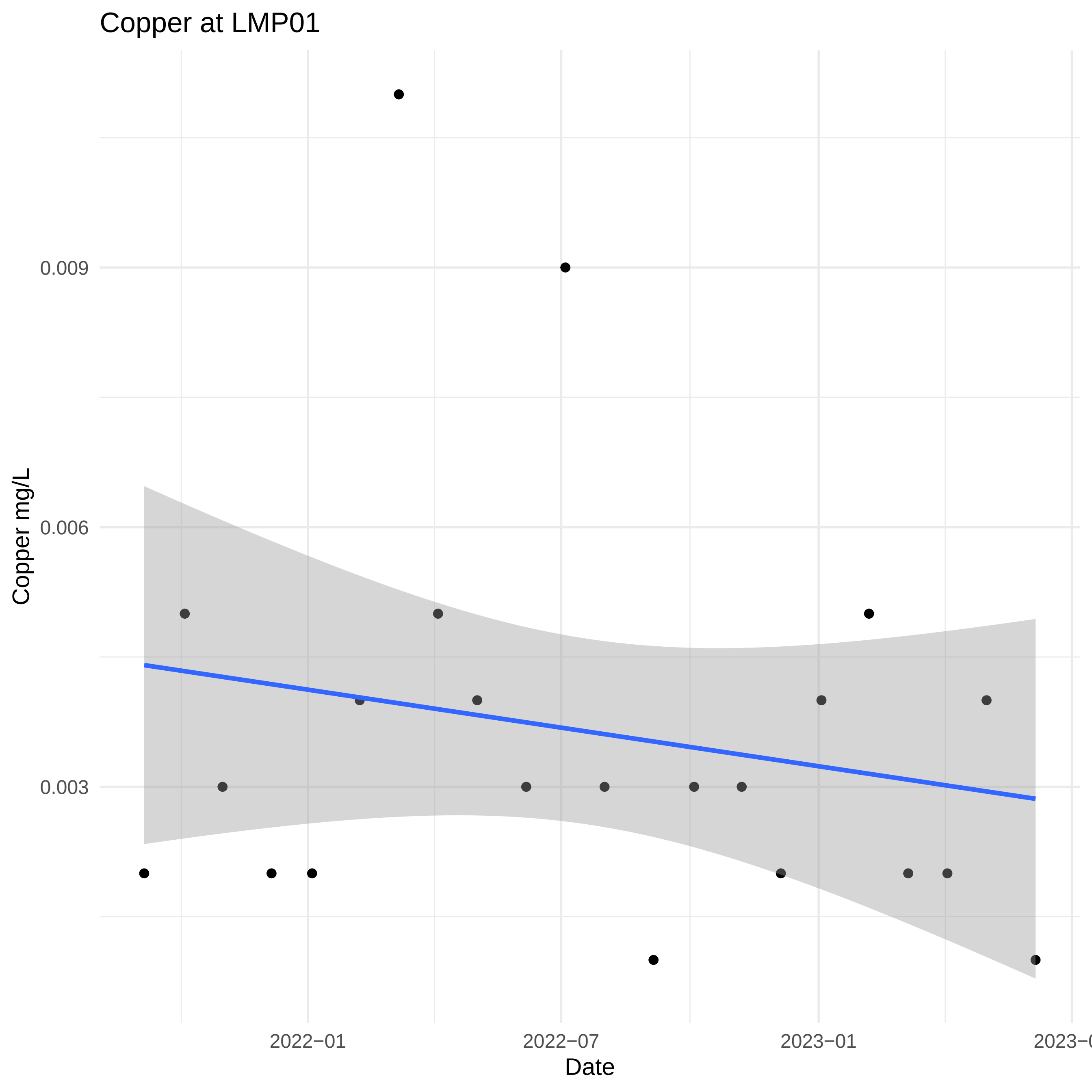


Copper at E
Copper mg/L
0.006
0.004
0.002
2021−07
2022−01
2022−07
2023−01
2023−07
Date

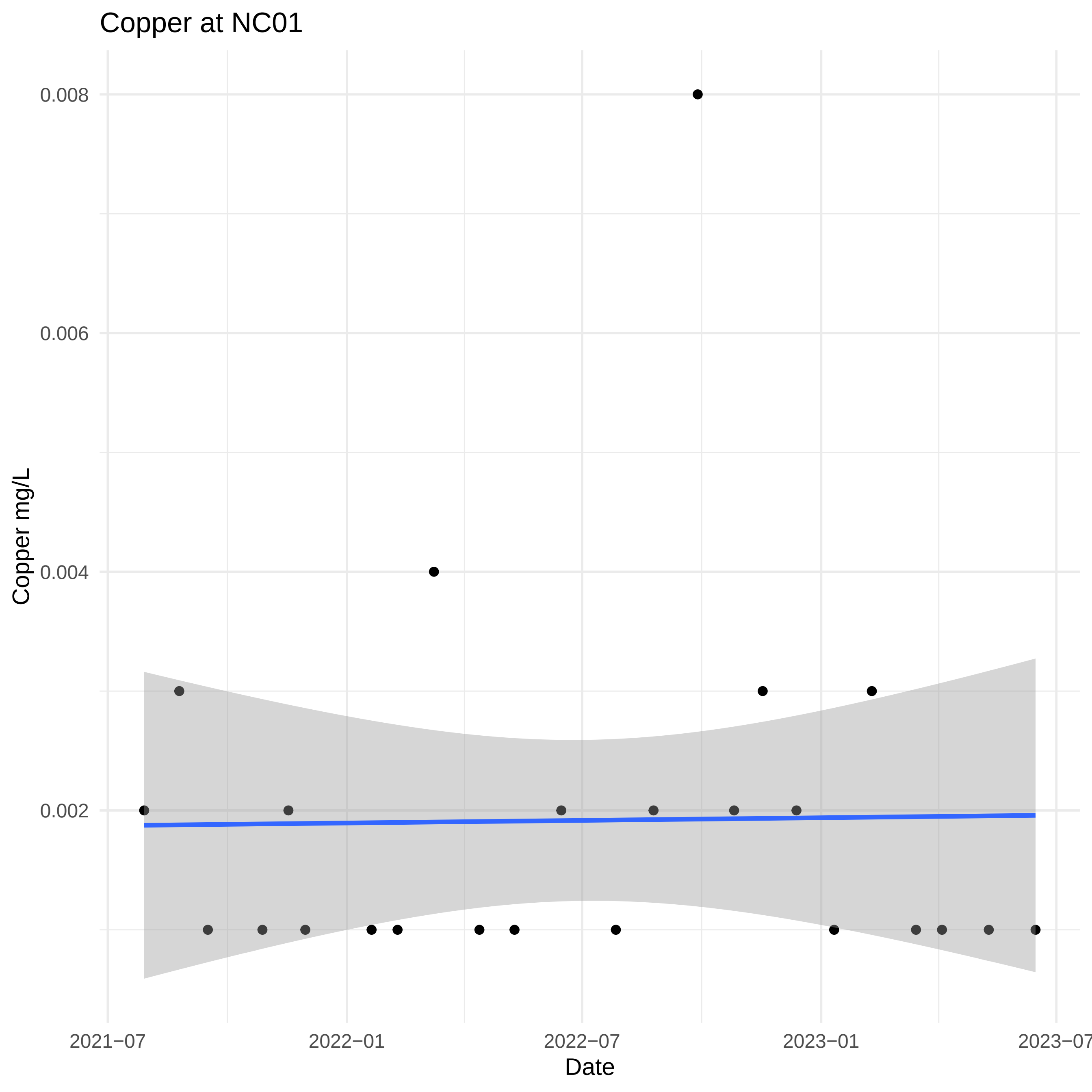


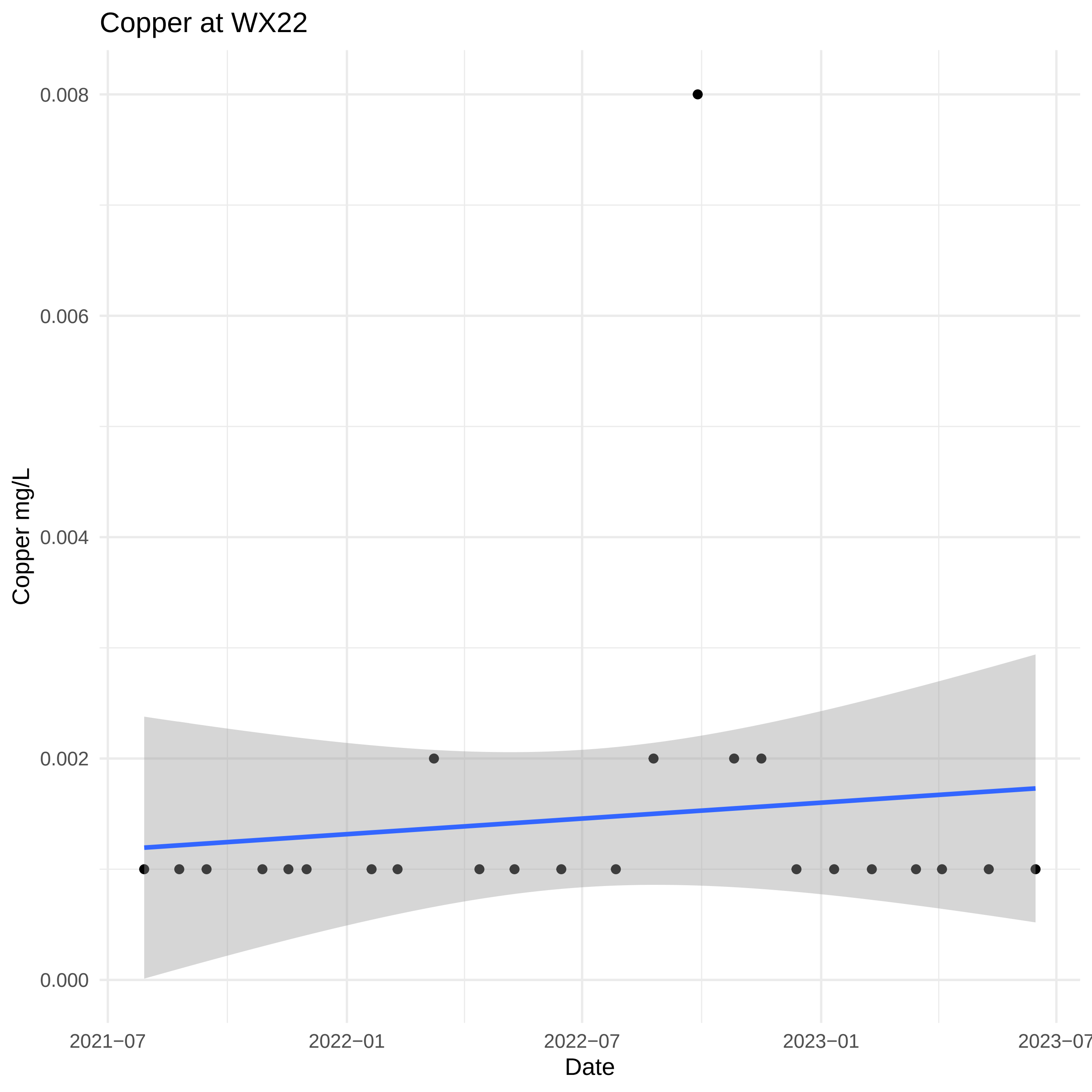
Copper at G
Copper mg/L
0.000
0.002
0.004
0.006
Date
2021−07
2022−01
2022−07
2023−01
2023−07


Copper at LDP01
0.08
0.06
0.04
0.02
0.00
−0.02
Copper mg/L
2022−07
2023−01
2023−07
Date

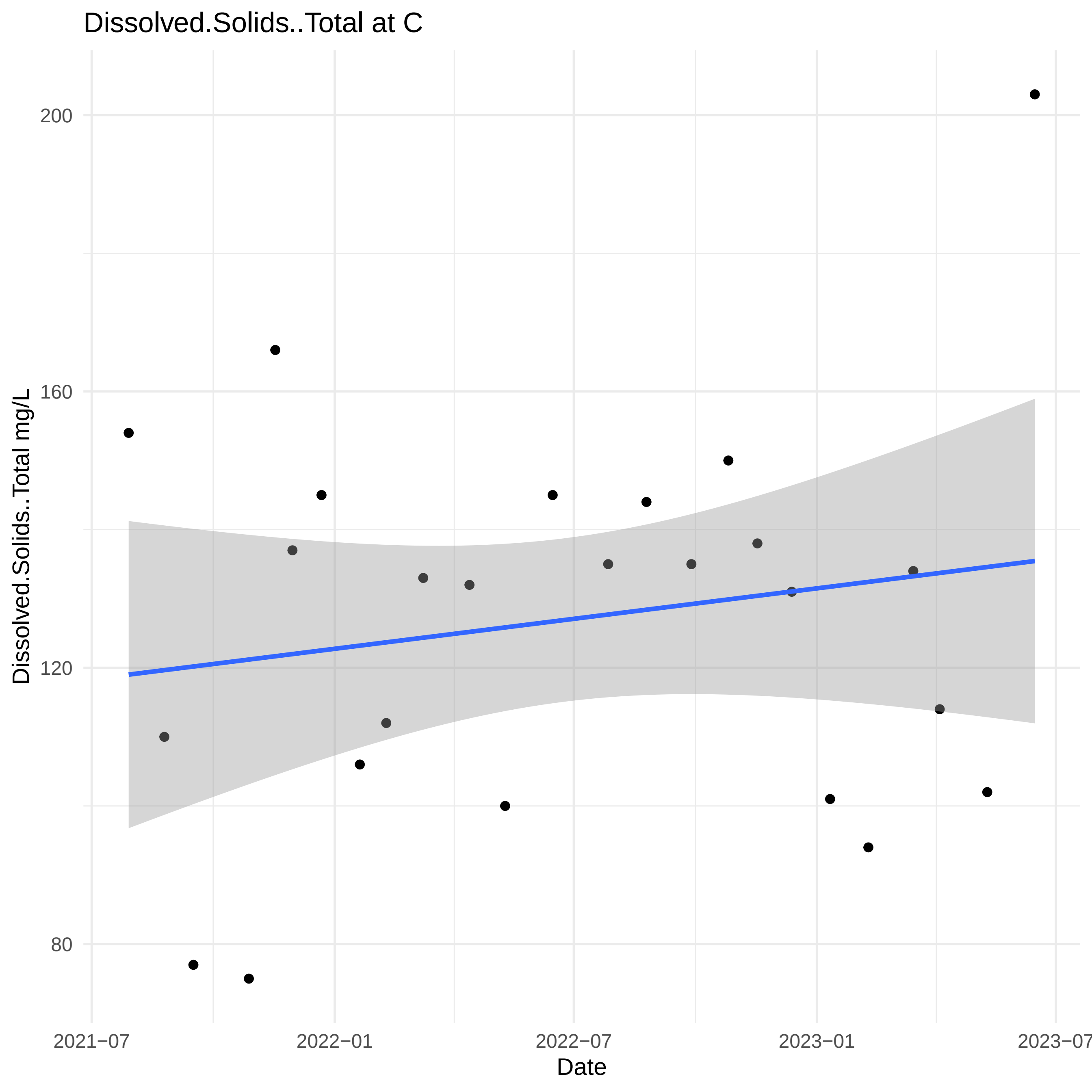


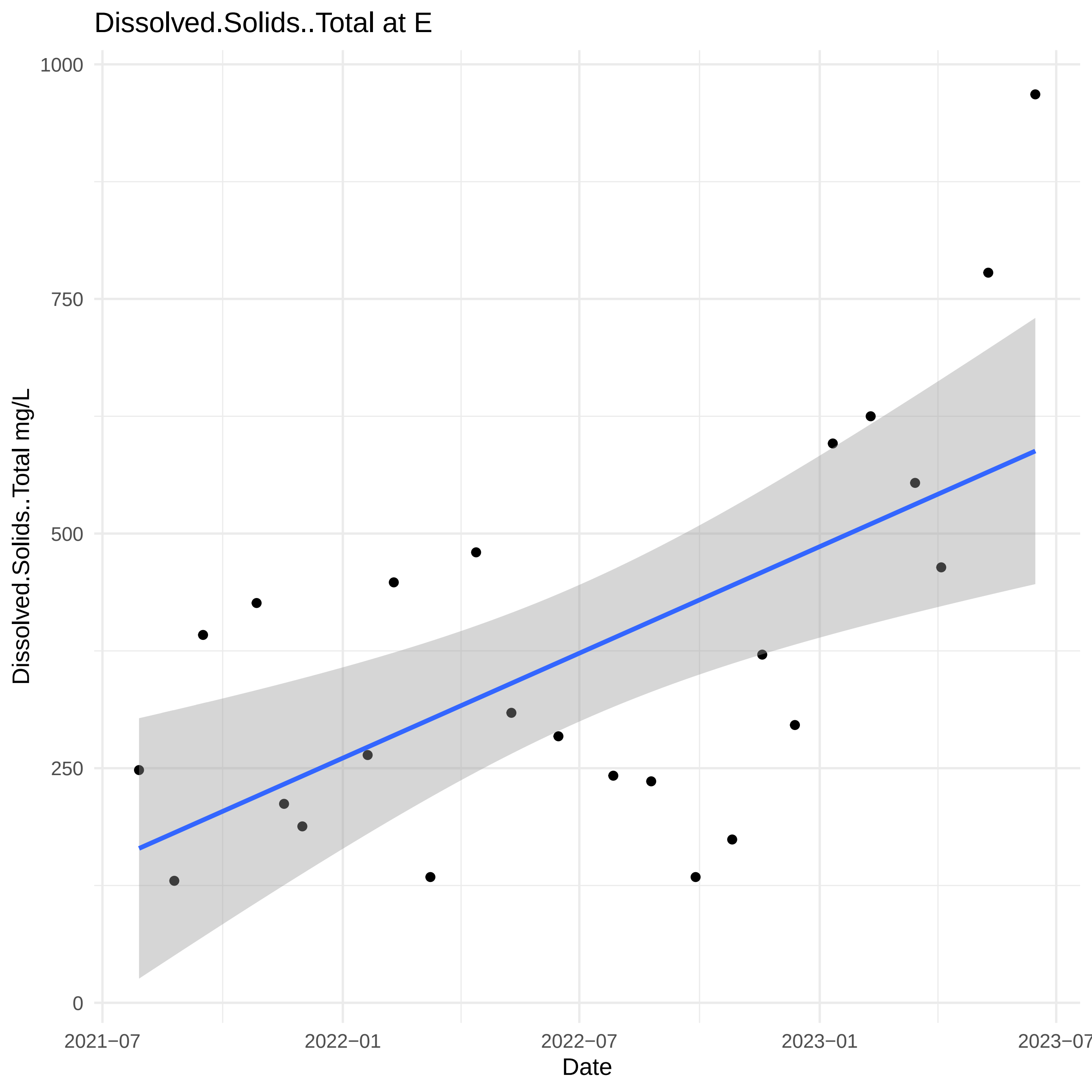
Copper at LMP01
Copper mg/L
0.009
0.006
0.003
2022−01
2022−07
2023−01
2023−0
Date


Copper at NC01
0.008
0.006
0.004
0.002
Copper mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

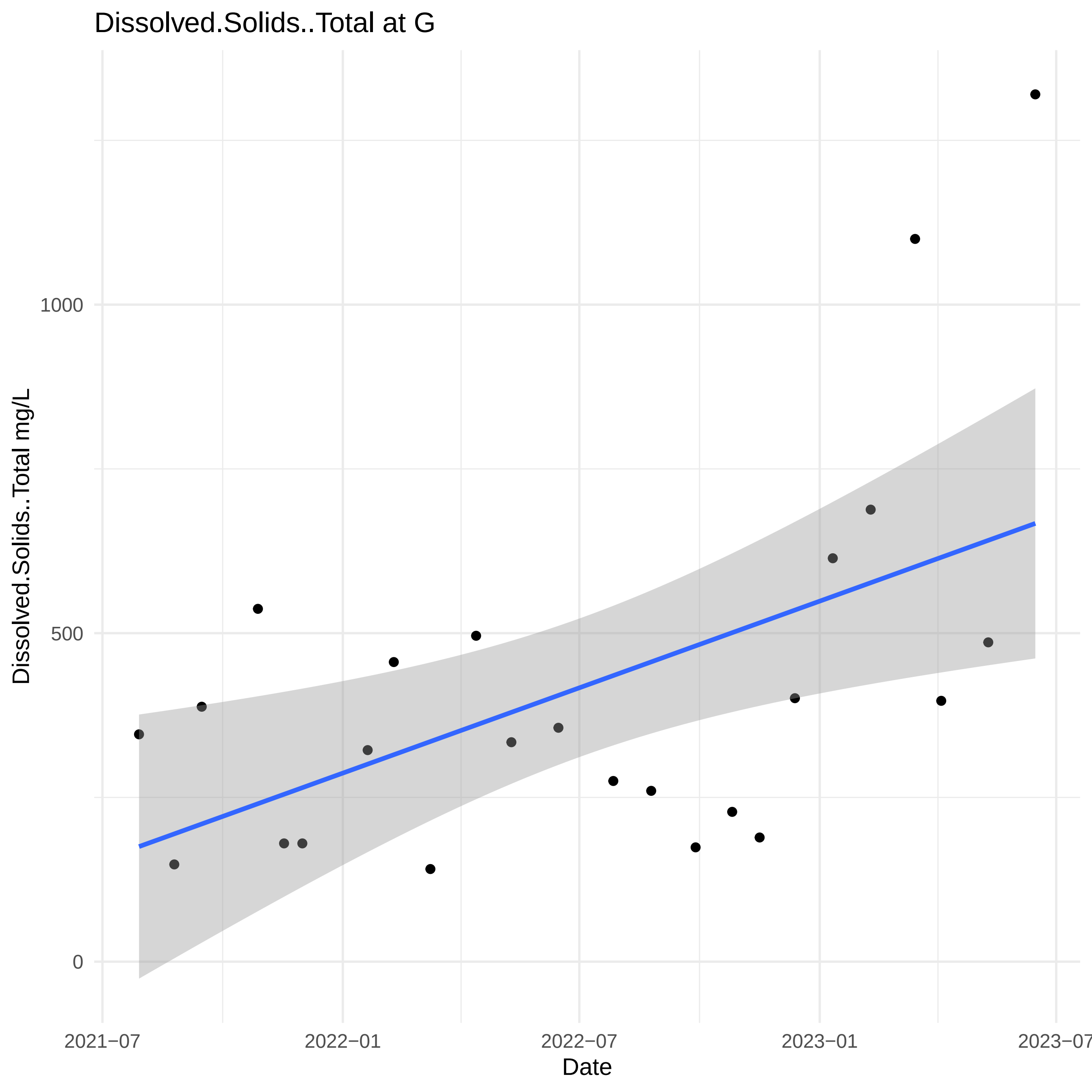


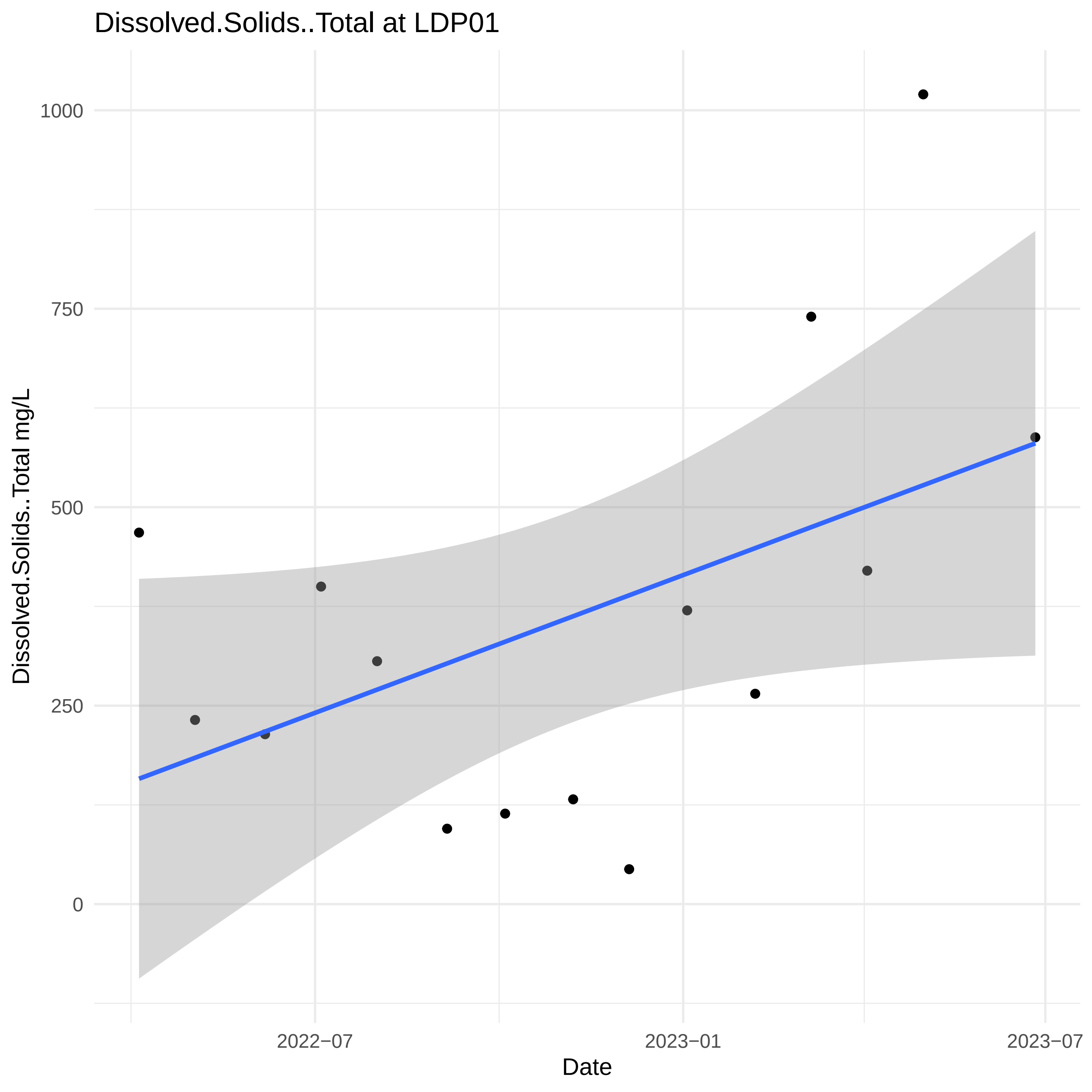
Copper at WX22
0.008
0.006
0.004
0.002
0.000
Copper mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Dissolved.Solids..Total at C
200
160
120
80
Dissolved.Solids..Total mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

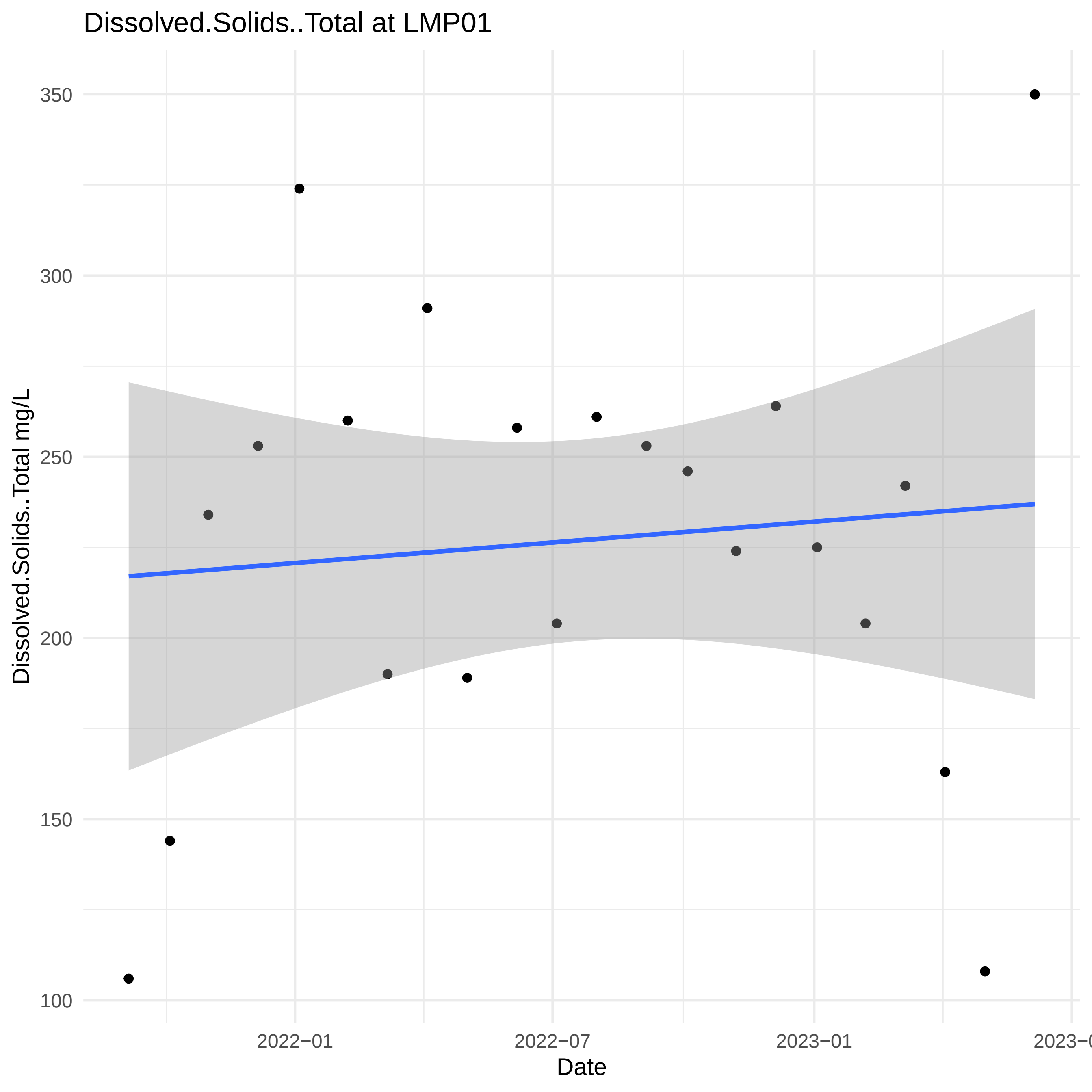


Dissolved.Solids..Total at E
1000
750
500
250
0
Dissolved.Solids..Total mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

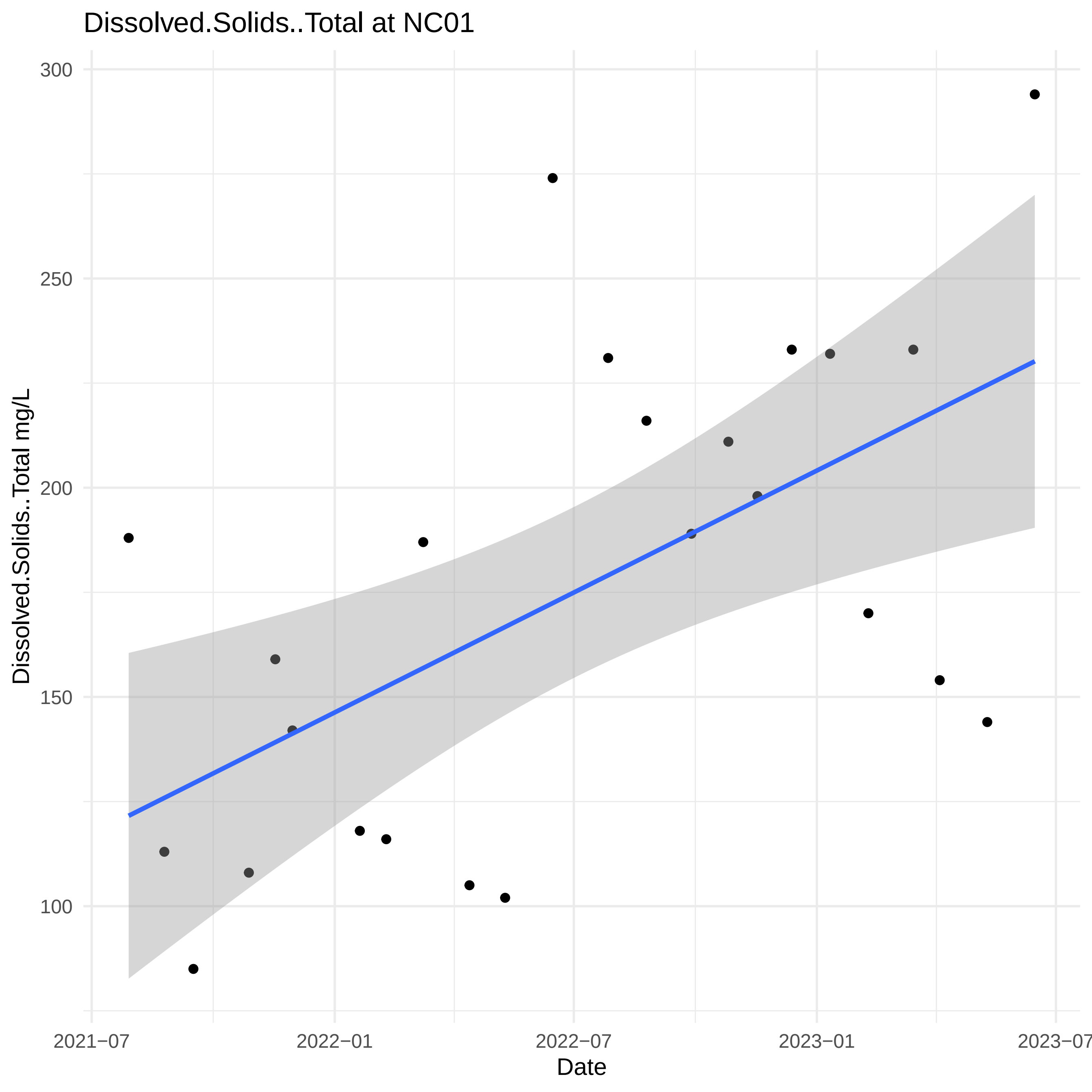

Dissolved.Solids..Total at G
Dissolved.Solids..Total mg/L
1000
500
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



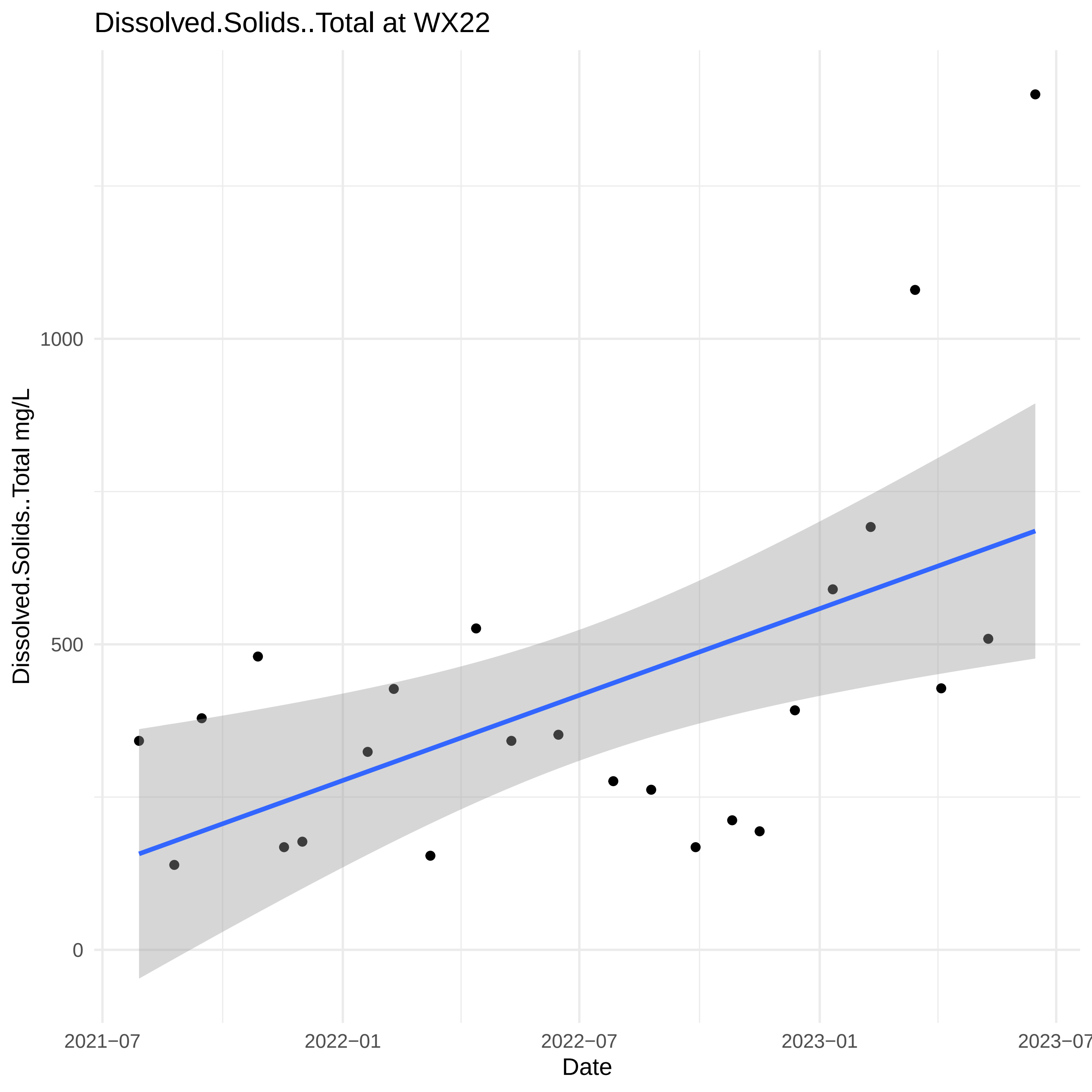
Dissolved.Solids..Total at LDP01
Dissolved.Solids..Total mg/L
1000
750
500
250
0
2022−07
2023−01
2023−07
Date

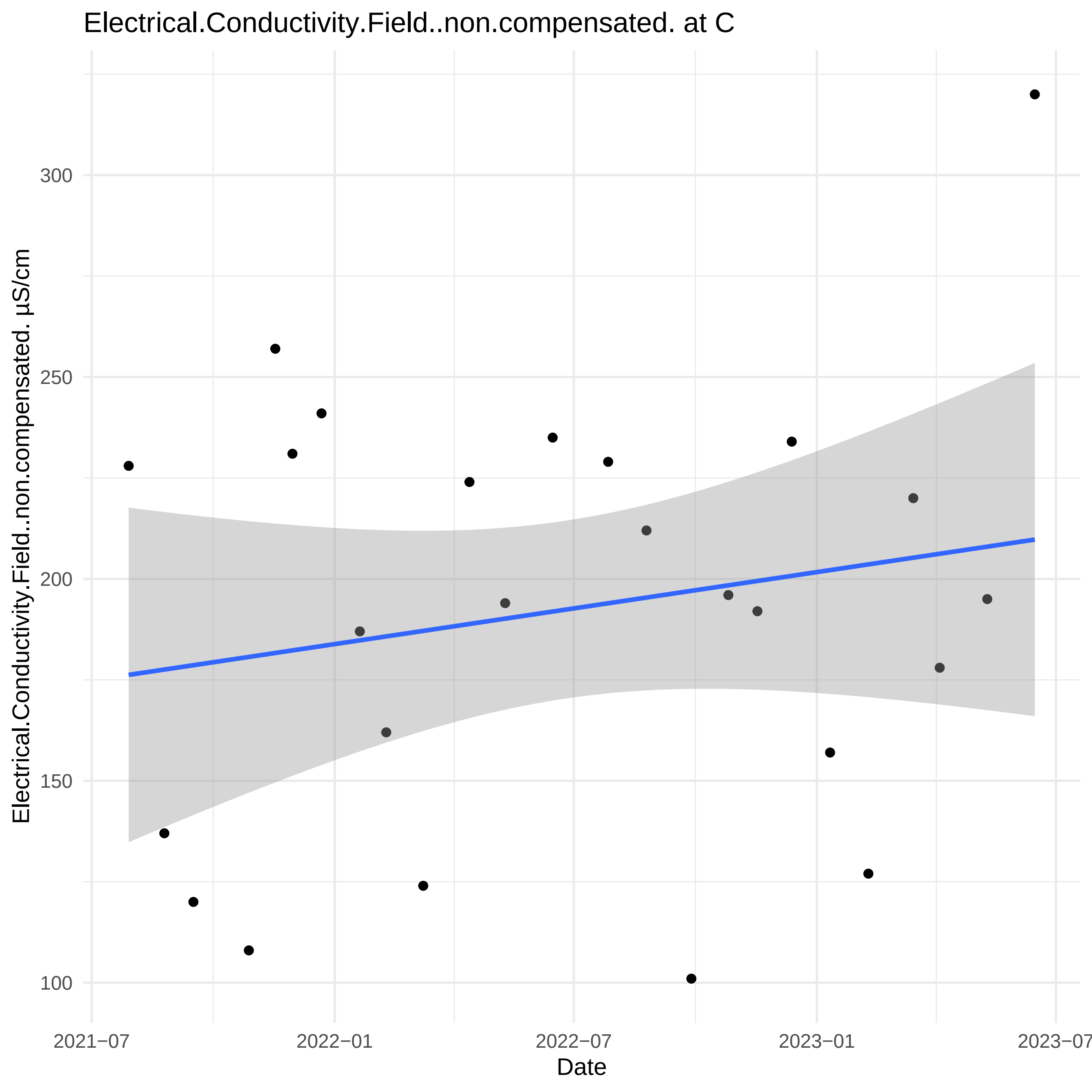


Dissolved.Solids..Total at LMP01
Dissolved.Solids..Total mg/L
350
300
250
200
150
100
2022−01
2022−07
2023−01
Date

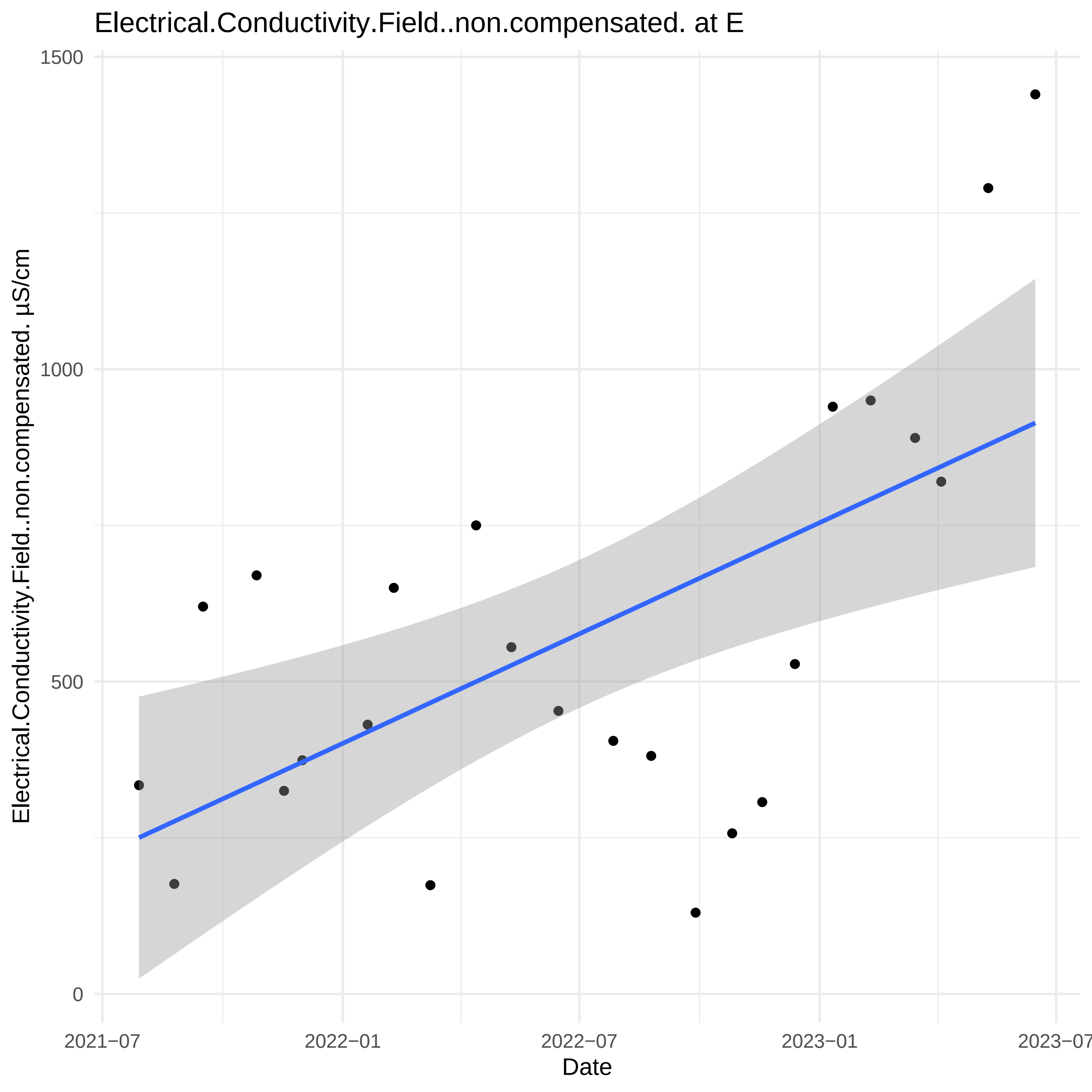


Dissolved.Solids..Total at NC01
300
250
200
150
100
Dissolved.Solids..Total mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

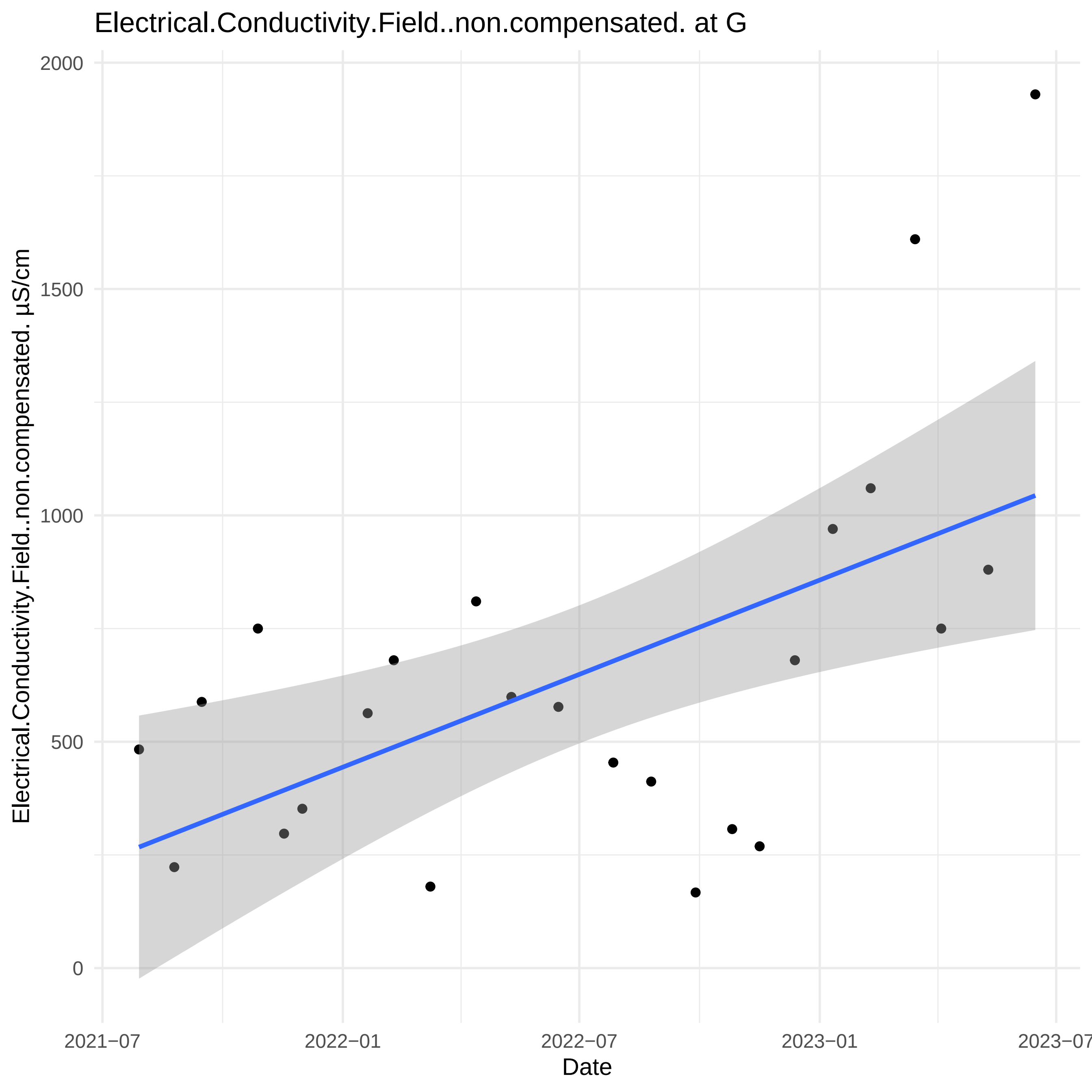

Dissolved.Solids..Total at WX22
Dissolved.Solids..Total mg/L
1000
500
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



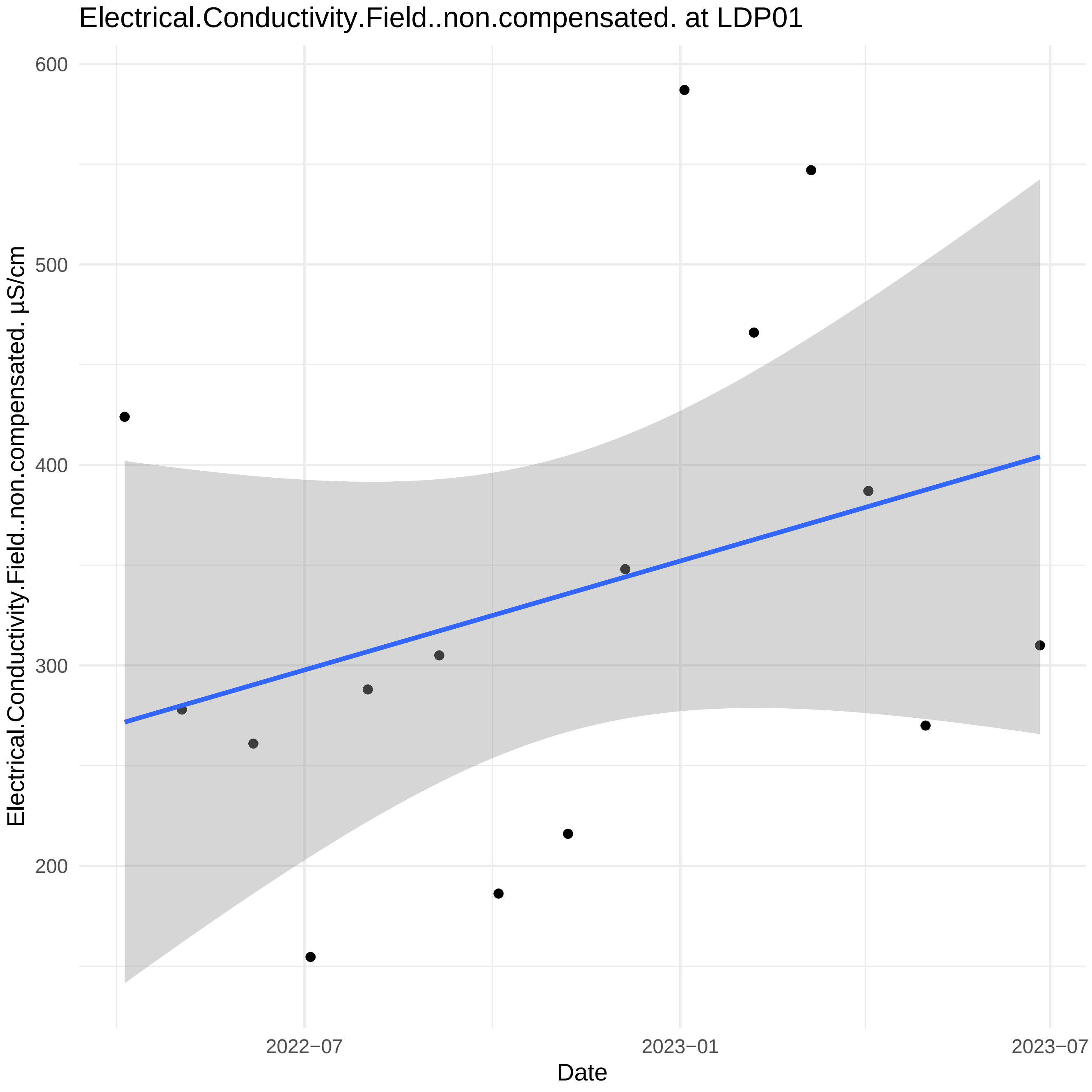
Electrical.Conductivity.Field..non.compensated. at C
Electrical.Conductivity.Field..non.compensated. µS/cm
300
250
200
150
100
2021−07
2022−01
2022−07
2023−01
2023−07
Date



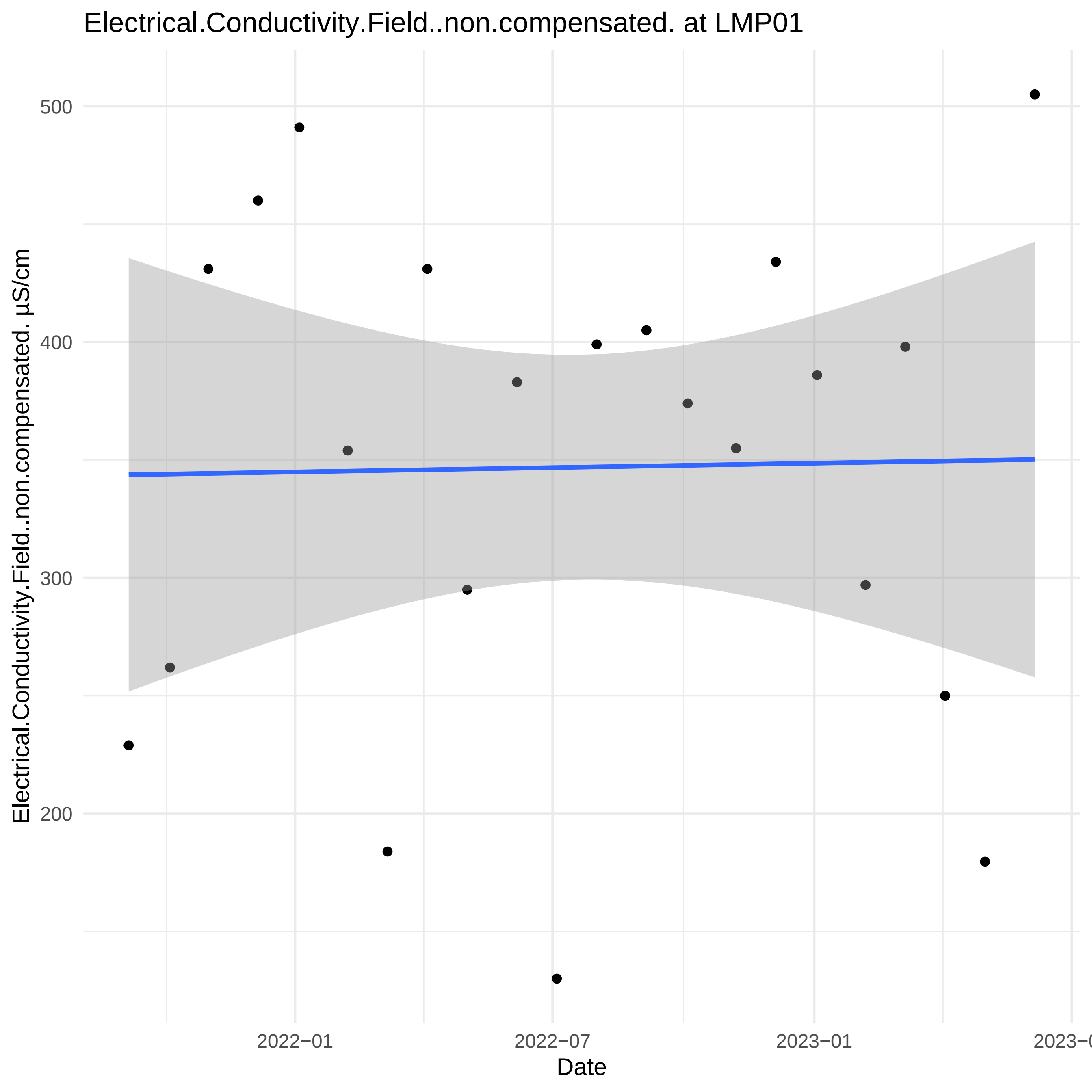
Electrical.Conductivity.Field..non.compensated. at E
Electrical.Conductivity.Field..non.compensated. µS/cm
1500
1000
500
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



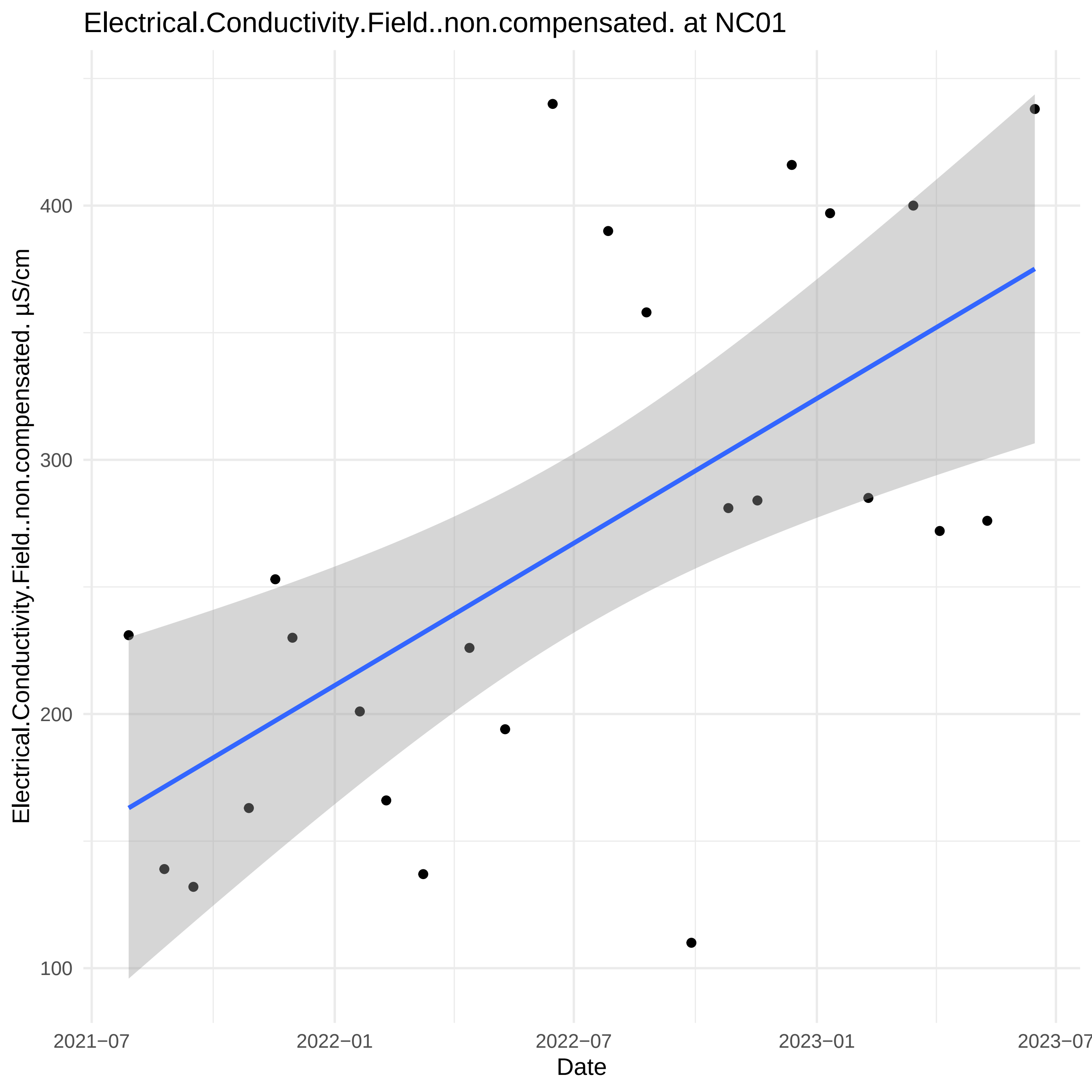
Electrical.Conductivity.Field..non.compensated. at G
Electrical.Conductivity.Field..non.compensated. µS/cm
2000
1500
1000
500
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

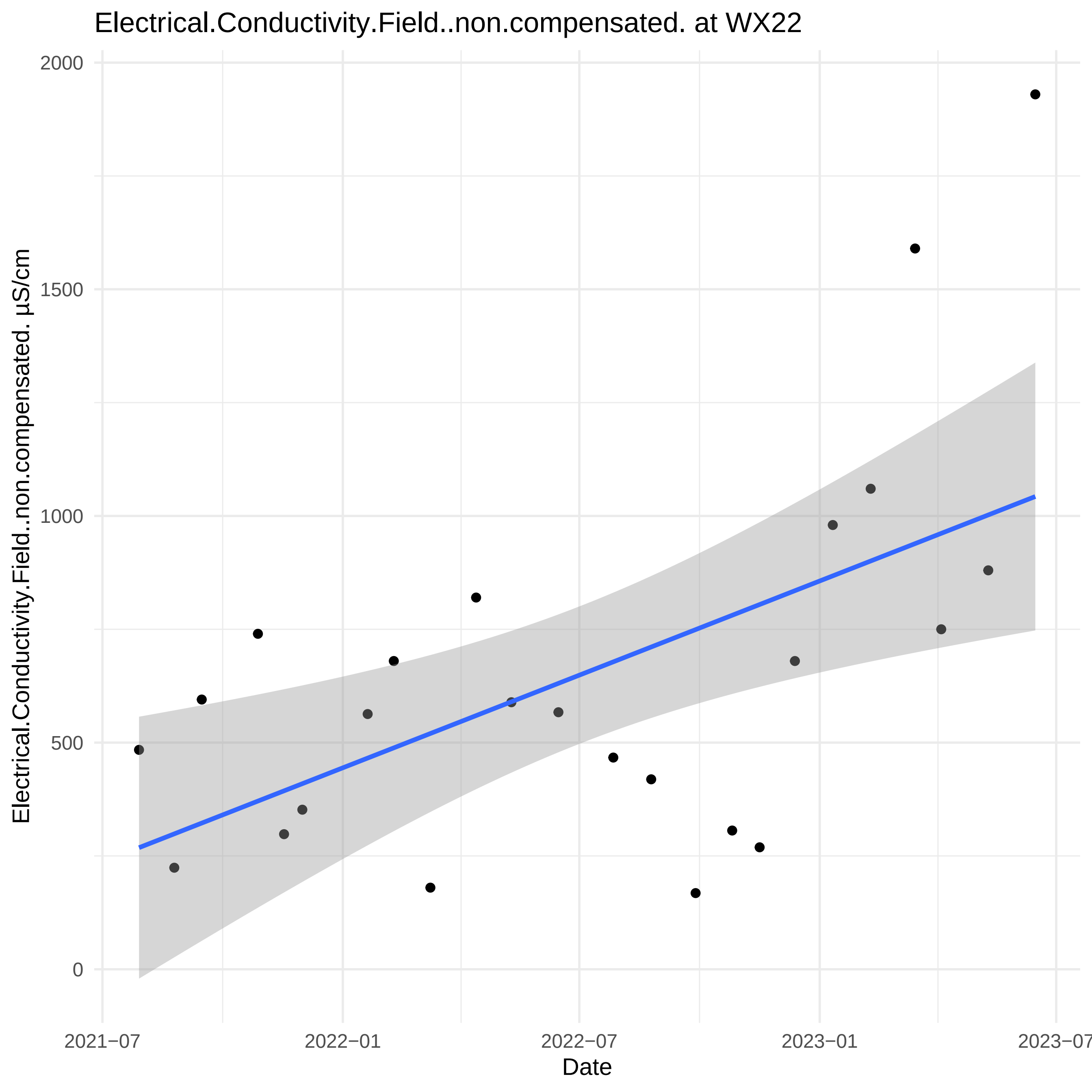


Electrical.Conductivity.Field..non.compensated. at LDP01
Electrical.Conductivity.Field..non.compensated. µS/cm
600
500
400
300
200
2022−07
2023−01
2023−07
Date

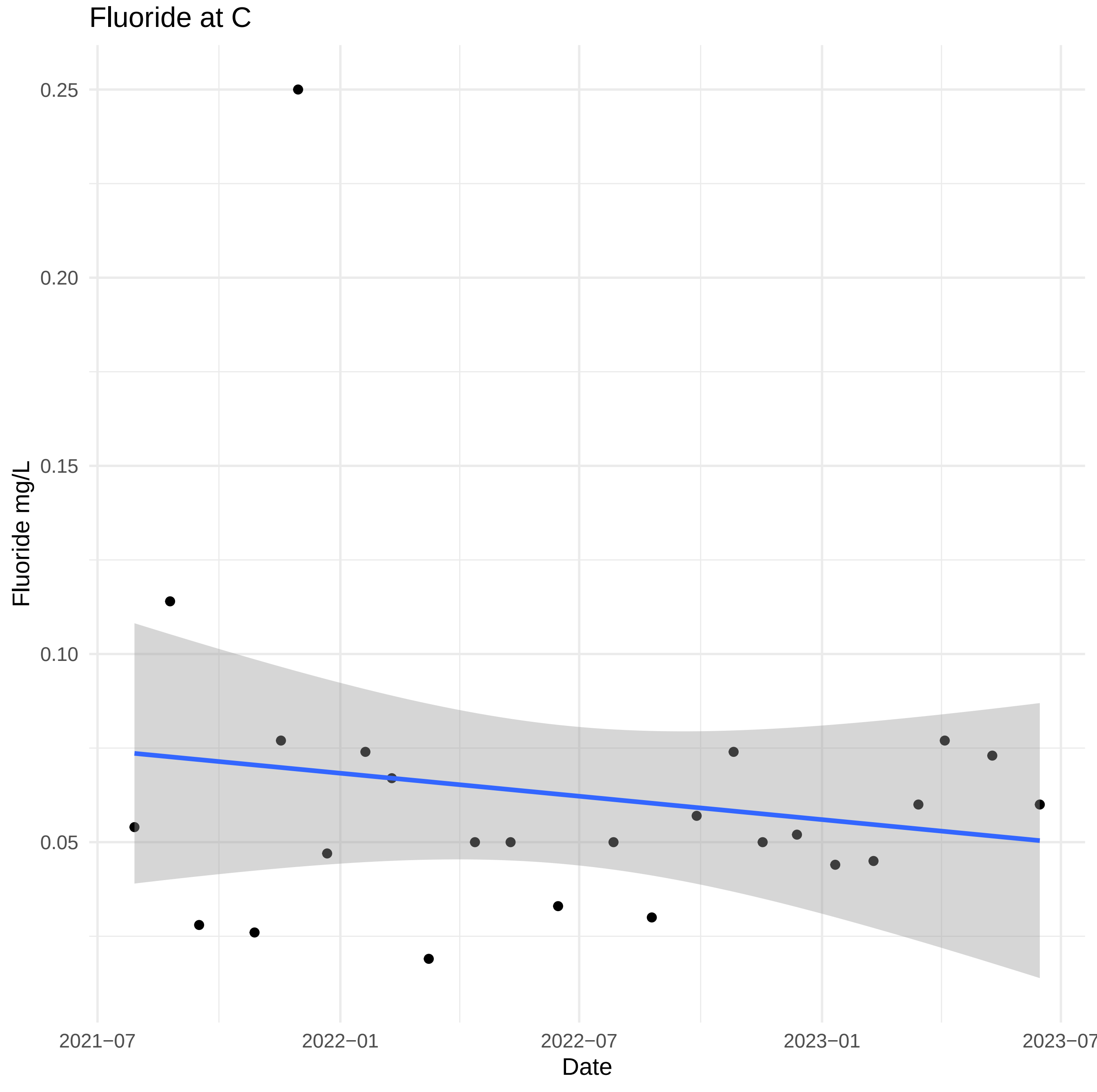


Electrical.Conductivity.Field..non.compensated. at LMP01
Electrical.Conductivity.Field..non.compensated. µS/cm
500
400
300
200
2022−01
2022−07
2023−01
Date

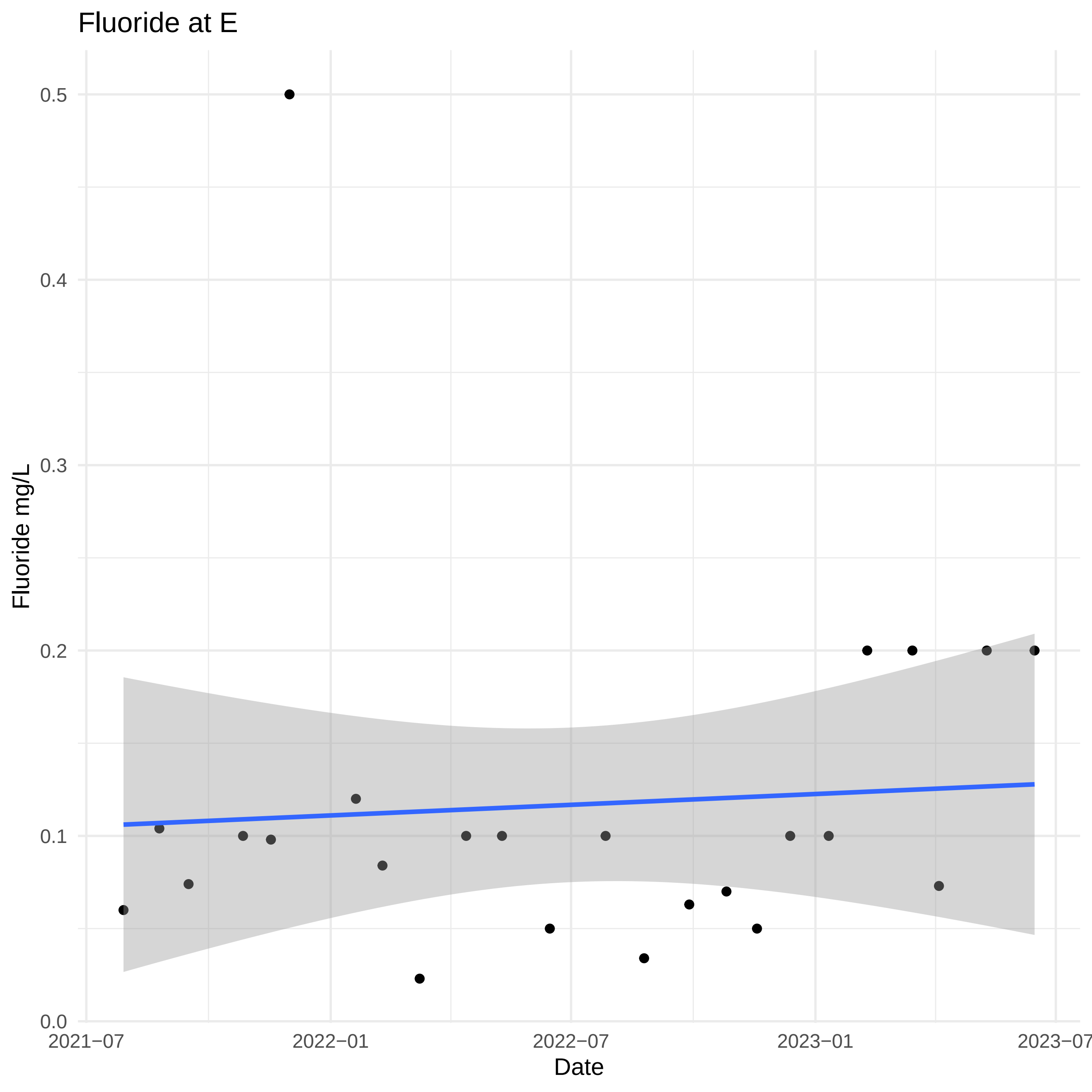

Electrical.Conductivity.Field..non.compensated. at NC01
Electrical.Conductivity.Field..non.compensated. µS/cm
400
300
200
100
2021−07
2022−01
2022−07
2023−01
2023−07
Date



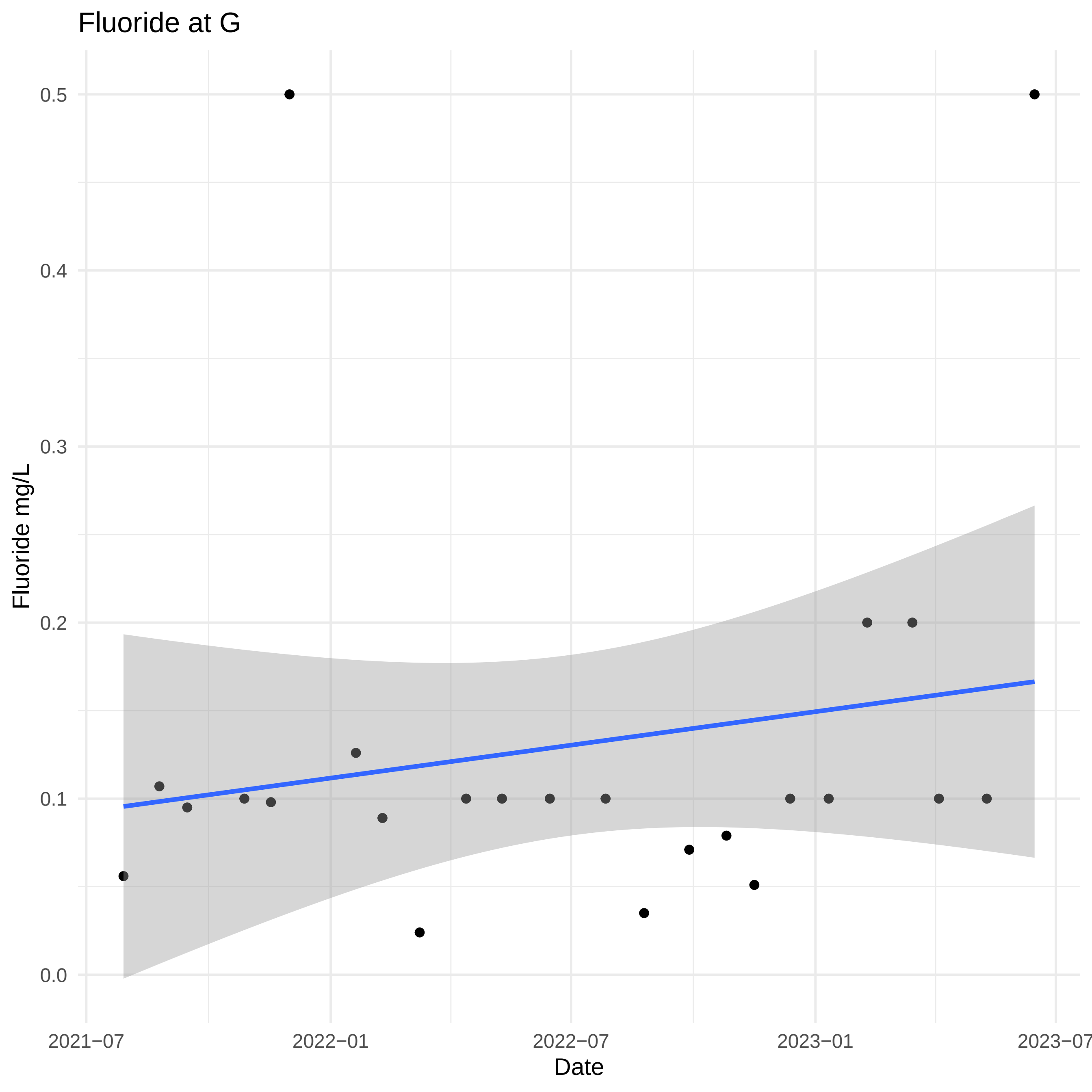
Electrical.Conductivity.Field..non.compensated. at WX22
Electrical.Conductivity.Field..non.compensated. µS/cm
2000
1500
1000
500
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



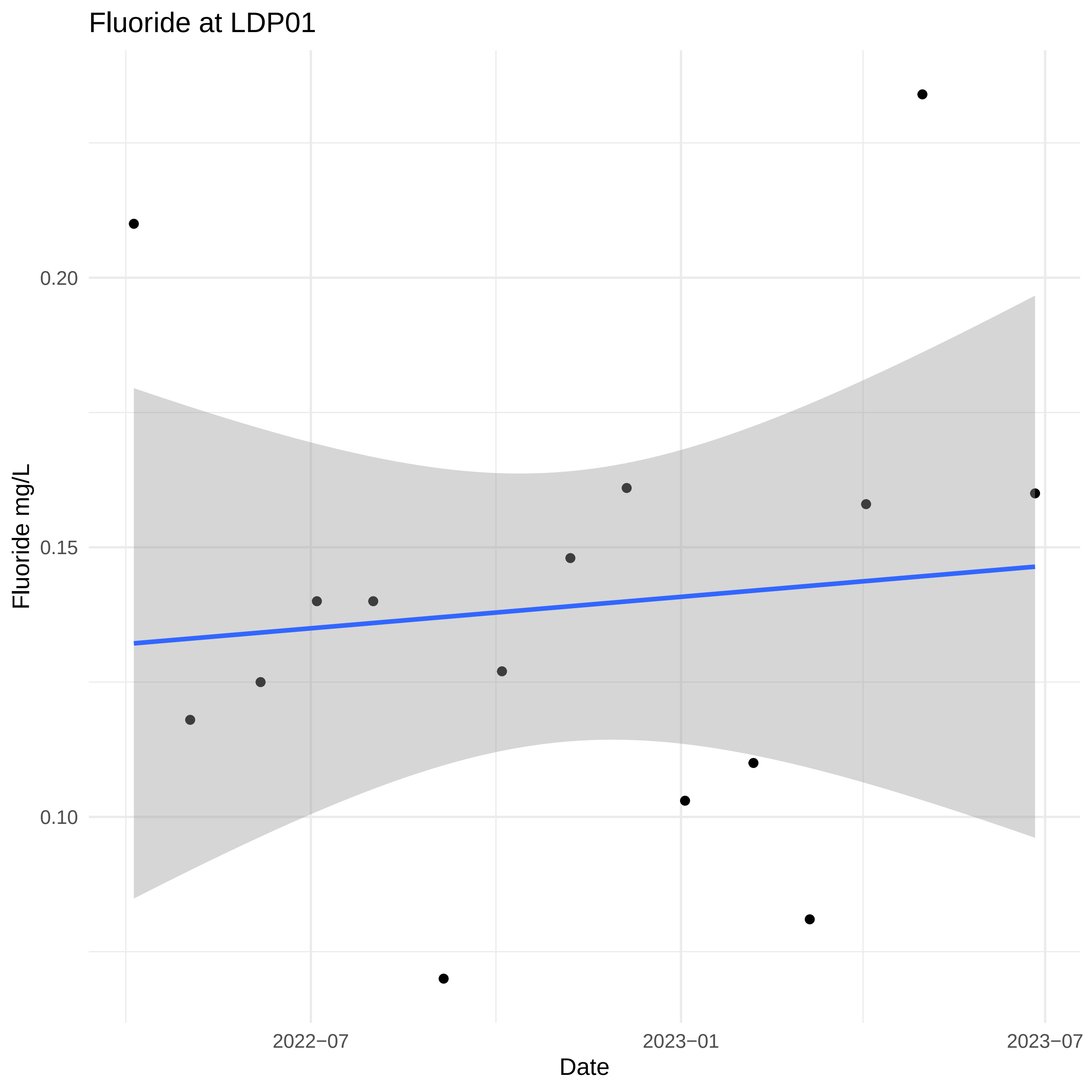
Fluoride at C
0.25
0.20
0.15
0.10
0.05
Fluoride mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



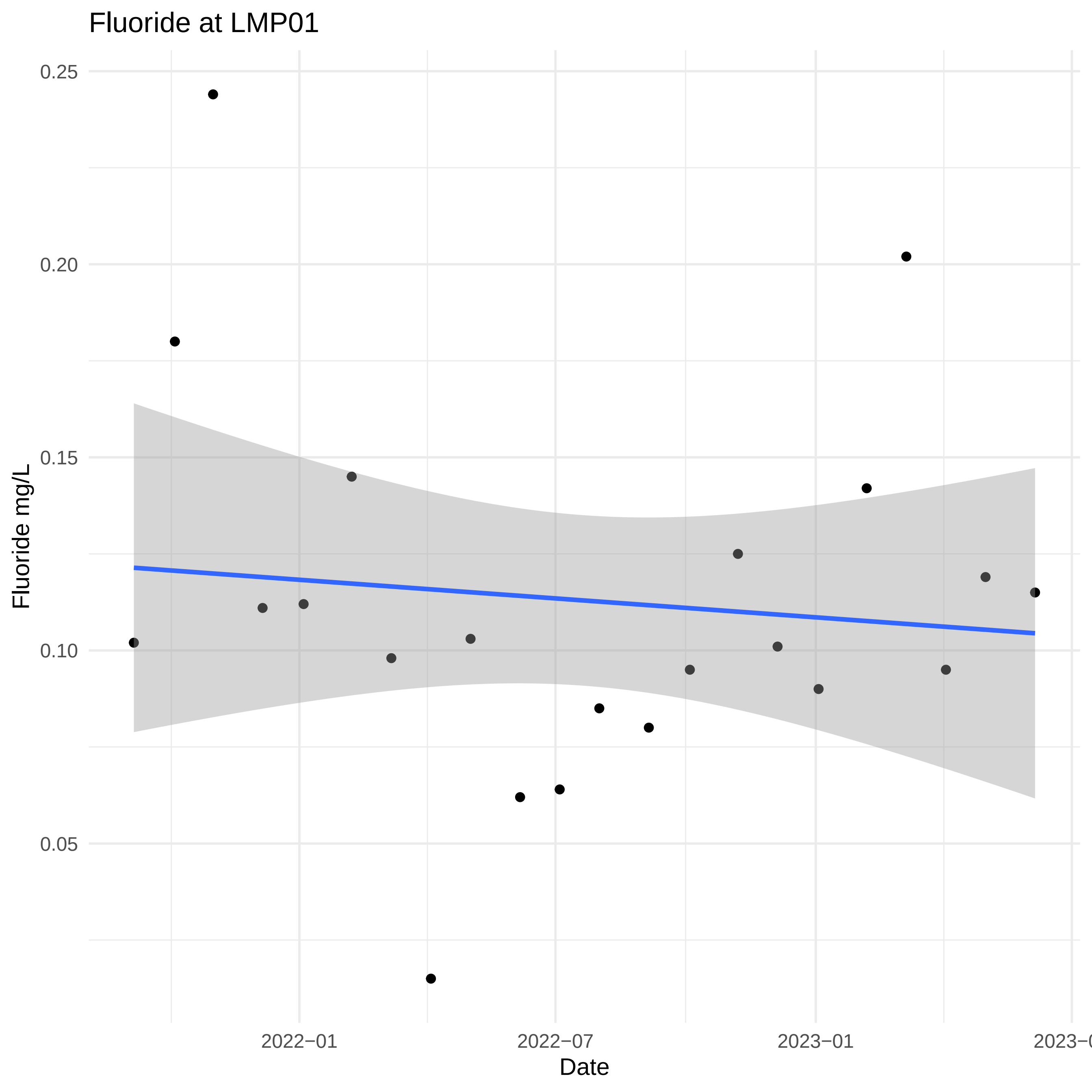
Fluoride at E
Fluoride mg/L
0.5
0.4
0.3
0.2
0.1
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



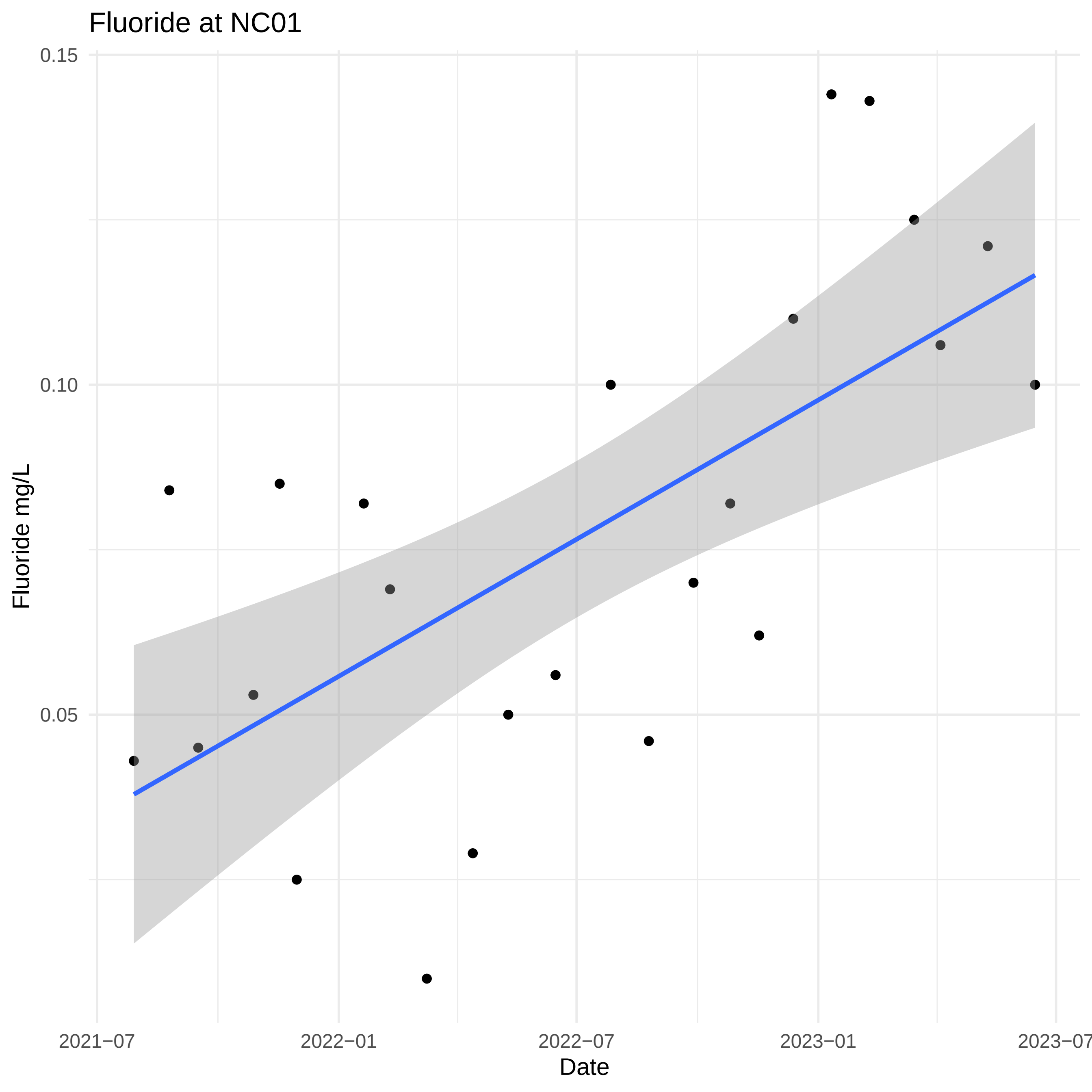
Fluoride at G
Fluoride mg/L
0.5
0.4
0.3
0.2
0.1
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



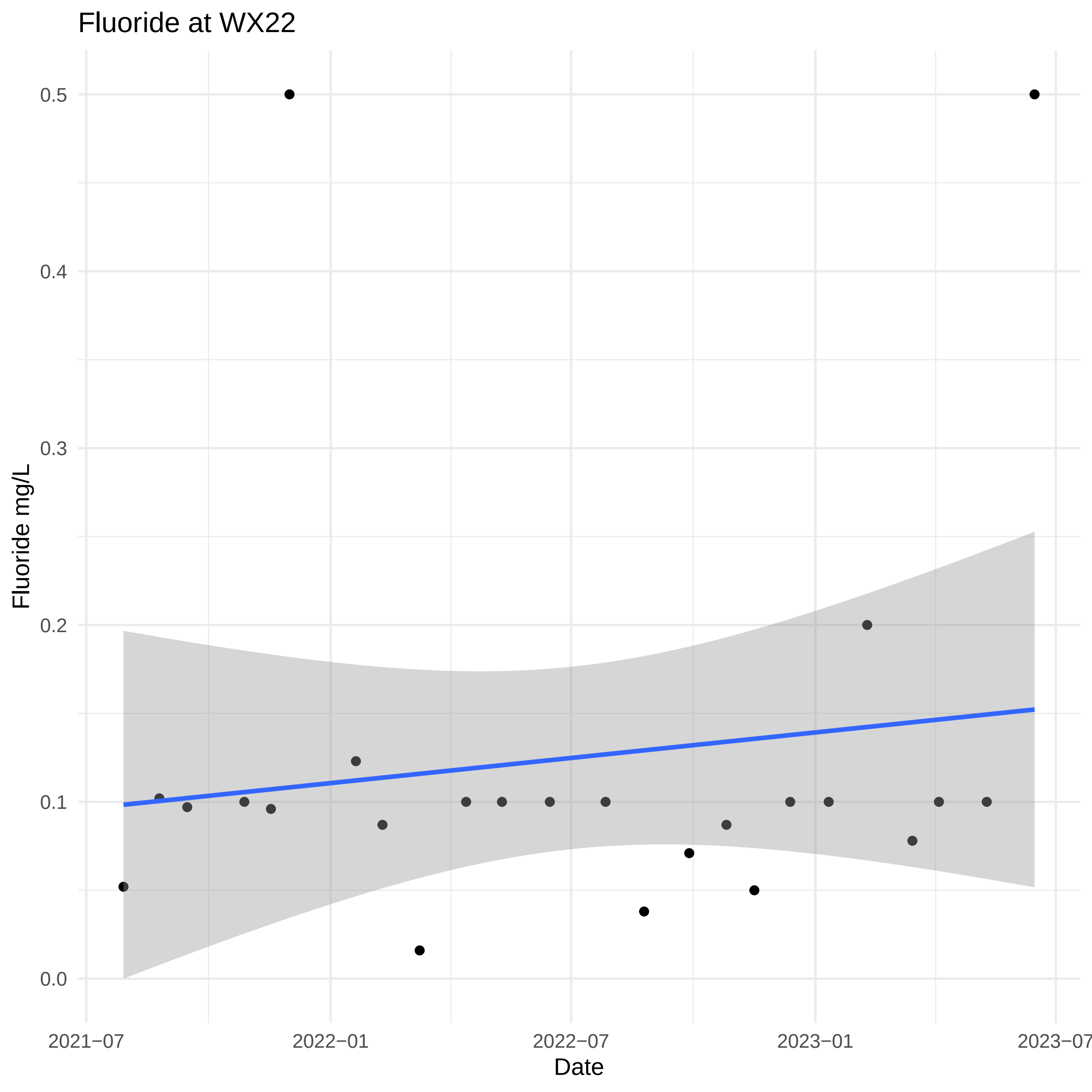
Fluoride at LDP01
Fluoride mg/L
0.20
0.15
0.10
2022−07
2023−01
2023−07
Date

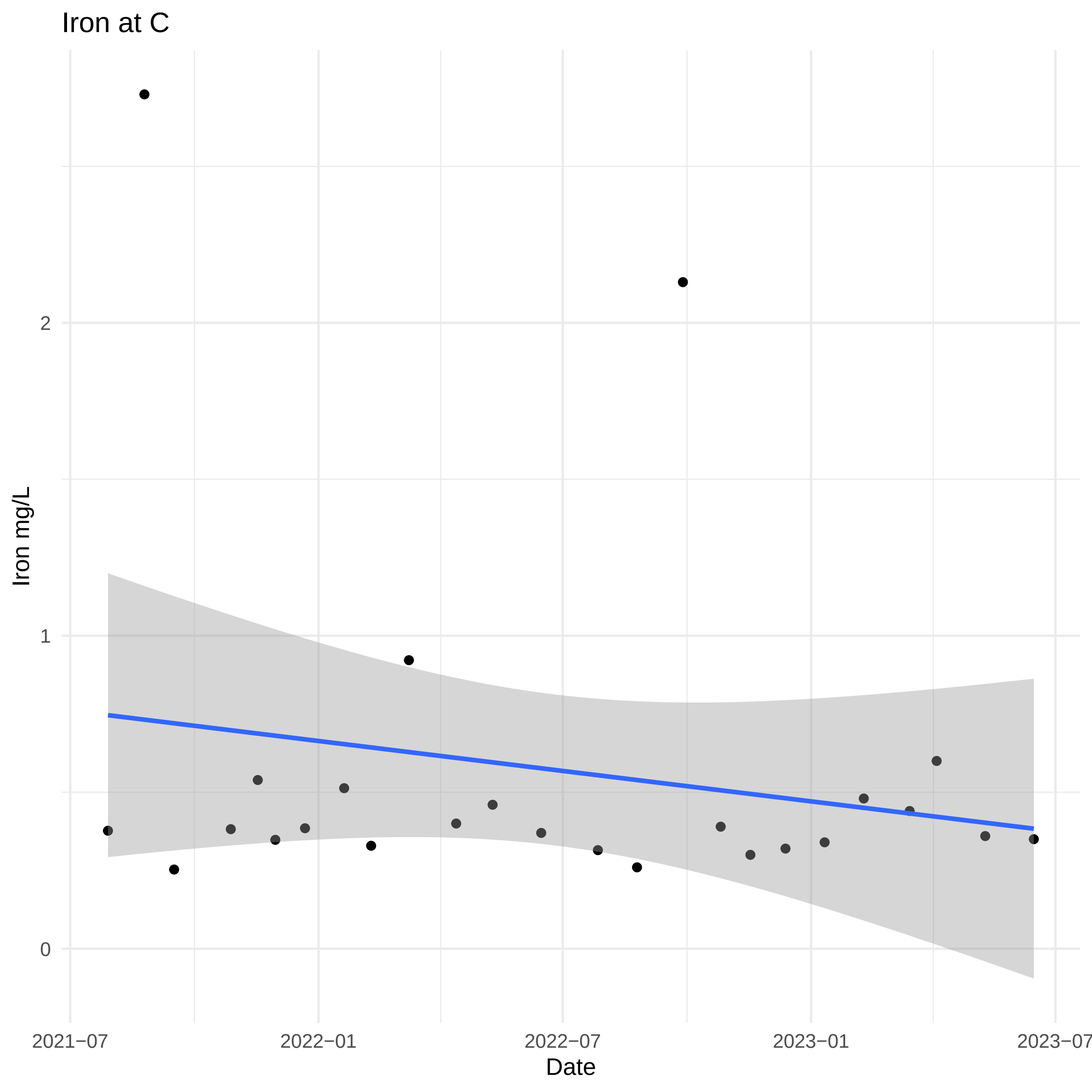


Fluoride at LMP01
0.25
0.20
0.15
0.10
0.05
Fluoride mg/L
2022−01
2022−07
2023−01
2023−0
Date

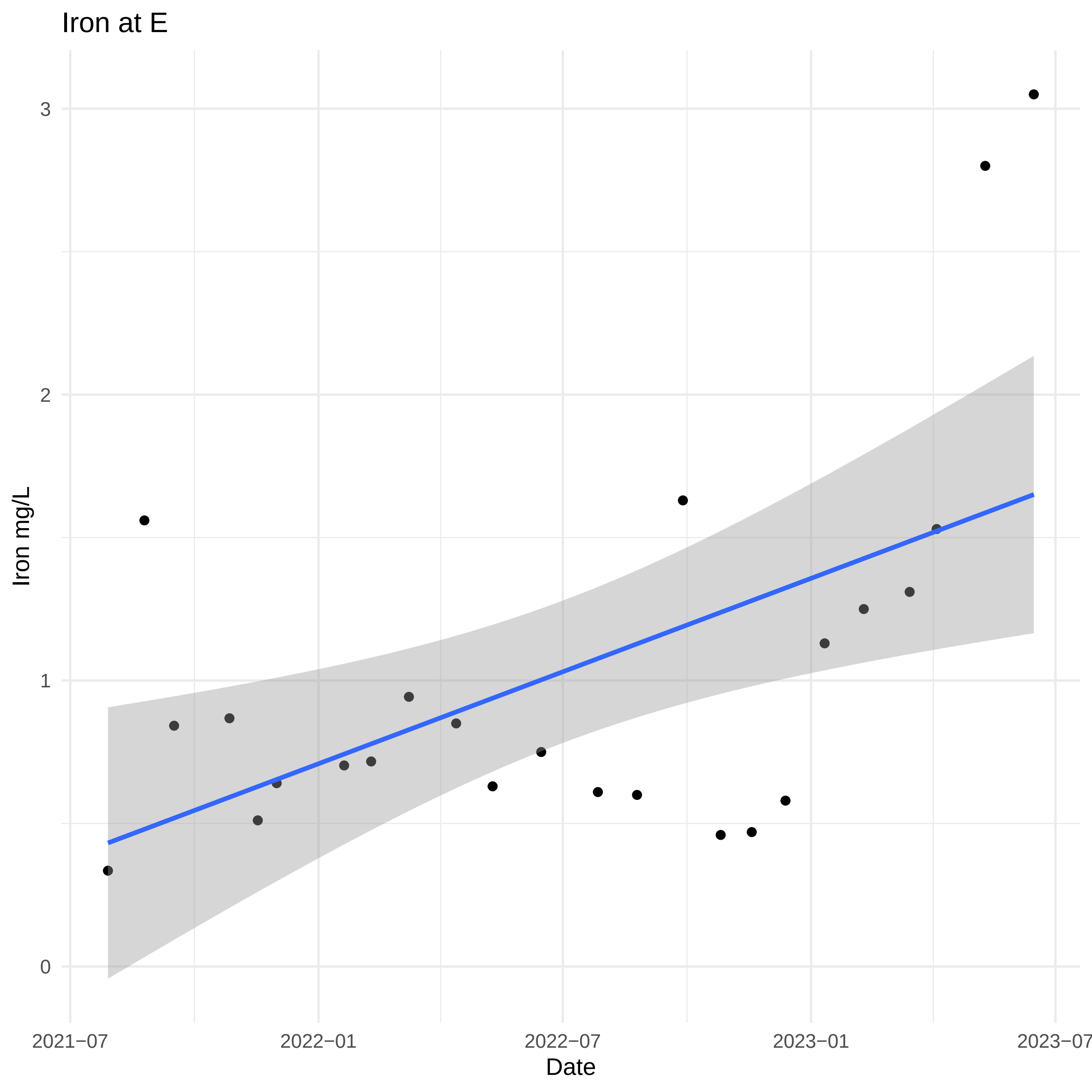


Fluoride at NC01
0.15
0.10
0.05
Fluoride mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

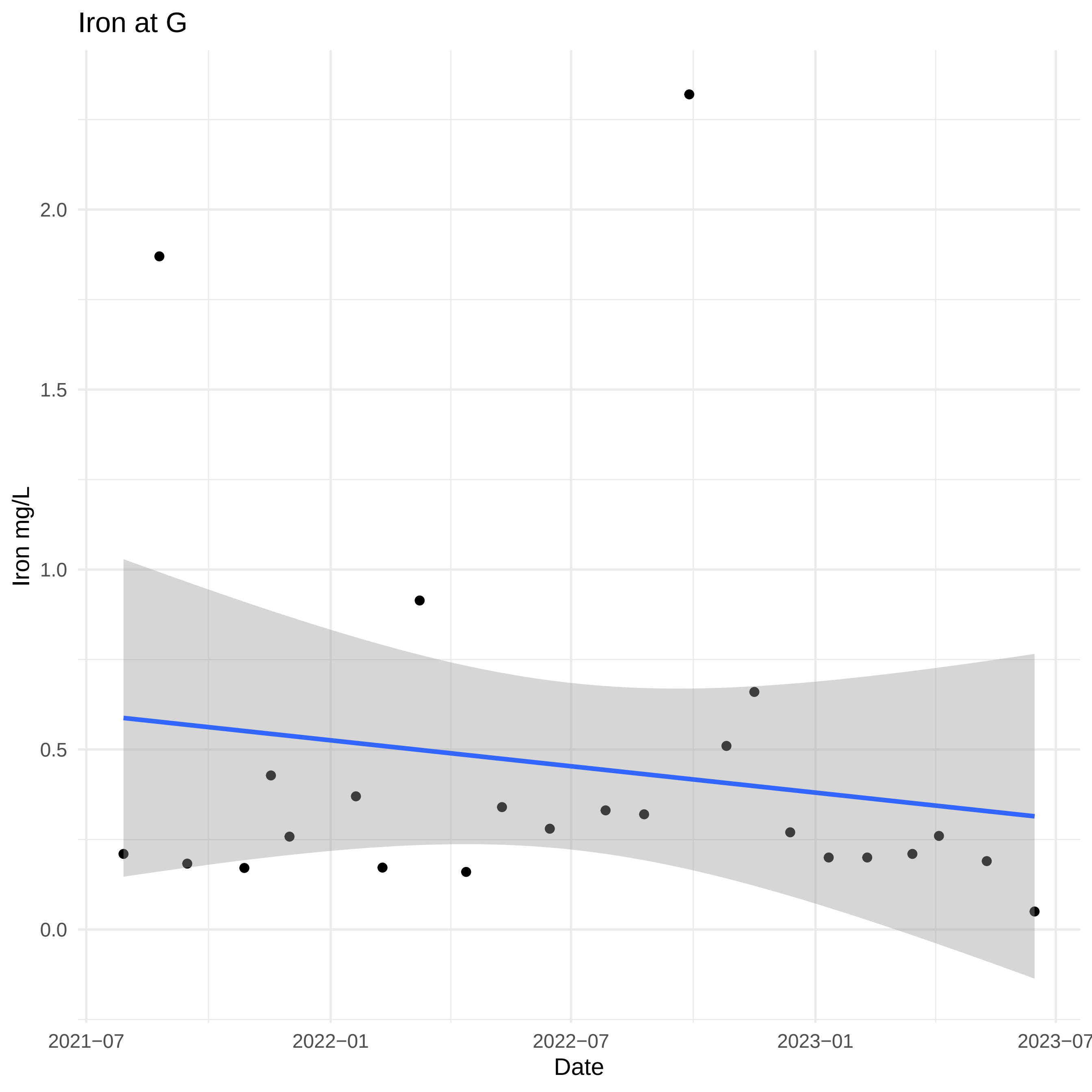

Fluoride at WX22
Fluoride mg/L
0.0
0.1
0.2
0.3
0.4
0.5
2021−07
2022−01
2022−07
2023−01
2023−07
Date



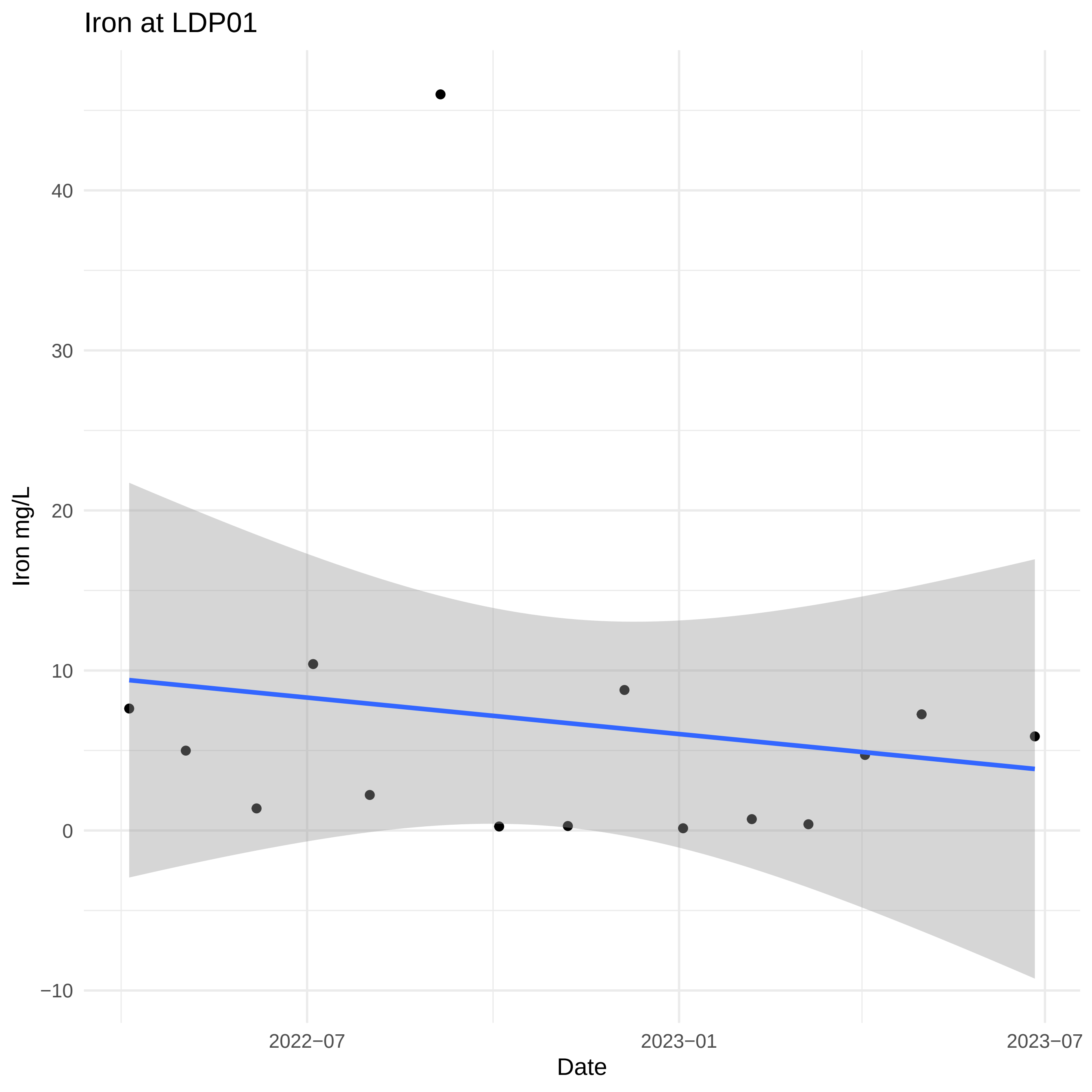
Iron at C
Iron mg/L
2
1
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



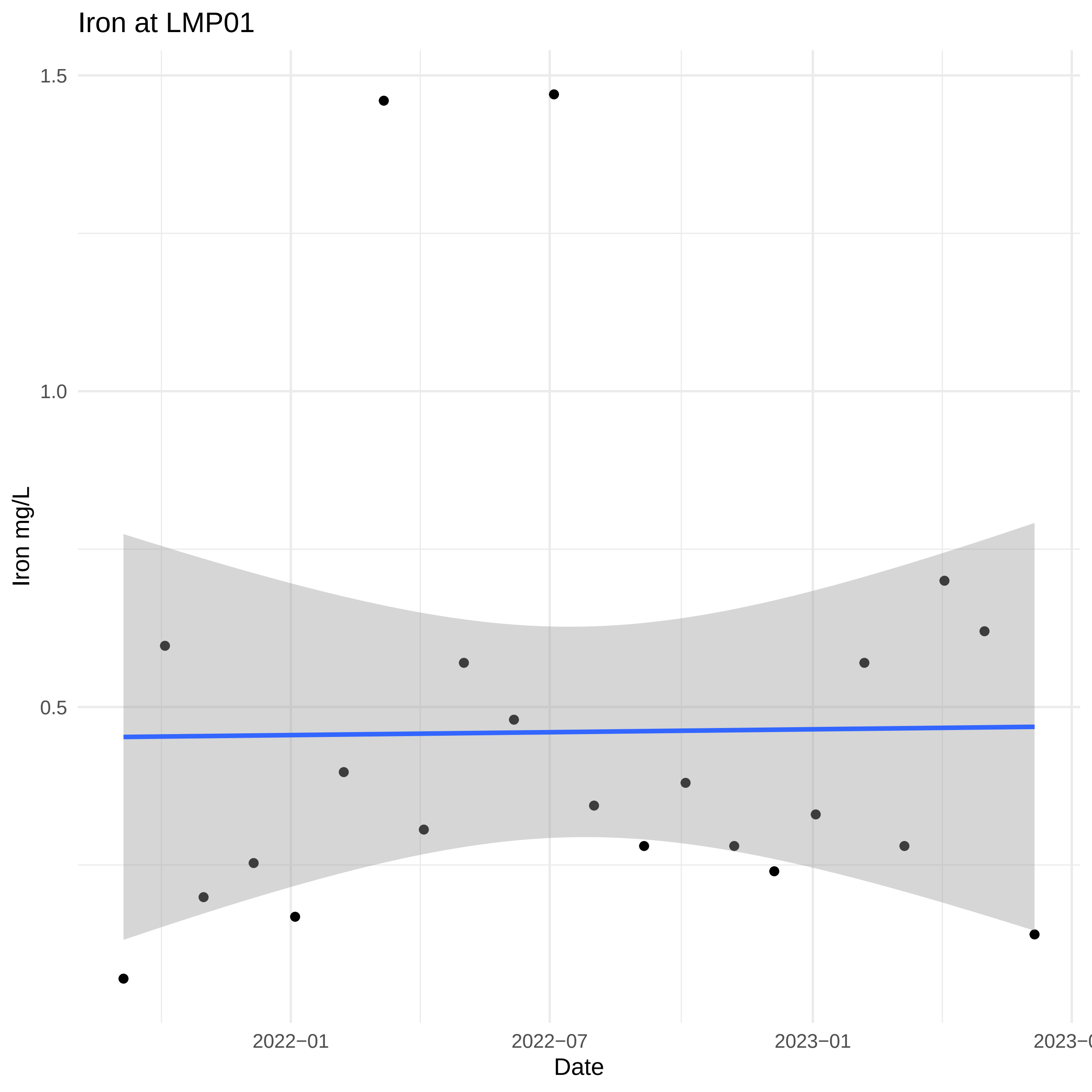
Iron at E
Iron mg/L
3
2
1
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



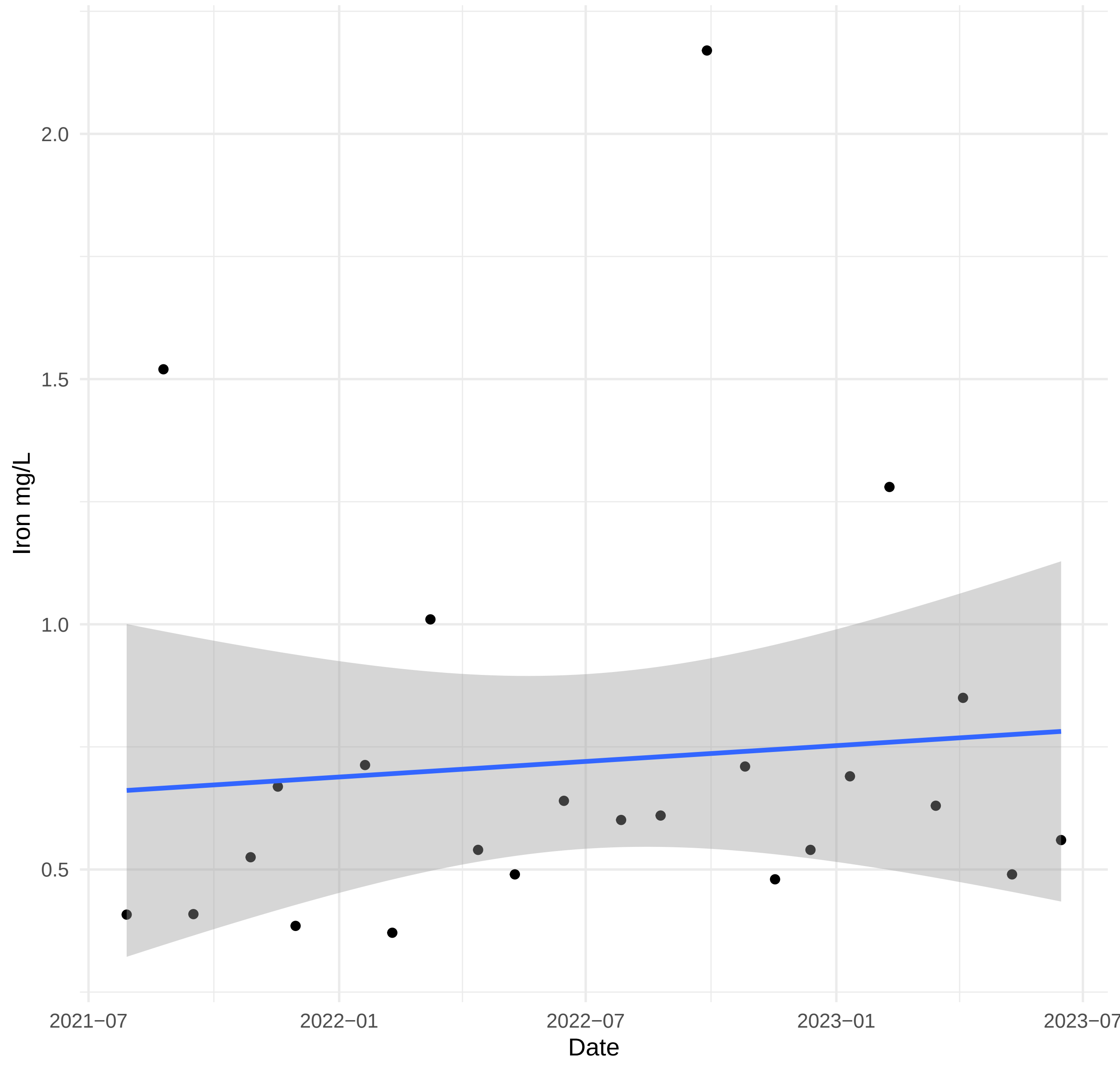
Iron at G
Iron mg/L
2.0
1.5
1.0
0.5
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

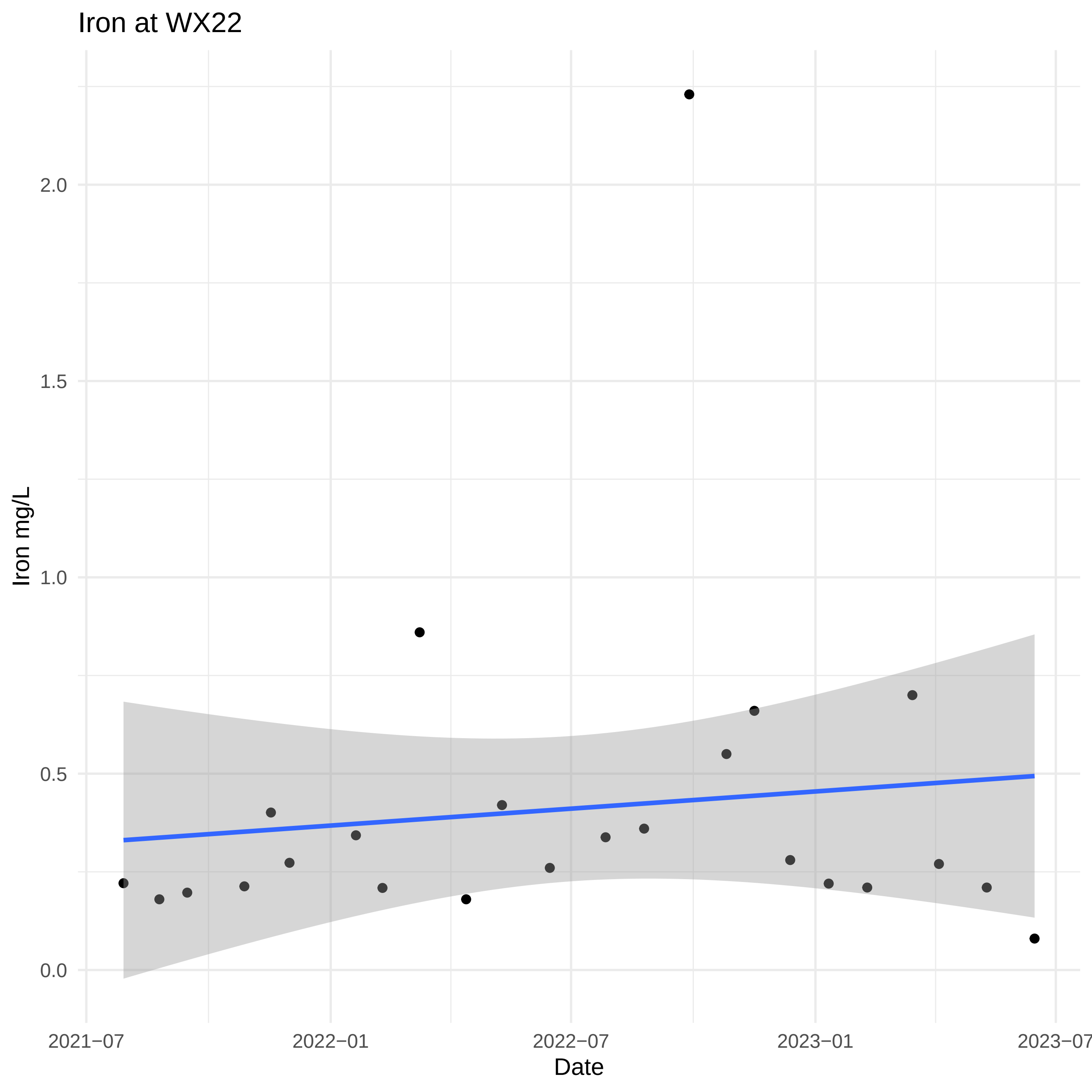


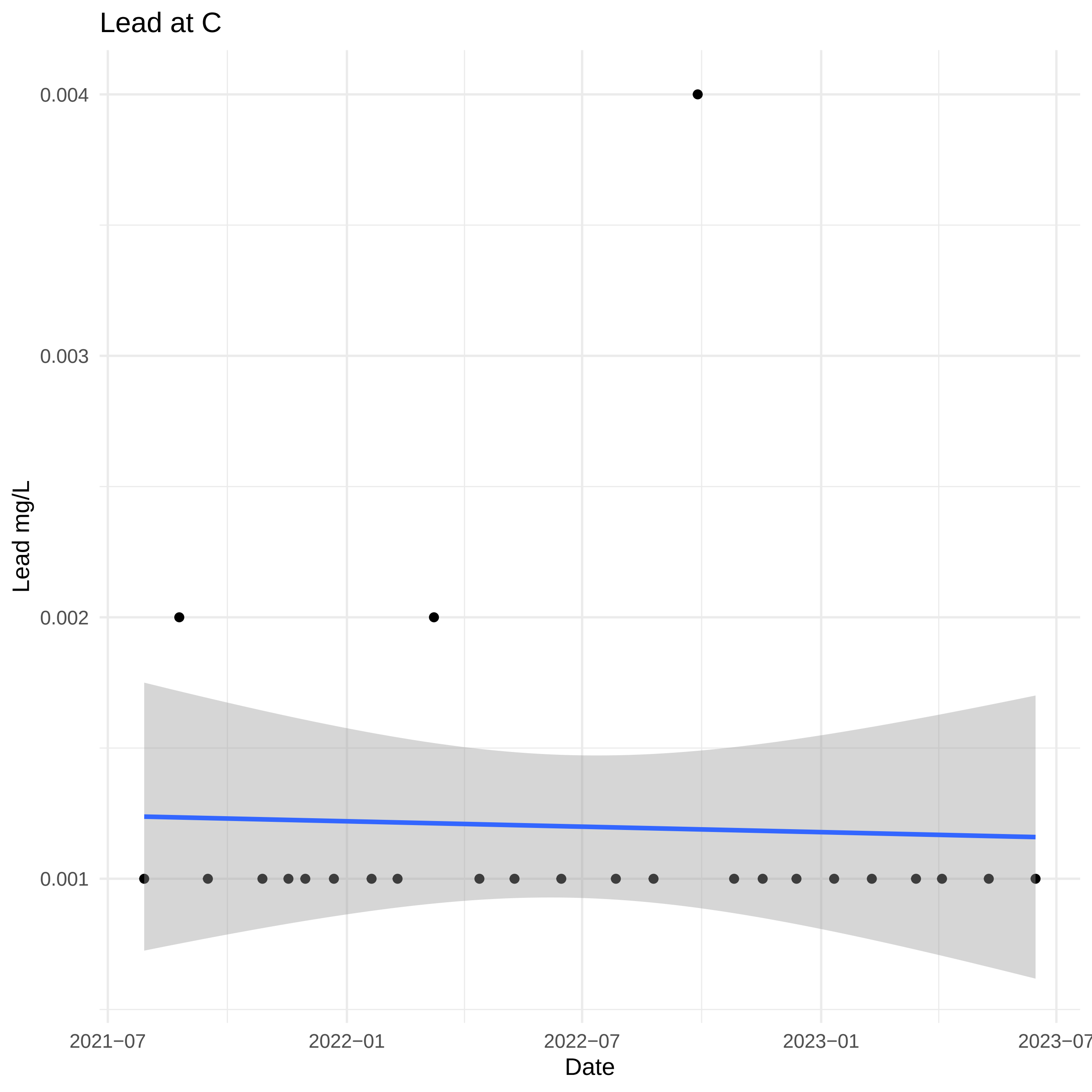
Iron at LDP01
Iron mg/L
40
30
20
10
0
−10
2022−07
2023−01
2023−07
Date


Iron at LMP01
Iron mg/L
1.5
1.0
0.5
2022−01
2022−07
2023−01
2023−0
Date

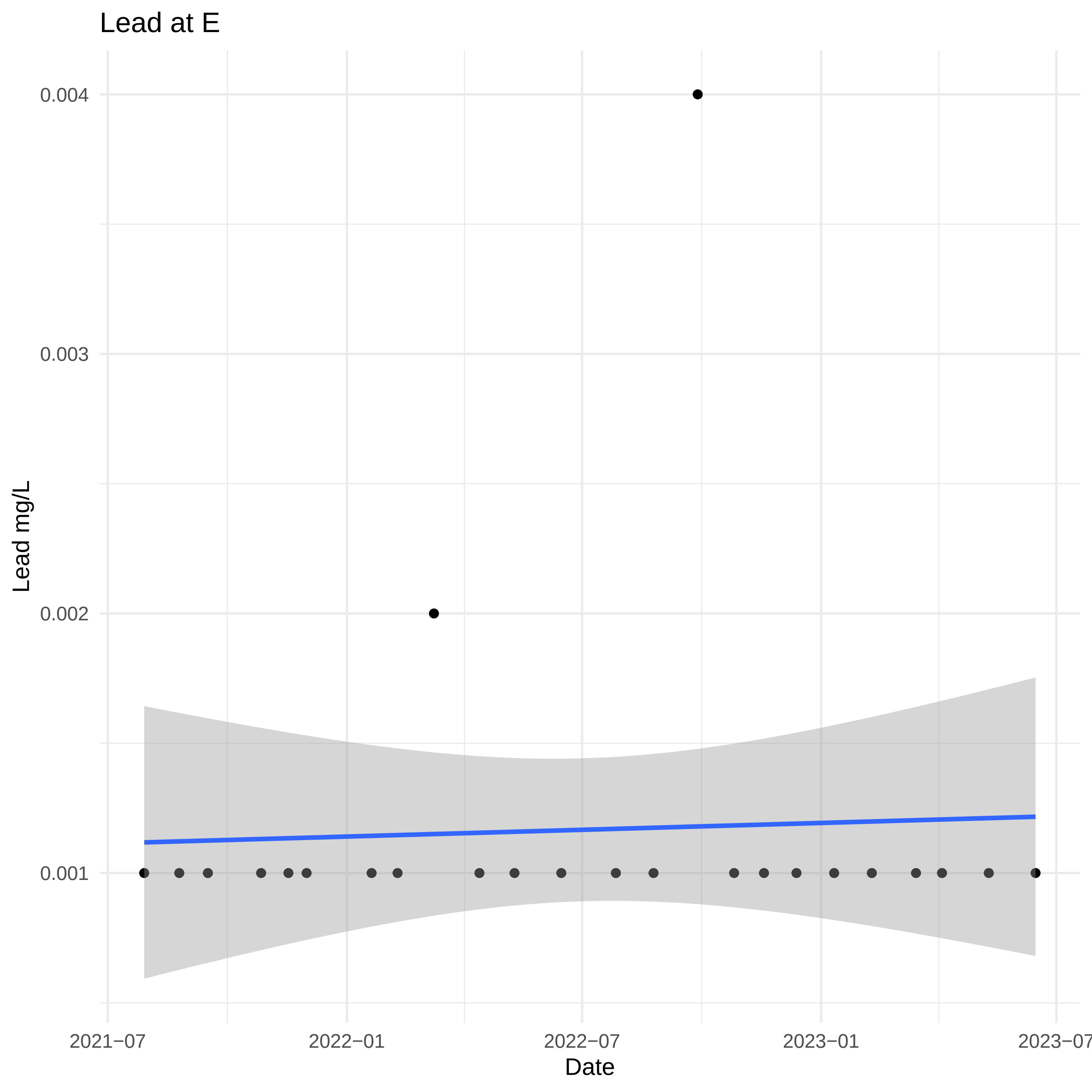
Iron at NC01



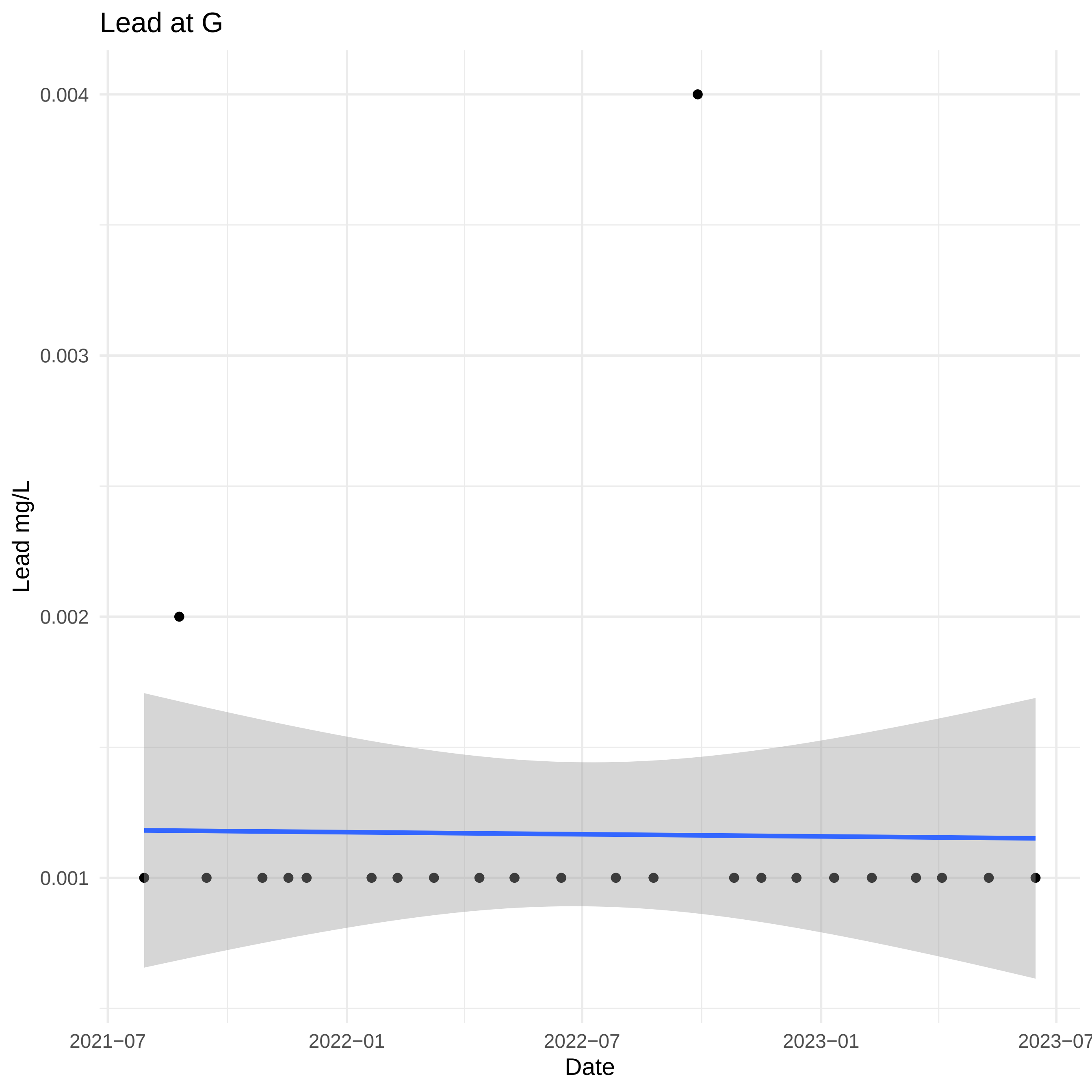

Iron at WX22
Iron mg/L
2.0
1.5
1.0
0.5
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



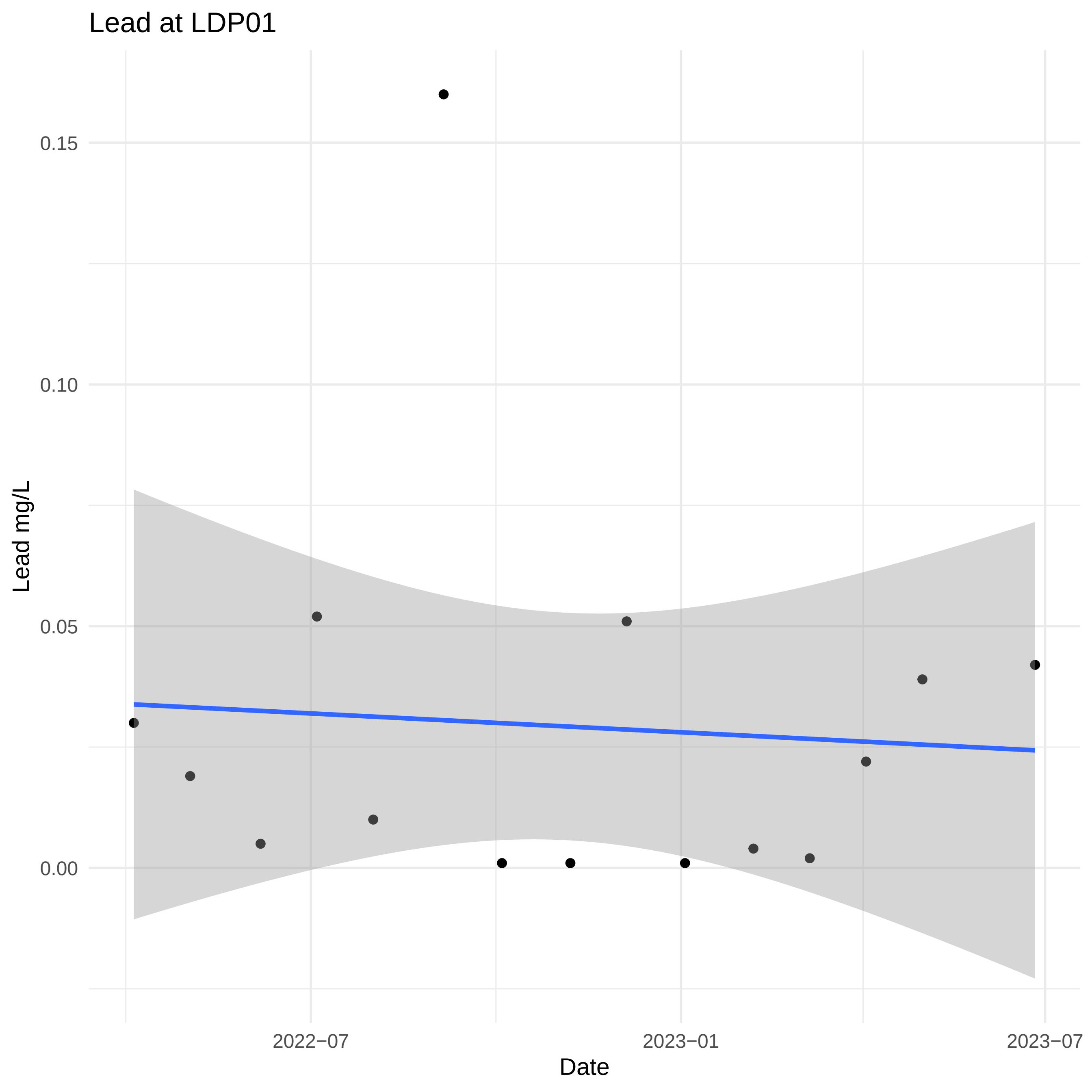
Lead at C
0.004
0.003
0.002
0.001
Lead mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



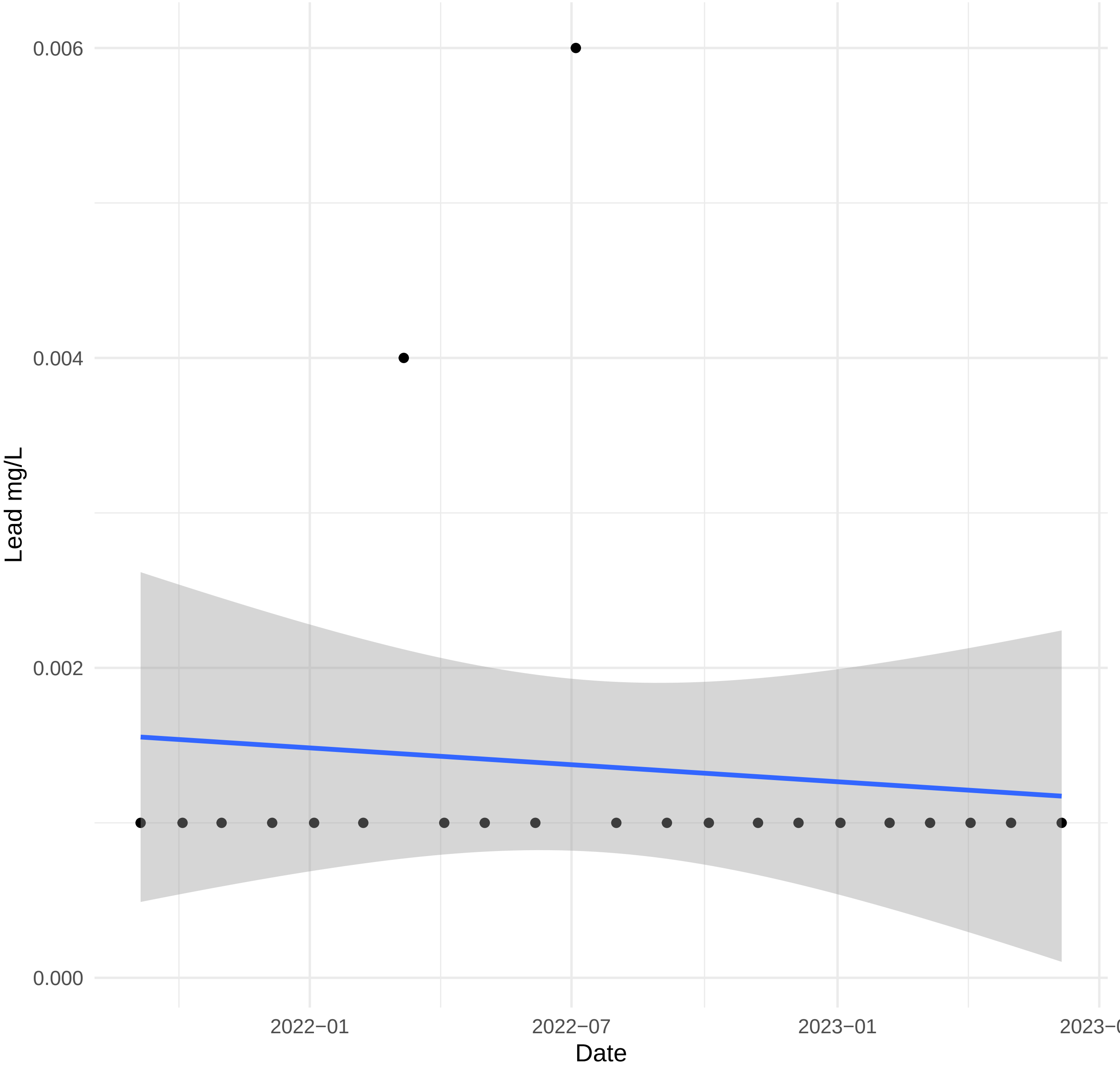
Lead at E
0.004
0.003
0.002
0.001
Lead mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

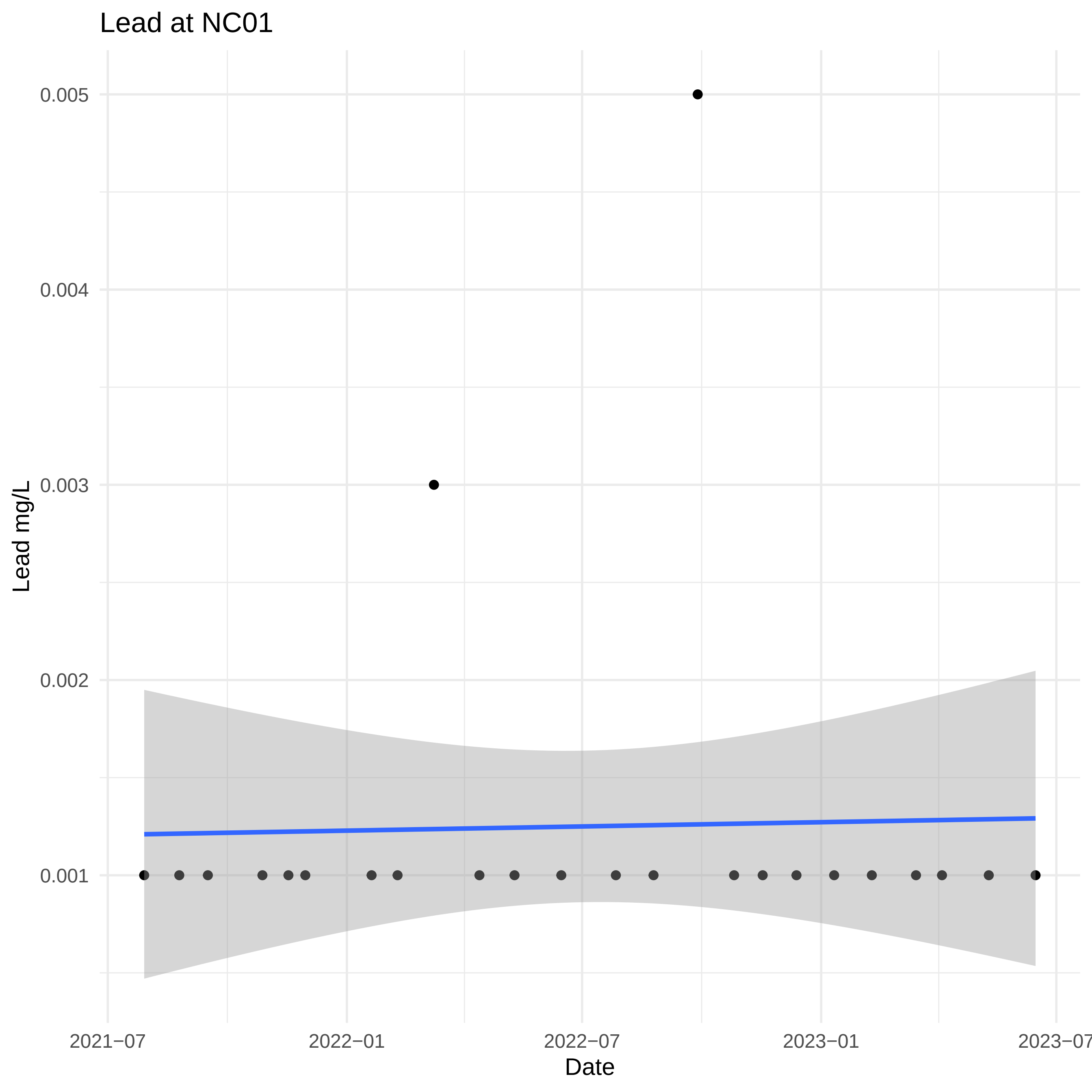


Lead at G
0.004
0.003
0.002
0.001
Lead mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

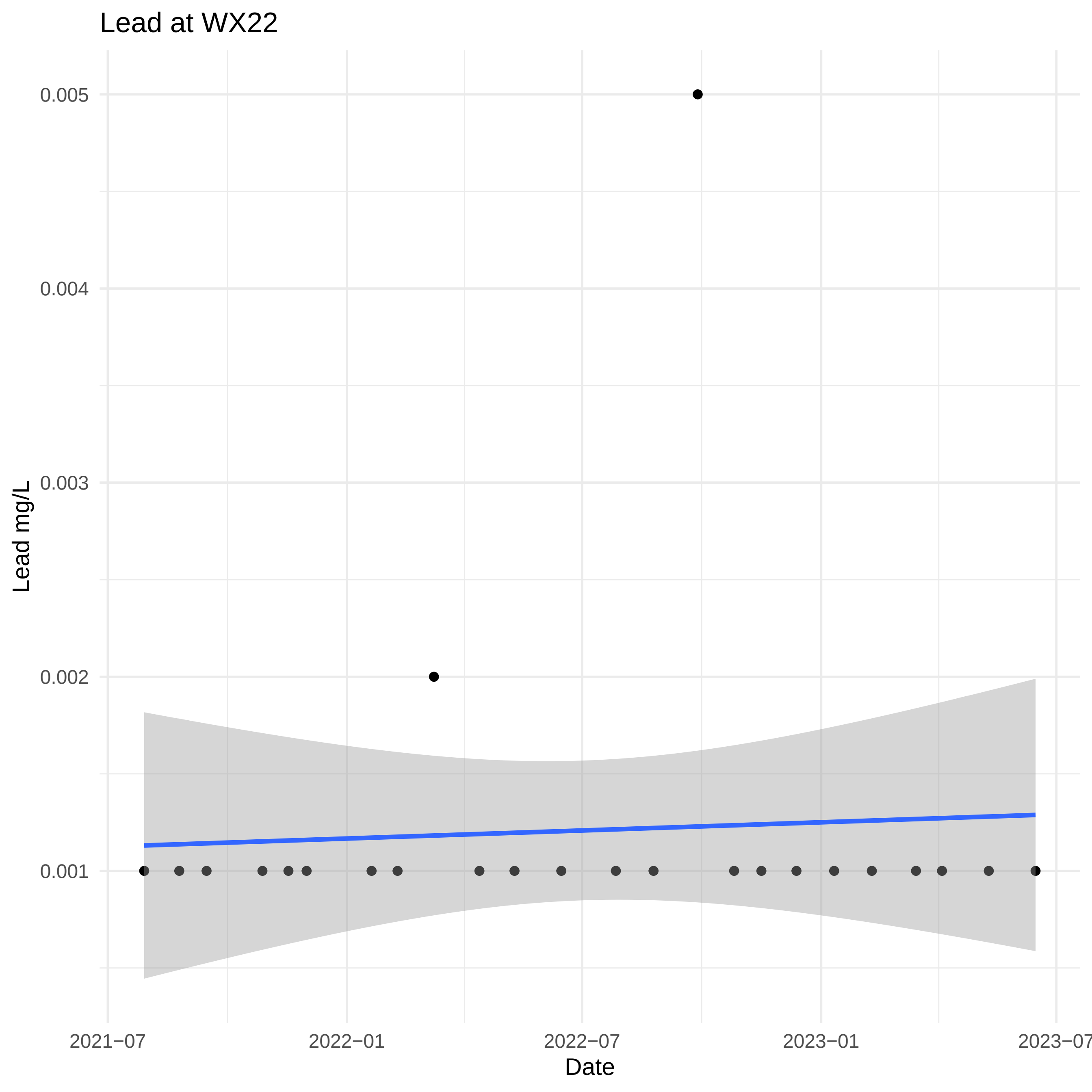

Lead at LDP01
0.15
0.10
0.05
0.00
Lead mg/L
2022−07
2023−01
2023−07
Date

Lead at LMP01

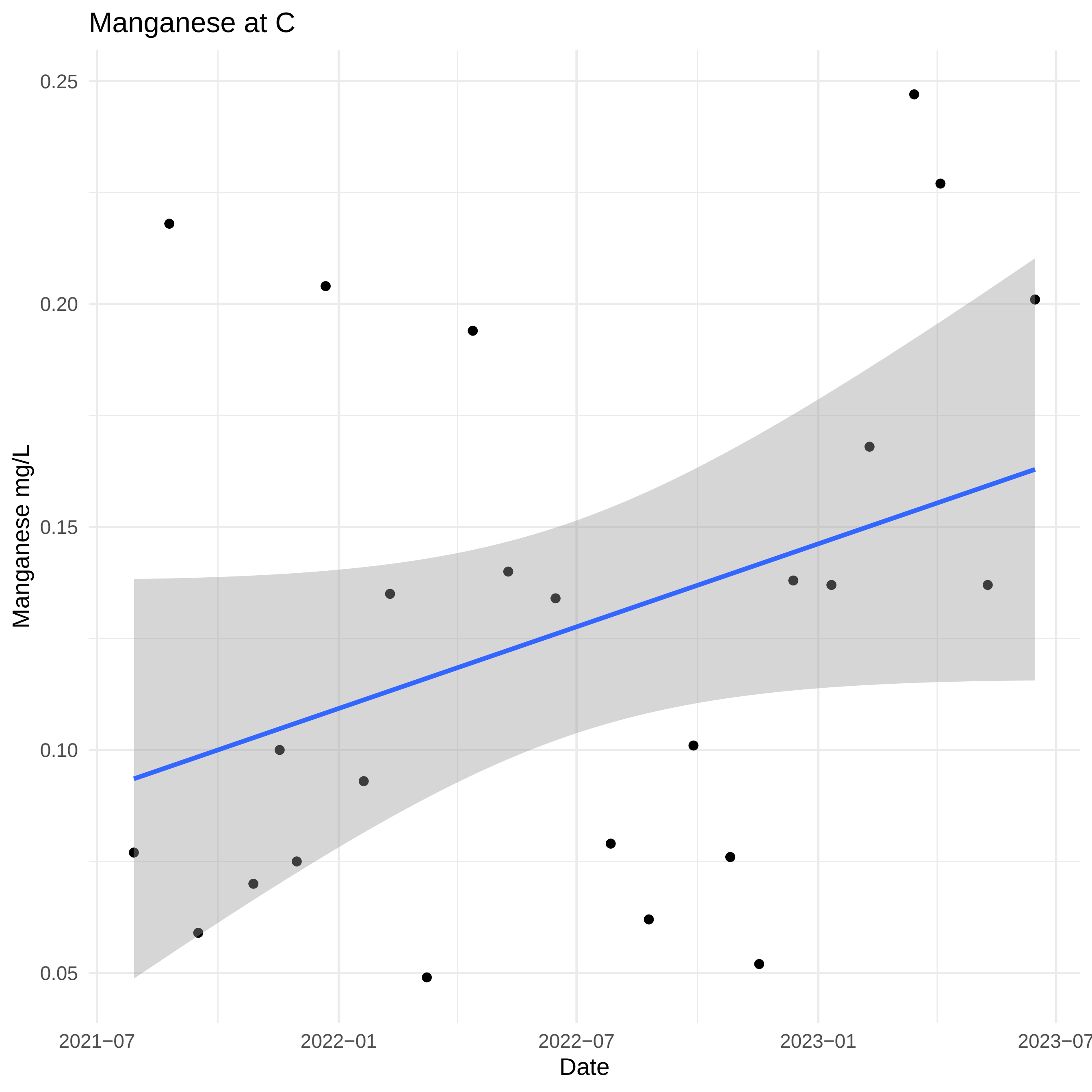




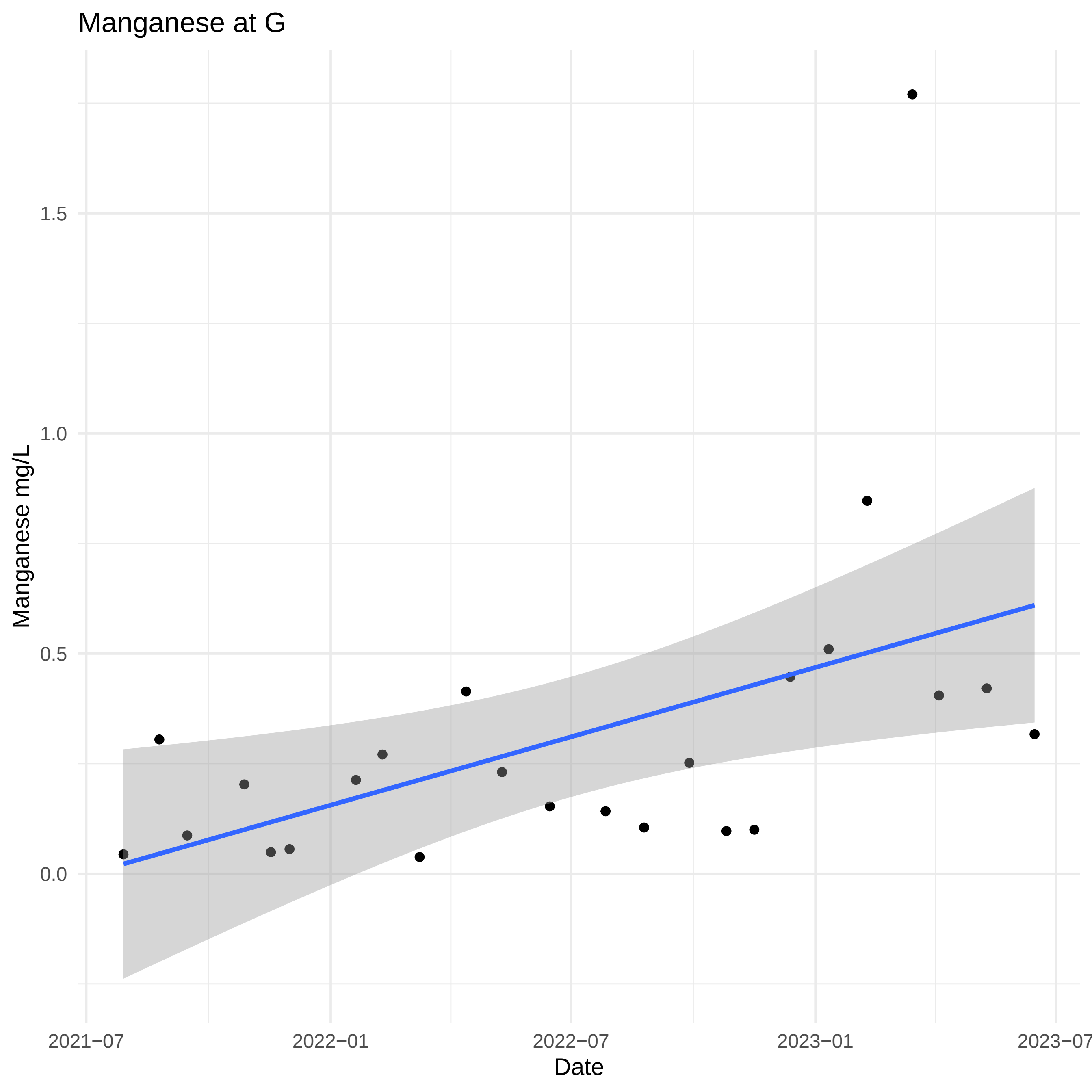
Lead at NC01
Lead mg/L
0.005
0.004
0.003
0.002
0.001
2021−07
2022−01
2022−07
2023−01
2023−07
Date



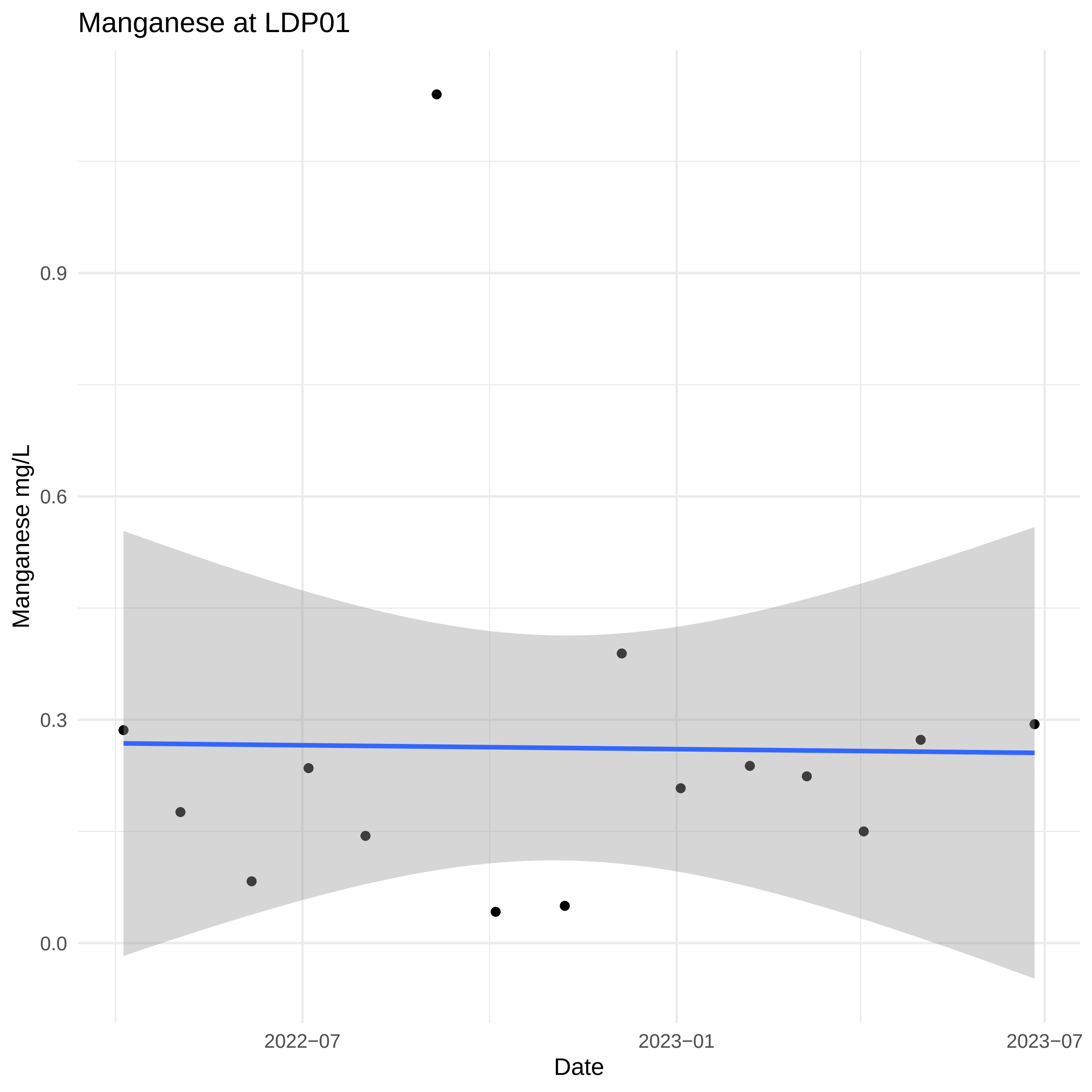
Lead at WX22
0.005
0.004
0.003
0.002
0.001
Lead mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Manganese at C
0.25
0.20
0.15
0.10
0.05
Manganese mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

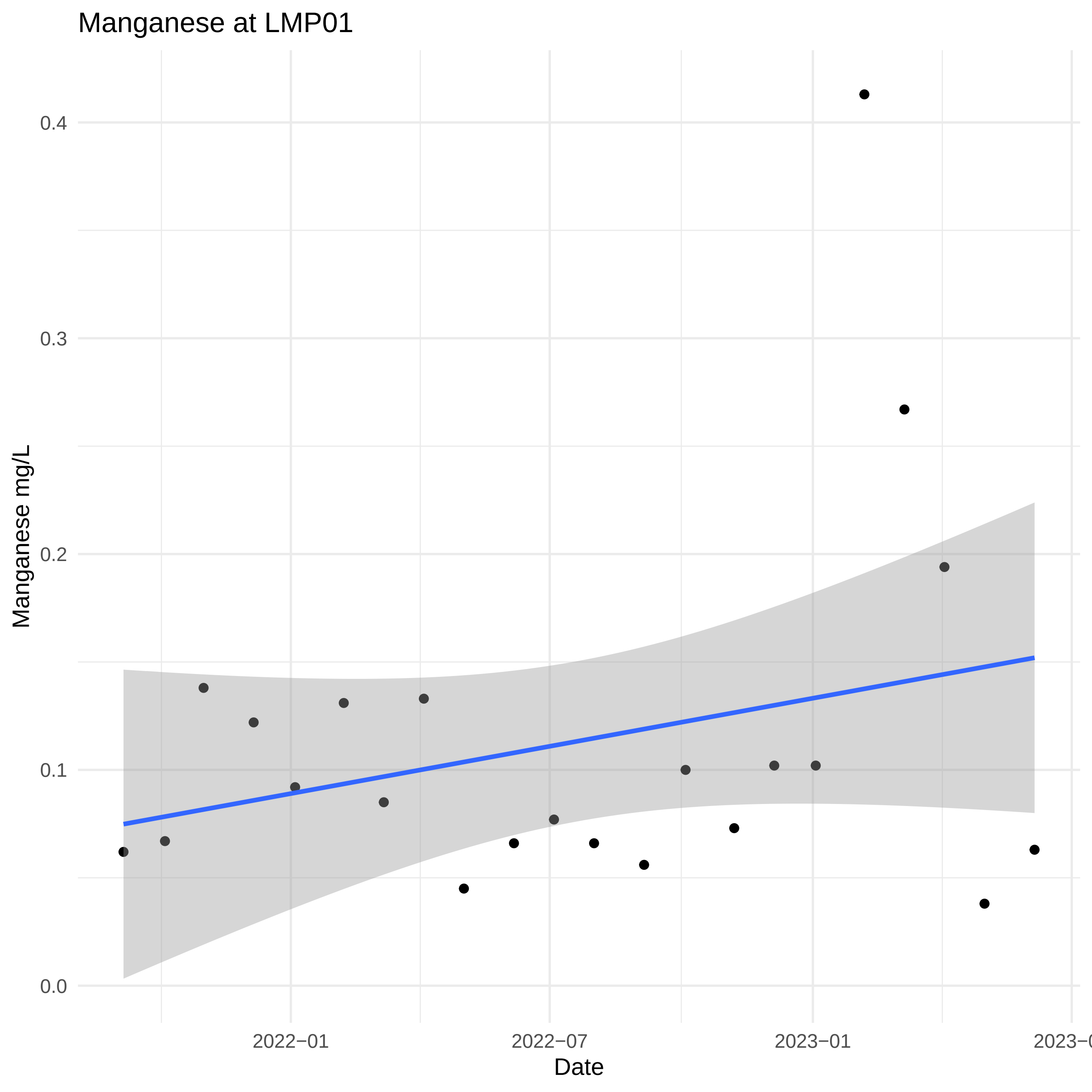

Manganese at E
Manganese mg/L
0
1
2
3
2021−07
2022−01
2022−07
2023−01
2023−07
Date



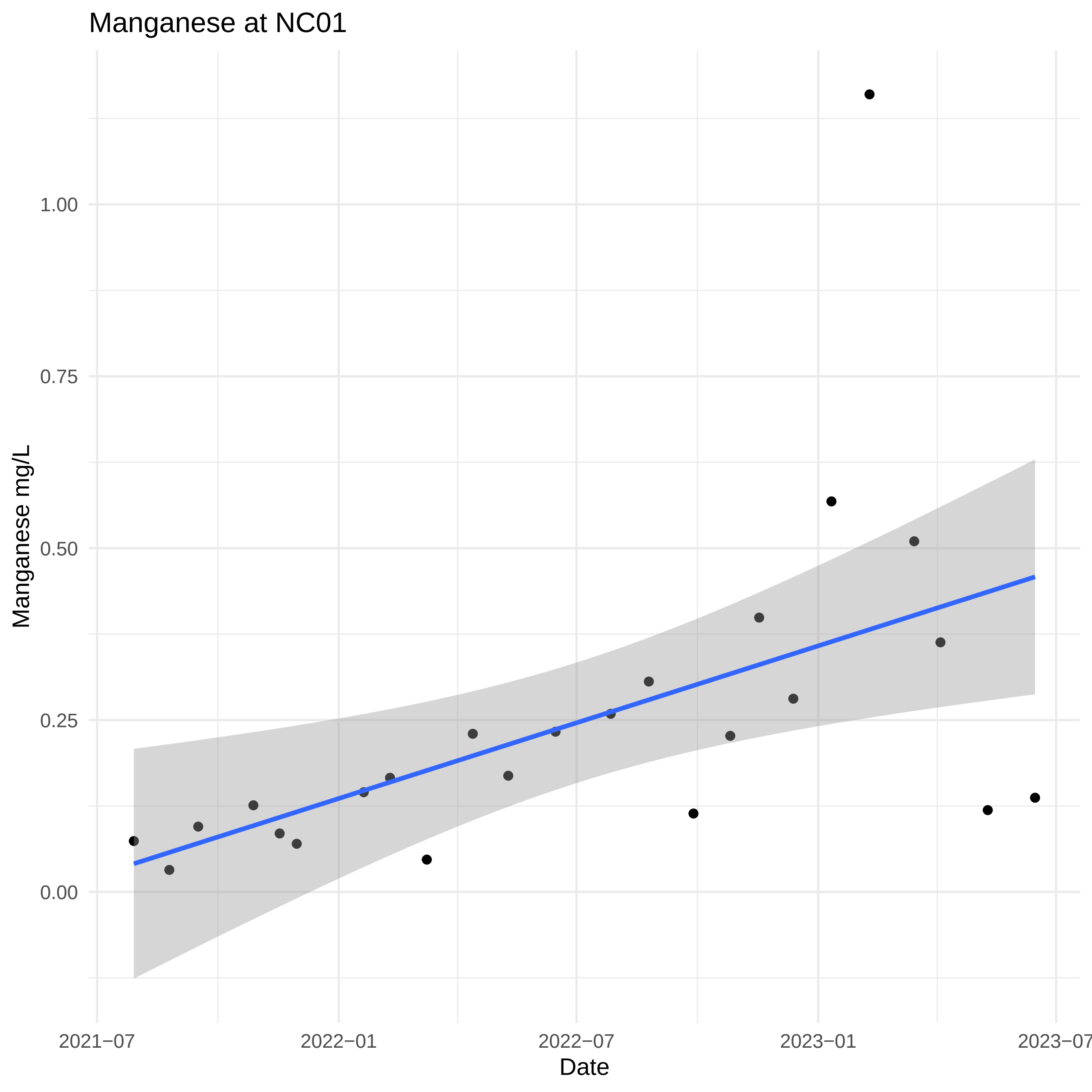
Manganese at G
Manganese mg/L
1.5
1.0
0.5
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



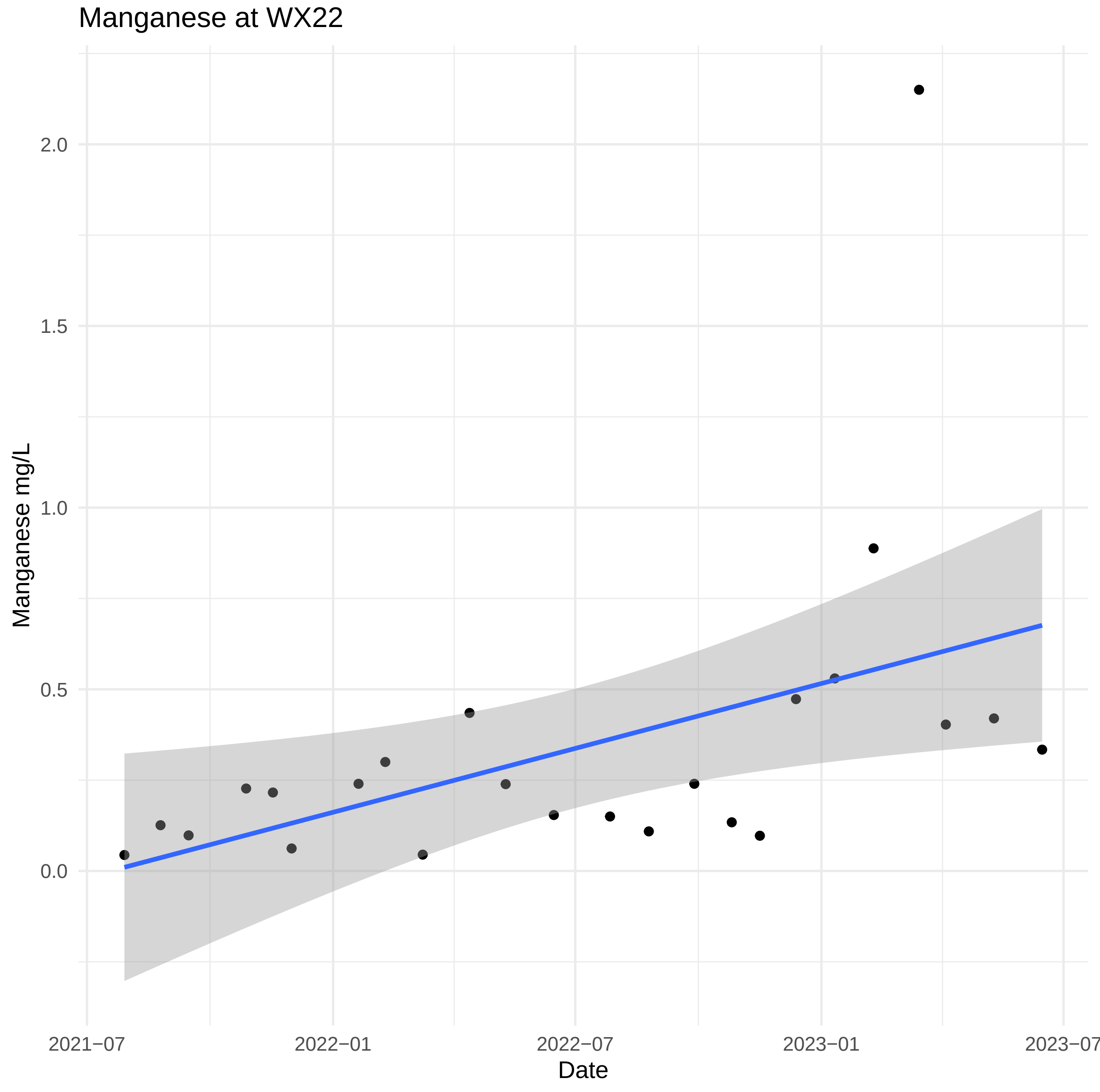
Manganese at LDP01
Manganese mg/L
0.9
0.6
0.3
0.0
2022−07
2023−01
2023−07
Date



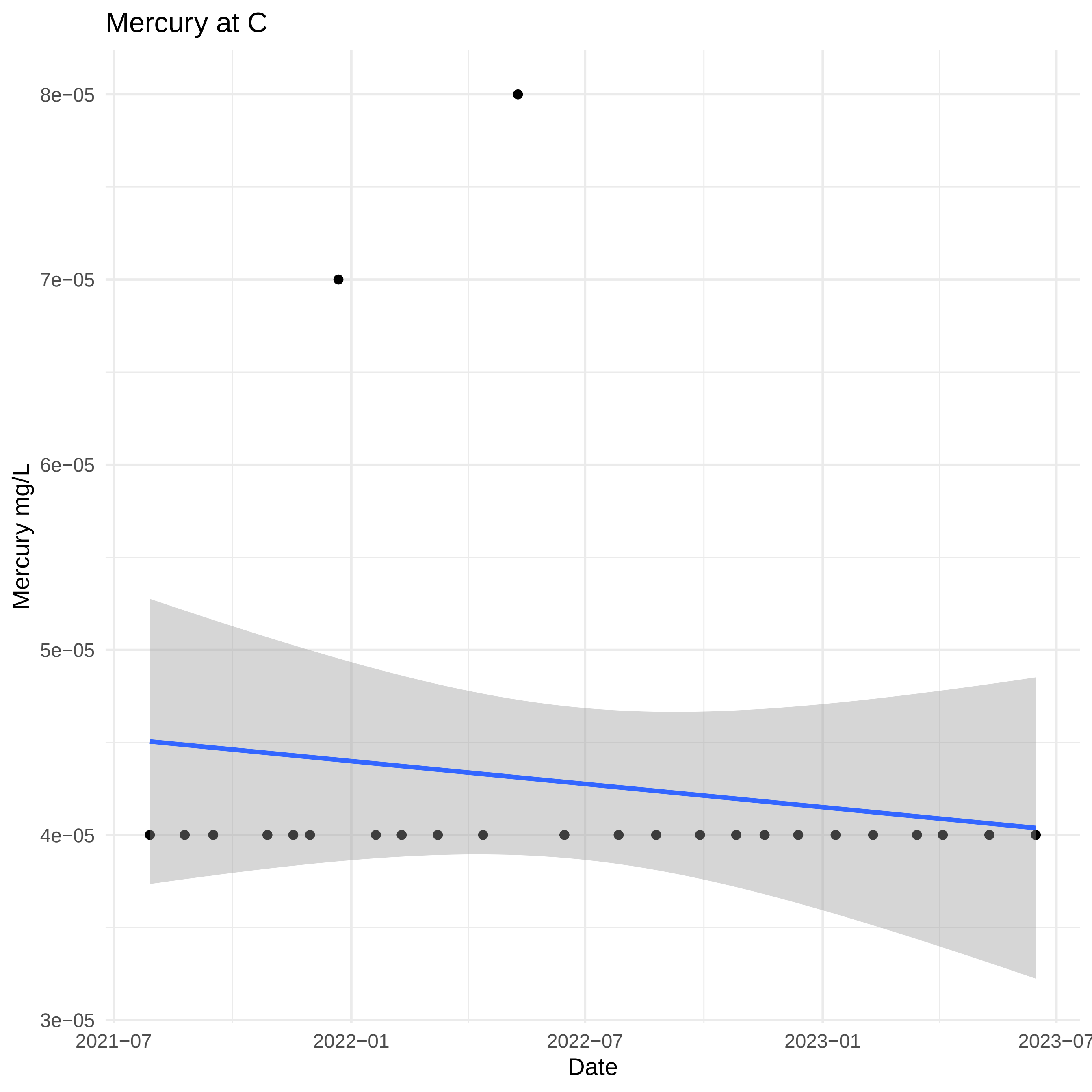
Manganese at LMP01
Manganese mg/L
0.4
0.3
0.2
0.1
0.0
2022−01
2022−07
2023−01
2023−0
Date



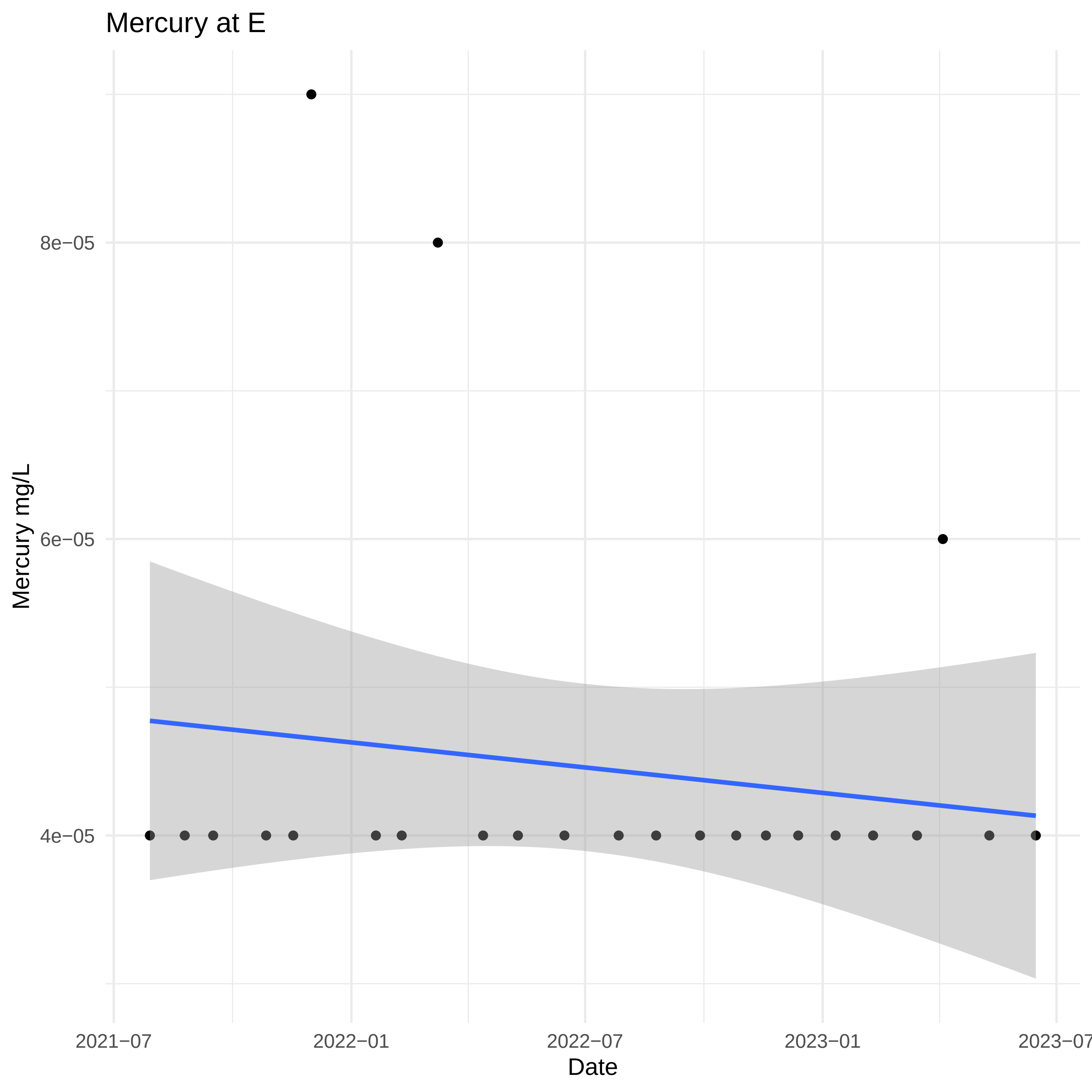
Manganese at NC01
1.00
0.75
0.50
0.25
0.00
Manganese mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



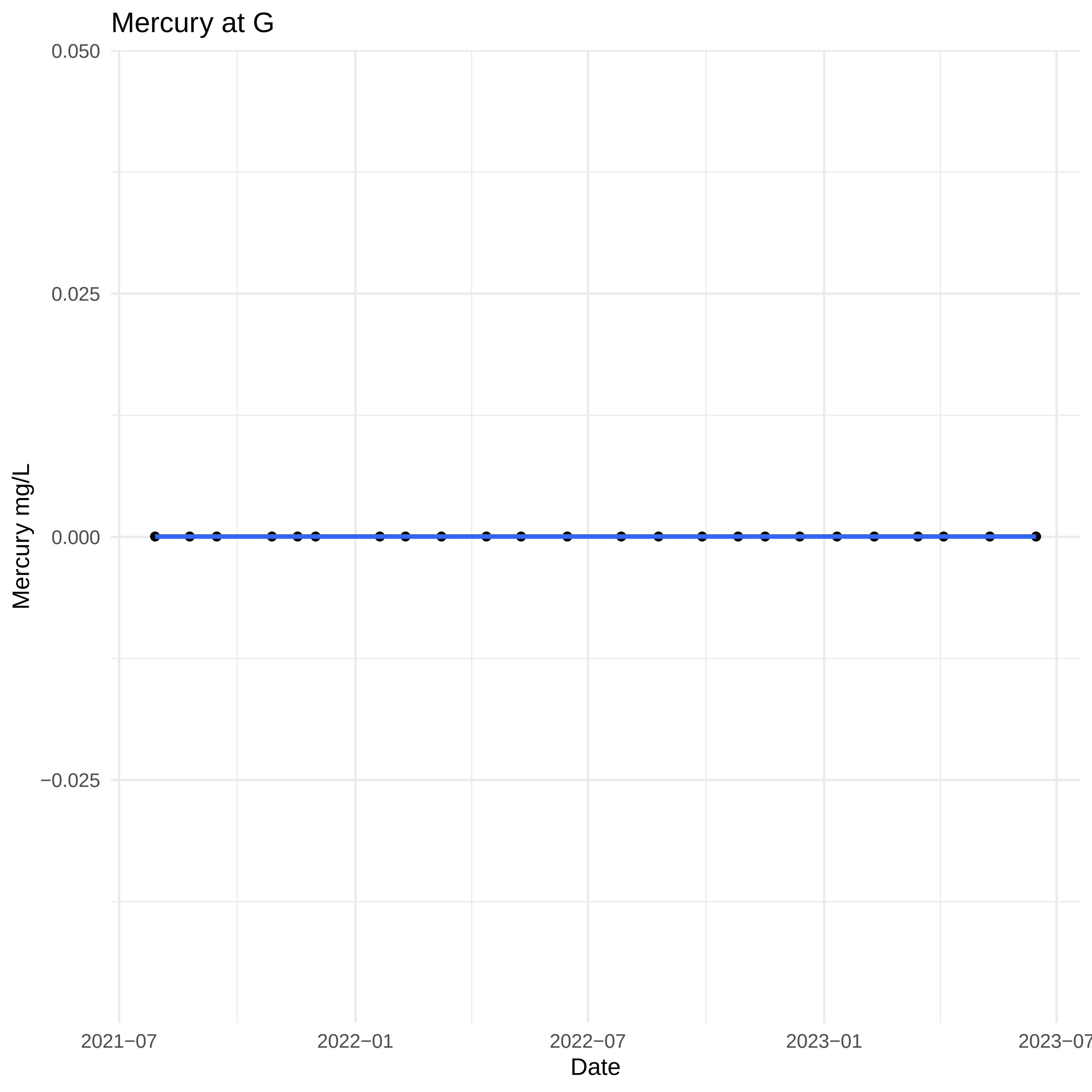
Manganese at WX22
Manganese mg/L
2.0
1.5
1.0
0.5
0.0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



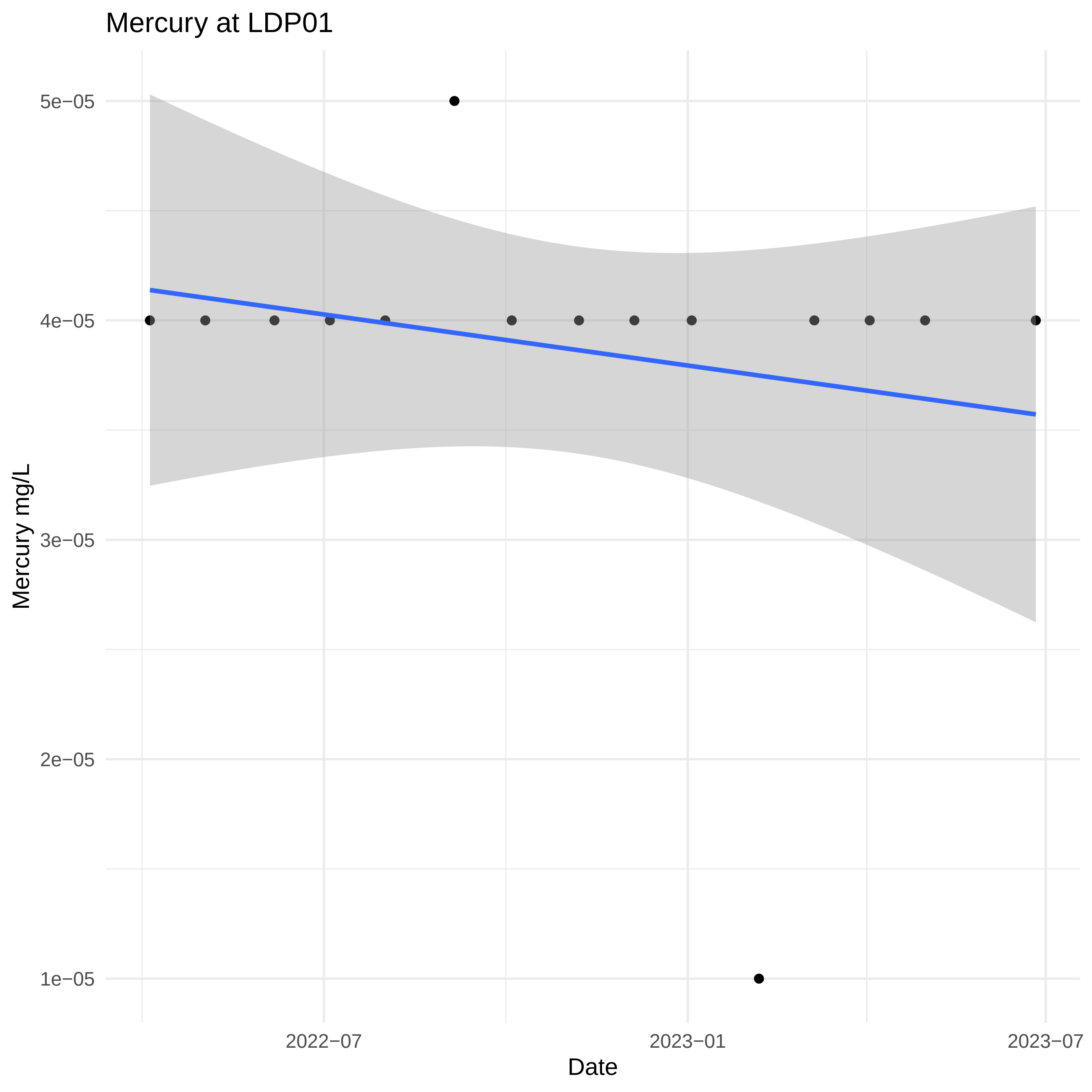
Mercury at C
Mercury mg/L
8e−05
7e−05
6e−05
5e−05
4e−05
3e−05
2021−07
2022−01
2022−07
2023−01
2023−07
Date

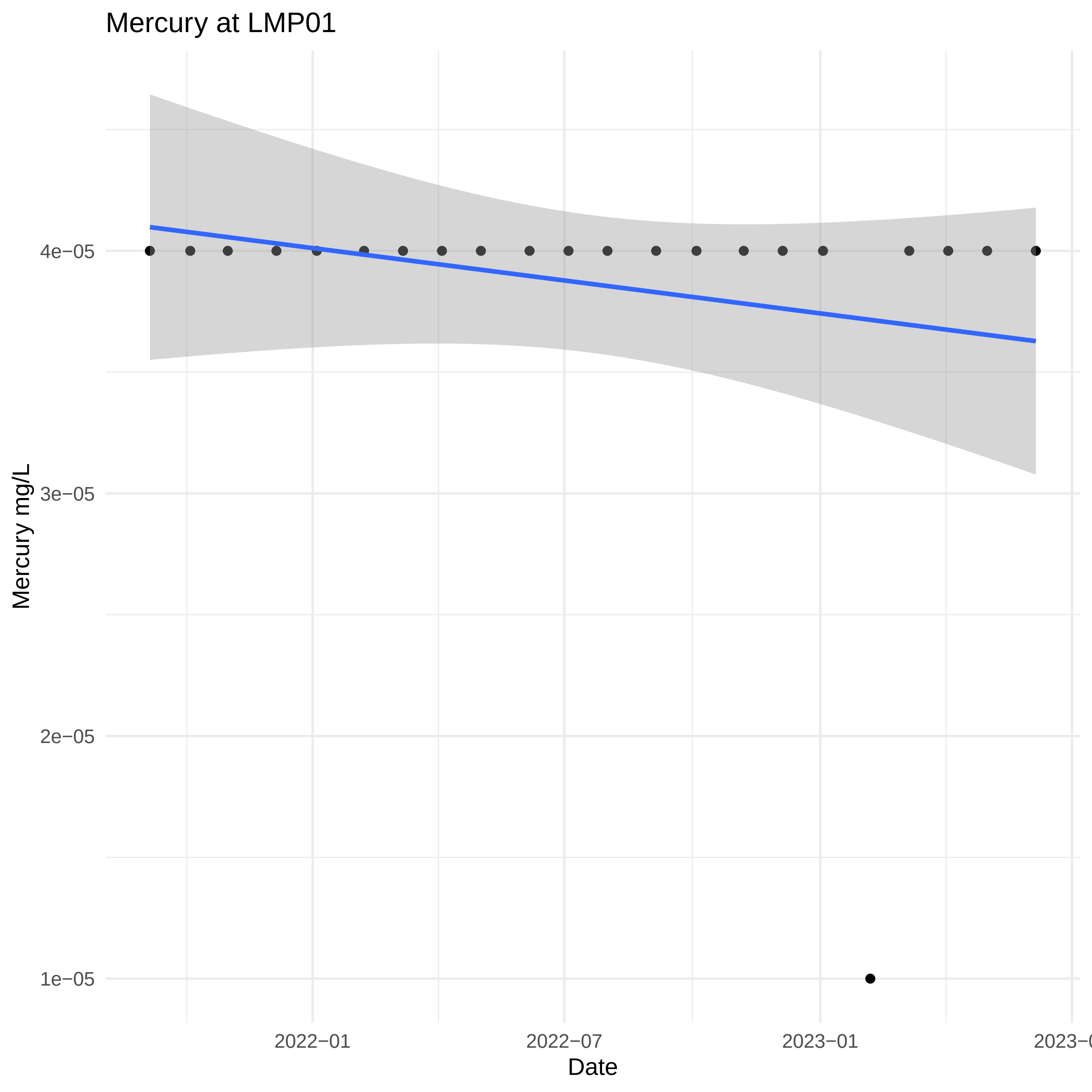


Mercury at E
Mercury mg/L
8e−05
6e−05
4e−05
2021−07
2022−01
2022−07
2023−01
2023−07
Date

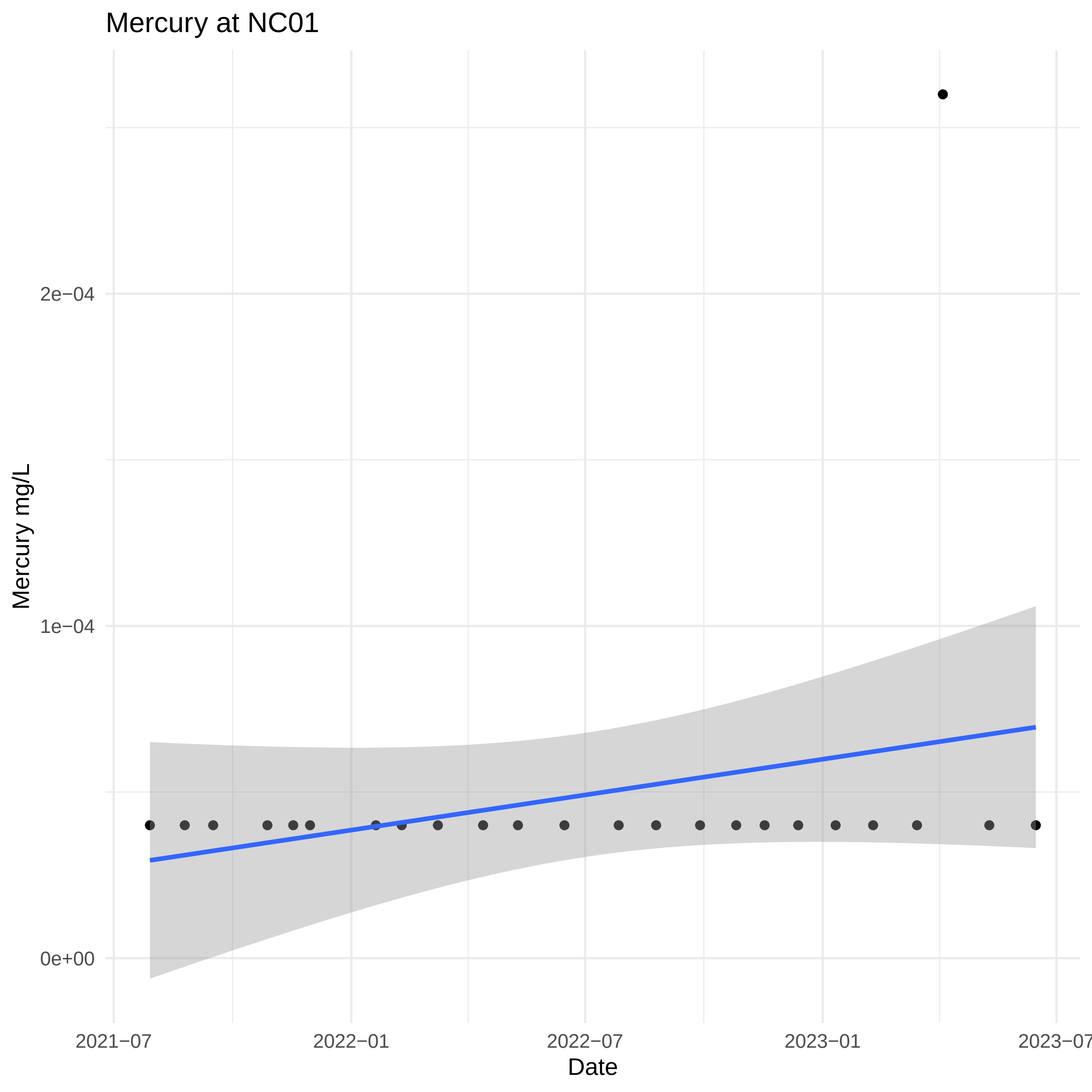


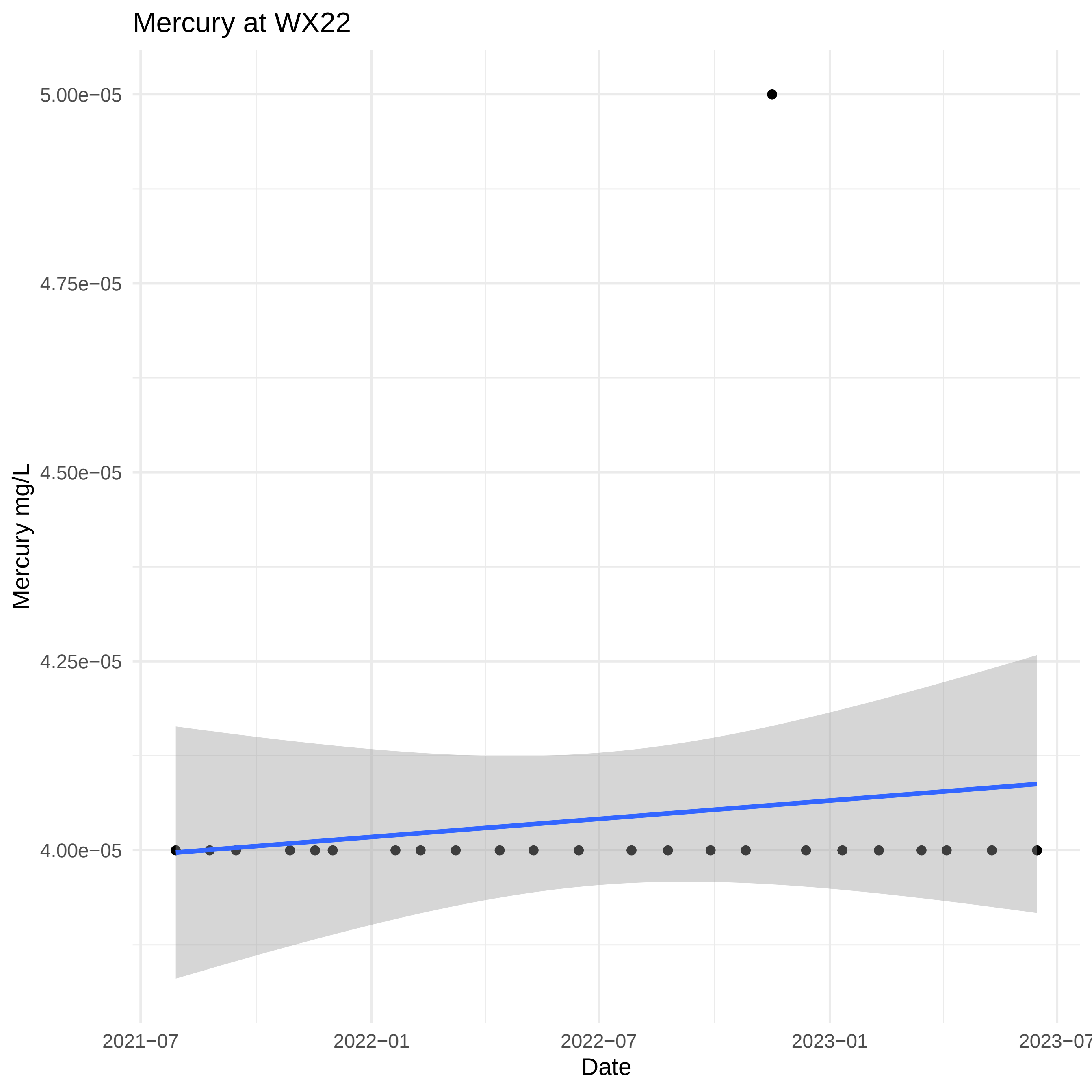
Mercury at G
0.050
0.025
0.000
−0.025
Mercury mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Mercury at LDP01
5e−05
4e−05
3e−05
2e−05
1e−05
Mercury mg/L
2022−07
2023−01
2023−07
Date

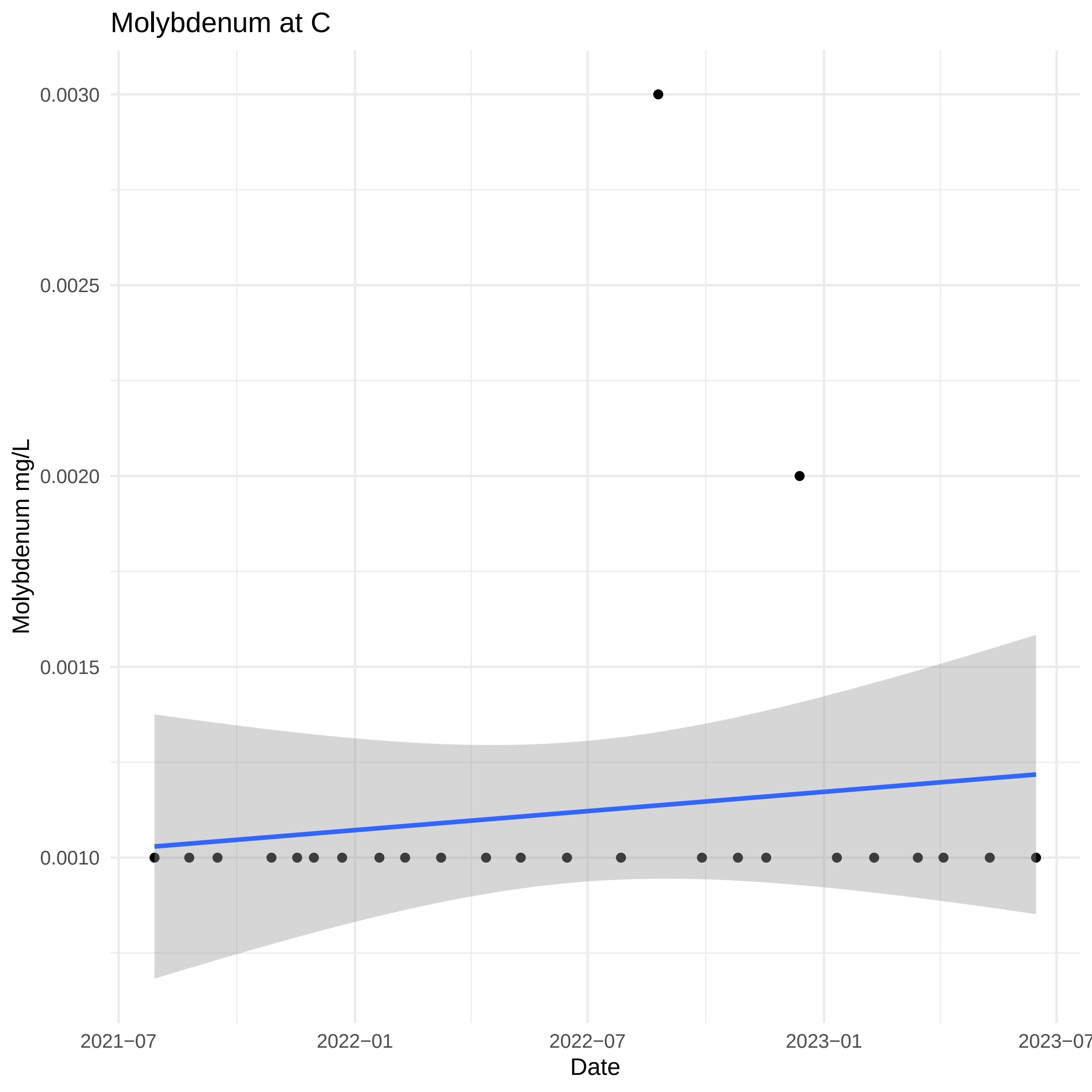


Mercury at LMP01
Mercury mg/L
4e−05
3e−05
2e−05
1e−05
2022−01
2022−07
2023−01
2023−0
Date

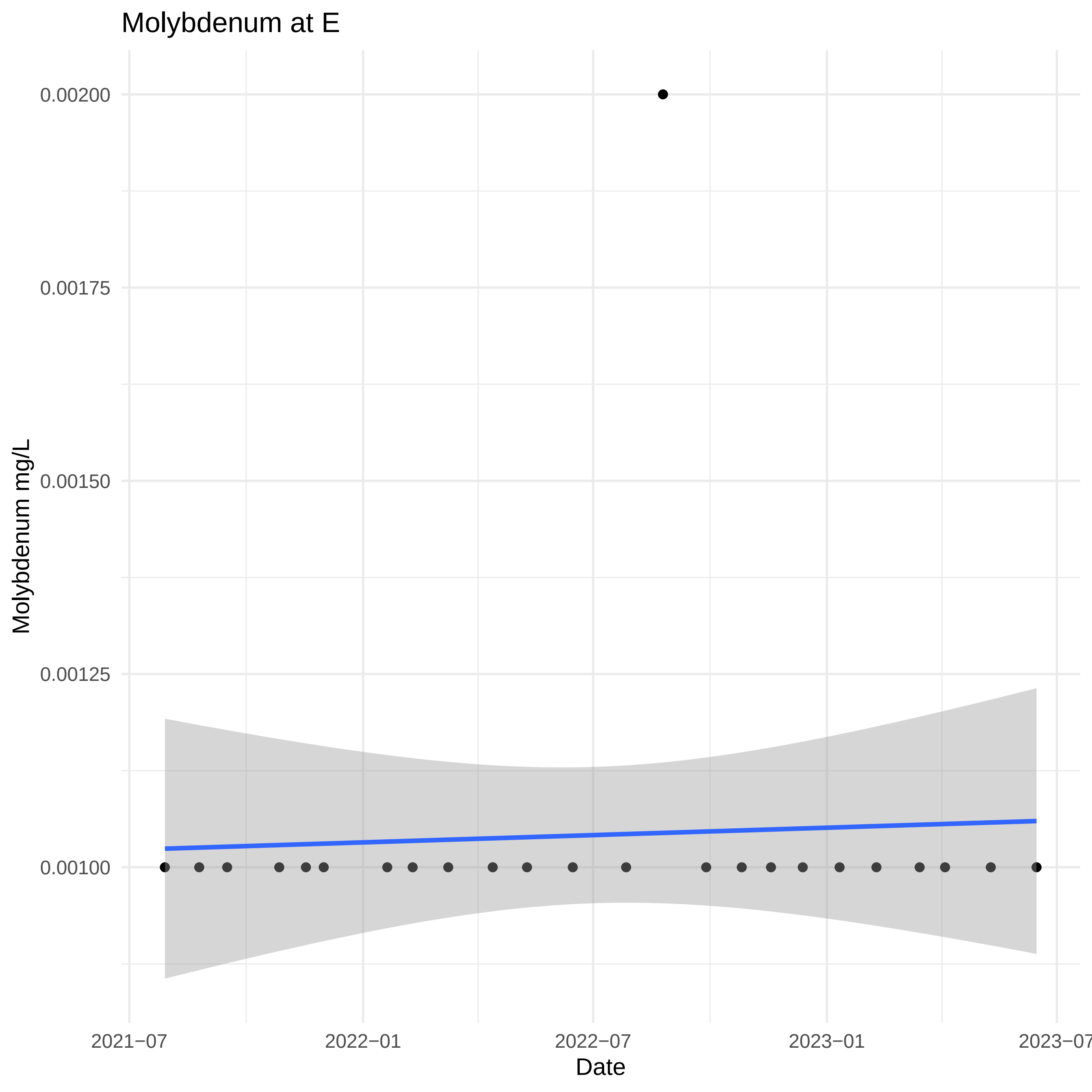

Mercury at NC01
Mercury mg/L
2e−04
1e−04
0e+00
2021−07
2022−01
2022−07
2023−01
2023−07
Date



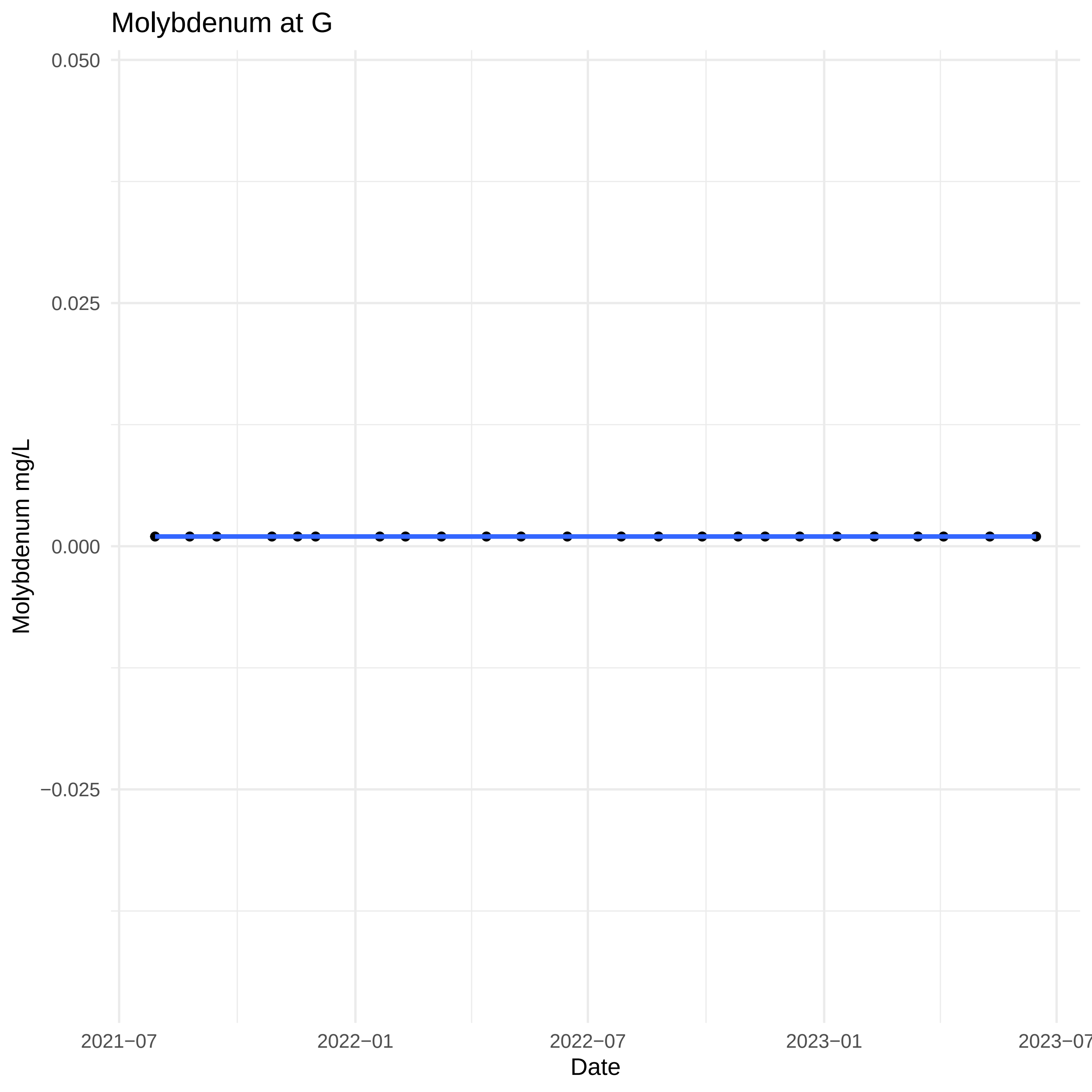
Mercury at WX22
5.00e−05
4.75e−05
4.50e−05
4.25e−05
4.00e−05
Mercury mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



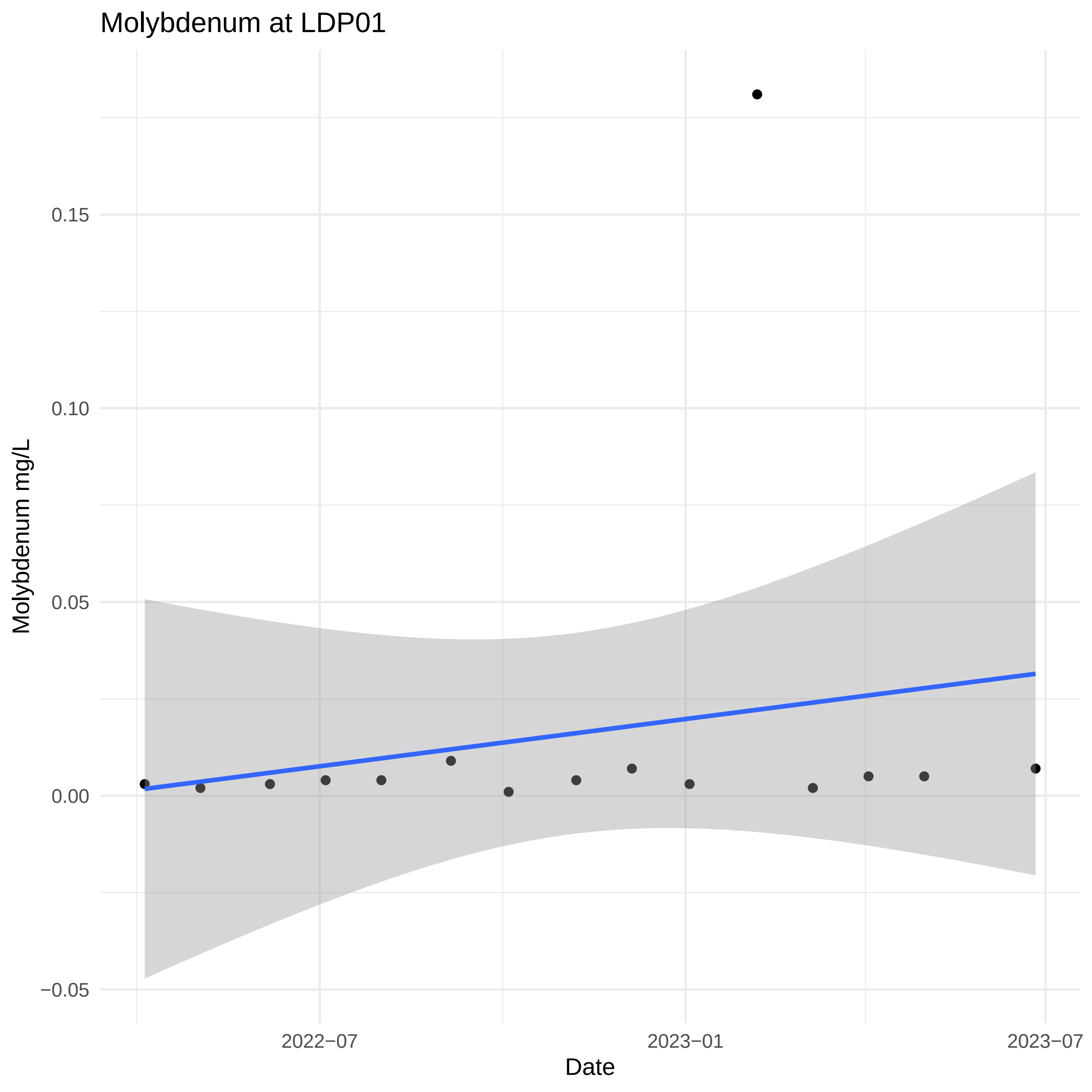
Molybdenum at C
Molybdenum mg/L
0.0030
0.0025
0.0020
0.0015
0.0010
2021−07
2022−01
2022−07
2023−01
2023−07
Date



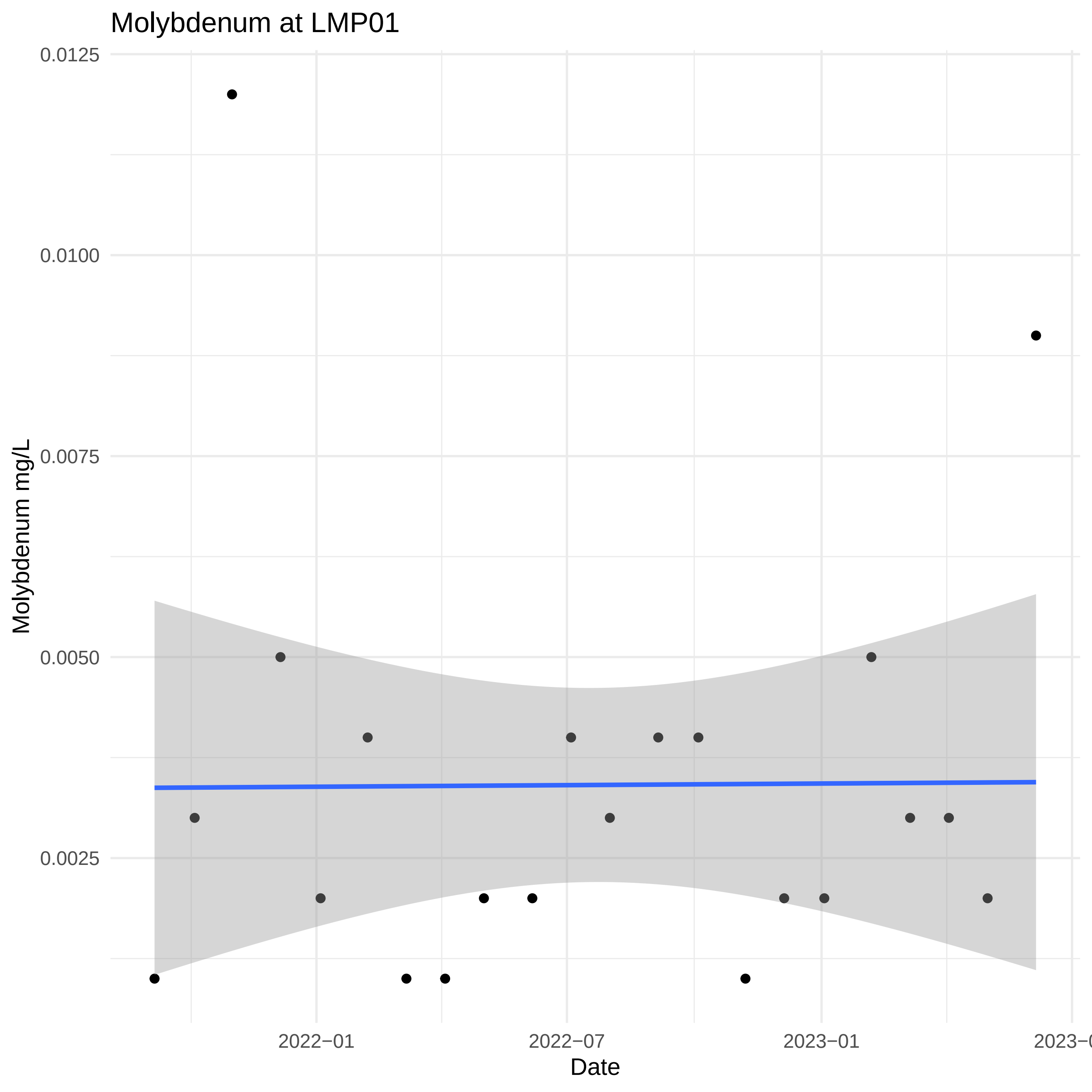
Molybdenum at E
0.00200
0.00175
0.00150
0.00125
0.00100
Molybdenum mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



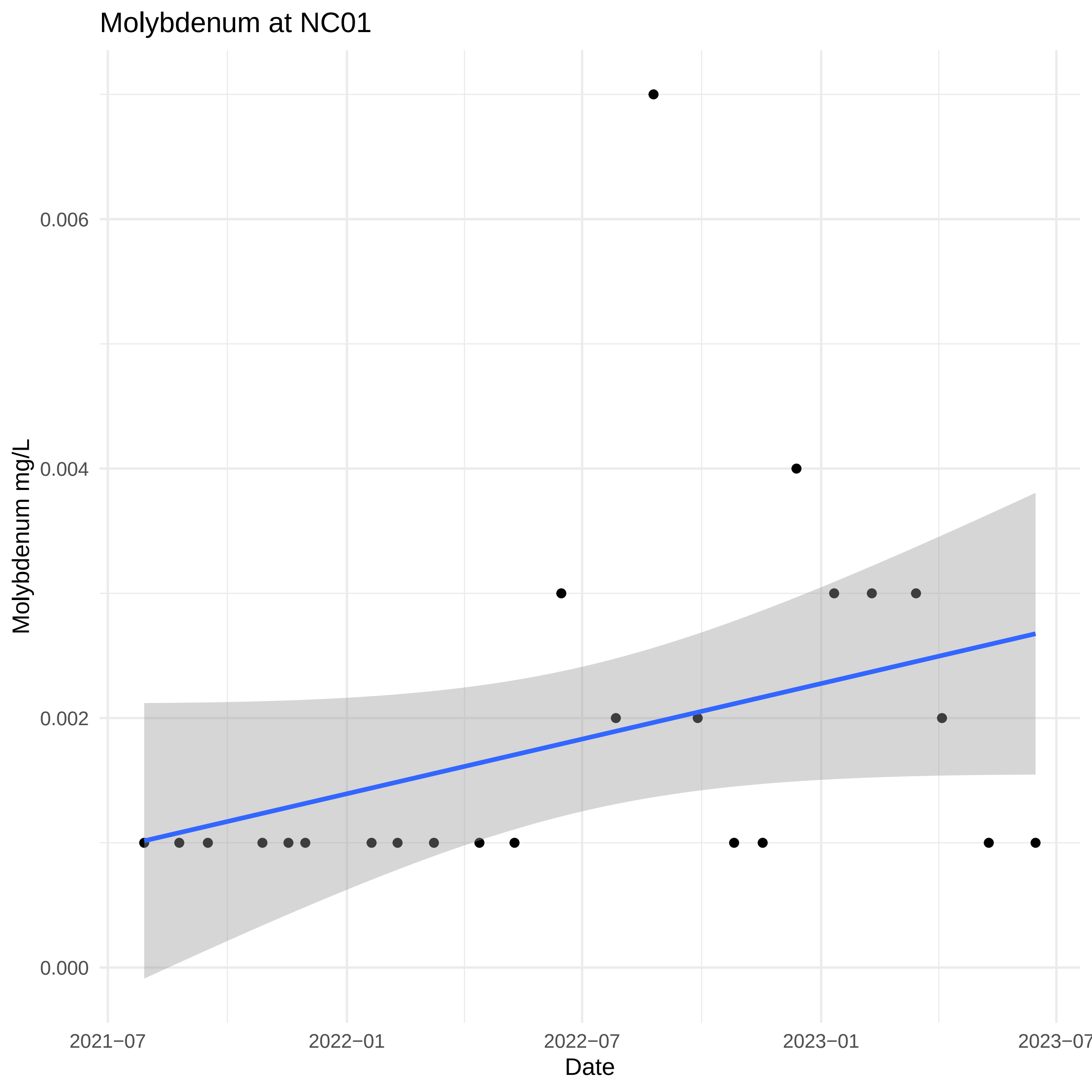
Molybdenum at G
0.050
0.025
0.000
−0.025
Molybdenum mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



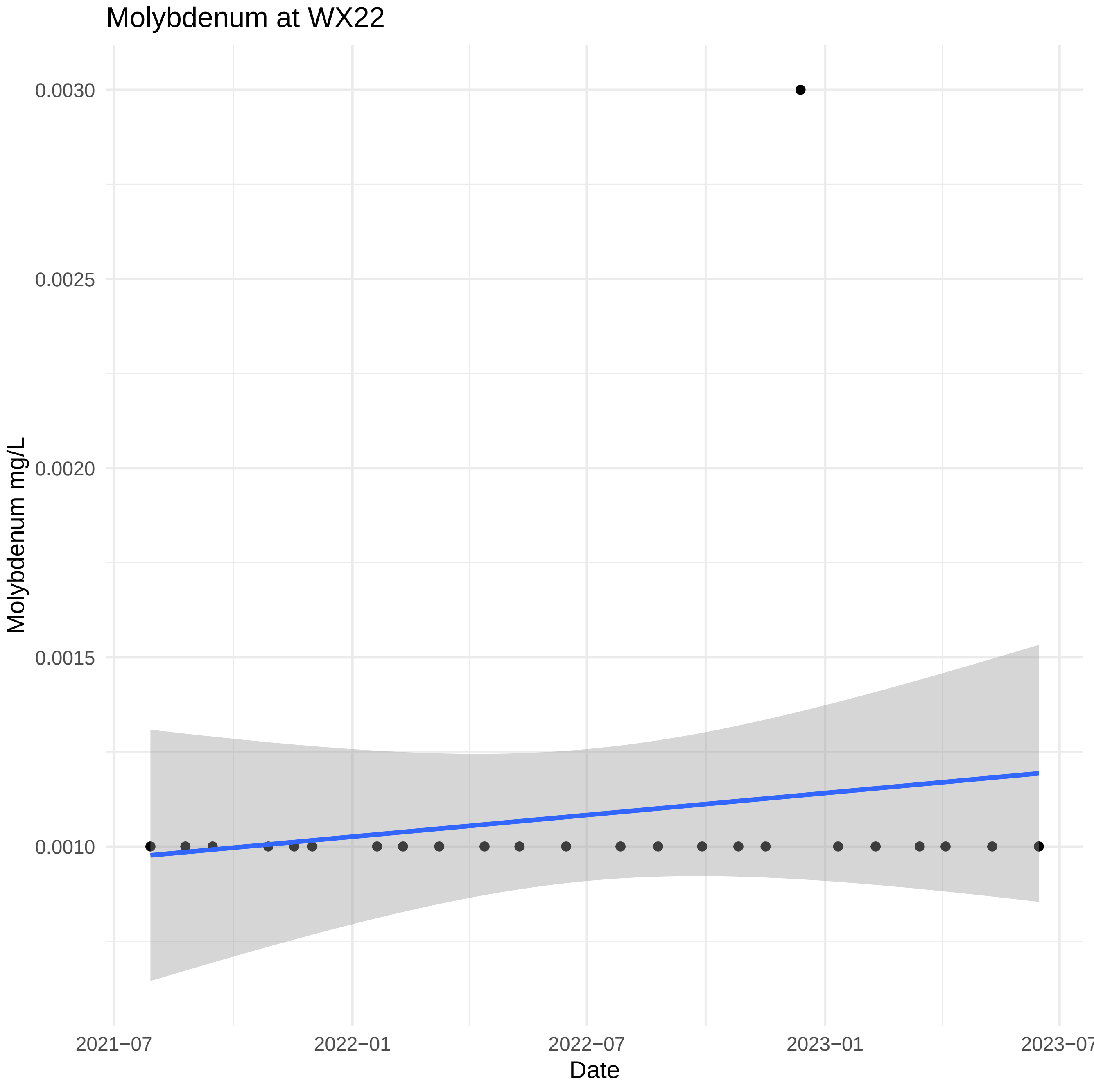
Molybdenum at LDP01
0.15
0.10
0.05
0.00
−0.05
Molybdenum mg/L
2022−07
2023−01
2023−07
Date



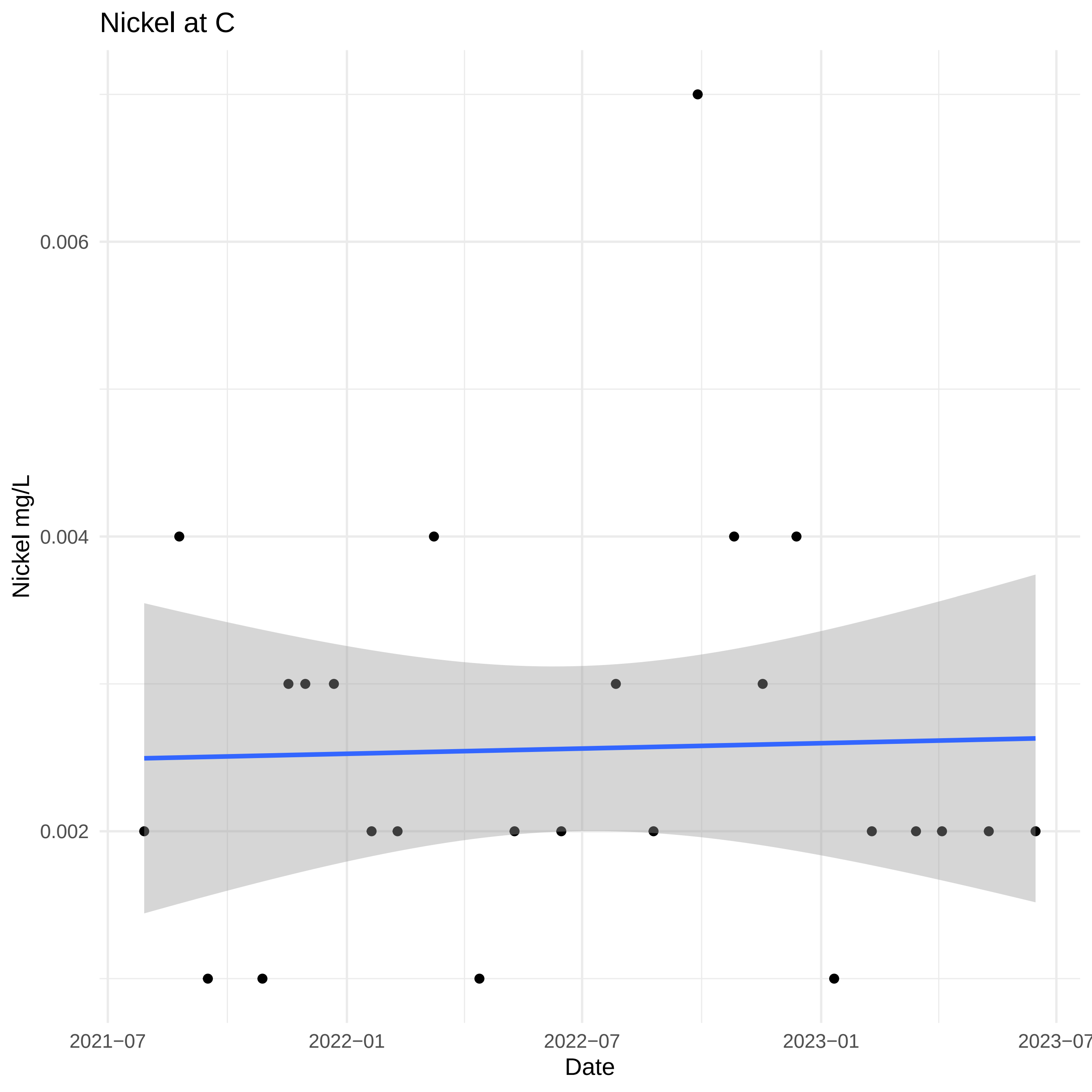
Molybdenum at LMP01
0.0125
0.0100
0.0075
0.0050
0.0025
Molybdenum mg/L
2022−01
2022−07
2023−01
2023−0
Date



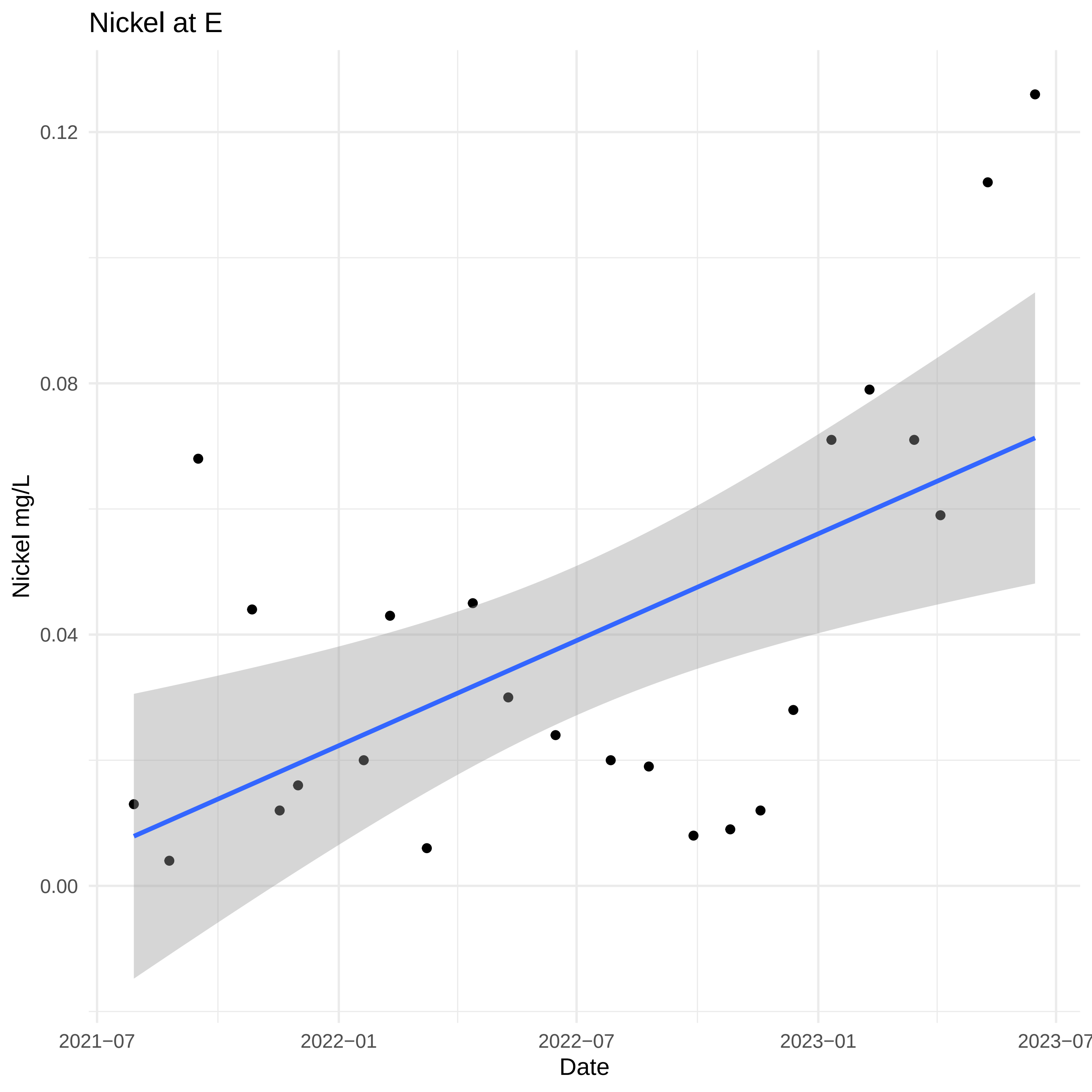
Molybdenum at NC01
0.006
0.004
0.002
0.000
Molybdenum mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



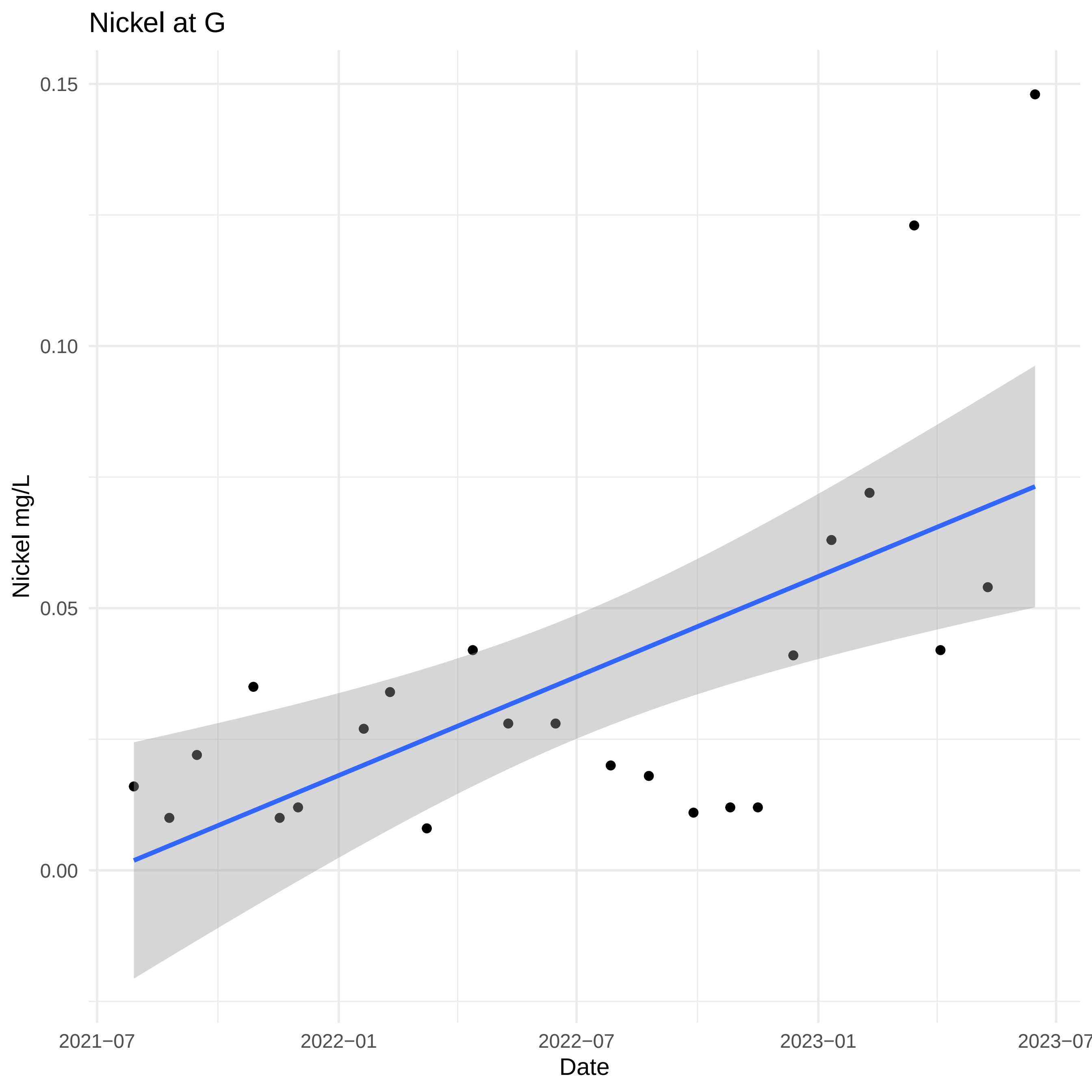
Molybdenum at WX22
0.0030
0.0025
0.0020
0.0015
0.0010
Molybdenum mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



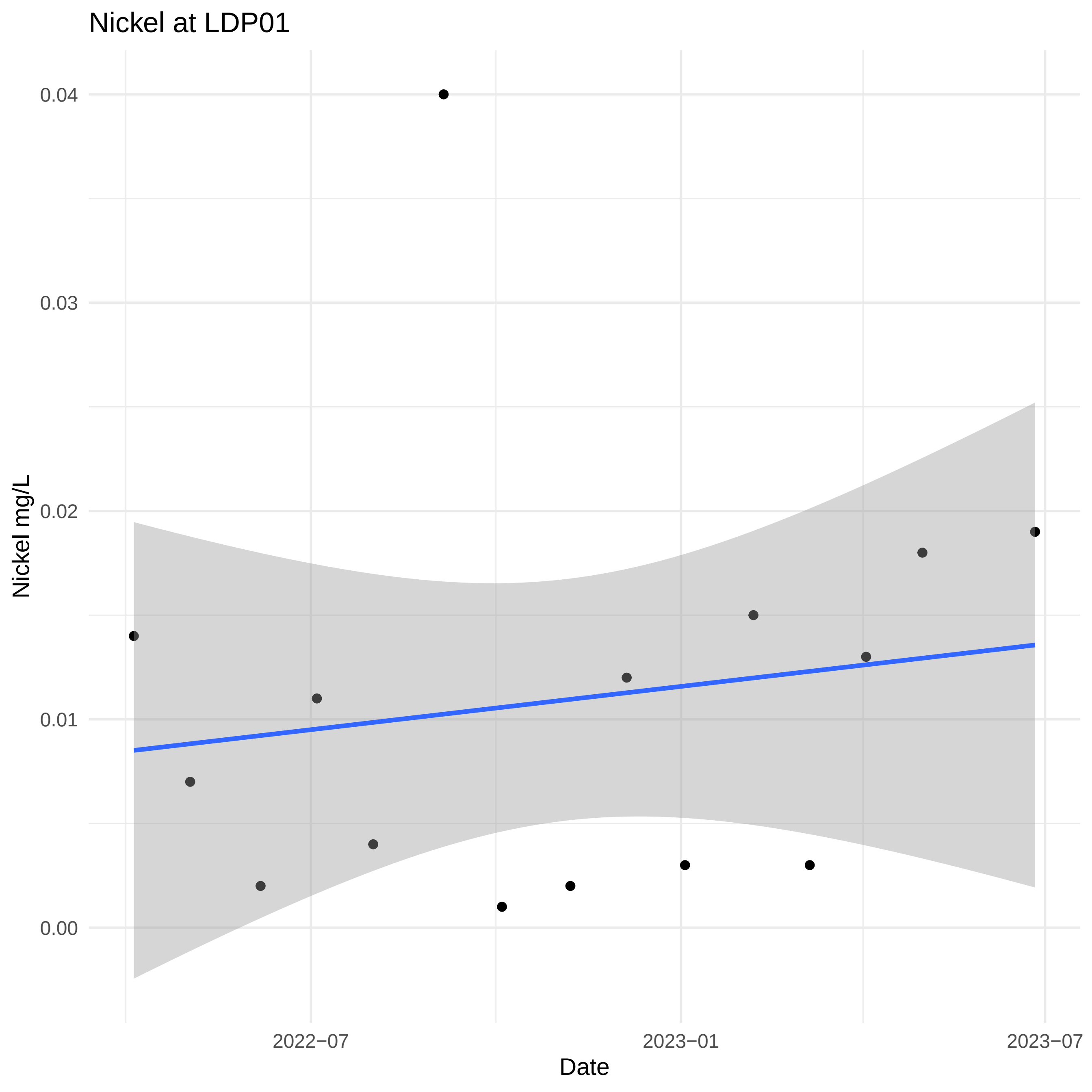
Nickel at C
Nickel mg/L
0.006
0.004
0.002
2021−07
2022−01
2022−07
2023−01
2023−07
Date



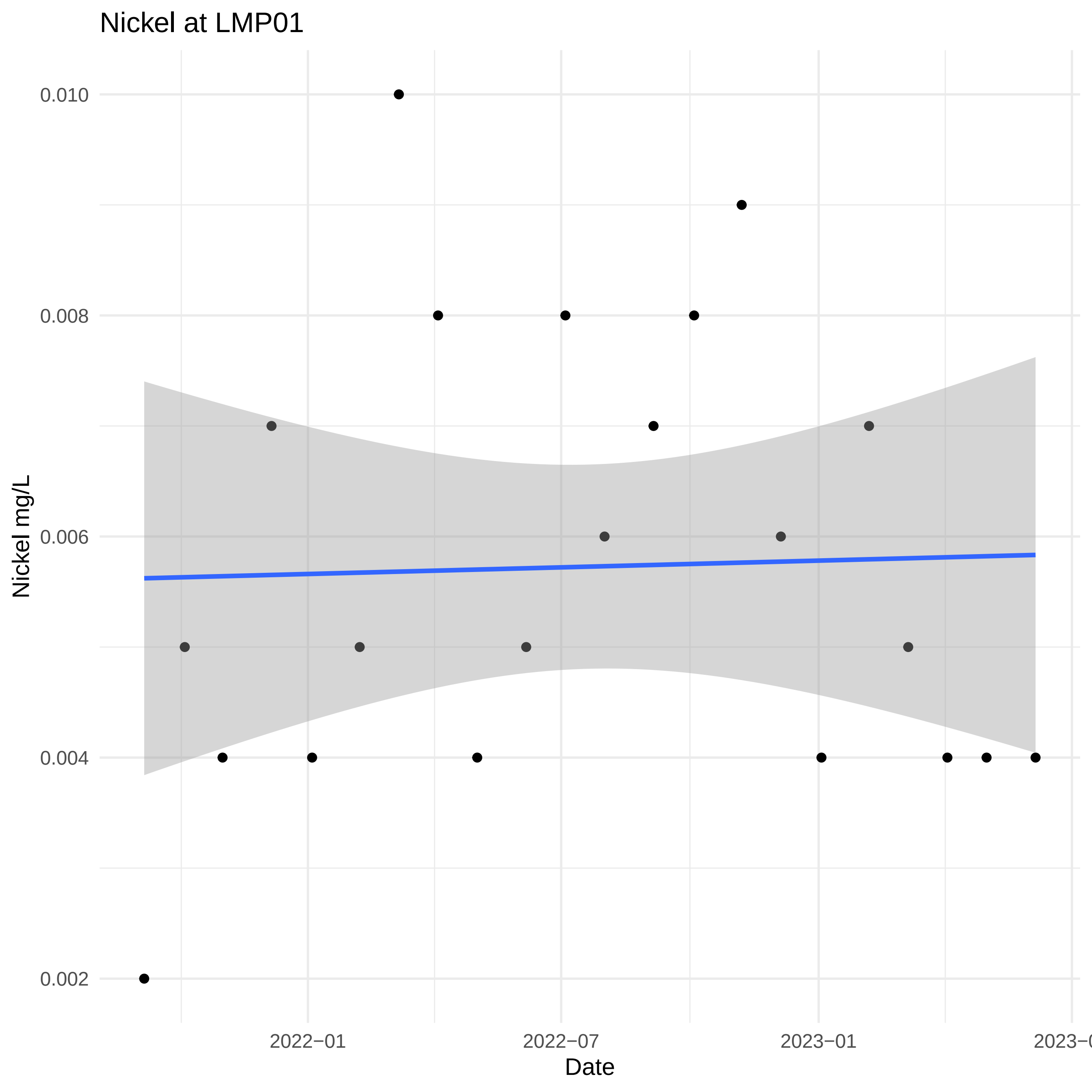
Nickel at E
0.12
0.08
0.04
0.00
Nickel mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



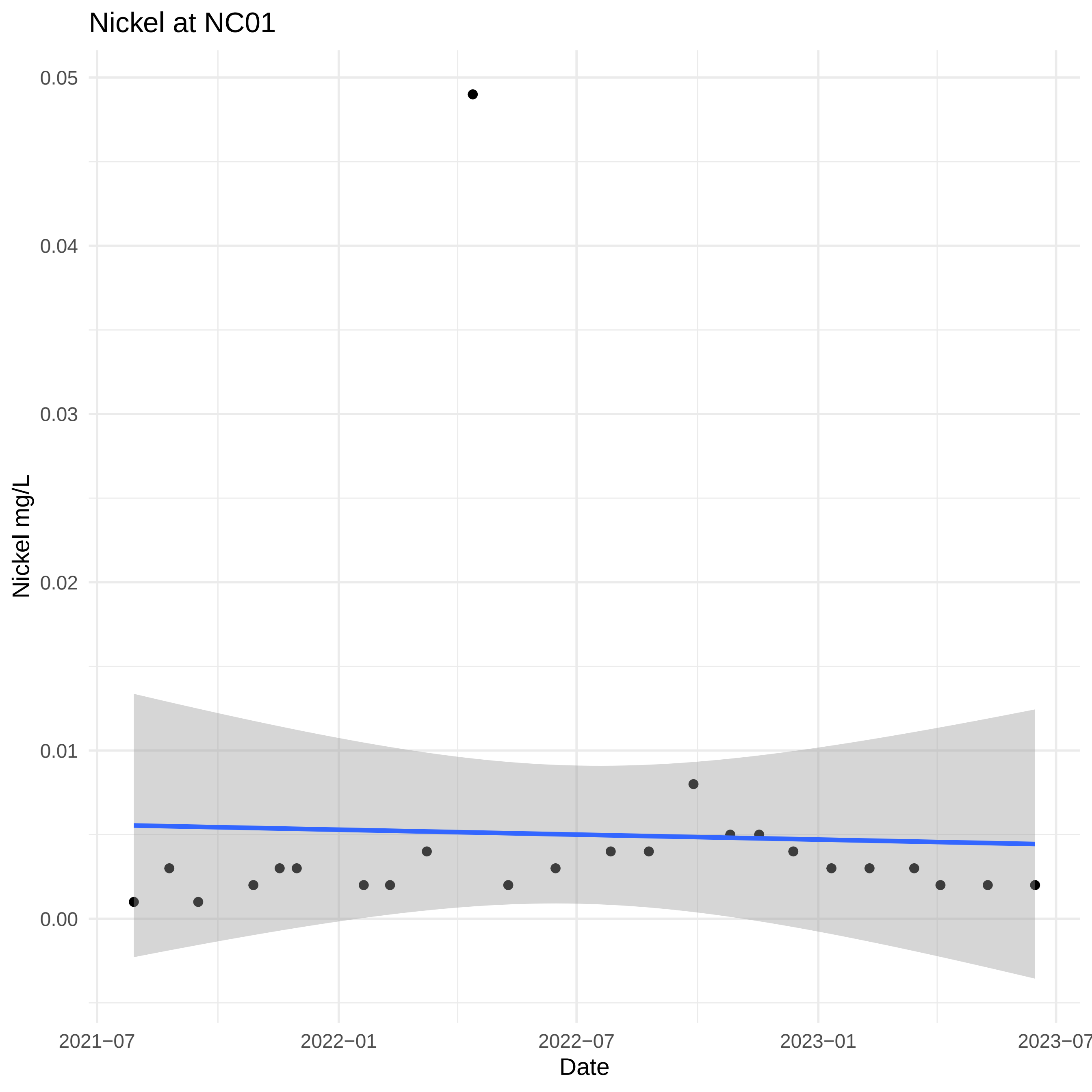
Nickel at G
Nickel mg/L
0.15
0.10
0.05
0.00
2021−07
2022−01
2022−07
2023−01
2023−07
Date

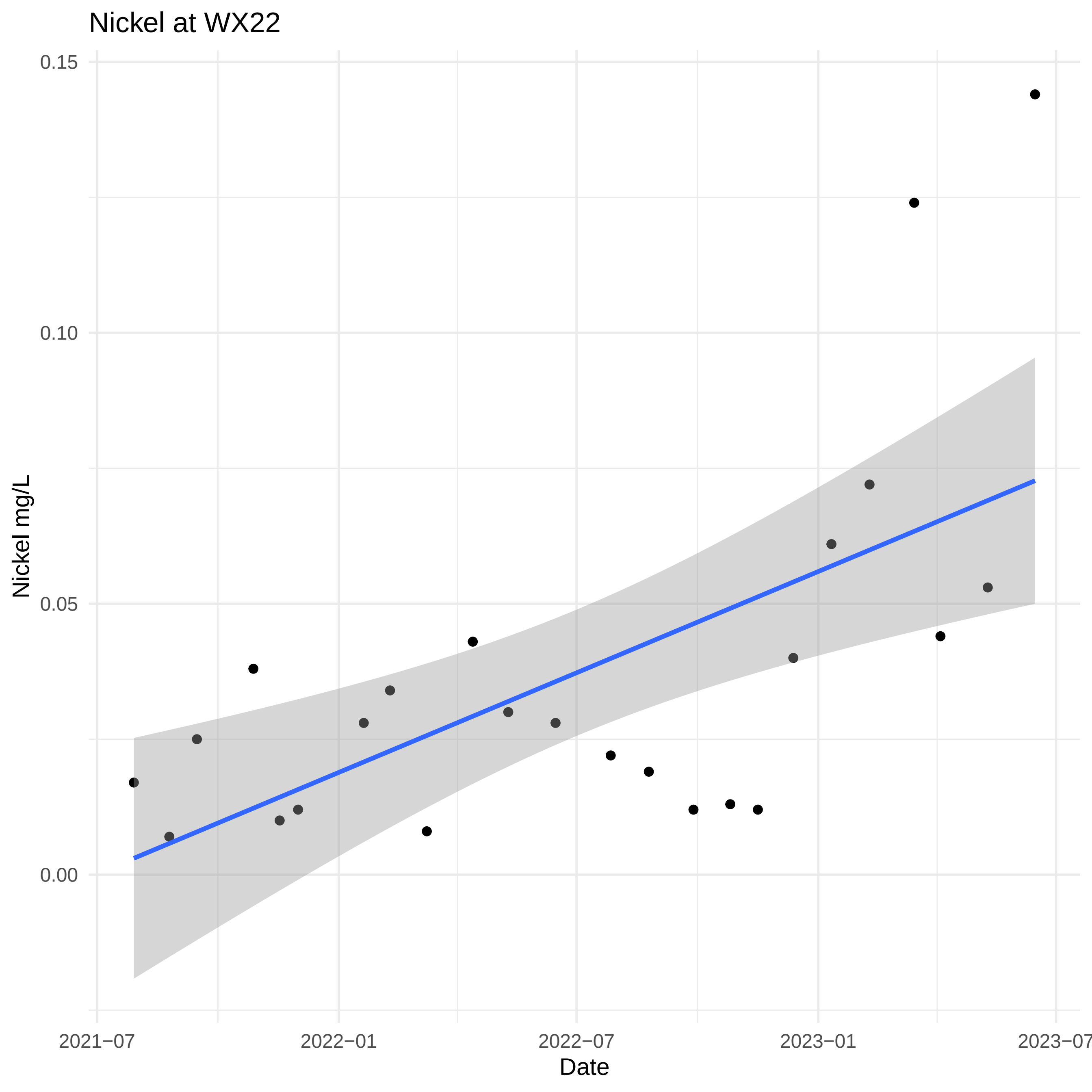


Nickel at LDP01
0.04
0.03
0.02
0.01
0.00
Nickel mg/L
2022−07
2023−01
2023−07
Date

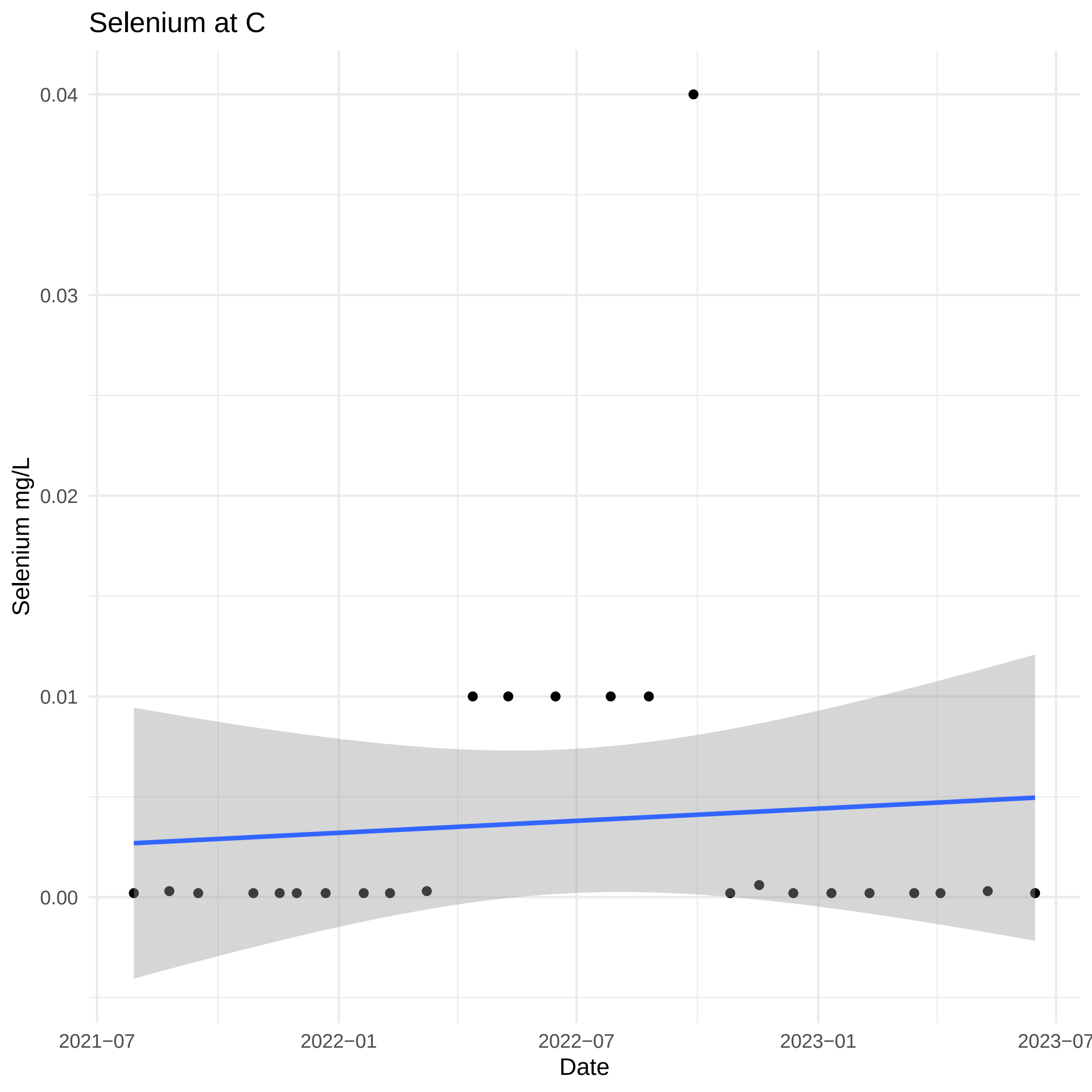


Nickel at LMP01
0.010
0.008
0.006
0.004
0.002
Nickel mg/L
2022−01
2022−07
2023−01
2023−0
Date

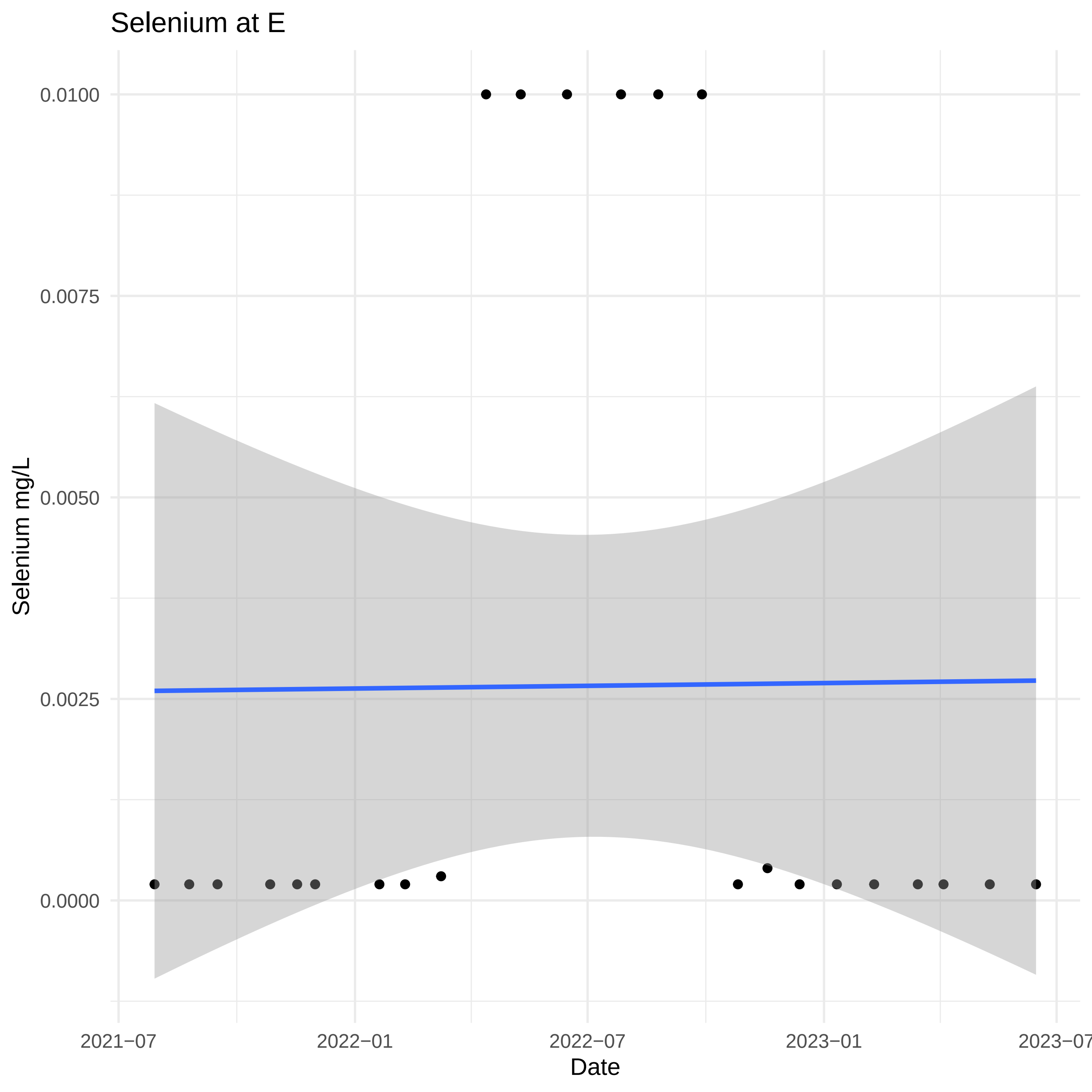

Nickel at NC01
Nickel mg/L
0.05
0.04
0.03
0.02
0.01
0.00
2021−07
2022−01
2022−07
2023−01
2023−07
Date



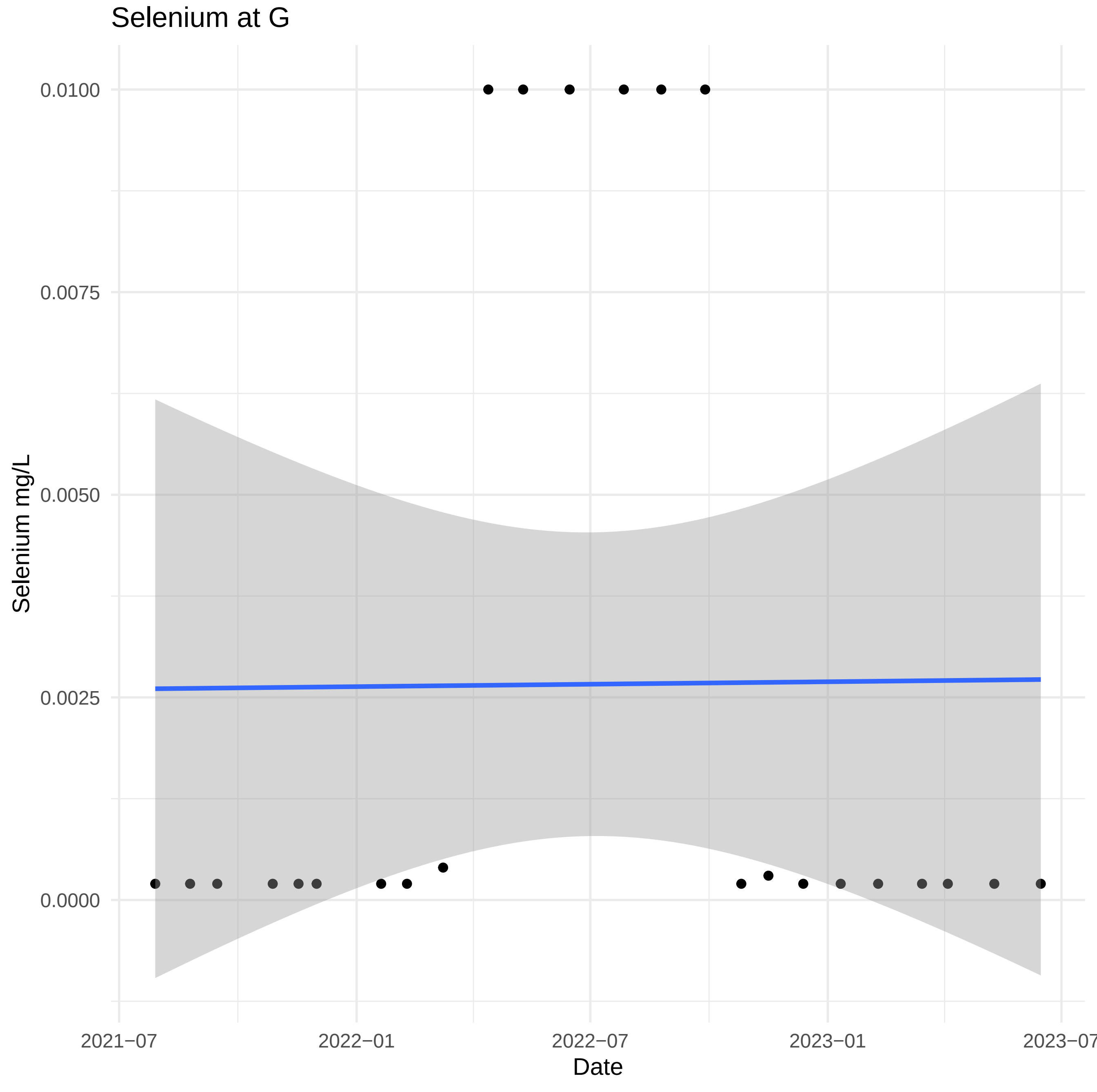
Nickel at WX22
Nickel mg/L
0.15
0.10
0.05
0.00
2021−07
2022−01
2022−07
2023−01
2023−07
Date



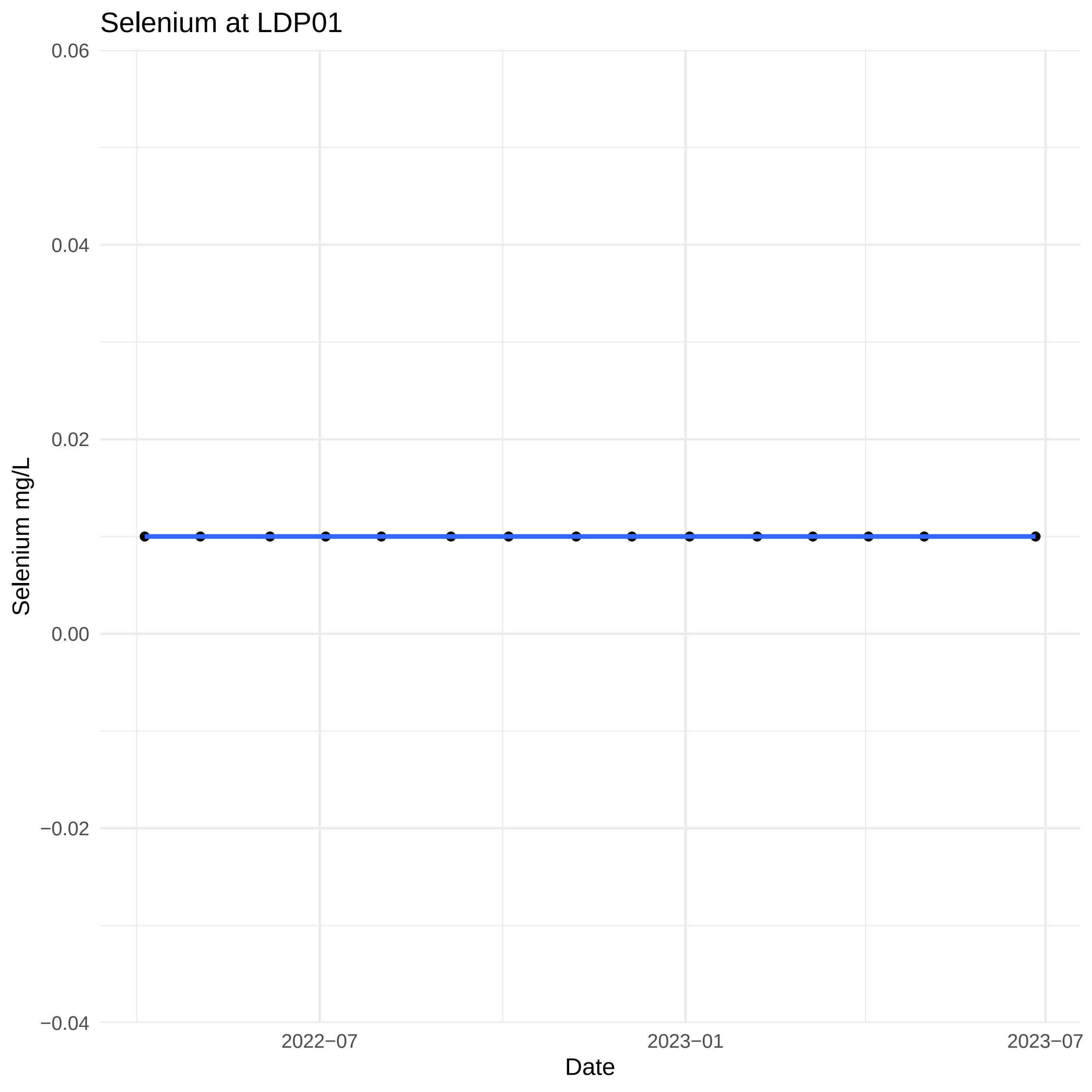
Selenium at C
0.04
0.03
0.02
0.01
0.00
Selenium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



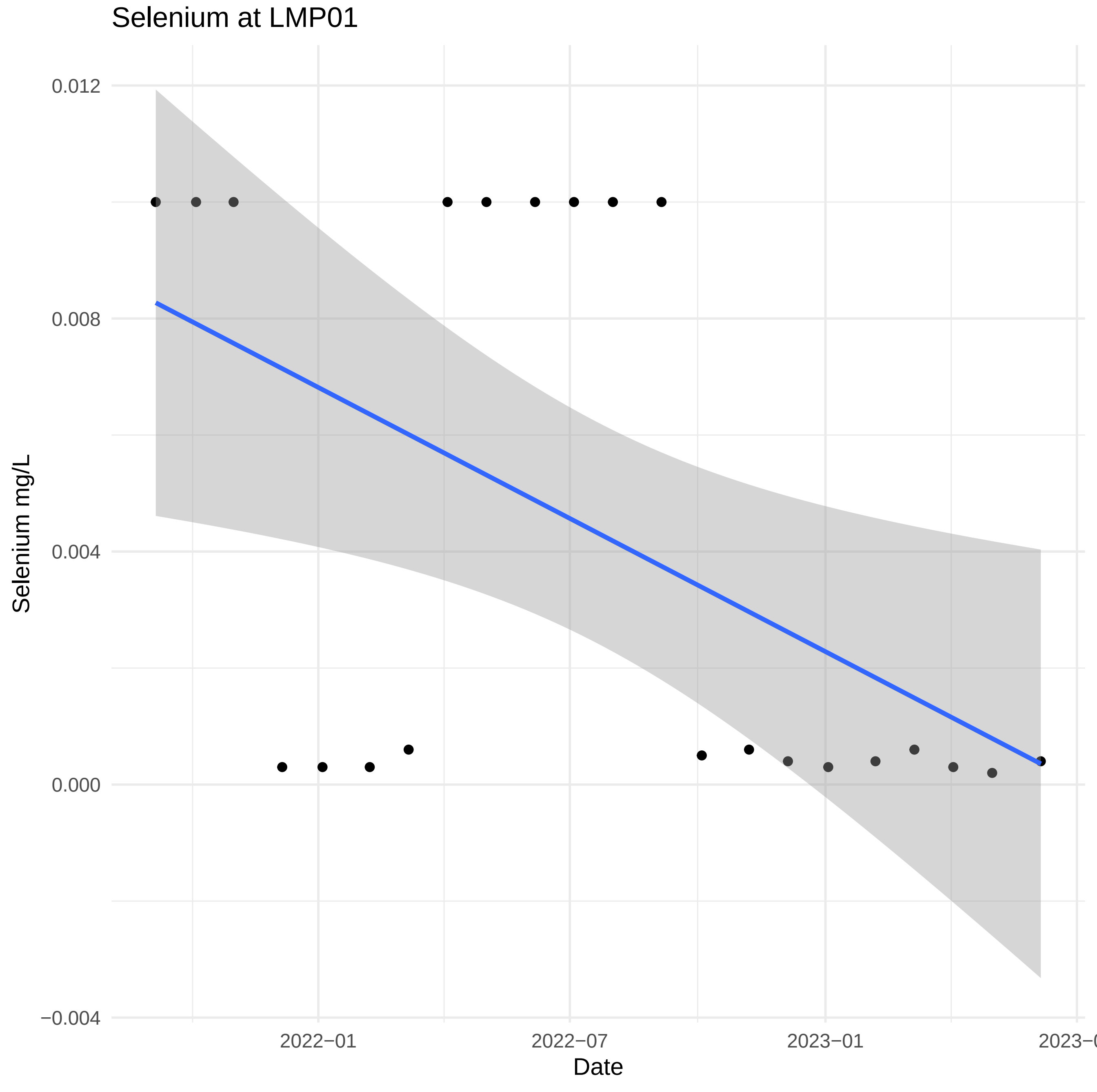
Selenium at E
0.0100
0.0075
0.0050
0.0025
0.0000
Selenium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



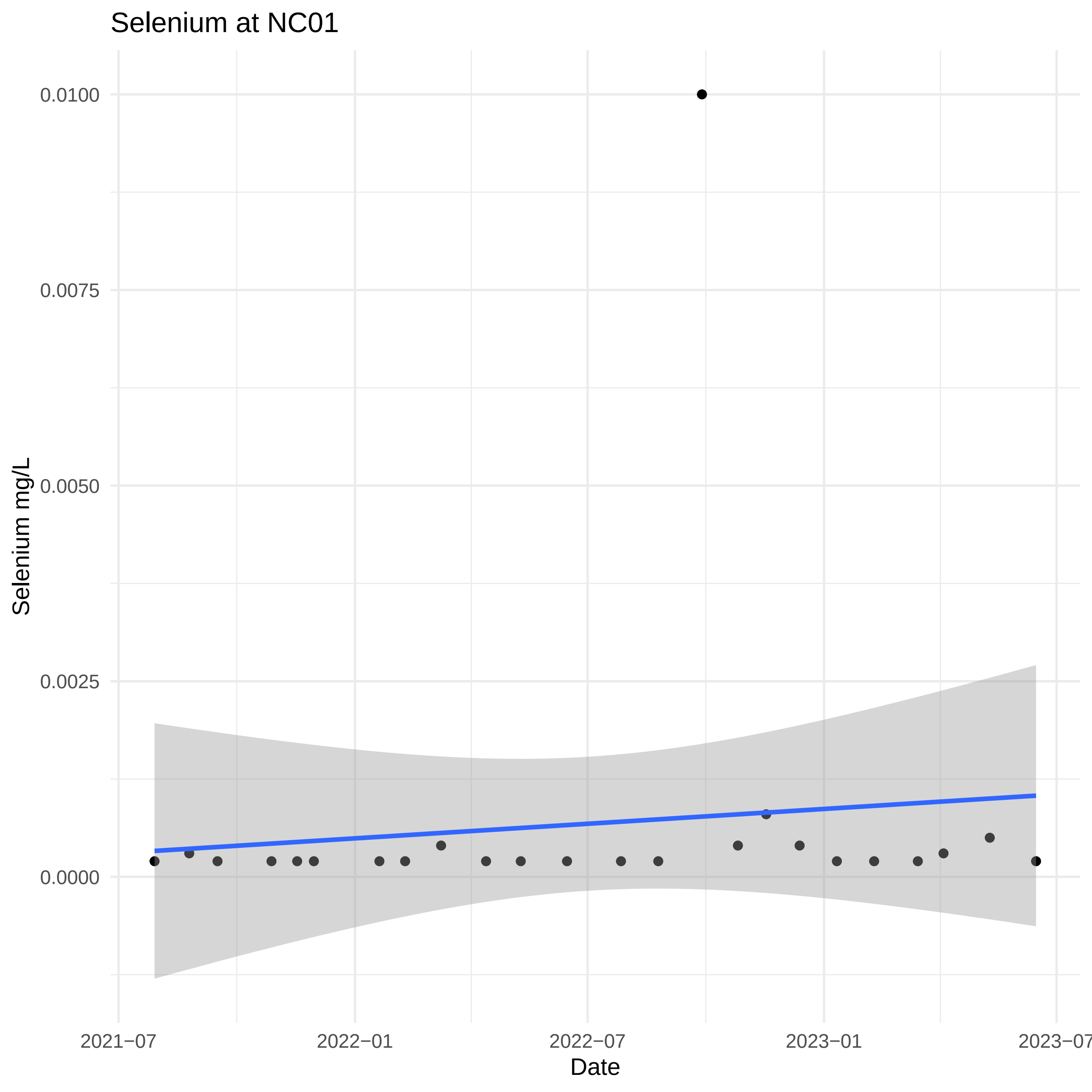
Selenium at G
0.0100
0.0075
0.0050
0.0025
0.0000
Selenium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



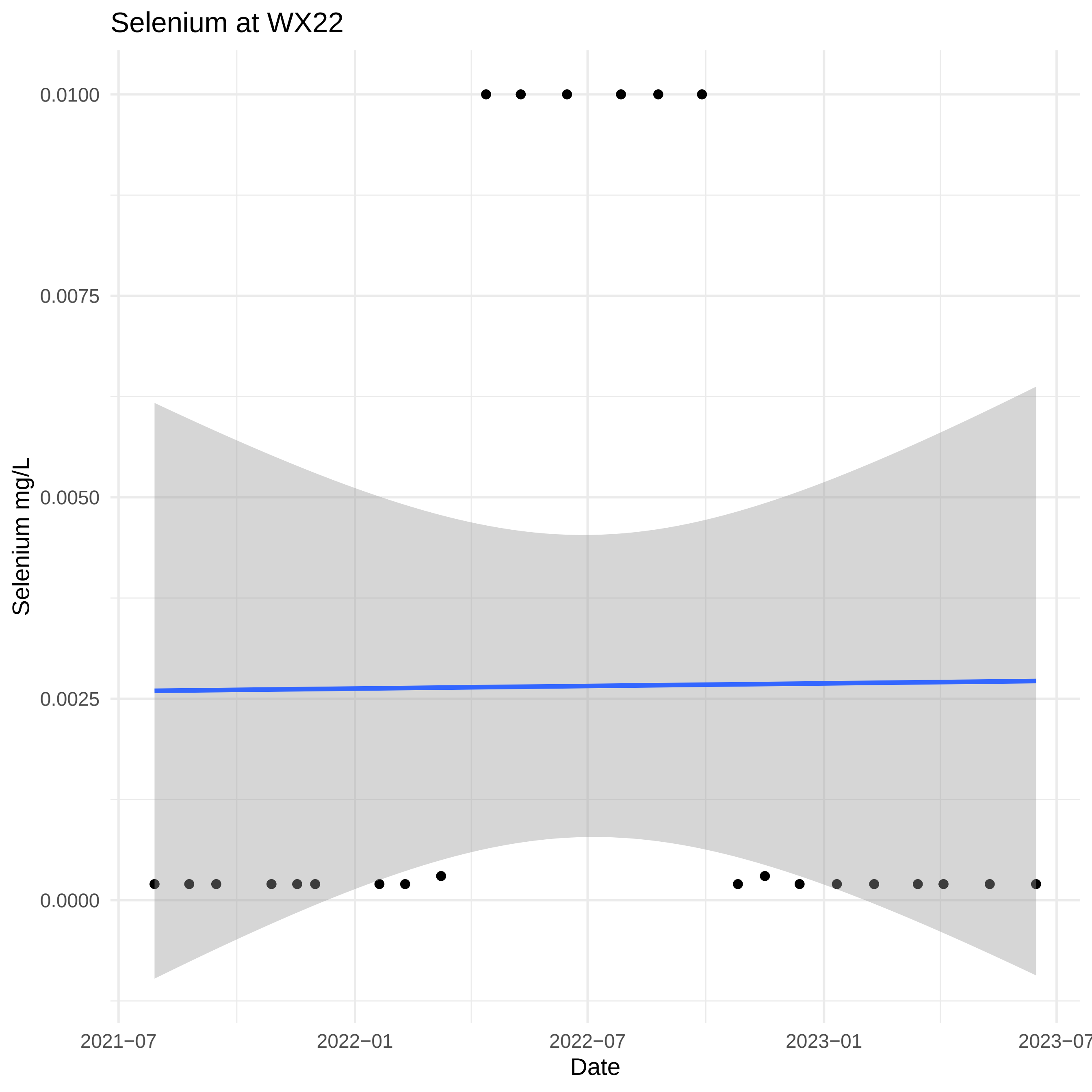
Selenium at LDP01
0.06
0.04
0.02
0.00
−0.02
−0.04
Selenium mg/L
2022−07
2023−01
2023−07
Date



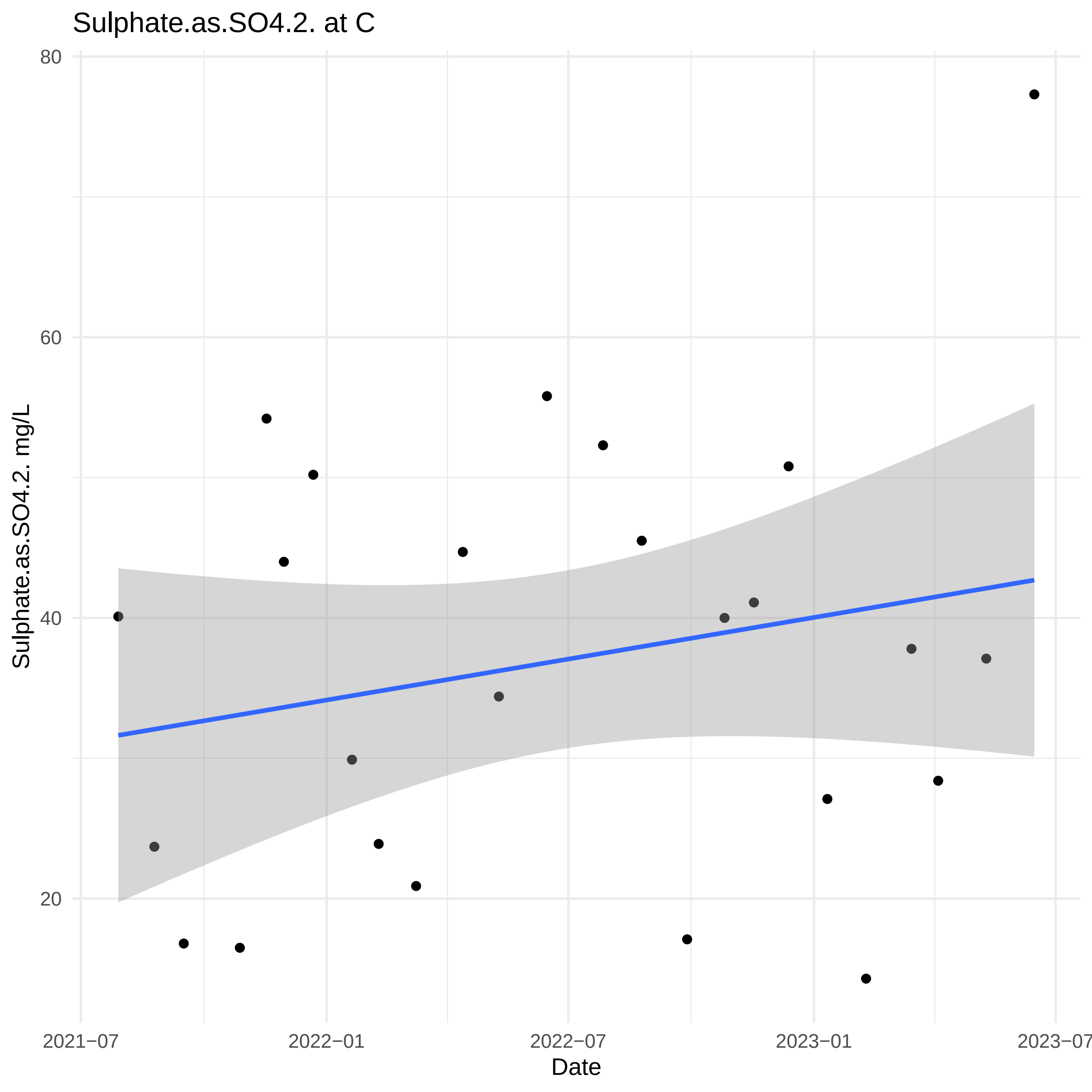
Selenium at LMP01
0.012
0.008
0.004
0.000
−0.004
Selenium mg/L
2022−01
2022−07
2023−01
2023−0
Date



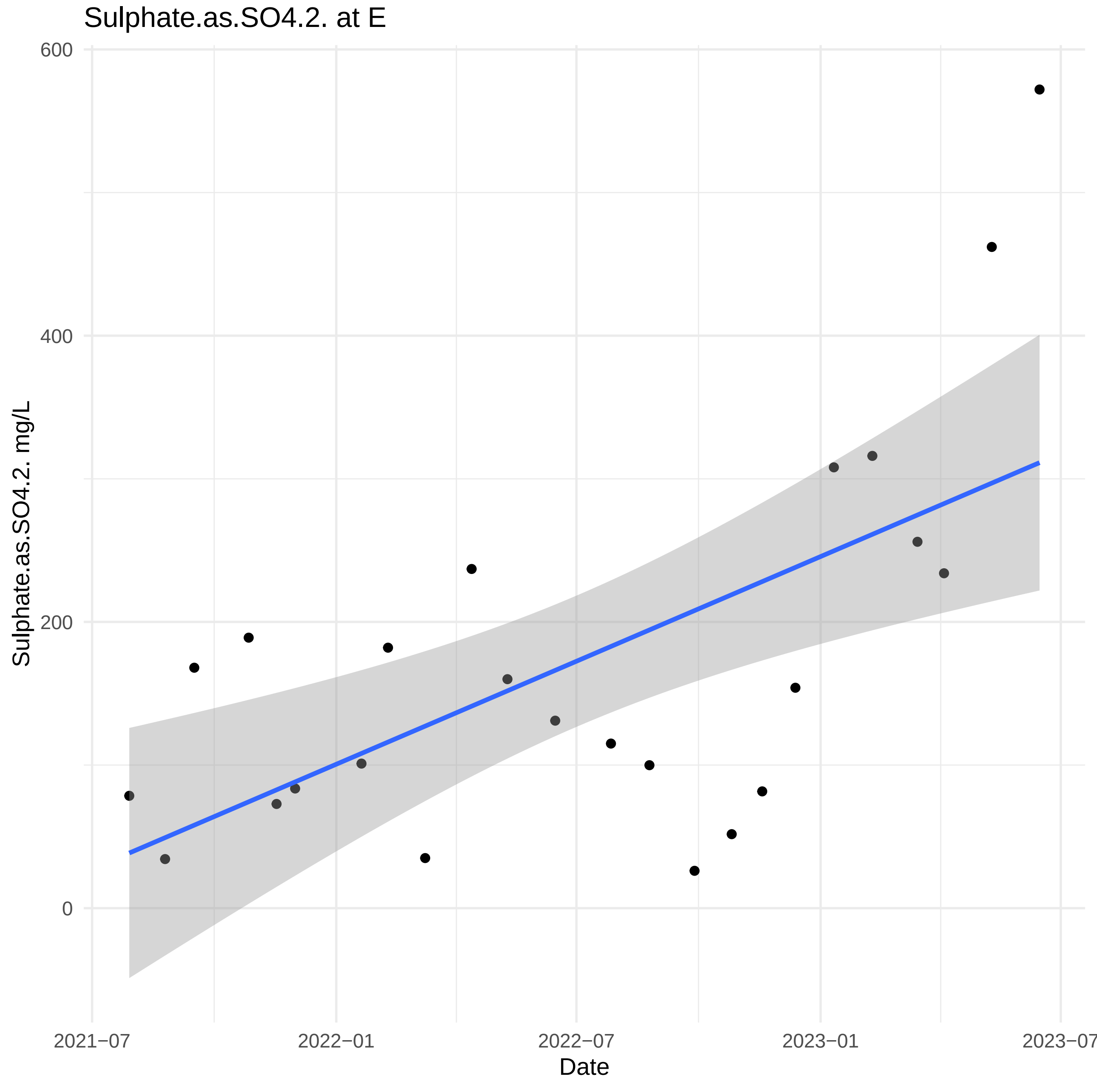
Selenium at NC01
Selenium mg/L
0.0100
0.0075
0.0050
0.0025
0.0000
2021−07
2022−01
2022−07
2023−01
2023−07
Date

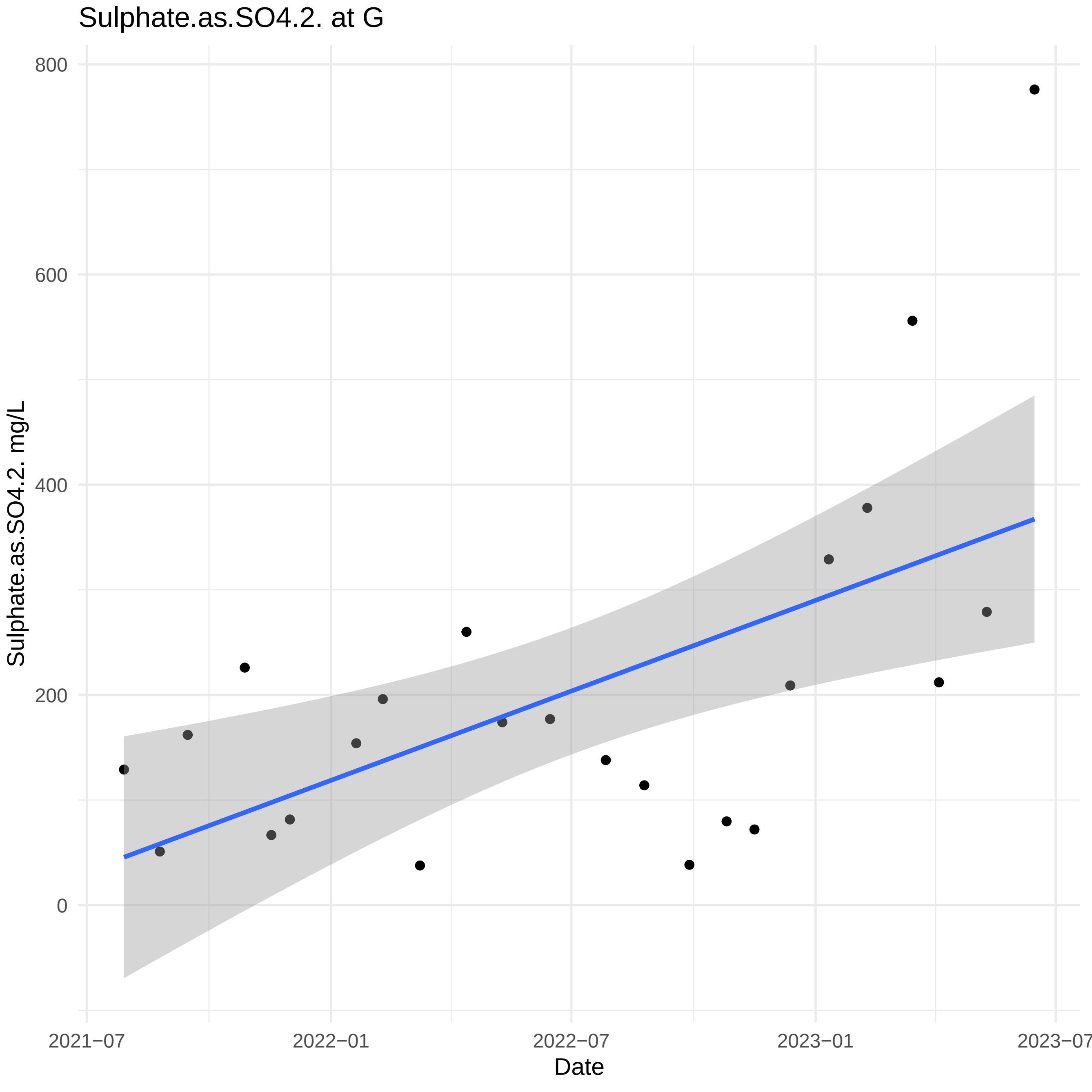


Selenium at WX22
0.0100
0.0075
0.0050
0.0025
0.0000
Selenium mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

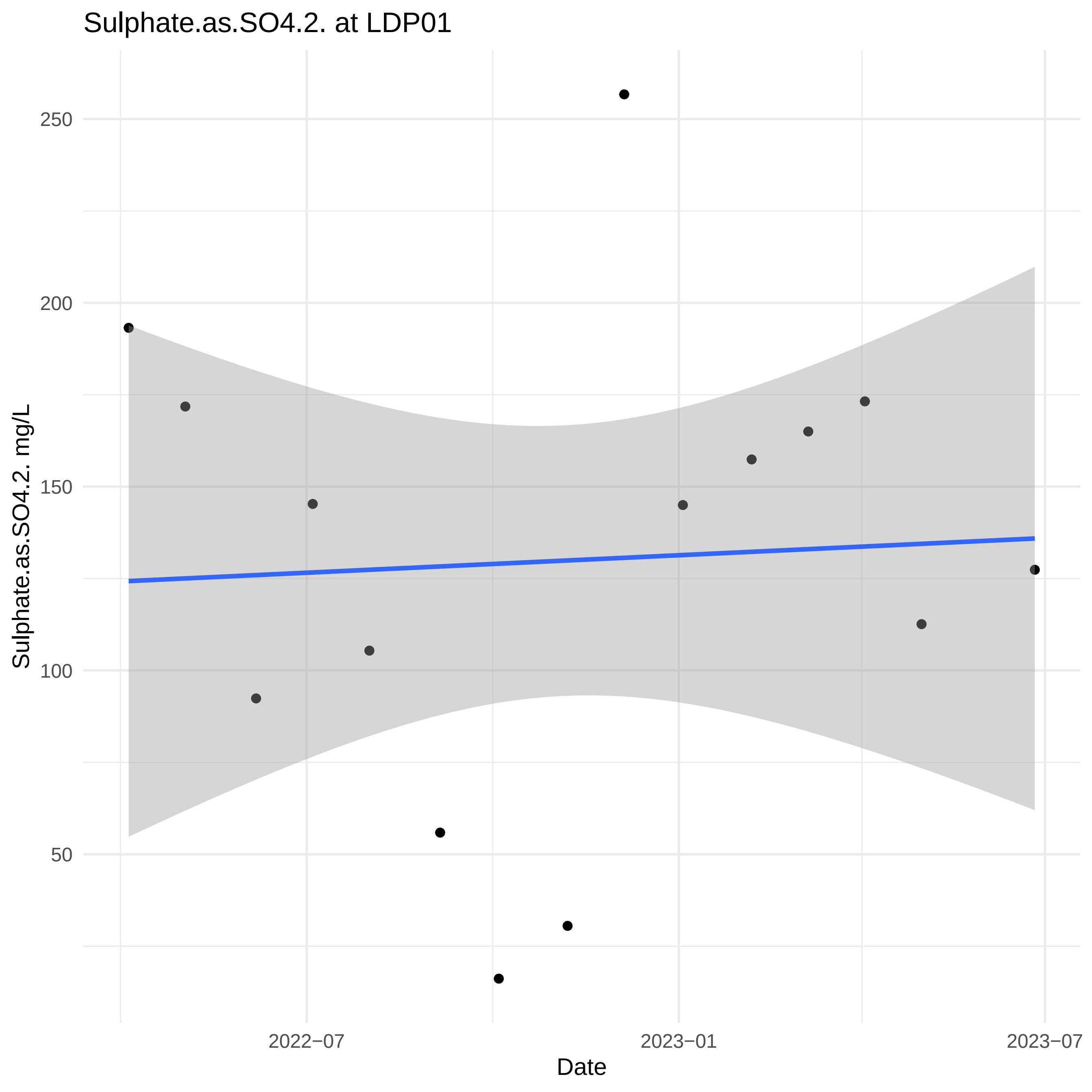


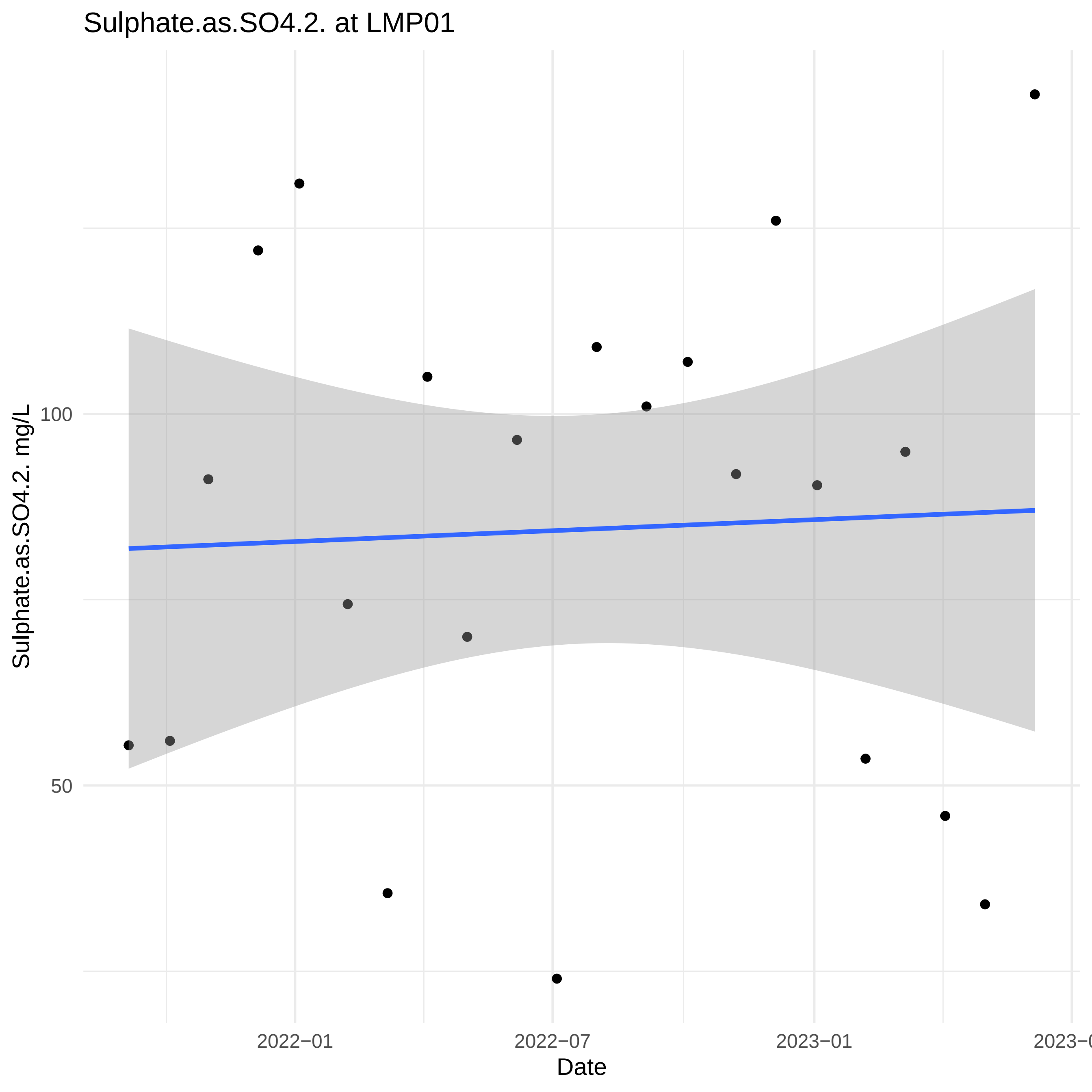
Sulphate.as.SO4.2. at C
80
60
40
20
Sulphate.as.SO4.2. mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date


Sulphate.as.SO4.2. at E
Sulphate.as.SO4.2. mg/L
600
400
200
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

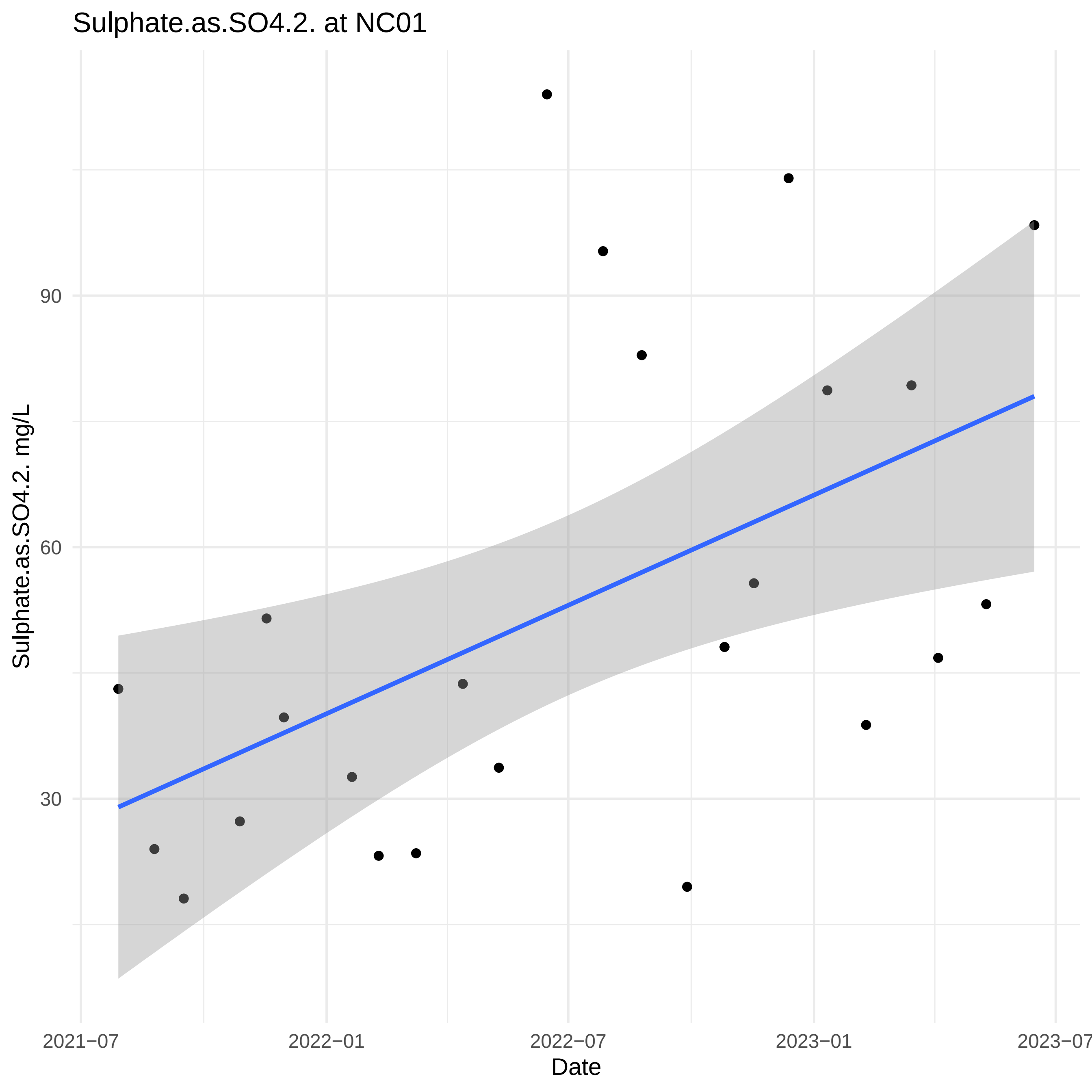


Sulphate.as.SO4.2. at G
Sulphate.as.SO4.2. mg/L
800
600
400
200
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date

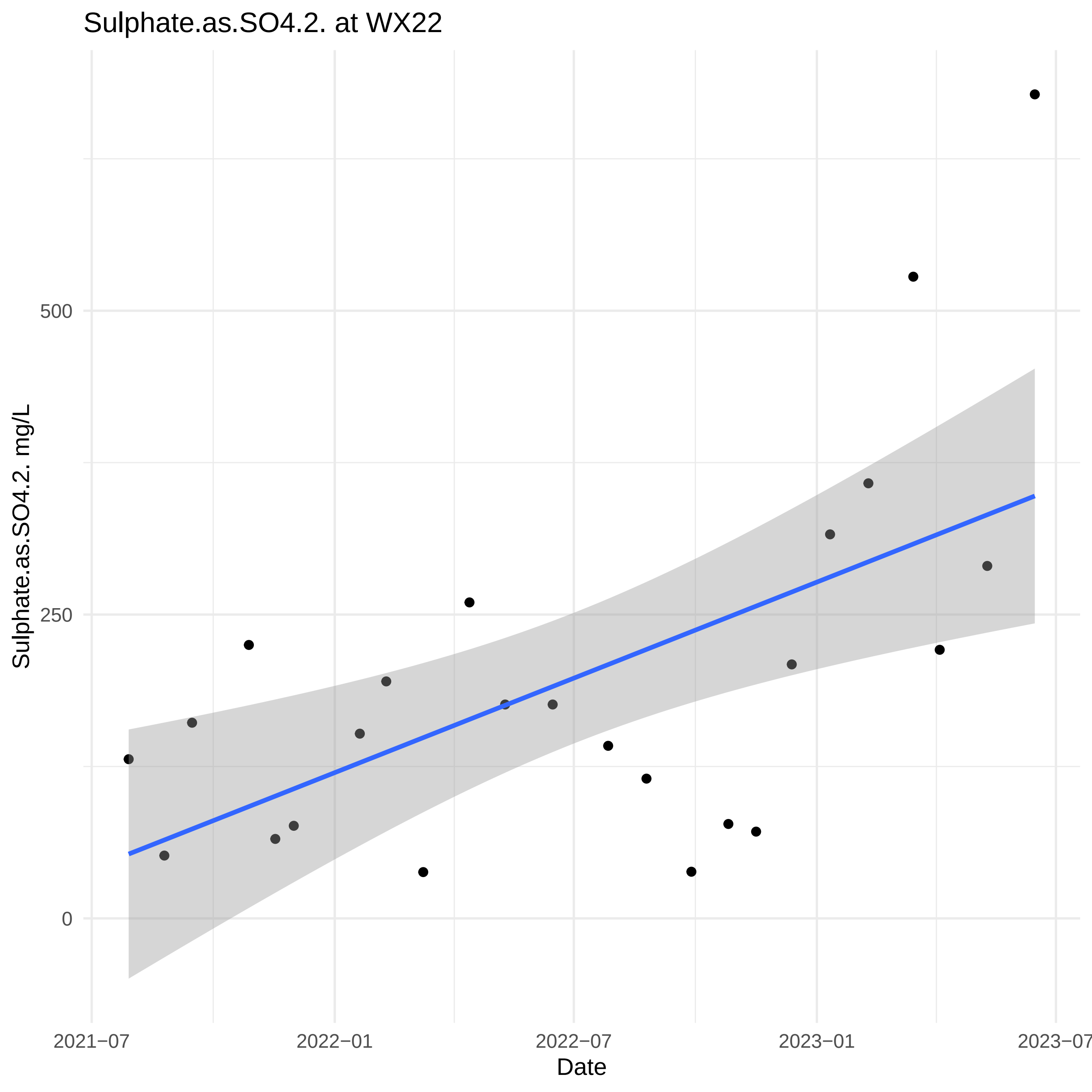

Sulphate.as.SO4.2. at LDP01
Sulphate.as.SO4.2. mg/L
250
200
150
100
50
2022−07
2023−01
2023−07
Date



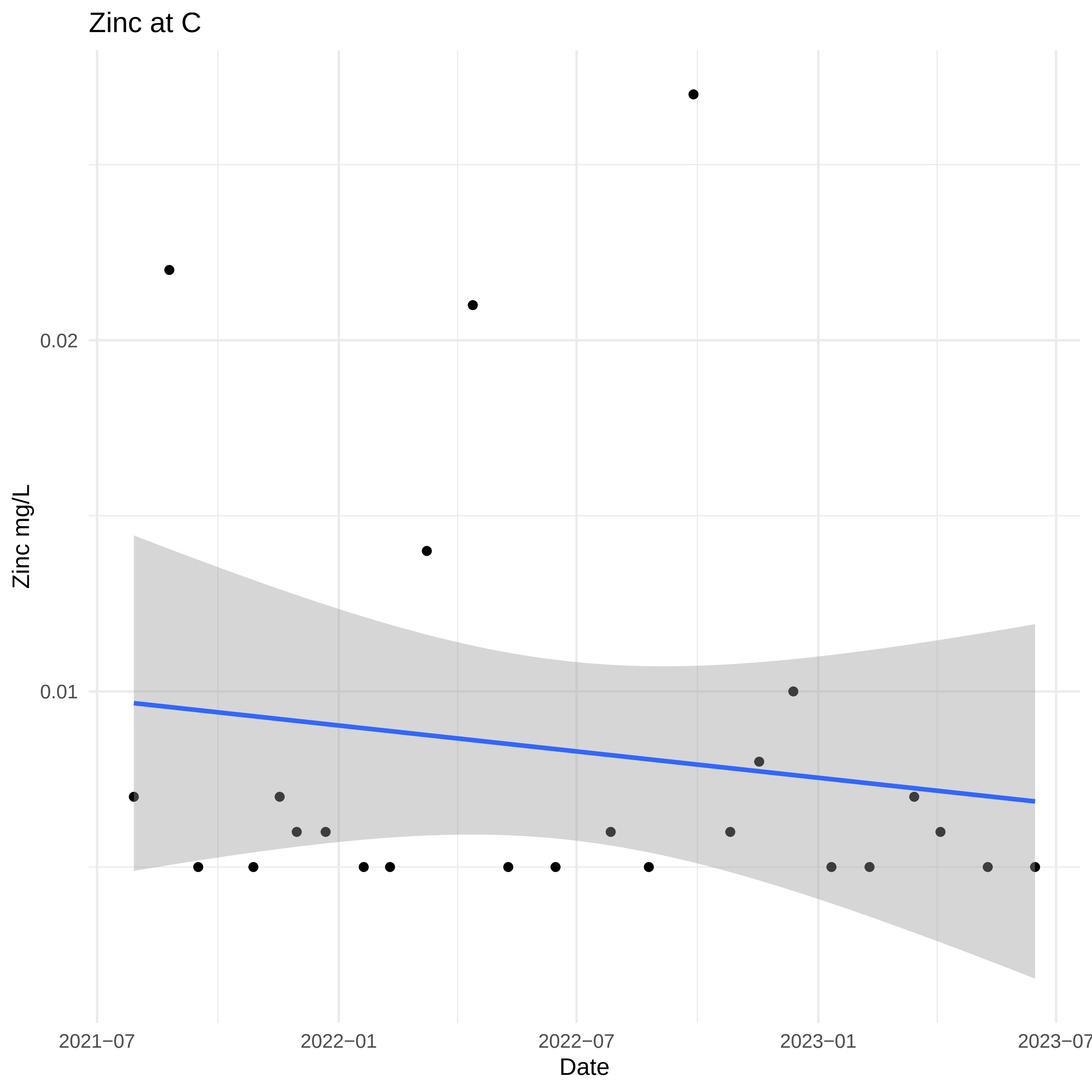
Sulphate.as.SO4.2. at LMP01
Sulphate.as.SO4.2. mg/L
100
50
2022−01
2022−07
2023−01
2023−0
Date



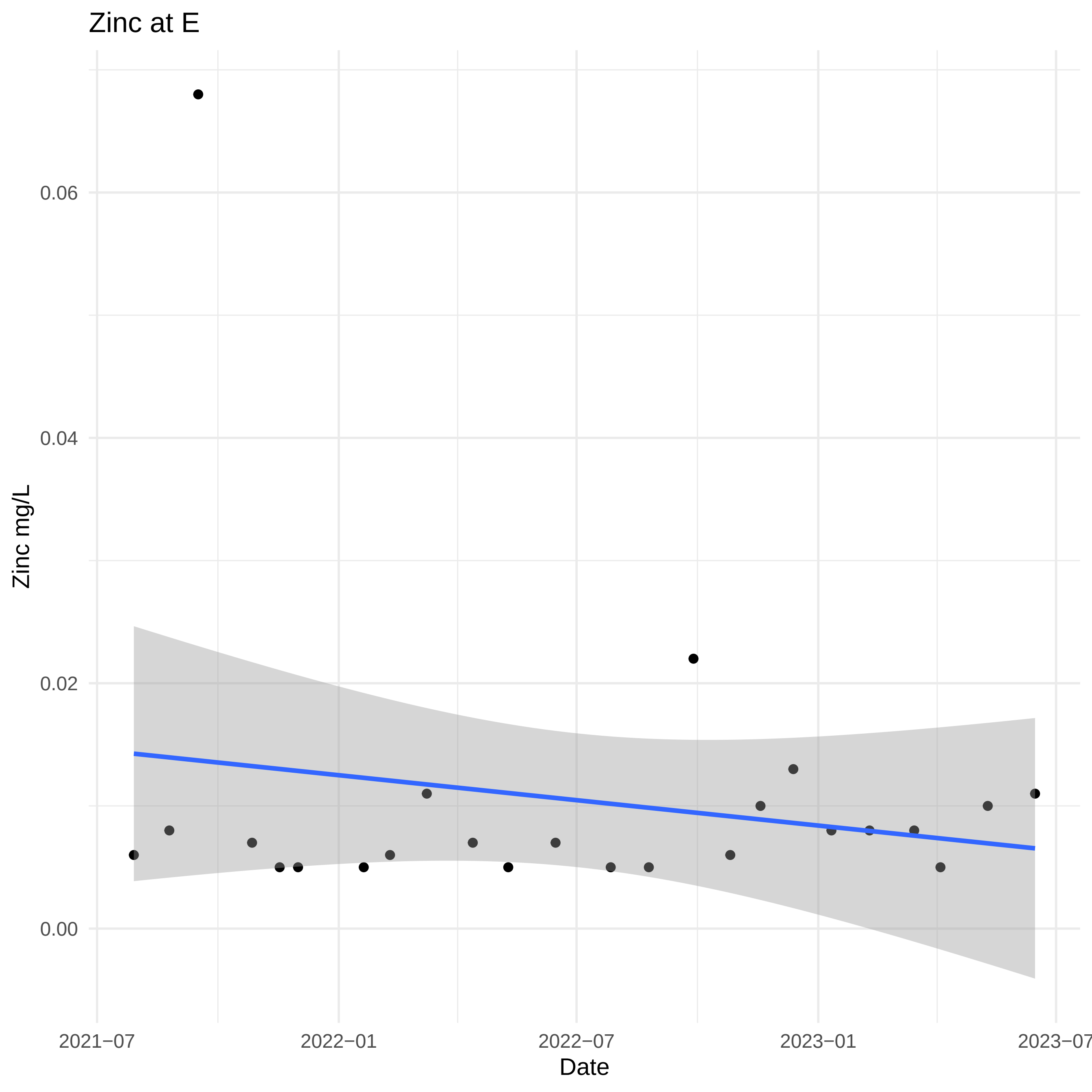
Sulphate.as.SO4.2. at NC01
Sulphate.as.SO4.2. mg/L
90
60
30
2021−07
2022−01
2022−07
2023−01
2023−07
Date



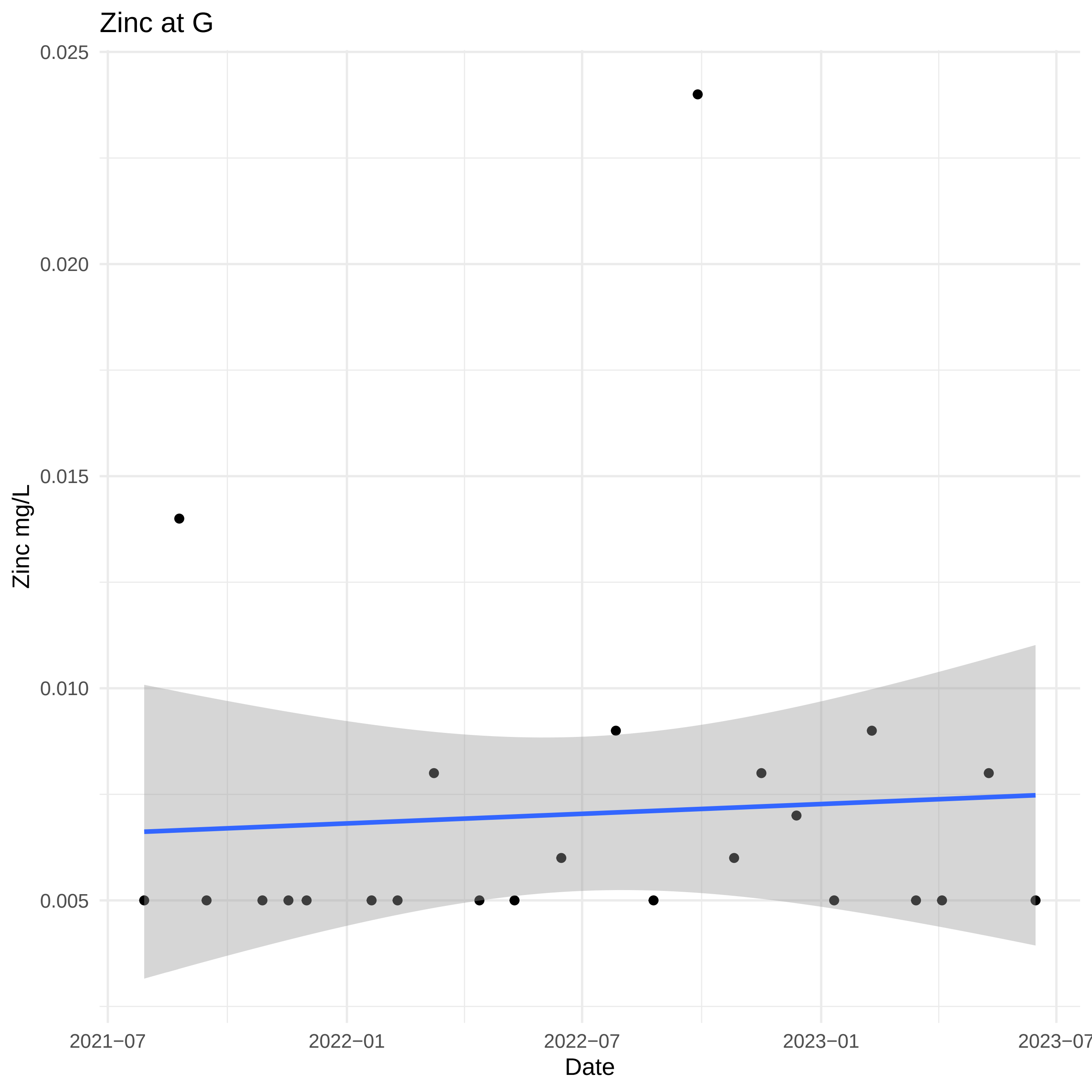
Sulphate.as.SO4.2. at WX22
Sulphate.as.SO4.2. mg/L
500
250
0
2021−07
2022−01
2022−07
2023−01
2023−07
Date



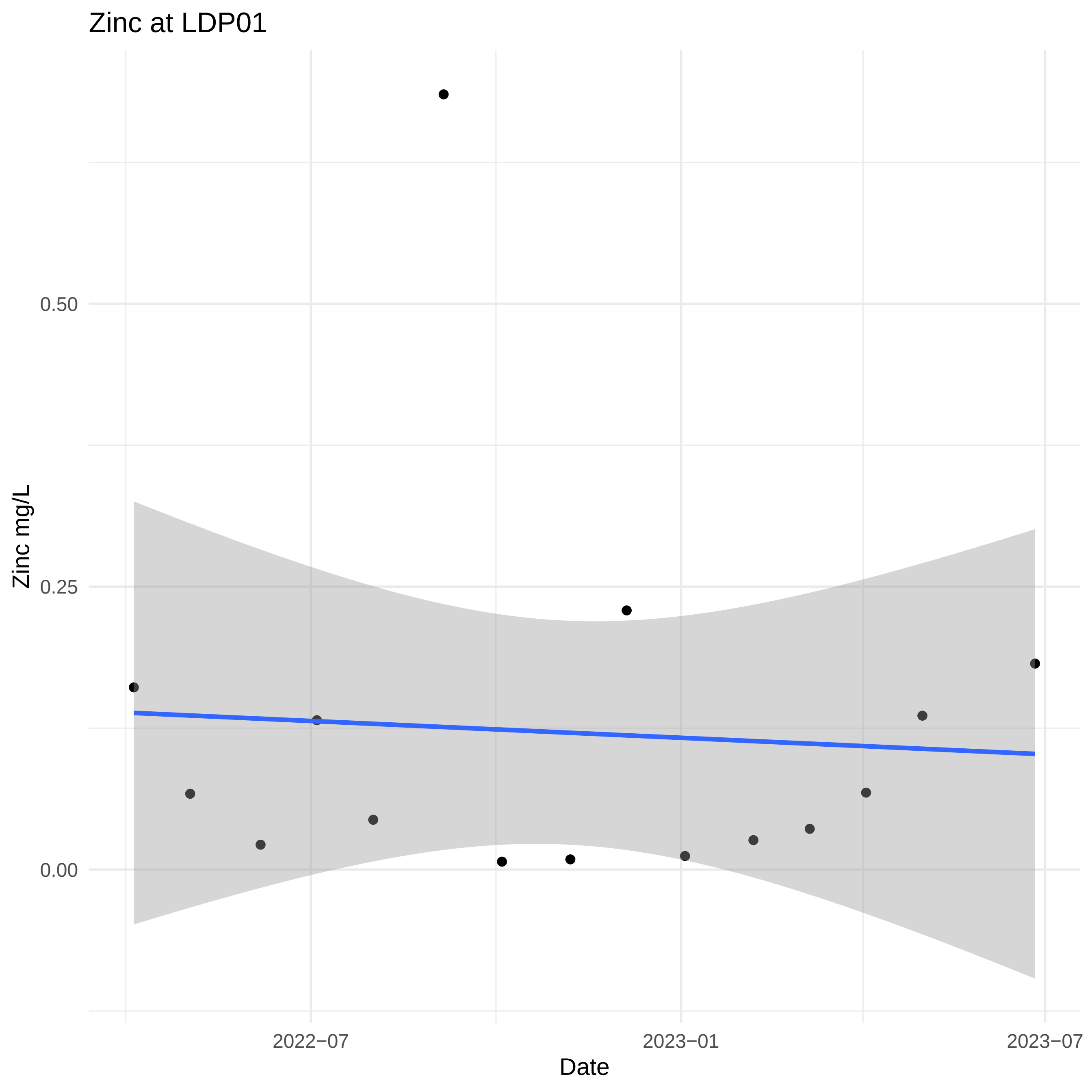
Zinc at C
0.02
0.01
Zinc mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date



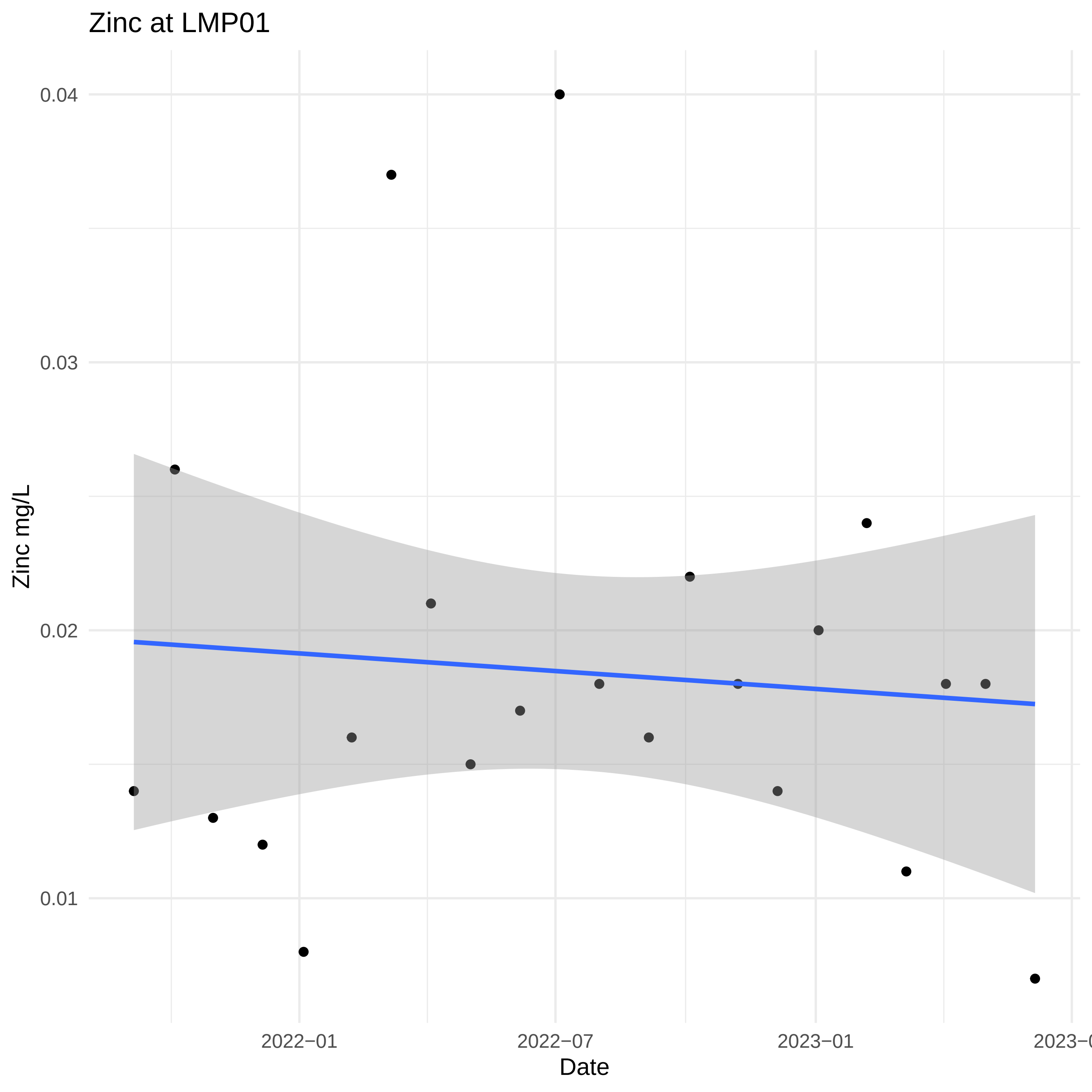
Zinc at E
Zinc mg/L
0.00
0.02
0.04
0.06
Date
2021−07
2022−01
2022−07
2023−01
2023−07



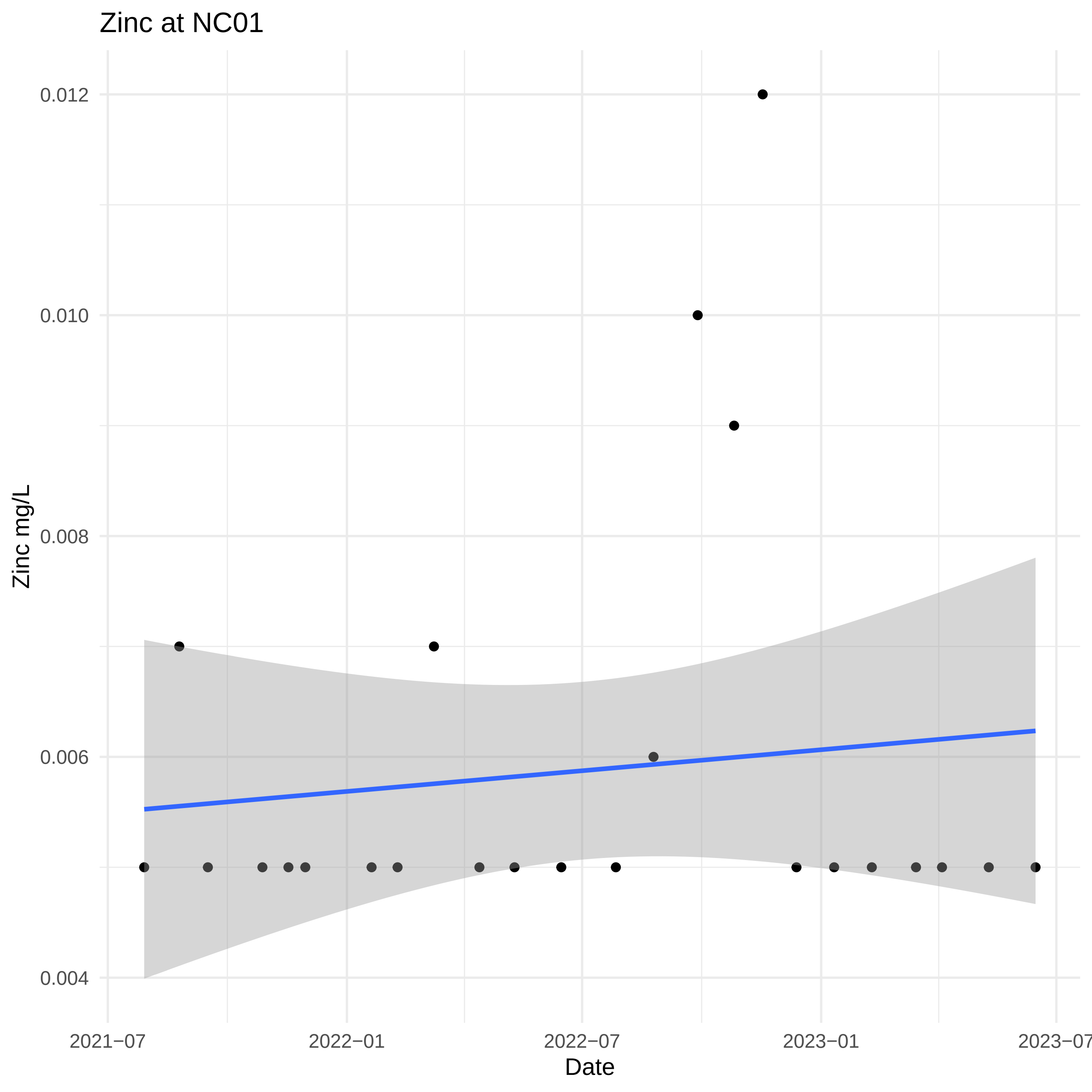
Zinc at G
0.025
0.020
0.015
0.010
0.005
Zinc mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

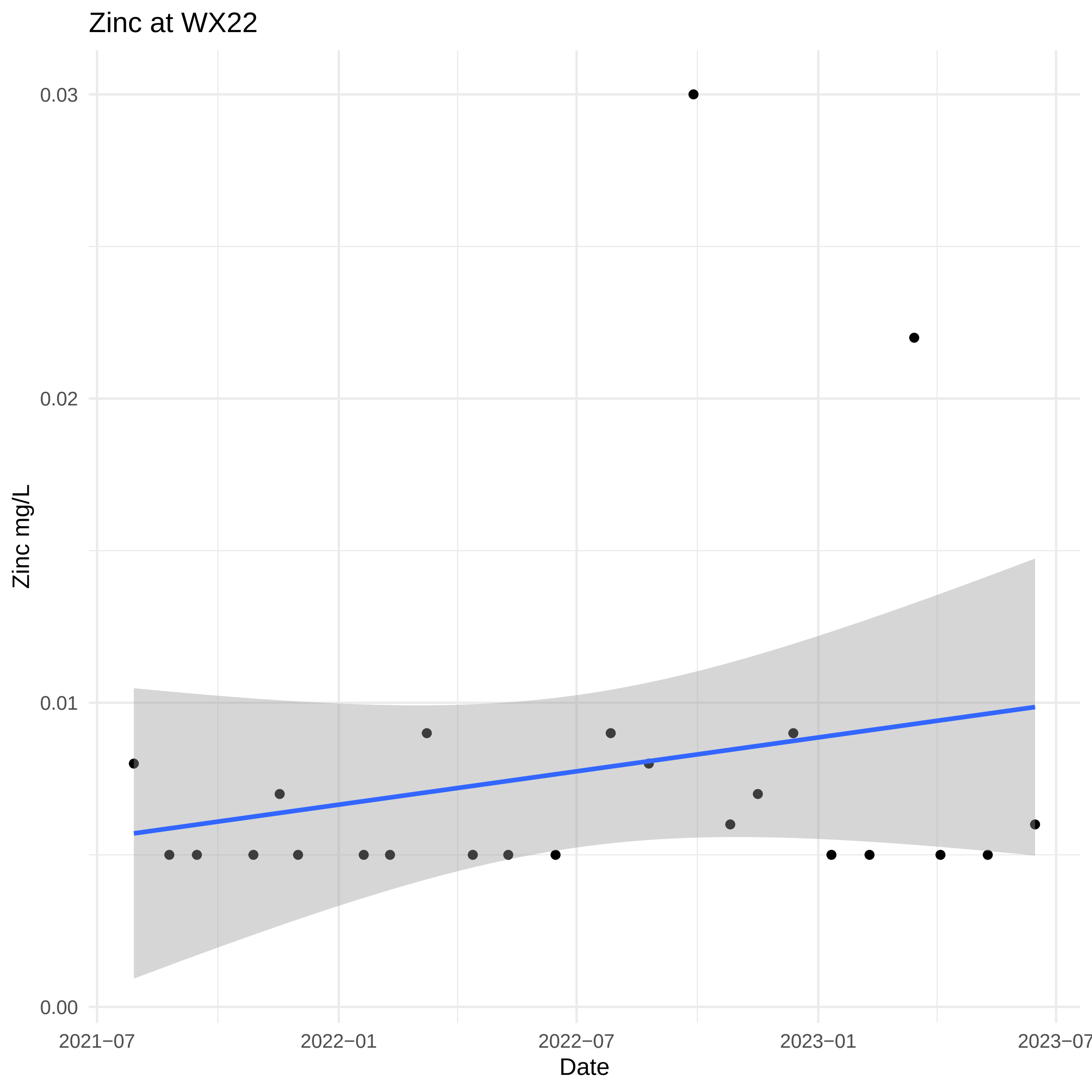


Zinc at LDP01
Zinc mg/L
0.50
0.25
0.00
2022−07
2023−01
2023−07
Date



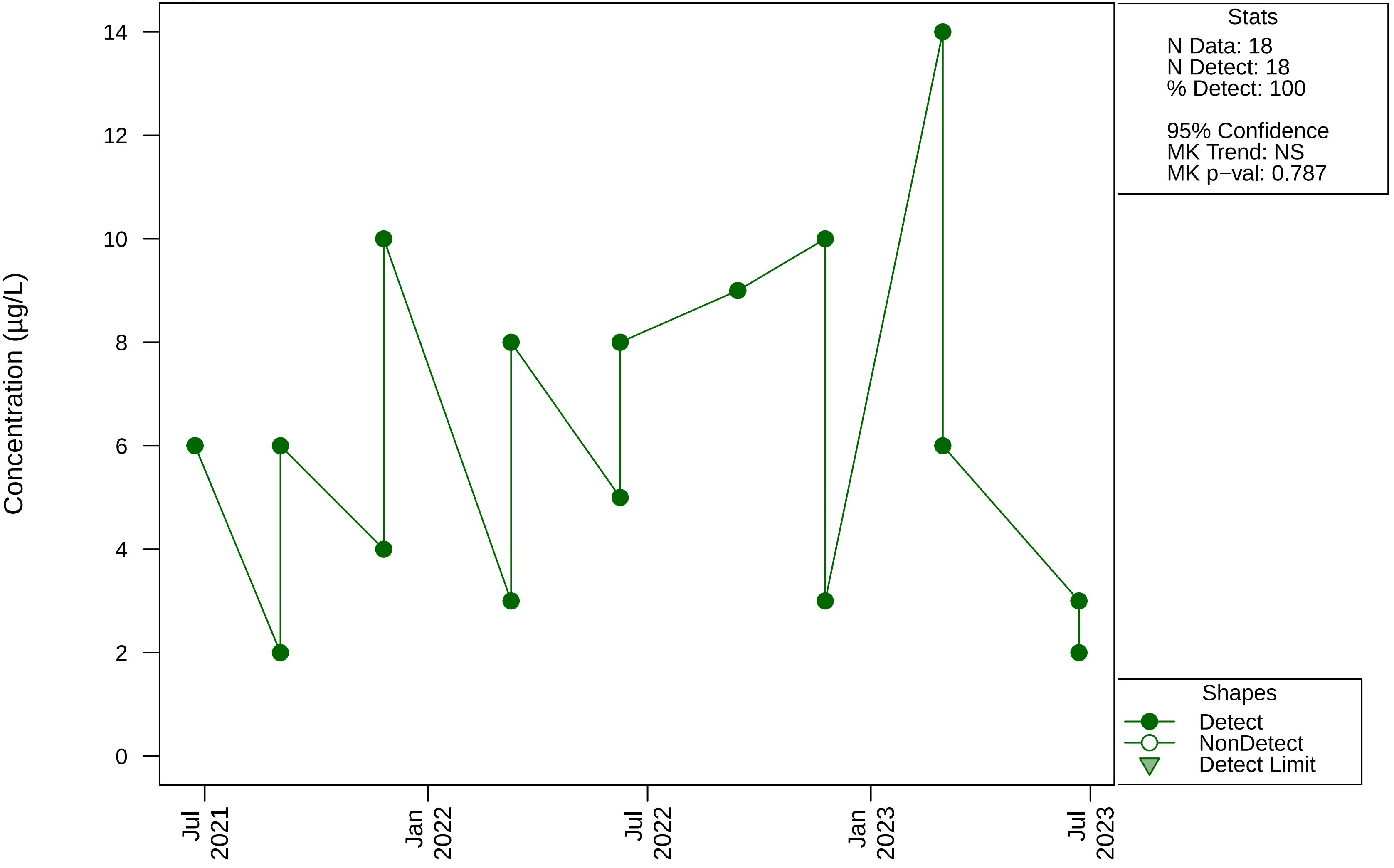
Zinc at LMP01
0.04
0.03
0.02
0.01
Zinc mg/L
2022−01
2022−07
2023−01
2023−0
Date


Zinc at NC01
0.012
0.010
0.008
0.006
0.004
Zinc mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

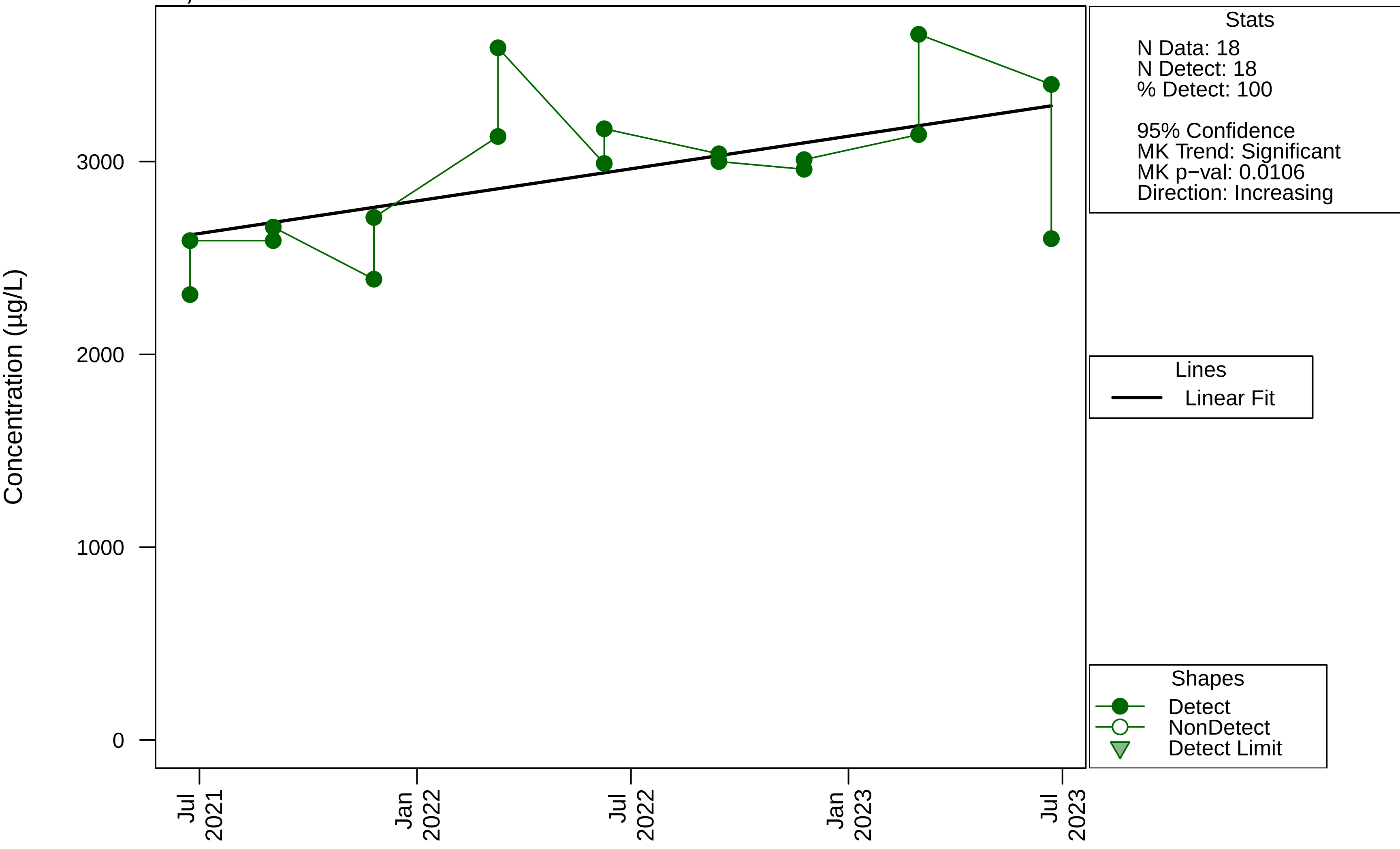

Zinc at WX22
0.03
0.02
0.01
0.00
Zinc mg/L
2021−07
2022−01
2022−07
2023−01
2023−07
Date

APPENDIX M MANN-KENDALL OUTPUTS

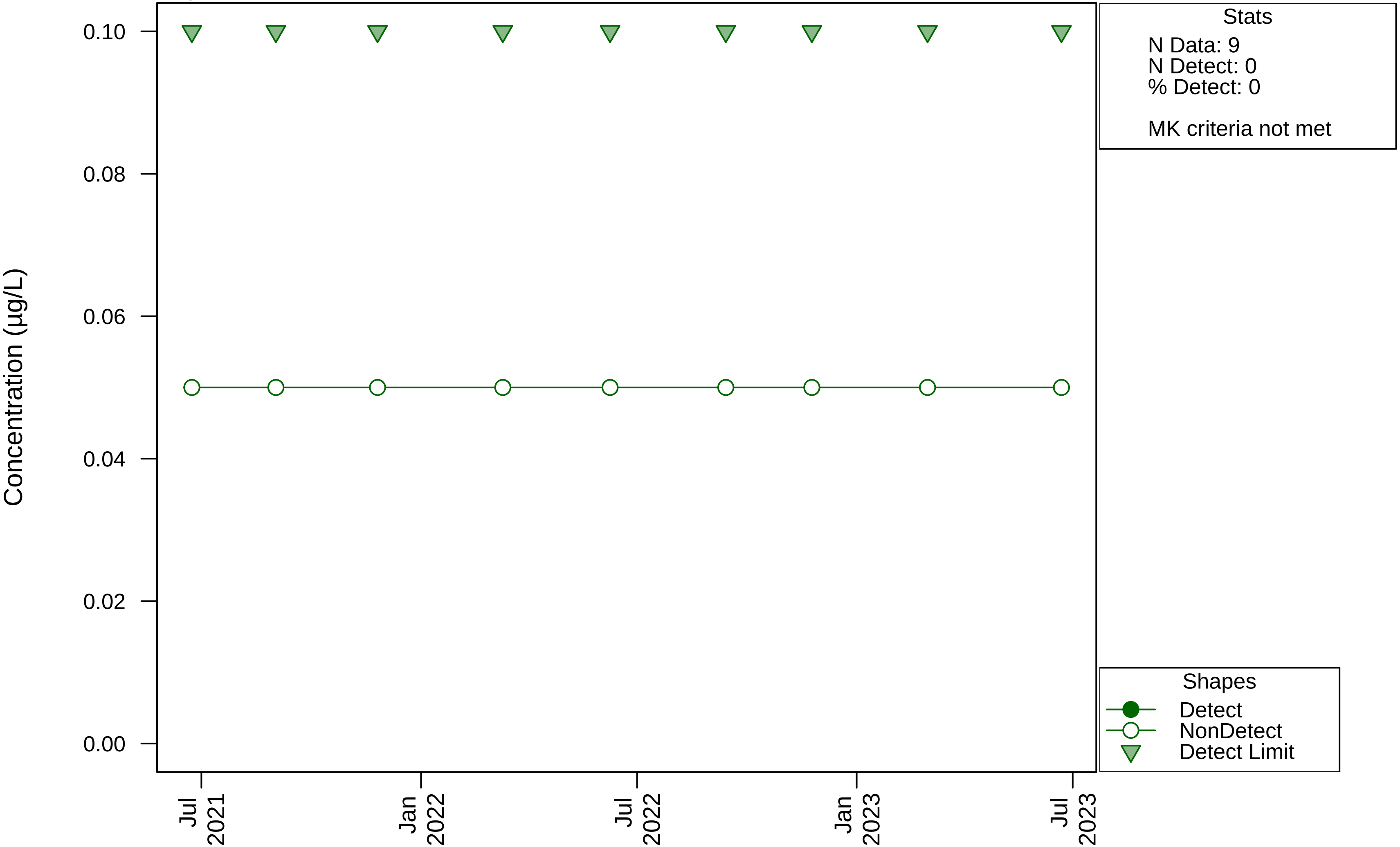
Scatterplots and Trend Analysis
D1, Arsenic

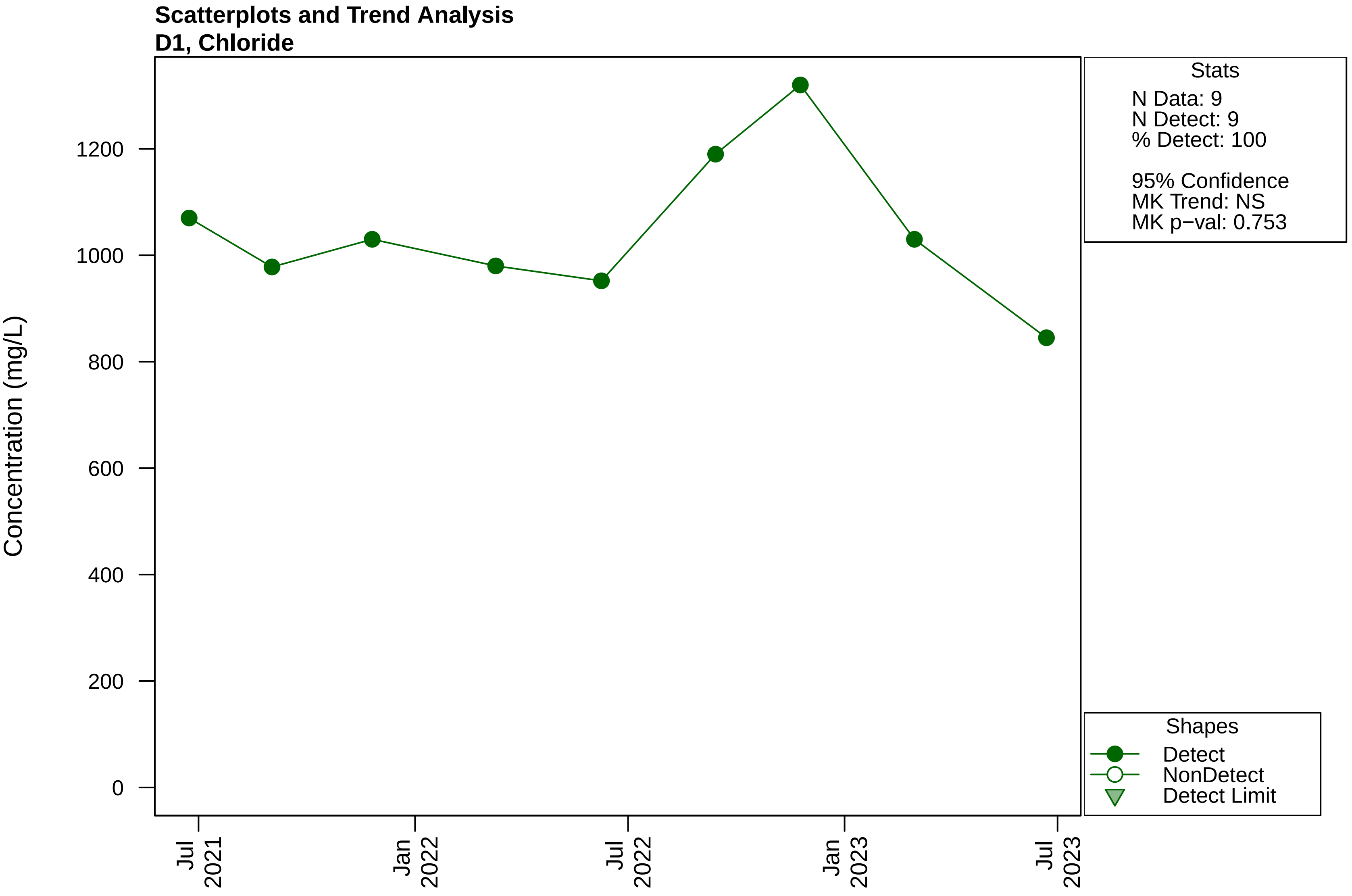


Scatterplots and Trend Analysis
D1, Boron



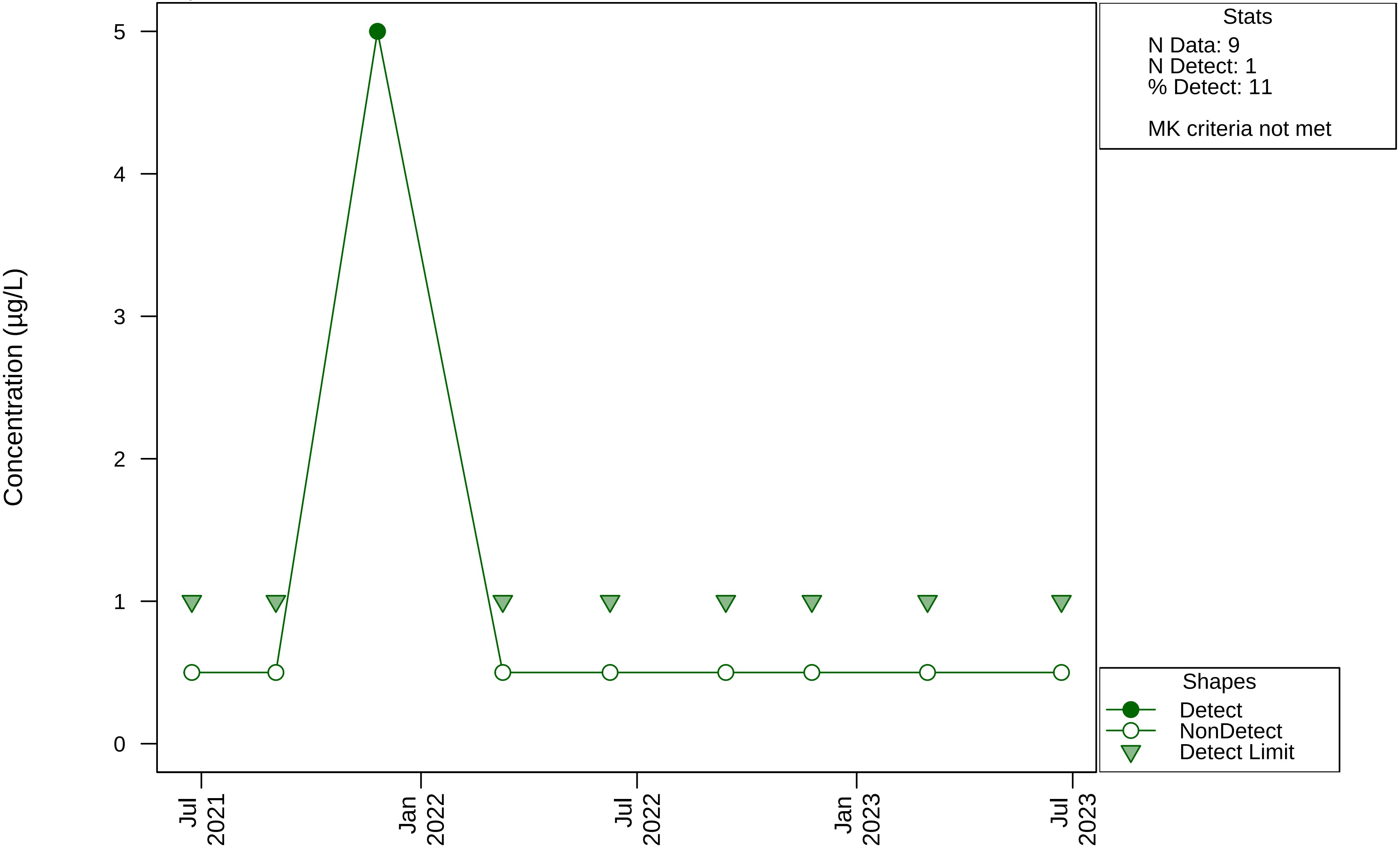
Scatterplots and Trend Analysis
D1, Cadmium



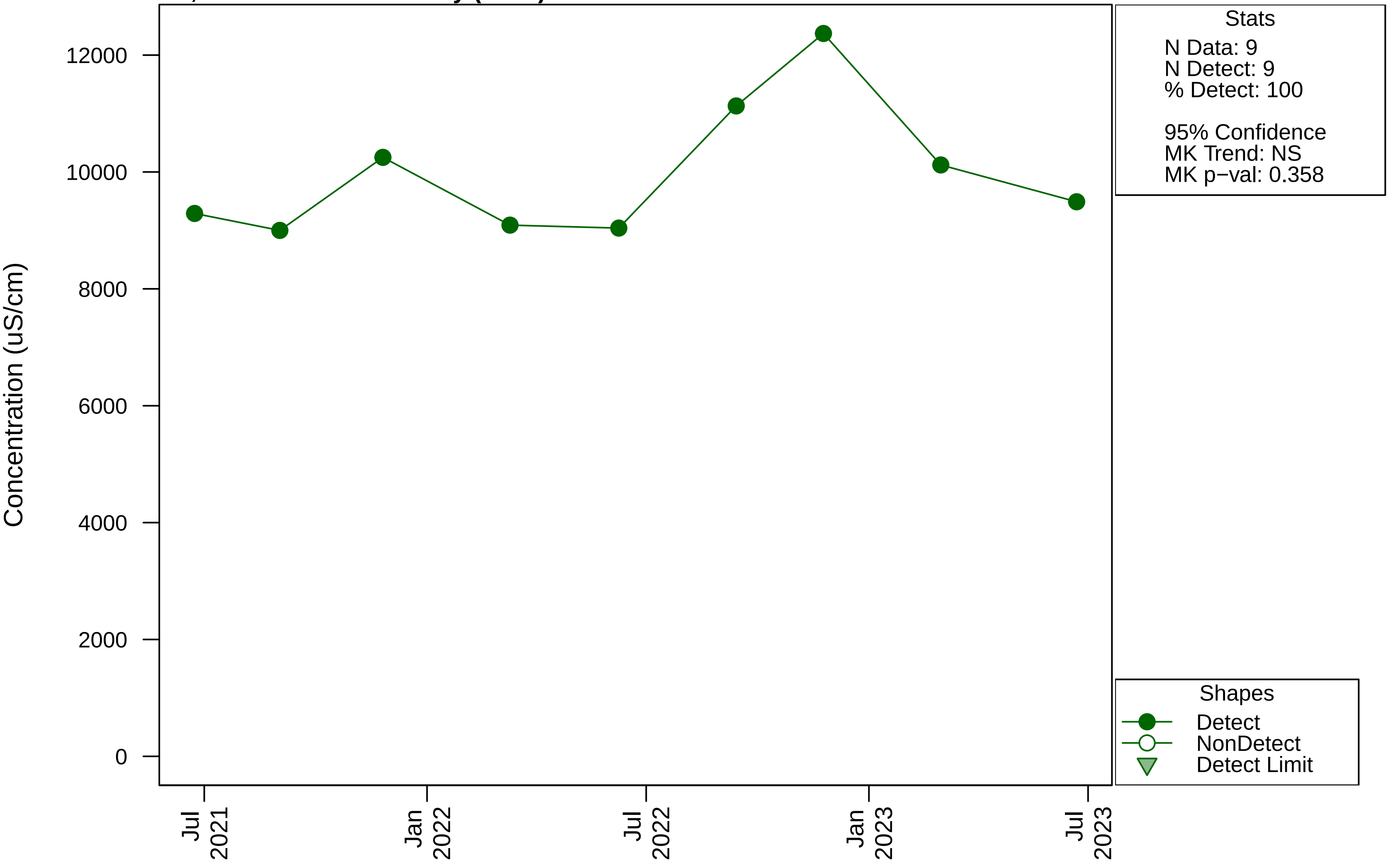


Scatterplots and Trend Analysis
D1, Chloride
Concentration (mg/L)
0
200
400
600
800
1000
1200
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.753
Shapes
Detect
NonDetect
Detect Limit

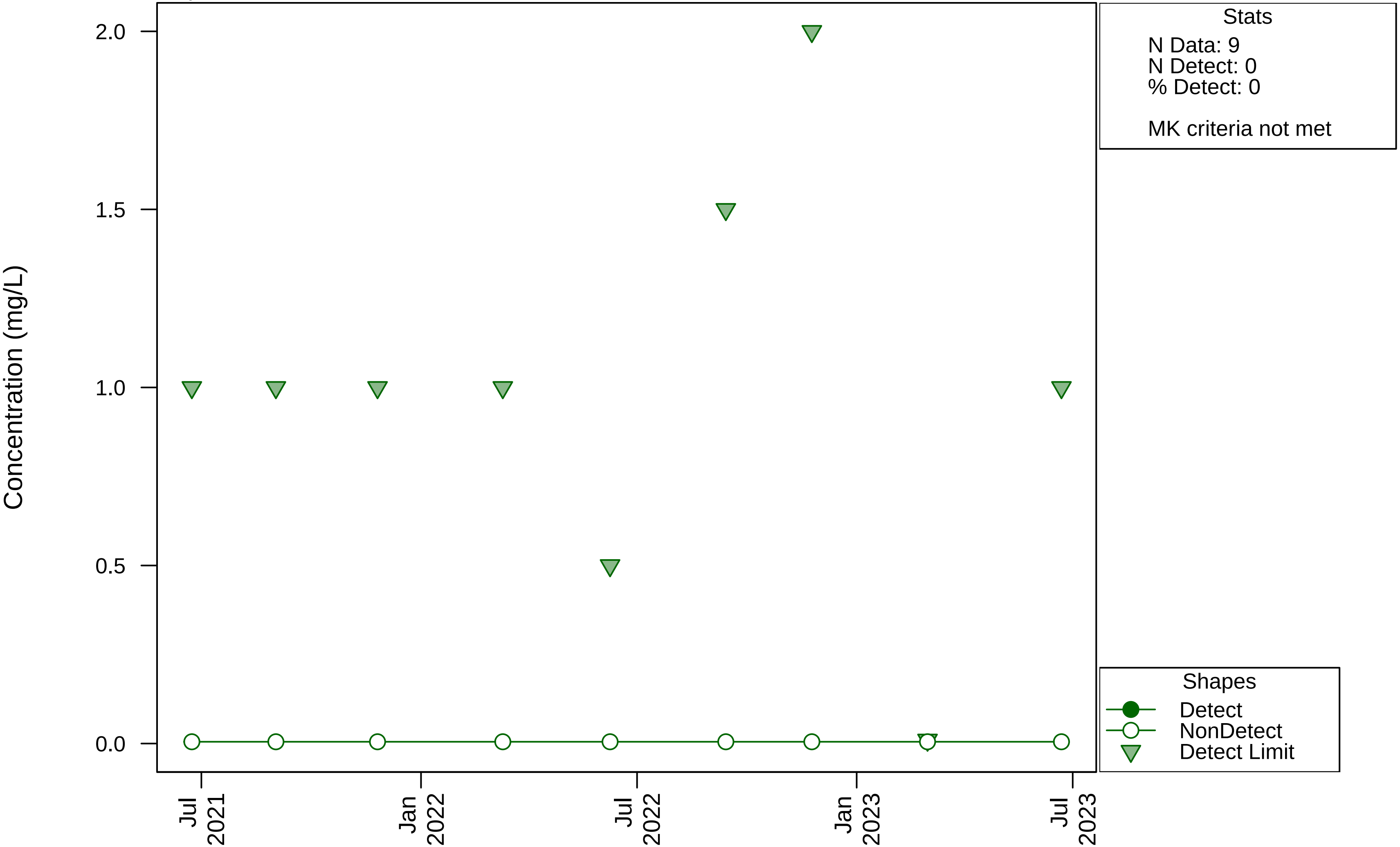
Scatterplots and Trend Analysis
D1, Chromium

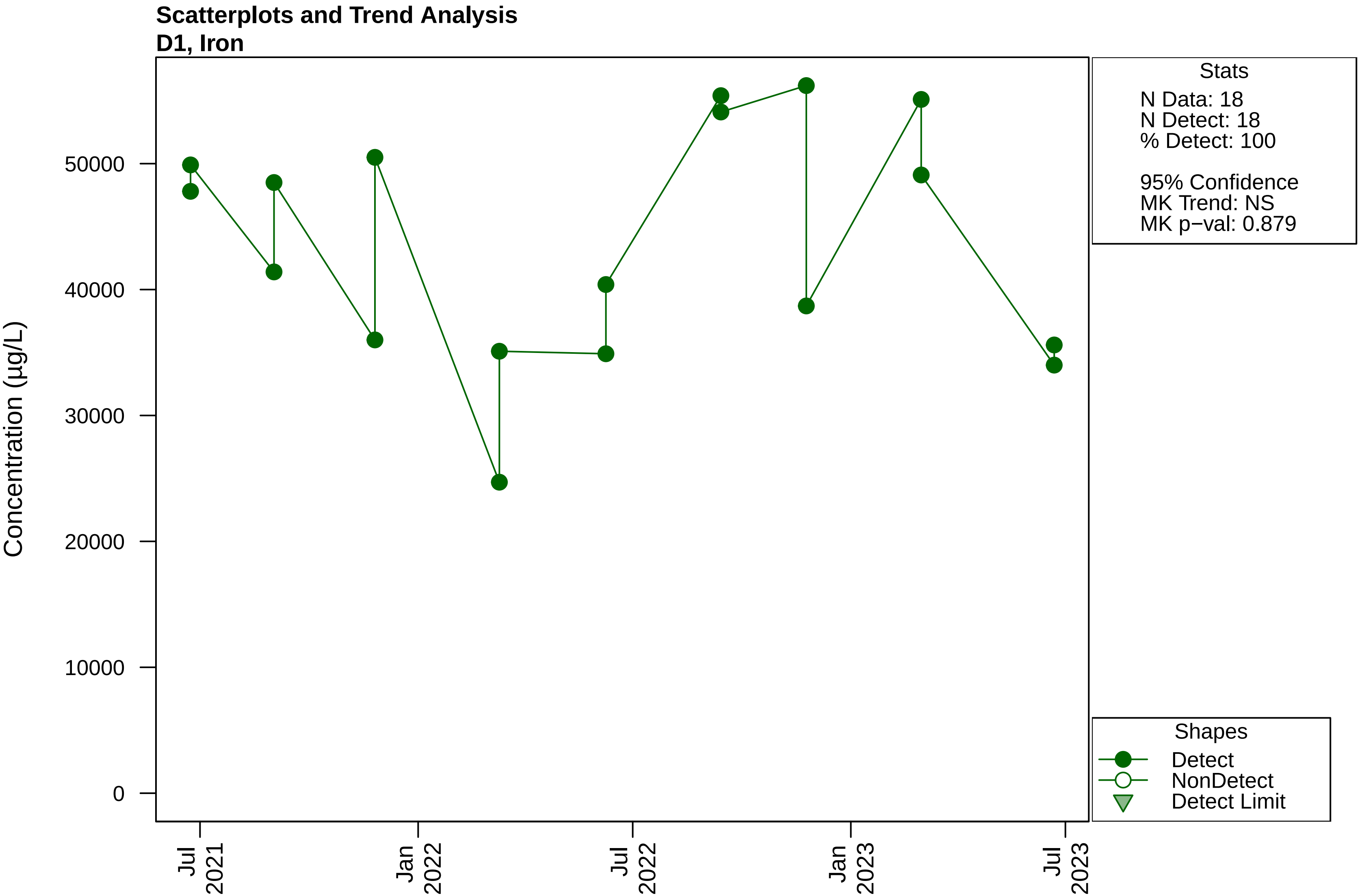


Scatterplots and Trend Analysis
D1, Electrical Conductivity (Field)



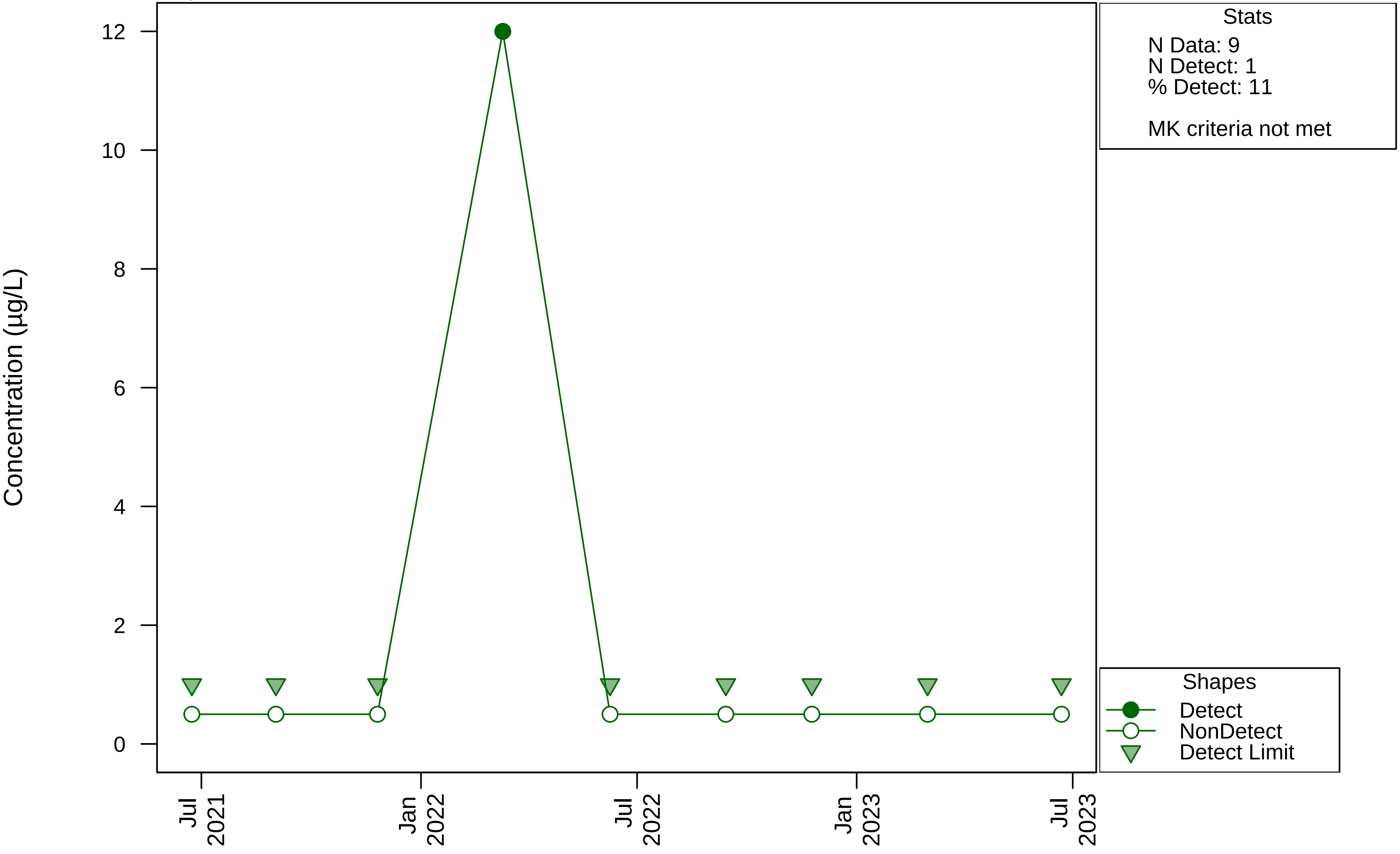
Scatterplots and Trend Analysis
D1, Fluoride

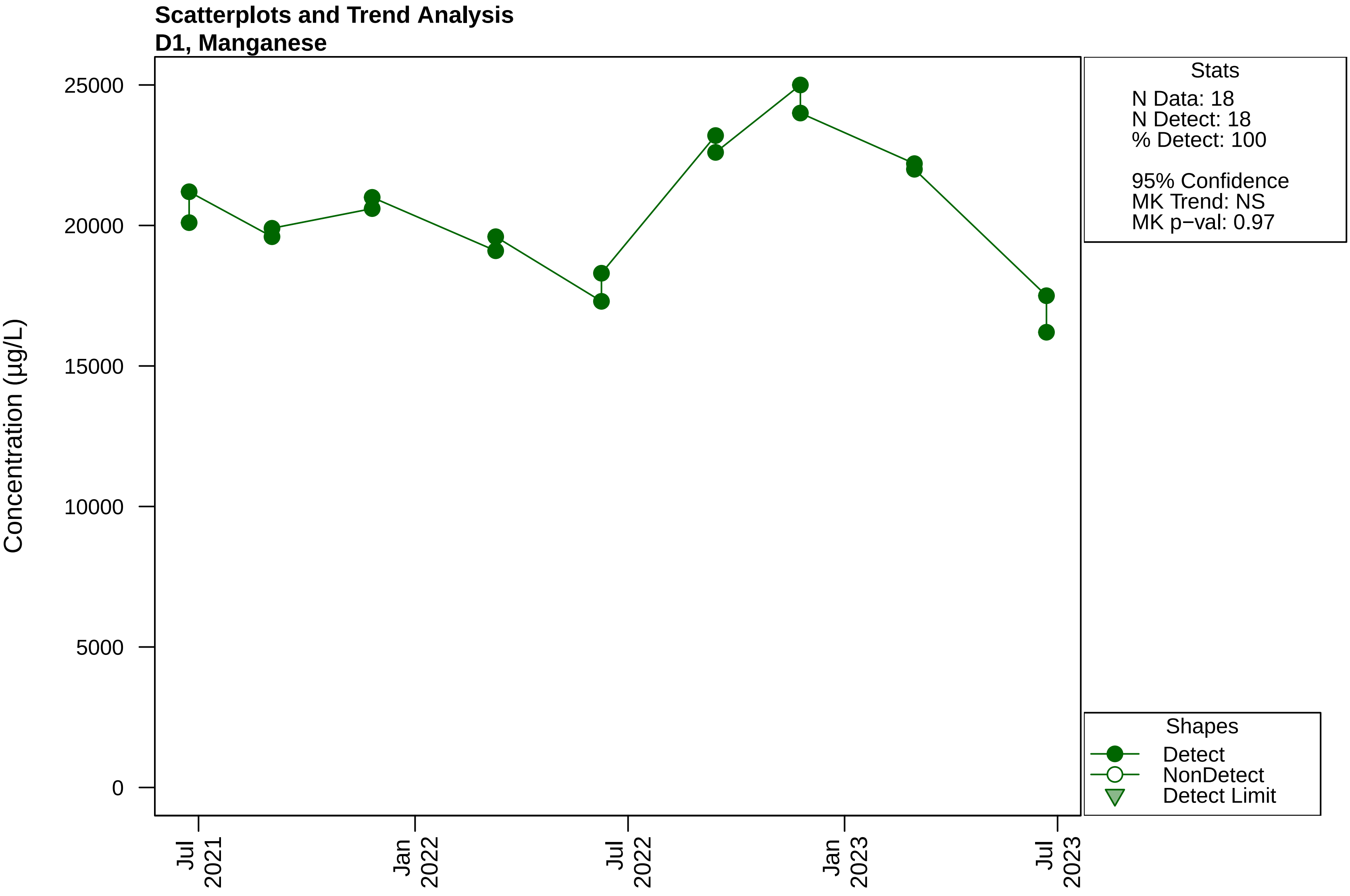


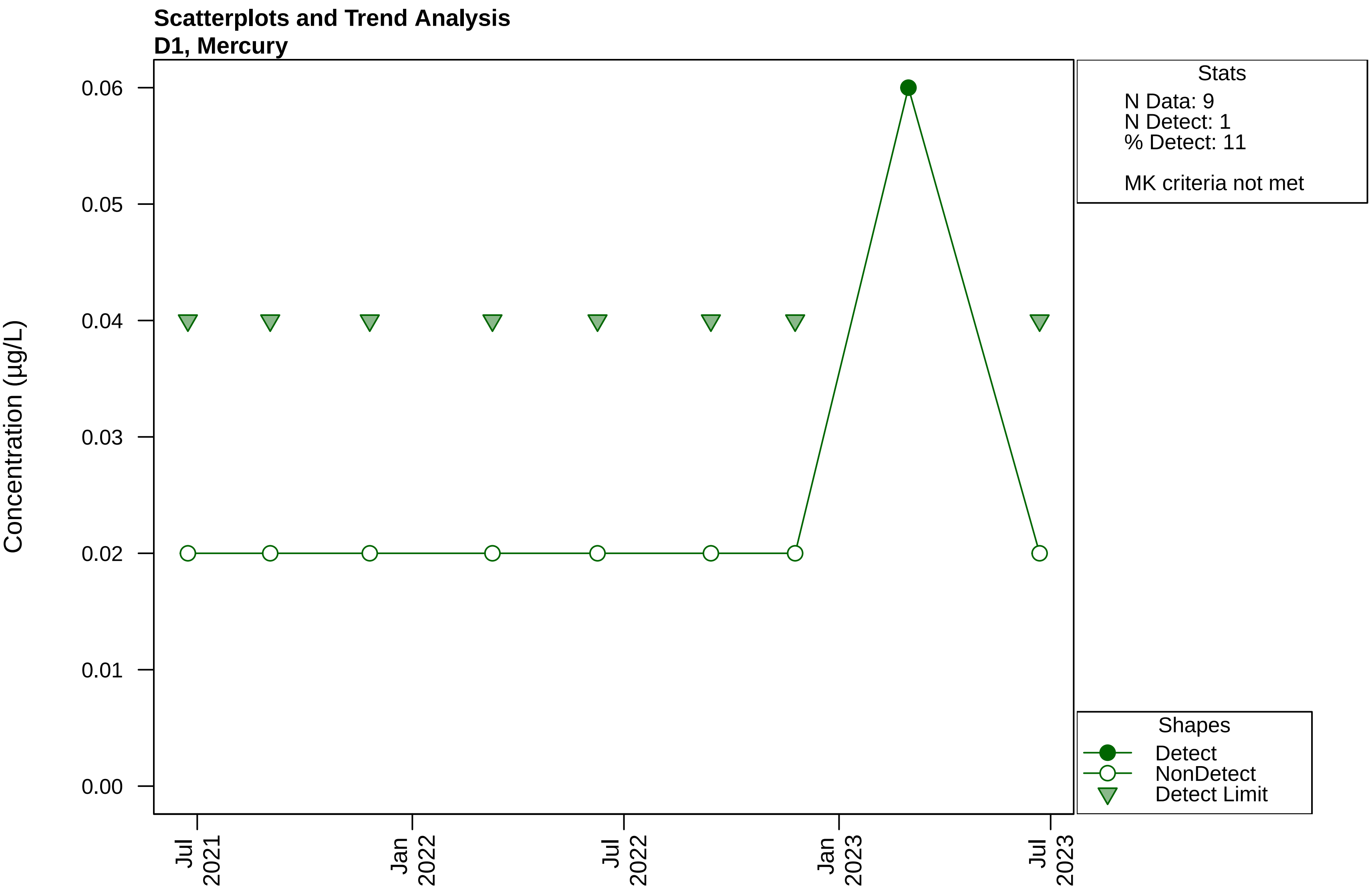


Scatterplots and Trend Analysis
D1, Iron
Concentration (µg/L)
0
10000
20000
30000
40000
50000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.879
Shapes
Detect
NonDetect
Detect Limit

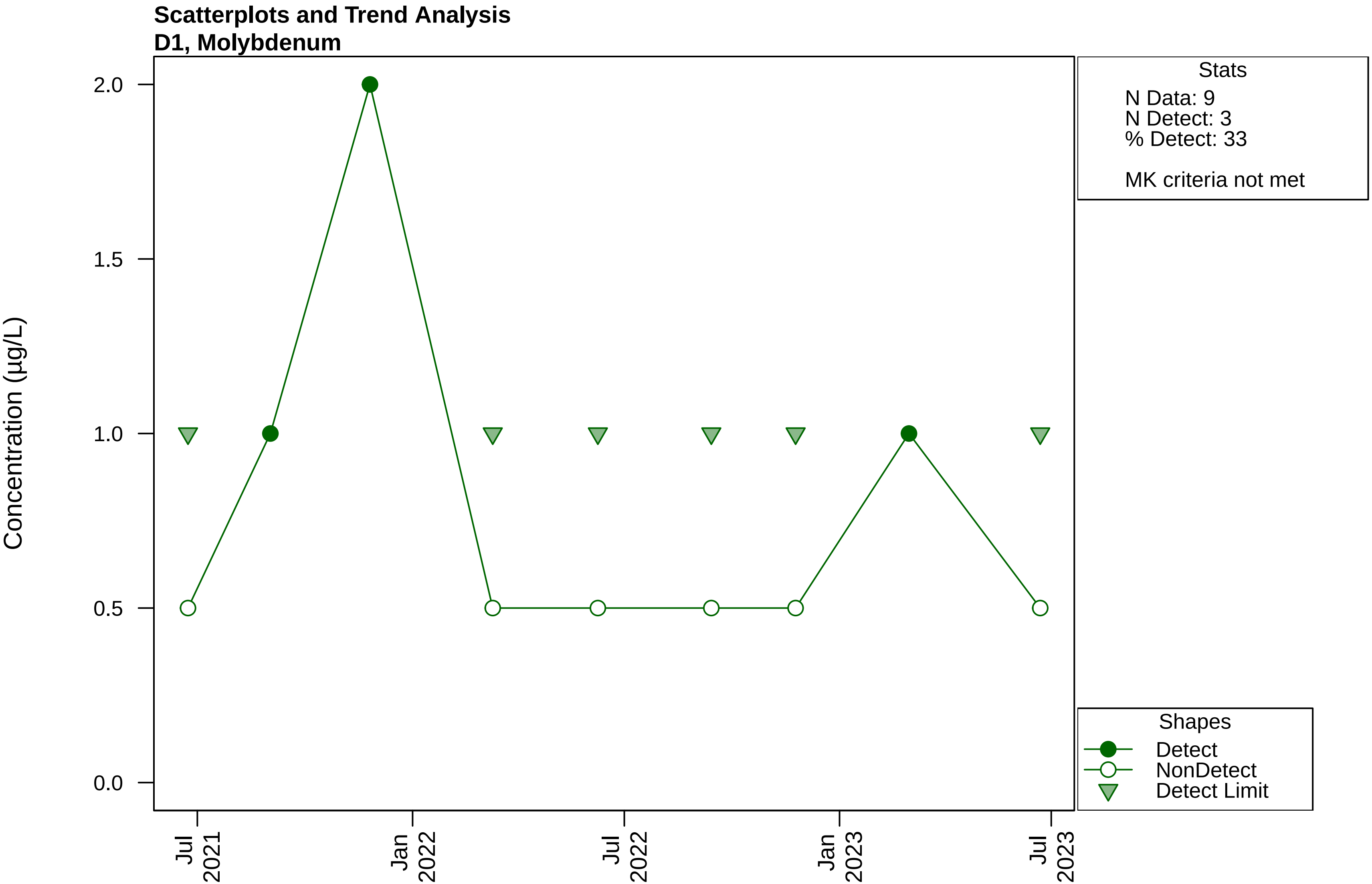
Scatterplots and Trend Analysis
D1, Lead




Scatterplots and Trend Analysis
D1, Manganese
Concentration (µg/L)
25000
20000
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.97
Shapes
Detect
NonDetect
Detect Limit

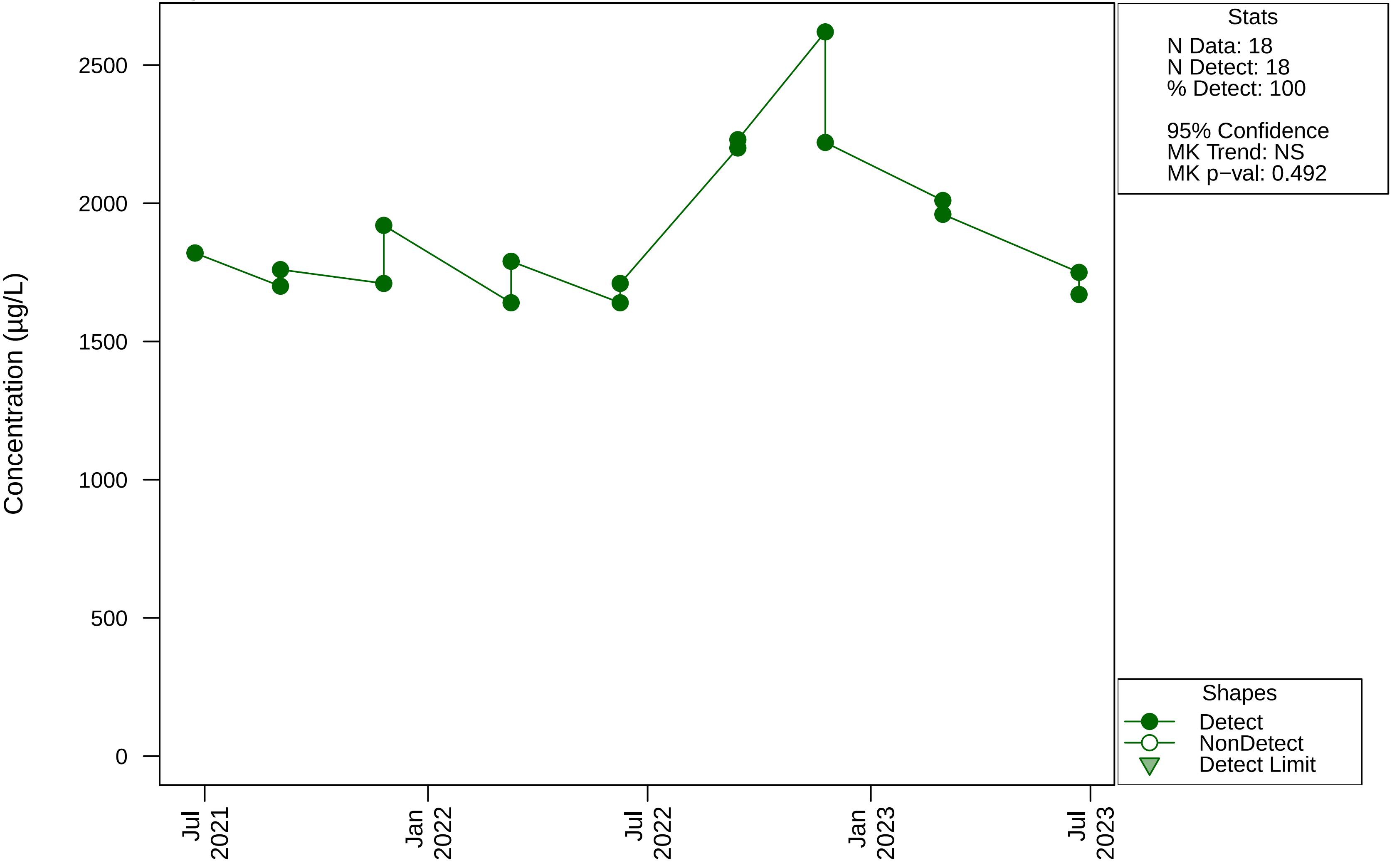


Scatterplots and Trend Analysis
D1, Mercury
Concentration (µg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

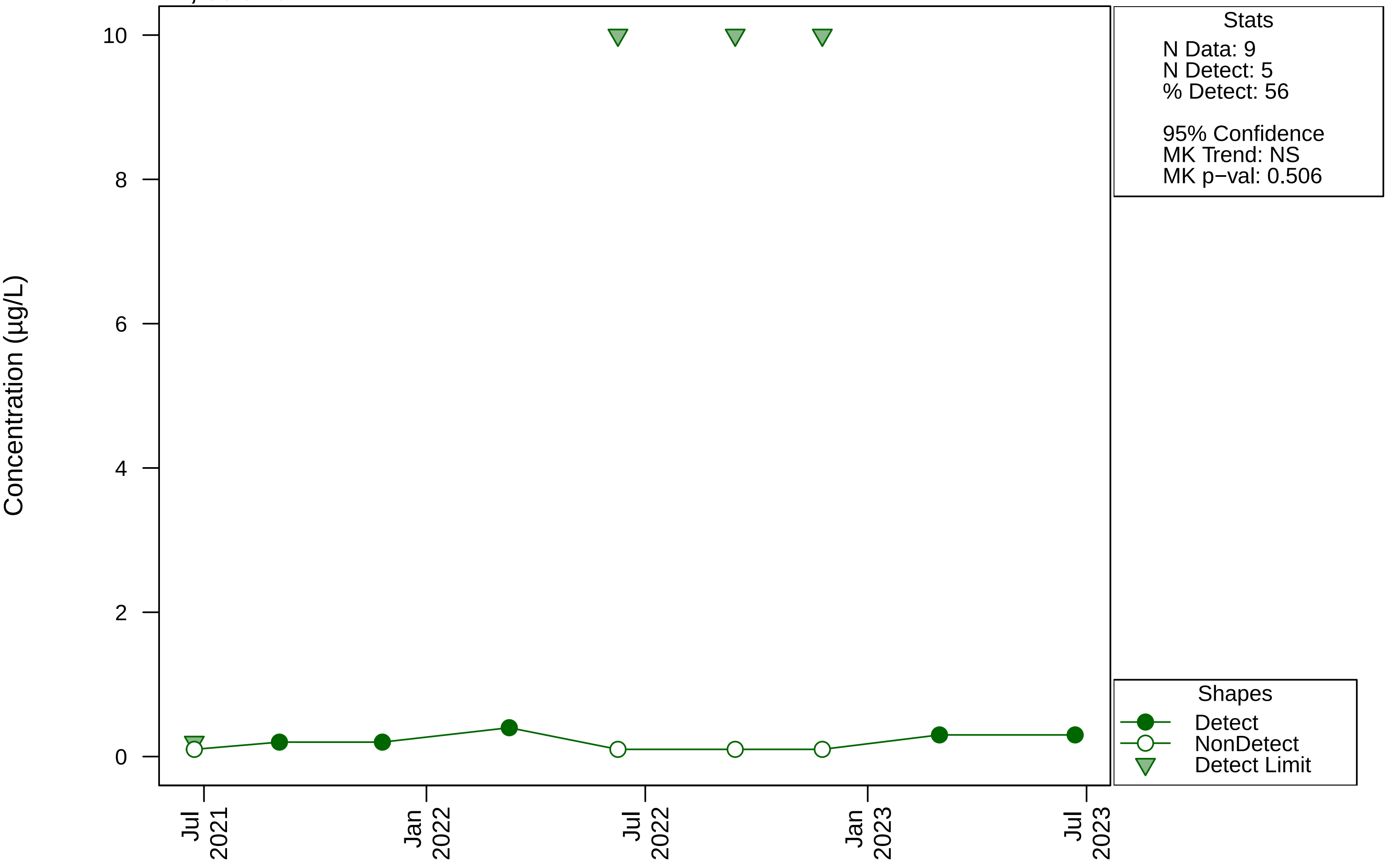


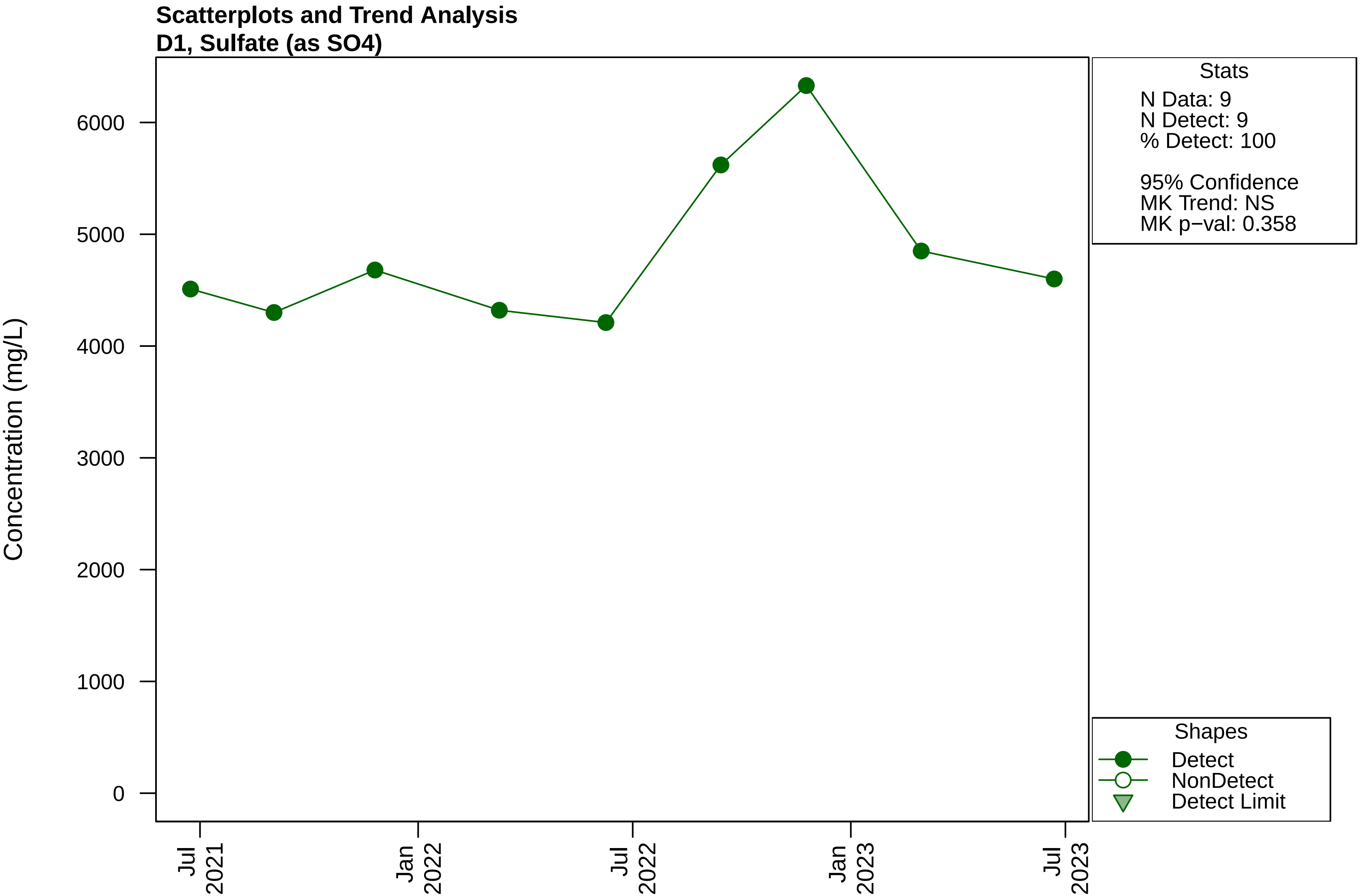
Scatterplots and Trend Analysis
D1, Molybdenum
Stats
N Data: 9
N Detect: 3
% Detect: 33
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023

Scatterplots and Trend Analysis
D1, Nickel



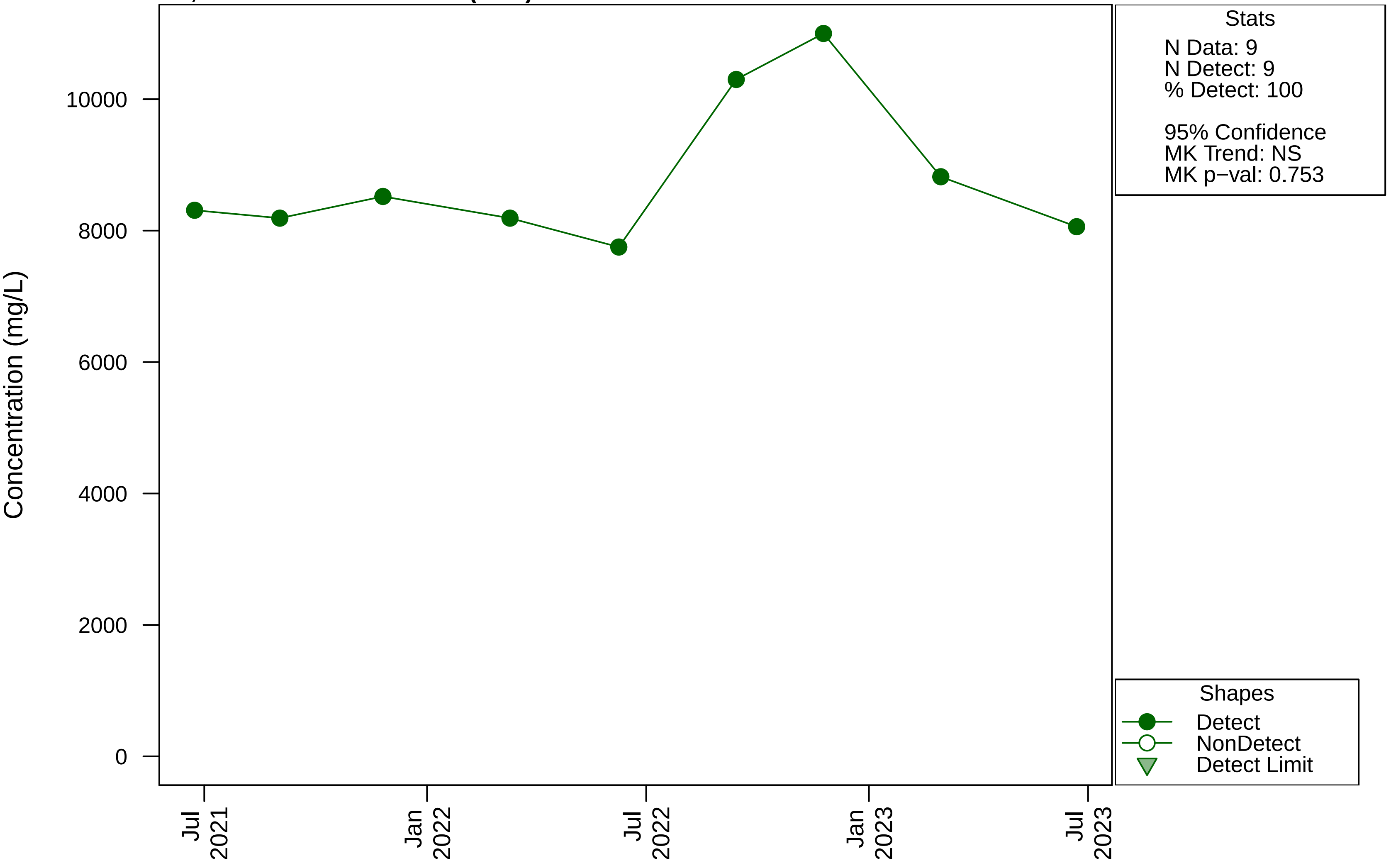
Scatterplots and Trend Analysis
D1, Selenium



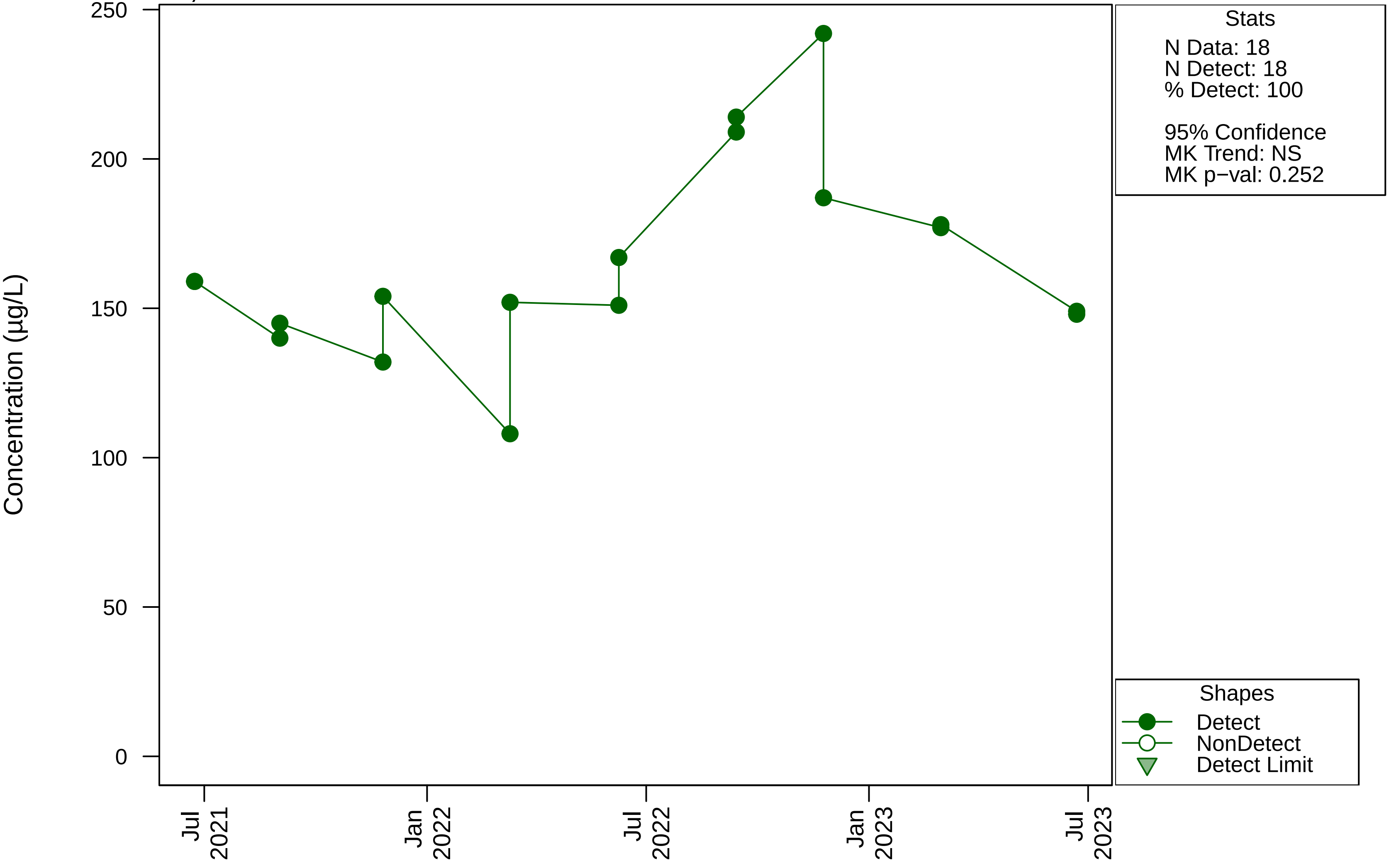


Scatterplots and Trend Analysis
D1, Sulfate (as SO4)
Concentration (mg/L)
0
1000
2000
3000
4000
5000
6000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.358
Shapes
Detect
NonDetect
Detect Limit

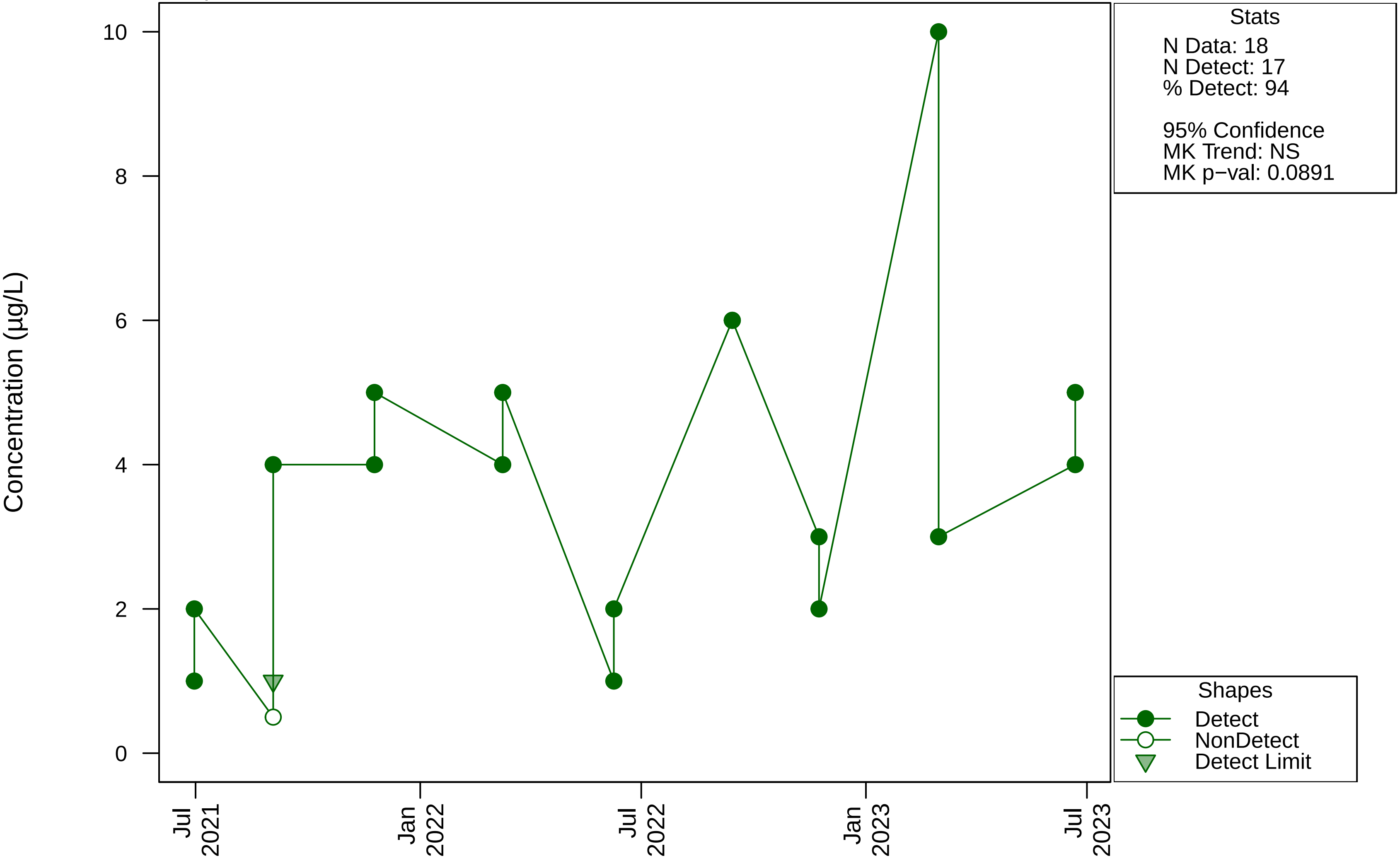
Scatterplots and Trend Analysis
D1, Total Dissolved Solids (TDS)

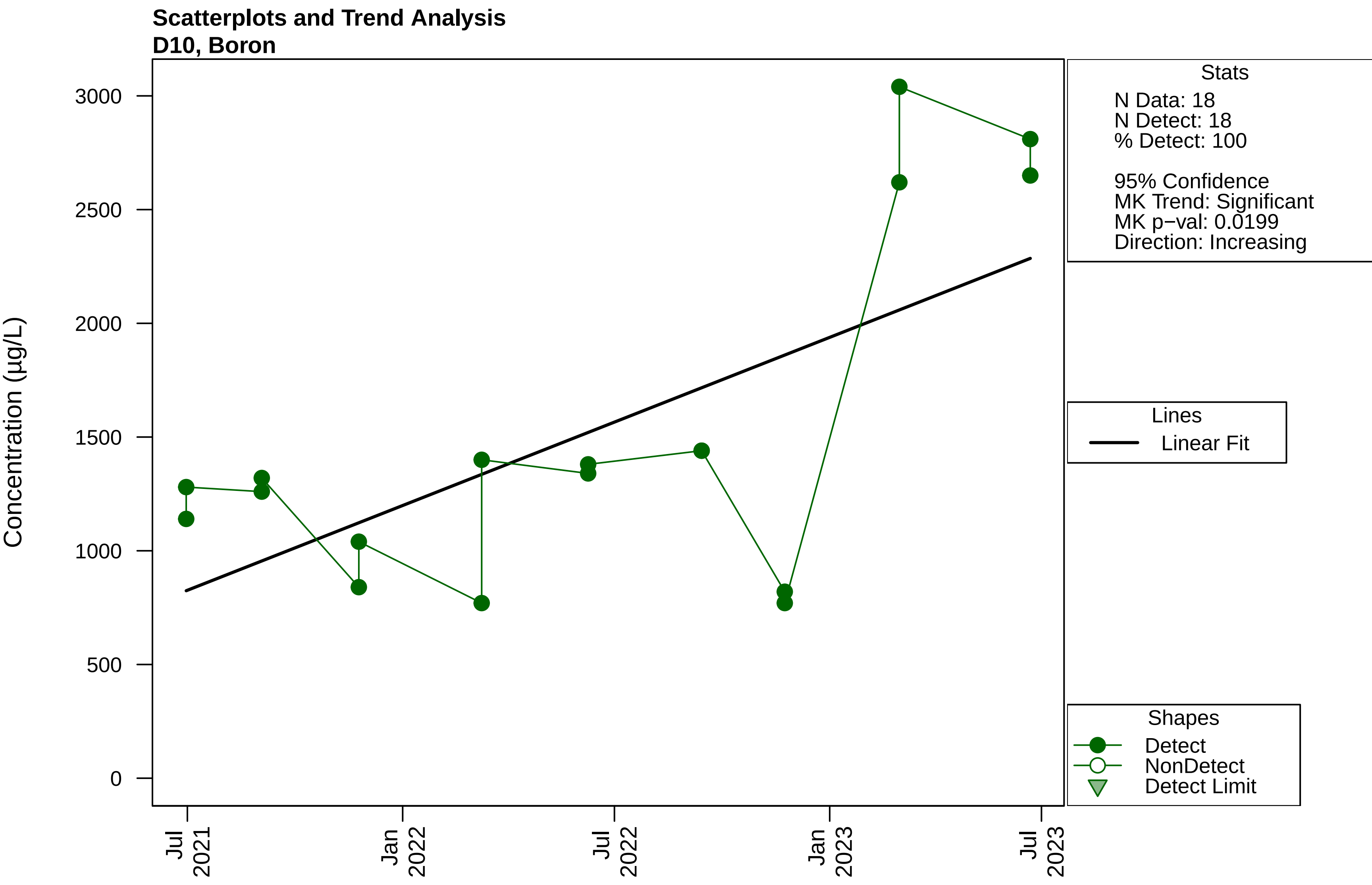


Scatterplots and Trend Analysis
D1, Zinc



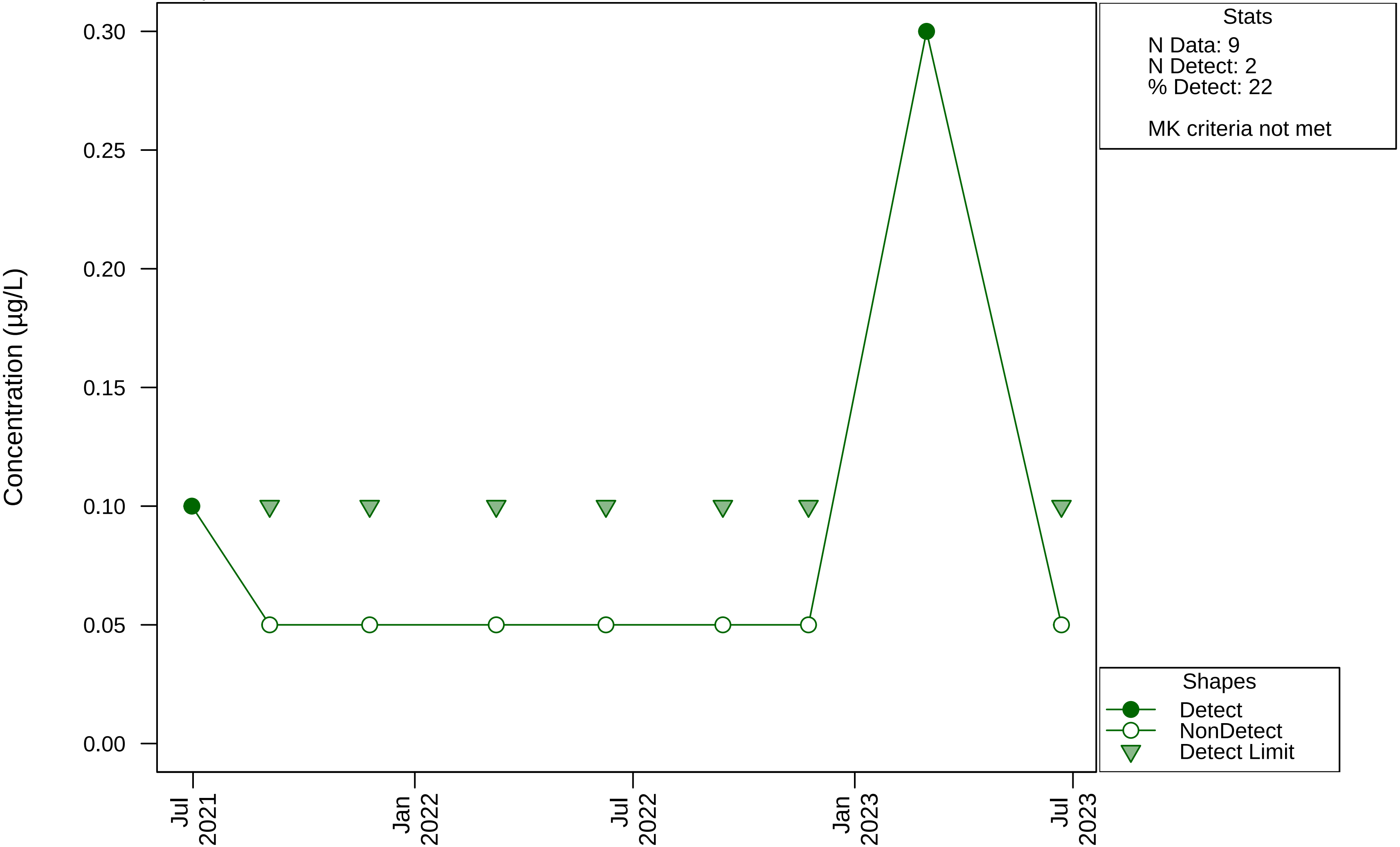
Scatterplots and Trend Analysis
D10, Arsenic

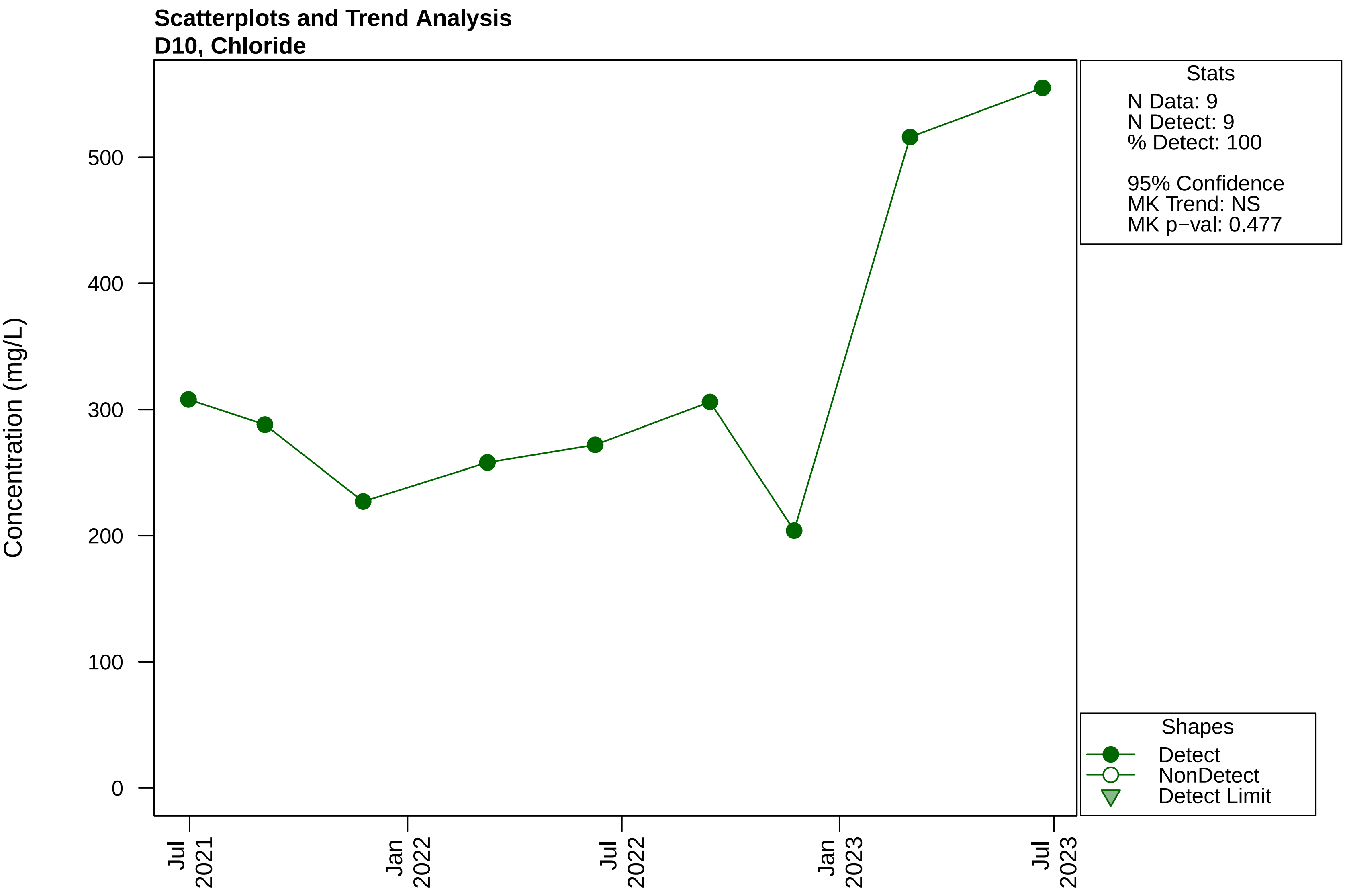




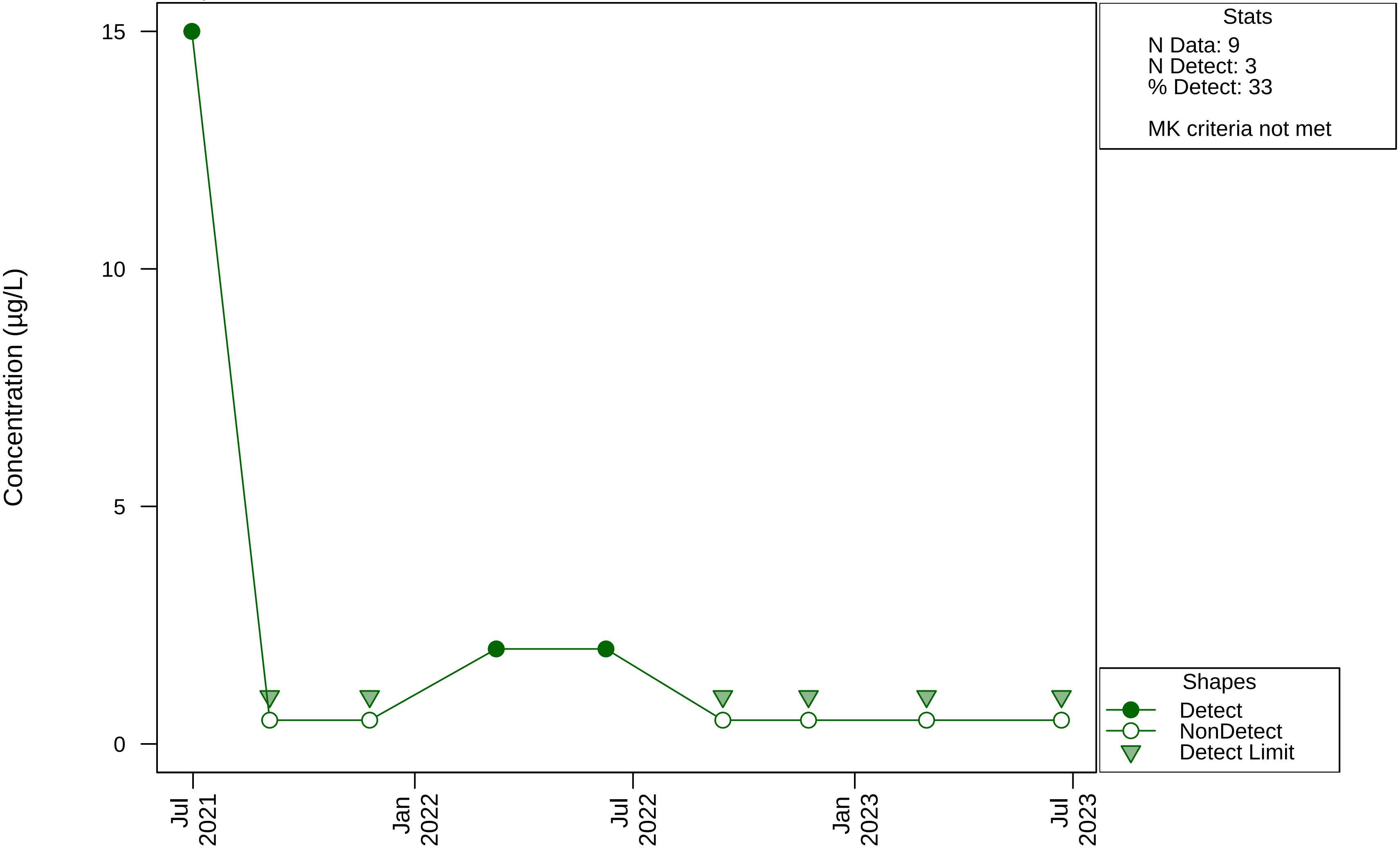
Scatterplots and Trend Analysis
D10, Boron
Concentration (µg/L)
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0199
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

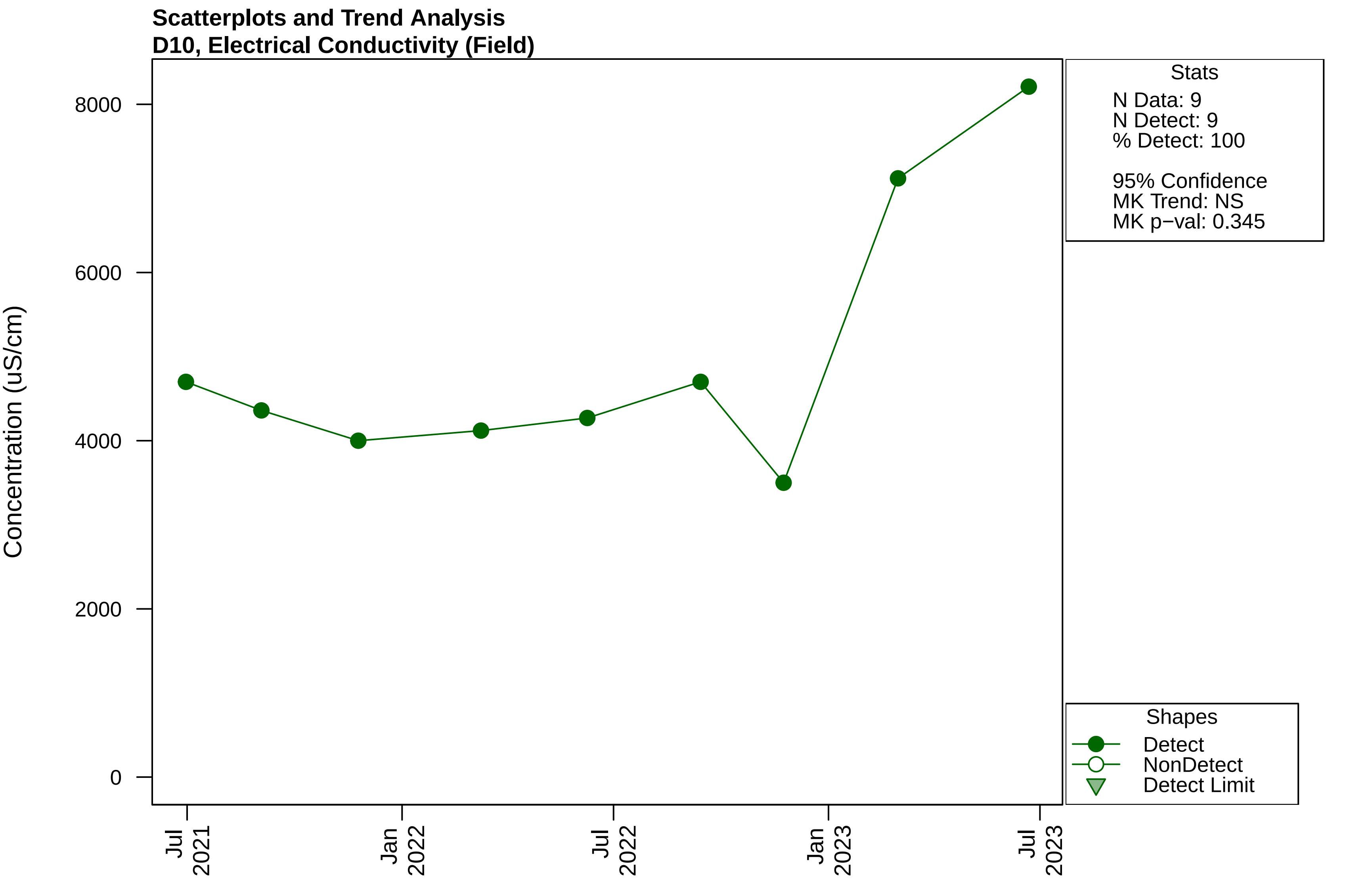
Scatterplots and Trend Analysis
D10, Cadmium



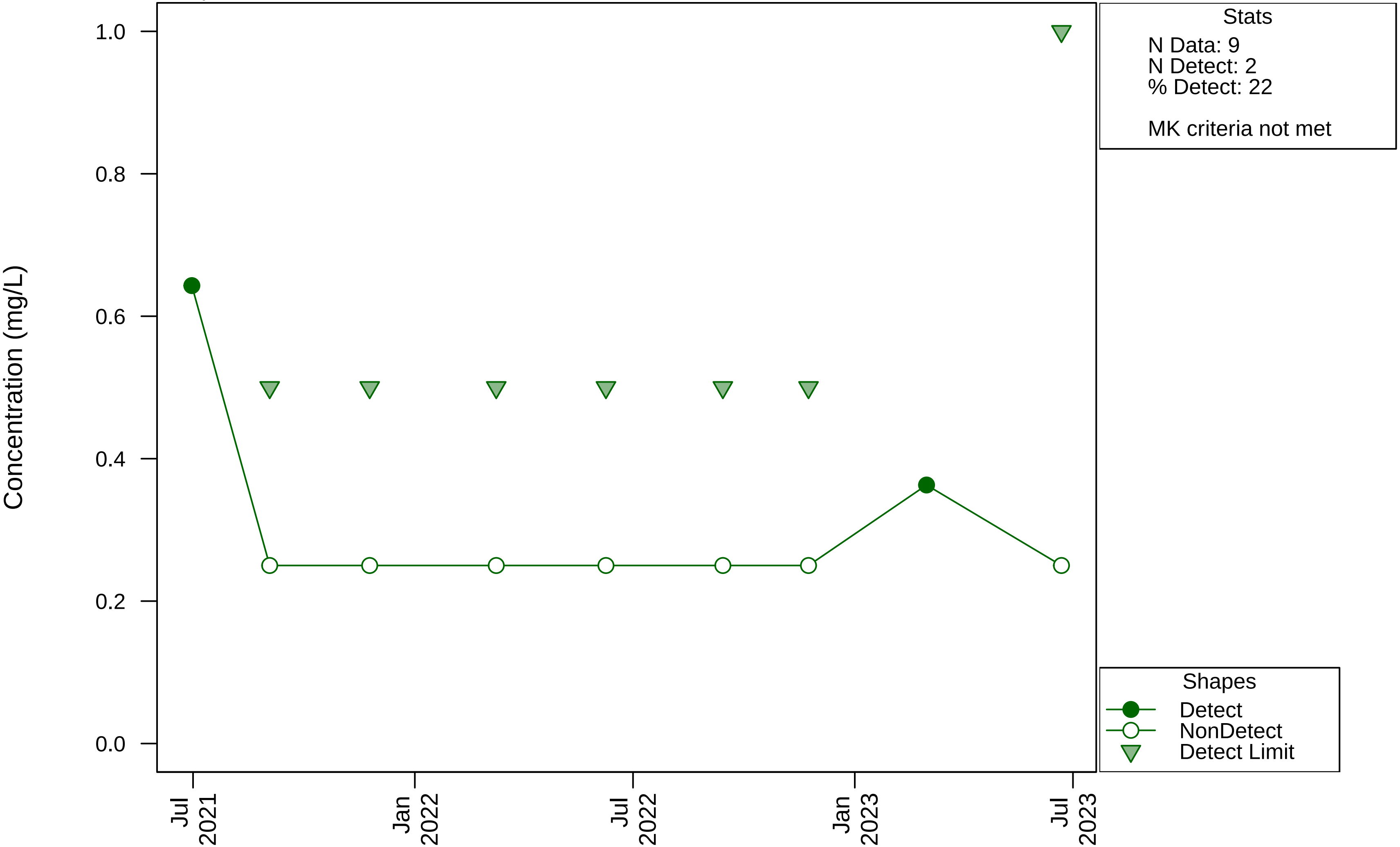

Scatterplots and Trend Analysis
D10, Chloride
Concentration (mg/L)
0
100
200
300
400
500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.477
Shapes
Detect
NonDetect
Detect Limit

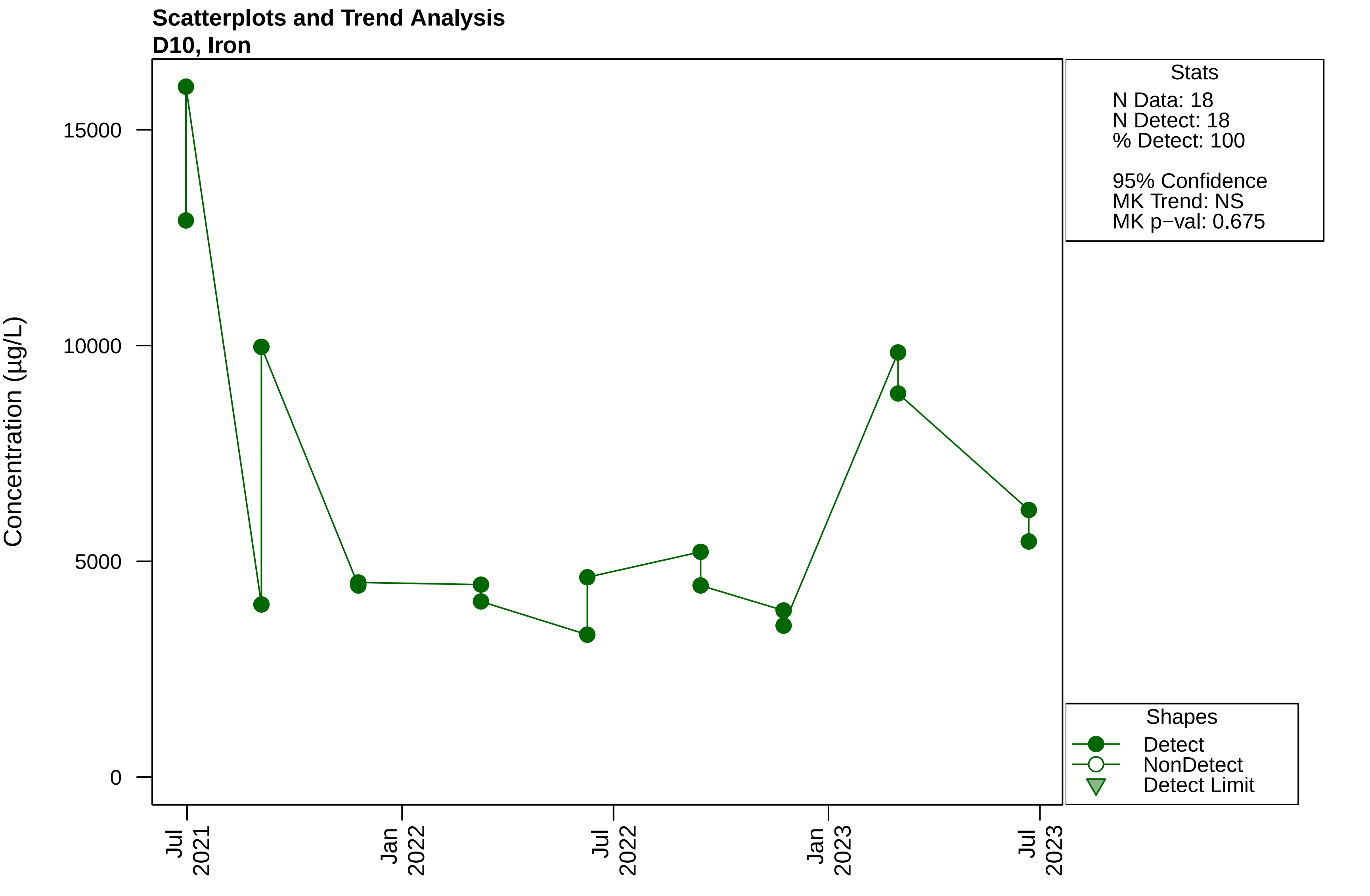
Scatterplots and Trend Analysis
D10, Chromium

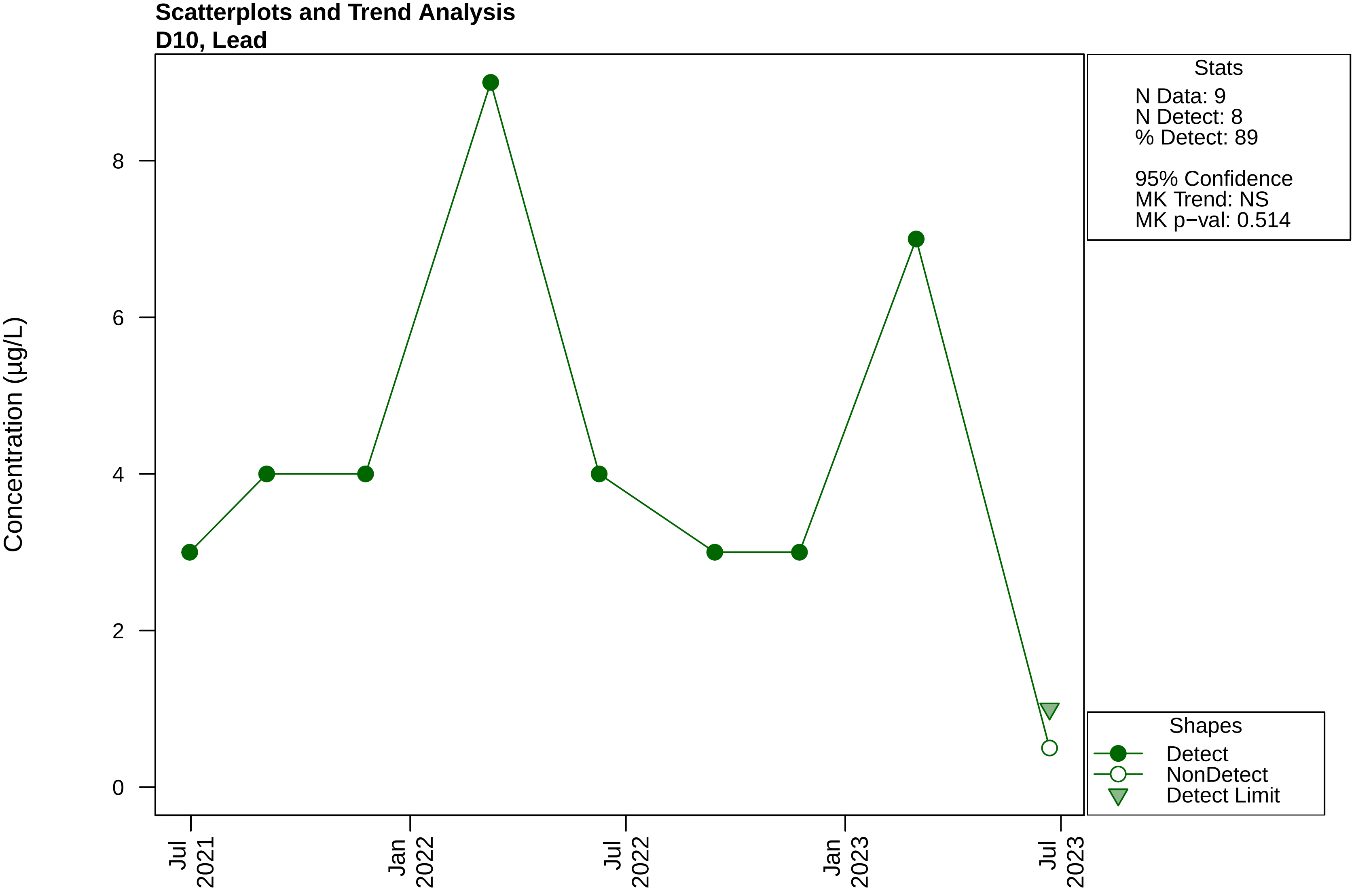



Scatterplots and Trend Analysis
D10, Electrical Conductivity (Field)
Concentration (uS/cm)
0
2000
4000
6000
8000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.345
Shapes
Detect
NonDetect
Detect Limit

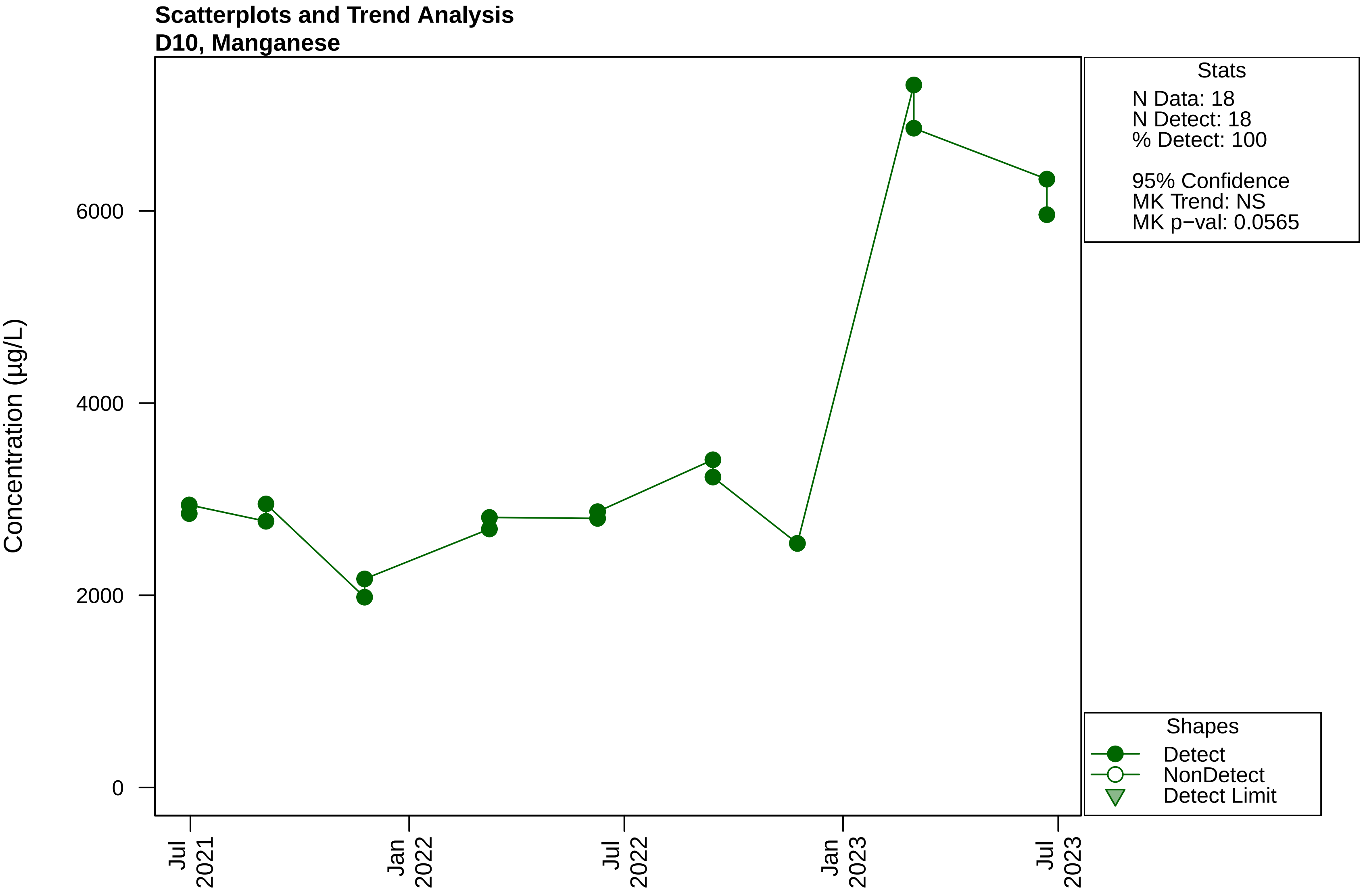
Scatterplots and Trend Analysis
D10, Fluoride



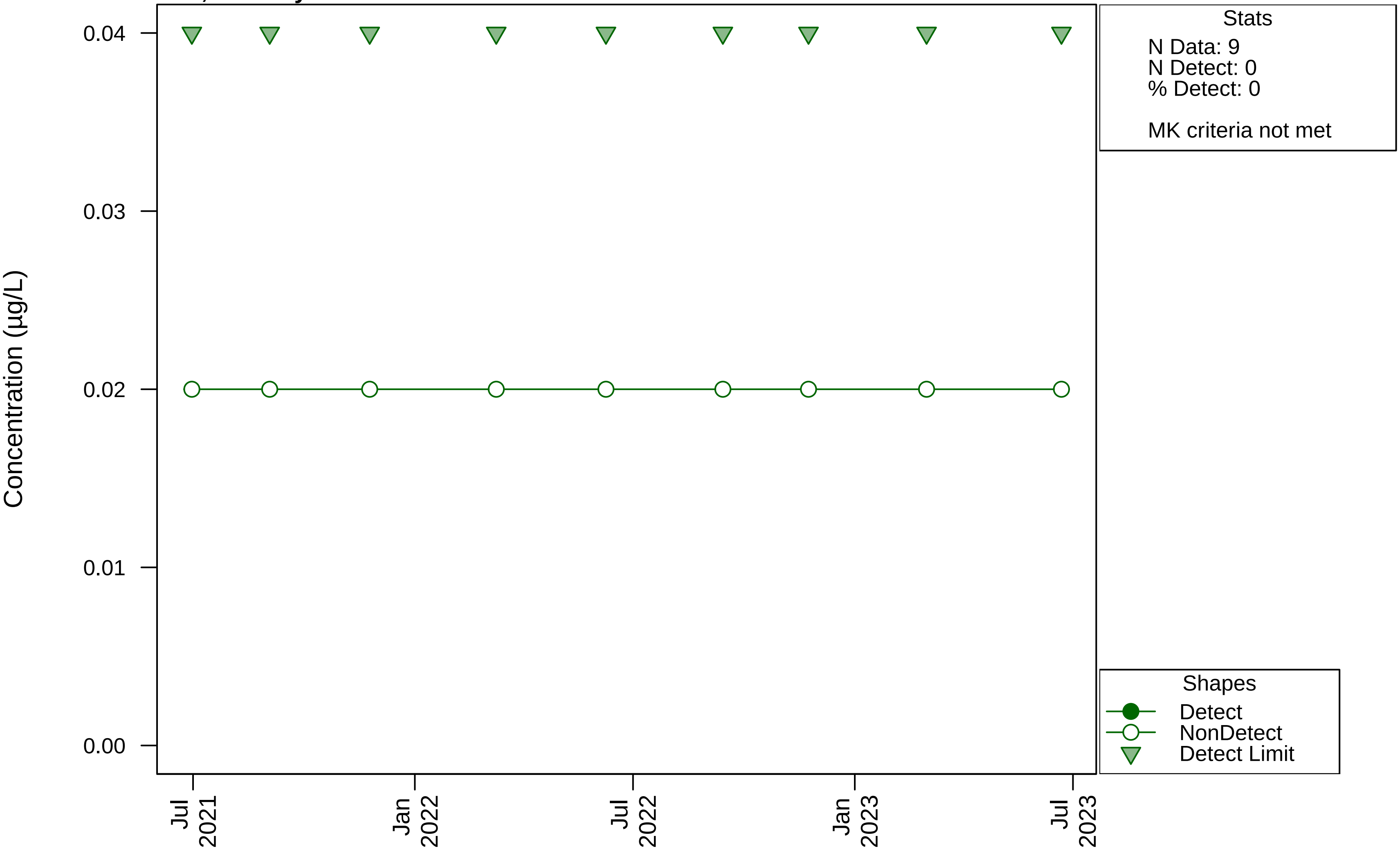

Scatterplots and Trend Analysis
D10, Iron
Concentration (µg/L)
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.675
Shapes
Detect
NonDetect
Detect Limit



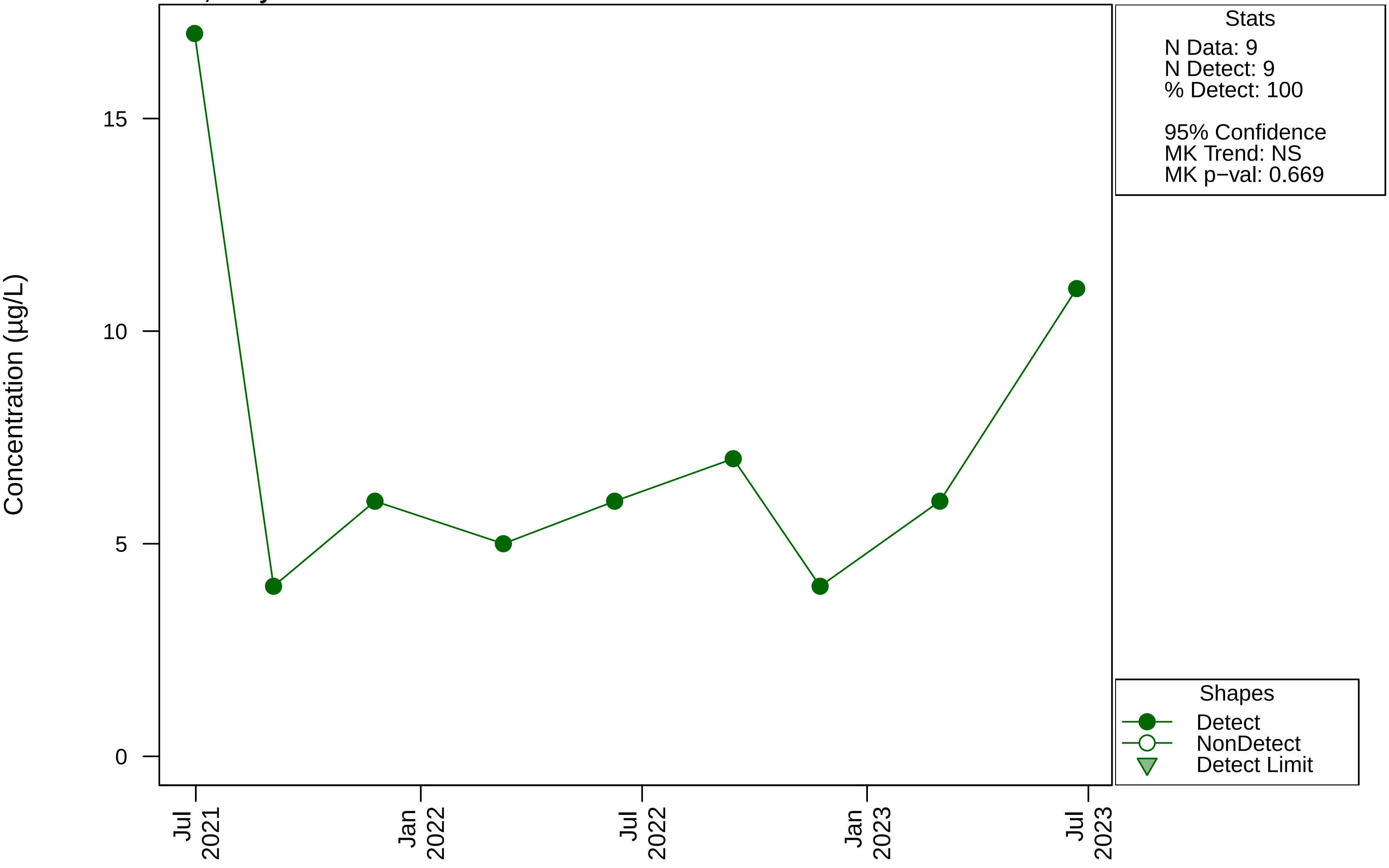
Scatterplots and Trend Analysis
D10, Lead
Concentration (µg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 8
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.514
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D10, Manganese
Concentration (µg/L)
0
2000
4000
6000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0565
Shapes
Detect
NonDetect
Detect Limit

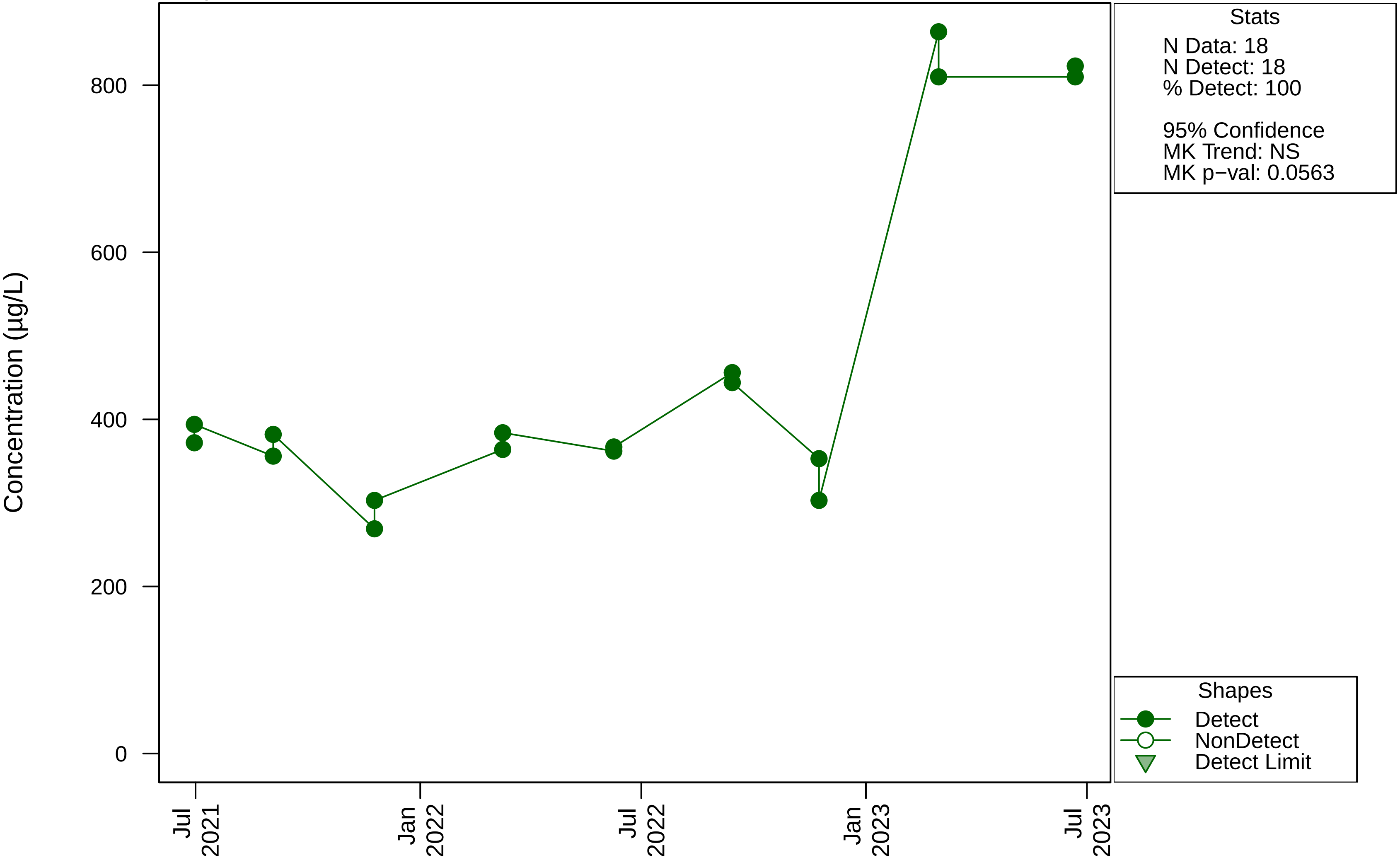
Scatterplots and Trend Analysis
D10, Mercury

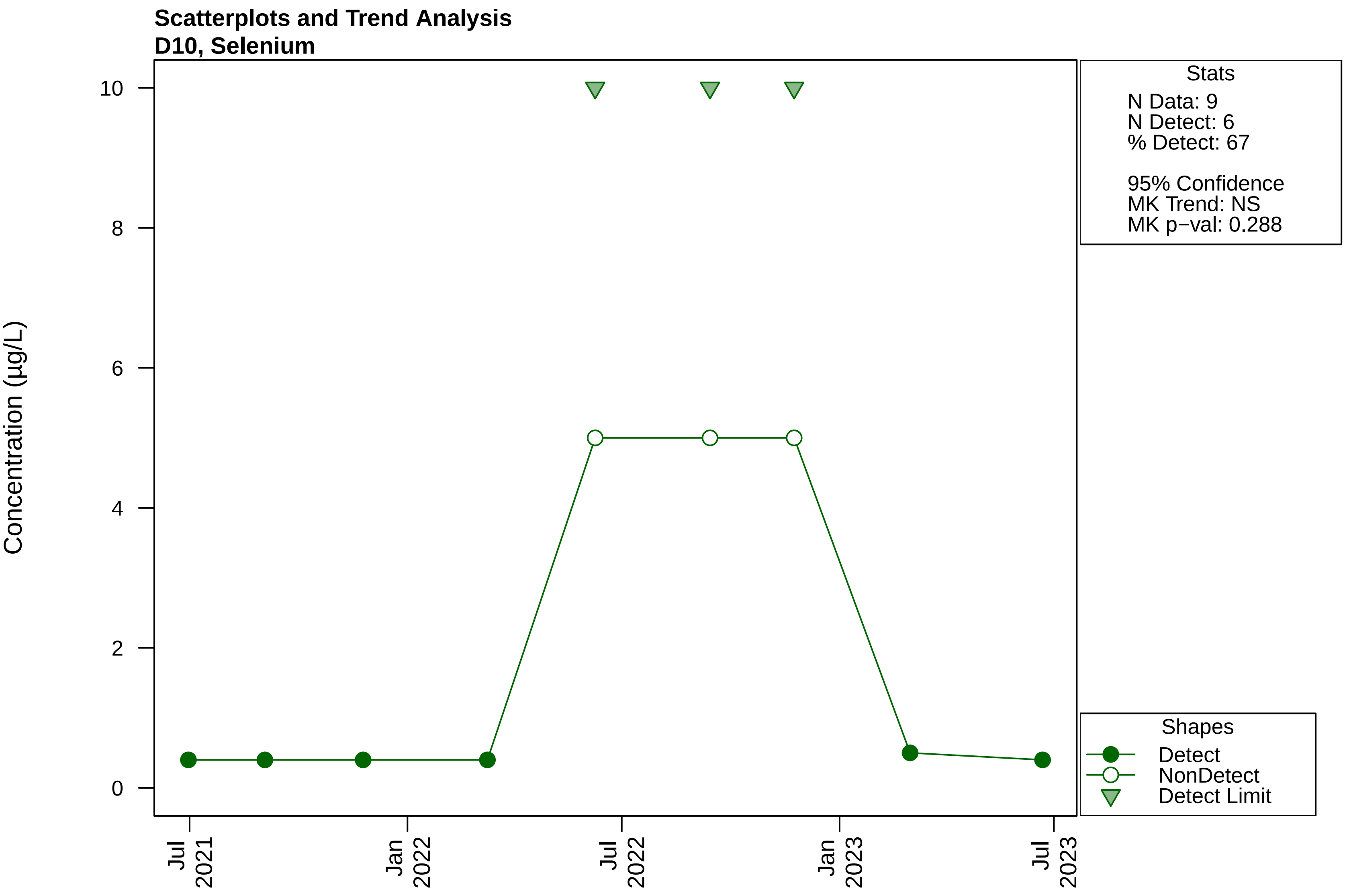


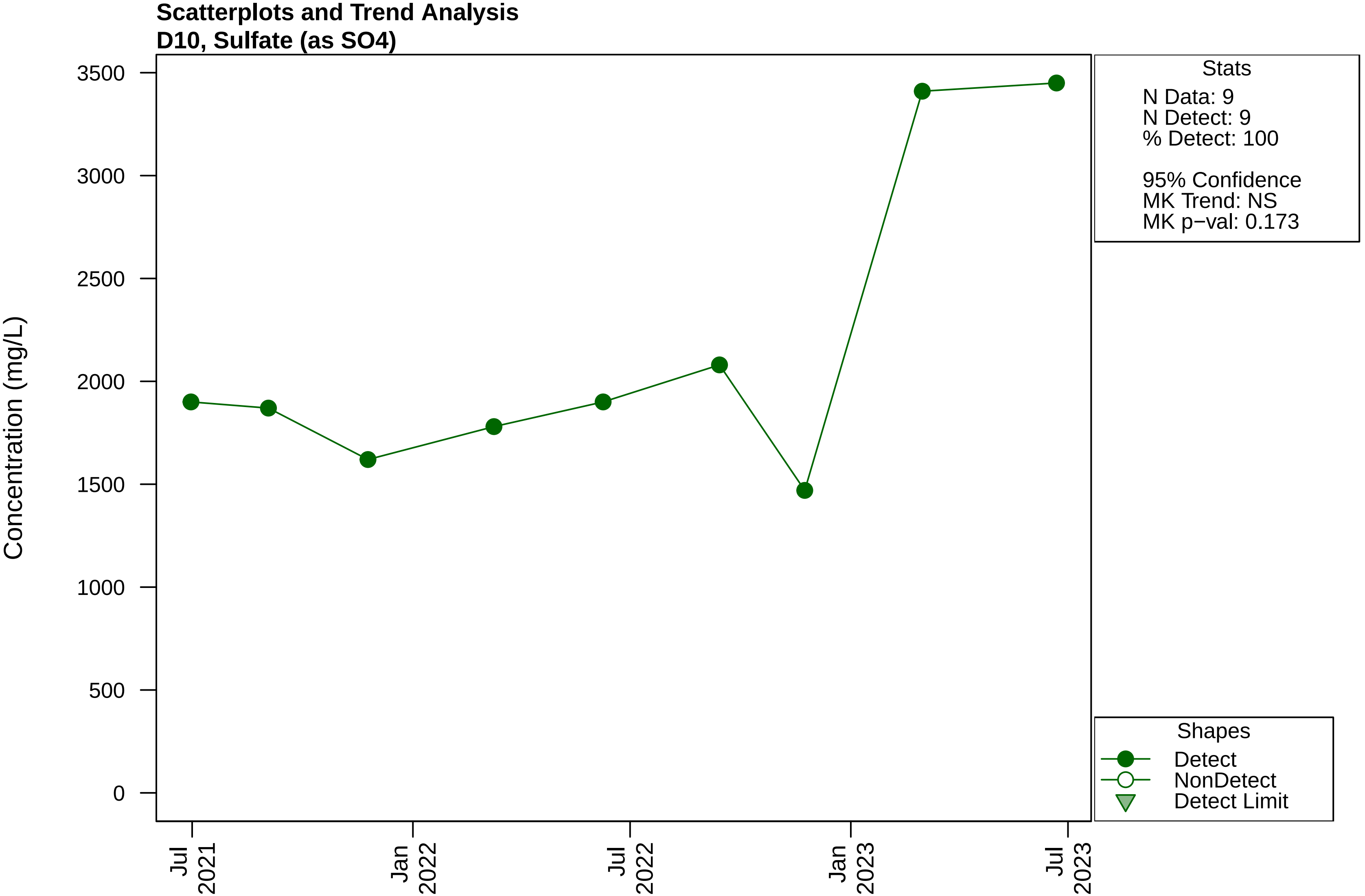
Scatterplots and Trend Analysis
D10, Molybdenum



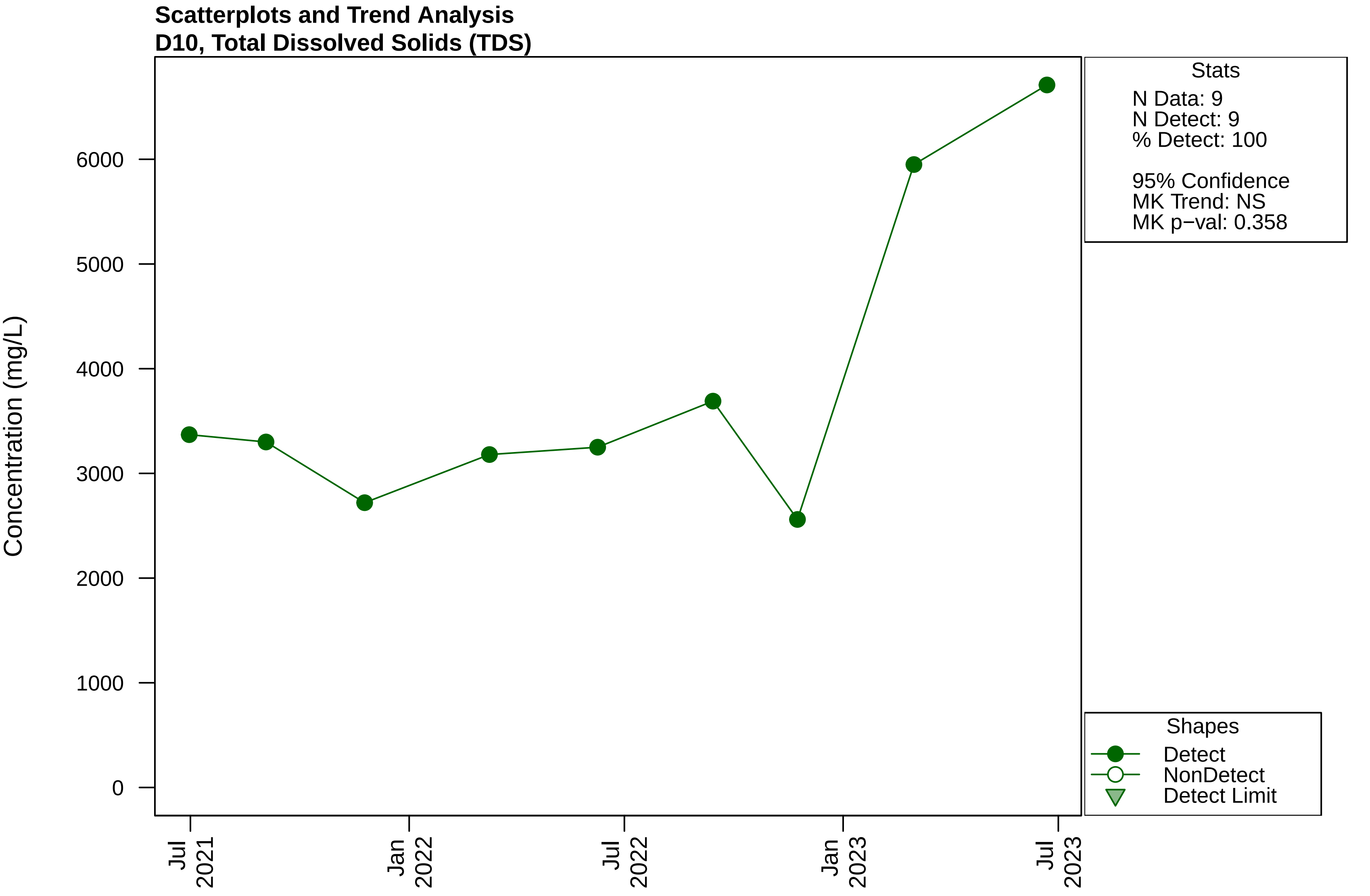
Scatterplots and Trend Analysis
D10, Nickel



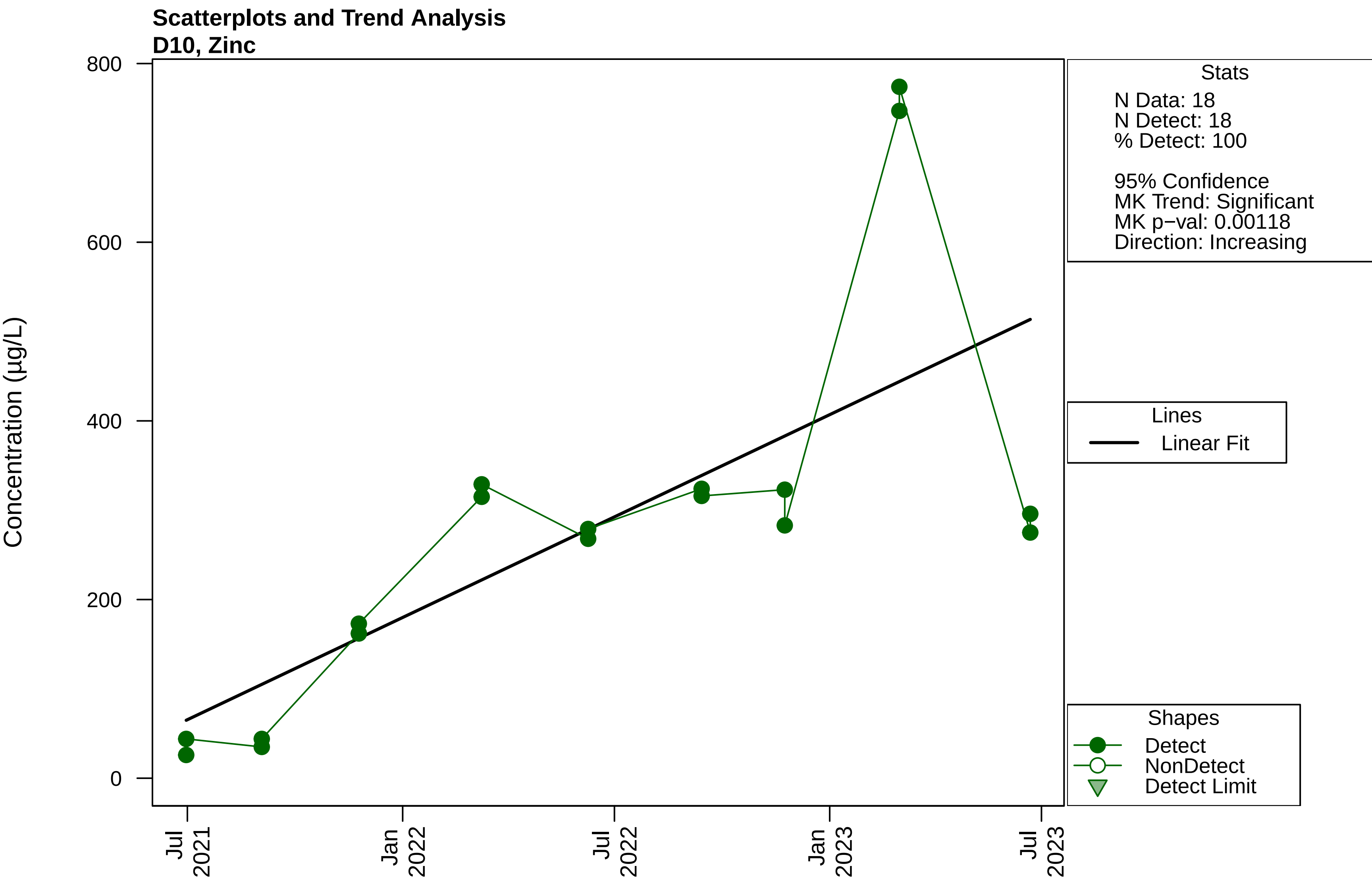

Scatterplots and Trend Analysis
D10, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 6
% Detect: 67
95% Confidence
MK Trend: NS
MK p−val: 0.288
Shapes
Detect
NonDetect
Detect Limit



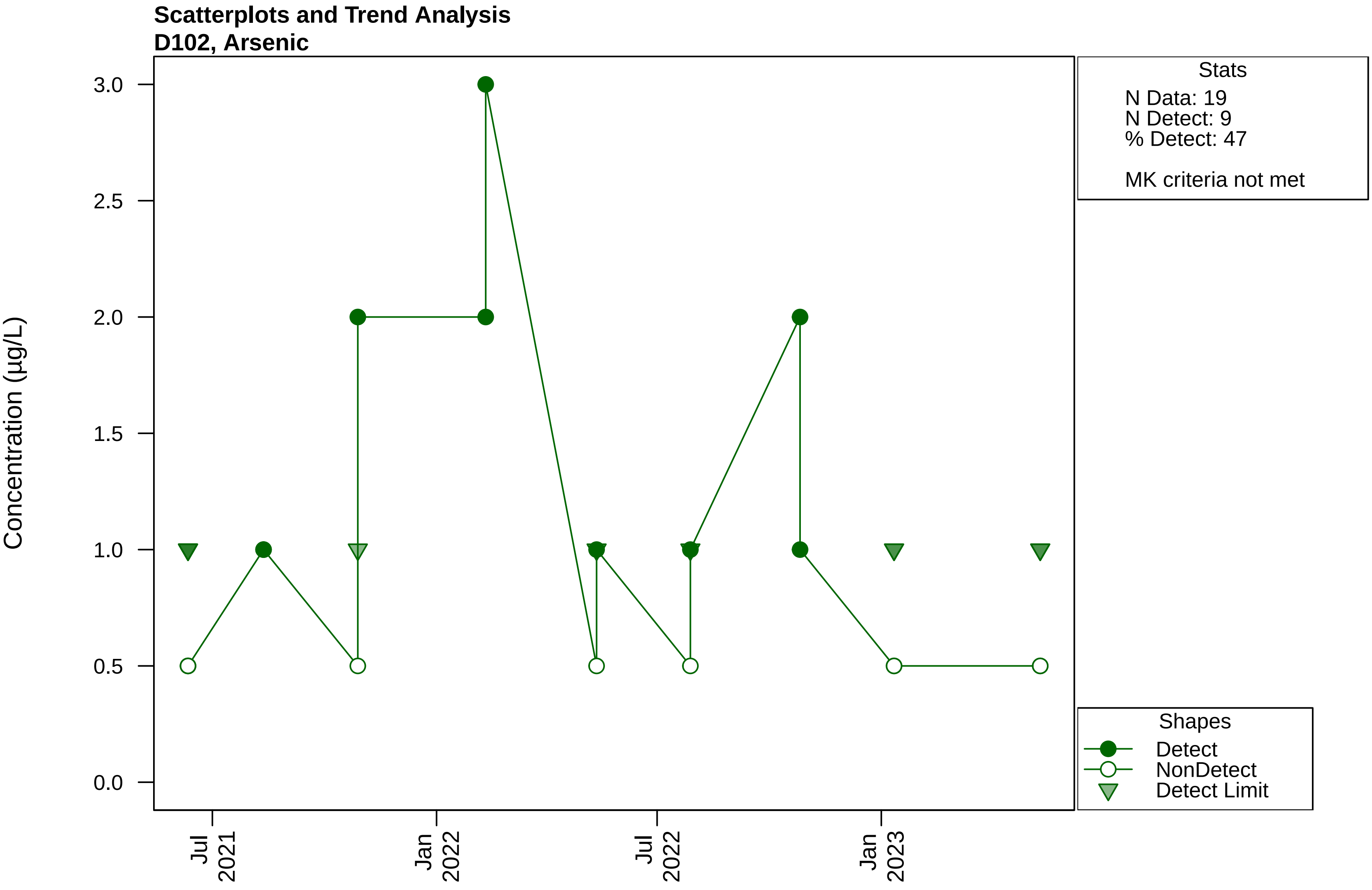
Scatterplots and Trend Analysis
D10, Sulfate (as SO4)
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.173
Shapes
Detect
NonDetect
Detect Limit

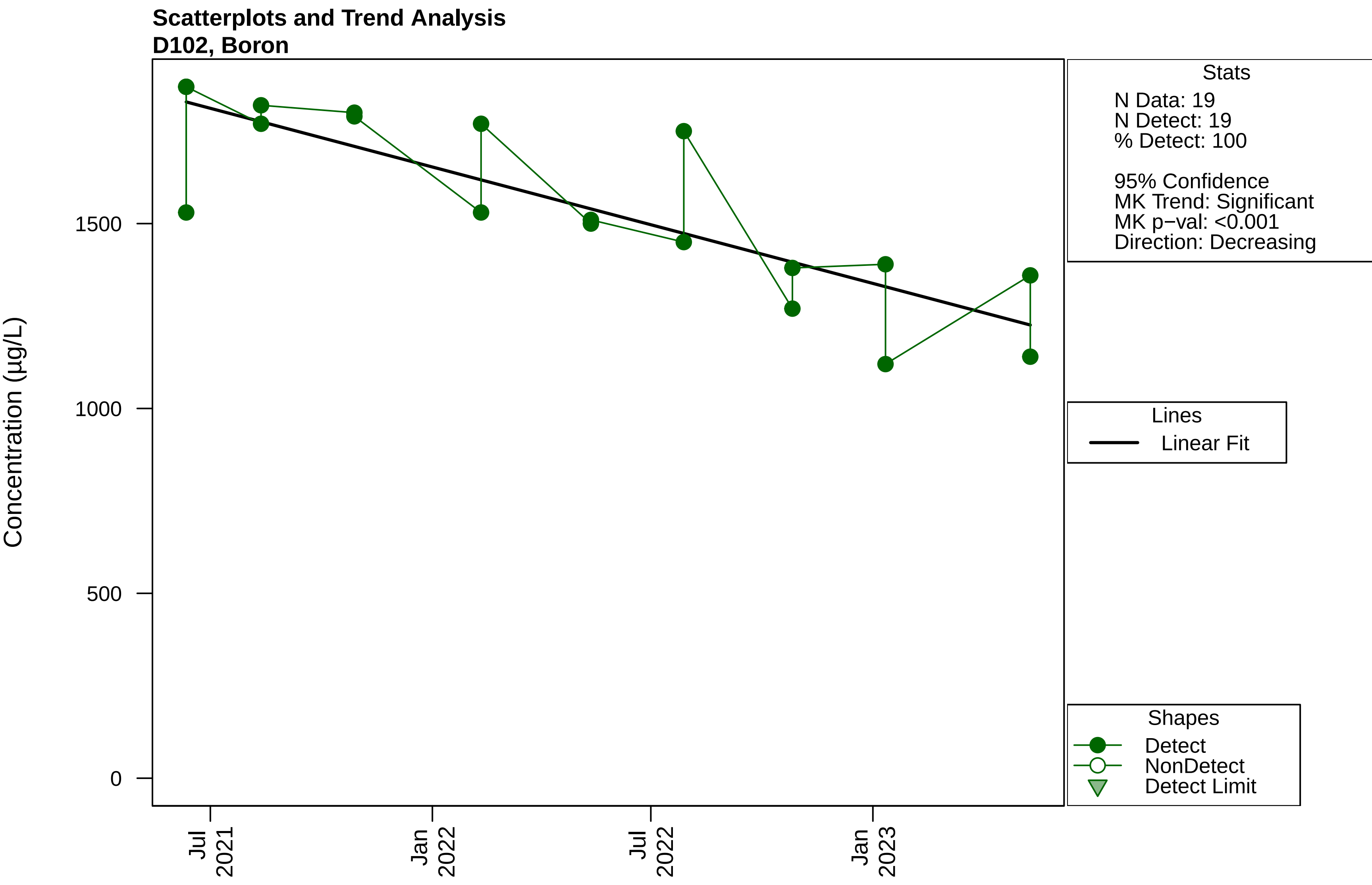


Scatterplots and Trend Analysis
D10, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
1000
2000
3000
4000
5000
6000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.358
Shapes
Detect
NonDetect
Detect Limit

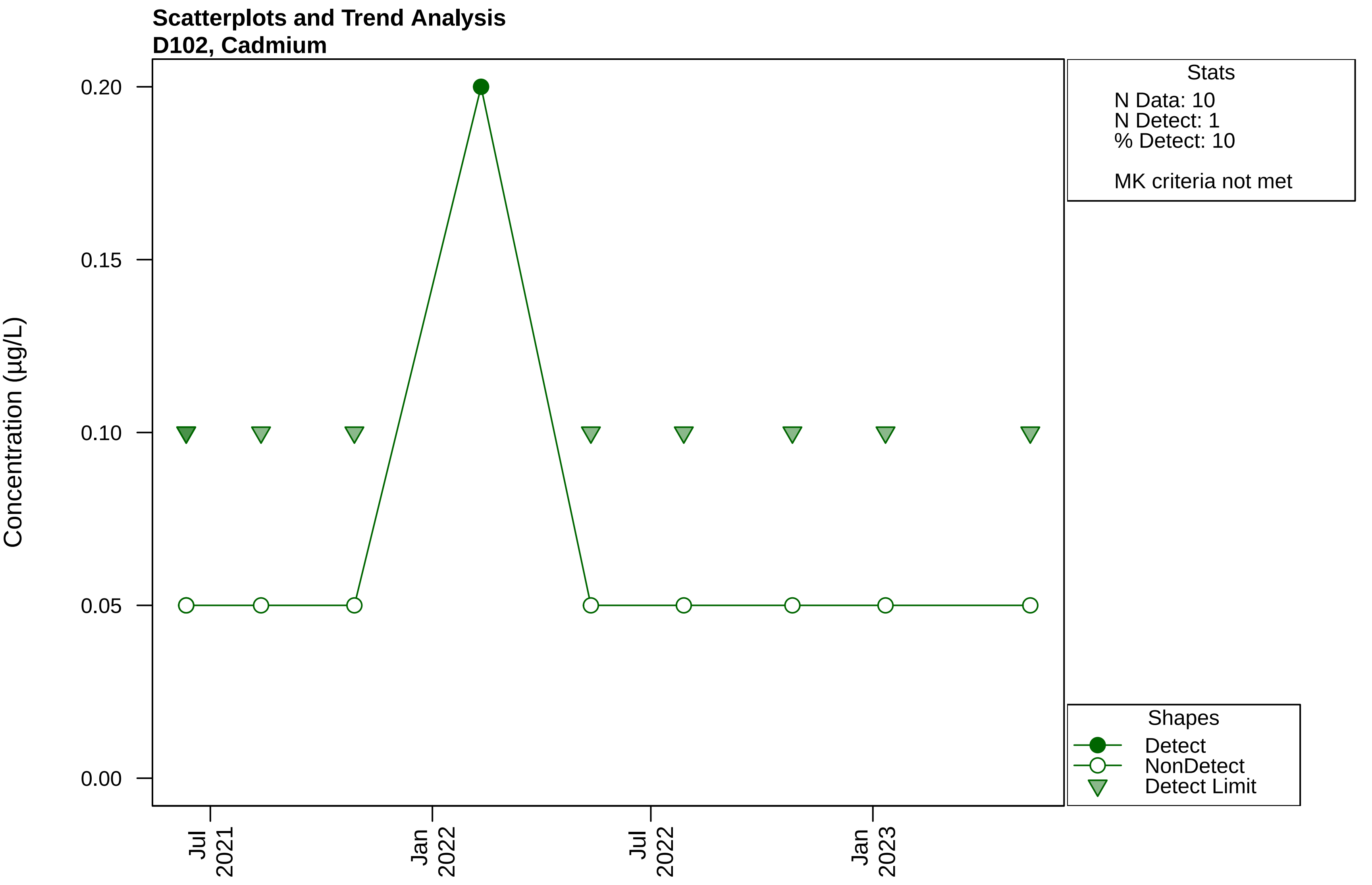


Scatterplots and Trend Analysis
D10, Zinc
Concentration (µg/L)
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00118
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

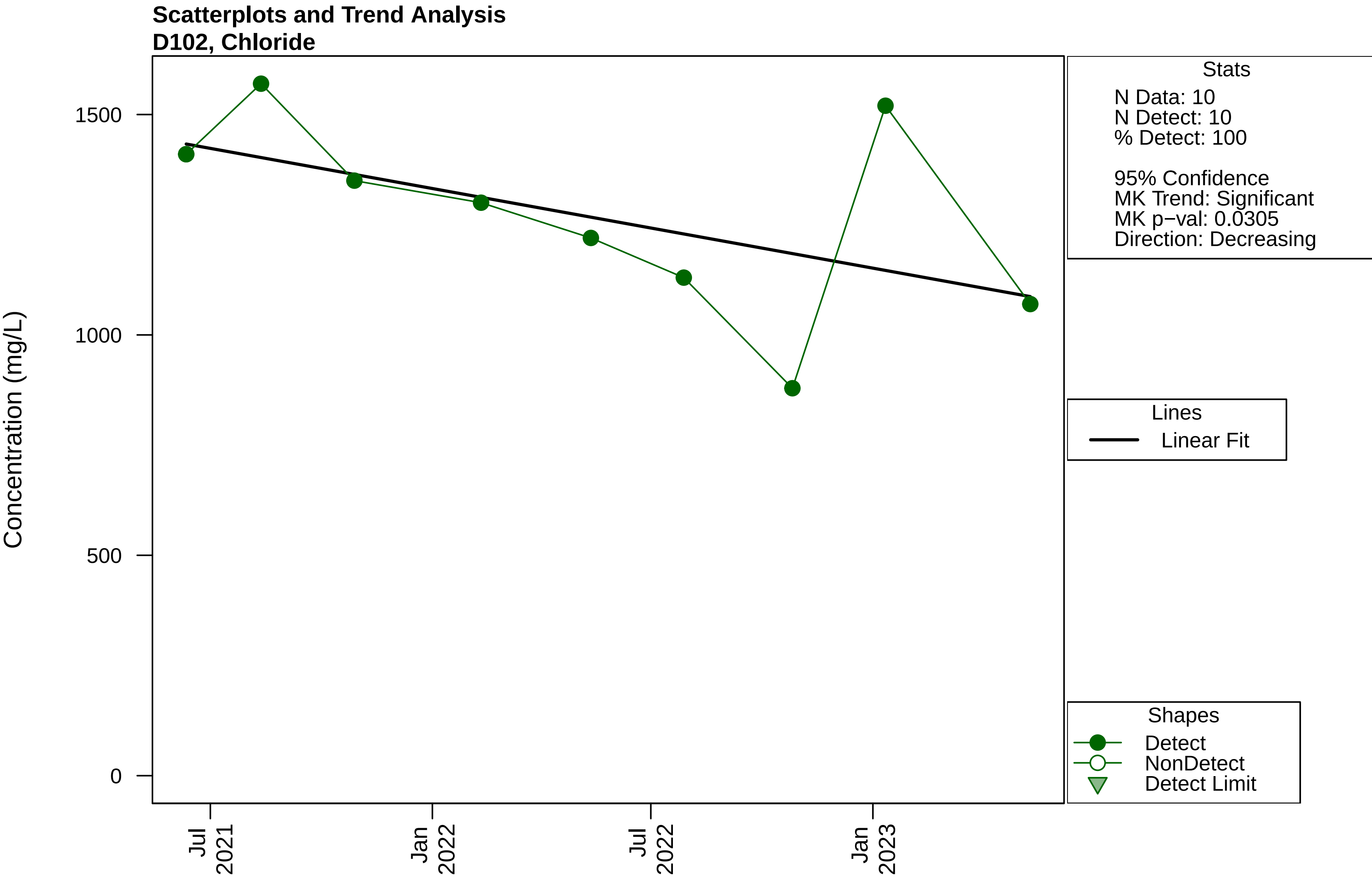

Scatterplots and Trend Analysis
D102, Arsenic
Concentration (µg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 9
% Detect: 47
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



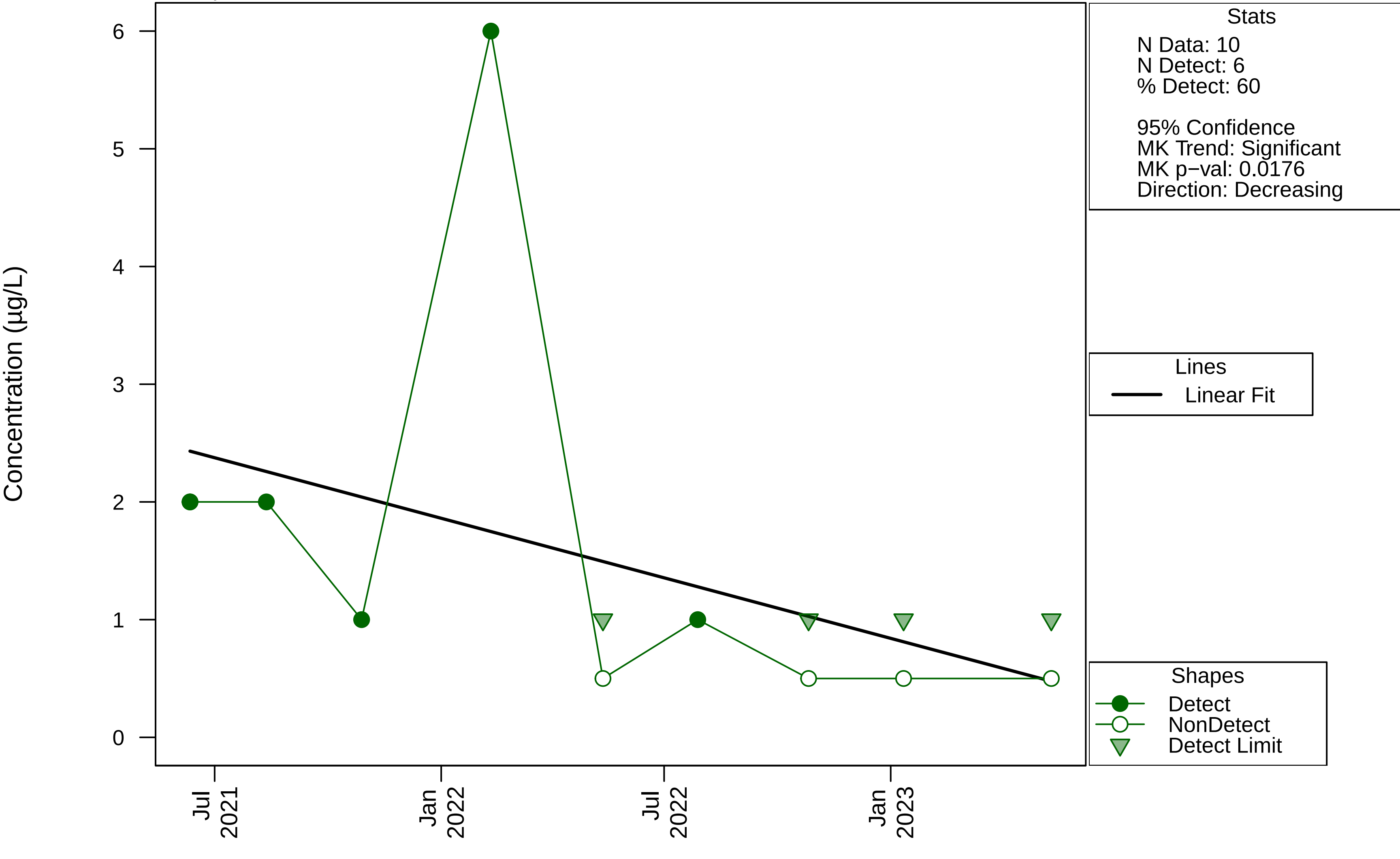
Scatterplots and Trend Analysis
D102, Boron
Concentration (µg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

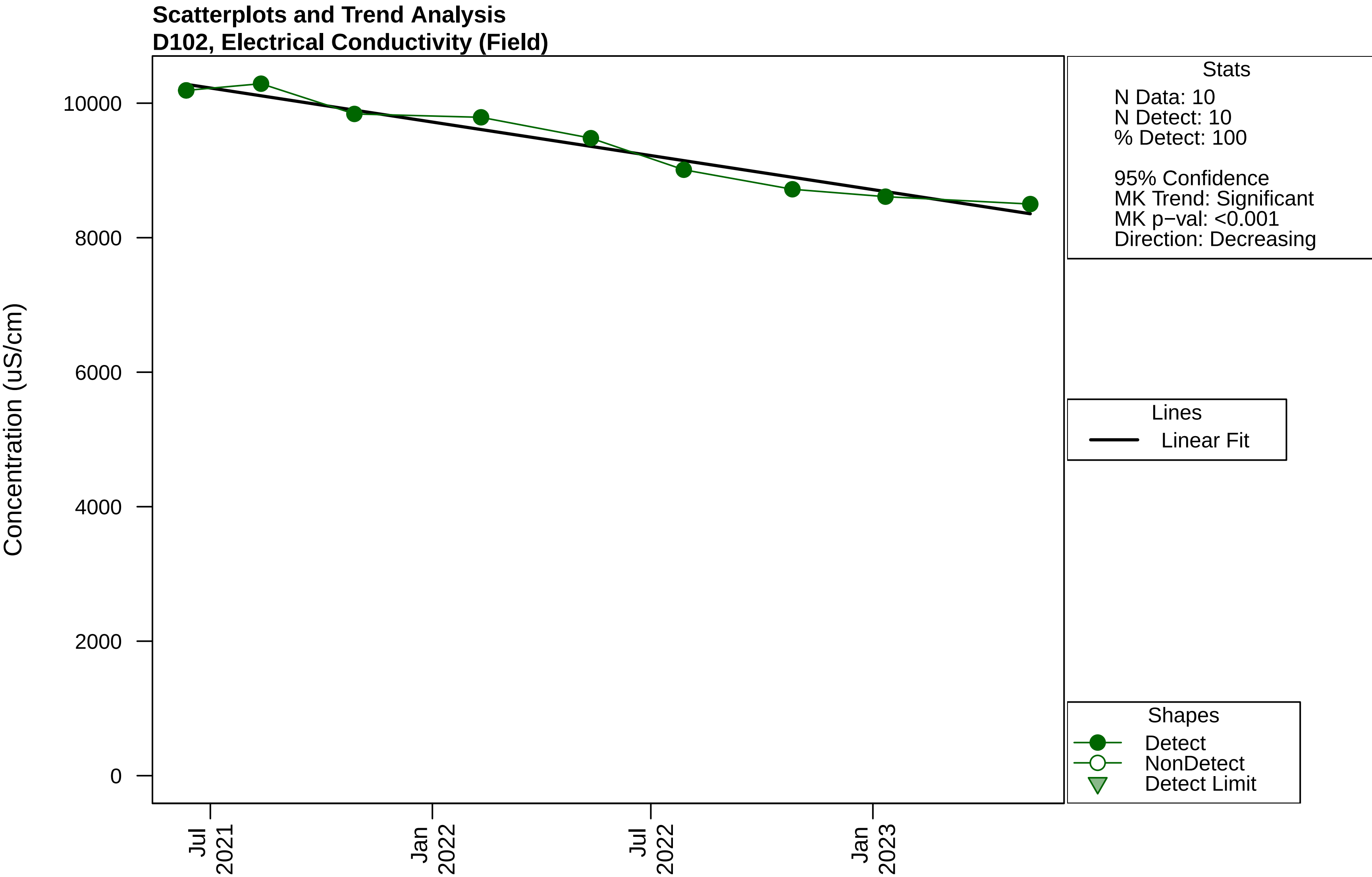


Scatterplots and Trend Analysis
D102, Cadmium
Concentration (µg/L)
0.20
0.15
0.10
0.05
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

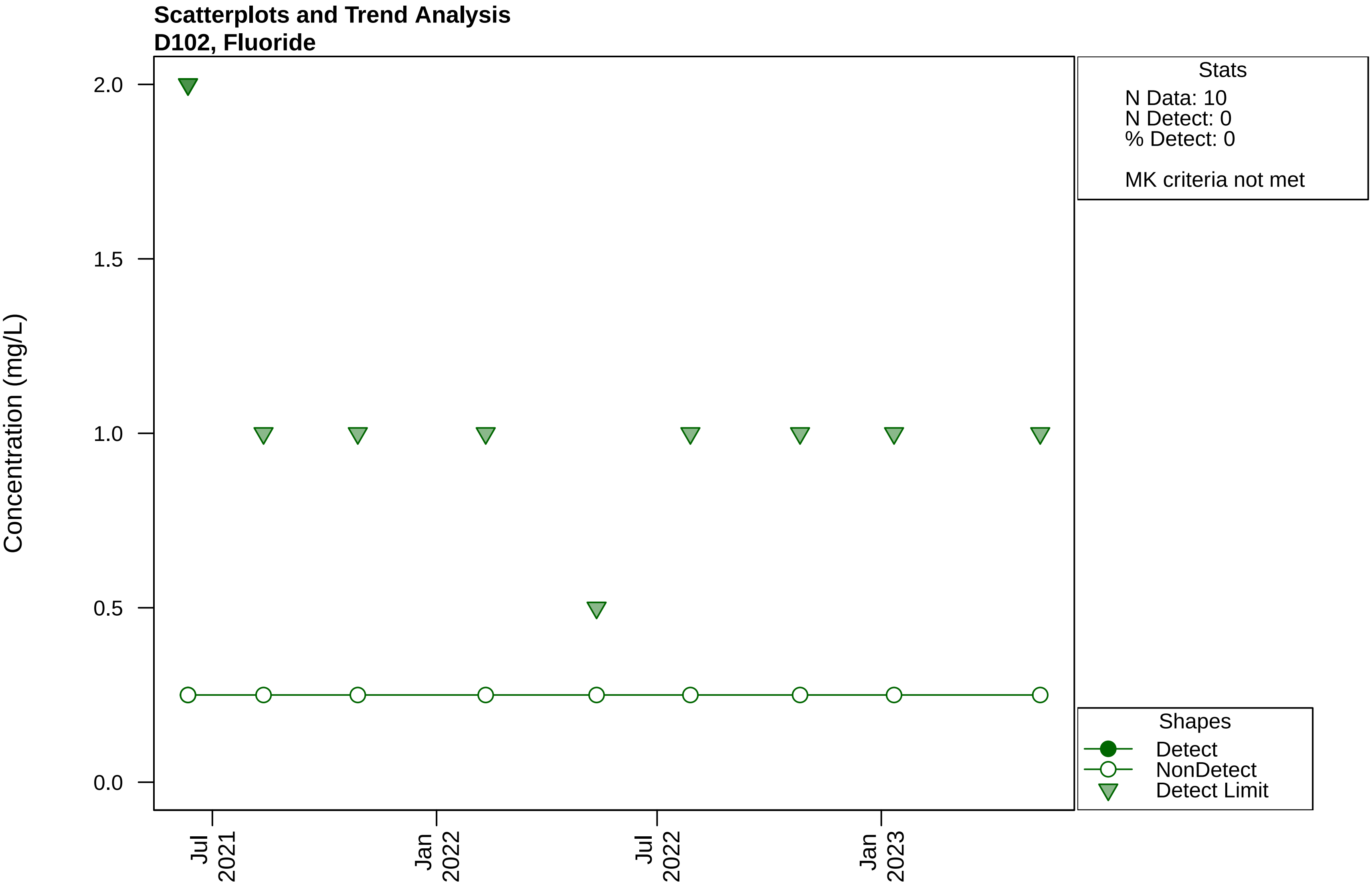

Scatterplots and Trend Analysis
D102, Chloride
Concentration (mg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0305
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D102, Chromium

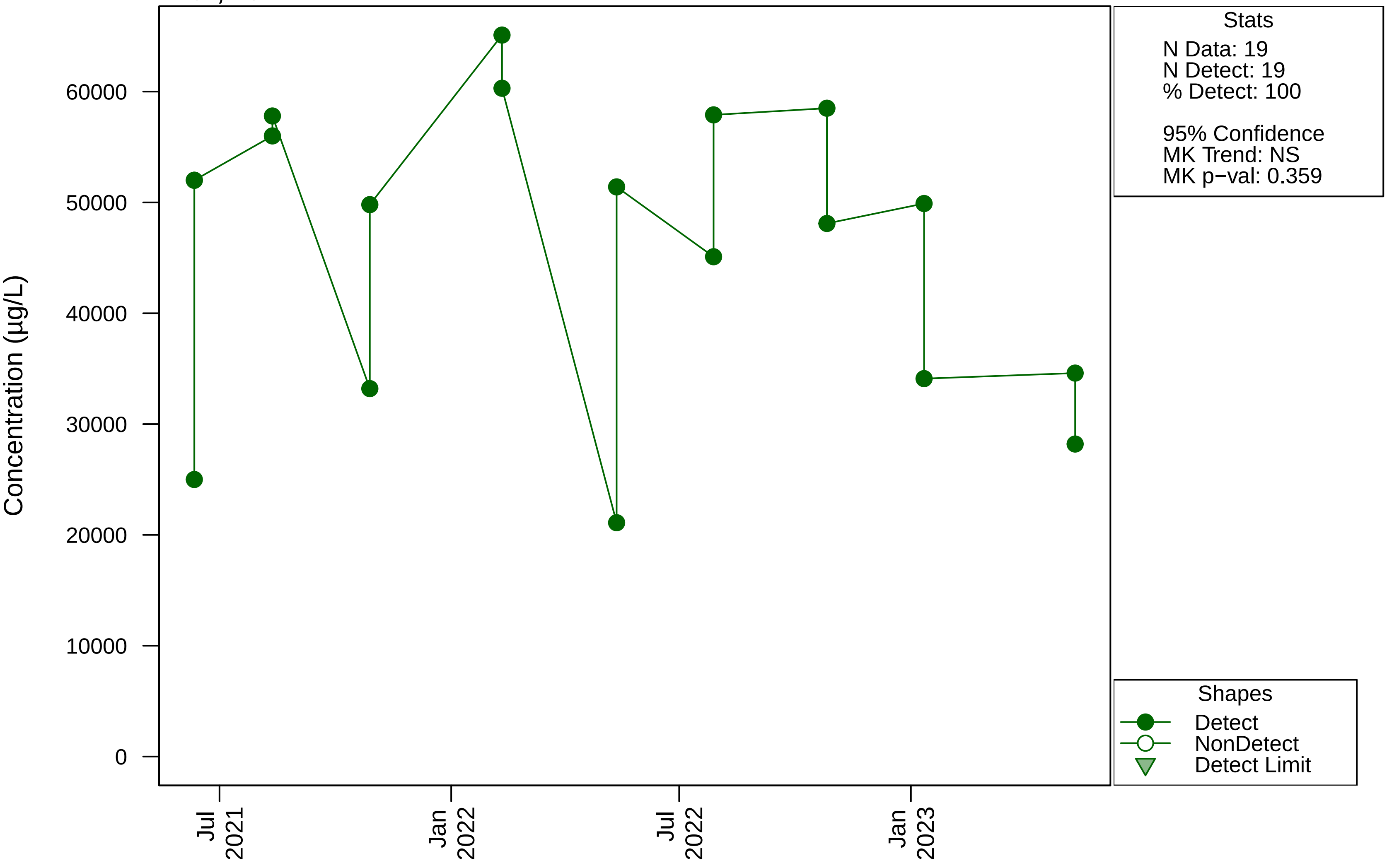


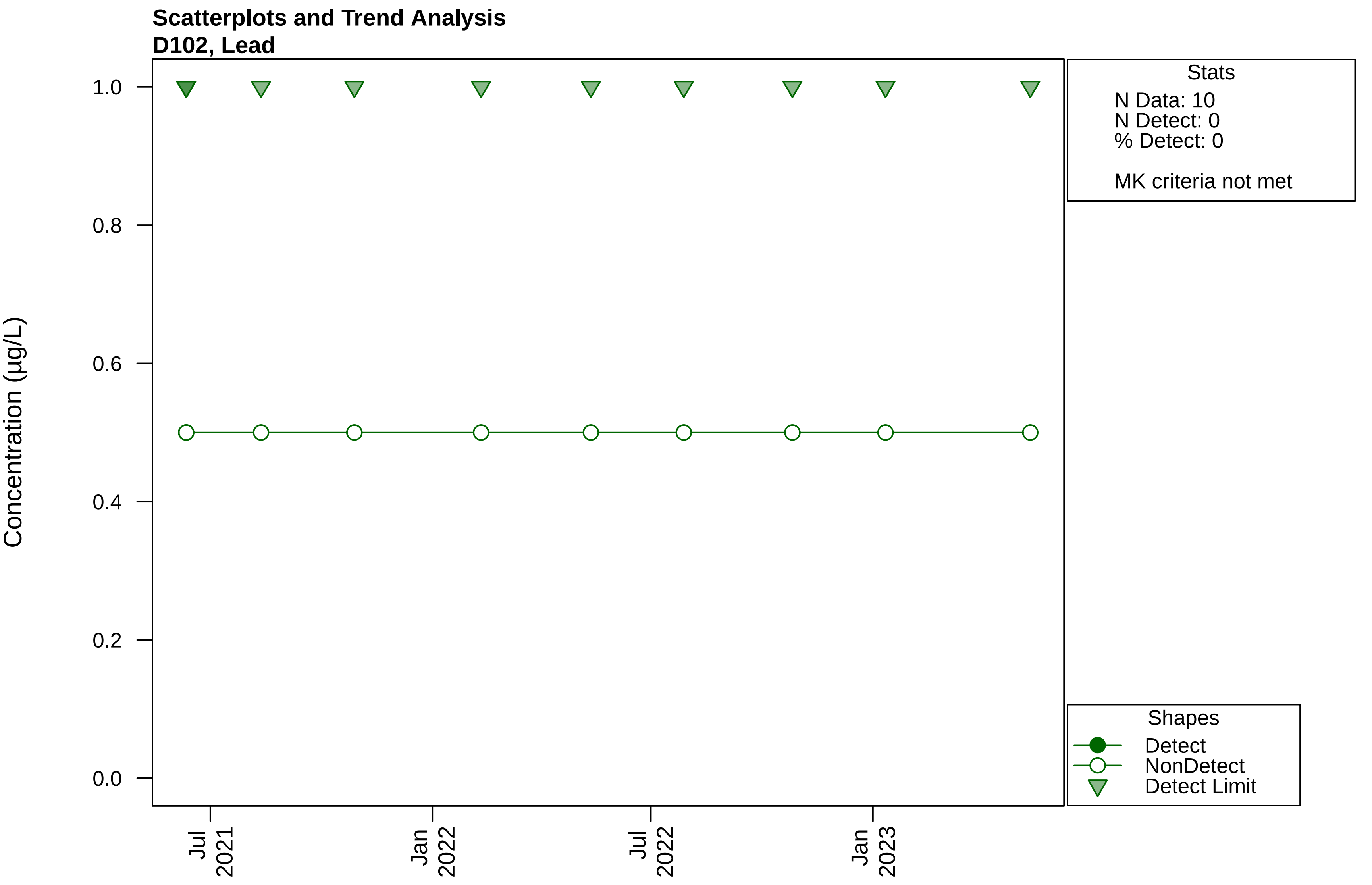


Scatterplots and Trend Analysis
D102, Electrical Conductivity (Field)
Concentration (uS/cm)
10000
8000
6000
4000
2000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

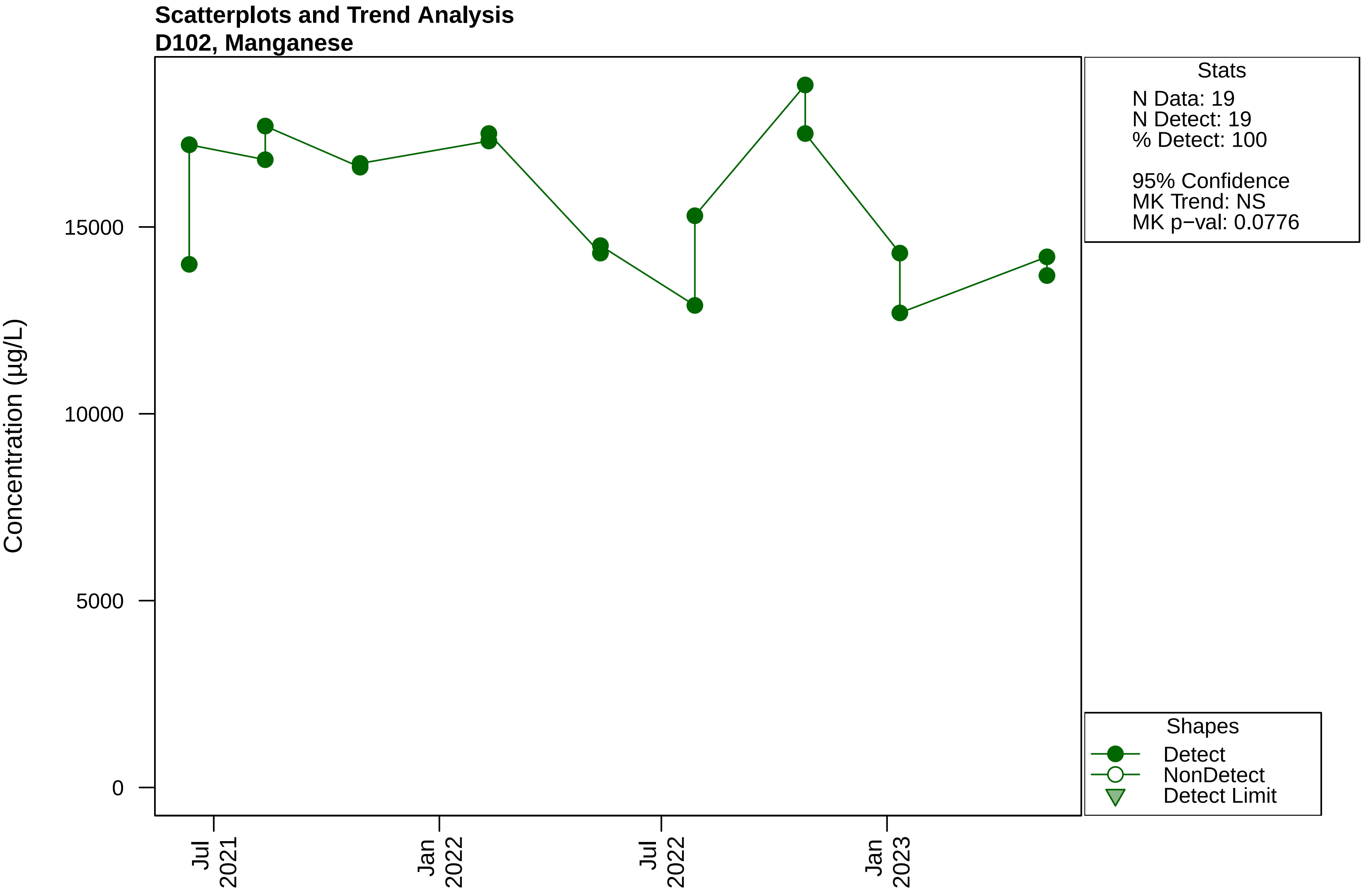

Scatterplots and Trend Analysis
D102, Fluoride
Concentration (mg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

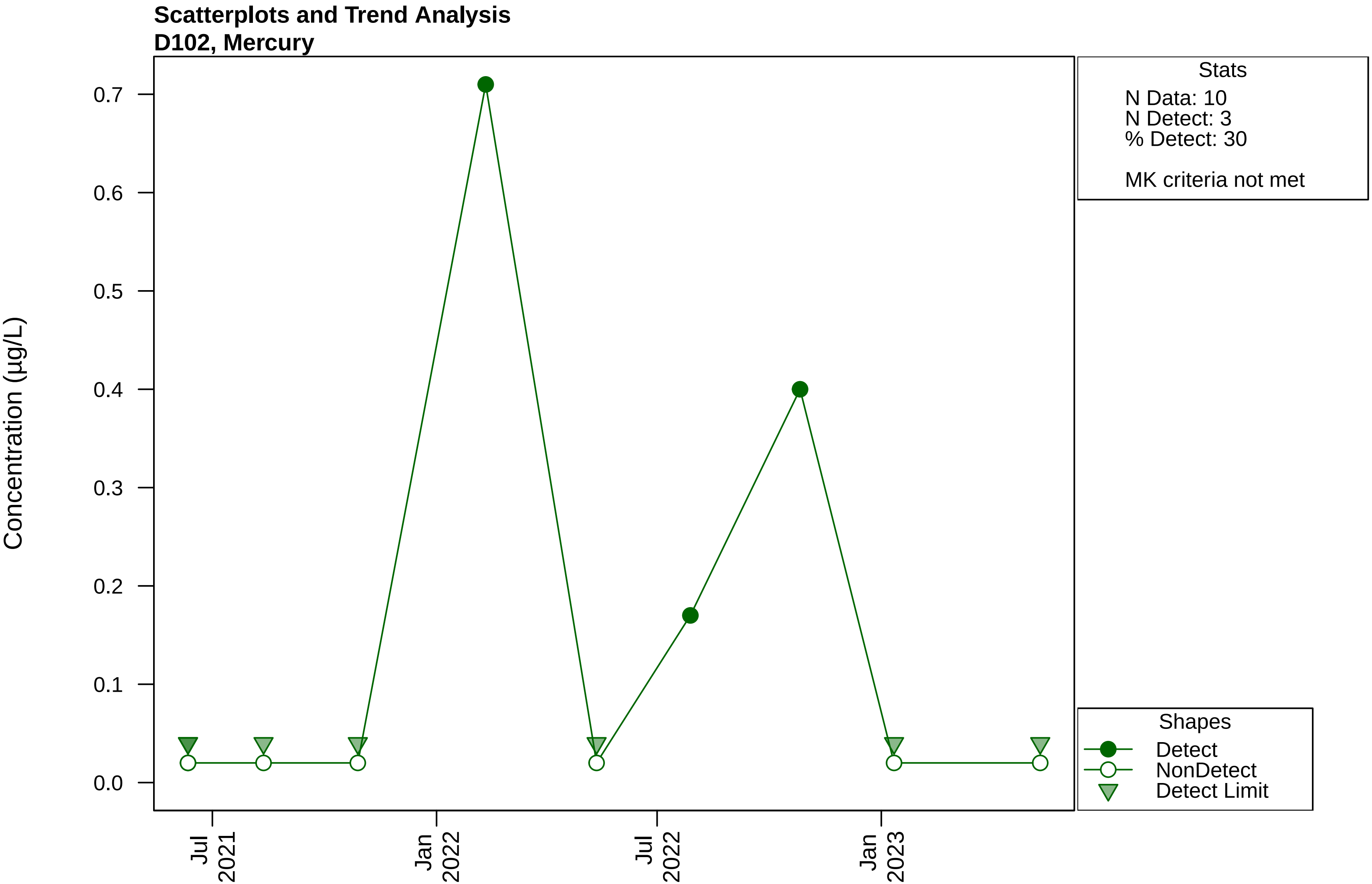
Scatterplots and Trend Analysis
D102, Iron



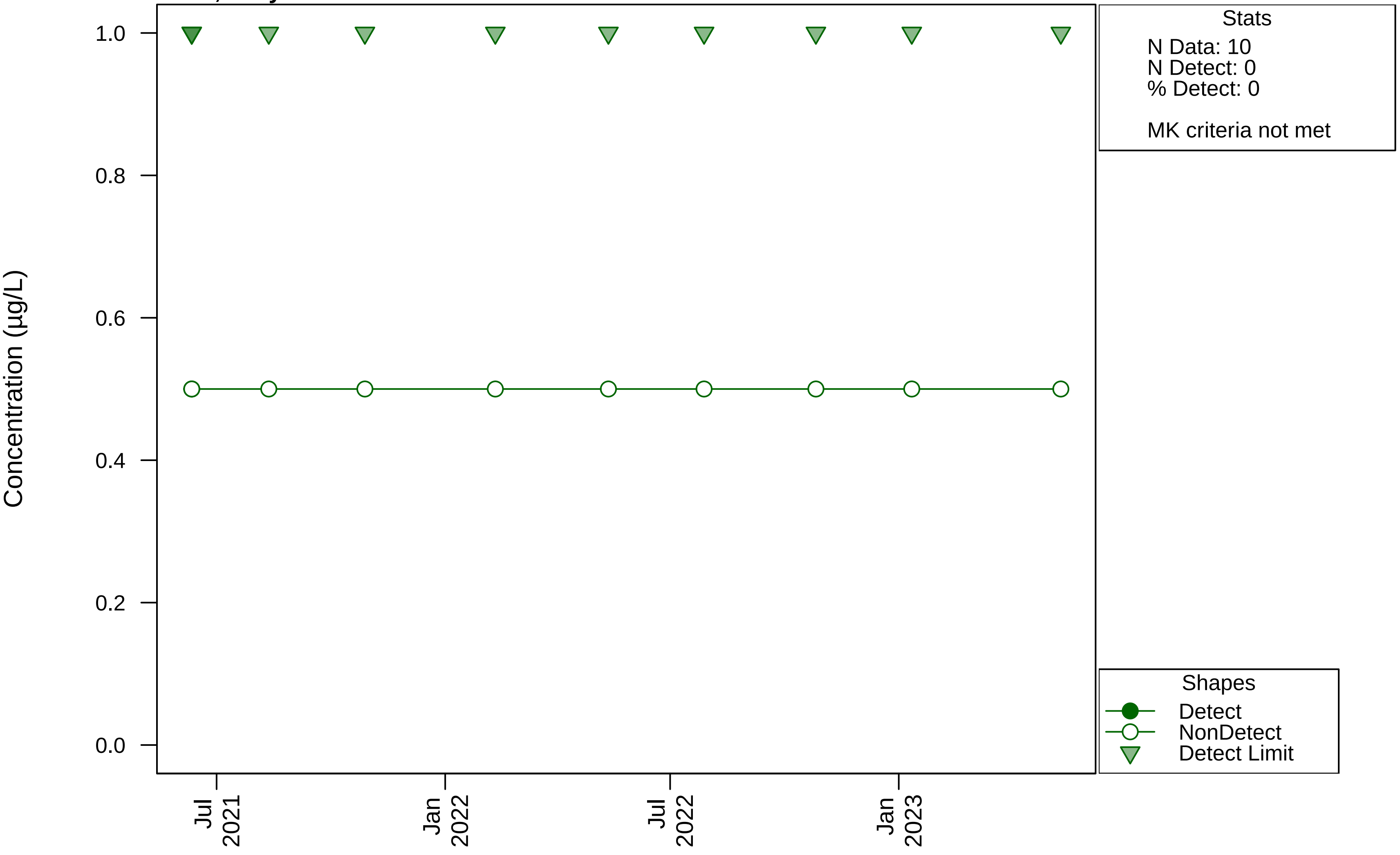


Scatterplots and Trend Analysis
D102, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

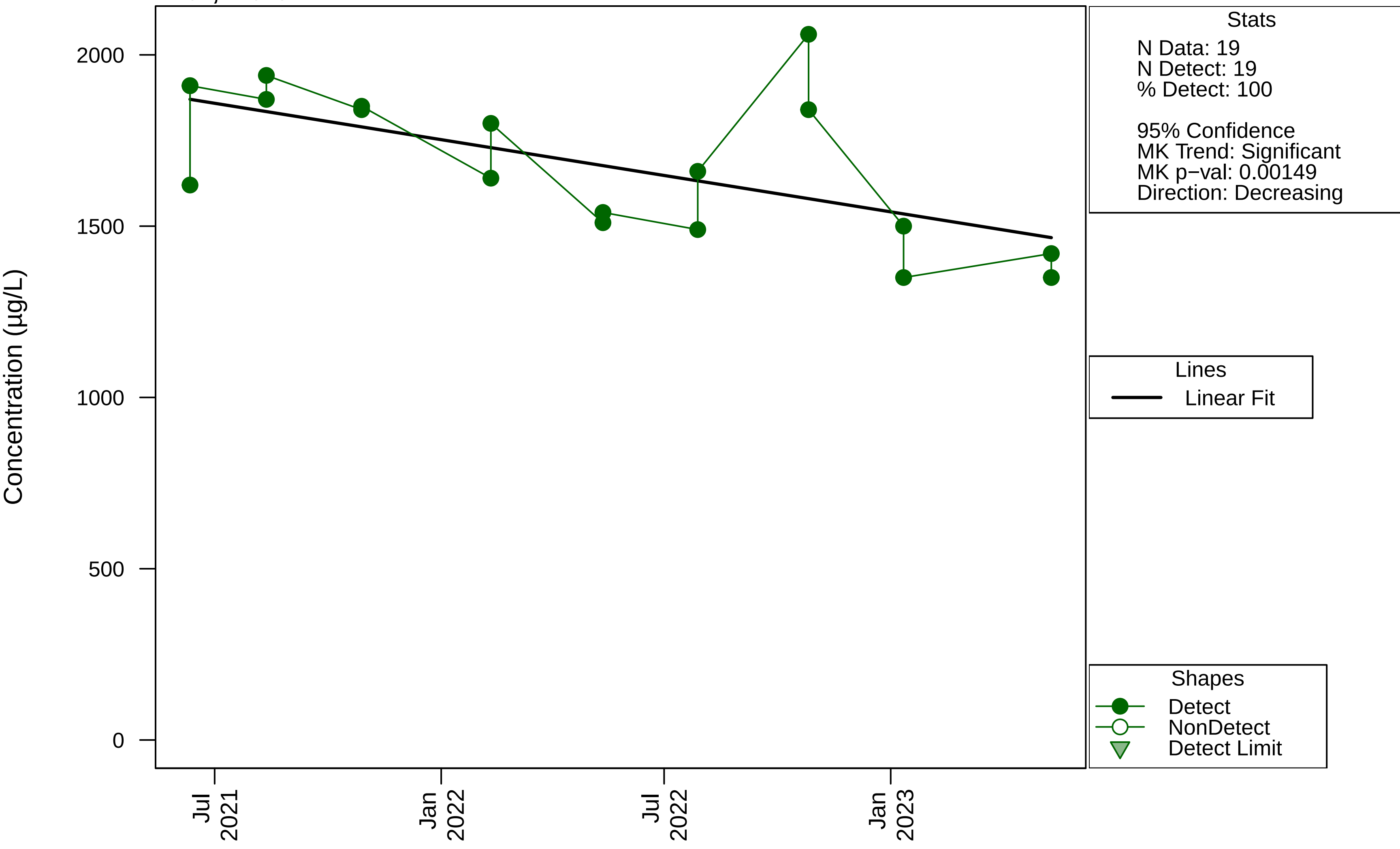

Scatterplots and Trend Analysis
D102, Manganese
Concentration (µg/L)
0
5000
10000
15000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0776
Shapes
Detect
NonDetect
Detect Limit

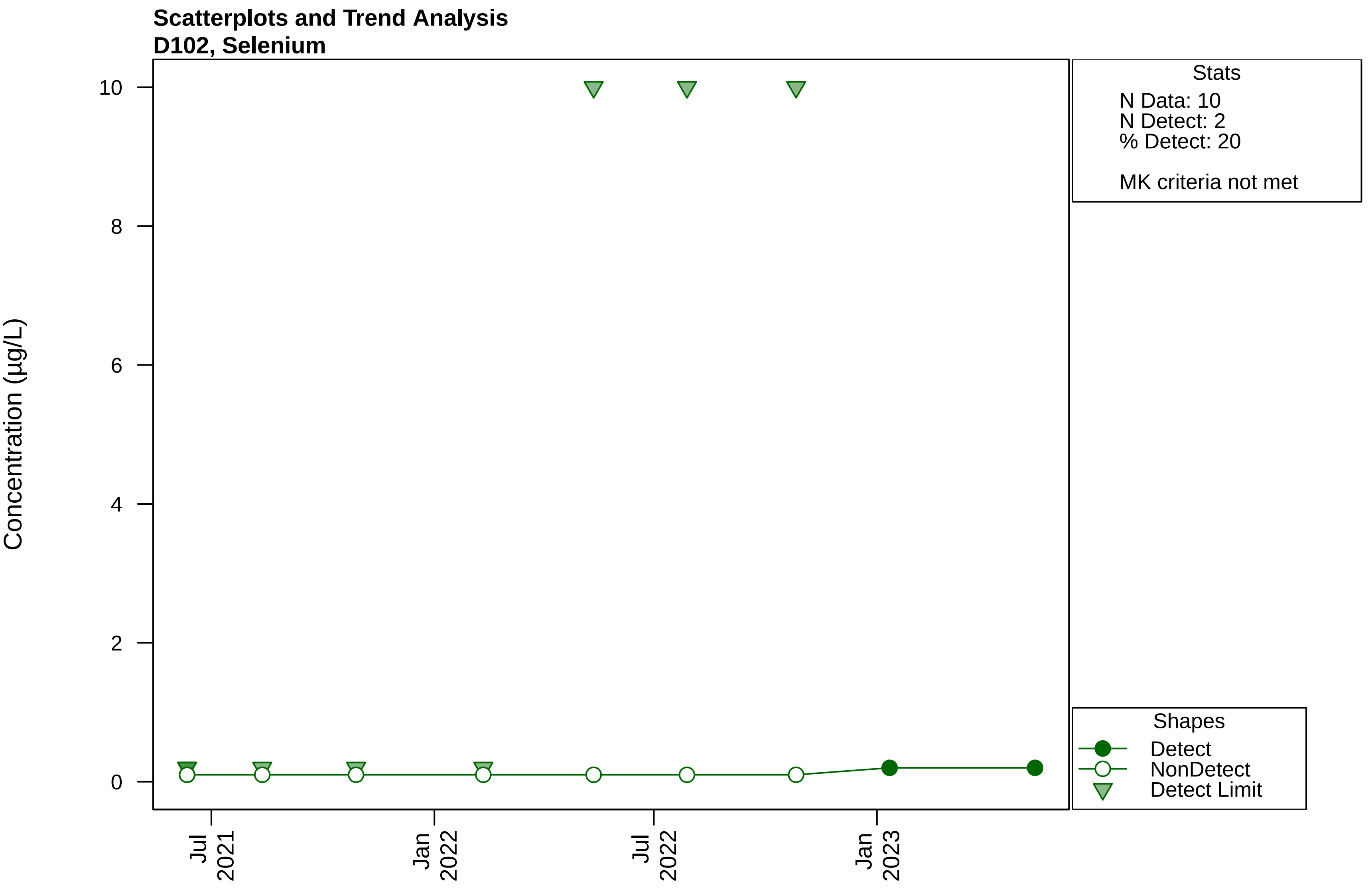

Scatterplots and Trend Analysis
D102, Mercury
Concentration (µg/L)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 3
% Detect: 30
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

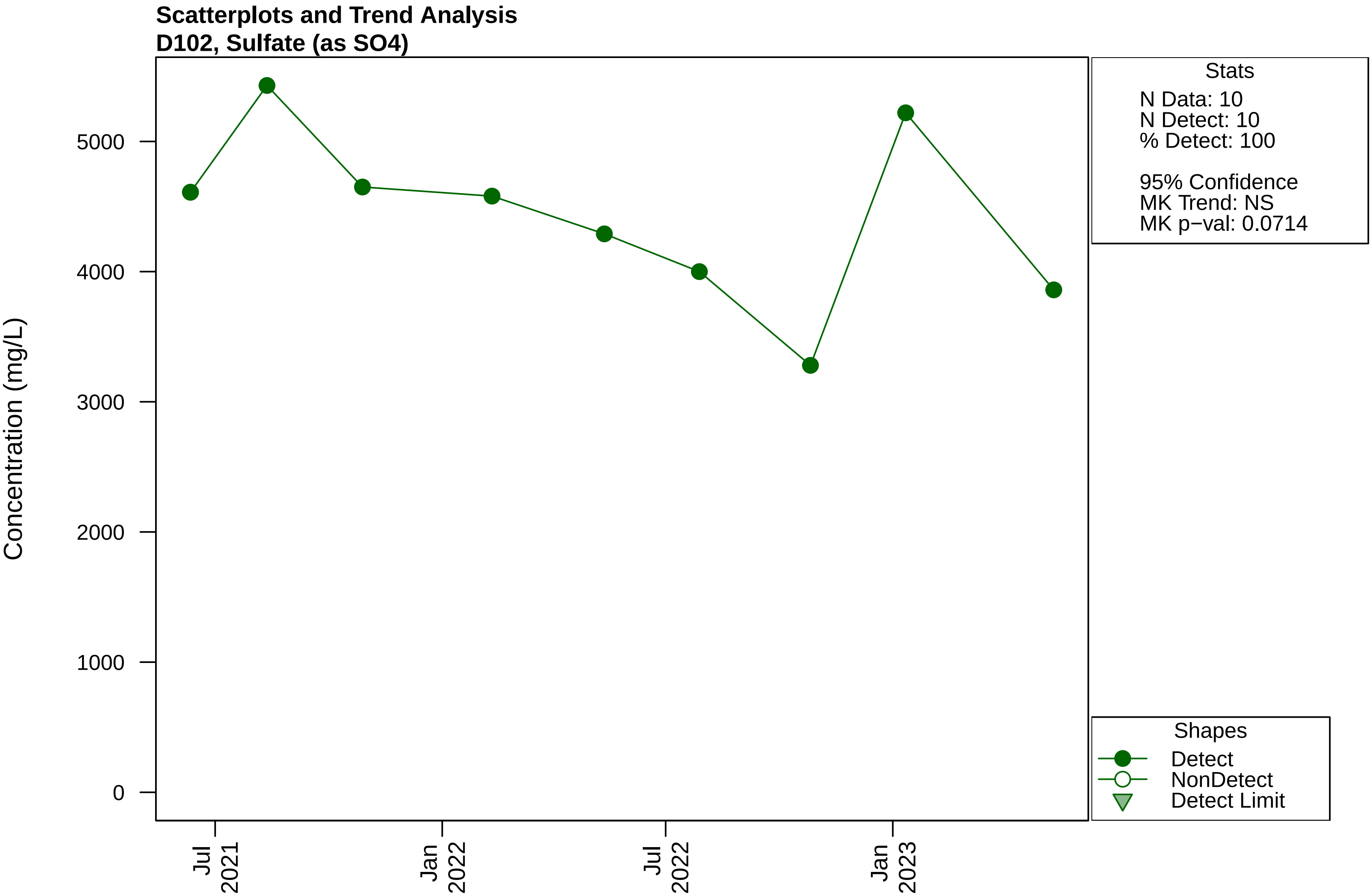
Scatterplots and Trend Analysis
D102, Molybdenum

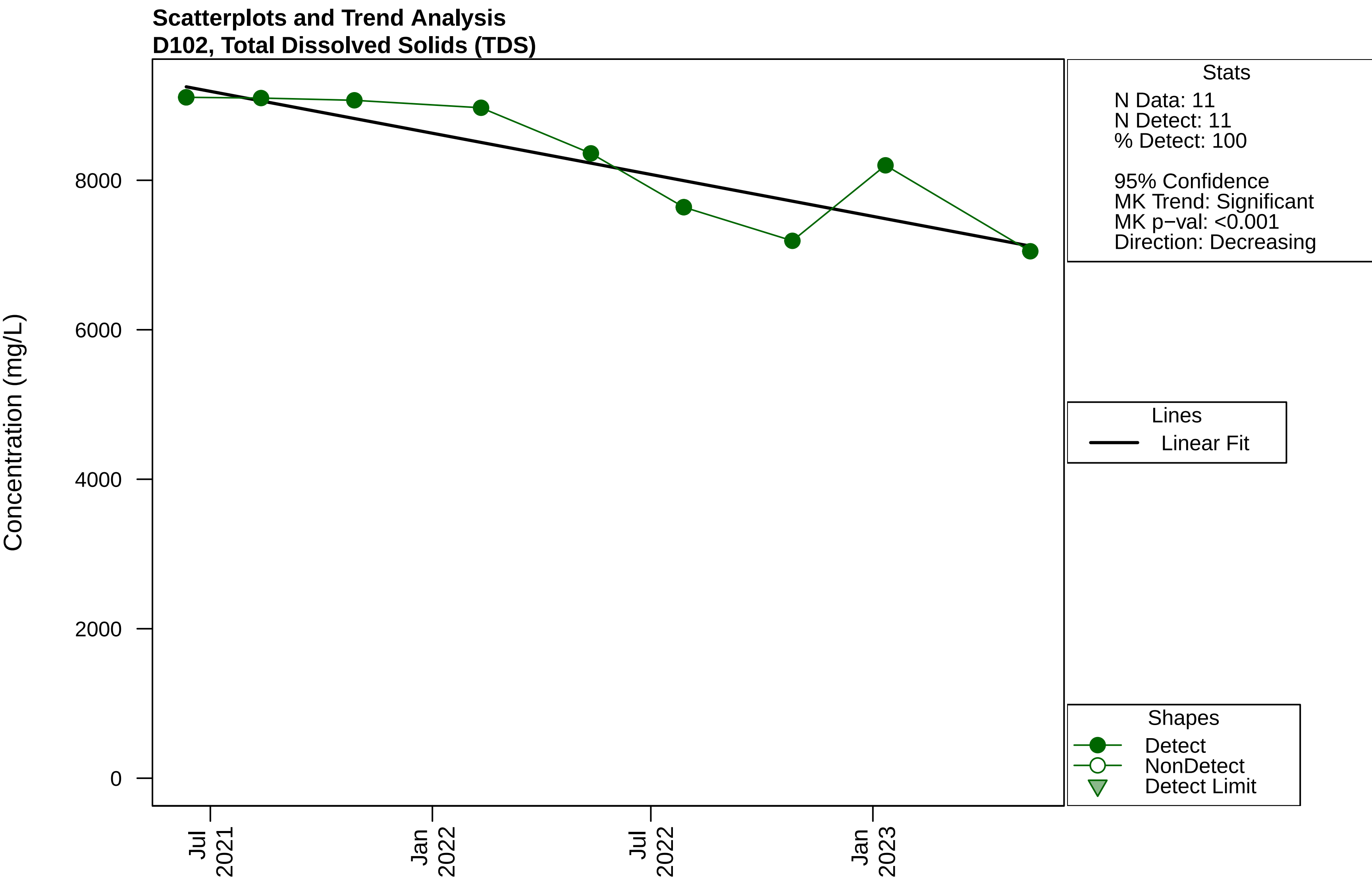


Scatterplots and Trend Analysis
D102, Nickel

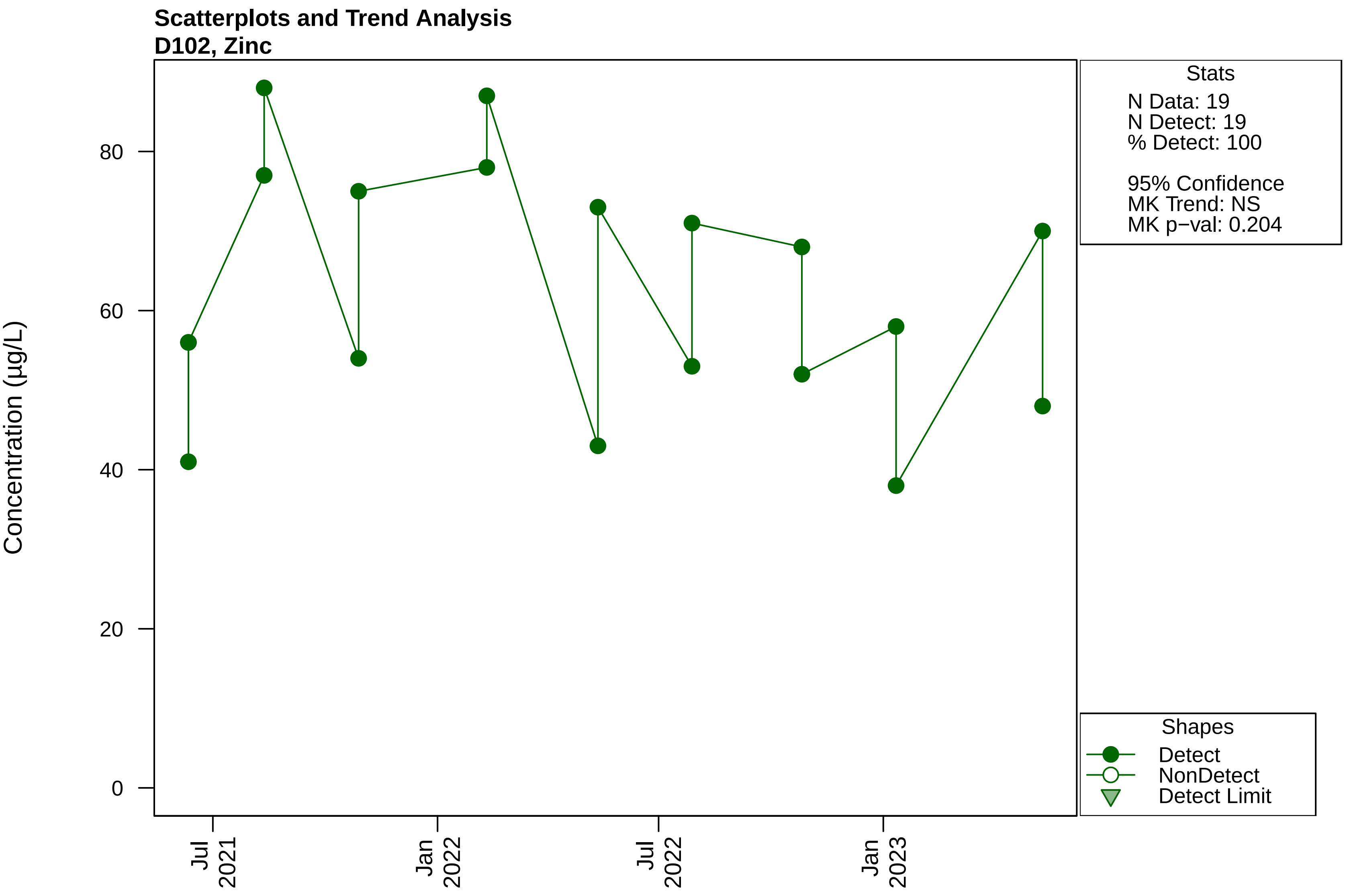



Scatterplots and Trend Analysis
D102, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 2
% Detect: 20
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

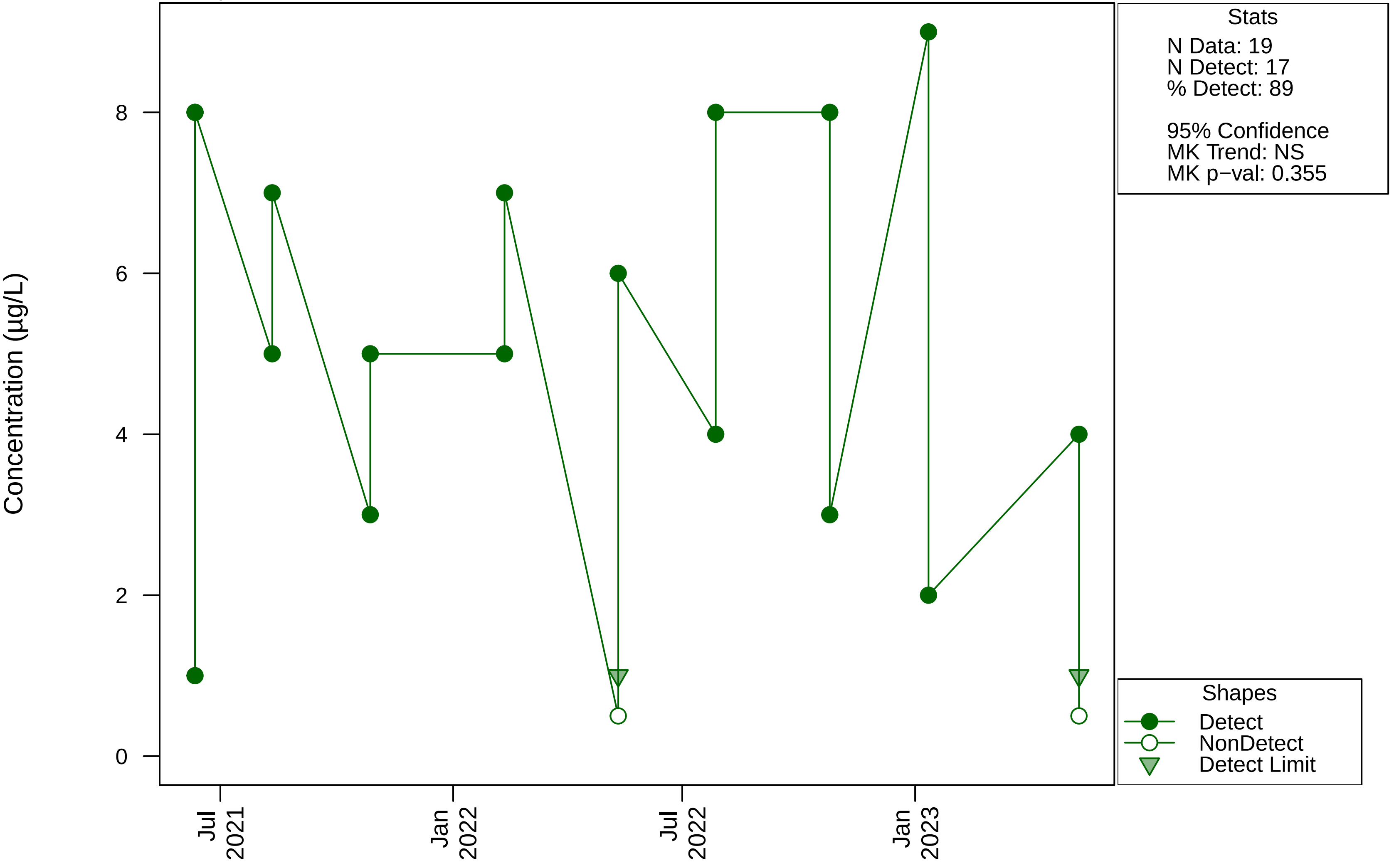

Scatterplots and Trend Analysis
D102, Sulfate (as SO4)
Concentration (mg/L)
0
1000
2000
3000
4000
5000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0714
Shapes
Detect
NonDetect
Detect Limit



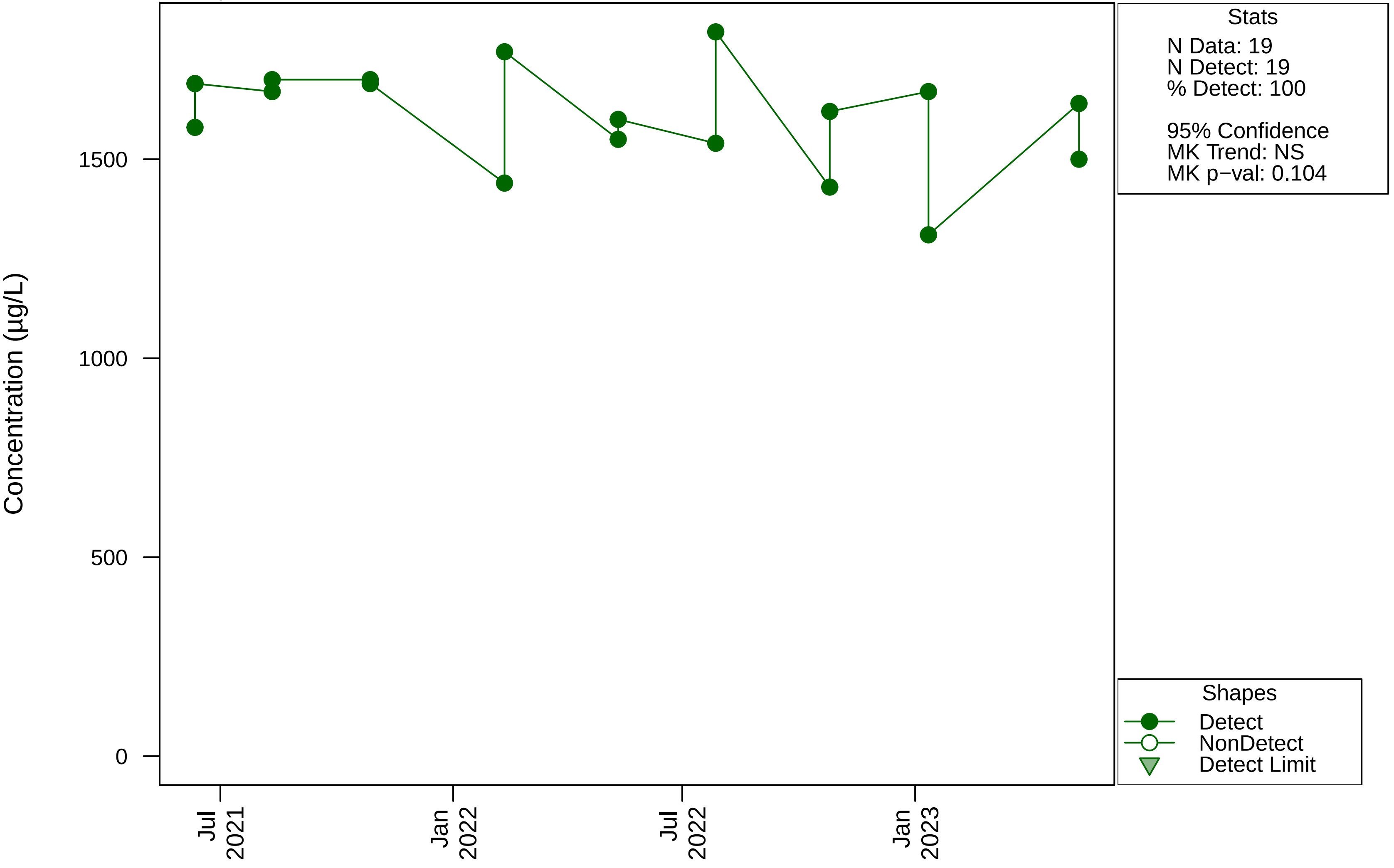
Scatterplots and Trend Analysis
D102, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
2000
4000
6000
8000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

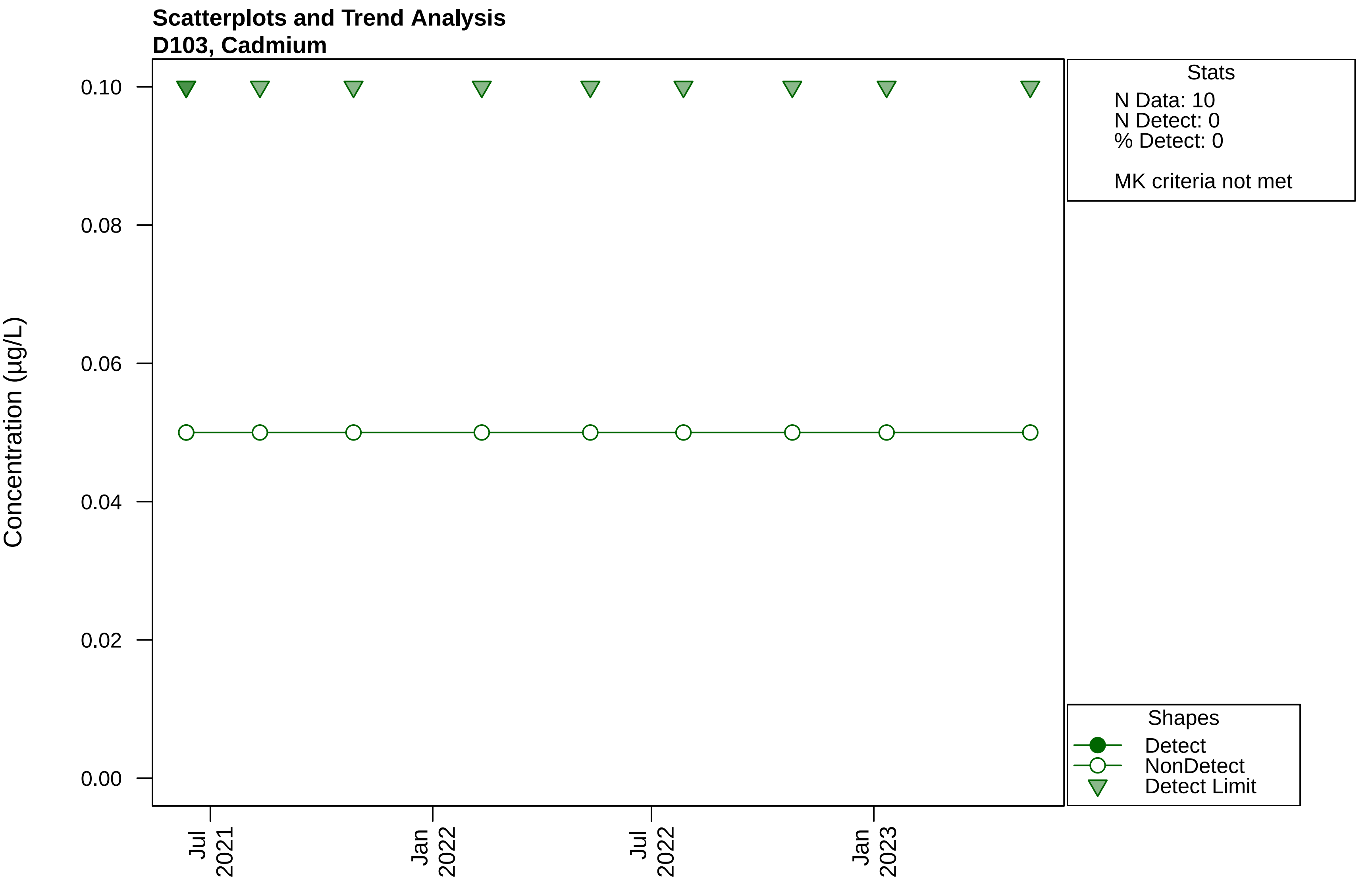

Scatterplots and Trend Analysis
D102, Zinc
Concentration (µg/L)
0
20
40
60
80
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.204
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D103, Arsenic

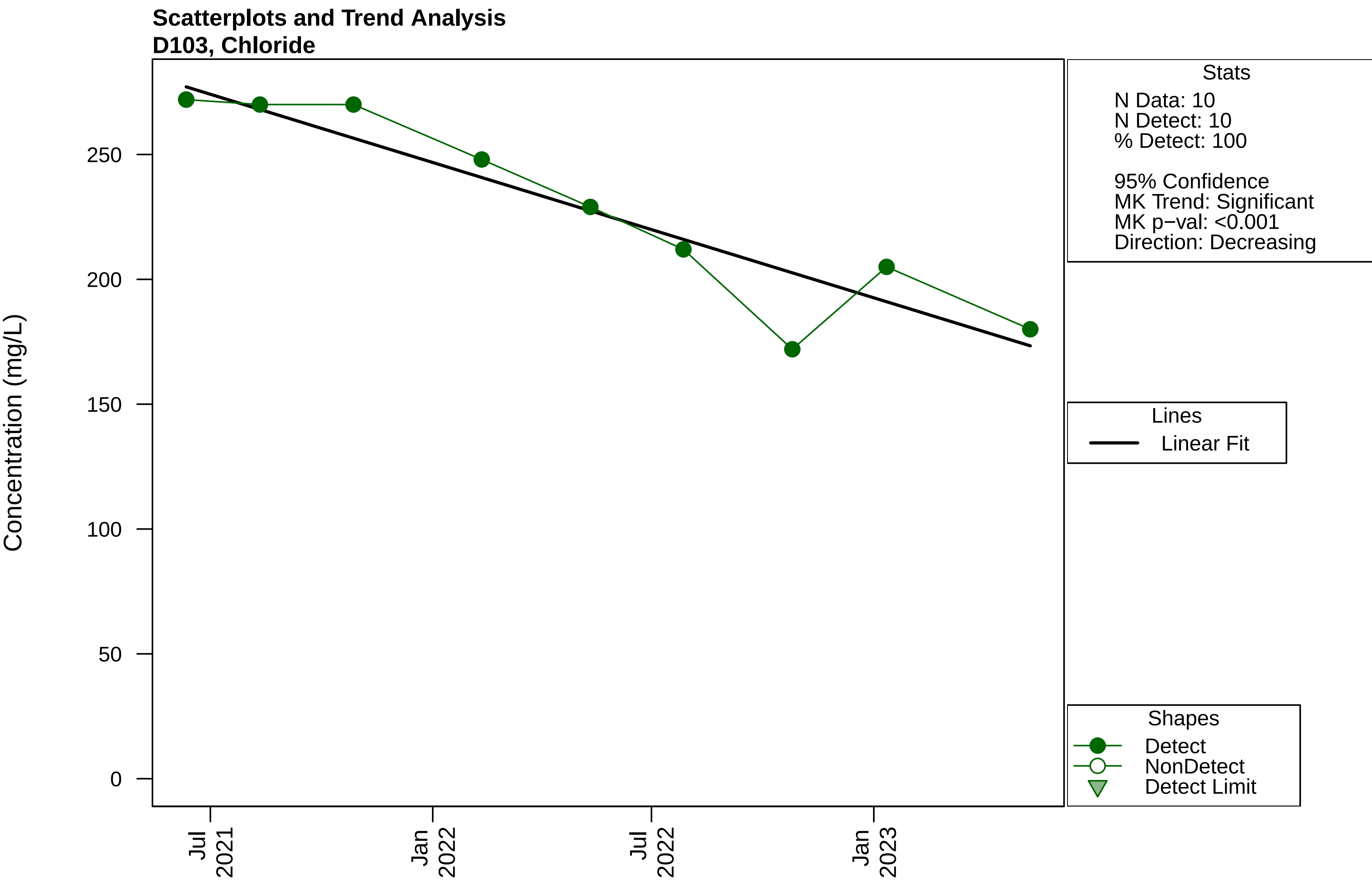


Scatterplots and Trend Analysis
D103, Boron



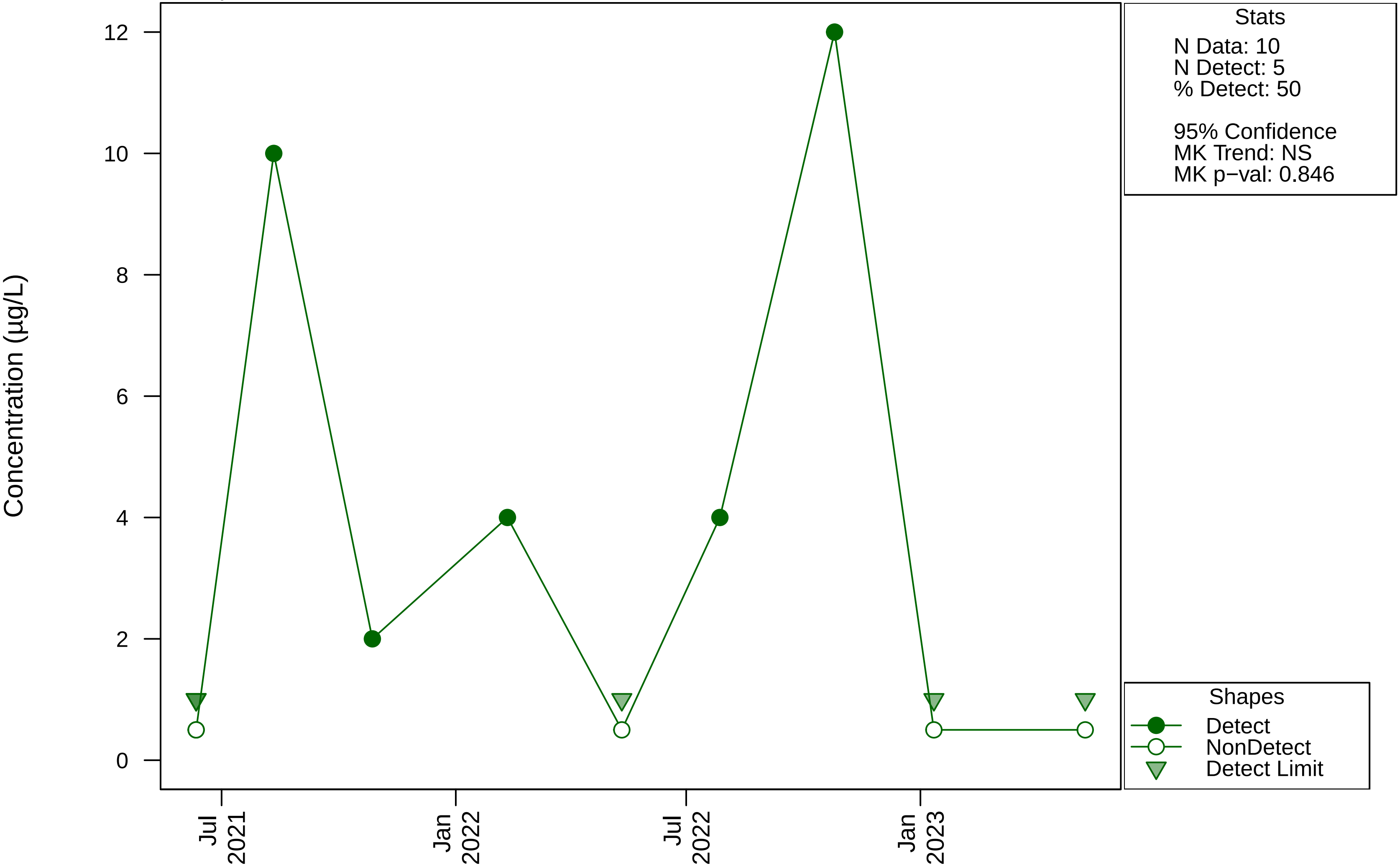


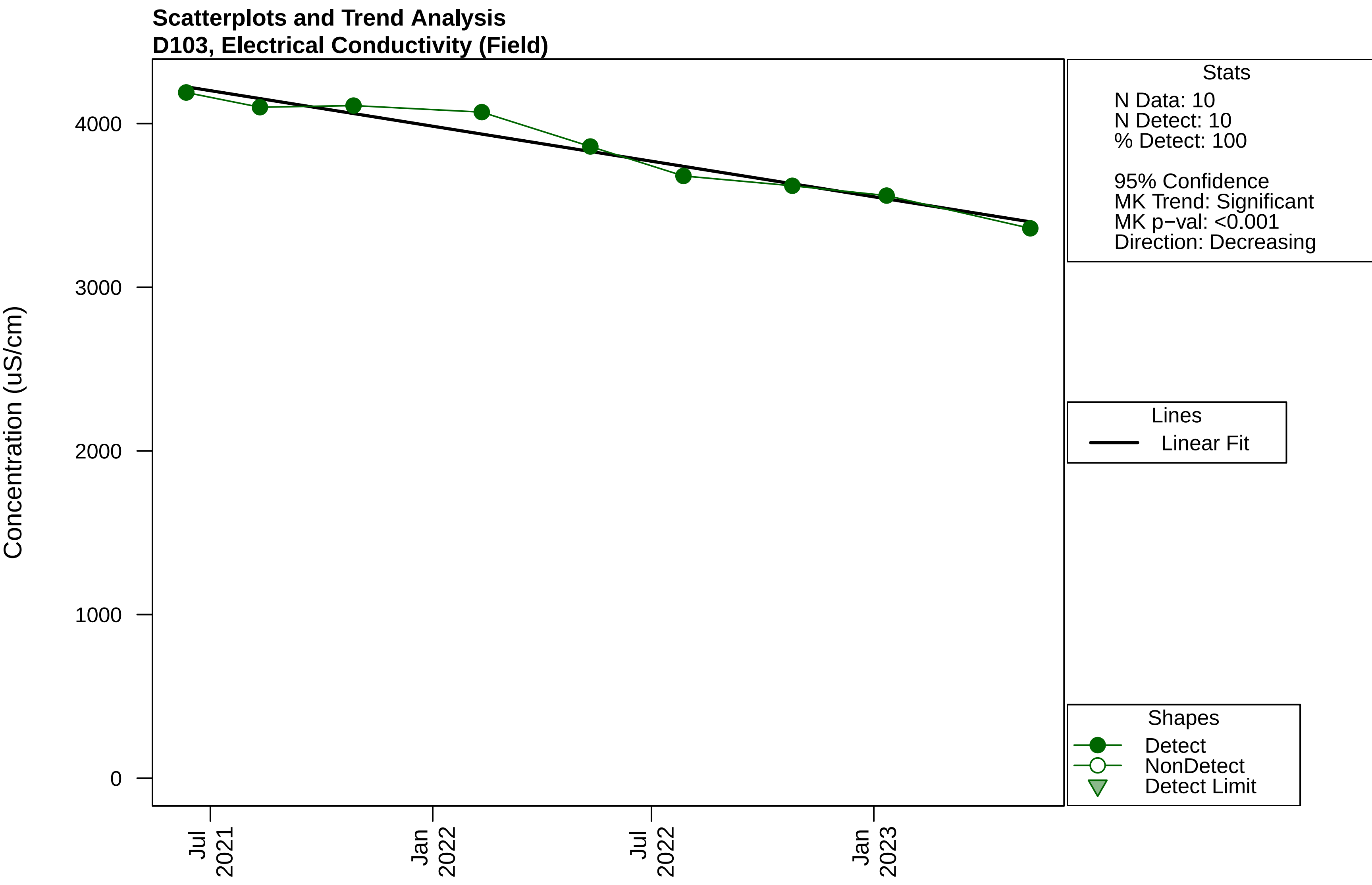
Scatterplots and Trend Analysis
D103, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



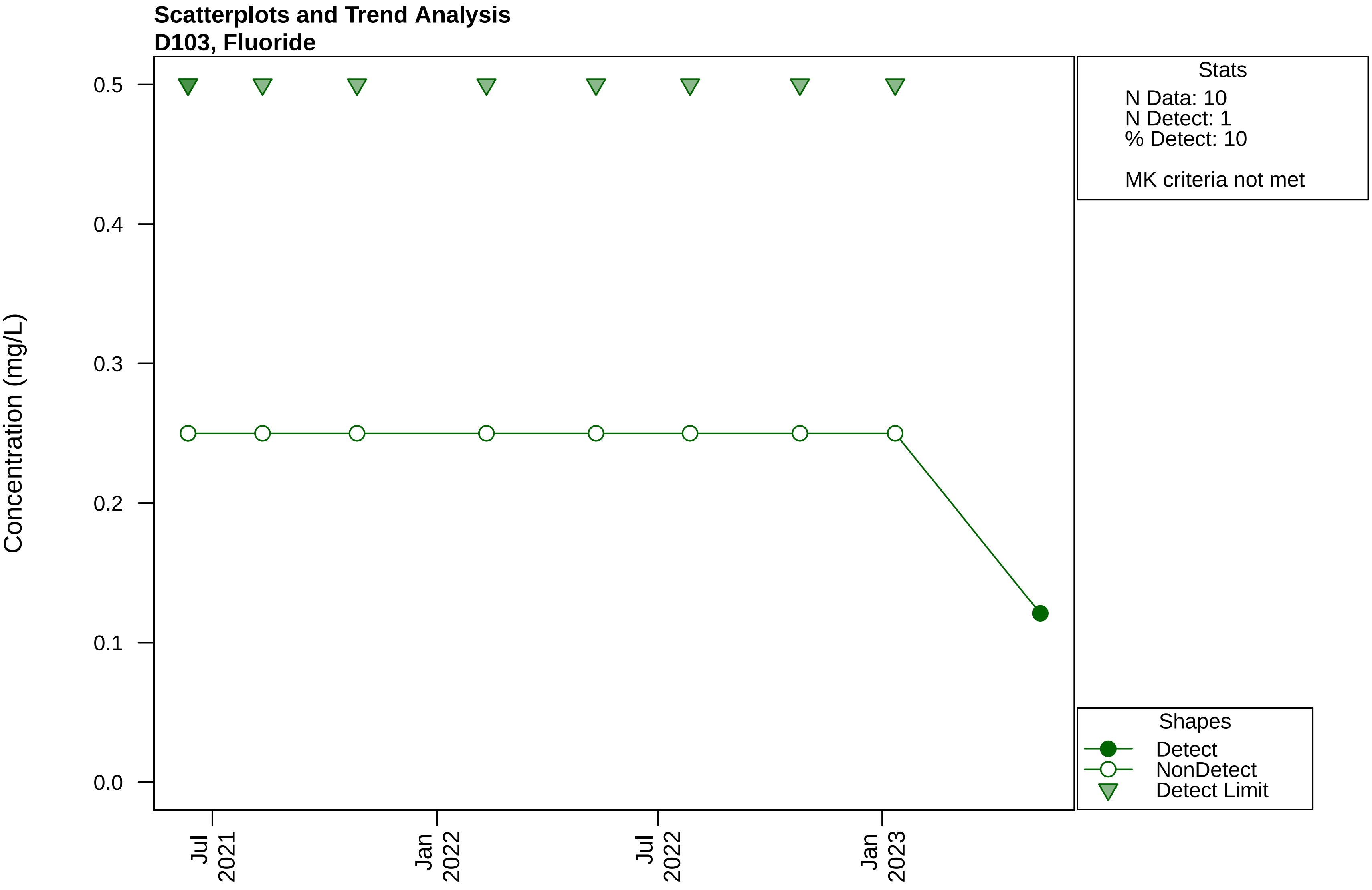
Scatterplots and Trend Analysis
D103, Chloride
Concentration (mg/L)
0
50
100
150
200
250
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D103, Chromium



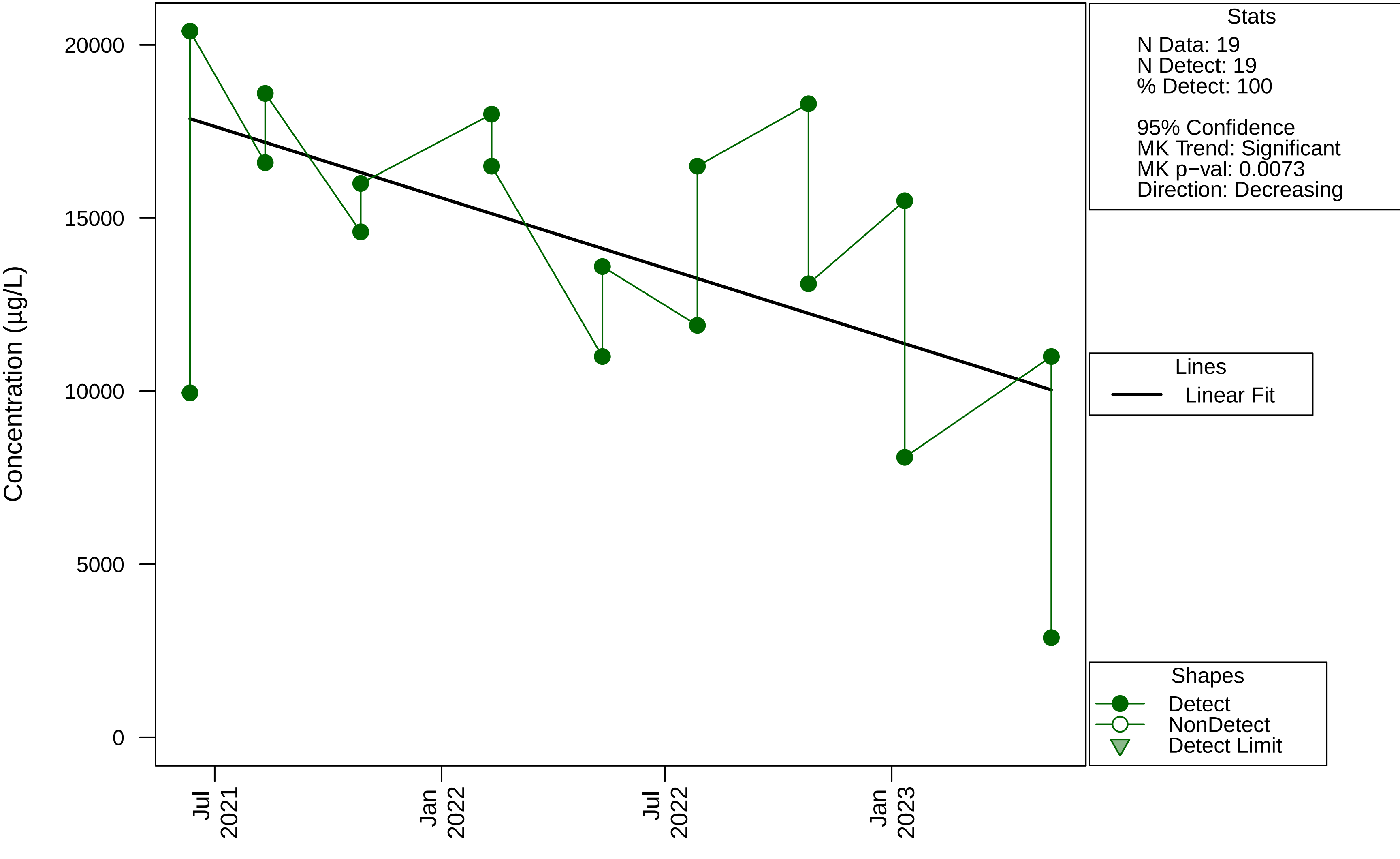


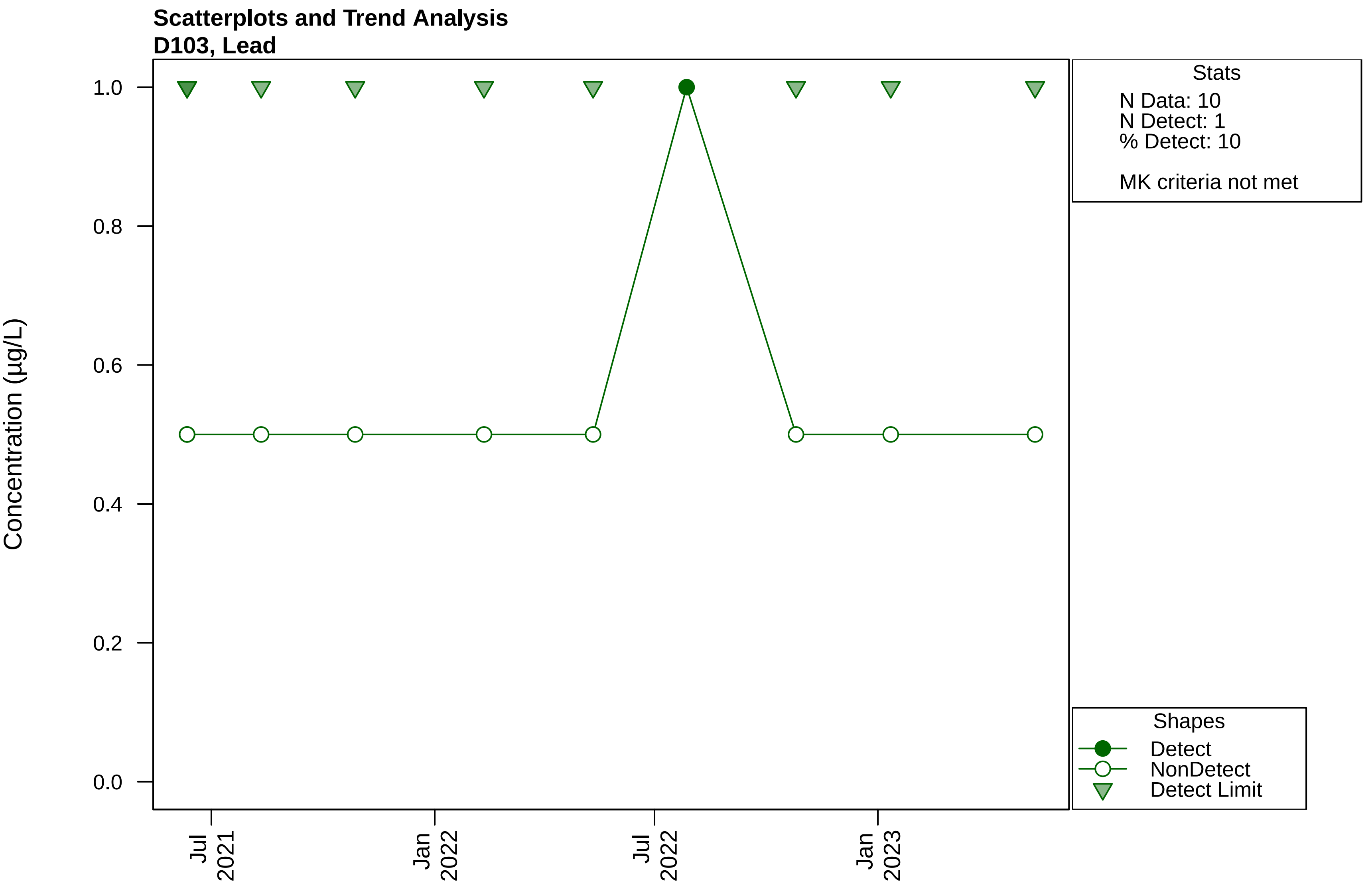
Scatterplots and Trend Analysis
D103, Electrical Conductivity (Field)
Concentration (uS/cm)
4000
3000
2000
1000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit



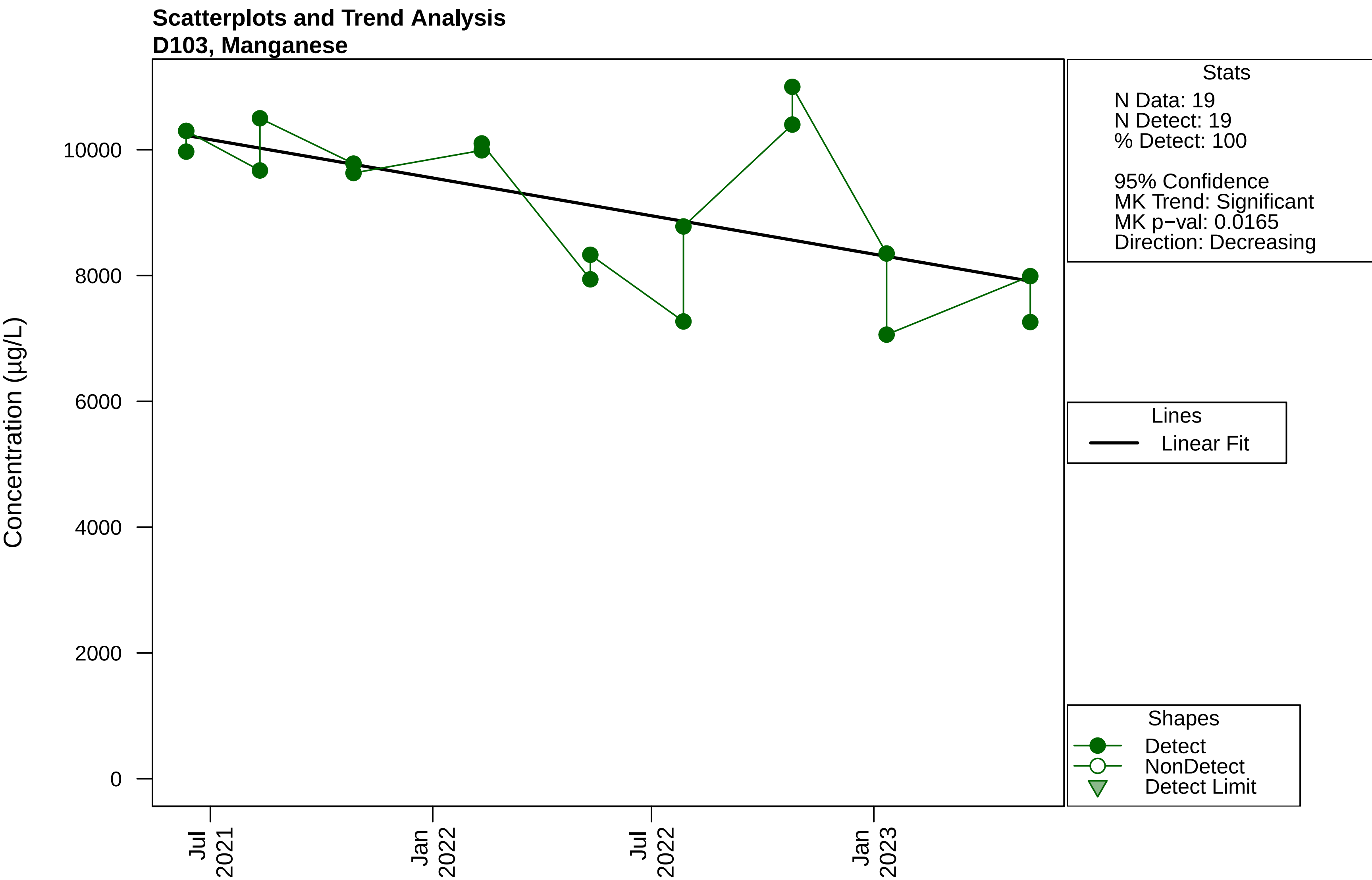
Scatterplots and Trend Analysis
D103, Fluoride
Concentration (mg/L)
0.5
0.4
0.3
0.2
0.1
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D103, Iron

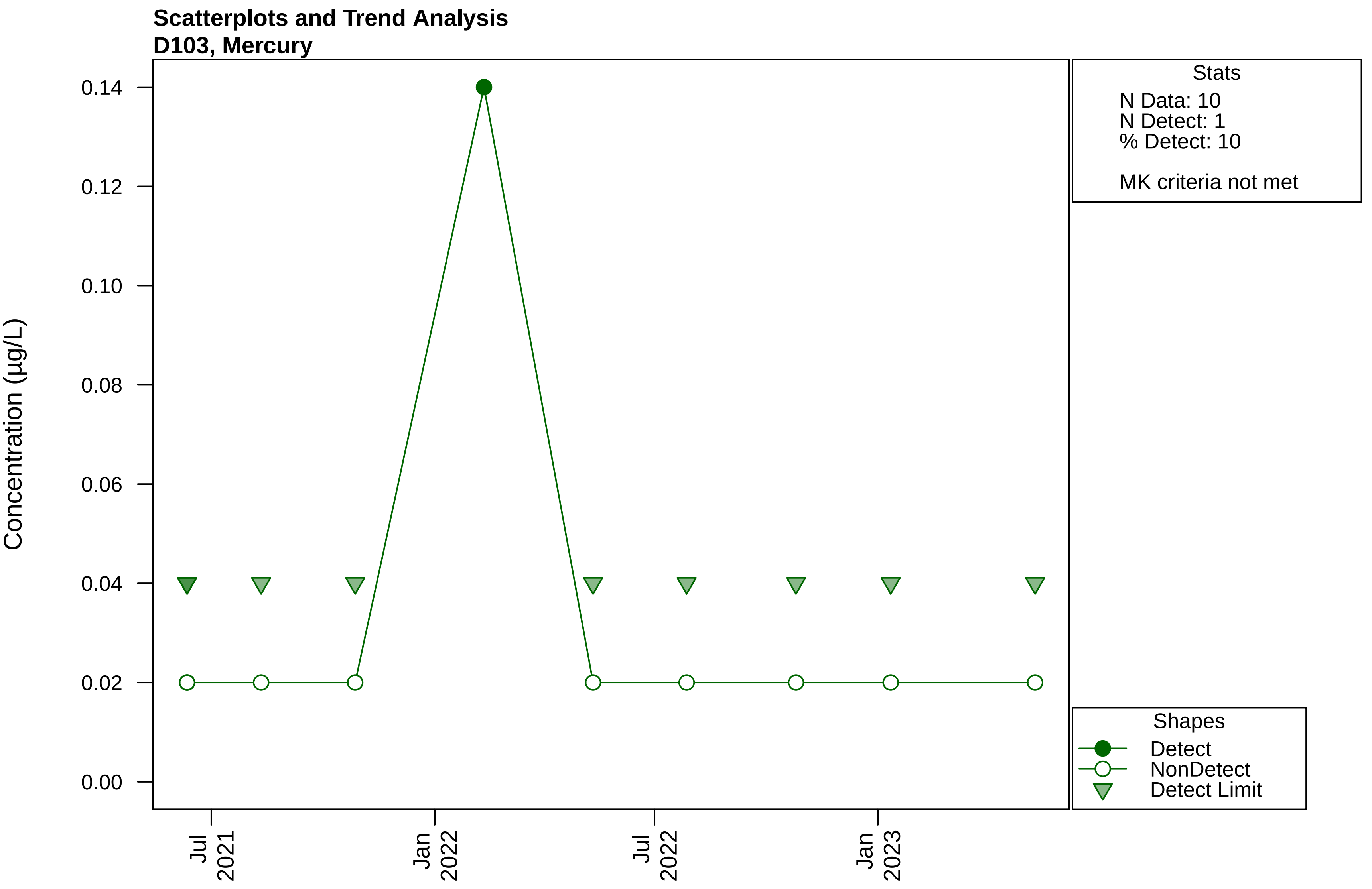


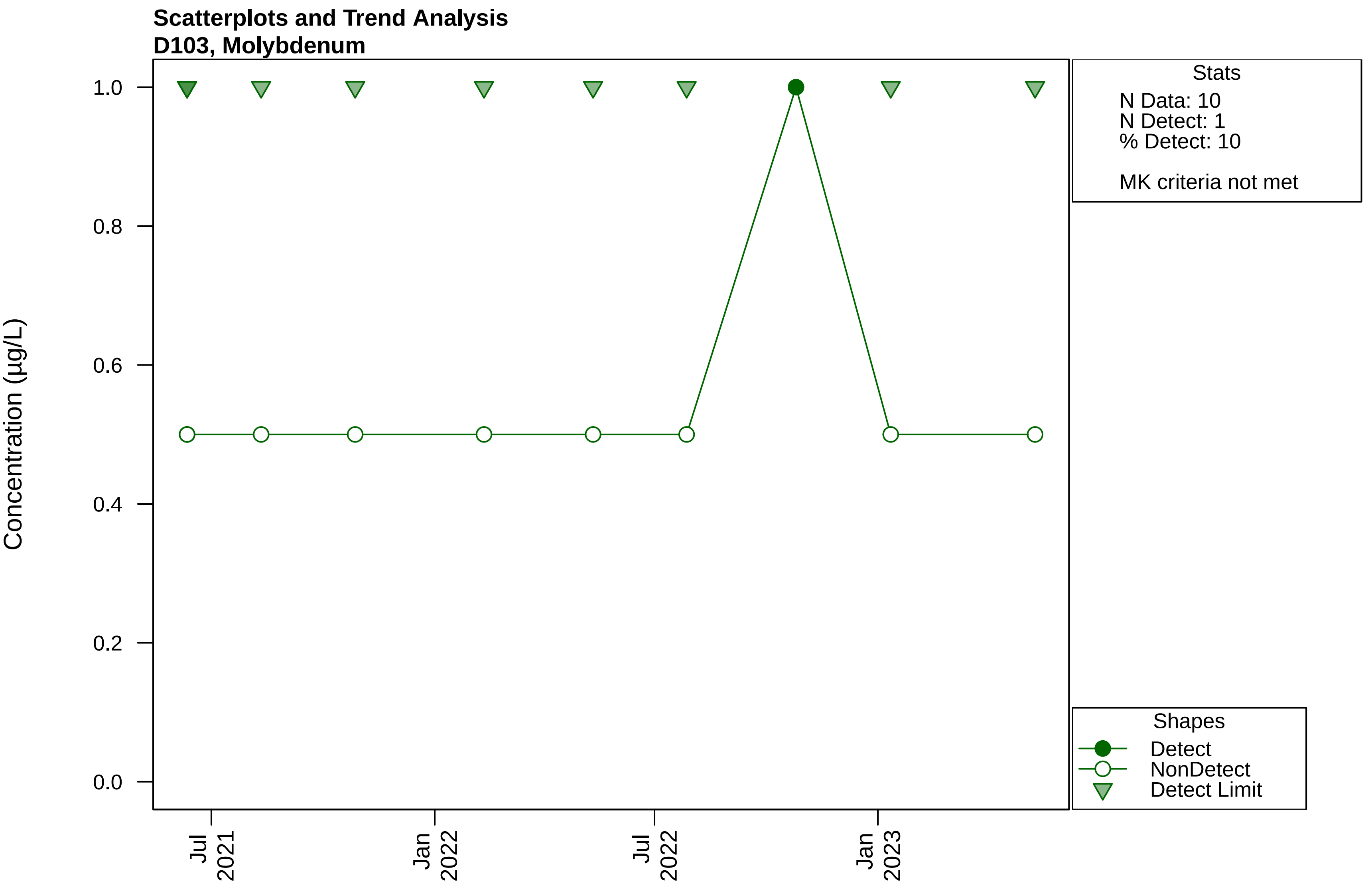


Scatterplots and Trend Analysis
D103, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

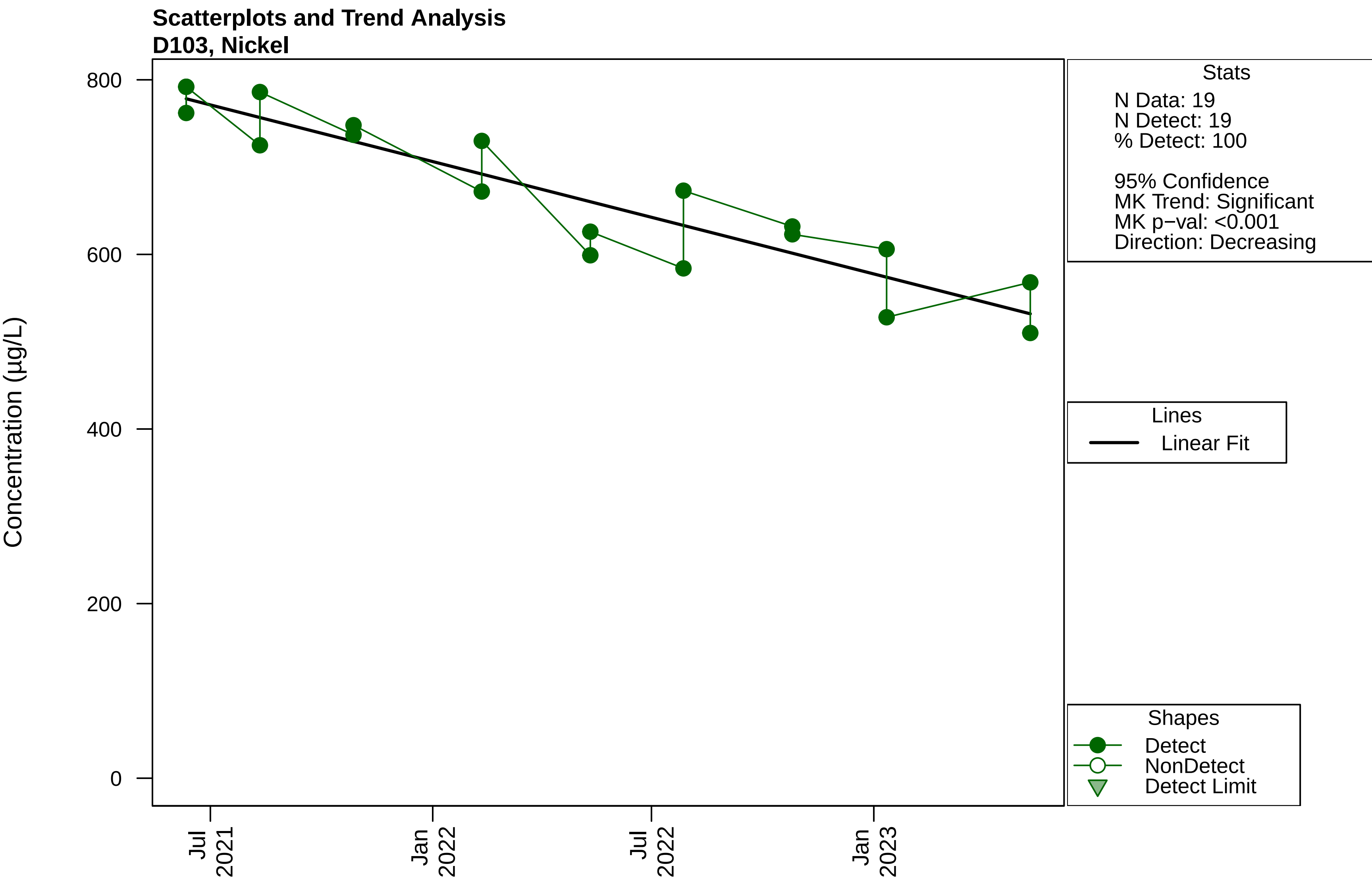


Scatterplots and Trend Analysis
D103, Manganese
Concentration (µg/L)
0
2000
4000
6000
8000
10000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0165
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

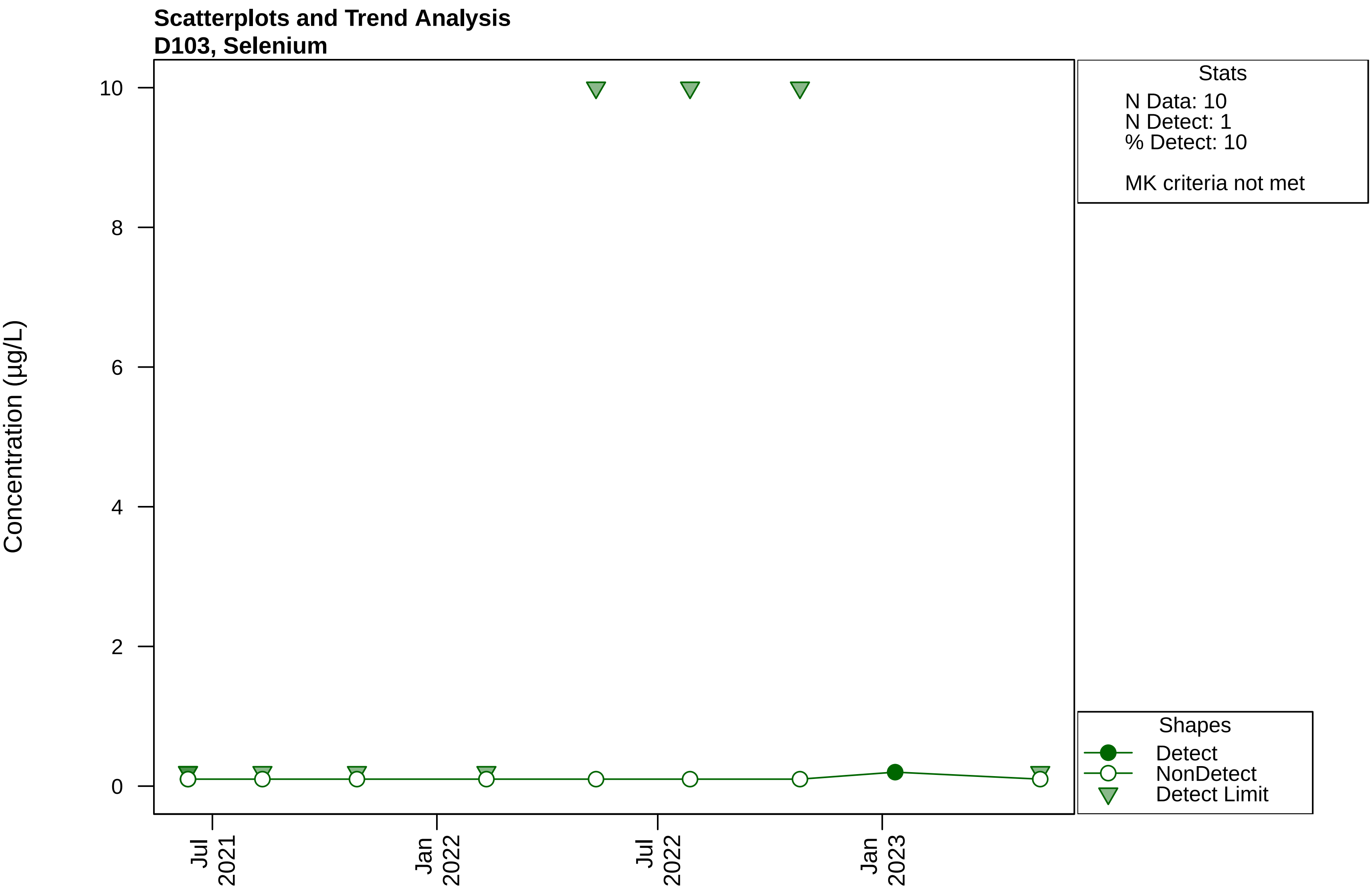

Scatterplots and Trend Analysis
D103, Mercury
Concentration (µg/L)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



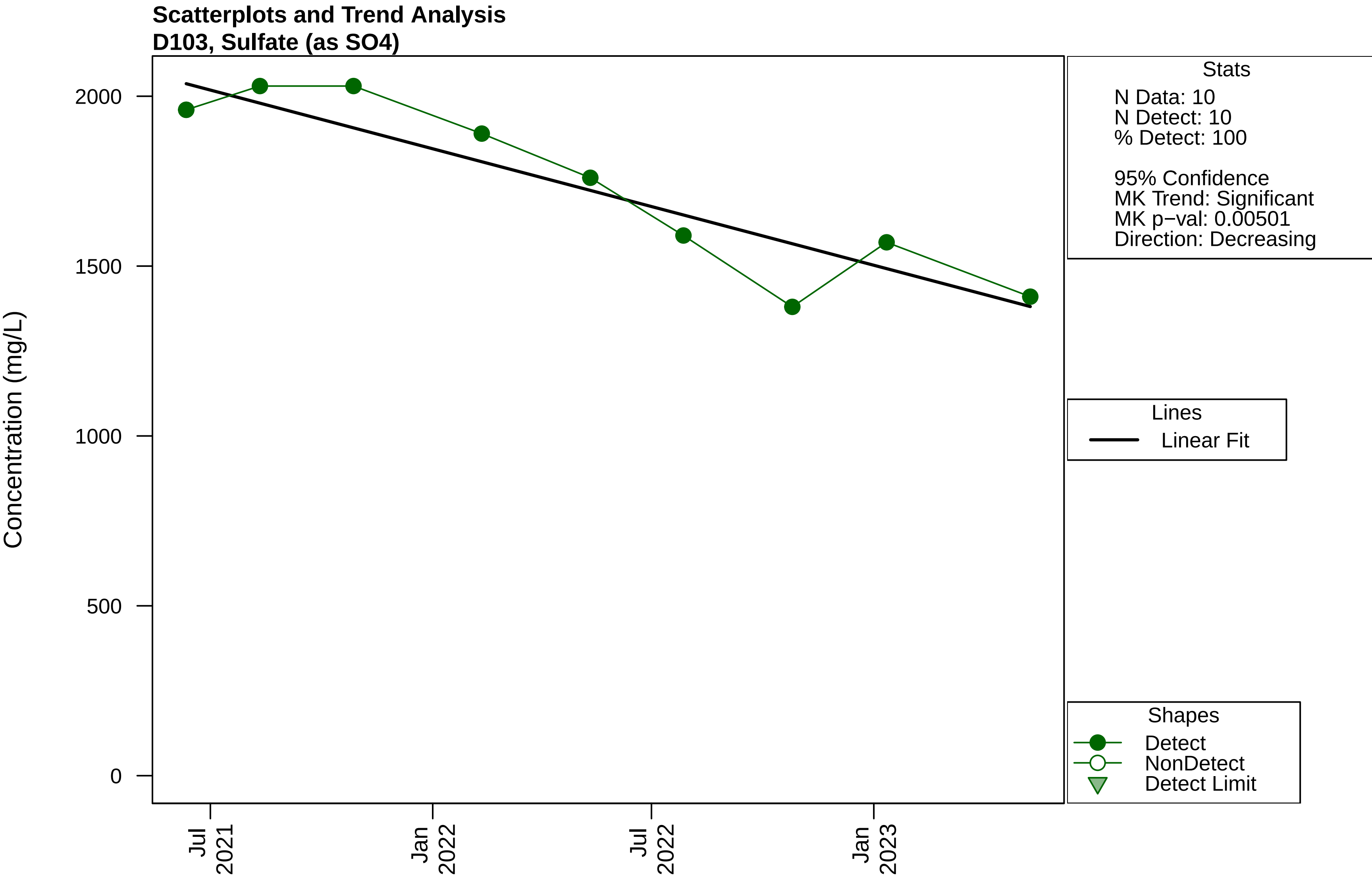
Scatterplots and Trend Analysis
D103, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

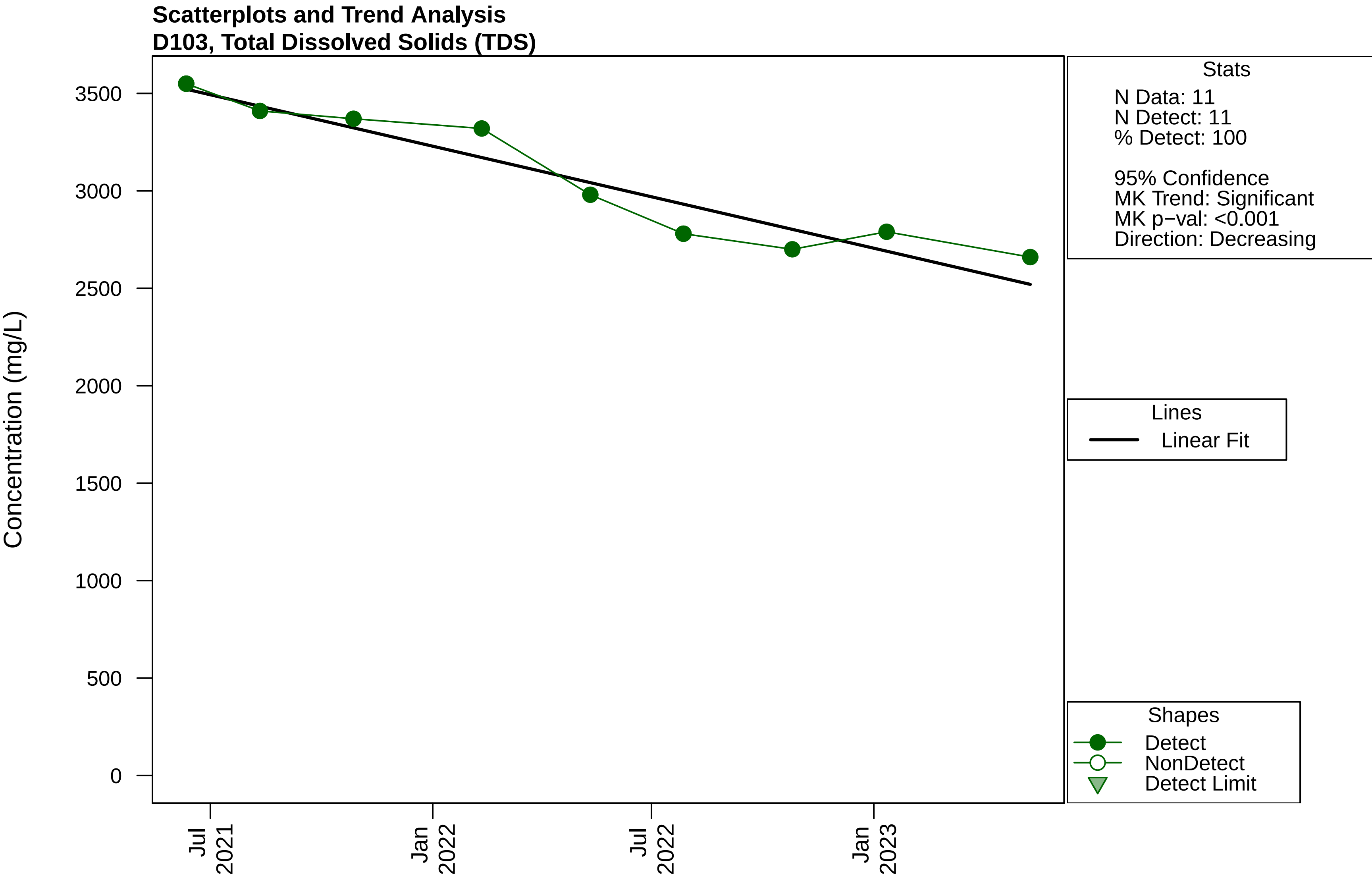


Scatterplots and Trend Analysis
D103, Nickel
Concentration (µg/L)
0
200
400
600
800
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

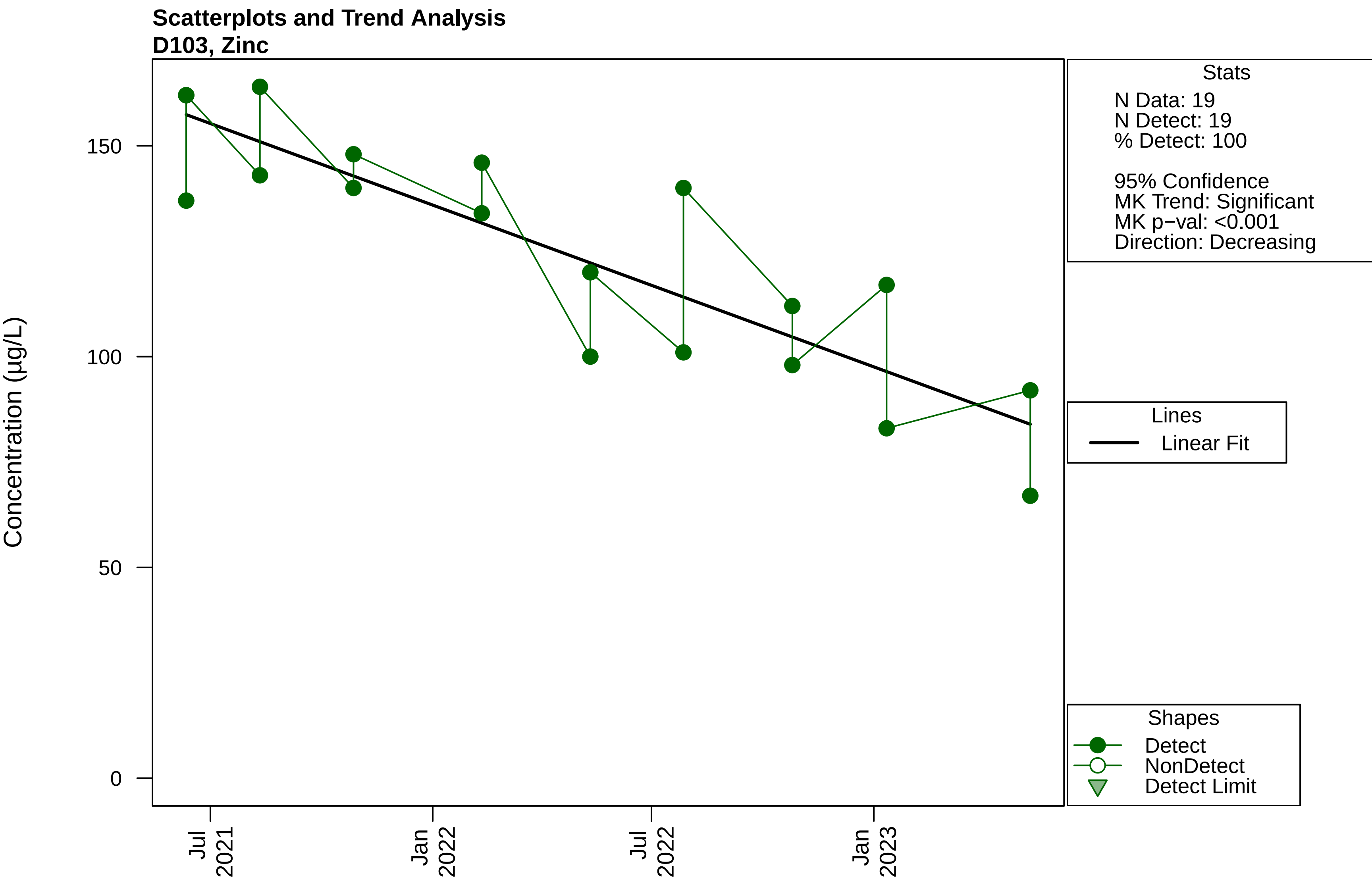


Scatterplots and Trend Analysis
D103, Selenium
Concentration (µg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

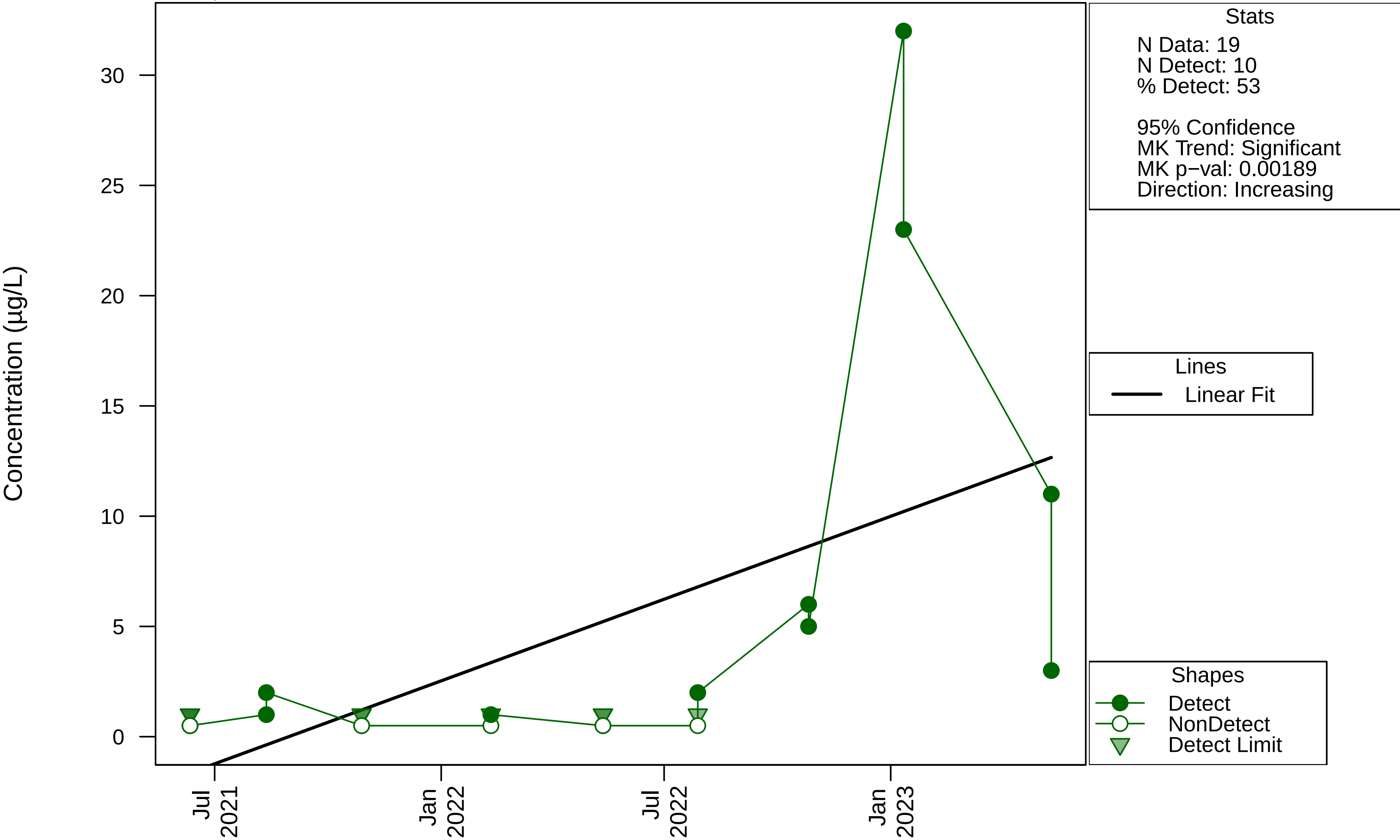

Scatterplots and Trend Analysis
D103, Sulfate (as SO4)
Concentration (mg/L)
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00501
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

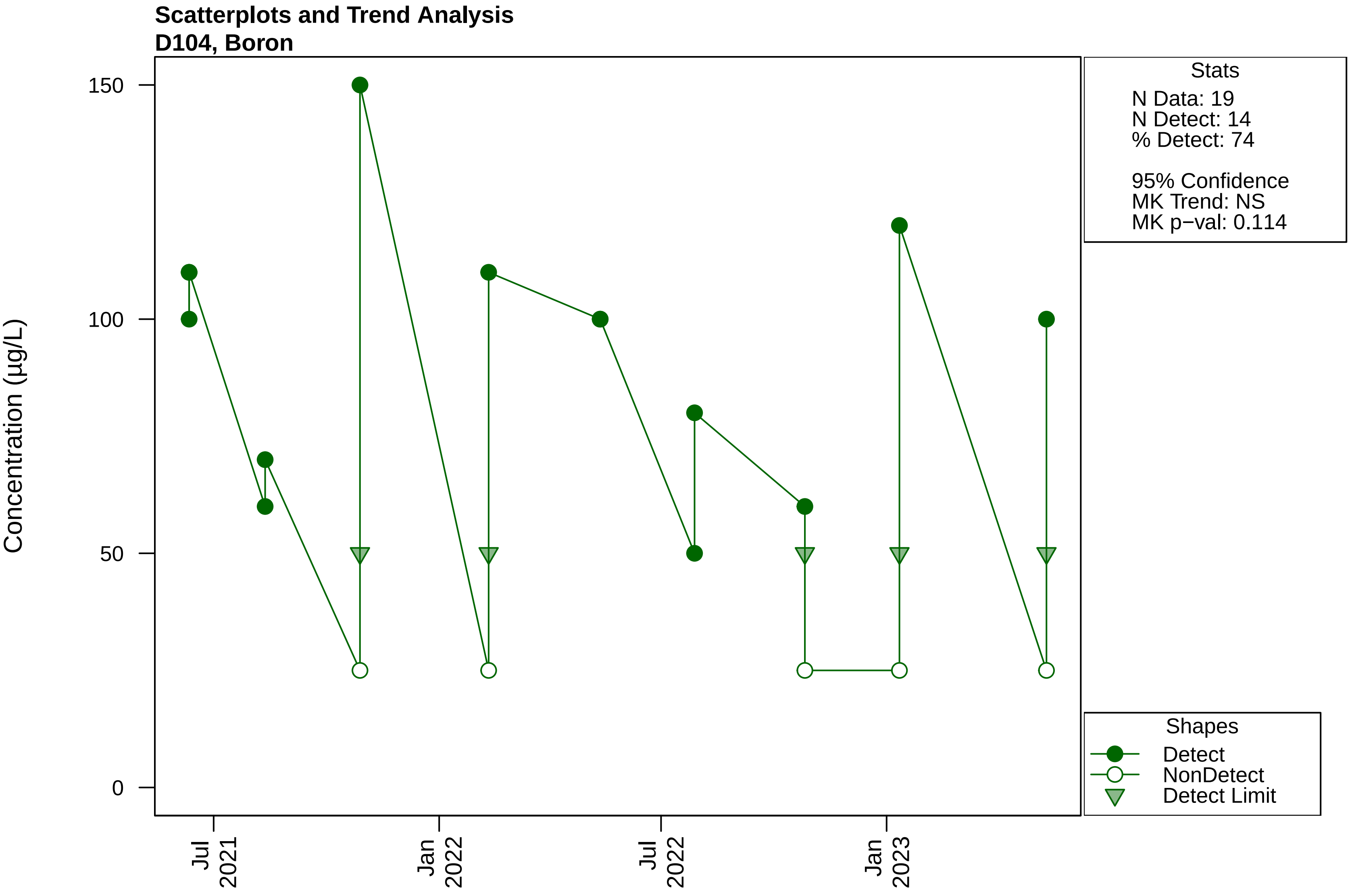


Scatterplots and Trend Analysis
D103, Total Dissolved Solids (TDS)
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

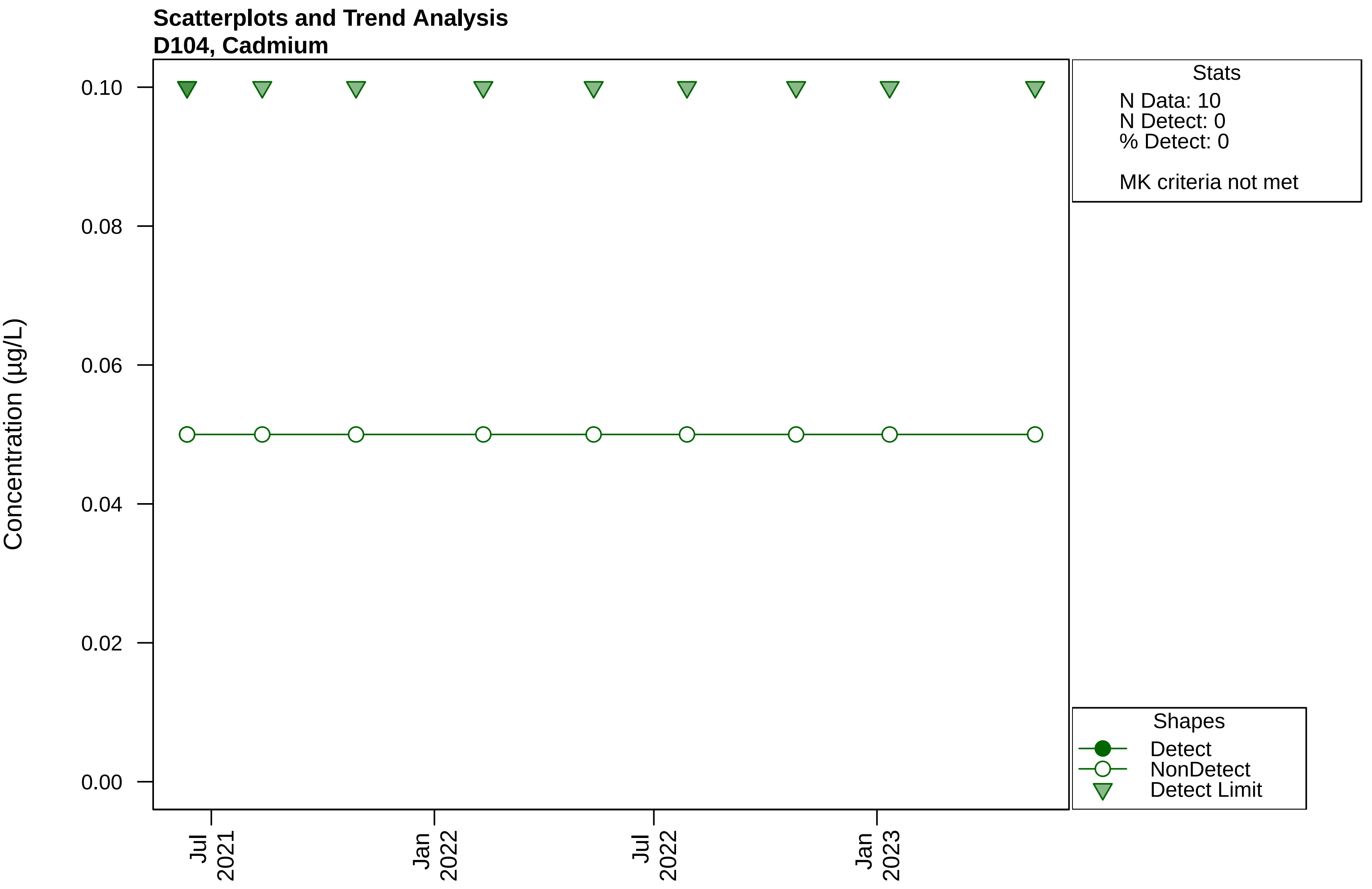

Scatterplots and Trend Analysis
D103, Zinc
Concentration (µg/L)
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

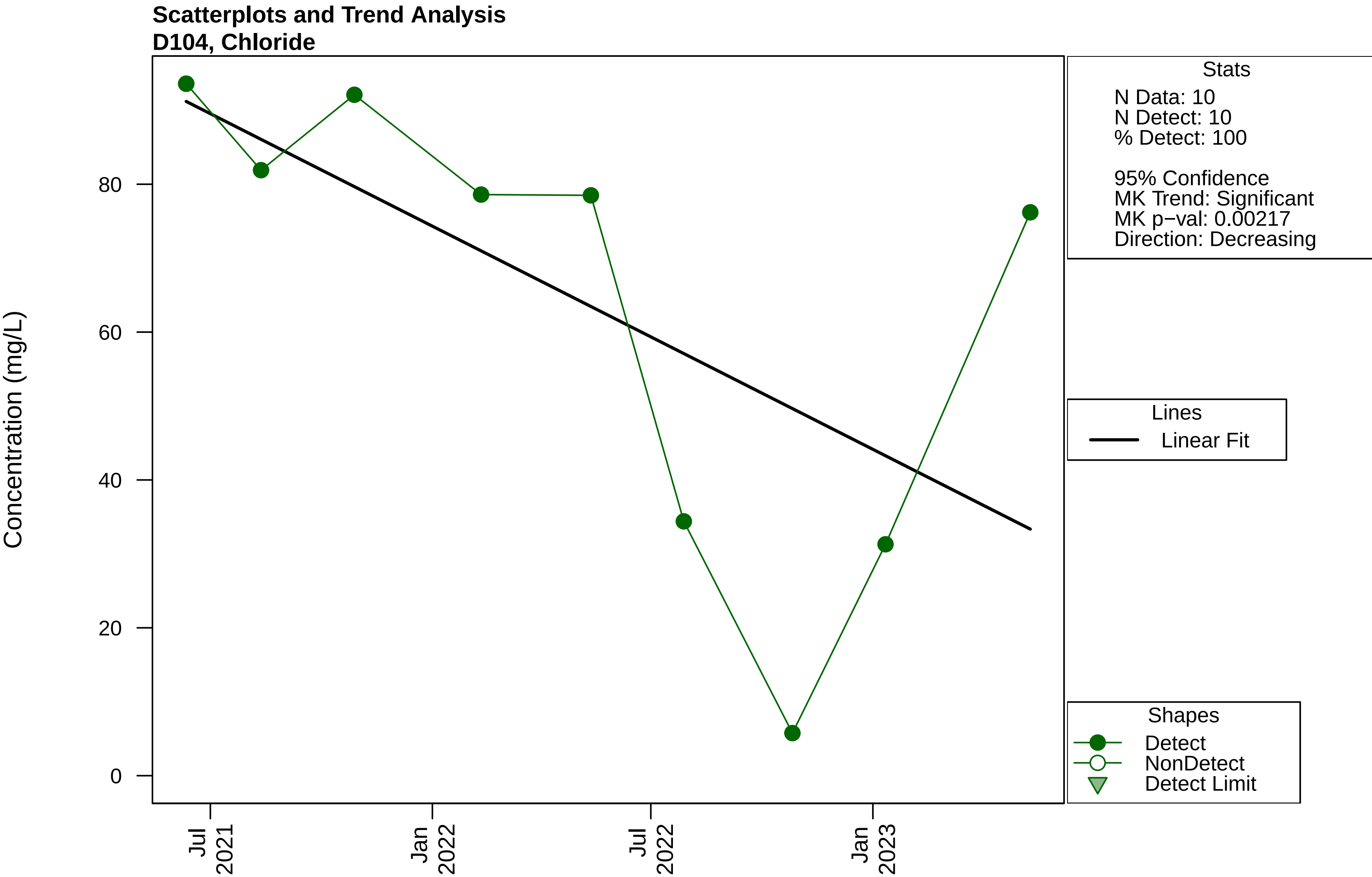
Scatterplots and Trend Analysis
D104, Arsenic



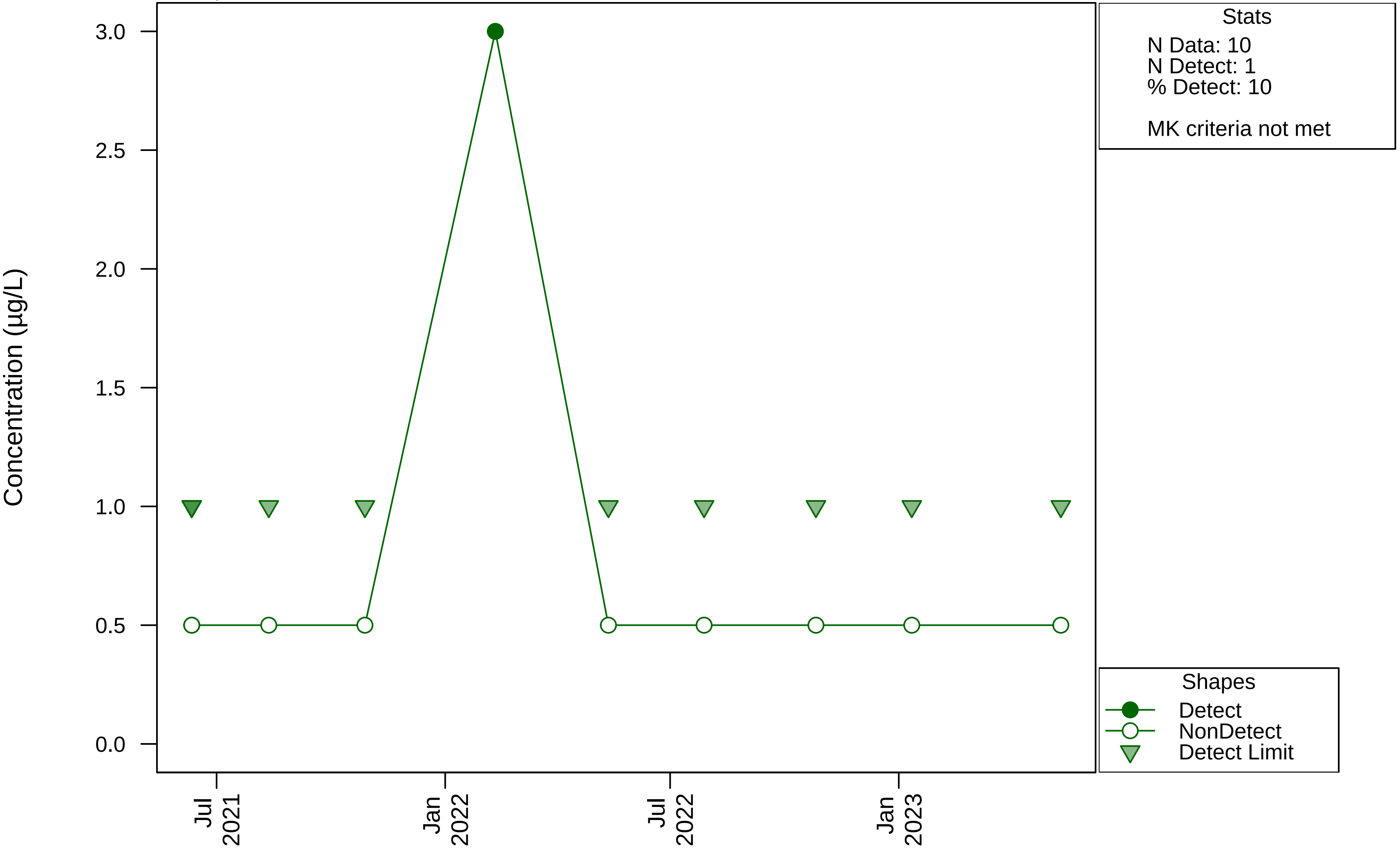


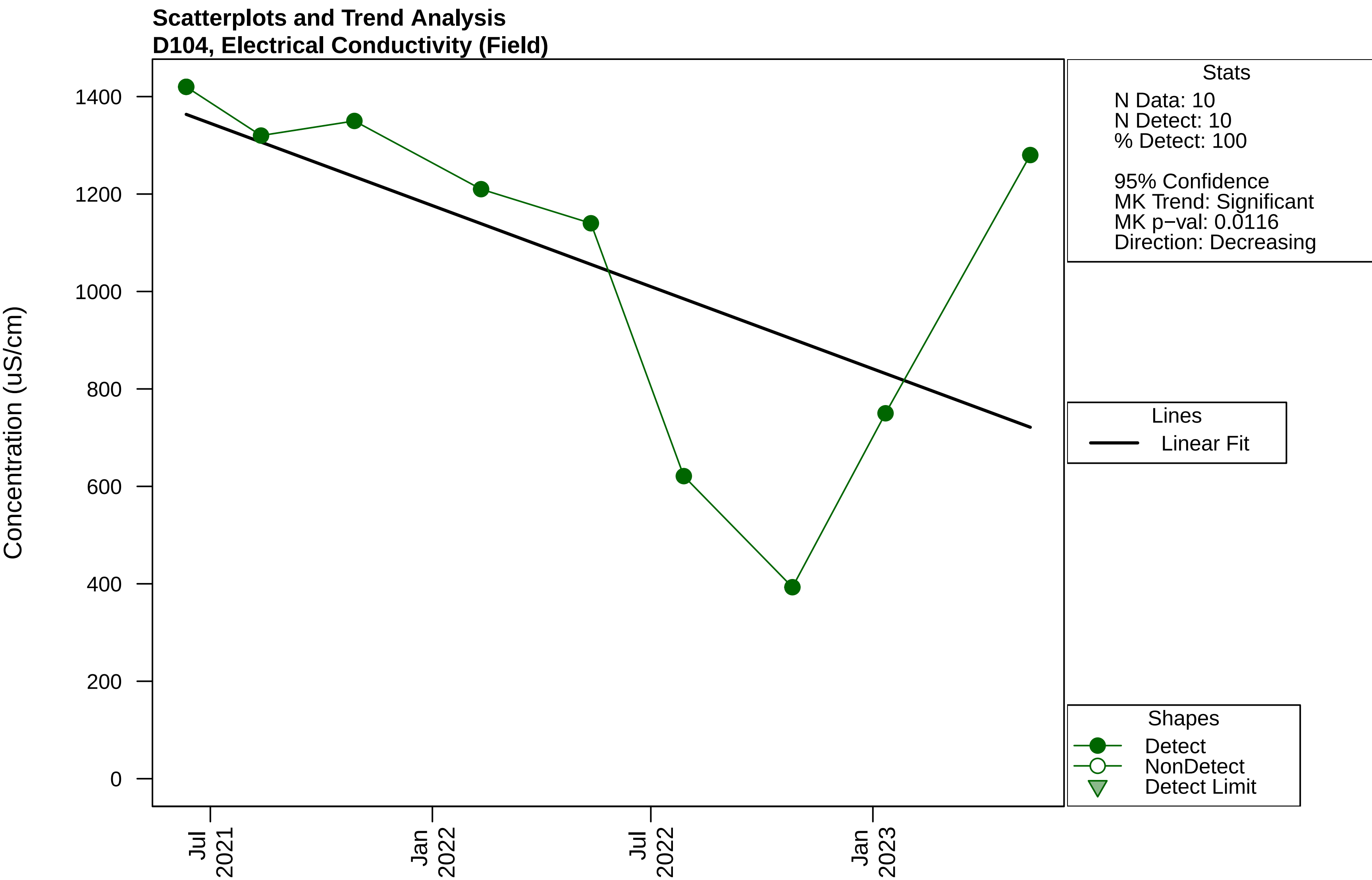
Scatterplots and Trend Analysis
D104, Boron
Concentration (µg/L)
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 14
% Detect: 74
95% Confidence
MK Trend: NS
MK p−val: 0.114
Shapes
Detect
NonDetect
Detect Limit

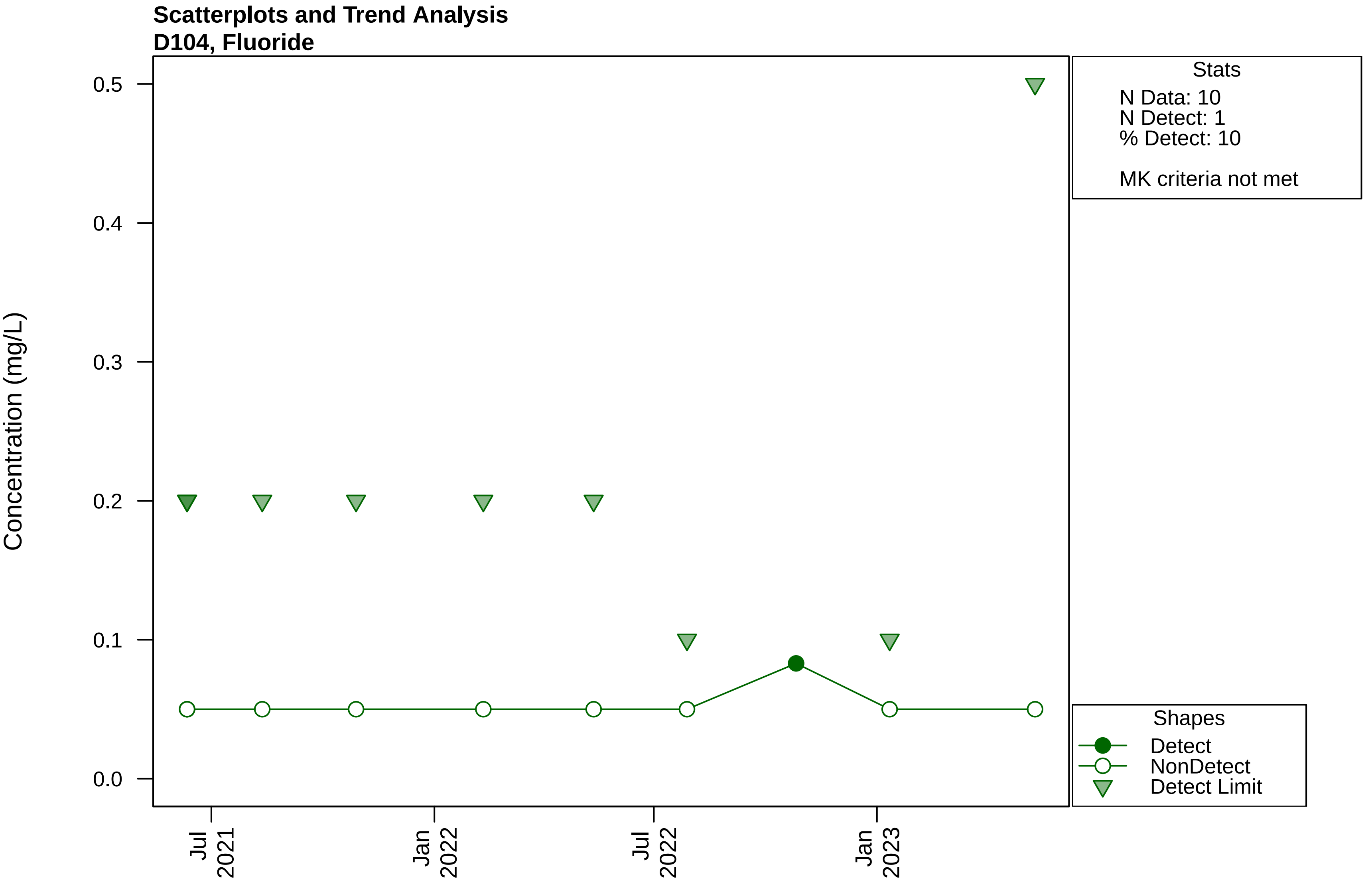

Scatterplots and Trend Analysis
D104, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D104, Chloride
Concentration (mg/L)
0
20
40
60
80
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00217
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

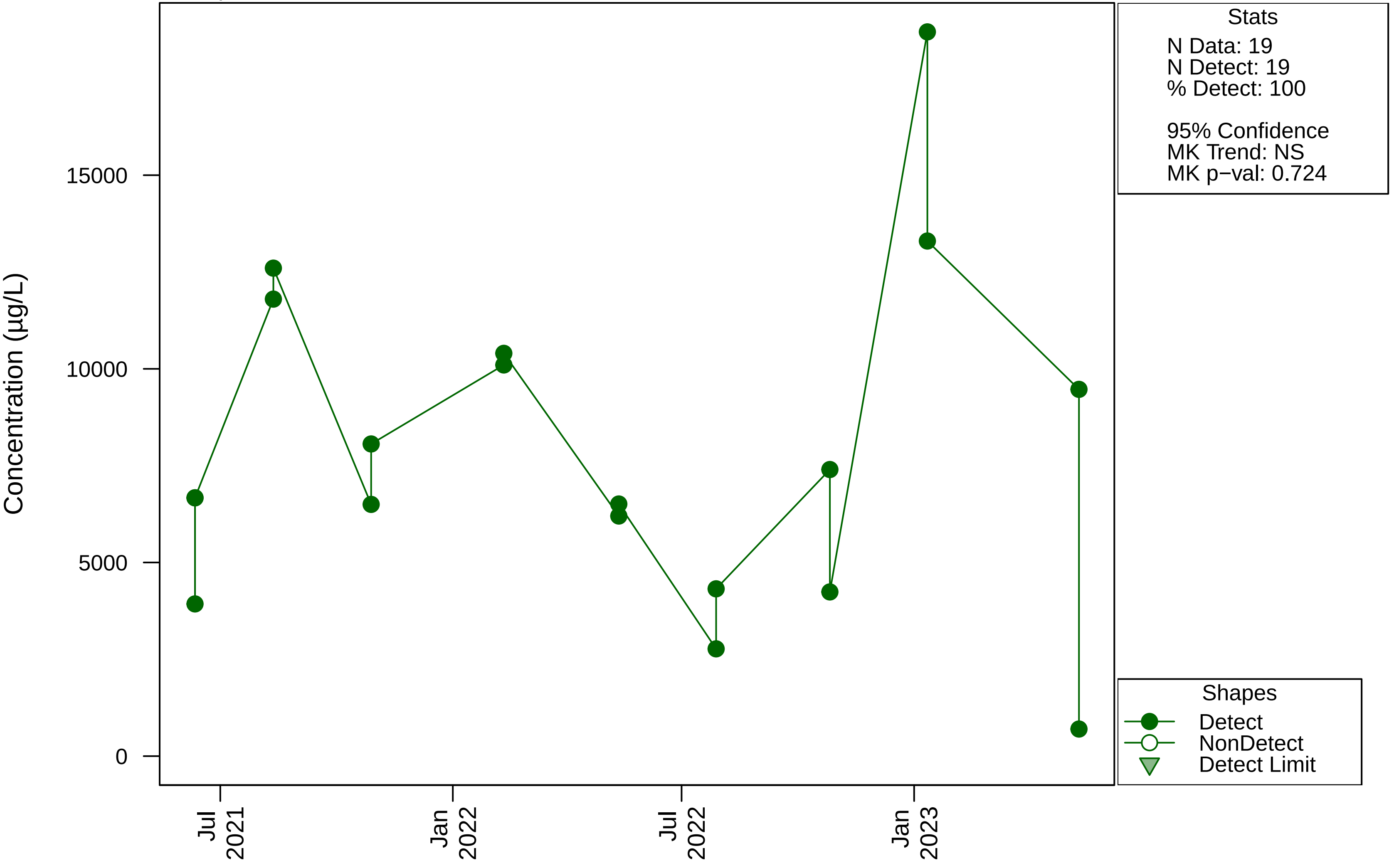
Scatterplots and Trend Analysis
D104, Chromium

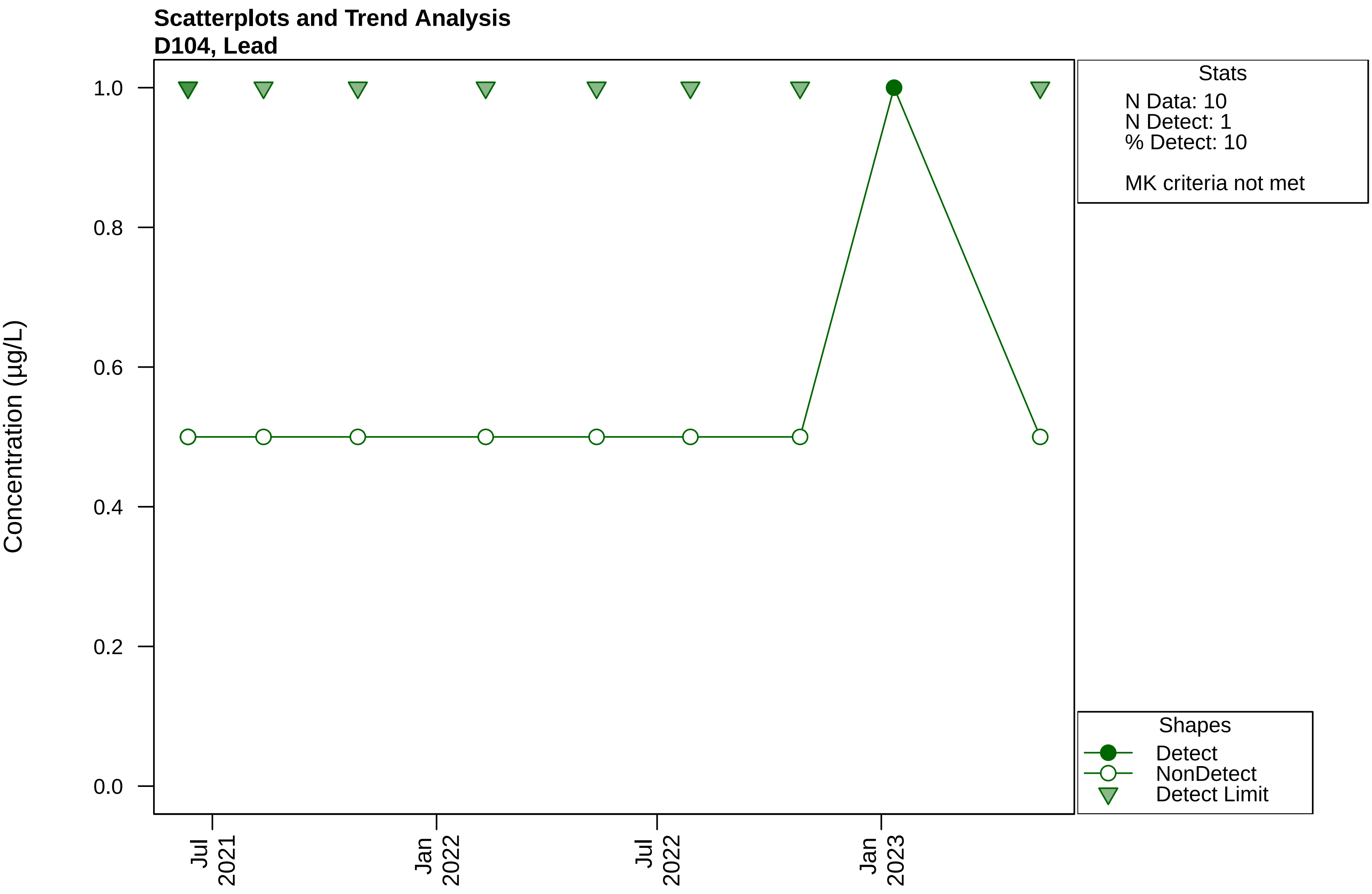



Scatterplots and Trend Analysis
D104, Electrical Conductivity (Field)
Concentration (uS/cm)
1400
1200
1000
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0116
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

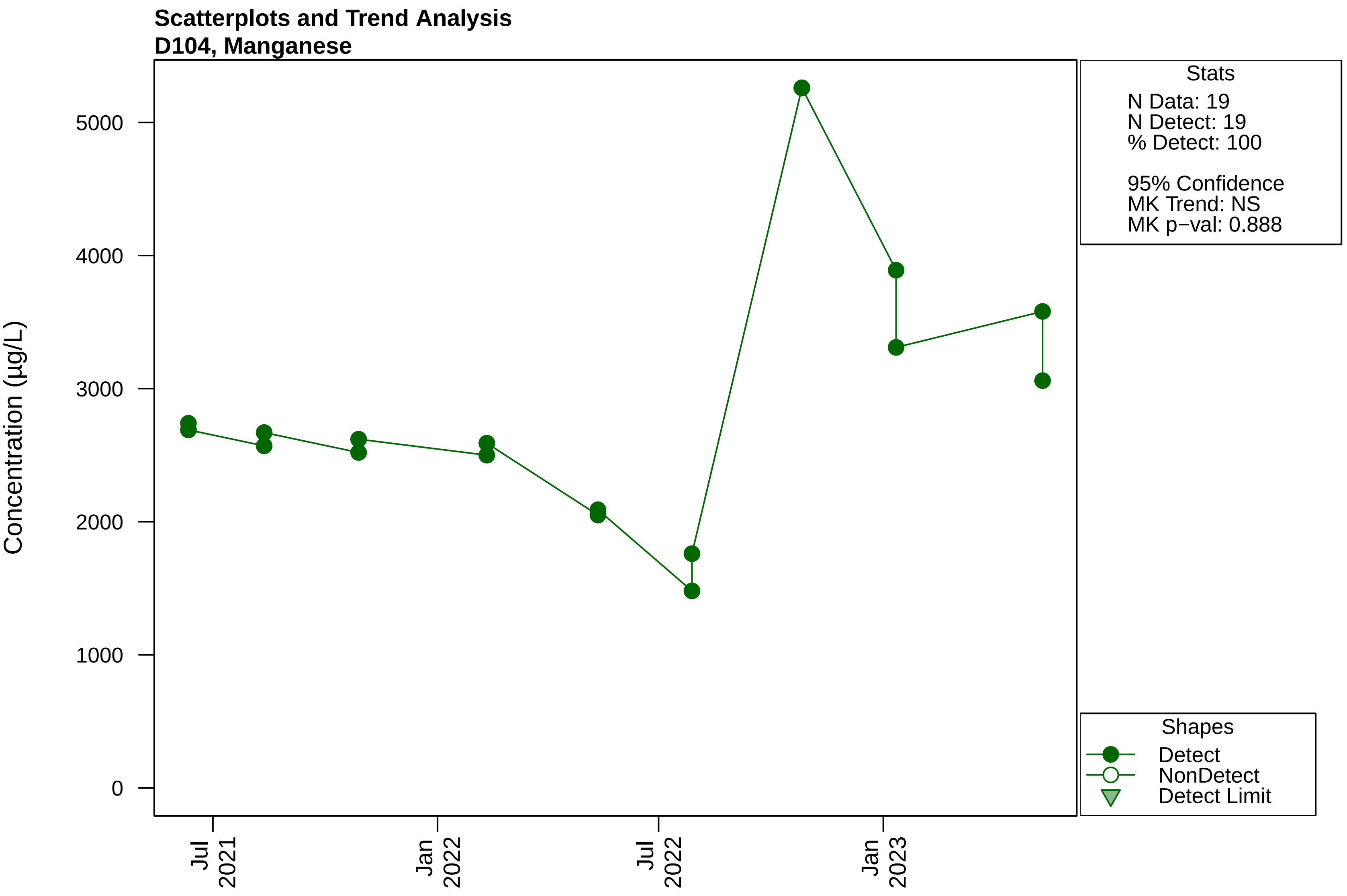

Scatterplots and Trend Analysis
D104, Fluoride
Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D104, Iron

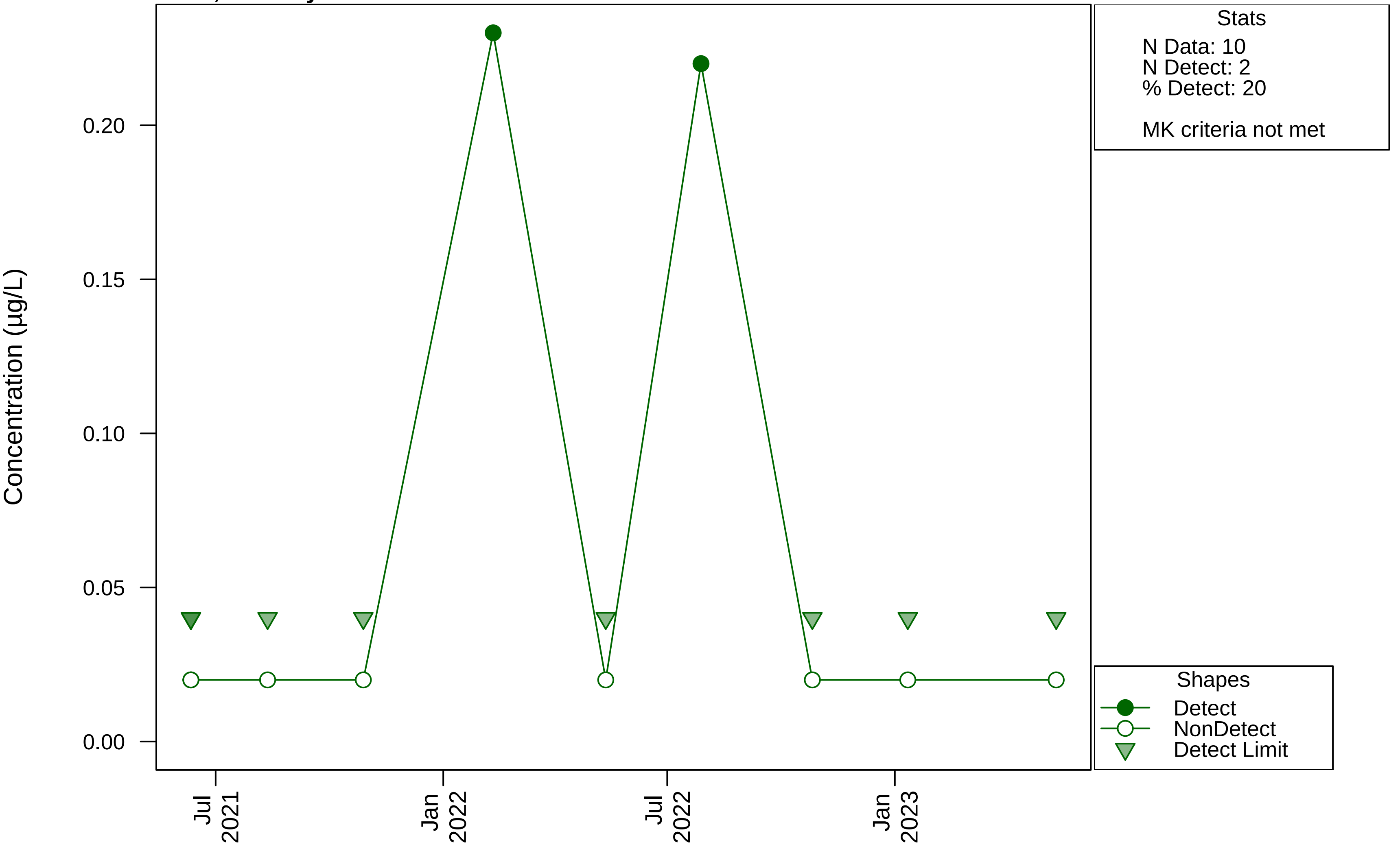


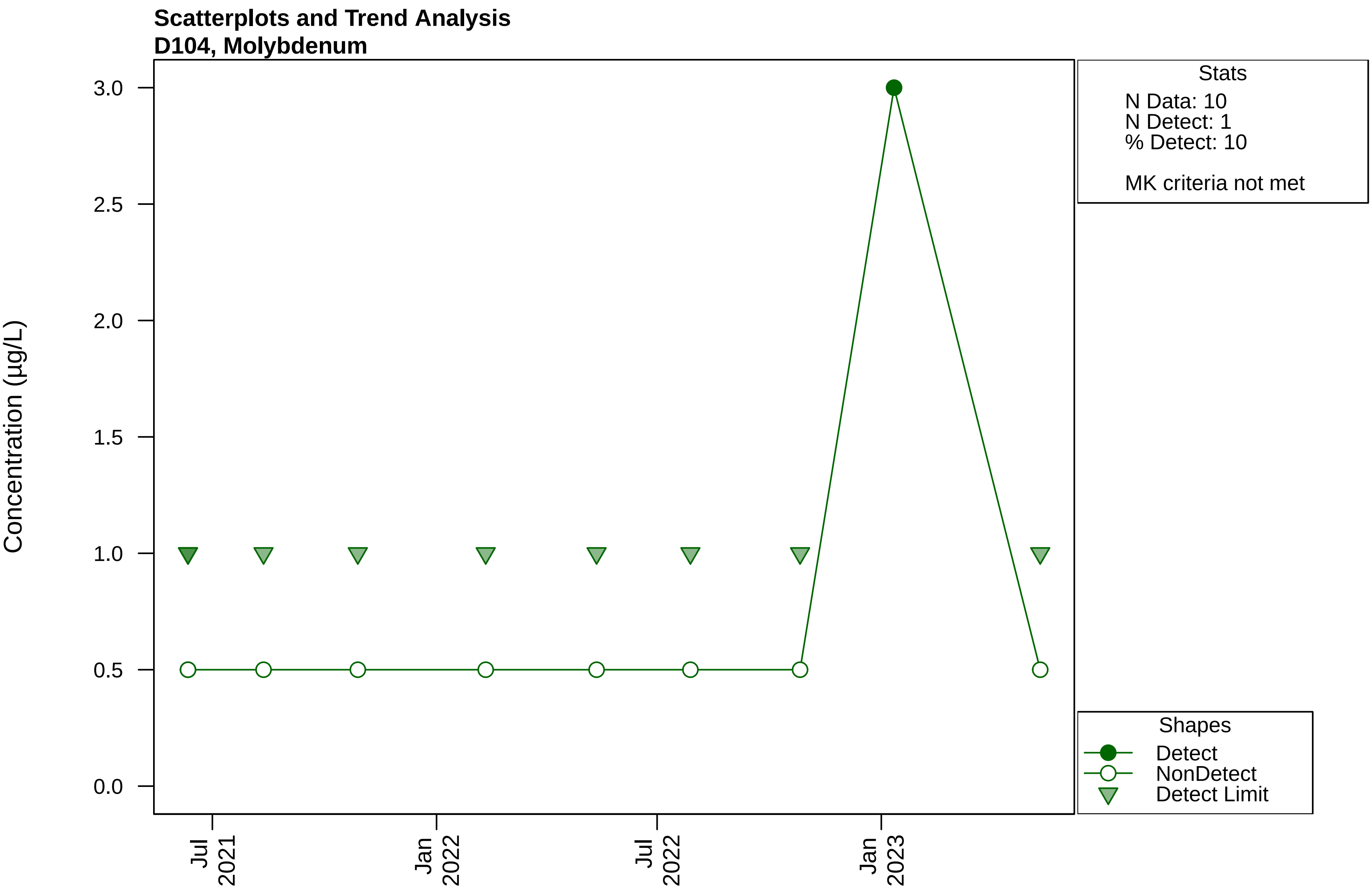


Scatterplots and Trend Analysis
D104, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

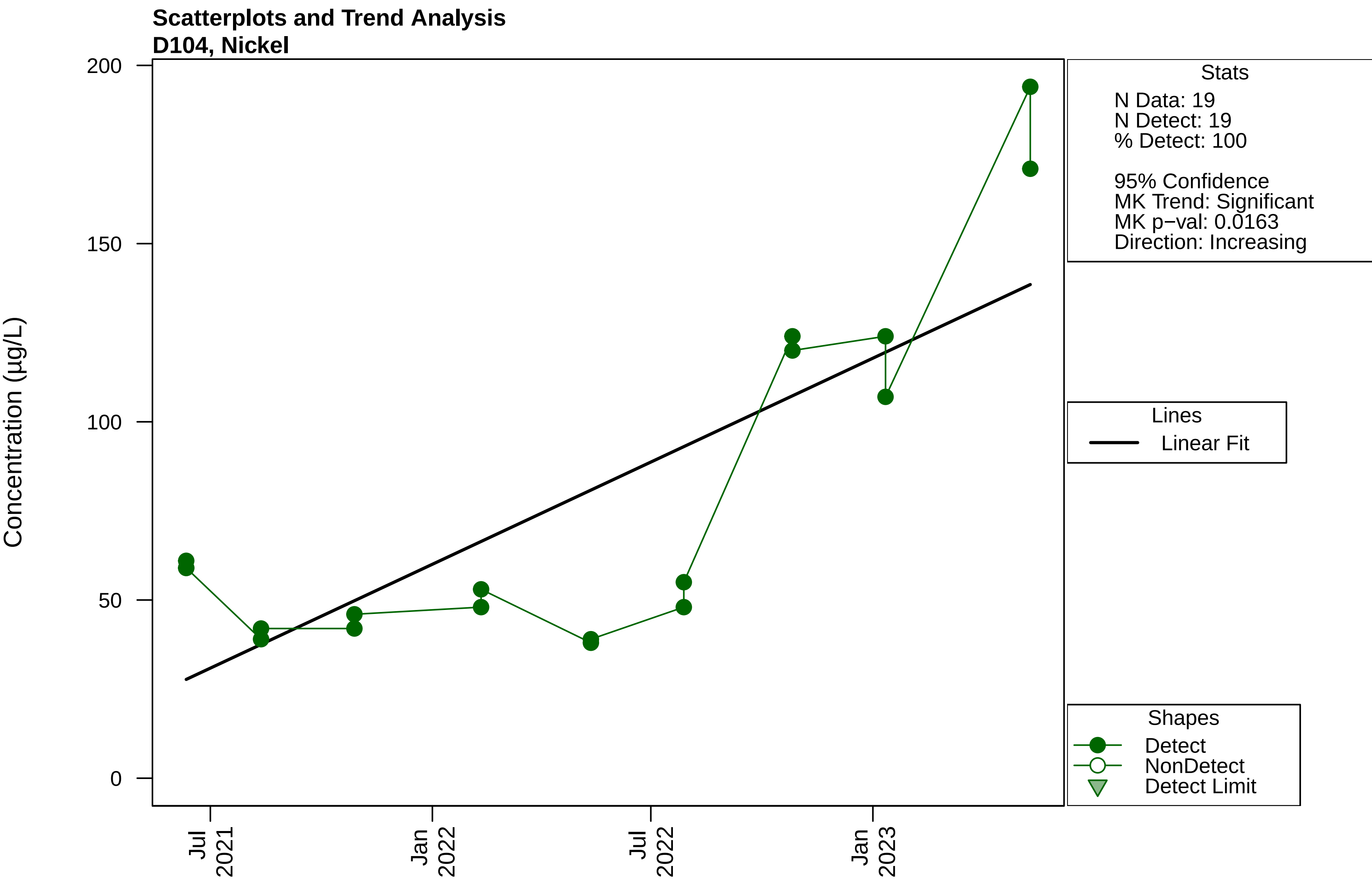

Scatterplots and Trend Analysis
D104, Manganese
Concentration (µg/L)
0
1000
2000
3000
4000
5000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.888
Shapes
Detect
NonDetect
Detect Limit

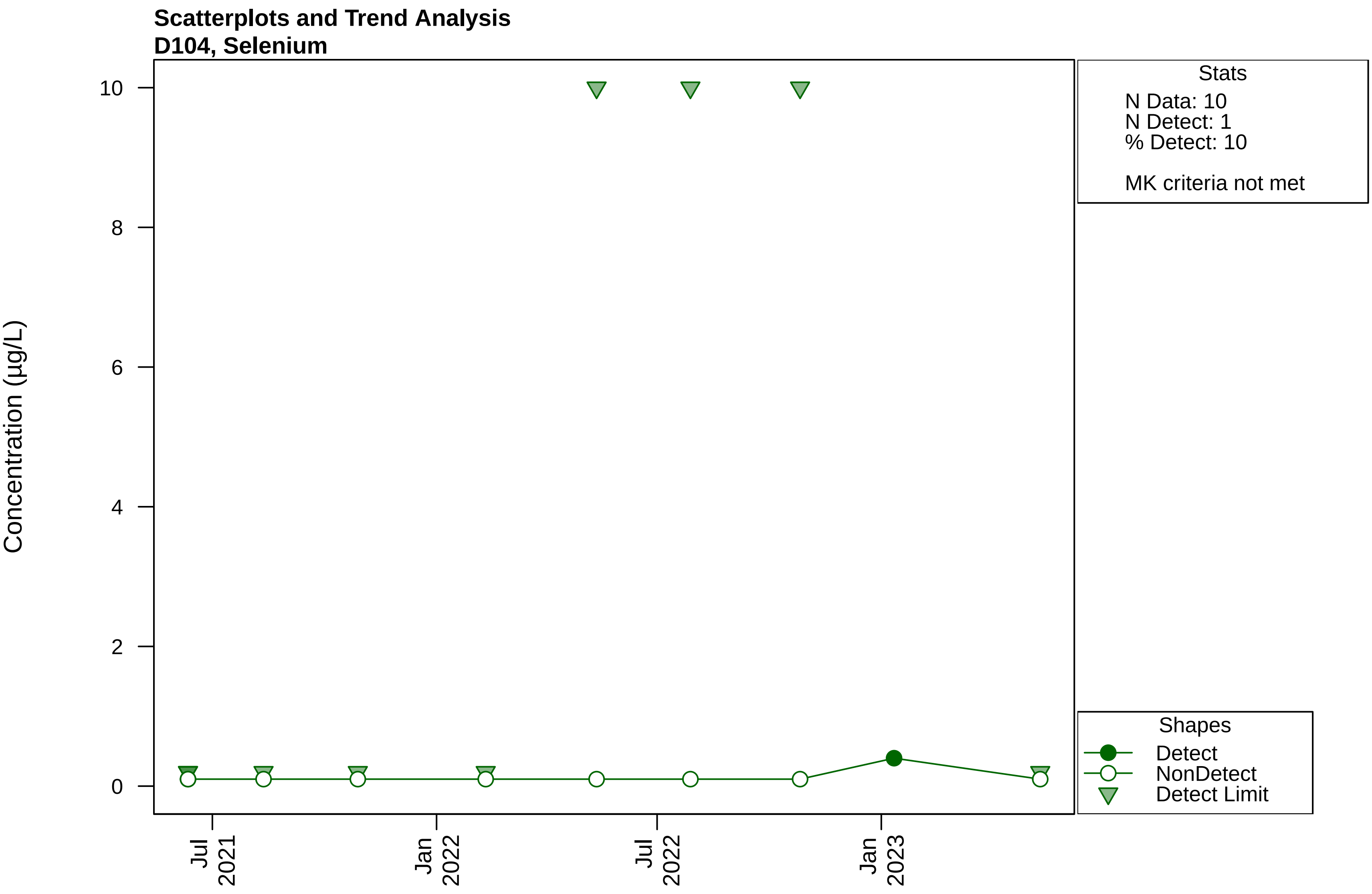
Scatterplots and Trend Analysis
D104, Mercury

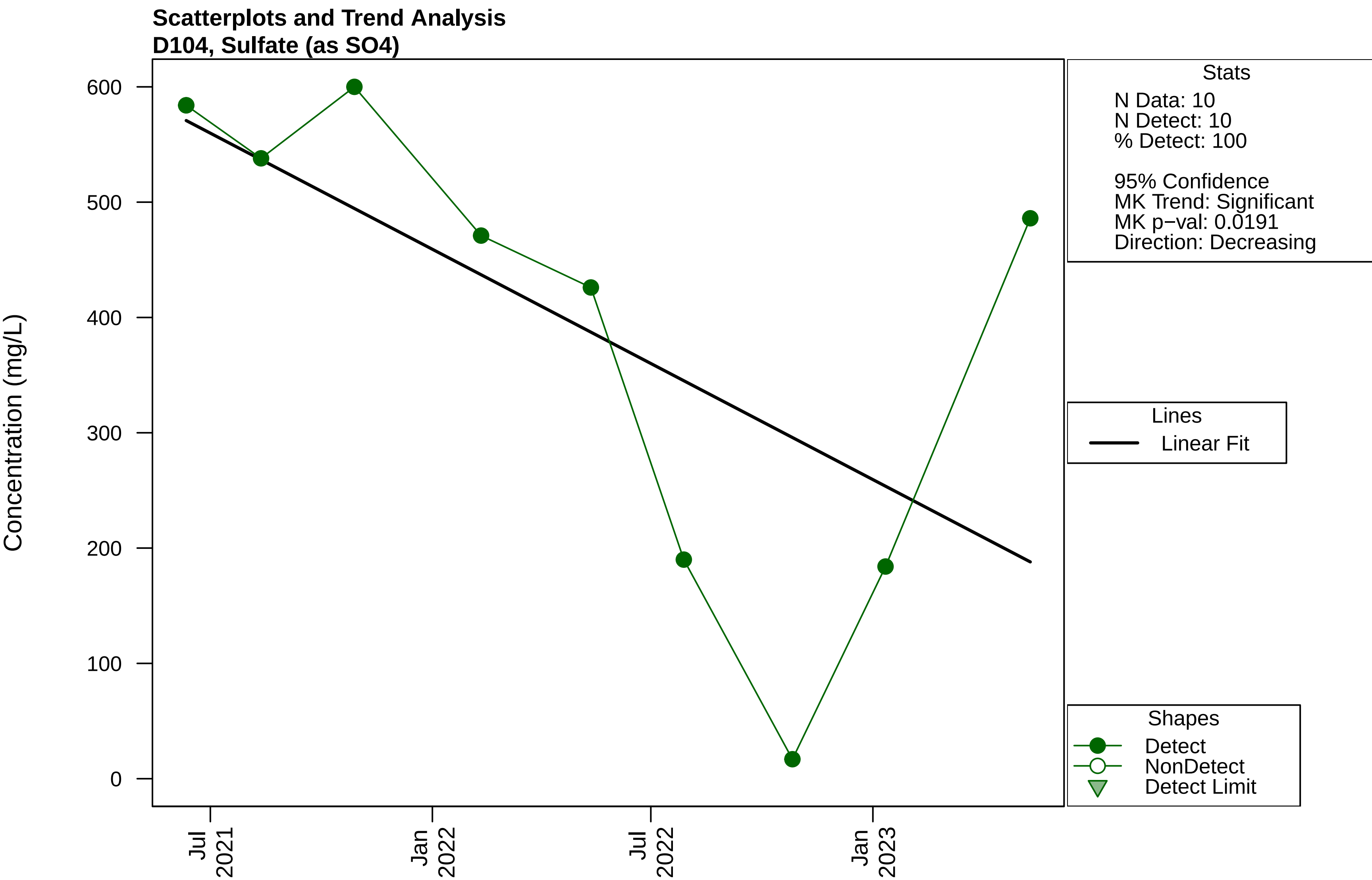




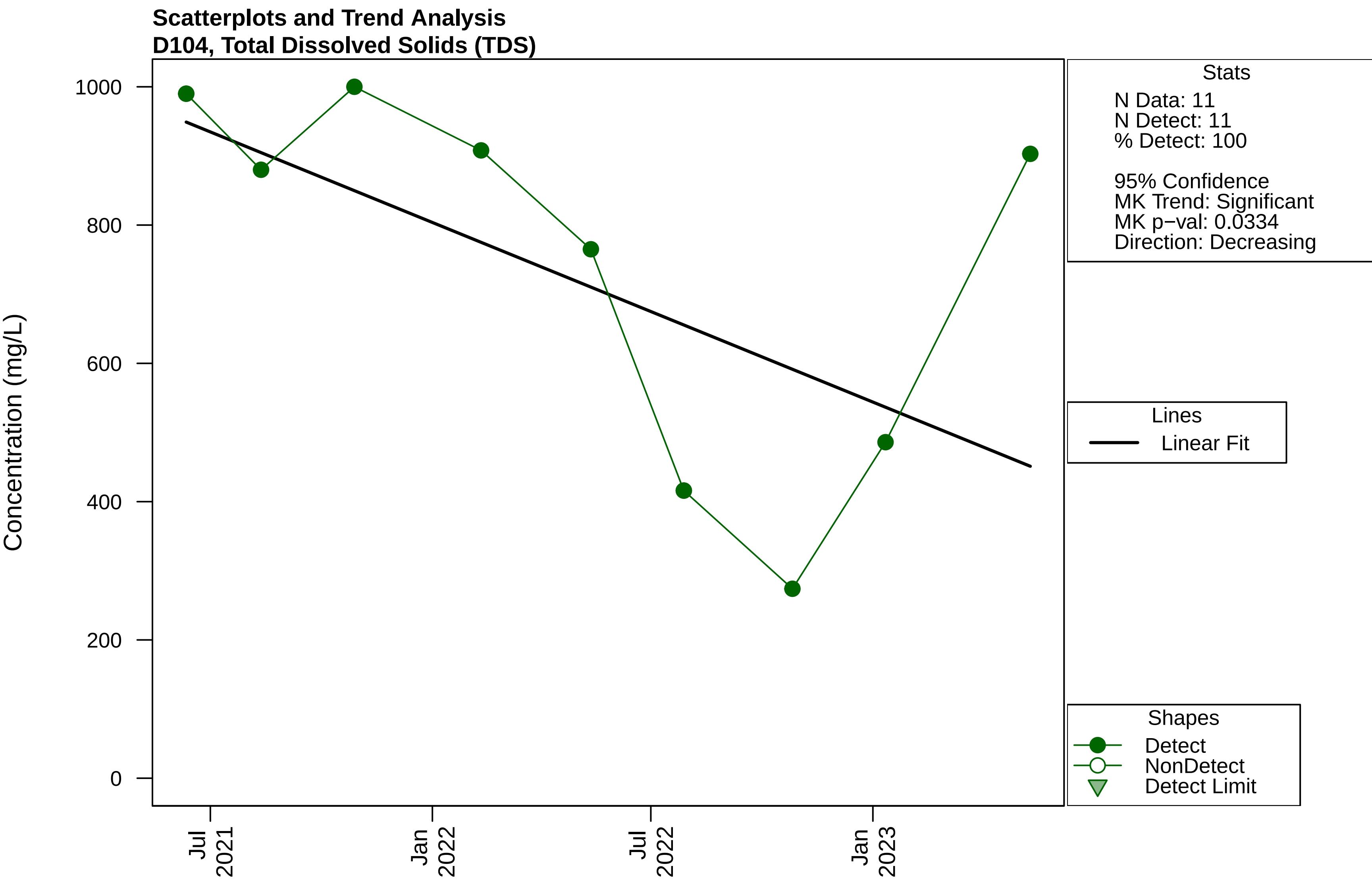
Scatterplots and Trend Analysis
D104, Molybdenum
Concentration (µg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

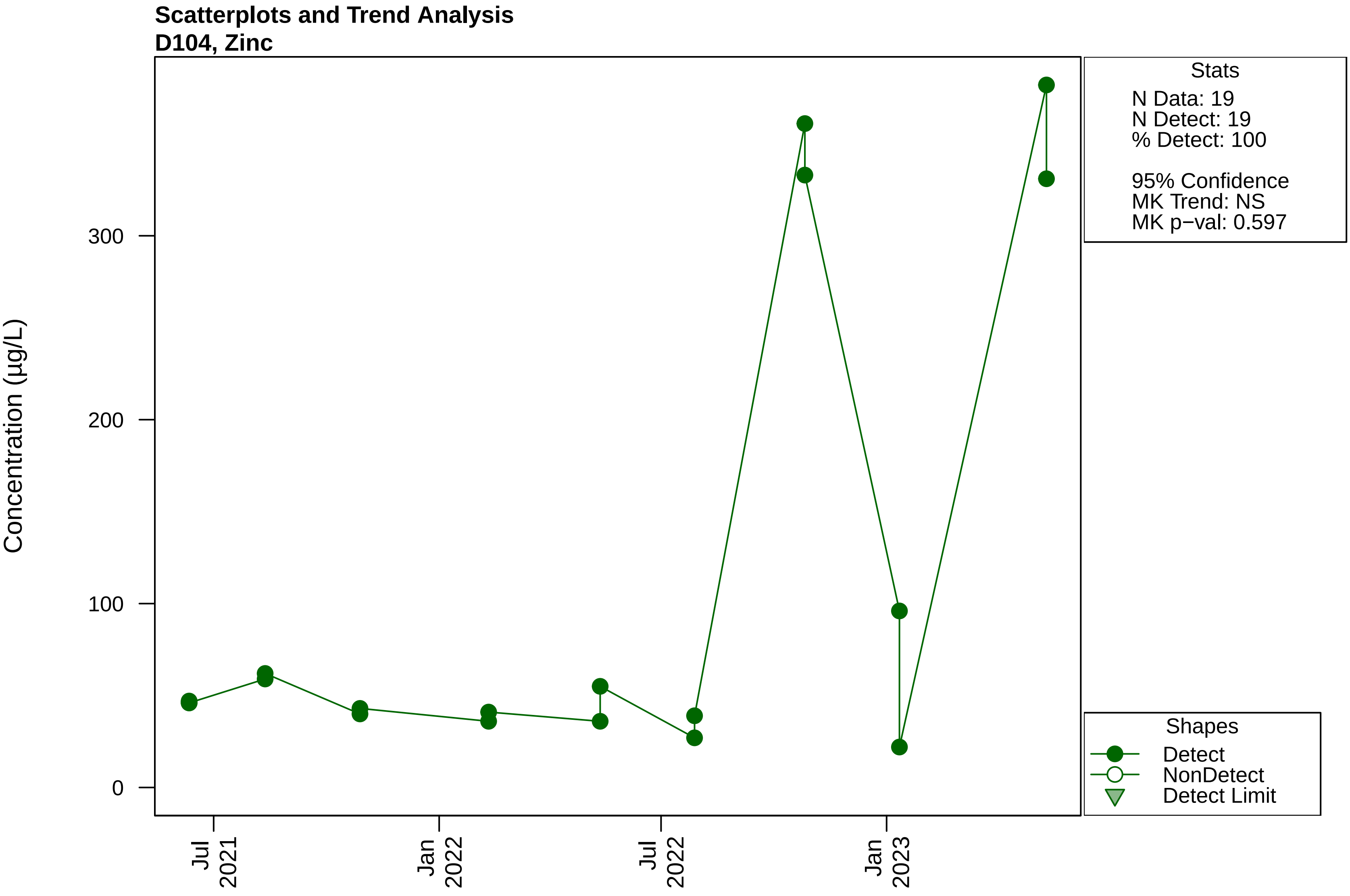

Scatterplots and Trend Analysis
D104, Nickel
Concentration (µg/L)
200
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0163
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D104, Selenium
Concentration (µg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

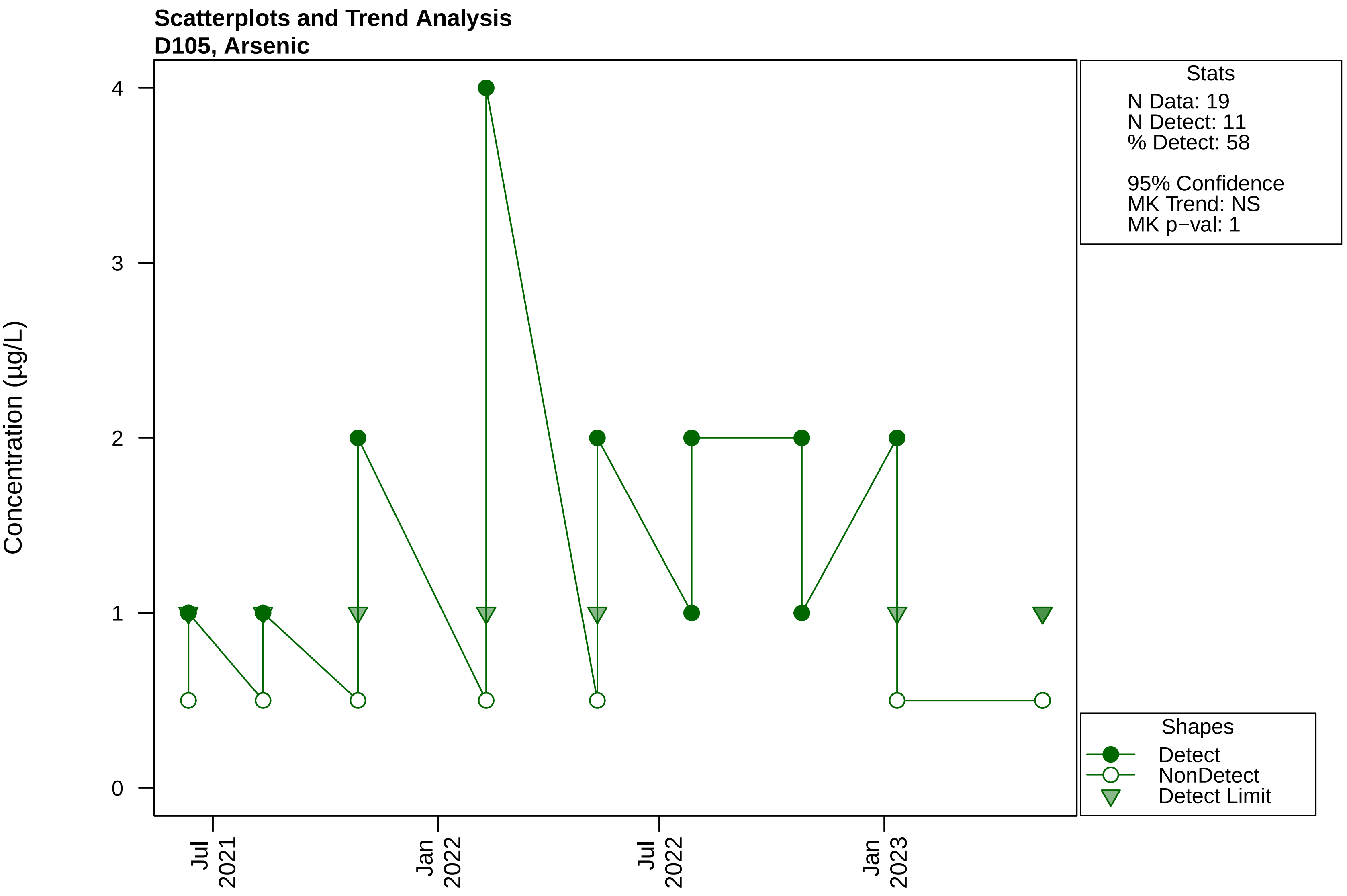


Scatterplots and Trend Analysis
D104, Sulfate (as SO4)
Concentration (mg/L)
0
100
200
300
400
500
600
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0191
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

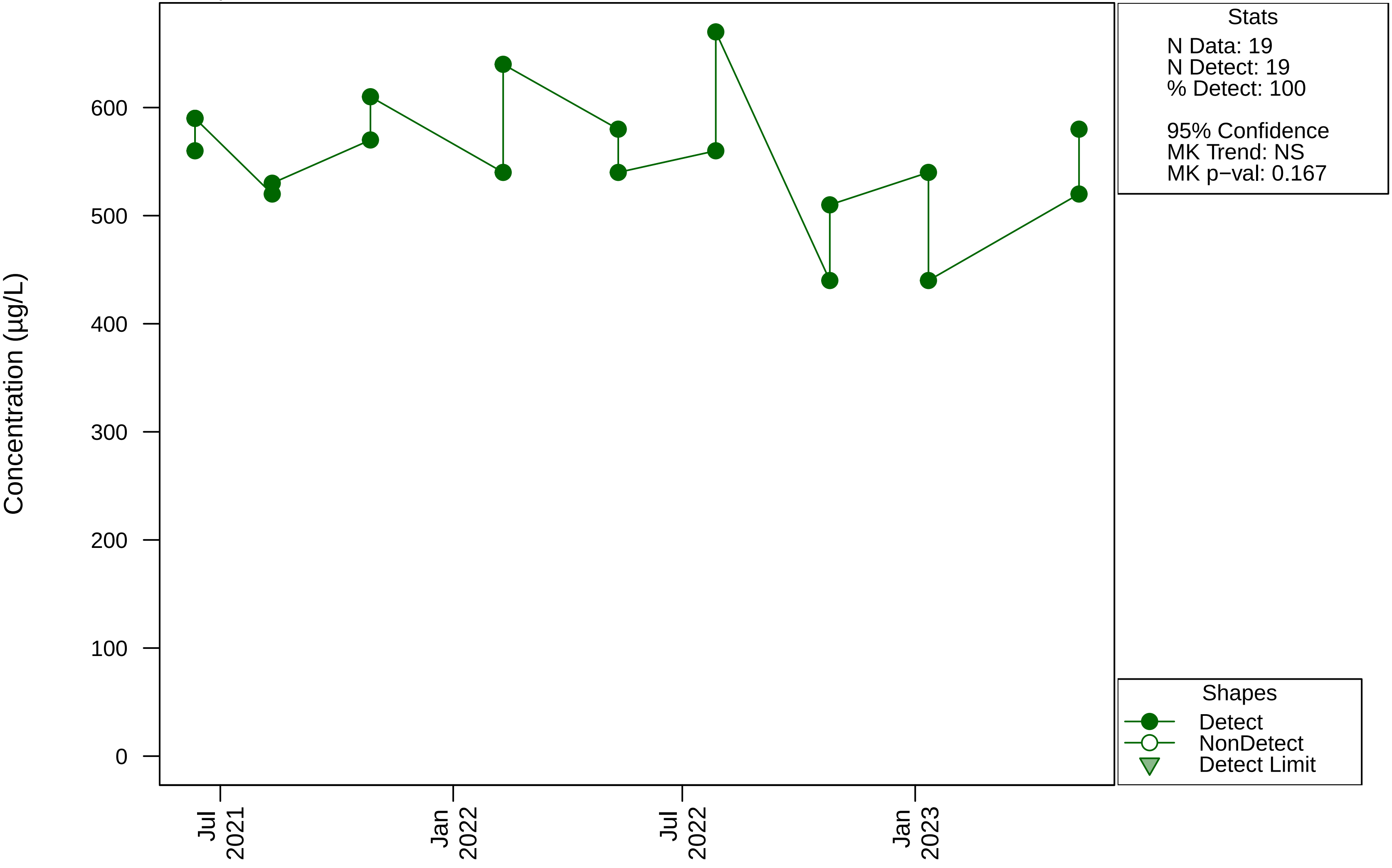

Scatterplots and Trend Analysis
D104, Total Dissolved Solids (TDS)
Concentration (mg/L)
1000
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0334
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit



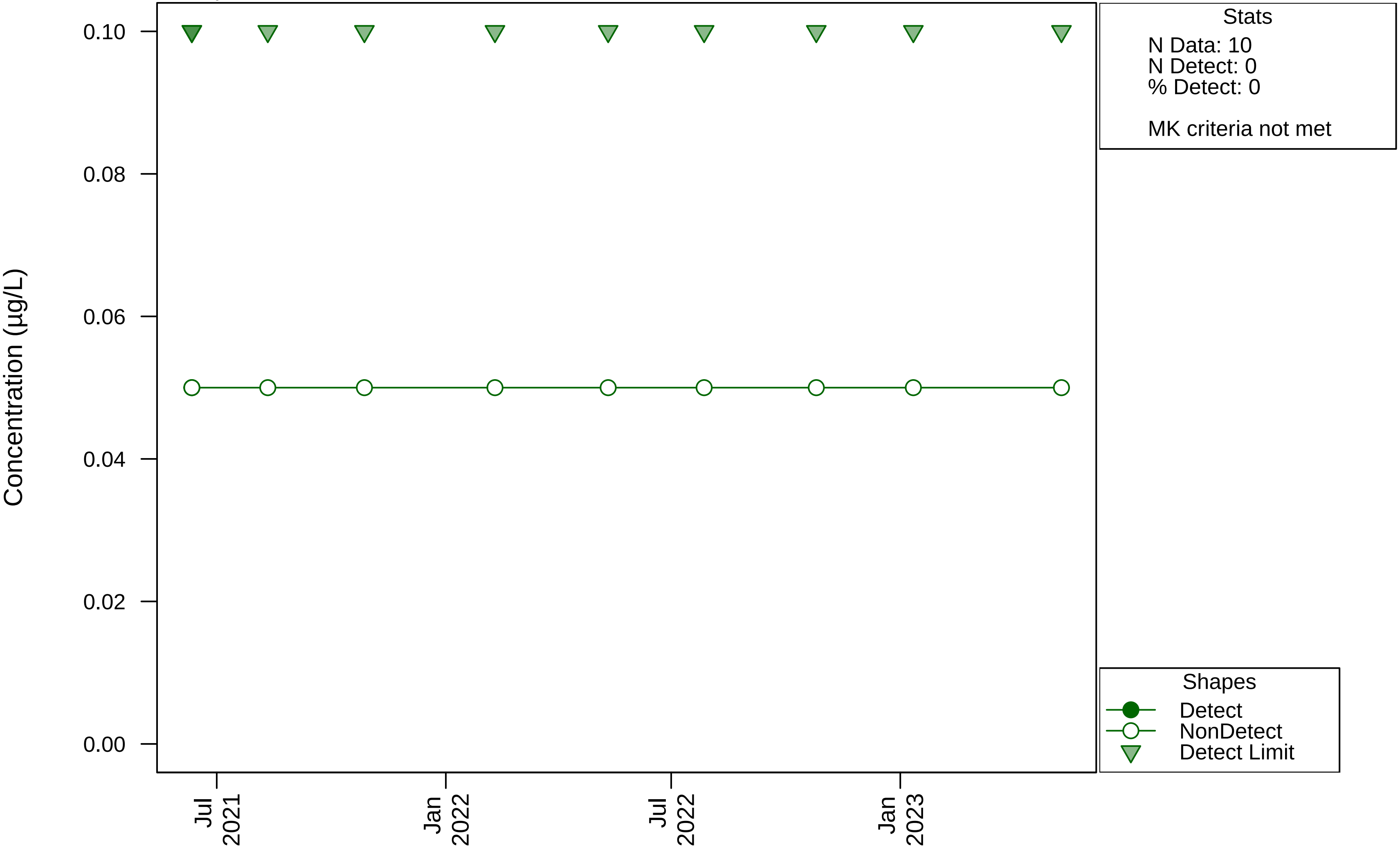
Scatterplots and Trend Analysis
D104, Zinc
Concentration (µg/L)
0
100
200
300
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.597
Shapes
Detect
NonDetect
Detect Limit

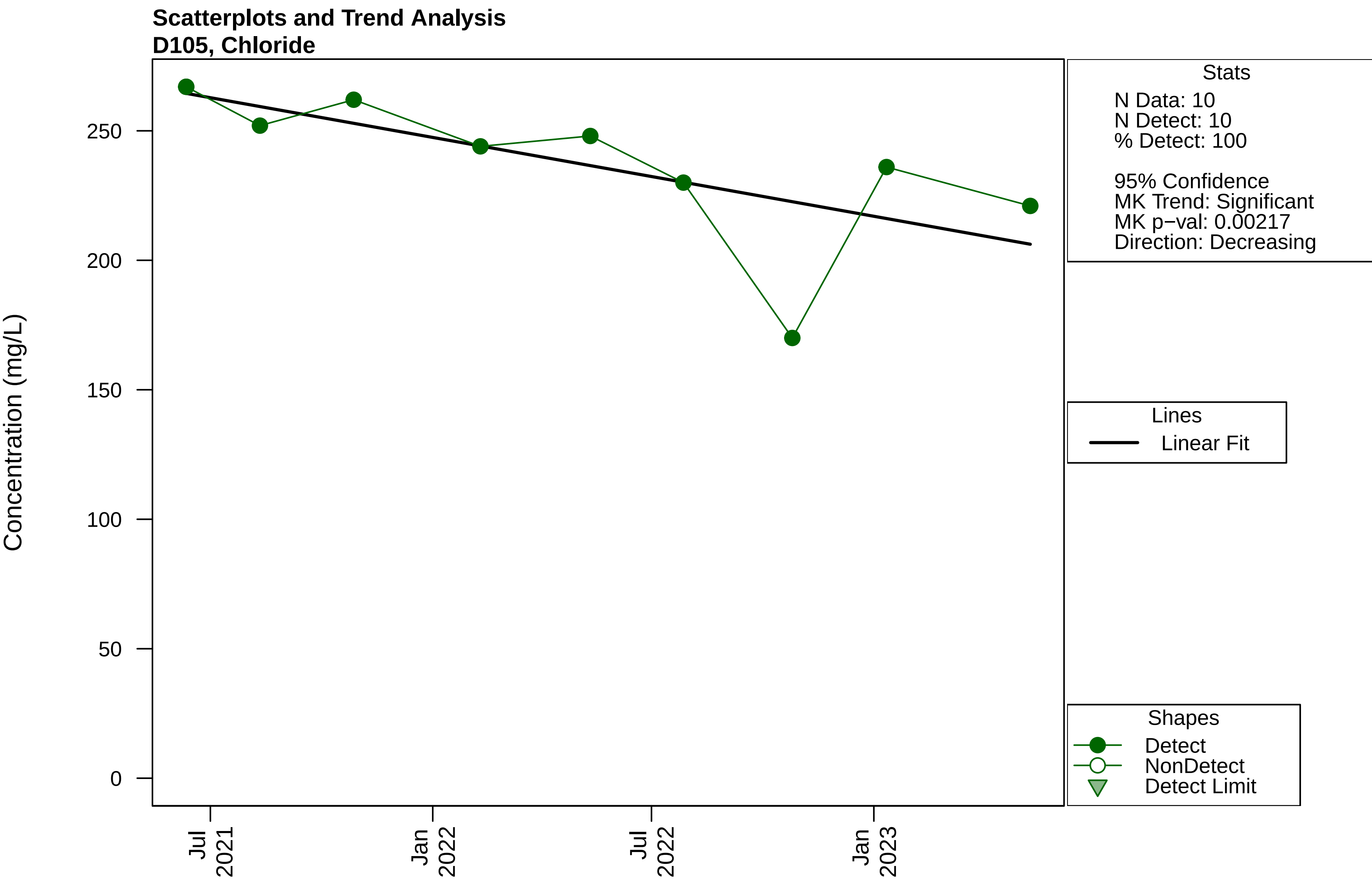

Scatterplots and Trend Analysis
D105, Arsenic
Concentration (µg/L)
0
1
2
3
4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 11
% Detect: 58
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D105, Boron

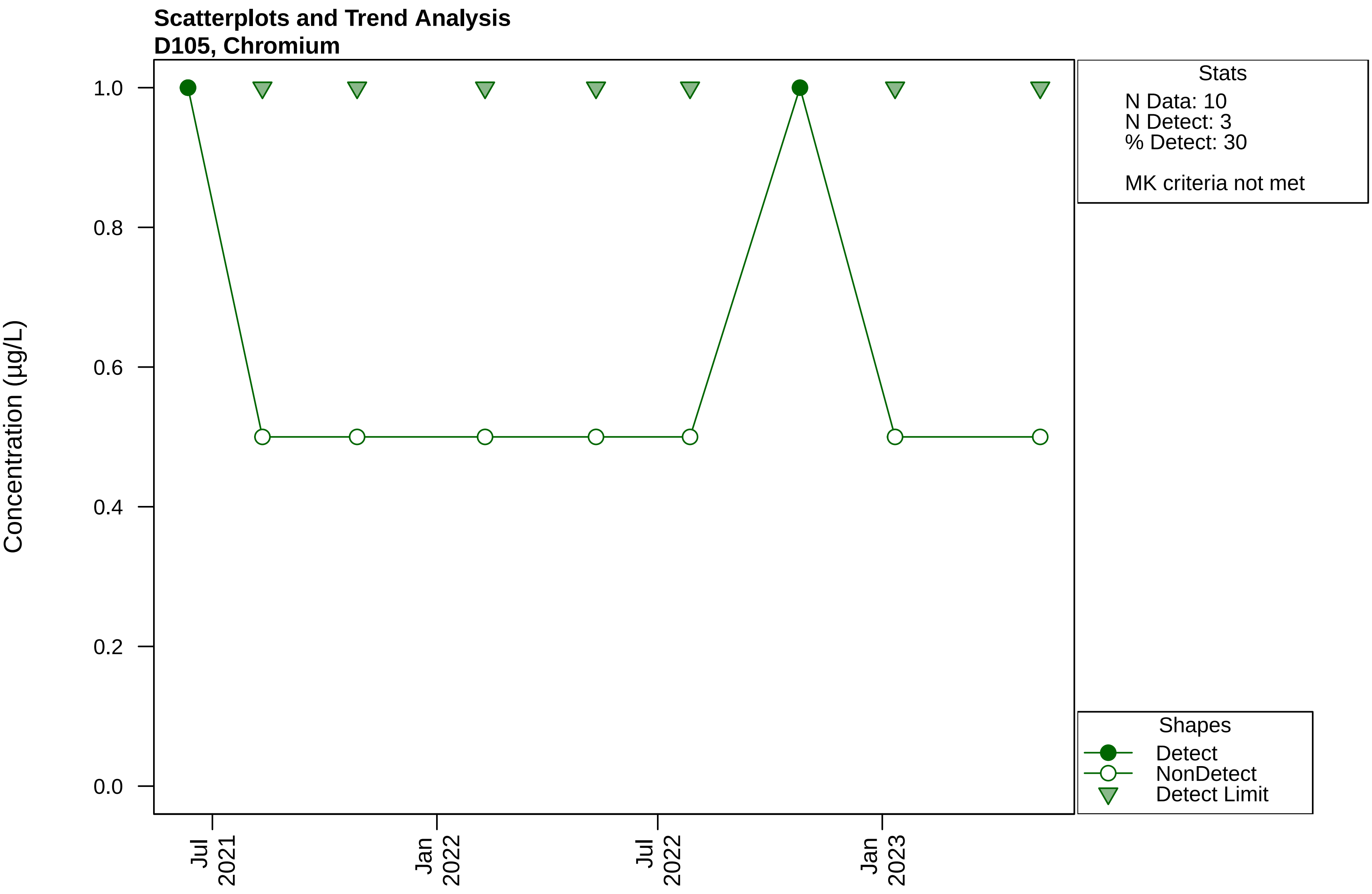


Scatterplots and Trend Analysis
D105, Cadmium

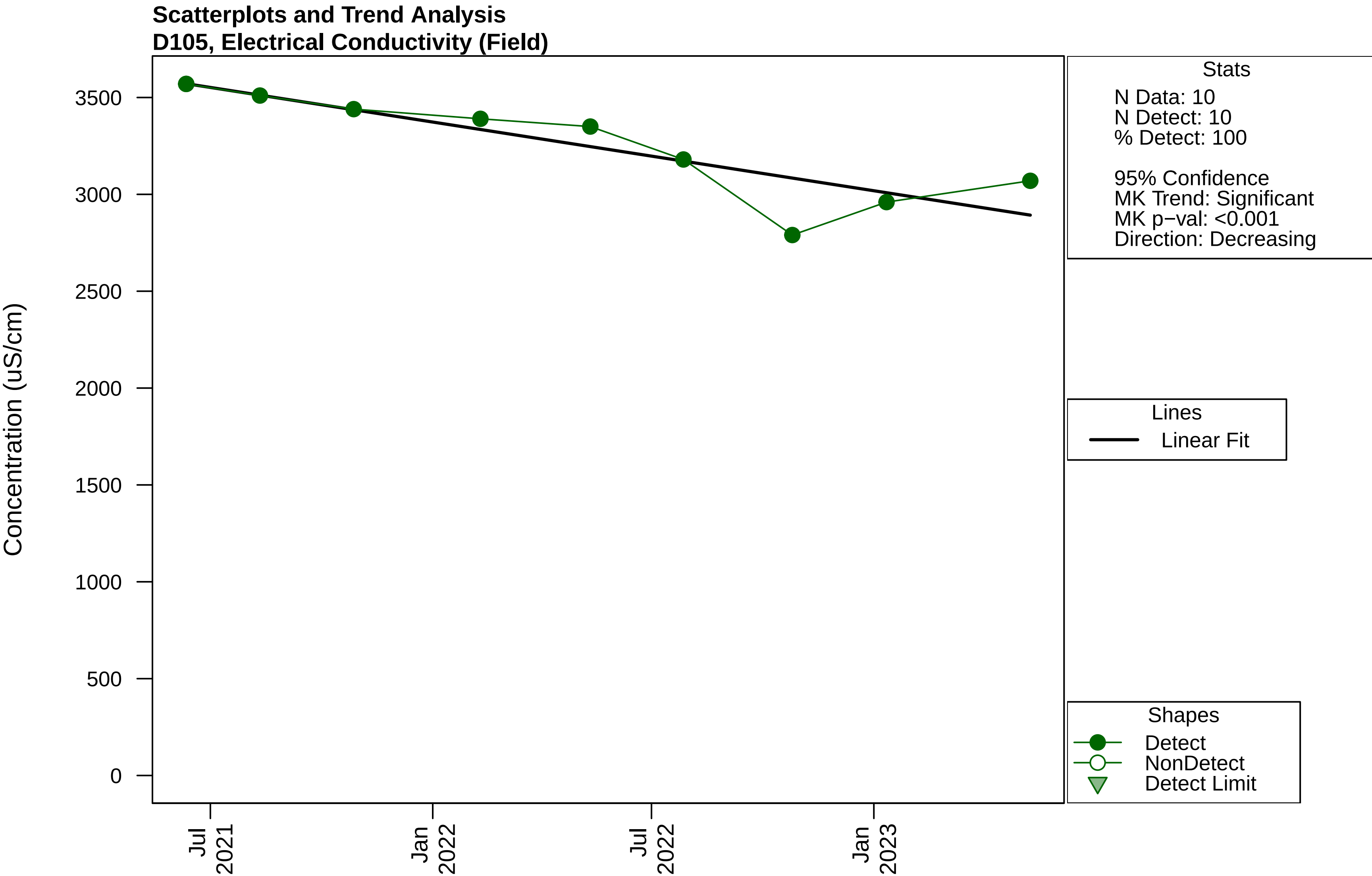




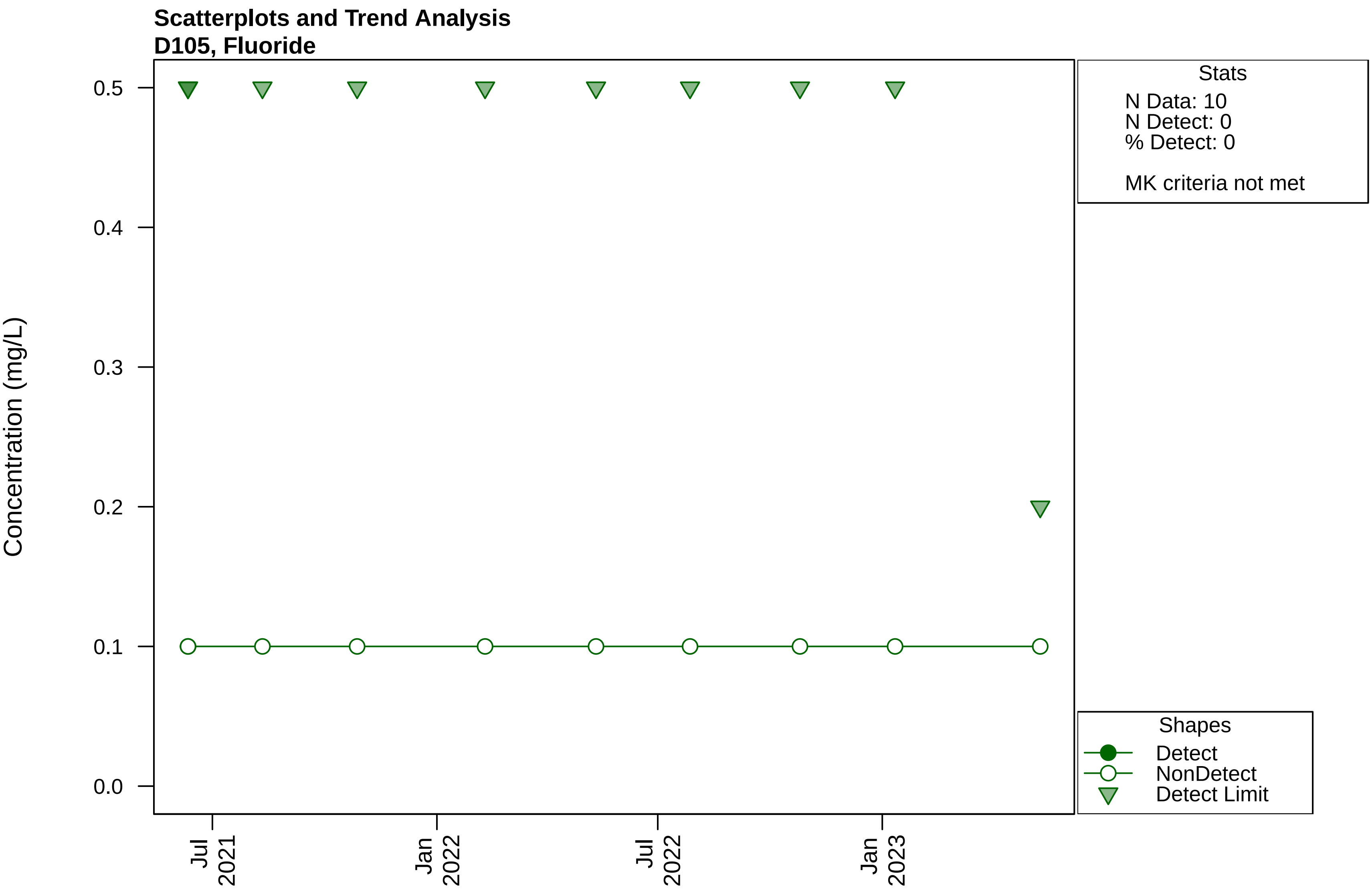
Scatterplots and Trend Analysis
D105, Chloride
Concentration (mg/L)
0
50
100
150
200
250
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00217
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit



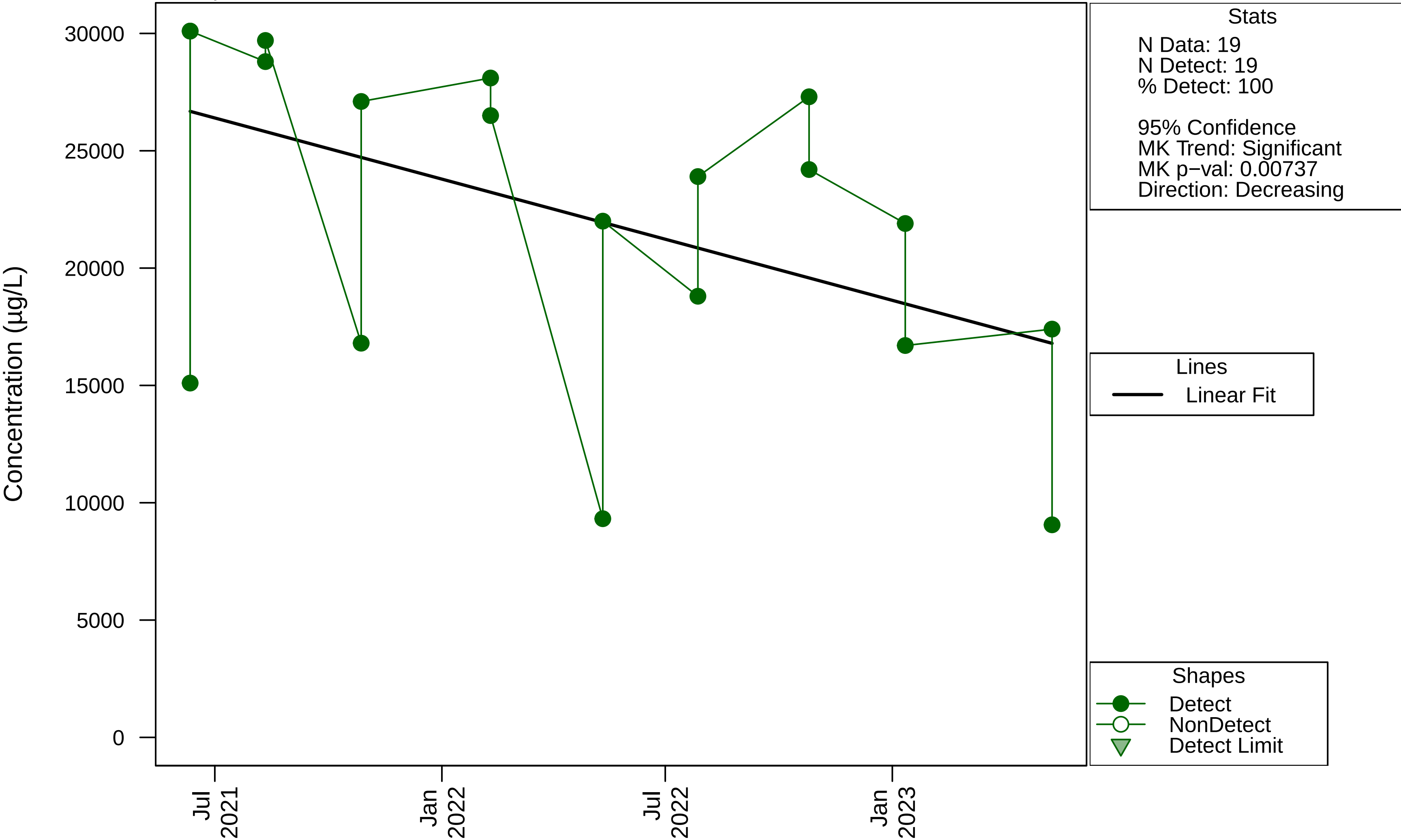
Scatterplots and Trend Analysis
D105, Chromium
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 3
% Detect: 30
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

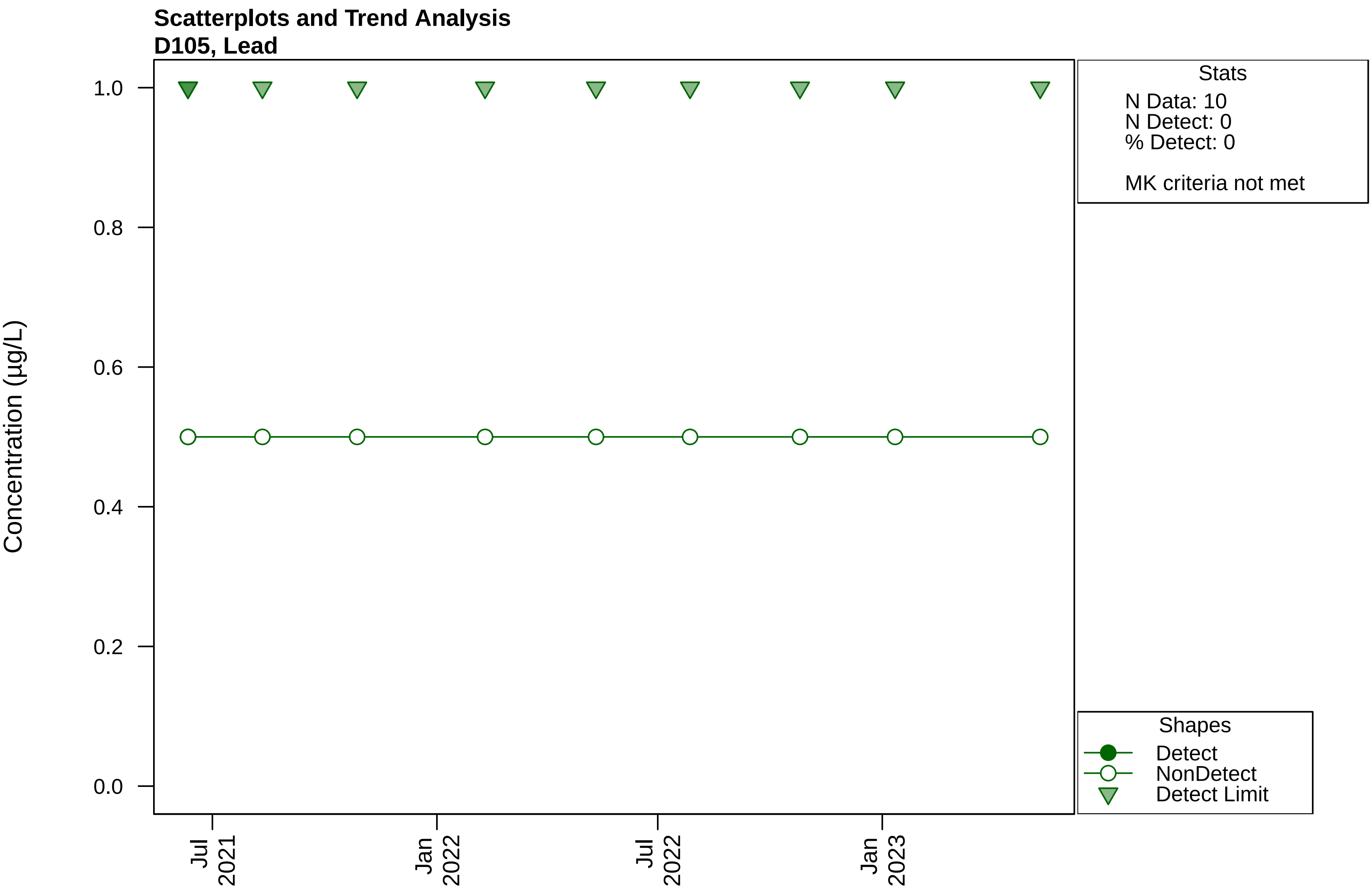


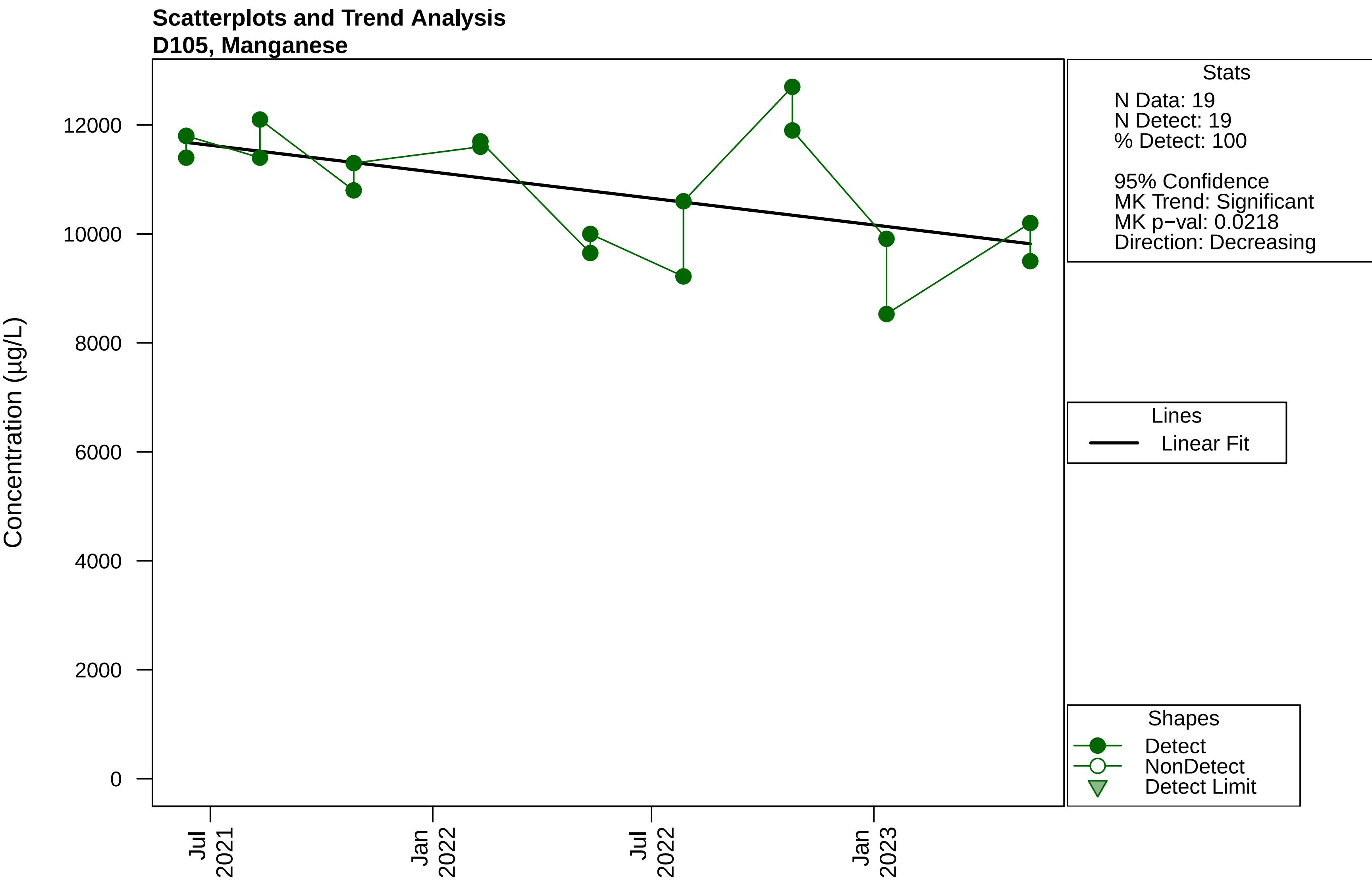
Scatterplots and Trend Analysis
D105, Electrical Conductivity (Field)
Concentration (uS/cm)
3500
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

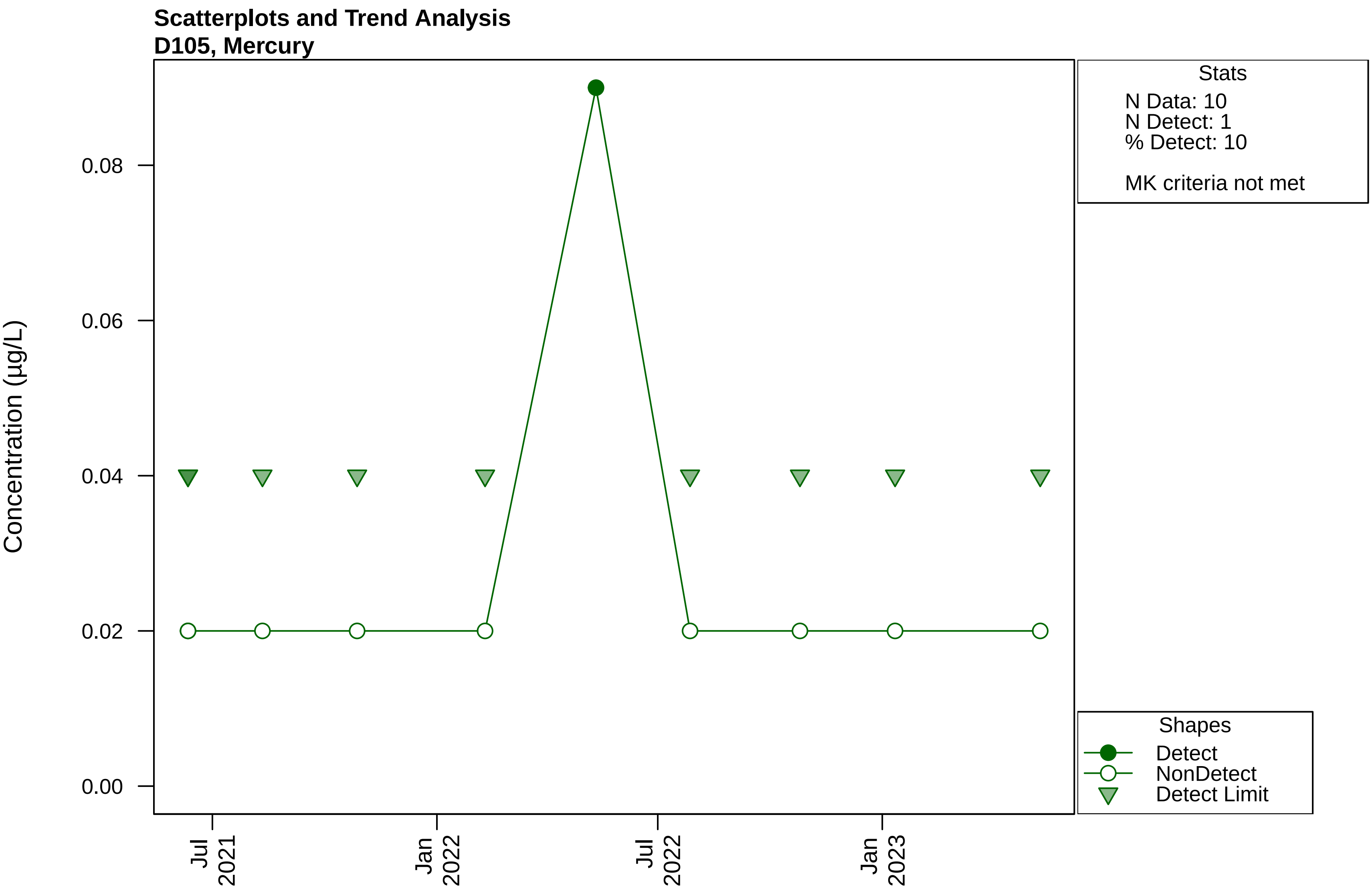

Scatterplots and Trend Analysis
D105, Fluoride
Concentration (mg/L)
0.5
0.4
0.3
0.2
0.1
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

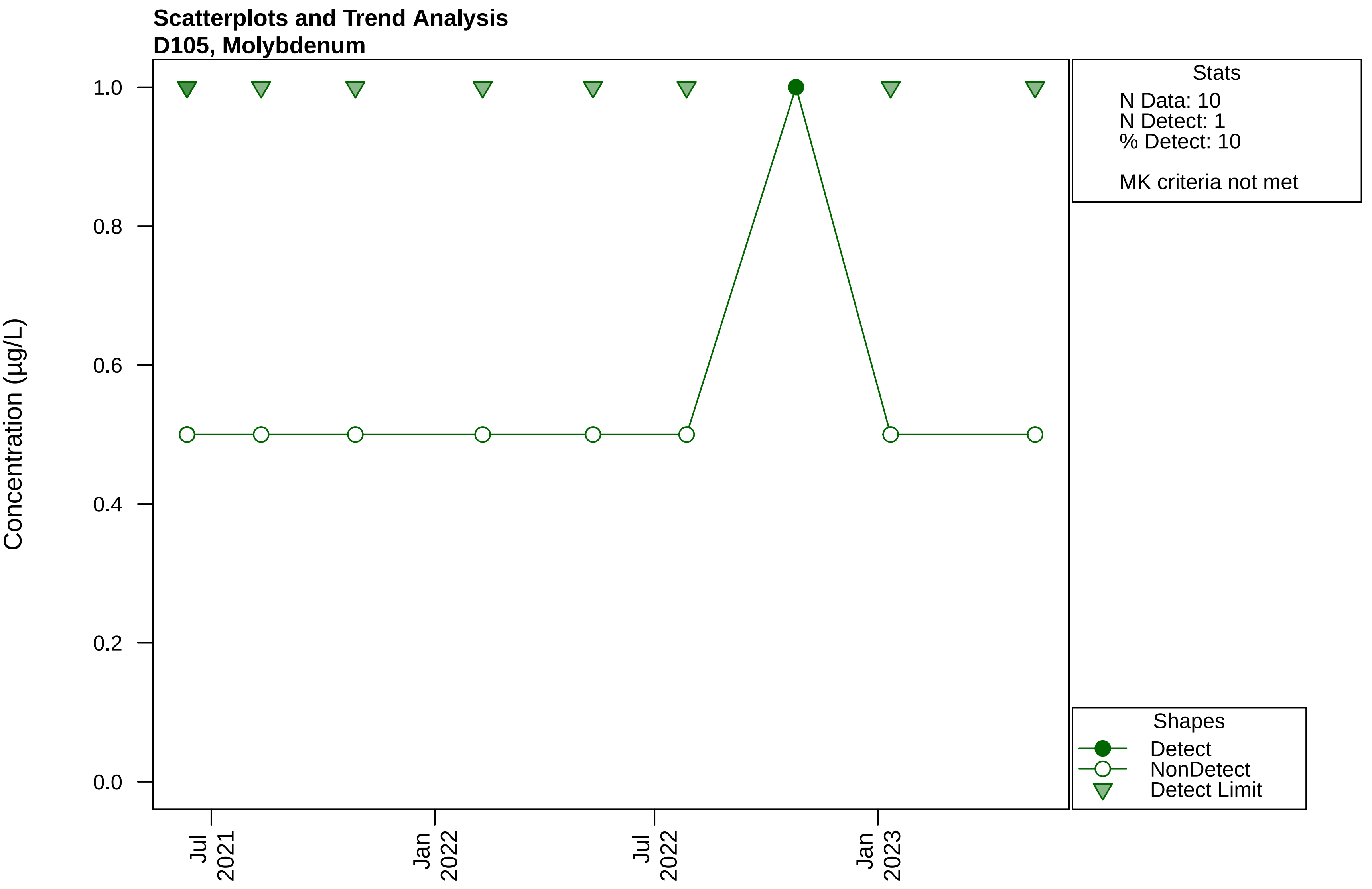
Scatterplots and Trend Analysis
D105, Iron

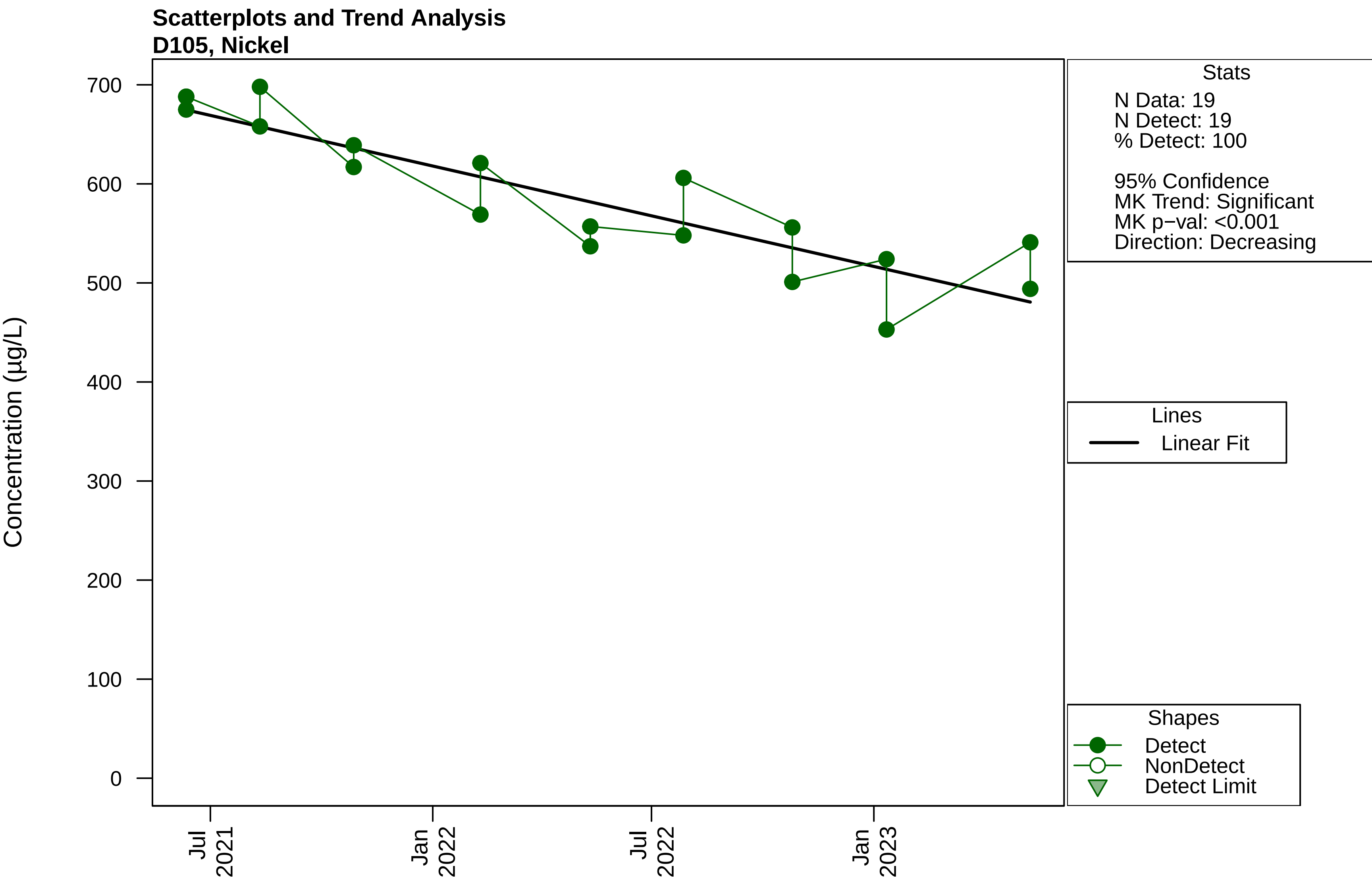


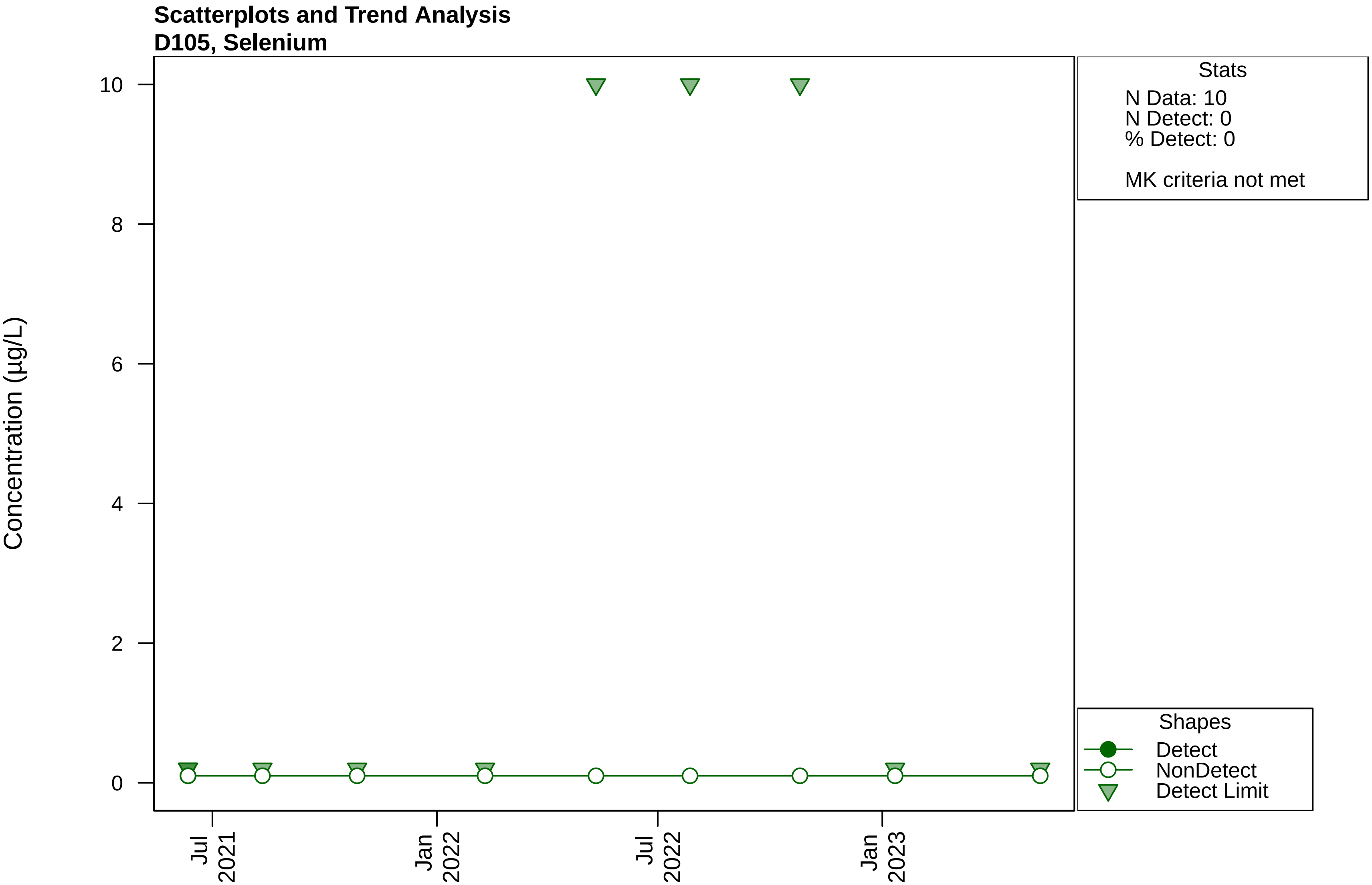

Scatterplots and Trend Analysis
D105, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

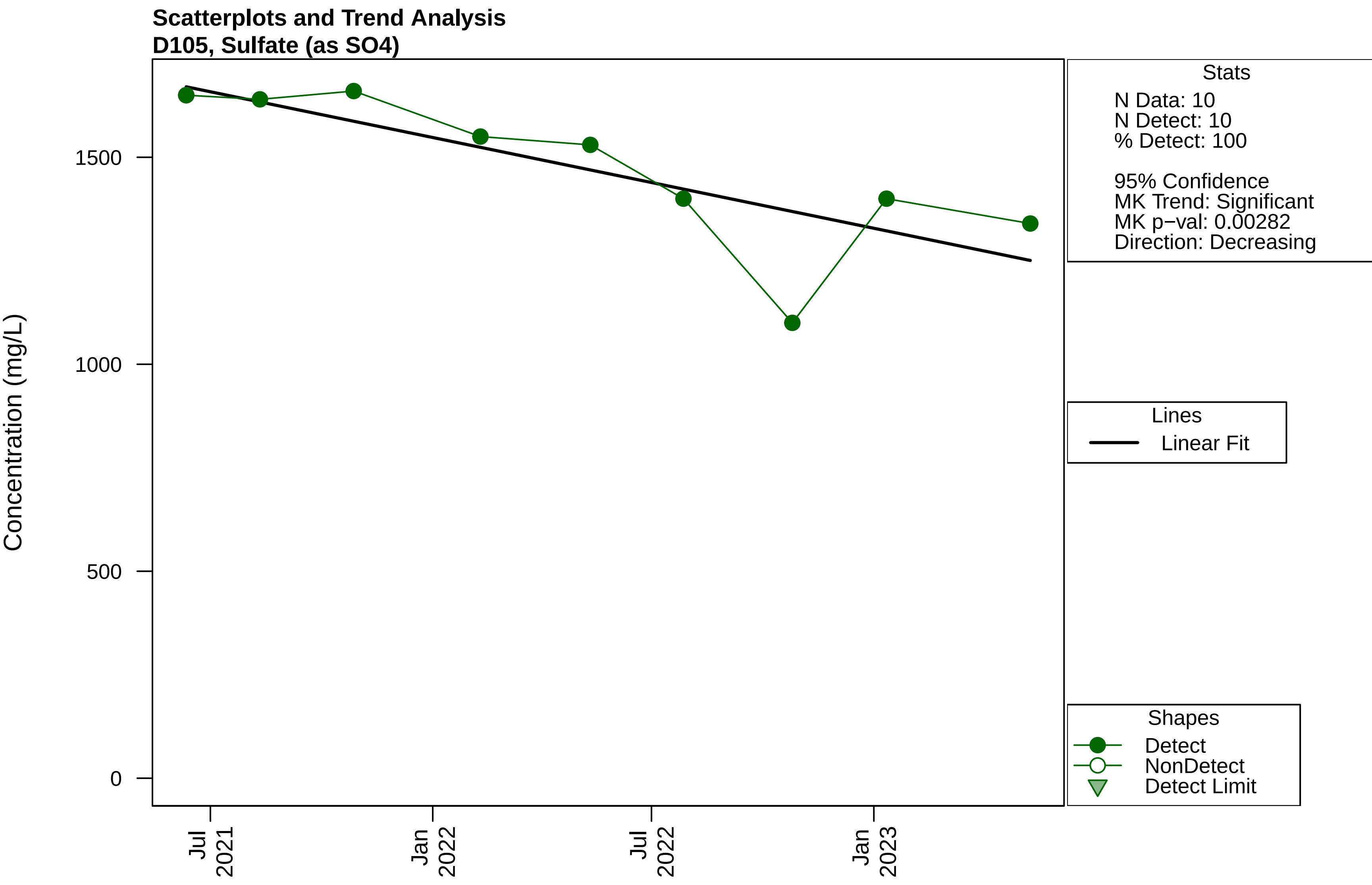

Scatterplots and Trend Analysis
D105, Manganese
Concentration (µg/L)
0
2000
4000
6000
8000
10000
12000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0218
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D105, Mercury
Concentration (µg/L)
0.00
0.02
0.04
0.06
0.08
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

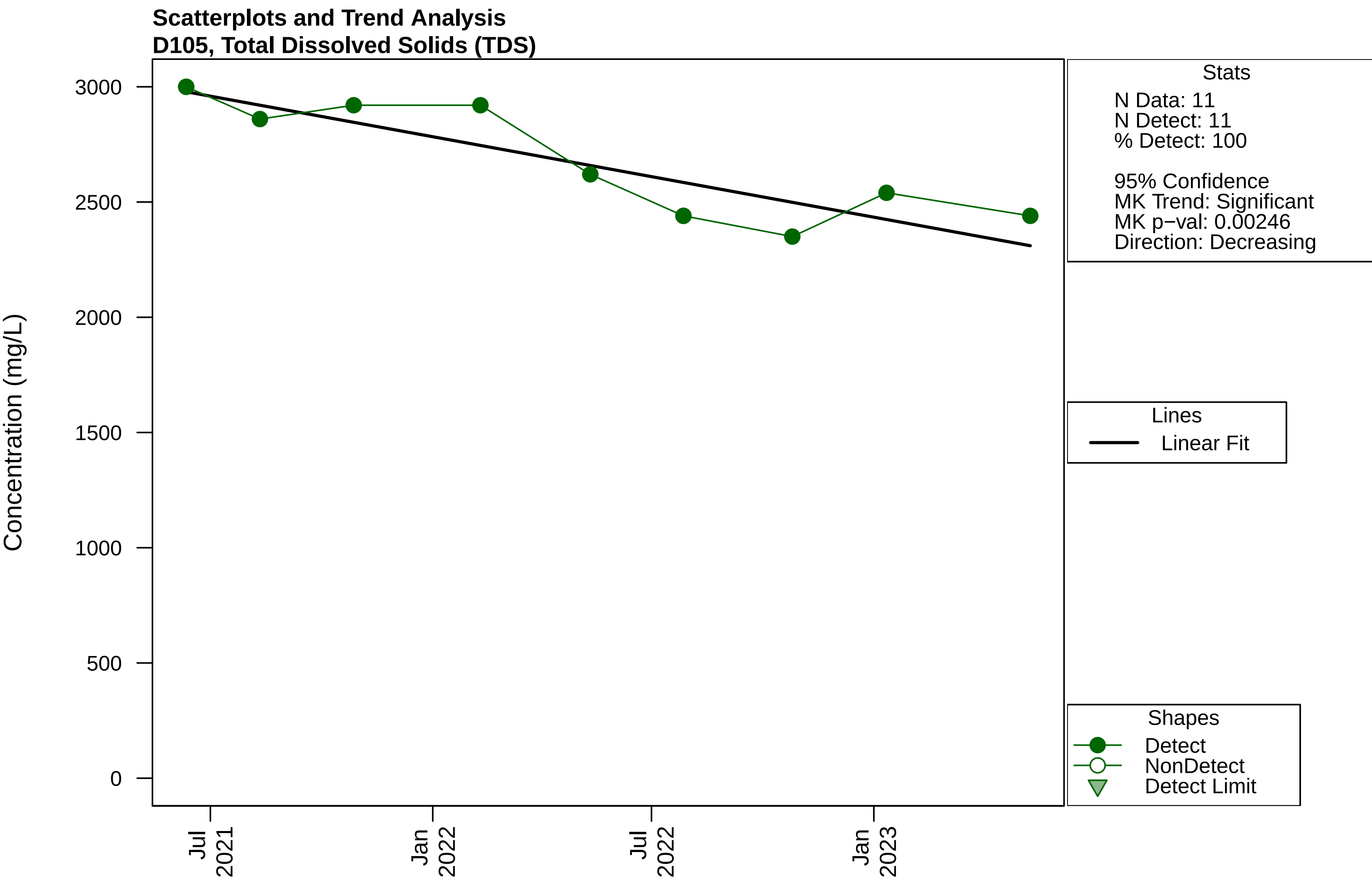

Scatterplots and Trend Analysis
D105, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D105, Nickel
Concentration (µg/L)
700
600
500
400
300
200
100
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D105, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

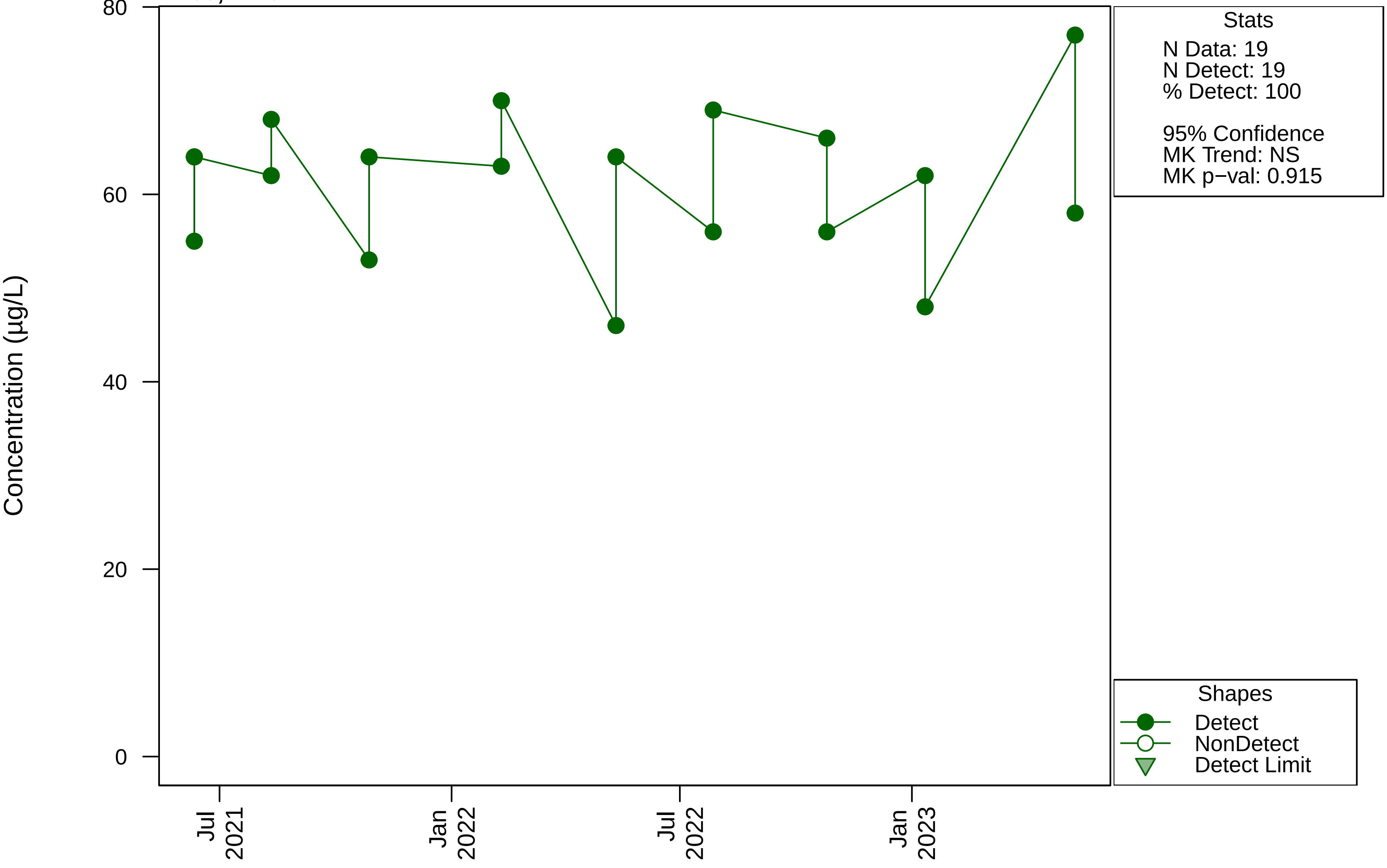


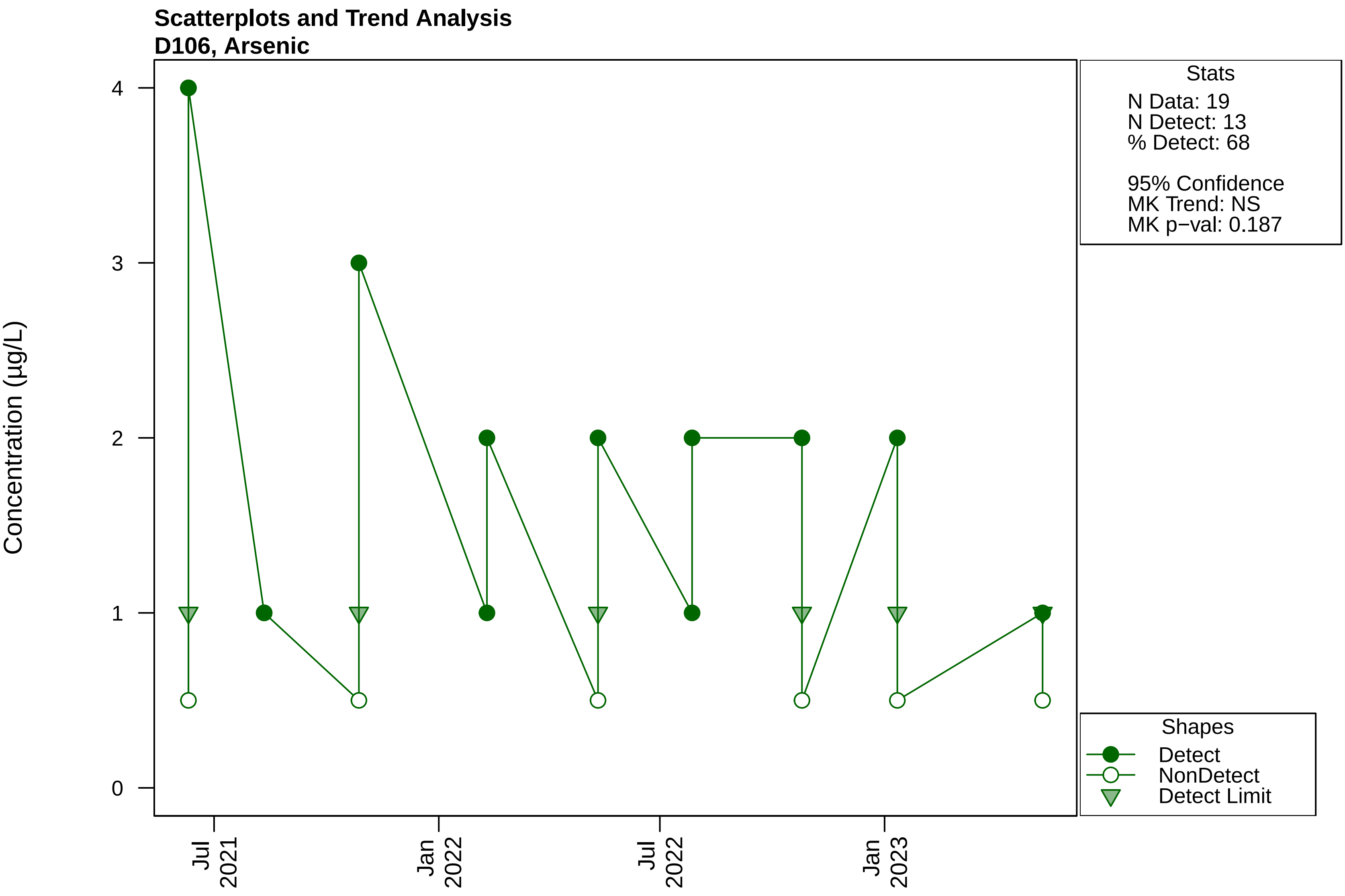
Scatterplots and Trend Analysis
D105, Sulfate (as SO4)
Concentration (mg/L)
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00282
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit



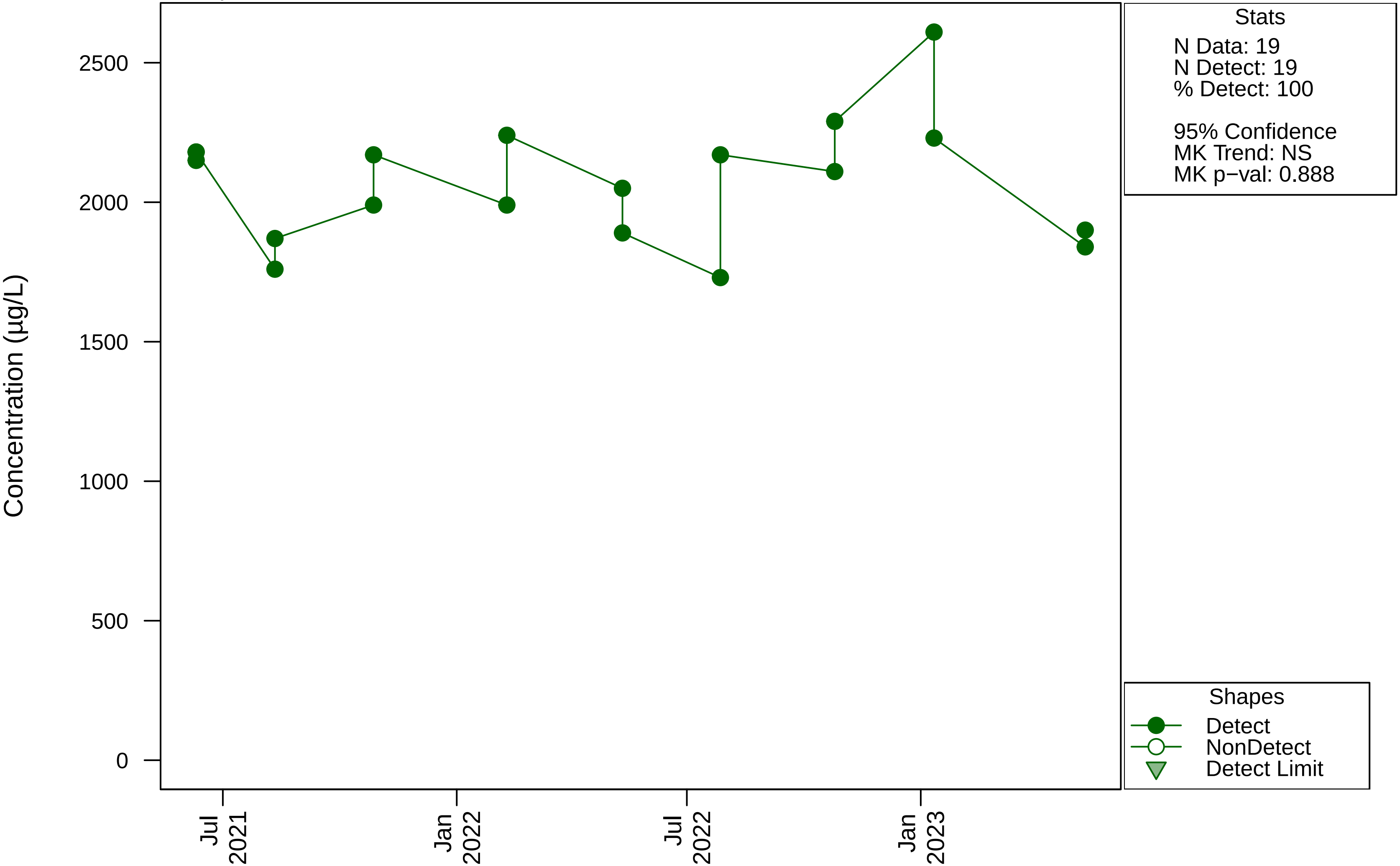
Scatterplots and Trend Analysis
D105, Total Dissolved Solids (TDS)
Concentration (mg/L)
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00246
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

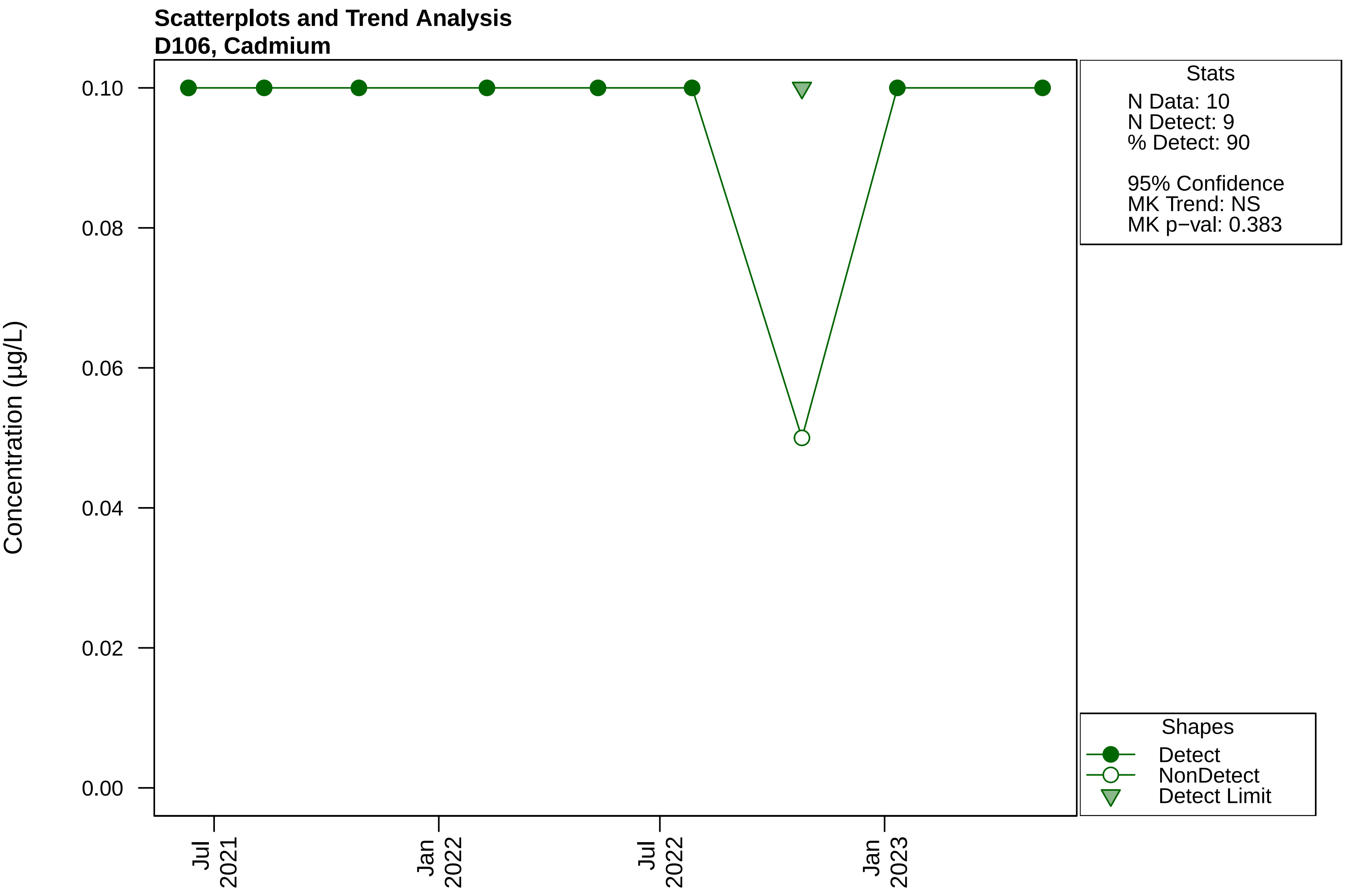
Scatterplots and Trend Analysis
D105, Zinc



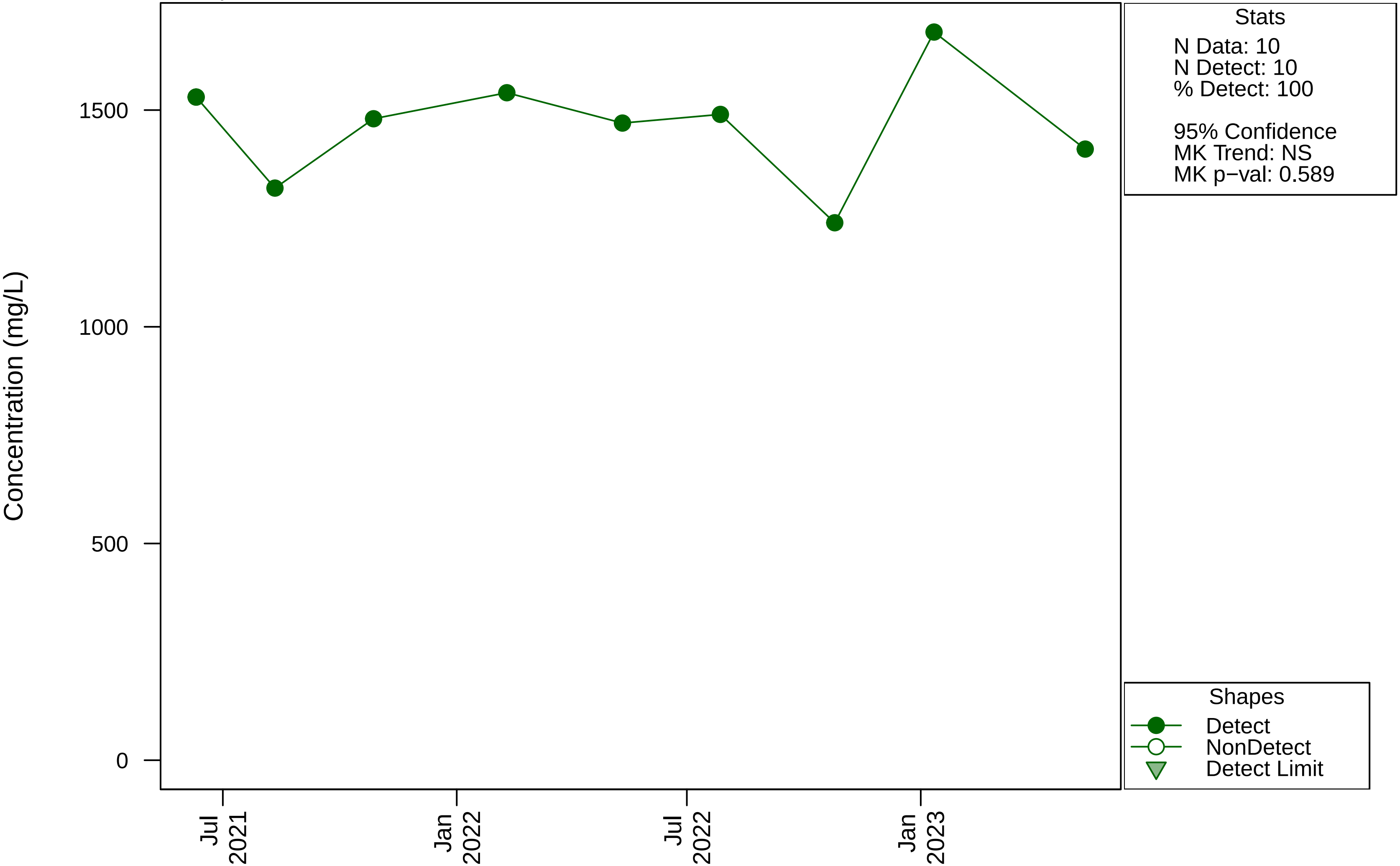

Scatterplots and Trend Analysis
D106, Arsenic
Concentration (µg/L)
0
1
2
3
4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 13
% Detect: 68
95% Confidence
MK Trend: NS
MK p−val: 0.187
Shapes
Detect
NonDetect
Detect Limit

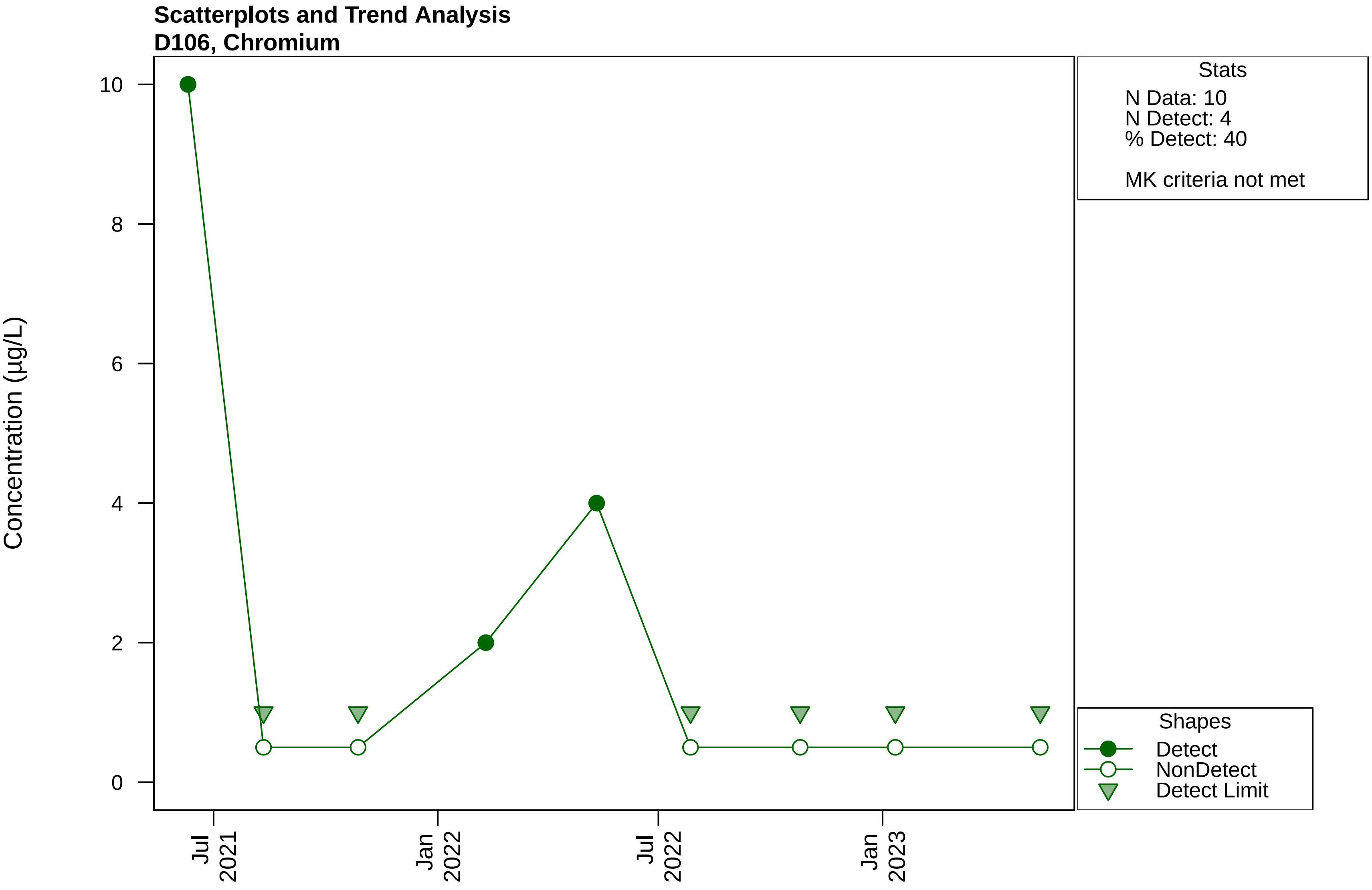
Scatterplots and Trend Analysis
D106, Boron



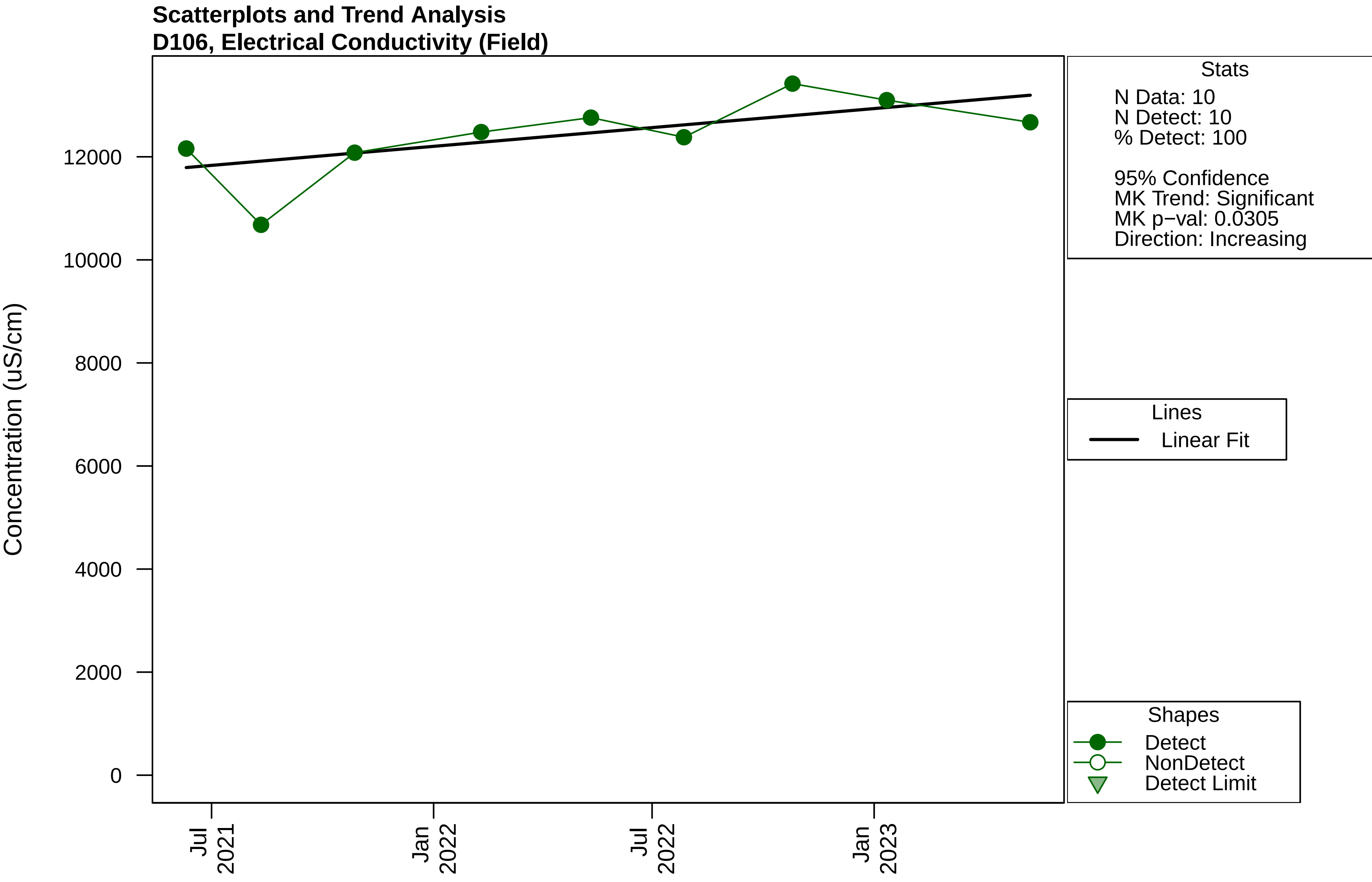

Scatterplots and Trend Analysis
D106, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 9
% Detect: 90
95% Confidence
MK Trend: NS
MK p−val: 0.383
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D106, Chloride



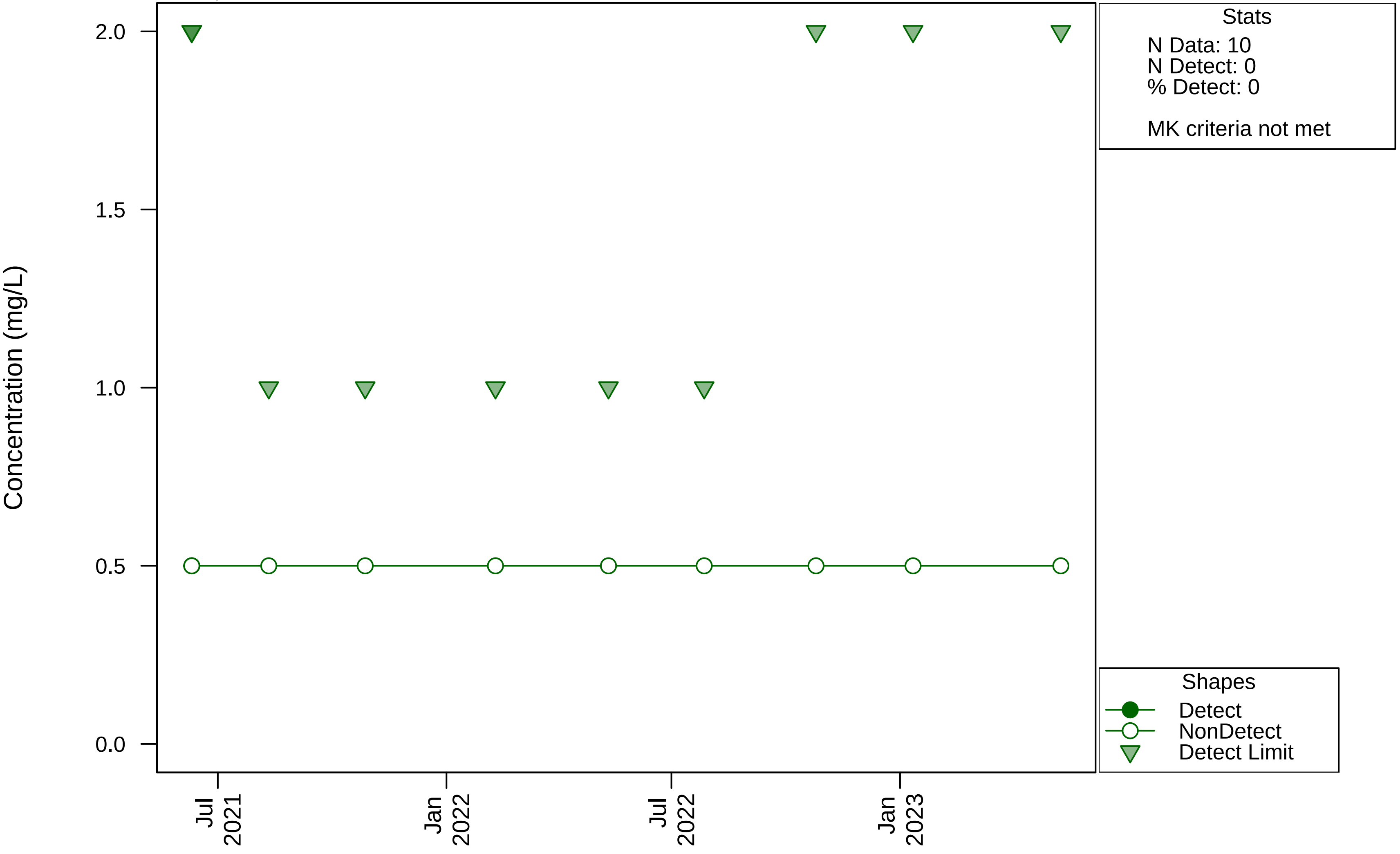


Scatterplots and Trend Analysis
D106, Chromium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 4
% Detect: 40
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

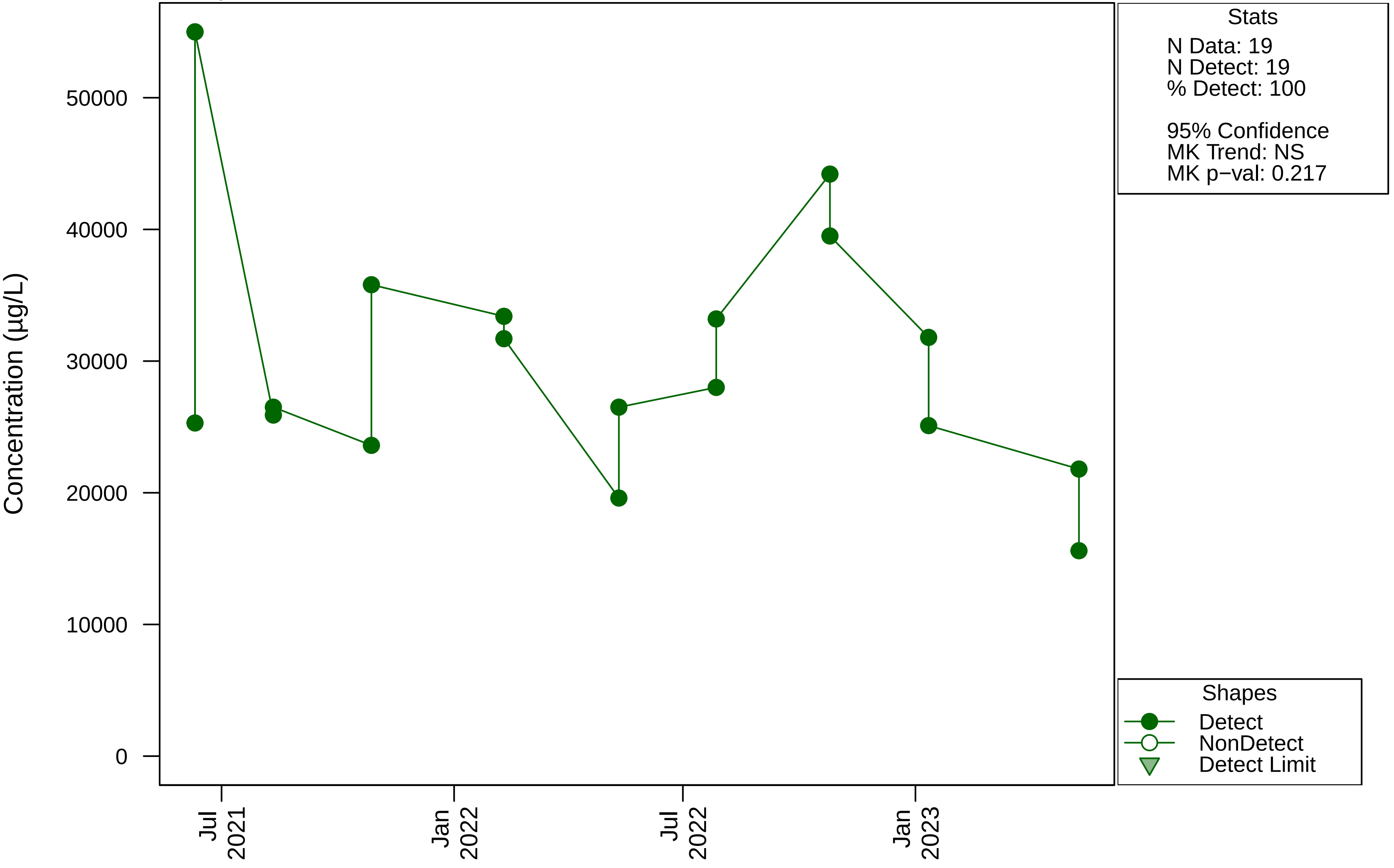


Scatterplots and Trend Analysis
D106, Electrical Conductivity (Field)
Concentration (uS/cm)
0
2000
4000
6000
8000
10000
12000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0305
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

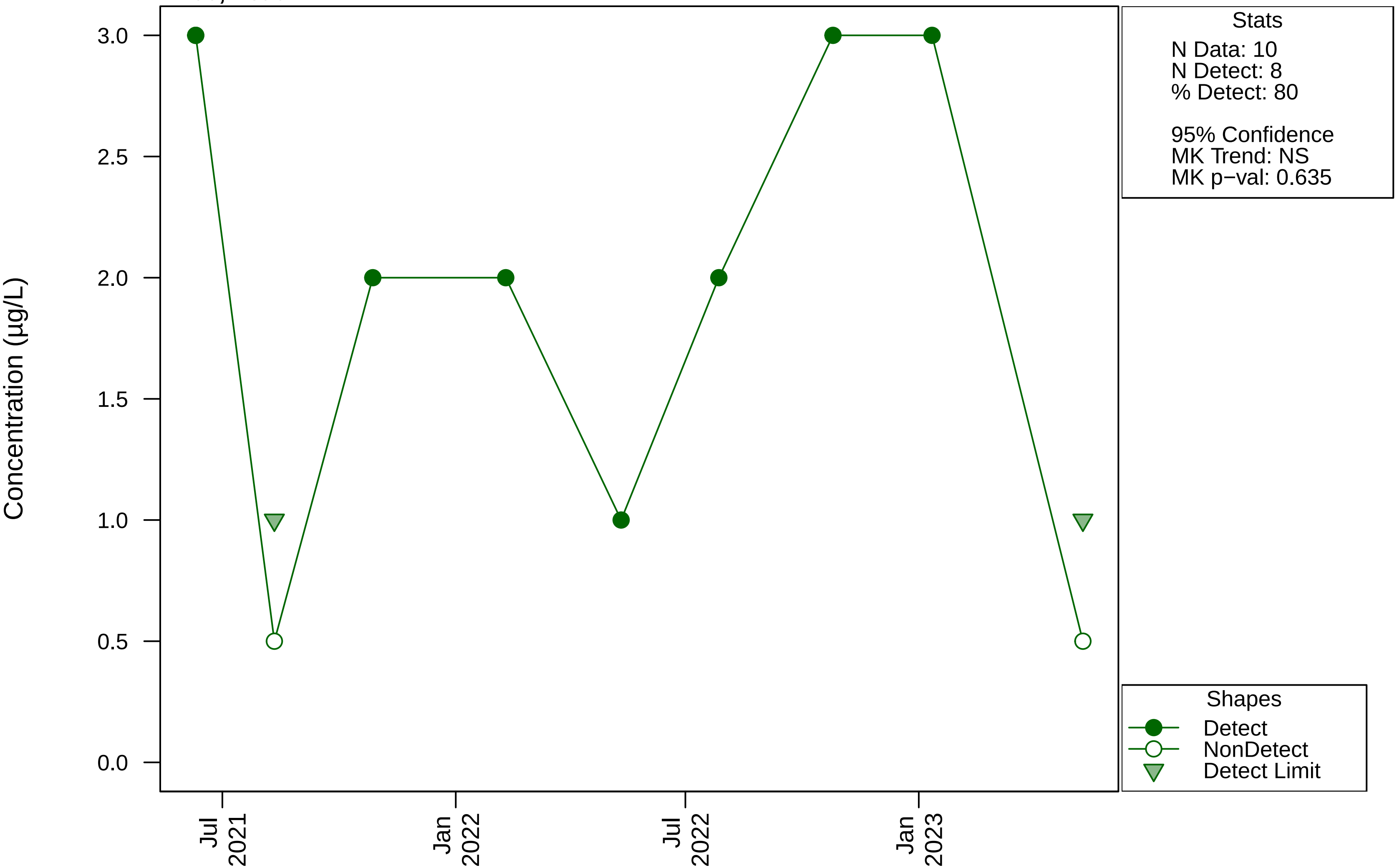
Scatterplots and Trend Analysis
D106, Fluoride



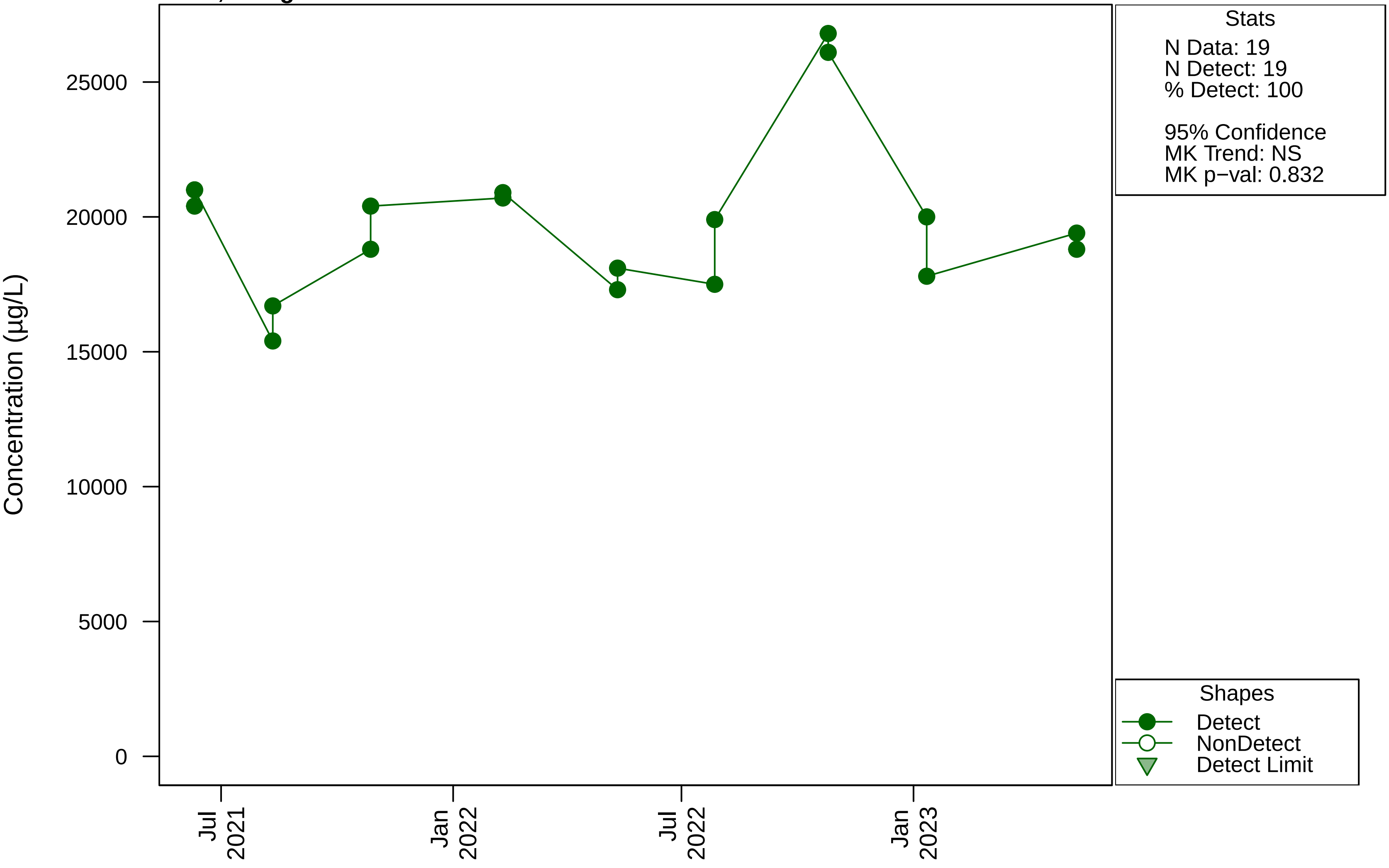
Scatterplots and Trend Analysis
D106, Iron

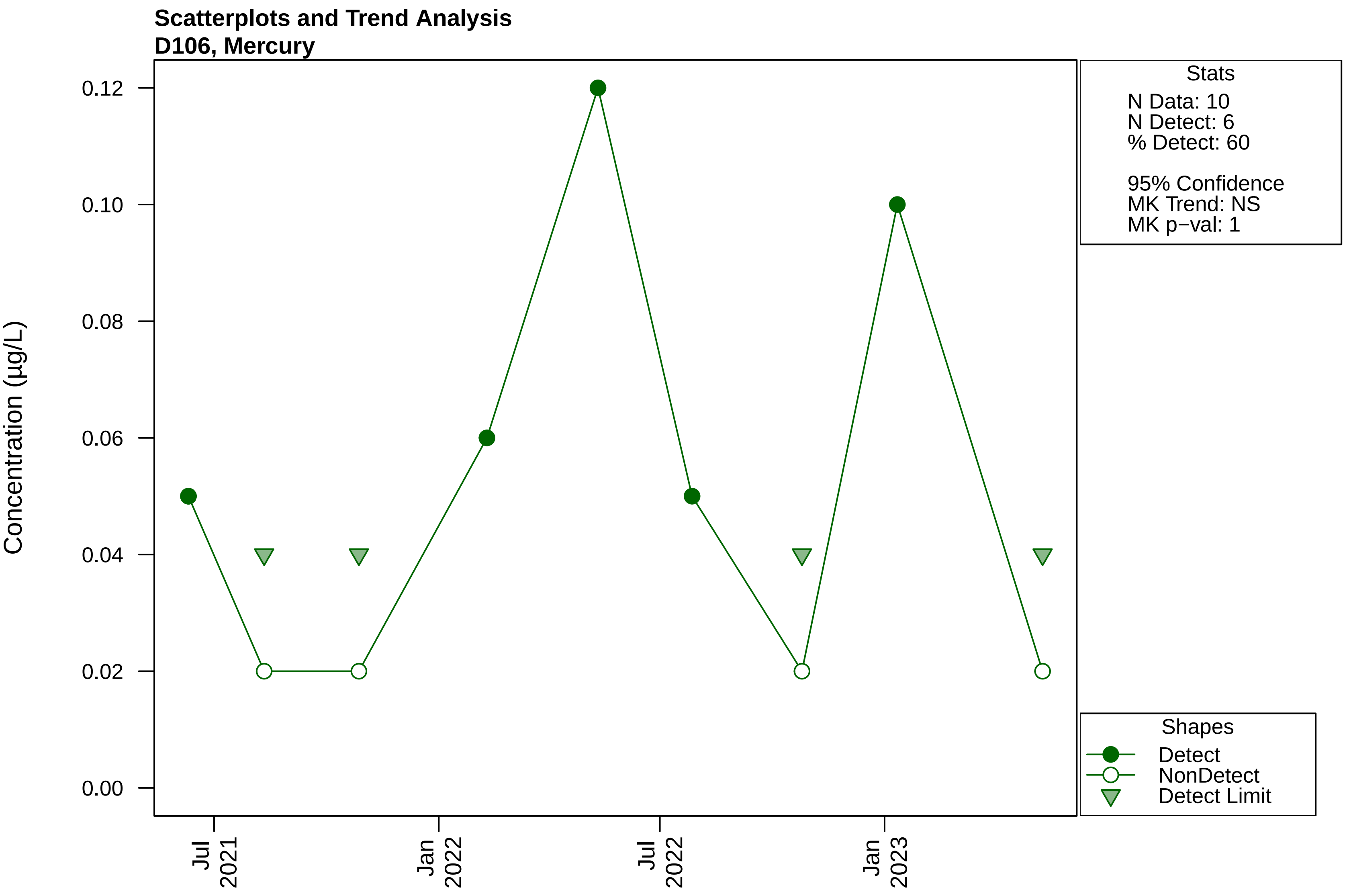


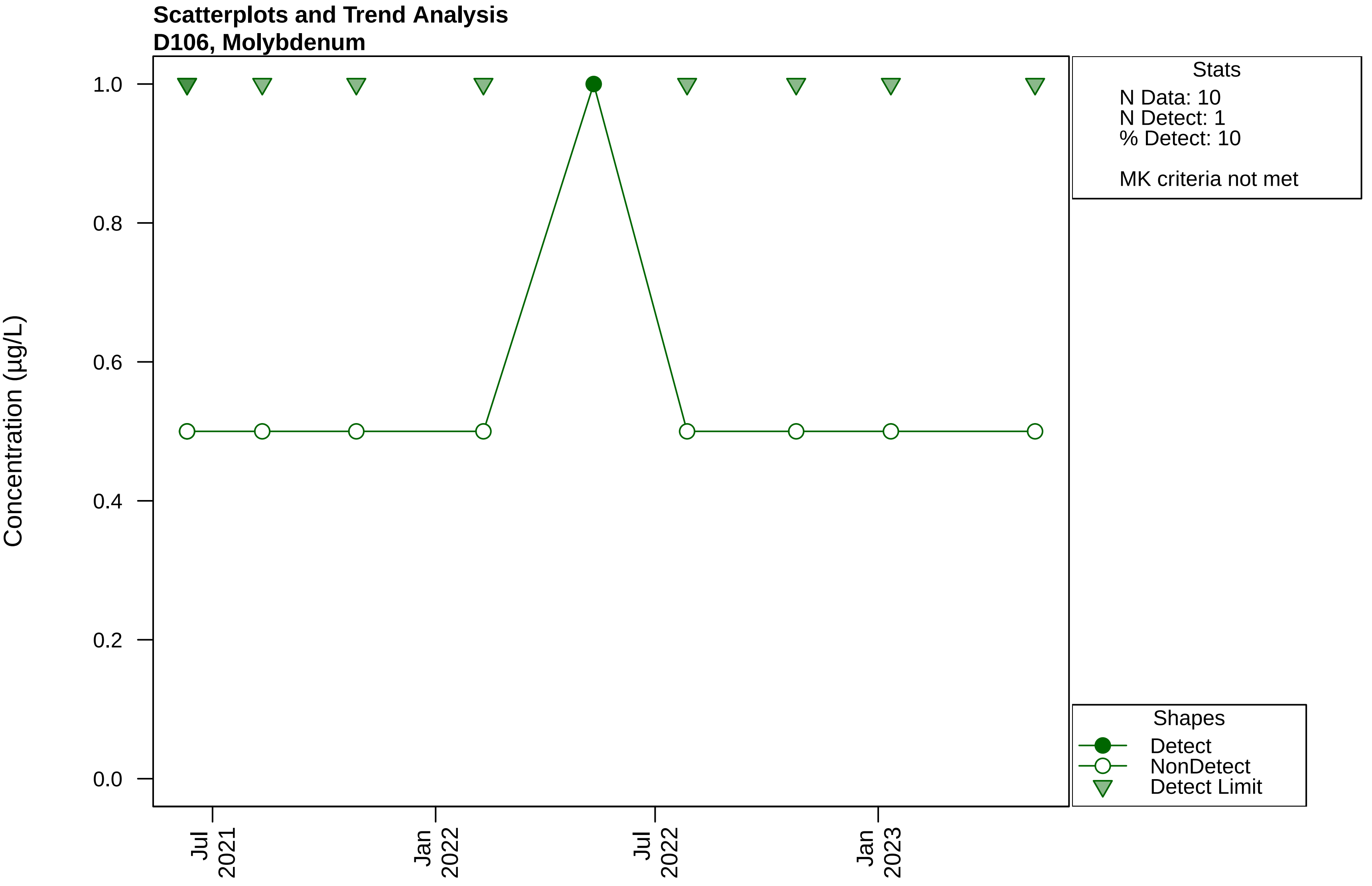
Scatterplots and Trend Analysis
D106, Lead



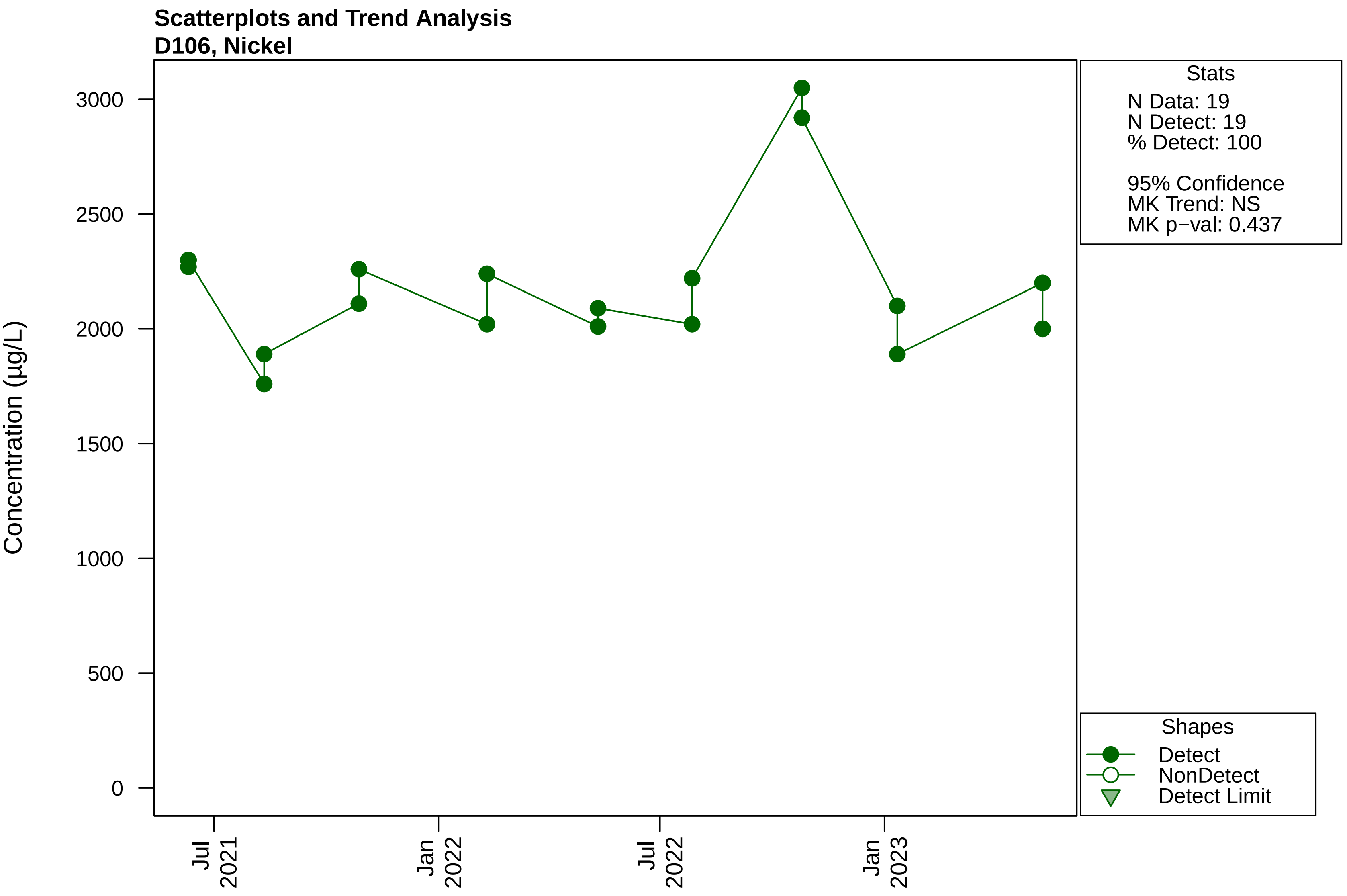
Scatterplots and Trend Analysis
D106, Manganese



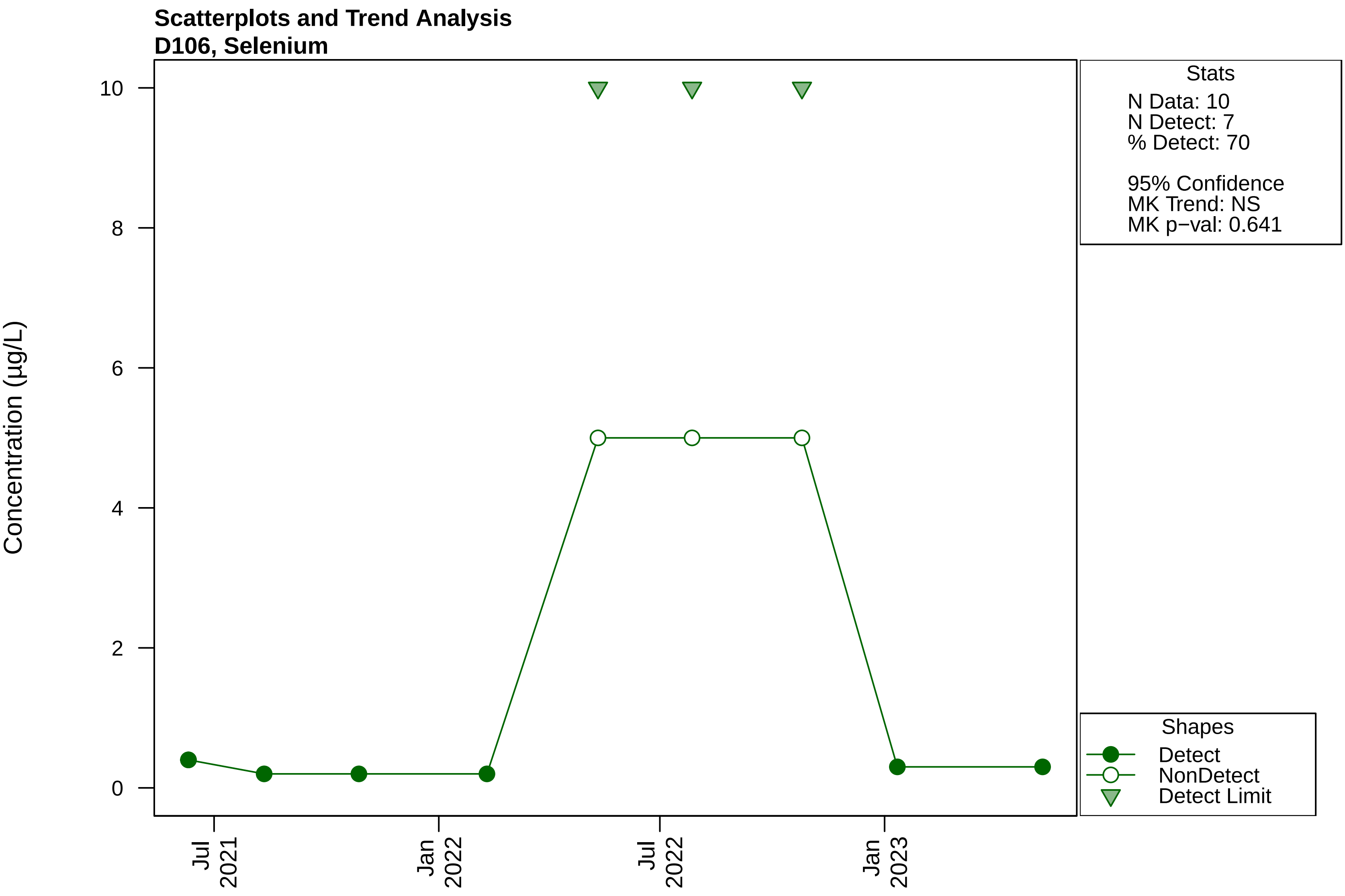

Scatterplots and Trend Analysis
D106, Mercury
Concentration (µg/L)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 6
% Detect: 60
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit



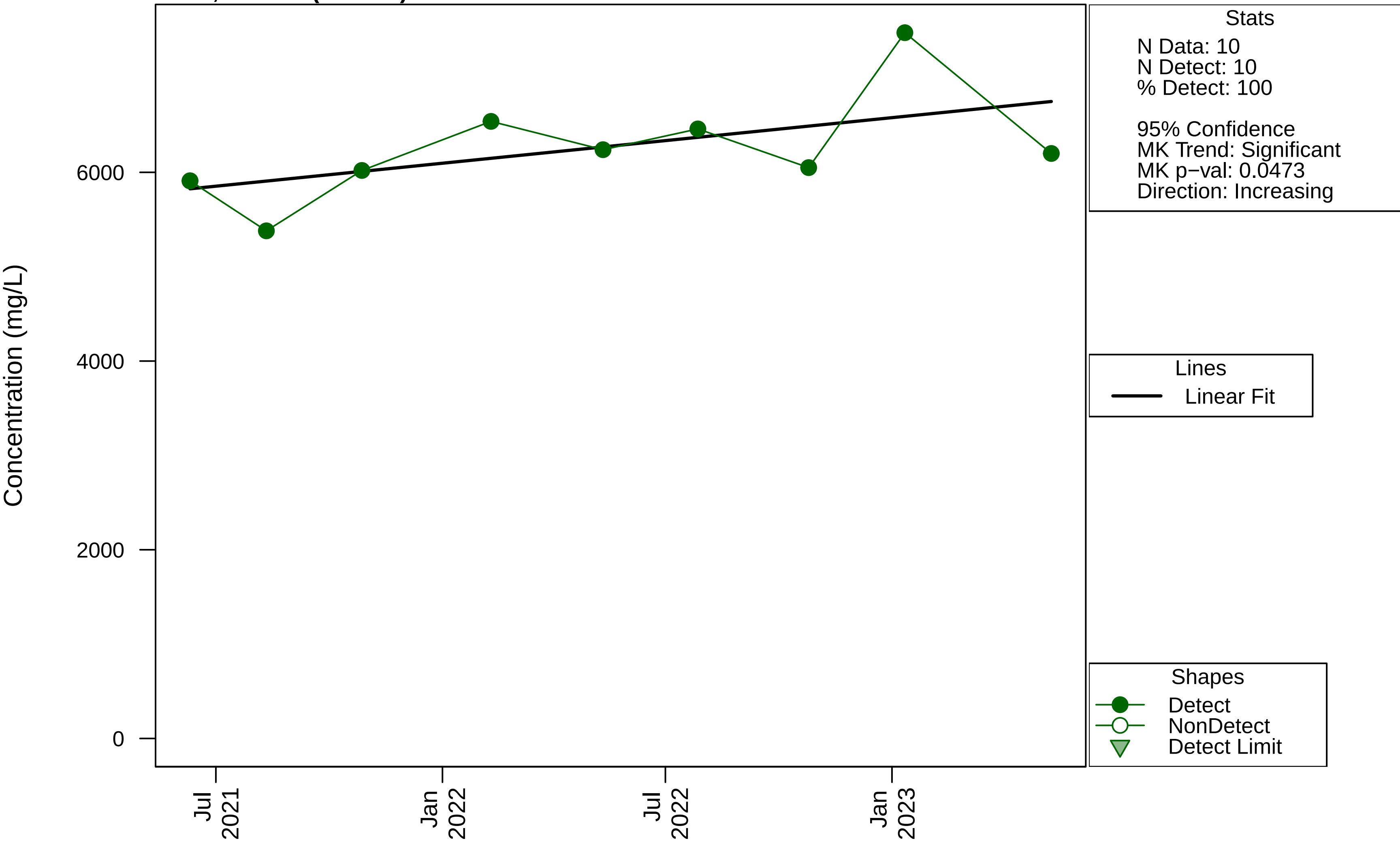
Scatterplots and Trend Analysis
D106, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

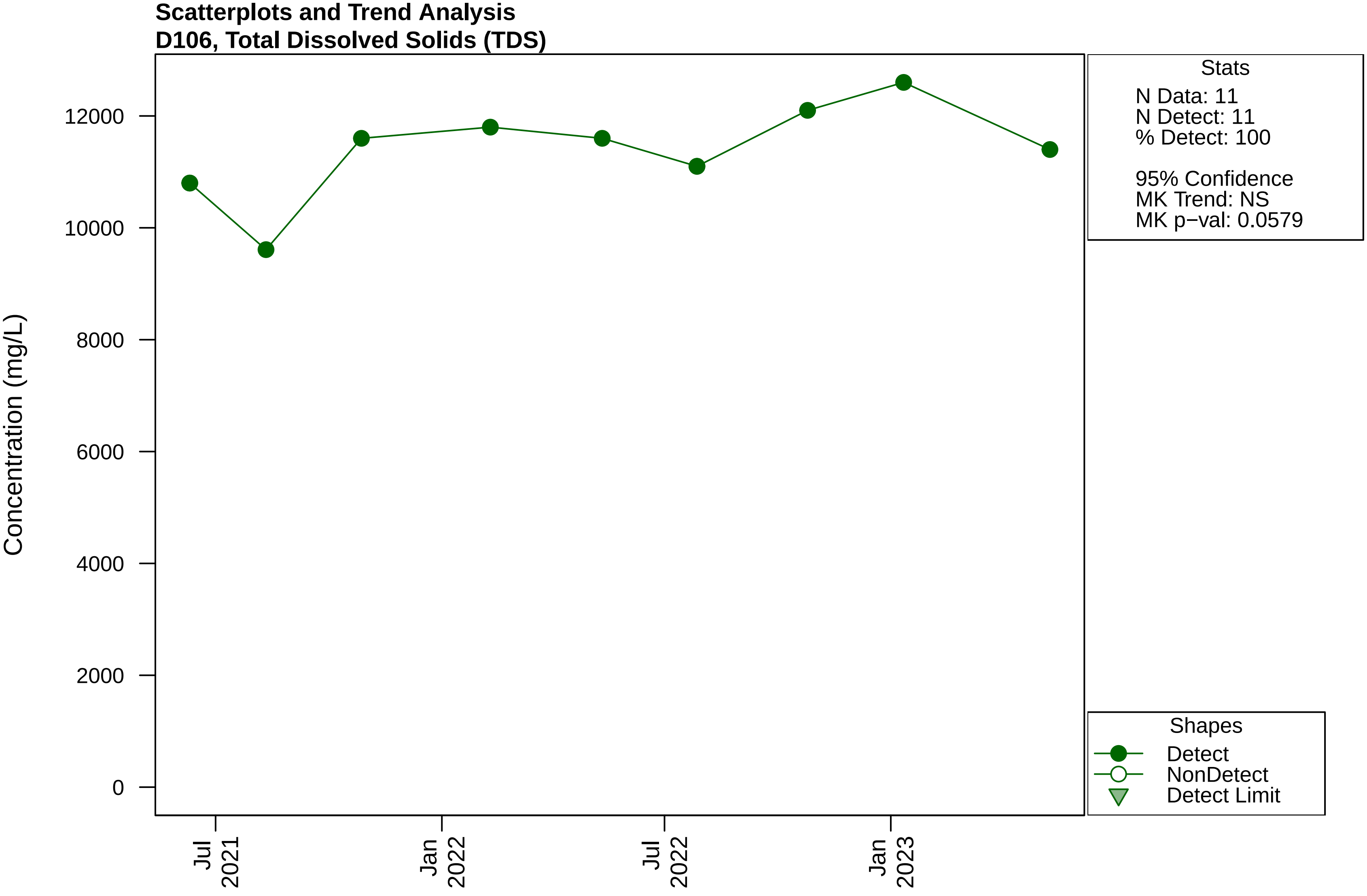


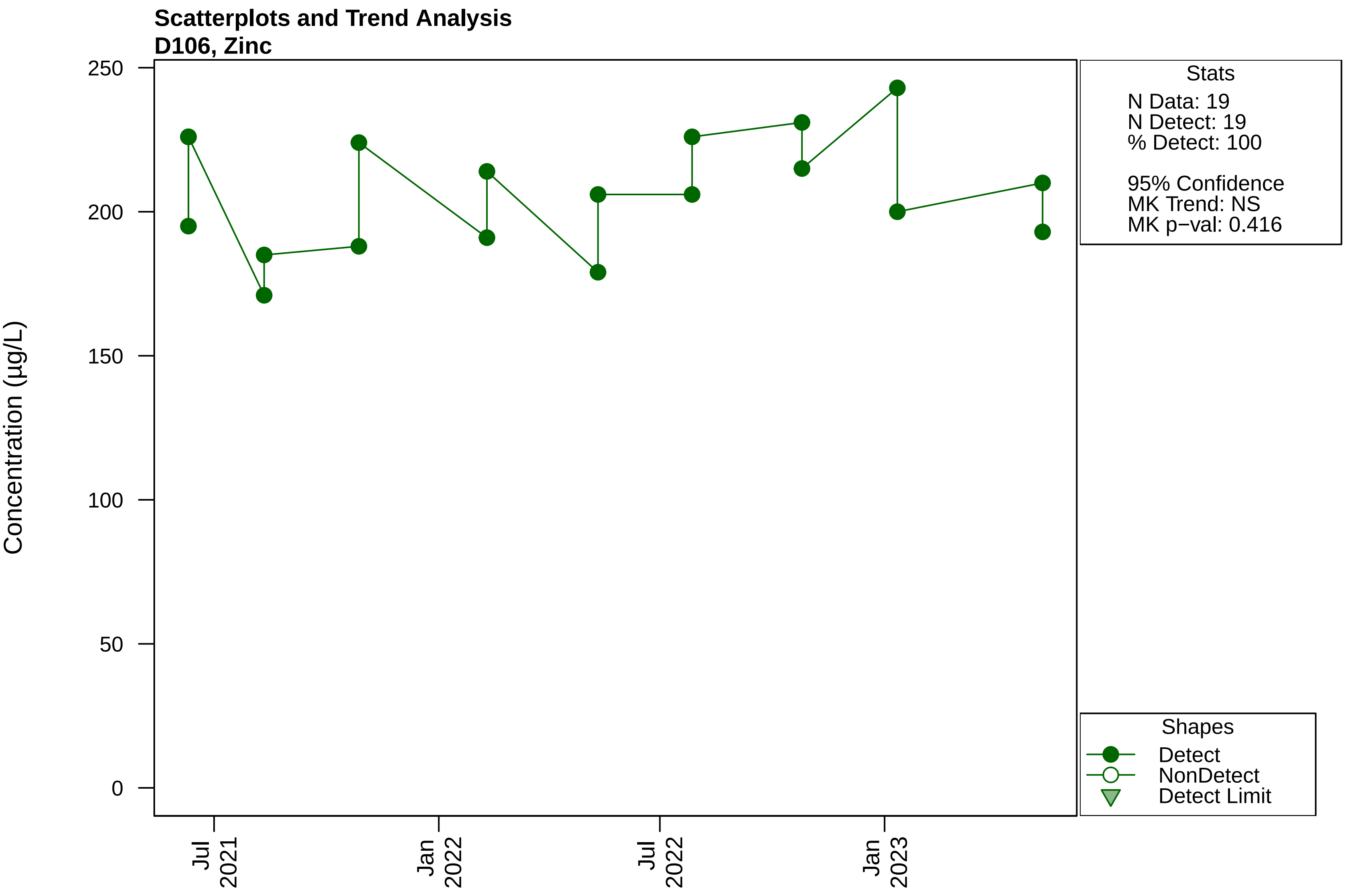
Scatterplots and Trend Analysis
D106, Nickel
Concentration (µg/L)
0
500
1000
1500
2000
2500
3000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.437
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D106, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 7
% Detect: 70
95% Confidence
MK Trend: NS
MK p−val: 0.641
Shapes
Detect
NonDetect
Detect Limit

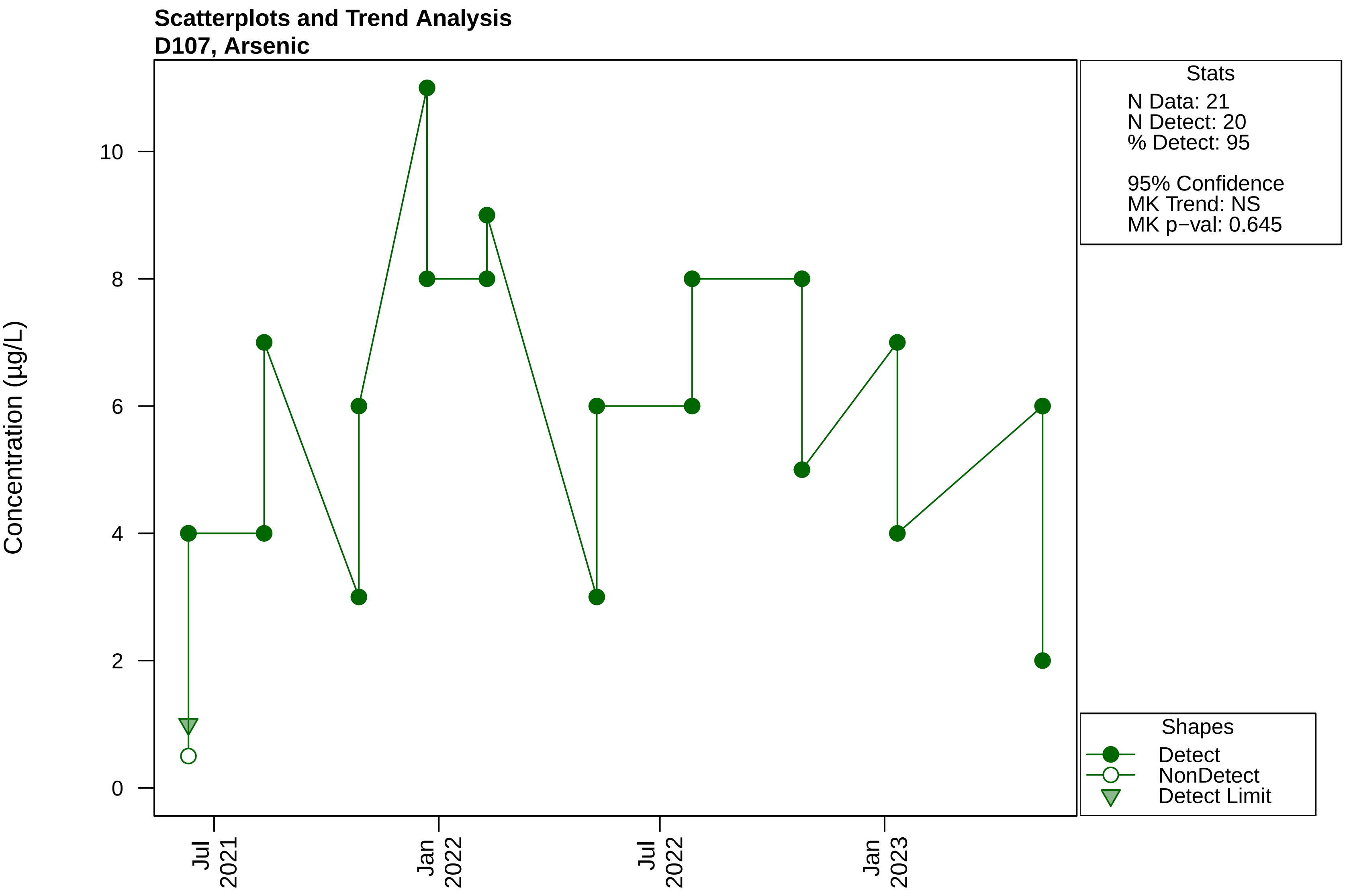
Scatterplots and Trend Analysis
D106, Sulfate (as SO4)

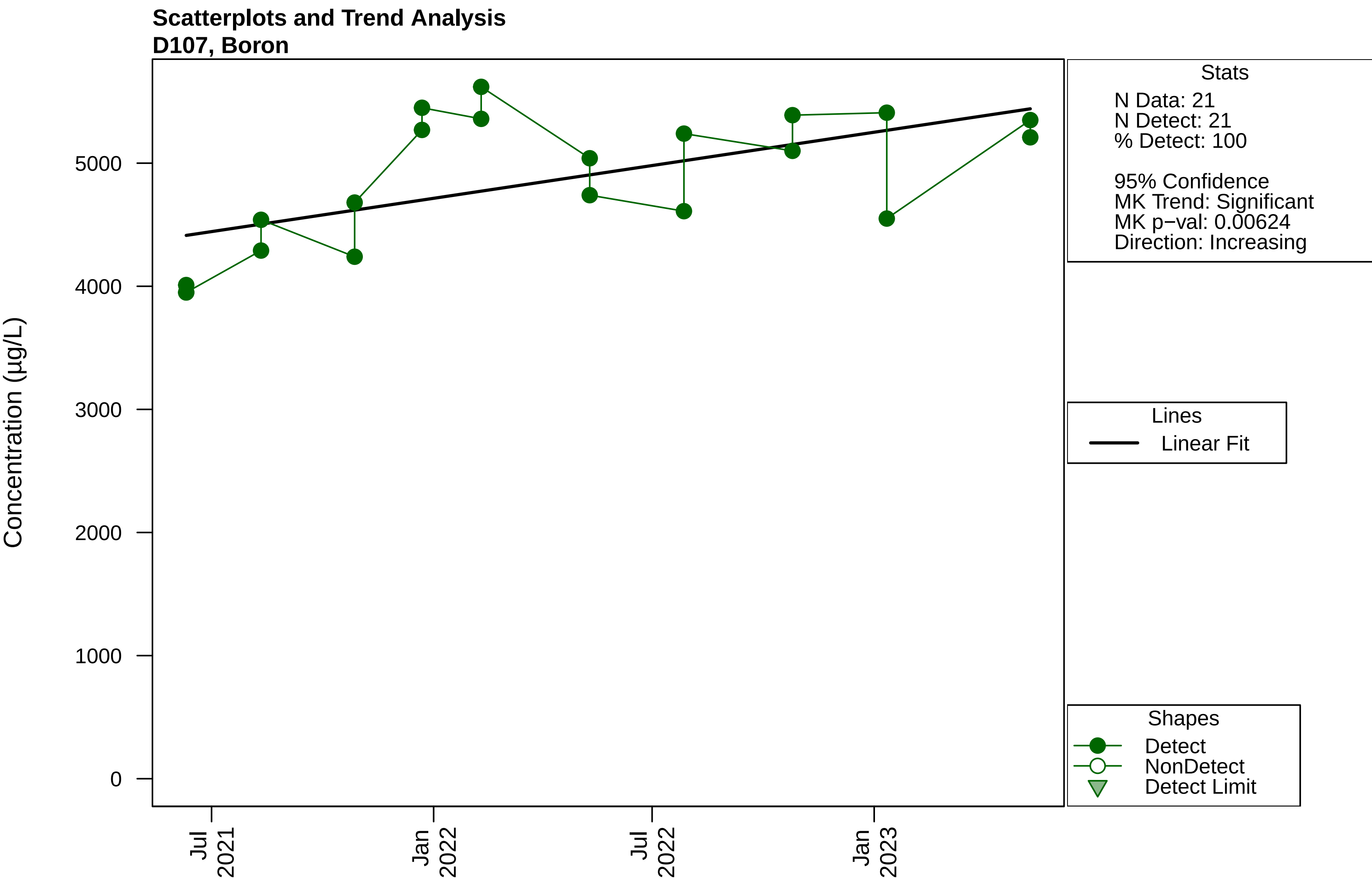


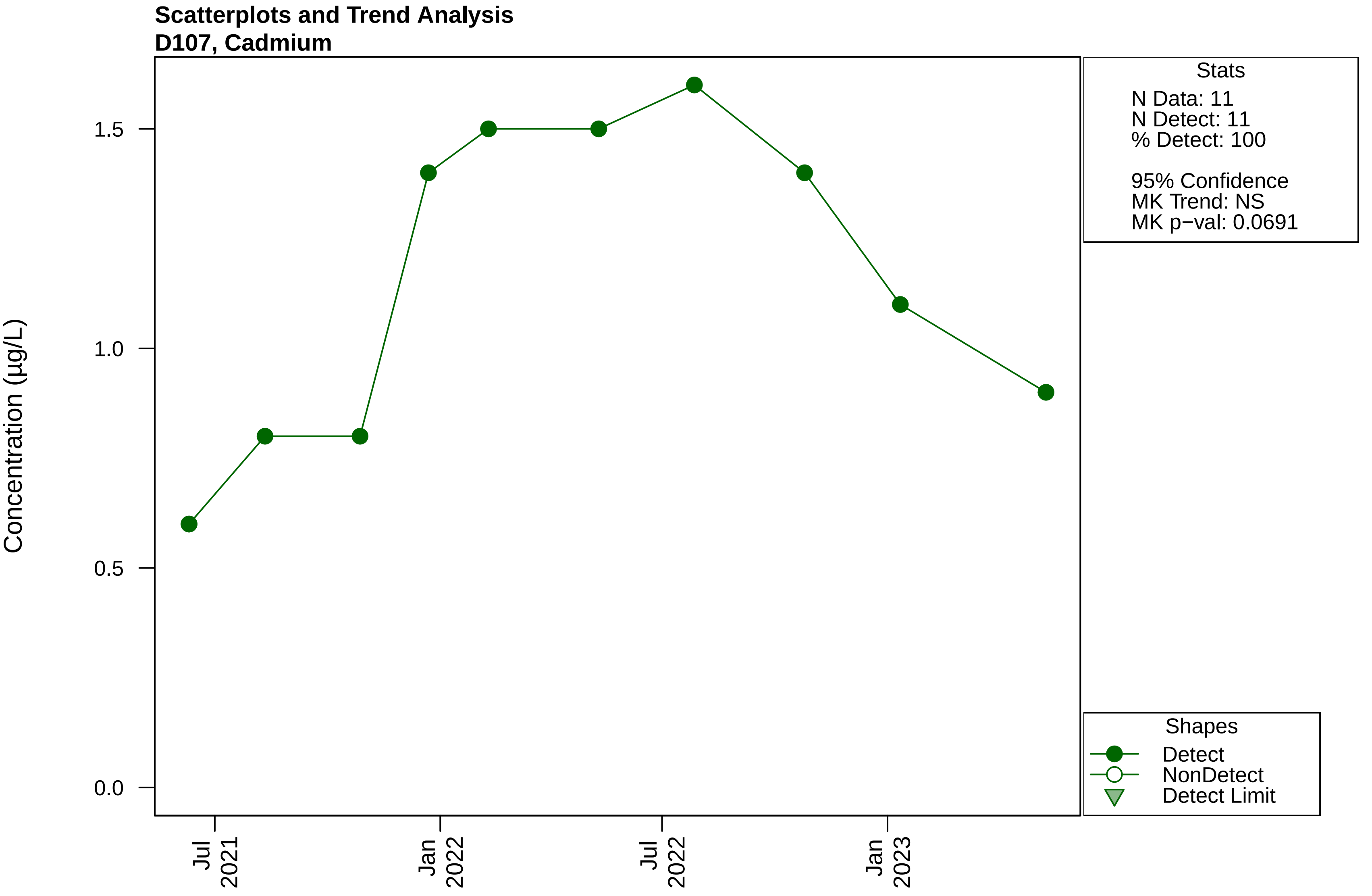

Scatterplots and Trend Analysis
D106, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
2000
4000
6000
8000
10000
12000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0579
Shapes
Detect
NonDetect
Detect Limit



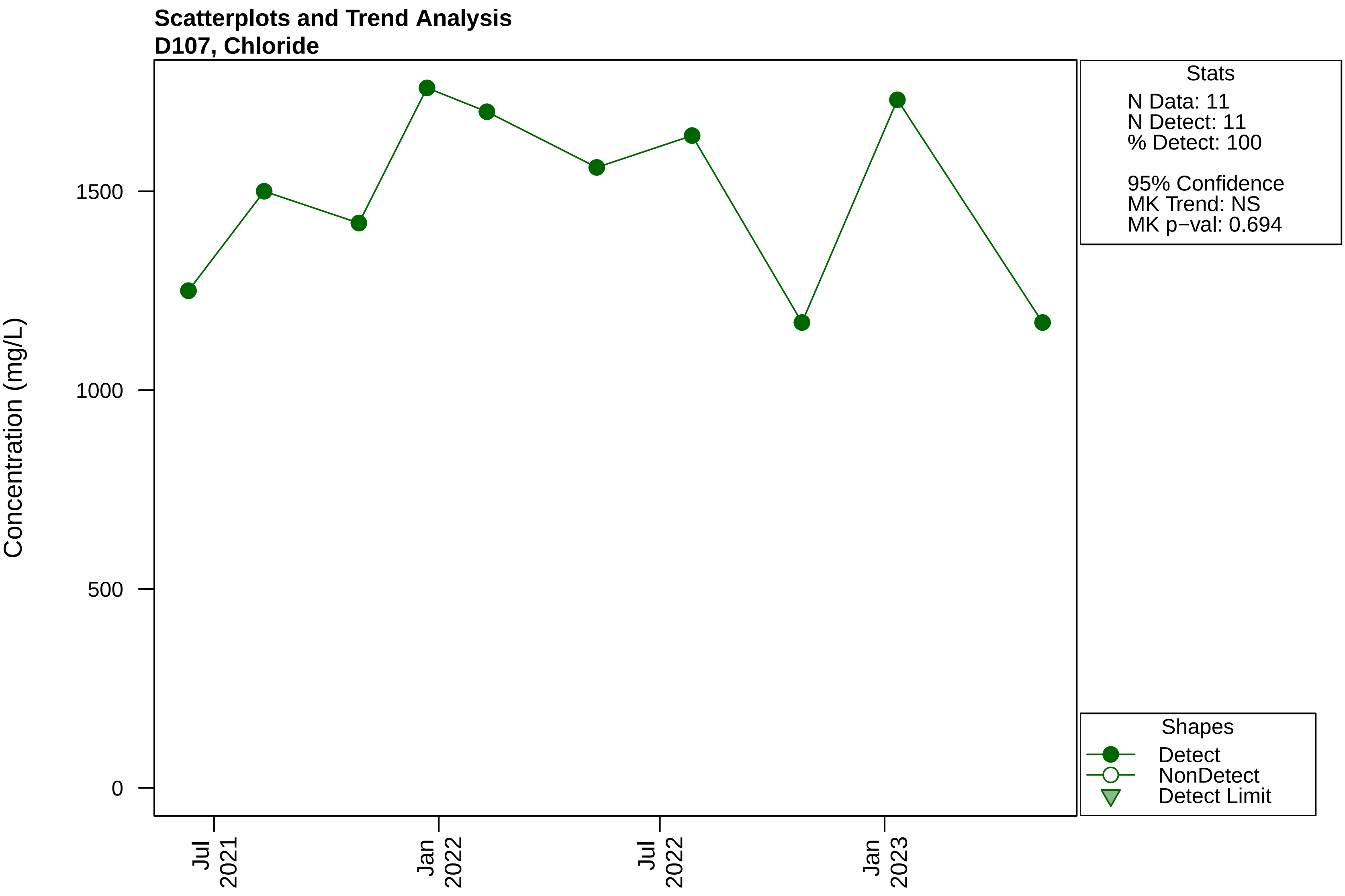
Scatterplots and Trend Analysis
D106, Zinc
Concentration (µg/L)
250
200
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.416
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D107, Arsenic
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 21
N Detect: 20
% Detect: 95
95% Confidence
MK Trend: NS
MK p−val: 0.645
Shapes
Detect
NonDetect
Detect Limit

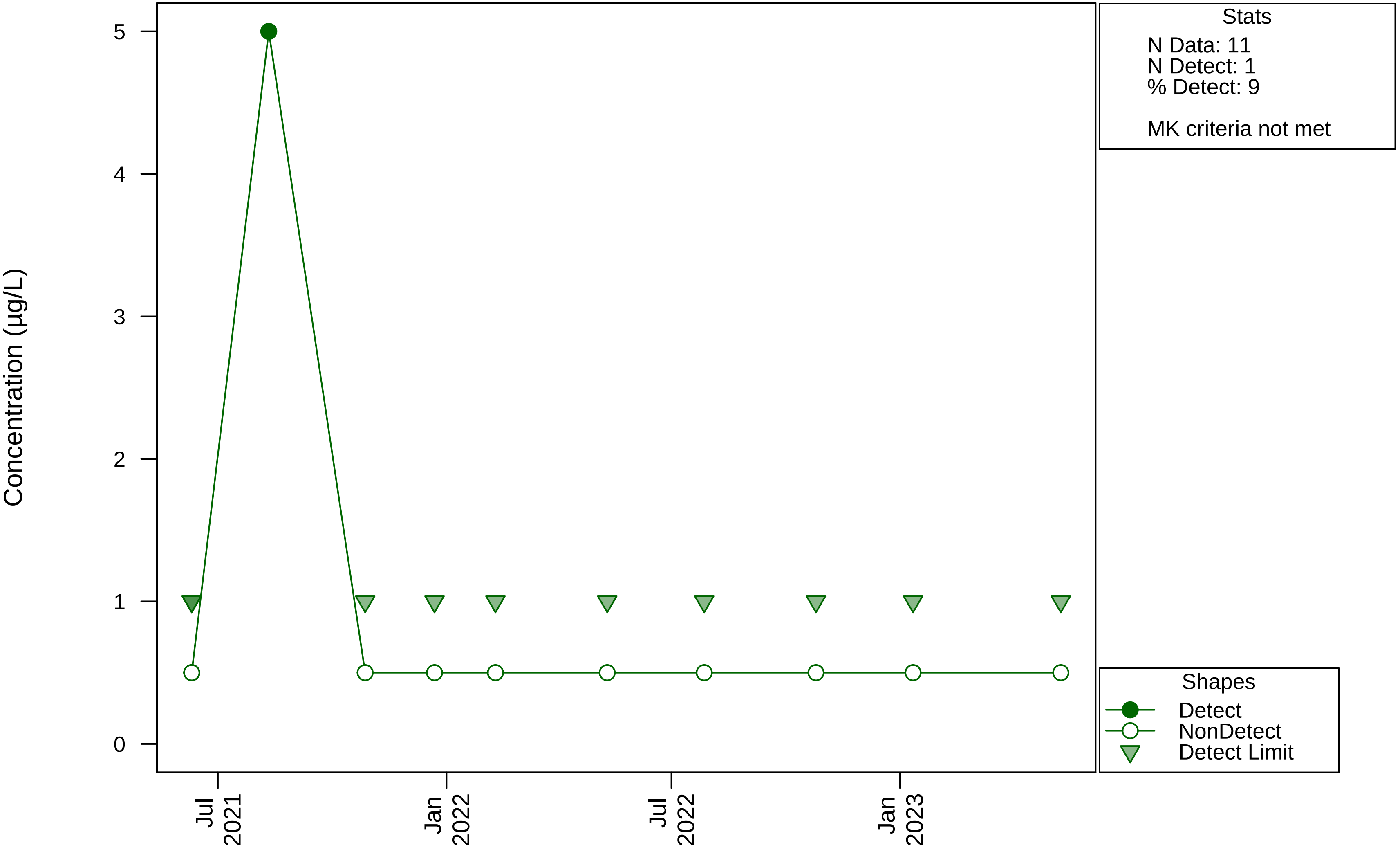

Scatterplots and Trend Analysis
D107, Boron
Concentration (µg/L)
0
1000
2000
3000
4000
5000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 21
N Detect: 21
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00624
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

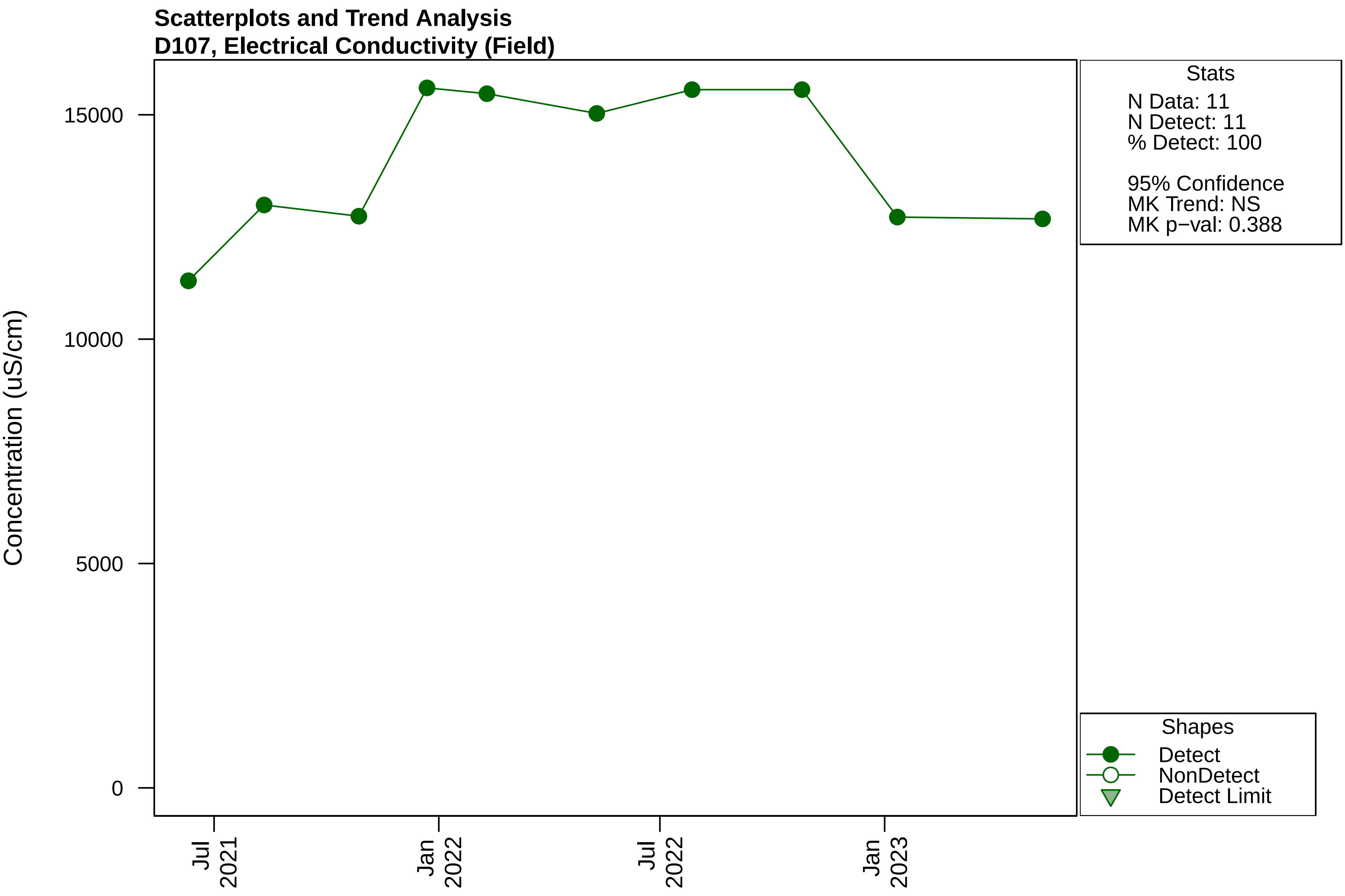


Scatterplots and Trend Analysis
D107, Cadmium
Concentration (µg/L)
0.0
0.5
1.0
1.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0691
Shapes
Detect
NonDetect
Detect Limit

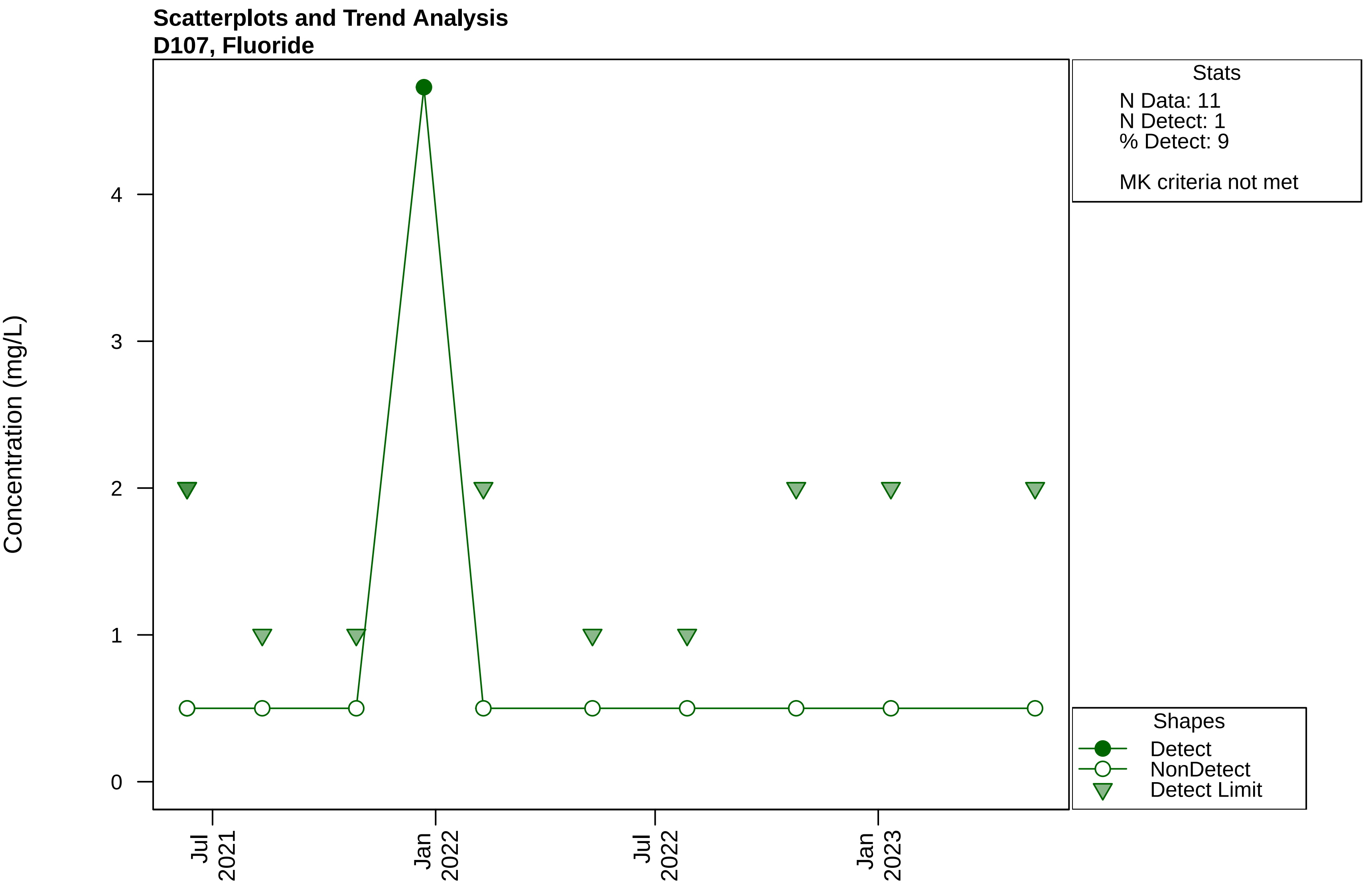

Scatterplots and Trend Analysis
D107, Chloride
Concentration (mg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.694
Shapes
Detect
NonDetect
Detect Limit

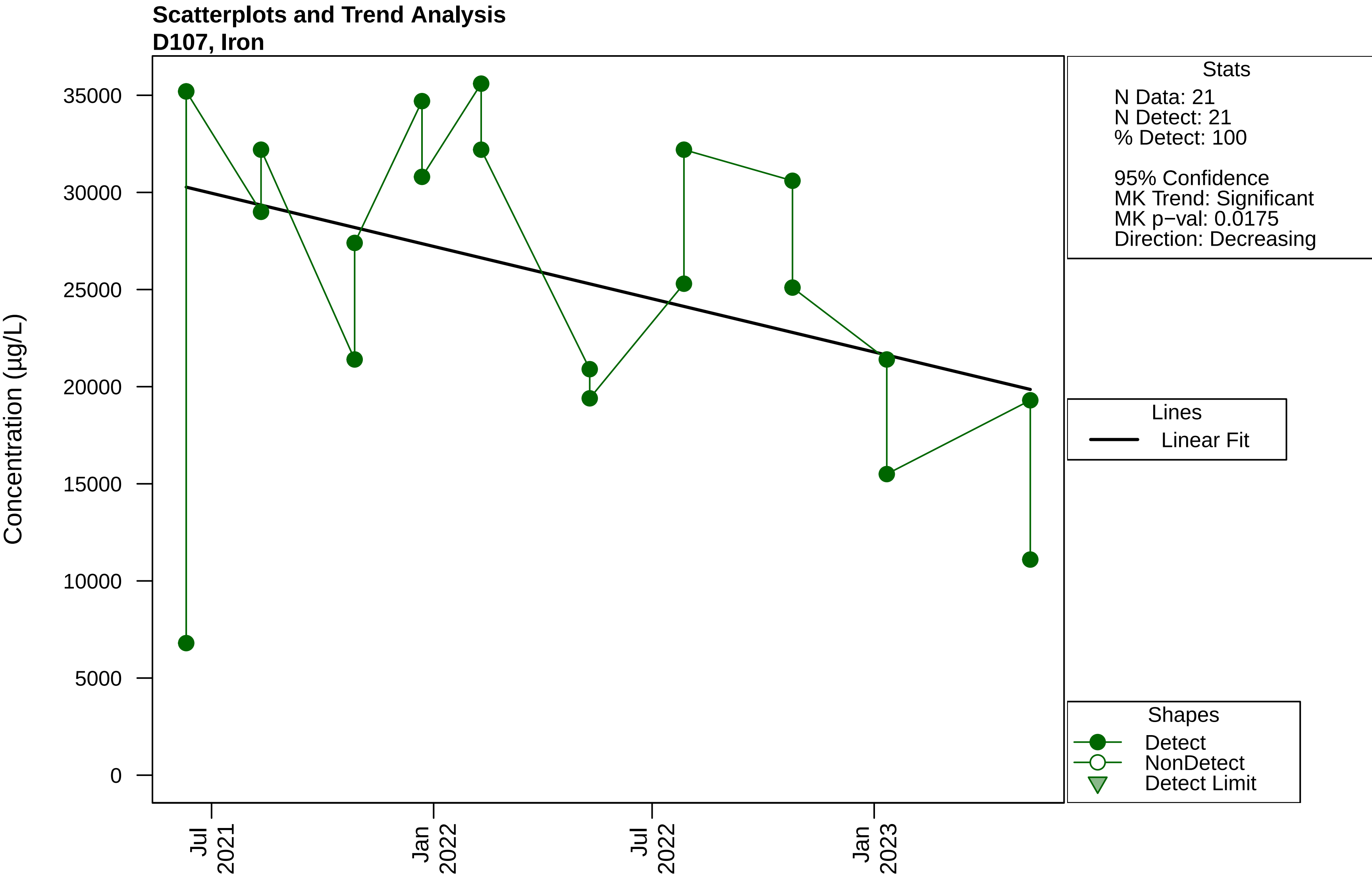
Scatterplots and Trend Analysis
D107, Chromium

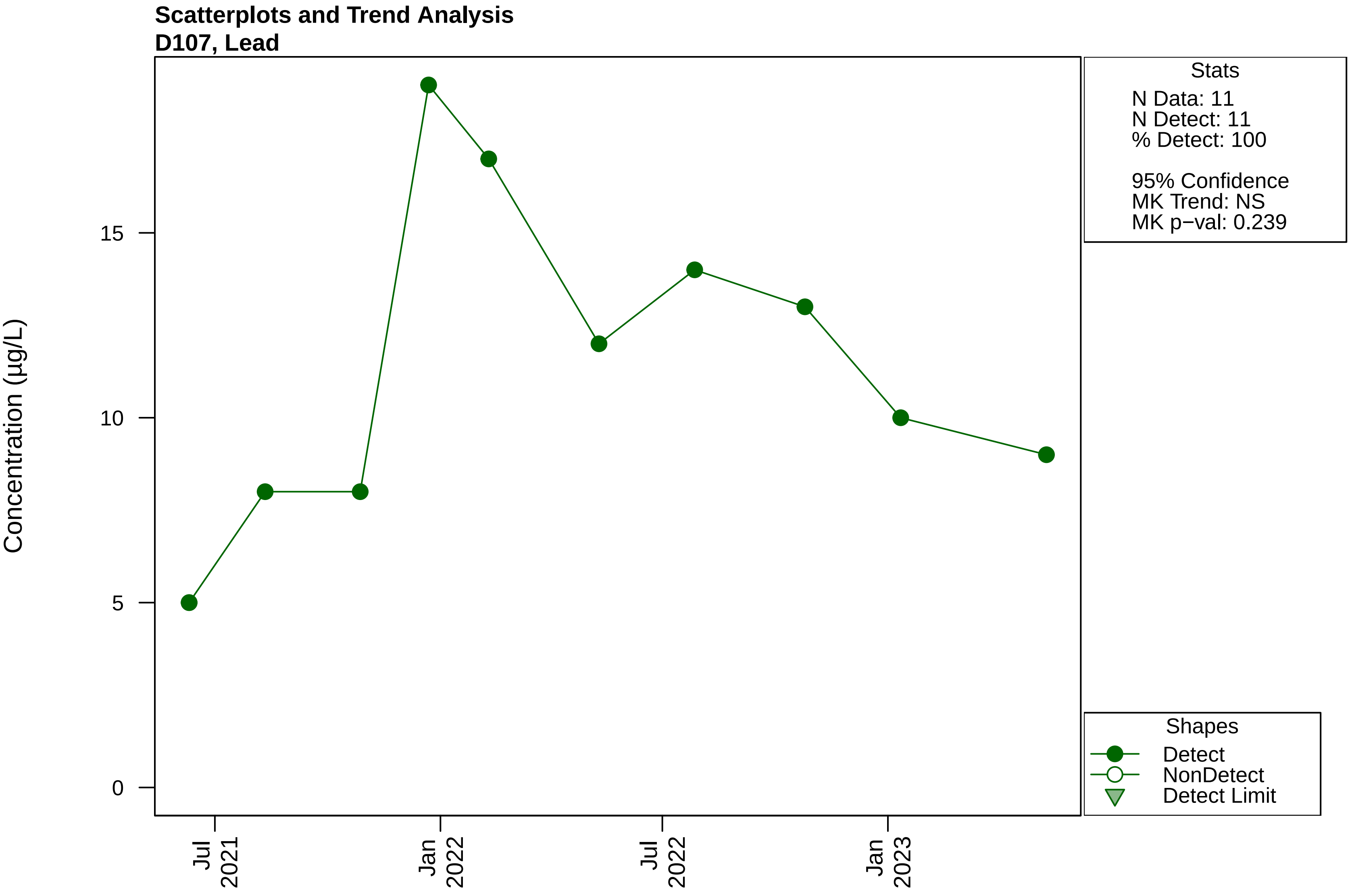




Scatterplots and Trend Analysis
D107, Electrical Conductivity (Field)
Concentration (uS/cm)
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.388
Shapes
Detect
NonDetect
Detect Limit

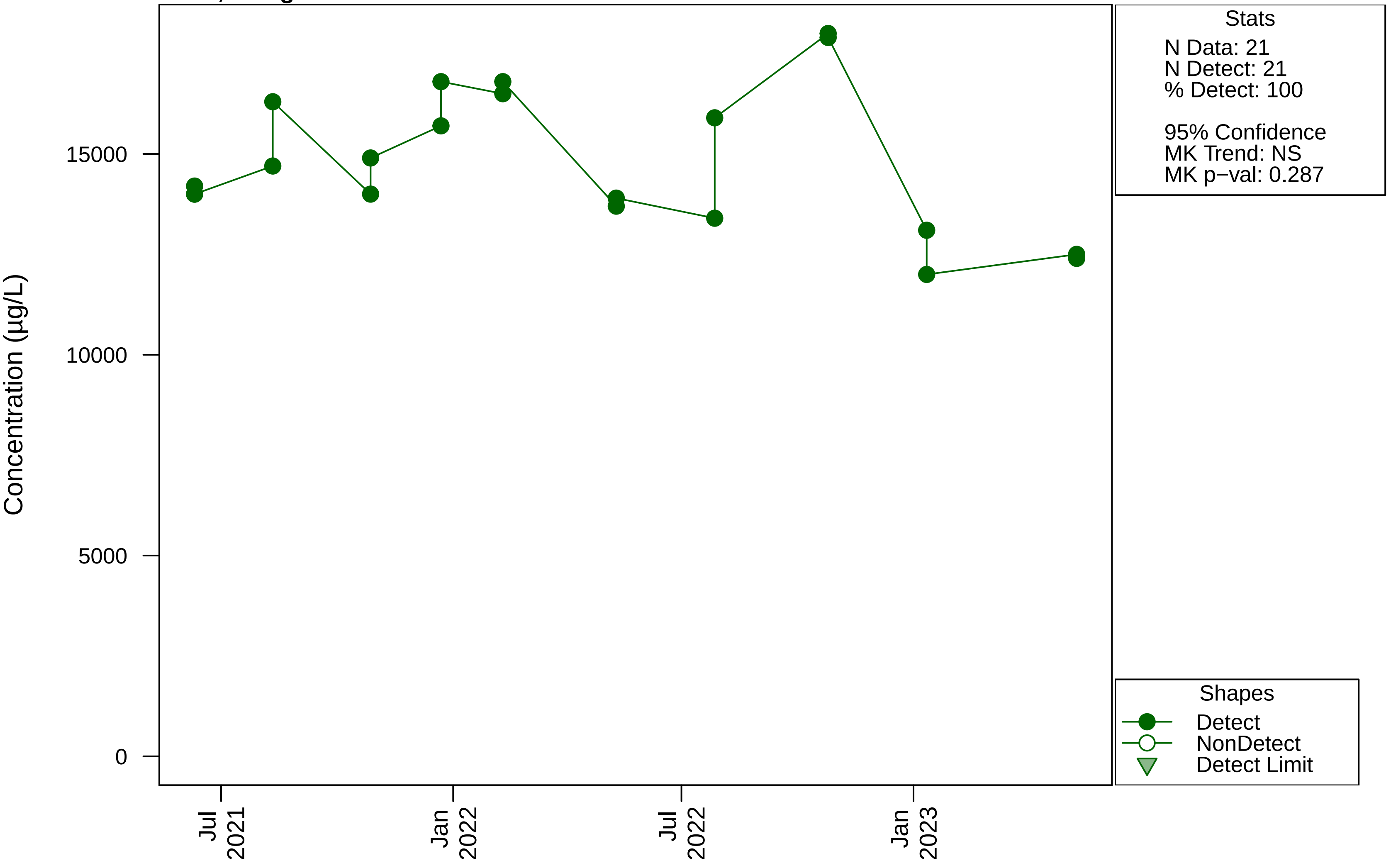

Scatterplots and Trend Analysis
D107, Fluoride
Concentration (mg/L)
0
1
2
3
4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 1
% Detect: 9
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D107, Iron
Concentration (µg/L)
35000
30000
25000
20000
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 21
N Detect: 21
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0175
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

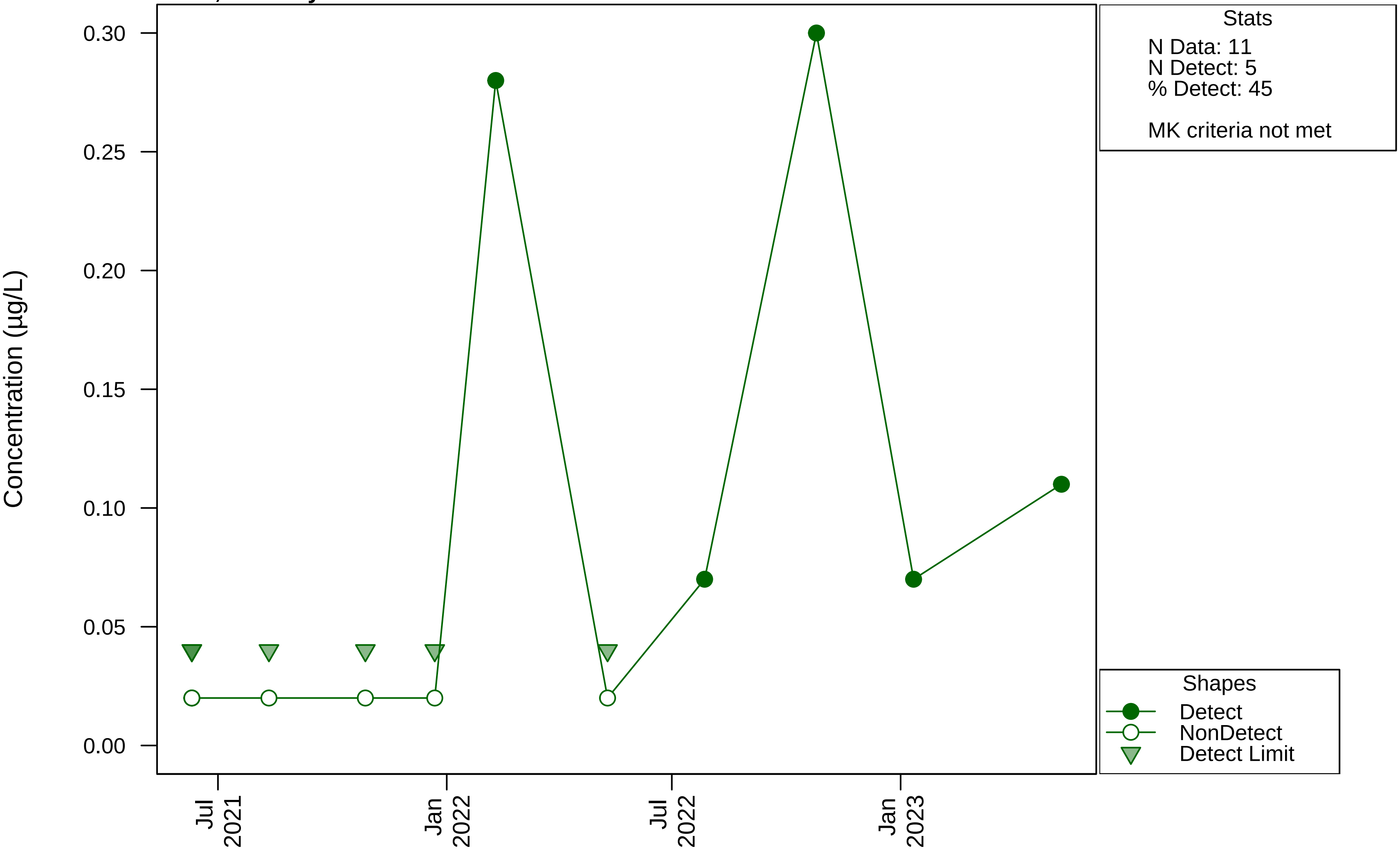


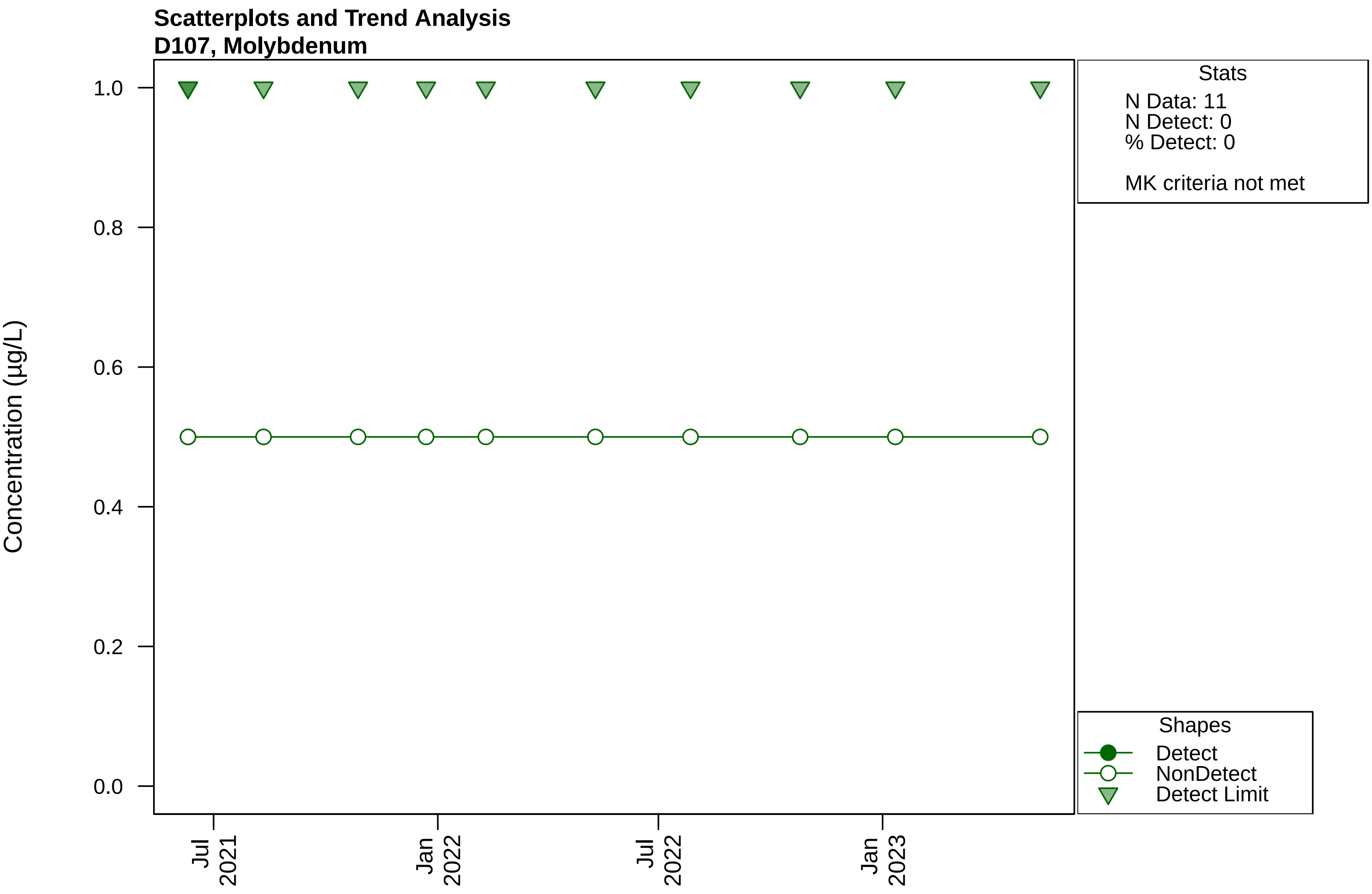
Scatterplots and Trend Analysis
D107, Lead
Concentration (µg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.239
Shapes
Detect
NonDetect
Detect Limit

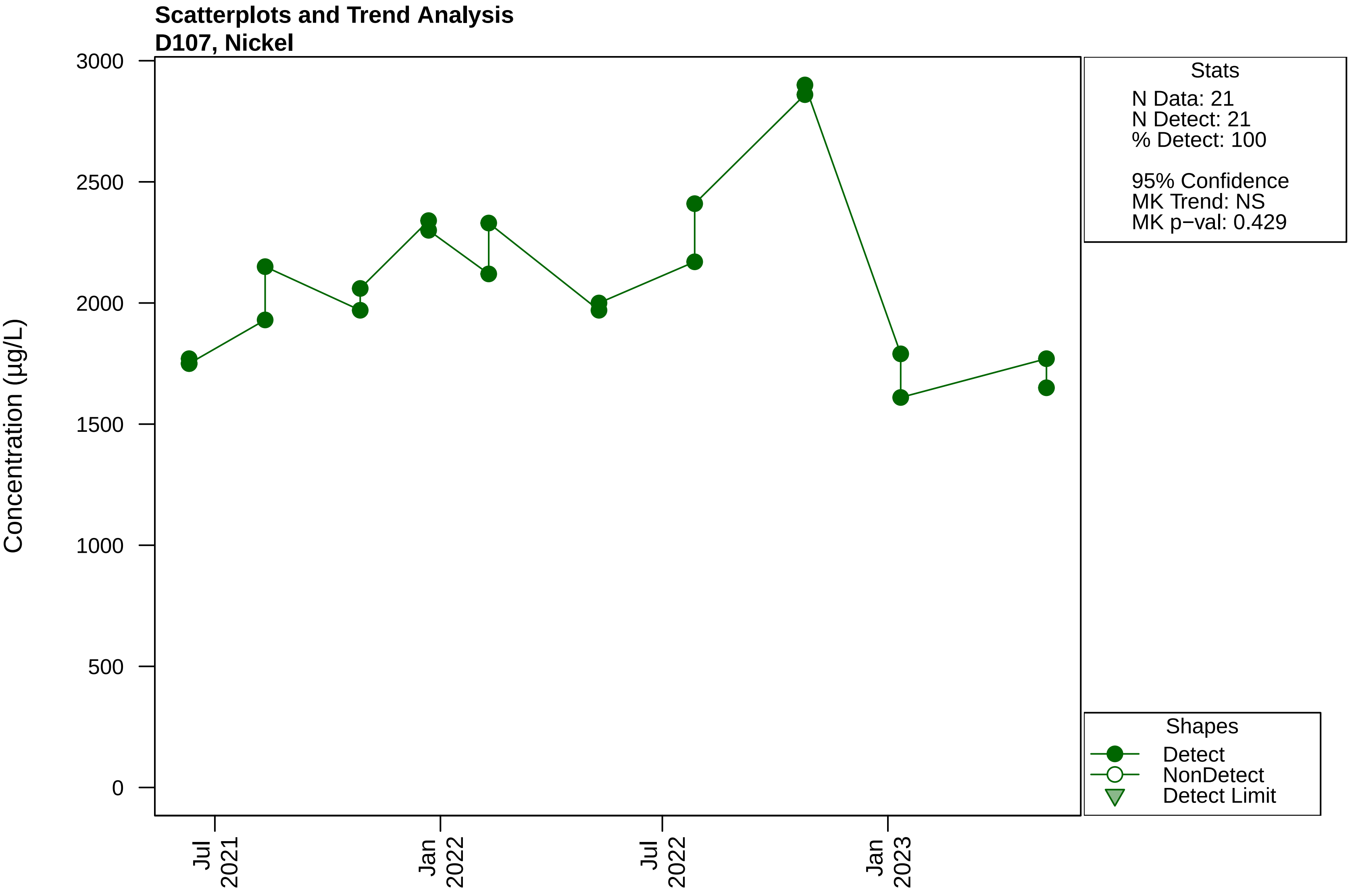
Scatterplots and Trend Analysis
D107, Manganese



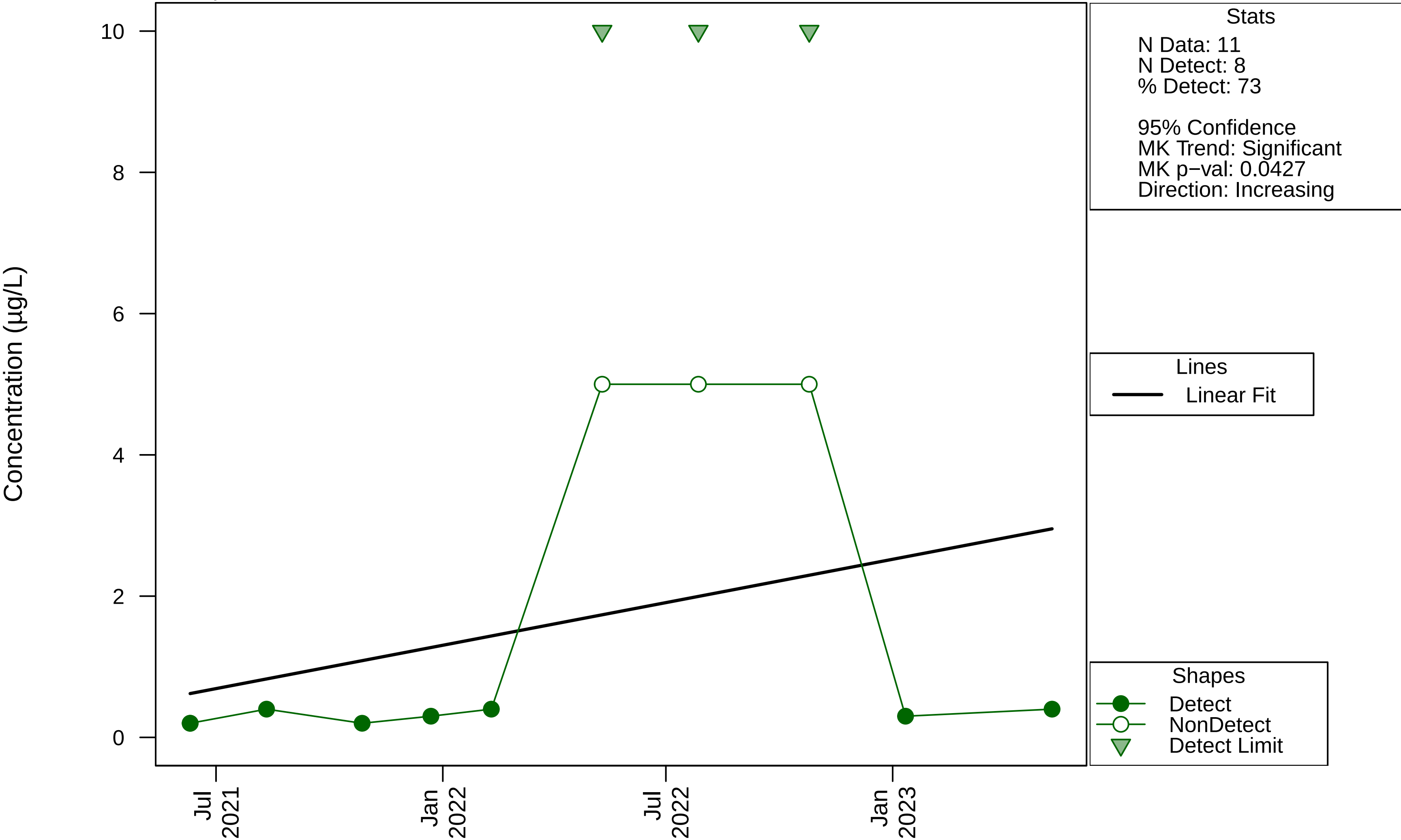
Scatterplots and Trend Analysis
D107, Mercury

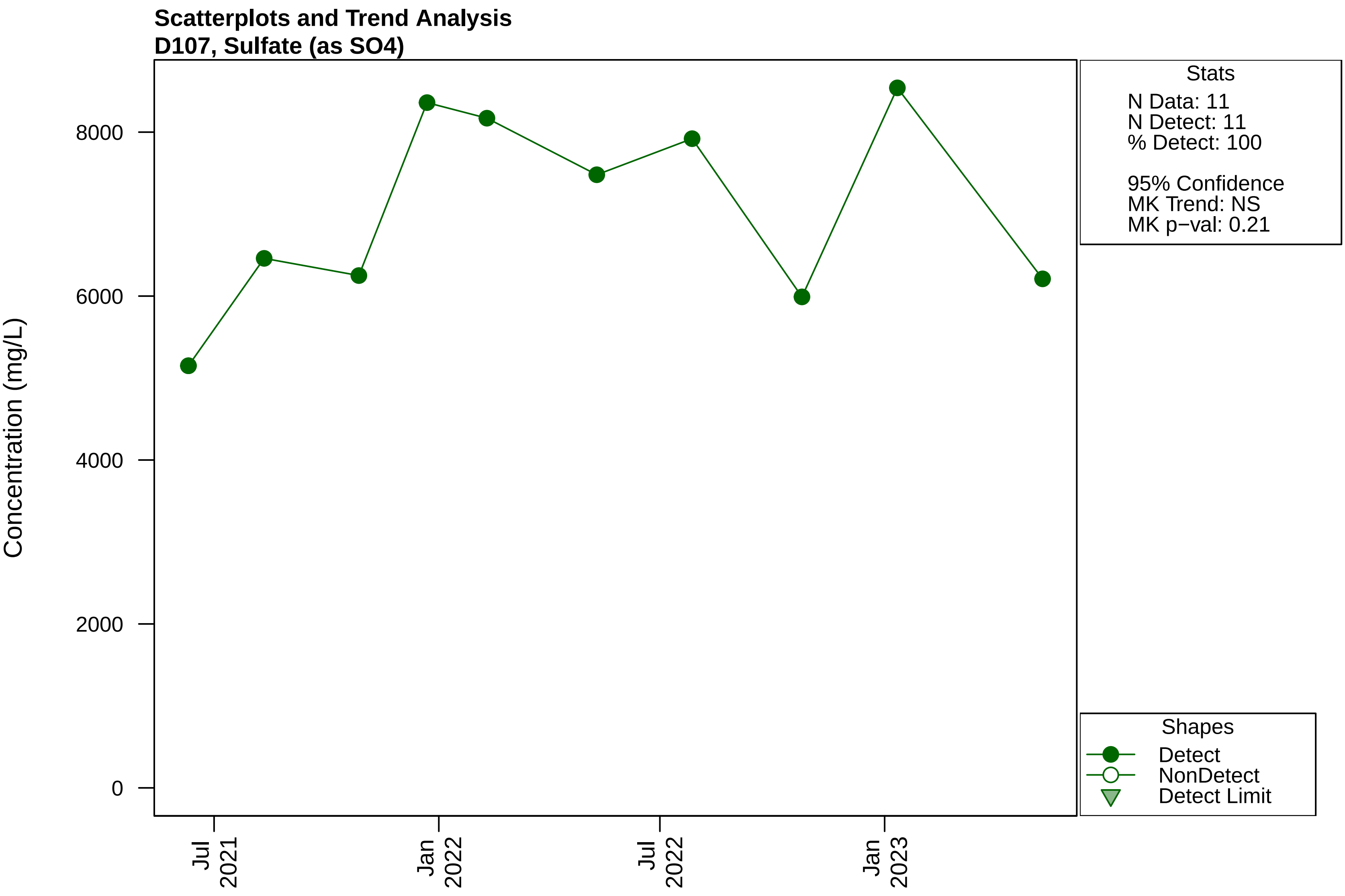


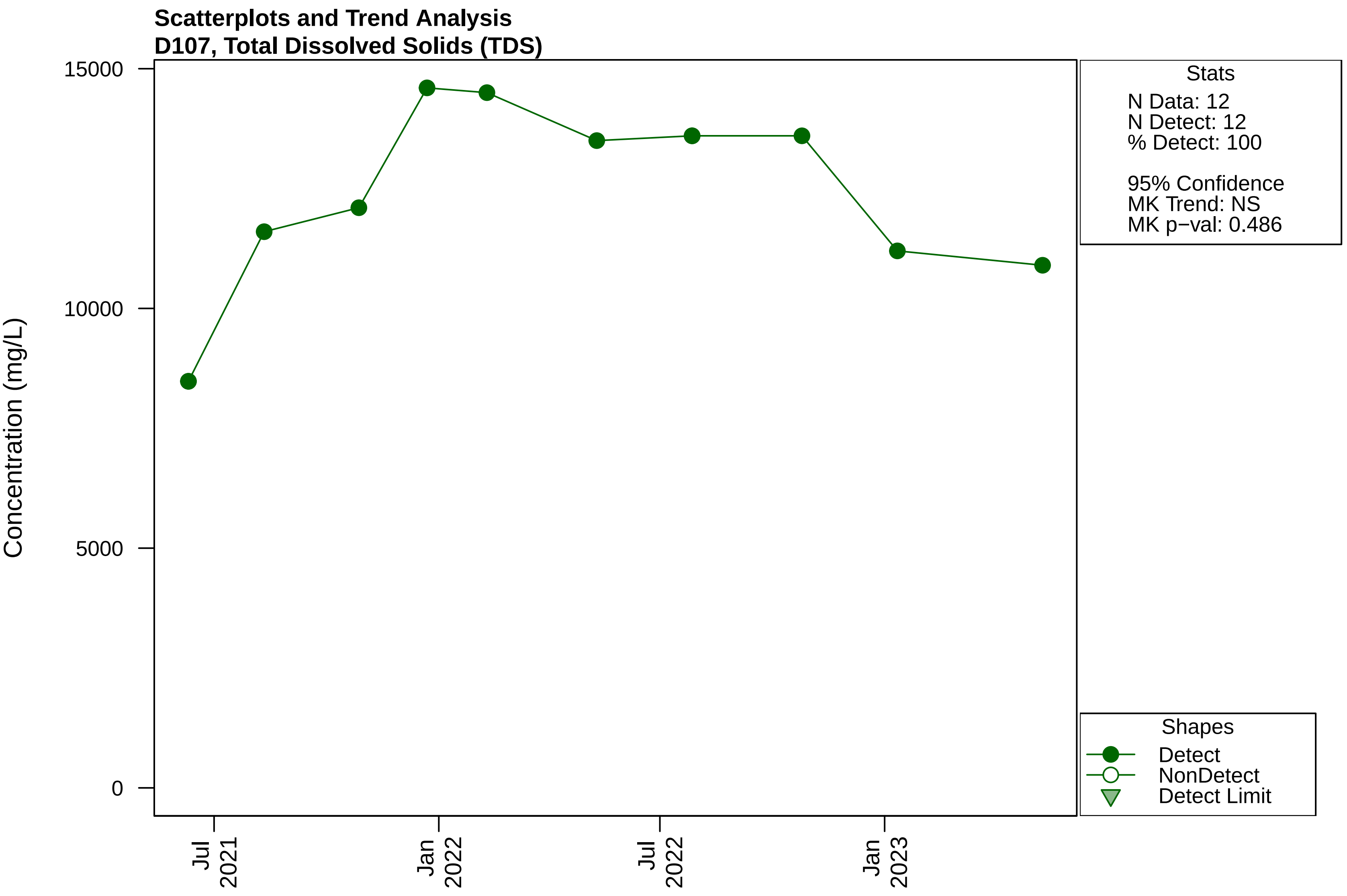

Scatterplots and Trend Analysis
D107, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

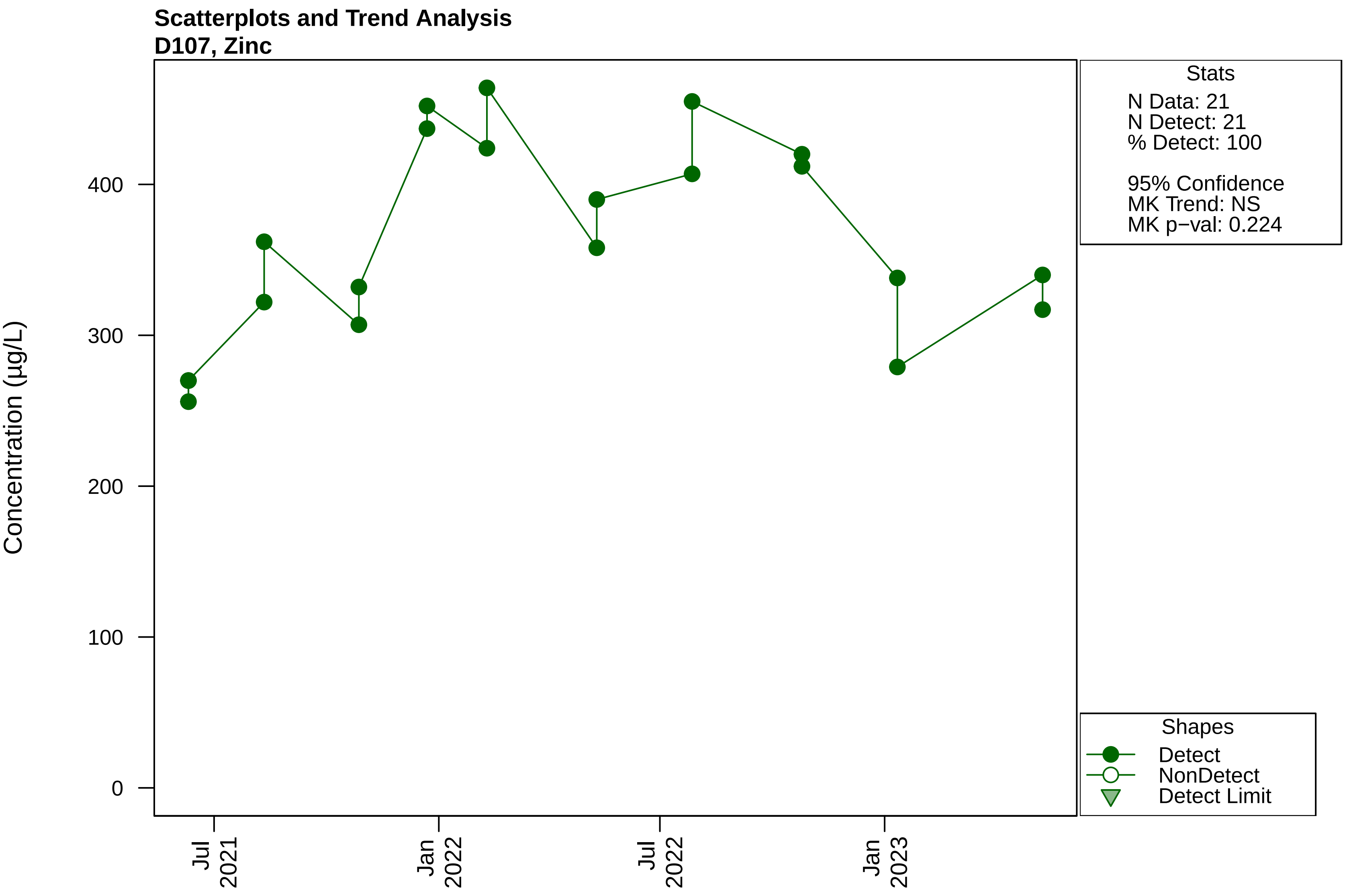

Scatterplots and Trend Analysis
D107, Nickel
Concentration (µg/L)
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 21
N Detect: 21
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.429
Shapes
Detect
NonDetect
Detect Limit

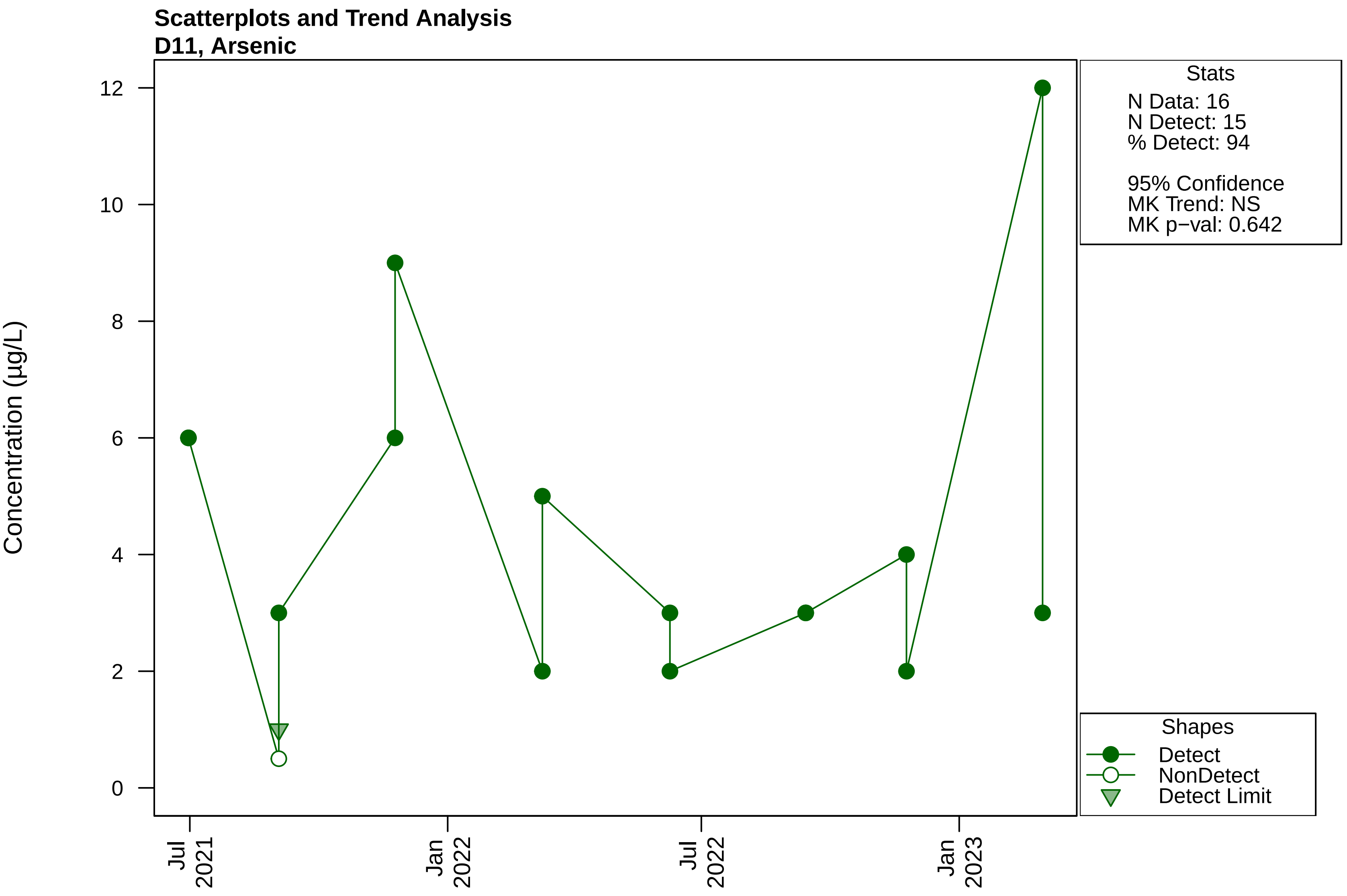
Scatterplots and Trend Analysis
D107, Selenium

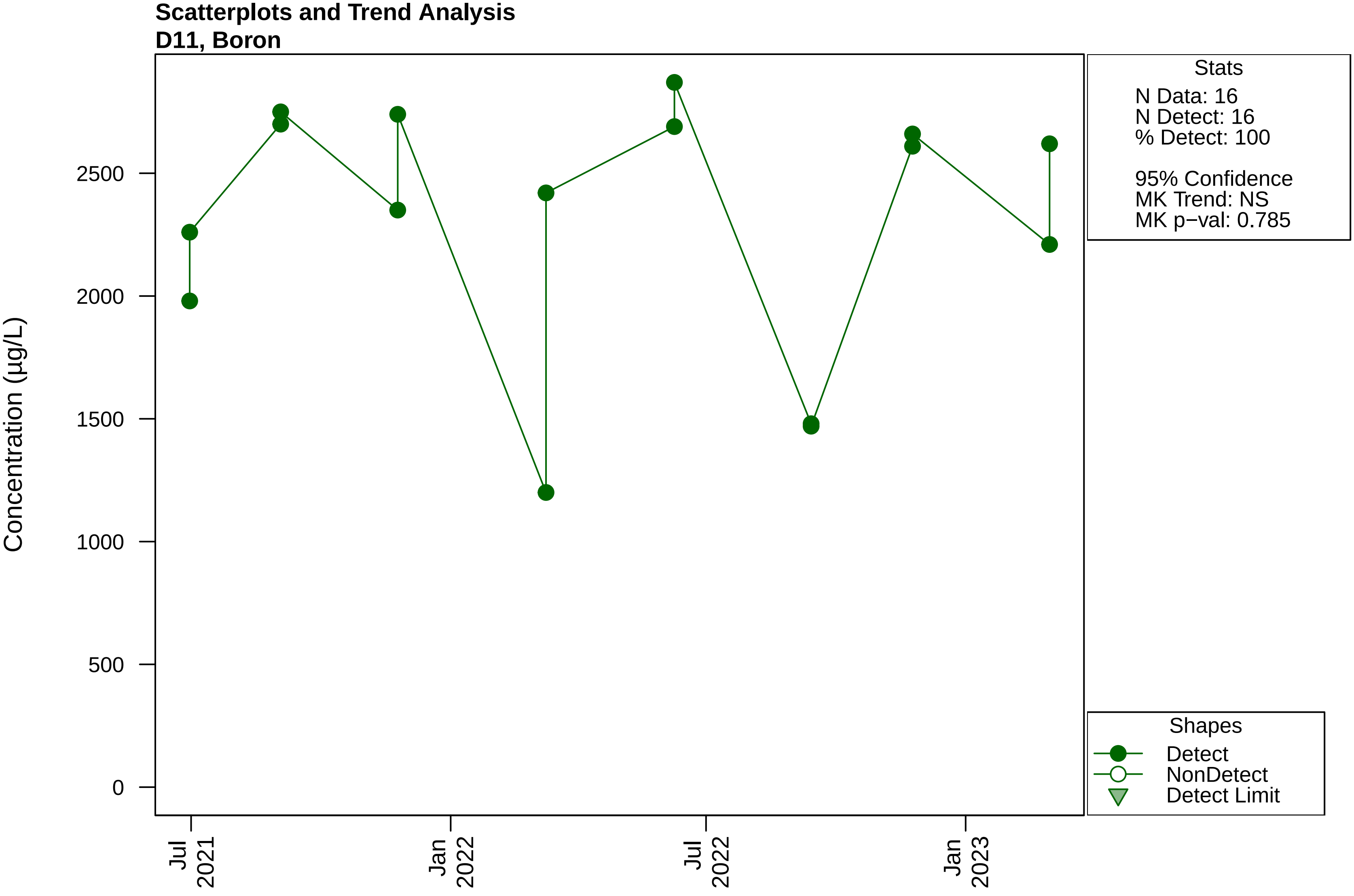



Scatterplots and Trend Analysis
D107, Sulfate (as SO4)
Concentration (mg/L)
0
2000
4000
6000
8000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.21
Shapes
Detect
NonDetect
Detect Limit

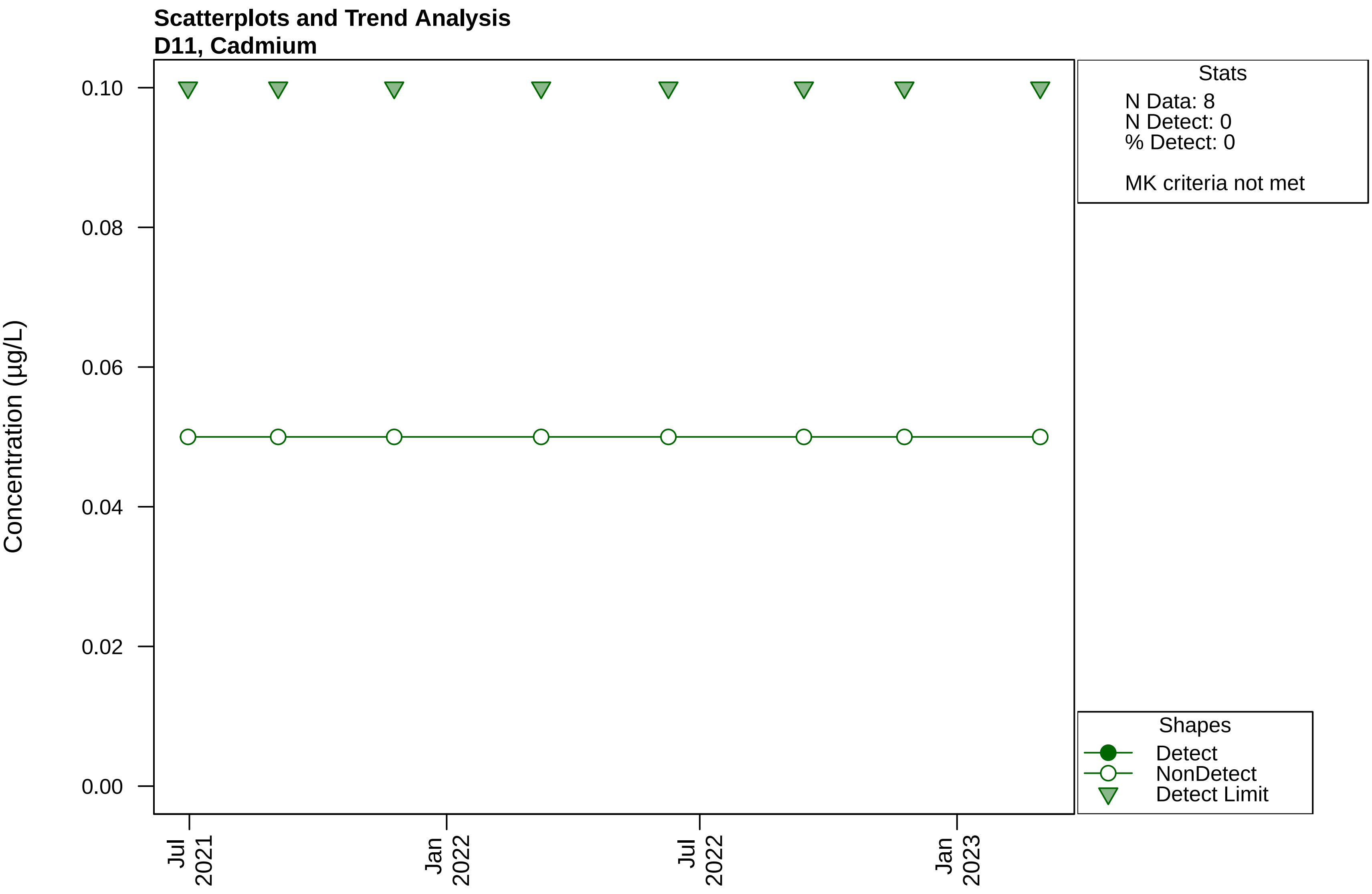

Scatterplots and Trend Analysis
D107, Total Dissolved Solids (TDS)
Concentration (mg/L)
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 12
N Detect: 12
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.486
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D107, Zinc
Concentration (µg/L)
0
100
200
300
400
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 21
N Detect: 21
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.224
Shapes
Detect
NonDetect
Detect Limit

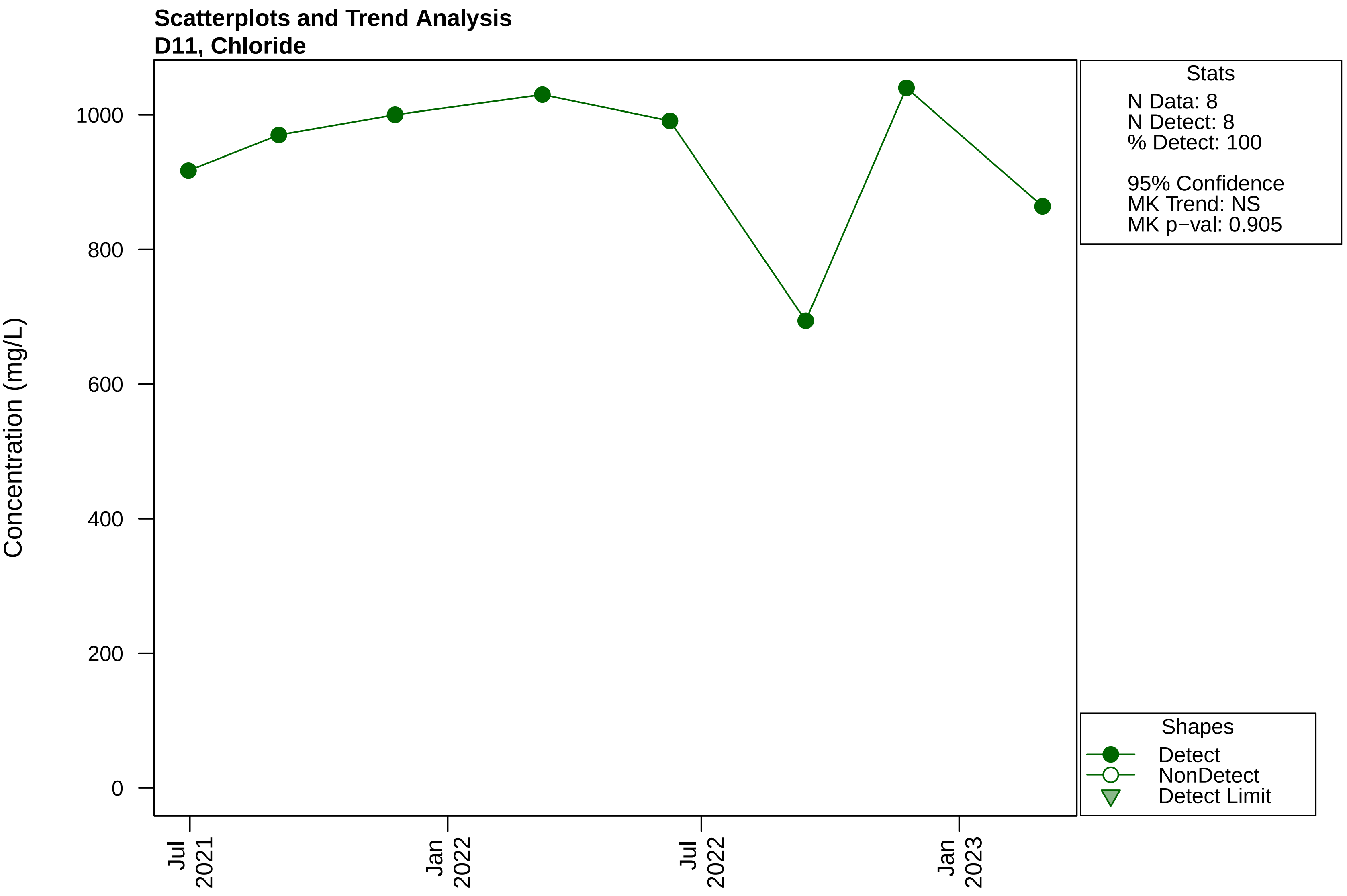

Scatterplots and Trend Analysis
D11, Arsenic
Concentration (µg/L)
0
2
4
6
8
10
12
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 15
% Detect: 94
95% Confidence
MK Trend: NS
MK p−val: 0.642
Shapes
Detect
NonDetect
Detect Limit



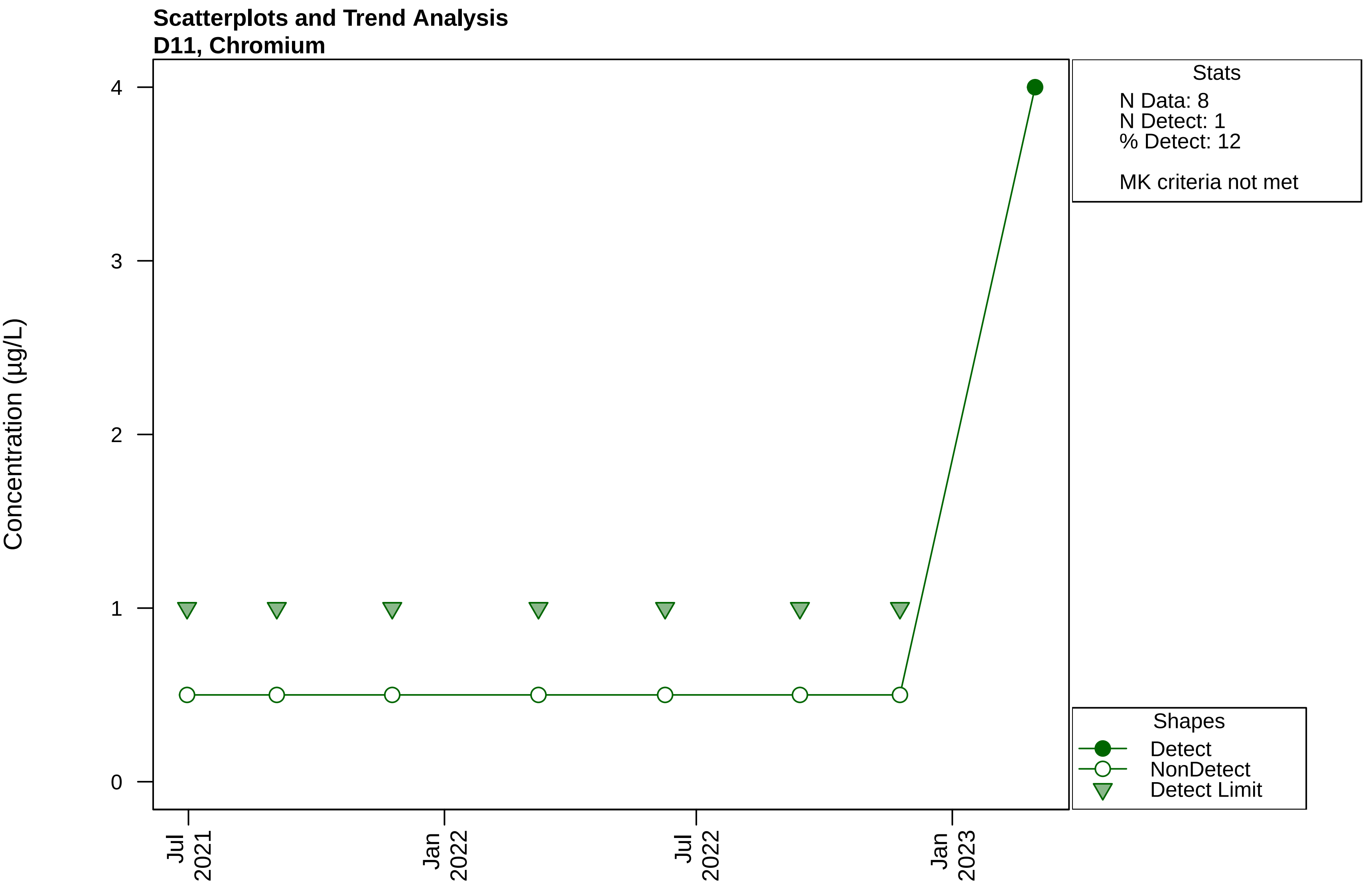
Scatterplots and Trend Analysis
D11, Boron
Concentration (µg/L)
0
500
1000
1500
2000
2500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.785
Shapes
Detect
NonDetect
Detect Limit



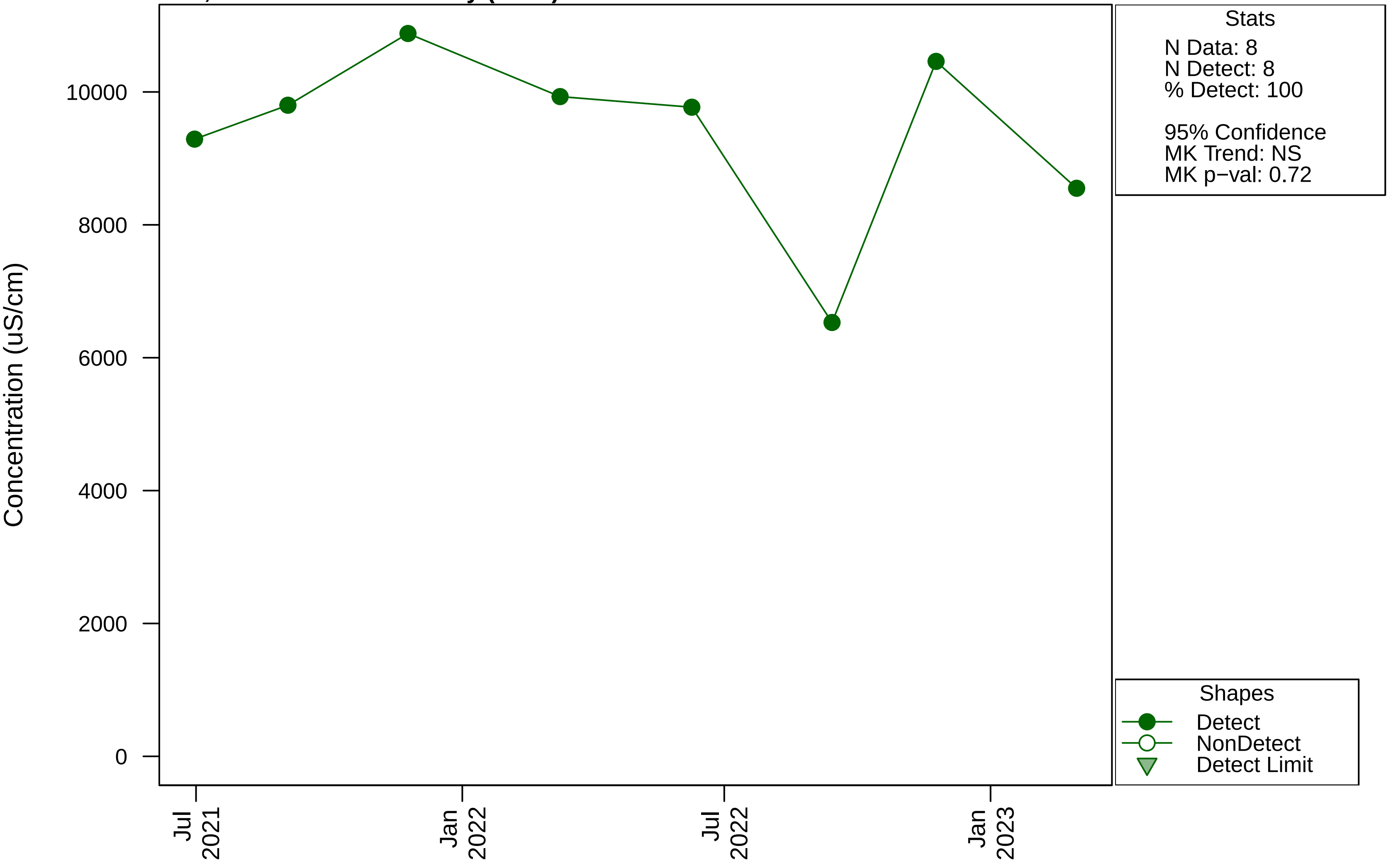
Scatterplots and Trend Analysis
D11, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

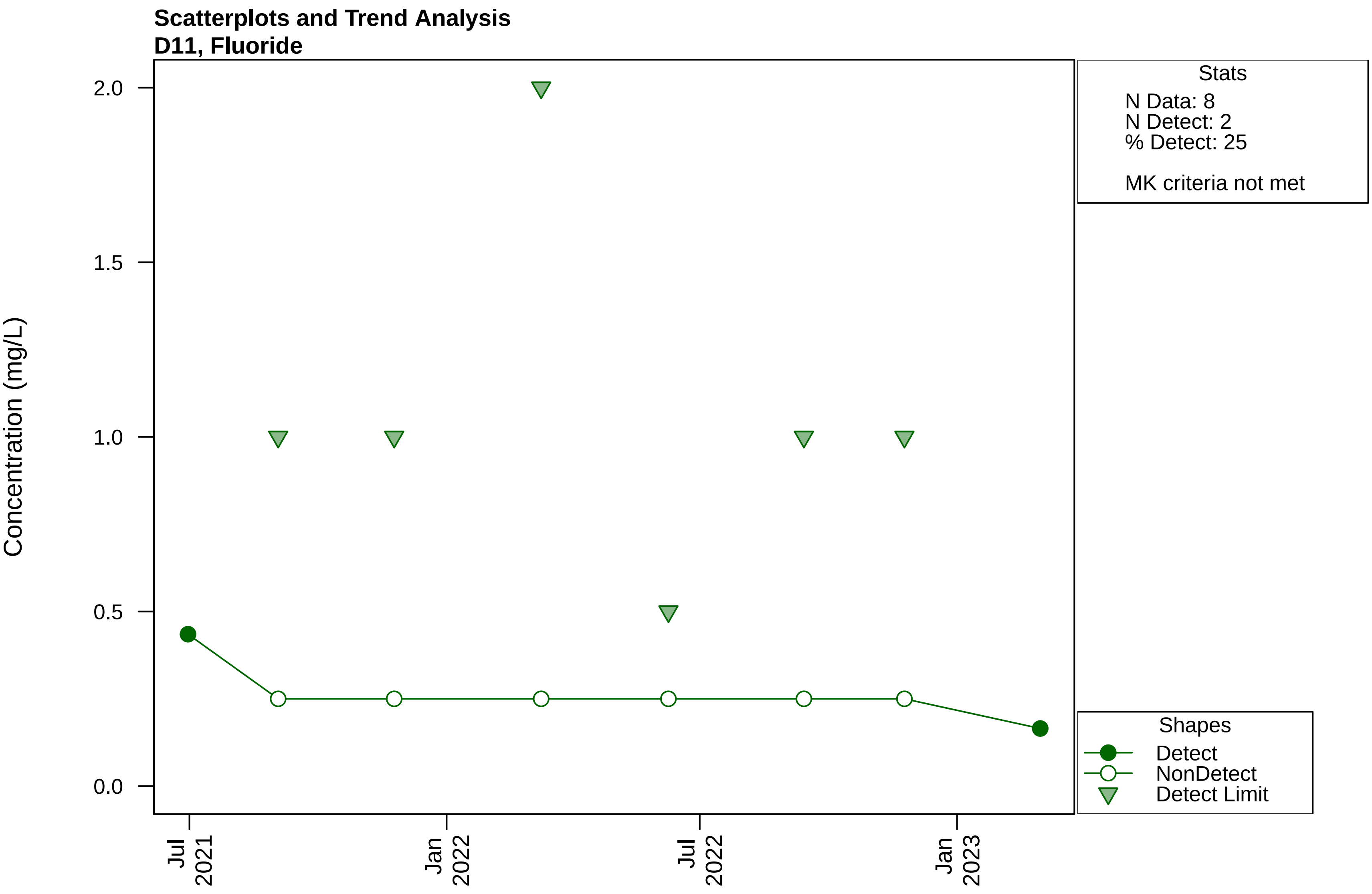


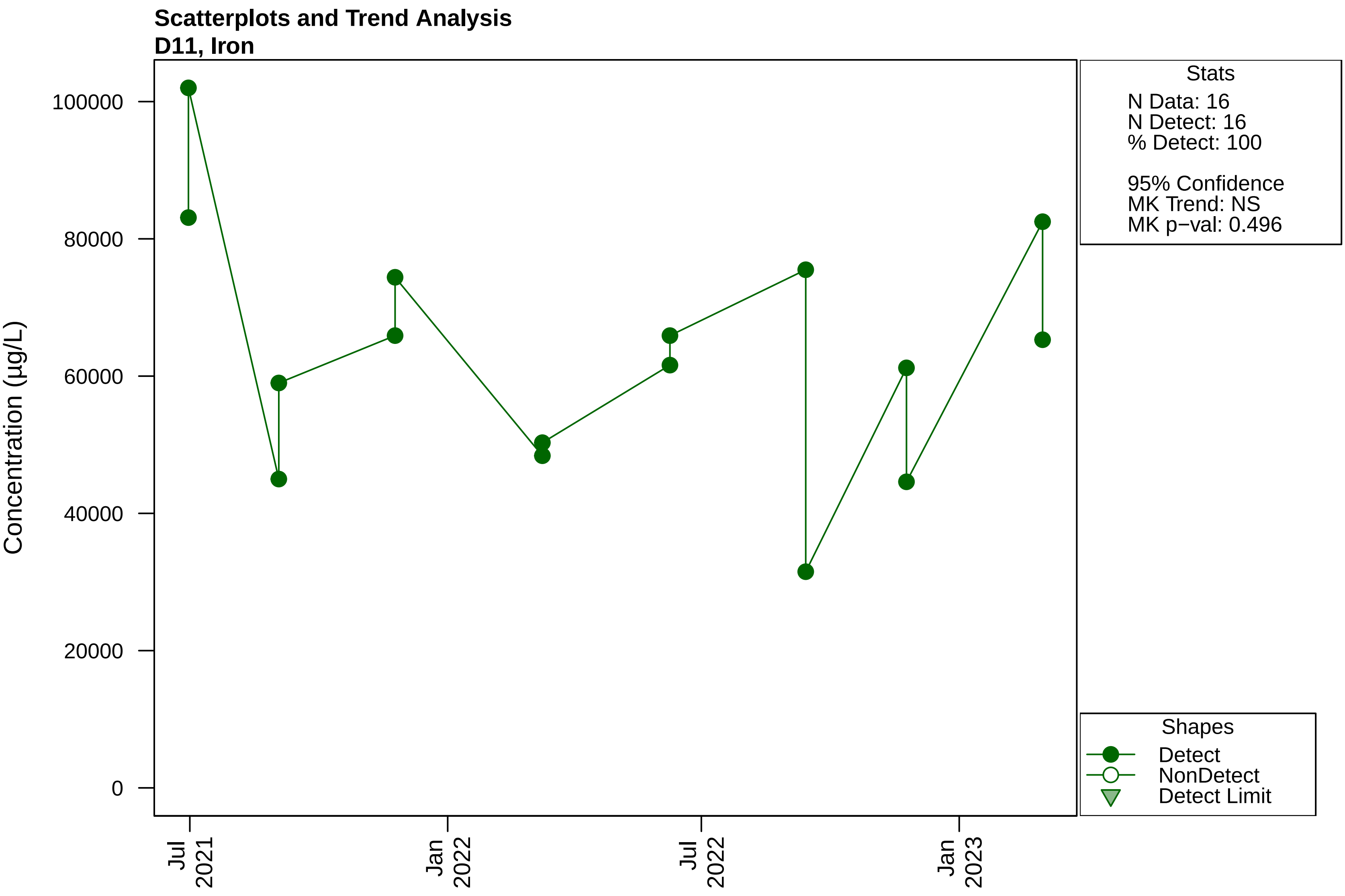
Scatterplots and Trend Analysis
D11, Chloride
Concentration (mg/L)
0
200
400
600
800
1000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.905
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D11, Chromium
Concentration (µg/L)
0
1
2
3
4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 1
% Detect: 12
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

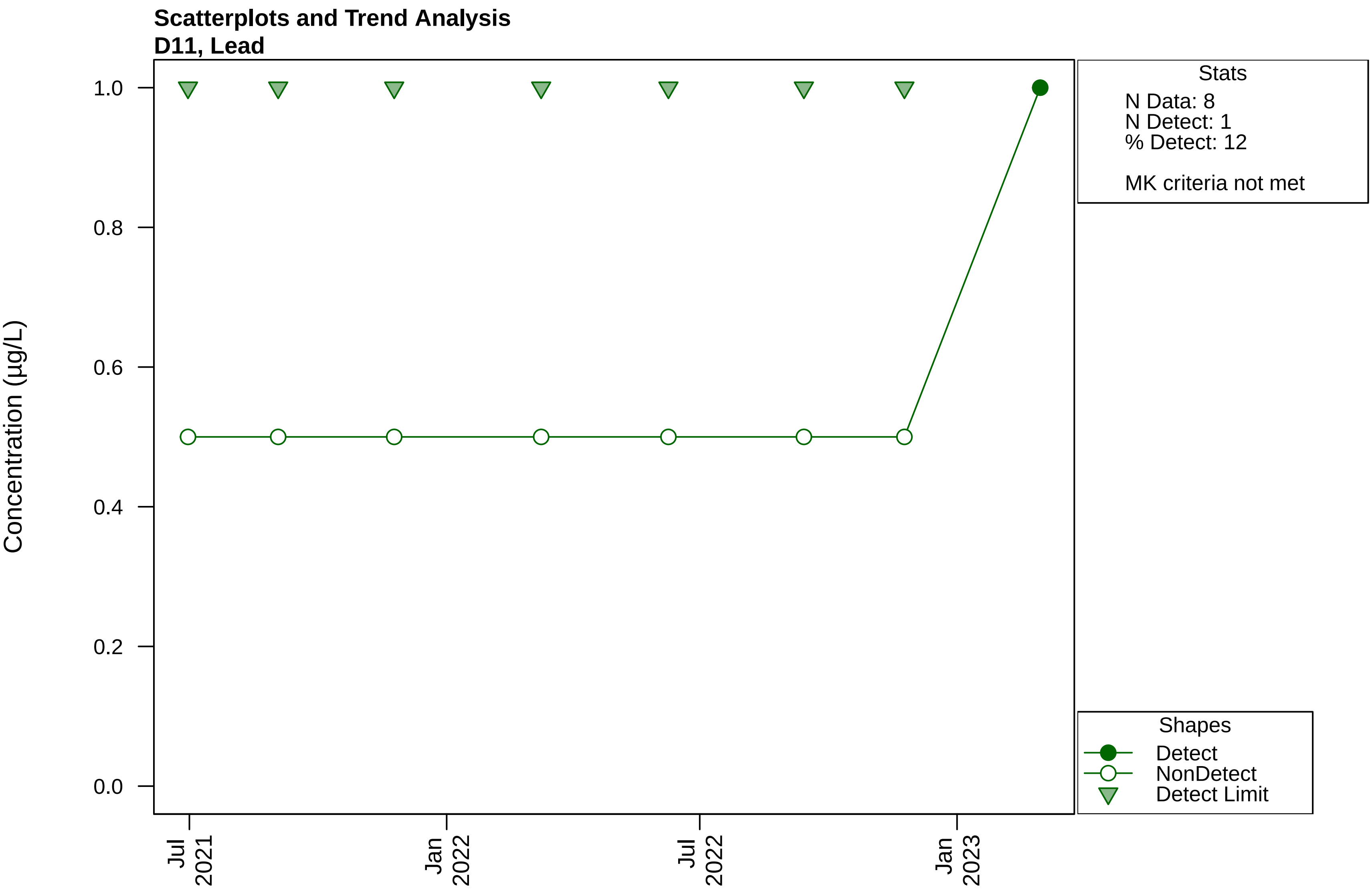
Scatterplots and Trend Analysis
D11, Electrical Conductivity (Field)

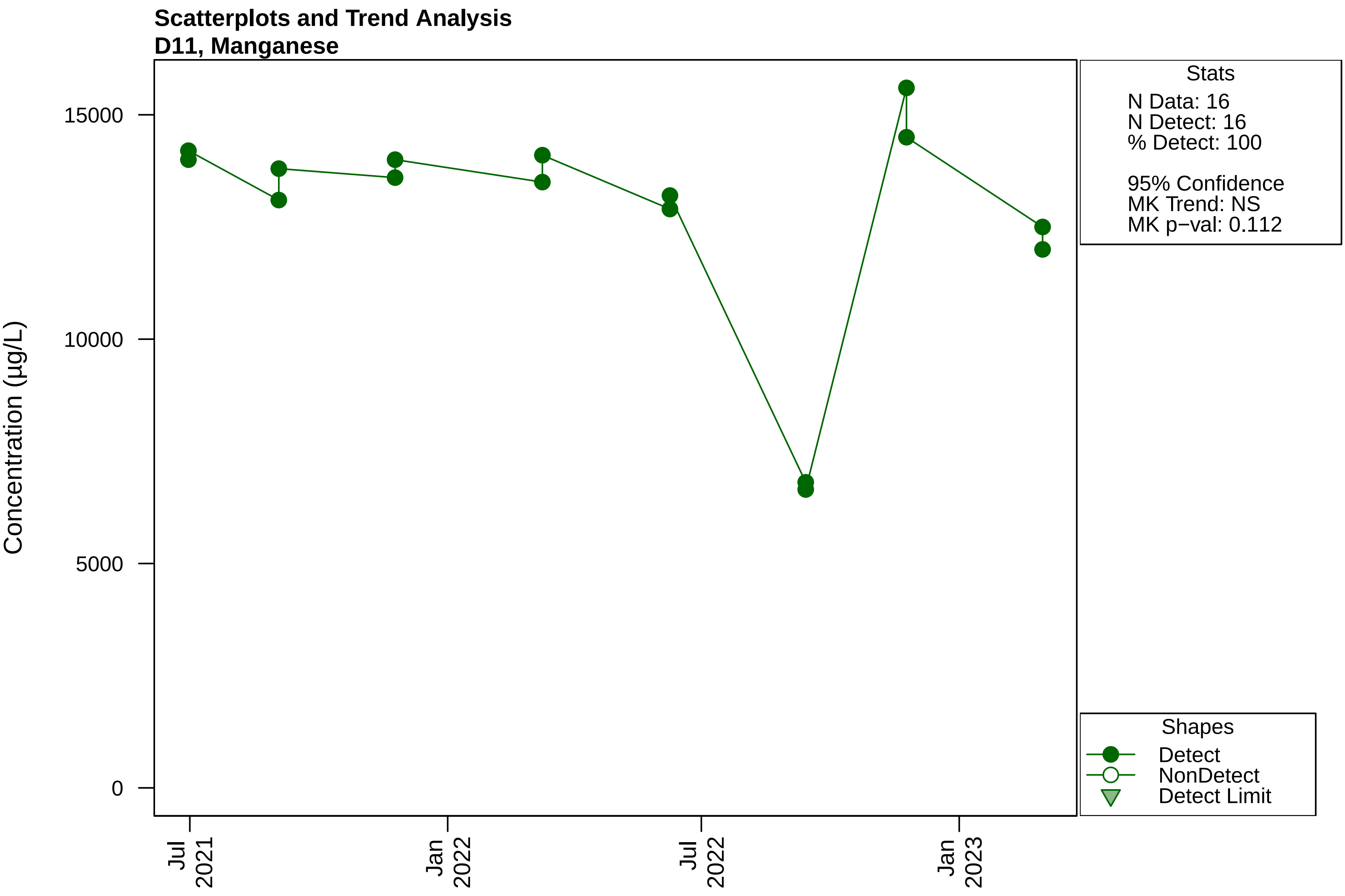


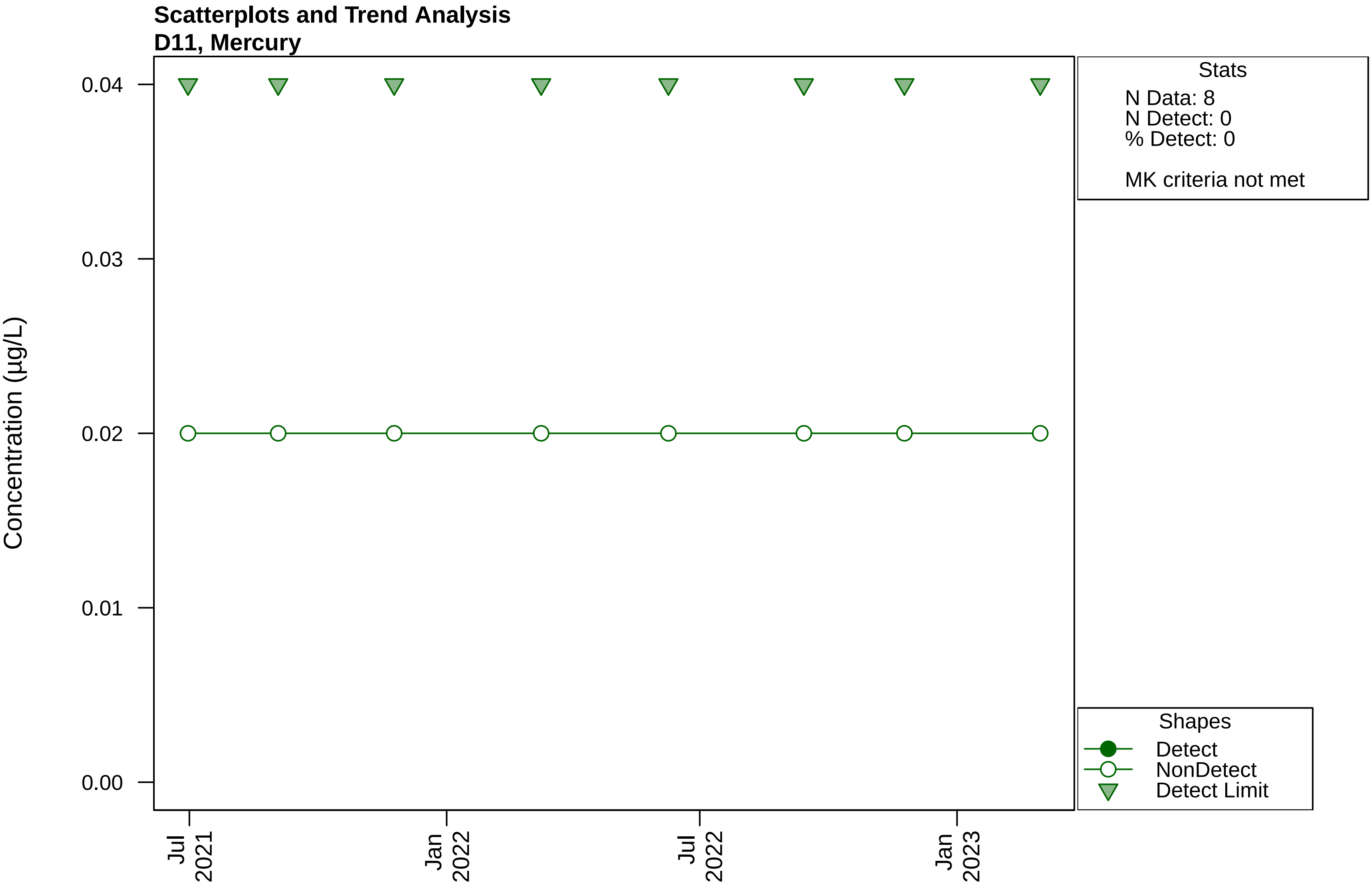

Scatterplots and Trend Analysis
D11, Fluoride
Concentration (mg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 2
% Detect: 25
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



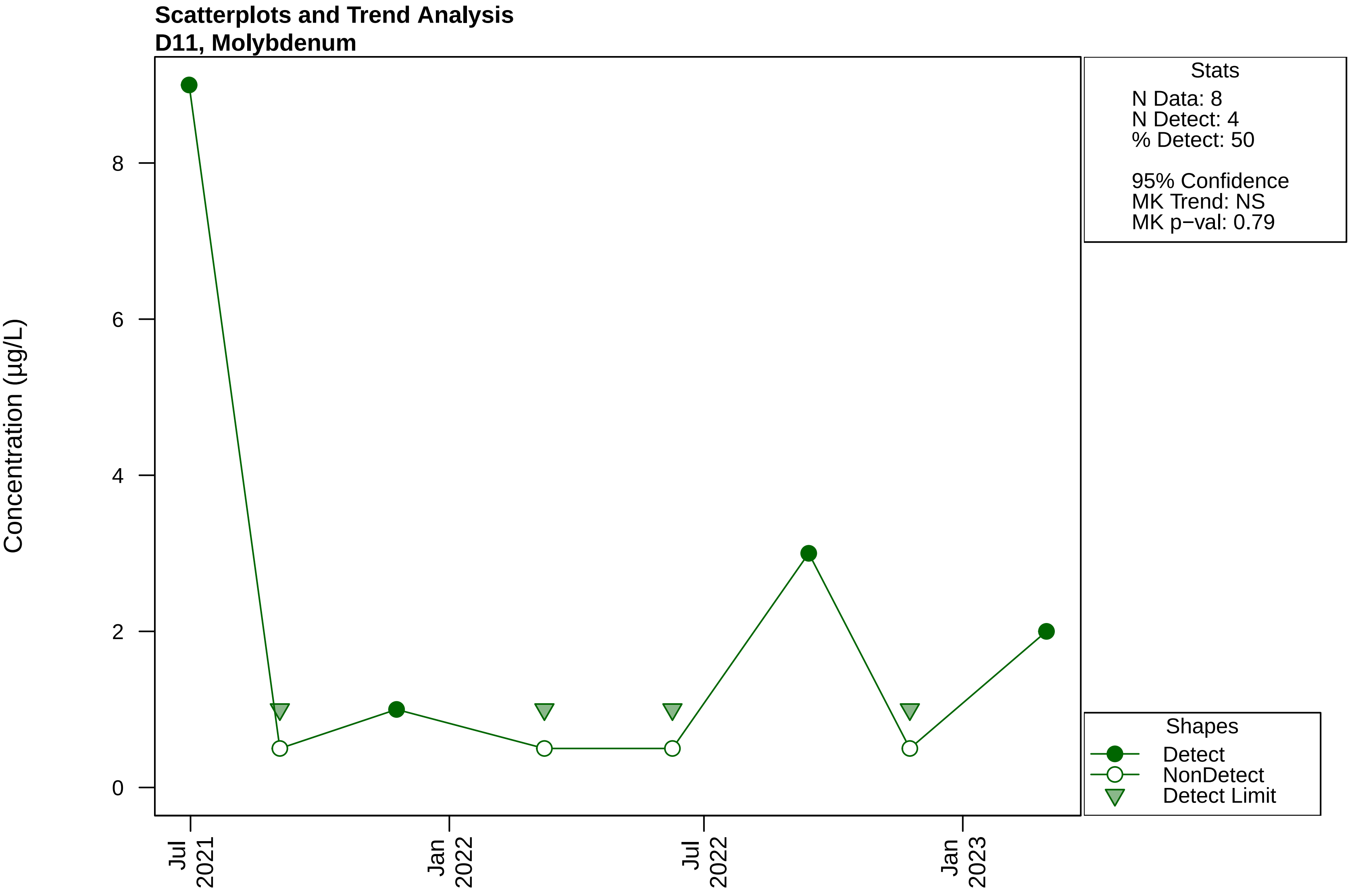
Scatterplots and Trend Analysis
D11, Iron
Concentration (µg/L)
100000
80000
60000
40000
20000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.496
Shapes
Detect
NonDetect
Detect Limit

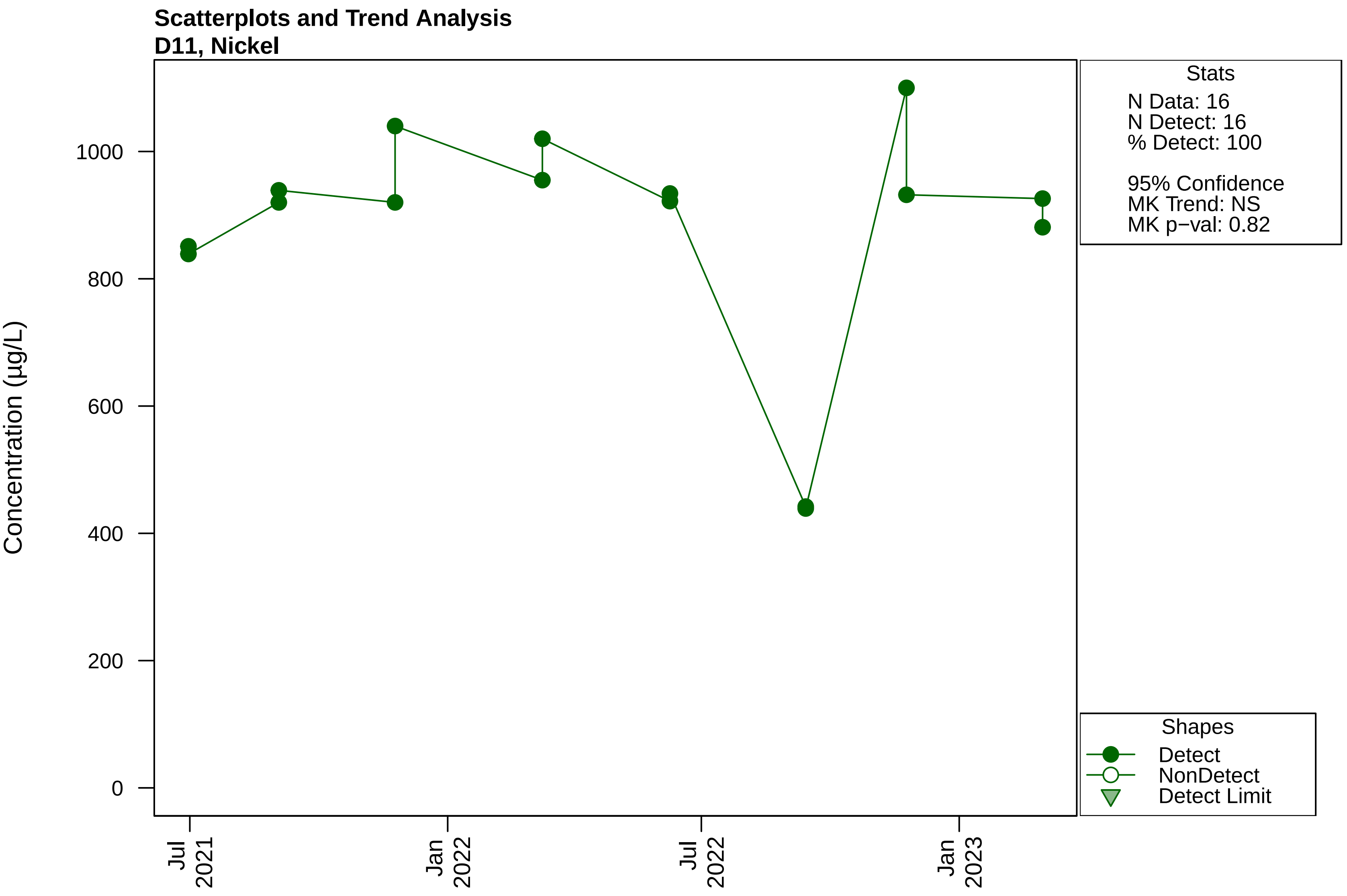

Scatterplots and Trend Analysis
D11, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 1
% Detect: 12
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

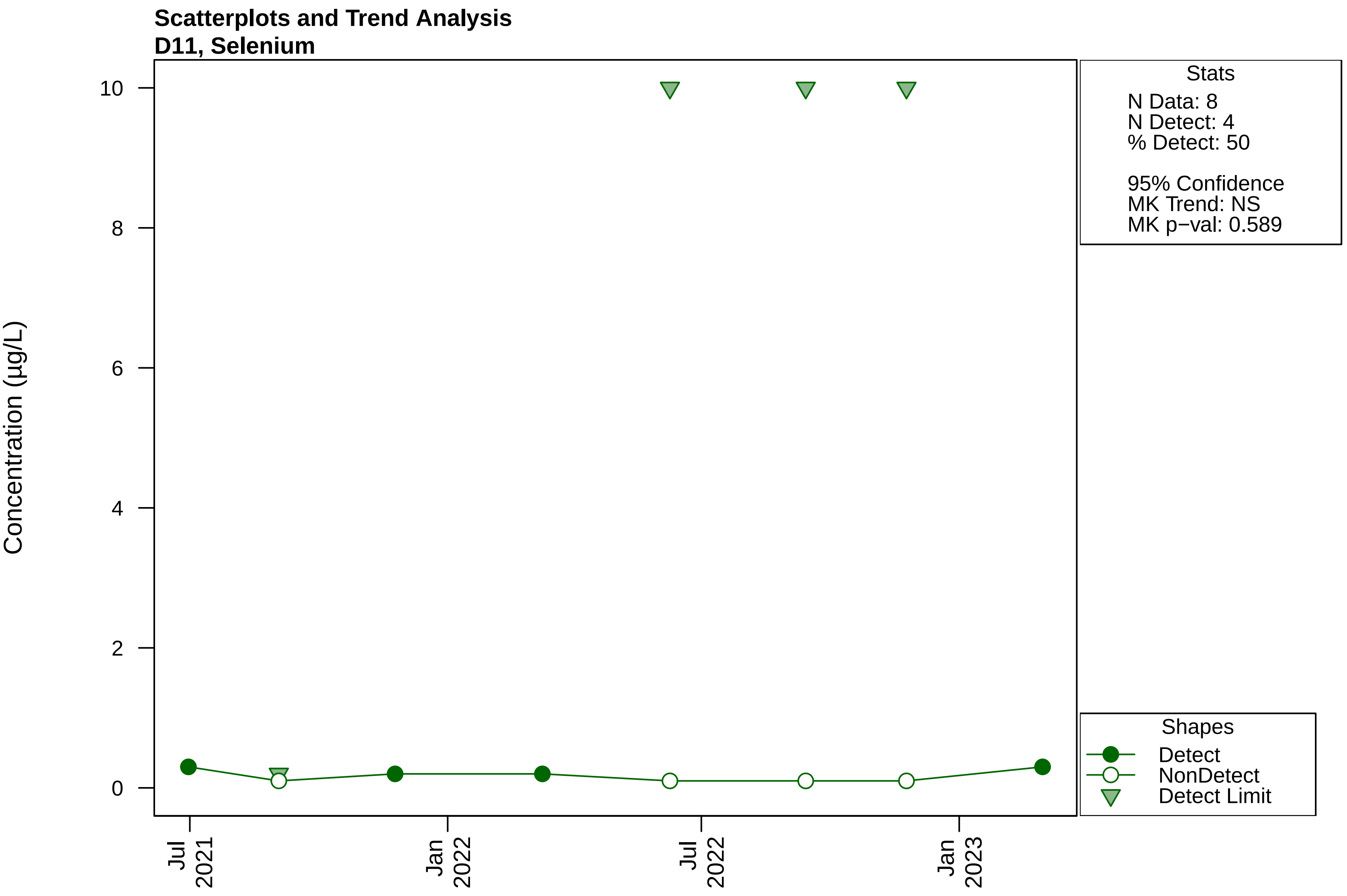

Scatterplots and Trend Analysis
D11, Manganese
Concentration (µg/L)
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.112
Shapes
Detect
NonDetect
Detect Limit

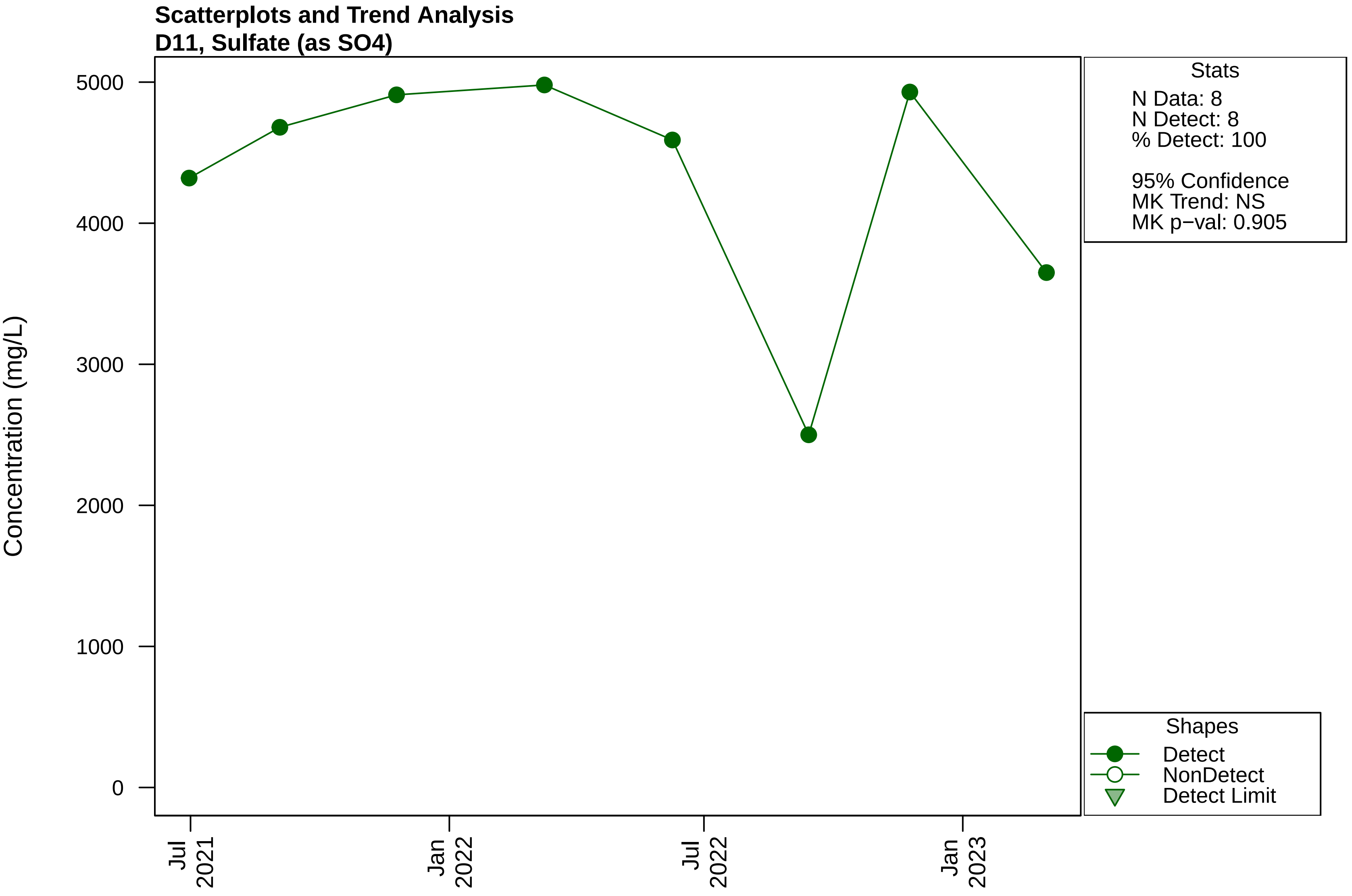


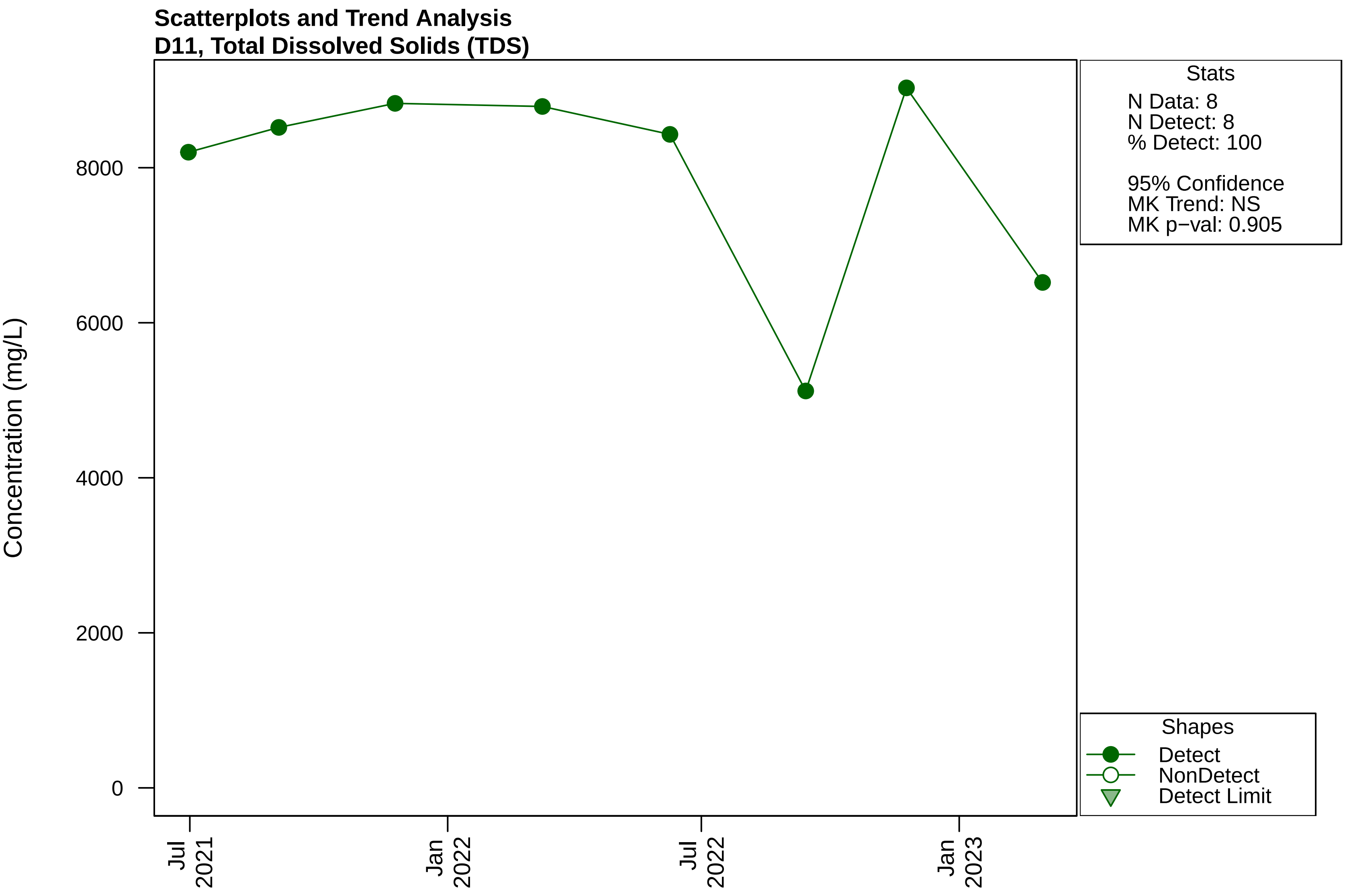
Scatterplots and Trend Analysis
D11, Mercury
Concentration (µg/L)
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

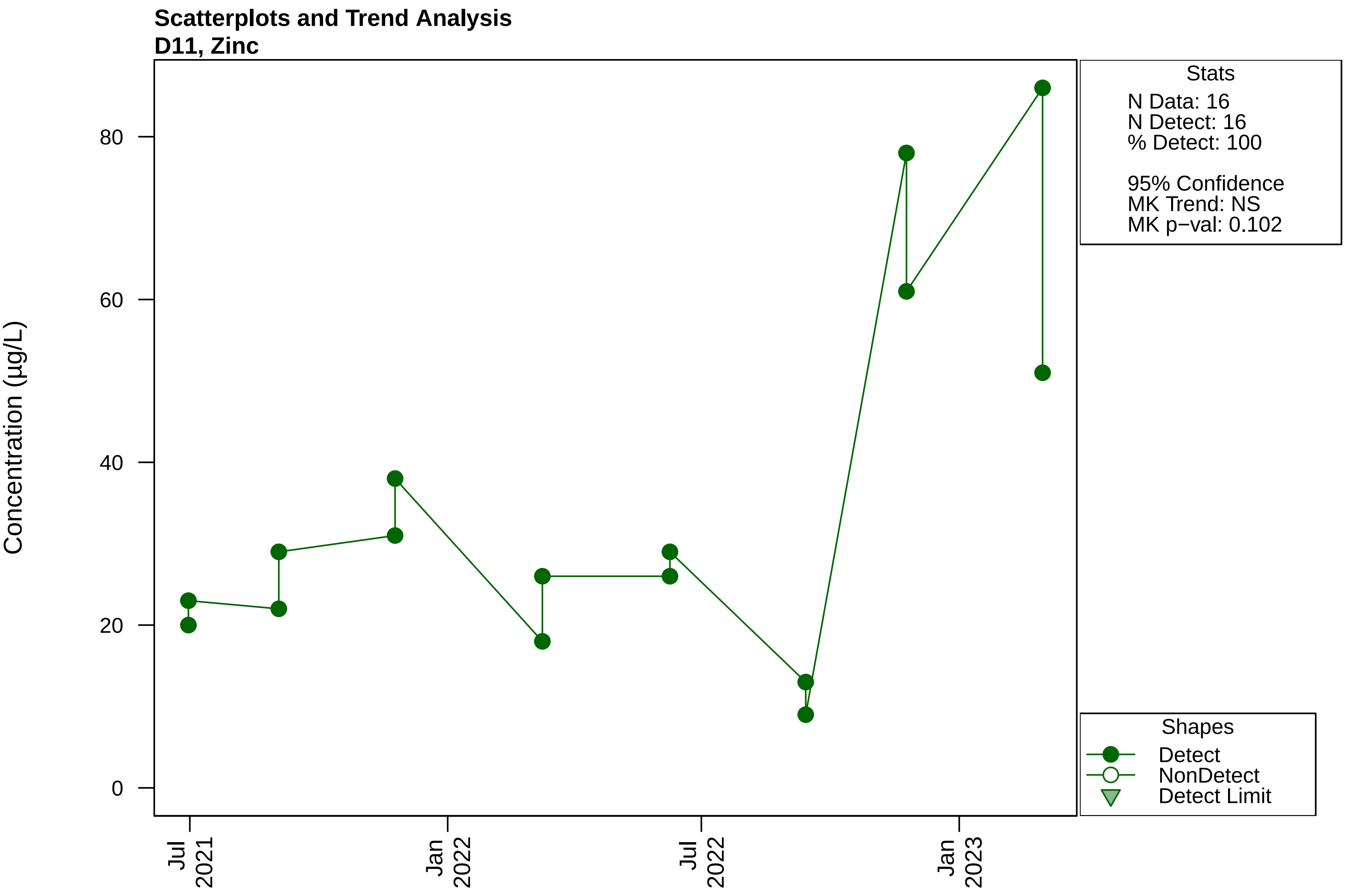

Scatterplots and Trend Analysis
D11, Molybdenum
Concentration (µg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 4
% Detect: 50
95% Confidence
MK Trend: NS
MK p−val: 0.79
Shapes
Detect
NonDetect
Detect Limit

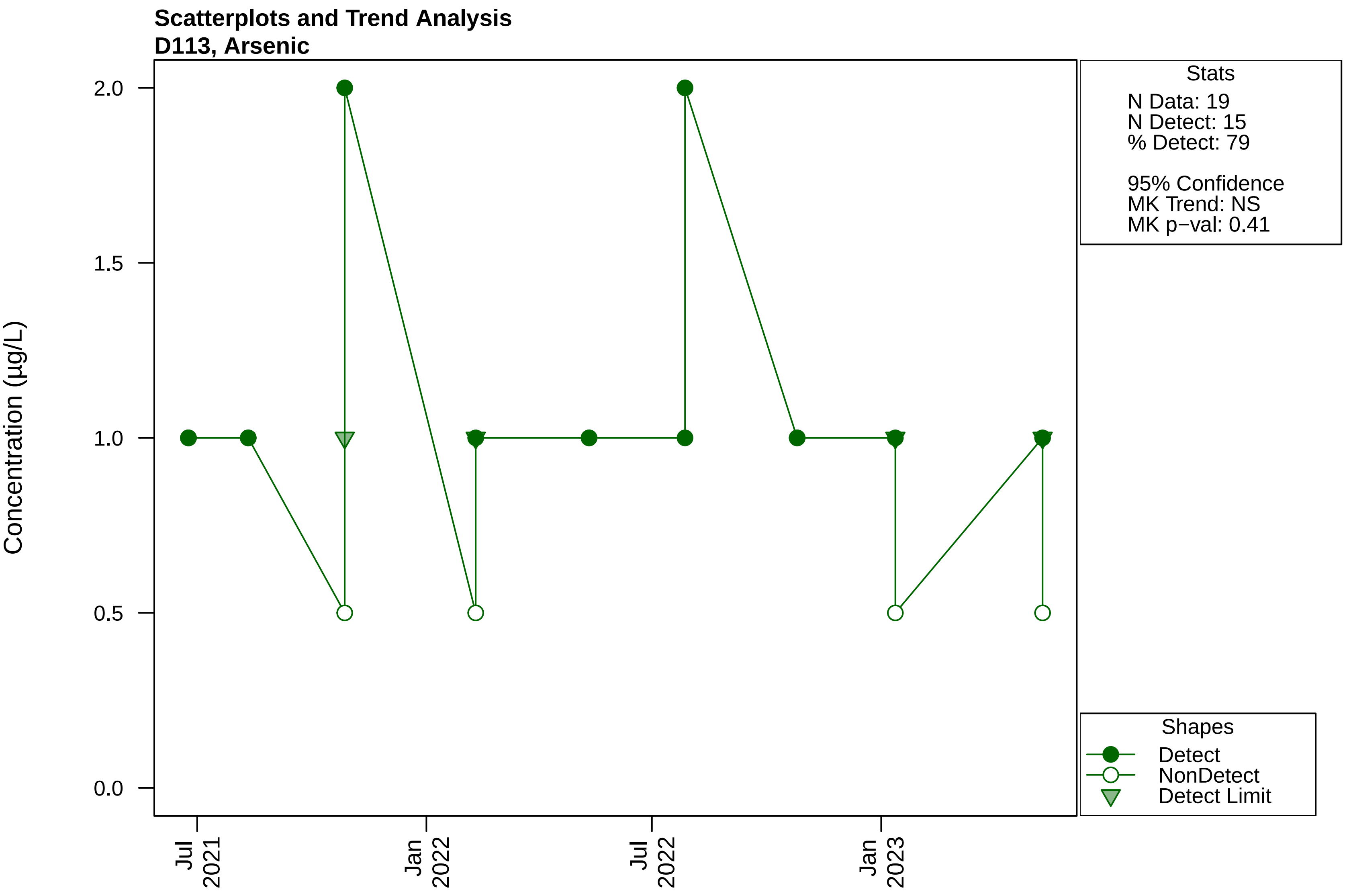

Scatterplots and Trend Analysis
D11, Nickel
Concentration (µg/L)
0
200
400
600
800
1000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.82
Shapes
Detect
NonDetect
Detect Limit

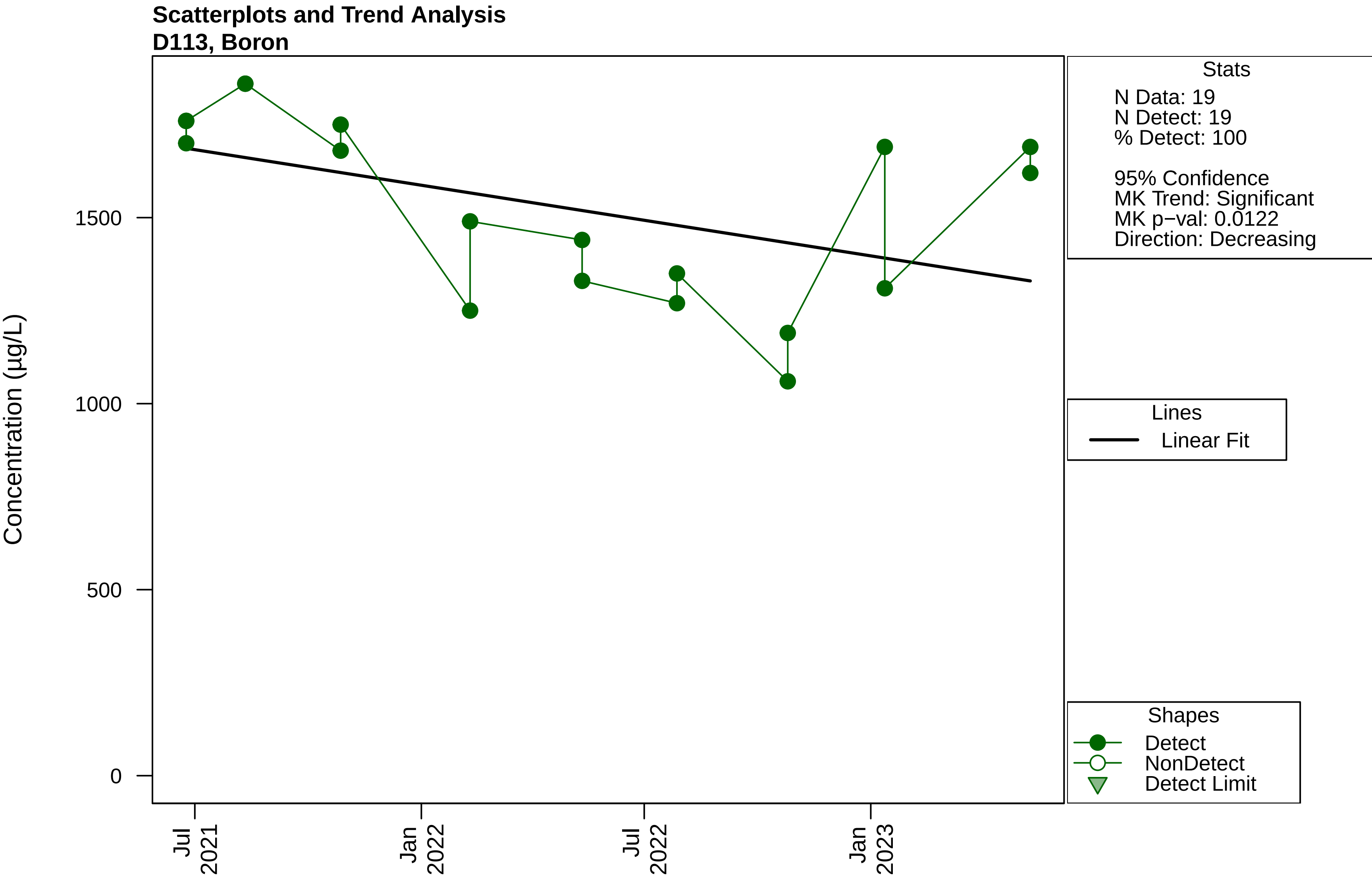

Scatterplots and Trend Analysis
D11, Selenium
Concentration (µg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 4
% Detect: 50
95% Confidence
MK Trend: NS
MK p−val: 0.589
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D11, Sulfate (as SO4)
Concentration (mg/L)
0
1000
2000
3000
4000
5000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.905
Shapes
Detect
NonDetect
Detect Limit

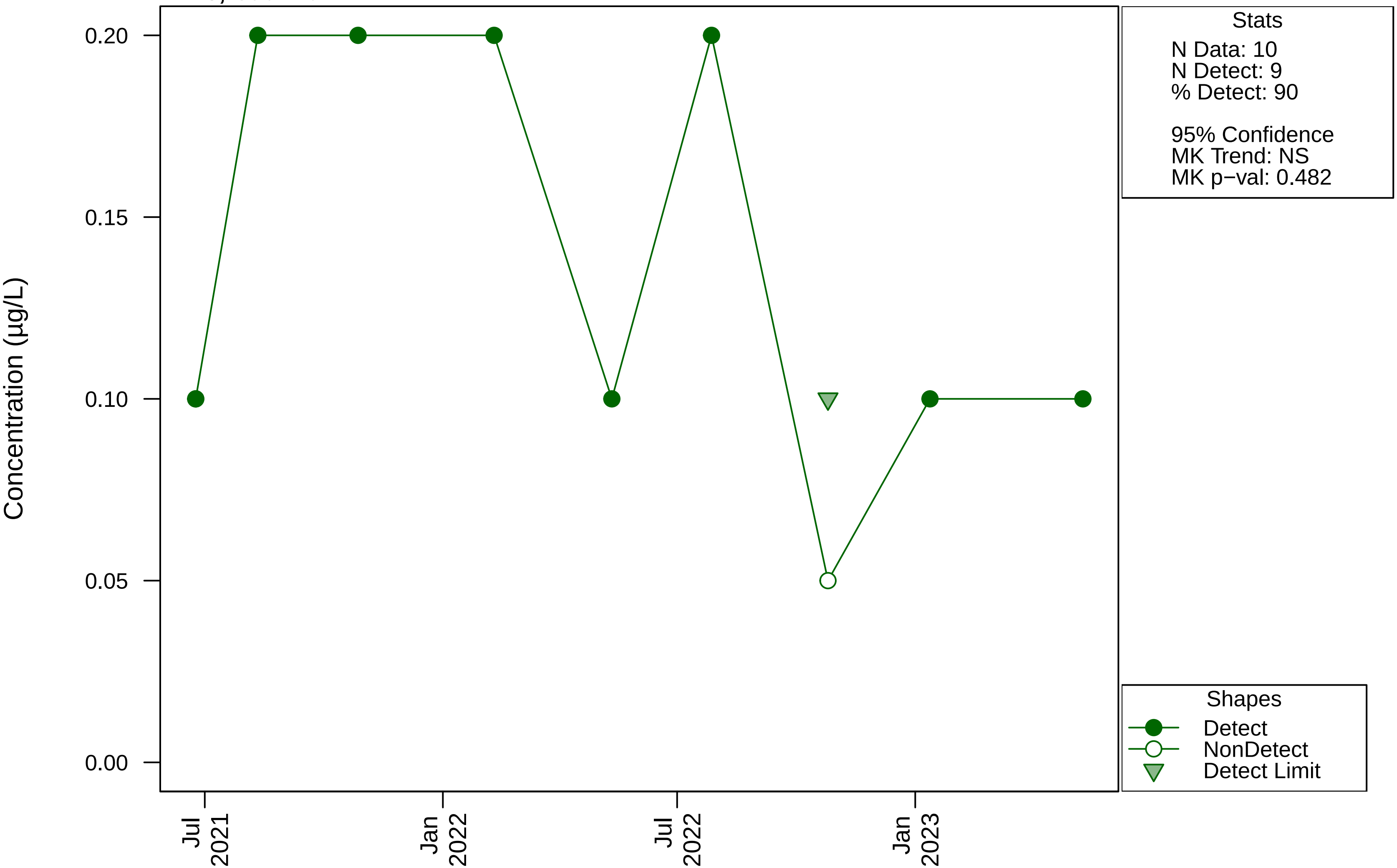

Scatterplots and Trend Analysis
D11, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
2000
4000
6000
8000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.905
Shapes
Detect
NonDetect
Detect Limit

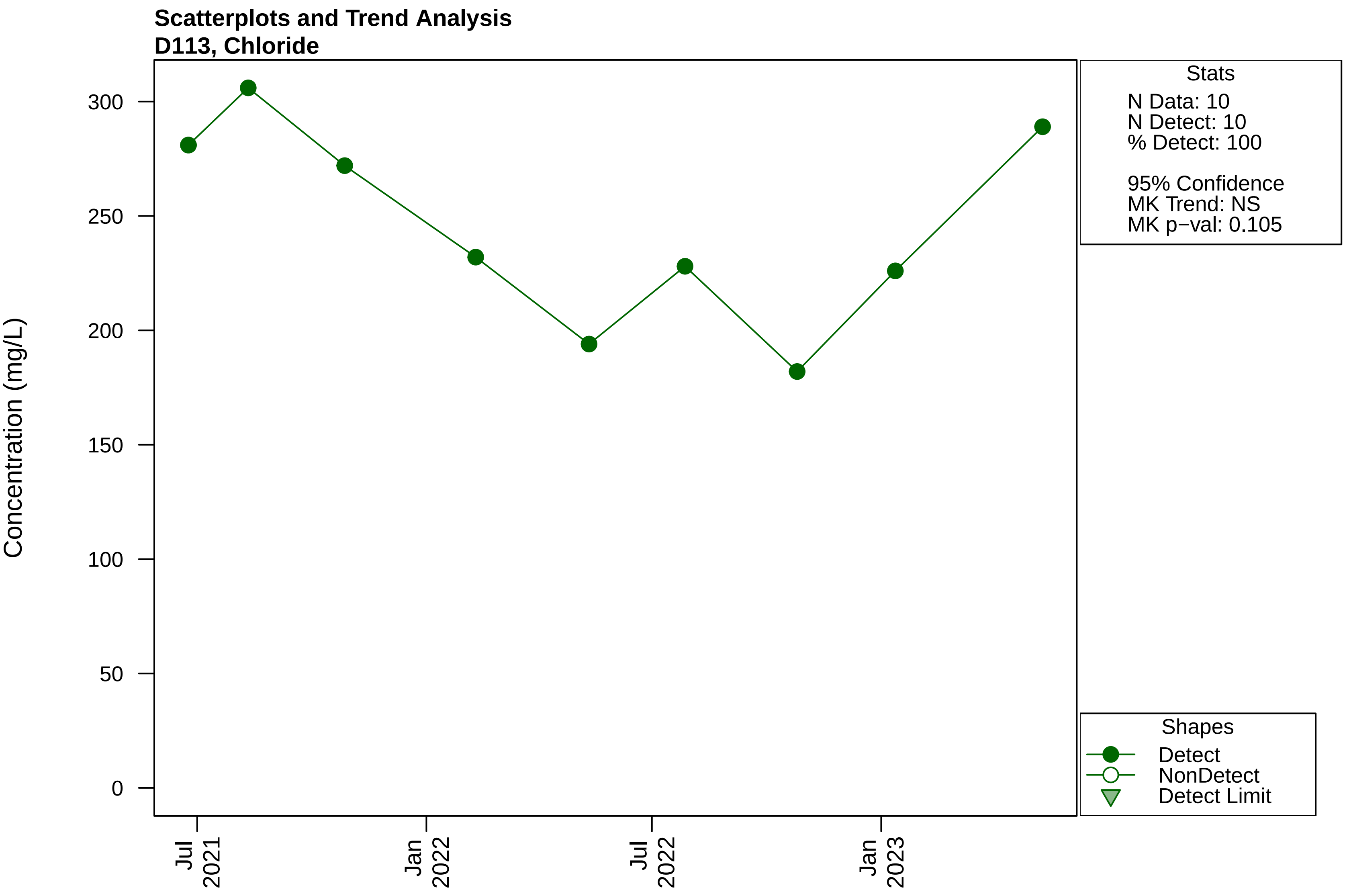

Scatterplots and Trend Analysis
D11, Zinc
Concentration (µg/L)
0
20
40
60
80
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.102
Shapes
Detect
NonDetect
Detect Limit

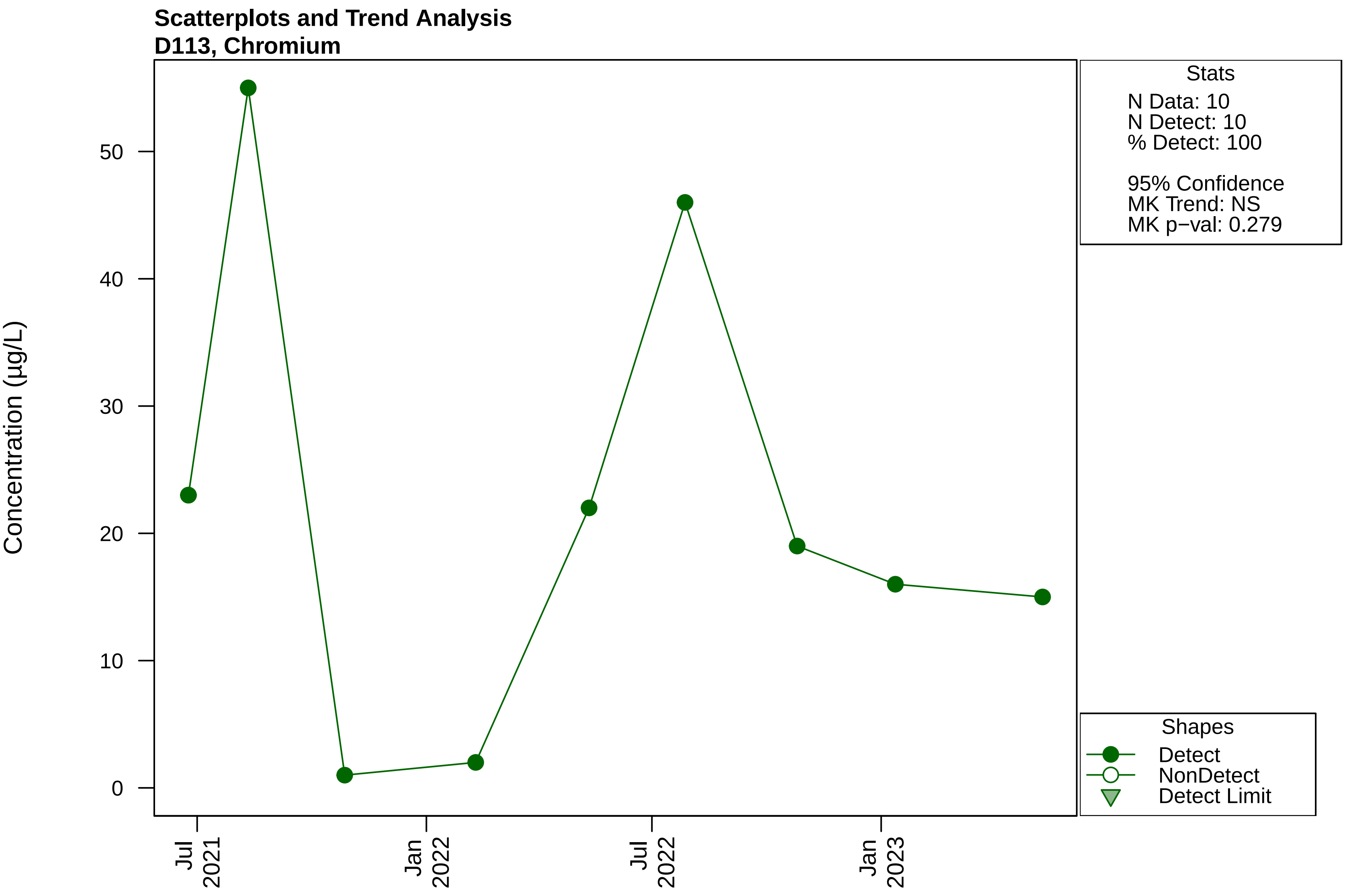

Scatterplots and Trend Analysis
D113, Arsenic
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 15
% Detect: 79
95% Confidence
MK Trend: NS
MK p−val: 0.41
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D113, Boron
Concentration (µg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0122
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

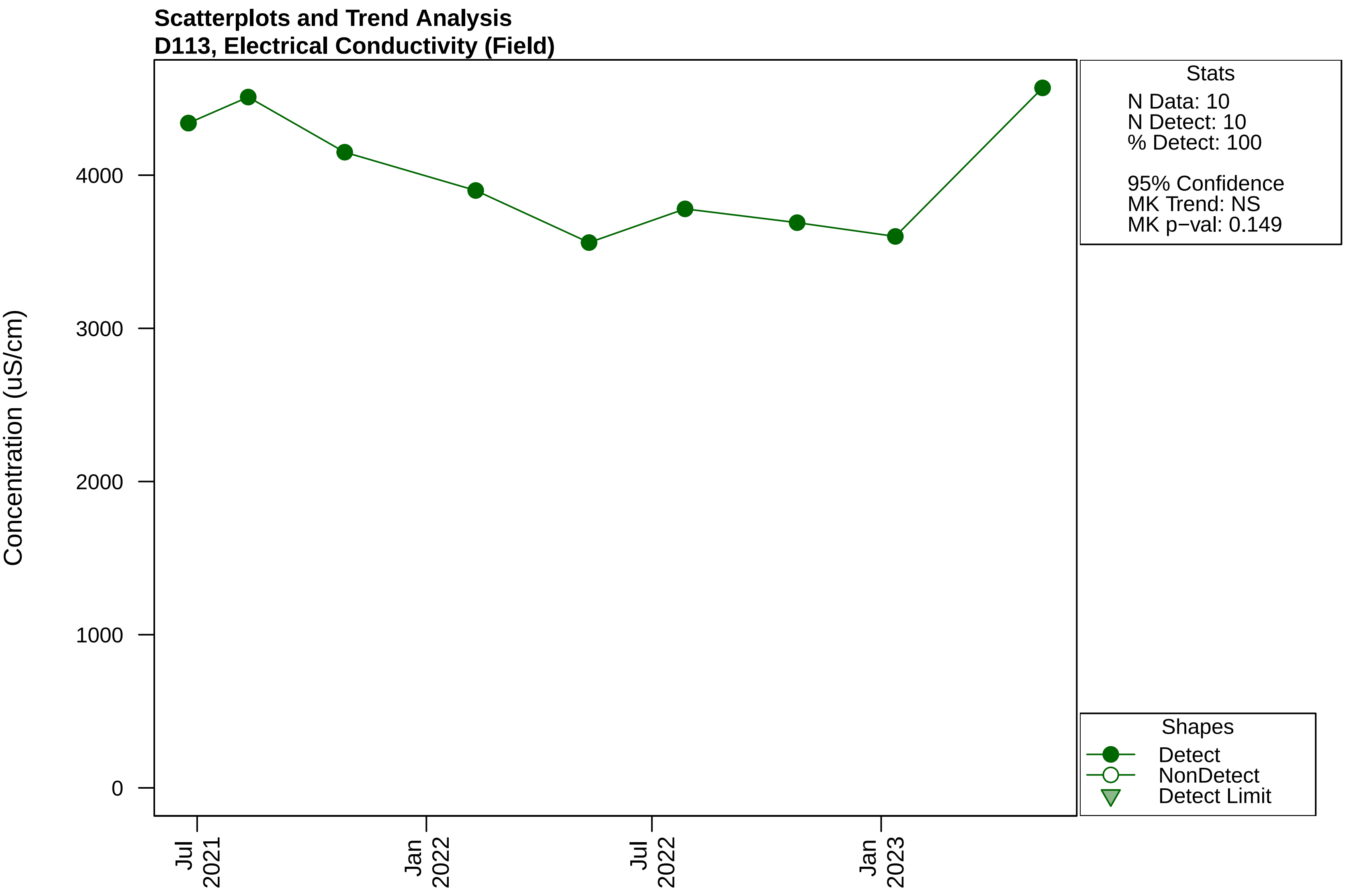
Scatterplots and Trend Analysis
D113, Cadmium



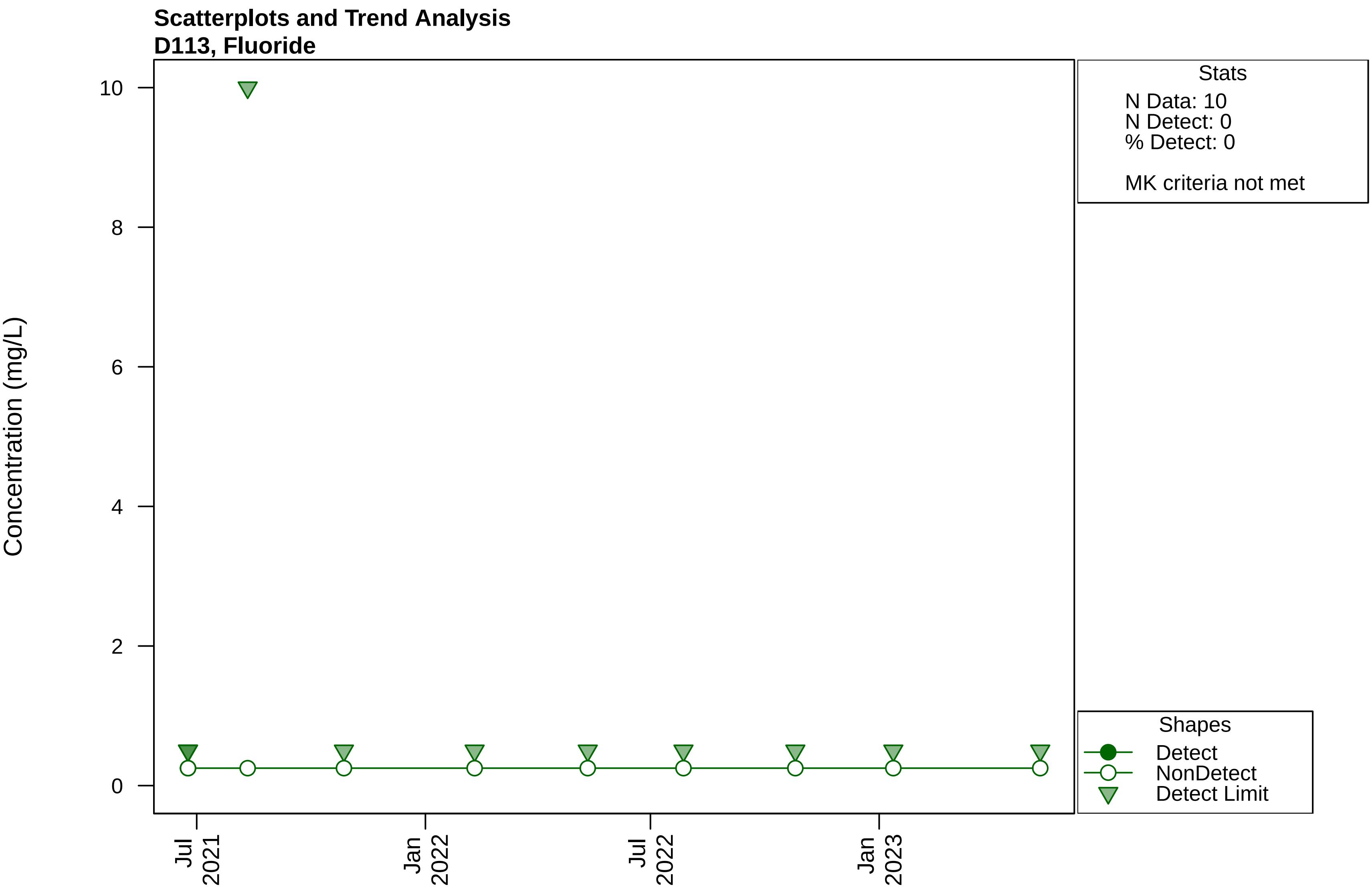

Scatterplots and Trend Analysis
D113, Chloride
Concentration (mg/L)
0
50
100
150
200
250
300
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.105
Shapes
Detect
NonDetect
Detect Limit



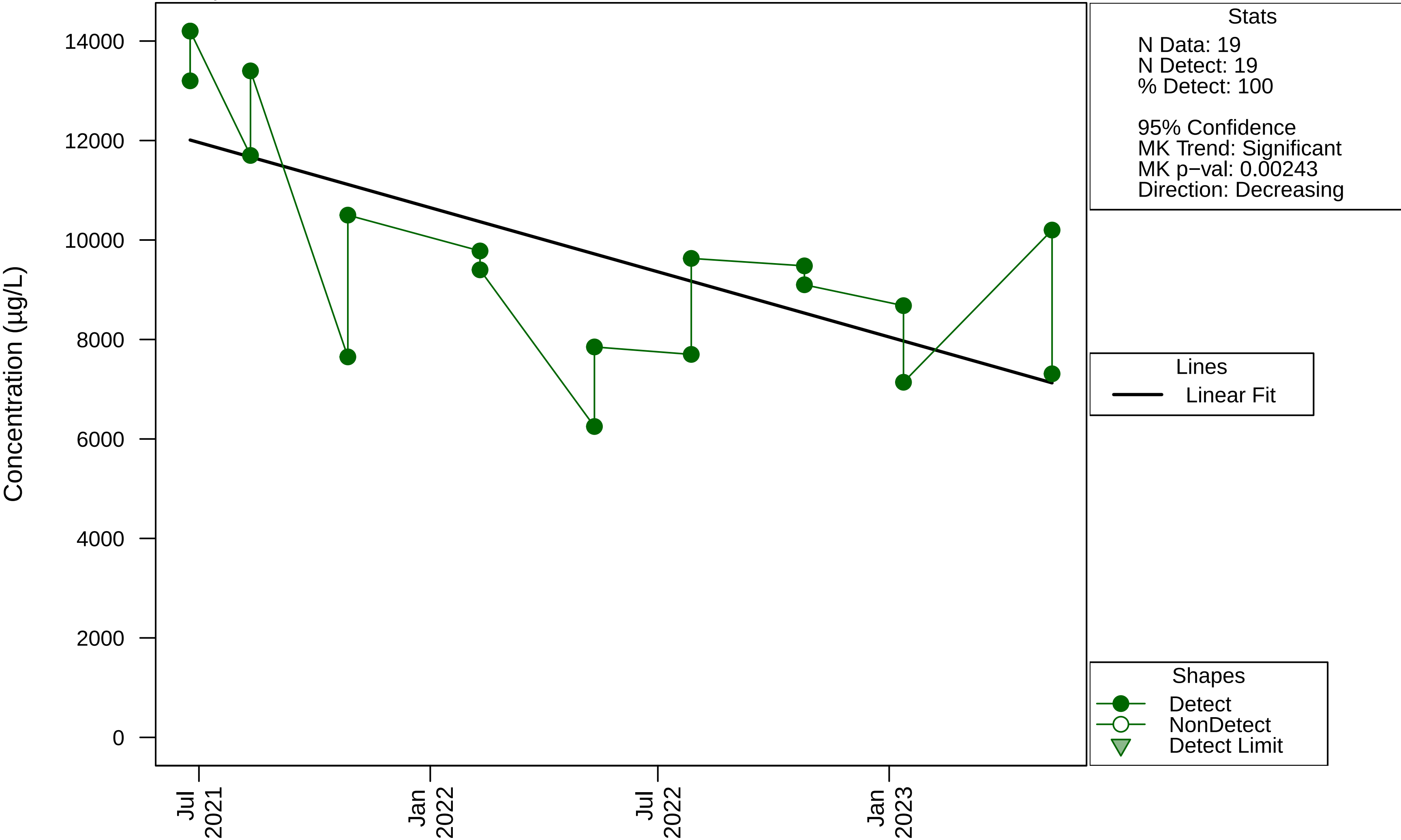
Scatterplots and Trend Analysis
D113, Chromium
Concentration (µg/L)
0
10
20
30
40
50
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.279
Shapes
Detect
NonDetect
Detect Limit



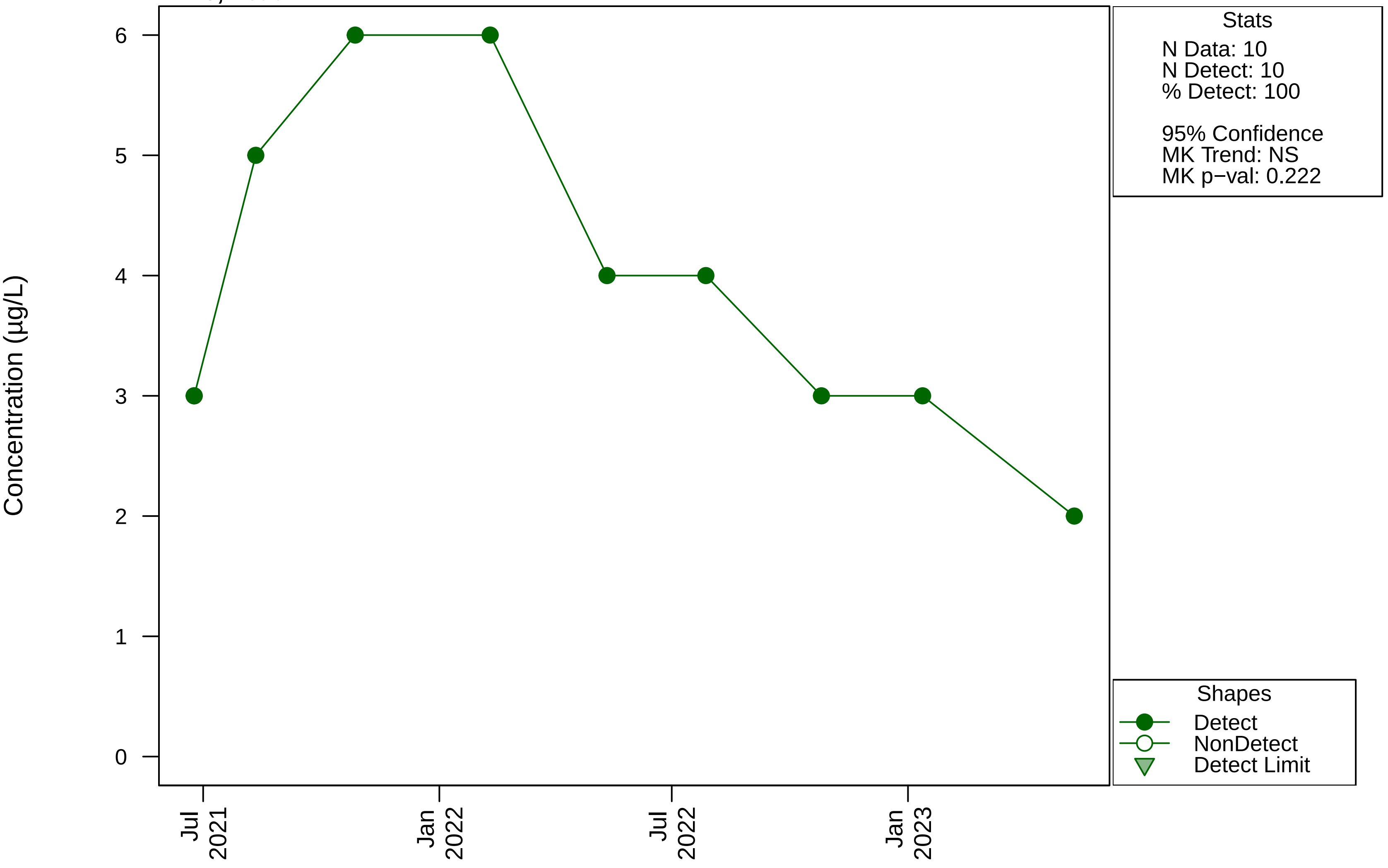
Scatterplots and Trend Analysis
D113, Electrical Conductivity (Field)
Concentration (uS/cm)
4000
3000
2000
1000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.149
Shapes
Detect
NonDetect
Detect Limit

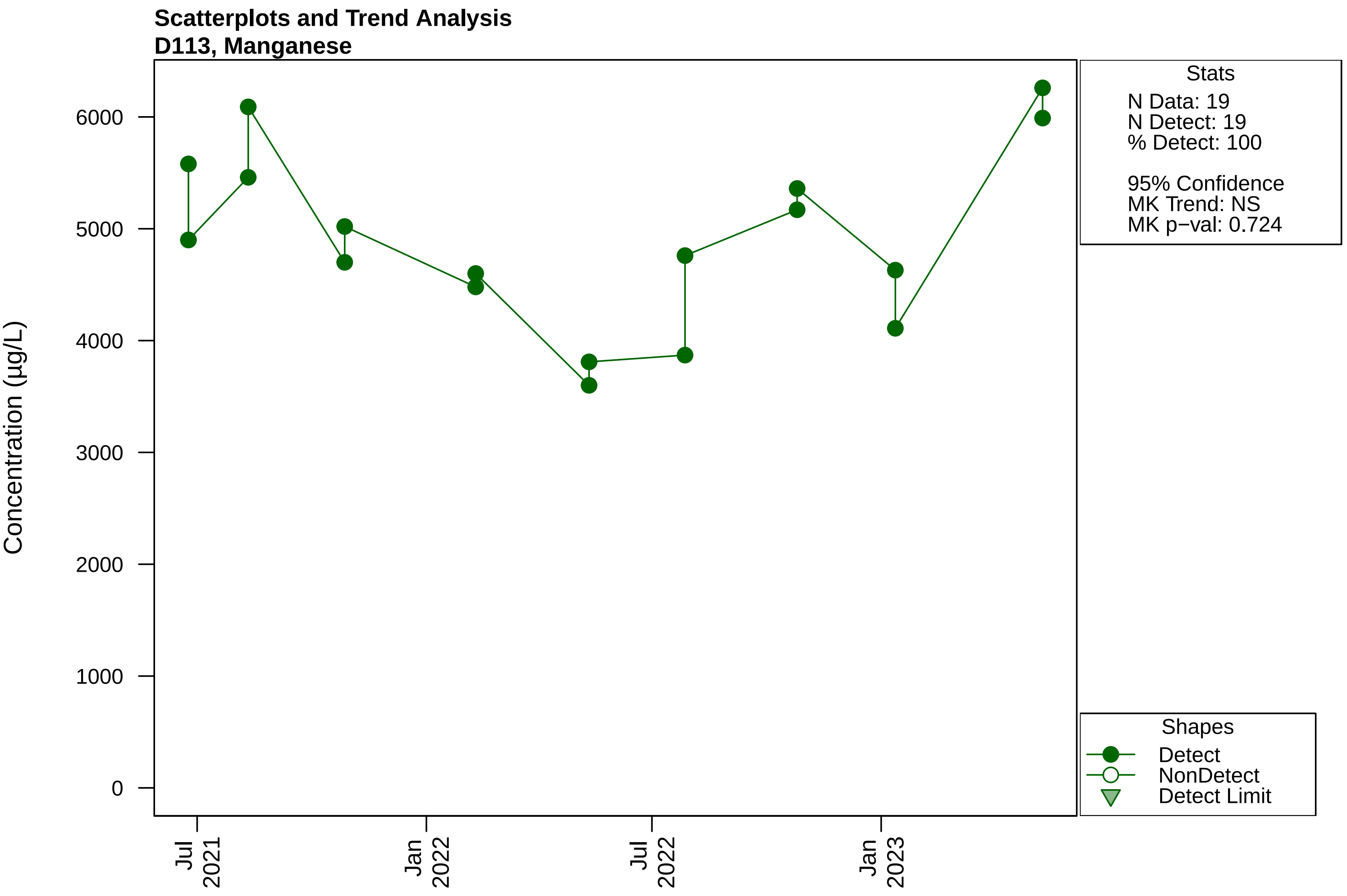

Scatterplots and Trend Analysis
D113, Fluoride
Concentration (mg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

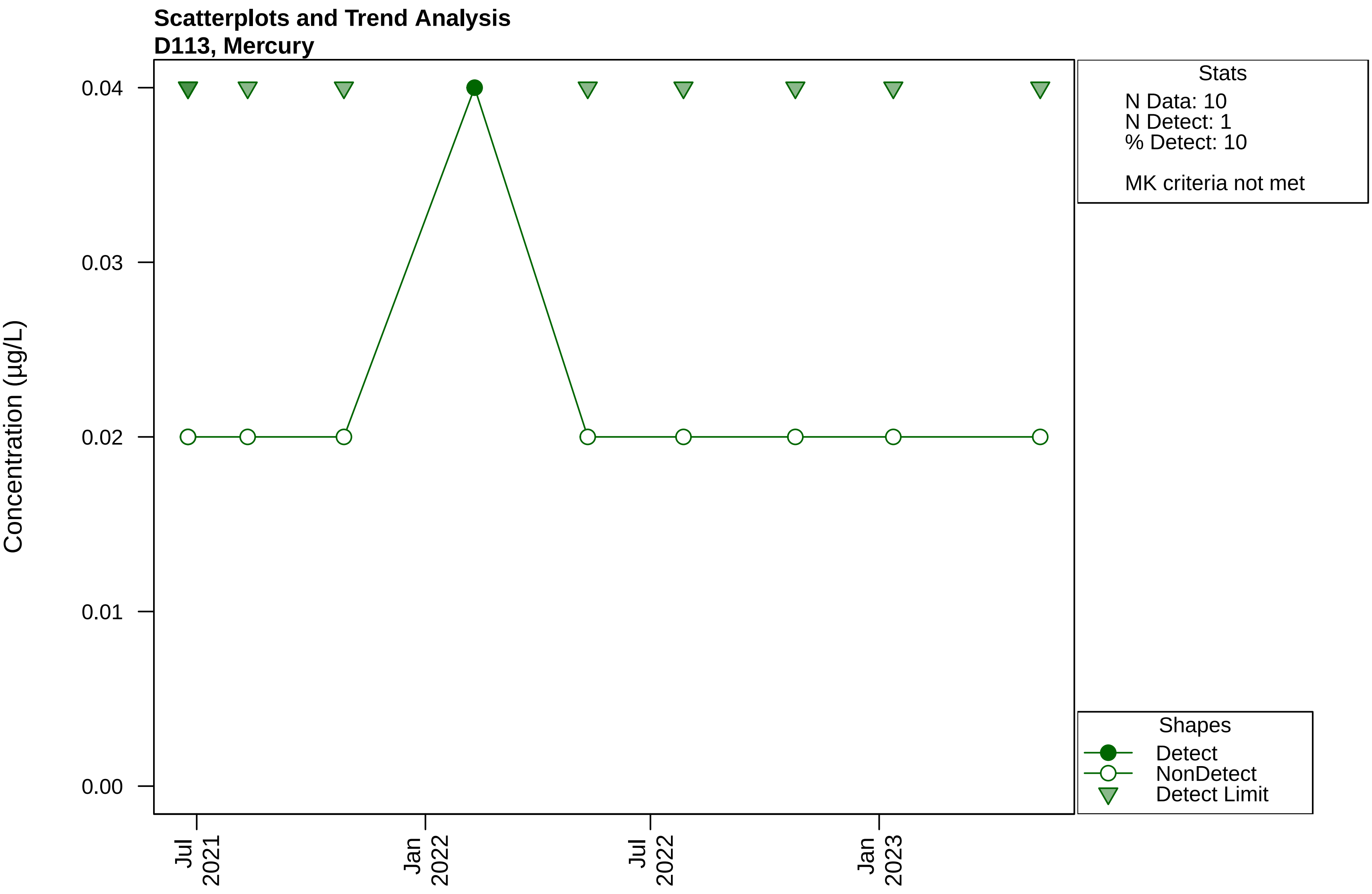
Scatterplots and Trend Analysis
D113, Iron



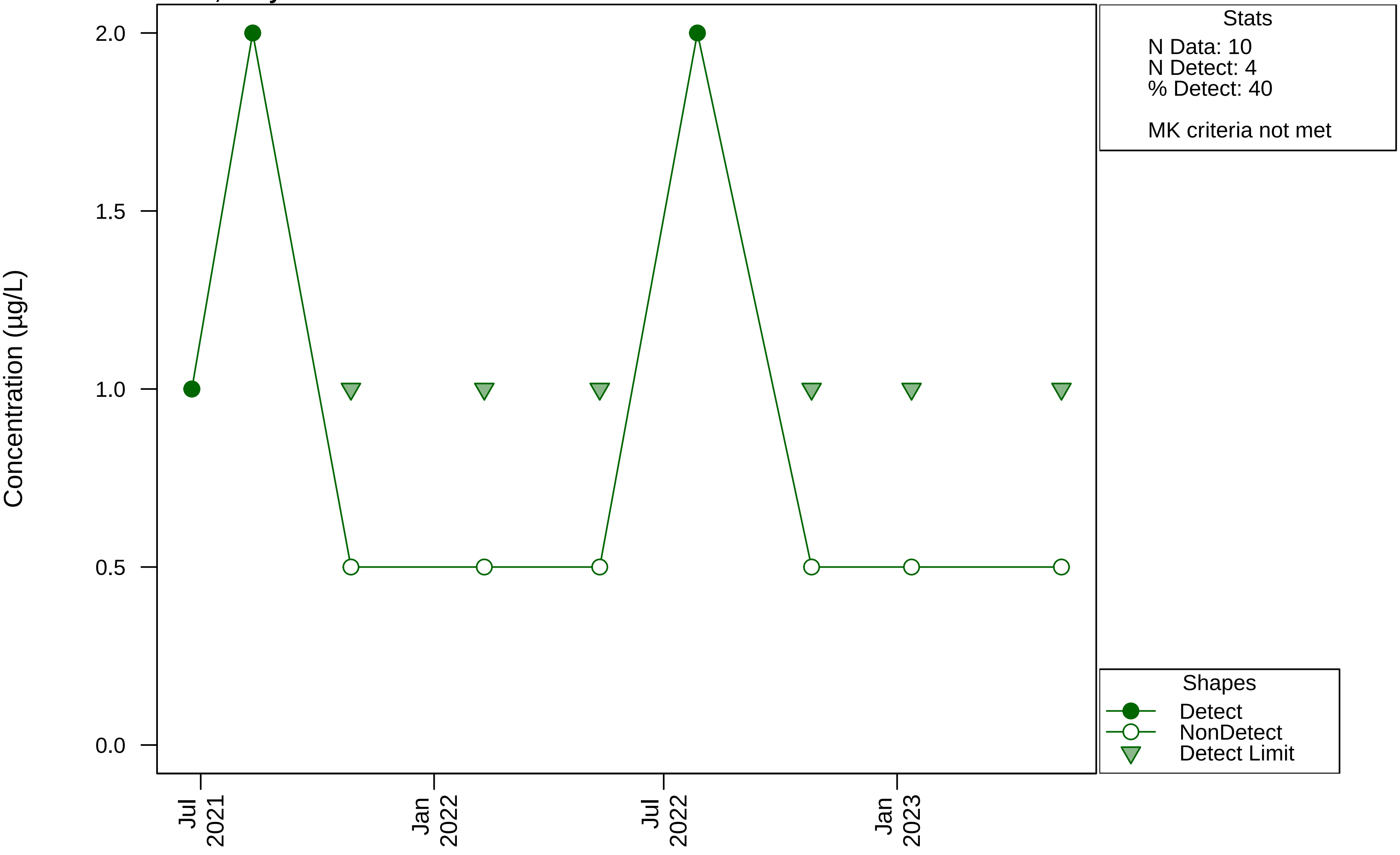
Scatterplots and Trend Analysis
D113, Lead

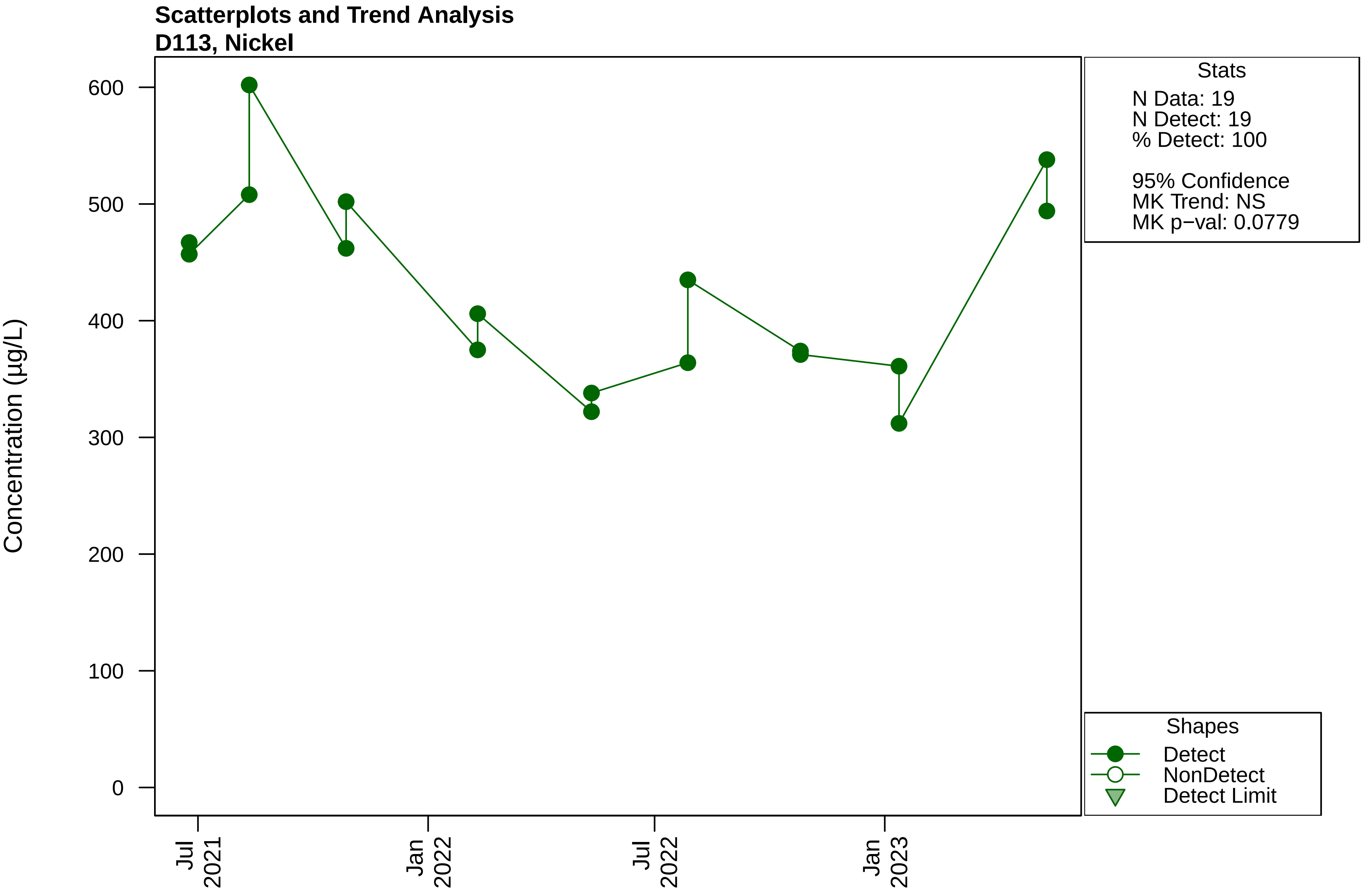



Scatterplots and Trend Analysis
D113, Manganese
Concentration (µg/L)
0
1000
2000
3000
4000
5000
6000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.724
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D113, Mercury
Concentration (µg/L)
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 1
% Detect: 10
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

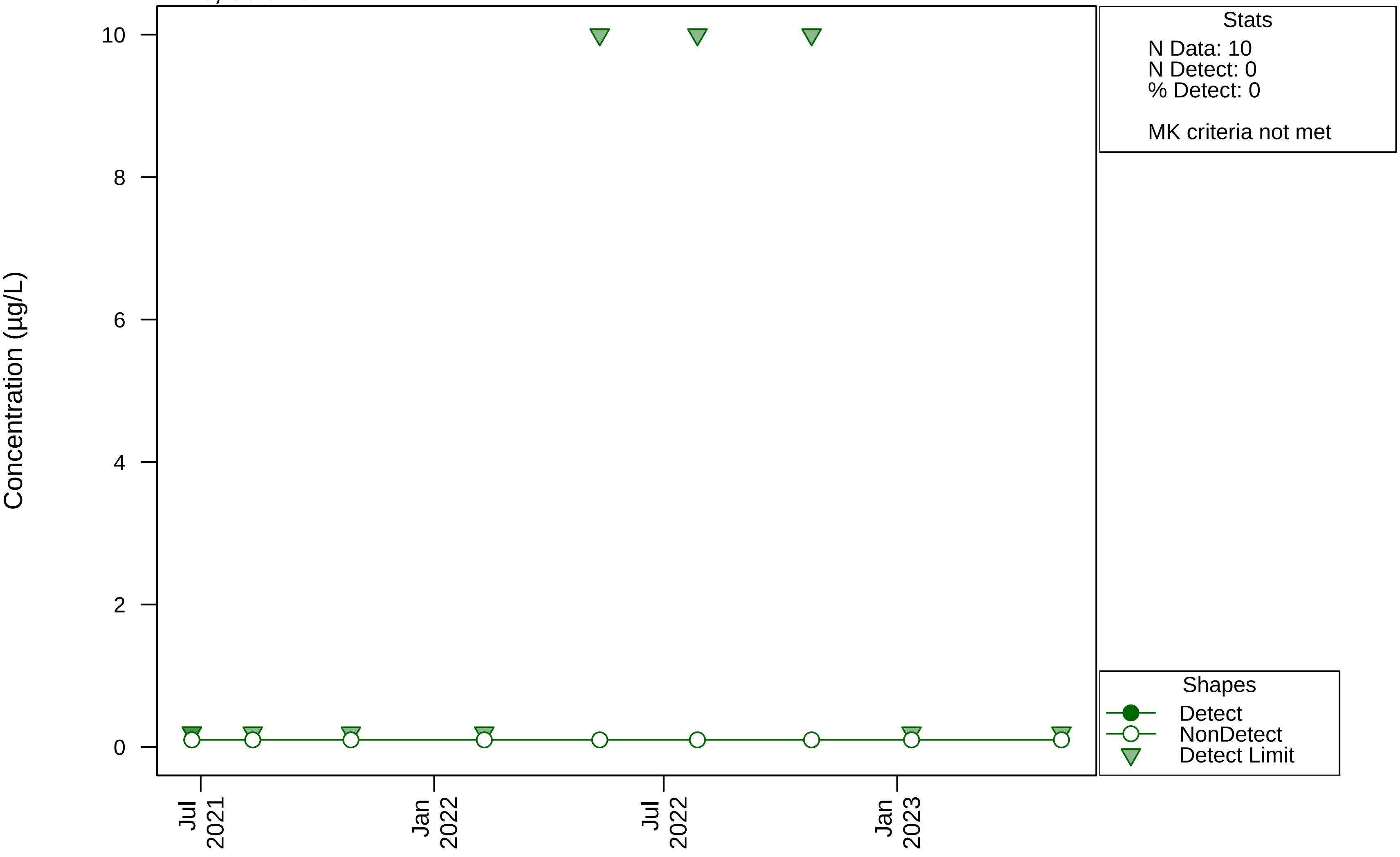
Scatterplots and Trend Analysis
D113, Molybdenum

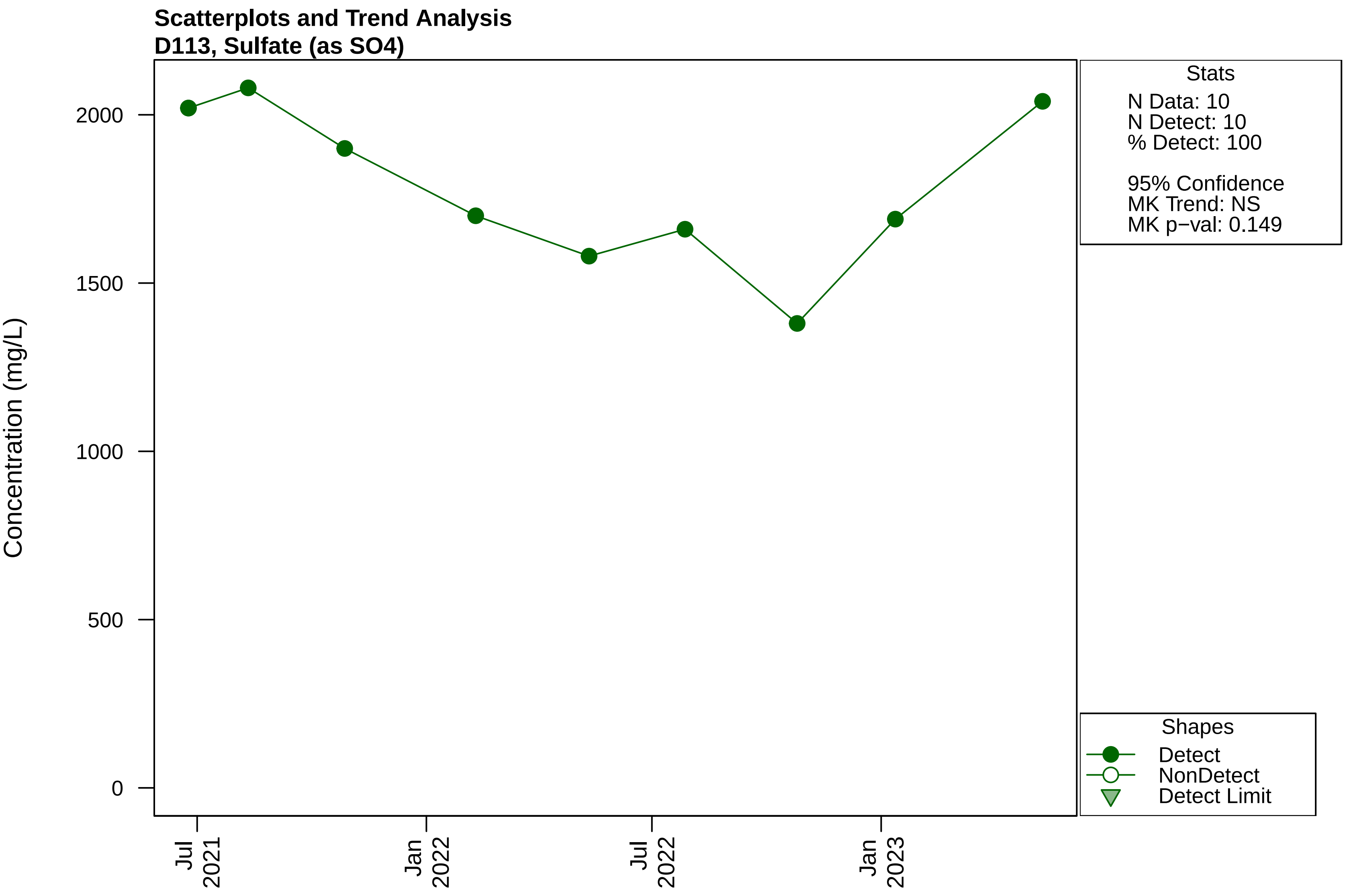


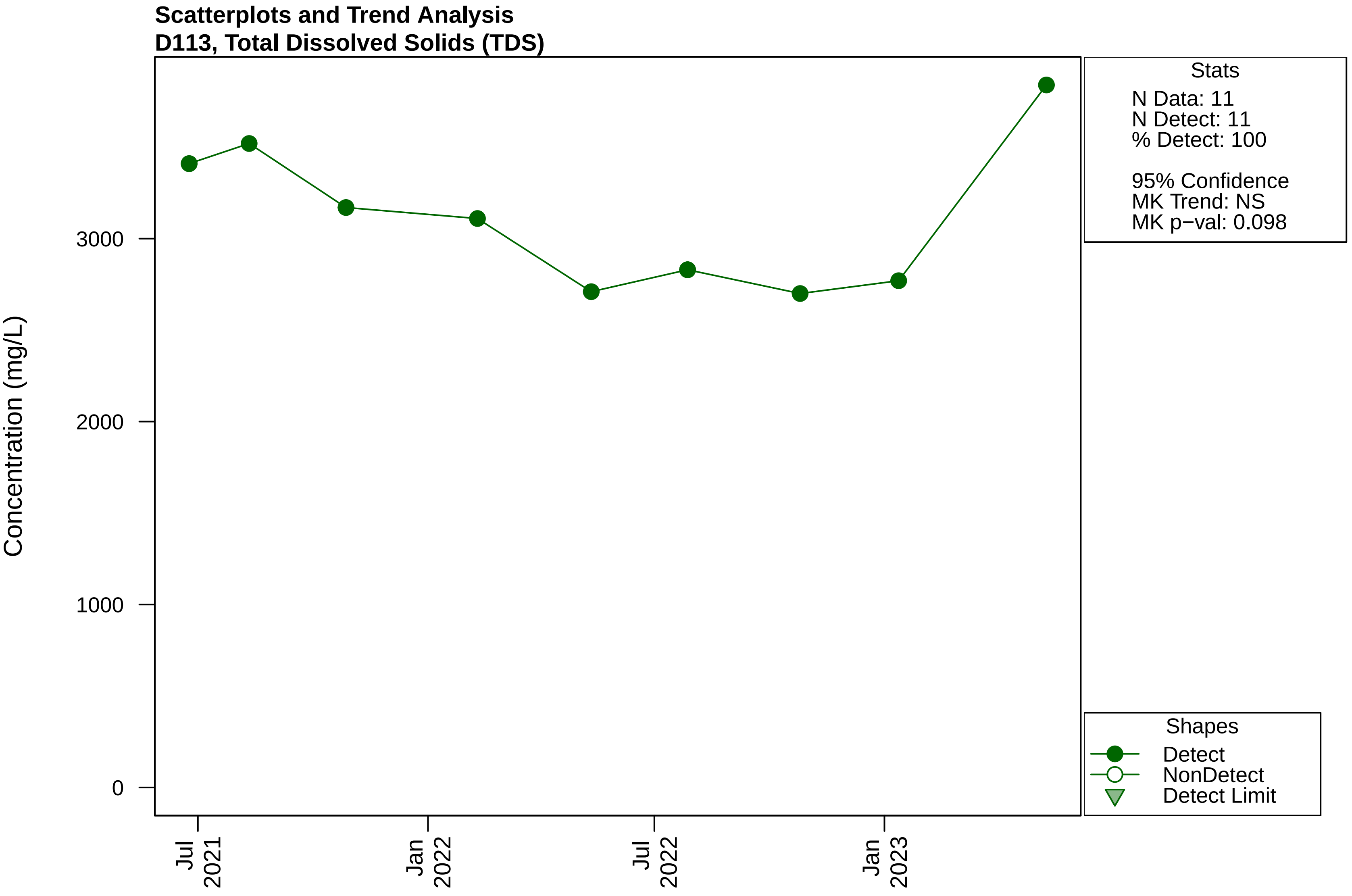


Scatterplots and Trend Analysis
D113, Nickel
Concentration (µg/L)
0
100
200
300
400
500
600
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0779
Shapes
Detect
NonDetect
Detect Limit

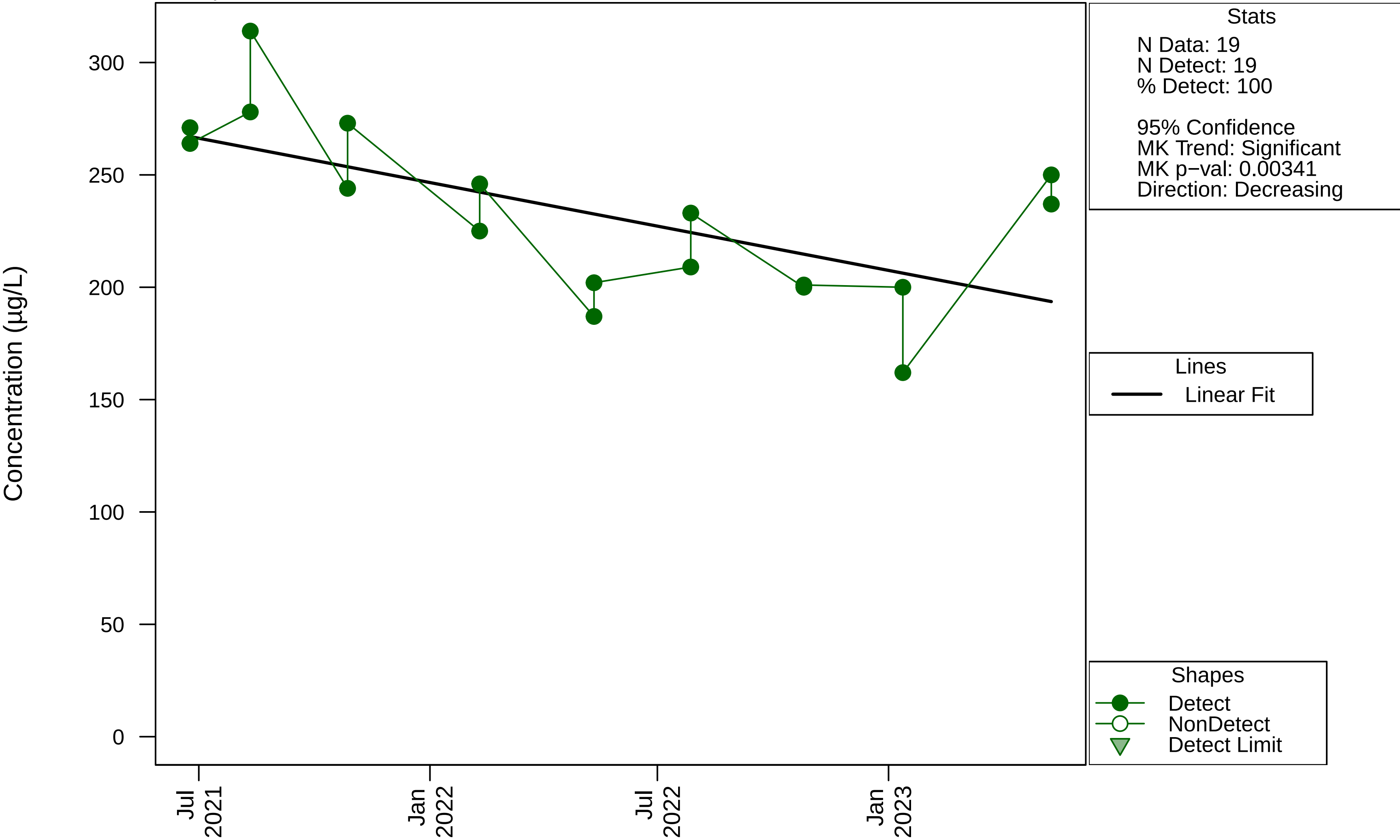
Scatterplots and Trend Analysis
D113, Selenium

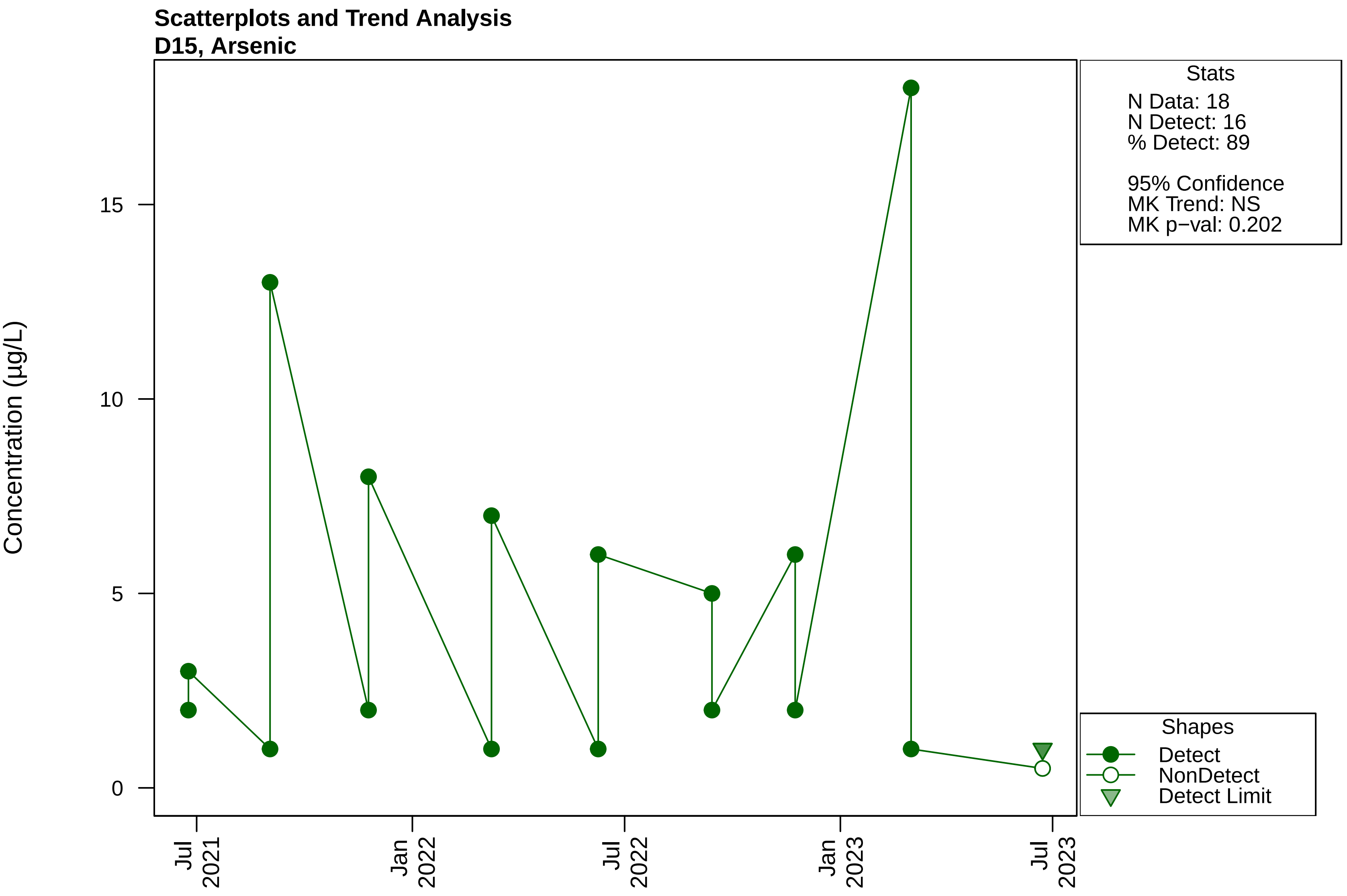



Scatterplots and Trend Analysis
D113, Sulfate (as SO4)
Concentration (mg/L)
0
500
1000
1500
2000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.149
Shapes
Detect
NonDetect
Detect Limit

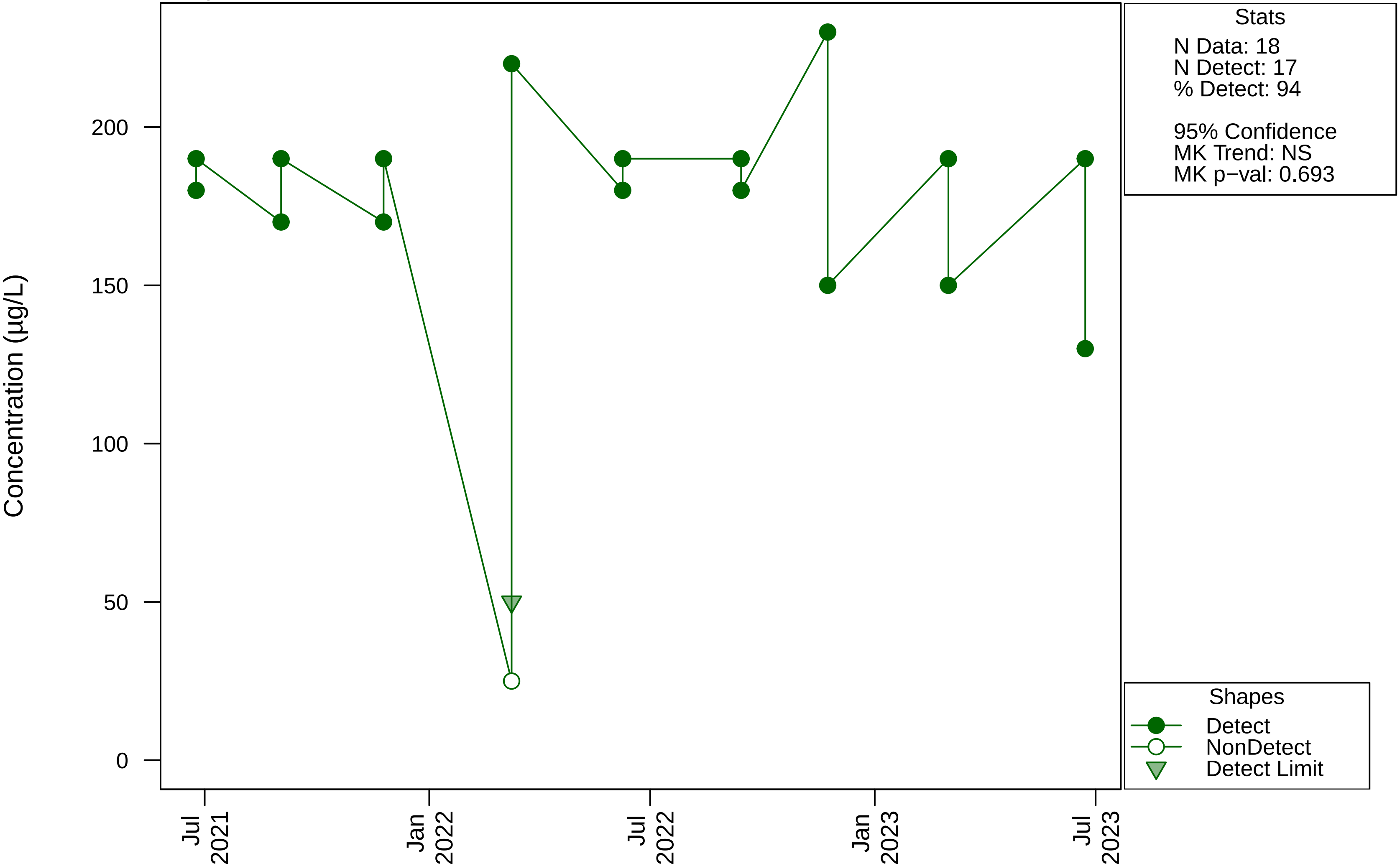

Scatterplots and Trend Analysis
D113, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
1000
2000
3000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 11
N Detect: 11
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.098
Shapes
Detect
NonDetect
Detect Limit

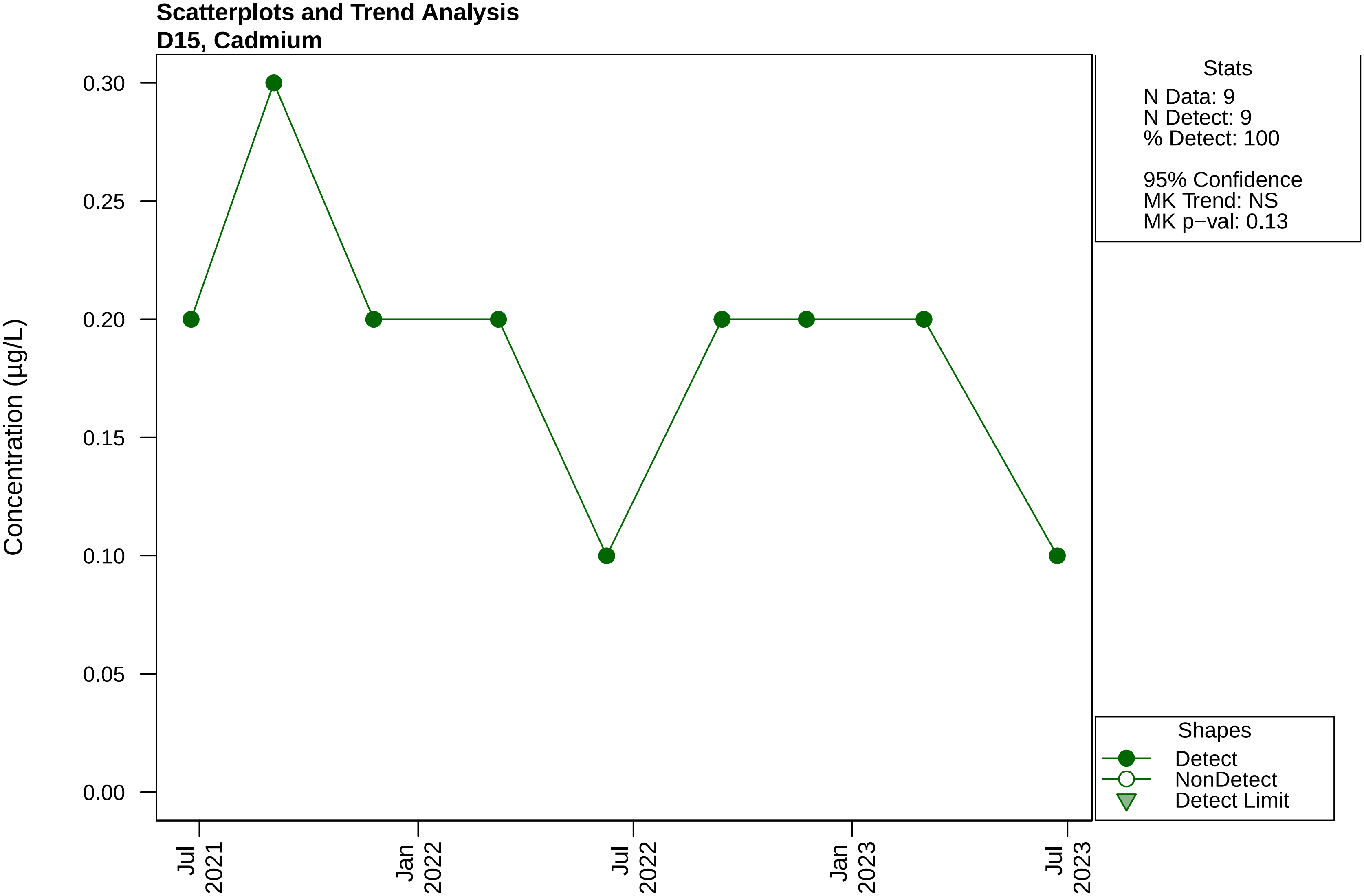
Scatterplots and Trend Analysis
D113, Zinc

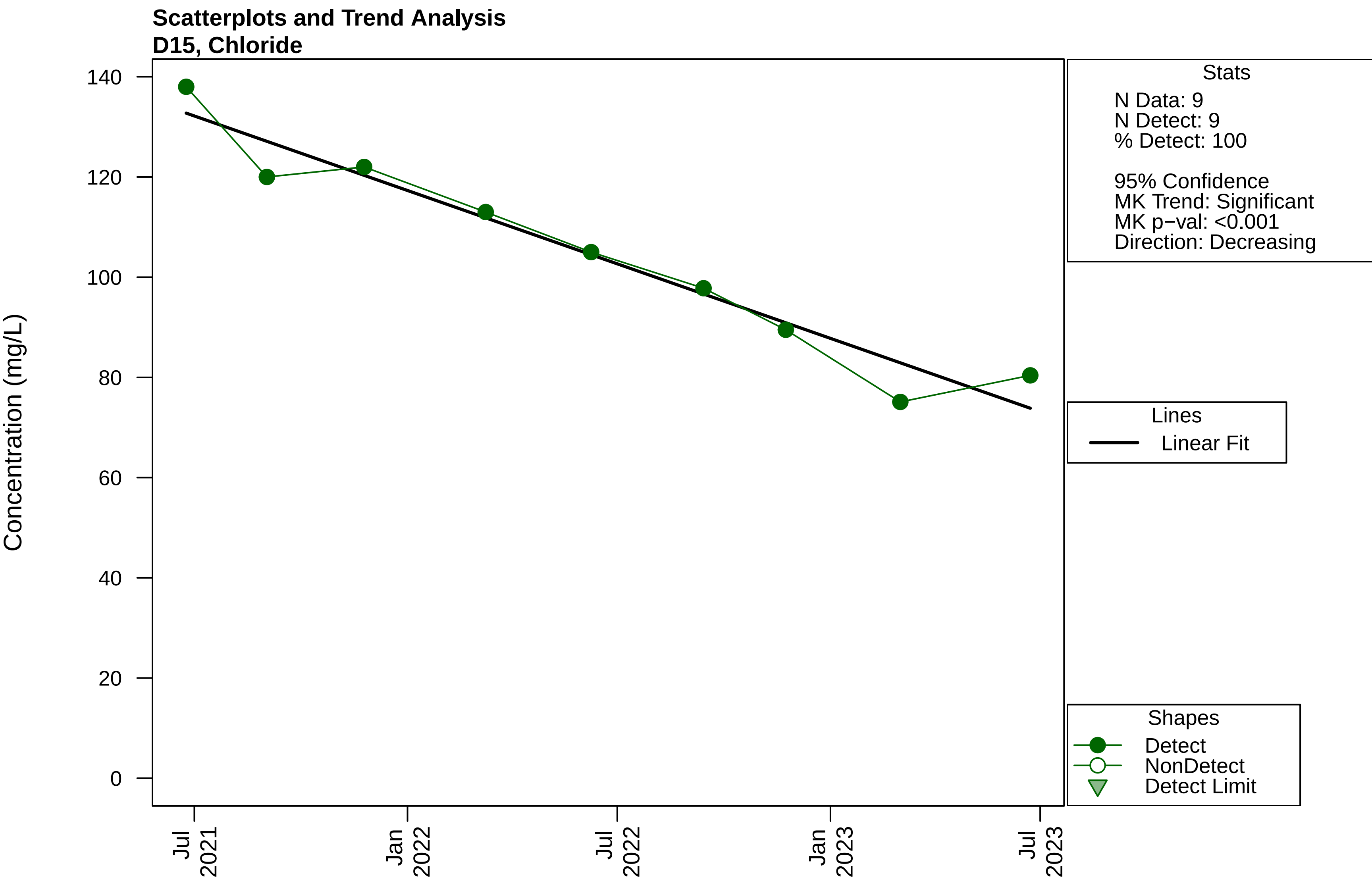



Scatterplots and Trend Analysis
D15, Arsenic
Concentration (µg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 16
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.202
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D15, Boron

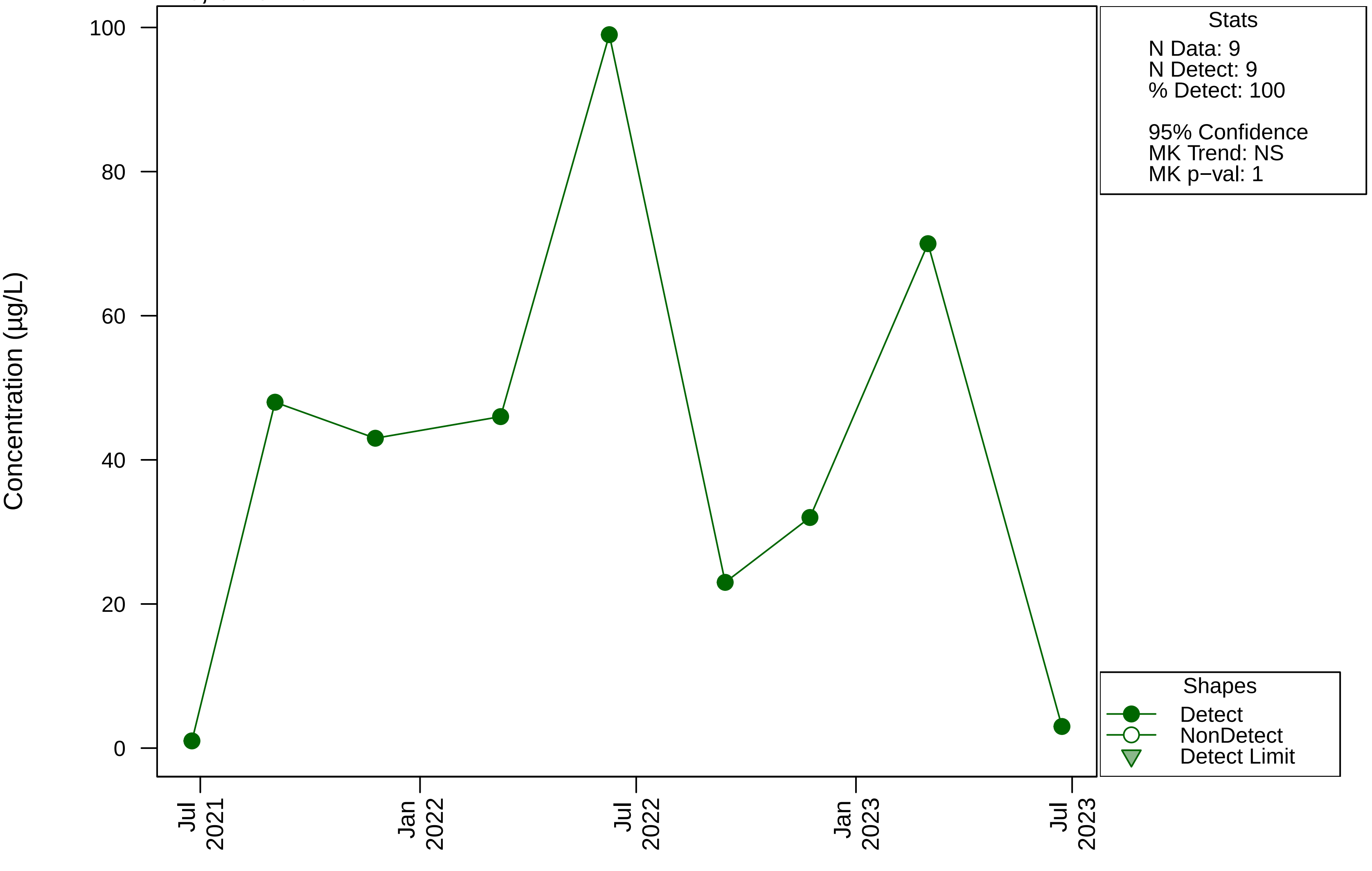


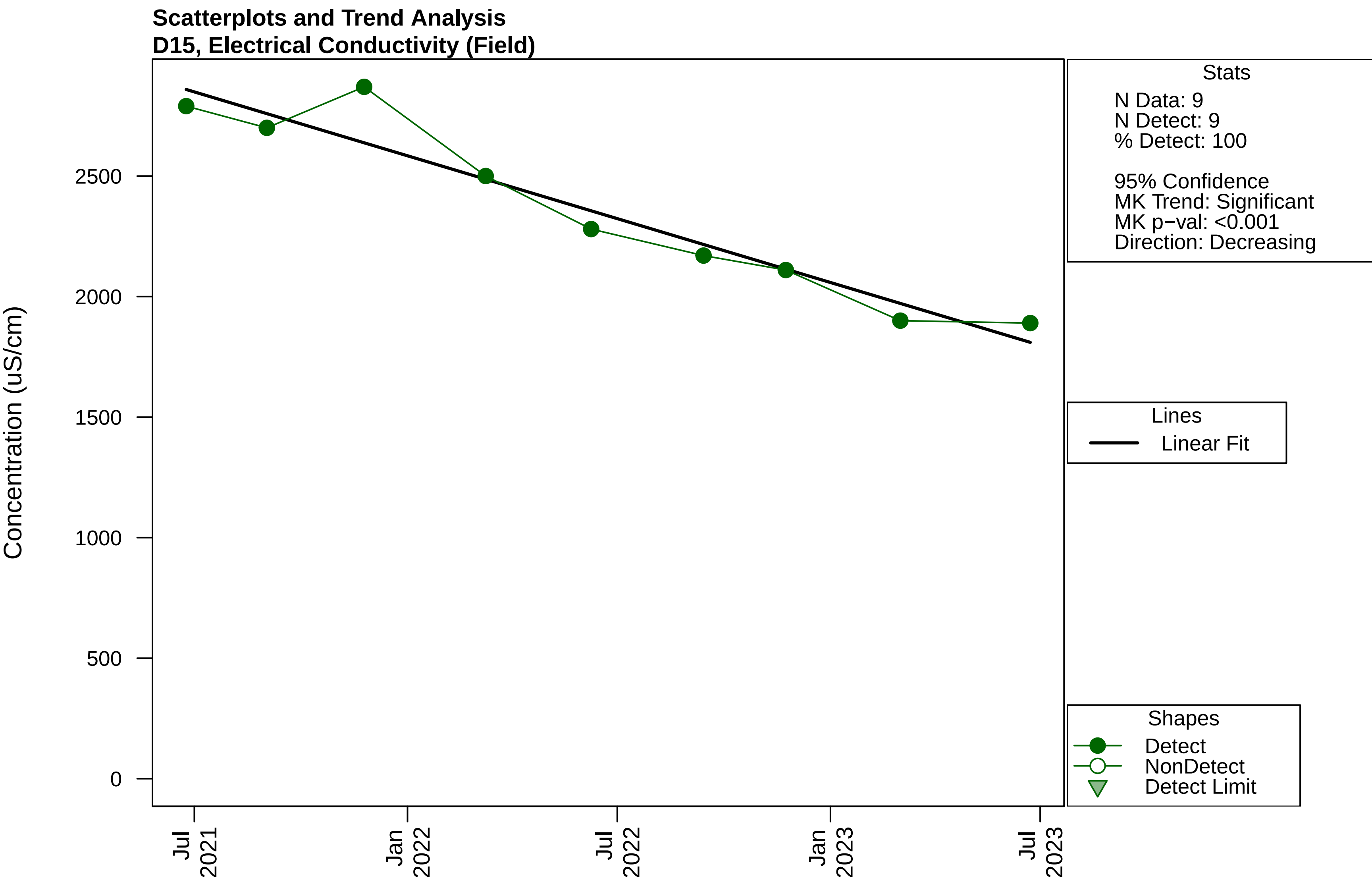

Scatterplots and Trend Analysis
D15, Cadmium
Concentration (µg/L)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.13
Shapes
Detect
NonDetect
Detect Limit

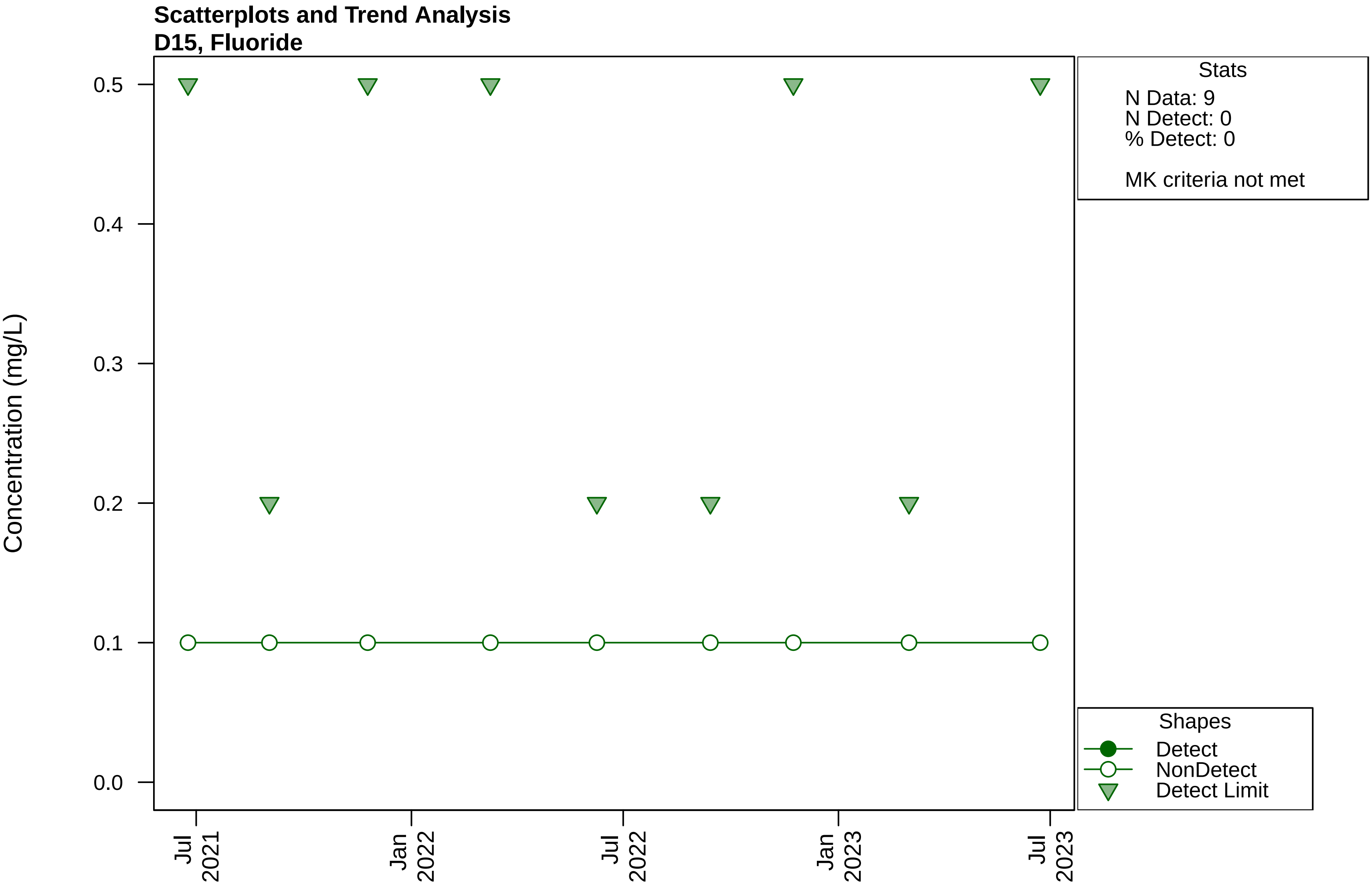


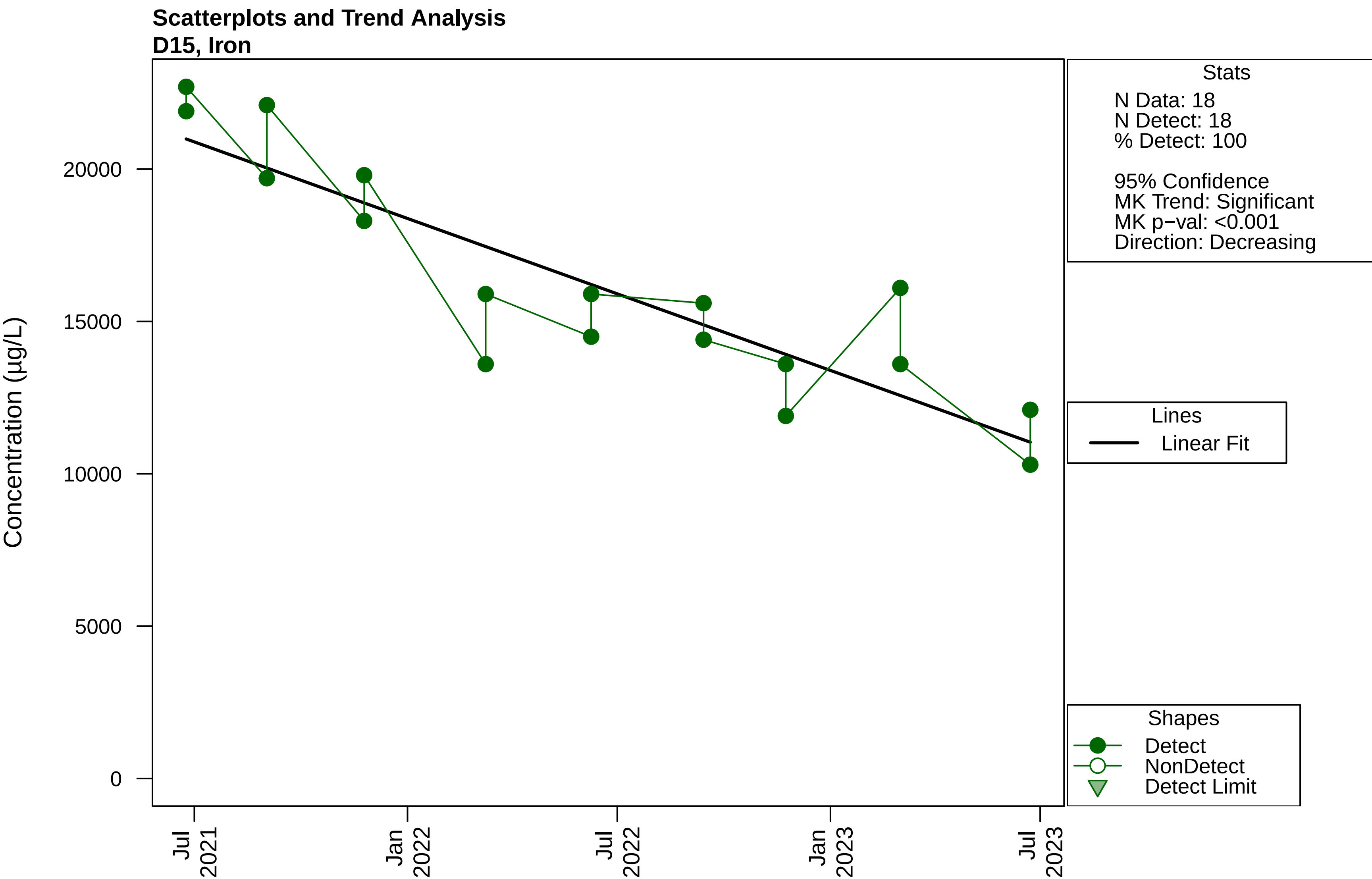
Scatterplots and Trend Analysis
D15, Chloride
Concentration (mg/L)
0
20
40
60
80
100
120
140
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

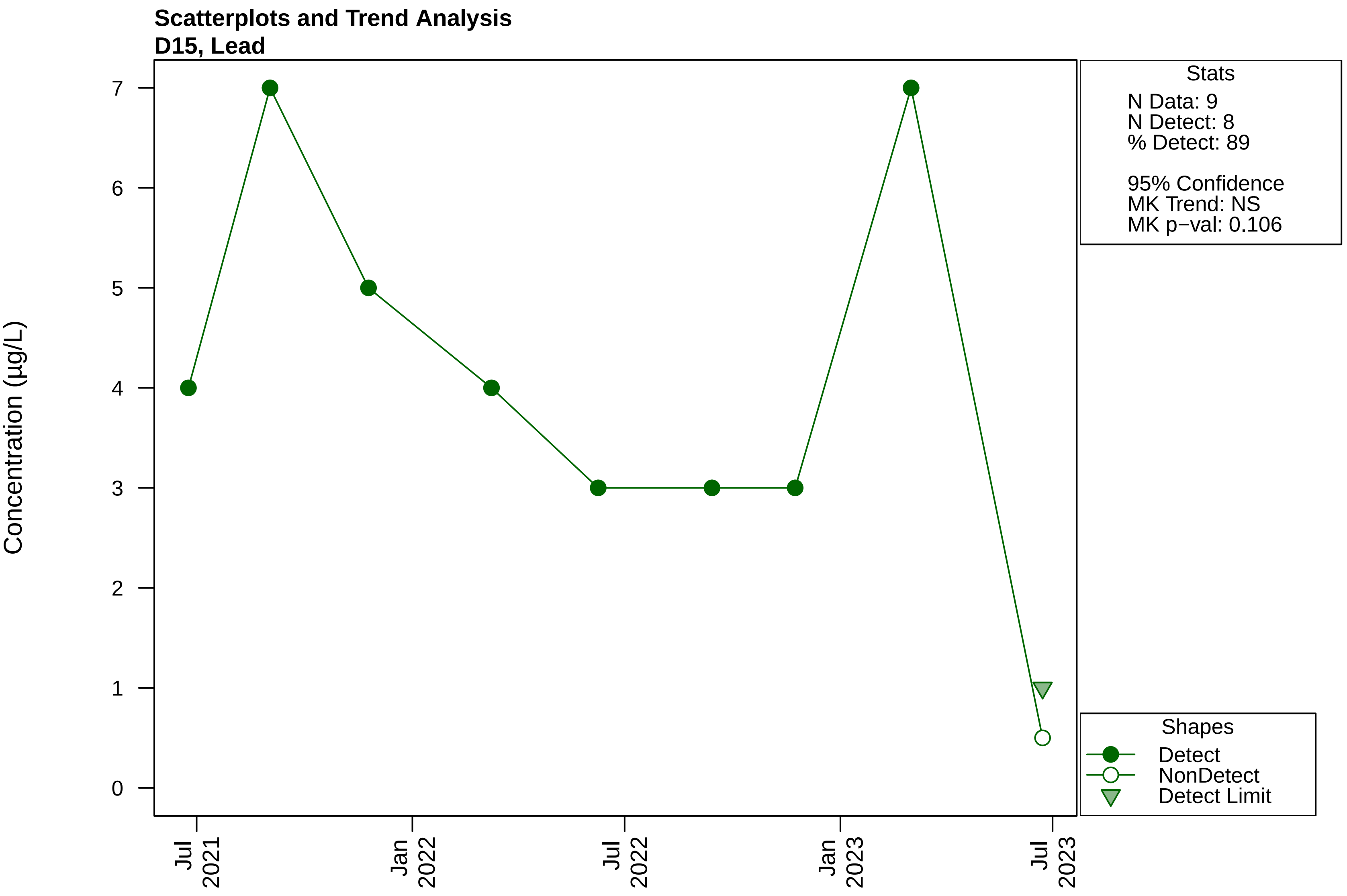
Scatterplots and Trend Analysis
D15, Chromium




Scatterplots and Trend Analysis
D15, Electrical Conductivity (Field)
Concentration (uS/cm)
0
500
1000
1500
2000
2500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

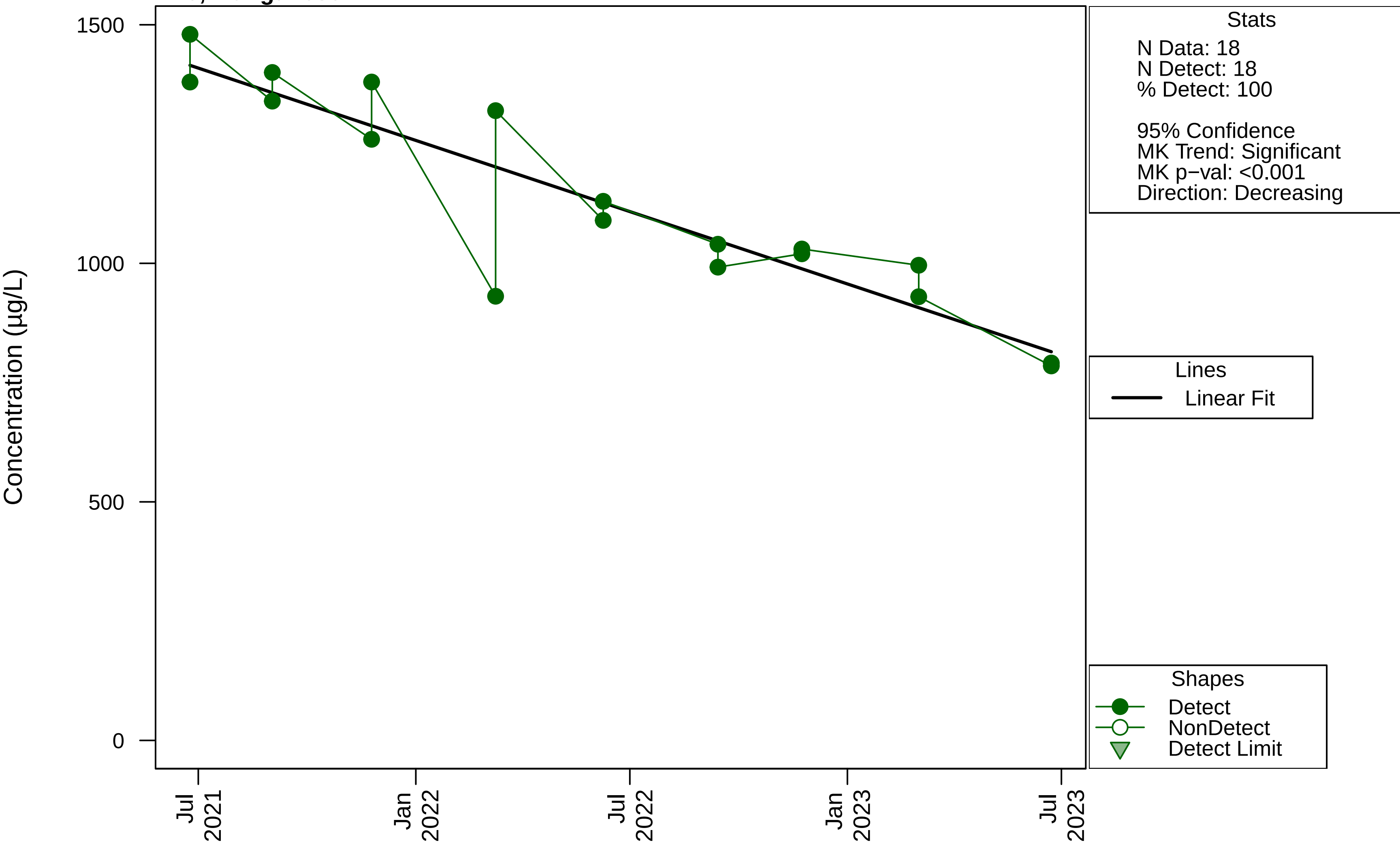

Scatterplots and Trend Analysis
D15, Fluoride
Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

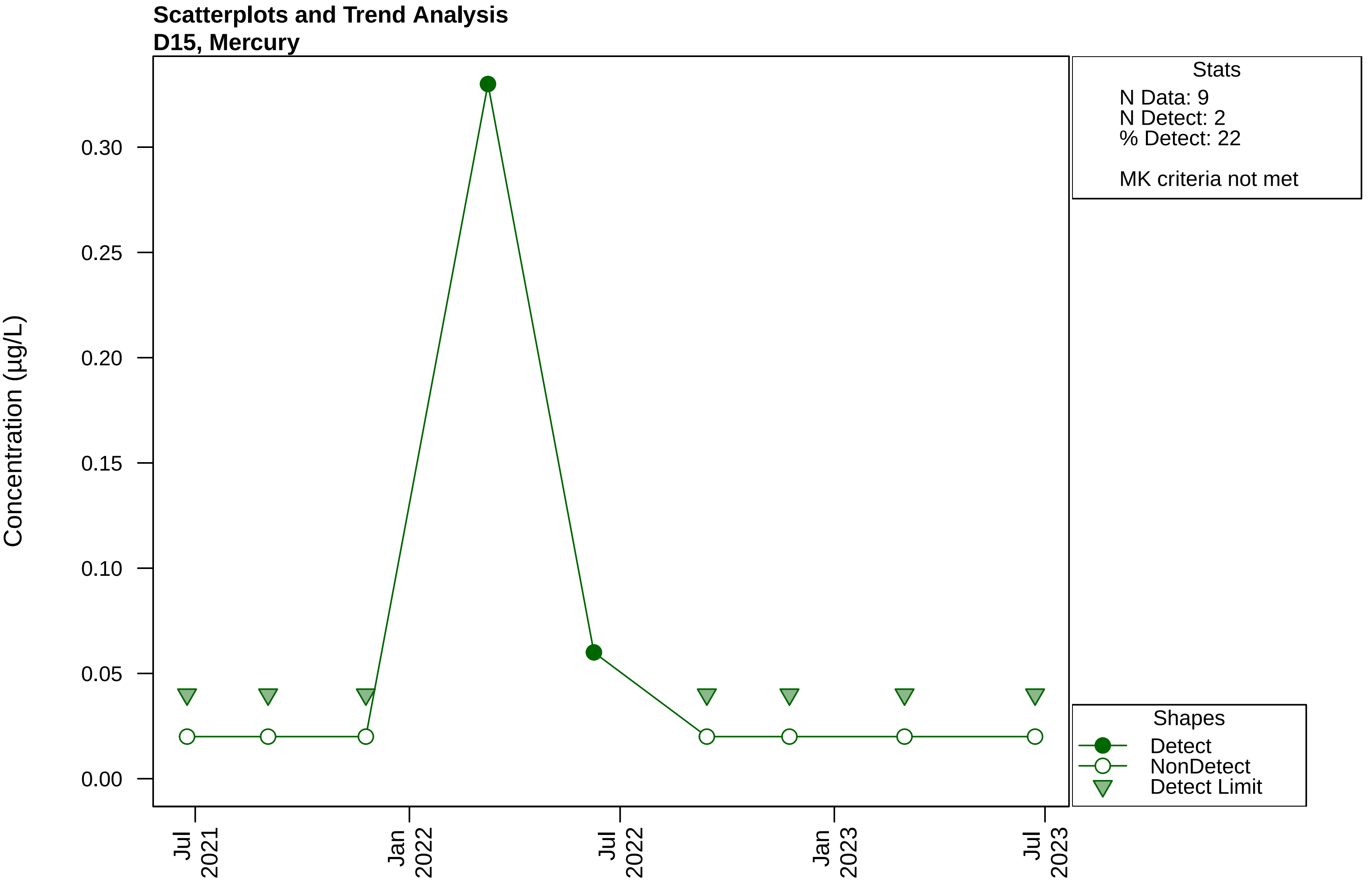

Scatterplots and Trend Analysis
D15, Iron
Concentration (µg/L)
0
5000
10000
15000
20000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

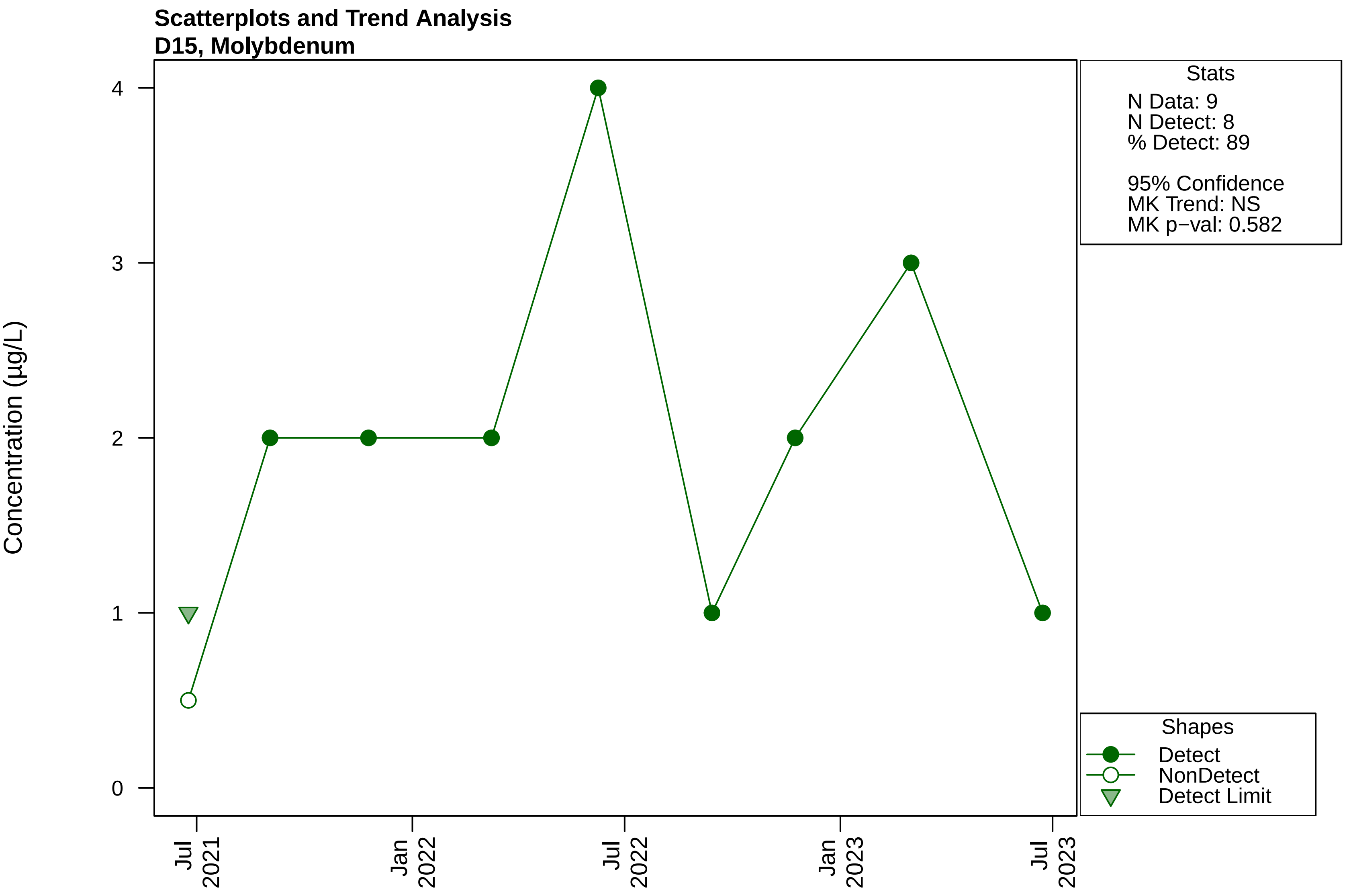


Scatterplots and Trend Analysis
D15, Lead
Concentration (µg/L)
0
1
2
3
4
5
6
7
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 8
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.106
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D15, Manganese

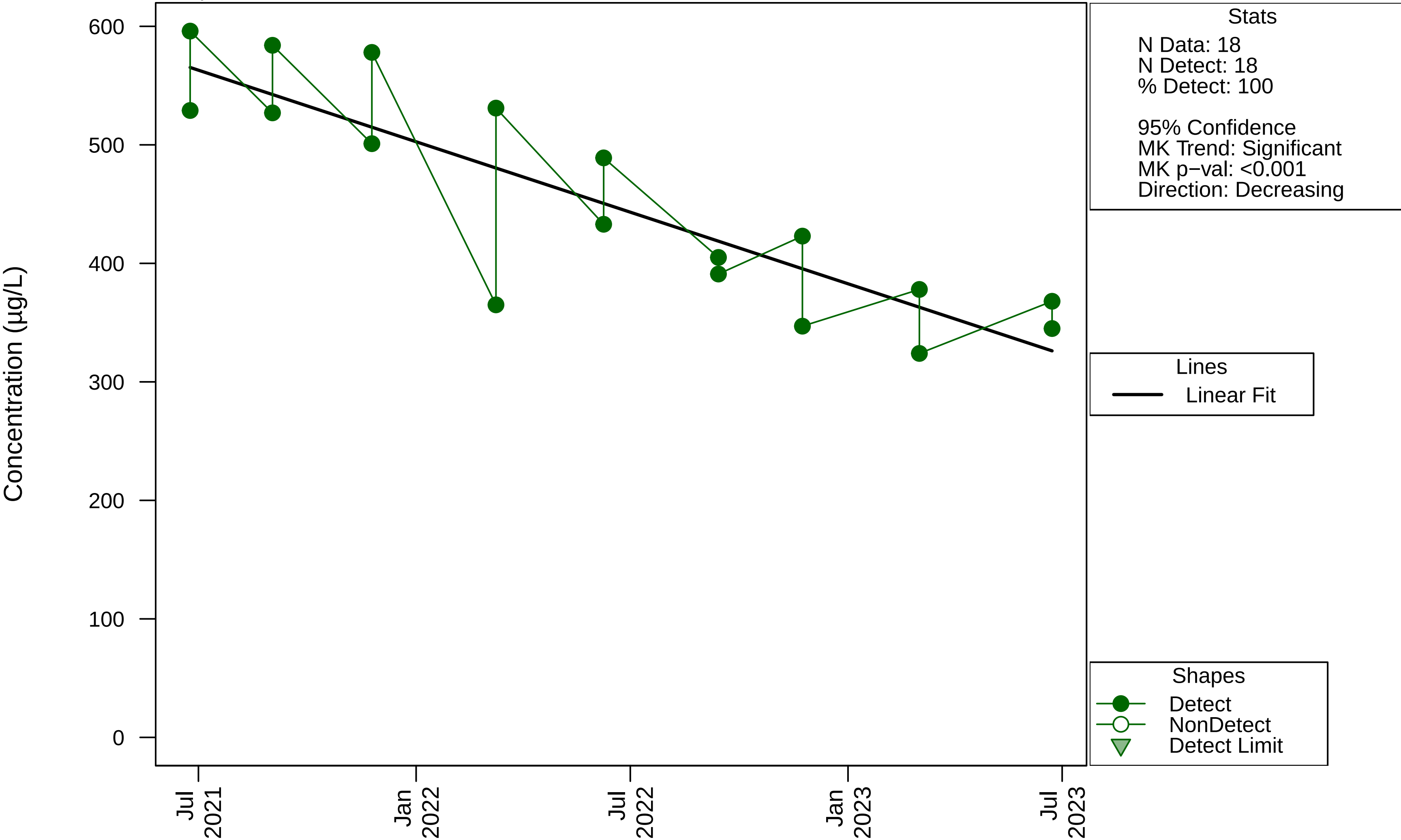



Scatterplots and Trend Analysis
D15, Mercury
Concentration (µg/L)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 2
% Detect: 22
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

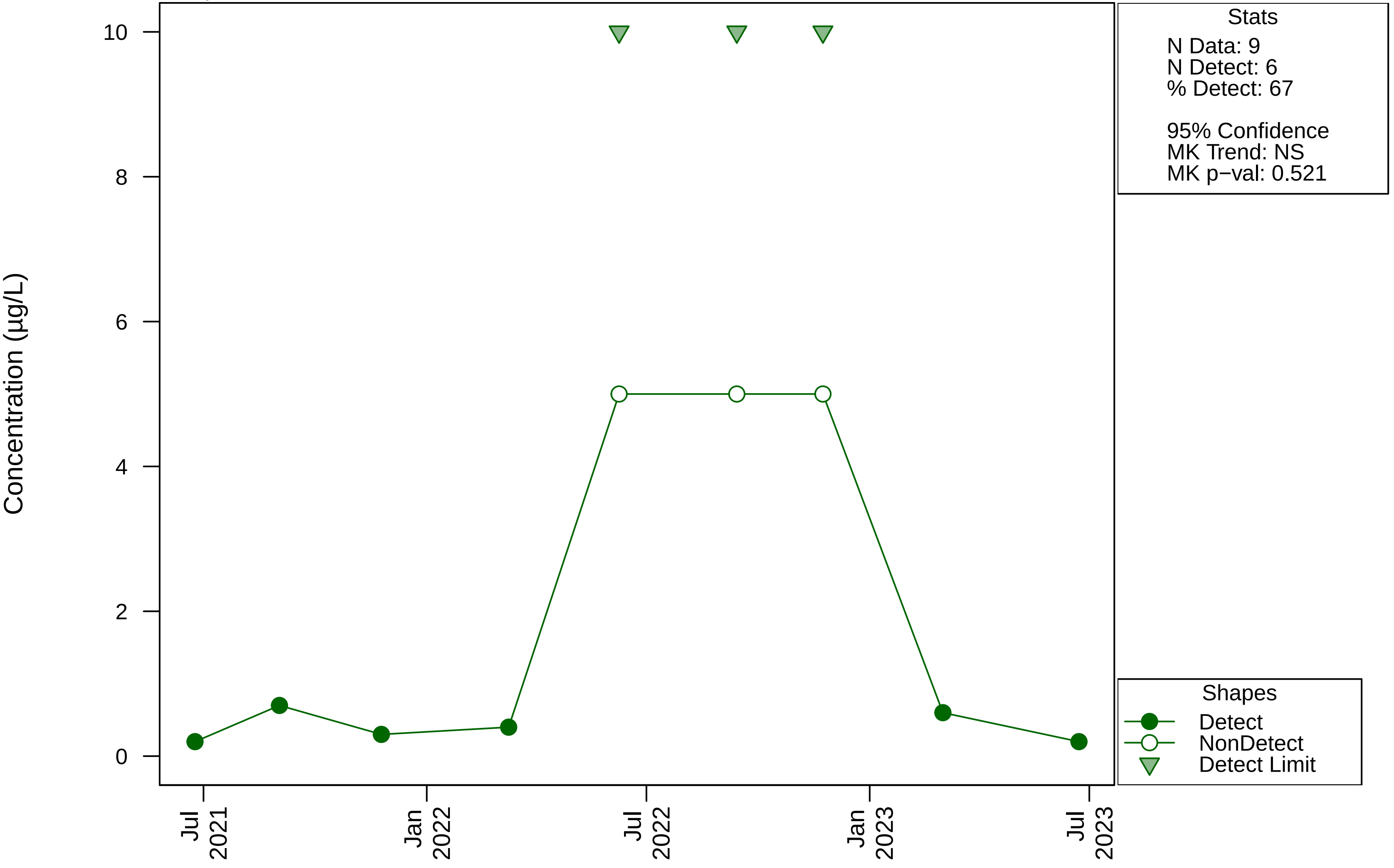


Scatterplots and Trend Analysis
D15, Molybdenum
Concentration (µg/L)
0
1
2
3
4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 8
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.582
Shapes
Detect
NonDetect
Detect Limit

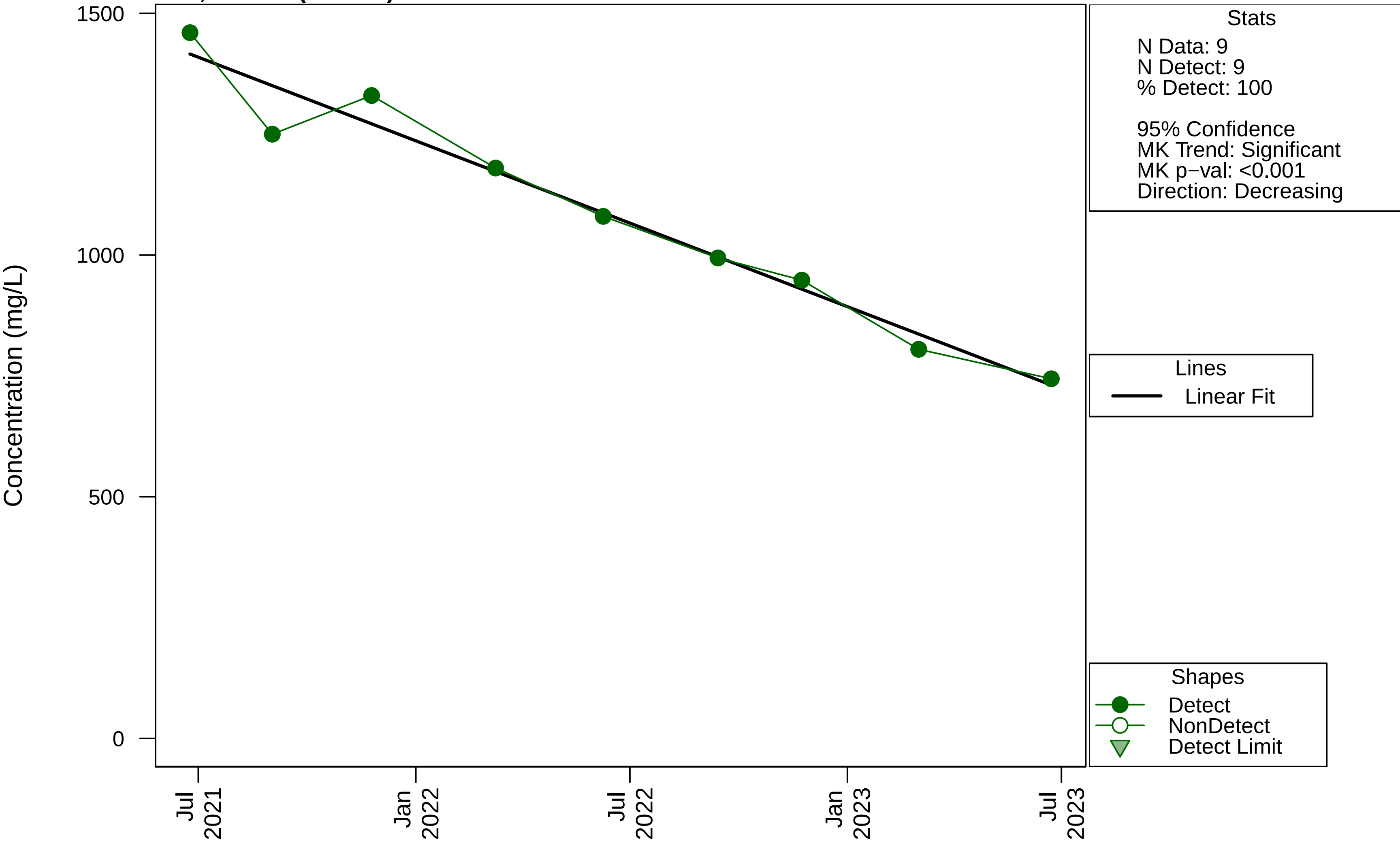
Scatterplots and Trend Analysis
D15, Nickel

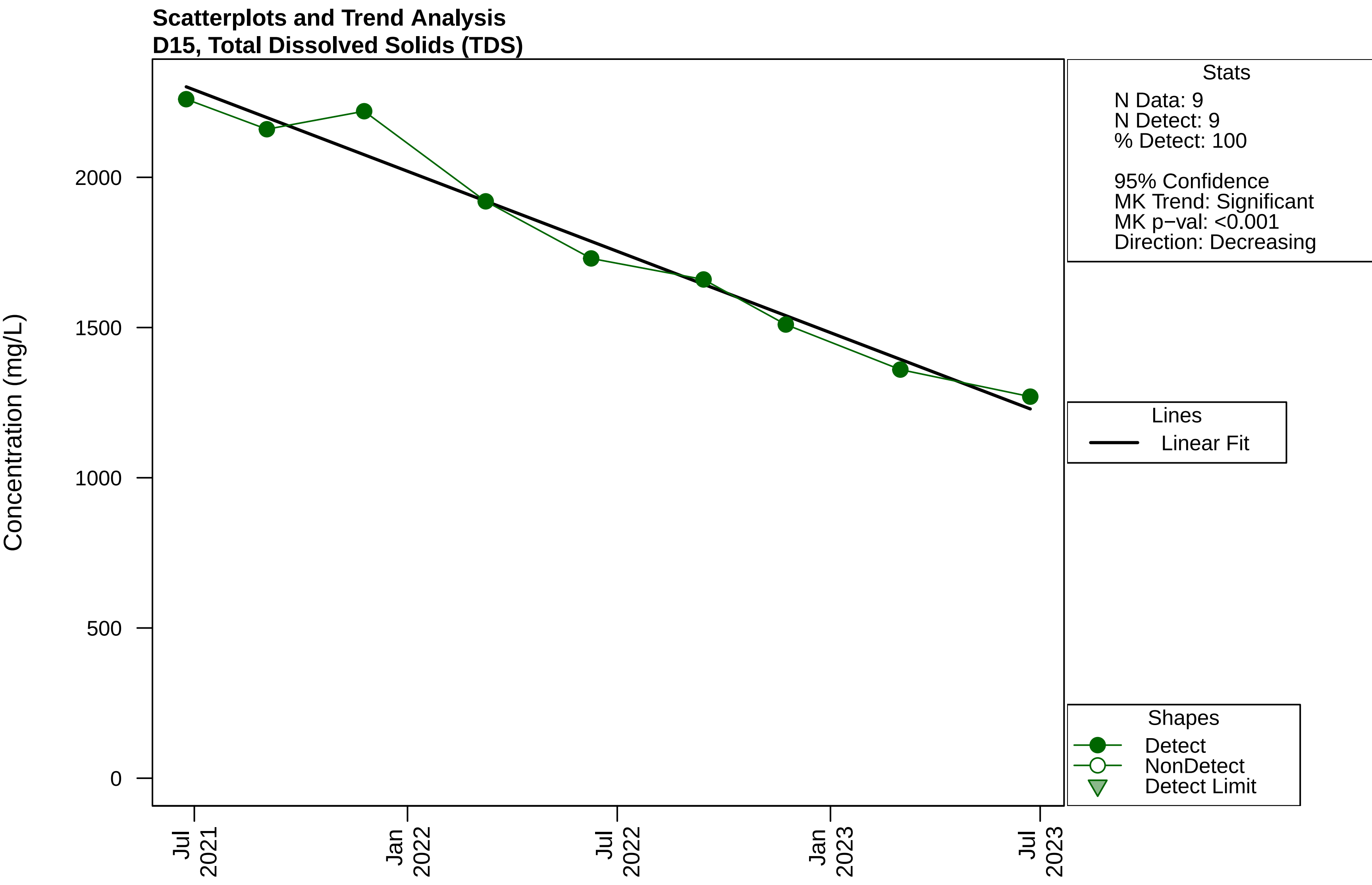


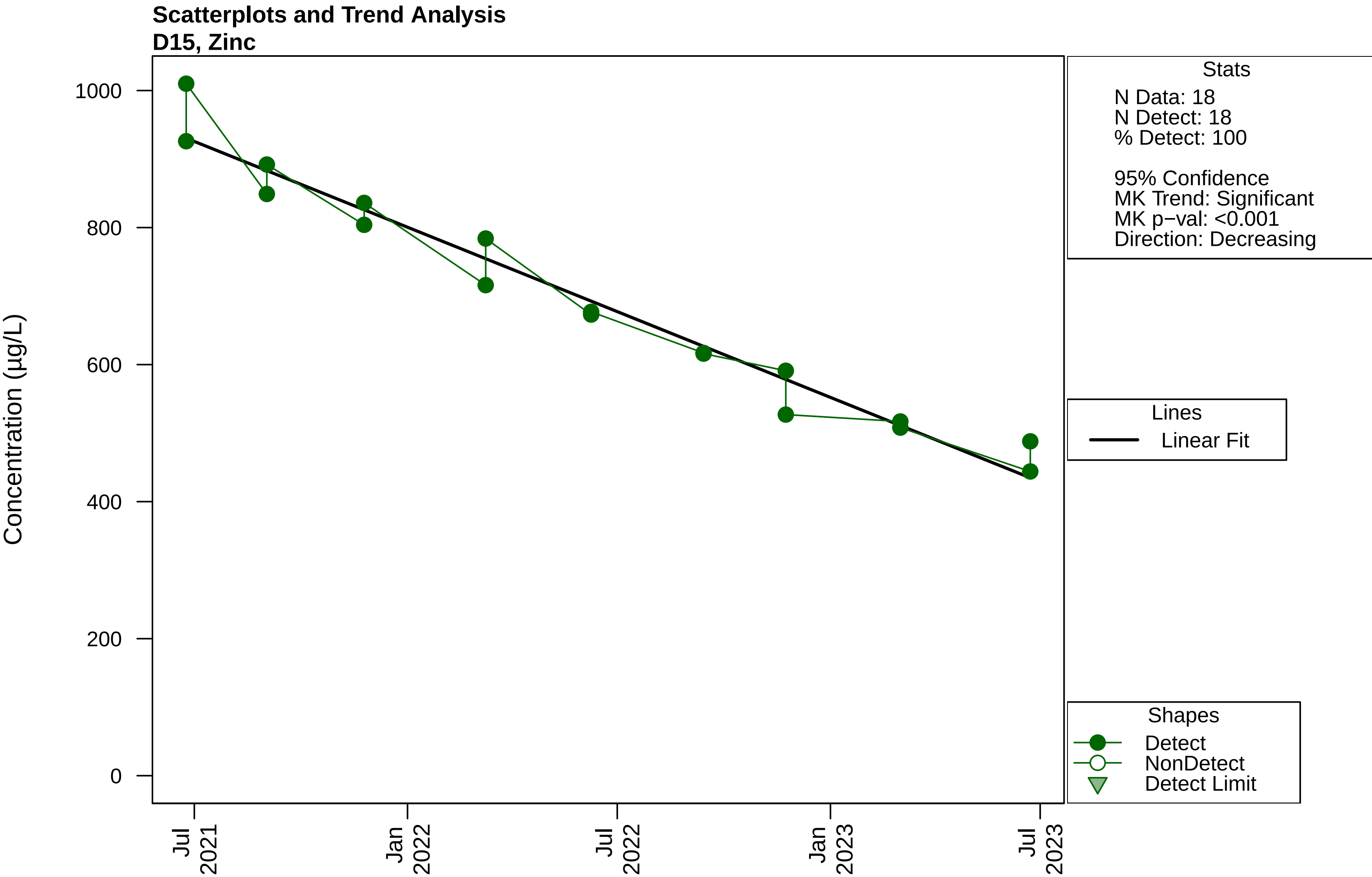
Scatterplots and Trend Analysis
D15, Selenium



Scatterplots and Trend Analysis
D15, Sulfate (as SO4)

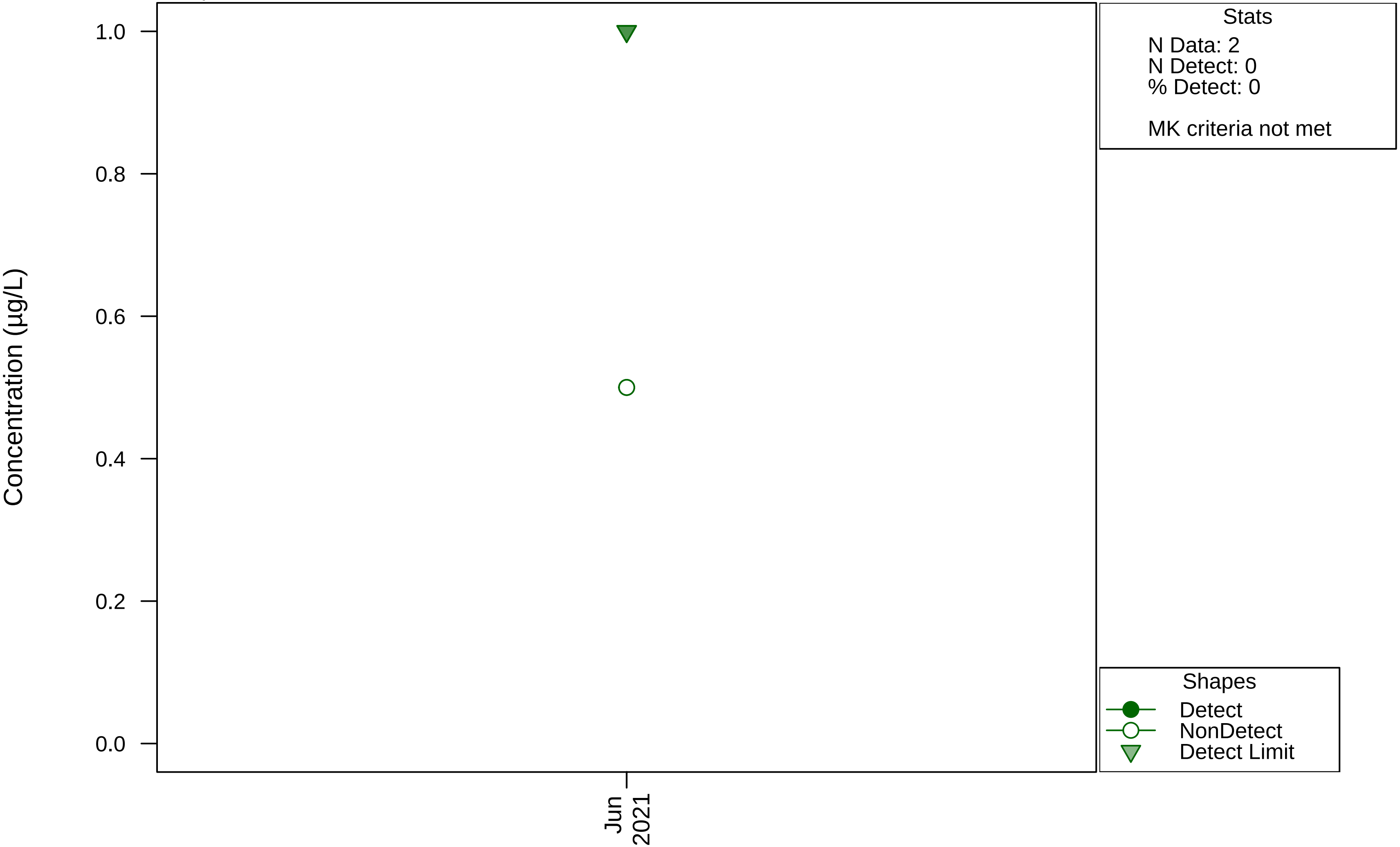


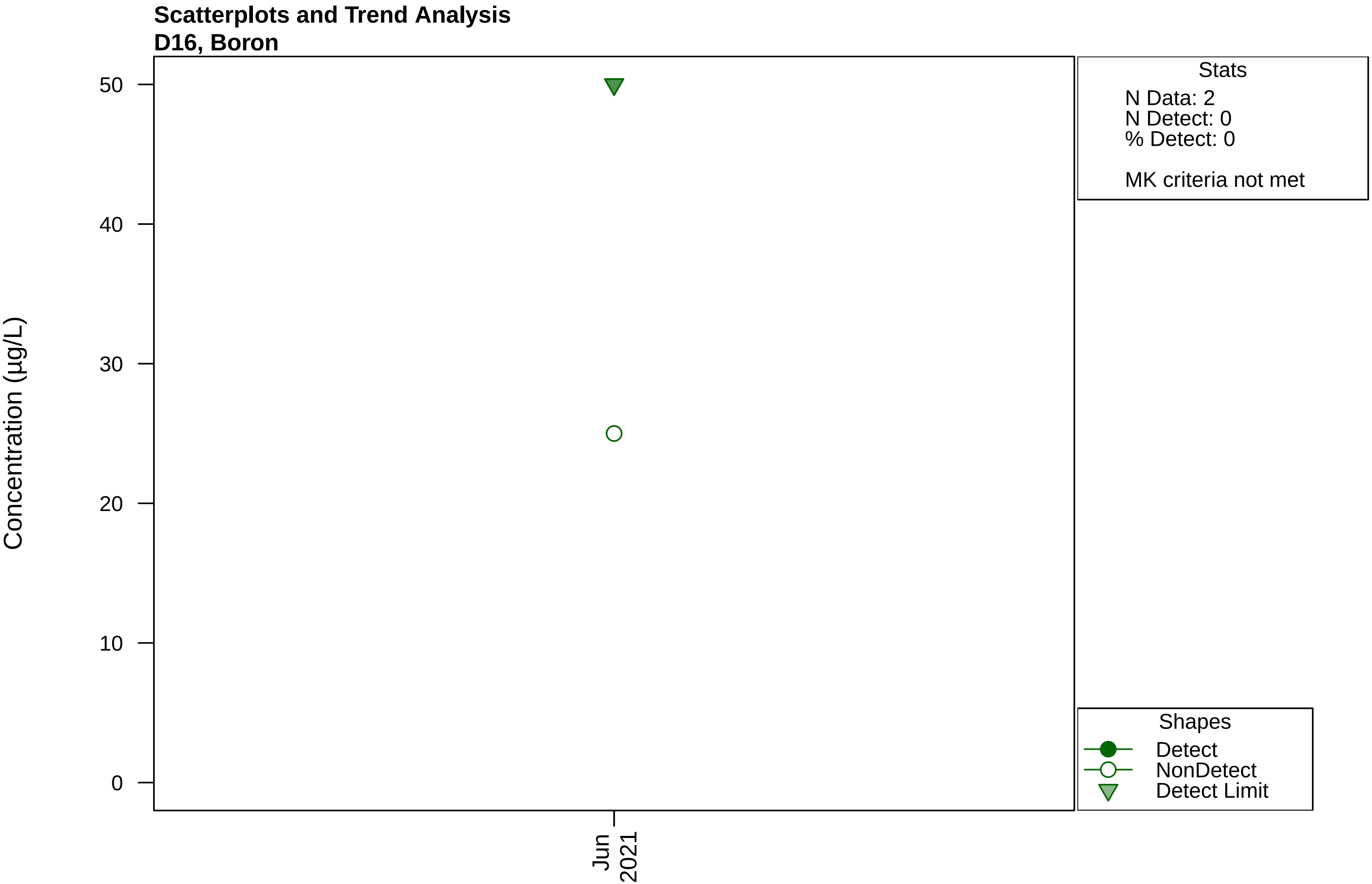

Scatterplots and Trend Analysis
D15, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
500
1000
1500
2000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

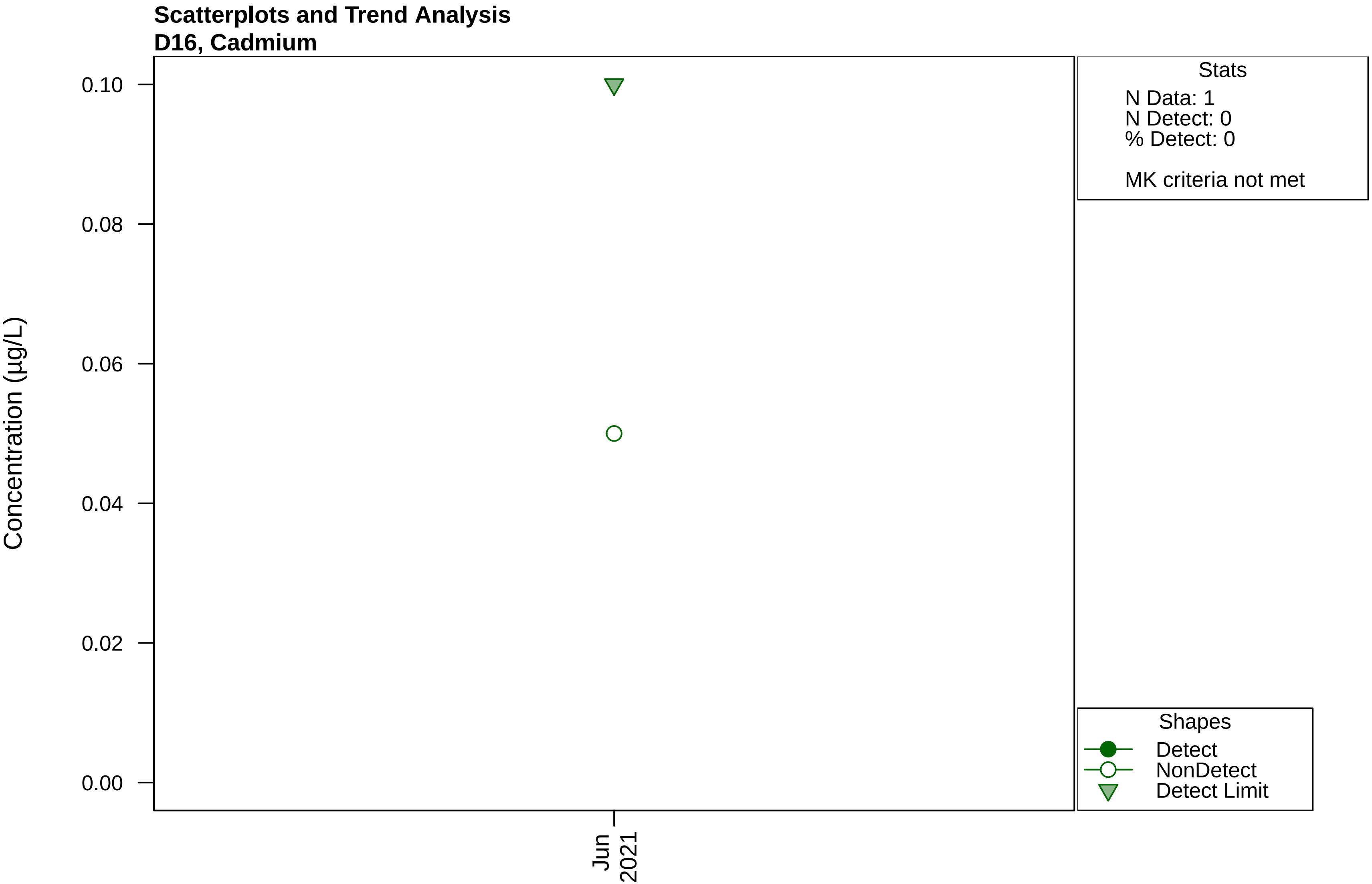


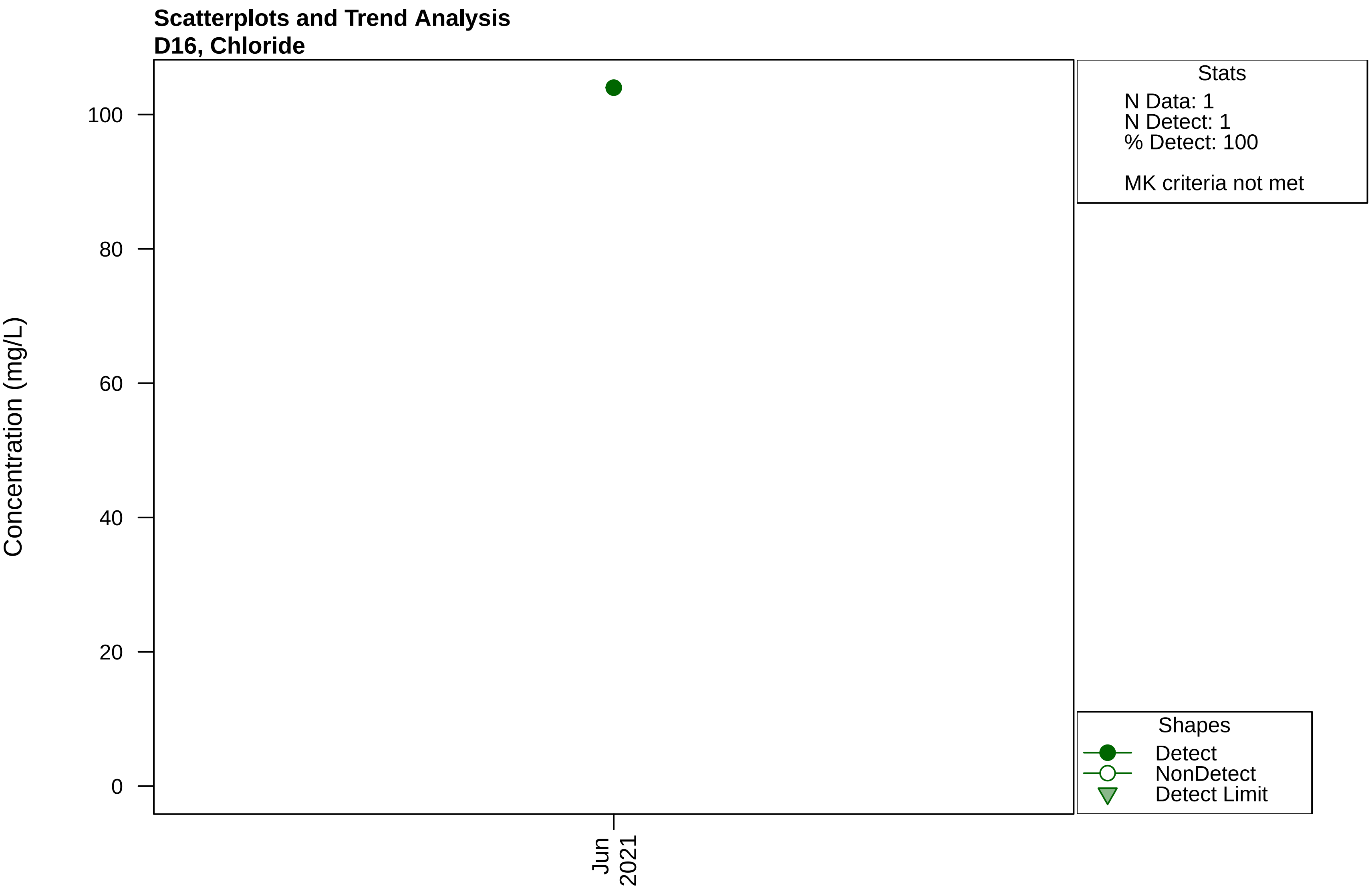
Scatterplots and Trend Analysis
D15, Zinc
Concentration (µg/L)
1000
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D16, Arsenic



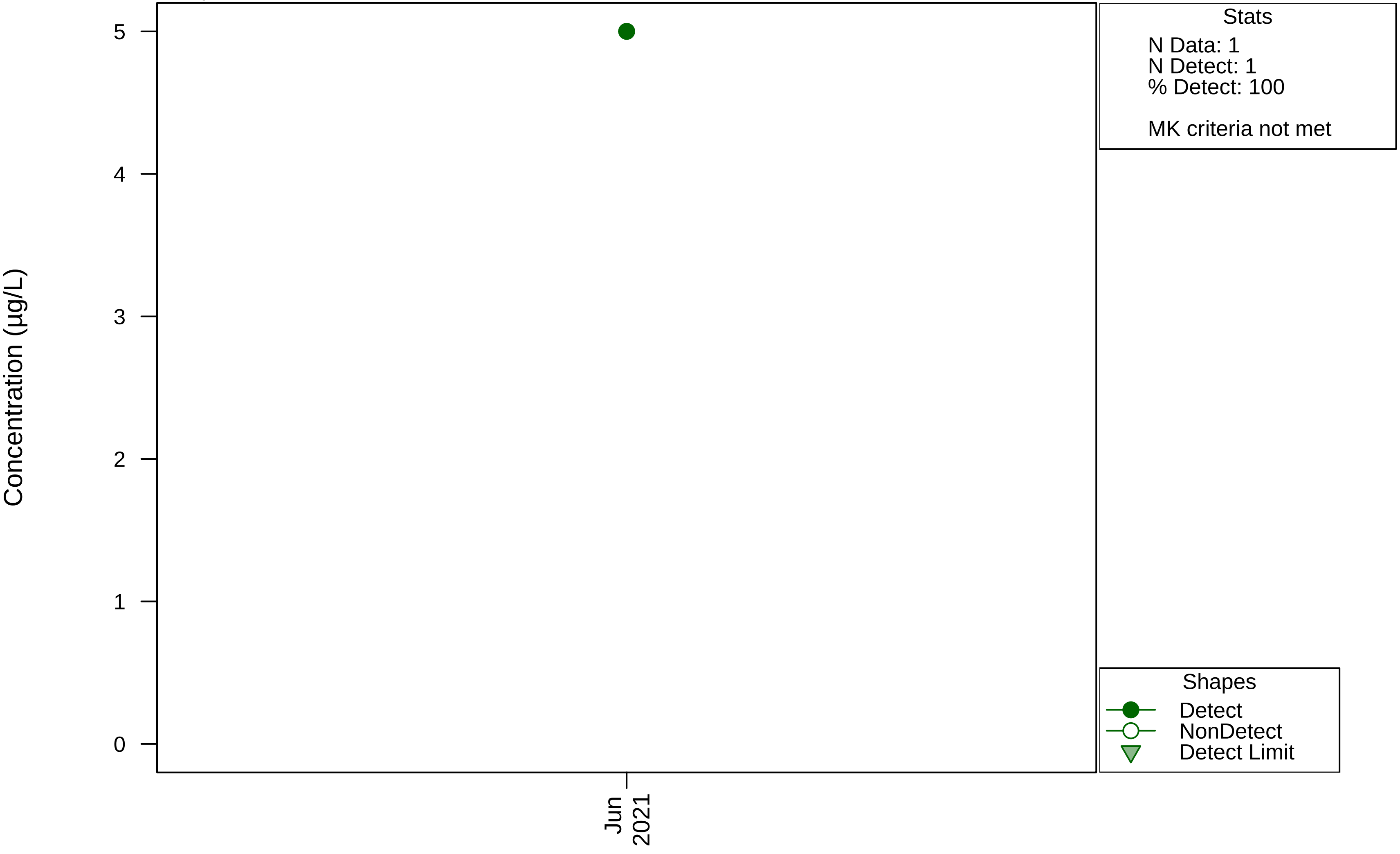

Scatterplots and Trend Analysis
D16, Boron
Concentration (µg/L)
50
40
30
20
10
0
Jun
2021
Stats
N Data: 2
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

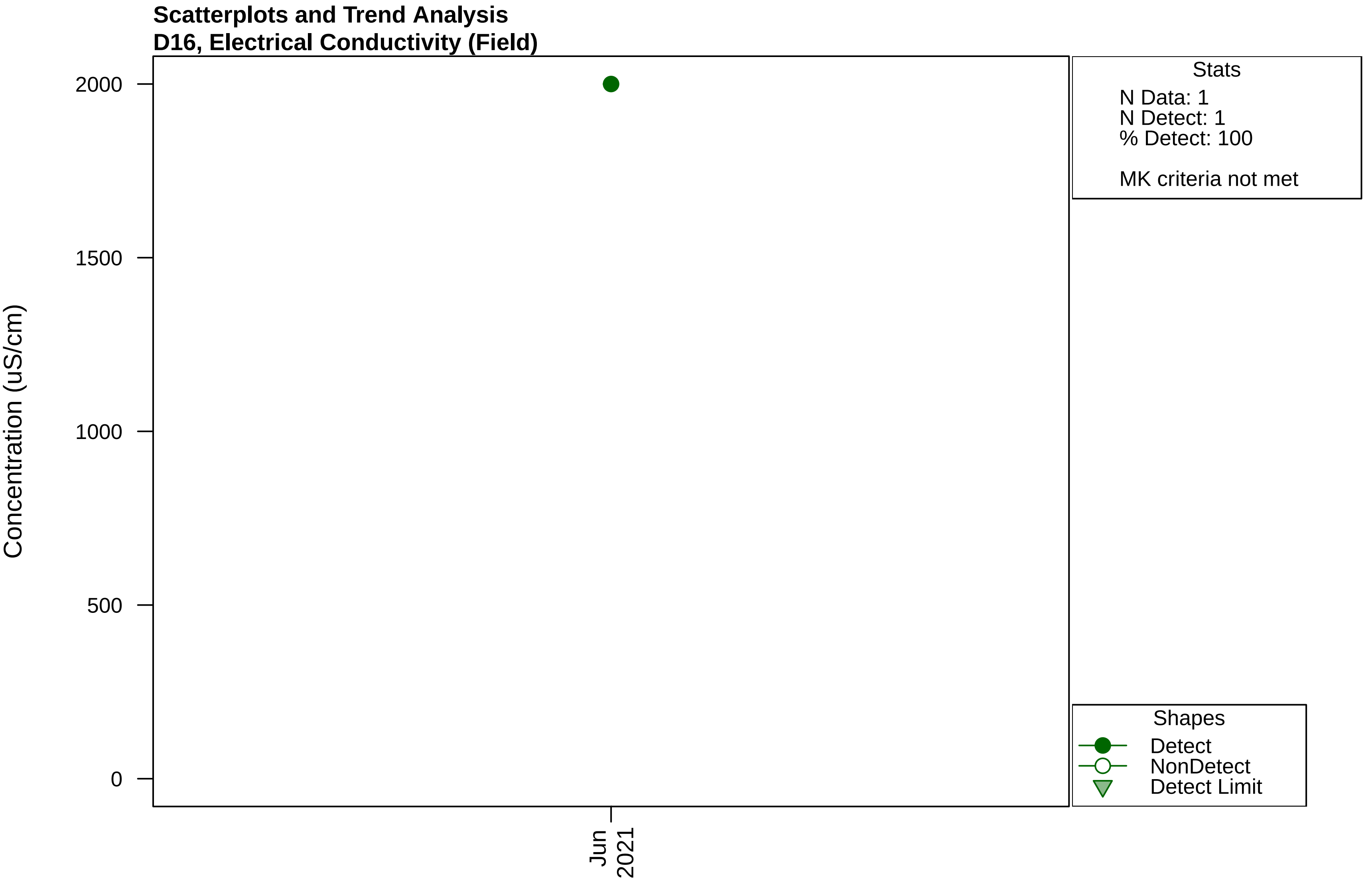

Scatterplots and Trend Analysis
D16, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jun
2021
Stats
N Data: 1
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

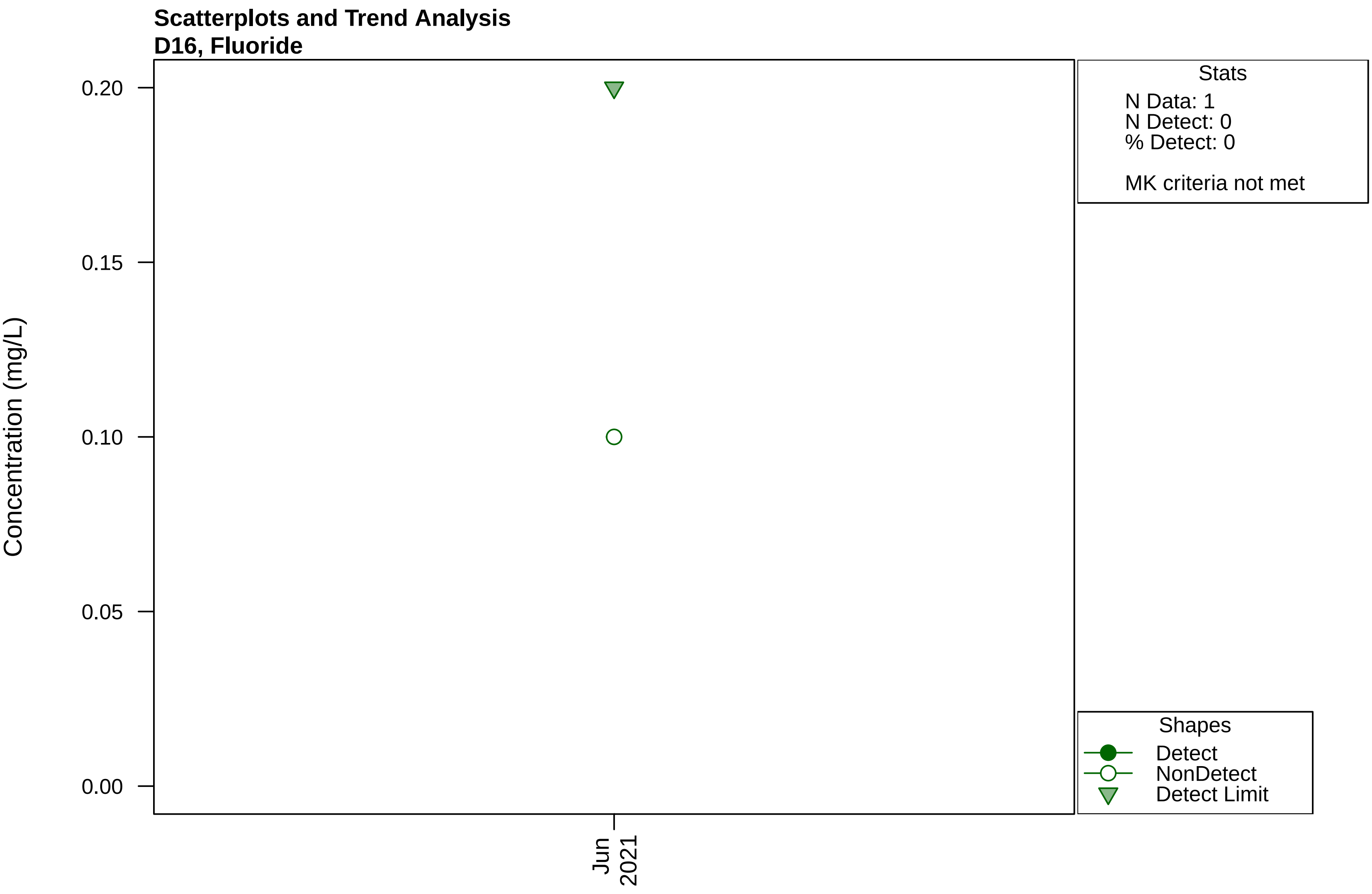


Scatterplots and Trend Analysis
D16, Chloride
Concentration (mg/L)
0
20
40
60
80
100
Jun 2021
Stats
N Data: 1
N Detect: 1
% Detect: 100
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D16, Chromium

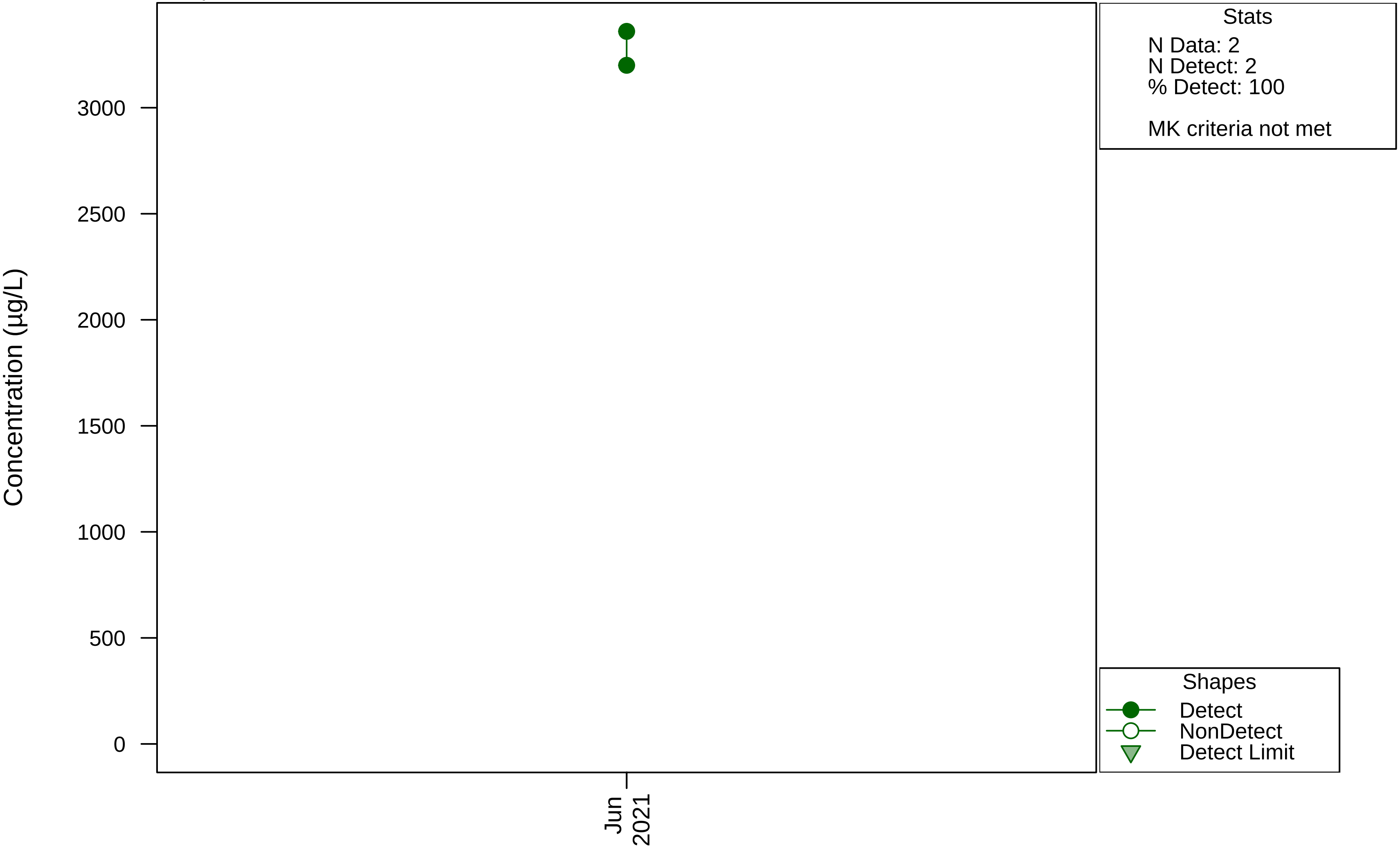


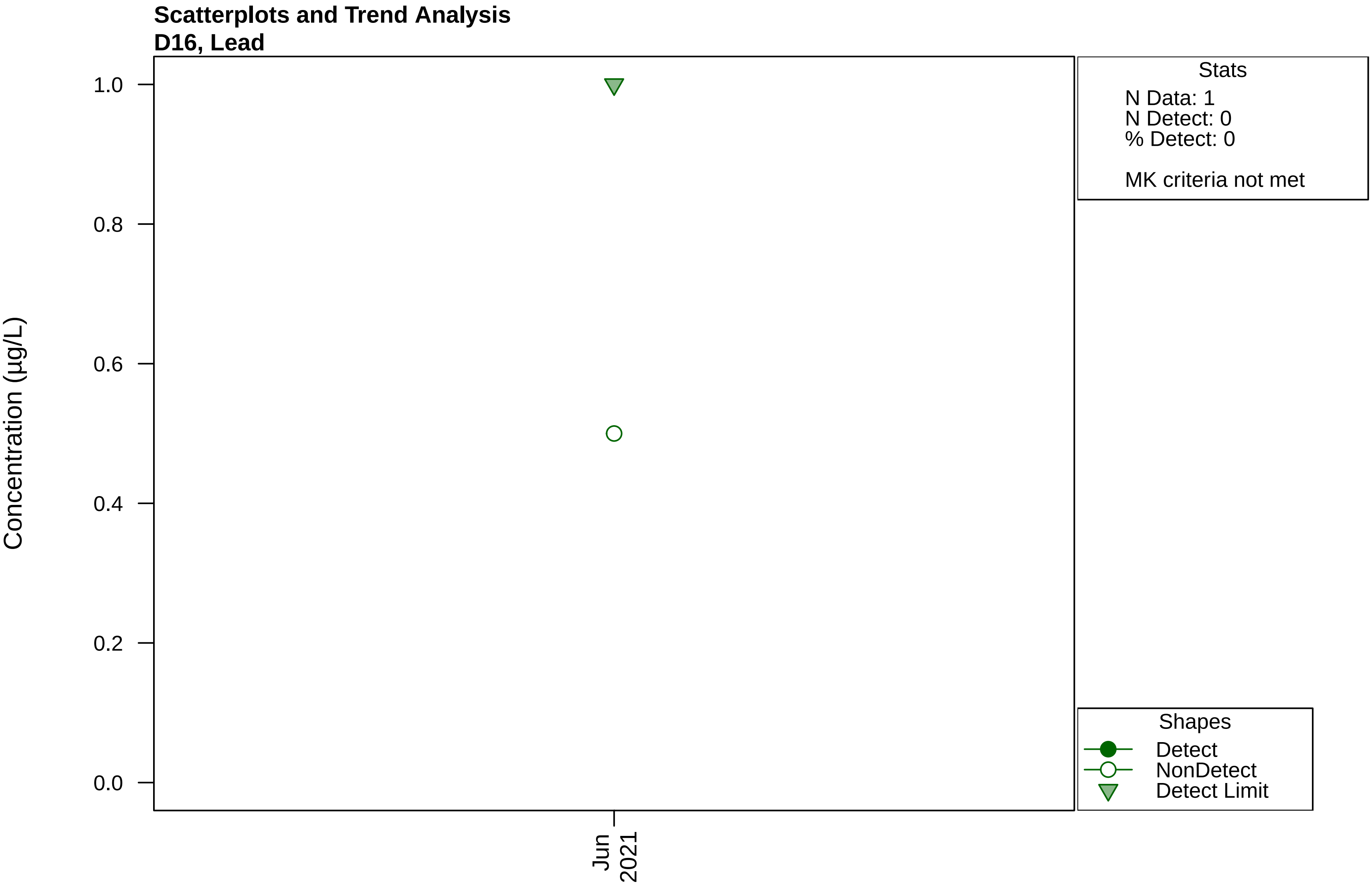

Scatterplots and Trend Analysis
D16, Electrical Conductivity (Field)
Concentration (uS/cm)
2000
1500
1000
500
0
Jun
2021
Stats
N Data: 1
N Detect: 1
% Detect: 100
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



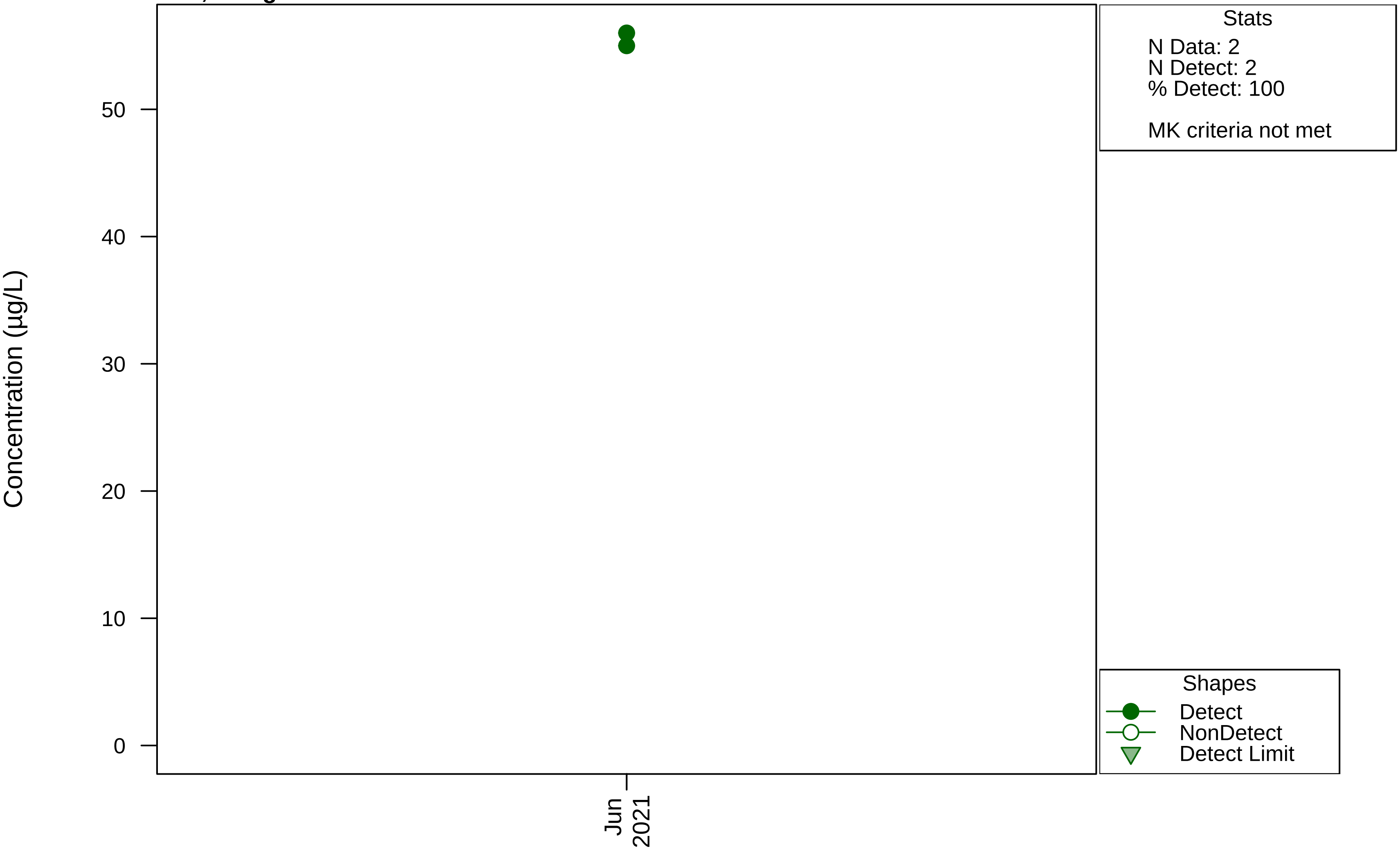
Scatterplots and Trend Analysis
D16, Fluoride
Concentration (mg/L)
0.20
0.15
0.10
0.05
0.00
Jun
2021
Stats
N Data: 1
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

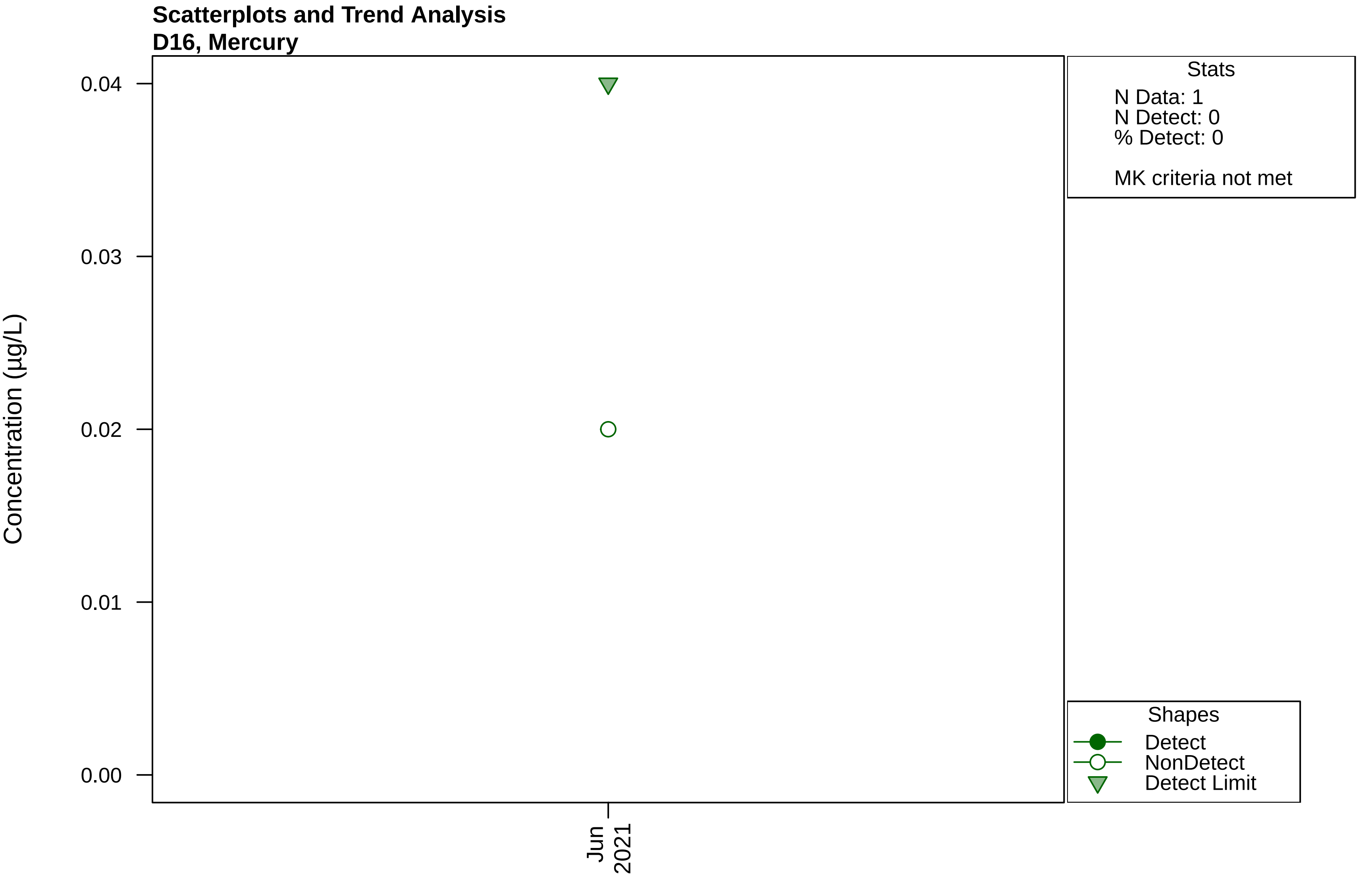
Scatterplots and Trend Analysis
D16, Iron




Scatterplots and Trend Analysis
D16, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jun 2021
Stats
N Data: 1
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

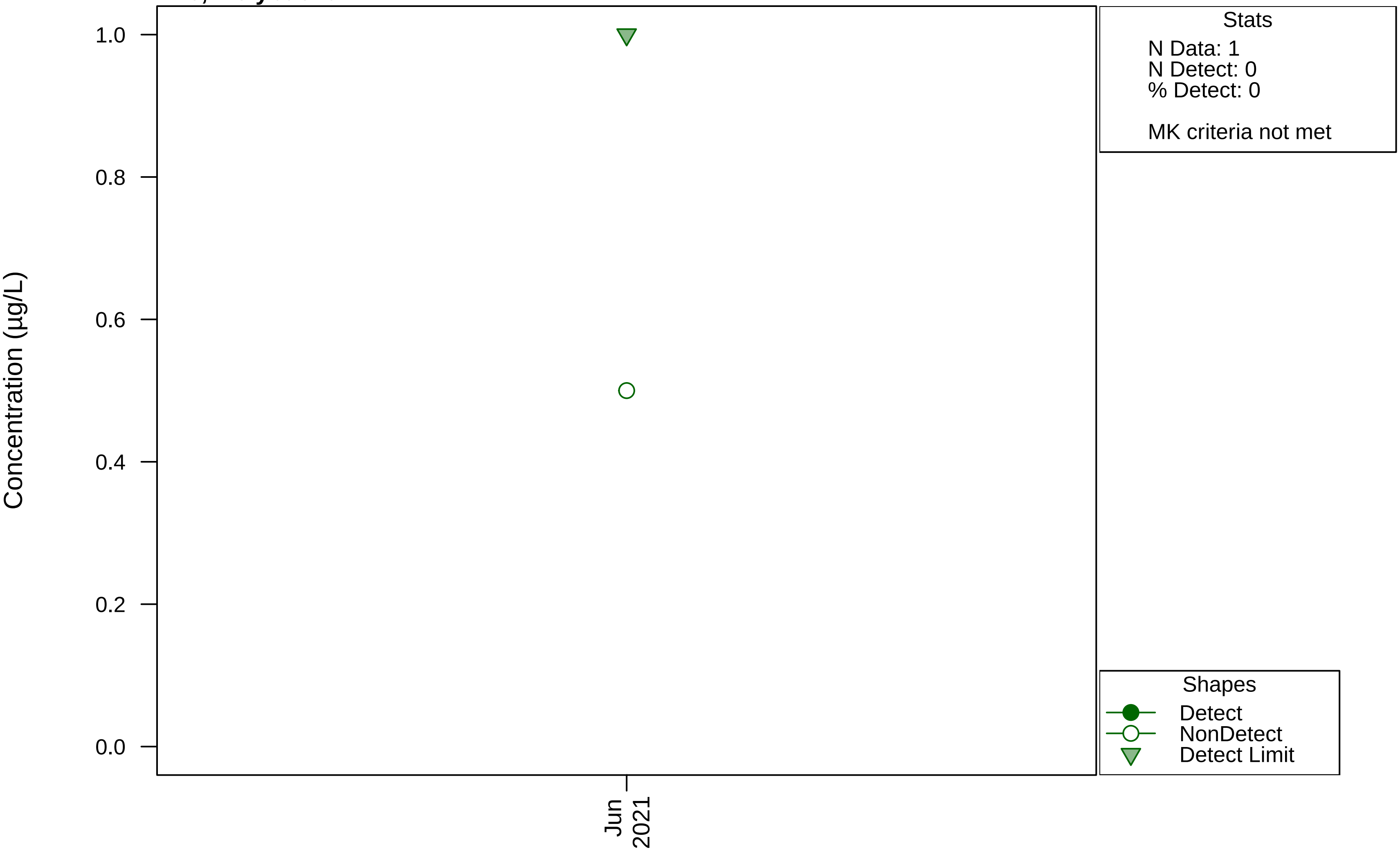
Scatterplots and Trend Analysis
D16, Manganese



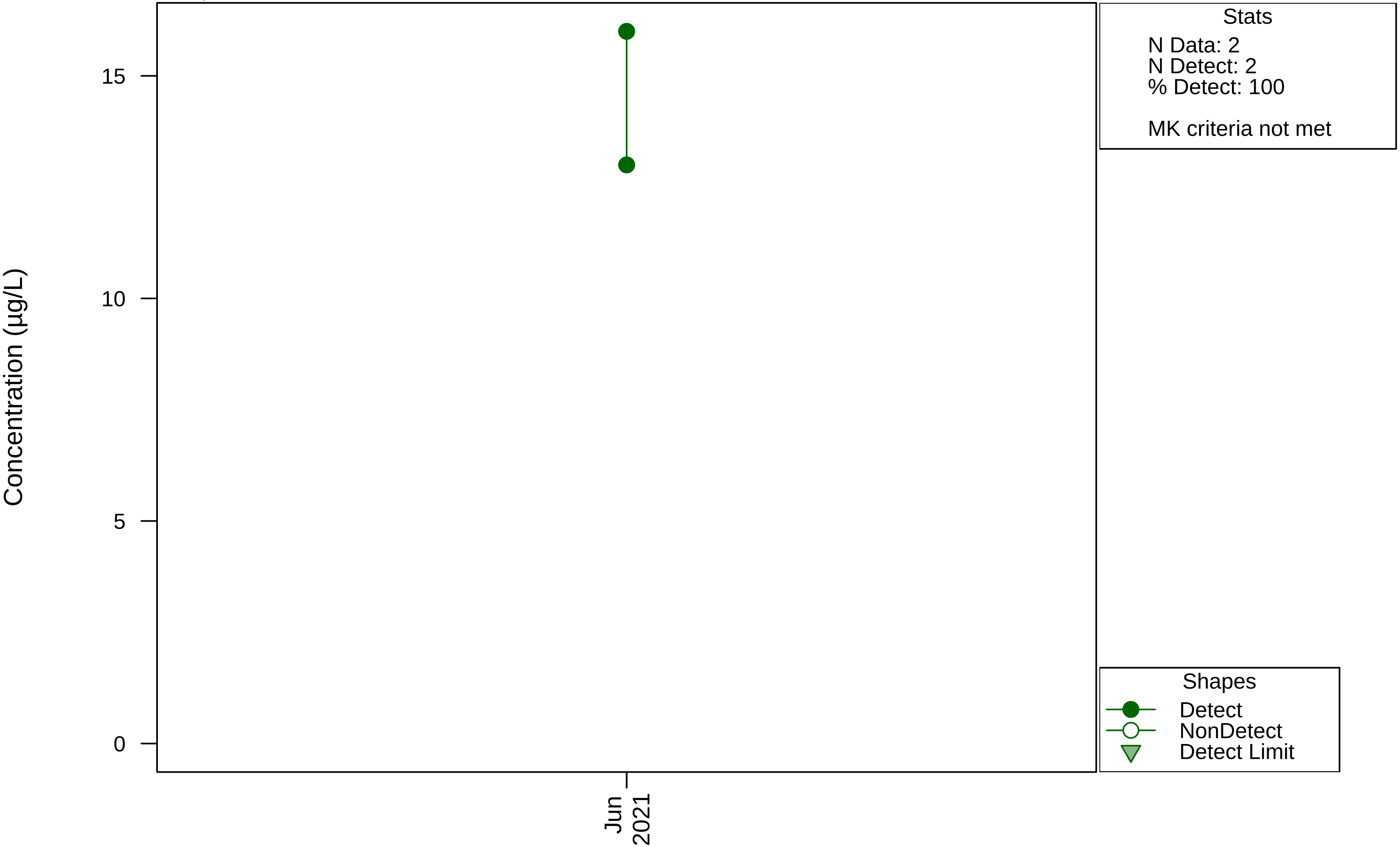


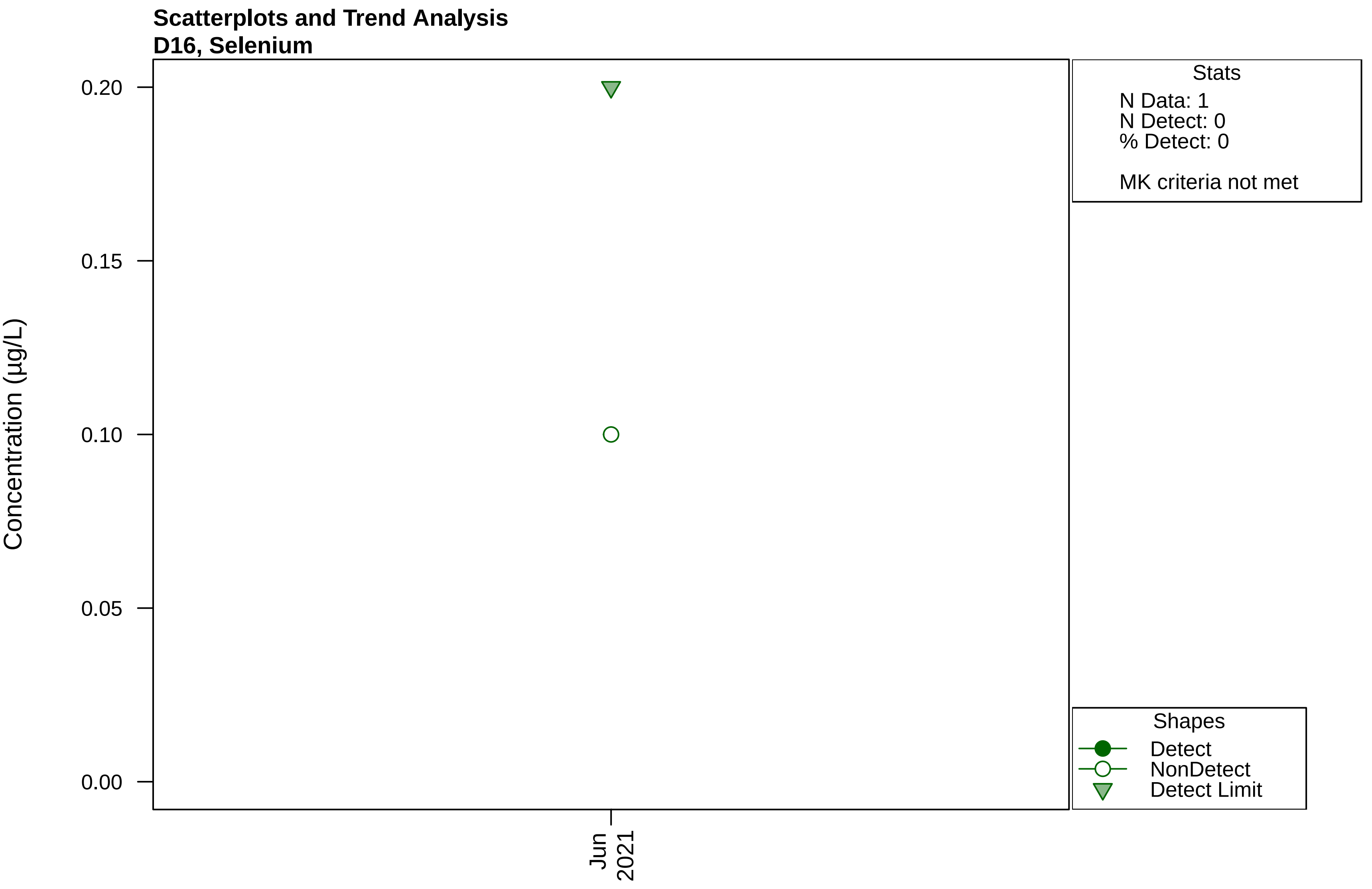
Scatterplots and Trend Analysis
D16, Mercury
Concentration (µg/L)
0.04
0.03
0.02
0.01
0.00
Jun
2021
Stats
N Data: 1
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D16, Molybdenum

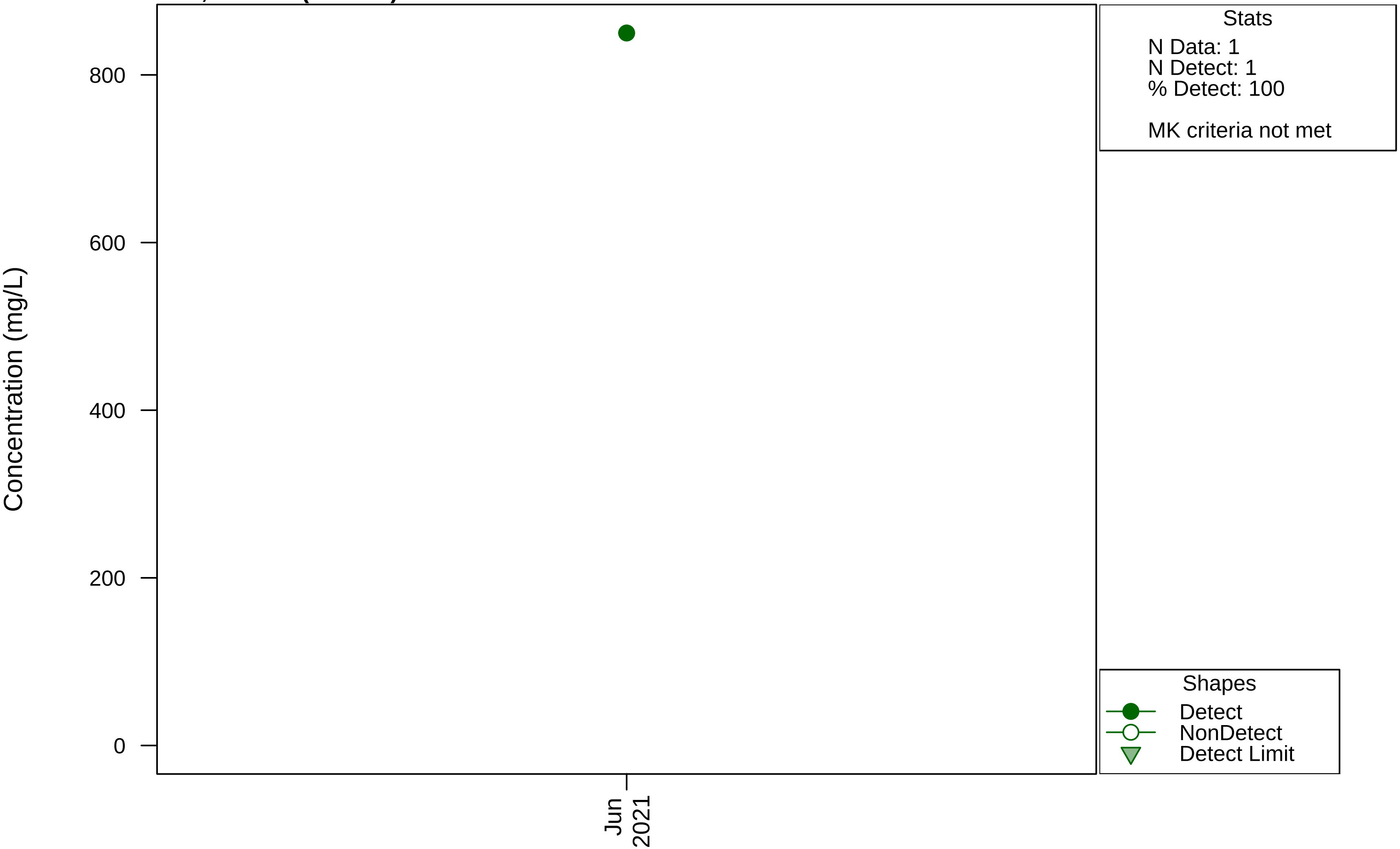


Scatterplots and Trend Analysis
D16, Nickel

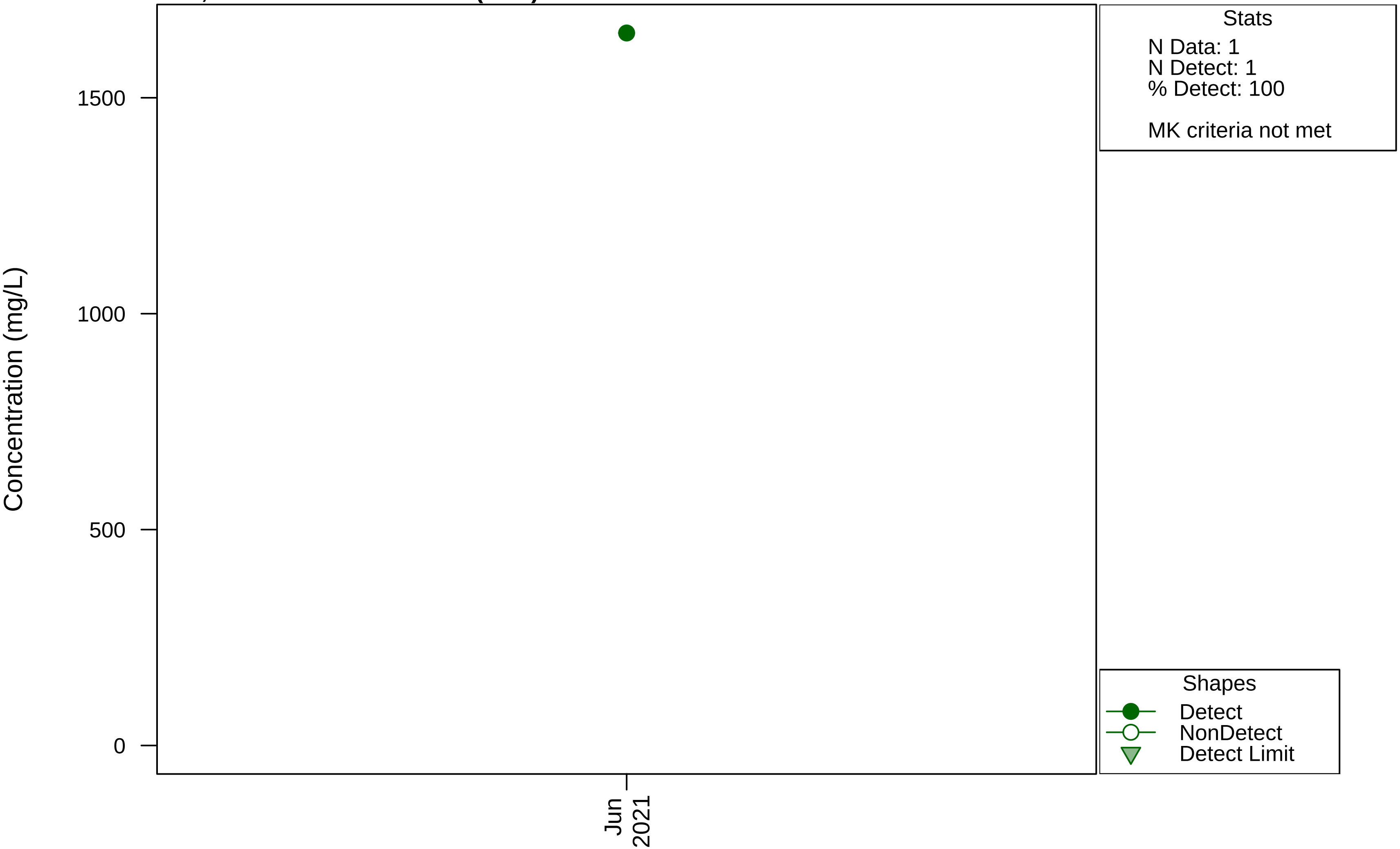



Scatterplots and Trend Analysis
D16, Selenium
Concentration (µg/L)
0.20
0.15
0.10
0.05
0.00
Jun
2021
Stats
N Data: 1
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

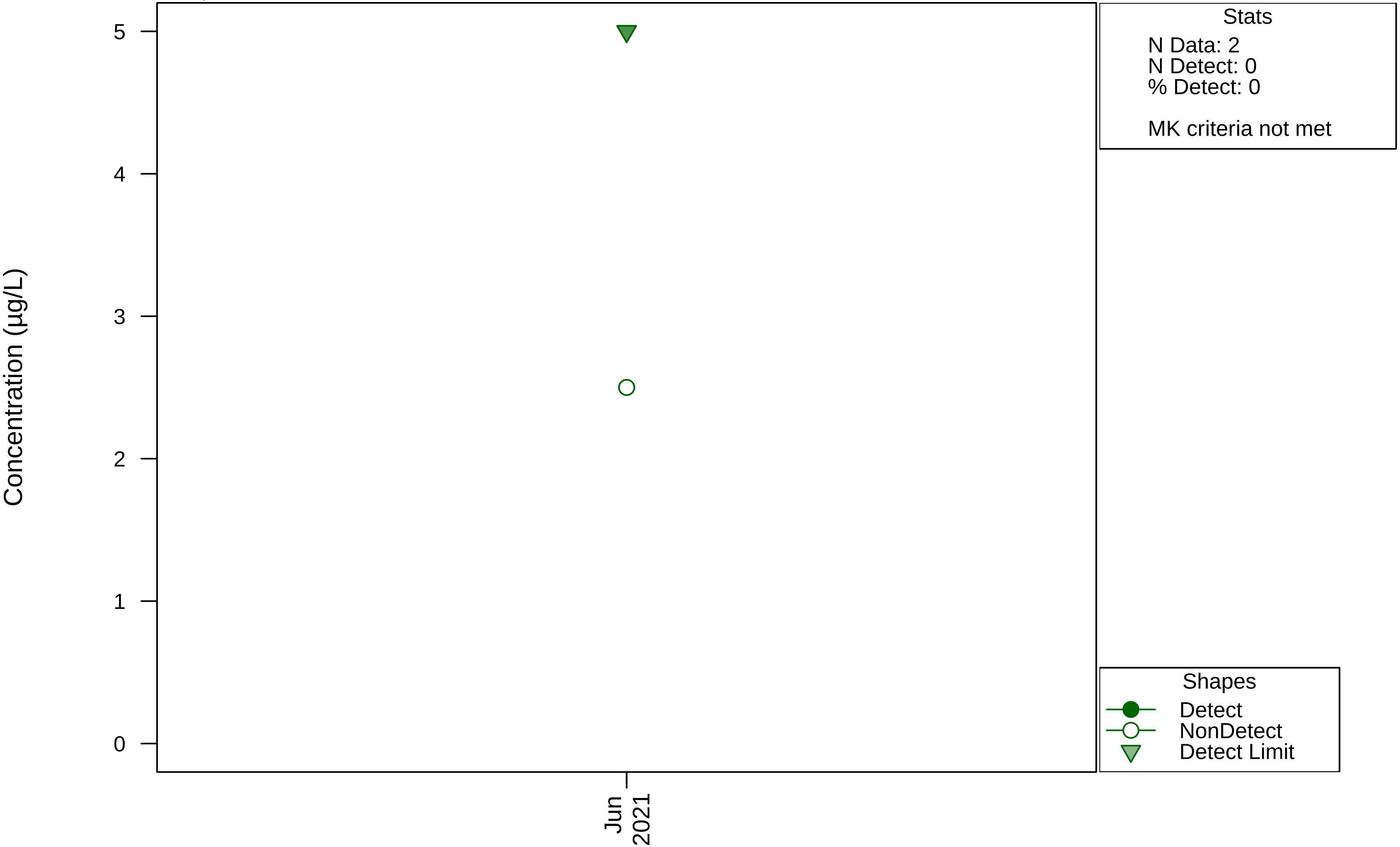
Scatterplots and Trend Analysis
D16, Sulfate (as SO4)



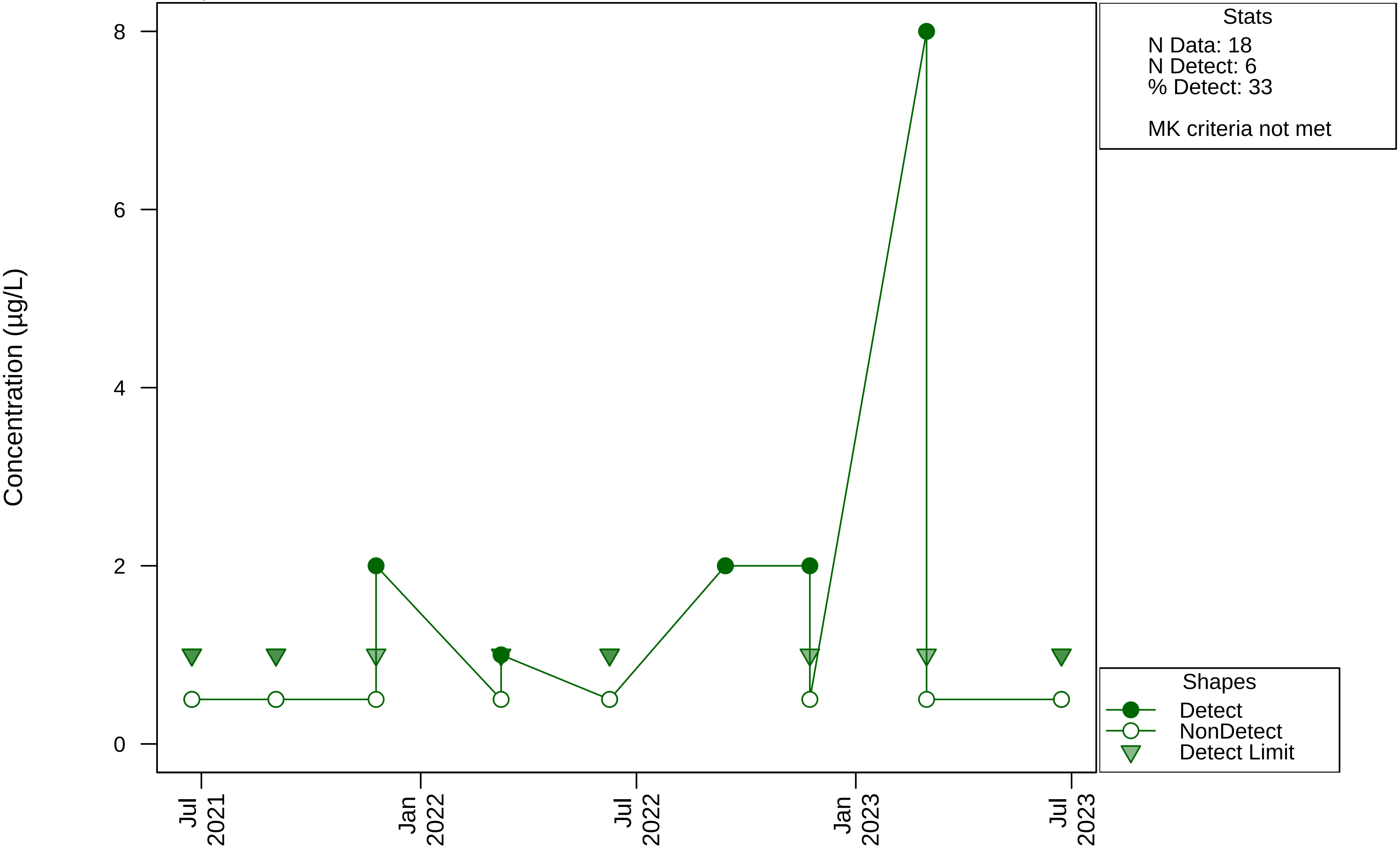
Scatterplots and Trend Analysis
D16, Total Dissolved Solids (TDS)

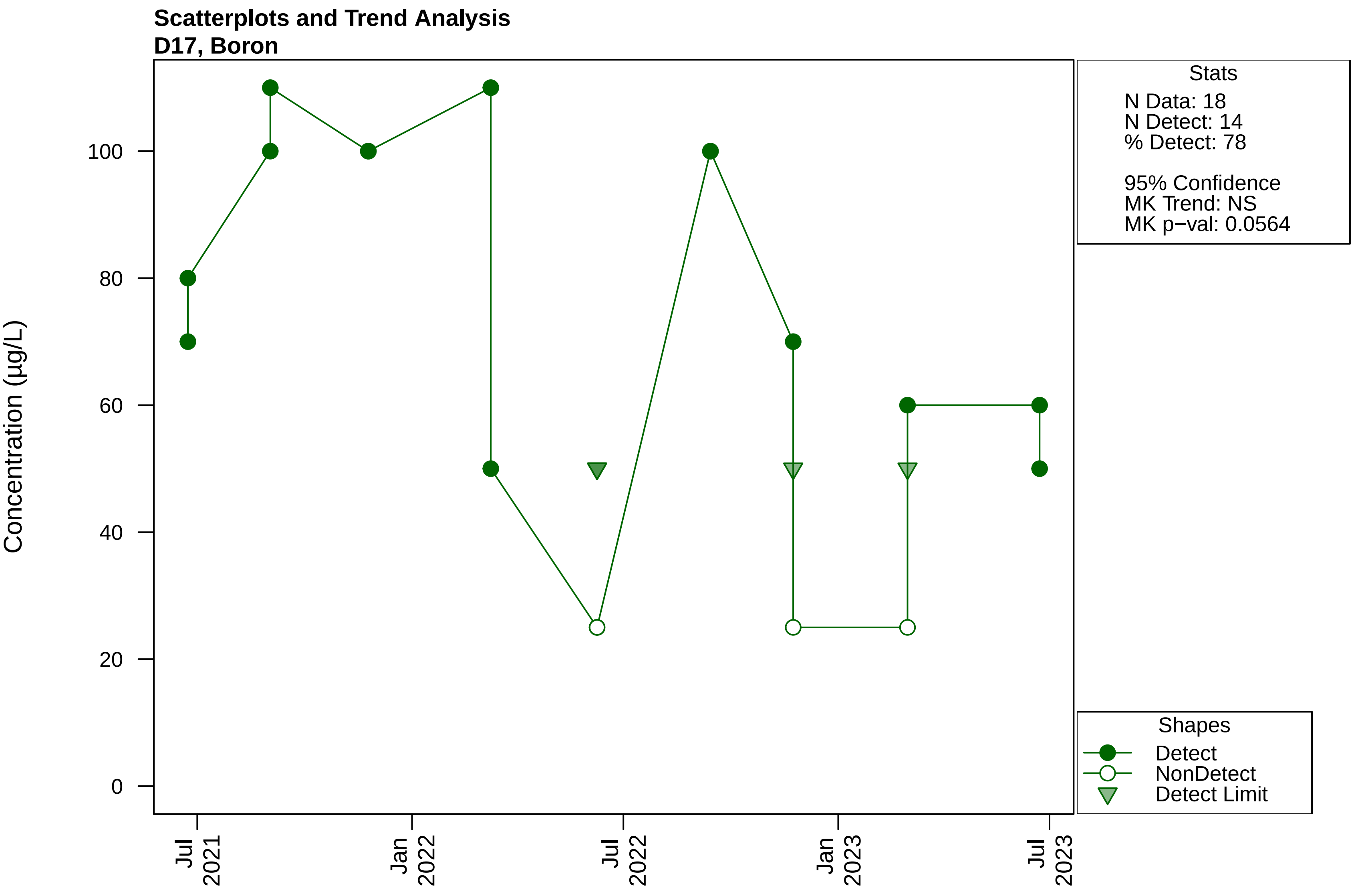


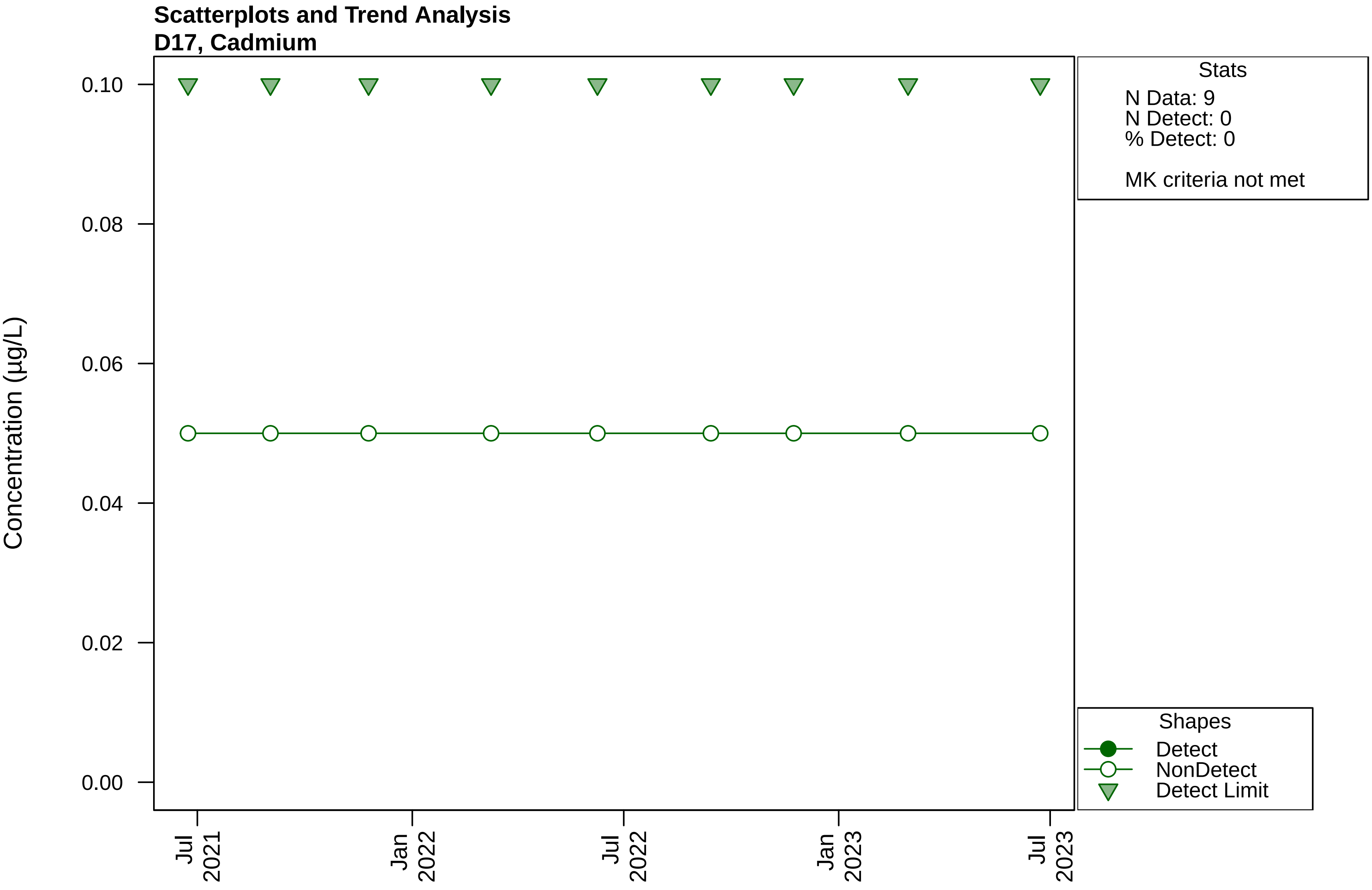
Scatterplots and Trend Analysis
D16, Zinc

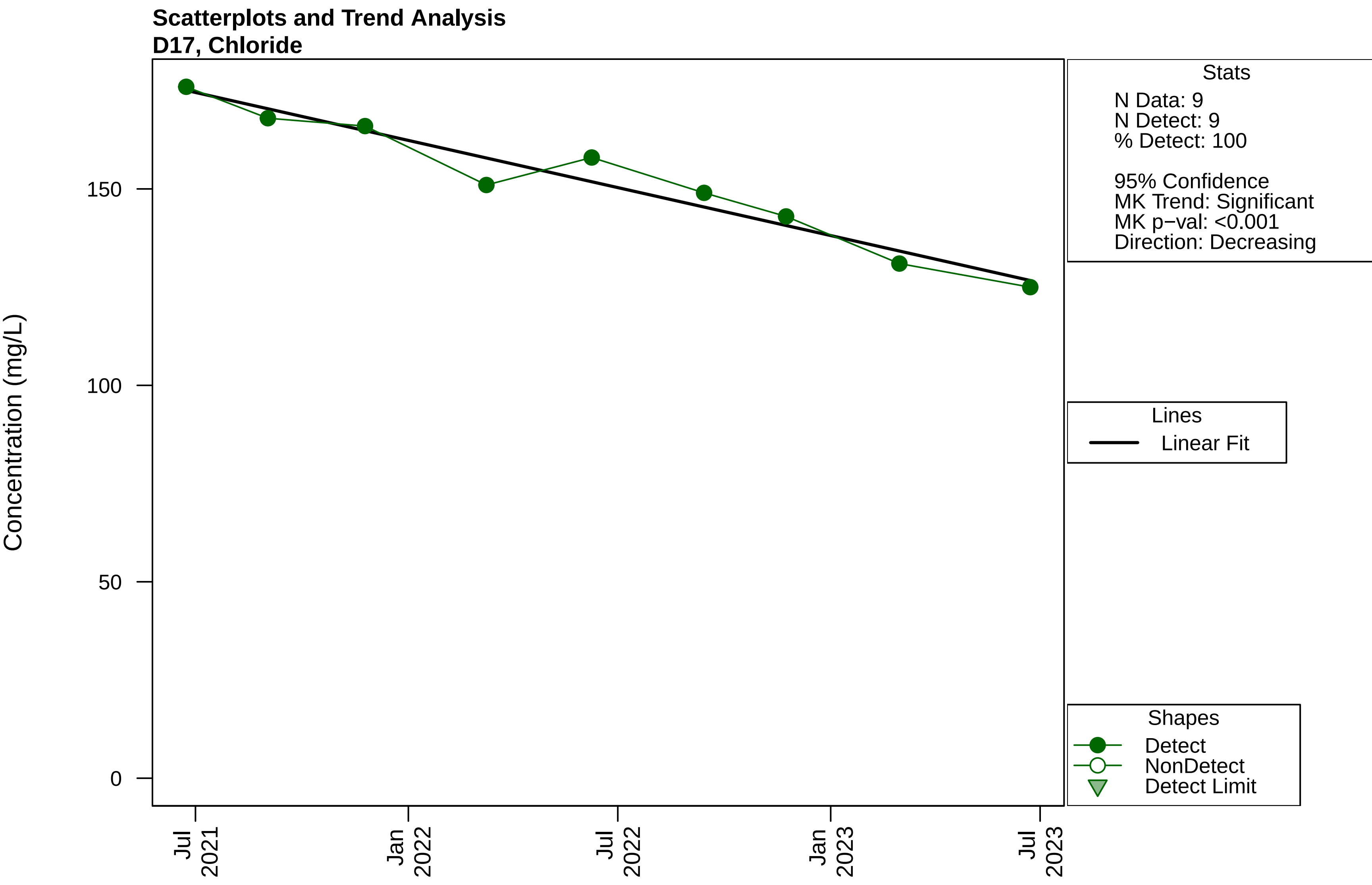


Scatterplots and Trend Analysis
D17, Arsenic

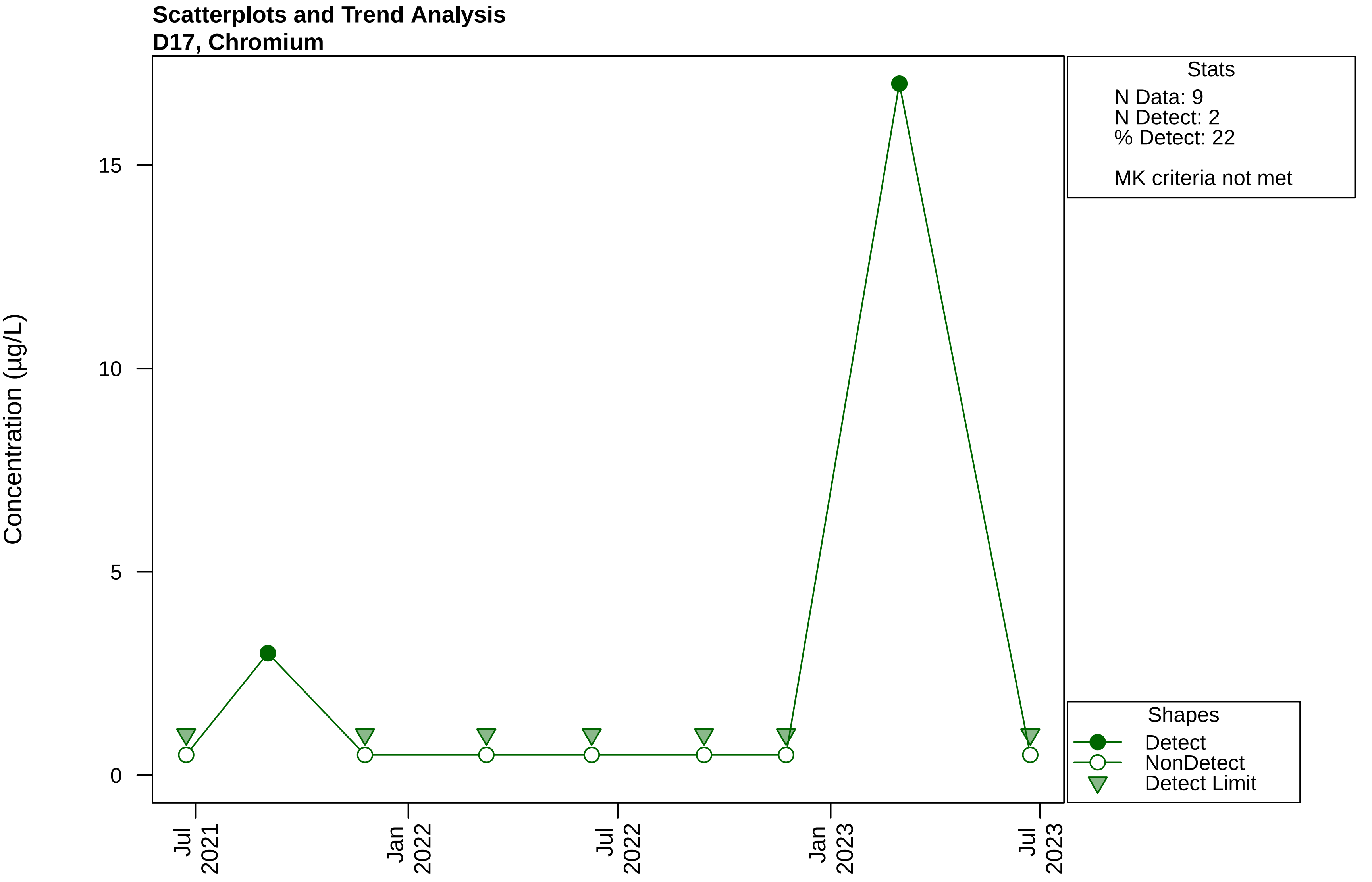


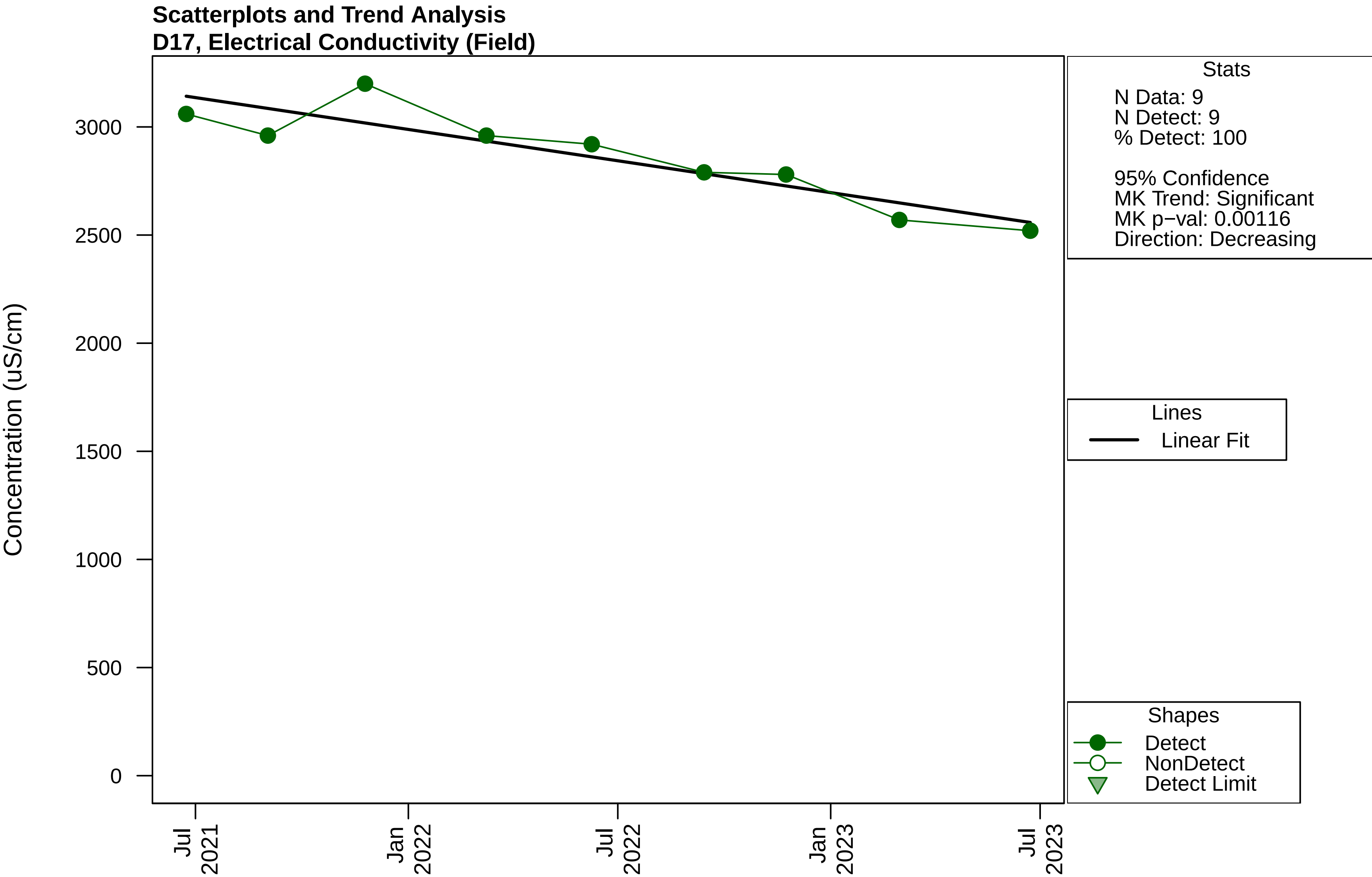

Scatterplots and Trend Analysis
D17, Boron
Concentration (µg/L)
0
20
40
60
80
100
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 14
% Detect: 78
95% Confidence
MK Trend: NS
MK p−val: 0.0564
Shapes
Detect
NonDetect
Detect Limit

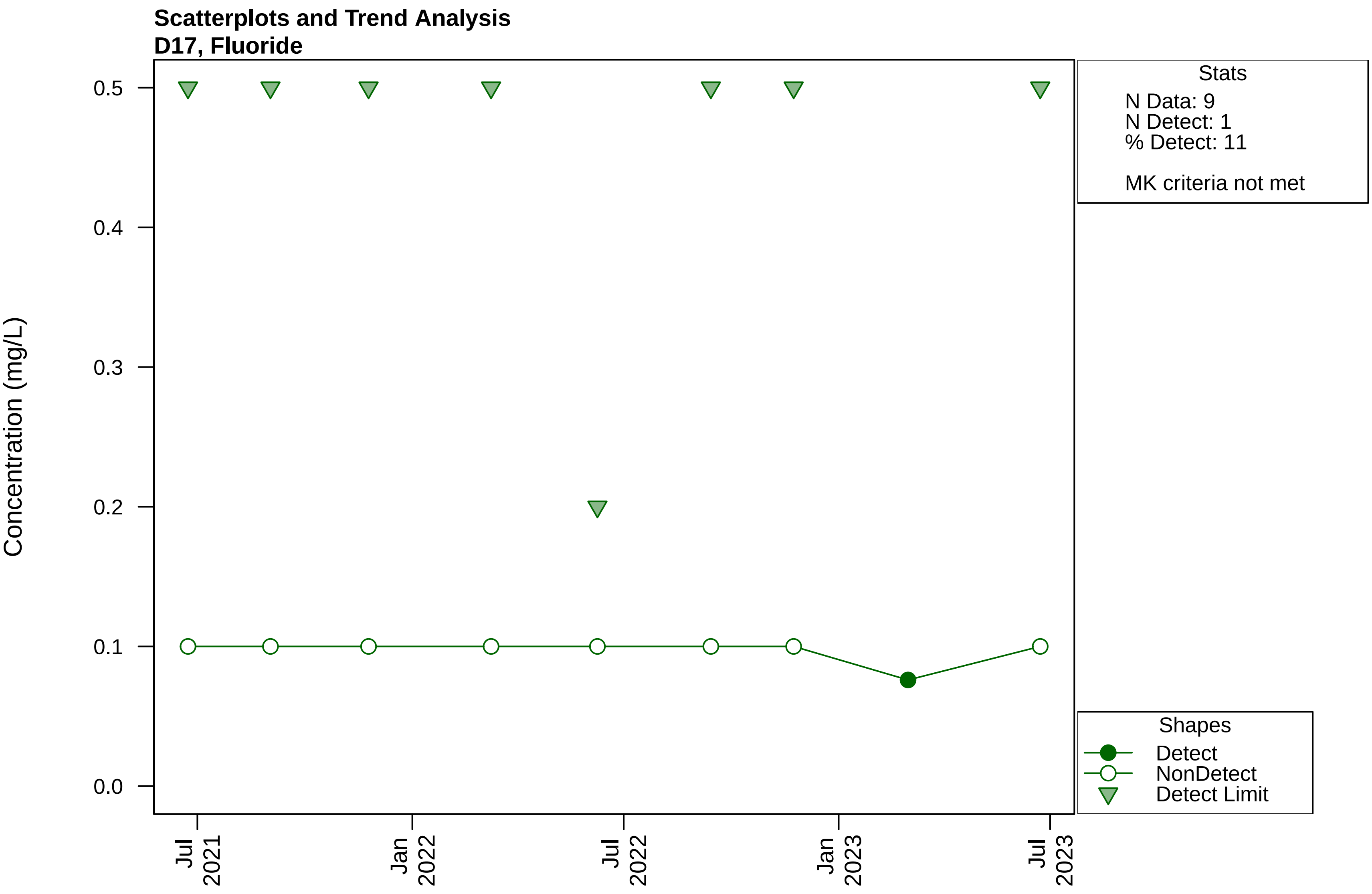

Scatterplots and Trend Analysis
D17, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



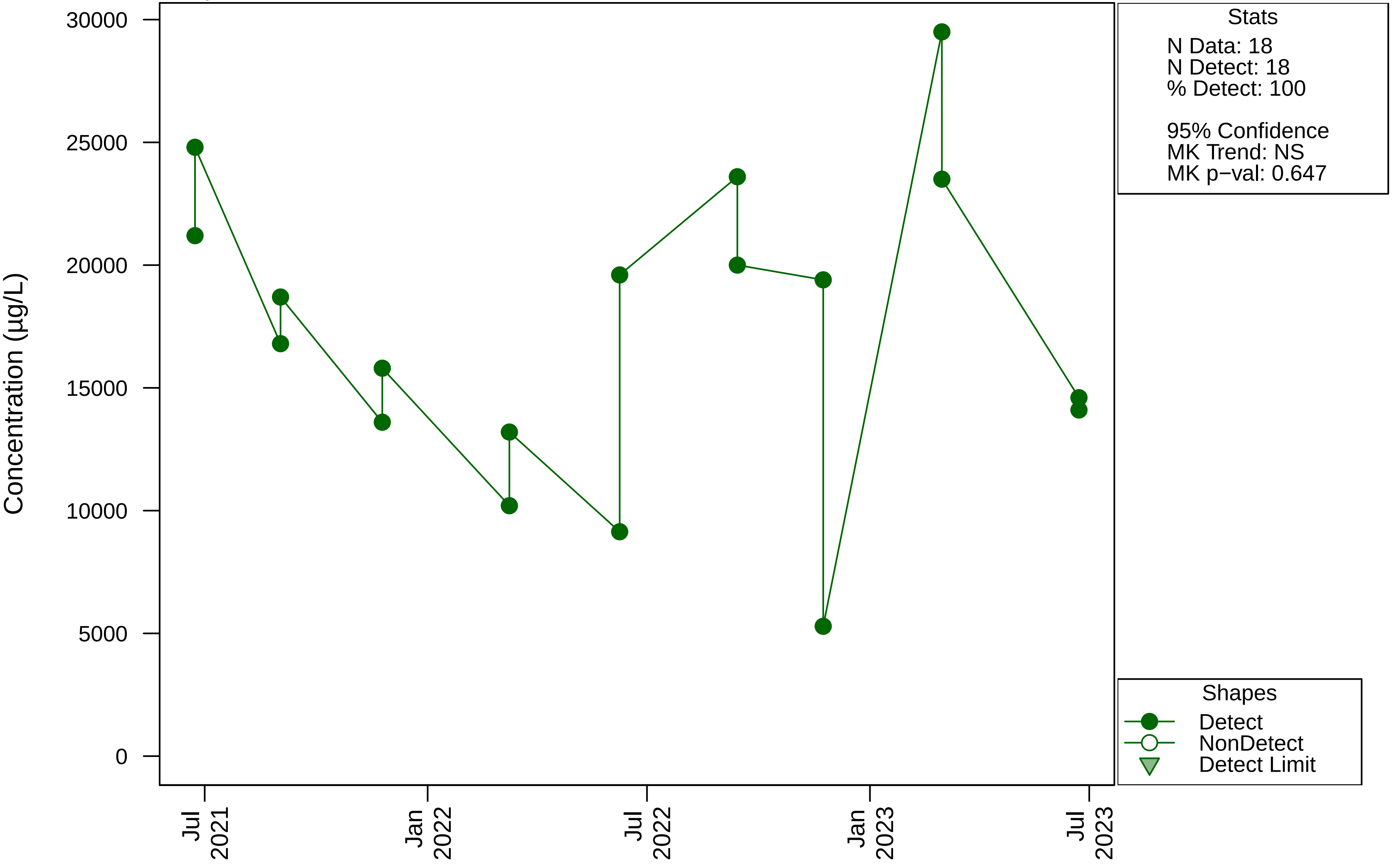
Scatterplots and Trend Analysis
D17, Chloride
Concentration (mg/L)
0
50
100
150
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D17, Chromium
Concentration (µg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 2
% Detect: 22
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

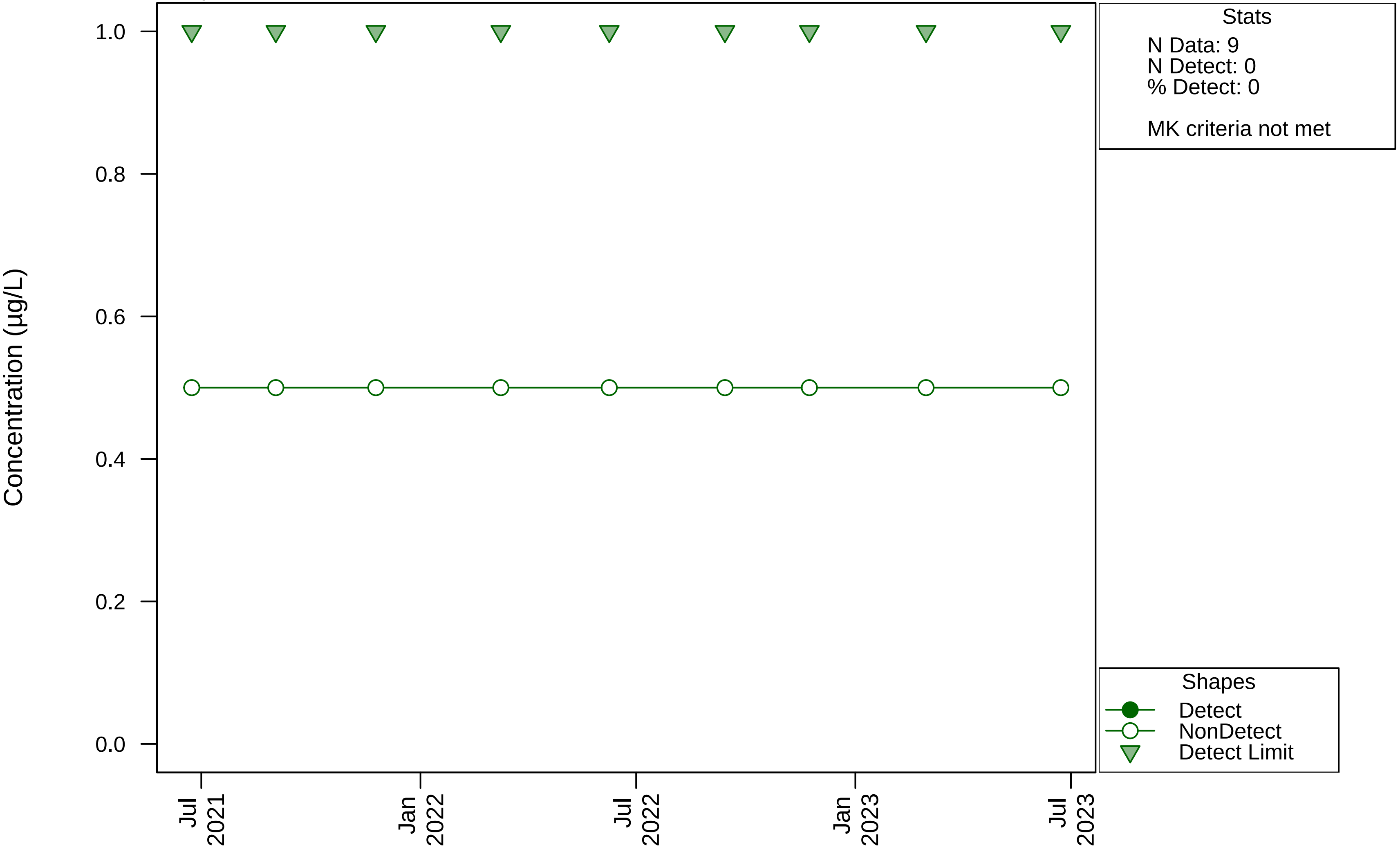

Scatterplots and Trend Analysis
D17, Electrical Conductivity (Field)
Concentration (uS/cm)
0
500
1000
1500
2000
2500
3000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00116
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

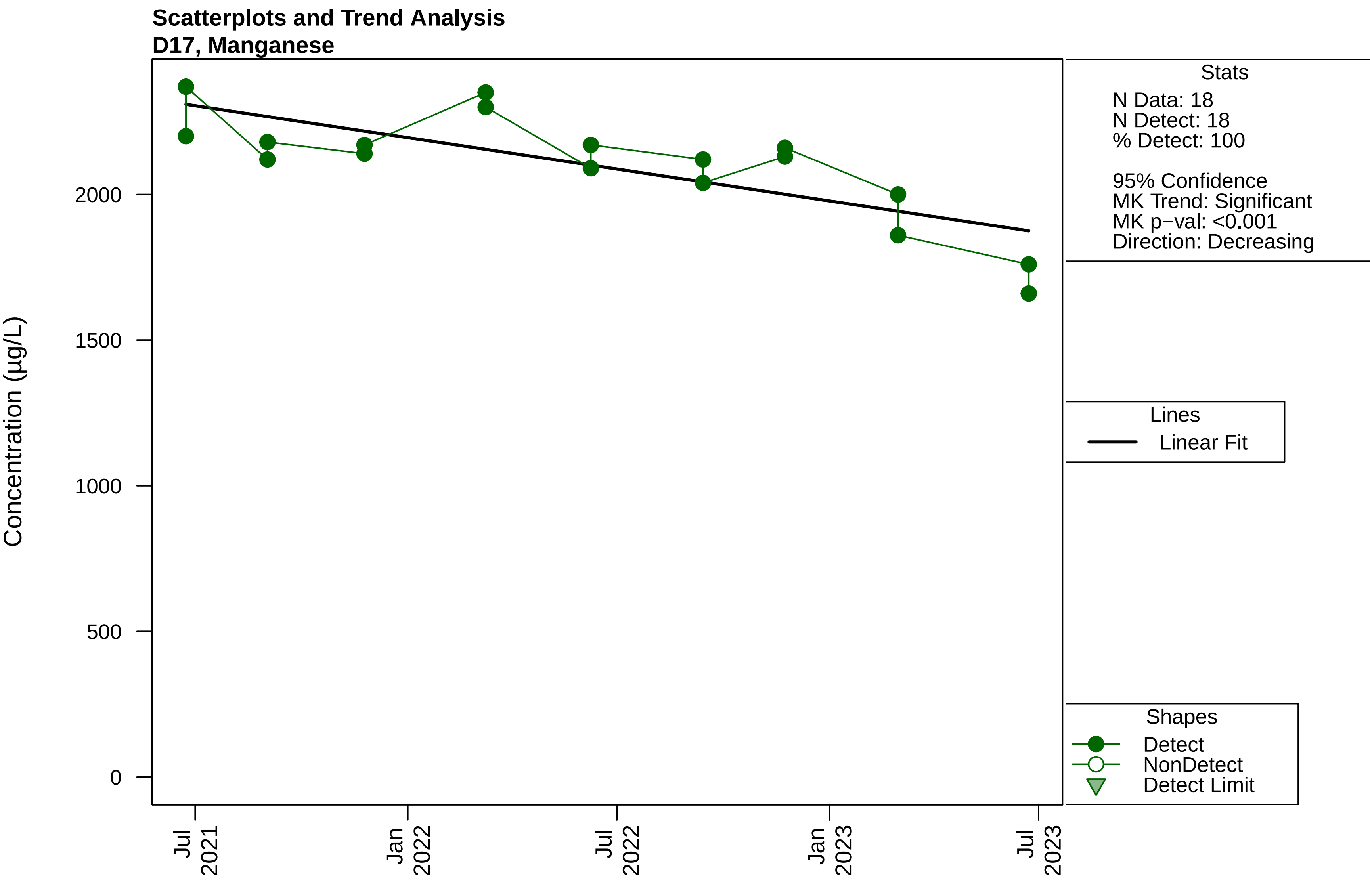

Scatterplots and Trend Analysis
D17, Fluoride
Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D17, Iron

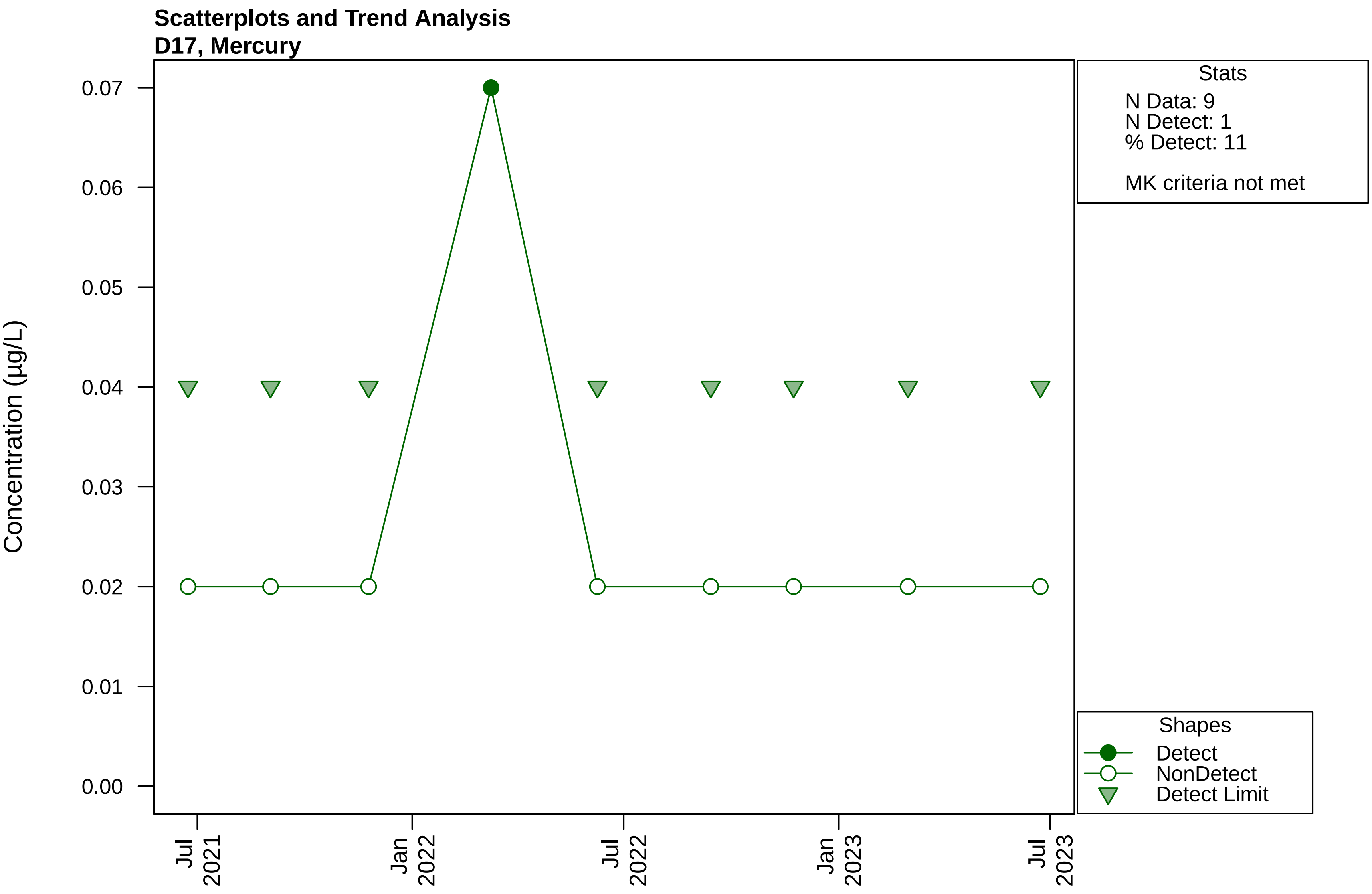


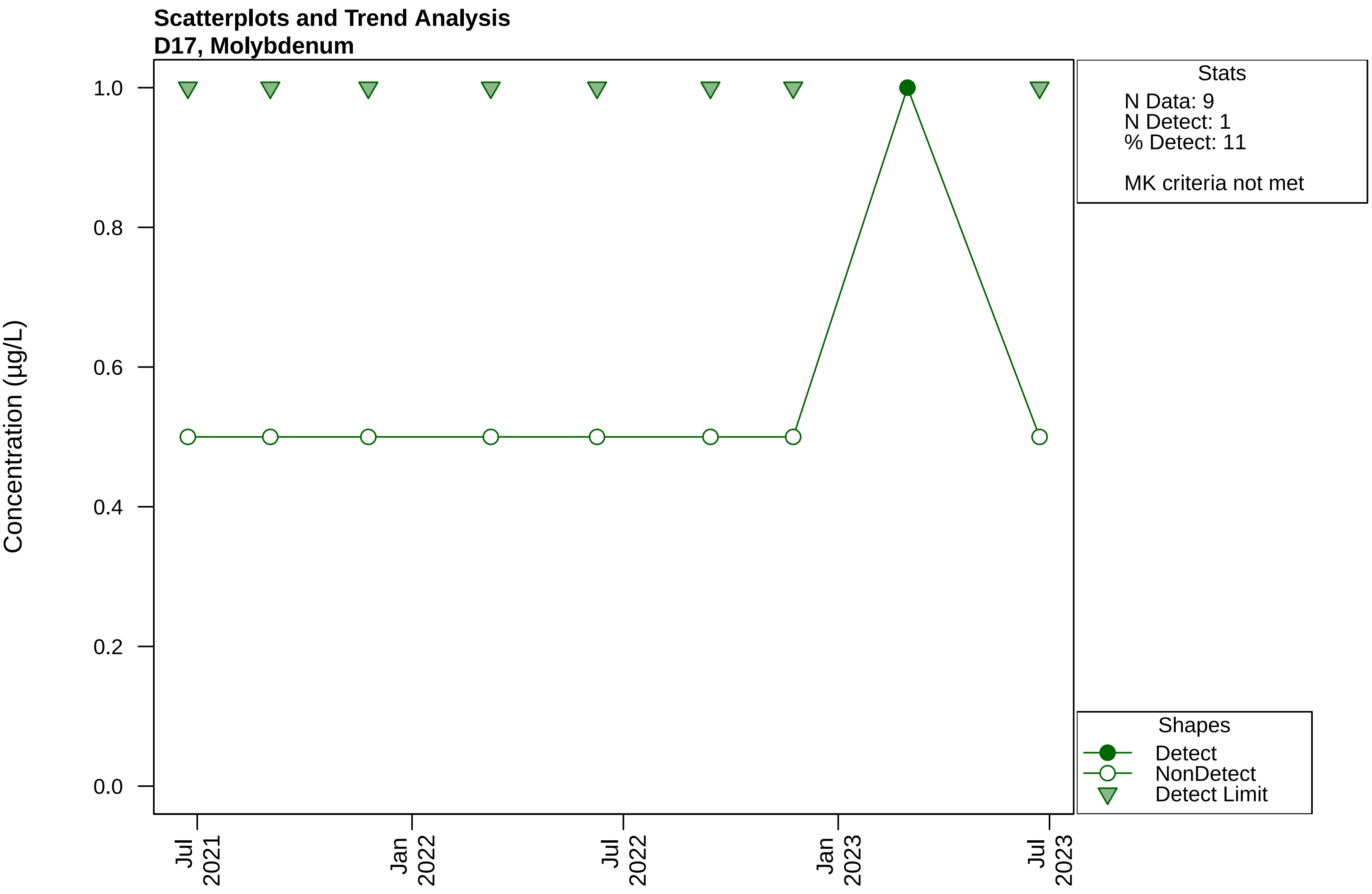
Scatterplots and Trend Analysis
D17, Lead



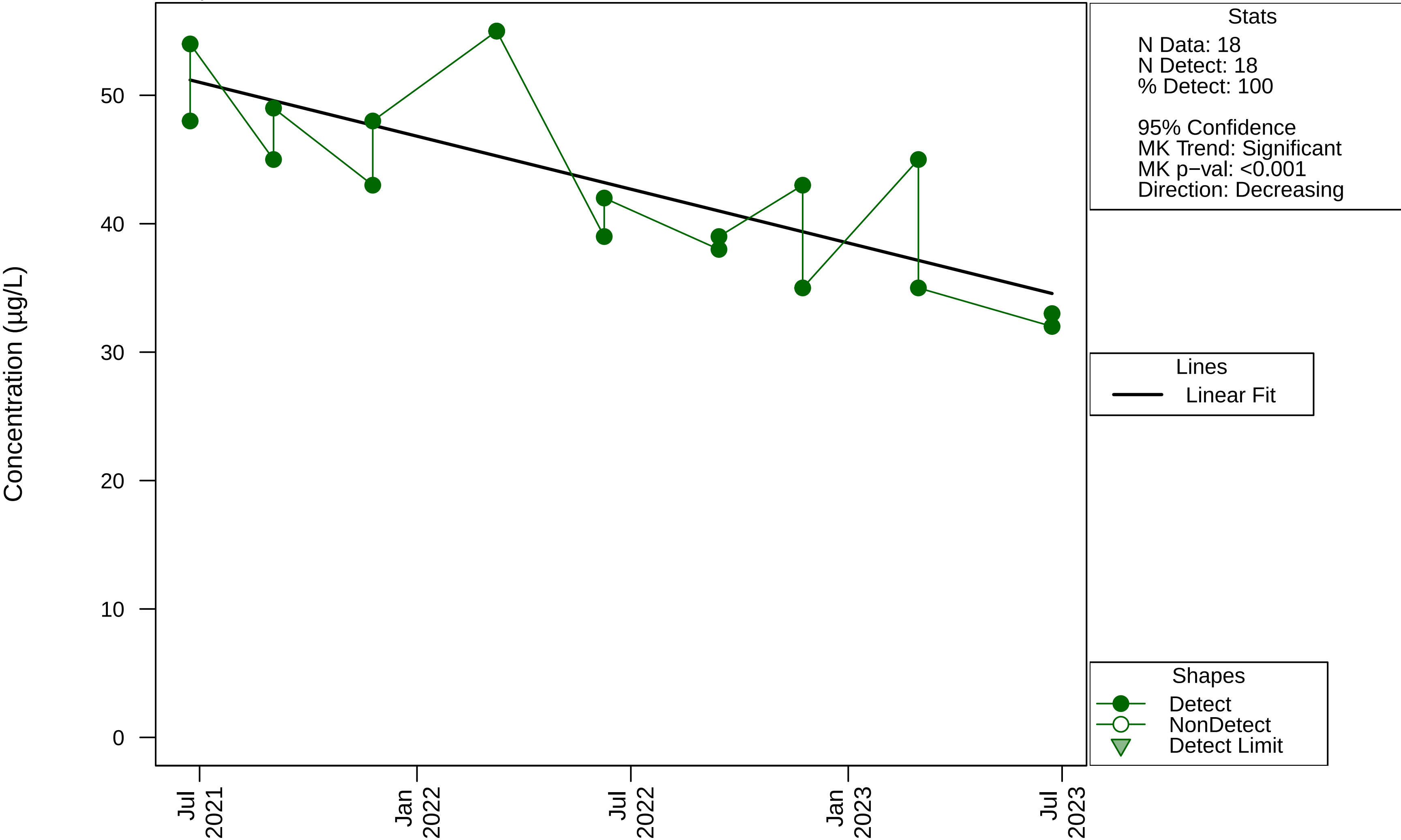


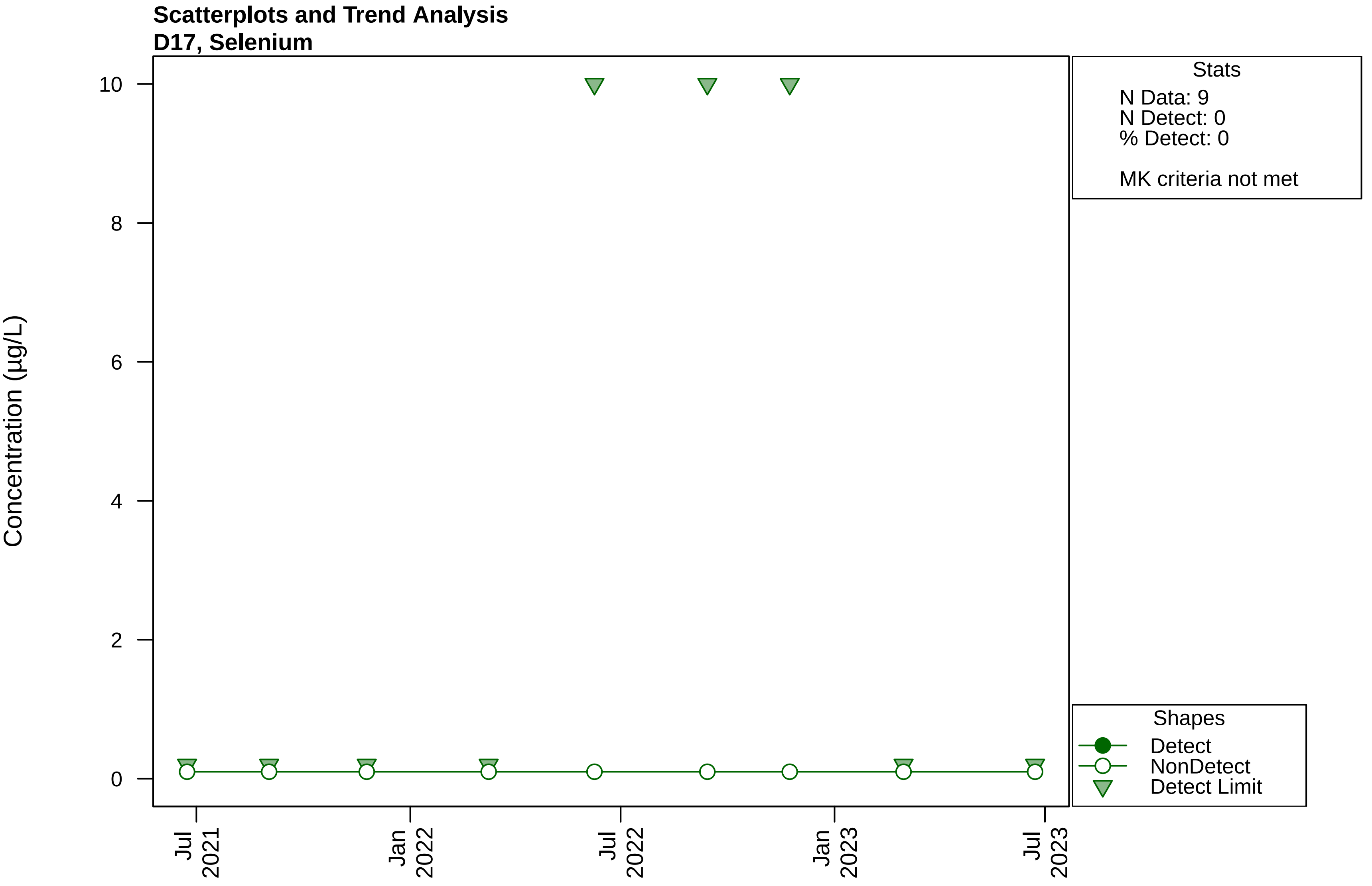
Scatterplots and Trend Analysis
D17, Manganese
Concentration (µg/L)
0
500
1000
1500
2000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D17, Mercury
Concentration (µg/L)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

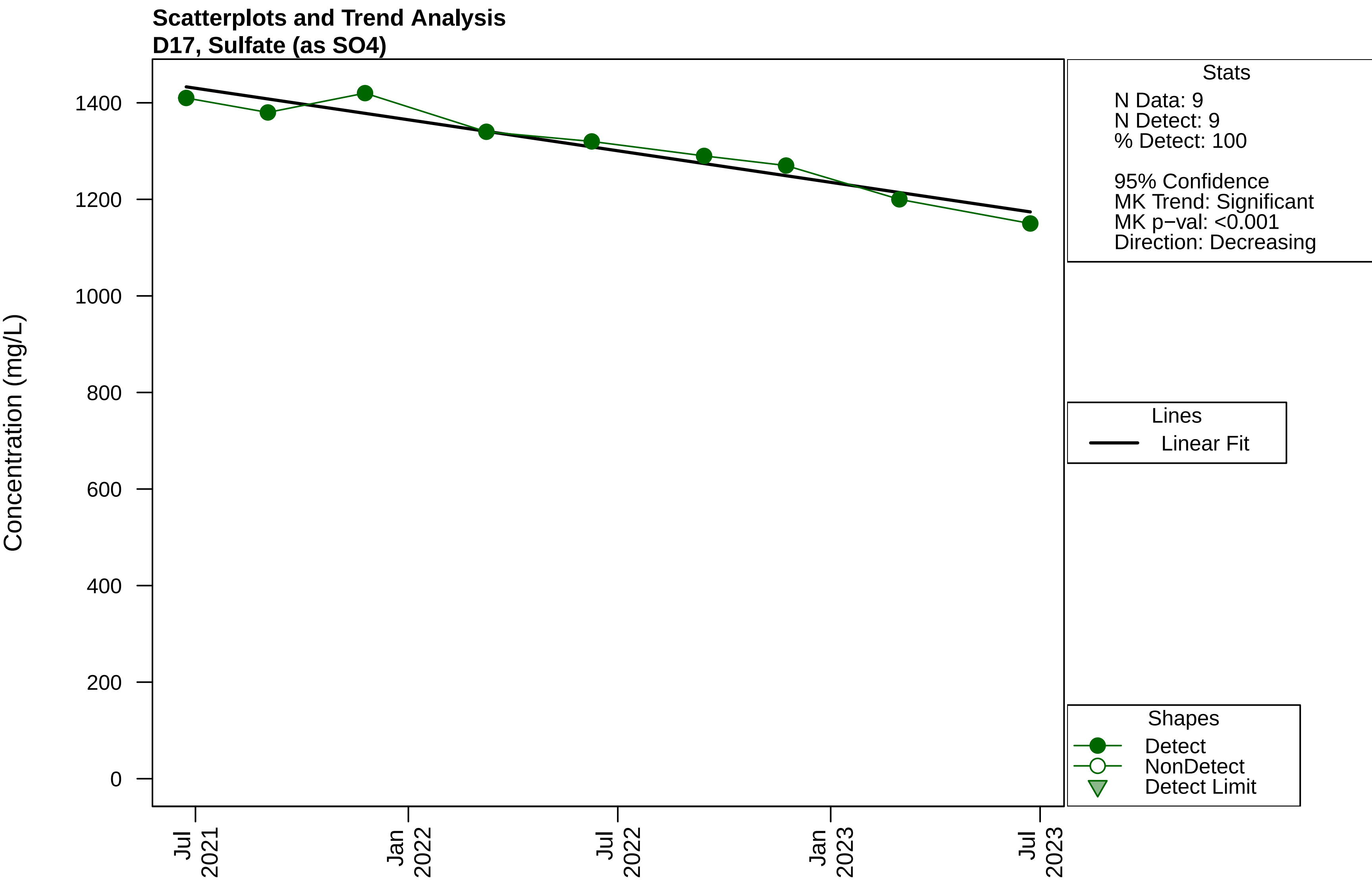

Scatterplots and Trend Analysis
D17, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D17, Nickel

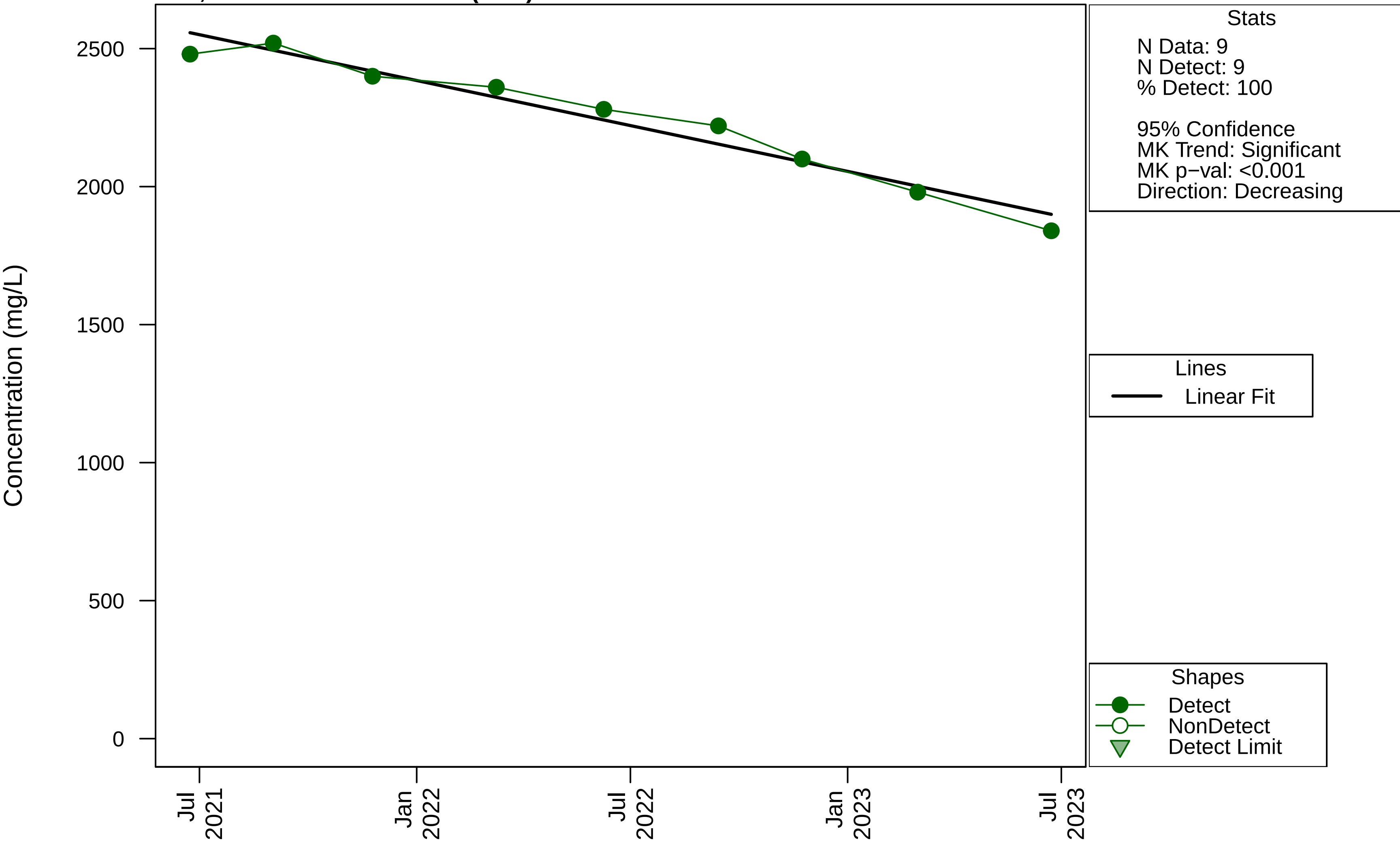


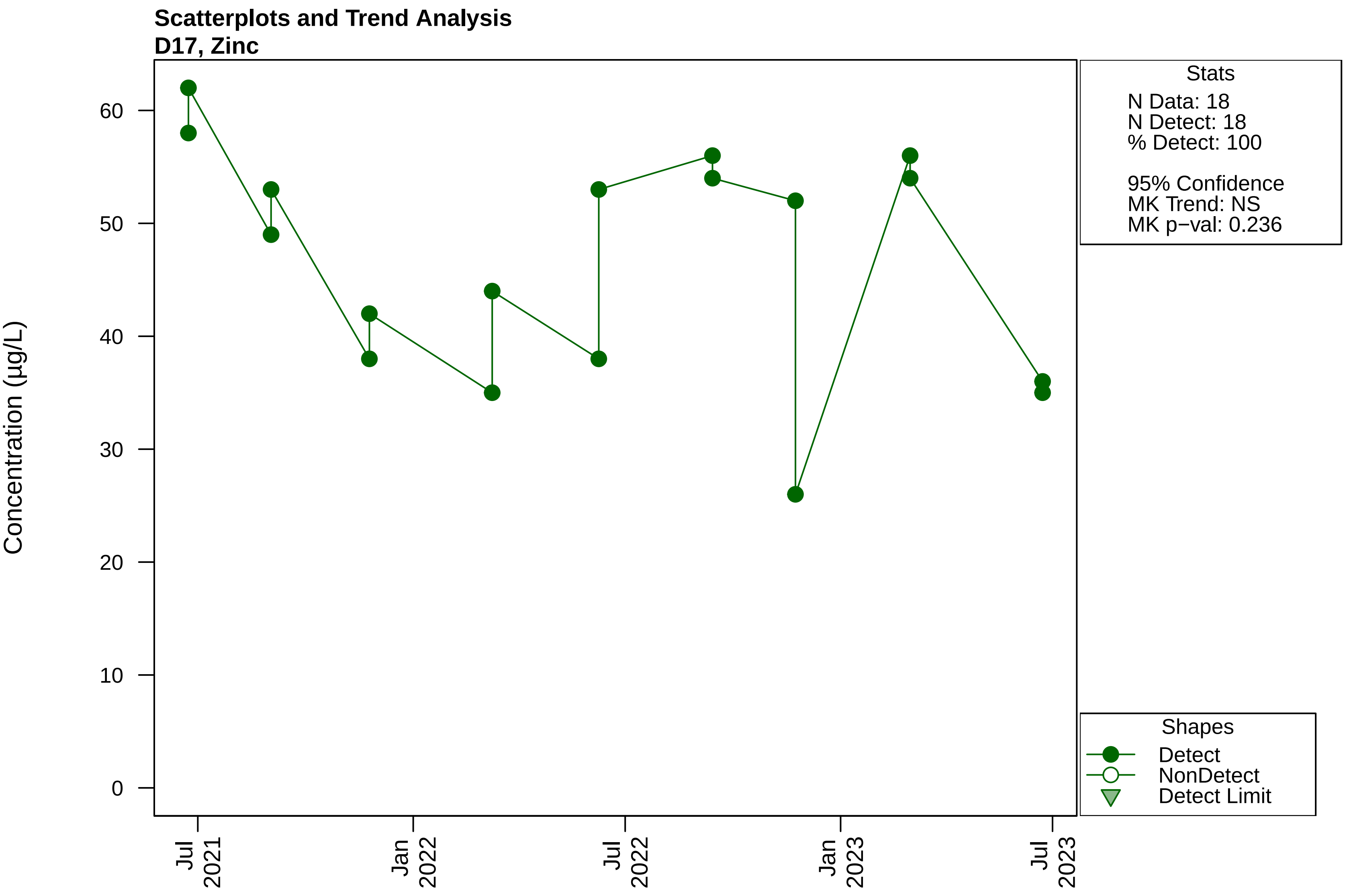


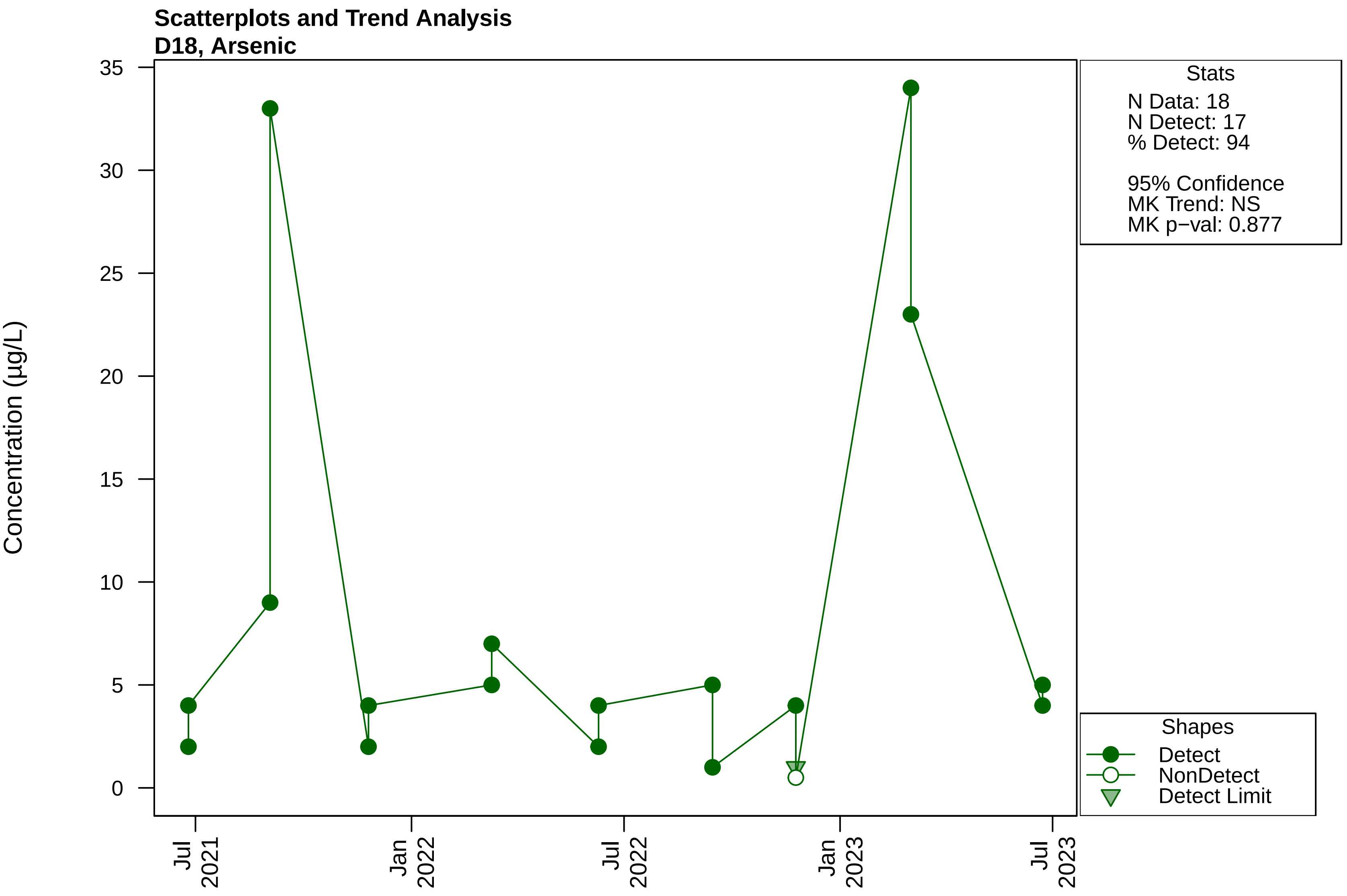
Scatterplots and Trend Analysis
D17, Selenium
Concentration (µg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D17, Sulfate (as SO4)
Concentration (mg/L)
0
200
400
600
800
1000
1200
1400
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D17, Total Dissolved Solids (TDS)

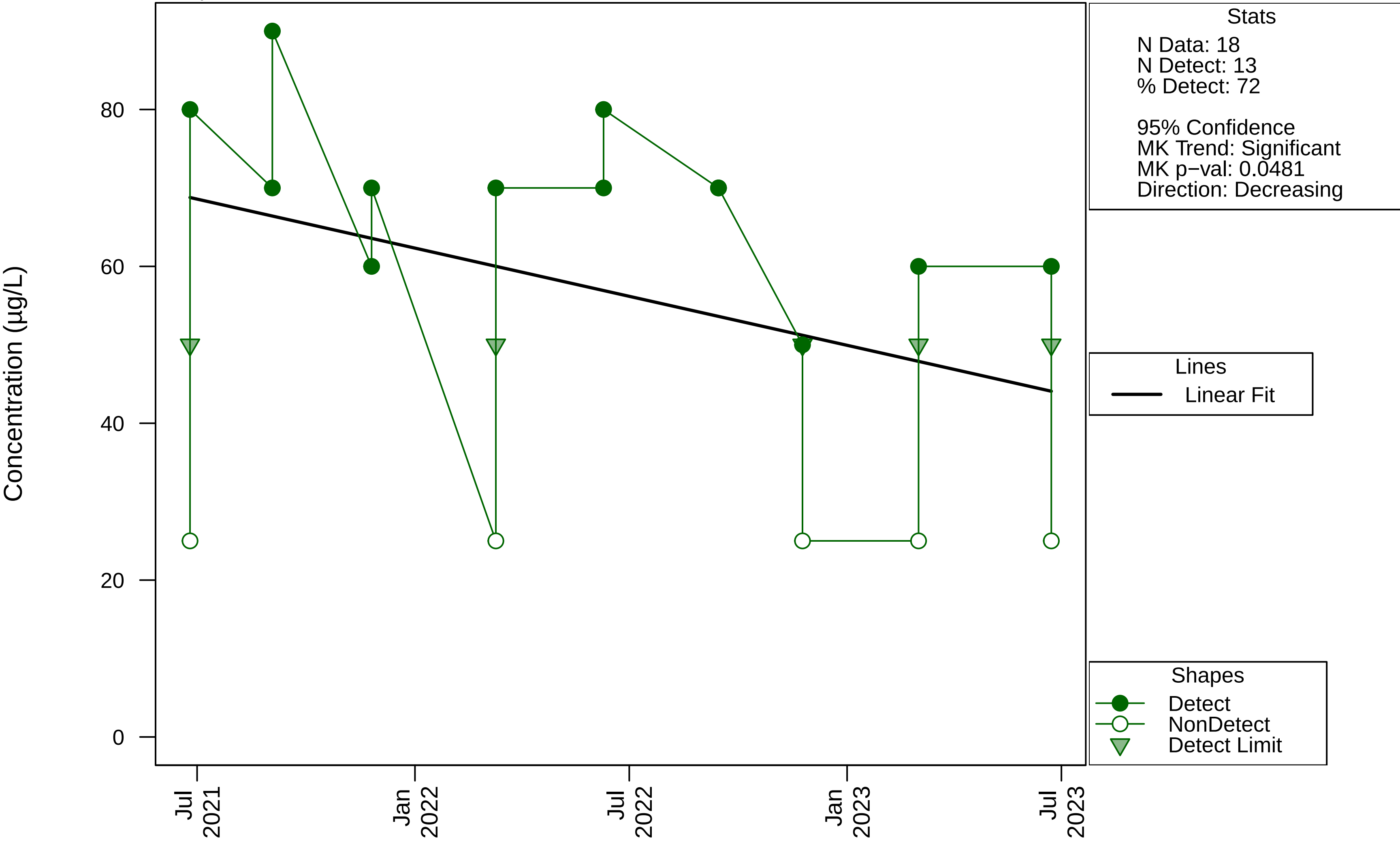



Scatterplots and Trend Analysis
D17, Zinc
Concentration (µg/L)
0
10
20
30
40
50
60
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.236
Shapes
Detect
NonDetect
Detect Limit

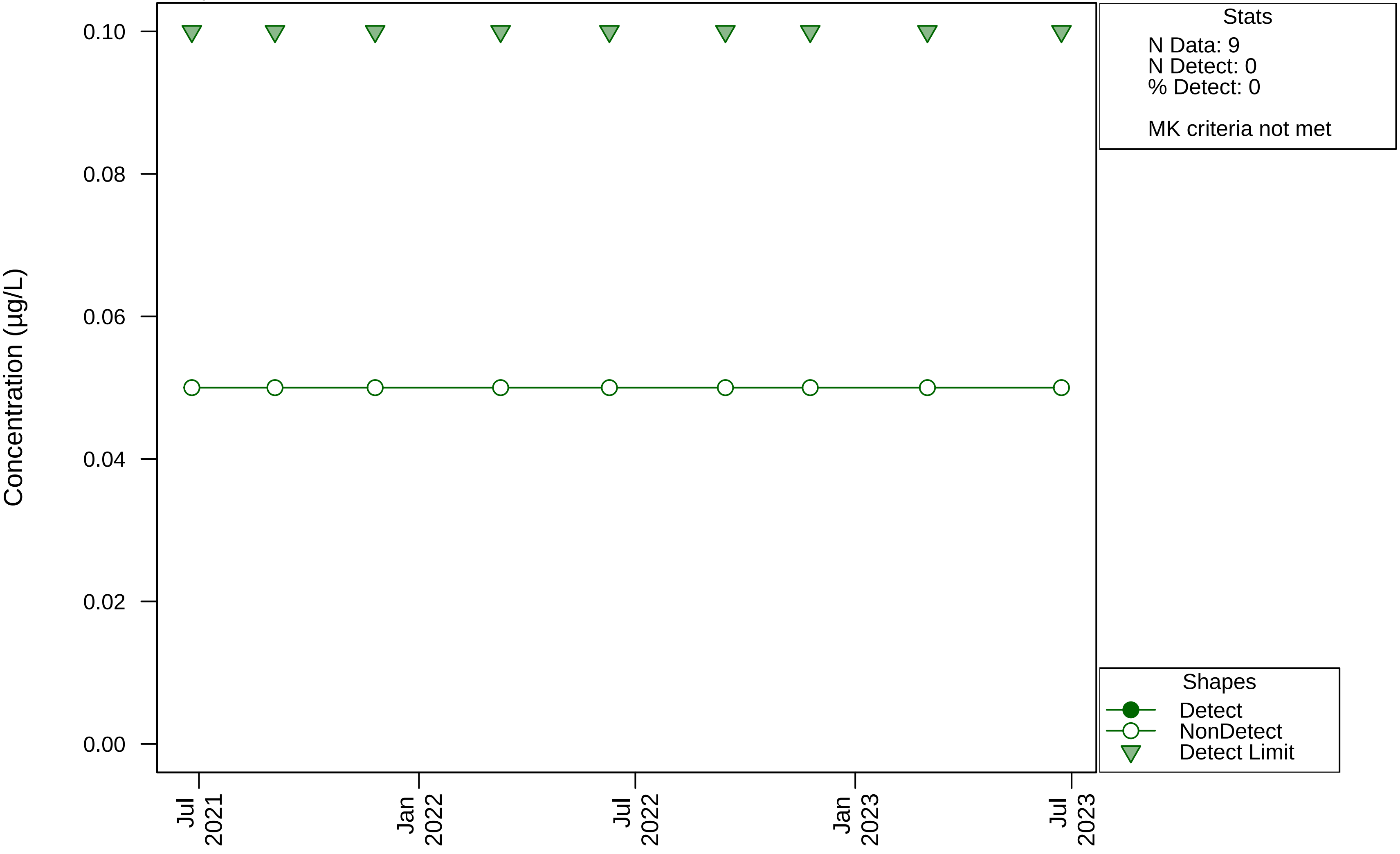


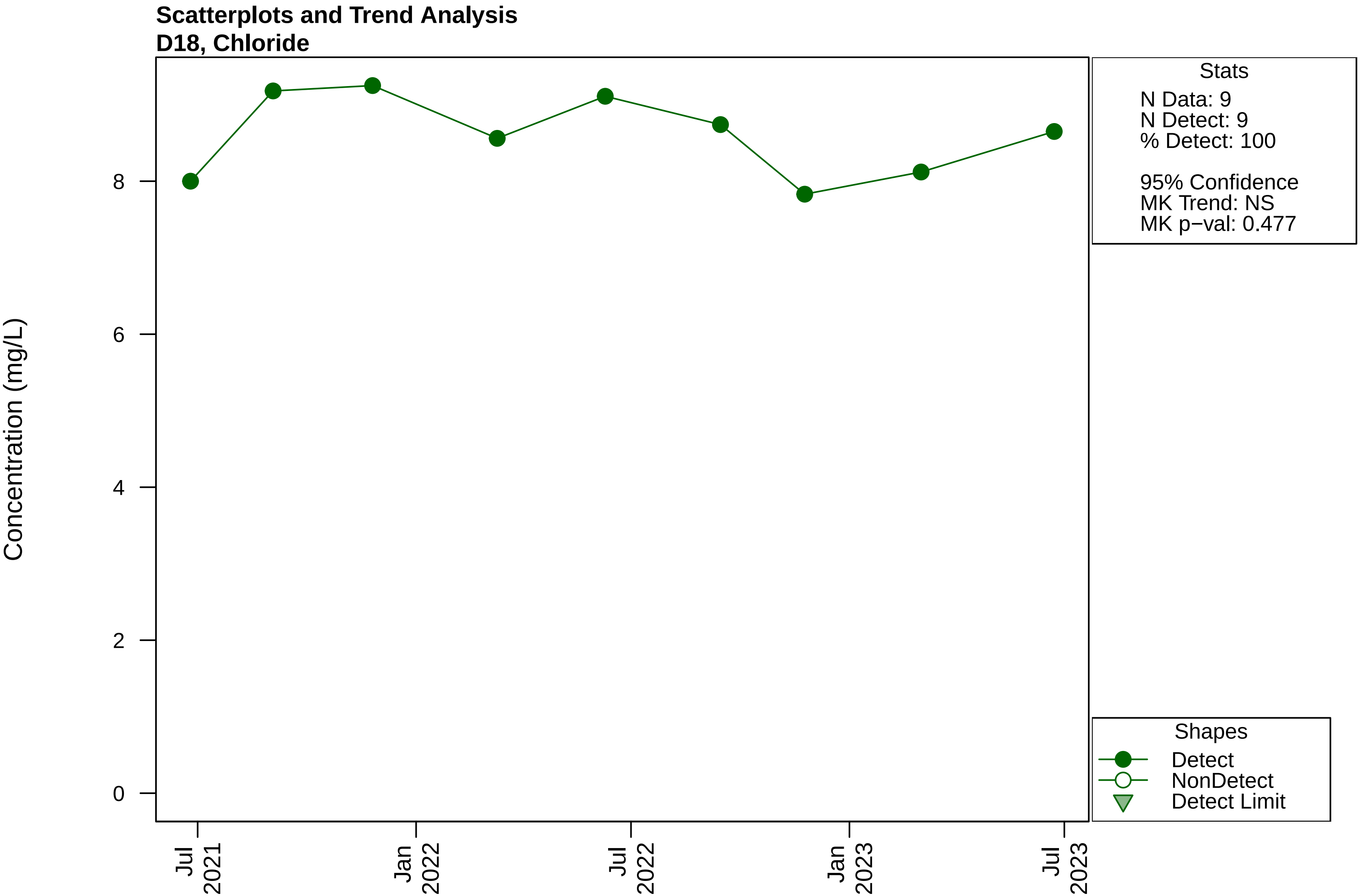
Scatterplots and Trend Analysis
D18, Arsenic
Concentration (µg/L)
35
30
25
20
15
10
5
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 17
% Detect: 94
95% Confidence
MK Trend: NS
MK p−val: 0.877
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D18, Boron



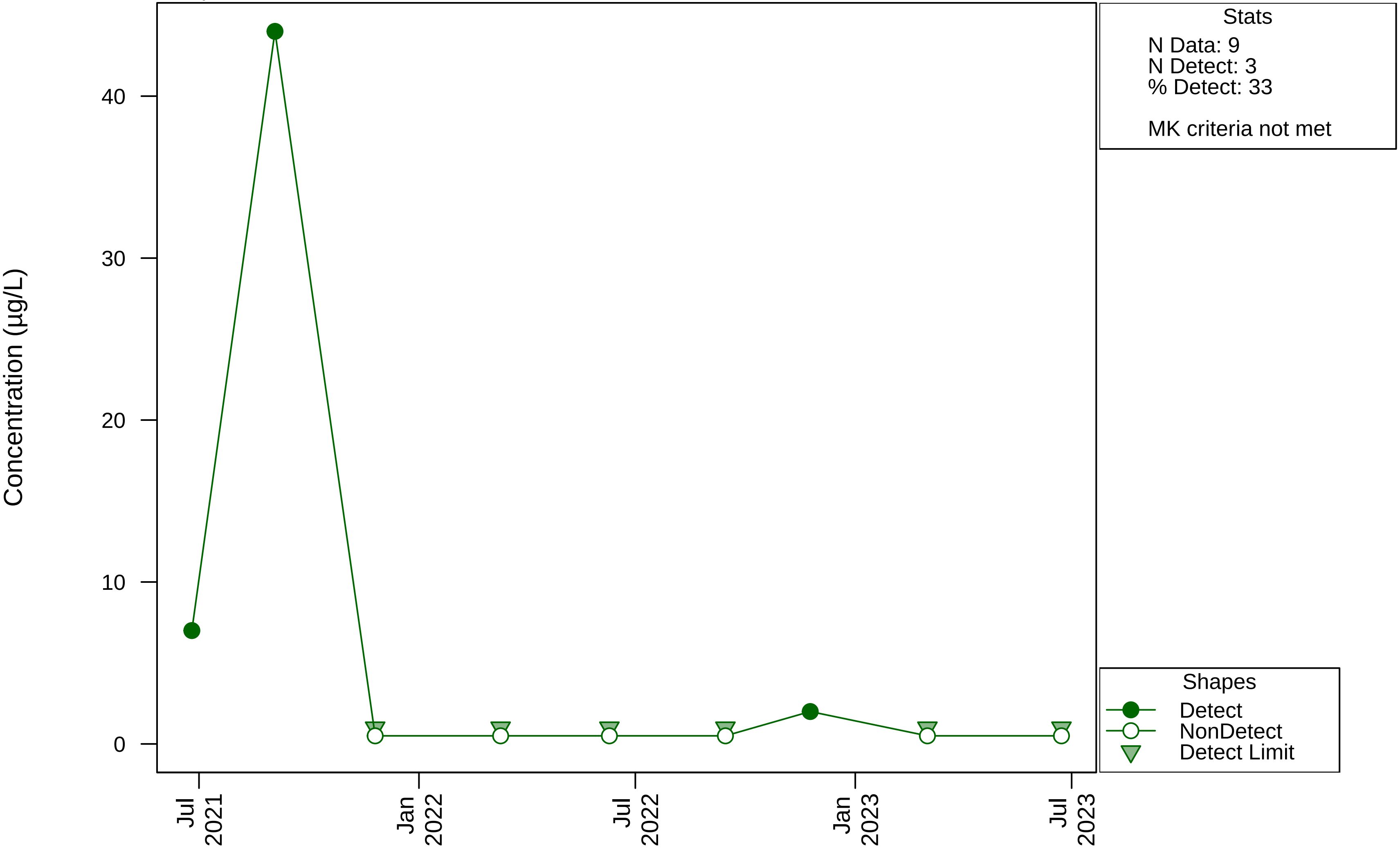
Scatterplots and Trend Analysis
D18, Cadmium

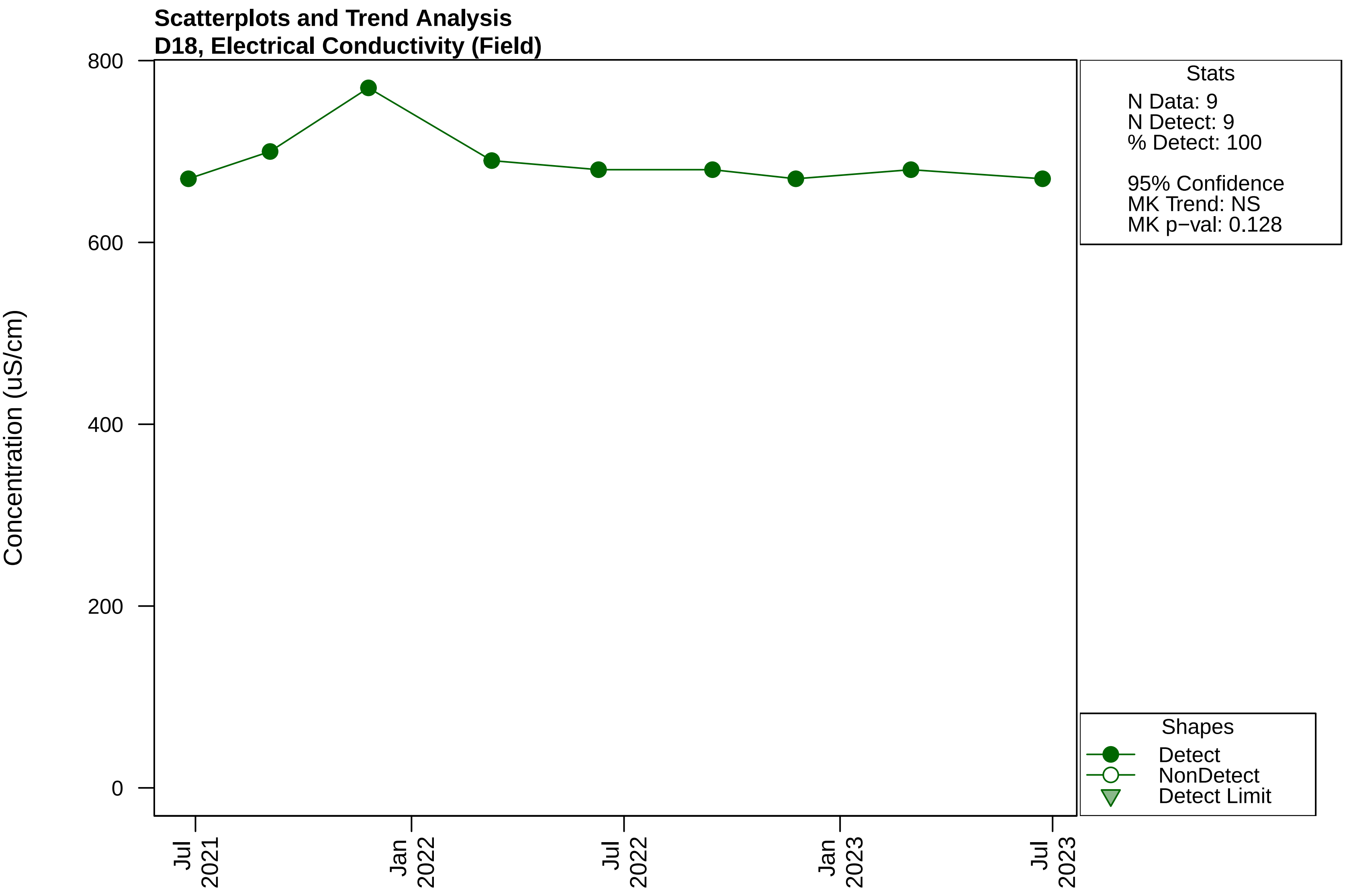




Scatterplots and Trend Analysis
D18, Chloride
Concentration (mg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.477
Shapes
Detect
NonDetect
Detect Limit

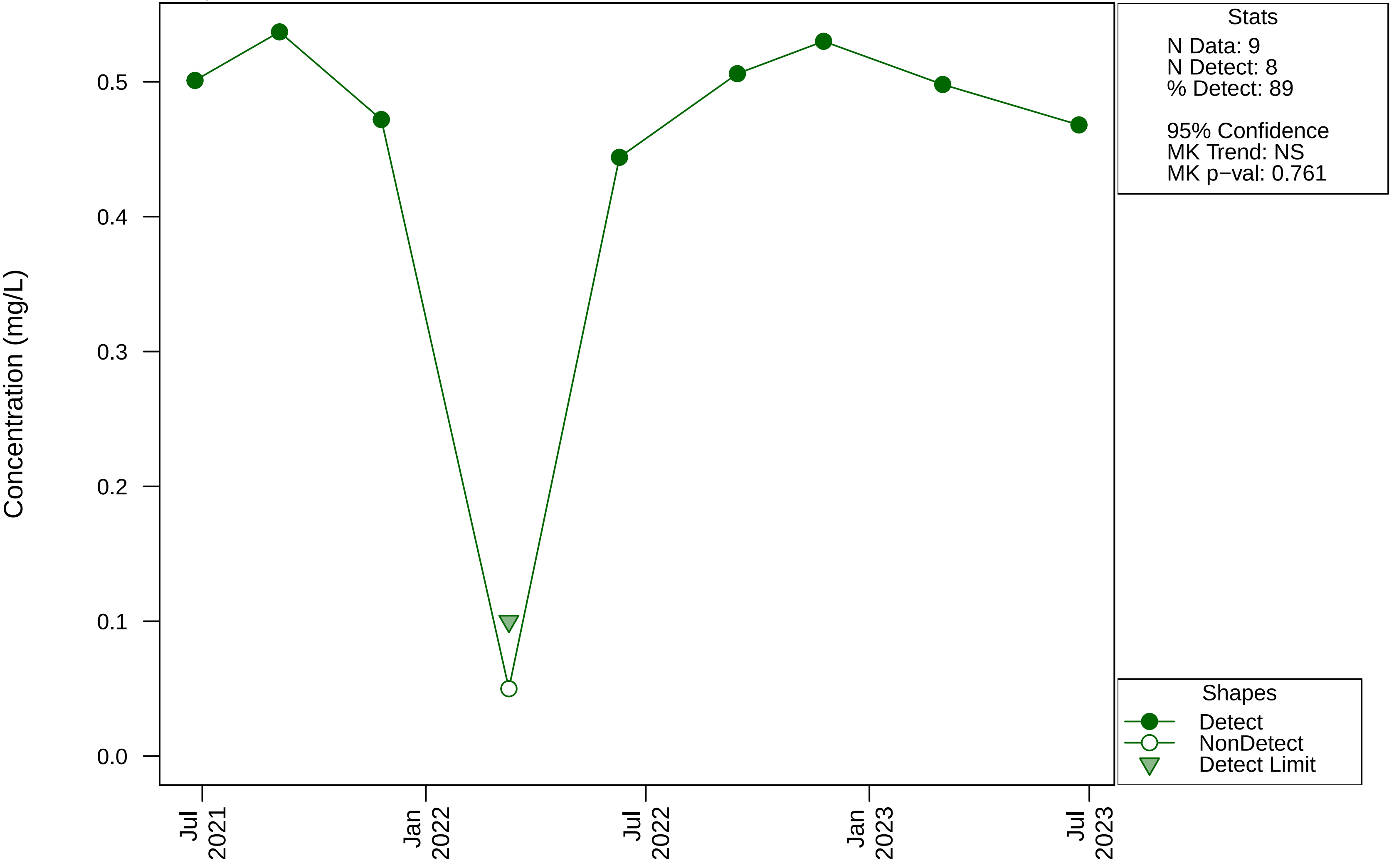
Scatterplots and Trend Analysis
D18, Chromium

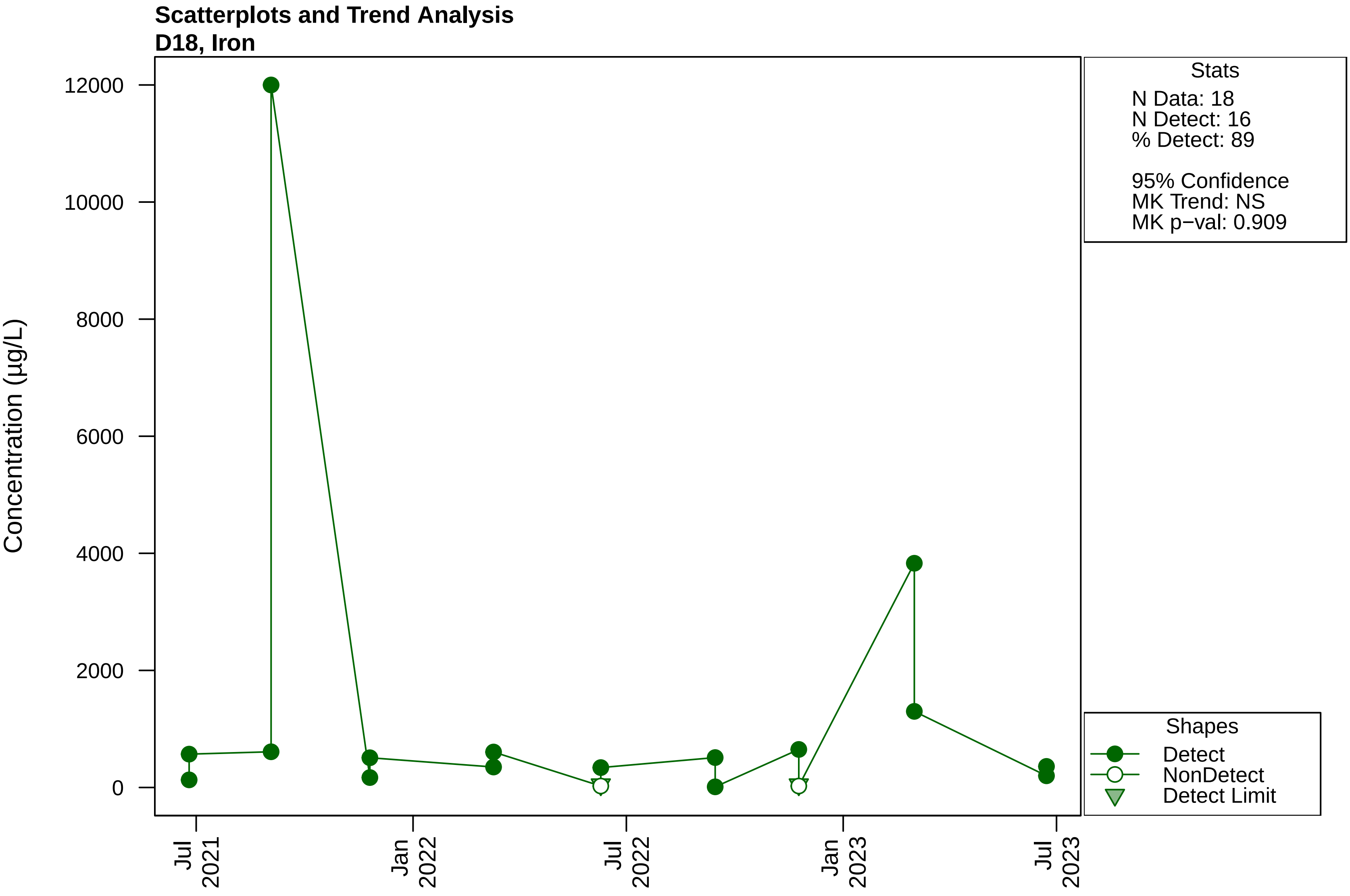




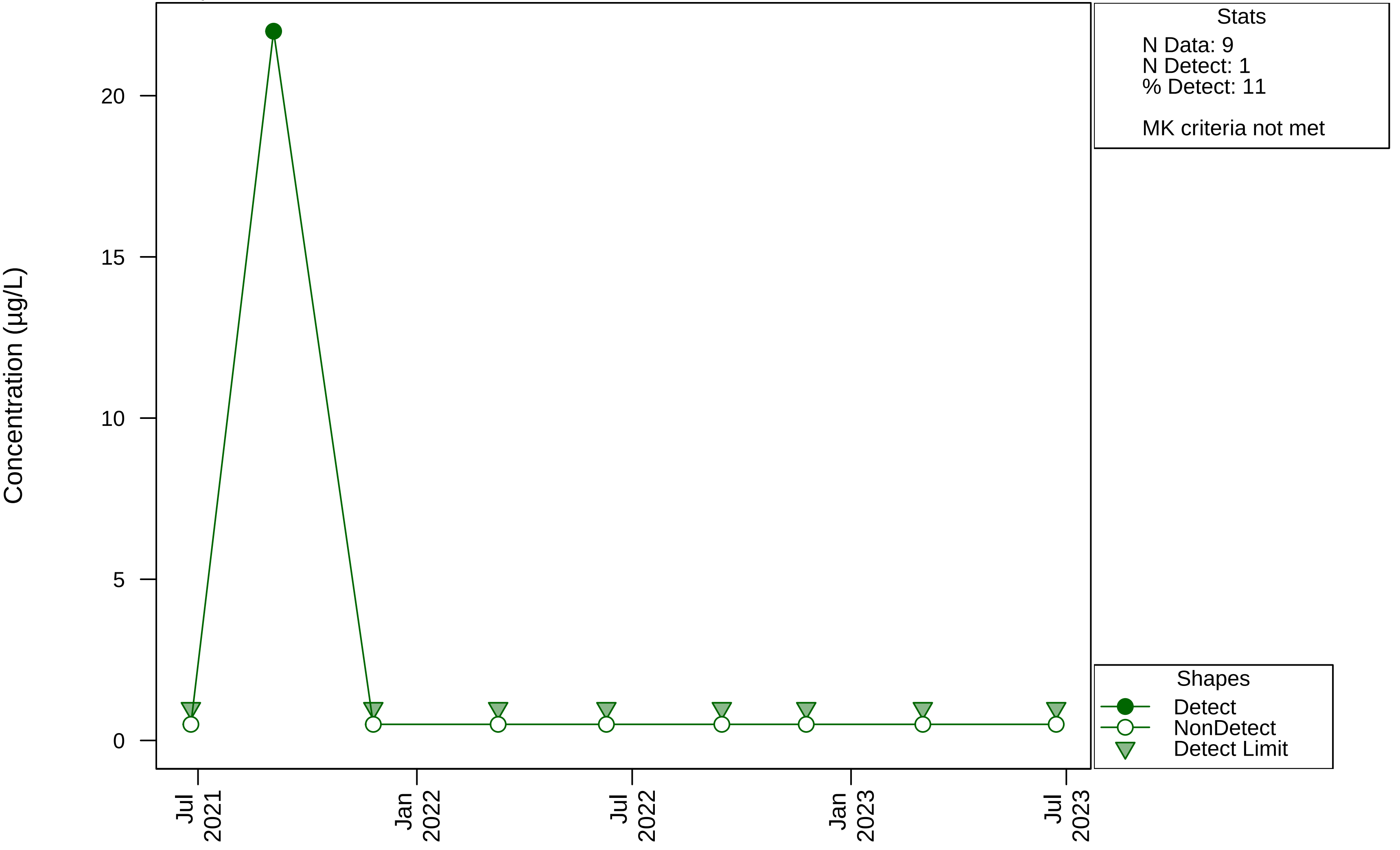
Scatterplots and Trend Analysis
D18, Electrical Conductivity (Field)
Concentration (uS/cm)
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.128
Shapes
Detect
NonDetect
Detect Limit

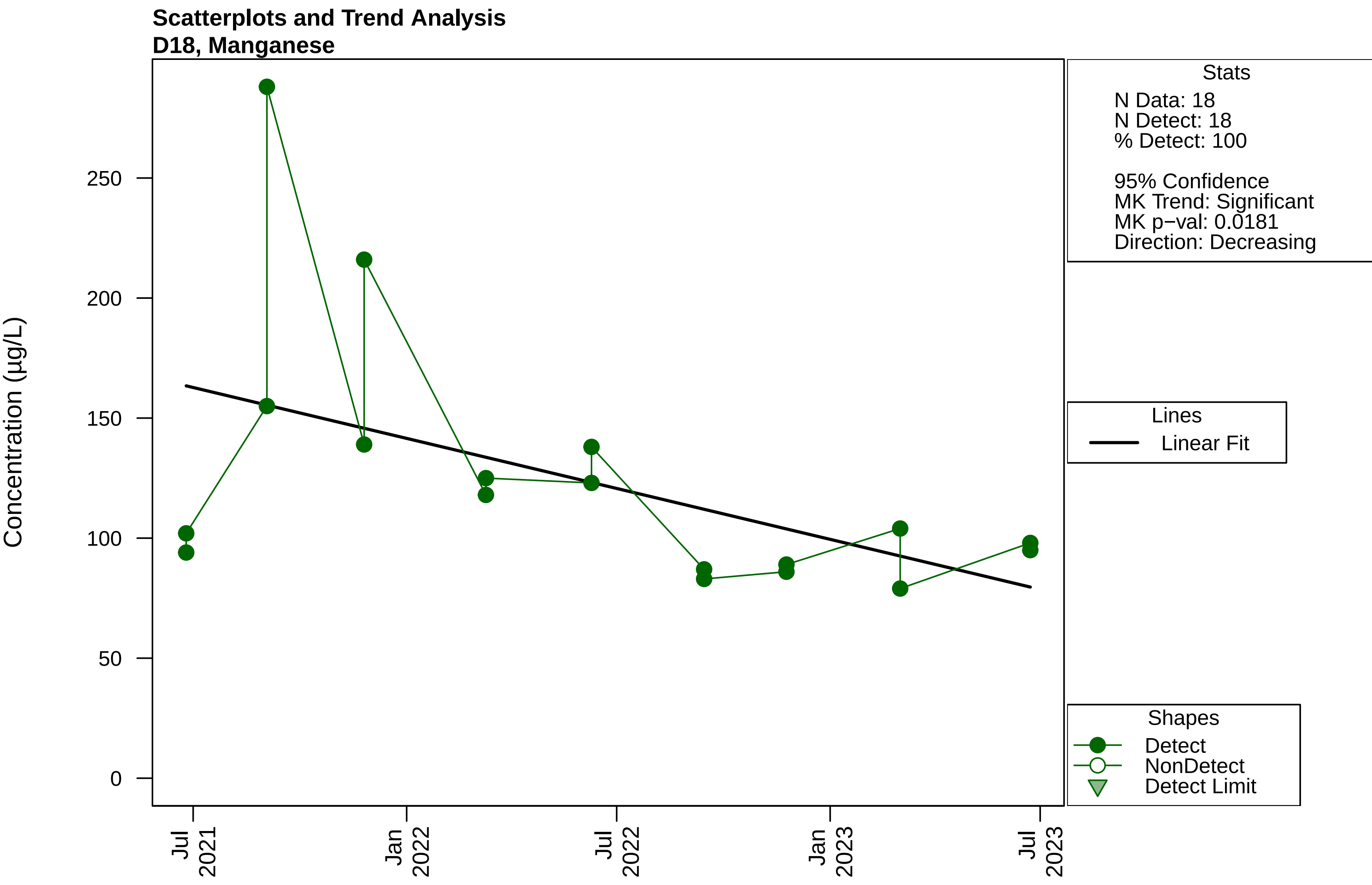
Scatterplots and Trend Analysis
D18, Fluoride

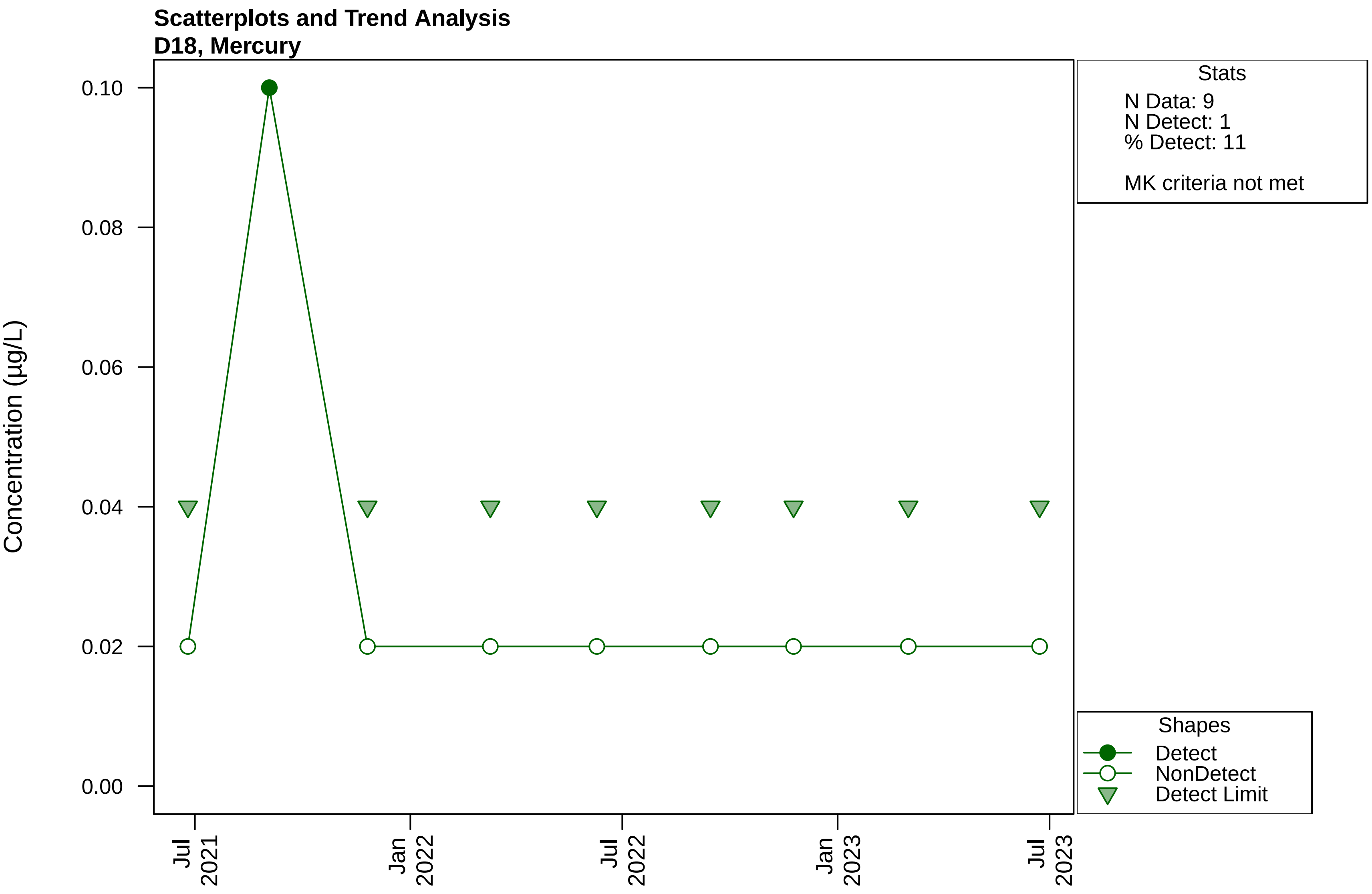


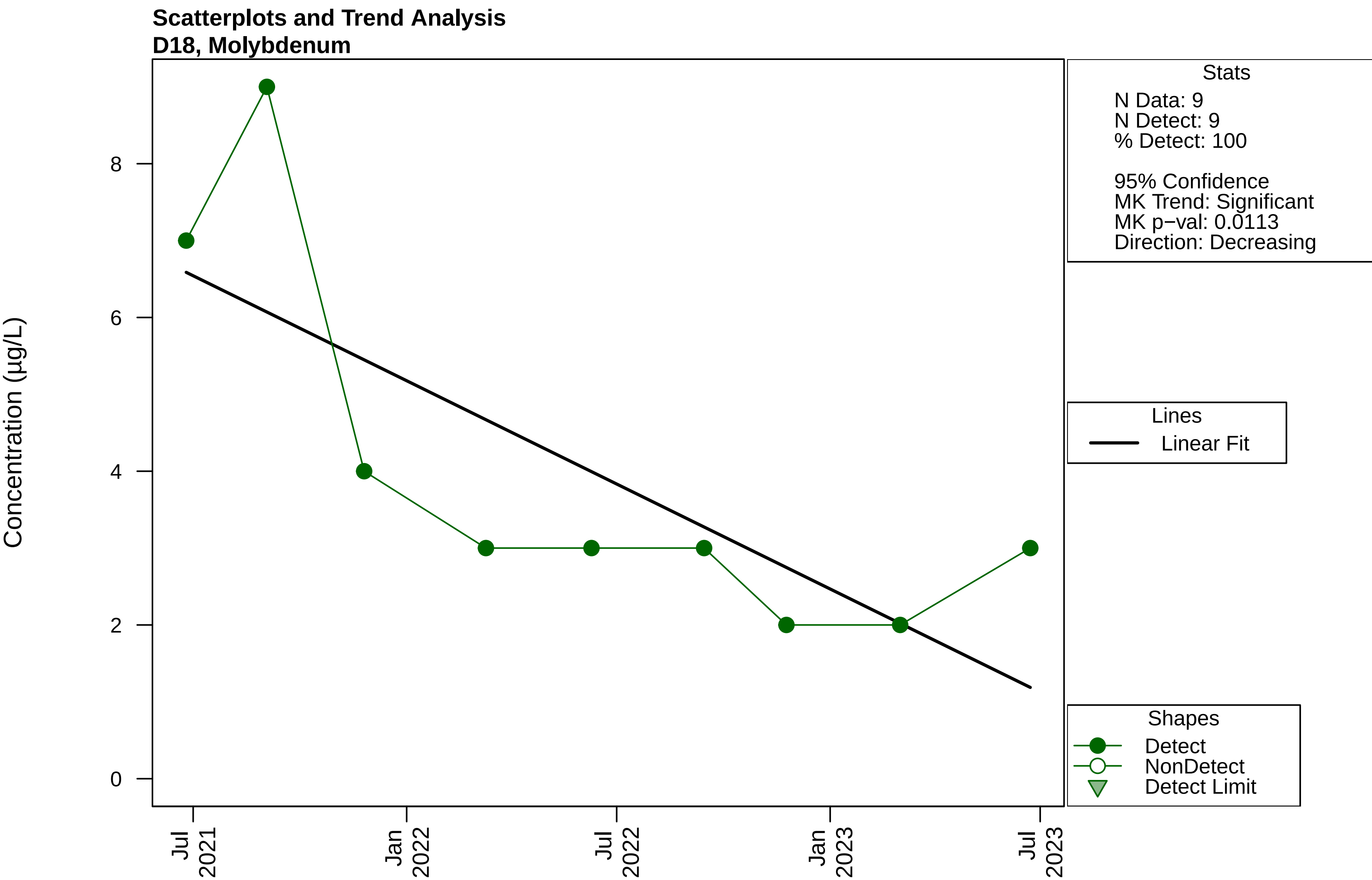

Scatterplots and Trend Analysis
D18, Iron
Concentration (µg/L)
12000
10000
8000
6000
4000
2000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 16
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.909
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D18, Lead

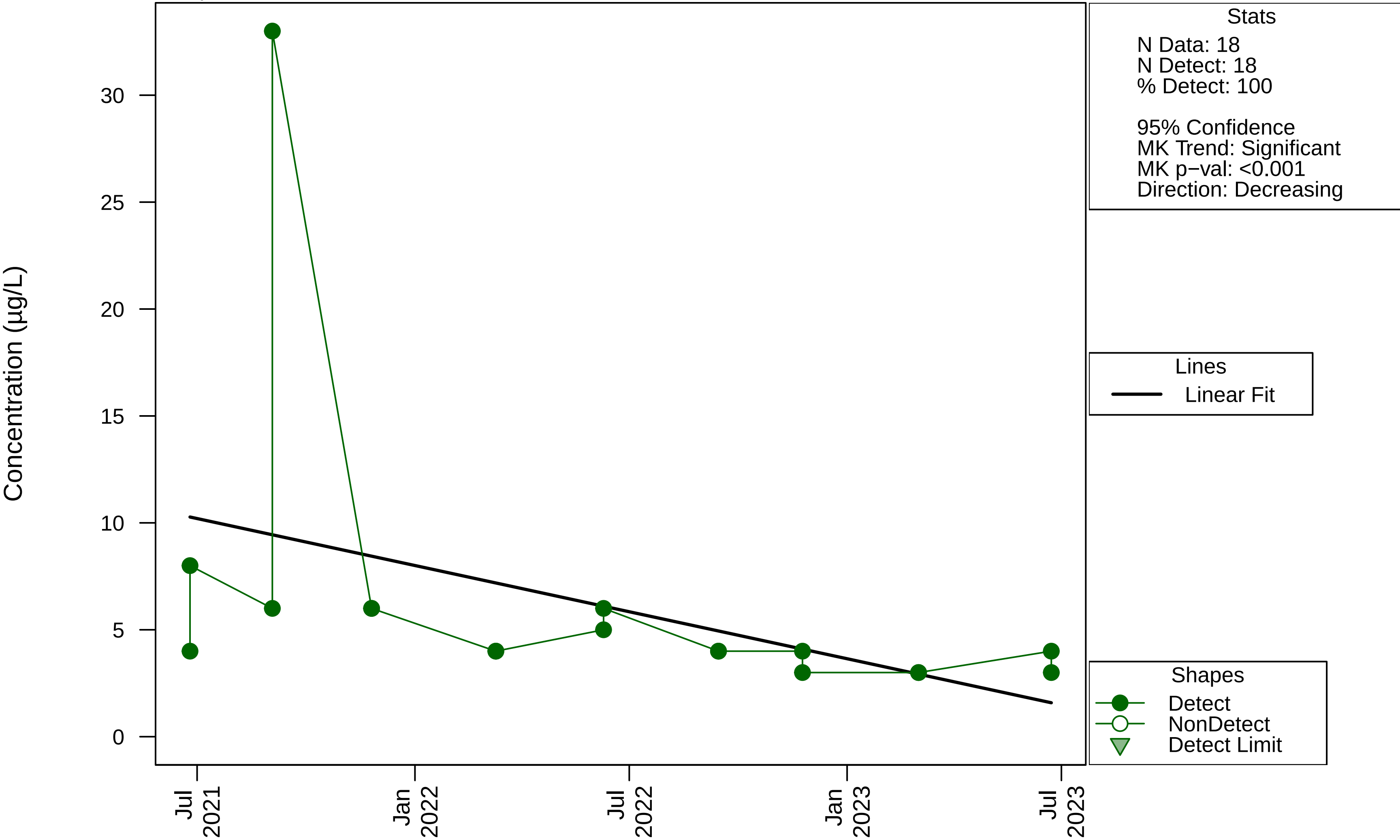


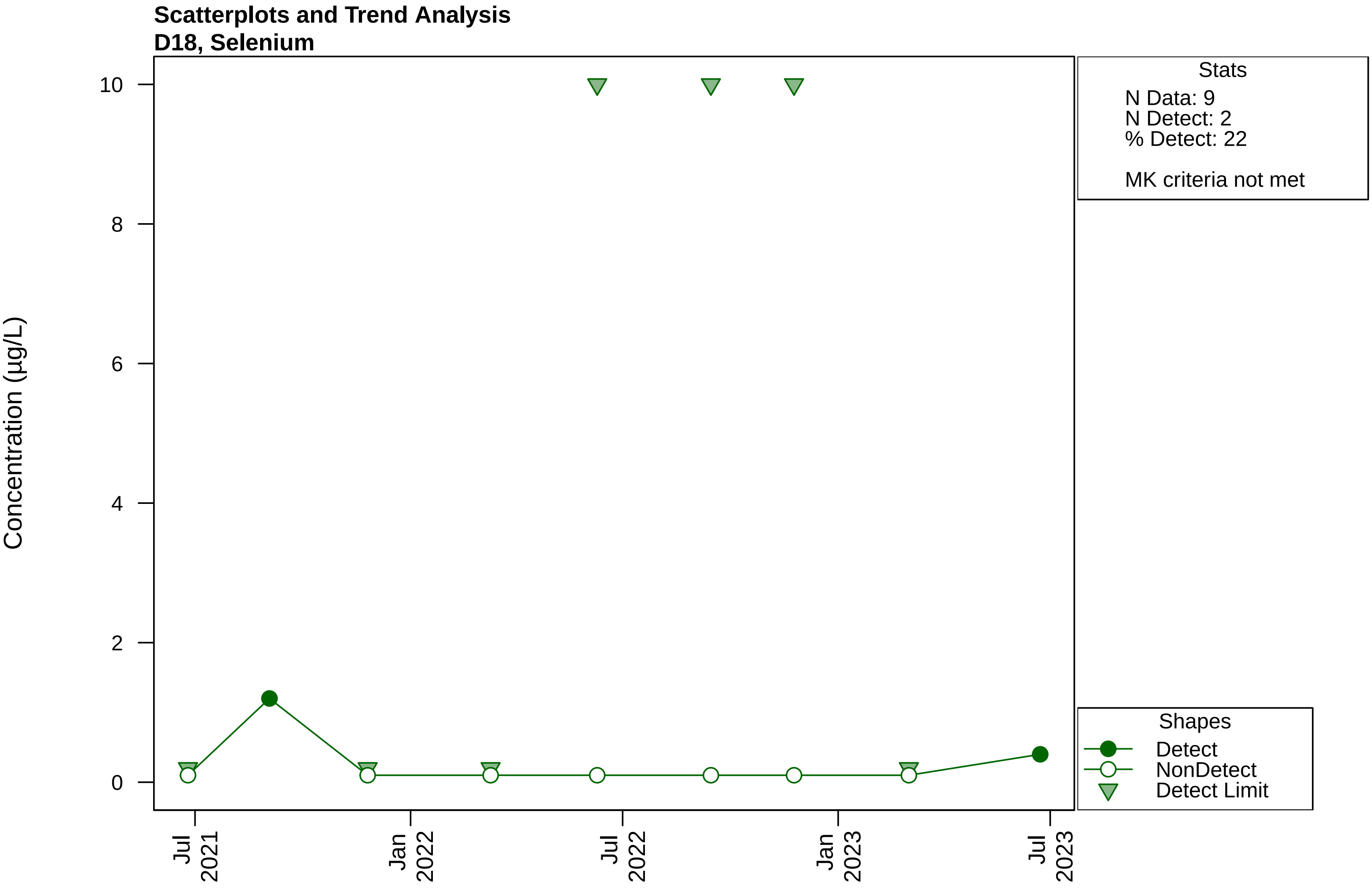

Scatterplots and Trend Analysis
D18, Manganese
Concentration (µg/L)
0
50
100
150
200
250
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0181
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

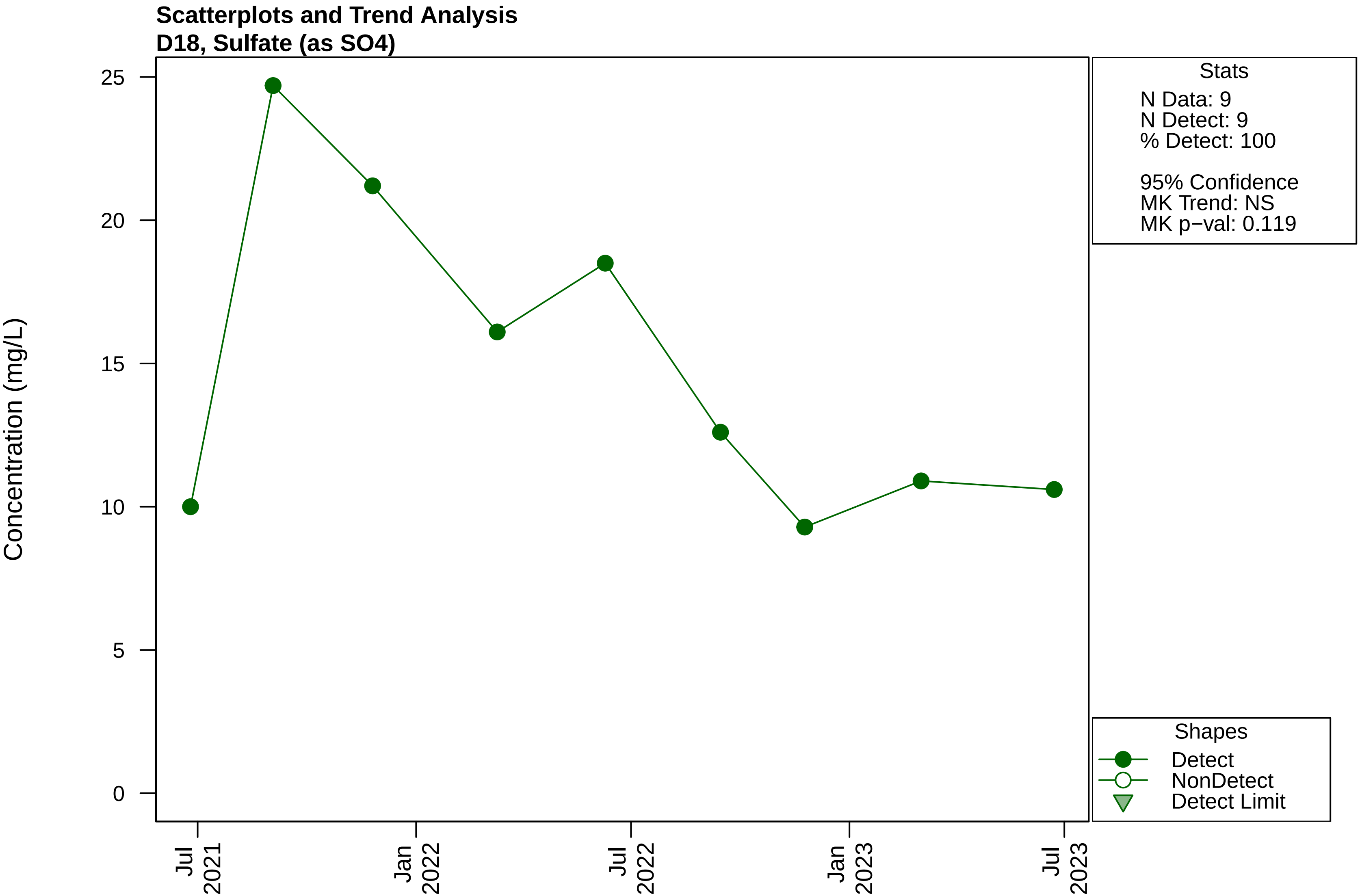

Scatterplots and Trend Analysis
D18, Mercury
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

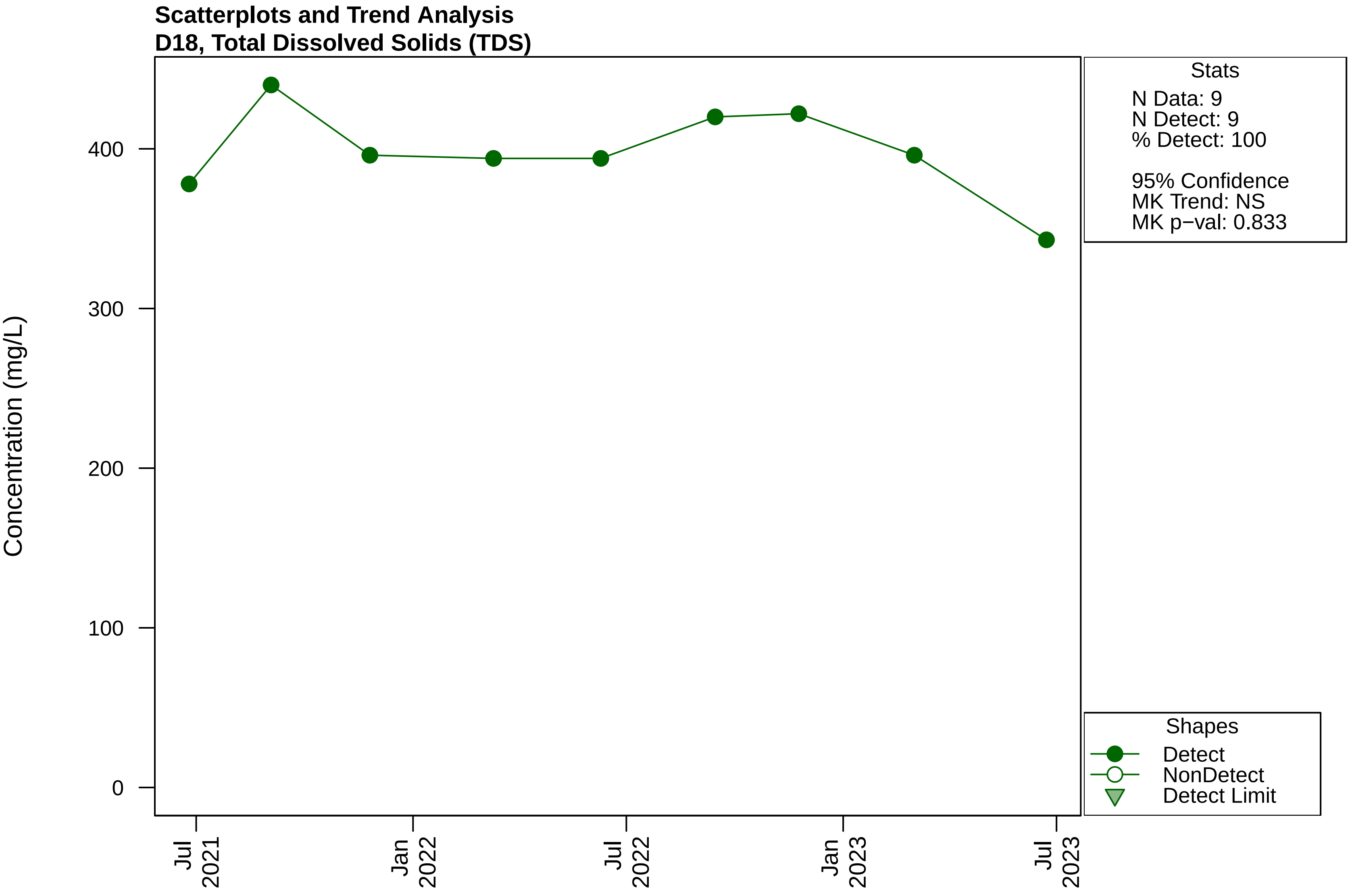

Scatterplots and Trend Analysis
D18, Molybdenum
Concentration (µg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0113
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D18, Nickel

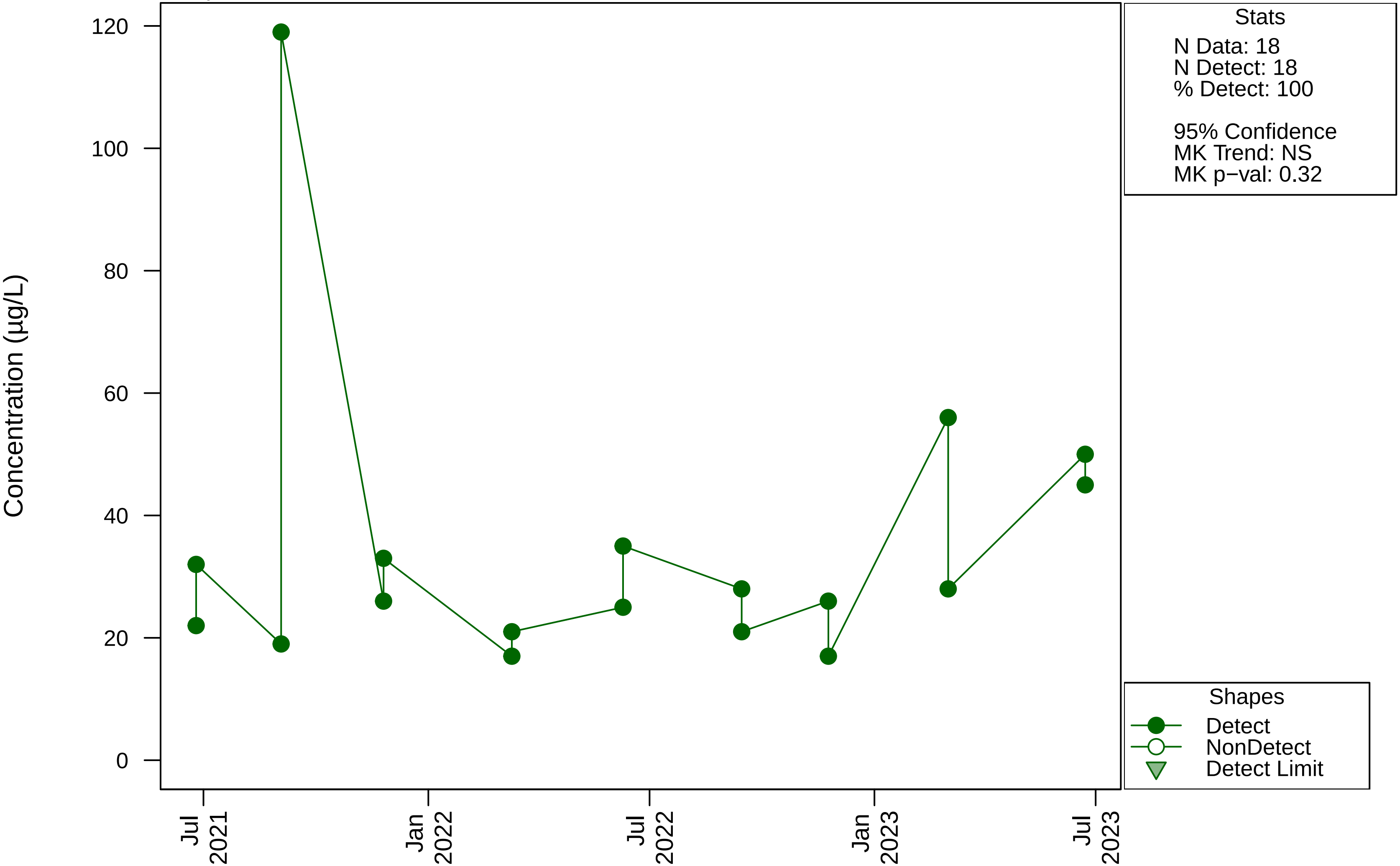



Scatterplots and Trend Analysis
D18, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 2
% Detect: 22
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

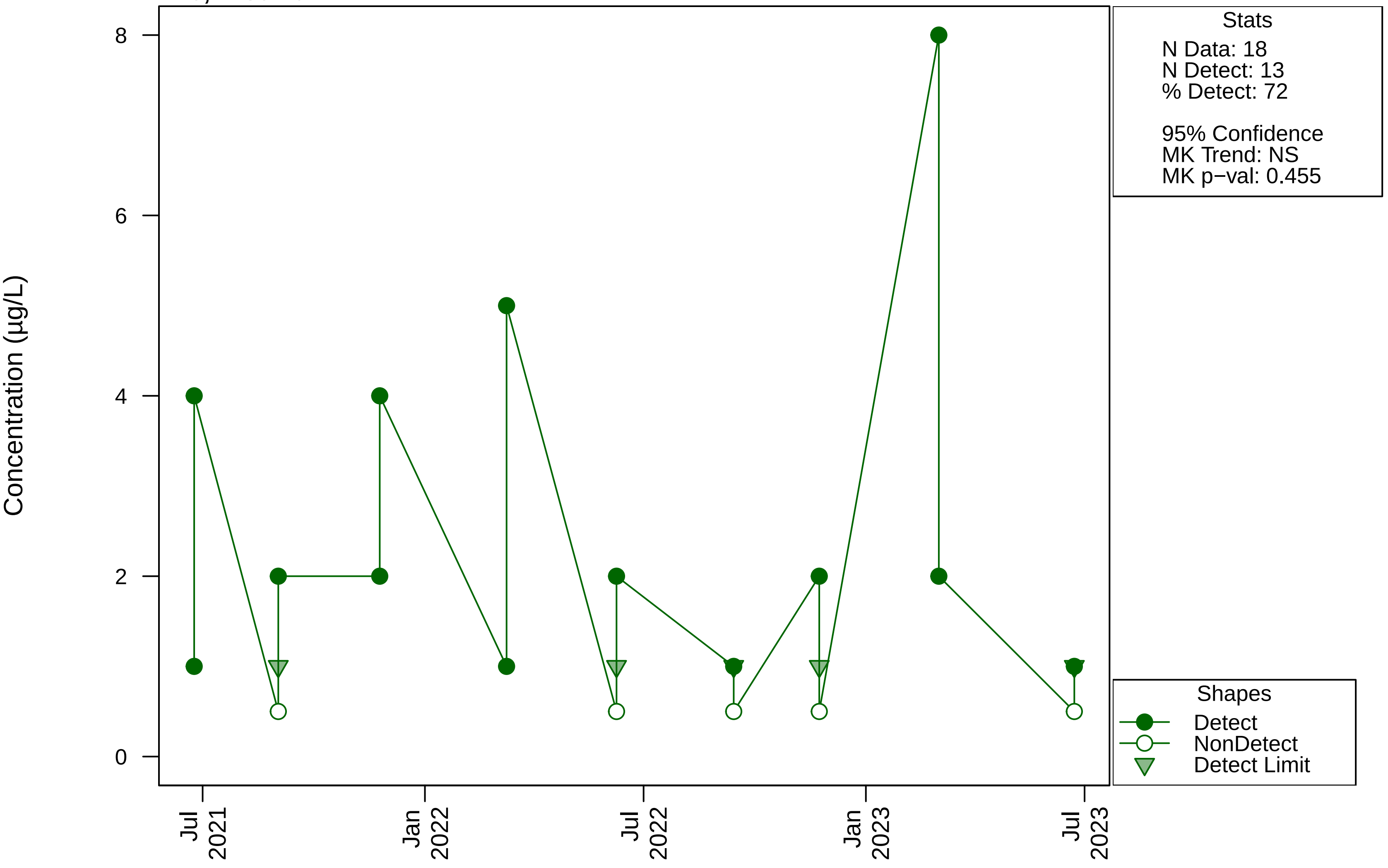

Scatterplots and Trend Analysis
D18, Sulfate (as SO4)
Concentration (mg/L)
0
5
10
15
20
25
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.119
Shapes
Detect
NonDetect
Detect Limit

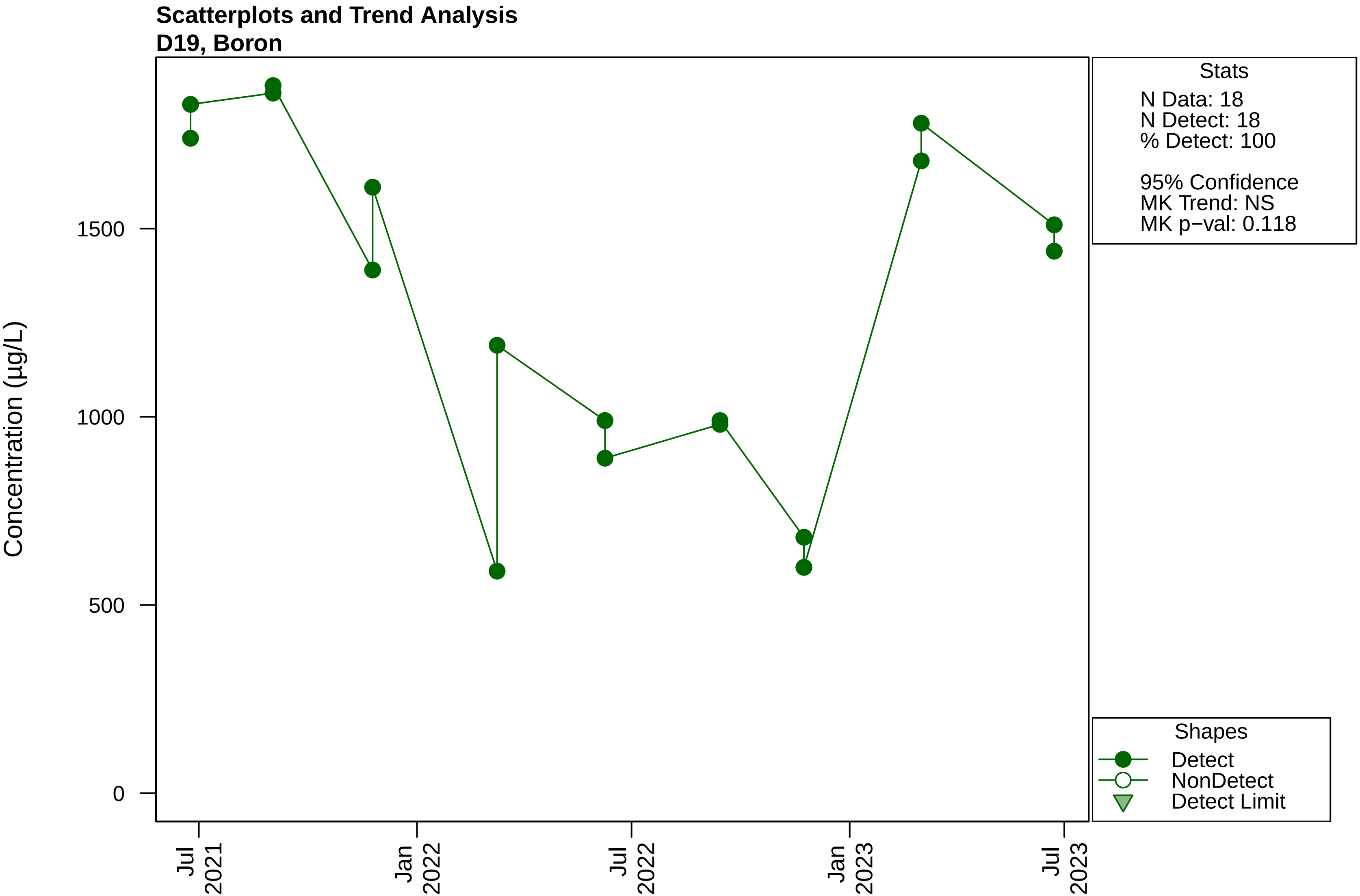

Scatterplots and Trend Analysis
D18, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
100
200
300
400
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.833
Shapes
Detect
NonDetect
Detect Limit

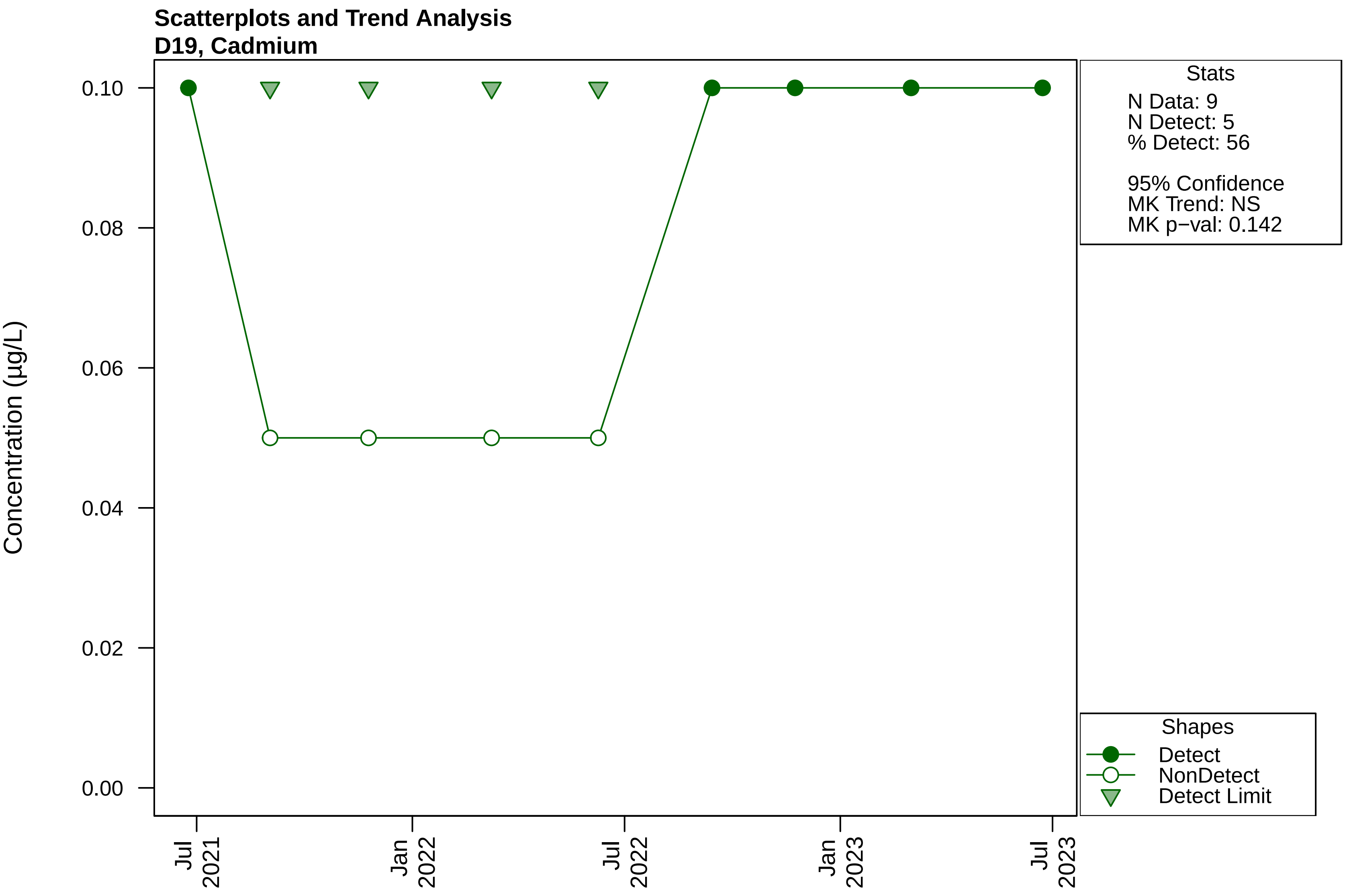
Scatterplots and Trend Analysis
D18, Zinc



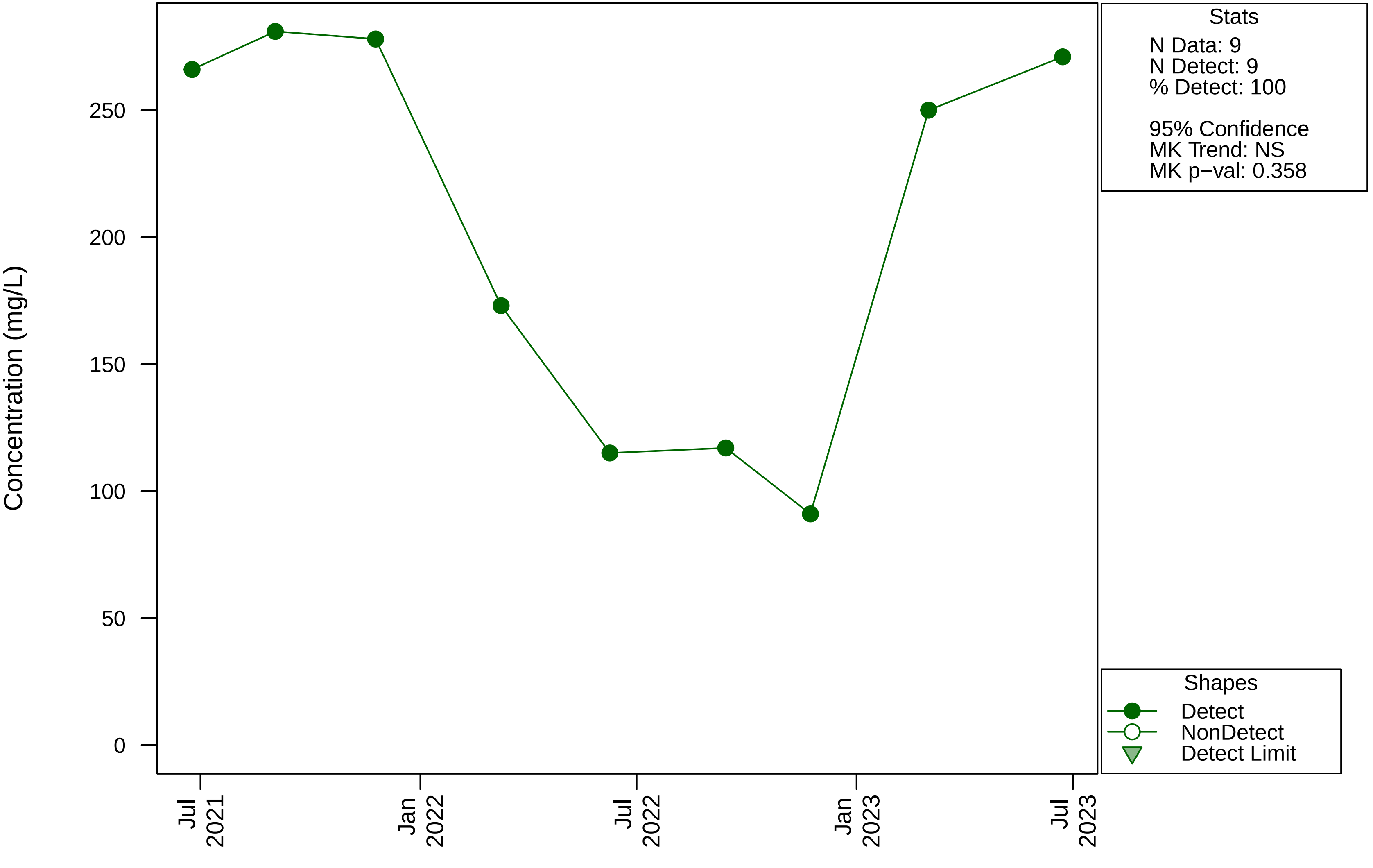
Scatterplots and Trend Analysis
D19, Arsenic

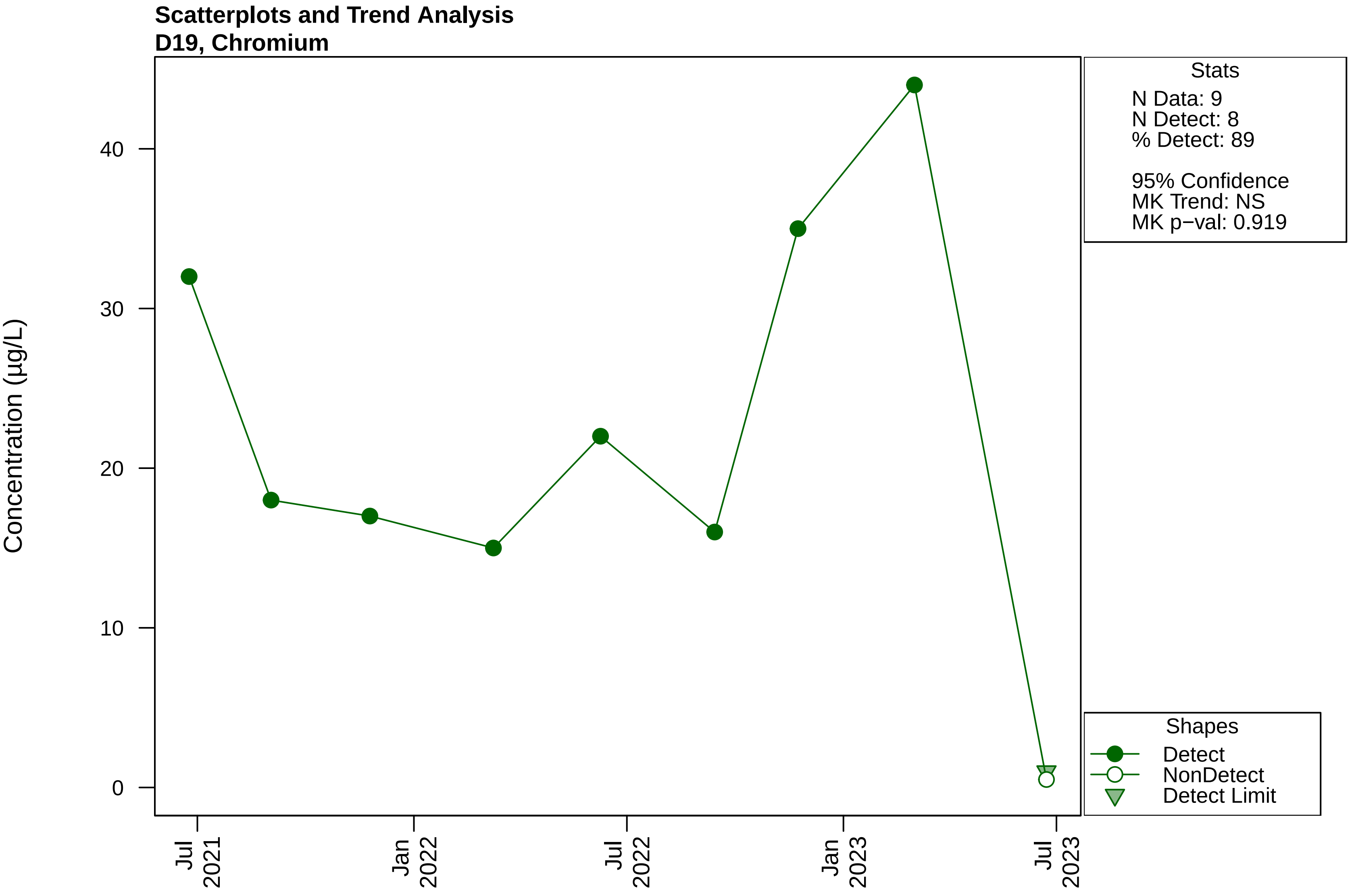



Scatterplots and Trend Analysis
D19, Boron
Concentration (µg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.118
Shapes
Detect
NonDetect
Detect Limit

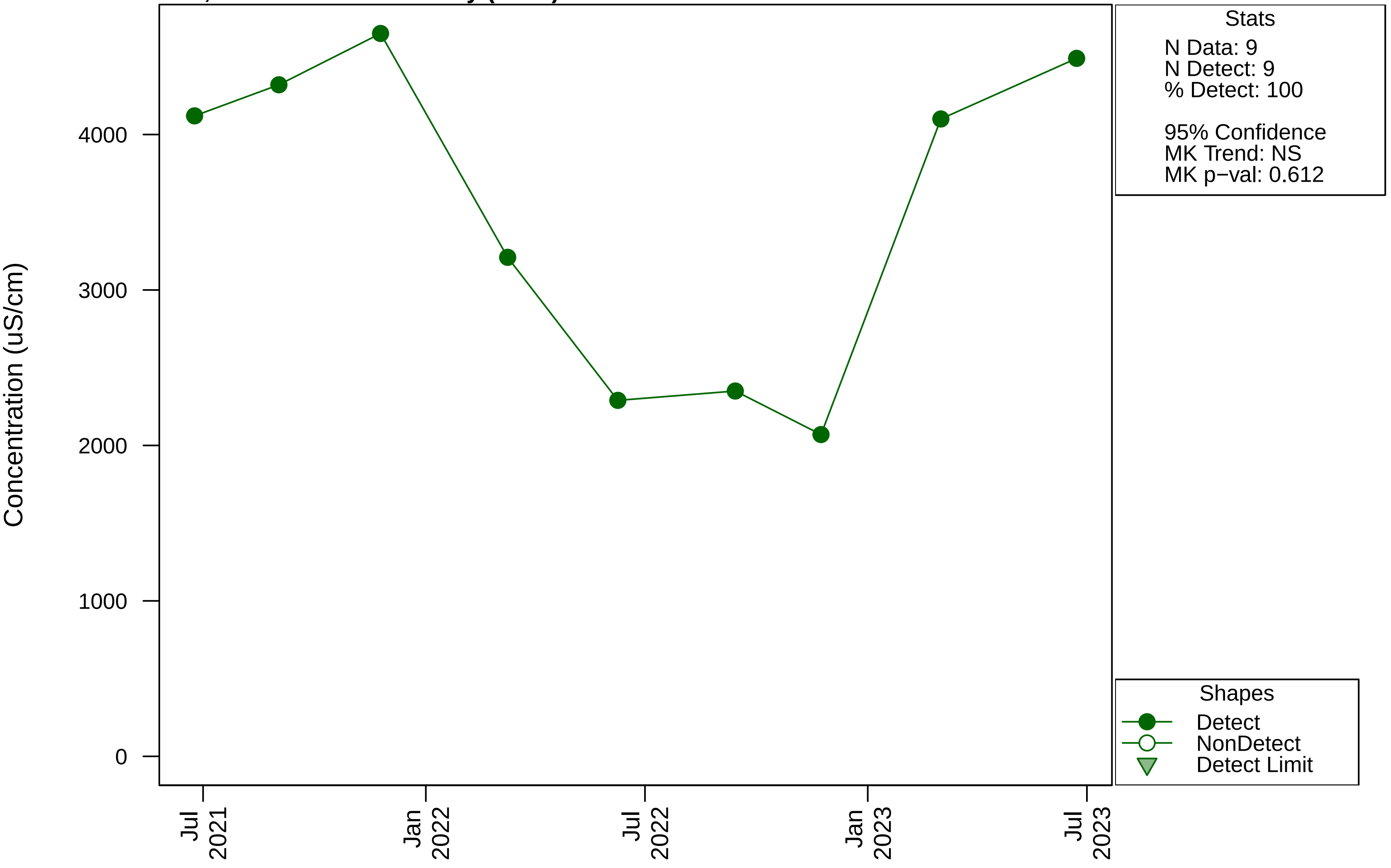

Scatterplots and Trend Analysis
D19, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 5
% Detect: 56
95% Confidence
MK Trend: NS
MK p−val: 0.142
Shapes
Detect
NonDetect
Detect Limit

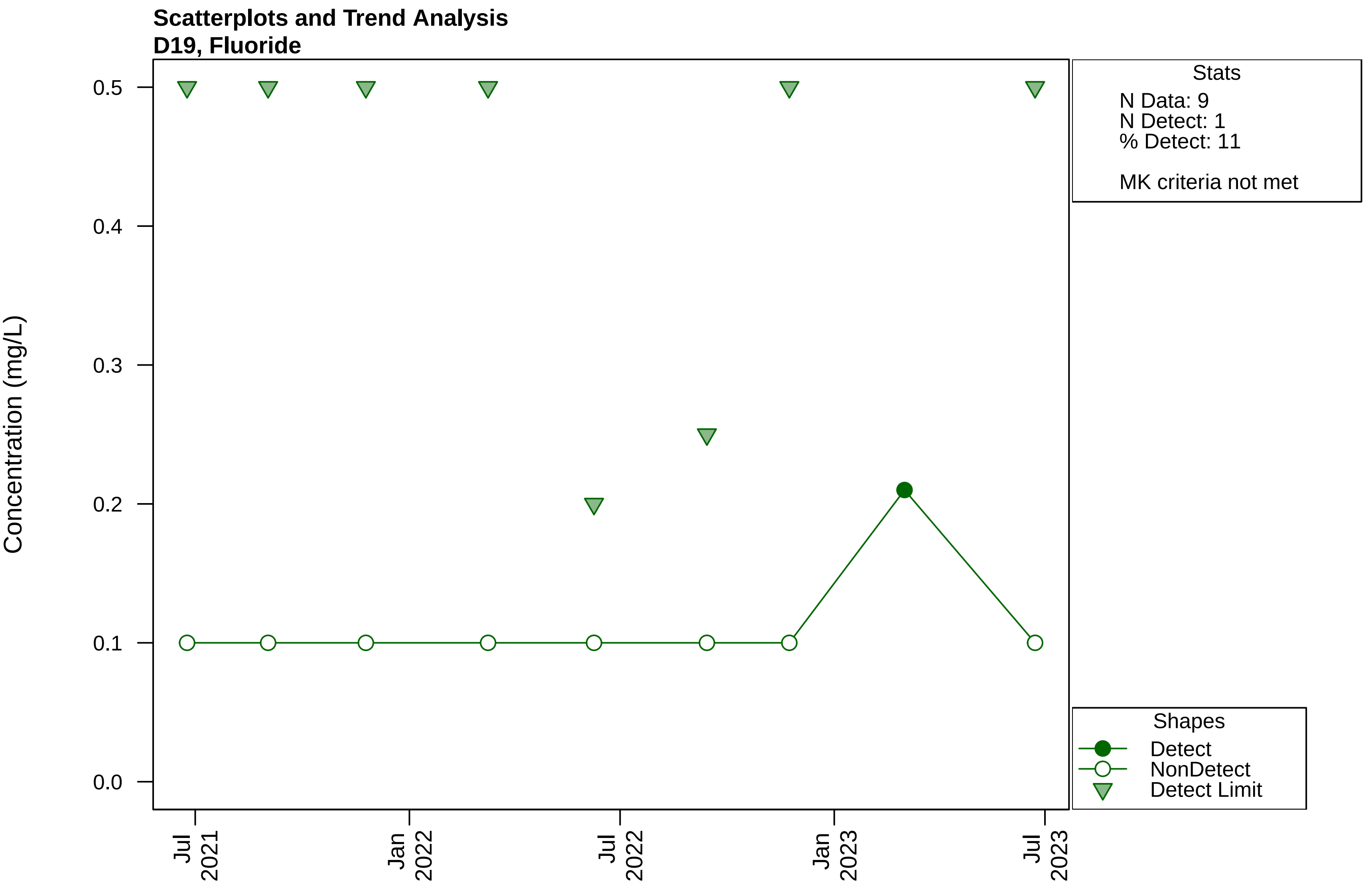
Scatterplots and Trend Analysis
D19, Chloride



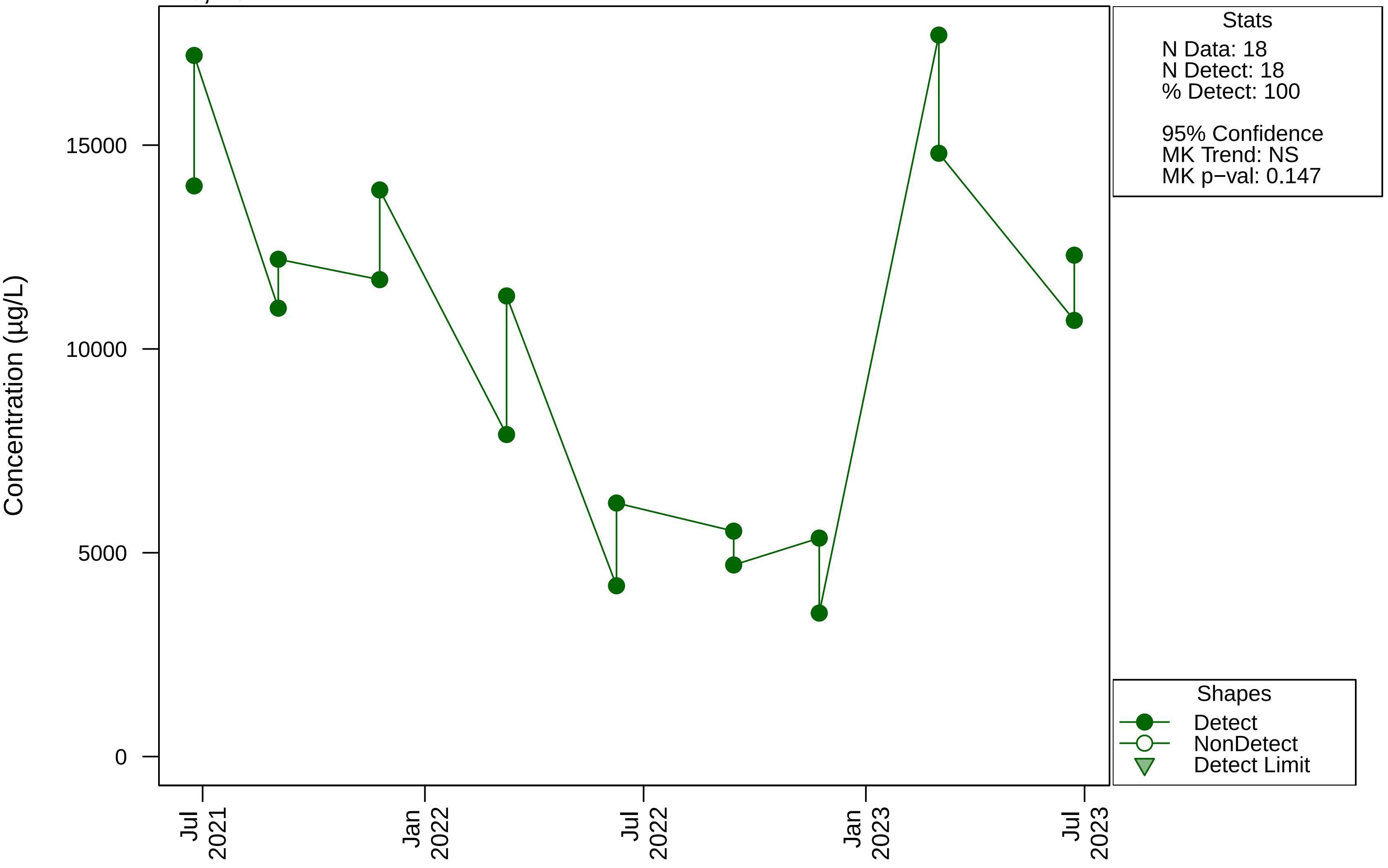

Scatterplots and Trend Analysis
D19, Chromium
Concentration (µg/L)
0
10
20
30
40
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 8
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.919
Shapes
Detect
NonDetect
Detect Limit

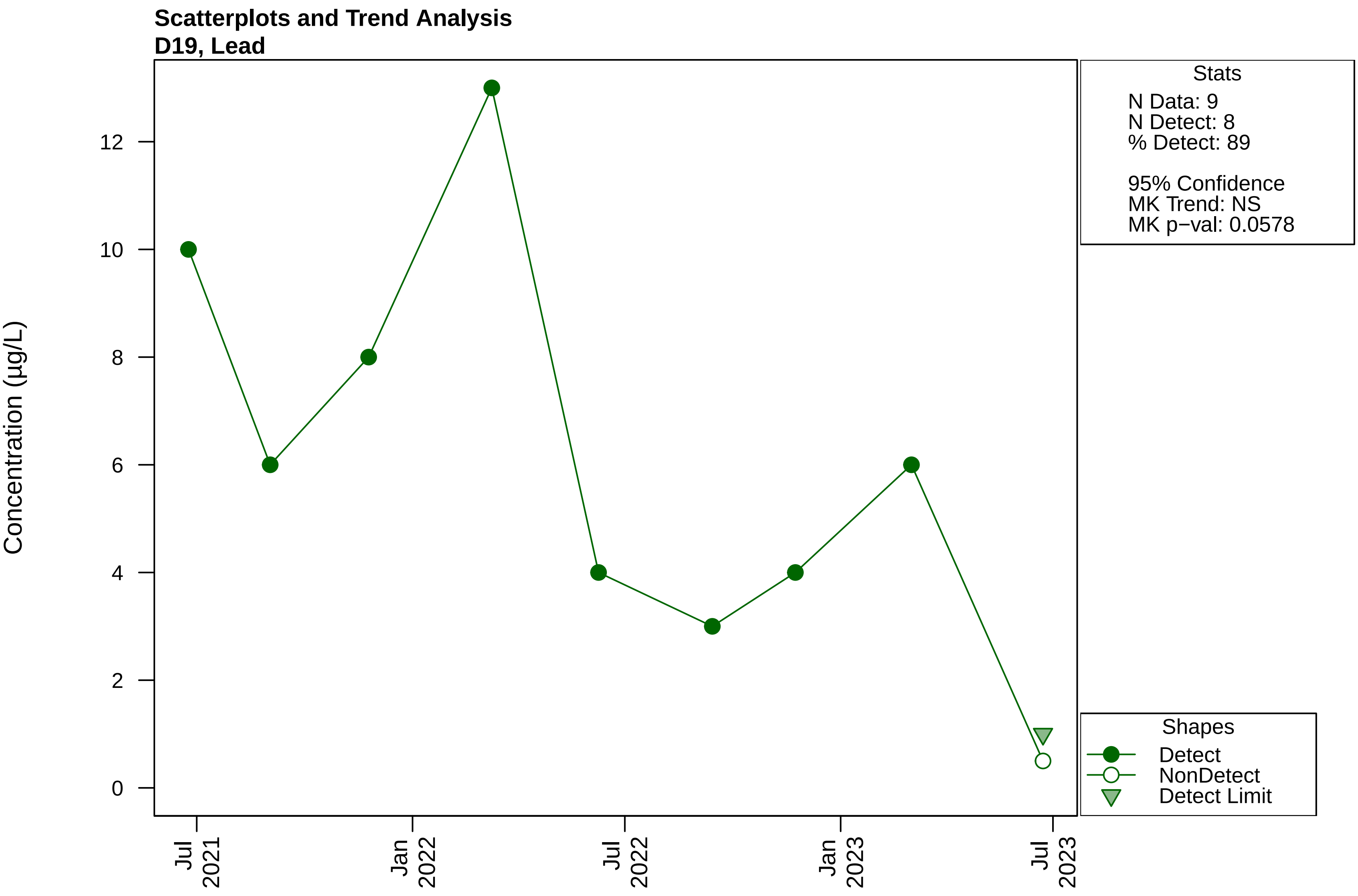
Scatterplots and Trend Analysis
D19, Electrical Conductivity (Field)



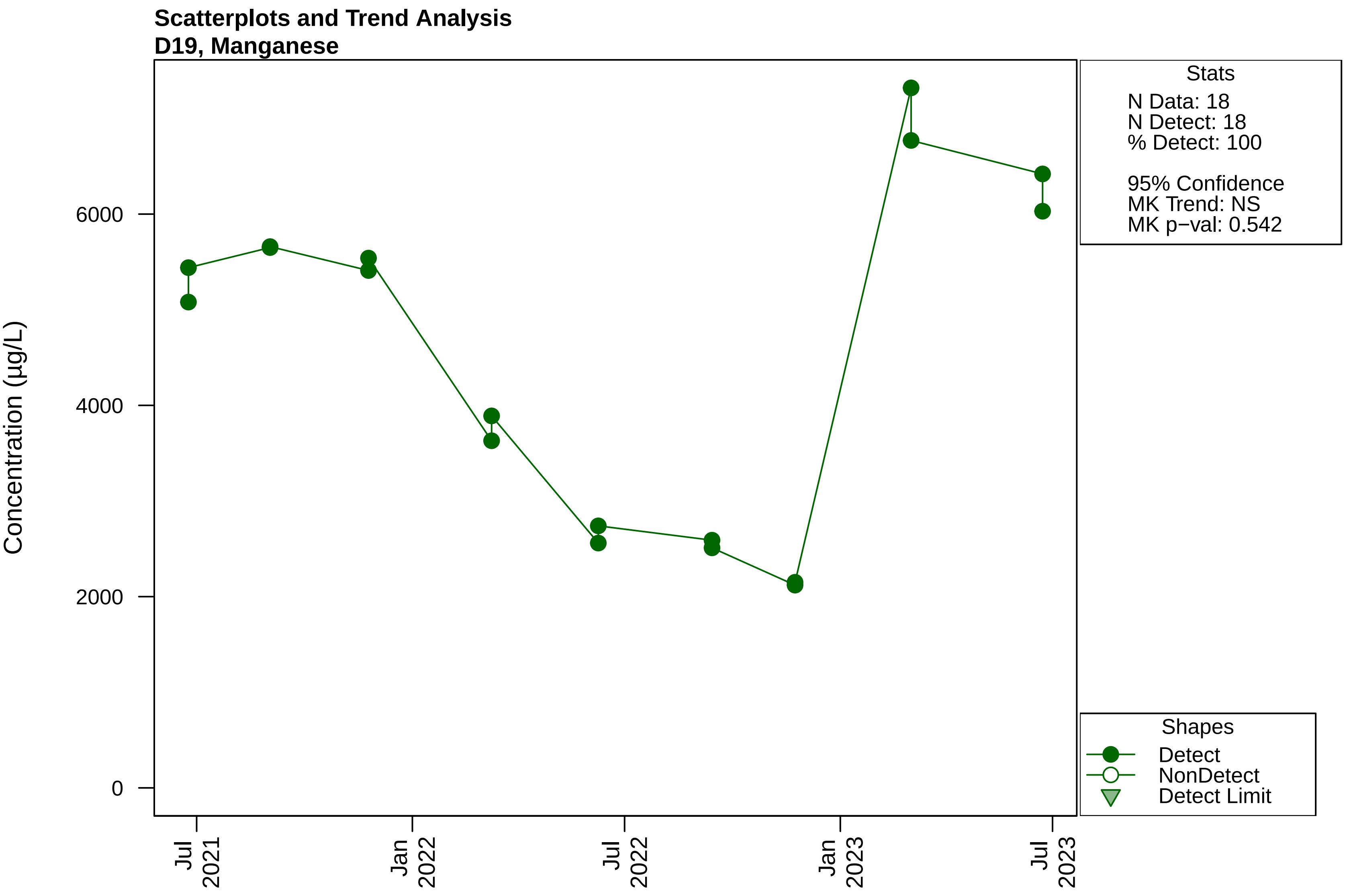

Scatterplots and Trend Analysis
D19, Fluoride
Concentration (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 1
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D19, Iron

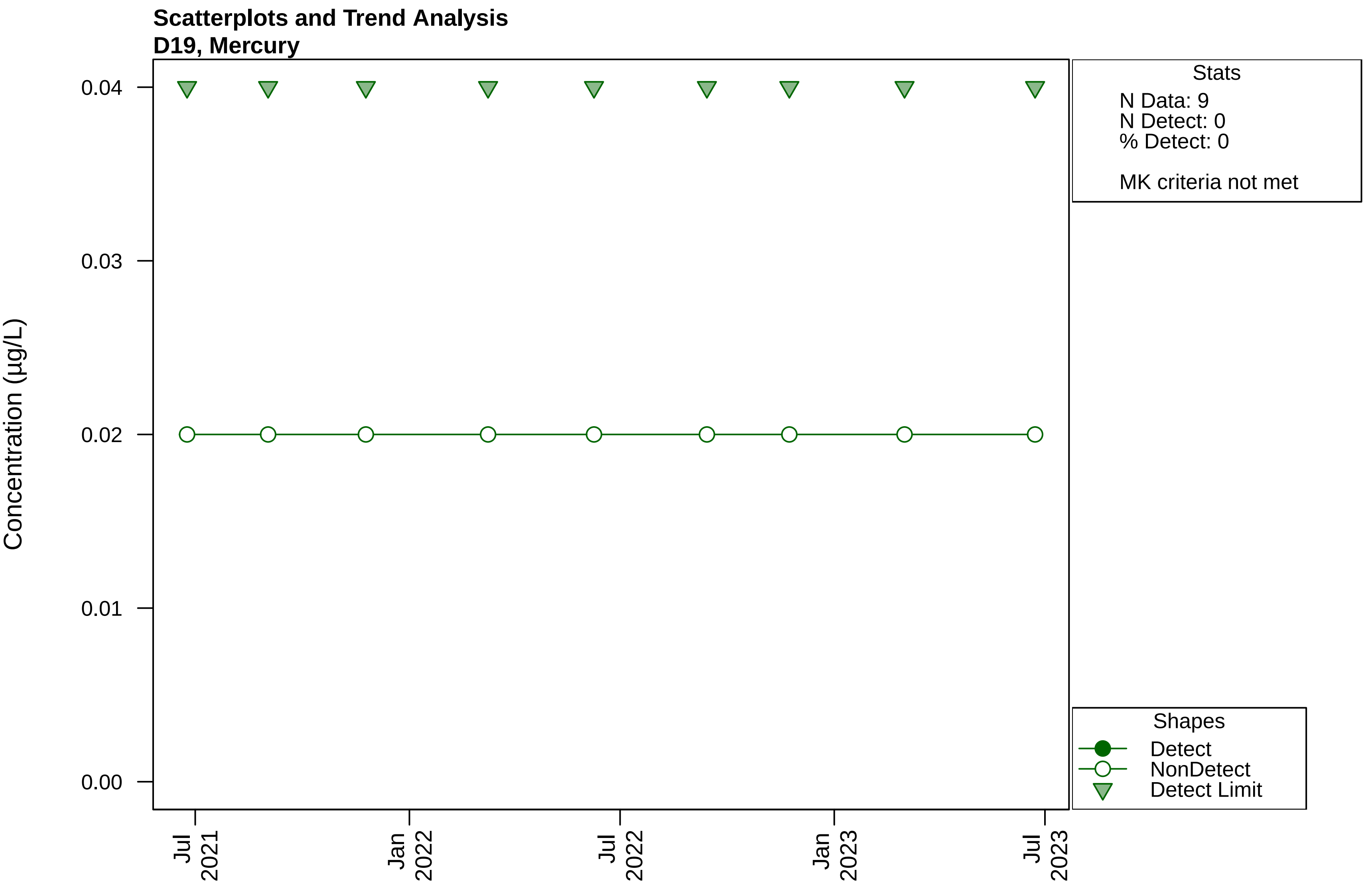


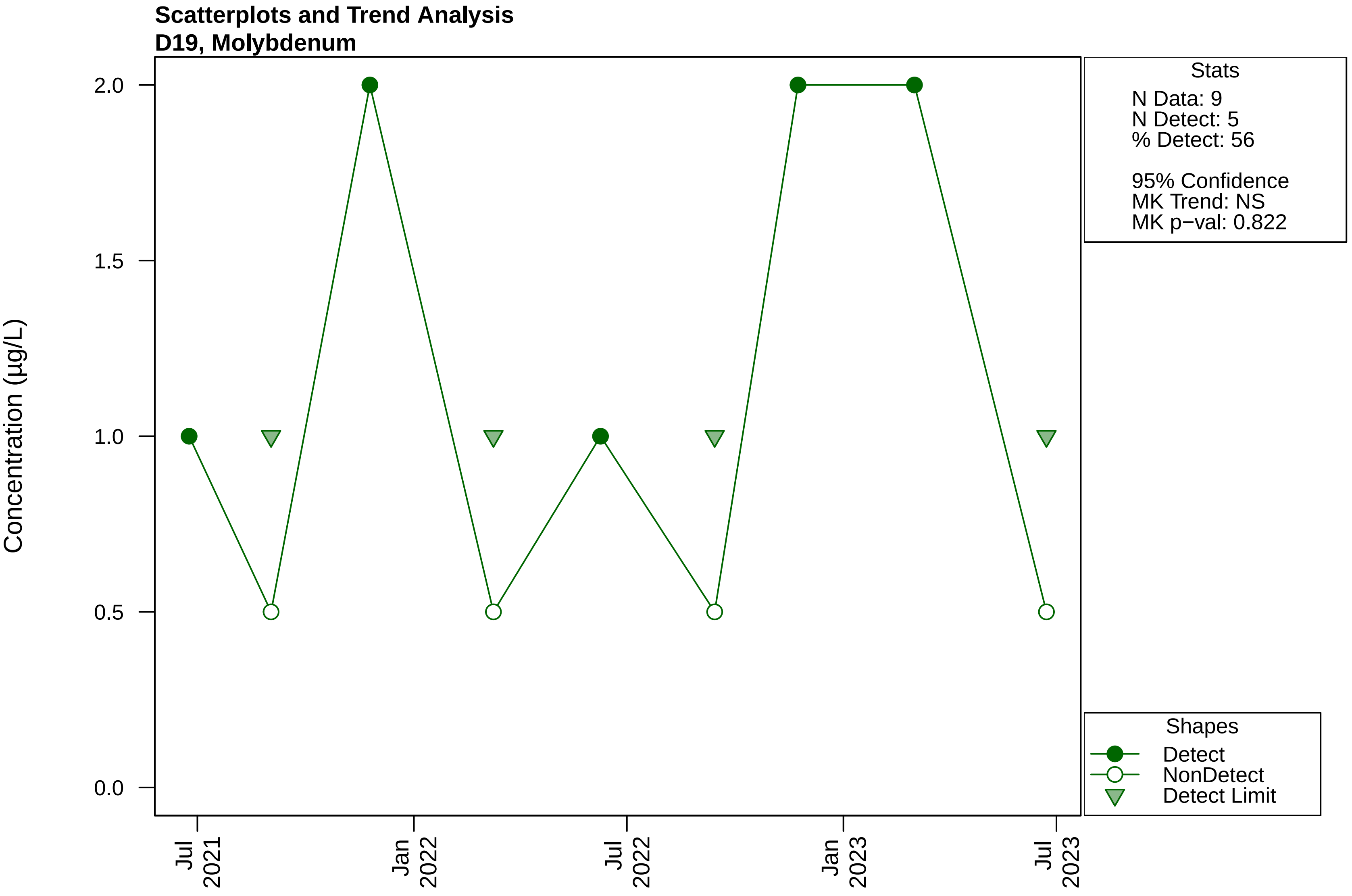


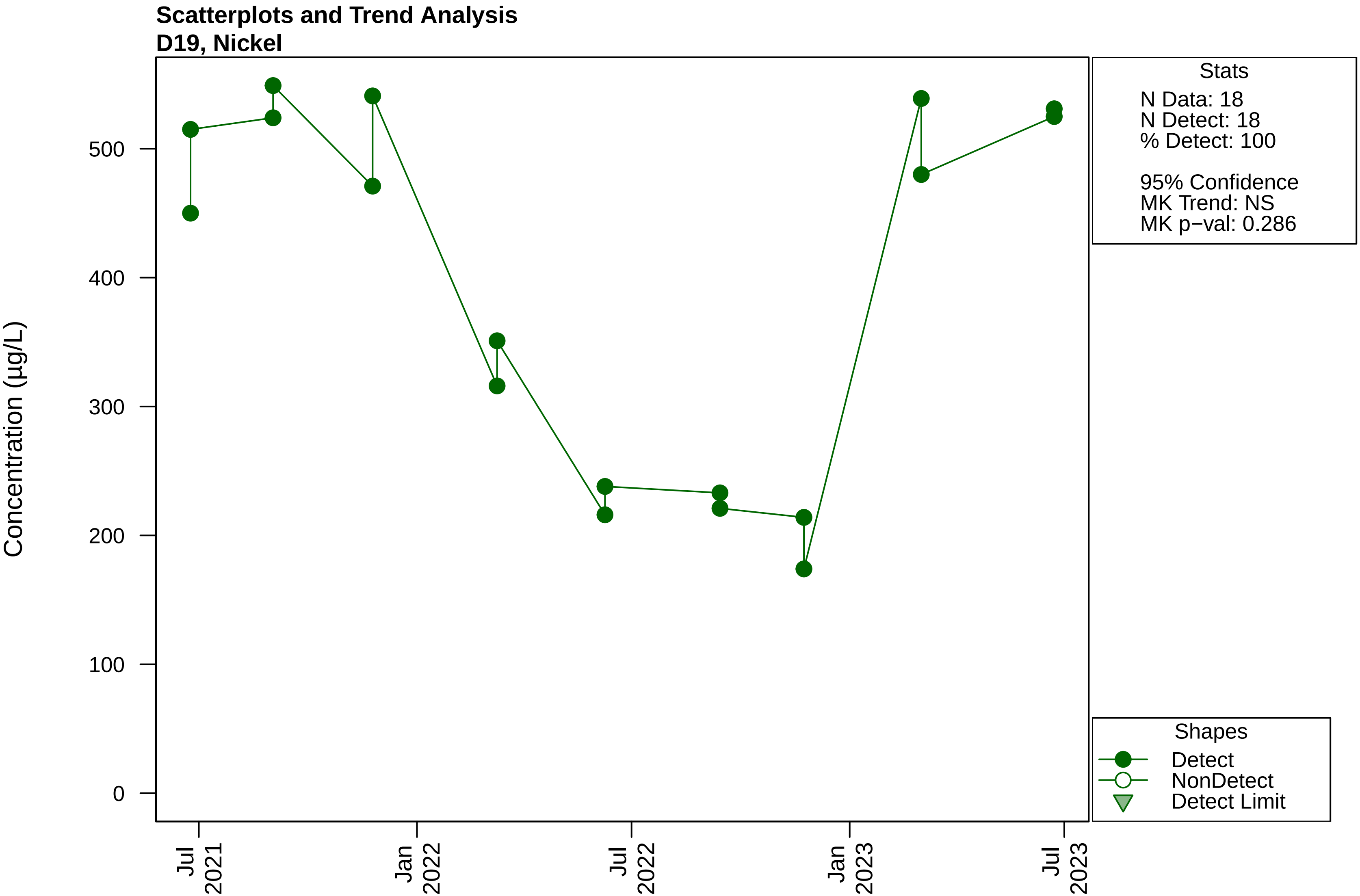
Scatterplots and Trend Analysis
D19, Lead
Concentration (µg/L)
0
2
4
6
8
10
12
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 8
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.0578
Shapes
Detect
NonDetect
Detect Limit



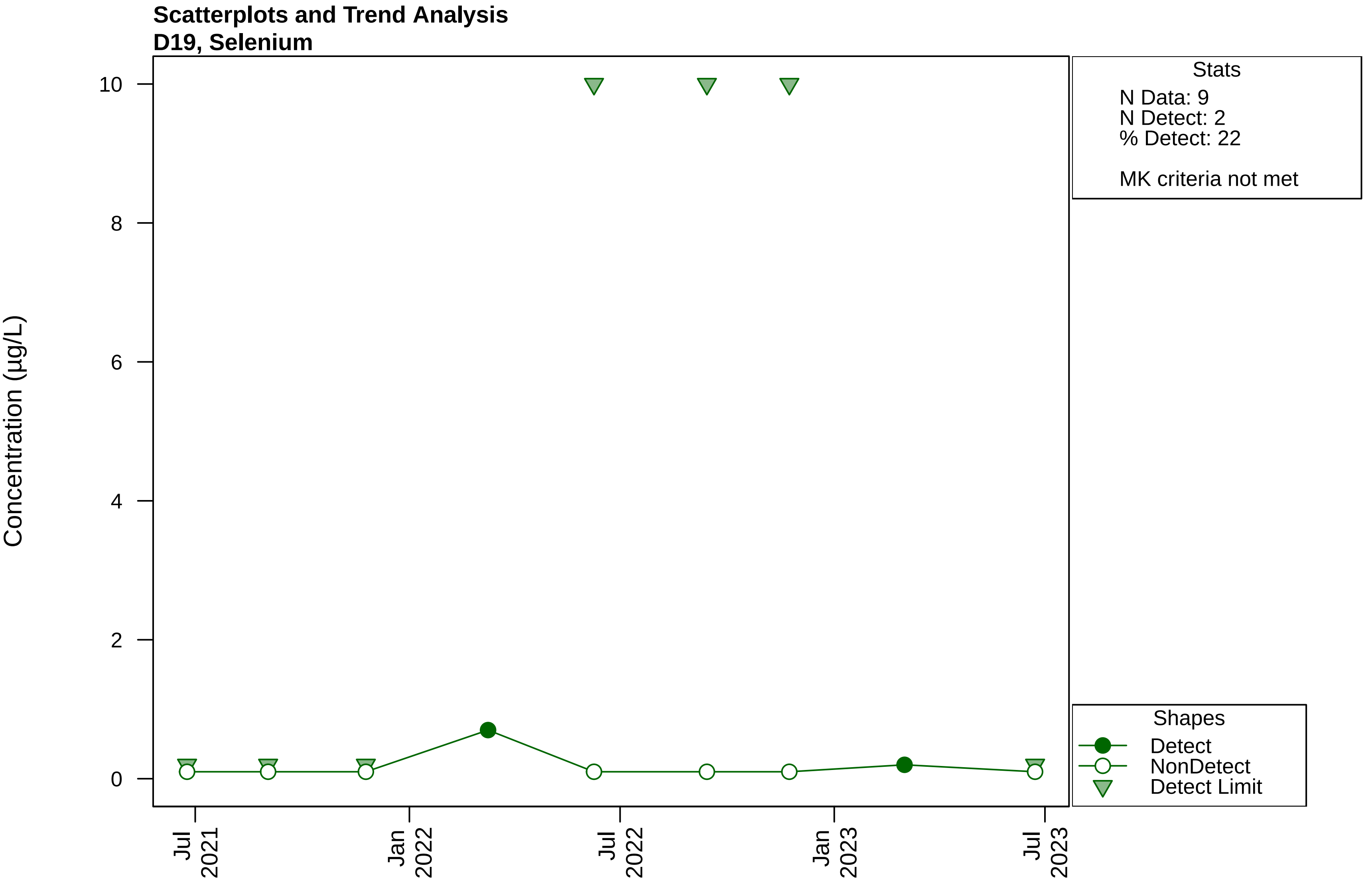
Scatterplots and Trend Analysis
D19, Manganese
Concentration (µg/L)
0
2000
4000
6000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.542
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D19, Mercury
Concentration (µg/L)
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

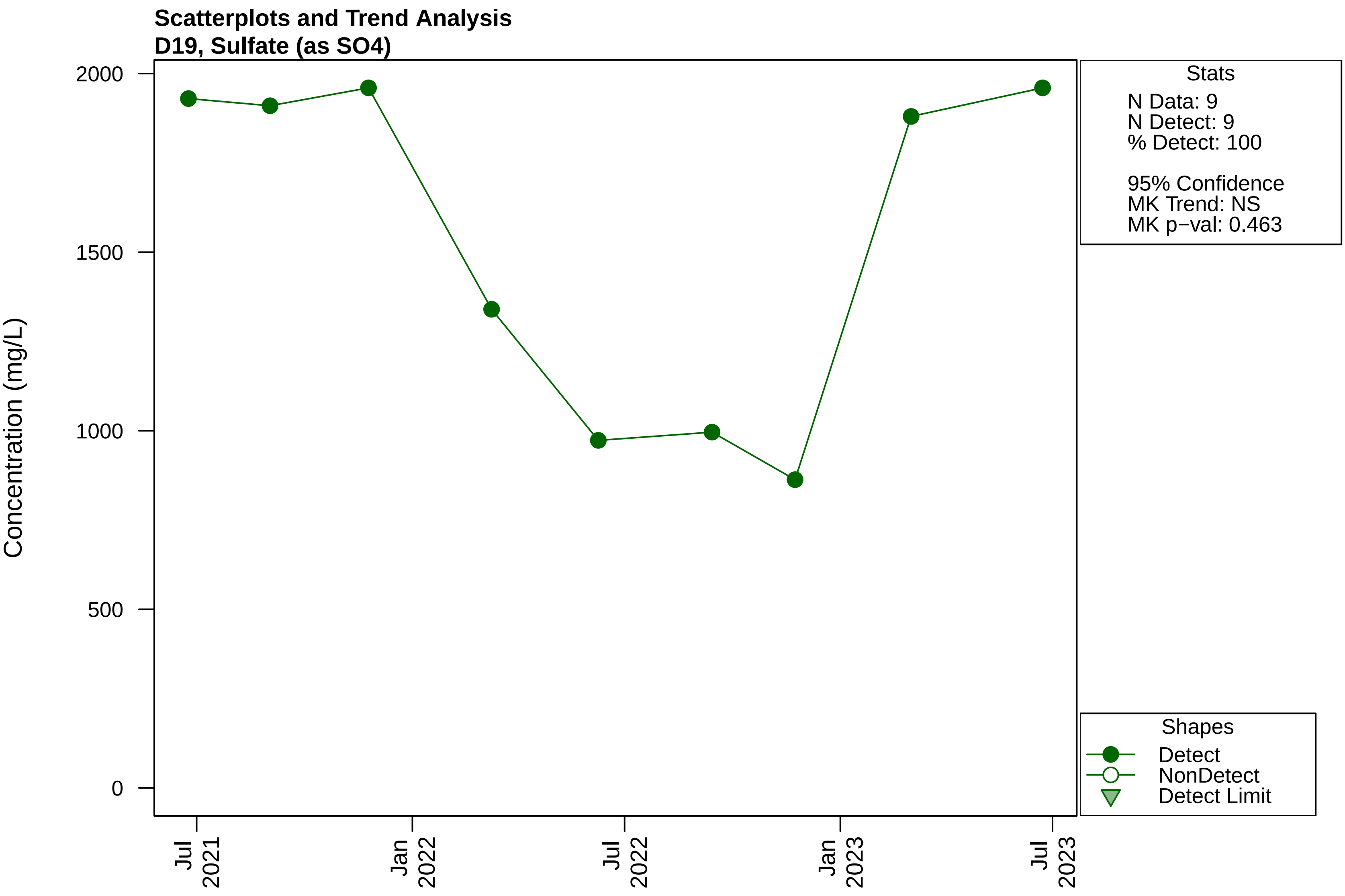

Scatterplots and Trend Analysis
D19, Molybdenum
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 5
% Detect: 56
95% Confidence
MK Trend: NS
MK p−val: 0.822
Shapes
Detect
NonDetect
Detect Limit



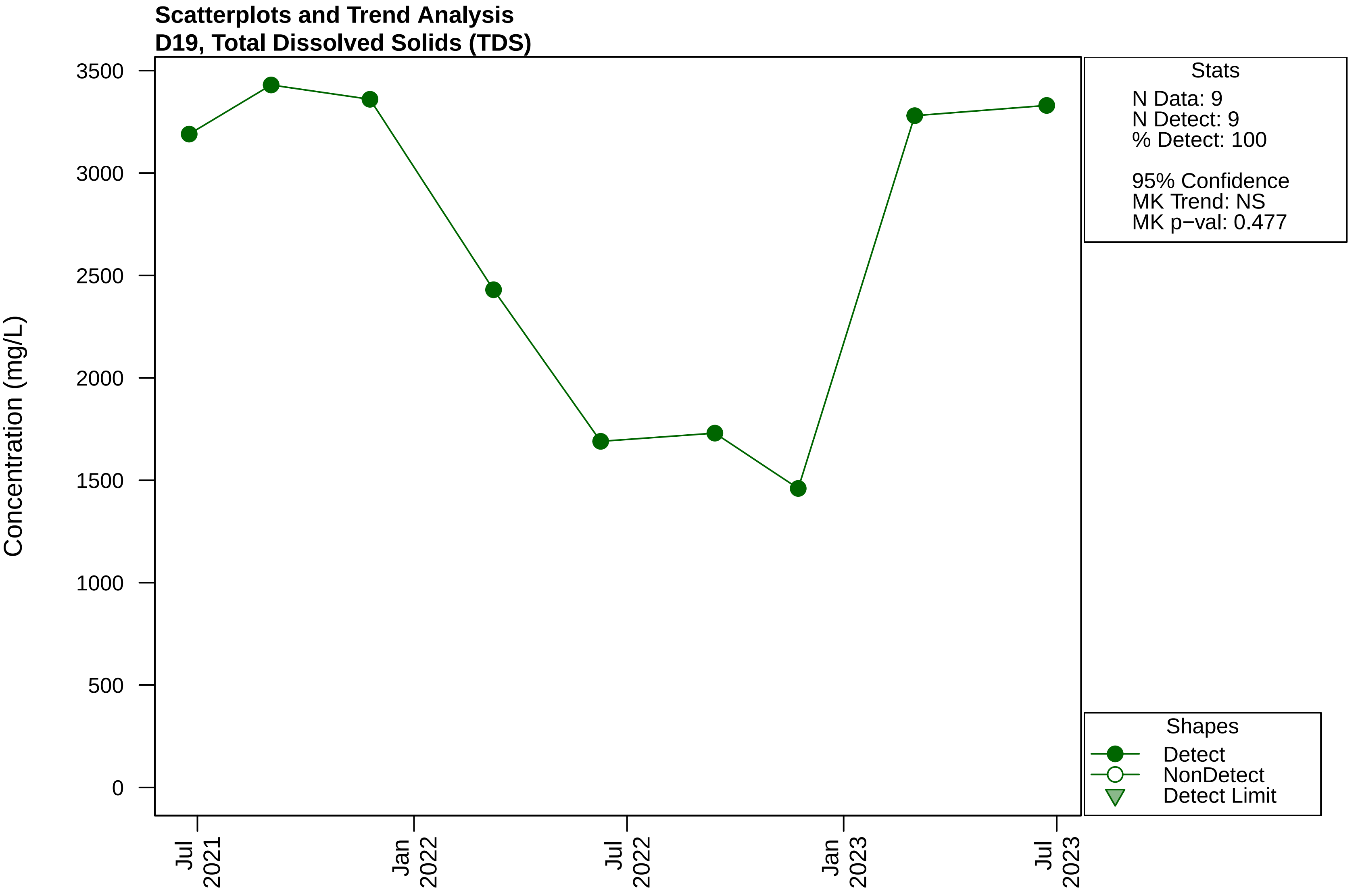
Scatterplots and Trend Analysis
D19, Nickel
Concentration (µg/L)
0
100
200
300
400
500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.286
Shapes
Detect
NonDetect
Detect Limit



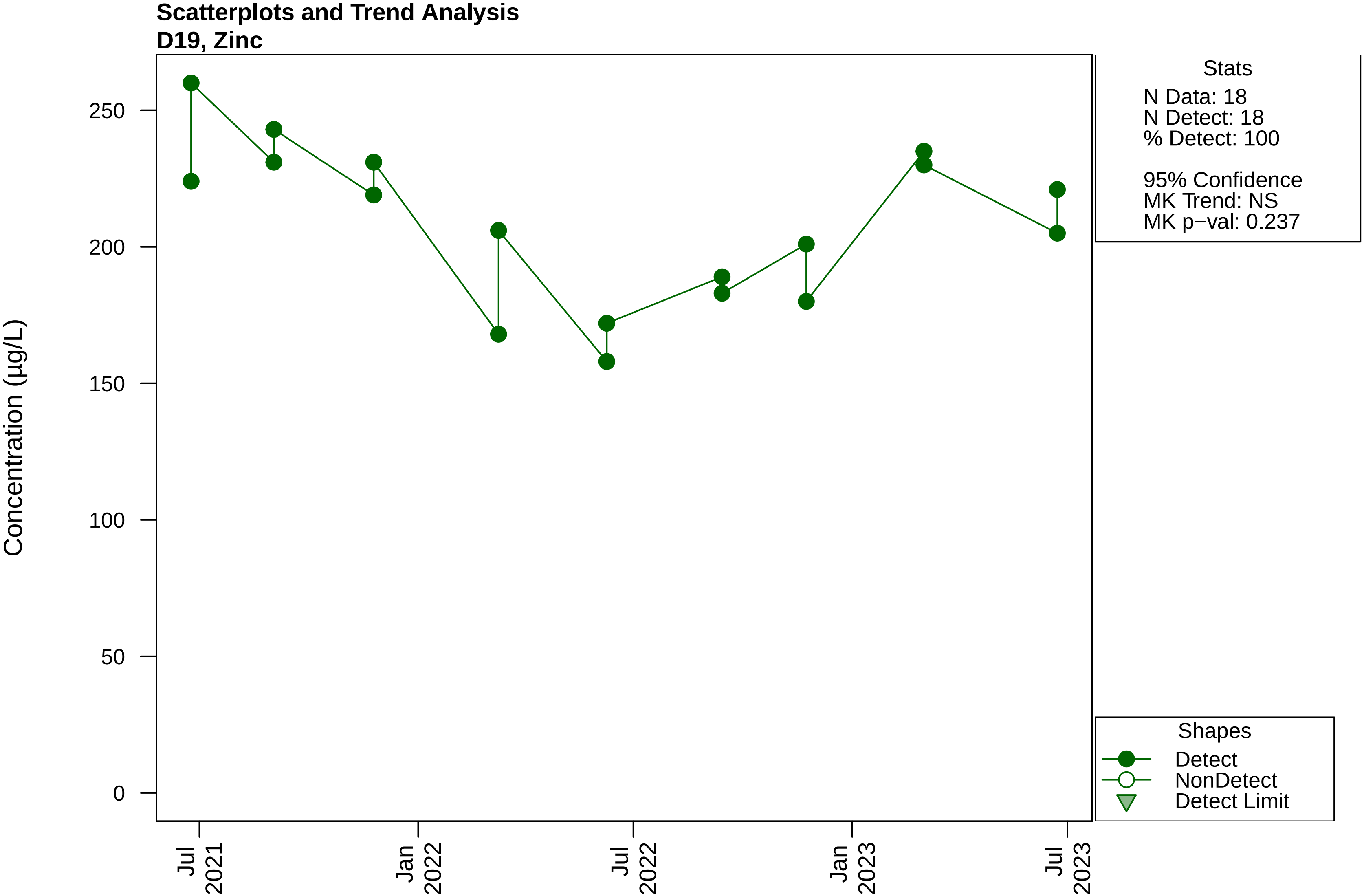
Scatterplots and Trend Analysis
D19, Selenium
Concentration (µg/L)
10
8
6
4
2
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 2
% Detect: 22
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



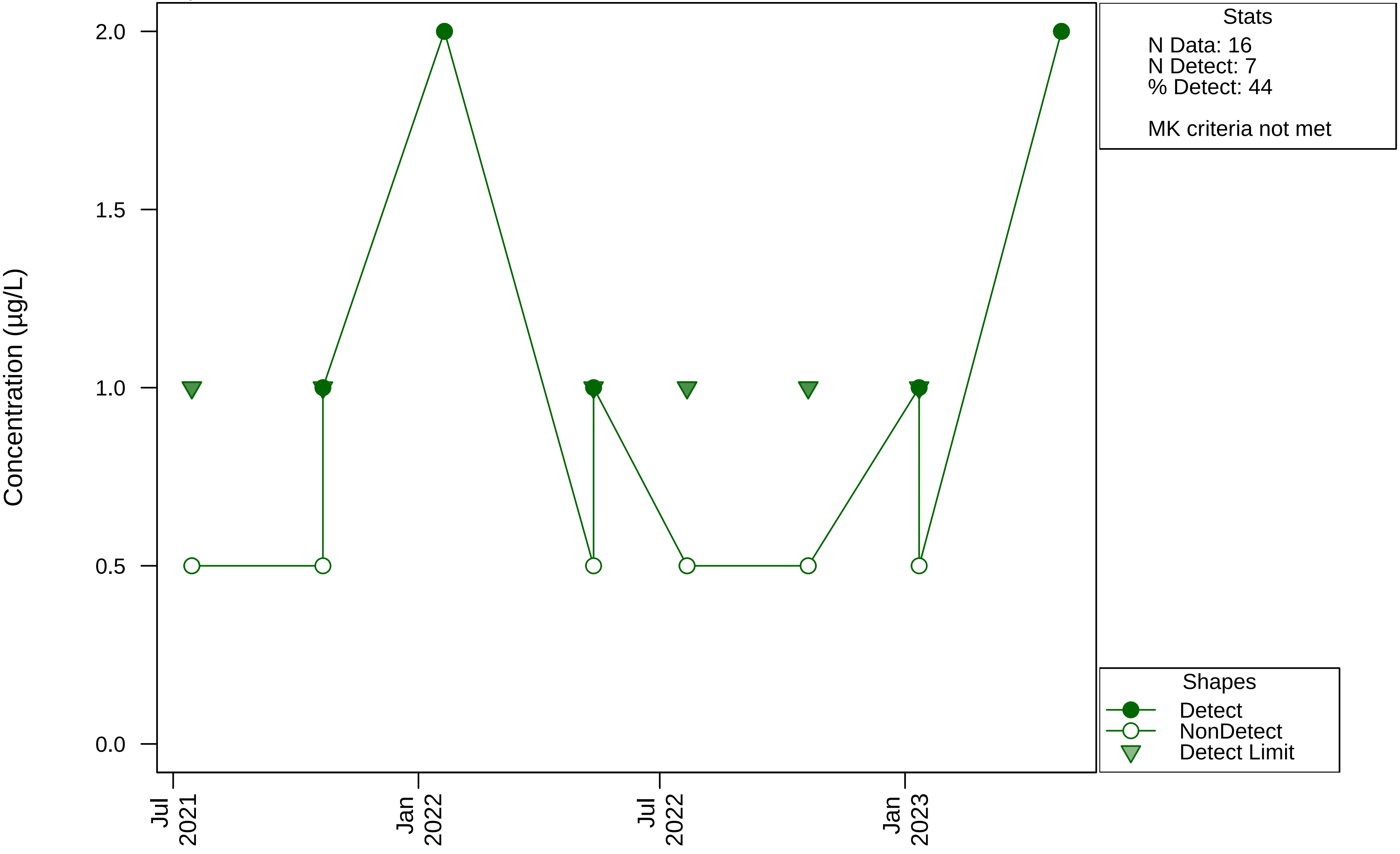
Scatterplots and Trend Analysis
D19, Sulfate (as SO4)
Concentration (mg/L)
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.463
Shapes
Detect
NonDetect
Detect Limit



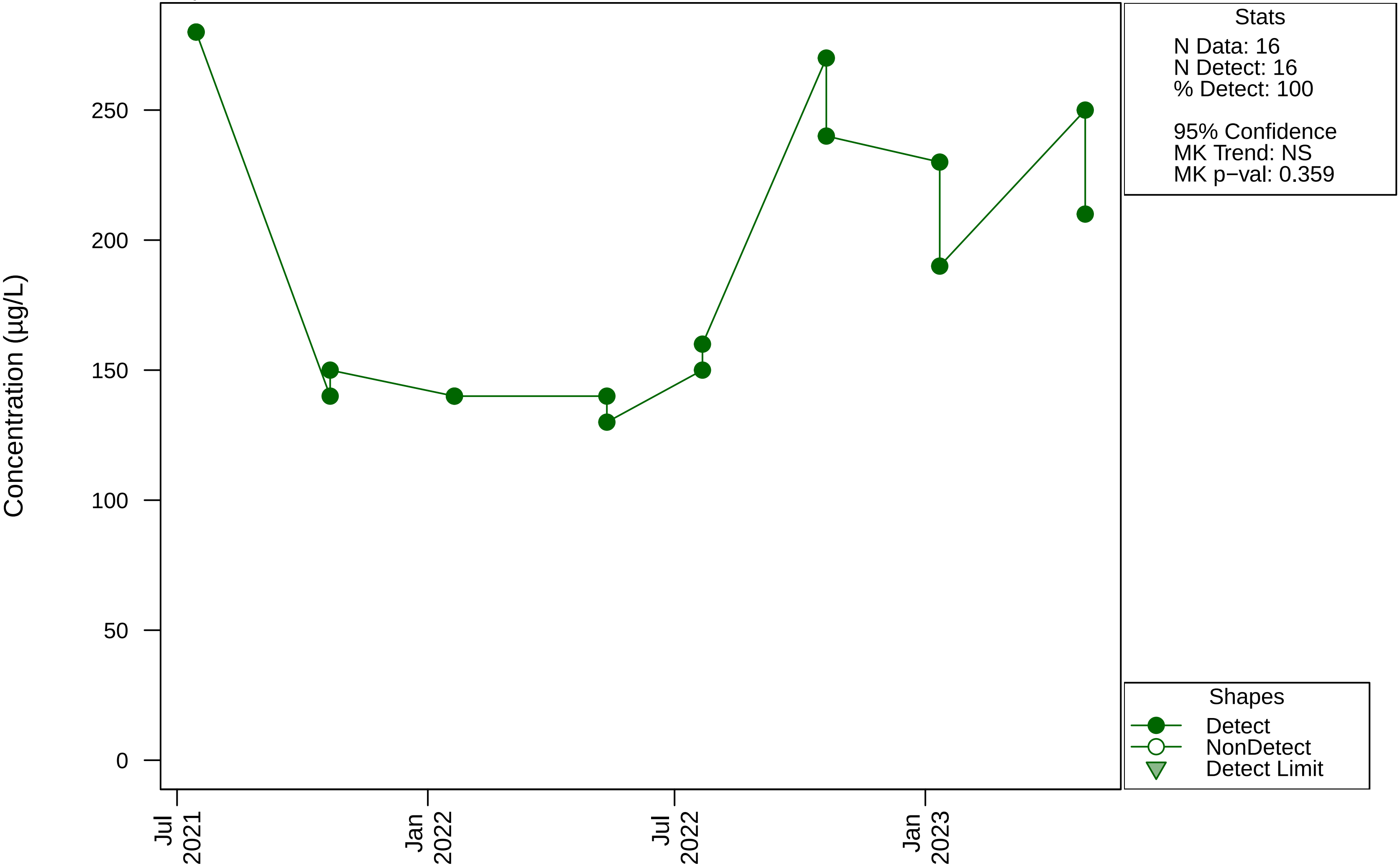
Scatterplots and Trend Analysis
D19, Total Dissolved Solids (TDS)
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.477
Shapes
Detect
NonDetect
Detect Limit

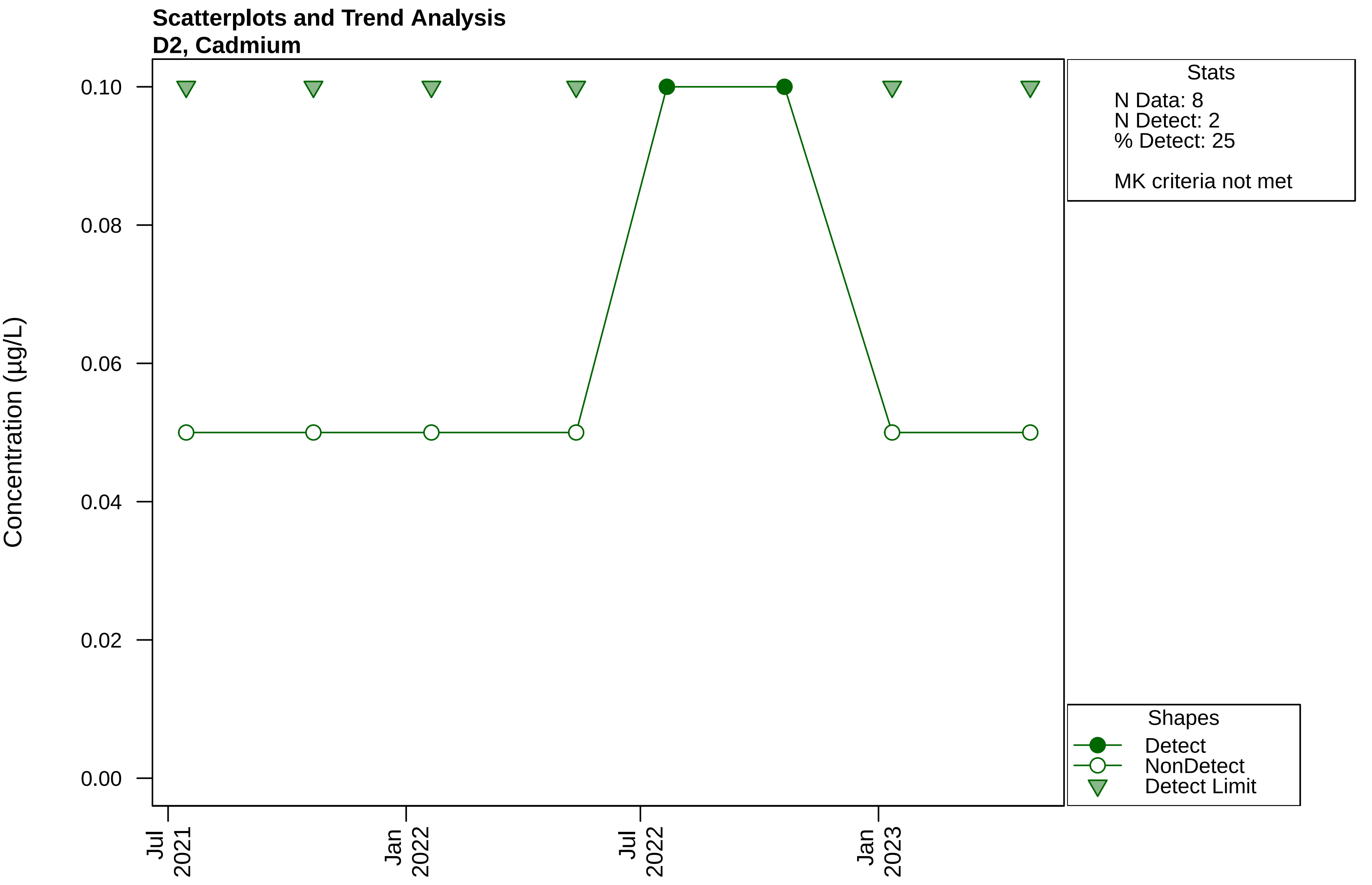

Scatterplots and Trend Analysis
D19, Zinc
Concentration (µg/L)
0
50
100
150
200
250
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.237
Shapes
Detect
NonDetect
Detect Limit

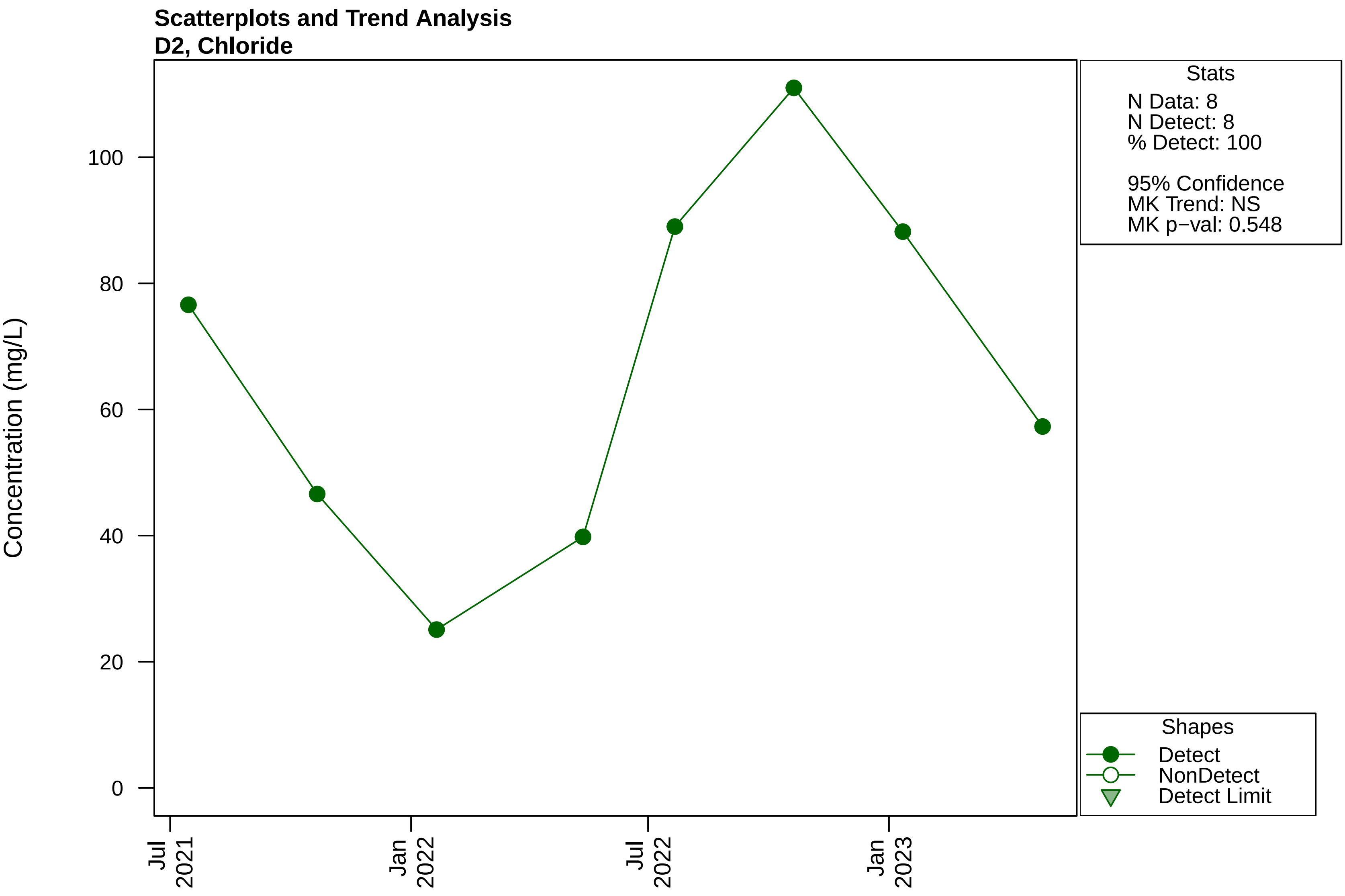
Scatterplots and Trend Analysis
D2, Arsenic

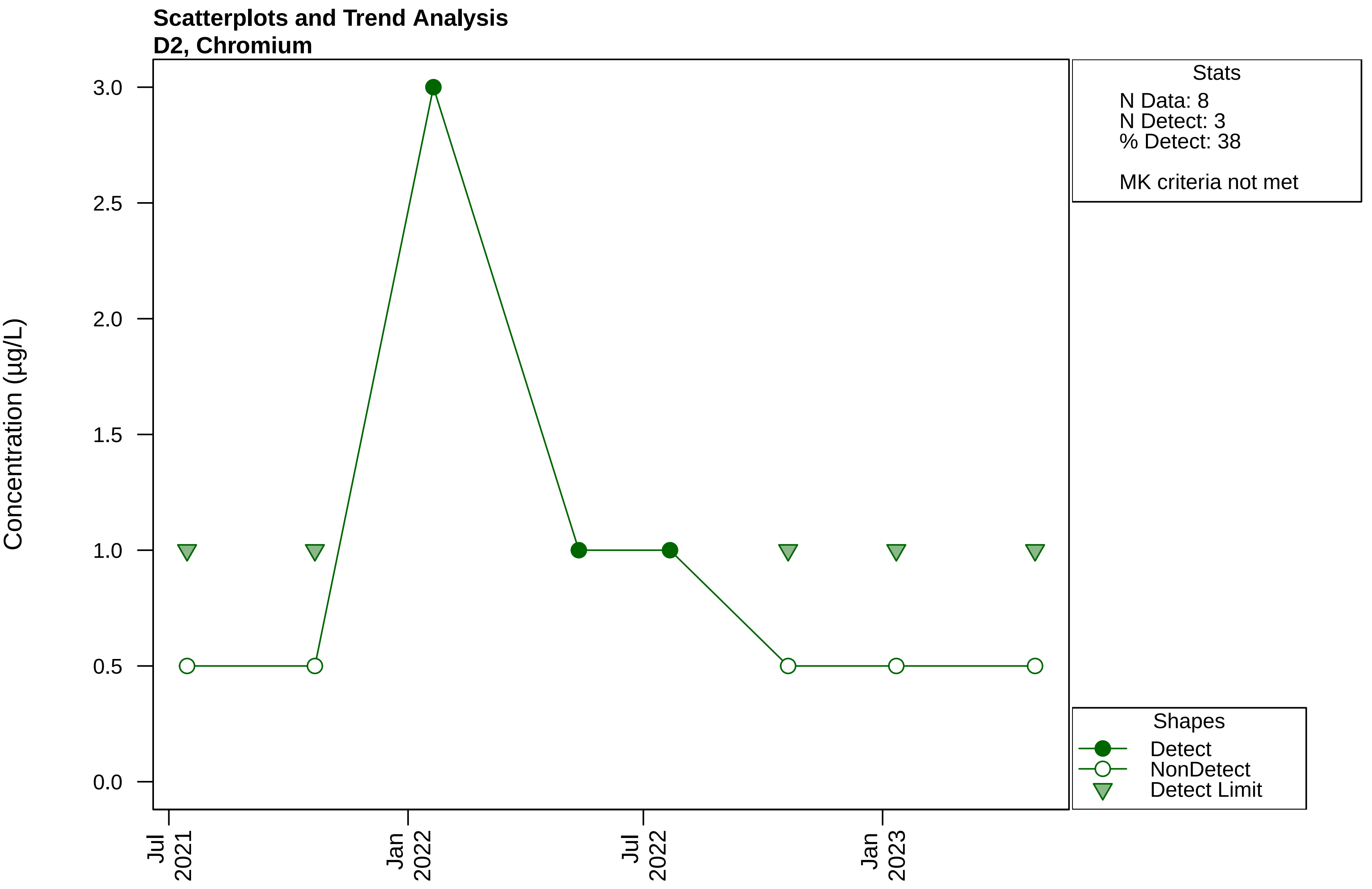


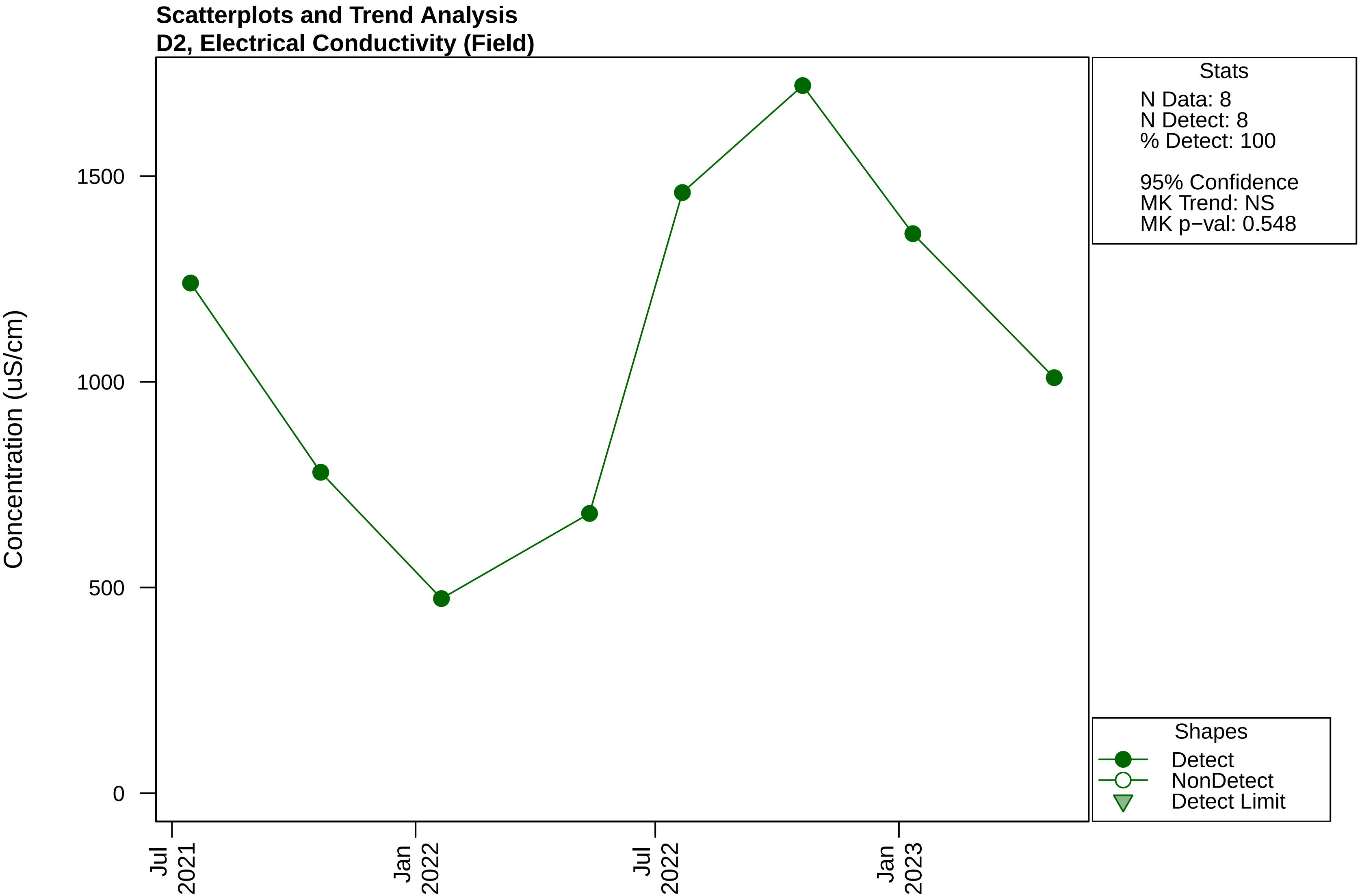
Scatterplots and Trend Analysis
D2, Boron



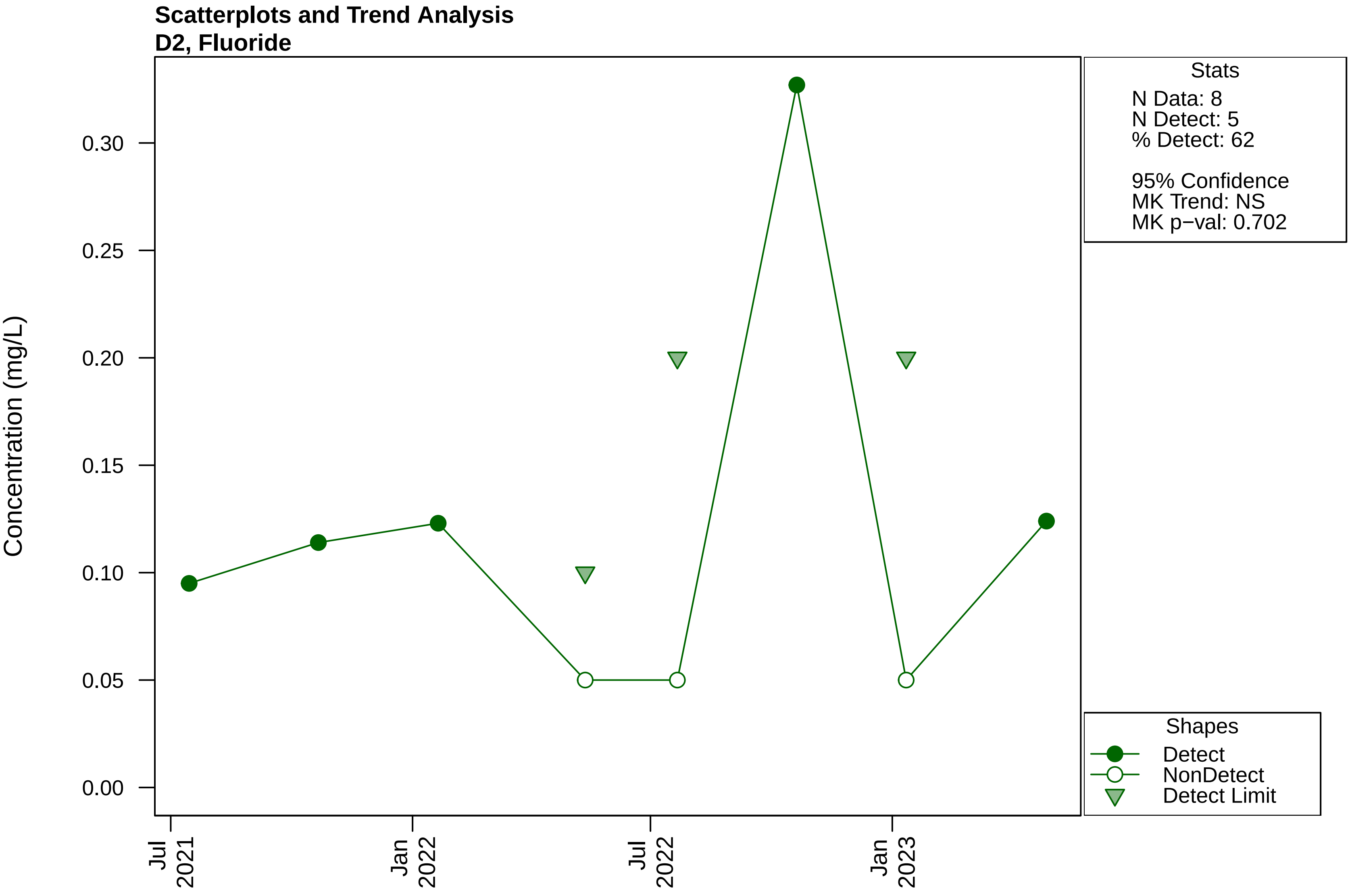

Scatterplots and Trend Analysis
D2, Cadmium
Concentration (µg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 2
% Detect: 25
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D2, Chloride
Concentration (mg/L)
0
20
40
60
80
100
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.548
Shapes
Detect
NonDetect
Detect Limit

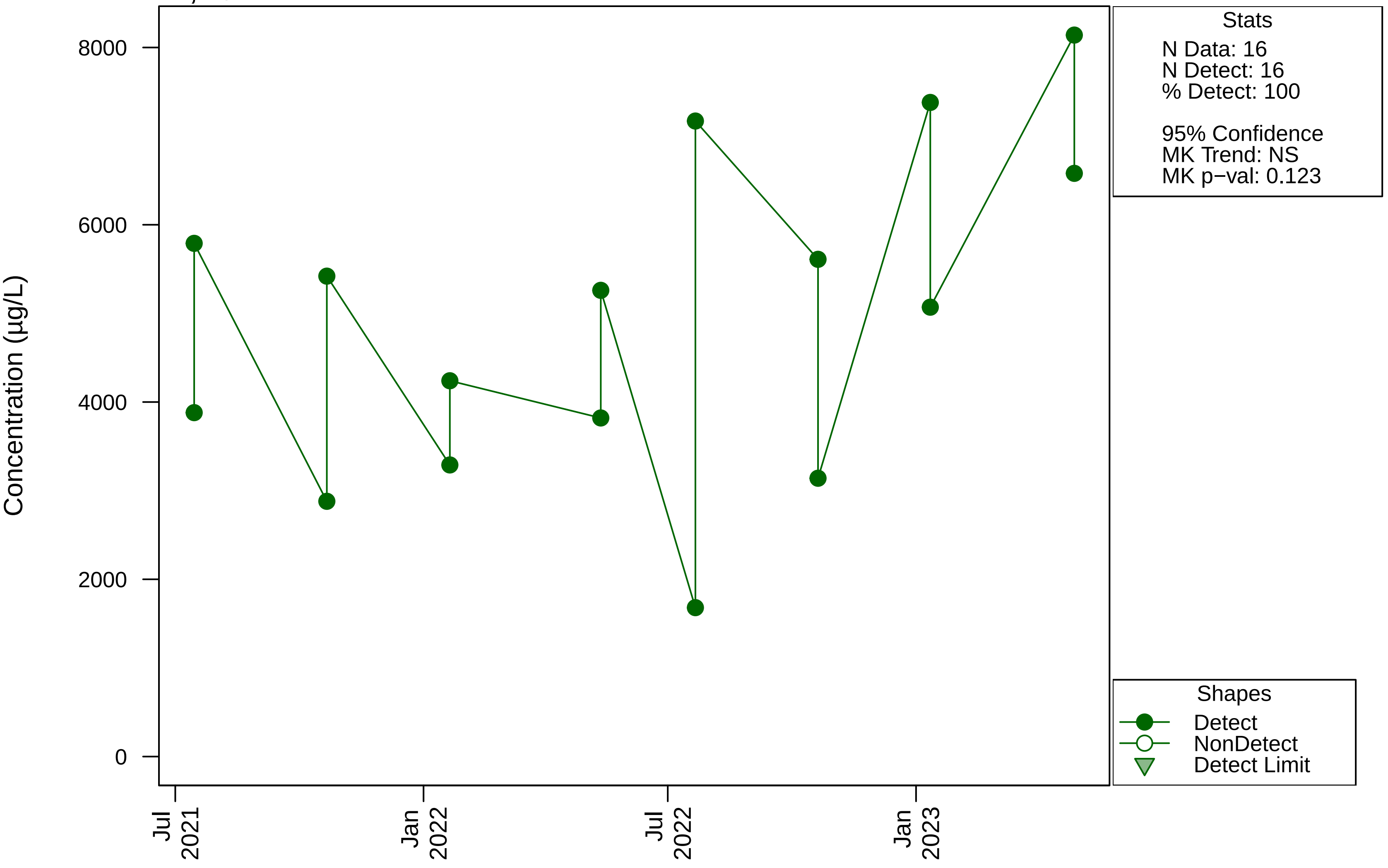

Scatterplots and Trend Analysis
D2, Chromium
Concentration (µg/L)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 3
% Detect: 38
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

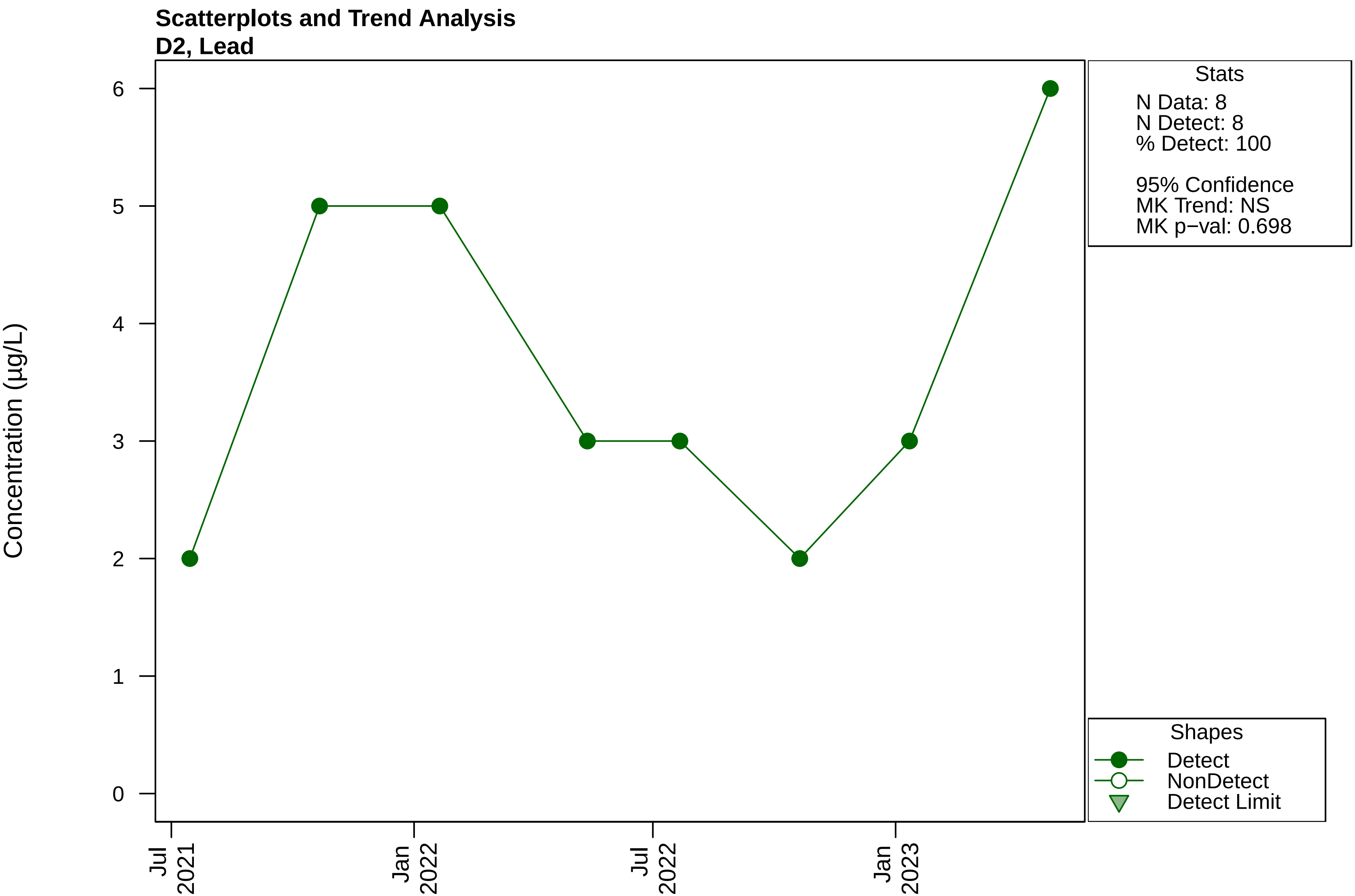


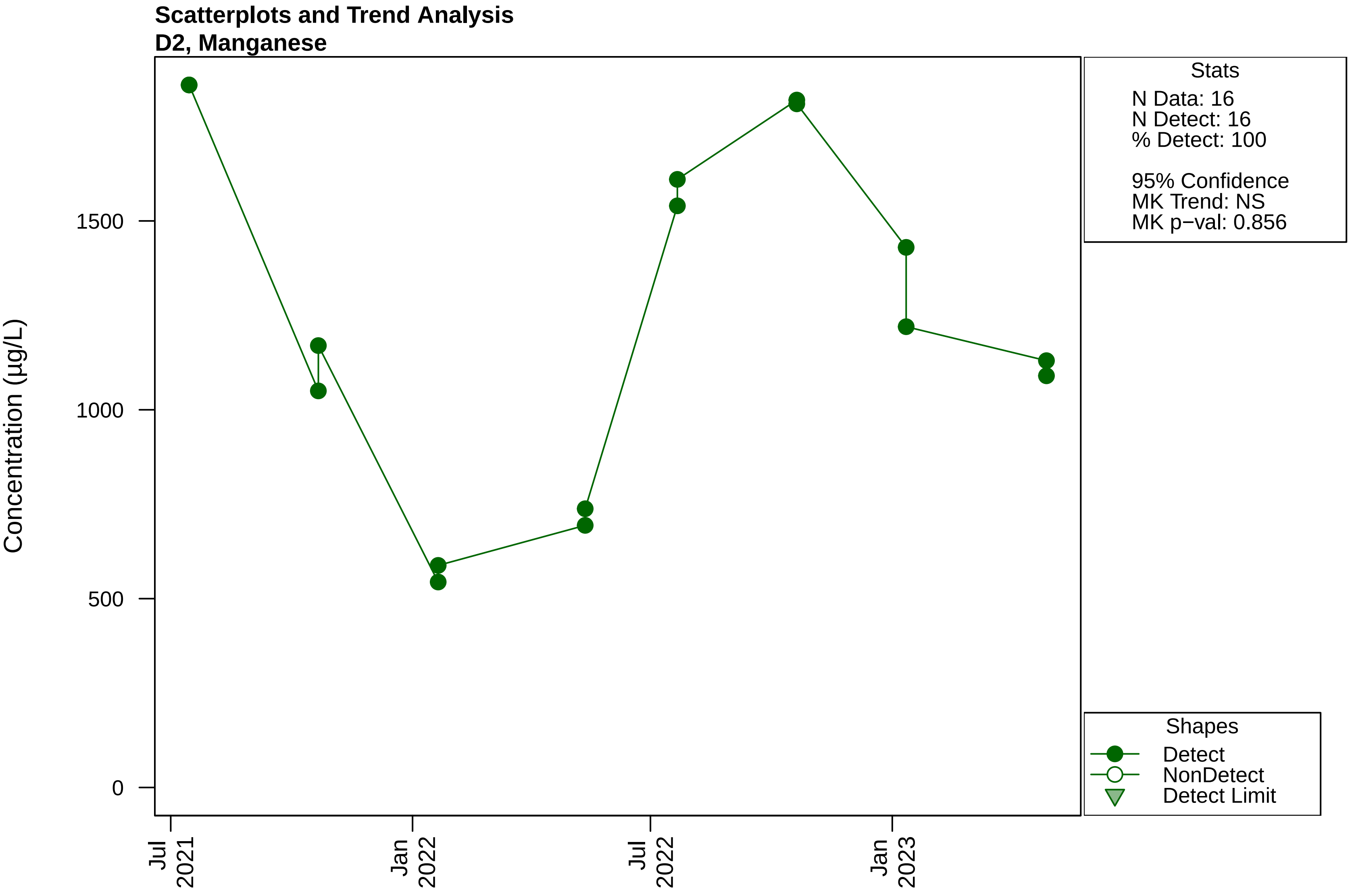
Scatterplots and Trend Analysis
D2, Electrical Conductivity (Field)
Concentration (uS/cm)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.548
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D2, Fluoride
Concentration (mg/L)
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 5
% Detect: 62
95% Confidence
MK Trend: NS
MK p−val: 0.702
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D2, Iron

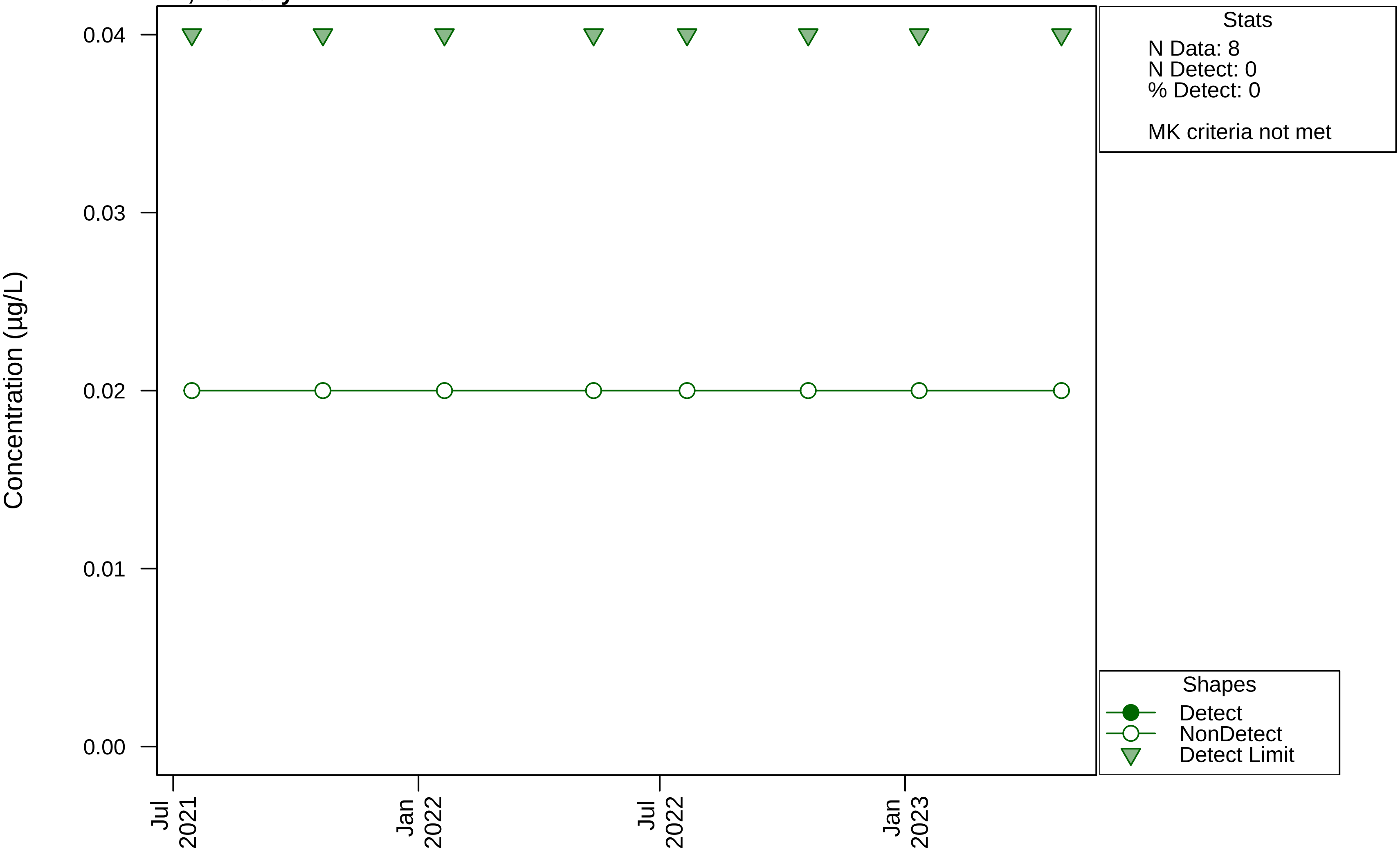


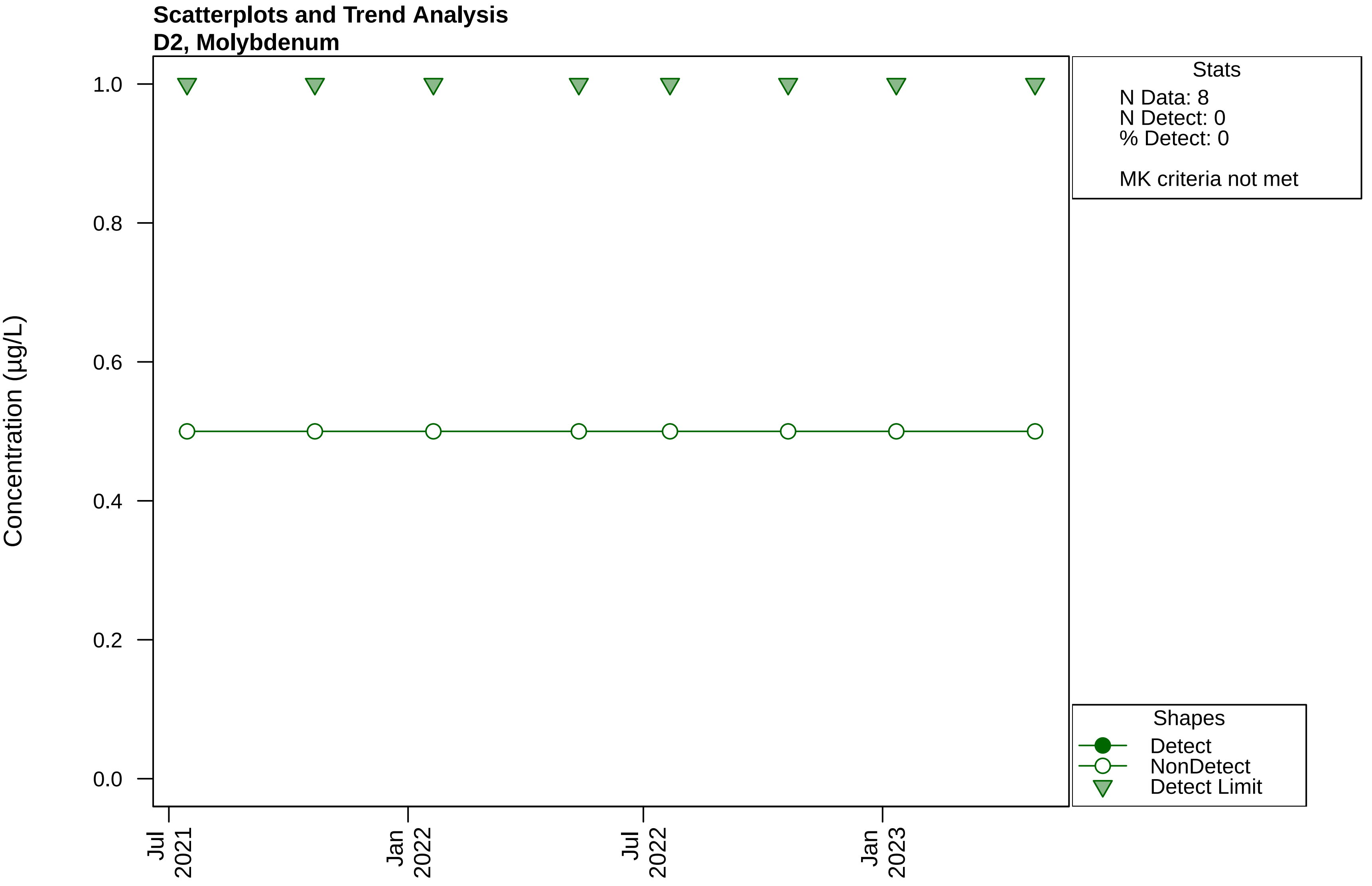

Scatterplots and Trend Analysis
D2, Lead
Concentration (µg/L)
0
1
2
3
4
5
6
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.698
Shapes
Detect
NonDetect
Detect Limit

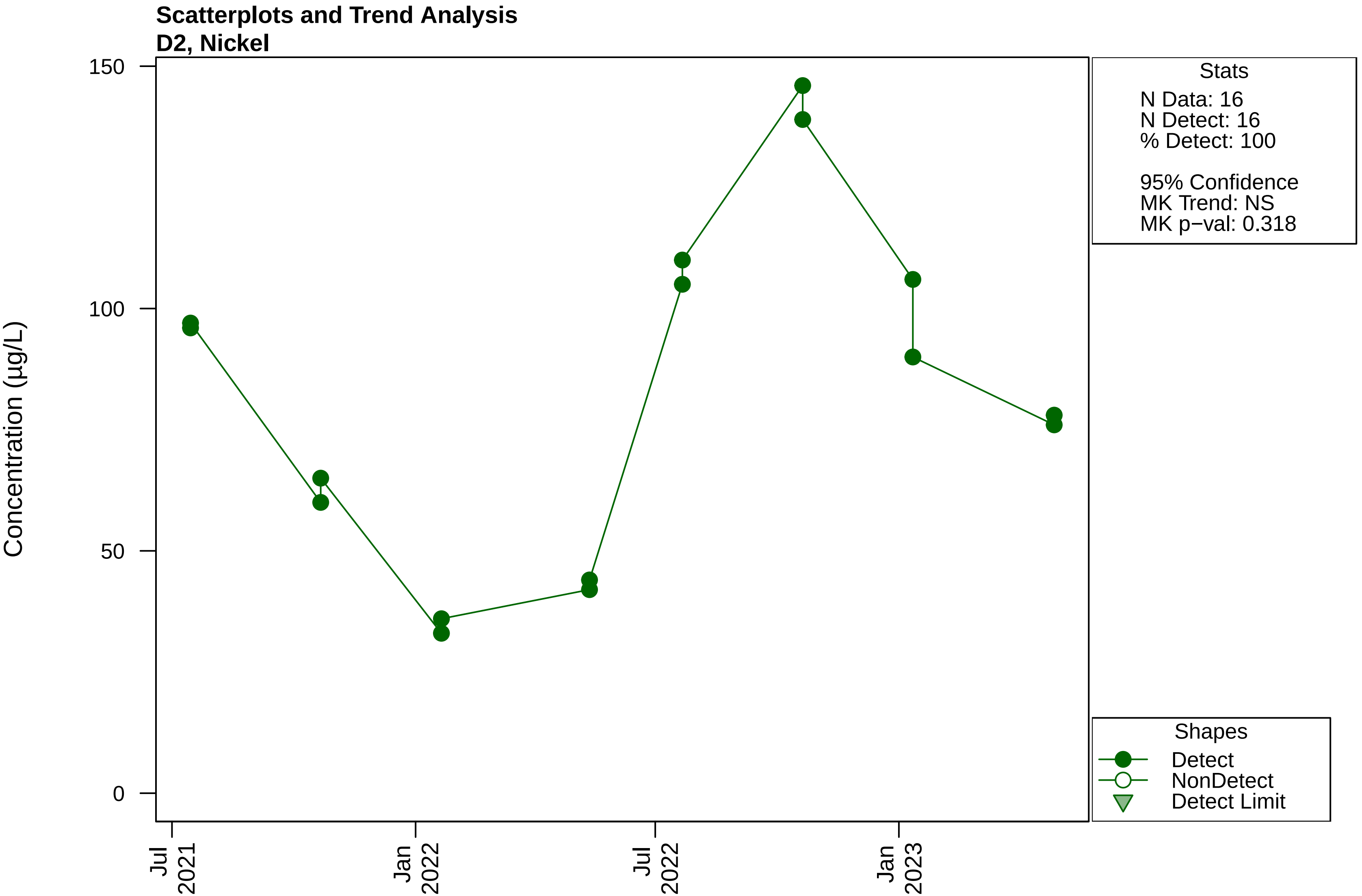


Scatterplots and Trend Analysis
D2, Manganese
Concentration (µg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.856
Shapes
Detect
NonDetect
Detect Limit

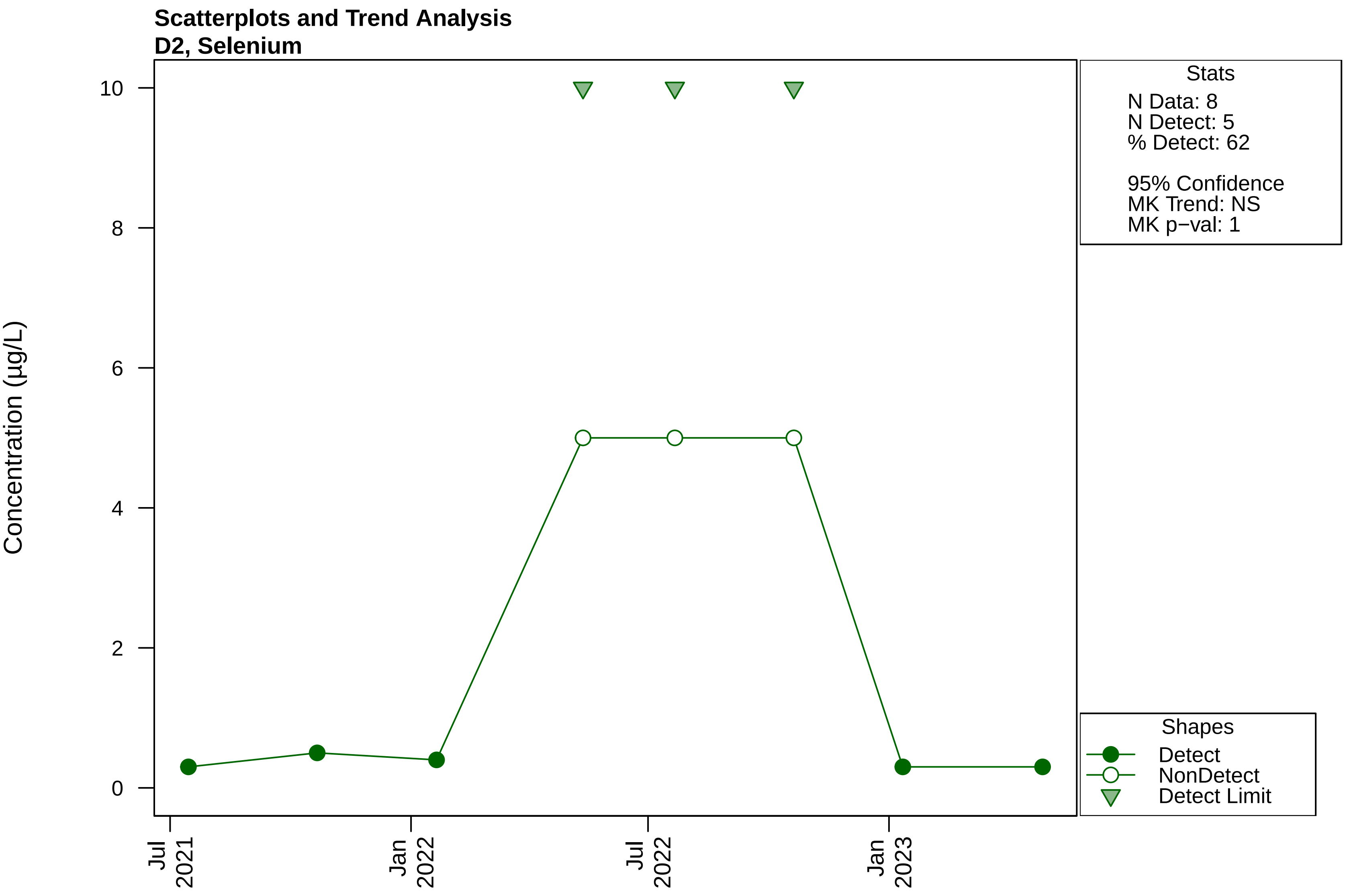
Scatterplots and Trend Analysis
D2, Mercury

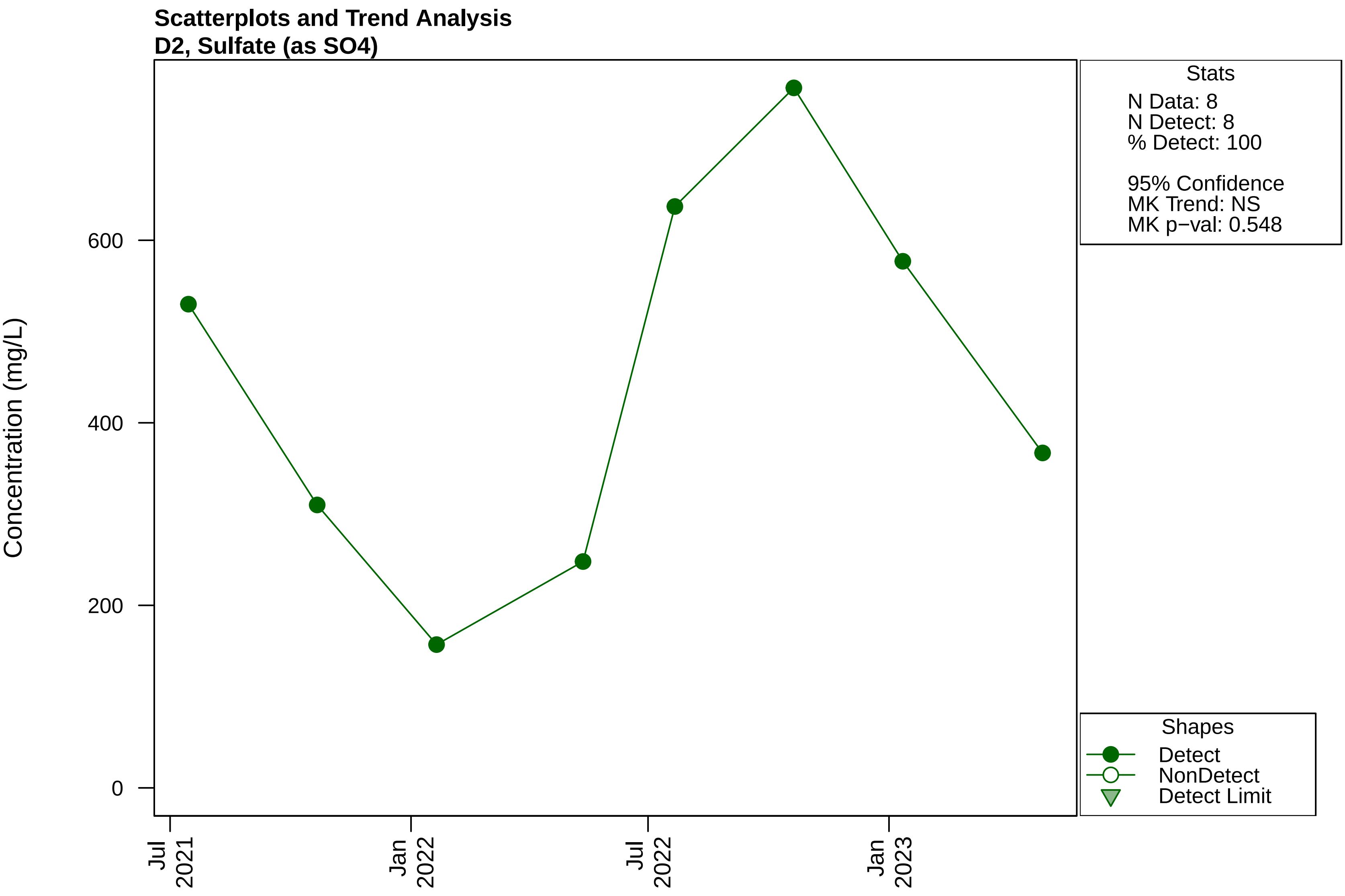


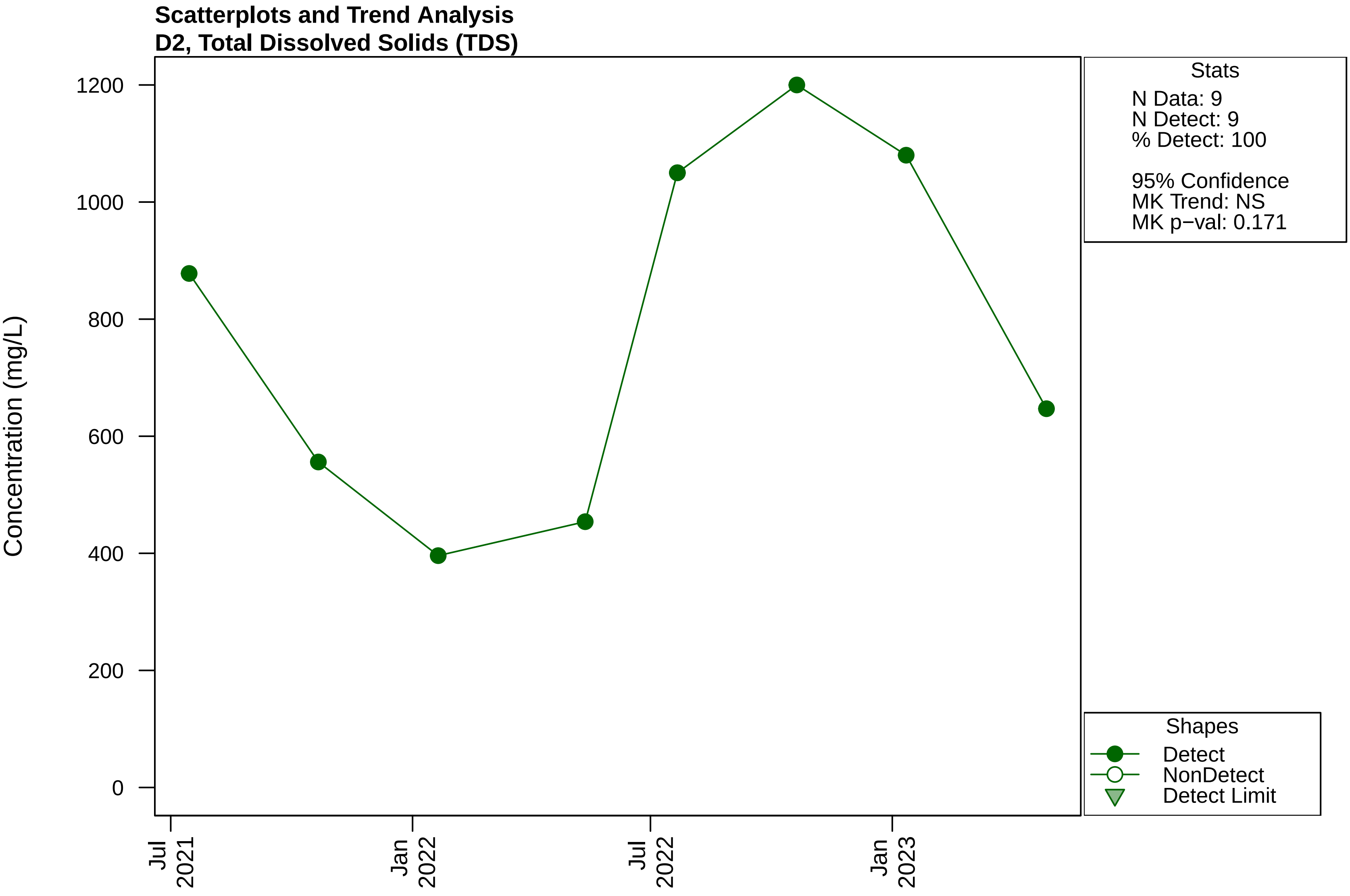

Scatterplots and Trend Analysis
D2, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

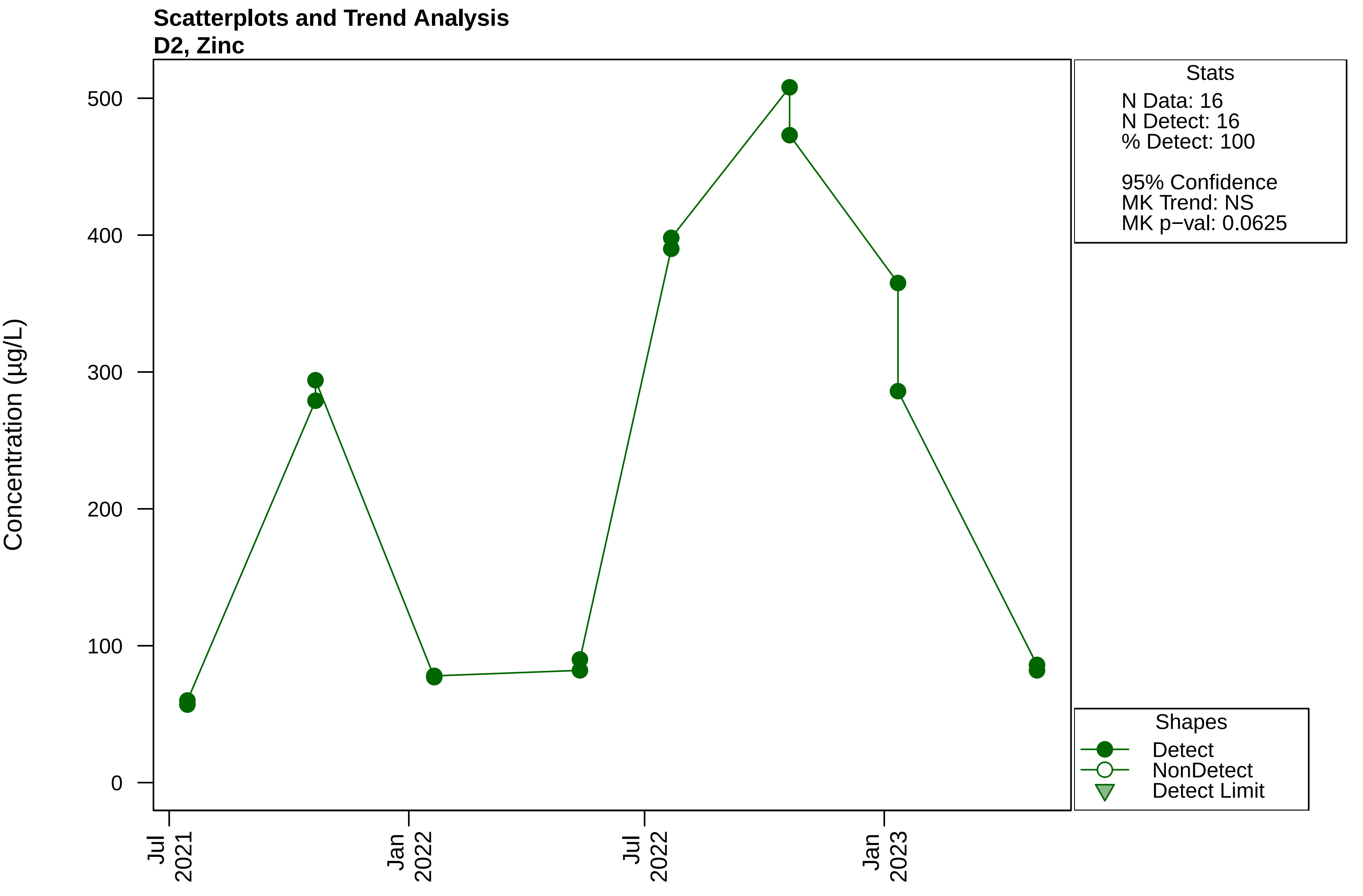


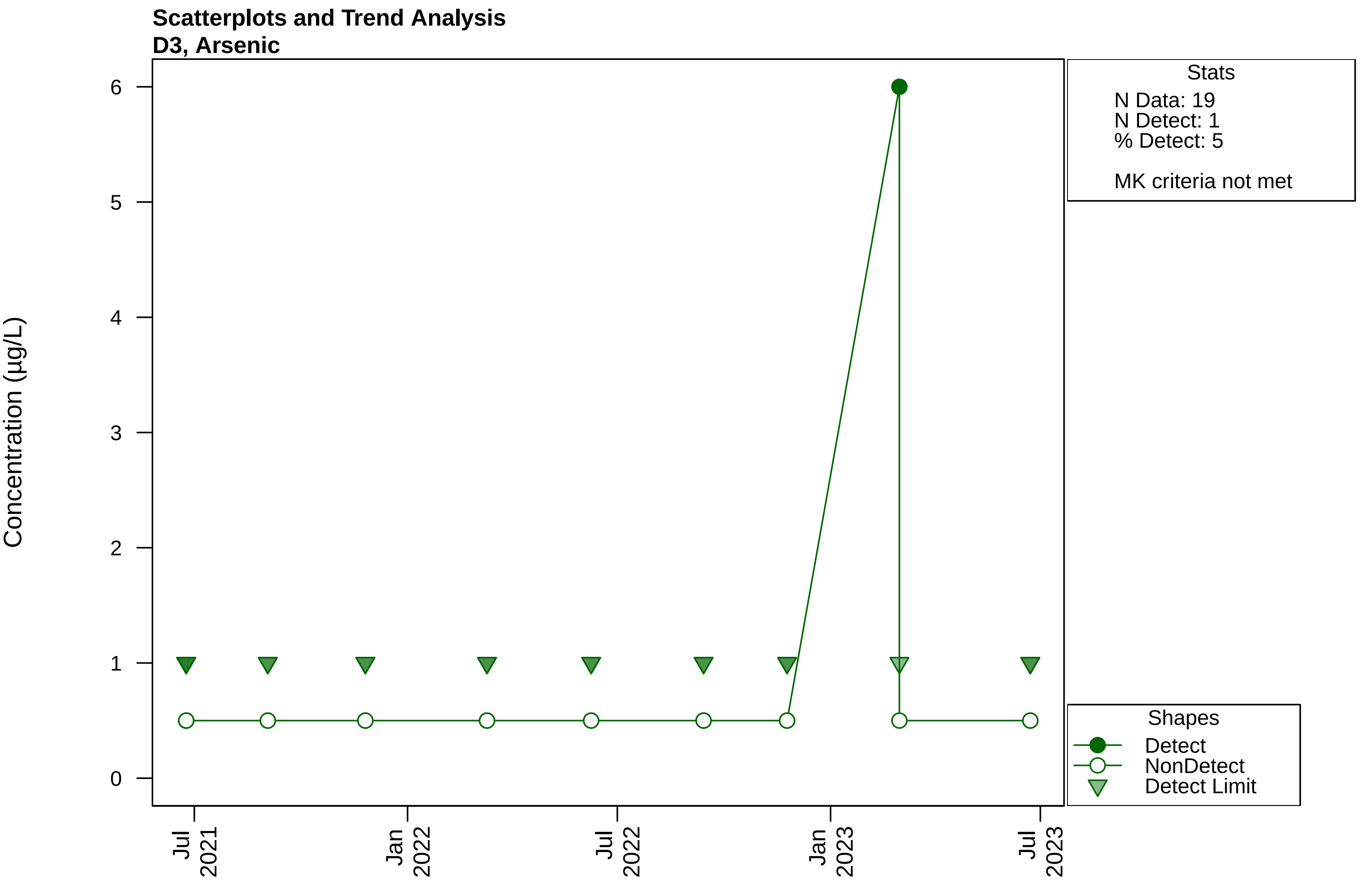
Scatterplots and Trend Analysis
D2, Nickel
Concentration (µg/L)
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.318
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D2, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 5
% Detect: 62
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit

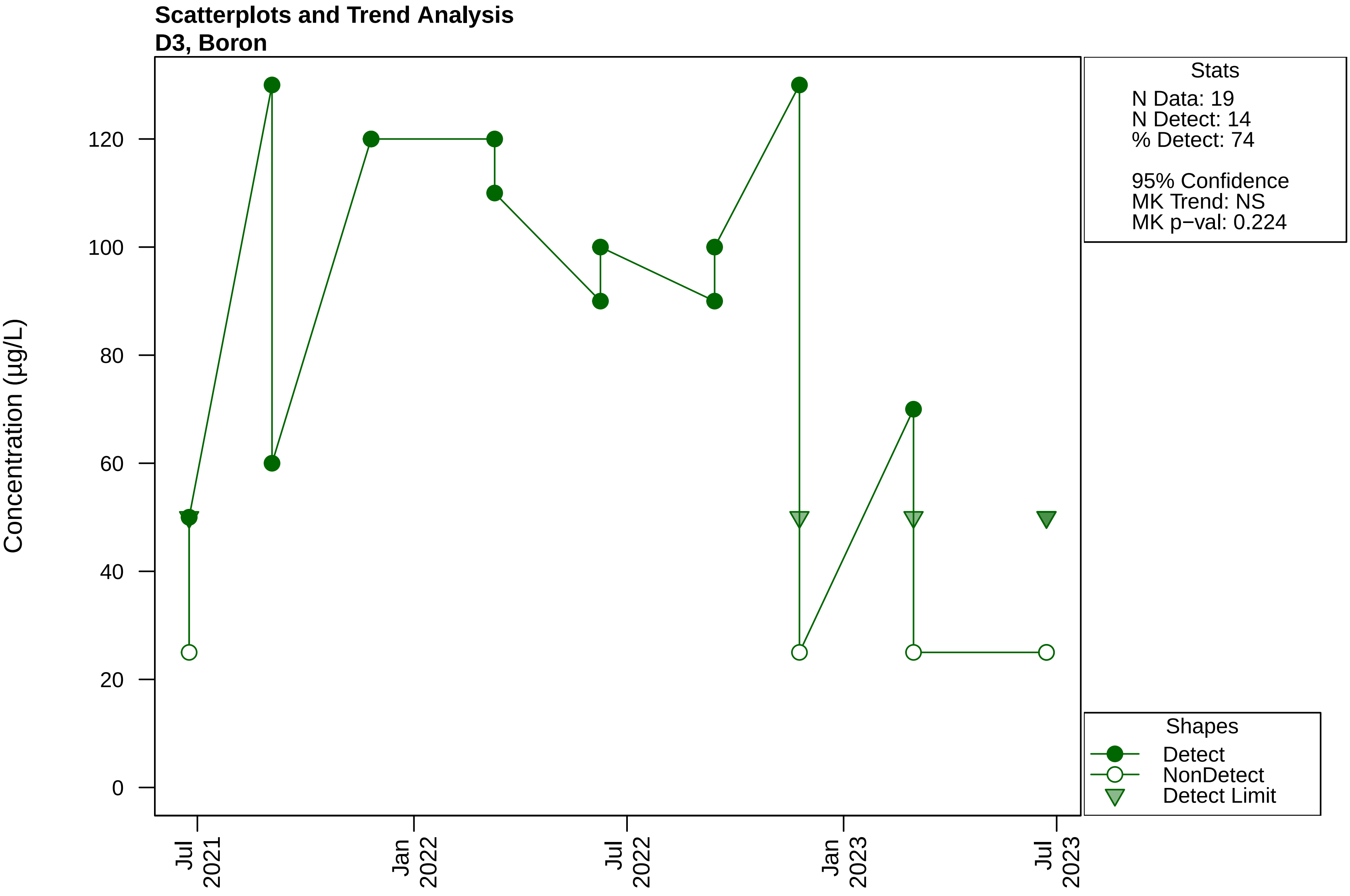

Scatterplots and Trend Analysis
D2, Sulfate (as SO4)
Concentration (mg/L)
0
200
400
600
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.548
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D2, Total Dissolved Solids (TDS)
Concentration (mg/L)
1200
1000
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.171
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D2, Zinc
Concentration (µg/L)
0
100
200
300
400
500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0625
Shapes
Detect
NonDetect
Detect Limit

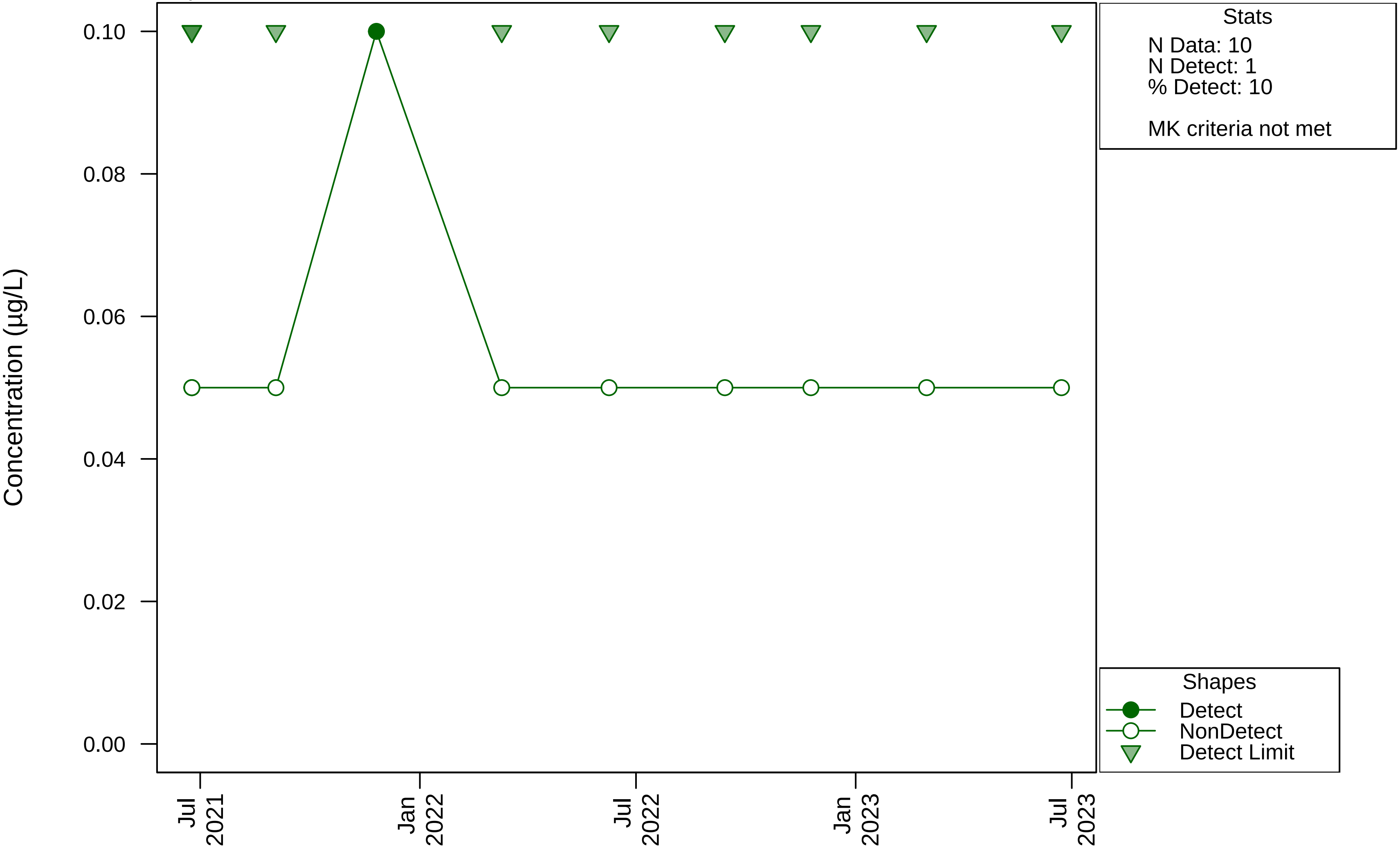


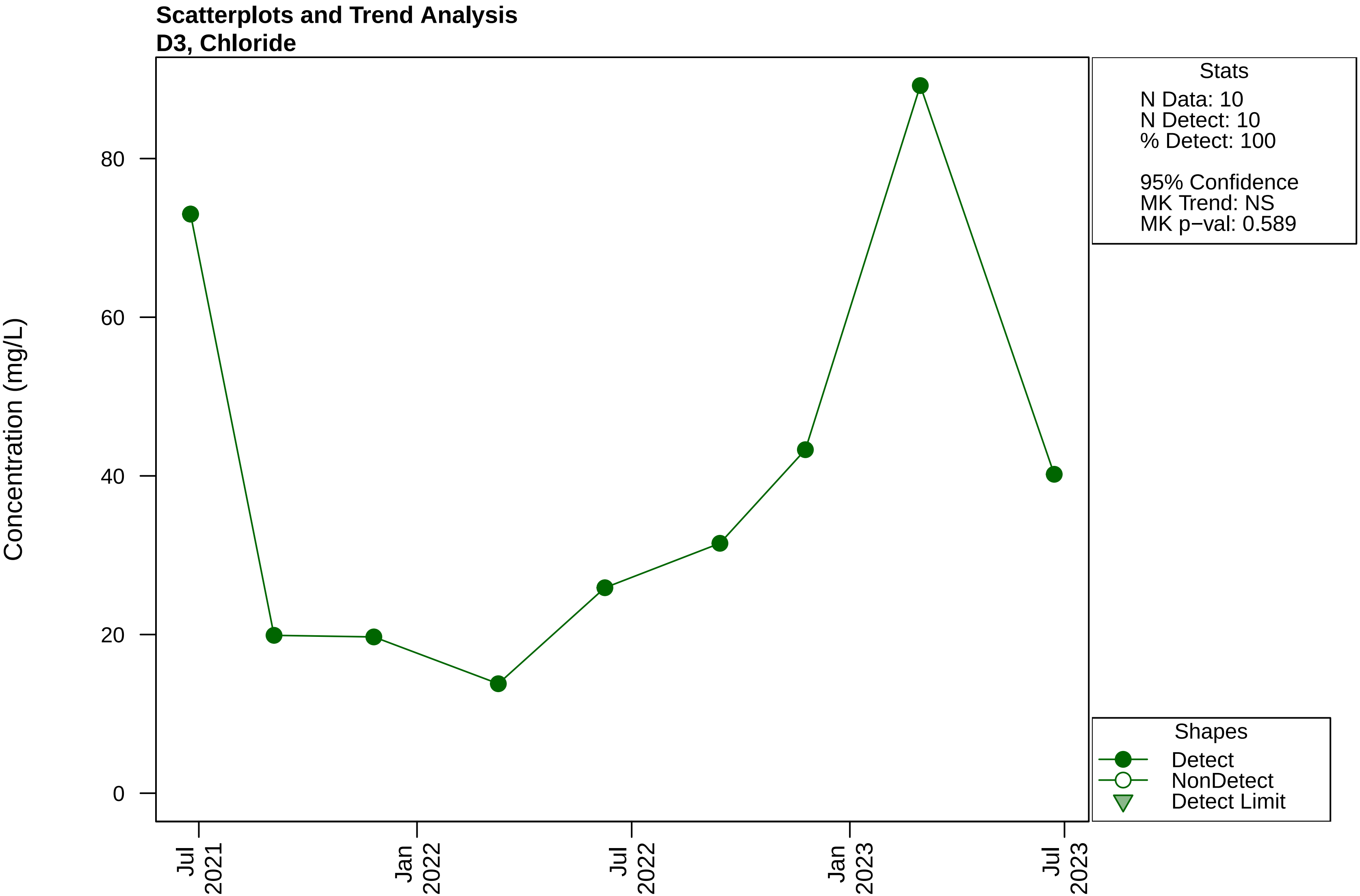
Scatterplots and Trend Analysis
D3, Arsenic
Concentration (µg/L)
0
1
2
3
4
5
6
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 19
N Detect: 1
% Detect: 5
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

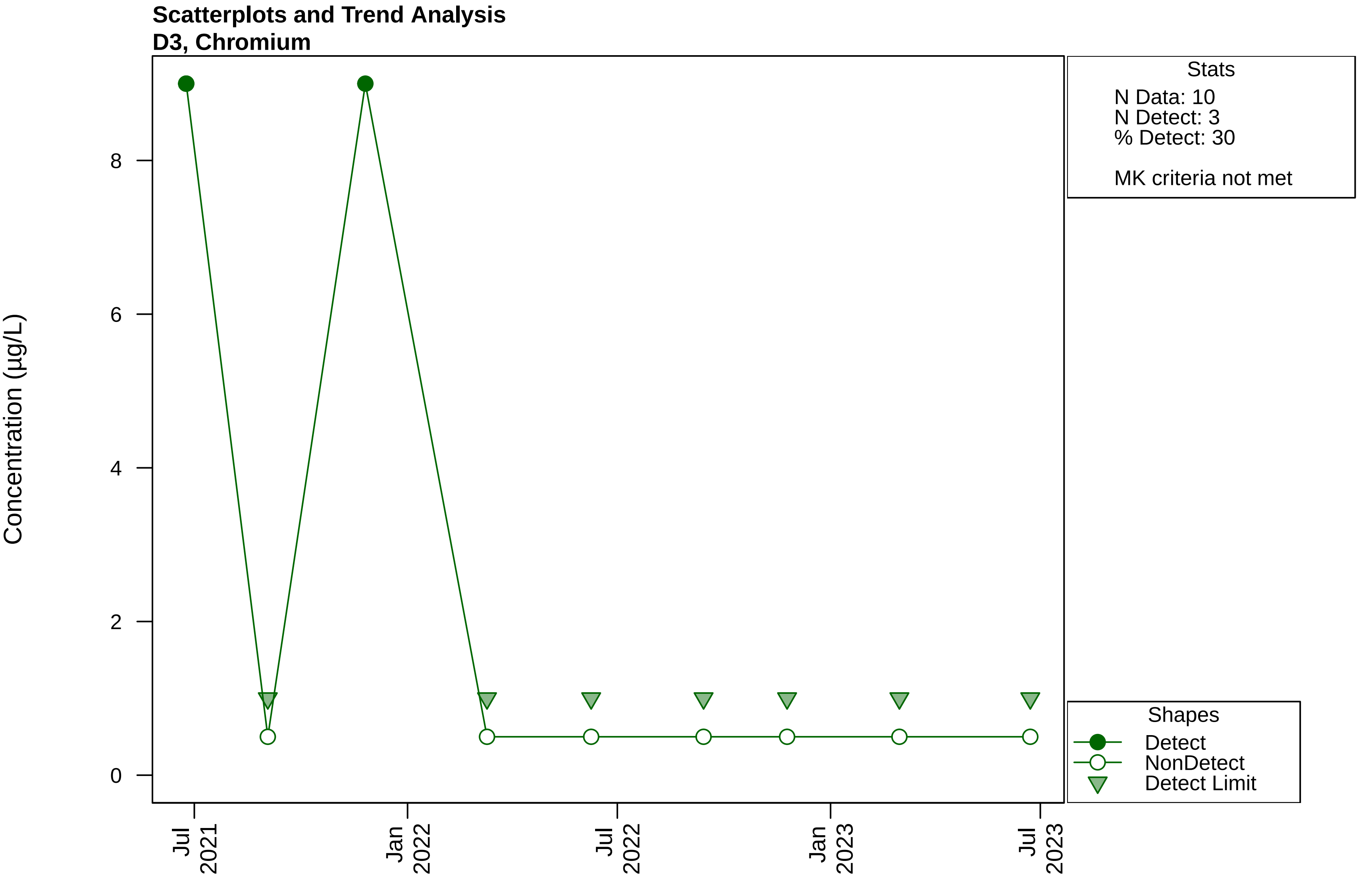


Scatterplots and Trend Analysis
D3, Boron
Concentration (µg/L)
0
20
40
60
80
100
120
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 19
N Detect: 14
% Detect: 74
95% Confidence
MK Trend: NS
MK p−val: 0.224
Shapes
Detect
NonDetect
Detect Limit

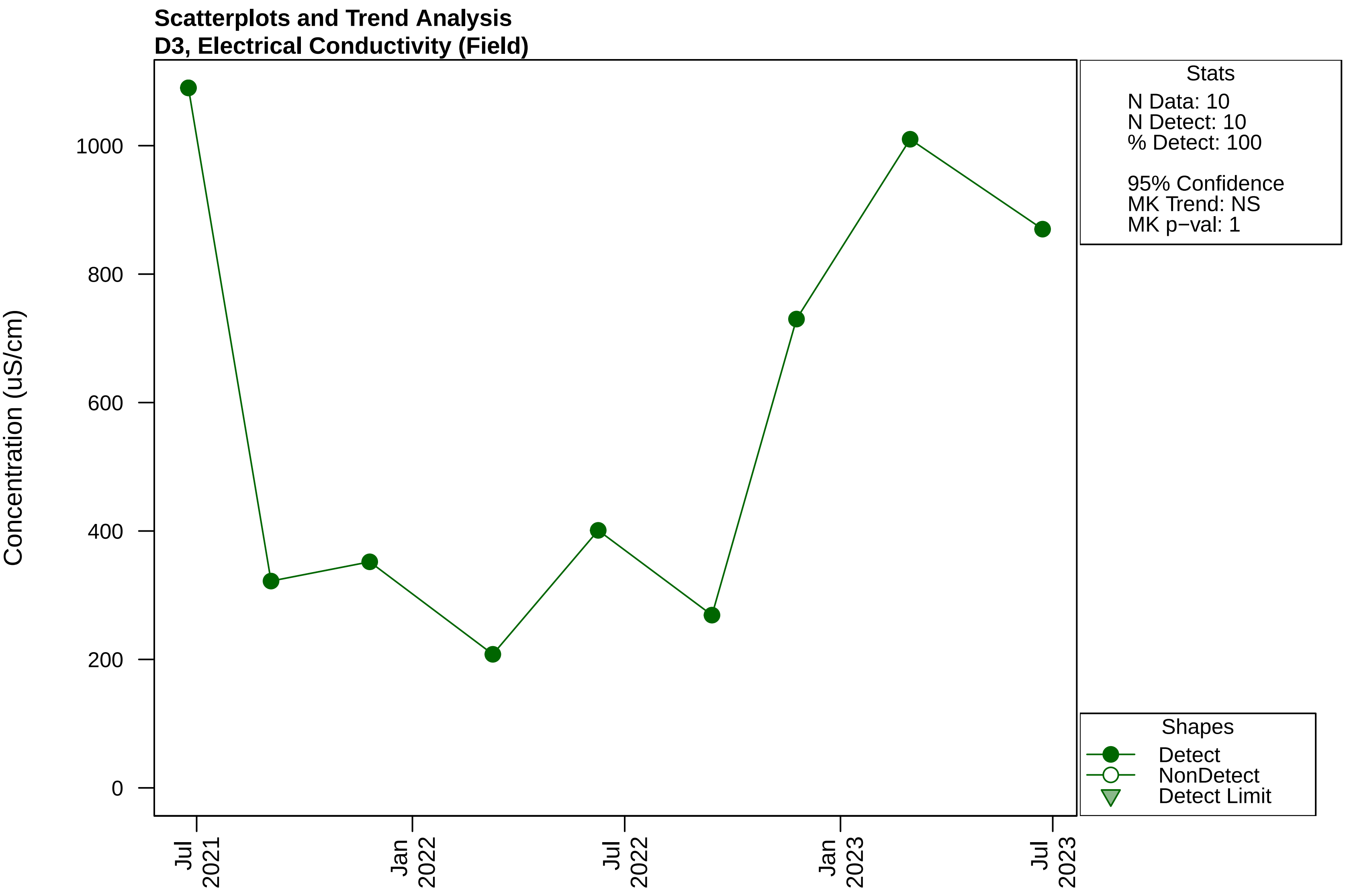
Scatterplots and Trend Analysis
D3, Cadmium

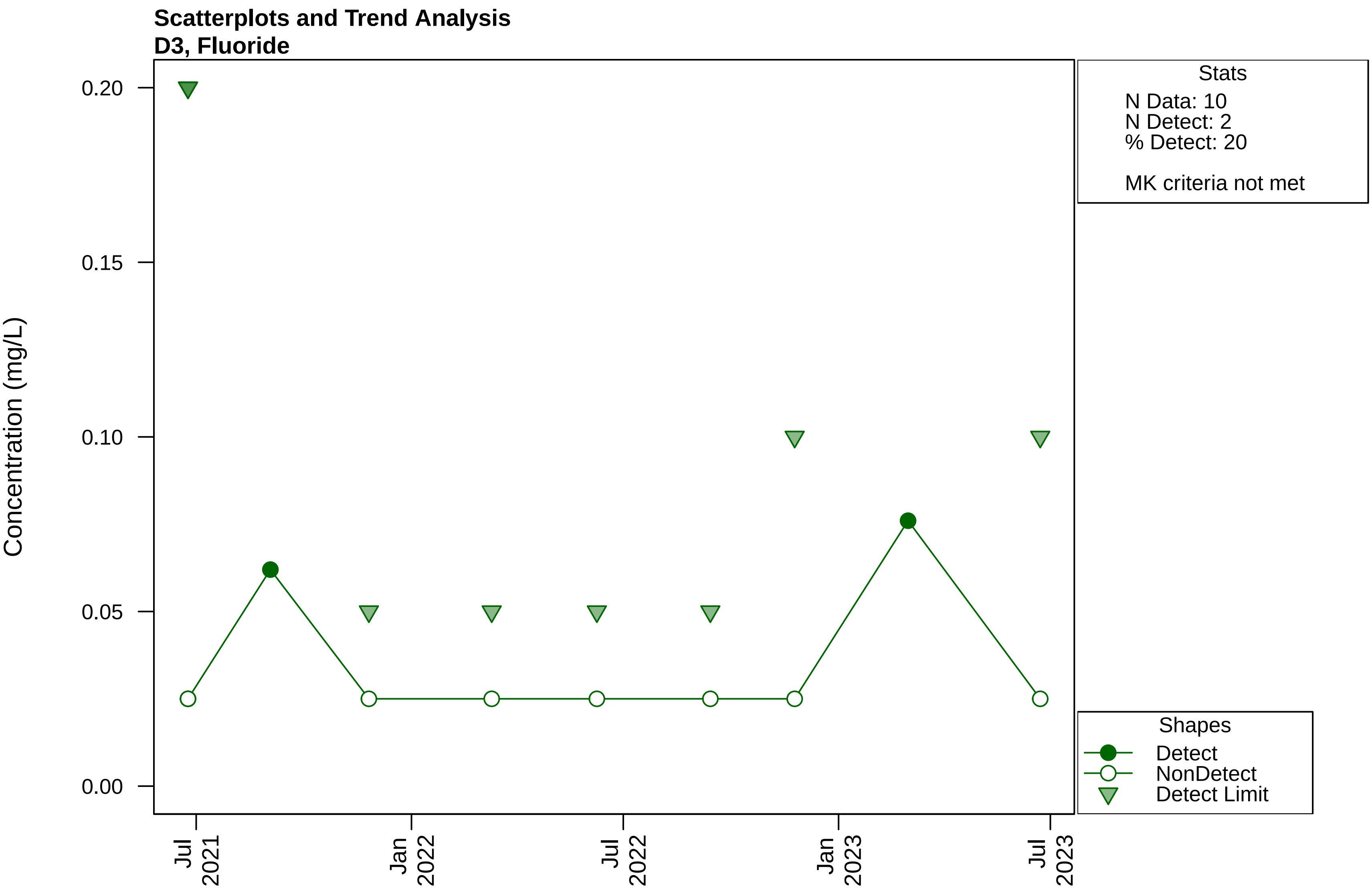



Scatterplots and Trend Analysis
D3, Chloride
Concentration (mg/L)
0
20
40
60
80
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.589
Shapes
Detect
NonDetect
Detect Limit

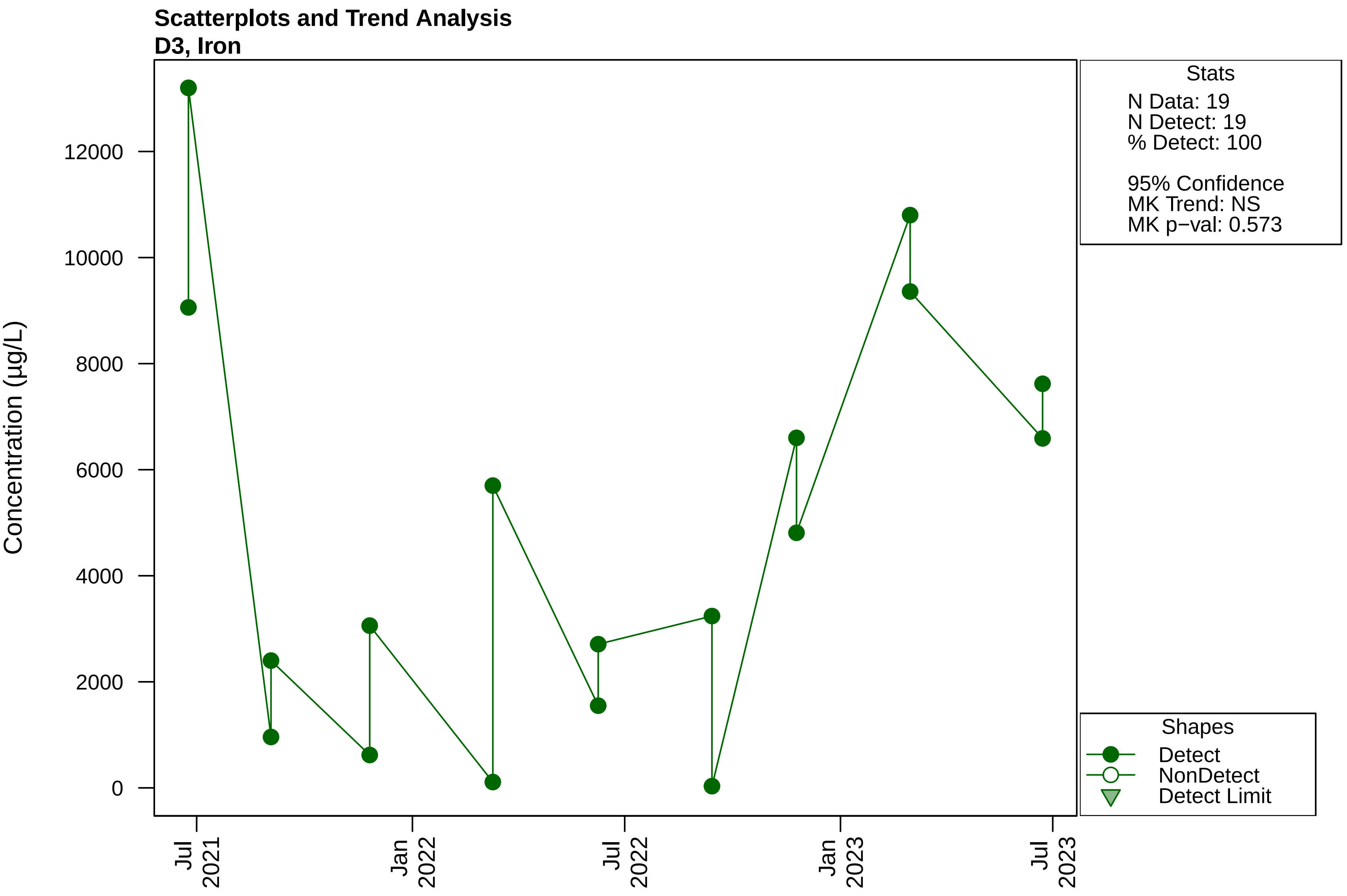


Scatterplots and Trend Analysis
D3, Chromium
Concentration (µg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 3
% Detect: 30
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D3, Electrical Conductivity (Field)
Concentration (uS/cm)
0
200
400
600
800
1000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit

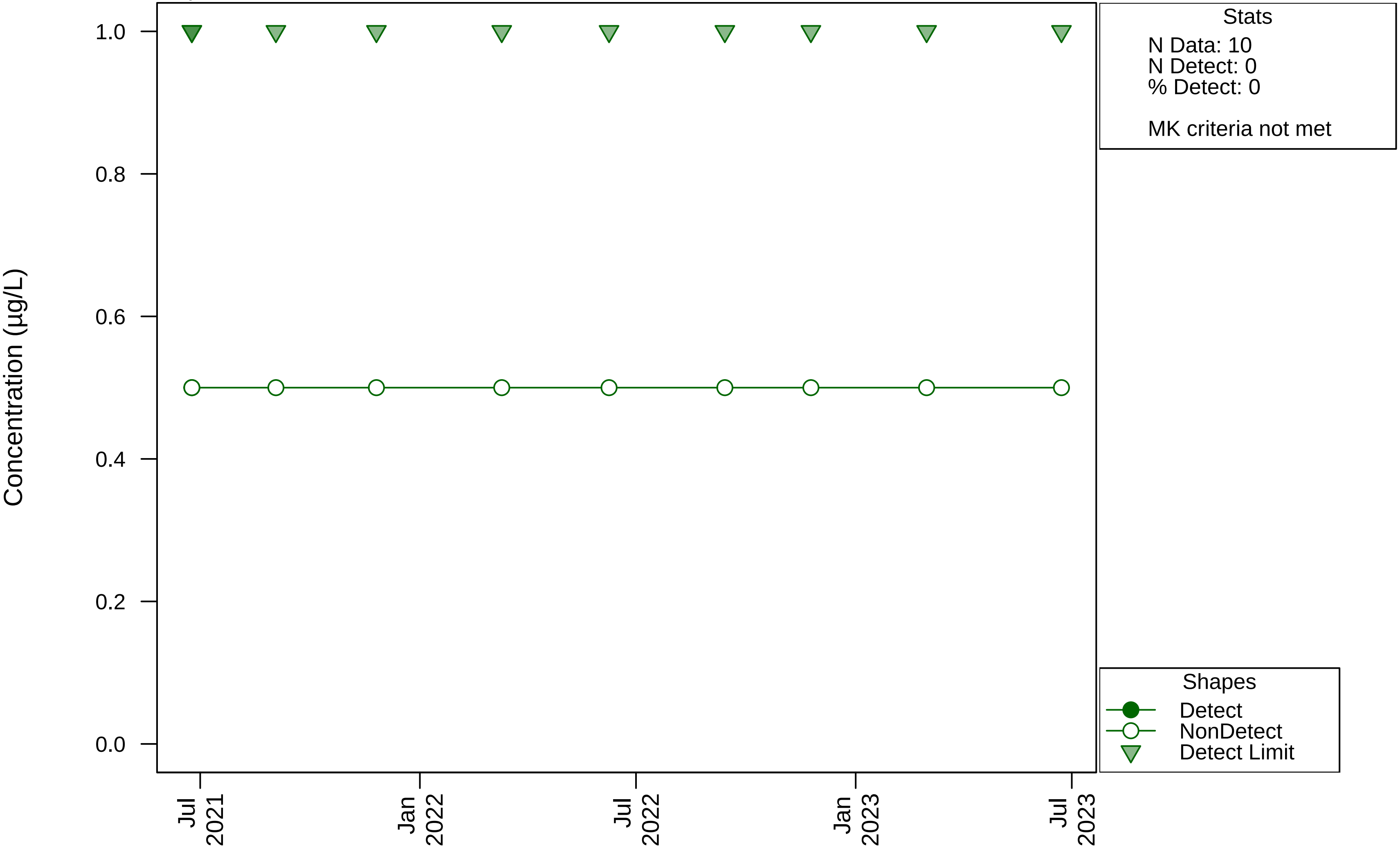


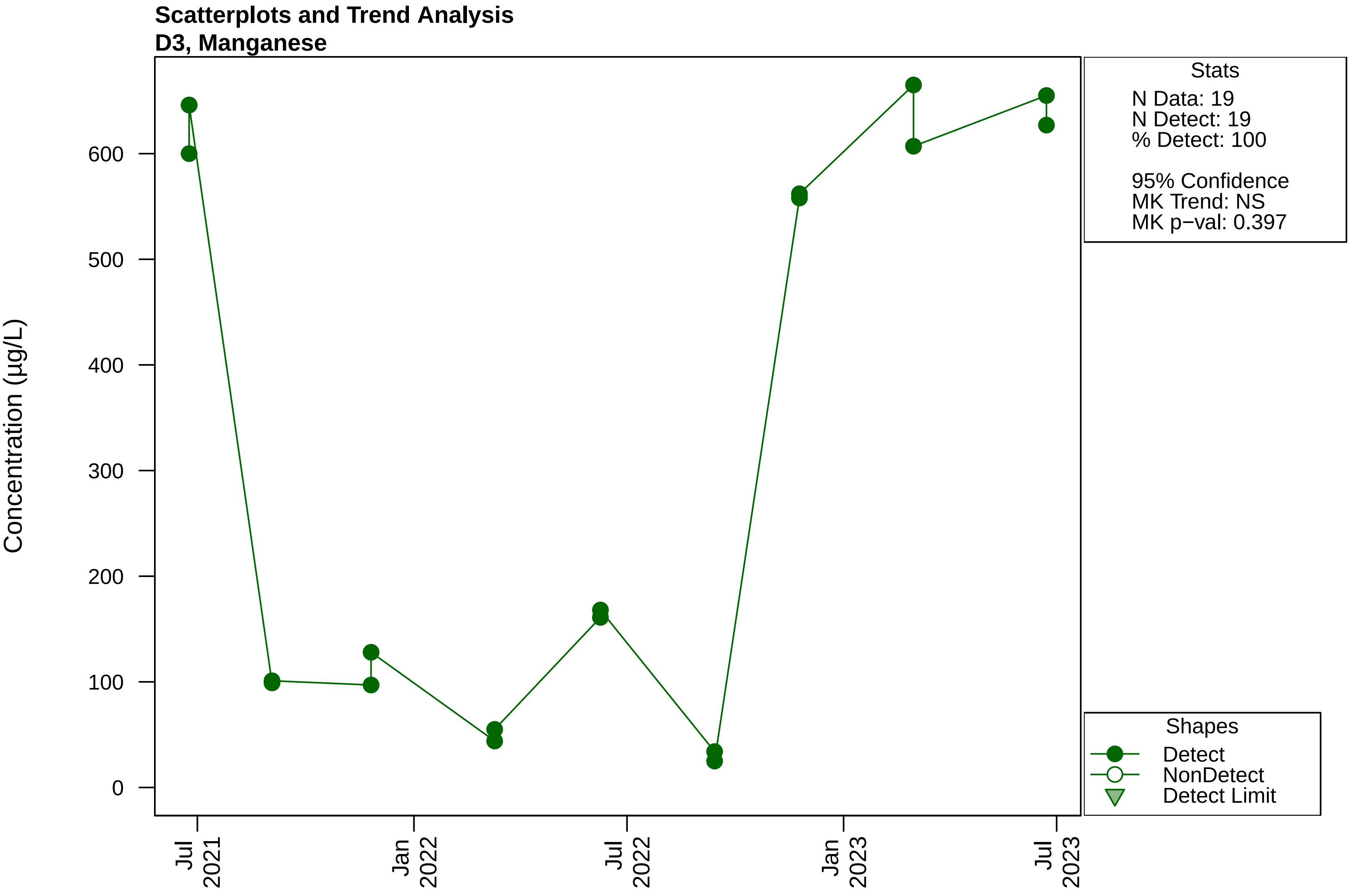
Scatterplots and Trend Analysis
D3, Fluoride
Concentration (mg/L)
0.00
0.05
0.10
0.15
0.20
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 2
% Detect: 20
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

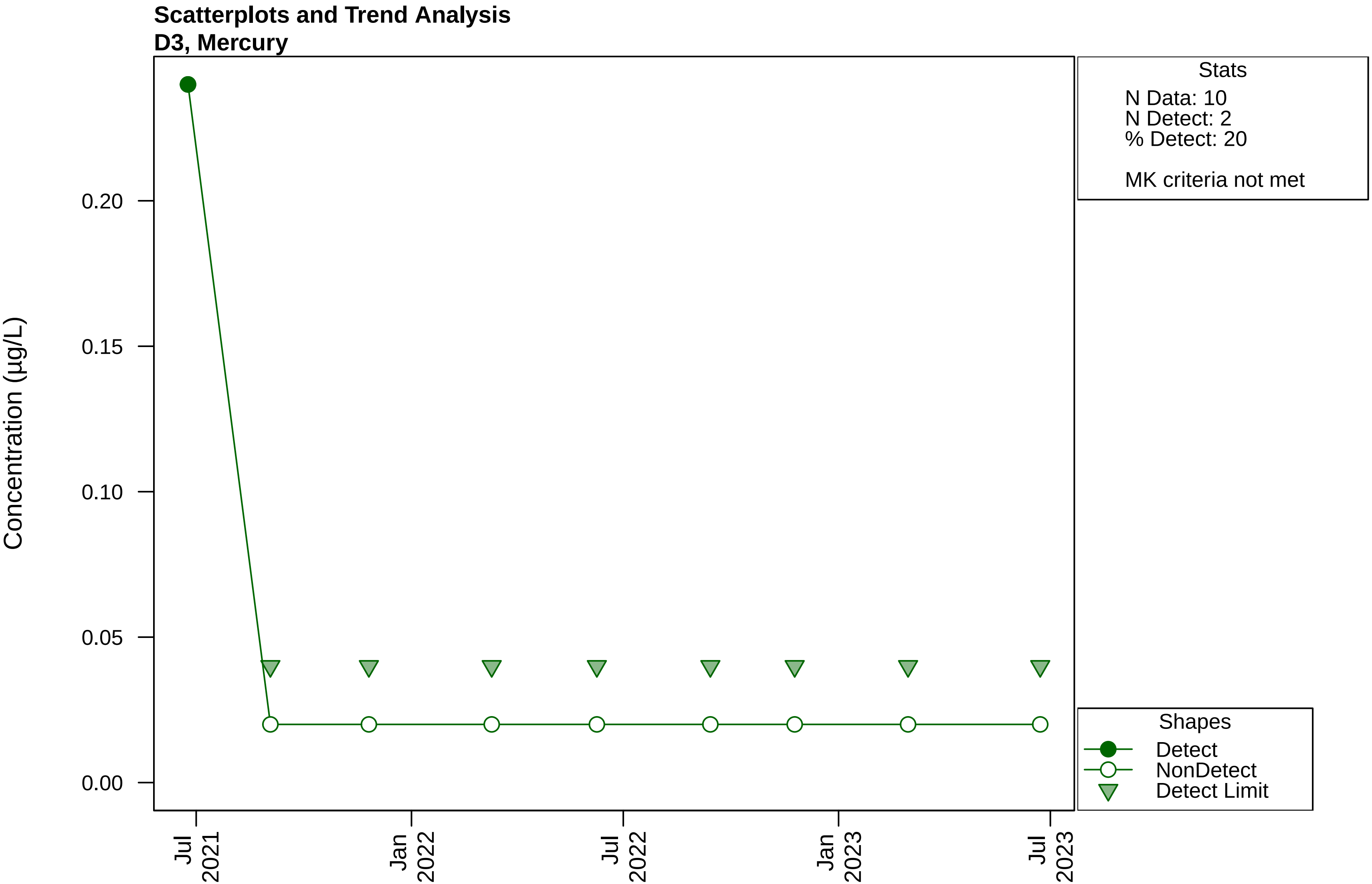


Scatterplots and Trend Analysis
D3, Iron
Concentration (µg/L)
0
2000
4000
6000
8000
10000
12000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.573
Shapes
Detect
NonDetect
Detect Limit

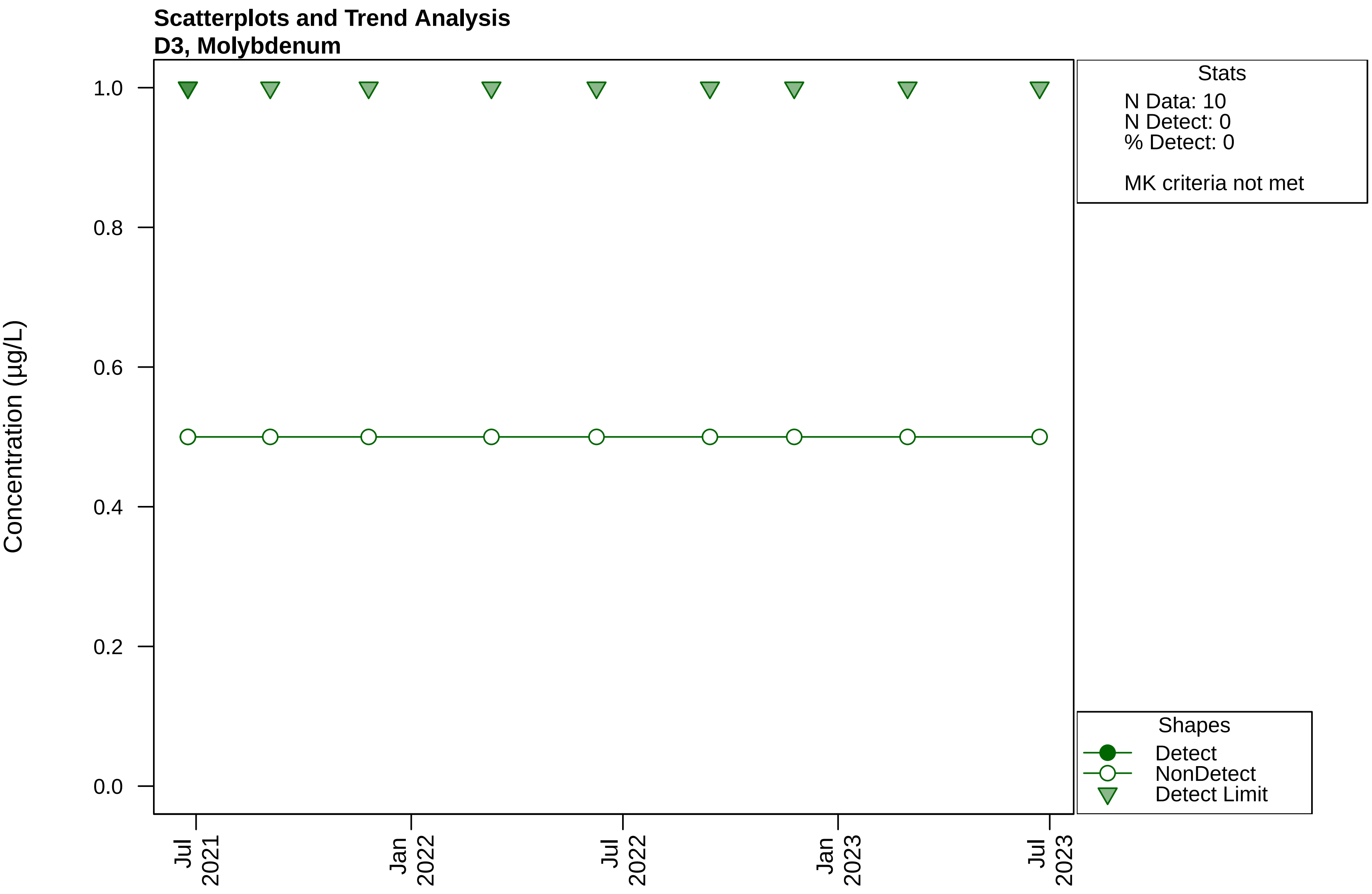
Scatterplots and Trend Analysis
D3, Lead



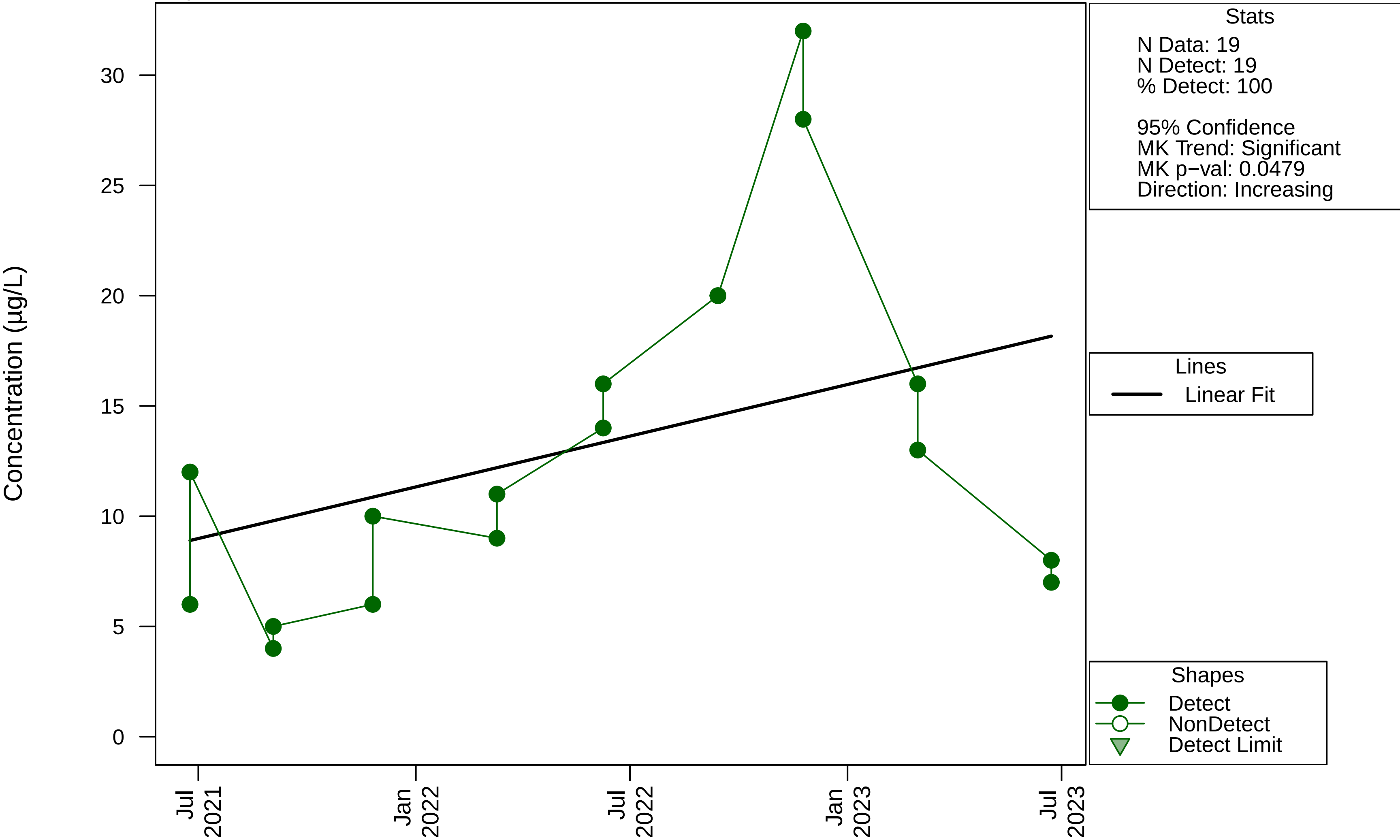

Scatterplots and Trend Analysis
D3, Manganese
Concentration (µg/L)
0
100
200
300
400
500
600
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 19
N Detect: 19
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.397
Shapes
Detect
NonDetect
Detect Limit

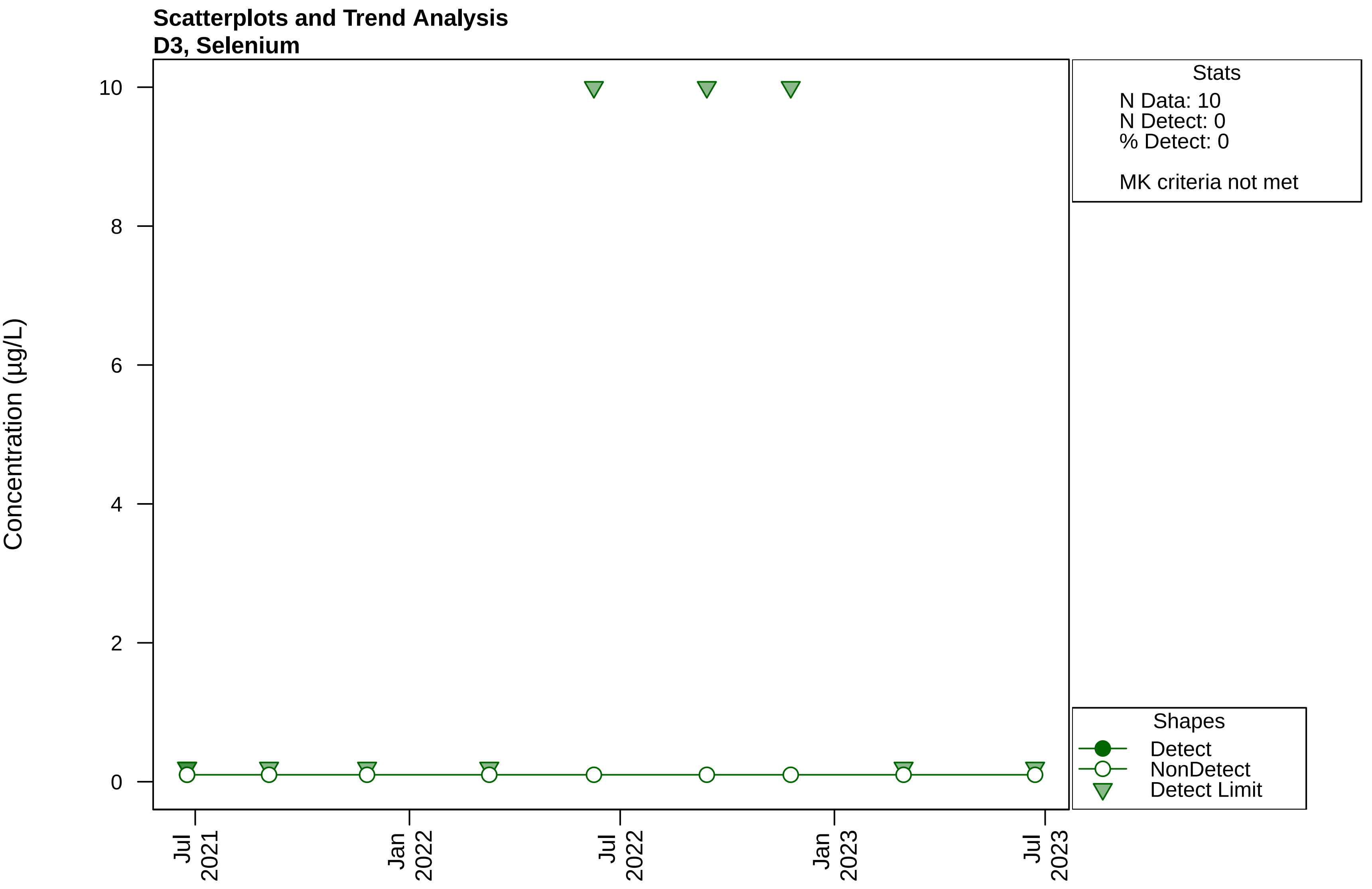


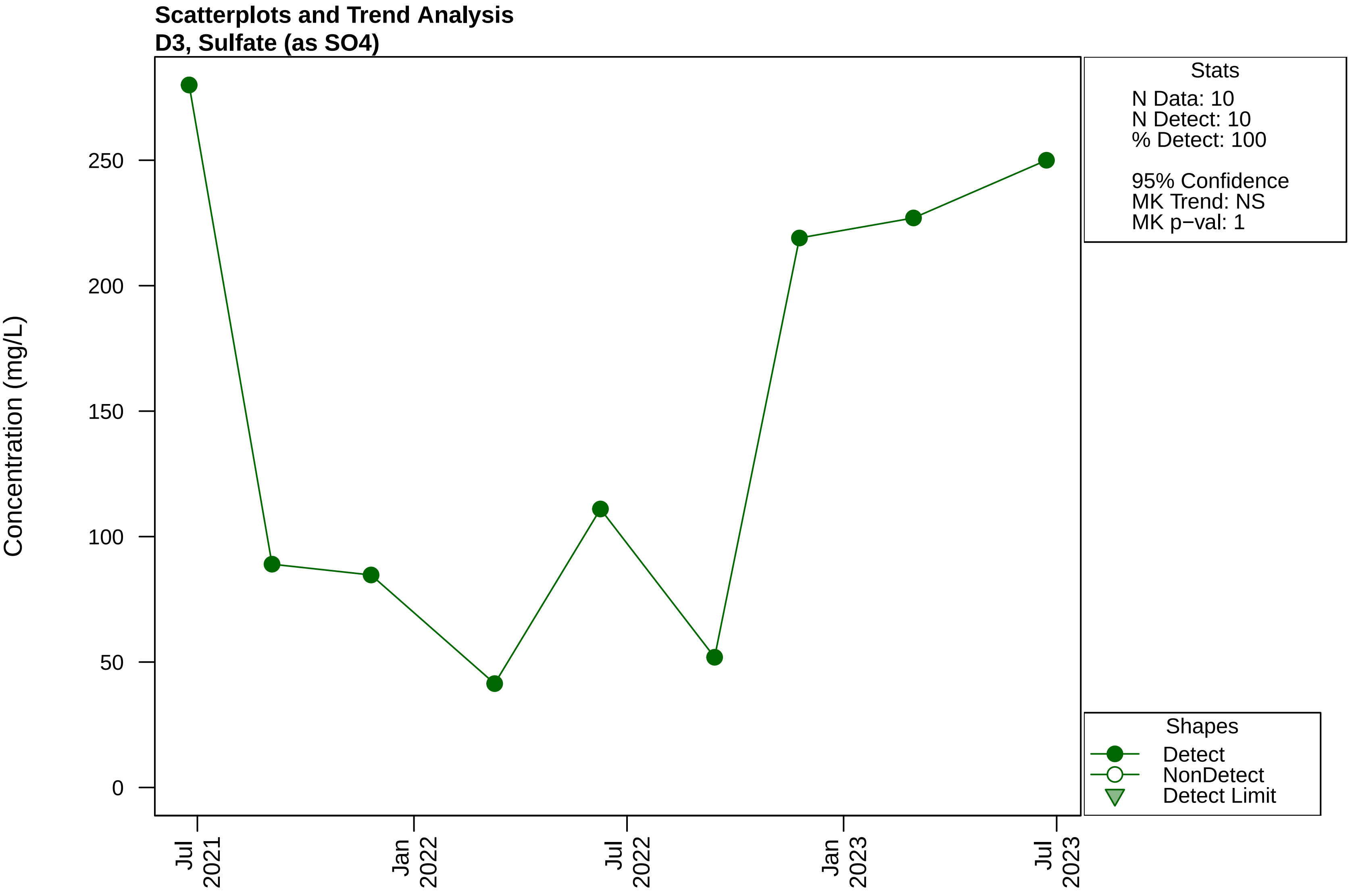
Scatterplots and Trend Analysis
D3, Mercury
Concentration (µg/L)
0.20
0.15
0.10
0.05
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 2
% Detect: 20
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D3, Molybdenum
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

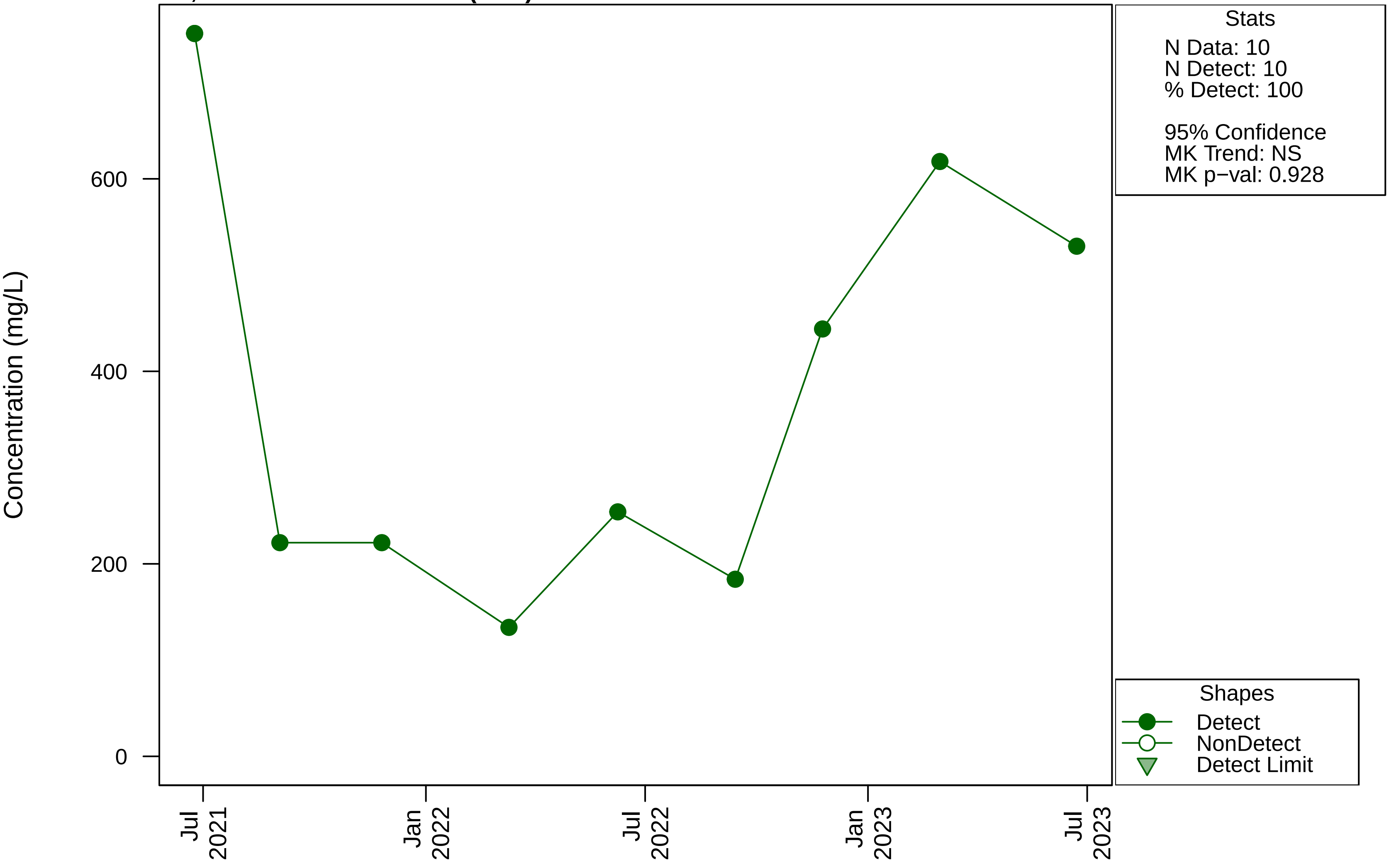
Scatterplots and Trend Analysis
D3, Nickel

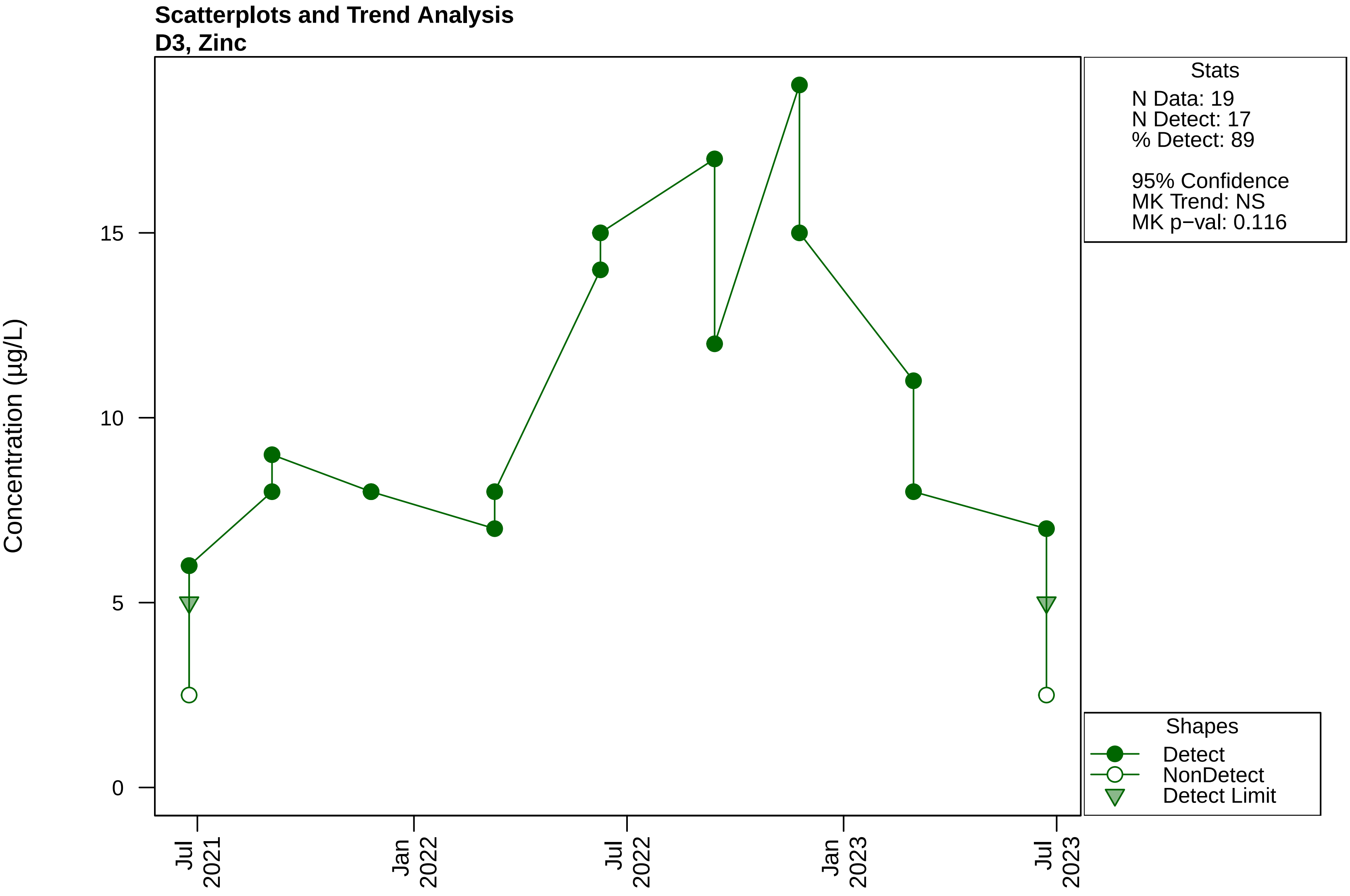


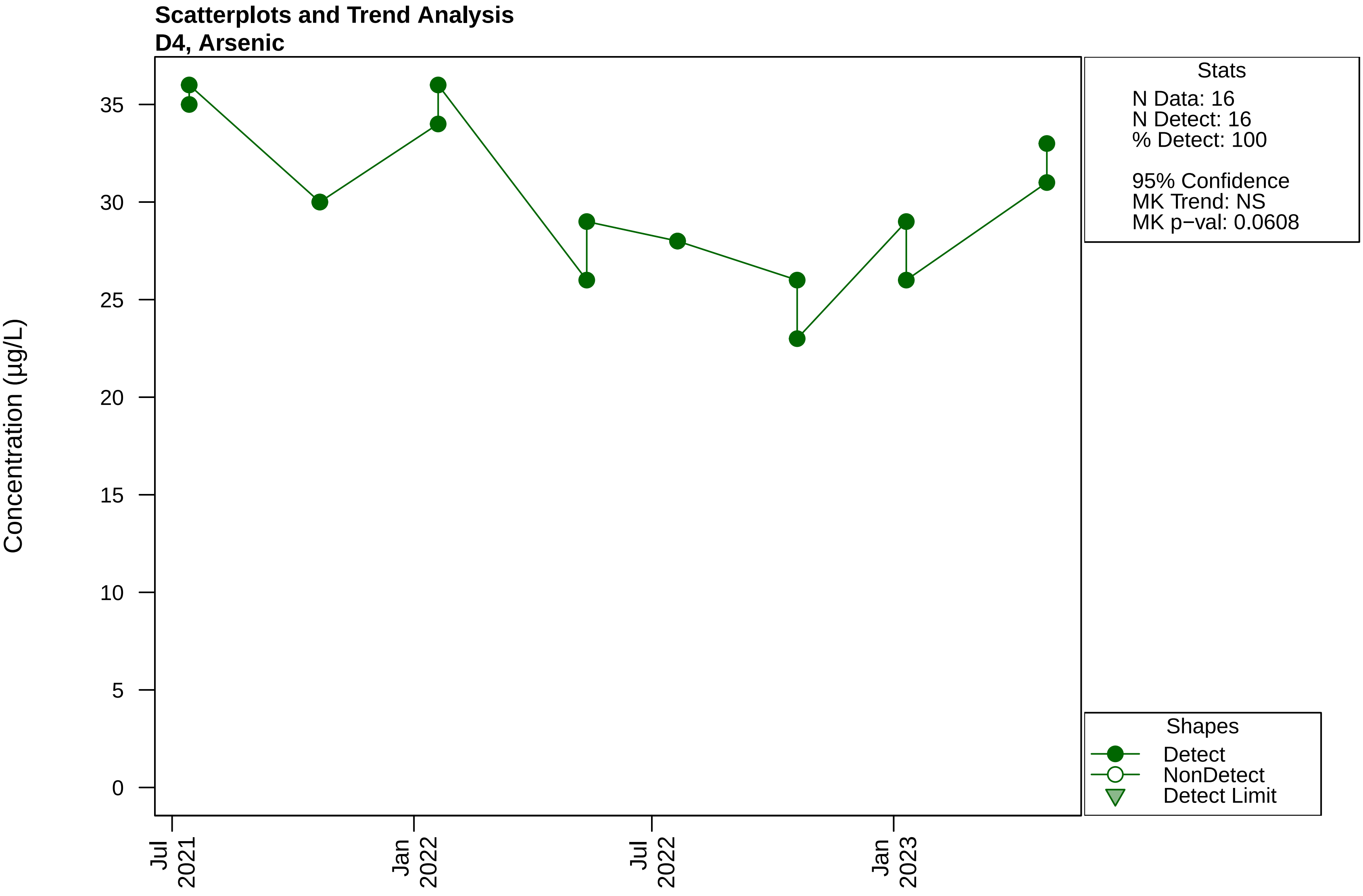

Scatterplots and Trend Analysis
D3, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

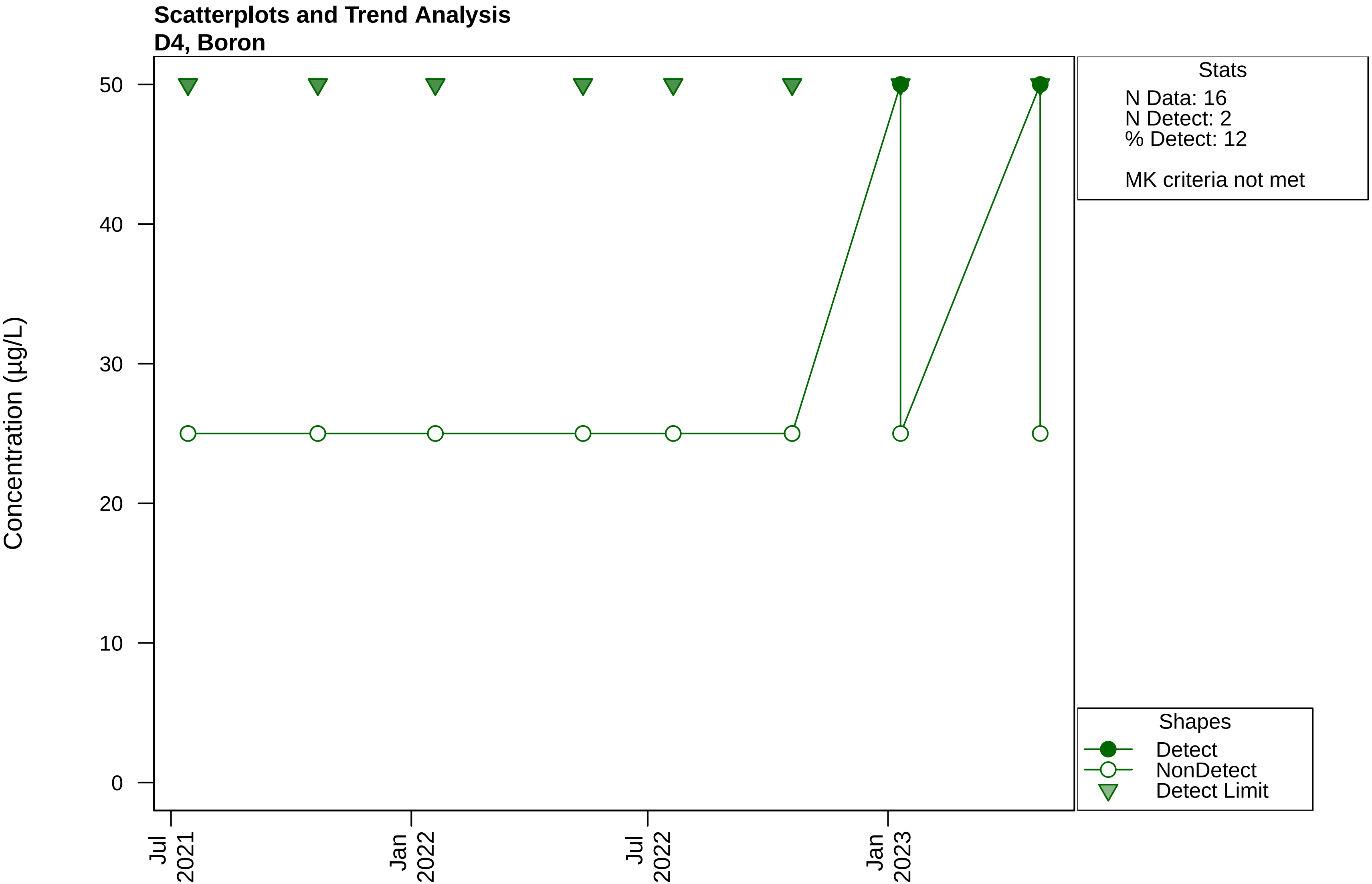

Scatterplots and Trend Analysis
D3, Sulfate (as SO4)
Concentration (mg/L)
0
50
100
150
200
250
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D3, Total Dissolved Solids (TDS)

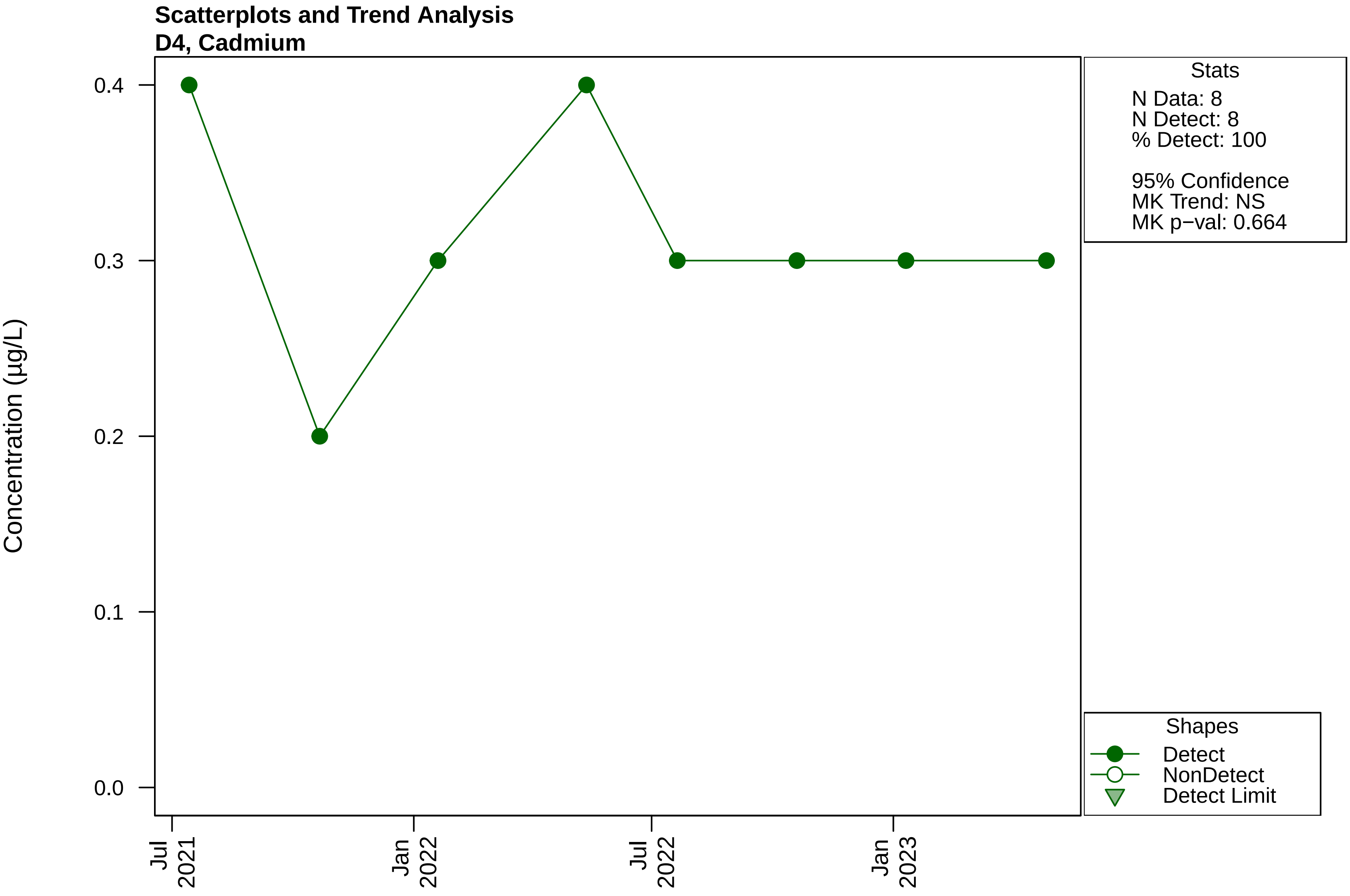


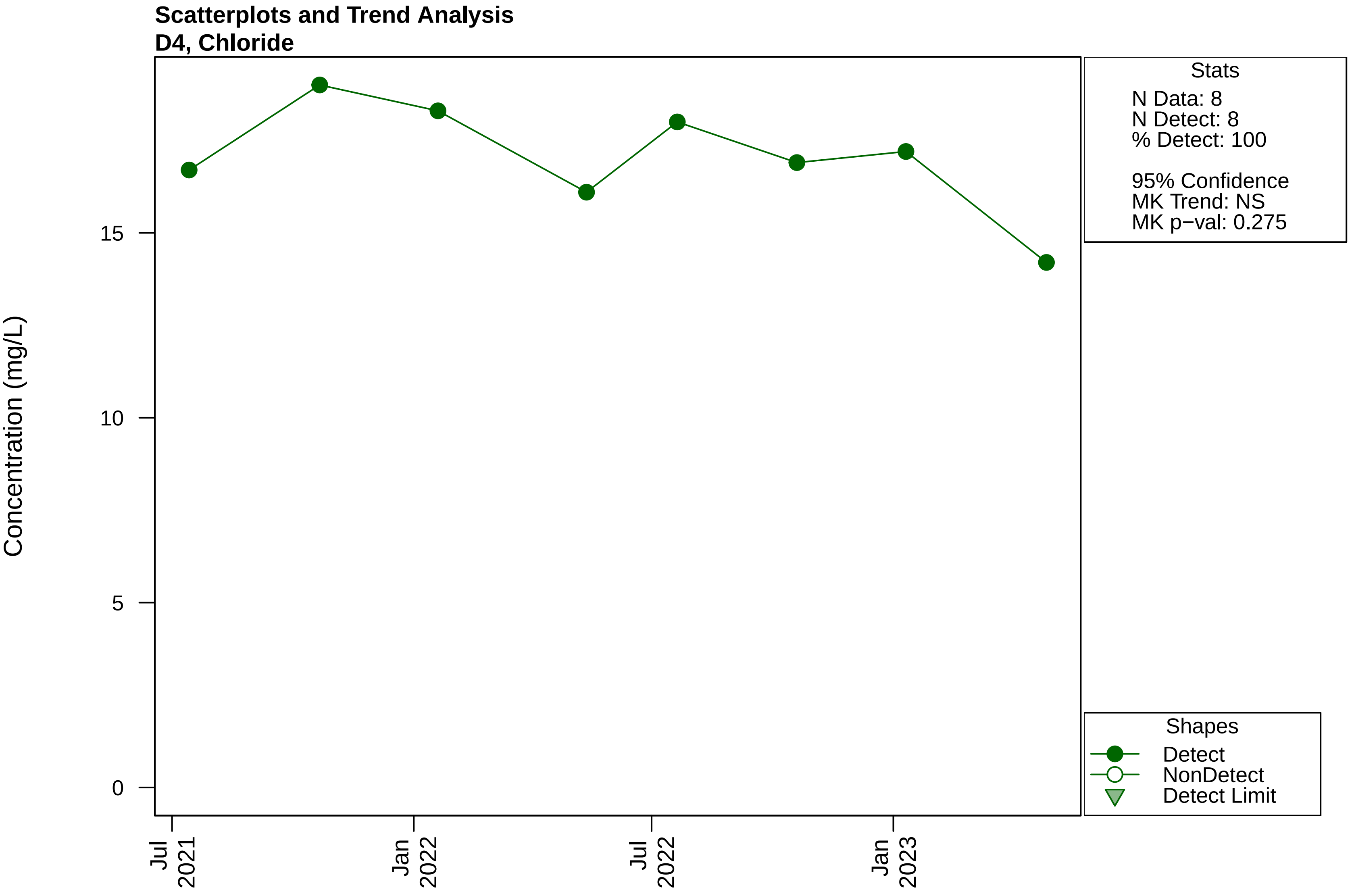

Scatterplots and Trend Analysis
D3, Zinc
Concentration (µg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 19
N Detect: 17
% Detect: 89
95% Confidence
MK Trend: NS
MK p−val: 0.116
Shapes
Detect
NonDetect
Detect Limit

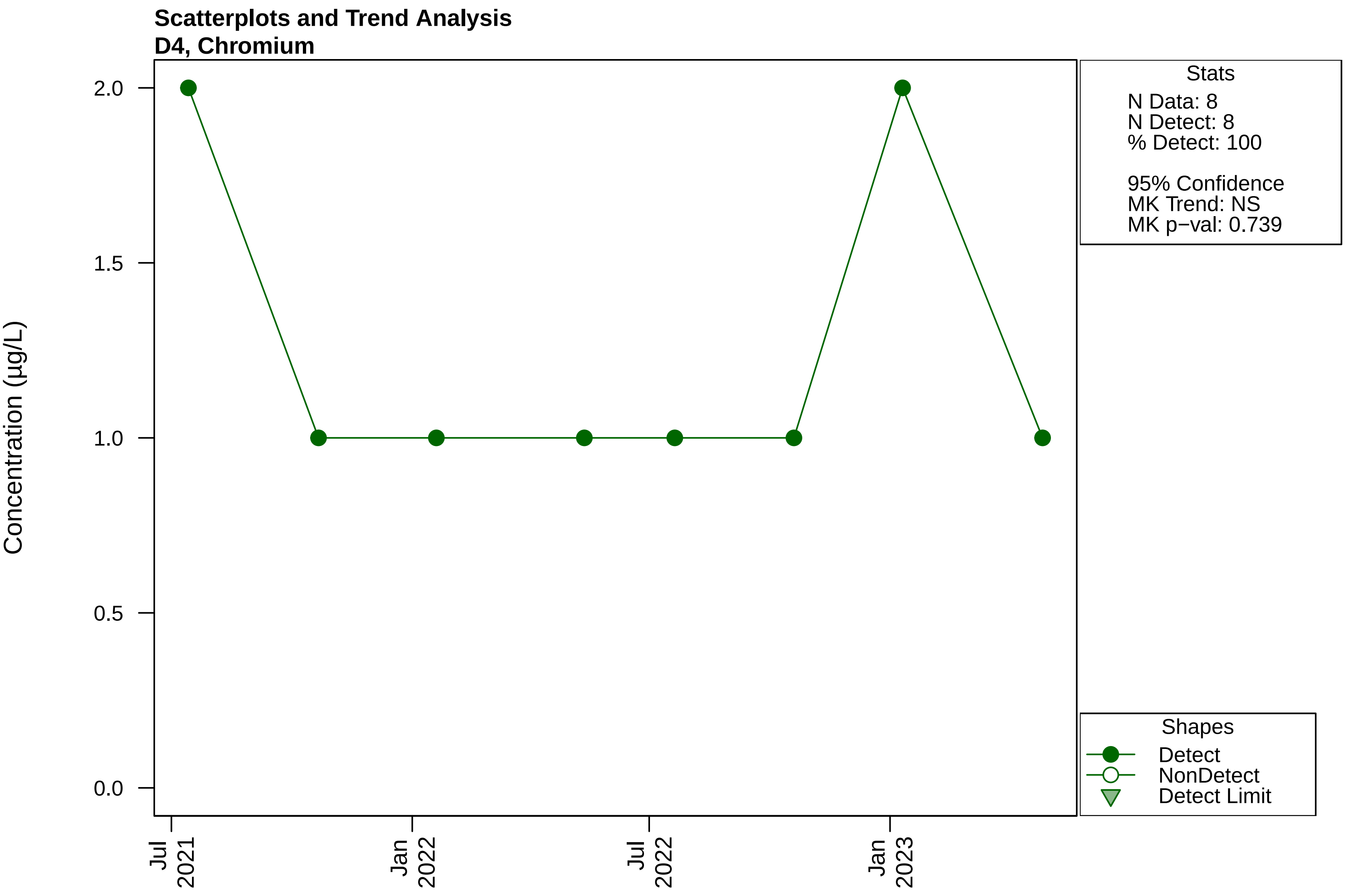

Scatterplots and Trend Analysis
D4, Arsenic
Concentration (µg/L)
0
5
10
15
20
25
30
35
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0608
Shapes
Detect
NonDetect
Detect Limit

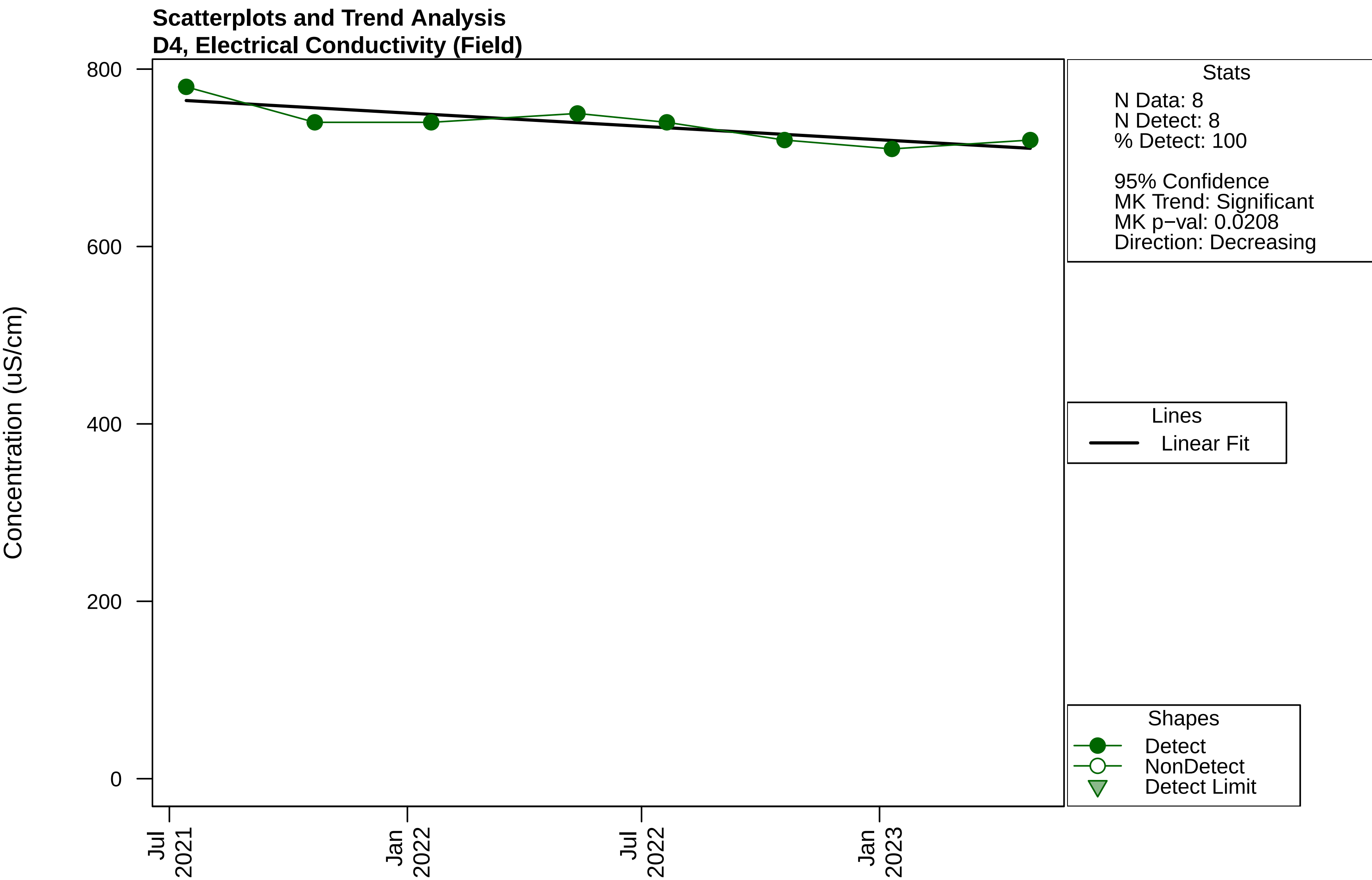


Scatterplots and Trend Analysis
D4, Boron
Concentration (µg/L)
0
10
20
30
40
50
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 2
% Detect: 12
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

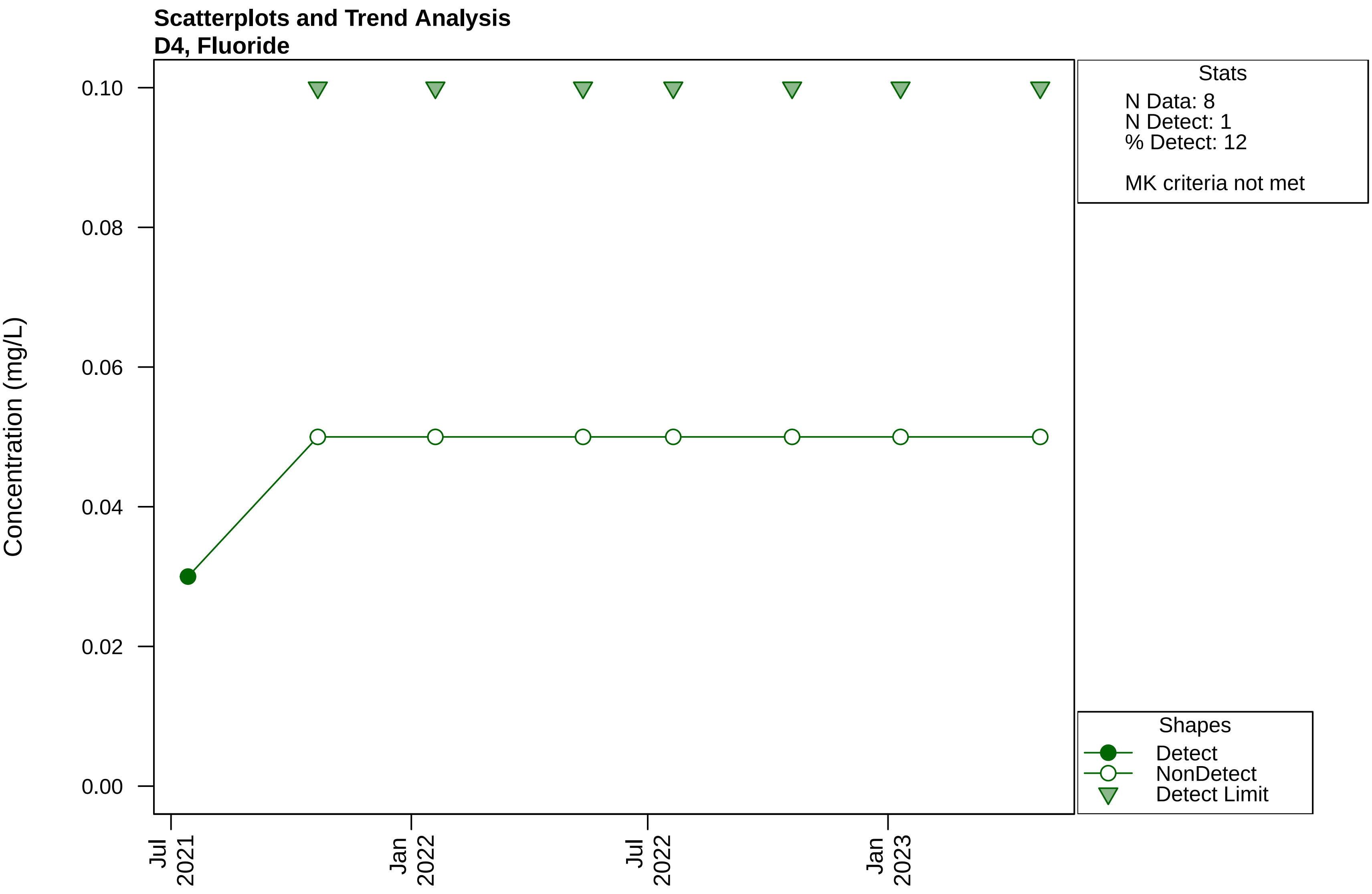

Scatterplots and Trend Analysis
D4, Cadmium
Concentration (µg/L)
0.0
0.1
0.2
0.3
0.4
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.664
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D4, Chloride
Concentration (mg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.275
Shapes
Detect
NonDetect
Detect Limit

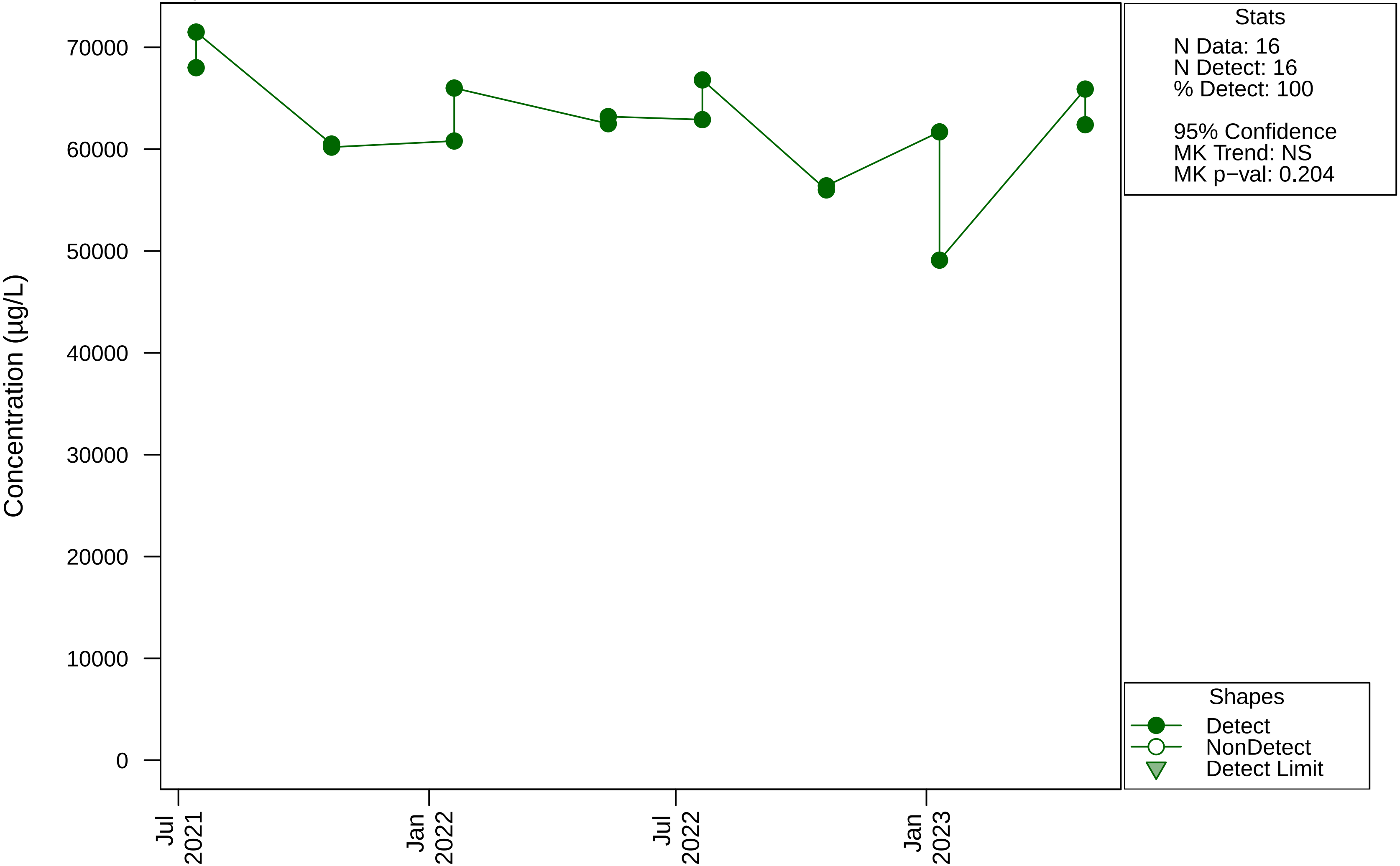

Scatterplots and Trend Analysis
D4, Chromium
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.739
Shapes
Detect
NonDetect
Detect Limit



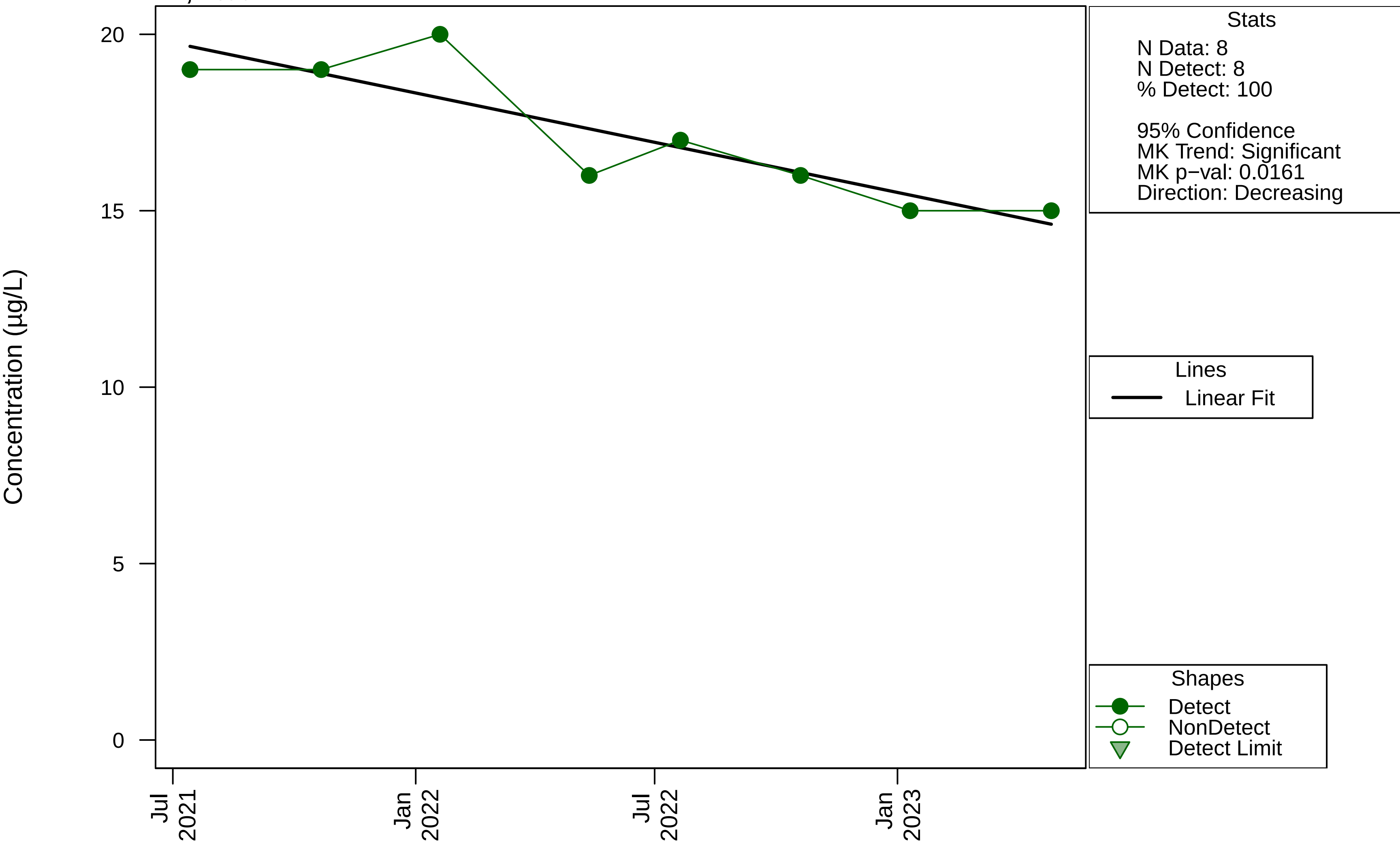
Scatterplots and Trend Analysis
D4, Electrical Conductivity (Field)
Concentration (uS/cm)
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0208
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

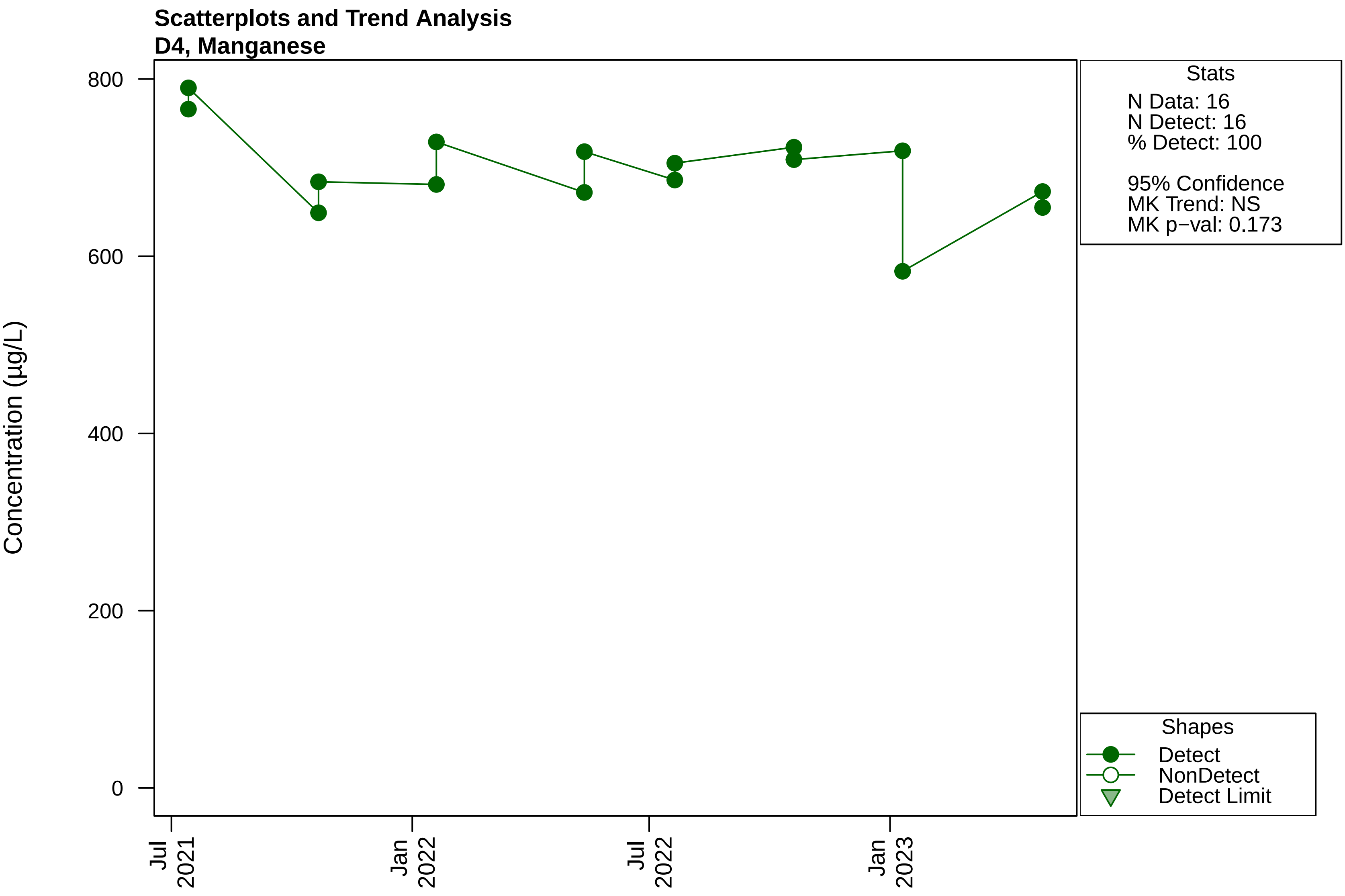

Scatterplots and Trend Analysis
D4, Fluoride
Concentration (mg/L)
0.10
0.08
0.06
0.04
0.02
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 1
% Detect: 12
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D4, Iron

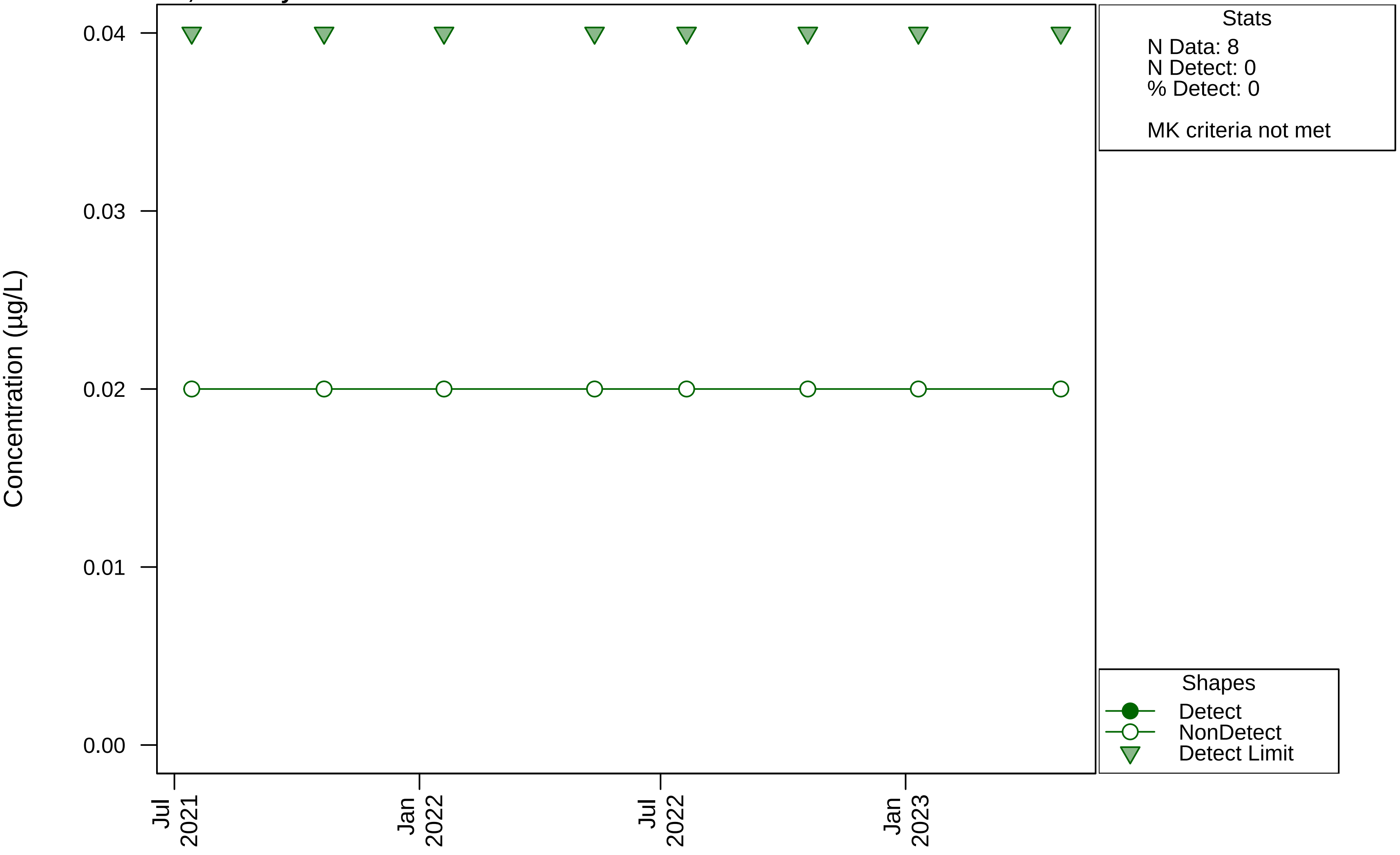


Scatterplots and Trend Analysis
D4, Lead

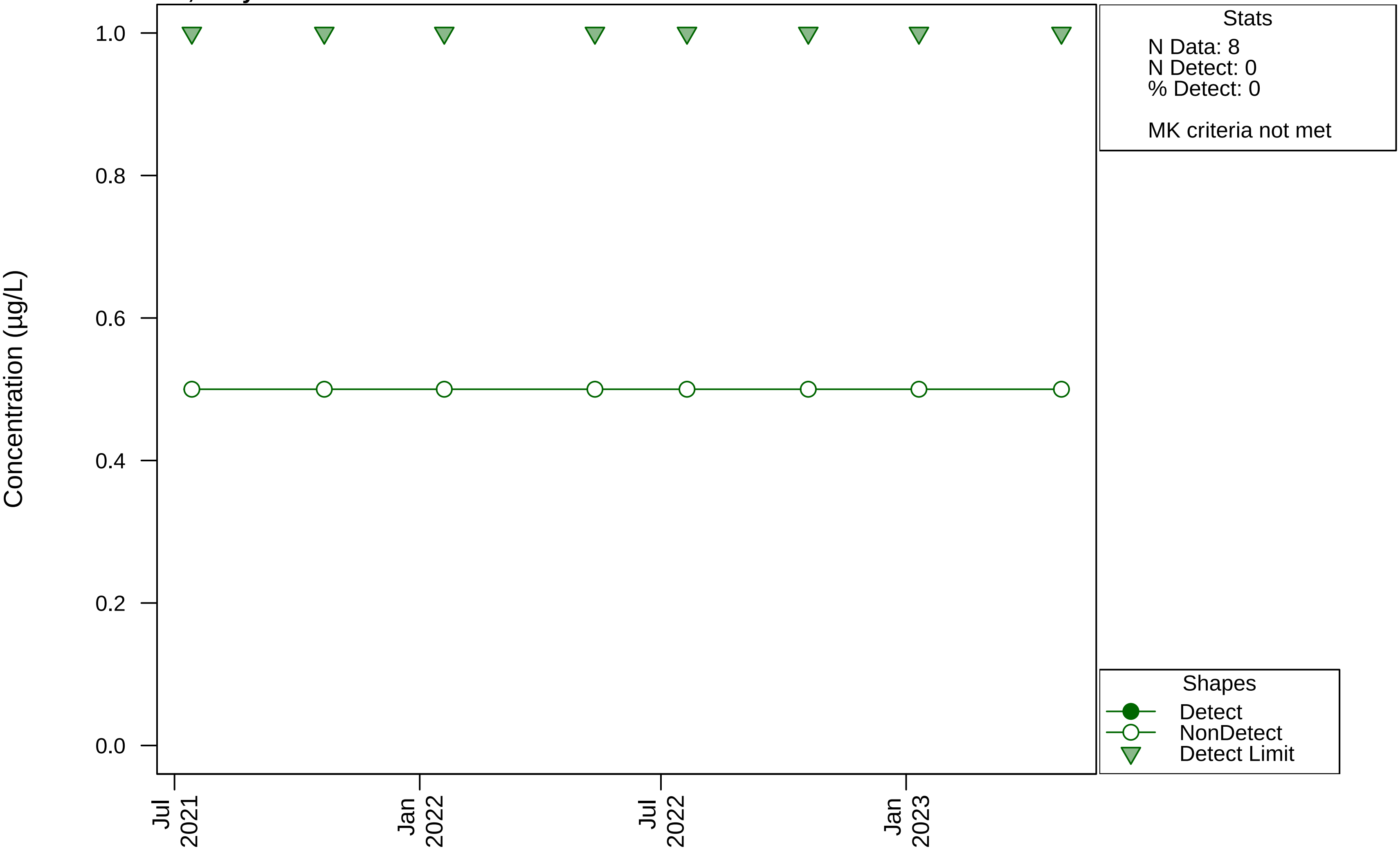


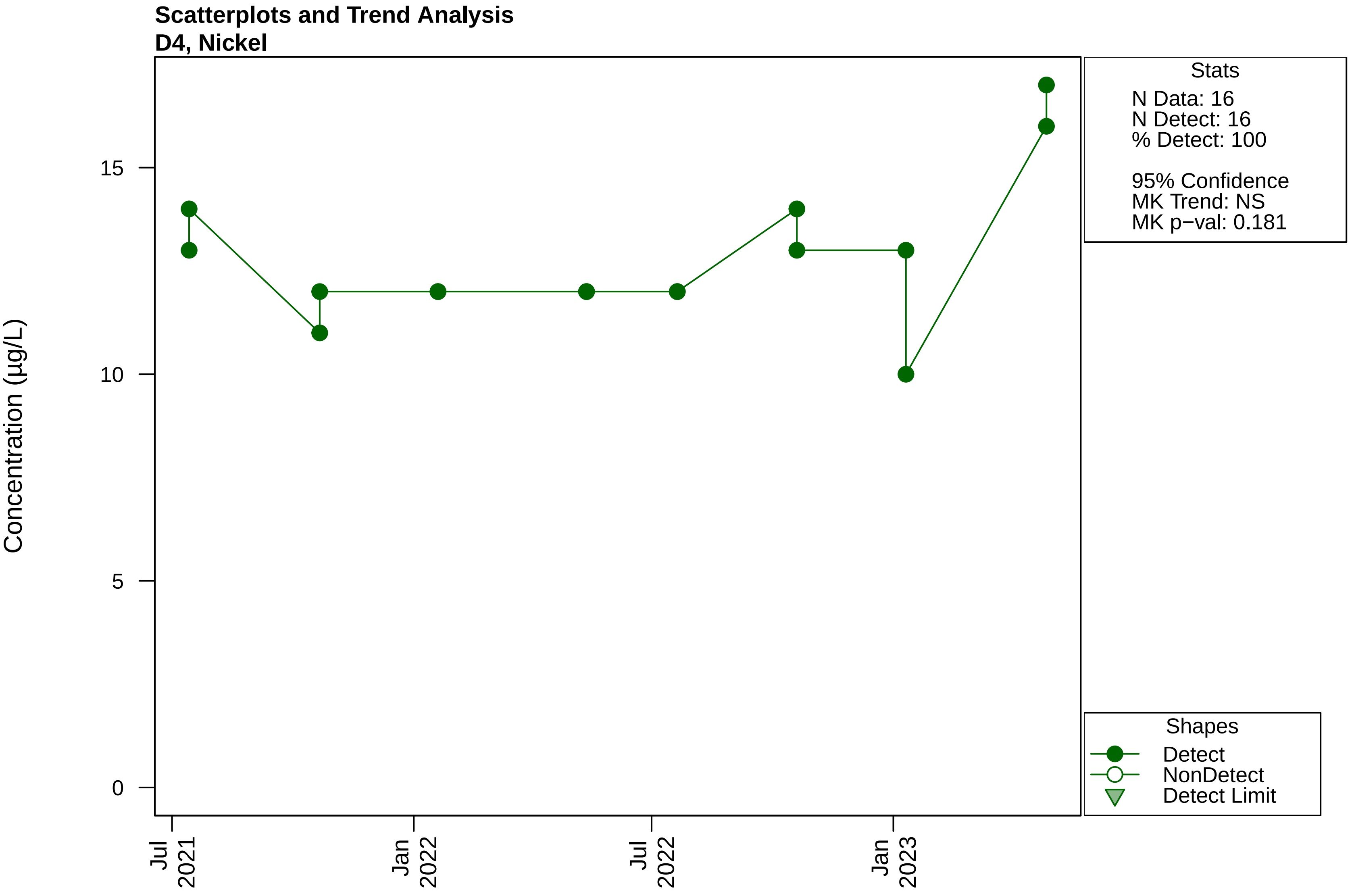

Scatterplots and Trend Analysis
D4, Manganese
Concentration (µg/L)
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.173
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D4, Mercury

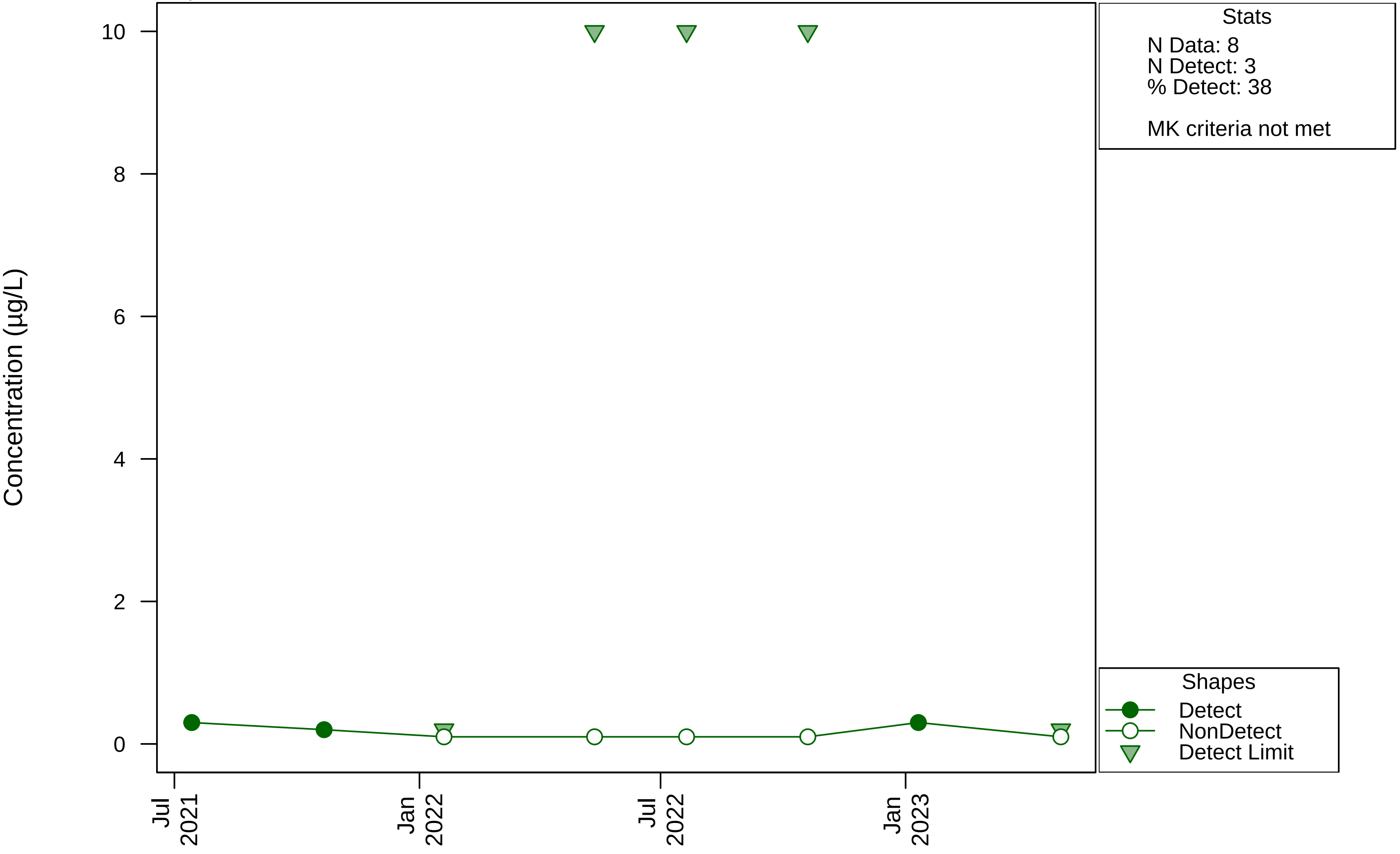


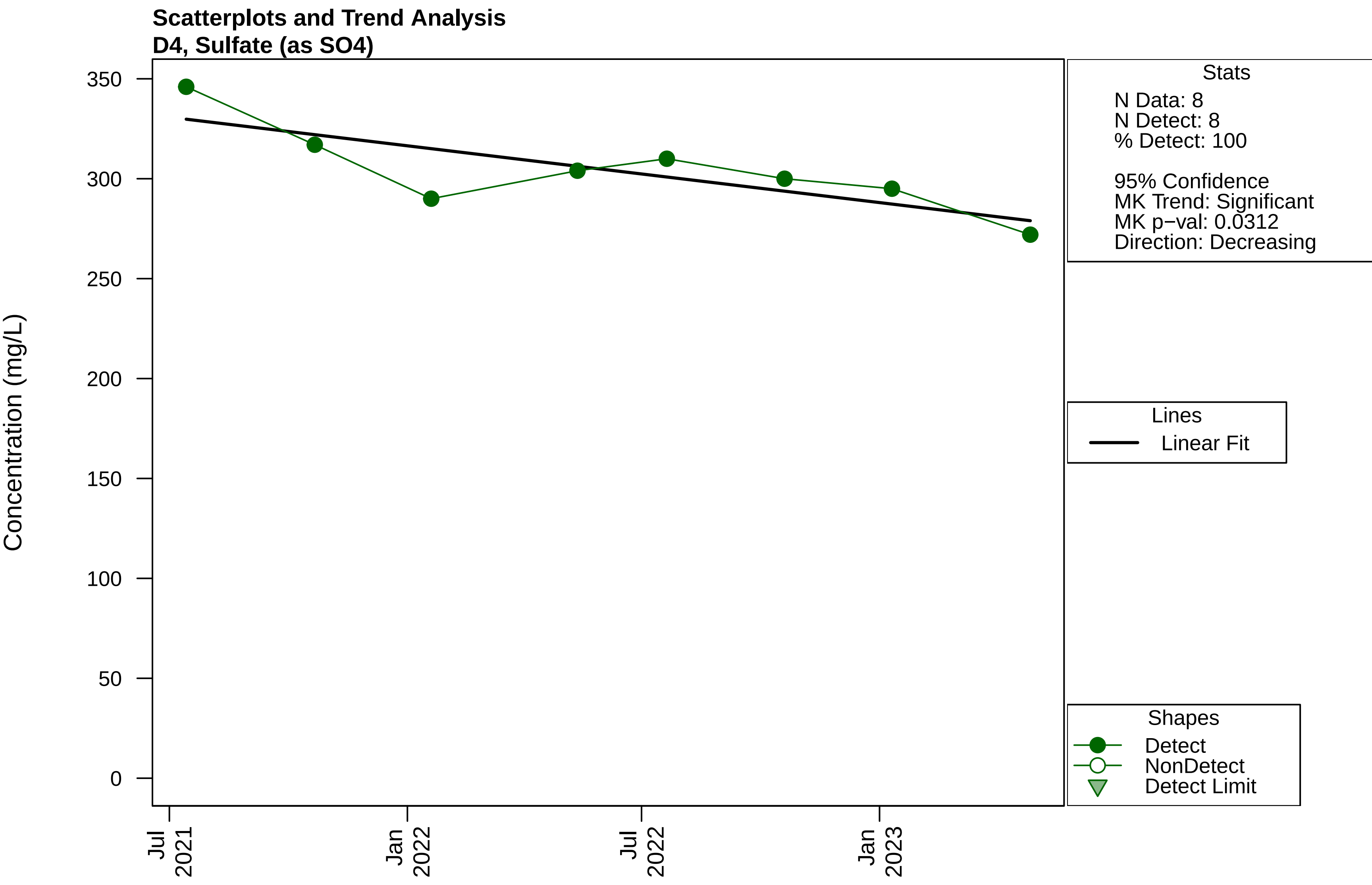
Scatterplots and Trend Analysis
D4, Molybdenum

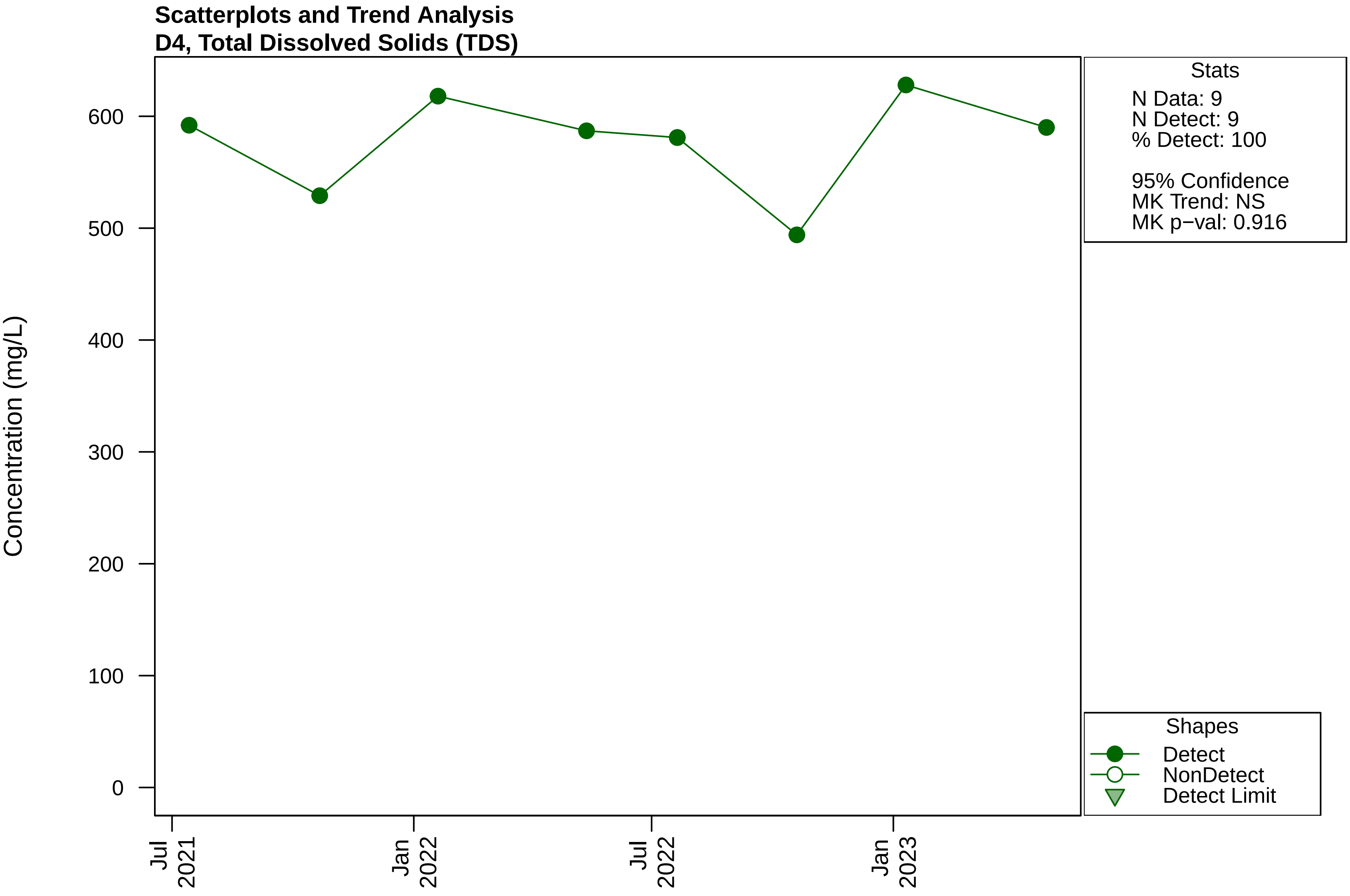


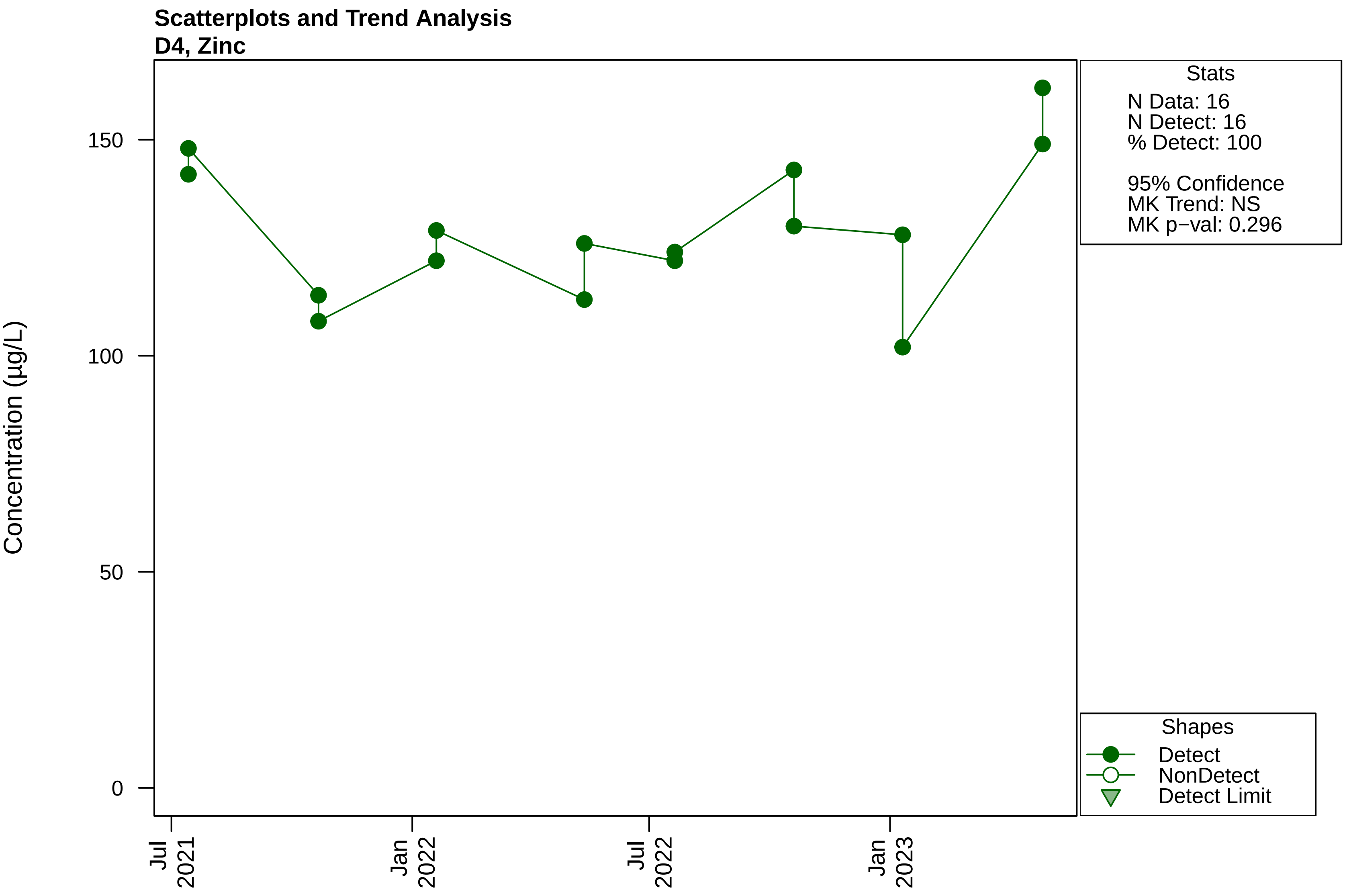

Scatterplots and Trend Analysis
D4, Nickel
Concentration (µg/L)
0
5
10
15
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.181
Shapes
Detect
NonDetect
Detect Limit

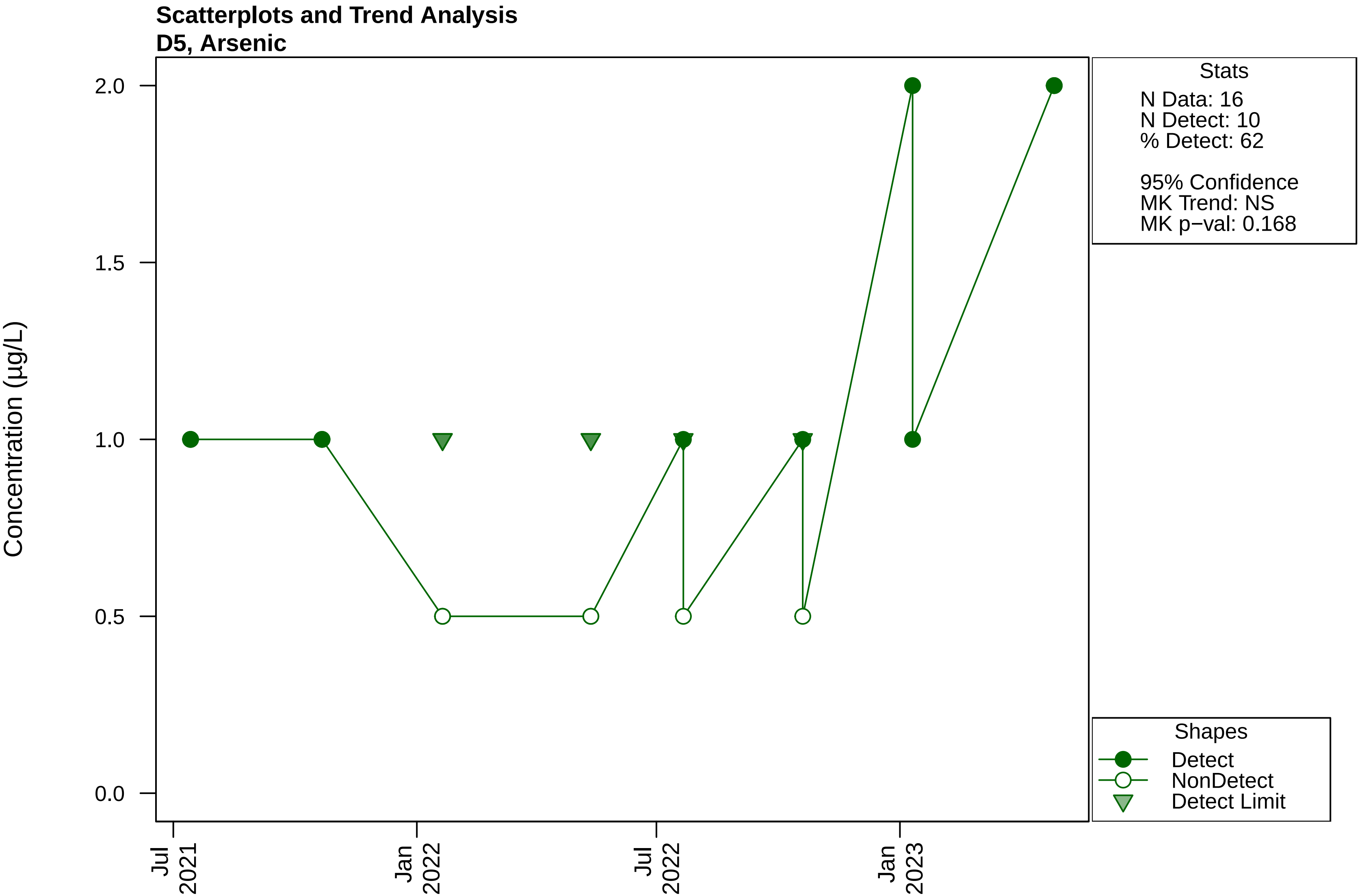
Scatterplots and Trend Analysis
D4, Selenium



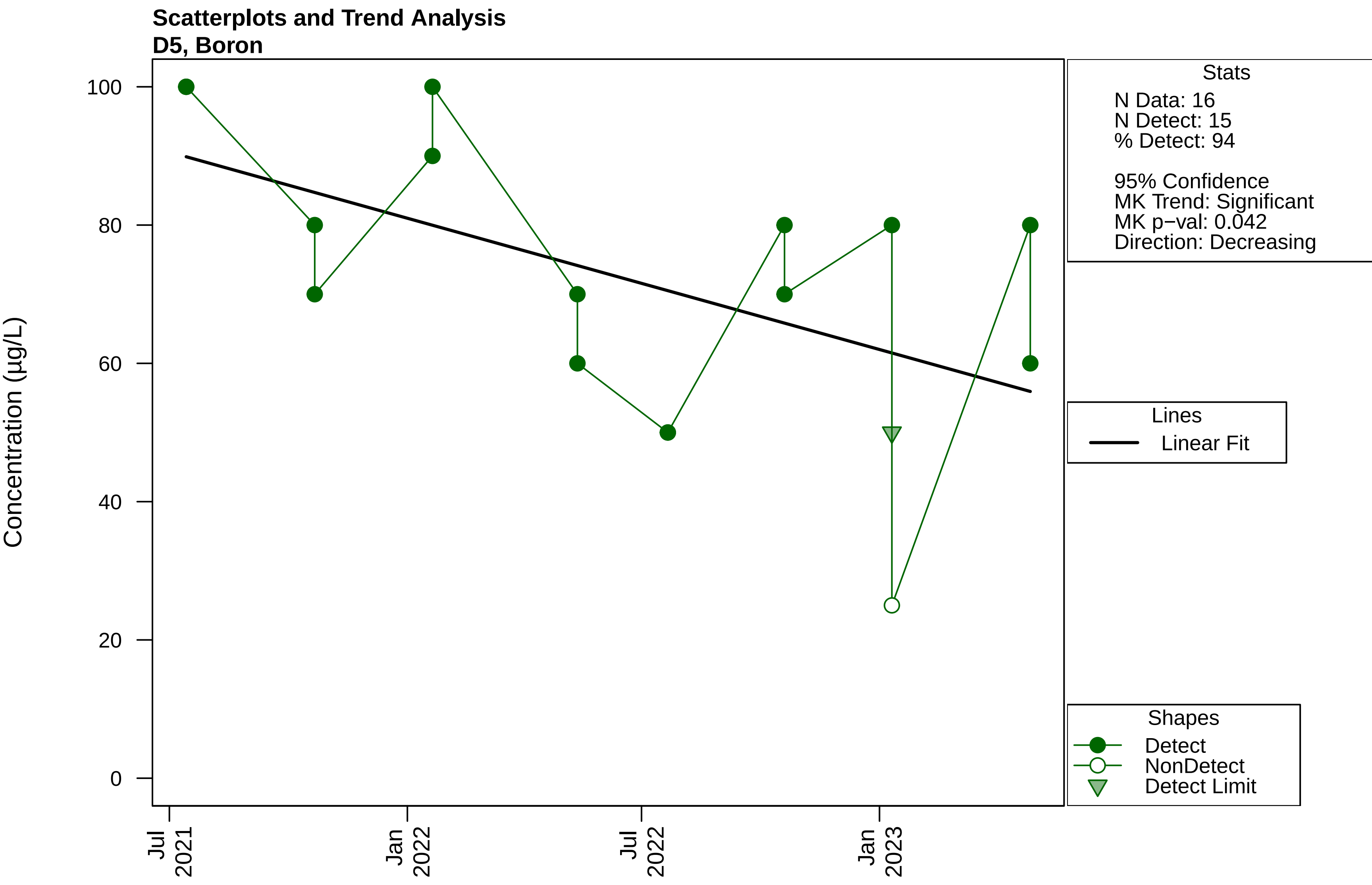

Scatterplots and Trend Analysis
D4, Sulfate (as SO4)
Concentration (mg/L)
350
300
250
200
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0312
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D4, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
100
200
300
400
500
600
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.916
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D4, Zinc
Concentration (µg/L)
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.296
Shapes
Detect
NonDetect
Detect Limit

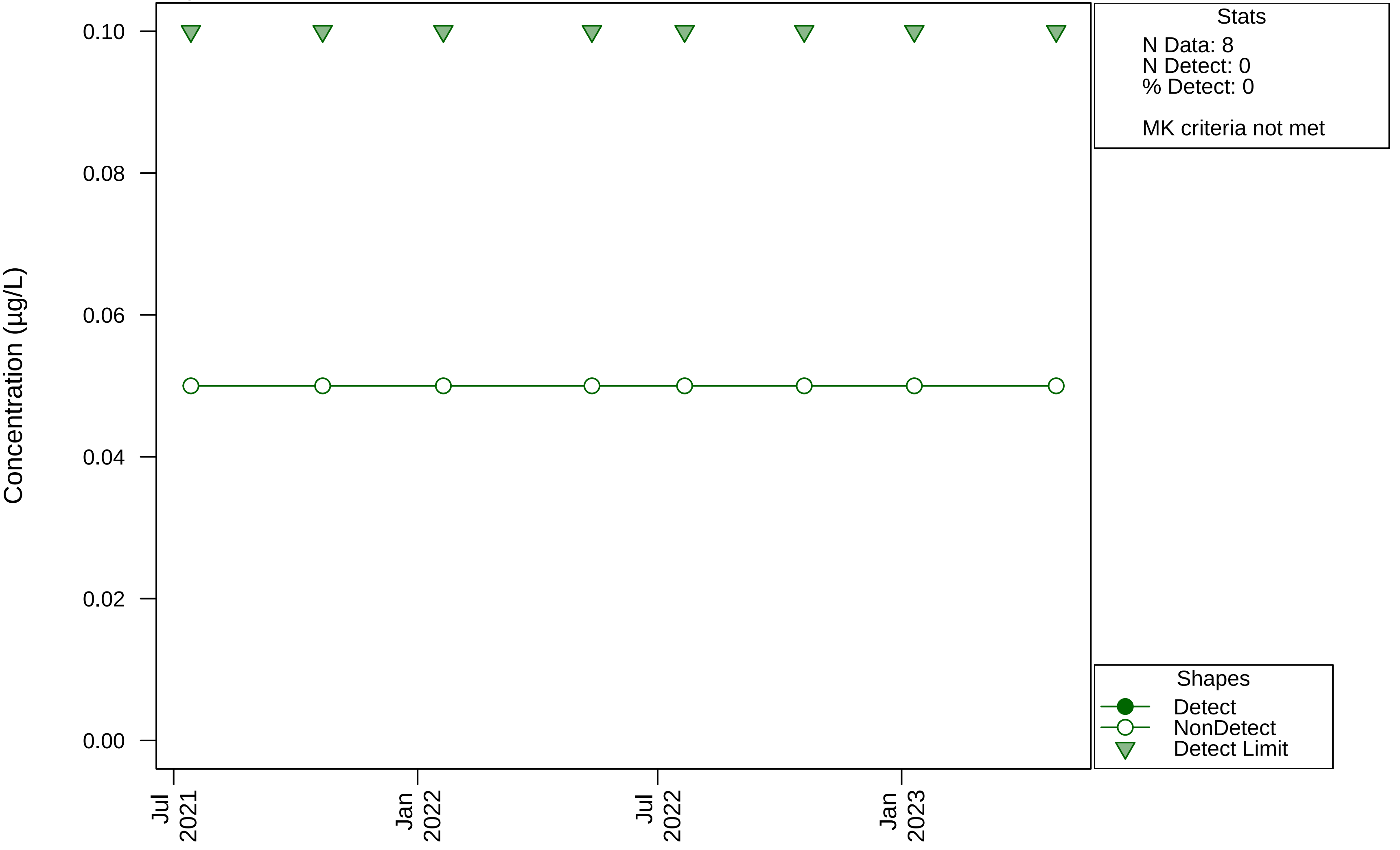


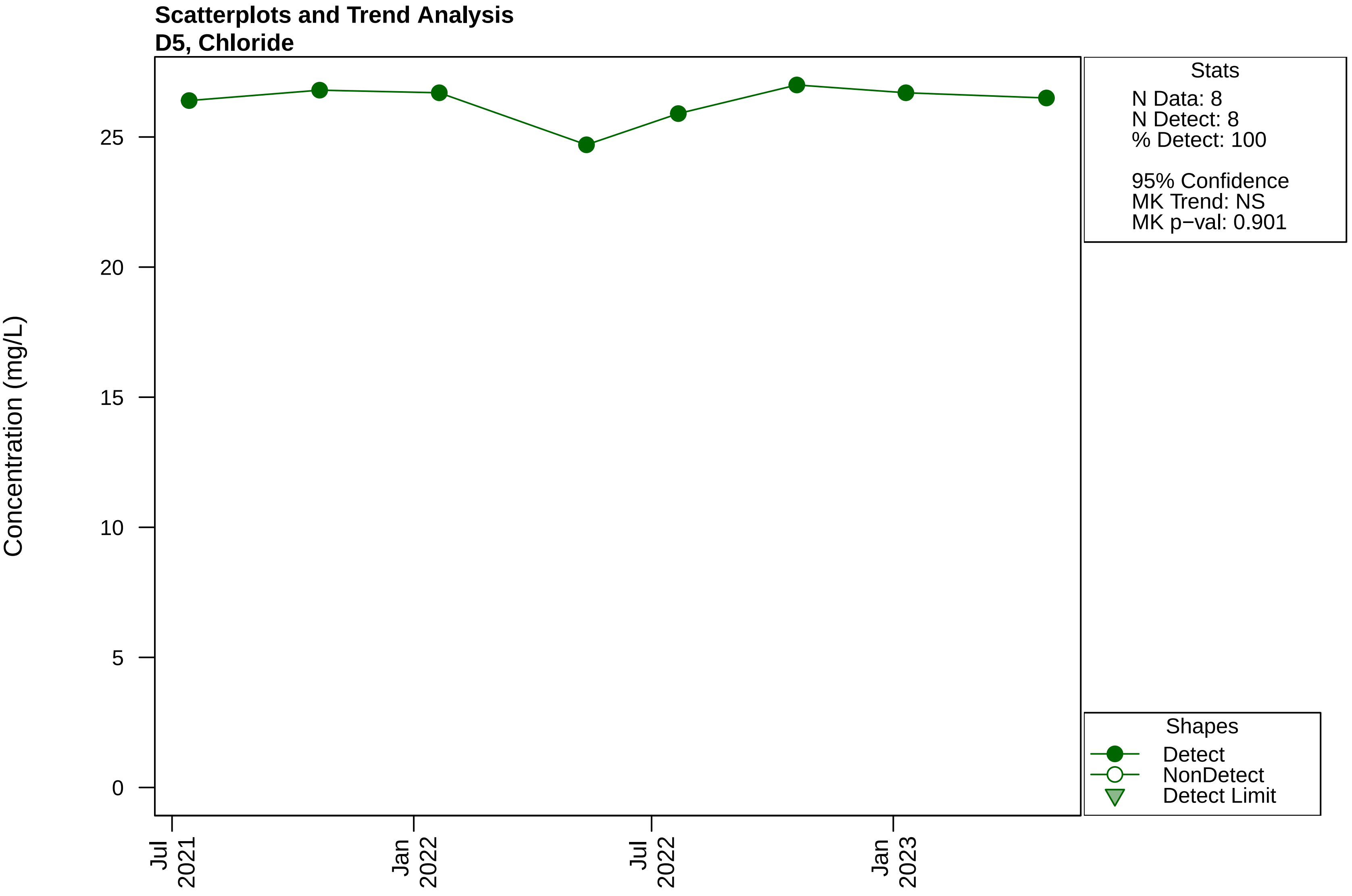
Scatterplots and Trend Analysis
D5, Arsenic
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 10
% Detect: 62
95% Confidence
MK Trend: NS
MK p−val: 0.168
Shapes
Detect
NonDetect
Detect Limit



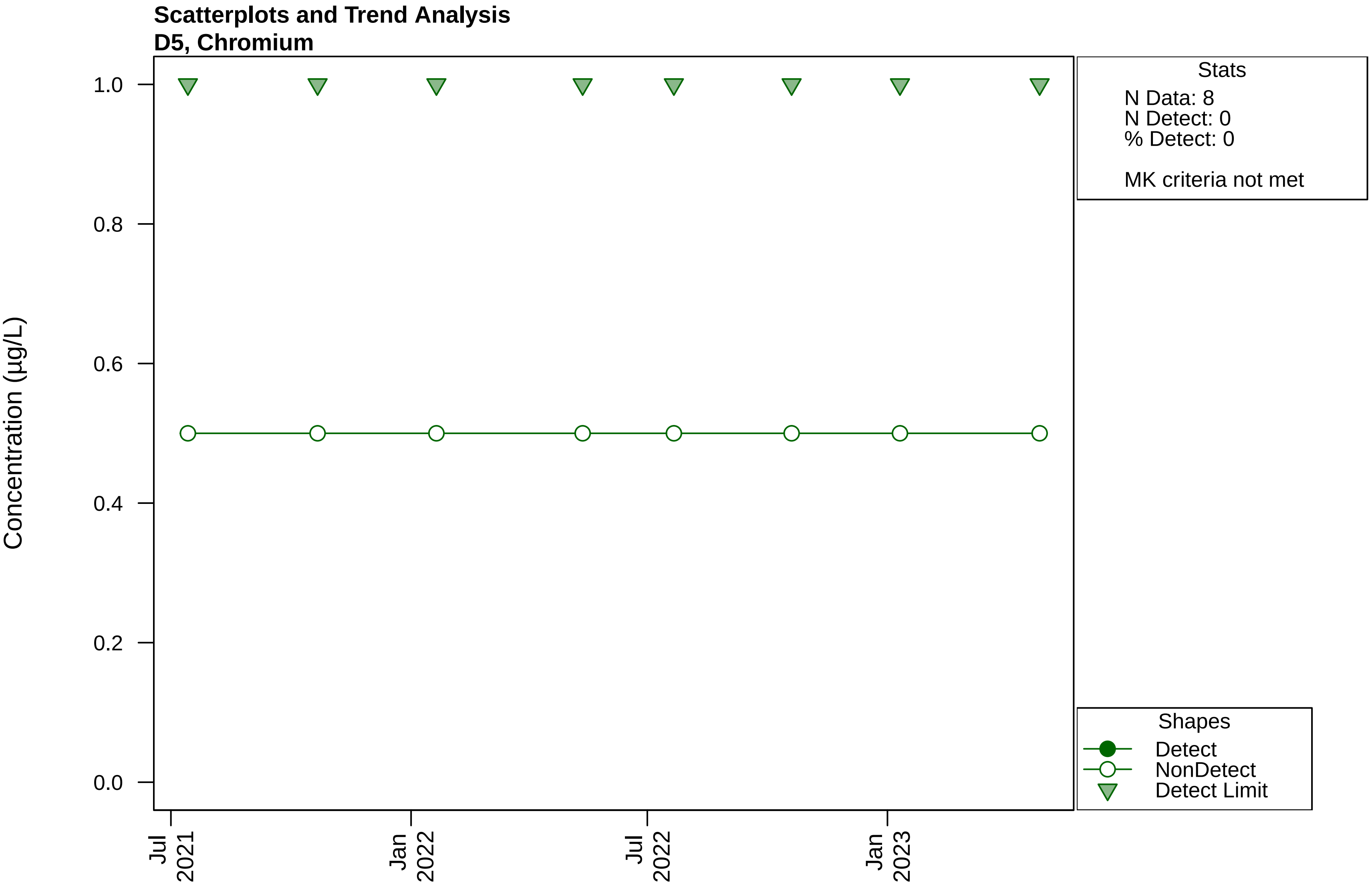
Scatterplots and Trend Analysis
D5, Boron
Concentration (µg/L)
100
80
60
40
20
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 15
% Detect: 94
95% Confidence
MK Trend: Significant
MK p−val: 0.042
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D5, Cadmium

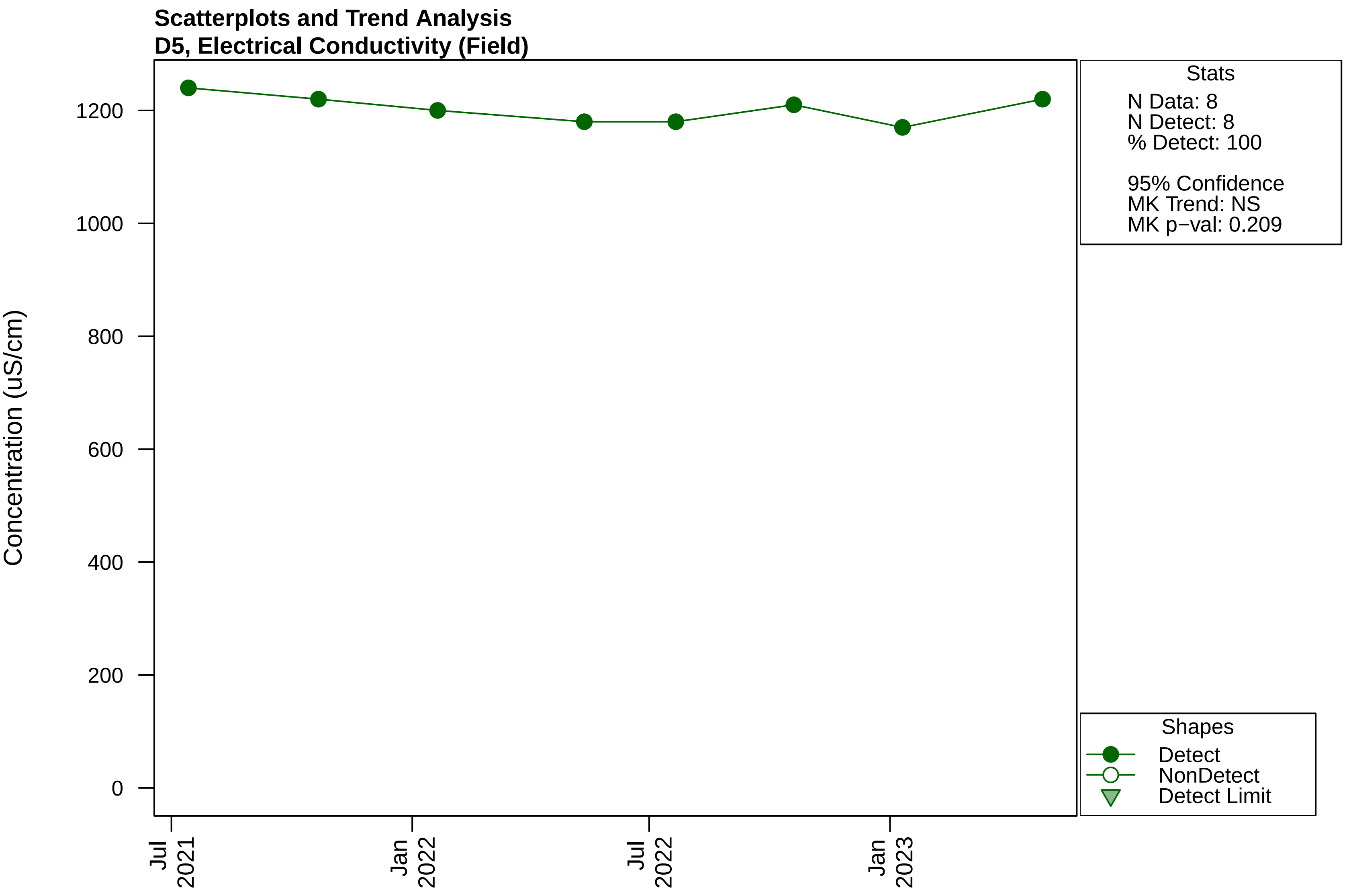




Scatterplots and Trend Analysis
D5, Chloride
Concentration (mg/L)
0
5
10
15
20
25
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.901
Shapes
Detect
NonDetect
Detect Limit

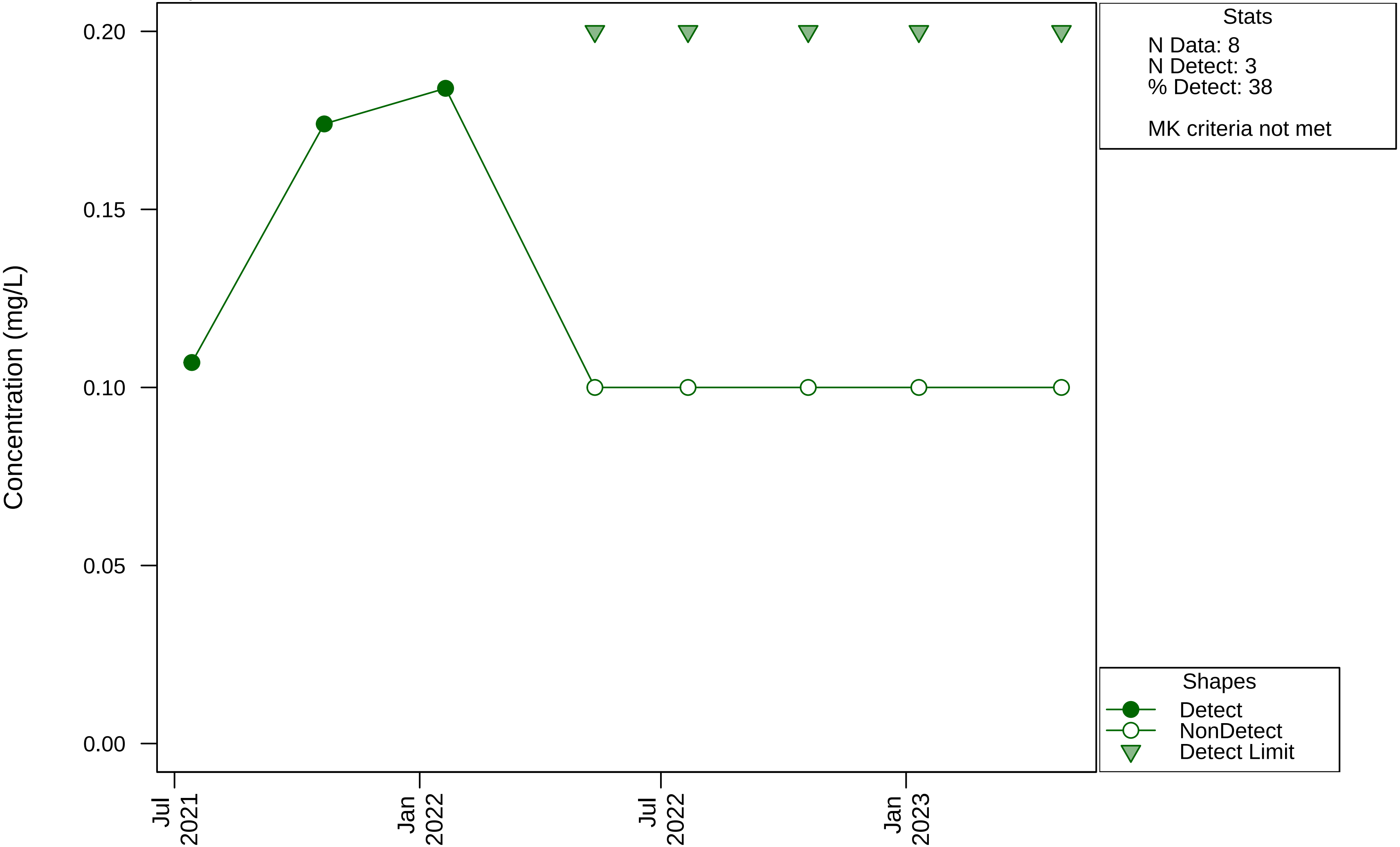


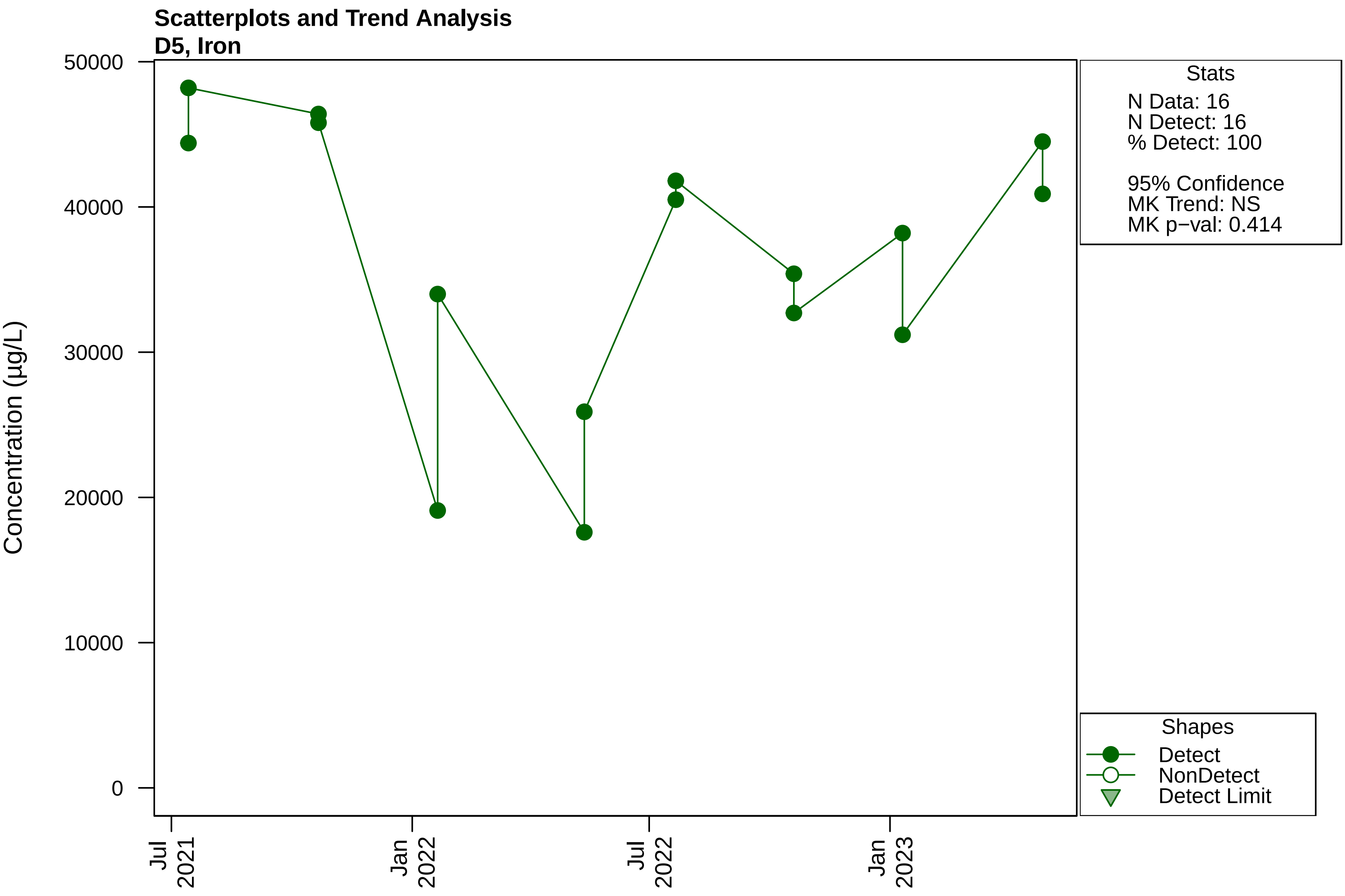
Scatterplots and Trend Analysis
D5, Chromium
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit



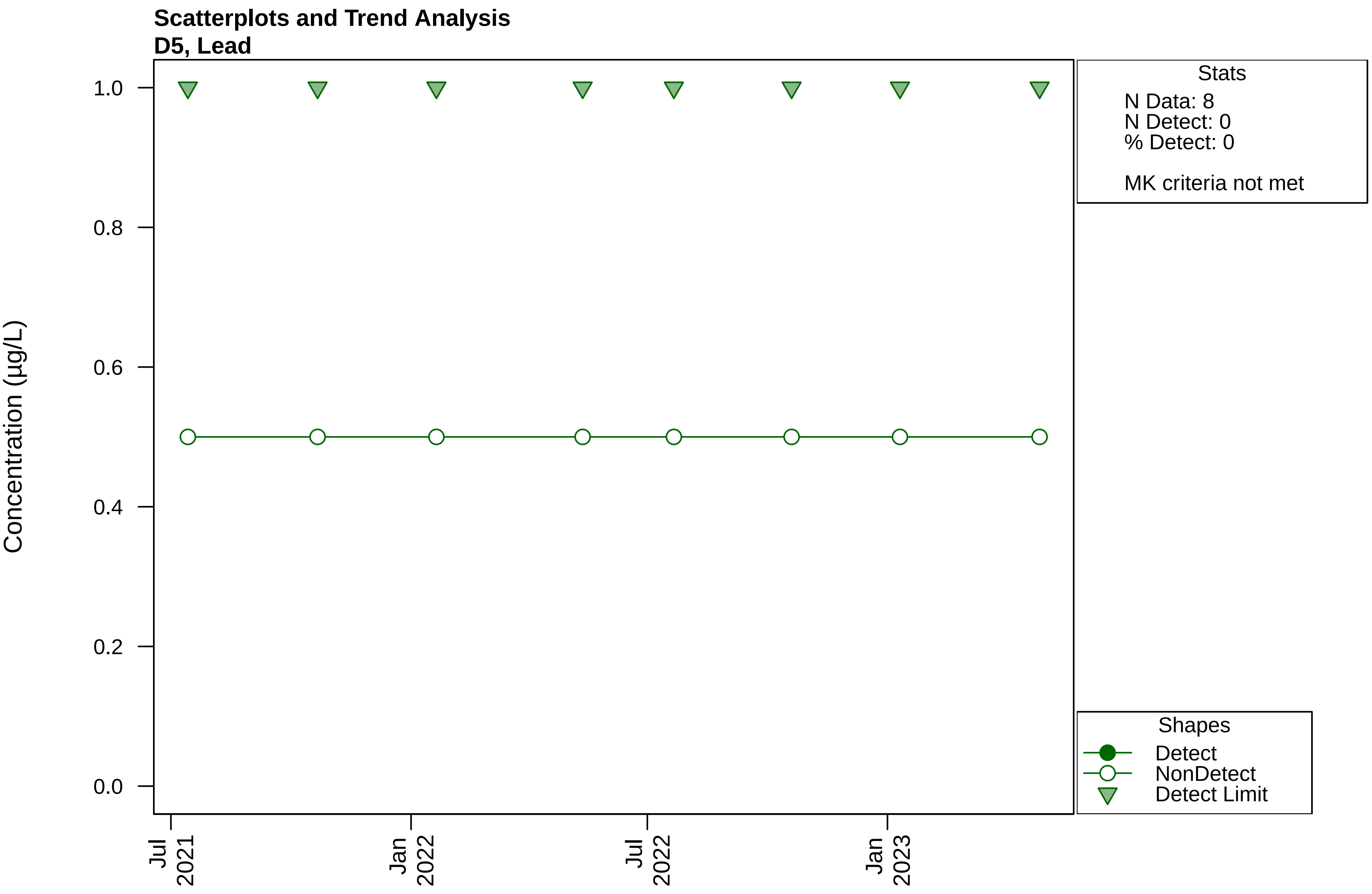
Scatterplots and Trend Analysis
D5, Electrical Conductivity (Field)
Concentration (uS/cm)
0
200
400
600
800
1000
1200
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.209
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D5, Fluoride

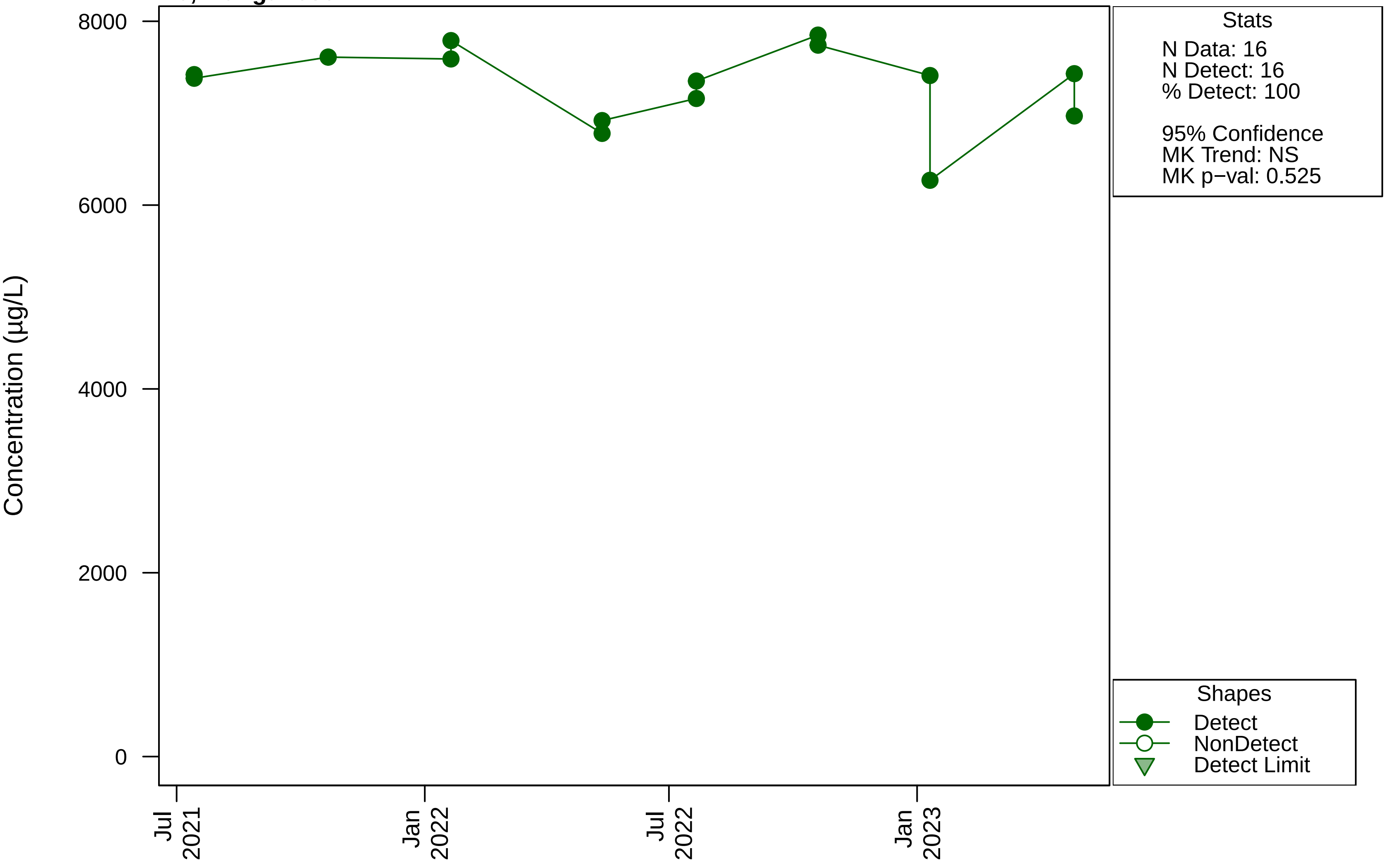


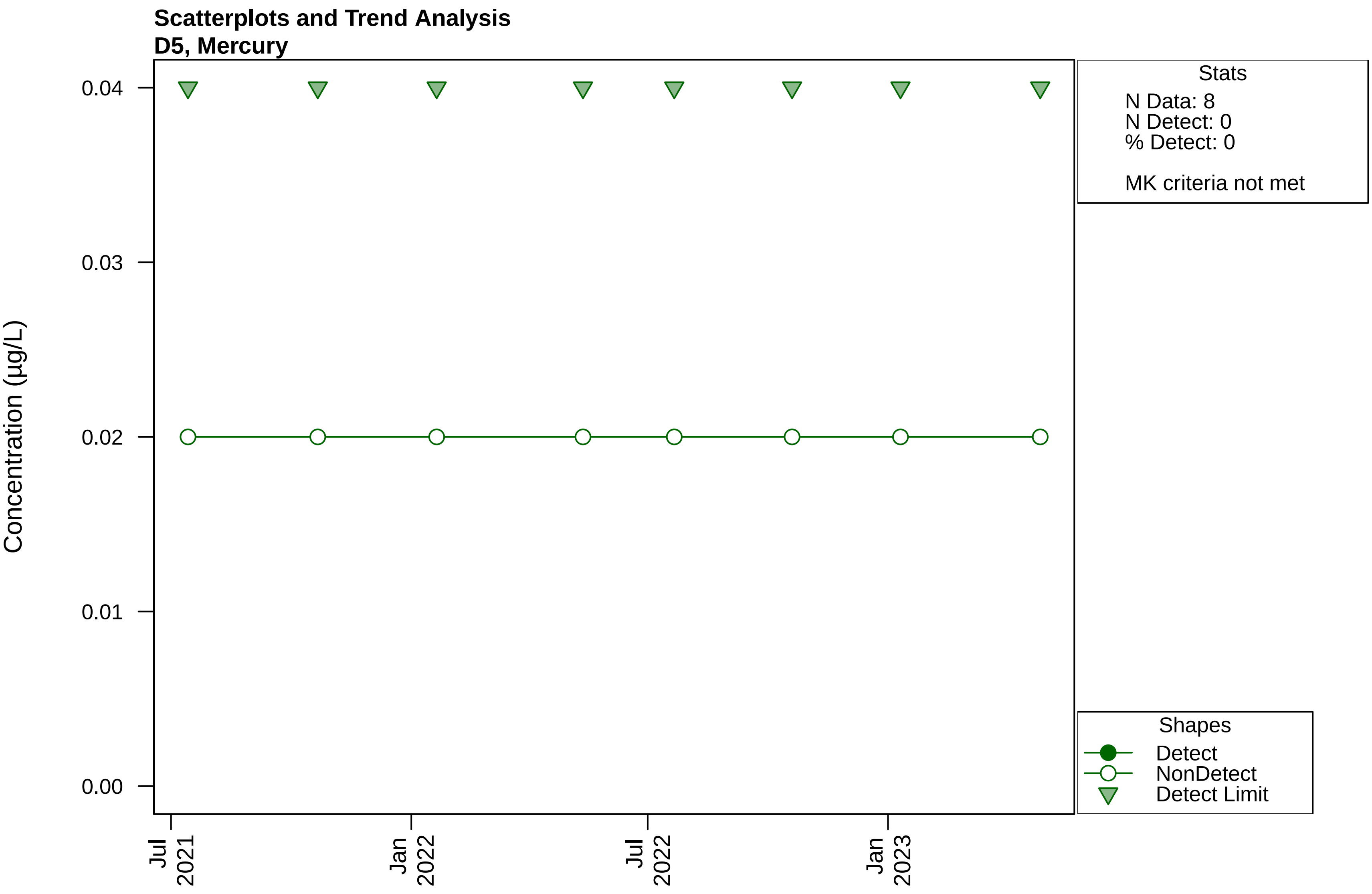


Scatterplots and Trend Analysis
D5, Iron
Concentration (µg/L)
50000
40000
30000
20000
10000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.414
Shapes
Detect
NonDetect
Detect Limit

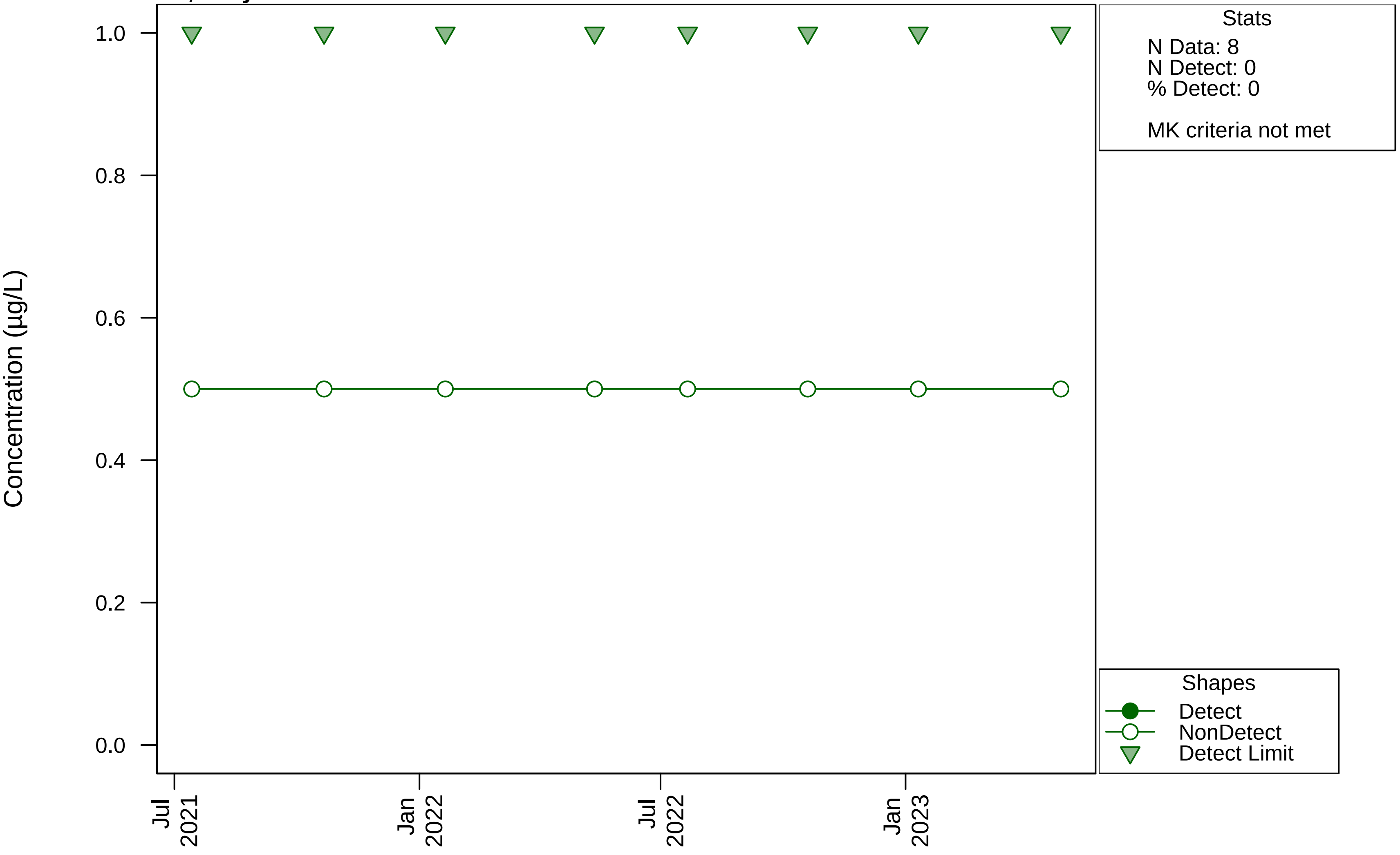

Scatterplots and Trend Analysis
D5, Lead
Concentration (µg/L)
1.0
0.8
0.6
0.4
0.2
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

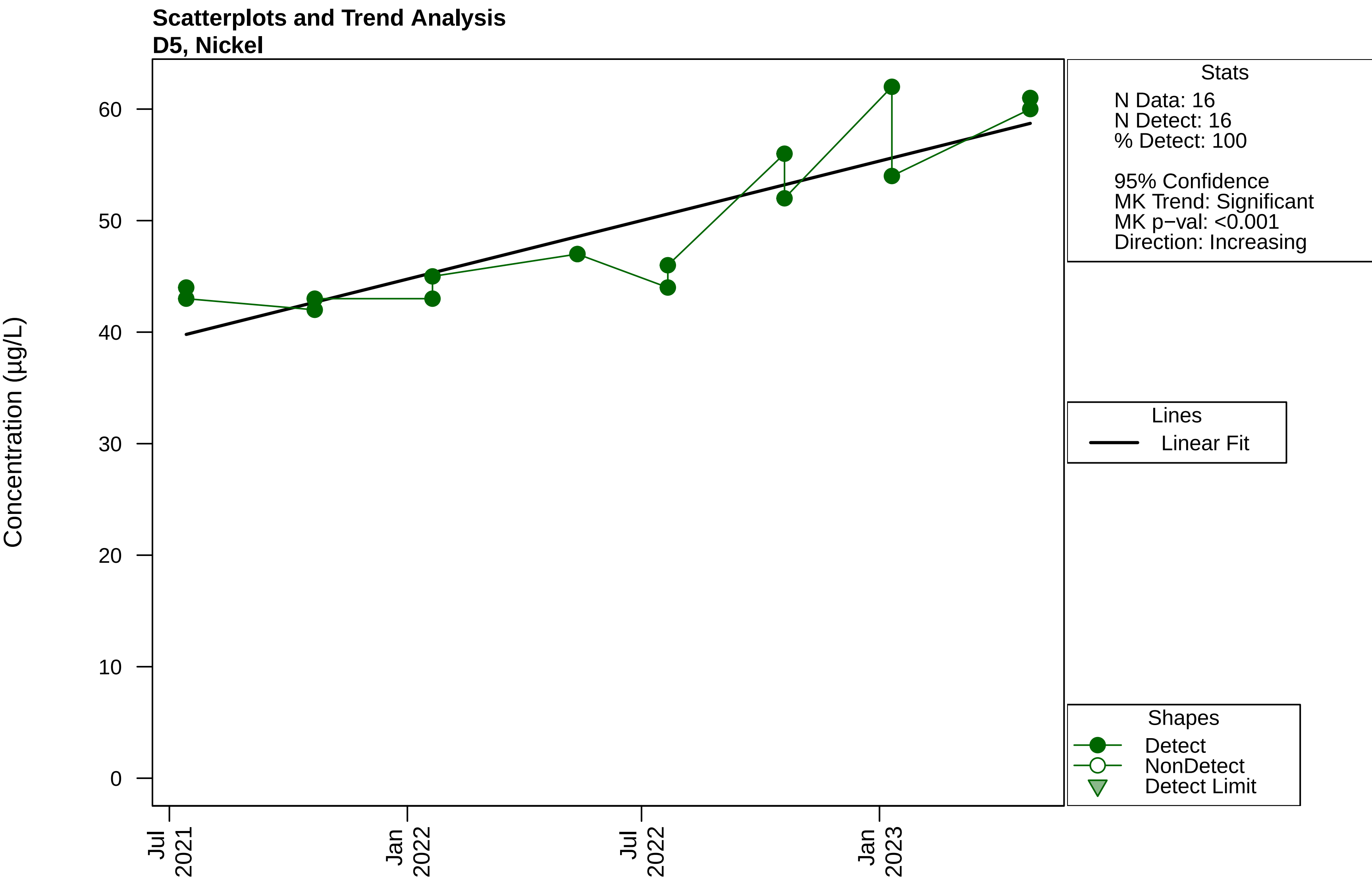
Scatterplots and Trend Analysis
D5, Manganese

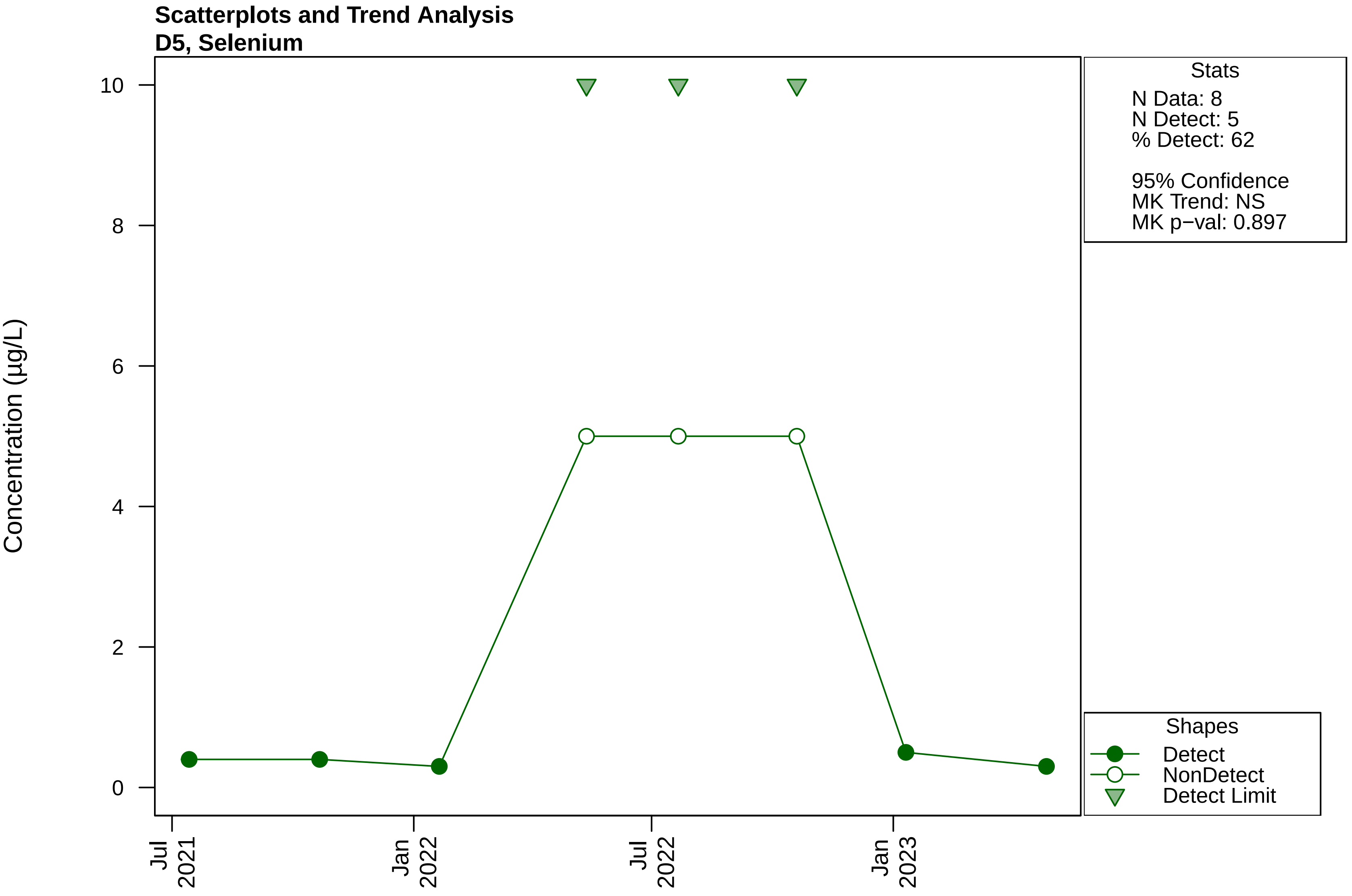


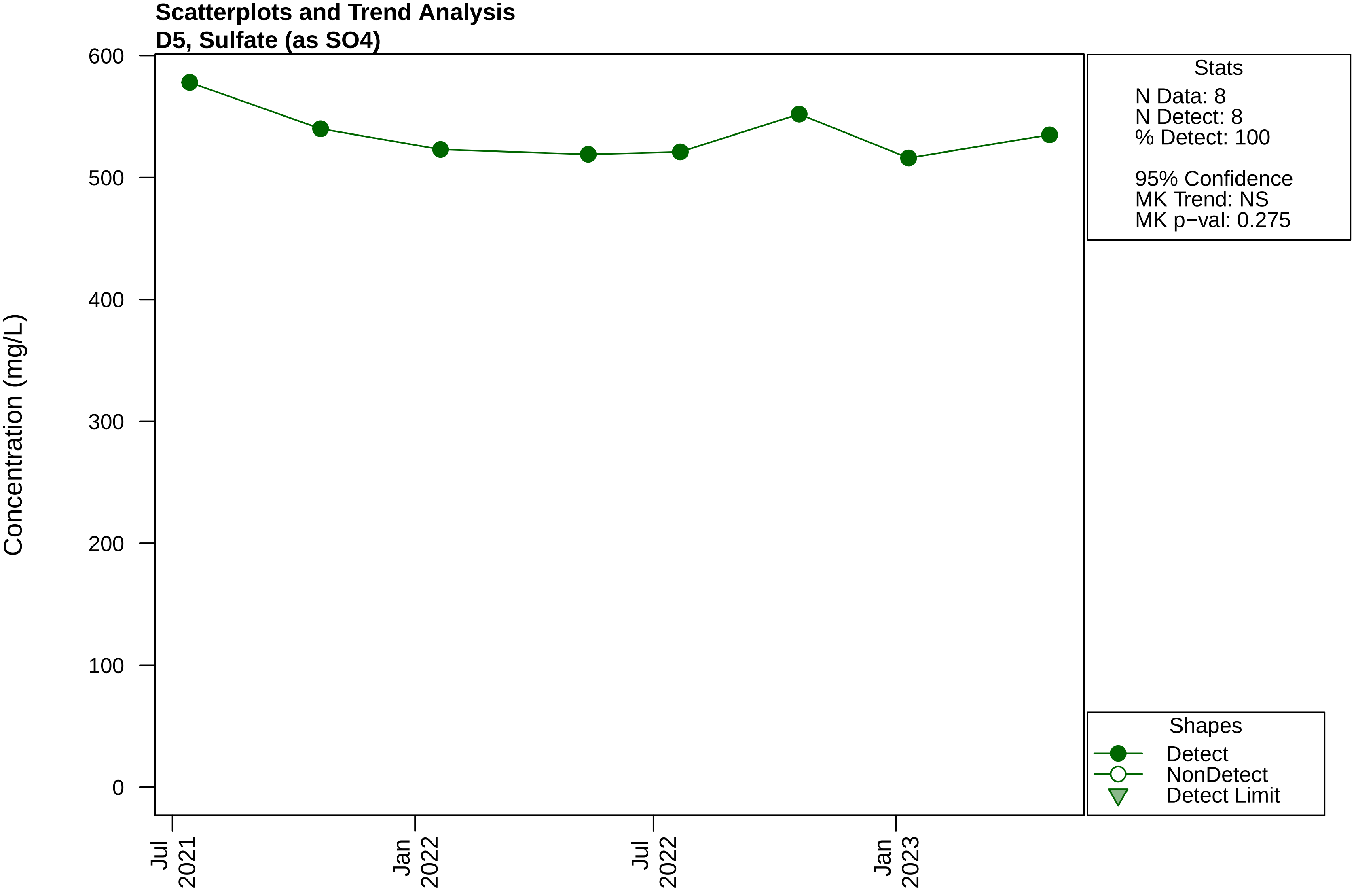

Scatterplots and Trend Analysis
D5, Mercury
Concentration (µg/L)
0.04
0.03
0.02
0.01
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

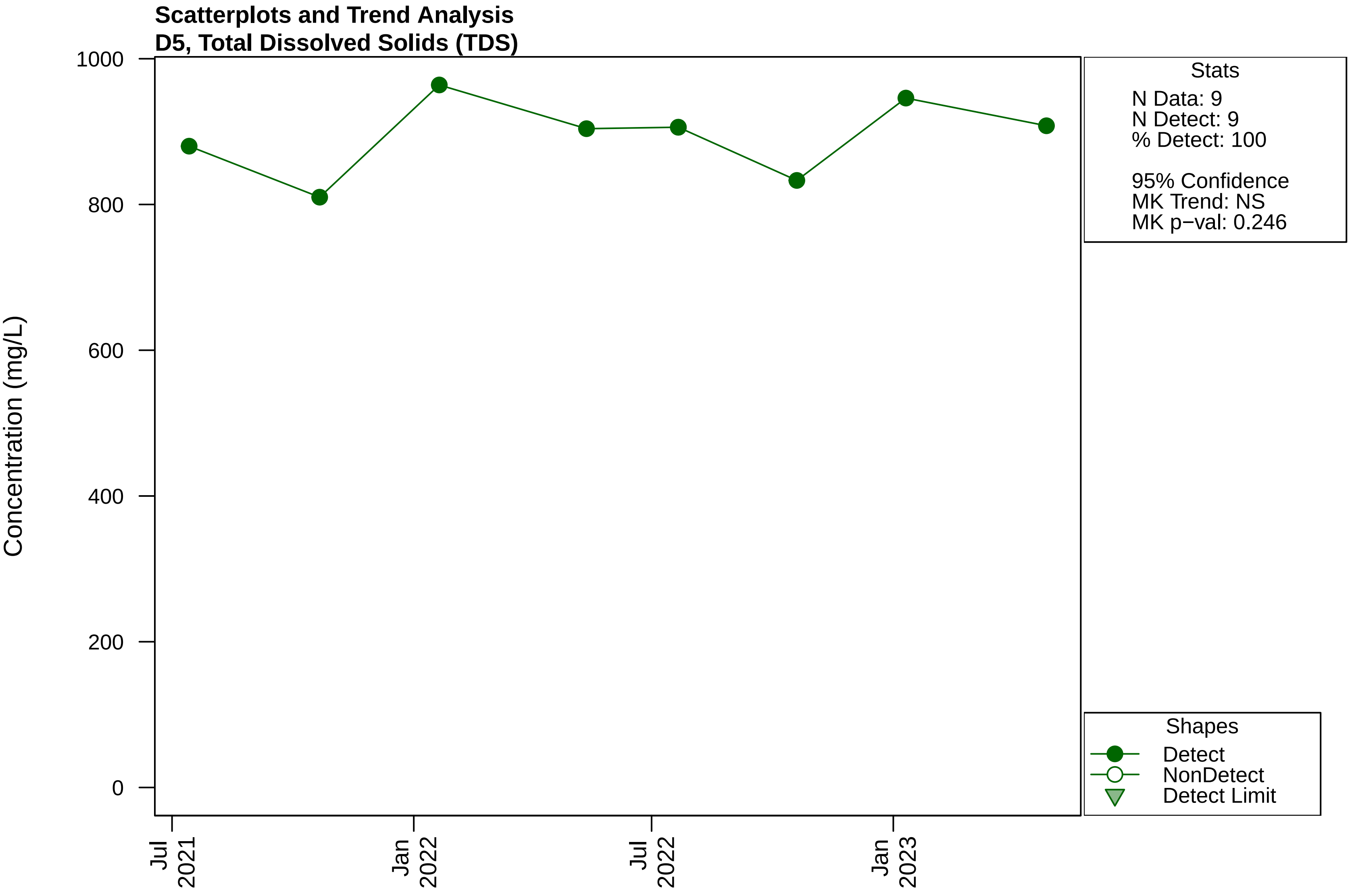
Scatterplots and Trend Analysis
D5, Molybdenum



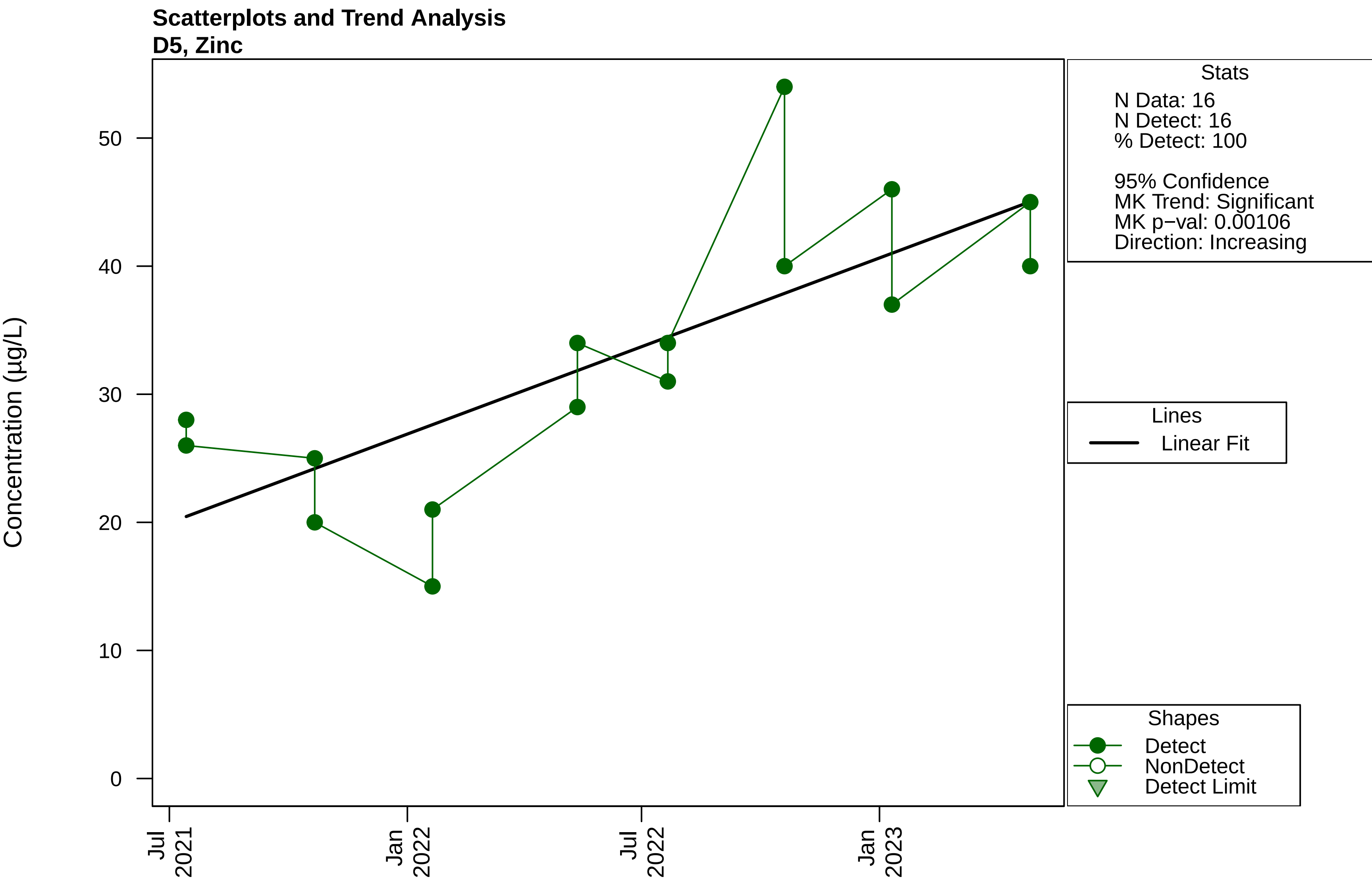

Scatterplots and Trend Analysis
D5, Nickel
Concentration (µg/L)
0
10
20
30
40
50
60
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

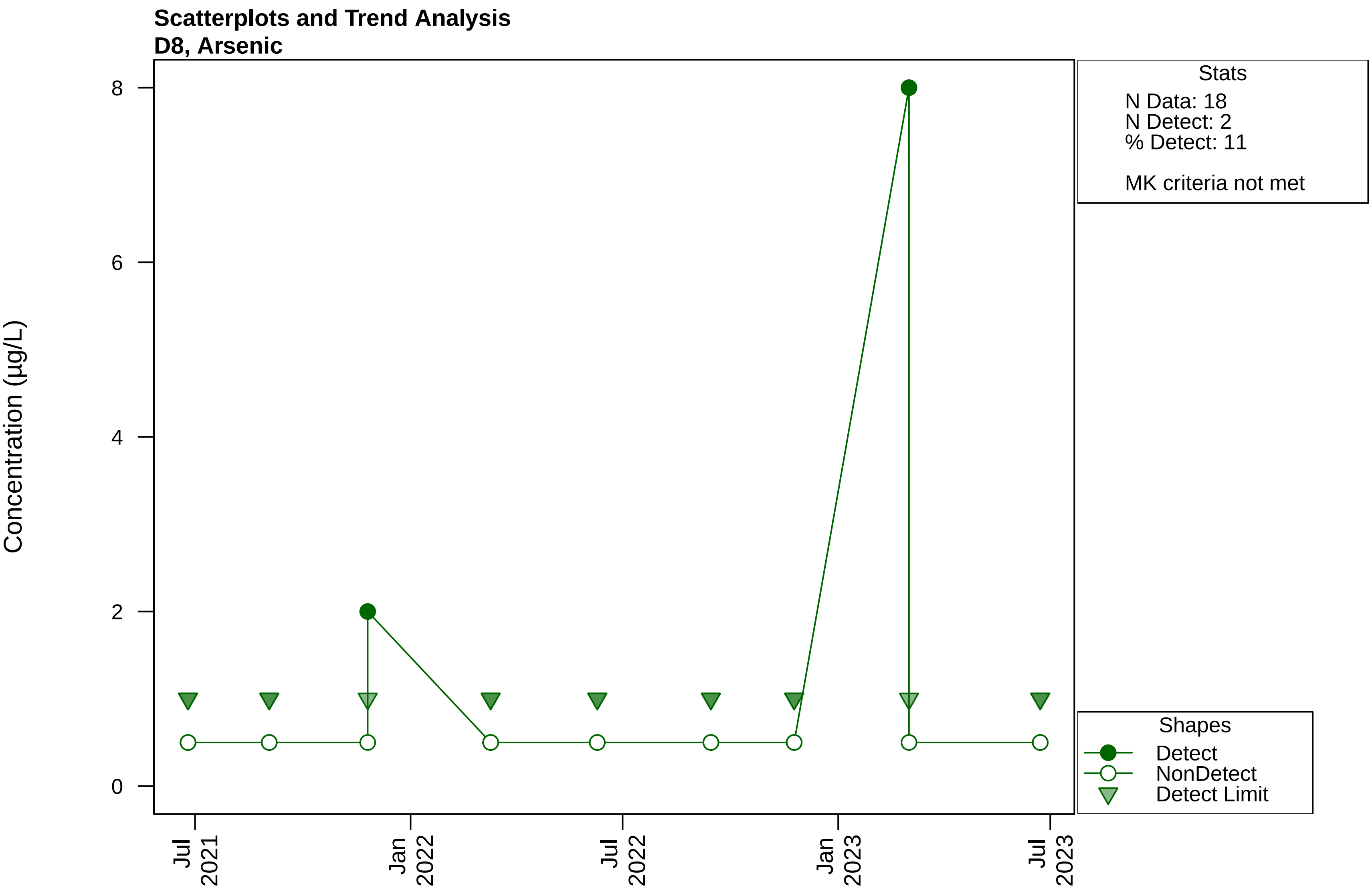

Scatterplots and Trend Analysis
D5, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 5
% Detect: 62
95% Confidence
MK Trend: NS
MK p−val: 0.897
Shapes
Detect
NonDetect
Detect Limit

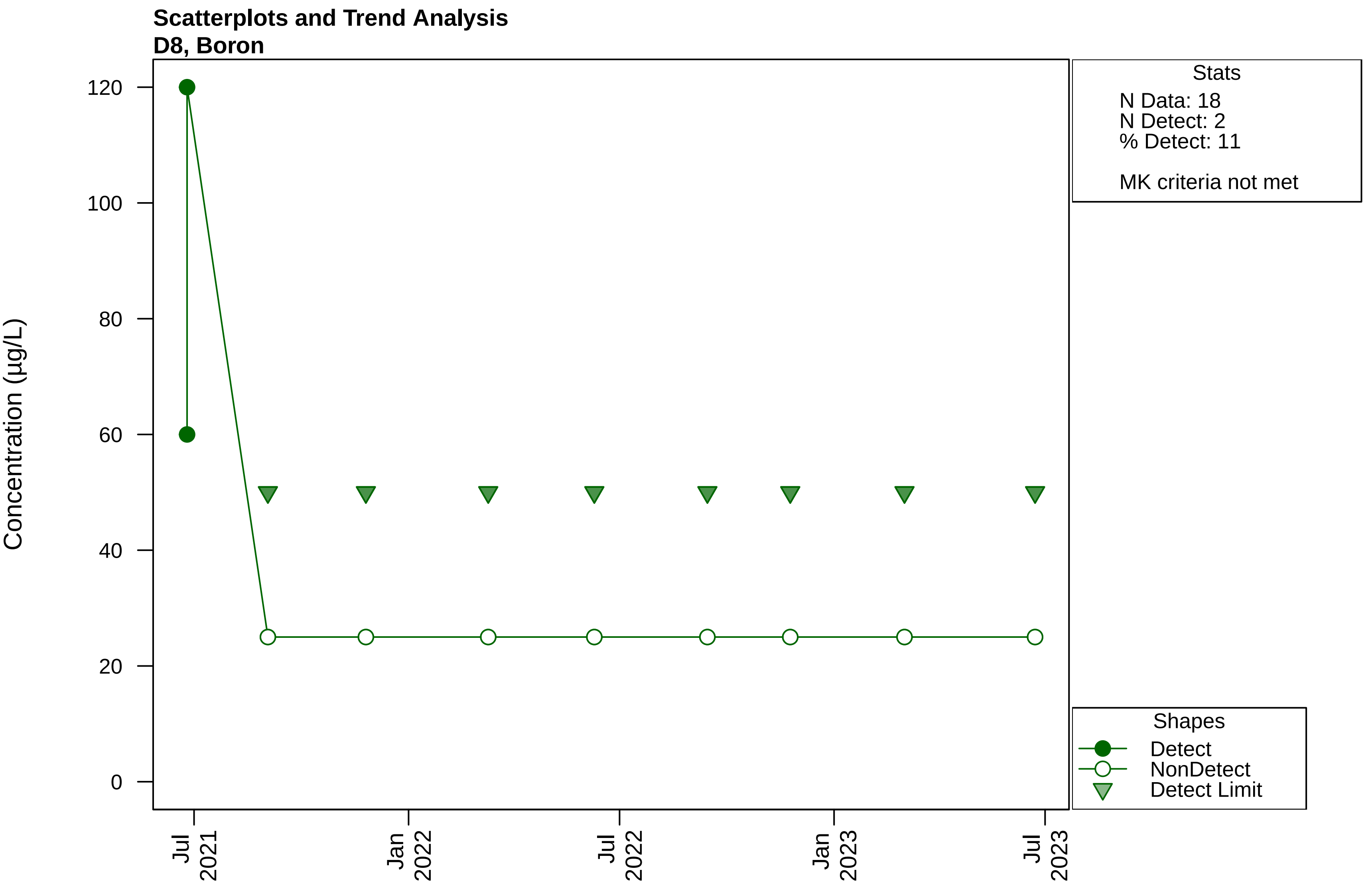

Scatterplots and Trend Analysis
D5, Sulfate (as SO4)
Concentration (mg/L)
600
500
400
300
200
100
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.275
Shapes
Detect
NonDetect
Detect Limit

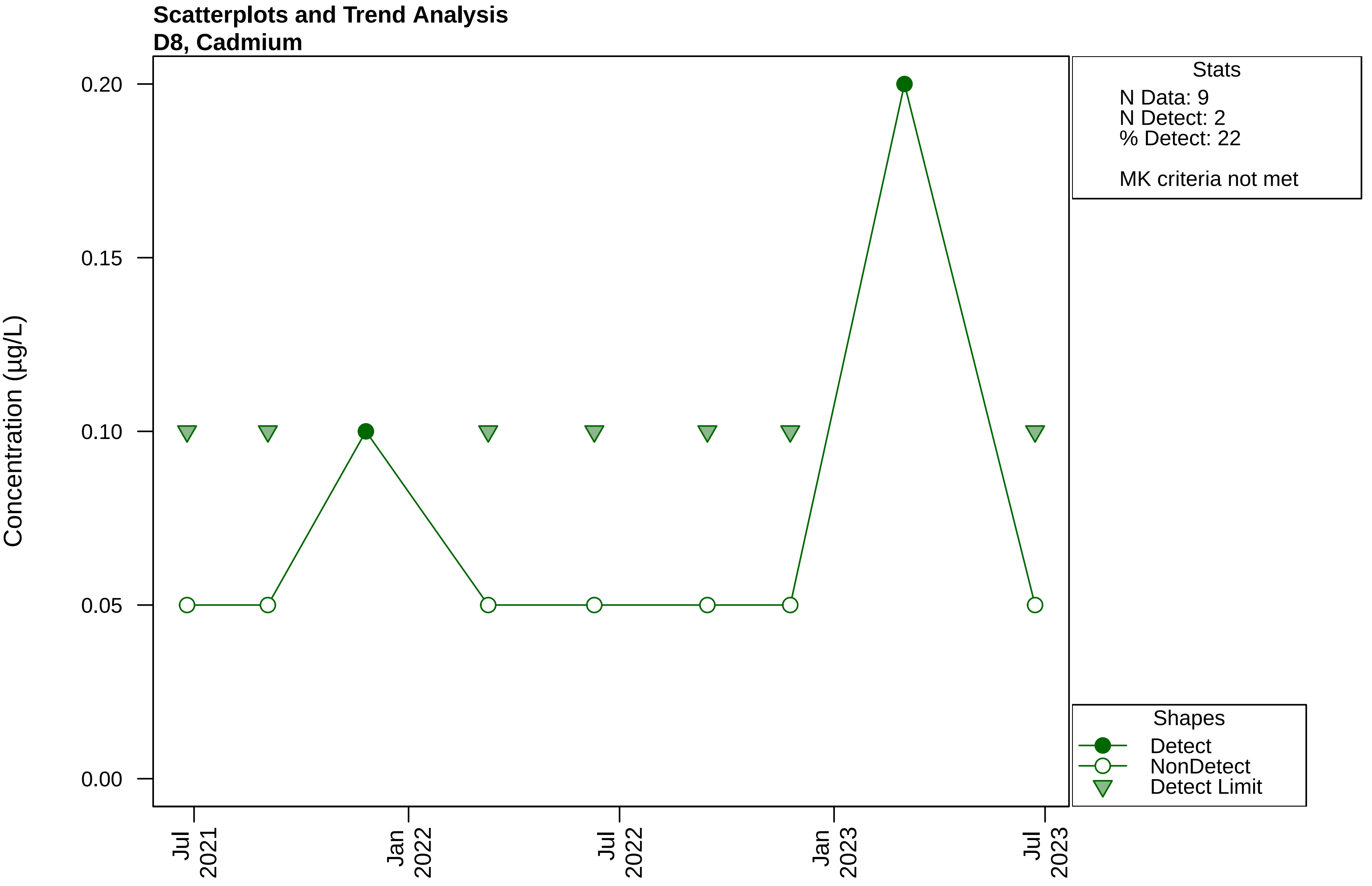


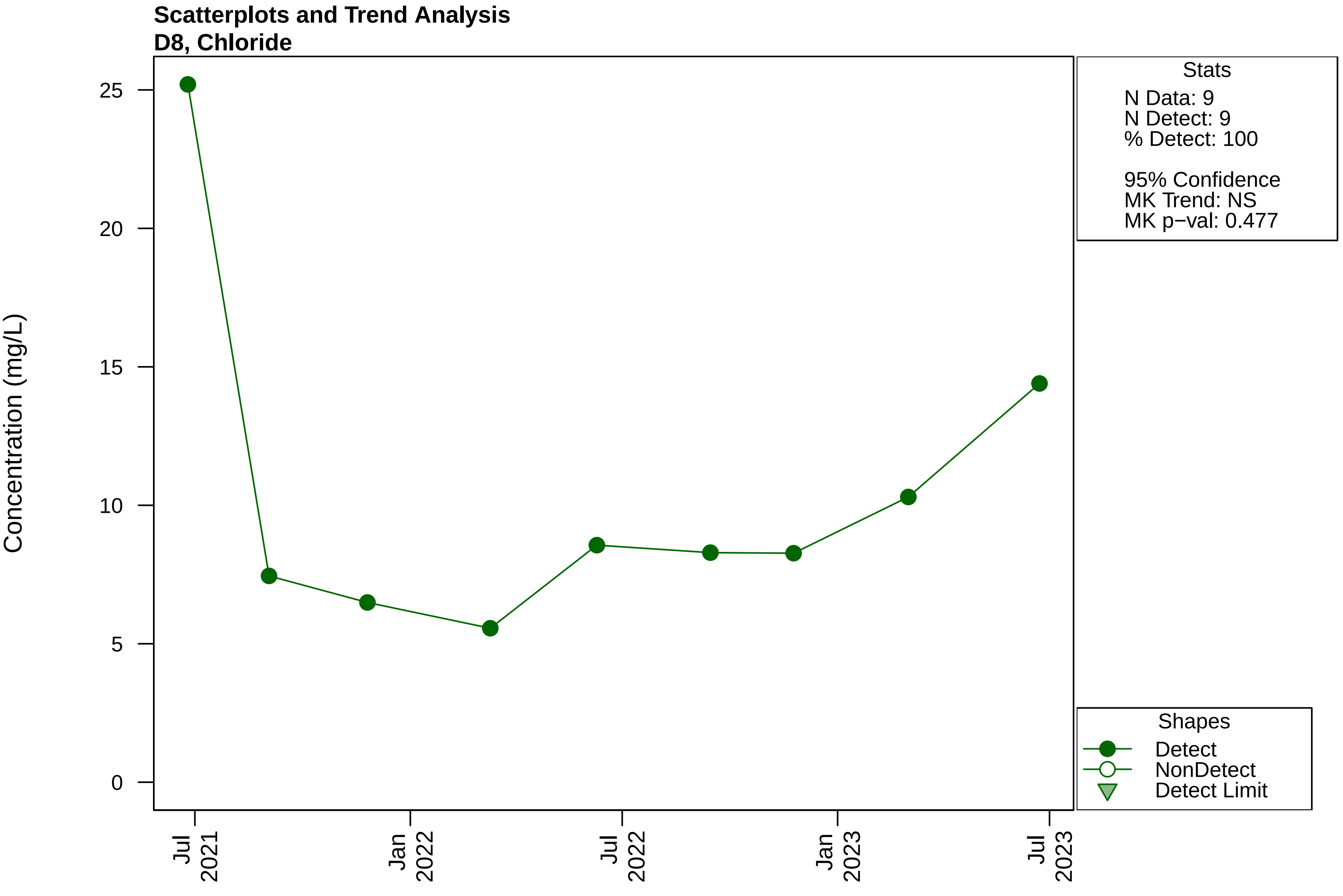
Scatterplots and Trend Analysis
D5, Total Dissolved Solids (TDS)
Concentration (mg/L)
1000
800
600
400
200
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.246
Shapes
Detect
NonDetect
Detect Limit

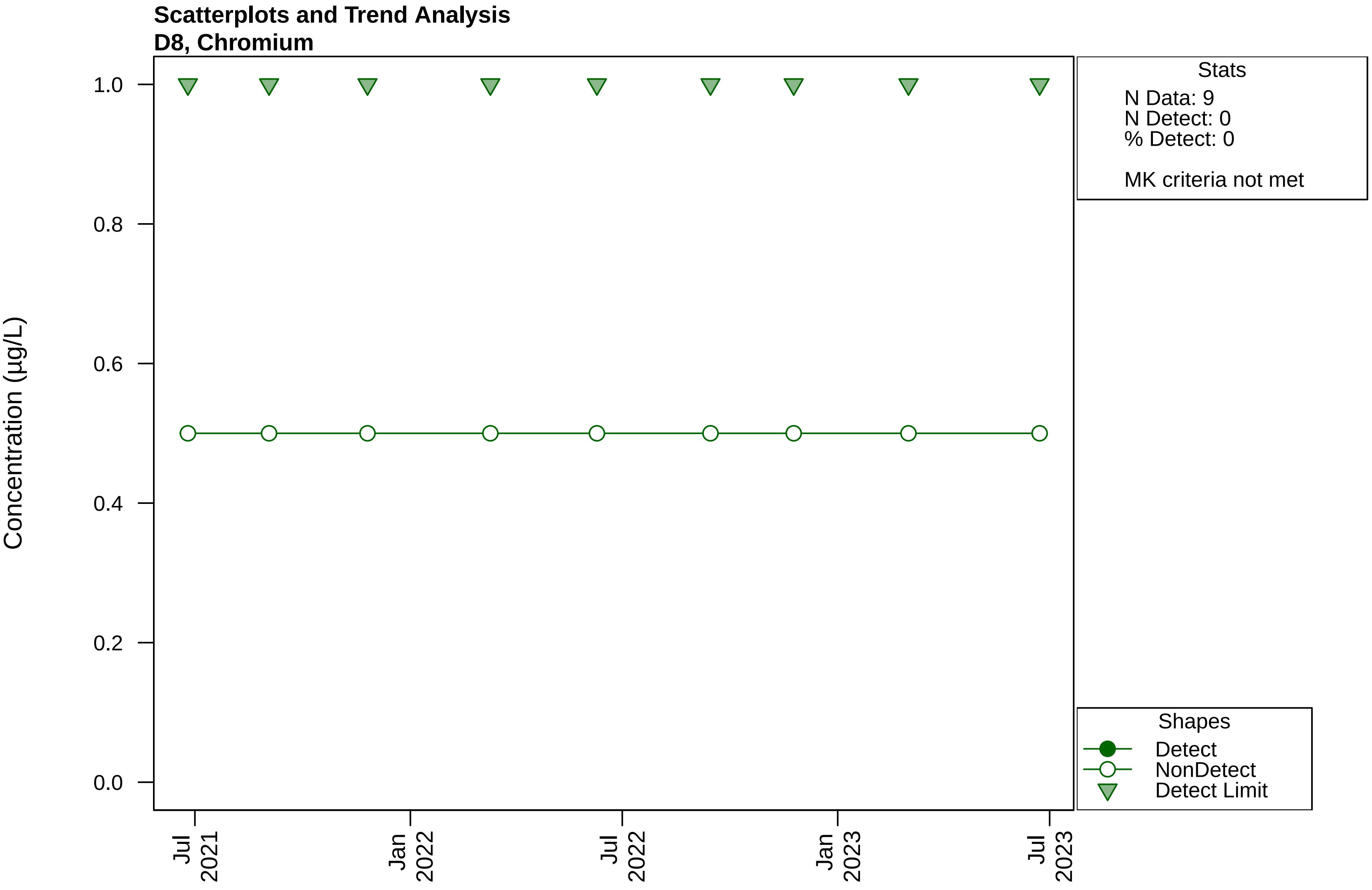

Scatterplots and Trend Analysis
D5, Zinc
Concentration (µg/L)
0
10
20
30
40
50
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 16
N Detect: 16
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00106
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

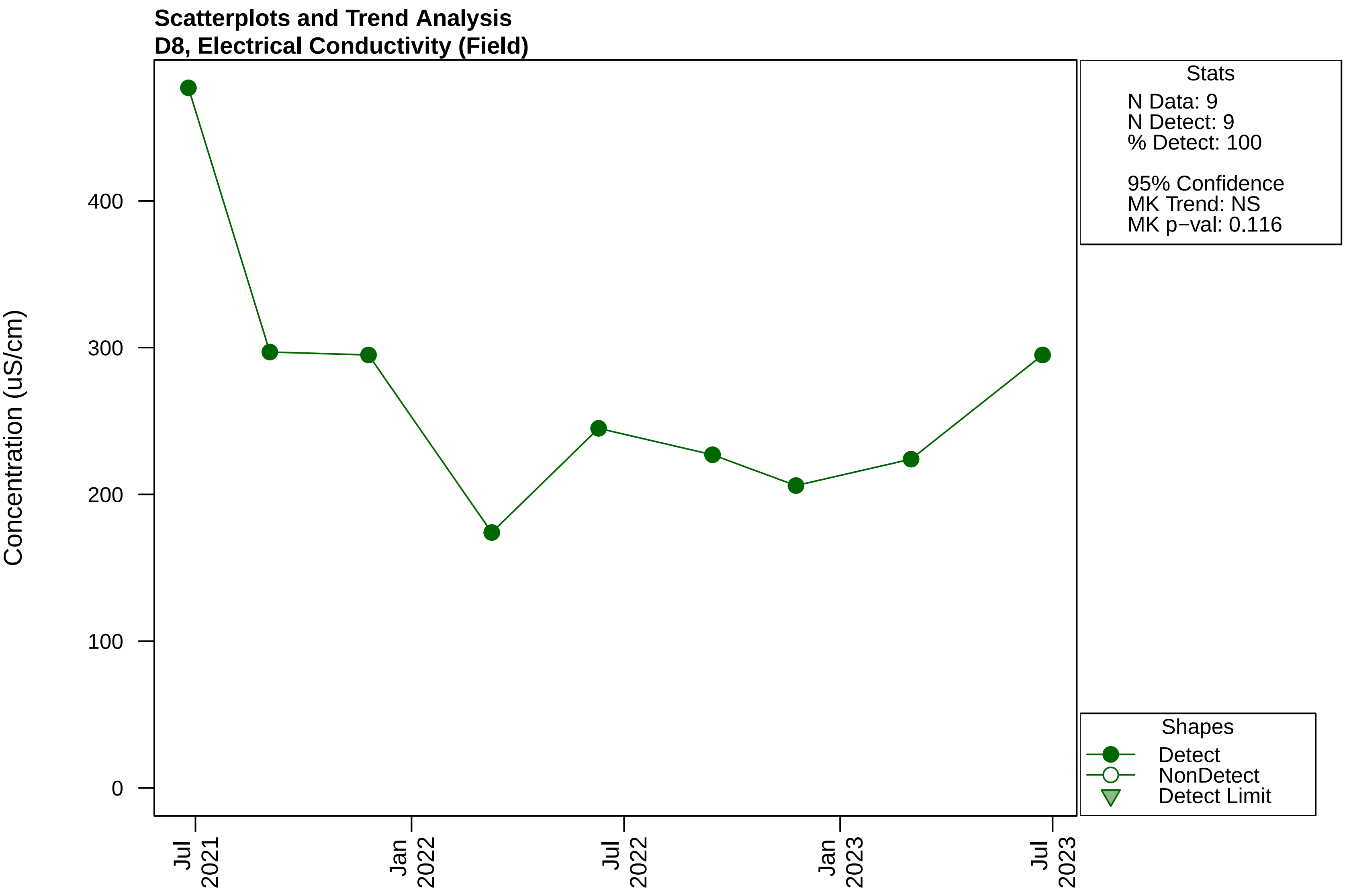

Scatterplots and Trend Analysis
D8, Arsenic
Concentration (µg/L)
0
2
4
6
8
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 2
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D8, Boron
Concentration (µg/L)
0
20
40
60
80
100
120
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 2
% Detect: 11
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

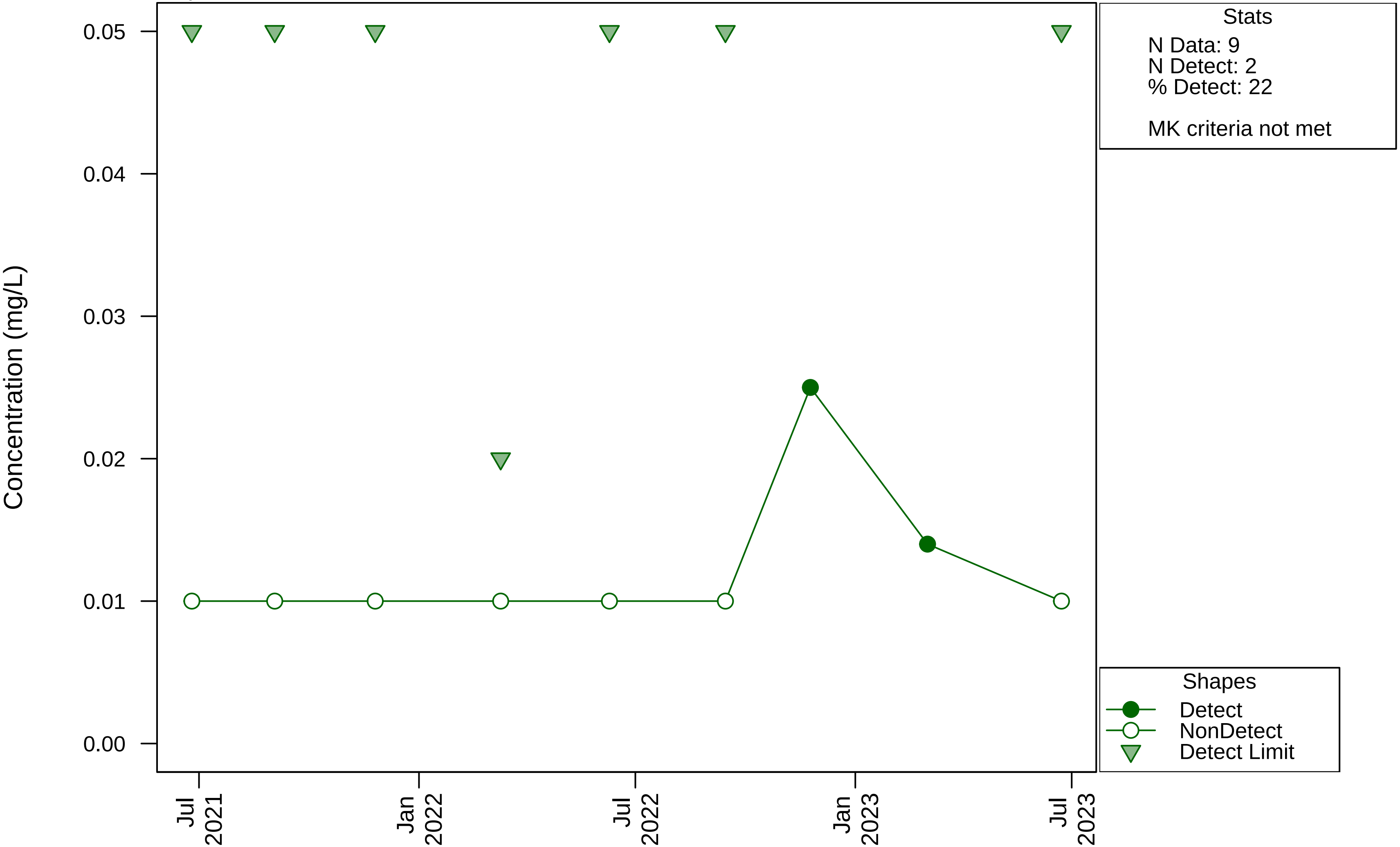

Scatterplots and Trend Analysis
D8, Cadmium
Concentration (µg/L)
0.00
0.05
0.10
0.15
0.20
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 2
% Detect: 22
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D8, Chloride
Concentration (mg/L)
25
20
15
10
5
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.477
Shapes
Detect
NonDetect
Detect Limit

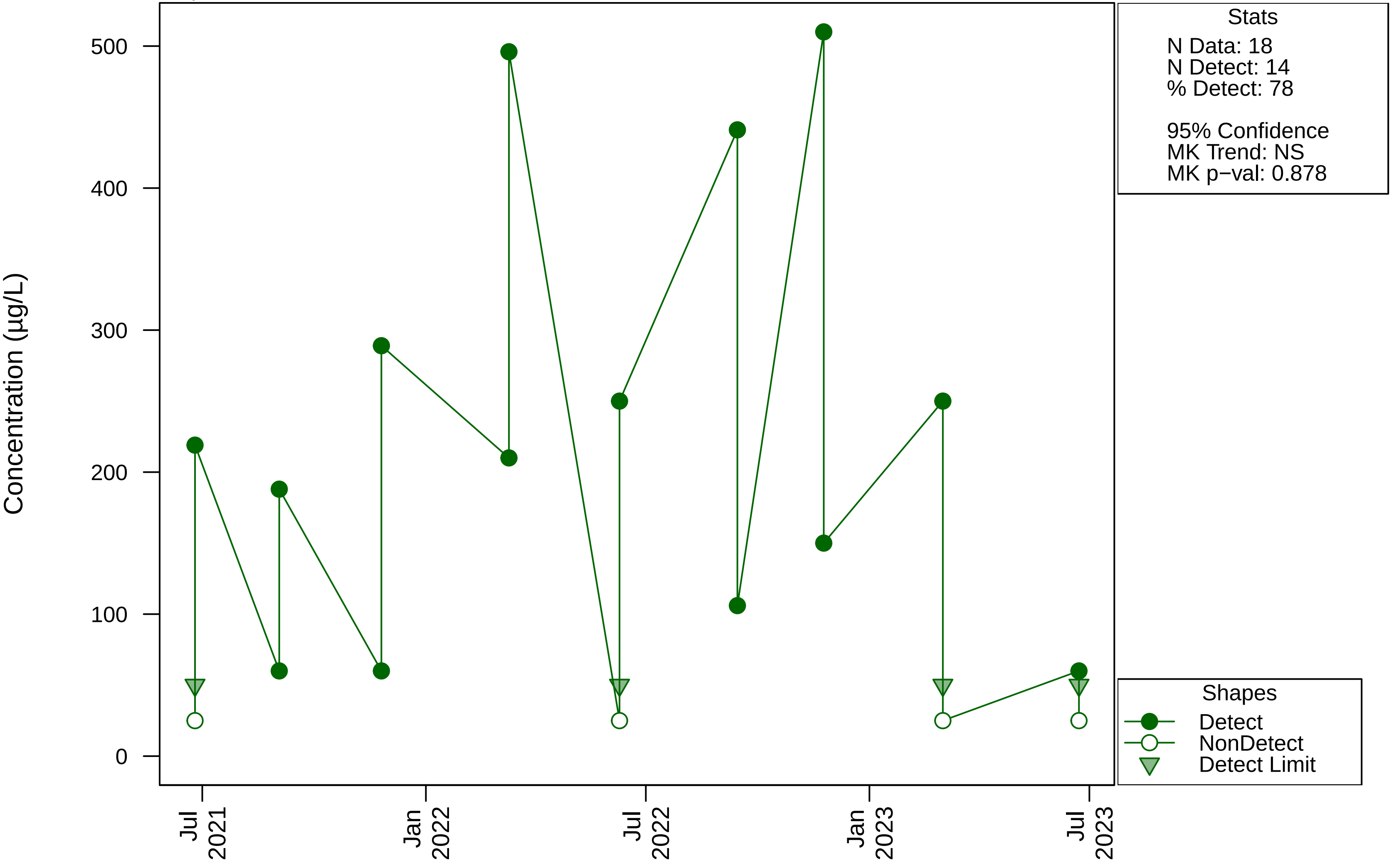

Scatterplots and Trend Analysis
D8, Chromium
Concentration (µg/L)
0.0
0.2
0.4
0.6
0.8
1.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 0
% Detect: 0
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D8, Electrical Conductivity (Field)
Concentration (uS/cm)
0
100
200
300
400
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.116
Shapes
Detect
NonDetect
Detect Limit

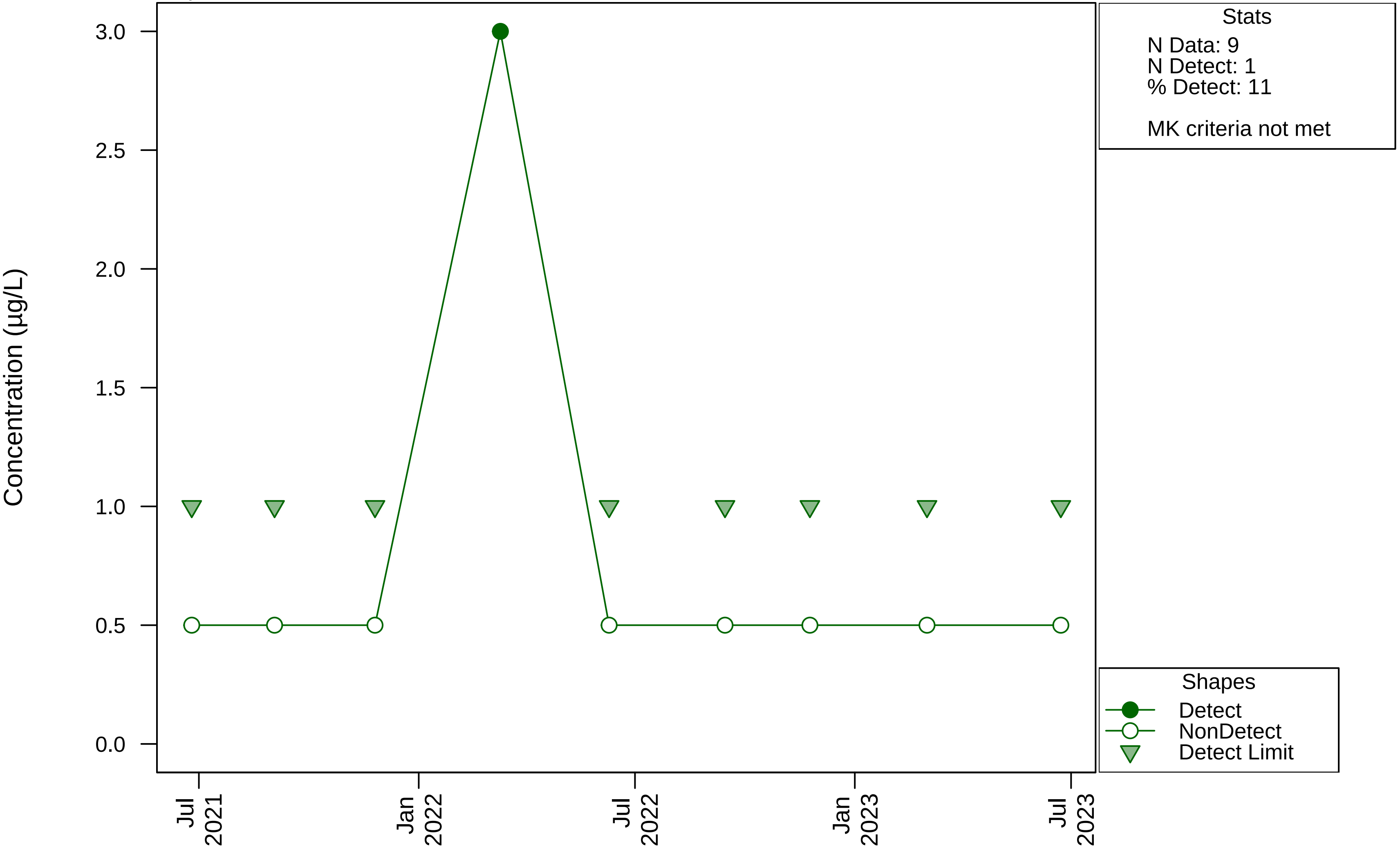
Scatterplots and Trend Analysis
D8, Fluoride

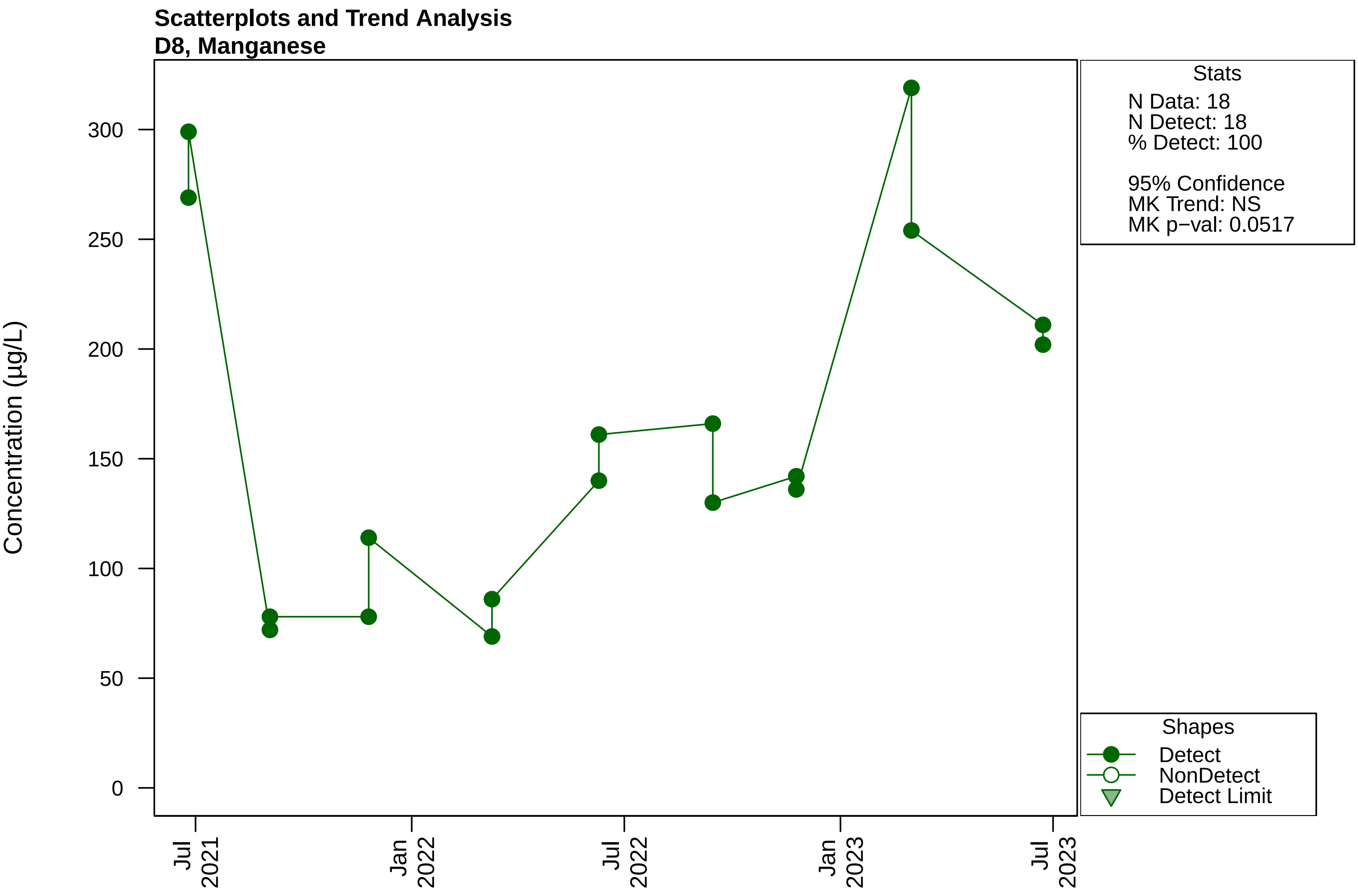


Scatterplots and Trend Analysis
D8, Iron

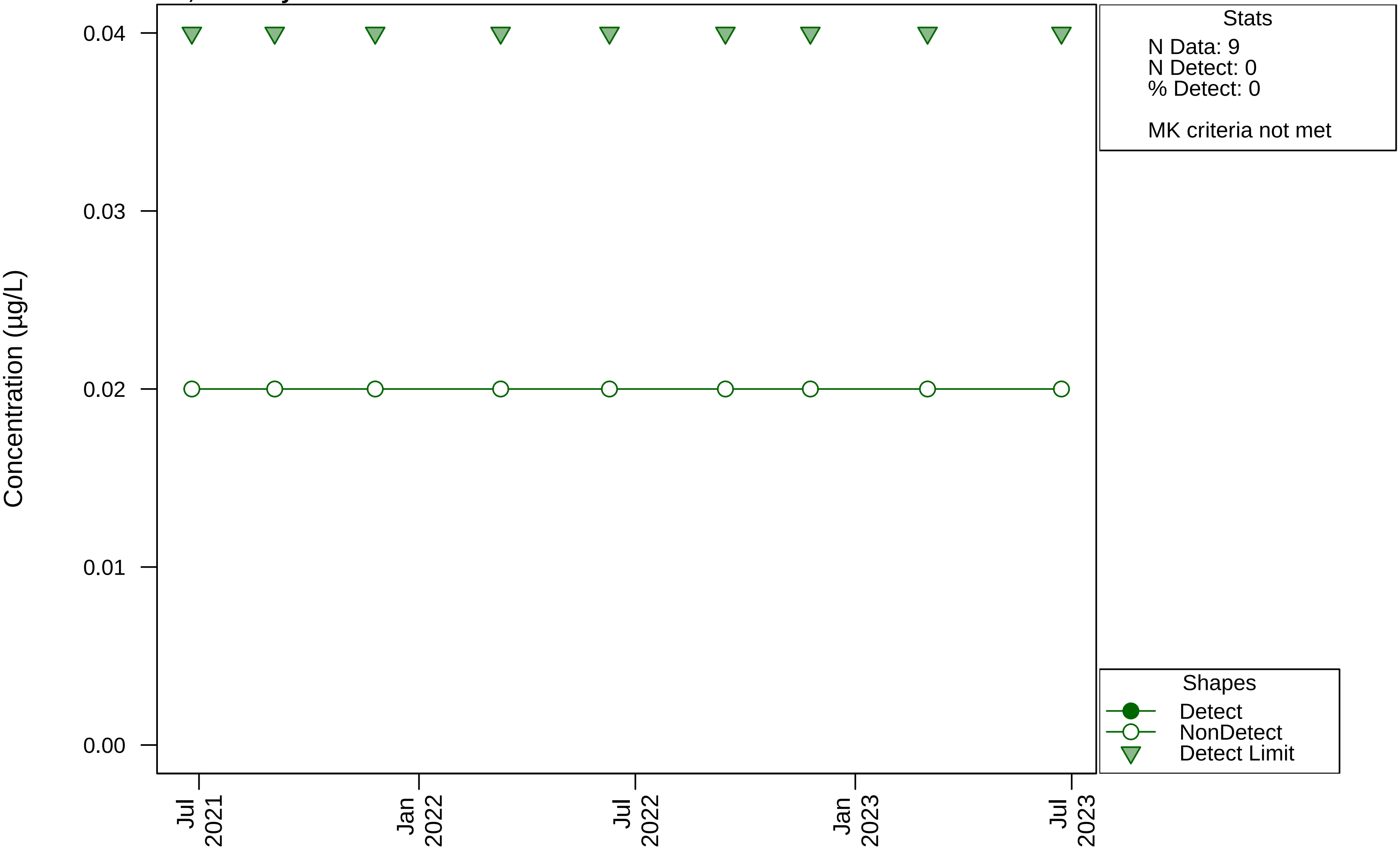


Scatterplots and Trend Analysis
D8, Lead

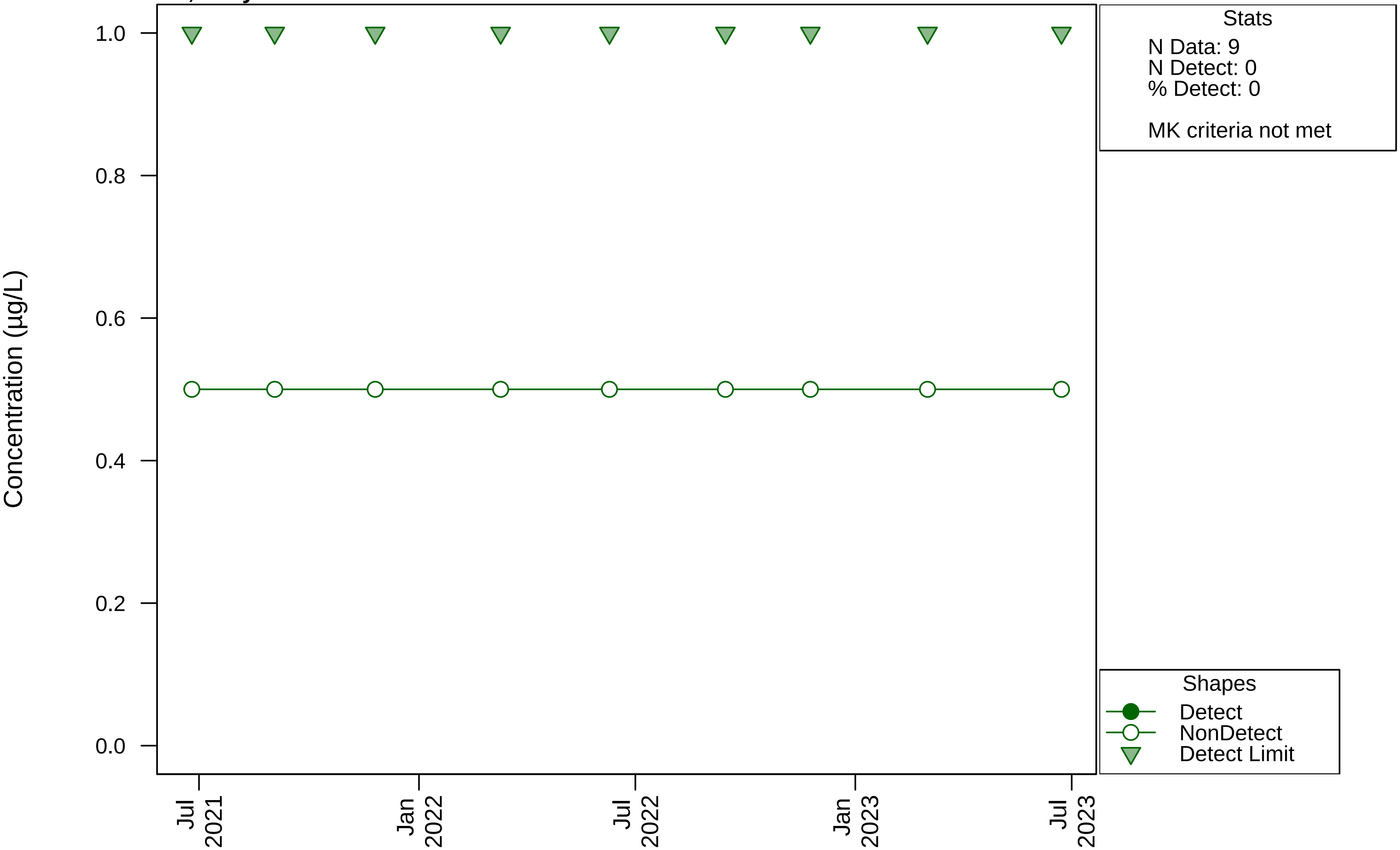



Scatterplots and Trend Analysis
D8, Manganese
Concentration (µg/L)
0
50
100
150
200
250
300
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0517
Shapes
Detect
NonDetect
Detect Limit

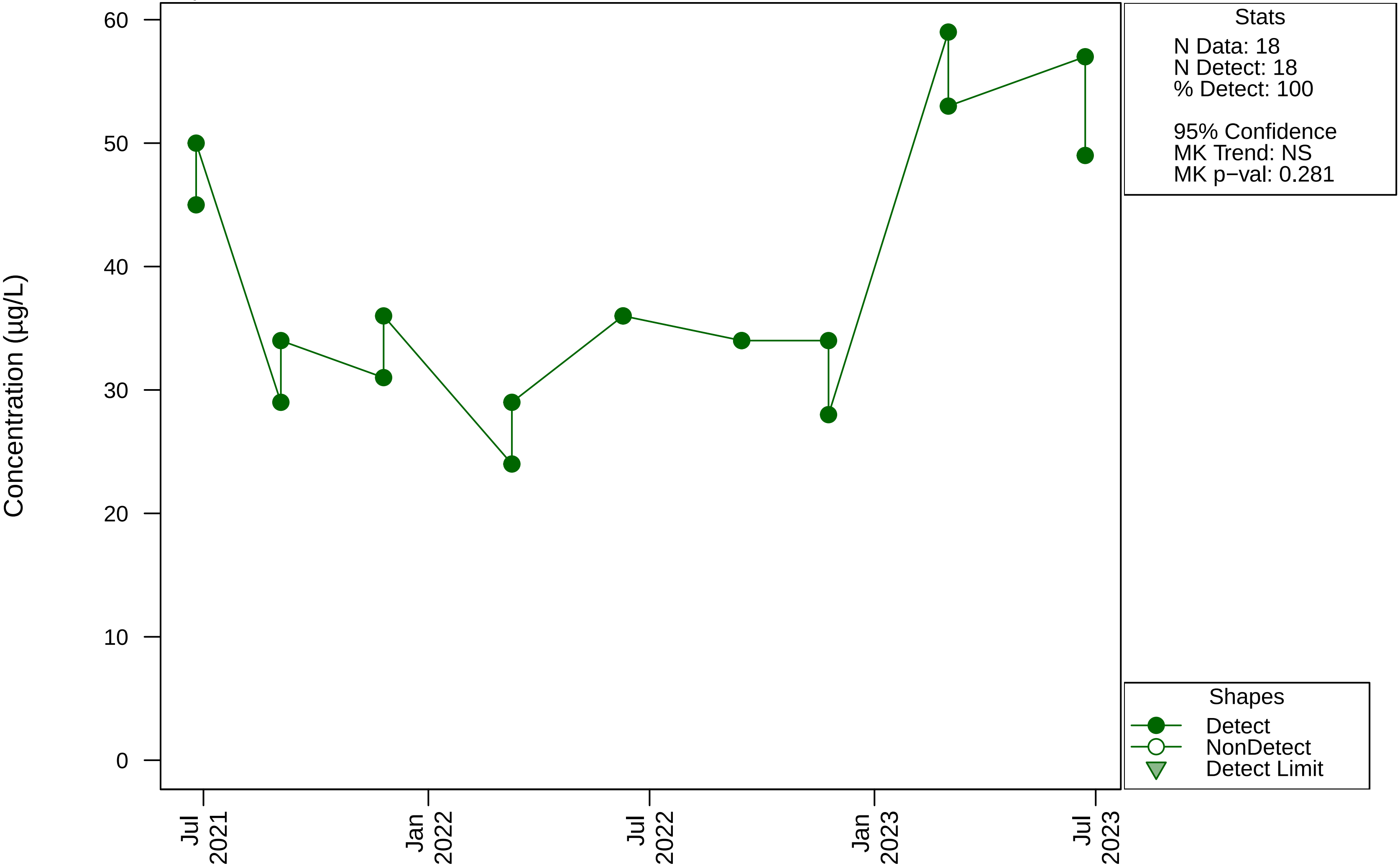
Scatterplots and Trend Analysis
D8, Mercury



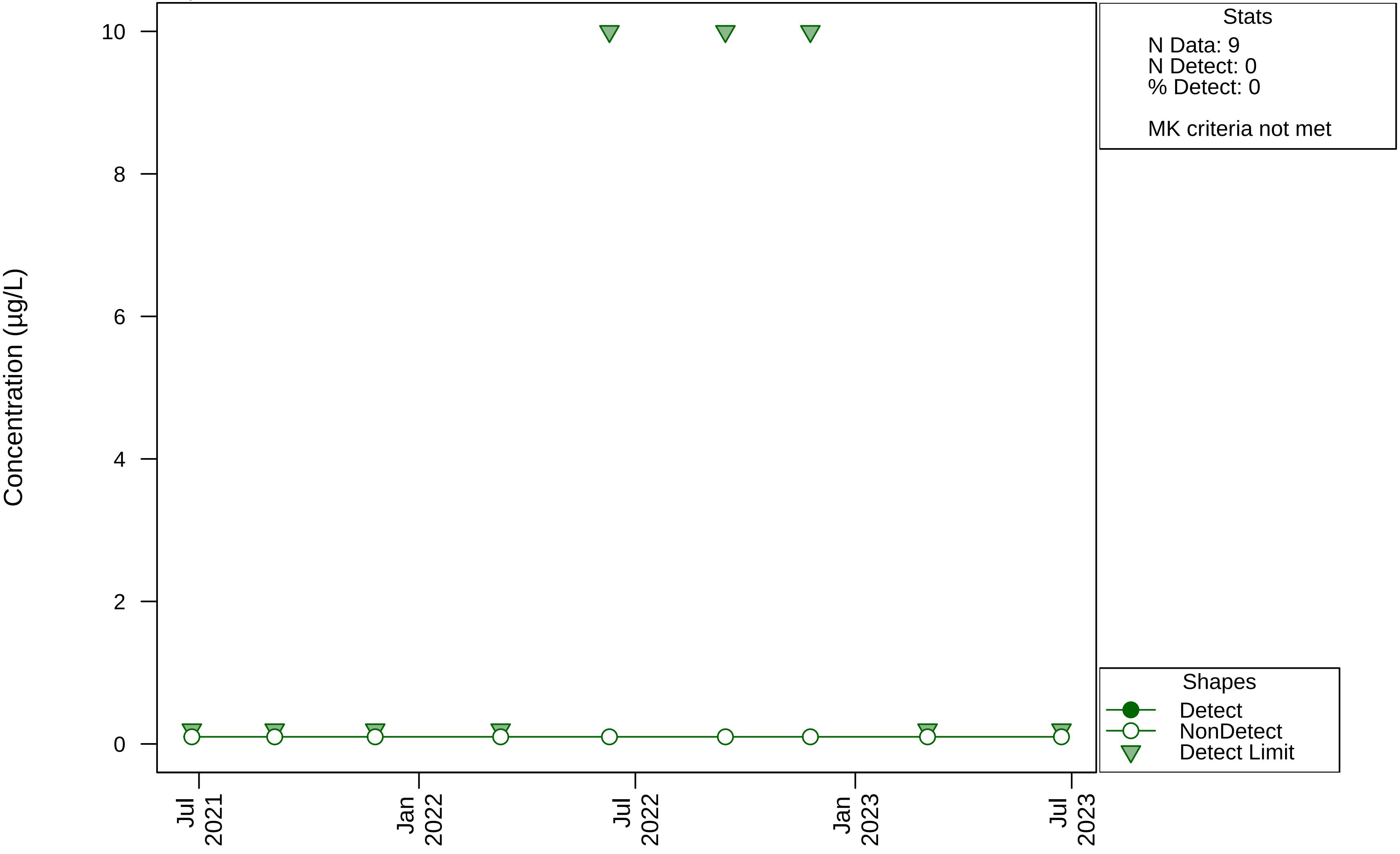
Scatterplots and Trend Analysis
D8, Molybdenum

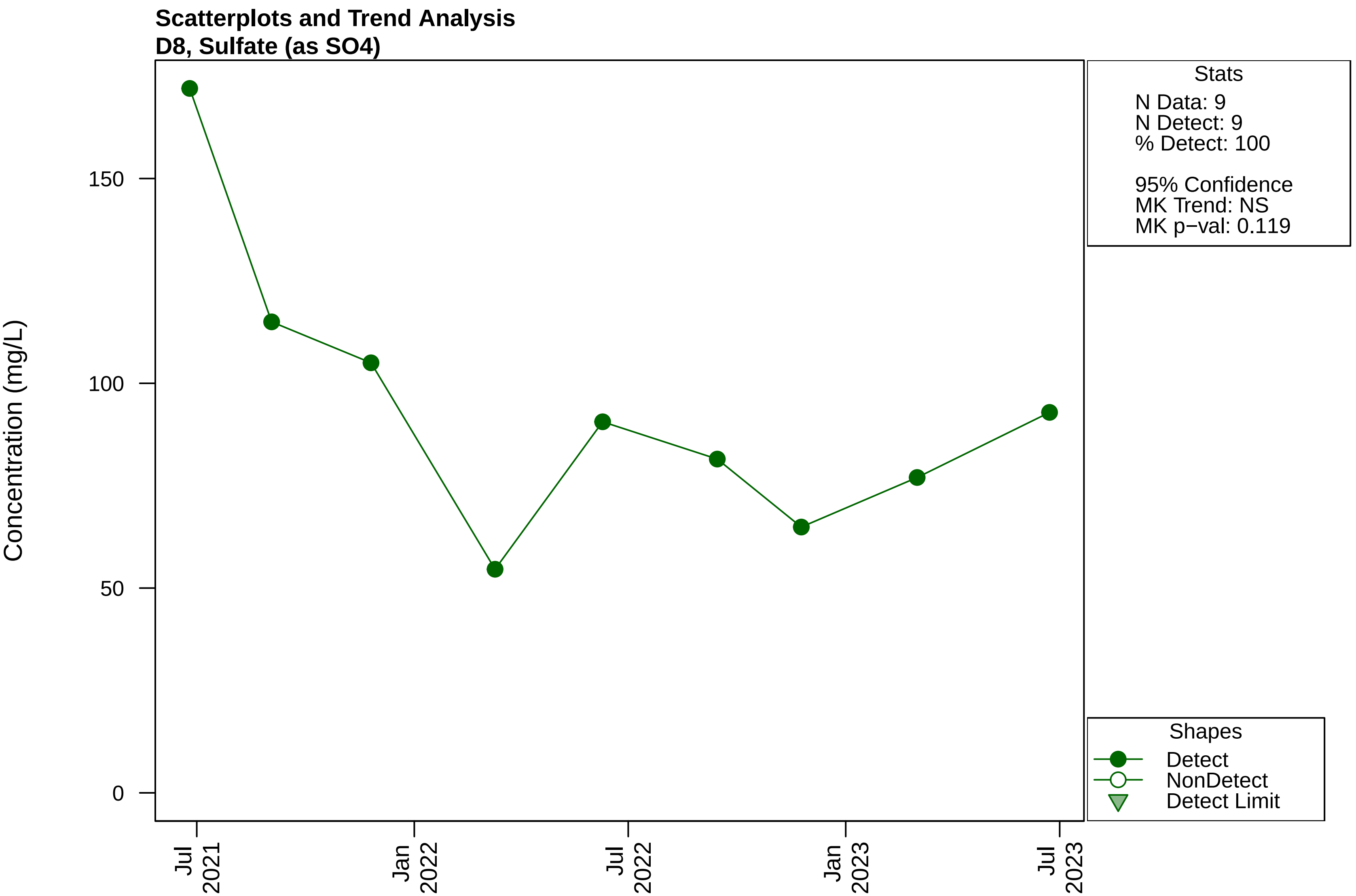


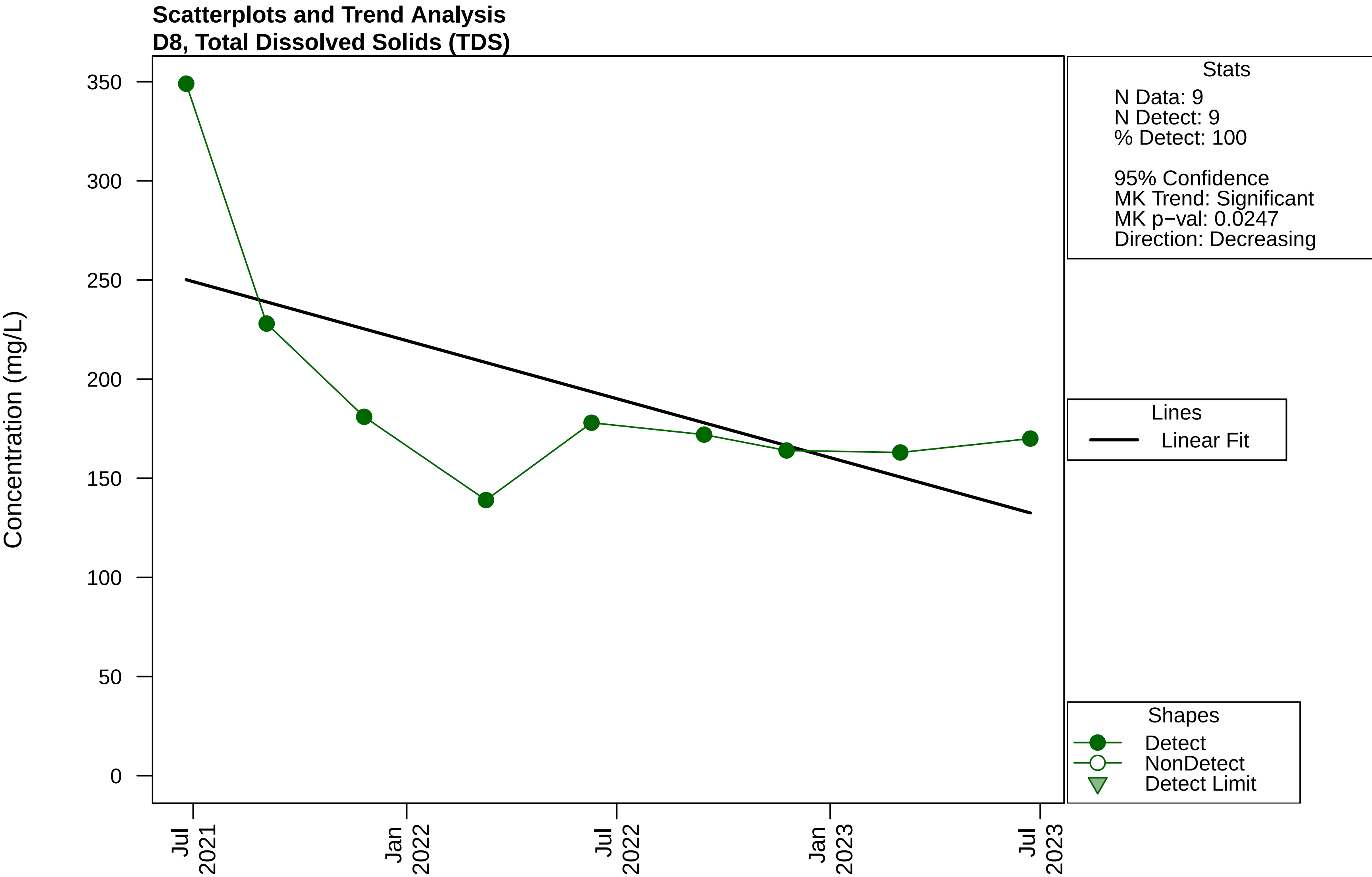
Scatterplots and Trend Analysis
D8, Nickel



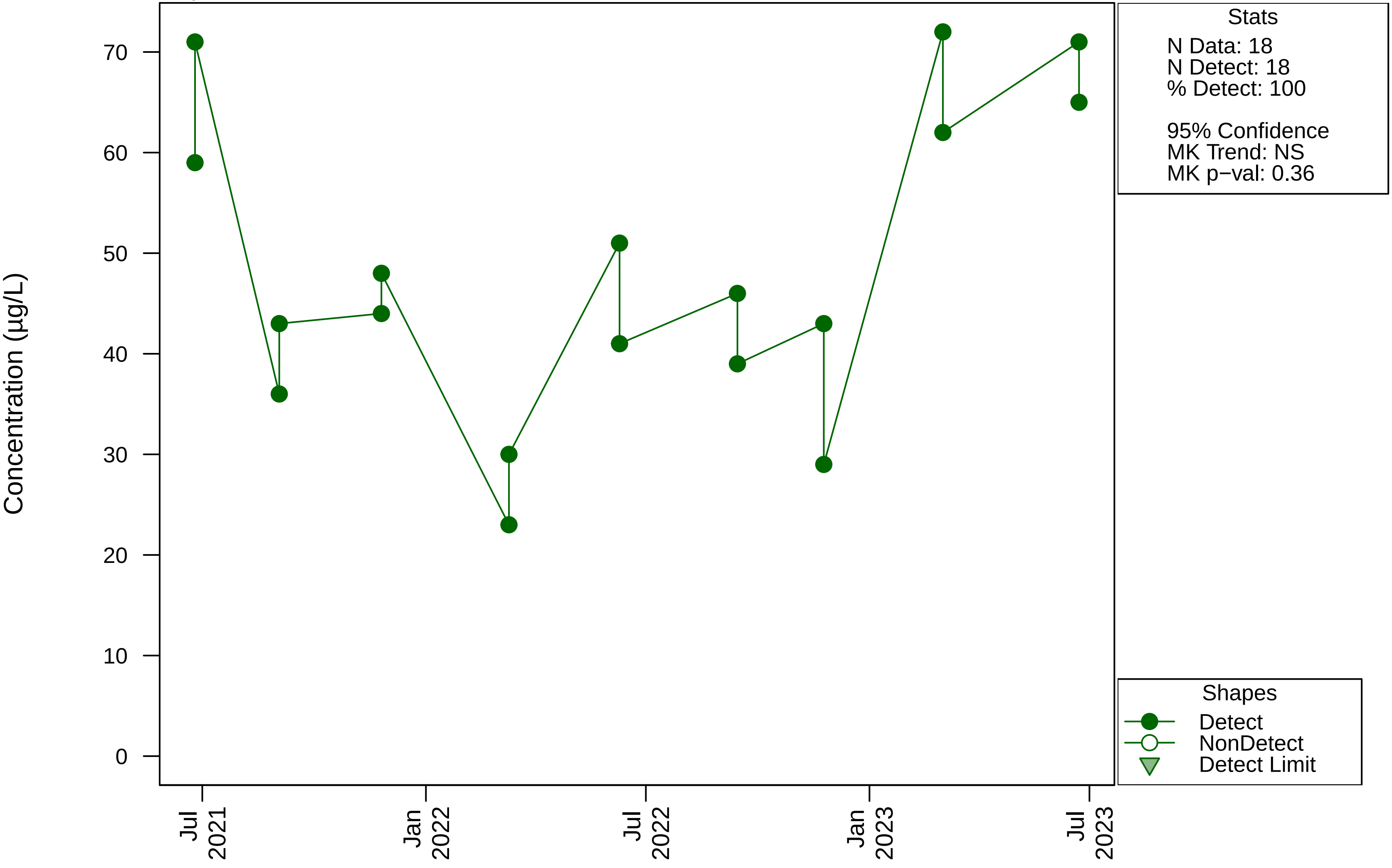
Scatterplots and Trend Analysis
D8, Selenium

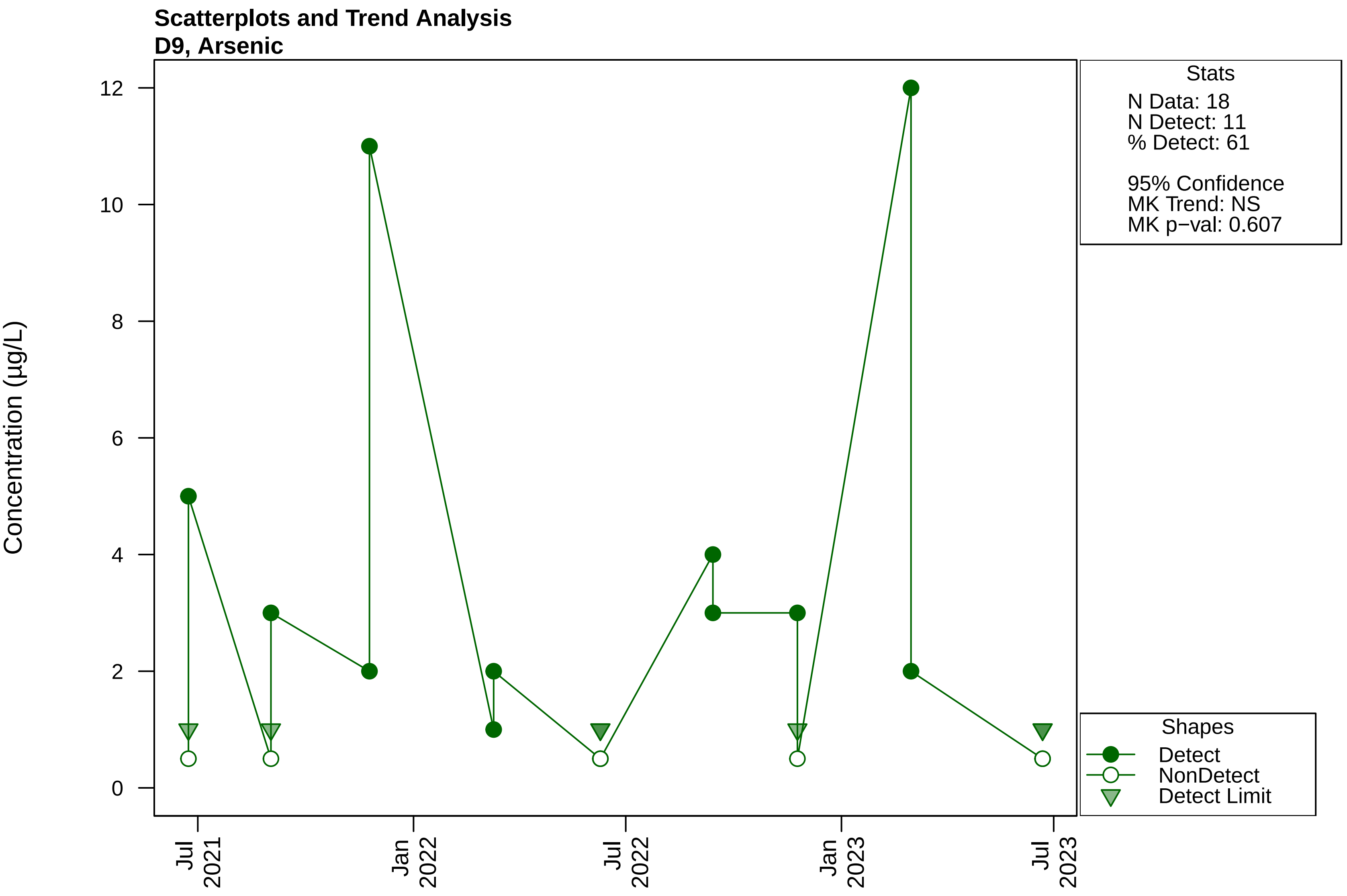



Scatterplots and Trend Analysis
D8, Sulfate (as SO4)
Concentration (mg/L)
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.119
Shapes
Detect
NonDetect
Detect Limit

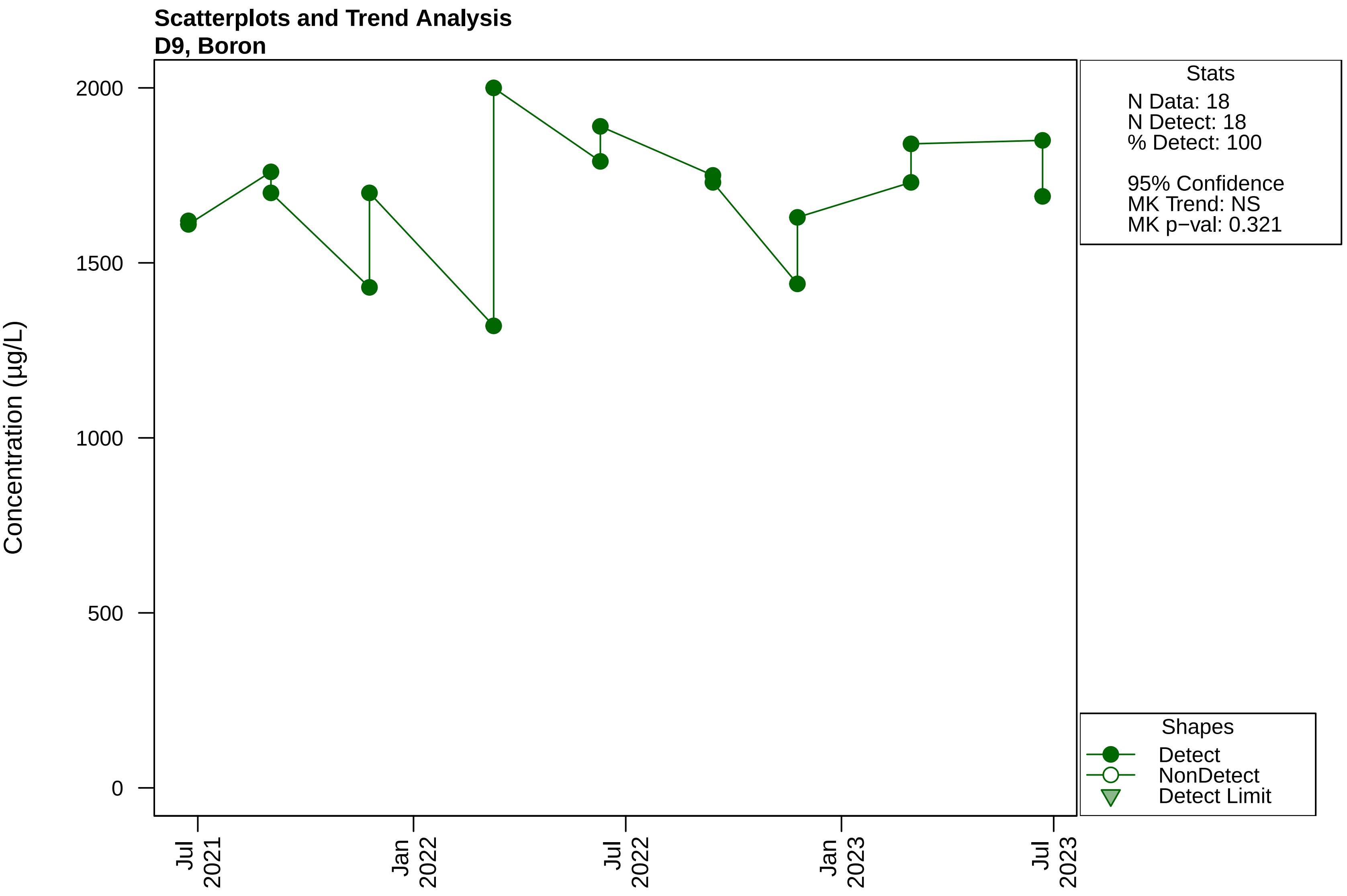

Scatterplots and Trend Analysis
D8, Total Dissolved Solids (TDS)
Concentration (mg/L)
350
300
250
200
150
100
50
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0247
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D8, Zinc

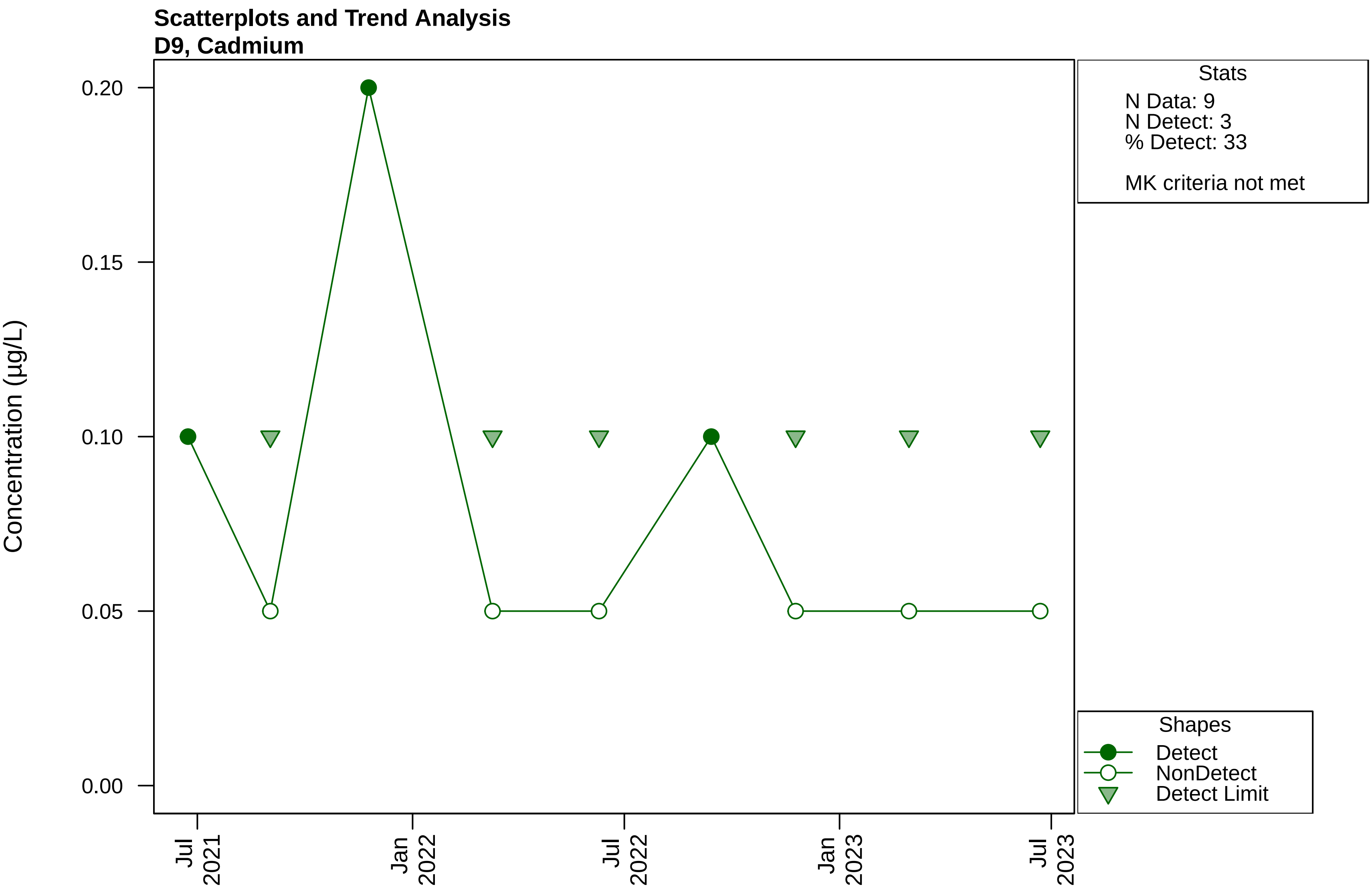


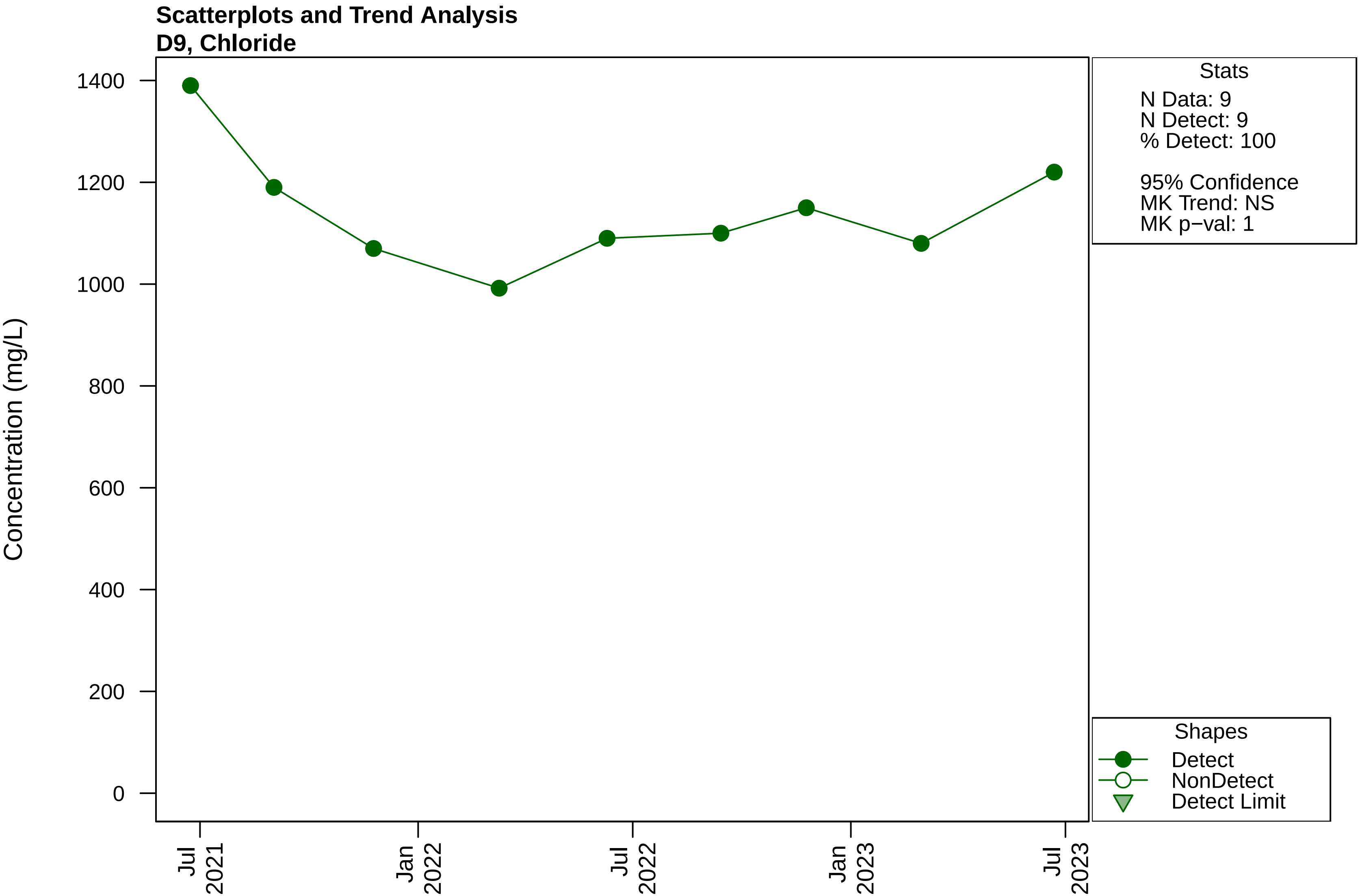


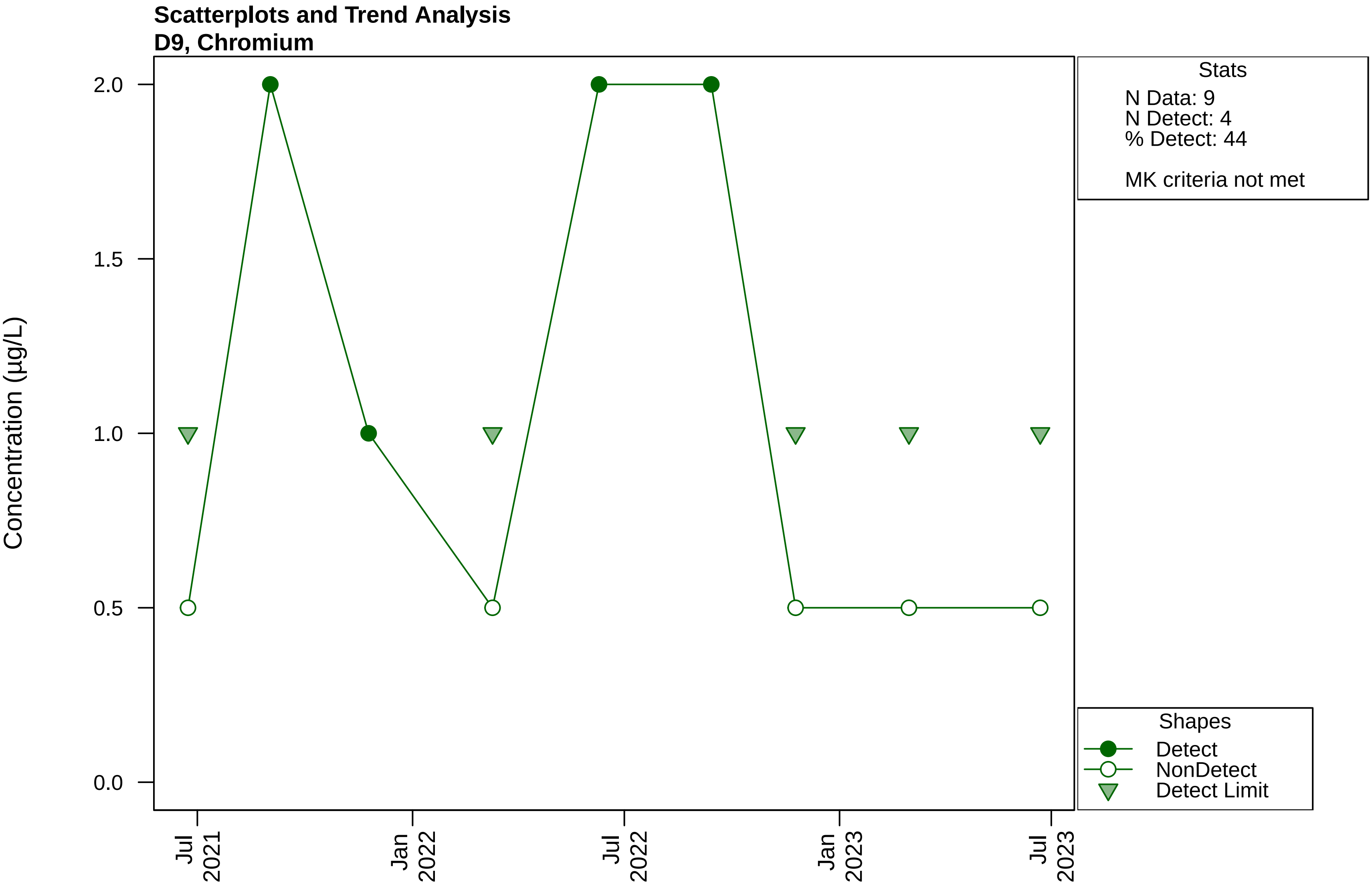
Scatterplots and Trend Analysis
D9, Arsenic
Concentration (µg/L)
0
2
4
6
8
10
12
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 11
% Detect: 61
95% Confidence
MK Trend: NS
MK p−val: 0.607
Shapes
Detect
NonDetect
Detect Limit

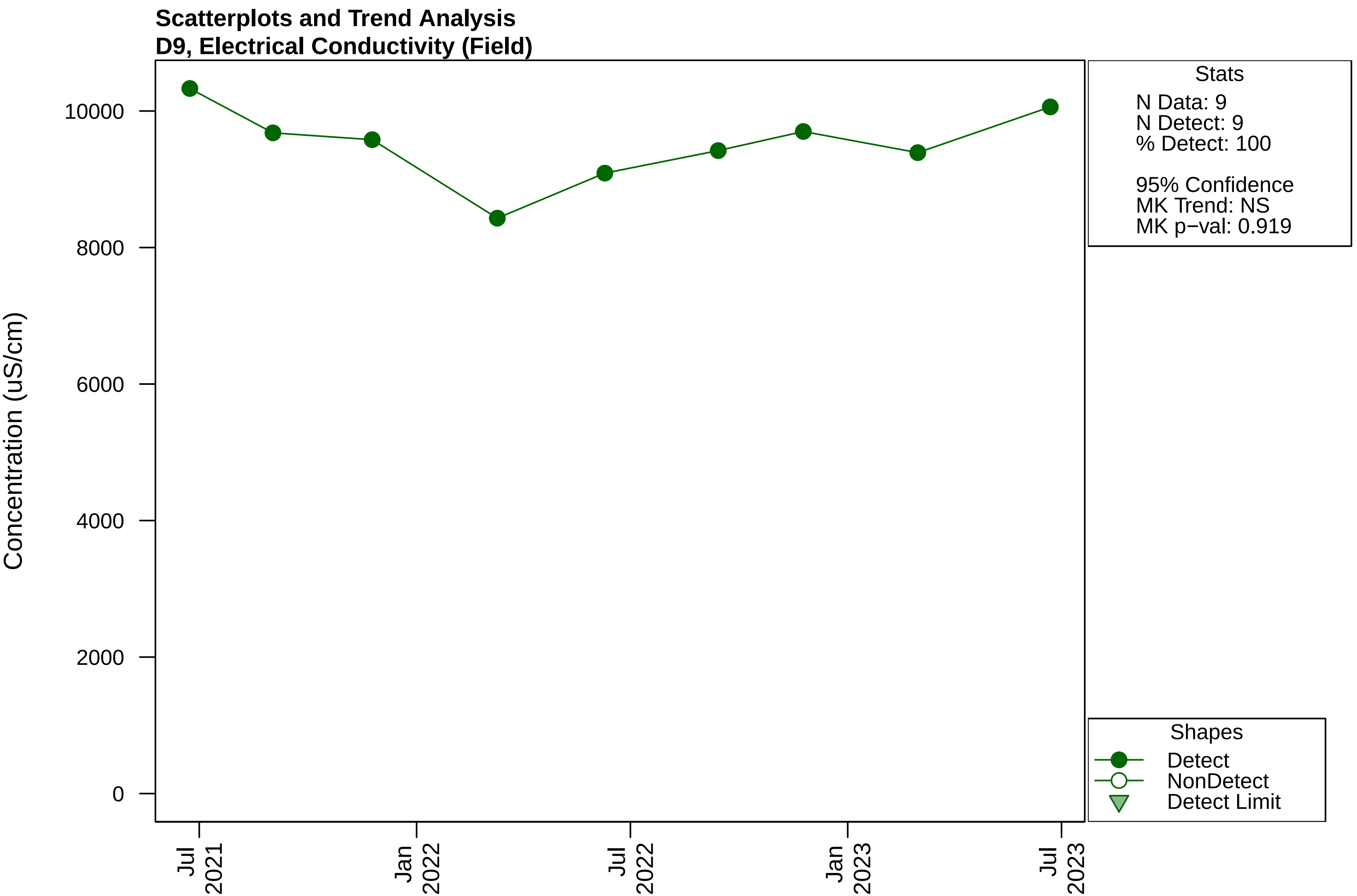


Scatterplots and Trend Analysis
D9, Boron
Concentration (µg/L)
2000
1500
1000
500
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.321
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
D9, Cadmium
Concentration (µg/L)
0.20
0.15
0.10
0.05
0.00
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 3
% Detect: 33
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

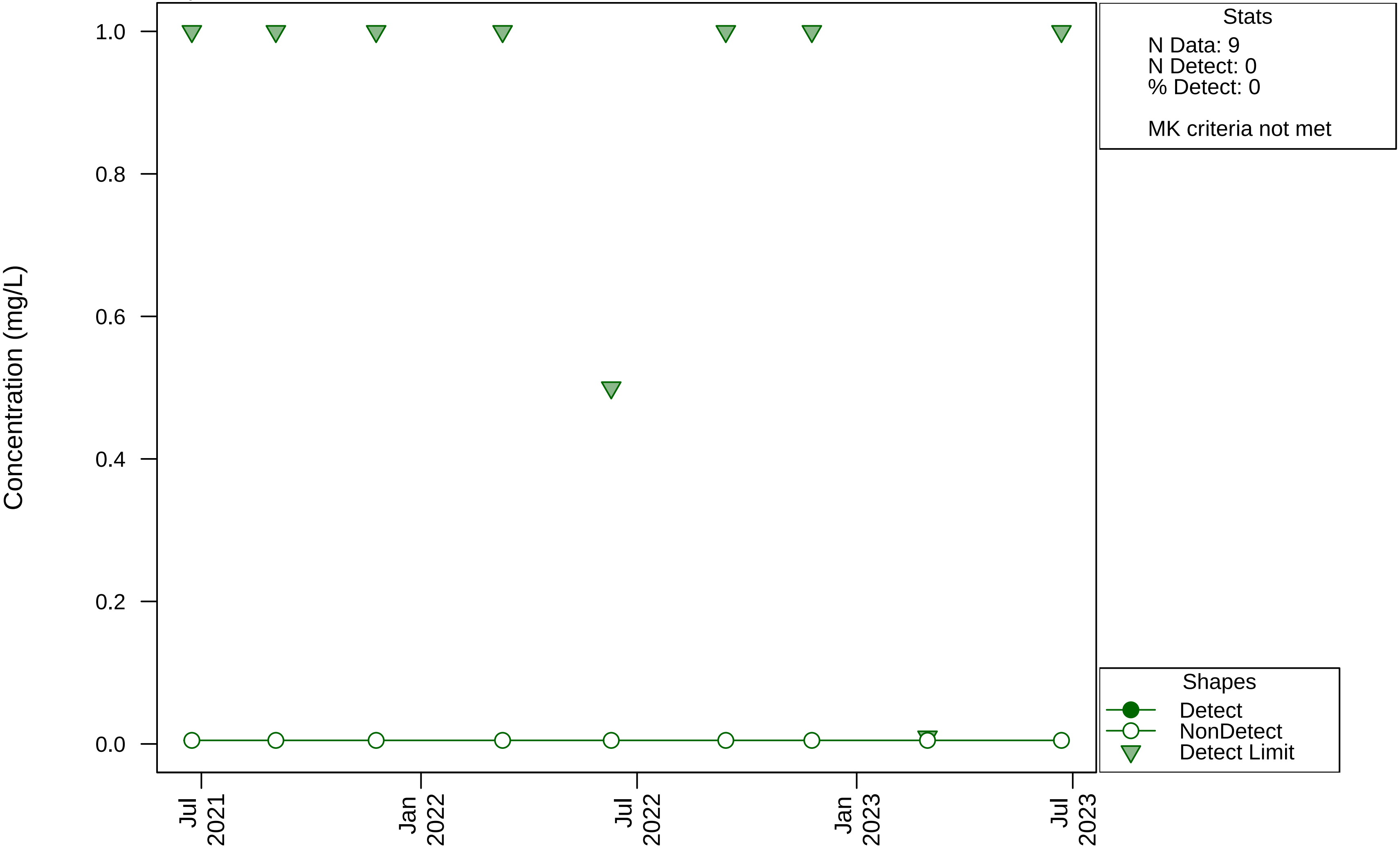

Scatterplots and Trend Analysis
D9, Chloride
Concentration (mg/L)
0
200
400
600
800
1000
1200
1400
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 1
Shapes
Detect
NonDetect
Detect Limit

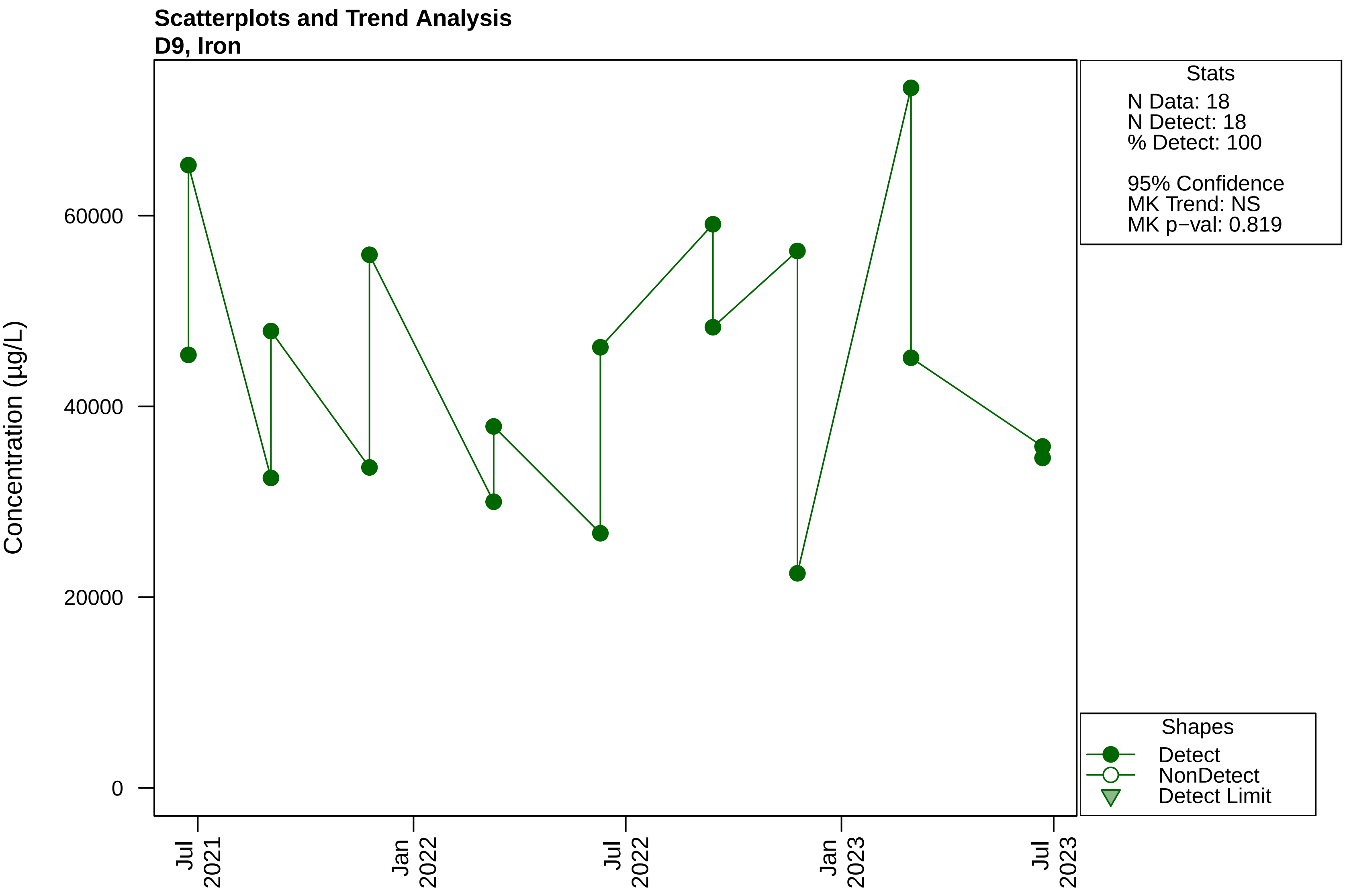

Scatterplots and Trend Analysis
D9, Chromium
Concentration (µg/L)
2.0
1.5
1.0
0.5
0.0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 4
% Detect: 44
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

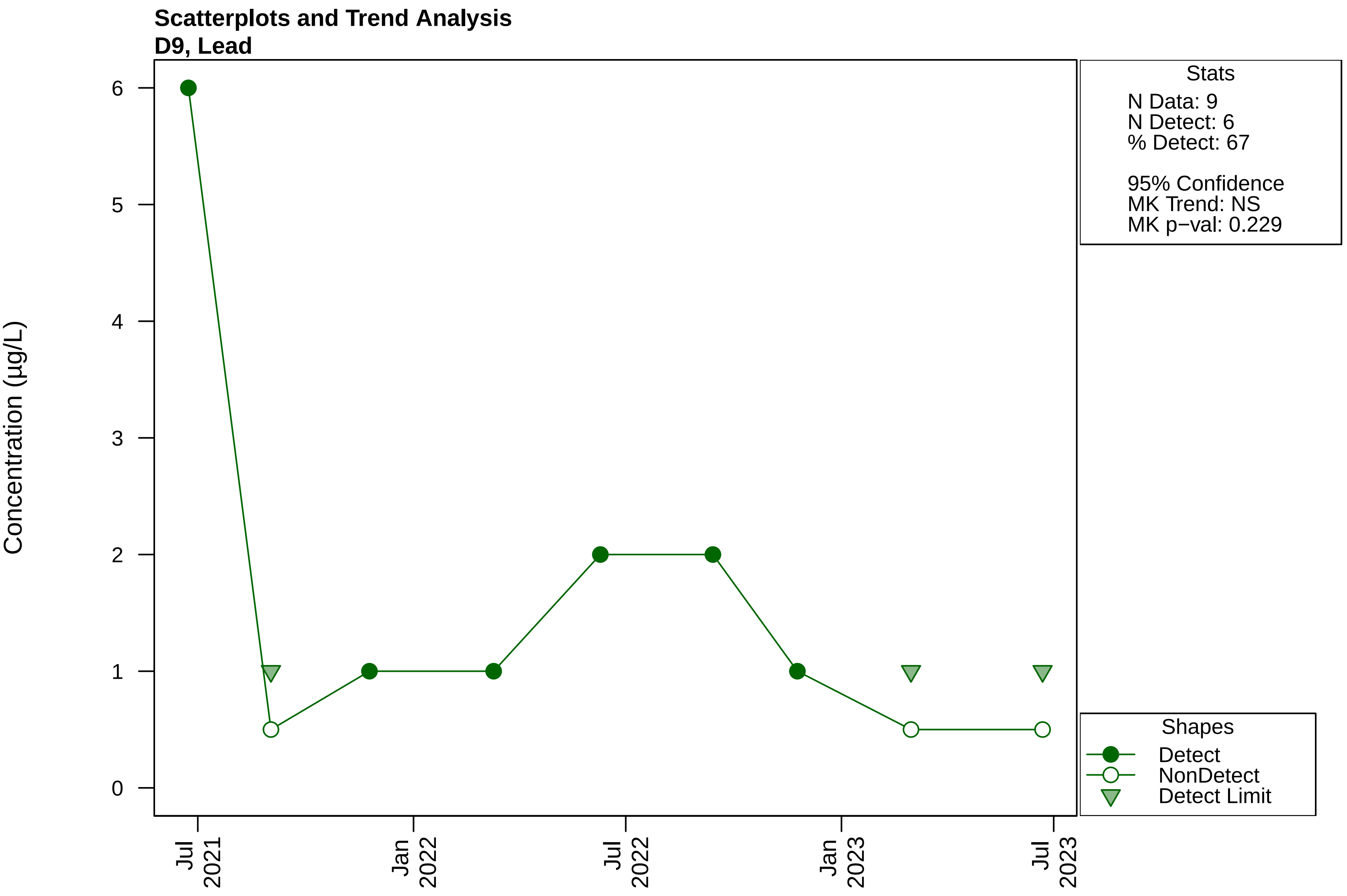


Scatterplots and Trend Analysis
D9, Electrical Conductivity (Field)
Concentration (uS/cm)
10000
8000
6000
4000
2000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.919
Shapes
Detect
NonDetect
Detect Limit

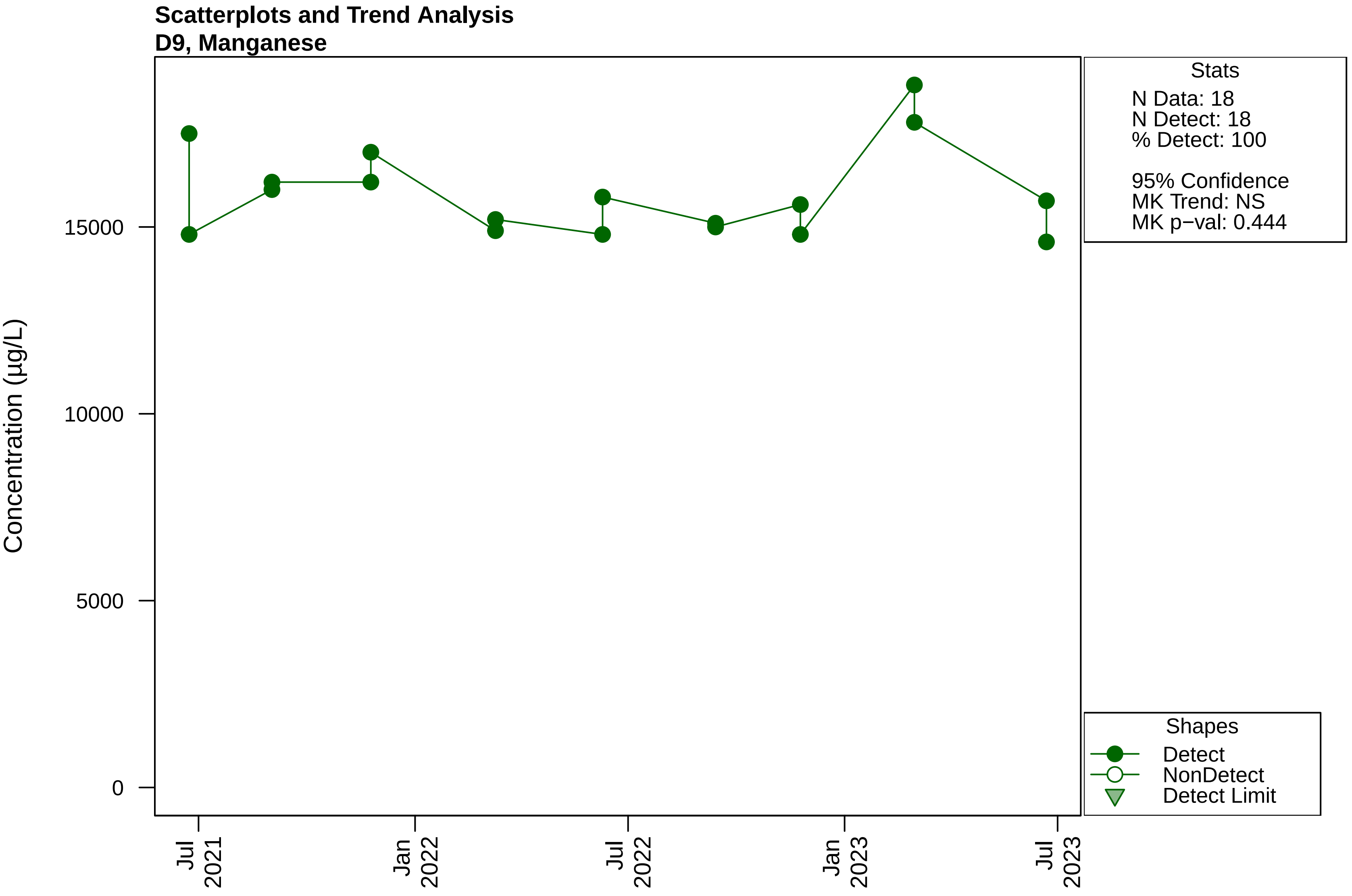
Scatterplots and Trend Analysis
D9, Fluoride

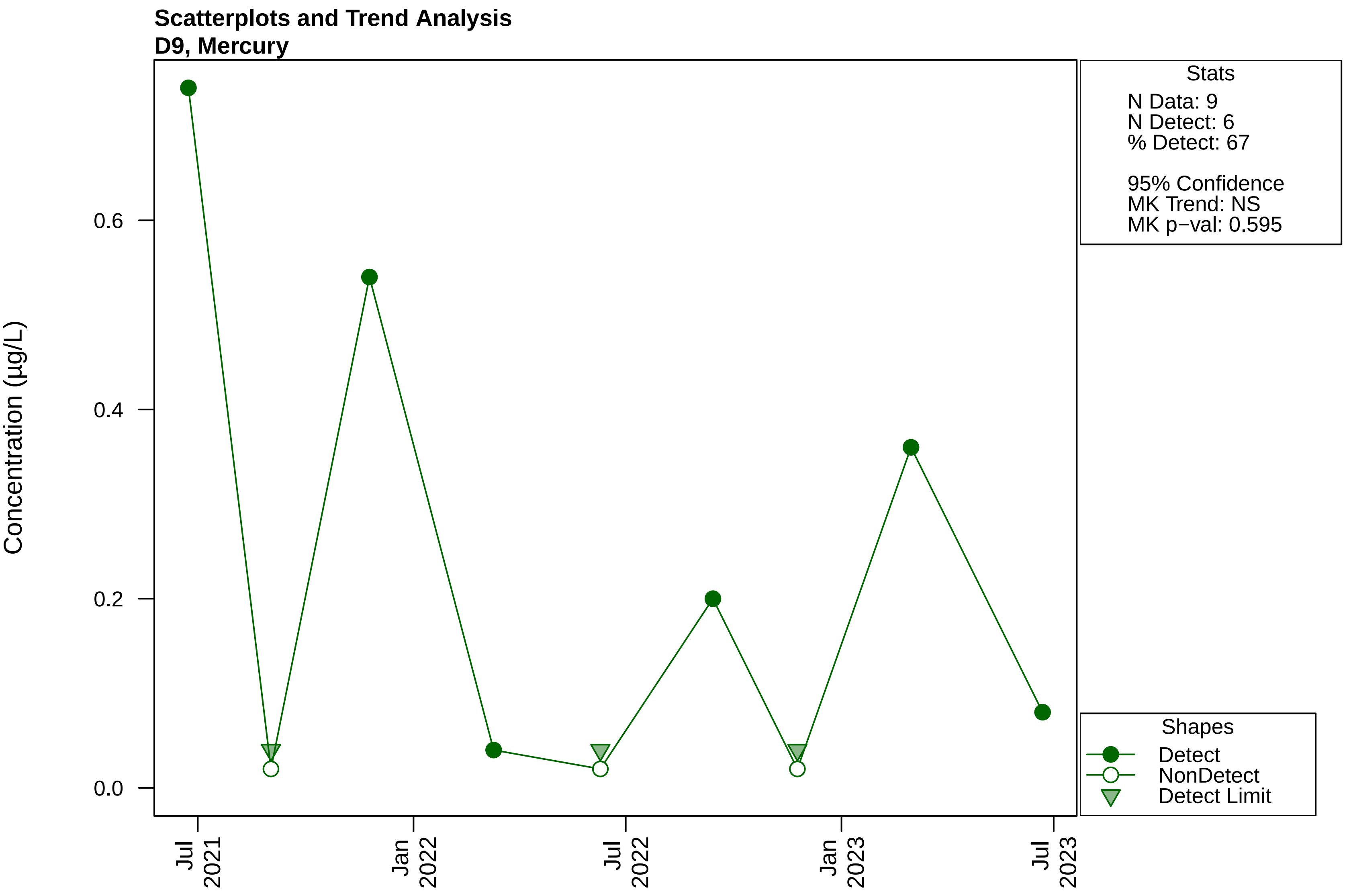



Scatterplots and Trend Analysis
D9, Iron
Concentration (µg/L)
60000
40000
20000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.819
Shapes
Detect
NonDetect
Detect Limit

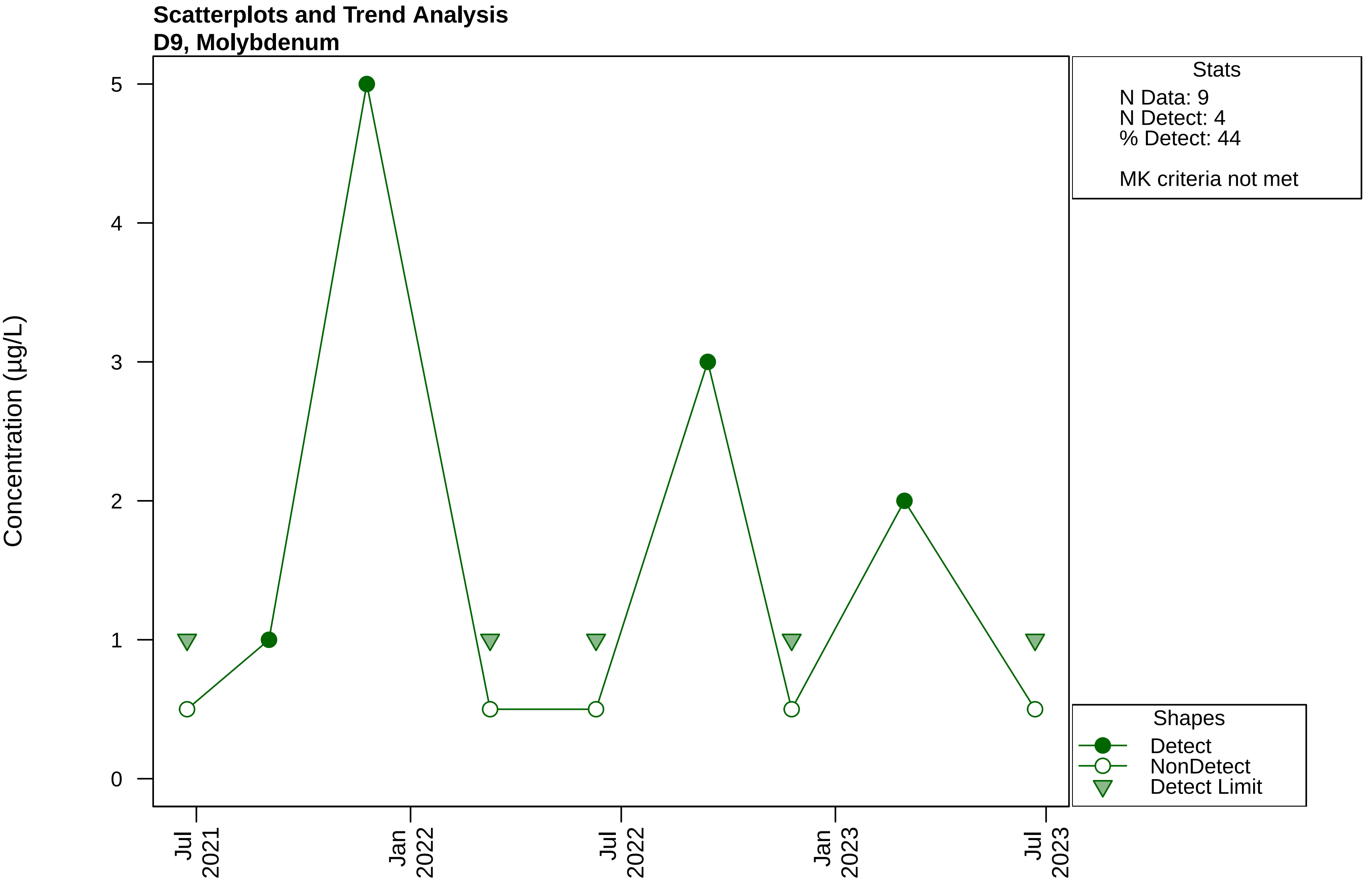


Scatterplots and Trend Analysis
D9, Lead
Concentration (µg/L)
0
1
2
3
4
5
6
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 6
% Detect: 67
95% Confidence
MK Trend: NS
MK p−val: 0.229
Shapes
Detect
NonDetect
Detect Limit

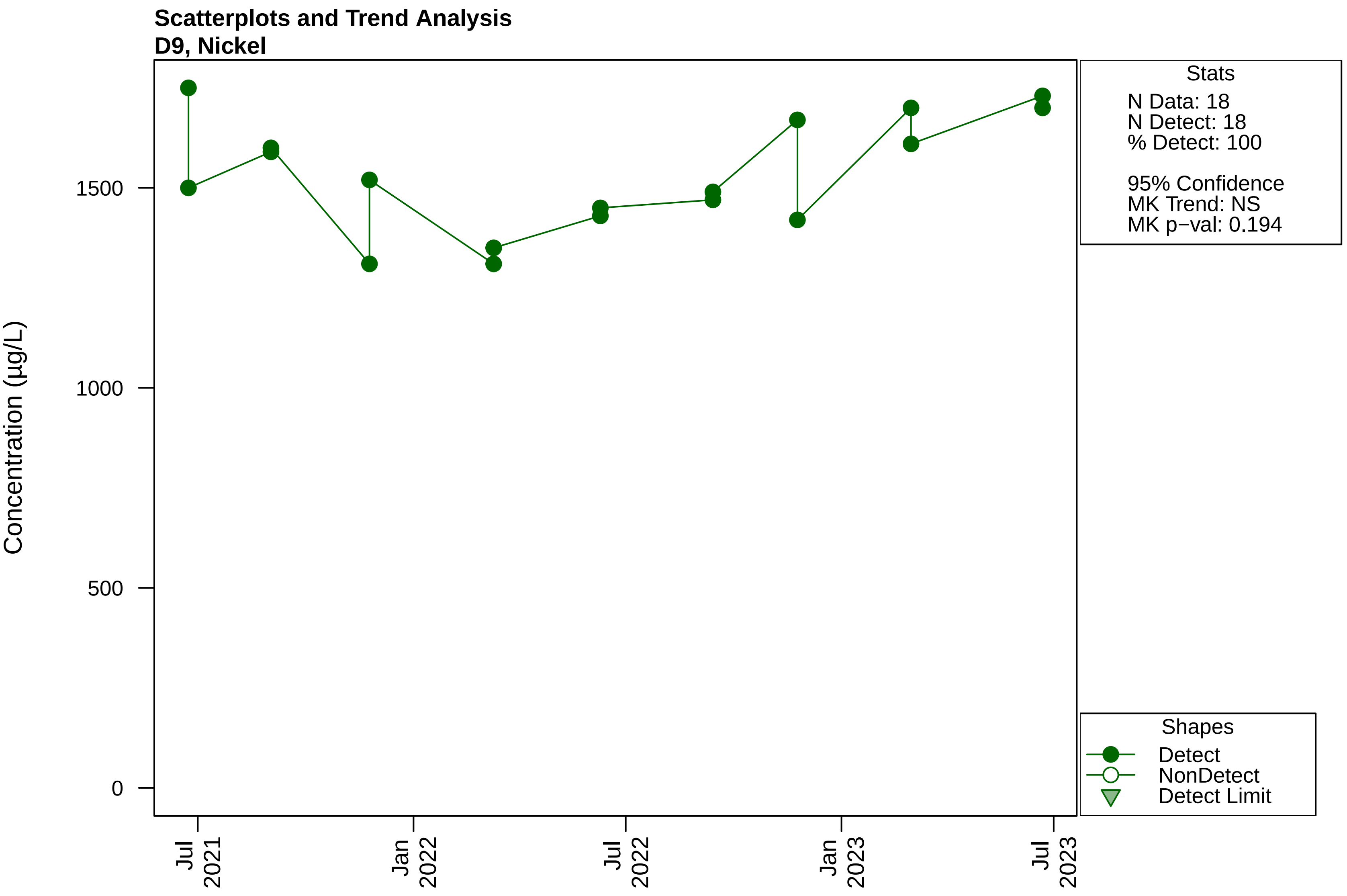

Scatterplots and Trend Analysis
D9, Manganese
Concentration (µg/L)
15000
10000
5000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.444
Shapes
Detect
NonDetect
Detect Limit



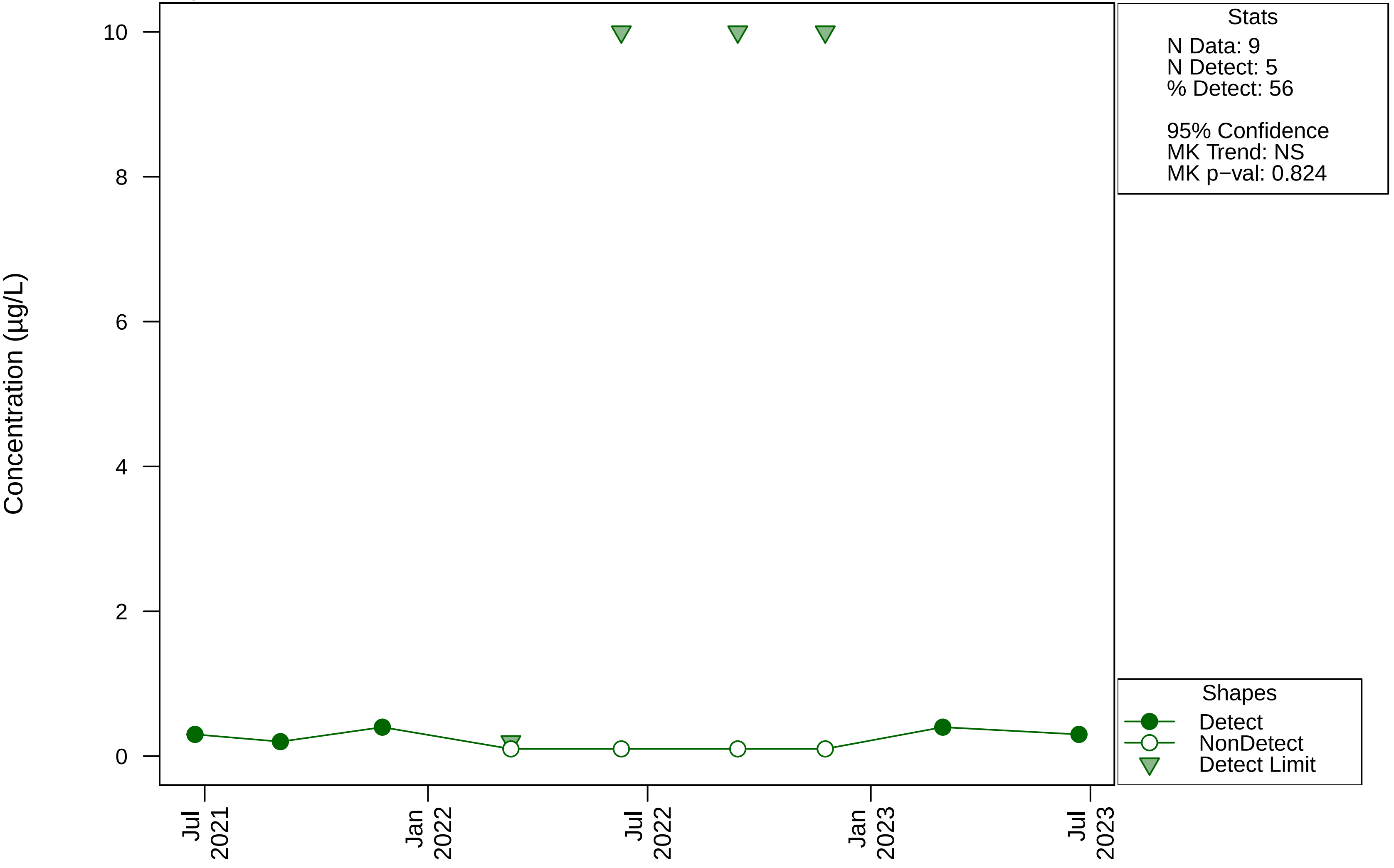
Scatterplots and Trend Analysis
D9, Mercury
Concentration (µg/L)
0.0
0.2
0.4
0.6
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 6
% Detect: 67
95% Confidence
MK Trend: NS
MK p−val: 0.595
Shapes
Detect
NonDetect
Detect Limit

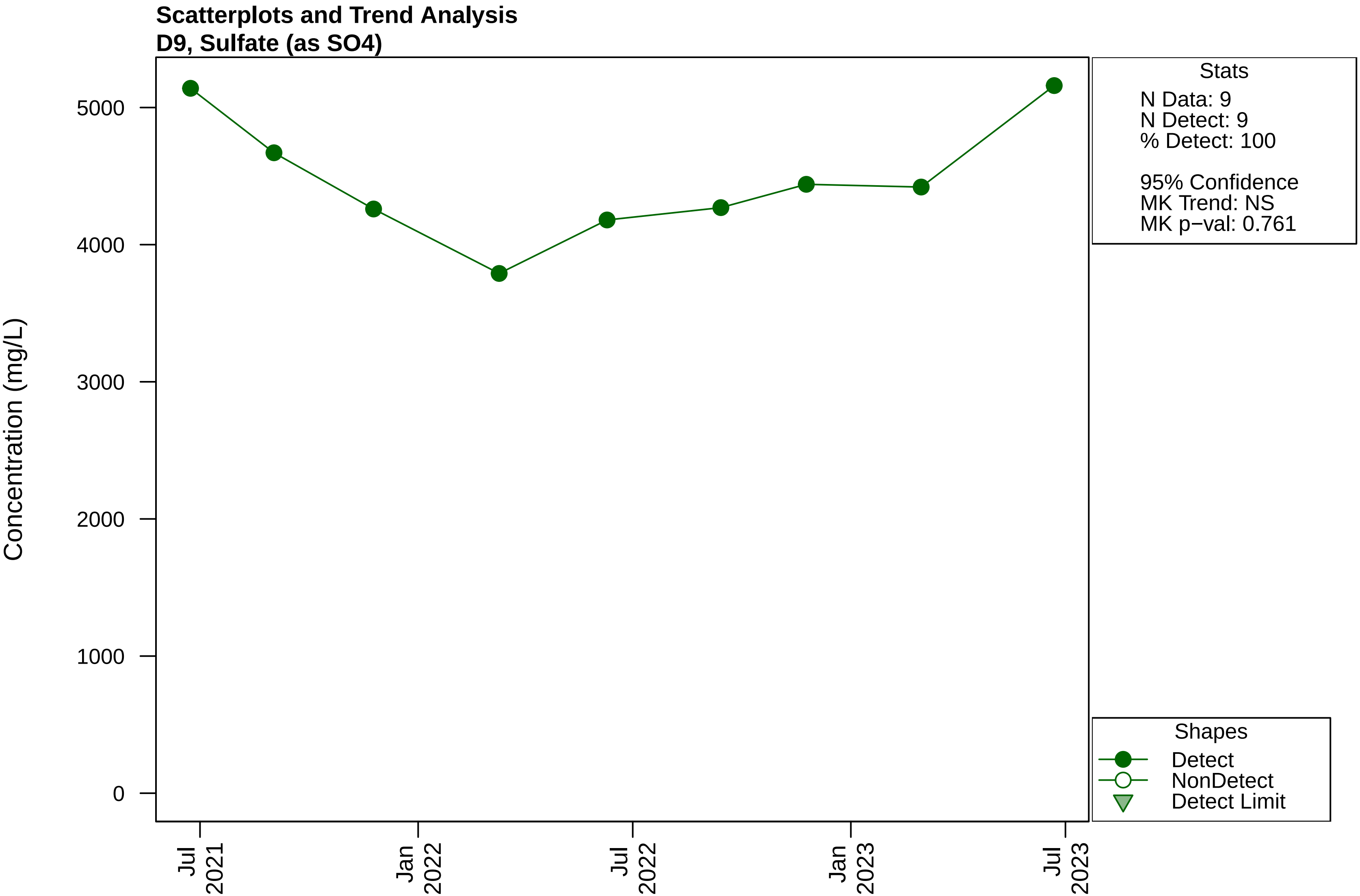


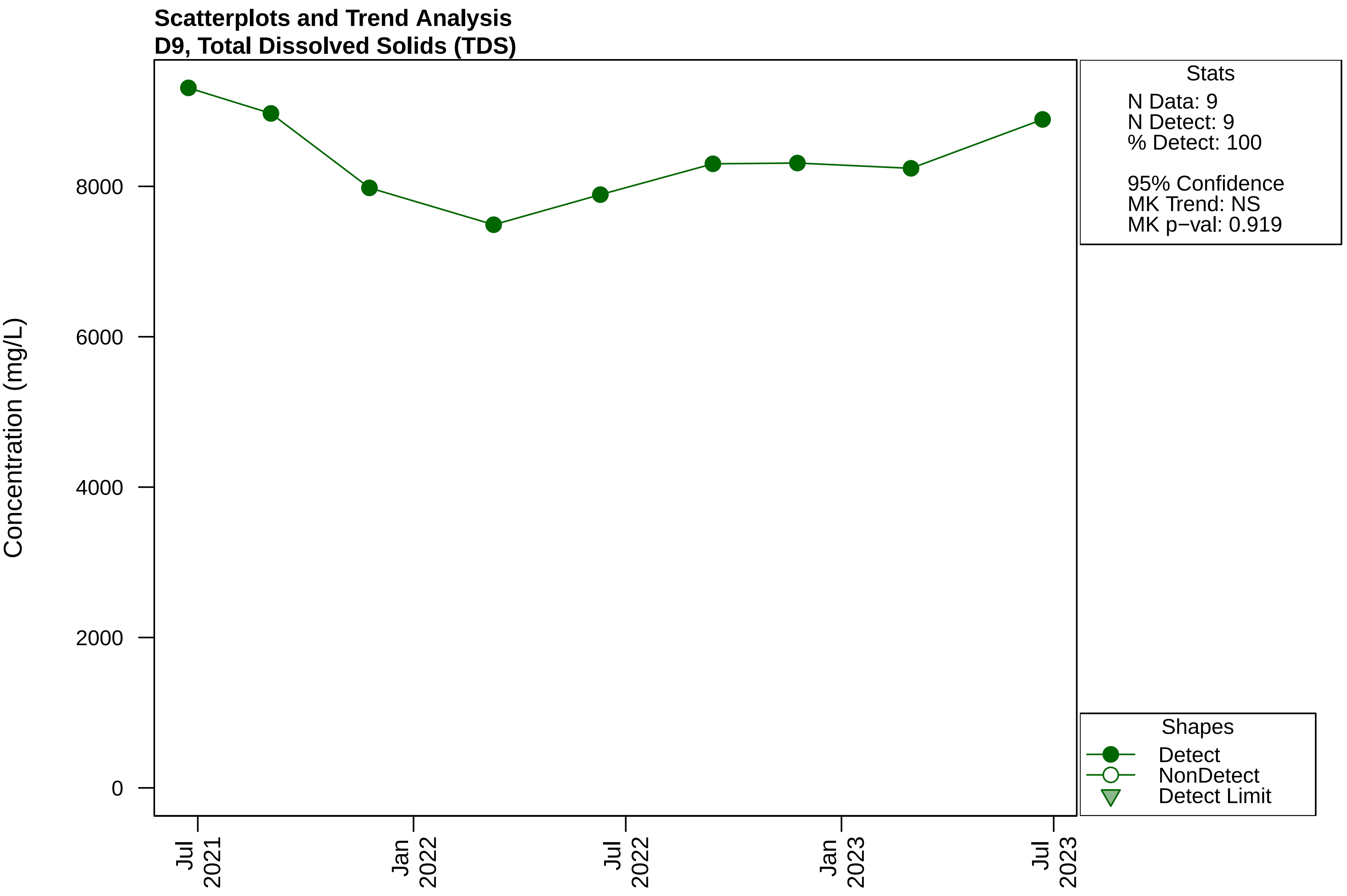
Scatterplots and Trend Analysis
D9, Molybdenum
Concentration (µg/L)
0
1
2
3
4
5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 4
% Detect: 44
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

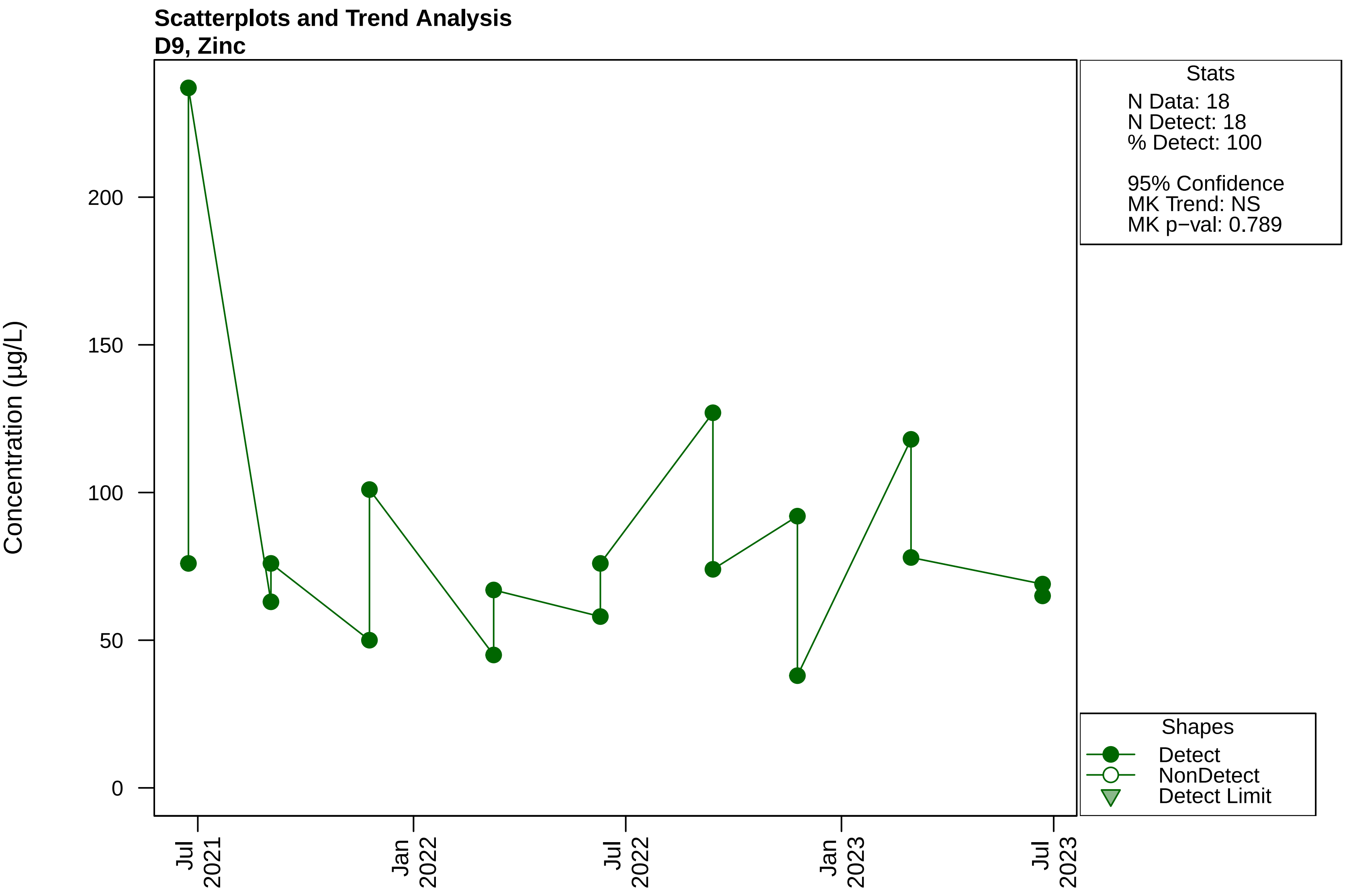

Scatterplots and Trend Analysis
D9, Nickel
Concentration (µg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.194
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
D9, Selenium

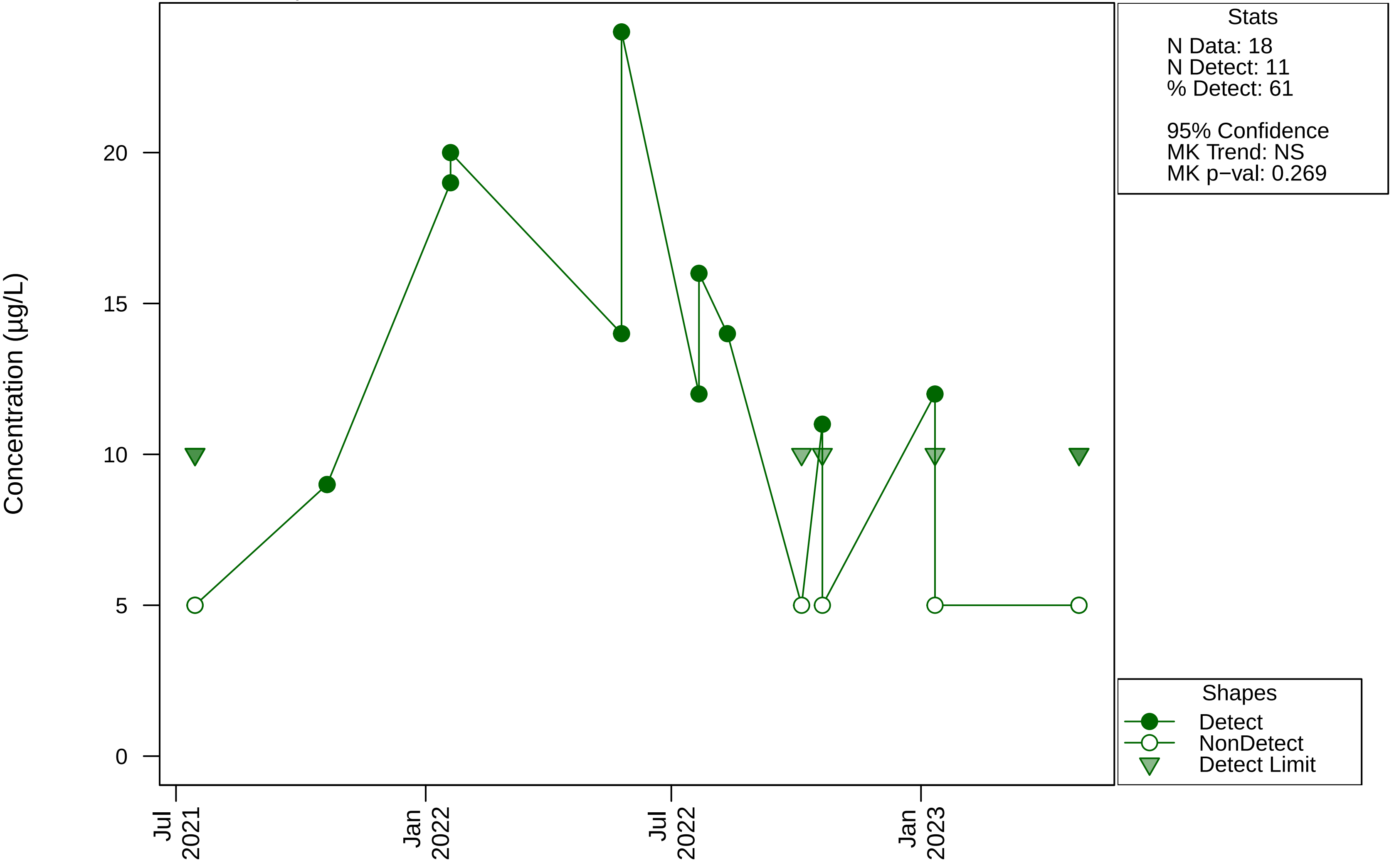


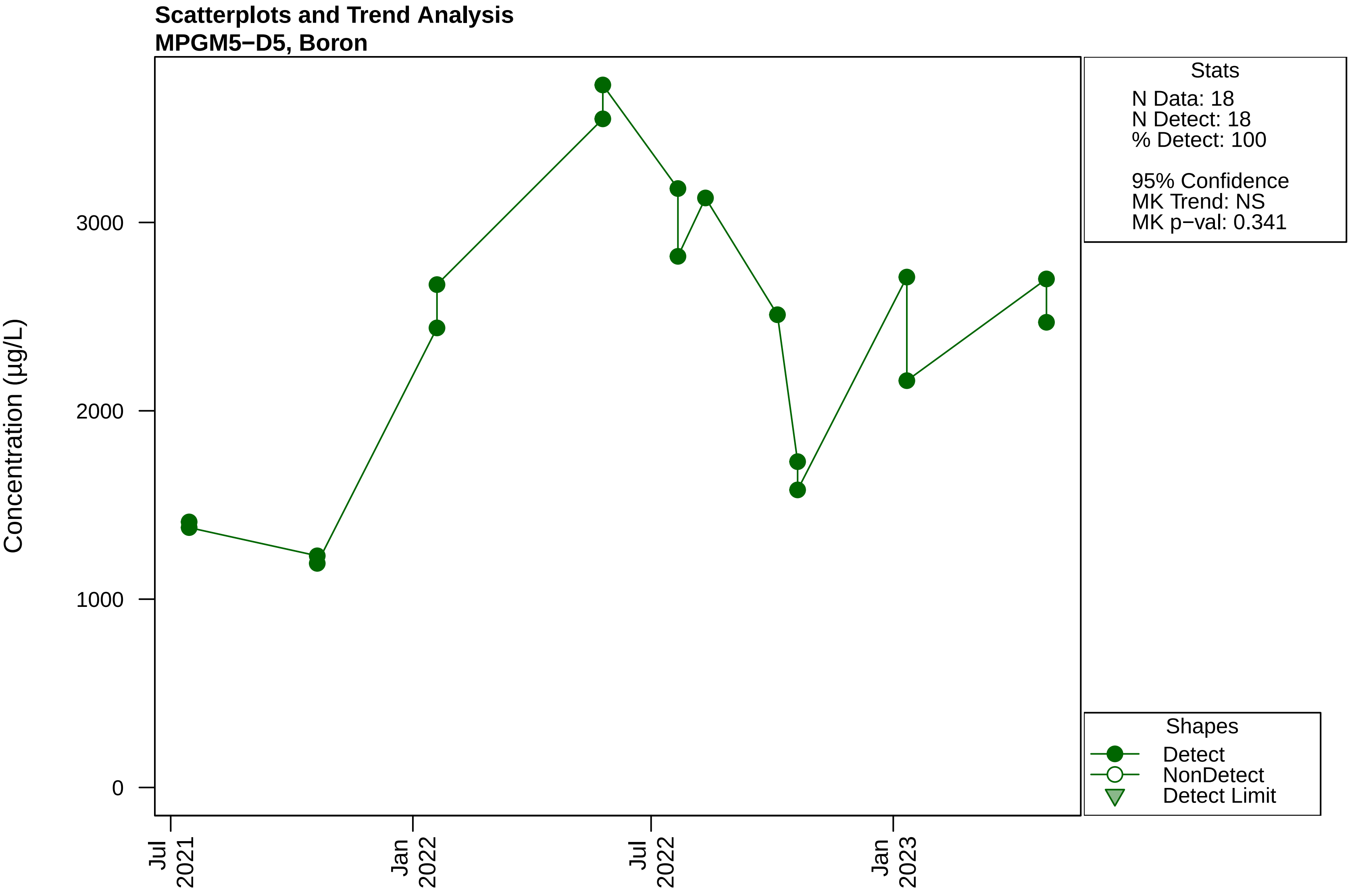

Scatterplots and Trend Analysis
D9, Sulfate (as SO4)
Concentration (mg/L)
5000
4000
3000
2000
1000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.761
Shapes
Detect
NonDetect
Detect Limit

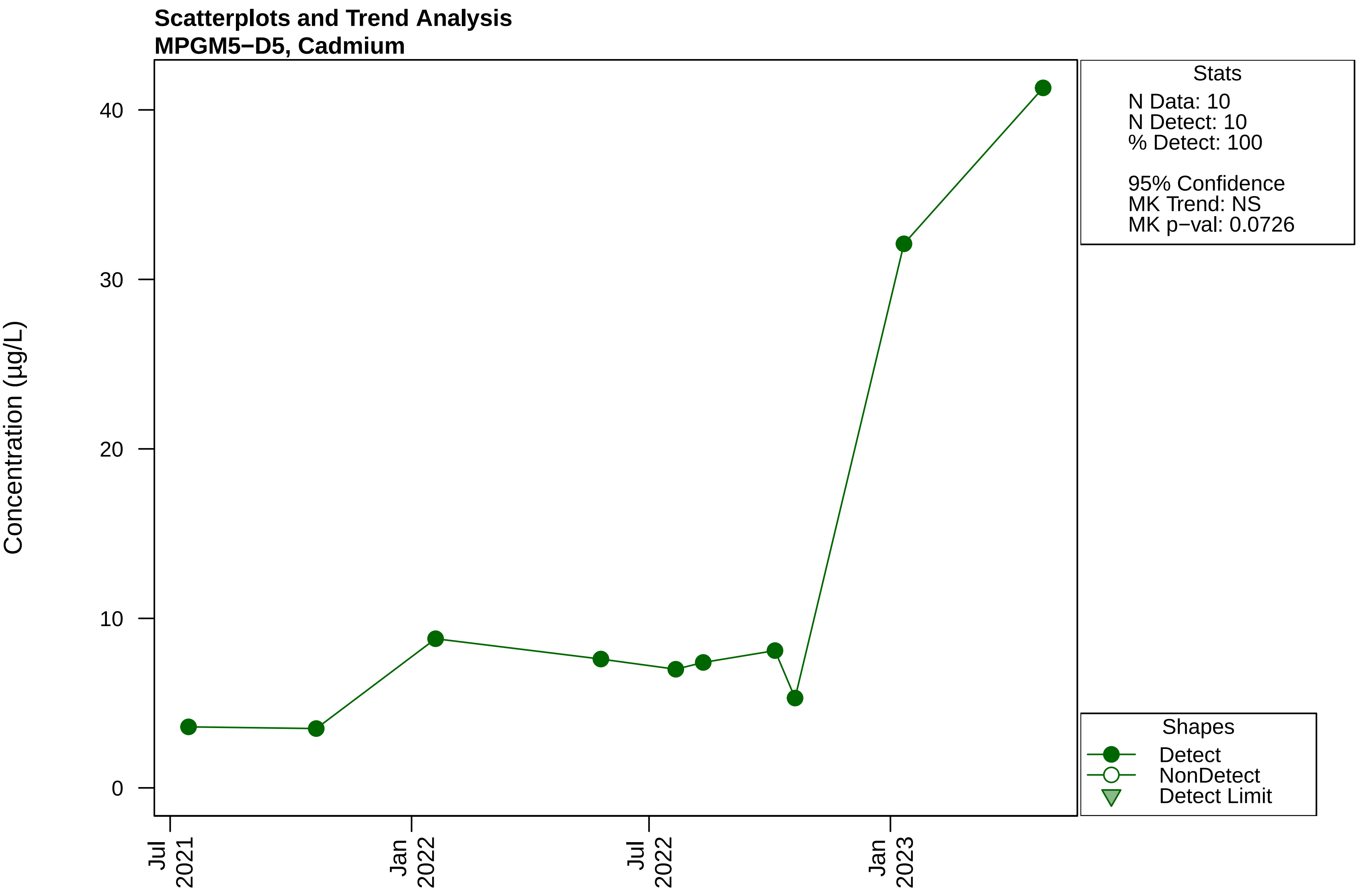

Scatterplots and Trend Analysis
D9, Total Dissolved Solids (TDS)
Concentration (mg/L)
8000
6000
4000
2000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 9
N Detect: 9
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.919
Shapes
Detect
NonDetect
Detect Limit

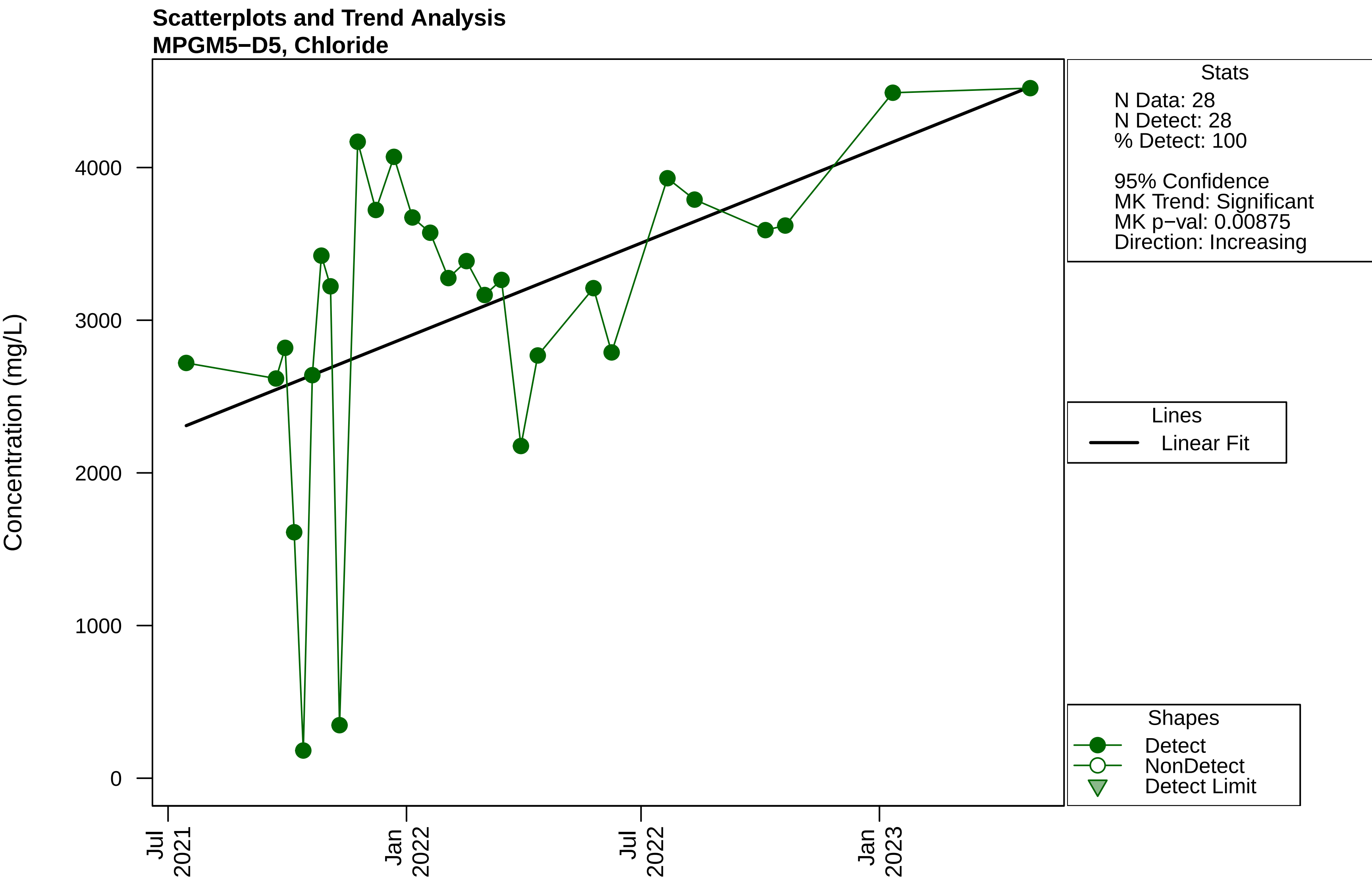

Scatterplots and Trend Analysis
D9, Zinc
Concentration (µg/L)
0
50
100
150
200
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.789
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D5, Arsenic

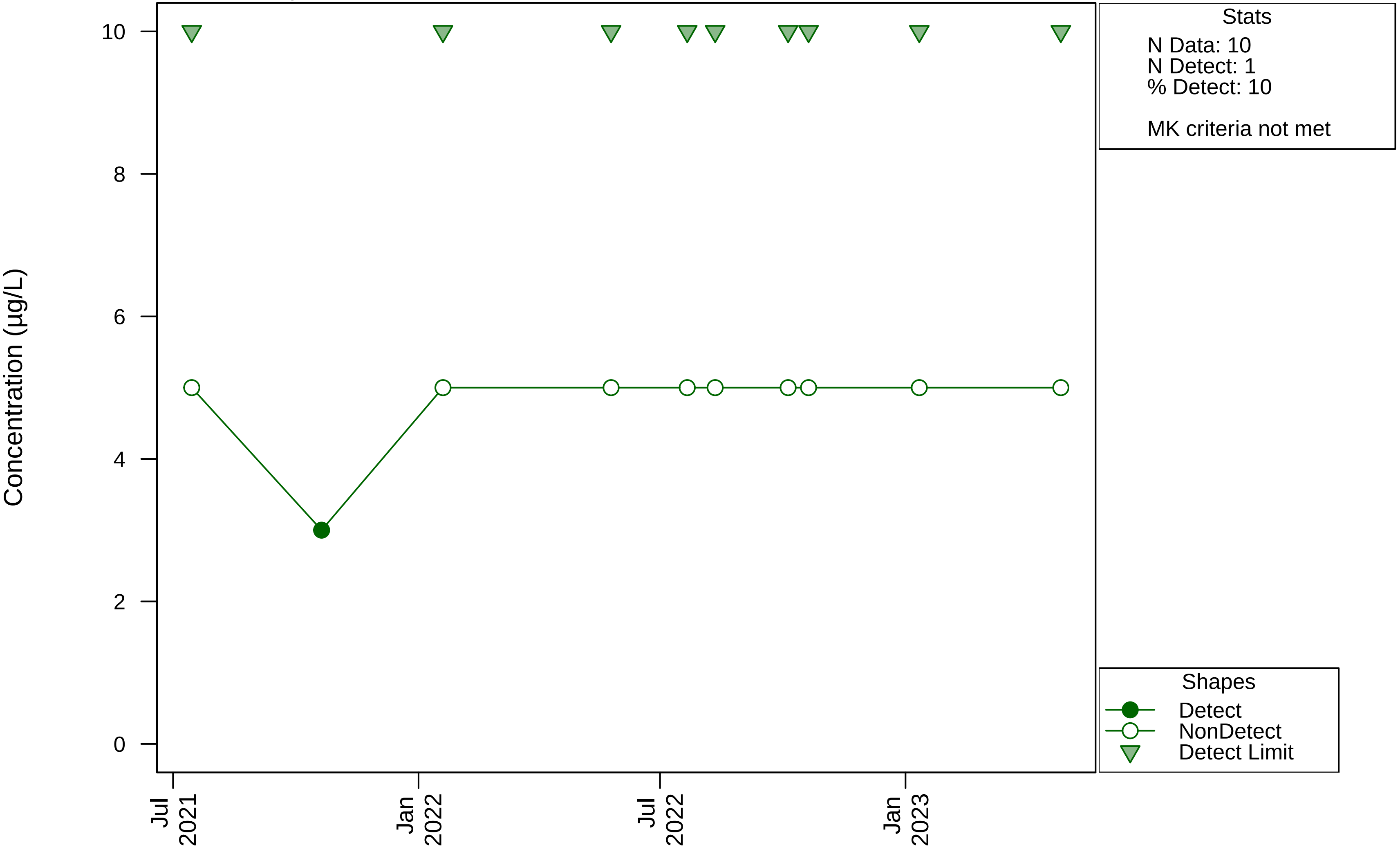


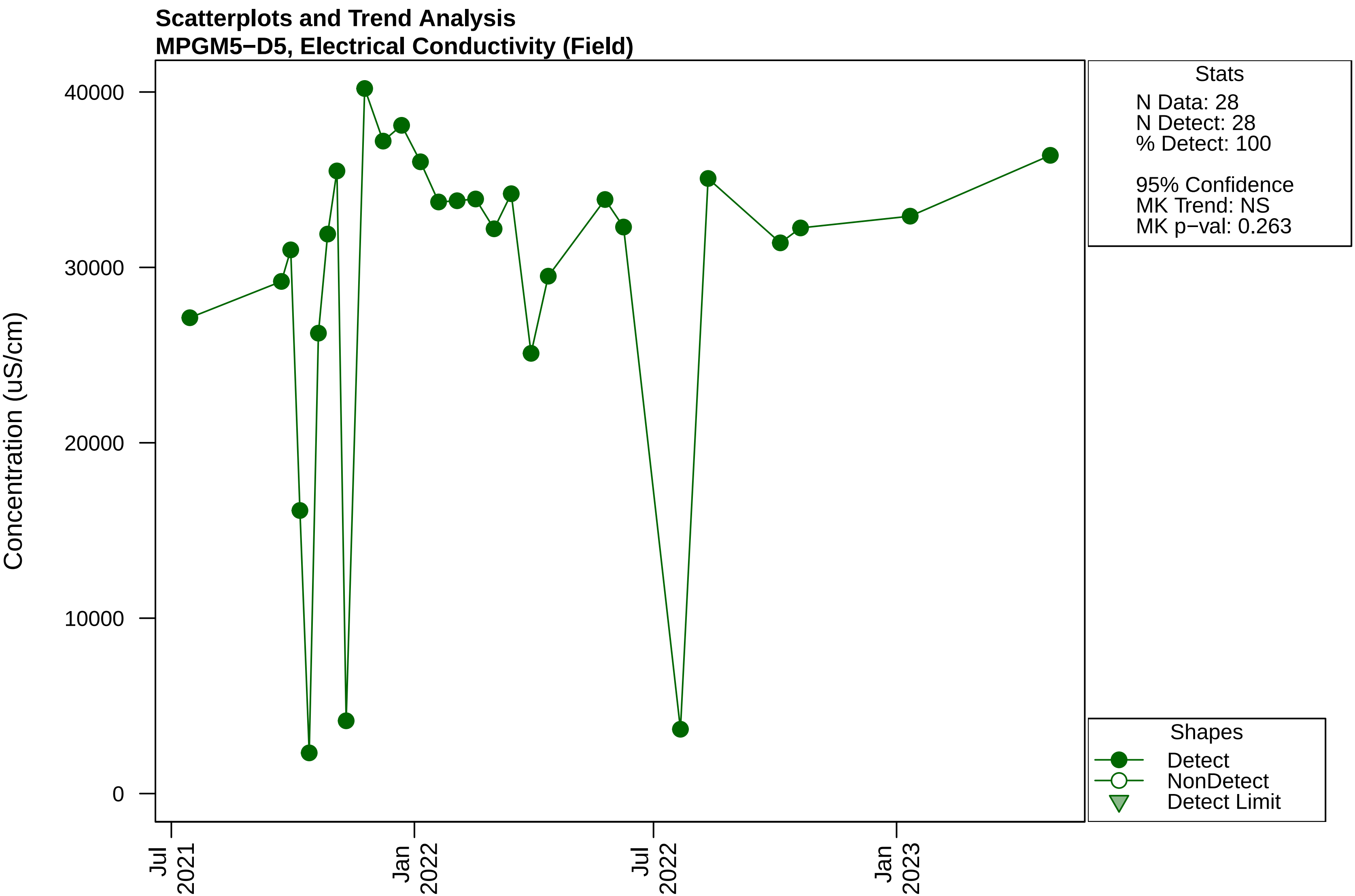

Scatterplots and Trend Analysis
MPGM5−D5, Boron
Concentration (µg/L)
0
1000
2000
3000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.341
Shapes
Detect
NonDetect
Detect Limit

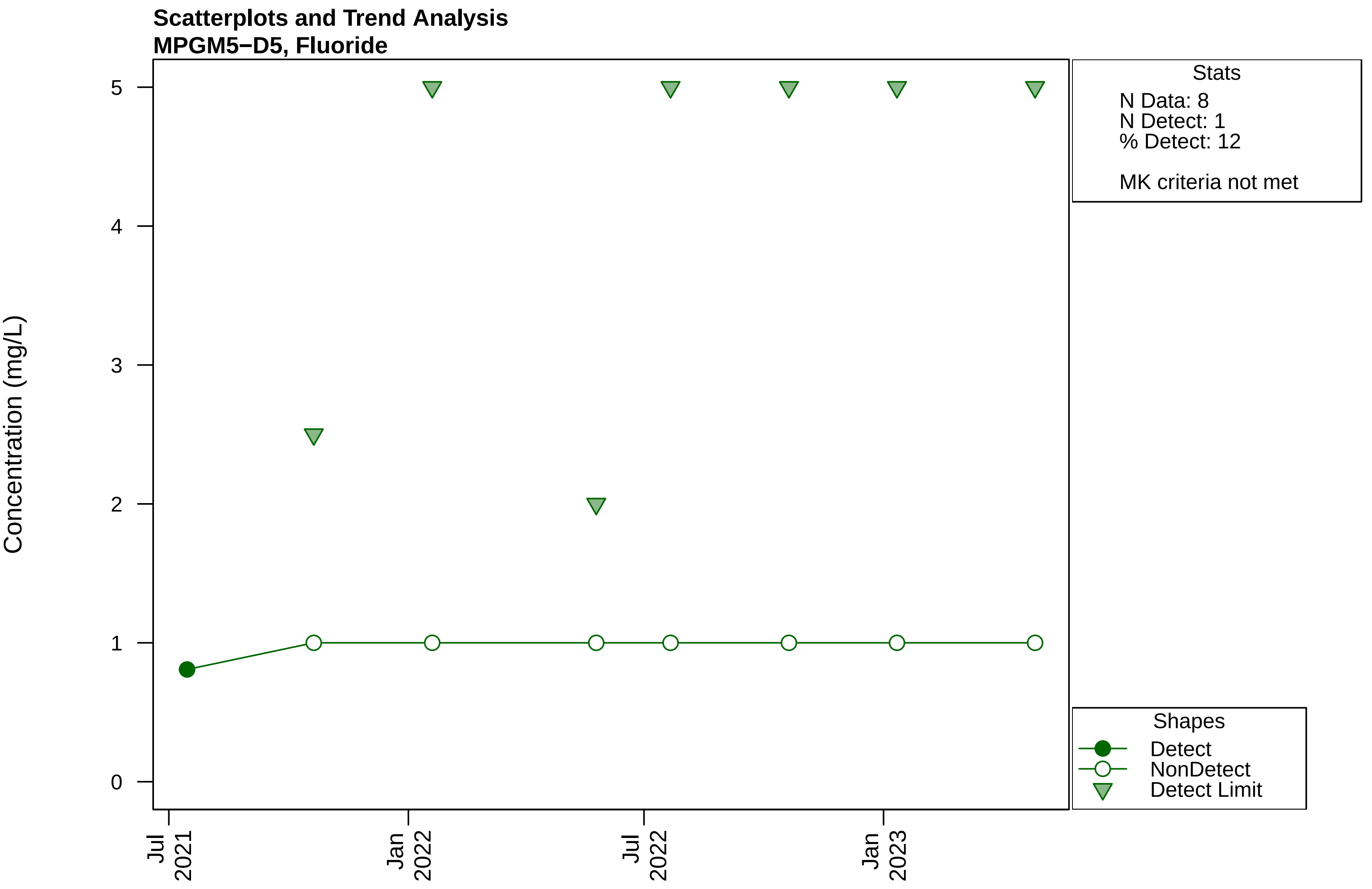

Scatterplots and Trend Analysis
MPGM5−D5, Cadmium
Concentration (µg/L)
0
10
20
30
40
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0726
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
MPGM5−D5, Chloride
Concentration (mg/L)
0
1000
2000
3000
4000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 28
N Detect: 28
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00875
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D5, Chromium

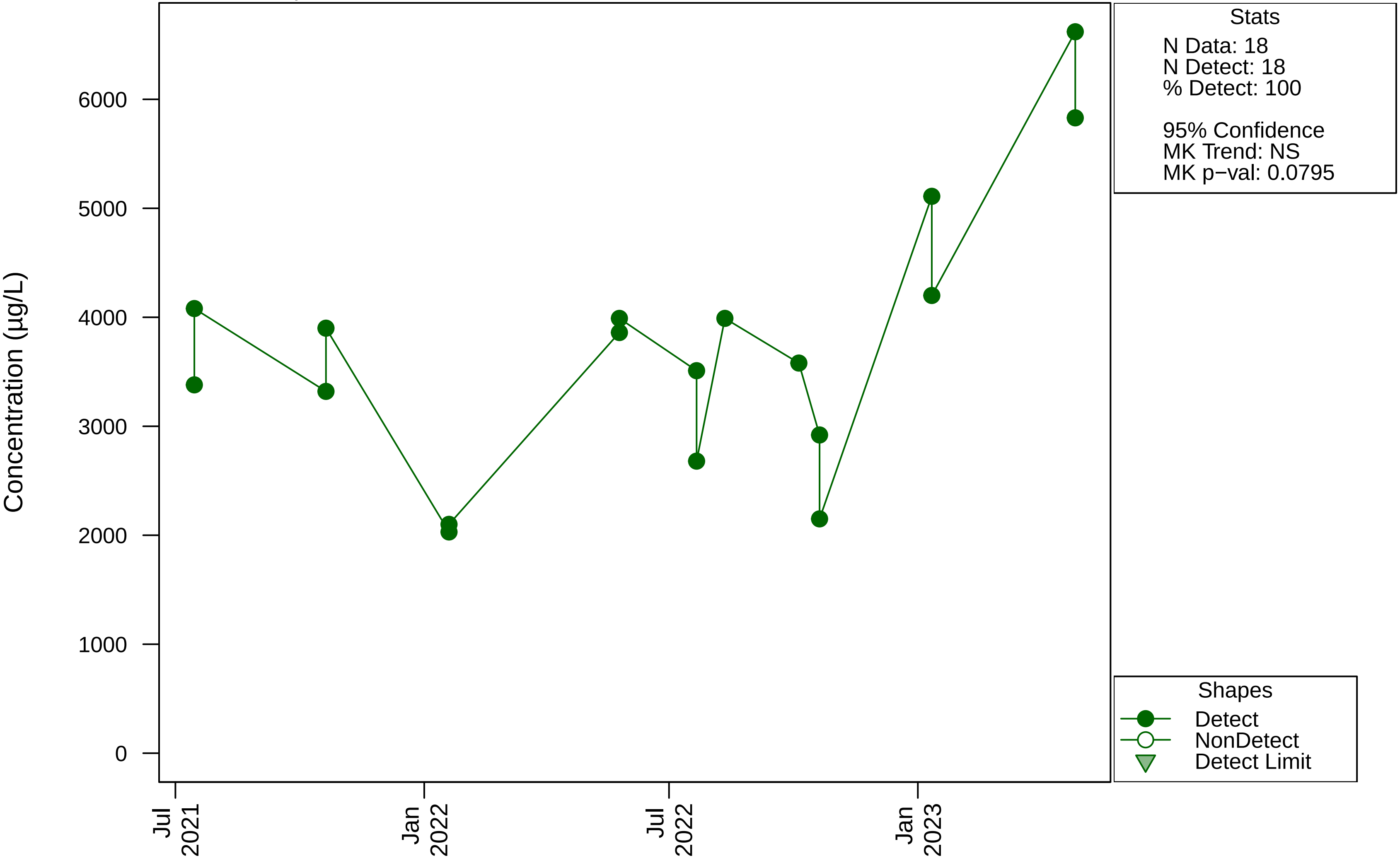


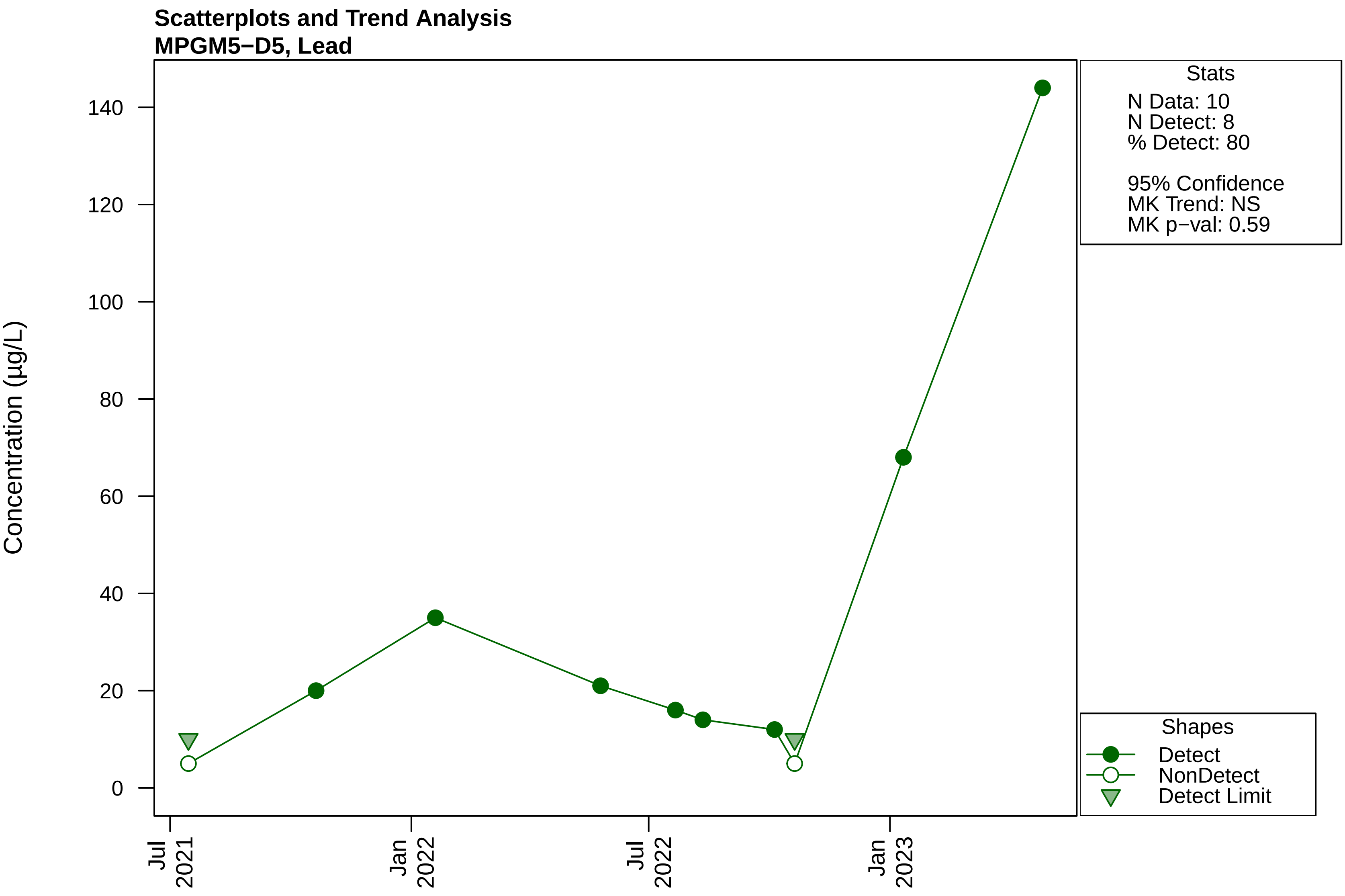

Scatterplots and Trend Analysis
MPGM5−D5, Electrical Conductivity (Field)
Concentration (uS/cm)
40000
30000
20000
10000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 28
N Detect: 28
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.263
Shapes
Detect
NonDetect
Detect Limit



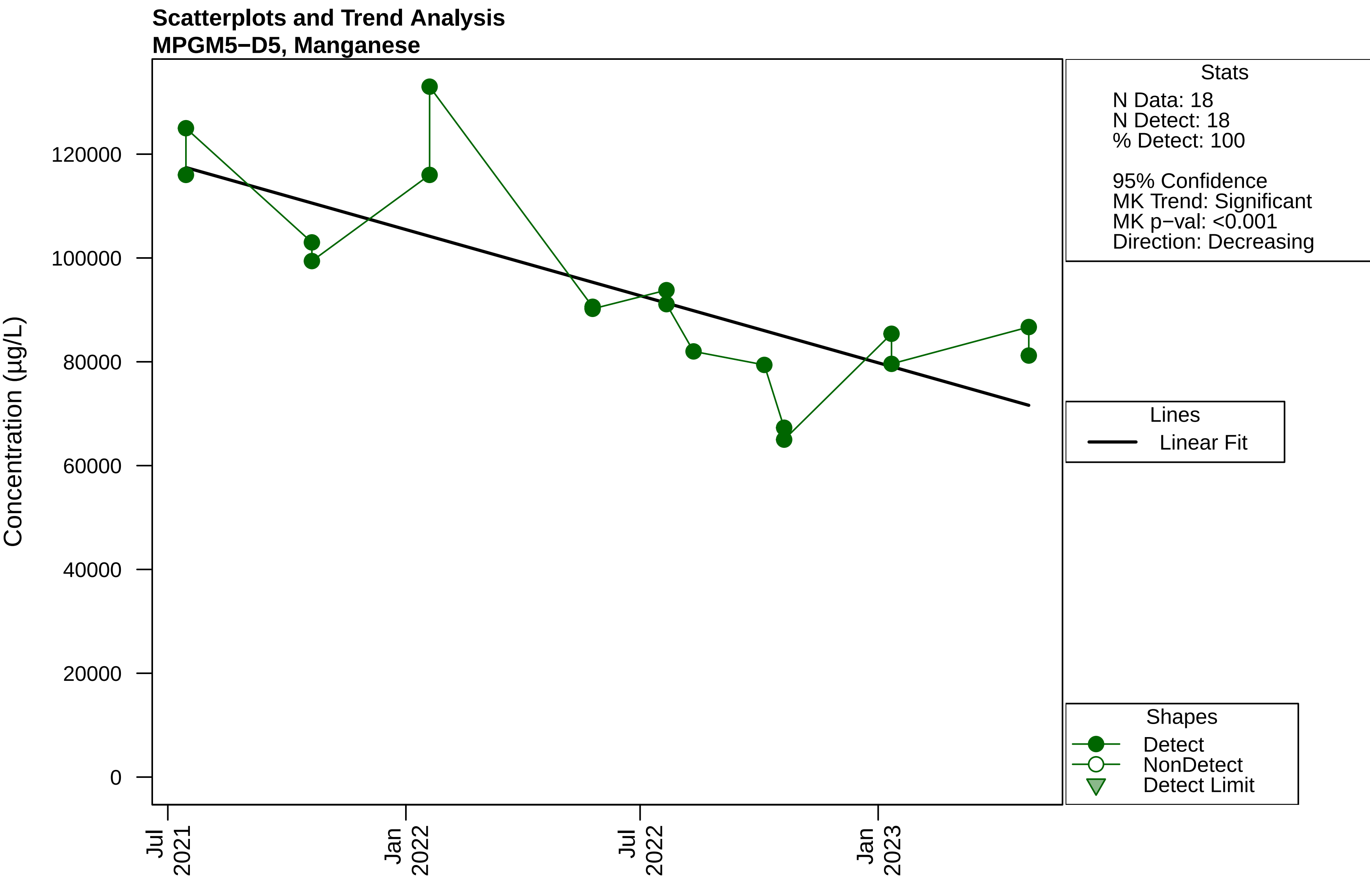
Scatterplots and Trend Analysis
MPGM5−D5, Fluoride
Concentration (mg/L)
0
1
2
3
4
5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 1
% Detect: 12
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D5, Iron



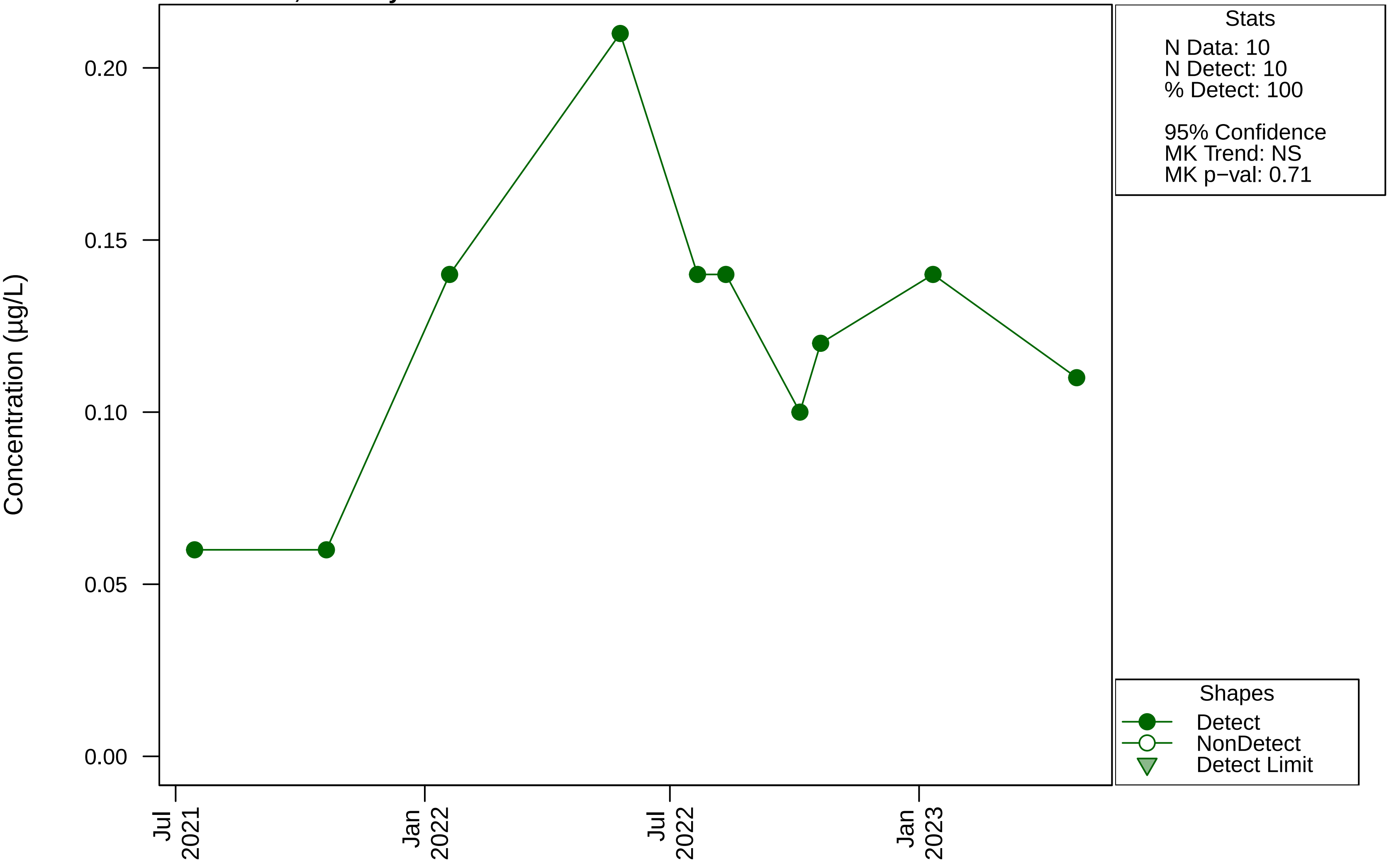


Scatterplots and Trend Analysis
MPGM5−D5, Lead
Concentration (µg/L)
0
20
40
60
80
100
120
140
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 8
% Detect: 80
95% Confidence
MK Trend: NS
MK p−val: 0.59
Shapes
Detect
NonDetect
Detect Limit

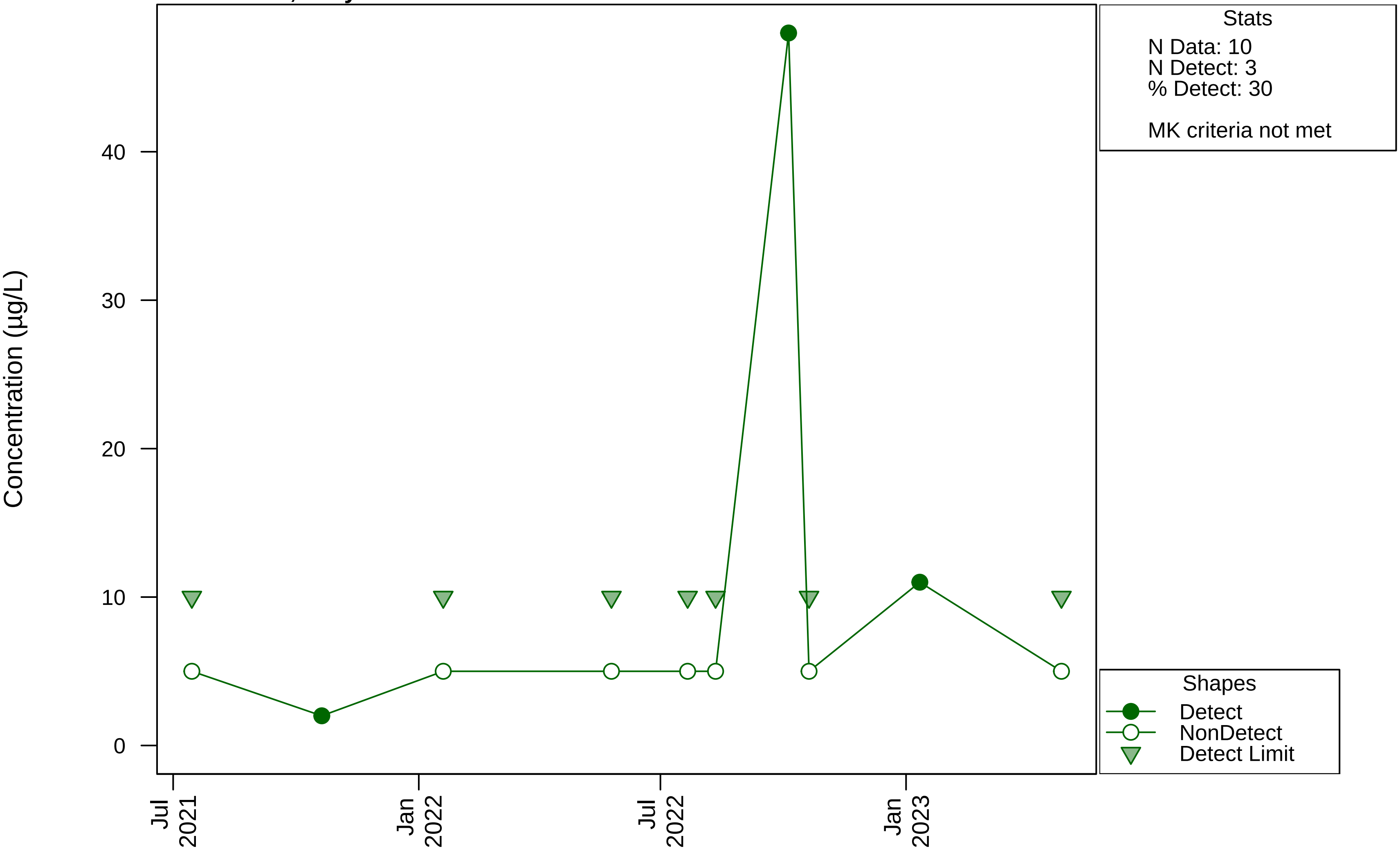


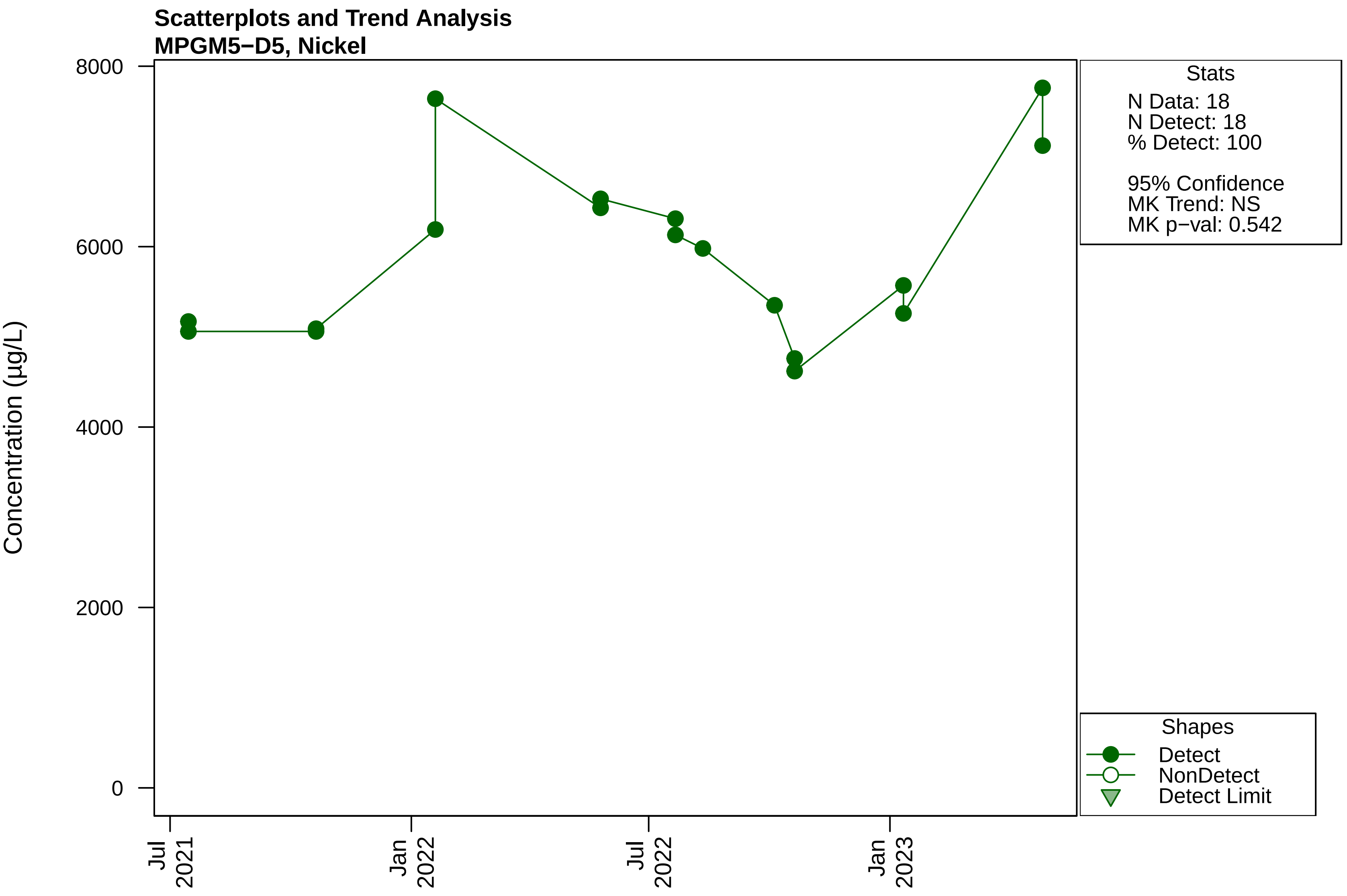
Scatterplots and Trend Analysis
MPGM5−D5, Manganese
Concentration (µg/L)
0
20000
40000
60000
80000
100000
120000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

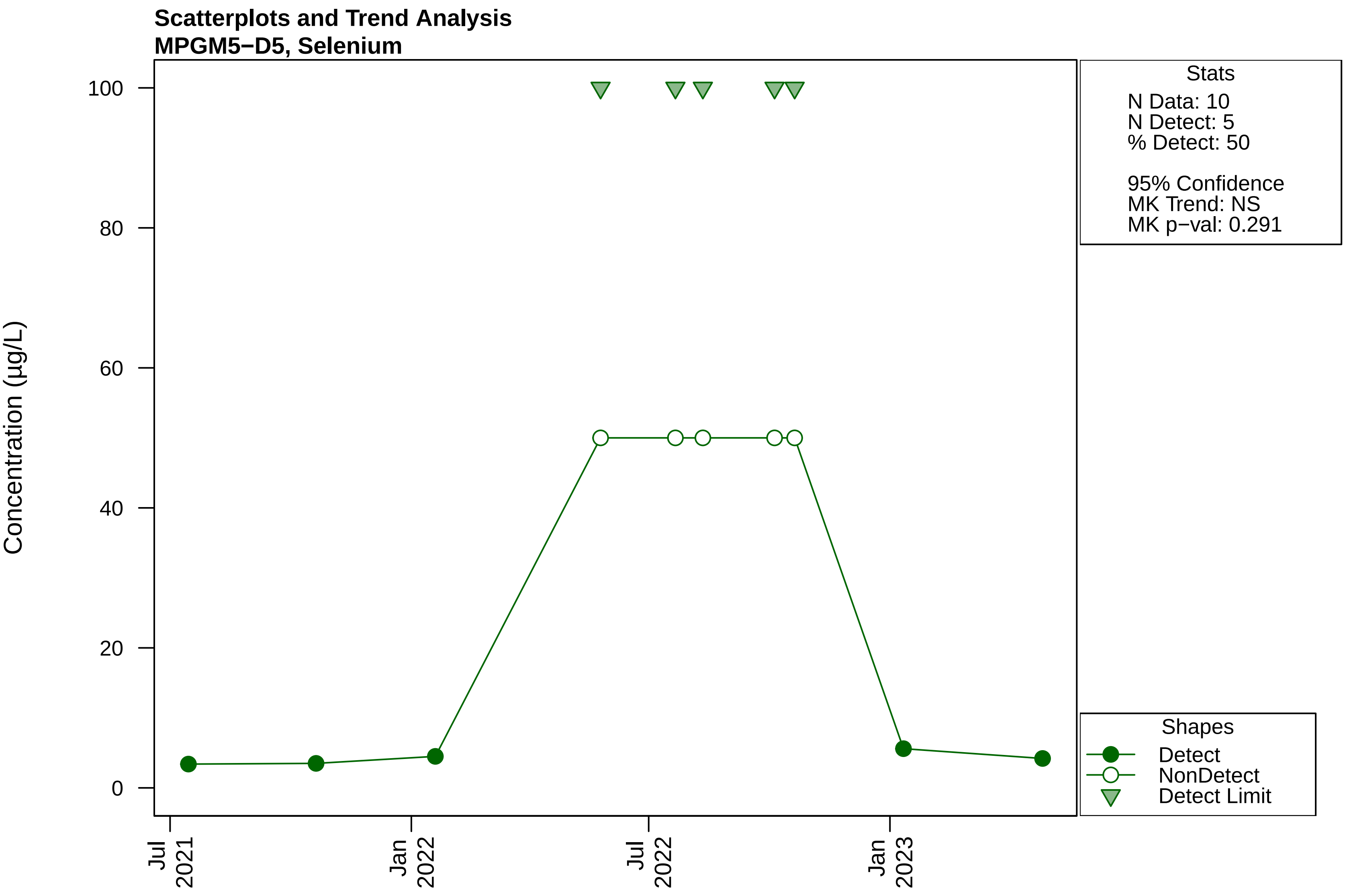
Scatterplots and Trend Analysis
MPGM5−D5, Mercury



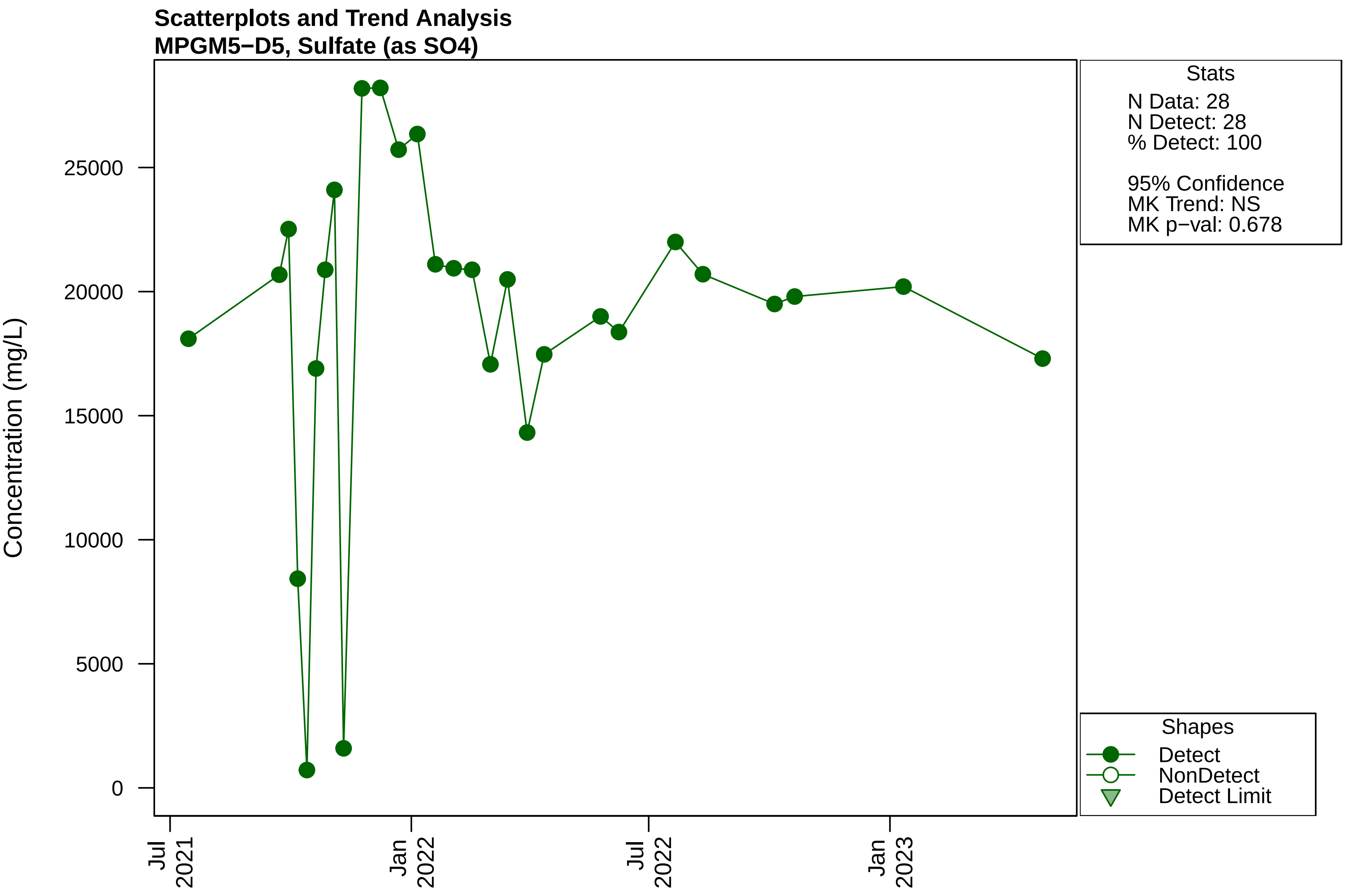
Scatterplots and Trend Analysis
MPGM5−D5, Molybdenum

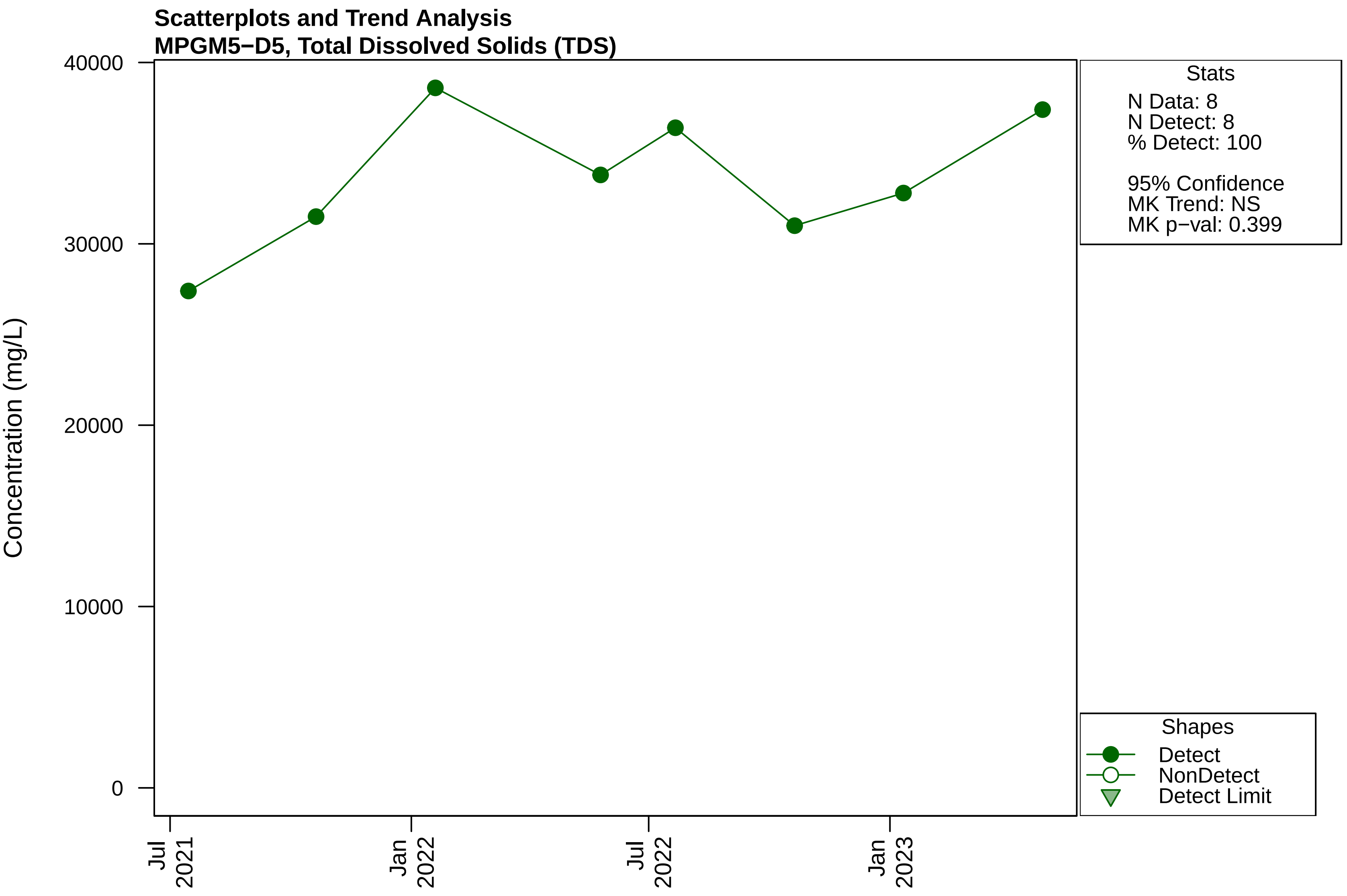



Scatterplots and Trend Analysis
MPGM5−D5, Nickel
Concentration (µg/L)
8000
6000
4000
2000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.542
Shapes
Detect
NonDetect
Detect Limit

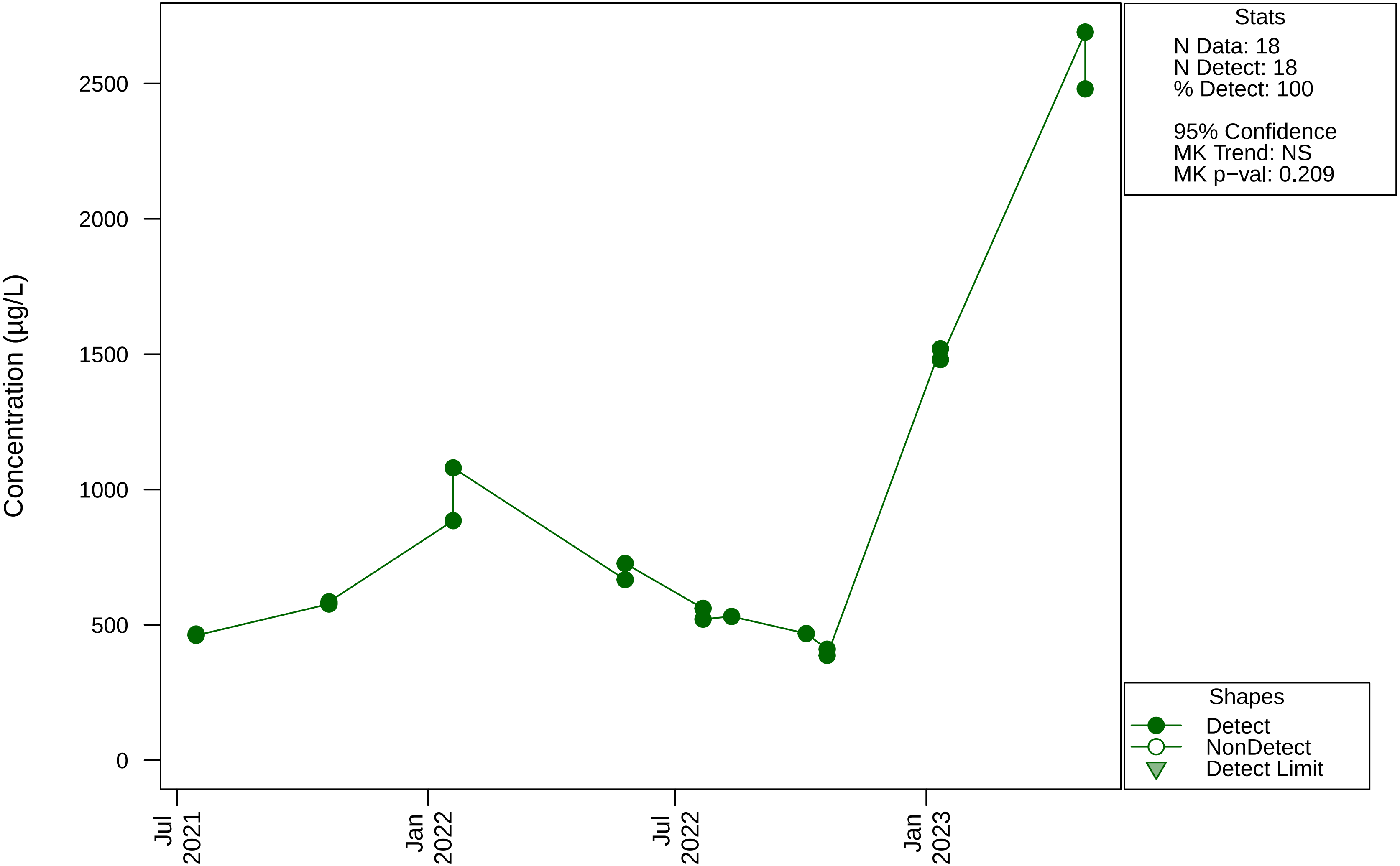


Scatterplots and Trend Analysis
MPGM5−D5, Selenium
Concentration (µg/L)
100
80
60
40
20
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 5
% Detect: 50
95% Confidence
MK Trend: NS
MK p−val: 0.291
Shapes
Detect
NonDetect
Detect Limit

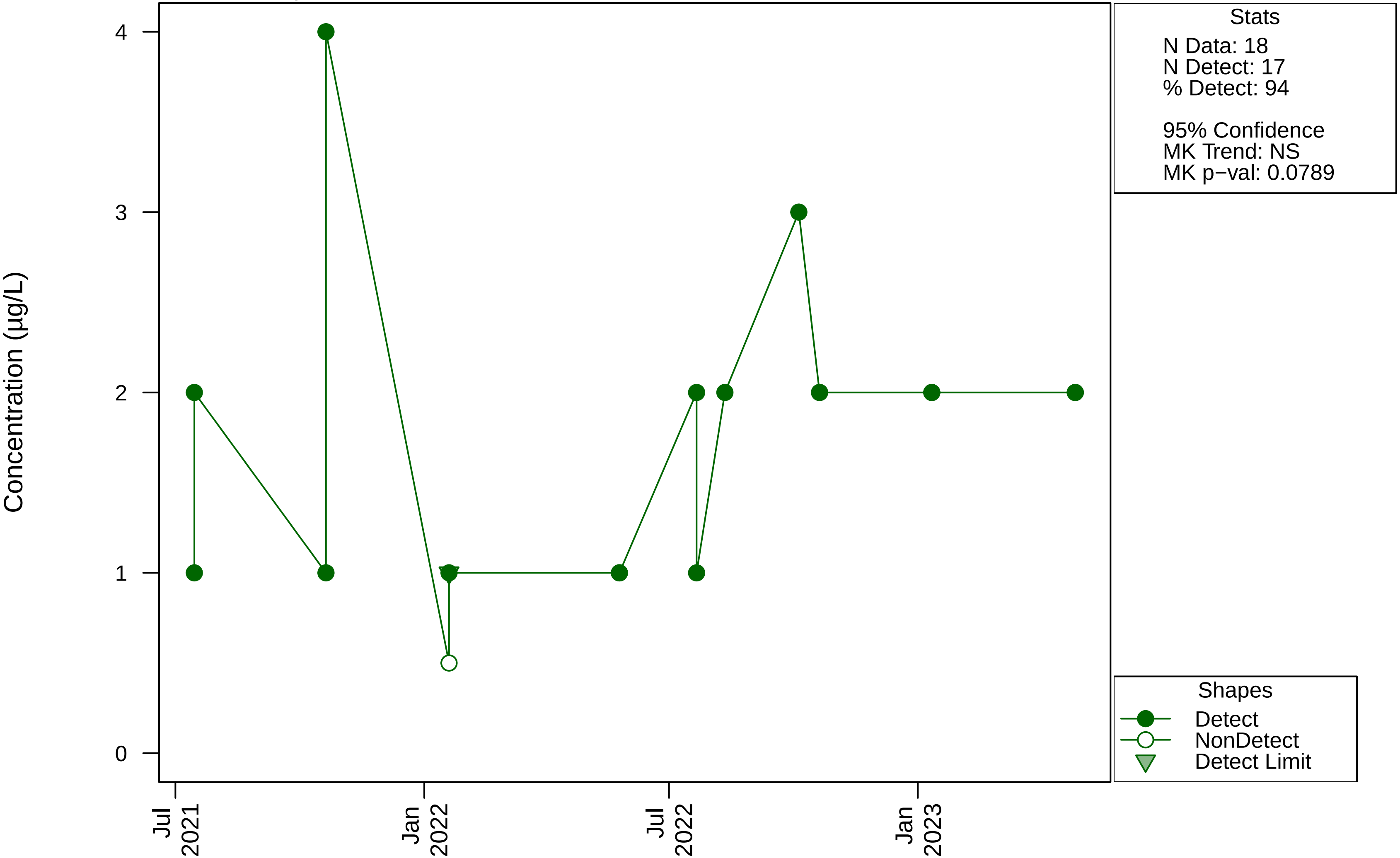

Scatterplots and Trend Analysis
MPGM5−D5, Sulfate (as SO4)
Concentration (mg/L)
0
5000
10000
15000
20000
25000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 28
N Detect: 28
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.678
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
MPGM5−D5, Total Dissolved Solids (TDS)
Concentration (mg/L)
40000
30000
20000
10000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.399
Shapes
Detect
NonDetect
Detect Limit

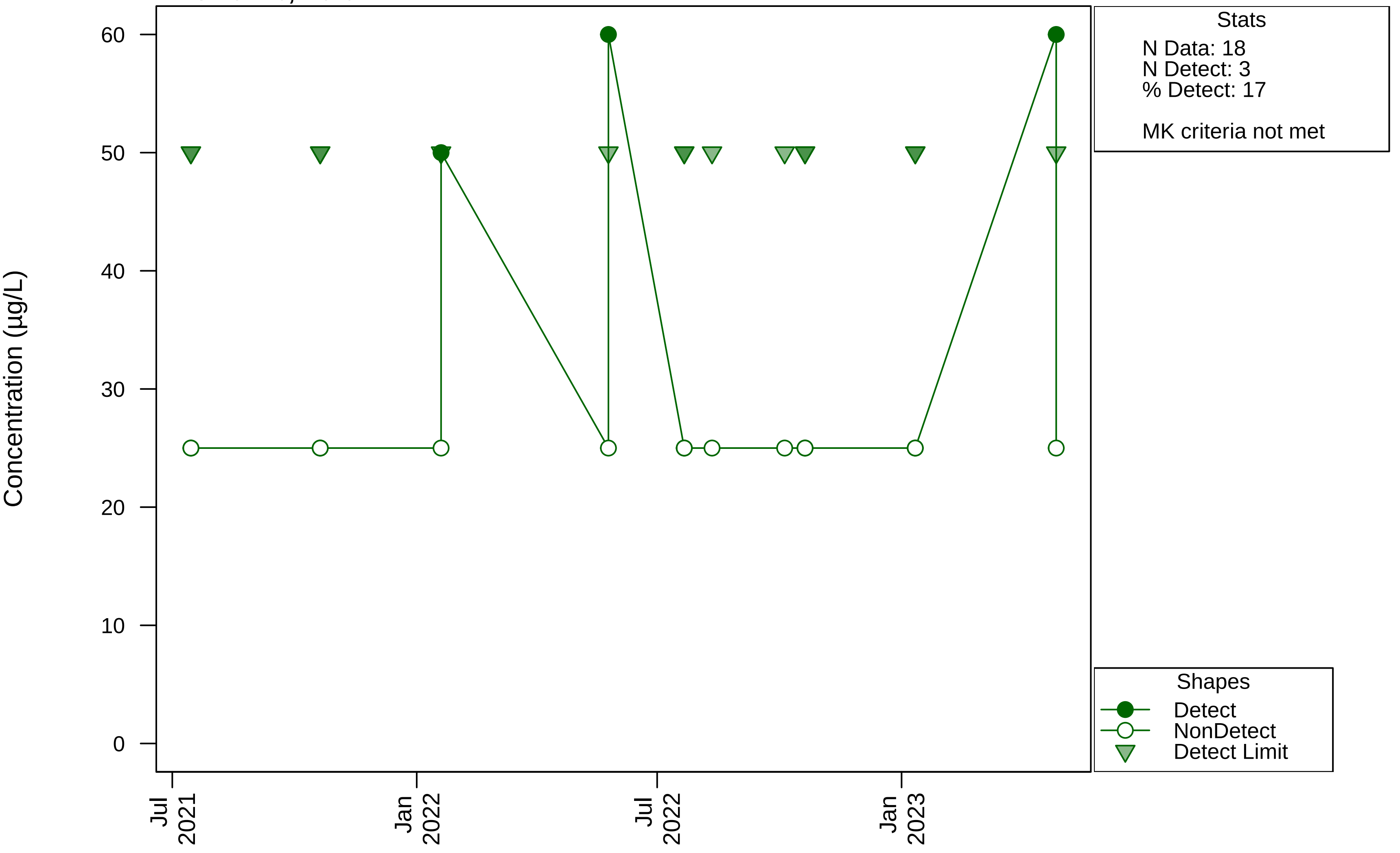
Scatterplots and Trend Analysis
MPGM5−D5, Zinc

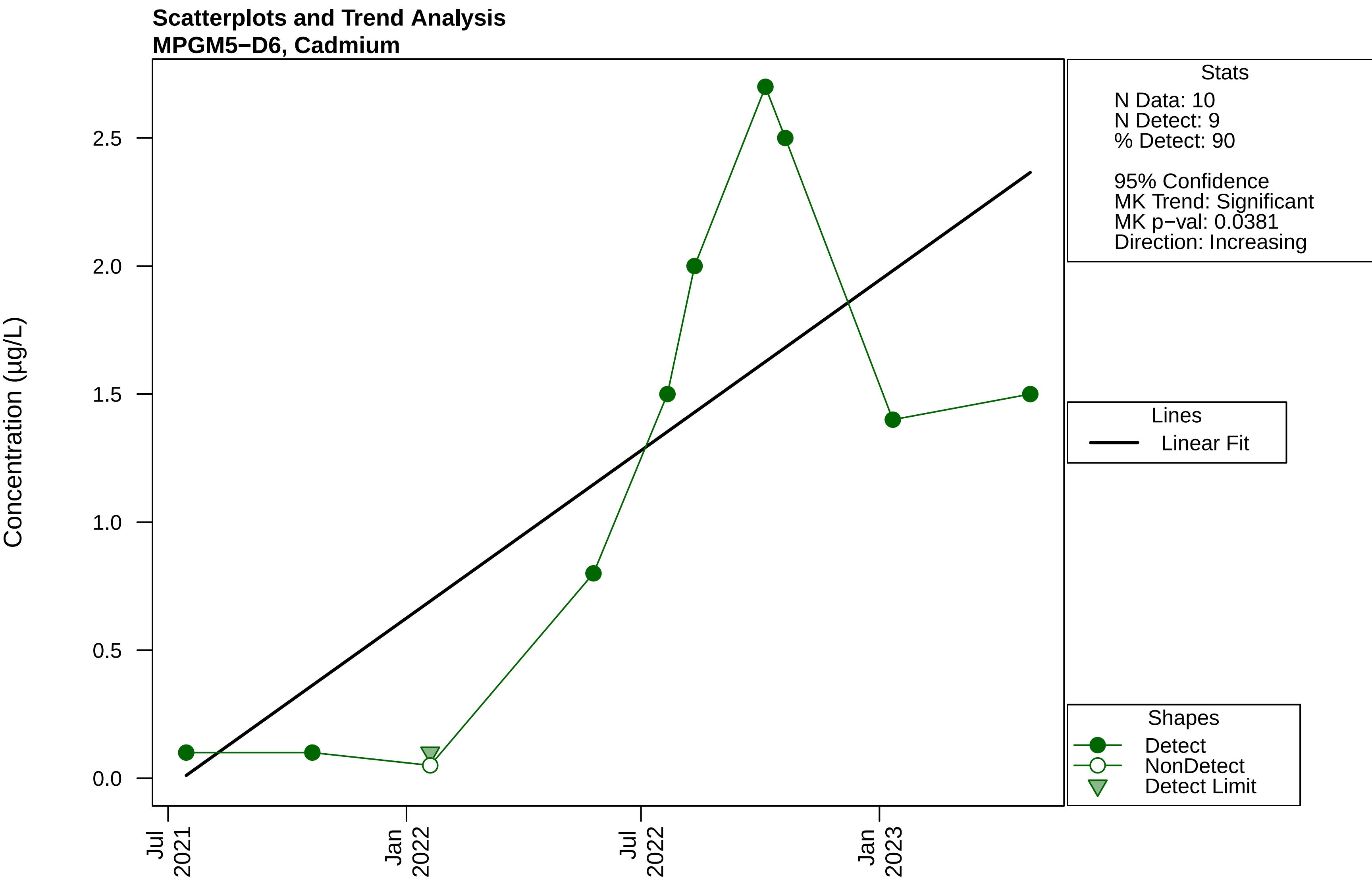


Scatterplots and Trend Analysis
MPGM5−D6, Arsenic

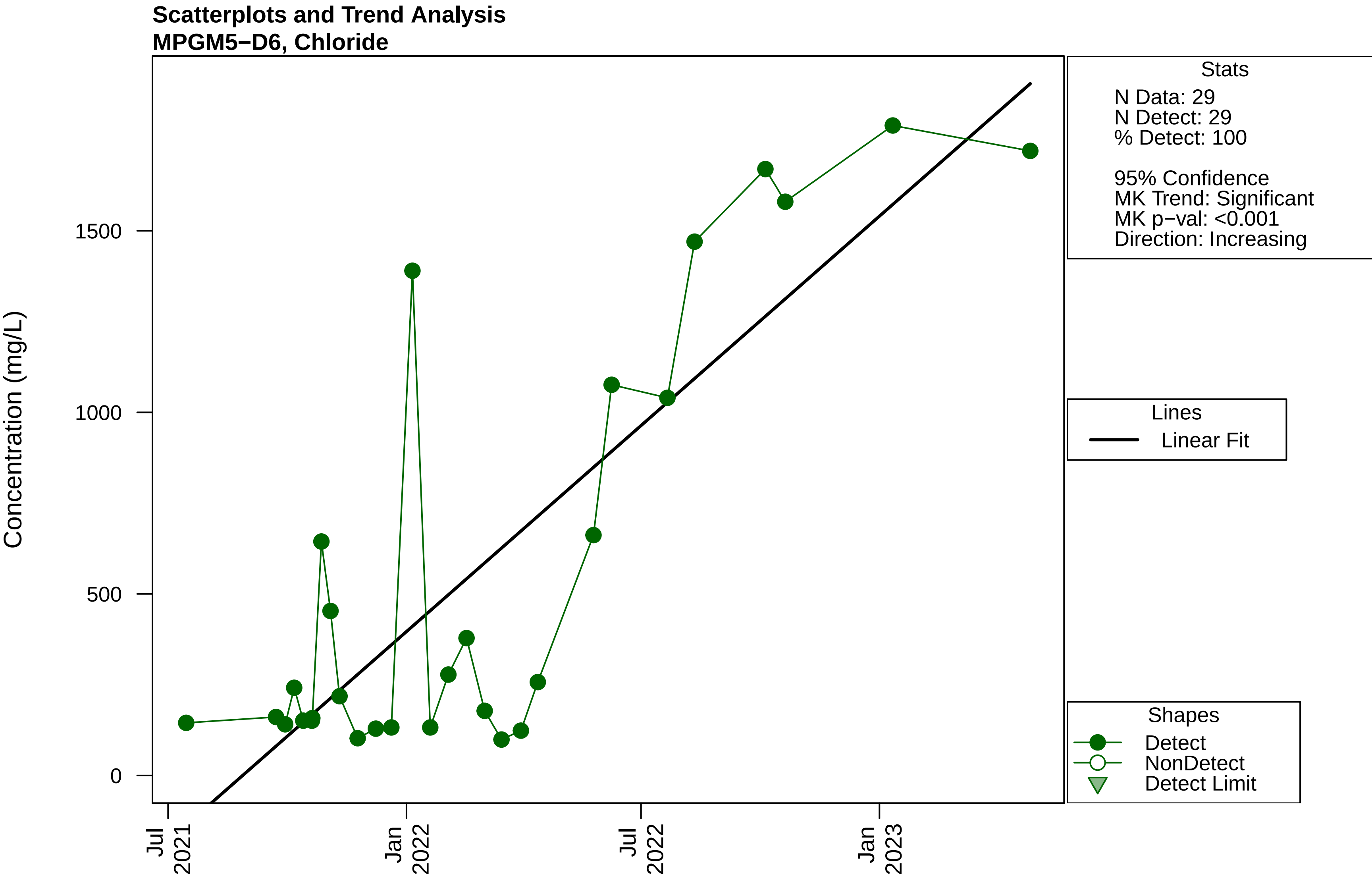


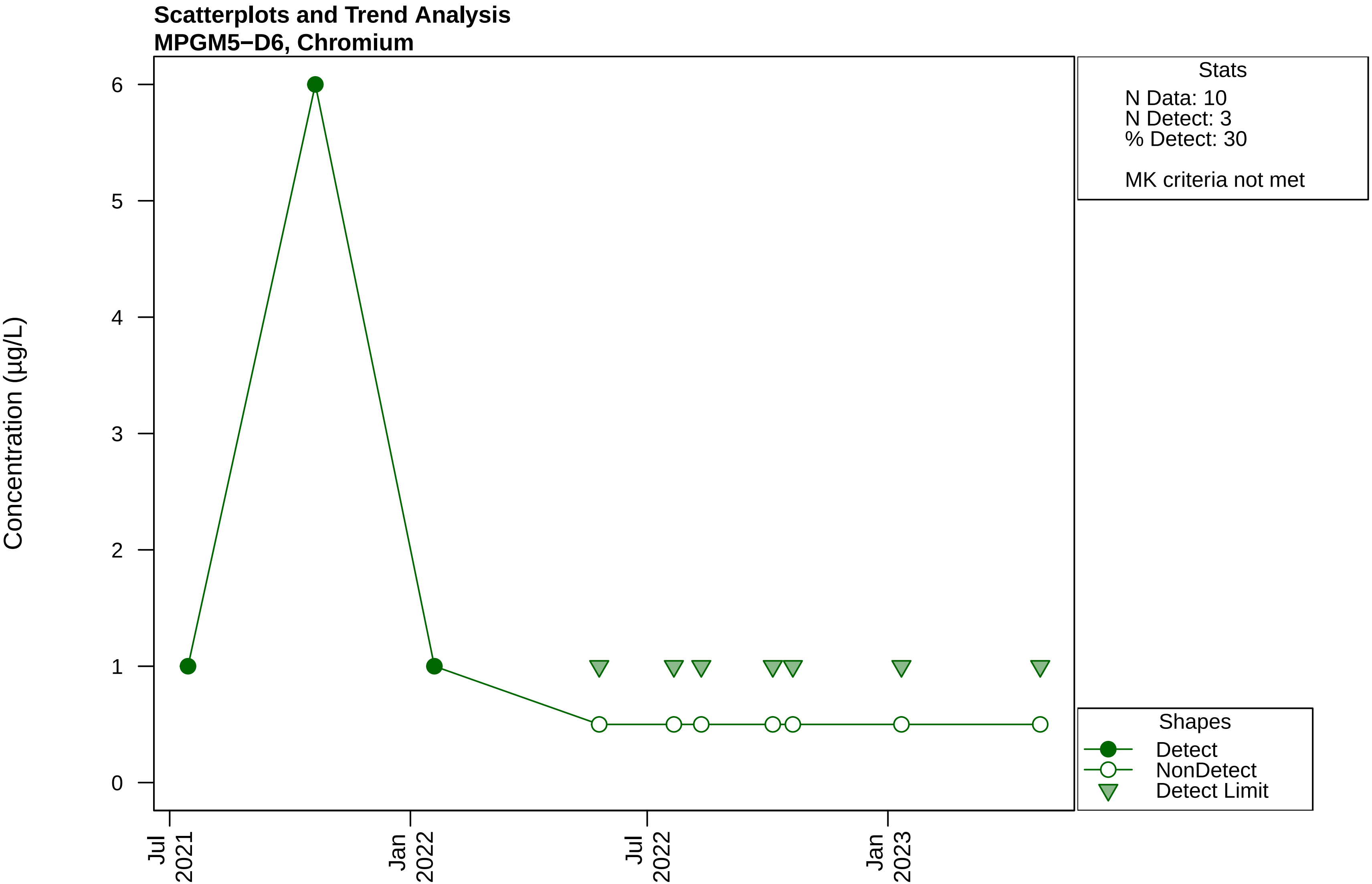
Scatterplots and Trend Analysis
MPGM5−D6, Boron



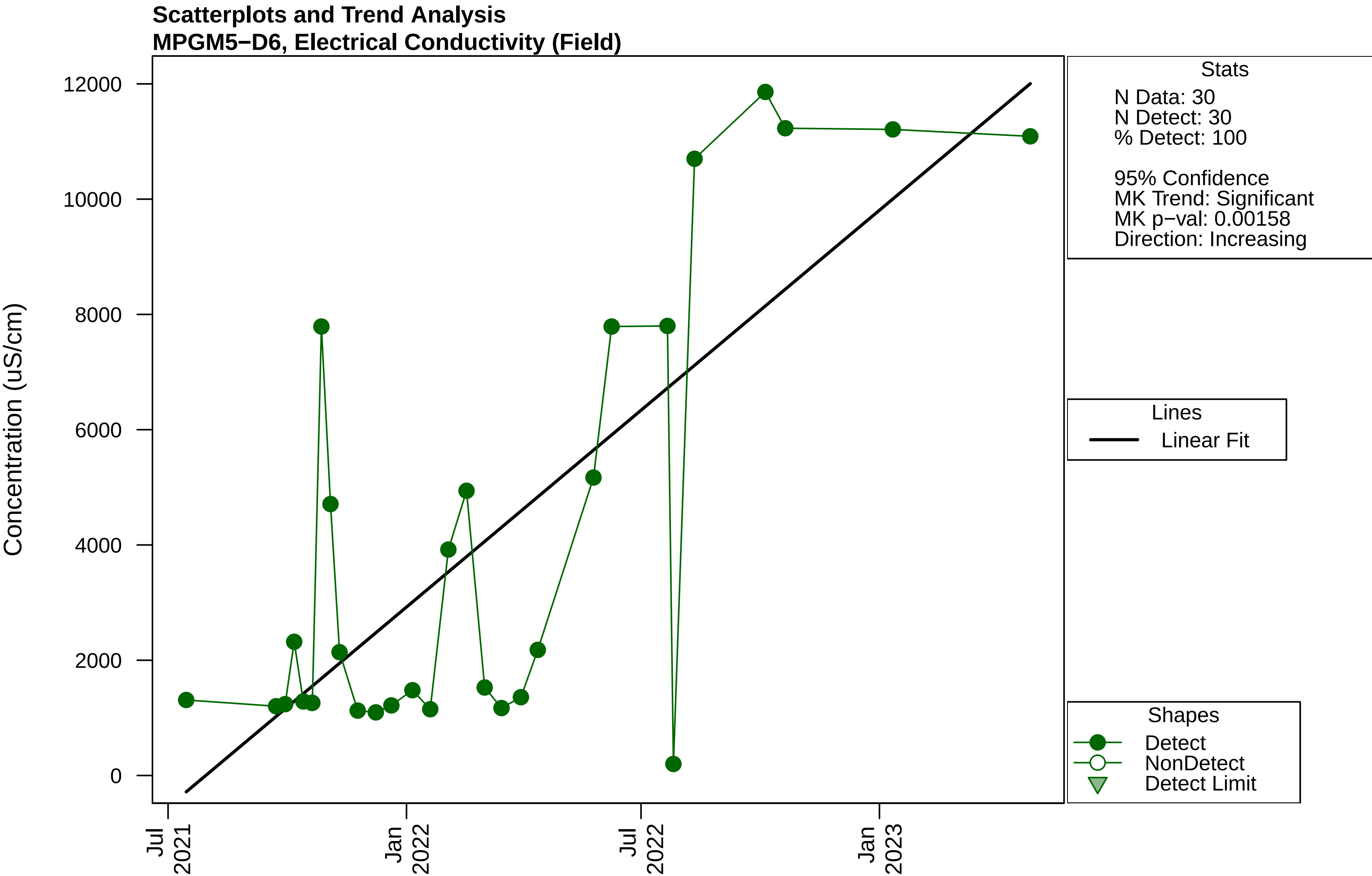


Scatterplots and Trend Analysis
MPGM5−D6, Cadmium
Concentration (µg/L)
0.0
0.5
1.0
1.5
2.0
2.5
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 9
% Detect: 90
95% Confidence
MK Trend: Significant
MK p−val: 0.0381
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

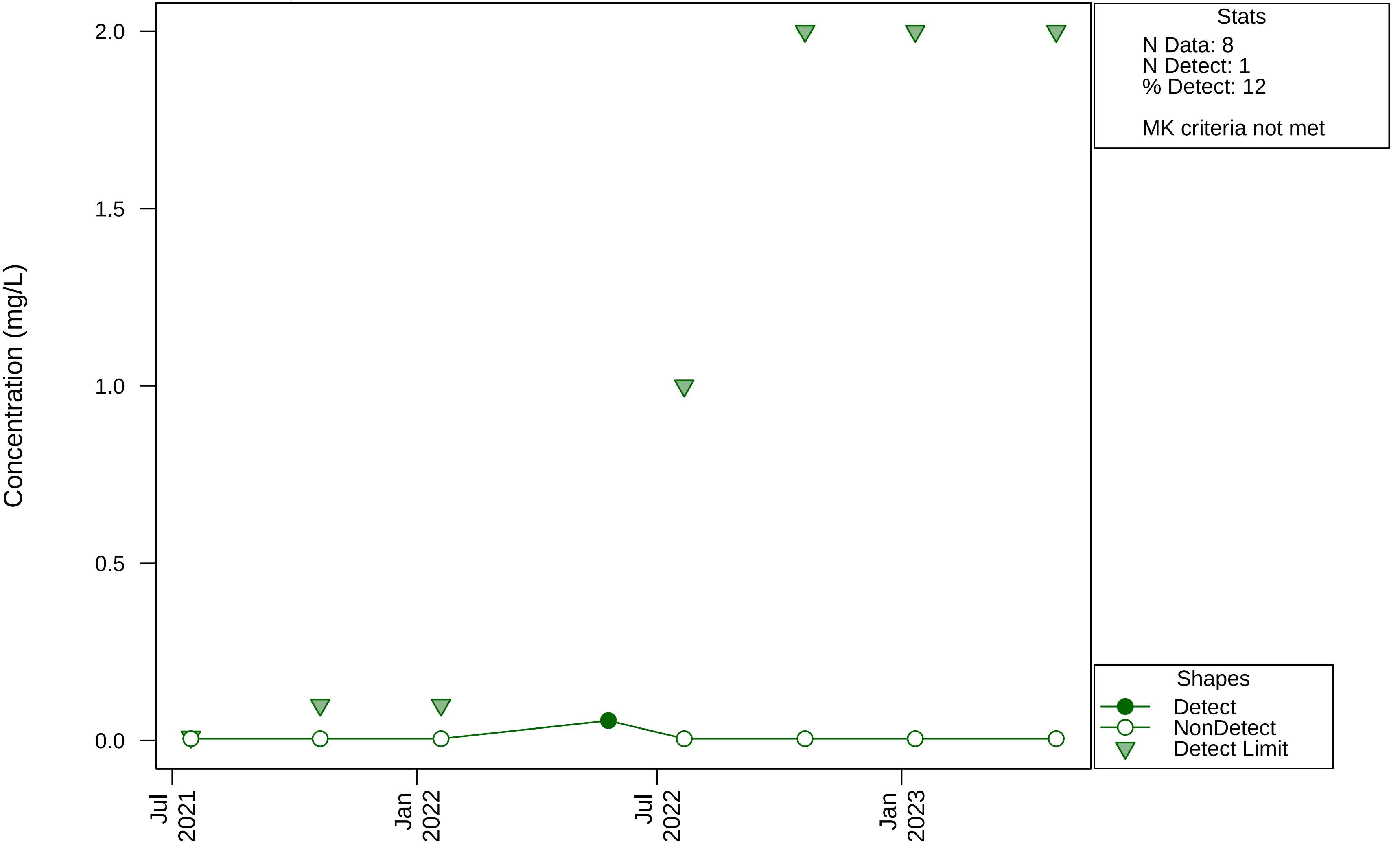

Scatterplots and Trend Analysis
MPGM5−D6, Chloride
Concentration (mg/L)
0
500
1000
1500
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 29
N Detect: 29
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

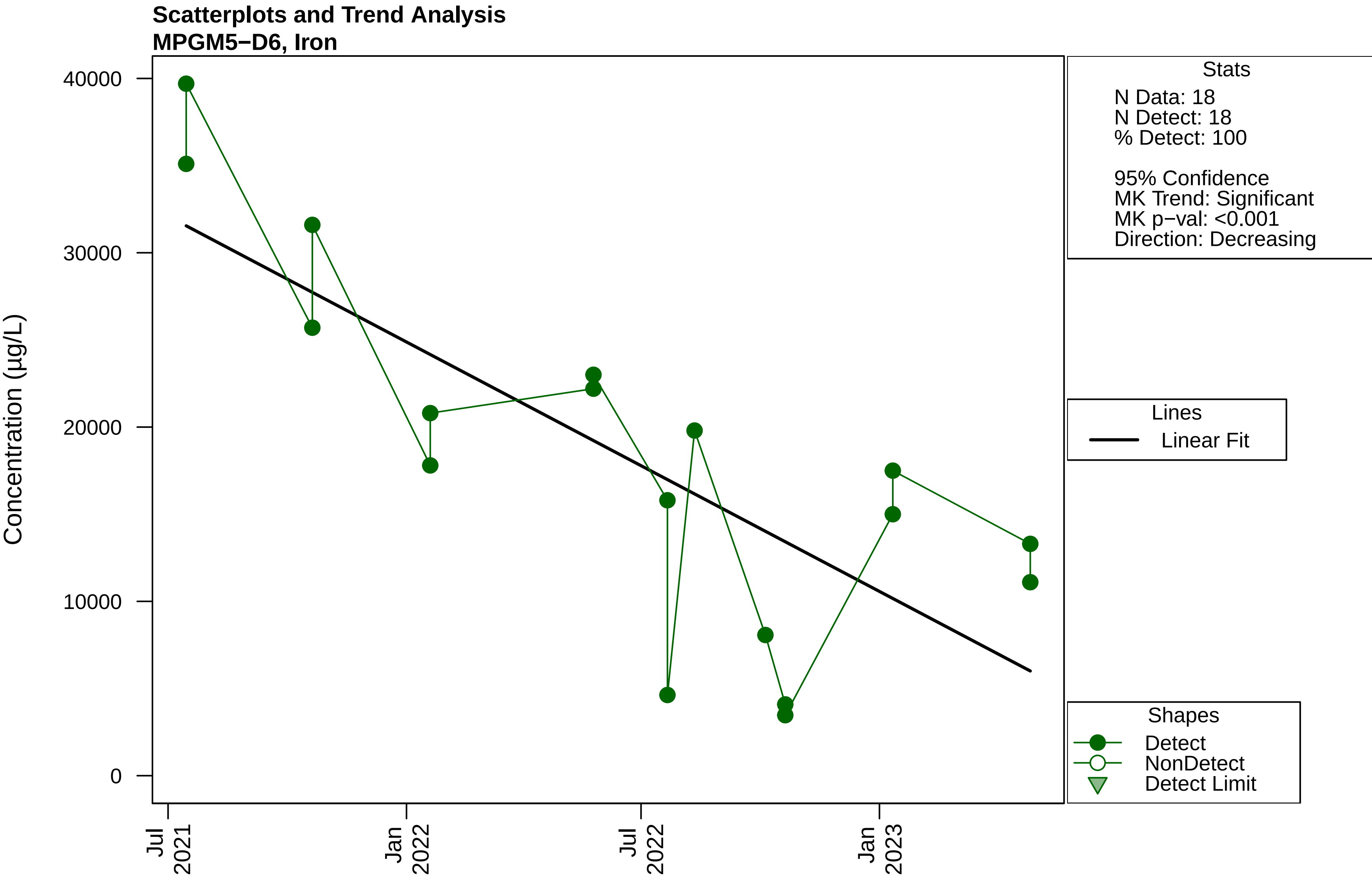


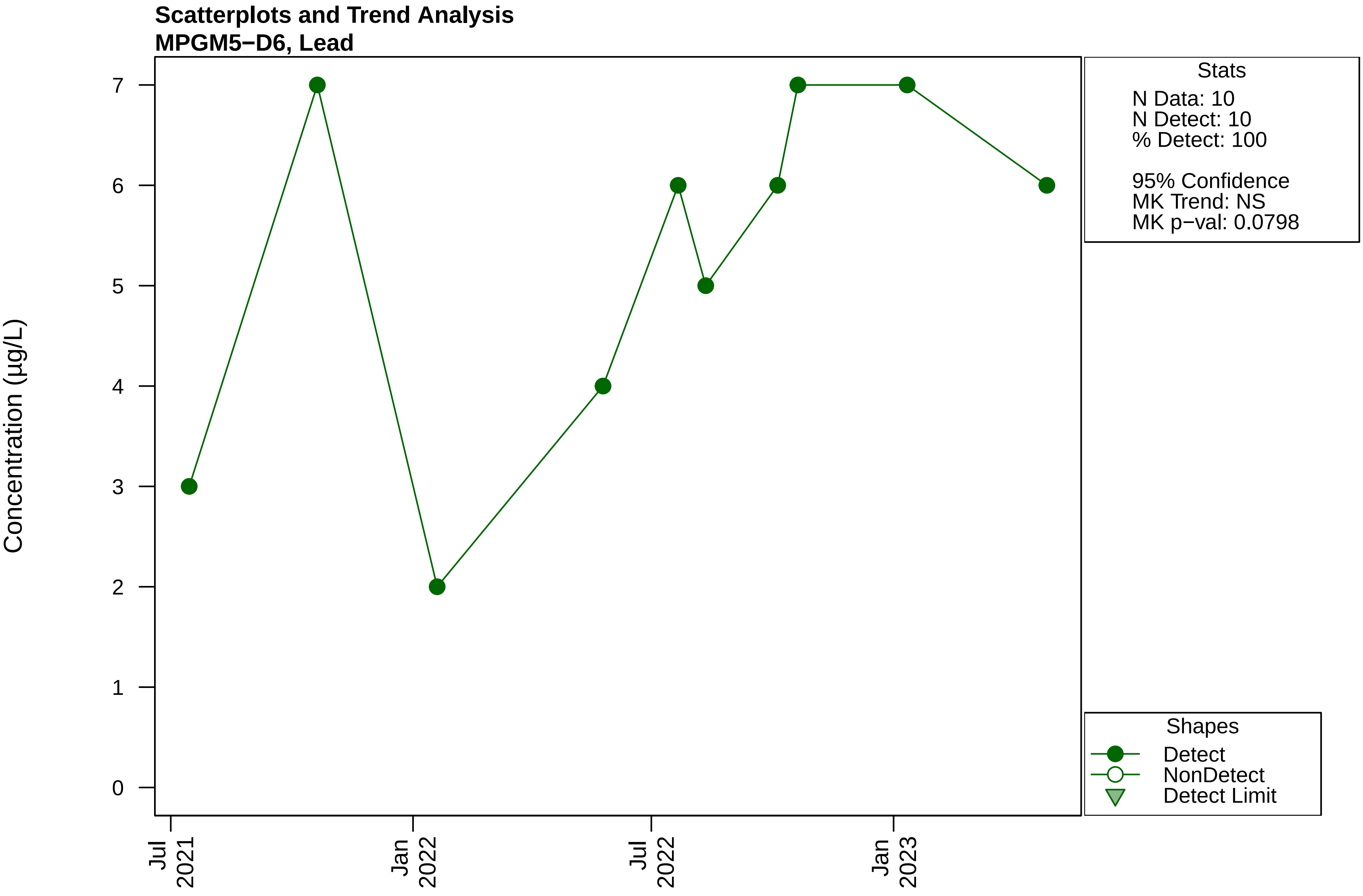
Scatterplots and Trend Analysis
MPGM5−D6, Chromium
Concentration (µg/L)
0
1
2
3
4
5
6
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 3
% Detect: 30
MK criteria not met
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
MPGM5−D6, Electrical Conductivity (Field)
Concentration (uS/cm)
0
2000
4000
6000
8000
10000
12000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 30
N Detect: 30
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.00158
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D6, Fluoride

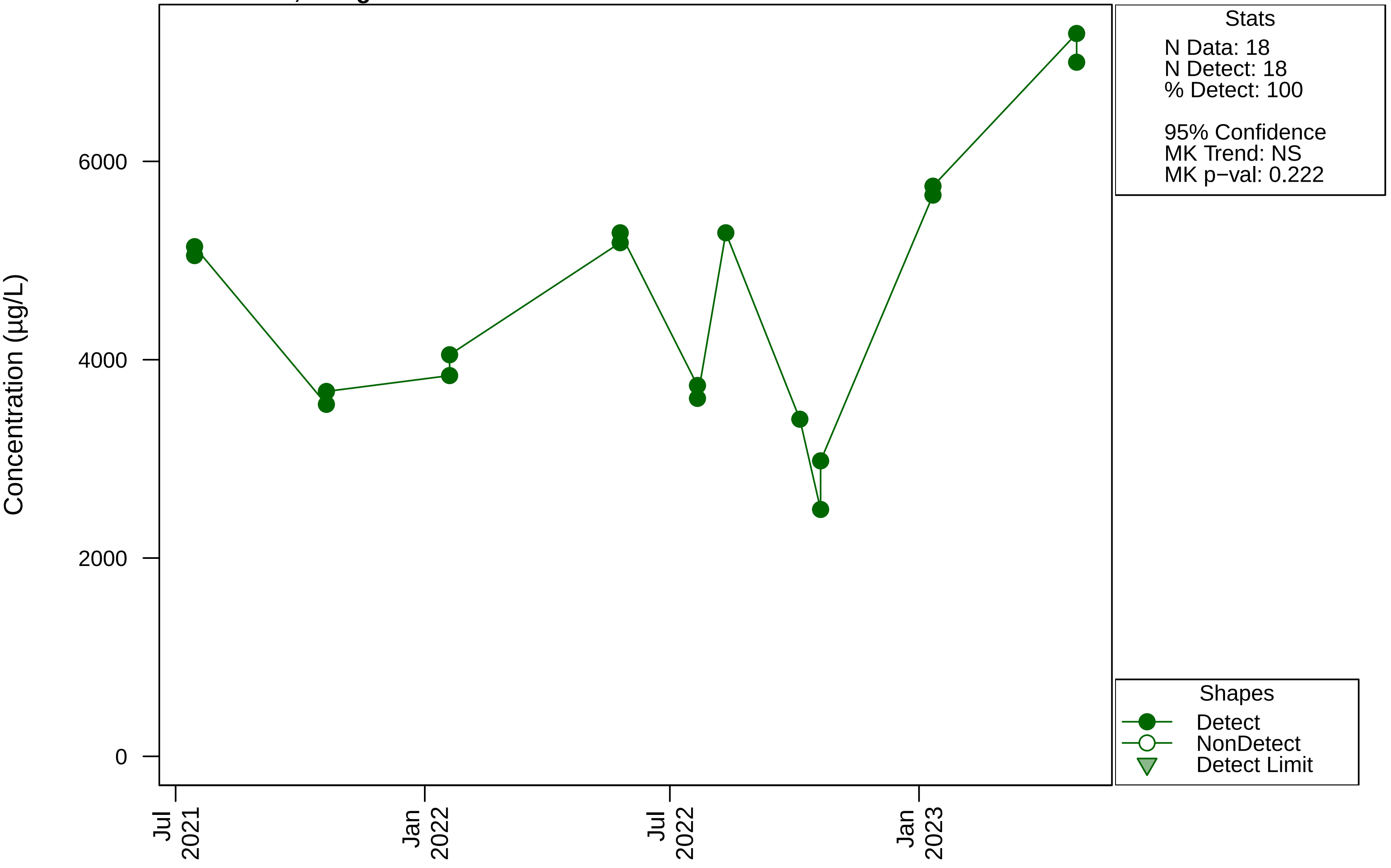



Scatterplots and Trend Analysis
MPGM5−D6, Iron
Concentration (µg/L)
40000
30000
20000
10000
0
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Decreasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

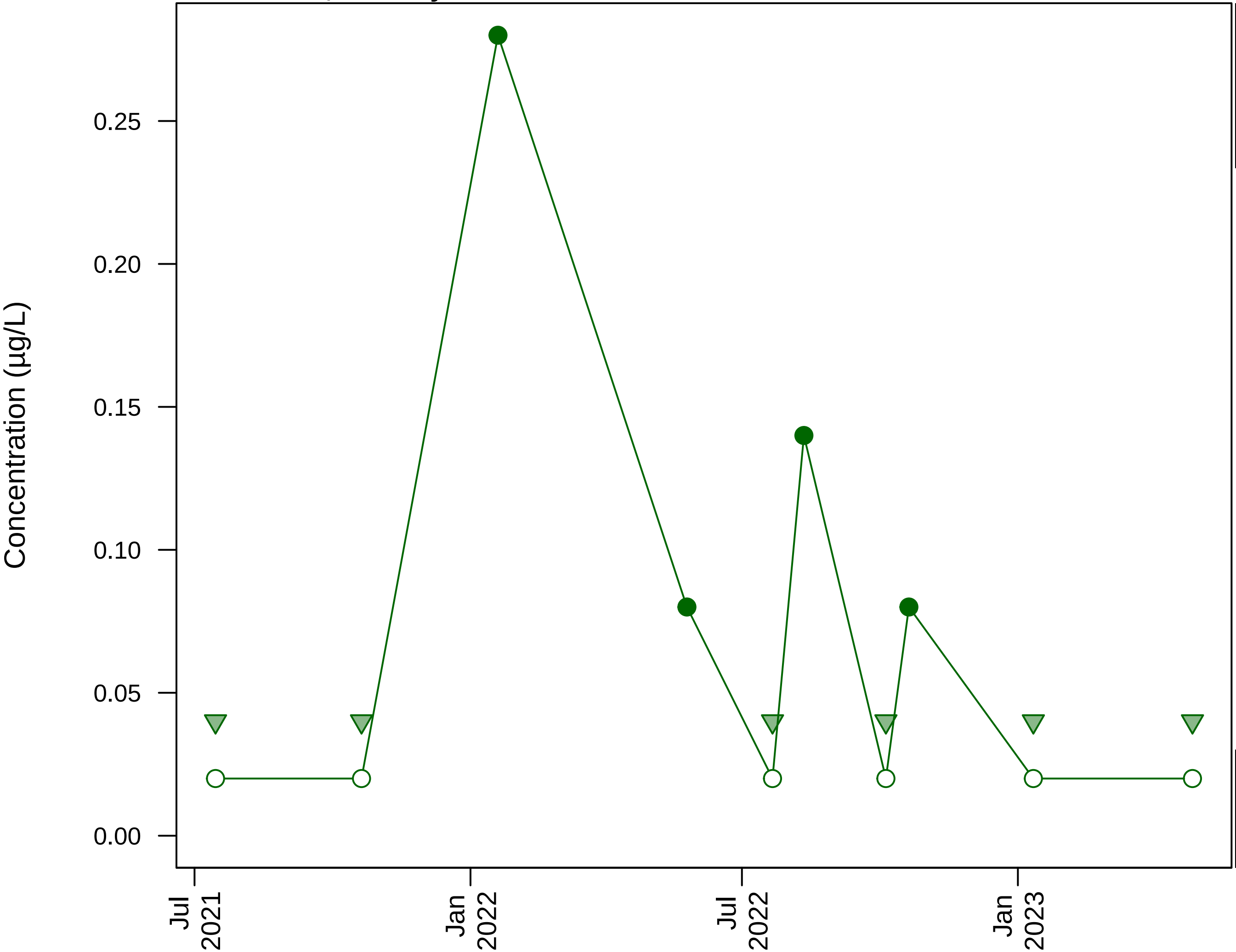


Scatterplots and Trend Analysis
MPGM5−D6, Lead
Concentration (µg/L)
0
1
2
3
4
5
6
7
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 10
% Detect: 100
95% Confidence
MK Trend: NS
MK p−val: 0.0798
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D6, Manganese



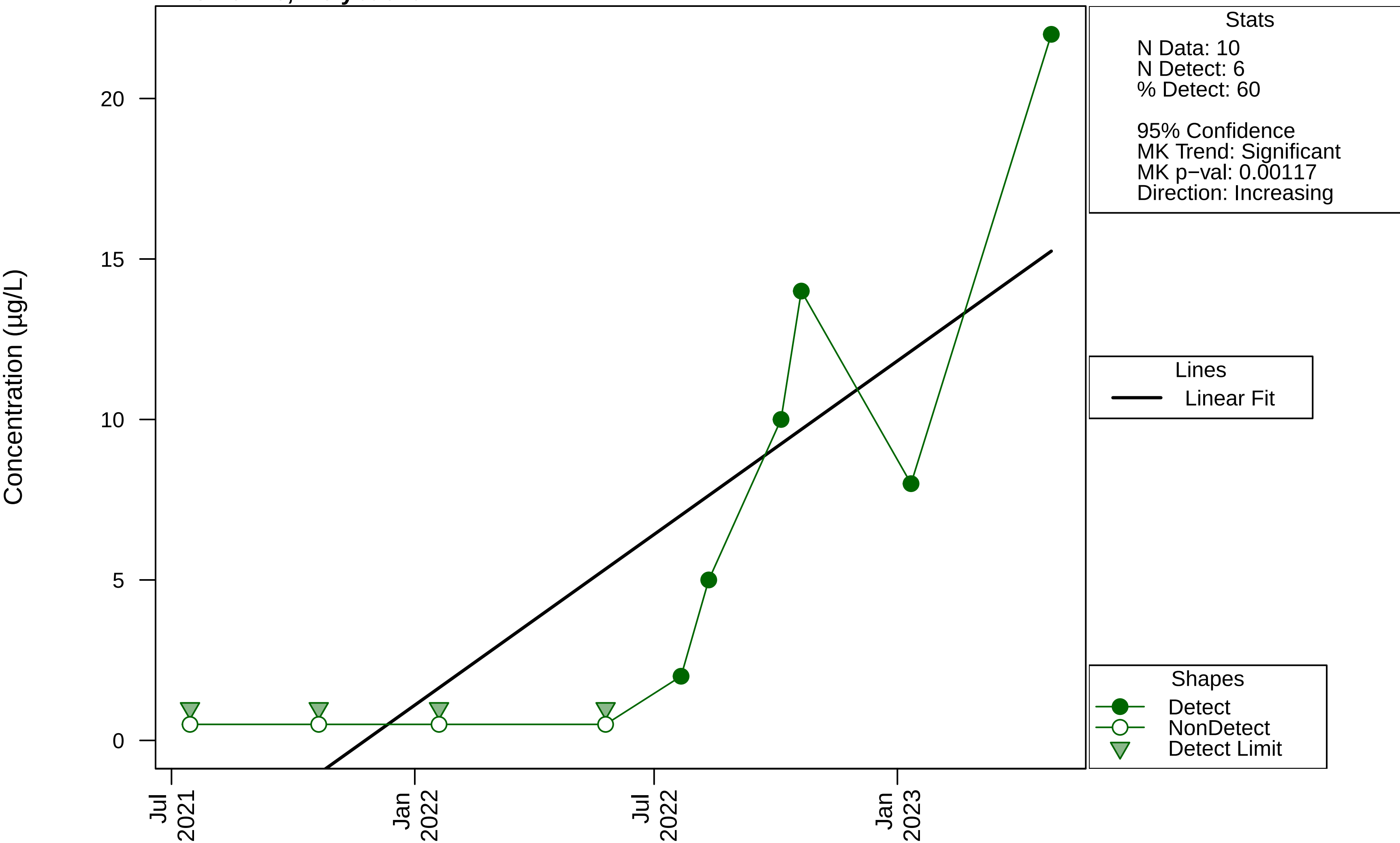
Scatterplots and Trend Analysis
MPGM5−D6, Mercury

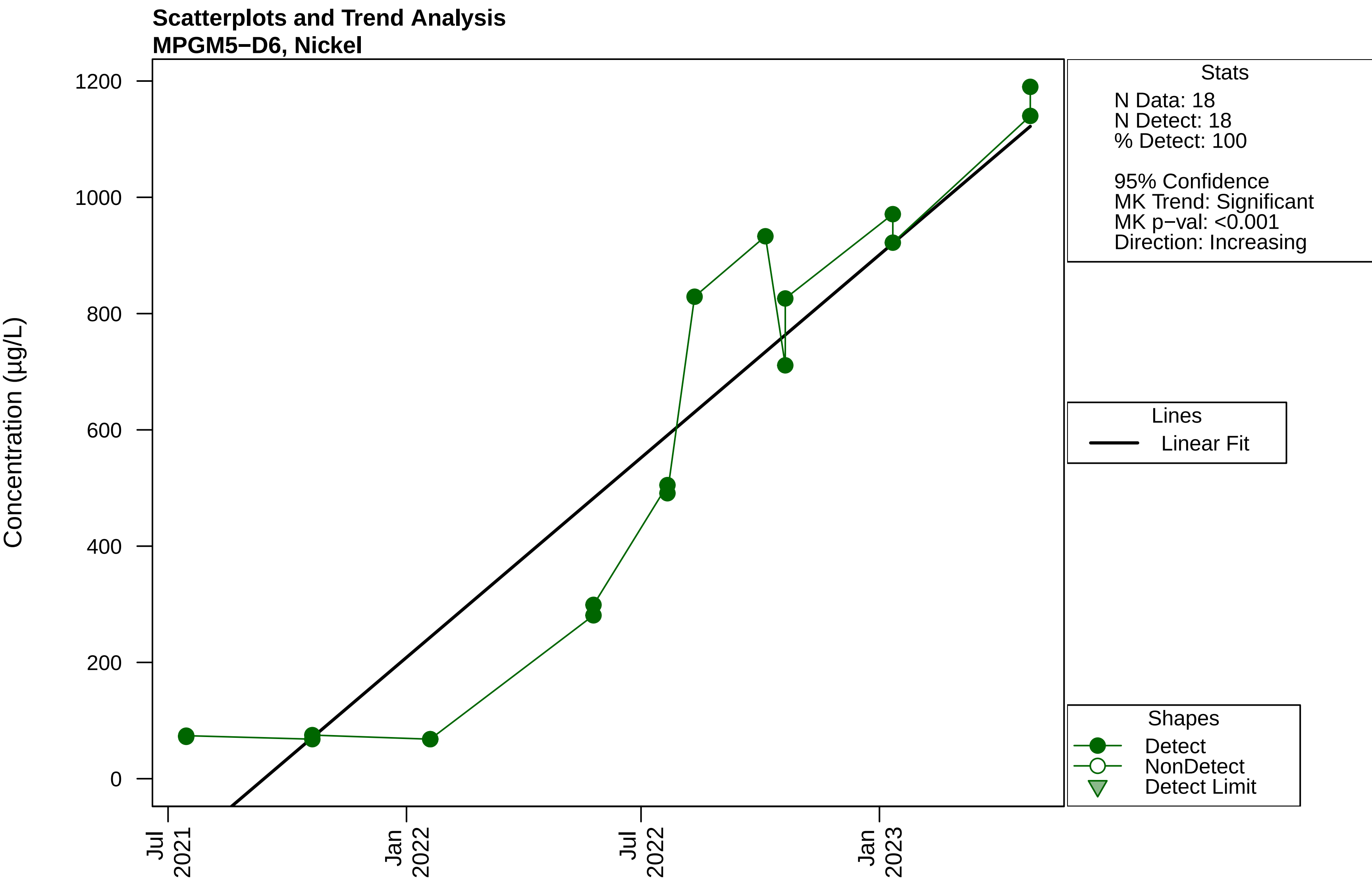


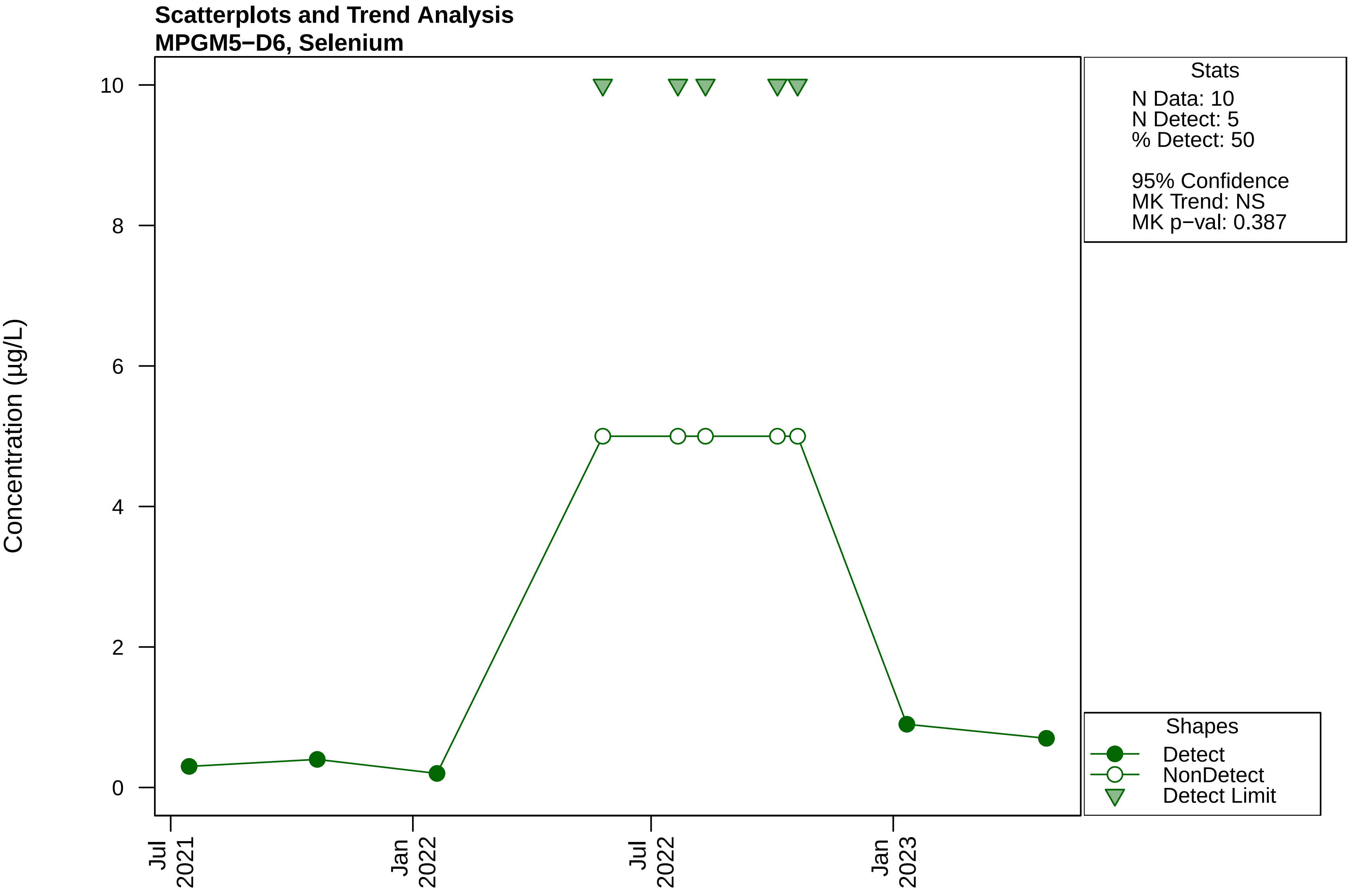
Stats
N Data: 10
N Detect: 4
% Detect: 40
MK criteria not met

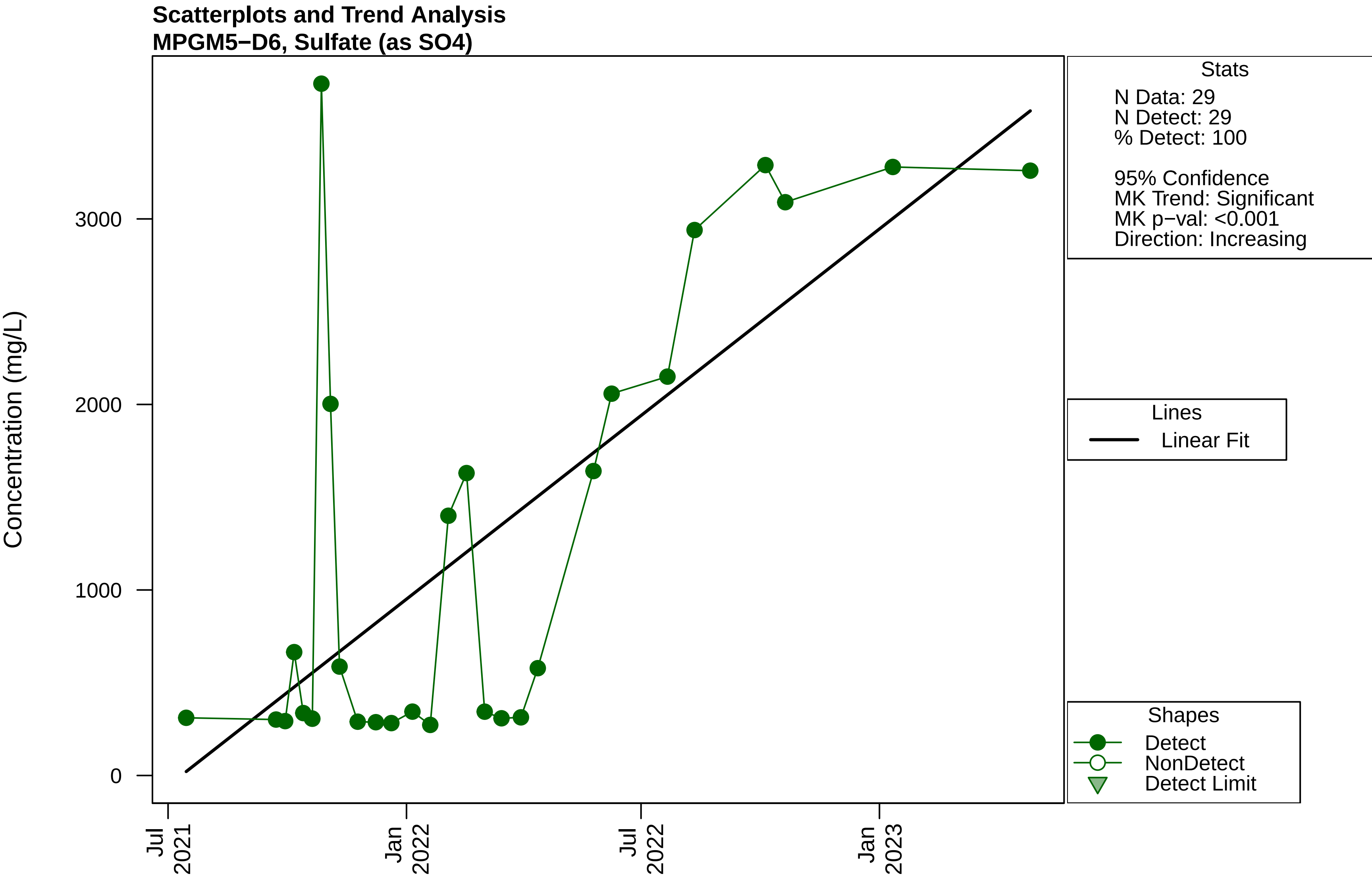
Shapes
- Detect
- NonDetect
- Detect Limit

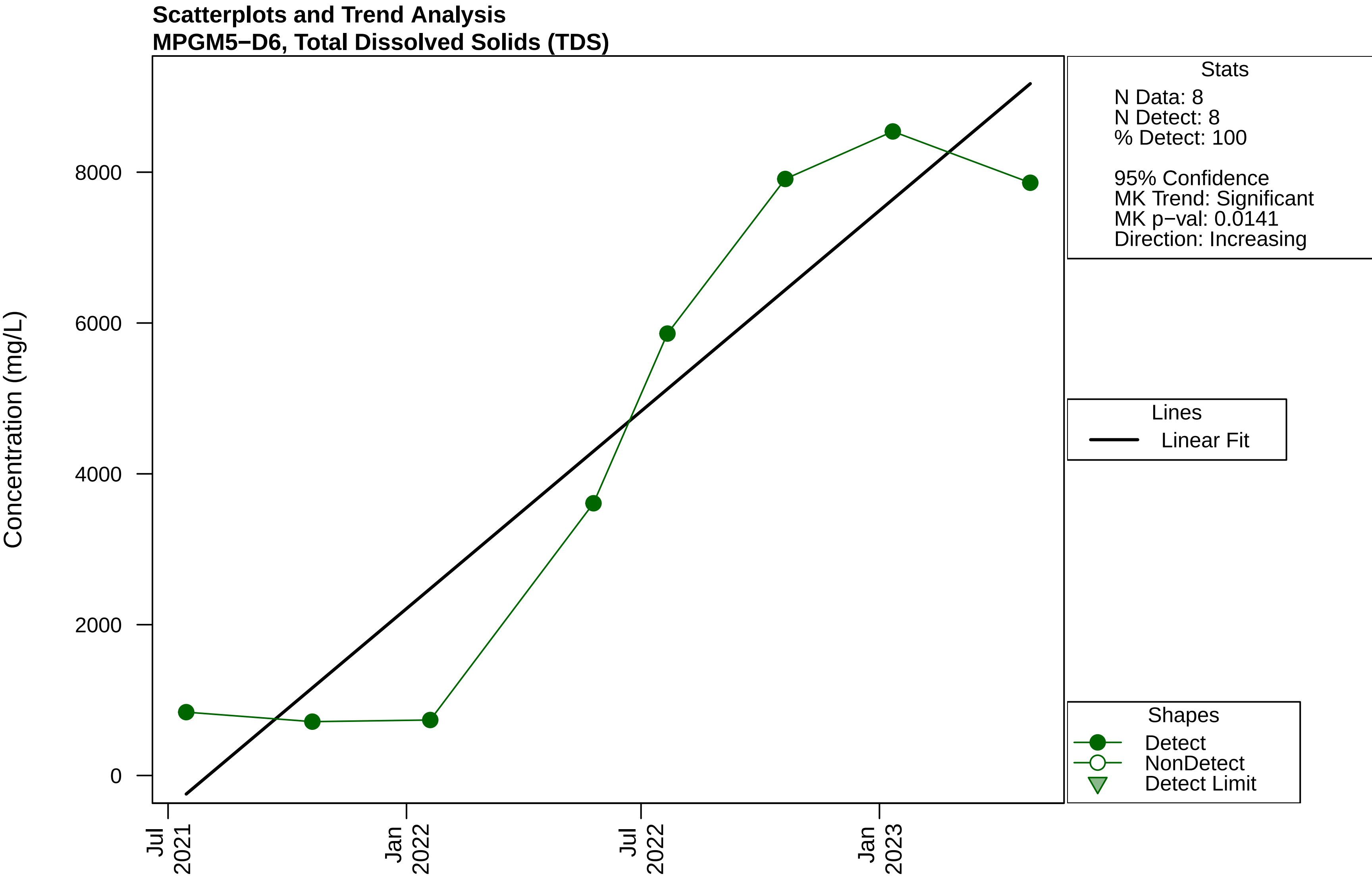
Scatterplots and Trend Analysis
MPGM5−D6, Molybdenum




Scatterplots and Trend Analysis
MPGM5−D6, Nickel
Concentration (µg/L)
0
200
400
600
800
1000
1200
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 18
N Detect: 18
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

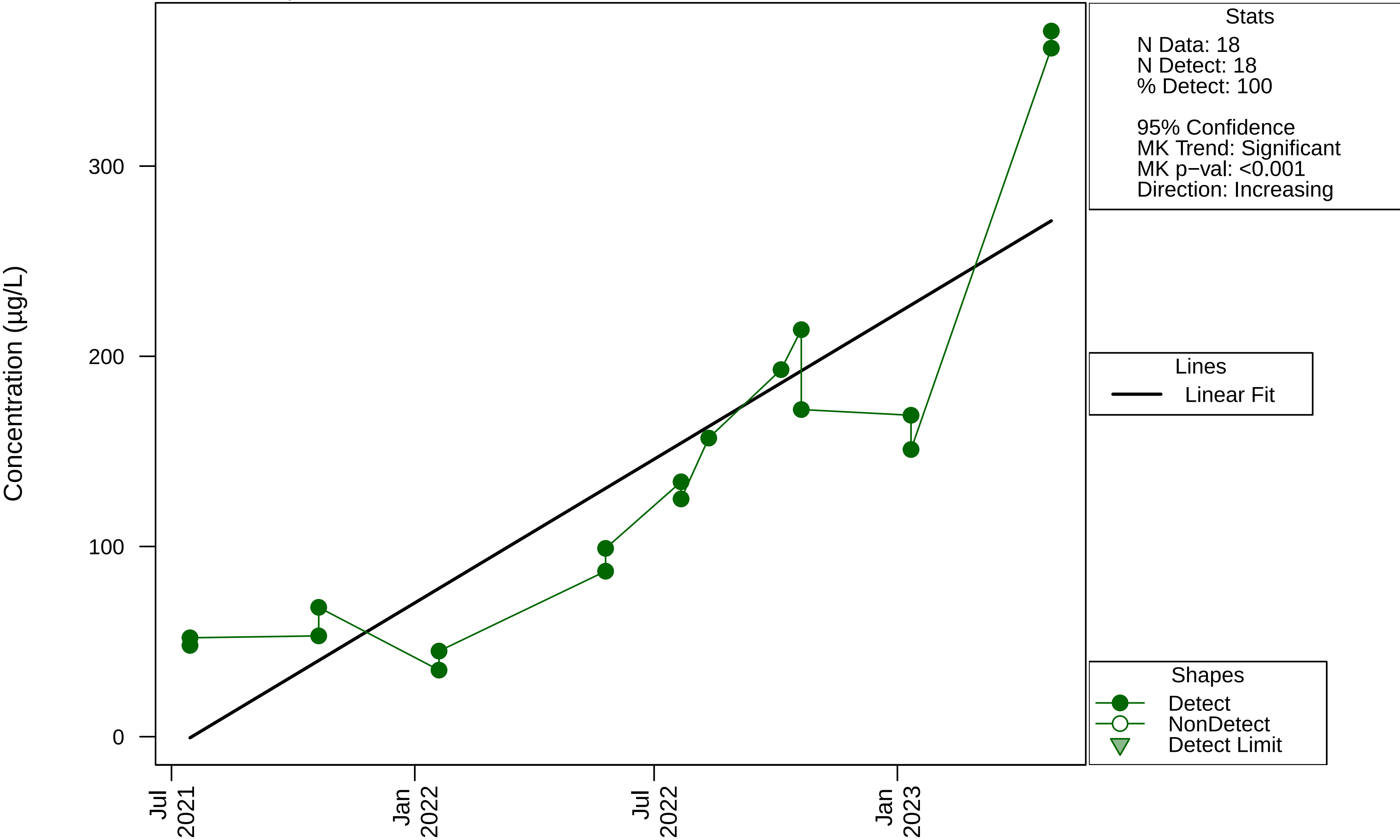

Scatterplots and Trend Analysis
MPGM5−D6, Selenium
Concentration (µg/L)
0
2
4
6
8
10
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 10
N Detect: 5
% Detect: 50
95% Confidence
MK Trend: NS
MK p−val: 0.387
Shapes
Detect
NonDetect
Detect Limit


Scatterplots and Trend Analysis
MPGM5−D6, Sulfate (as SO4)
Concentration (mg/L)
0
1000
2000
3000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 29
N Detect: 29
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: <0.001
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit



Scatterplots and Trend Analysis
MPGM5−D6, Total Dissolved Solids (TDS)
Concentration (mg/L)
0
2000
4000
6000
8000
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Stats
N Data: 8
N Detect: 8
% Detect: 100
95% Confidence
MK Trend: Significant
MK p−val: 0.0141
Direction: Increasing
Lines
Linear Fit
Shapes
Detect
NonDetect
Detect Limit

Scatterplots and Trend Analysis
MPGM5−D6, Zinc



APPENDIX N MANN-KENDALL METHODOLOGY

Trend Analysis Report

September 05, 2023

1. USER WARNINGS

Mann Kendall analysis is a commonly used statistical tool for assessing changes in concentration over time. Like most statistical analyses, Mann Kendall makes some assumptions about the data being analyzed. If these assumptions are not met, the results of the Mann Kendall may be wrong or misleading. The final section of this memo discusses scenarios that will likely require the input of a qualified statistician to ensure that the results of the trend test are appropriate for your data. A careful review of the results tables and figures can help identify any anomalies in the data that merit further assessment.

Selection of an appropriate α: Statistical convention typically uses an α equal to 0.05 which sets the probability of drawing a false positive conclusion (saying there is a trend when one does not exist) in the statistical analysis at 5 percent. α can be adjusted up or down to meet specific programmatic needs or to meet data quality objectives, but changes in α should be made a priori and should not be changed in an attempt to obtain a more 'favorable' result. Often decreasing α will result in a reduction in the probability of finding a false negative result (saying there is no trend when one actually exists).

2. INTRODUCTION

This report covers the Mt Piper data quality, descriptive statistics, and trend analysis.

- The data file used in this report (MK_Input_010823.xlsx) consists of samples from June 2021 to June 2023.
- The analysis includes 23 unique wells and 17 analytes.
- Descriptive statistics and trend analysis are run for every unique combination of: sys_loc_code, chemical_name (referred to as *Group* from hereon). There are 391 unique Groups.
- Trends were conducted at 95% confidence with minimum data requirements of at least 4 detected values and 50% detection frequency for each Group.

3. DATA HANDLING

This section describes the data included in this evaluation, the handling of field duplicates, data qualifiers, censored values, and handling of anomalous data points.

3.1 Field Duplicates

Only one set of primary and field duplicate measurements were retained for statistical evaluation. While field duplicates can provide useful information on the sampling methodology, the duplicates are almost always statistically dependant on the parent sample (USEPA 2009, Page 6-27). Although complicated methods can be used to allow the inclusion of both values in statistical tests, simpler strategies involve keeping the maximum value between the two samples, randomly selecting one of the two samples, or removing the duplicates altogether (USEPA 2009, Page 6-28). Unless otherwise noted, field duplicates were removed prior to all analysis.

3.2 Data Qualifiers

Data was qualified by a data validator to ensure the quality of the reported results. Consistent with lab conventions, J-flagged values were estimated quantities. Guidance allows for J-flagged values to be used with reported concentrations but cautions against making regulatory decision based on these values (USEPA 2014).

Measurements that have an R-flag had their concentration rejected; the result is rejected due to serious deficiencies in meeting quality control criteria and the analyte may or may not be present in the sample (USEPA 2014). The data quality review found the results to be valid, reliable and useable for decision making purposes with the listed qualifiers. No analytical results were rejected.

3.3 Non-Detects

Non-detects (NDs) commonly reported in water monitoring are statistically known as “left censored” measurements because the concentration of any ND can only be estimated. NDs are assumed to fall between zero and the reporting limit (USEPA 2009). USEPA (2015) offers a number of options for handling non-detected values, including Kaplan-Meier estimators, Regression on Order Statistics, and replacement with surrogate values. The appropriate handling of NDs depends on the statistical test being used and will be discussed in the following sections as appropriate.

Multiple reporting limits were found for several Groups. Of the 391 unique Groups, 32 of them had different reporting limits.

Maximum reporting limits were found to be greater than detected values for 34 of the Groups.

4. DESCRIPTIVE STATISTICS

Descriptive statistics were calculated for all Groups and can be found in Table 1. Non-detects were substituted with a value of half the reporting limit for calculations. The descriptive statistics highlight a number of relevant characteristics about the datasets, including:

- There are a total of 391 Groups.
- 267 Groups have detection rates greater than or equal to 50 percent.
- 50 Groups have 100 percent non-detects.
- 211 Groups have 100 percent detects.
- 151 Groups follow a normal distribution (using Shapiro-Wilks Normality Test) and 29 Groups follow a log-normal distribution. The remaining 211 Groups have no discernible distribution.

5. TESTING FOR TRENDS

Trend tests are a commonly used tool to assess the effectiveness of remediation efforts. By examining whether concentrations are increasing, decreasing, or not significant, trend tests provide one line of evidence about the directional change in concentrations over time.

5.1 Trend Testing Approach

A Mann Kendall test was used to detect changes in concentrations over time. The Mann Kendall Test is a non-parametric method that tests the following null hypothesis (USEPA 2009):

- Null Hypothesis (Ho): No monotonic trend exists.

- Alternative Hypothesis (Ha): A monotonic trend exists.

A monotonic upward (downward) trend means that the variable consistently increases (decreases) through time, but the trend may or may not be linear. The Mann-Kendall test is based on the premise that the lack of monotonic trend should correspond to a time series plot fluctuating randomly about a constant median with no visually apparent upward or downward pattern (Helsel and Hirsch 2002). Significantly increasing or decreasing trends (τ) are identified at a significant level (α) of less than or equal to 0.05. τ^2 can be used like an R^2 value to estimate how much variance in y is explained by x (i.e., what proportion of the variability in concentration is explained by time). USEPA 2009 guidance and/or Helsel and Hirsch (2002) may be consulted for further details for the Mann-Kendall test. With the specified 95% confidence, significantly increasing or decreasing trends are identified with p-values as follows:

Tau	p-value	Conclusion	Trend
Positive	p <= 0.05	Ho Rejected	Increasing
Negative	p <= 0.05	Ho Rejected	Decreasing
Positive or Negative	p > 0.05	Ho Accepted	Not Significant

5.2 Data Constraints

Guidance recommends that trend tests be performed with at least eight detected data points to ensure a reasonable amount of confidence in results (USEPA 2009, p. 17-24). However, it is mathematically possible to carry out the test with five detected samples. The consequences of using the minimum sample size is that there is a greater chance of concluding that there is no trend when, in fact there is a trend (USEPA 2009). If a dataset is comprised of more than 50 percent ND values, the loss of information is considered too great to support a reliable analysis of trends, so no Mann Kendall test was formed.

Consistent with guidance, in cases where FOD was greater than 50 percent, NDs were substituted with a constant that is below the lowest detected value (Helsel and Hirsch 2002). This ensures that all NDs are “tied” in the Mann Kendall and that changing reporting limits have limited influence on whether trends are detected (USEPA 2009, Helsel and Hirsch 2002). NDs were chosen to be substituted with the half reporting limit for the trend analysis. As mentioned previously, multiple reporting limits were found for several Groups. For any of these Groups, the largest value of half the reporting limit was subsituted for all other ND values, to ensure that all NDs are tied during the trend test.

5.3 Results

Trend tests were calculated with 95% confidence for all Groups that met the minimum data requirements of at least 4 detected values and 50% detection frequency. A full report of the Mann Kendall trend test results and timeseries plots can be found in Table 2. The following summarize the results of the trend analysis:

- There are a total of 391 Groups in the dataset.
- 259 Groups meet the data requirements of the trend test. Of those:
- 21 Groups had a significant increasing trend,
- 54 Groups had a significant decreasing trend,
- 184 Groups had no significant trend.

Time series scatterplots are provided in Figure 1 for each Group. Detection limits for each sample are also plotted for an easy visual assessment of changing detection limits over time. For Groups with significant trend, a visual of the linear fit is provided on the graph. The Mann Kendall is a correlation test and does not provide an estimate of the slope and y-intercept. A parametric test was used to provide a visual guide only.

6. SPECIAL CONSIDERATIONS

Like most statistical analyses, Mann Kendall makes some assumptions about the data being analyzed including:

- Observations or data obtained over time are independent.
- The observations obtained over time are representative of the true conditions at sampling times.
- The sample collection, handling, and measurement methods provide unbiased and representative observations of the underlying populations over time.

  There is no requirement that the measurements be normally distributed. The Mann Kendall test can be computed if there are missing values and varying detection limits, but the performance of the test will be adversely affected by such events. The assumption of independence requires that the time between samples be sufficiently large so that there is no correlation between measurements collected at different times.

The Mann Kendall test does not assume that the underlying relationship is linear. However, in cases where the data are clearly curvilinear, it may be more appropriate to consult with a statistician to employ different statistical techniques that more accurately characterize the changes in concentration over time.

Special consideration should be given to dataset with clear seasonality and/or NDs. These are considered in the following sections.

6.1 Seasonality

Seasonal changes in precipitation and temperature can cause cyclical fluctuations in groundwater concentrations. These seasonal fluctuations functionally add ‘noise’ to the data. This type of noise is called serial dependence and can make it difficult to determine trends in the data because of a long-term persistent pattern (like seasonality) or whether it represents a true, underlying change. USEPA Guidance (2009) strongly recommends accounting for seasonality when performing linear trends in hydrologic data. Seasonality has not been explicitly handled in the data described herein.

6.2 Non-Detects and Detection Limits

Non-detects (NDs) commonly reported in water monitoring are statistically known as “left censored” measurements because the concentration of any non-detect either cannot be estimated or is not reported directly. Rather, it is known or assumed only to fall within a certain range of concentration values (USEPA 2009 p. 15-1). With higher detection limits, that uncertainty is greater because the true value lies somewhere in a larger range of possible values.

USEPA (2006) notes that no general procedures exist for the statistical analyses of censored datasets. If a dataset is comprised of more than 50 percent non-detected (ND) values, guidance cautions the user when interpreting the results of statistical tests, especially for relatively small datasets (USEPA 2009). In the context of Mann Kendall, there is general agreement that substituting a constant below the lowest detected value is the best solution for handling non-detected values.

When detection rates are below 85 percent, however, this simple substitution method may lead to bias in the correlation estimates. Visually reviewing the data is a key step in interpreting the appropriateness of the statistical results. The time series plots have been generated using the detection limit for non-detects so that detection rates and multiple detection limits can be visualized. Additional statistical testing may be needed to address datasets with low detection rates or elevated detection limits.

7. REFERENCES

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