# Site Remedy Review Report and Proposed Updated Focused Feasibility Study

## Lilyblad Cleanup Site

*Prepared for*

**Washington Department of Ecology**
300 Desmond Drive SE
Lacey, Washington 98503

*Prepared by*

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Seattle, Washington 98101

Project Number: PNR0697

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| $\mu g/m^3$ | micrograms per cubic meter |
| 1,1-DCE | 1,2-dichloroethene |
| 1,4-DCB | 1,4-dichlorobenzene |
| CDM | Camp Dresser and McKee Inc. |
| cis-DCE | cis-1,2--dichloroethene |
| $CO_2$ | carbon dioxide |
| COCs | constituents of concern |
| CSM | conceptual site model |
| CULs | groundwater cleanup levels |
| DCA | Disproportionate Cost Analysis |
| DO | dissolved oxygen |
| DPE | dual-phase extraction |
| DVE | dual-vacuum extraction |
| Ecology | Washington Department of Ecology |
| EPA | Environmental Protection Agency |
| FS | Feasibility Study |
| ft bgs | feet below ground surface |
| GAC | granular-activated carbon |
| Geosyntec | Geosyntec Consultants |
| gpm | gallons per minute |
| $H^+$ | hydrogen ion |
| $H_2$ | hydrogen |
| IC | Institutional Controls |
| ISCO | nutrient and in-situ chemical oxidation |
| IWW permit | industrial wastewater discharge permit |
| lbs | pounds |
| LGAC | liquid-phase granular-activated carbon |
| Lilyblad | Lilyblad Petroleum Inc. |
| LNAPL | light non-aqueous phase liquid |
| mg/L | milligrams per liter |
| MNA | monitored natural attenuation |
| MPE | multi-phase extraction |
| MTCA | Model Toxics Control Act |
| NA | natural attenuation |

| | |
|---|---|
| NGS | Next-Generation Sequencing |
| NSZD | natural source zone depletion |
| NWTPH | Northwest Total Petroleum Hydrocarbon method |
| O&M | Operation and Maintenance |
| ORP | oxidation-reduction potential |
| PCE | tetrachloroethene |
| PID | photoionization detector |
| ppm | parts per million |
| ppmv | parts per million by volume |
| PSCAA | Puget Sound Clean Air Agency Permit |
| psi | pounds per square inch |
| psig | lbs per square inch gauge |
| RA | risk assessment |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| ROI | radius of influence |
| scfm | standard cubic feet per minute |
| site | Former Lilyblad Cleanup Site |
| SMP | Site Management Plan |
| SVE | soil vapor extraction |
| SVOCs | semi-volatile organic compounds |
| TCE | trichloroethylene |
| TPH | total petroleum hydrocarbons |
| TPH-G | TPH as gasoline |
| trans-DCE | trans-1,2-dichloroethene |
| TSS | total suspended solids |
| USEPA | United States Environmental Protection Agency |
| VC | Vinyl chloride |
| VGAC | vapor-phase granular-activated carbon |
| VOCs | volatile organic compounds |

# 1. INTRODUCTION

This Site Remedy Review Report and Proposed Updated Focused Feasibility Study (report) for the Former Lilyblad Cleanup Site (the site) was prepared by Geosyntec Consultants (Geosyntec) at the request of the Washington Department of Ecology (Ecology). The purpose of this report is to provide a comprehensive review of the remedial progress to address constituents of concern (COCs) in soil and groundwater and to develop a strategic path forward for remediation.

The site remedy review began in 2020 with a performance review of the existing dual-phase extraction (DPE) system, including a field test of the system, an evaluation of current conceptual site model (CSM) based on sampling and monitoring data to date, and preparation of a draft focused feasibility study to compare remedial alternatives for the site. The results of the 2020 evaluation identified the need to collect additional data on natural attenuation of COCs, primarily natural source zone depletion (NSZD) of petroleum hydrocarbons, and to evaluate bio-sparge as a remedial alternative for the site. As a result, in late 2020 through mid-2021, Geosyntec collected additional parameters to evaluate monitored natural attenuation (MNA), conducted an NSZD evaluation, and conducted a bio-sparge pilot study. The results of the 2020 site remedy review and the subsequent work in 2021 are included herein, along with the updated focused feasibility study.

The report is organized into the following sections:

- **Section 2: Background** – This section summarizes the historical understanding of the site and includes a summary of the site geology and hydrogeology, regulatory history, site cleanup levels, and past remedial activities.
- **Section 3: Current CSM** – The site conceptual site model is provided in this section and includes a summary of the current site hydrology and geochemistry, the nature and extent of COCs in soil and groundwater, potential source receptors, contaminant fate and transport. This section begins to discuss MNA and NSZD in context of the CSM. MNA and NSZD are further evaluated in Section 5.
- **Section 4: Dual-Phase Extraction System Performance Evaluation** – This section summarizes the historical operation of the DPE system and provides results from the 2020 system testing and evaluation.
- **Section 5: NSZD and MNA Evaluation** – This section summarizes the results of the NSZD and MNA evaluations completed in late 2020 through mid-2021. Due to the overlap of this evaluation with the bio-sparge pilot study detailed in Section 6, this section will also discuss changes to NSZD rates as a result of the bio-sparge pilot study activities.
- **Section 6: Bio-Sparge Pilot Study Performance Evaluation** – This section provides results from the 2021 bio-sparge pilot study, which was conducted in Spring 2021.
- **Section 7: Focused Feasibility Study** – This section evaluates potential alternative technology options of the site, presents remedial alternatives, and evaluates the alternatives using a set of weighted criteria and a disproportionate cost analysis. This section concludes with a recommendation of an alternative that combines bio-sparge and NSZD/MNA with eventual institutional controls.

- **Section 8: Conclusions** – This section outlines findings and conclusions from this review.
- **Section 9: References** – Documents referenced in the report are summarized in this section.

Supporting tables, figures, and appendices that are referenced herein are attached.

# 2. BACKGROUND

The former Lilyblad Petroleum Inc. (Lilyblad) site is located at 2244 Port of Tacoma Road in Tacoma, Washington, and consists of the Lilyblad Property and adjacent properties that have been affected by historical releases from the Lilyblad facility. The site and adjacent properties are shown in Figure 1 with the greater site vicinity shown in Figure 2. The historical Lilybald facility is currently occupied by Pacific Fluids, LLC (Pacific Fluids), and adjoining properties are industrial and include the following:

- Northeast – Port of Tacoma Road, followed by the Port of Tacoma and the Blair Waterway;
- Southeast – TriPak Total Transportation Services (TriPak), which was formerly JM Eagle Manufacturing (JM Eagle);
- Southwest – United Motor Freight Tacoma, which was also formerly JM Eagle; and
- Northwest – Platinum Lease, followed by Tacoma Screw. Platinum Lease was formerly Chambers Bay RV and formerly referred to as the Nelson property.

Lilyblad began operation in 1972 as a distributor of gasoline, diesel, solvents, and packaged petroleum products. Between 1978 and 1991, the site was utilized as a solvent recycling facility. Since 1983, the site has been used as a chemical storage, blending, and distribution facility. During these various site activities, releases and potential releases of solvents and hydrocarbons from the main site building, tank farms, fuel island, loading rack, and other operative areas were identified (CH2M Hill, 2004). In this section, previous findings regarding the nature and extent of the site contamination, as well as remediation activities, are summarized.

## 2.1 Geology and Hydrogeology Summary

In 2004, CH2M Hill prepared a detailed *Supplemental Remedial Investigation Report* (Supplemental RI; CH2M Hill, 2004). In this section, the geological and hydrogeological findings from the 2004 Supplemental RI conceptual site model are summarized.

The site is fully covered with asphalt and concrete, which is immediately underlain by a structural fill unit, which consists of sandy, gravelly silt to slightly silty, sandy gravel. This structural fill unit is typically observed within the upper 10 feet underlying the Site (Northwest Archaeological Associates, Inc., 2009).. Directly below the structural fill layer is an upper sand layer. This layer consists of clean to silty sand with some shell fragments and gravel. This unit becomes finer with depth and was reported to have a thickness of 2 to 8 feet throughout the site. First encountered groundwater is observed in the upper sand layer, and the saturated portion of the upper sand layer has been historically referred to as the "shallow aquifer." The upper sand layer and shallow aquifer is underlain by a silt layer, which consists of clayey silt to silty clay; Geosyntec notes that this shallow aquifer is likely a perched groundwater layer (as discussed in Section 3). This layer has low permeability and forms an aquitard of approximately 10 to 15 feet in thickness. Underneath the silt layer is a second sand layer, which is generally comprised of clean to silty-fine sand. This second sand layer is saturated, confined or semi-confined, and referred to as the "second aquifer."

During the 2004 Supplemental RI study period, the depth to water was reported as approximately 3 and 8 feet below ground surface (ft bgs) and the water table appeared to remain below the structural fill layer. Groundwater was reported to flow both generally northward and southward, as shown in Figures ES-7 and ES-8 in Appendix A.

A potential groundwater flow pathway was proposed by CH2M Hill to the Blair Waterway. This pathway was conceptualized via groundwater interception of a stormwater sewer installed at approximately 15 ft bgs in the north-adjoining Port of Tacoma Road. Groundwater flowing north from the site was likely to infiltrate into the sewer or flow along the sewer bedding to the Lincoln Avenue Ditch and then flow into the Blair Waterway. The sewer location in relation to the site and Blair Waterway is shown in Figure 2. The storm drain bedding lies beneath the water table in the shallow aquifer, as shown in the cross section included Appendix A (CH2M Hill, 2004). This potential pathway is further discussed in Section 3.

## 2.2 Regulatory History

In 1981, Lilyblad notified the Washington State Department of Ecology (Ecology) of on-site waste management activities, applied for an Ecology Resource Conservation and Recovery Act (RCRA) permit, and was granted interim status. By November 1994, Ecology received authorization for RCRA corrective action and notified Lilyblad it would proceed with corrective action via the Model Toxics Control Act (MTCA) process, and in 1995, an agreed Order was signed for the facility (Ecology, 1995). In 2000, Ecology issued the *First Amendment to MTCA Agreed Order No DE 95HS-S292* (Ecology, 2000). In 2006, Ecology issued the *Second Amendment Agreed Order (Order) No. DE 95HS-S292* (Ecology, 2006a).

## 2.3 Constituents of Concern and Site-Specific Cleanup Levels

COCs were initially proposed in the 2001 Interim Action Final Work Plan (CDM, 2001) and were established in the Second Amendment to the Agreed Order No. DE95HS-S292 (Ecology, 2006a). These COCs included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and total petroleum hydrocarbons (TPH). Based on the CSM presented in the 2004 Supplemental RI and the preliminary MTCA Method B cleanup levels (prior to the 2000 MTCA Rule Amendments), site-specific soil and groundwater cleanup levels (CULs) were established in the Second Amendment to the Agreed Order No. DE95HS-S292 (Ecology, 2006a) and revised in the Exhibit A, Enforcement Order No. 4515: Cleanup Action Plan (Ecology, 2007). These CULs were established for the protection of human health and potential downgradient ecological receptors. Table 1 presents the current list of site COCs and associated soil and groundwater CULs.

In the 2004 Supplemental RI, soil contamination was found in the unsaturated zone, the capillary fringe, the saturated zone, and the silt aquitard. This soil contamination was believed to reside mainly on the Pacific Fluids property, though soil contamination was found in each of these zones to extend to the TriPak and United Freight properties (former JM Eagle Manufacturing) to the southeast and southwest. Soil contamination in the saturated zone and in the silt aquifer was believed to extend to the Platinum Lease (former Nelson) property to the northwest and into the Port of Tacoma Road to the north. The 2004 estimated extent of soil contamination in the unsaturated zone, capillary fringe, saturated zone, and the aquitard can be found in Figures ES-3 through ES-6 in Appendix A (CH2M Hill, 2004).

The lateral extent of contamination in groundwater was found to be most extensive for benzene and vinyl chloride (VC). Other identified COCs in groundwater were found to closely follow the lateral extent of soil contamination. Benzene and VC groundwater contamination was found to predominantly reside in a similar footprint as the soil contamination, but also extended further to the southeastern and southwestern TriPak property to the northwestern Platinum Lease property and northern Port of Tacoma Road. The approximate 2004 extent of groundwater contamination in the shallow aquifer can be found in Figures ES-7 and ES-8 in Appendix A, respectively (CH2M Hill, 2004).

TPH was previously reported to be found both in the dissolved and light non-aqueous phase liquid (LNAPL) phases in locations throughout the site. However, in the 2004 Supplemental RI sampling events, LNAPL was not encountered at any monitoring well, including monitoring wells where LNAPL had been reported in the past (CH2M Hill, 2004).

Groundwater contamination was assessed to be confined to the shallow aquifer and not extend to the second aquifer, due to the low permeability of the silt aquitard. Samples collected from the second aquifer and the aquitard confirm that the aquifer creates an effective barrier for downward migration of contaminants (CH2M Hill, 2004).

## 2.4 Remediation History

After the initial Agreed Order of 1995, several remedial technologies were implemented to address site contamination. These remedial technologies are summarized below.

In 2001, Camp Dresser and McKee Inc. (CDM) installed two groundwater interception trenches, one at the northern property boundary and one at the southern property boundary, to prevent off-site migration of the on-site contamination plume. These interception trenches were installed approximately 4 to 6 feet beneath the top of the groundwater table, partially into the silt aquitard (CDM, 2001). Multi-phase extraction (MPE) wells were also installed and operated on the west side of the current TriPak building (Ecology, 2007). Piping and groundwater extraction pumps were installed to divert groundwater collected in the interception trenches into a treatment system. Collected and treated groundwater was discharged into City of Tacoma storm drains (CDM, 2001). The interception trenches, MPE wells, and associated treatment system were utilized from 2001 to September 2003. However, the removal of contaminants in this system was not found to be effective, and the system was discontinued (Ecology, 2007).

In 2003, Terra Vac implemented a remedy that included dual-vacuum extraction (DVE) wells with an associated water and vapor treatment system, as well as in-situ treatment injections, using oxidation and nutrient media. The in-situ groundwater treatment injections were conducted in the known hot spot (near the southern corner of the Pacific Fluids property boundary), the dissolved plume, and in the region evaluated by Terra Vac to contain LNAPL. These in-situ injections were intended to promote biodegradation, thereby reducing the COC concentrations within the site. These treatment actions were continued until March 2006 (Ecology, 2007).

In 2009, a full-scale DPE system was installed (PSCAA, 2007). The layout of this system is presented in Figure 3. The DPE system consisted of 71 groundwater and SVE wells, two knockout tanks, two blowers, a heat exchanger, two transfer pumps, an electric catalytic oxidized, an air stripper, two vapor-phase and two liquid-phase granular-activated carbon (GAC) vessels, and a nutrient and in-situ chemical oxidation (ISCO) injection system (that were installed but never utilized). Water and vapor collected and treated through this system were discharged under a City of Tacoma industrial wastewater discharge permit (IWW permit) and a Puget Sound Clean Air Agency Permit (PSCAA permit), respectively. The DPE system was periodically operated by CH2M Hill, and quarterly groundwater monitoring was conducted until January 2019, at which point shutdown procedures, as outlined in the Operation and Maintenance (O&M) manual (CH2M Hill, 2011), were carried out. The system remained inactive until DPE testing was conducted by Geosyntec in February 2020. Results from the 2020 DPE testing is addressed in Section 4.

# 3. UPDATED CONCEPTUAL SITE MODEL

This section outlines the current understanding of the nature and extent of COCs in soil and groundwater, hydrogeology, geochemistry, fate and transport, and potential receptors based on recent groundwater monitoring data and other data collected since the 2004 Supplemental RI.

## 3.1 Nature and Extent

To characterize the nature and extent of the contamination, as well as which COCs remain above the CULs, Geosyntec conducted groundwater monitoring events in March 2020, June 2020 (MW-11 only), December 2020, and June 2021 (Geosyntec, 2020a, 2020b, 2021). These results were reviewed along with recent soil sampling conducted by Jacobs in 2017. Monitoring well locations are shown in Figure 4.

Recent soil and groundwater sampling results are compared to CULs in Table 1, and for COCs that have current exceedances of CULs, Figures 5a through 5i were created to evaluate the lateral extent of current impacts for each COC with Figure 5j overlying the extents of each COC.[1] Data tables from these groundwater sampling events are provided in Appendix A for reference. Based on recent groundwater and soil concentrations in comparison to CULs, Geosyntec has found the following current COCs that remain at concentrations consistently over CULs:

- TPH, including gasoline, diesel, and motor oil range organics; and
- VOCs of primarily 1,4-dichlorobenzene (1,4-DCB) and VC, with limited detections of tetrachloroethene (PCE).

SVOCs of bis(2-ethylhexyl)phthalate and pentachlorophenol were not detected over CULs during the March 2020, June 2020, December 2020, and June 2021 groundwater monitoring events. With the exception of sporadic and isolated detections in groundwater, concentrations of these COCs generally appear to be consistent with background for the area or are at concentrations above CULs in soil only.[2] With the CULs for these two SVOCs primarily being based on risk to ecological receptors downgradient in the Blaire Waterway, the lack of concentrations in groundwater over CULs indicates that the concentrations in soil may not be a risk to groundwater and downgradient receptors.

Historical soil CUL exceedances can be found for select contaminants within the site boundary and within adjacent properties, as shown in Figures 5a through 5i. The majority of these exceedances were detected in samples collected within the saturated soil or capillary fringe horizons.

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[1] These figures primarily display the results of the March and June 2020 groundwater monitoring event, which included the largest numbers of wells sampled in comparison to the other sampling events in 2020 and 2021. As needed, more recent data or historical data are displayed and are indicated in the figures.

[2] Note that due to matrix interference issues, a subset of the groundwater results in 2020 and 2021 had elevated laboratory reporting limits and method detection limits over the CULs. Concentrations are generally assumed to be at or below groundwater CULs for bis(2-ethylhexyl)phthalate and pentachlorophenol, based on a combination of historical and current groundwater data, with the exception of sporadic and isolated groundwater detections, such as the result in bio-sparge well GS-02, summarized in Section 6 and Appendix E.

As shown in Figure 5j, the overall lateral extent was found to be largely consistent the extent presented in the 2004 Supplemental RI. Site COCs above the CULs were found to reside mainly on the Pacific Fluids property. Groundwater impacts also extend to the adjoining properties at concentrations above CULs and primarily include:

- Motor oil, diesel, and VC extend onto the current Platinum Lease property to the north-northwest of the site, onto the northern edge of the United Motor property to the south-southwest, and into Port of Tacoma Road to the north and northeast of the site. A small amount of motor oil and diesel also appear to extend onto the TriPak property to the south/southeast along the boundary with the site. There are also a few isolated motor oil and diesel detections that exist on the TriPak property that likely represent residual impacts from the site or are possibly from a different source.
- 1,4-DCB and gasoline extend onto the TriPak to the south/southeast.

COCs were not detected in monitoring well MW-11, located north of Port of Tacoma Road in the Port of Tacoma property. As such, the extent of COCs is assumed to be bounded within Port of Tacoma Road to the north/northeast of the site.

## 3.2 Hydrogeology

During the 2020 and 2021 groundwater monitoring events, depth to water in the shallow aquifer was measured at up to 35 groundwater monitoring wells. These results are shown on Figures 6a through 6c for the March 2020, December 2020, and June 2021 events, respectively. The groundwater elevations and the elevation of the silt aquitard are found to be above median sea level, and therefore, the aquifer is interpreted by Geosyntec to be perched. The results showed that groundwater elevations in the shallow aquifer were generally consistent among events with elevations (i.e., no seasonal variation observed) ranging from approximately 9.8 to 13.5 feet above mean sea level (NAVD88; Appendix A).

Groundwater gradients were divided across the monitoring well network during all three groundwater monitoring events, with generally higher groundwater elevations in the southern portion of the Pacific Fluids site and lower elevations radially outward from this area. In general, this resulted in northward gradients on the northern portion of the monitoring network and southward gradients in the southern portion. These gradients are consistent with gradients observed in the 2004 Supplemental RI (CH2M Hill, 2004).

## 3.3 Geochemistry

Field parameters, including dissolved oxygen (DO) and oxidation-reduction potential (ORP), were monitored during the 2020 and 2021 groundwater monitoring events. DO and ORP isopleth maps were generated to characterize and summarize the trends across the site, as shown in Figures 7a and 7b. In March 2020, DO and ORP were found to be higher in the southern portion of the groundwater monitoring well network, where substantial ponding was observed in this area. This area also corresponds to areas with generally lower COC concentrations. Ponding could present a source of surface water infiltration, which would likely raise the DO in this region and promote biological degradation of TPH. The elevated DO and ORP trends in the southern portion of the monitoring network were not as apparent during the June 2021 event, when ground conditions were observed to be generally drier in comparison to the March 2020 event.

## 3.4 Fate and Transport in Groundwater

Groundwater elevations calculated from the 2020 and 2021 groundwater monitoring events indicate that groundwater divides within the perched groundwater zone and groundwater generally flows in two directions: to the north/northwest and to the south. COC concentrations reported in the 2020 and 2021 groundwater sampling events indicated that COC migration to the south is limited, with the following exceptions: gasoline and 1,4-DCB extend to the southern boundary and to the adjacent property to the south and southwest. High DO and ORP values have been observed in the southern extent of the plume and could indicate ongoing aerobic biodegradation or contaminant dilution due to surface water infiltration, as discussed in Section 3.3 above.

The 2004 Supplemental RI identified a potential contaminant migration pathway to the Blair Waterway via the interception of impacted-groundwater migrating northward with the stormwater sewer in the north-adjoining Port of Tacoma Road and then transport via the stormwater sewer and its bedding to the Lincoln Avenue Ditch into the Blair Waterway, as shown in Figure 2 (CH2M Hill, 2004). Supporting evidence for this conceptual pathway was not presented in the 2004 Supplemental RI. Additional investigations in Port of Tacoma Road were evaluated as part of this report to determine if this pathway is active. However, work in the road was found to be prohibited due to a combination of a significant number of underground utilities and City of Tacoma road restoration requirements. As such, this pathway continues to be considered a potential risk to ecological receptors in the Blair Waterway, based on the interpreted extent of COCs in groundwater to the north/northeast of the site to be bounded within Port of Tacoma Road.

## 3.5 Potential Receptors

Geosyntec has prepared a risk assessment (RA) CSM for contamination, which addresses the potential receptors. The site and the adjoining affected properties are zoned for commercial and industrial use; therefore commercial, industrial, and construction workers will be the main focus of this section. Residential use will not be addressed in this report, as this area is not zoned as residential, and this is not expected to change in the future. The RA CSM summary can be found in Figure 8. A summary and discussion of the RA CSM, detailing exposure pathways related to groundwater, soil, and soil vapor, are presented in this section.

Groundwater contamination could reach human receptors in two main ways: through ingestion of contaminated groundwater or ingestion of contaminated surface water. Ingestion of contaminated groundwater was not evaluated to be a likely human exposure pathway, as drinking water wells are not present in this area. However, construction of a groundwater drinking well is not prohibited in this area. Land use restrictions will need to be enacted in this area to prevent future installation of groundwater drinking wells. In the 2004 Supplemental RI, a potential pathway was proposed wherein contaminated groundwater could be discharged to Blair Waterway (Figure 2; CH2M Hill, 2004). Human exposure from contamination to this waterbody is unlikely, as this is not a recreational area, nor is it likely for commercial, industrial, or construction workers to contact water from Blair Waterway on a regular basis. Therefore, a potential pathway could exist for aquatic/ecological receptors.

Soil contamination could reach human receptors in two main ways: through ingestion of contaminated soil and through dermal contact with contaminated soil. Incidental ingestion of or dermal contact with contaminated soil is not likely for present or future commercial or industrial workers. Surficial soil has historically had lower concentrations than soil within the saturated zone. Any exposure to receptors through these pathways would likely be brief and infrequent and are limited to the extensive buildings and pavement at and in the vicinity of the site. Due to the nature of their occupation, construction workers would be more likely to experience incidental ingestion or contact contaminated soil. Additionally, construction workers would be more likely to contact saturated soil, which has historically been shown to have higher soil concentrations.

Soil vapor contamination could reach human receptors in two main ways: through inhalation of indoor air or outdoor air. The depth to groundwater and soil type and density, as well as building size and slab construction, are important factors in evaluating the vapor intrusion pathway. Soil vapor in outdoor air dissipates in ambient air; the rate of which is affected by wind speed and air temperature. Soil vapors typically do not accumulate in outdoor air, with the possible exception of trenches that are dug during utility installations or repairs. If there is a potential for construction worker activity in trenches on site, this pathway should be assessed further based on current COC concentrations and depending on the location of the planned construction activities.

# 4. DUAL-PHASE EXTRACTION SYSTEM PERFORMANCE EVALUATION

In 2009, a DPE System was installed by CH2M Hill. The DPE system was operated intermittently by CH2M Hill until January 2019, at which point shutdown procedures, as outlined in the O&M manual (CH2M Hill, 2011), were carried out. The system remained inactive until DPE testing was conducted by Geosyntec in February/March 2020 to evaluate its performance and identify maintenance requirements. The DPE testing was conducted in three parts: system evaluation and maintenance; short-term tests; and a long-term test. The methods and full results from the 2020 DPE testing are detailed in Appendix D.

In this section, the historical DPE system performance, as well as the February/March 2020 testing results are summarized and evaluated by reviewing vapor and groundwater extraction rates, pneumatic and hydraulic data, extracted vapor and groundwater sampling results, mass removal rates, and maintenance performance in order to understand the efficiency of the DPE system.

## 4.1 Historical DPE Operation

In 2003, a supplemental RI was conducted by CH2M Hill, and in 2009, a DPE system, equipped with a catalytic oxidizer, GAC vessels, and an air stripper was installed to help treat groundwater and vapor (CH2M Hill, 2004 and PSCAA, 2007). The catalytic oxidizer was removed in April 2012, and the DPE system was operated until January 2019 before it was shut down. The system remained inactive for 13 months until DPE testing was conducted by Geosyntec Consultants (Geosyntec) in February and March 2020.

Based on operation and maintenance logs provided by the previous consultant, Jacobs, the DPE system was constructed and began regular operation in October 2009. The system had irregular and frequent shutdown periods, with some of the longest being November 2009 to January 2011 (14 months), November 2013 to the end of December 2013 (2 months), and July 2014 to December 2014 (6 months).

Between October 19, 2009 and June 30, 2017:

- DPE blower 1 operated for 40% of the time period;
- DPE blower 2 operated for 26% of the time period;
- The air stripper operated for 42% of the time period; and
- The system processed water at an average of 3 gallons per minute (gpm).

The most common maintenance issues included:

- Pump fouling or motor overload, requiring shutdown of the air stripper, transfer pumps, and discharge pump;
- System pressure gauge replacements;
- Replacement of filter bags placed in series;
- Clogging of wells and well field pipes; and

- Malfunctioning of ball valves.

Lab reports provided by Jacobs show that influent water was analyzed for VOCs, SVOCs, and n-Hexane Extractable Material (HEM; oil and grease). Influent water had an average HEM concentration of 4.9 milligrams per liter (mg/L) throughout operation, an average total VOC concentration of 0.09 mg/L, and an average total SVOC concentration of 0.25 mg/L. Concentrations did not significantly decrease over the 10--year operational time period (as discussed in Section 5). The DPE system removed an estimated 218 pounds (lbs) of HEM oil and grease, 4 lbs of VOCs, and 11 lbs of SVOCs from groundwater over system operation from 6 August 2009 to 23 January 2019. Groundwater removed by the DPE system was treated on-Site prior to discharge into the sanitary sewer.

Influent laboratory vapor concentrations, provided by Jacobs, show that VOCs and TPH as gasoline had negligible change during the approximately 10 years of system operation, but varied significantly based on which well fields were operating. Influent vapor had an average TPH concentration of 99 parts per million (ppm) and an average total VOC concentration of 390 parts per billion. In total, it is estimated that approximately 18 billion cubic feet of subsurface vapor was removed from the Site during those 10 years of system operation. This resulted in an estimated 43,000 lbs of TPH and over 3,000 lbs of VOCs removed from the subsurface vapor.

## 4.2 2020 DPE Test Results

Based on an evaluation of available data, information shared by the previous consultant (Jacobs), and discussions with Ecology, the DPE testing focused on well fields D, E, and G. Three short-term (24 hours or less) tests were conducted on well fields D, E, and G and a long-term (3 days) test was conducted on well field G. Data collected included manual depth to water readings, extraction wellhead vacuums, vapor and groundwater flow rates, extracted groundwater and vapor VOC/SVOC and semi-volatile and volatile petroleum products concentrations, DPE system operational data, and system operating hours.

### 4.2.1 Operational Performance

The short-term well field D test operated for 5.75 hours on ten wells. The average groundwater extraction rate was observed to be 8.5 gpm, or 0.85 gpm per well. The vapor extraction rate was calculated at 147 standard cubic feet per minute (scfm), or 14.7 scfm per well. The short-term test for well field E operated for 23.5 hours with eight out of the nine extraction wells in operation. The average groundwater extraction rate was observed to be 5.5 gpm, or 0.7 gpm per well. The vapor extraction rate was calculated at 150 scfm, or 18.8 scfm per well.

The short-term well field G test operated for 24 hours on eight wells. The average groundwater extraction rate was observed to be 4.9 gpm, or 0.61 gpm per well. The vapor extraction rate was calculated at 148 scfm, or 18.5 scfm per well. The long-term test conducted on well field G operated for 72.7 non-continuous hours utilizing the eight wells. The average groundwater extraction rate was observed to be 4.7 gpm, or 0.59 gpm per well. The vapor extraction rate was calculated at 148 scfm, or 18.5 scfm per well.

### 4.2.2 Pneumatic Response

Manual vacuum readings were collected from recovery and monitoring wells two to four times for each short-term test and seven times for the long-term test using a digital manometer. BaroDiver® transducers were also placed in eight monitoring wells to collect vacuum data every 1 to 15 minutes throughout the system testing.

The manual vacuum and BaroDiver® readings taken from the surrounding monitoring wells during each test showed minimal to no pneumatic response within well casings. The negligible readings in wells, especially in wells in the direct vicinity of the extraction wells, is believed to be more likely a result of leaks/improper seals in the monitoring wells than a lack of vacuum influence. As a result, calculating a vacuum radius of influence (ROI) was not possible with the data obtained during the testing.

### 4.2.3 Hydraulic Response

Depth to groundwater was collected from monitoring wells with a manual water level meter prior to startup and within an hour of shutdown of each test. Depth to groundwater was also taken from the monitoring wells three to four times during each short-term test and eight times during the long-term test. In addition, eight MicroDiver® transducers were placed in monitoring wells six days prior to system startup and collected readings every minute during the tests.

Transducer data from wells within the extraction areas were compared to transducer data from the background well (MW-01), which is located 200 feet from the closest operating recovery well (Appendix D). The background transducer showed negligible temporal change in groundwater elevation during the test. Hydraulic influence was observed 39 feet from the nearest extraction well during short well field E test, 11 feet for test D, and 64 feet for test G. The largest drawdown (15 inches) was observed at well B-19 (9 feet from extraction well) during the long-term test in well field G.

### 4.2.4 Extracted Vapor Sampling Results

A total of seven vapor samples were collected during testing: five influent samples, one effluent sample, and one sample taken between the vapor-phase granular-activated carbon (VGAC) vessels. Samples were collected in ALS Environmental bottle-vacs and analyzed for TPH as gasoline (TPH-G) per EPA Method TO-3 and VOCs per EPA Method TO-15.

Maximum untreated TPH-G readings for the short-term test in well fields D, E, and G were 110,000 micrograms per cubic meter (µg/m$^3$), <1,300 µg/m$^3$, and 250,000 µg/m$^3$, respectively. The maximum concentration for TPH-G observed during the long-term well field G test was 61,000 µg/m$^3$. VOCs were detected in untreated influent samples for the three short-term tests and the long-term test. Well field D contained the highest concentration of VOCs with PCE, trichloroethene, cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), 1,1-dichloroethene (1,1-DCE), and VC concentrations of 1,600, 200, 2,800, 15, 27, and 270 µg/m$^3$ respectively. The treated effluent vapor sample result was below permit concentration limits.

### 4.2.5 Extracted Groundwater Sampling Results

A total of six influent were collected during the testing and analyzed for VOCs by EPA Method 8260D, SVOCS by EPA Method 8270E, TPH as gasoline by NWTPH-GX, and for #2 diesel and motor oil by NWTPH-DX. Two effluent samples (one grab and one 24-hour composite) were collected during the long-term test. The grab sample was analyzed for VOCs by EPA Method 624, pH by EPA Method 151.1, and TPH (SGT-HEM) by EPA Method 1664A. The composite sample was analyzed for SVOCs by EPA Method 625 and metals by EPA Methods 200.7 and 245.1 (mercury). To evaluate the performance of sediment levels and treatment within the DPE trailer, five water samples were collected during the long-term test and analyzed for total suspended solids (TSS) by EPA Method 2450D.

With the exception of diesel and motor oil results, all influent VOC and SVOC results were below the site cleanup levels. Maximum #2 diesel and motor oil results were 11,000 and 4,300 µg/L for short-term test D, 170,000 and 7,100 µg/L for short-term well test E, and 22,000 and 7,200 for short-term well test G. The maximum #2 diesel and motor oil concentrations observed during the long-term well field G test were 25,000 and 8,900 µg/L, respectively. There were not exceedances of cleanup levels or discharge limitation in the treated effluent samples.

Based on the results of the TSS sampling (all samples ranged from 200 to 290 milligrams per liter), sediment removal with the bag filters did not appear to be occurring during the test. Additionally, the relatively high TSS values suggest that additional filtration would be needed to prolong the life of the LGAC vessels.

#### 4.2.6 Mass Removal

Contaminant mass removal estimates in the extracted vapor and groundwater are calculated using the estimated extracted vapor/groundwater volumes and laboratory analytical results. During the short-term tests, an estimated 0.4 lbs of contaminants was removed from well field D, 0.07 lbs from well field E, and 3.4 lbs from well field G in the vapor phase. During the long-term well field G test, approximately 2.0 lbs of contaminants was removed in the vapor phase.

During the short-term tests, an estimated 0.4 lbs of contaminants was removed from well field D, 1.6 lbs from well field E, and 1.8 lbs from well field G in the extracted groundwater. During the long-term well field G test, approximately 4.9 lbs of contaminants was removed in the extracted groundwater.

#### 4.2.7 Maintenance

After the DPE pilot operation, a number of maintenance issues were identified, including wellhead and stinger damage, suspected extraction well sand pack failure, significant sediment accumulation in transfer piping, rusted liquid and VGAC vessels, broken gauges, inoperable flow meters, a failed liquids transfer pump, and an inadequately sized discharge transfer pump.

### 4.3 Dual-Phase Extraction System Assessment

The DPE system was installed in 2009 and operated intermittently during a span of approximately 10 years. During this operation, it is estimated that approximately 230 lbs of COCs was removed from the groundwater. The intermittent operation of the DPE system, over the 10-year operational span, reduced the overall effectiveness at reducing COC concentrations in the groundwater. When DPE operations are stopped, the water rebounds and has to be dewatered again prior to be able to effectively extractor vapors from the subsurface. DPE is most effective during continuous operations that allow for sustained dewatering of the target remedial area.

During the pilot operation approximately 14 lbs of contaminant (gasoline, #2 diesel, motor oil, VOCs, and SVOCs) mass was removed. Approximately 9 lbs of contaminant mass was removed in the water phase, and 5 lbs was removed in the vapor phase. A changeout of the GAC system was required during the pilot operation, system operation issues were observed, and additional maintenance issues were identified if the system was to be used for full-scale remediation again. The main issues and uncertainties that remain pertaining to the DPE system include:

- Ability to continuously operate the system for an extended period of time, given funding limitations for this project. Frequent shutdowns can result in less efficient system operation because of the time needed to dewater the site and allow for vapor extraction from the dewatered zone;
- Limited access to portions of the site for remediation, based on the believed ROI from DPE wells. This would likely limit DPE's effectiveness in achieving CULs across the plume;
- Expected plumbing repairs and well redevelopment requirements needed to make existing well fields useable;
- Diminishing integrity of the DPE wells, requiring routine cleaning or redevelopment to remain effective;
- Continual maintenance requirements (e.g., bag filter and GAC changeouts) to keep the system operational;
- Purchase of new equipment to (e.g., replacement of GAC vessel and new pump following knockout tank) to allow for effective treatment system operation; and
- Limited mass removal without increasing the permitted discharge under the site's industrial wastewater discharge permit.

Additionally, there has been limited evaluation of DPE well fields that were not used during the pilot operation. Therefore, uncertainties exist related to operational efficacy and maintenance requirements associated with those well fields.

Although the DPE system was able to be operated for the pilot test and successfully removed COC mass from the site, there is still an abundance of equipment-related issues that will require attention to successfully operate the system on a full-scale, continuous basis. These issues and the other items noted above are considered in the focused feasibility in Section 7.

# 5. NSZD AND MNA EVALUATION

The NSZD and MNA evaluation was conducted to provide insight into the rate and extent of anticipated natural degradation and attenuation of TPH and VOC COCs in groundwater related to the site. Along with this assessment, Geosyntec also collected data to assess whether bio-sparging is effective at increasing the rate of NSZD, in conjunction with the other data collected as part of the bio-sparging pilot study, described in Section 6. Overall, the NSZD and MNA evaluation included the following elements:

- **Statistical Trend Analysis**, which included Mann Kendall and linear regression statistical analysis. Mann Kendall trends were evaluated for each COC currently above CULs in groundwater with trends reviewed pre-DPE (before 2009), since the start of DPE in 2009, and the entire data set. Note that due to the recent and limited operation (both in extent and duration) of the bio-sparge pilot study, statistical trends during the bio-sparge pilot study could not be evaluated. Long-term bio-sparge operations would be needed to evaluate statistical trends in groundwater monitoring data.
- **MNA and NSZD Groundwater Parameter Evaluation**, which included groundwater monitoring to evaluate natural attenuation of COCs, primarily TPH and VOCs. Samples were collected during two monitoring events with samples analyzed for geochemical parameters, breakdown products, COCs, and microbial analysis of native biota enumeration and genetic indicators.
- **NSZD In Situ Microcosms & Microbial Toxicity (MicroTox) Assessment**, which included the collection of carbon dioxide ($CO_2$) flux data to evaluate intrinsic rate and extent of anticipated NSZD of TPH in groundwater and to provide supporting data to assess and quantify the effect of bio-sparging on the rate of petroleum hydrocarbon attenuation. Along with the $CO_2$ flux data collection, Geosyntec also collected groundwater samples to conduct a MicrTox assay to evaluate if there are areas of the contaminant plume that may be inhibiting microbial growth and biodegradation.

The elements of the MNA/NSZD evaluation are detailed in the subsections below.

## 5.1 Statistical Trend Analysis

To characterize historical trends, Mann Kendall and linear regression statistical analyses were evaluated for historical site COC results at groundwater monitoring wells across the site using data provided by the previous consultant, Jacobs Engineering Group Inc. (Jacobs) and data from the 2020 and 2021 groundwater sampling events. While seasonal variation was not observed, the data were found to be highly variable. Due to high variability, linear regression was not found to be an appropriate statistical analysis for the majority of the dataset. More information regarding the use of linear regression and Mann Kendall analysis for this dataset can be found in Appendix B.

In preparation for Mann Kendall analysis, data were divided into three categories: the pre-DPE remedy time period, from 2003 to 2009; the DPE remedy time period, from 2009 to 2021; and the overall time period, from 2003 to 2021. Mann Kendall results were categorized as follows: decreasing; probably decreasing; increasing; probably increasing; no trend; insufficient data (less than 4 data points); and non-detect (less than 50% detection frequency). Groundwater samples were not historically collected at consistent locations throughout the study period, and as a result, many wells had insufficient data for analysis. Spatial Mann Kendall results for the primary remaining COCs, as outlined in Section 3.1, are summarized in Figures 9a through 9i.

Mann Kendall results for COCs were found to be predominantly stable, less than 50% detection, no trend, insufficient data, decreasing, or probably decreasing. Thirteen well locations were identified to have probably increasing or increasing Mann Kendall trends for one or more of the COCs. COC concentrations at these locations were all below the respective CULs during 2020 and 2021 monitoring events, with the following exceptions:

- Mann Kendall results at CDM-31 indicated that diesel concentrations had an increasing trend in the DPE time range and the overall time period. Concentrations since 2017 have been above the CUL.
- Mann Kendall results at B-02 indicated that diesel concentrations had an increasing trend in the DPE and overall time periods. Diesel concentrations at this location are currently above the CUL.
- Mann Kendall results at B-13 indicated that motor oil concentrations had an increasing trend in the DPE time range and overall time period. Concentrations since 2013 have been above the CUL.

Due to inconsistent historical monitoring, especially within the pre-DPE time period, many of the wells that demonstrated decreasing or probably decreasing trends within the DPE time period did not have sufficient data or did not show a trend in the pre-DPE time period. As a result, insufficient data exist to statistically evaluate whether there was a definitive reduction in COC concentrations as a result of the DPE treatment versus natural attenuation of COCs.

In addition to reviewing long term trends, isoconcentration contours maps showing historical (2011) and recent (2021) groundwater analytical results were created to evaluate the changes in the plume footprint over time. Two COCs (TPH as gasoline and TPH as motor oil) were selected to represent a range of mobility and degradation rates. TPH gasoline, having shorter carbon chains than motor oil, is more mobile and likely to have a higher degradation rate. TPH as gasoline and TPH as motor oil isoconcentration contours for both April 2011 and June 2021 are represented on Figures 9j and 9k. A review of these figures shows that the aerial extent of TPH as motor oil above the CULs has not changed significantly over the past ten years, suggesting that the plume is stable and not migrating or expanding. Additionally, as expected, TPH as gasoline plume has significantly decreased over time.

## 5.2 MNA and NSZD Groundwater Parameter Evaluation

From December 2020 through June 2021, Geosyntec conducted groundwater monitoring for the purpose of collecting data to evaluate natural attenuation of COCs, primarily TPH and VOCs. Two primary sampling events were conducted: one in December 2020 and one in June 2021, which followed the completion of the bio-sparge pilot study. The results of these events were documented separately to Ecology (Geosyntec, 2020b, 2021) with data tables provided in Appendix A for reference. Groundwater sampling parameters during both events consisted of the following:

- Field parameters to evaluate oxidation-reduction in the shallow aquifer, including DO and ORP, which were discussed in Section 3.3;
- Nitrate and sulfate to evaluate competing electron acceptors;
- Orthophosphate to evaluate nutrients for biological degradation of petroleum hydrocarbons;
- Dissolved and total ferrous iron and manganese, also to evaluate oxidation-reduction state in the shallow aquifer;
- Dissolved methane, ethane, and ethene to evaluate degradation products of TPH and chlorinated ethanes/ethenes; and
- Microbial analysis of native biota enumeration and genetic indicators to assess native biota that are capable of degradation of COCs in groundwater.

Oxygen, $CO_2$, methane, and hydrogen sulfide were also measured in the well headspaces prior to sampling. A summary of these results and key observations are provided below.

Geochemical Indicators

As discussed in Section 3.3, ORP is typically positive across the site and indicate conditions conducive to oxidization. The level of ORP and DO concentrations vary across the site and between monitoring events with higher DO and ORP observed in March 2020, particularly in the southern portion of the monitoring well network, compared to June 2021. The oxidative conditions are also evidenced by 0the presence of nitrate and sulfate in groundwater across the monitoring well network (if ORP were negative, both nitrate and sulfate would likely be reduced). Consistent with the spatial variability of DO and ORP, variability is also observed in iron and manganese concentrations in groundwater, with higher concentrations observed in the central portion of the site. Iron and manganese are also detected at similar ranges for dissolved and total concentrations.

COC Breakdown Products

Methane, a breakdown product of petroleum hydrocarbon degradation, has been detected in groundwater samples across the site, with the highest concentrations in the centration portion (up to 16,000 µg/L), where the highest concentrations of diesel and motor oil are located. Methane has also been detected in the vapors in the well headspace, after the monitoring wells have been capped for several months. Methane vapor concentrations have been observed up to 1.4% by volume but attenuated quickly after opening wells. These methane detections in groundwater samples and well headspace are indicative of methanogenesis occurring.

Dissolved ethane and ethene, which are non-toxic end-products of reductive dechlorination of chlorinated ethanes and ethenes, have also been detected in groundwater samples. Ethane has been detected in seven wells at concentrations up to 180 µg/L, and ethene was detected in one of the December 2020 samples (B-19) at a concentration of 1.5 µg/L.

Nutrients

Orthophosphate was detected in several wells at concentrations up to 0.42 mg/L. These results suggest the presence of nutrients to support biological activity.

Microbial Analysis

Native biota samples were collected and analyzed via Gene-Trac® Next-Generation Sequencing (NGS) for a nontargeted analysis of the native biota present. The biota present were genetically sequenced, identified, and categorized and a functional analysis was performed to identify which biodegradation processes, such as methanogenesis (methane generation), are most likely to be occurring or would succeed given the biota already present. Two sets of samples were collected: 1) one set from December 2020, before the bio-sparge pilot study and consisting of samples from three wells (SP-06, AGI-07, and CDM-19); and 2) one in June 2021, three weeks after the completion of the bio-sparge pilot study with the same three wells sampled plus two other wells (CDM-21 and B-25). B-25 was collected as background samples since it is out of the likely radius of influence for the bio-sparge pilot. CDM-21 was sampled as a test well that is near the edge of the pilot test area. Sampling locations are shown in Figure 10, and the operational taxonomic unit enumeration results and functional analysis results from the NGS sequencing are shown on Tables 2 and 3. Analyzing the changes in the functional analysis between the samples collected before the bio-sparge pilot (pre-pilot) and three weeks after the conclusion of the bio-sparge pilot (post-pilot), the following observations are made:

- SP-06 and AGI-07, which are located near retrofitted DPE wells RW-47D and RW-19-G, respectively, showed very little change in functional diversity from pre- and post-pilot samples and mostly contained more reductive functional groups (methanogenesis, fermentation, methanotrophy, and methylotrophy) along with chemoheterotrophy;
- CDM-19, which is located near new well GS-01, had a significant increase in functional diversity. The system contained the functions identified with SP-06 and AGI-07, but also had the addition of higher oxidation reduction potential functions including oxygenic phototrophy, nitrification, nitrogen respiration, and sulfate respiration;
- CDM-21 sample was not collected during the pre-pilot sampling, but the sample was collected as an additional sample for the June 2021 sampling event because it was located downgradient from new well GS-02. The post-pilot sample showed significant functional diversity including several functional overlaps with post-pilot sample for CDM-19; and
- B-25 was not sampled during the pilot-pilot sampling, but sample was collected during the post-pilot sampling as a general background because the location was out of the area of influence of the pilot test. This sample had relatively the same functional diversity as SP-06 and AGI-07 which were primarily reductive environment functions (methanogenesis, fermentation, methanotrophy, and methylotrophy).

Properly functioning biosparge systems should increase the diversity and abundance of the microbial community during operation. Based on these NGS sequencing results, the new bio-sparge wells appeared to have greater impact on the native biota by increasing the diversity than the retrofitted DPE wells. While this may suggest that improved bio-sparge activity might be achieved by installing new bio-sparge wells rather than retrofitting the DPE wells, the bio-sparge pilot study was conducted with a relatively limited number of DPE wells and new bio-sparge wells (three wells each) and over a limited six-week duration. Interestingly, the total bacterial counts appeared to go up in SP-06 and AGI-07 by two to three times based on enumeration data listed in Table 2, but total counts in samples from CDM-19 decreased by approximately 0.5 times. Based on this conflicting data, extended bio-sparge operations would be beneficial to evaluating this observation further.

## 5.3 NSZD In-Situ Microcosms and MicroTox Assessment

Geosyntec preformed an NSZD rate estimation study using in-situ microcosms. This was conducted in two monitoring events in April and June 2021. The two field events were scheduled to occur immediately prior to the 2021 bio-sparge pilot test and in the final two weeks of the bio-sparge pilot study. The objectives of the NSZD rate estimation study were to provide insight into the intrinsic rate and extent of anticipated NSZD of TPH in groundwater and to provide supporting data to assess and quantify the effect of biosparging on the rate of petroleum hydrocarbon attenuation.

To accomplish these objectives, Geosyntec collected $CO_2$ flux data using eight in-situ microcosms to estimate NSZD rates. The microcosm locations are shown in Figure 10. To estimate the $CO_2$ flux data associated with biological activity, only $CO_2$ with a 14/12 Carbon isotope ratio associated with fossil fuel degradation was used in NSZD rate calculations. The details of the NSZD rate estimation evaluation are provided in Appendix C. These NSZD rate estimates were also used to evaluate cleanup timeframes with and without bio-sparge.

Results from both events were evaluated with respect to the lateral distribution of COCs to identify potential trends in degradation rates. During the baseline NSZD rate estimation monitoring event (5 April and 19 April 2021) n general, NSZD rates less than a few hundred gallons of fossil fuels degraded per acre per year are considered low and rates in the thousands of gallons of fossil fuels degraded per acre per year are considered high. The results are summarized below:

- The background in-situ microcosm ($CO_2$-04) had equivalent NSZD rates of 67 gallons of fossil fuels degraded per acre per year;
- In-situ microcosm locations with motor oil and diesel concentrations exceeding the respective site-specific CULs, but 1,4-DCB and VC concentrations below the respective site-specific CULs, ($CO_2$-03 and $CO_2$-05) had equivalent NSZD rates ranging from 1,172 to 6,827 gallons of fossil fuels degraded per acre per year;
- In-situ microcosm locations with motor oil, diesel, and 1,4-DCB concentrations exceeding the respective site-specific CULs ($CO_2$-06, $CO_2$-07, and $CO_2$-08) exhibited equivalent NSZD rates of between less than 30 and 318 gallons of fossil fuels degraded per acre per year; and
- In-situ microcosm locations within or adjacent to motor oil, diesel, and VC concentrations exceeding the respective site-specific CULs ($CO_2$-01 and $CO_2$-02) were not reported above the detection limit of 30 gallons of fossil fuel degraded per acre per year.

In comparison, at the end of the bio-sparge pilot study (18 May to 1 June 2021), results can be summarized as follows:

- The background in-situ microcosm ($CO_2$-04) had equivalent NSZD rates of 92 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 37% between the two monitoring events. This increase is assumed to be a result of increased subsurface temperatures between the April 2021 and June 2021 events.
- In-situ microcosm locations with motor oil and diesel concentrations exceeding the respective site-specific CULs, but 1,4-DCB and VC concentrations below the respective site-specific CULs ($CO_2$-03 and $CO_2$-05) had equivalent NSZD rates ranging from 9,083 and 12,834 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 33% to 995% between the two monitoring events.
- In-situ microcosm locations with motor oil, diesel, and 1,4-DCB concentrations exceeding the respective site-specific CULs ($CO_2$-06, $CO_2$-07, and $CO_2$08) exhibited equivalent NSZD rates of between 841 and 277 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 79% to 3,233% between the two monitoring events.
- In-situ microcosm locations within or adjacent to motor oil, diesel, and VC concentrations exceeding the respective site-specific CULs ($CO_2$-01 and $CO_2$-02) exhibited equivalent NSZD rates of between 49 and 93 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 227% to 520% between the two monitoring events.

Due to the lower relative NSZD rates in areas with concentrations of 1,4-DCB and VC in groundwater over CULs compared to other areas within the contaminant plume, Geosyntec collected groundwater samples at select wells for MicroTox assay. These locations are also shown in Figure 10. The purpose of the MicroTox analysis was to evaluate areas that may be inhibiting microbial growth and biodegradation. The MicroTox analysis used the bacteria vibrio fischeri as an indicator of general microbial toxicity of the groundwater samples. The results of this test are only for the purposes of evaluating groundwater microbial toxicity and are not an indicator of aquatic toxicity. As discussed in Appendix C, the results overall supported that the areas with relatively low NSZD rates exhibit moderate to high microbial toxicity. However, given the significant increase in NSZD rates at the end of the bio-sparge pilot study, these results suggest that the bio-sparge may be effective at reducing the level of microbial toxicity and enhancing NSZD processes.

Using the $CO_2$ flux trap data, site wide area-weighted average NSZD rates were calculated under baseline and anticipated bio-sparge conditions. The average NSZD rates under baseline and anticipated bio-sparge conditions were calculated to be approximately 2,073 gallons of fossil fuels degraded per acre per year and 5,795 gallons of fossil fuels degraded per acre per year, respectively. The petroleum hydrocarbon mass remaining was estimated using a combination of recent groundwater monitoring data to estimate mass in the dissolved phase and partitioning ratios between historical COC concentrations in groundwater, unsaturated soil, capillary fringe soil, and saturated soil to estimate current mass remaining that is sorbed to soil. Mass estimates were then compared to the assigned NSZD rates under baseline and anticipated bio-sparge conditions to evaluate areas that showed potential for enhanced cleanup timelines using the bio-sparge remedy and was utilized in the development of remedial alternatives in the focused feasibility study presented in Section 7.

Overall, mass removal estimates were developed assuming a linear degradation rate over time, projecting cleanup to non-detect levels. Cleanup timeframes with bio-sparge are estimated to be approximately 30% of the timeframe for NSZD alone. The average estimated cleanup time frame under bio-sparge and NSZD were 18 and 85 years, respectively, with some areas expected to clean up significantly faster or slower than these averages. However, it should be noted that bio-sparge degradation rates are likely to be faster than estimated based on the current rates, because the current rates are estimated using $CO_2$ flux results after only four to six weeks of bio-sparge operation at only six wells. NSZD depletion rates are likely to be slower than estimated because degradation rates tend to decline with time, as COC concentrations decline. These timeframe estimates were also utilized in the focused feasibility study for comparison purposes of the NSZD and bio-sparge remedial alternatives.

## 5.4 NSZD and MNA Evaluation Results Summary

Consistent with the CSM presented in Section 3, the results of the NSZD and MNA evaluation demonstrated that the primary COCs remaining are hydrocarbons in the motor oil and diesel range. VOCs are also observed but to a more limited extent. Both VC and 1,4-DCE, which may contribute to microbial toxicity and limit rates for NSZD of petroleum hydrocarbons, are limited in extent and showing declining or stable trends. PCE is also detected above the CUL but currently only in samples from one well; PCE concentrations have likely attenuated in groundwater over time due to the presence of dehalogenating bacteria (as detected in the NGS samples) and the presence of a carbon source (electron donor) from the petroleum hydrocarbons.

Both diesel and motor oil are present in groundwater across the site and extended off-site with a subarea also containing concentrations of gasoline range hydrocarbons above the CUL in groundwater. Overall, the $CO_2$ flux rates indicated that NSZD is occurring in most areas of the site and at relatively high rates in the eastern portion of the plume. Microbial populations conducive to petroleum hydrocarbon degradation were also detected across the site. Lower $CO_2$ flux rates were observed where concentrations of petroleum hydrocarbons are lower and/or higher levels of microbial toxicity were observed. These higher levels of microbial toxicity may be due chemicals in groundwater that could include COCs of VC and 1,4-DCE. However, the operation of the bio-sparge pilot system appeared to have a positive influence in increasing microbial populations conductive to petroleum depredation, increasing the $CO_2$ flux rates, and lowering microbial toxicity.

Overall, MNA and NSZD appear to be occurring, as evident by the Mann-Kendall statistical assessment and visual evaluation of isoconcentration contours maps, which show overall stable or declining concentration trends and plume extent. In addition, the rates of NSZD appeared to increase after bio-sparge, as bio-sparge likely enhances the petroleum degradation processes that are already occurring.

# 6. BIO-SPARGE PILOT STUDY

In Spring 2021, a bio-sparge pilot study was conducted to assess the efficacy of remediating COCs to concentrations below the site-specific CULs. The pilot study was conducted to evaluate the following:

- The effectiveness at increasing DO and ORP in groundwater and how long DO will remain in the groundwater following system shutdown;
- The ROI associated with the injection wells and the impact that bio-sparge may have on sub-slab vapor concentrations and risk to indoor air quality; and
- The differences in well efficiencies between the existing DPE wells and newly installed injection wells.

In this section, the 2021 testing results are summarized and evaluated by reviewing field parameters, groundwater sampling results, and system operating parameters. Data collected included manual depth to water readings, vapor readings ($CO_2$,VOCs, oxygen, methane, hydrogen sulfide), groundwater readings (DO, ORP, pH), air injection flow and pressures, and groundwater analytical results for site COCs. A detailed discussion of pilot study activities and results is included in Appendix E and summarized in this section.

## 6.1 Pilot Study Setup and Operations Summary

Based on an evaluation of current DPE system configuration, the bio-sparge system was designed to utilize existing equipment when feasible. The system was configured to inject air into six wells: three redeveloped DPE wells (RW-12-G, RW-19-G, and RW-47-D) and three newly installed injection wells (GS-01 through GS-03) with several monitoring points in proximity to each well. Well locations are shown in Figure 10. The bio-sparge system was able to use preexisting nutrient lines to inject air into the ground. The pilot study was operated for approximately six weeks from 20 April to 3 June 2021.

During the six-week pilot operation, the system operated at different pulsing frequencies. This was conducted to evaluate the efficacy of long-term bio-sparge with pulsing patterns adjusted to assess how much air could be injected into the formation at a time without creating preferential pathways in the subsurface. Over the course of the pilot study, three different pulsing rates were implemented: 9 minutes on and one minute off (referred to as “9/1”), 15 minutes on and 5 minutes off (“15/5”), and 55 minutes on and 5 minutes off (“55/5”).

The 9/1 pulsing frequency was operated for 11 days with an average air injection rate of 6.4 scfm and pressures ranging from 0 to 6 pounds per square inch (psi) at the well heads. Pulsing was then adjusted to 15/5 for 11 days with an average air injection rate of 7.0 scfm and pressures ranging from 2.5 to 4.5 psi at the well heads. During this pulsing frequency, ORP levels began to show an increasing upward trend suggestive of more efficient oxygen transfer to the groundwater. Pulsing was then adjusted to 55/5 for 14 days with an average air injection rate of 6.5 scfm and pressures ranging from 2 to 5.5 psi at the well heads. During this 55/5 pulsing frequency, ORP levels began to drop steeply back down to levels observed prior to the start of the bio-sparge pilot study. This behavior is suggestive of preferential pathway formation causing a decrease of oxygen transfer into the groundwater. In response to the reduced ORP readings, Geosyntec reverted to the earlier operational pulsing of 15 min on and 5 min off (15/5) for the final 10 days of operation with an average air injection rate of 5.5 scfm and pressures ranging from 2.5 to 5 psi at the well heads. During this pulsing frequency, ORP levels did not increase again, which could be a result of the preferential pathways having been established. These trends/correlations are uncertain and additional long-term operation is needed to further evaluate.

## 6.2 2021 Bio-Sparge Operation Results

To evaluate the effectiveness of bio-sparge, a variety of parameters were collected, including sub-slab vapor, groundwater parameters and samples, general system maintenance and operation, and $CO_2$ in-situ microcosm samples. The monitoring results are discussed in the subsections below.

### 6.2.1 Vadose Zone Field Results

Pressure readings recorded from the injection well heads and surrounding vapor pins during the pilot test showed that air was being injected into the formation at pressures (0 to 6 psi) similar to the theoretical overburden pressure[3] (2.1 to 8.5 psi). Pressures observed at vapor pins near the injection locations showed a measurable response to system pulsing at distance of 9 feet from the newly installed injection well. Pressure responses were not observed at any vapor pins installed adjacent to the redeveloped DPE wells that were utilized for this pilot study.

Background $CO_2$ data was measured in sub-slab vapor and well headspace and ranged from 0.1 to 0.9% by volume (%v). Monitoring well SP-06, which is 8 ft from a modified DPE injection well, had $CO_2$ concentrations increase from 0.3 to 0.6%v during the pilot study operations. In vapor pins, elevated $CO_2$ concentrations were observed at 3 ft and 6 ft from DPE injection well RW-47-D with concentrations reaching as high as 1.1%v at 3 ft and 0.7%v at 6 ft. Carbon dioxide concentrations in vapor pins near newly installed injection well GS-01 did not increase above background levels throughout the study. Observed $CO_2$ concentrations at GS-01 ranged from 0 to 0.2%v.

Total VOC concentrations, as measured by a photoionization detector (PID), show temporary increases at select locations during the first few weeks of the pilot study. These concentrations subsequently declined, indicating that implementation of bio-sparge may only have a temporary impact on VOC accumulation in sub-slab vapors. This temporary increase in PID readings was observed at wells that contained detectable concentrations of VOCs in the groundwater prior to system startup. Spikes in PID readings were observed north of injection location RW-47-D (monitoring well CDM-20), near GS-03 (monitoring well AGI-14), and near RW-12-G (monitoring well P-1A). Increases in VOC concentration were observed to change from 14 parts per million by volume (ppmv) to 250 ppmv in monitoring well CDM-20, 160 ft from bio-sparge injection well RW-47-D, 0 ppmv to 380 ppmv in monitoring well AGI-14, 15 ft from injection well GS-03, and 0 to 40 ppmv in monitoring well P-1A, 10 ft from infection well RW-12-G.

[3] The overburden pressure is the vertical pressure attributed to the weight of the overlying soil and fluids. The overburden pressure can be calculated by taking the surface pressure plus the density of the overlying soil multiplied by the depth of interest (e.g. the depth of injection) multiplied by the acceleration of gravity.

### 6.2.2 Groundwater Sampling Results

Prior to the startup of the bio-sparge pilot study, groundwater samples were collected from the six bio-sparge injection wells. These same locations were resampled at the end of the six-week pilot study. Samples were analyzed for VOCs, SVOCS, and TPHg, diesel, and motor oil. Pre-pilot study results showed that groundwater exceeded the CUL for motor oil and diesel, except at GS-02. RW-12-G was the only location where groundwater exceeded the CUL for gasoline. Samples collected from RW-47-D and GS-03 exceeded the CUL for 1,4-DCB. In addition, groundwater at RW-12-G exceeded the CUL for VC and groundwater at GS-02 exceeded the CUL for pentachlorophenol.

In general, field parameters collected at the injection wells prior to the pilot study showed low DO concentrations (0 to 0.1 mg/L), neutral pH (6.22 to 7.15 standard units), and low to negative ORP (-114 to 50 mV). Modified DPE well RW-47-D was the only injection well with an elevated baseline DO concentration (8.66 mg/L). During post-pilot groundwater sampling, the injection wells generally had higher DO concentrations (1.18 to 8.32 mg/L), lower pH (2.75 to 5.1 standard units), and higher ORP (180 to 395 mV). RW-12-G was the only location with a pH that was more basic (8.03) than baseline results. The development of acidic conditions may partially be attributed to biological activity at the injection locations. The more biologically active an area, the higher the $CO_2$ production. The $CO_2$ will then create carbonic acid in the groundwater and lower the pH. Another contributor to the reduction in pH concentrations may be attributed to the injected air reacting to VOCs and producing $CO_2$ and hydrochloric acid; however, given the relatively low concentrations of VOCs, this is likely less of a contributor to changes in pH.

Post-pilot laboratory results showed that samples from the injections wells had concentrations of gasoline below the CUL. Concentrations of motor oil also declining in the wells compare to pre-pilot study results, with motor oil concentrations in samples from RW-19-G, RW-47-D, and GS-03 being reported below the CUL. Concentrations of diesel were reduced in half of the wells and increased in half of the wells. The increase in diesel concentration may be attributed to the incomplete biodegradation of motor oil, which may result in shorter chain hydrocarbons within the diesel range. 1,4-DCB, VC, and pentachlorophenol were below the CUL in samples collected from the six wells and was not detected in the sample from GS-02. The reduction in VOC concentrations and the lighter chain/volatile TPH (within the gasoline range) is believed to be attributed to the process of air sparging within the wells, and the reduction of the mid-to-heavy-range/semi-volatile TPH compounds (diesel and motor oil range) is more likely attributed to biodegradation. The reduction of the pentachlorophenol concentration in the samples collected from GS-02 may be attributed to several factors, including but not limited to, turbidity in the original, pre-pilot study sample that may have resulted in a higher bias of the dissolved-phase concentration, groundwater becoming more acidic during the pilot study, which increases pentachlorophenol's ability to adsorb to soils, and/or general variation in concentrations. Groundwater samples collected from monitoring wells, located near bio-sparge injection locations, were evaluated for trends following the bio-sparge pilot test. Appendix E, Figure 8 series presents the monitoring well data that was reviewed. Findings from the nearby monitoring wells suggest that injection wells from the bio-sparge pilot study may have impacted COC concentrations in groundwater up to 12 ft. The evaluation of the bio-sparge ROI was limited to existing monitoring well proximity or vapor pin placement.

The overall reduction of VOCs and TPH, at the bio-sparge injection locations, indicate that volatilization and/or biological breakdown of COCs occurred in the groundwater at the injection wells. The results from the pilot study suggest that bio-sparge is a viable approach for remediating COCs, particularly within the injection wells; however, continued operations would be useful in better evaluating the ROI from injection locations.

### 6.2.3 Maintenance

The operation of the bio-sparge system required minimal maintenance during the pilot study. The primary maintenance involved adjusting flow valves to balance flows and reinflating packers to maintain an air-tight seal in the injection wells. The air delivery system via the existing DPE system nutrient injection lines did not require any maintenance during operation.

### 6.2.4 Bio-Sparge Pilot Study NSZD Rate Evaluation using In Situ Microcosms

As discussed in Section 5 above, bio-sparge in situ microcosm results showed that locations with motor oil, diesel, and 1,4-DCB concentrations exceeding the site-specific CULs had a greater than 79% increase in degradation rate, compared to pre-bio-sparge (baseline) conditions. Additionally, locations with motor oil, diesel, and VC concentrations exceeding the CULs had a greater than 227% increase in degradation rate, compared to pre-bio-sparge conditions. Finally, locations with motor oil and diesel concentrations as the only COCs exceeding the site-specific CULs had a 33% to 995% increase in degradation rate. These results are a several fold increase to the 37% increase attributed to temperature increases between the April and June 2021 sampling events.

## 6.3 Bio-Sparge Pilot Study Conclusions

Overall, the bio-sparge pilot study was successful at increasing ORP and enhancing conditions favorable for aerobic biodegradation within and in vicinity of the injection wells and showed that COCs in groundwater can be reduced to concentrations below the CULs at the injection locations. Injections were generally successful at both retrofitted DPE well and newly installed wells with a ROI observed up to 7 to 12 ft. The bio-sparge system did not have operational issues and was able to operate continuously for the duration of the six-week pilot study without being turned off. The existing site infrastructure was able to be utilized for bio-sparge with development of the DPE wells and limited alterations to the conveyance lines and wellheads.

While the pilot study showed that bio-sparge is a promising technology for the site, the pilot study was limited with respect to scale and duration. As such, following the bio-sparge pilot test, there are still uncertainties that remain if a bio-sparge system is to be utilized for full-scale remediation. The main uncertainties that remain pertaining to operation of a bio-sparge system include:

- Limited access to portions of the site for remediation, based on the estimated ROI from bio-sparge wells. While this is similar to the DPE limitation in Section 4, bio-sparge enhances the natural attenuation processes, which are assumed to likely propagate further across the site during long-term operations than with DPE, which is limited to its dewatering ROI.

- Likely a need for redevelopment of DPE wells that will be used as part of the bio-sparge system due to observed well fouling during DPE operations and during well assessments prior to the bio-sparge pilot study.
- Likely a need for installation of new bio-sparge wells to increase coverage.

These uncertainties are considered in the focused feasibility study in Section 7 below.

# 7. FOCUSED FEASIBILITY STUDY

This section presents an updated focused feasibility study (FS) for the site. The original focused feasibility study was prepared in 2007 and led to the implementation of DPE (Hart Crowser, 2007). In this FS, remedial technologies were screened, and remedial alternatives were developed and evaluated in comparison to continuation of the current correction action for the site, which consists of DPE. This FS was developed using the existing site-specific CULs, which were developed in 2016 (Ecology, 2016a) and revised in 2017 (Ecology, 2017) for protection of human health and downgradient ecological receptors in the Blair Waterway. The pathway to the Blair Waterway was presumed to be interception of impacted-groundwater with the stormwater sewer in the north-adjoining Port of Tacoma Road and then transport via the stormwater sewer and its bedding to the discharge point into the Blair Waterway (CH2M Hill, 2004).

The following subsections present the remedial technology screening and remedial alternatives development and evaluation. Referenced cost estimates are included in Appendix D.

## 7.1 Technology Screening

The following remedial technologies were screened and are used in the remedial alternative development and evaluation in the section below.

- No Action;
- Institutional Controls (ICs) – Soil and Groundwater Use Restrictions;
- DPE;
- MNA and NSZD;
- Excavation;
- In Situ:
    - Bio or Air Sparging;
    - Enhanced Reductive Remediation (Biological or Abiotic);
    - ISCO/Aerobic Biodegradation;
    - Activated Carbon;
- Thermal Desorption/Destruction:
    - Resistive or Conductive Heating;
    - Steam-Enhanced Extraction;
- Slurry Wall;
- Permeable Reactive Barrier; and
- Groundwater Extraction and Treatment.

A description of each technology is provided in Table 4, and each technology is screened against the three United States Environmental Protection Agency (EPA) screening criteria (EPA, 1988) for evaluating remedial technologies: effectiveness, implementability, and cost.

- **Effectiveness** is the ability of each remedial technology to address COCs and protect human health and the environment relative to other options, based on the following:

  - The ability of a remedial technology to achieve the desired cleanup goal for each COC and address the specified areas and volumes;
  - The degree of protectiveness to human health and the environment provided by the remedial technology during construction and implementation; and
  - The reliability of the remedial technology with respect to the COCs and site conditions.
- **Implementability** is the administrative and technical feasibility of a remedial technology, based on the following:
  - The institutional or administrative aspects of implementation, including the ability to obtain necessary permits and general public acceptance;
  - The availability of support services and equipment and the degree to which the technology process option has been demonstrated at other sites; and
  - Property owner acceptance of the remedial technology.
- **Relative Cost** is used to compare the capital and O&M costs of the remedial technology. Cost plays a limited role in the screening of remedial technologies relative to effectiveness and implementability. Relative capital and O&M costs are used rather than detailed estimates. Relative costs are determined based on professional judgment, and each option is evaluated as to whether costs are expected to be low, medium, or high.

Based on the results of the screening, the following technologies were selected for consideration either as stand-alone remedies or in combination with other technologies:

- ICs;
- DPE;
- NSZD/MNA;
- Excavation;
- Bio-Sparging;
- ISCO/Aerobic Biodegradation; and
- Groundwater Extraction and Treatment.

## 7.2 Remedial Alternatives Development

The following remedial alternatives were developed in collaboration with Ecology, were strategically developed based on pilot study performance or proven success when implemented at similar sites and were developed based on their expected ability to meet site-specific CULs:

- Source Remediation Alternatives:
  - Alternative 1 – DPE with Transition to MNA and ICs (i.e., continuation of current remedy),
  - Alternative 2 – MNA/NSZD with ICs,
  - Alternative 3 – Bio-Sparging with NSZD/MNA and ICs, with options below:
    - Alternative 3a – With Concurrent Soil Vapor Extraction (SVE),
    - Alternative 3b – With Concurrent Groundwater Extraction,

    - Alternative 3c – Followed by ISCO/Aerobic Biodegradation,
    - Alternative 3d – Expanded Bio-Sparge Operations,
  - Alternative 4 – Excavation with MNA and ICs; and
- Containment Alternatives:
  - Alternative 5 – Groundwater Containment via Extraction and Treatment with ICs,
  - Alternative 6 – Bio-Sparging Treatment Zone at Downgradient Site Boundary with ICs.

As shown in the alternatives list above, a component of the remediation strategy for all alternatives is establishment of ICs. For these alternatives, complete cleanup to levels protective of unrestrictive land use is unlikely, and ICs are proposed to be implemented for protection of human health. ICs may include: i) land use controls, specifically the prohibition of groundwater use and prohibition of sensitive land uses, such as residential; and ii) engineering controls, including potential need for vapor intrusion mitigation and soil management protocols, should soil with residual levels of COCs be encountered during future construction or site development activities.

For the two containment alternatives, only containment of the northern property boundary is assumed, based on the assumed pathway of COC transport to the Blair Waterway. Even though groundwater elevation contour maps indicate a hydraulic mound with groundwater flow to the north and to the south, COCs to the south of the site are delineated and do not appear to be migrating farther off site. As such, no active containment of the southern portion of the plume is assumed to be needed in Alternatives 5 and 6.

In addition, each alternative outlined below was developed with the following assumptions:

- Exceedances of CULs are only limited to the perched groundwater zone, which is nominally in the upper 12 ft bgs. Previous investigations of the underlying aquitard indicate that COCs are limited to this perched groundwater zone.

- Remedial timeframe projections were limited to within 30 years for costing and comparison purposes of the alternatives. However, as indicated by the $CO_2$ flux trap results, the timeframes to meet the CULs in portions of the site could be longer. Longer timeframes are evaluated as part of a sensitivity analysis in Section 7.3 for the top alternatives.

- Active treatment systems are assumed to be operated continuously during operations, unless otherwise noted below. This applies to all alternatives except Alternatives 2 and 4.

- Preparation of a revised Corrective Action Plan with a remedial design and associated public comment period would be required for Alternatives 2 through 6, because these would be changes from the currently approved DPE corrective action (Alternative 1).

- For Source Remediation Alternatives 1, 3, 3a, 3b, 3c, 3d, and 4, a completion report following active remediation (i.e., DPE, bio-sparging, excavation, and ISCO) would be prepared and submitted to Ecology before transition to MNA.

- For all alternatives, annual groundwater monitoring reports are assumed with data transmittals for interim sampling events (i.e., quarterly or semi-annual events). Each alternative also includes a five-year remedy review report.

- Removal of any existing or future system components and monitoring wells is not included, unless such removal is necessary to implement the proposed remedy. For example, removal of the DPE system components and wells within the excavation footprint is included in Alternative 4; however, DPE system removal is not included in Alternative 2 – MNA/NSZD. Geosyntec assumes that remedial system decommissioning costs will be similar between alternatives and likely incurred at the completion of the project.

### 7.2.1 Alternative 1: DPE with Transition to MNA and ICs

Under Alternative 1, the remedial approach involves continued operation of the current DPE system with updated mechanical equipment and well field improvements, and then transition to MNA with ICs before project closure. Because of historical issues associated with DPE operation, along with issues and notable maintenance needs observed during the pilot study (Section 4.3), the effectiveness of continued DPE operations may be limited. This alternative has been developed primarily for comparison purposes of the existing remedy to other alternatives. The timeframes for this alternative are assumed to be five years of DPE, followed by 15 years of MNA monitoring. The conceptual layout of this alternative is presented in Figure 11. The estimated cost for this alternative in 2021 dollars is $3.2M ($2.3M to $4.8M -30%/+50% range).

The DPE system uses wells to simultaneously extract groundwater and soil vapors from the subsurface, with the objective of drawing down the groundwater table to dewater and expose saturated soil to vapor extraction. On-site wells are connected to a treatment system by above- and below-grade piping that is used to convey groundwater and vapors under vacuum. Once groundwater and vapors are pulled into the on-site treatment system, the site-specific COCs are removed from the groundwater and vapor by bag filtration, air stripping, and liquid- and vapor-phase GAC filtration. There are currently nine distinct well fields (A through I), each with six to ten recovery wells, as shown in Figure 3. Two of the well fields (A and B) are not currently connected to the remedial system. Based on an expected ROI of 40 feet[4] and the current COC plume extent, Geosyntec assumes that the DPE system would operate with concurrent extraction from well fields A, D, E, F, and G. Well field A is currently not connected to the treatment system and would require the installation of new conveyance piping to the treatment system. Figure 11 shows the current well field network, proposed connection of well field A, and current extent of COCs in groundwater or soil over CULs.

It is assumed that the DPE system will operate for five years at an average groundwater extraction rate of up to 45 gpm, which is an increase from its past operation of approximately 6 gpm. Historically, this system has had frequent shutdowns for maintenance issues, operating for less than 50% of the time between 2009 and 2017. To reduce downtime and operational costs and to increase system capacity, several improvements will be needed prior to the system restart that include the following:

[4] During a two-week pilot operation, conducted by Geosyntec, between February and March 2020, Geosyntec observed that the ROI from extraction wells may be as great as 40 feet. This observation is similar to what was observed by Terra Vac and presented in Section 2.2.2 of the Focused Feasibility Study (Hart Crowser, 2007).

- Replacement of treatment system equipment, including liquid and vapor GAC units, liquid transfer pumps, and installation of total dissolved solids (i.e., fine sediment) treatment equipment;
- Replacement of an estimated 2/3 of the piping and wells, due to clogging and intrusion of formation fines into the system; and
- Modifications to the City of Tacoma IWW permit to allow for increased discharge (this includes preparation of a new engineering report).

During DPE system operation, the PSCAA permit and the City of Tacoma IWW permit will be maintained, sampling and reporting will be conducted to maintain compliance, and groundwater monitoring will be conducted semi-annually and will include the following:

- Approximately 15 wells monitored during one event and 35 wells monitored during the second event (25 wells on average per event);
- Monitoring depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe; and
- Sampling of wells for the following:
  - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP);
  - General chemistry parameters (nitrate as N, sulfate); and
  - Constituents of concern: VOCs, SVOCs, and TPH.

Once COCs reach asymptotic conditions, the remedial approach will transition to MNA. As part of the MNA remedy, groundwater monitoring will be conducted annually for an assumed 15 years. Approximately 20 wells will be monitored in the first five years of MNA and approximately 10 wells will be monitored in the next 10 years. During each event, monitoring is assumed to involve the same monitoring as above, with the following additions to the analytical list: total and dissolved iron and manganese; methane; and total organic carbon. In addition, approximately 25% of wells will be monitored for presence of biodegrading bacteria.

Nearing project closure, the institutional controls will be implemented on site to provide ongoing protection of human health and the environment. Future on-site land use will be limited to commercial/industrial use, groundwater use would be restricted, and a Site Management Plan (SMP) will be implemented to ensure the effectiveness of ICs and to outline procedures for notification and response actions in the event of subsurface work, such as trenching.

### 7.2.2 Alternative 2: MNA/NSZD with ICs

Under Alternative 2, no further active remedial action will be conducted. MNA and NSZD, using the existing monitoring well network, will be used to monitor and evaluate decreases in site COC concentrations. Additionally, $CO_2$ flux, using the existing eight in-situ microcosms installed in 2021, will be measured every five years to estimate the NSZD rates across the site. For the purpose of this evaluation, it is assumed that this alternative will be implemented for 30 years; however, timeframes may be longer based on review of COC concentrations, $CO_2$ flux, and mass removal evaluation estimates over time. The conceptual layout of this alternative is presented in Figure 12.

The estimated cost for this alternative in 2021 dollars is $2.2M ($1.5M to $3.2M -30%/+50% range).

Natural attenuation (NA) refers to the natural processes of sorption, dissolution, volatilization, and biodegradation to decrease COC concentrations, especially in the dissolved plume. NSZD refers to the processes of sorption, dissolution, volatilization, and biodegradation to break down TPH, including LNAPL mass, specifically within the source zone. Existing monitoring wells were selected within the source zone and the dissolved plume to monitor both NA and NSZD. Additionally, eight in-situ microcosms installed in 2021 will be sampled for $CO_2$ flux using E-Flux Fossil Fuel Traps™. These wells and in situ microcosms are shown in Figure 3.

To evaluate whether NA and NSZD are occurring, select parameters will be analyzed and evaluated. The COCs must be monitored to evaluate whether concentrations in the source zone and the dissolved plume are decreasing. Dissolved electron acceptor reactants (DO, nitrate, and sulfate), dissolved electron acceptor products (dissolved iron and manganese), and potential breakdown product (methane) will be monitored within the plume and downstream of the plume to evaluate whether conditions are suitable for biodegradation and whether evidence indicates that biodegradation is occurring (The Interstate Technology & Regulatory Council, 2009). Approximately 25% of wells will be monitored for presence of biodegrading bacteria. Using the initial sampling results, Geosyntec assumes that a detailed review of MNA and NSZD will be conducted to evaluate NA and NSZD processes and establish a baseline for evaluation of future monitoring results.

As part of the MNA/NSZD remedy, groundwater monitoring will be conducted annually for an assumed 30 years. Approximately 25 wells will be monitored for the first 10 years, approximately 15 wells will be monitored in the next 10 years, and 10 wells will be monitored in the final 10 years. During each event, monitoring is assumed to involve:

- Monitoring depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe;
- Headspace screening for methane and $CO_2$ generation; and
- Sampling of wells for the following:
    - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP);
    - General chemistry parameters (nitrate as N, sulfate);
    - Total and dissolved iron and manganese;
    - Dissolved methane, ethene, and ethane;
    - COCs: VOCs, SVOCs, and TPH; and
    - Presence of biodegrading bacteria (only 25% of the wells assumed).

No permits are assumed to be needed for this alternative, meaning the current IWW and PSCAA permits for the DPE system can be terminated.

To estimate the NSZD that is occurring over time, $CO_2$ flux monitoring will be conducted every five years as part of the remedy evaluation and reporting. This monitoring will utilize the in-situ microcosms installed in 2021. These rates will be monitored every five years to ensure that NSZD is still occurring and in order to estimate time remaining for site COCs to reach site-specific CULs.

During or near the end of MNA/NSZD, ICs will be implemented on site to provide ongoing protection of human health and the environment. Future on-site land use will be limited to commercial/industrial use, groundwater use would be restricted, and an SMP will be implemented to ensure the effectiveness of ICs and to outline procedures for notification and response actions in the event of subsurface work, such as trenching.

### 7.2.3 Alternative 3: Bio-Sparging with NSZD/MNA and IC

Under Alternative 3, bio-sparging will be implemented, repurposing much of the existing DPE wells, conveyance lines, and equipment and will be conducted concurrent with NSZD/MNA with ICs implemented before project closure. Alternative 3 is the base alternative with optional additions to this alternative for concurrent SVE, concurrent groundwater extractions, implementation of ISCO/aerobic biodegradation after bio-sparging, or an expanded bio-sparging system presented in Alternatives 3a, 3b, 3c, and 3d respectively. For Alternative 3 alone (with no additions), the timeframes for this alternative are assumed to be eight years of continuous bio-sparging, followed by 10 years of MNA monitoring. While continuous bio-sparing is assumed for costing purposes in this remedial alternative, bio-sparge could be operated intermittently for a longer period of time as funding is available; bio-sparge is expected to enhance NSZD, which would continue in the off-periods. The conceptual layout of this alternative is presented in Figure 13 with bio-sparged limited to areas with elevated COCs and relatively lower NSZD rates. Areas outside the bio-sparge area are assumed to attenuate to CULs via NSZD/MNA. The estimated cost for this alternative in 2021 dollars is \$3.5M (\$2.5M to \$5.3M -30%/+50% range).

This alternative involves modifying the current DPE well heads and network to inject air into the groundwater, enhancing aerobic conditions in groundwater and vadose zone soil to promote biodegradation and volatilization of site-specific COCs. The primary removal mechanism for TPH is through stimulated microbial activity caused by the introduction of DO, which increases the biodegradation rate of the COCs in the saturated zone. This technology also has the ability to promote aerobic degradation of VC and volatilization of dissolved PCE and SVOCs, as well as low levels of LNAPL (NFESC, 2001).

Under this remediation alternative, a compressor system would be required to replace the current blowers installed in the treatment system. Piping within the treatment system would have to be retrofitted to reverse the flow direction, so that air is transferred from the treatment system through the well fields and into selected bio-sparging wells. Wells assumed to be repurposed for bio-sparging are located in well fields C, D, E, F, G, and H (see Figure 3 for wellfield labels). The compressor system is anticipated to provide a flow rate of approximately 5 scfm at each well, with a pressure between 2 and 5 lbs per square inch gauge (psig), based on pilot operations. Well head repairs and additional pressure relief valves, pressure gauges, and flow meters would also be necessary amendments to the system under this alternative. Additionally, it is expected that 2/3 of the existing DPE wells will need to be redeveloped and 18 new bio-sparge wells will be required to be installed to enhance coverage for bio-sparging. Based on the bio-sparge pilot study results, it is expected that a ROI of approximately 12 feet can be expected; however, the ROI will vary by location depending on geology and preferential pathways in proximity to each well. At least 10 soil vapor probes will be installed to monitor vapors in and around vicinity buildings to evaluate protection of human health via the vapor intrusion pathway. As such, conceptual placement of the 18 new bio-sparging wells and 10 new vapor probes is shown in Figure 13. The conceptual placement of the 18 new wells and the proposed DPE wells for injection is based off findings from the 2021 bio-sparge pilot operation and associated $CO_2$ flux trap microcosm study.

Based on Geosyntec's experience during the bio-sparge pilot study and with systems at similar sites, it is expected that the system will operate for eight years. It is expected the VOCs and volatile petroleum hydrocarbons (i.e., gasoline range organics) may be remediated within one to two years. SVOCs and semi-volatile petroleum hydrocarbons (i.e., diesel range organics and some motor oil range organics) is estimated to extend the timeframe to eight years. The eight-year operational period is an estimate; therefore, conditions may occur that require operations to be extended or finish before the estimated eight-year timeframe in portions of the site.

During bio-sparge operation, monitoring of the assumed 10 vapor probes will be screened in the field for pressure and total VOCs using a PID with two vapor samples collected semi-annually for VOC laboratory analysis. In addition, groundwater monitoring will be conducted semi-annually. During each semi-annual event, monitoring is assumed to involve:

- Approximately 15 wells monitored during one event and 35 wells monitored during the second event (25 wells on average per event);
- Monitoring depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe; and
- Collecting groundwater samples for the following:
    - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP);
    - General chemistry parameters (nitrate as N, sulfate); and
    - Constituents of concern: VOCs, SVOCs, and TPH.

Once COCs reach asymptotic conditions, the remedial approach will transition to MNA. As part of the MNA remedy, groundwater monitoring will be conducted annually for an assumed 10 years. Approximately 20 wells will be monitored in the first two years of MNA and approximately 10 wells will be monitored in the next eight years. During each event, monitoring is assumed to utilize the existing monitoring wells that were used during system operation and with the following additions to the analytical list: total and dissolved iron and manganese; methane; and total organic carbon. In addition, approximately 25% of wells will be monitored for volatile fatty acids and presence of biodegrading bacteria.

No permits are assumed to be needed for Alternative 3 alone, meaning the current IWW and PSCAA permits for the DPE system can be terminated.

Nearing project closure, ICs will be implemented on site to provide ongoing protection of human health and the environment. Future on-site land use will be limited to commercial/industrial use, groundwater use would be restricted, and an SMP will be implemented to ensure the effectiveness of institutional controls and to outline procedures for notification and response actions in the event of subsurface work, such as trenching.

### 7.2.4 Alternative 3a: Bio-Sparging with Concurrent SVE

Alternative 3a will utilize SVE concurrent with bio-sparging to reduce the potential migration of vapors released during bio-sparging that may pose a risk to human health via the vapor intrusion pathway to indoor air. The need for concurrent SVE is expected to be low based on PID readings during the pilot test; however, this option may still be required based on results during full-scale implementation. While the addition of SVE may promote removal of VOCs in the vadose zone, SVE is not anticipated to have a measurable impact on the mass removal of the more significant COCs, which primarily include petroleum hydrocarbons. As such, the objective of SVE will be to mitigate potential vapor intrusion risk to the current on-site and adjacent buildings. Bio-sparging with SVE is expected to have a slightly longer timeframe from Alternative 3, because a small number of the wells planned for use as bio-sparge wells would be utilized for SVE instead. As such, a nine-year operational duration of concurrent SVE and bio-sparging is assumed, followed by the same 10 years of MNA monitoring with ICs as Alternative 3. The conceptual layout of this alternative is presented in Figure 13a. The estimated cost for this alternative in 2021 dollars is $4.6M ($3.2M to $6.9M -30%/+50% range).

Utilizing the current DPE wells, piping, and GAC treatment system, soil vapor will be extracted from a sub-set of existing wells (existing nine DPE wells in well field E), plus an assumed seven additional SVE wells. To extract soil vapors, one blower will remain connected in the treatment system. The second blower will be removed and replaced with the bio-sparging system presented in Alternative 3. The same well fields will be used for injecting air as presented in Alternative 3, with the exception of well field E, which will be used for SVE. This modification will allow the injection and the extraction of air using the current DPE system well network with limited modifications. The seven additional SVE wells will be installed in and around the Pacific Fluids Warehouse and Nelson/current Platinum Leaf building. In addition, Geosyntec assumes that up to five sub-slab vapor probes will be installed within the building slabs to evaluate vacuums and total VOCs using a PID beneath the building foundations semi-annually; this is in addition to the 10 sub-soil vapor probes proposed under Alternative 3. Conceptual locations of the new SVE wells and sub-slab vapor probes are shown in Figure 4a. It is expected that the ROI for the SVE extraction would be around 20 feet, based on typical ROI for sandy/silty soil (NFESC, 2001).

The SVE system operation will require the continued compliance with the PSCAA permit.

Monitoring and ICs would be implemented consistent with Alternative 3 with the addition of semi-annual monitoring of extracted vapor VOC concentrations and semi-annual pneumatic monitoring of sub-slab vapor probes installed in the building slabs.

### 7.2.5 Alternative 3b: Bio-Sparging with Concurrent Groundwater Extraction

Alternative 3b will utilize groundwater extraction concurrent with bio-sparging to promote groundwater flow and thereby enhancing the distribution of oxygenated groundwater in key areas of the plume. This is proposed as an optional addition to Alternative 3, due to the relatively slow groundwater flow velocity (approximately 0.75 to 1.5 feet per month; CH2M Hill, 2004). This increased groundwater flow allows for a higher rate of aerobic groundwater movement, thereby increasing the rate of biodegradation and volatilization of dissolved COCs. Concurrent groundwater extraction is expected to expediate source remediations with an assumed bio-sparging/groundwater extraction operational duration of six years, followed by the same 10 years of MNA monitoring with ICs implemented before project closure, as Alternative 3. The conceptual layout of this alternative is presented in Figure 13b. The estimated cost for this alternative in 2021 dollars is $4.5M ($3.2M to $6.9M -30%/+50% range).

Under this alternative, well fields C, D, F, and G would be used to inject air into groundwater, causing aerobic conditions to promote biodegradation and volatilization, while well fields A, E, and H would be used to extract groundwater, increasing flow within the COC plume. Geosyntec assumes that nine wells from well fields A, E, H, and I would be retrofitted for groundwater extraction with up to eight wells pumping at one time. Well field labels are shown in Figure 3.

In addition to system modifications necessary for bio-sparging, as explained in Alternative 3, the Alternative 3b remedy includes changes to create efficient groundwater extraction. This includes replacing the wells proposed for groundwater extraction, adding pneumatic pumps in each well, trenching to add pneumatic lines to each well and, at some wells, additional water conveyance lines. The reason for the assumed well replacement is to improve filtration of formation fines in the well filter packs and screens, as well as install a sump in each well that extends into the first 3 to 5 feet of the underlying aquitard, allowing the pump intake to be placed at the bottom of the targeted water bearing zone. This allows for maximum drawdown, and with an assumed pumping rate from a single well of 0.5 gpm and an ROI of at least 40 feet. A pump test prior to system installation is recommended and assumed in the cost estimate; the results of this pump test would be used to refine the ROI and adjust extraction well locations. These groundwater extraction wells could also be configured for use as bio-sparge well, allowing for cycling between bio-sparging and groundwater extraction, as needed.

Groundwater will be extracted from each well and transferred to the former DPE treatment system for treatment via GAC and discharge under the IWW permit. The current IWW permit will not have to be modified for this remedy because, even with eight wells pumping, the total discharge would be 4 to 5 gpm. However, an update to the engineering report for the system will likely be required due to the extraction process changes (utilization of pumps, rather than the current blower for extraction). The extraction system is expected to continuously operate when the bio-sparging system is in operation; however, this could be adjusted based on performance with extraction cycled, reducing operations and maintenance costs.

Monitoring and ICs would be implemented consistent with Alternative 3, except semi-annual monitoring during bio-sparging/groundwater extraction would be reduced from eight to six years.

### 7.2.6 Alternative 3c: Bio-Sparging with Transition to ISCO/Aerobic Biodegradation (Before MNA)

Under Alternative 3c, ISCO combined with aerobic biodegradation will be implemented following bio-sparging, detailed in Alternative 3. ISCO/Aerobic Biodegradation will be used to target areas where bio-sparging was insufficient to bring concentrations below the Site-Specific CULs within the eight-year timeframe assumed and where statistical analyses suggest that MNA is not expected to bring concentrations below the CULs within a reasonable timeframe. This approach will utilize a modified Fenton's reagent to degrade remaining COCs within the injection ROI, while injected oxygen, nutrients, and microbial culture will facilitate longer-term biodegradation with a greater ROI. These injections are expected to reduce the timeframe for MNA. The ISCO/Aerobic Biodegradation is expected to be implemented within a three-year timeframe after the eight years of bio-sparging and will be followed by an assumed three years of MNA monitoring with ICs implemented before project closure. Given that the location of these injections would be dependent upon site conditions near the end of bio-sparge operations, no conceptual layout is provided. The estimated cost for this alternative in 2021 dollars is $4.8M ($3.3M to $7.1M -30%/+50% range).

Geosyntec anticipates that the need for ISCO/Aerobic Biodegradation will be evaluated around year six of the expected eight-year bio-sparging operation. During the last two years of the bio-sparging activities, a bench-scale treatability study will be implemented to verify the efficacy of the oxidant and assess the quantity of oxidant needed for each injection event. This treatability study will consist of measuring the site's total oxidant demand, selecting an adequate oxidant dose, and verifying effectiveness of dissolved COC destruction using the modified Fenton's reagent. If the bench-scale study supports the use of the chemical oxidant, a field ISCO pilot study will be implemented to confirm remediation effectiveness and collect additional field parameters to design the full-scale injections.

Prior to the first injection event, Underground Injection Control registration will be obtained from Ecology. The chemical oxidant, biostimulation amendments, and biological culture will be distributed in groundwater using temporary injection points via a direct-push drilling rig. Three injection events are assumed, each followed by four performance monitoring events.

The treatment area for injections will depend on which region of the site is found to have COC concentrations exceeding the CULs. For the purposes of this evaluation, a treatment area consistent with approximately 20% of the site is assumed. Three transects, perpendicular to groundwater flow, will be placed along the treatment area. These transects will be placed to provide broad coverage of the treatment area and to avoid tank farms and buildings located on site. Approximately 11 or 12 injection locations will be placed along each transect, assuming an ROI of 7.5 feet. Final injection locations, spacing, and number will be selected by the ROI measured in the ISCO pilot study. During each of the three injection events, approximately 250 gallons of approximately 6 grams per liter of a stabilized hydrogen peroxide solution will be injected at each injection location, followed by an injection of approximately 1,250 gallons of a microbial nutrient and culture solution (Tersus Environmental, 2020). Each injection event will take place over the course of approximately two weeks.

During bio-sparging remediation, groundwater monitoring will be conducted semi-annually consistent with Alternative 3 (eight years). Following the first ISCO/Aerobic Biodegradation injection event, groundwater monitoring will be conducted quarterly for one year, with an assumed 15 wells monitored. During, and for one year following the second and third ISCO/Aerobic Biodegradation injection events, groundwater monitoring will be conducted semi-annually, for total of two years, with an assumed 15 wells monitored. During each event, monitoring is assumed to involve the same scope as presented for Alternative 3.

MNA monitoring and ICs would be implemented consistent with Alternative 3 with the exception that MNA monitoring is assumed for three years with 10 wells monitored.

### 7.2.7 Alternative 3d: Expanded Bio-Sparge Operations

Under Alternative 3d, bio-sparge operations would be implemented throughout the entire site, an expansion of the system proposed under Alternative 3. This approach would utilize the same bio-sparge wells presented in Alternative 3 and include the addition of seven new bio-sparge wells and redevelopment of 13 existing DPE wells. A conceptual layout is shown in Figure 13c. It is estimated that the system operation time and following MNA will be consistent with Alternative 3 (eight years of bio-sparge operations and ten years of MNA). The estimated cost for this alternative in 2021 dollars is $3.8M ($2.7M to $5.8M -30%/+50% range).

The additional injection locations would be contained to the site boundary and primarily focused in the northeastern and southwestern portions of the site. Wells that would be redeveloped would be from DPE well fields C, E, and H (see Figure 3). These wells are located on the northeastern portion of the site and outside the Alternative 3 remedial area. During the bio-sparging operation wells may be turned off once COC concentrations in the vicinity of that well reach CULs and/or asymptotic conditions.

This alternative would not require the IWW or PSCAA permits be maintained, as no water or vapors will be discharged from the site. Monitoring and ICs would be implemented consistent with Alternative 3.

### 7.2.8 Alternative 4: Excavation with MNA and ICs

Under Alternative 4, soils within the site boundary that have groundwater impacts above the CULs will be excavated down to the aquitard at approximately 12 ft bgs. This accounts for approximately 95% of the area within the property boundary. It is anticipated that site soils will be removed to the aquitard that underlies the site (approximately 12 ft bgs). Remaining off-site impacts will be addressed through MNA. It is anticipated that the excavation process, including preparation, demolition of site infrastructure, and excavation of site soils will take up to two years. Off-site attenuation of COCs is assumed to require four years of MNA monitoring after the completion of on-site excavation activities. The conceptual layout of this alternative is presented in Figure 14. The estimated cost for this alternative in 2021 dollars is $12.2M ($8.5M to $18.3M -30%/+50% range).

Prior to excavation, the infrastructure currently present on the site will be demolished. This includes three buildings, aboveground chemical storage tanks, and other site improvements, such as pavement and canopies. In addition, the existing groundwater monitoring wells, treatment wells, and conveyance piping will be removed from the excavation footprint. The costs for this alternative use the assumption that all equipment and materials are removed from the interior of the buildings by the building occupants. The tanks are assumed to be empty but will require cleaning prior to decommissioning.

Due to the shallow nature of site groundwater, it is anticipated that saturated soils will be encountered during excavation activities. As such, the site will need to be dewatered during the excavation. It is anticipated that the existing extraction and monitoring wells, along with some additional temporary dewatering points, will be connected to pumps to lower the water table. Recovered groundwater would be processed through a modified version of the existing groundwater treatment system and discharged into the sanitary sewer system. The actual volume of water that will be generated during the dewatering activities is unknown, but we have assumed that up to 50,000 gallons of water a day will need to be managed.

Excavation of soils will be restricted to within the property boundaries. Sidewalls of the excavation will have a one-to-one slope beginning at the property line. Soil will be excavated to the top of the aquitard, which is approximately 12 ft bgs. To keep excavation activities within the property footprint, excavation will occur in stages, with one area excavated, disposed of, and backfilled prior to beginning the next area. Soil can be stockpiled within the property boundary and use of the off-site property will not be required for stockpiling. The volume of material to be excavated and disposed of is estimated at approximately 34,000 cubic yards (47,600 tons). It is assumed that the removed materials as a whole will not be characterized as RCRA hazardous waste or State of Washington dangerous waste, and thereby, a Subtitle D landfill will be acceptable, and no pre-treatment will be required.

Standard construction mitigation measures also would be implemented to minimize stormwater impacts and dust during removal of soil. Once the impacted soils are removed, confirmation soil samples will be collected from the excavations to verify COC concentrations. Under Alternative 4, the aquitard soils will not be removed. As such, the confirmation sampling will be used to document remaining concentrations, not to verify that soils meet CULs.

After confirmation sampling, excavations would be backfilled with clean soil from an off-site borrow source and compacted to the required geotechnical standards and to match the surrounding grade. No restoration of structures and utilities is included in the cost estimate.

Prior to and during excavation, groundwater monitoring in the off-site wells will be conducted semi-annually. During the expected two years, monitoring is assumed to involve:

- Monitoring of 15 wells, including depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe;
- Sampling of 15 wells for the following:
    - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP);
    - General chemistry parameters (nitrate as N, sulfate); and
    - Constituents of concern: VOCs, SVOCs, and TPH.

After the excavation is completed, groundwater monitoring will transition to MNA for an additional four years. During each annual event, monitoring is assumed to involve the same monitoring as above with approximately 15 wells monitored and with the following additions to the analytical list: total and dissolved iron and manganese; methane; and total organic carbon. In addition, approximately 25% of wells will be monitored for presence of biodegrading bacteria.

Nearing project closure, the ICs will be implemented on site to provide ongoing protection of human health and the environment. Future on-site land use will be limited to commercial/industrial use, and groundwater use would be restricted. Depending on remaining soil concentration in the excavation confirmation samples, an SMP may also be needed to outline procedures for notification and response actions in the event of subsurface work.

### 7.2.9 Alternative 5: Groundwater Containment via Extraction and Treatment with ICs

Alternative 5 will utilize groundwater extraction as a site containment alternative to prevent off-site migration of COCs by creating a hydraulic barrier at the northern downgradient end of the plume. The timeframe for this alternative is assumed to be 30 years and includes implementation with ICs. The conceptual layout of this alternative is presented in Figure 15. The estimated cost for this alternative in 2021 dollars is \$6.0M (\$4.2M to \$8.9M -30%/+50% range).

For this remedy, a groundwater extraction and treatment system will need to be created/retrofitted. Six new wells with pneumatic pumps and pressure transducers will be installed and pneumatic lines added. Additional conveyance piping would connect from the extraction wells to a centralized air compressor, which would operate the pneumatic pumps placed in the wells. As the groundwater bearing unit beneath the site is shallow (less than 5 feet), the most effective way to extract water will require the new wells be installed with a sump that extends into the first 3 to 5 feet of the underlying aquitard. This allows for maximum drawdown, and with an assumed pumping rate of 0.5 gpm, an ROI of at least 40 feet. However, a pump test prior to system installation is recommended and assumed in the cost estimate; this would refine ROI calculations, the number and placement of extraction wells, and verify necessary rates for containment.

With an extraction rate of 0.5 gpm per well, the maximum discharge the system would need capacity for is approximately 3 gpm. Groundwater will be extracted from each well and transferred to the former DPE treatment system for treatment via GAC and discharge under the IWW permit. The current IWW permit will not have to be modified for this remedy, but an update to the engineering report for the system will likely be required due to the extraction process changes (utilization of pumps, rather than the current blower for extraction). The system is expected to operate continuously to maintain hydraulic control.

During active extraction, depth to groundwater measurements will be conducted semi-annually, while groundwater sampling will be conducted annually at a subset of the existing monitoring wells to confirm the effectiveness of containment. This monitoring will occur for 30 years. Approximately 25 wells will be monitored for the first 10 years, approximately 20 wells will be monitored in the next 10 years, and 15 wells will be monitored in the final 10 years. Routine monitoring is assumed to involve:

- Semi-annual monitoring of depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe;
- Annual groundwater sampling for the following:
  - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP); and
  - Constituents of concern: VOCs, SVOCs, and TPH.

Under this alternative, ICs will be implemented within the first few years of implementation. The ICs would provide protection of human health for the current and future site uses. The ICs would limit site use to commercial/industrial and groundwater use would be restricted. In addition, an SMP will be prepared and implemented to ensure the effectiveness of ICs and to outline procedures for notification and response actions in the event of subsurface work, such as trenching.

#### 7.2.10 Alternative 6: Bio-Sparging Treatment Zone at Downgradient Site Boundary with ICs

Similar to Alternative 5, the objective of Alternative 6 is to prevent off-site migration of COCs. Under this alternative, bio-sparging will be used to remove dissolved-phase volatile and biodegradable COCs from the saturated zone at the northern downgradient boundary of the site, along the Port of Tacoma road. The timeframe for this alternative is assumed to be 30 years and includes ICs implementation. The conceptual layout of this alternative is presented in Figure 16.

The estimated cost for this alternative in 2021 dollars is $5.7M ($4.0M to $8.7M -30%/+50% range).

Under this alternative, 34 new bio-sparge wells, installed in two rows of 17 wells each, will be used to create a bio-sparging treatment barrier. Similar to Alternative 3, an air compressor(s) will be utilized for the injection of air or oxygen-enriched air into the groundwater within the treatment barrier, and Geosyntec expects that injection of air will likely have an effective ROI of 12 feet based on assumed flow of approximately 5 scfm at a pressure of 2 to 5 psig, based on the bio-sparge pilot study conducted during 2021. Based on CH2M Hill's 2004 report, the average groundwater flow velocity is between 0.75 and 1.5 feet per month. As a result of the report and pilot study, groundwater is expected to have a hydraulic residence time within the bio-sparge treatment barrier of between 10 to 24 months. The biodegradation rate can vary at sites based on the concentration of bacteria present, the COCs, and concentration of compounds in the soil, groundwater, and vapor, and oxygen levels; however, biodegradation rates for TPH in aerobic groundwater conditions and using bio-sparge have been observed to range from 0.8 to 8 kilograms per day at other sites (Leeson et al., 2001). Additionally, based on findings from the pilot study that showed concentration of some COCs decreasing below cleanup levels over the six-week operation, it is believed that the retention time across the bio-sparge barrier will provide sufficient time to reduce COCs in groundwater to levels below CULs before migrating off-site. No soil vapor probes or vapor monitoring are assumed to be needed, given distance of the bio-sparging wells from current on-site buildings. The system is expected to operate continuously to maintain treatment at the property boundary.

During implementation, groundwater monitoring will be conducted at a reduced number of wells, primarily near the north property boundary and at off-site wells, confirming effectiveness of the treatment barrier. This monitoring will occur for an assumed 30 years. During the first 10 years, monitoring will occur semi-annually, with approximately nine wells sampled during the first semi-annual event and 25 wells during the second semi-annual event (17 wells on average per event). Monitoring is expected to occur annually during the following twenty years, with 20 wells monitored during years 11 to 20 and 15 monitored during years 21 to 30. During each event, monitoring is assumed to involve:

- Monitoring of depth to groundwater, total depth of the well, and LNAPL thickness (if present) using an oil/water interface probe; and
- Sampling of wells for the following:
  - Field parameters (conductivity, temperature, pH, DO, turbidity, and ORP);
  - General chemistry parameters (nitrate as N, sulfate); and
  - Constituents of concern: VOCs, SVOCs, and TPH.

No permits are assumed to be needed for Alternative 6, meaning the current IWW and PSCAA permits for the DPE system can be terminated.

Under this alternative, ICs will be implemented within the first few years of implementation. The ICs would provide protection of human health for the current and future site uses. The ICs would limit site use to commercial/industrial, and groundwater use would be restricted. In addition, an

SMP will be prepared and implemented to ensure the effectiveness of ICs and to outline procedures for notification and response actions in the event of subsurface work, such as trenching.

## 7.3 Remedial Alternatives Evaluation and Comparison

The remedial alternatives presented above are summarized and evaluated in the attached Table 5 with a Disproportionate Cost Analysis (DCA) presented in Table 6. Figure 17 provides a visual comparison of the costs, weighted scores, and the DCA for each alternative. In these tables, the criteria used to evaluate each remedial alternative are consistent with the Ecology Feasibility Study Checklist guidance (Ecology, 2016b) and include:

- Protection of human health and the environment;
- Permanence;
- Effectiveness;
- Management of short-term risks;
- Implementability;
- Public acceptance; and
- Cost.

These criteria are weighted based on site-specific factors with each alternative scored. These alternative scores and their estimated costs are compared in Table 6 showing relative cost-benefit, assuming maximum of 30 years in the cleanup timeframe. The length of time for site remediation is estimated based on the current site knowledge and is specific to each alternative, with timeframes of each alternative being relative to one another. However, during remedy implementation, as more data becomes available, the cleanup timeframe may be updated to reflect the new information.

As shown in Table 6, the preferred alternative based on the Relative Benefit/Cost Ratio is Alternative 3 – Bio-Sparge with MNA/NSZD and ICs (Relative Ratio of 29), followed by Alternative 3d, which is an expanded version of Alternative 3 (Relative Ratio of 26), and then Alternative 2 – MNA/NSZD with ICs (Relative Ratio of 24). As such, the top two alternatives are bio-sparge with MNA/NSZD or MNA/NSZD alone. For Alternative 3, while the results of the bio-sparging pilot test indicate that the need for SVE is unlikely to mitigate vapor intrusion risk, Geosyntec recommends that Ecology consider SVE as a contingency for this alternative and plan to monitor sub-slab vapors during startup of bio-sparge. If SVE is needed, as detailed in Alternative 3a, the Relative Benefit/Cost Ratio for bio-sparge with SVE is similar to that of Alternative 2 (Relative Ratio of 22 compared to 24).

The remediation timeframes are also an important factor in comparing Alternatives 2 and 3. The timeframes assumed for the purposes of remedial alternative evaluation may be on the low end of these remedies, as suggested by the $CO_2$ flux trap microcosm study discussed in Section 5.3. As such, evaluation of longer timeframes is provided in Table 7 to review the sensitivity in scoring based on timeframes. For this evaluation, a timeframe of 85 years of MNA/NSZD was assumed for Alternative 2, and 20 years of bio-sparing followed by 10 years of MNA was assumed for Alternative 3. These timeframes are averages derived using estimates of remaining mass combined with the mass removal rate estimates from the $CO_2$ flux trap sampling before and during the bio-sparing pilot study. Details on the cost assumptions for the extended timeframes for Alternatives 2 and 3 are provided in Appendix D. As shown in Table 7, for the extended timeframes, Alternative

3 also scores higher on the Relative Benefit/Cost Ratio for 2021 dollars at 33, compared to Alternative 2 with a score of 19.

Costs aside, Alternative 3 scores higher on the Overall Weighted Benefit Score for both timeframe scenarios, with a scores of 48 and 47. Evaluating individual categories, Alternative 3 scores relatively high (≥3 out of 5). In comparison, Alternative 2 scores lower on the Overall Weighted Benefit Score at 24 and 19 for the two timeframe scenarios and scores low (≤2 out of 5) on protection of human health and the environment, permanence, effectiveness, and public acceptance. Alternative 2 only scores high (4 out of 5) on management of short-term risks and implementability, and if the timeframe for MNA/NSZD is actually several decades or more, this alternative would score even lower on implementability and potentially zero on public acceptance.

## 7.4 Remedial Alternative Selection

Based on the above remedy alternative evaluation, while Alternatives 2 – MNA/NSZD and Alternative 3 – Bio-Sparge with NSZD/MNA are relatively comparable in their score, Alternative 3 provides higher certainty in most evaluation criteria and more certainty in cleaning up the site within a reasonable timeframe. Alternative 3 utilizes and enhances natural attenuation through the injection of air into groundwater, and while continuous operations of bio-sparge are assumed herein, bio-sparge can be operated intermittently (i.e., pulsed) over a longer overall duration as funds are available for this project. As such, Geosyntec recommends Alternative 3 – Bio-sparge with NSZD/MNA and ICs.

Geosyntec also recommends that the bio-sparge implementation includes a plan for monitoring sub-slab vapor concentrations during initial startup of bio-sparge operations. While methane and VOCs did not appear to accumulate in sub-slab vapors during the bio-sparge pilot study, sub-slab vapor should still be monitored in areas with bio-sparge wells and buildings during startup of expanded or full-scale operations. If VOC or methane concentrations are sustained in sub-slab vapors at levels that may pose a vapor intrusion risk, Ecology should consider indoor air sampling and potential design and implementation of SVE (or sub-slab depressurization). This would be an interim contingency measure until VOC and/or methane concentrations attenuate and is unlikely to be needed based on observations during the pilot study.

In addition, Geosyntec recommends that Ecology retain ISCO/Aerobic Biodegradation as a contingency measure. This technology was proposed as a component of Alternative 3c and could be used after implementation of full-scale bio-sparge to target areas that have not yet reached their Site-Specific CULs. These areas may include where bio-sparging was insufficient to bring concentrations below the Site-Specific CULs and/or where statistical analyses suggest that MNA is not expected to bring concentrations below the CULs within a reasonable timeframe.

Lastly, to refine the scope and costs for implementation of Alternative 3, Geosyntec recommends that Ecology consider continuing the bio-sparge pilot study operations ahead of, and during, the preparation of the CAP. Pilot study operations could expand in footprint to include redevelopment and/or retrofitting of other viable DPE wells to identify specific well replacement and other maintenance needs for the CAP and engineering design. In addition, vapor intrusion risk could be evaluated under expanded and extended pilot study operations in order to eliminate the need for, or aid in the design of, a mitigation system. An extended bio-sparge pilot study would also allow for further evaluation of the rate of COC degradation at monitoring wells near injection locations, which were not observed over the limited six-week-long pilot study. This evaluation would help further refine expectations associated with the estimated bio-sparge remedial timeline.

# 8. CONCLUSIONS

This report was prepared to provide a comprehensive review of the current environmental condition and remedial progress at the former Lilybald site to address COCs in soil and groundwater and to develop a strategic path forward for remediation, including an updated focused feasibility study. The site remedy review began in 2020 with a performance review of the existing DPE system, including a field test of the system, an evaluation of current CSM based on sampling and monitoring data to date, and preparation of a draft focused feasibility study to compare remedial alternatives. The results of the 2020 evaluation identified several issues and uncertainties with continued operations of the DPE system and the need to collect additional data to evaluate natural attenuation of COCs and bio-sparge as remedial alternatives. These additional evaluations were completed through the collection of MNA and NSZD field data from December 2020 through June 2021 and a bio-sparge pilot study in Spring 2021.

The results of these additional activities indicated the following:

- While 1,4-DCB, VC, and PCE are present in groundwater, their extent is limited, and petroleum hydrocarbons, mainly diesel and motor oil, are the primary COCs remaining.
- MNA/NSZD is occurring with relatively high levels of petroleum hydrocarbon biological degradation occurring in the eastern portion of the site.
- Within six weeks of bio-sparge pilot study operations, increased TPH biological degradation rates were observed in proximity to the bio-sparge wells. Combined with additional field data that showed shifts in microbial populations, geochemistry, and COC concentrations after pilot study implementation, these results indicate that bio-sparging may be an effective technology to enhance the natural attenuation processes. However, given the limited duration and footprint of this pilot study, additional pilot study operations that include an extended operational timeframe and footprint (i.e., addition of more bio-sparge wells) would be beneficial in confirming COC mass removal in groundwater outside the bio-sparge injections wells and to refine the scope, cost, and remedial timeframe of full-scale implementation of this remedial technology.
- While some microbial toxicity was observed in subareas that generally align with detections of 1,4-DCB and VC in groundwater, bio-sparge is expected to promote air stripping and/or aerobic degradation of these VOCs. Once VOC concentrations are reduced in these areas, petroleum hydrocarbon biological degradation rates are expected to increase.

Based on the above, Geosyntec conducted a focused feasibility study evaluation, comparing remediation technologies and alternatives. Alternatives included combinations of DPE, MNA/NSZD, bio-sparge, ISCO/Aerobic Biodegradation, SVE, groundwater extraction, and excavation. These alternatives were evaluated against criteria including protection of human health and the environment, permanence, effectiveness, management of short-term risks, implementability, public acceptance, and cost. The top two alternatives included bio-sparge with MNA/NSZD and ICs or MNA/NSZD with ICs with the bio-sparge alterative scoring higher. As such, Geosyntec recommends Ecology revise its corrective action for the site from DPE to an alternative that combined bio-sparging with NSZD/MNA with eventual implementation of ICs.

Under this recommended alternative, ISCO/Aerobic Biodegradation would be retained a contingency measure. Geosyntec also recommends that Ecology consider expanded operations of the bio-sparge pilot study before, and during preparation of the CAP, in order to obtain information to refine the full-scale bio-sparge scope of work, timeframes, and collect information for the engineering design.

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# TABLES

**Table 1**
**Site Constituents of Concern Summary**
**Site Remedy Review Report**
Lilyblad Site
Tacoma, Washington

| **Constituent of Concern** | **CAS Number** | **Groundwater Units** | **Groundwater CUL** | **Maximum Groundwater Concentration or Max MDL[1]** | **Max GW MDL for ND** | **Soil Units** | **Soil CUL** | **Maximum Soil Concentration or Max MDL[a]** | **Max Soil MDL for ND** |
|---|---|---|---|---|---|---|---|---|---|
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | |
| Motor Oil (>C24-C36) | C24-C36 | mg/L | 1 | **14** | - | mg/kg | 2,000 | **3,900** | 9.5 |
| #2 Diesel (C10-C24) | 68476-30-2 | mg/L | 1 | **40** | - | mg/kg | 2,000 | **7,000** | 13 |
| TPH as Gasoline | TPH-g | mg/L | 1 | **4.0 J** | 100 | mg/kg | 100 | **5,200** | 2.3 |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | |
| 2-Methylnaphthalene | 91-57-6 | µg/L | 23 | 2.3 J | 7.2 | µg/kg | - | 9,600 | 98 |
| bis(2-ethylhexyl)phthalate | 117-81-7 | µg/L | 2.2 | All ND (<0.61[2]) | 0.61[2] | µg/kg | 4,400 | 1,400 | 750 |
| Pentachlorophenol | 87-86-5 | µg/L | 3 | 2.4 J | 50[2] | µg/kg | 37.97 | **720** | 500 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | µg/L | 230 | 0.91 J | 0.39 | µg/kg | 1,144 | 450 J | 40 |
| 1,1,2-Trichloroethane | 79-00-5 | µg/L | 16 | 0.51 J | 0.70 | µg/kg | 54.1 | All ND (< 35) | 35 |
| 1,1-Dichloroethane | 75-34-3 | µg/L | 52,000 | 15 | 0.25 | µg/kg | 164,000 | 1,200 | 61 |
| 1,1-Dichloroethene | 75-35-4 | µg/L | 2 | All ND (<0.78) | 0.78 | µg/kg | 8 | **All ND (<61)** | 61 |
| 1,2-Dichloroethane | 107-06-2 | µg/L | 37 | All ND (<0.53) | 0.53 | µg/kg | 101 | All ND (<68) | 68 |
| 1,4-Dichlorobenzene | 106-46-7 | µg/L | 4.86 | **62** | 0.98 | µg/kg | 64.6 | **52,000** | 130 |
| 1,2,4-Trimethylbenzene | 95-63-6 | µg/L | 26,000 | 110 | 0.72 | µg/kg | 10,350,000 | 200,000 H | 0.16 |
| Benzene | 71-43-2 | µg/L | 23 | 19 | 0.53 | µg/kg | 75 | 0.48 J | 110 |
| cis-1,2-Dichloroethene | 156-59-2 | µg/L | 5,200 | 68 | 0.69 | µg/kg | 14,880 | 300 J | 58 |
| Ethylbenzene | 100-41-4 | µg/L | 6,900 | 54 | 0.50 | µg/kg | 41,130 | 1,300 | 11 |
| m&p-Xylenes | 179601-23-1 | µg/L | 26,000 | 370 J | 0.75 | µg/kg | 58,400 | 25,000 | 38 |
| Methylene Chloride | 75-09-2 | µg/L | 590 | All ND (<12) | 12 | µg/kg | 1,332 | 1.5 JB | 800 |
| Naphthalene | 91-20-3 | µg/L | 4,900 | 18 | 2.0 | µg/kg | 115,900 | 1,400 | 6.2 |
| Tetrachloroethene (PCE) | 127-18-4 | µg/L | 3.3 | **6.8** | 0.84 | µg/kg | 24.5 | **180 J** | 390 |
| Toluene | 108-88-3 | µg/L | 15,000 | 190 | 0.50 | µg/kg | 71,340 | 2,400 | 37 |
| Trichloroethene (TCE) | 79-01-6 | µg/L | 30 | 1.8 J | 0.85 | µg/kg | 121.7 | 1.5 J | 99 |
| Vinyl Chloride | 75-01-4 | µg/L | 2.4 | **37** | 0.22 | µg/kg | 7.91 | **All ND (< 330)** | 330 |

**Notes**
**Bolded maxium concentrations are above the CULs.**
mg/L - milligrams per liter
µg/L - micrograms per liter
B - indicates the analyte was detected in the corresponding method blank or equipment blank
J - indicates the concentration is considered to be an estimated value, based on laboratory QC issue
H - indicates the analysis was performed past the method required holding time
MDL - Method Detection Limit

**Groundwater:**
[1] Groundwater analytical concentrations presented are from the most recent sampling events conducted in March 2020 through June 2021.
[2] The MDLs for bis(2-ethylhexyl)phthalate and pentachlorophenol from the June 2021 groundwater monitoring event are shown. The MDLs were elevated in March 2020 due to dilutions during the analyses as a result of matrix interfereance.

**Soil:**
[a] Soil analytical results are from the most recent sampling event (June 2017).

**Table 2**
**Native Biota Estimated Enumeration**
**4Q 2020 and 2Q 2021**
Former Lilyblad Cleanup Site
Tacoma, Washington

| | | | CDM-19 | CDM-19 | SP-06 | SP-06 | AG1-07 | AGI-07 | CDM-21 | LS-GW-B-25 |
|---|---|---|---|---|---|---|---|---|---|---|
| Taxonomic Designation | Units | Functional Role | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 6/24/2021 | 6/24/2021 |
| ABY1_46 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | 35,000,000 | -- |
| ANME-2D_114 | E.E./L | Hydrocarbon degradation | -- | -- | -- | -- | -- | -- | 30,000,000 | -- |
| Bacteroidales_34 | E.E./L | Fermentation | -- | -- | -- | -- | 229,000,000 | -- | -- | -- |
| BD4-9_71 | E.E./L | N/A | -- | 8,000,000 | -- | -- | -- | 229,000,000 | -- | -- |
| Betaproteobacteria_13 | E.E./L | Generalist | 27,000,000 | -- | -- | 3,711,000,000 | -- | -- | -- | -- |
| Betaproteobacteria_160 | E.E./L | Generalist | -- | 12,000,000 | -- | -- | -- | -- | -- | -- |
| C1_B004_12 | E.E./L | N/A | -- | -- | 223,000,000 | 494,000,000 | -- | -- | -- | -- |
| CandidatusKoribacter_15 | E.E./L | N/A | -- | -- | -- | 1,963,000,000 | -- | -- | -- | -- |
| CandidatusMethanoregula_2488 | E.E./L | Methanogenesis | -- | -- | -- | 501,000,000 | 188,000,000 | 328,000,000 | -- | -- |
| CandidatusMethanoregula_5983 | E.E./L | Methanogenesis | -- | -- | 230,000,000 | 721,000,000 | 188,000,000 | 776,000,000 | -- | -- |
| CandidatusMethanoregula_9 | E.E./L | Methanogenesis | -- | -- | 839,000,000 | 2,682,000,000 | 153,000,000 | 477,000,000 | -- | -- |
| Cenarchaeaceae_7 | E.E./L | N/A | -- | 72,000,000 | -- | -- | -- | -- | -- | -- |
| Comamonadaceae_70 | E.E./L | Generalist | 21,000,000 | -- | -- | -- | -- | -- | -- | -- |
| Crenothrix_2500 | E.E./L | Hydrocarbon degradation | -- | 7,000,000 | -- | -- | -- | -- | -- | -- |
| Crenothrix_5 | E.E./L | Hydrocarbon degradation | 20,000,000 | -- | -- | -- | 177,000,000 | 277,000,000 | -- | 1,705,000,000 |
| Crenothrix_60 | E.E./L | Hydrocarbon degradation | -- | -- | -- | -- | -- | -- | -- | 1,202,000,000 |
| Crenothrix_93 | E.E./L | Hydrocarbon degradation | -- | -- | -- | -- | -- | -- | -- | 1,522,000,000 |
| Deltaproteobacteria_19 | E.E./L | Generalist | -- | 24,000,000 | -- | -- | -- | -- | -- | -- |
| Elusimicrobiales_44 | E.E./L | N/A | -- | -- | 105,000,000 | -- | -- | -- | -- | -- |
| Endomicrobia_27 | E.E./L | N/A | -- | -- | 170,000,000 | -- | -- | -- | -- | -- |
| Erysipelotrichaceae_24 | E.E./L | N/A | -- | -- | -- | -- | 120,000,000 | -- | -- | -- |
| Euryarchaeota_63 | E.E./L | Generalist | -- | -- | -- | -- | -- | -- | -- | 1,180,000,000 |
| Flavobacterium_56 | E.E./L | Aerobic chemoheterotrophy | -- | -- | -- | -- | -- | -- | -- | 3,197,000,000 |
| Gallionella_67 | E.E./L | Iron oxidation | -- | -- | -- | -- | -- | 263,000,000 | -- | -- |
| Geobacter_76 | E.E./L | Metals Reduction and Reductive dechlorination | 13,000,000 | -- | -- | -- | -- | -- | -- | -- |
| GIF10_116 | E.E./L | N/A | -- | 14,000,000 | 98,000,000 | -- | -- | -- | 191,000,000 | -- |
| GIF10_14 | E.E./L | N/A | -- | -- | -- | -- | -- | 495,000,000 | -- | -- |
| GIF10_3 | E.E./L | N/A | -- | -- | 627,000,000 | -- | 291,000,000 | 446,000,000 | -- | -- |
| GIF10_33 | E.E./L | N/A | -- | -- | 307,000,000 | -- | -- | -- | -- | -- |
| GIF10_3505 | E.E./L | N/A | -- | -- | -- | -- | 142,000,000 | -- | -- | -- |
| GIF10_40 | E.E./L | N/A | -- | -- | 204,000,000 | -- | -- | -- | -- | -- |
| GIF10_43 | E.E./L | N/A | -- | -- | 137,000,000 | -- | -- | 259,000,000 | -- | -- |
| GIF10_6 | E.E./L | N/A | -- | -- | 206,000,000 | -- | 143,000,000 | 1,114,000,000 | -- | -- |
| Hydrogenophaga_16 | E.E./L | Hydrogen oxidation, Aerobic chemoheterotrophy | -- | -- | -- | -- | -- | -- | -- | 3,269,000,000 |
| koll11_42 | E.E./L | N/A | -- | 16,000,000 | -- | -- | -- | -- | -- | -- |
| Methanoregulaceae_23 | E.E./L | Methanogenesis | -- | -- | 237,000,000 | -- | -- | -- | -- | -- |
| Methanosaeta_0 | E.E./L | Methanogenesis | -- | 10,000,000 | 2,010,000,000 | 3,615,000,000 | 316,000,000 | 1,491,000,000 | -- | -- |
| Methanosaeta_1282 | E.E./L | Methanogenesis | -- | -- | -- | -- | -- | 420,000,000 | -- | -- |
| Methylococcaceae_4 | E.E./L | Hydrocarbon degradation | 154,000,000 | 8,000,000 | -- | -- | -- | -- | -- | -- |
| Methylococcales_1379 | E.E./L | Hydrocarbon degradation | -- | -- | -- | -- | -- | -- | -- | 5,322,000,000 |
| Methylococcales_2414 | E.E./L | Hydrocarbon degradation | -- | -- | -- | 549,000,000 | -- | -- | -- | -- |
| Methylococcales_2642 | E.E./L | Hydrocarbon degradation | -- | -- | -- | 758,000,000 | -- | -- | -- | -- |
| Methylococcales_611 | E.E./L | Hydrocarbon degradation | -- | -- | -- | 2,726,000,000 | -- | -- | -- | 1,607,000,000 |
| Methylococcales_6745 | E.E./L | Hydrocarbon degradation | -- | -- | -- | 2,027,000,000 | -- | -- | -- | -- |
| Methylophilaceae_2 | E.E./L | Methylotrophy | -- | -- | -- | -- | -- | -- | -- | 17,542,000,000 |
| Methylophilaceae_209 | E.E./L | Methylotrophy | -- | -- | -- | -- | -- | -- | -- | 6,356,000,000 |
| Methylophilaceae_6847 | E.E./L | Methylotrophy | -- | -- | -- | -- | -- | -- | -- | 4,700,000,000 |
| Methylotenera sp._41 | E.E./L | Methylotrophy | 12,000,000 | -- | -- | -- | -- | -- | -- | 1,998,000,000 |
| Micrarchaeles_18 | E.E./L | N/A | -- | -- | 191,000,000 | -- | -- | -- | -- | -- |
| Micrarchaeles_54 | E.E./L | N/A | -- | -- | -- | -- | 153,000,000 | -- | -- | -- |
| Micrarchaeles_92 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | 39,000,000 | -- |
| Nitrosopumilus_32 | E.E./L | N/A | -- | 21,000,000 | -- | -- | -- | -- | -- | -- |
| OD1_11 | E.E./L | N/A | -- | -- | 139,000,000 | 582,000,000 | -- | 469,000,000 | -- | -- |
| OD1_21 | E.E./L | N/A | -- | -- | -- | -- | 107,000,000 | -- | -- | -- |
| OD1_29 | E.E./L | N/A | -- | -- | 212,000,000 | -- | -- | -- | -- | -- |
| OD1_31 | E.E./L | N/A | -- | -- | 179,000,000 | 780,000,000 | -- | -- | -- | -- |
| OD1_3108 | E.E./L | N/A | -- | -- | 112,000,000 | -- | -- | -- | -- | -- |
| Oxalobacteraceae_1 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | -- | 15,156,000,000 |
| PBS-25_20 | E.E./L | N/A | -- | 30,000,000 | 144,000,000 | -- | 128,000,000 | -- | -- | -- |
| Porphyromonadaceae_66 | E.E./L | Fermentation | -- | -- | -- | -- | 75,000,000 | -- | -- | -- |
| Rhodocyclaceae_1383 | E.E./L | Generalist | 20,000,000 | -- | -- | -- | -- | -- | -- | -- |
| Rhodoferax_45 | E.E./L | Generalist | -- | -- | -- | -- | -- | -- | -- | 1,683,000,000 |
| SAGMA-X_17 | E.E./L | Nitrification | -- | 8,000,000 | -- | -- | -- | -- | 45,000,000 | -- |
| SAGMA-X_51 | E.E./L | Nitrification | 45,000,000 | -- | -- | -- | -- | -- | -- | -- |
| Syntrophus_28 | E.E./L | Fermentation | -- | -- | 169,000,000 | -- | -- | -- | -- | -- |
| Syntrophus_8 | E.E./L | Fermentation | -- | -- | 135,000,000 | -- | 304,000,000 | 313,000,000 | -- | -- |
| Thiobacterales_65 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | 28,000,000 | -- |
| Treponema_10 | E.E./L | N/A | -- | -- | 439,000,000 | 1,360,000,000 | 289,000,000 | 664,000,000 | -- | -- |
| Treponema_2181 | E.E./L | N/A | -- | -- | 152,000,000 | 1,338,000,000 | 154,000,000 | 300,000,000 | -- | -- |
| Treponema_2188 | E.E./L | N/A | -- | -- | 108,000,000 | -- | -- | -- | -- | -- |
| Treponema_35 | E.E./L | N/A | -- | -- | -- | -- | 79,000,000 | -- | -- | -- |
| Unclassified_26 | E.E./L | N/A | 63,000,000 | -- | -- | -- | -- | -- | -- | -- |
| WCHB1-03_50 | E.E./L | N/A | -- | -- | 97,000,000 | -- | 95,000,000 | -- | -- | -- |
| WCHB1-07_25 | E.E./L | N/A | -- | -- | -- | 497,000,000 | 131,000,000 | -- | -- | -- |
| WCHD3-30_38 | E.E./L | N/A | -- | -- | -- | -- | 99,000,000 | -- | -- | -- |
| Xanthomonadaceae_37 | E.E./L | Aerobic chemoheterotrophy | -- | -- | -- | -- | -- | -- | 62,000,000 | -- |
| YLA114_22 | E.E./L | N/A | 45,000,000 | -- | -- | -- | -- | -- | -- | -- |
| YLA114_52 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | 34,000,000 | -- |

**Table 2**
**Native Biota Estimated Enumeration**
**4Q 2020 and 2Q 2021**
Former Lilyblad Cleanup Site
Tacoma, Washington

| | | | CDM-19 | CDM-19 | SP-06 | SP-06 | AG1-07 | AGI-07 | CDM-21 | LS-GW-B-25 |
|---|---|---|---|---|---|---|---|---|---|---|
| Taxonomic Designation | Units | Functional Role | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 6/24/2021 | 6/24/2021 |
| YLA114_59 | E.E./L | N/A | -- | -- | -- | -- | -- | -- | 33,000,000 | -- |
| YLA114_937 | E.E./L | N/A | 18,000,000 | -- | -- | -- | -- | -- | -- | -- |

***Notes***
E.E./L = Estimated Enumeration per liter
Samples were analyzed using GeneTrac® NGS, a suite of testing including genetic DNA extraction and microbial quantification.
E.E/L was calculated by multiplying the percent of microbial community value by the Bacteria Archaea qPCR result for the sample.
qPCR = quantitative polymerase chain reaction
Generalist = Group has several functional roles
N/A = Not Available

**Table 3**
**4Q 2020 and 2Q 2021**
**Native Biota Functional Analysis**
Former Lilyblad Cleanup Site
Tacoma, Washington

| | CDM-19 | CDM-19 | SP-06 | SP-06 | AGI-07 | AGI-07 | CDM-21 | LS-GW-B-25 |
|---|---|---|---|---|---|---|---|---|
| Functional Group | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 12/22/2020 | 6/24/2021 | 6/24/2021 | 6/24/2021 |
| Chemoheterotrophy | 23.9% | 20.5% | 21.1% | 20.6% | 20.3% | 20.4% | 12.9% | 30.2% |
| Methanogenesis | - | 3.7% | 29.7% | 13.3% | 15.0% | 20.3% | 7.4% | - |
| Methylotrophy | 20.7% | 11.4% | - | 12.0% | 4.9% | 5.2% | 6.7% | 24.9% |
| Hydrocarbon Degradation | 18.3% | 10.7% | - | 11.6% | 4.3% | 3.6% | 6.2% | 7.2% |
| Methanotrophy | 18.3% | 10.7% | - | 11.6% | 4.3% | 3.6% | 6.2% | 7.2% |
| Acetoclastic Methanogenesis | - | 2.6% | 17.2% | 6.0% | 5.8% | 10.6% | 1.2% | - |
| Hydrogenotrophic Methanogenesis | - | 1.1% | 12.3% | 7.3% | 9.2% | 9.8% | 2.3% | - |
| Methanogenesis by CO2 Reduction with H2 | - | 1.0% | 12.3% | 7.3% | 9.2% | 9.8% | 1.1% | - |
| Fermentation | 1.0% | 4.5% | 3.4% | 1.8% | 7.5% | 3.4% | 3.8% | 1.0% |
| Methanol Oxidation | 2.4% | - | - | - | - | 1.5% | - | 17.7% |
| Aerobic Chemoheterotrophy | 2.6% | 2.2% | - | - | 2.0% | 1.3% | 2.0% | 5.0% |
| Intracellular Parasites | 2.2% | 3.2% | - | - | - | - | 3.6% | - |
| Phototrophy | 1.4% | 2.0% | - | - | - | - | 2.7% | - |
| Respiration of Sulfur Compounds | - | 3.9% | - | - | - | - | 2.3% | - |
| Sulfate Respiration | - | 3.7% | - | - | - | - | 2.2% | - |
| Nitrate Reduction | - | 1.2% | - | - | - | - | 4.1% | - |
| Nitrogen Respiration | - | 1.1% | - | - | - | - | 3.9% | - |
| Nitrate Respiration | - | 1.1% | - | - | - | - | 3.9% | - |
| Photoautotrophy | - | 1.9% | - | - | - | - | 1.6% | - |
| Nitrification | - | 1.7% | - | - | - | - | 2.3% | - |
| Aerobic Nitrite Oxidation | - | 1.7% | - | - | - | - | 2.3% | - |
| Dark Oxidation of Sulfur Compounds | - | - | - | - | 1.3% | - | 3.5% | - |
| Cyanobacteria | - | 1.6% | - | - | - | - | 1.6% | - |
| Oxygenic Photoautotrophy | - | 1.6% | - | - | - | - | 1.6% | - |
| Dark Sulfide Oxidation | - | - | - | - | 1.2% | - | 3.2% | - |
| Dark Sulfur Oxidation | - | - | - | - | 1.2% | - | 3.1% | - |
| Dark Thiosulfate Oxidation | - | - | - | - | 1.2% | - | 3.1% | - |
| Iron Respiration | 1.1% | 1.3% | - | - | - | - | - | - |
| Dark Hydrogen Oxidation | - | - | - | - | - | - | 1.3% | 1.9% |
| Photoheterotrophy | - | - | - | - | - | - | 1.2% | - |
| Reductive Dechlorination | - | - | - | - | 1.0% | - | - | - |
| Dark Iron Oxidation | - | - | - | - | - | 1.4% | - | - |

***Notes***
% = Percent
"--" = Functional analysis was below 1% functional annotations.
Samples were analyzed using GeneTrac® NGS, a suite of testing including genetic DNA extraction and microbial quantification.

**Table 4**
**Remedial Technology Description and Screening**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Remedial Technology | Treatment Type(s) | Description | Effectiveness | Implementability | Relative Cost | Retained Technology for Alternative Development? |
|---|---|---|---|---|---|---|
| No Action | No Action | No institutional or engineering controls, actions, or treatment. | Not effective for protecting human health and the environment when risks are present. | Implementable, but not acceptable to the general public or government agencies. | No cost. | No, will not meet clean up requirements |
| ICs - Soil and Groundwater Use Restrictions | Land Use Restrictions | Implement land and groundwater use restrictions to inform current and future site owners of COCs and for the protection of human health and environment. ICs could include groundwater use restrictions, prohibition of sensitive land uses, and requirement of a soil management plan for ground disturbing activities at the Site. | Effectiveness for protection of human health and environment would depend on enforcement of, and compliance with, land use covenants and specific application. Prevents ingestion of COC-impacted groundwater, establishes soil management protocols for ground disturbing activities, and prohibits sensitive land uses. Given site conditions and anticipated land and groundwater use, ICs could be effective to mitigate potential risk to human health and the environment on-Site. ICs would not be effective at mitigating risk to human health and the environment off-site. | Practical to implement with property owner approval/acceptance. Acceptable likely based on zoning and site location. Specific legal requirements and authority would need to be met. | Low capital and O&M. | Yes, likely needed after remediation is complete for protection of sensitive land uses. |
| Dual Phase Extraction (continue with current remedy) | Source Remediation | Continued operation of DPE system with necessary improvements/maintenance to continue long-term operations. Additional extraction wells may also be added to influence areas between wells and beneath building and tank farm footprints. | Potentially effective with significant improvements to the well network (new wells), maintenance to the treatment system, and increase to permit discharge flow limits. | Technically implementable with significant improvements to current system. May need to coordinate with tenant to install more extraction wells within the footprints of tank farms or buildings. Will have to manage ongoing clogging and fouling issues, resulting in high O&M costs. | Moderate capital. Moderate to high O&M. | Yes |
| Monitored Natural Attenuation (MNA) & Natural Source Zone Depletion (NSZD) | Source Remediation | Monitoring wells to track continued degradation of COCs through naturally occurring processes such as dilution, dispersion, volatilization, and biodegradation. Use combination of MNA and NSZD monitoring tools to assess breakdown and geochemistry in addition to COC trends. | Concentrations of TPH relatively high in saturated soil and groundwater. Other COCs are relatively low but remain above cleanup goals. Concentrations generally declining based on Mann-Kendall trends; however, variability in the data set makes cleanup timeframes difficult to assess. Results of the carbon dioxide flux trap sampling in 2021 indicated elevated rates of hydrocarbon degredation in most areas of the Site. Natural degradation would be effective in the long-term but would need continued monitoring and protective measures in place in the interim. | Technically implementable. Uses existing groundwater monitoring wells to evaluate natural attenuation and source zone depletion. No new groundwater monitoring wells are expected to be needed. May need to consider periodic carbon dioxide flux trap sampling to assess NSZD rates over time. | Low capital. Moderate O&M. | Yes, both as stand-alone remedial alternative and in combination with other technologies. |
| Excavation | Source Remediation | Excavation and disposal of impacted material. Import of clean backfill. | Effective for permanent COC removal in excavation areas and mitigating potential risks to human health and the environment. | Due to tenant operations, current accessible areas only consist of a limited portion of the impacted area. To be effective, demolition of structures and infrastructure would be required where they overlay areas of impacted soil, which makes up the majority of the Site. Maybe more feasible if/when site is ever redeveloped; however, no plans currently exist for redevelopment. | High capital. Negligible O&M. | Yes |
| In Situ - Bio or Air Sparging | Source Remediation or Containment | Injection of air into the saturated zone using air sparge wells to induce volatilization and aerobic bioremediation of COCs. Soil vapor concentrations during the pilot study were generally low and did not indicate the need for vapor capture; however, if concentrations are observed at higher levels during full-scale, volatized mass may need to be captured using a vapor capture system (e.g. SVE), liquids are collected in knock-out tank, and air stream is treated prior to venting to atmosphere. For source remediation application, can utilize much of the existing DPE infrastructure and equipment; however, improvements would be needed , including well rehabilitation and/or replacement, wellhead repairs, and additional blowers/wells if vapor capture is needed. May combine with minimal groundwater extraction to induce flow across the site and increase contact with biosparge wells. For containment implementation, could implement a treatment zone at the downgradient Site boundary. | Likely effective for site conditions and effective for VOCs and hydrocarbons. The need for combined SVE would need to be assessed, based on field testing to assess accumulation of VOC and other gases under the site pavements and buildings. Less effective for SVOCs, but SVOC concentrations are relatively low compared to hydrocarbons at the Site. For containment application, treatment zone would need to be designed with a thickness/width to create the appropriate groundwater residence time within the treatment zone. | Technically implementable and much of the existing DPE and treatment system infrastructure and equipment could be repurposed for this. Additional wells for air injections and potentially for concurrent SVE. Radius of influence would need to be evaluated using existing wells and could be combined with minimal groundwater extraction to induce water movement through sparing zones. | Moderate capital. Moderate O&M. | Yes, bio-sparing combined with NSZD/MNA (with contingencies for potential ISCO polishing for SVOCs and/or concurrent groundwater extraction) or as a containment technology at site boundary |
| In Situ - Enhanced Reductive Remediation (Biotic or Abiotic) | Source Remediation | Using wells and drilling of temporary borings to inject electron donor and/or microbial culture into the source areas to enhance reductive degradation of COCs in the groundwater and saturated soil. | Effectiveness of technology may be limited for hydrocarbons and SVOCs. Given that site is naturally aerobic (high dissolved oxygen and high ORP), reduction of VOCs, such as PCE, may also be difficult to achieve. Would need to conduct treatability study to assess effectiveness on COCS. | Technically implementable. Given shallow groundwater table, injections would need to be limited in volume and delivered at low pressures. Surfacing may be a concern/challenge. Delivery in areas currently covered by buildings and tank farms would be a challenge - Horizontal drilling or angled borings may be needed to deliver amendment in these areas. | Moderate to high capital. Low to Moderate O&M. | No |

**Table 4**
**Remedial Technology Description and Screening**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Remedial Technology | Treatment Type(s) | Description | Effectiveness | Implementability | Relative Cost | Retained Technology for Alternative Development? |
|---|---|---|---|---|---|---|
| In Situ - Chemical Oxidation (ISCO)/Aerobic Biodegradation | Source Remediation | Use of direct push technology to inject chemical oxidant, oxygen, nutrients, and microbial culture into the source areas to oxidize and promote aerobic biodegradation of COCs in the groundwater and saturated soil. Multiple injection events may be needed. | Chemical oxidation and aerobic biodegradation could be effective technologies for treating VOCs and SVOC at current concentrations and in areas immediately surrounding the injection areas. However, the current high levels of petroleum hydrocarbons would reduce effectiveness. If hydrocarbon concentrations could be reduced first, ISCO could then be used to remediate residual VOCs and SVOCs. | Technically implementable. Given shallow groundwater table, injections would need to be limited in volume and delivered at low pressures. Surfacing may be a concern/challenge. Given relatively high petroleum hydrocarbon concentrations, implementation may be a challenge as this would require large doses of chemical oxidant. Delivery in areas currently covered by buildings and tank farms would be a challenge - Horizontal drilling or angled borings may be needed to deliver amendment in these areas. | Moderate to high capital. Low to Moderate O&M. | Yes, but only after reduction of petroleum hydrocarbon concentrations |
| In Situ - Activated Carbon | Source Remediation or Containment | Injection of activated carbon through direct-push injections. Indefinite retention of COCs by adsorption onto carbon molecules. | Effectiveness uncertain. Technology is unproven for low concentrations of VOC and SVOCs. Relatively high concentrations of hydrocarbons may limit the effectiveness of this technology. Immobilized COC mass bound to carbon would remain in the subsurface and could pose potential risks during future site excavation or construction activities. | Technically implementable. Given shallow groundwater table, injections would need to be limited in volume and delivered at low pressures, which may prohibit ability to effectively distribute a carbon slurry. Surfacing may be a concern/challenge. Delivery in areas currently covered by buildings and tank farms would be a challenge - Horizontal drilling or angled borings may be needed to deliver amendment in these areas. | Moderate to high capital. Low to moderate O&M. | No |
| In Situ - Phytoremediation | Source Remediation or Containment | Trees (e.g., poplars) planted in the areas with COC impacted groundwater and saturated soil or along property boundary for hydraulic control. COCs are uptaken from the saturated zone into the plant and the more volatile COCs will phyto-volatilize and degrade in the atmosphere. Less volatile COCs may remain in root system and could biodegrade. Plant material may require profiling and off-site disposal at a landfill. | Survival of phytoremediation trees may be limited due to relatively high concentrations of petroleum hydrocarbons. Likely more effective for VOCs, than SVOCs and heavier range hydrocarbons. Effectiveness also depends on ability to plant trees directly into the saturated zone, which is feasible given the shallow depth to groundwater. | Not practical to implement, given site use and mostly paved surfaces at the Site. | Moderate to high capital. Low O&M. | No |
| Thermal Desorption/Destruction - Resistive or Conductive Heating | Source Remediation | Utilization of resistive or conductive heating of the subsurface to thermally desorb COCs from soil and extract them via groundwater and soil vapor for ex situ treatment. Some COC mass will be destroyed in situ. Remedy would require removal of all non-steel wells and piping in the target area, installation of relatively densely spaced heater and multiphase extraction wells, temperature monitoring points, and an insultation cover. Operation of the system for several months, followed by post-thermal groundwater monitoring. | Highly effective at remediating the site COCs. Effectiveness is primarily limited to target area of implementation. | Implementation difficult, due to current tenant operations. Accessible areas only consist of a limited portion of the impacted area. To be effective, removal of existing wells and installation of high density wells would be required, including areas where buildings/tank farms overlay areas of impacted soil. Maybe more feasible if/when site is ever redeveloped; however, no plans currently exist for redevelopment. Treatment systems on site would need to be upgraded to treat high concentrations of extraction groundwater and vapor. Increased water production likely and new permits with the City and air district would be required. | High capital. High O&M. | No |
| Thermal Desorption/Destruction - Steam-Enhanced Extraction | Source Remediation | Utilization of steam into the subsurface to thermally desorb COCs from soil and extract them via groundwater and soil vapor for ex situ treatment. Remedy would require removal of all non-steel wells and piping in the target area, installation of relatively densely spaced injection and extraction wells, and an insulation cover. Operation of the system for several months, followed by groundwater monitoring. | This technology would be moderately effective to enhance mass recovery, assuming steam can effectively be applied and recaptured across the source area. Steam would migrate via the paths of lease resistance. Effective application in areas with utility trenches and structural fill would be a challenge, and COCs could migrate outside of targeted areas via these coarse-grained pathways. For heavy-range hydrocarbons, its unlikely to result in meeting cleanup levels alone. | Implementability would be a challenge given current tenant operations. Steam and high temperatures would propagate up to the ground surface and could damage process lines and be a potential health and safety issue. In addition, control of steam migration may be a challenge with utility bedding and structural fill as a preferential pathway for steam migration. COCs could easy migrate off-site. | High capital. High O&M. | No |
| Slurry Wall | Containment | Implementation of physical barrier along downgradient Site boundaries within interior groundwater extraction and treatment to control the migration of COCs off-Site, particularly to the stormwater sewer along the adjacent roadway. Physical barrier would require trenching for placement of slurry wall or installation of another barrier (such as a sheet pile wall). Groundwater would need to be periodically or continuously extraction to reduce mounding and surfacing of groundwater at the Site. Extracted groundwater would require treatment before discharge to the sanitary sewer under a permit with the City of Tacoma. Long-term groundwater monitoring would be required. | Effective for containment and protection of downgradient receptors, but unlikely to reach cleanup levels. Effectiveness would be similar to utilizing groundwater extraction and treatment for containment (below). Would have to be maintained long-term. | Technically implementable and some existing groundwater extraction and treatment infrastructure and equipment could be utilized. Installation of slurry wall would have some temporary disruption to tenant operations at the Site. | Moderate capital. Moderate to high O&M. | No |
| Permeable Reactive Barrier (PRB) | Containment | Implementation of a permeable barrier along the downgradient Site boundaries to treat dissolved phase COCs before leaving the Site. This would involve trenching and replacing soils with a reactive material. PRB media would likely need to promote sorption and reduction based on the primary Site COCs being VOCs and petroleum hydrocarbons (e.g., combination of zero-valent iron or a bio barrier with organophilic clay). Long-term groundwater monitoring would be required. | Effectiveness may be limited due to the naturally oxidative conditions at the Site and limited in removing SVOCs. Would not address source area at the Site, and would therefore be unlikely to achieve cleanup goals at the Site alone. | Technically implementable. Installation of the PRB would have some temporary disruption to tenant operations at the Site. | Moderate capital. Moderate O&M. | No |

**Table 4**
**Remedial Technology Description and Screening**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Remedial Technology | Treatment Type(s) | Description | Effectiveness | Implementability | Relative Cost | Retained Technology for Alternative Development? |
|---|---|---|---|---|---|---|
| Groundwater Extraction and Treatment (i.e. "pump and treat") | Source Remediation or Containment | Extraction of groundwater using existing and/or new wells and treating COC using onsite treatment system. Objective is both removal of COCs from groundwater and prevention of groundwater migration beyond current footprint. May also be combined with other technologies, such as bio/air sparing or ISCO to promote groundwater movement and contact with oxidants. | Effectiveness primarily for hydraulic control. Unlikely to reach cleanup levels for SVOCs and hydrocarbons due to sorption to soil matrix. Generally, not an effective technology for significantly reducing mass or volume. Could be implemented with an in situ technology to move amendments or improve contact with oxidants. | Technically implementable and some existing infrastructure and equipment could be repurposed. | Moderate capital. Moderate to high O&M. | Yes, as a containment only alternative or to enhance an in situ technology |

Notes:
µg/L - micrograms per liter
COC - Constituent of Concern
ICs - Institutional Controls
DPE - Dual Phase Extraction
SVE - Soil Vapor Extraction
MNA - Monitored Natural Attenuation
O&M - operation and maintenance
NSZD - Natural Source Zone Depletion
SVOC - Semi-Volatile Organic Compound
VOC - Volatile Organic Compound
ISCO - In Situ Chemical Oxidation

**Table 5**
**Remedial Alternatives Evaluation**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Alternative | | | Evaluation Categories | | | | | | | | | | | | Total Weighted Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alt No. | Name | Description | Protection of Human Health & the Environment (1=Low Protection; 5=Highly Protective) | | Permanence (1=Ineffective; 5=Effective) | | Effectiveness (1=Ineffective; 5=Effective) | | Management of Short-Term Risks (1=Ineffective; 5=Effective) | | Implementability (Technical & Administrative) (1=Low Feasibility; 5=High Feasibility) | | Public Acceptance (1=Low Acceptance; 5=High Acceptance) | | |
| | | | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | |
| **Criteria Weight (1= low project importance; 3= high project importance)** | | | **3** | | **3** | | **3** | | **1** | | **2** | | **1** | | |
| **Source Remediation Alternatives** | | | | | | | | | | | | | | | |
| **1** | **DPE with transition to MNA and ICs** | Continued operation of the on-site DPE system with connection of well field A, redevelopment of all current wells at some point during system operation, and improvements to aging treatment system. DPE wells that will be operated will target areas with the highest concentration of site specific COCs reducing the mass in the groundwater and soil vapor. The DPE system is assumed to operate continuously for 5 years with semi-annual monitoring, followed by 15 years of annual MNA groundwater monitoring. Near the end of this alternative, ICs will be implemented to provide on-going protection of human health and the environment. | 3 | This alternative is expected to be moderately protective, given the combination of DPE, MNA, and ICs. DPE has been conducted at the Site for several years to date with limited effectiveness. However, continued operation of DPE is expected to remove more additional COC mass; however, reaching CULs may be limited with DPE alone. ICs implemented following active remediation will be protective of human health under future site uses. | 3 | By extracting COC-impacted soil vapor and groundwater, remediation of the site is expected to be permanent. However, previous operation of the system over the past 10 years and results from the pilot system operation did not demonstrate high mass removal rates, particularly for heavy-range hydrocarbons, which are likely to remain sorbed to subsurface soil and slowly diffuse into the saturated zone. Therefore, this alternative is only expected to have a moderate level of permanence. | 1.5 | Continued operation may have limited effectiveness on additional mass removal at the site, limiting its effectiveness in comparison to other alternatives. In addition, there is reduced effectiveness of DPE when operated intermittently, which would likely happen due to funding availability for this project. | 3.5 | When operated effectively, DPE systems can, within a short time period, reduce risk for vapor instruction to indoor air and prevent downgradient migration of groundwater. This system is expected to manage short-term risk, as it has been shown historically to drawdown groundwater and contain the Site. The proposed upgrades and re-installation of wells are not expected to have a measurable short-term impact to human health or the environment, when best management practices are implemented. | 2 | This alternative is implementable, as the DPE system and groundwater monitoring well network have already been installed. However, there will likely be repairs or redrilling of up to 67% of the piping and wells, and some changes will be required within the treatment system associated with pumps, treatment vessels, gauges, and valves. In addition, there is a higher level of effort required to operate a DPE system than the bio-sparge system outlined in Alternative 3. The IWW permit will require a modification to account for increased discharge to the sanitary sewer. A land use covenant will be incorporated into the site deed for ICs and require landowner acceptance and coordination. | 2 | This alternative was already accepted by the public and is currently used at the facility. Likely upgrades to the system will have little impact on the public or local stakeholders. However, uncertainty in DPE's ability to reduce concentrations further at the Site maybe lower public acceptance. | **32** |
| **2** | **MNA/NSZD with ICs** | This alternative assumes no more active remedial action will be conducted at the site. Existing monitoring wells (up to 35 wells) within the source zone and the dissolved plume will be monitored for both NA and NSZD for an assumed time period of 30 years; however, monitoring may require an expanded timeframe and will be routinely evaluated, based on COC concentrations. Monitoring parameters include groundwater levels, dissolved electron acceptor reactants (dissolved oxygen, nitrate, and sulfate), dissolved electron acceptor products (dissolved iron and manganese), and potential breakdown product (methane). Furthermore, 25% of the wells will be monitored for presence of biodegrading bacteria, and NSZD rates will be re-evaluated every 5 years using the microcosm flux traps. ICs will be implemented to provide on-going protection of human health and the environment. | 1 | No active remediation or containment is proposed under this alternative. While NA and NSZD processes are likely occurring at the Site and may be protective with ICs over the long-term, protection of human health and the environment in the interim may be limited. | 1 | Site COCs can naturally volatilize, break down, or biodegrade over time. Mann Kendall statistical trends show that site COCs are stable or slowly decreasing across the site. NA/NSZD monitoring will enable evaluation of natural attenuation processes that will result in permanent removal of COCs at the site. However, this alternative is ranked to only have a moderate level of permanence, given the long timeframe expected for NA to occur. | 1.5 | May be effective over the long-term, as Site COCs can naturally volatilize, breakdown, or biodegrade over time. Mann Kendall statistical trends show that site COCs are stable or slowly decreasing across the plume. NA/NSZD monitoring will allow more detailed statistical analysis of these trends and timeframe to reach CULs will likely be long in comparison to other alternatives. | 4 | This alternative does not include additional construction activities and therefore~~,~~ eliminates additional short-term risk to workers and the surrounding population. However, this alternative does not provide short-term reduction in mass or mobility of the current COCs that remain in the subsurface at the site. | 4 | This alternative is highly implementable, as groundwater monitoring is already being performed at the site. Transitioning to annual MNA/NSZD monitoring will require additional laboratory analysis and data trend analysis. A land use covenant will be incorporated into the site deed for ICs and require landowner acceptance and coordination. | 1 | This alternative may be acceptable to many in the public, as it is inexpensive and unobtrusive. However, this alternative does not guarantee permanence, does not provide short-term protection of potential downgradient receptors, and is capped at 30 years but may extend to a longer timeframe pending COC concentrations. As a result, many in the public may find this unacceptable for potential risk to environmental health. | **24** |
| **3** | **Bio-Sparging with NSZD/MNA and ICs and with options for items below** | This alternative involves implementation of bio-sparge in areas of the site with elevated COCs and lower NSZD rates with MNA/NSZD implemented in the remaining areas. Bio-sparge will be implemented by modifying the current DPE well heads and network to inject air into the groundwater, enhancing aerobic conditions to promote biodegradation and volatilization of site-specific COCs. Existing wells within the source zone will be monitored to identify when COCs reach asymptotic conditions as a result of bio-sparging. This alternative is expected to operate for 8 years with semi-annual groundwater monitoring; however, system operations may require more than 8 years and will be routinely evaluated, based on COC concentrations. As COC concentrations stabilize they biosparge system will be turned off and followed by 10 years of annual MNA groundwater monitoring. Near the end of this alternative, ICs will be implemented to provide on-going protection of human health and the environment. This alternative may be implemented with one or more of the options below (concurrent SVE, concurrent groundwater extraction, or ISCO/aerobic biodegradation injections). | 3.5 | This alternative is expected to have moderately high protection of human health and the environment. This alternative is expected to enhance aerobic conditions through the injection of air, which will aid in the biodegradation of the majority of site-specific COCs. COC concentrations will be monitored throughout the alternative to evaluate protection of human health and the environment. ICs implemented following active remediation will be protective of human health under future site uses. | 4 | Bio-sparging is expected to have moderately high permanence in remediating VOC, SVOCs, and TPH, if NAPL is not present. NAPL has not been observed during the past three sampling events, but historical monitoring and current site TPH concentrations suggest NAPL may be present. If NAPL is present, it may diffuse into the saturate zone over time, reducing the level of effectiveness and permanence of this alternative. SVOCs at the site will not likely be fully degraded; however, SVOC concentrations are relatively low and not anticipated to be a current risk to groundwater. | 3.5 | Bio-sparing is likely to be effective at this site, along with MNA and ICs. Bio-sparging is expected to enhance aerobic conditions at the site, promoting volatilization and degradation of COCs. A pilot study was conducted during the Spring 2021 and demonstrated that bio-sparging can effectively reduce COC concentrations at the Site. In addition, since bio-sparge enhances natural attenuation mechanisms that are already occurring at the Site, bio-sparge operations can occurred intermittently or pulsed and still be effective. | 3.5 | While this alternative is expected to utilize the current DPE system, additional bio-sparging wells, system retrofits, and conveyance lines will likely need to be installed. These construction activities are unlikely to have a measurable short-term impact to human health or the environment, when best management practices are implemented. | 3.5 | Implementation of this alternative is expected to be feasible. This alternative will use the current groundwater monitoring well network and DPE system. Existing blowers will be replaced with compressors to allow the injection of air. Additional bio-sparging wells and some new conveyance lines will need to be installed. A land use covenant will be incorporated into the site deed for ICs and require landowner acceptance and coordination. | 4 | This alternative will likely have public acceptance, as it is likely to be effective, will utilize the current DPE system with limited additional construction, and will include monitoring and ICs to protect human and environmental health. Modifications to the existing system are anticipated to have some but likely minimal disruption to the site tenant. | **48** |
| *a* | *Concurrent SVE* | In conjunction with the bio-sparging, the extraction of soil vapors may be needed or required in order to reduce the potential migration of vapors released during air sparging into nearby buildings. This alternative will use preexisting DPE wells and new wells to extract soil vapors in and around existing on-site buildings that fall within the footprint of the bio-sparge operations. Sub-slab vapor monitoring will be conducted during operation. This alternative is expected to operate for 9 years, concurrent with bio-sparging with the same groundwater monitoring and ICs implemented under Alternative 3 above. | 3.5 | Same as Alternative 3, plus this alternative will include the protective benefits of extraction of soil vapors from beneath the vicinity buildings, which will reduce risk to human health via vapor intrusion. | 4 | Same as Alternative 3. | 3.5 | Same as Alternative 3. | 3.5 | Same as Alternative 3, plus implementation of SVE will have an immediate impact to reducing risk to human health via the vapor intrusion pathway at the site. | 3.5 | Same as Alternative 3, with the additional modifications and additions to the existing DPE system for SVE. The SVE additions are not anticipated to reduce the implementability of this Alternative compared to Alternative 3. | 4 | Same as Alternative 3, with likely added public benefit of SVE. | **48** |

**Table 5**
**Remedial Alternatives Evaluation**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Alternative | | | Evaluation Categories | | | | | | | | | | | | | Total Weighted Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alt No. | Name | Description | Protection of Human Health & the Environment (1=Low Protection; 5=Highly Protective) | | Permanence (1=Ineffective; 5=Effective) | | Effectiveness (1=Ineffective; 5=Effective) | | Management of Short-Term Risks (1=Ineffective; 5=Effective) | | Implementability (Technical & Administrative) (1=Low Feasibility; 5=High Feasibility) | | Public Acceptance (1=Low Acceptance; 5=High Acceptance) | | |
| | | | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | |
| Criteria Weight (1= low project importance; 3= high project importance) | | | 3 | | 3 | | 3 | | 1 | | 2 | | 1 | | |
| *b* | *Concurrent Groundwater Extraction* | This alternative includes the modification and operation of a groundwater extraction system to increase groundwater movement in the vicinity of bio-sparging wells, promoting movement of aerobic water throughout the site and expediting COC remediation. The bio-sparge/extraction system is expected to operate for 6 years with semi-annual groundwater monitoring, followed by 10 years of annual MNA. Groundwater will be extracted from 8 re-installed groundwater extraction wells (formerly DPE wells), using pneumatic pumps at the wellheads. The pneumatic pumps will require trenching for pneumatic lines to wells. Where available, the extracted water will use existing DPE conveyance lines, with additional conveyance added as needed. The extracted water will be treated on-site using the existing GAC treatment system and will be discharged under the existing IWW permit. Near the end of this alternative, ICs will be implemented to provide on-going protection of human health and the environment. | 3.5 | Same as Alternative 3. | 4 | Same as Alternative 3. However, this alternative may have slightly greater, because groundwater extraction is expected to increase subsurface mixing and groundwater movement, which will subsequently increase the effectiveness of bio-sparging and therefore mass removal at the site. | 3.5 | Same as Alternative 3 with added groundwater movement that may promote remediation in a shorter timeframe compared to bio-sparing alone. | 3.5 | Same as Alternative 3. | 3 | Same as Alternative 3 with added implementation challenges related to the addition of groundwater extraction. This alternative will include the installation of shallow groundwater extraction wells and trenching in the open parking area and inside the facility. As a result, these construction activities will likely include added coordination and disruption to current site activities. | 4 | Same as Alternative 3. | 47 |
| *c* | *Followed by ISCO/Aerobic Biodegradation* | Following bio-sparging, in situ chemical oxidation (ISCO) and aerobic bioremediation will be implemented prior to MNA. ISCO/Aerobic Biodegradation will be used to target areas where bio-sparging was insufficient to bring concentrations below the CULs and where statistical analyses suggest that MNA is not expected to bring concentrations below the CULs within a reasonable timeframe. This approach will utilize a modified Fenton's reagent to degrade remaining COCs within the injection ROI, while injected oxygen, nutrients, and microbial culture will facilitate long-term aerobic biodegradation at the site. Injections will be applied via a direct push rig at approximately 35 locations within the site. Bio-sparging is expected to occur for 8 years, followed by 3 years of annual injection events. The site will then transition to 3 years of MNA. Near the end of this alternative, ICs will be implemented to provide on-going protection of human health and the environment. | 4 | Same as Alternative 3, plus this alternative will also include the oxidation of remaining site COCs and promote long-term aerobic biodegradation, which will further reduce risk to human health and the environment. | 4.5 | Same as Alternative 3, plus ISCO/Aerobic Biodegradation is also expected to remediate residual VOCs, TPH, and SVOCs, either by short-term oxidation or long-term aerobic biodegradation. As such, this alternative is considered to be highly effective in permanence. | 4 | Same as Alternative 3, with the addition of in situ treatment of residual mass that may remain after bio-sparging. A treatability study and an additional pilot study will be conducted to evaluate effectiveness of ISCO/Aerobic Biodegradation, prior to full-scale implementation. The chemical oxidants and microbes proposed for this remedy have been shown to be effective for the site VOCs, SVOCs, and TPH. | 3 | Same as Alternative 3. Additionally, there will be some short-term risk to the site workers from the ISCO injection solution. Best management practices will be implemented to minimize these risks. | 3 | Same as Alternative 3, plus the ISCO/Aerobic Biodegradation injections, which will be coordinated around current site operations to minimize conflict with site tank farms and buildings, where possible. Surfacing may be a concern/challenge during implementation. | 4 | Same as Alternative 3 with added impact to the site tenant for implementation of the injections. The introduction to new bacteria to the subsurface for long-term remediation may have lower public acceptance, but the benign nature of the injected cultures should dispel public concern. | 51 |
| ***d*** | ***Expanded Biosparge Operations*** | In addition to the bio-sparge injection locations presented in Alternative 3, additional new wells and DPE wells will be utilized to increase bio-sparge coverage throughout the site footprint. This alternative will involve the operation of the biosparge system for 8 years and then transition to 10 years of MNA. Near the end of this alternative, ICs will be implemented to provide on-going protection of human health and the environment. | 3.5 | Same as Alternative 3; however, this alternative will include bio-sparge throughout the site and likely increase cleanup timeframes for portions of the Site. | 4 | Same as Alternative 3. | 3.5 | Same as Alternative 3; Even with expanded operations of bio-sparge, this alternative is not anticipated to be more effective than Alternative 3 | 3.5 | Same as Alternative 3. | 3 | Same as Alternative 3. | 4 | Same as Alternative 3. | 47 |
| **4** | **Excavation with MNA and ICs** | Soils within the Site boundary down to the aquitard at approximately 12 ft bgs will be excavated. Site infrastructure will be removed, including three buildings and numerous chemical storage tanks. Groundwater dewatering will occur during excavation activities. Since this alternative does not address off-site impacts, off-site wells will continue to be monitored for MNA. Excavation activities, including preparation of the site, in expected to take 1-2 years. MNA of off-site wells is assumed to occur for 4 years after completion of excavation activities. Near the end of this alternative, ICs may be implemented to provide on-going protection of human health and the environment. | 5 | Excavation will be protective of human health and the environment. Removal of soil from within the site boundary will eliminate a potential exposure pathways and eliminate source mass for down-gradient impacts. | 5 | Excavation will result in permanent removal of the on-site contaminant mass. MNA monitoring will allow for monitoring of off-site contaminant attenuation over time. As such, this alternative is considered to be highly effective in permanence. | 5 | Removal of the on-site contaminant mass is an effective measure. MNA monitoring will allow for monitoring of off-site contaminant attenuation over time. ICs will then be effective for the protection of human health under future land use scenarios. | 1 | Implementation of the excavation remedy will have a significant short-term impact on the site by disturbing impacted soil and terminating site operations. However, in a short time frame, risk associated from contaminants on the site will be mitigated by the removal of on-site contamination. | 1 | Excavation requires that the activities at the site be discontinued and site infrastructure removed. Excavation will need to be completed in stages to keep activities within site boundaries. Groundwater dewatering and treatment will need to be implemented. | 1 | Public acceptance is likely to be low, as it will increase traffic and noise in the area as infrastructure is removed, equipment is brought to the site, and building debris and excavated soil are removed from the site. In addition, this alternative is unlikely to be accepted by the property owner and tenant. | 49 |

**Table 5**
**Remedial Alternatives Evaluation**
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Alternative | | | Evaluation Categories | | | | | | | | | | | | Total Weighted Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alt No. | Name | Description | Protection of Human Health & the Environment (1=Low Protection; 5=Highly Protective) | | Permanence (1=Ineffective; 5=Effective) | | Effectiveness (1=Ineffective; 5=Effective) | | Management of Short-Term Risks (1=Ineffective; 5=Effective) | | Implementability (Technical & Administrative) (1=Low Feasibility; 5=High Feasibility) | | Public Acceptance (1=Low Acceptance; 5=High Acceptance) | | |
| | | | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | Score | Discussion | |
| **Criteria Weight (1= low project importance; 3= high project importance)** | | | 3 | | 3 | | 3 | | 1 | | 2 | | 1 | | |
| **Containment Alternatives** | | | | | | | | | | | | | | | |
| **5** | **Groundwater Containment via Extraction & Treatment with ICs** | This alternative includes the modification and operation of a groundwater extraction system to prevent the migration of contaminated groundwater off the northern site boundary. The extraction system is assumed to operate for 30 years, with semi-annual groundwater elevation monitoring and 30 years of annual groundwater sampling. Groundwater will be extracted from six newly installed groundwater extraction wells, using pneumatic pumps at the wellheads. The pneumatic pumps will require trenching for pneumatic lines to the wells. Where available, the extracted water will use existing DPE conveyance lines. The extracted water will be treated on-site using the existing DPE treatment system and will be discharged under the existing IWW permit. ICs will be implemented to provide on-going protection of human health and the environment. | 2.5 | This alternative is expected to be moderately protective of human health and the environment, given the combination of downgradient groundwater containment and ICs. Containment will be protective of downgradient receptors. However, no active remediation of the interior on-site source areas will occur, meaning protection of human health and the environment on-site is limited to ICs rather than mass removal. | 2 | The permanence of this alternative would be similar to Alternative 2. Containment of the site would not remove/remediate source mass. However, COCs at the site could naturally attenuate, consistent with Alternative 2, and there will be some mass removal from the subsurface from extraction and treatment of impacted groundwater at the downgradient boundary. | 1.5 | This alternative would be effective at protection of human health and the environment through the combination of containment and ICs; however, groundwater extraction would need to be continued long-term. This alternative may be effective, similar to Alternative 2, at reduction of Site COCs long-term, as COCs can naturally volatilize, breakdown, or biodegrade over time. A pump test is proposed to be implemented to confirm the effectiveness of groundwater extraction to effectively contain the site. | 3.5 | New extraction wells and associated trenching for pneumatic lines and conveyance lines will be installed and modifications/upgrades to the existing treatment system will be needed. These construction activities are unlikely to have a measurable short-term impact to human health or the environment, when best management practices are implemented. In addition, initiation of extraction will likely establish containment within a short-time frame, providing protection to downgradient ecological receptors in the short-term. | 3.5 | This alternative will include the installation of shallow groundwater extraction wells and trenching to install conveyance lines. These activities will likely include some coordination with on-site activities. The wells and trenching will be in the open parking area on the northern edge of the property, and as a result, may be easier to implement. Long-term operation along the northern property boundary should be fairly easy to implement given location relative to on-site activities. | 2.5 | This alternative may be acceptable to many in the public, as it eliminates off-site contaminant migration, and combined with ICs, provides protection of human health and the environment. However, this alternative may result in remaining contaminant mass at the site, which may lower public acceptance. | **31** |
| **6** | **Bio-Sparging Treatment Zone at Downgradient Site Boundary with ICs** | This alternative involves the installation of 34 wells and associated trenching and transfer lines on the northern edge of the property to create a bio-sparge barrier that will create an aerobic environment, which will promote biodegradation of site-specific COCs prior to leaving the property boundary. This alternative is expected to operate for 30 years, with 30 years of semi-annual groundwater monitoring. ICs will be implemented to provide on-going protection of human health and the environment. | 2.5 | This alternative is expected to be moderately protective of human health and the environment, given the combination of downgradient groundwater treatment and ICs. Treatment at the northern site boundary will be protective of downgradient receptors. However, no active remediation of the interior on-site source areas will occur, meaning protection of human health and the environment on-site is limited to ICs rather than mass removal. | 2 | The permanence of this alternative would be similar to Alternative 2. This alternative would not remove/remediate source mass. However, COCs at the site could naturally attenuate, consistent with Alternative 2, and there will be some remediation of mass in groundwater at the downgradient boundary. | 1.5 | Would be effective at protection of human health and the environment through the combination of the treatment zone and ICs; however, bio-sparging would need to be continued long-term. Maybe effective, similar to Alternative 2, at reduction of Site COCs long-term, as COCs can naturally volatilize, breakdown, or biodegrade over time. A pilot test is proposed to confirm the effectiveness of bio-sparging at reducing COCs in groundwater before migrating off-site. | 3.5 | As part of this alternative, 34 wells and associated conveyance line and trenching will be installed, in addition to modifications/upgrades to the existing treatment system. These construction activities are unlikely to have a measurable short-term impact to human health or the environment, when best management practices are implemented. In addition, initiation of extraction will likely establish containment within a short-time frame, providing protection to downgradient ecological receptors in the short-term. | 4 | This alternative will include the installation wells and trenching to install conveyance lines. These activities will likely include some coordination with on-site activities. The wells and trenching will be in the open parking area on the northern edge of the property, and as a result, may be easier to implement. Long-term operation along the northern property boundary should be fairly easy to implement given location relative to on-site activities. | 2.5 | This alternative may be acceptable to many in the public, as it remediates groundwater migrating off-site, and combined with ICs, provides protection of human health and the environment. However, this alternative may result in remaining contaminant mass at the site, which may lower public acceptance. | **32** |

Notes:

a. Protection of human health & the environment need to be "Yes" for an alternative to be eligible for selection.

COC - Constituent of Concern
ICs - Institutional Controls
DPE - Dual Phase Extraction
SVE - Soil Vapor Extraction
MNA - Monitored Natural Attenuation
O&M - operation and maintenance
NA - Natural Attenuation
NSZD - Natural Source Zone Depletion
SVOC - Semi-Volatile Organic Compound
VOC - Volatile Organic Compound
ISCO - In Situ Chemical Oxidation

**Table 6**

**Disproportionate Cost Analysis**

Site Remedy Review - Focused Feasibility Study

Former Lilyblad Cleanup Site

Tacoma, Washington

| Alternative Number and Name | Criteria Weight (1= low project importance; 3= high project importance) | Alternative 1 | | Alternative 2 | | Alternative 3 | | Alternative 3a | | Alternative 3b | | Alternative 3c | | Alternative 3d | | Alternative 4 | | Alternative 5 | | Alternative 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **DPE with transition to MNA and ICs** | | **MNA/NSZD with ICs** | | **Bio-Sparging with NSZD/MNA and ICs** | | **Bio-Sparging with Concurrent SVE with transition to MNA and ICs** | | **Bio-Sparging with Concurrent Groundwater Extraction with transition to MNA and ICs** | | **Bio-Sparging with ISCO/Aerobic Biodegradation with transition to MNA and ICs** | | **Expanded Bio-Sparging Operations** | | **Excavation with MNA and ICs** | | **Groundwater Containment via Extraction & Treatment with ICs** | | **Bio-Sparging Treatment Zone at Downgradient Site Boundary with ICs** | |
| *Comparative Overall Benefit* | | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** | **Score** | **Weighted Score** |
| **Protection of Human Health & the Environment** | *3* | 3 | 9 | 1 | 3 | 3.5 | 10.5 | 3.5 | 10.5 | 3.5 | 10.5 | 4 | 12 | 3.5 | 10.5 | 5 | 15 | 2.5 | 7.5 | 2.5 | 7.5 |
| **Permanence** | *3* | 3 | 9 | 1 | 3 | 4 | 12 | 4 | 12 | 4 | 12 | 4.5 | 13.5 | 4 | 12 | 5 | 15 | 2 | 6 | 2 | 6 |
| **Effectiveness** | *3* | 1.5 | 4.5 | 1.5 | 4.5 | 3.5 | 10.5 | 3.5 | 10.5 | 3.5 | 10.5 | 4 | 12 | 3.5 | 10.5 | 5 | 15 | 1.5 | 4.5 | 1.5 | 4.5 |
| **Management of Short-Term Risks** | *1* | 3.5 | 3.5 | 4 | 4 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3 | 3 | 3.5 | 3.5 | 1 | 1 | 3.5 | 3.5 | 3.5 | 3.5 |
| **Implementability** | *2* | 2 | 4 | 4 | 8 | 3.5 | 7 | 3.5 | 7 | 3 | 6 | 3 | 6 | 3 | 6 | 1 | 2 | 3.5 | 7 | 4 | 8 |
| **Public Acceptance** | *1* | 2 | 2 | 1 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 1 | 2.5 | 2.5 | 2.5 | 2.5 |
| ***Overall Weighted Benefit Score*** | | | **32** | | **24** | | **48** | | **48** | | **47** | | **51** | | **47** | | **49** | | **31** | | **32** |

| **Disproportionate Cost Analysis - Quantitative Evaluation** | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 3a | Alternative 3b | Alternative 3c | Alternative 3d | Alternative 4 | Alternative 5 | Alternative 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Overall Weighted Benefit Score | 32 | 24 | 48 | 48 | 47 | 51 | 47 | 49 | 31 | 32 |
| Estimated Remedy Cost (2021 Dollars; +50%/-30%) | **$3,220,000** | **$2,160,000** | **$3,520,000** | **$4,570,000** | **$4,520,000** | **$4,760,000** | **$3,830,000** | **$12,210,000** | **$5,950,000** | **$5,770,000** |
| Estimated Remedy Cost Range (+50%/-30%) | $2,250,000-$4,830,000 | $1,510,000-$3,240,000 | $2,460,000-$5,280,000 | $3,190,000-$6,860,000 | $3,160,000-$6,780,000 | $3,330,000-$7,140,000 | $2,680,000-$5,750,000 | $8,540,000-$18,320,000 | $4,160,000-$8,930,000 | $4,030,000-$8,660,000 |
| **Relative Benefit/Cost Ratio*** | **21** | **24** | **29** | **22** | **22** | **23** | **26** | **9** | **11** | **12** |
| Estimated Remedy Cost NPV | $2,780,000 | $1,445,000 | $3,055,000 | $3,970,000 | $4,151,000 | $3,955,000 | $3,835,000 | $12,000,000 | $4,040,000 | $4,110,000 |
| Relative Benefit/Cost NPV Ratio* | 17 | 24 | 22 | 17 | 16 | 18 | 18 | 6 | 11 | 11 |
| **Preferred Alternatives (for additional evaluation on Table 5)** | No | **Yes** | **Yes** | No** | No | No** | No | No | No | No |

**Notes:**

Relative Benefits Ranking for Disproportionate Cost Analysis (Washington Administrative Code [WAC] 173-340-360[2][b][i] and WAC 173-340-360[3][f])

All non-NPV costs are in 2020 dollars.

NPV = Net present value assuming an annual rate of 3%.

* Benefit/Cost Ratio scaled by lowest cost alternative in order to compare ranges similar in scale to comparative overall benefit.

**SVE and ISCO/Aerobic Biodegredation recommended to be retained as contingency measures.

# Table 7
## Disproportionate Cost Analysis - Preferred Alternative Timeframe Sensitivity Analysis
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Tacoma, Washington

| Alternative Number and Name | *Criteria Weight (1= low project importance; 3= high project importance)* | Alternative 2 - MNA/NSZD with ICs | | | | Alternative 3 - Bio-Sparging with NSZD/MNA and ICs | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 30 year Timeframe | | 85 year Timeframe | | 18 year Timeframe (8 years bio-sparge; 10 years MNA) | | 30 year Timeframe (20 years bio-sparge; 10 years MNA) | |
| *Comparative Overall Benefit* | | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score | Score | Weighted Score |
| **Protection of Human Health & the Environment** | *3* | 1 | 3 | 1 | 3 | 3.5 | 10.5 | 3.5 | 10.5 |
| **Permanence** | *3* | 1 | 3 | 1 | 3 | 4 | 12 | 4 | 12 |
| **Effectiveness** | *3* | 1.5 | 4.5 | 1 | 3 | 3.5 | 10.5 | 3.5 | 10.5 |
| **Management of Short-Term Risks** | *1* | 4 | 4 | 4 | 4 | 3.5 | 3.5 | 3.5 | 3.5 |
| **Implementability** | *2* | 4 | 8 | 3 | 6 | 3.5 | 7 | 3 | 6 |
| **Public Acceptance** | *1* | 1 | 1 | 0 | 0 | 4 | 4 | 4 | 4 |
| ***Overall Weighted Benefit Score*** | | | **24** | | **19** | | **48** | | **47** |

| **Disproportionate Cost Analysis - Quantitative Evaluation** | Alternative 2 - 30 year Timeframe | Alternative 2 - 85 year Timeframe | Alternative 3 - 18 year Timeframe | Alternative 3 - 30 year Timeframe |
|---|---|---|---|---|
| Overall Weighted Benefit Score | 24 | 19 | 48 | 47 |
| Estimated Remedy Cost (2021 Dollars; +50%/-30%) | **$2,160,000** | **$3,740,000** | **$3,520,000** | **$5,250,000** |
| Estimated Remedy Cost Range (+50%/-30%) | $1,510,000-$3,240,000 | $2,610,000-$5,610,000 | $2,460,000-$5,280,000 | $3,670,000-$7,880,000 |
| **Relative Benefit/Cost Ratio*** | **24** | **19** | **29** | **33** |
| Estimated Remedy Cost NPV | $1,445,000 | $1,725,000 | $3,055,000 | $4,015,000 |
| Relative Benefit/Cost NPV Ratio* | 24 | 19 | 22 | 20 |
| **Recommended Alternative** | **No** | | **Yes** | |

**Notes:**
Relative Benefits Ranking for Disproportionate Cost Analysis (Washington Administrative Code [WAC] 173-340-360[2][b][i] and WAC 173-340-360[3][f])
All non-NPV costs are in 2020 dollars.
NPV = Net present value assuming an annual rate of 3%.
* Benefit/Cost Ratio scaled by lowest cost alternative for each timeframe option, in order to compare ranges similar in scale to comparative overall benefit.

# FIGURES


**Legend**

- Fence
- Rail Line
- Road
- Approximate Site Boundary
- Tax Lot
- Building
- Tank

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
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N

0 50 Feet

**Site Location Map**

Site Review Report
2244 Port of Tacoma Road,
Tacoma, Washington

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**Figure**

**1**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 1 Site Location.mxd 10/13/2021 12:13:38 PM


**Legend**

- Potential Outfall
- Storm Sewer Location (Approximate)
- Approximate Site Boundary
- Building
- Tank

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Notes:
The 2004 Supplemental Remedial Investigation Report (CH2M Hill, 2004) identified a potential groundwater discharge pathway to Blair Waterway via the Port of Tacoma storm sewer bedding and the Lincoln Avenue Ditch.

N

0 240 Feet

**Site and Vicinity Layout**

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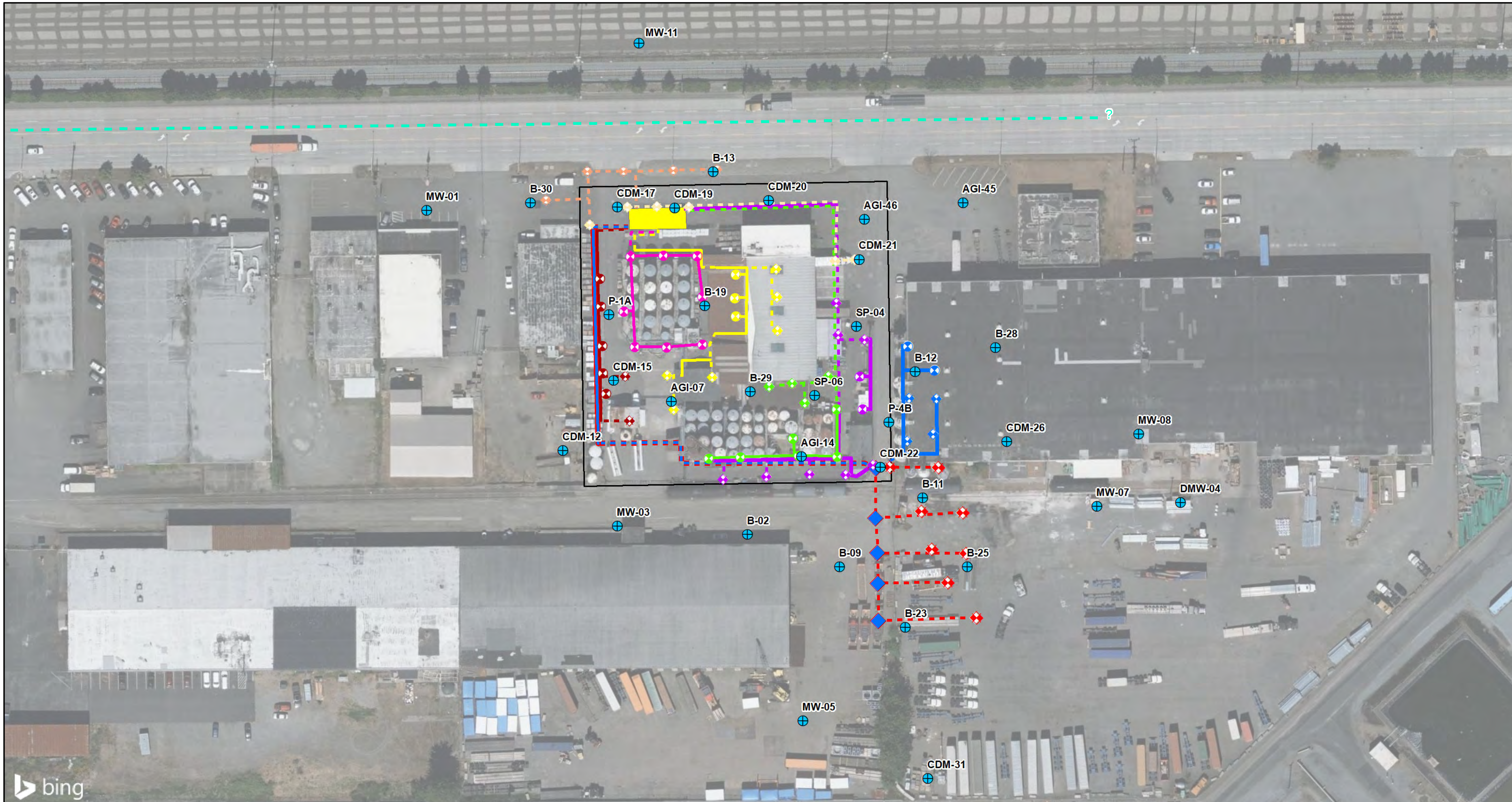
| PNR0697 | April 2022 | Figure 2 |
|---|---|---|

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 2 Site Layout Map.mxd 10/13/2021 12:20:42 PM




**Legend**

- Groundwater Monitoring Well Location
- Below Grade Recovery Well, A
- Above Grade Recovery Well, B
- Below Grade Recovery Well, B
- Above Grade Recovery Well, C
- Below Grade Recovery Well, C
- Above Grade Recovery Well, D
- Below Grade Recovery Well, D
- Above Grade Recovery Well, E
- Below Grade Recovery Well, E
- Above Grade Recovery Well, F
- Below Grade Recovery Well, F
- Above Grade Recovery Well, G
- Below Grade Recovery Well, H
- Below Grade Recovery Well, I
- Vault
- Field A, Below
- Field A/B,
- Field A/B,
- Field B, Above
- Field B, Below
- Field C, Above
- Field C, Below
- Field D, Above
- Field D, Below
- Field E, Above
- Field E, Below
- Field F, Above
- Field F, Below
- Field G, Above
- Field G, Below
- Field H, Below
- Field I, Below
- Storm Sewer Location (Approximate)
- Remedial Equipment Compound
- Parcel Boundary

Notes:
DPE = Dual Phase Extraction

N

0 80 Feet

**DPE Well Field Map**

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| PNR0697 | April 2022 |
|---|---|

**Figure 3**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 3 DPE Well Field Map.mxd 10/13/2021 12:23:46 PM


**Legend**

Monitoring Well

Rail Line

N

0 25 50 100 Feet

**Monitoring Well Locations**

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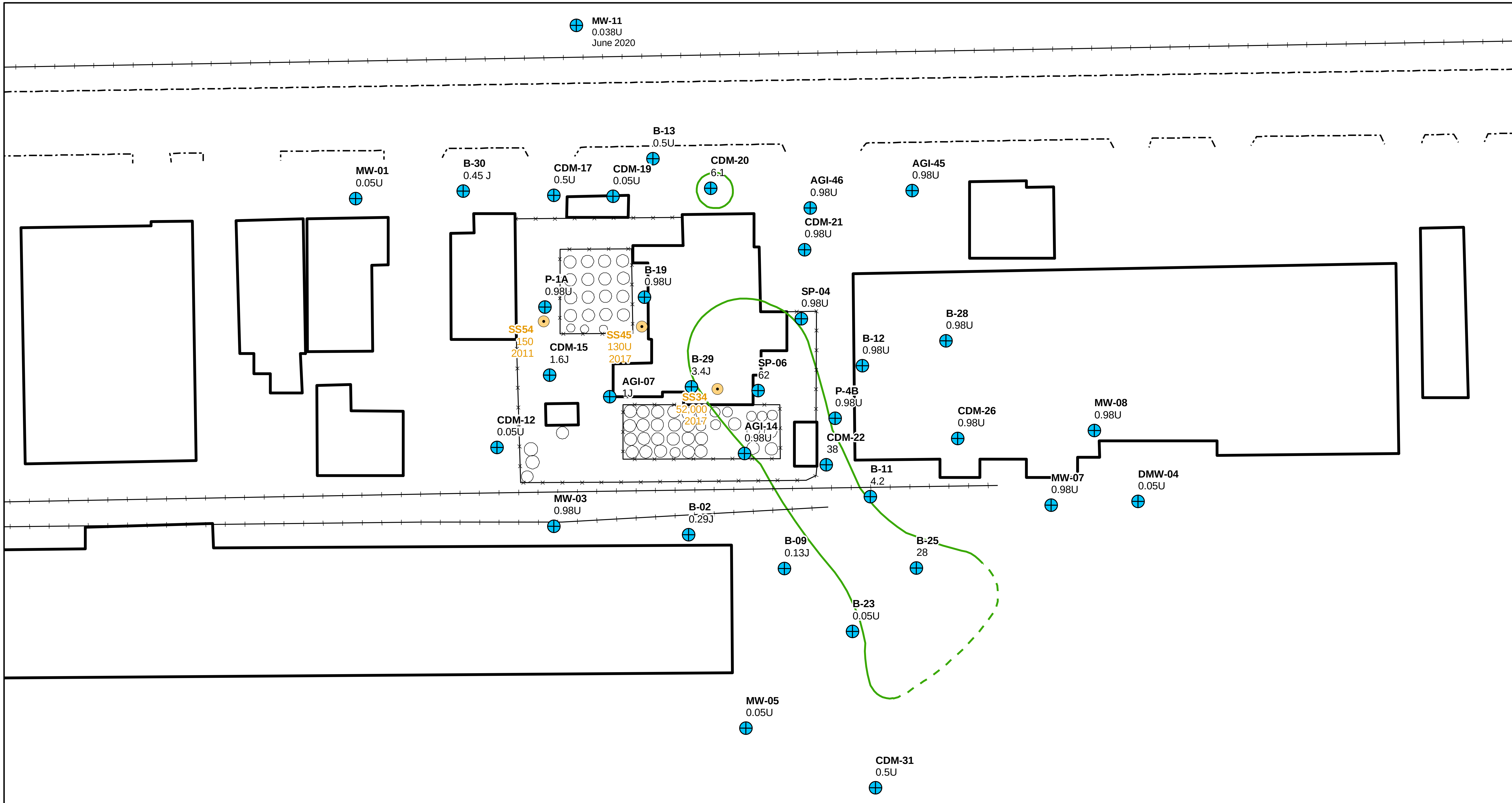
**Figure 4**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 4 Monitoring Well Locations.mxd 10/13/2021 12:25:57 PM




**Legend**

- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**1,4-Dichlorobenzene**

**Groundwater Isoconcentration Contours (µg/l)**

> 4.86 (GW CUL)

CDM-20 — Monitoring Well ID
6.1 — Concentration of 1,4-dichlorobenzene (µg/L)
2017 — Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 4.86 µg/L
Soil Cleanup Level = 64.6 µg/kg
Groundwater contours dashed where inferred
Concentrations shown are from samples collected in March 2020 except for MW-11 (June 2020) or unless otherwise indicated.

**1,4-Dichlorobenzene Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**

Site Review Report
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Tacoma, Washington

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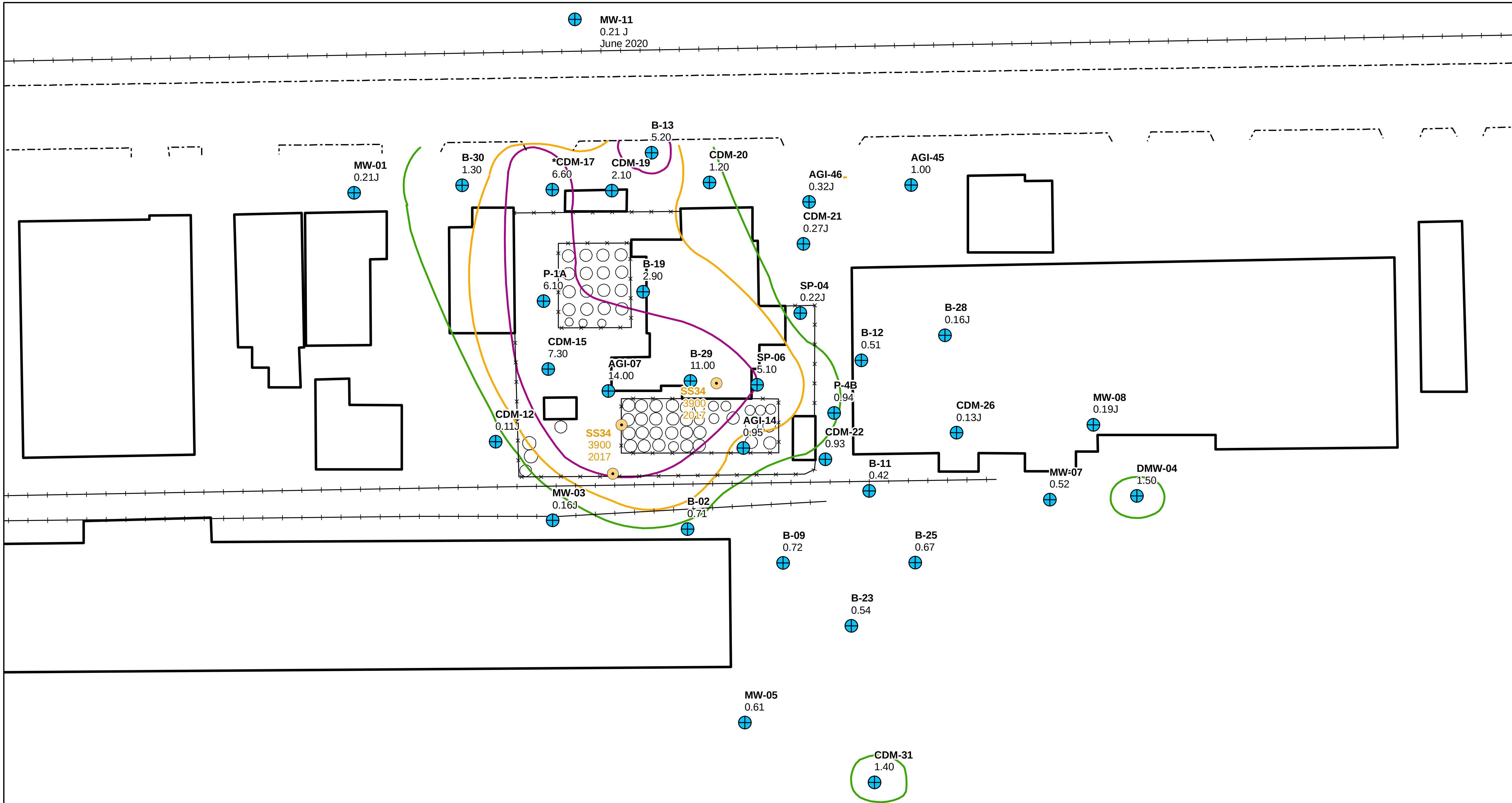
**Figure**

**5a**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 6a Interpolated 1,4-Dichlorobenzene Concentrationv2.mxd 10/13/2021 12:35:46 PM




**Legend**

- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**Motor Oil (>C24-C36)**

**Groundwater Isoconcentration Contours (mg/l)**

- > 1 (GW CUL)
- > 2 (2xGW CUL)
- > 5 (5xGW CUL)

CDM-20 —Monitoring Well ID
6.1 —Concentration of Motor Oil (>C24-C36) (mg/L)
2017 —Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
mg/l = milligrams per liter
mg/kg = milligrams per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 1.0 mg/L
Soil Cleanup Level = 2,000 mg/kg
Concentrations shown are from samples collected in March 2020 except for MW-11 (June 2020) or unless otherwise indicated.
*- Data may be anomolous based on historical concentrations and June 2021 results (Appendix B).

N

0 80 Feet

**Motor Oil (>C24-C36) Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**
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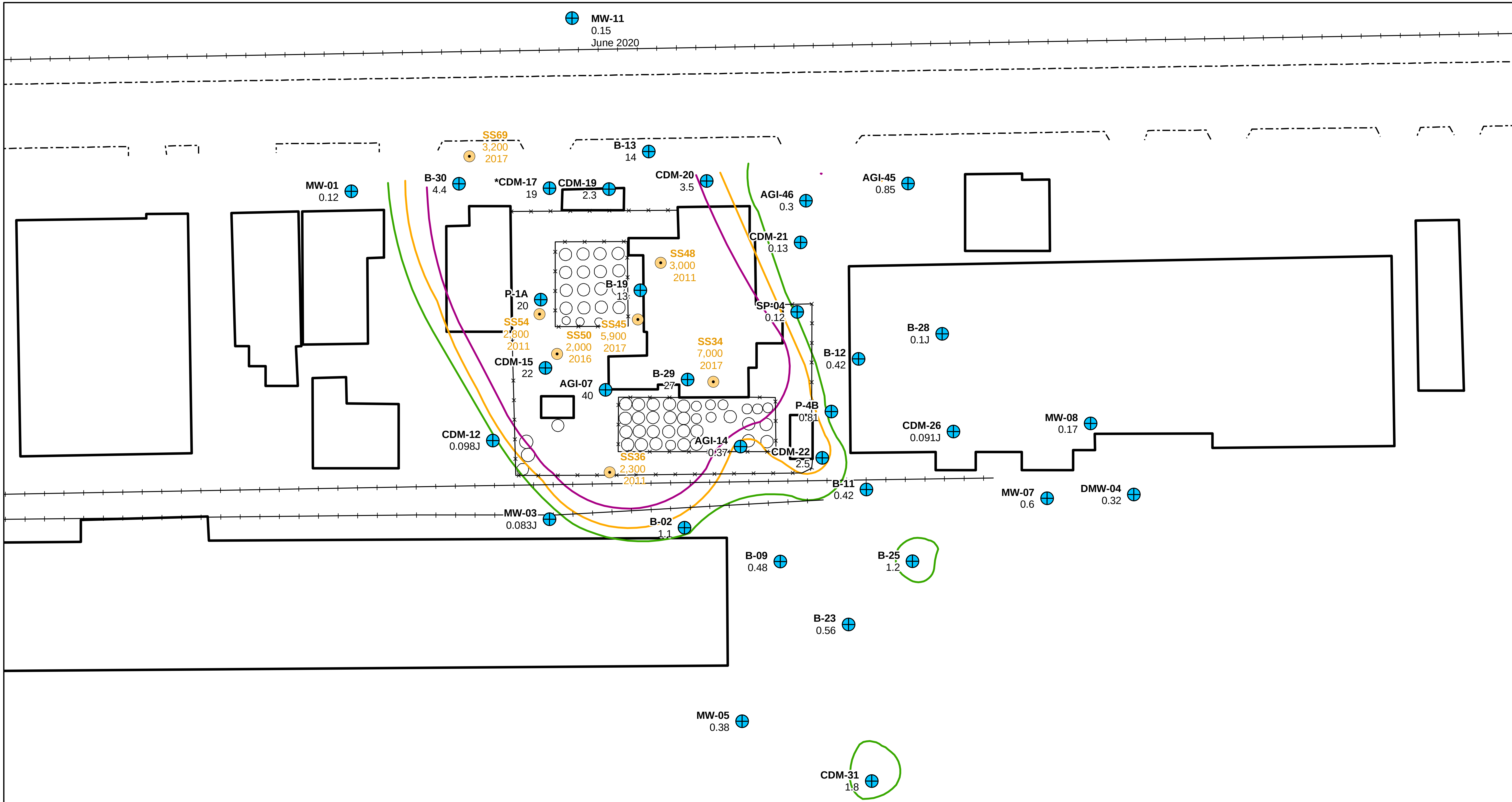
| PNR0697 | April 2022 | Figure 5b |
|---|---|---|

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 5b Interpolated Motor Oil Concentrationv2.mxd 2/18/2022 10:45:56 AM




**Legend**

- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**#2 Diesel (C10-C24)**

**Groundwater Isoconcentration Contours (mg/L)**

- > 1 (GW CUL)
- > 2 (2xGW CUL)
- >5 (5xGW CUL)

**CDM-20** —Monitoring Well ID
6.1 —Concentration of #2 Diesel (C10-C24) (mg/L)
2017 —Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
mg/l = milligrams per liter
mg/kg = milligrams per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 1 mg/L
Soil Cleanup Level = 2,000 mg/kg
Concentrations shown are from samples collected in March 2020 except for MW-11 (June 2020) or unless otherwise indicated.
*- Data may be anomolous based on historical concentrations and June 2021 results (Appendix B).

N

0 80 Feet

**#2 Diesel (C10-C24) Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**
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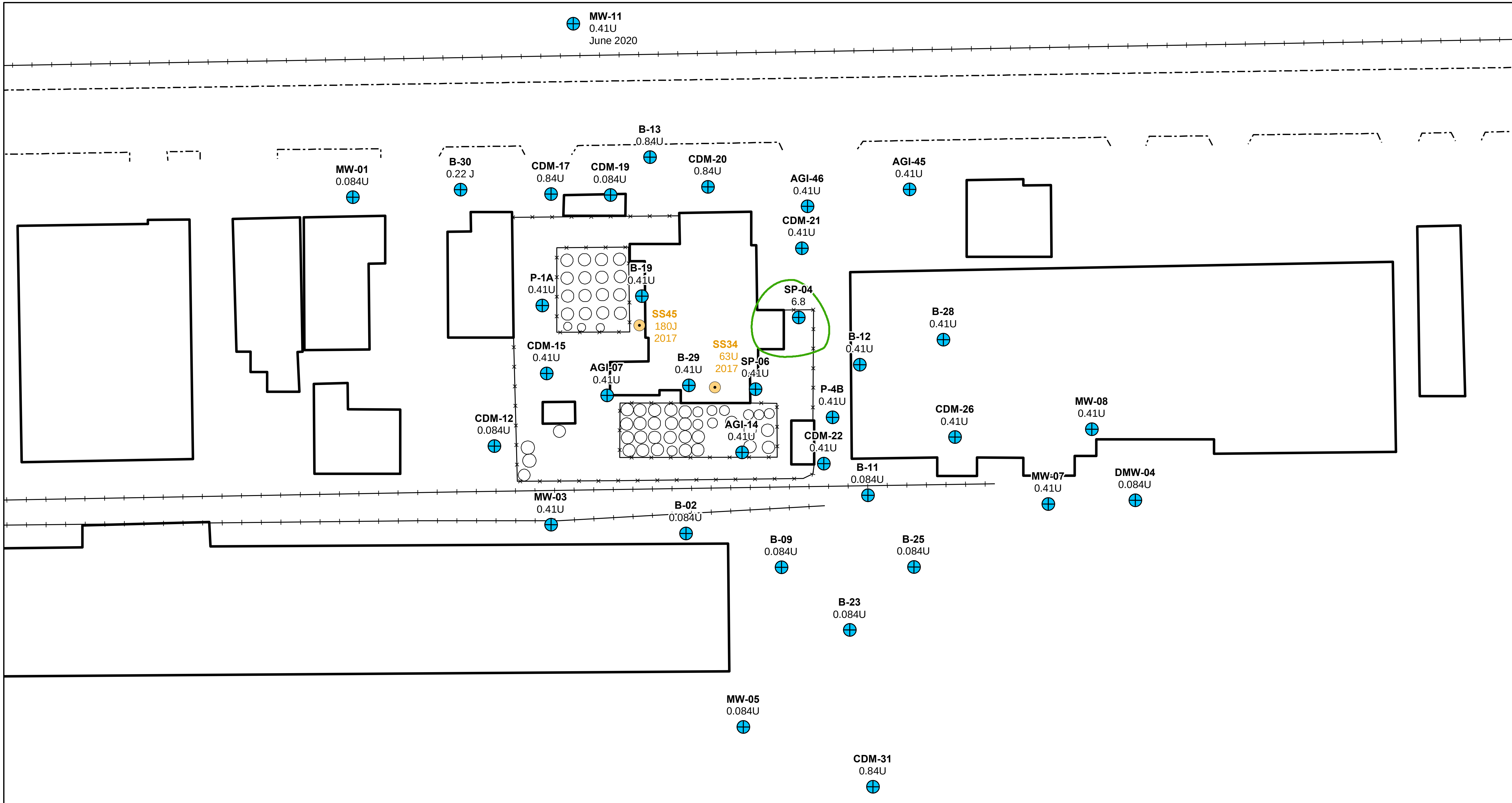
**Figure**
**5c**

PNR0697 | April 2022




**Legend**

- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**PCE**

**Groundwater Isoconcentration Contours (µg/l)**

> 3.3 (GW CUL)

CDM-20 —Monitoring Well ID
6.1 —Concentration of PCE (µg/L)
2017 —Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 3.3 µg/L
Soil Cleanup Level = 24.5 µg/kg
Concentrations shown are from samples collected in March 2020 except for MW-11 (June 2020) or unless otherwise indicated.

**PCE Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**

Site Review Report
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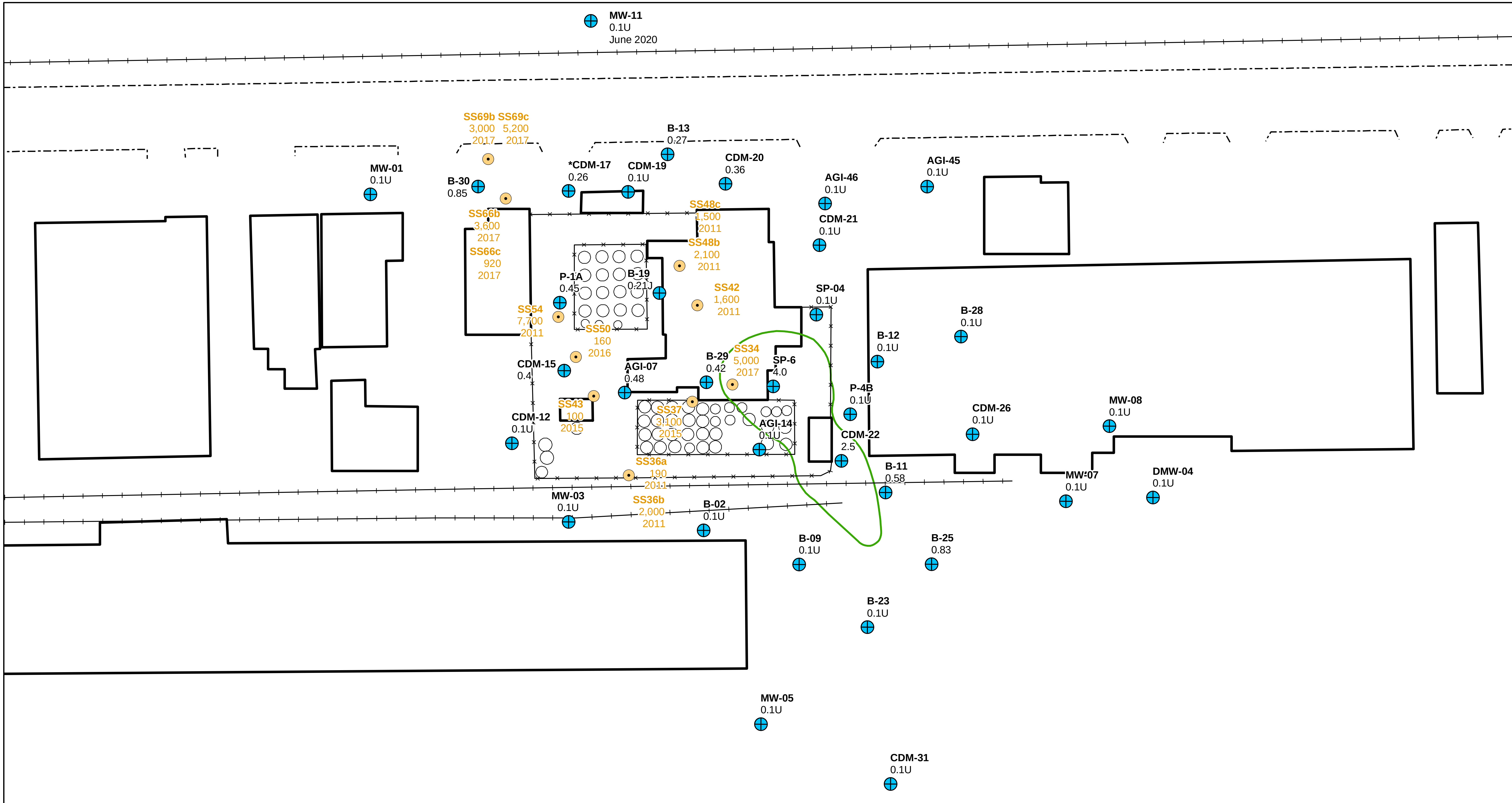
| PNR0697 | April 2022 | Figure 5d |
| --- | --- | --- |




**Legend**

- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**TPH as Gasoline**

**Groundwater Isoconcentration Contours (mg/l)**

> 1 (GW CUL)

CDM-20 — Monitoring Well ID
6.1 — Concentration of TPH as Gasoline (mg/L)
2017 — Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
mg/l = micrograms per liter
mg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 1 mg/L
Soil Cleanup Level = 100 mg/kg
Concentrations shown are from samples collected in March 2020 except for MW-11 (June 2020) or unless otherwise indicated.
*- Data may be anomolous based on historical concentrations and June 2021 results (Appendix B).

N

0 80 Feet

**TPH as Gasoline Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**
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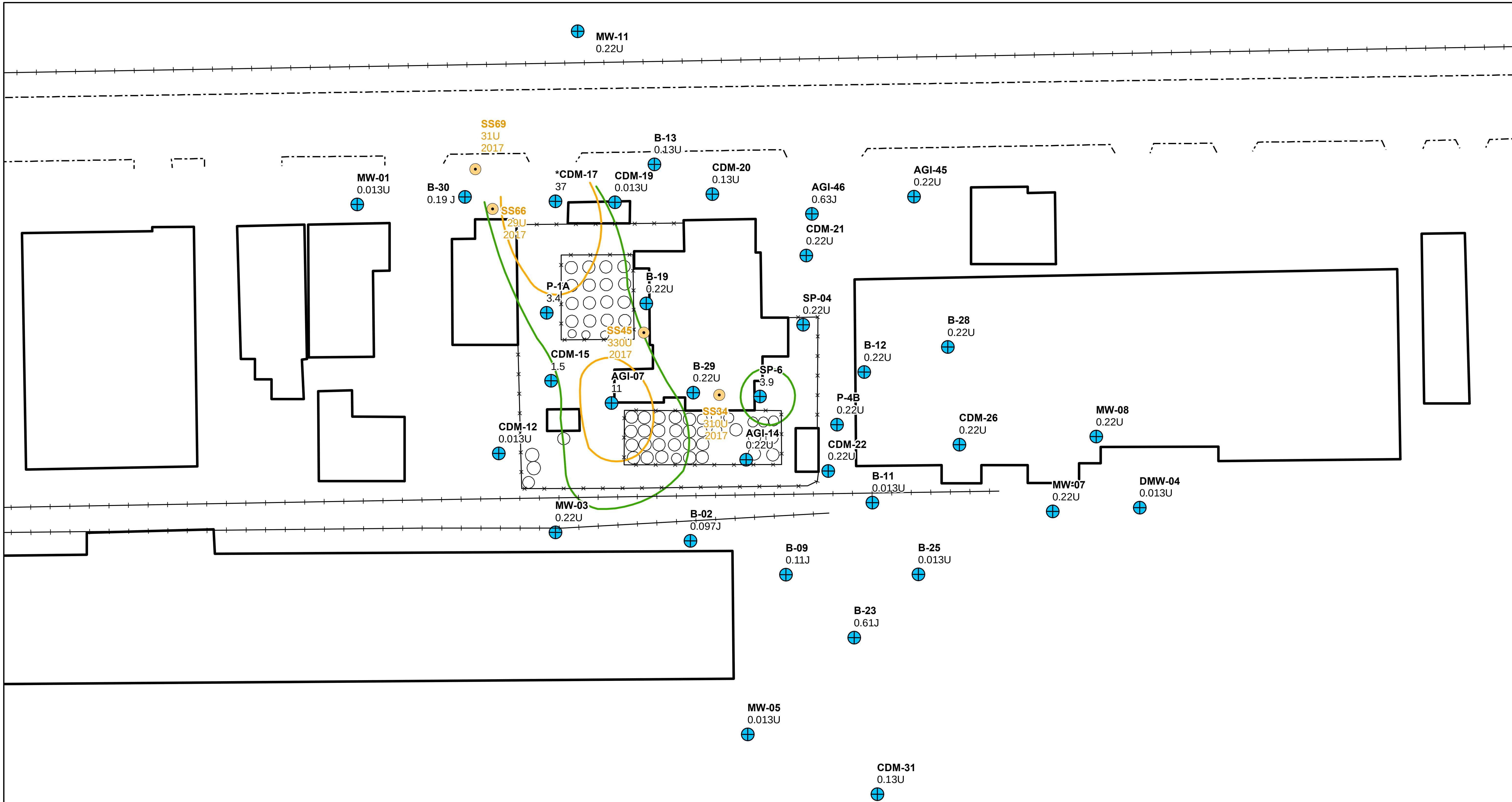
| | | |
|---|---|---|
| PNR0697 | April 2022 | Figure 5e |

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 5e Interpolated TPH as Gasoline Concentrationv2.mxd 2/18/2022 9:09:19 AM




Legend
- Groundwater Monitoring Well Location
- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

**Vinyl Chloride**
**Groundwater Isoconcentration Contours (µg/l)**
- > 2.4 (GW CUL)
- > 4.8 (2xGW CUL)

CDM-20 — Monitoring Well ID
6.1 — Concentration of Vinyl Chloride (µg/L)
2017 — Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 2.40 µg/L
Soil Cleanup Level = 7.91 µg/kg
Concentrations shown are from samples collected in March 2020 unless otherwise indicated.
*- Data may be anomolous based on historical concentrations and June 2021 results (Appendix B).

N
0 80 Feet

**Vinyl Chloride Groundwater Concentrations (March 2020) and Historical Soil Cleanup Level Exceedances**
Site Review Report
2244 Port of Tacoma Road,
Tacoma, Washington

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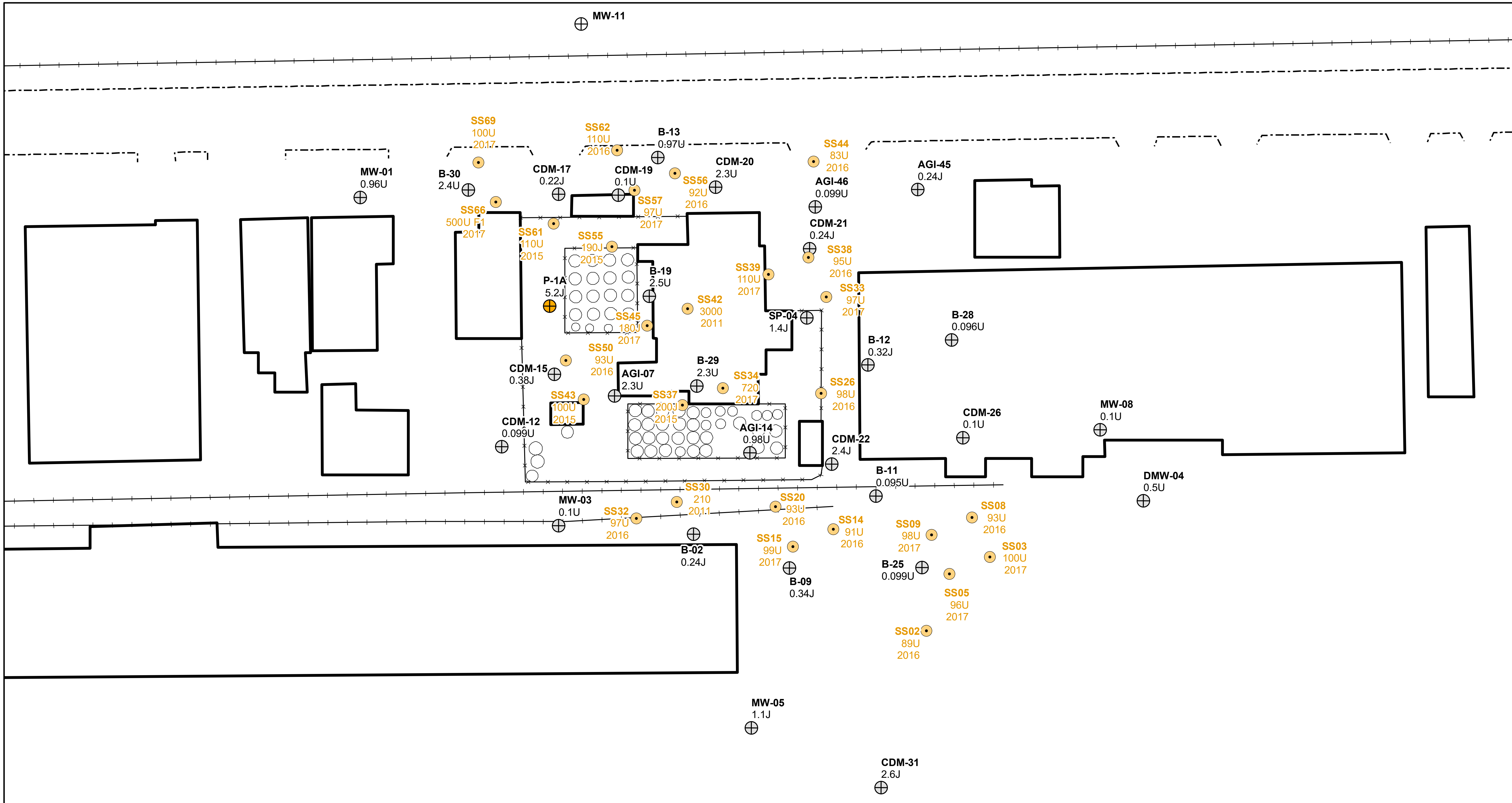
PNR0697 | April 2022

**Figure 5f**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 5f Interpolated Vinyl Chloride ConcentrationV2.mxd 2/18/2022 9:10:23 AM




**Legend**

**Pentachlorophenol Groundwater Locations (µg/l)**

- ⊗ <= 3
- ⊗ <3 (GW CUL)
- ● Soil CUL Exceedance Location

- Fence
- Rail Line
- Road
- Building
- Tank

CDM-20 — Monitoring Well ID
6.1 — Concentration of Pentachlorophenol (µg/L)
2017 — Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
µg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 3 µg/L
Groundwater results shown are from 2017 and 2018, when there was widespread sampling with laboratory reporting limits below the CUL. June 2021 sampling had a smaller number of wells sampled and similar results.
Soil Cleanup Level = 37.97 µg/kg
2017 soil locations were sampled in January, March, April, September, and October.
2018 soil locations were sampled in April and July.

N

0 80 Feet

**Pentachlorophenol Groundwater Concentrations (2017-2018) and Historical Soil Cleanup Level Exceedances**
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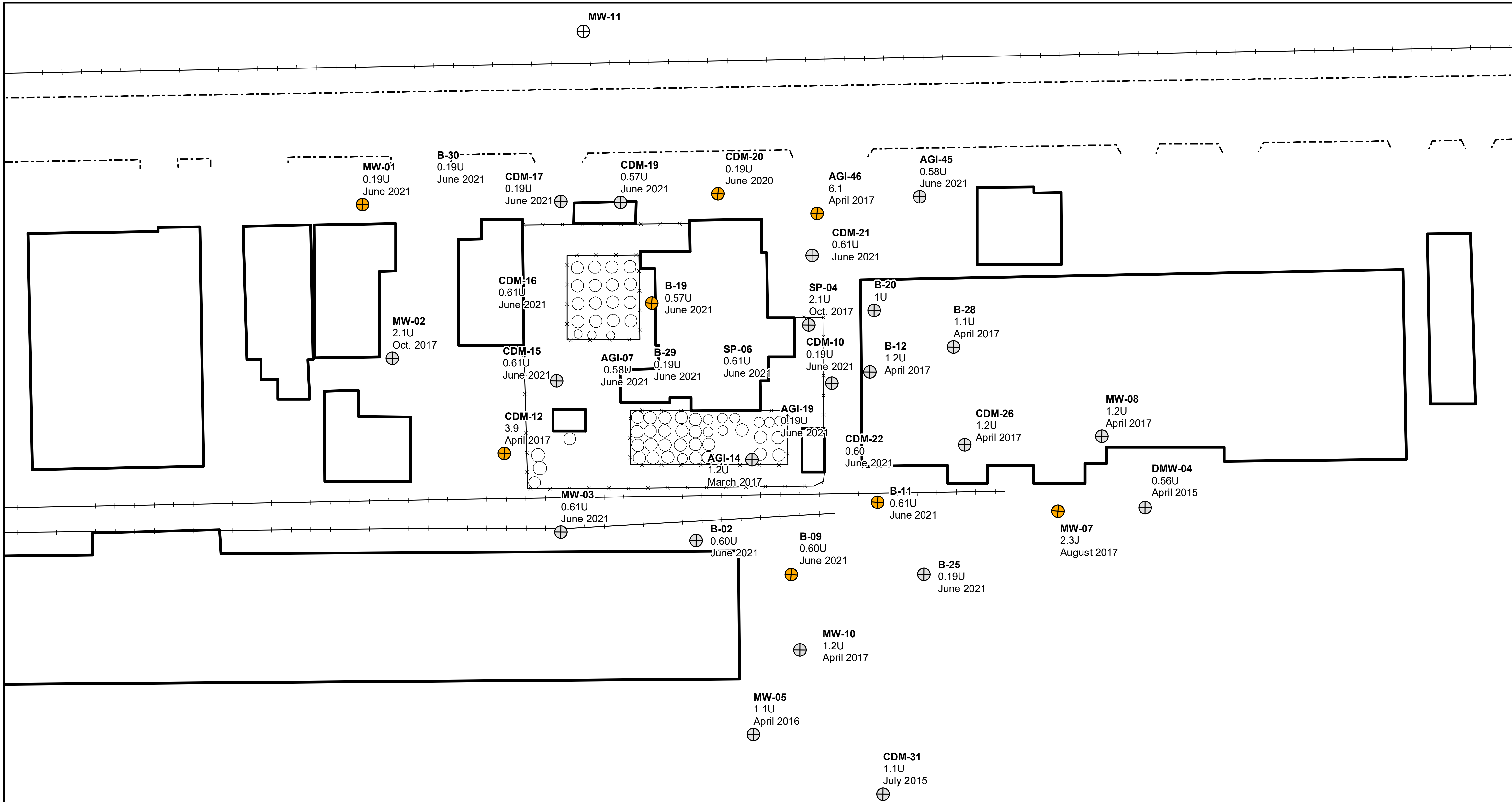
**Figure 5g**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 6g Pentachlorophenol Concentration.mxd 10/13/2021 12:55:30 PM




**Legend**

**bis(2-Ethylhexyl)phthalate Groundwater Sample Locations (µg/l)**

- <= 2.2
- > 2.2 (GW CUL)

CDM-20 —Monitoring Well ID
6.1 —Concentration of bis(2-Ethylhexl)phtalate (µg/L)
2017 —Year Sample Collected

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 2.2 µg/L
Groundwater data posted is the most recent result with detection or non-detect result with laboratory method detection limits below CUL.

N

0 80 Feet

**bis(2-Ethylhexyl)phthalate Groundwater Concentrations (2015-2021)**

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**Figure 5h**

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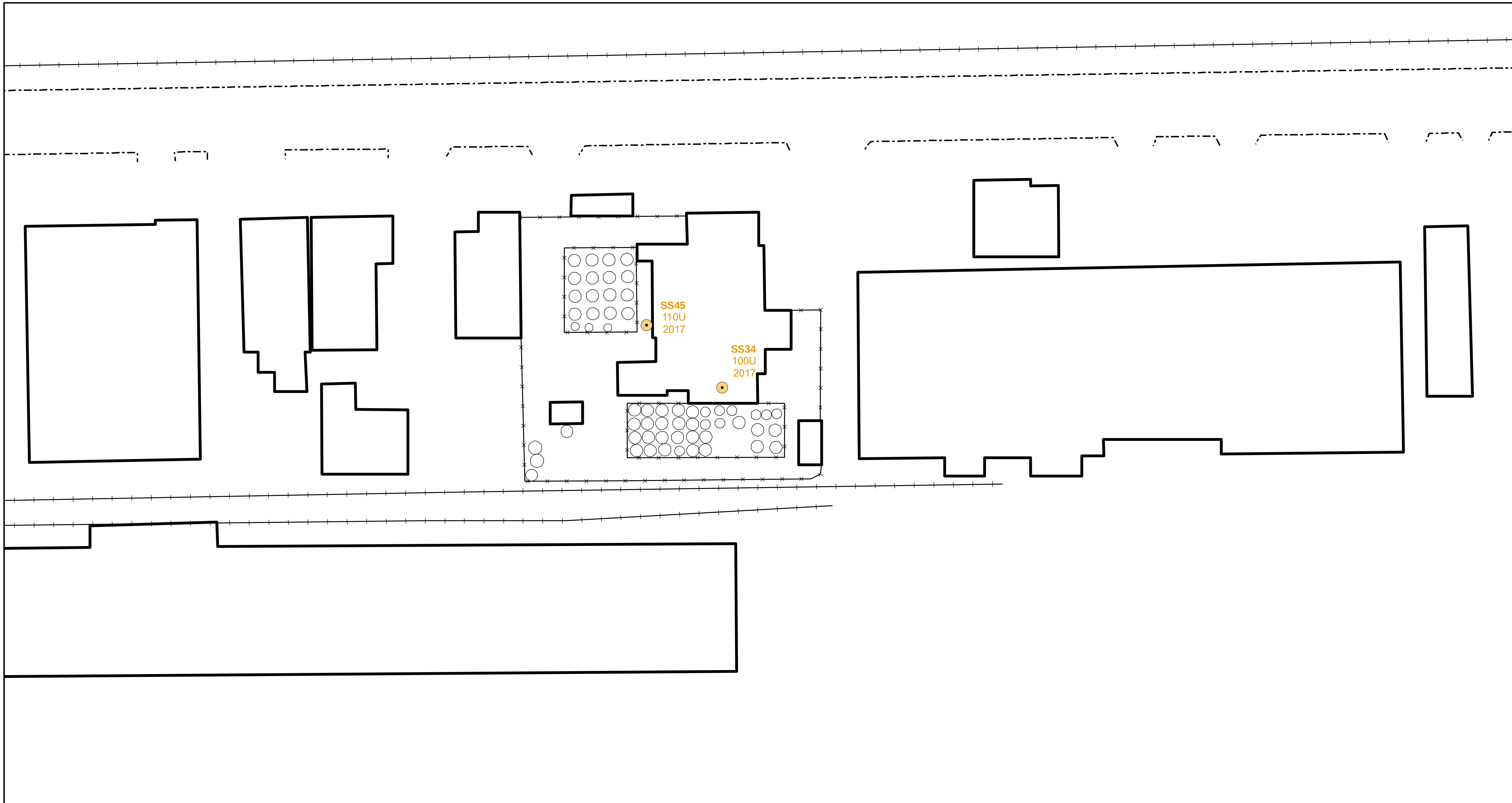
P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 6h bis(2-Ethylhexyl)phthalate Concentration.mxd 10/15/2021 9:33:10 AM




**Legend**

- Soil CUL Exceedance Location
- Fence
- Rail Line
- Road
- Building
- Tank

Notes:
CUL = Clean-up Level
µg/kg = micrograms per kilogram
U = not detected above the Method Detection Limit shown
Soil Cleanup Level= 75 µg/kg

N

0 80 Feet

**Benzene Soil Exceedance Locations (June 2017)**

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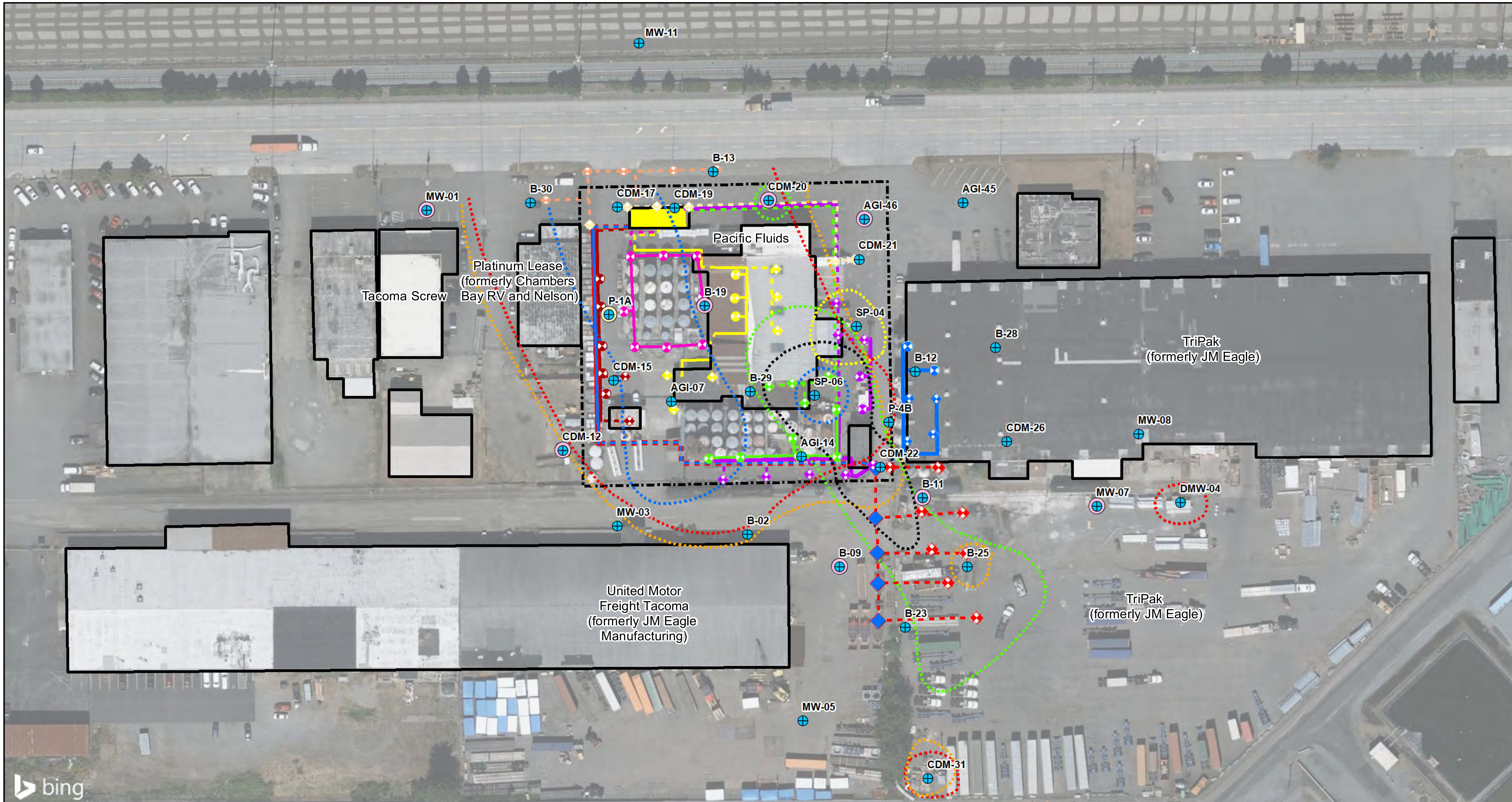
**Figure 5i**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 6i Benzene Soil Exceedances.mxd 10/13/2021 1:03:38 PM




**Legend**

- bis(2-Ethylhexyl)phthalate>GW CUL (> 2.2 µg/l)
- Pentachlorophenol>GW CUL (> 3 µg/l)
- TPH as Gasoline> 1mg/l (GW CUL)
- Vinyl Chloride> 2.4 µg/l (GW CUL)
- 1,4-Dichlorobenzene> 4.86µg/l (GW CUL)
- #2 Diesel > 1mg/l (GW CUL)
- Motor Oil> 1mg/l (GW CUL)
- PCE> 3.3µg/l (GW CUL)
- Groundwater Monitoring Well Location
- Below Grade Recovery Well, A
- Above Grade Recovery Well, B
- Below Grade Recovery Well, B
- Above Grade Recovery Well, C
- Below Grade Recovery Well, C
- Above Grade Recovery Well, D
- Below Grade Recovery Well, D
- Above Grade Recovery Well, E
- Below Grade Recovery Well, E
- Above Grade Recovery Well, F
- Below Grade Recovery Well, F
- Above Grade Recovery Well, G
- Below Grade Recovery Well, H
- Below Grade Recovery Well, I
- Vault
- Field A, Below
- Field A/B,
- Field A/B,
- Field B, Above
- Field B, Below
- Field C, Above
- Field C, Below
- Field D, Above
- Field D, Below
- Field E, Above
- Field E, Below
- Field F, Above
- Field F, Below
- Field G, Above
- Field G, Below
- Field H, Below
- Field I, Below
- Remedial Equipment Compound
- Approximate Site Boundary
- Building

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
mg/l = milligrams per liter

N

0 80 Feet

**Constituents of Concern over Cleanup Levels in Groundwater**

Site Review Report
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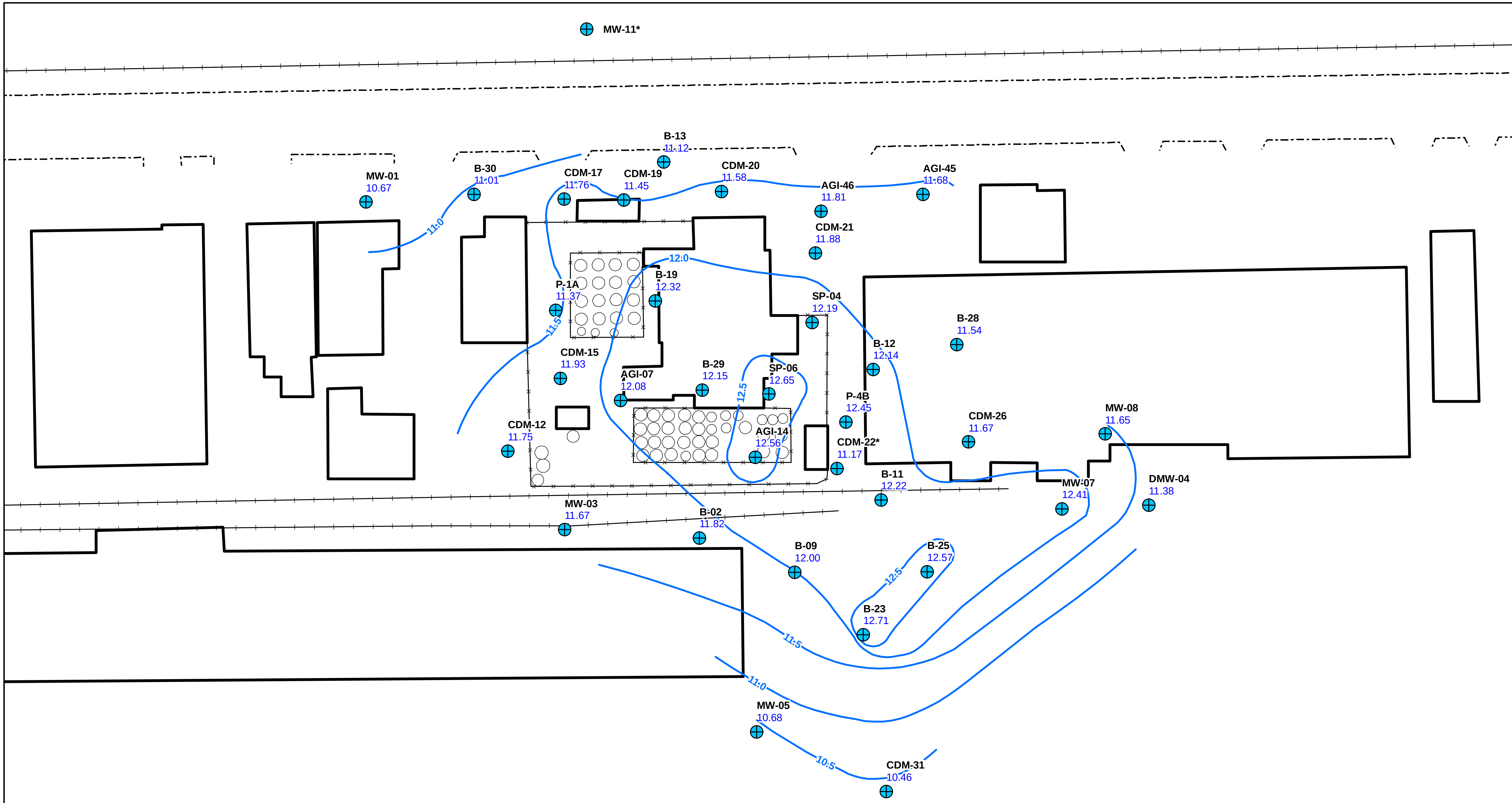
| PNR0697 | April 2022 | Figure 5j |
|---|---|---|

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 6j Combined Exceedance Footprints.mxd 10/14/2021 4:55:13 AM




**Legend**

- March 2020 Groundwater Sample Location
- Groundwater Elevation Contour (ft NAVD88)
- Fence
- Rail Line
- Road
- Building
- Tank

CDM-31 —Monitoring Well ID
10.46 —Groundwater elevation in feet NAVD88

Notes:
* Denotes location not used for contouring.
Depth to groundwater measured between 16 and 18 March 2020.

N

0 80 Feet

**Groundwater Elevation and Contour Map (March 2020)**

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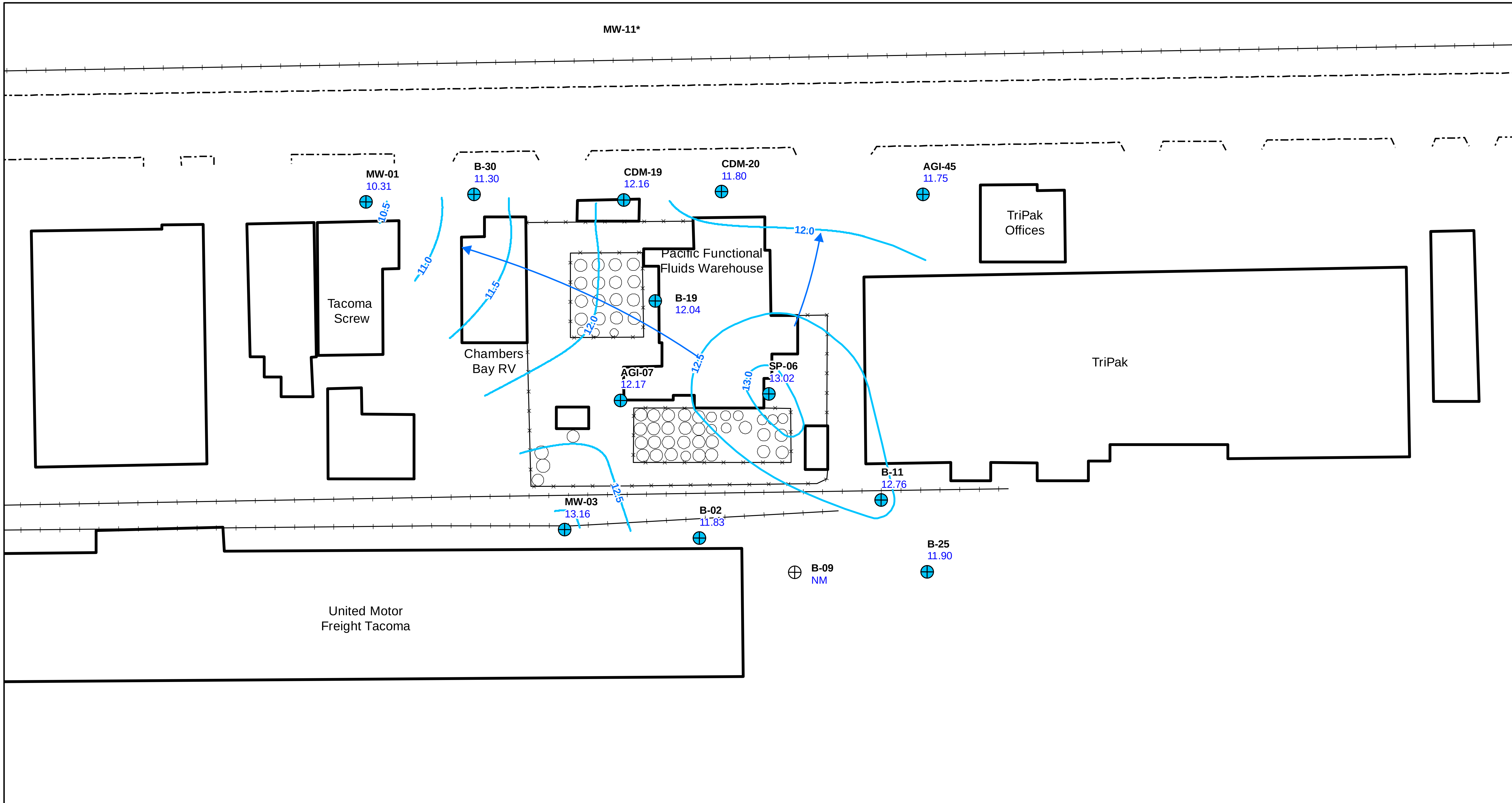
|---|---|

**Figure 6a**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 7a 2020 GWE.mxd 10/14/2021 5:00:49 AM




**Legend**

December 2020 Groundwater Sample Location (MNA)

Groundwater Elevation Contour (ft NAVD88)

Groundwater Gradient Direction

Fence

Rail Line

Road

Building

Tank

**CDM-31** — Monitoring Well ID

10.46 — Groundwater elevation in feet NAVD88

Notes:
NM denotes depth to water not measured.
Depth to groundwater measured on 22 December 2020.
B-09 was not gauged or sampled due to standing water.

N

0 80 Feet

**Groundwater Elevation and Contour Map (December 2020)**

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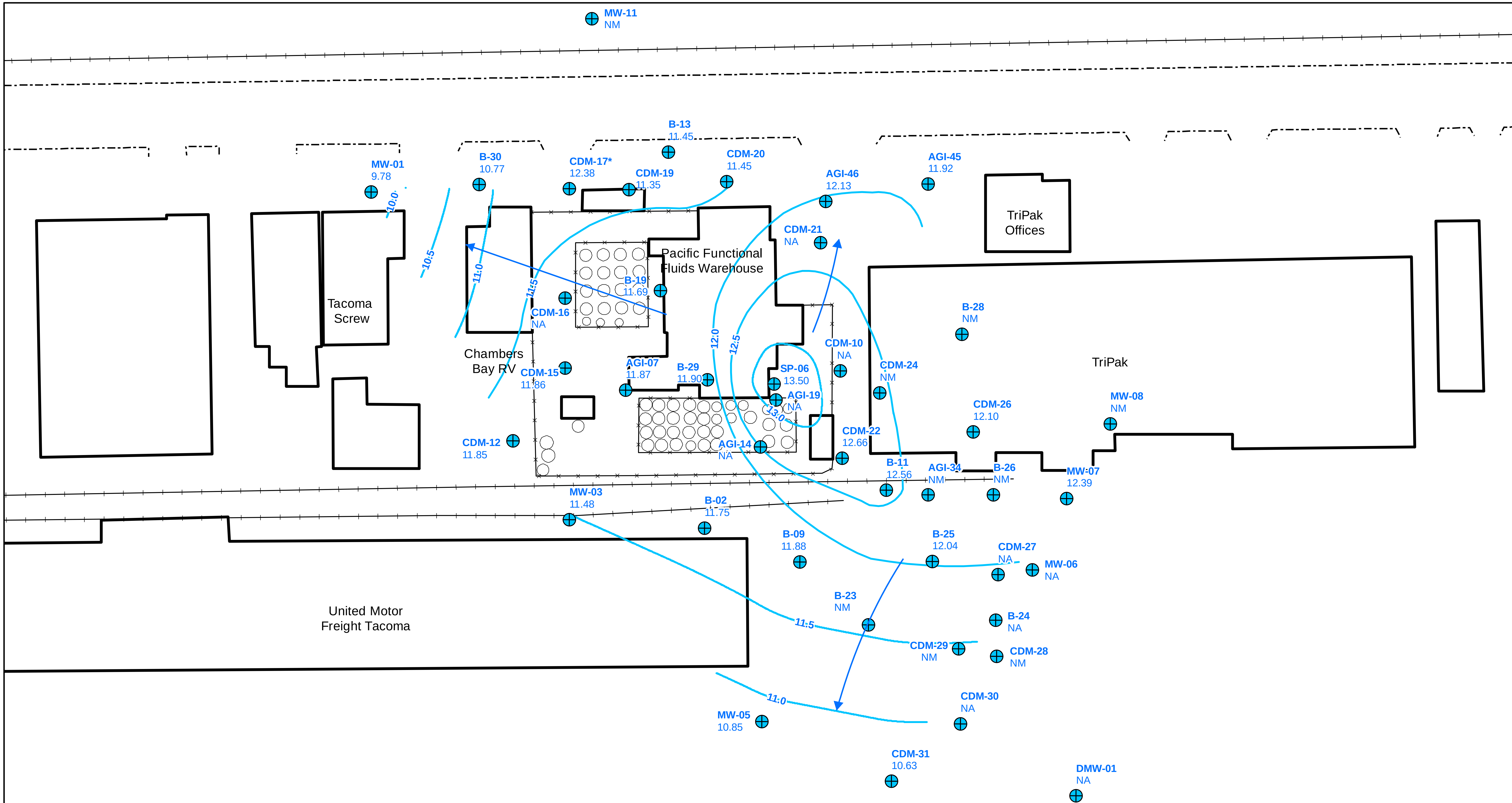
**Figure 6b**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 7b 2020 GWE Q4.mxd 10/14/2021 5:02:46 AM




**Legend**

- June 2021 Groundwater elevation measurement
- Building
- Tank
- Groundwater Gradient Direction
- Fence
- Rail Line
- Road

CDM-31 — Monitoring Well ID
10.46 — Groundwater elevation in feet NAVD88

Notes:
NA = Not Applicable.
NM = Not Measured (AGI-34, B-26 and 28, CDM-24, 28, and 29 and MW-08 and MW-11). These monitoring wells were not able to be accessed due to shipping containers or materials staged over the wells.
Depth to groundwater measured on 21 June 2021.
Vertical Datum NAVD88 used for elevation due to nearby tidal influence on groundwater levels.
* denotes location not used in countouring.

N

0 80 Feet

**Groundwater Elevation and Contour Map (June 2021)**

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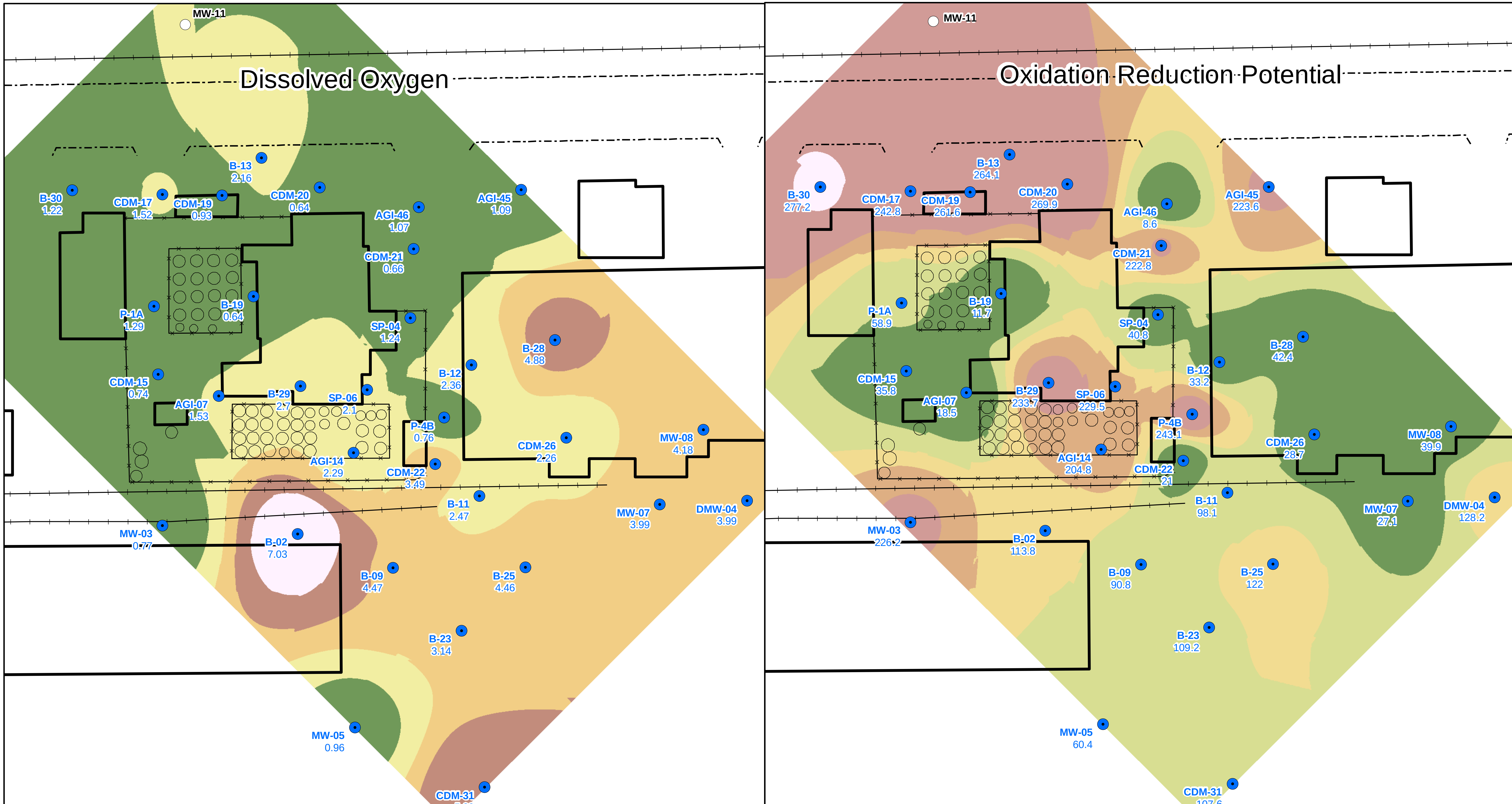
Figure 6c

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 7c 2021 GWE Q2.mxd 10/15/2021 9:41:16 AM




**Legend**

- Sample Location
- Fence
- Rail Line
- Road
- Building
- Tank

**Dissolved Oxgen (mg/L)**

- <= 1.5
- > 1.5 - 3.0
- > 3.0 - 4.5
- > 4.5 - 6.0
- > 6.0

**Oxidation Reduction Potential (mV)**

- <= 55
- > 55 - 110
- > 110 - 165
- > 165 - 220
- > 220 - 275
- > 275

Notes:
mg/l = micrograms per liter
mV = millivolts

N

0 80 Feet

**Dissolved Oxygen/Oxidation Reduction Potential (March 2020)**
Site Review Report
2244 Port of Tacoma Road,
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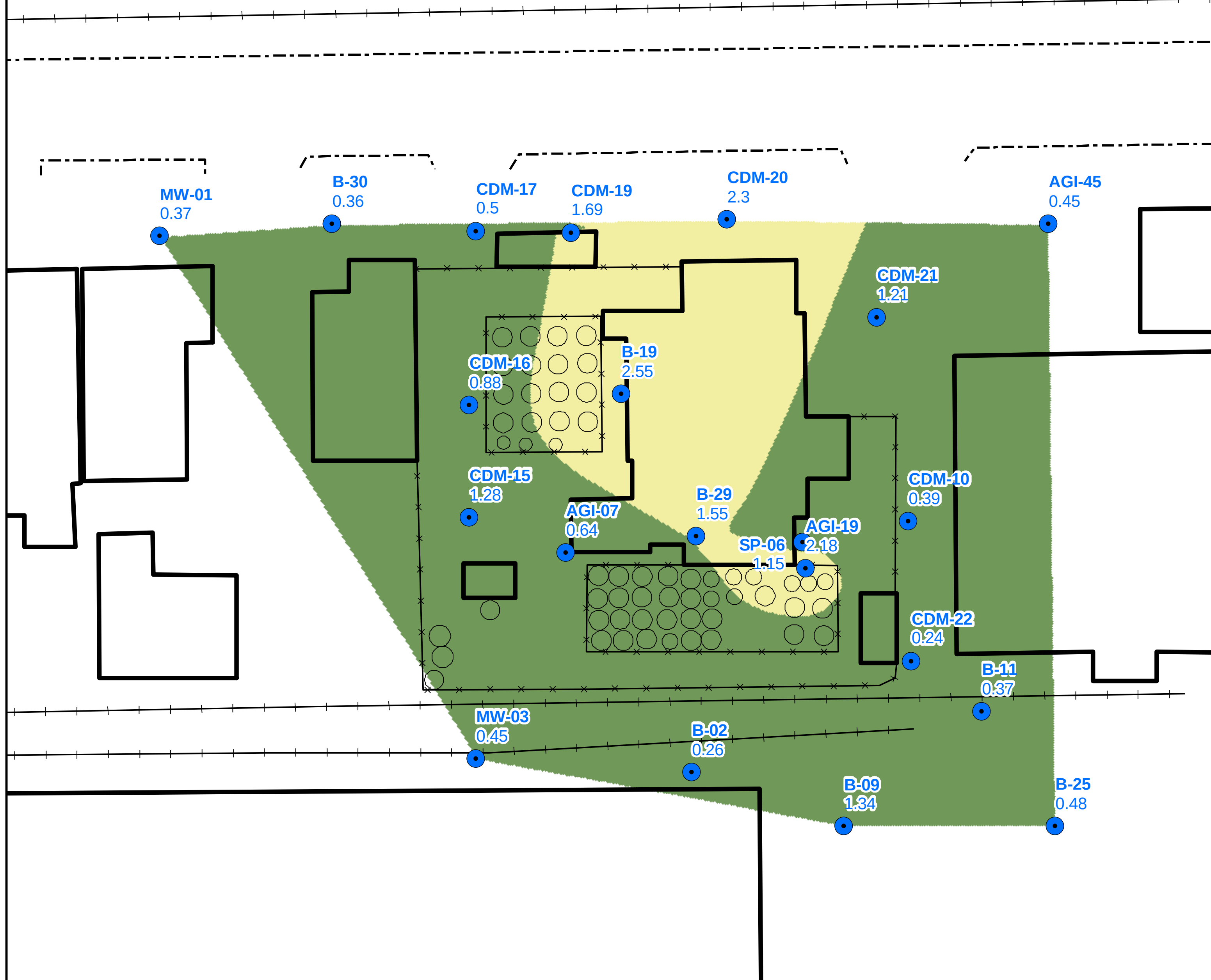
Figure 7a

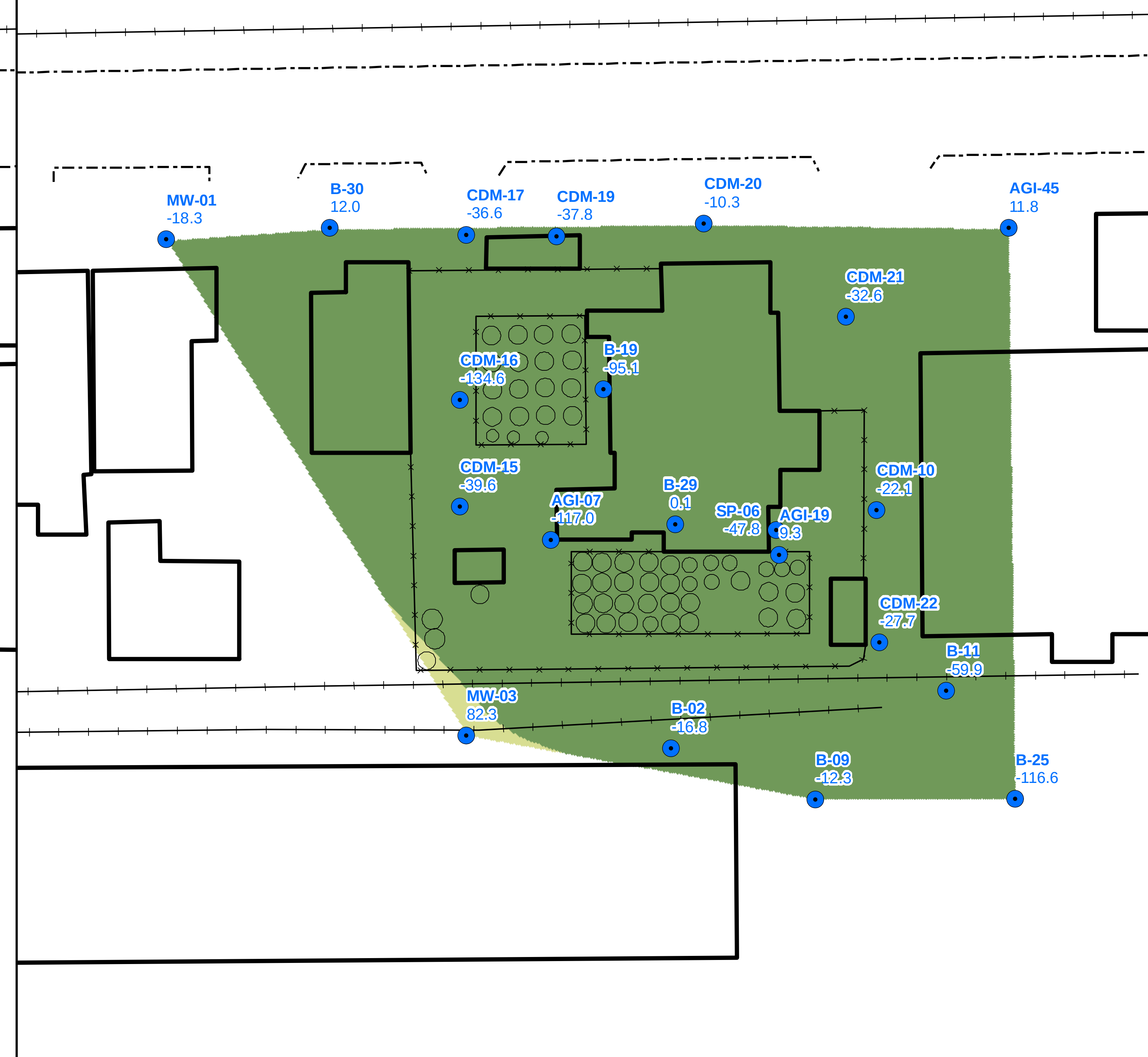
PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 8a Dissolved Oxygen_ORP.mxd 10/14/2021 5:09:25 AM

## Dissolved Oxygen




## Oxidation Reduction Potential




Notes:
mg/l = micrograms per liter
mV = millivolts
Samples were collected 06/21/2021.
Dissolved oxygen (DO) and oxidation/reduction potential readings were collected using a YSI Pro DSS field meter during purging.

**Legend**

- June (2Q) 2021 Groundwater Monitoring Location
- Fence
- Rail Line
- Road
- Building
- Tank

**Dissolved Oxgen (mg/L)**

- <= 1.5
- > 1.5 - 3.0
- > 3.0 - 4.5
- > 4.5 - 6.0
- > 6.0

**Oxidation Reduction Potential (mV)**

- <= 55
- > 55 - 110
- > 110 - 165
- > 165 - 220
- > 220 - 275
- > 275

N

0 80 Feet

**Dissolved Oxygen/Oxidation Reduction Potential (June 2021)**

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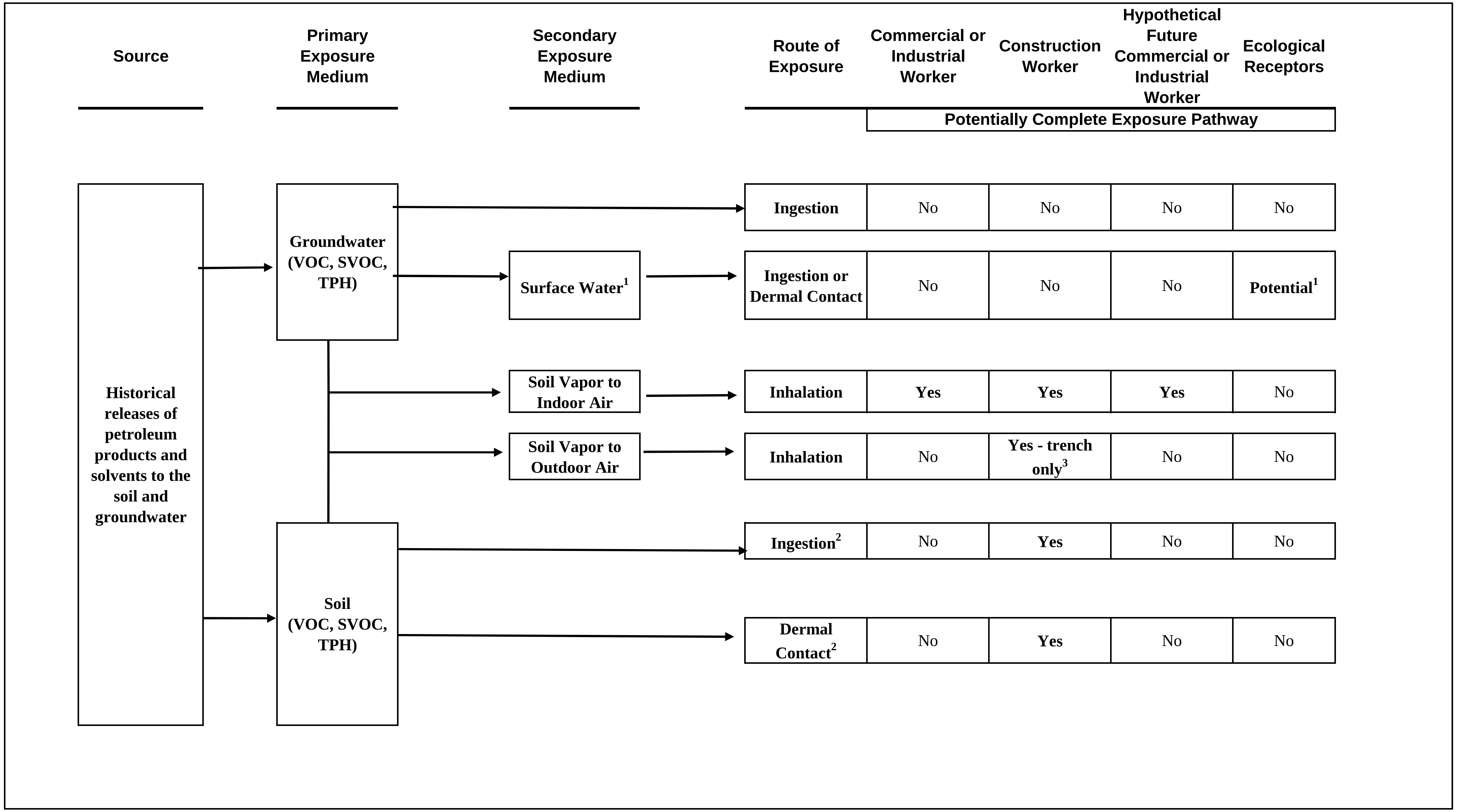
**Figure 7b**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 8b Dissolved Oxygen_ORPV2.mxd 10/14/2021 5:10:19 AM

**Figure 8**
**Risk Assessment Conceptual Site Model**
Site Remedy Review
Former Lilyblad Cleanup Site
Tacoma, Washington




Notes:

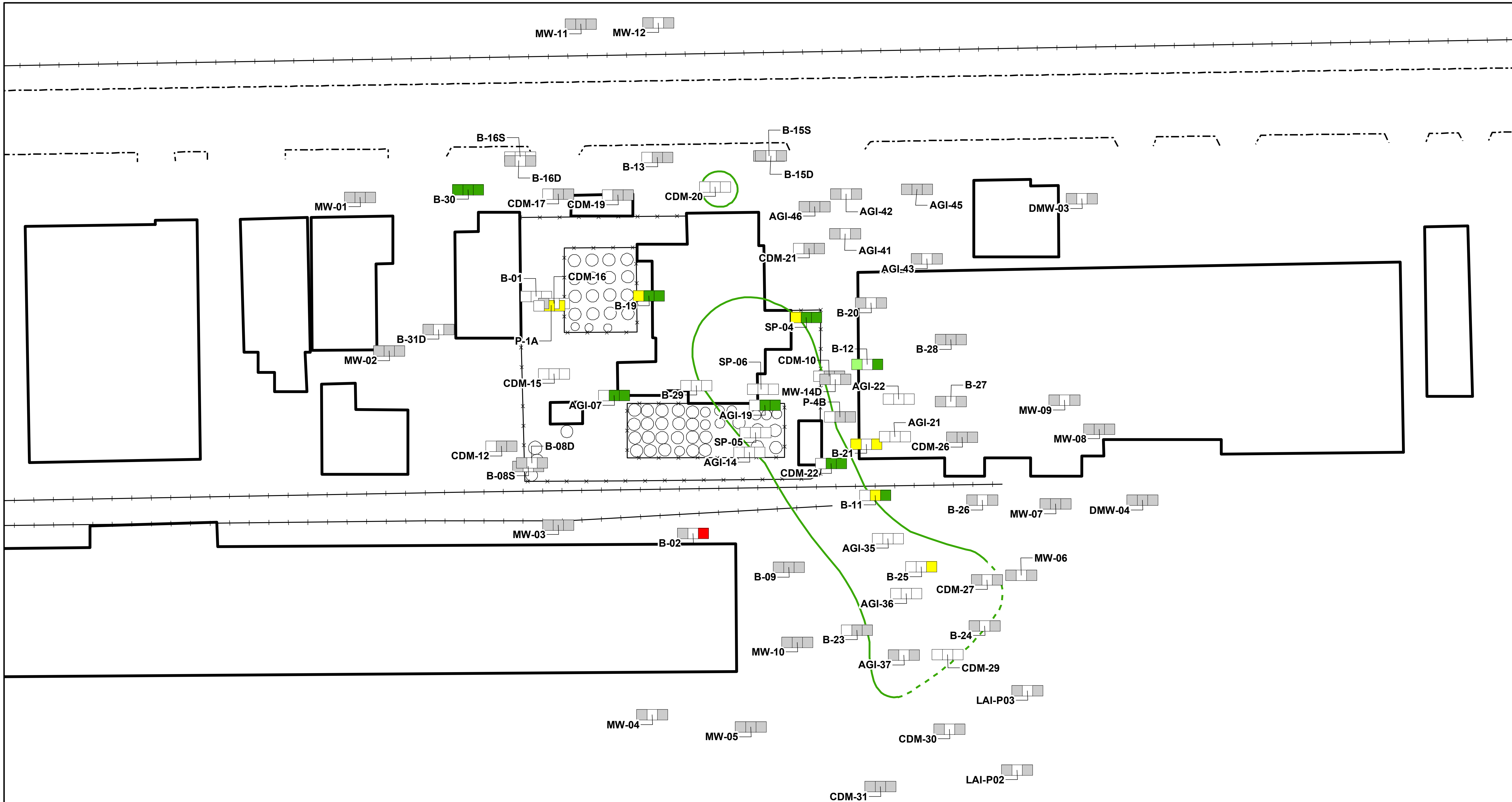
[1]Surface Water is included for consideration due to potential impacts to the Blair Waterway, via groundwater discharge through the Port of Tacoma storm storm sewer line and bedding.

[2]Ingestion of soil and dermal contact with soil by a Commercial or Industrial Worker are not complete exposure pathways because the site is paved. However, ingestion is included in WAC Method C in a typical Commercial or Industrial Worker scenario at a nominal amount of 50 mg/day. This is consistent with USEPA guidance.

[3]Construction Worker exposure to soil vapor in outdoor air would not be significant, with the possible exception of a trenching scenario.

Note that residential exposure is not included because the site is zoned as commercial and industrial.

Complete or potential exposure pathways are shown in bold text.




**Legend**

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (µg/l)**

- > 4.89 (GW CUL)
- Fence
- Rail Line
- Road
- Building
- Tank

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
µg/l = micrograms per liter
Groundwater Cleanup Level = 4.89 µg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

0 80 Feet

N

**1,4-Dichlorobenzene**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
Site Review Report
2244 Port of Tacoma Road,
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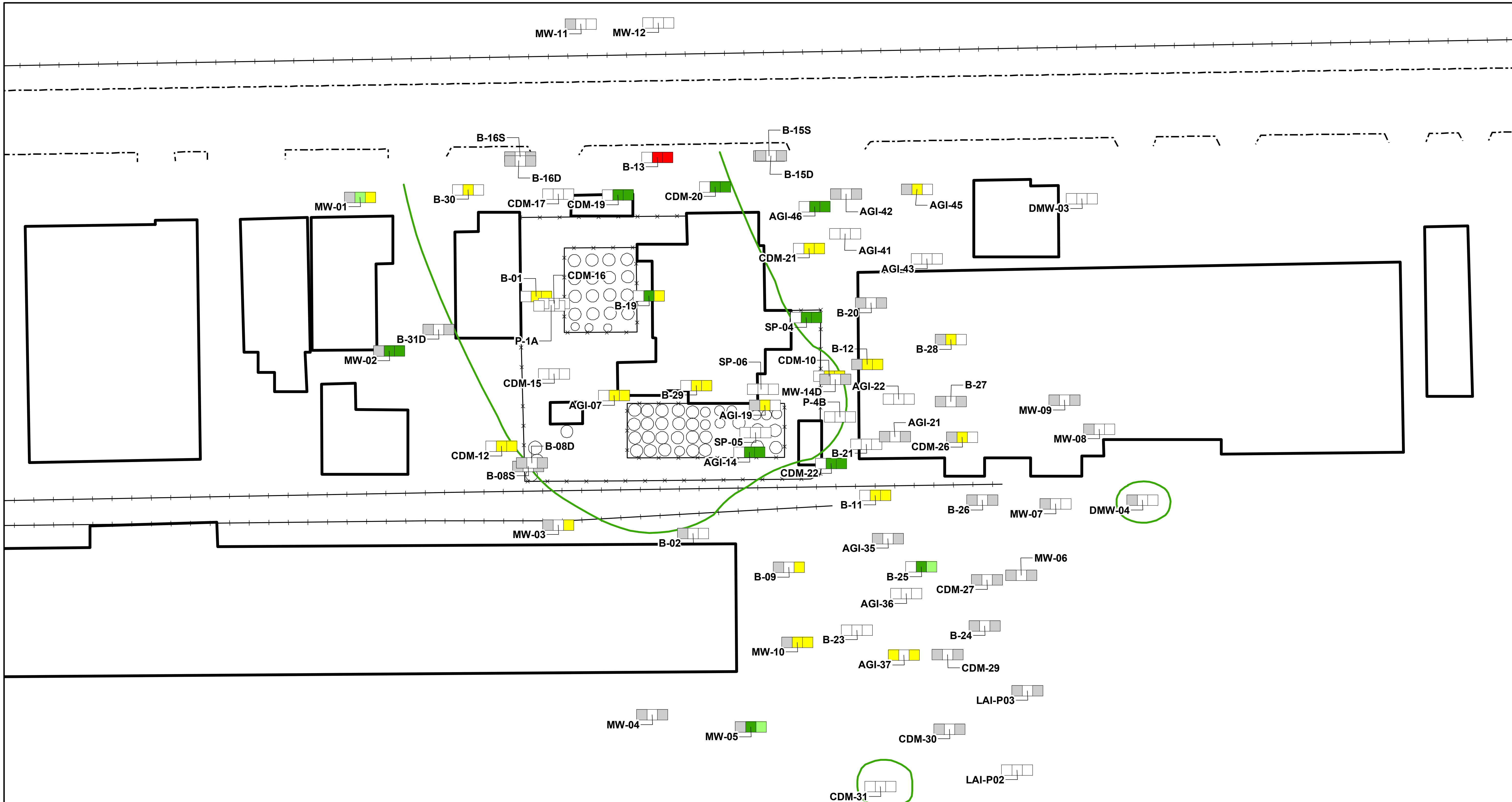
**Figure 9a**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9a Dichlorobenzene Trends.mxd 10/14/2021 5:54:04 AM




Legend

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (mg/l)**

- > 1.0 (GW CUL)
- Fence
- Rail Line
- Road
- Building
- Tank

- Trends before the DPE system started (2003-2009)
- Overall trend (2003-2021)
- Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
mg/l = milligrams per liter
Groundwater Cleanup Level = 1.0 mg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoing Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

**Motor Oil (>C24-C36)**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
Site Review Report
2244 Port of Tacoma Road,
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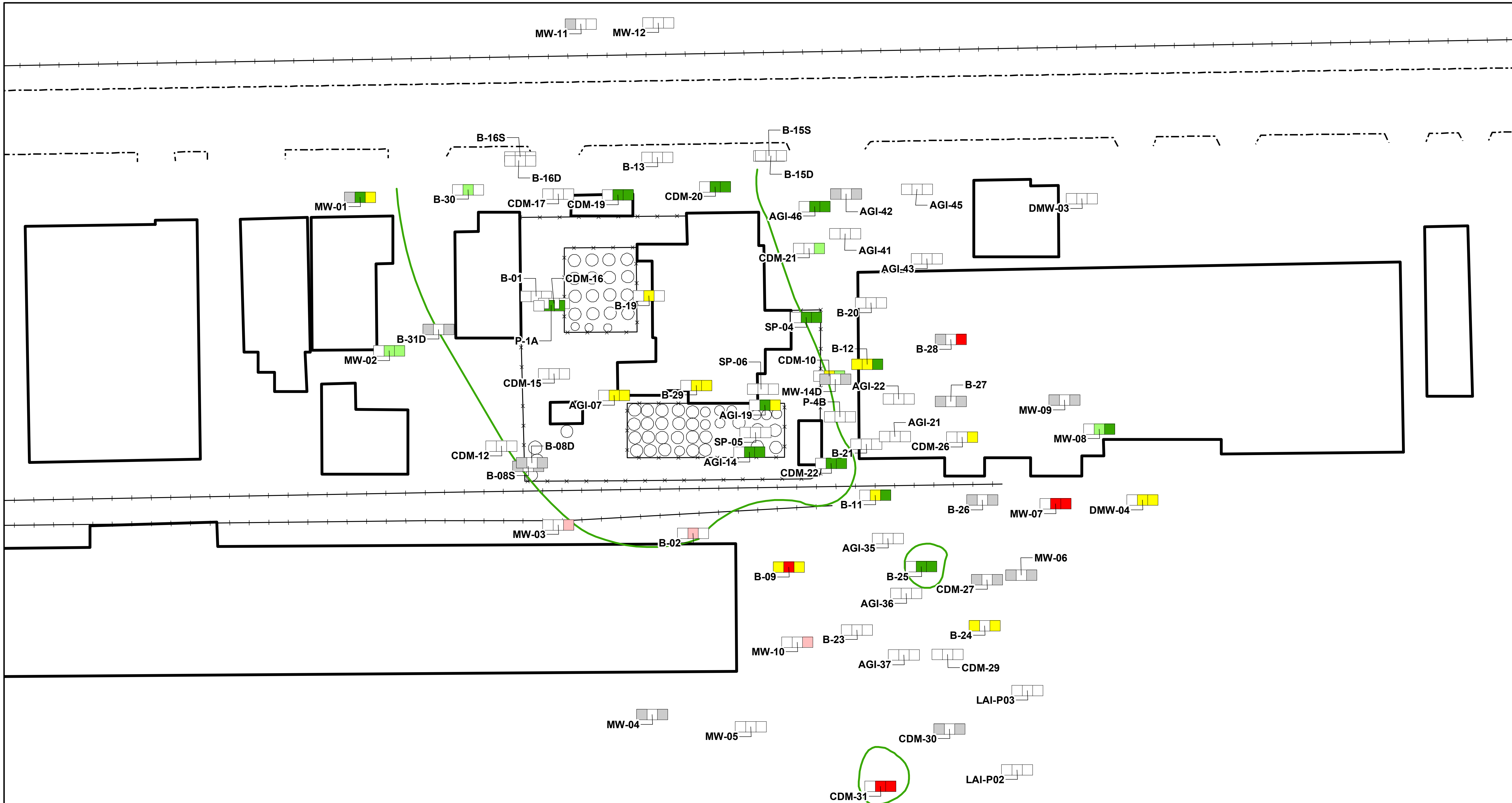
**Figure 9b**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9b Motor Oil Trends.mxd 10/14/2021 7:22:54 AM




**Legend**

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (mg/l)**

- > 1.0 (GW CUL)
- Fence
- Rail Line
- Road
- Building
- Tank

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

0 80 Feet

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
mg/l = milligrams per liter
Groundwater Cleanup Level = 1.0 mg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoing Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

**#2 Diesel (C10-C24)**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
Site Review Report
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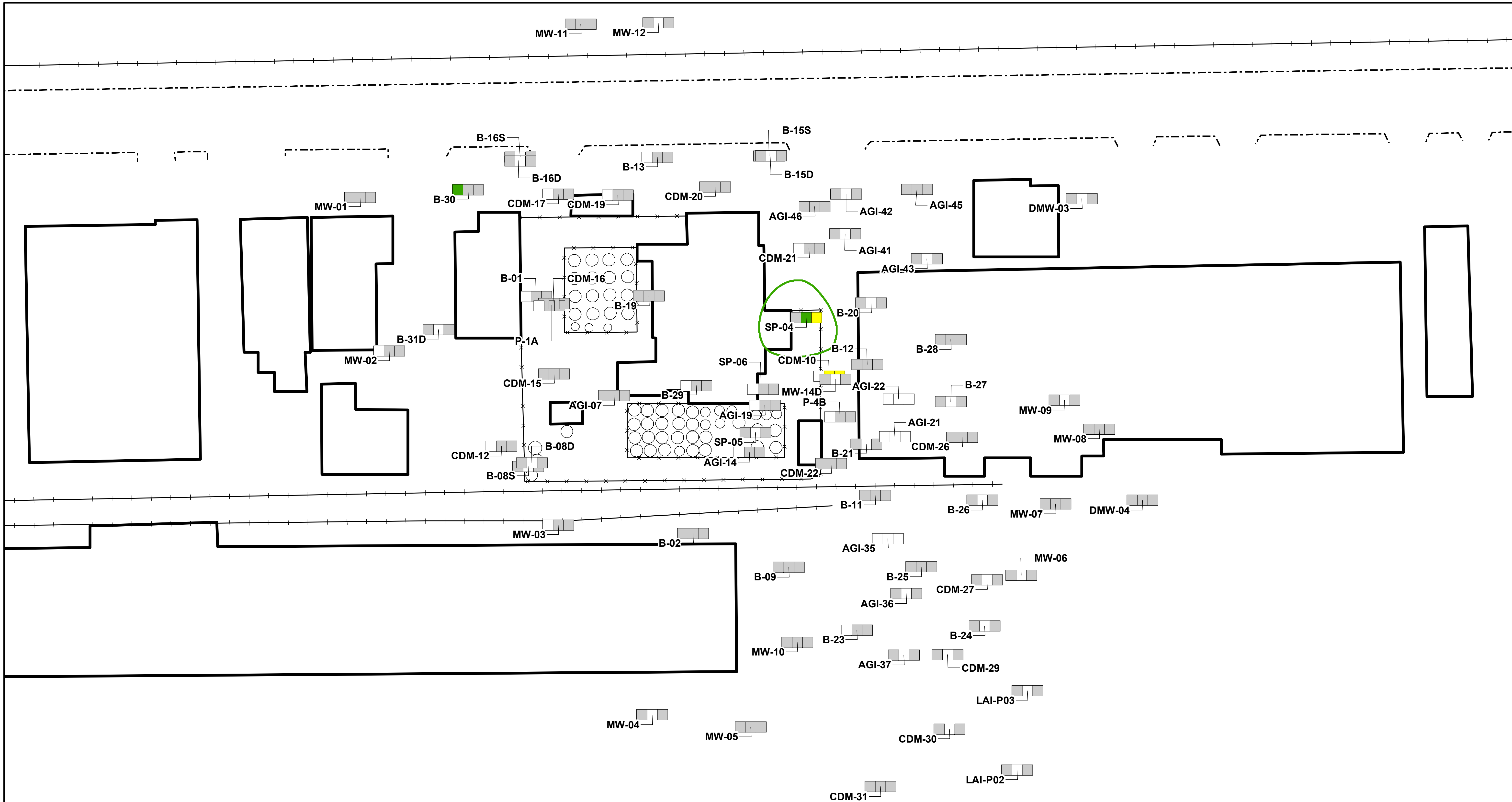
**Figure 9c**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9c Diesel Trends.mxd 10/14/2021 7:26:07 AM




Legend

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (µg/l)**

- > 3.3 (GW CUL)
- Fence
- Rail Line
- Road
- Building
- Tank

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
µg/l = micrograms per liter
Groundwater Cleanup Level = 3.3 µg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

0 80 Feet

N

**PCE**
**Mann Kendall Statistical Trends (2003 – Second Quarter 2021)**
Site Review Report
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Tacoma, Washington

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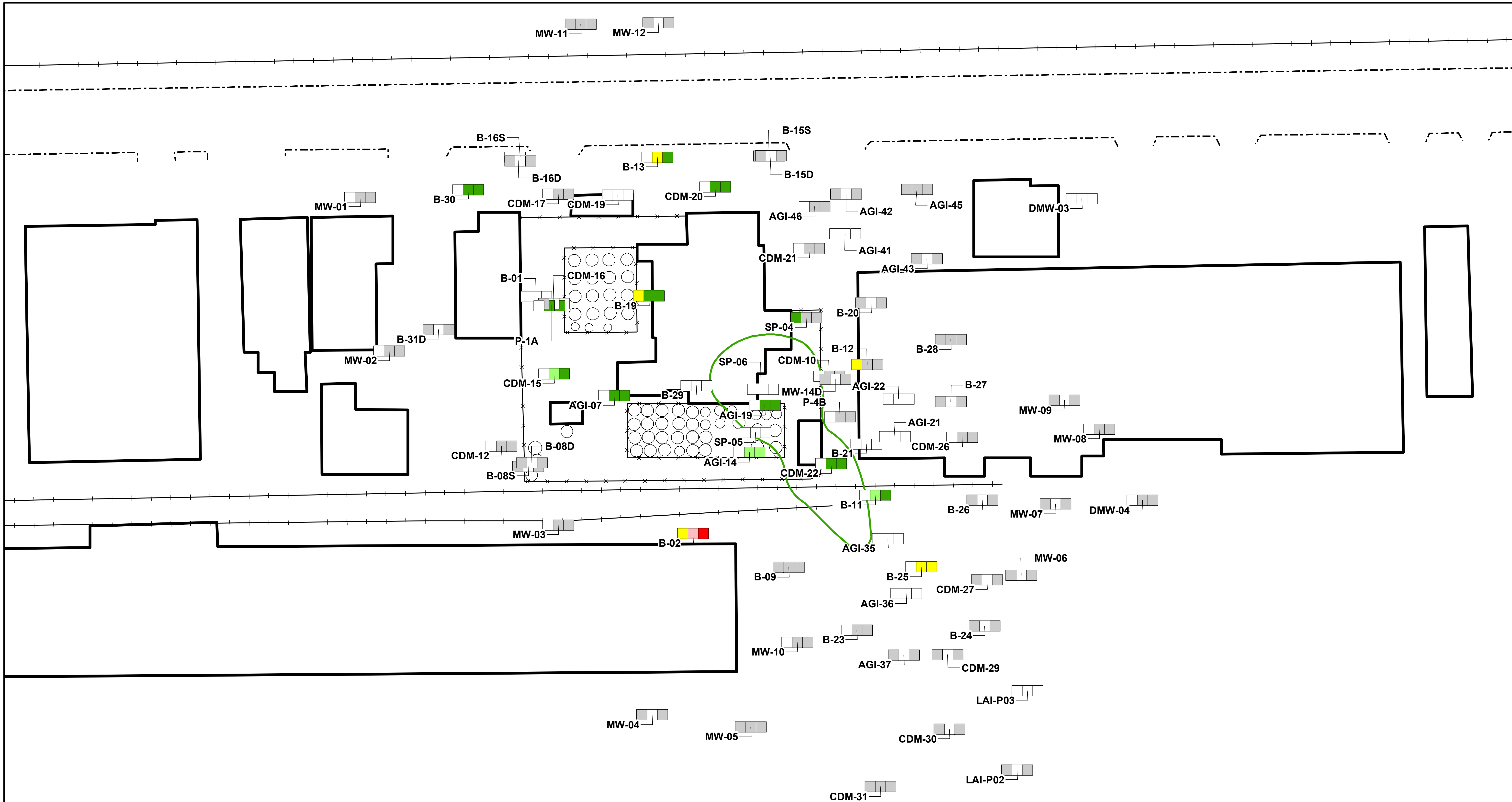
Figure 9d

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9d PCE Trends.mxd 10/14/2021 7:30:50 AM




Legend

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (mg/l)**

- > 1.0 (GW CUL)
- Fence
- Rail Line

- Road
- Building
- Tank

- Trends before the DPE system started (2003-2009)
- Overall trend (2003-2021)
- Trends since the DPE system started (2009-2021)

0 80 Feet

N

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
mg/l = milligrams per liter
Groundwater Cleanup Level = 1.0 mg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

**TPH as Gasoline**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
Site Review Report
2244 Port of Tacoma Road,
Tacoma, Washington

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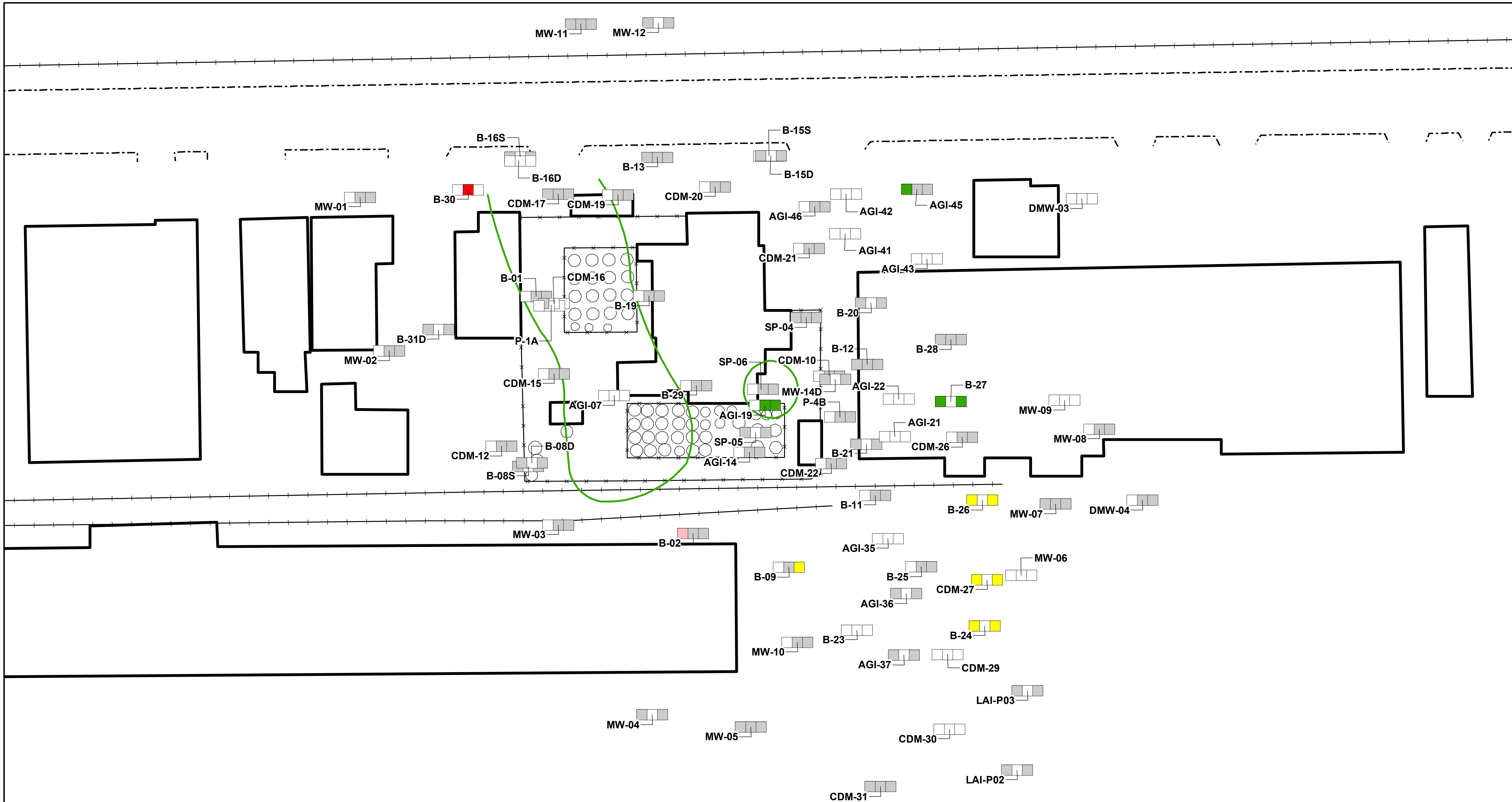
**Figure 9e**

| PNR0697 | April 2022 |
|---|---|

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9e TPH as Gasoline Trends.mxd 10/14/2021 7:32:42 AM




**Legend**

**Mann Kendall Statistical Trend**
- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Isoconcentration Contours (µg/l)**
- >2.40 (GW CUL)
- Fence
- Rail Line

- Road
- Building
- Tank

- Trends before the DPE system started (2003-2009)
- Overall trend (2003-2021)
- Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
µg/l = micrograms per liter
Groundwater Cleanup Level = 2.40 µg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

0 80 Feet

N

**Vinyl Chloride**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
Site Review Report
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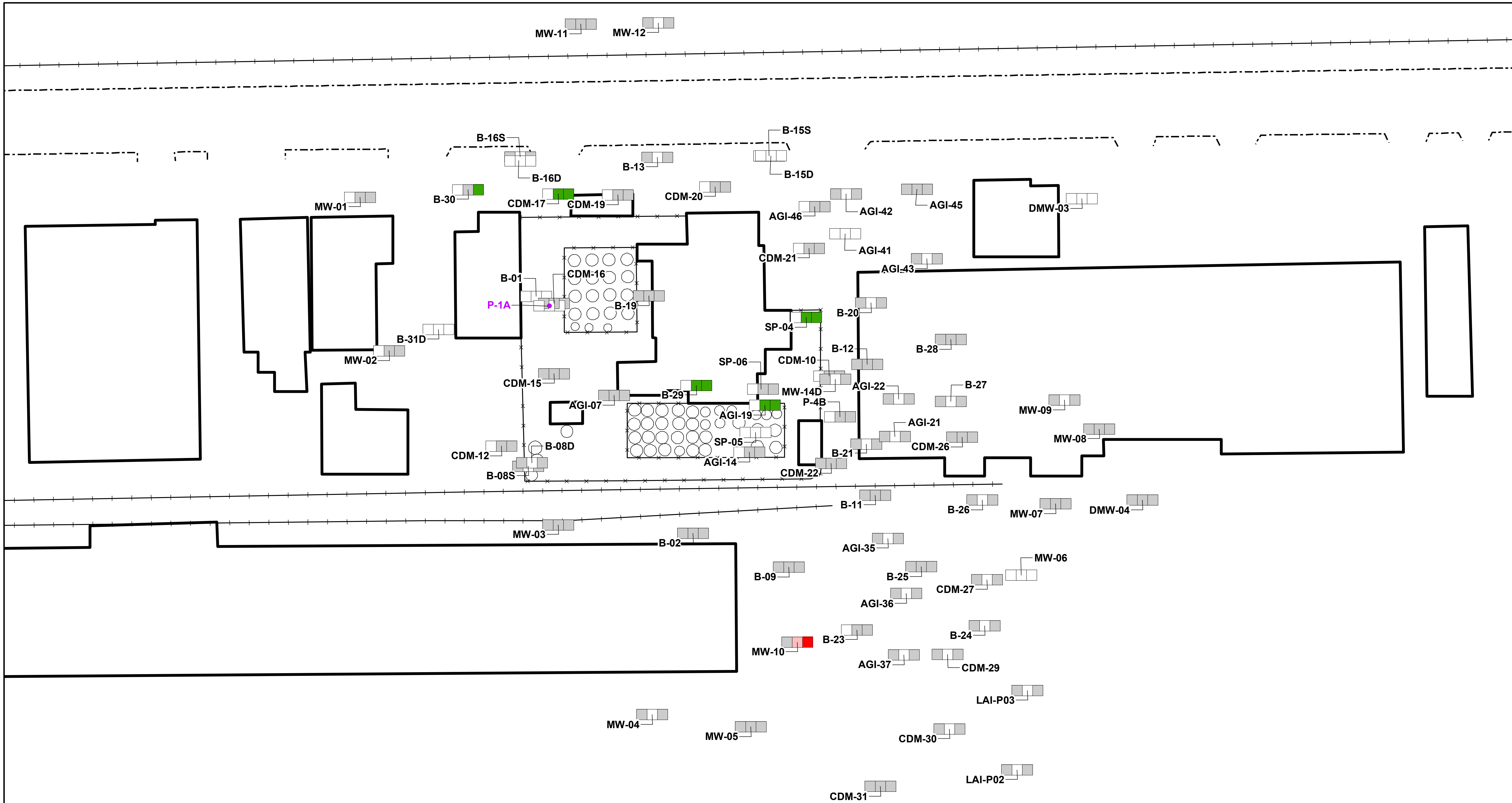
**Figure 9f**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9f Vinyl Chloride Trends.mxd 10/14/2021 7:34:11 AM




**Legend**

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Sample Locations (µg/l)**

- >3.0 (GW CUL)

- Fence
- Rail Line
- Road
- Building
- Tank

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
Purple text denotes groundwater cleanup level exceedance location
µg/l = micrograms per liter
Groundwater Cleanup Level = 3.0 µg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well;
Concentration > 3.0 µg/L (GW CUL)
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

0 80 Feet

N

**Pentachlorophenol**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
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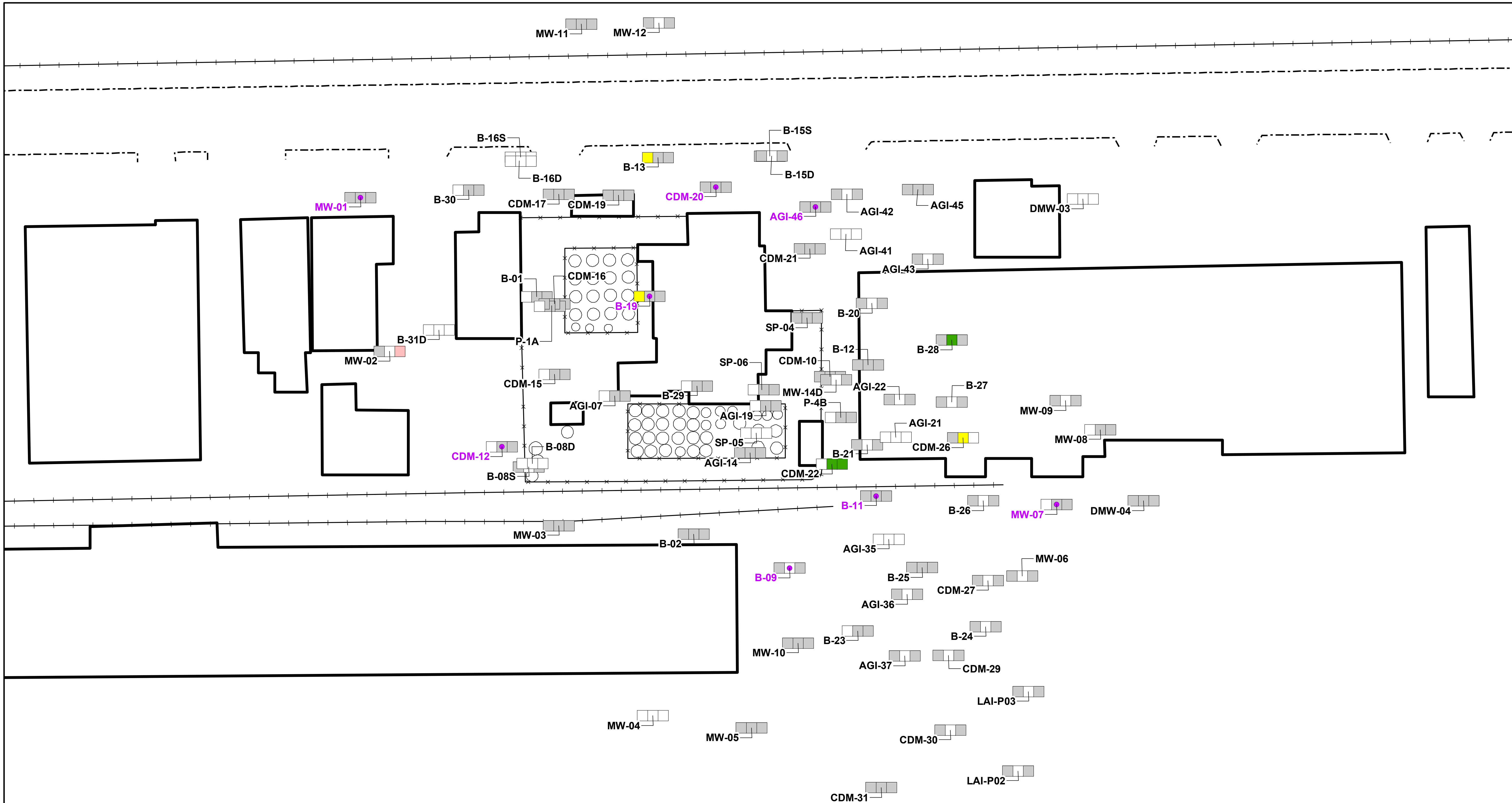
**Figure 9g**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9g Pentachlorophenol Trends.mxd 10/14/2021 7:36:30 AM




**Legend**

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- Non-Detect (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Groundwater Sample Locations (µg/l)**

- > 2.2 (GW CUL)
- Fence
- Rail Line
- Road

- Building
- Tank

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

0 80 Feet

N

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
GW = Groundwater
Purple text denotes groundwater cleanup level exceedance location
µg/l = micrograms per liter
Groundwater Cleanup Level = 2..2 µg/L
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well;
Concentration > 2.2 µg/L (GW CUL)
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

**bis(2-Ethylhexyl)phthalate**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
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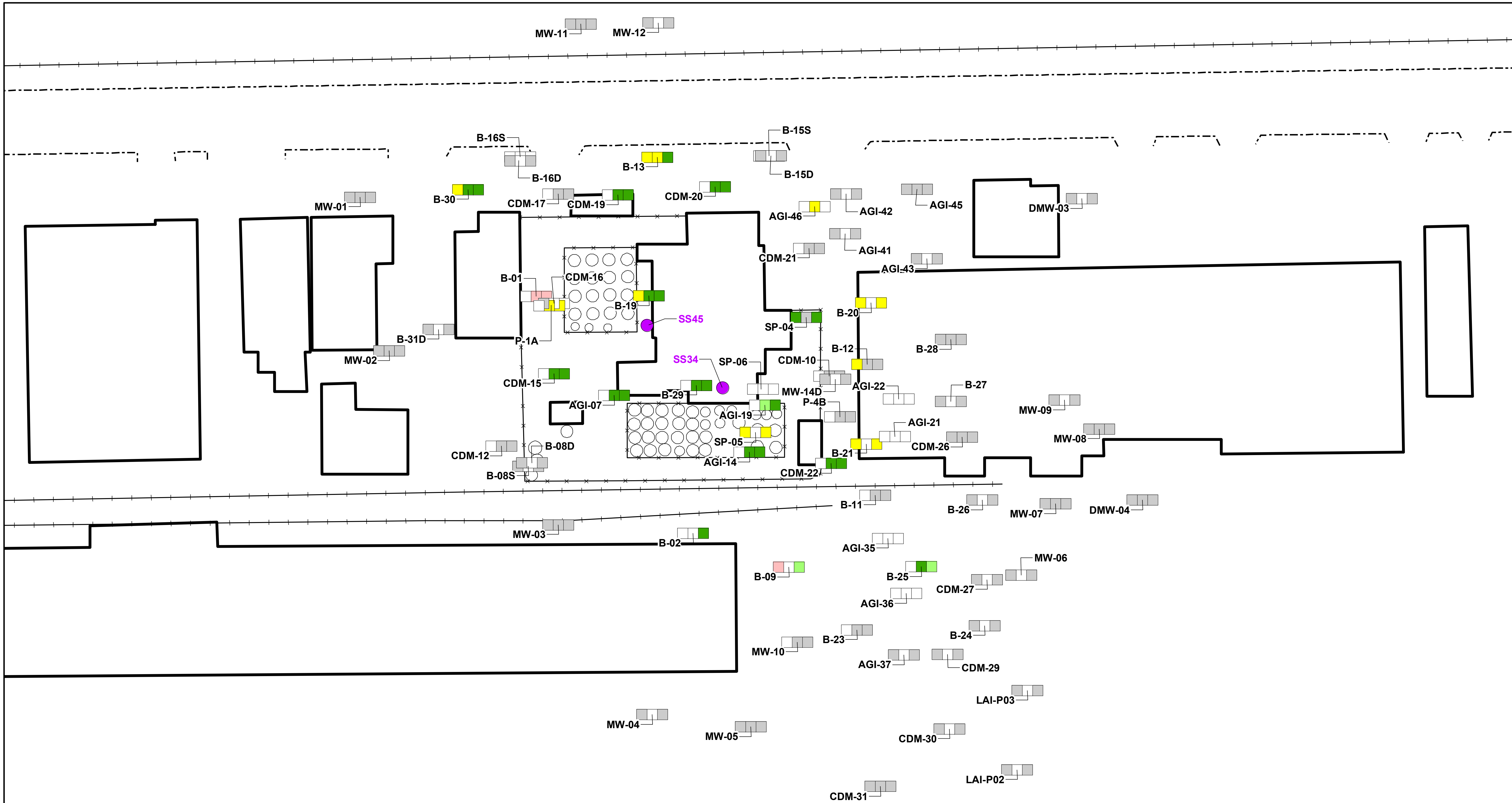
|---|---|

**Figure 9h**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9h bis(2-Ethylhexyl)phthalate Trends.mxd 10/14/2021 7:38:00 AM




**Legend**

**Mann Kendall Statistical Trend**

- No Trend or Insufficient Data
- ND (<50% detection frequency)
- Stable
- Probably decreasing
- Decreasing
- Probably increasing
- Increasing

**Soil Sample Location (µg/kg)**

- ND > 75 (Soil CUL)

- Rail Line
- Road
- Building
- Tank
- Fence

Trends before the DPE system started (2003-2009)
Overall trend (2003-2021)
Trends since the DPE system started (2009-2021)

Notes:
CUL = Clean-up Level
DPE = Dual Phase Extraction
Purple text denotes soil cleanup level exceedance location
µg/kg = micrograms per kilogram
Soil Cleanup Level = 75 µg/kg
ND = not detected above the Method Detection Limit
MW-01 = Groundwater Monitoring Well
Groundwater contours based on March 2020 groundwater monitoring results and is generally consistent with December 2020 and June 2021 results. Contours are dashed where inferred.

0 80 Feet

**Benzene**
**Mann Kendall Statistical Trends**
**(2003 – Second Quarter 2021)**
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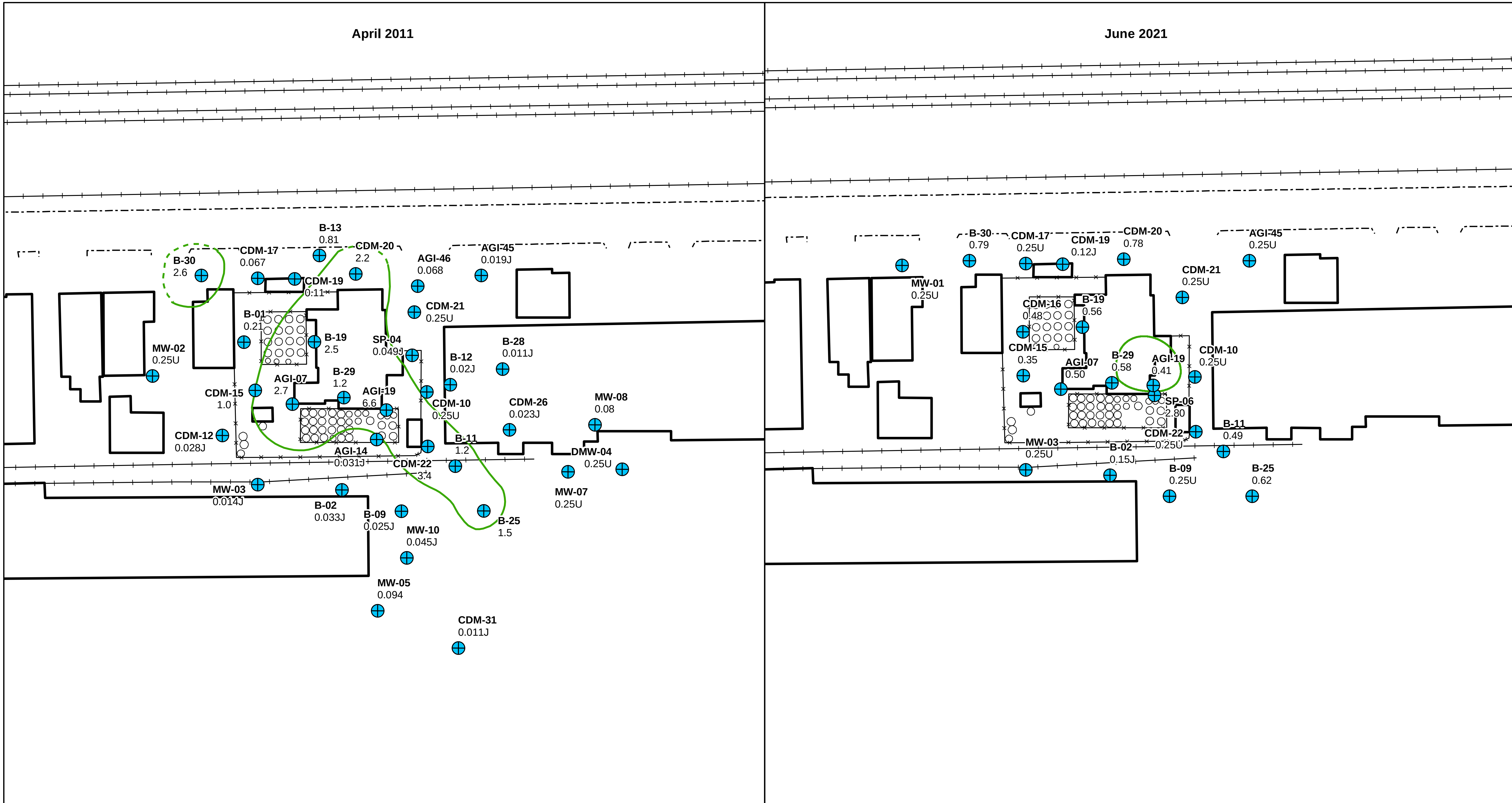
**Figure 9i**

PNR0697 | April 2022

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 9i Benzene Trends.mxd 10/14/2021 7:42:23 AM




**Legend**

- Groundwater Monitoring Well Location
- Fence
- Rail Line
- Road
- Building
- Tank

**TPH as Gasoline**

**Groundwater Isoconcentration Contours (mg/l)**

> 1 (GW CUL)

CDM-20 —Monitoring Well ID
6.1 —Concentration of TPH as Gasoline (mg/L)

Notes:
CUL = Clean-up Level
GW = Groundwater
mg/l = micrograms per liter
mg/kg = micrograms per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 1 mg/L

N

0 140 Feet

**TPH as Gasoline Groundwater Concentrations (April 2011 and June 2021)**

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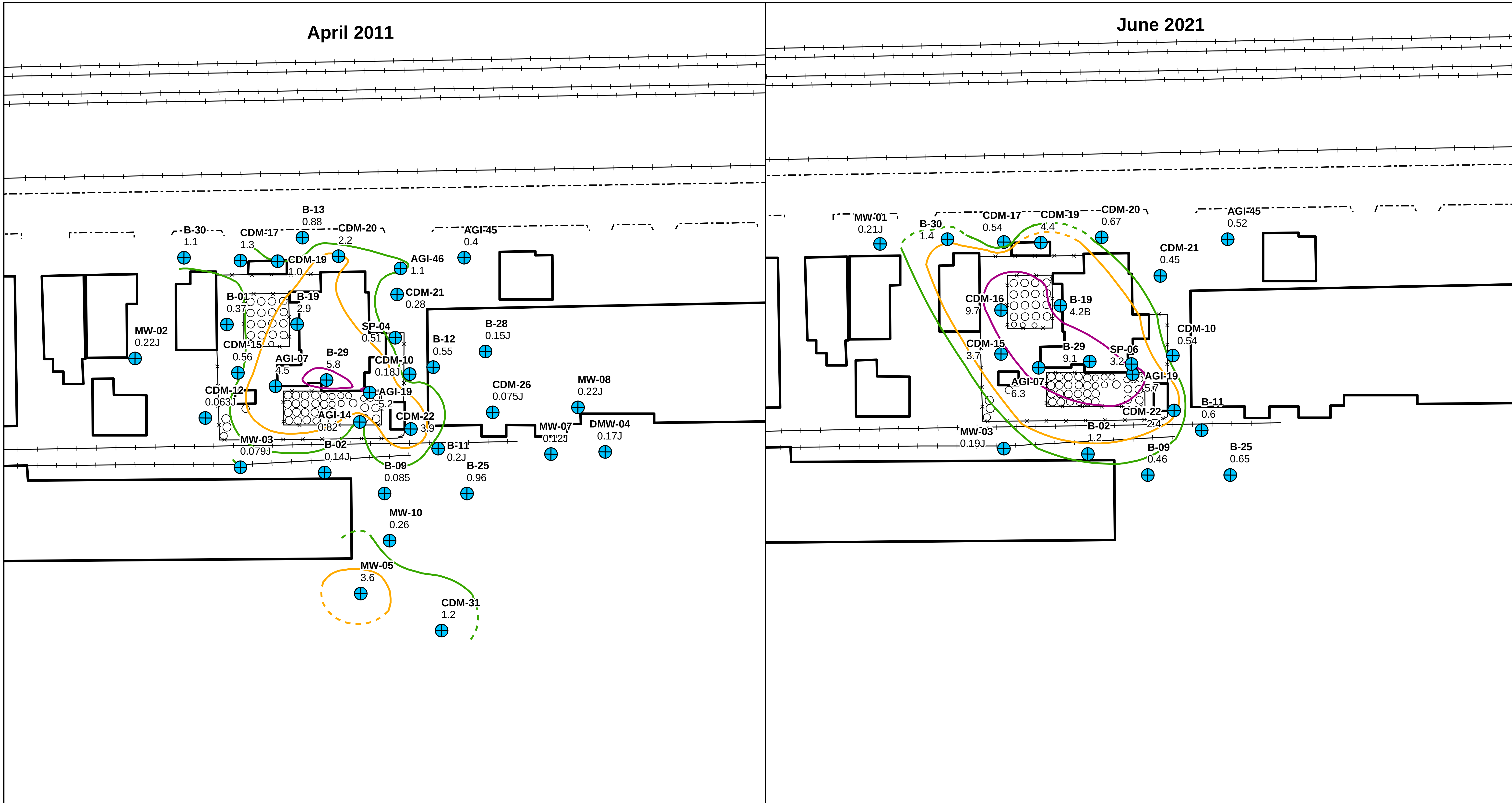
**Figure 9j**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Figures122921\Figure 9j Interpolated TPH as Gasoline Combined.mxd 2/14/2022 9:07:03 AM




**Legend**

- Groundwater Monitoring Well Location
- Fence
- Rail Line
- Road
- Building
- Tank

**Motor Oil (>C24-C36)**

**Groundwater Isoconcentration Contours (mg/l)**

- > 1 (GW CUL)
- > 2 (2xGW CUL)
- > 5 (5xGW CUL)

CDM-20—Monitoring Well ID
6.1 —Concentration of Motor Oil (>C24-C36) (mg/L)

Notes:
CUL = Clean-up Level
GW = Groundwater
mg/l = milligrams per liter
mg/kg = milligrams per kilogram
J = indicates a concentration detected between the Method Detection Limit and the Reporting Limit
U = not detected above the Method Detection Limit shown
Groundwater Cleanup Level = 1.0 mg/L

N

0 140 Feet

**TPH as Motor Oil Groundwater Concentrations (April 2011 and June 2021)**

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**Figure 9k**


**Legend**

- Microbial Toxicity Assay Location
- New Biosparge Well
- $CO_2$ Microcosm with Co-Located Vapor Pin
- Approximate Vapor Pin Location
- Retrofitted DPE current wells
- Pilot Study and Groundwater Monitoring Well
- NGS Sample Location
- Groundwater Monitoring Well
- TPH as Gasoline> 1mg/l (GW CUL)
- Vinyl Chloride> 2.4 µg/l (GW CUL)
- 1,4-Dichlorobenzene> 4.86µg/l (GW CUL)
- #2 Diesel > 1mg/l (GW CUL)
- Motor Oil> 1mg/l (GW CUL)
- PCE> 3.3µg/l (GW CUL)

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
mg/l = milligrams per liter

N

0 80 Feet

**Bio-Sparge Pilot Study Layout and NSZD Evaluation Locations**

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**Figure 10**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Site Review Report\Figure 10 CO2 Microcosm and Bio-Sparging andToxicity.mxd 10/15/2021 1:53:11 AM

**Legend**

- DPE Recovery Wells
- DPE Vault
- Conveyance Piping
- Proposed Conveyance Piping
- Conveyance Piping, Not Previously Connected to the System
- Remedial Treatment System Compound
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction

N

0 80 Feet

**Alternative 1**
**DPE Remedy Layout**
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**Figure** **11**

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P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 1.mxd 10/14/2021 8:18:36 AM


**Legend**

- Wells monitored for both NSZD/MNA
- Wells monitored for NSZD only
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction
MNA = Monitored Natural Attenuation
NSZD = Natural Source Zone Depletion

N

0 80 Feet

**Alternative 2**
**MNA/NSZD Remedy Layout**
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| PNR0697 | April 2022 | Figure 12 |
|---|---|---|

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 2.mxd 10/14/2021 8:19:40 AM


**Legend**

- Proposed Bio-Sparge Well/12 ft ROI (Retrofitted Former DPE Well)
- Proposed New Bio-Sparge Well/12 ft ROI
- Proposed New Vapor Probe
- Conveyance Piping
- Proposed New Conveyance Piping
- Remedial Treatment System Compound
- Target Biosparge
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction
ROI = Radius of Influence

N

0 80 Feet

**Alternative 3**
**Bio-Sparge Remedy Layout**
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**Figure 13**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 3.mxd 2/14/2022 9:44:16 AM


**Legend**

- Proposed SVE Well
- Proposed SVE Well (Retrofitted from Former DPE Well)
- Proposed Bio-Sparge Well/12 ft ROI (Retrofitted Former DPE Well)
- Proposed New Bio-Sparge Well/12 ft ROI
- Proposed Soil Vapor Probe
- Conveyance Piping
- Proposed New Conveyance Piping
- Estimated SVE Well Radius of Influence
- Remedial Treatment System Compound
- Target Biosparge
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

N

0 80 Feet

**Alternative 3a**
**Bio-Sparge with SVE Remedy Layout**
Site Review Report
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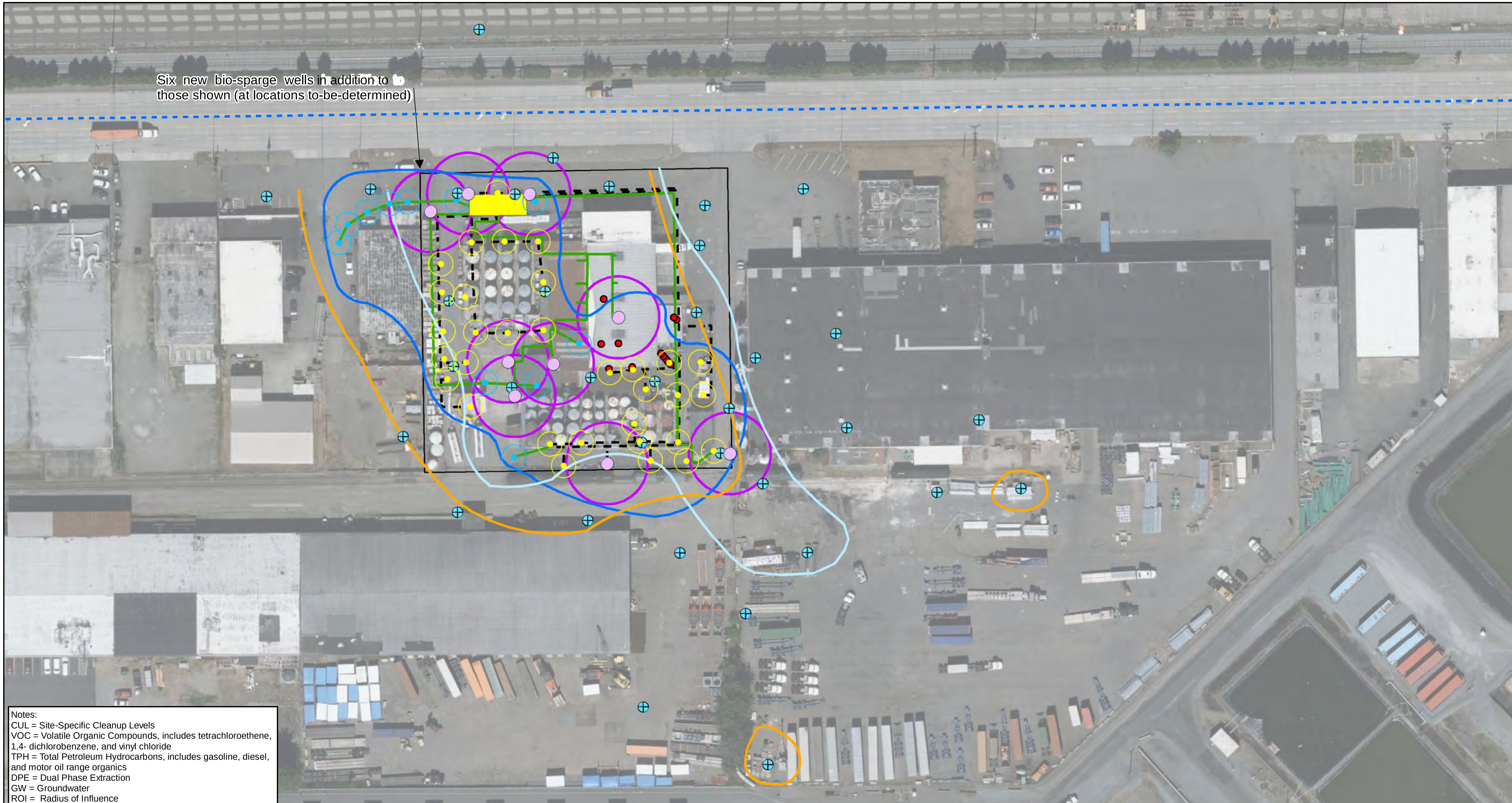
PNR0697 | April 2022

**Figure 13a**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 3A.mxd 2/14/2022 9:46:03 AM




Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction
GW = Groundwater
ROI = Radius of Influence

**Legend**

- Proposed GW Extraction Well (Retrofitted from Former DPE Well)
- Proposed Bio-Sparge Well/12 ft ROI (Retrofitted Former DPE Well)
- Proposed New Bio-Sparge Well/12 ft ROI
- Proposed Soil Vapor Probe
- Conveyance Piping
- Proposed New Conveyance Piping
- Estimated Groundwater Extraction Well Radius of Influence
- Remedial Treatment System Compound
- Target Biosparge Area
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

N

0 80 Feet

**Alternative 3b**
**Bio-Sparge with GW Extraction Remedy Layout**
Site Review Report
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| | | |
|---|---|---|
| PNR0697 | April 2022 | **Figure 13b** |

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 3b.mxd 2/14/2022 10:49:30 AM


**Legend**

- Proposed Bio-Sparge Well/12 ft ROI (Retrofitted Former DPE Well)
- Proposed New Bio-Sparge Well/12 ft ROI
- Proposed New Vapor Probe
- Conveyance Piping
- Proposed New Conveyance Piping
- Remedial Treatment System Compound
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction
ROI = Radius of Influence

N

0 80 Feet

**Alternative 3d**
**Expanded Bio-Sparge Operations**
Site Review Report
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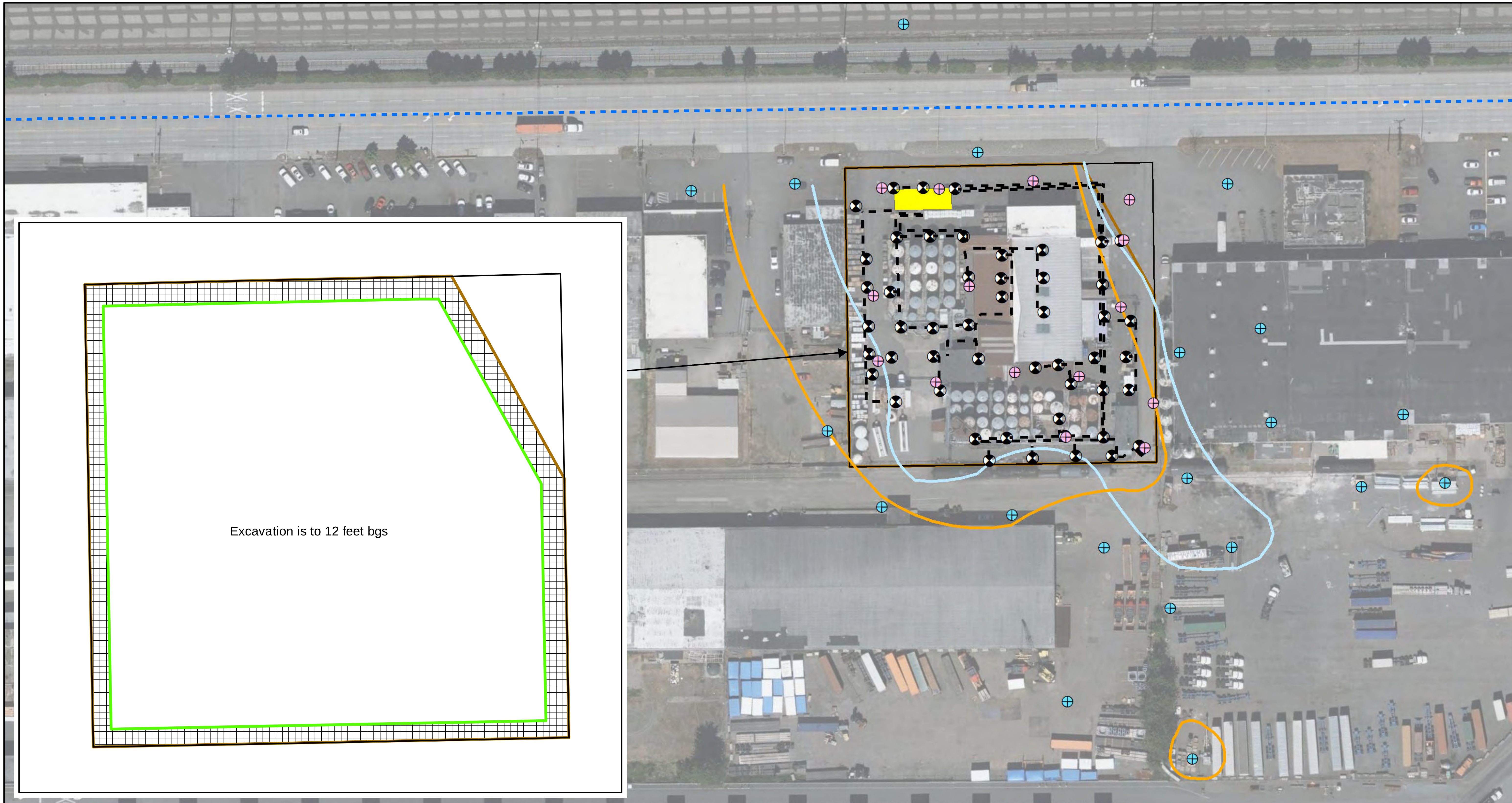
**Figure 13c**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 3d.mxd 2/14/2022 10:42:26 AM




**Legend**

- Top of Excavation
- Bottom of Excavation
- 1:1 Slope
- DPE Recovery Wells
- DPE Vault
- Conveyance Piping
- Remedial Treatment System Compound (To Be Removed During Excavation)
- Off-Site Groundwater Monitoring Well Location
- On-Site Groundwater Monitoring Well Location (to be destroyed)
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction

N

0 80 Feet

**Alternative 4**
**Excavation Remedy Layout**
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**Figure 14**

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P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 4.mxd 10/14/2021 8:26:00 AM


**Legend**

- Proposed New Extraction Well
- Proposed New Conveyance Piping
- Estimated Groundwater Extraction Well Radius of Influence
- Remedial Treatment System Compound
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics
DPE = Dual Phase Extraction
GW = Groundwater

N

0 80 Feet

**Alternative 5**
**GW Containment via Extraction Remedy Layout**
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**Figure 15**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 5.mxd 10/14/2021 8:27:28 AM

**Legend**

- Proposed New Bio-Sparge Well Location
- Proposed New Conveyance Piping
- Estimated Bio-Sparging Well Radius of Influence
- Remedial Equipment Compound
- Groundwater Monitoring Well Location
- Estimated Extent of VOC Groundwater Concentrations above CULs
- Estimated Extent of TPH Groundwater Concentrations above CULs
- Storm Sewer Utility
- Parcel Boundary

Notes:
CUL = Site-Specific Cleanup Levels
VOC = Volatile Organic Compounds, includes tetrachloroethene, 1,4- dichlorobenzene, and vinyl chloride
TPH = Total Petroleum Hydrocarbons, includes gasoline, diesel, and motor oil range organics

N

0 80 Feet

**Alternative 6**
**Bio-Sparge at Downgradient Site Boundary Remedy Layout**
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**Figure 16**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Remedial Alternatives\Alternative 6.mxd 10/14/2021 8:28:23 AM

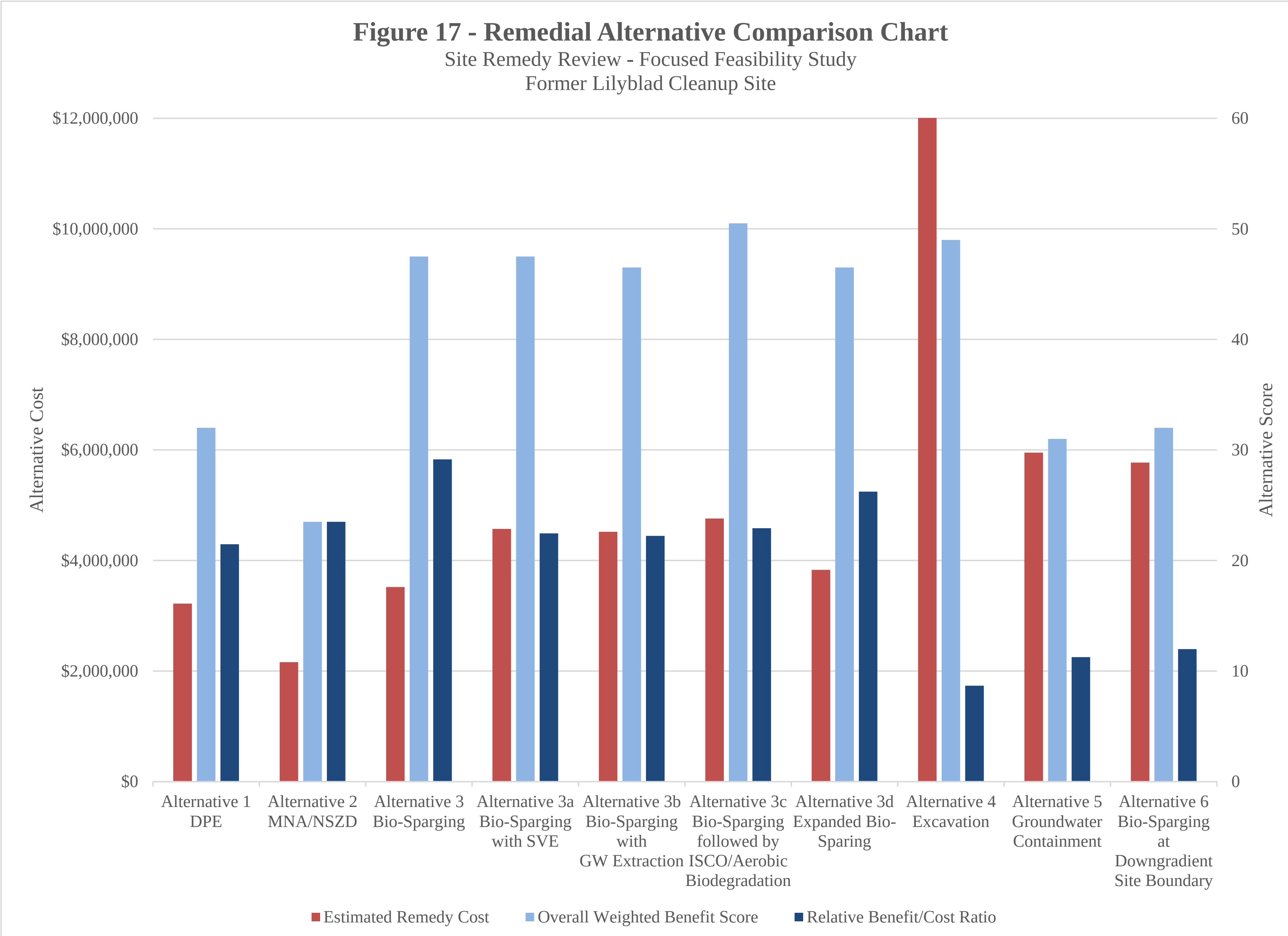
Figure 17 - Remedial Alternative Comparison Chart
Site Remedy Review - Focused Feasibility Study
Former Lilyblad Cleanup Site
Alternative Cost
Alternative Score
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$0
60
50
40
30
20
10
0
Alternative 1 DPE
Alternative 2 MNA/NSZD
Alternative 3 Bio-Sparging
Alternative 3a Bio-Sparging with SVE
Alternative 3b Bio-Sparging with GW Extraction
Alternative 3c Bio-Sparging followed by ISCO/Aerobic Biodegradation
Alternative 3d Expanded Bio-Sparing
Alternative 4 Excavation
Alternative 5 Groundwater Containment
Alternative 6 Bio-Sparging at Downgradient Site Boundary
Estimated Remedy Cost
Overall Weighted Benefit Score
Relative Benefit/Cost Ratio

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# APPENDIX A

## Historical Document Excerpts & Recent Groundwater Monitoring Data

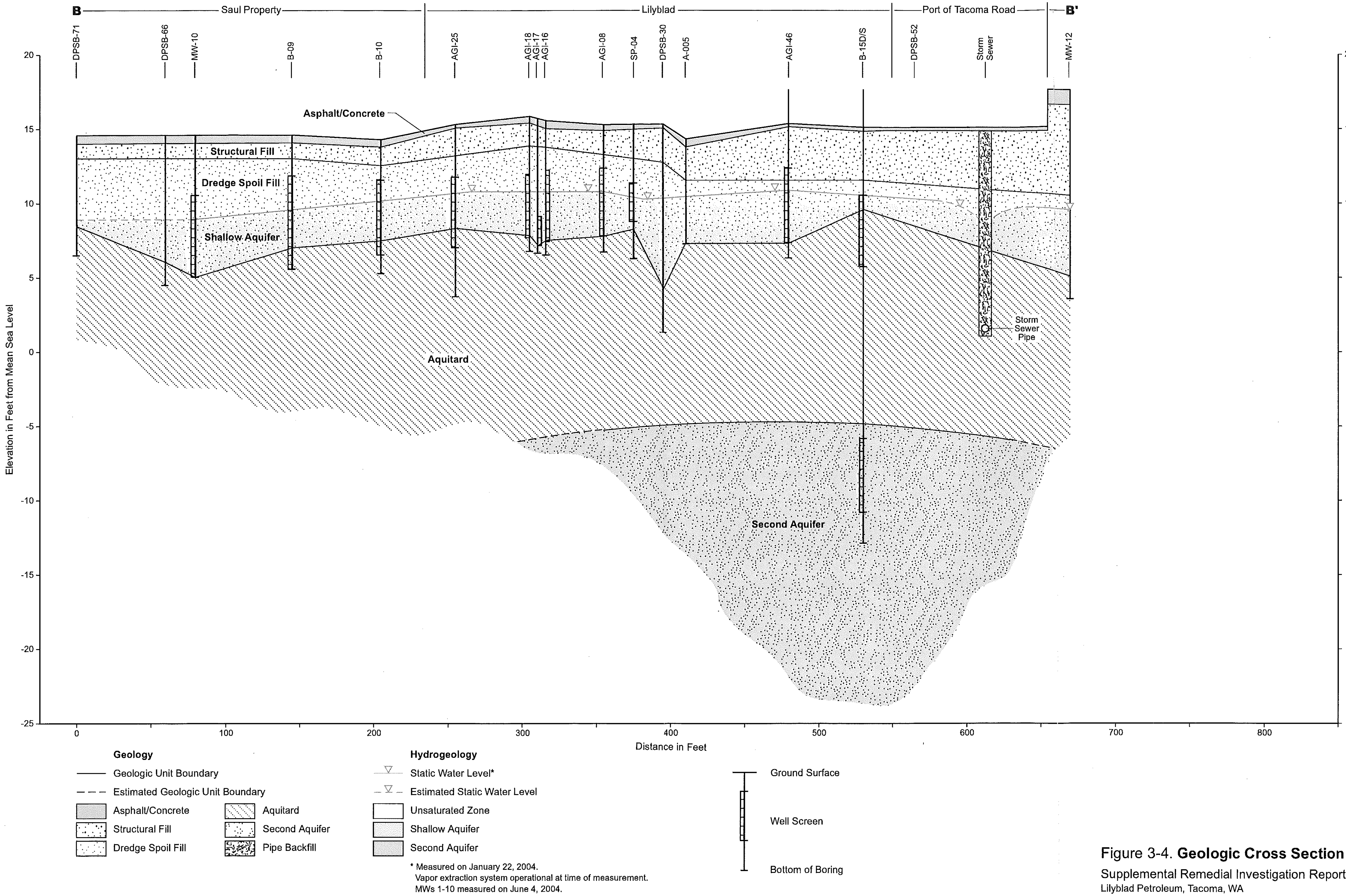


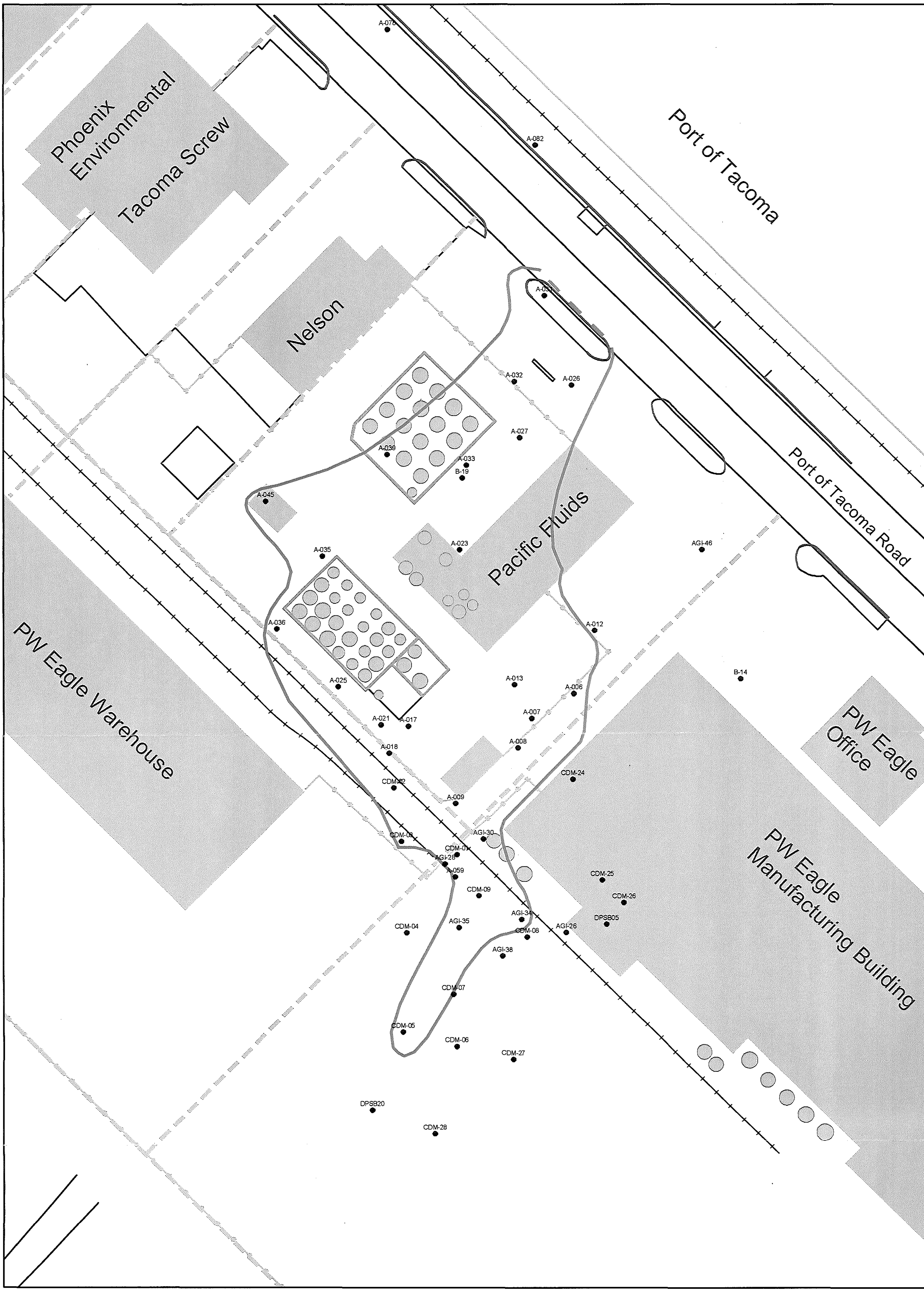

Figure 3-4. **Geologic Cross Section B-B′**

Supplemental Remedial Investigation Report

Lilyblad Petroleum, Tacoma, WA

177582.12.01_E092004000SEA . b-b xsec . 14oct04

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




True North

Plant North

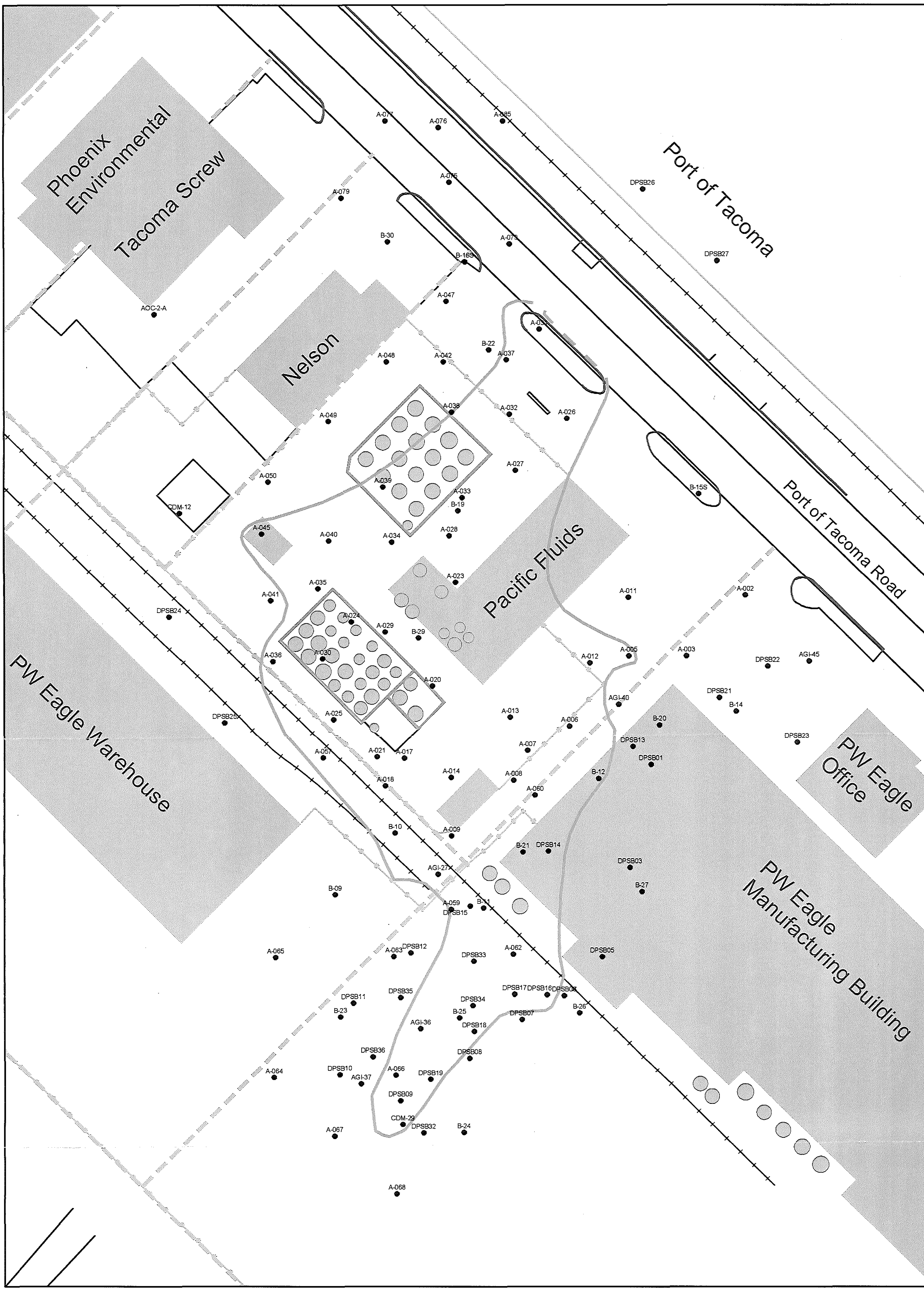
0 50 100 Feet

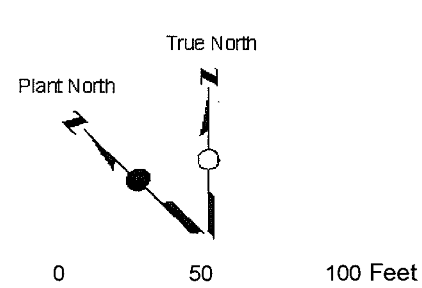
- Soil Sample Location
- Property Line
- Approximate extent of unsaturated soil contamination

Figure ES-3. **Approximate Extent of Soil Contamination in Unsaturated Interval**
Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\Soil_Unsaturated_Fig4-1.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




- Soil Sample Location
- Property Line
- Approximate extent of capillary fringe soil contamination

Figure ES-4. **Approximate Extent of Soil Contamination in Capillary Fringe Interval**
Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\Soil_CapillaryFringe_Fig4-2.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

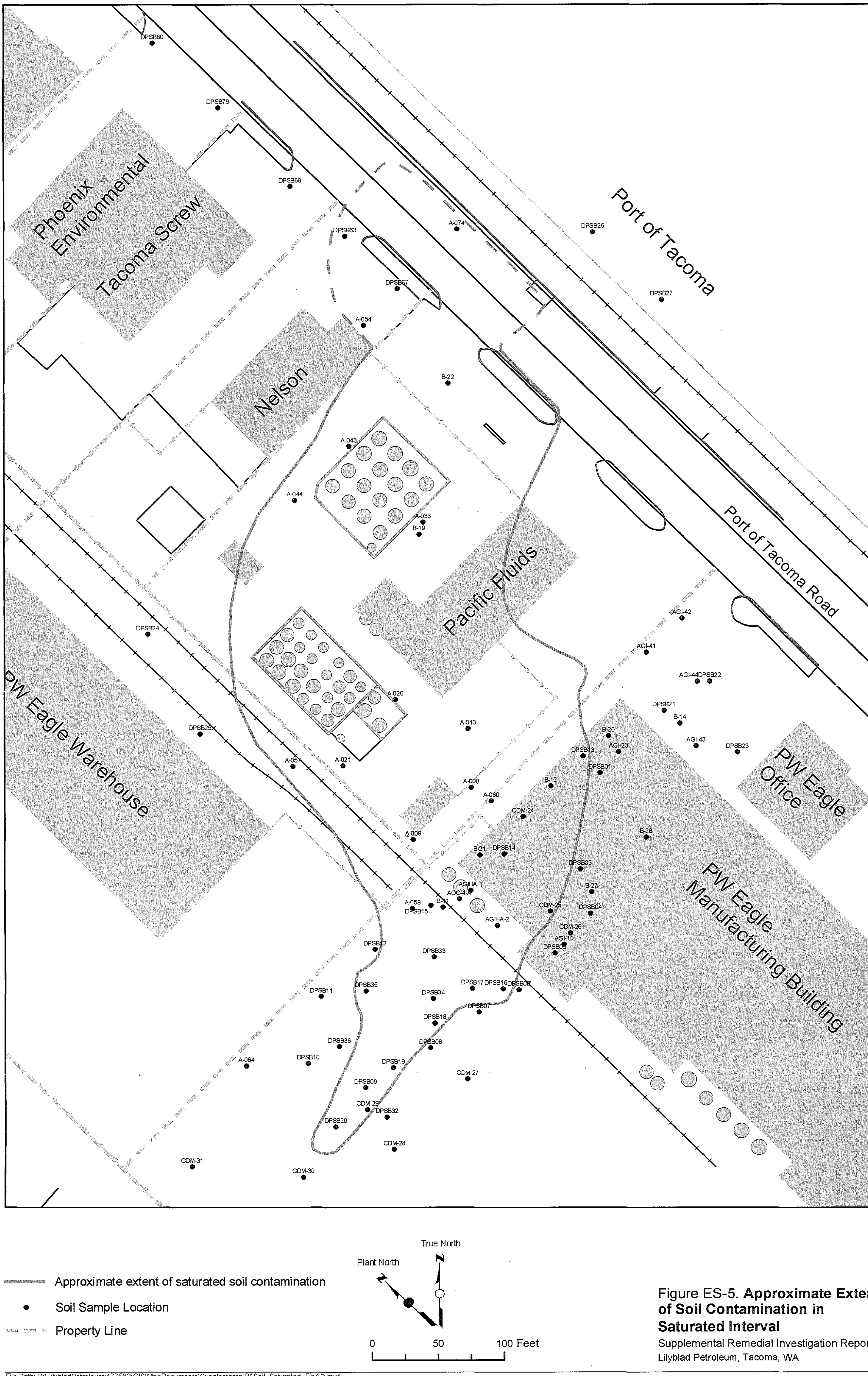
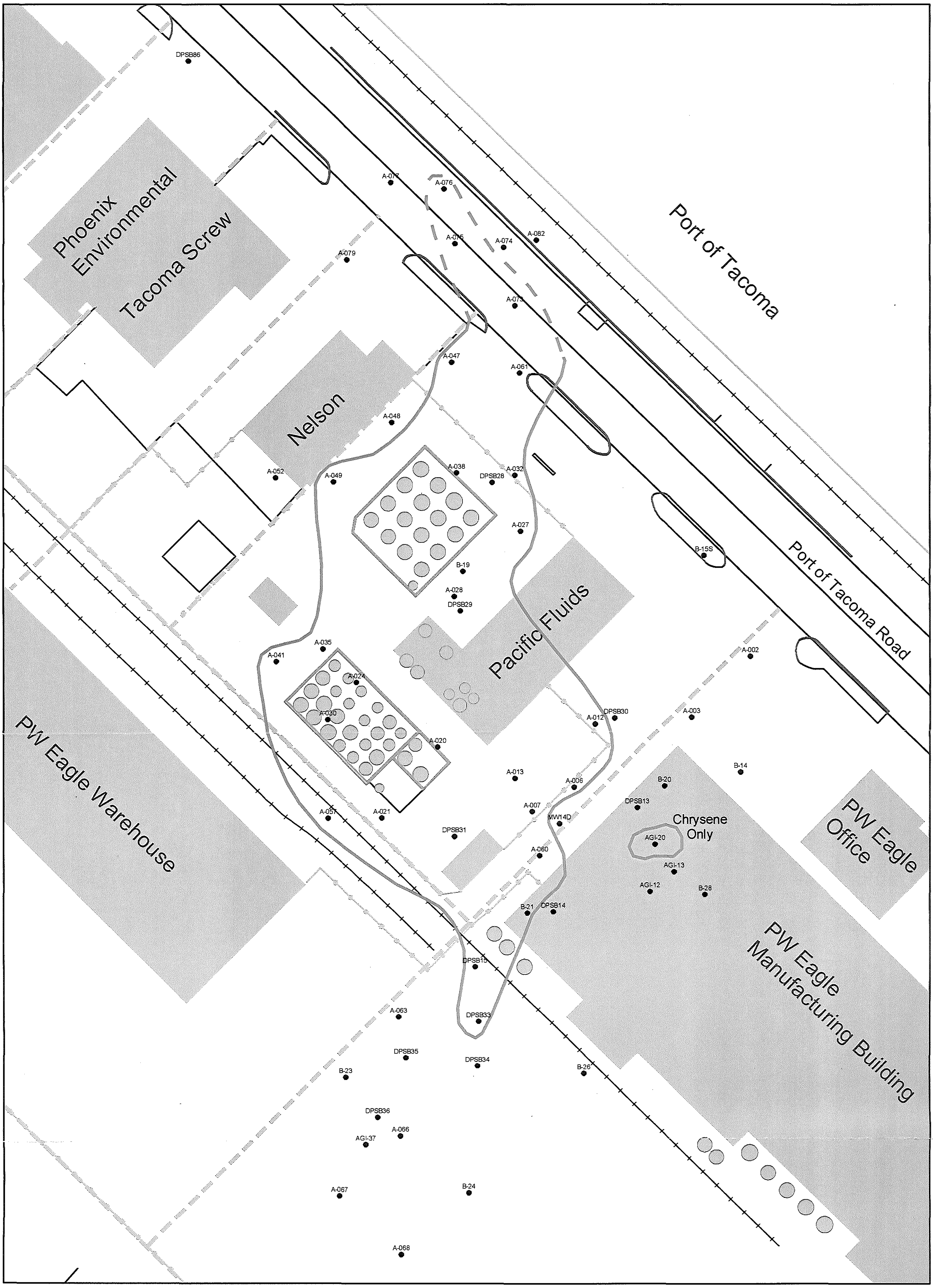



Figure ES-5. **Approximate Extent of Soil Contamination in Saturated Interval**

Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\Soil_Saturated_Fig4-3.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




Approximate extent of aquitard soil contamination
Soil Sample Location
Property Line

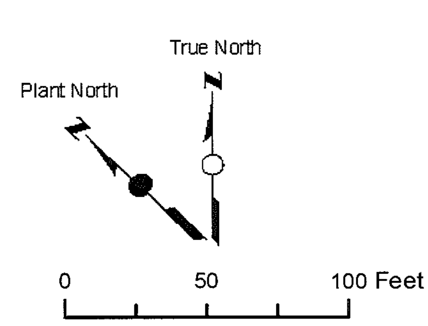
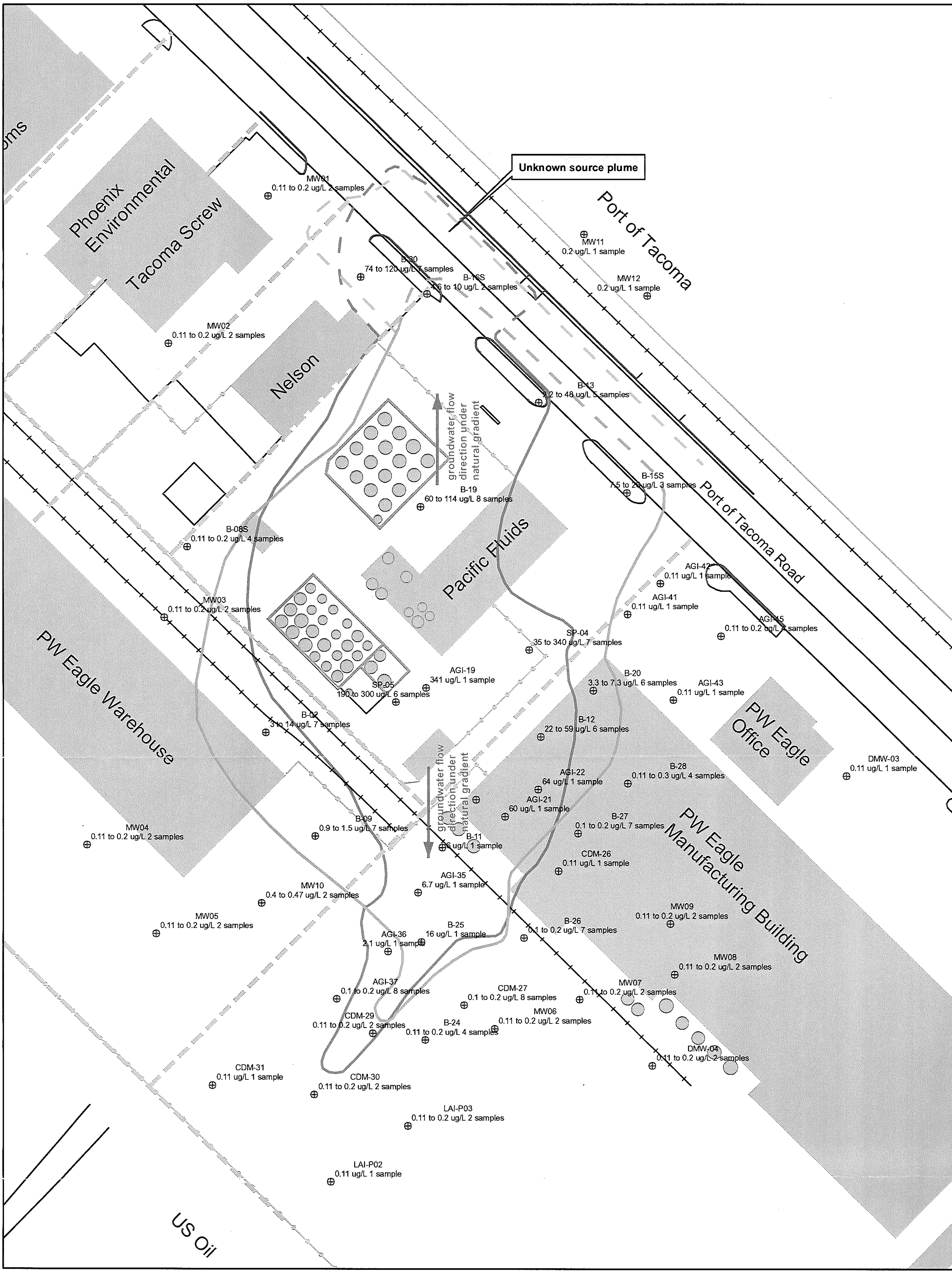



Figure ES-6. **Approximate Extent of Soil Contamination in Aquitard Interval**
Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\Aquitard_Fig4-4.mxd, Date: 09 27, 2004 1:37:17 PM

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




Unknown source plume

Approximate extent of benzene plume based on cleanup level of 0.8 ug/L. Note: Postion of line determined using analytical data from wells and 2004 Supplemental RI direct push groundwater data.

0.11 to 0.2 ug/L 2 samples - Reported concentration range in well. Note: nondetect reporting limit results are also listed.

Approximate extent of soil contamination

⊕ Monitoring Well

Property Line

True North

Plant North

0 50 100 Feet

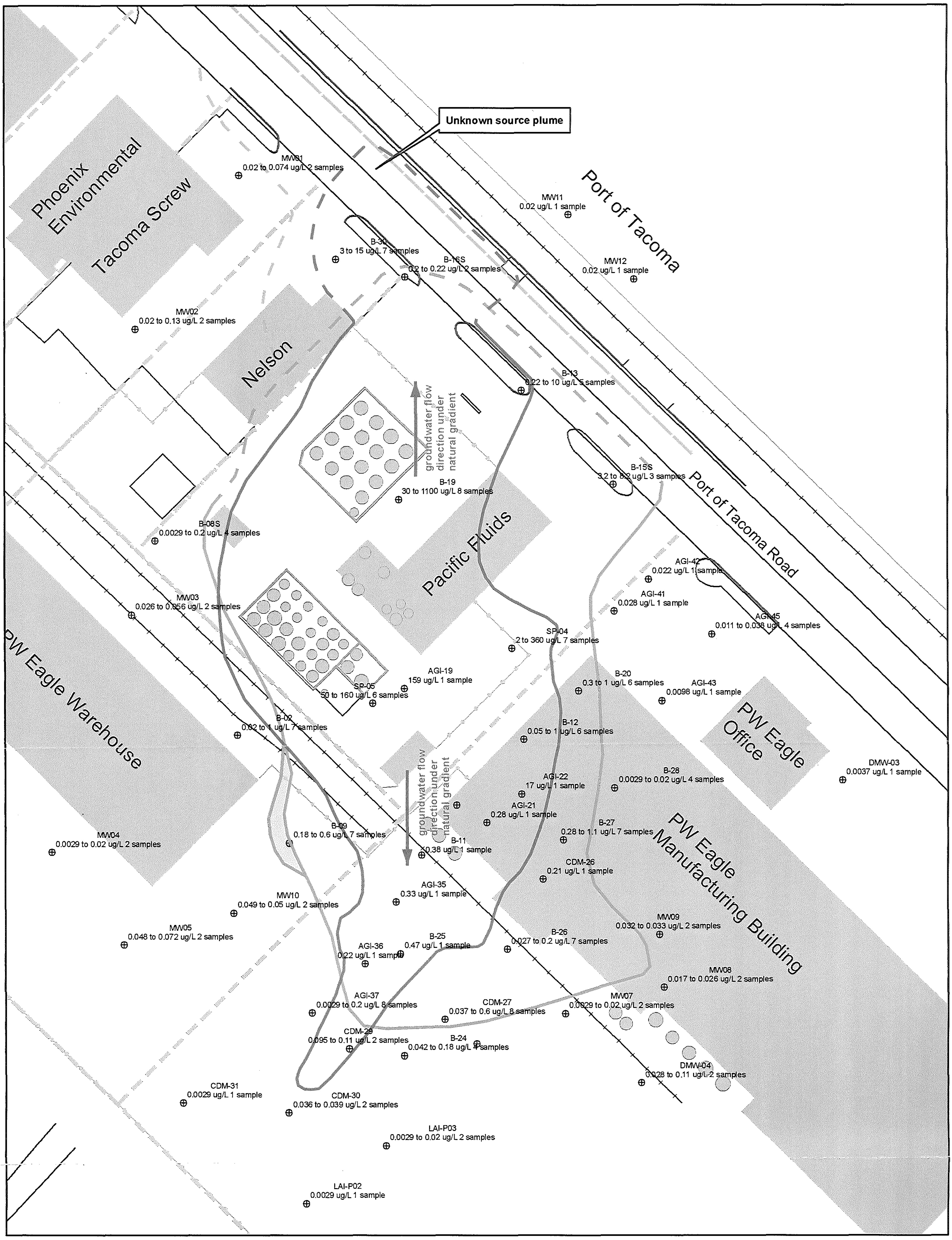
Figure ES-7. **Distribution of Benzene in Shallow Aquifer Monitoring Wells**

Supplemental Remedial Investigation Report

Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\Benzene_Fig4-5.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




Unknown source plume

Approximate extent of vinyl chloride plume based on unadjusted cleanup level of 0.18 ug/L. Note: Position of line determined using analytical data from from wells and 2004 Supplemental RI direct push groundwater data (line broadens in areas where vinyl chloride concentrations on occasion exceed CUL).

0.039 to 1 ug/L 2 samples - Reported concentration range (Note: nondetect reporting limit results are also listed).

Approximate extent of soil contamination

Monitoring Well

Property Line

True North

Plant North

0 50 100 Feet

Figure ES-8. **Distribution of Vinyl Chloride in Shallow Aquifer Monitoring Wells**

Supplemental Remedial Investigation Report

Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\VinylChloride_Fig4-6.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

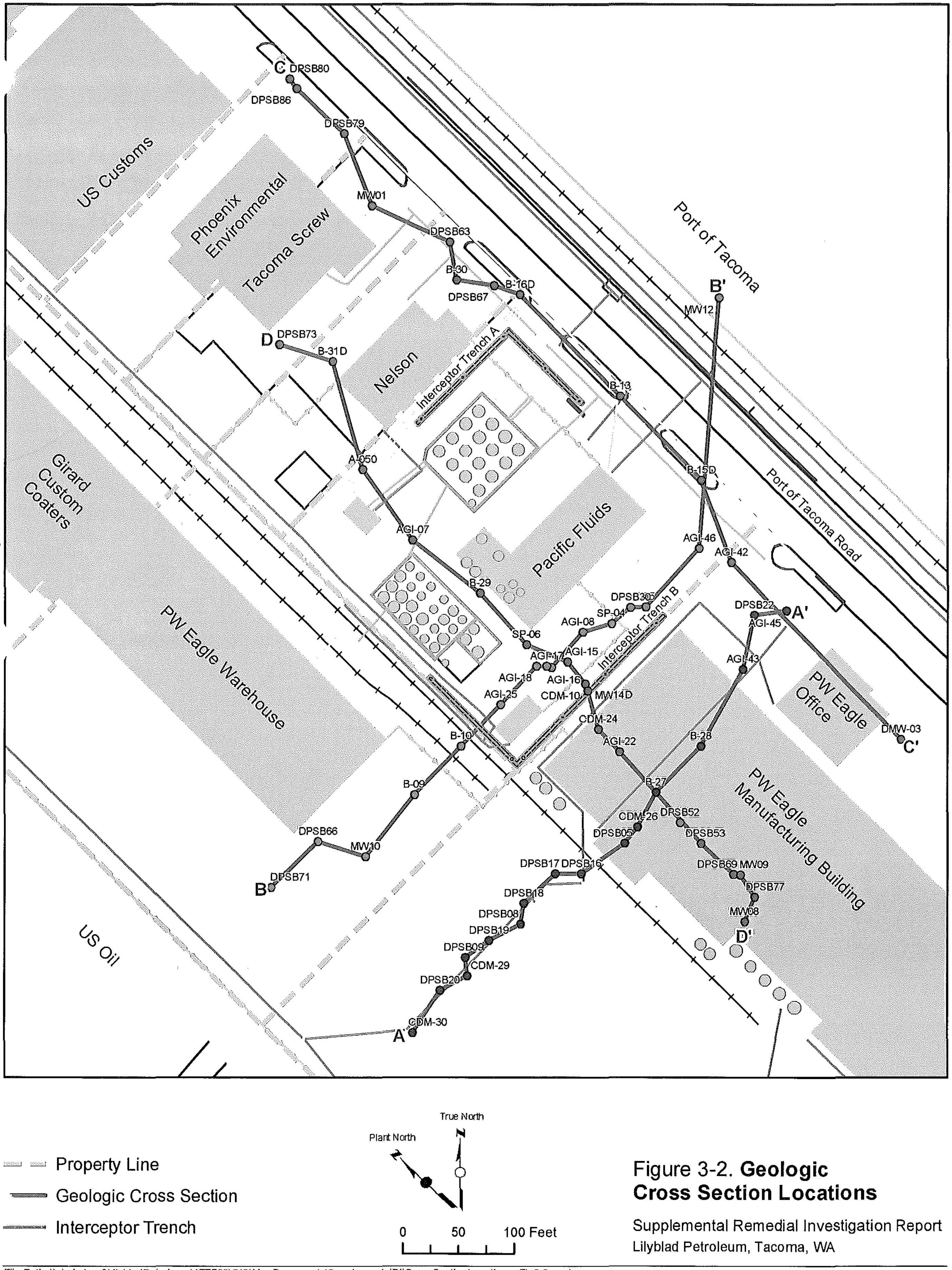



Figure 3-2. **Geologic Cross Section Locations**

Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: \\simba\proj\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\CrossSectionLocations_Fig3-2.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

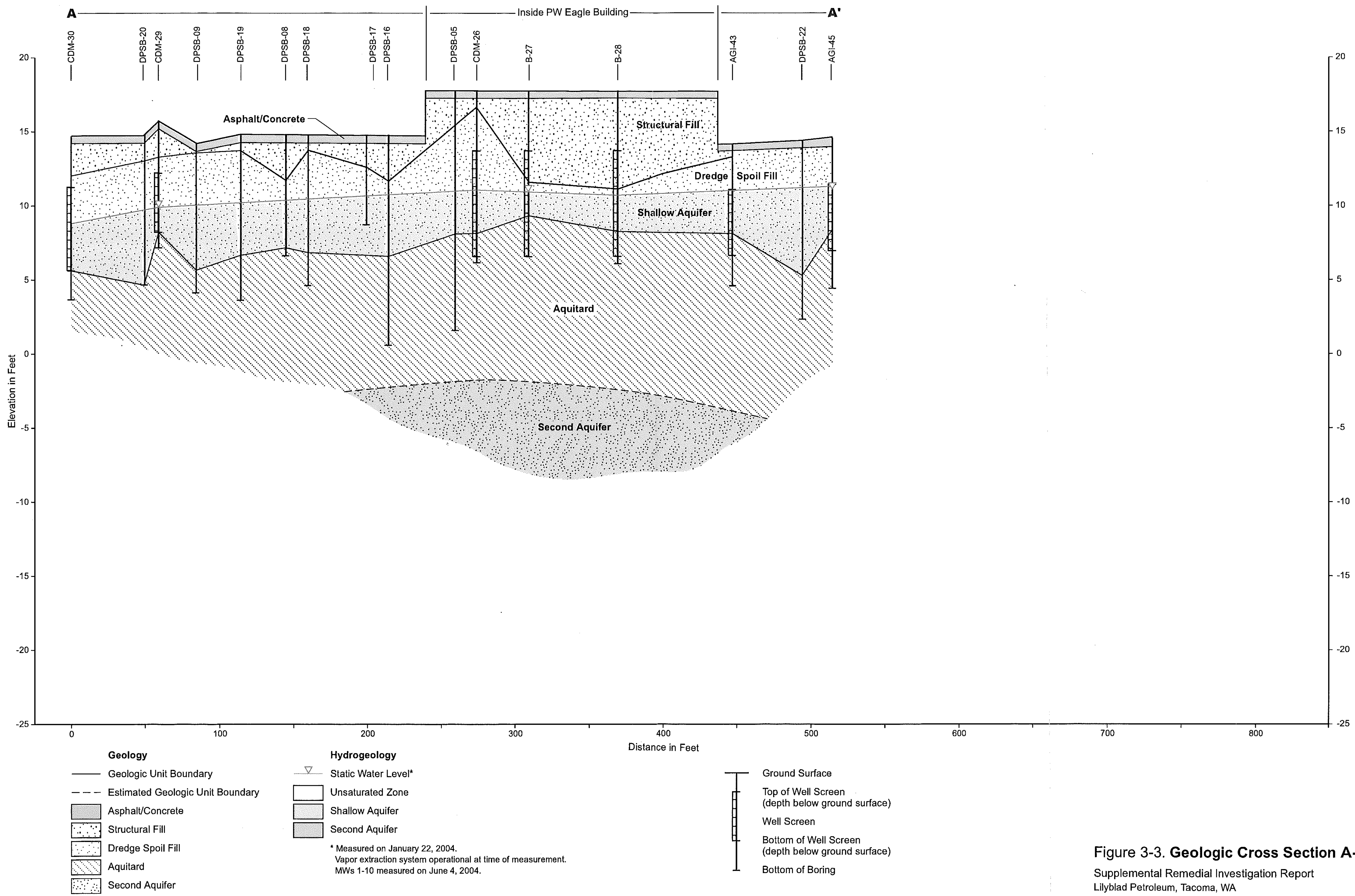



Figure 3-3. **Geologic Cross Section A-A′**

Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

177582.12.01_E092004000SEA . a-a xsec . 4oct04

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

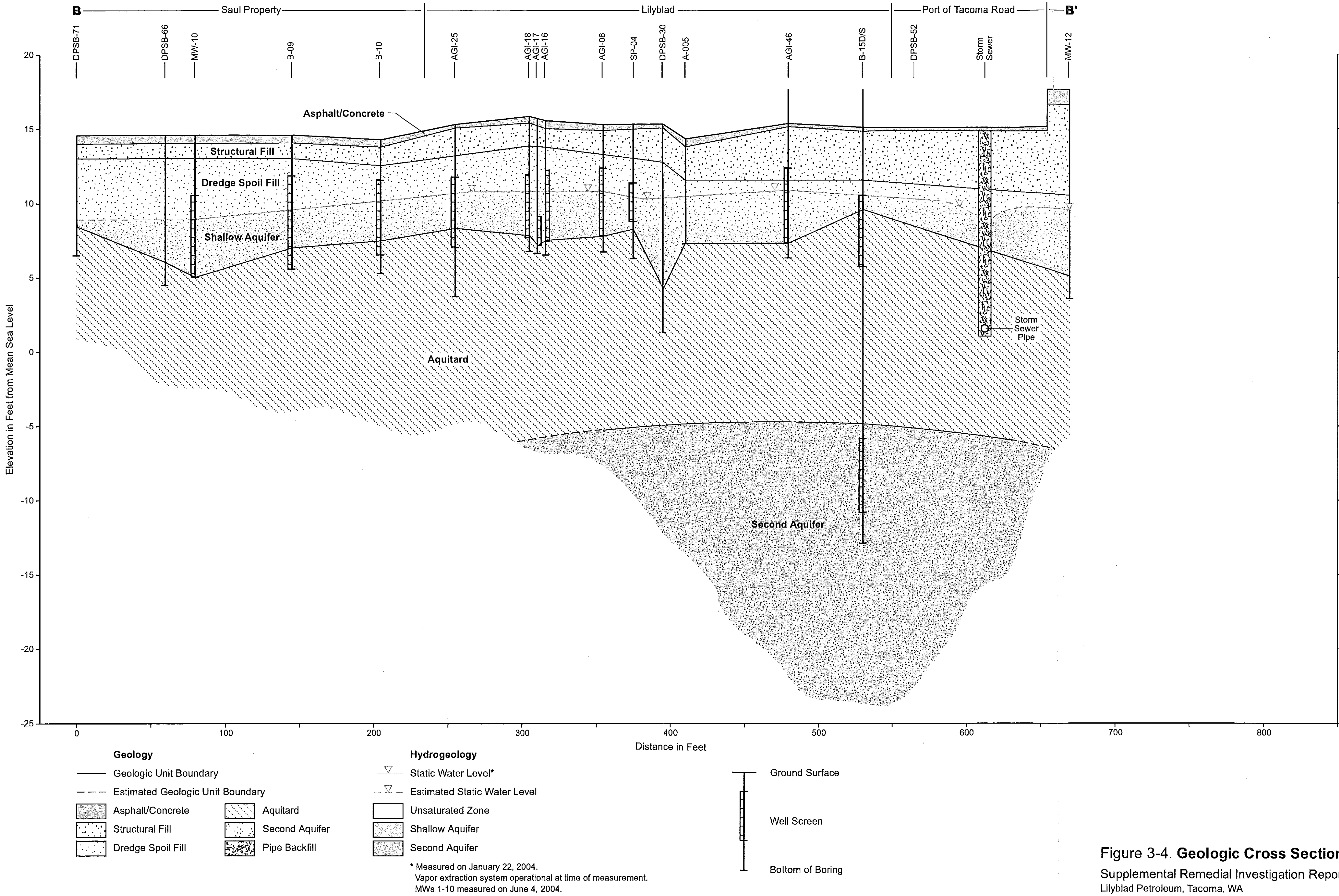



Figure 3-4. **Geologic Cross Section B-B′**
Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

177582.12.01_E092004000SEA . b-b xsec . 14oct04

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

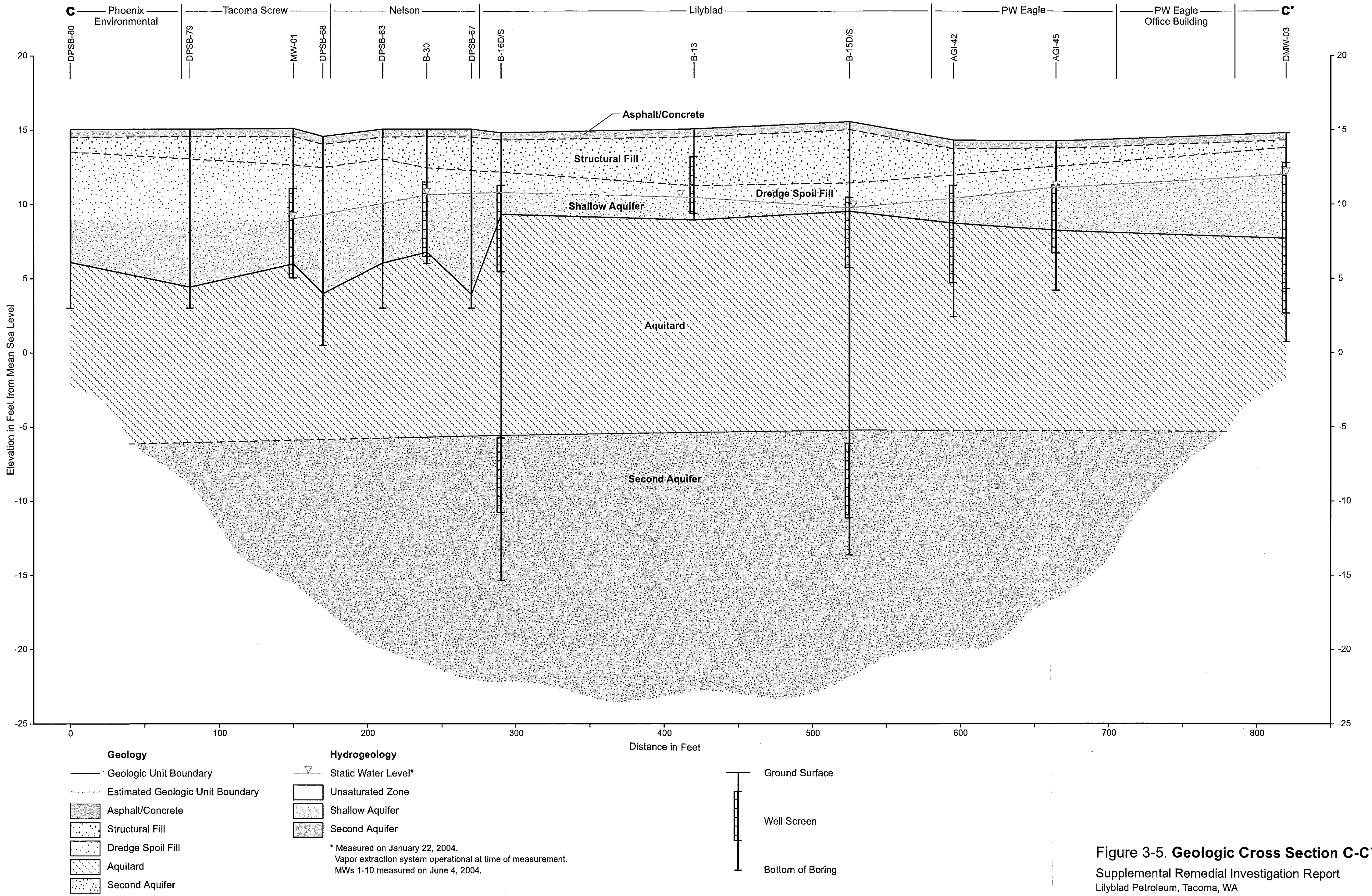



Figure 3-5. **Geologic Cross Section C-C′**

Supplemental Remedial Investigation Report

Lilyblad Petroleum, Tacoma, WA

177582.12.01_E092004000SEA . c-c xsec . 4oct04

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

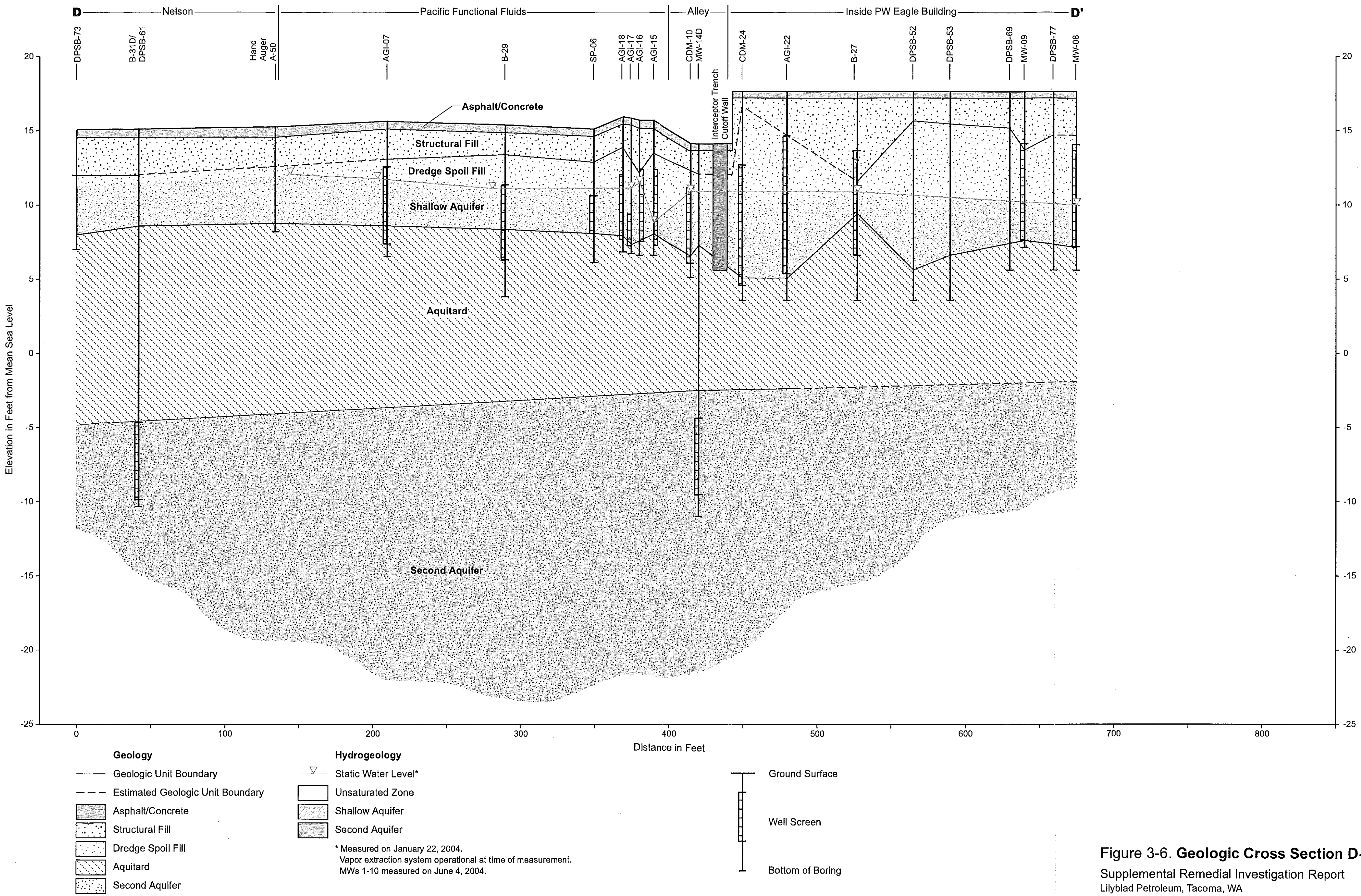
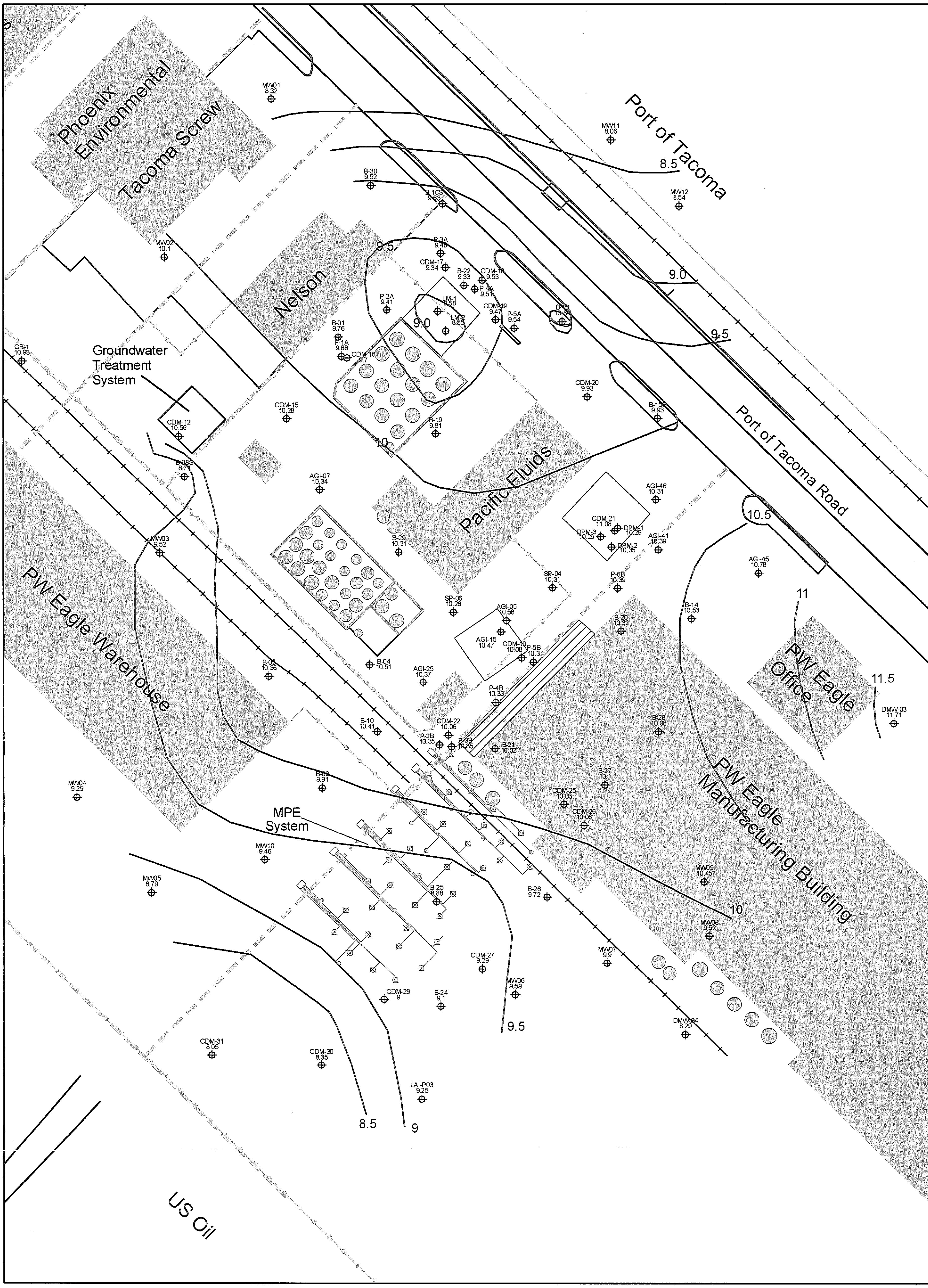
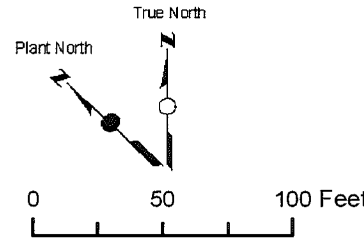



Figure 3-6. **Geologic Cross Section D-D′**
Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

177582.12.01_E092004000SEA . d-d xsec . 14oct04

CH2M Hill, 2004. Supplemental Remedial Investigation Report.




⊕ Monitoring Well Location

—— Groundwater Elevation Contour (feet above NAVD88)

- - - Property Line

☐ Pilot Study Area

Figure 3-8. **Groundwater Elevation Shallow Aquifer - August 2004**

Supplemental Remedial Investigation Report
Lilyblad Petroleum, Tacoma, WA

File Path: P:\LilybladPetroleum\177582\GIS\MapDocuments\SupplementalRI\GWElevationAug04_Fig3-8.mxd

CH2M Hill, 2004. Supplemental Remedial Investigation Report.

**Table 1**
**Second Quarter 2021**
**Groundwater Elevations**
Lilyblad Site
Tacoma, Washington

Geosyntec consultants

| Monitoring Point ID | Well Construction Information[1] | Monitoring Results | | | |
|---|---|---|---|---|---|
| | Top of Well Casing (ft NAVD88[2]) | Measurement Date | Measured Total Depth (ft btoc) | Depth to Water (ft. btoc) | Water Elevation (ft NAVD88) |
| AGI-07 | 15.49 | 6/21/2021 | 7.78 | 3.62 | 11.87 |
| AGI-14 | -- | 6/21/2021 | 7.20 | 2.30 | NA |
| AGI-19 | -- | 6/21/2021 | 7.90 | 3.27 | NA |
| AGI-34 | -- | 6/21/2021 | NM | NM | NA |
| AGI-45 | 14.28 | 6/21/2021 | 7.50 | 2.36 | 11.92 |
| AGI-46 | 15.53 | 6/21/2021 | 7.52 | 3.40 | 12.13 |
| B-02 | 15.34 | 6/21/2021 | 7.32 | 3.59 | 11.75 |
| B-09 | 14.43 | 6/21/2021 | 7.35 | 2.55 | 11.88 |
| B-11 | 14.16 | 6/21/2021 | 7.98 | 1.60 | 12.56 |
| B-13 | 15.63 | 6/21/2021 | 6.22 | 4.18 | 11.45 |
| B-19 | 15.14 | 6/21/2021 | 13.65 | 3.45 | 11.69 |
| B-23 | 16.24 | 6/21/2021 | NM | NM | NA |
| B-24 | -- | 6/21/2021 | 9.90 | 3.90 | NA |
| B-25 | 14.19 | 6/21/2021 | 9.98 | 2.15 | 12.04 |
| B-26 | -- | 6/21/2021 | NM | NM | NA |
| B-28 | 17.59 | 6/21/2021 | NM | NM | NA |
| B-29 | 15.18 | 6/21/2021 | 8.27 | 3.08 | 12.10 |
| B-30 | 14.92 | 6/21/2021 | 7.35 | 4.15 | 10.77 |
| CDM-10 | -- | 6/21/2021 | 6.58 | 1.82 | NA |
| CDM-12 | 14.87 | 6/21/2021 | 7.60 | 3.02 | 11.85 |
| CDM-15 | 15.38 | 6/21/2021 | 7.31 | 3.52 | 11.86 |
| CDM-16 | -- | 6/21/2021 | 5.35 | 3.85 | NA |
| CDM-17 | 15.49 | 6/21/2021 | 7.91 | 3.11 | 12.38 |
| CDM-19 | 14.98 | 6/21/2021 | 7.59 | 3.63 | 11.35 |
| CDM-20 | 15.10 | 6/21/2021 | 7.60 | 3.65 | 11.45 |
| CDM-21 | -- | 6/21/2021 | 9.50 | 3.15 | NA |
| CDM-22 | 14.38 | 6/21/2021 | 7.33 | 1.72 | 12.66 |
| CDM-24 | -- | 6/21/2021 | NM | NM | NA |
| CDM-26 | 17.45 | 6/21/2021 | 11.24 | 5.35 | 12.10 |
| CDM-27 | -- | 6/21/2021 | 7.45 | 2.00 | NA |
| CDM-28 | -- | 6/21/2021 | NM | NM | NA |
| CDM-29 | -- | 6/21/2021 | NM | NM | NA |
| CDM-30 | -- | 6/21/2021 | 9.40 | 2.65 | NA |
| CDM-31 | 15.91 | 6/21/2021 | 9.48 | 5.28 | 10.63 |
| DMW-01 | -- | 6/21/2021 | 19.18 | 5.31 | NA |
| MW-01 | 14.30 | 6/21/2021 | 9.50 | 4.52 | 9.78 |
| MW-03 | 14.39 | 6/21/2021 | 7.45 | 2.91 | 11.48 |
| MW-05 | 14.07 | 6/21/2021 | 6.88 | 3.22 | 10.85 |
| MW-06 | -- | 6/21/2021 | 6.24 | 3.70 | NA |
| MW-07 | 15.07 | 6/21/2021 | 6.92 | 2.68 | 12.39 |
| MW-08 | 17.47 | 6/21/2021 | NM | NM | NA |
| MW-11 | 17.13 | 6/21/2021 | NM | NM | N/A |
| SP-06 | 15.86 | 6/21/2021 | 7.50 | 2.36 | 13.50 |

Notes:
1. Well construction information tabulated from well installation logs and groundwater monitoring tables provided by Jacobs/CH2M/Hill and found on Washington Department of Ecology State Well Viewer.
2. Vertical Datum NAVD88 used for elevation due to nearby tidal influence on groundwater levels.
ft. btoc - feet below top of casing
ft. bgs - feet below ground surface
-- - Data Not Available
NM - Not Measured; well inacessible and covered by shipping containers at time of gauging.
NA = Not Applicable

**Table 1**
**Fourth Quarter 2020**
**Groundwater Elevations**
Lilyblad Site
Tacoma, Washington

| Monitoring Point ID | Well Construction Information[1] | Monitoring Results | | | |
|---|---|---|---|---|---|
| | Top of Well Casing (ft NAVD88[2]) | Measurement Date | Measured Total Depth (ft btoc) | Depth to Water (ft. btoc) | Water Elevation (ft NAVD88) |
| AGI-07 | 15.49 | 12/22/2020 | 7.82 | 3.32 | 12.17 |
| AGI-45 | 14.28 | 12/22/2020 | 7.40 | 2.53 | 11.75 |
| B-02 | 15.34 | 12/22/2020 | 7.30 | 3.51 | 11.83 |
| B-09 | 14.43 | 12/22/2020 | NM | NM | -- |
| B-11 | 14.16 | 12/22/2020 | 7.82 | 1.40 | 12.76 |
| B-19 | 15.14 | 12/22/2020 | 13.55 | 3.10 | 12.04 |
| B-25 | 14.19 | 12/22/2020 | 9.81 | 2.29 | 11.90 |
| B-30 | 14.92 | 12/22/2020 | 7.30 | 3.62 | 11.30 |
| CDM-19 | 14.98 | 12/22/2020 | 7.52 | 2.82 | 12.16 |
| CDM-20 | 15.10 | 12/22/2020 | 7.70 | 3.30 | 11.80 |
| MW-01 | 14.30 | 12/22/2020 | 9.62 | 3.99 | 10.31 |
| MW-03 | 14.39 | 12/22/2020 | 7.42 | 1.23 | 13.16 |
| SP-06 | 15.86 | 12/22/2020 | 6.80 | 2.84 | 13.02 |

Notes:
1. Well construction information tabulated from well installation logs and groundwater monitoring tables provided by Jacobs/CH2M/Hill and found on Washington Department of Ecology State Well Viewer.
2. Vertical Datum NAVD88 used for elevation due to nearby tidal influence on groundwater levels.
ft. btoc - feet below top of casing
ft. bgs - feet below ground surface
-- - Data Not Available

**Table 1**
**Well Construction Information and**
**First and Second Quarter 2020 Groundwater Elevations**
Lilyblad Site
Tacoma, Washington

| Monitoring Point ID | Well Construction Information[1] | | | Monitoring Results | | | |
|---|---|---|---|---|---|---|---|
| | Top of Well Casing (ft NAVD88[2]) | Screen Interval (ft. bgs) | Total Well Depth (ft bgs) | Measurement Date | Measured Total Depth (ft btoc) | Depth to Water (ft. btoc) | Water Elevation (ft NAVD88) |
| AGI-07 | 15.49 | -- | -- | 3/16/2020 | 7.69 | 3.41 | 12.08 |
| AGI-14 | 15.00 | -- | -- | 3/18/2020 | 6.90 | 2.44 | 12.56 |
| AGI-45 | 14.28 | -- | -- | 3/18/2020 | 7.41 | 2.60 | 11.68 |
| AGI-46 | 15.26 | -- | -- | 3/16/2020 | 7.45 | 3.45 | 11.81 |
| B-02 | 15.34 | -- | -- | 3/17/2020 | 7.28 | 3.52 | 11.82 |
| B-09 | 14.43 | -- | -- | 3/17/2020 | 7.35 | 2.43 | 12.00 |
| B-11 | 14.16 | -- | -- | 3/17/2020 | 7.85 | 1.94 | 12.22 |
| B-12 | 17.39 | -- | -- | 3/18/2020 | 10.81 | 5.25 | 12.14 |
| B-13 | 15.19 | -- | -- | 3/17/2020 | 6.17 | 4.07 | 11.12 |
| B-19 | 15.14 | 8-13.4 | 13.4 | 3/16/2020 | 13.38 | 2.82 | 12.32 |
| B-23 | 16.24 | -- | -- | 3/17/2020 | 7.92 | 3.53 | 12.71 |
| B-25 | 14.19 | -- | -- | 3/17/2020 | 9.86 | 1.62 | 12.57 |
| B-28 | 17.19 | -- | -- | 3/18/2020 | 10.88 | 5.65 | 11.54 |
| B-29 | 15.18 | -- | -- | 3/18/2020 | 8.37 | 3.03 | 12.15 |
| B-30 | 14.92 | -- | -- | 3/17/2020 | 7.22 | 3.91 | 11.01 |
| CDM-12 | 14.49 | -- | -- | 3/17/2020 | 7.52 | 2.74 | 11.75 |
| CDM-15 | 15.04 | -- | -- | 3/16/2020 | 7.31 | 3.11 | 11.93 |
| CDM-17 | 15.24 | -- | -- | 3/17/2020 | 8.90 | 3.48 | 11.76 |
| CDM-19 | 14.98 | -- | -- | 3/17/2020 | 7.54 | 3.53 | 11.45 |
| CDM-20 | 15.10 | -- | -- | 3/17/2020 | 7.66 | 3.52 | 11.58 |
| CDM-21 | 15.48 | -- | -- | 3/18/2020 | 9.32 | 3.60 | 11.88 |
| CDM-22 | 14.15 | -- | -- | 3/18/2020 | 8.12 | 2.98 | 11.17 |
| CDM-26 | 17.11 | 4-10.5 | 10.5 | 3/18/2020 | 11.23 | 5.44 | 11.67 |
| CDM-31 | 15.50 | 4-9.5 | 9.5 | 3/17/2020 | 9.45 | 5.04 | 10.46 |
| DMW-04 | 13.70 | -- | -- | 3/17/2020 | 12.63 | 2.32 | 11.38 |
| MW-01 | 14.30 | 4-10 | 10 | 3/17/2020 | 9.60 | 3.63 | 10.67 |
| MW-03 | 14.39 | 4-7.5 | 8 | 3/18/2020 | 7.35 | 2.72 | 11.67 |
| MW-05 | 13.73 | 4-7 | 8 | 3/17/2020 | 6.83 | 3.05 | 10.68 |
| MW-07 | 14.86 | 4-7 | 7.5 | 3/18/2020 | 6.88 | 2.45 | 12.41 |
| MW-08 | 17.13 | 3.5-10.5 | 11 | 3/18/2020 | 10.06 | 5.48 | 11.65 |
| MW-11 | -- | 5-10.35 | 10.35 | 6/12/2020 | 11.89 | 7.80 | -- |
| P-1A | 15.21 | -- | -- | 3/16/2020 | 8.58 | 3.84 | 11.37 |
| P-4B | 13.90 | -- | -- | 3/18/2020 | 7.16 | 1.45 | 12.45 |
| SP-04 | 15.02 | -- | -- | 3/16/2020 | 6.01 | 2.83 | 12.19 |
| SP-06 | 15.86 | -- | -- | 3/18/2020 | 6.80 | 3.21 | 12.65 |

Notes:
1. Well construction information tabulated from well installation logs and groundwater monitoring tables provided by Jacobs/CH2M/Hill
2. Vertical Datum NAVD88 used for elevation due to nearby tidal influence on groundwater levels.
Access to Washington United Terminal, the location of MW-11, was approved by the Port of Tacoma on May 29, 2020.
ft. btoc - feet below top of casing
ft. bgs - feet below ground surface
-- - Data Not Available

**Table 2**
**Second Quarter 2021**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington

Geosyntec consultants

| | Units | CAS Number | CUL[1,2] | AGI-07 | AGI-19 | AGI-45 | B-02 | B-09 | B-11 | B-19 | B-25 | B-29 | B-30 | CDM-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6/24/2021 | 6/21/2021 | 6/22/2021 | 6/22/2021 | 6/23/2021 | 6/23/2021 | 6/24/2021 | 6/25/2021 | 6/21/2021 | 6/22/2021 | 6/21/2021 |
| **Headspace Readings** | | | | | | | | | | | | | | |
| Methane | % | 74-82-8 | NE | 0 | 0 | 0 | 0 | 0.2 | 0.7 | 0 | 0 | 0.1 | 0 | 0 |
| Oxygen | % | 7782-44-7 | NE | **22.7** | **21** | 21.2 | 20.9 | 20.9 | 21.3 | 21.3 | **21.6** | 20.6 | 21.9 | 20.4 |
| Hydrogen Sulfide | % | 7783-06-4 | NE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbon Dioxide | % | 124-38-9 | NE | 0 | **0.1** | 0 | 0 | 0.3 | 0.1 | 0 | 0 | 0.2 | 0 | 0.1 |
| Balance | % | N/A | NE | **77.9** | **79** | 78.8 | 79.1 | 78.9 | 77.9 | 78.6 | **78.5** | 78.9 | 78.1 | 78.9 |
| **Field Parameters** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 0.64 | 2.18 | 0.45 | 0.26 | 1.34 | 0.37 | 2.55 | 0.48 | 1.55 | 0.36 | 0.39 |
| Oxidation Reduction Potential | mV | NA | NE | -117 | 9.3 | 11.8 | -16.8 | -12.3 | -59.9 | -95.1 | -116.6 | 0.1 | 12 | -22.1 |
| pH | SU | NA | NE | 6.4 | 7.22 | 7.17 | 7.1 | 7.05 | 6.3 | 6.7 | 6.48 | 7.45 | 7.08 | 7.31 |
| Conductivity | µS/cm | NA | NE | 914 | 631 | 472 | 710 | 722 | 329 | 1599 | 568 | 1550 | 359 | 99 |
| Temperature | °C | NA | NE | 19 | 13.64 | 14.86 | 11.66 | 12.2 | 18.7 | 19.03 | 17.9 | 16.53 | 13.12 | 12.1 |
| Turbidity | NTU | NA | NE | 14 | 25 | 29 | 48 | 58 | 13 | 20 | 19 | 55 | 30 | 46 |
| **General Chemistry** | | | | | | | | | | | | | | |
| Nitrate as N (EPA Method 9056A) | mg/L | 14797-55-8 | NE | **1.4** | NA | **0.85** | NA | **0.21** | **0.12 J** | **0.048 J** | **0.76** | NA | **0.070 J** | NA |
| Sulfate (EPA Method 9056A) | mg/L | 14808-79-8 | NE | < 1.5 | NA | < 1.5 | NA | **12** | **8.5** | **43** | < 1.5 | NA | **3.6** | NA |
| Orthophosphate (EPA Method 365.1)[1] | mg/L | 98059-61-1 | NE | < 0.25 | NA | < 0.25 | NA | **0.11 J** | **0.4** | < 0.25 | < 0.25 | NA | **0.090 J** | NA |
| Dissolved Iron | µg/l | 7439-89-6 | NE | **90,000** | NA | **33,000** | NA | **2,200** | **3,700** | **11,000** | **25,000** | NA | **16,000** | NA |
| Dissolved Manganese | µg/l | 7439-96-5 | NE | **1,000** | NA | **470** | NA | **210** | **270** | **2,100** | **360** | NA | **240** | NA |
| Total Iron | µg/l | 7439-89-6 | NE | **89,000** | NA | **34,000** | NA | **2,300** | **5,100** | **13,000** | **26,000** | NA | **18,000** | NA |
| Total Manganese | µg/l | 7439-96-5 | NE | **NA** | NA | **470** | NA | **220** | **270** | **NA** | **370** | NA | **250** | NA |
| **Dissolved Gases (Method RSK 175(M))** | | | | | | | | | | | | | | |
| Dissolved methane | µg/l | 74-82-8 | NE | **5,940** | NA | **8,500** | NA | **7,600** | **3,500** | **11,000** | **7,120** | NA | **3,400** | NA |
| Dissolved ethane | µg/l | 74-84-0 | NE | **19.5** | NA | < 1.0 | NA | < 1.0 | < 1.0 | **99** | < 15.1 | NA | **2.4** | NA |
| Dissolved ethene | µg/l | 74-85-1 | NE | < 14.6 | NA | < 1.0 | NA | < 1.0 | < 1.0 | **15 J** | < 14.6 | NA | < 1.0 | NA |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **6.3 B** | **5.7** | **0.52** | **1.2** | **0.46** | **0.6** | **4.2 B** | **0.65** | **9.1** | **1.4** | **0.54** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **16 B** | **6.3** | **0.29** | **1.5** | **0.43** | **0.48** | **14 B** | **0.65** | **15** | **2.7** | **0.17** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.50** | **0.41** | < 0.25 | 0.15 J | < 0.25 | < 0.49 | **0.56** | **0.62** | **0.58** | **0.79** | < 0.25 |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | **0.69** | **0.72** | < 0.38 | **0.20 J** | **0.23 J** | **0.23 J** | **5.9** | **0.37 J** | **3.6 J** | **0.77** | < 0.38 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | **0.15 J** | **0.64** | < 0.38 | **0.044 J** | **0.13 J** | **0.44** | **0.13 J** | **1.3** | < 19 | **0.080 J** | < 0.38 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | **0.74** | **3.9** | < 0.38 | **0.29 J** | **1.7** | **3.2** | **0.81** | **14** | < 19 | **0.45** | < 0.38 |
| 1-Methylnaphthalene | µg/L | 90-12-0 | NE | **0.048 J** | **0.49 J** | < 0.96 | **0.22 J** | < 1.0 | **0.14 J** | < 0.96 | **0.14 J** | < 48 | < 0.96 | < 0.96 |
| 2,4-Dichlorophenol | µg/L | 120-83-2 | NE | < 0.97 | < 0.96 | < 0.96 | < 1.0 | < 1.0 | < 1.0 | < 0.96 | **0.20 J** | < 48 | < 0.96 | < 0.96 |
| 2,4-Dimethylphenol | µg/L | 105-67-9 | NE | **0.93 J** | < 3.8 | < 3.8 | < 4.0 | < 4.0 | < 4.0 | **1.1 J** | < 3.8 | < 190 | < 3.8 | < 3.8 |
| 2,6-Dinitrotoluene | µg/L | 606-20-2 | NE | < 19 | < 0.38 U*1 | < 0.38 | < 20 | < 0.40 | < 0.40 | < 19 | < 0.38 | < 19 U*1 | < 0.38 U*1 | **0.12 J *1** |
| 2-Chlorophenol | µg/L | 95-57-8 | NE | < 0.97 | < 0.96 | < 0.96 | < 1.0 | **0.056 J** | < 1.0 | **0.084 J** | < 0.96 | < 48 | < 0.96 | < 0.96 |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 1.9 | < 1.9 U*1 | < 1.9 | < 2.0 | < 2.0 | < 2.0 | **0.56 J** | < 1.9 | < 96 U*1 | < 1.9 U*1 | < 1.9 U*1 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | **0.29 J** | **0.42** | < 0.38 | < 0.40 | < 0.40 | < 0.40 | < 0.38 | < 0.38 | < 19 | < 0.38 | < 0.38 |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | **2.6** | < 0.57 | < 0.58 | < 0.60 | < 0.60 | < 0.61 | < 0.57 | < 0.57 | **2.7 J** | < 0.58 | < 0.57 |
| 2-Nitrophenol | µg/L | 88-75-5 | NE | < 0.97 | < 0.96 U*1 | < 0.96 | < 1.0 | < 1.0 | < 1.0 | < 0.96 | < 0.96 | < 48 U*1 | < 0.96 U*1 | < 0.96 U*1 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | **6.8** | **5.5** | < 0.58 | < 0.60 | < 0.60 | < 0.61 | **0.15 J** | < 0.57 | **7.7 J** | < 0.58 | < 0.57 |
| Acenaphthene | µg/L | 83-32-9 | NE | < 19 | < 0.38 U*1 | < 0.38 | < 20 | < 0.40 | < 0.40 | < 19 | < 0.38 | < 19 U*1 | **0.18 J *1** | < 0.38 U*1 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | < 0.58 | < 0.19 | < 0.58 | < 0.60 | < 0.60 | < 0.61 | < 0.57 | < 0.19 | < 0.19 | < 0.19 | < 0.19 |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 9.7 | < 9.6 | < 9.6 | < 10 | < 10 | < 10 | < 9.6 | < 9.6 | < 480 | < 9.6 | < 9.6 |
| Benzyl alcohol | µg/L | 100-51-6 | NE | < 4.8 | < 4.8 | < 4.8 | < 5.0 | < 5.0 | < 5.0 | **0.26 J** | **0.52 J** | < 240 | < 4.8 | < 4.8 |
| Benzyl butyl phthalate | µg/L | 85-68-7 | NE | < 3.9 | < 3.8 | < 3.8 | < 4.0 | < 4.0 | < 4.0 | **0.30 J** | < 3.8 | < 190 | **0.28 J** | < 3.8 |
| Bis(2-chloro-1-methylethyl) ether | µg/L | 108-60-1 | NE | **0.062 J** | < 0.24 | < 0.24 | < 0.25 | < 0.25 | < 0.25 | **0.84** | < 0.24 | < 12 | < 0.24 | < 0.24 |
| Bis(2-Chloroethoxy)Methane | µg/L | 111-91-1 | NE | < 0.58 | < 0.57 U*1 | < 0.58 | < 0.60 | < 0.60 | < 0.61 | **0.94** | < 0.57 | < 29 U*1 | < 0.58 U*1 | < 0.57 U*1 |
| Bis(2-Chloroethyl) Ether | µg/L | 111-44-4 | NE | **0.083 J** | < 0.096 | < 0.096 | < 0.10 | < 0.10 | < 0.10 | **0.096** | < 0.096 | < 4.8 | < 0.096 | < 0.096 |
| Dibutyl phthalate | µg/L | 84-74-2 | NE | < 2.9 *+ | **16 B*+** | < 2.9 | **1.3 J** | **3.5** | < 3.0 | **13 *+ B** | **2.1 J * + B** | **6.0 B *+** | **3.8 B*+** | **5.3 B *+** |
| Diethyl phthalate | µg/L | 84-66-2 | NE | < 48 | **3.8 *1** | < 0.96 | < 50 | < 1.0 | < 1.0 | < 48 | < 0.96 | < 48 U*1 | < 0.96 U*1 | **3.0 *1** |
| Dimethyl phthalate | µg/L | 131-11-3 | NE | < 29 | < 0.57 | < 0.58 | < 30 | < 0.60 | < 0.61 | < 29 | < 0.57 | < 29 | < 0.58 | < 0.57 |
| Fluorene | µg/L | 86-73-7 | NE | < 12 | < 0.24 U*1 | < 0.24 | < 13 | < 0.25 | < 0.25 | < 12 | < 0.24 | < 12 U*1 | **0.11 J *1** | < 0.24 U*1 |
| Isophorone | µg/L | 78-59-1 | NE | **1.1** | < 0.38 | < 0.38 | < 0.40 | < 0.40 | < 0.40 | **2.1** | < 0.38 | < 19 | < 0.38 | < 0.38 |
| Naphthalene | µg/L | 91-20-3 | 4940 | < 0.39 | **1.5** | < 0.38 | < 0.40 | < 0.40 | < 0.40 | < 0.38 | < 0.38 | < 19 | < 0.38 | < 0.38 |
| Nitrobenzene | µg/L | 98-95-3 | NE | < 0.97 | < 0.96 U*1 | < 0.96 | < 1.0 | < 1.0 | < 1.0 | **0.56 J** | < 0.96 | < 48 U*1 | < 0.96 U*1 | < 0.96 U*1 |
| n-Nitrosodipropylamine | µg/L | 621-64-7 | NE | **0.89** | < 0.38 | < 0.38 | < 0.40 | < 0.40 | < 0.40 | < 0.38 | < 0.38 | < 19 | < 0.38 | < 0.38 |
| Pentachlorophenol[1] | µg/L | 87-86-5 | 3 | < 48 | **0.30 J** | < 2.9 | < 3.0 | < 3.0 | < 50 | < 48 | < 0.96 | < 48 | < 2.9 | < 0.96 |
| Phenol | µg/L | 108-95-2 | NE | < 0.97 | < 0.96 | < 0.96 | < 1.0 | < 1.0 | < 1.0 | < 0.96 | < 0.96 | < 48 | < 0.96 | < 0.96 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | | | | |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | < 10 | **0.90 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | **0.51 J** | < 4.0 | < 1.0 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 10 | **1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | **0.78 J** | **5.4** | < 4.0 | < 1.0 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 10 | **0.88 J** | < 1.0 | < 1.0 | < 1.0 | **0.63 J** | < 20 | **2.7** | < 1.0 | < 4.0 | < 1.0 |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 10 | **0.57 J** | < 1.0 | **3.4** | < 1.0 | **1.8** | < 20 | **3.4** | < 1.0 | < 4.0 | < 1.0 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 30 | **14** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 60 | < 3.0 | < 3.0 | < 12 | < 3.0 |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 10 | **5.6** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Benzene | µg/L | 71-43-2 | 22.7 | < 10 | **1.7** | < 1.0 | **1.6** | **0.46 J** | < 1.0 | < 20 | **0.70 J** | **1.2** | < 4.0 | < 1.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | < 10 | **21** | < 1.0 | **5** | **23** | **1.7** | **11 J** | **15** | **34** | < 4.0 | < 1.0 |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | **220** | < 1.0 | < 1.0 | **1.6** | < 1.0 | < 1.0 | **420** | < 1.0 | **0.84 J** | < 4.0 | < 1.0 |
| Ethylbenzene | µg/L | 100-41-4 | 6,910 | < 10 | **0.59 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 20 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 40 | < 2.0 | < 2.0 | < 8.0 | < 2.0 |
| n-Propylbenzene | µg/L | 103-65-1 | NE | < 10 | **1.1** | < 1.0 U*1 | **3.2 *1** | < 1.0 | **5.1** | < 20 | **2.9** | < 1.0 | < 4.0 U*1 | < 1.0 |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | **0.90 J** | < 1.0 | < 4.0 | < 1.0 |
| o-Xylene | µg/L | 95-47-6 | NE | < 10 | **2.2** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | **0.90 J** | < 4.0 | < 1.0 |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 10 | **0.53 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 10 | < 1.0 | < 1.0 | **0.76 J** | < 1.0 | **3.7** | < 20 | **1** | < 1.0 | < 4.0 | < 1.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 20 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.82 J** | < 40 | **1.5 J** | < 2.0 | < 8.0 | < 2.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | **0.41 J** |
| Toluene | µg/L | 108-88-3 | 15,000 | < 10 | **0.67 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | **0.62 J** | **0.76 J** | < 4.0 | < 1.0 |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Trichloroethane, 1,1,1- | µg/L | 71-55-6 | 227 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Trichloroethane, 1,1,2- | µg/L | 79-00-5 | 16 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | < 4.0 | < 1.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 20 | < 1.0 | < 1.0 | **2.1 J** | < 1.0 |

**Table 2**
**Second Quarter 2021**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington

Geosyntec consultants

| | Units | CAS Number | CUL[1,2] | CDM-15 | CDM-16 | CDM-17 | CDM-19 | CDM-20 | CDM-21 | CDM-22 | MW-01 | MW-03 | SP-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6/24/2021 | 6/25/2021 | 6/22/2021 | 6/24/2021 | 6/22/2021 | 6/24/2021 | 6/22/2021 | 6/22/2021 | 6/23/2021 | 6/24/2021 |
| **Headspace Readings** | | | | | | | | | | | | | |
| Methane | % | 74-82-8 | NE | 0 | 0 | 0.4 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 |
| Oxygen | % | 7782-44-7 | NE | 20.5 | 21 | 21 | 20.4 | 20.5 | 20.2 | 21.5 | 21 | 21.4 | **20.5** |
| Hydrogen Sulfide | % | 7783-06-4 | NE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbon Dioxide | % | 124-38-9 | NE | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0.2 | 0 | 0 |
| Balance | % | N/A | NE | 79.4 | 78.4 | 78.5 | 79.5 | 79.5 | 78.8 | 78.4 | 78.5 | 78.6 | **79.5** |
| **Field Parameters** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 1.28 | 0.88 | 0.5 | 1.69 | 2.3 | 1.21 | 0.24 | 0.37 | 0.45 | 1.15 |
| Oxidation Reduction Potential | mV | NA | NE | -39.6 | -134.6 | -36.6 | -37.8 | -10.3 | -32.6 | -27.7 | -18.3 | 82.3 | -47.8 |
| pH | SU | NA | NE | 6.49 | 6.59 | 6.76 | 6.34 | 7.42 | 7.12 | 7.21 | 7.52 | 6.58 | 6.05 |
| Conductivity | µS/cm | NA | NE | 385 | 1169 | 268 | 664 | 527 | 163 | 275 | 675 | 163 | 467 |
| Temperature | °C | NA | NE | 19.94 | 18.5 | 13.13 | 18.54 | 11.2 | 21.45 | 12.89 | 13.44 | 16.71 | 21.46 |
| Turbidity | NTU | NA | NE | 38 | 203 | 22 | 22 | 10 | 11 | 1.87 | 13 | 9 | 43 |
| **General Chemistry** | | | | | | | | | | | | | |
| Nitrate as N (EPA Method 9056A) | mg/L | 14797-55-8 | NE | NA | NA | NA | **0.045 J** | < 0.20 | NA | NA | < 0.20 | **0.090 J** | **0.061 J** |
| Sulfate (EPA Method 9056A) | mg/L | 14808-79-8 | NE | NA | NA | NA | **22** | < 1.5 | NA | NA | **6.4** | **2.9** | **1.8** |
| Orthophosphate (EPA Method 365.1)[1] | mg/L | 98059-61-1 | NE | NA | NA | NA | < 0.25 | < 0.25 UF1 | NA | NA | **0.22 J** | **0.30** | < 0.25 |
| Dissolved Iron | µg/l | 7439-89-6 | NE | NA | NA | NA | **120 J** | **29,000** | NA | NA | **1,600** | **560** | **35,000** |
| Dissolved Manganese | µg/l | 7439-96-5 | NE | NA | NA | NA | **1,500** | **1,200** | NA | NA | **110** | **66** | **1,700** |
| Total Iron | µg/l | 7439-89-6 | NE | NA | NA | NA | **280 J** | **28,000** | NA | NA | **1,600** | **670** | **36,000** |
| Total Manganese | µg/l | 7439-96-5 | NE | NA | NA | NA | **NA** | **1,200** | NA | NA | **110** | **67** | **NA** |
| **Dissolved Gases (Method RSK 175(M))** | | | | | | | | | | | | | |
| Dissolved methane | µg/l | 74-82-8 | NE | NA | NA | NA | **3,560** | **9,500** | NA | NA | **1,200** | **8,000** | **5,400** |
| Dissolved ethane | µg/l | 74-84-0 | NE | NA | NA | NA | < 15.1 | **25** | NA | NA | < 1.0 | < 1.0 | **38.1 J** |
| Dissolved ethene | µg/l | 74-85-1 | NE | NA | NA | NA | < 14.6 | < 1.0 | NA | NA | < 1.0 | < 1.0 | < 14.6 |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **3.7 B** | **9.7** | **0.54** | **4.4 B** | **0.67 F1 F2** | **0.45 B** | **2.4** | **0.21 J** | **0.19 J** | **3.2 B** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **7.8 B** | **15** | **0.41** | **4.1 B** | **2.2 F1** | **0.21 B** | **0.58** | **0.090 J** | **0.12** | **12 B** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.35** | **0.48** | < 0.25 | **0.12 J** | **0.78 F1** | < 0.25 | < 0.25 | < 0.25 | < 0.25 | **2.80** |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | | | |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 20 | **1.6** | < 0.38 | **0.055 J** | **5.3 F1 F2** | < 0.40 | **0.13 J** | < 0.38 | < 0.40 | **13** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 20 | **0.20 J** | < 0.38 | < 0.40 | **0.18 J** | < 0.40 | **0.13 J** | < 0.38 | < 0.40 | **2.2** |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | < 20 | **1.4** | < 0.38 | **0.052 J** | **2.7 F1** | < 0.40 | **1** | < 0.38 | < 0.40 | **19** |
| 1-Methylnaphthalene | µg/L | 90-12-0 | NE | < 50 | < 1.0 | < 0.95 | < 1.0 | < 0.96 | < 1.0 | < 1.0 | < 0.96 | < 1.0 | **1.1** |
| 2,4-Dichlorophenol | µg/L | 120-83-2 | NE | < 50 | < 1.0 | < 0.95 | < 1.0 | < 0.96 | < 1.0 | < 1.0 | < 0.96 | < 1.0 | < 1.0 |
| 2,4-Dimethylphenol | µg/L | 105-67-9 | NE | < 200 | **0.92 J** | < 3.8 | < 4.0 | < 3.8 UF2 | < 4.0 | < 4.0 | < 3.8 | < 4.0 | < 4.0 |
| 2,6-Dinitrotoluene | µg/L | 606-20-2 | NE | < 20 | < 20 | < 0.38 U*1 | < 0.40 | < 19 U*1 | < 0.40 | < 0.40 | < 0.38 U*1 | < 0.40 | < 20 |
| 2-Chlorophenol | µg/L | 95-57-8 | NE | < 50 | **0.063 J** | < 0.95 | < 1.0 | < 0.96 | < 1.0 | < 1.0 | < 0.96 | < 1.0 | < 1.0 |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 100 | **0.55 J** | < 1.9 U*1 | < 2.0 | < 1.9 U*1 | < 2.0 | < 2.0 | < 1.9 U*1 | < 2.0 | < 2.0 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 20 | **0.27 J** | < 0.38 | < 0.40 | < 0.38 | < 0.40 | < 0.40 | < 0.38 | < 0.40 | **0.95** |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 30 | **0.31 J** | < 0.57 | < 0.61 | < 0.57 | < 0.61 | < 0.60 | < 0.58 | < 0.61 | < 0.61 |
| 2-Nitrophenol | µg/L | 88-75-5 | NE | < 50 | **0.33 J** | < 0.95 U*1 | < 1.0 | < 0.96 U*1 | < 1.0 | < 1.0 | < 0.96 U*1 | < 1.0 | < 1.0 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 30 | **0.10 J** | < 0.57 | < 0.61 | < 0.57 | < 0.61 | < 0.60 | < 0.58 | < 0.61 | < 0.61 |
| Acenaphthene | µg/L | 83-32-9 | NE | < 20 | < 20 | < 0.38 U*1 | < 0.40 | < 19 U*1 | < 0.40 | < 0.40 | < 0.38 U*1 | < 0.40 | < 20 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | < 0.61 | < 0.61 | < 0.19 | < 0.57 | < 0.19 | < 0.61 | < 0.60 | < 0.19 | < 0.61 | < 0.61 |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 500 | < 10 | < 9.5 | < 10 | < 9.6 UF1 | < 10 | < 10 | < 9.6 | < 10 | < 10 |
| Benzyl alcohol | µg/L | 100-51-6 | NE | < 250 | **0.43 J** | < 4.8 | < 5.0 | < 4.8 | < 5.0 | < 5.0 | < 4.8 | < 5.0 | < 5.1 |
| Benzyl butyl phthalate | µg/L | 85-68-7 | NE | < 200 | **0.60 J** | < 3.8 | < 4.0 | < 3.8 | < 4.0 | < 4.0 | < 3.8 | < 4.0 | **0.38 J** |
| Bis(2-chloro-1-methylethyl) ether | µg/L | 108-60-1 | NE | < 13 | **0.12 J** | < 0.24 | < 0.25 | < 0.24 | < 0.25 | < 0.25 | < 0.24 | < 0.25 | < 0.25 |
| Bis(2-Chloroethoxy)Methane | µg/L | 111-91-1 | NE | < 30 | **1.1** | < 0.57 U*1 | < 0.61 | < 0.57 UF2 *1 | < 0.61 | < 0.60 | < 0.58 U*1 | < 0.61 | < 0.61 |
| Bis(2-Chloroethyl) Ether | µg/L | 111-44-4 | NE | < 5.0 | **0.11** | < 0.095 | < 0.10 | < 0.096 | < 0.10 | < 0.10 | < 0.096 | < 0.10 | < 0.10 |
| Dibutyl phthalate | µg/L | 84-74-2 | NE | **10 J** | **11 *+ B** | **0.63 J B *+** | < 3.0 | **12 B *+** | < 3.0 | < 3.0 | **3.2 B *+** | **2.2 J** | **4.0** |
| Diethyl phthalate | µg/L | 84-66-2 | NE | < 50 | < 50 | **2.4 *1** | < 1.0 | < 48 U*1 | **7.7** | **6** | < 0.96 U*1 | < 1.0 | < 51 |
| Dimethyl phthalate | µg/L | 131-11-3 | NE | < 30 | < 30 | < 0.57 | < 0.61 | < 29 | < 0.61 | < 0.60 | < 0.58 | < 0.61 | < 30 |
| Fluorene | µg/L | 86-73-7 | NE | < 13 | < 13 | < 0.24 U*1 | < 0.25 | < 12 U*1 | < 0.25 | < 0.25 | < 0.24 U*1 | < 0.25 | < 13 |
| Isophorone | µg/L | 78-59-1 | NE | < 20 | < 0.40 | < 0.38 | < 0.40 | < 0.38 | < 0.40 | < 0.40 | < 0.38 | < 0.40 | < 0.40 |
| Naphthalene | µg/L | 91-20-3 | 4940 | < 20 | < 0.40 | < 0.38 | < 0.40 | < 0.38 | < 0.40 | < 0.40 | < 0.38 | < 0.40 | **6.5** |
| Nitrobenzene | µg/L | 98-95-3 | NE | < 50 | **0.23 J** | < 0.95 U*1 | < 1.0 | < 0.96 U*1 | < 1.0 | < 1.0 | < 0.96 U*1 | < 1.0 | < 1.0 |
| n-Nitrosodipropylamine | µg/L | 621-64-7 | NE | < 20 | **2.3** | < 0.38 | < 0.40 | < 0.38 | < 0.40 | < 0.40 | < 0.38 | < 0.40 | < 0.40 |
| Pentachlorophenol[1] | µg/L | 87-86-5 | 3 | < 50 | < 50 | < 0.95 | < 2.9 | < 2.9 UF2 | < 3.0 | < 3.0 | < 0.96 | < 3.0 | < 3.0 |
| Phenol | µg/L | 108-95-2 | NE | < 50 | < 1.0 | < 0.95 | < 1.0 | < 0.96 | < 1.0 | < 1.0 | < 0.96 | < 1.0 | < 1.0 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | | | |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | < 1.0 | **2.2** | < 1.0 | **0.56 J** | < 1.0 UF2 F1 | **0.79 J** | < 1.0 | **0.23 J** | < 1.0 | < 10 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | **0.56 J** | **2.2** | < 1.0 | < 1.0 | **7.9 F2 F1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **31** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | **0.50 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **5.9 J** |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **2.0 F2 F1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 UF2 F1 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **60** |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **20** |
| Benzene | µg/L | 71-43-2 | 22.7 | **0.35 J** | **1.5** | < 1.0 | **0.56 J** | **3.4 F2 F1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Chlorobenzene | µg/L | 108-90-7 | NE | **3.1** | < 1.0 | < 1.0 | **0.59 J** | **3.6 F2 F1** | < 1.0 | **3.1** | < 1.0 | < 1.0 | **300** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **1.2** | **2.4** | < 1.0 | **0.49 J** | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | < 1.0 | **5.7** | < 1.0 | < 1.0 | **26** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Ethylbenzene | µg/L | 100-41-4 | 6,910 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **35** |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 2.0 | **0.78 J** | < 2.0 | < 2.0 | < 2.0 UF2 F1 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **180** |
| n-Propylbenzene | µg/L | 103-65-1 | NE | < 1.0 | < 1.0 | < 1.0 U*1 | < 1.0 | **2.6 F2 F1 *1** | < 1.0 | < 1.0 U*1 | < 1.0 U*1 | < 1.0 | < 10 |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| o-Xylene | µg/L | 95-47-6 | NE | < 1.0 | **0.42 J** | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **140** |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **2.3 F2 F1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.59 J F2 F1** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 20 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Toluene | µg/L | 108-88-3 | 15,000 | **0.58 J** | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **25** |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 1.0 | **0.60 J** | < 1.0 | < 1.0 | **0.51 J F2 F1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Trichloroethane, 1,1,1- | µg/L | 71-55-6 | 227 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Trichloroethane, 1,1,2- | µg/L | 79-00-5 | 16 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 1.0 | **0.51 J** | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | < 1.0 U*1 | **0.89 J *1** | < 1.0 | < 1.0 | < 1.0 UF2 F1 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |

**Table 2**
**Second Quarter 2021**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington

**Notes:**
With the exception of select constituents of concern, only analytes that were detected in one or more samples are shown.
CUL - Cleanup Level
**Bold** values are detections above the laboratory reporting limit
Shaded values are results or reporting limits that exceed the CUL
NE - Not Established
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
µS/cm - microsiemens per centimeter
mV - millivolts
°C - degrees Celsius
*Laboratory Qualifiers*
*1 - Laboratory Control Sample (LCS)/LCS Duplicate (LCSD) Relative Percent Difference (RPD) exceeds control limits.
B - Compound was found in the blank and the sample.
F1 - Matrix Spike (MS) and/or MS Duplicate (MSD) recovery exceeds control limits.
F2 - MS/MSD RPD exceeds control limits.
J - indicates a concentration detected between the Method Detection Limit and the Reporting Limit
Prep batch 360264 contained a di-n-butyl phthalate contamination in the method blank, laboratory control sample, and laboratory control sample duplicate. Detections of this compound are likely due to this laboratory-related contamination per communication with the laboratory dated 7 July 2021
*Validation Qualifiers*
J - indicates the concentration is considered to be an estimated value, based on laboratory QC issue

**Table 2**
**Fourth Quarter 2020**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington

Geosyntec consultants

| | Units | CAS Number | CUL[1,2] | AGI-07<br>12/22/2020 | AGI-45<br>12/22/2020 | B-02<br>12/23/2020 | B-11<br>12/23/2020 | B-19<br>12/23/2020 | B-25<br>12/23/2020 |
|---|---|---|---|---|---|---|---|---|---|
| **Headspace Readings** | | | | | | | | | |
| Methane | % | 74-82-8 | NE | **0.4** | **0.9** | -- | 0.4 | 2 | 3.7 |
| Oxygen | % | 7782-44-7 | NE | **21.4** | **21.1** | -- | 20.4 | 21.6 | 21.6 |
| Hydrogen Sulfide | % | 7783-06-4 | NE | 0 | 0 | -- | 0 | 0 | 0 |
| Carbon Dioxide | % | 124-38-9 | NE | **0.3** | **0.3** | -- | 0.3 | 0.4 | 1.3 |
| **Field Parameters** | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 0.75 | 0.72 | 1.09 | 0.86 | 1.2 | 0.74 |
| Oxidation Reduction Potential | mV | NA | NE | -71.4 | -59.5 | -24.1 | -18.2 | -39.4 | -44.3 |
| pH | SU | NA | NE | 6.23 | 6.34 | 6.3 | 6.62 | 6.52 | 6.3 |
| Conductivity | µS/cm | NA | NE | 658 | 381.4 | 576 | 146.4 | 1269 | 616 |
| Temperature | °C | NA | NE | 11.8 | 11.5 | 9.6 | 10.3 | 11.3 | 12.3 |
| Turbidity | NTU | NA | NE | 22 | 8 | 73 | 14 | 31 | 23 |
| **General Chemistry** | | | | | | | | | |
| Nitrate as N (EPA Method 9056A) | mg/L | 14797-55-8 | NE | < 0.20 | **0.065 J** | **0.11 J** | **0.13 J** | < 0.20 | **0.10 J** |
| Sulfate (EPA Method 9056A) | mg/L | 14808-79-8 | NE | **0.82 J** | < 1.2 | **1.0 J** | **7.7** | **210** | < 1.2 |
| Orthophosphate (EPA Method 365.1)[1] | mg/L | 98059-61-1 | NE | < 0.080 | < 0.080 | **0.080 J** | **0.42** | **0.16 J** | **0.12 J** |
| Dissolved Iron | µg/l | 7439-89-6 | NE | **83,000** | **42,000** | **12,000** | **3,400** | **12,000** | **28,000** |
| Dissolved Manganese | µg/l | 7439-96-5 | NE | **1,100** | **600** | **560** | **230** | **2,600** | **430** |
| Total Iron | µg/l | 7439-89-6 | NE | **89,000** | **41,000** | **11,000** | **3,700** | **14,000** | **26,000** |
| Total Manganese | µg/l | 7439-96-5 | NE | **1,200** | **570** | **520** | **230** | **2,400** | **430** |
| **Dissolved Gases (Method RSK 175(M))** | | | | | | | | | |
| Dissolved methane | µg/l | 74-82-8 | NE | **7,800** | **10,000** | **16,000** | **2,300** | **13,000** | **16,000** |
| Dissolved ethane | µg/l | 74-84-0 | NE | **16** | < 1.0 | **3.1** | < 1.0 | **74** | **3.2** |
| Dissolved ethene | µg/l | 74-85-1 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **1.5** | < 1.0 |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **14** | **0.72** | **1.2** | **0.47** | **4.6** | **1.0** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **27** | **0.4** | **1.2** | **0.33** | **14** | **1.6** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.65** | <0.25 | **0.14 J** | **0.32** | **0.33** | **1.10** |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | **1.5 J** | < 0.60 | **0.20 J** | < 0.63 | **6.4** | **0.68 J** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | **0.31 J** | < 0.40 | **0.051 J** | **0.46 J** | **0.19 J** | **4.2** |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | **1.3 J** | < 0.40 | **0.32 J** | **3.5 J** | **0.82 J** | **34** |
| 1-Methylnaphthalene | µg/L | 90-12-0 | NE | < 19 | < 1.0 | **0.24 J** | **0.068 J** | < 0.98 | **0.24 J** |
| 2,4-Dichlorophenol | µg/L | 120-83-2 | NE | < 77 | < 4.0 | < 4.1 | < 4.2 | < 3.9 | **0.31 J** |
| 2,4-Dimethylphenol | µg/L | 105-67-9 | NE | **23** | < 4.0 | **3.8** | < 4.2 | < 3.9 | < 4.1 |
| 2,6-Dinitrotoluene | µg/L | 606-20-2 | NE | < 58 | < 0.60 | **0.10 J** | < 0.63 | < 59 | < 0.62 |
| 2-Chlorophenol | µg/L | 95-57-8 | NE | < 19 | < 1.0 | < 1.0 | < 1.0 | < 0.98 | **0.14 J** |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 7.7 | < 0.40 | < 0.41 | < 0.42 | < 0.39 | < 0.41 |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | **38** | < 0.60 | **0.066 J** | < 0.63 | < 0.59 | < 0.62 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 15 | < 0.80 | **0.089 J** | < 0.83 | < 0.79 | < 0.82 |
| Acenaphthene | µg/L | 83-32-9 | NE | < 39 | < 0.40 | **0.076 J** | < 0.42 | < 39 | < 0.41 |
| Acenaphthylene | µg/L | 208-96-8 | NE | < 96 | < 1.0 | < 1.0 | < 1.0 | < 98 | < 1.0 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | < 290 | < 15 | < 15 | < 16 | < 15 | < 15 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | < 1,200 | < 12 | < 12 | **0.71 J** | < 1,200 | **2.8 J** |
| Dimethyl phthalate | µg/L | 131-11-3 | NE | < 58 | < 0.60 | < 0.62 | < 0.63 | < 59 | < 0.62 |
| Fluorene | µg/L | 86-73-7 | NE | < 190 | < 2.0 | < 2.1 | < 2.1 | < 200 | < 2.1 |
| Isophorone | µg/L | 78-59-1 | NE | < 7.7 | < 0.40 | **0.11 J** | < 0.42 | < 0.39 | < 0.41 |
| Naphthalene | µg/L | 91-20-3 | 4940 | < 4.0 | < 0.40 | < 0.41 | < 0.42 | < 0.39 | < 0.41 |
| n-Nitrosodipropylamine | µg/L | 621-64-7 | NE | < 12 | < 0.60 | < 0.62 | < 0.63 | **1** | < 0.62 |
| Pentachlorophenol[1] | µg/L | 87-86-5 | 3 | < 8.7 | < 0.18 | < 0.19 | < 0.19 | < 0.89 | < 0.18 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | 0.96 J | < 3.0 | < 3.0 | **3.8** | **1.2 J** | **3.3** |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | **0.24 J** | < 2.0 | < 2.0 | < 2.0 | **0.75 J** | **0.32 J** |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 20 | < 2.0 | **1.6 J** | **1.3 J** | **0.95 J** | **11** |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | **0.67 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Benzene | µg/L | 71-43-2 | 22.7 | **0.64 J** | < 3.0 | **1.2 J** | < 3.0 | **1.7 J** | **1.9 J** |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | **0.85 J** | < 3.0 | < 3.0 | **1.9 J** | < 3.0 | < 3.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | **1.4 J** | < 2.0 | **2.2** | **1.1 J** | **6.3** | **27** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **0.82 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | **270** | < 5.0 | **1.9 J** | < 5.0 | **570 J** | **0.83 J** |
| Ethylbenzene | µg/L | 100-41-4 | 6,910 | **1.0 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | **3.4** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| n-Propylbenzene | µg/L | 103-65-1 | NE | **2.3 J** | < 3.0 | **1.3 J** | **3.7** | **0.80 J** | **8.9** |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **1.7 J** |
| o-Xylene | µg/L | 95-47-6 | NE | **1.6 J** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.43 J** |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 3.0 | < 3.0 | < 3.0 | **0.71 J** | < 3.0 | **2.5 J** |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | **6** | < 2.0 | **0.51 J** | < 2.0 | **0.40 J** | **0.58 J** |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **2.6 J** | < 3.0 |
| Trichloroethane, 1,1,1- | µg/L | 71-55-6 | 227 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Trichloroethane, 1,1,2- | µg/L | 79-00-5 | 16 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | **0.47 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | < 10 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |

**Table 2**
**Fourth Quarter 2020**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington



| | Units | CAS Number | CUL[1,2] | **B-30**<br>12/23/2020 | **CDM-19**<br>12/22/2020 | **CDM-20**<br>12/23/2020 | **MW-01**<br>12/23/2020 | **MW-03**<br>12/22/2020 | **SP-06**<br>12/22/2020 |
|---|---|---|---|---|---|---|---|---|---|
| **Headspace Readings** | | | | | | | | | |
| Methane | % | 74-82-8 | NE | 0.4 | 0 | 0 | 1 | 0.1 | **2.3** |
| Oxygen | % | 7782-44-7 | NE | 21.2 | **21.7** | 21.3 | 20.4 | 21.4 | **21.6** |
| Hydrogen Sulfide | % | 7783-06-4 | NE | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbon Dioxide | % | 124-38-9 | NE | 0.1 | **0.3** | 0.2 | 0.2 | 0.2 | **2.2** |
| **Field Parameters** | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 0.78 | 1.93 | 0.76 | 0.78 | 0.87 | 0.72 |
| Oxidation Reduction Potential | mV | NA | NE | -36.8 | 5 | -64.2 | -38 | -23.5 | -57.9 |
| pH | SU | NA | NE | 6.33 | 6.3 | 6.31 | 6.62 | 6.74 | 5.86 |
| Conductivity | µS/cm | NA | NE | 568 | 242 | 523 | 338 | 200 | 511 |
| Temperature | °C | NA | NE | 10.3 | 9.7 | 10.00 | 10.5 | 9.4 | 9.1 |
| Turbidity | NTU | NA | NE | 38 | 19 | 7 | 13 | 24 | 35 |
| **General Chemistry** | | | | | | | | | |
| Nitrate as N (EPA Method 9056A) | mg/L | 14797-55-8 | NE | **0.21** | **0.41** | **0.080 J** | **0.35** | **0.21 J** | < 0.20 |
| Sulfate (EPA Method 9056A) | mg/L | 14808-79-8 | NE | **95** | **11** | **1.4** | **5.7** | **3.3 J** | **0.26 J** |
| Orthophosphate (EPA Method 365.1)[1] | mg/L | 98059-61-1 | NE | **0.093 J** | < 0.080 | **0.10 J** | **0.14 J** | < 0.080 | **0.13 J** |
| Dissolved Iron | µg/l | 7439-89-6 | NE | **36,000** | **310 J** | **33,000** | **3,400** | **1,800** | **100,000** |
| Dissolved Manganese | µg/l | 7439-96-5 | NE | **550** | **150** | **1,800** | **110** | **160** | **3,700** |
| Total Iron | µg/l | 7439-89-6 | NE | **38,000** | **500** | **33,000** | **3,400** | **2,000** | **100,000** |
| Total Manganese | µg/l | 7439-96-5 | NE | **560** | **170** | **1,700** | **100** | **150** | **3,400** |
| **Dissolved Gases (Method RSK 175(M))** | | | | | | | | | |
| Dissolved methane | µg/l | 74-82-8 | NE | **3,300** | **160** | **8800 J** | **2,100** | **5,100** | **14,000** |
| Dissolved ethane | µg/l | 74-84-0 | NE | **13** | < 1.0 | **25** | < 1.0 | < 1.0 | **180** |
| Dissolved ethene | µg/l | 74-85-1 | NE | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **4.4** | **0.71** | **1 J** | **0.33** | **0.35** | **6.3** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **6.9** | **0.42** | **3.1 J** | **0.15** | **0.21** | **17** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.54** | <0.25 | **0.41 J** | <0.25 | <0.25 | **3.50** |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | **0.76 J** | < 0.58 | **9.2** | < 0.57 | < 0.57 | **52 J** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 0.41 | < 0.38 | **0.40 J** | < 0.38 | < 0.38 | **8.1 J** |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | **0.56 J** | **0.055 J** | **4.9 J** | < 0.38 | < 0.38 | **60 J** |
| 1-Methylnaphthalene | µg/L | 90-12-0 | NE | < 1.0 | < 0.96 | < 0.97 | < 0.95 | < 0.96 | **2.7 J** |
| 2,4-Dichlorophenol | µg/L | 120-83-2 | NE | < 4.1 | < 3.8 | < 3.9 | < 3.8 | < 3.8 | < 77 |
| 2,4-Dimethylphenol | µg/L | 105-67-9 | NE | < 4.1 | < 3.8 | < 3.9 | < 3.8 | < 3.8 | **13 J** |
| 2,6-Dinitrotoluene | µg/L | 606-20-2 | NE | < 0.62 | < 0.58 | < 0.58 | **0.18 J** | < 0.57 | < 58 |
| 2-Chlorophenol | µg/L | 95-57-8 | NE | < 1.0 | < 0.96 | < 0.97 | < 0.95 | < 0.96 | < 19 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 0.41 | < 0.38 | < 0.39 | **0.032 J** | < 0.38 | **2.8 J** |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 0.62 | < 0.58 | < 0.58 | < 0.57 | < 0.57 | **28** |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 0.83 | < 0.77 | < 0.77 | **2.5** | < 0.76 | **5.8 J** |
| Acenaphthene | µg/L | 83-32-9 | NE | **0.16 J** | < 0.38 | < 0.39 | < 0.38 | < 0.38 | < 38 |
| Acenaphthylene | µg/L | 208-96-8 | NE | **0.47 J** | < 0.96 | **0.14 J** | < 0.95 | < 0.96 | < 96 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | < 16 | < 14 | < 14 | < 14 | < 14 | < 290 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | < 12 | **0.21 J** | **0.72 J** | **0.62 J** | **0.61 J** | < 1,200 |
| Dimethyl phthalate | µg/L | 131-11-3 | NE | **0.14 J** | < 0.58 | <0.59 J | < 0.57 | < 0.57 | < 58 |
| Fluorene | µg/L | 86-73-7 | NE | **0.073 J** | < 1.9 | **0.057 J** | < 1.9 | < 1.9 | < 190 |
| Isophorone | µg/L | 78-59-1 | NE | < 0.41 | < 0.38 | < 0.39 | < 0.38 | < 0.38 | < 7.7 |
| Naphthalene | µg/L | 91-20-3 | 4940 | < 0.41 | < 0.38 | < 0.39 | < 0.38 | < 0.38 | **15** |
| n-Nitrosodipropylamine | µg/L | 621-64-7 | NE | < 0.62 | < 0.58 | **0.30 J** | < 0.57 | < 0.57 | < 12 |
| Pentachlorophenol[1] | µg/L | 87-86-5 | 3 | < 0.93 | < 0.17 | < 0.89 | < 0.17 | < 0.17 | < 0.86 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 3.0 | < 3.0 | **2.9 J** | < 3.0 | < 3.0 | < 3.0 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | **0.80 J** | < 2.0 | **0.24 J** | < 2.0 | < 2.0 | **4.6** |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 2.0 | < 2.0 | **2.4** | < 2.0 | < 2.0 | < 20 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **55** |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **23** |
| Benzene | µg/L | 71-43-2 | 22.7 | **0.28 J** | < 3.0 | **3.2** | < 3.0 | < 3.0 | **2.9 J** |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | < 2.0 | < 2.0 | **2.5** | < 2.0 | < 2.0 | **330** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **3.8** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **1.2 J** |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | **0.36 J** | < 5.0 | **32 J** | < 5.0 | < 5.0 | < 50 |
| Ethylbenzene | µg/L | 100-41-4 | 6,910 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **46** |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **230** |
| n-Propylbenzene | µg/L | 103-65-1 | NE | < 3.0 | < 3.0 | **3.3** | < 3.0 | < 3.0 | **2.4 J** |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **1.7 J** |
| o-Xylene | µg/L | 95-47-6 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **180** |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.81 J** |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 3.0 | < 3.0 | **0.80 J** | < 3.0 | < 3.0 | < 3.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **160** |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 3.0 | < 3.0 | **0.55 J** | < 3.0 | < 3.0 | < 3.0 |
| Trichloroethane, 1,1,1- | µg/L | 71-55-6 | 227 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Trichloroethane, 1,1,2- | µg/L | 79-00-5 | 16 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | **0.50 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | **3.9** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 10 |

**Table 2**
**Fourth Quarter 2020**
**Groundwater Monitoring Results - Chemical Data**
Lilyblad Site
Tacoma, Washington

**Notes:**
With the exception of bis(2-ethylhexyl)phthlate, only analytes that were detected in one or more samples are shown.
Pentachlorophenol and ortho-phosphate concentrations are shown as less than the Method Detection Limit. All other analytes are shown as less than the Reporting Limit.
CUL - Cleanup Level
**Bold** values are detections above the laboratory reporting limit
Shaded values are results or reporting limits that exceed the CUL
NE - Not Established
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
µS/cm - microsiemens per centimeter
mV - millivolts
°C - degrees Celsius
*Laboratory Qualifiers*
J - indicates a concentration detected between the Method Detection Limit and the Reporting Limit
*Validation Qualifiers*
J - indicates the concentration is considered to be an estimated value, based on laboratory QC issue

**Table 2**
**First and Second Quarter 2020**
**Groundwater Monitoring Results**
Lilyblad Site
Tacoma, Washington

| | Units | CAS Number | CUL[1,2] | AGI-07<br>3/16/2020 | AGI-14<br>3/18/2020 | AGI-45<br>3/18/2020 | AGI-46<br>3/16/2020 | B-02<br>3/17/2020 | B-09<br>3/17/2020 | B-11<br>3/17/2020 | B-12<br>3/18/2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 1.53 | 2.29 | 1.09 | 1.07 | 7.03 | 4.47 | 2.47 | 2.36 |
| Oxidation Reduction Potential | mV | NA | NE | 18.5 | 204.8 | 223.6 | 8.6 | 113.8 | 90.8 | 98.1 | 33.2 |
| pH | SU | NA | NE | 6.45 | 8.14 | 7.13 | 6.53 | 5.93 | 6.54 | 6.67 | 6.84 |
| Conductivity | µS/cm | NA | NE | 529 | 445 | 247 | 377 | 641 | 438 | 200 | 383 |
| Temperature | °C | NA | NE | 18.7 | 11.03 | 11.47 | 17.5 | 5.41 | 5.10 | 5.76 | 5.75 |
| Turbidity | NTU | NA | NE | 20 | 42 | 25 | 6 | 36 | 103 | 42 | 21 |
| **General Chemistry (EPA Method 9056A)** | | | | | | | | | | | |
| Nitrate as N | mg/L | 14797-55-8 | NE | < 0.20 | **0.88** | NA | NA | NA | NA | NA | NA |
| Sulfate | mg/L | 14808-79-8 | NE | **8.5 J** | **34** | NA | NA | NA | NA | NA | NA |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **14** | **0.95** | **1.0** | **0.32 J** | **0.71** | **0.72** | **0.42 J** | **0.51** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **40** | **0.37 J** | **0.85 J** | **0.30** | **1.1** | **0.48 J** | **0.42 J** | **0.42** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.48 J** | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | **0.58 J** | < 0.25 |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 1,200 | < 240 | < 240 | < 4.9 | < 260 | < 250 J | < 250 | < 280 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 95 | < 19 | < 19 | < 0.39 | < 21 | < 20 J | < 20 | < 22 |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 140 | < 29 | < 29 | < 0.59 | < 31 | < 30 J | < 30 | < 33 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | **170 J** | < 39 | < 39 | < 0.78 | < 42 U* | < 40 J | < 40 | < 44 |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 950 | < 190 | < 190 | **1.9 J** | < 210 R | < 200 R | < 200 R | < 220 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | <210 | <42 | <42 | <0.85 | <46 | <750 J | <43 | <48 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | <2,800 | <580 | <580 | <12 | <630 | <600 J | <600 | <660 |
| Pentachlorophenol | µg/L | 87-86-5 | 3 | < 2,400 | < 480 | < 490 | < 9.8 | < 520 R | < 500 R | < 500 R | < 550 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | |
| 1,1,1-Trichloroethane | µg/L | 71-55-6 | 230 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| 1,1,2-Trichloroethane | µg/L | 79-00-5 | 16 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | **15** | < 2.0 | < 2.0 | < 2.0 | **0.067 J** | **0.054 J** | < 2.0 | < 2.0 |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | **0.75 J** | < 2.0 | < 2.0 | < 2.0 | <2.0 | <2.0 | < 2.0 | < 2.0 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | **0.20 J** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.67 J** | < 2.0 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | **1.0 J** | < 4.0 | < 4.0 | < 4.0 | **0.29 J** | **0.13 J** | **4.2** | < 4.0 |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | **0.53 J** | < 2.0 | < 2.0 | < 2.0 | **1.3 J** | < 2.0 | **3.8** | < 2.0 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | **0.69 J** | < 3.0 | < 3.0 | < 3.0 | **0.078 J** | < 3.0 | < 3.0 | < 3.0 |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Benzene | µg/L | 71-43-2 | 23 | **0.82 J** | < 3.0 | < 3.0 | < 3.0 | **1.1 J** | **0.59 J** | **0.14 J** | < 3.0 |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | **1.5 J** | < 3.0 | < 3.0 | < 3.0 | < 1.0 | < 1.0 | **3.8** | < 3.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | **0.52 J** | **0.81 J** | < 2.0 | < 2.0 | **2.2** | **18** | **1.6 J** | **0.99 J** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **11** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.11 J** | < 3.0 | < 3.0 |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | **52** | < 5.0 | < 5.0 | < 5.0 | **1.0 J** | < 5.0 | < 5.0 | < 5.0 |
| Ethylbenzene | µg/L | 100-41-4 | 6,900 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.065 J** | < 3.0 |
| Freon 12 (Dichlorodifluoromethane) | µg/L | 75-71-8 | NE | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | **5.5** | < 3.0 | < 3.0 | < 3.0 | **0.16 J** | < 3.0 | < 3.0 | < 3.0 |
| Methyl tert-Butyl Ether (MTBE) | µg/L | 1634-04-4 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.20 J** | < 2.0 | < 2.0 | < 2.0 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 4.0 | < 4.0 | < 4.0 | < 4.0 | <4.0 | < 4.0 | < 4.0 | < 4.0 |
| n-Propylbenzene | µg/L | 103-65-1 | NE | **1.7 J** | < 3.0 | < 3.0 | < 3.0 | **1.2 J** | < 3.0 | **9.4** | < 3.0 |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.33 J** | < 3.0 |
| o-Xylene | µg/L | 95-47-6 | NE | **1.8 J** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | **0.82 J** | < 3.0 | < 3.0 | < 3.0 | **0.25 J** | < 3.0 | **7.8** | < 3.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **1.1 J** | < 3.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | **31** | < 2.0 | < 2.0 | < 2.0 | **0.10 J** | **0.062 J** | **0.058 J** | < 2.0 |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | **0.63 J** | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | **11** | < 1.0 | < 1.0 | **0.63 J** | **0.097 J** | **0.11 J** | < 1.0 | < 1.0 |
| **VOCs (EPA Method 8270E)** | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 95 | < 19 | < 19 | < 0.39 | < 21 | < 20 J | < 20 | < 22 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 140 | < 29 J | < 29 J | < 0.59 | < 31 | < 30 J | < 30 | < 33 J |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 95 | < 19 J | < 19 J | < 0.39 | < 21 | < 20 J | < 20 | < 22 J |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.9 | < 95 | < 19 | < 19 | < 0.39 | < 21 | < 20 J | 2.7 J | < 22 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 95 | < 19 | < 19 | < 0.39 | < 21 | < 20 J | < 20 | < 22 |

**Table 2**
**First and Second Quarter 2020**
**Groundwater Monitoring Results**
Lilyblad Site
Tacoma, Washington

| | Units | CAS Number | CUL[1,2] | **B-13** 3/17/2020 | **B-19** 3/16/2020 | **B-23** 3/17/2020 | **B-25** 3/17/2020 | **B-28** 3/18/2020 | **B-29** 3/18/2020 | **B-30** 3/17/2020 | **CDM-12** 3/17/2020 | **CDM-15** 3/16/2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 2.16 | 0.64 | 3.14 | 4.46 | 4.88 | 2.70 | 1.22 | 1.47 | 0.74 |
| Oxidation Reduction Potential | mV | NA | NE | 264.1 | 11.7 | 109.2 | 122.0 | 42.4 | 233.7 | 277.2 | 358.6 | 35.8 |
| pH | SU | NA | NE | 8.36 | 6.77 | 6.31 | 5.97 | 6.89 | 8.07 | 8.09 | 7.65 | 7.12 |
| Conductivity | µS/cm | NA | NE | 597 | 904 | 546 | 509 | 682 | 1310 | 632 | 266 | 349 |
| Temperature | °C | NA | NE | 9.16 | 16.2 | 5.97 | 5.28 | 7.37 | 10.95 | 9.29 | 9.16 | 15.7 |
| Turbidity | NTU | NA | NE | 21 | 45 | 22 | 19 | 11 | 25 | 43 | 10 | 32 |
| **General Chemistry (EPA Method 9056A)** | | | | | | | | | | | | |
| Nitrate as N | mg/L | 14797-55-8 | NE | NA | < 0.20 | NA | NA | NA | < 0.20 | NA | NA | NA |
| Sulfate | mg/L | 14808-79-8 | NE | NA | **450** | NA | NA | NA | **5.5** | NA | NA | NA |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **5.2** | **2.9** | **0.54** | **0.67** | **0.16 J** | **11** | **1.3 J** | **0.11 J** | **7.3** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **14** | **13** | **0.56** | **1.2** | **0.10 J** | **27 J** | **4.4** | **0.098 J** | **22** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.27 J** | **0.21 J** | < 0.25 | **0.83 J** | < 0.25 | **0.42 J** | **0.85 J** | < 0.25 | **0.4 J** |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | | |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 240 | < 240 | < 260 | < 250 | < 260 | < 240 | < 240 | < 240 | < 1,200 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 19 | < 19 | < 21 | < 20 | < 20 | < 19 | < 19 J | < 19 | < 96 |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 29 | < 29 | < 31 | < 30 | < 31 | **2.9 J** | < 29 | < 29 | < 140 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 39 | < 38 | < 41 | < 41 | < 41 | **29 J** | < 38 J | < 38 | < 190 |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 190 R | < 190 | < 210 R | < 200 R | < 200 | < 190 | < 190 R | < 190 R | < 960 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | <42 | <42 | <45 | <44 | <45 | <42 | <41 | <41 | <210 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | <580 | <580 | <620 | <610 | <610 | <580 | <570 | <570 | <2,900 |
| Pentachlorophenol | µg/L | 87-86-5 | 3 | < 480 R | < 480 | < 510 R | < 510 R | < 510 | < 480 | < 480 R | < 480 R | < 2,400 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | µg/L | 71-55-6 | 230 | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| 1,1,2-Trichloroethane | µg/L | 79-00-5 | 16 | < 2.0 | < 1.0 | < 1.0 | **0.37 J** | < 1.0 | < 1.0 | **0.51 J** | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | **0.90 J** | **0.25 J** | **0.57 J** | **0.21 J** | < 2.0 | **0.62 J** | **0.29 J** | **0.045 J** | **0.24 J** |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 5.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 J | < 2.0 | < 2.0 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | <2.0 | **5.4** | < 2.0 | <2.0 | < 2.0 | **10** | <2.0 | < 2.0 | < 2.0 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 3.0 | < 2.0 | < 2.0 | **3.3** | < 2.0 | < 2.0 | < 2.0 J | < 2.0 | < 2.0 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | < 3.0 | < 4.0 | < 4.0 | **28** | < 4.0 | **3.4 J** | **0.45 J** | < 4.0 | **1.6 J** |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | **2.1 J** | < 2.0 | < 2.0 | **9.5** | < 2.0 | < 2.0 | < 2.0 J | < 2.0 | < 2.0 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 3.0 | < 3.0 | < 3.0 | **0.10 J** | < 3.0 | **0.79 J** | < 3.0 J | < 3.0 | < 3.0 |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| Benzene | µg/L | 71-43-2 | 23 | **1.3 J** | **19** | < 3.0 | **1.8 J** | < 3.0 | **1.2 J** | **0.16 J** | < 3.0 | < 3.0 |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | < 10 | < 3.0 | < 1.0 | **1.5** | < 3.0 | < 3.0 | < 1.0 J | < 1.0 | < 3.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | **2.8** | **3.6** | **0.27 J** | **18** | < 2.0 | **30** | < 2.0 J | < 2.0 | **1.0 J** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **1.6 J** | < 3.0 | **0.64 J** | **0.058 J** | < 3.0 | < 3.0 | **1.2 J** | < 3.0 | **2.3 J** |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | < 5.0 | **680** | < 5.0 | < 5.0 | < 5.0 | **2.0 J** | < 5.0 J | < 5.0 | < 5.0 |
| Ethylbenzene | µg/L | 100-41-4 | 6,900 | **0.30 J** | < 3.0 | < 3.0 | **0.092 J** | < 3.0 | < 3.0 | **0.051 J** | < 3.0 | < 3.0 |
| Freon 12 (Dichlorodifluoromethane) | µg/L | 75-71-8 | NE | < 4.0 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 J | < 10 | < 10 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| Methyl tert-Butyl Ether (MTBE) | µg/L | 1634-04-4 | NE | < 3.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 J | < 2.0 | < 2.0 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 10 | < 4.0 | < 4.0 | < 4.0 | < 4.0 | < 4.0 | < 4.0 J | < 4.0 | < 4.0 |
| n-Propylbenzene | µg/L | 103-65-1 | NE | **3.1** | < 3.0 | < 3.0 | **6.9** | < 3.0 | < 3.0 | **0.10 J** | < 3.0 | < 3.0 |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 5.0 | < 3.0 | < 3.0 | **1.1 J** | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| o-Xylene | µg/L | 95-47-6 | NE | < 5.0 | < 2.0 | < 2.0 | **0.22 J** | < 2.0 | **1.2 J** | < 2.0 J | < 2.0 | < 2.0 |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 10 | **0.61 J** | < 3.0 | **2.6 J** | < 3.0 | < 3.0 | **0.35 J** | < 3.0 | < 3.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 5.0 | < 3.0 | < 3.0 | **2.6 J** | < 3.0 | < 3.0 | < 3.0 J | < 3.0 | < 3.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.22 J** | < 3.0 | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | < 2.0 | < 2.0 | < 2.0 | **0.20 J** | < 2.0 | **2.8** | **0.077 J** | < 2.0 | < 2.0 |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 2.0 | **2.1 J** | **0.058 J** | **0.14 J** | < 3.0 | < 3.0 | **0.20 J** | < 3.0 | < 3.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **0.77 J** | < 3.0 | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | < 0.20 | < 1.0 | **0.61 J** | < 1.0 | < 1.0 | < 1.0 | **0.19 J** | < 1.0 | **1.5** |
| **VOCs (EPA Method 8270E)** | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 19 | < 19 | < 21 | < 20 | < 20 | < 19 | < 19 | < 19 | < 96 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 29 | **2.8 J** | < 31 | < 30 | < 31 J | **6.9 J** | < 29 | < 29 | < 140 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 19 | < 19 | < 21 | < 20 | < 20 J | < 19 J | < 19 | < 19 | < 96 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.9 | < 19 | < 19 | < 21 | **15 J** | < 20 | 2.0 J | < 19 | < 19 | < 96 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 19 | < 19 | < 21 | < 20 | < 20 | < 19 | < 19 | < 19 | < 96 |

**Table 2**
**First and Second Quarter 2020**
**Groundwater Monitoring Results**
Lilyblad Site
Tacoma, Washington

| | Units | CAS Number | CUL[1,2] | CDM-17<br>3/17/2020 | CDM-19<br>3/17/2020 | CDM-20<br>3/17/2020 | CDM-21<br>3/18/2020 | CDM-22<br>3/18/2020 | CDM-26<br>3/18/2020 | CDM-31<br>3/17/2020 | DMW-04<br>3/17/2020 | MW-01<br>3/17/2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Field Parameters** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 1.52 | 0.93 | 0.64 | 0.66 | 3.49 | 2.26 | 5.89 | 3.99 | 0.70 |
| Oxidation Reduction Potential | mV | NA | NE | 242.8 | 261.6 | 269.9 | 222.8 | 21.0 | 28.7 | 107.6 | 128.2 | 255.6 |
| pH | SU | NA | NE | 7.76 | 7.79 | 7.62 | 7.20 | 6.86 | 6.94 | 6.30 | 5.87 | 8.12 |
| Conductivity | µS/cm | NA | NE | 2109 | 533 | 662 | 180 | 551 | 363 | 500 | 657 | 899 |
| Temperature | °C | NA | NE | 11.68 | 10.25 | 10.70 | 11.58 | 7.90 | 7.02 | 5.78 | 7.35 | 11.66 |
| Turbidity | NTU | NA | NE | 25 | 19 | 32 | 55 | 27 | 13 | 10 | 10 | 48 |
| **General Chemistry (EPA Method 9056A)** | | | | | | | | | | | | |
| Nitrate as N | mg/L | 14797-55-8 | NE | < 0.20 J | **0.16 J** | NA | NA | < 0.20 | NA | NA | NA | NA |
| Sulfate | mg/L | 14808-79-8 | NE | **380 J** | **24** | NA | NA | **2.8** | NA | NA | NA | NA |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **6.6** | **2.1 J** | **1.2** | **0.27 J-** | **0.93** | **0.13 J** | **1.4 J** | **1.5** | **0.21 J** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **19** | **2.3 J** | **3.5** | **0.13 J** | **2.5** | **0.091 J** | **1.8 J** | **0.32** | **0.12 J** |
| TPH as Gasoline | mg/L | TPH-g | 1 | **0.26 J** | < 0.25 | **0.36 J** | < 0.25 | **2.5 J** | < 0.25 | < 0.25 | < 0.25 | < 0.25 |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | | |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 240 | < 240 | < 240 | < 240 | < 270 | < 280 | < 240 | < 250 | < 240 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 19 | < 19 | < 20 | < 19 | < 21 | < 22 | < 19 | < 20 | < 19 |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 29 | < 29 | < 29 | < 29 | < 32 | < 33 | < 29 | < 30 | < 29 |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 39 | < 38 | < 39 | < 38 | < 43 | < 44 | < 39 | < 40 | < 38 |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 190 R | < 190 R | < 200 R | < 190 | < 210 | < 220 | < 190 R | < 200 R | < 190 R |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | <42 | <42 | <43 | <42 | <46 | <48 | <42 | <44 | <42 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | <580 | <570 | <590 | <580 | <640 | <660 | <580 | <600 | <580 |
| Pentachlorophenol | µg/L | 87-86-5 | 3 | < 480 R | < 480 R | < 490 R | < 480 | < 530 | < 550 | < 480 R | < 500 R | < 480 R |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | µg/L | 71-55-6 | 230 | < 2.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 |
| 1,1,2-Trichloroethane | µg/L | 79-00-5 | 16 | < 2.0 | < 1.0 | < 2.0 | < 1.0 | < 1.0 | < 1.0 | < 2.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | **6.7** | **0.24 J** | < 2.0 | **1.5 J** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | **0.16 J** |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 5.0 | < 2.0 | < 5.0 | < 2.0 | < 2.0 | < 2.0 | < 5.0 | < 2.0 | < 2.0 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 3.0 | <2.0 | **10** | < 2.0 | **0.70 J** | < 2.0 | < 3.0 | < 2.0 | < 2.0 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 3.0 | < 2.0 | **0.50 J** | < 2.0 | **5.9** | < 2.0 | < 3.0 | < 2.0 | < 2.0 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | < 3.0 | < 4.0 | **6.1** | < 4.0 | **38** | < 4.0 | < 3.0 | < 4.0 | < 4.0 |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 10 | < 2.0 | < 10 | < 2.0 | **7** | < 2.0 | < 10 | < 2.0 | < 2.0 |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 5.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| Benzene | µg/L | 71-43-2 | 23 | **1.3 J** | **0.28 J** | **1.3 J** | < 3.0 | **2.5 J** | < 3.0 | < 2.0 | **0.047 J** | < 3.0 |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | < 10 | < 1.0 | **2.3 J** | < 3.0 | < 3.0 | < 3.0 | < 10 | < 1.0 | < 1.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | < 2.0 | < 2.0 | **0.63 J** | < 2.0 | **100** | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | **68** | **0.17 J** | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 2.0 | **0.082 J** | **0.058 J** |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | **5.9** | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylbenzene | µg/L | 100-41-4 | 6,900 | < 2.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 |
| Freon 12 (Dichlorodifluoromethane) | µg/L | 75-71-8 | NE | < 4.0 | < 10 | < 4.0 | < 10 | < 10 | < 10 | < 4.0 | < 10 | < 10 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 5.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| Methyl tert-Butyl Ether (MTBE) | µg/L | 1634-04-4 | NE | < 3.0 | < 2.0 | < 3.0 | < 2.0 | < 2.0 | < 2.0 | < 3.0 | < 2.0 | < 2.0 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 10 | < 4.0 | <10 | < 4.0 | < 4.0 | < 4.0 | < 10 | < 4.0 | < 4.0 |
| n-Propylbenzene | µg/L | 103-65-1 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | **12** | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 5.0 | < 3.0 | < 5.0 | < 3.0 | **3.8** | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| o-Xylene | µg/L | 95-47-6 | NE | < 5.0 | < 2.0 | < 5.0 | < 2.0 | **0.96 J** | < 2.0 | < 5.0 | < 2.0 | < 2.0 |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 5.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 10 | < 3.0 | **2.2 J** | < 3.0 | **12** | < 3.0 | < 10 | < 3.0 | < 3.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 5.0 | < 3.0 | < 5.0 | < 3.0 | **3.1** | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 5.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 | < 3.0 | < 5.0 | < 3.0 | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | < 2.0 | **2** | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | **1.0 J** | < 3.0 | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 2.0 | **0.071 J** | < 2.0 | < 3.0 | < 3.0 | < 3.0 | < 2.0 | < 3.0 | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | **37** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 1.0 | < 0.20 | < 1.0 | < 1.0 |
| **VOCs (EPA Method 8270E)** | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 19 | < 19 | < 20 | < 19 | < 21 | < 22 | < 19 | < 20 | < 19 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 29 | < 29 | **7.2 J** | < 29 J | < 32 J | < 33 J | < 29 | < 30 | < 29 |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 19 | < 19 | < 20 | < 19 J | **3.0 J** | < 22 J | < 19 | < 20 | < 19 |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.9 | < 19 | < 19 | 4.0 J | < 19 | **21** | < 22 | < 19 | < 20 | < 19 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 19 | < 19 | < 20 | < 19 | < 21 | < 22 | < 19 | < 20 | < 19 |

**Table 2**
**First and Second Quarter 2020**
**Groundwater Monitoring Results**
Lilyblad Site
Tacoma, Washington

| | Units | CAS Number | CUL[1,2] | MW-03 | MW-05 | MW-07 | MW-08 | MW-11 | P-4B | P-1A | SP-04 | SP-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3/18/2020 | 3/17/2020 | 3/18/2020 | 3/18/2020 | 6/12/2020 | 3/18/2020 | 3/16/2020 | 3/16/2020 | 3/18/2020 |
| **Field Parameters** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | NA | NE | 0.77 | 0.96 | 3.99 | 4.18 | 1.68 | 0.76 | 1.29 | 1.24 | 2.10 |
| Oxidation Reduction Potential | mV | NA | NE | 226.2 | 60.4 | 27.1 | 39.9 | 62.3 | 243.1 | 58.9 | 40.8 | 229.5 |
| pH | SU | NA | NE | 6.93 | 6.13 | 6.46 | 6.80 | 7.09 | 8.52 | 7.19 | 6.41 | 7.84 |
| Conductivity | µS/cm | NA | NE | 160 | 480 | 1,220 | 572 | 1182 | 254 | 724 | 139 | 467 |
| Temperature | °C | NA | NE | 9.42 | 5.06 | 6.71 | 6.91 | 15.99 | 9.01 | 5.75 | 16.4 | 8.98 |
| Turbidity | NTU | NA | NE | 18 | 10 | 18 | 19 | 15 | 48 | 13 | 27 | 24 |
| **General Chemistry (EPA Method 9056A)** | | | | | | | | | | | | |
| Nitrate as N | mg/L | 14797-55-8 | NE | NA | NA | NA | NA | NA | < 0.20 | **0.041 J** | NA | < 0.20 |
| Sulfate | mg/L | 14808-79-8 | NE | NA | NA | NA | NA | NA | **3.1** | **200** | NA | **2.1** |
| **Petroleum Compounds (Ecology Method NWTPH-Dx or -Gx)** | | | | | | | | | | | | |
| Motor Oil (>C24-C36) | mg/L | C24-C36 | 1 | **0.16 J** | **0.61** | **0.52** | **0.19 J** | **0.21 J** | **0.94** | **6.1** | **0.22 J** | **5.1 J-** |
| #2 Diesel (C10-C24) | mg/L | 68476-30-2 | 1 | **0.083 J** | **0.38 J** | **0.60** | **0.17** | **0.15** | **0.81** | **20** | **0.12** | **18 J** |
| TPH as Gasoline | mg/L | TPH-g | 1 | < 0.25 | < 0.25 | < 0.25 | < 0.25 | < 250 | < 0.25 | **0.45 J** | < 0.25 | **4.0 J** |
| **Semivolatile Organic Compounds (SVOCs; EPA Method 8270E)** | | | | | | | | | | | | |
| 2-Methyl-4,6-Dinitrophenol | µg/L | 534-52-1 | NE | < 240 | < 250 | < 250 | < 290 | <4.8 | < 240 | < 24 | **0.68 J** | < 240 |
| 2-Methylnaphthalene | µg/L | 91-57-6 | 23 | < 19 | < 20 | < 20 | < 23 | <0.38 | < 19 | < 1.9 | < 0.39 | **2.3 J** |
| 2-Methylphenol (o-cresol) | µg/L | 95-48-7 | NE | < 29 | < 30 | < 30 | < 35 | <0.57 | < 29 | < 2.9 | < 0.58 | **2.6 J** |
| 3/4-Methylphenol | µg/L | 65794-96-9 | NE | < 39 | < 40 | < 40 | < 46 | **0.030 J** | < 38 | < 3.8 | < 0.77 | **50** |
| Benzoic Acid | µg/L | 65-85-0 | NE | < 190 | < 200 R | < 200 | < 230 | <9.5 | < 190 | < 19 | < 3.9 | < 190 |
| bis(2-ethylhexyl)phthalate | µg/L | 117-81-7 | 2.2 | <42 | <44 | <43 | <50 | <14 | <41 | <4.1 | <0.84 | <42 |
| Diethyl phthalate | µg/L | 84-66-2 | NE | <580 | <600 | <600 | <690 | **0.30 J** | <570 | <2,900 | <12 | <580 |
| Pentachlorophenol | µg/L | 87-86-5 | 3 | < 480 | < 500 R | < 500 | < 580 | <9.5 | < 480 | **2.4 J** | **0.92 J** | < 480 |
| **Volatile Organic Compounds (VOCs; EPA Method 8260D)** | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | µg/L | 71-55-6 | 230 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | **0.91 J** | < 3.0 |
| 1,1,2-Trichloroethane | µg/L | 79-00-5 | 16 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | <1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1-Dichloroethane | µg/L | 75-34-3 | 52,000 | < 2.0 | **0.14 J** | < 2.0 | < 2.0 | <2.0 | < 2.0 | **1.2 J** | **2.4** | **4.5 J** |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | **87** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | **6.9** |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.86 | < 4.0 | < 4.0 | < 4.0 | < 4.0 | <4.0 | < 4.0 | < 4.0 | < 4.0 | **62** |
| Benzene, (1-methylethyl)- (Isopropylbenzene) | µg/L | 98-82-8 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | **3.3** |
| Benzene, 1,2,4-trimethyl- | µg/L | 95-63-6 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **110** |
| Benzene, 1,3,5-trimethyl- | µg/L | 108-67-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **47** |
| Benzene | µg/L | 71-43-2 | 23 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | **0.89 J** | < 3.0 | **1.4 J** |
| Butylbenzene (n-butylbenzene) | µg/L | 104-51-8 | NE | < 3.0 | < 1.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Chlorobenzene | µg/L | 108-90-7 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | **1.1 J** | **0.62 J** | < 2.0 | **210 J** |
| cis-1,2-Dichloroethene | µg/L | 156-59-2 | 5,200 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | **0.79 J** | **7.1** | **1.4 J** | **10 J** |
| Ethyl Chloride (Chloroethane) | µg/L | 75-00-3 | NE | < 5.0 | < 5.0 | < 5.0 | < 5.0 | <5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| Ethylbenzene | µg/L | 100-41-4 | 6,900 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **54** |
| Freon 12 (Dichlorodifluoromethane) | µg/L | 75-71-8 | NE | < 10 | **0.58 J** | < 10 | < 10 | <10 | < 10 | < 10 | < 10 | < 10 |
| m&p-Xylenes | µg/L | 179601-23-1 | 26,000 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **370 J** |
| Methyl tert-Butyl Ether (MTBE) | µg/L | 1634-04-4 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 4.0 | < 4.0 | < 4.0 | < 4.0 | <4.0 | < 4.0 | < 4.0 | < 4.0 | **18** |
| n-Propylbenzene | µg/L | 103-65-1 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **4.9** |
| o-Chlorotoluene (2-chlorotoluene) | µg/L | 95-49-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **2.4 J** |
| o-Xylene | µg/L | 95-47-6 | NE | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | **240 J** |
| p-Cymene (4-isopropyltoluene) | µg/L | 99-87-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | **1.4 J** |
| sec-Butylbenzene | µg/L | 135-98-8 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| tert-Butylbenzene | µg/L | 98-06-6 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | **1.3 J** | < 3.0 | < 3.0 |
| Tetrachloroethene (PCE) | µg/L | 127-18-4 | 3.3 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | **6.8** | < 3.0 |
| Toluene | µg/L | 108-88-3 | 15,000 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | <2.0 | < 2.0 | < 2.0 | < 2.0 | **190 J** |
| trans-1,2-Dichloroethene | µg/L | 156-60-5 | NE | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | < 3.0 | < 3.0 |
| Trichloroethene (TCE) | µg/L | 79-01-6 | 30 | < 3.0 | < 3.0 | < 3.0 | < 3.0 | <3.0 | < 3.0 | < 3.0 | **1.8 J** | < 3.0 |
| Vinyl Chloride | µg/L | 75-01-4 | 2.4 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | <1.0 | < 1.0 | **3.4** | < 1.0 | **3.9** |
| **VOCs (EPA Method 8270E)** | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | µg/L | 120-82-1 | NE | < 19 | < 20 | < 20 | < 23 | NA | < 19 | < 1.9 | < 0.39 | < 19 |
| 1,2-Dichlorobenzene | µg/L | 95-50-1 | NE | < 29 J | < 30 | < 30 J | < 35 J | NA | < 29 J | < 2.9 | **0.17 J** | **62 J** |
| 1,3-Dichlorobenzene | µg/L | 541-73-1 | NE | < 19 J | < 20 | < 20 J | < 23 J | NA | < 19 J | < 1.9 | < 0.39 | **5.1 J** |
| 1,4-Dichlorobenzene | µg/L | 106-46-7 | 4.9 | < 19 | < 20 | < 20 | < 23 | NA | < 19 | 0.33 J | < 0.39 | **40** |
| Naphthalene | µg/L | 91-20-3 | 4,900 | < 19 | < 20 | < 20 | < 23 | NA | < 19 | < 1.9 | < 0.39 | **29** |

**Notes:**
With the exception of bis(2-ethylhexyl)phthlate, only analytes that were detected in one or more samples are shown.
CUL - Cleanup Level
**Bold** values are detections above the laboratory reporting limit
Shaded values are results or reporting limits that exceed the CUL
NE - Not Established
NA - Not Analyzed
mg/L - milligrams per liter
µg/L - micrograms per liter
µS/cm - microsiemens per centimeter
mV - millivolts
°C - degrees Celsius

NTU - Nephelometric Units

"< X" - Not detected above the method detection limit X
1. Washington Department of Ecology (DOE) used Method A soil and groundwater CULs for total petroleum
2. Ecology derived groundwater CULs for protection of surface water and for VOCs and SVOCs applied the
3. MW-11 was monitored June 12 2020 as access to this well was not granted until May 2020.
*Laboratory Qualifiers*
J - indicates a concentration detected between the Method Detection Limit and the Reporting Limit
*Validation Qualifiers*
J - indicates the concentration is considered to be an estimated value, based on laboratory QC issue
J- - indicates a low bias, based on failed surrogate recovery
U - not detected above the Method Detection Limit

# APPENDIX B

## Groundwater COC Mann-Kendall and Trend Analysis

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# Appendix B
# Groundwater COC Trend Analysis

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April 2022

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# LIST OF ATTACHMENTS

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| COC | contaminant of concern |
| CUL | clean-up level |
| DPE | dual-phase extraction |
| MDL | method detection limit |
| SD | standard deviation |

# 1. INTRODUCTION

A statistical analysis was conducted to assess the concertation trends of historical constituents of concern (COC) at monitoring wells across the Site. Two methods were used to conduct the analysis: (i) Mann-Kendall test and (ii) linear regression. Details of the data review and preparation process and the methods used to conduct the analysis are provided herein.

# 2. DATA REVIEW AND PREPARATION

Groundwater concentration data collected from 2003 to 2021 at 73 monitoring wells across the Site were reviewed and prepared for inclusion in the statistical analysis. The concentration data for 23 COCs were prepared before statistical analysis as follows:

- Data not detected above the method detection limit (MDL) were included in the analyses and substituted with the MDL. For some historical data, MDLs were not reported by the laboratory; therefore, the reporting limit was used instead;
- The maximum over a primary and field duplicate sample;
- Total petroleum hydrocarbons (TPHs) results were assumed to have been analyzed without the silica gel cleanup (EPA method 3630C) procedure[1]; and
- When a COC was analyzed under two analytical methods, one method was selected as the preferred method. Historically, 1,4-dichlorobenzene and naphthalene were analyzed under methods 8260 and 8270, resulting in two analytical results for one groundwater sample. When two analytical results were available, the result reported under 8260 was used for 1,4-dichlorobenzene, and the result reported under 8270 was used for naphthalene. Pentachlorophenol was analyzed with two methods in December 2020 and results from method 8270 E SIM and 8270 E were available and results from method 8270 E SIM were used in the analysis.

After the data preparation stage, each of the 73 monitoring wells were assessed as follows:

1. Time series plots were generated and reviewed for each of the 23 COCs (Attachment 1);
2. Mann-Kendall tests were conducted for each of the 23 COCs across three time periods: (i) the pre-DPE time period 2003 to 2009, (ii) the DPE remedy time period from 2009 to 2021[2]; and (i) the overall time period from 2003 to 2021.
3. Linear regressions were performed for nine of the COCs in order to estimate bulk attenuation rates and time to reach the cleanup level (CUL). This subset of COCs were the

1 Geosyntec: Historical data and reports were reviewed to evaluate whether silica gel cleanup (EPA method 3630C) had been used historically as part of total petroleum hydrocarbons (TPHs) analysis. No evidence was found the silica gel cleanup had been performed, therefore it was assumed that the past and present sample results for TPHs were directly comparable.

2 Note that the DPE system was intermittently operated during this time period. In addition, a biosparge pilot study was completed in Spring 2021 and the DPE system was off during that time.

only ones found to have soil and groundwater CUL exceedances in the most recent usable data.

## 3. MANN-KENDALL TEST FOR TREND

Mann-Kendall tests were conducted to evaluate whether there was an increasing, decreasing, or stable trend at each monitoring well across the Site. A seasonable Mann-Kendall analysis was not performed because the time trends did not exhibit any seasonality (Attachment 1). Tables B1-A through B3-B summarize the results of the Mann-Kendall tests done for all 23 COCs for the three time periods outlined in Section 2. Below are technical details on the conduct the Mann-Kendall test.

The Mann-Kendall tests was The Mann-Kendall test for trend (Kendall, 1970) is a rank-based, non-parametric test used to detect monotonic trends in time series data. Since the Mann-Kendall test is non-parametric, it does not require data to conform to any specific probability distribution, and no distributional tests were performed.

The Mann-Kendall test calculates a statistic that represents the difference between the number of observations that are increasing or decreasing relative to earlier observations when arranged in a temporal order. The difference between one observation and an earlier observation is computed and assigned a value of 1 if the difference is positive, -1 if the difference is negative, and zero if there is no difference. The sum of these differences is the statistic S. If S is a sufficiently large, positive sum, the Mann-Kendall analysis indicates an increasing trend. Alternatively, if S is a sufficiently large, negative sum, then a decreasing trend is indicated. Non-detect results are treated as follows: the lowest reporting limit associated with a non-detect result is divided by 2, and this value is used as the result for all non-detects. This prevents a non-detect result with a high reporting limit (due, for example, to sample dilution) giving rise to an apparent increasing trend.

In equation form the Mann-Kendall statistic (S) is represented by:

$$S = \sum_{k=1}^{n-1} \sum_{i=k+1}^{n} sign(x_i - x_k),$$

where $x_1, x_2, \ldots x_n$ represent n data points, $x_i$ represents the data point at time *i,* and

$$\text{sign}(x_i - x_k) = 1 \text{ if } x_i - x_k > 0,$$
$$\text{sign}(x_i - x_k) = 0 \text{ if } x_i - x_k = 0,$$
$$\text{sign}(x_i - x_k) = -1 \text{ if } x_i - x_k < 0.$$

The Mann-Kendall test is based on the critical ranges of the S statistic, which are calculated under stationary conditions, i.e., no trend or S = 0. If the absolute value of the calculated test statistic S (i.e., the observed S statistic calculated from the sample) is larger than the S critical point, then there is strong evidence of a real increasing or decreasing trend.

When the sample size n becomes large (i.e. n>10), exact critical values for the S statistic are not readily available. Therefore, a normal approximation to S is used in which a standardized Z-statistic is calculated and then compared to the critical values of a standard normal distribution. The Z-statistic is computed as follows:

$$Z = (|S| - 1)/SD\ (S).$$

The standard deviation (SD) of the observed S statistic is computed as:

$$SD(S) = \sqrt{\frac{1}{18}n(n-1)(2n+5) - \sum_{j=1}^{g} t_j(t_{j-1})(2t_j+5)}\ ,$$

where n is the sample size, g is the number of groups of ties in the data set (if any), and $t_j$ is the number of ties in the $j^{th}$ group of ties.

Once the observed S test statistic is calculated from the data, the probability of observing a test statistic at least as extreme as the one observed/calculated from the data. This probability is called the p-value and is computed from the S probability mass function (for $n \leq 10$) or the standard normal probability distribution function (for $n > 10$). The confidence in the test statistic is then calculated as 1-p-value.

The following decision matrix was used to make conclusions based on the confidence of the Mann-Kendall S test statistic (USEPA, 2009):

| Mann-Kendall Statistic (S) | Confidence in Trend | Concentration Trend |
|---|---|---|
| S>0 | >95% | Increasing |
| S>0 | 90% - 95% | Probably Increasing |
| S>0 | <90% | No Trend |
| S≤0 | <90% and COV*≥1 | No Trend |
| S≤0 | <90% and COV*<1 | Stable |
| S<0 | 90% - 95% | Probably Decreasing |
| S<0 | >95% | Decreasing |

*COV = coefficient of variation, ratio of standard deviation and the mean.

Some assumptions/limitations of the Mann-Kendall test include:

1. A result that shows "No Trend" does not imply the absence of a trend. It simply means that the Mann-Kendall test could not discern either an upward or downward trend for the given data set.
2. Although the Mann-Kendall test can be used for samples sizes $n \geq 4$, it is recommended that there are at least six data points to conduct the test. For these smaller sample sizes, the effect of one fluctuation from the overall increasing/decreasing trend in a time series could result in "No Trend".
3. The Mann-Kendall is a test to detect a monotonically increasing/decreasing trend only. If a time series does not have a clear upward/downward trend (i.e., the trend increases to a

certain point in time and then begins to decline), then this test may not be appropriate for the data and instead a non-parametric regression should be considered.

# 4. REGRESSION ANALYSIS

Regression analysis was conducted to calculate bulk attenuation rates and estimated timeframes to reach the cleanup level for each monitoring well across the Site. Table B4 summarizes the results of the regression analysis done for the subset of ten COCs. Below are technical details on the regression analysis and time to reach the cleanup time frames.

Linear regression analysis was used to calculate bulk attenuation rates and estimated timeframes to reach the cleanup level for each monitoring well and COC across the Site. To calculate the bulk attenuation rate, a plot of the natural logarithm (ln) concentration versus time is constructed and a line (or curve) of best fit is estimated assuming the following model:

$$\ln(C) = \beta_0 + \beta_1 t,$$

where C is the COC concentration, $\beta_0$ is the y-intercept, $\beta_1$ is the slope, and t is time (in years).

This results in the following rate equation (i.e., exponential decay equation) for the unlogged concentration:

$$C = C_{start} \times e^{kt},$$

where $C_{start} = e^{\beta_0}$, $k = -\beta_1$ is the bulk attenuation rate (k value), and t is time (in years).

Because the slope of the line, $\beta_1$, represents the rate of change, it is multiplied by -1 to represent the rate of degradation. For example, if the slope of the line is negative, then concentrations are attenuating and the rate of degradation is positive.

Additionally, by rearranging the rate equation, an estimate of the time (t) to reach the interim cleanup goal ($C_{goal}$) at a particular well may be calculated by:

$$t = \frac{-\ln\left[\frac{C_{goal}}{C_{start}}\right]}{k}.$$

A few key points to note regarding the estimation of attenuation rates and cleanup timeframes:

1. At least six data points, or more than three years of data, must be available in order to make a statistically significant projection of the rate of natural attenuation. Just a few years of data cannot accurately predict COC concentration behavior in the future (USEPA, 2002).

2. Because there is natural scatter in long-term monitoring data, there is uncertainty in the estimate of k and the cleanup timeframe. To account for this uncertainty, a confidence interval (i.e., 95% confidence limit) should be calculated and reported with the estimates to evaluate whether the estimate of k is statistically different than zero (or simply report the p-value associated with the statistical test). If the interval contains 0 or the p-value for test is greater than the specified level of significance (i.e., $\alpha = 0.05$), then there is no statistical evidence to suggest that attenuation is occurring at the well and it is not possible to predict the cleanup timeframe. However, this does not imply that attenuation is not occurring, but rather that the test cannot evaluate attenuation with the data provided and specified level of significance.
3. When fitting any statistical model to a data set, a goodness-of-fit measure should be considered to evaluate whether the mode is appropriate for the data. For a regression model, e.g., first-order decay rate model, the coefficient of determination, or $R^2$, is a statistic that will give some information about the goodness-of-fit. An $R^2$ value explains how well the regression line approximates the real data points, where 0 indicates a poor fit and 1 indicates a perfect fit. When using the regression model for predictions, i.e., to estimate cleanup timeframes, then an $R^2$ of at least 0.5 is recommended to ensure representative predictions.
4. These estimates may change over time.

## 5. ISOCONCENTRATIONS MAPS

In addition to reviewing long term trends, isoconcentration contours maps showing historical (2011) and recent (2021) groundwater analytical results were created to evaluate the changes in the plume footprint over time. Two COCs (TPH as gasoline and TPH as motor oil) were selected to represent a range of mobility and degradation rates. TPH gasoline, being shorter chain than motor oil, is more mobile and likely to have a higher degradation rate. TPH as gasoline and TPH as motor oil isoconcentration contours for both April 2011 and June 2021 are represented on Figures 9j and 9k in the main text of this Site Remedy Review report. A review of these figures shows that the aerial extent TPH as motor oil above the CULs has not changed significantly over the past ten years, suggesting that the plume is stable and not migrating or expanding. Additionally, as expected, the extent of the shorter-chain TPH as gasoline plume has significantly decreased over time.

## 6. REFERENCES

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USEPA, 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities.* Unified Guidance.

Geosyntec consultants

# TABLES

**TABLE B1-A**
**MANN-KENDALL RESULTS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | 2-Methylnaphthalene | bis(2-Ethylhexyl)phthalate | Naphthalene | Pentachlorophenol | Diesel Range Hydrocarbons | Gasoline Range Hydrocarbons | Motor Oil | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | 1,1-Dichloroethane | 1,1-Dichloroethene | 1,2,4-Trimethylbenzene | 1,2-Dichloroethane | 1,4-Dichlorobenzene | Benzene | cis-1,2-Dichloroethene | Ethylbenzene | m,p-Xylene | Methylene Chloride | Tetrachloroethene | Toluene | Trichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | IS | IS | IS | IS and ND | IS | IS | No Data | No Data | IS and ND | IS | IS and ND | IS | IS | IS | IS | No Data | IS | IS | IS | IS and ND | IS | No Data | IS |
| AGI-14 | IS and ND | IS and ND | IS and ND | IS | IS | IS | No Data | No Data | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS | No Data | IS | IS | IS and ND | IS | IS | No Data | IS |
| AGI-19 | IS | IS | IS | IS | IS | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS |
| AGI-21 | IS and ND | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS |
| AGI-22 | No Data | IS and ND | No Data | IS and ND | IS | IS | No Data | IS | IS and ND | IS | IS | No Data | IS | IS | IS | IS | No Data | IS | IS | IS | IS | IS | IS |
| AGI-35 | IS | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS and ND | IS | IS and ND | IS | IS |
| AGI-36 | No Data | IS and ND | No Data | IS and ND | IS | IS | No Data | IS and ND | IS and ND | IS | IS and ND | No Data | IS and ND | IS | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| AGI-37 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-41 | No Data | No Data | No Data | No Data | IS | IS | No Data | IS and ND | IS and ND | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS |
| AGI-42 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| AGI-43 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| AGI-45 | ND | ND | ND | IS and ND | No Trend | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Decreasing |
| AGI-46 | IS and ND | IS and ND | IS | IS | IS | IS | No Data | No Data | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | No Data | IS | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS |
| B-02 | ND | ND | ND | ND | No Trend | Stable | IS and ND | ND | ND | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | Probably Increasing |
| B-08D | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| B-08S | IS and ND | IS and ND | ND | IS and ND | IS and ND | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-09 | ND | ND | ND | ND | Stable | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | Probably Increasing | Stable | ND | ND | ND | ND | ND | ND | No Trend |
| B-11 | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS and ND | IS and ND | IS | IS | IS |
| B-12 | ND | ND | No Trend | ND | Stable | Stable | IS and ND | ND | ND | ND | ND | Probably Decreasing | ND | Probably Decreasing | Stable | ND | ND | ND | ND | ND | ND | ND | ND |
| B-13 | No Trend | Stable | Stable | ND | No Trend | IS | IS | ND | ND | Probably Decreasing | ND | Stable | ND | No Trend | Stable | ND | Stable | Probably Decreasing | ND | No Trend | No Trend | ND | ND |
| B-15D | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| B-15S | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS |
| B-16D | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| B-16S | IS | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS | IS | IS | IS and ND | IS | IS and ND | IS and ND |
| B-19 | Stable | Stable | Stable | ND | No Trend | Stable | IS | No Trend | ND | No Trend | ND | Probably Decreasing | ND | Stable | Stable | No Trend | Stable | Decreasing | ND | ND | Decreasing | ND | No Trend |
| B-20 | IS and ND | IS and ND | ND | IS and ND | IS | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND |
| B-21 | IS | IS and ND | No Trend | IS and ND | IS | IS | IS | ND | ND | ND | ND | No Trend | ND | Stable | Stable | ND | No Trend | No Trend | ND | ND | Stable | ND | ND |
| B-24 | ND | ND | ND | ND | Stable | ND | IS and ND | ND | ND | Stable | ND | ND | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | Stable |
| B-25 | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS and ND | IS and ND | IS | IS | IS |
| B-26 | ND | ND | ND | ND | ND | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Stable | Stable |
| B-27 | IS and ND | IS and ND | ND | IS and ND | IS and ND | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | Increasing | ND | ND | ND | ND | ND | ND | Decreasing |
| B-28 | ND | ND | ND | ND | ND | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-29 | IS | IS | IS | IS | IS | IS | No Data | No Data | IS and ND | IS | IS | IS | IS | IS | IS | No Data | IS | IS | IS | IS | IS | No Data | IS |
| B-30 | No Trend | No Trend | Decreasing | No Trend | No Trend | IS | IS | ND | ND | No Trend | ND | Decreasing | ND | Decreasing | Stable | No Trend | Probably Decreasing | Decreasing | ND | Decreasing | Decreasing | No Trend | No Trend |
| B-31D | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| CDM-10 | IS and ND | IS and ND | IS | IS | IS | IS | No Data | No Data | IS and ND | IS | IS | IS and ND | IS | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | No Data | IS |
| CDM-15 | IS | IS | IS | IS and ND | IS | IS | No Data | No Data | IS and ND | IS and ND | IS and ND | IS | IS | IS | IS | No Data | IS | IS | IS and ND | IS and ND | IS | No Data | IS |
| CDM-16 | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | No Data | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND |
| CDM-17 | IS and ND | IS and ND | IS and ND | IS | IS | IS | No Data | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | No Data | IS and ND |
| CDM-19 | IS | IS and ND | IS and ND | IS | IS | IS | No Data | No Data | IS and ND | IS | IS and ND | IS | IS | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | IS | No Data | IS |
| CDM-20 | IS | IS and ND | IS | IS | IS | IS | No Data | No Data | IS and ND | IS | IS | IS | IS | IS | IS | No Data | IS | IS | IS and ND | IS and ND | IS | No Data | IS |
| CDM-21 | IS | IS and ND | IS | IS | IS | IS | No Data | No Data | IS and ND | IS | IS | IS and ND | IS | IS | IS | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | No Data | IS |
| CDM-22 | IS | IS | IS | IS and ND | IS | IS | No Data | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | No Data | IS | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS |
| CDM-26 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| CDM-27 | ND | ND | ND | ND | ND | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | Stable |
| CDM-29 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| CDM-30 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| CDM-31 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| DMW-03 | No Data | No Data | No Data | No Data | No Data | No Data | No Data | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| DMW-04 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| LAI-P02 | No Data | IS and ND | No Data | IS and ND | No Data | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| LAI-P03 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| MW-01 | IS and ND | IS and ND | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| MW-02 | IS and ND | IS and ND | IS and ND | No Data | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS |
| MW-03 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS |
| MW-04 | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-05 | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-06 | IS and ND | IS and ND | IS and ND | No Data | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| MW-07 | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-08 | IS | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| MW-09 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| MW-10 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| MW-11 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-12 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| MW-14D | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| SP-04 | ND | ND | No Trend | No Trend | No Trend | Decreasing | IS | Decreasing | ND | Decreasing | ND | Decreasing | ND | Stable | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | ND | Decreasing | Decreasing | ND |
| SP-05 | IS | IS | Stable | IS | IS | IS | IS | No Trend | ND | Stable | ND | Decreasing | ND | No Trend | Stable | Stable | Decreasing | Decreasing | ND | ND | Decreasing | ND | ND |

***Notes:***
ND, IS = Not analyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-07 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-07 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-07 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-07 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-07 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-07 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | Methylene Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-07 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-07 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-07 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-14 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-14 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-14 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-14 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-14 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-14 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | SVOC | 2-Methylnaphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-19 | SVOC | Naphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | SVOC | Pentachlorophenol | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-19 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-19 | VOC | 1,1,1-Trichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-19 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | 1,1-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | 1,2,4-Trimethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | 1,2-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Benzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Ethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Methylene Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Toluene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-19 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-21 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,2-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Benzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Methylene Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Toluene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Trichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | 1,1,1-Trichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Methylene Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,2-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Benzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | Trichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-36 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-36 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-37 | SVOC | 2-Methylnaphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | bis(2-Ethylhexyl)phthalate | 5 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | Naphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | Pentachlorophenol | 4 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-37 | TPH | Diesel Range Hydrocarbons | 5 | 80 | 2 | -- | 0.78 | 0.408 | 0.592 | No Trend |
| AGI-37 | TPH | Gasoline Range Hydrocarbons | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | TPH | Motor Oil | 4 | 50 | -1 | -- | 0.15 | (0.375, 0.625) | (0.375, 0.625) | Stable |
| AGI-37 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1-Dichloroethane | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,2,4-Trimethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | cis-1,2-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Ethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Toluene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Vinyl Chloride | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-41 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | bis(2-Ethylhexyl)phthalate | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-42 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | 1,1-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-42 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-43 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-43 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-43 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-43 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-45 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Naphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Pentachlorophenol | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| AGI-45 | TPH | Diesel Range Hydrocarbons | 4 | 75 | 2 | -- | 0.67 | 0.375 | 0.625 | No Trend |
| AGI-45 | TPH | Gasoline Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-45 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-45 | VOC | 1,1,1-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Benzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | cis-1,2-Dichloroethene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Methylene Chloride | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Tetrachloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Toluene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Trichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Vinyl Chloride | 5 | 60 | -9 | -- | 0.78 | (0.0083, 0.042) | (0.958, 0.9917) | Decreasing |
| AGI-46 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-46 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-46 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-46 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-46 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-46 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-46 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-46 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-02 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | Naphthalene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | TPH | Diesel Range Hydrocarbons | 4 | 75 | 2 | -- | 0.66 | 0.375 | 0.625 | No Trend |
| B-02 | TPH | Gasoline Range Hydrocarbons | 4 | 50 | -3 | -- | 0.50 | (0.167, 0.375) | (0.625, 0.833) | Stable |
| B-02 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-02 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2,4-Trimethylbenzene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2-Dichloroethane | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,4-Dichlorobenzene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Benzene | 6 | 100 | 3 | -- | 0.17 | 0.360 | 0.640 | No Trend |
| B-02 | VOC | cis-1,2-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | m,p-Xylene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Tetrachloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Toluene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Vinyl Chloride | 6 | 50 | 10 | -- | 1.13 | (0.028, 0.068) | (0.932, 0.972) | Probably Increasing |
| B-08D | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-08D | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-08D | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | Naphthalene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-08S | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Diesel Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | VOC | 1,1,1-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1,2-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,2,4-Trimethylbenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,2-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,4-Dichlorobenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Benzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | cis-1,2-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Ethylbenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | m,p-Xylene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Methylene Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Tetrachloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Toluene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Trichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Vinyl Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-09 | SVOC | Naphthalene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Diesel Range Hydrocarbons | 4 | 100 | -2 | -- | 0.37 | 0.375 | 0.625 | Stable |
| B-09 | TPH | Gasoline Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-09 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethane | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,2-Dichloroethane | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,4-Dichlorobenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Benzene | 6 | 100 | 9 | -- | 0.23 | 0.068 | 0.932 | Probably Increasing |
| B-09 | VOC | cis-1,2-Dichloroethene | 5 | 60 | -1 | -- | 0.21 | (0.408, 0.592) | (0.408, 0.592) | Stable |
| B-09 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | m,p-Xylene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Tetrachloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Toluene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Vinyl Chloride | 6 | 100 | 7 | -- | 0.36 | 0.136 | 0.864 | No Trend |
| B-11 | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-11 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | SVOC | Naphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-11 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | 1,1-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | 1,2,4-Trimethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | Benzene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | Ethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | m,p-Xylene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | Tetrachloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-11 | VOC | Toluene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | Trichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-11 | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-12 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | Naphthalene | 6 | 50 | -6 | -- | 1.44 | (0.136, 0.235) | (0.765, 0.864) | No Trend |
| B-12 | SVOC | Pentachlorophenol | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-12 | TPH | Diesel Range Hydrocarbons | 4 | 100 | -4 | -- | 0.27 | 0.167 | 0.833 | Stable |
| B-12 | TPH | Gasoline Range Hydrocarbons | 4 | 50 | -5 | -- | 0.66 | (0.042, 0.167) | (0.833, 0.958) | Stable |
| B-12 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-12 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1-Dichloroethane | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1-Dichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,2,4-Trimethylbenzene | 6 | 67 | -10 | -- | 0.95 | (0.028, 0.068) | (0.932, 0.972) | Probably Decreasing |
| B-12 | VOC | 1,2-Dichloroethane | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,4-Dichlorobenzene | 6 | 100 | -9 | -- | 0.75 | 0.068 | 0.932 | Probably Decreasing |
| B-12 | VOC | Benzene | 6 | 83 | -8 | -- | 0.80 | (0.068, 0.136) | (0.864, 0.932) | Stable |
| B-12 | VOC | cis-1,2-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | m,p-Xylene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Tetrachloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Toluene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Vinyl Chloride | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | 2-Methylnaphthalene | 4 | 50 | 3 | -- | 1.45 | (0.167, 0.375) | (0.625, 0.833) | No Trend |
| B-13 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 50 | -3 | -- | 0.65 | (0.167, 0.375) | (0.625, 0.833) | Stable |
| B-13 | SVOC | Naphthalene | 6 | 83 | -7 | -- | 0.97 | 0.136 | 0.864 | Stable |
| B-13 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | TPH | Diesel Range Hydrocarbons | 4 | 100 | 4 | -- | 0.37 | 0.167 | 0.833 | No Trend |
| B-13 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-13 | TPH | Motor Oil | 2 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-13 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1-Dichloroethane | 6 | 50 | -10 | -- | 0.57 | (0.028, 0.068) | (0.932, 0.972) | Probably Decreasing |
| B-13 | VOC | 1,1-Dichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,2,4-Trimethylbenzene | 6 | 100 | -5 | -- | 0.91 | 0.235 | 0.765 | Stable |
| B-13 | VOC | 1,2-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,4-Dichlorobenzene | 6 | 83 | -7 | -- | 1.01 | 0.136 | 0.864 | No Trend |
| B-13 | VOC | Benzene | 6 | 100 | -1 | -- | 0.84 | 0.500 | 0.500 | Stable |
| B-13 | VOC | cis-1,2-Dichloroethene | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Ethylbenzene | 6 | 100 | -2 | -- | 0.75 | (0.36, 0.5) | (0.5, 0.64) | Stable |
| B-13 | VOC | m,p-Xylene | 6 | 100 | -9 | -- | 1.02 | 0.068 | 0.932 | Probably Decreasing |
| B-13 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Tetrachloroethene | 6 | 50 | -8 | -- | 1.15 | (0.068, 0.136) | (0.864, 0.932) | No Trend |
| B-13 | VOC | Toluene | 6 | 67 | -4 | -- | 1.14 | (0.235, 0.36) | (0.64, 0.765) | No Trend |
| B-13 | VOC | Trichloroethene | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Vinyl Chloride | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-15D | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | Naphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-15D | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-15D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1,1-Trichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,2,4-Trimethylbenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,2-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | cis-1,2-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | m,p-Xylene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Toluene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15D | VOC | Trichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Vinyl Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | Naphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | Pentachlorophenol | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-15S | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | TPH | Gasoline Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,2,4-Trimethylbenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,2-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Benzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | cis-1,2-Dichloroethene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Methylene Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Toluene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Trichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | Naphthalene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,2,4-Trimethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-16D | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,4-Dichlorobenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | cis-1,2-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Toluene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | 2-Methylnaphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | Naphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,2,4-Trimethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Benzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Ethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Methylene Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Toluene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-19 | SVOC | 2-Methylnaphthalene | 5 | 100 | -2 | -- | 0.68 | 0.408 | 0.592 | Stable |
| B-19 | SVOC | bis(2-Ethylhexyl)phthalate | 5 | 100 | -4 | -- | 0.74 | 0.242 | 0.758 | Stable |
| B-19 | SVOC | Naphthalene | 7 | 71 | -8 | -- | 0.66 | (0.119, 0.191) | (0.809, 0.881) | Stable |
| B-19 | SVOC | Pentachlorophenol | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-19 | TPH | Diesel Range Hydrocarbons | 5 | 100 | 4 | -- | 0.44 | 0.242 | 0.758 | No Trend |
| B-19 | TPH | Gasoline Range Hydrocarbons | 4 | 100 | -4 | -- | 0.58 | 0.167 | 0.833 | Stable |
| B-19 | TPH | Motor Oil | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-19 | VOC | 1,1,1-Trichloroethane | 6 | 67 | -4 | -- | 1.04 | (0.235, 0.36) | (0.64, 0.765) | No Trend |
| B-19 | VOC | 1,1,2-Trichloroethane | 7 | 14 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,1-Dichloroethane | 7 | 100 | -9 | -- | 1.31 | 0.119 | 0.881 | No Trend |
| B-19 | VOC | 1,1-Dichloroethene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,2,4-Trimethylbenzene | 7 | 100 | -12 | -- | 0.55 | (0.035, 0.068) | (0.932, 0.965) | Probably Decreasing |
| B-19 | VOC | 1,2-Dichloroethane | 7 | 29 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,4-Dichlorobenzene | 7 | 71 | -8 | -- | 0.65 | (0.119, 0.191) | (0.809, 0.881) | Stable |
| B-19 | VOC | Benzene | 7 | 100 | -8 | -- | 0.22 | (0.119, 0.191) | (0.809, 0.881) | Stable |
| B-19 | VOC | cis-1,2-Dichloroethene | 6 | 83 | -3 | -- | 2.20 | 0.360 | 0.640 | No Trend |
| B-19 | VOC | Ethylbenzene | 7 | 100 | -8 | -- | 0.45 | (0.119, 0.191) | (0.809, 0.881) | Stable |
| B-19 | VOC | m,p-Xylene | 7 | 100 | -13 | -- | 0.59 | 0.035 | 0.965 | Decreasing |
| B-19 | VOC | Methylene Chloride | 7 | 29 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Tetrachloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Toluene | 7 | 100 | -15 | -- | 0.74 | 0.015 | 0.985 | Decreasing |
| B-19 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Vinyl Chloride | 7 | 71 | -4 | -- | 1.98 | (0.281, 0.386) | (0.614, 0.719) | No Trend |
| B-20 | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | SVOC | Naphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-20 | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,2-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Benzene | 5 | 100 | -2 | -- | 0.64 | 0.408 | 0.592 | Stable |
| B-20 | VOC | cis-1,2-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-20 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Methylene Chloride | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Tetrachloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Toluene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Vinyl Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-21 | SVOC | 2-Methylnaphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-21 | SVOC | Naphthalene | 4 | 100 | 2 | -- | 0.45 | 0.375 | 0.625 | No Trend |
| B-21 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-21 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | TPH | Motor Oil | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-21 | VOC | 1,1,1-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1,2-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,2,4-Trimethylbenzene | 4 | 100 | 2 | -- | 0.22 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | 1,2-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,4-Dichlorobenzene | 4 | 100 | 0 | -- | 0.22 | 0.625 | 0.375 | Stable |
| B-21 | VOC | Benzene | 4 | 100 | 0 | -- | 0.54 | 0.625 | 0.375 | Stable |
| B-21 | VOC | cis-1,2-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Ethylbenzene | 4 | 100 | 2 | -- | 0.35 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | m,p-Xylene | 4 | 100 | 2 | -- | 0.30 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | Methylene Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Tetrachloroethene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Toluene | 4 | 100 | -4 | -- | 0.55 | 0.167 | 0.833 | Stable |
| B-21 | VOC | Trichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Vinyl Chloride | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | Naphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | TPH | Diesel Range Hydrocarbons | 4 | 50 | -1 | -- | 0.62 | (0.375, 0.625) | (0.375, 0.625) | Stable |
| B-24 | TPH | Gasoline Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-24 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,1-Dichloroethane | 5 | 60 | -3 | -- | 0.22 | (0.242, 0.408) | (0.592, 0.758) | Stable |
| B-24 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,2-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Benzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | cis-1,2-Dichloroethene | 5 | 80 | -9 | -- | 0.30 | (0.0083, 0.042) | (0.958, 0.9917) | Decreasing |
| B-24 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Methylene Chloride | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Tetrachloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Toluene | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Vinyl Chloride | 5 | 80 | -2 | -- | 0.69 | 0.408 | 0.592 | Stable |
| B-25 | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-25 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | SVOC | Naphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | VOC | 1,2,4-Trimethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | 1,2-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | Benzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | Ethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | m,p-Xylene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | Methylene Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-25 | VOC | Toluene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | VOC | Trichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-25 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-26 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | Naphthalene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Diesel Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Gasoline Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-26 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1-Dichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,2-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,4-Dichlorobenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Benzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | cis-1,2-Dichloroethene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | m,p-Xylene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Tetrachloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Toluene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Trichloroethene | 6 | 50 | -3 | -- | 0.73 | 0.360 | 0.640 | Stable |
| B-26 | VOC | Vinyl Chloride | 6 | 67 | -4 | -- | 0.76 | (0.235, 0.36) | (0.64, 0.765) | Stable |
| B-27 | SVOC | 2-Methylnaphthalene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | SVOC | Naphthalene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-27 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Diesel Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,2-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Benzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | cis-1,2-Dichloroethene | 5 | 100 | 9 | -- | 0.33 | (0.0083, 0.042) | (0.958, 0.9917) | Increasing |
| B-27 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Methylene Chloride | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Tetrachloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Toluene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Vinyl Chloride | 5 | 100 | -8 | -- | 0.29 | 0.042 | 0.958 | Decreasing |
| B-28 | SVOC | 2-Methylnaphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | bis(2-Ethylhexyl)phthalate | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | Naphthalene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | Pentachlorophenol | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Diesel Range Hydrocarbons | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Gasoline Range Hydrocarbons | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-28 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,4-Dichlorobenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Benzene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | cis-1,2-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | m,p-Xylene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Tetrachloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Toluene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Vinyl Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-29 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| B-29 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| B-29 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-29 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| B-29 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | Methylene Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-29 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| B-29 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-30 | SVOC | 2-Methylnaphthalene | 4 | 100 | -4 | -- | 1.85 | 0.167 | 0.833 | No Trend |
| B-30 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 100 | -4 | -- | 1.99 | 0.167 | 0.833 | No Trend |
| B-30 | SVOC | Naphthalene | 6 | 100 | -11 | -- | 1.38 | 0.028 | 0.972 | Decreasing |
| B-30 | SVOC | Pentachlorophenol | 4 | 75 | -4 | -- | 1.38 | 0.167 | 0.833 | No Trend |
| B-30 | TPH | Diesel Range Hydrocarbons | 4 | 100 | -2 | -- | 1.93 | 0.375 | 0.625 | No Trend |
| B-30 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-30 | TPH | Motor Oil | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-30 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1-Dichloroethane | 6 | 67 | 2 | -- | 0.57 | (0.36, 0.5) | (0.5, 0.64) | No Trend |
| B-30 | VOC | 1,1-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,2,4-Trimethylbenzene | 6 | 100 | -11 | -- | 0.48 | 0.028 | 0.972 | Decreasing |
| B-30 | VOC | 1,2-Dichloroethane | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,4-Dichlorobenzene | 6 | 67 | -12 | -- | 1.06 | (0.0083, 0.028) | (0.972, 0.9917) | Decreasing |
| B-30 | VOC | Benzene | 6 | 100 | -4 | -- | 0.47 | (0.235, 0.36) | (0.64, 0.765) | Stable |
| B-30 | VOC | cis-1,2-Dichloroethene | 5 | 80 | 4 | -- | 0.55 | 0.242 | 0.758 | No Trend |
| B-30 | VOC | Ethylbenzene | 6 | 100 | -9 | -- | 0.66 | 0.068 | 0.932 | Probably Decreasing |
| B-30 | VOC | m,p-Xylene | 6 | 100 | -11 | -- | 0.54 | 0.028 | 0.972 | Decreasing |
| B-30 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Tetrachloroethene | 6 | 67 | -12 | -- | 0.97 | (0.0083, 0.028) | (0.972, 0.9917) | Decreasing |
| B-30 | VOC | Toluene | 6 | 100 | -13 | -- | 1.28 | 0.008 | 0.992 | Decreasing |
| B-30 | VOC | Trichloroethene | 5 | 60 | 1 | -- | 0.80 | (0.408, 0.592) | (0.408, 0.592) | No Trend |
| B-30 | VOC | Vinyl Chloride | 6 | 83 | 1 | -- | 0.31 | 0.500 | 0.500 | No Trend |
| B-31D | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-31D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-10 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-10 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-10 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-10 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-10 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-10 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-15 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-15 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-15 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-15 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-15 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-15 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-16 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-16 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-16 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-16 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-17 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-17 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-17 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-17 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-17 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-17 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-19 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-19 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-19 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-19 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-19 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-19 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-20 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-20 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-20 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-20 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-20 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-20 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-20 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-20 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-20 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | SVOC | Pentachlorophenol | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-21 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-21 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-21 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-21 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-21 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-21 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-21 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-22 | VOC | 1,1,1-Trichloroethane | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-22 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | VOC | cis-1,2-Dichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-22 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-22 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-22 | VOC | Trichloroethene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-22 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-26 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-26 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-26 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,1-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Benzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-26 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-26 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-27 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | Naphthalene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Diesel Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Gasoline Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-27 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | cis-1,2-Dichloroethene | 7 | 57 | 2 | -- | 0.06 | (0.386, 0.5) | (0.5, 0.614) | No Trend |
| CDM-27 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Toluene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Vinyl Chloride | 7 | 86 | -7 | -- | 0.50 | 0.191 | 0.809 | Stable |
| CDM-29 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-29 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-29 | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,2,4-Trimethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | cis-1,2-Dichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Toluene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-30 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-30 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-31 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-31 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| CDM-31 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-31 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-31 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | bis(2-Ethylhexyl)phthalate | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | TPH | Diesel Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | TPH | Gasoline Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| DMW-03 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| DMW-03 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| DMW-04 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| DMW-04 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| DMW-04 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,1-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Benzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| DMW-04 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-04 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| LAI-P02 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | TPH | Diesel Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| LAI-P02 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| LAI-P03 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | SVOC | Naphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-01 | SVOC | Pentachlorophenol | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-01 | TPH | Diesel Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | TPH | Gasoline Range Hydrocarbons | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-01 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,1-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-01 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-02 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| MW-02 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-02 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-02 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-02 | VOC | 1,1-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-02 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-02 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-02 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-02 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-03 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | TPH | Diesel Range Hydrocarbons | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-03 | TPH | Gasoline Range Hydrocarbons | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-03 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | 1,1,1-Trichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-03 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-03 | VOC | 1,1-Dichloroethene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-03 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | Benzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-03 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | Tetrachloroethene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-03 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-03 | VOC | Trichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-03 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-04 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-04 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-04 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | SVOC | Naphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-05 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-05 | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-05 | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-05 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | VOC | Vinyl Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| MW-06 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-06 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-07 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-07 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-07 | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,1-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Benzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Tetrachloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-07 | VOC | Vinyl Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-08 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-08 | SVOC | Naphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-08 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-08 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-08 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,1-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | 1,2-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-08 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Benzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Ethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-08 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Methylene Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Toluene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-08 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-08 | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-09 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,2-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-09 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-09 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-10 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-10 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-10 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-10 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| MW-10 | VOC | 1,1-Dichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-10 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Benzene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-10 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Toluene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-10 | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| MW-11 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B1-B**
**MANN-KENDALL STATISTICS - 2003 TO 2009**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-14D | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-04 | SVOC | 2-Methylnaphthalene | 5 | 40 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | bis(2-Ethylhexyl)phthalate | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | Naphthalene | 7 | 57 | -10 | -- | 1.38 | (0.068, 0.119) | (0.881, 0.932) | No Trend |
| SP-04 | SVOC | Pentachlorophenol | 5 | 100 | -3 | -- | 1.29 | (0.242, 0.408) | (0.592, 0.758) | No Trend |
| SP-04 | TPH | Diesel Range Hydrocarbons | 5 | 100 | -4 | -- | 1.02 | 0.242 | 0.758 | No Trend |
| SP-04 | TPH | Gasoline Range Hydrocarbons | 5 | 100 | -10 | -- | 1.38 | 0.008 | 0.992 | Decreasing |
| SP-04 | TPH | Motor Oil | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-04 | VOC | 1,1,1-Trichloroethane | 6 | 67 | -12 | -- | 1.35 | (0.0083, 0.028) | (0.972, 0.9917) | Decreasing |
| SP-04 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,1-Dichloroethane | 7 | 100 | -17 | -- | 1.15 | 0.005 | 0.995 | Decreasing |
| SP-04 | VOC | 1,1-Dichloroethene | 7 | 43 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,2,4-Trimethylbenzene | 7 | 86 | -20 | -- | 0.84 | (0.0002, 0.0014) | (0.9986, 0.9998) | Decreasing |
| SP-04 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,4-Dichlorobenzene | 7 | 71 | -10 | -- | 0.73 | (0.068, 0.119) | (0.881, 0.932) | Stable |
| SP-04 | VOC | Benzene | 7 | 100 | -16 | -- | 0.84 | (0.0054, 0.015) | (0.985, 0.9946) | Decreasing |
| SP-04 | VOC | cis-1,2-Dichloroethene | 6 | 83 | -11 | -- | 1.03 | 0.028 | 0.972 | Decreasing |
| SP-04 | VOC | Ethylbenzene | 7 | 86 | -17 | -- | 0.97 | 0.005 | 0.995 | Decreasing |
| SP-04 | VOC | m,p-Xylene | 7 | 86 | -19 | -- | 0.97 | 0.001 | 0.999 | Decreasing |
| SP-04 | VOC | Methylene Chloride | 7 | 57 | -14 | -- | 1.29 | (0.015, 0.035) | (0.965, 0.985) | Decreasing |
| SP-04 | VOC | Tetrachloroethene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Toluene | 7 | 86 | -19 | -- | 1.25 | 0.001 | 0.999 | Decreasing |
| SP-04 | VOC | Trichloroethene | 6 | 67 | -12 | -- | 1.24 | (0.0083, 0.028) | (0.972, 0.9917) | Decreasing |
| SP-04 | VOC | Vinyl Chloride | 7 | 43 | -- | -- | -- | -- | -- | ND |
| SP-05 | SVOC | 2-Methylnaphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-05 | SVOC | Naphthalene | 5 | 80 | -6 | -- | 0.93 | 0.117 | 0.883 | Stable |
| SP-05 | SVOC | Pentachlorophenol | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Motor Oil | 2 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | VOC | 1,1,1-Trichloroethane | 5 | 100 | -6 | -- | 1.02 | 0.117 | 0.883 | No Trend |
| SP-05 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,1-Dichloroethane | 5 | 100 | -4 | -- | 0.73 | 0.242 | 0.758 | Stable |
| SP-05 | VOC | 1,1-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,2,4-Trimethylbenzene | 5 | 100 | -9 | -- | 1.20 | (0.0083, 0.042) | (0.958, 0.9917) | Decreasing |
| SP-05 | VOC | 1,2-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,4-Dichlorobenzene | 5 | 80 | -6 | -- | 1.20 | 0.117 | 0.883 | No Trend |
| SP-05 | VOC | Benzene | 5 | 100 | -3 | -- | 0.13 | (0.242, 0.408) | (0.592, 0.758) | Stable |
| SP-05 | VOC | cis-1,2-Dichloroethene | 5 | 80 | -4 | -- | 0.75 | 0.242 | 0.758 | Stable |
| SP-05 | VOC | Ethylbenzene | 5 | 100 | -10 | -- | 0.65 | 0.008 | 0.992 | Decreasing |
| SP-05 | VOC | m,p-Xylene | 5 | 100 | -10 | -- | 0.61 | 0.008 | 0.992 | Decreasing |
| SP-05 | VOC | Methylene Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Tetrachloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Toluene | 5 | 100 | -8 | -- | 0.75 | 0.042 | 0.958 | Decreasing |
| SP-05 | VOC | Trichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Vinyl Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |

***Notes:***
% - percent
N = Total number of samples
Mann-Kendall (S) = Mann-Kendall test statistic
Z Statistic = Standardized Mann-Kendall S value based on the normal approximation (for sample sizes greater than 10)
COV - coefficient of variation calculated as the ratio of sample standard deviation to the sample mean
Probability = Probability associated with Mann-Kendall Hypothesis Test (i.e., *p* -value associated with the S/Z Statistic). For sample sizes N ≤10, if an exact p-value was not available, then a range for the
Concentration Trend = Indication of whether Mann-Kendall test can detect a trend, and if so, the direction of the trend is shown
-- = not calculated due to N<4 or > 50% detection frequency
ND, IS = Not aNDlyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B2-A**
**MANN-KENDALL RESULTS - 2009-2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | 2-Methylnaphthalene | bis(2-Ethylhexyl)phthalate | Naphthalene | Pentachlorophenol | Diesel Range Hydrocarbons | Gasoline Range Hydrocarbon | Motor Oil | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | 1,1-Dichloroethane | 1,1-Dichloroethene | 1,2,4-Trimethylbenzene | 1,2-Dichloroethane | 1,4-Dichlorobenzene | Benzene | cis-1,2-Dichloroethene | Ethylbenzene | m,p-Xylene | Methylene Chloride | Tetrachloroethene | Toluene | Trichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | ND | ND | ND | ND | Stable | Decreasing | Stable | Decreasing | ND | No Trend | ND | Decreasing | ND | Decreasing | Decreasing | No Trend | Decreasing | Decreasing | ND | ND | No Trend | ND | No Trend |
| AGI-14 | ND | ND | ND | ND | Decreasing | Probably Decreasing | Decreasing | ND | ND | ND | ND | ND | ND | No Trend | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-19 | Decreasing | ND | Decreasing | Decreasing | Decreasing | Decreasing | Stable | ND | ND | Decreasing | ND | Decreasing | ND | Decreasing | Probably Decreasing | Decreasing | Decreasing | Decreasing | ND | ND | Decreasing | Decreasing | Decreasing |
| AGI-45 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-46 | ND | ND | ND | ND | Decreasing | ND | Decreasing | ND | ND | Decreasing | ND | ND | ND | ND | Stable | Probably Decreasing | ND | ND | ND | ND | ND | ND | ND |
| B-01 | ND | ND | ND | No Trend | No Trend | No Trend | Stable | ND | ND | No Trend | ND | ND | ND | No Trend | Probably Increasing | No Trend | No Trend | ND | ND | ND | ND | ND | ND |
| B-02 | ND | ND | No Trend | ND | Increasing | Probably Increasing | No Trend | ND | ND | ND | ND | ND | ND | No Trend | No Trend | ND | ND | ND | ND | ND | No Trend | ND | ND |
| B-09 | ND | No Trend | ND | ND | Increasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND |
| B-11 | Decreasing | ND | Decreasing | ND | Stable | Probably Decreasing | Stable | ND | ND | ND | ND | Decreasing | ND | Stable | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND |
| B-12 | ND | ND | ND | ND | Stable | ND | Stable | ND | ND | Decreasing | ND | ND | ND | No Trend | ND | Probably Decreasing | ND | ND | ND | ND | ND | ND | ND |
| B-13 | ND | ND | ND | No Trend | No Trend | Stable | Increasing | ND | ND | ND | ND | No Trend | ND | ND | Stable | Probably Increasing | No Trend | ND | ND | ND | ND | ND | ND |
| B-19 | ND | ND | ND | ND | Stable | Decreasing | Decreasing | ND | ND | Probably Decreasing | ND | Decreasing | ND | Decreasing | Decreasing | ND | Decreasing | Decreasing | ND | ND | Decreasing | ND | ND |
| B-23 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| B-25 | ND | ND | Decreasing | ND | Decreasing | Stable | Decreasing | ND | ND | No Trend | ND | Stable | ND | No Trend | Decreasing | ND | ND | ND | ND | ND | Stable | ND | ND |
| B-28 | ND | Decreasing | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-29 | Decreasing | ND | Decreasing | Decreasing | Stable | No Trend | Stable | ND | ND | Decreasing | ND | Decreasing | ND | No Trend | Decreasing | ND | Decreasing | Decreasing | ND | ND | No Trend | ND | ND |
| B-30 | ND | ND | ND | ND | Decreasing | Decreasing | Stable | ND | ND | No Trend | ND | Decreasing | ND | Decreasing | Decreasing | No Trend | Decreasing | ND | ND | ND | ND | bably Decrea | Increasing |
| CDM-10 | ND | ND | ND | ND | Stable | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Stable | ND | ND | ND |
| CDM-12 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-15 | ND | ND | ND | ND | No Trend | Probably Decreasing | No Trend | ND | ND | Stable | ND | ND | ND | No Trend | Decreasing | Probably Increasing | Decreasing | Decreasing | ND | ND | ND | ND | ND |
| CDM-16 | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS |
| CDM-17 | ND | ND | ND | Decreasing | No Trend | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-19 | ND | ND | ND | ND | Decreasing | No Trend | Decreasing | ND | ND | ND | ND | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-20 | ND | ND | ND | ND | Decreasing | Decreasing | Decreasing | ND | ND | Decreasing | ND | ND | ND | No Trend | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-21 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-22 | Stable | Decreasing | ND | ND | Decreasing | Decreasing | Decreasing | ND | ND | ND | ND | Decreasing | ND | Decreasing | Decreasing | ND | Decreasing | ND | ND | ND | ND | ND | ND |
| CDM-26 | ND | Stable | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-31 | ND | ND | ND | ND | Increasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| DMW-04 | ND | ND | ND | ND | Stable | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-01 | ND | ND | ND | ND | Decreasing | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-02 | ND | No Trend | ND | ND | Probably Decreasing | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND |
| MW-03 | ND | ND | ND | ND | No Trend | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Decreasing | ND |
| MW-05 | ND | ND | ND | ND | No Trend | ND | Decreasing | ND | ND | Probably Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-07 | ND | ND | ND | ND | Increasing | No Trend | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-08 | ND | ND | ND | ND | Probably Decreasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-10 | ND | ND | ND | Probably Increasing | No Trend | ND | Stable | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-11 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| P-4B | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| P-IA | ND | ND | ND | No Trend | Decreasing | Decreasing | No Trend | ND | ND | No Trend | ND | ND | ND | Stable | Stable | No Trend | ND | ND | ND | ND | ND | ND | No Trend |
| SP-04 | ND | ND | ND | Decreasing | Decreasing | ND | Decreasing | No Trend | ND | Decreasing | ND | ND | ND | Decreasing | ND | Decreasing | ND | ND | ND | Decreasing | ND | Decreasing | ND |
| SP-06 | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND |

***Notes:***
ND, IS = Not analyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | SVOC | 2-Methylnaphthalene | 29 | 7 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | bis(2-Ethylhexyl)phthalate | 28 | 11 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | Naphthalene | 29 | 41 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | Pentachlorophenol | 29 | 24 | -- | -- | -- | -- | -- | ND |
| AGI-07 | TPH | Diesel Range Hydrocarbons | 29 | 100 | -6 | -0.09 | 0.55 | 0.463 | 0.537 | Stable |
| AGI-07 | TPH | Gasoline Range Hydrocarbons | 29 | 100 | -229 | -4.29 | 0.58 | 0.000 | 1.000 | Decreasing |
| AGI-07 | TPH | Motor Oil | 29 | 100 | -47 | -0.86 | 0.94 | 0.194 | 0.806 | Stable |
| AGI-07 | VOC | 1,1,1-Trichloroethane | 26 | 54 | -75 | -1.72 | 2.18 | 0.042 | 0.958 | Decreasing |
| AGI-07 | VOC | 1,1,2-Trichloroethane | 29 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,1-Dichloroethane | 29 | 93 | -56 | -1.03 | 1.37 | 0.151 | 0.849 | No Trend |
| AGI-07 | VOC | 1,1-Dichloroethene | 29 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,2,4-Trimethylbenzene | 29 | 83 | -293 | -5.50 | 1.26 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | 1,2-Dichloroethane | 29 | 34 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,4-Dichlorobenzene | 28 | 89 | -192 | -3.78 | 2.30 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | Benzene | 29 | 76 | -247 | -4.65 | 0.95 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | cis-1,2-Dichloroethene | 26 | 73 | -23 | -0.49 | 1.76 | 0.312 | 0.688 | No Trend |
| AGI-07 | VOC | Ethylbenzene | 29 | 62 | -234 | -4.50 | 1.42 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | m,p-Xylene | 29 | 59 | -193 | -3.75 | 1.26 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | Methylene Chloride | 29 | 34 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Tetrachloroethene | 29 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Toluene | 29 | 72 | -65 | -1.21 | 2.22 | 0.112 | 0.888 | No Trend |
| AGI-07 | VOC | Trichloroethene | 26 | 42 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Vinyl Chloride | 29 | 72 | -41 | -0.76 | 2.28 | 0.224 | 0.776 | No Trend |
| AGI-14 | SVOC | 2-Methylnaphthalene | 62 | 3 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | bis(2-Ethylhexyl)phthalate | 61 | 16 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | Naphthalene | 62 | 8 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | Pentachlorophenol | 62 | 40 | -- | -- | -- | -- | -- | ND |
| AGI-14 | TPH | Diesel Range Hydrocarbons | 61 | 100 | -390 | -2.42 | 1.15 | 0.008 | 0.992 | Decreasing |
| AGI-14 | TPH | Gasoline Range Hydrocarbons | 61 | 61 | -245 | -1.57 | 2.92 | 0.058 | 0.942 | Probably Decreasing |
| AGI-14 | TPH | Motor Oil | 61 | 97 | -436 | -2.71 | 0.79 | 0.003 | 0.997 | Decreasing |
| AGI-14 | VOC | 1,1,1-Trichloroethane | 52 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1,2-Trichloroethane | 61 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1-Dichloroethane | 61 | 16 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1-Dichloroethene | 61 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,2,4-Trimethylbenzene | 61 | 21 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,2-Dichloroethane | 61 | 3 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,4-Dichlorobenzene | 61 | 57 | 51 | 0.32 | 1.38 | 0.373 | 0.627 | No Trend |
| AGI-14 | VOC | Benzene | 61 | 56 | -522 | -3.40 | 1.91 | 0.000 | 1.000 | Decreasing |
| AGI-14 | VOC | cis-1,2-Dichloroethene | 52 | 4 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Ethylbenzene | 61 | 8 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | m,p-Xylene | 61 | 16 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Methylene Chloride | 61 | 7 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Tetrachloroethene | 61 | 23 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Toluene | 61 | 23 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Trichloroethene | 52 | 2 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Vinyl Chloride | 61 | 3 | -- | -- | -- | -- | -- | ND |
| AGI-19 | SVOC | 2-Methylnaphthalene | 8 | 75 | -19 | -- | 1.10 | (0.0071, 0.016) | (0.984, 0.9929) | Decreasing |
| AGI-19 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 13 | -- | -- | -- | -- | -- | ND |
| AGI-19 | SVOC | Naphthalene | 8 | 75 | -17 | -- | 1.01 | (0.016, 0.031) | (0.969, 0.984) | Decreasing |
| AGI-19 | SVOC | Pentachlorophenol | 8 | 100 | -18 | -- | 1.36 | 0.016 | 0.984 | Decreasing |
| AGI-19 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -19 | -- | 0.67 | (0.0071, 0.016) | (0.984, 0.9929) | Decreasing |
| AGI-19 | TPH | Gasoline Range Hydrocarbons | 8 | 100 | -18 | -- | 0.89 | 0.016 | 0.984 | Decreasing |
| AGI-19 | TPH | Motor Oil | 8 | 100 | -4 | -- | 0.48 | 0.360 | 0.640 | Stable |
| AGI-19 | VOC | 1,1,1-Trichloroethane | 6 | 33 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,1-Dichloroethane | 8 | 100 | -24 | -- | 1.34 | 0.001 | 0.999 | Decreasing |
| AGI-19 | VOC | 1,1-Dichloroethene | 8 | 38 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,2,4-Trimethylbenzene | 8 | 100 | -16 | -- | 1.28 | 0.031 | 0.969 | Decreasing |
| AGI-19 | VOC | 1,2-Dichloroethane | 8 | 13 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,4-Dichlorobenzene | 8 | 100 | -19 | -- | 0.81 | (0.0071, 0.016) | (0.984, 0.9929) | Decreasing |
| AGI-19 | VOC | Benzene | 8 | 100 | -13 | -- | 0.89 | (0.054, 0.089) | (0.911, 0.946) | Probably Decreasing |
| AGI-19 | VOC | cis-1,2-Dichloroethene | 6 | 83 | -15 | -- | 1.07 | 0.001 | 0.999 | Decreasing |
| AGI-19 | VOC | Ethylbenzene | 8 | 100 | -22 | -- | 1.42 | 0.003 | 0.997 | Decreasing |
| AGI-19 | VOC | m,p-Xylene | 8 | 88 | -19 | -- | 1.21 | (0.0071, 0.016) | (0.984, 0.9929) | Decreasing |
| AGI-19 | VOC | Methylene Chloride | 8 | 38 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | Tetrachloroethene | 8 | 38 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | Toluene | 8 | 100 | -22 | -- | 1.39 | 0.003 | 0.997 | Decreasing |
| AGI-19 | VOC | Trichloroethene | 6 | 67 | -12 | -- | 1.49 | (0.0083, 0.028) | (0.972, 0.9917) | Decreasing |
| AGI-19 | VOC | Vinyl Chloride | 8 | 75 | -19 | -- | 0.94 | (0.0071, 0.016) | (0.984, 0.9929) | Decreasing |
| AGI-45 | SVOC | 2-Methylnaphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Pentachlorophenol | 10 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-45 | TPH | Diesel Range Hydrocarbons | 10 | 100 | 6 | -- | 0.54 | (0.3, 0.364) | (0.636, 0.7) | No Trend |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-45 | TPH | Gasoline Range Hydrocarbons | 10 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-45 | TPH | Motor Oil | 10 | 100 | 0 | -- | 0.53 | >0.5 | <0.5 | Stable |
| AGI-45 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,4-Dichlorobenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Benzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | cis-1,2-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | m,p-Xylene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Tetrachloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Toluene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Trichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Vinyl Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | Pentachlorophenol | 8 | 13 | -- | -- | -- | -- | -- | ND |
| AGI-46 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -18 | -- | 0.46 | 0.016 | 0.984 | Decreasing |
| AGI-46 | TPH | Gasoline Range Hydrocarbons | 8 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-46 | TPH | Motor Oil | 8 | 100 | -18 | -- | 0.74 | 0.016 | 0.984 | Decreasing |
| AGI-46 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,1-Dichloroethane | 8 | 63 | -25 | -- | 1.35 | (0.00019, 0.00087) | 0.99913, 0.99981 | Decreasing |
| AGI-46 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Benzene | 8 | 50 | -2 | -- | 0.86 | 0.452 | 0.548 | Stable |
| AGI-46 | VOC | cis-1,2-Dichloroethene | 6 | 67 | -10 | -- | 0.65 | (0.028, 0.068) | (0.932, 0.972) | Probably Decreasing |
| AGI-46 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Tetrachloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Trichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Vinyl Chloride | 8 | 38 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | 2-Methylnaphthalene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | Naphthalene | 11 | 27 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | Pentachlorophenol | 11 | 64 | 17 | 1.28 | 1.04 | 0.100 | 0.900 | No Trend |
| B-01 | TPH | Diesel Range Hydrocarbons | 11 | 100 | 15 | 1.09 | 0.84 | 0.138 | 0.862 | No Trend |
| B-01 | TPH | Gasoline Range Hydrocarbons | 11 | 100 | 11 | 0.78 | 0.72 | 0.218 | 0.782 | No Trend |
| B-01 | TPH | Motor Oil | 11 | 100 | -1 | 0.00 | 0.85 | 0.500 | 0.500 | Stable |
| B-01 | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,1-Dichloroethane | 11 | 64 | -1 | 0.00 | 1.81 | 0.500 | 0.500 | No Trend |
| B-01 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,2,4-Trimethylbenzene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,2-Dichloroethane | 11 | 9 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,4-Dichlorobenzene | 10 | 80 | 10 | -- | 0.53 | (0.19, 0.242) | (0.758, 0.81) | No Trend |
| B-01 | VOC | Benzene | 11 | 100 | 19 | 1.40 | 1.20 | 0.081 | 0.919 | Probably Increasing |
| B-01 | VOC | cis-1,2-Dichloroethene | 9 | 56 | 10 | -- | 1.12 | 0.179 | 0.821 | No Trend |
| B-01 | VOC | Ethylbenzene | 11 | 64 | 3 | 0.16 | 2.65 | 0.436 | 0.564 | No Trend |
| B-01 | VOC | m,p-Xylene | 11 | 36 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Tetrachloroethene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Toluene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Trichloroethene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Vinyl Chloride | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | 2-Methylnaphthalene | 10 | 20 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | Naphthalene | 10 | 50 | 1 | -- | 0.86 | 0.500 | 0.500 | No Trend |
| B-02 | SVOC | Pentachlorophenol | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-02 | TPH | Diesel Range Hydrocarbons | 10 | 100 | 29 | -- | 0.68 | 0.005 | 0.995 | Increasing |
| B-02 | TPH | Gasoline Range Hydrocarbons | 10 | 80 | 20 | -- | 0.87 | (0.036, 0.054) | (0.946, 0.964) | Probably Increasing |
| B-02 | TPH | Motor Oil | 10 | 100 | 16 | -- | 0.68 | (0.078, 0.108) | (0.892, 0.922) | No Trend |
| B-02 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1-Dichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-02 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2,4-Trimethylbenzene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,4-Dichlorobenzene | 10 | 70 | 16 | -- | 0.74 | (0.078, 0.108) | (0.892, 0.922) | No Trend |
| B-02 | VOC | Benzene | 10 | 90 | 6 | -- | 0.68 | (0.3, 0.364) | (0.636, 0.7) | No Trend |
| B-02 | VOC | cis-1,2-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Ethylbenzene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | m,p-Xylene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Tetrachloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Toluene | 10 | 70 | 2 | -- | 1.73 | (0.431, 0.5) | (0.5, 0.569) | No Trend |
| B-02 | VOC | Trichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Vinyl Chloride | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 56 | 0 | -- | 1.69 | 0.540 | 0.460 | No Trend |
| B-09 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | Pentachlorophenol | 9 | 33 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Diesel Range Hydrocarbons | 9 | 89 | 21 | -- | 0.43 | (0.012, 0.022) | (0.978, 0.988) | Increasing |
| B-09 | TPH | Gasoline Range Hydrocarbons | 9 | 22 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Motor Oil | 9 | 100 | 8 | -- | 0.61 | 0.238 | 0.762 | No Trend |
| B-09 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethane | 9 | 33 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,4-Dichlorobenzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Benzene | 9 | 67 | 9 | -- | 0.80 | (0.179, 0.238) | (0.762, 0.821) | No Trend |
| B-09 | VOC | cis-1,2-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Ethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | m,p-Xylene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Methylene Chloride | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Tetrachloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Toluene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Vinyl Chloride | 9 | 33 | -- | -- | -- | -- | -- | ND |
| B-11 | SVOC | 2-Methylnaphthalene | 10 | 70 | -22 | -- | 1.05 | (0.023, 0.036) | (0.964, 0.977) | Decreasing |
| B-11 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-11 | SVOC | Naphthalene | 10 | 70 | -25 | -- | 0.95 | 0.014 | 0.986 | Decreasing |
| B-11 | SVOC | Pentachlorophenol | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | TPH | Diesel Range Hydrocarbons | 10 | 100 | -13 | -- | 0.29 | 0.146 | 0.854 | Stable |
| B-11 | TPH | Gasoline Range Hydrocarbons | 10 | 100 | -20 | -- | 0.68 | (0.036, 0.054) | (0.946, 0.964) | Probably Decreasing |
| B-11 | TPH | Motor Oil | 10 | 100 | -3 | -- | 0.46 | 0.431 | 0.569 | Stable |
| B-11 | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1-Dichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,2,4-Trimethylbenzene | 10 | 60 | -35 | -- | 1.46 | 0.000 | 1.000 | Decreasing |
| B-11 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,4-Dichlorobenzene | 10 | 100 | -13 | -- | 0.49 | 0.146 | 0.854 | Stable |
| B-11 | VOC | Benzene | 10 | 40 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | cis-1,2-Dichloroethene | 9 | 44 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Ethylbenzene | 10 | 70 | -32 | -- | 0.74 | (0.0011, 0.0023) | (0.9977, 0.9989) | Decreasing |
| B-11 | VOC | m,p-Xylene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Tetrachloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Toluene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Trichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Vinyl Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 38 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | Pentachlorophenol | 8 | 25 | -- | -- | -- | -- | -- | ND |
| B-12 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -11 | -- | 0.51 | (0.089, 0.138) | (0.862, 0.911) | Stable |
| B-12 | TPH | Gasoline Range Hydrocarbons | 8 | 38 | -- | -- | -- | -- | -- | ND |
| B-12 | TPH | Motor Oil | 8 | 100 | -10 | -- | 0.73 | 0.138 | 0.862 | Stable |
| B-12 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1-Dichloroethane | 8 | 88 | -24 | -- | 0.62 | 0.001 | 0.999 | Decreasing |
| B-12 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,2,4-Trimethylbenzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,4-Dichlorobenzene | 8 | 75 | 5 | -- | 0.21 | (0.274, 0.36) | (0.64, 0.726) | No Trend |
| B-12 | VOC | Benzene | 8 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-12 | VOC | cis-1,2-Dichloroethene | 6 | 67 | -10 | -- | 1.79 | (0.028, 0.068) | (0.932, 0.972) | Probably Decreasing |
| B-12 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Tetrachloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Trichloroethene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Vinyl Chloride | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | 2-Methylnaphthalene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 25 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | Naphthalene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | Pentachlorophenol | 8 | 50 | 6 | -- | 1.57 | 0.274 | 0.726 | No Trend |
| B-13 | TPH | Diesel Range Hydrocarbons | 7 | 100 | 7 | -- | 0.89 | 0.191 | 0.809 | No Trend |
| B-13 | TPH | Gasoline Range Hydrocarbons | 8 | 100 | -2 | -- | 0.72 | 0.452 | 0.548 | Stable |
| B-13 | TPH | Motor Oil | 7 | 100 | 15 | -- | 0.73 | 0.015 | 0.985 | Increasing |
| B-13 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1-Dichloroethane | 8 | 38 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,2,4-Trimethylbenzene | 8 | 75 | -5 | -- | 1.55 | (0.274, 0.36) | (0.64, 0.726) | No Trend |
| B-13 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,4-Dichlorobenzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Benzene | 8 | 75 | -1 | -- | 0.84 | (0.452, 0.548) | (0.452, 0.548) | Stable |
| B-13 | VOC | cis-1,2-Dichloroethene | 6 | 50 | 10 | -- | 1.37 | (0.028, 0.068) | (0.932, 0.972) | Probably Increasing |
| B-13 | VOC | Ethylbenzene | 8 | 50 | -4 | -- | 2.41 | 0.360 | 0.640 | No Trend |
| B-13 | VOC | m,p-Xylene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Tetrachloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Toluene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Vinyl Chloride | 8 | 25 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | 2-Methylnaphthalene | 70 | 3 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | bis(2-Ethylhexyl)phthalate | 69 | 10 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | Naphthalene | 70 | 36 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | Pentachlorophenol | 70 | 14 | -- | -- | -- | -- | -- | ND |
| B-19 | TPH | Diesel Range Hydrocarbons | 70 | 100 | -112 | -0.56 | 0.46 | 0.287 | 0.713 | Stable |
| B-19 | TPH | Gasoline Range Hydrocarbons | 70 | 100 | -929 | -4.71 | 0.48 | 0.000 | 1.000 | Decreasing |
| B-19 | TPH | Motor Oil | 70 | 100 | -413 | -2.09 | 0.57 | 0.018 | 0.982 | Decreasing |
| B-19 | VOC | 1,1,1-Trichloroethane | 61 | 0 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,1,2-Trichloroethane | 70 | 0 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,1-Dichloroethane | 70 | 69 | -303 | -1.56 | 3.01 | 0.060 | 0.940 | Probably Decreasing |
| B-19 | VOC | 1,1-Dichloroethene | 70 | 4 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,2,4-Trimethylbenzene | 70 | 77 | -1469 | -7.49 | 1.12 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | 1,2-Dichloroethane | 70 | 36 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,4-Dichlorobenzene | 69 | 78 | -742 | -3.86 | 0.73 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Benzene | 70 | 90 | -636 | -3.23 | 0.55 | 0.001 | 0.999 | Decreasing |
| B-19 | VOC | cis-1,2-Dichloroethene | 61 | 26 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Ethylbenzene | 70 | 77 | -1087 | -5.54 | 1.22 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | m,p-Xylene | 70 | 54 | -1215 | -6.48 | 1.97 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Methylene Chloride | 70 | 39 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Tetrachloroethene | 70 | 1 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Toluene | 70 | 63 | -841 | -4.38 | 6.31 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Trichloroethene | 61 | 11 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Vinyl Chloride | 70 | 21 | -- | -- | -- | -- | -- | ND |
| B-23 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-23 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-25 | SVOC | 2-Methylnaphthalene | 10 | 40 | -- | -- | -- | -- | -- | ND |
| B-25 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-25 | SVOC | Naphthalene | 10 | 70 | -24 | -- | 0.75 | (0.014, 0.023) | (0.977, 0.986) | Decreasing |
| B-25 | SVOC | Pentachlorophenol | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | TPH | Diesel Range Hydrocarbons | 10 | 100 | -35 | -- | 0.40 | 0.000 | 1.000 | Decreasing |
| B-25 | TPH | Gasoline Range Hydrocarbons | 10 | 100 | -10 | -- | 0.34 | (0.19, 0.242) | (0.758, 0.81) | Stable |
| B-25 | TPH | Motor Oil | 10 | 100 | -22 | -- | 0.60 | (0.023, 0.036) | (0.964, 0.977) | Decreasing |
| B-25 | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,1,2-Trichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,1-Dichloroethane | 10 | 50 | -10 | -- | 1.68 | (0.19, 0.242) | (0.758, 0.81) | No Trend |
| B-25 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,2,4-Trimethylbenzene | 10 | 80 | -2 | -- | 0.59 | (0.431, 0.5) | (0.5, 0.569) | Stable |
| B-25 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,4-Dichlorobenzene | 10 | 90 | 1 | -- | 0.50 | 0.500 | 0.500 | No Trend |
| B-25 | VOC | Benzene | 10 | 100 | -22 | -- | 0.50 | (0.023, 0.036) | (0.964, 0.977) | Decreasing |
| B-25 | VOC | cis-1,2-Dichloroethene | 9 | 33 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Ethylbenzene | 10 | 40 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | m,p-Xylene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Tetrachloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Toluene | 10 | 100 | -11 | -- | 0.49 | 0.190 | 0.810 | Stable |
| B-25 | VOC | Trichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Vinyl Chloride | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 50 | -20 | -- | 1.72 | 0.007 | 0.993 | Decreasing |
| B-28 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | Pentachlorophenol | 8 | 13 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Diesel Range Hydrocarbons | 8 | 88 | 2 | -- | 0.12 | 0.452 | 0.548 | No Trend |
| B-28 | TPH | Gasoline Range Hydrocarbons | 8 | 25 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Motor Oil | 8 | 75 | -5 | -- | 0.81 | (0.274, 0.36) | (0.64, 0.726) | Stable |
| B-28 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Benzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | cis-1,2-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Tetrachloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Vinyl Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | SVOC | 2-Methylnaphthalene | 30 | 57 | -186 | -3.45 | 2.13 | 0.000 | 1.000 | Decreasing |
| B-29 | SVOC | bis(2-Ethylhexyl)phthalate | 29 | 14 | -- | -- | -- | -- | -- | ND |
| B-29 | SVOC | Naphthalene | 30 | 83 | -128 | -2.27 | 0.94 | 0.012 | 0.988 | Decreasing |
| B-29 | SVOC | Pentachlorophenol | 30 | 57 | -135 | -2.50 | 1.55 | 0.006 | 0.994 | Decreasing |
| B-29 | TPH | Diesel Range Hydrocarbons | 30 | 100 | -36 | -0.63 | 0.39 | 0.265 | 0.735 | Stable |
| B-29 | TPH | Gasoline Range Hydrocarbons | 30 | 100 | -14 | -0.23 | 1.06 | 0.408 | 0.592 | No Trend |
| B-29 | TPH | Motor Oil | 30 | 100 | -41 | -0.71 | 0.85 | 0.238 | 0.762 | Stable |
| B-29 | VOC | 1,1,1-Trichloroethane | 26 | 4 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,1,2-Trichloroethane | 30 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,1-Dichloroethane | 30 | 73 | -201 | -3.61 | 1.48 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | 1,1-Dichloroethene | 30 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,2,4-Trimethylbenzene | 30 | 87 | -151 | -2.68 | 1.51 | 0.004 | 0.996 | Decreasing |
| B-29 | VOC | 1,2-Dichloroethane | 30 | 3 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,4-Dichlorobenzene | 29 | 97 | 10 | 0.17 | 1.12 | 0.433 | 0.567 | No Trend |
| B-29 | VOC | Benzene | 30 | 80 | -239 | -4.27 | 0.49 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | cis-1,2-Dichloroethene | 26 | 46 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Ethylbenzene | 30 | 53 | -118 | -2.21 | 1.35 | 0.014 | 0.986 | Decreasing |
| B-29 | VOC | m,p-Xylene | 30 | 63 | -190 | -3.47 | 2.88 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | Methylene Chloride | 30 | 37 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Tetrachloroethene | 30 | 7 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Toluene | 30 | 67 | -22 | -0.38 | 1.53 | 0.351 | 0.649 | No Trend |
| B-29 | VOC | Trichloroethene | 26 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Vinyl Chloride | 30 | 37 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | 2-Methylnaphthalene | 30 | 13 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | bis(2-Ethylhexyl)phthalate | 29 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-30 | SVOC | Naphthalene | 30 | 10 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | Pentachlorophenol | 30 | 47 | -- | -- | -- | -- | -- | ND |
| B-30 | TPH | Diesel Range Hydrocarbons | 29 | 100 | -142 | -2.65 | 0.73 | 0.004 | 0.996 | Decreasing |
| B-30 | TPH | Gasoline Range Hydrocarbons | 30 | 100 | -167 | -2.97 | 0.41 | 0.001 | 0.999 | Decreasing |
| B-30 | TPH | Motor Oil | 29 | 100 | -24 | -0.43 | 0.53 | 0.333 | 0.667 | Stable |
| B-30 | VOC | 1,1,1-Trichloroethane | 26 | 0 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1,2-Trichloroethane | 30 | 3 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1-Dichloroethane | 30 | 73 | 71 | 1.26 | 1.01 | 0.103 | 0.897 | No Trend |
| B-30 | VOC | 1,1-Dichloroethene | 30 | 3 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,2,4-Trimethylbenzene | 30 | 57 | -229 | -4.25 | 2.26 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | 1,2-Dichloroethane | 30 | 3 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,4-Dichlorobenzene | 29 | 66 | -127 | -2.42 | 0.66 | 0.008 | 0.992 | Decreasing |
| B-30 | VOC | Benzene | 30 | 60 | -253 | -4.66 | 1.24 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | cis-1,2-Dichloroethene | 26 | 81 | 12 | 0.24 | 0.86 | 0.404 | 0.596 | No Trend |
| B-30 | VOC | Ethylbenzene | 30 | 57 | -215 | -3.99 | 1.56 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | m,p-Xylene | 30 | 10 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Methylene Chloride | 30 | 7 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Tetrachloroethene | 30 | 43 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Toluene | 30 | 27 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Trichloroethene | 26 | 58 | -64 | -1.45 | 0.79 | 0.074 | 0.926 | Probably Decreasing |
| B-30 | VOC | Vinyl Chloride | 30 | 60 | 139 | 2.55 | 1.28 | 0.005 | 0.995 | Increasing |
| CDM-10 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | Pentachlorophenol | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-10 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -9 | -- | 0.72 | (0.138, 0.199) | (0.801, 0.862) | Stable |
| CDM-10 | TPH | Gasoline Range Hydrocarbons | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-10 | TPH | Motor Oil | 8 | 100 | -3 | -- | 0.72 | (0.36, 0.452) | (0.548, 0.64) | Stable |
| CDM-10 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1-Dichloroethane | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,4-Dichlorobenzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Benzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | cis-1,2-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Tetrachloroethene | 8 | 100 | 0 | -- | 0.37 | 0.548 | 0.452 | Stable |
| CDM-10 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Trichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Vinyl Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | 2-Methylnaphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | bis(2-Ethylhexyl)phthalate | 7 | 43 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | Naphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | Pentachlorophenol | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | TPH | Diesel Range Hydrocarbons | 7 | 86 | 5 | -- | 0.53 | 0.281 | 0.719 | No Trend |
| CDM-12 | TPH | Gasoline Range Hydrocarbons | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-12 | TPH | Motor Oil | 7 | 100 | -1 | -- | 0.46 | 0.500 | 0.500 | Stable |
| CDM-12 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1-Dichloroethane | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,2,4-Trimethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | cis-1,2-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Ethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Toluene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Vinyl Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | 2-Methylnaphthalene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | bis(2-Ethylhexyl)phthalate | 11 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | Naphthalene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | Pentachlorophenol | 11 | 45 | -- | -- | -- | -- | -- | ND |
| CDM-15 | TPH | Diesel Range Hydrocarbons | 11 | 100 | 8 | 0.55 | 1.31 | 0.292 | 0.708 | No Trend |
| CDM-15 | TPH | Gasoline Range Hydrocarbons | 11 | 91 | -19 | -1.41 | 0.75 | 0.079 | 0.921 | Probably Decreasing |
| CDM-15 | TPH | Motor Oil | 11 | 100 | 16 | 1.18 | 0.93 | 0.119 | 0.881 | No Trend |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-15 | VOC | 1,1,1-Trichloroethane | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,1-Dichloroethane | 11 | 64 | -11 | -0.80 | 0.93 | 0.212 | 0.788 | Stable |
| CDM-15 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,2,4-Trimethylbenzene | 11 | 27 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,2-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,4-Dichlorobenzene | 11 | 91 | 13 | 0.93 | 0.87 | 0.175 | 0.825 | No Trend |
| CDM-15 | VOC | Benzene | 11 | 73 | -23 | -1.74 | 0.69 | 0.041 | 0.959 | Decreasing |
| CDM-15 | VOC | cis-1,2-Dichloroethene | 9 | 56 | 16 | -- | 1.23 | 0.060 | 0.940 | Probably Increasing |
| CDM-15 | VOC | Ethylbenzene | 11 | 55 | -27 | -2.13 | 0.75 | 0.016 | 0.984 | Decreasing |
| CDM-15 | VOC | m,p-Xylene | 11 | 55 | -38 | -3.05 | 1.17 | 0.001 | 0.999 | Decreasing |
| CDM-15 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Tetrachloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Toluene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Trichloroethene | 9 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Vinyl Chloride | 11 | 27 | -- | -- | -- | -- | -- | ND |
| CDM-16 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-17 | SVOC | 2-Methylnaphthalene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | Naphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | Pentachlorophenol | 9 | 56 | -18 | -- | 1.70 | 0.038 | 0.962 | Decreasing |
| CDM-17 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -8 | -- | 1.80 | 0.199 | 0.801 | No Trend |
| CDM-17 | TPH | Gasoline Range Hydrocarbons | 9 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-17 | TPH | Motor Oil | 8 | 100 | -5 | -- | 1.34 | (0.274, 0.36) | (0.64, 0.726) | No Trend |
| CDM-17 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1-Dichloroethane | 9 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1-Dichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,4-Dichlorobenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Benzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | cis-1,2-Dichloroethene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Ethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | m,p-Xylene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Methylene Chloride | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Tetrachloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Toluene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Vinyl Chloride | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | 2-Methylnaphthalene | 63 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | bis(2-Ethylhexyl)phthalate | 62 | 2 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | Naphthalene | 63 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | Pentachlorophenol | 63 | 38 | -- | -- | -- | -- | -- | ND |
| CDM-19 | TPH | Diesel Range Hydrocarbons | 63 | 100 | -472 | -2.79 | 0.97 | 0.003 | 0.997 | Decreasing |
| CDM-19 | TPH | Gasoline Range Hydrocarbons | 63 | 92 | 18 | 0.10 | 1.21 | 0.460 | 0.540 | No Trend |
| CDM-19 | TPH | Motor Oil | 63 | 100 | -522 | -3.09 | 0.76 | 0.001 | 0.999 | Decreasing |
| CDM-19 | VOC | 1,1,1-Trichloroethane | 53 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1,2-Trichloroethane | 63 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1-Dichloroethane | 63 | 19 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1-Dichloroethene | 63 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,2,4-Trimethylbenzene | 63 | 17 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-19 | VOC | 1,2-Dichloroethane | 63 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,4-Dichlorobenzene | 62 | 24 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Benzene | 63 | 71 | -606 | -3.63 | 1.78 | 0.000 | 1.000 | Decreasing |
| CDM-19 | VOC | cis-1,2-Dichloroethene | 53 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Ethylbenzene | 63 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | m,p-Xylene | 63 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Methylene Chloride | 63 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Tetrachloroethene | 63 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Toluene | 63 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Trichloroethene | 53 | 2 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Vinyl Chloride | 63 | 2 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | 2-Methylnaphthalene | 33 | 15 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | bis(2-Ethylhexyl)phthalate | 32 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | Naphthalene | 33 | 39 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | Pentachlorophenol | 33 | 42 | -- | -- | -- | -- | -- | ND |
| CDM-20 | TPH | Diesel Range Hydrocarbons | 32 | 100 | -321 | -5.19 | 0.93 | 0.000 | 1.000 | Decreasing |
| CDM-20 | TPH | Gasoline Range Hydrocarbons | 33 | 100 | -340 | -5.26 | 1.24 | 0.000 | 1.000 | Decreasing |
| CDM-20 | TPH | Motor Oil | 32 | 97 | -165 | -2.66 | 0.77 | 0.004 | 0.996 | Decreasing |
| CDM-20 | VOC | 1,1,1-Trichloroethane | 29 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,1,2-Trichloroethane | 33 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,1-Dichloroethane | 33 | 76 | -274 | -4.26 | 2.07 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | 1,1-Dichloroethene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,2,4-Trimethylbenzene | 33 | 48 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,2-Dichloroethane | 33 | 18 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,4-Dichlorobenzene | 32 | 91 | 70 | 1.12 | 0.51 | 0.131 | 0.869 | No Trend |
| CDM-20 | VOC | Benzene | 33 | 100 | -233 | -3.60 | 1.00 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | cis-1,2-Dichloroethene | 29 | 41 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Ethylbenzene | 33 | 48 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | m,p-Xylene | 33 | 48 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Methylene Chloride | 33 | 21 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Tetrachloroethene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Toluene | 33 | 42 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Trichloroethene | 29 | 31 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Vinyl Chloride | 33 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | Naphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | Pentachlorophenol | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-21 | TPH | Diesel Range Hydrocarbons | 9 | 100 | -13 | -- | 1.06 | (0.09, 0.13) | (0.87, 0.91) | No Trend |
| CDM-21 | TPH | Gasoline Range Hydrocarbons | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-21 | TPH | Motor Oil | 9 | 100 | -9 | -- | 0.78 | (0.179, 0.238) | (0.762, 0.821) | Stable |
| CDM-21 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,1-Dichloroethane | 9 | 89 | 3 | -- | 0.67 | (0.381, 0.46) | (0.54, 0.619) | No Trend |
| CDM-21 | VOC | 1,1-Dichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,4-Dichlorobenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Benzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | cis-1,2-Dichloroethene | 7 | 43 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Ethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | m,p-Xylene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Methylene Chloride | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Tetrachloroethene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Toluene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Trichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Vinyl Chloride | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-22 | SVOC | 2-Methylnaphthalene | 26 | 77 | -53 | -1.16 | 0.71 | 0.124 | 0.876 | Stable |
| CDM-22 | SVOC | bis(2-Ethylhexyl)phthalate | 25 | 64 | -122 | -2.90 | 1.08 | 0.002 | 0.998 | Decreasing |
| CDM-22 | SVOC | Naphthalene | 26 | 31 | -- | -- | -- | -- | -- | ND |
| CDM-22 | SVOC | Pentachlorophenol | 26 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | TPH | Diesel Range Hydrocarbons | 26 | 100 | -125 | -2.73 | 0.83 | 0.003 | 0.997 | Decreasing |
| CDM-22 | TPH | Gasoline Range Hydrocarbons | 26 | 96 | -113 | -2.50 | 3.48 | 0.006 | 0.994 | Decreasing |
| CDM-22 | TPH | Motor Oil | 26 | 100 | -135 | -2.96 | 0.80 | 0.002 | 0.998 | Decreasing |
| CDM-22 | VOC | 1,1,1-Trichloroethane | 23 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1,2-Trichloroethane | 26 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1-Dichloroethane | 26 | 31 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1-Dichloroethene | 26 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,2,4-Trimethylbenzene | 26 | 54 | -202 | -4.68 | 1.26 | 0.000 | 1.000 | Decreasing |
| CDM-22 | VOC | 1,2-Dichloroethane | 26 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,4-Dichlorobenzene | 25 | 100 | -91 | -2.11 | 0.36 | 0.018 | 0.982 | Decreasing |
| CDM-22 | VOC | Benzene | 26 | 85 | -146 | -3.21 | 0.52 | 0.001 | 0.999 | Decreasing |
| CDM-22 | VOC | cis-1,2-Dichloroethene | 23 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Ethylbenzene | 26 | 58 | -215 | -4.92 | 1.00 | 0.000 | 1.000 | Decreasing |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-22 | VOC | m,p-Xylene | 26 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Methylene Chloride | 26 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Tetrachloroethene | 26 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Toluene | 26 | 46 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Trichloroethene | 23 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Vinyl Chloride | 26 | 27 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | 2-Methylnaphthalene | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 63 | -5 | -- | 0.70 | (0.274, 0.36) | (0.64, 0.726) | Stable |
| CDM-26 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | Pentachlorophenol | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-26 | TPH | Diesel Range Hydrocarbons | 8 | 75 | 1 | -- | 0.64 | (0.452, 0.548) | (0.452, 0.548) | No Trend |
| CDM-26 | TPH | Gasoline Range Hydrocarbons | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-26 | TPH | Motor Oil | 8 | 75 | -5 | -- | 0.91 | (0.274, 0.36) | (0.64, 0.726) | Stable |
| CDM-26 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,2,4-Trimethylbenzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Benzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | cis-1,2-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Tetrachloroethene | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Vinyl Chloride | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | 2-Methylnaphthalene | 22 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | bis(2-Ethylhexyl)phthalate | 21 | 19 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | Naphthalene | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | Pentachlorophenol | 22 | 23 | -- | -- | -- | -- | -- | ND |
| CDM-31 | TPH | Diesel Range Hydrocarbons | 22 | 100 | 73 | 2.03 | 0.71 | 0.021 | 0.979 | Increasing |
| CDM-31 | TPH | Gasoline Range Hydrocarbons | 22 | 41 | -- | -- | -- | -- | -- | ND |
| CDM-31 | TPH | Motor Oil | 22 | 100 | 35 | 0.96 | 0.55 | 0.168 | 0.832 | No Trend |
| CDM-31 | VOC | 1,1,1-Trichloroethane | 18 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1,2-Trichloroethane | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1-Dichloroethane | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1-Dichloroethene | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,2,4-Trimethylbenzene | 22 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,2-Dichloroethane | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,4-Dichlorobenzene | 21 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Benzene | 22 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | cis-1,2-Dichloroethene | 18 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Ethylbenzene | 22 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | m,p-Xylene | 22 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Methylene Chloride | 22 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Tetrachloroethene | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Toluene | 22 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Trichloroethene | 18 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Vinyl Chloride | 22 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | 2-Methylnaphthalene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 25 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | Pentachlorophenol | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -6 | -- | 0.27 | 0.274 | 0.726 | Stable |
| DMW-04 | TPH | Gasoline Range Hydrocarbons | 8 | 13 | -- | -- | -- | -- | -- | ND |
| DMW-04 | TPH | Motor Oil | 8 | 100 | 1 | -- | 0.78 | (0.452, 0.548) | (0.452, 0.548) | No Trend |
| DMW-04 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,1-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Benzene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | cis-1,2-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Tetrachloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Trichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| DMW-04 | VOC | Vinyl Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | 2-Methylnaphthalene | 33 | 15 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | bis(2-Ethylhexyl)phthalate | 32 | 47 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | Naphthalene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | Pentachlorophenol | 33 | 9 | -- | -- | -- | -- | -- | ND |
| MW-01 | TPH | Diesel Range Hydrocarbons | 33 | 97 | -111 | -1.71 | 0.59 | 0.044 | 0.956 | Decreasing |
| MW-01 | TPH | Gasoline Range Hydrocarbons | 33 | 42 | -- | -- | -- | -- | -- | ND |
| MW-01 | TPH | Motor Oil | 33 | 97 | -117 | -1.80 | 0.93 | 0.036 | 0.964 | Decreasing |
| MW-01 | VOC | 1,1,1-Trichloroethane | 30 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,1,2-Trichloroethane | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,1-Dichloroethane | 33 | 12 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,1-Dichloroethene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,2,4-Trimethylbenzene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,2-Dichloroethane | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,4-Dichlorobenzene | 32 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Benzene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | cis-1,2-Dichloroethene | 30 | 40 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Ethylbenzene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | m,p-Xylene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Methylene Chloride | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Tetrachloroethene | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Toluene | 33 | 9 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Trichloroethene | 30 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Vinyl Chloride | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | 2-Methylnaphthalene | 33 | 12 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | bis(2-Ethylhexyl)phthalate | 33 | 52 | 74 | 1.21 | 1.72 | 0.114 | 0.886 | No Trend |
| MW-02 | SVOC | Naphthalene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | Pentachlorophenol | 33 | 12 | -- | -- | -- | -- | -- | ND |
| MW-02 | TPH | Diesel Range Hydrocarbons | 33 | 100 | -98 | -1.51 | 1.50 | 0.066 | 0.934 | Probably Decreasing |
| MW-02 | TPH | Gasoline Range Hydrocarbons | 33 | 42 | -- | -- | -- | -- | -- | ND |
| MW-02 | TPH | Motor Oil | 33 | 94 | -167 | -2.57 | 1.60 | 0.005 | 0.995 | Decreasing |
| MW-02 | VOC | 1,1,1-Trichloroethane | 26 | 4 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,1,2-Trichloroethane | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,1-Dichloroethane | 33 | 48 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,1-Dichloroethene | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,2,4-Trimethylbenzene | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,2-Dichloroethane | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,4-Dichlorobenzene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Benzene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | cis-1,2-Dichloroethene | 26 | 65 | 29 | 0.63 | 1.16 | 0.264 | 0.736 | No Trend |
| MW-02 | VOC | Ethylbenzene | 33 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | m,p-Xylene | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Methylene Chloride | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Tetrachloroethene | 33 | 15 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Toluene | 33 | 6 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Trichloroethene | 26 | 8 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Vinyl Chloride | 33 | 3 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | 2-Methylnaphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | Pentachlorophenol | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | TPH | Diesel Range Hydrocarbons | 10 | 90 | 10 | -- | 0.50 | (0.19, 0.242) | (0.758, 0.81) | No Trend |
| MW-03 | TPH | Gasoline Range Hydrocarbons | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-03 | TPH | Motor Oil | 10 | 100 | 8 | -- | 0.65 | (0.242, 0.3) | (0.7, 0.758) | No Trend |
| MW-03 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1-Dichloroethane | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,4-Dichlorobenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Benzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | cis-1,2-Dichloroethene | 8 | 38 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | m,p-Xylene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Tetrachloroethene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Toluene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Trichloroethene | 8 | 50 | -20 | -- | 0.73 | 0.007 | 0.993 | Decreasing |
| MW-03 | VOC | Vinyl Chloride | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 38 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | Pentachlorophenol | 8 | 25 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-05 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -8 | -- | 1.27 | 0.199 | 0.801 | No Trend |
| MW-05 | TPH | Gasoline Range Hydrocarbons | 8 | 38 | -- | -- | -- | -- | -- | ND |
| MW-05 | TPH | Motor Oil | 8 | 100 | -16 | -- | 1.05 | 0.031 | 0.969 | Decreasing |
| MW-05 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,1-Dichloroethane | 8 | 63 | -15 | -- | 1.59 | (0.031, 0.054) | (0.946, 0.969) | Probably Decreasing |
| MW-05 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Benzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | cis-1,2-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Tetrachloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Vinyl Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | 2-Methylnaphthalene | 25 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | bis(2-Ethylhexyl)phthalate | 24 | 8 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | Naphthalene | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | Pentachlorophenol | 25 | 20 | -- | -- | -- | -- | -- | ND |
| MW-07 | TPH | Diesel Range Hydrocarbons | 25 | 92 | 102 | 2.36 | 4.47 | 0.009 | 0.991 | Increasing |
| MW-07 | TPH | Gasoline Range Hydrocarbons | 25 | 52 | 33 | 0.80 | 4.87 | 0.213 | 0.787 | No Trend |
| MW-07 | TPH | Motor Oil | 25 | 96 | 9 | 0.19 | 0.69 | 0.426 | 0.574 | No Trend |
| MW-07 | VOC | 1,1,1-Trichloroethane | 21 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1,2-Trichloroethane | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1-Dichloroethane | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1-Dichloroethene | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,2,4-Trimethylbenzene | 25 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,2-Dichloroethane | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,4-Dichlorobenzene | 24 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Benzene | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | cis-1,2-Dichloroethene | 21 | 5 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Ethylbenzene | 25 | 8 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | m,p-Xylene | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Methylene Chloride | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Tetrachloroethene | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Toluene | 25 | 20 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Trichloroethene | 21 | 5 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Vinyl Chloride | 25 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | 2-Methylnaphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | bis(2-Ethylhexyl)phthalate | 8 | 25 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | Naphthalene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | Pentachlorophenol | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-08 | TPH | Diesel Range Hydrocarbons | 8 | 100 | -14 | -- | 0.56 | 0.054 | 0.946 | Probably Decreasing |
| MW-08 | TPH | Gasoline Range Hydrocarbons | 8 | 25 | -- | -- | -- | -- | -- | ND |
| MW-08 | TPH | Motor Oil | 8 | 75 | -11 | -- | 1.09 | (0.089, 0.138) | (0.862, 0.911) | No Trend |
| MW-08 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1,2-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1-Dichloroethane | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1-Dichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,2,4-Trimethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,2-Dichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,4-Dichlorobenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Benzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | cis-1,2-Dichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Ethylbenzene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | m,p-Xylene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Methylene Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Tetrachloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Toluene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Trichloroethene | 6 | 17 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Vinyl Chloride | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | 2-Methylnaphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | bis(2-Ethylhexyl)phthalate | 7 | 14 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | Naphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | Pentachlorophenol | 7 | 71 | 12 | -- | 0.68 | (0.035, 0.068) | (0.932, 0.965) | Probably Increasing |
| MW-10 | TPH | Diesel Range Hydrocarbons | 7 | 100 | 5 | -- | 0.25 | 0.281 | 0.719 | No Trend |
| MW-10 | TPH | Gasoline Range Hydrocarbons | 7 | 29 | -- | -- | -- | -- | -- | ND |
| MW-10 | TPH | Motor Oil | 7 | 100 | -9 | -- | 0.58 | 0.119 | 0.881 | Stable |
| MW-10 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-10 | VOC | 1,1-Dichloroethane | 7 | 57 | -14 | -- | 1.49 | (0.015, 0.035) | (0.965, 0.985) | Decreasing |
| MW-10 | VOC | 1,1-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,2,4-Trimethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | cis-1,2-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Ethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Toluene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Trichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Vinyl Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-11 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-11 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-11 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-IA | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | Naphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | Pentachlorophenol | 9 | 56 | 6 | -- | 0.97 | 0.306 | 0.694 | No Trend |
| P-IA | TPH | Diesel Range Hydrocarbons | 9 | 100 | -20 | -- | 0.72 | 0.022 | 0.978 | Decreasing |
| P-IA | TPH | Gasoline Range Hydrocarbons | 9 | 89 | -22 | -- | 0.60 | 0.012 | 0.988 | Decreasing |
| P-IA | TPH | Motor Oil | 9 | 100 | -12 | -- | 1.26 | 0.130 | 0.870 | No Trend |
| P-IA | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,1-Dichloroethane | 9 | 67 | -3 | -- | 1.23 | (0.381, 0.46) | (0.54, 0.619) | No Trend |
| P-IA | VOC | 1,1-Dichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,2,4-Trimethylbenzene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,4-Dichlorobenzene | 9 | 67 | -5 | -- | 0.77 | (0.306, 0.381) | (0.619, 0.694) | Stable |

**TABLE B2-B**
**MANN-KENDALL STATISTICS - 2009 TO 2021**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| P-IA | VOC | Benzene | 9 | 67 | -6 | -- | 0.94 | 0.306 | 0.694 | Stable |
| P-IA | VOC | cis-1,2-Dichloroethene | 9 | 78 | 1 | -- | 1.97 | (0.46, 0.54) | (0.46, 0.54) | No Trend |
| P-IA | VOC | Ethylbenzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | m,p-Xylene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Methylene Chloride | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Tetrachloroethene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Toluene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Trichloroethene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Vinyl Chloride | 9 | 56 | 0 | -- | 1.72 | 0.540 | 0.460 | No Trend |
| SP-04 | SVOC | 2-Methylnaphthalene | 62 | 6 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | bis(2-Ethylhexyl)phthalate | 61 | 33 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | Naphthalene | 62 | 6 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | Pentachlorophenol | 62 | 95 | -865 | -5.25 | 1.23 | 0.000 | 1.000 | Decreasing |
| SP-04 | TPH | Diesel Range Hydrocarbons | 62 | 100 | -912 | -5.54 | 0.94 | 0.000 | 1.000 | Decreasing |
| SP-04 | TPH | Gasoline Range Hydrocarbons | 62 | 44 | -- | -- | -- | -- | -- | ND |
| SP-04 | TPH | Motor Oil | 62 | 95 | -736 | -4.47 | 6.57 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | 1,1,1-Trichloroethane | 52 | 63 | 42 | 0.33 | 0.85 | 0.370 | 0.630 | No Trend |
| SP-04 | VOC | 1,1,2-Trichloroethane | 62 | 0 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,1-Dichloroethane | 62 | 97 | -638 | -3.87 | 0.95 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | 1,1-Dichloroethene | 62 | 19 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,2,4-Trimethylbenzene | 62 | 6 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,2-Dichloroethane | 62 | 2 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,4-Dichlorobenzene | 61 | 56 | -315 | -2.05 | 0.89 | 0.020 | 0.980 | Decreasing |
| SP-04 | VOC | Benzene | 62 | 45 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | cis-1,2-Dichloroethene | 52 | 100 | -575 | -4.53 | 0.99 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | Ethylbenzene | 62 | 2 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | m,p-Xylene | 62 | 15 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Methylene Chloride | 62 | 11 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Tetrachloroethene | 62 | 98 | -495 | -3.00 | 0.67 | 0.001 | 0.999 | Decreasing |
| SP-04 | VOC | Toluene | 62 | 10 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Trichloroethene | 52 | 100 | -606 | -4.78 | 0.79 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | Vinyl Chloride | 62 | 39 | -- | -- | -- | -- | -- | ND |
| SP-06 | SVOC | 2-Methylnaphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | SVOC | Naphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | TPH | Motor Oil | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,1-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,2,4-Trimethylbenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Benzene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | cis-1,2-Dichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Ethylbenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | m,p-Xylene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | Toluene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | Vinyl Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |

***Notes:***

% - percent

N = Total number of samples

Mann-Kendall (S) = Mann-Kendall test statistic

Z Statistic = Standardized Mann-Kendall S value based on the normal approximation (for sample sizes greater than 10)

COV - coefficient of variation calculated as the ratio of sample standard deviation to the sample mean

Probability = Probability associated with Mann-Kendall Hypothesis Test (i.e., *p* -value associated with the S/Z Statistic). For sample sizes N ≤10, if an exact p-value was not available, then a range for the p-value was provided as: (minimum p-value, maximum p-value), where the minimum and maximum p-values correspond to |S|-1 and |S|+1, respectively.

Concentration Trend = Indication of whether Mann-Kendall test can detect a trend, and if so, the direction of the trend is shown

-- = not calculated due to N<4 or > 50% detection frequency

ND, IS = Not analyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B3-A**
**MANN-KENDALL RESULTS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | 2-Methylnaphthalene | bis(2-Ethylhexyl)phthalate | Naphthalene | Pentachlorophenol | Diesel Range Hydrocarbons | Gasoline Range Hydrocarbon | Motor Oil | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | 1,1-Dichloroethane | 1,1-Dichloroethene | 1,2,4-Trimethylbenzene | 1,2-Dichloroethane | 1,4-Dichlorobenzene | Benzene | cis-1,2-Dichloroethene | Ethylbenzene | m,p-Xylene | Methylene Chloride | Tetrachloroethene | Toluene | Trichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | ND | ND | ND | ND | Stable | Decreasing | Stable | Decreasing | ND | No Trend | ND | Decreasing | ND | Decreasing | Decreasing | No Trend | Decreasing | Decreasing | ND | ND | Probably Decreasing | ND | No Trend |
| AGI-14 | ND | ND | ND | ND | Decreasing | Probably Decreasing | Decreasing | ND | ND | ND | ND | ND | ND | No Trend | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-19 | Decreasing | ND | Decreasing | Decreasing | Stable | Decreasing | No Trend | ND | ND | Decreasing | ND | Decreasing | ND | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | Decreasing | ND | Decreasing | Decreasing | Decreasing |
| AGI-21 | IS and ND | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS | IS |
| AGI-22 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS | IS | IS | IS | IS and ND | IS | IS | IS | IS | IS | IS |
| AGI-35 | IS | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS | IS | IS and ND | IS | IS and ND | IS | IS |
| AGI-36 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| AGI-37 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-41 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS |
| AGI-42 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| AGI-43 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| AGI-45 | ND | ND | ND | ND | No Trend | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| AGI-46 | ND | ND | ND | ND | Decreasing | ND | Decreasing | ND | ND | Decreasing | ND | ND | ND | ND | No Trend | Probably Decreasing | ND | ND | ND | ND | ND | ND | ND |
| B-01 | ND | ND | ND | No Trend | No Trend | No Trend | Stable | ND | ND | No Trend | ND | ND | ND | No Trend | Probably Increasing | No Trend | No Trend | ND | ND | ND | ND | ND | ND |
| B-02 | ND | ND | ND | ND | Probably Increasing | Increasing | No Trend | ND | ND | ND | ND | ND | ND | Increasing | Decreasing | ND | ND | ND | ND | ND | No Trend | ND | ND |
| B-08D | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| B-08S | IS and ND | IS and ND | ND | IS and ND | IS and ND | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-09 | ND | ND | ND | ND | Stable | ND | Stable | ND | ND | ND | ND | ND | ND | ND | Probably Decreasing | ND | ND | ND | ND | ND | ND | ND | Stable |
| B-11 | bably Decrea | ND | Decreasing | ND | Decreasing | Decreasing | Stable | ND | ND | ND | ND | Decreasing | ND | Decreasing | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND |
| B-12 | ND | ND | ND | ND | Decreasing | ND | Stable | ND | ND | No Trend | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-13 | ND | ND | ND | ND | No Trend | Decreasing | Increasing | ND | ND | ND | ND | Decreasing | ND | ND | Decreasing | ND | Decreasing | Decreasing | ND | ND | ND | ND | ND |
| B-15D | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| B-15S | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS |
| B-16D | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| B-16S | IS | IS | IS | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS | IS and ND | IS | IS | IS | IS and ND | IS | IS and ND | IS and ND |
| B-19 | ND | ND | ND | ND | No Trend | Decreasing | Stable | ND | ND | Decreasing | ND | Decreasing | ND | Decreasing | Decreasing | ND | Decreasing | Decreasing | ND | ND | Decreasing | ND | ND |
| B-20 | IS and ND | IS and ND | ND | IS and ND | IS | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND |
| B-21 | IS | IS and ND | No Trend | IS and ND | IS | IS | IS | ND | ND | ND | ND | No Trend | ND | Stable | Stable | ND | No Trend | No Trend | ND | ND | Stable | ND | ND |
| B-23 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| B-24 | ND | ND | ND | ND | Stable | ND | IS and ND | ND | ND | Stable | ND | ND | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | Stable |
| B-25 | ND | ND | Decreasing | ND | Decreasing | Stable | Probably Decreasing | ND | ND | Decreasing | ND | bably Decrea | ND | Stable | Probably Decreasing | ND | Decreasing | ND | ND | ND | Stable | ND | ND |
| B-26 | ND | ND | ND | ND | ND | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Stable | Stable |
| B-27 | IS and ND | IS and ND | ND | IS and ND | IS and ND | IS and ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | Increasing | ND | ND | ND | ND | ND | ND | Decreasing |
| B-28 | ND | ND | ND | ND | Increasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| B-29 | Decreasing | ND | Decreasing | Decreasing | Stable | No Trend | Stable | ND | ND | Decreasing | ND | Decreasing | ND | No Trend | Decreasing | ND | Decreasing | Decreasing | ND | ND | No Trend | ND | ND |
| B-30 | ND | ND | ND | Decreasing | Probably Decreasing | Decreasing | No Trend | ND | ND | No Trend | ND | Decreasing | ND | Decreasing | Decreasing | No Trend | Decreasing | ND | ND | ND | ND | Decreasing | No Trend |
| B-31D | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| CDM-10 | ND | ND | ND | ND | Probably Decreasing | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | Stable | ND | ND | ND |
| CDM-12 | ND | ND | ND | ND | No Trend | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-15 | ND | ND | ND | ND | No Trend | Decreasing | No Trend | ND | ND | No Trend | ND | ND | ND | No Trend | Decreasing | Probably Increasing | Decreasing | Decreasing | ND | ND | No Trend | ND | ND |
| CDM-16 | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS | IS |
| CDM-17 | ND | ND | ND | Decreasing | No Trend | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-19 | ND | ND | ND | ND | Decreasing | No Trend | Decreasing | ND | ND | ND | ND | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-20 | ND | ND | ND | ND | Decreasing | Decreasing | Decreasing | ND | ND | Decreasing | ND | Decreasing | ND | No Trend | Decreasing | ND | Decreasing | Decreasing | ND | ND | ND | ND | ND |
| CDM-21 | ND | ND | ND | ND | Probably Decreasing | ND | Stable | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-22 | Stable | Decreasing | ND | ND | Decreasing | Decreasing | Decreasing | ND | ND | ND | ND | Decreasing | ND | Decreasing | Decreasing | ND | Decreasing | ND | ND | ND | ND | ND | ND |
| CDM-26 | ND | No Trend | ND | ND | Stable | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| CDM-27 | ND | ND | ND | ND | ND | ND | IS and ND | ND | ND | ND | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | Stable |
| CDM-29 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| CDM-30 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| CDM-31 | ND | ND | ND | ND | Increasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| DMW-03 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| DMW-04 | ND | ND | ND | ND | Stable | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| LAI-P02 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| LAI-P03 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| MW-01 | ND | ND | ND | ND | Stable | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-02 | ND | Probably Increasing | ND | ND | Probably Decreasing | ND | Decreasing | ND | ND | Decreasing | ND | ND | ND | ND | ND | No Trend | ND | ND | ND | ND | ND | ND | ND |
| MW-03 | ND | ND | ND | ND | Probably Increasing | ND | Stable | ND | ND | ND | ND | ND | ND | ND | ND | Decreasing | ND | ND | ND | ND | ND | Decreasing | ND |
| MW-04 | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-05 | ND | ND | ND | ND | No Trend | ND | Probably Decreasing | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |

**TABLE B3-A**
**MANN-KENDALL RESULTS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | 2-Methylnaphthalene | bis(2-Ethylhexyl)phthalate | Naphthalene | Pentachlorophenol | Diesel Range Hydrocarbons | Gasoline Range Hydrocarbon | Motor Oil | 1,1,1-Trichloroethane | 1,1,2-Trichloroethane | 1,1-Dichloroethane | 1,1-Dichloroethene | 1,2,4-Trimethylbenzene | 1,2-Dichloroethane | 1,4-Dichlorobenzene | Benzene | cis-1,2-Dichloroethene | Ethylbenzene | m,p-Xylene | Methylene Chloride | Tetrachloroethene | Toluene | Trichloroethene | Vinyl Chloride |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-06 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS |
| MW-07 | ND | ND | ND | ND | Increasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-08 | ND | ND | ND | ND | Decreasing | ND | No Trend | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-09 | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS |
| MW-10 | ND | ND | ND | Increasing | Probably Increasing | ND | Stable | ND | ND | Decreasing | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| MW-11 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| MW-12 | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND |
| MW-14D | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| P-4B | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND | IS and ND |
| P-IA | ND | ND | ND | No Trend | Decreasing | Decreasing | No Trend | ND | ND | No Trend | ND | ND | ND | Stable | Stable | No Trend | ND | ND | ND | ND | ND | ND | No Trend |
| SP-04 | ND | ND | ND | Decreasing | Decreasing | ND | Decreasing | No Trend | ND | Decreasing | ND | ND | ND | Decreasing | Decreasing | Decreasing | ND | ND | ND | Stable | ND | Decreasing | ND |
| SP-05 | IS | IS | Stable | IS | IS | IS | IS | No Trend | ND | Stable | ND | Decreasing | ND | No Trend | Stable | Stable | Decreasing | Decreasing | ND | ND | Decreasing | ND | ND |
| SP-06 | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS | IS and ND | IS | IS | IS | IS | IS | IS and ND | IS and ND | IS | IS and ND | IS and ND |

***Notes:***
ND, IS = Not analyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | SVOC | 2-Methylnaphthalene | 30 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | bis(2-Ethylhexyl)phthalate | 29 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | Naphthalene | 30 | 43 | -- | -- | -- | -- | -- | ND |
| AGI-07 | SVOC | Pentachlorophenol | 30 | 23 | -- | -- | -- | -- | -- | ND |
| AGI-07 | TPH | Diesel Range Hydrocarbons | 30 | 100 | -33 | -0.57 | 0.55 | 0.284 | 0.716 | Stable |
| AGI-07 | TPH | Gasoline Range Hydrocarbons | 30 | 100 | -227 | -4.04 | 0.57 | 0.000 | 1.000 | Decreasing |
| AGI-07 | TPH | Motor Oil | 29 | 100 | -47 | -0.86 | 0.94 | 0.194 | 0.806 | Stable |
| AGI-07 | VOC | 1,1,1-Trichloroethane | 26 | 54 | -75 | -1.72 | 2.18 | 0.042 | 0.958 | Decreasing |
| AGI-07 | VOC | 1,1,2-Trichloroethane | 30 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,1-Dichloroethane | 30 | 93 | -47 | -0.82 | 1.40 | 0.206 | 0.794 | No Trend |
| AGI-07 | VOC | 1,1-Dichloroethene | 30 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,2,4-Trimethylbenzene | 30 | 83 | -310 | -5.53 | 1.21 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | 1,2-Dichloroethane | 30 | 37 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | 1,4-Dichlorobenzene | 29 | 90 | -186 | -3.48 | 2.31 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | Benzene | 30 | 77 | -262 | -4.69 | 0.92 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | cis-1,2-Dichloroethene | 26 | 73 | -23 | -0.49 | 1.76 | 0.312 | 0.688 | No Trend |
| AGI-07 | VOC | Ethylbenzene | 30 | 63 | -260 | -4.75 | 1.37 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | m,p-Xylene | 30 | 60 | -222 | -4.09 | 1.22 | 0.000 | 1.000 | Decreasing |
| AGI-07 | VOC | Methylene Chloride | 30 | 37 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Tetrachloroethene | 30 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Toluene | 30 | 73 | -92 | -1.64 | 2.04 | 0.050 | 0.950 | Probably Decreasing |
| AGI-07 | VOC | Trichloroethene | 26 | 42 | -- | -- | -- | -- | -- | ND |
| AGI-07 | VOC | Vinyl Chloride | 30 | 73 | -35 | -0.61 | 2.31 | 0.270 | 0.730 | No Trend |
| AGI-14 | SVOC | 2-Methylnaphthalene | 63 | 3 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | bis(2-Ethylhexyl)phthalate | 62 | 16 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | Naphthalene | 63 | 8 | -- | -- | -- | -- | -- | ND |
| AGI-14 | SVOC | Pentachlorophenol | 63 | 41 | -- | -- | -- | -- | -- | ND |
| AGI-14 | TPH | Diesel Range Hydrocarbons | 62 | 100 | -449 | -2.72 | 1.19 | 0.003 | 0.997 | Decreasing |
| AGI-14 | TPH | Gasoline Range Hydrocarbons | 62 | 61 | -260 | -1.62 | 2.93 | 0.052 | 0.948 | Probably Decreasing |
| AGI-14 | TPH | Motor Oil | 61 | 97 | -436 | -2.71 | 0.79 | 0.003 | 0.997 | Decreasing |
| AGI-14 | VOC | 1,1,1-Trichloroethane | 52 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1,2-Trichloroethane | 62 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1-Dichloroethane | 62 | 18 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,1-Dichloroethene | 62 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,2,4-Trimethylbenzene | 62 | 23 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,2-Dichloroethane | 62 | 3 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | 1,4-Dichlorobenzene | 62 | 58 | 32 | 0.20 | 1.38 | 0.422 | 0.578 | No Trend |
| AGI-14 | VOC | Benzene | 62 | 56 | -578 | -3.66 | 1.84 | 0.000 | 1.000 | Decreasing |
| AGI-14 | VOC | cis-1,2-Dichloroethene | 52 | 4 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Ethylbenzene | 62 | 10 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | m,p-Xylene | 62 | 18 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Methylene Chloride | 62 | 6 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Tetrachloroethene | 62 | 24 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Toluene | 62 | 24 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Trichloroethene | 52 | 2 | -- | -- | -- | -- | -- | ND |
| AGI-14 | VOC | Vinyl Chloride | 62 | 5 | -- | -- | -- | -- | -- | ND |
| AGI-19 | SVOC | 2-Methylnaphthalene | 10 | 80 | -26 | -- | 1.42 | (0.0083, 0.014) | (0.986, 0.9917) | Decreasing |
| AGI-19 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-19 | SVOC | Naphthalene | 10 | 80 | -24 | -- | 1.07 | (0.014, 0.023) | (0.977, 0.986) | Decreasing |
| AGI-19 | SVOC | Pentachlorophenol | 10 | 90 | -21 | -- | 1.62 | 0.036 | 0.964 | Decreasing |
| AGI-19 | TPH | Diesel Range Hydrocarbons | 10 | 100 | -14 | -- | 0.67 | (0.108, 0.146) | (0.854, 0.892) | Stable |
| AGI-19 | TPH | Gasoline Range Hydrocarbons | 10 | 100 | -31 | -- | 1.41 | 0.002 | 0.998 | Decreasing |
| AGI-19 | TPH | Motor Oil | 9 | 89 | 4 | -- | 0.60 | 0.381 | 0.619 | No Trend |
| AGI-19 | VOC | 1,1,1-Trichloroethane | 7 | 43 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,1-Dichloroethane | 10 | 100 | -41 | -- | 2.36 | 0.000 | 1.000 | Decreasing |
| AGI-19 | VOC | 1,1-Dichloroethene | 10 | 40 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,2,4-Trimethylbenzene | 10 | 100 | -31 | -- | 1.12 | 0.002 | 0.998 | Decreasing |
| AGI-19 | VOC | 1,2-Dichloroethane | 10 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | 1,4-Dichlorobenzene | 10 | 100 | -30 | -- | 0.69 | (0.0023, 0.0046) | (0.9954, 0.9977) | Decreasing |
| AGI-19 | VOC | Benzene | 10 | 100 | -28 | -- | 2.31 | (0.0046, 0.0083) | (0.9917, 0.9954) | Decreasing |
| AGI-19 | VOC | cis-1,2-Dichloroethene | 7 | 86 | -21 | -- | 2.44 | 0.000 | 1.000 | Decreasing |
| AGI-19 | VOC | Ethylbenzene | 10 | 100 | -37 | -- | 2.17 | 0.000 | 1.000 | Decreasing |
| AGI-19 | VOC | m,p-Xylene | 10 | 90 | -34 | -- | 1.56 | (0.00047, 0.0011) | (0.9989, 0.99953) | Decreasing |
| AGI-19 | VOC | Methylene Chloride | 10 | 50 | -31 | -- | 3.05 | 0.002 | 0.998 | Decreasing |
| AGI-19 | VOC | Tetrachloroethene | 10 | 40 | -- | -- | -- | -- | -- | ND |
| AGI-19 | VOC | Toluene | 10 | 100 | -39 | -- | 2.87 | 0.000 | 1.000 | Decreasing |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-19 | VOC | Trichloroethene | 7 | 71 | -18 | -- | 2.56 | (0.0014, 0.0054) | (0.9946, 0.9986) | Decreasing |
| AGI-19 | VOC | Vinyl Chloride | 10 | 70 | -22 | -- | 2.42 | (0.023, 0.036) | (0.964, 0.977) | Decreasing |
| AGI-21 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-21 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,2-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Benzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Methylene Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Toluene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Trichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-21 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | 1,1,1-Trichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-22 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | 1,2-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-22 | VOC | m,p-Xylene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Methylene Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Tetrachloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-22 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | 2-Methylnaphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | Naphthalene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,1-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | 1,2,4-Trimethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,2-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Benzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Ethylbenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-35 | VOC | Tetrachloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-35 | VOC | Trichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-35 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-36 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | 1,4-Dichlorobenzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Benzene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-36 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-36 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-36 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-37 | SVOC | 2-Methylnaphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | bis(2-Ethylhexyl)phthalate | 5 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | Naphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | SVOC | Pentachlorophenol | 4 | 25 | -- | -- | -- | -- | -- | ND |
| AGI-37 | TPH | Diesel Range Hydrocarbons | 5 | 80 | 2 | -- | 0.78 | 0.408 | 0.592 | No Trend |
| AGI-37 | TPH | Gasoline Range Hydrocarbons | 5 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | TPH | Motor Oil | 4 | 50 | -1 | -- | 0.15 | (0.375, 0.625) | (0.375, 0.625) | Stable |
| AGI-37 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1-Dichloroethane | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,1-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,2,4-Trimethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | cis-1,2-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Ethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Toluene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-37 | VOC | Vinyl Chloride | 7 | 14 | -- | -- | -- | -- | -- | ND |
| AGI-41 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | bis(2-Ethylhexyl)phthalate | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | TPH | Gasoline Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | 1,1-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| AGI-41 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-41 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-41 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-41 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-42 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,1-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | 1,1-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | cis-1,2-Dichloroethene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-42 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-42 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-43 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-43 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| AGI-43 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-43 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| AGI-43 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| AGI-45 | SVOC | 2-Methylnaphthalene | 14 | 7 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | bis(2-Ethylhexyl)phthalate | 14 | 29 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Naphthalene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | SVOC | Pentachlorophenol | 13 | 23 | -- | -- | -- | -- | -- | ND |
| AGI-45 | TPH | Diesel Range Hydrocarbons | 14 | 93 | 10 | 0.49 | 0.55 | 0.311 | 0.689 | No Trend |
| AGI-45 | TPH | Gasoline Range Hydrocarbons | 14 | 21 | -- | -- | -- | -- | -- | ND |
| AGI-45 | TPH | Motor Oil | 12 | 83 | 4 | 0.21 | 0.48 | 0.418 | 0.582 | No Trend |
| AGI-45 | VOC | 1,1,1-Trichloroethane | 12 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1,2-Trichloroethane | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethane | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,1-Dichloroethene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2,4-Trimethylbenzene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,2-Dichloroethane | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | 1,4-Dichlorobenzene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Benzene | 15 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| AGI-45 | VOC | cis-1,2-Dichloroethene | 12 | 8 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Ethylbenzene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | m,p-Xylene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Methylene Chloride | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Tetrachloroethene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Toluene | 15 | 7 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Trichloroethene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-45 | VOC | Vinyl Chloride | 15 | 20 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 22 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | Naphthalene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| AGI-46 | SVOC | Pentachlorophenol | 9 | 22 | -- | -- | -- | -- | -- | ND |
| AGI-46 | TPH | Diesel Range Hydrocarbons | 9 | 100 | -24 | -- | 0.45 | 0.006 | 0.994 | Decreasing |
| AGI-46 | TPH | Gasoline Range Hydrocarbons | 9 | 33 | -- | -- | -- | -- | -- | ND |
| AGI-46 | TPH | Motor Oil | 8 | 100 | -18 | -- | 0.74 | 0.016 | 0.984 | Decreasing |
| AGI-46 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,1-Dichloroethane | 9 | 67 | -33 | -- | 1.69 | (0.000025, 0.00012) | (0.99988, 0.999975) | Decreasing |
| AGI-46 | VOC | 1,1-Dichloroethene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | 1,4-Dichlorobenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Benzene | 9 | 56 | -10 | -- | 1.02 | 0.179 | 0.821 | No Trend |
| AGI-46 | VOC | cis-1,2-Dichloroethene | 6 | 67 | -10 | -- | 0.65 | (0.028, 0.068) | (0.932, 0.972) | Probably Decreasing |
| AGI-46 | VOC | Ethylbenzene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | m,p-Xylene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Methylene Chloride | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Tetrachloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Toluene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Trichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| AGI-46 | VOC | Vinyl Chloride | 9 | 44 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | 2-Methylnaphthalene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | Naphthalene | 11 | 27 | -- | -- | -- | -- | -- | ND |
| B-01 | SVOC | Pentachlorophenol | 11 | 64 | 17 | 1.28 | 1.04 | 0.100 | 0.900 | No Trend |
| B-01 | TPH | Diesel Range Hydrocarbons | 11 | 100 | 15 | 1.09 | 0.84 | 0.138 | 0.862 | No Trend |
| B-01 | TPH | Gasoline Range Hydrocarbons | 11 | 100 | 11 | 0.78 | 0.72 | 0.218 | 0.782 | No Trend |
| B-01 | TPH | Motor Oil | 11 | 100 | -1 | 0.00 | 0.85 | 0.500 | 0.500 | Stable |
| B-01 | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,1-Dichloroethane | 11 | 64 | -1 | 0.00 | 1.81 | 0.500 | 0.500 | No Trend |
| B-01 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,2,4-Trimethylbenzene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,2-Dichloroethane | 11 | 9 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | 1,4-Dichlorobenzene | 10 | 80 | 10 | -- | 0.53 | (0.19, 0.242) | (0.758, 0.81) | No Trend |
| B-01 | VOC | Benzene | 11 | 100 | 19 | 1.40 | 1.20 | 0.081 | 0.919 | Probably Increasing |
| B-01 | VOC | cis-1,2-Dichloroethene | 9 | 56 | 10 | -- | 1.12 | 0.179 | 0.821 | No Trend |
| B-01 | VOC | Ethylbenzene | 11 | 64 | 3 | 0.16 | 2.65 | 0.436 | 0.564 | No Trend |
| B-01 | VOC | m,p-Xylene | 11 | 36 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Tetrachloroethene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Toluene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Trichloroethene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| B-01 | VOC | Vinyl Chloride | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | 2-Methylnaphthalene | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | bis(2-Ethylhexyl)phthalate | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | Naphthalene | 16 | 38 | -- | -- | -- | -- | -- | ND |
| B-02 | SVOC | Pentachlorophenol | 14 | 7 | -- | -- | -- | -- | -- | ND |
| B-02 | TPH | Diesel Range Hydrocarbons | 14 | 93 | 26 | 1.37 | 0.65 | 0.085 | 0.915 | Probably Increasing |
| B-02 | TPH | Gasoline Range Hydrocarbons | 14 | 71 | 31 | 1.66 | 0.88 | 0.048 | 0.952 | Increasing |
| B-02 | TPH | Motor Oil | 12 | 83 | 16 | 1.03 | 0.65 | 0.151 | 0.849 | No Trend |
| B-02 | VOC | 1,1,1-Trichloroethane | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1,2-Trichloroethane | 16 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1-Dichloroethane | 16 | 6 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,1-Dichloroethene | 16 | 6 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2,4-Trimethylbenzene | 16 | 25 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | 1,2-Dichloroethane | 16 | 6 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-02 | VOC | 1,4-Dichlorobenzene | 16 | 50 | 46 | 2.18 | 1.20 | 0.015 | 0.985 | Increasing |
| B-02 | VOC | Benzene | 16 | 94 | -51 | -2.25 | 0.87 | 0.012 | 0.988 | Decreasing |
| B-02 | VOC | cis-1,2-Dichloroethene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Ethylbenzene | 16 | 6 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | m,p-Xylene | 16 | 25 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Methylene Chloride | 16 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Tetrachloroethene | 16 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Toluene | 16 | 56 | 27 | 1.23 | 1.89 | 0.110 | 0.890 | No Trend |
| B-02 | VOC | Trichloroethene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-02 | VOC | Vinyl Chloride | 16 | 25 | -- | -- | -- | -- | -- | ND |
| B-08D | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-08D | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-08D | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08D | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | SVOC | Naphthalene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-08S | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Diesel Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-08S | VOC | 1,1,1-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1,2-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,1-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,2,4-Trimethylbenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,2-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | 1,4-Dichlorobenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Benzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | cis-1,2-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Ethylbenzene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | m,p-Xylene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Methylene Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Tetrachloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Toluene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Trichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-08S | VOC | Vinyl Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | 2-Methylnaphthalene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | bis(2-Ethylhexyl)phthalate | 13 | 38 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | Naphthalene | 16 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | SVOC | Pentachlorophenol | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Diesel Range Hydrocarbons | 13 | 92 | -1 | 0.00 | 0.43 | 0.500 | 0.500 | Stable |
| B-09 | TPH | Gasoline Range Hydrocarbons | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-09 | TPH | Motor Oil | 11 | 82 | -2 | -0.08 | 0.53 | 0.469 | 0.531 | Stable |
| B-09 | VOC | 1,1,1-Trichloroethane | 12 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1,2-Trichloroethane | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethane | 15 | 27 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,1-Dichloroethene | 15 | 7 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-09 | VOC | 1,2,4-Trimethylbenzene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,2-Dichloroethane | 15 | 7 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | 1,4-Dichlorobenzene | 15 | 13 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Benzene | 15 | 80 | -30 | -1.44 | 0.68 | 0.075 | 0.925 | Probably Decreasing |
| B-09 | VOC | cis-1,2-Dichloroethene | 12 | 33 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Ethylbenzene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | m,p-Xylene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Methylene Chloride | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Tetrachloroethene | 15 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Toluene | 15 | 20 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Trichloroethene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| B-09 | VOC | Vinyl Chloride | 15 | 60 | -25 | -1.23 | 0.67 | 0.109 | 0.891 | Stable |
| B-11 | SVOC | 2-Methylnaphthalene | 12 | 67 | -24 | -1.61 | 1.26 | 0.054 | 0.946 | Probably Decreasing |
| B-11 | SVOC | bis(2-Ethylhexyl)phthalate | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-11 | SVOC | Naphthalene | 12 | 67 | -27 | -1.82 | 1.29 | 0.034 | 0.966 | Decreasing |
| B-11 | SVOC | Pentachlorophenol | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | TPH | Diesel Range Hydrocarbons | 13 | 100 | -44 | -2.62 | 1.28 | 0.004 | 0.996 | Decreasing |
| B-11 | TPH | Gasoline Range Hydrocarbons | 13 | 100 | -49 | -2.93 | 1.05 | 0.002 | 0.998 | Decreasing |
| B-11 | TPH | Motor Oil | 11 | 100 | -13 | -0.94 | 0.78 | 0.174 | 0.826 | Stable |
| B-11 | VOC | 1,1,1-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1,2-Trichloroethane | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1-Dichloroethane | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,1-Dichloroethene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,2,4-Trimethylbenzene | 12 | 67 | -56 | -3.85 | 1.54 | 0.000 | 1.000 | Decreasing |
| B-11 | VOC | 1,2-Dichloroethane | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | 1,4-Dichlorobenzene | 13 | 100 | -46 | -2.75 | 1.43 | 0.003 | 0.997 | Decreasing |
| B-11 | VOC | Benzene | 13 | 46 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | cis-1,2-Dichloroethene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Ethylbenzene | 12 | 67 | -36 | -2.45 | 1.28 | 0.007 | 0.993 | Decreasing |
| B-11 | VOC | m,p-Xylene | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Methylene Chloride | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Tetrachloroethene | 13 | 8 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Toluene | 13 | 46 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Trichloroethene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| B-11 | VOC | Vinyl Chloride | 13 | 15 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | 2-Methylnaphthalene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | bis(2-Ethylhexyl)phthalate | 12 | 25 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | Naphthalene | 14 | 21 | -- | -- | -- | -- | -- | ND |
| B-12 | SVOC | Pentachlorophenol | 12 | 25 | -- | -- | -- | -- | -- | ND |
| B-12 | TPH | Diesel Range Hydrocarbons | 12 | 100 | -35 | -2.34 | 0.45 | 0.010 | 0.990 | Decreasing |
| B-12 | TPH | Gasoline Range Hydrocarbons | 12 | 42 | -- | -- | -- | -- | -- | ND |
| B-12 | TPH | Motor Oil | 11 | 73 | -10 | -0.71 | 0.61 | 0.239 | 0.761 | Stable |
| B-12 | VOC | 1,1,1-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1,2-Trichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,1-Dichloroethane | 14 | 64 | 1 | 0.00 | 0.89 | 0.500 | 0.500 | No Trend |
| B-12 | VOC | 1,1-Dichloroethene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,2,4-Trimethylbenzene | 14 | 36 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,2-Dichloroethane | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | 1,4-Dichlorobenzene | 14 | 86 | -36 | -1.92 | 1.30 | 0.027 | 0.973 | Decreasing |
| B-12 | VOC | Benzene | 14 | 36 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | cis-1,2-Dichloroethene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Ethylbenzene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | m,p-Xylene | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Methylene Chloride | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Tetrachloroethene | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Toluene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Trichloroethene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-12 | VOC | Vinyl Chloride | 14 | 14 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | 2-Methylnaphthalene | 12 | 25 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | bis(2-Ethylhexyl)phthalate | 12 | 33 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | Naphthalene | 15 | 40 | -- | -- | -- | -- | -- | ND |
| B-13 | SVOC | Pentachlorophenol | 12 | 33 | -- | -- | -- | -- | -- | ND |
| B-13 | TPH | Diesel Range Hydrocarbons | 11 | 100 | 13 | 0.93 | 0.81 | 0.175 | 0.825 | No Trend |
| B-13 | TPH | Gasoline Range Hydrocarbons | 11 | 100 | -29 | -2.18 | 1.74 | 0.015 | 0.985 | Decreasing |
| B-13 | TPH | Motor Oil | 9 | 100 | 24 | -- | 0.85 | 0.006 | 0.994 | Increasing |
| B-13 | VOC | 1,1,1-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1,2-Trichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-13 | VOC | 1,1-Dichloroethane | 14 | 43 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,1-Dichloroethene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,2,4-Trimethylbenzene | 14 | 86 | -58 | -3.13 | 1.77 | 0.001 | 0.999 | Decreasing |
| B-13 | VOC | 1,2-Dichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | 1,4-Dichlorobenzene | 14 | 43 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Benzene | 14 | 86 | -46 | -2.47 | 1.52 | 0.007 | 0.993 | Decreasing |
| B-13 | VOC | cis-1,2-Dichloroethene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Ethylbenzene | 14 | 71 | -54 | -2.96 | 1.58 | 0.002 | 0.998 | Decreasing |
| B-13 | VOC | m,p-Xylene | 14 | 50 | -64 | -3.70 | 1.90 | 0.000 | 1.000 | Decreasing |
| B-13 | VOC | Methylene Chloride | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Tetrachloroethene | 14 | 21 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Toluene | 14 | 36 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Trichloroethene | 11 | 27 | -- | -- | -- | -- | -- | ND |
| B-13 | VOC | Vinyl Chloride | 14 | 29 | -- | -- | -- | -- | -- | ND |
| B-15D | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | Naphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-15D | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-15D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1,1-Trichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,2,4-Trimethylbenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,2-Dichloroethane | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | cis-1,2-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | m,p-Xylene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Toluene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15D | VOC | Trichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15D | VOC | Vinyl Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | Naphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | SVOC | Pentachlorophenol | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-15S | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | TPH | Gasoline Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,1-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | 1,1-Dichloroethene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,2,4-Trimethylbenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | 1,2-Dichloroethane | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | 1,4-Dichlorobenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Benzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | cis-1,2-Dichloroethene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Methylene Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-15S | VOC | Toluene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Trichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-15S | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16D | SVOC | Naphthalene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-16D | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,2,4-Trimethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | 1,4-Dichlorobenzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | cis-1,2-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Ethylbenzene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Toluene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16D | VOC | Vinyl Chloride | 3 | 67 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | 2-Methylnaphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | Naphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,2,4-Trimethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | 1,4-Dichlorobenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Benzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Ethylbenzene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | m,p-Xylene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Methylene Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Toluene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-16S | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-16S | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-19 | SVOC | 2-Methylnaphthalene | 75 | 9 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | bis(2-Ethylhexyl)phthalate | 74 | 16 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | Naphthalene | 77 | 39 | -- | -- | -- | -- | -- | ND |
| B-19 | SVOC | Pentachlorophenol | 75 | 16 | -- | -- | -- | -- | -- | ND |
| B-19 | TPH | Diesel Range Hydrocarbons | 75 | 100 | 220 | 1.00 | 0.50 | 0.158 | 0.842 | No Trend |
| B-19 | TPH | Gasoline Range Hydrocarbons | 74 | 100 | -1166 | -5.44 | 1.38 | 0.000 | 1.000 | Decreasing |
| B-19 | TPH | Motor Oil | 73 | 100 | -236 | -1.12 | 0.59 | 0.131 | 0.869 | Stable |
| B-19 | VOC | 1,1,1-Trichloroethane | 67 | 6 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,1,2-Trichloroethane | 77 | 1 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,1-Dichloroethane | 77 | 71 | -743 | -3.30 | 4.33 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | 1,1-Dichloroethene | 77 | 6 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,2,4-Trimethylbenzene | 77 | 79 | -1949 | -8.61 | 2.79 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | 1,2-Dichloroethane | 77 | 35 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | 1,4-Dichlorobenzene | 76 | 78 | -886 | -4.00 | 0.94 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Benzene | 77 | 91 | -1134 | -4.99 | 0.91 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | cis-1,2-Dichloroethene | 67 | 31 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Ethylbenzene | 77 | 79 | -1583 | -6.99 | 2.18 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | m,p-Xylene | 77 | 58 | -1706 | -7.79 | 3.40 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Methylene Chloride | 77 | 38 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Tetrachloroethene | 77 | 3 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Toluene | 77 | 66 | -1330 | -5.97 | 3.75 | 0.000 | 1.000 | Decreasing |
| B-19 | VOC | Trichloroethene | 67 | 12 | -- | -- | -- | -- | -- | ND |
| B-19 | VOC | Vinyl Chloride | 77 | 26 | -- | -- | -- | -- | -- | ND |
| B-20 | SVOC | 2-Methylnaphthalene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | SVOC | Naphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-20 | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-20 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,2-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Benzene | 5 | 100 | -2 | -- | 0.64 | 0.408 | 0.592 | Stable |
| B-20 | VOC | cis-1,2-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Methylene Chloride | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Tetrachloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Toluene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-20 | VOC | Vinyl Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-21 | SVOC | 2-Methylnaphthalene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-21 | SVOC | Naphthalene | 4 | 100 | 2 | -- | 0.45 | 0.375 | 0.625 | No Trend |
| B-21 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-21 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-21 | TPH | Motor Oil | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-21 | VOC | 1,1,1-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1,2-Trichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,1-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,2,4-Trimethylbenzene | 4 | 100 | 2 | -- | 0.22 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | 1,2-Dichloroethane | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | 1,4-Dichlorobenzene | 4 | 100 | 0 | -- | 0.22 | 0.625 | 0.375 | Stable |
| B-21 | VOC | Benzene | 4 | 100 | 0 | -- | 0.54 | 0.625 | 0.375 | Stable |
| B-21 | VOC | cis-1,2-Dichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Ethylbenzene | 4 | 100 | 2 | -- | 0.35 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | m,p-Xylene | 4 | 100 | 2 | -- | 0.30 | 0.375 | 0.625 | No Trend |
| B-21 | VOC | Methylene Chloride | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Tetrachloroethene | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Toluene | 4 | 100 | -4 | -- | 0.55 | 0.167 | 0.833 | Stable |
| B-21 | VOC | Trichloroethene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-21 | VOC | Vinyl Chloride | 4 | 25 | -- | -- | -- | -- | -- | ND |
| B-23 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,1-Dichloroethane | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-23 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-23 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| B-24 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | SVOC | Naphthalene | 5 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-24 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | TPH | Diesel Range Hydrocarbons | 4 | 50 | -1 | -- | 0.62 | (0.375, 0.625) | (0.375, 0.625) | Stable |
| B-24 | TPH | Gasoline Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-24 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,1-Dichloroethane | 5 | 60 | -3 | -- | 0.22 | (0.242, 0.408) | (0.592, 0.758) | Stable |
| B-24 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,2-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Benzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | cis-1,2-Dichloroethene | 5 | 80 | -9 | -- | 0.30 | (0.0083, 0.042) | (0.958, 0.9917) | Decreasing |
| B-24 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Methylene Chloride | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Tetrachloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Toluene | 5 | 40 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-24 | VOC | Vinyl Chloride | 5 | 80 | -2 | -- | 0.69 | 0.408 | 0.592 | Stable |
| B-25 | SVOC | 2-Methylnaphthalene | 12 | 42 | -- | -- | -- | -- | -- | ND |
| B-25 | SVOC | bis(2-Ethylhexyl)phthalate | 13 | 23 | -- | -- | -- | -- | -- | ND |
| B-25 | SVOC | Naphthalene | 12 | 75 | -40 | -2.70 | 0.66 | 0.003 | 0.997 | Decreasing |
| B-25 | SVOC | Pentachlorophenol | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | TPH | Diesel Range Hydrocarbons | 13 | 100 | -68 | -4.10 | 0.57 | 0.000 | 1.000 | Decreasing |
| B-25 | TPH | Gasoline Range Hydrocarbons | 13 | 100 | -11 | -0.61 | 0.37 | 0.270 | 0.730 | Stable |
| B-25 | TPH | Motor Oil | 11 | 100 | -20 | -1.48 | 0.58 | 0.069 | 0.931 | Probably Decreasing |
| B-25 | VOC | 1,1,1-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,1,2-Trichloroethane | 13 | 8 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,1-Dichloroethane | 13 | 62 | -37 | -2.27 | 1.21 | 0.012 | 0.988 | Decreasing |
| B-25 | VOC | 1,1-Dichloroethene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,2,4-Trimethylbenzene | 12 | 83 | -23 | -1.51 | 2.04 | 0.065 | 0.935 | Probably Decreasing |
| B-25 | VOC | 1,2-Dichloroethane | 13 | 15 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | 1,4-Dichlorobenzene | 13 | 92 | -1 | 0.00 | 0.45 | 0.500 | 0.500 | Stable |
| B-25 | VOC | Benzene | 13 | 100 | -24 | -1.41 | 0.83 | 0.079 | 0.921 | Probably Decreasing |
| B-25 | VOC | cis-1,2-Dichloroethene | 11 | 45 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Ethylbenzene | 12 | 50 | -25 | -1.77 | 1.38 | 0.039 | 0.961 | Decreasing |
| B-25 | VOC | m,p-Xylene | 13 | 38 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Methylene Chloride | 13 | 8 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Tetrachloroethene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Toluene | 13 | 100 | -12 | -0.67 | 0.47 | 0.250 | 0.750 | Stable |
| B-25 | VOC | Trichloroethene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| B-25 | VOC | Vinyl Chloride | 13 | 46 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | Naphthalene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Diesel Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Gasoline Range Hydrocarbons | 4 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-26 | VOC | 1,1,1-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1,2-Trichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,1-Dichloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,2-Dichloroethane | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | 1,4-Dichlorobenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Benzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | cis-1,2-Dichloroethene | 6 | 33 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | m,p-Xylene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Methylene Chloride | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Tetrachloroethene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Toluene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| B-26 | VOC | Trichloroethene | 6 | 50 | -3 | -- | 0.73 | 0.360 | 0.640 | Stable |
| B-26 | VOC | Vinyl Chloride | 6 | 67 | -4 | -- | 0.76 | (0.235, 0.36) | (0.64, 0.765) | Stable |
| B-27 | SVOC | 2-Methylnaphthalene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-27 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | SVOC | Naphthalene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-27 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Diesel Range Hydrocarbons | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Gasoline Range Hydrocarbons | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-27 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,1-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,2,4-Trimethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,2-Dichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | 1,4-Dichlorobenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Benzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | cis-1,2-Dichloroethene | 5 | 100 | 9 | -- | 0.33 | (0.0083, 0.042) | (0.958, 0.9917) | Increasing |
| B-27 | VOC | Ethylbenzene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | m,p-Xylene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Methylene Chloride | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Tetrachloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Toluene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| B-27 | VOC | Vinyl Chloride | 5 | 100 | -8 | -- | 0.29 | 0.042 | 0.958 | Decreasing |
| B-28 | SVOC | 2-Methylnaphthalene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | bis(2-Ethylhexyl)phthalate | 13 | 46 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | Naphthalene | 14 | 7 | -- | -- | -- | -- | -- | ND |
| B-28 | SVOC | Pentachlorophenol | 13 | 8 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Diesel Range Hydrocarbons | 13 | 69 | 29 | 1.74 | 0.32 | 0.041 | 0.959 | Increasing |
| B-28 | TPH | Gasoline Range Hydrocarbons | 13 | 15 | -- | -- | -- | -- | -- | ND |
| B-28 | TPH | Motor Oil | 11 | 55 | 13 | 0.99 | 1.03 | 0.162 | 0.838 | No Trend |
| B-28 | VOC | 1,1,1-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1,2-Trichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,1-Dichloroethene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2,4-Trimethylbenzene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,2-Dichloroethane | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | 1,4-Dichlorobenzene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Benzene | 14 | 7 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | cis-1,2-Dichloroethene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Ethylbenzene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | m,p-Xylene | 14 | 7 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Methylene Chloride | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Tetrachloroethene | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Toluene | 14 | 7 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Trichloroethene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| B-28 | VOC | Vinyl Chloride | 14 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | SVOC | 2-Methylnaphthalene | 31 | 58 | -214 | -3.77 | 2.03 | 0.000 | 1.000 | Decreasing |
| B-29 | SVOC | bis(2-Ethylhexyl)phthalate | 30 | 17 | -- | -- | -- | -- | -- | ND |
| B-29 | SVOC | Naphthalene | 31 | 84 | -157 | -2.66 | 0.99 | 0.004 | 0.996 | Decreasing |
| B-29 | SVOC | Pentachlorophenol | 31 | 58 | -163 | -2.87 | 1.51 | 0.002 | 0.998 | Decreasing |
| B-29 | TPH | Diesel Range Hydrocarbons | 31 | 100 | -48 | -0.80 | 0.38 | 0.211 | 0.789 | Stable |
| B-29 | TPH | Gasoline Range Hydrocarbons | 31 | 100 | -30 | -0.49 | 1.03 | 0.311 | 0.689 | No Trend |
| B-29 | TPH | Motor Oil | 30 | 100 | -41 | -0.71 | 0.85 | 0.238 | 0.762 | Stable |
| B-29 | VOC | 1,1,1-Trichloroethane | 26 | 4 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,1,2-Trichloroethane | 31 | 0 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,1-Dichloroethane | 31 | 74 | -227 | -3.88 | 1.41 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | 1,1-Dichloroethene | 31 | 3 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,2,4-Trimethylbenzene | 31 | 87 | -179 | -3.03 | 1.53 | 0.001 | 0.999 | Decreasing |
| B-29 | VOC | 1,2-Dichloroethane | 31 | 6 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | 1,4-Dichlorobenzene | 30 | 97 | -1 | 0.00 | 1.10 | 0.500 | 0.500 | No Trend |
| B-29 | VOC | Benzene | 31 | 81 | -261 | -4.44 | 0.48 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | cis-1,2-Dichloroethene | 26 | 46 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Ethylbenzene | 31 | 55 | -146 | -2.59 | 1.30 | 0.005 | 0.995 | Decreasing |
| B-29 | VOC | m,p-Xylene | 31 | 65 | -218 | -3.78 | 2.64 | 0.000 | 1.000 | Decreasing |
| B-29 | VOC | Methylene Chloride | 31 | 39 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Tetrachloroethene | 31 | 10 | -- | -- | -- | -- | -- | ND |
| B-29 | VOC | Toluene | 31 | 68 | -46 | -0.78 | 1.46 | 0.218 | 0.782 | No Trend |
| B-29 | VOC | Trichloroethene | 26 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| B-29 | VOC | Vinyl Chloride | 31 | 39 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | 2-Methylnaphthalene | 34 | 24 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | bis(2-Ethylhexyl)phthalate | 33 | 12 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | Naphthalene | 36 | 25 | -- | -- | -- | -- | -- | ND |
| B-30 | SVOC | Pentachlorophenol | 34 | 50 | -124 | -1.95 | 2.79 | 0.025 | 0.975 | Decreasing |
| B-30 | TPH | Diesel Range Hydrocarbons | 33 | 100 | -102 | -1.57 | 2.56 | 0.059 | 0.941 | Probably Decreasing |
| B-30 | TPH | Gasoline Range Hydrocarbons | 33 | 100 | -246 | -3.81 | 1.70 | 0.000 | 1.000 | Decreasing |
| B-30 | TPH | Motor Oil | 31 | 97 | -27 | -0.44 | 3.26 | 0.329 | 0.671 | No Trend |
| B-30 | VOC | 1,1,1-Trichloroethane | 31 | 0 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1,2-Trichloroethane | 36 | 3 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,1-Dichloroethane | 36 | 72 | 11 | 0.14 | 2.44 | 0.445 | 0.555 | No Trend |
| B-30 | VOC | 1,1-Dichloroethene | 36 | 6 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,2,4-Trimethylbenzene | 36 | 64 | -420 | -5.85 | 2.46 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | 1,2-Dichloroethane | 36 | 8 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | 1,4-Dichlorobenzene | 35 | 66 | -205 | -2.96 | 3.31 | 0.002 | 0.998 | Decreasing |
| B-30 | VOC | Benzene | 36 | 67 | -437 | -6.06 | 2.41 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | cis-1,2-Dichloroethene | 31 | 81 | -69 | -1.16 | 2.16 | 0.123 | 0.877 | No Trend |
| B-30 | VOC | Ethylbenzene | 36 | 64 | -404 | -5.63 | 2.61 | 0.000 | 1.000 | Decreasing |
| B-30 | VOC | m,p-Xylene | 36 | 25 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Methylene Chloride | 36 | 6 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Tetrachloroethene | 36 | 47 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Toluene | 36 | 39 | -- | -- | -- | -- | -- | ND |
| B-30 | VOC | Trichloroethene | 31 | 58 | -111 | -1.95 | 2.01 | 0.026 | 0.974 | Decreasing |
| B-30 | VOC | Vinyl Chloride | 36 | 64 | 6 | 0.07 | 1.78 | 0.472 | 0.528 | No Trend |
| B-31D | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | SVOC | Pentachlorophenol | 2 | 100 | -- | -- | -- | -- | -- | IS |
| B-31D | TPH | Diesel Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| B-31D | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| B-31D | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-10 | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | Naphthalene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-10 | SVOC | Pentachlorophenol | 9 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-10 | TPH | Diesel Range Hydrocarbons | 9 | 100 | -17 | -- | 1.26 | (0.038, 0.06) | (0.94, 0.962) | Probably Decreasing |
| CDM-10 | TPH | Gasoline Range Hydrocarbons | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-10 | TPH | Motor Oil | 8 | 100 | -3 | -- | 0.72 | (0.36, 0.452) | (0.548, 0.64) | Stable |
| CDM-10 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1-Dichloroethane | 9 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,1-Dichloroethene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,2-Dichloroethane | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | 1,4-Dichlorobenzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Benzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | cis-1,2-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Ethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | m,p-Xylene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Methylene Chloride | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Tetrachloroethene | 9 | 100 | -4 | -- | 0.35 | 0.381 | 0.619 | Stable |

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-10 | VOC | Toluene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Trichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-10 | VOC | Vinyl Chloride | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | 2-Methylnaphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | bis(2-Ethylhexyl)phthalate | 7 | 43 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | Naphthalene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | SVOC | Pentachlorophenol | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | TPH | Diesel Range Hydrocarbons | 7 | 86 | 5 | -- | 0.53 | 0.281 | 0.719 | No Trend |
| CDM-12 | TPH | Gasoline Range Hydrocarbons | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-12 | TPH | Motor Oil | 7 | 100 | -1 | -- | 0.46 | 0.500 | 0.500 | Stable |
| CDM-12 | VOC | 1,1,1-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1-Dichloroethane | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,1-Dichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,2,4-Trimethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | cis-1,2-Dichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Ethylbenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Toluene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Trichloroethene | 5 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-12 | VOC | Vinyl Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | 2-Methylnaphthalene | 12 | 17 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | bis(2-Ethylhexyl)phthalate | 12 | 17 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | Naphthalene | 12 | 17 | -- | -- | -- | -- | -- | ND |
| CDM-15 | SVOC | Pentachlorophenol | 12 | 42 | -- | -- | -- | -- | -- | ND |
| CDM-15 | TPH | Diesel Range Hydrocarbons | 12 | 100 | 9 | 0.55 | 1.31 | 0.291 | 0.709 | No Trend |
| CDM-15 | TPH | Gasoline Range Hydrocarbons | 12 | 92 | -26 | -1.72 | 0.70 | 0.042 | 0.958 | Decreasing |
| CDM-15 | TPH | Motor Oil | 11 | 100 | 16 | 1.18 | 0.93 | 0.119 | 0.881 | No Trend |
| CDM-15 | VOC | 1,1,1-Trichloroethane | 9 | 11 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,1,2-Trichloroethane | 12 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,1-Dichloroethane | 12 | 58 | -4 | -0.21 | 1.11 | 0.415 | 0.585 | No Trend |
| CDM-15 | VOC | 1,1-Dichloroethene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,2,4-Trimethylbenzene | 12 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,2-Dichloroethane | 12 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | 1,4-Dichlorobenzene | 12 | 92 | 8 | 0.48 | 0.81 | 0.316 | 0.684 | No Trend |
| CDM-15 | VOC | Benzene | 12 | 75 | -34 | -2.29 | 0.92 | 0.011 | 0.989 | Decreasing |
| CDM-15 | VOC | cis-1,2-Dichloroethene | 9 | 56 | 16 | -- | 1.23 | 0.060 | 0.940 | Probably Increasing |
| CDM-15 | VOC | Ethylbenzene | 12 | 58 | -38 | -2.64 | 1.22 | 0.004 | 0.996 | Decreasing |
| CDM-15 | VOC | m,p-Xylene | 12 | 58 | -49 | -3.44 | 2.09 | 0.000 | 1.000 | Decreasing |
| CDM-15 | VOC | Methylene Chloride | 12 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Tetrachloroethene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Toluene | 12 | 50 | -17 | -1.18 | 1.01 | 0.119 | 0.881 | No Trend |
| CDM-15 | VOC | Trichloroethene | 9 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-15 | VOC | Vinyl Chloride | 12 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-16 | SVOC | 2-Methylnaphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | SVOC | Naphthalene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,1-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | 1,4-Dichlorobenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Benzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | m,p-Xylene | 2 | 50 | -- | -- | -- | -- | -- | IS |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-16 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-16 | VOC | Trichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-16 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-17 | SVOC | 2-Methylnaphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | SVOC | Pentachlorophenol | 10 | 60 | -24 | -- | 1.59 | (0.014, 0.023) | (0.977, 0.986) | Decreasing |
| CDM-17 | TPH | Diesel Range Hydrocarbons | 9 | 100 | -12 | -- | 1.72 | 0.130 | 0.870 | No Trend |
| CDM-17 | TPH | Gasoline Range Hydrocarbons | 10 | 40 | -- | -- | -- | -- | -- | ND |
| CDM-17 | TPH | Motor Oil | 8 | 100 | -5 | -- | 1.34 | (0.274, 0.36) | (0.64, 0.726) | No Trend |
| CDM-17 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1-Dichloroethane | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,1-Dichloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,2-Dichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | 1,4-Dichlorobenzene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Benzene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | cis-1,2-Dichloroethene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | m,p-Xylene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Tetrachloroethene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Toluene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-17 | VOC | Vinyl Chloride | 10 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | 2-Methylnaphthalene | 64 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | bis(2-Ethylhexyl)phthalate | 63 | 2 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | Naphthalene | 64 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | SVOC | Pentachlorophenol | 64 | 39 | -- | -- | -- | -- | -- | ND |
| CDM-19 | TPH | Diesel Range Hydrocarbons | 64 | 100 | -511 | -2.96 | 0.96 | 0.002 | 0.998 | Decreasing |
| CDM-19 | TPH | Gasoline Range Hydrocarbons | 64 | 92 | 43 | 0.24 | 1.21 | 0.404 | 0.596 | No Trend |
| CDM-19 | TPH | Motor Oil | 63 | 100 | -522 | -3.09 | 0.76 | 0.001 | 0.999 | Decreasing |
| CDM-19 | VOC | 1,1,1-Trichloroethane | 53 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1,2-Trichloroethane | 64 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1-Dichloroethane | 64 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,1-Dichloroethene | 64 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,2,4-Trimethylbenzene | 64 | 19 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,2-Dichloroethane | 64 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | 1,4-Dichlorobenzene | 63 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Benzene | 64 | 72 | -643 | -3.76 | 1.76 | 0.000 | 1.000 | Decreasing |
| CDM-19 | VOC | cis-1,2-Dichloroethene | 53 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Ethylbenzene | 64 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | m,p-Xylene | 64 | 8 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Methylene Chloride | 64 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Tetrachloroethene | 64 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Toluene | 64 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Trichloroethene | 53 | 2 | -- | -- | -- | -- | -- | ND |
| CDM-19 | VOC | Vinyl Chloride | 64 | 3 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | 2-Methylnaphthalene | 34 | 18 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | bis(2-Ethylhexyl)phthalate | 33 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | Naphthalene | 34 | 41 | -- | -- | -- | -- | -- | ND |
| CDM-20 | SVOC | Pentachlorophenol | 34 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-20 | TPH | Diesel Range Hydrocarbons | 33 | 100 | -347 | -5.36 | 0.90 | 0.000 | 1.000 | Decreasing |
| CDM-20 | TPH | Gasoline Range Hydrocarbons | 34 | 100 | -349 | -5.16 | 1.22 | 0.000 | 1.000 | Decreasing |
| CDM-20 | TPH | Motor Oil | 32 | 97 | -165 | -2.66 | 0.77 | 0.004 | 0.996 | Decreasing |
| CDM-20 | VOC | 1,1,1-Trichloroethane | 29 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,1,2-Trichloroethane | 34 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,1-Dichloroethane | 34 | 76 | -307 | -4.57 | 3.23 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | 1,1-Dichloroethene | 34 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,2,4-Trimethylbenzene | 34 | 50 | -310 | -4.91 | 1.94 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | 1,2-Dichloroethane | 34 | 21 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | 1,4-Dichlorobenzene | 33 | 91 | 80 | 1.23 | 0.51 | 0.110 | 0.890 | No Trend |
| CDM-20 | VOC | Benzene | 34 | 100 | -266 | -3.93 | 1.06 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | cis-1,2-Dichloroethene | 29 | 41 | -- | -- | -- | -- | -- | ND |

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**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-20 | VOC | Ethylbenzene | 34 | 50 | -376 | -5.96 | 2.05 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | m,p-Xylene | 34 | 50 | -309 | -4.90 | 1.91 | 0.000 | 1.000 | Decreasing |
| CDM-20 | VOC | Methylene Chloride | 34 | 21 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Tetrachloroethene | 34 | 6 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Toluene | 34 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Trichloroethene | 29 | 31 | -- | -- | -- | -- | -- | ND |
| CDM-20 | VOC | Vinyl Chloride | 34 | 35 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | 2-Methylnaphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 40 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | Naphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-21 | SVOC | Pentachlorophenol | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-21 | TPH | Diesel Range Hydrocarbons | 10 | 100 | -20 | -- | 0.95 | (0.036, 0.054) | (0.946, 0.964) | Probably Decreasing |
| CDM-21 | TPH | Gasoline Range Hydrocarbons | 10 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-21 | TPH | Motor Oil | 9 | 100 | -9 | -- | 0.78 | (0.179, 0.238) | (0.762, 0.821) | Stable |
| CDM-21 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,1-Dichloroethane | 10 | 90 | -6 | -- | 1.87 | (0.3, 0.364) | (0.636, 0.7) | No Trend |
| CDM-21 | VOC | 1,1-Dichloroethene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,2-Dichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | 1,4-Dichlorobenzene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Benzene | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | cis-1,2-Dichloroethene | 7 | 43 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | m,p-Xylene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Tetrachloroethene | 10 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Toluene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Trichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-21 | VOC | Vinyl Chloride | 10 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-22 | SVOC | 2-Methylnaphthalene | 27 | 78 | -39 | -0.80 | 0.73 | 0.212 | 0.788 | Stable |
| CDM-22 | SVOC | bis(2-Ethylhexyl)phthalate | 26 | 65 | -143 | -3.20 | 1.05 | 0.001 | 0.999 | Decreasing |
| CDM-22 | SVOC | Naphthalene | 27 | 33 | -- | -- | -- | -- | -- | ND |
| CDM-22 | SVOC | Pentachlorophenol | 27 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | TPH | Diesel Range Hydrocarbons | 27 | 100 | -149 | -3.09 | 0.85 | 0.001 | 0.999 | Decreasing |
| CDM-22 | TPH | Gasoline Range Hydrocarbons | 27 | 96 | -89 | -1.85 | 3.52 | 0.032 | 0.968 | Decreasing |
| CDM-22 | TPH | Motor Oil | 26 | 100 | -135 | -2.96 | 0.80 | 0.002 | 0.998 | Decreasing |
| CDM-22 | VOC | 1,1,1-Trichloroethane | 23 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1,2-Trichloroethane | 27 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1-Dichloroethane | 27 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,1-Dichloroethene | 27 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,2,4-Trimethylbenzene | 27 | 56 | -228 | -4.97 | 1.22 | 0.000 | 1.000 | Decreasing |
| CDM-22 | VOC | 1,2-Dichloroethane | 27 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | 1,4-Dichlorobenzene | 26 | 100 | -108 | -2.36 | 0.36 | 0.009 | 0.991 | Decreasing |
| CDM-22 | VOC | Benzene | 27 | 85 | -159 | -3.31 | 0.50 | 0.000 | 1.000 | Decreasing |
| CDM-22 | VOC | cis-1,2-Dichloroethene | 23 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Ethylbenzene | 27 | 59 | -241 | -5.20 | 1.03 | 0.000 | 1.000 | Decreasing |
| CDM-22 | VOC | m,p-Xylene | 27 | 7 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Methylene Chloride | 27 | 7 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Tetrachloroethene | 27 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Toluene | 27 | 44 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Trichloroethene | 23 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-22 | VOC | Vinyl Chloride | 27 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | 2-Methylnaphthalene | 10 | 20 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 50 | 5 | -- | 0.97 | 0.364 | 0.636 | No Trend |
| CDM-26 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | SVOC | Pentachlorophenol | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-26 | TPH | Diesel Range Hydrocarbons | 10 | 70 | 0 | -- | 0.75 | >0.5 | <0.5 | Stable |
| CDM-26 | TPH | Gasoline Range Hydrocarbons | 10 | 30 | -- | -- | -- | -- | -- | ND |
| CDM-26 | TPH | Motor Oil | 9 | 67 | 1 | -- | 1.00 | (0.46, 0.54) | (0.46, 0.54) | No Trend |
| CDM-26 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,2,4-Trimethylbenzene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,2-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | 1,4-Dichlorobenzene | 11 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-26 | VOC | Benzene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | cis-1,2-Dichloroethene | 8 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | m,p-Xylene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Tetrachloroethene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Toluene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Trichloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| CDM-26 | VOC | Vinyl Chloride | 11 | 45 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | 2-Methylnaphthalene | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | bis(2-Ethylhexyl)phthalate | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | Naphthalene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | SVOC | Pentachlorophenol | 4 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Diesel Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Gasoline Range Hydrocarbons | 4 | 25 | -- | -- | -- | -- | -- | ND |
| CDM-27 | TPH | Motor Oil | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-27 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1,2-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,1-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,2,4-Trimethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,2-Dichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | 1,4-Dichlorobenzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Benzene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | cis-1,2-Dichloroethene | 7 | 57 | 2 | -- | 0.06 | (0.386, 0.5) | (0.5, 0.614) | No Trend |
| CDM-27 | VOC | Ethylbenzene | 6 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | m,p-Xylene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Methylene Chloride | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Tetrachloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Toluene | 7 | 29 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Trichloroethene | 7 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-27 | VOC | Vinyl Chloride | 7 | 86 | -7 | -- | 0.50 | 0.191 | 0.809 | Stable |
| CDM-29 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-29 | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | TPH | Motor Oil | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,1-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,2,4-Trimethylbenzene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | Benzene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | cis-1,2-Dichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| CDM-29 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | m,p-Xylene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Toluene | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-29 | VOC | Vinyl Chloride | 3 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-30 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| CDM-30 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| CDM-30 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| CDM-30 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| CDM-31 | SVOC | 2-Methylnaphthalene | 23 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | bis(2-Ethylhexyl)phthalate | 22 | 18 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | Naphthalene | 23 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | SVOC | Pentachlorophenol | 23 | 22 | -- | -- | -- | -- | -- | ND |
| CDM-31 | TPH | Diesel Range Hydrocarbons | 23 | 100 | 67 | 1.74 | 0.70 | 0.041 | 0.959 | Increasing |
| CDM-31 | TPH | Gasoline Range Hydrocarbons | 23 | 39 | -- | -- | -- | -- | -- | ND |
| CDM-31 | TPH | Motor Oil | 22 | 100 | 35 | 0.96 | 0.55 | 0.168 | 0.832 | No Trend |
| CDM-31 | VOC | 1,1,1-Trichloroethane | 19 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1,2-Trichloroethane | 24 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1-Dichloroethane | 24 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,1-Dichloroethene | 24 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,2,4-Trimethylbenzene | 23 | 9 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,2-Dichloroethane | 24 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | 1,4-Dichlorobenzene | 22 | 5 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Benzene | 24 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | cis-1,2-Dichloroethene | 19 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Ethylbenzene | 23 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | m,p-Xylene | 24 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Methylene Chloride | 24 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Tetrachloroethene | 24 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Toluene | 24 | 4 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Trichloroethene | 19 | 0 | -- | -- | -- | -- | -- | ND |
| CDM-31 | VOC | Vinyl Chloride | 24 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-03 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | bis(2-Ethylhexyl)phthalate | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | TPH | Diesel Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | TPH | Gasoline Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| DMW-03 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| DMW-03 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| DMW-03 | VOC | Vinyl Chloride | 1 | 100 | -- | -- | -- | -- | -- | IS |
| DMW-04 | SVOC | 2-Methylnaphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 20 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | Naphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | SVOC | Pentachlorophenol | 10 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | TPH | Diesel Range Hydrocarbons | 10 | 90 | -13 | -- | 0.27 | 0.146 | 0.854 | Stable |
| DMW-04 | TPH | Gasoline Range Hydrocarbons | 10 | 20 | -- | -- | -- | -- | -- | ND |
| DMW-04 | TPH | Motor Oil | 9 | 89 | 1 | -- | 0.74 | (0.46, 0.54) | (0.46, 0.54) | No Trend |
| DMW-04 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,1-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| DMW-04 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,2-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | 1,4-Dichlorobenzene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Benzene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | cis-1,2-Dichloroethene | 8 | 25 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | m,p-Xylene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Tetrachloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Toluene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Trichloroethene | 8 | 0 | -- | -- | -- | -- | -- | ND |
| DMW-04 | VOC | Vinyl Chloride | 11 | 27 | -- | -- | -- | -- | -- | ND |
| LAI-P02 | SVOC | 2-Methylnaphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | SVOC | Naphthalene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | TPH | Diesel Range Hydrocarbons | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | TPH | Motor Oil | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,2,4-Trimethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Ethylbenzene | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| LAI-P02 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| LAI-P02 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P02 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | TPH | Diesel Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | TPH | Gasoline Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| LAI-P03 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| LAI-P03 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-01 | SVOC | 2-Methylnaphthalene | 35 | 14 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | bis(2-Ethylhexyl)phthalate | 34 | 44 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | Naphthalene | 35 | 3 | -- | -- | -- | -- | -- | ND |
| MW-01 | SVOC | Pentachlorophenol | 35 | 11 | -- | -- | -- | -- | -- | ND |
| MW-01 | TPH | Diesel Range Hydrocarbons | 36 | 92 | -75 | -1.01 | 0.67 | 0.156 | 0.844 | Stable |
| MW-01 | TPH | Gasoline Range Hydrocarbons | 36 | 44 | -- | -- | -- | -- | -- | ND |
| MW-01 | TPH | Motor Oil | 34 | 94 | -85 | -1.25 | 0.95 | 0.106 | 0.894 | Stable |
| MW-01 | VOC | 1,1,1-Trichloroethane | 32 | 0 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-01 | VOC | 1,1,2-Trichloroethane | 36 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,1-Dichloroethane | 36 | 14 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,1-Dichloroethene | 36 | 3 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,2,4-Trimethylbenzene | 35 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,2-Dichloroethane | 36 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | 1,4-Dichlorobenzene | 35 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Benzene | 36 | 3 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | cis-1,2-Dichloroethene | 32 | 44 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Ethylbenzene | 35 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | m,p-Xylene | 36 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Methylene Chloride | 36 | 6 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Tetrachloroethene | 36 | 3 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Toluene | 36 | 8 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Trichloroethene | 32 | 0 | -- | -- | -- | -- | -- | ND |
| MW-01 | VOC | Vinyl Chloride | 36 | 6 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | 2-Methylnaphthalene | 34 | 12 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | bis(2-Ethylhexyl)phthalate | 34 | 50 | 91 | 1.43 | 1.74 | 0.076 | 0.924 | Probably Increasing |
| MW-02 | SVOC | Naphthalene | 34 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | SVOC | Pentachlorophenol | 33 | 12 | -- | -- | -- | -- | -- | ND |
| MW-02 | TPH | Diesel Range Hydrocarbons | 35 | 97 | -95 | -1.34 | 1.47 | 0.090 | 0.910 | Probably Decreasing |
| MW-02 | TPH | Gasoline Range Hydrocarbons | 35 | 43 | -- | -- | -- | -- | -- | ND |
| MW-02 | TPH | Motor Oil | 34 | 91 | -136 | -2.00 | 1.63 | 0.023 | 0.977 | Decreasing |
| MW-02 | VOC | 1,1,1-Trichloroethane | 28 | 4 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,1,2-Trichloroethane | 35 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,1-Dichloroethane | 35 | 51 | -221 | -3.33 | 1.75 | 0.000 | 1.000 | Decreasing |
| MW-02 | VOC | 1,1-Dichloroethene | 35 | 9 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,2,4-Trimethylbenzene | 34 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,2-Dichloroethane | 35 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | 1,4-Dichlorobenzene | 35 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Benzene | 35 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | cis-1,2-Dichloroethene | 28 | 68 | -18 | -0.34 | 1.07 | 0.366 | 0.634 | No Trend |
| MW-02 | VOC | Ethylbenzene | 34 | 0 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | m,p-Xylene | 35 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Methylene Chloride | 35 | 3 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Tetrachloroethene | 35 | 17 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Toluene | 35 | 6 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Trichloroethene | 28 | 7 | -- | -- | -- | -- | -- | ND |
| MW-02 | VOC | Vinyl Chloride | 35 | 6 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | 2-Methylnaphthalene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | bis(2-Ethylhexyl)phthalate | 12 | 25 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | Naphthalene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | SVOC | Pentachlorophenol | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | TPH | Diesel Range Hydrocarbons | 13 | 85 | 27 | 1.60 | 0.57 | 0.055 | 0.945 | Probably Increasing |
| MW-03 | TPH | Gasoline Range Hydrocarbons | 13 | 38 | -- | -- | -- | -- | -- | ND |
| MW-03 | TPH | Motor Oil | 11 | 91 | -2 | -0.08 | 0.78 | 0.469 | 0.531 | Stable |
| MW-03 | VOC | 1,1,1-Trichloroethane | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1,2-Trichloroethane | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1-Dichloroethane | 13 | 46 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,1-Dichloroethene | 13 | 23 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,2,4-Trimethylbenzene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,2-Dichloroethane | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | 1,4-Dichlorobenzene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Benzene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | cis-1,2-Dichloroethene | 10 | 50 | -21 | -- | 0.98 | 0.036 | 0.964 | Decreasing |
| MW-03 | VOC | Ethylbenzene | 12 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | m,p-Xylene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Methylene Chloride | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Tetrachloroethene | 13 | 31 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Toluene | 13 | 0 | -- | -- | -- | -- | -- | ND |
| MW-03 | VOC | Trichloroethene | 10 | 60 | -35 | -- | 0.80 | 0.000 | 1.000 | Decreasing |
| MW-03 | VOC | Vinyl Chloride | 13 | 31 | -- | -- | -- | -- | -- | ND |
| MW-04 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-04 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-04 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,1-Dichloroethane | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-04 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-04 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-05 | SVOC | 2-Methylnaphthalene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | Naphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-05 | SVOC | Pentachlorophenol | 9 | 22 | -- | -- | -- | -- | -- | ND |
| MW-05 | TPH | Diesel Range Hydrocarbons | 10 | 90 | -1 | -- | 1.32 | 0.500 | 0.500 | No Trend |
| MW-05 | TPH | Gasoline Range Hydrocarbons | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-05 | TPH | Motor Oil | 9 | 89 | -14 | -- | 1.06 | 0.090 | 0.910 | Probably Decreasing |
| MW-05 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,1-Dichloroethane | 11 | 73 | -34 | -2.60 | 1.15 | 0.005 | 0.995 | Decreasing |
| MW-05 | VOC | 1,1-Dichloroethene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,2-Dichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | 1,4-Dichlorobenzene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Benzene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | cis-1,2-Dichloroethene | 8 | 38 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Ethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | m,p-Xylene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Methylene Chloride | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Tetrachloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Toluene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Trichloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-05 | VOC | Vinyl Chloride | 11 | 9 | -- | -- | -- | -- | -- | ND |
| MW-06 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | SVOC | Pentachlorophenol | 0 | 0 | -- | -- | -- | -- | -- | No Data |
| MW-06 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Toluene | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-06 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-06 | VOC | Vinyl Chloride | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-07 | SVOC | 2-Methylnaphthalene | 27 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | bis(2-Ethylhexyl)phthalate | 26 | 12 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | Naphthalene | 27 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | SVOC | Pentachlorophenol | 27 | 19 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-07 | TPH | Diesel Range Hydrocarbons | 27 | 89 | 124 | 2.57 | 4.63 | 0.005 | 0.995 | Increasing |
| MW-07 | TPH | Gasoline Range Hydrocarbons | 27 | 48 | -- | -- | -- | -- | -- | ND |
| MW-07 | TPH | Motor Oil | 26 | 92 | 33 | 0.71 | 0.73 | 0.240 | 0.760 | No Trend |
| MW-07 | VOC | 1,1,1-Trichloroethane | 23 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1,2-Trichloroethane | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1-Dichloroethane | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,1-Dichloroethene | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,2,4-Trimethylbenzene | 27 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,2-Dichloroethane | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | 1,4-Dichlorobenzene | 27 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Benzene | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | cis-1,2-Dichloroethene | 23 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Ethylbenzene | 27 | 7 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | m,p-Xylene | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Methylene Chloride | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Tetrachloroethene | 28 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Toluene | 28 | 18 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Trichloroethene | 23 | 4 | -- | -- | -- | -- | -- | ND |
| MW-07 | VOC | Vinyl Chloride | 28 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | 2-Methylnaphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | bis(2-Ethylhexyl)phthalate | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | Naphthalene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-08 | SVOC | Pentachlorophenol | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-08 | TPH | Diesel Range Hydrocarbons | 10 | 100 | -27 | -- | 0.77 | 0.008 | 0.992 | Decreasing |
| MW-08 | TPH | Gasoline Range Hydrocarbons | 10 | 30 | -- | -- | -- | -- | -- | ND |
| MW-08 | TPH | Motor Oil | 9 | 67 | -5 | -- | 1.19 | (0.306, 0.381) | (0.619, 0.694) | No Trend |
| MW-08 | VOC | 1,1,1-Trichloroethane | 8 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1,2-Trichloroethane | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1-Dichloroethane | 11 | 18 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,1-Dichloroethene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,2,4-Trimethylbenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,2-Dichloroethane | 11 | 27 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | 1,4-Dichlorobenzene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Benzene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | cis-1,2-Dichloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Ethylbenzene | 10 | 10 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | m,p-Xylene | 11 | 0 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Methylene Chloride | 11 | 9 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Tetrachloroethene | 11 | 9 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Toluene | 11 | 18 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Trichloroethene | 8 | 13 | -- | -- | -- | -- | -- | ND |
| MW-08 | VOC | Vinyl Chloride | 11 | 18 | -- | -- | -- | -- | -- | ND |
| MW-09 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | 1,2-Dichloroethane | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-09 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | cis-1,2-Dichloroethene | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-09 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-09 | VOC | Vinyl Chloride | 2 | 100 | -- | -- | -- | -- | -- | IS |
| MW-10 | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 11 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-10 | SVOC | Naphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | SVOC | Pentachlorophenol | 8 | 63 | 17 | -- | 0.88 | (0.016, 0.031) | (0.969, 0.984) | Increasing |
| MW-10 | TPH | Diesel Range Hydrocarbons | 9 | 89 | 16 | -- | 0.29 | 0.060 | 0.940 | Probably Increasing |
| MW-10 | TPH | Gasoline Range Hydrocarbons | 9 | 33 | -- | -- | -- | -- | -- | ND |
| MW-10 | TPH | Motor Oil | 8 | 88 | -10 | -- | 0.53 | 0.138 | 0.862 | Stable |
| MW-10 | VOC | 1,1,1-Trichloroethane | 7 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,1,2-Trichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,1-Dichloroethane | 10 | 70 | -27 | -- | 1.17 | 0.008 | 0.992 | Decreasing |
| MW-10 | VOC | 1,1-Dichloroethene | 10 | 20 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,2,4-Trimethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,2-Dichloroethane | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | 1,4-Dichlorobenzene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Benzene | 10 | 20 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | cis-1,2-Dichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Ethylbenzene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | m,p-Xylene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Methylene Chloride | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Tetrachloroethene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Toluene | 10 | 0 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Trichloroethene | 7 | 14 | -- | -- | -- | -- | -- | ND |
| MW-10 | VOC | Vinyl Chloride | 10 | 20 | -- | -- | -- | -- | -- | ND |
| MW-11 | SVOC | 2-Methylnaphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | bis(2-Ethylhexyl)phthalate | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Naphthalene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | SVOC | Pentachlorophenol | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Diesel Range Hydrocarbons | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-11 | TPH | Gasoline Range Hydrocarbons | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | TPH | Motor Oil | 2 | 50 | -- | -- | -- | -- | -- | IS |
| MW-11 | VOC | 1,1,1-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1,2-Trichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,1-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2,4-Trimethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,2-Dichloroethane | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | 1,4-Dichlorobenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Benzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | cis-1,2-Dichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Ethylbenzene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | m,p-Xylene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Methylene Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Tetrachloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Toluene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Trichloroethene | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-11 | VOC | Vinyl Chloride | 2 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Toluene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| MW-12 | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-12 | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-14D | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Diesel Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | TPH | Motor Oil | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | cis-1,2-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| MW-14D | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | 2-Methylnaphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | bis(2-Ethylhexyl)phthalate | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | Naphthalene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | SVOC | Pentachlorophenol | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | TPH | Diesel Range Hydrocarbons | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | TPH | Gasoline Range Hydrocarbons | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | TPH | Motor Oil | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | VOC | 1,1,1-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1,2-Trichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,1-Dichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,2,4-Trimethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,2-Dichloroethane | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | 1,4-Dichlorobenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Benzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | cis-1,2-Dichloroethene | 1 | 100 | -- | -- | -- | -- | -- | IS |
| P-4B | VOC | Ethylbenzene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | m,p-Xylene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Methylene Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Tetrachloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Toluene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Trichloroethene | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-4B | VOC | Vinyl Chloride | 1 | 0 | -- | -- | -- | -- | -- | IS and ND |
| P-IA | SVOC | 2-Methylnaphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | bis(2-Ethylhexyl)phthalate | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | Naphthalene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | SVOC | Pentachlorophenol | 9 | 56 | 6 | -- | 0.97 | 0.306 | 0.694 | No Trend |
| P-IA | TPH | Diesel Range Hydrocarbons | 9 | 100 | -20 | -- | 0.72 | 0.022 | 0.978 | Decreasing |
| P-IA | TPH | Gasoline Range Hydrocarbons | 9 | 89 | -22 | -- | 0.60 | 0.012 | 0.988 | Decreasing |
| P-IA | TPH | Motor Oil | 9 | 100 | -12 | -- | 1.26 | 0.130 | 0.870 | No Trend |
| P-IA | VOC | 1,1,1-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,1,2-Trichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,1-Dichloroethane | 9 | 67 | -3 | -- | 1.23 | (0.381, 0.46) | (0.54, 0.619) | No Trend |
| P-IA | VOC | 1,1-Dichloroethene | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,2,4-Trimethylbenzene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,2-Dichloroethane | 9 | 0 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | 1,4-Dichlorobenzene | 9 | 67 | -5 | -- | 0.77 | (0.306, 0.381) | (0.619, 0.694) | Stable |
| P-IA | VOC | Benzene | 9 | 67 | -6 | -- | 0.94 | 0.306 | 0.694 | Stable |
| P-IA | VOC | cis-1,2-Dichloroethene | 9 | 78 | 1 | -- | 1.97 | (0.46, 0.54) | (0.46, 0.54) | No Trend |
| P-IA | VOC | Ethylbenzene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | m,p-Xylene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Methylene Chloride | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Tetrachloroethene | 9 | 11 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Toluene | 9 | 22 | -- | -- | -- | -- | -- | ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| P-IA | VOC | Trichloroethene | 9 | 22 | -- | -- | -- | -- | -- | ND |
| P-IA | VOC | Vinyl Chloride | 9 | 56 | 0 | -- | 1.72 | 0.540 | 0.460 | No Trend |
| SP-04 | SVOC | 2-Methylnaphthalene | 67 | 9 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | bis(2-Ethylhexyl)phthalate | 66 | 32 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | Naphthalene | 69 | 12 | -- | -- | -- | -- | -- | ND |
| SP-04 | SVOC | Pentachlorophenol | 67 | 96 | -1178 | -6.37 | 4.77 | 0.000 | 1.000 | Decreasing |
| SP-04 | TPH | Diesel Range Hydrocarbons | 67 | 100 | -1180 | -6.39 | 1.89 | 0.000 | 1.000 | Decreasing |
| SP-04 | TPH | Gasoline Range Hydrocarbons | 67 | 48 | -- | -- | -- | -- | -- | ND |
| SP-04 | TPH | Motor Oil | 65 | 94 | -786 | -4.45 | 6.62 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | 1,1,1-Trichloroethane | 58 | 64 | -112 | -0.76 | 4.82 | 0.222 | 0.778 | No Trend |
| SP-04 | VOC | 1,1,2-Trichloroethane | 69 | 0 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,1-Dichloroethane | 69 | 97 | -1085 | -5.62 | 4.28 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | 1,1-Dichloroethene | 69 | 22 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,2,4-Trimethylbenzene | 69 | 14 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,2-Dichloroethane | 69 | 1 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | 1,4-Dichlorobenzene | 68 | 57 | -548 | -3.02 | 3.90 | 0.001 | 0.999 | Decreasing |
| SP-04 | VOC | Benzene | 69 | 51 | -1099 | -6.07 | 3.81 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | cis-1,2-Dichloroethene | 58 | 98 | -869 | -5.83 | 3.46 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | Ethylbenzene | 69 | 10 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | m,p-Xylene | 69 | 22 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Methylene Chloride | 69 | 16 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Tetrachloroethene | 69 | 91 | -193 | -1.00 | 0.76 | 0.160 | 0.840 | Stable |
| SP-04 | VOC | Toluene | 69 | 17 | -- | -- | -- | -- | -- | ND |
| SP-04 | VOC | Trichloroethene | 58 | 97 | -822 | -5.51 | 1.87 | 0.000 | 1.000 | Decreasing |
| SP-04 | VOC | Vinyl Chloride | 69 | 39 | -- | -- | -- | -- | -- | ND |
| SP-05 | SVOC | 2-Methylnaphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-05 | SVOC | Naphthalene | 5 | 80 | -6 | -- | 0.93 | 0.117 | 0.883 | Stable |
| SP-05 | SVOC | Pentachlorophenol | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Gasoline Range Hydrocarbons | 2 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | TPH | Motor Oil | 2 | 100 | -- | -- | -- | -- | -- | IS |
| SP-05 | VOC | 1,1,1-Trichloroethane | 5 | 100 | -6 | -- | 1.02 | 0.117 | 0.883 | No Trend |
| SP-05 | VOC | 1,1,2-Trichloroethane | 5 | 0 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,1-Dichloroethane | 5 | 100 | -4 | -- | 0.73 | 0.242 | 0.758 | Stable |
| SP-05 | VOC | 1,1-Dichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,2,4-Trimethylbenzene | 5 | 100 | -9 | -- | 1.20 | (0.0083, 0.042) | (0.958, 0.9917) | Decreasing |
| SP-05 | VOC | 1,2-Dichloroethane | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | 1,4-Dichlorobenzene | 5 | 80 | -6 | -- | 1.20 | 0.117 | 0.883 | No Trend |
| SP-05 | VOC | Benzene | 5 | 100 | -3 | -- | 0.13 | (0.242, 0.408) | (0.592, 0.758) | Stable |
| SP-05 | VOC | cis-1,2-Dichloroethene | 5 | 80 | -4 | -- | 0.75 | 0.242 | 0.758 | Stable |
| SP-05 | VOC | Ethylbenzene | 5 | 100 | -10 | -- | 0.65 | 0.008 | 0.992 | Decreasing |
| SP-05 | VOC | m,p-Xylene | 5 | 100 | -10 | -- | 0.61 | 0.008 | 0.992 | Decreasing |
| SP-05 | VOC | Methylene Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Tetrachloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Toluene | 5 | 100 | -8 | -- | 0.75 | 0.042 | 0.958 | Decreasing |
| SP-05 | VOC | Trichloroethene | 5 | 20 | -- | -- | -- | -- | -- | ND |
| SP-05 | VOC | Vinyl Chloride | 5 | 40 | -- | -- | -- | -- | -- | ND |
| SP-06 | SVOC | 2-Methylnaphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | SVOC | bis(2-Ethylhexyl)phthalate | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | SVOC | Naphthalene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | SVOC | Pentachlorophenol | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | TPH | Diesel Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | TPH | Gasoline Range Hydrocarbons | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | TPH | Motor Oil | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,1,1-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,1,2-Trichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,1-Dichloroethane | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,1-Dichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,2,4-Trimethylbenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | 1,2-Dichloroethane | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | 1,4-Dichlorobenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Benzene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | cis-1,2-Dichloroethene | 3 | 67 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Ethylbenzene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | m,p-Xylene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Methylene Chloride | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |

**TABLE B3-B**
**MANN-KENDALL STATISTICS - ALL YEARS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location | Group | Analyte | N | Detection Frequency (%) | Mann-Kendall (S) | Z Statistic | COV | Probability | Confidence in Trend | Concentration Trend |
|---|---|---|---|---|---|---|---|---|---|---|
| SP-06 | VOC | Tetrachloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | Toluene | 3 | 100 | -- | -- | -- | -- | -- | IS |
| SP-06 | VOC | Trichloroethene | 3 | 0 | -- | -- | -- | -- | -- | IS and ND |
| SP-06 | VOC | Vinyl Chloride | 3 | 33 | -- | -- | -- | -- | -- | IS and ND |

***Notes:***
% - percent
N = Total number of samples
Mann-Kendall (S) = Mann-Kendall test statistic
Z Statistic = Standardized Mann-Kendall S value based on the normal approximation (for sample sizes greater than 10)
COV - coefficient of variation calculated as the ratio of sample standard deviation to the sample mean
Probability = Probability associated with Mann-Kendall Hypothesis Test (i.e., *p* -value associated with the S/Z Statistic). For sample sizes N ≤10, if an exact p-value was not available, then a range for the p-value was provided as: (minimum p-value, maximum p-value), where the minimum and maximum p-values correspond to |S|-1 and |S|+1, respectively.
Concentration Trend = Indication of whether Mann-Kendall test can detect a trend, and if so, the direction of the trend is shown
-- = not calculated due to N<4 or > 50% detection frequency
ND, IS = Not aNDlyzed due to insufficient data (IS), i.e., N<4, and/or high proportion of non-detects (ND), i.e., <50% detection frequency.

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-07 | bis(2-ethylhexyl)phthalate | 29 | 14 | ND | ND | ND | -- | 0.25 U | 2.2 | No | 0 | ND |
| AGI-07 | Pentachlorophenol | 30 | 23 | ND | ND | ND | -- | 8.7 U | 3 | RL > CUL | Cannot be determined | ND |
| AGI-07 | Diesel Range Hydrocarbons | 30 | 100 | 0.032 | 0.427 | 0.02 | No | 16000 J | 1000 | Yes | Cannot be determined | Stable |
| AGI-07 | Gasoline Range Hydrocarbons | 30 | 100 | 0.138 | 0.000 | 0.46 | No | 500 | 1000 | No | 0 | Decreasing |
| AGI-07 | Motor Oil | 29 | 100 | 0.011 | 0.815 | 0.00 | No | 6300 J | 1000 | Yes | Cannot be determined | Stable |
| AGI-07 | 1,1-Dichloroethene | 30 | 10 | ND | ND | ND | -- | 2.8 U | 1.93 | RL > CUL | Cannot be determined | ND |
| AGI-07 | 1,4-Dichlorobenzene | 29 | 90 | 0.055 | 0.231 | 0.05 | No | 4.6 U | 4.86 | No | 0 | Decreasing |
| AGI-07 | Benzene | 30 | 77 | 0.239 | 0.000 | 0.59 | Yes | 2.4 U | 22.7 | No | 0 | Decreasing |
| AGI-07 | Tetrachloroethene | 30 | 10 | ND | ND | ND | -- | 4.1 U | 3.3 | RL > CUL | Cannot be determined | ND |
| AGI-07 | Vinyl Chloride | 30 | 73 | -0.077 | 0.365 | 0.03 | No | 2.2 U | 2.4 | No | 0 | No Trend |
| AGI-14 | bis(2-ethylhexyl)phthalate | 62 | 16 | ND | ND | ND | -- | 42 U | 2.2 | RL > CUL | Cannot be determined | ND |
| AGI-14 | Pentachlorophenol | 63 | 41 | ND | ND | ND | -- | 25 U | 3 | RL > CUL | Cannot be determined | ND |
| AGI-14 | Diesel Range Hydrocarbons | 62 | 100 | 0.203 | 0.002 | 0.15 | No | 370 | 1000 | No | 0 | Decreasing |
| AGI-14 | Gasoline Range Hydrocarbons | 62 | 61 | -0.068 | 0.283 | 0.02 | No | 100 U | 1000 | No | 0 | Probably Decreasing |
| AGI-14 | Motor Oil | 61 | 97 | 0.131 | 0.022 | 0.09 | No | 950 | 1000 | No | 0 | Decreasing |
| AGI-14 | 1,1-Dichloroethene | 62 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| AGI-14 | 1,4-Dichlorobenzene | 62 | 58 | -0.071 | 0.320 | 0.02 | No | 0.98 U | 4.86 | No | 0 | No Trend |
| AGI-14 | Benzene | 62 | 56 | 0.049 | 0.361 | 0.01 | No | 0.53 U | 22.7 | No | 0 | Decreasing |
| AGI-14 | Tetrachloroethene | 62 | 24 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| AGI-14 | Vinyl Chloride | 62 | 5 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| AGI-19 | bis(2-ethylhexyl)phthalate | 10 | 20 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| AGI-19 | Pentachlorophenol | 10 | 90 | 0.410 | 0.042 | 0.42 | No | 0.3 | 3 | No | 0 | Decreasing |
| AGI-19 | Diesel Range Hydrocarbons | 10 | 100 | 0.023 | 0.671 | 0.02 | No | 6300 | 1000 | Yes | Cannot be determined | Stable |
| AGI-19 | Gasoline Range Hydrocarbons | 10 | 100 | 0.252 | 0.000 | 0.81 | Yes | 410 | 1000 | No | 0 | Decreasing |
| AGI-19 | Motor Oil | 9 | 89 | -0.091 | 0.140 | 0.28 | No | 5700 | 1000 | Yes | Cannot be determined | No Trend |
| AGI-19 | 1,1-Dichloroethene | 10 | 40 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| AGI-19 | 1,4-Dichlorobenzene | 10 | 100 | 0.175 | 0.034 | 0.45 | No | 5.4 | 4.86 | Yes | Cannot be determined | Decreasing |
| AGI-19 | Benzene | 10 | 100 | 0.276 | 0.000 | 0.80 | Yes | 1.7 | 22.7 | No | 0 | Decreasing |
| AGI-19 | Tetrachloroethene | 10 | 40 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| AGI-19 | Vinyl Chloride | 10 | 70 | 0.246 | 0.222 | 0.18 | No | 0.22 U | 2.4 | No | 0 | Decreasing |
| AGI-21 | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 2.2 | 2.2 | No | 0 | ND |
| AGI-21 | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| AGI-21 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 730 | 1000 | No | 0 | ND |
| AGI-21 | Gasoline Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 1200 | 1000 | Yes | Cannot be determined | ND |
| AGI-21 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| AGI-21 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| AGI-21 | 1,4-Dichlorobenzene | 2 | 100 | ND | ND | ND | -- | 3.8 | 4.86 | No | 0 | ND |
| AGI-21 | Benzene | 2 | 50 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| AGI-21 | Tetrachloroethene | 2 | 50 | ND | ND | ND | -- | 58 | 3.3 | Yes | Cannot be determined | ND |
| AGI-21 | Vinyl Chloride | 2 | 100 | ND | ND | ND | -- | 0.5 | 2.4 | No | 0 | ND |
| AGI-22 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 2.8 U | 2.2 | RL > CUL | Cannot be determined | ND |
| AGI-22 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.3 U | 3 | No | 0 | ND |
| AGI-22 | Diesel Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 2800 | 1000 | Yes | Cannot be determined | ND |
| AGI-22 | Gasoline Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 3700 | 1000 | Yes | Cannot be determined | ND |
| AGI-22 | Motor Oil | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| AGI-22 | 1,1-Dichloroethene | 1 | 100 | ND | ND | ND | -- | 0.17 | 1.93 | No | 0 | ND |
| AGI-22 | 1,4-Dichlorobenzene | 1 | 100 | ND | ND | ND | -- | 20 | 4.86 | Yes | Cannot be determined | ND |
| AGI-22 | Benzene | 1 | 100 | ND | ND | ND | -- | 64 | 22.7 | Yes | Cannot be determined | ND |
| AGI-22 | Tetrachloroethene | 1 | 100 | ND | ND | ND | -- | 0.61 | 3.3 | No | 0 | ND |
| AGI-22 | Vinyl Chloride | 1 | 100 | ND | ND | ND | -- | 17 | 2.4 | Yes | Cannot be determined | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-35 | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 1.6 | 2.2 | No | 0 | ND |
| AGI-35 | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 5 U | 3 | RL > CUL | Cannot be determined | ND |
| AGI-35 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 5400 | 1000 | Yes | Cannot be determined | ND |
| AGI-35 | Gasoline Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 7500 | 1000 | Yes | Cannot be determined | ND |
| AGI-35 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 1000 U | 1000 | No | 0 | ND |
| AGI-35 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 5 U | 1.93 | RL > CUL | Cannot be determined | ND |
| AGI-35 | 1,4-Dichlorobenzene | 2 | 100 | ND | ND | ND | -- | 36.4 | 4.86 | Yes | Cannot be determined | ND |
| AGI-35 | Benzene | 2 | 50 | ND | ND | ND | -- | 5 U | 22.7 | No | 0 | ND |
| AGI-35 | Tetrachloroethene | 2 | 50 | ND | ND | ND | -- | 5 U | 3.3 | RL > CUL | Cannot be determined | ND |
| AGI-35 | Vinyl Chloride | 2 | 50 | ND | ND | ND | -- | 5 U | 2.4 | RL > CUL | Cannot be determined | ND |
| AGI-36 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 3 U | 2.2 | RL > CUL | Cannot be determined | ND |
| AGI-36 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.32 U | 3 | No | 0 | ND |
| AGI-36 | Diesel Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 1100 | 1000 | Yes | Cannot be determined | ND |
| AGI-36 | Gasoline Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 890 | 1000 | No | 0 | ND |
| AGI-36 | Motor Oil | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| AGI-36 | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.12 U | 1.93 | No | 0 | ND |
| AGI-36 | 1,4-Dichlorobenzene | 1 | 100 | ND | ND | ND | -- | 22 | 4.86 | Yes | Cannot be determined | ND |
| AGI-36 | Benzene | 1 | 100 | ND | ND | ND | -- | 2.1 | 22.7 | No | 0 | ND |
| AGI-36 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| AGI-36 | Vinyl Chloride | 1 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| AGI-37 | bis(2-ethylhexyl)phthalate | 5 | 20 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| AGI-37 | Pentachlorophenol | 4 | 25 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| AGI-37 | Diesel Range Hydrocarbons | 5 | 80 | ND | ND | ND | -- | 840 | 1000 | No | 0 | No Trend |
| AGI-37 | Gasoline Range Hydrocarbons | 5 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| AGI-37 | Motor Oil | 4 | 50 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | Stable |
| AGI-37 | 1,1-Dichloroethene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| AGI-37 | 1,4-Dichlorobenzene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| AGI-37 | Benzene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| AGI-37 | Tetrachloroethene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| AGI-37 | Vinyl Chloride | 7 | 14 | ND | ND | ND | -- | 0.2 U | 2.4 | No | 0 | ND |
| AGI-41 | bis(2-ethylhexyl)phthalate | 0 | No Data | No Data | No Data | No Data | -- | No Data | 2.2 | -- | 0 | No Data |
| AGI-41 | Pentachlorophenol | 0 | No Data | No Data | No Data | No Data | -- | No Data | 3 | -- | 0 | No Data |
| AGI-41 | Diesel Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 180 | 1000 | No | 0 | ND |
| AGI-41 | Gasoline Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 13 | 1000 | No | 0 | ND |
| AGI-41 | Motor Oil | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| AGI-41 | 1,1-Dichloroethene | 1 | 100 | ND | ND | ND | -- | 0.082 | 1.93 | No | 0 | ND |
| AGI-41 | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.098 U | 4.86 | No | 0 | ND |
| AGI-41 | Benzene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| AGI-41 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| AGI-41 | Vinyl Chloride | 1 | 100 | ND | ND | ND | -- | 0.028 | 2.4 | No | 0 | ND |
| AGI-42 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| AGI-42 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| AGI-42 | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| AGI-42 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| AGI-42 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| AGI-42 | 1,1-Dichloroethene | 2 | 50 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| AGI-42 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| AGI-42 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| AGI-42 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| AGI-42 | Vinyl Chloride | 2 | 50 | ND | ND | ND | -- | 0.2 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AGI-43 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| AGI-43 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| AGI-43 | Diesel Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 1000 | 1000 | No | 0 | ND |
| AGI-43 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| AGI-43 | Motor Oil | 1 | 100 | ND | ND | ND | -- | 640 | 1000 | No | 0 | ND |
| AGI-43 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| AGI-43 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| AGI-43 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| AGI-43 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| AGI-43 | Vinyl Chloride | 2 | 50 | ND | ND | ND | -- | 0.2 U | 2.4 | No | 0 | ND |
| AGI-45 | bis(2-ethylhexyl)phthalate | 14 | 29 | ND | ND | ND | -- | 0.25 U | 2.2 | No | 0 | ND |
| AGI-45 | Pentachlorophenol | 13 | 23 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| AGI-45 | Diesel Range Hydrocarbons | 14 | 93 | -0.022 | 0.406 | 0.06 | No | 290 | 1000 | No | 0 | No Trend |
| AGI-45 | Gasoline Range Hydrocarbons | 14 | 21 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| AGI-45 | Motor Oil | 12 | 83 | -0.002 | 0.944 | 0.00 | No | 520 | 1000 | No | 0 | No Trend |
| AGI-45 | 1,1-Dichloroethene | 15 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| AGI-45 | 1,4-Dichlorobenzene | 15 | 0 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| AGI-45 | Benzene | 15 | 0 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| AGI-45 | Tetrachloroethene | 15 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| AGI-45 | Vinyl Chloride | 15 | 20 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| AGI-46 | bis(2-ethylhexyl)phthalate | 9 | 22 | ND | ND | ND | -- | 0.85 U | 2.2 | No | 0 | ND |
| AGI-46 | Pentachlorophenol | 9 | 22 | ND | ND | ND | -- | 0.5 U | 3 | No | 0 | ND |
| AGI-46 | Diesel Range Hydrocarbons | 9 | 100 | 0.123 | 0.010 | 0.64 | Yes | 300 | 1000 | No | 0 | Decreasing |
| AGI-46 | Gasoline Range Hydrocarbons | 9 | 33 | ND | ND | ND | -- | 950 | 1000 | No | 0 | ND |
| AGI-46 | Motor Oil | 8 | 100 | 0.229 | 0.022 | 0.61 | Yes | 320 | 1000 | No | 0 | Decreasing |
| AGI-46 | 1,1-Dichloroethene | 9 | 11 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| AGI-46 | 1,4-Dichlorobenzene | 9 | 0 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| AGI-46 | Benzene | 9 | 56 | -0.041 | 0.594 | 0.04 | No | 0.53 U | 22.7 | No | 0 | No Trend |
| AGI-46 | Tetrachloroethene | 9 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| AGI-46 | Vinyl Chloride | 9 | 44 | ND | ND | ND | -- | 0.63 | 2.4 | No | 0 | ND |
| B-01 | bis(2-ethylhexyl)phthalate | 10 | 30 | ND | ND | ND | -- | 5.7 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-01 | Pentachlorophenol | 11 | 64 | -0.022 | 0.922 | 0.00 | No | 1.7 | 3 | No | 0 | No Trend |
| B-01 | Diesel Range Hydrocarbons | 11 | 100 | -0.180 | 0.347 | 0.10 | No | 4800 | 1000 | Yes | Cannot be determined | No Trend |
| B-01 | Gasoline Range Hydrocarbons | 11 | 100 | -0.127 | 0.309 | 0.11 | No | 470 | 1000 | No | 0 | No Trend |
| B-01 | Motor Oil | 11 | 100 | 0.005 | 0.977 | 0.00 | No | 630 | 1000 | No | 0 | Stable |
| B-01 | 1,1-Dichloroethene | 11 | 0 | ND | ND | ND | -- | 0.33 U | 1.93 | No | 0 | ND |
| B-01 | 1,4-Dichlorobenzene | 10 | 80 | -0.080 | 0.331 | 0.12 | No | 0.67 | 4.86 | No | 0 | No Trend |
| B-01 | Benzene | 11 | 100 | -0.291 | 0.223 | 0.16 | No | 2.5 | 22.7 | No | 0 | Probably Increasing |
| B-01 | Tetrachloroethene | 11 | 18 | ND | ND | ND | -- | 0.33 U | 3.3 | No | 0 | ND |
| B-01 | Vinyl Chloride | 11 | 18 | ND | ND | ND | -- | 0.45 | 2.4 | No | 0 | ND |
| B-02 | bis(2-ethylhexyl)phthalate | 14 | 14 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| B-02 | Pentachlorophenol | 14 | 7 | ND | ND | ND | -- | 0.54 U | 3 | No | 0 | ND |
| B-02 | Diesel Range Hydrocarbons | 14 | 93 | -0.069 | 0.187 | 0.14 | No | 1500 | 1000 | Yes | Cannot be determined | Probably Increasing |
| B-02 | Gasoline Range Hydrocarbons | 14 | 71 | 0.030 | 0.490 | 0.04 | No | 150 | 1000 | No | 0 | Increasing |
| B-02 | Motor Oil | 12 | 83 | -0.034 | 0.356 | 0.09 | No | 1200 | 1000 | Yes | Cannot be determined | No Trend |
| B-02 | 1,1-Dichloroethene | 16 | 6 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| B-02 | 1,4-Dichlorobenzene | 16 | 50 | 0.028 | 0.558 | 0.03 | No | 0.59 | 4.86 | No | 0 | Increasing |
| B-02 | Benzene | 16 | 94 | 0.127 | 0.003 | 0.47 | No | 1.6 | 22.7 | No | 0 | Decreasing |
| B-02 | Tetrachloroethene | 16 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-02 | Vinyl Chloride | 16 | 25 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-08D | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 0.45 | 2.2 | No | 0 | ND |
| B-08D | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 0.029 U | 3 | No | 0 | ND |
| B-08D | Diesel Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 36 U | 1000 | No | 0 | ND |
| B-08D | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| B-08D | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-08D | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| B-08D | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.098 U | 4.86 | No | 0 | ND |
| B-08D | Benzene | 2 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| B-08D | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-08D | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.0029 U | 2.4 | No | 0 | ND |
| B-08S | bis(2-ethylhexyl)phthalate | 3 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| B-08S | Pentachlorophenol | 3 | 0 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| B-08S | Diesel Range Hydrocarbons | 3 | 33 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-08S | Gasoline Range Hydrocarbons | 3 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-08S | Motor Oil | 2 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-08S | 1,1-Dichloroethene | 4 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| B-08S | 1,4-Dichlorobenzene | 4 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| B-08S | Benzene | 4 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| B-08S | Tetrachloroethene | 4 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| B-08S | Vinyl Chloride | 4 | 0 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |
| B-09 | bis(2-ethylhexyl)phthalate | 13 | 38 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| B-09 | Pentachlorophenol | 13 | 23 | ND | ND | ND | -- | 0.54 U | 3 | No | 0 | ND |
| B-09 | Diesel Range Hydrocarbons | 13 | 92 | 0.002 | 0.951 | 0.00 | No | 430 | 1000 | No | 0 | Stable |
| B-09 | Gasoline Range Hydrocarbons | 13 | 23 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| B-09 | Motor Oil | 11 | 82 | -0.002 | 0.961 | 0.00 | No | 460 | 1000 | No | 0 | Stable |
| B-09 | 1,1-Dichloroethene | 15 | 7 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| B-09 | 1,4-Dichlorobenzene | 15 | 13 | ND | ND | ND | -- | 2.1 | 4.86 | No | 0 | ND |
| B-09 | Benzene | 15 | 80 | 0.056 | 0.074 | 0.23 | No | 0.46 | 22.7 | No | 0 | Probably Decreasing |
| B-09 | Tetrachloroethene | 15 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-09 | Vinyl Chloride | 15 | 60 | 0.016 | 0.356 | 0.07 | No | 0.22 U | 2.4 | No | 0 | Stable |
| B-11 | bis(2-ethylhexyl)phthalate | 13 | 23 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| B-11 | Pentachlorophenol | 13 | 0 | ND | ND | ND | -- | 9.1 U | 3 | RL > CUL | Cannot be determined | ND |
| B-11 | Diesel Range Hydrocarbons | 13 | 100 | 0.141 | 0.001 | 0.67 | Yes | 480 | 1000 | No | 0 | Decreasing |
| B-11 | Gasoline Range Hydrocarbons | 13 | 100 | 0.148 | 0.000 | 0.70 | Yes | 490 | 1000 | No | 0 | Decreasing |
| B-11 | Motor Oil | 11 | 100 | 0.053 | 0.369 | 0.09 | No | 600 | 1000 | No | 0 | Stable |
| B-11 | 1,1-Dichloroethene | 13 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| B-11 | 1,4-Dichlorobenzene | 13 | 100 | 0.155 | 0.000 | 0.69 | Yes | 4.3 | 4.86 | No | 0 | Decreasing |
| B-11 | Benzene | 13 | 46 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| B-11 | Tetrachloroethene | 13 | 8 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-11 | Vinyl Chloride | 13 | 15 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| B-12 | bis(2-ethylhexyl)phthalate | 12 | 25 | ND | ND | ND | -- | 48 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-12 | Pentachlorophenol | 12 | 25 | ND | ND | ND | -- | 28 U | 3 | RL > CUL | Cannot be determined | ND |
| B-12 | Diesel Range Hydrocarbons | 12 | 100 | 0.066 | 0.010 | 0.50 | Yes | 420 | 1000 | No | 0 | Decreasing |
| B-12 | Gasoline Range Hydrocarbons | 12 | 42 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| B-12 | Motor Oil | 11 | 73 | 0.042 | 0.304 | 0.12 | No | 510 | 1000 | No | 0 | Stable |
| B-12 | 1,1-Dichloroethene | 14 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| B-12 | 1,4-Dichlorobenzene | 14 | 86 | 0.135 | 0.006 | 0.48 | No | 0.98 U | 4.86 | No | 0 | Decreasing |
| B-12 | Benzene | 14 | 36 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| B-12 | Tetrachloroethene | 14 | 14 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-12 | Vinyl Chloride | 14 | 14 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-13 | bis(2-ethylhexyl)phthalate | 12 | 33 | ND | ND | ND | -- | 42 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-13 | Pentachlorophenol | 12 | 33 | ND | ND | ND | -- | 25 U | 3 | RL > CUL | Cannot be determined | ND |
| B-13 | Diesel Range Hydrocarbons | 11 | 100 | -0.043 | 0.560 | 0.04 | No | 14000 | 1000 | Yes | Cannot be determined | No Trend |
| B-13 | Gasoline Range Hydrocarbons | 11 | 100 | 0.199 | 0.023 | 0.45 | No | 270 | 1000 | No | 0 | Decreasing |
| B-13 | Motor Oil | 9 | 100 | -0.120 | 0.028 | 0.52 | Yes | 5200 | 1000 | Yes | Cannot be determined | Increasing |
| B-13 | 1,1-Dichloroethene | 14 | 0 | ND | ND | ND | -- | 0.35 U | 1.93 | No | 0 | ND |
| B-13 | 1,4-Dichlorobenzene | 14 | 43 | ND | ND | ND | -- | 0.5 U | 4.86 | No | 0 | ND |
| B-13 | Benzene | 14 | 86 | 0.185 | 0.014 | 0.41 | No | 1.3 | 22.7 | No | 0 | Decreasing |
| B-13 | Tetrachloroethene | 14 | 21 | ND | ND | ND | -- | 0.84 U | 3.3 | No | 0 | ND |
| B-13 | Vinyl Chloride | 14 | 29 | ND | ND | ND | -- | 0.13 U | 2.4 | No | 0 | ND |
| B-15D | bis(2-ethylhexyl)phthalate | 2 | 0 | ND | ND | ND | -- | 0.27 U | 2.2 | No | 0 | ND |
| B-15D | Pentachlorophenol | 2 | 100 | ND | ND | ND | -- | 0.087 | 3 | No | 0 | ND |
| B-15D | Diesel Range Hydrocarbons | 2 | 50 | ND | ND | ND | -- | 58 | 1000 | No | 0 | ND |
| B-15D | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| B-15D | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-15D | 1,1-Dichloroethene | 3 | 33 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| B-15D | 1,4-Dichlorobenzene | 3 | 0 | ND | ND | ND | -- | 0.098 U | 4.86 | No | 0 | ND |
| B-15D | Benzene | 3 | 33 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| B-15D | Tetrachloroethene | 3 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-15D | Vinyl Chloride | 3 | 33 | ND | ND | ND | -- | 0.0029 U | 2.4 | No | 0 | ND |
| B-15S | bis(2-ethylhexyl)phthalate | 3 | 33 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| B-15S | Pentachlorophenol | 2 | 50 | ND | ND | ND | -- | 0.067 | 3 | No | 0 | ND |
| B-15S | Diesel Range Hydrocarbons | 3 | 100 | ND | ND | ND | -- | 740 | 1000 | No | 0 | ND |
| B-15S | Gasoline Range Hydrocarbons | 3 | 33 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-15S | Motor Oil | 2 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-15S | 1,1-Dichloroethene | 3 | 33 | ND | ND | ND | -- | 1 U | 1.93 | No | 0 | ND |
| B-15S | 1,4-Dichlorobenzene | 3 | 0 | ND | ND | ND | -- | 1 U | 4.86 | No | 0 | ND |
| B-15S | Benzene | 3 | 100 | ND | ND | ND | -- | 22 | 22.7 | No | 0 | ND |
| B-15S | Tetrachloroethene | 3 | 0 | ND | ND | ND | -- | 1 U | 3.3 | No | 0 | ND |
| B-15S | Vinyl Chloride | 3 | 100 | ND | ND | ND | -- | 3.6 | 2.4 | Yes | Cannot be determined | ND |
| B-16D | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 0.27 | 2.2 | No | 0 | ND |
| B-16D | Pentachlorophenol | 2 | 100 | ND | ND | ND | -- | 0.1 | 3 | No | 0 | ND |
| B-16D | Diesel Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 36 U | 1000 | No | 0 | ND |
| B-16D | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| B-16D | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-16D | 1,1-Dichloroethene | 3 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| B-16D | 1,4-Dichlorobenzene | 3 | 33 | ND | ND | ND | -- | 0.014 U | 4.86 | No | 0 | ND |
| B-16D | Benzene | 3 | 33 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| B-16D | Tetrachloroethene | 3 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-16D | Vinyl Chloride | 3 | 67 | ND | ND | ND | -- | 0.013 | 2.4 | No | 0 | ND |
| B-16S | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 8.1 | 2.2 | Yes | Cannot be determined | ND |
| B-16S | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 0.029 U | 3 | No | 0 | ND |
| B-16S | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 470 | 1000 | No | 0 | ND |
| B-16S | Gasoline Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 880 | 1000 | No | 0 | ND |
| B-16S | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-16S | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.12 U | 1.93 | No | 0 | ND |
| B-16S | 1,4-Dichlorobenzene | 2 | 100 | ND | ND | ND | -- | 0.23 | 4.86 | No | 0 | ND |
| B-16S | Benzene | 2 | 100 | ND | ND | ND | -- | 4.6 | 22.7 | No | 0 | ND |
| B-16S | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-16S | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-19 | bis(2-ethylhexyl)phthalate | 74 | 16 | ND | ND | ND | -- | 0.25 U | 2.2 | No | 0 | ND |
| B-19 | Pentachlorophenol | 75 | 16 | ND | ND | ND | -- | 8.6 U | 3 | RL > CUL | Cannot be determined | ND |
| B-19 | Diesel Range Hydrocarbons | 75 | 100 | -0.055 | 0.001 | 0.15 | No | 14000 J | 1000 | Yes | Cannot be determined | No Trend |
| B-19 | Gasoline Range Hydrocarbons | 74 | 100 | 0.151 | 0.000 | 0.52 | Yes | 560 | 1000 | No | 0 | Decreasing |
| B-19 | Motor Oil | 73 | 100 | -0.031 | 0.189 | 0.02 | No | 4200 J | 1000 | Yes | Cannot be determined | Stable |
| B-19 | 1,1-Dichloroethene | 77 | 6 | ND | ND | ND | -- | 5.6 U | 1.93 | RL > CUL | Cannot be determined | ND |
| B-19 | 1,4-Dichlorobenzene | 76 | 78 | 0.101 | 0.000 | 0.23 | No | 9.2 U | 4.86 | RL > CUL | Cannot be determined | Decreasing |
| B-19 | Benzene | 77 | 91 | 0.120 | 0.000 | 0.43 | No | 4.8 U | 22.7 | No | 0 | Decreasing |
| B-19 | Tetrachloroethene | 77 | 3 | ND | ND | ND | -- | 8.2 U | 3.3 | RL > CUL | Cannot be determined | ND |
| B-19 | Vinyl Chloride | 77 | 26 | ND | ND | ND | -- | 4.4 U | 2.4 | RL > CUL | Cannot be determined | ND |
| B-20 | bis(2-ethylhexyl)phthalate | 3 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| B-20 | Pentachlorophenol | 3 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| B-20 | Diesel Range Hydrocarbons | 3 | 100 | ND | ND | ND | -- | 560 | 1000 | No | 0 | ND |
| B-20 | Gasoline Range Hydrocarbons | 3 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-20 | Motor Oil | 3 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-20 | 1,1-Dichloroethene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| B-20 | 1,4-Dichlorobenzene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| B-20 | Benzene | 5 | 100 | ND | ND | ND | -- | 0.2 | 22.7 | No | 0 | Stable |
| B-20 | Tetrachloroethene | 5 | 20 | ND | ND | ND | -- | 0.3 | 3.3 | No | 0 | ND |
| B-20 | Vinyl Chloride | 5 | 40 | ND | ND | ND | -- | 0.2 U | 2.4 | No | 0 | ND |
| B-21 | bis(2-ethylhexyl)phthalate | 2 | 0 | ND | ND | ND | -- | 1.1 U | 2.2 | No | 0 | ND |
| B-21 | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 5.5 U | 3 | RL > CUL | Cannot be determined | ND |
| B-21 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 2500 | 1000 | Yes | Cannot be determined | ND |
| B-21 | Gasoline Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 8100 | 1000 | Yes | Cannot be determined | ND |
| B-21 | Motor Oil | 2 | 50 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-21 | 1,1-Dichloroethene | 4 | 0 | ND | ND | ND | -- | 5 U | 1.93 | RL > CUL | Cannot be determined | ND |
| B-21 | 1,4-Dichlorobenzene | 4 | 100 | ND | ND | ND | -- | 40 | 4.86 | Yes | Cannot be determined | Stable |
| B-21 | Benzene | 4 | 100 | ND | ND | ND | -- | 93 | 22.7 | Yes | Cannot be determined | Stable |
| B-21 | Tetrachloroethene | 4 | 25 | ND | ND | ND | -- | 5 U | 3.3 | RL > CUL | Cannot be determined | ND |
| B-21 | Vinyl Chloride | 4 | 25 | ND | ND | ND | -- | 5 U | 2.4 | RL > CUL | Cannot be determined | ND |
| B-23 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 45 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-23 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 26 U | 3 | RL > CUL | Cannot be determined | ND |
| B-23 | Diesel Range Hydrocarbons | 1 | 100 | ND | NA | NA | -- | 560 | 1000 | No | 0 | IS |
| B-23 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| B-23 | Motor Oil | 1 | 100 | ND | NA | NA | -- | 540 | 1000 | No | 0 | IS |
| B-23 | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.035 U | 1.93 | No | 0 | ND |
| B-23 | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.05 U | 4.86 | No | 0 | ND |
| B-23 | Benzene | 1 | 0 | ND | ND | ND | -- | 0.03 U | 22.7 | No | 0 | ND |
| B-23 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.084 U | 3.3 | No | 0 | ND |
| B-23 | Vinyl Chloride | 1 | 100 | ND | ND | ND | -- | 0.61 | 2.4 | No | 0 | ND |
| B-24 | bis(2-ethylhexyl)phthalate | 4 | 0 | ND | ND | ND | -- | 5 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-24 | Pentachlorophenol | 4 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| B-24 | Diesel Range Hydrocarbons | 4 | 50 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | Stable |
| B-24 | Gasoline Range Hydrocarbons | 4 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-24 | Motor Oil | 3 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-24 | 1,1-Dichloroethene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| B-24 | 1,4-Dichlorobenzene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| B-24 | Benzene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| B-24 | Tetrachloroethene | 5 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| B-24 | Vinyl Chloride | 5 | 80 | ND | ND | ND | -- | 0.2 U | 2.4 | No | 0 | Stable |

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| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-25 | bis(2-ethylhexyl)phthalate | 13 | 23 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| B-25 | Pentachlorophenol | 13 | 0 | ND | ND | ND | -- | 0.17 U | 3 | No | 0 | ND |
| B-25 | Diesel Range Hydrocarbons | 13 | 100 | 0.101 | 0.000 | 0.87 | Yes | 650 J | 1000 | No | 0 | Decreasing |
| B-25 | Gasoline Range Hydrocarbons | 13 | 100 | 0.020 | 0.373 | 0.07 | No | 620 | 1000 | No | 0 | Stable |
| B-25 | Motor Oil | 11 | 100 | 0.045 | 0.247 | 0.15 | No | 650 J | 1000 | No | 0 | Probably Decreasing |
| B-25 | 1,1-Dichloroethene | 13 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| B-25 | 1,4-Dichlorobenzene | 13 | 92 | 0.009 | 0.895 | 0.00 | No | 24 | 4.86 | Yes | Cannot be determined | Stable |
| B-25 | Benzene | 13 | 100 | 0.089 | 0.028 | 0.37 | No | 0.7 | 22.7 | No | 0 | Probably Decreasing |
| B-25 | Tetrachloroethene | 13 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-25 | Vinyl Chloride | 13 | 46 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| B-26 | bis(2-ethylhexyl)phthalate | 4 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| B-26 | Pentachlorophenol | 4 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| B-26 | Diesel Range Hydrocarbons | 4 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-26 | Gasoline Range Hydrocarbons | 4 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| B-26 | Motor Oil | 3 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-26 | 1,1-Dichloroethene | 6 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| B-26 | 1,4-Dichlorobenzene | 6 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| B-26 | Benzene | 6 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| B-26 | Tetrachloroethene | 6 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| B-26 | Vinyl Chloride | 6 | 67 | -0.250 | 0.308 | 0.25 | No | 0.2 U | 2.4 | No | 0 | Stable |
| B-27 | bis(2-ethylhexyl)phthalate | 3 | 0 | ND | ND | ND | -- | 0.27 U | 2.2 | No | 0 | ND |
| B-27 | Pentachlorophenol | 3 | 0 | ND | ND | ND | -- | 0.029 U | 3 | No | 0 | ND |
| B-27 | Diesel Range Hydrocarbons | 3 | 33 | ND | ND | ND | -- | 51 | 1000 | No | 0 | ND |
| B-27 | Gasoline Range Hydrocarbons | 3 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| B-27 | Motor Oil | 2 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-27 | 1,1-Dichloroethene | 5 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| B-27 | 1,4-Dichlorobenzene | 5 | 0 | ND | ND | ND | -- | 0.098 U | 4.86 | No | 0 | ND |
| B-27 | Benzene | 5 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| B-27 | Tetrachloroethene | 5 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-27 | Vinyl Chloride | 5 | 100 | ND | ND | ND | -- | 0.28 | 2.4 | No | 0 | Decreasing |
| B-28 | bis(2-ethylhexyl)phthalate | 13 | 46 | ND | ND | ND | -- | 45 U | 2.2 | RL > CUL | Cannot be determined | ND |
| B-28 | Pentachlorophenol | 13 | 8 | ND | ND | ND | -- | 26 U | 3 | RL > CUL | Cannot be determined | ND |
| B-28 | Diesel Range Hydrocarbons | 13 | 69 | 0.046 | 0.075 | 0.26 | No | 100 | 1000 | No | 0 | Increasing |
| B-28 | Gasoline Range Hydrocarbons | 13 | 15 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| B-28 | Motor Oil | 11 | 55 | 0.124 | 0.027 | 0.43 | No | 160 | 1000 | No | 0 | No Trend |
| B-28 | 1,1-Dichloroethene | 14 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| B-28 | 1,4-Dichlorobenzene | 14 | 0 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| B-28 | Benzene | 14 | 7 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| B-28 | Tetrachloroethene | 14 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-28 | Vinyl Chloride | 14 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| B-29 | bis(2-ethylhexyl)phthalate | 30 | 17 | ND | ND | ND | -- | 0.084 U | 2.2 | No | 0 | ND |
| B-29 | Pentachlorophenol | 31 | 58 | -0.150 | 0.086 | 0.10 | No | 8.7 U | 3 | RL > CUL | Cannot be determined | Decreasing |
| B-29 | Diesel Range Hydrocarbons | 31 | 100 | 0.017 | 0.491 | 0.02 | No | 15000 | 1000 | Yes | Cannot be determined | Stable |
| B-29 | Gasoline Range Hydrocarbons | 31 | 100 | 0.058 | 0.164 | 0.07 | No | 580 | 1000 | No | 0 | No Trend |
| B-29 | Motor Oil | 30 | 100 | 0.018 | 0.670 | 0.01 | No | 9100 | 1000 | Yes | Cannot be determined | Stable |
| B-29 | 1,1-Dichloroethene | 31 | 3 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| B-29 | 1,4-Dichlorobenzene | 30 | 97 | 0.008 | 0.906 | 0.00 | No | 3.1 | 4.86 | No | 0 | No Trend |
| B-29 | Benzene | 31 | 81 | 0.088 | 0.141 | 0.07 | No | 1.2 | 22.7 | No | 0 | Decreasing |
| B-29 | Tetrachloroethene | 31 | 10 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| B-29 | Vinyl Chloride | 31 | 39 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate (yr$^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-30 | bis(2-ethylhexyl)phthalate | 33 | 12 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| B-30 | Pentachlorophenol | 34 | 50 | 0.089 | 0.123 | 0.07 | No | 0.52 U | 3 | No | 0 | Decreasing |
| B-30 | Diesel Range Hydrocarbons | 33 | 100 | 0.032 | 0.455 | 0.02 | No | 2700 | 1000 | Yes | Cannot be determined | Probably Decreasing |
| B-30 | Gasoline Range Hydrocarbons | 33 | 100 | 0.149 | 0.000 | 0.65 | Yes | 790 | 1000 | No | 0 | Decreasing |
| B-30 | Motor Oil | 31 | 97 | 0.057 | 0.152 | 0.07 | No | 1400 | 1000 | Yes | Cannot be determined | No Trend |
| B-30 | 1,1-Dichloroethene | 36 | 6 | ND | ND | ND | -- | 1.1 U | 1.93 | No | 0 | ND |
| B-30 | 1,4-Dichlorobenzene | 35 | 66 | 0.174 | 0.000 | 0.66 | Yes | 1.8 U | 4.86 | No | 0 | Decreasing |
| B-30 | Benzene | 36 | 67 | 0.336 | 0.000 | 0.74 | Yes | 0.96 U | 22.7 | No | 0 | Decreasing |
| B-30 | Tetrachloroethene | 36 | 47 | ND | ND | ND | -- | 1.6 U | 3.3 | No | 0 | ND |
| B-30 | Vinyl Chloride | 36 | 64 | 0.129 | 0.005 | 0.21 | No | 2.1 | 2.4 | No | 0 | No Trend |
| B-31D | bis(2-ethylhexyl)phthalate | 2 | 50 | ND | ND | ND | -- | 0.32 | 2.2 | No | 0 | ND |
| B-31D | Pentachlorophenol | 2 | 100 | ND | ND | ND | -- | 0.081 | 3 | No | 0 | ND |
| B-31D | Diesel Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 36 U | 1000 | No | 0 | ND |
| B-31D | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| B-31D | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| B-31D | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| B-31D | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.014 U | 4.86 | No | 0 | ND |
| B-31D | Benzene | 2 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| B-31D | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| B-31D | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.0029 U | 2.4 | No | 0 | ND |
| CDM-10 | bis(2-ethylhexyl)phthalate | 9 | 22 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| CDM-10 | Pentachlorophenol | 9 | 33 | ND | ND | ND | -- | 0.17 U | 3 | No | 0 | ND |
| CDM-10 | Diesel Range Hydrocarbons | 9 | 100 | 0.131 | 0.138 | 0.29 | No | 170 | 1000 | No | 0 | Probably Decreasing |
| CDM-10 | Gasoline Range Hydrocarbons | 9 | 22 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-10 | Motor Oil | 8 | 100 | 0.009 | 0.935 | 0.00 | No | 540 | 1000 | No | 0 | Stable |
| CDM-10 | 1,1-Dichloroethene | 9 | 11 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-10 | 1,4-Dichlorobenzene | 9 | 22 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| CDM-10 | Benzene | 9 | 22 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| CDM-10 | Tetrachloroethene | 9 | 100 | 0.025 | 0.528 | 0.06 | No | 0.41 | 3.3 | No | 0 | Stable |
| CDM-10 | Vinyl Chloride | 9 | 11 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| CDM-12 | bis(2-ethylhexyl)phthalate | 7 | 43 | ND | ND | ND | -- | 41 U | 2.2 | RL > CUL | Cannot be determined | ND |
| CDM-12 | Pentachlorophenol | 7 | 0 | ND | ND | ND | -- | 24 U | 3 | RL > CUL | Cannot be determined | ND |
| CDM-12 | Diesel Range Hydrocarbons | 7 | 86 | -0.029 | 0.690 | 0.03 | No | 98 | 1000 | No | 0 | No Trend |
| CDM-12 | Gasoline Range Hydrocarbons | 7 | 29 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-12 | Motor Oil | 7 | 100 | 0.010 | 0.883 | 0.00 | No | 110 | 1000 | No | 0 | Stable |
| CDM-12 | 1,1-Dichloroethene | 7 | 0 | ND | ND | ND | -- | 0.035 U | 1.93 | No | 0 | ND |
| CDM-12 | 1,4-Dichlorobenzene | 7 | 0 | ND | ND | ND | -- | 0.05 U | 4.86 | No | 0 | ND |
| CDM-12 | Benzene | 7 | 0 | ND | ND | ND | -- | 0.03 U | 22.7 | No | 0 | ND |
| CDM-12 | Tetrachloroethene | 7 | 0 | ND | ND | ND | -- | 0.084 U | 3.3 | No | 0 | ND |
| CDM-12 | Vinyl Chloride | 7 | 0 | ND | ND | ND | -- | 0.013 U | 2.4 | No | 0 | ND |
| CDM-15 | bis(2-ethylhexyl)phthalate | 12 | 17 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| CDM-15 | Pentachlorophenol | 12 | 42 | ND | ND | ND | -- | 9.1 U | 3 | RL > CUL | Cannot be determined | ND |
| CDM-15 | Diesel Range Hydrocarbons | 12 | 100 | -0.026 | 0.801 | 0.01 | No | 7800 | 1000 | Yes | Cannot be determined | No Trend |
| CDM-15 | Gasoline Range Hydrocarbons | 12 | 92 | 0.104 | 0.246 | 0.13 | No | 350 | 1000 | No | 0 | Decreasing |
| CDM-15 | Motor Oil | 11 | 100 | -0.096 | 0.297 | 0.12 | No | 3700 | 1000 | Yes | Cannot be determined | No Trend |
| CDM-15 | 1,1-Dichloroethene | 12 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-15 | 1,4-Dichlorobenzene | 12 | 92 | -0.004 | 0.974 | 0.00 | No | 4.7 | 4.86 | No | 0 | No Trend |
| CDM-15 | Benzene | 12 | 75 | 0.098 | 0.087 | 0.26 | No | 0.35 | 22.7 | No | 0 | Decreasing |
| CDM-15 | Tetrachloroethene | 12 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-15 | Vinyl Chloride | 12 | 33 | ND | ND | ND | -- | 0.22 UJ | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CDM-16 | bis(2-ethylhexyl)phthalate | 2 | 0 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| CDM-16 | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 9.1 U | 3 | RL > CUL | Cannot be determined | ND |
| CDM-16 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 15000 J | 1000 | Yes | Cannot be determined | ND |
| CDM-16 | Gasoline Range Hydrocarbons | 2 | 50 | ND | ND | ND | -- | 480 | 1000 | No | 0 | ND |
| CDM-16 | Motor Oil | 1 | 100 | ND | ND | ND | -- | 9700 | 1000 | Yes | Cannot be determined | ND |
| CDM-16 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-16 | 1,4-Dichlorobenzene | 2 | 50 | ND | ND | ND | -- | 2 | 4.86 | No | 0 | ND |
| CDM-16 | Benzene | 2 | 50 | ND | ND | ND | -- | 1.5 | 22.7 | No | 0 | ND |
| CDM-16 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-16 | Vinyl Chloride | 2 | 50 | ND | ND | ND | -- | 0.89 J | 2.4 | No | 0 | ND |
| CDM-17 | bis(2-ethylhexyl)phthalate | 10 | 30 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| CDM-17 | Pentachlorophenol | 10 | 60 | -0.123 | 0.459 | 0.07 | No | 0.17 U | 3 | No | 0 | Decreasing |
| CDM-17 | Diesel Range Hydrocarbons | 9 | 100 | 0.058 | 0.685 | 0.02 | No | 410 | 1000 | No | 0 | No Trend |
| CDM-17 | Gasoline Range Hydrocarbons | 10 | 40 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-17 | Motor Oil | 8 | 100 | 0.020 | 0.890 | 0.00 | No | 540 | 1000 | No | 0 | No Trend |
| CDM-17 | 1,1-Dichloroethene | 10 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-17 | 1,4-Dichlorobenzene | 10 | 10 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| CDM-17 | Benzene | 10 | 30 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| CDM-17 | Tetrachloroethene | 10 | 10 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-17 | Vinyl Chloride | 10 | 20 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| CDM-19 | bis(2-ethylhexyl)phthalate | 63 | 2 | ND | ND | ND | -- | 0.25 U | 2.2 | No | 0 | ND |
| CDM-19 | Pentachlorophenol | 64 | 39 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| CDM-19 | Diesel Range Hydrocarbons | 64 | 100 | 0.149 | 0.003 | 0.13 | No | 4100 J | 1000 | Yes | Cannot be determined | Decreasing |
| CDM-19 | Gasoline Range Hydrocarbons | 64 | 92 | -0.035 | 0.509 | 0.01 | No | 120 | 1000 | No | 0 | No Trend |
| CDM-19 | Motor Oil | 63 | 100 | 0.093 | 0.013 | 0.10 | No | 4400 J | 1000 | Yes | Cannot be determined | Decreasing |
| CDM-19 | 1,1-Dichloroethene | 64 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-19 | 1,4-Dichlorobenzene | 63 | 25 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| CDM-19 | Benzene | 64 | 72 | 0.218 | 0.003 | 0.13 | No | 0.56 | 22.7 | No | 0 | Decreasing |
| CDM-19 | Tetrachloroethene | 64 | 9 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-19 | Vinyl Chloride | 64 | 3 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| CDM-20 | bis(2-ethylhexyl)phthalate | 33 | 6 | ND | ND | ND | -- | 0.083 U | 2.2 | No | 0 | ND |
| CDM-20 | Pentachlorophenol | 34 | 44 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| CDM-20 | Diesel Range Hydrocarbons | 33 | 100 | 0.239 | 0.000 | 0.66 | Yes | 2200 J | 1000 | Yes | 3 | Decreasing |
| CDM-20 | Gasoline Range Hydrocarbons | 34 | 100 | 0.152 | 0.000 | 0.45 | No | 780 J | 1000 | No | 0 | Decreasing |
| CDM-20 | Motor Oil | 32 | 97 | 0.077 | 0.171 | 0.06 | No | 670 J | 1000 | No | 0 | Decreasing |
| CDM-20 | 1,1-Dichloroethene | 34 | 9 | ND | ND | ND | -- | 0.28 UJ | 1.93 | No | 0 | ND |
| CDM-20 | 1,4-Dichlorobenzene | 33 | 91 | -0.042 | 0.345 | 0.03 | No | 3.7 J | 4.86 | No | 0 | No Trend |
| CDM-20 | Benzene | 34 | 100 | 0.244 | 0.000 | 0.41 | No | 3.4 J | 22.7 | No | 0 | Decreasing |
| CDM-20 | Tetrachloroethene | 34 | 6 | ND | ND | ND | -- | 0.41 UJ | 3.3 | No | 0 | ND |
| CDM-20 | Vinyl Chloride | 34 | 35 | ND | ND | ND | -- | 0.22 UJ | 2.4 | No | 0 | ND |
| CDM-21 | bis(2-ethylhexyl)phthalate | 10 | 40 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| CDM-21 | Pentachlorophenol | 10 | 30 | ND | ND | ND | -- | 0.55 U | 3 | No | 0 | ND |
| CDM-21 | Diesel Range Hydrocarbons | 10 | 100 | 0.120 | 0.071 | 0.35 | No | 210 J+ | 1000 | No | 0 | Probably Decreasing |
| CDM-21 | Gasoline Range Hydrocarbons | 10 | 20 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-21 | Motor Oil | 9 | 100 | 0.065 | 0.480 | 0.07 | No | 450 J+ | 1000 | No | 0 | Stable |
| CDM-21 | 1,1-Dichloroethene | 10 | 10 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-21 | 1,4-Dichlorobenzene | 10 | 10 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| CDM-21 | Benzene | 10 | 30 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| CDM-21 | Tetrachloroethene | 10 | 20 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-21 | Vinyl Chloride | 10 | 20 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CDM-22 | bis(2-ethylhexyl)phthalate | 26 | 65 | 0.160 | 0.027 | 0.19 | No | 0.26 U | 2.2 | No | 0 | Decreasing |
| CDM-22 | Pentachlorophenol | 27 | 4 | ND | ND | ND | -- | 0.54 U | 3 | No | 0 | ND |
| CDM-22 | Diesel Range Hydrocarbons | 27 | 100 | 0.216 | 0.000 | 0.66 | Yes | 580 | 1000 | No | 0 | Decreasing |
| CDM-22 | Gasoline Range Hydrocarbons | 27 | 96 | 0.120 | 0.095 | 0.11 | No | 100 U | 1000 | No | 0 | Decreasing |
| CDM-22 | Motor Oil | 26 | 100 | 0.131 | 0.013 | 0.23 | No | 2400 | 1000 | Yes | Cannot be determined | Decreasing |
| CDM-22 | 1,1-Dichloroethene | 27 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| CDM-22 | 1,4-Dichlorobenzene | 26 | 100 | 0.144 | 0.001 | 0.35 | No | 1.3 | 4.86 | No | 0 | Decreasing |
| CDM-22 | Benzene | 27 | 85 | 0.083 | 0.047 | 0.15 | No | 0.24 U | 22.7 | No | 0 | Decreasing |
| CDM-22 | Tetrachloroethene | 27 | 4 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-22 | Vinyl Chloride | 27 | 30 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| CDM-26 | bis(2-ethylhexyl)phthalate | 10 | 50 | -0.190 | 0.089 | 0.32 | No | 48 U | 2.2 | RL > CUL | Cannot be determined | No Trend |
| CDM-26 | Pentachlorophenol | 10 | 10 | ND | ND | ND | -- | 28 U | 3 | RL > CUL | Cannot be determined | ND |
| CDM-26 | Diesel Range Hydrocarbons | 10 | 70 | 0.031 | 0.701 | 0.02 | No | 91 | 1000 | No | 0 | Stable |
| CDM-26 | Gasoline Range Hydrocarbons | 10 | 30 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-26 | Motor Oil | 9 | 67 | 0.107 | 0.255 | 0.18 | No | 130 | 1000 | No | 0 | No Trend |
| CDM-26 | 1,1-Dichloroethene | 11 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| CDM-26 | 1,4-Dichlorobenzene | 11 | 0 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| CDM-26 | Benzene | 11 | 0 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| CDM-26 | Tetrachloroethene | 11 | 18 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| CDM-26 | Vinyl Chloride | 11 | 45 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| CDM-27 | bis(2-ethylhexyl)phthalate | 4 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| CDM-27 | Pentachlorophenol | 4 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| CDM-27 | Diesel Range Hydrocarbons | 4 | 25 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| CDM-27 | Gasoline Range Hydrocarbons | 4 | 25 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| CDM-27 | Motor Oil | 3 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| CDM-27 | 1,1-Dichloroethene | 7 | 14 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| CDM-27 | 1,4-Dichlorobenzene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| CDM-27 | Benzene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| CDM-27 | Tetrachloroethene | 7 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| CDM-27 | Vinyl Chloride | 7 | 86 | -0.078 | 0.714 | 0.03 | No | 0.2 U | 2.4 | No | 0 | Stable |
| CDM-29 | bis(2-ethylhexyl)phthalate | 3 | 33 | ND | ND | ND | -- | 5.4 U | 2.2 | RL > CUL | Cannot be determined | ND |
| CDM-29 | Pentachlorophenol | 3 | 0 | ND | ND | ND | -- | 0.25 U | 3 | No | 0 | ND |
| CDM-29 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 620 | 1000 | No | 0 | ND |
| CDM-29 | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| CDM-29 | Motor Oil | 2 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| CDM-29 | 1,1-Dichloroethene | 3 | 0 | ND | ND | ND | -- | 0.2 U | 1.93 | No | 0 | ND |
| CDM-29 | 1,4-Dichlorobenzene | 3 | 100 | ND | ND | ND | -- | 1.6 | 4.86 | No | 0 | ND |
| CDM-29 | Benzene | 3 | 33 | ND | ND | ND | -- | 0.3 | 22.7 | No | 0 | ND |
| CDM-29 | Tetrachloroethene | 3 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| CDM-29 | Vinyl Chloride | 3 | 100 | ND | ND | ND | -- | 0.4 | 2.4 | No | 0 | ND |
| CDM-30 | bis(2-ethylhexyl)phthalate | 2 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| CDM-30 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.32 U | 3 | No | 0 | ND |
| CDM-30 | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| CDM-30 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| CDM-30 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| CDM-30 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| CDM-30 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| CDM-30 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| CDM-30 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| CDM-30 | Vinyl Chloride | 2 | 100 | ND | ND | ND | -- | 0.039 | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CDM-31 | bis(2-ethylhexyl)phthalate | 22 | 18 | ND | ND | ND | -- | 42 U | 2.2 | RL > CUL | Cannot be determined | ND |
| CDM-31 | Pentachlorophenol | 23 | 22 | ND | ND | ND | -- | 25 U | 3 | RL > CUL | Cannot be determined | ND |
| CDM-31 | Diesel Range Hydrocarbons | 23 | 100 | -0.115 | 0.015 | 0.25 | No | 1800 | 1000 | Yes | Cannot be determined | Increasing |
| CDM-31 | Gasoline Range Hydrocarbons | 23 | 39 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| CDM-31 | Motor Oil | 22 | 100 | -0.050 | 0.348 | 0.04 | No | 1400 | 1000 | Yes | Cannot be determined | No Trend |
| CDM-31 | 1,1-Dichloroethene | 24 | 0 | ND | ND | ND | -- | 0.35 U | 1.93 | No | 0 | ND |
| CDM-31 | 1,4-Dichlorobenzene | 22 | 5 | ND | ND | ND | -- | 0.5 U | 4.86 | No | 0 | ND |
| CDM-31 | Benzene | 24 | 4 | ND | ND | ND | -- | 0.3 U | 22.7 | No | 0 | ND |
| CDM-31 | Tetrachloroethene | 24 | 0 | ND | ND | ND | -- | 0.84 U | 3.3 | No | 0 | ND |
| CDM-31 | Vinyl Chloride | 24 | 0 | ND | ND | ND | -- | 0.13 U | 2.4 | No | 0 | ND |
| DMW-03 | bis(2-ethylhexyl)phthalate | 0 | No Data | No Data | No Data | No Data | -- | No Data | 2.2 | -- | 0 | No Data |
| DMW-03 | Pentachlorophenol | 0 | No Data | No Data | No Data | No Data | -- | No Data | 3 | -- | 0 | No Data |
| DMW-03 | Diesel Range Hydrocarbons | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| DMW-03 | Gasoline Range Hydrocarbons | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| DMW-03 | Motor Oil | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| DMW-03 | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| DMW-03 | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.098 U | 4.86 | No | 0 | ND |
| DMW-03 | Benzene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| DMW-03 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| DMW-03 | Vinyl Chloride | 1 | 100 | ND | ND | ND | -- | 0.0037 | 2.4 | No | 0 | ND |
| DMW-04 | bis(2-ethylhexyl)phthalate | 10 | 20 | ND | ND | ND | -- | 44 U | 2.2 | RL > CUL | Cannot be determined | ND |
| DMW-04 | Pentachlorophenol | 10 | 0 | ND | ND | ND | -- | 26 U | 3 | RL > CUL | Cannot be determined | ND |
| DMW-04 | Diesel Range Hydrocarbons | 10 | 90 | 0.017 | 0.442 | 0.08 | No | 320 | 1000 | No | 0 | Stable |
| DMW-04 | Gasoline Range Hydrocarbons | 10 | 20 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| DMW-04 | Motor Oil | 9 | 89 | -0.033 | 0.567 | 0.05 | No | 1500 | 1000 | Yes | Cannot be determined | No Trend |
| DMW-04 | 1,1-Dichloroethene | 11 | 0 | ND | ND | ND | -- | 0.035 U | 1.93 | No | 0 | ND |
| DMW-04 | 1,4-Dichlorobenzene | 11 | 0 | ND | ND | ND | -- | 0.05 U | 4.86 | No | 0 | ND |
| DMW-04 | Benzene | 11 | 9 | ND | ND | ND | -- | 0.047 | 22.7 | No | 0 | ND |
| DMW-04 | Tetrachloroethene | 11 | 0 | ND | ND | ND | -- | 0.084 U | 3.3 | No | 0 | ND |
| DMW-04 | Vinyl Chloride | 11 | 27 | ND | ND | ND | -- | 0.013 U | 2.4 | No | 0 | ND |
| LAI-P02 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 2.7 U | 2.2 | RL > CUL | Cannot be determined | ND |
| LAI-P02 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.095 U | 3 | No | 0 | ND |
| LAI-P02 | Diesel Range Hydrocarbons | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| LAI-P02 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 12 U | 1000 | No | 0 | ND |
| LAI-P02 | Motor Oil | 0 | No Data | No Data | No Data | No Data | -- | No Data | 1000 | -- | 0 | No Data |
| LAI-P02 | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.0024 U | 1.93 | No | 0 | ND |
| LAI-P02 | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.14 U | 4.86 | No | 0 | ND |
| LAI-P02 | Benzene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 22.7 | No | 0 | ND |
| LAI-P02 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.11 U | 3.3 | No | 0 | ND |
| LAI-P02 | Vinyl Chloride | 1 | 0 | ND | ND | ND | -- | 0.0029 U | 2.4 | No | 0 | ND |
| LAI-P03 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| LAI-P03 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| LAI-P03 | Diesel Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 410 | 1000 | No | 0 | ND |
| LAI-P03 | Gasoline Range Hydrocarbons | 2 | 50 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| LAI-P03 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| LAI-P03 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| LAI-P03 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| LAI-P03 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| LAI-P03 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| LAI-P03 | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-01 | bis(2-ethylhexyl)phthalate | 34 | 44 | ND | ND | ND | -- | 0.084 U | 2.2 | No | 0 | ND |
| MW-01 | Pentachlorophenol | 35 | 11 | ND | ND | ND | -- | 0.17 U | 3 | No | 0 | ND |
| MW-01 | Diesel Range Hydrocarbons | 36 | 92 | 0.023 | 0.378 | 0.02 | No | 90 | 1000 | No | 0 | Stable |
| MW-01 | Gasoline Range Hydrocarbons | 36 | 44 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-01 | Motor Oil | 34 | 94 | 0.083 | 0.040 | 0.13 | No | 210 | 1000 | No | 0 | Stable |
| MW-01 | 1,1-Dichloroethene | 36 | 3 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| MW-01 | 1,4-Dichlorobenzene | 35 | 0 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| MW-01 | Benzene | 36 | 3 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| MW-01 | Tetrachloroethene | 36 | 3 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| MW-01 | Vinyl Chloride | 36 | 6 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-02 | bis(2-ethylhexyl)phthalate | 34 | 50 | -0.007 | 0.897 | 0.00 | No | 2.2 U | 2.2 | No | 0 | Probably Increasing |
| MW-02 | Pentachlorophenol | 33 | 12 | ND | ND | ND | -- | 1 U | 3 | No | 0 | ND |
| MW-02 | Diesel Range Hydrocarbons | 35 | 97 | 0.015 | 0.675 | 0.01 | No | 120 | 1000 | No | 0 | Probably Decreasing |
| MW-02 | Gasoline Range Hydrocarbons | 35 | 43 | ND | ND | ND | -- | 63 | 1000 | No | 0 | ND |
| MW-02 | Motor Oil | 34 | 91 | 0.117 | 0.028 | 0.14 | No | 490 | 1000 | No | 0 | Decreasing |
| MW-02 | 1,1-Dichloroethene | 35 | 9 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| MW-02 | 1,4-Dichlorobenzene | 35 | 0 | ND | ND | ND | -- | 0.06 U | 4.86 | No | 0 | ND |
| MW-02 | Benzene | 35 | 0 | ND | ND | ND | -- | 0.42 U | 22.7 | No | 0 | ND |
| MW-02 | Tetrachloroethene | 35 | 17 | ND | ND | ND | -- | 0.33 U | 3.3 | No | 0 | ND |
| MW-02 | Vinyl Chloride | 35 | 6 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-03 | bis(2-ethylhexyl)phthalate | 12 | 25 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| MW-03 | Pentachlorophenol | 11 | 0 | ND | ND | ND | -- | 0.54 U | 3 | No | 0 | ND |
| MW-03 | Diesel Range Hydrocarbons | 13 | 85 | 0.001 | 0.971 | 0.00 | No | 120 | 1000 | No | 0 | Probably Increasing |
| MW-03 | Gasoline Range Hydrocarbons | 13 | 38 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-03 | Motor Oil | 11 | 91 | 0.034 | 0.552 | 0.04 | No | 190 J | 1000 | No | 0 | Stable |
| MW-03 | 1,1-Dichloroethene | 13 | 23 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| MW-03 | 1,4-Dichlorobenzene | 13 | 0 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| MW-03 | Benzene | 13 | 0 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| MW-03 | Tetrachloroethene | 13 | 31 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| MW-03 | Vinyl Chloride | 13 | 31 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-04 | bis(2-ethylhexyl)phthalate | 1 | 100 | ND | ND | ND | -- | 1.9 | 2.2 | No | 0 | ND |
| MW-04 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.56 U | 3 | No | 0 | ND |
| MW-04 | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-04 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-04 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| MW-04 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| MW-04 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| MW-04 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| MW-04 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| MW-04 | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |
| MW-05 | bis(2-ethylhexyl)phthalate | 10 | 30 | ND | ND | ND | -- | 44 U | 2.2 | RL > CUL | Cannot be determined | ND |
| MW-05 | Pentachlorophenol | 9 | 22 | ND | ND | ND | -- | 26 U | 3 | RL > CUL | Cannot be determined | ND |
| MW-05 | Diesel Range Hydrocarbons | 10 | 90 | 0.006 | 0.935 | 0.00 | No | 380 | 1000 | No | 0 | No Trend |
| MW-05 | Gasoline Range Hydrocarbons | 10 | 30 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-05 | Motor Oil | 9 | 89 | 0.058 | 0.530 | 0.06 | No | 610 | 1000 | No | 0 | Probably Decreasing |
| MW-05 | 1,1-Dichloroethene | 11 | 9 | ND | ND | ND | -- | 0.035 U | 1.93 | No | 0 | ND |
| MW-05 | 1,4-Dichlorobenzene | 11 | 0 | ND | ND | ND | -- | 0.05 U | 4.86 | No | 0 | ND |
| MW-05 | Benzene | 11 | 9 | ND | ND | ND | -- | 0.03 U | 22.7 | No | 0 | ND |
| MW-05 | Tetrachloroethene | 11 | 0 | ND | ND | ND | -- | 0.084 U | 3.3 | No | 0 | ND |
| MW-05 | Vinyl Chloride | 11 | 9 | ND | ND | ND | -- | 0.013 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-06 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| MW-06 | Pentachlorophenol | 0 | No Data | No Data | No Data | No Data | -- | No Data | 3 | -- | 0 | No Data |
| MW-06 | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-06 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-06 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| MW-06 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| MW-06 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| MW-06 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| MW-06 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| MW-06 | Vinyl Chloride | 2 | 50 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |
| MW-07 | bis(2-ethylhexyl)phthalate | 26 | 12 | ND | ND | ND | -- | 43 U | 2.2 | RL > CUL | Cannot be determined | ND |
| MW-07 | Pentachlorophenol | 27 | 19 | ND | ND | ND | -- | 25 U | 3 | RL > CUL | Cannot be determined | ND |
| MW-07 | Diesel Range Hydrocarbons | 27 | 89 | -0.128 | 0.118 | 0.10 | No | 600 | 1000 | No | 0 | Increasing |
| MW-07 | Gasoline Range Hydrocarbons | 27 | 48 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-07 | Motor Oil | 26 | 92 | 0.018 | 0.711 | 0.01 | No | 520 | 1000 | No | 0 | No Trend |
| MW-07 | 1,1-Dichloroethene | 28 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| MW-07 | 1,4-Dichlorobenzene | 27 | 4 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| MW-07 | Benzene | 28 | 0 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| MW-07 | Tetrachloroethene | 28 | 4 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| MW-07 | Vinyl Chloride | 28 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-08 | bis(2-ethylhexyl)phthalate | 10 | 30 | ND | ND | ND | -- | 50 U | 2.2 | RL > CUL | Cannot be determined | ND |
| MW-08 | Pentachlorophenol | 10 | 10 | ND | ND | ND | -- | 29 U | 3 | RL > CUL | Cannot be determined | ND |
| MW-08 | Diesel Range Hydrocarbons | 10 | 100 | 0.111 | 0.020 | 0.51 | Yes | 170 | 1000 | No | 0 | Decreasing |
| MW-08 | Gasoline Range Hydrocarbons | 10 | 30 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-08 | Motor Oil | 9 | 67 | 0.108 | 0.216 | 0.21 | No | 190 | 1000 | No | 0 | No Trend |
| MW-08 | 1,1-Dichloroethene | 11 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| MW-08 | 1,4-Dichlorobenzene | 11 | 0 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| MW-08 | Benzene | 11 | 0 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| MW-08 | Tetrachloroethene | 11 | 9 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| MW-08 | Vinyl Chloride | 11 | 18 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-09 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1.1 U | 2.2 | No | 0 | ND |
| MW-09 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.53 U | 3 | No | 0 | ND |
| MW-09 | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-09 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-09 | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| MW-09 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| MW-09 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| MW-09 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| MW-09 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| MW-09 | Vinyl Chloride | 2 | 100 | ND | ND | ND | -- | 0.032 | 2.4 | No | 0 | ND |
| MW-10 | bis(2-ethylhexyl)phthalate | 9 | 11 | ND | ND | ND | -- | 1.2 U | 2.2 | No | 0 | ND |
| MW-10 | Pentachlorophenol | 8 | 63 | -0.212 | 0.265 | 0.20 | No | 0.29 | 3 | No | 0 | Increasing |
| MW-10 | Diesel Range Hydrocarbons | 9 | 89 | -0.043 | 0.114 | 0.32 | No | 280 | 1000 | No | 0 | Probably Increasing |
| MW-10 | Gasoline Range Hydrocarbons | 9 | 33 | ND | ND | ND | -- | 27 U | 1000 | No | 0 | ND |
| MW-10 | Motor Oil | 8 | 88 | 0.054 | 0.382 | 0.13 | No | 170 | 1000 | No | 0 | Stable |
| MW-10 | 1,1-Dichloroethene | 10 | 20 | ND | ND | ND | -- | 0.33 U | 1.93 | No | 0 | ND |
| MW-10 | 1,4-Dichlorobenzene | 10 | 0 | ND | ND | ND | -- | 0.099 U | 4.86 | No | 0 | ND |
| MW-10 | Benzene | 10 | 20 | ND | ND | ND | -- | 0.42 U | 22.7 | No | 0 | ND |
| MW-10 | Tetrachloroethene | 10 | 0 | ND | ND | ND | -- | 0.33 U | 3.3 | No | 0 | ND |
| MW-10 | Vinyl Chloride | 10 | 20 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-11 | bis(2-ethylhexyl)phthalate | 2 | 0 | ND | ND | ND | -- | 4.3 U | 2.2 | RL > CUL | Cannot be determined | ND |
| MW-11 | Pentachlorophenol | 2 | 0 | ND | ND | ND | -- | 3.1 U | 3 | RL > CUL | Cannot be determined | ND |
| MW-11 | Diesel Range Hydrocarbons | 2 | 50 | ND | ND | ND | -- | 150 | 1000 | No | 0 | ND |
| MW-11 | Gasoline Range Hydrocarbons | 2 | 0 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| MW-11 | Motor Oil | 2 | 50 | ND | ND | ND | -- | 210 | 1000 | No | 0 | ND |
| MW-11 | 1,1-Dichloroethene | 2 | 0 | ND | ND | ND | -- | 0.28 U | 1.93 | No | 0 | ND |
| MW-11 | 1,4-Dichlorobenzene | 2 | 0 | ND | ND | ND | -- | 0.46 U | 4.86 | No | 0 | ND |
| MW-11 | Benzene | 2 | 0 | ND | ND | ND | -- | 0.24 U | 22.7 | No | 0 | ND |
| MW-11 | Tetrachloroethene | 2 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| MW-11 | Vinyl Chloride | 2 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| MW-12 | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| MW-12 | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.52 U | 3 | No | 0 | ND |
| MW-12 | Diesel Range Hydrocarbons | 1 | 100 | ND | ND | ND | -- | 1300 | 1000 | Yes | Cannot be determined | ND |
| MW-12 | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-12 | Motor Oil | 1 | 100 | ND | ND | ND | -- | 650 | 1000 | No | 0 | ND |
| MW-12 | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| MW-12 | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| MW-12 | Benzene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| MW-12 | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| MW-12 | Vinyl Chloride | 1 | 0 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |
| MW-14D | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 1 U | 2.2 | No | 0 | ND |
| MW-14D | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 0.5 U | 3 | No | 0 | ND |
| MW-14D | Diesel Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-14D | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 250 U | 1000 | No | 0 | ND |
| MW-14D | Motor Oil | 1 | 0 | ND | ND | ND | -- | 500 U | 1000 | No | 0 | ND |
| MW-14D | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.02 U | 1.93 | No | 0 | ND |
| MW-14D | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 4.86 | No | 0 | ND |
| MW-14D | Benzene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 22.7 | No | 0 | ND |
| MW-14D | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.2 U | 3.3 | No | 0 | ND |
| MW-14D | Vinyl Chloride | 1 | 0 | ND | ND | ND | -- | 0.02 U | 2.4 | No | 0 | ND |
| P-4B | bis(2-ethylhexyl)phthalate | 1 | 0 | ND | ND | ND | -- | 41 U | 2.2 | RL > CUL | Cannot be determined | ND |
| P-4B | Pentachlorophenol | 1 | 0 | ND | ND | ND | -- | 24 U | 3 | RL > CUL | Cannot be determined | ND |
| P-4B | Diesel Range Hydrocarbons | 1 | 100 | ND | NA | NA | -- | 810 | 1000 | No | 0 | IS |
| P-4B | Gasoline Range Hydrocarbons | 1 | 0 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| P-4B | Motor Oil | 1 | 100 | ND | NA | NA | -- | 940 | 1000 | No | 0 | IS |
| P-4B | 1,1-Dichloroethene | 1 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| P-4B | 1,4-Dichlorobenzene | 1 | 0 | ND | ND | ND | -- | 0.98 U | 4.86 | No | 0 | ND |
| P-4B | Benzene | 1 | 0 | ND | ND | ND | -- | 0.53 U | 22.7 | No | 0 | ND |
| P-4B | Tetrachloroethene | 1 | 0 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| P-4B | Vinyl Chloride | 1 | 0 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| P-IA | bis(2-ethylhexyl)phthalate | 9 | 0 | ND | ND | ND | -- | 4.1 U | 2.2 | RL > CUL | Cannot be determined | ND |
| P-IA | Pentachlorophenol | 9 | 56 | -0.325 | 0.204 | 0.22 | No | 2.4 | 3 | No | 0 | No Trend |
| P-IA | Diesel Range Hydrocarbons | 9 | 100 | 0.023 | 0.938 | 0.00 | No | 20000 | 1000 | Yes | Cannot be determined | Decreasing |
| P-IA | Gasoline Range Hydrocarbons | 9 | 89 | 0.346 | 0.217 | 0.21 | No | 450 | 1000 | No | 0 | Decreasing |
| P-IA | Motor Oil | 9 | 100 | -0.284 | 0.233 | 0.20 | No | 6100 | 1000 | Yes | Cannot be determined | No Trend |
| P-IA | 1,1-Dichloroethene | 9 | 0 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| P-IA | 1,4-Dichlorobenzene | 9 | 67 | -0.069 | 0.661 | 0.03 | No | 0.98 U | 4.86 | No | 0 | Stable |
| P-IA | Benzene | 9 | 67 | 0.074 | 0.758 | 0.01 | No | 0.89 | 22.7 | No | 0 | Stable |
| P-IA | Tetrachloroethene | 9 | 11 | ND | ND | ND | -- | 0.41 U | 3.3 | No | 0 | ND |
| P-IA | Vinyl Chloride | 9 | 56 | -0.052 | 0.913 | 0.00 | No | 3.4 | 2.4 | Yes | Cannot be determined | No Trend |

**TABLE B4**
**REGRESSION ANALYSIS RESULTS**
**2244 Port of Tacoma Road, Tacoma, Washington**

| Location ID | Analyte | Total Samples (n) | Detection Frequency (%) | Attenuation Rate ($yr^{-1}$) | p-value | $R^2$ | Goodness-of-fit? | Most Recent Concentration (µg/L) | GW CUL (µg/L) | Most Recent > Standard | Time to Reach GW CUL (years) | Mann-Kendall Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SP-04 | bis(2-ethylhexyl)phthalate | 66 | 32 | ND | ND | ND | -- | 0.84 U | 2.2 | No | 0 | ND |
| SP-04 | Pentachlorophenol | 67 | 96 | 0.360 | 0.000 | 0.50 | Yes | 0.92 | 3 | No | 0 | Decreasing |
| SP-04 | Diesel Range Hydrocarbons | 67 | 100 | 0.201 | 0.000 | 0.65 | Yes | 120 | 1000 | No | 0 | Decreasing |
| SP-04 | Gasoline Range Hydrocarbons | 67 | 48 | ND | ND | ND | -- | 100 U | 1000 | No | 0 | ND |
| SP-04 | Motor Oil | 65 | 94 | 0.136 | 0.001 | 0.17 | No | 220 | 1000 | No | 0 | Decreasing |
| SP-04 | 1,1-Dichloroethene | 69 | 22 | ND | ND | ND | -- | 0.78 U | 1.93 | No | 0 | ND |
| SP-04 | 1,4-Dichlorobenzene | 68 | 57 | 0.287 | 0.000 | 0.57 | Yes | 0.98 U | 4.86 | No | 0 | Decreasing |
| SP-04 | Benzene | 69 | 51 | 0.372 | 0.000 | 0.60 | Yes | 0.53 U | 22.7 | No | 0 | Decreasing |
| SP-04 | Tetrachloroethene | 69 | 91 | 0.078 | 0.056 | 0.05 | No | 6.8 | 3.3 | Yes | Cannot be determined | Stable |
| SP-04 | Vinyl Chloride | 69 | 39 | ND | ND | ND | -- | 0.22 U | 2.4 | No | 0 | ND |
| SP-05 | bis(2-ethylhexyl)phthalate | 3 | 67 | ND | ND | ND | -- | 2.7 U | 2.2 | RL > CUL | Cannot be determined | ND |
| SP-05 | Pentachlorophenol | 3 | 100 | ND | ND | ND | -- | 55 | 3 | Yes | Cannot be determined | ND |
| SP-05 | Diesel Range Hydrocarbons | 3 | 100 | ND | ND | ND | -- | 7100 | 1000 | Yes | Cannot be determined | ND |
| SP-05 | Gasoline Range Hydrocarbons | 2 | 100 | ND | ND | ND | -- | 25000 | 1000 | Yes | Cannot be determined | ND |
| SP-05 | Motor Oil | 2 | 100 | ND | ND | ND | -- | 2900 | 1000 | Yes | Cannot be determined | ND |
| SP-05 | 1,1-Dichloroethene | 5 | 20 | ND | ND | ND | -- | 22 | 1.93 | Yes | Cannot be determined | ND |
| SP-05 | 1,4-Dichlorobenzene | 5 | 80 | ND | ND | ND | -- | 54 | 4.86 | Yes | Cannot be determined | No Trend |
| SP-05 | Benzene | 5 | 100 | ND | ND | ND | -- | 240 | 22.7 | Yes | Cannot be determined | Stable |
| SP-05 | Tetrachloroethene | 5 | 20 | ND | ND | ND | -- | 10 | 3.3 | Yes | Cannot be determined | ND |
| SP-05 | Vinyl Chloride | 5 | 40 | ND | ND | ND | -- | 70 | 2.4 | Yes | Cannot be determined | ND |
| SP-06 | bis(2-ethylhexyl)phthalate | 3 | 0 | ND | ND | ND | -- | 0.26 U | 2.2 | No | 0 | ND |
| SP-06 | Pentachlorophenol | 3 | 0 | ND | ND | ND | -- | 0.55 U | 3 | No | 0 | ND |
| SP-06 | Diesel Range Hydrocarbons | 3 | 100 | ND | NA | NA | -- | 12000 | 1000 | Yes | Cannot be determined | IS |
| SP-06 | Gasoline Range Hydrocarbons | 3 | 100 | ND | ND | ND | -- | 2800 | 1000 | Yes | Cannot be determined | ND |
| SP-06 | Motor Oil | 3 | 100 | ND | NA | NA | -- | 3200 | 1000 | Yes | Cannot be determined | IS |
| SP-06 | 1,1-Dichloroethene | 3 | 0 | ND | ND | ND | -- | 2.8 U | 1.93 | RL > CUL | Cannot be determined | ND |
| SP-06 | 1,4-Dichlorobenzene | 3 | 100 | ND | ND | ND | -- | 42 | 4.86 | Yes | Cannot be determined | ND |
| SP-06 | Benzene | 3 | 67 | ND | ND | ND | -- | 2.4 U | 22.7 | No | 0 | ND |
| SP-06 | Tetrachloroethene | 3 | 0 | ND | ND | ND | -- | 4.1 U | 3.3 | RL > CUL | Cannot be determined | ND |
| SP-06 | Vinyl Chloride | 3 | 33 | ND | ND | ND | -- | 2.2 U | 2.4 | No | 0 | ND |

***Notes:***

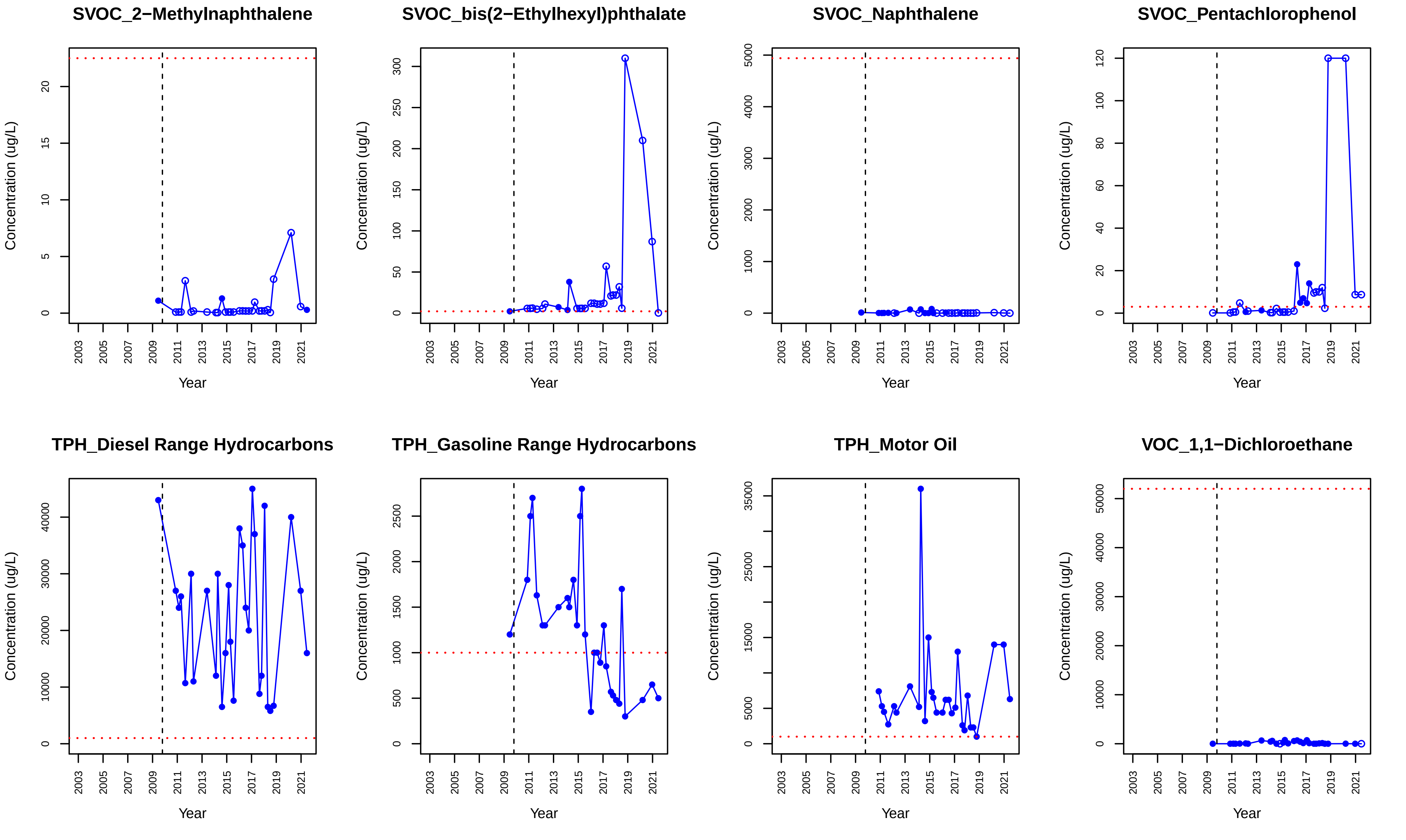
[shaded cell] Statistically significant attenuation rate (p-value < 0.05) and model fit that achieved an $R^2$ of at least 0.5.

Time to reach standard is only calculated for statistically significant attenuation rates (p-value < 0.05) and model fits that achieved an $R^2$ of at least 0.5.
Time to reach standard cannot be calculated for non-detect analytes where with the laboratory RLs greater than the CULs.
µg/L - micrograms per liter
GW CUL - groundwater cleanup level
ID - insufficient data (n < 4 for Mann-Kendall and n < 6 for attenuation rates)
- - not applicable
ND - could not calculate due to < 50% detection frequency
$R^2$ - coefficient of determination, i.e., measure of model fit.
RL - Reporting Limit
J - The measured concentration is estimated and is uncertain.
J+ - The measured concentration is estimated and is biased high.
U - The measured concentration is below the reporting limit and the reporting limit is reported.

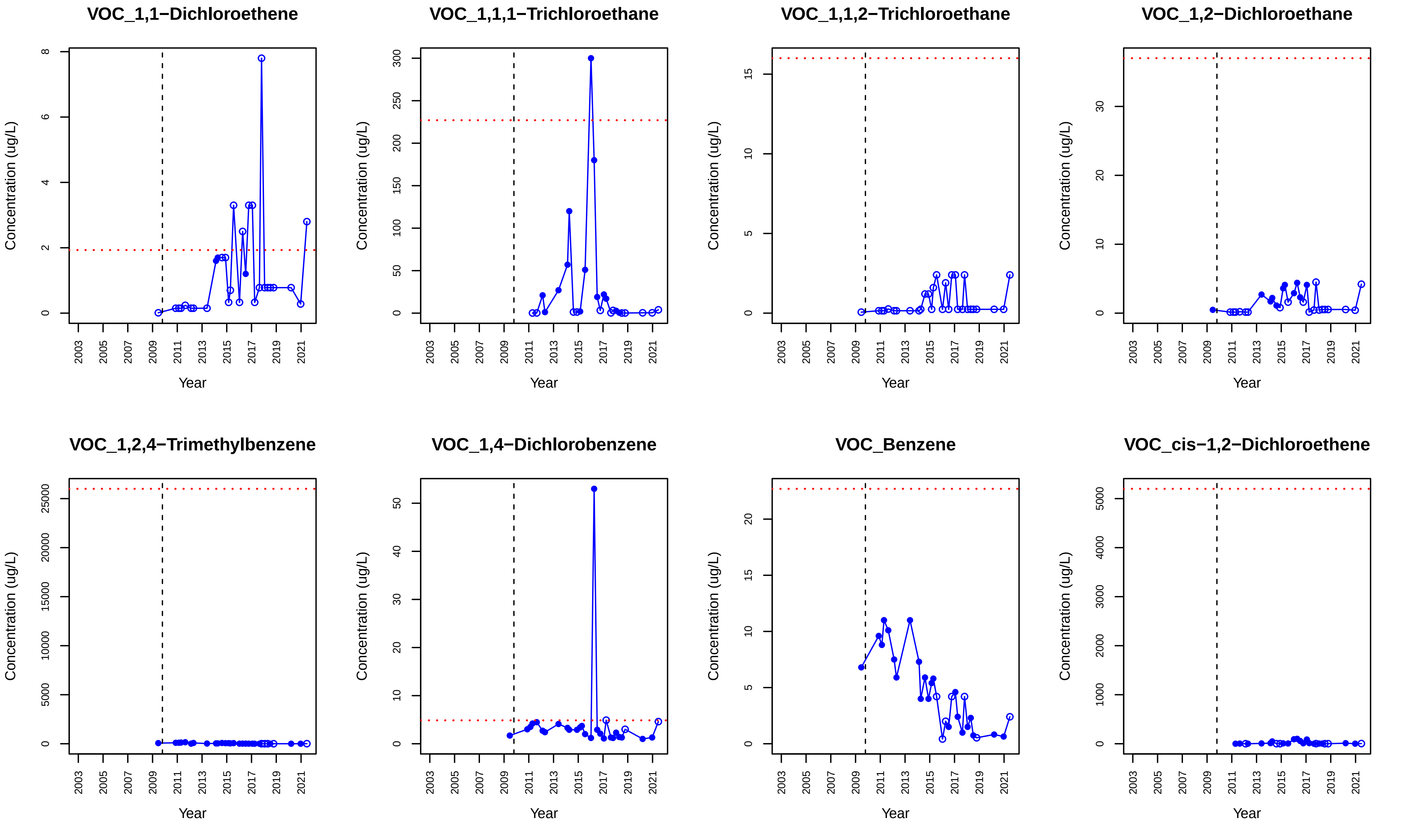
# ATTACHMENT 1

Time Series Graphs

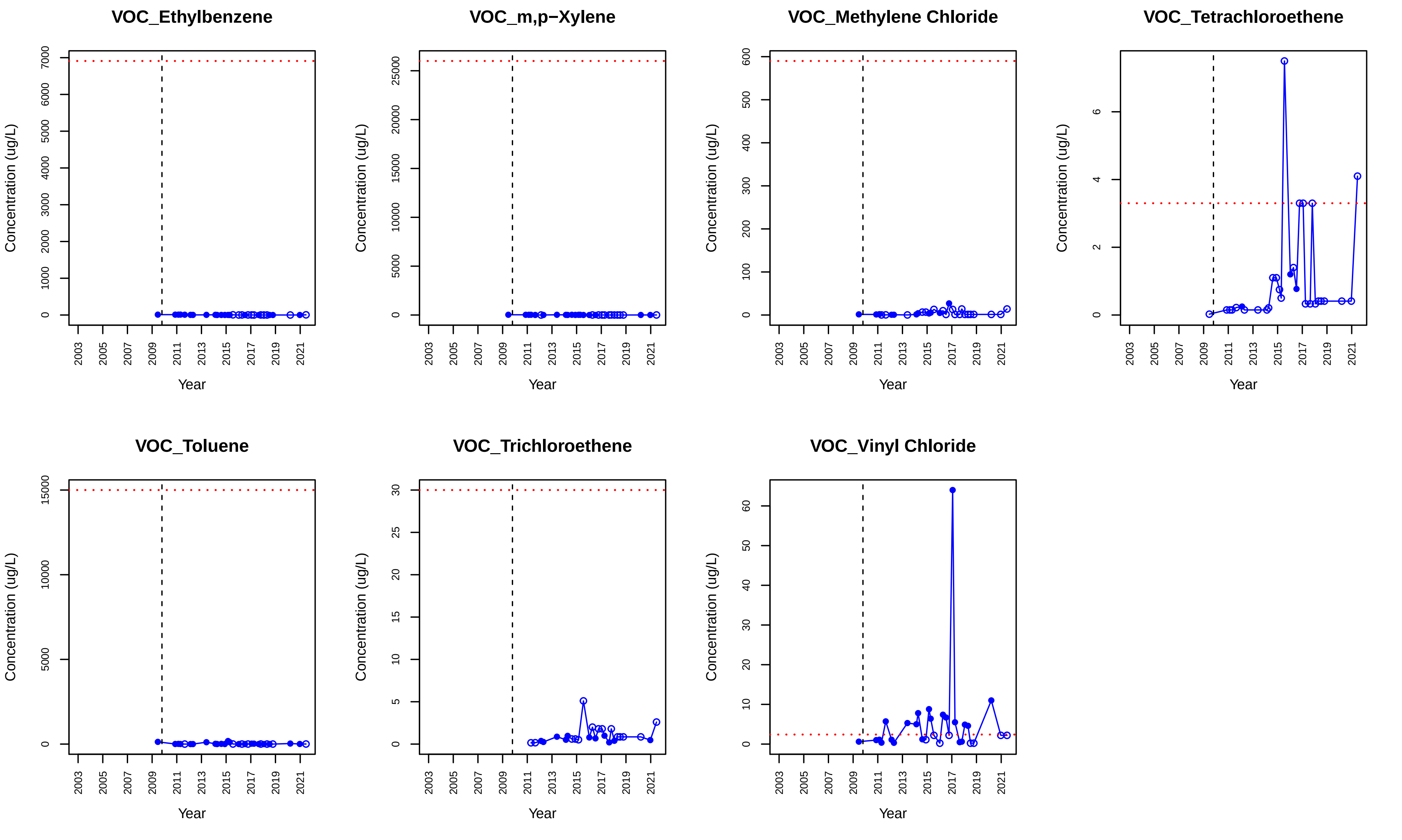
# AGI−07


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

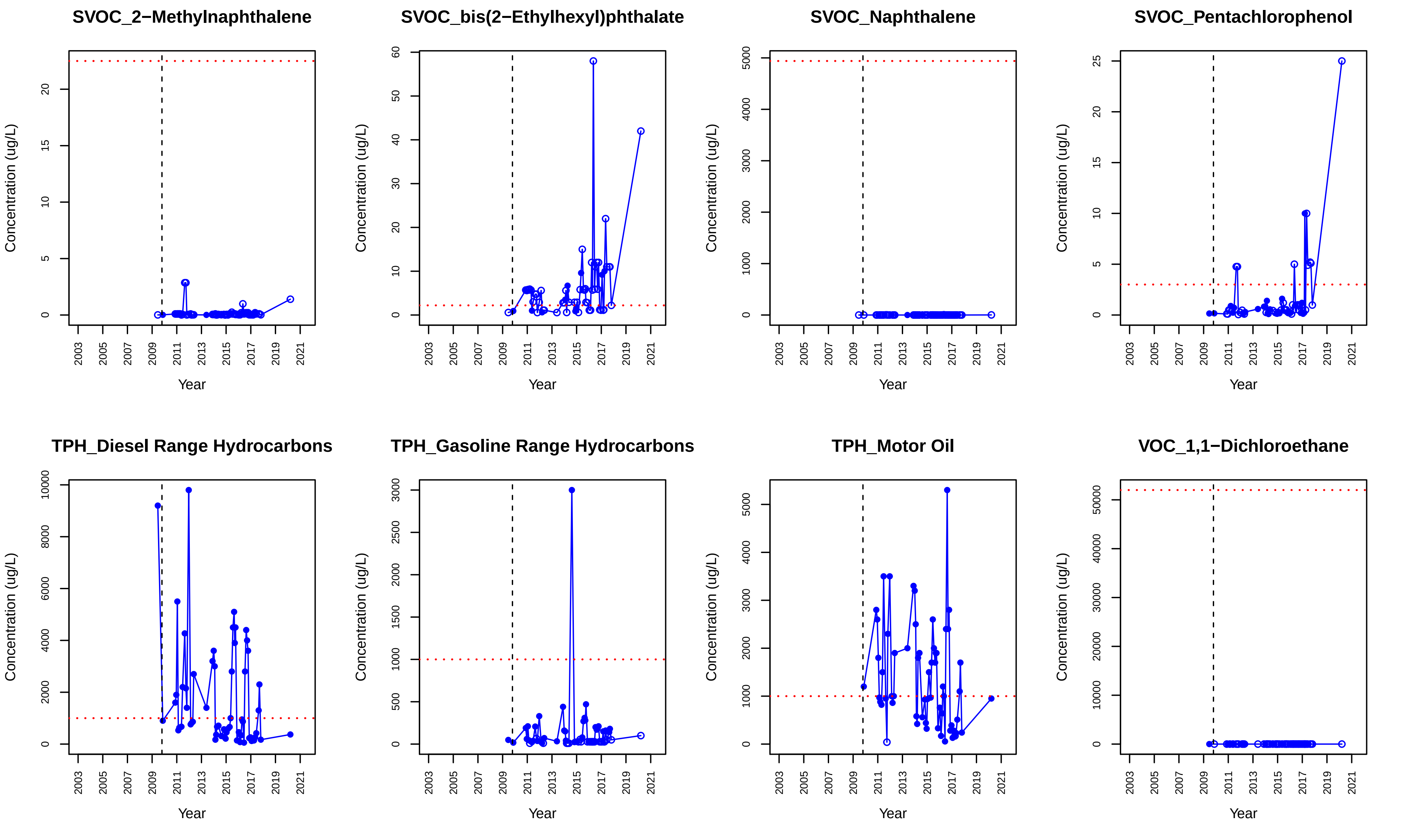
# AGI−07


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

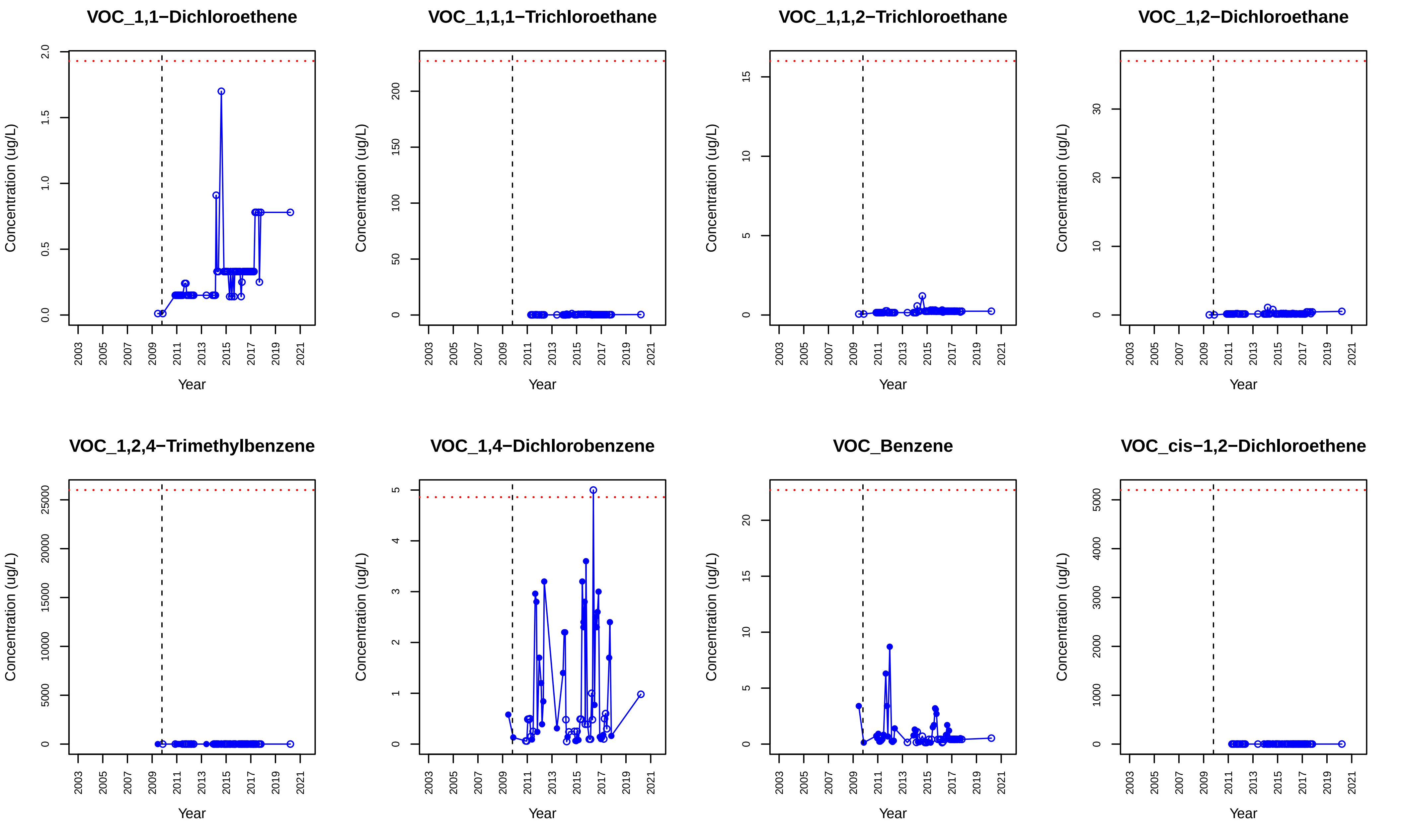
# AGI−07


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## AGI−14

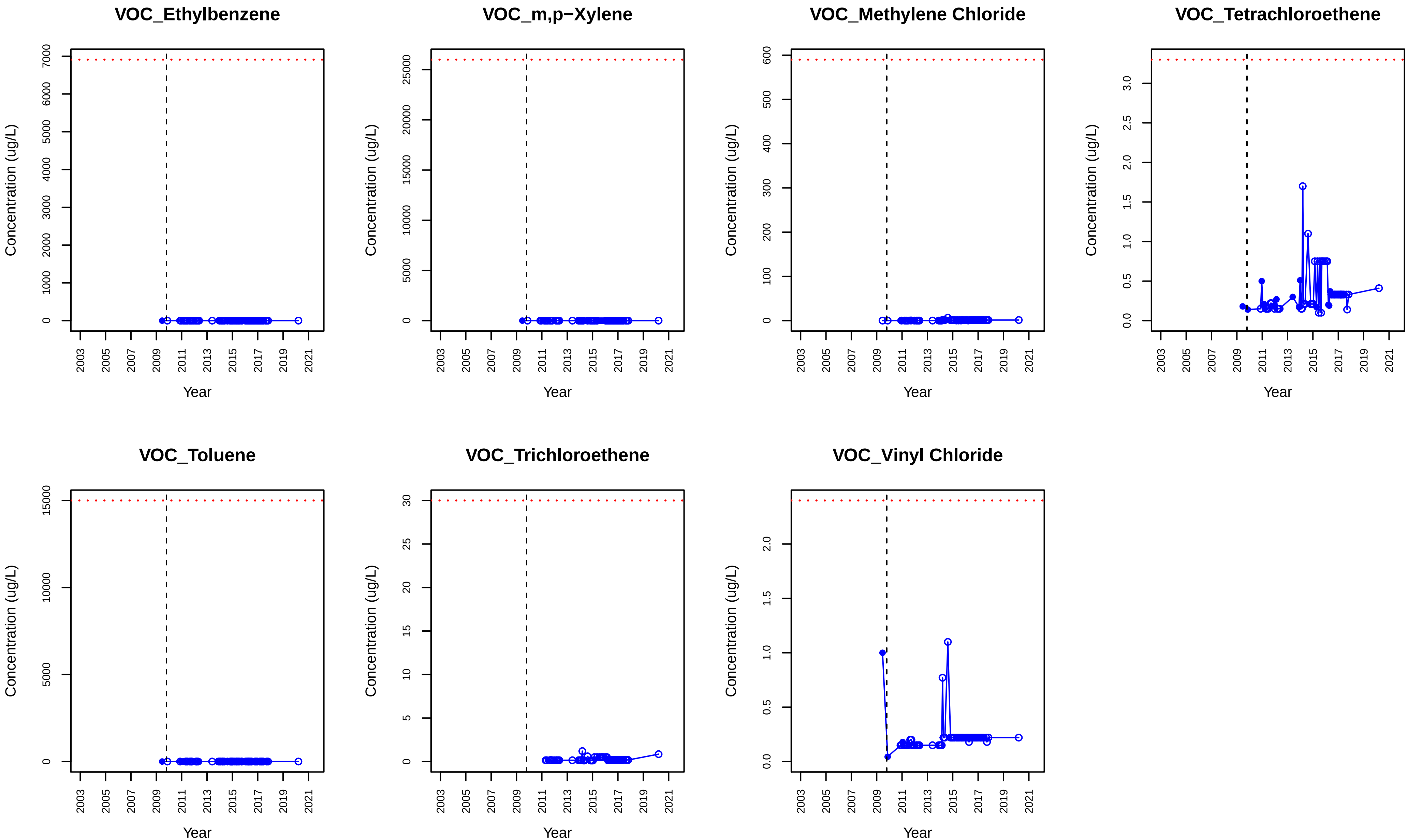

SVOC_2−Methylnaphthalene
Concentration (ug/L)
Year
SVOC_bis(2−Ethylhexyl)phthalate
Concentration (ug/L)
Year
SVOC_Naphthalene
Concentration (ug/L)
Year
SVOC_Pentachlorophenol
Concentration (ug/L)
Year
TPH_Diesel Range Hydrocarbons
Concentration (ug/L)
Year
TPH_Gasoline Range Hydrocarbons
Concentration (ug/L)
Year
TPH_Motor Oil
Concentration (ug/L)
Year
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

# AGI−14



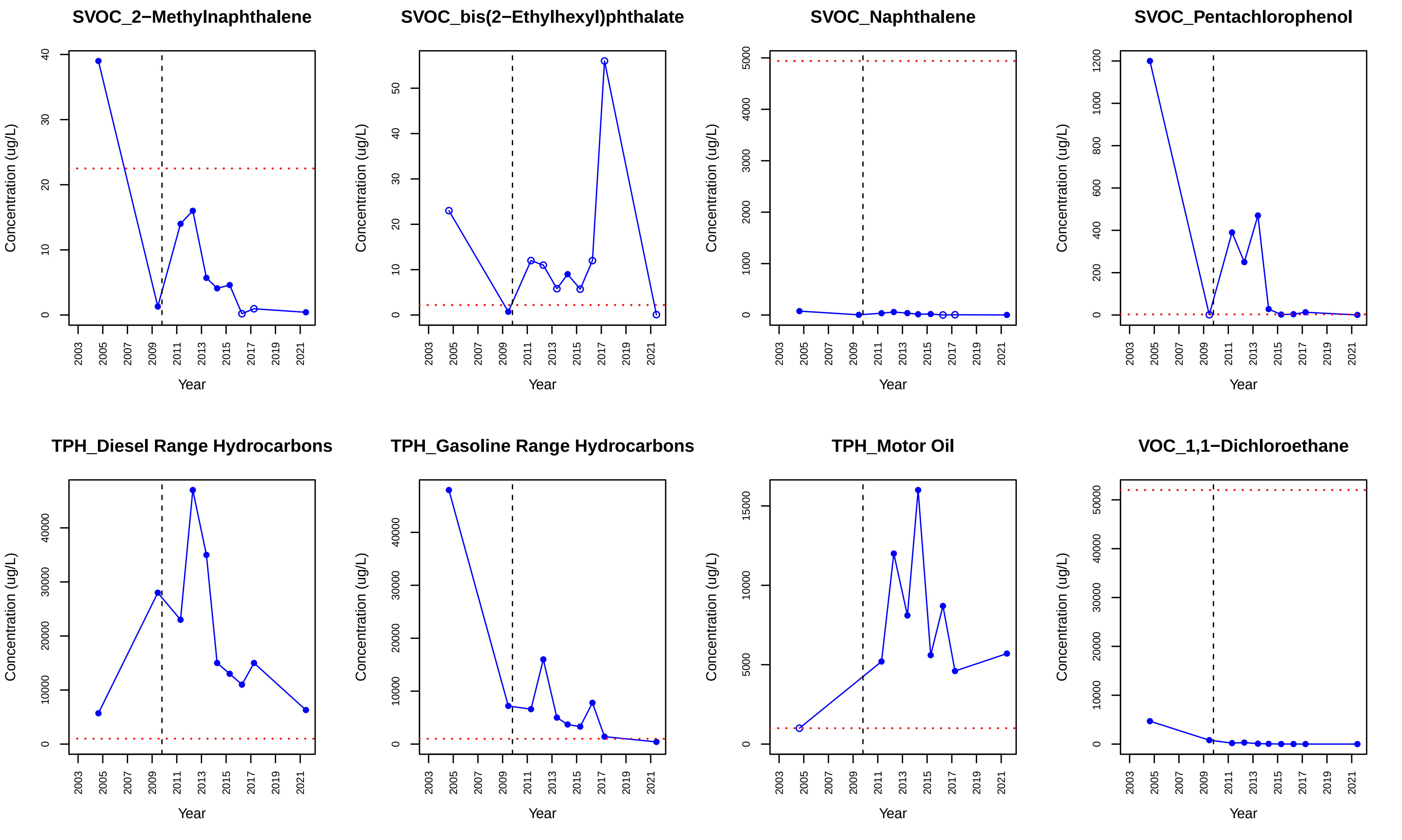
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−14

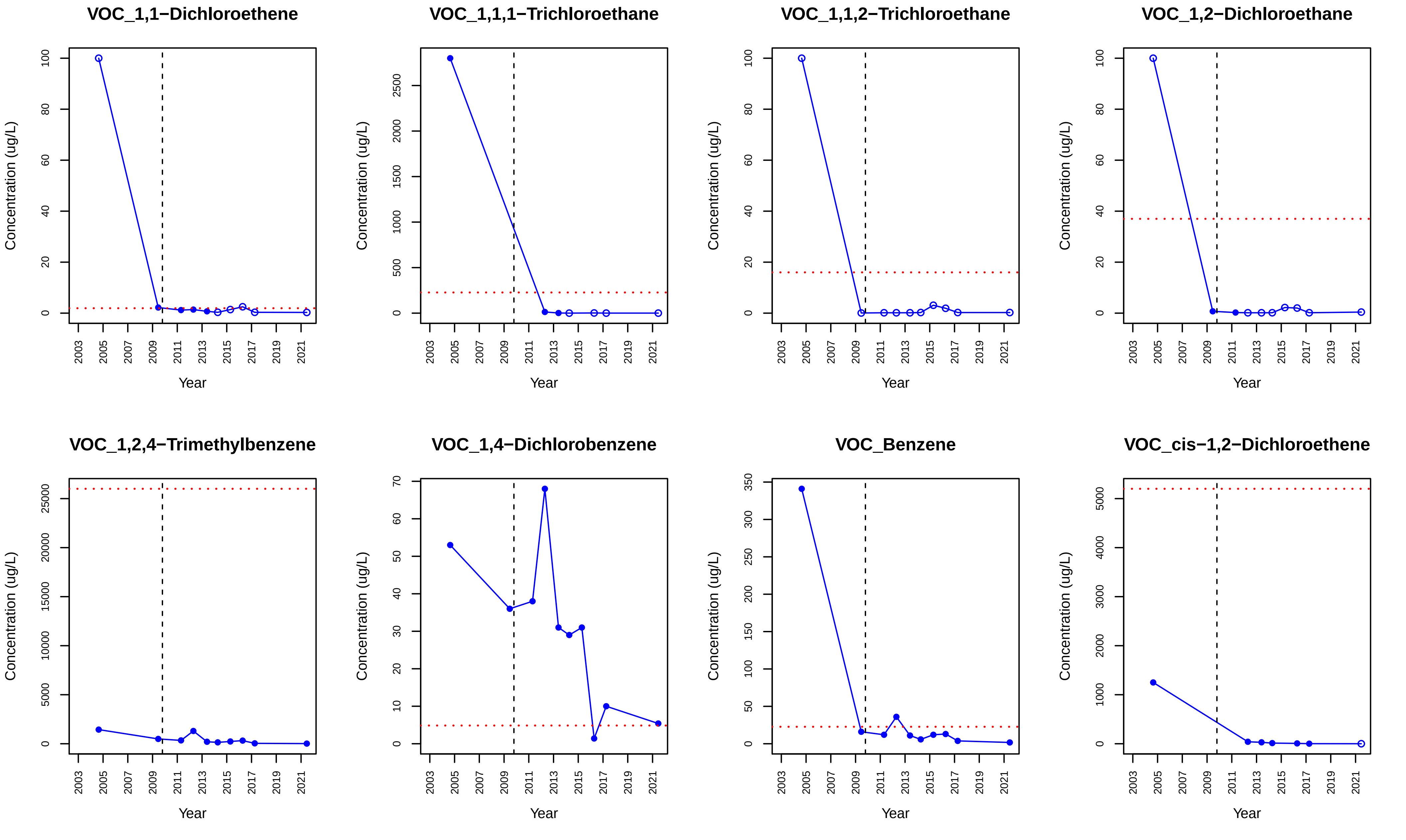


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−19

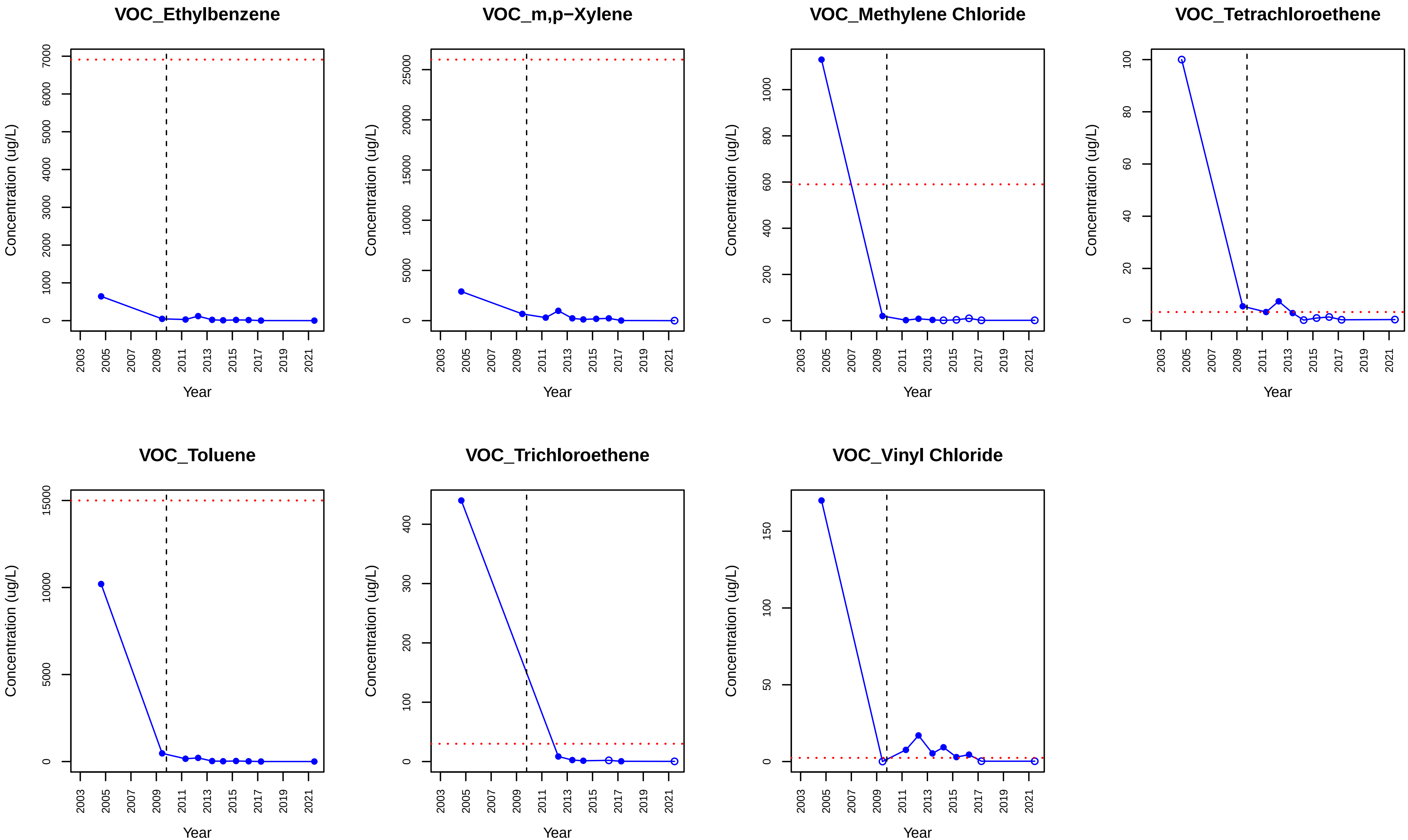

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**AGI−19**



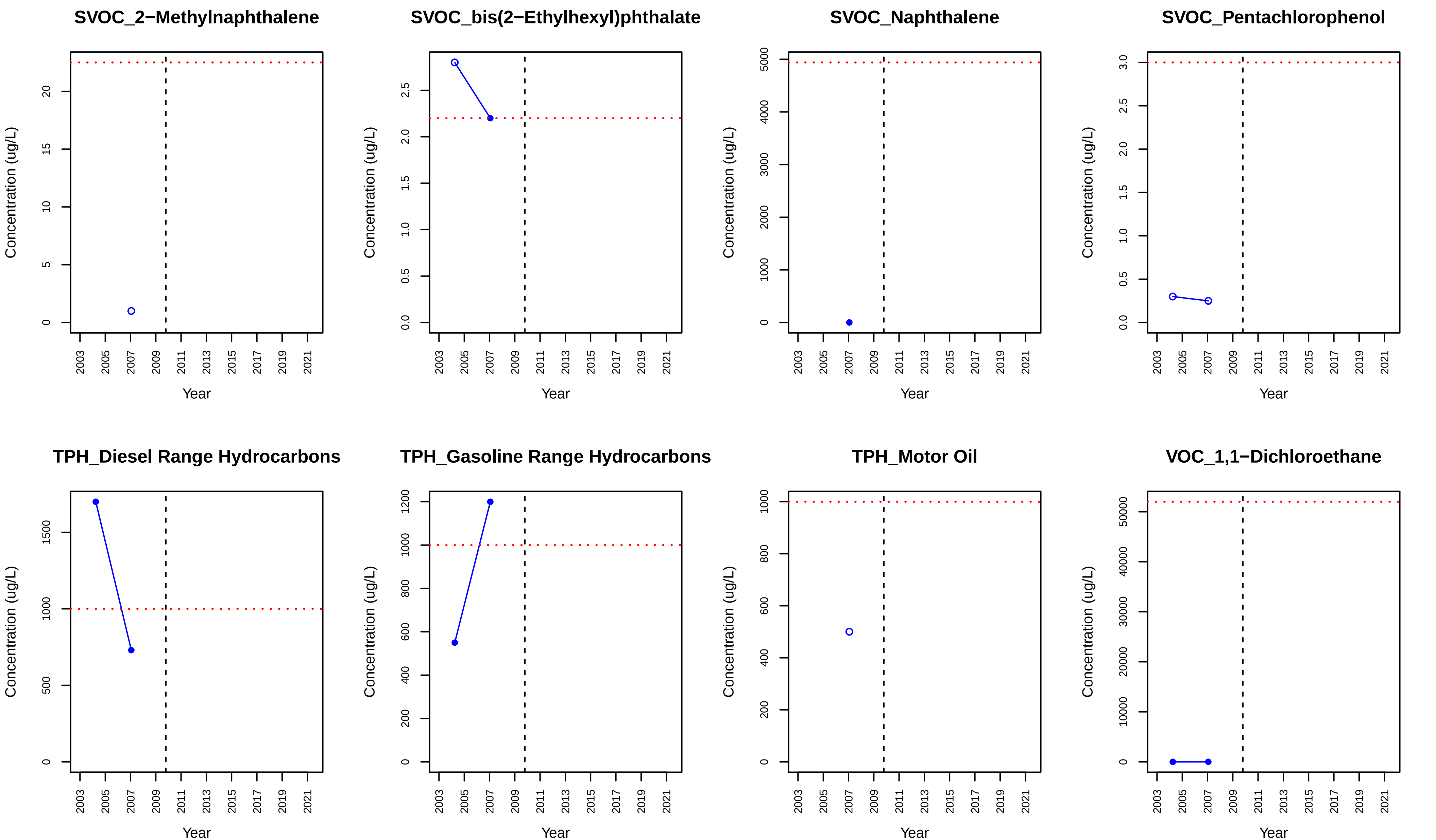
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−19



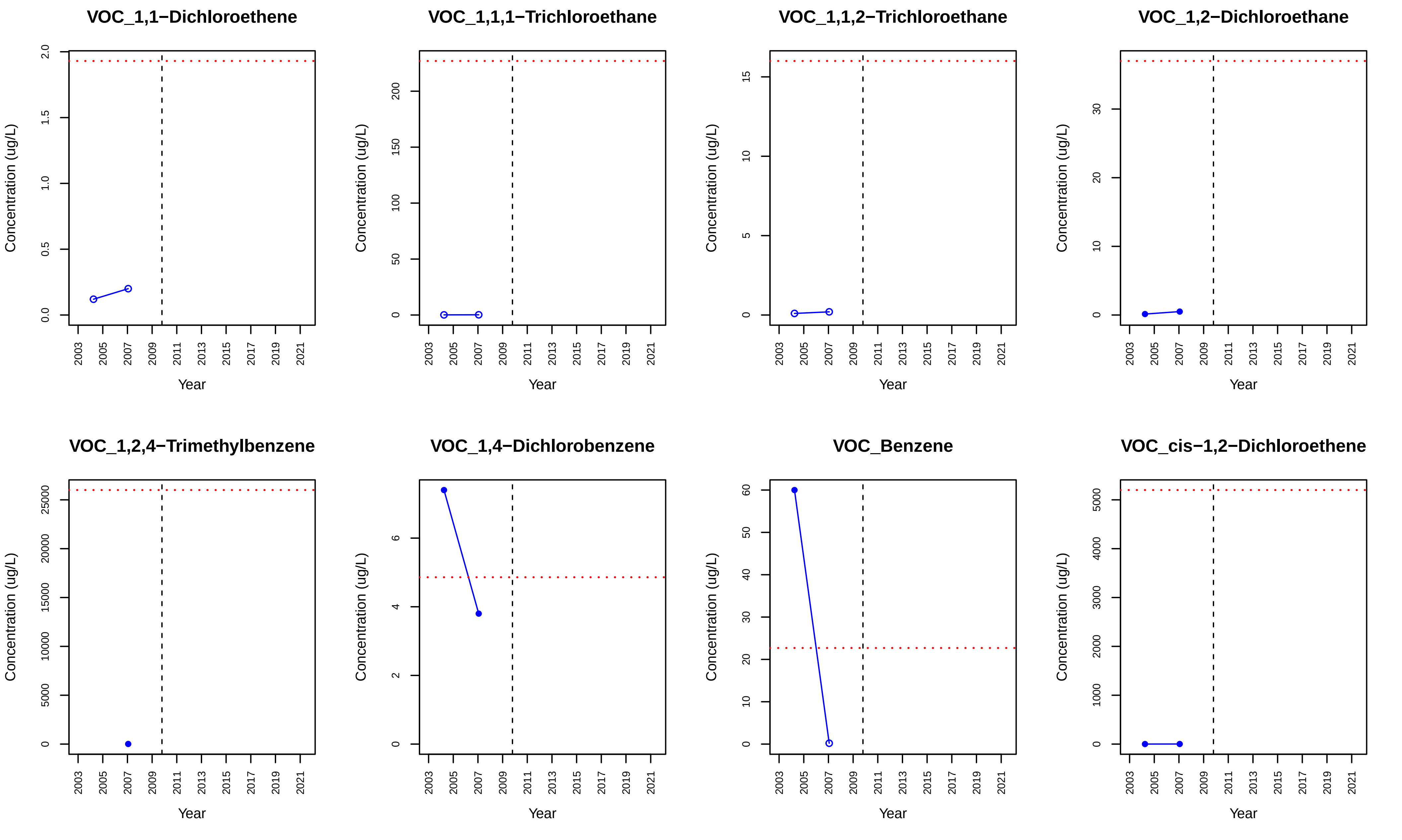
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 1000 2000 3000 4000 5000 6000 7000
0 5000 10000 15000 20000 25000
0 200 400 600 800 1000
0 20 40 60 80 100
0 5000 10000 15000
0 100 200 300 400
0 50 100 150

# AGI−21



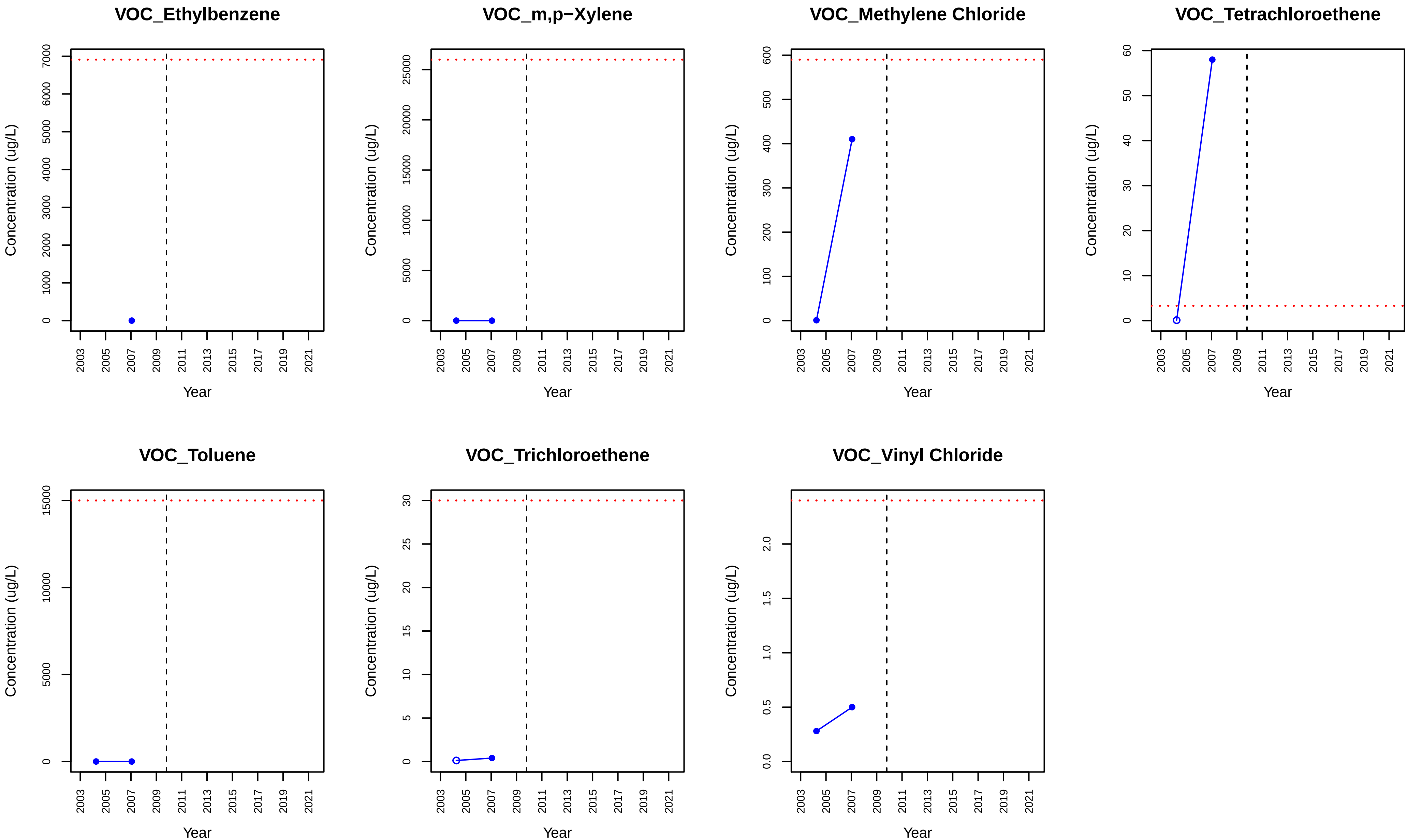
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

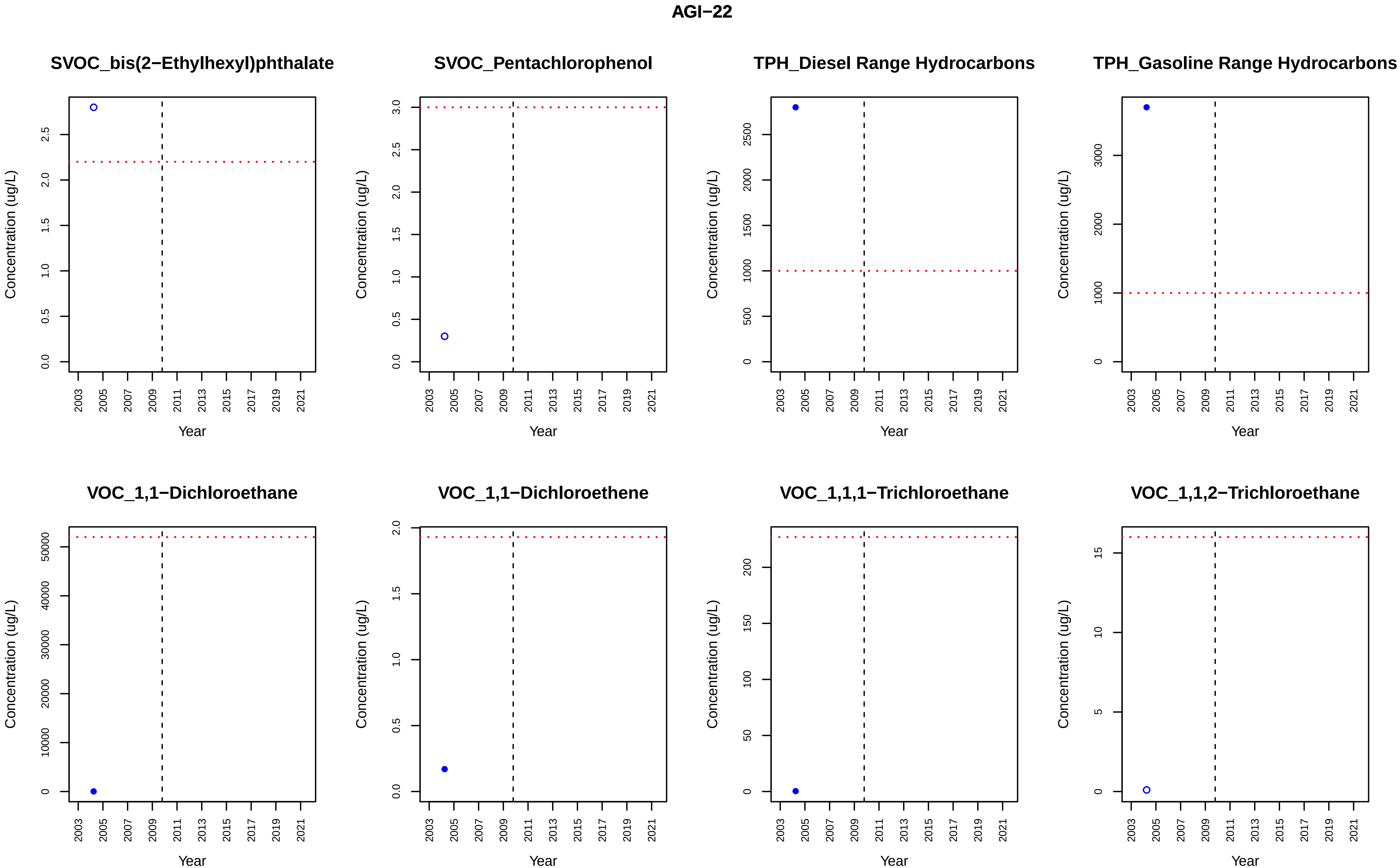
## AGI−21



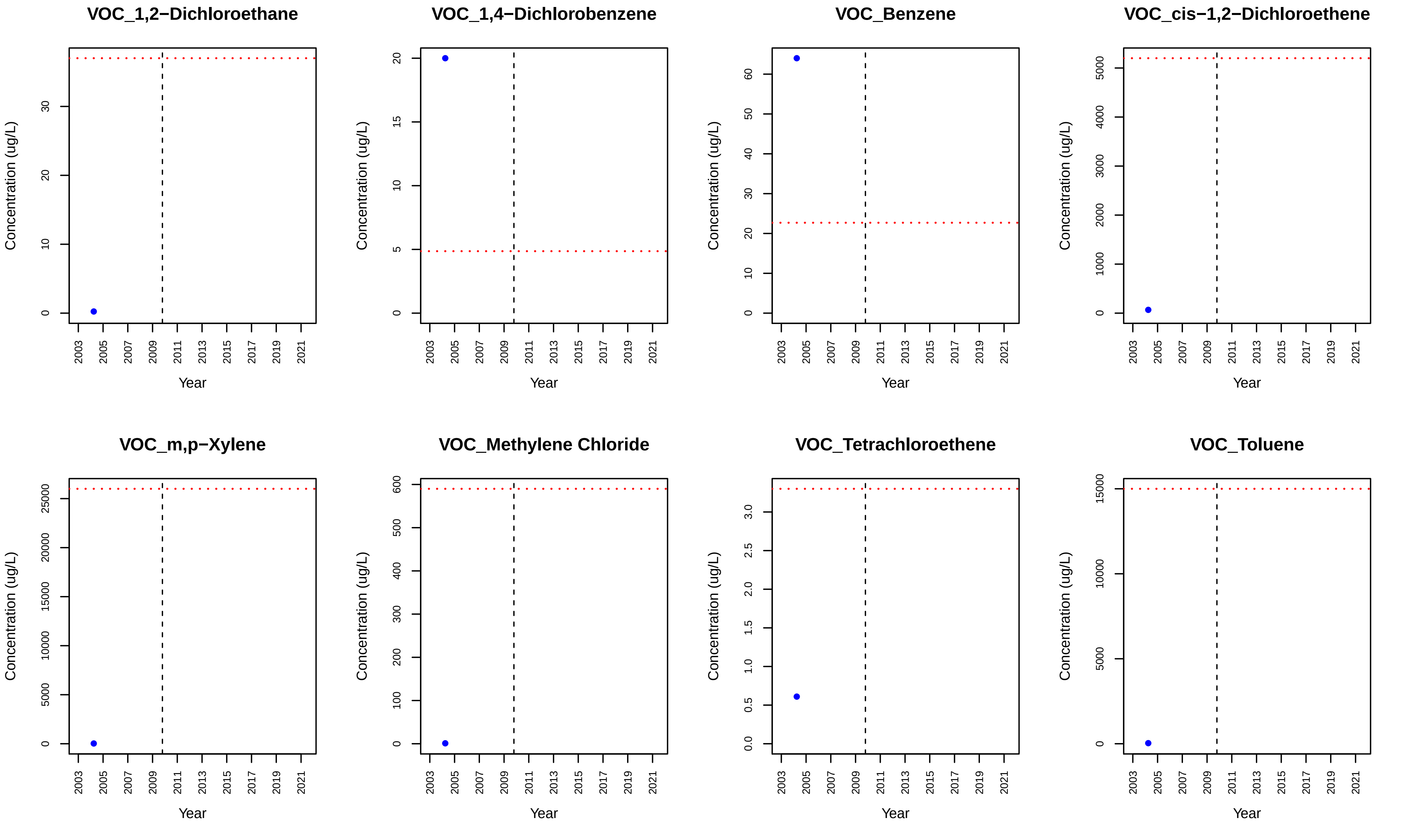
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−21

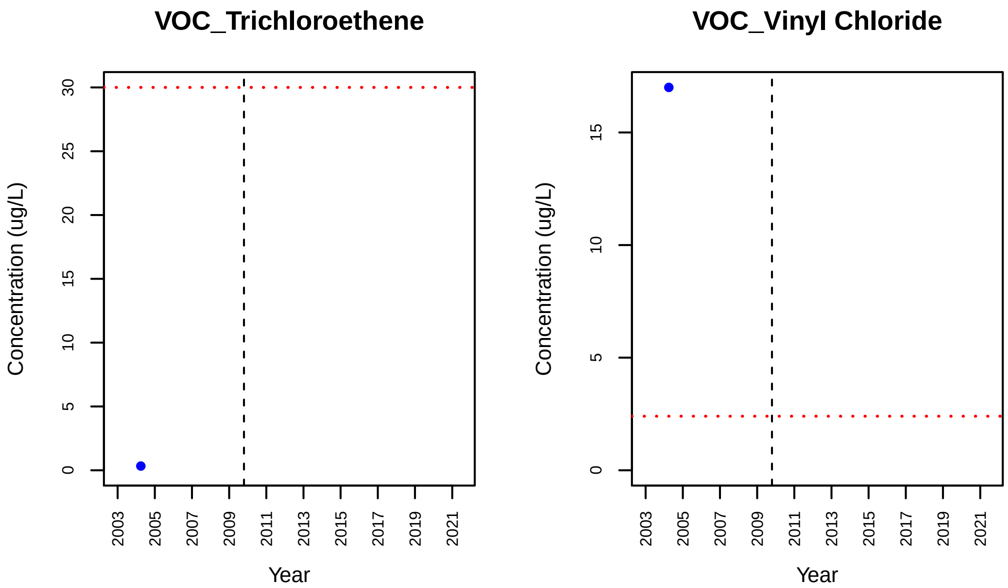

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021


AGI−22
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
VOC_1,1−Dichloroethane
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

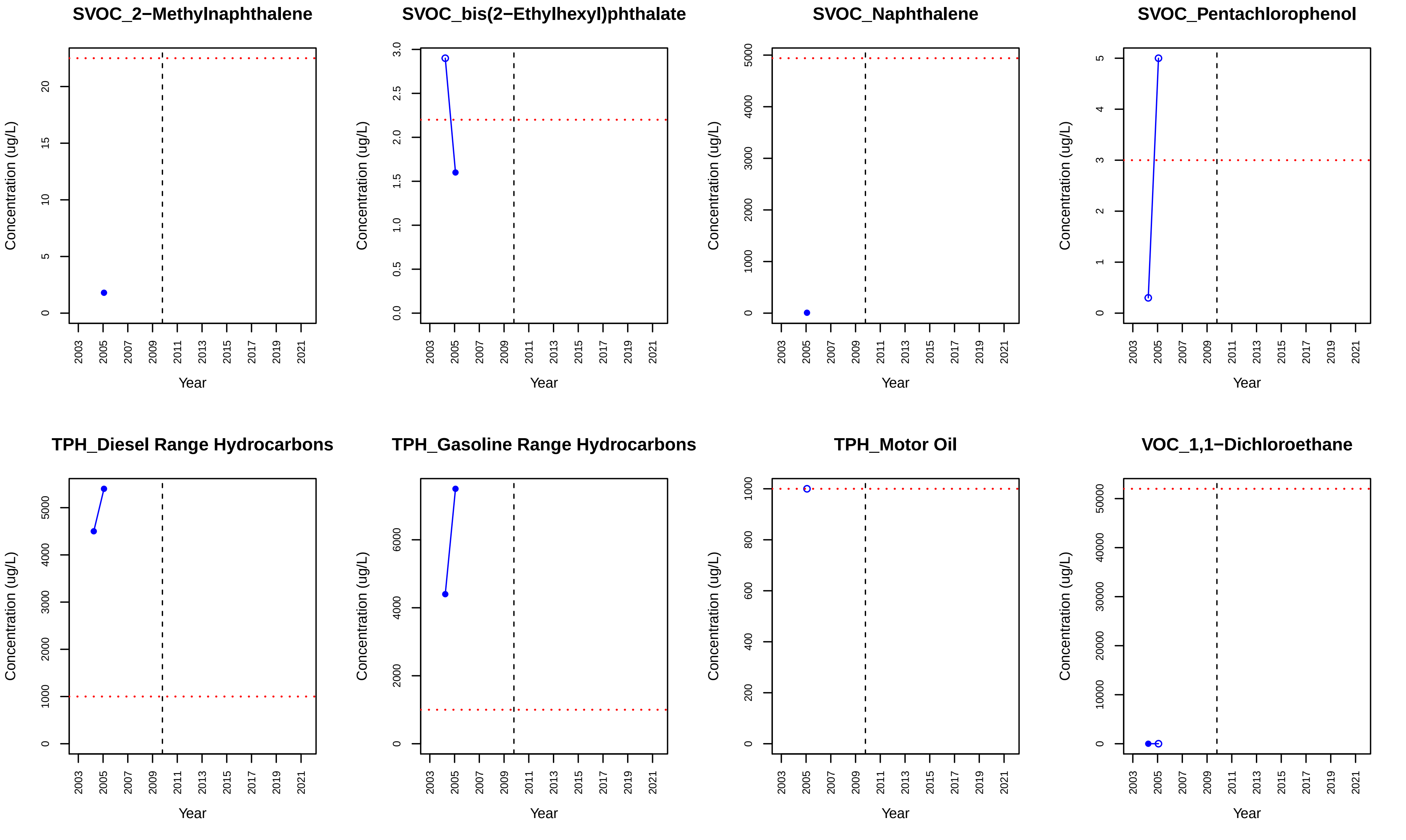
# AGI−22


VOC_1,2−Dichloroethane
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

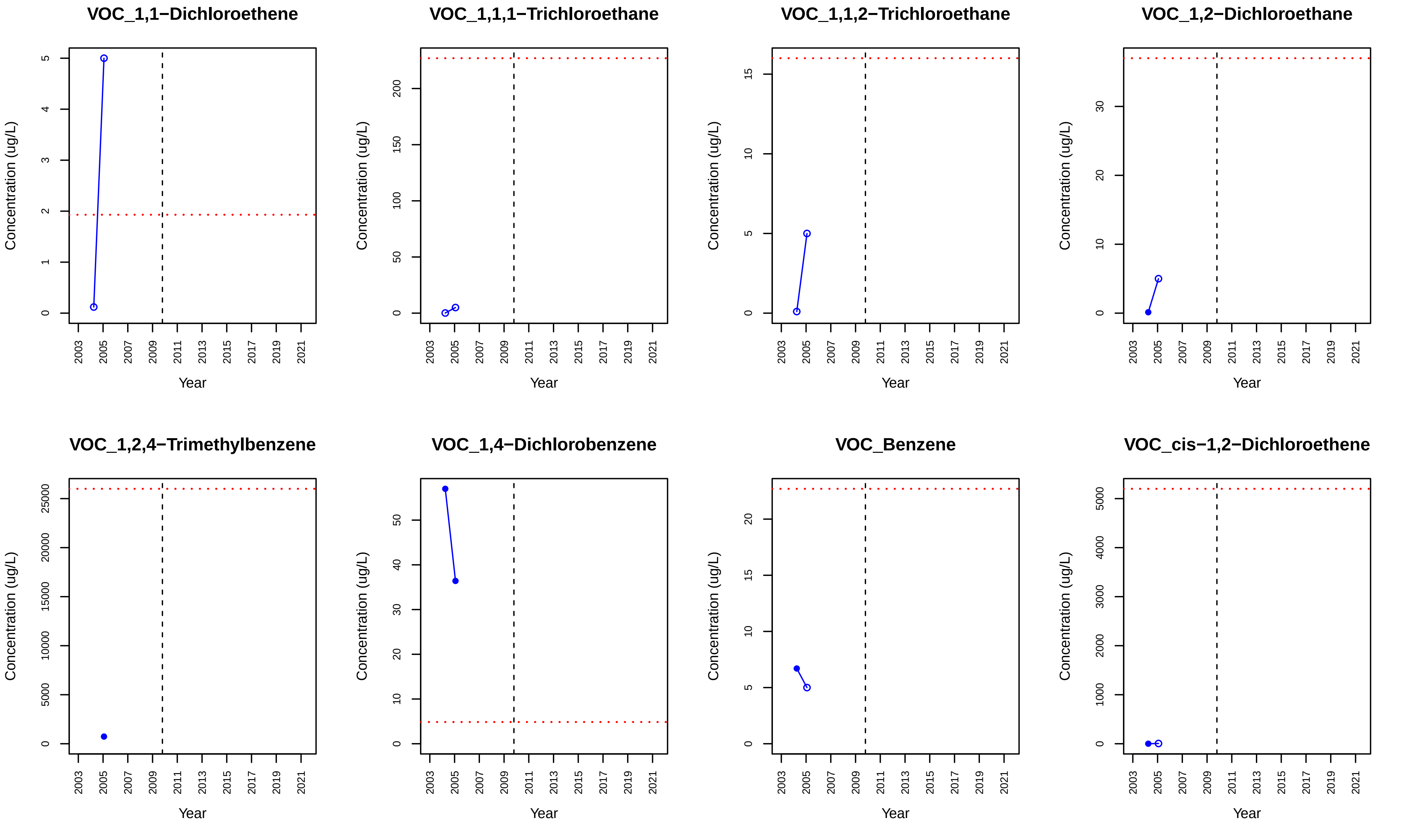
# AGI−22


VOC_Trichloroethene
Concentration (ug/L)
0
5
10
15
20
25
30
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year
VOC_Vinyl Chloride
Concentration (ug/L)
0
5
10
15
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

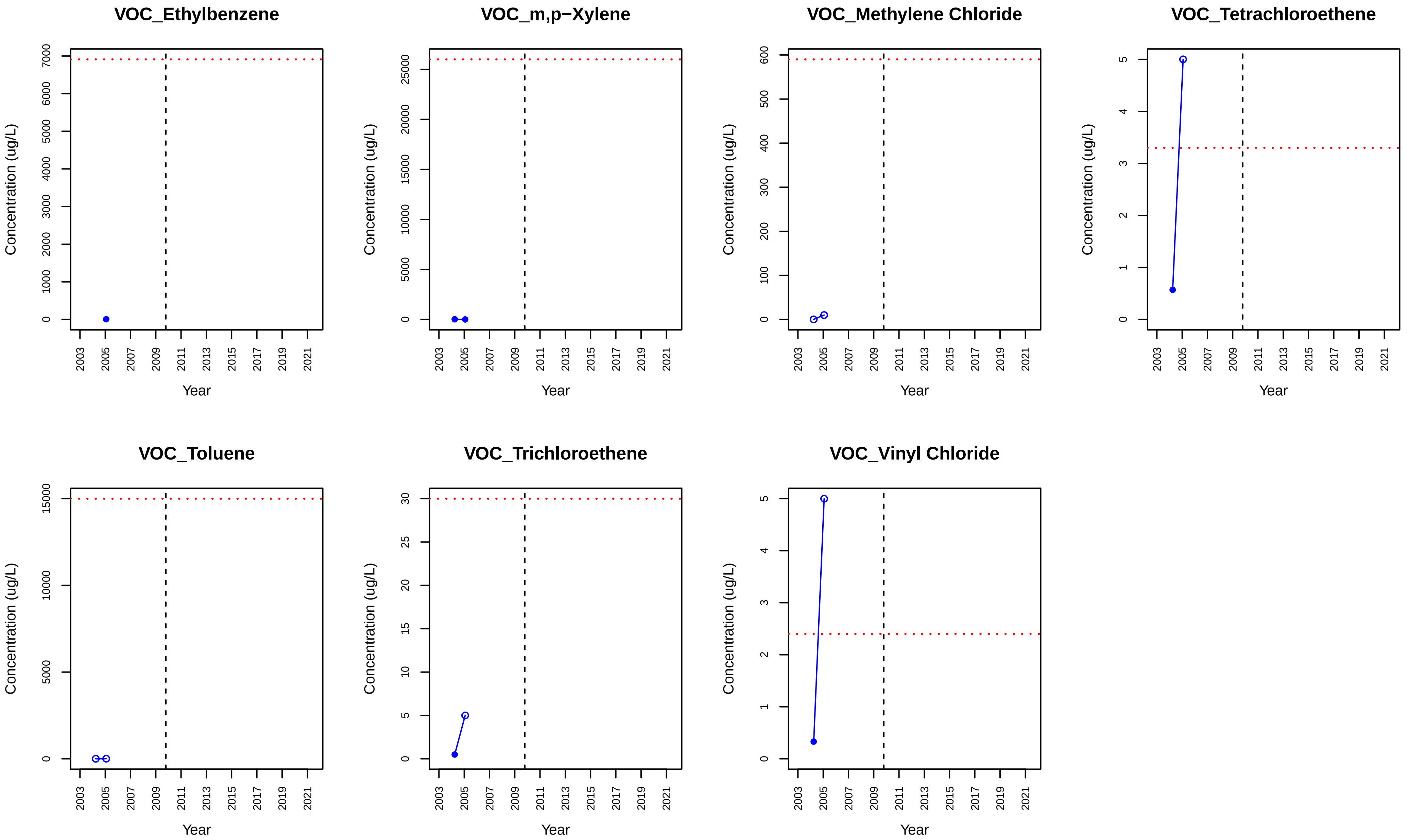
# AGI−35


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−35

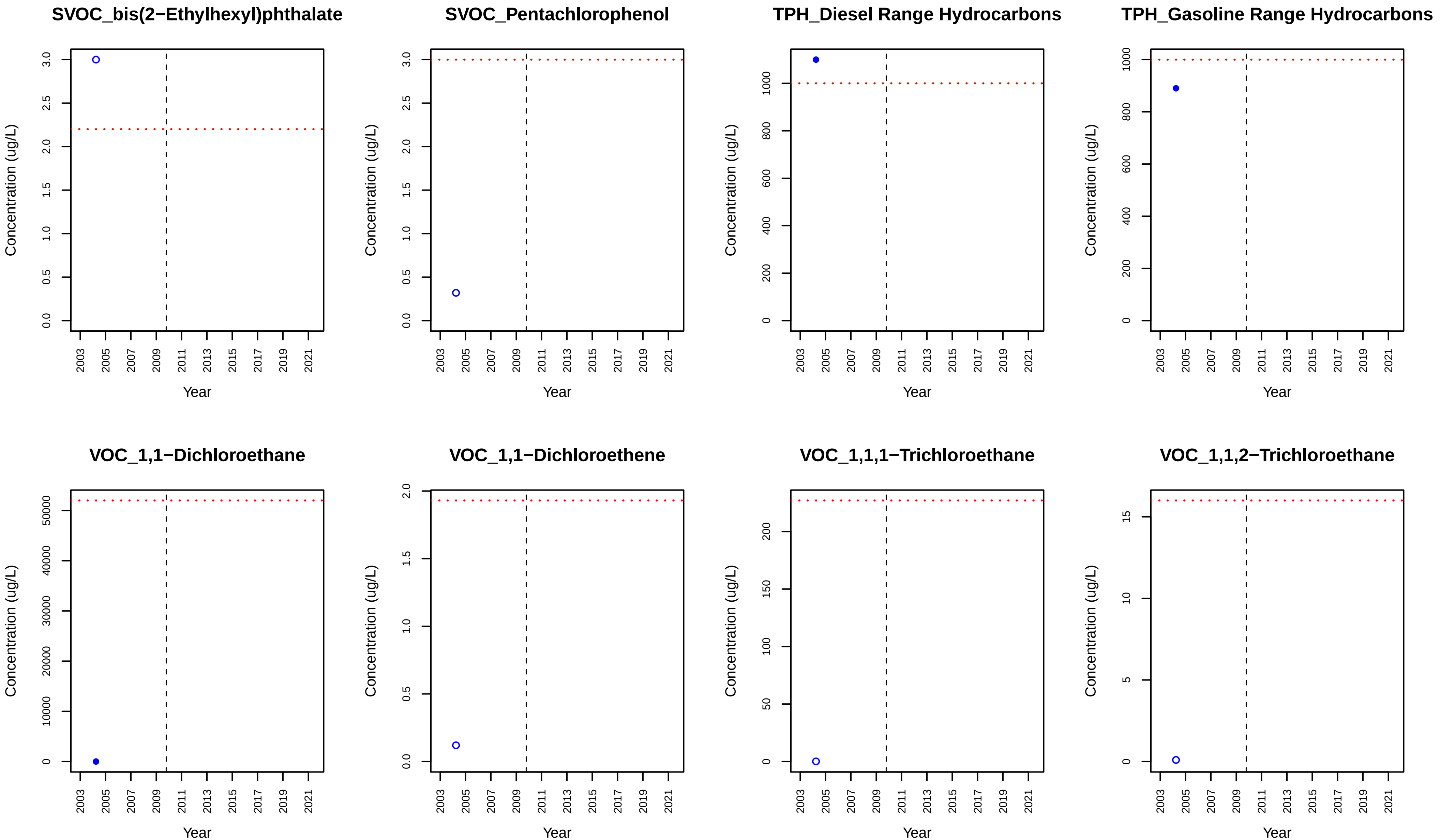

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−35

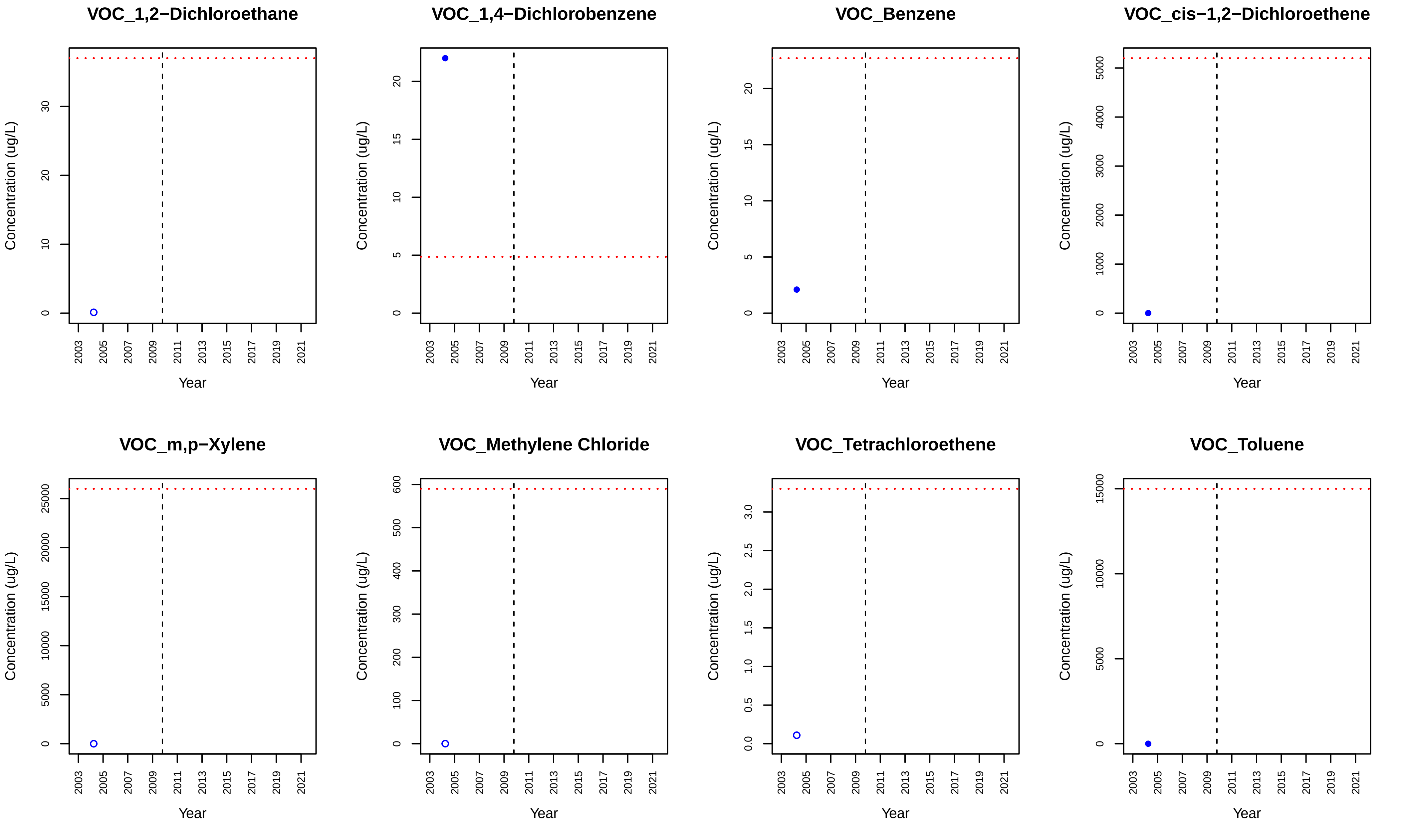


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 1000 2000 3000 4000 5000 6000 7000
0 5000 10000 15000 20000 25000
0 100 200 300 400 500 600
0 1 2 3 4 5
0 5000 10000 15000
0 5 10 15 20 25 30

## AGI−36

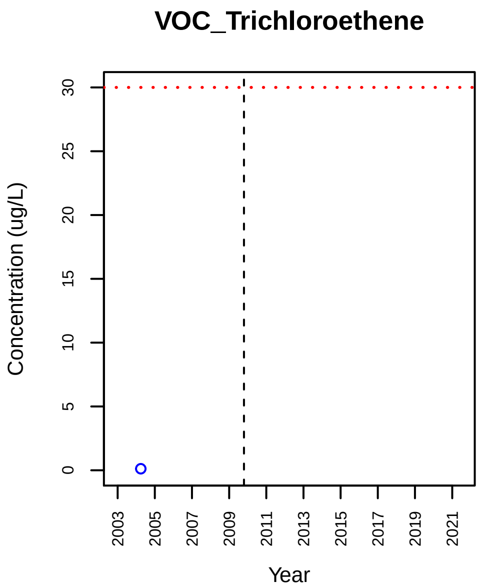

SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
VOC_1,1−Dichloroethane
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

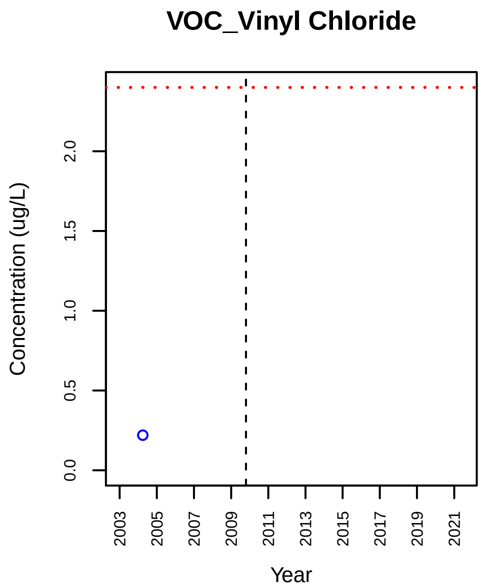
# AGI−36



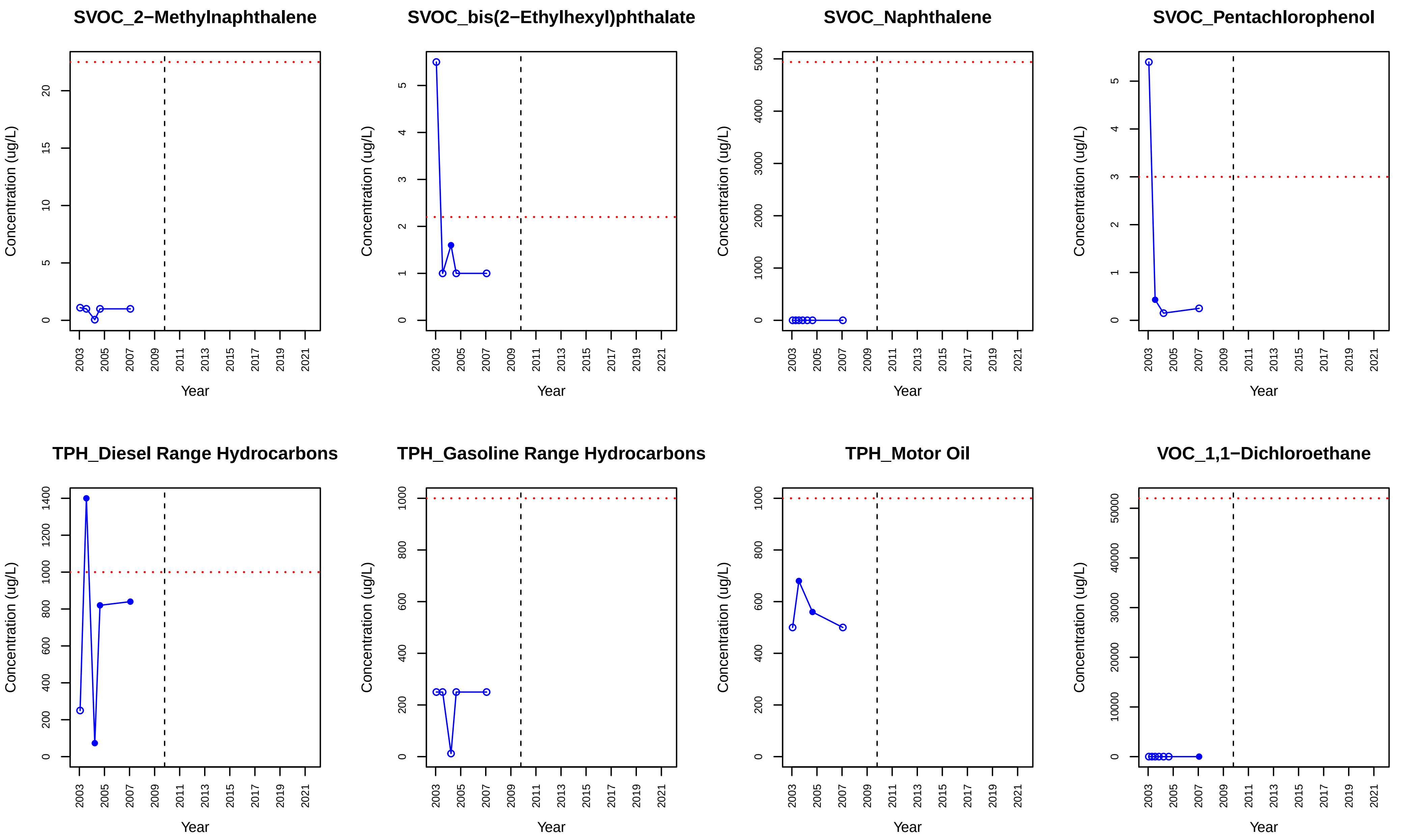
VOC_1,2−Dichloroethane
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 10 20 30
0 5 10 15 20
0 1000 2000 3000 4000 5000
0 5000 10000 15000 20000 25000
0 100 200 300 400 500 600
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 5000 10000 15000

# AGI−36


VOC_Trichloroethene
Concentration (ug/L)
0
5
10
15
20
25
30
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

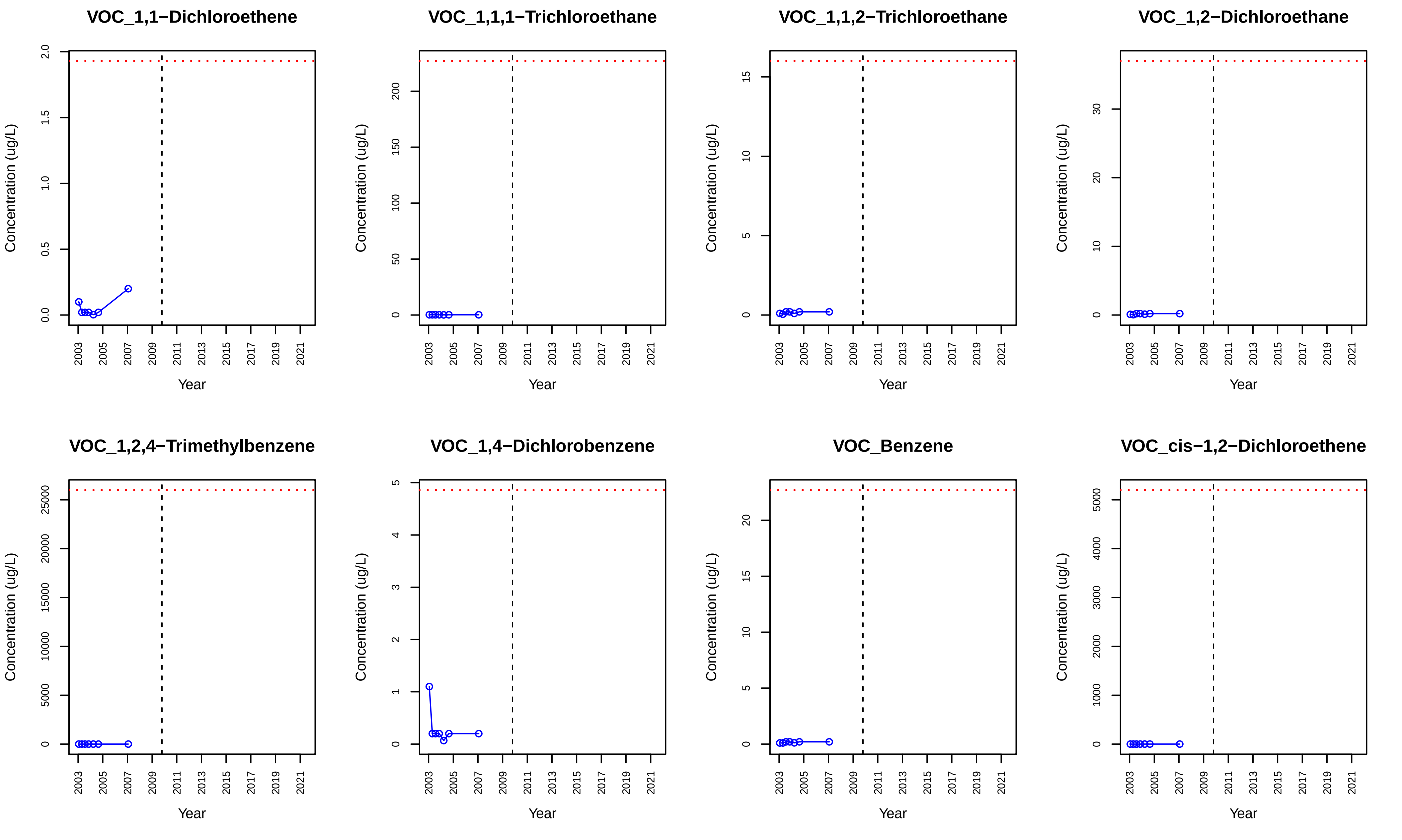

VOC_Vinyl Chloride
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

## AGI−37



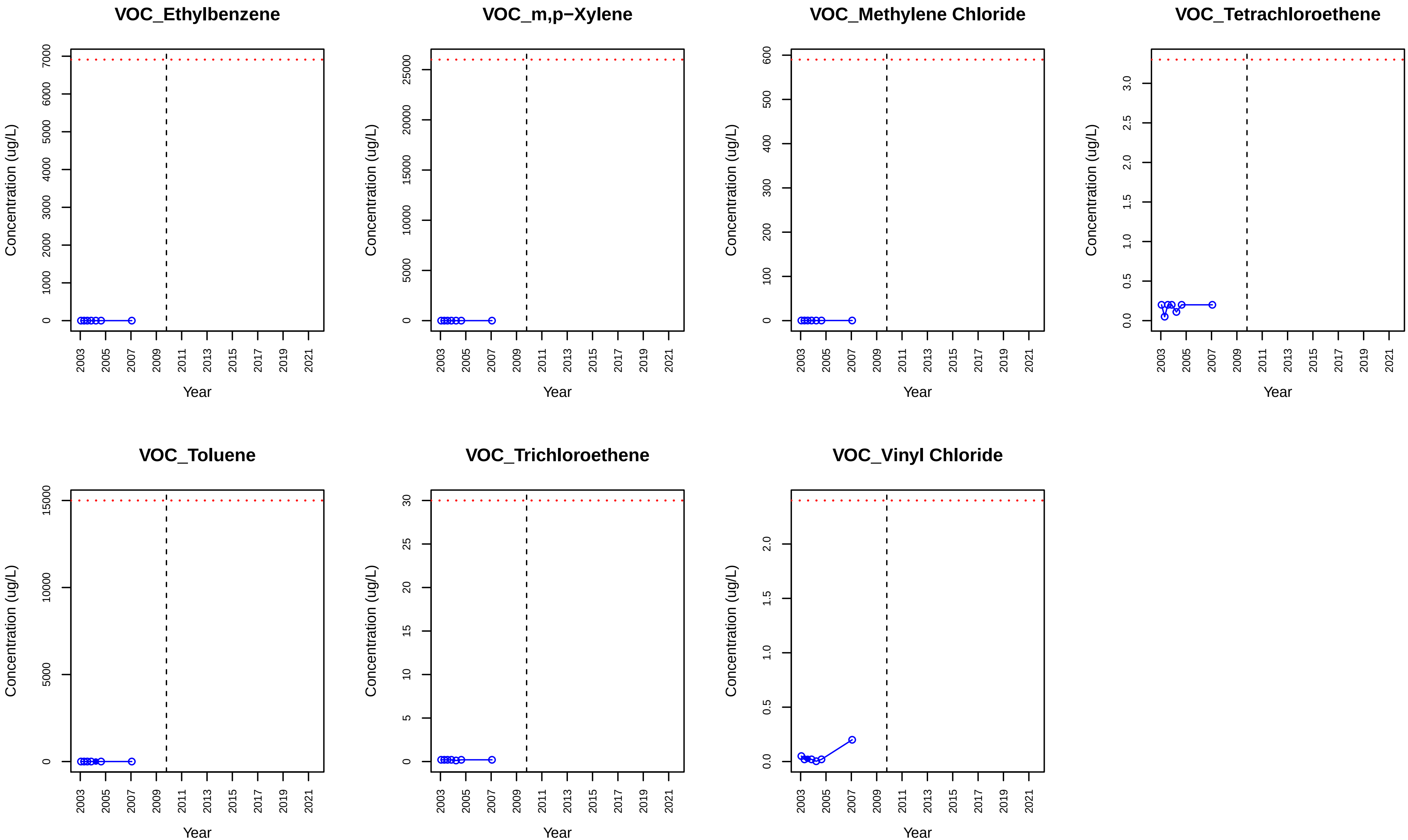
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

## AGI−37



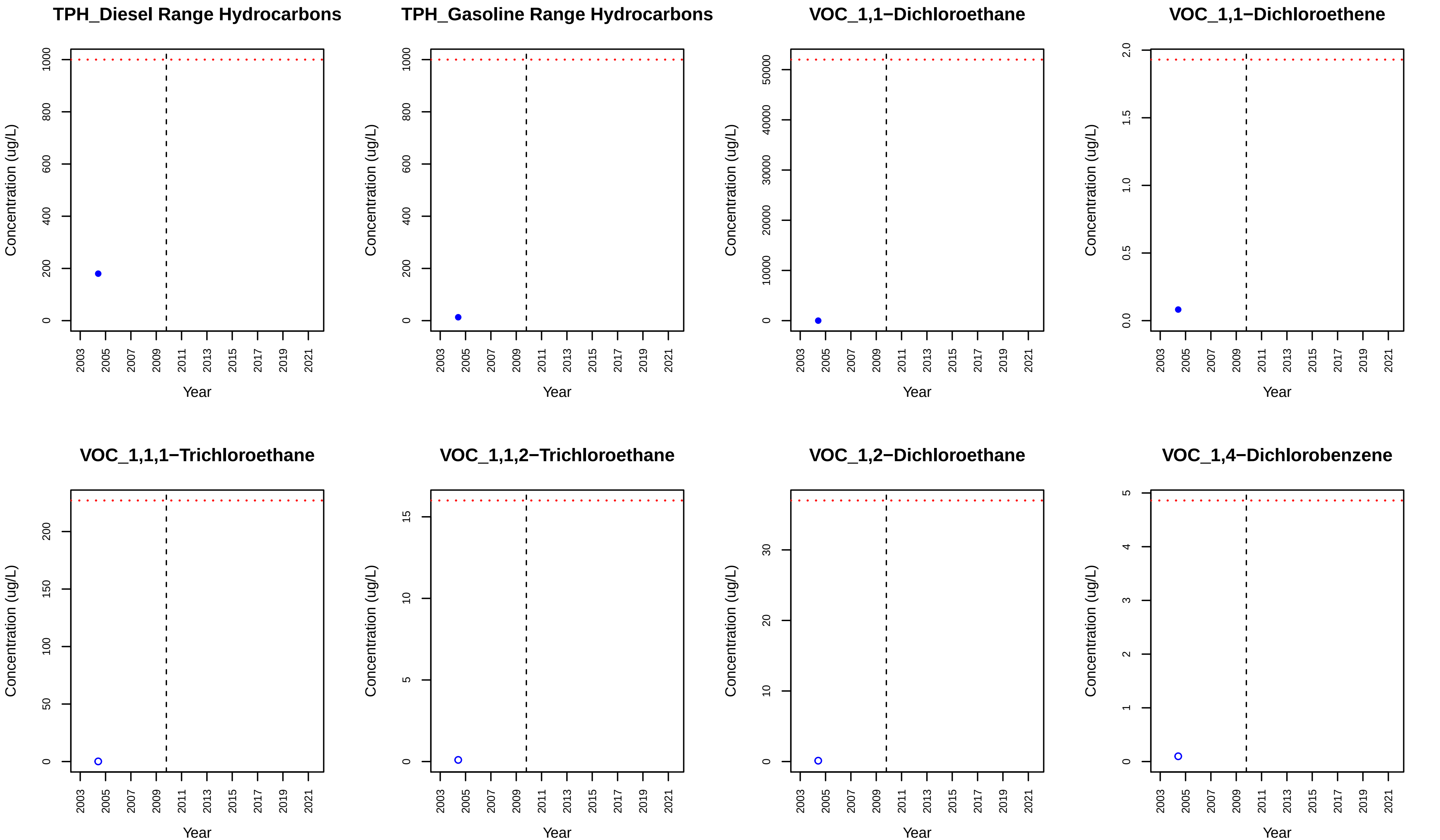
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0.0
0.5
1.0
1.5
2.0
0
50
100
150
200
5
10
15
20
30
5000
10000
15000
20000
25000
1
2
3
4
1000
2000
3000
4000

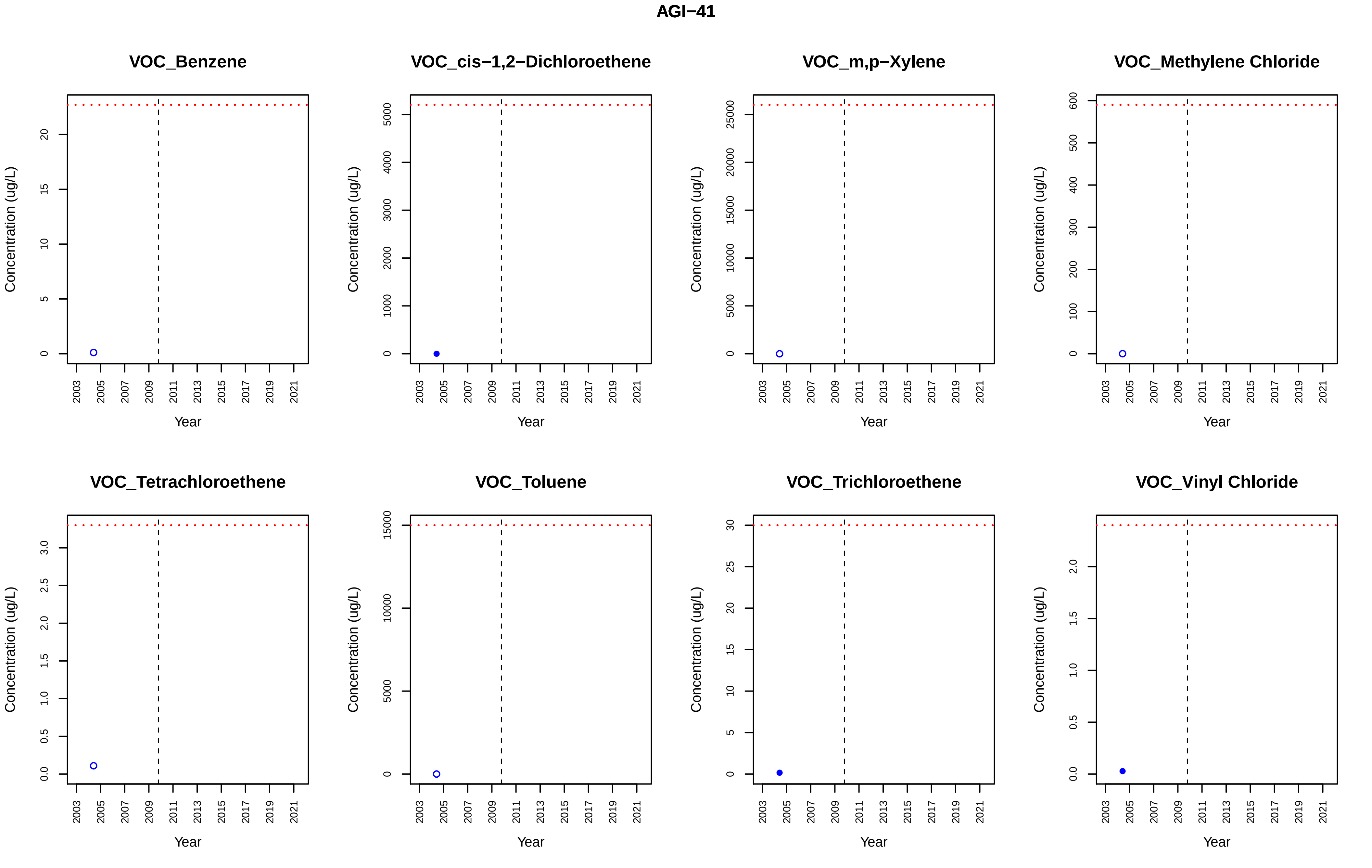
# AGI−37



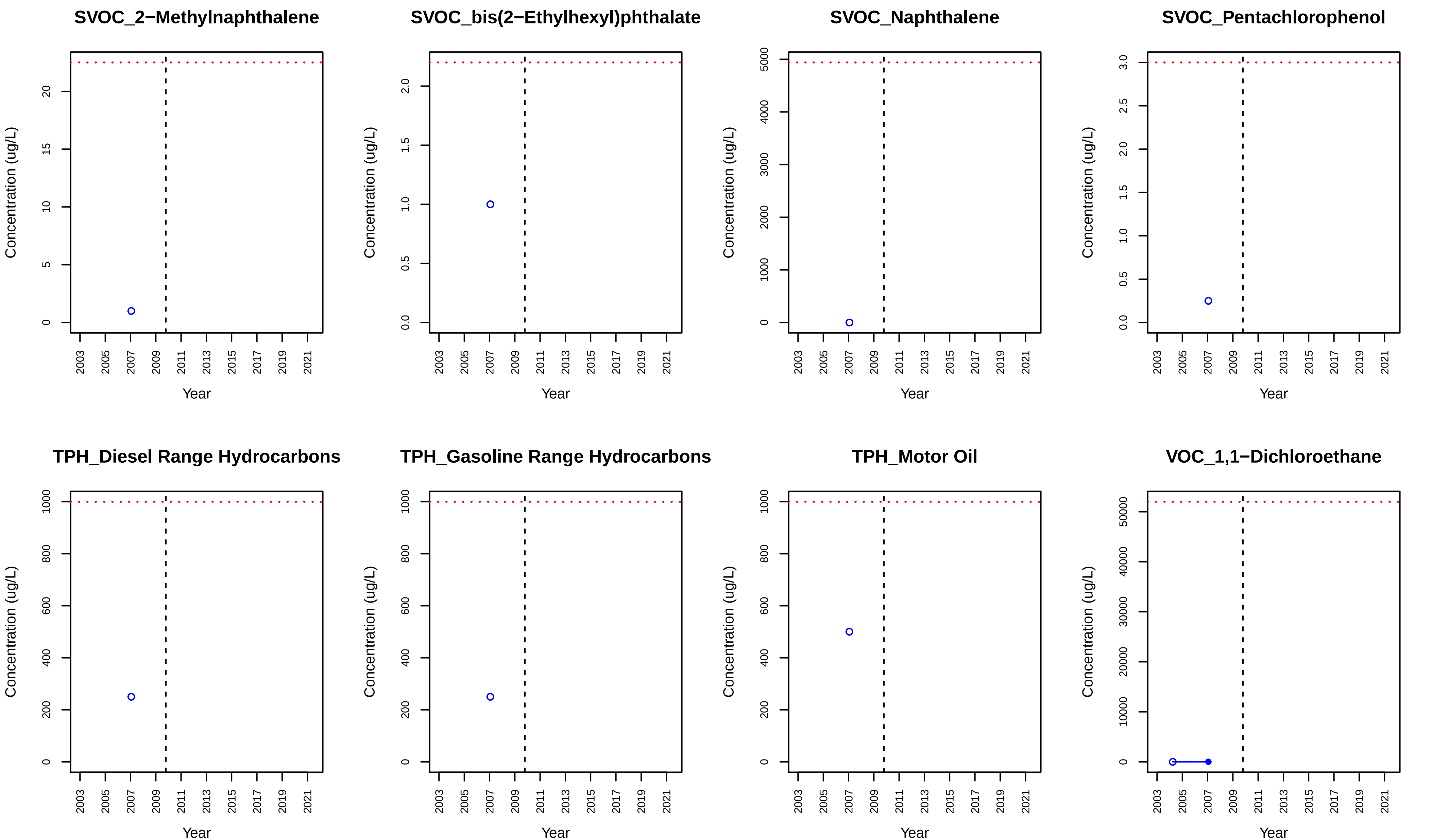
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

# AGI−41

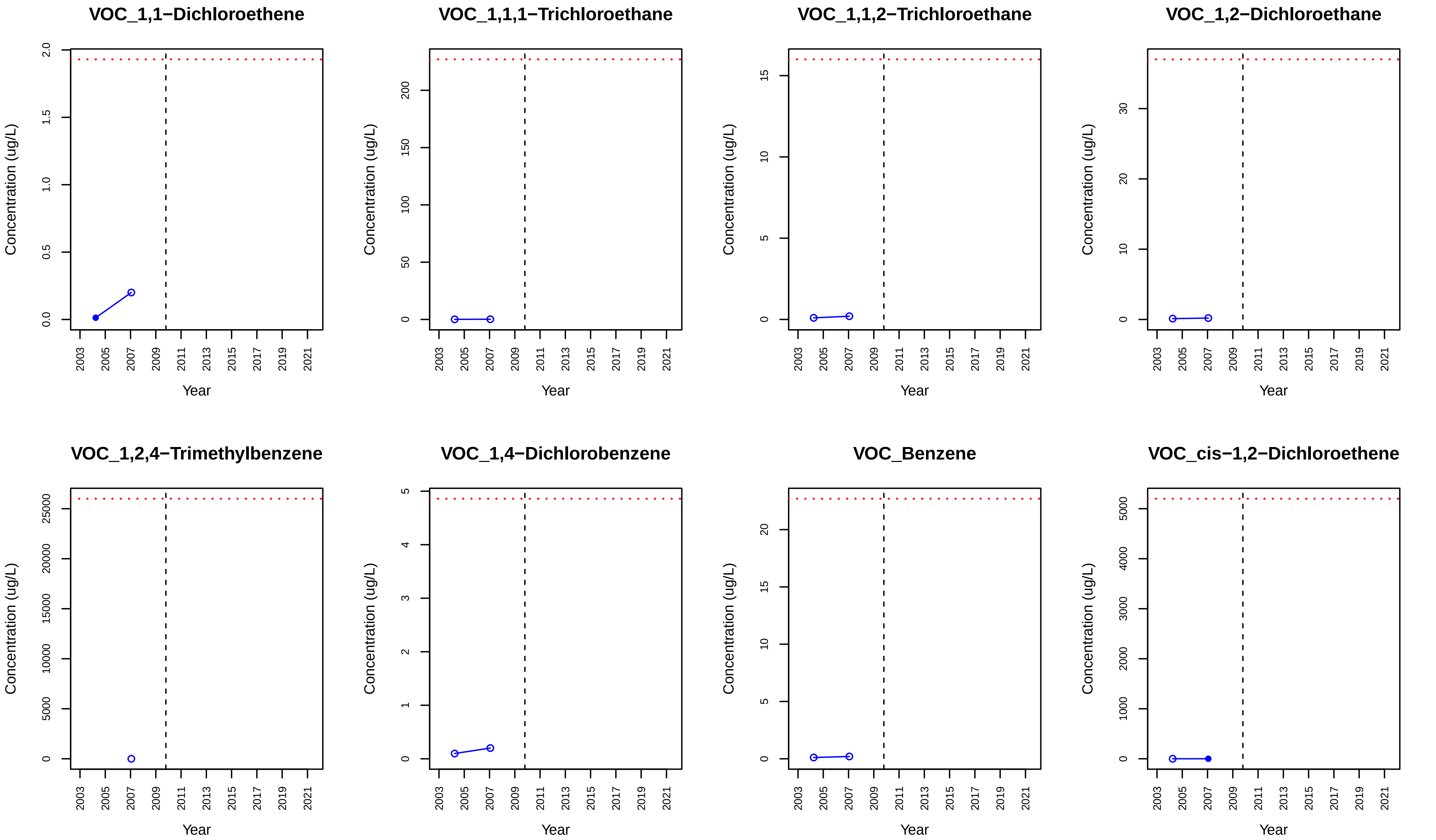

TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
VOC_1,1−Dichloroethane
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,4−Dichlorobenzene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


AGI−41
VOC_Benzene
VOC_cis−1,2−Dichloroethene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

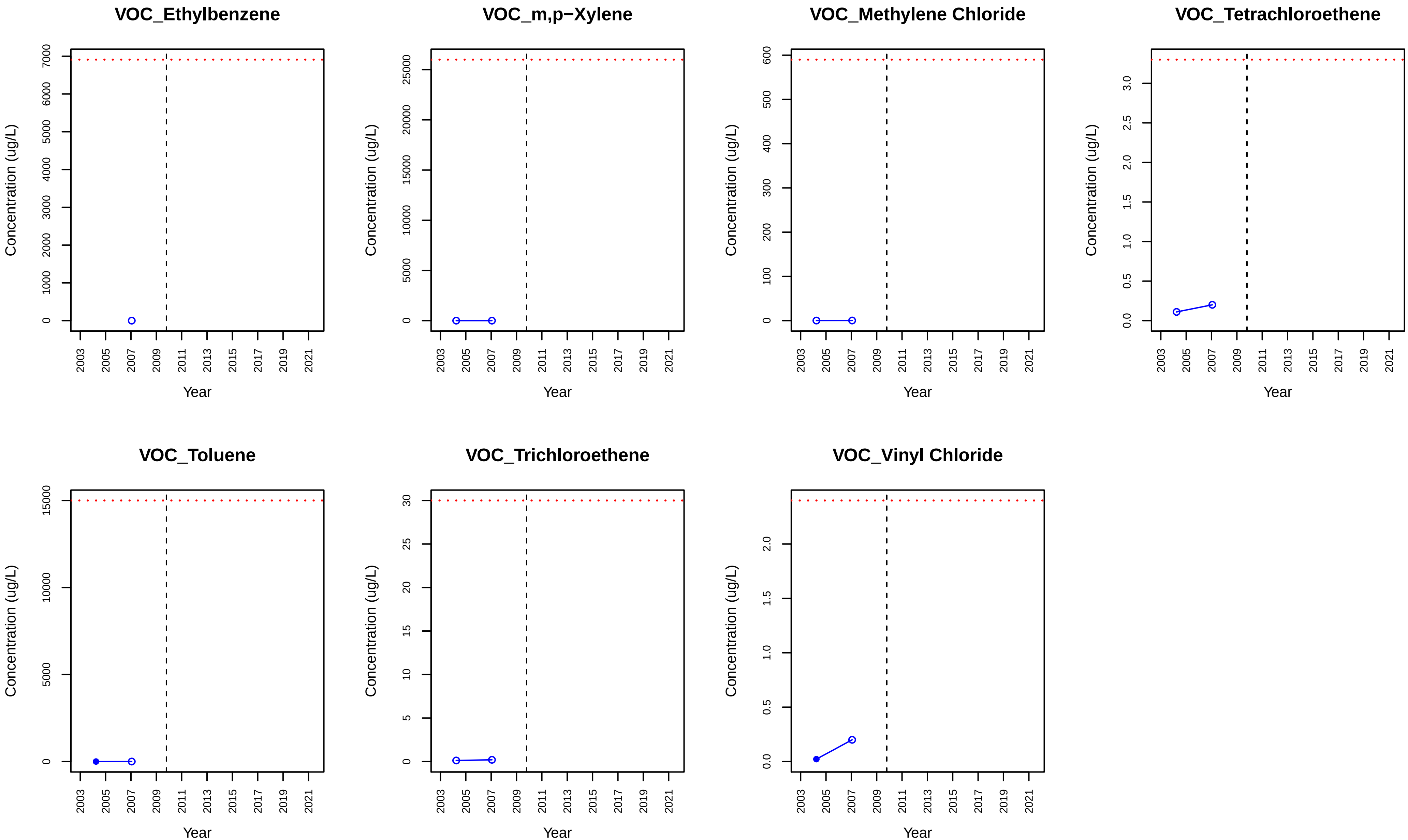
## AGI−42


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

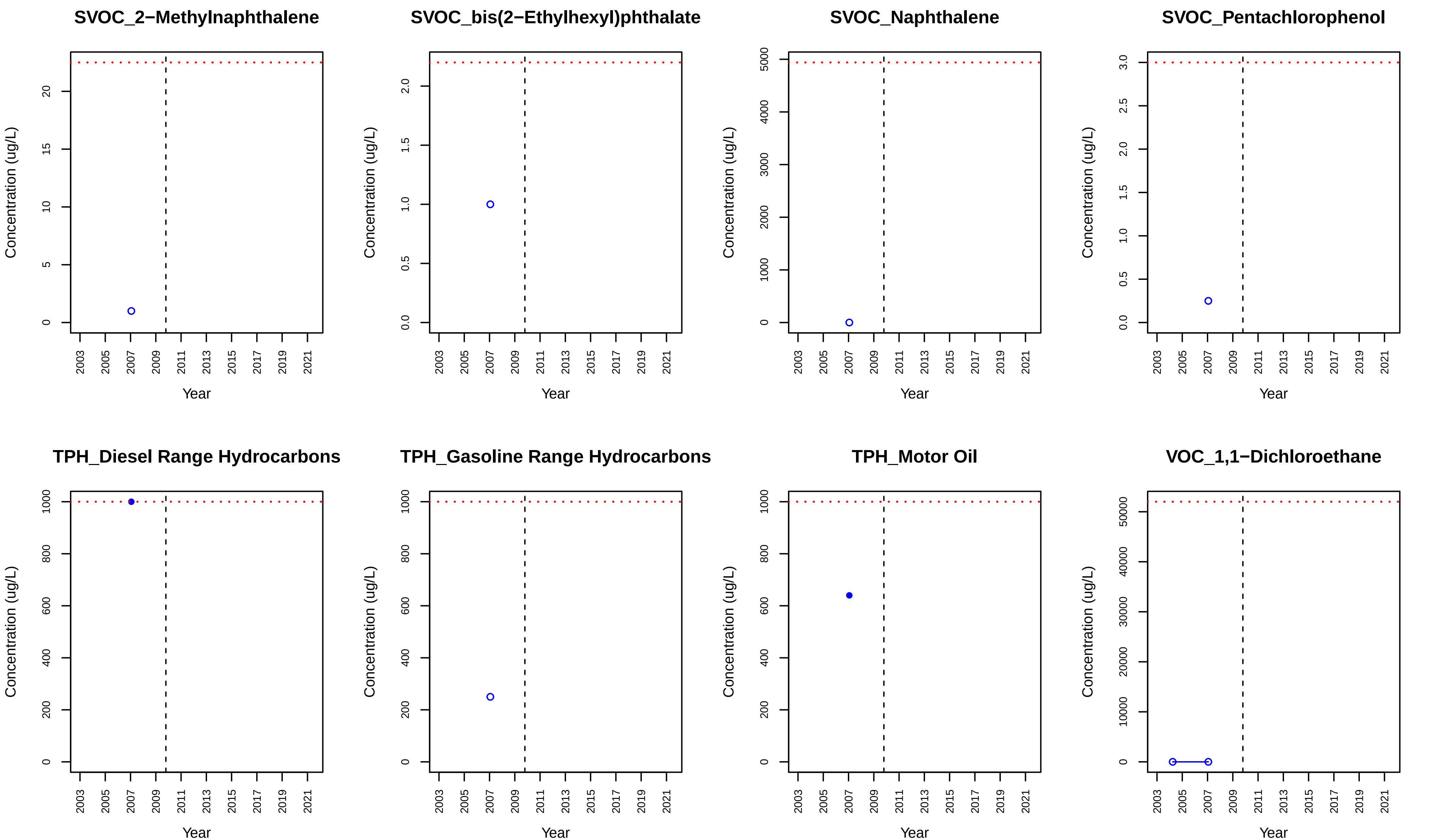
# AGI−42


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

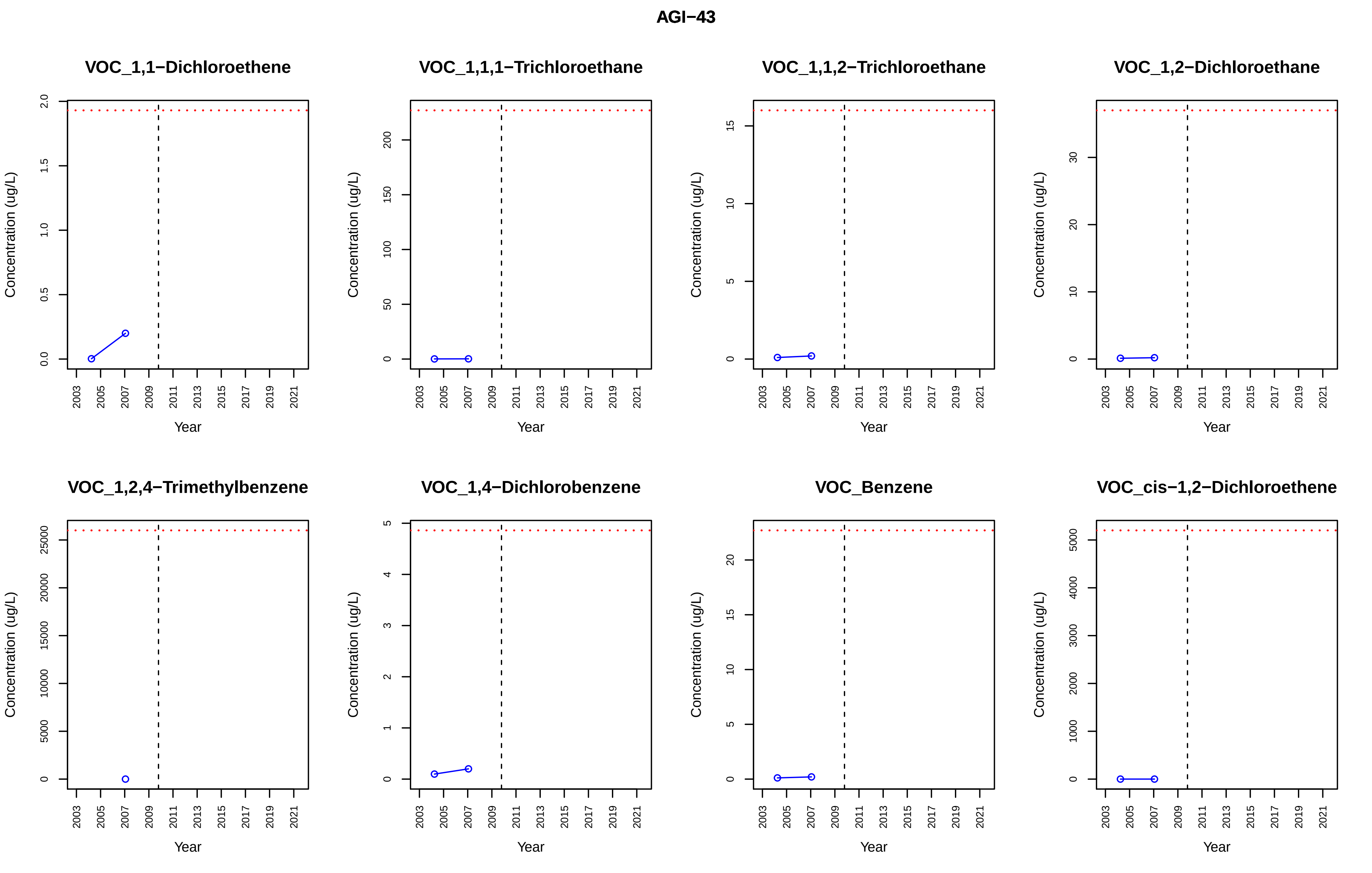
# AGI−42


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

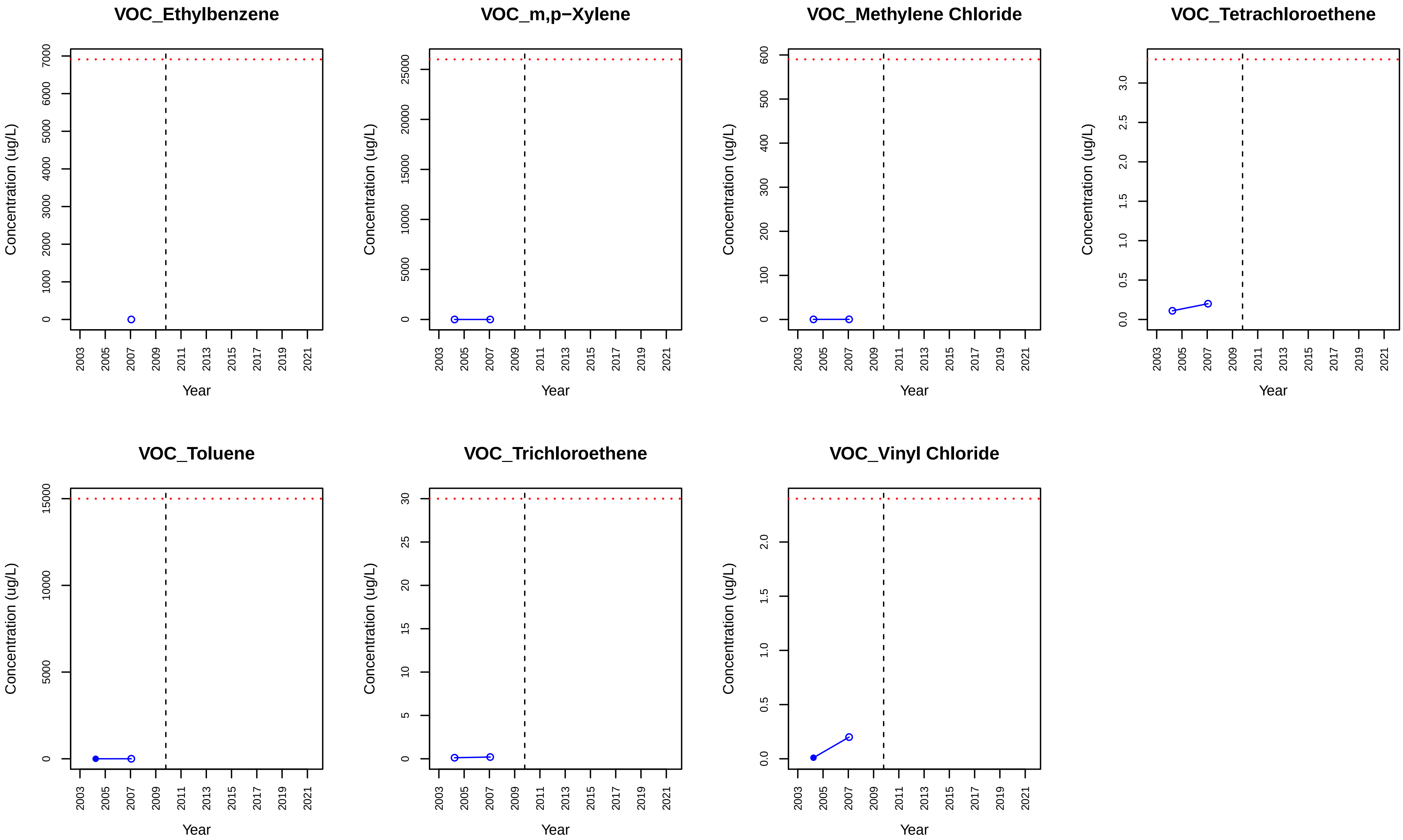
# AGI−43

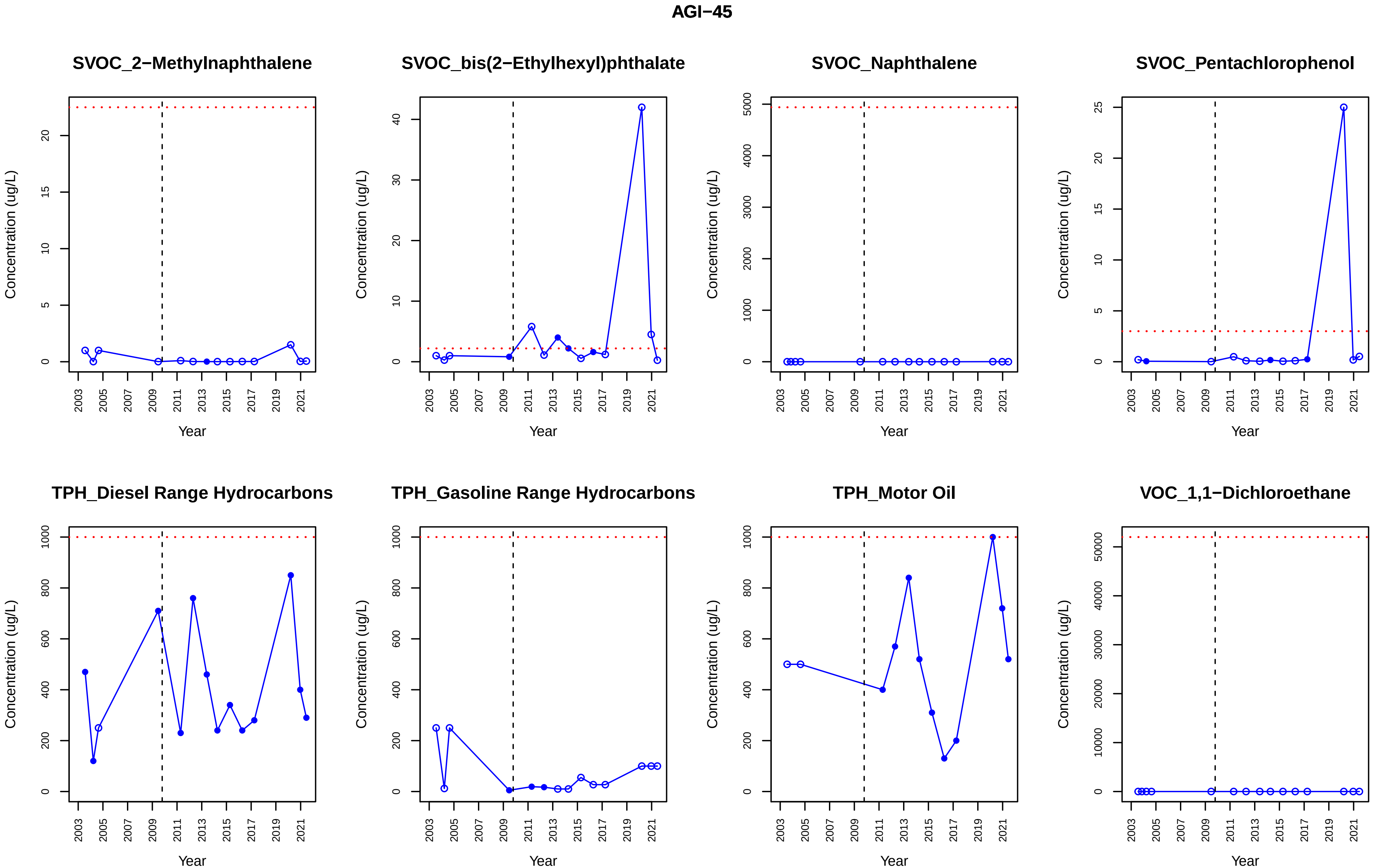


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

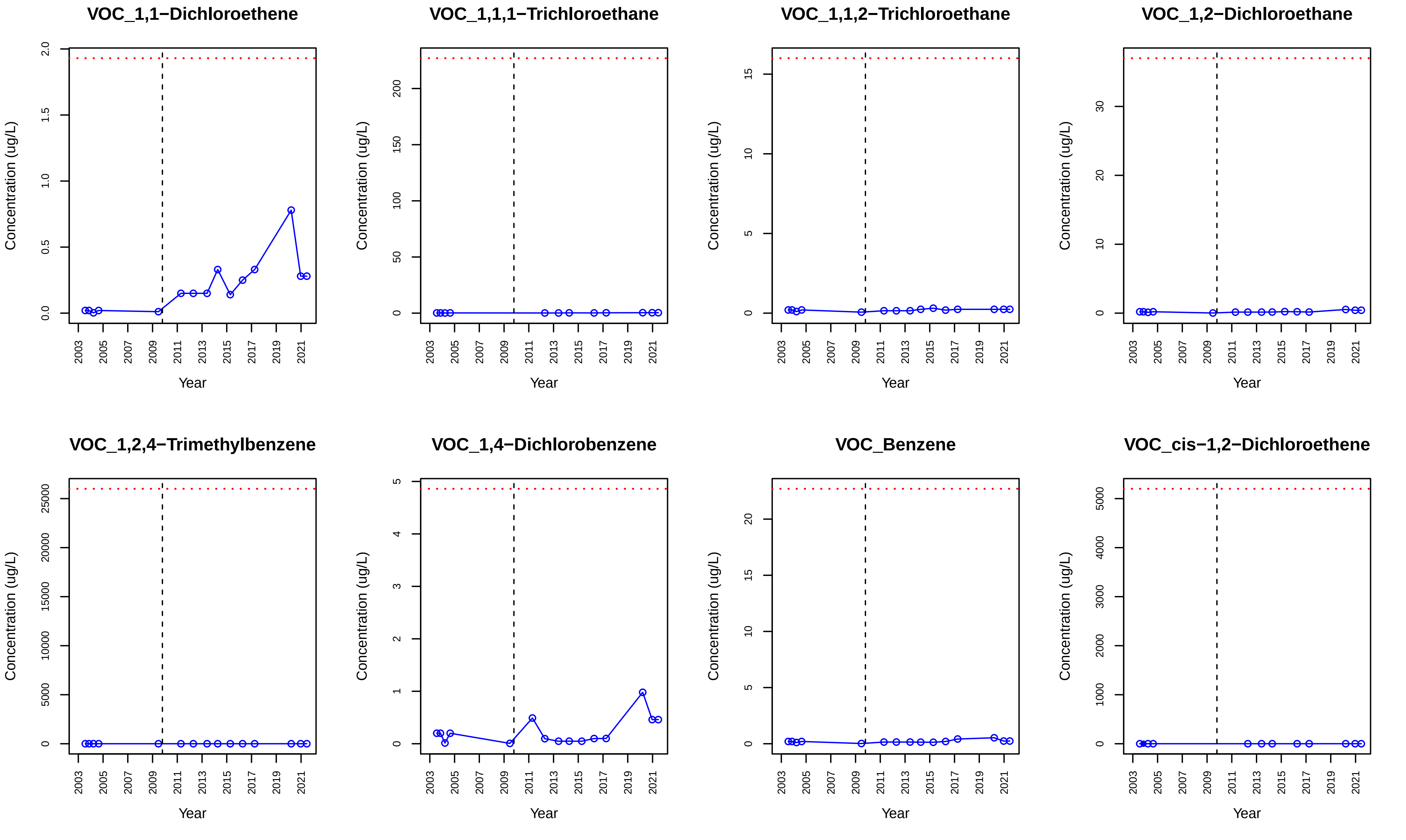

AGI−43
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**AGI−43**

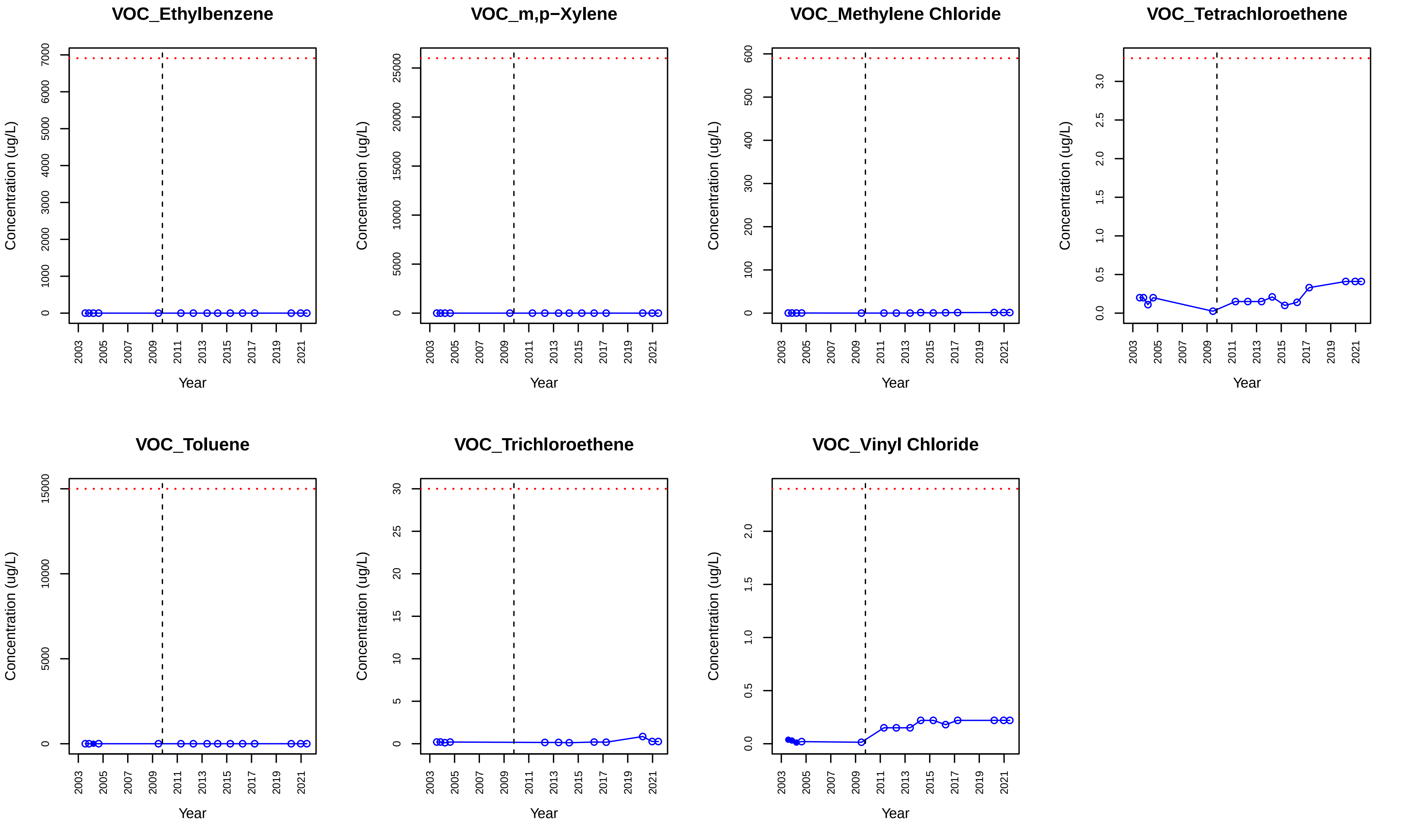

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021


AGI−45
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−45

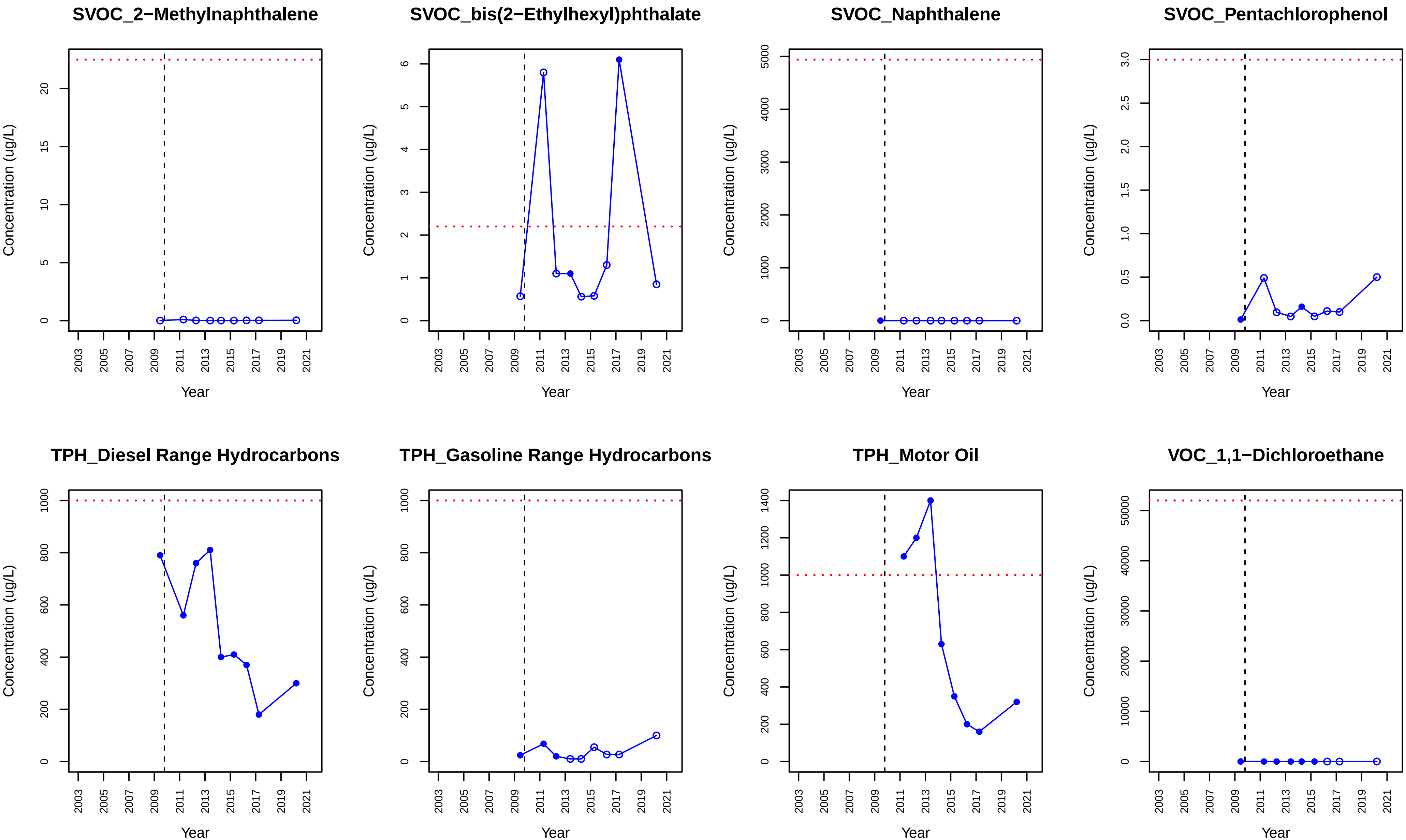

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−45

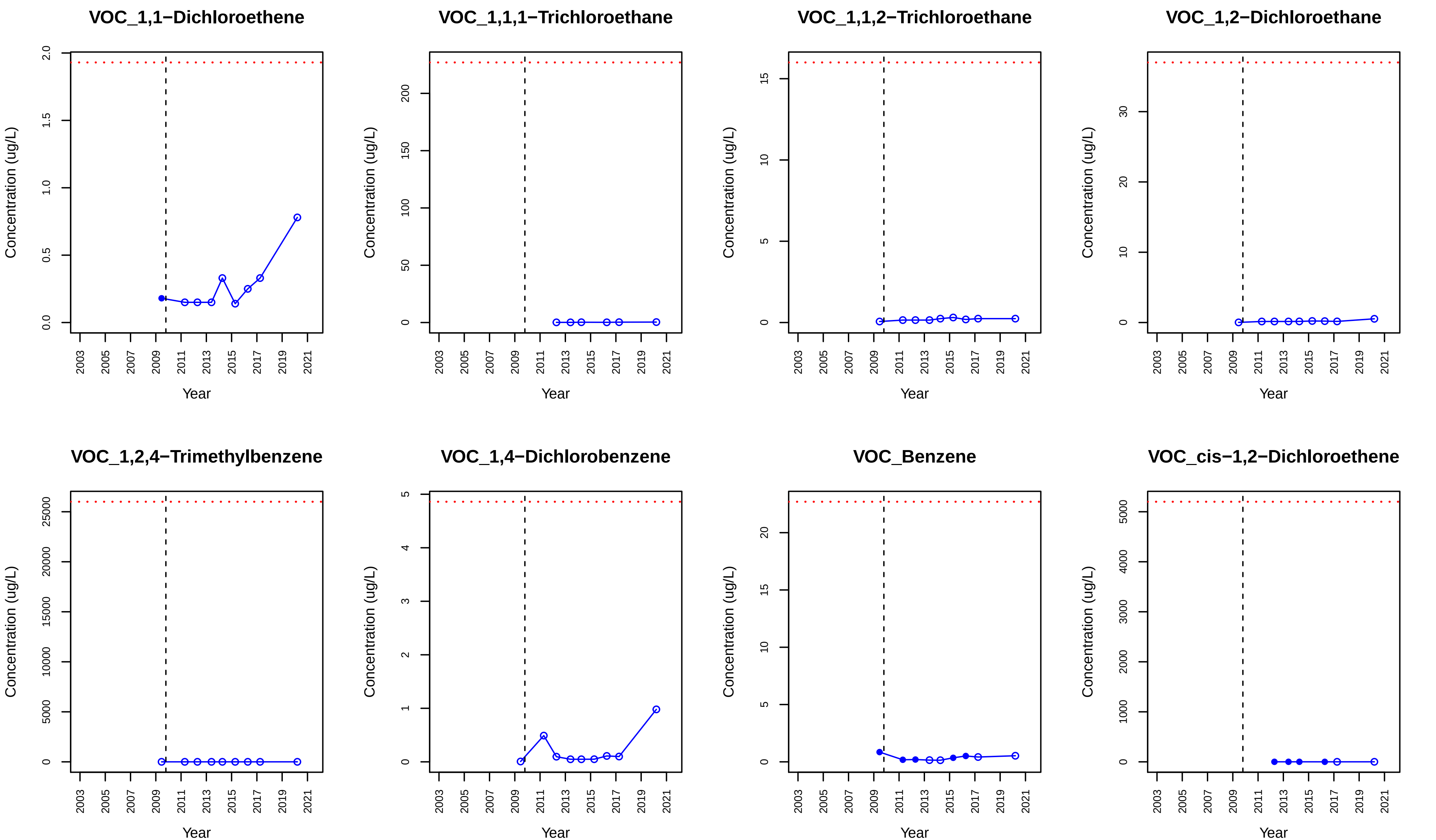


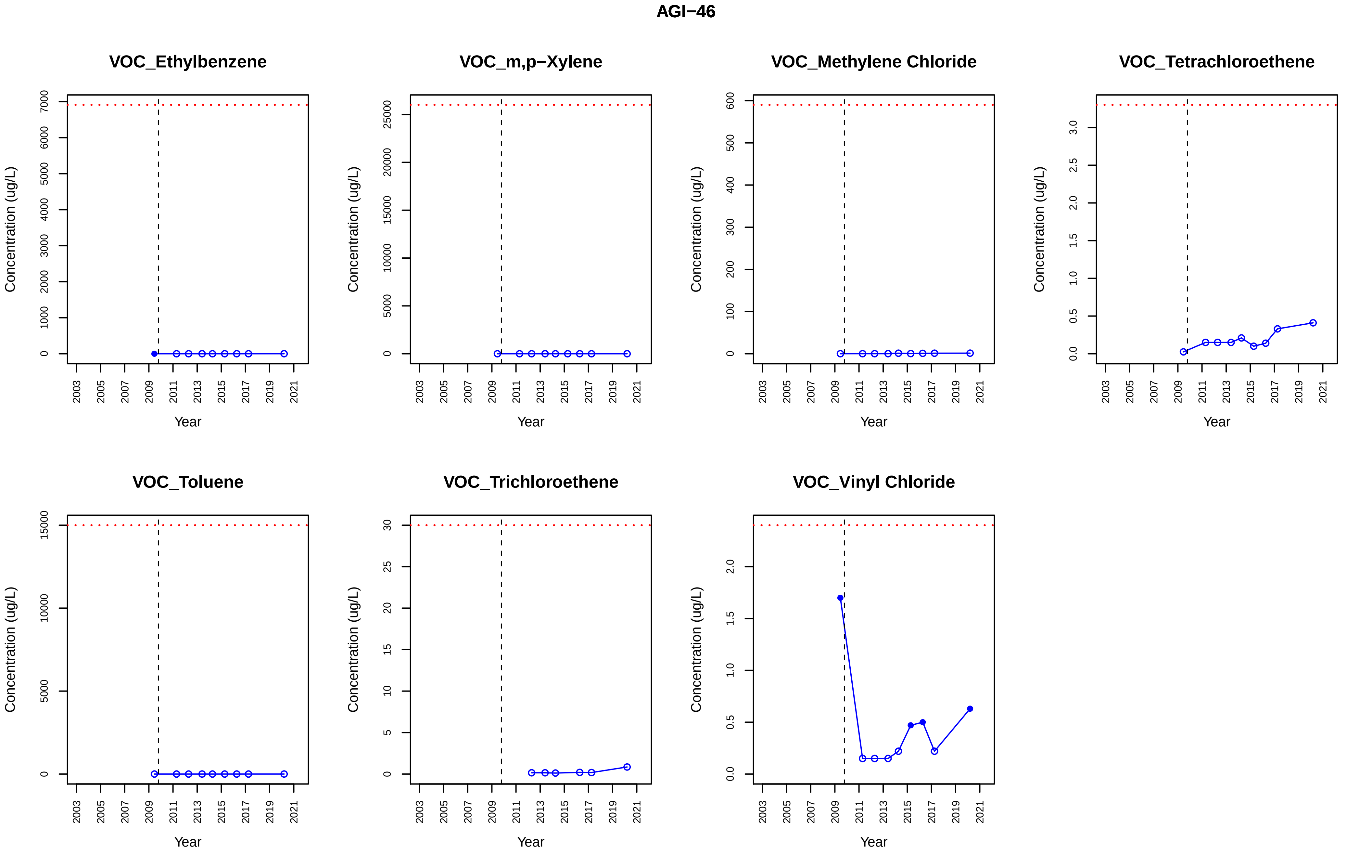
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# AGI−46


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

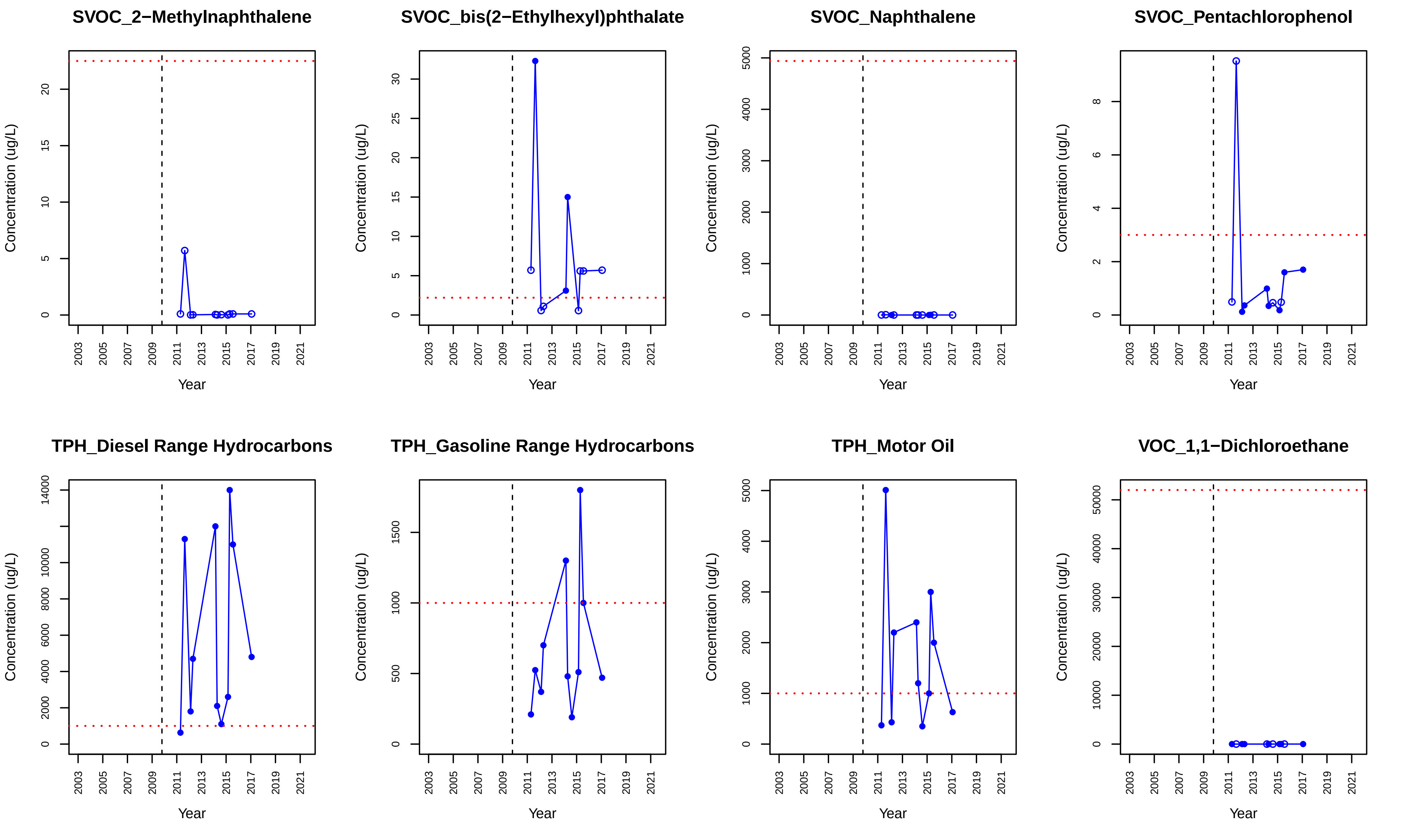
# AGI−46


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year

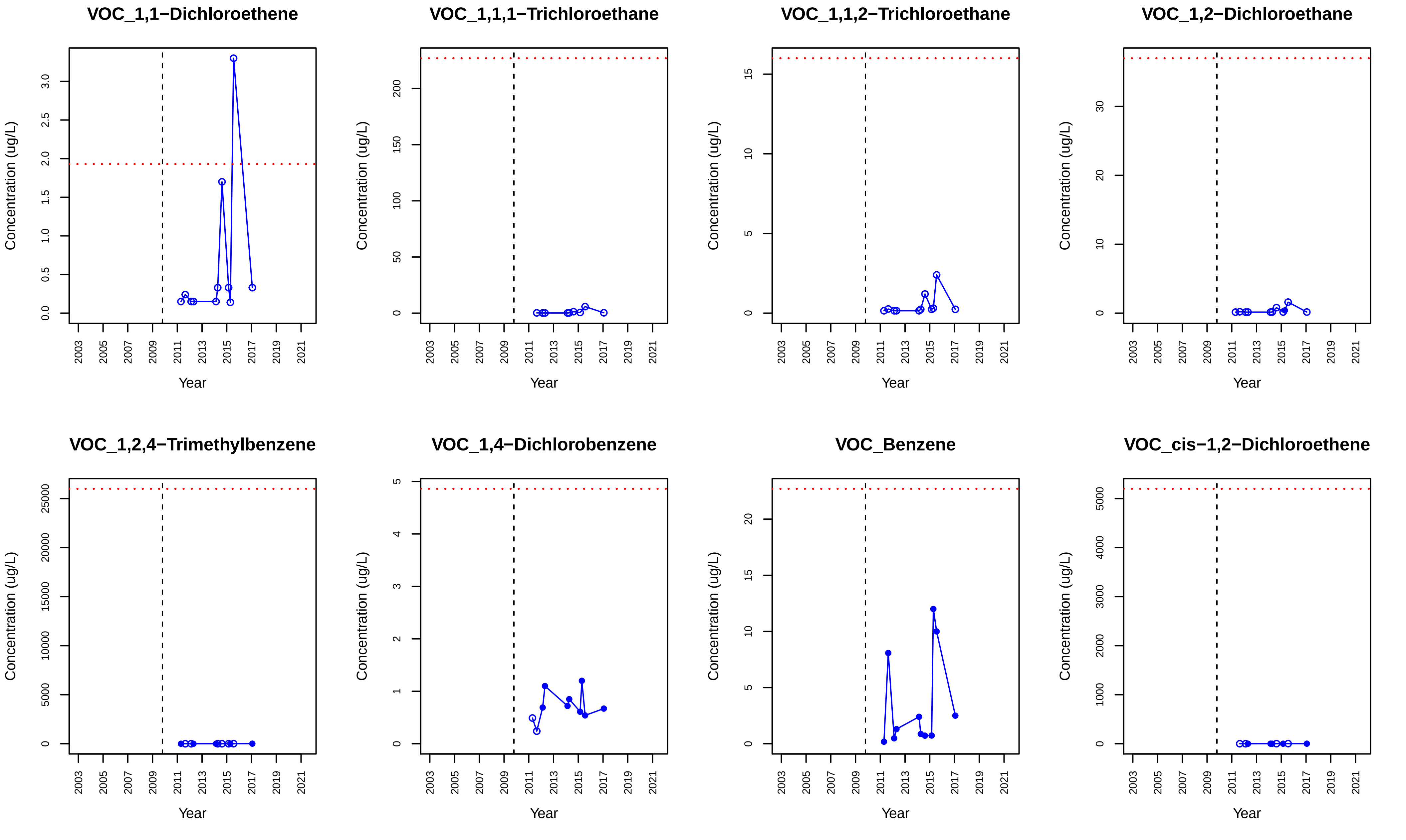


AGI−46
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

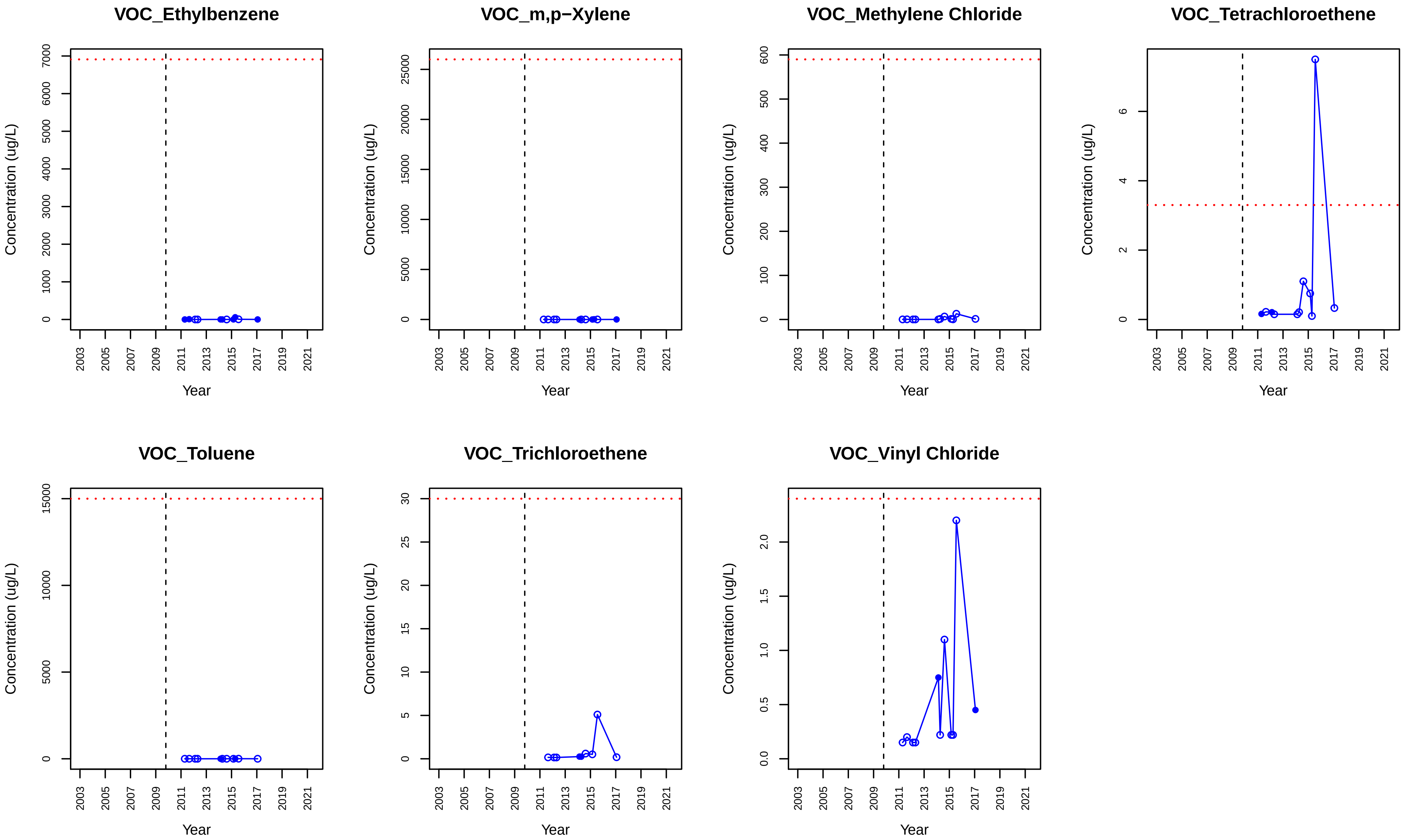
**B−01**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 5 10 15 20
0 5 10 15 20 25 30
0 1000 2000 3000 4000 5000
0 2 4 6 8
0 2000 4000 6000 8000 10000 14000
0 500 1000 1500
0 1000 2000 3000 4000 5000
0 10000 20000 30000 40000 50000

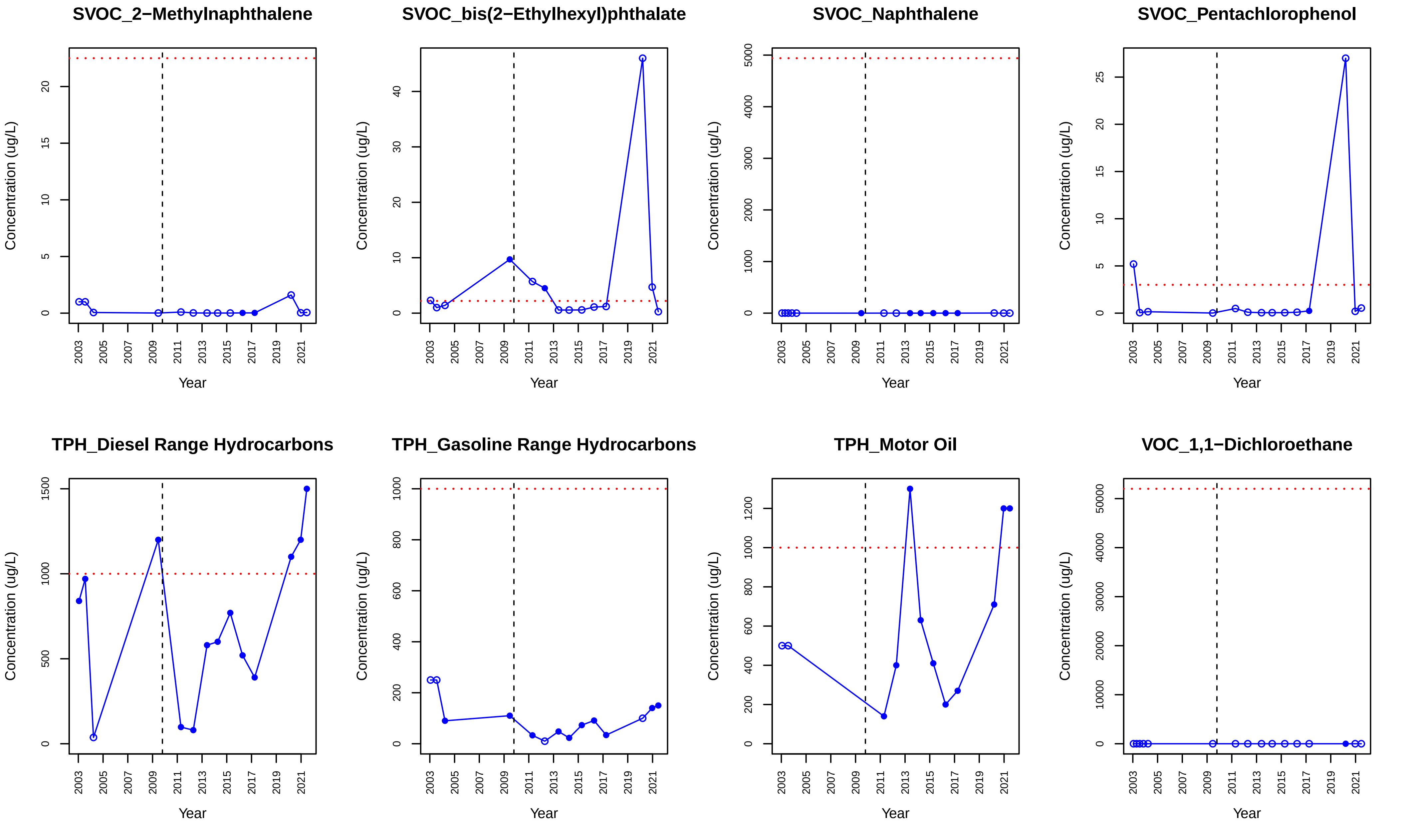
# B−01


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

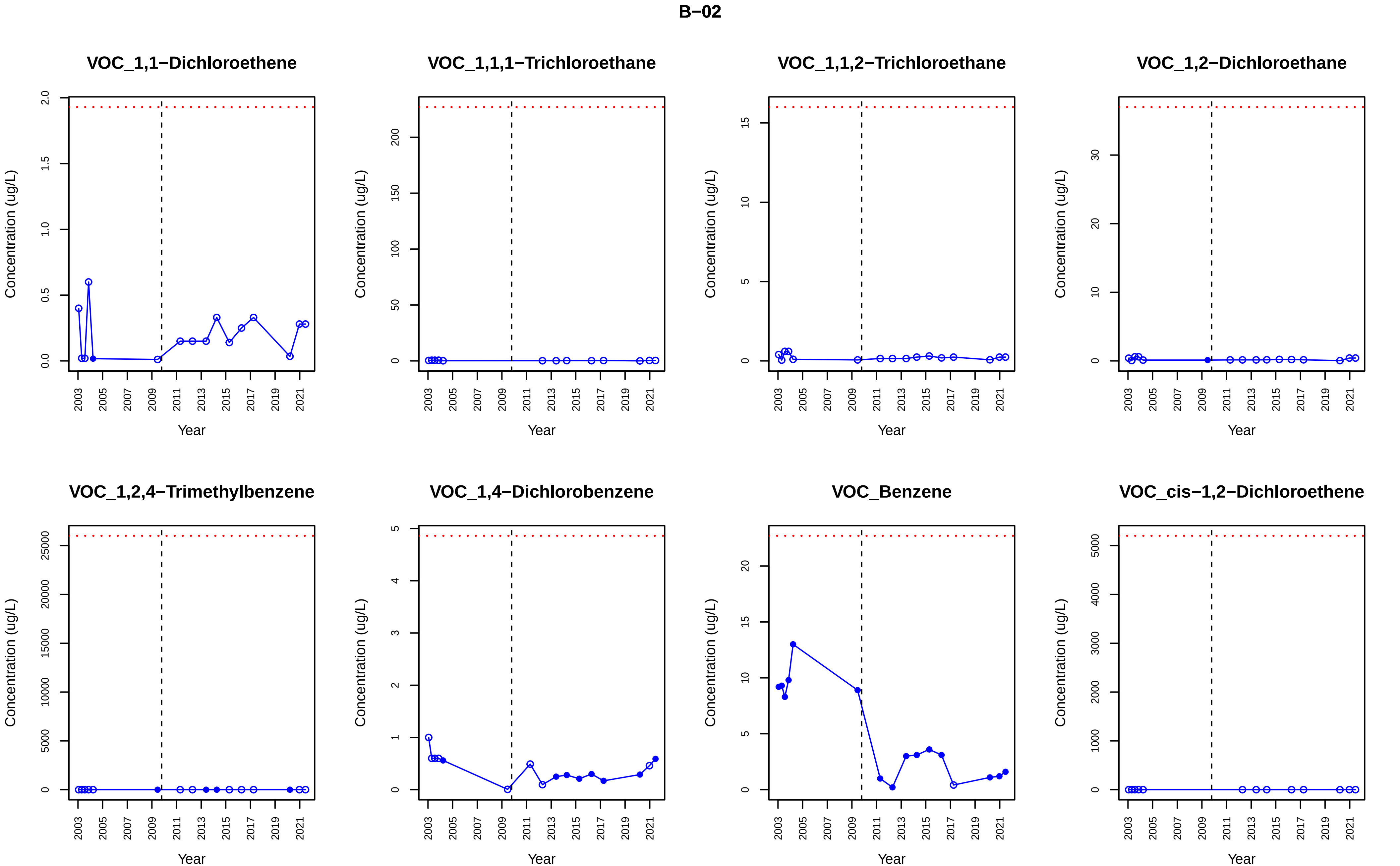
**B−01**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−02**

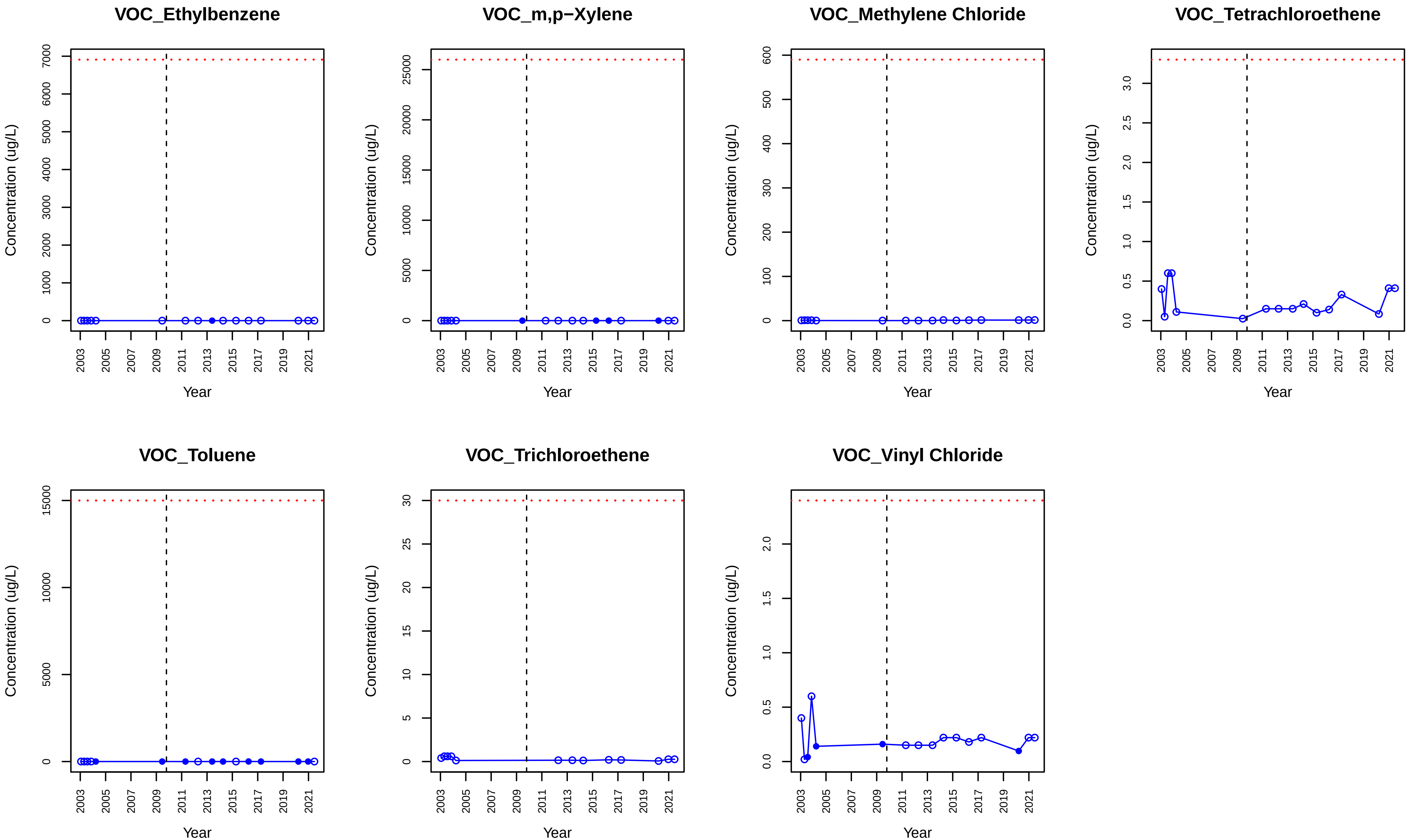


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

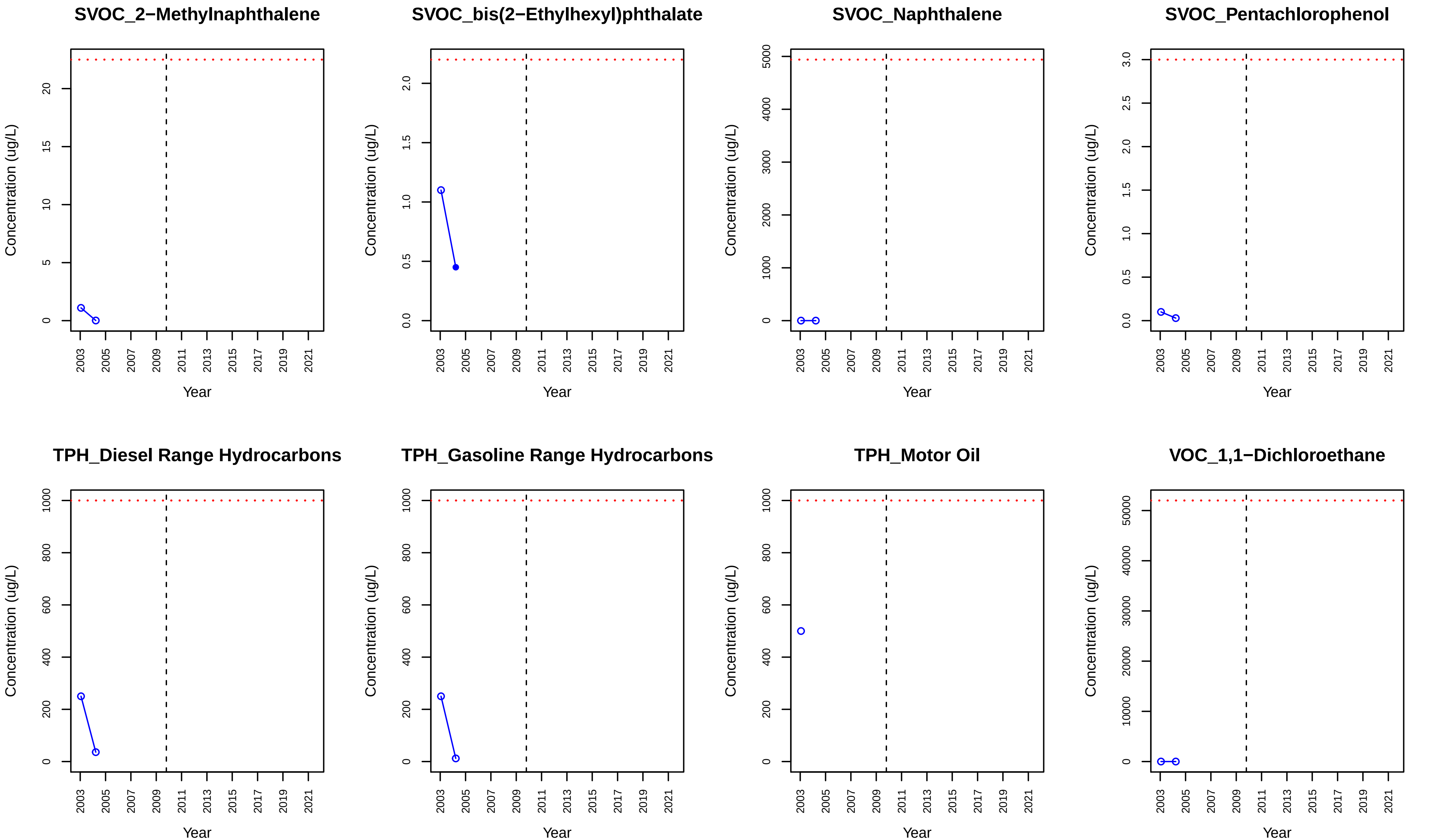


B−02
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year

**B−02**

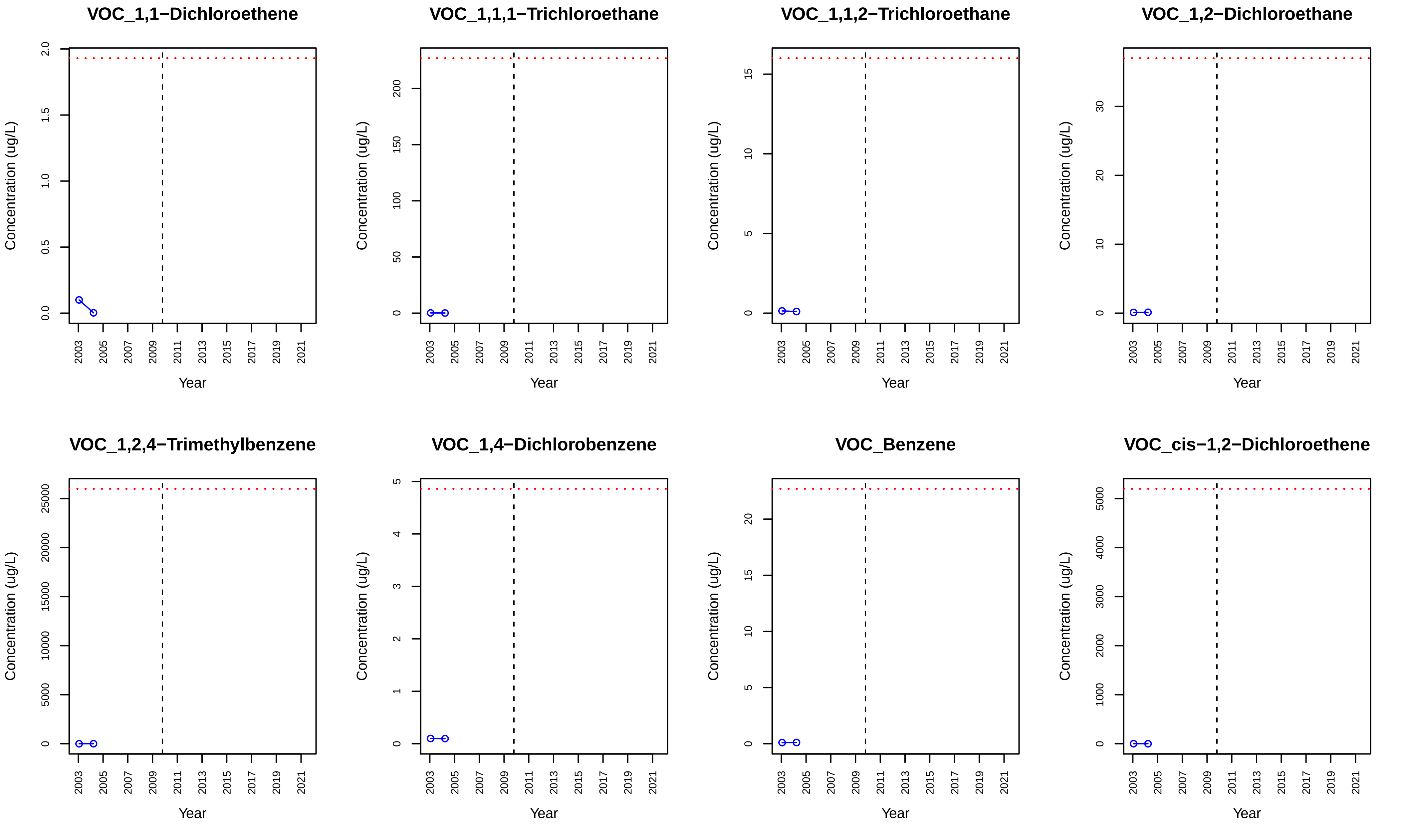

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

## B−08D

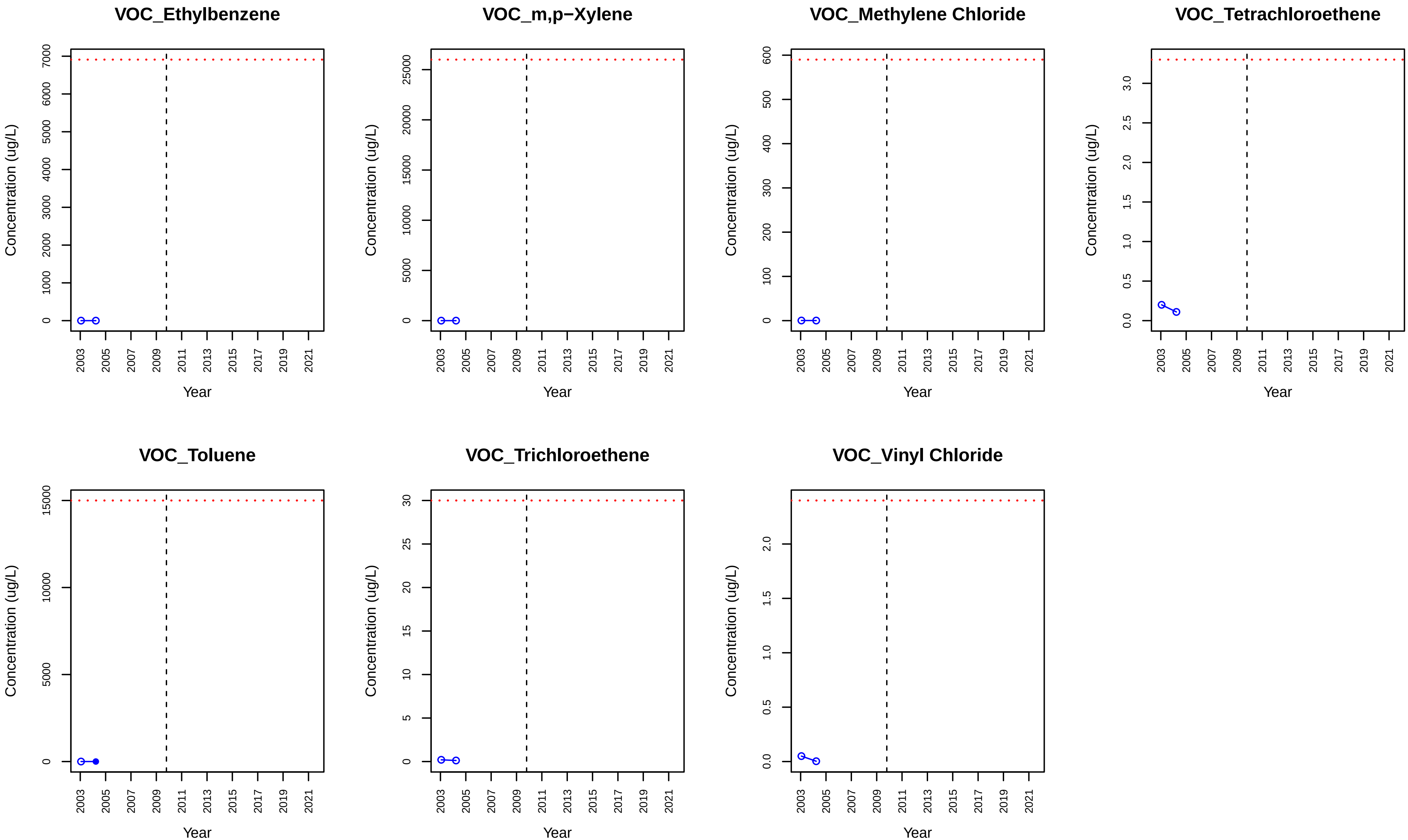


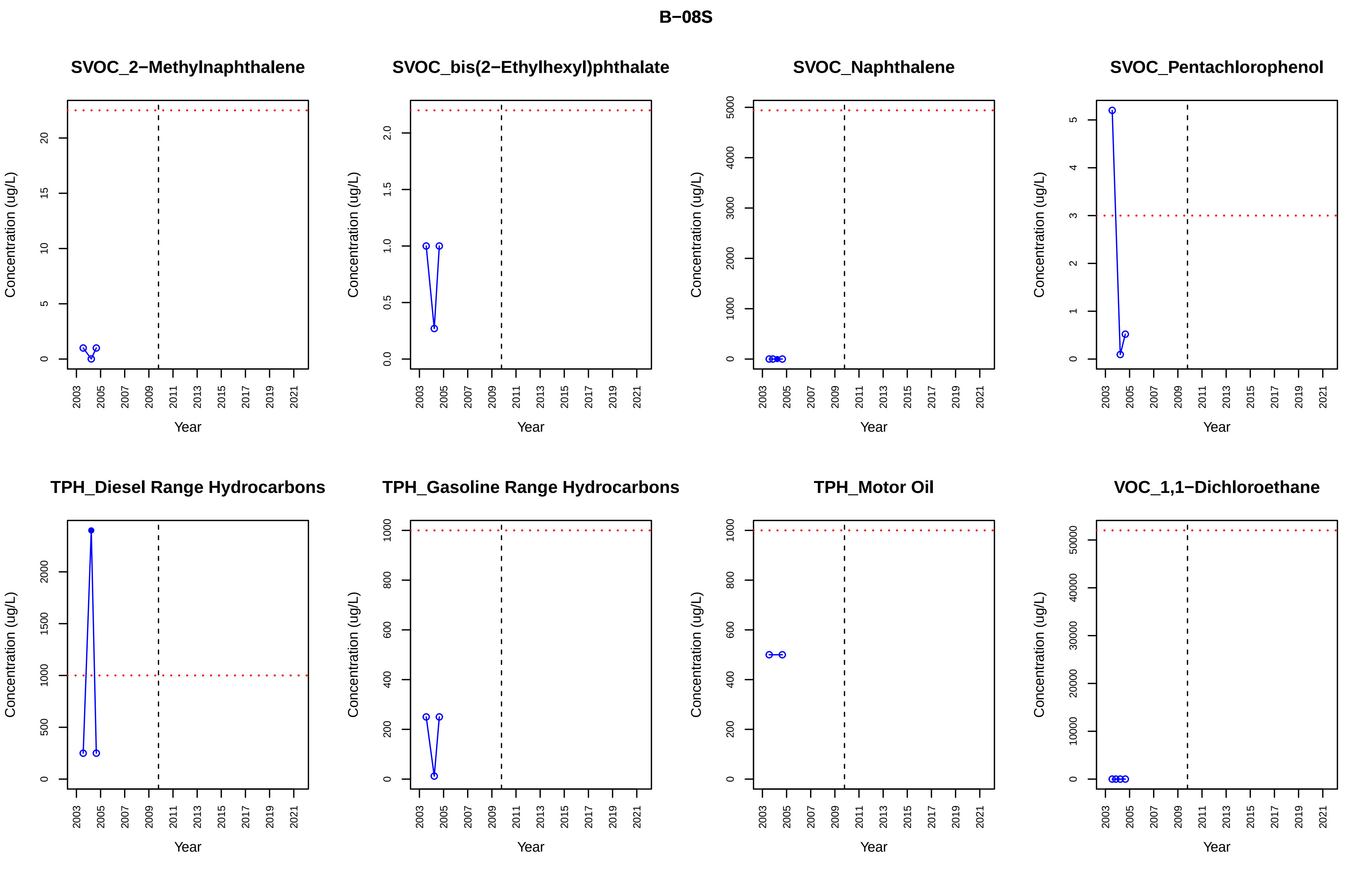
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−08D

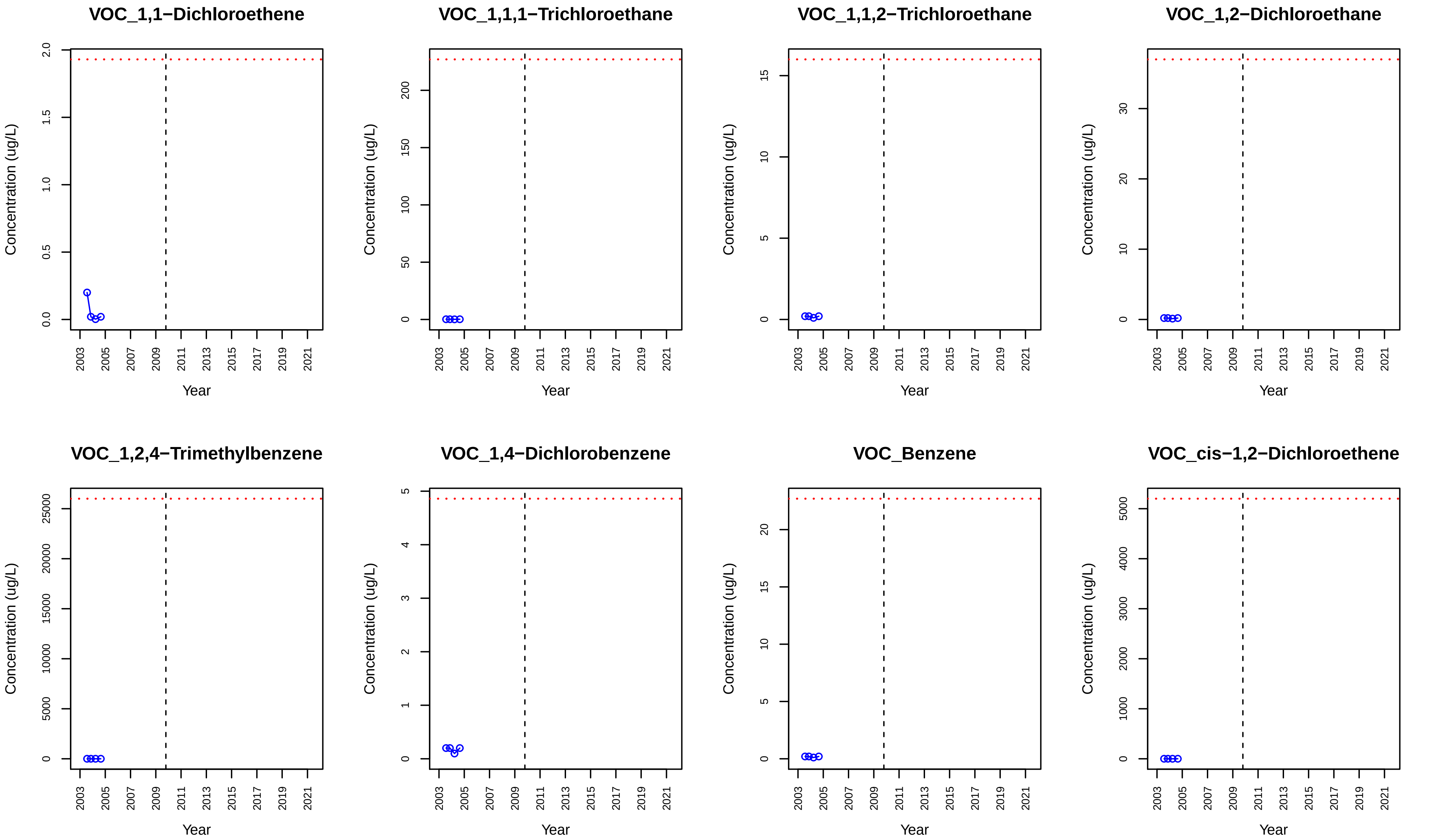

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−08D

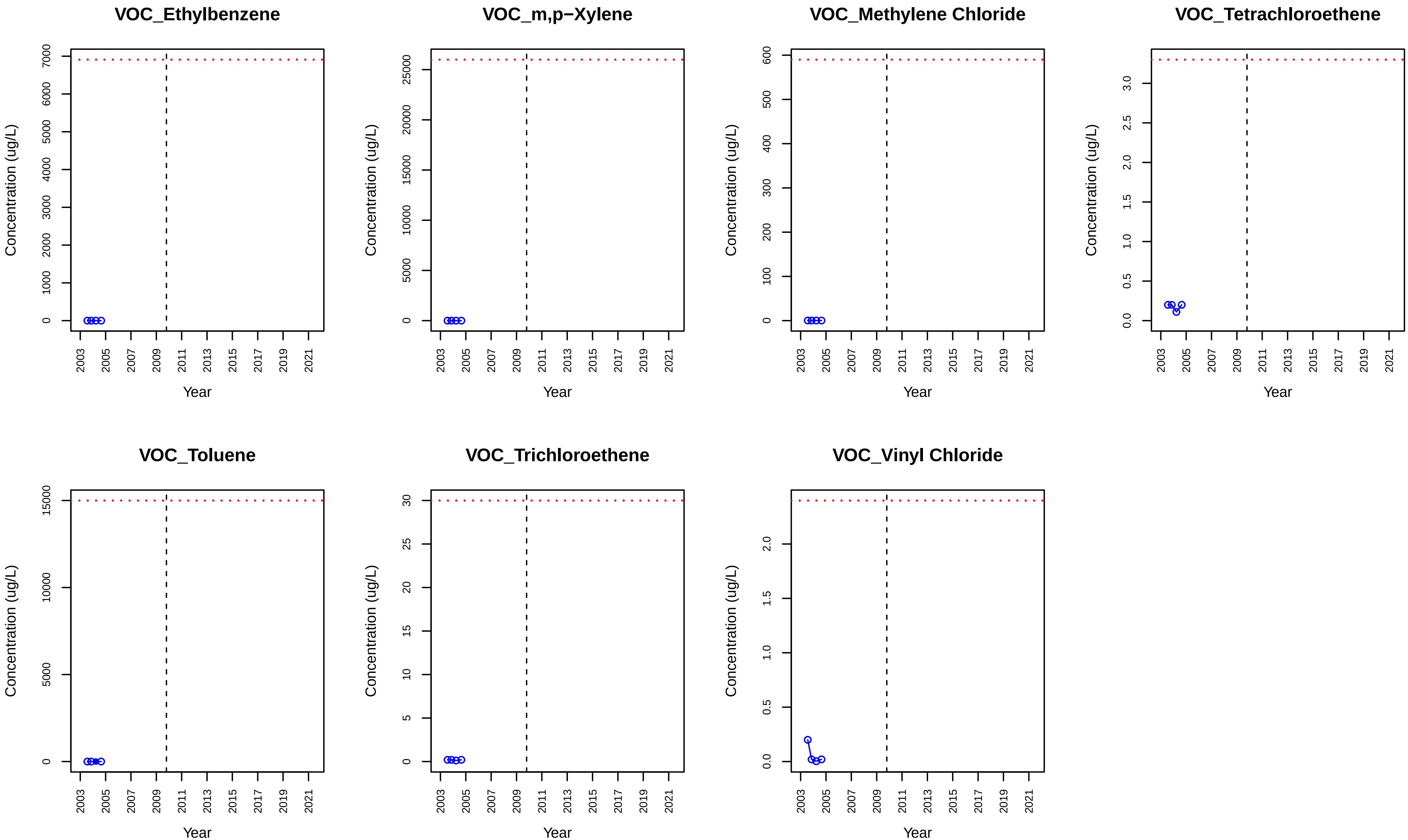

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


B−08S
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

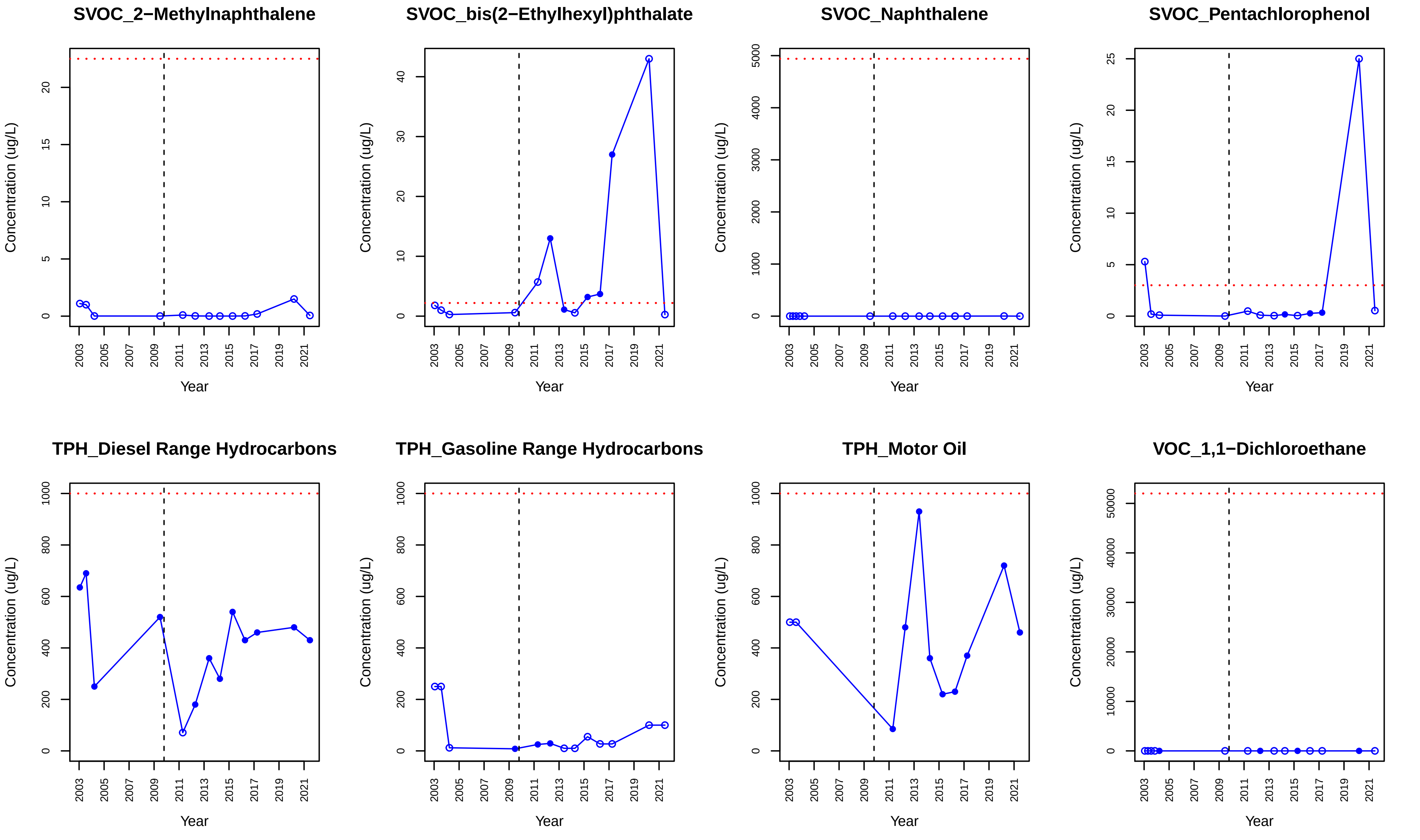
# B−08S


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−08S

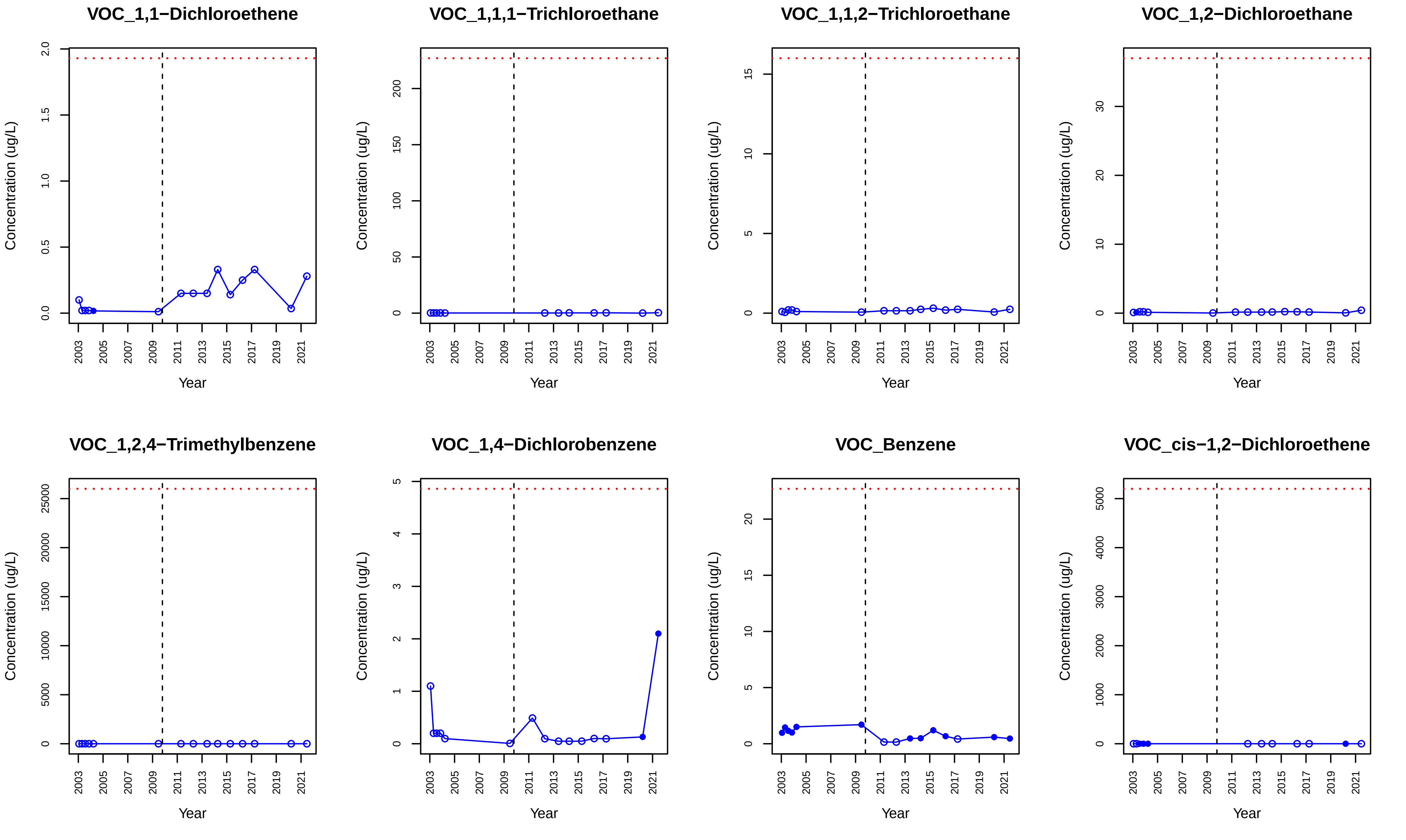

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# B−09

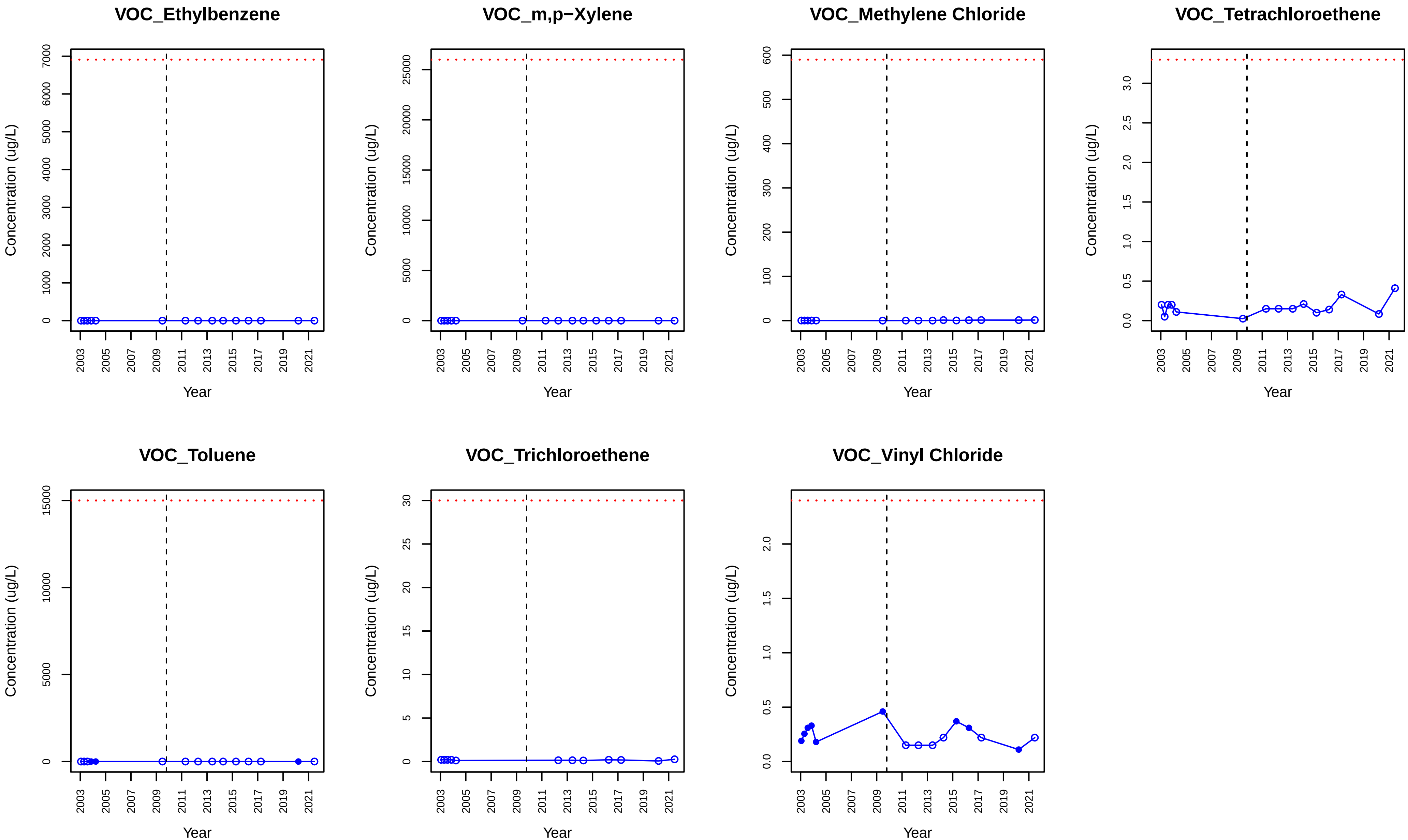


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−09

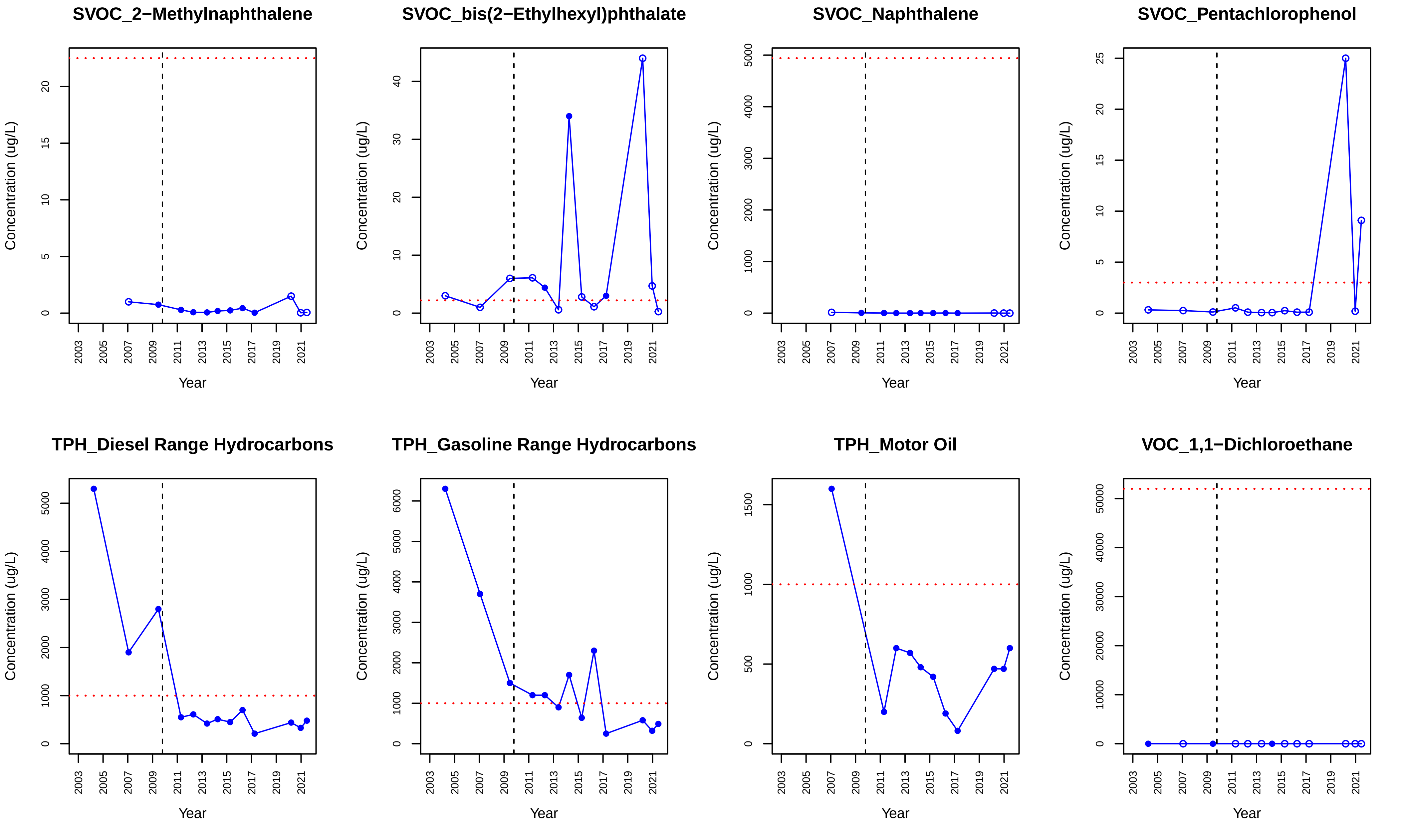

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

B−09

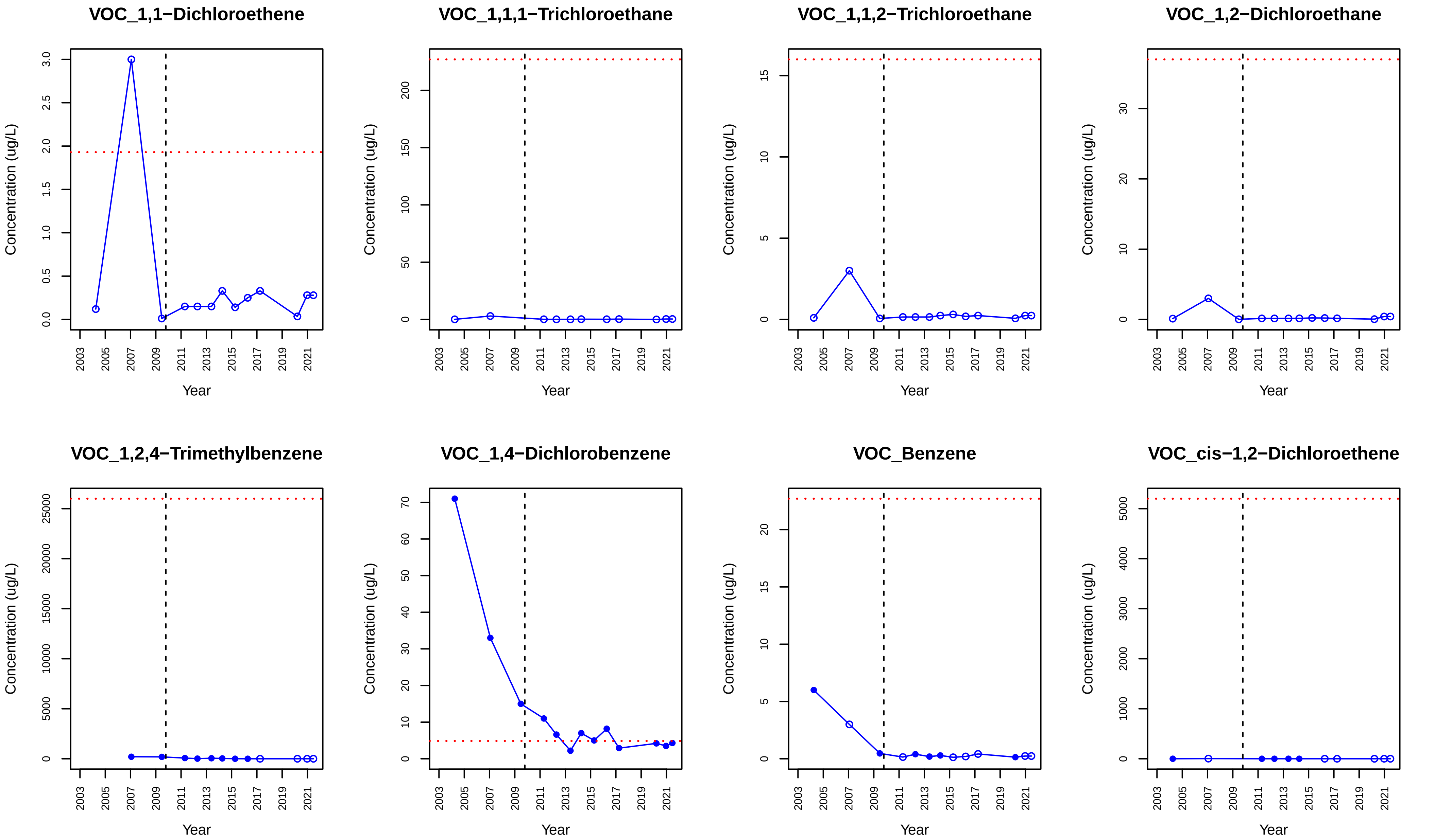


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

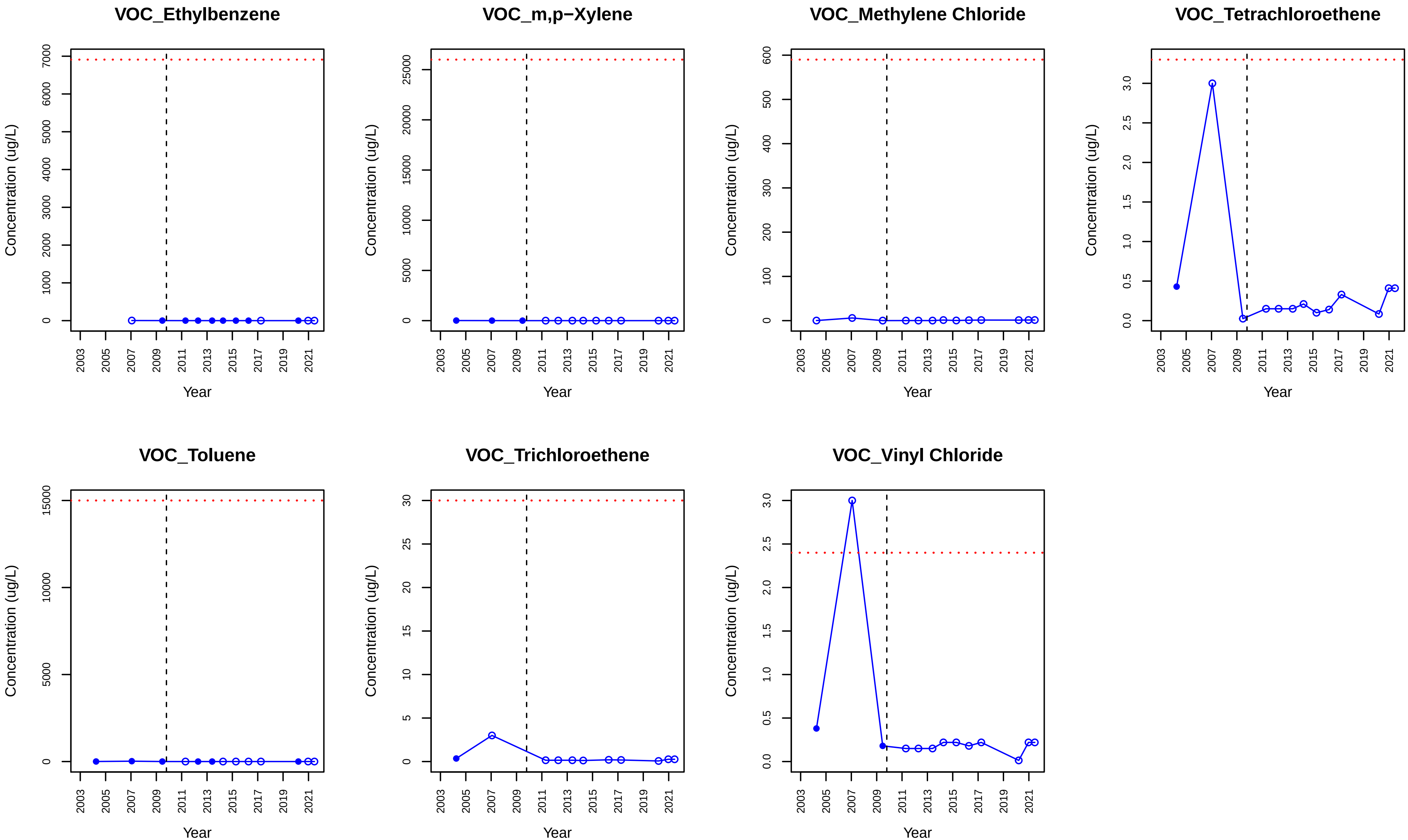
**B−11**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−11

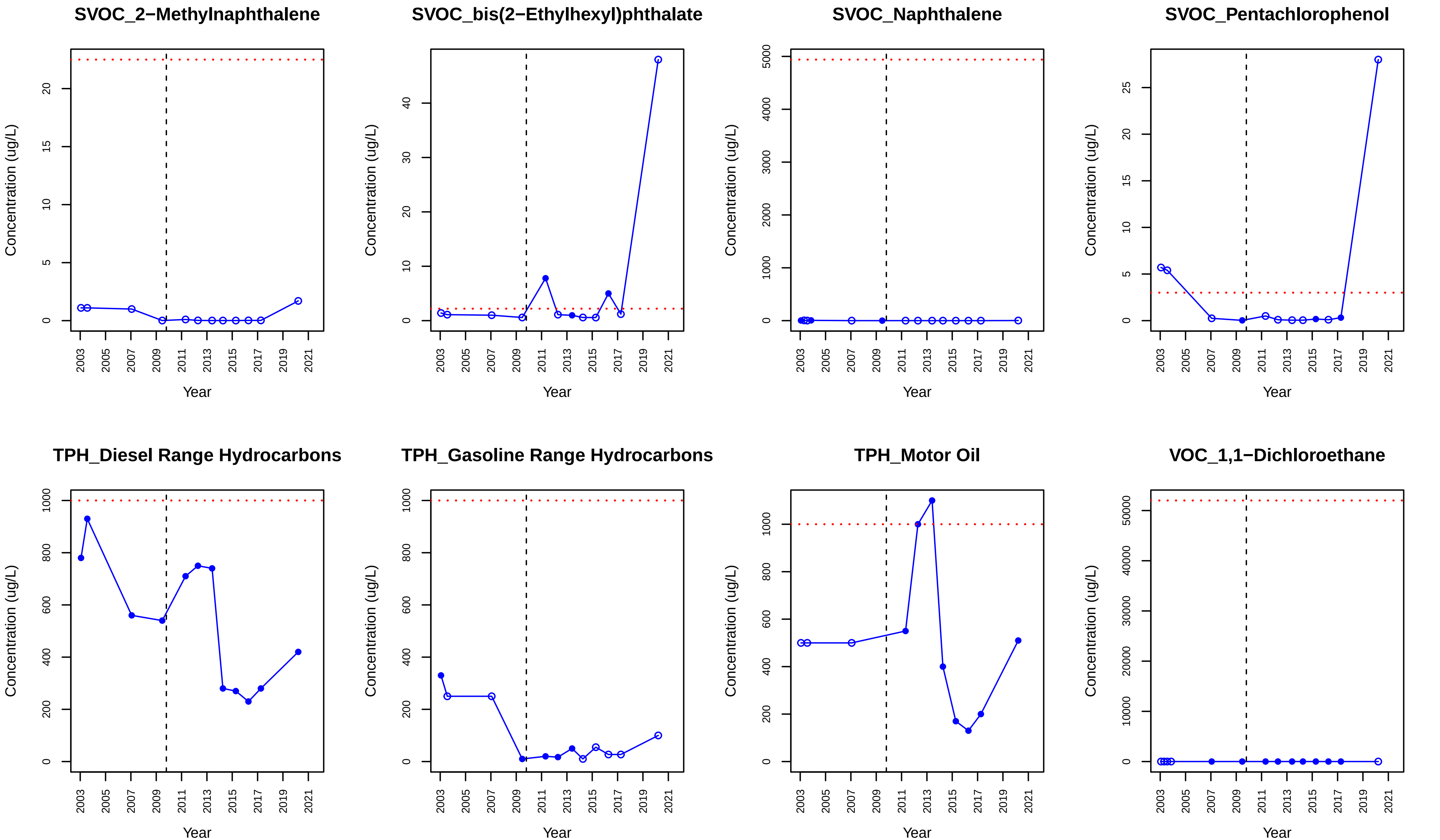

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## B−11

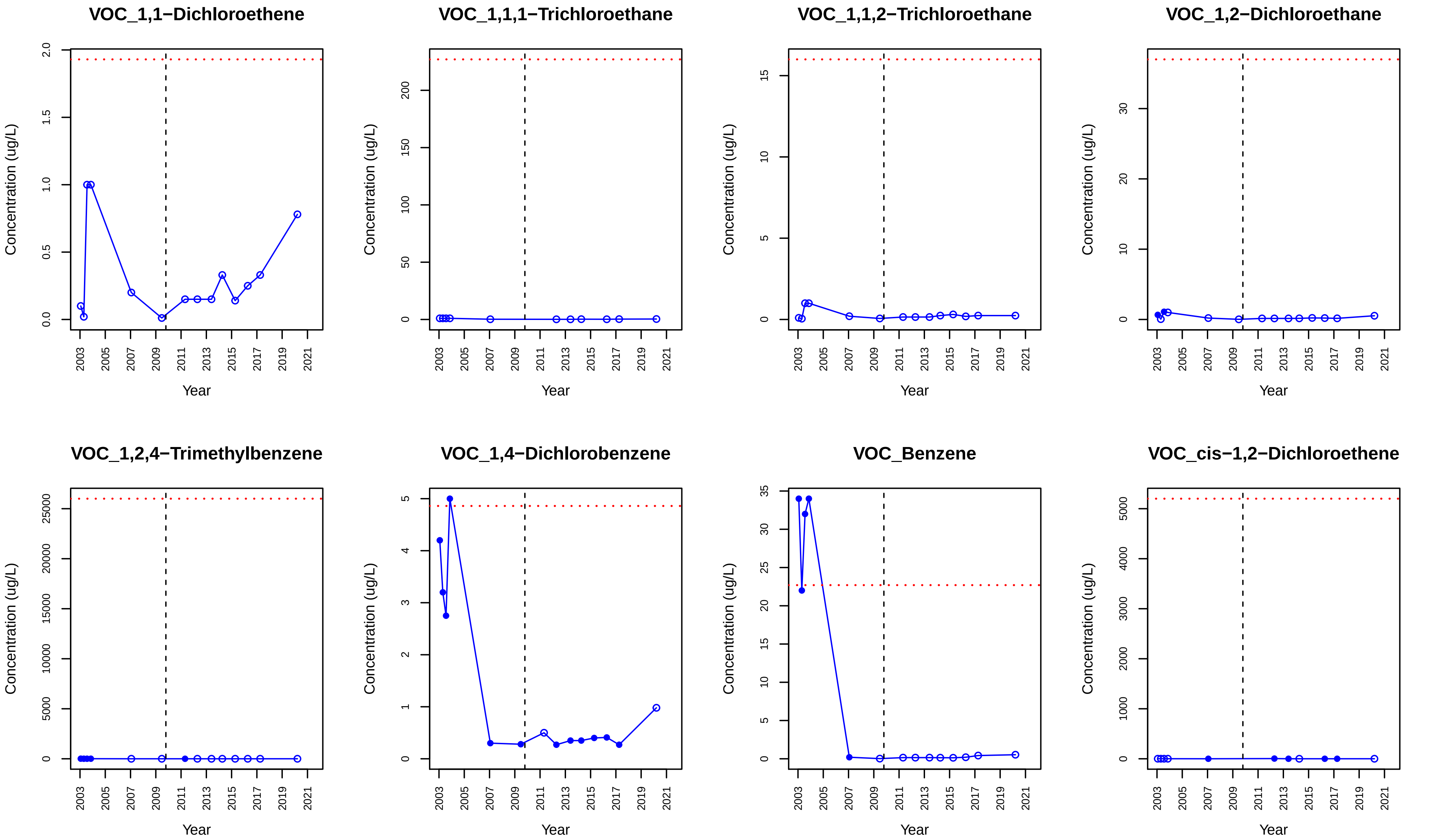


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

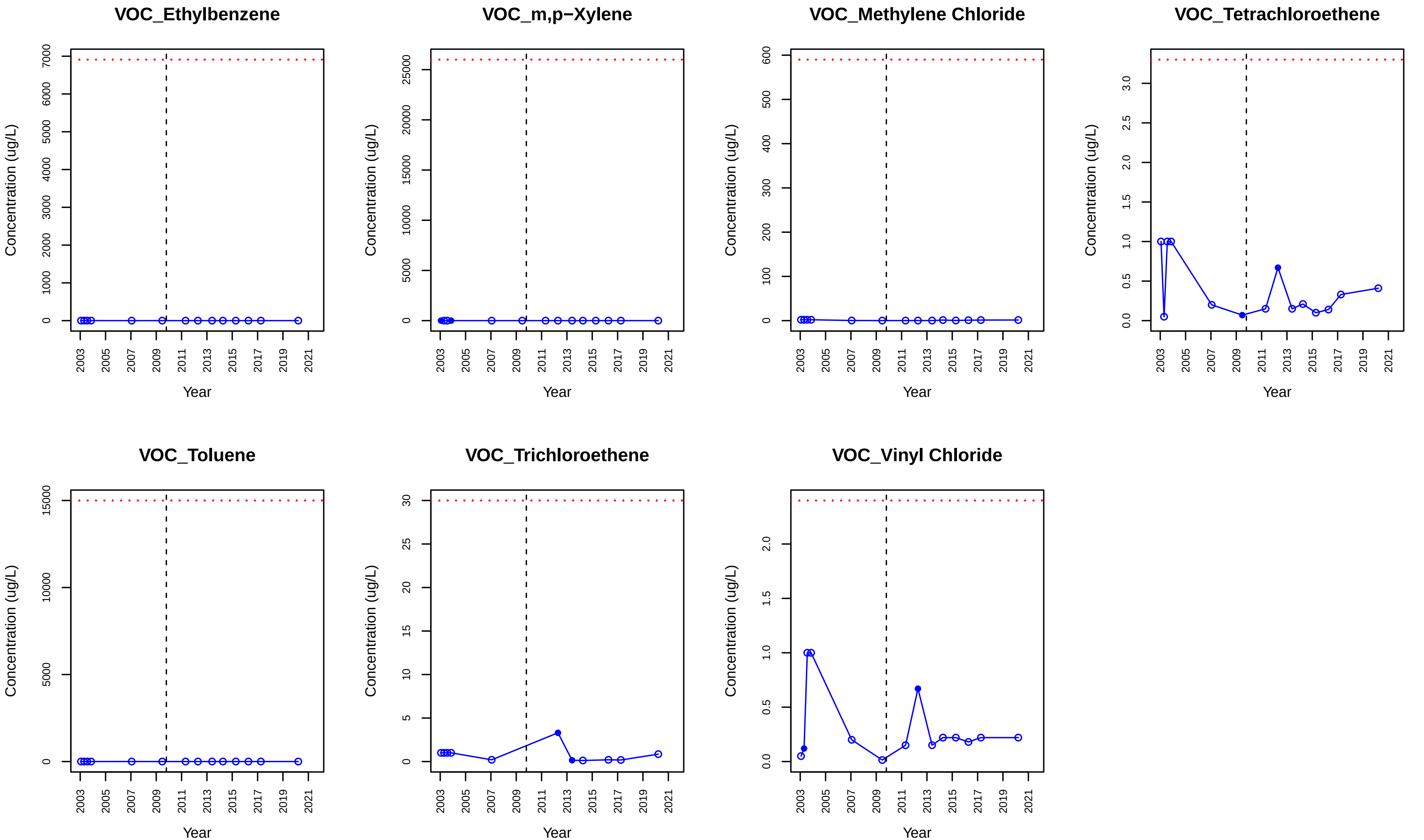
# B−12


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

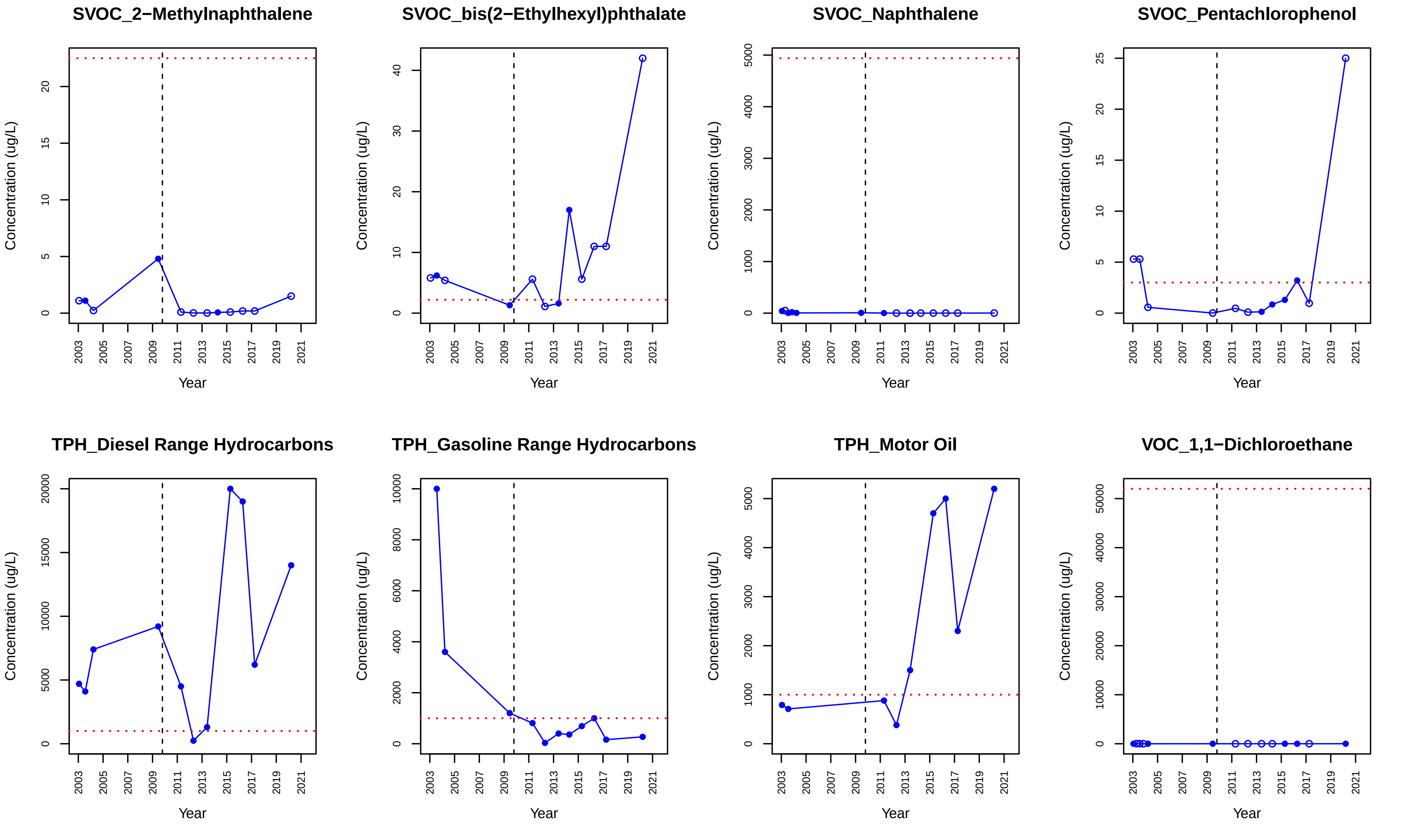
# B−12


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

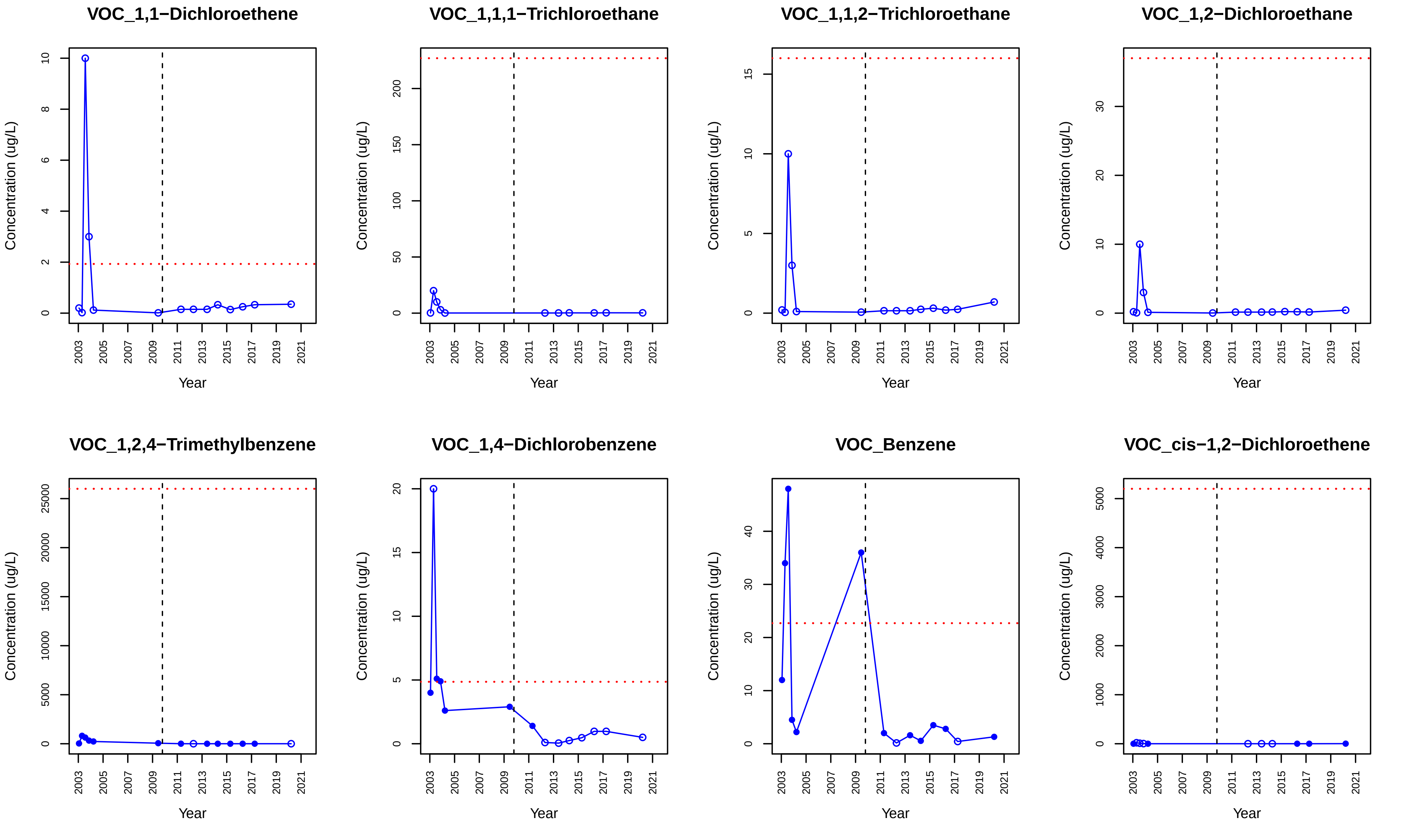
# B−12


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

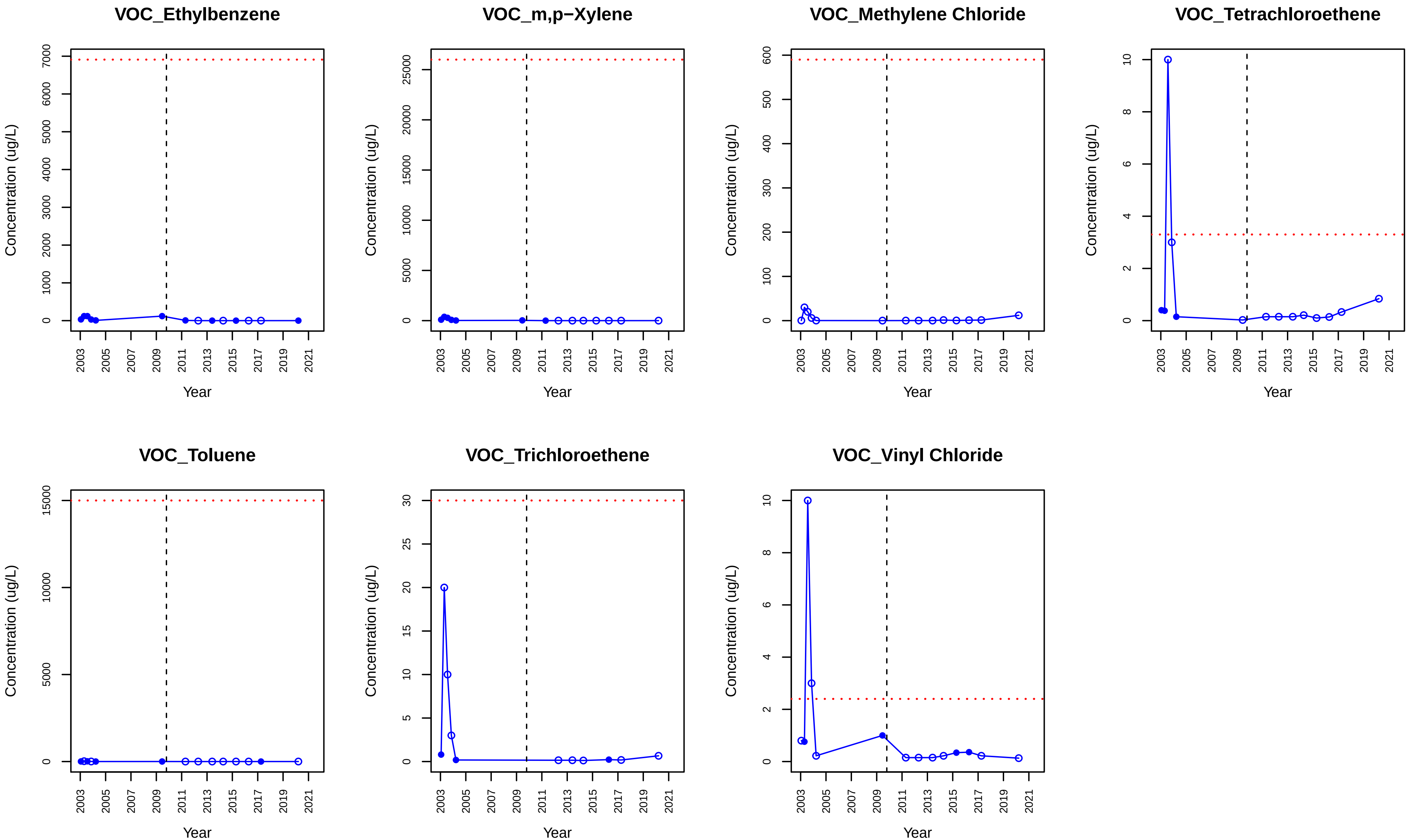
# B−13


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

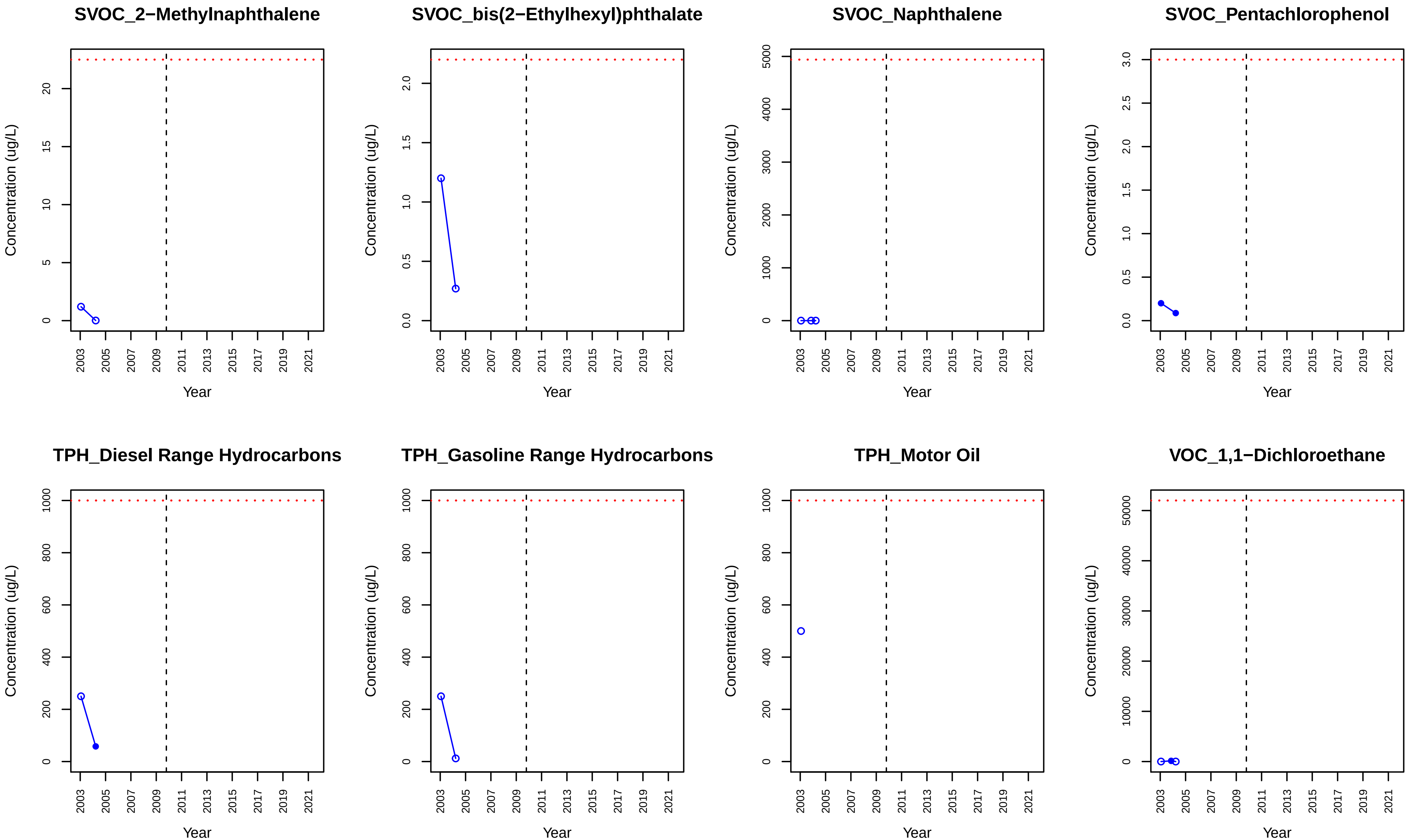
**B−13**


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

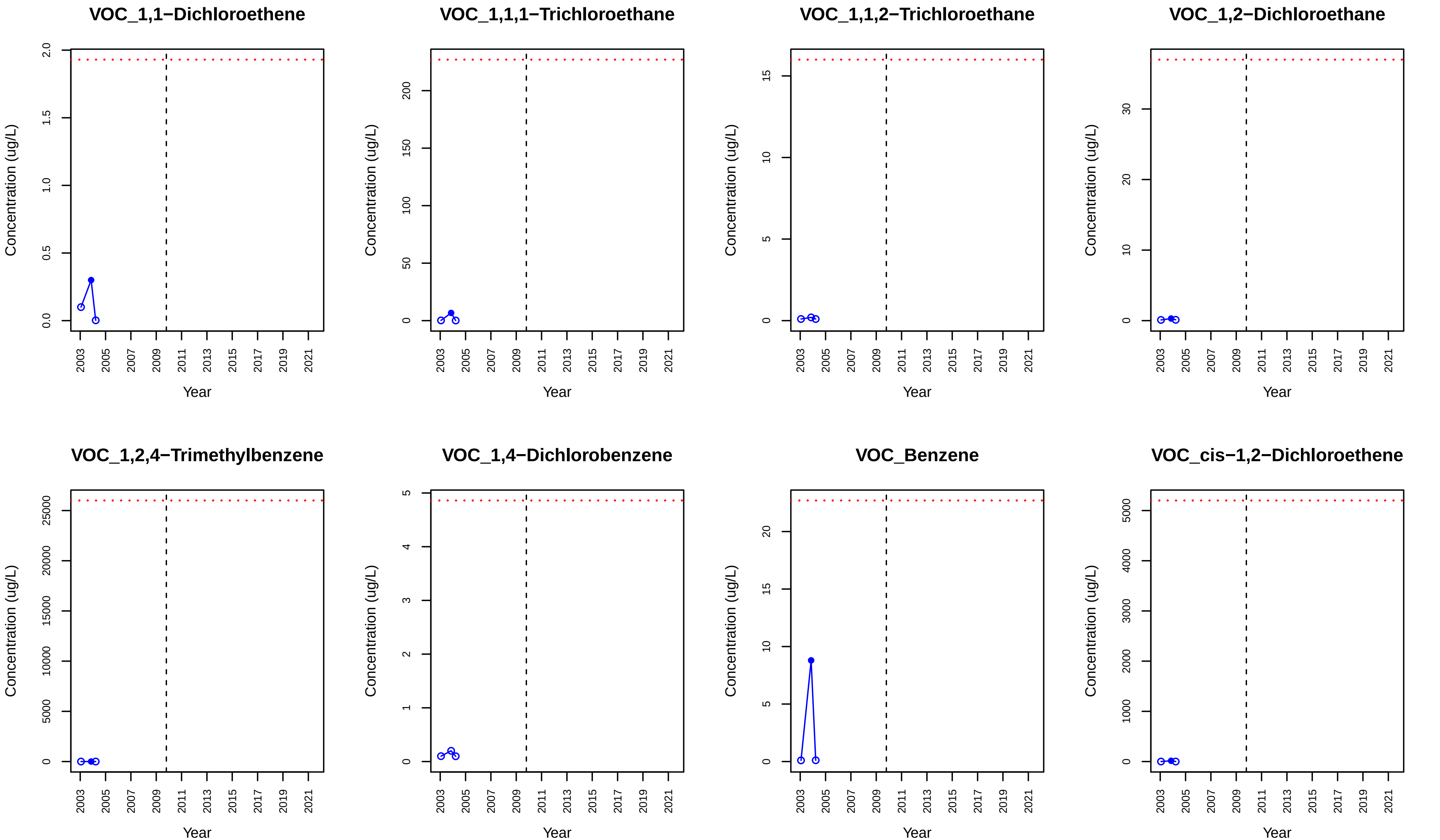
## B−13

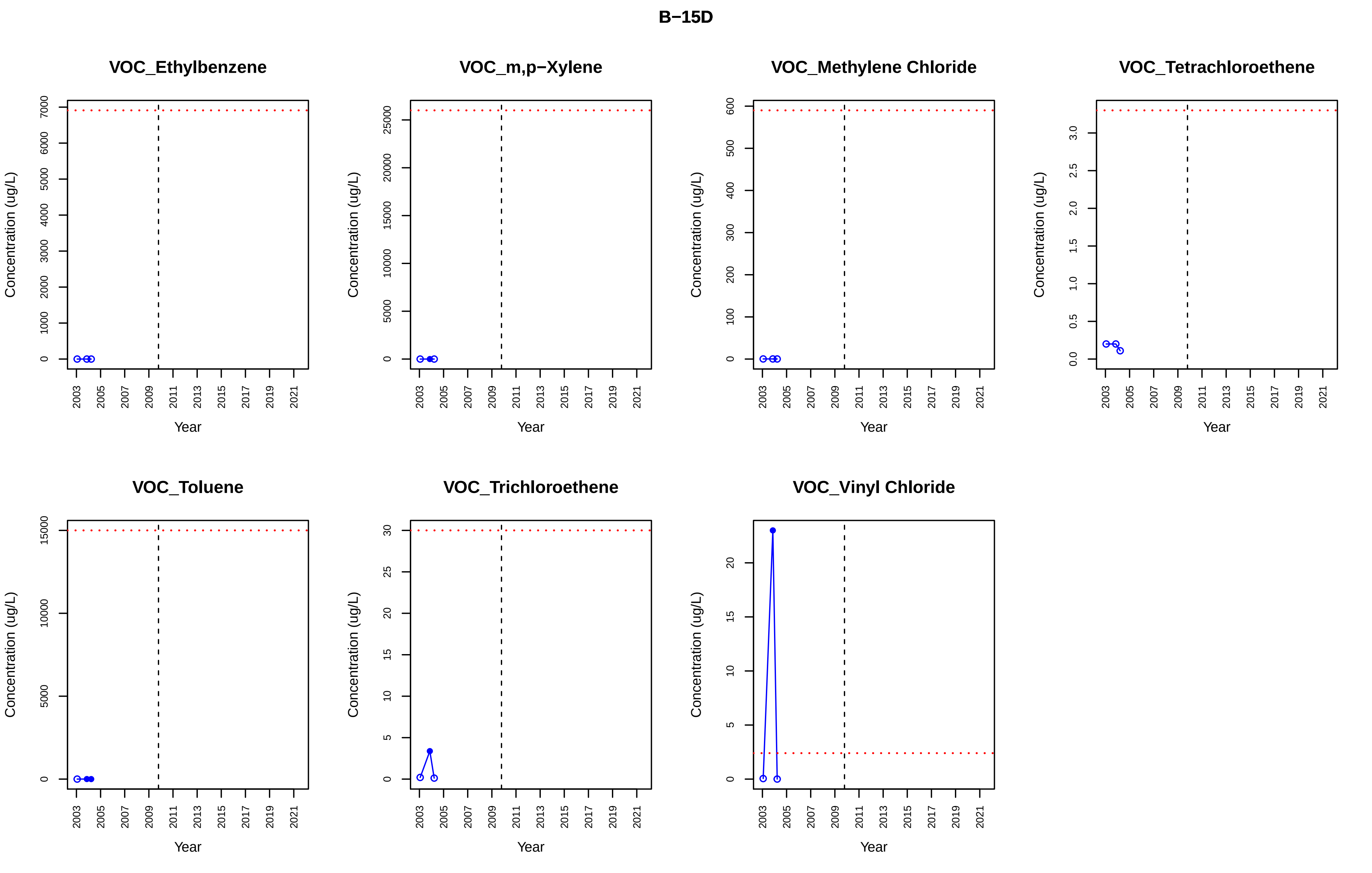

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−15D**

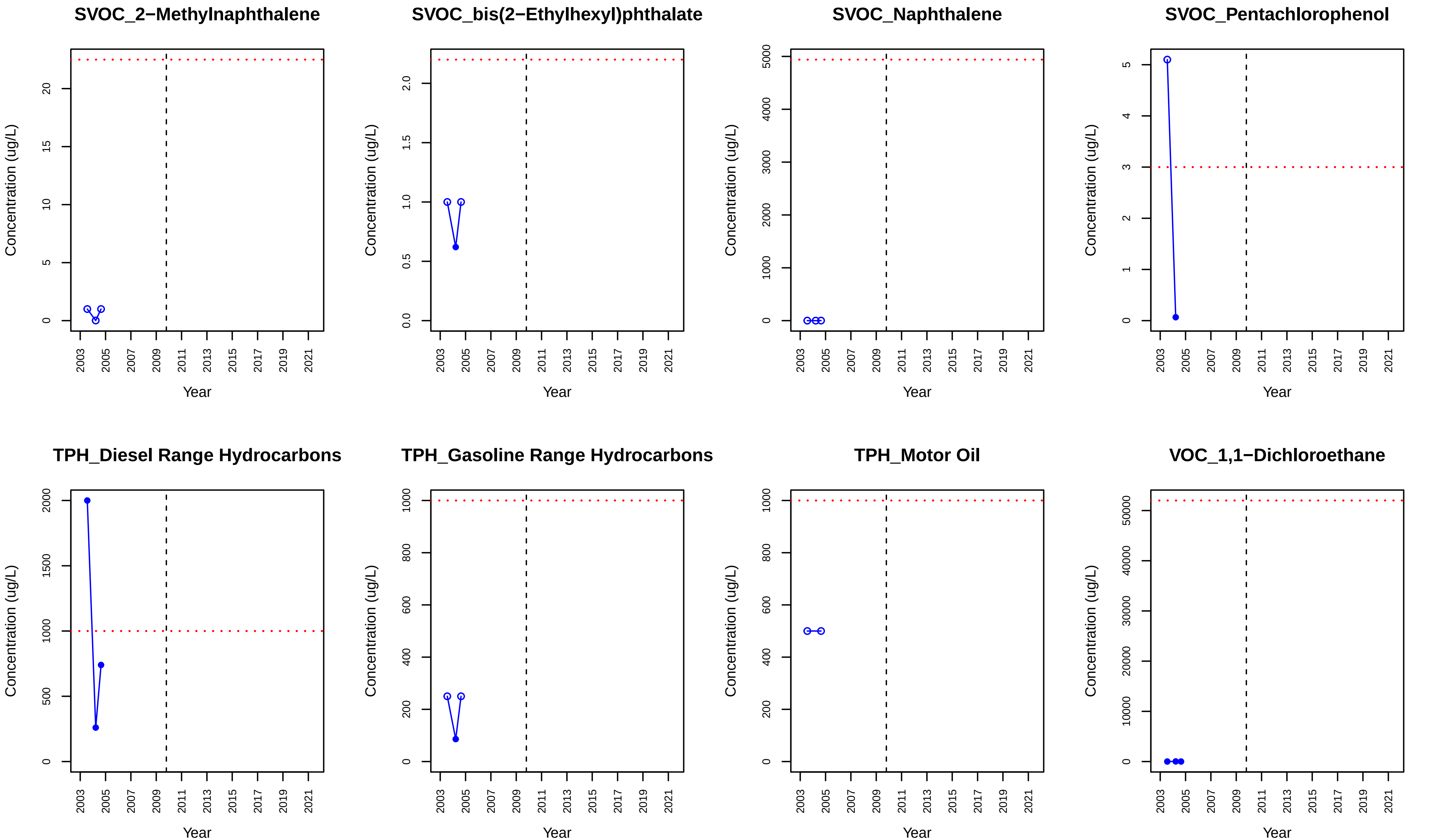

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

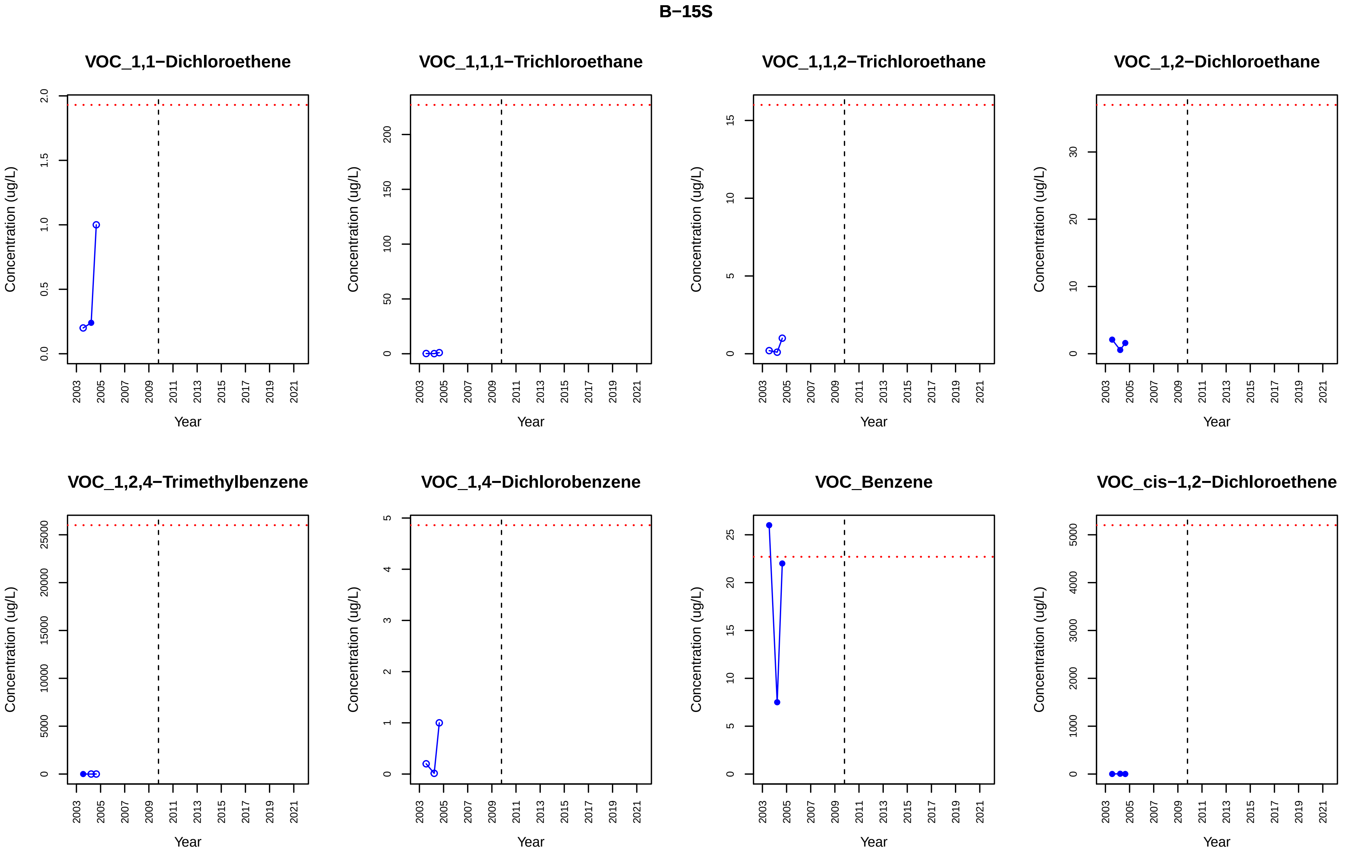
**B−15D**


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

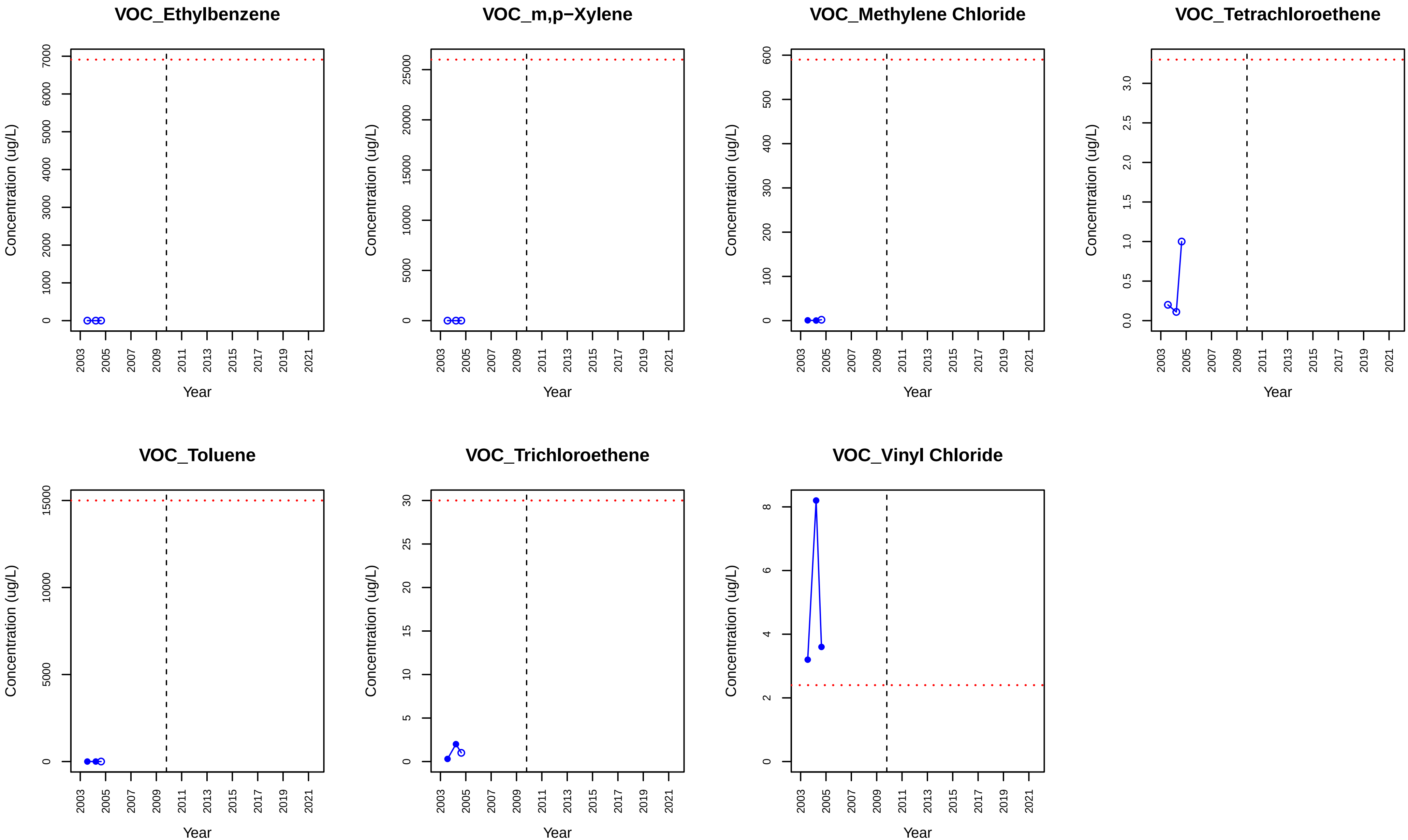

B−15D
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−15S


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

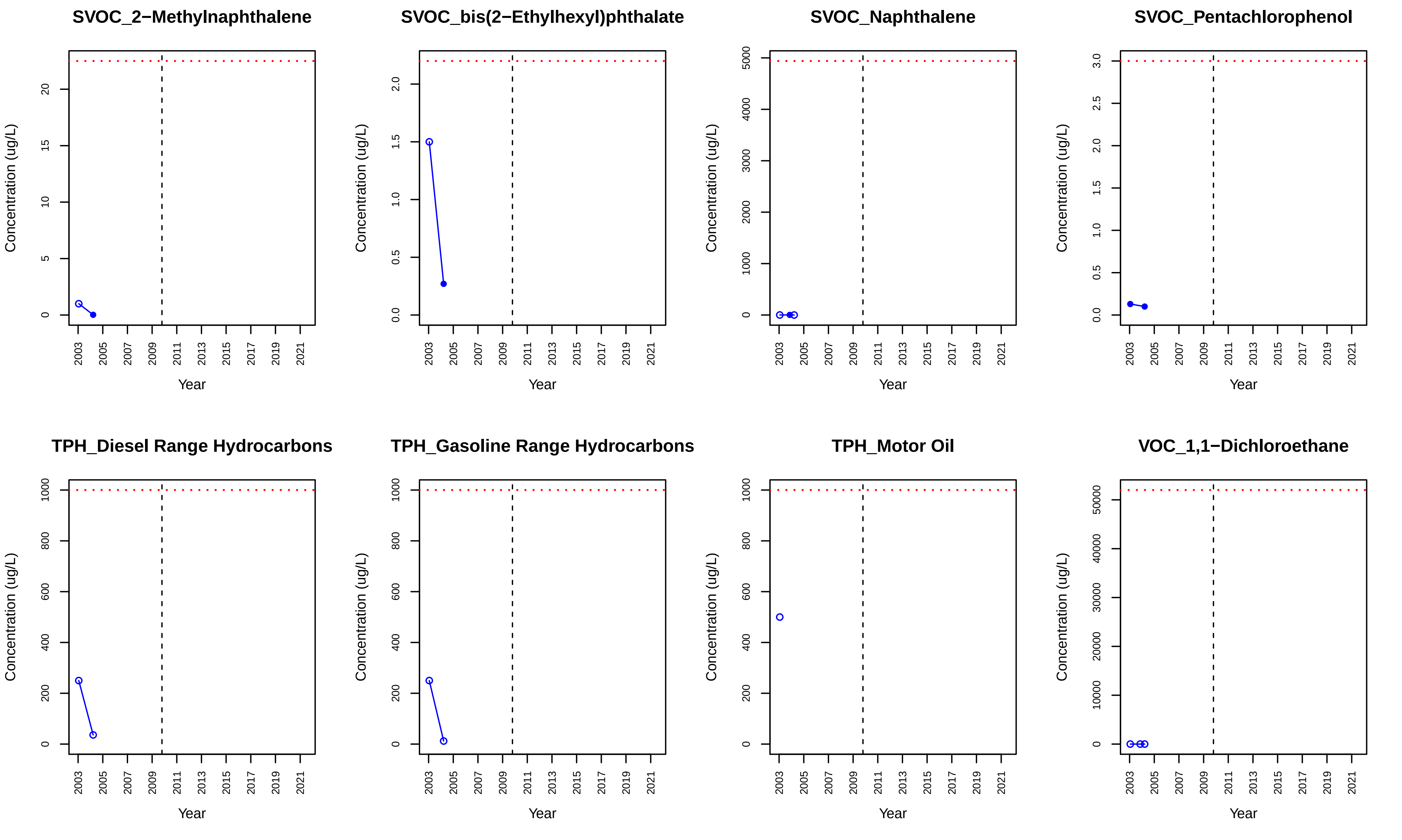

B−15S
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year

**B−15S**



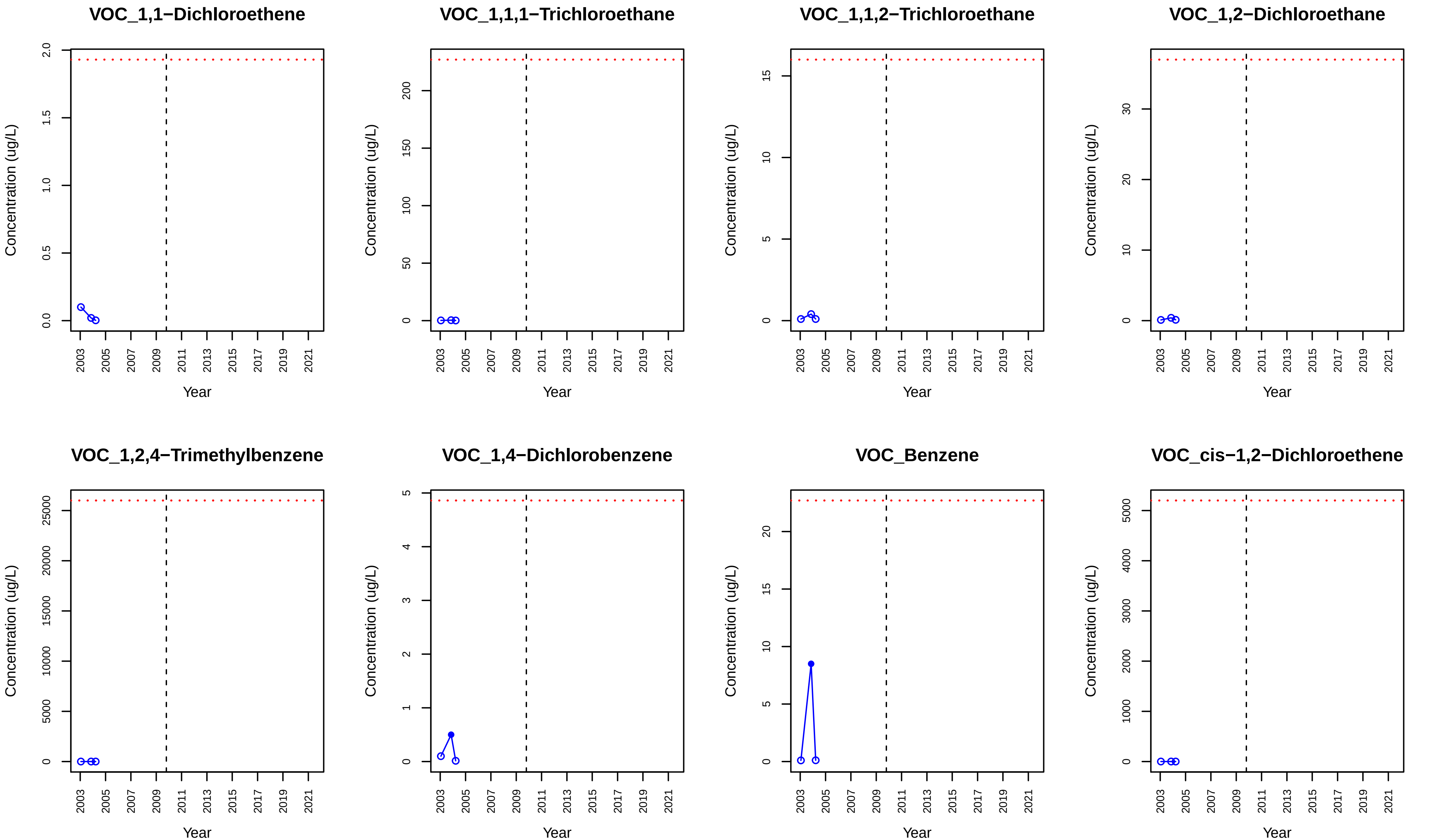
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# B−16D



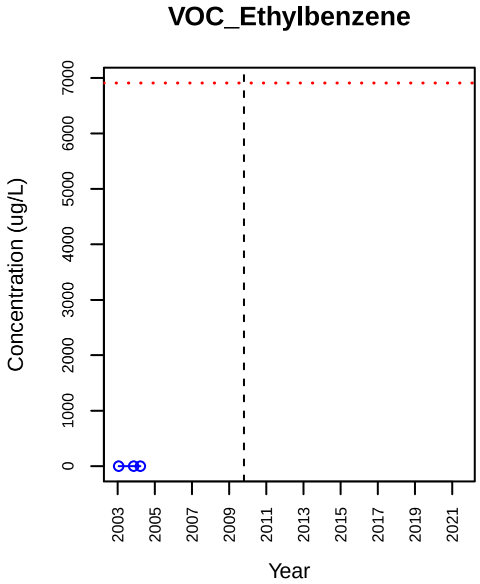
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

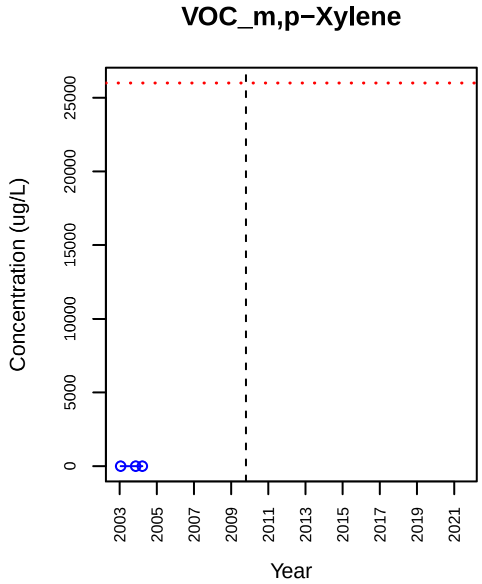
# B−16D

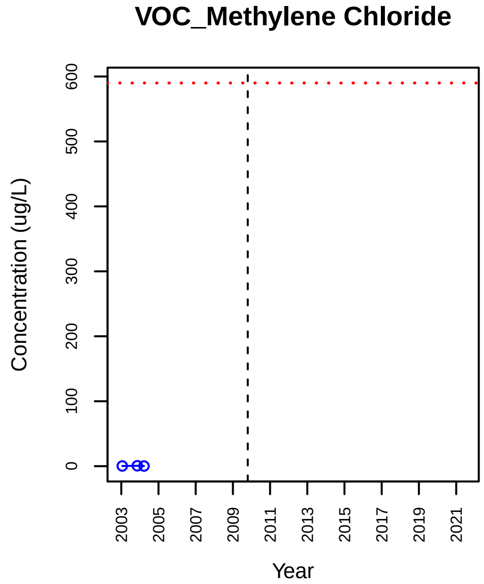


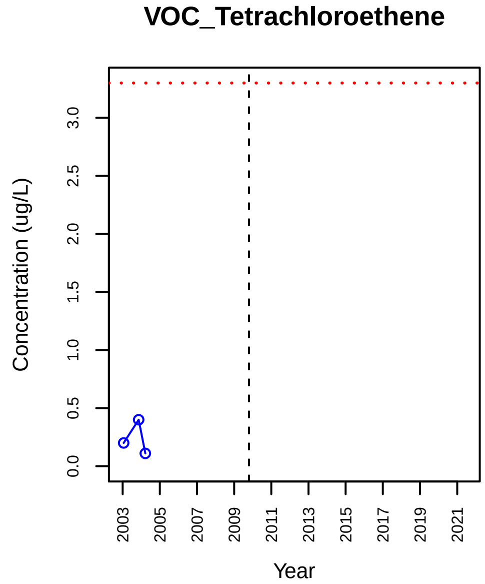
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

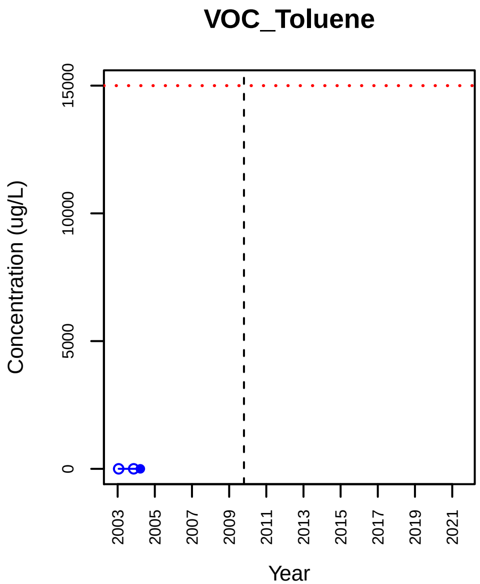
# B−16D

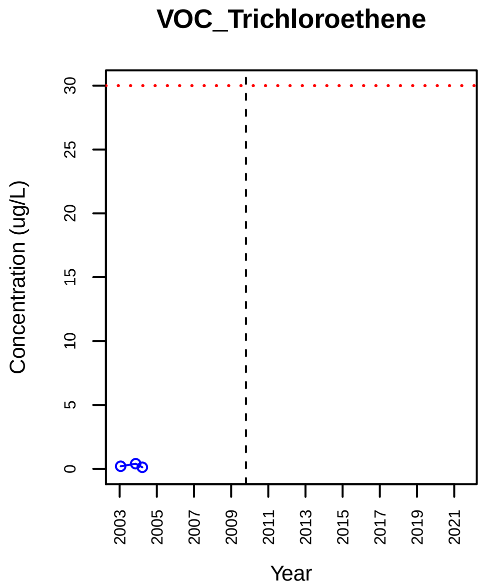

VOC_Ethylbenzene
Concentration (ug/L)
0
1000
2000
3000
4000
5000
6000
7000
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

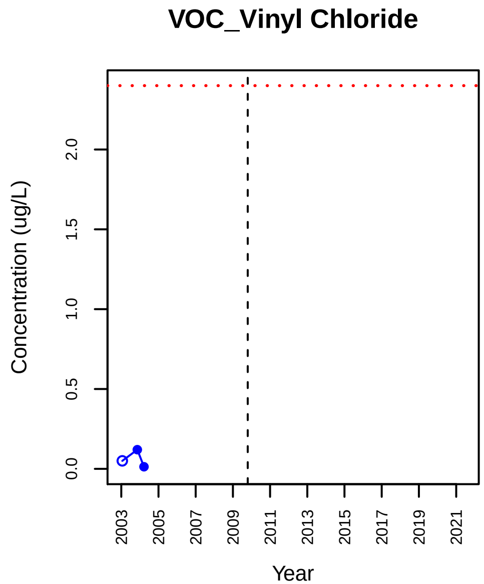

VOC_m,p−Xylene
Concentration (ug/L)
0
5000
10000
15000
20000
25000
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year


VOC_Methylene Chloride
Concentration (ug/L)
0
100
200
300
400
500
600
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

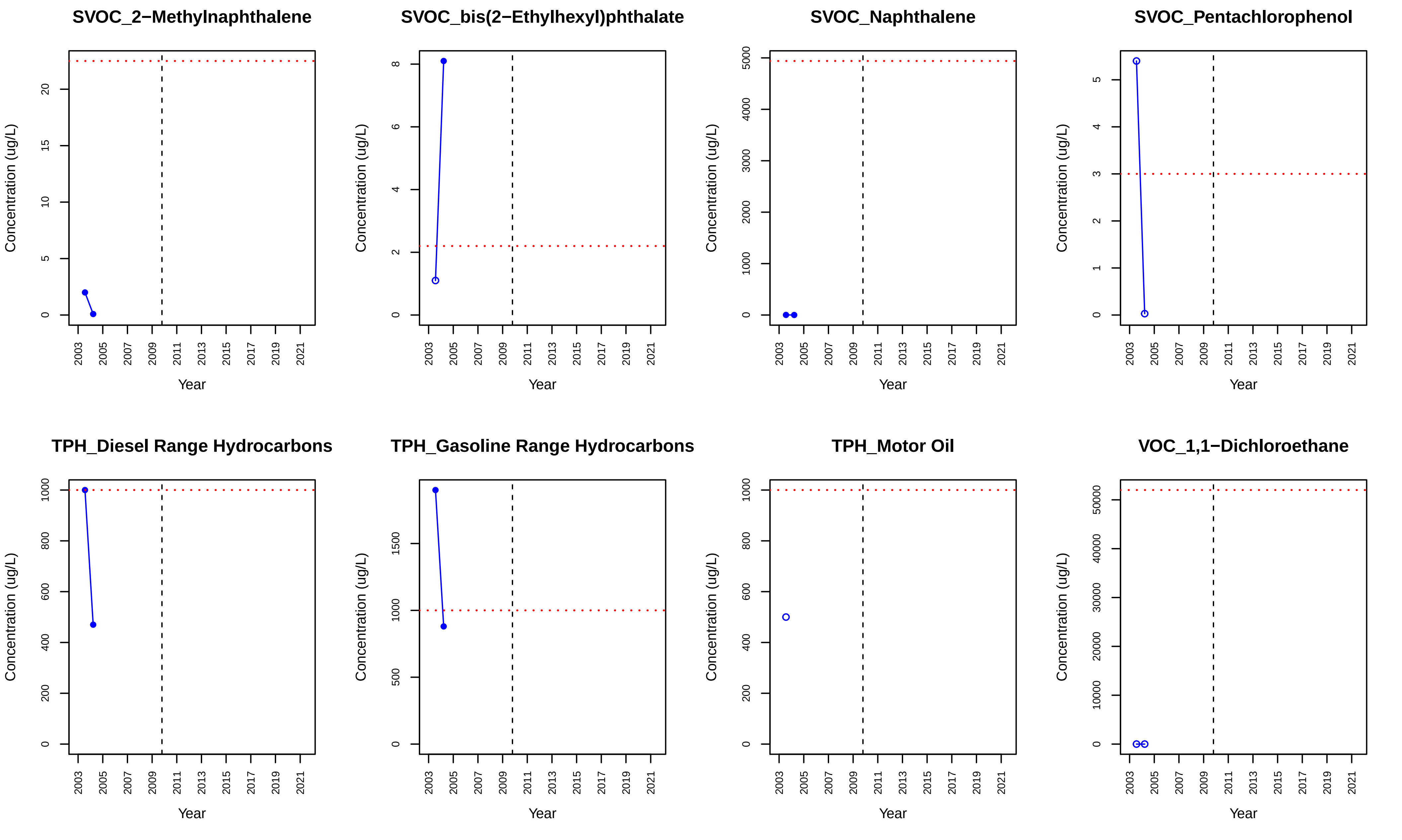

VOC_Tetrachloroethene
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year


VOC_Toluene
Concentration (ug/L)
0
5000
10000
15000
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year


VOC_Trichloroethene
Concentration (ug/L)
0
5
10
15
20
25
30
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

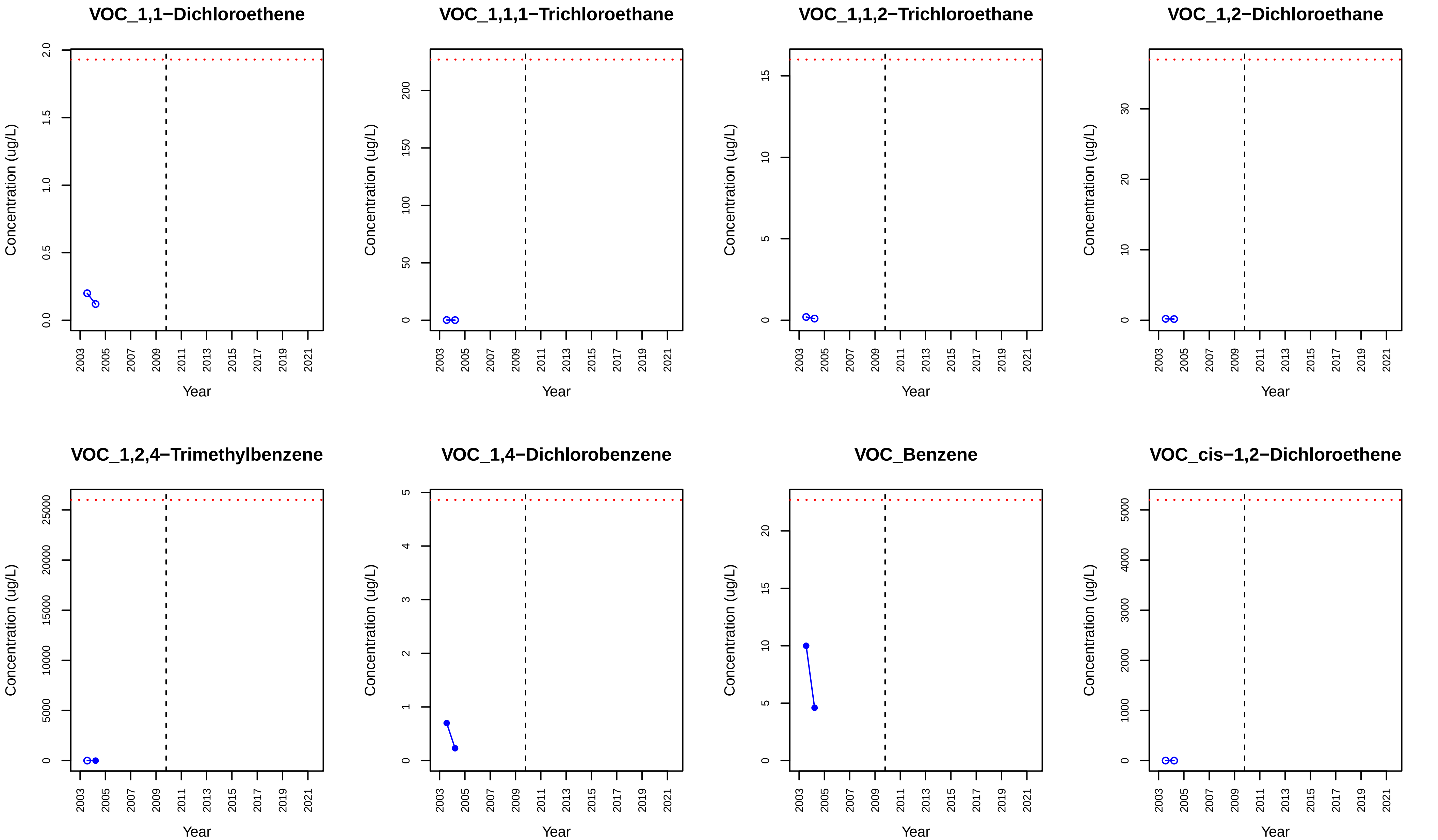

VOC_Vinyl Chloride
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

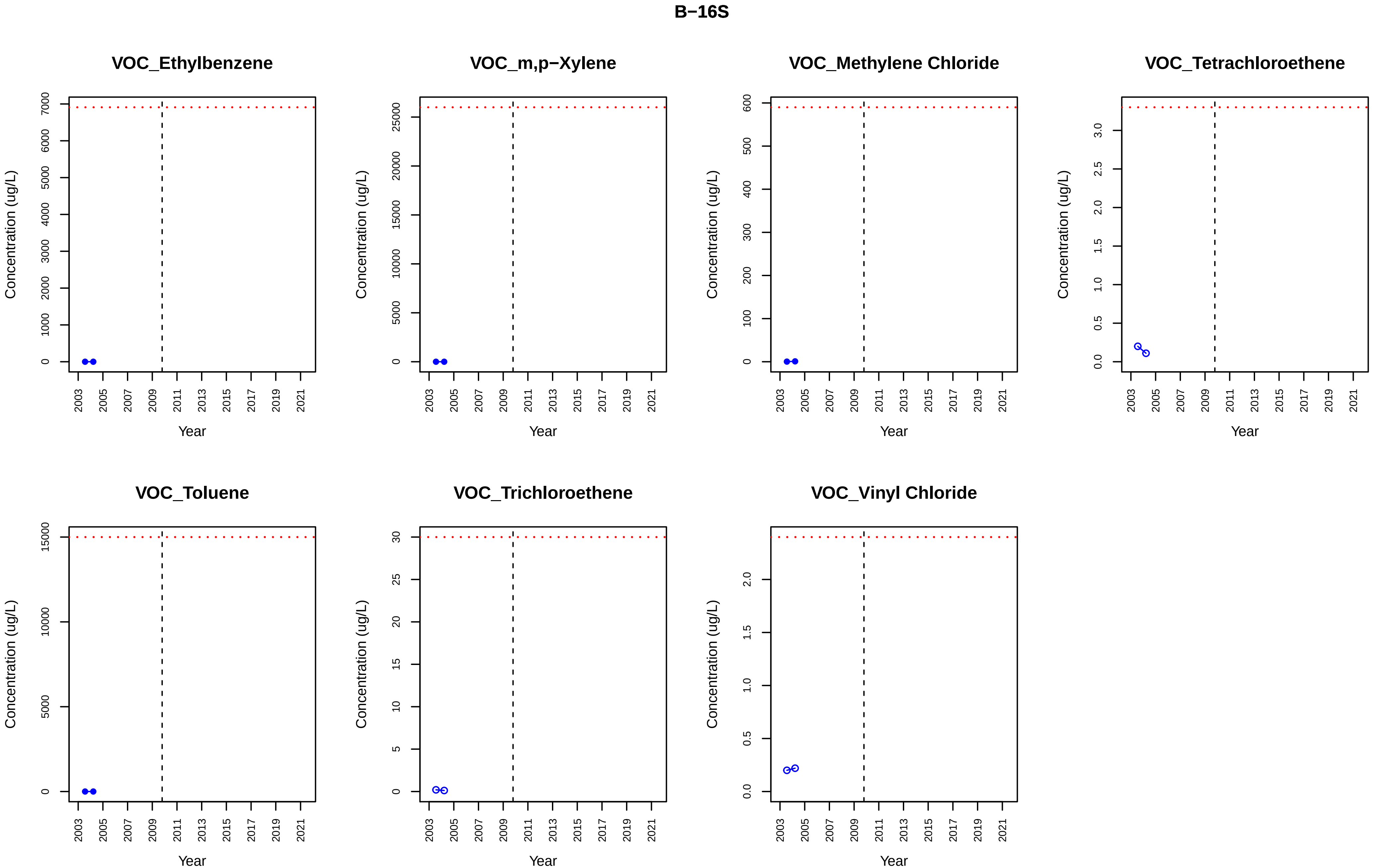
# B−16S



SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

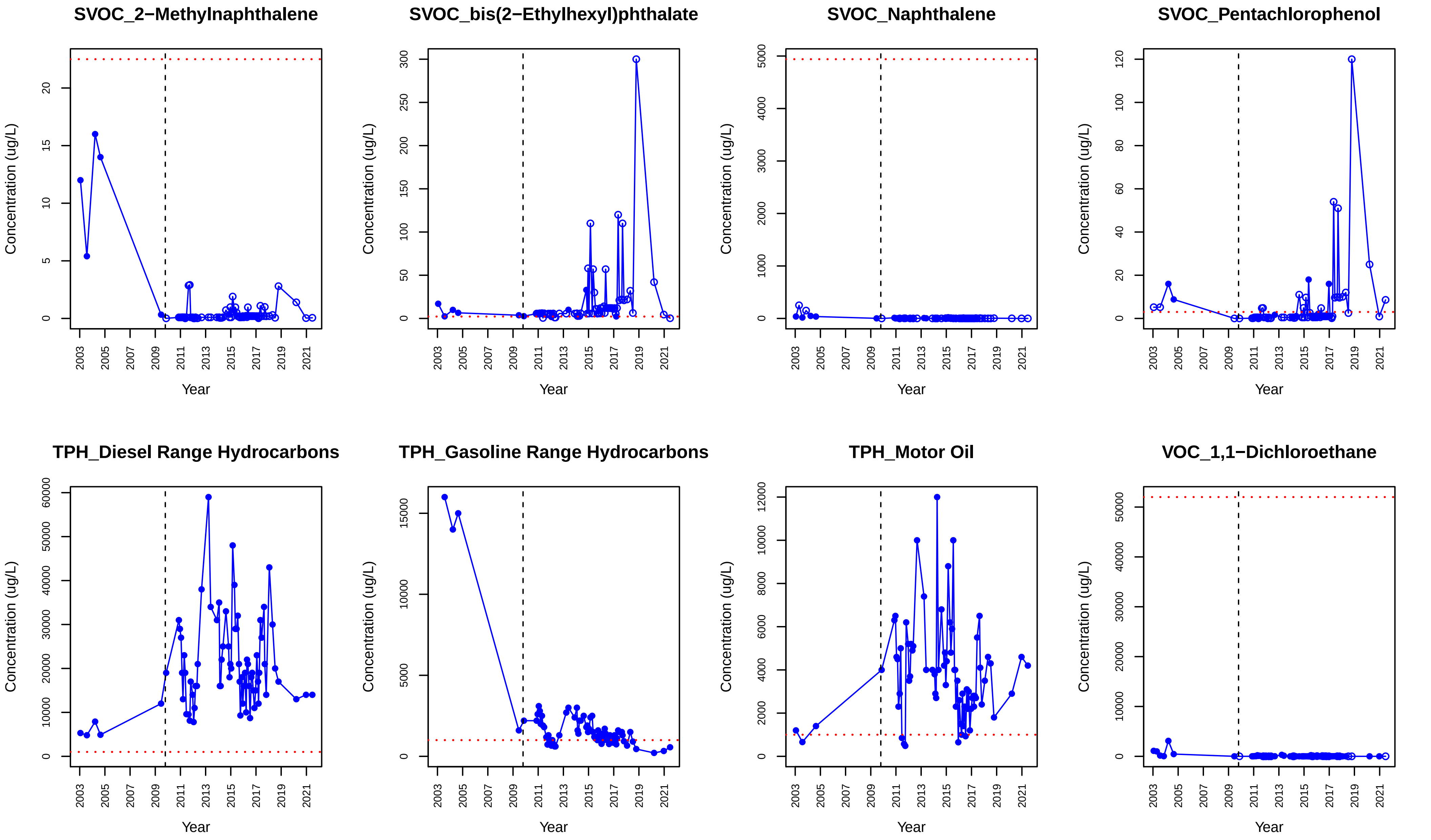
# B−16S


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

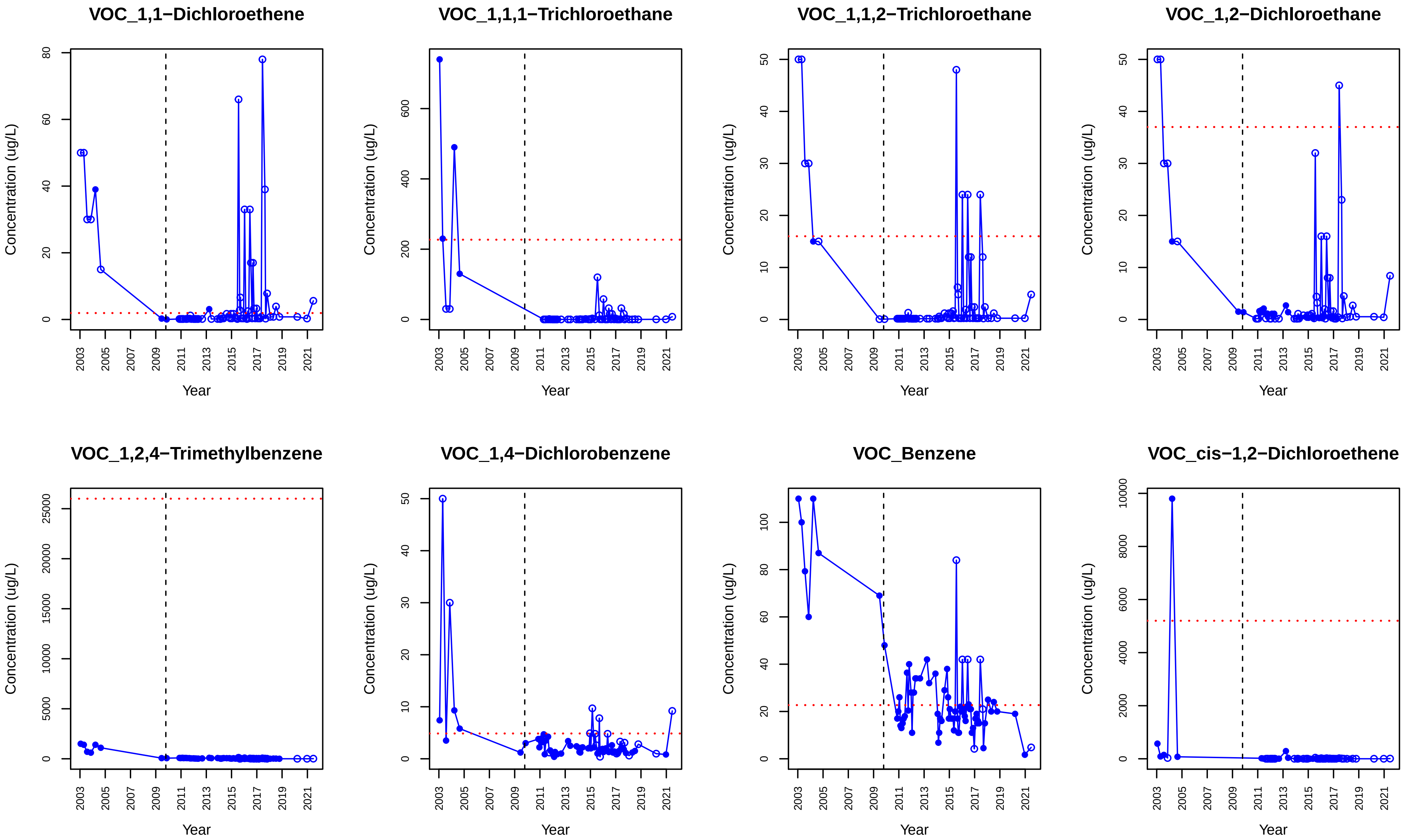


B−16S
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

**B−19**

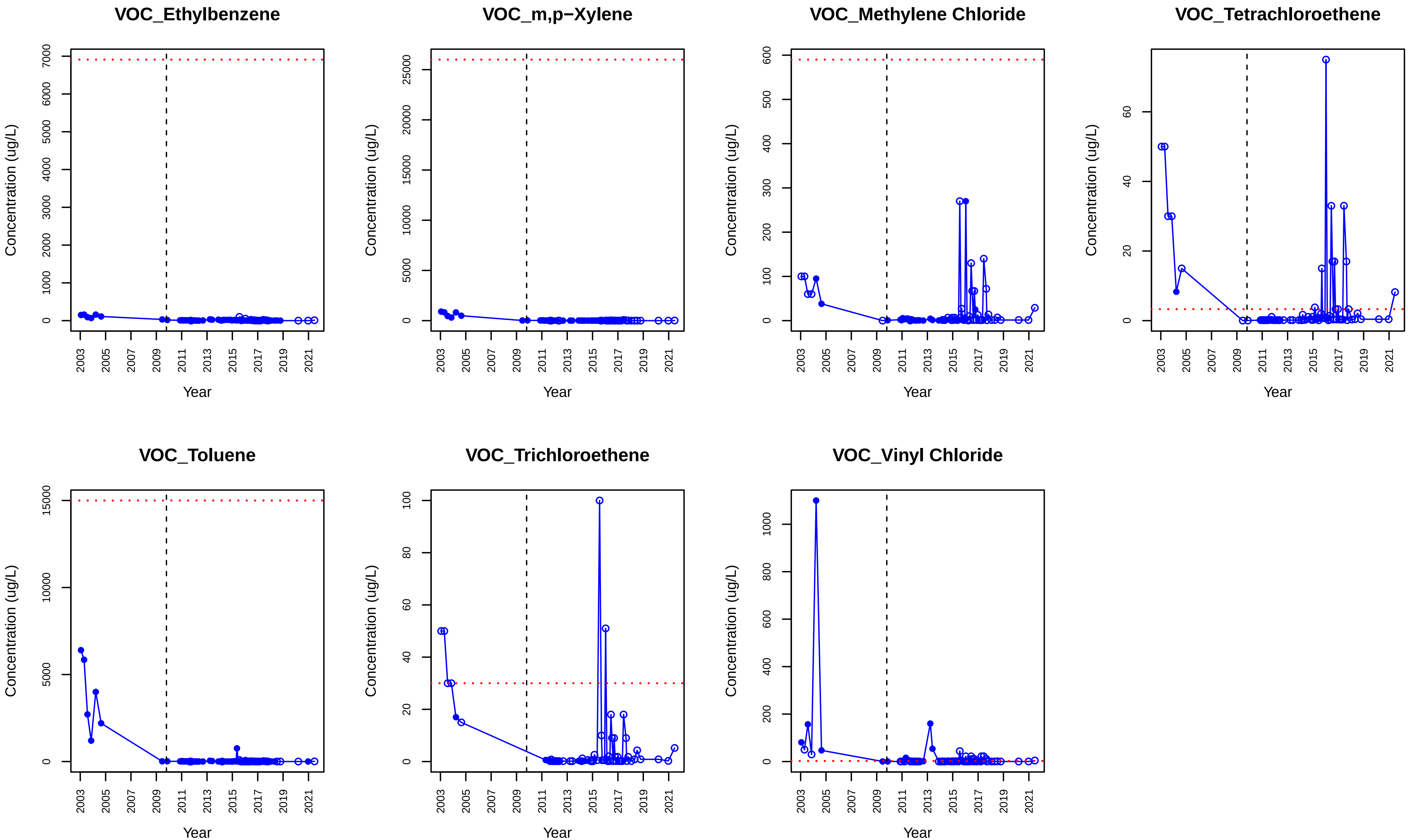

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−19**

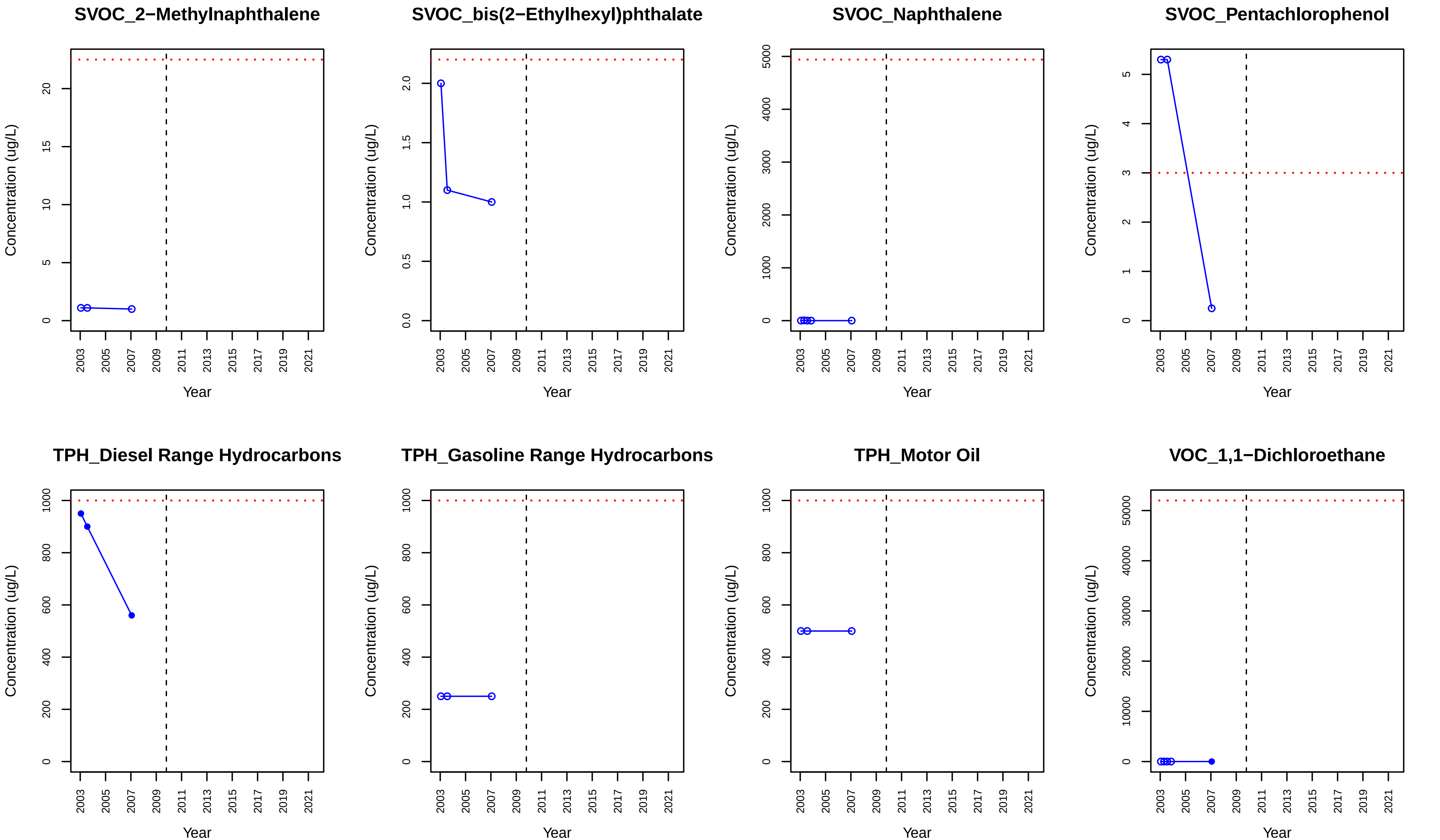


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

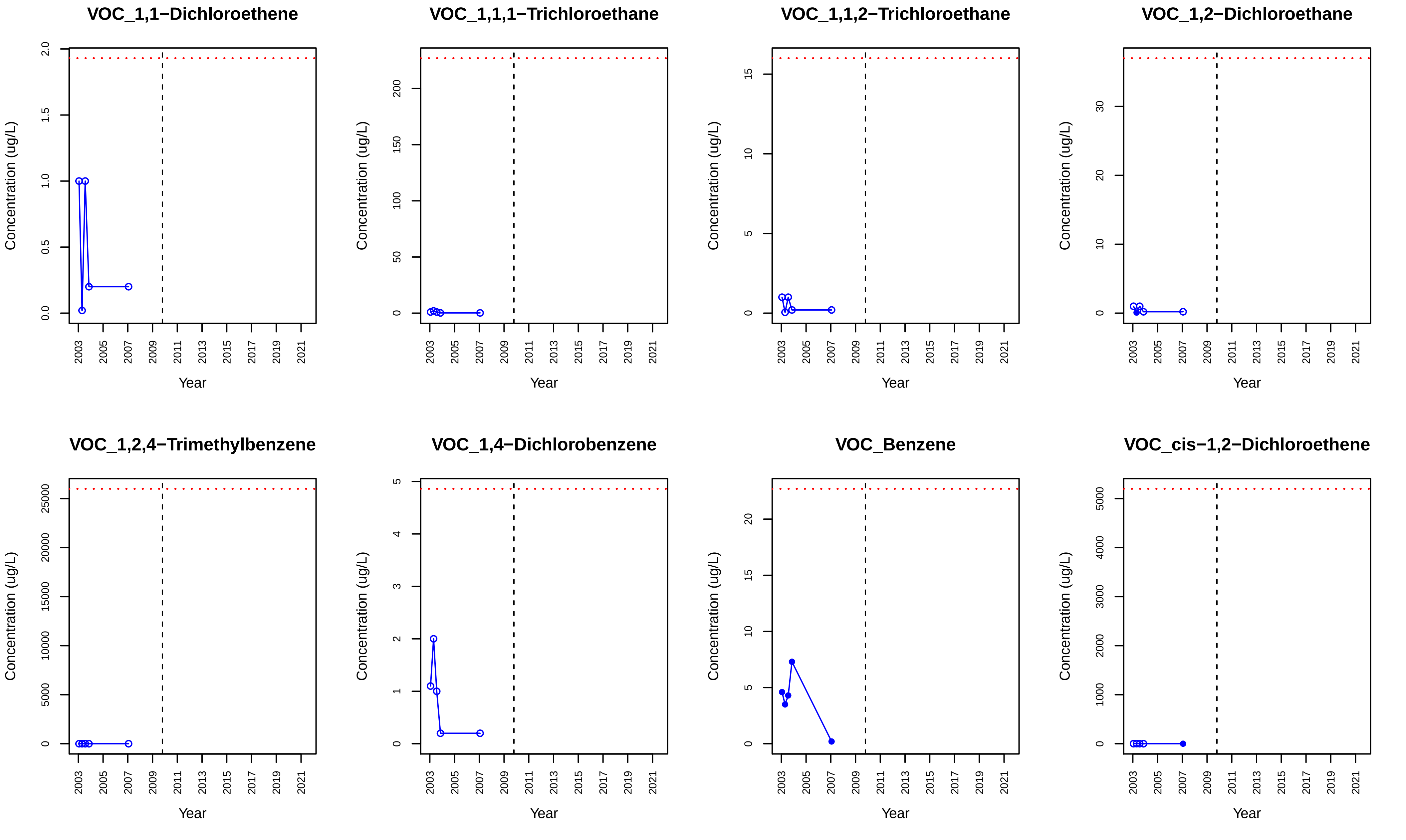
**B−19**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

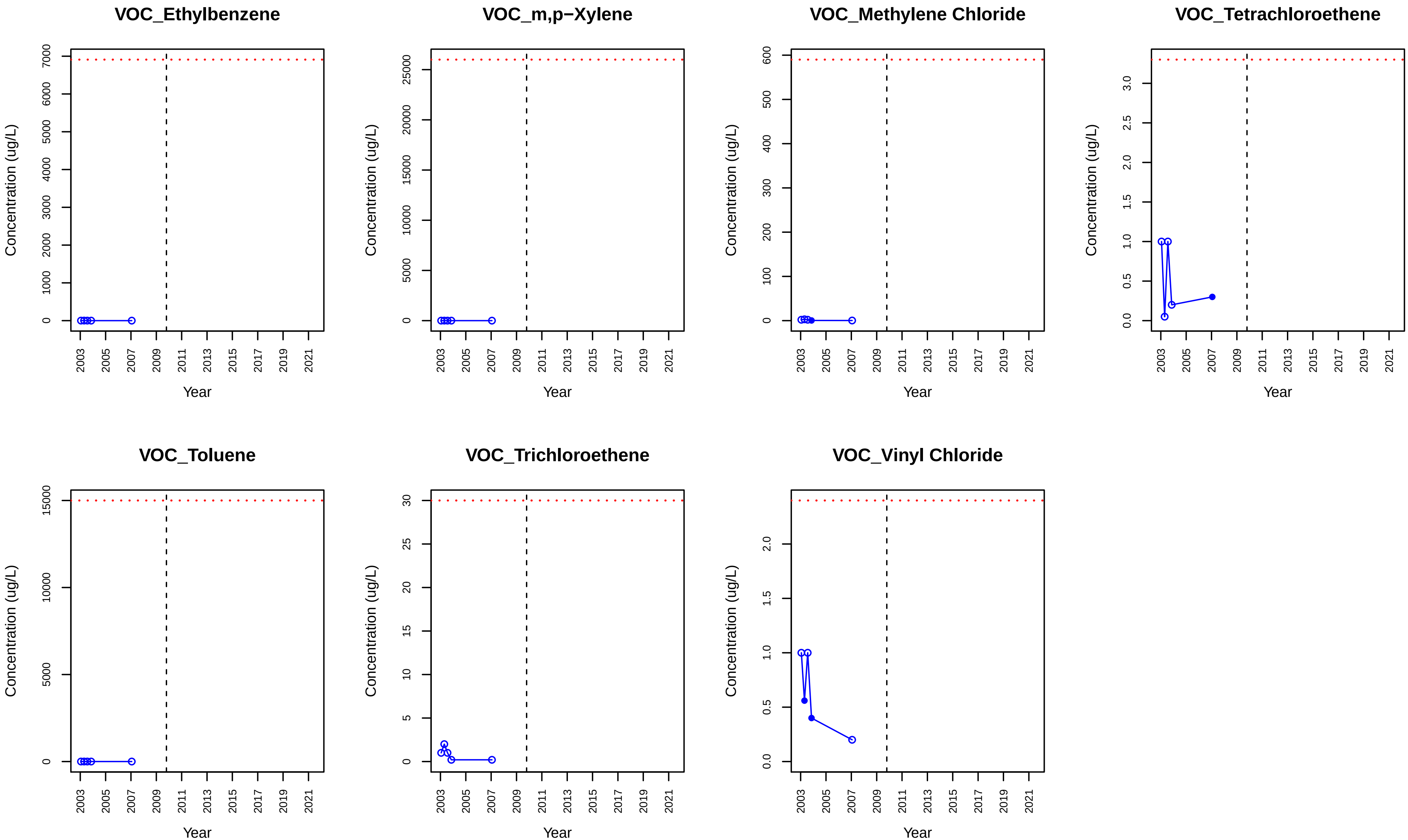
# B−20


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

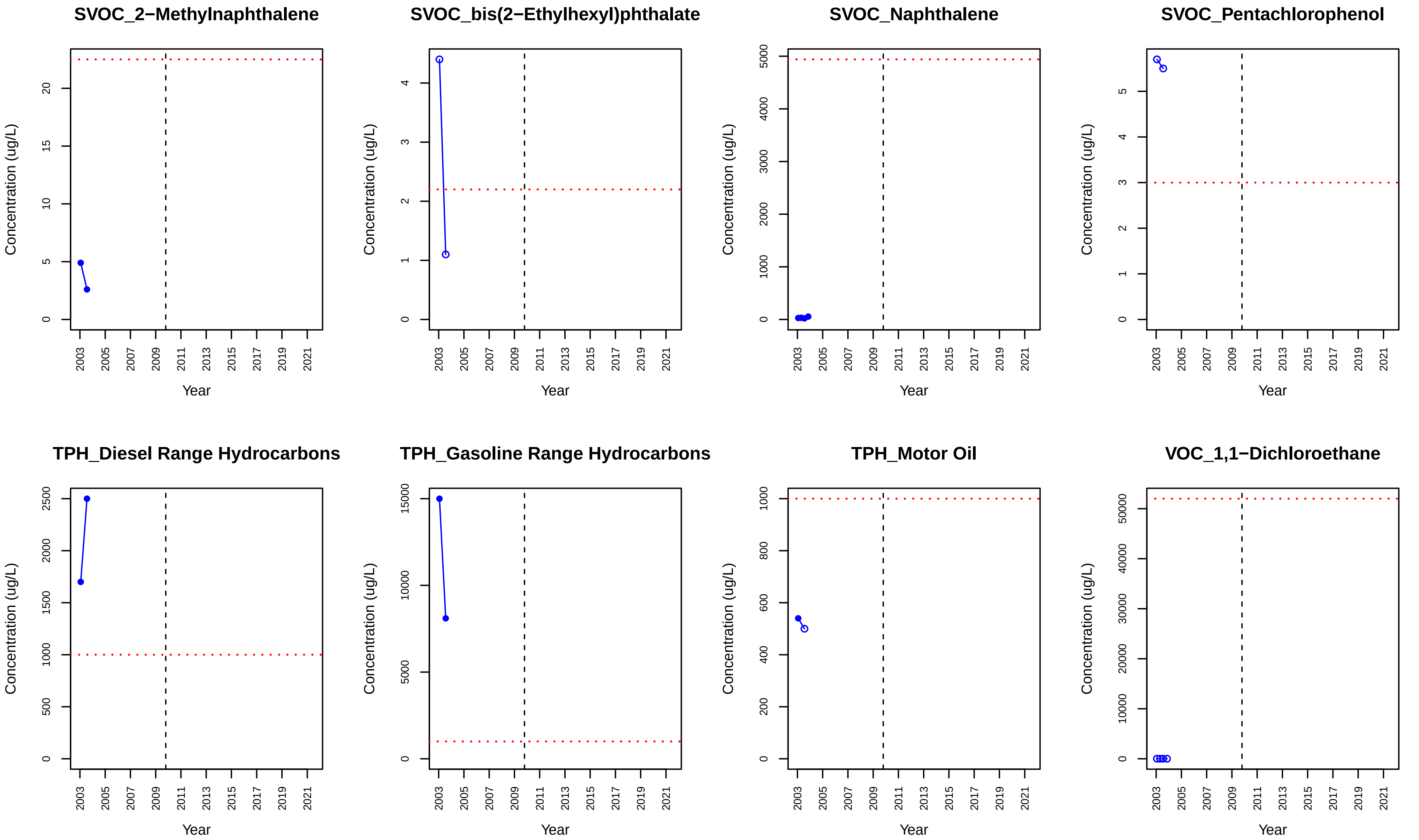
# B−20


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

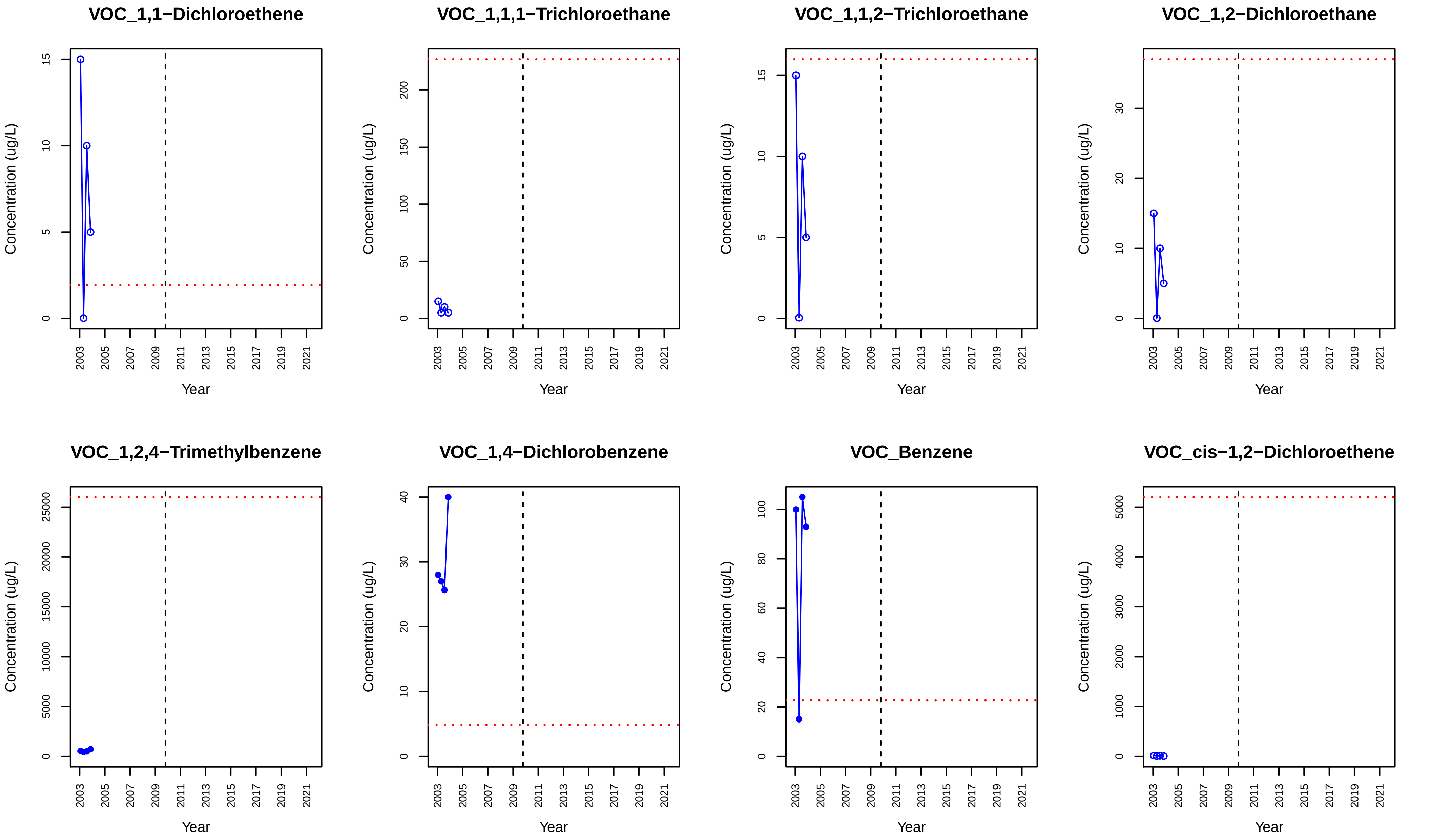
**B−20**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

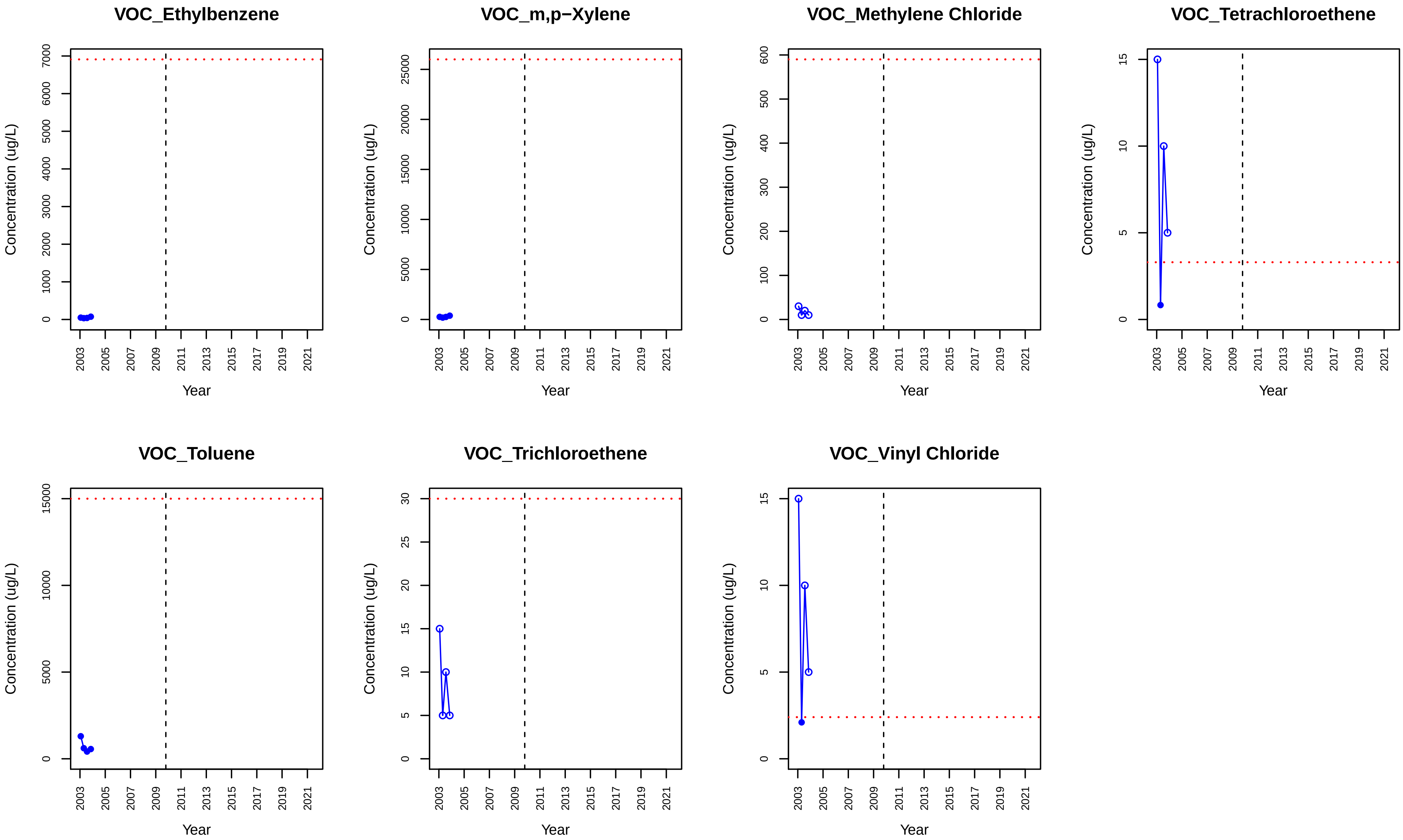
# B−21


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

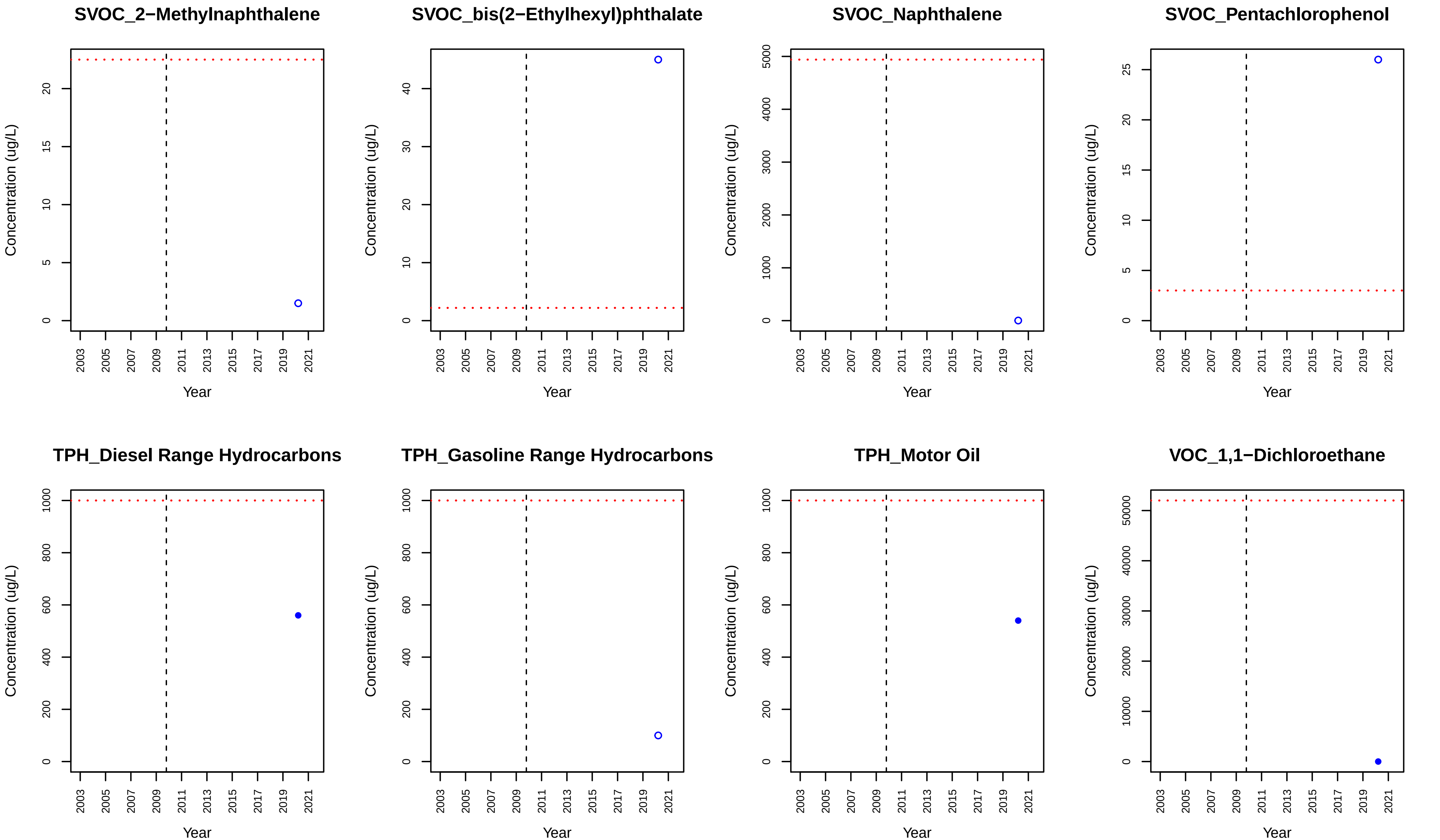
# B−21


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−21

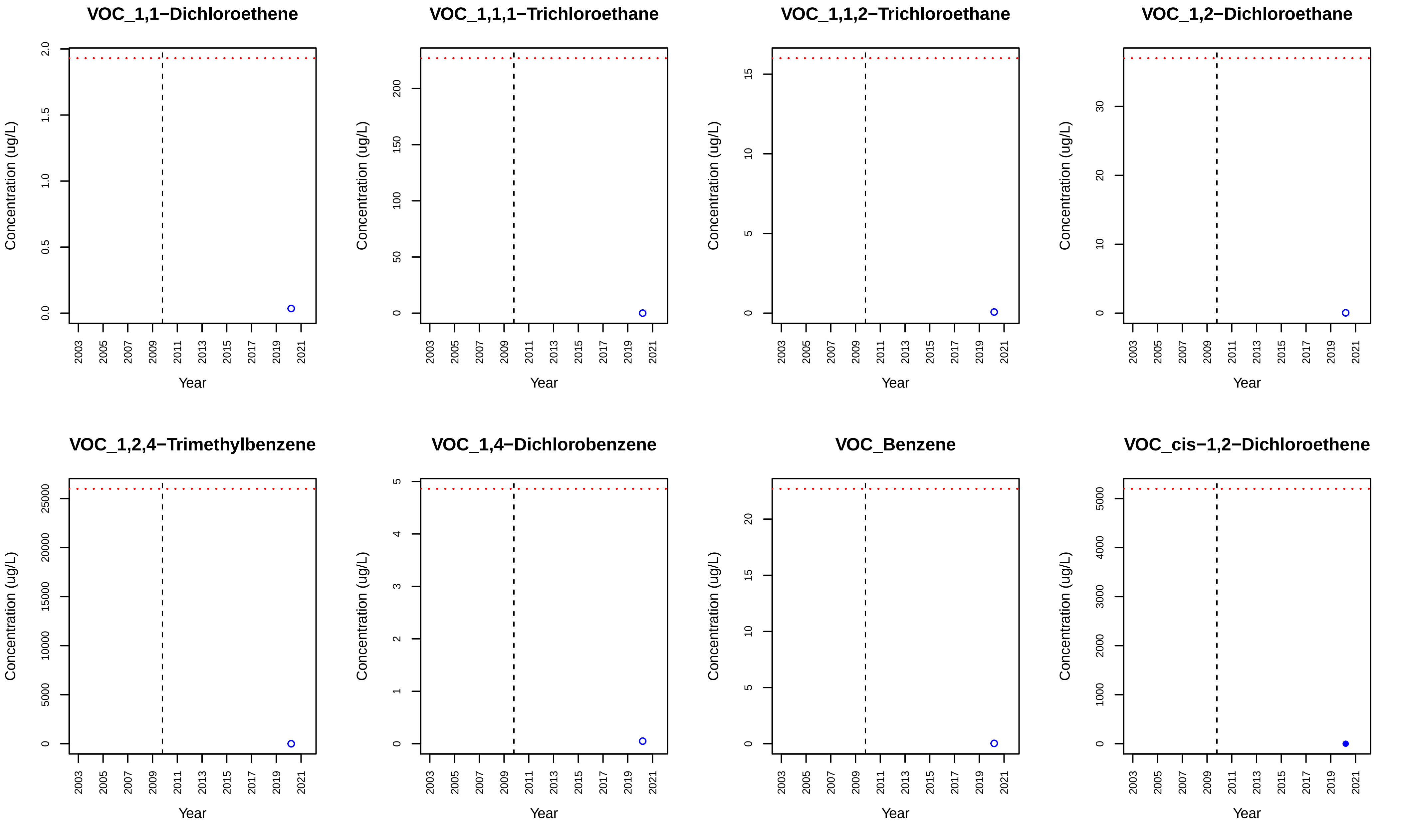

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−23



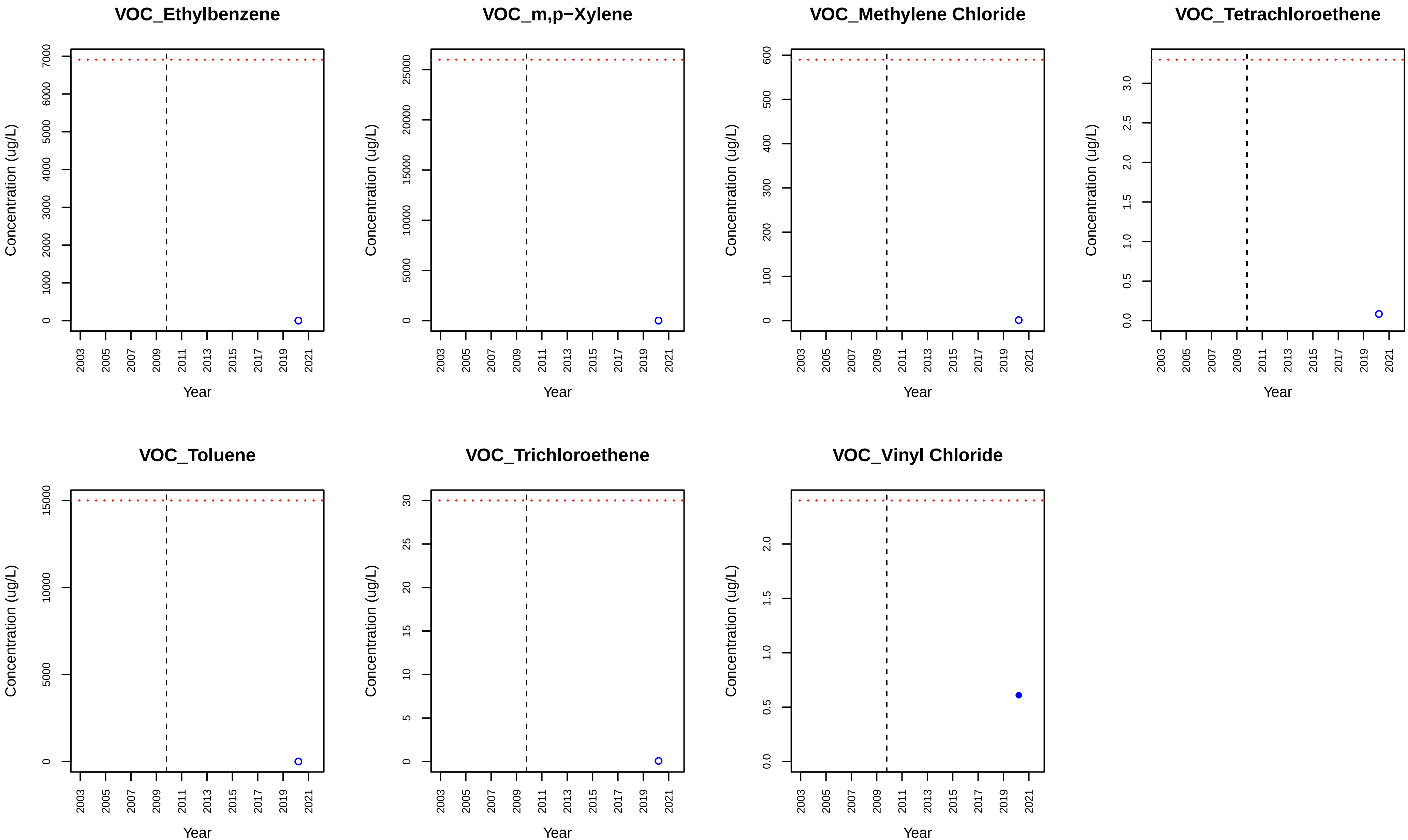
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# B−23

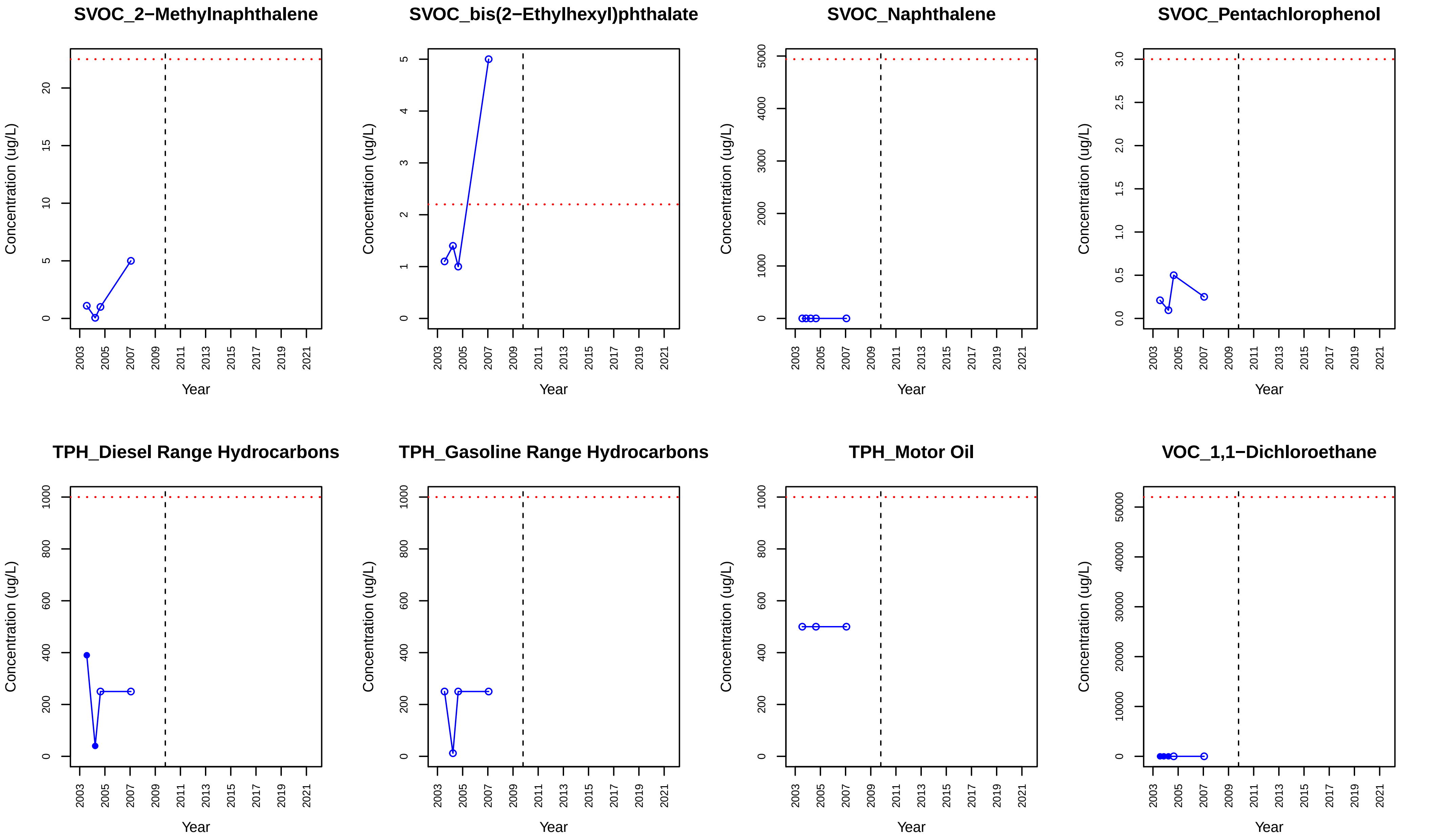


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

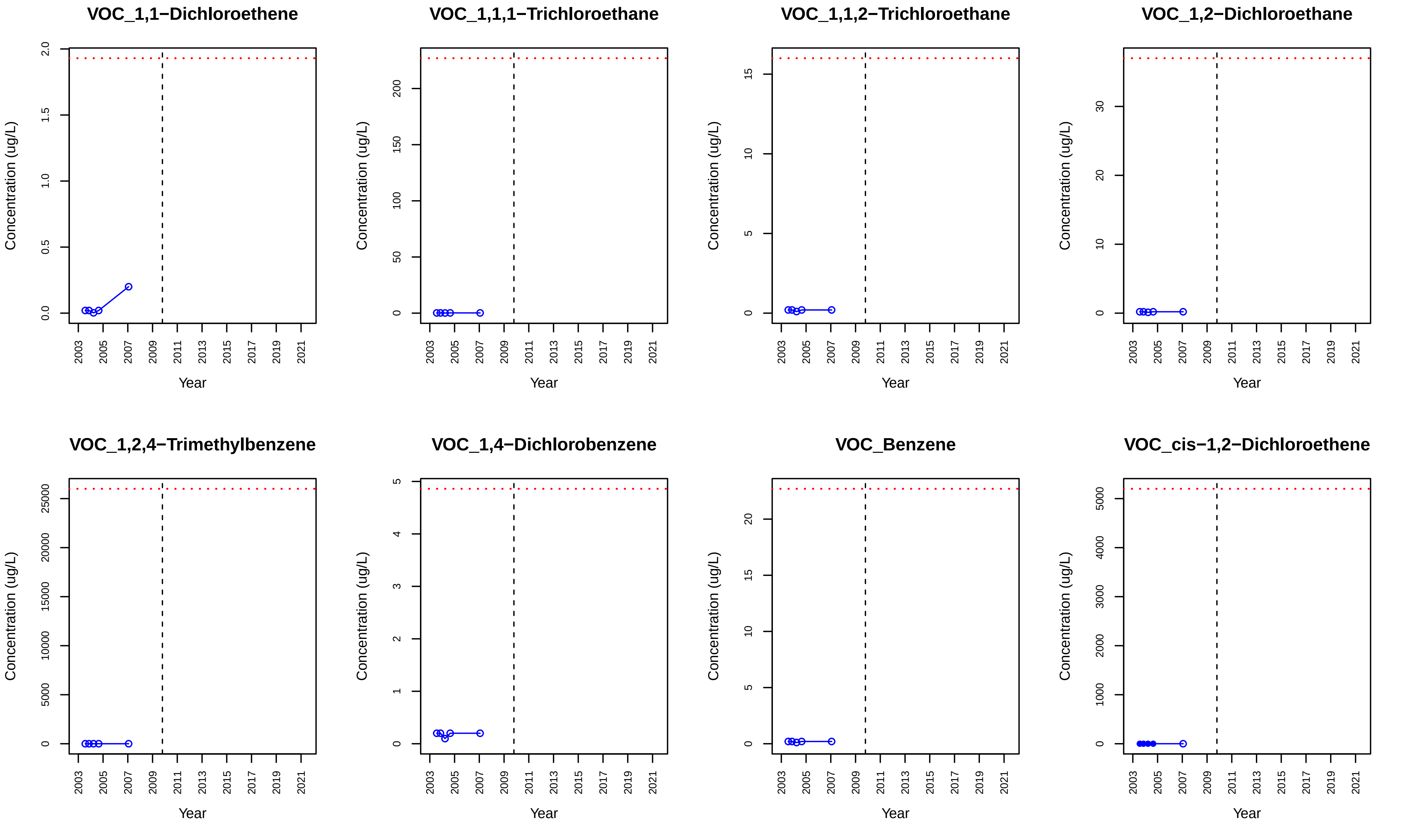
# B−23


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

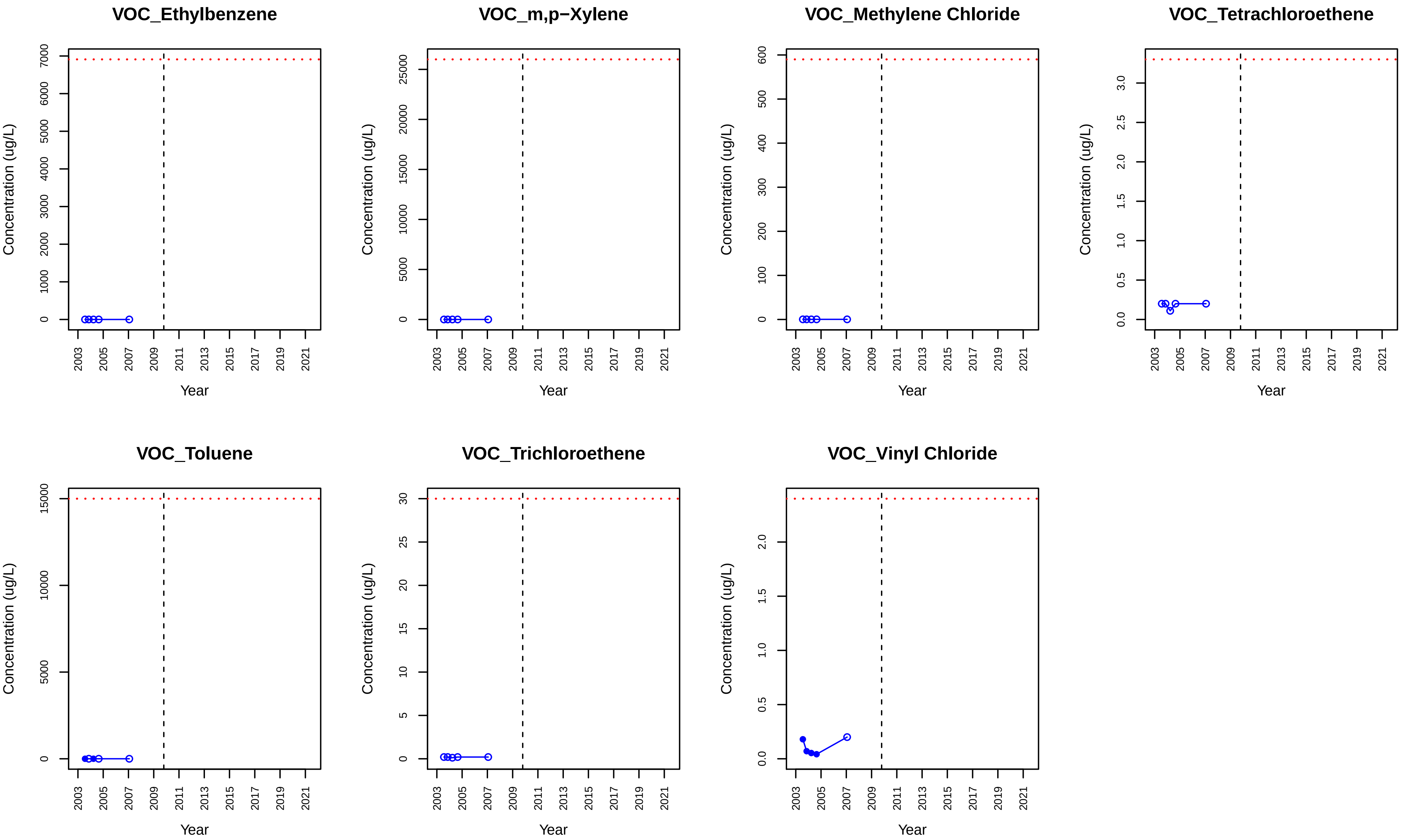
# B−24


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

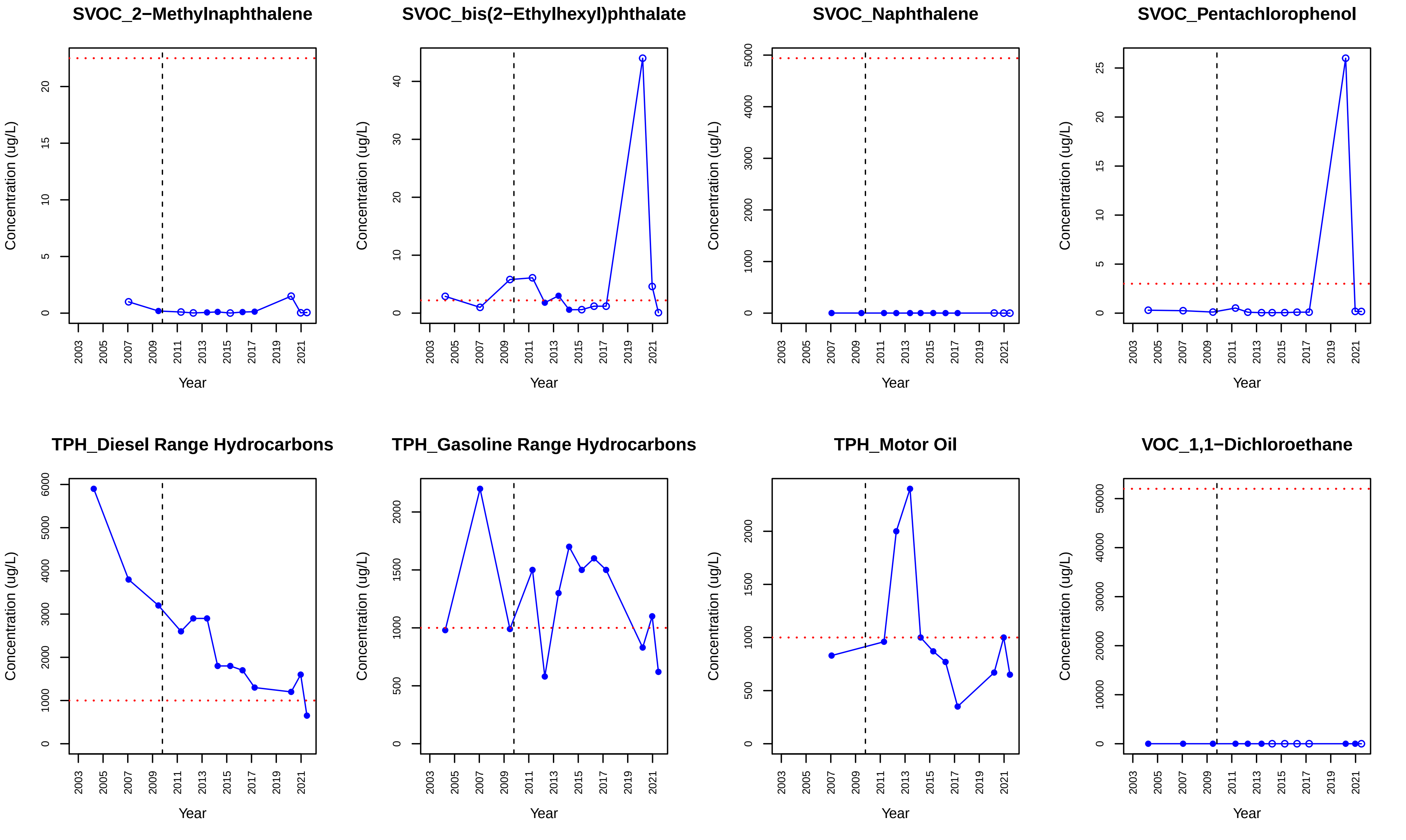
# B−24


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

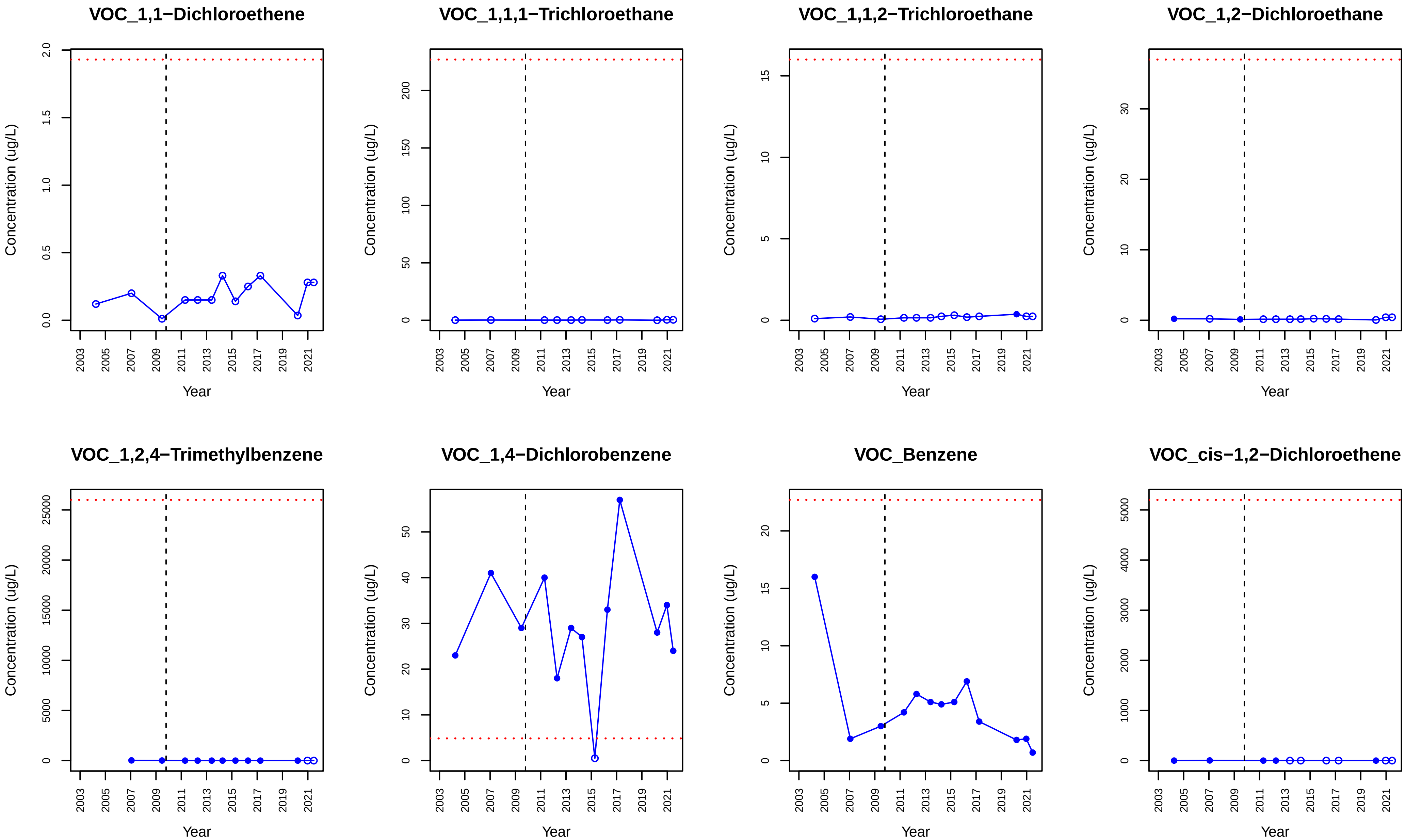
**B−24**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−25**

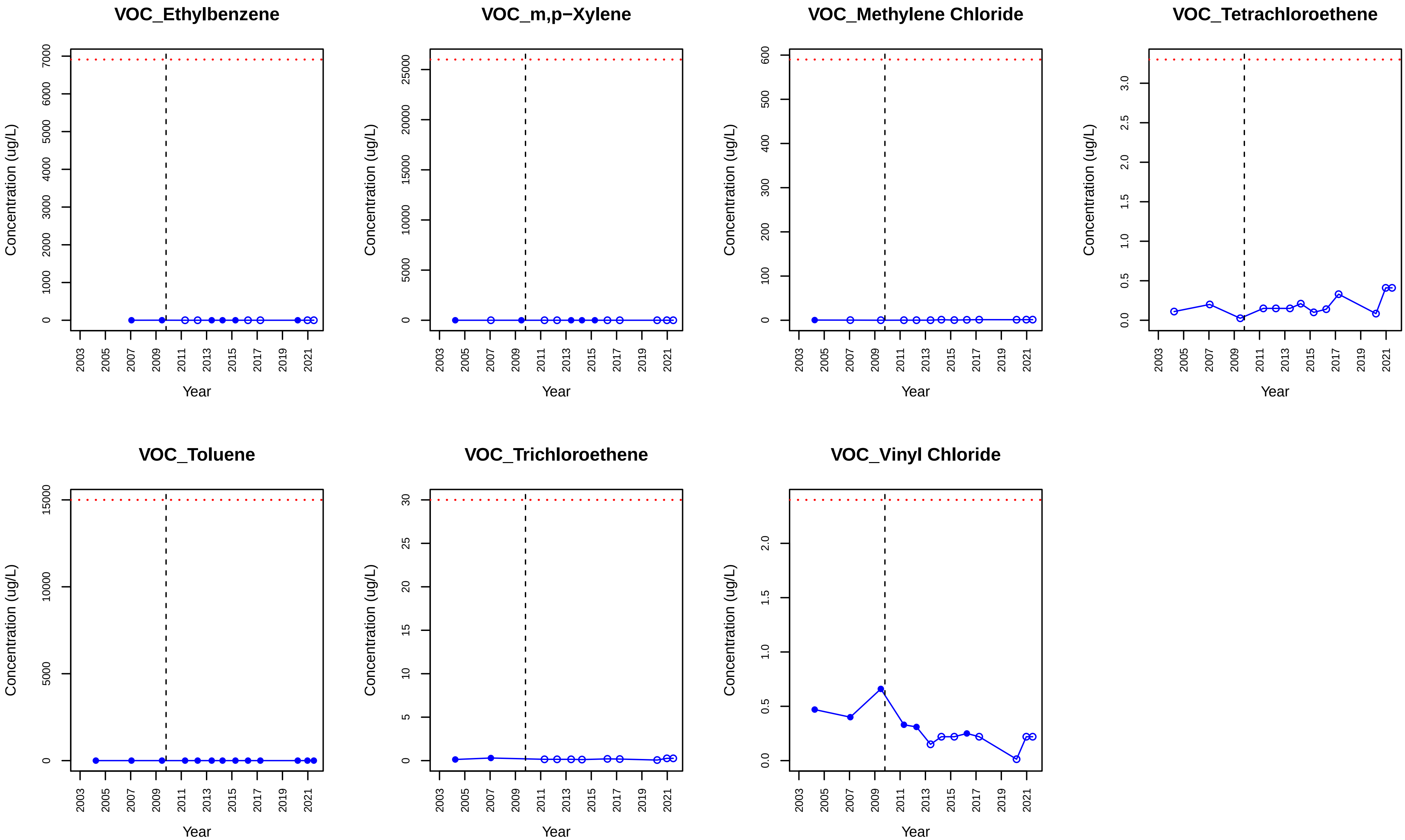

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−25

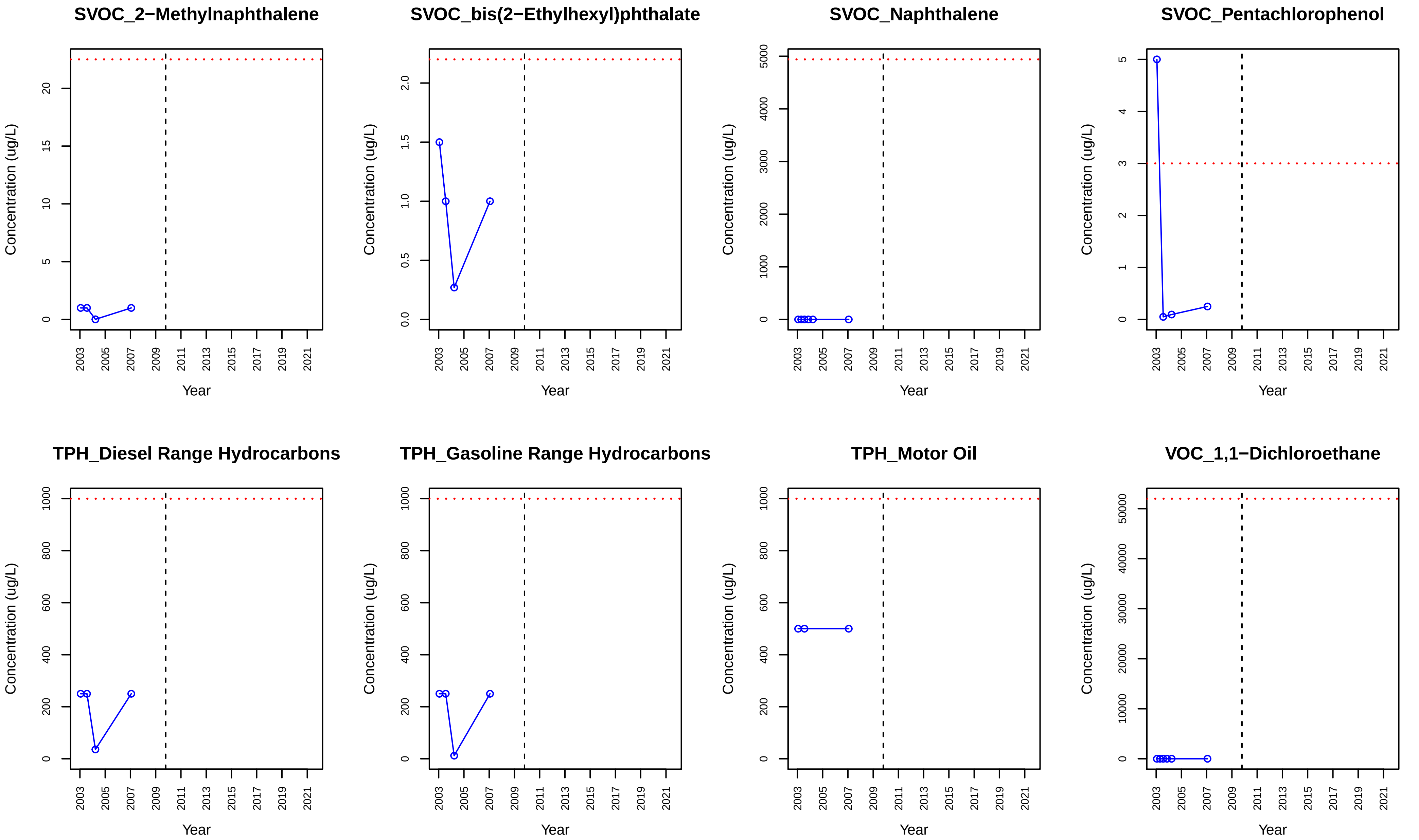


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

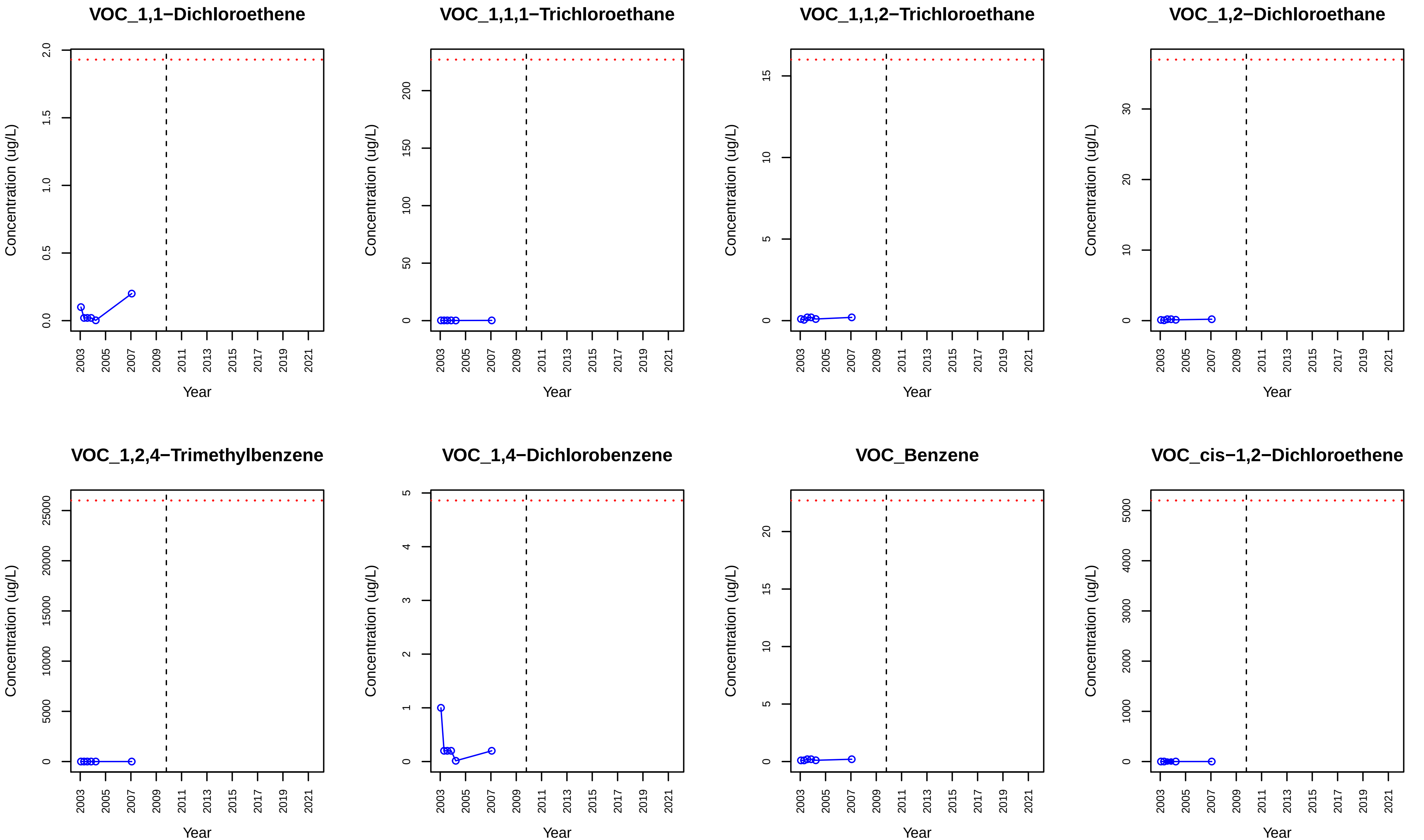
## B−25


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

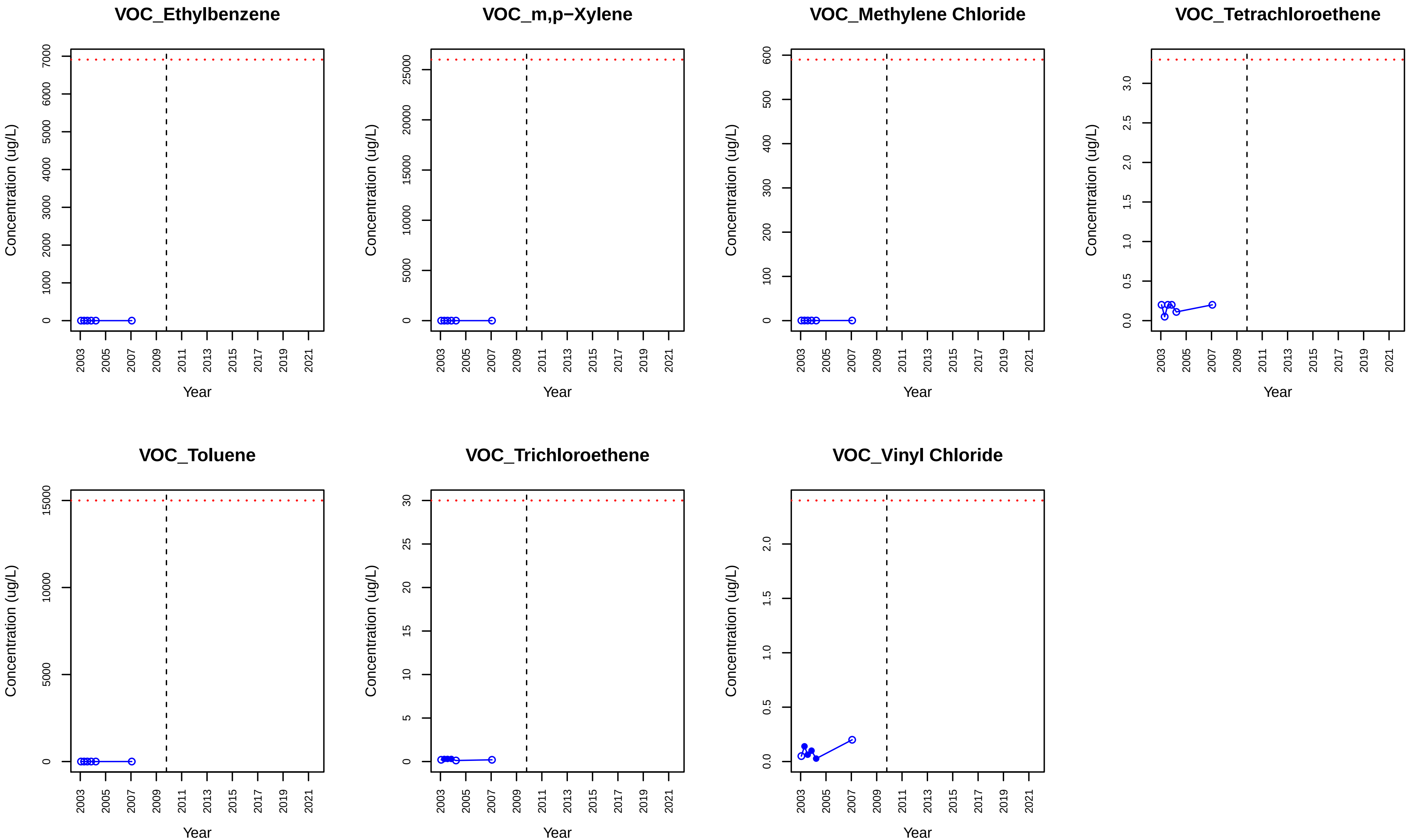
## B−26


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

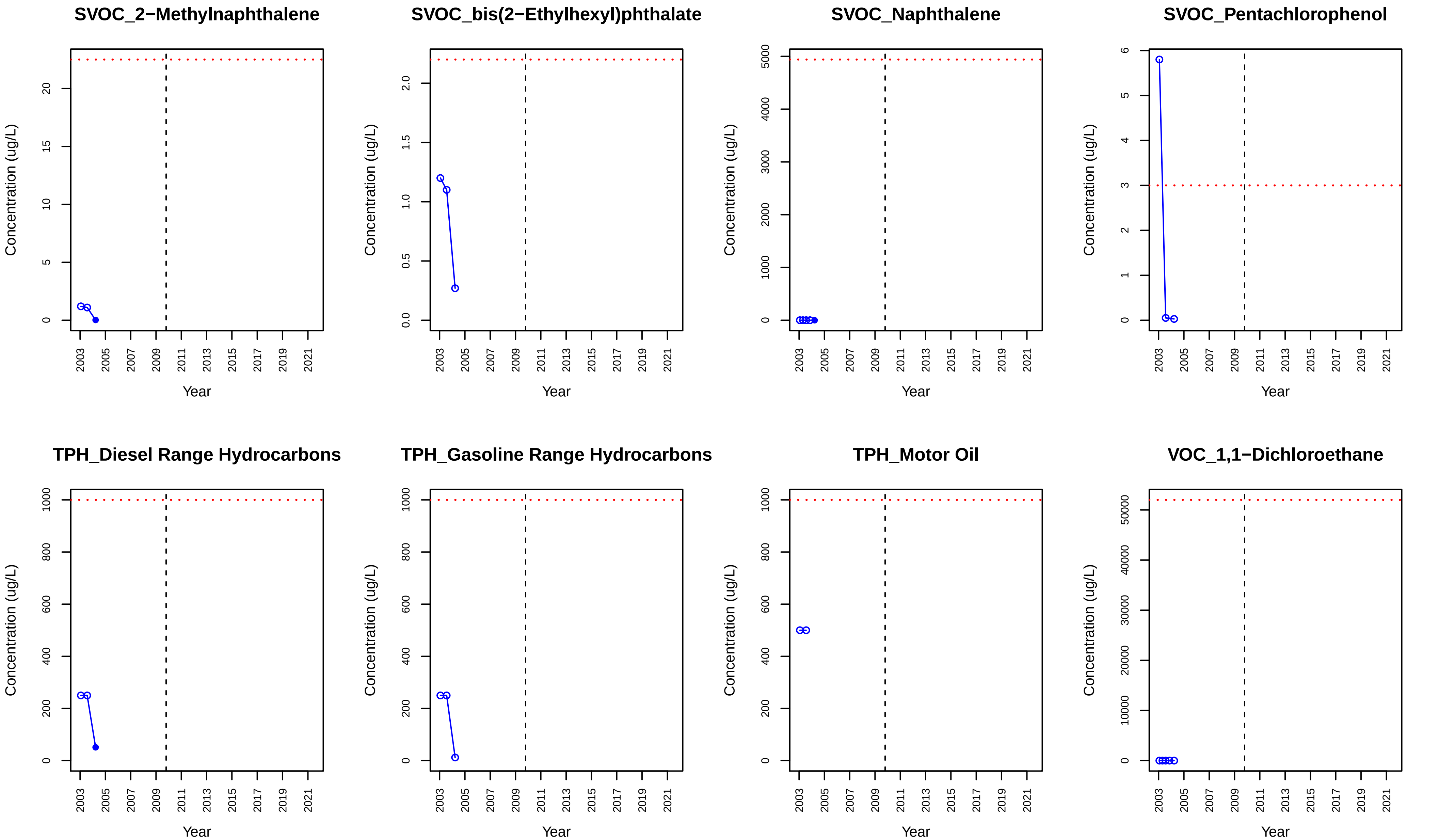
**B−26**


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−26

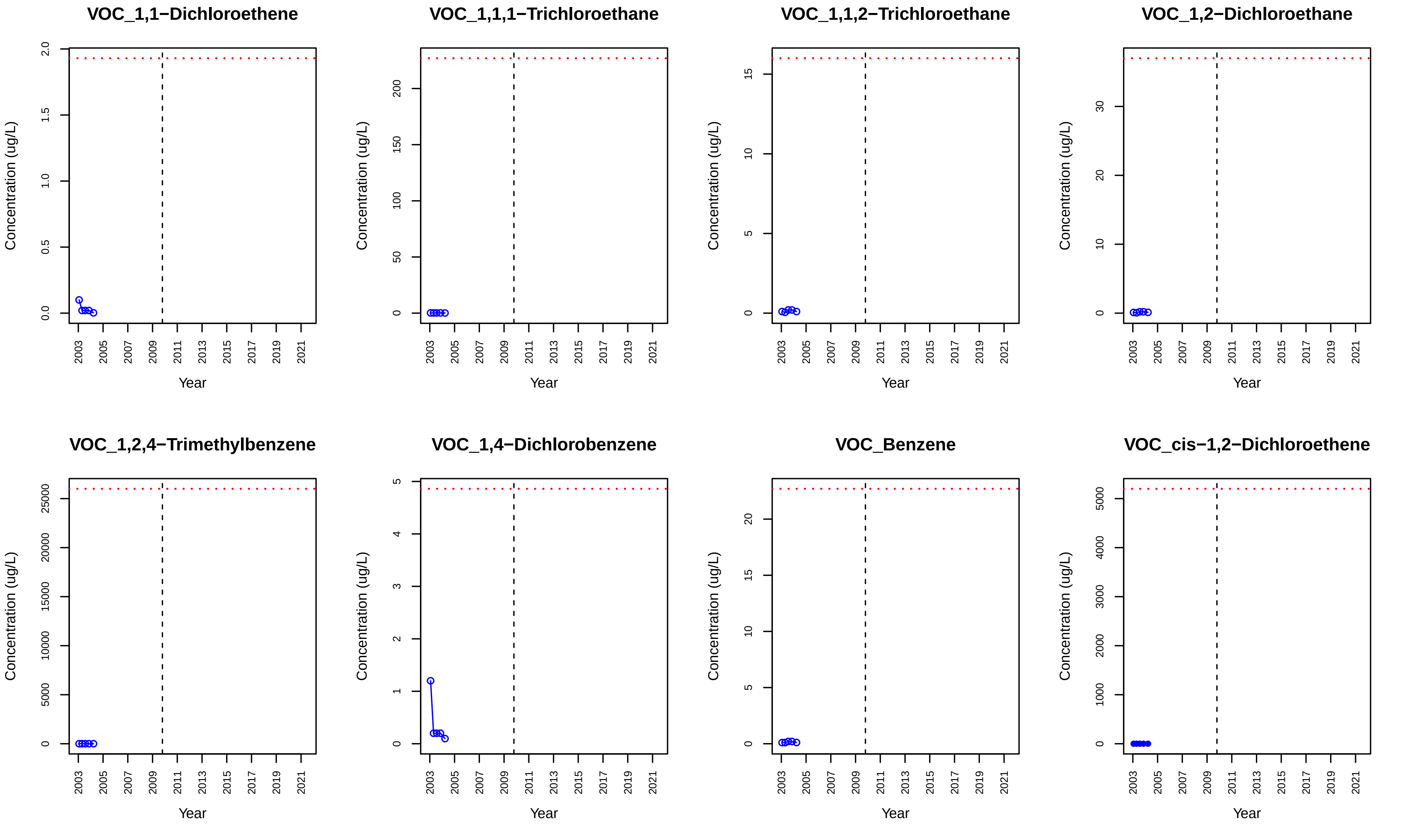

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−27**

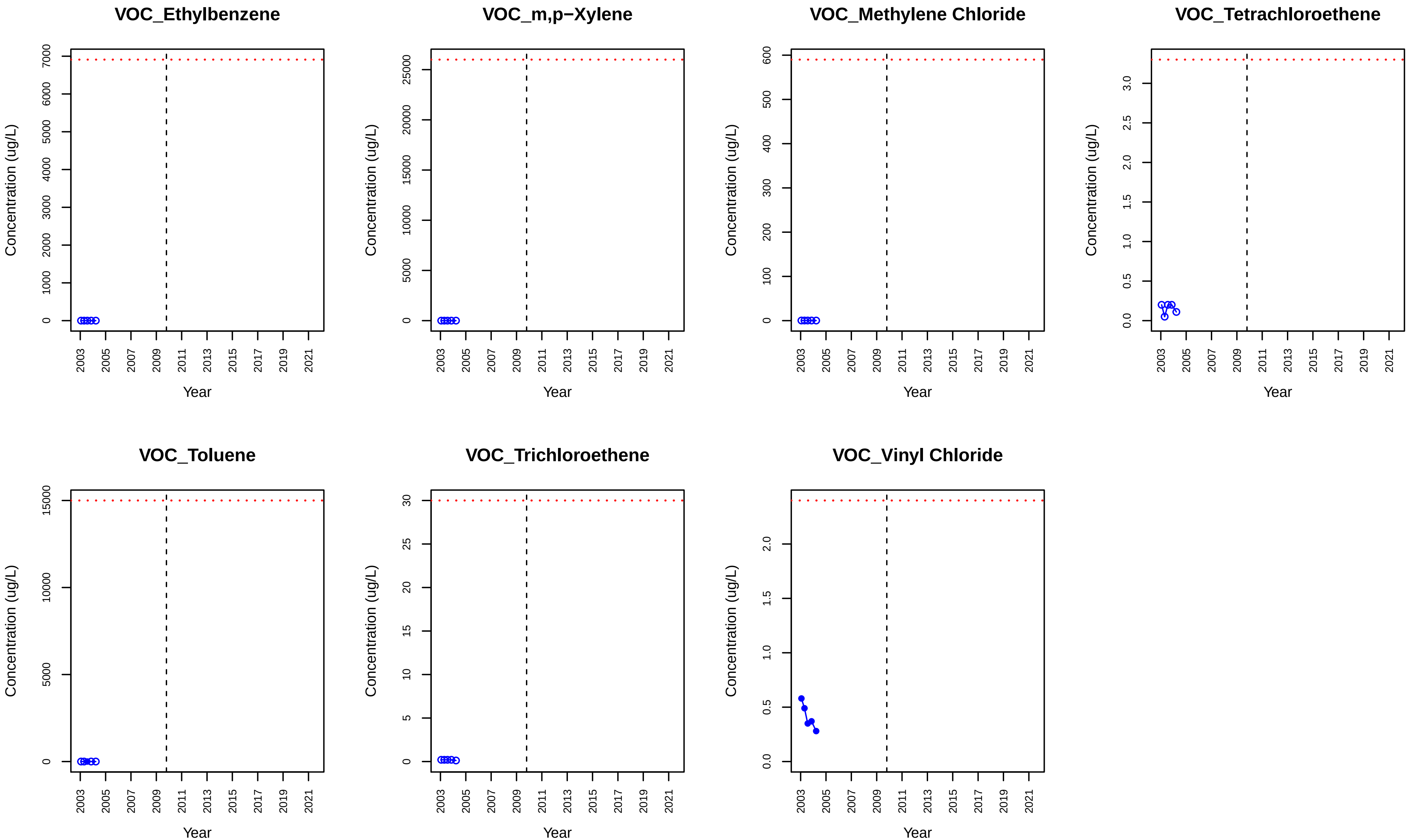


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

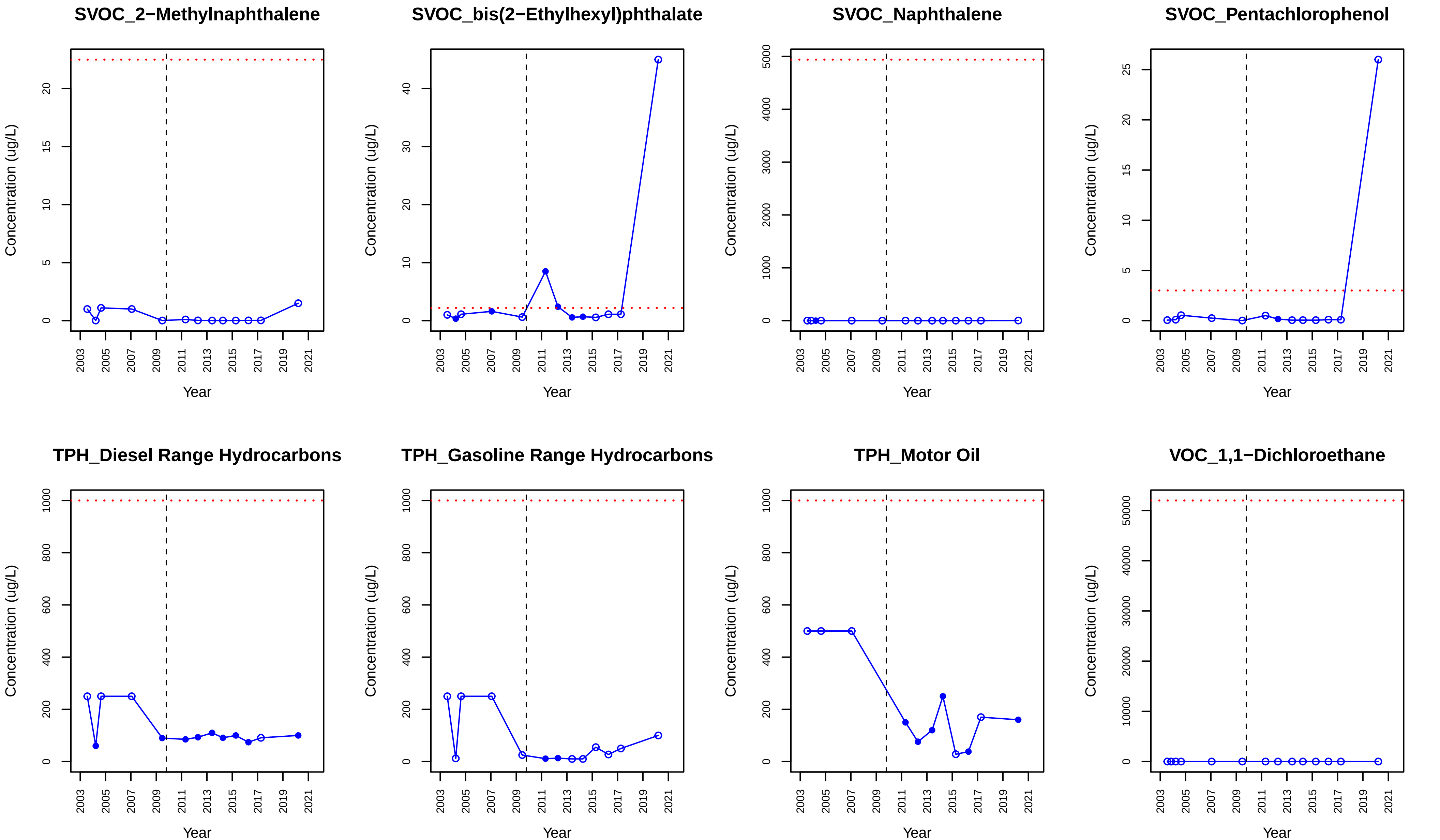
# B−27


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−27

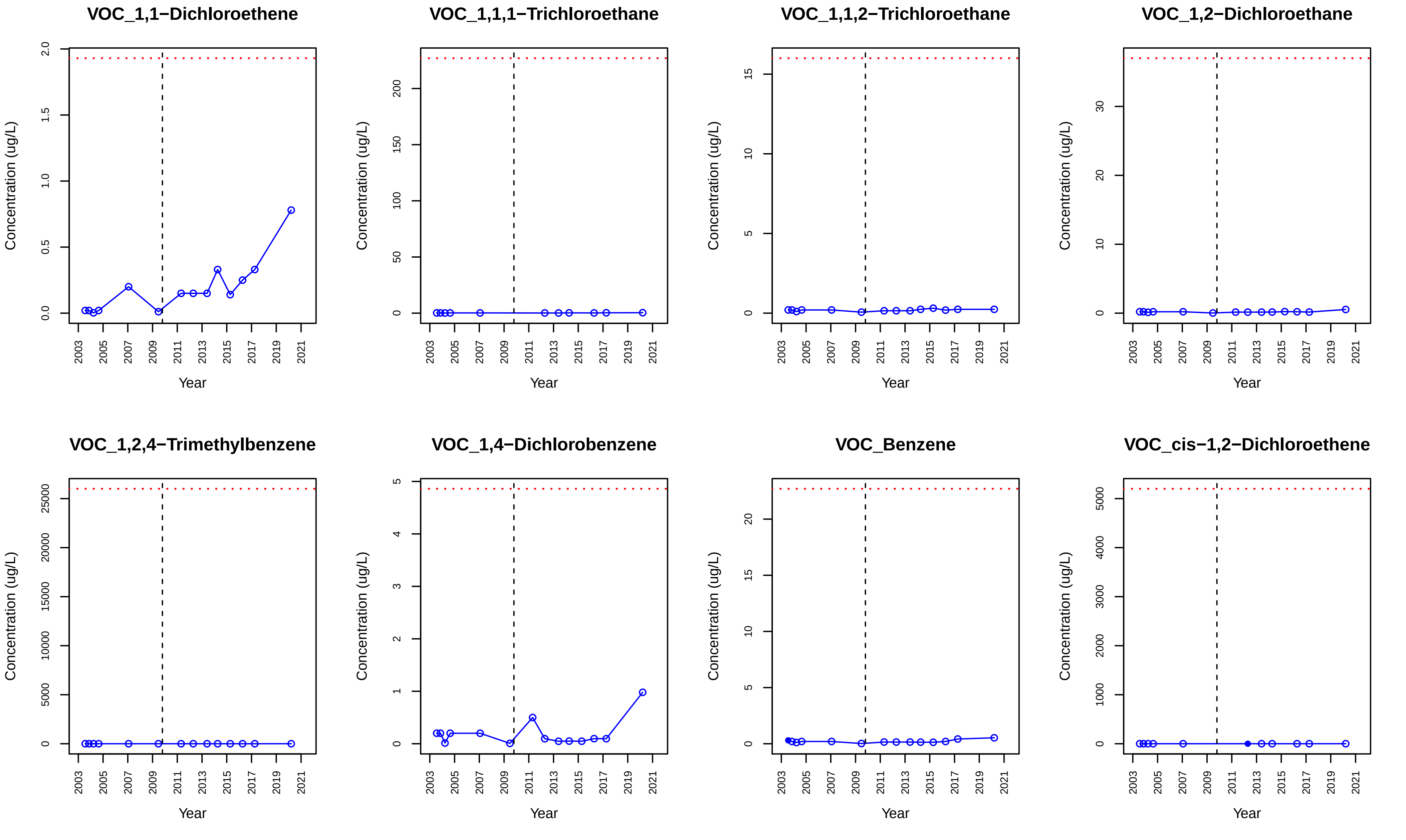

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# B−28

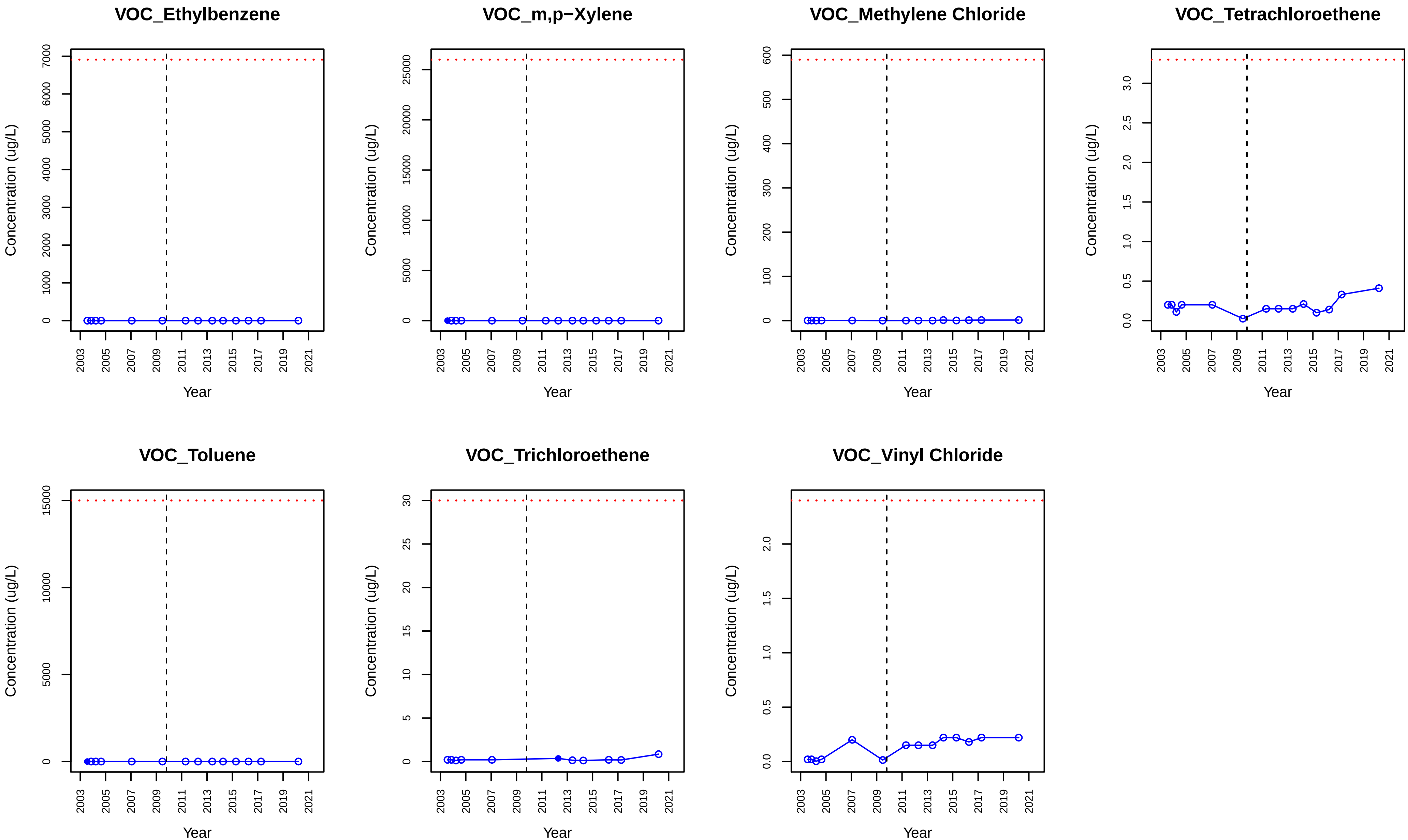


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

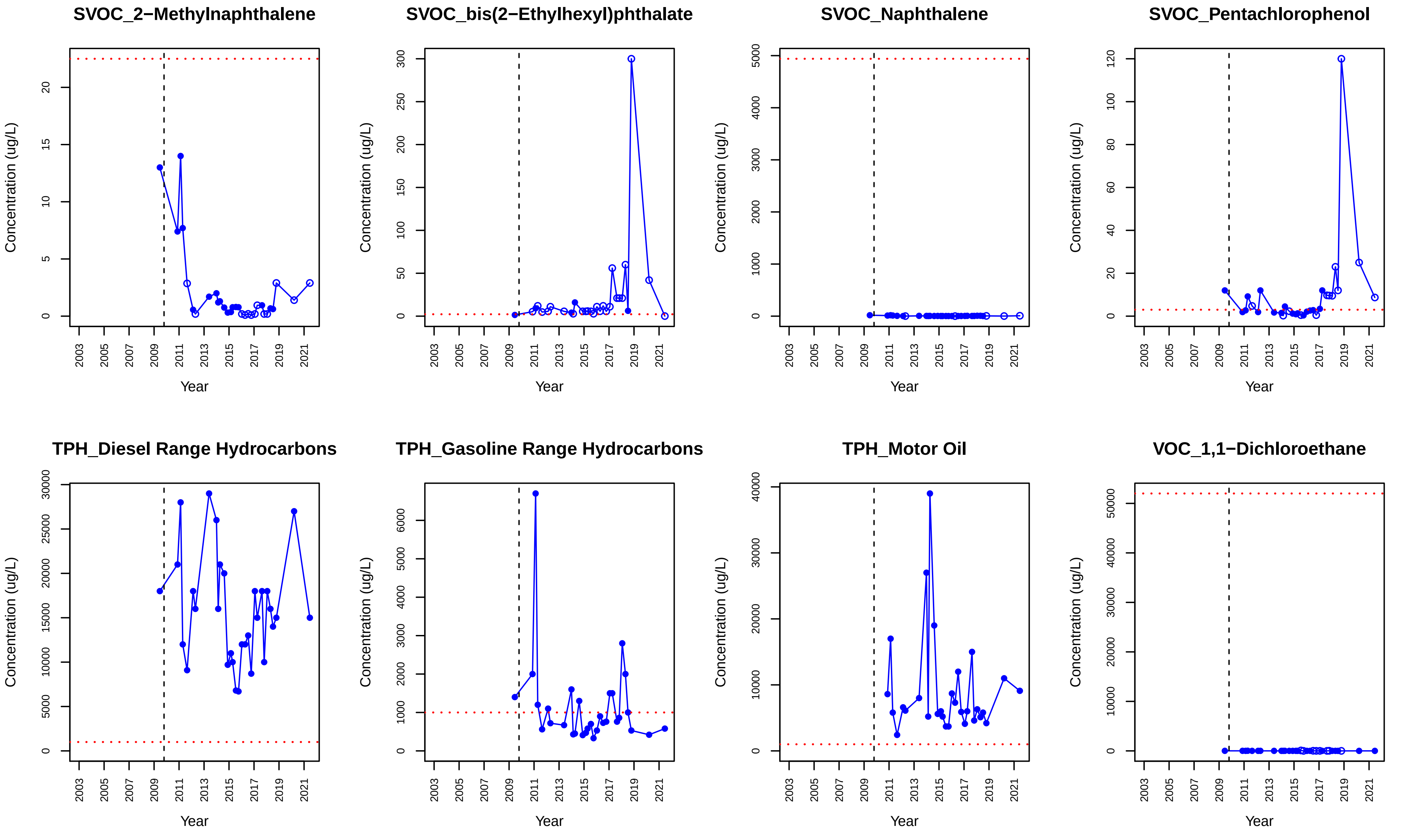
# B−28


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

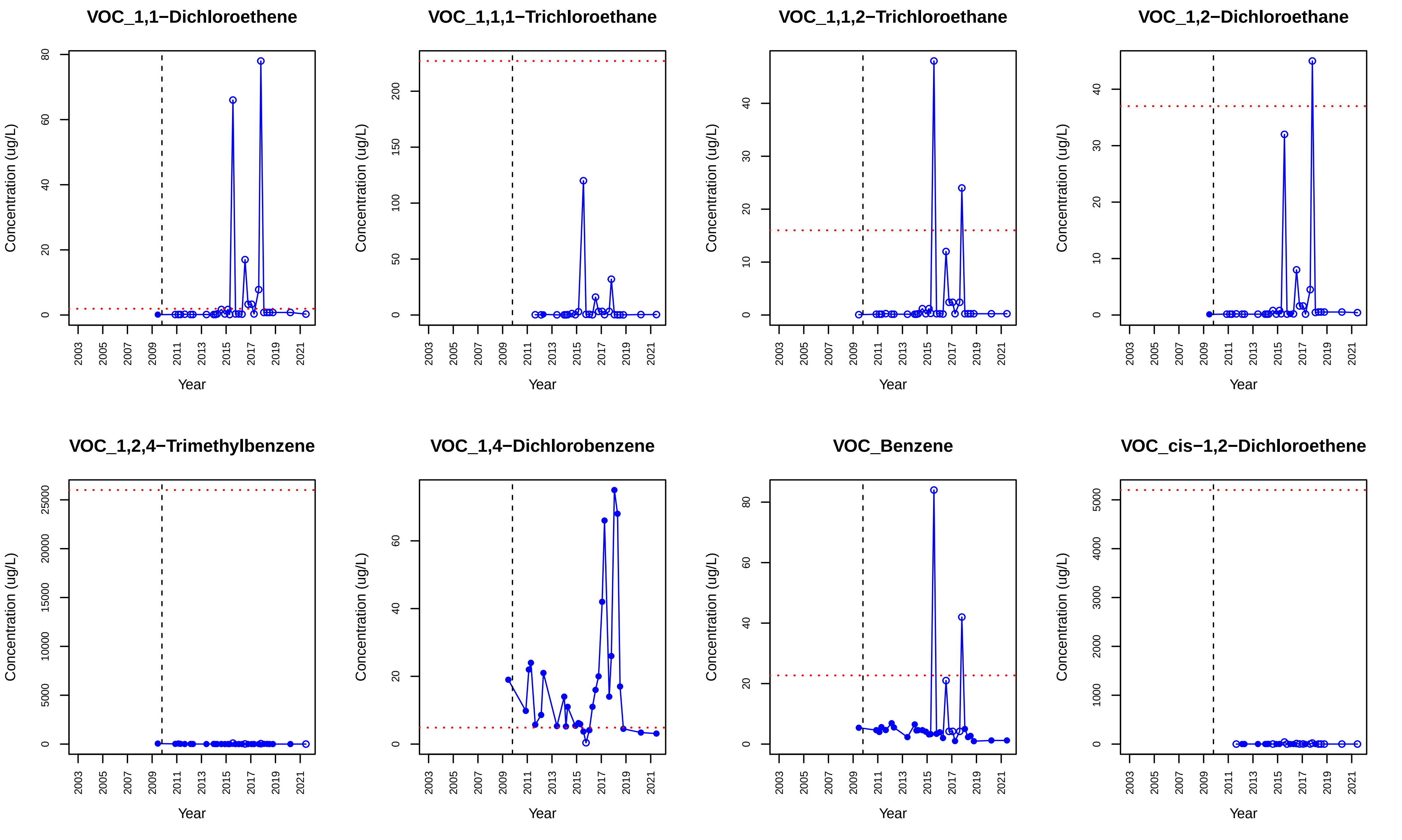
## B−28


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

# B−29

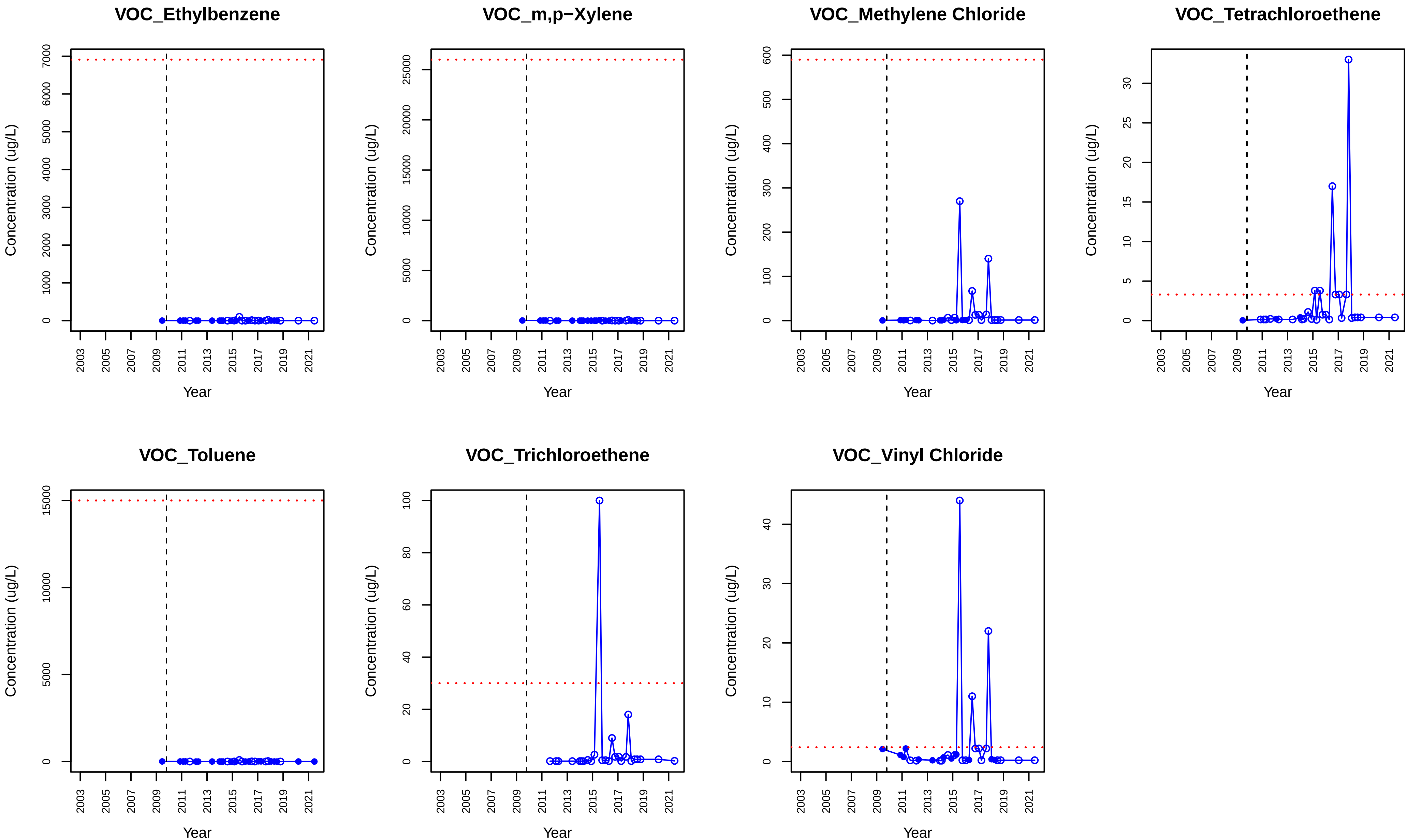

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

## B−29



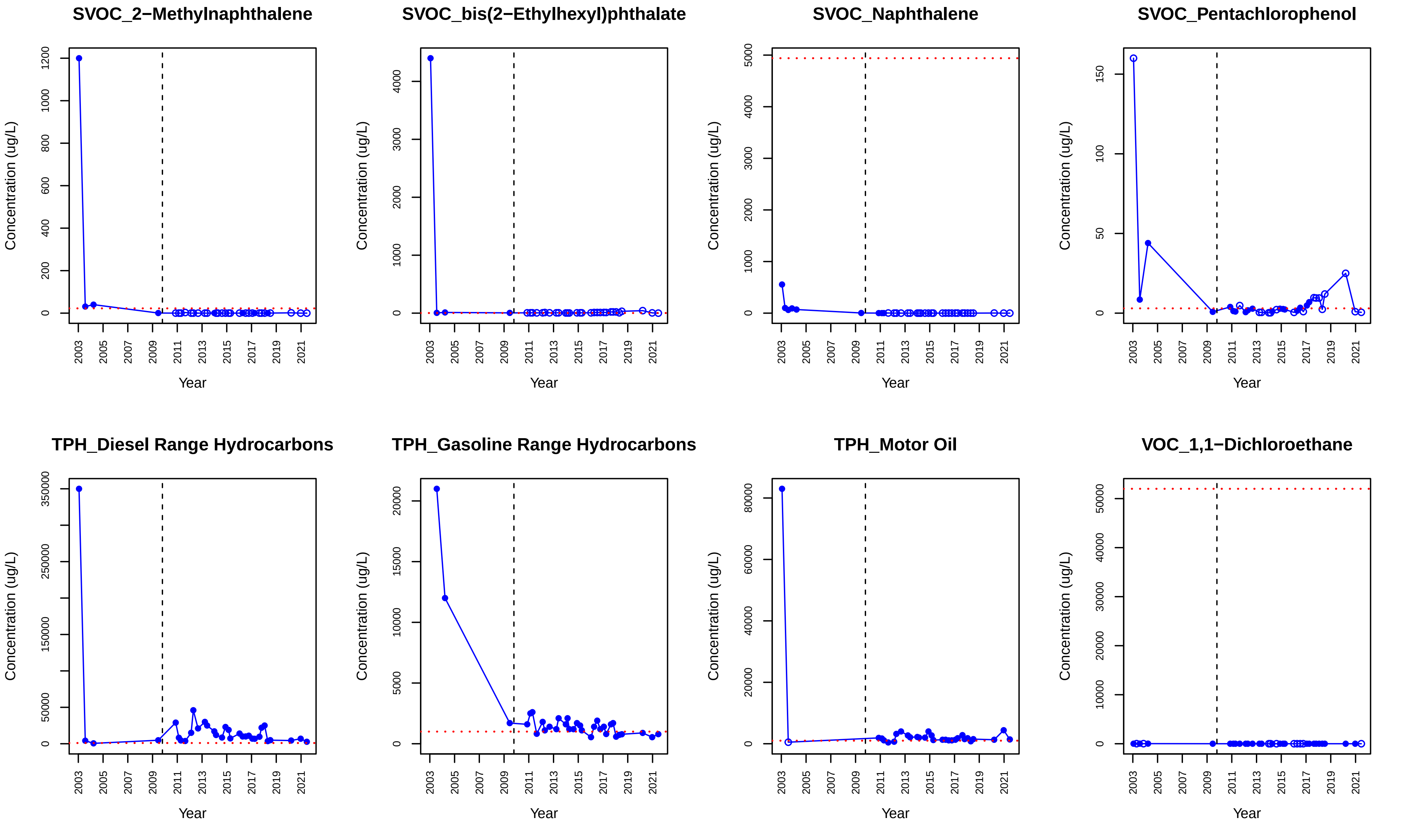
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−29**

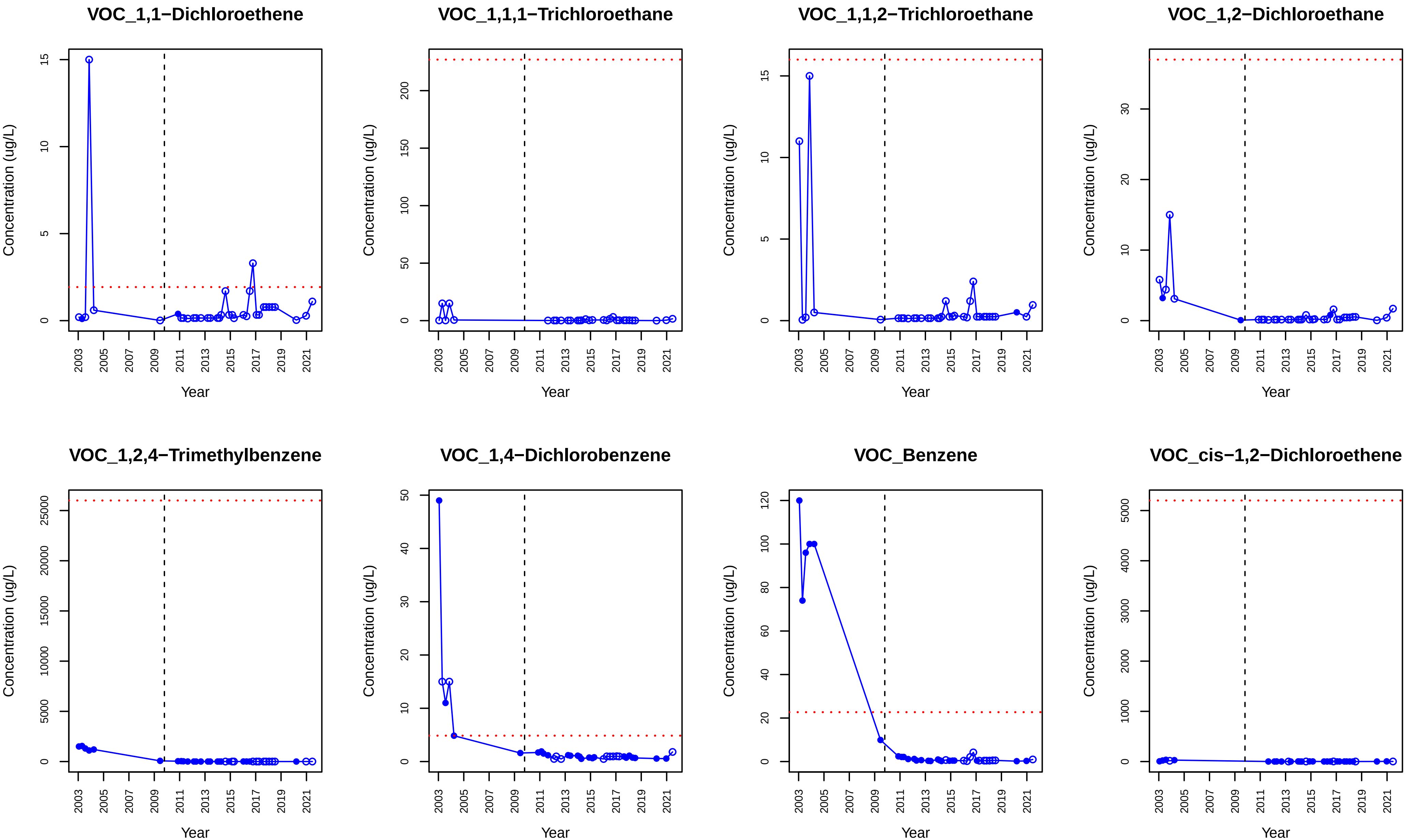


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 1000 2000 3000 4000 5000 6000 7000
0 5000 10000 15000 20000 25000
0 100 200 300 400 500 600
0 5 10 15 20 25 30
0 5000 10000 15000
0 20 40 60 80 100
0 10 20 30 40

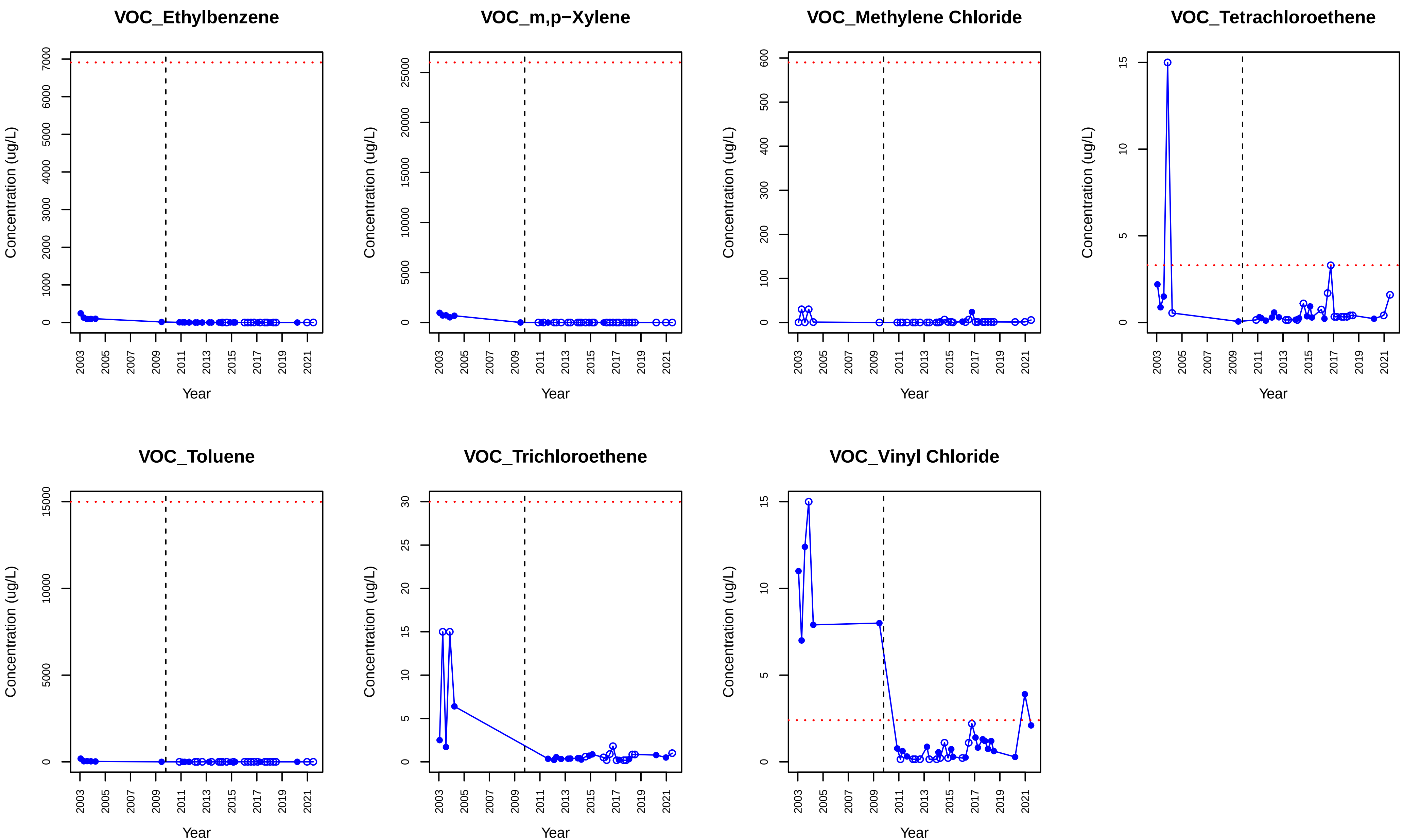
## B−30


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**B−30**

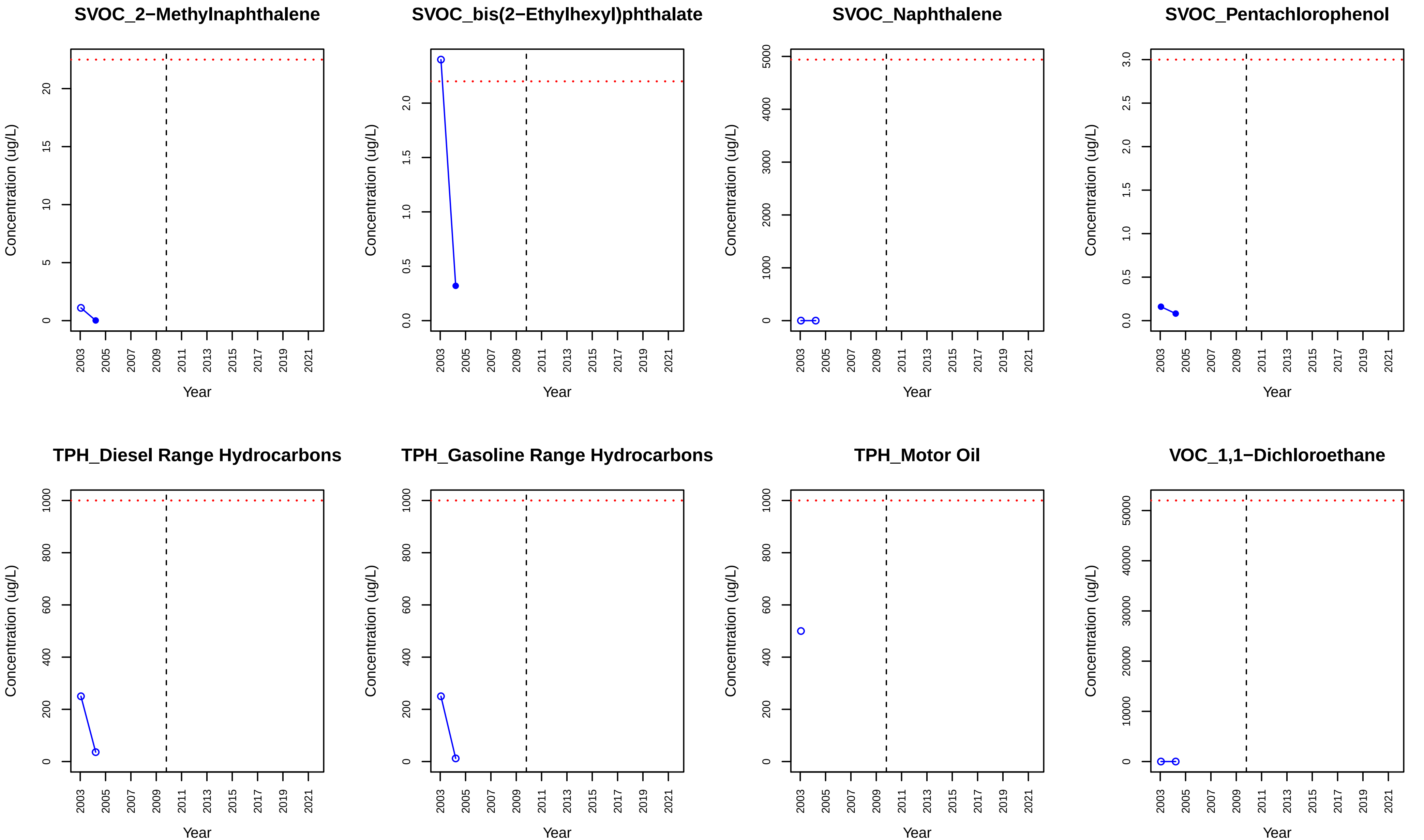

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## B−30

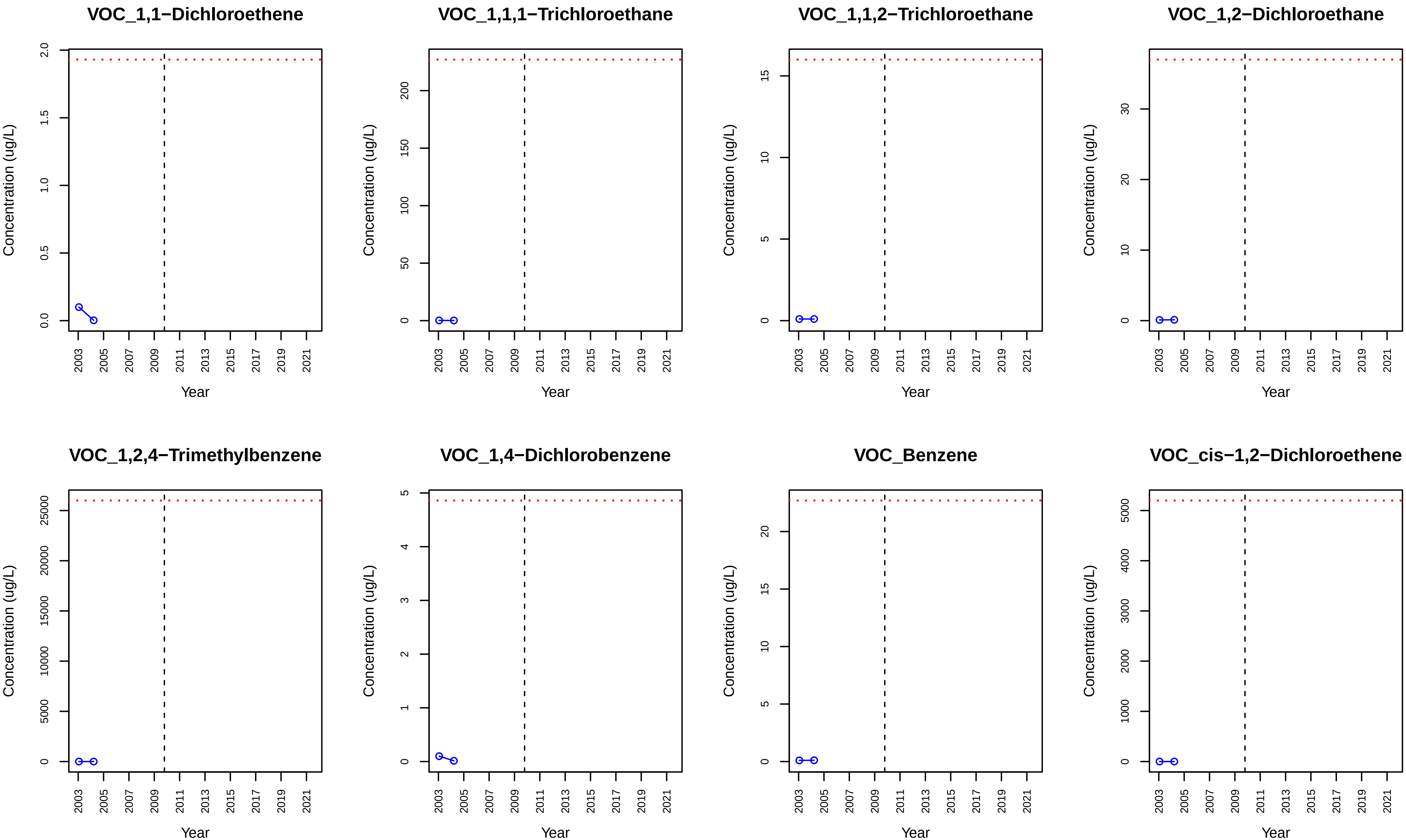


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

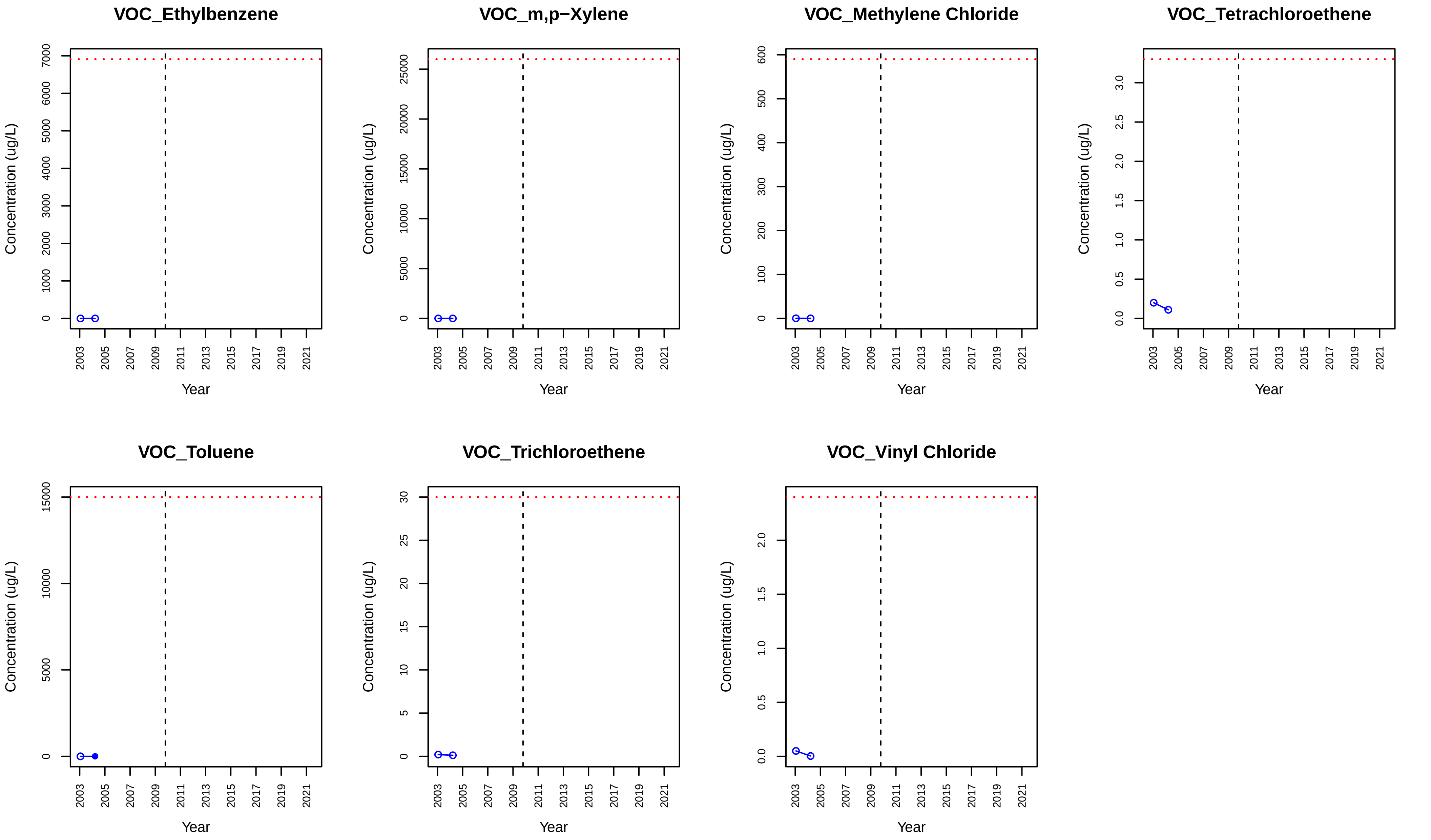
## B−31D


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 5 10 15 20
0.0 0.5 1.0 1.5 2.0
0 1000 2000 3000 4000 5000
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 200 400 600 800 1000
0 10000 20000 30000 40000 50000

# B−31D

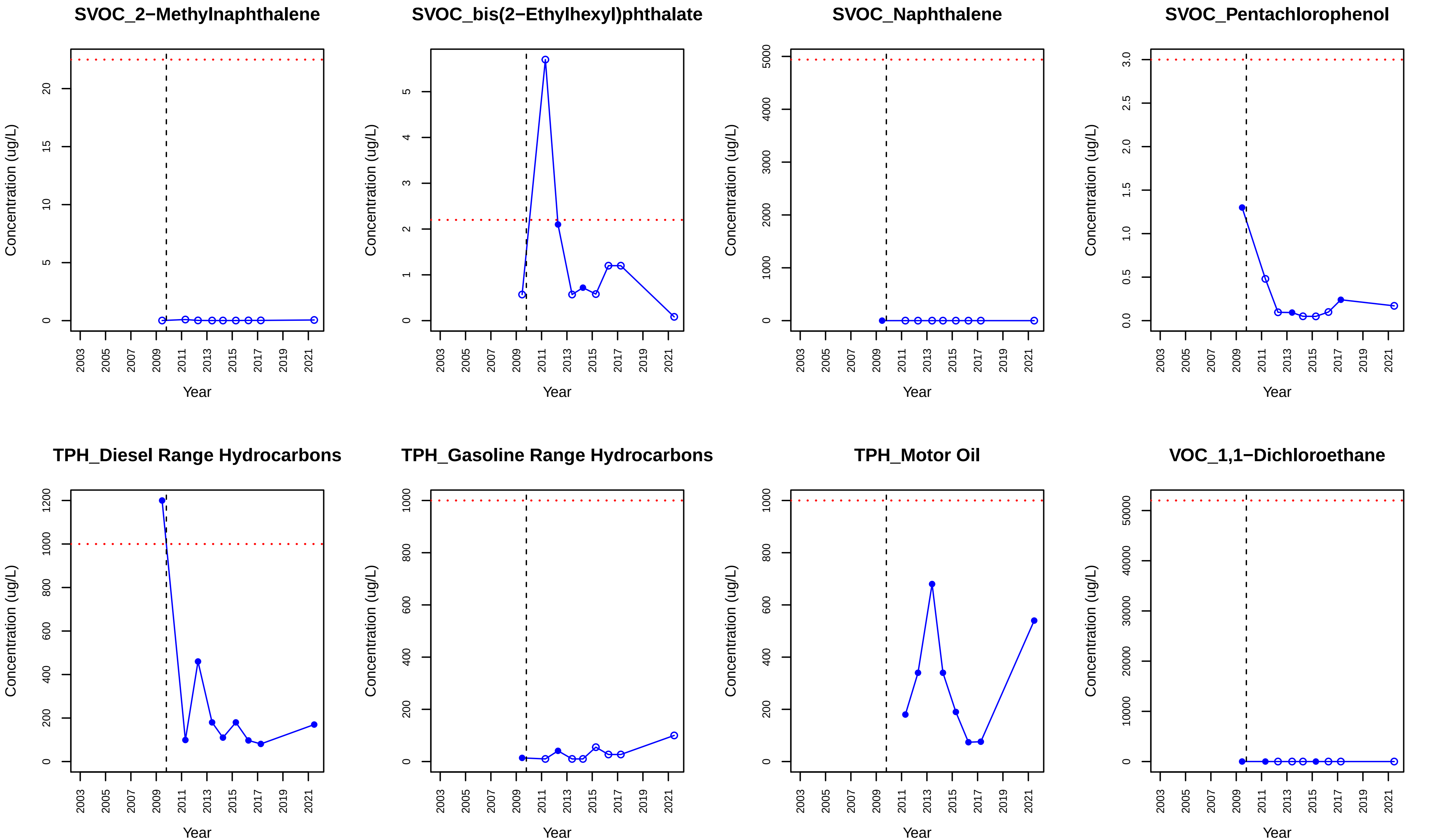

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# B−31D

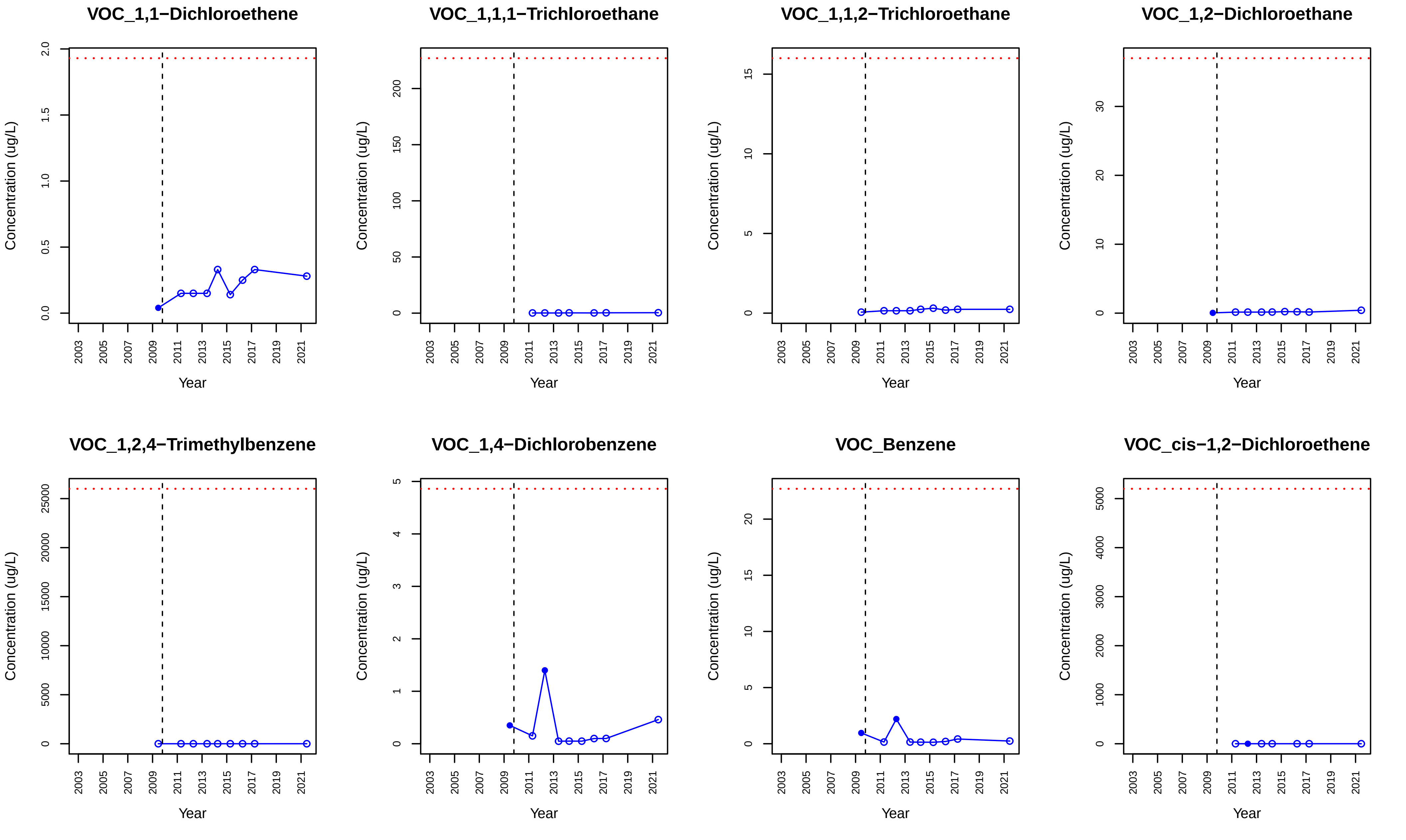


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

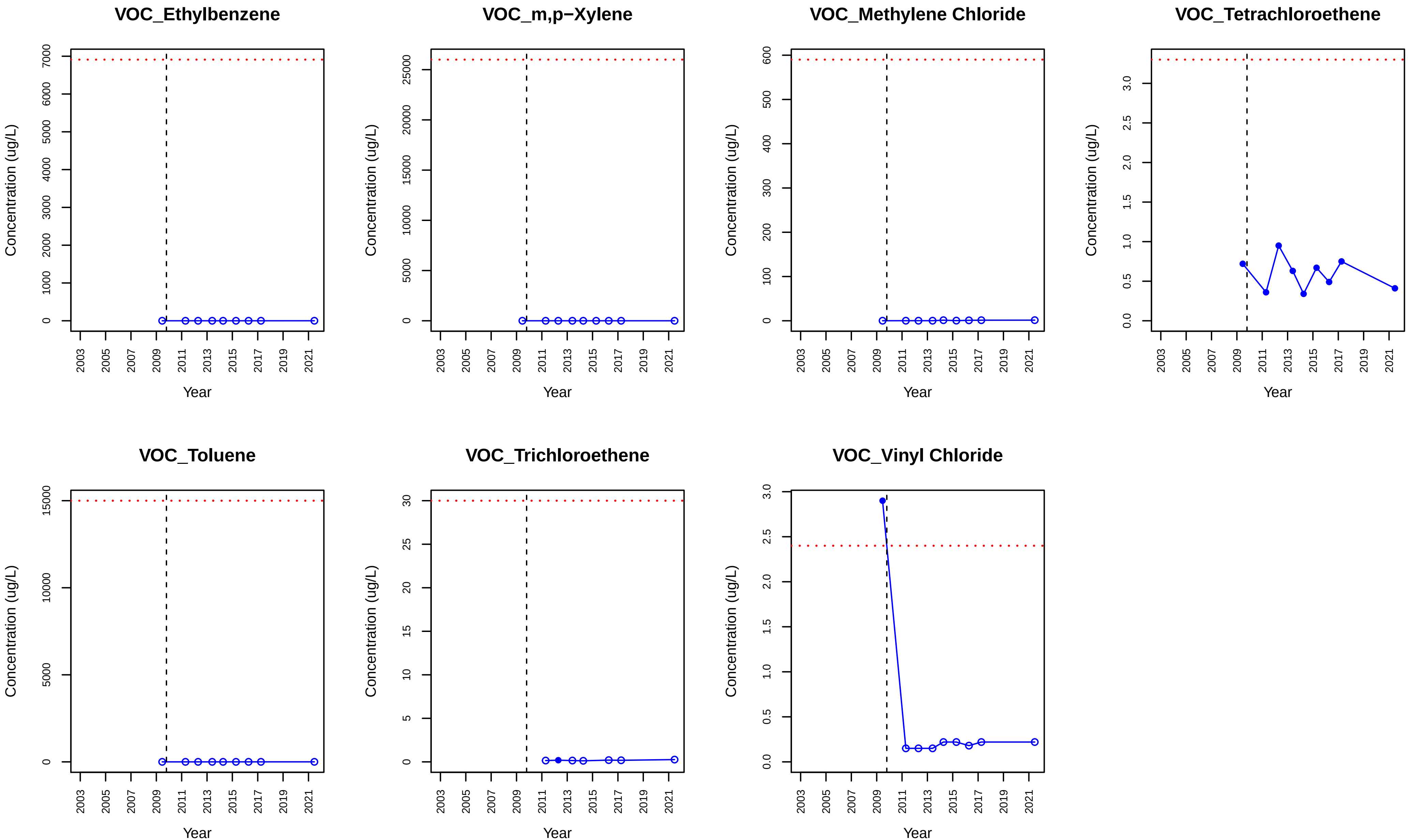
# CDM−10


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

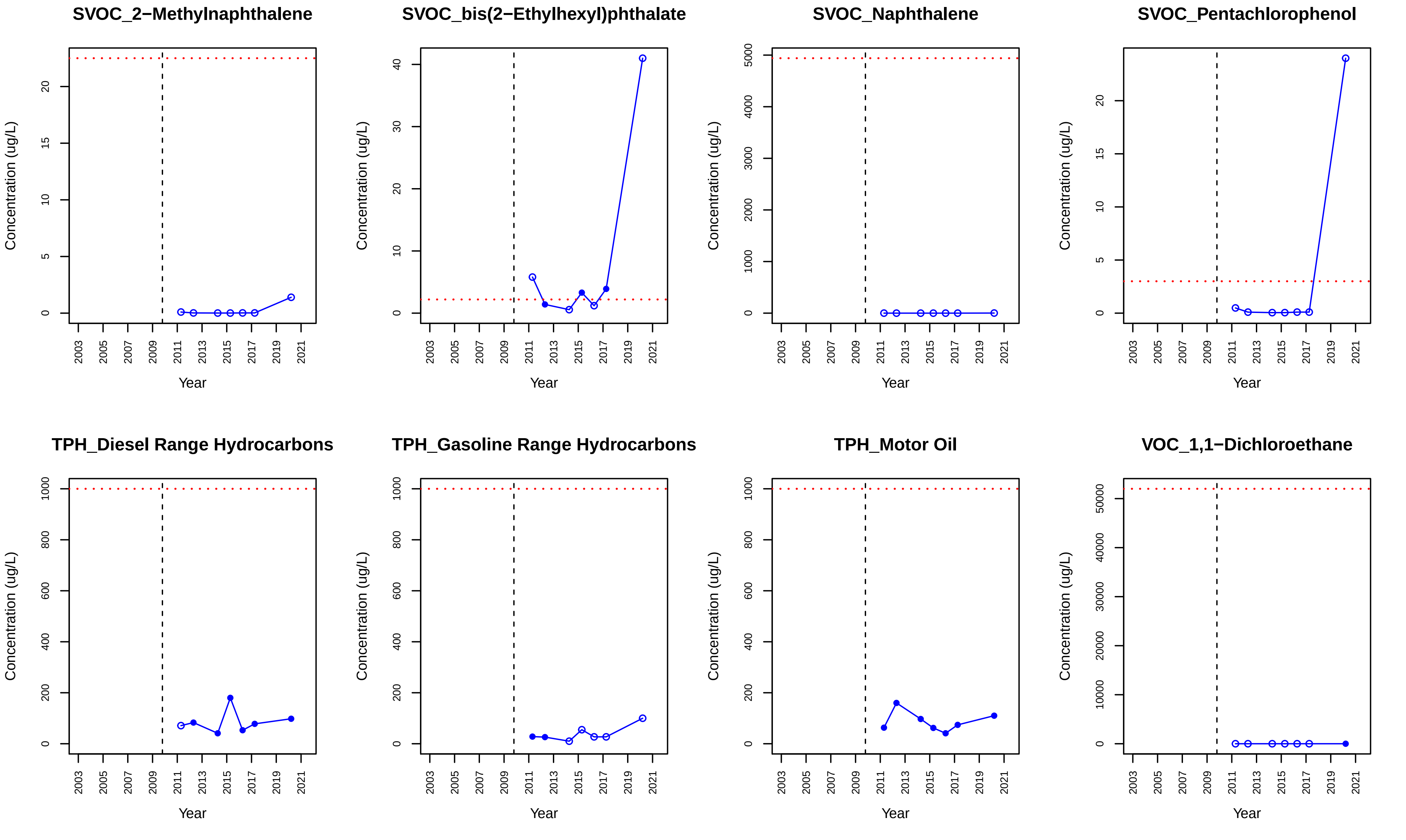
# CDM−10


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

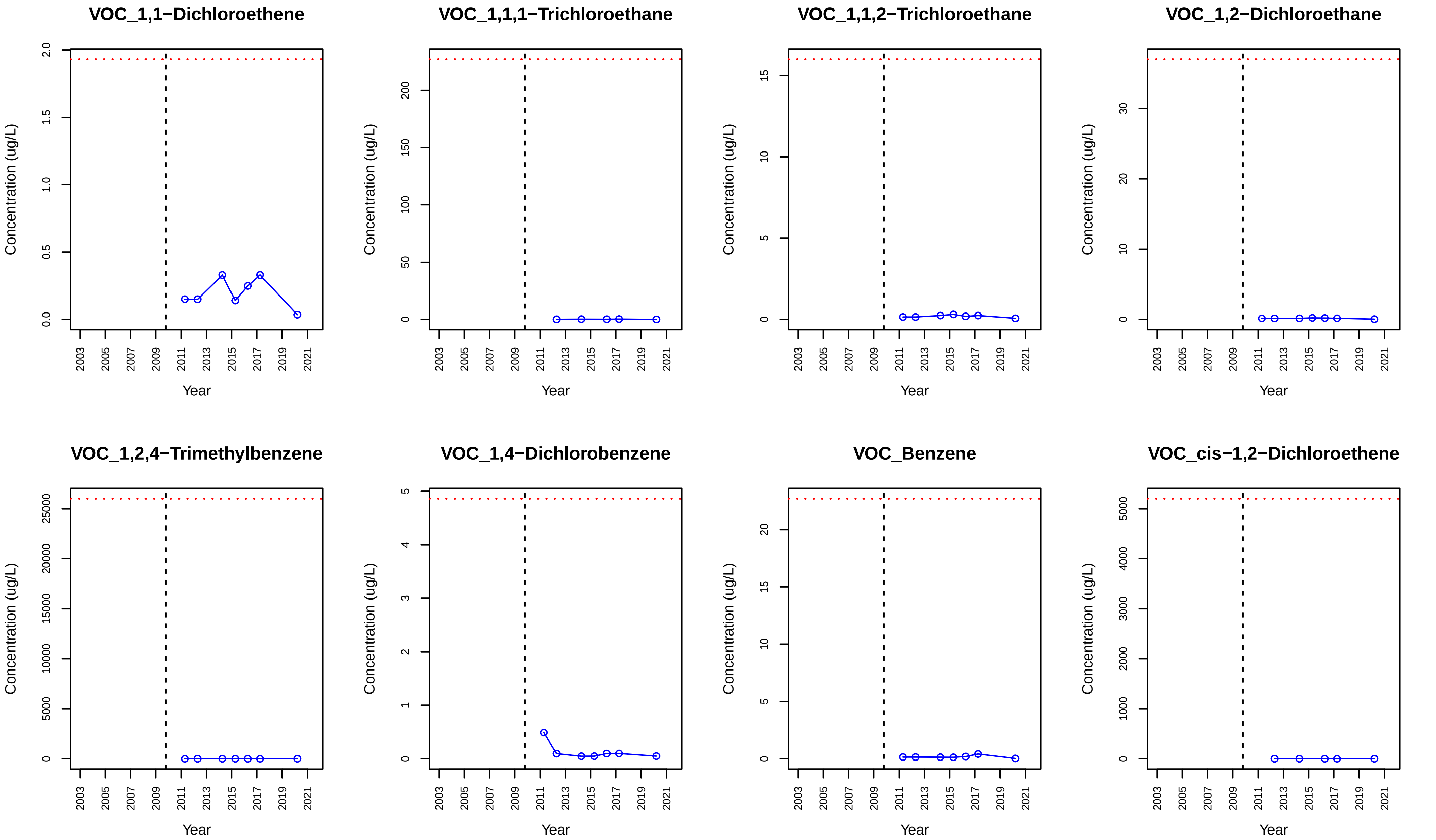
# CDM−10


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

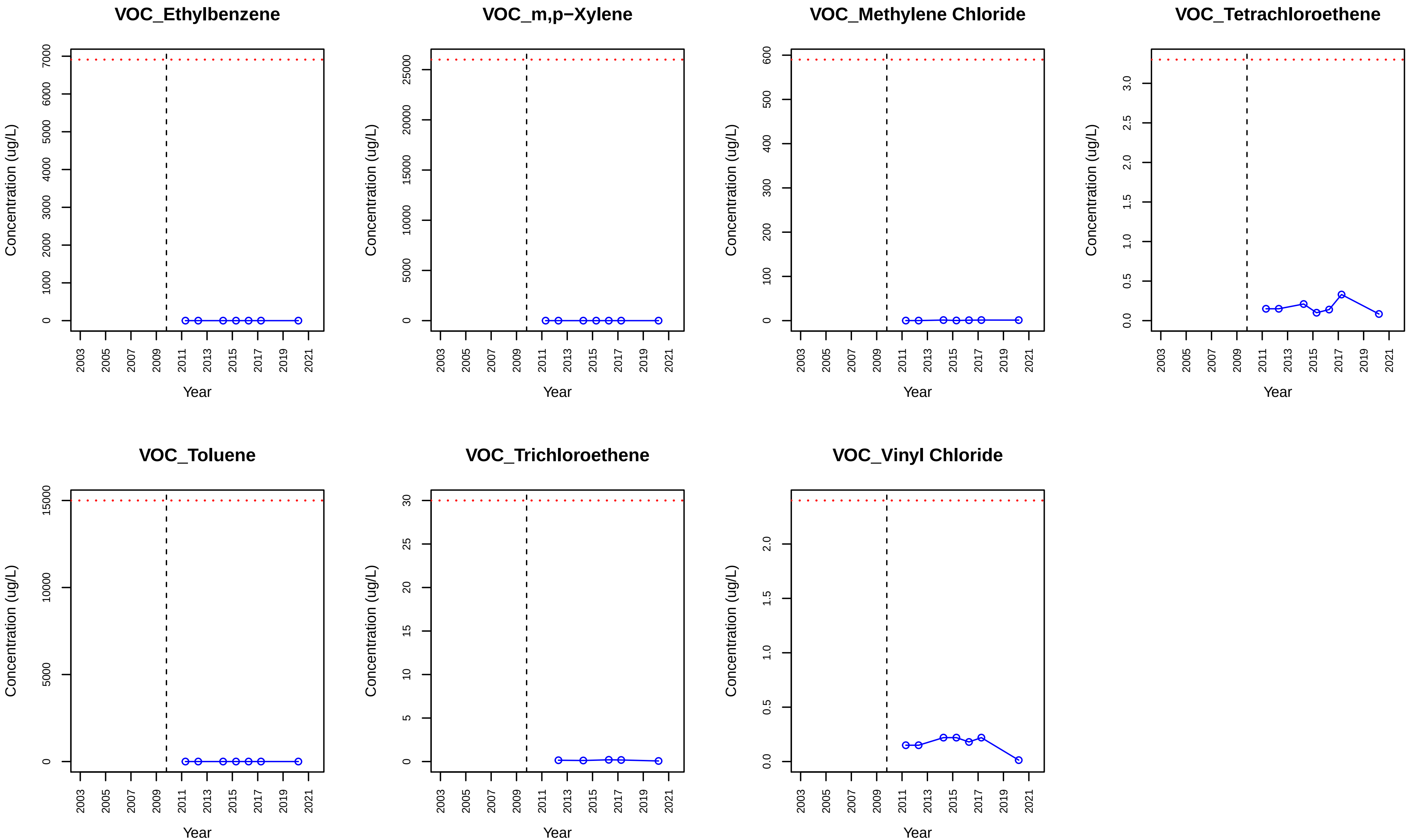
# CDM−12


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

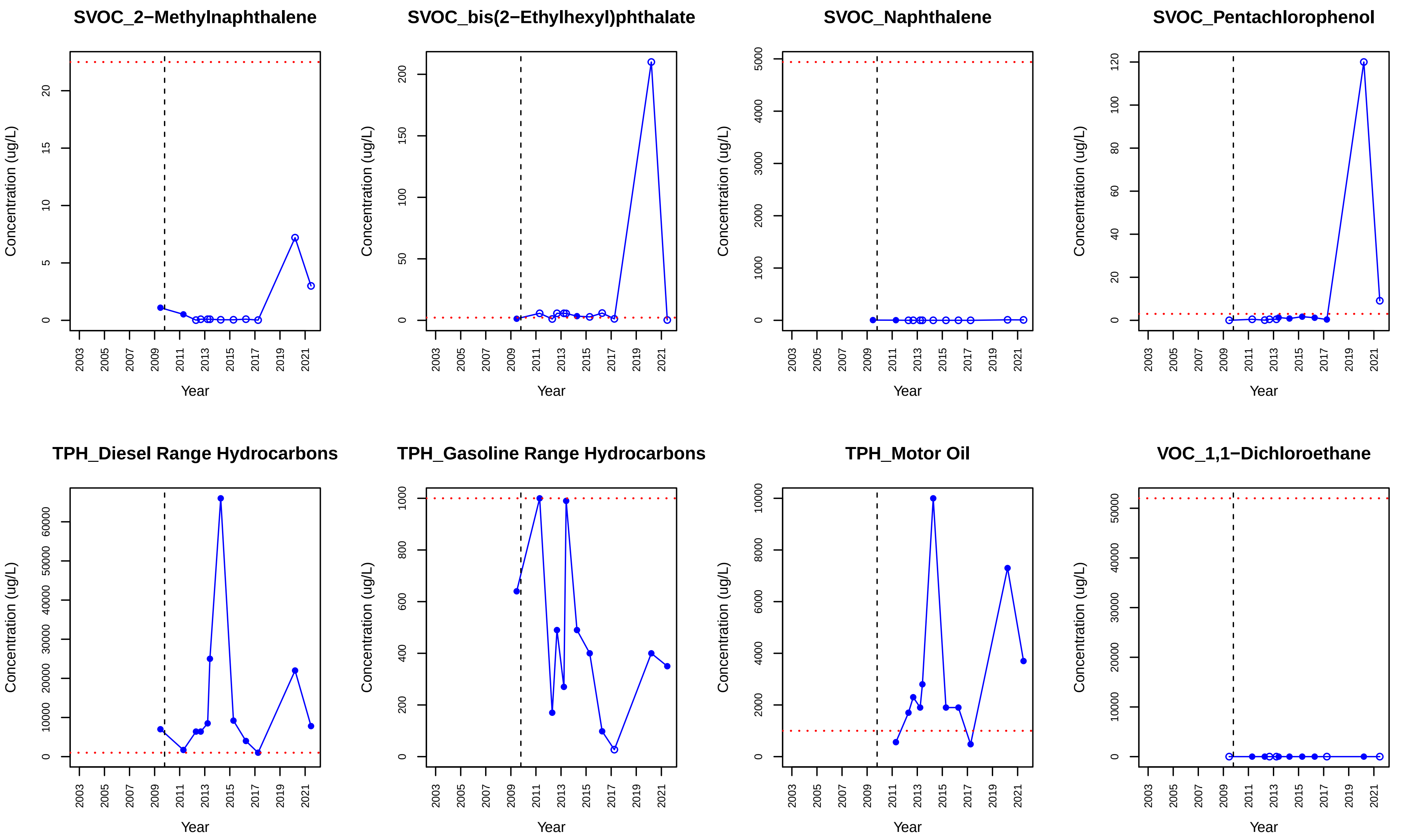
# CDM−12


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# CDM−12

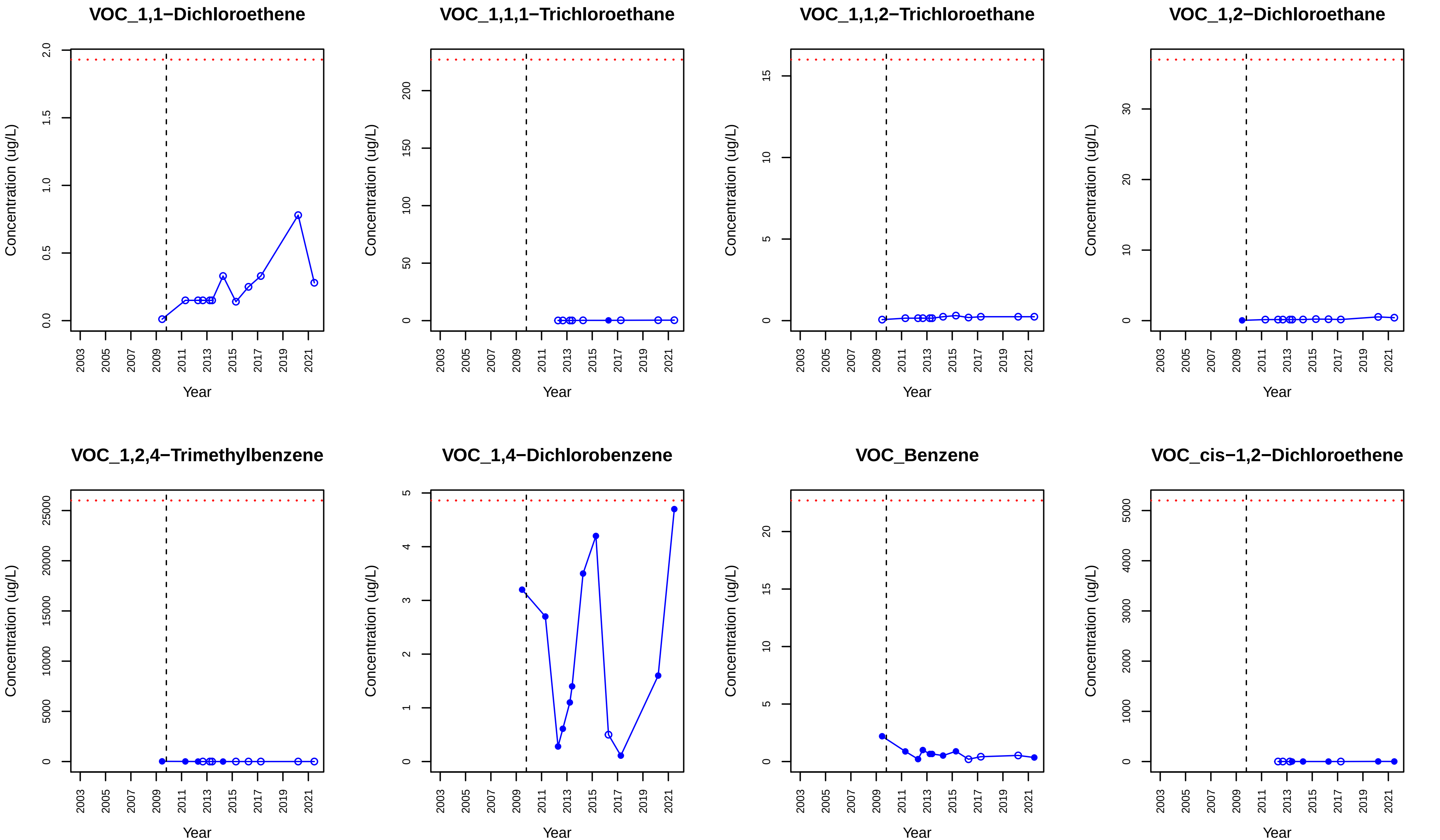

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30

## CDM−15



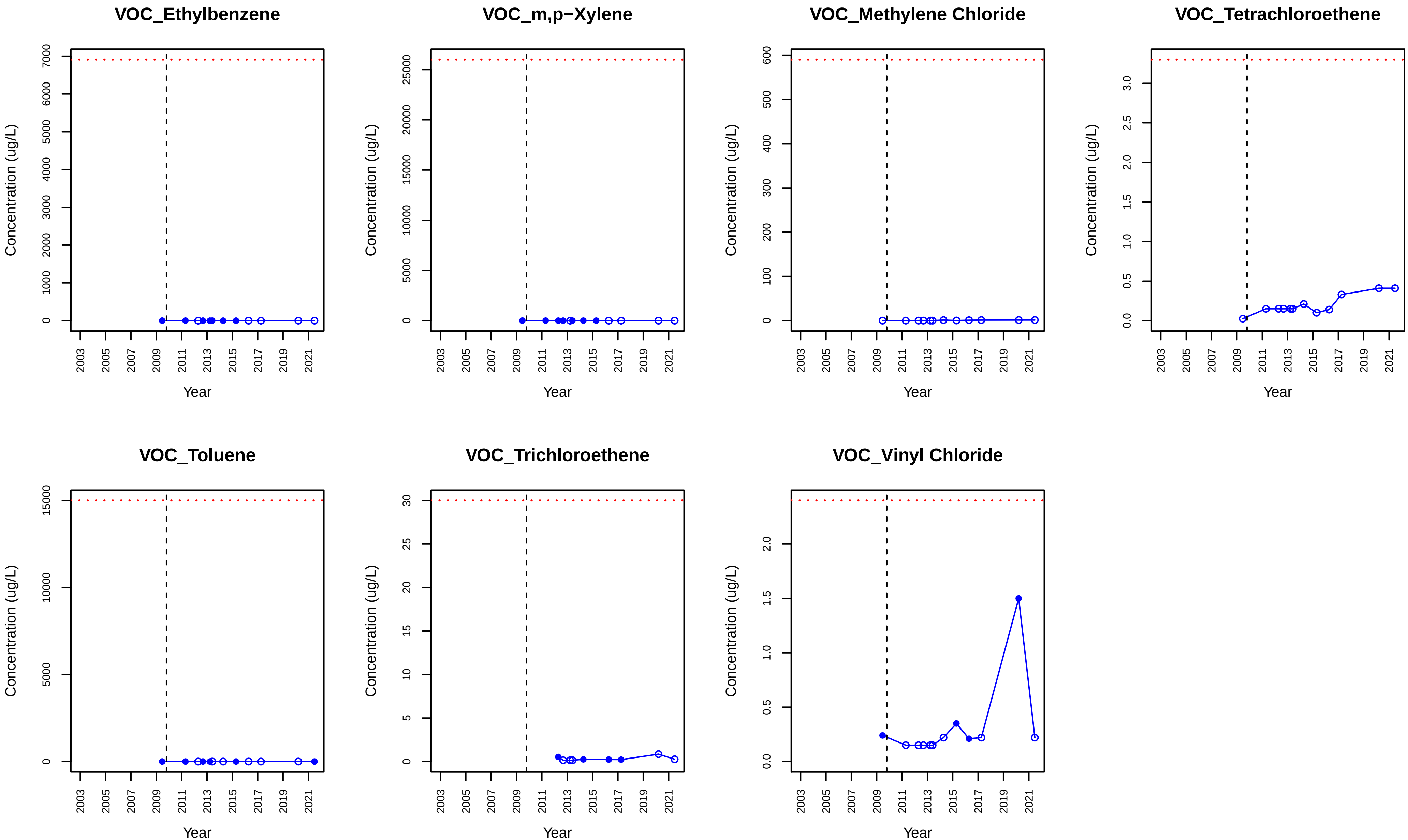
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−15

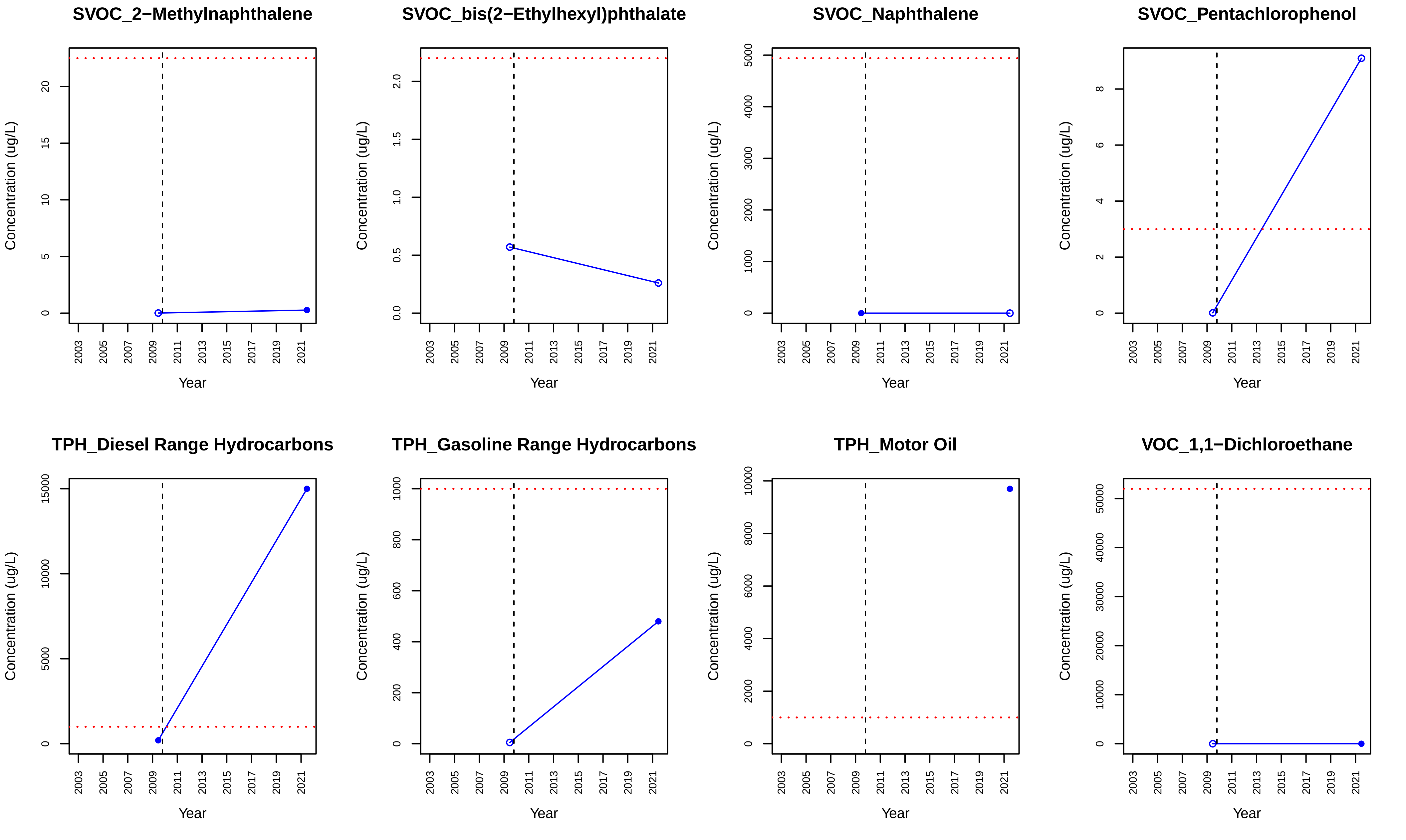


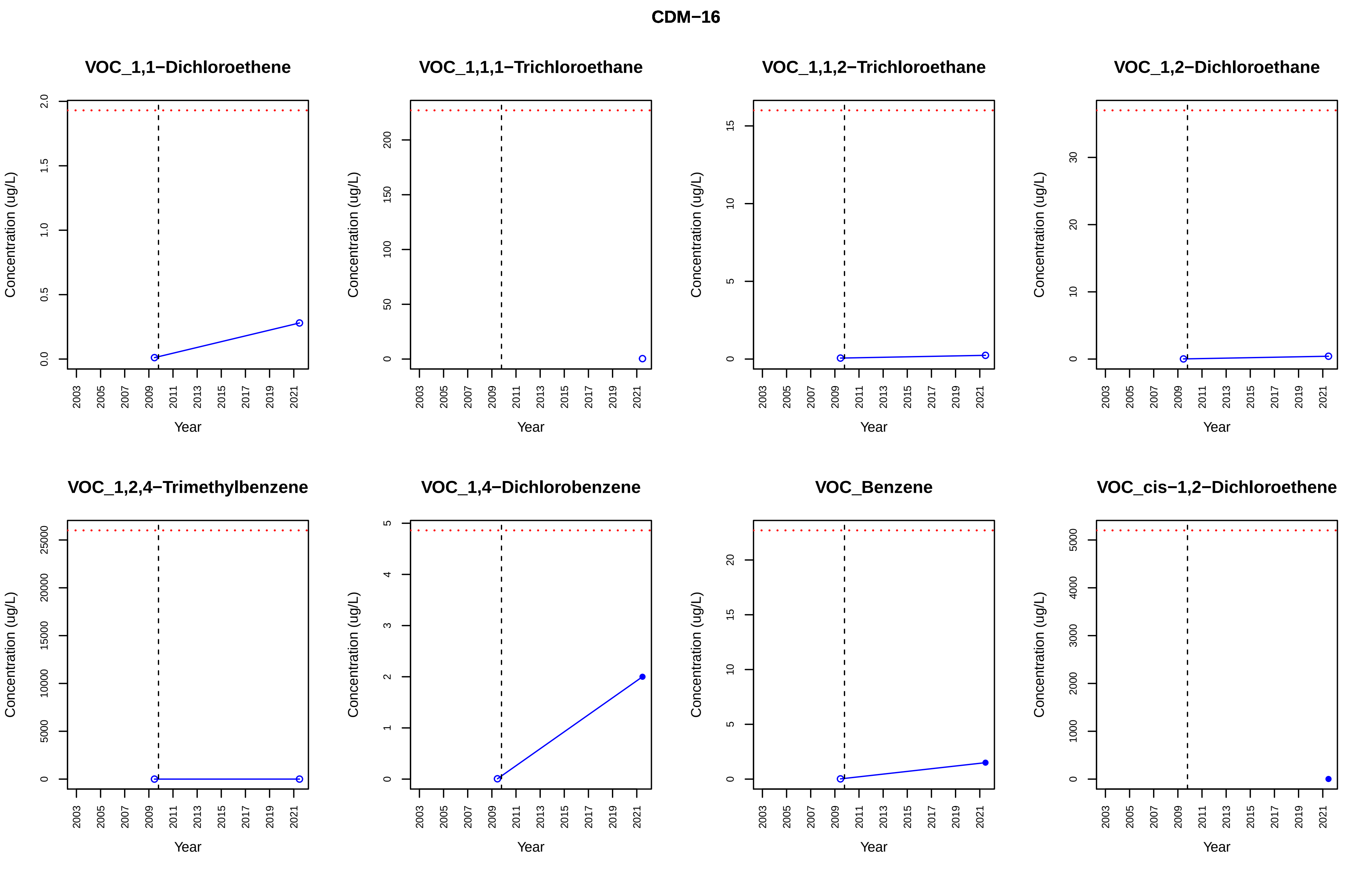
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−15

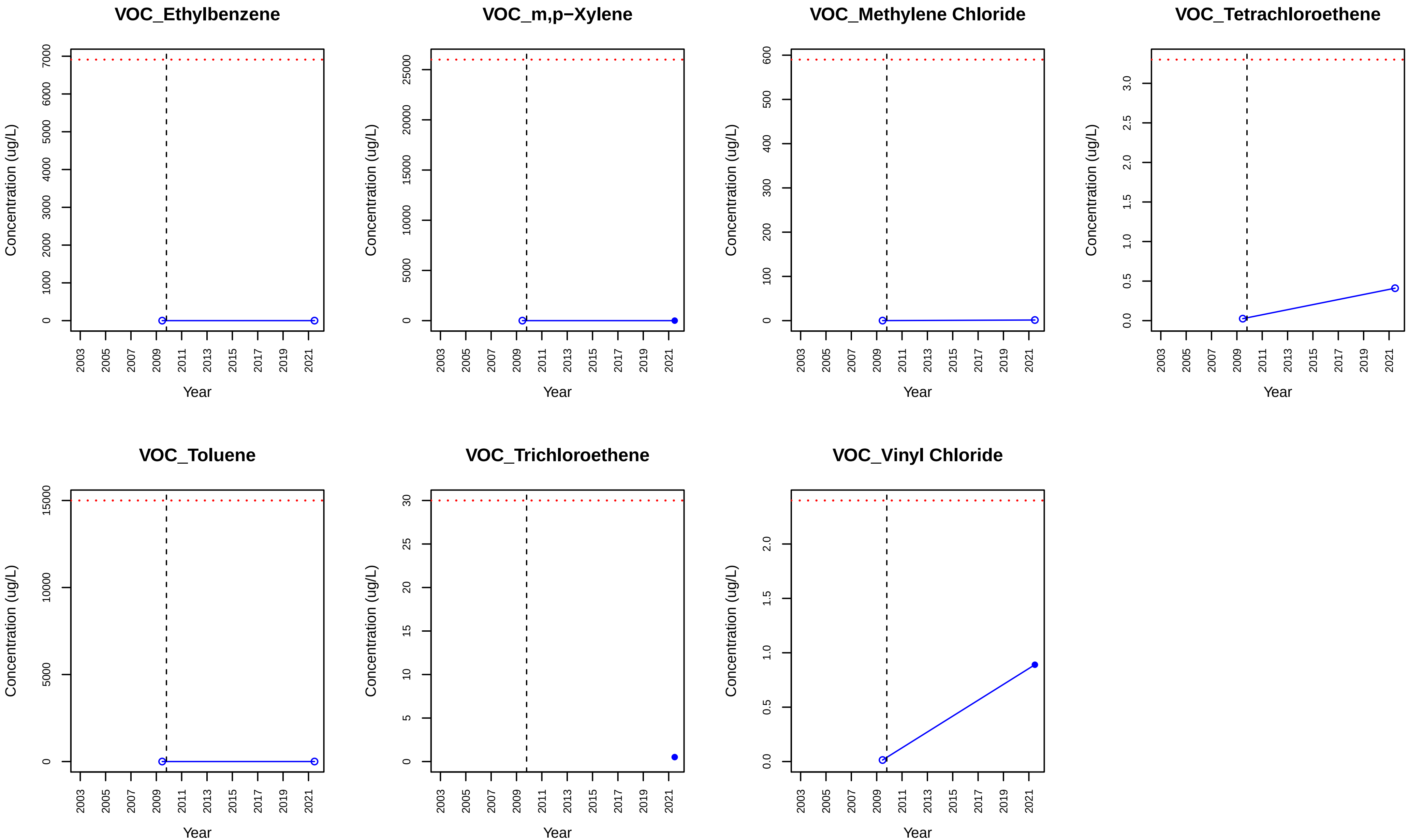

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**CDM−16**

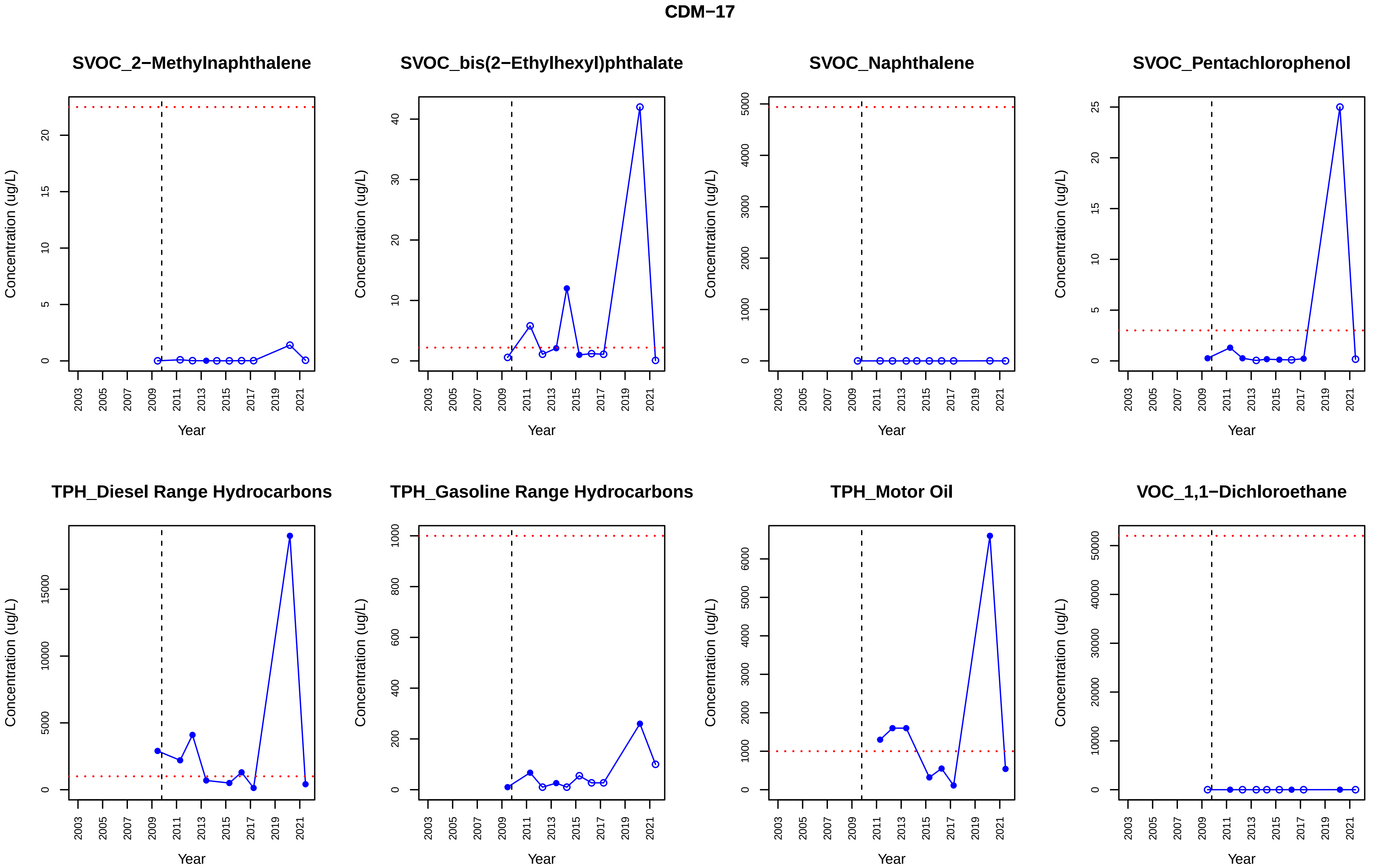

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

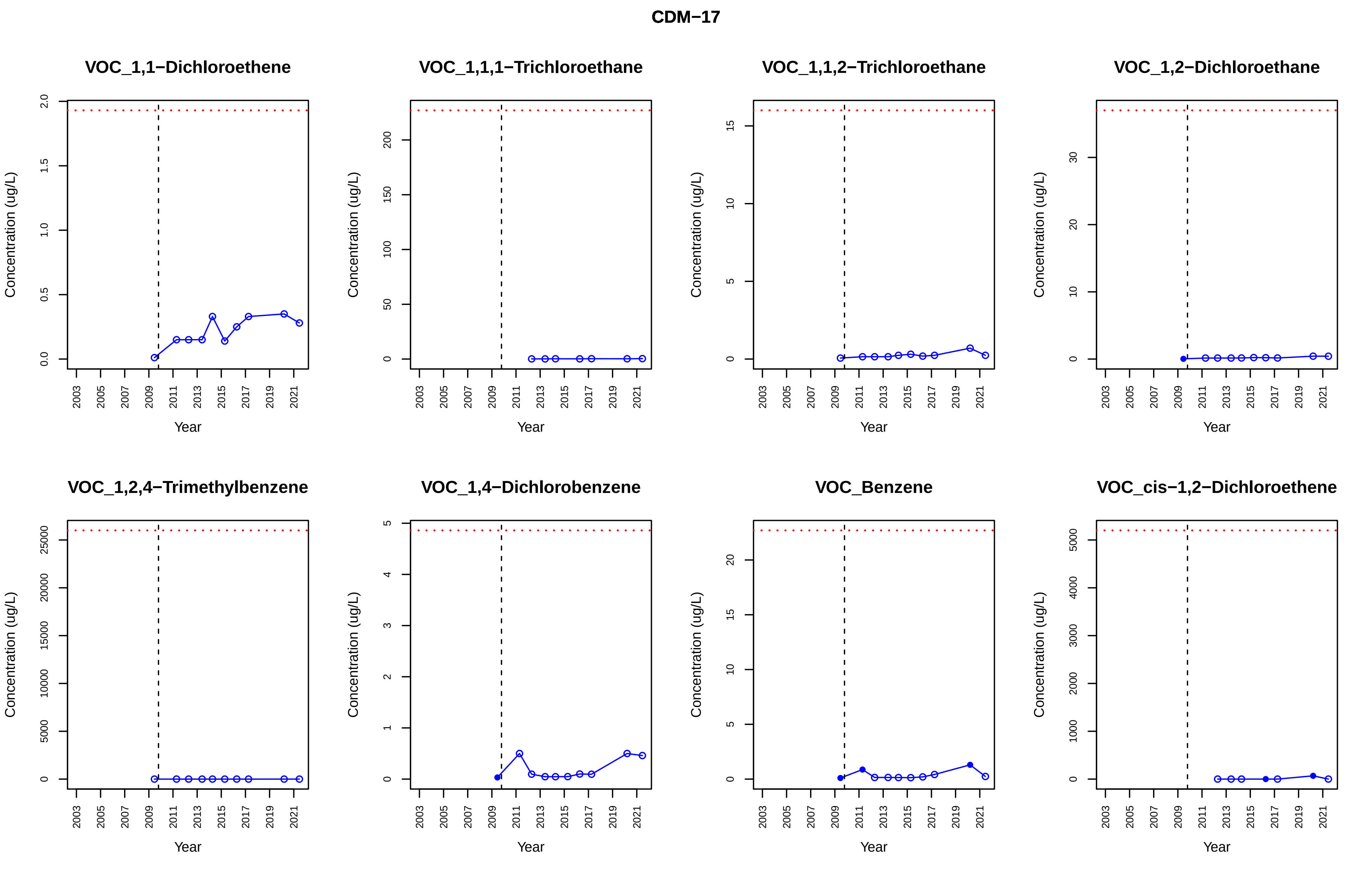

CDM−16
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−16

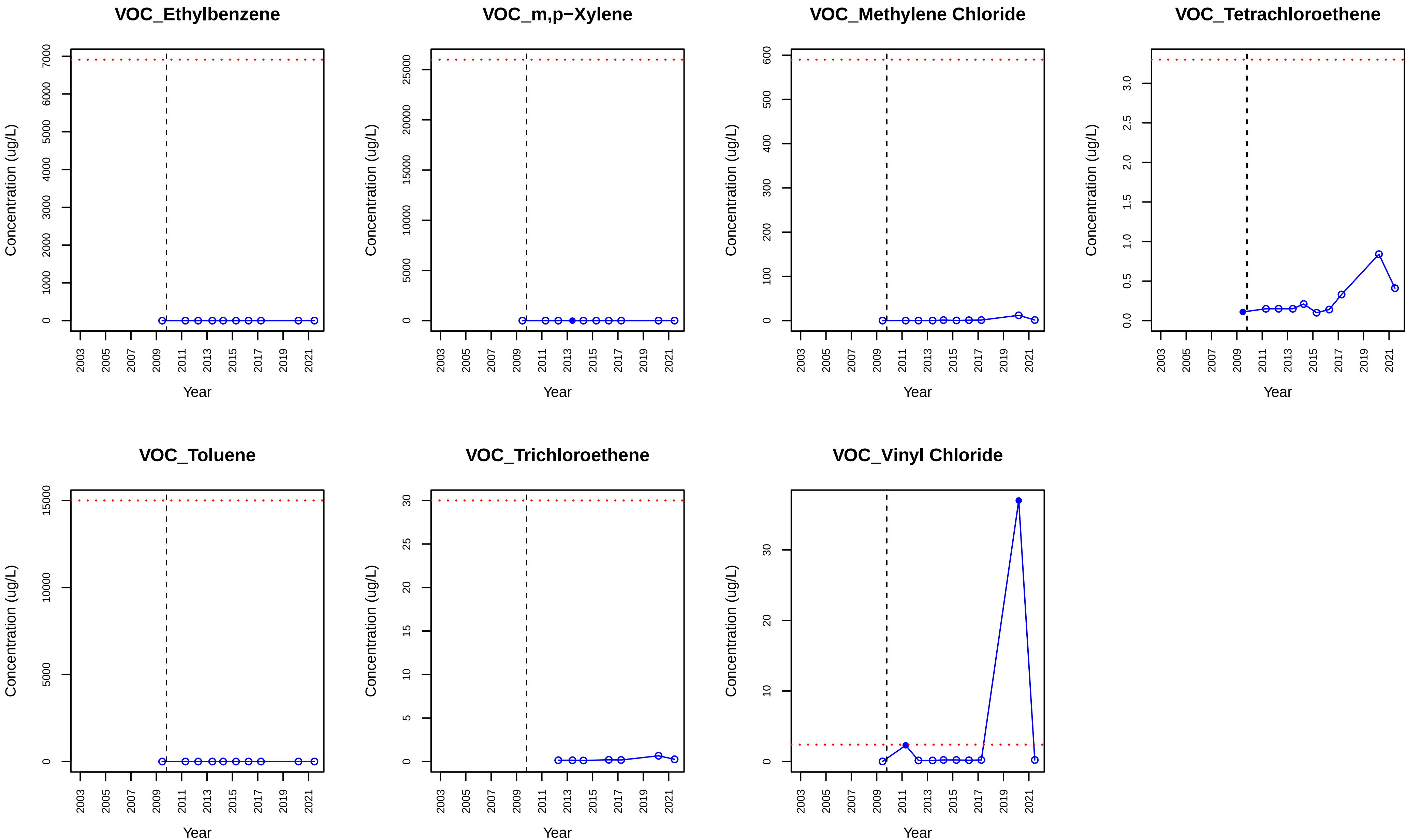


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30

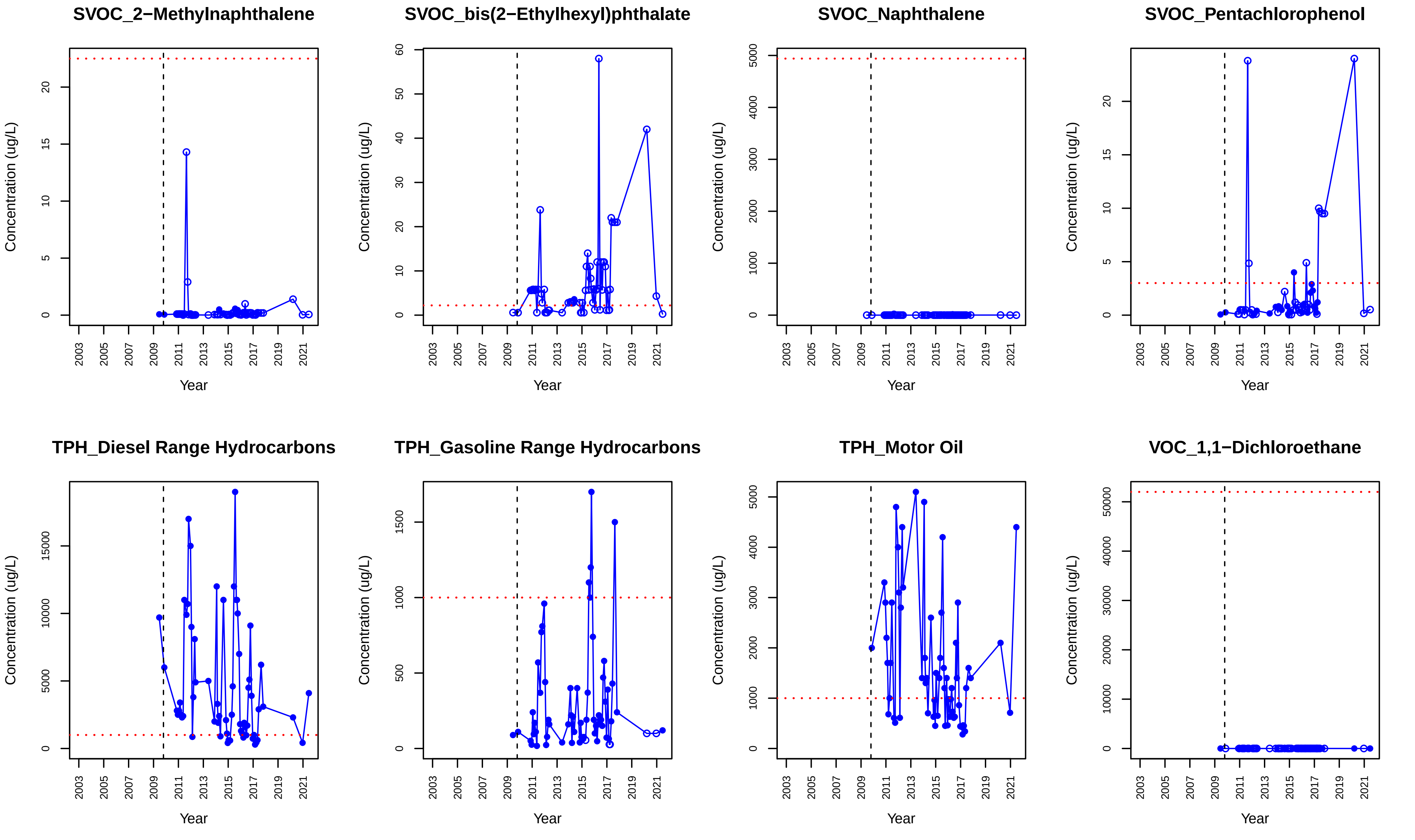

CDM−17
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


CDM−17
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

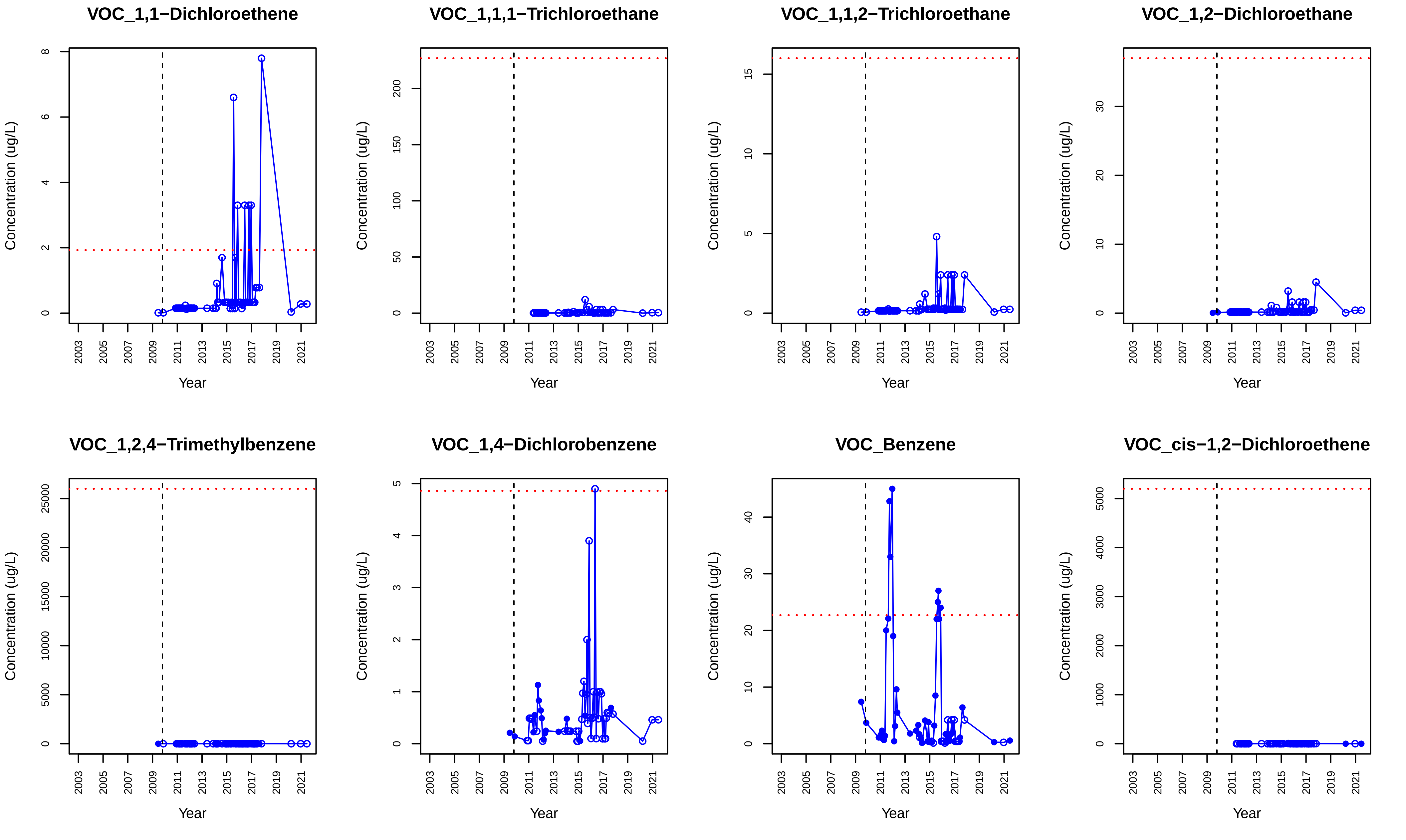
# CDM−17


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

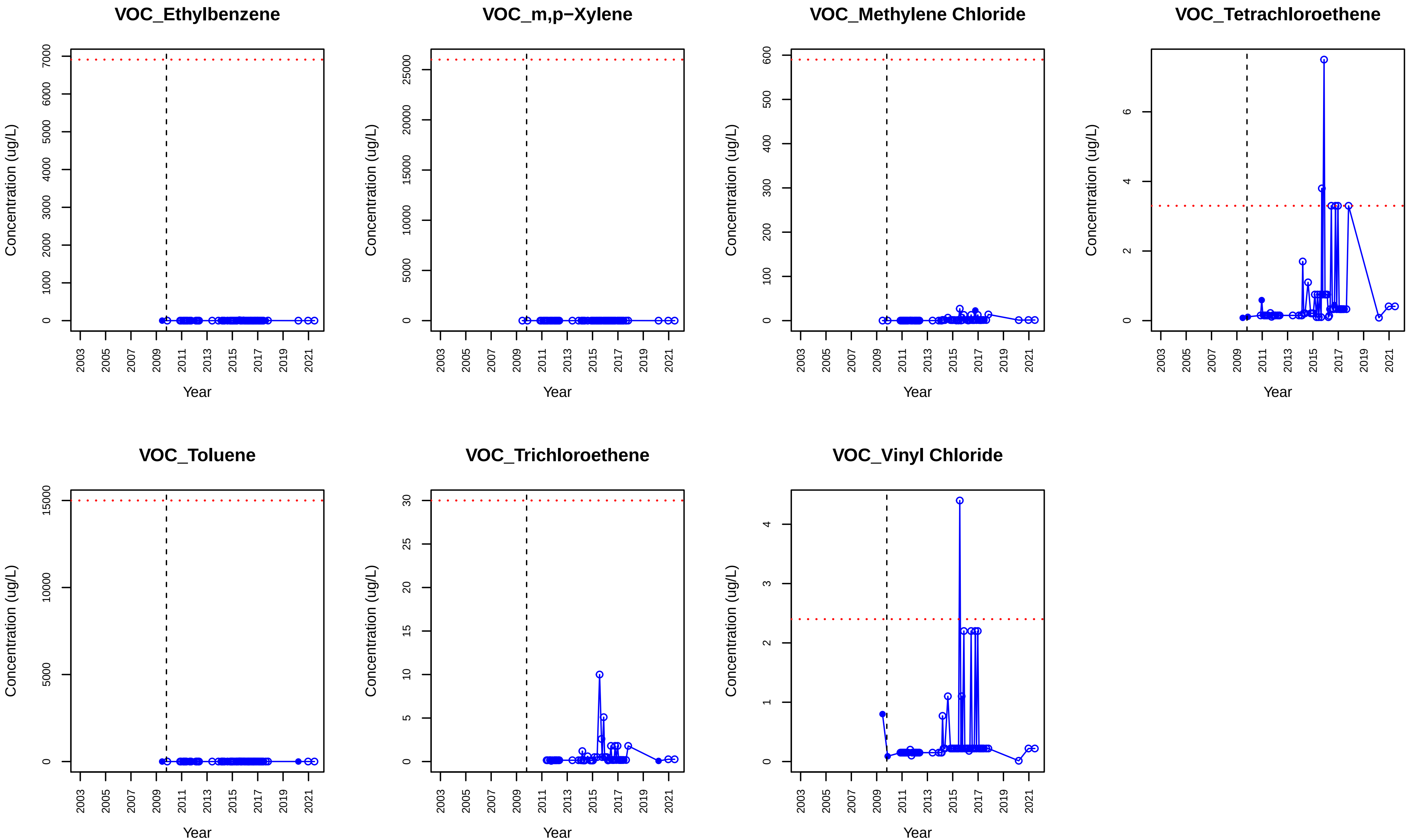
# CDM−19


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

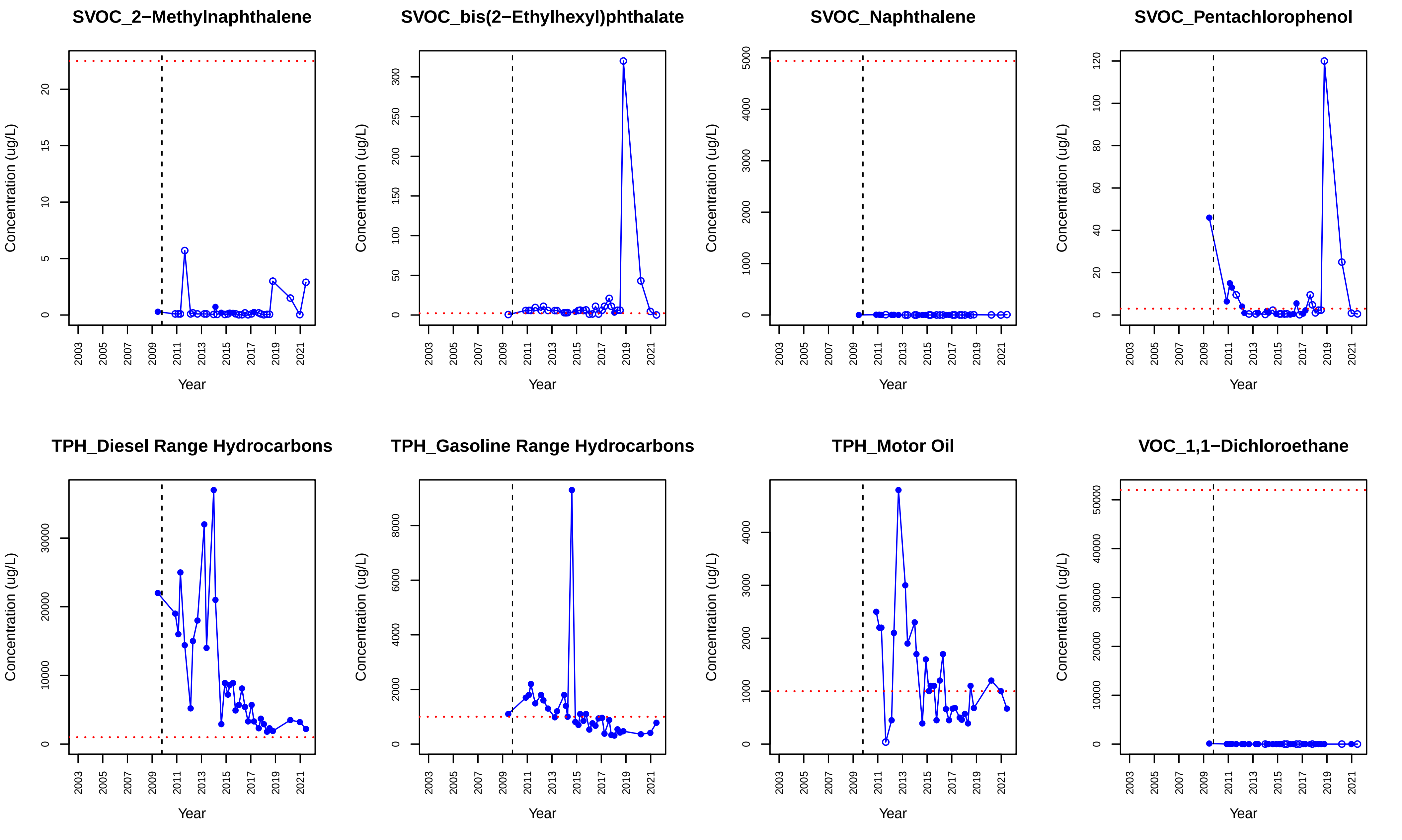
## CDM−19


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−19

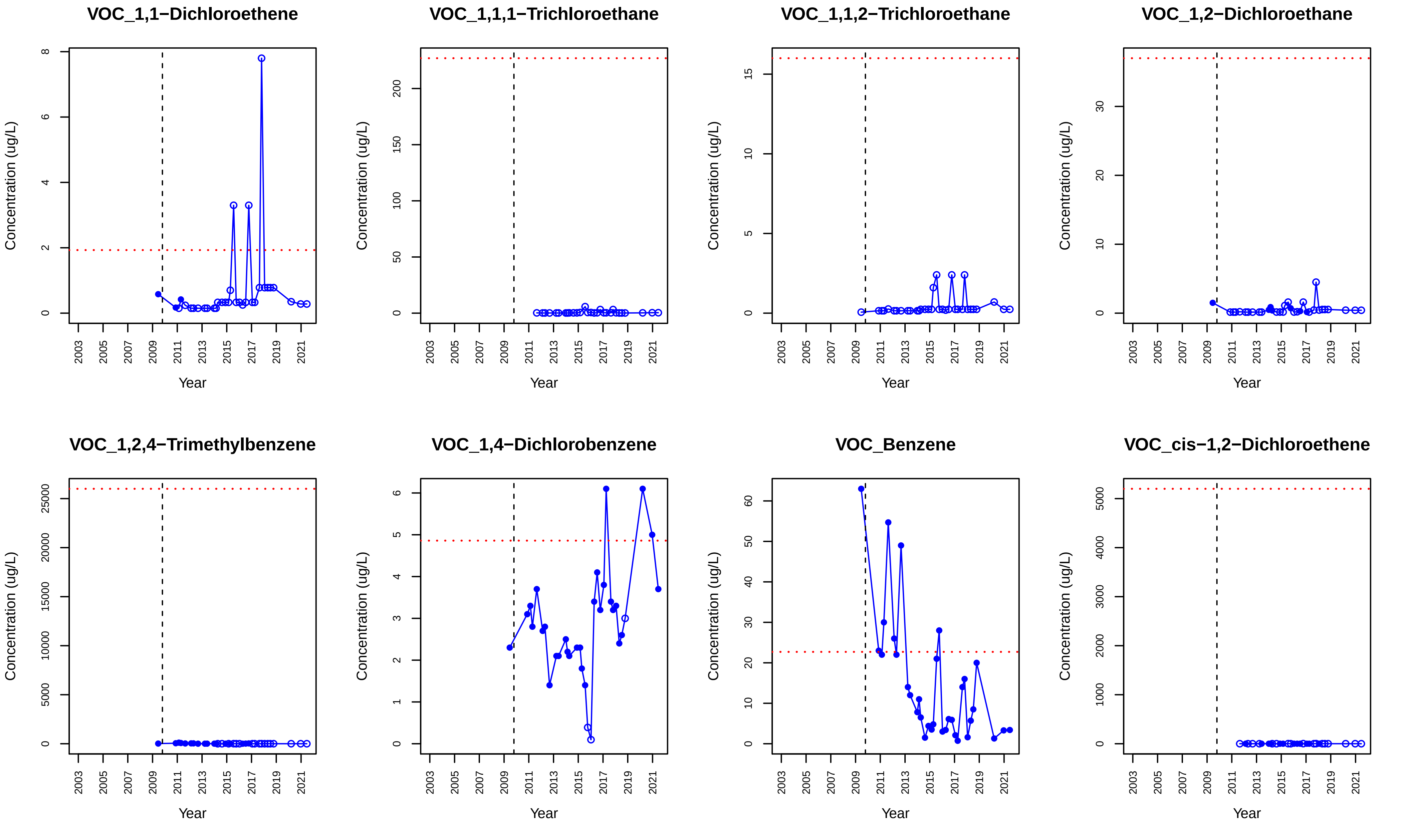

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−20

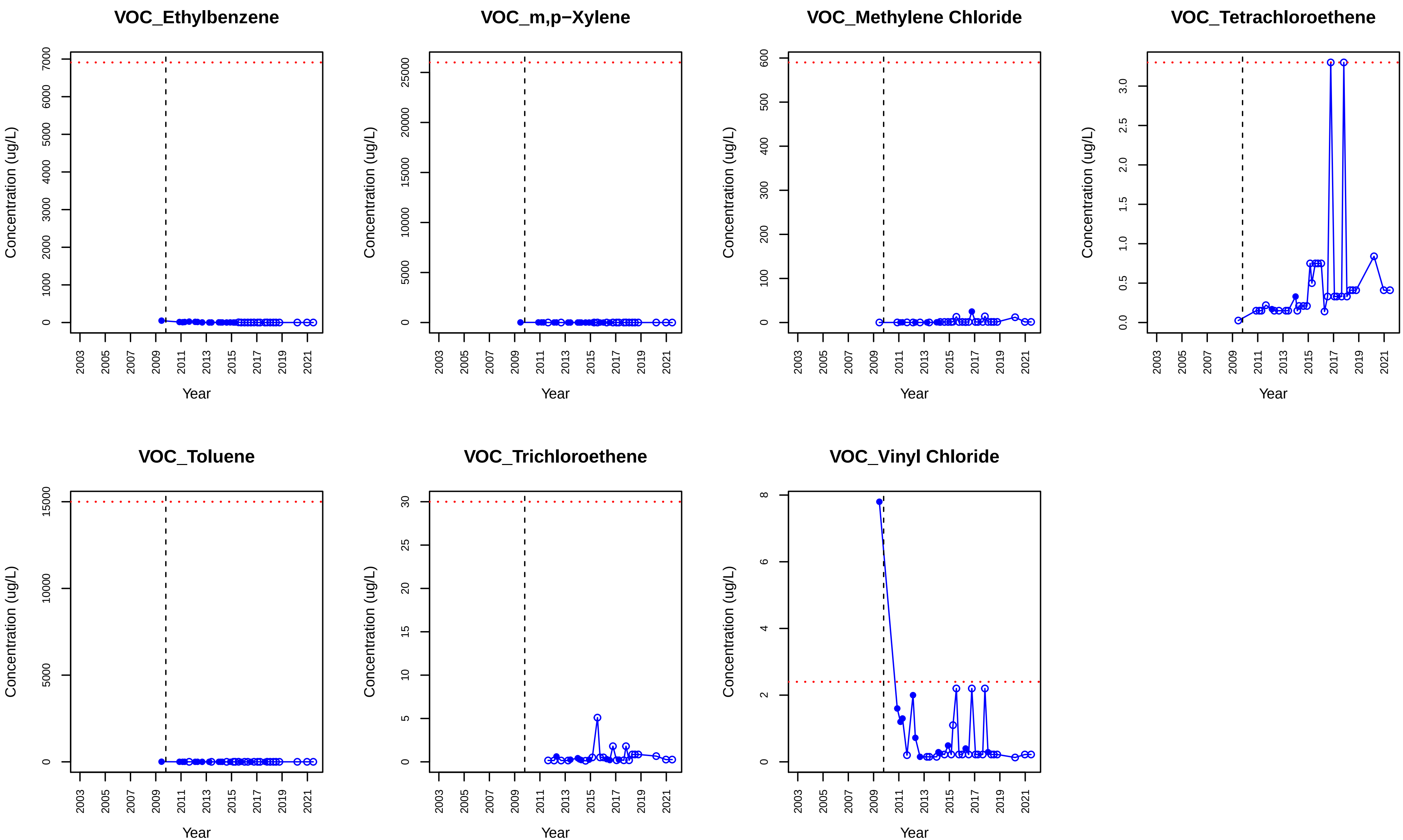


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 5 10 15 20
0 50 100 150 200 250 300
0 1000 2000 3000 4000 5000
0 20 40 60 80 100 120
0 10000 20000 30000
0 2000 4000 6000 8000
0 1000 2000 3000 4000
0 10000 20000 30000 40000 50000

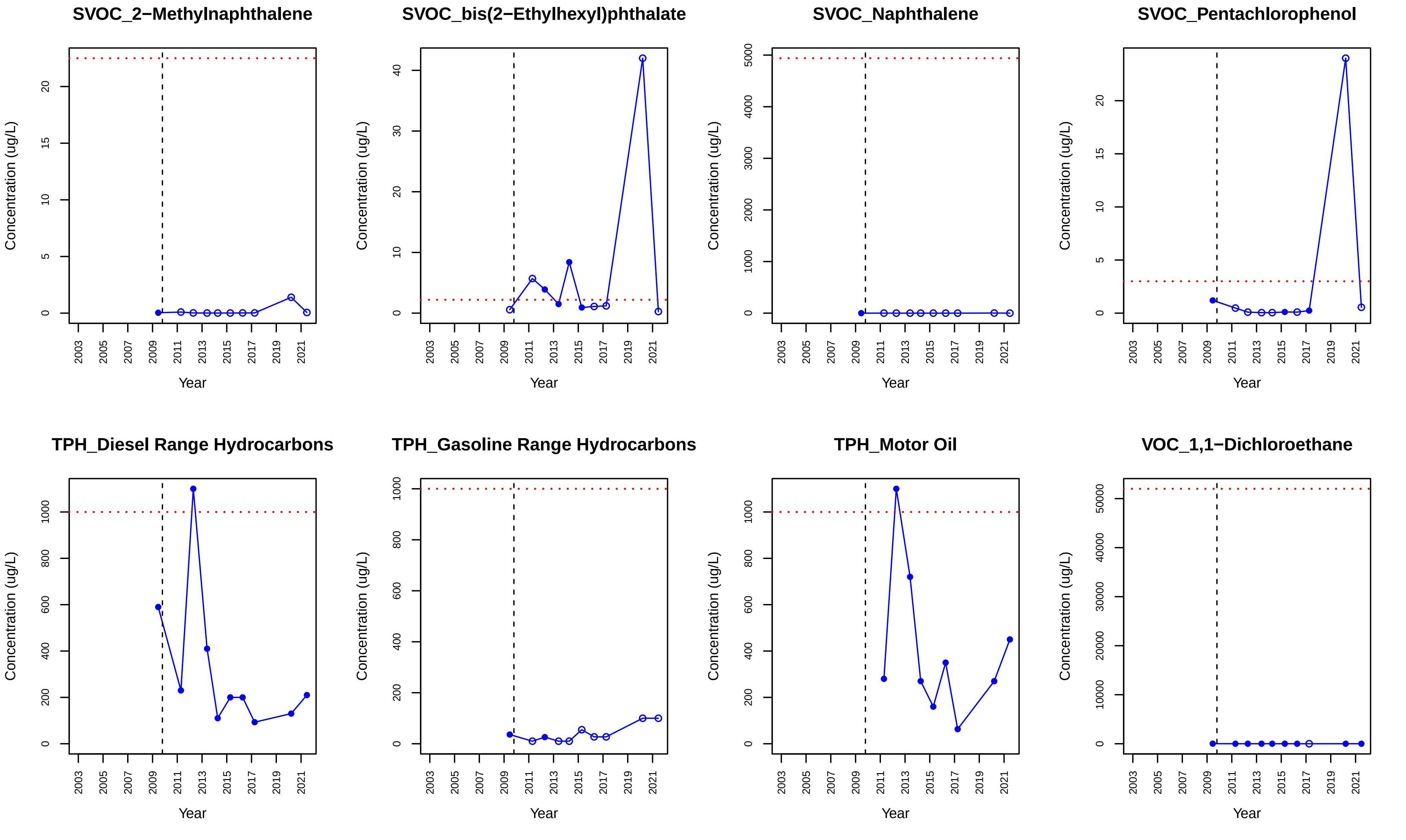
**CDM−20**

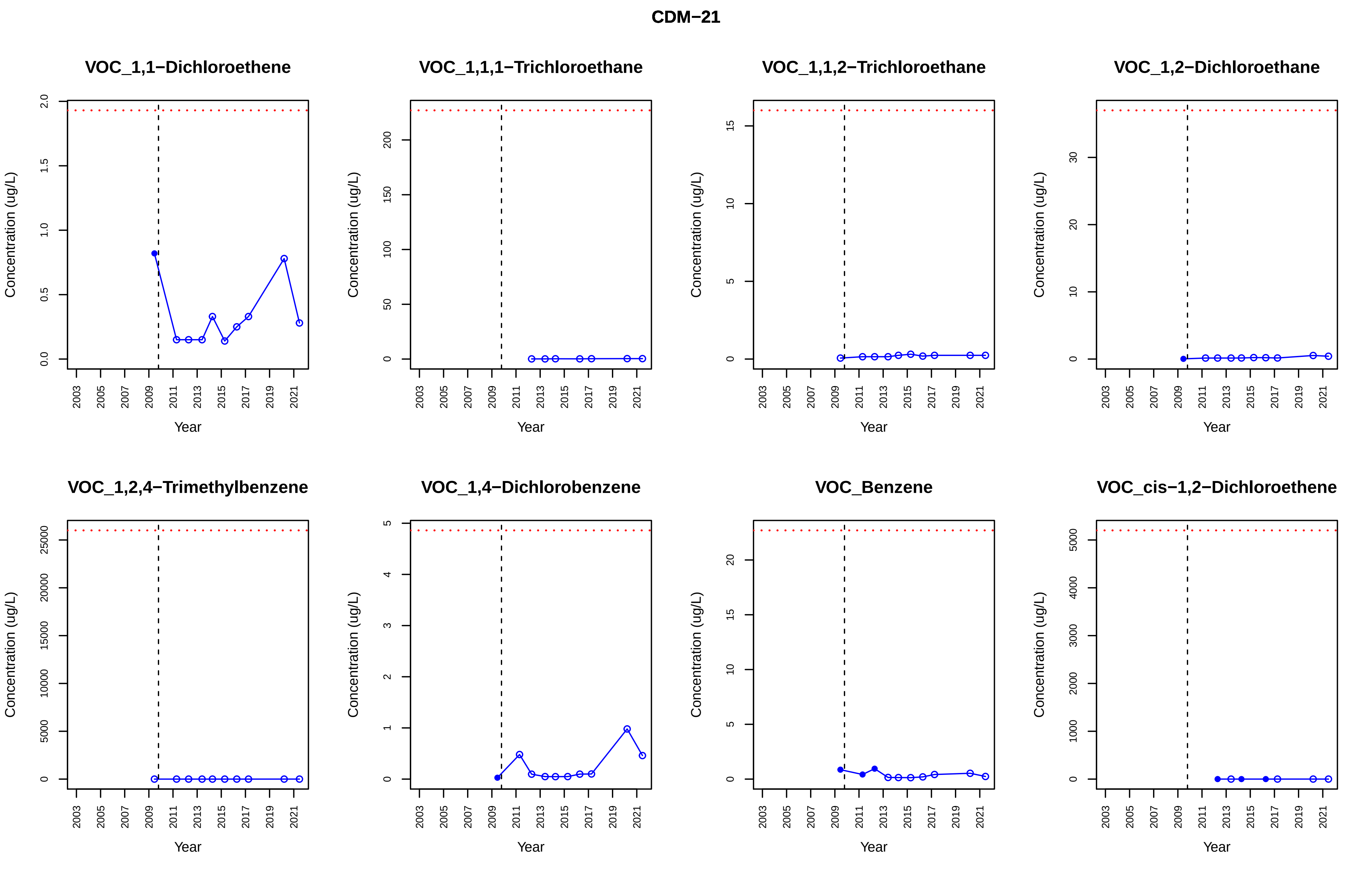

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−20


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

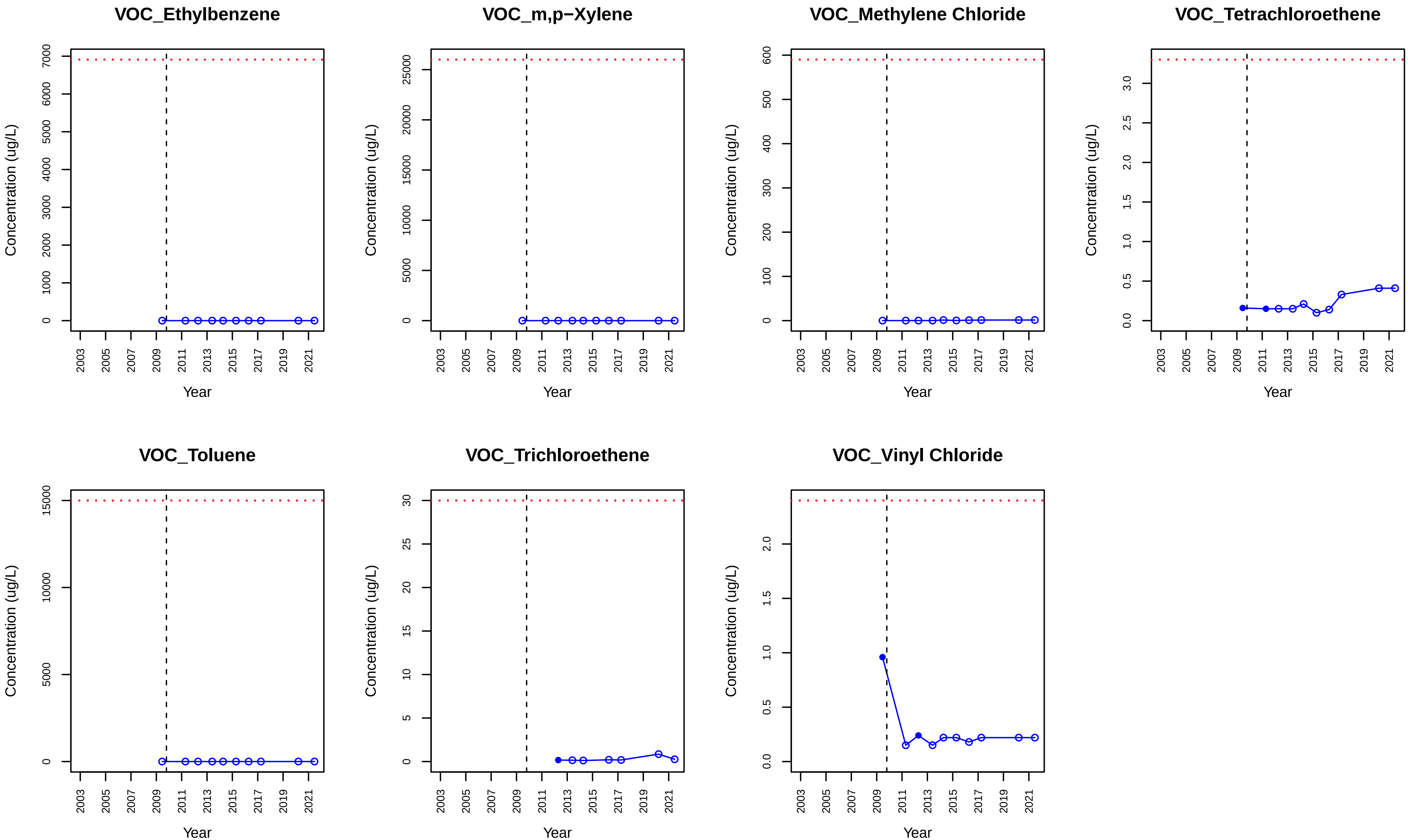
## CDM−21


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

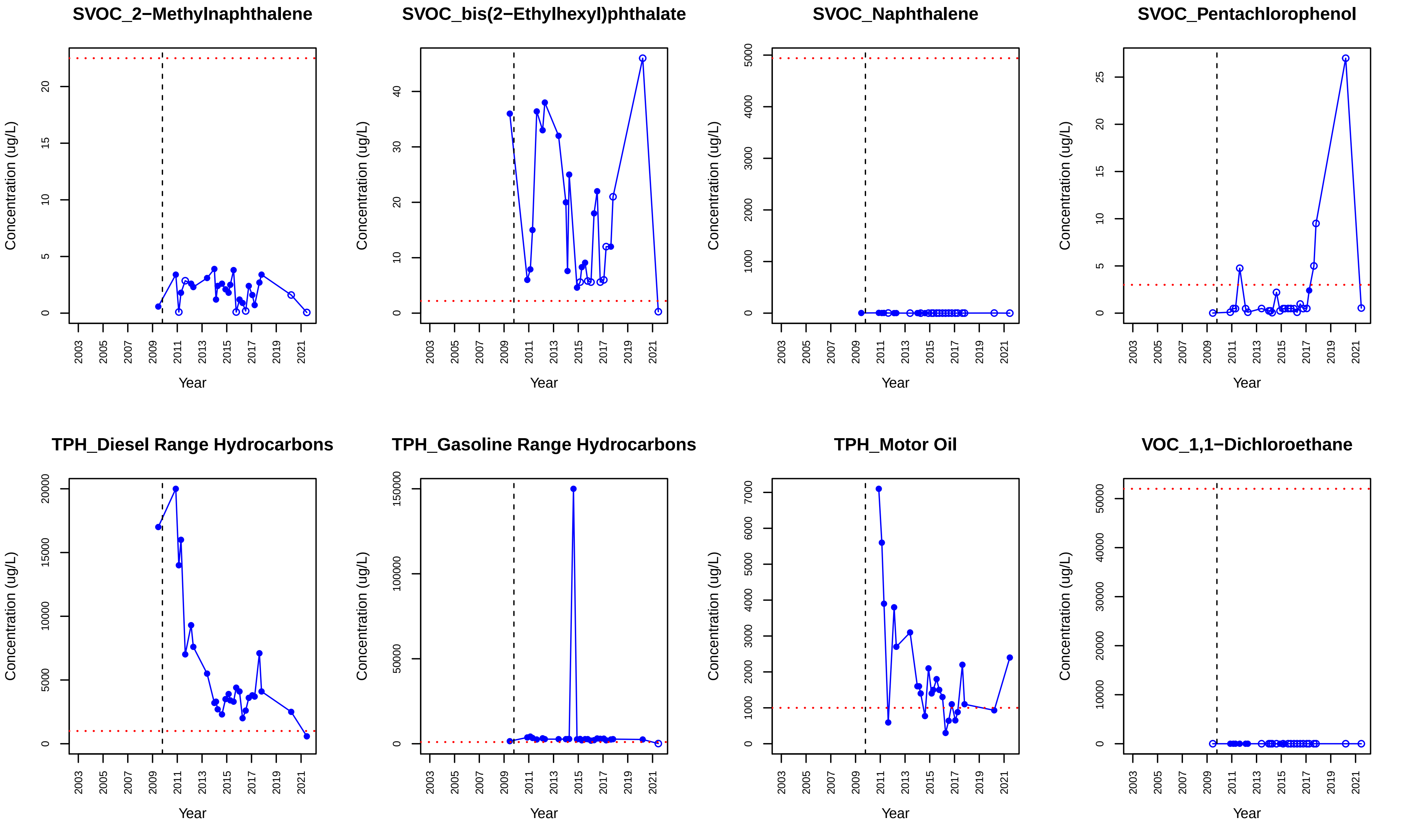


CDM−21
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−21

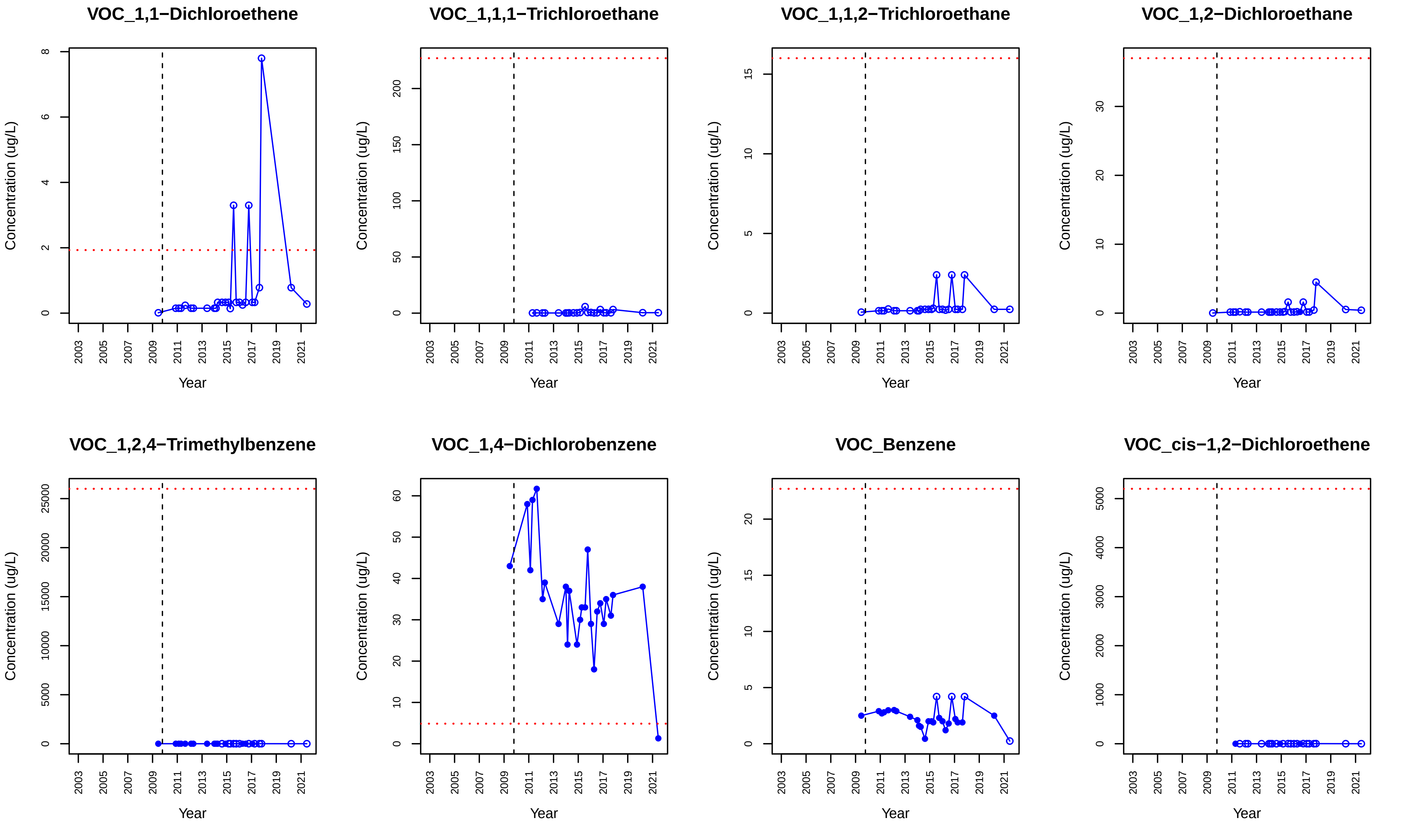

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30

CDM−22



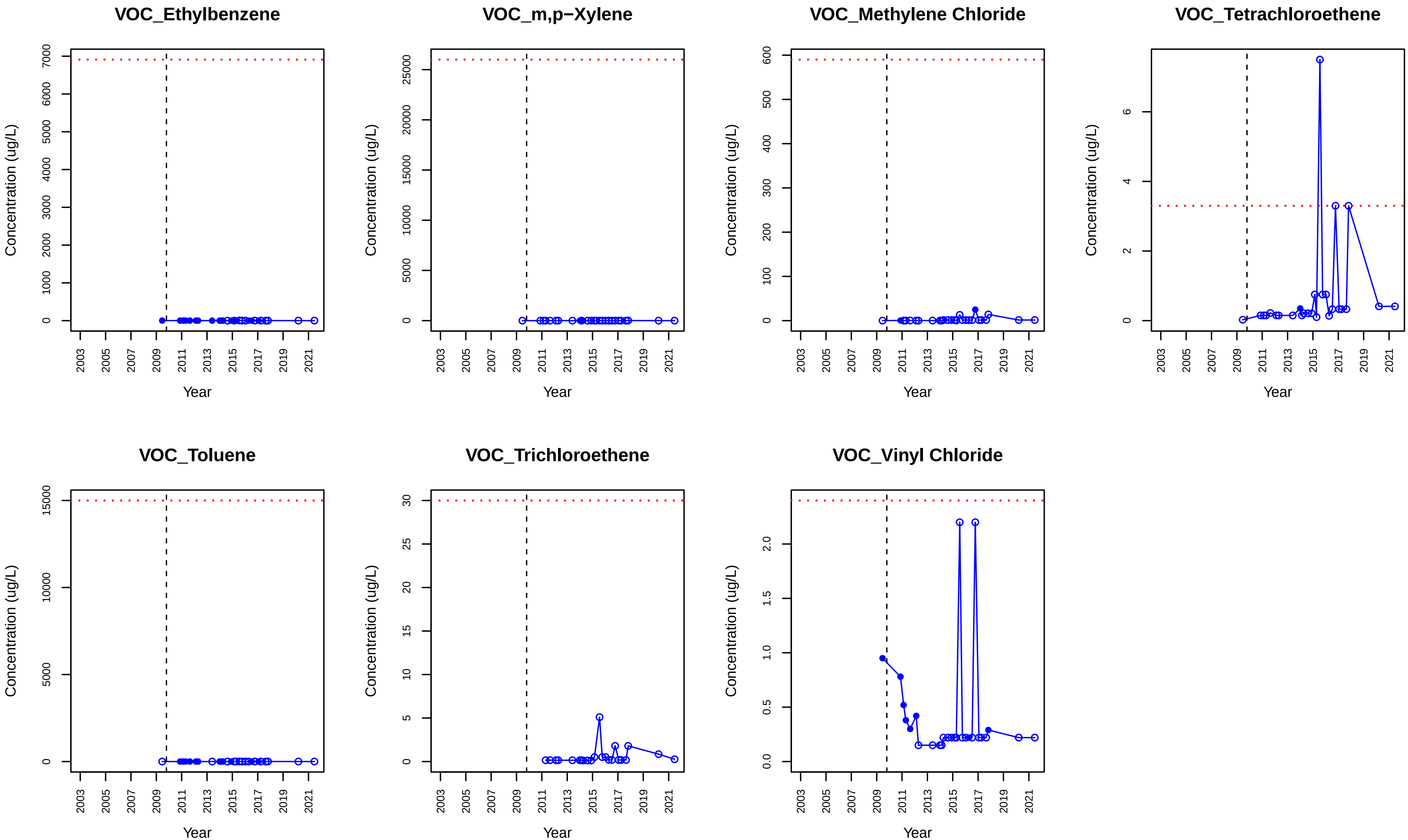
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−22

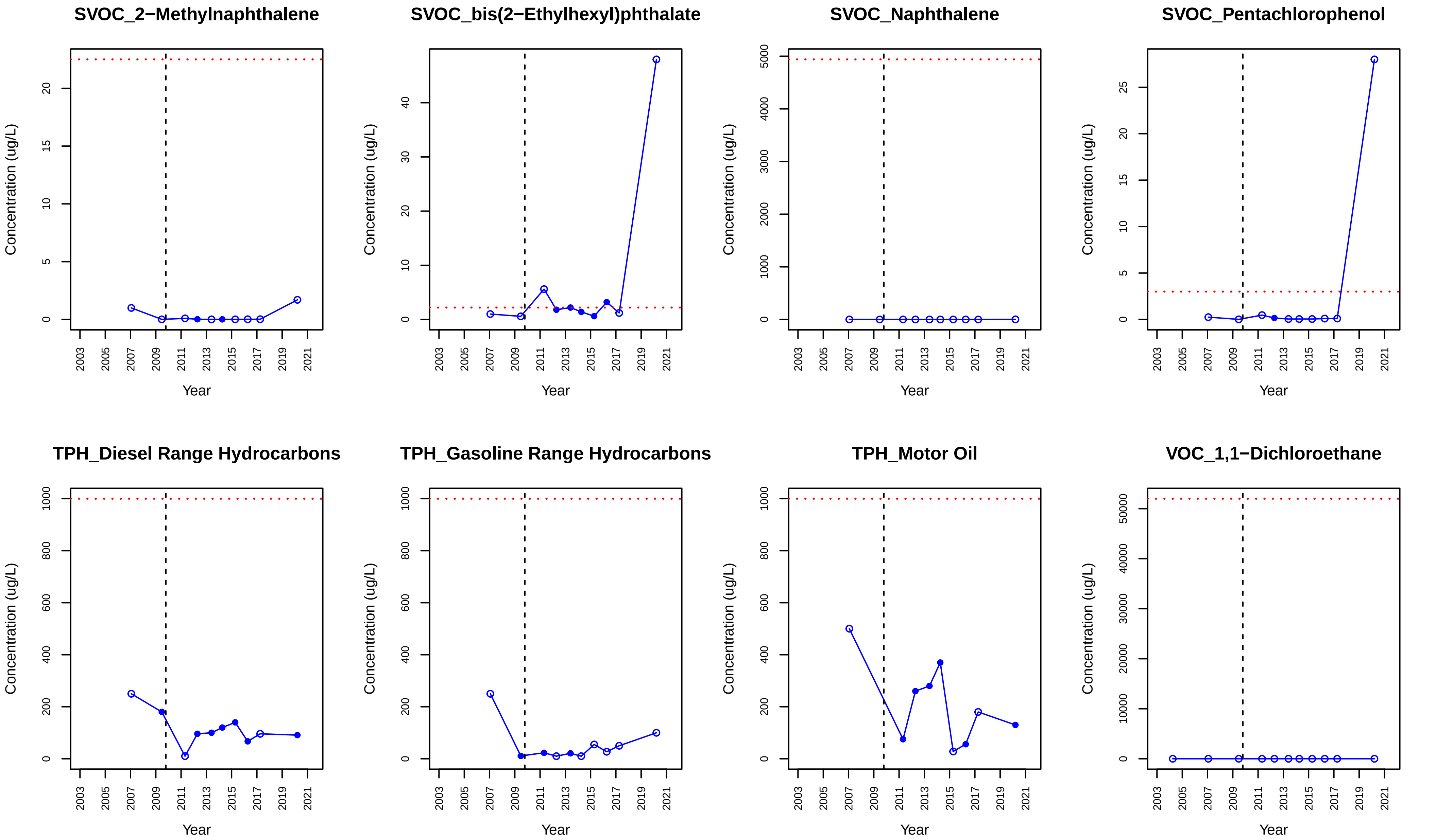


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

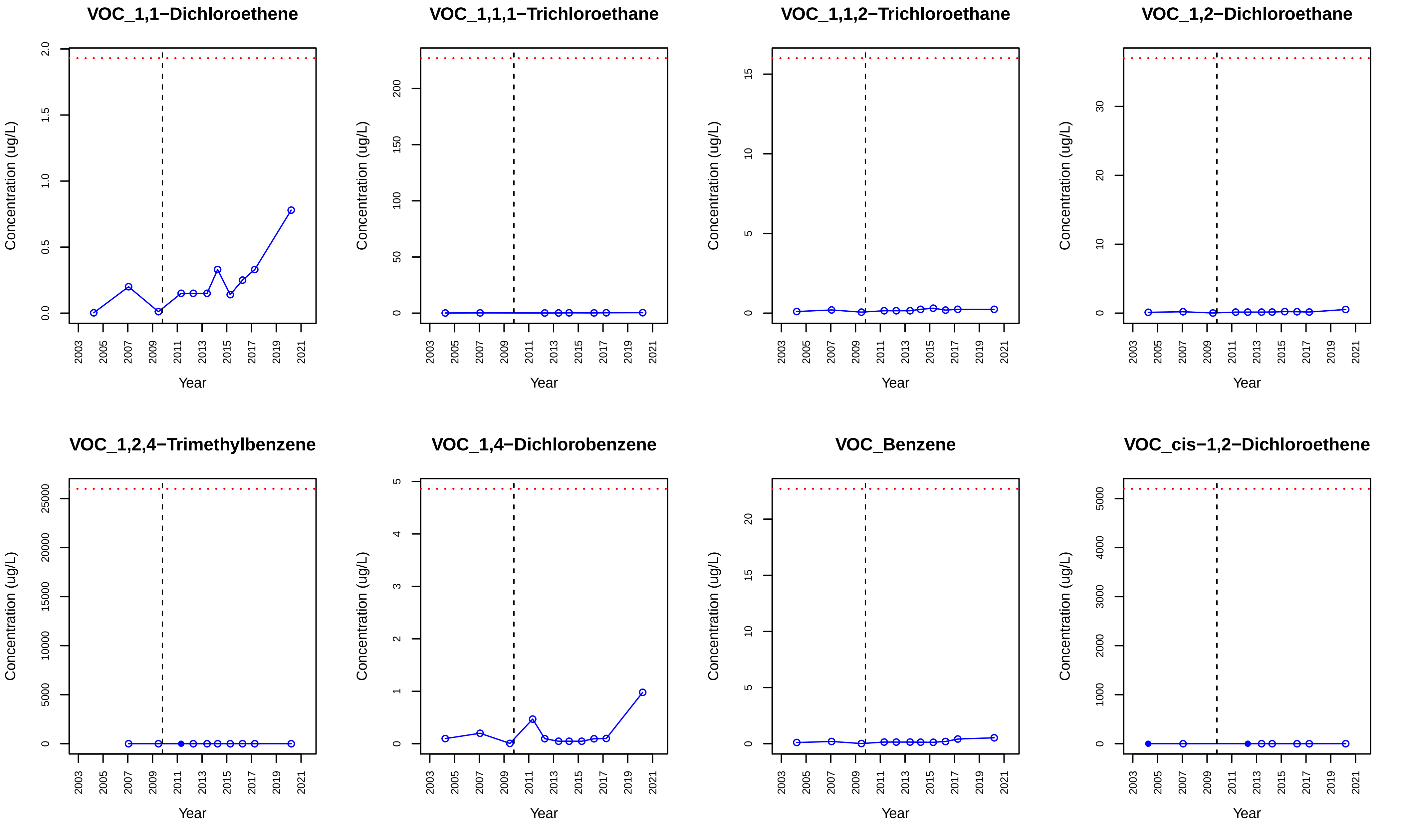
# CDM−22


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−26

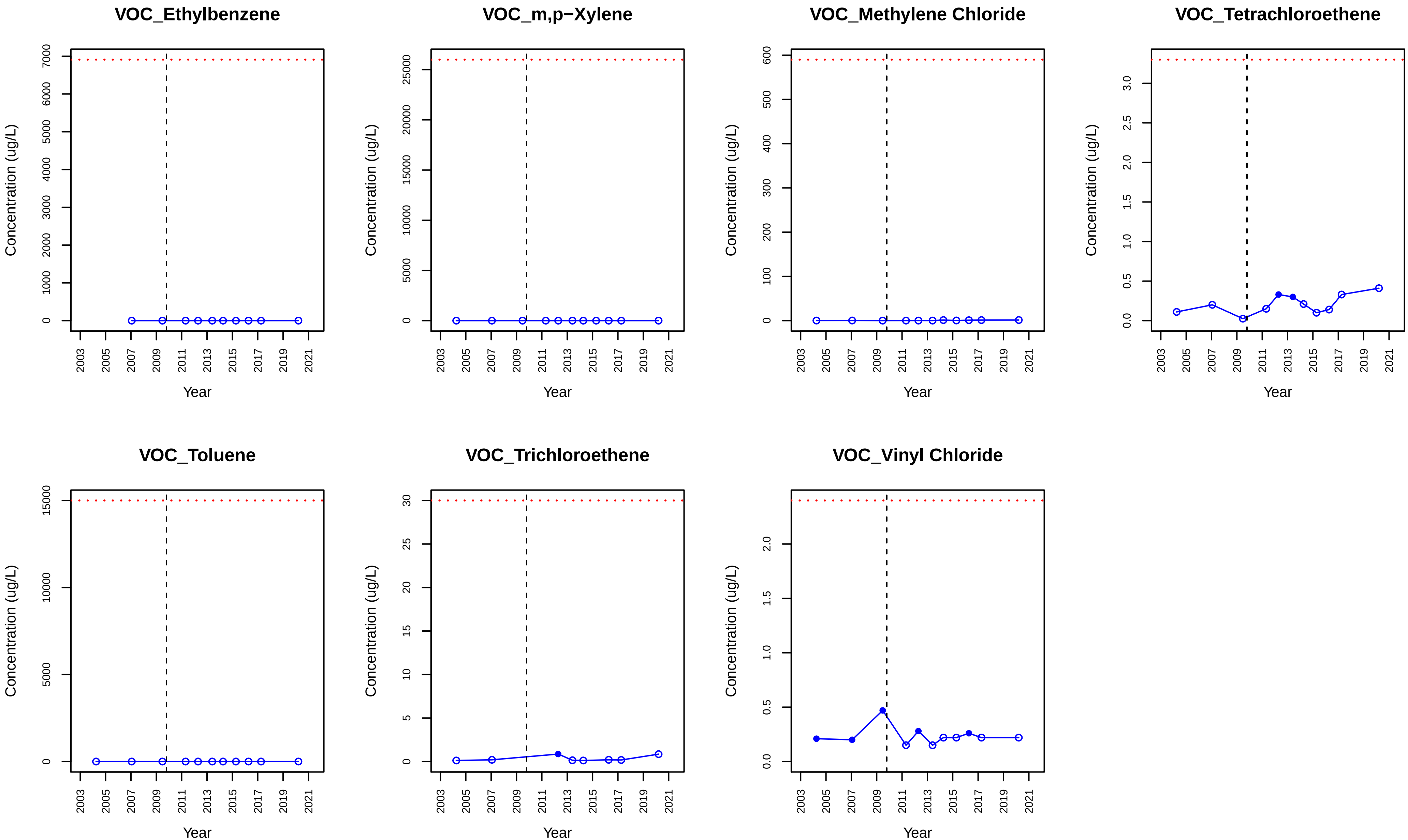

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−26



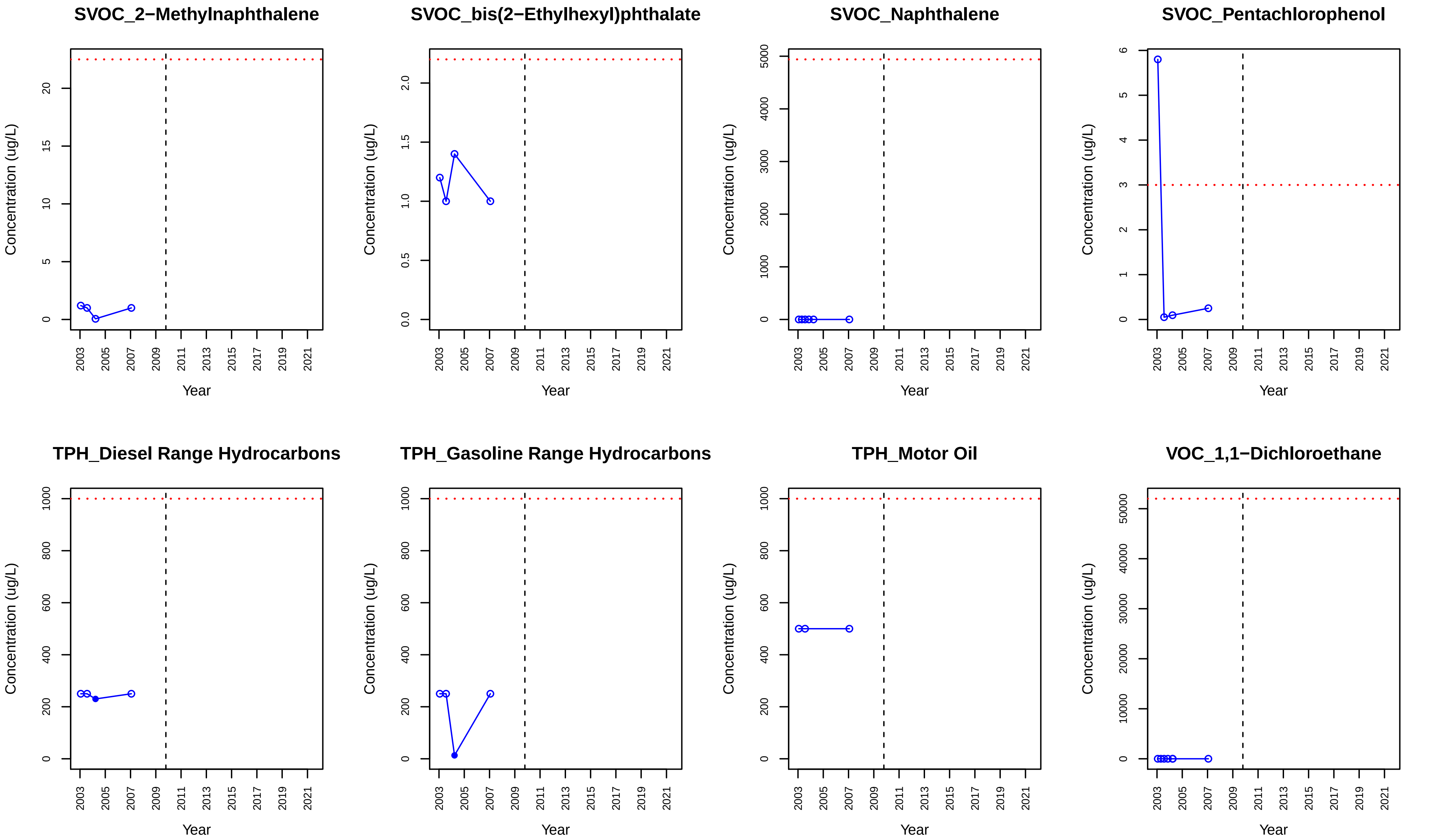
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**CDM−26**



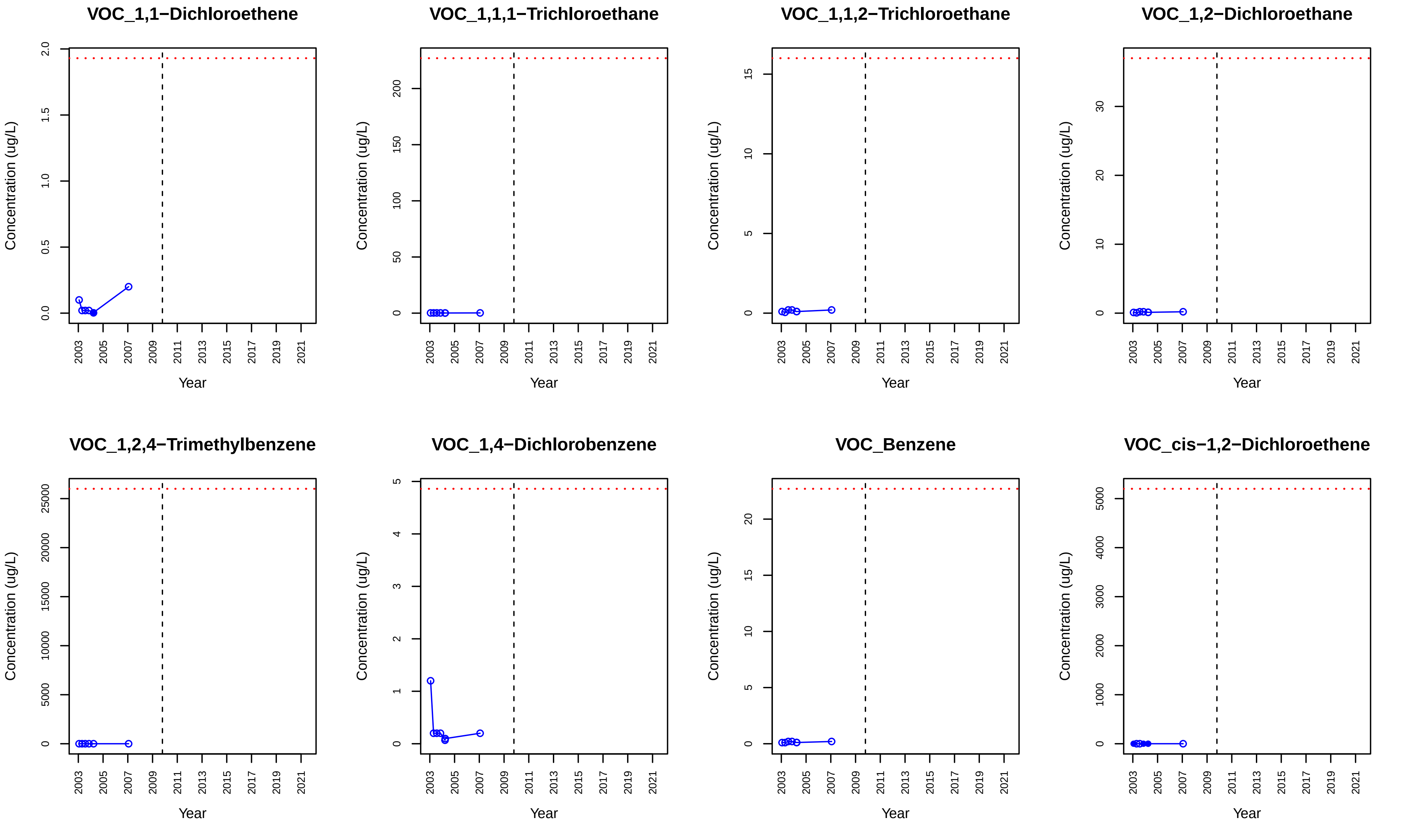
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## CDM−27

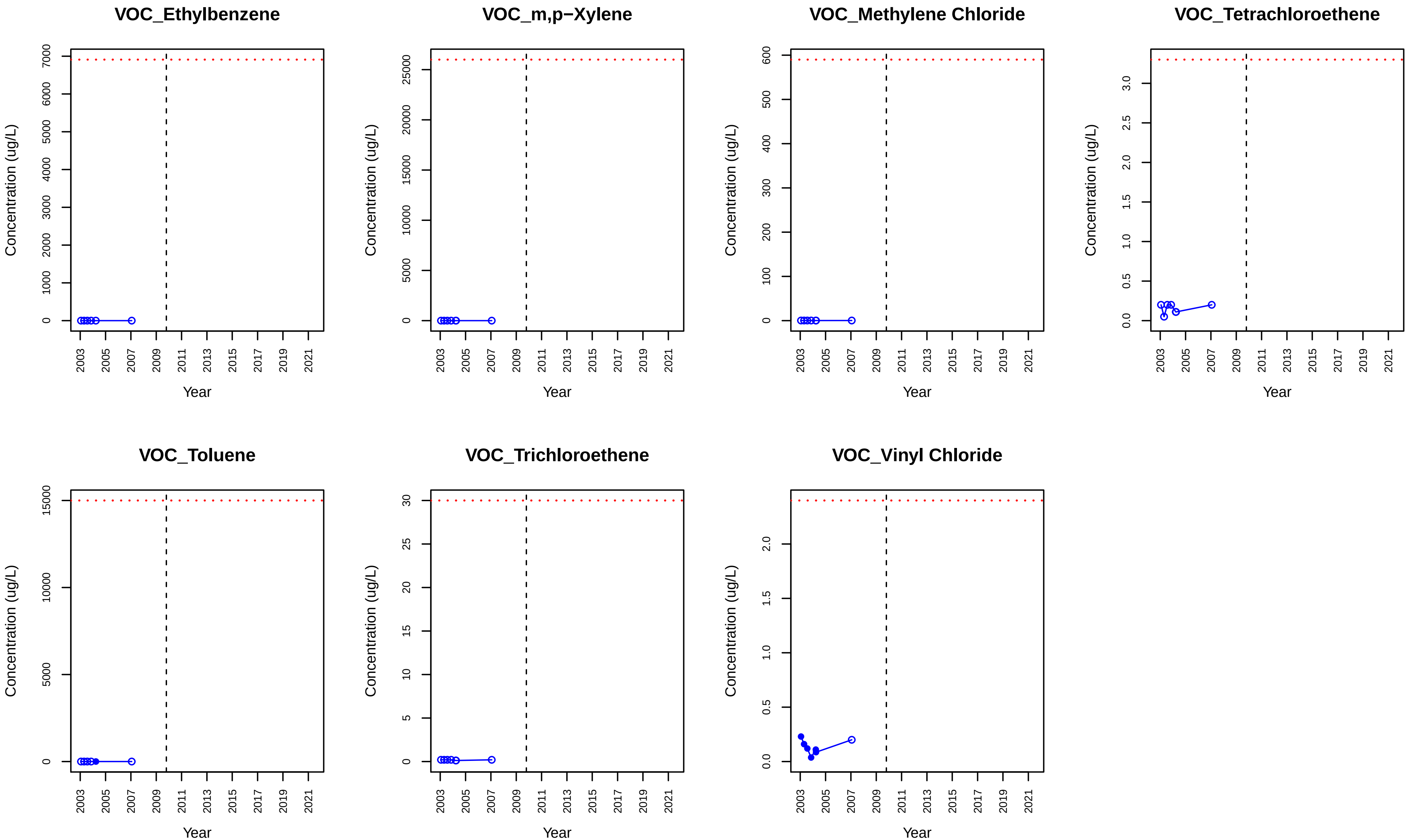


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**CDM−27**

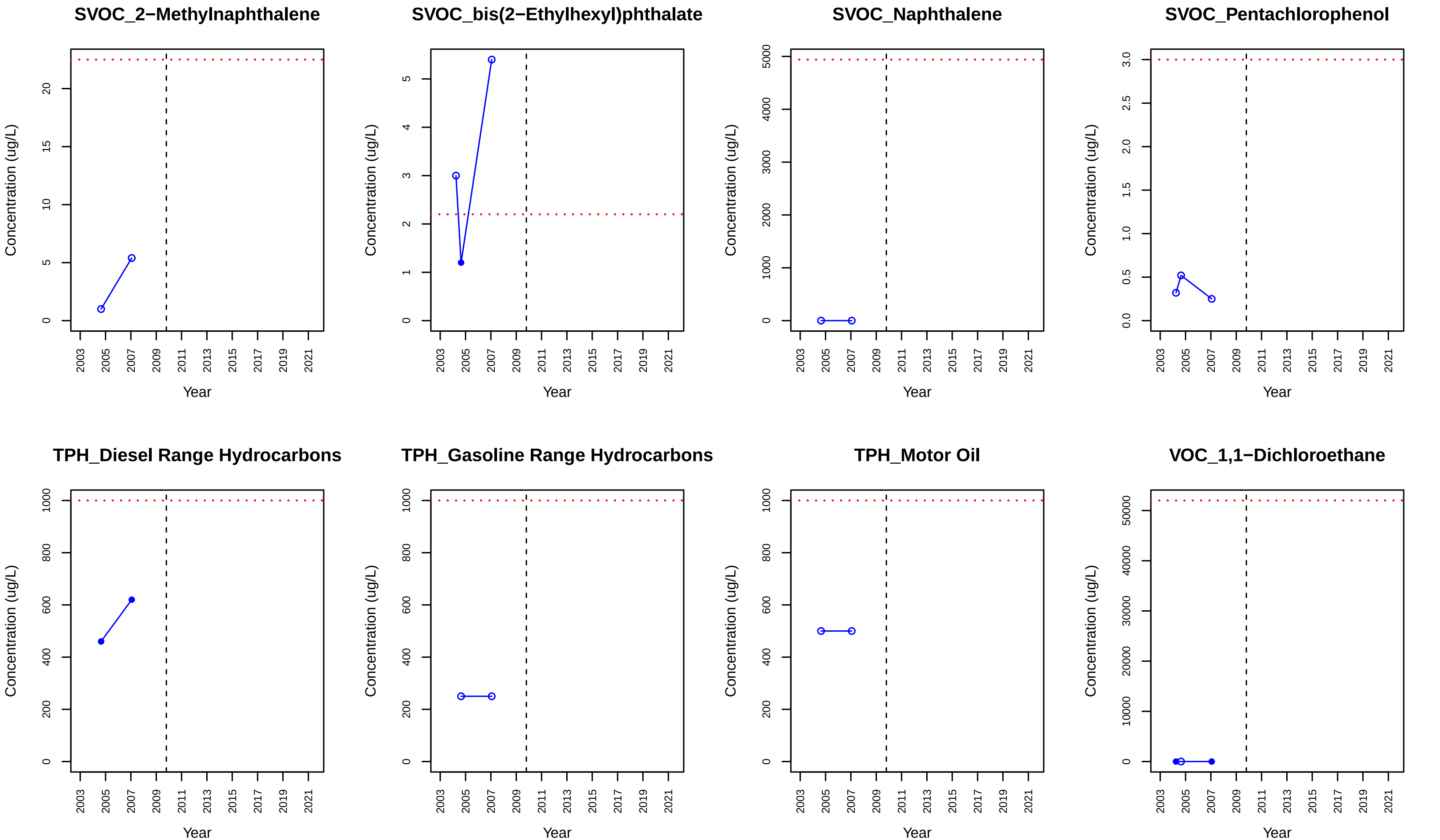

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−27

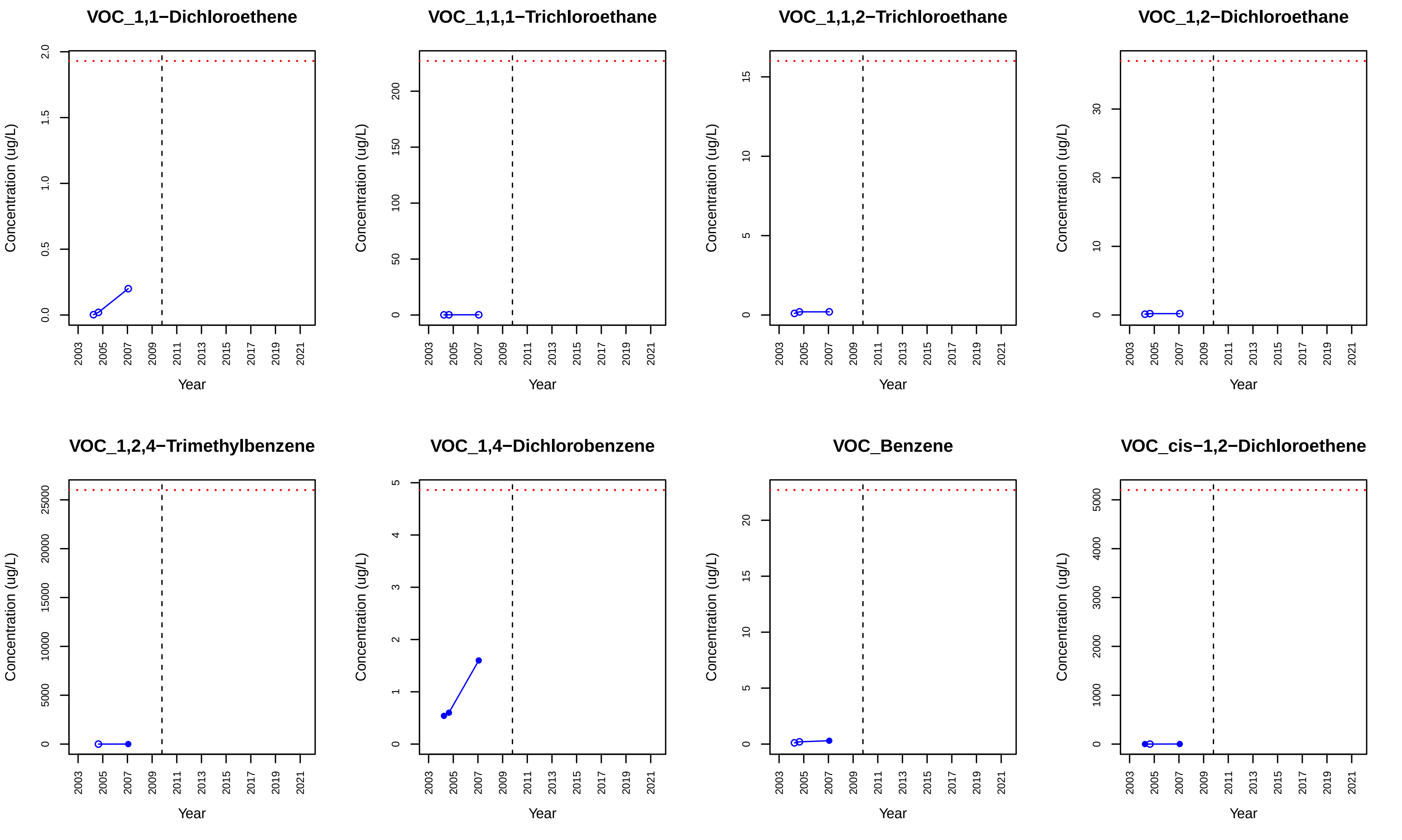


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

# CDM−29

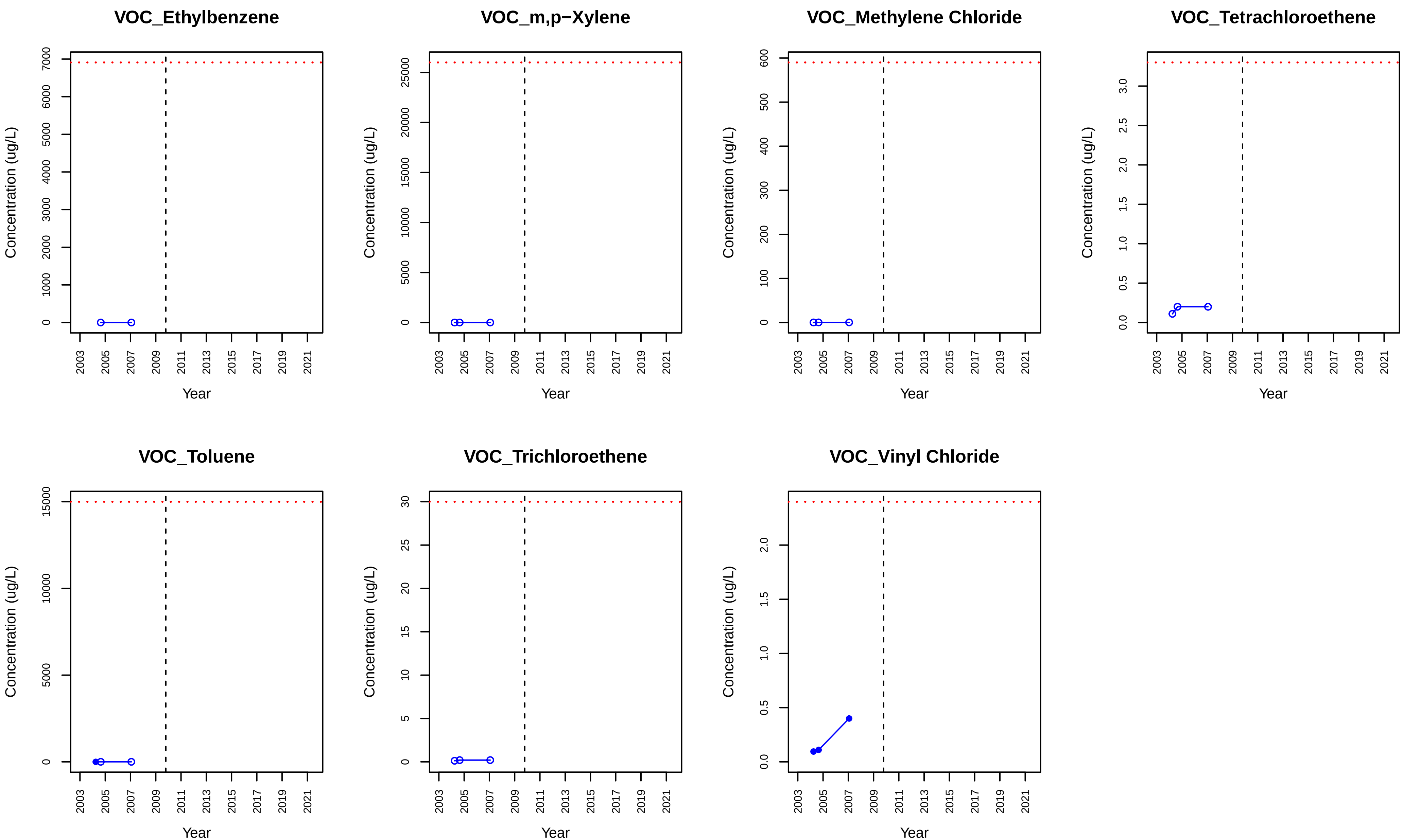

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−29



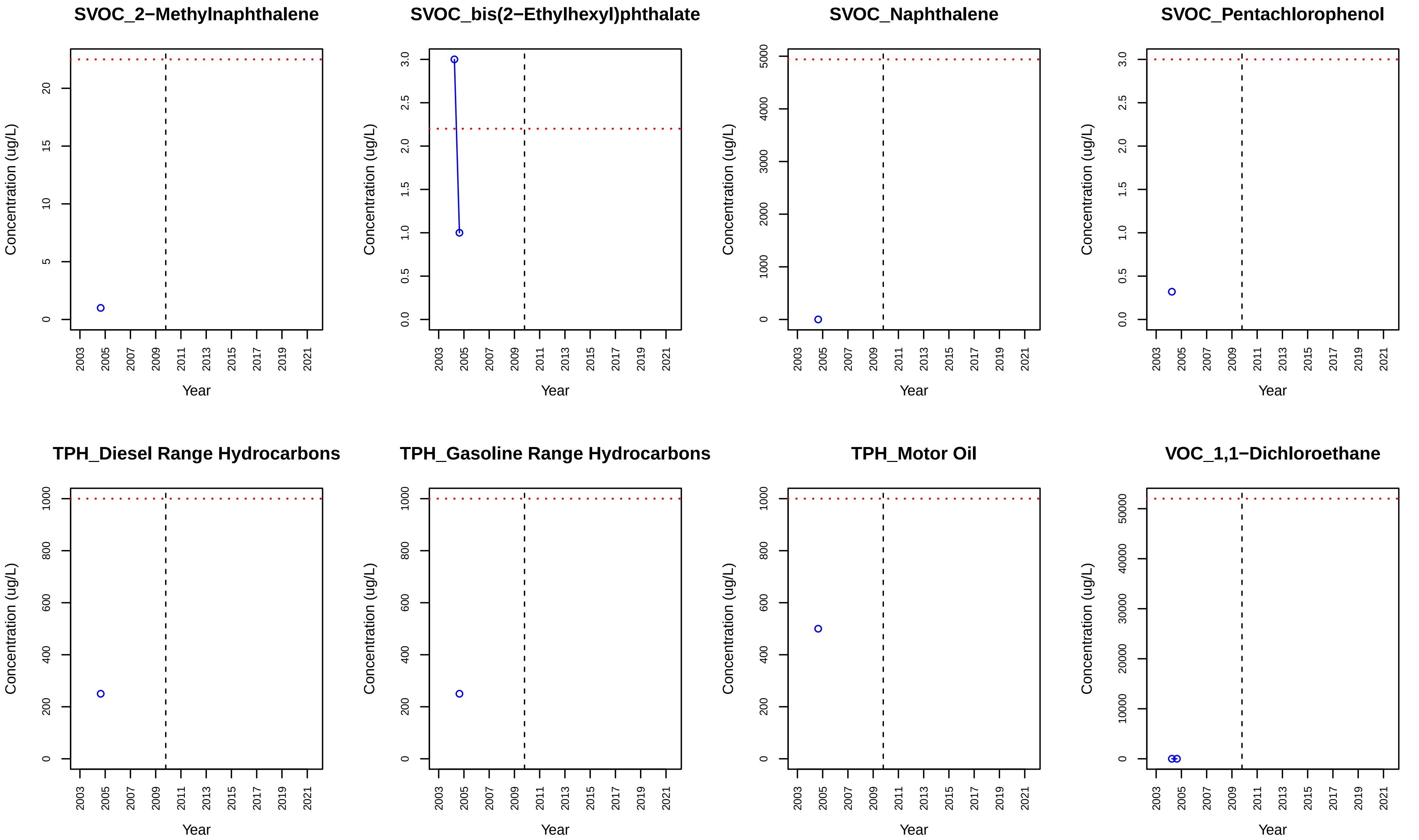
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−29



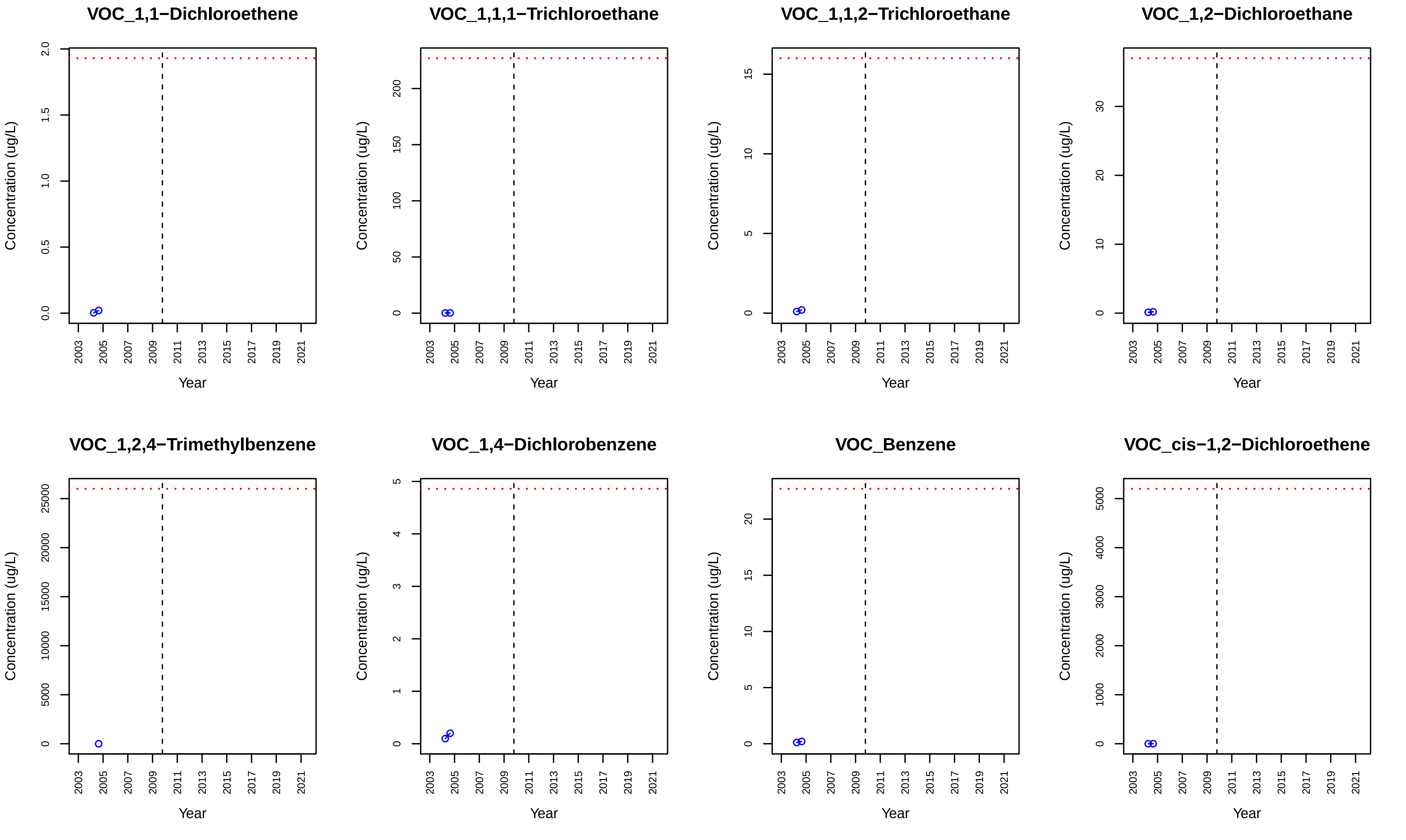
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

# CDM−30

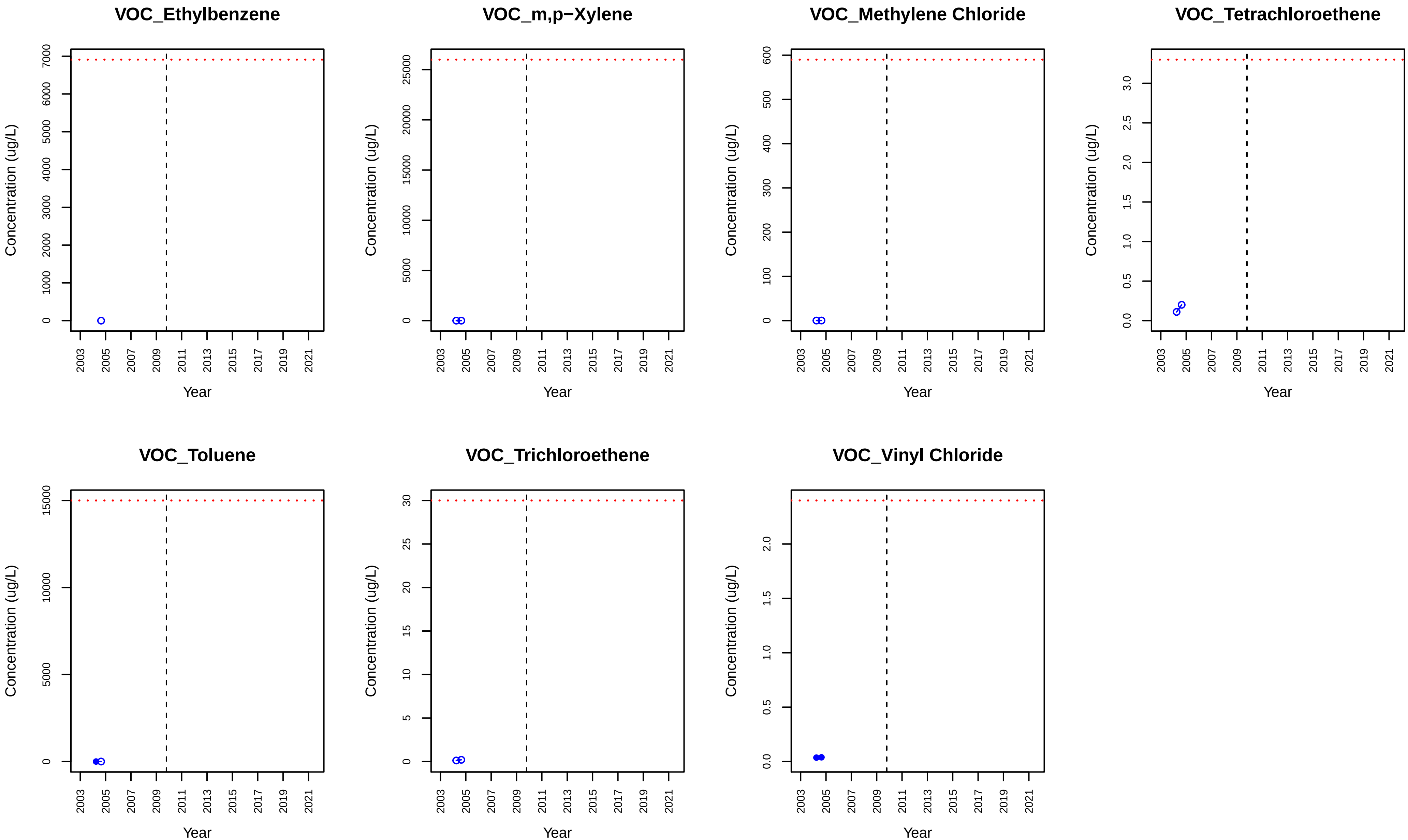


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**CDM−30**

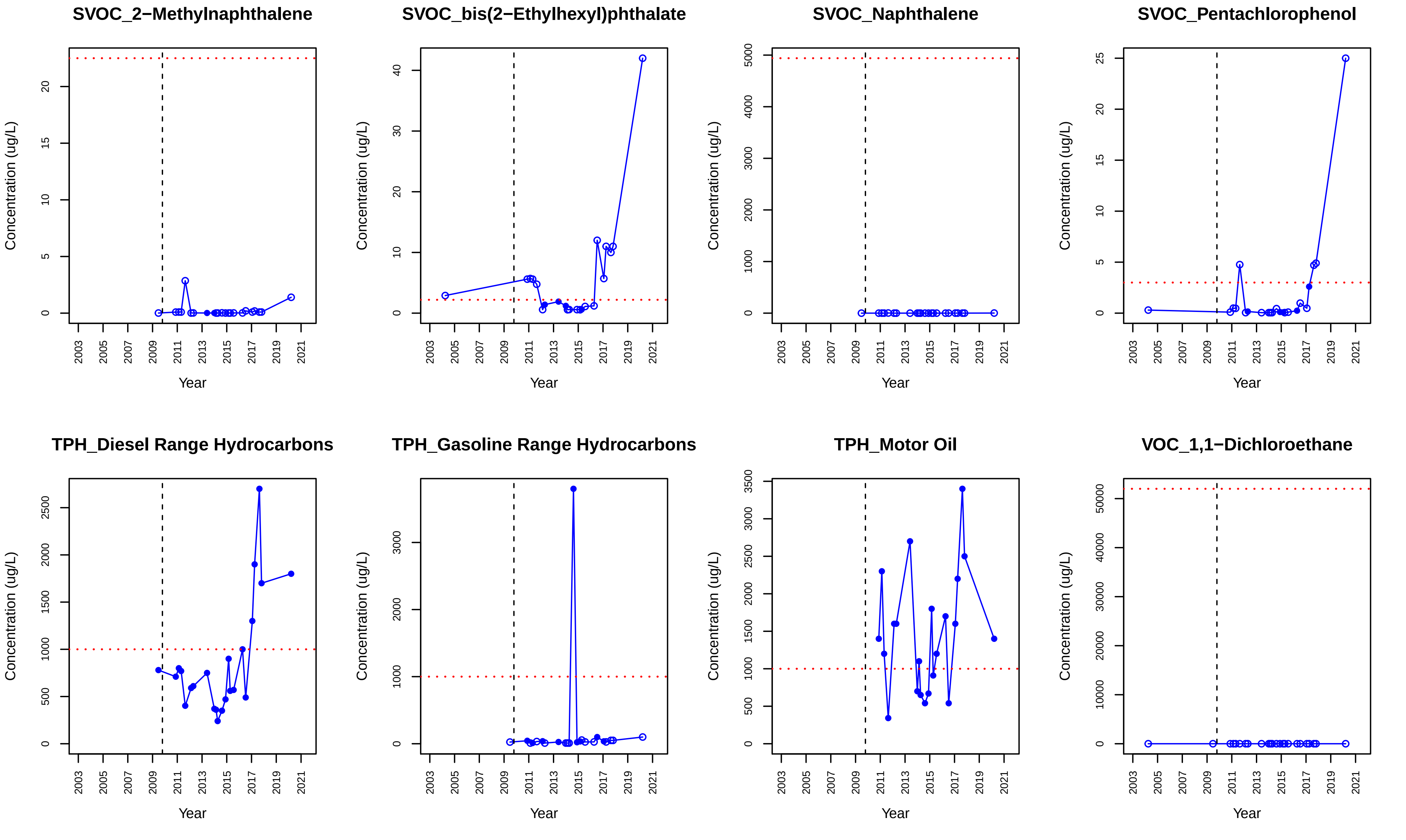

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−30



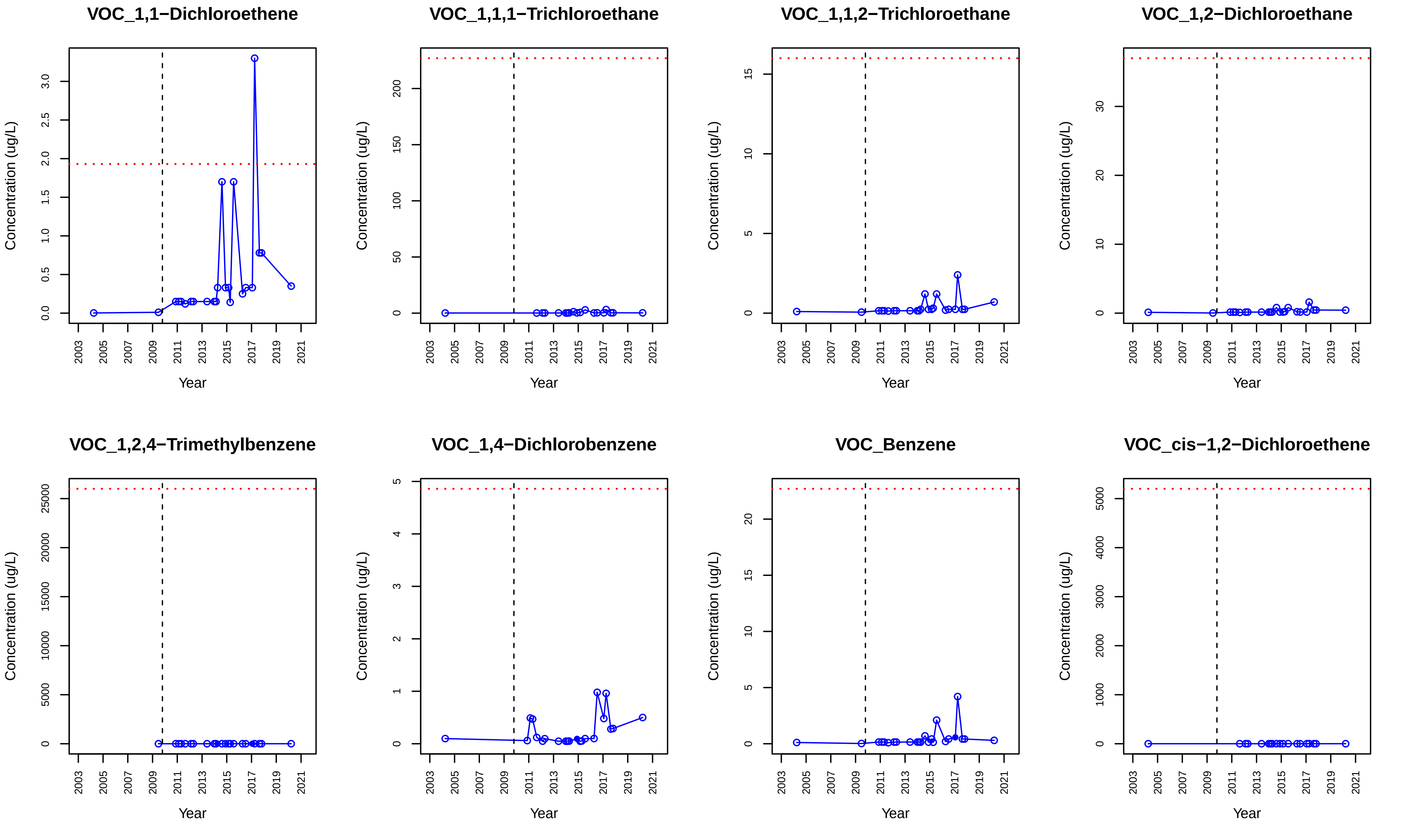
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−31

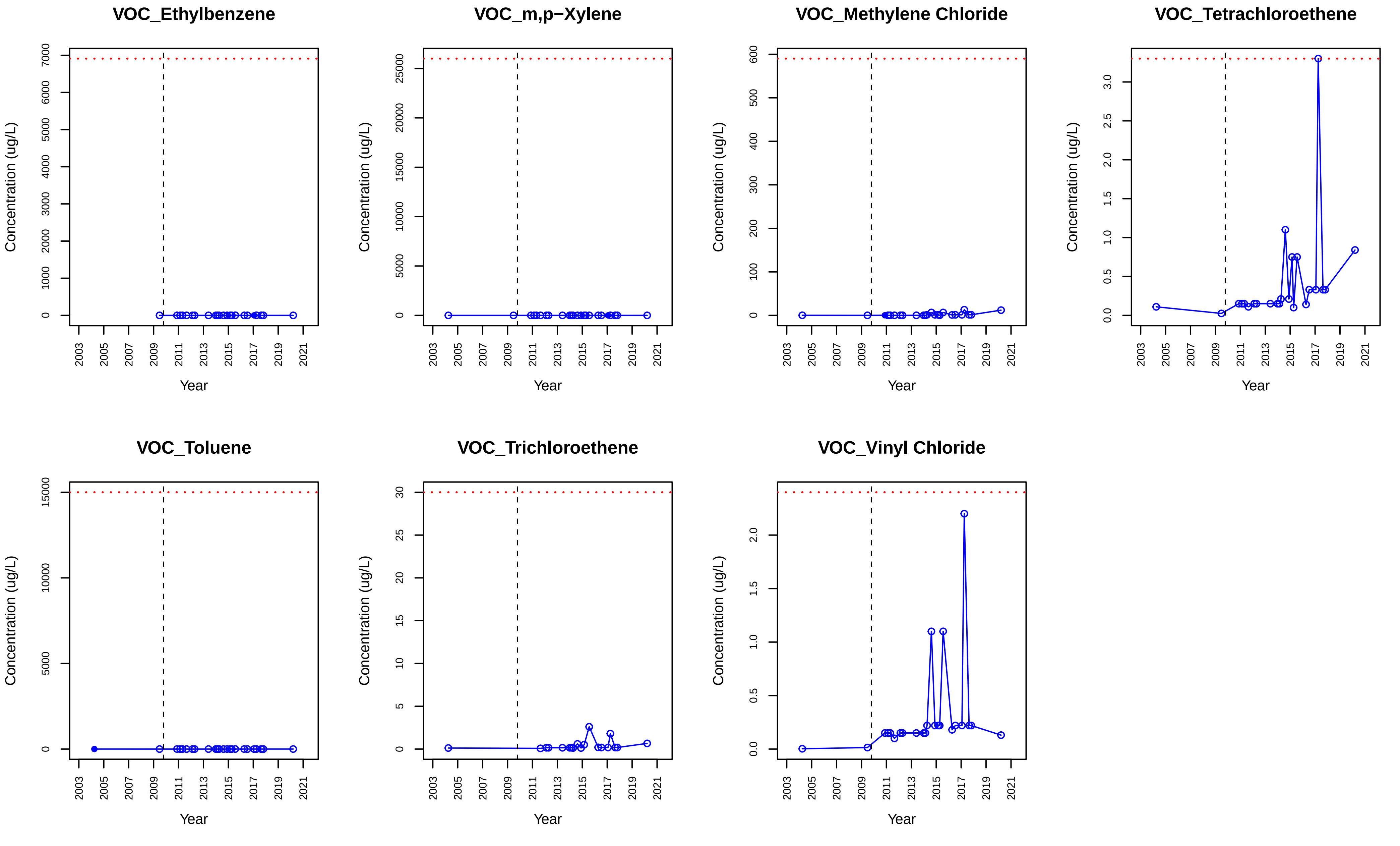


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# CDM−31

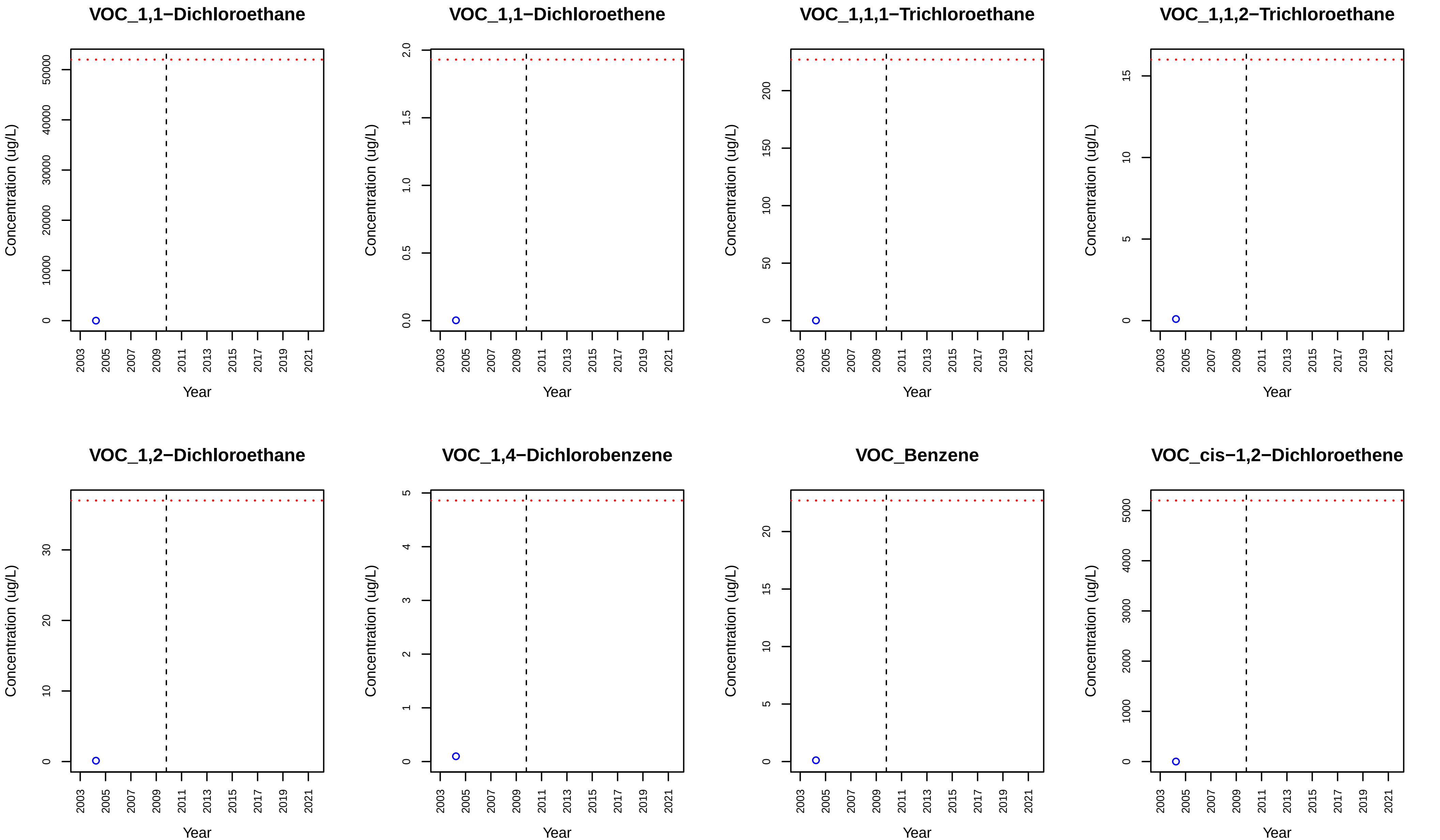

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0
50
100
150
200
5
10
15
20
30
1
2
3
4
5000
10000
15000
20000
25000
1000
2000
3000
4000
5000

## CDM−31

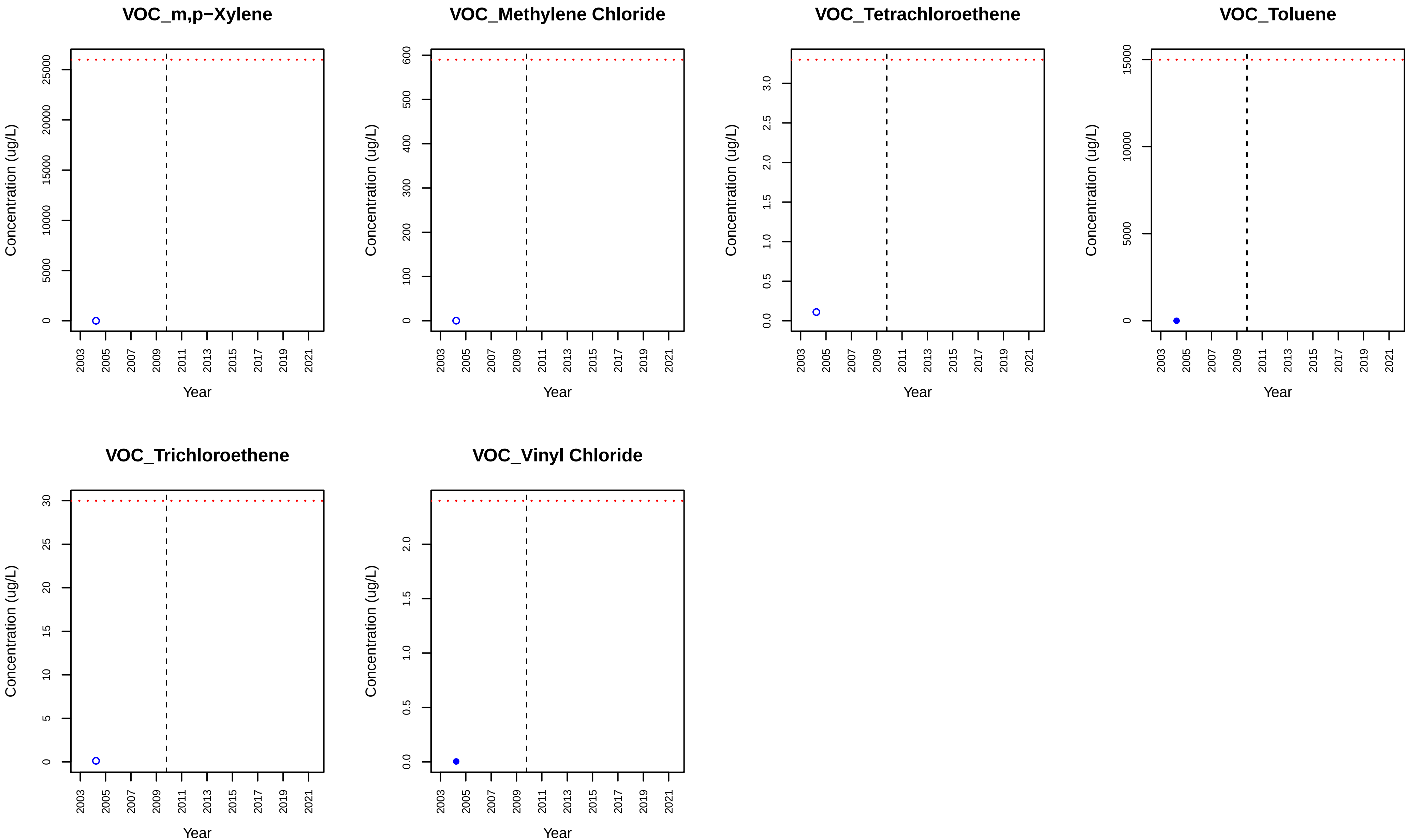


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

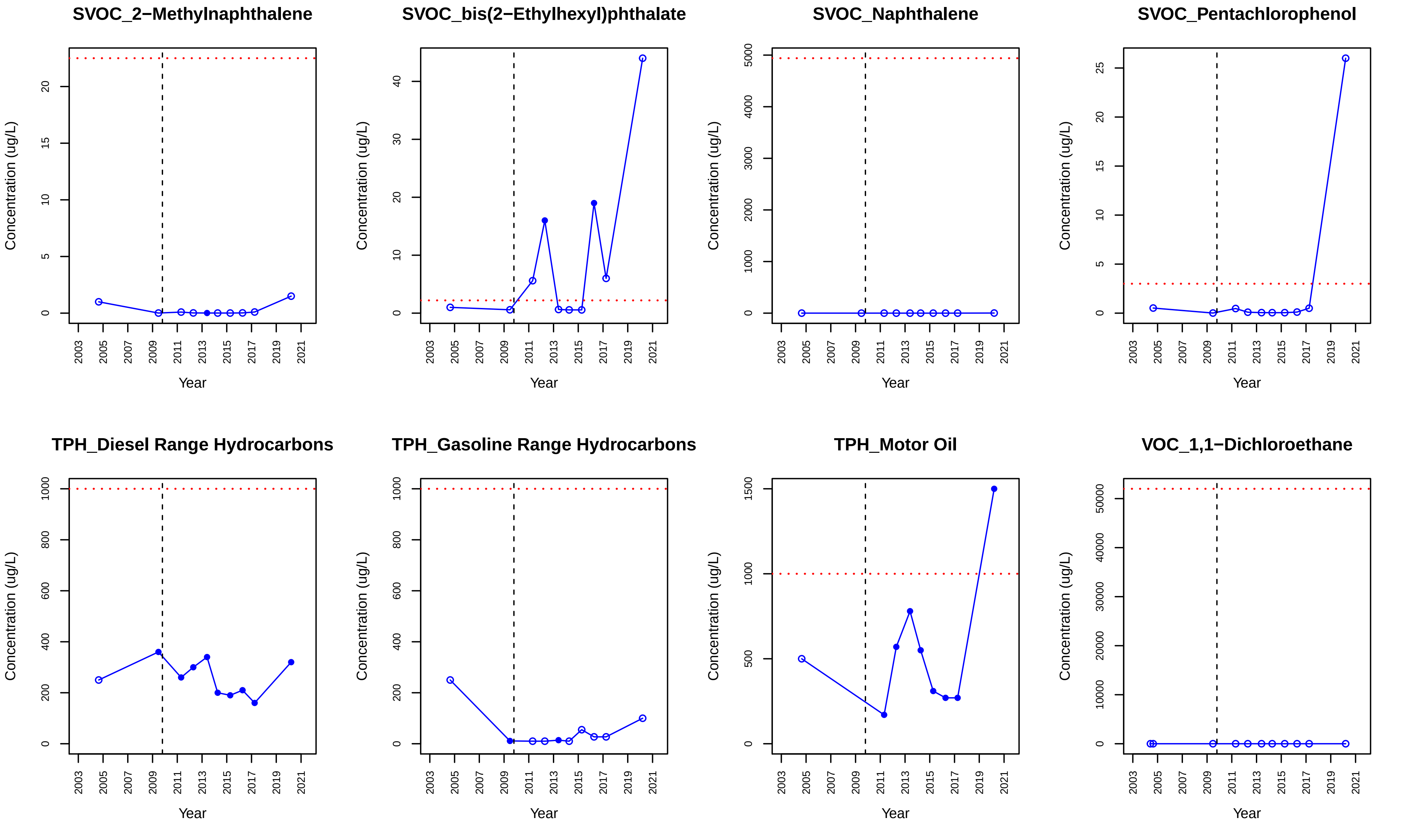
**DMW−03**


VOC_1,1−Dichloroethane
Concentration (ug/L)
0
10000
20000
30000
40000
50000
Year
VOC_1,1−Dichloroethene
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
Year
VOC_1,1,1−Trichloroethane
Concentration (ug/L)
0
50
100
150
200
Year
VOC_1,1,2−Trichloroethane
Concentration (ug/L)
0
5
10
15
Year
VOC_1,2−Dichloroethane
Concentration (ug/L)
0
10
20
30
Year
VOC_1,4−Dichlorobenzene
Concentration (ug/L)
0
1
2
3
4
5
Year
VOC_Benzene
Concentration (ug/L)
0
5
10
15
20
Year
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
0
1000
2000
3000
4000
5000
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

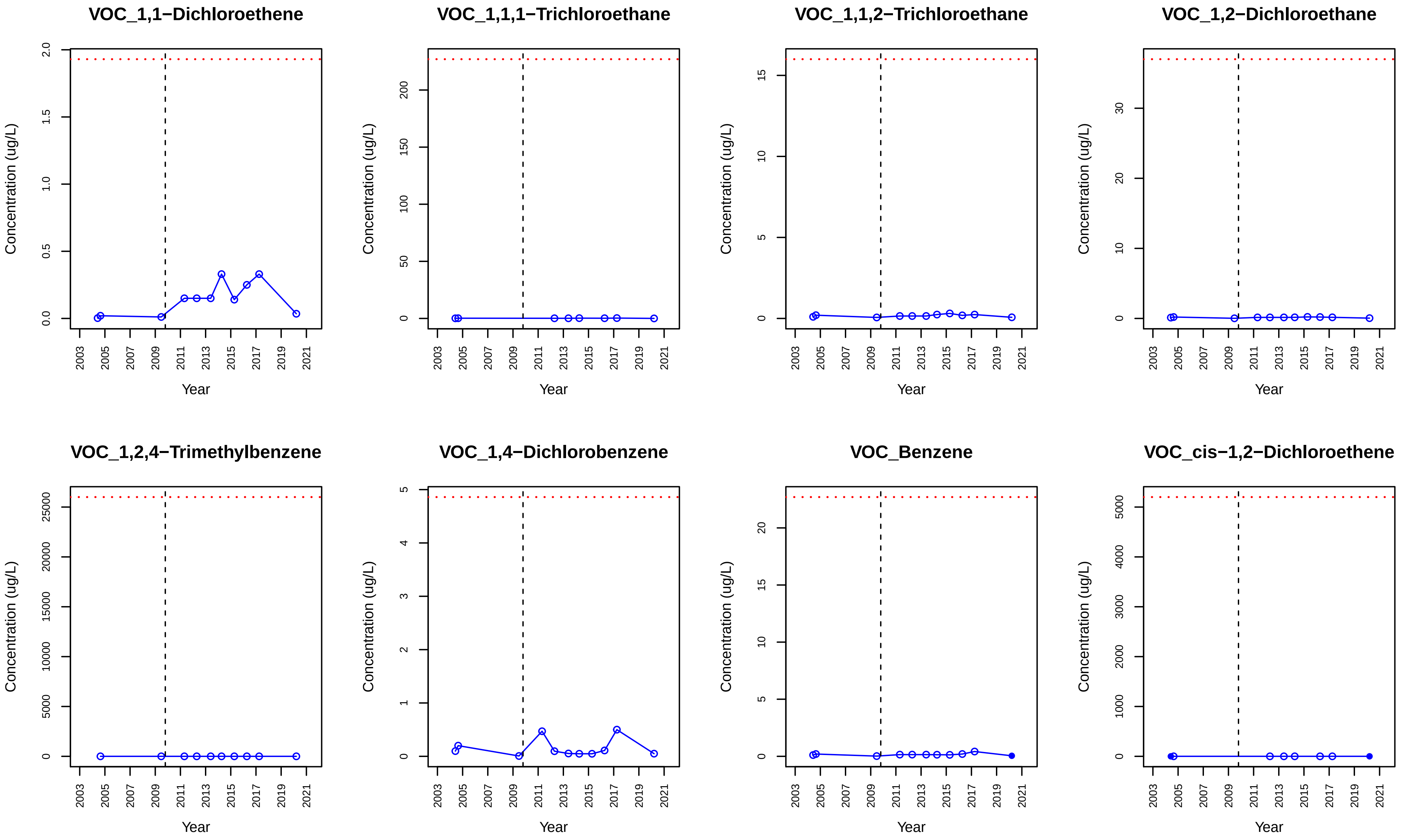
## DMW−03


VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 5000 10000 15000 20000 25000
0 100 200 300 400 500 600
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 5000 10000 15000
0 5 10 15 20 25 30
0.0 0.5 1.0 1.5 2.0

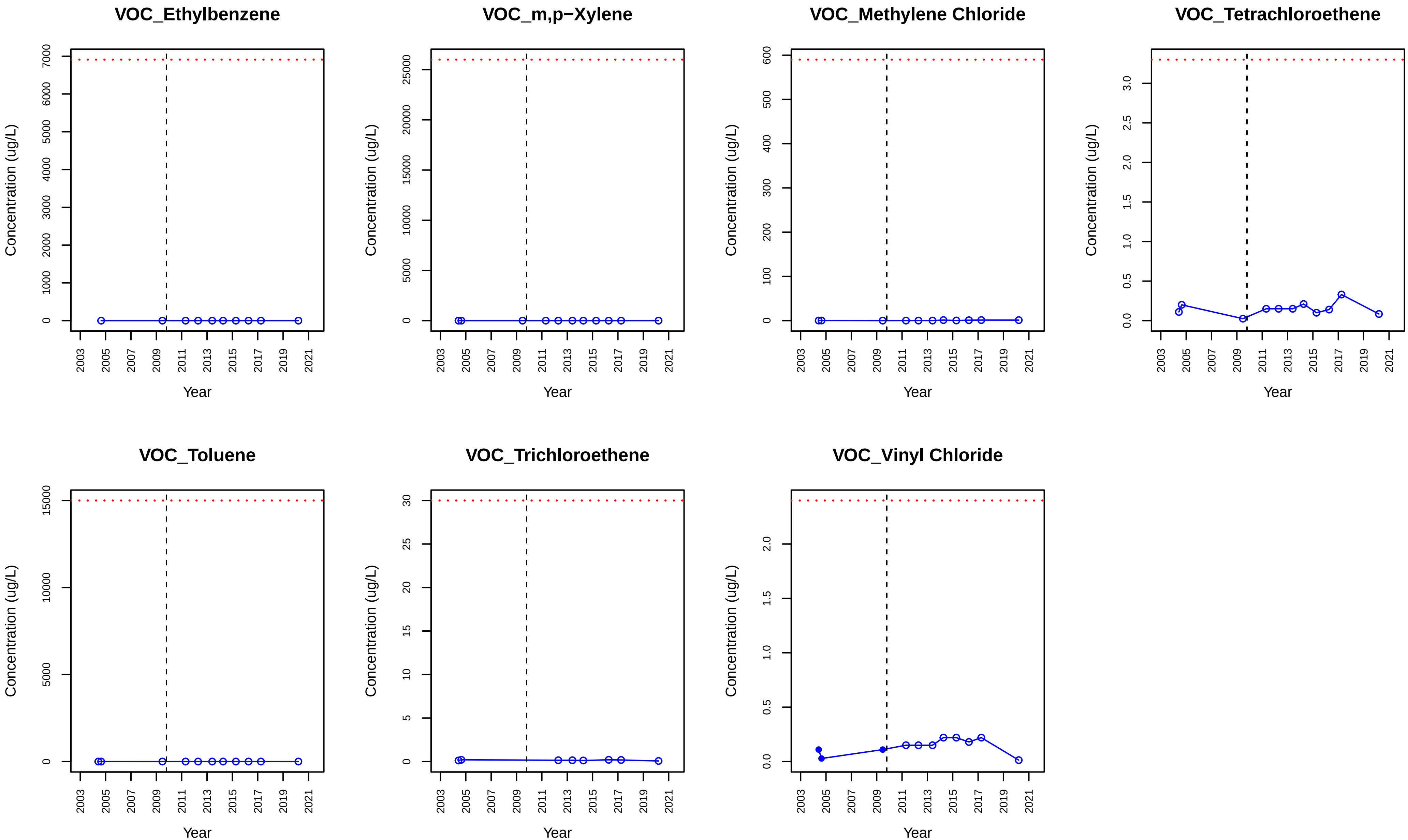
**DMW−04**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

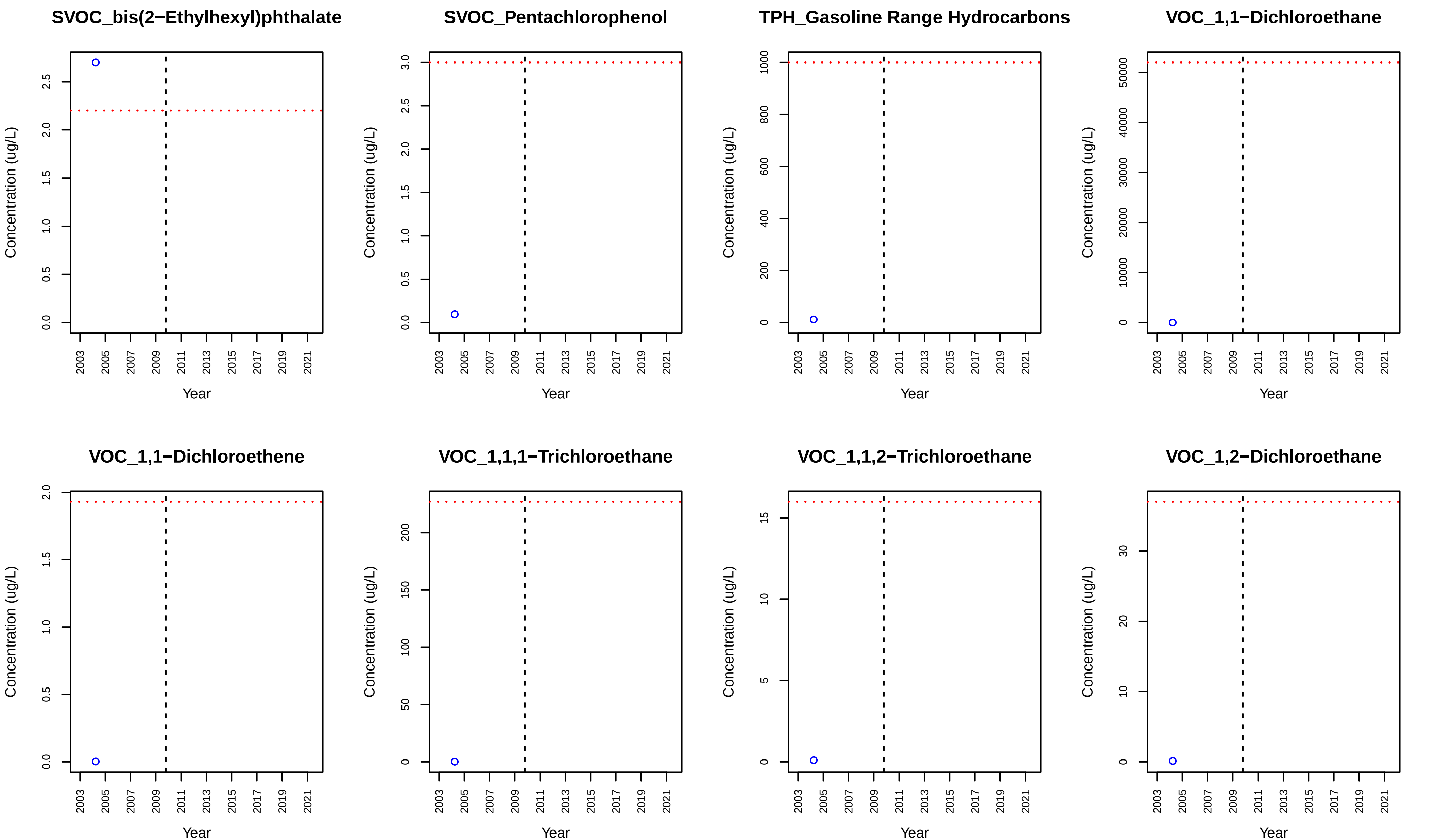
**DMW−04**


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# DMW−04

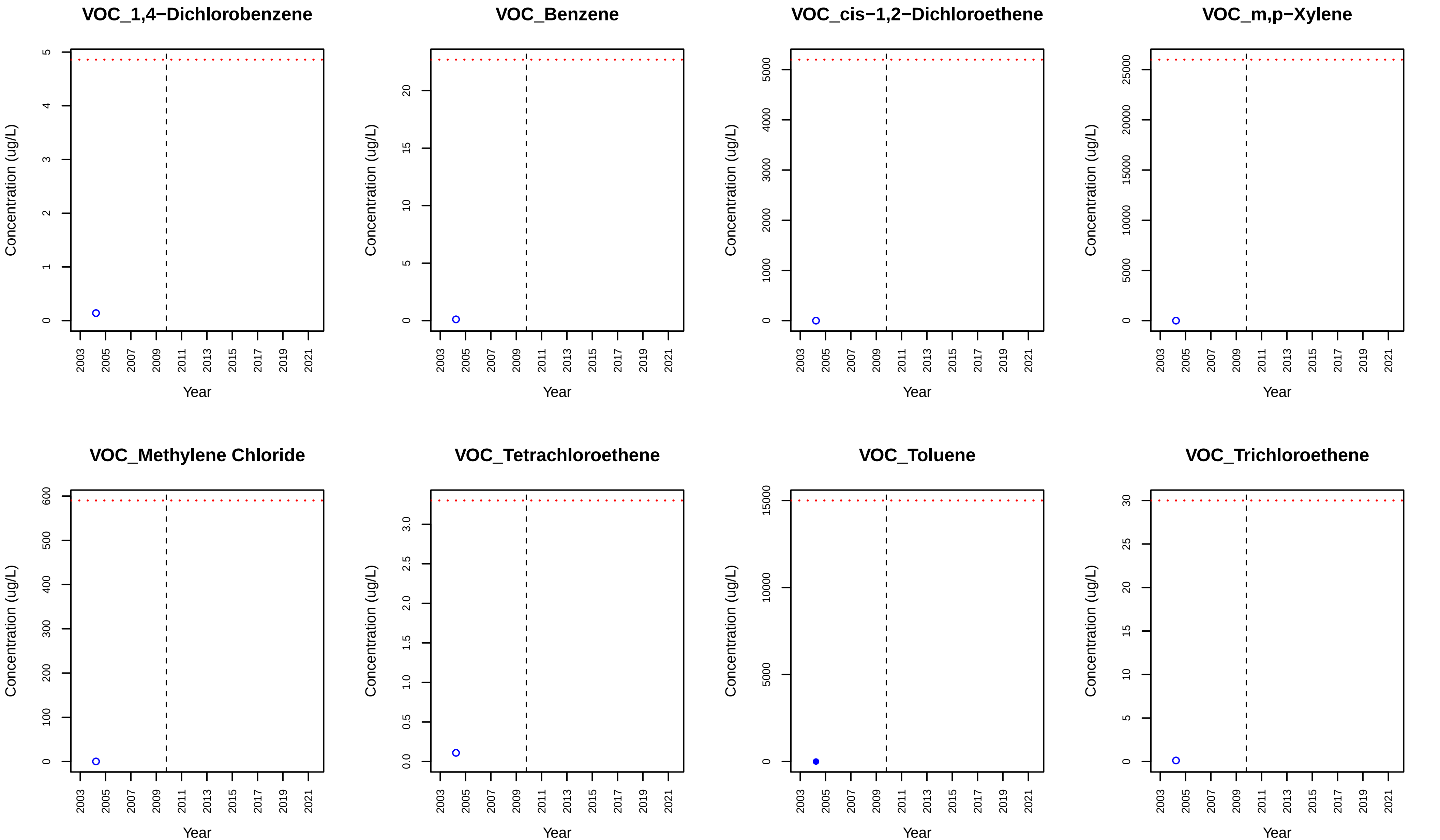

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## LAI−P02

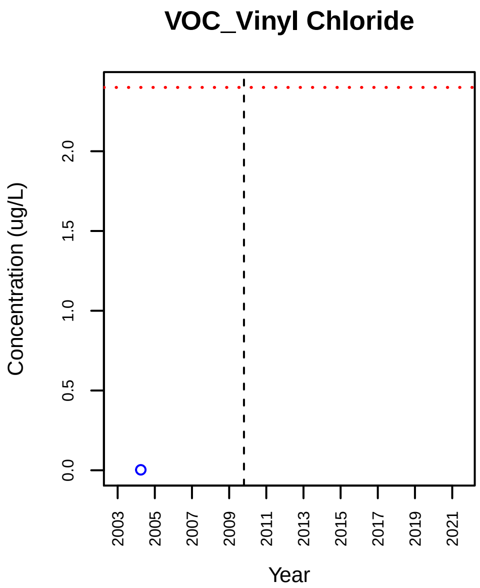


SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Pentachlorophenol
TPH_Gasoline Range Hydrocarbons
VOC_1,1−Dichloroethane
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

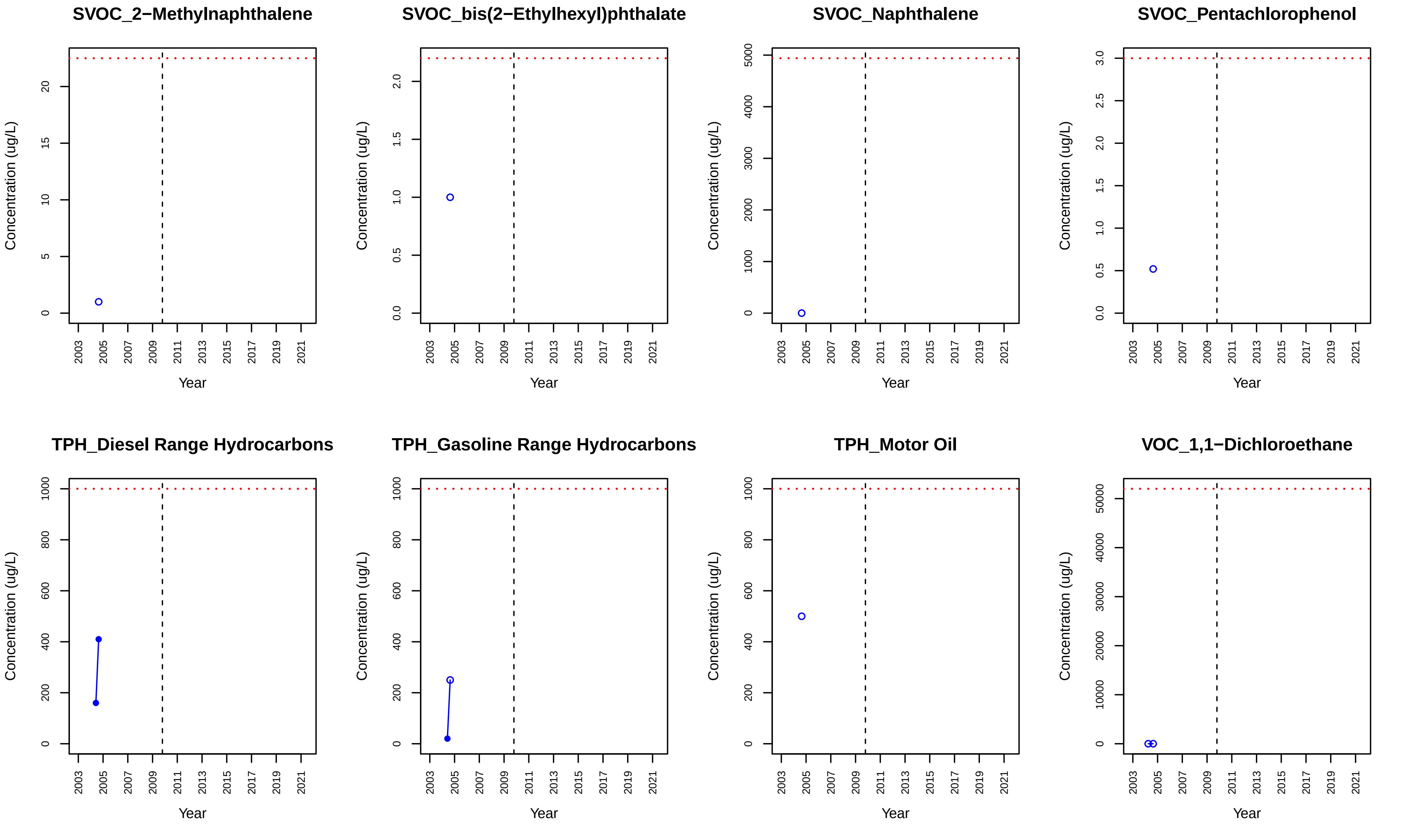
# LAI−P02


VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

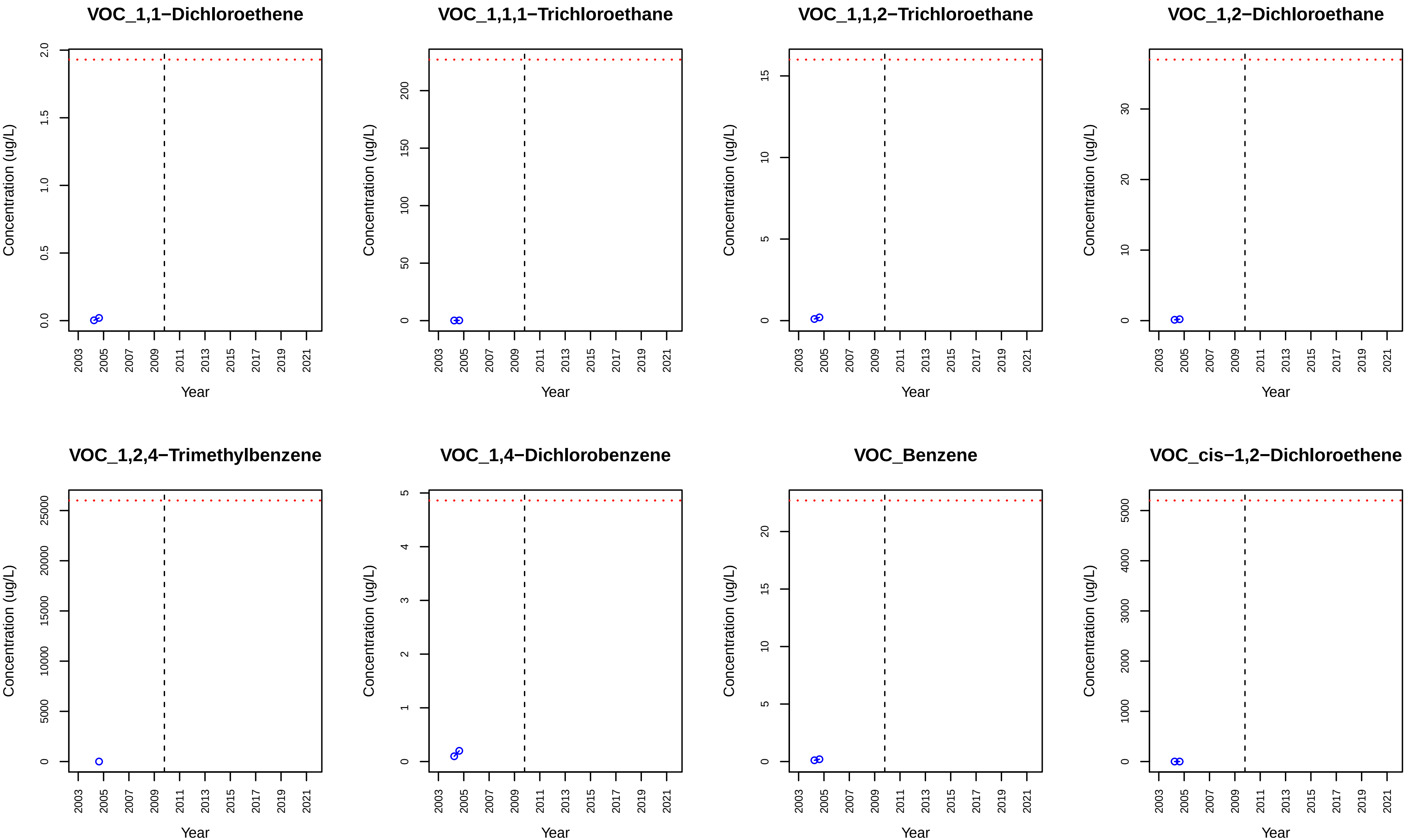
# LAI−P02


VOC_Vinyl Chloride
Concentration (ug/L)
0.0
0.5
1.0
1.5
2.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
Year

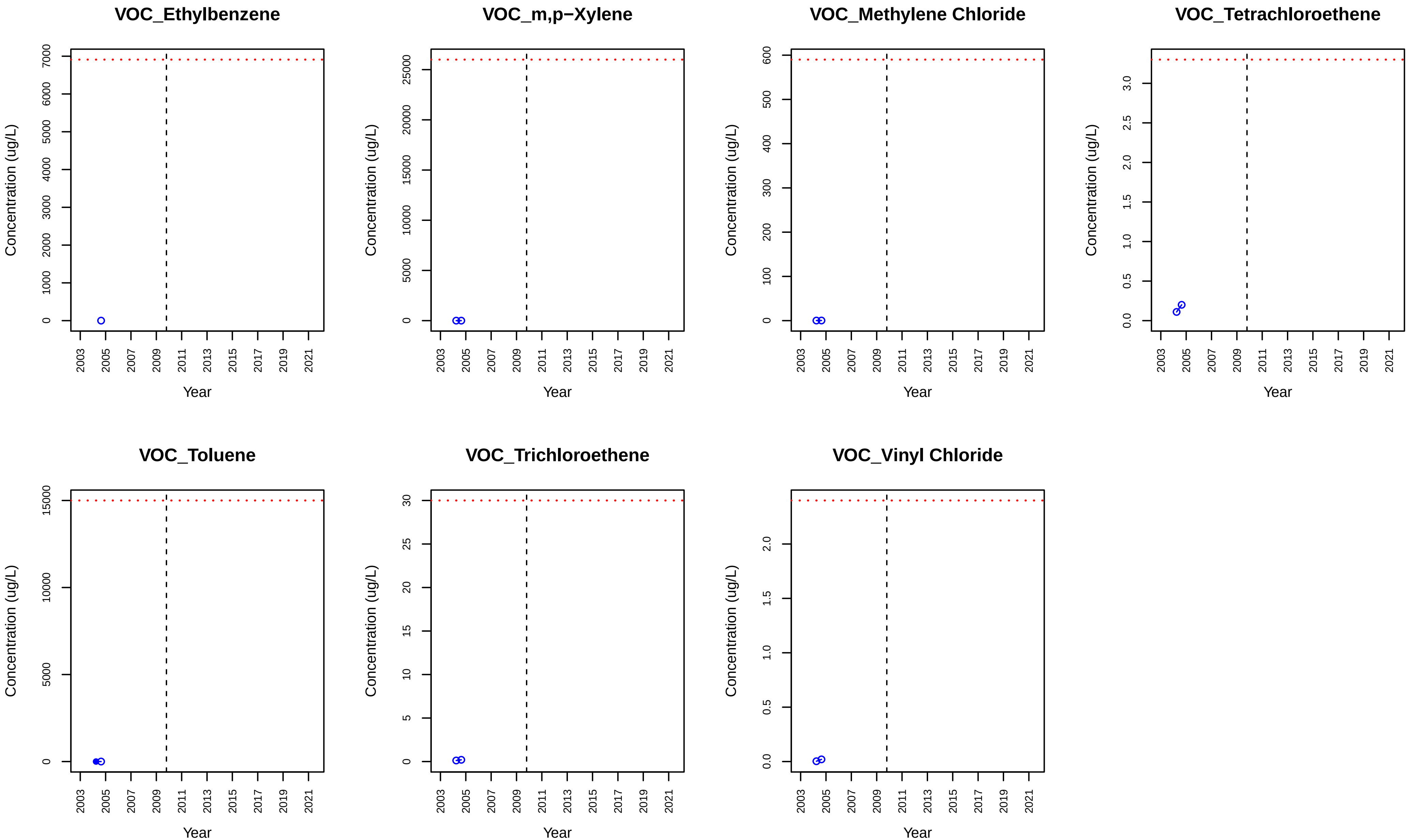
**LAI−P03**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**LAI−P03**

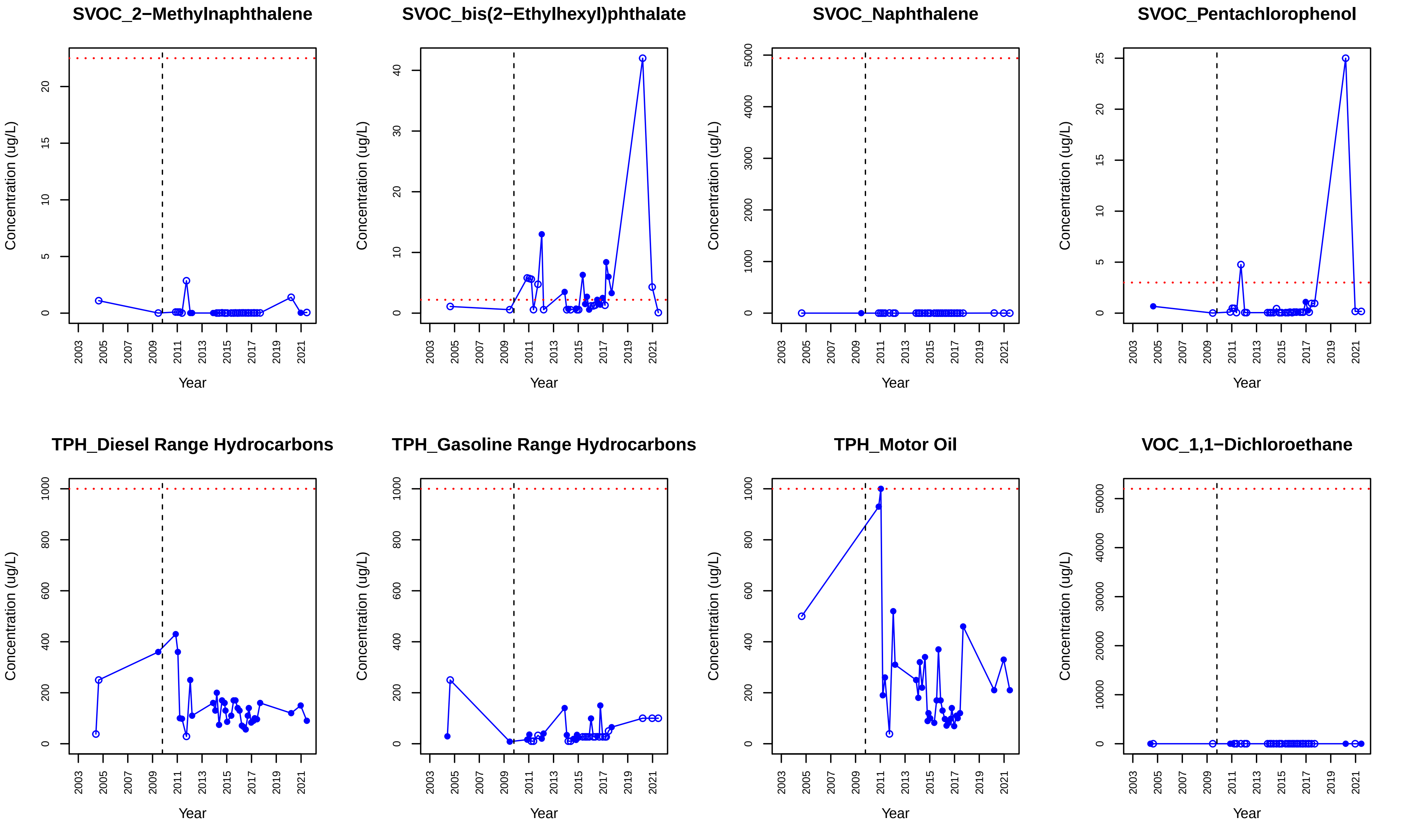

VOC_1,1−Dichloroethene
Concentration (ug/L)
0.0 0.5 1.0 1.5 2.0
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_1,1,1−Trichloroethane
Concentration (ug/L)
0 50 100 150 200
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_1,1,2−Trichloroethane
Concentration (ug/L)
0 5 10 15
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_1,2−Dichloroethane
Concentration (ug/L)
0 10 20 30
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_1,2,4−Trimethylbenzene
Concentration (ug/L)
0 5000 10000 15000 20000 25000
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_1,4−Dichlorobenzene
Concentration (ug/L)
0 1 2 3 4 5
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_Benzene
Concentration (ug/L)
0 5 10 15 20
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
0 1000 2000 3000 4000 5000
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
Year

# LAI−P03



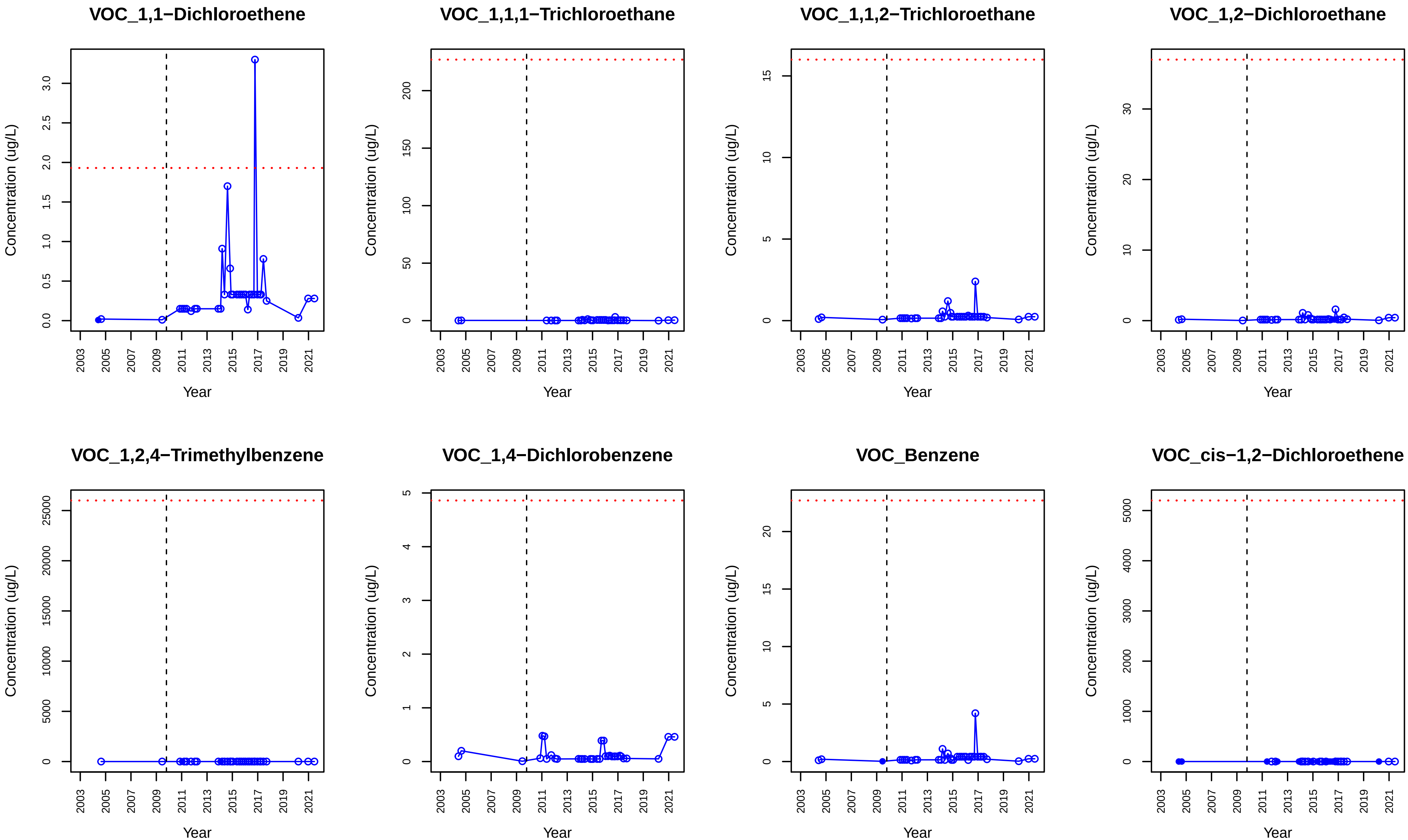
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−01

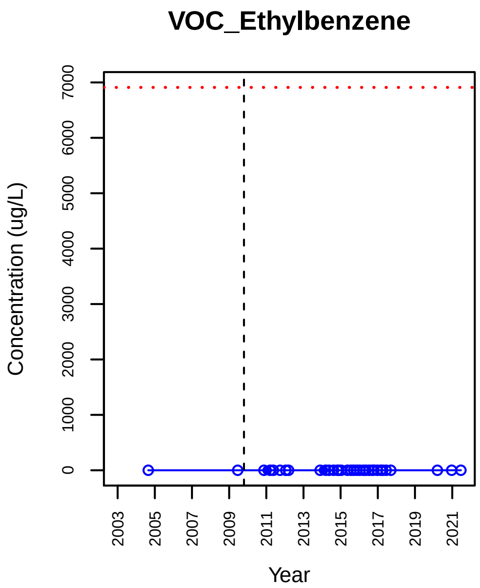


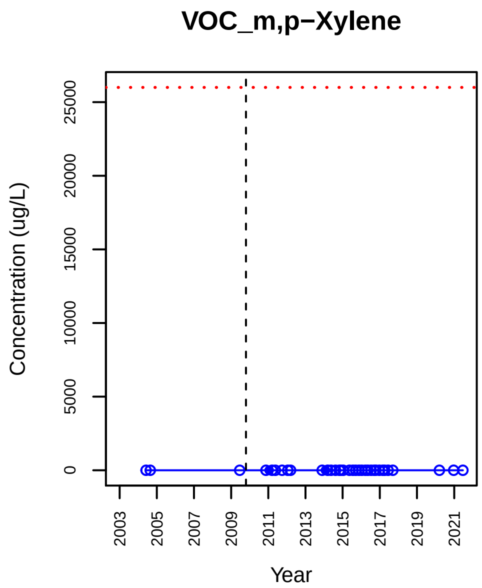
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

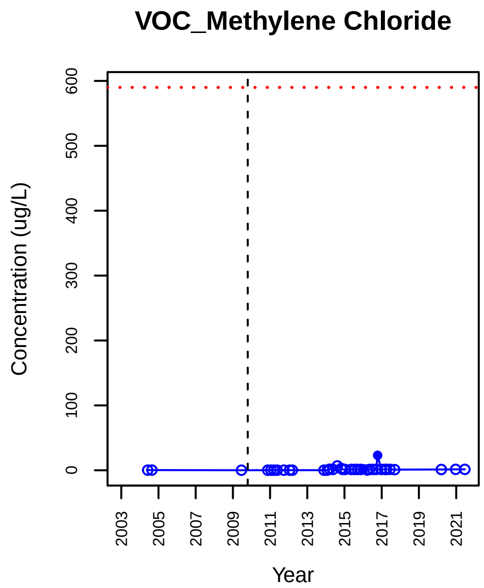
**MW−01**

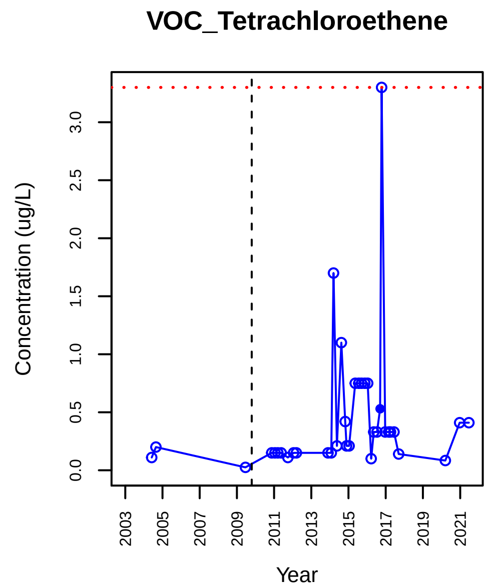

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

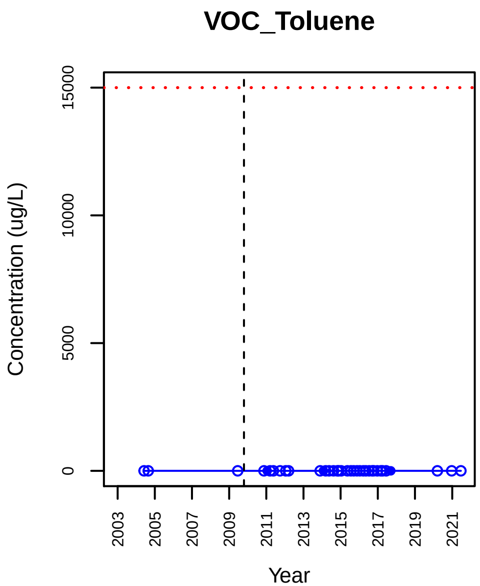
# MW−01

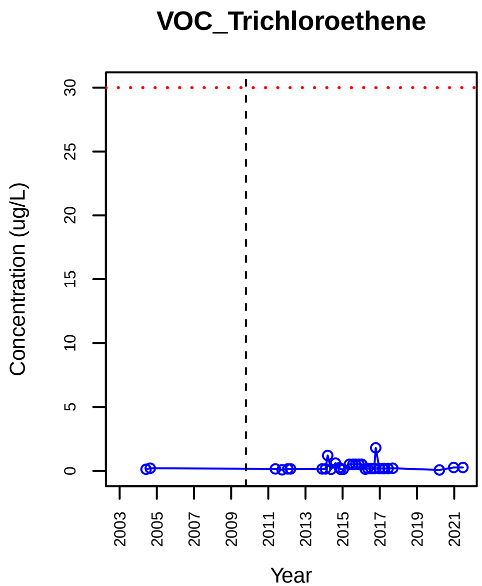

VOC_Ethylbenzene
Concentration (ug/L)
Year

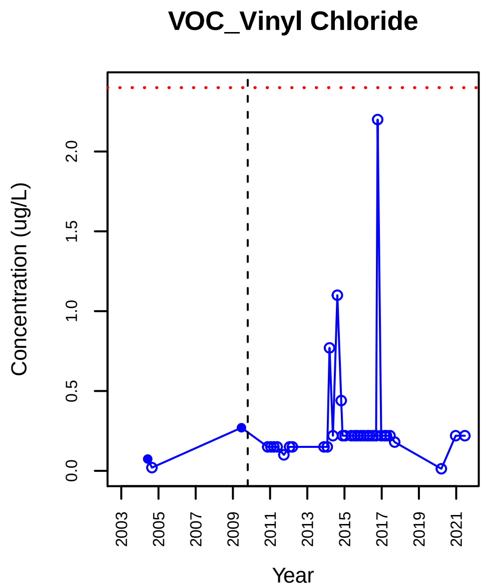

VOC_m,p−Xylene
Concentration (ug/L)
Year

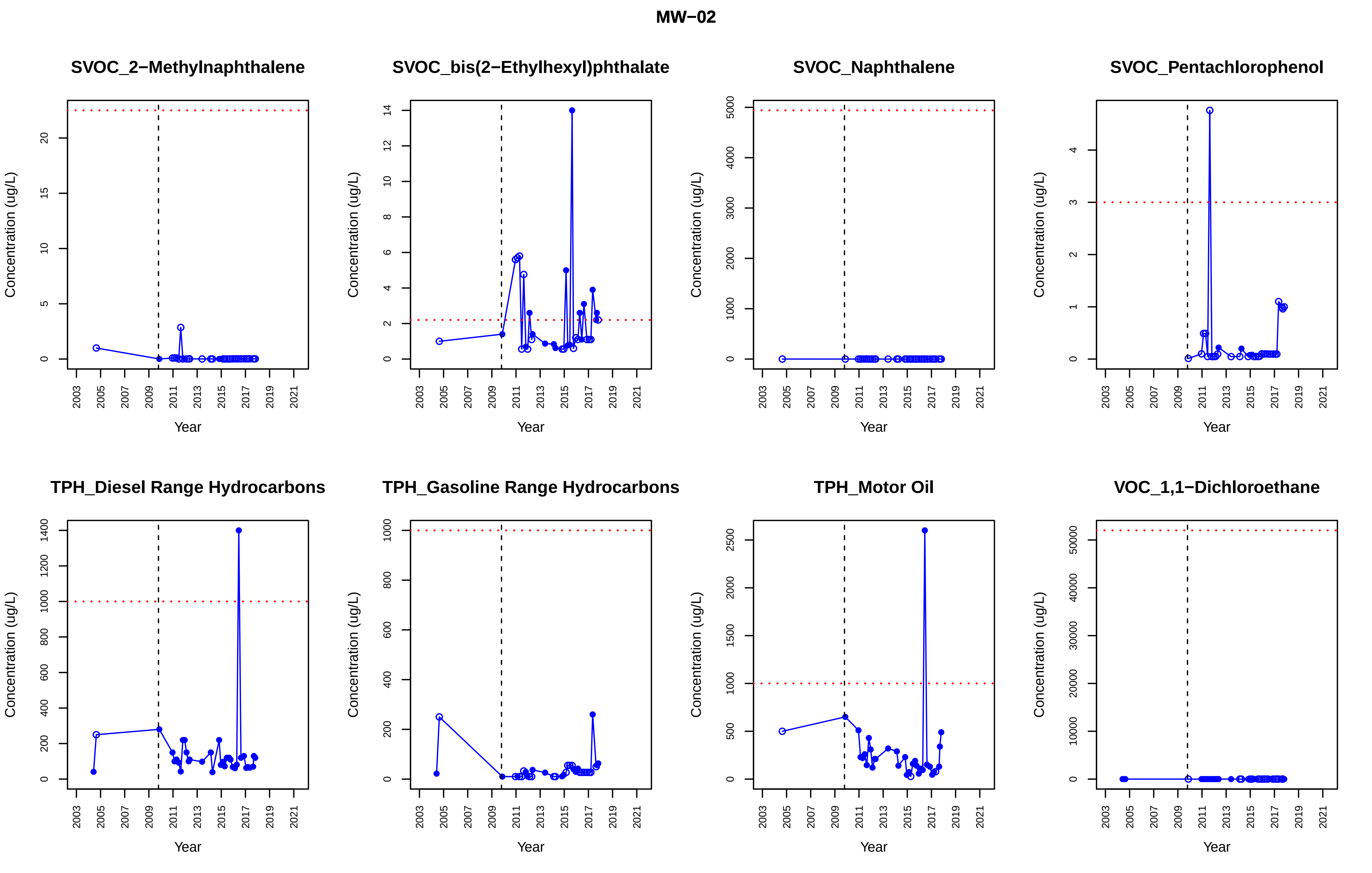

VOC_Methylene Chloride
Concentration (ug/L)
Year


VOC_Tetrachloroethene
Concentration (ug/L)
Year

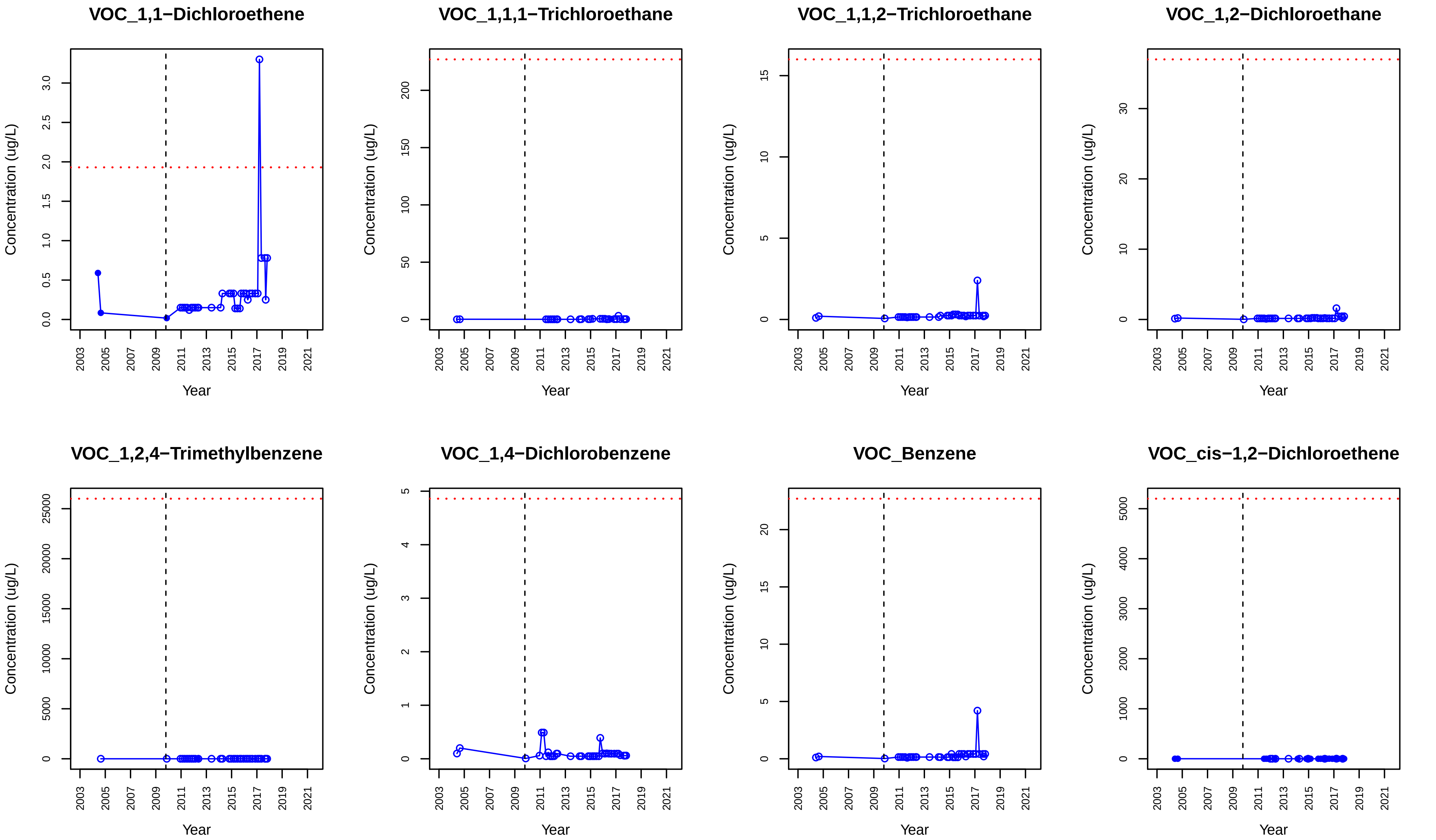

VOC_Toluene
Concentration (ug/L)
Year


VOC_Trichloroethene
Concentration (ug/L)
Year


VOC_Vinyl Chloride
Concentration (ug/L)
Year

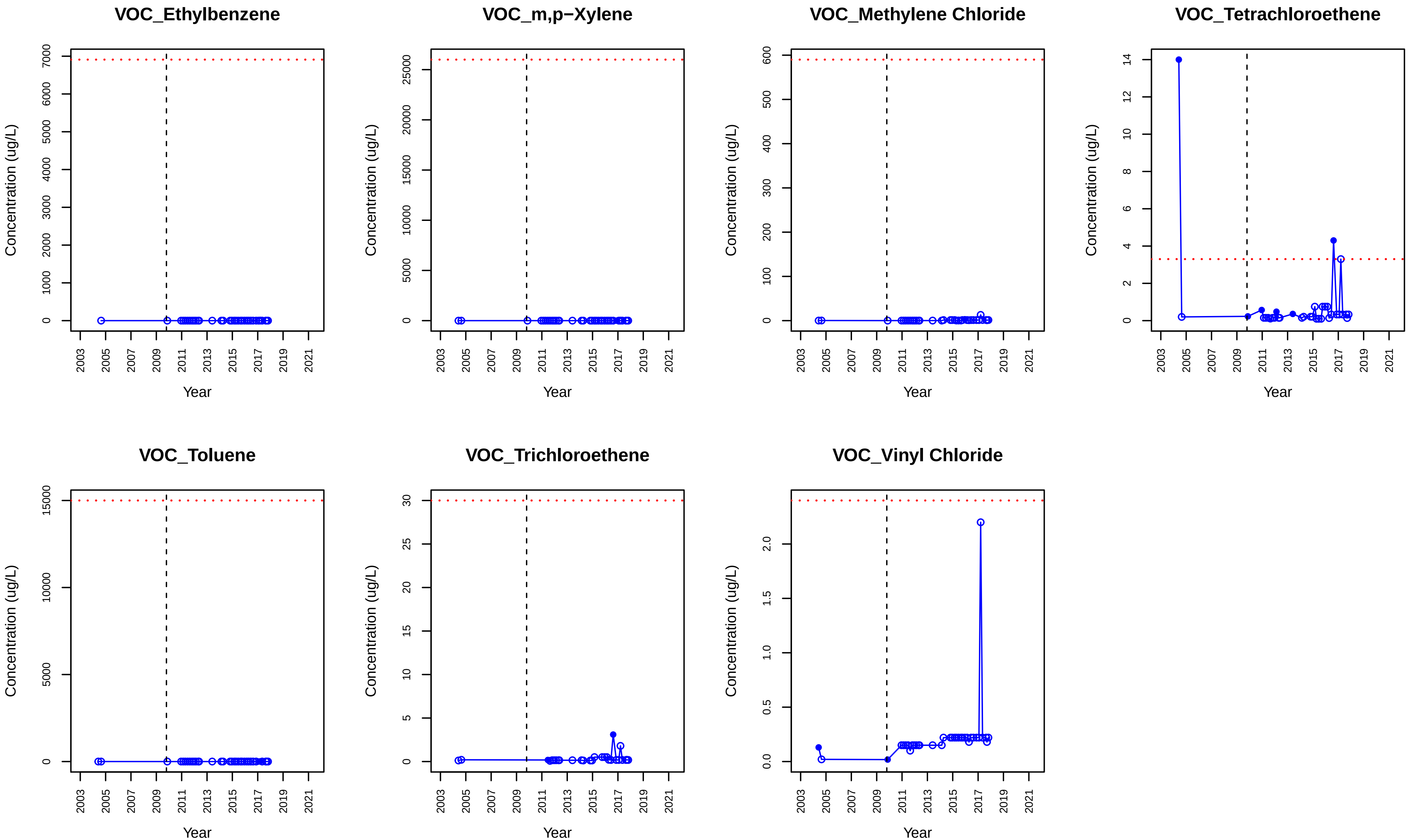

MW−02
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

# MW−02

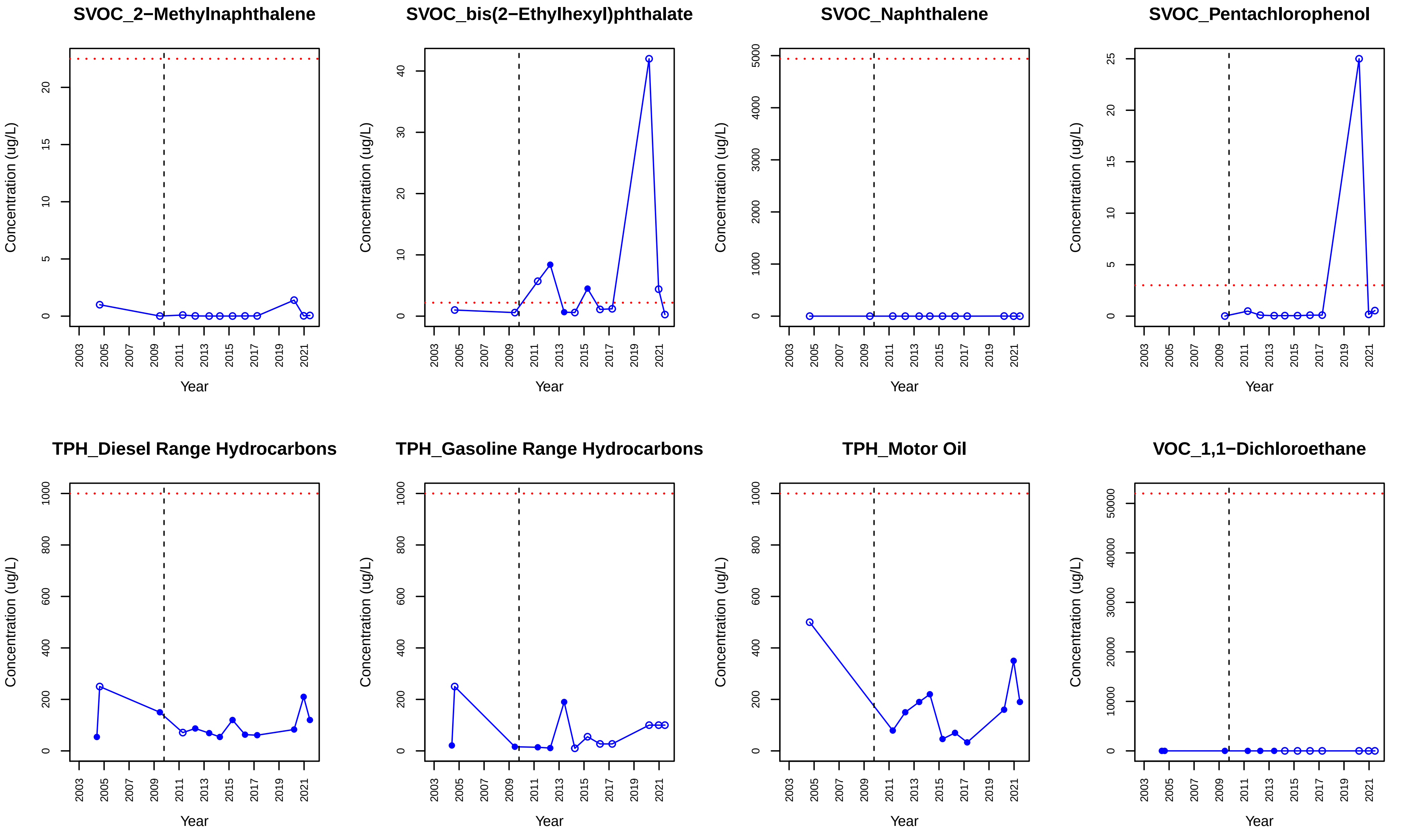


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

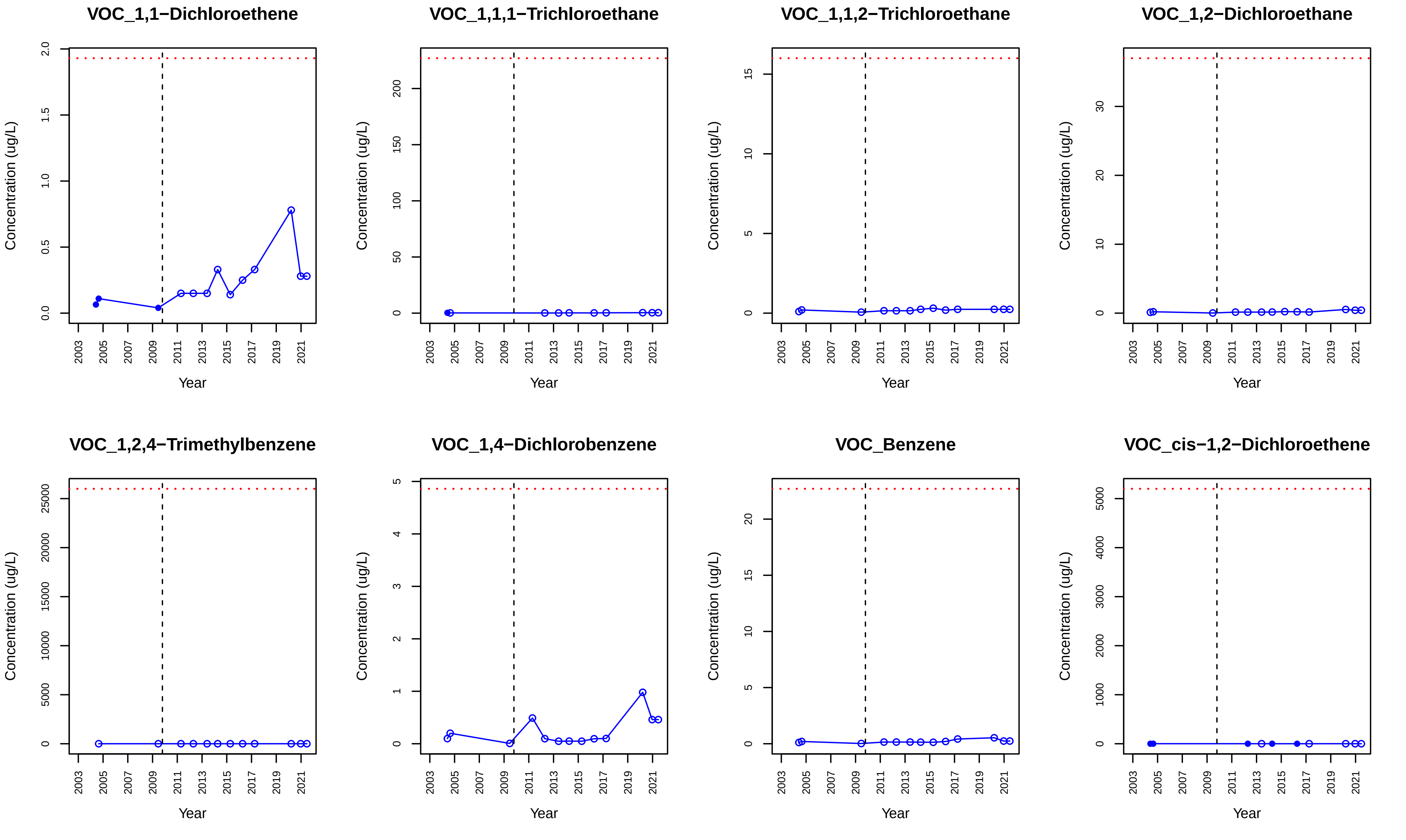
# MW−02

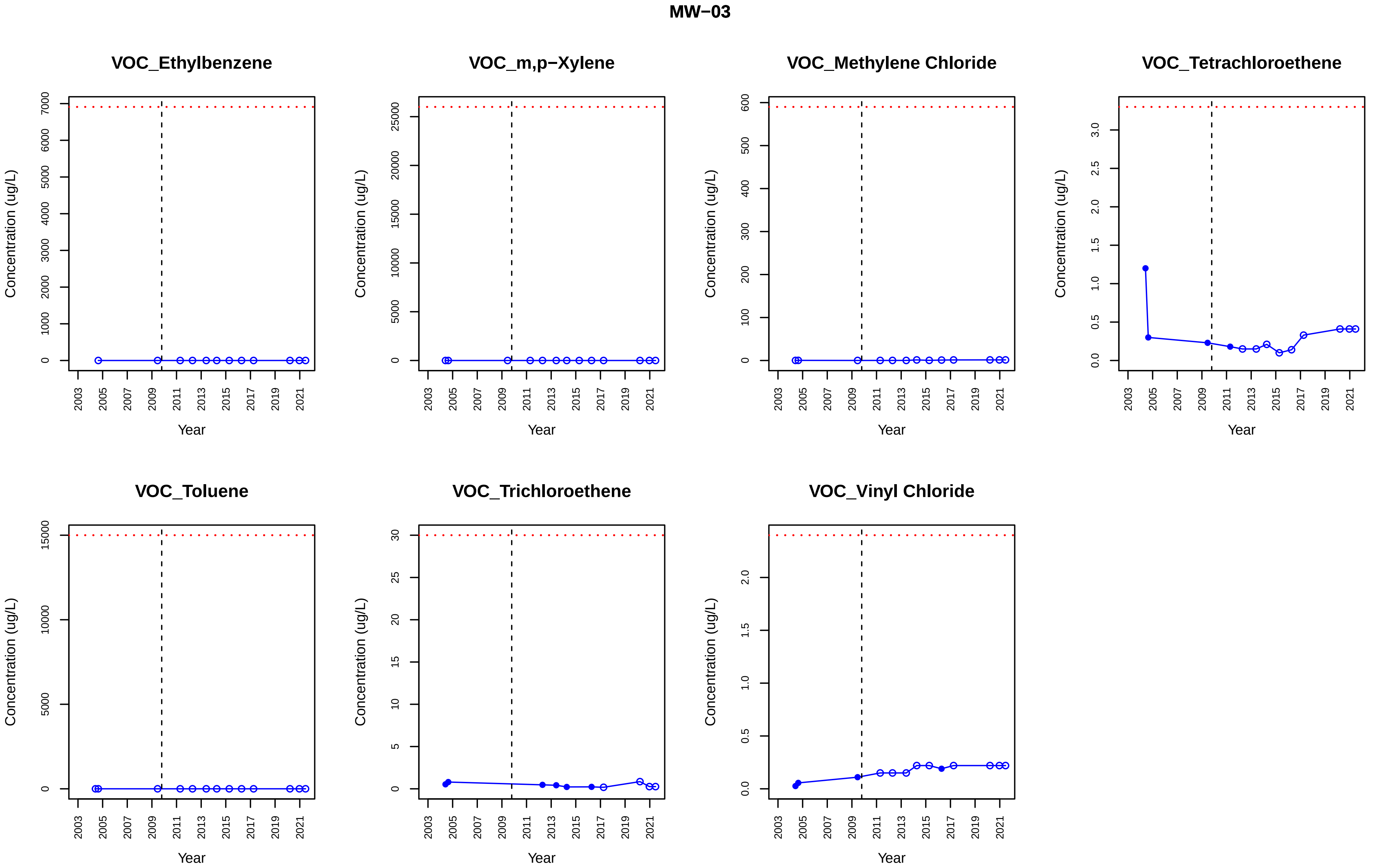

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
2
4
6
8
10
12
14
30
25
20
15
10
5
0.0
0.5
1.0
1.5
2.0
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−03


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

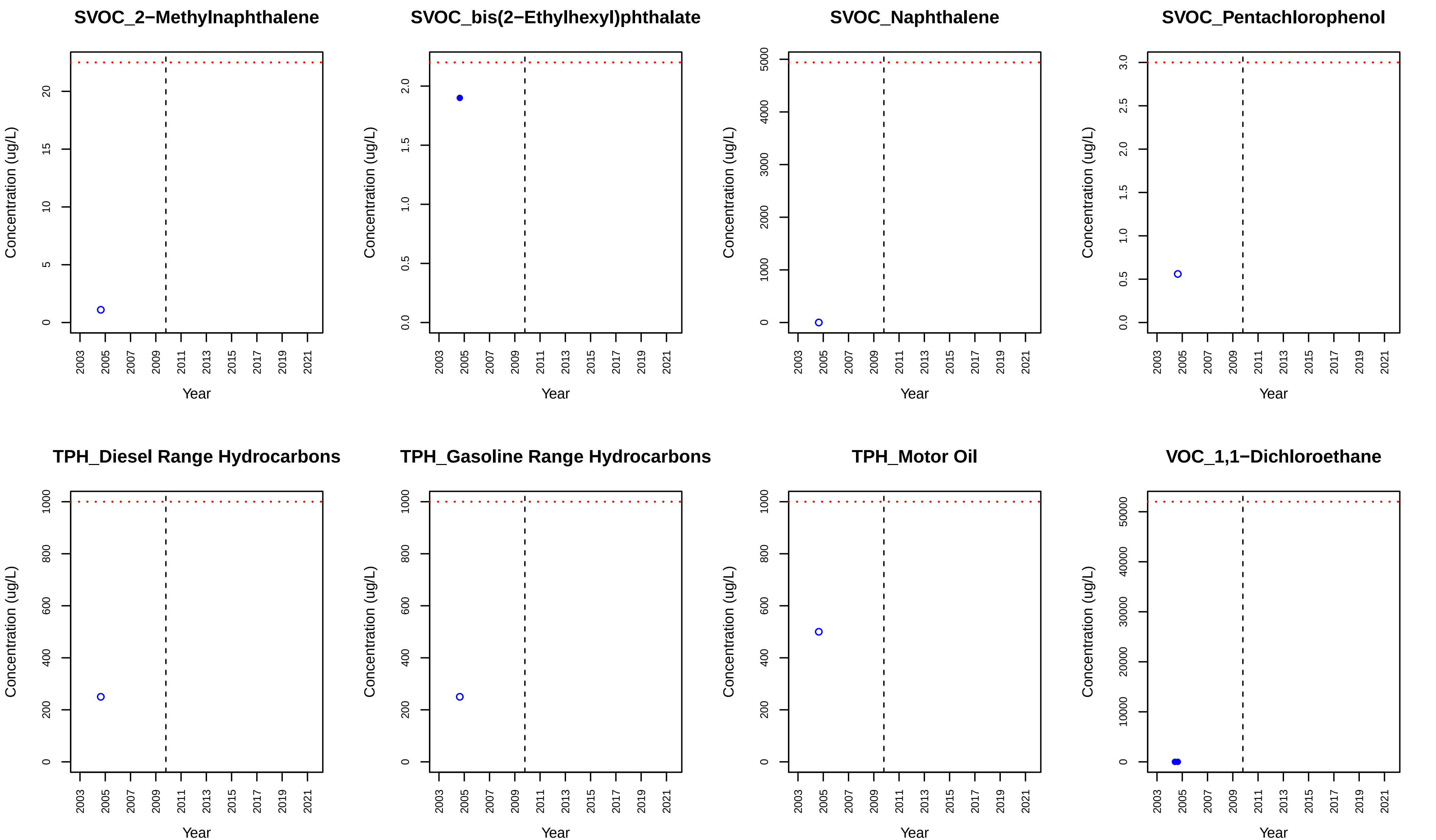
# MW−03


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

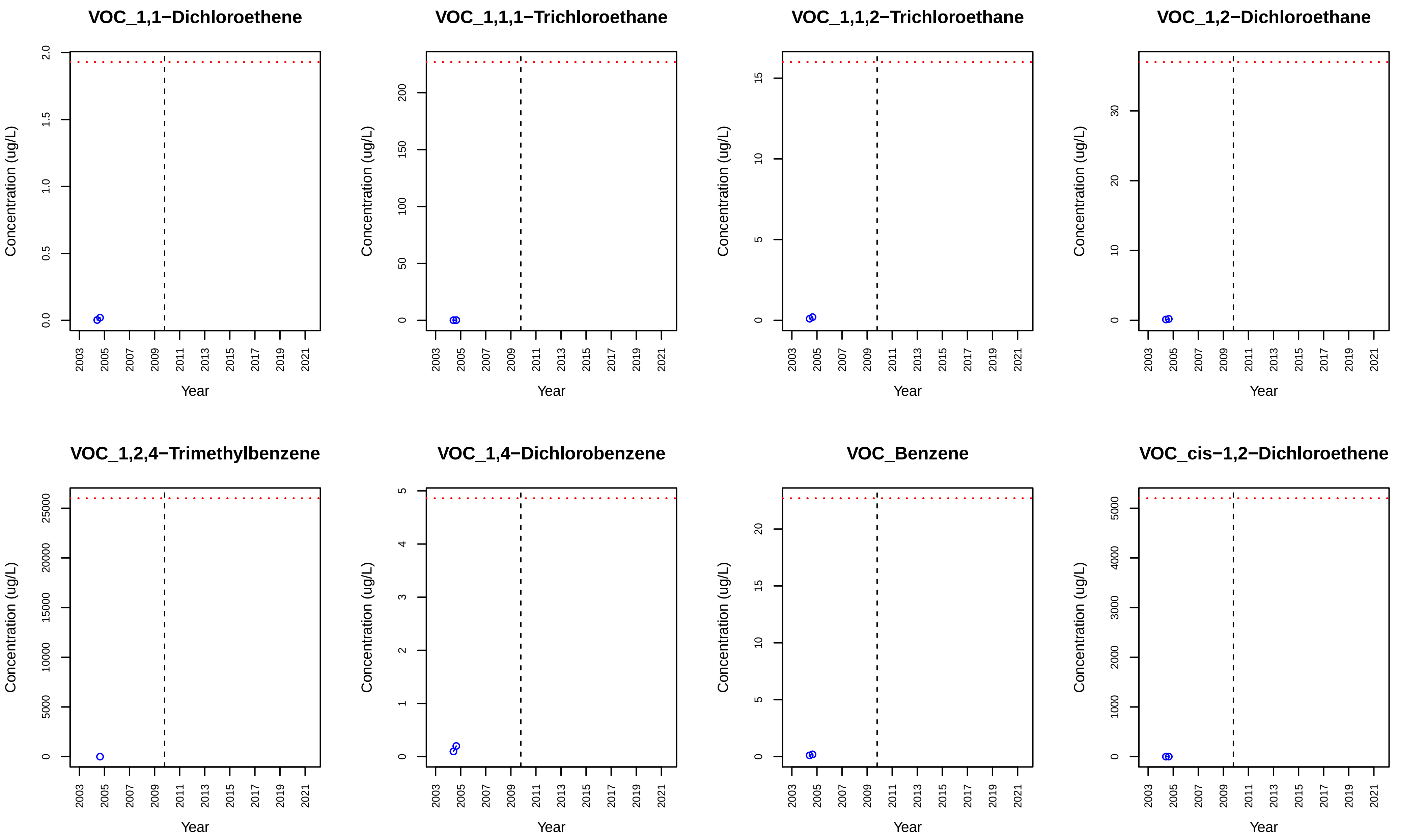


MW−03
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

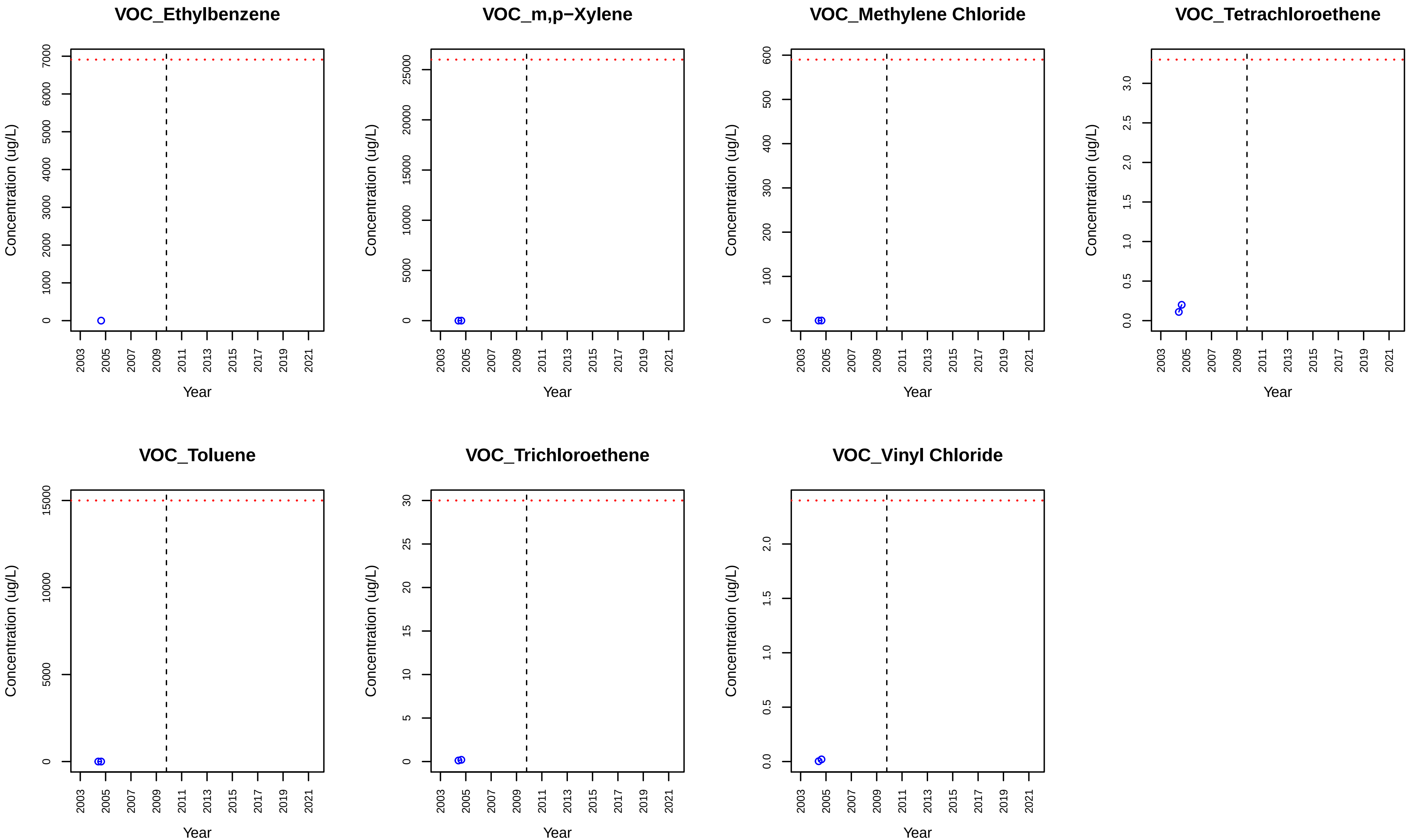
## MW−04


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−04

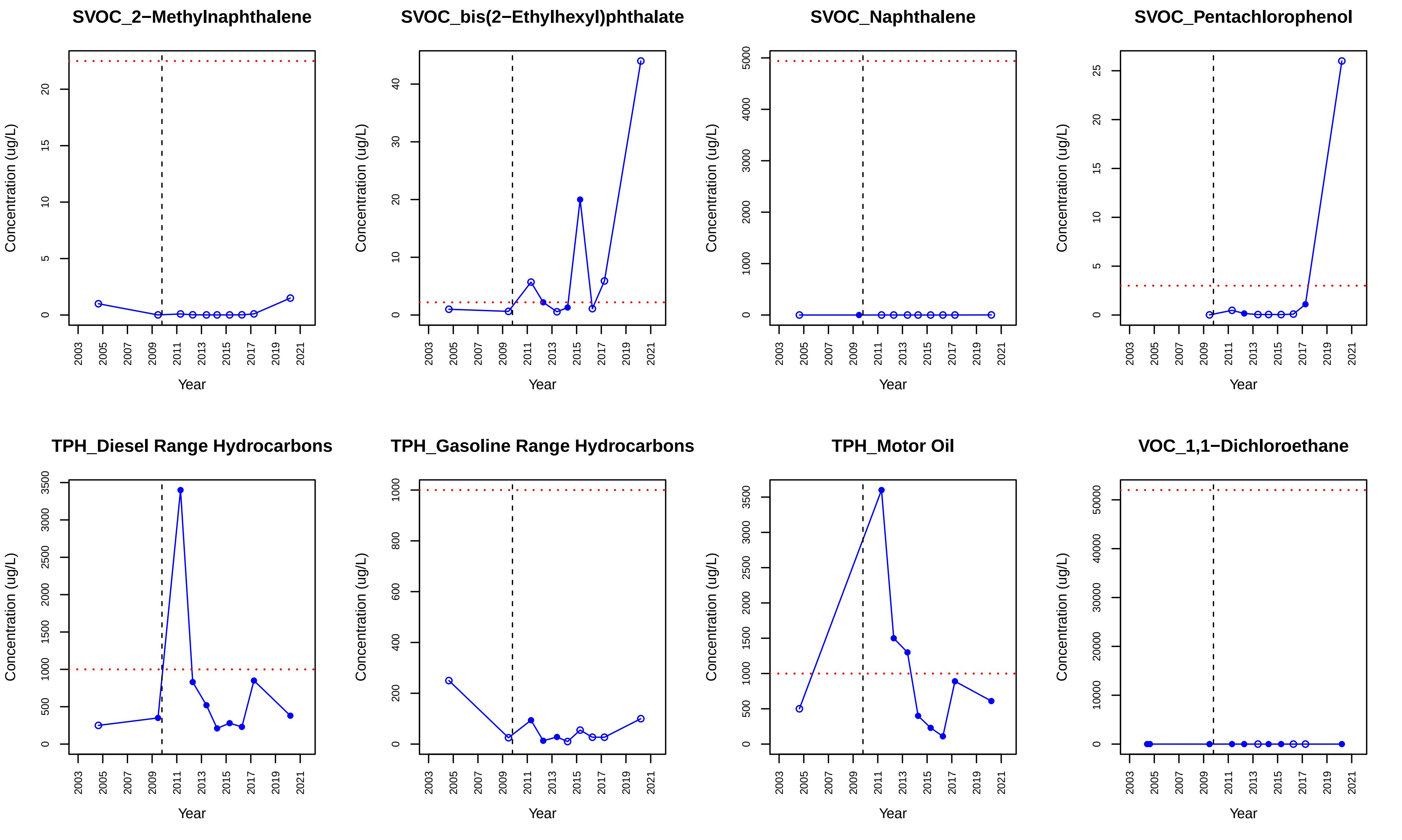

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−04



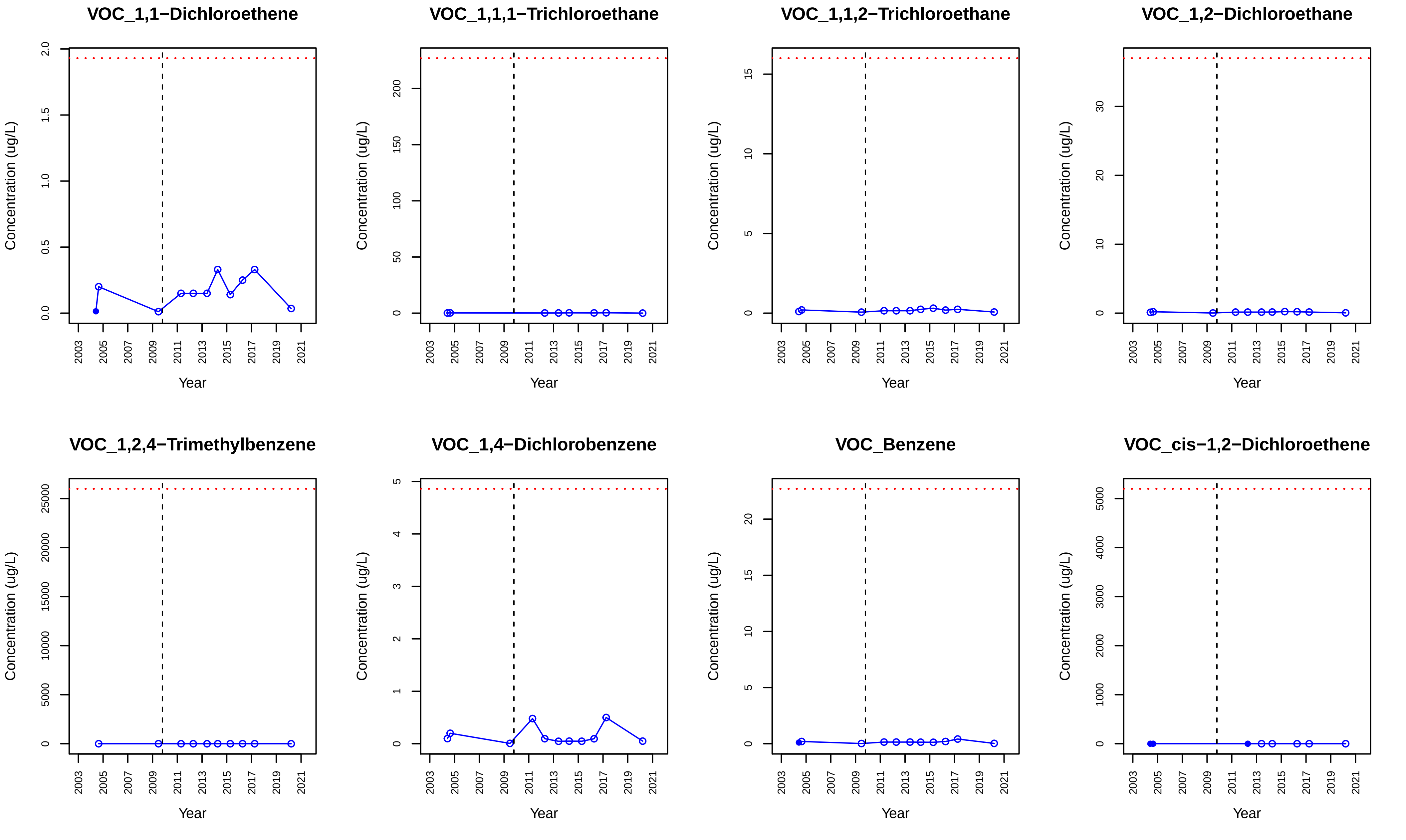
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**MW−05**

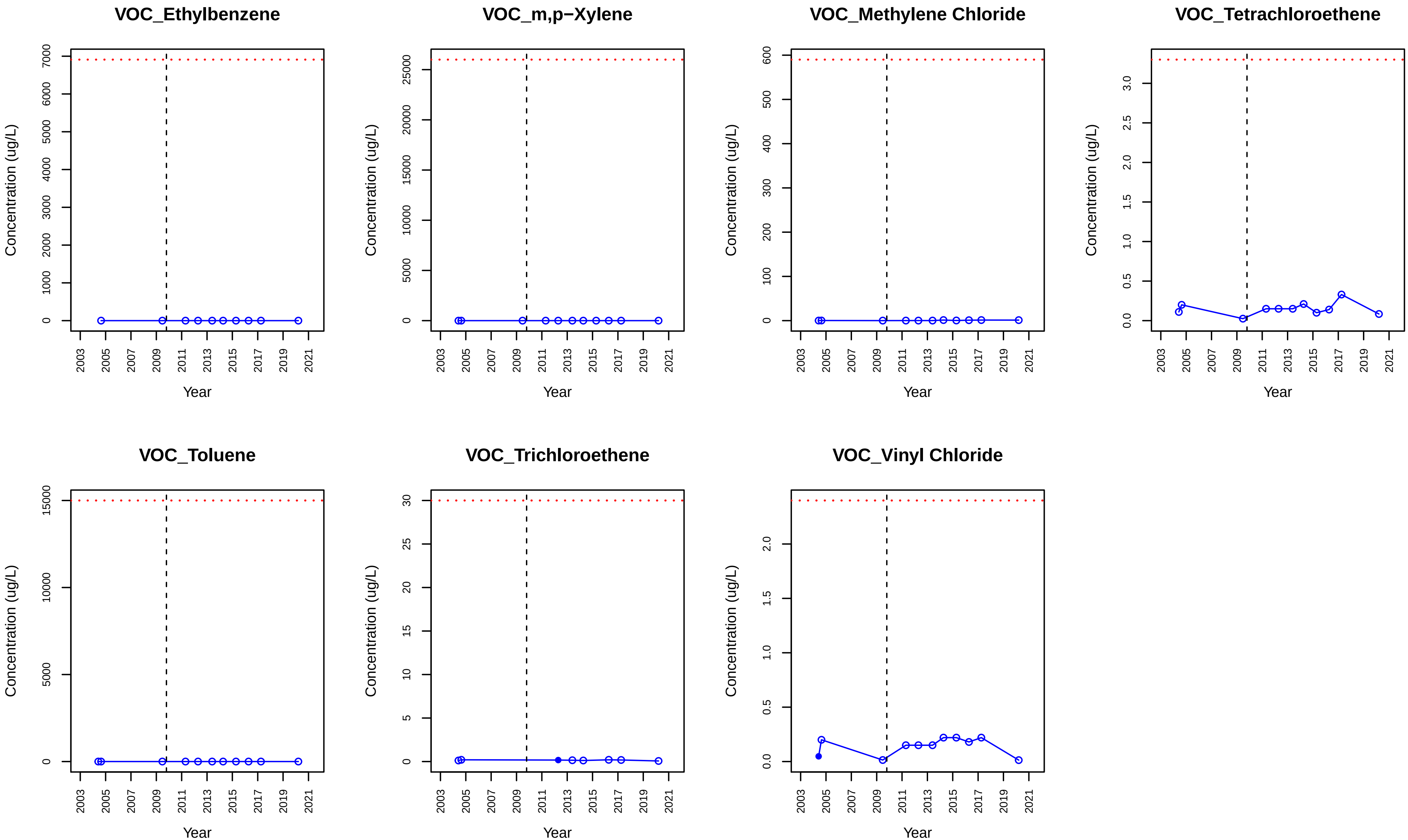


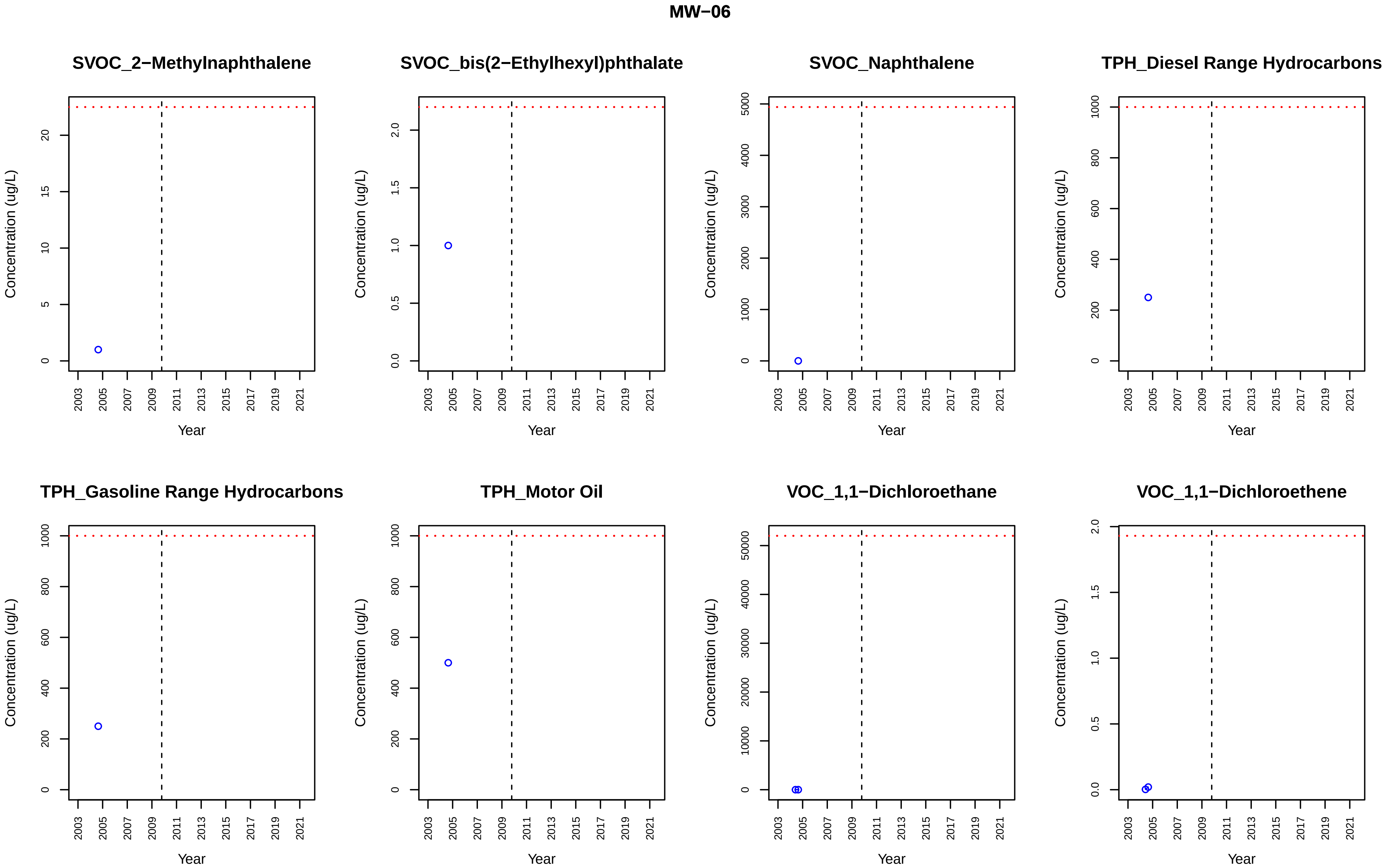
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−05

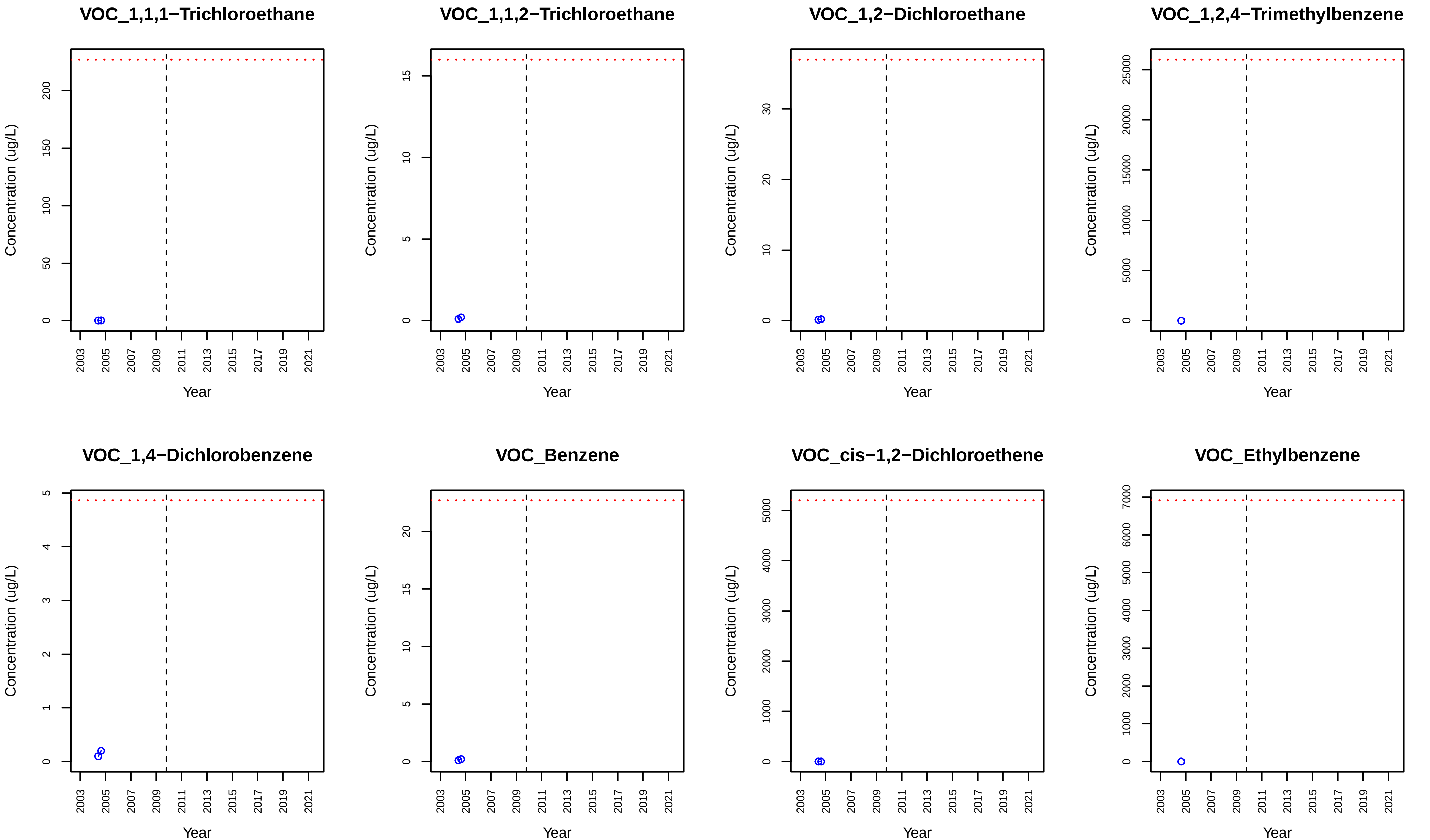

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year

# MW−05

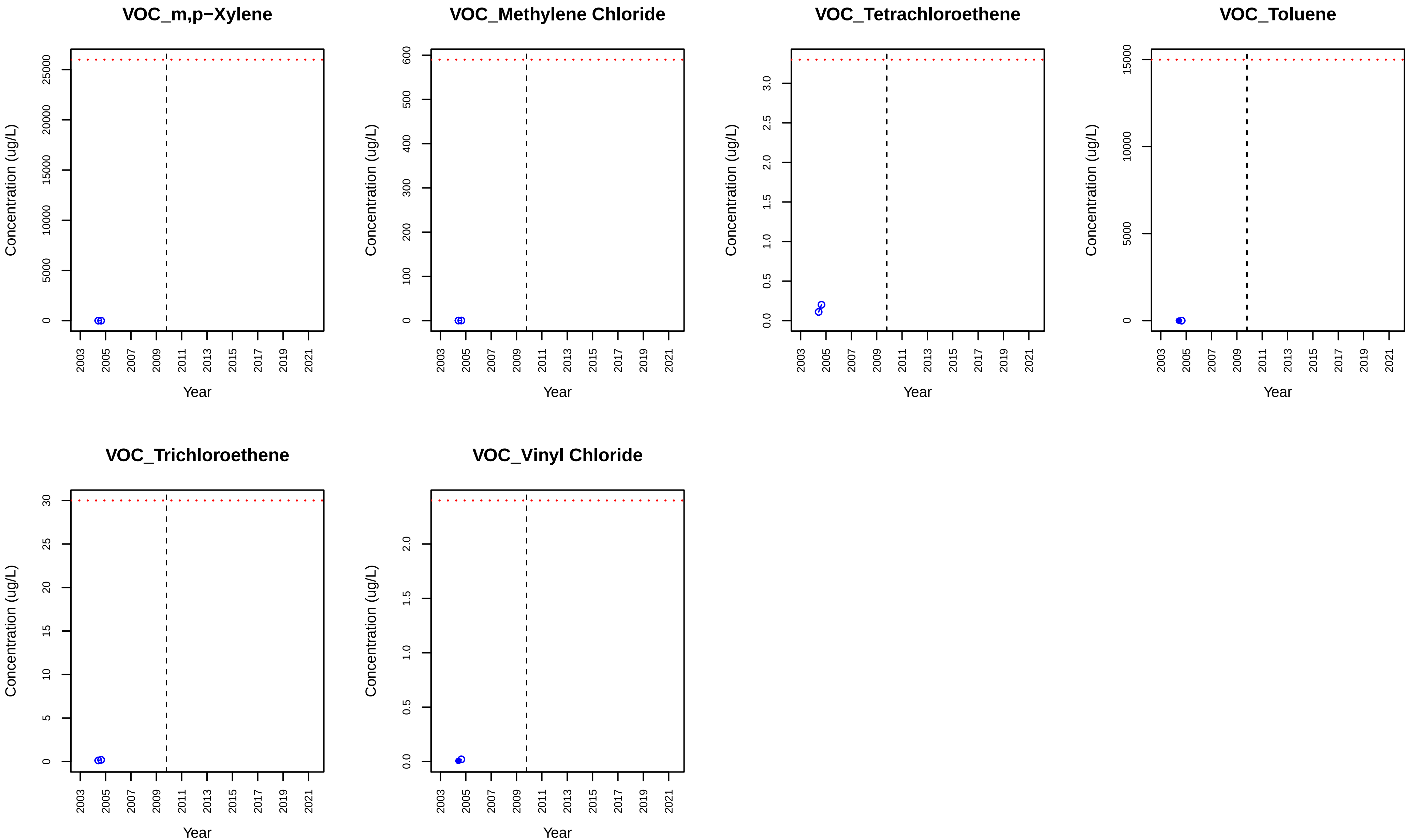

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year


MW−06
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
VOC_1,1−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

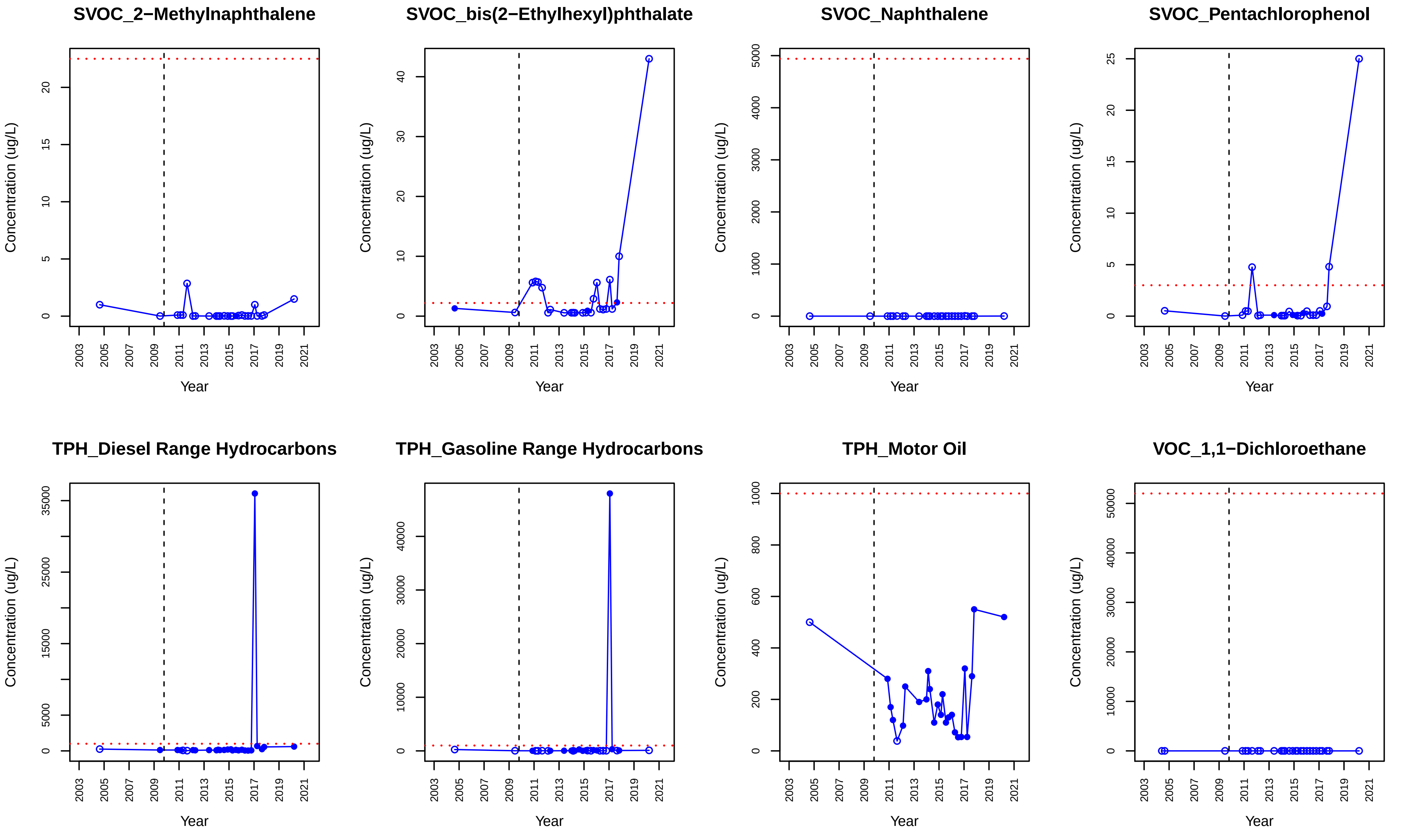
## MW−06

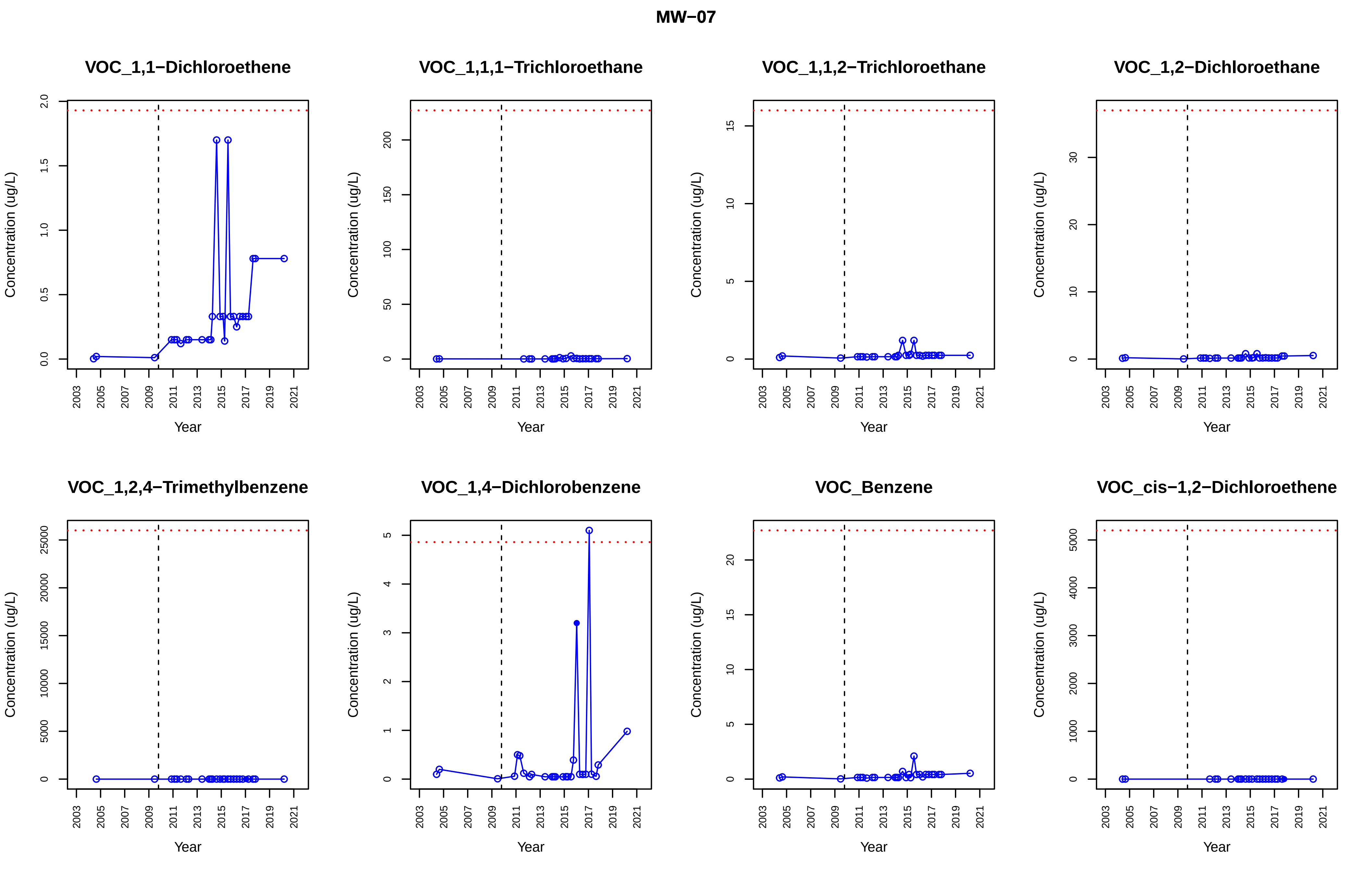

VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
VOC_Ethylbenzene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

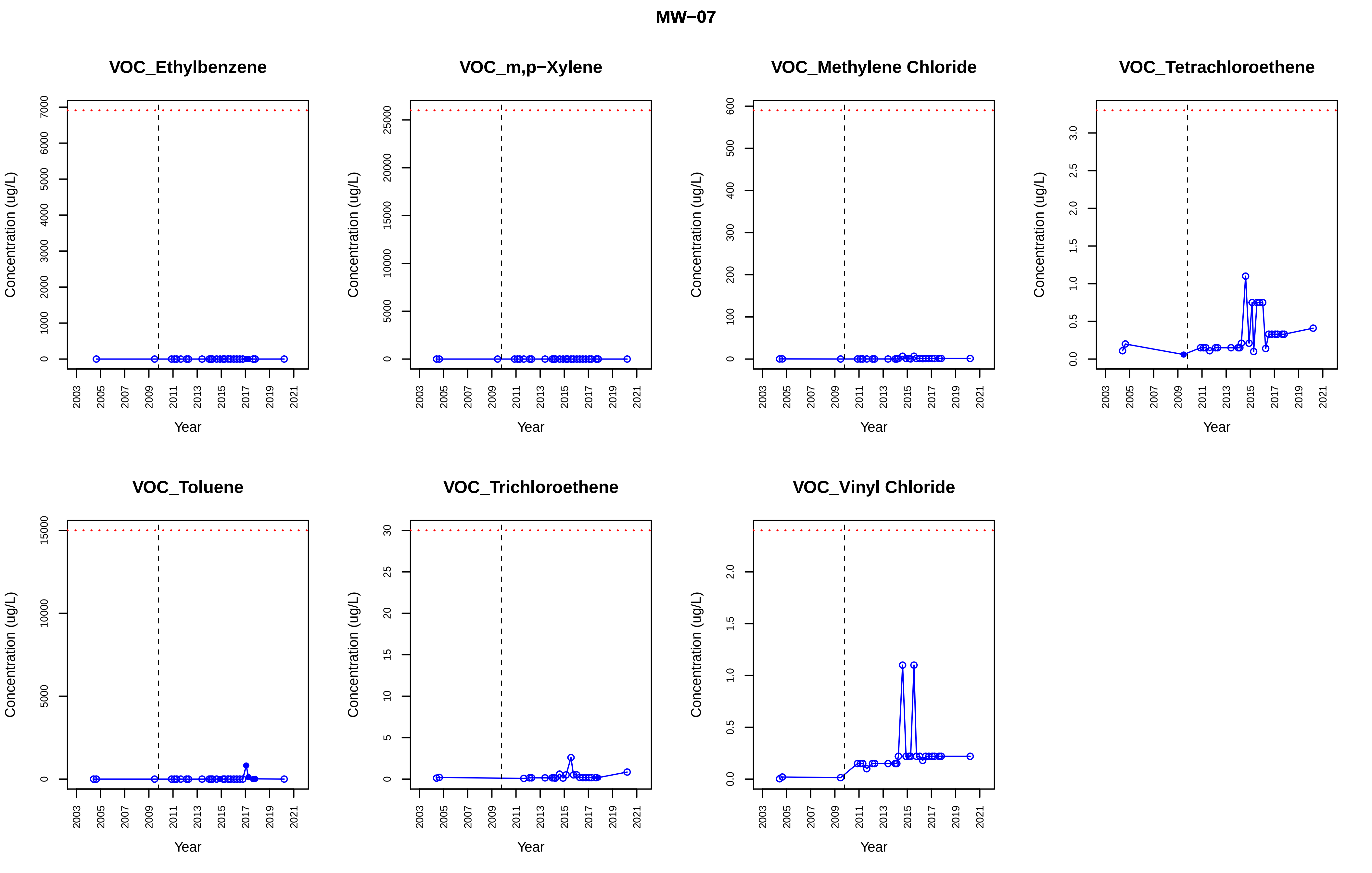
## MW−06


VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
0 5000 10000 15000 20000 25000
0 100 200 300 400 500 600
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0 5000 10000 15000
0 5 10 15 20 25 30
0.0 0.5 1.0 1.5 2.0
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

# MW−07

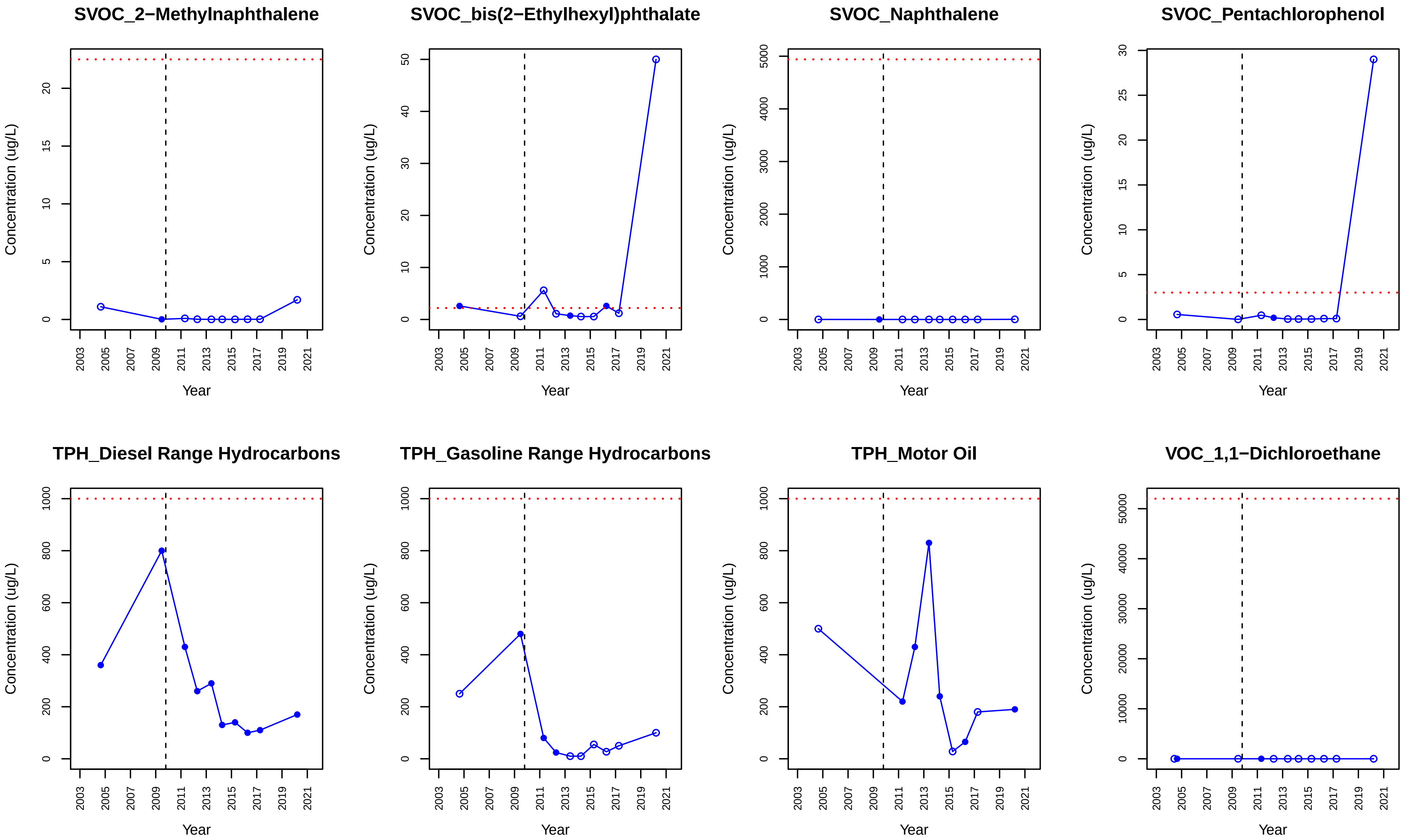

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


MW−07
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year

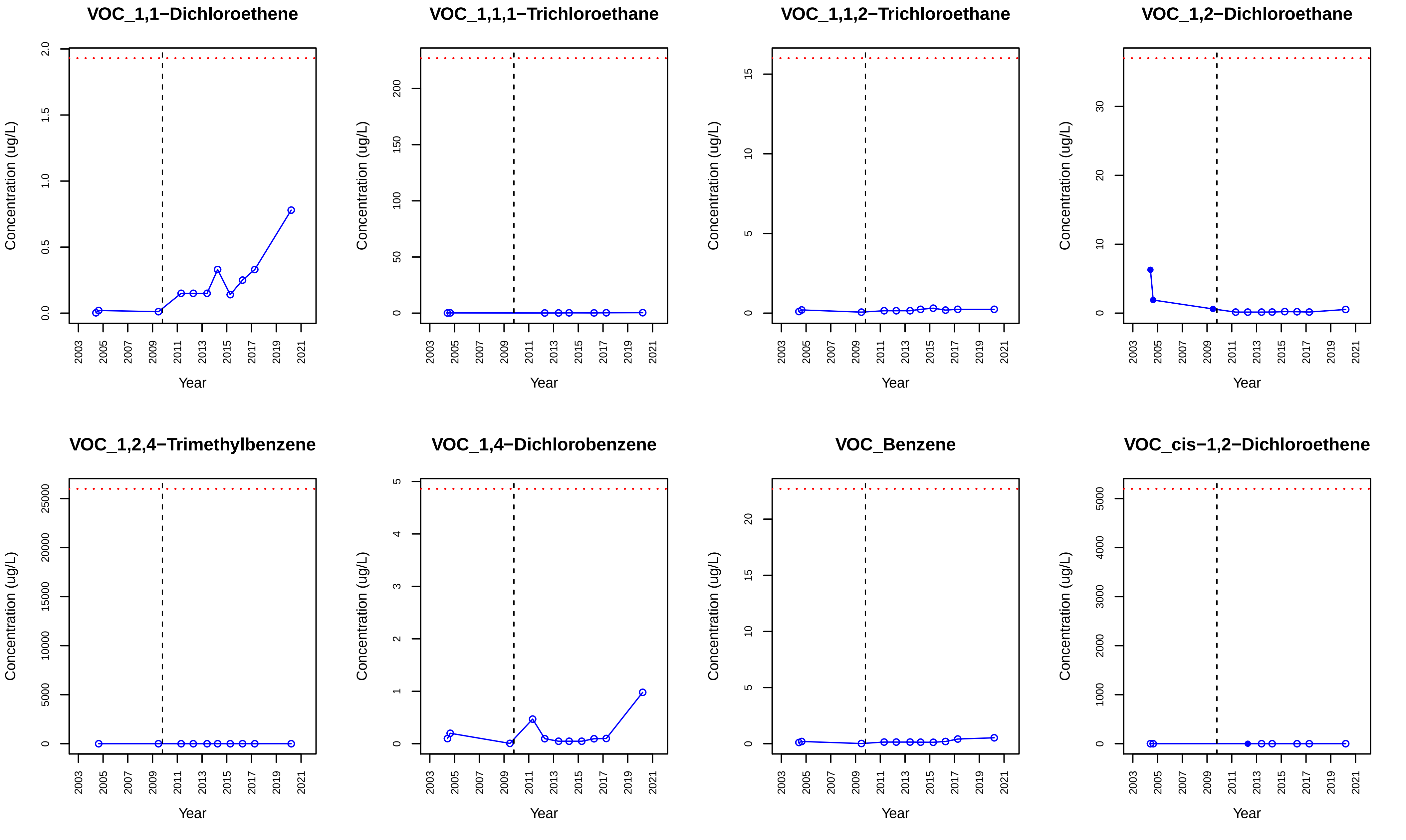


MW−07
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

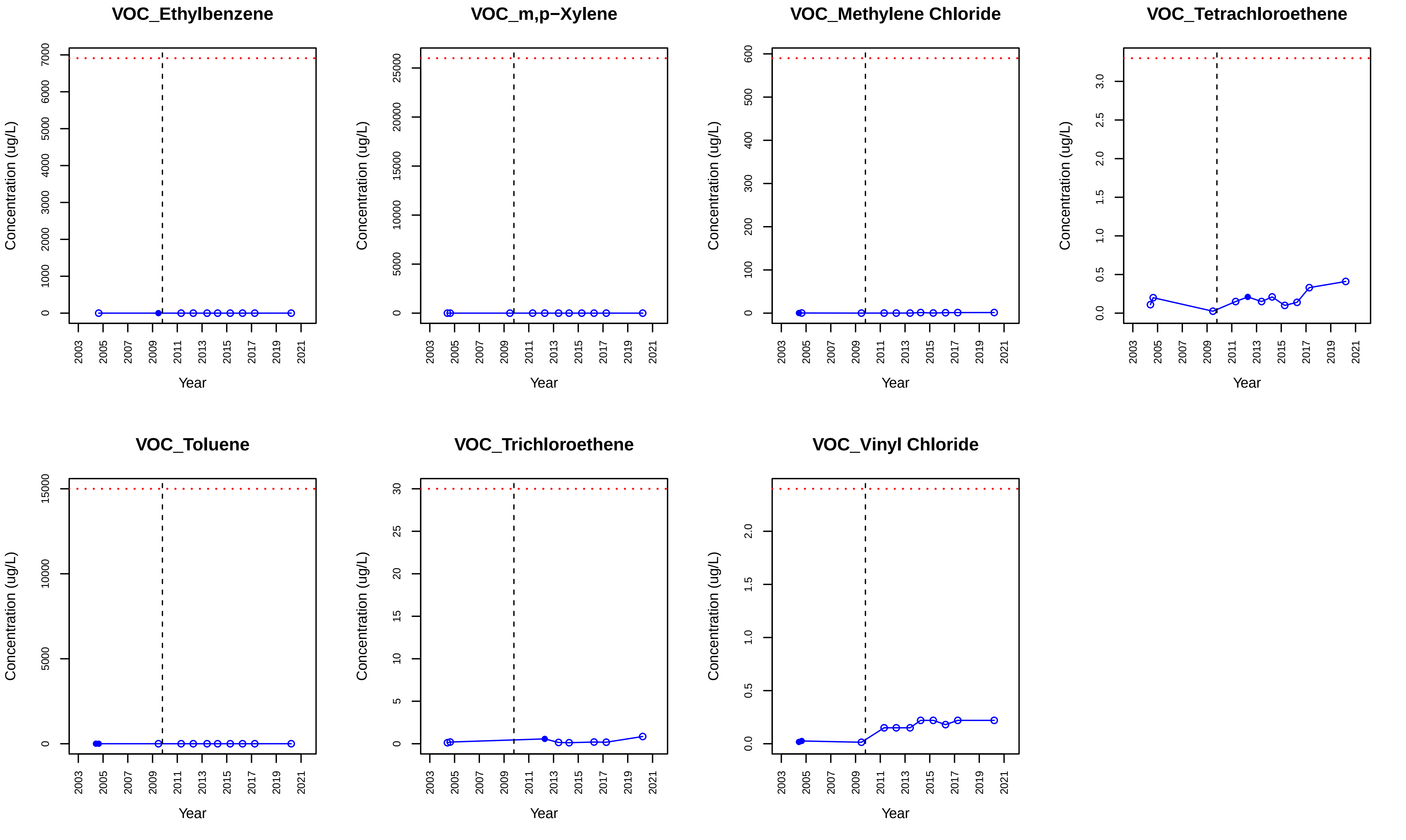
**MW−08**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

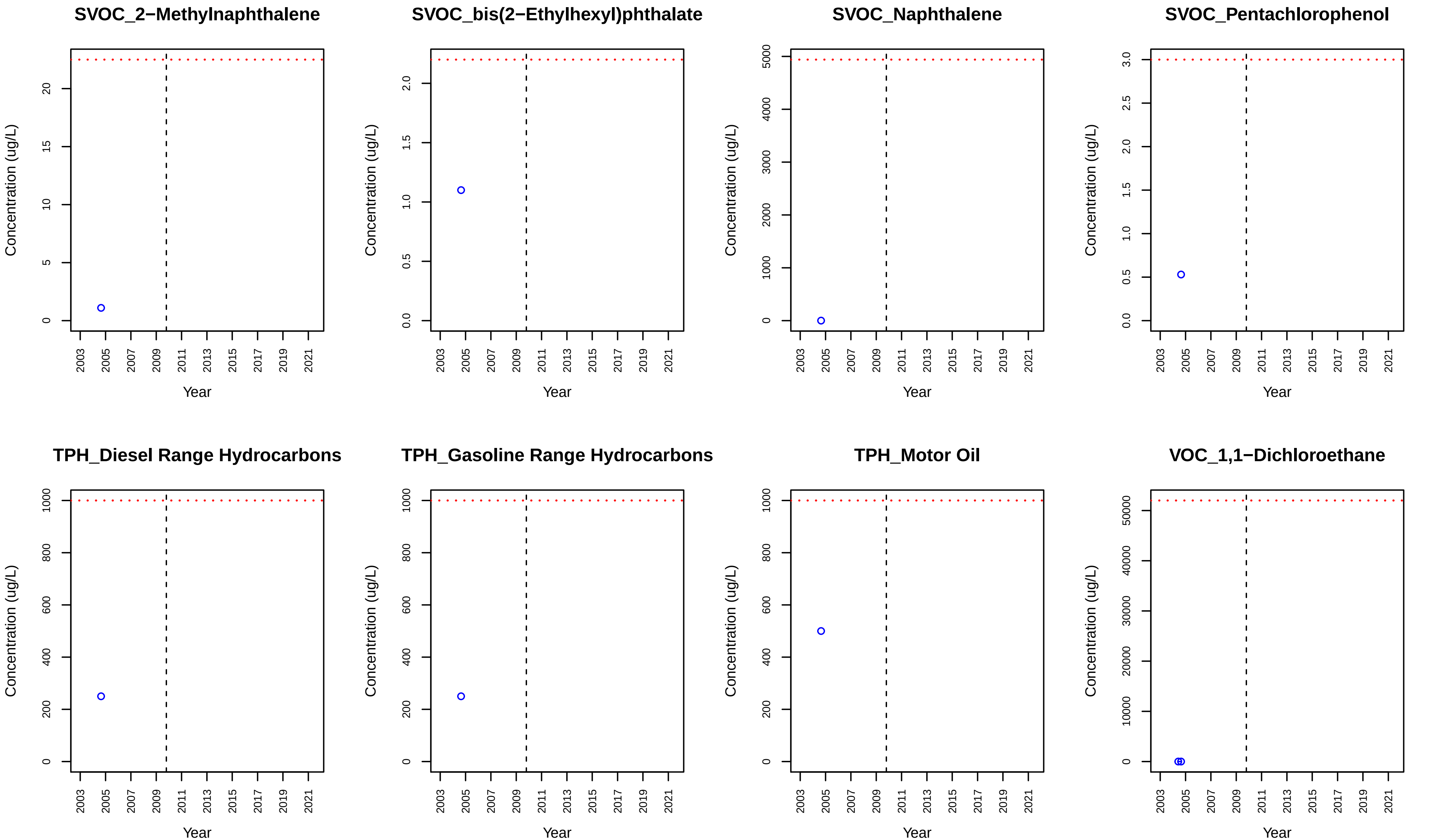
# MW−08


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

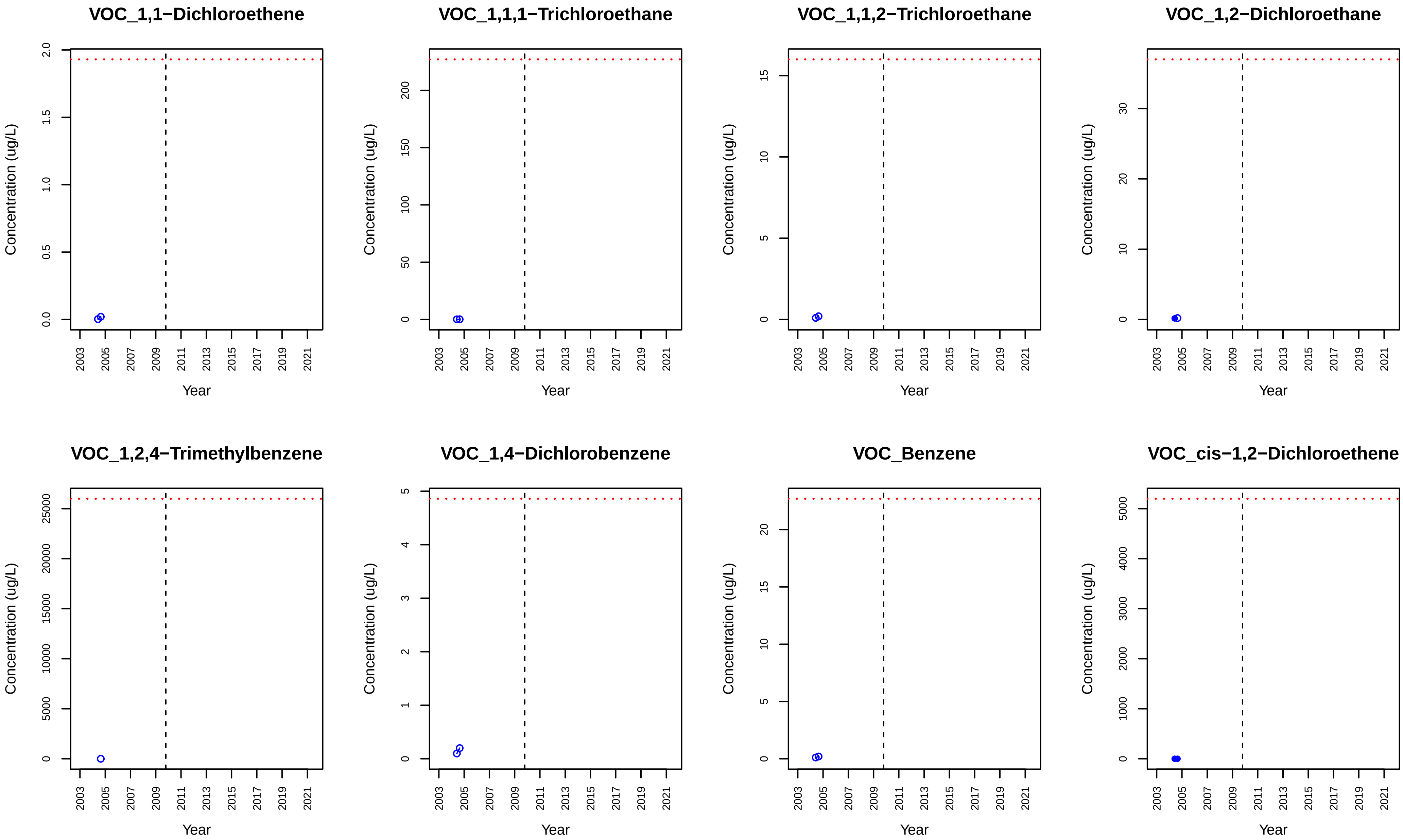
# MW−08


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

**MW−09**

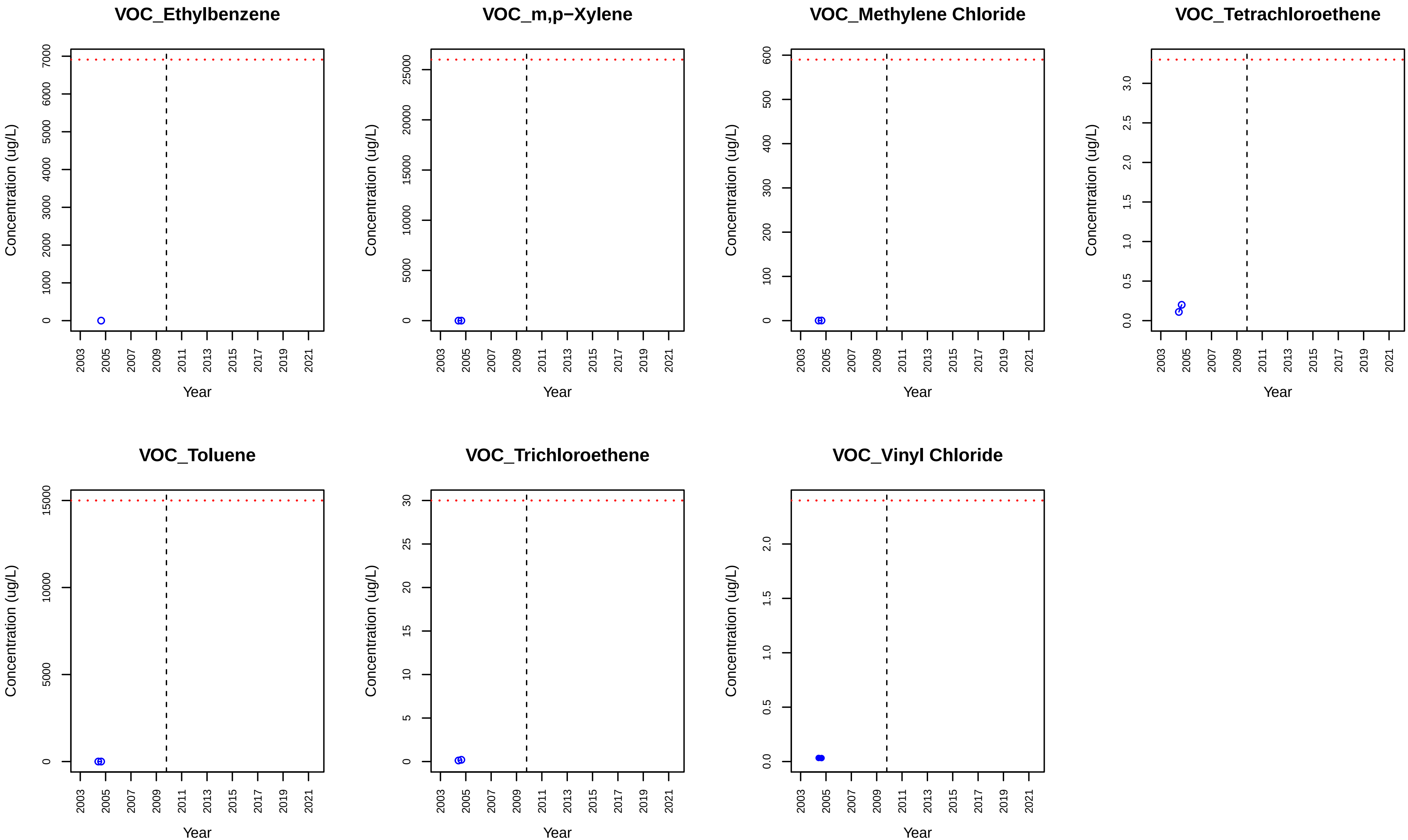

SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−09

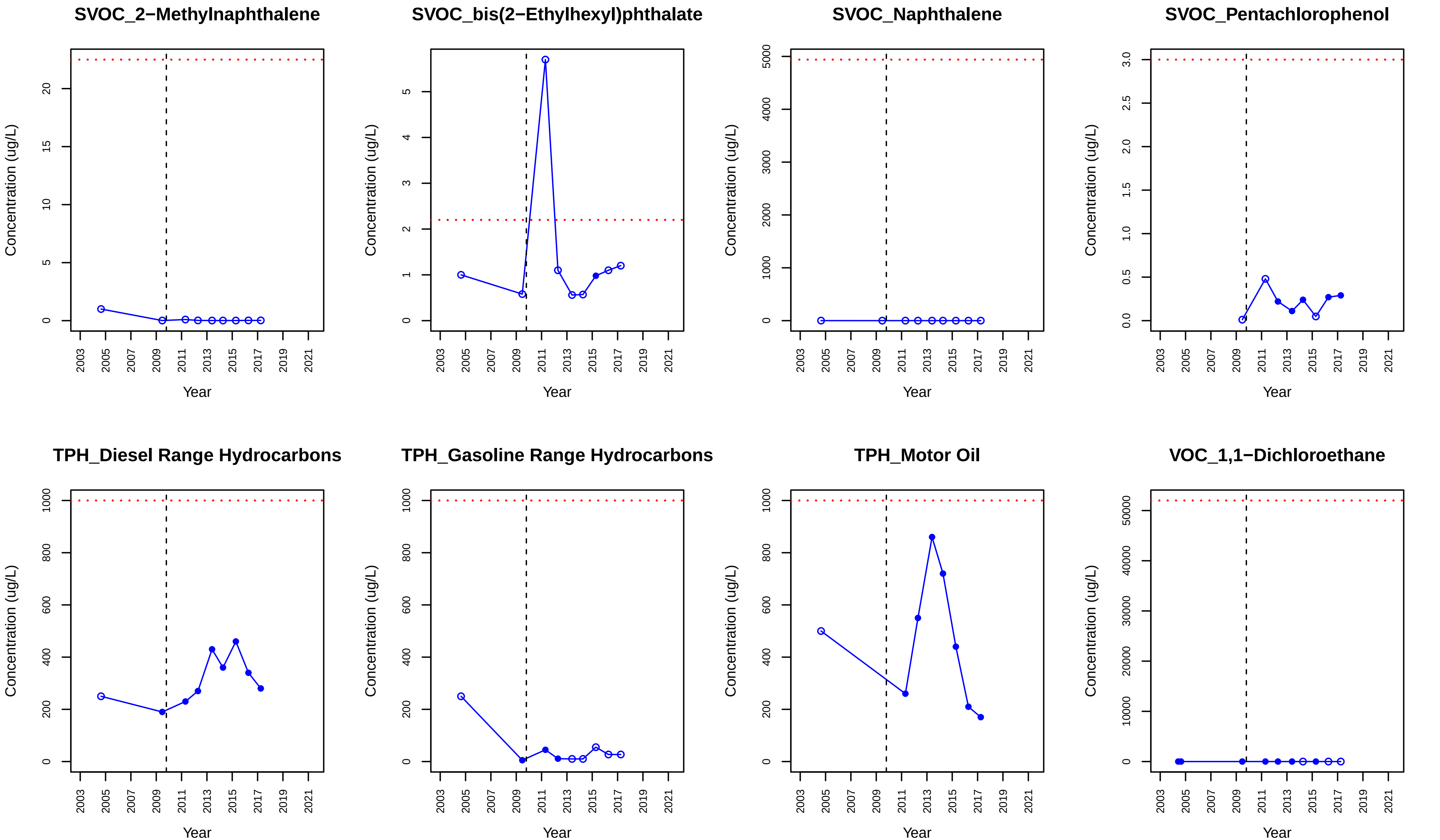


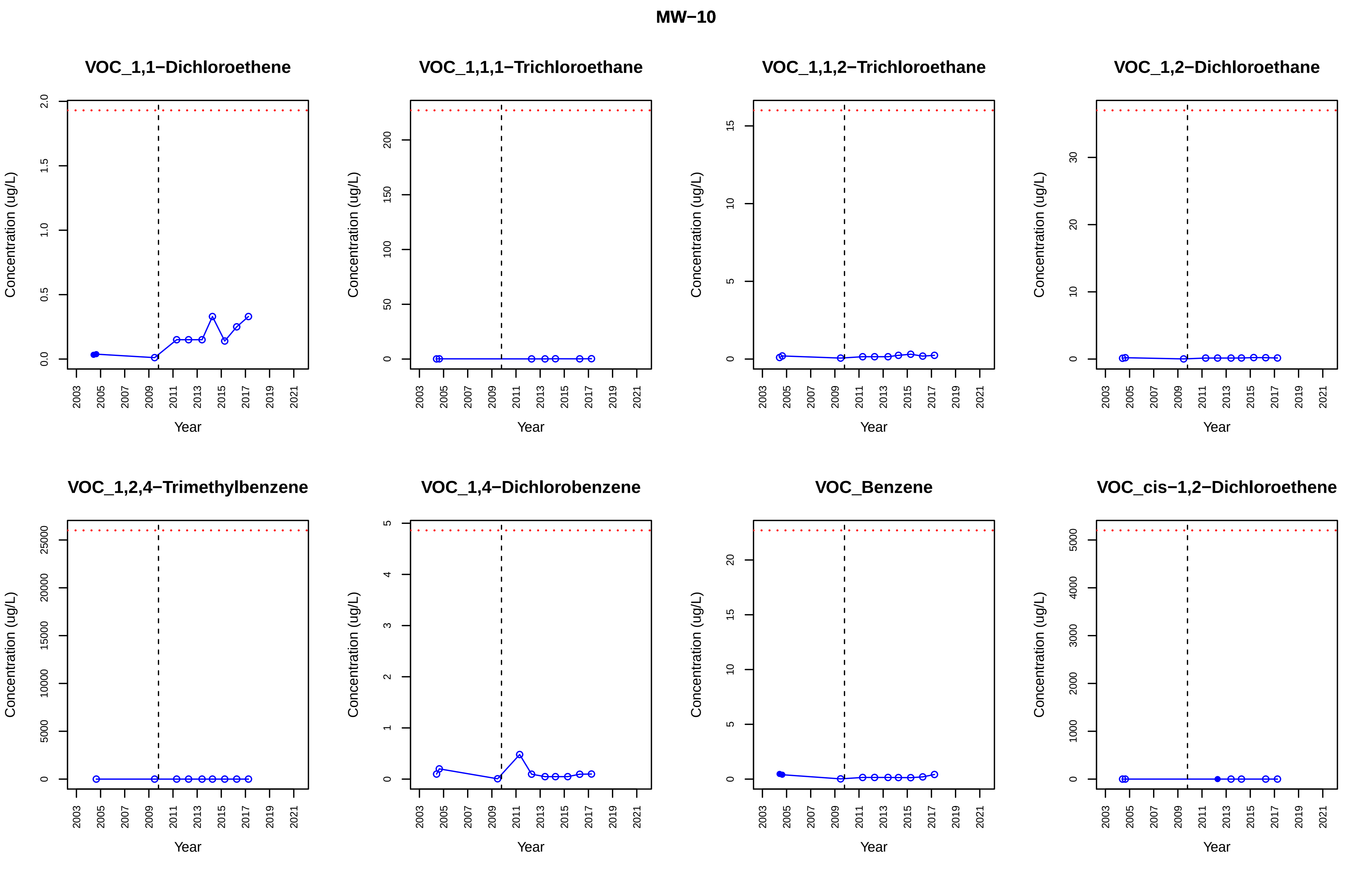
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

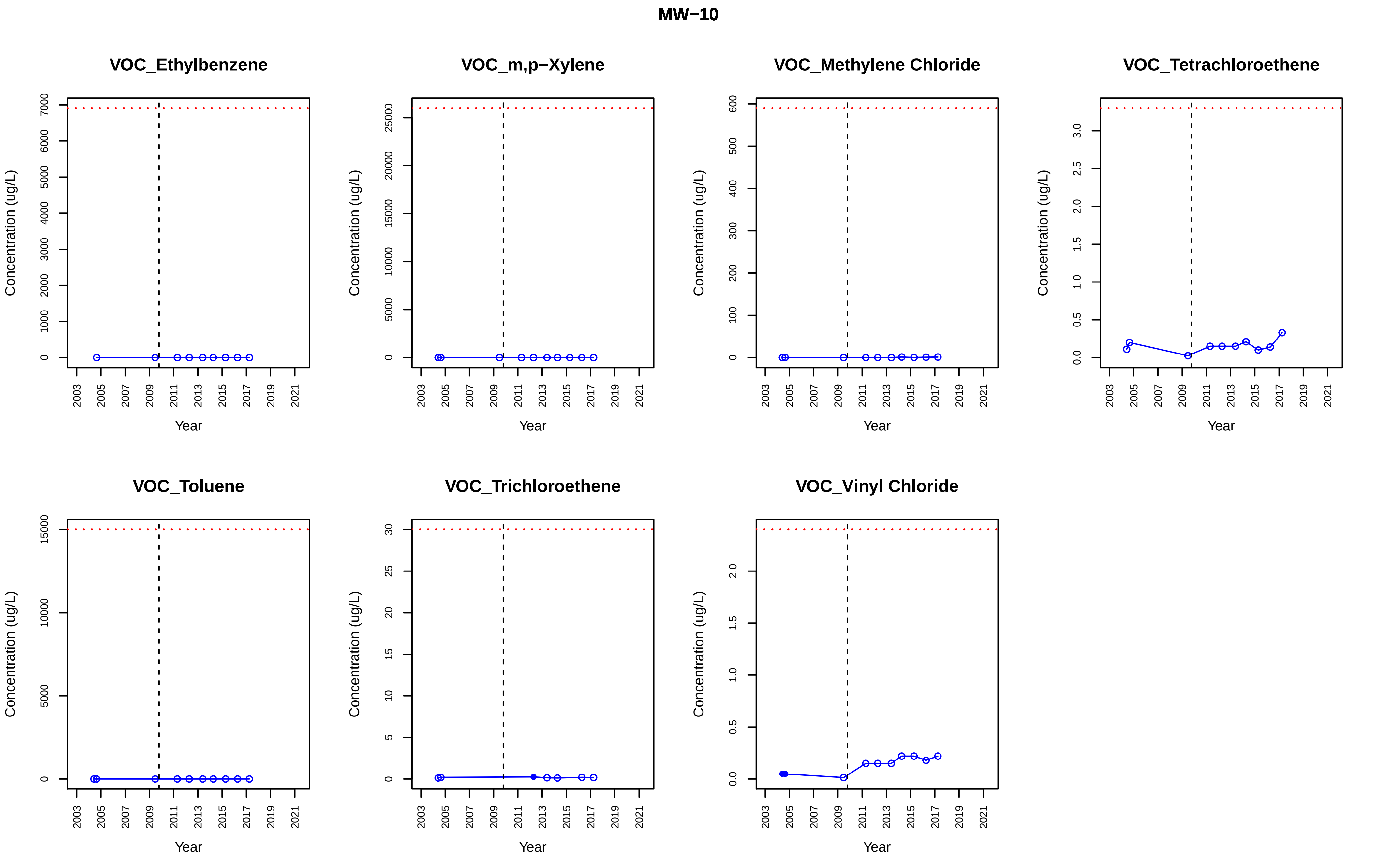
**MW−09**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30

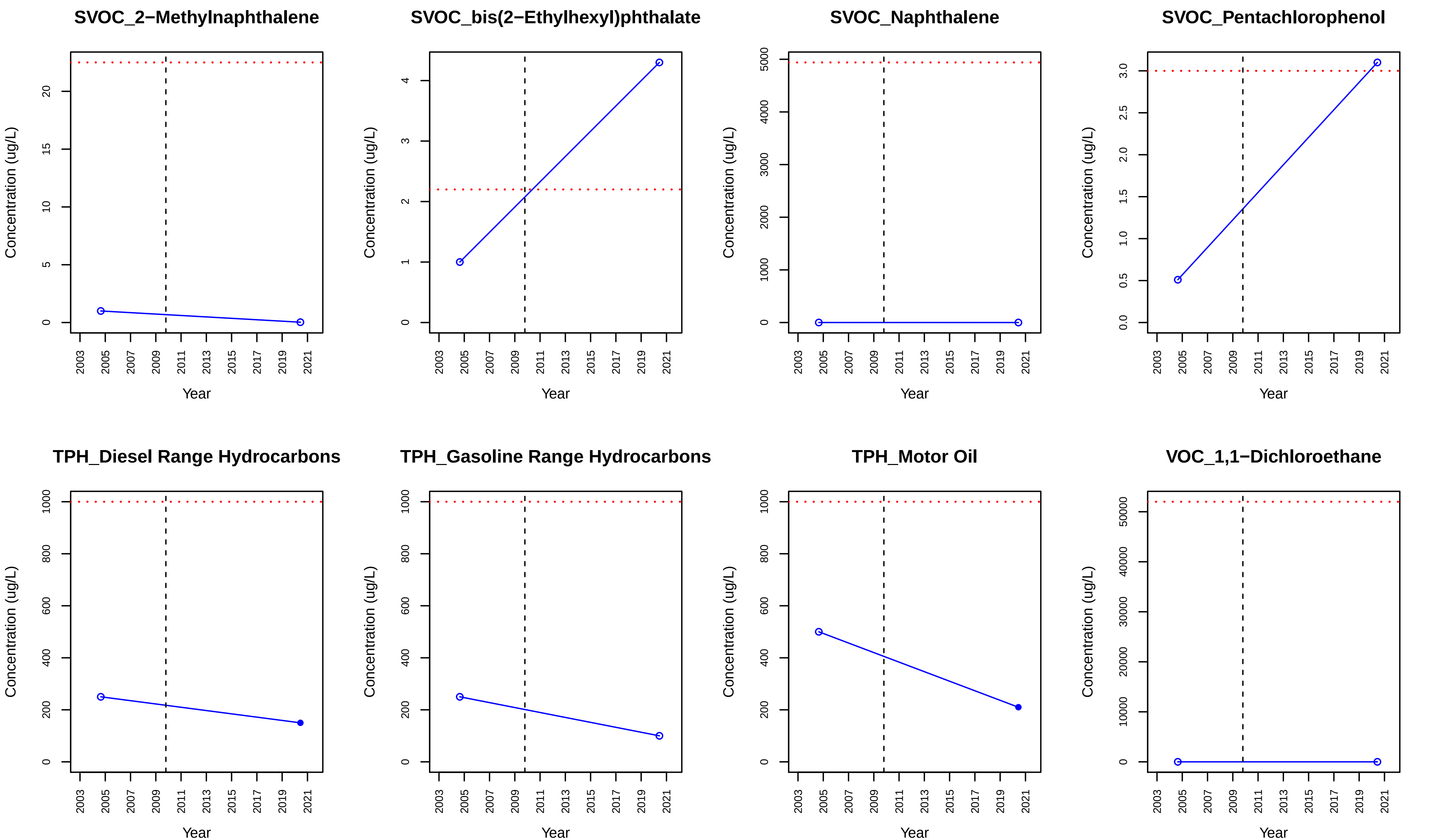
# MW−10


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


MW−10
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

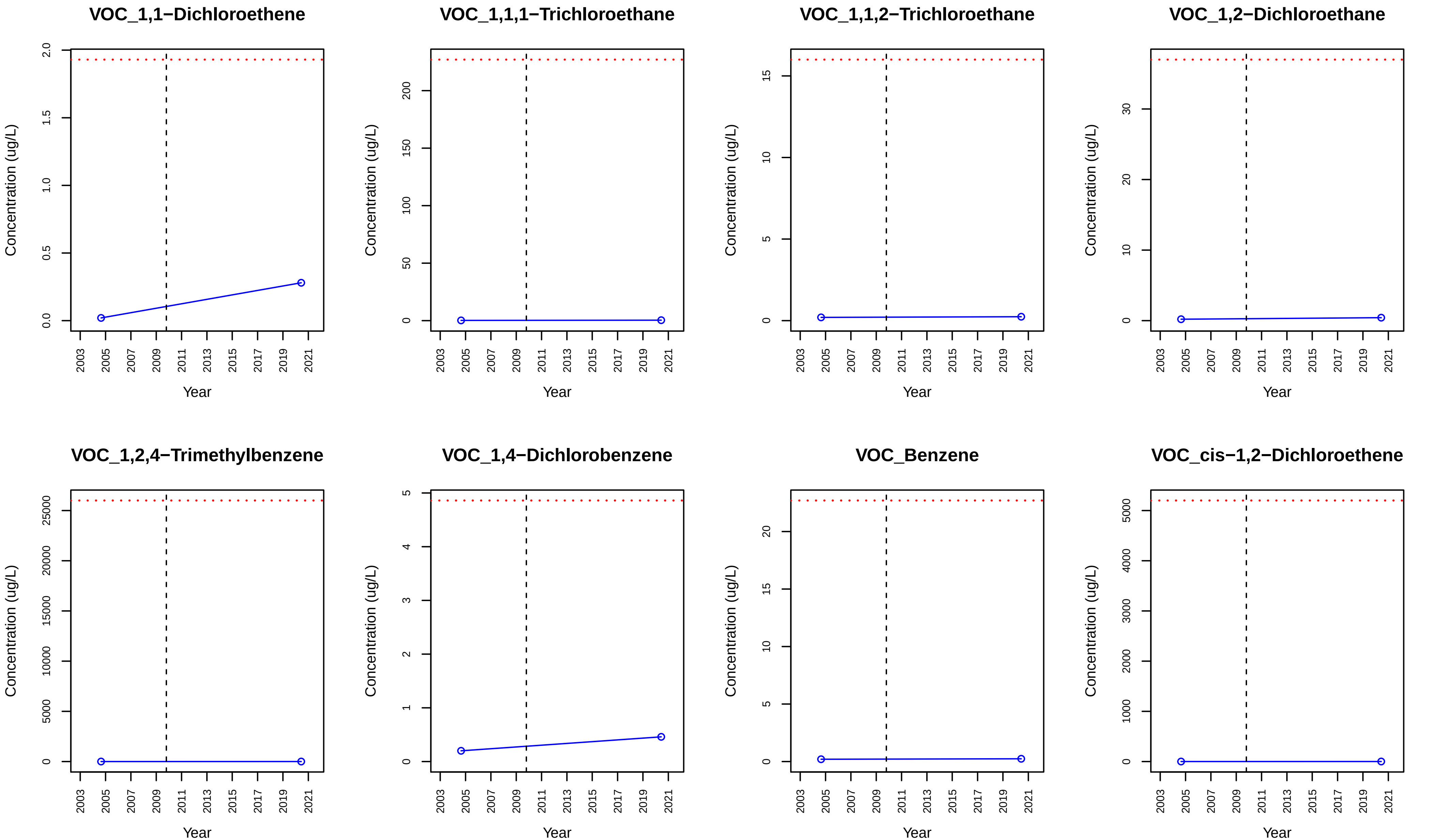

MW−10
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## MW−11

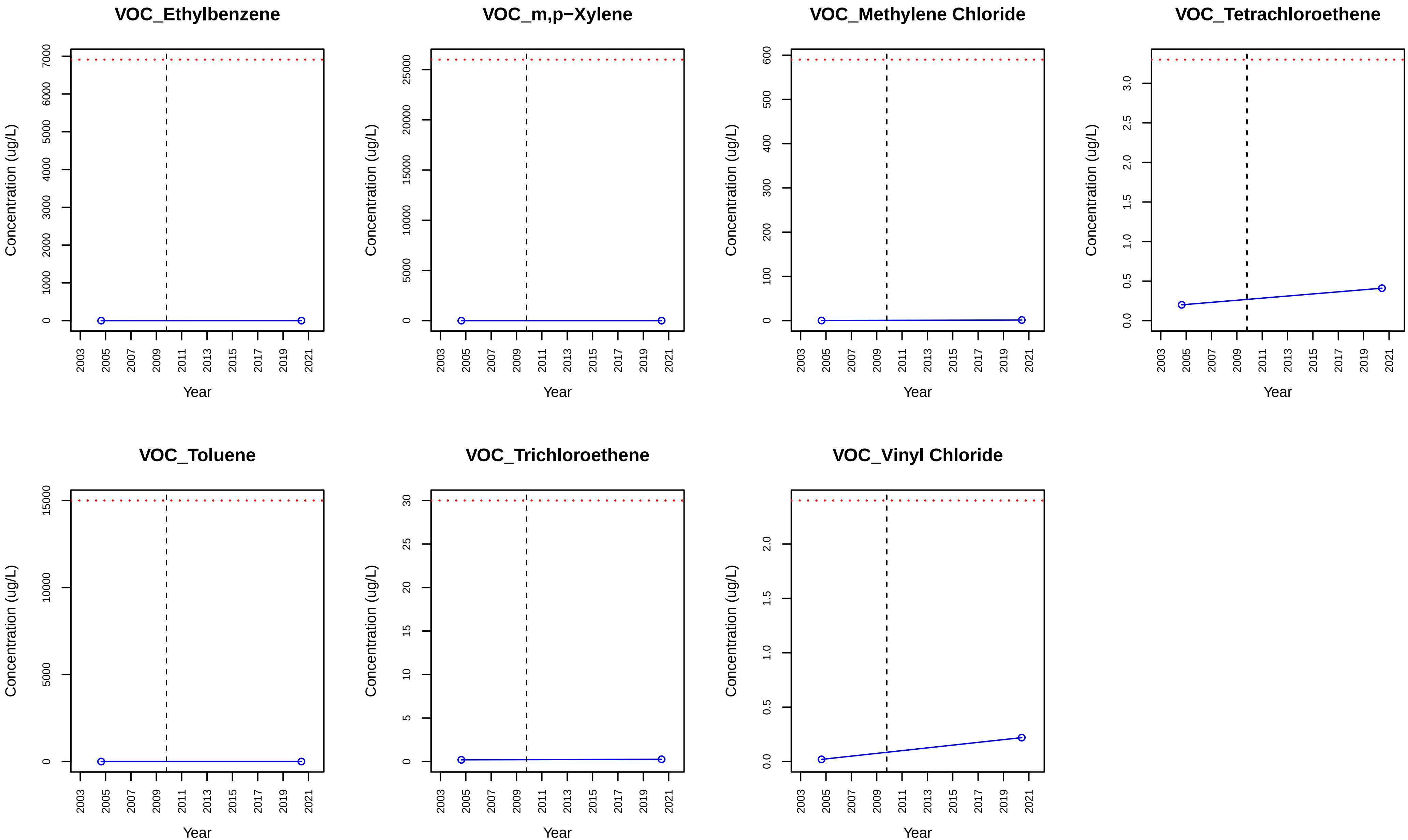


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−11

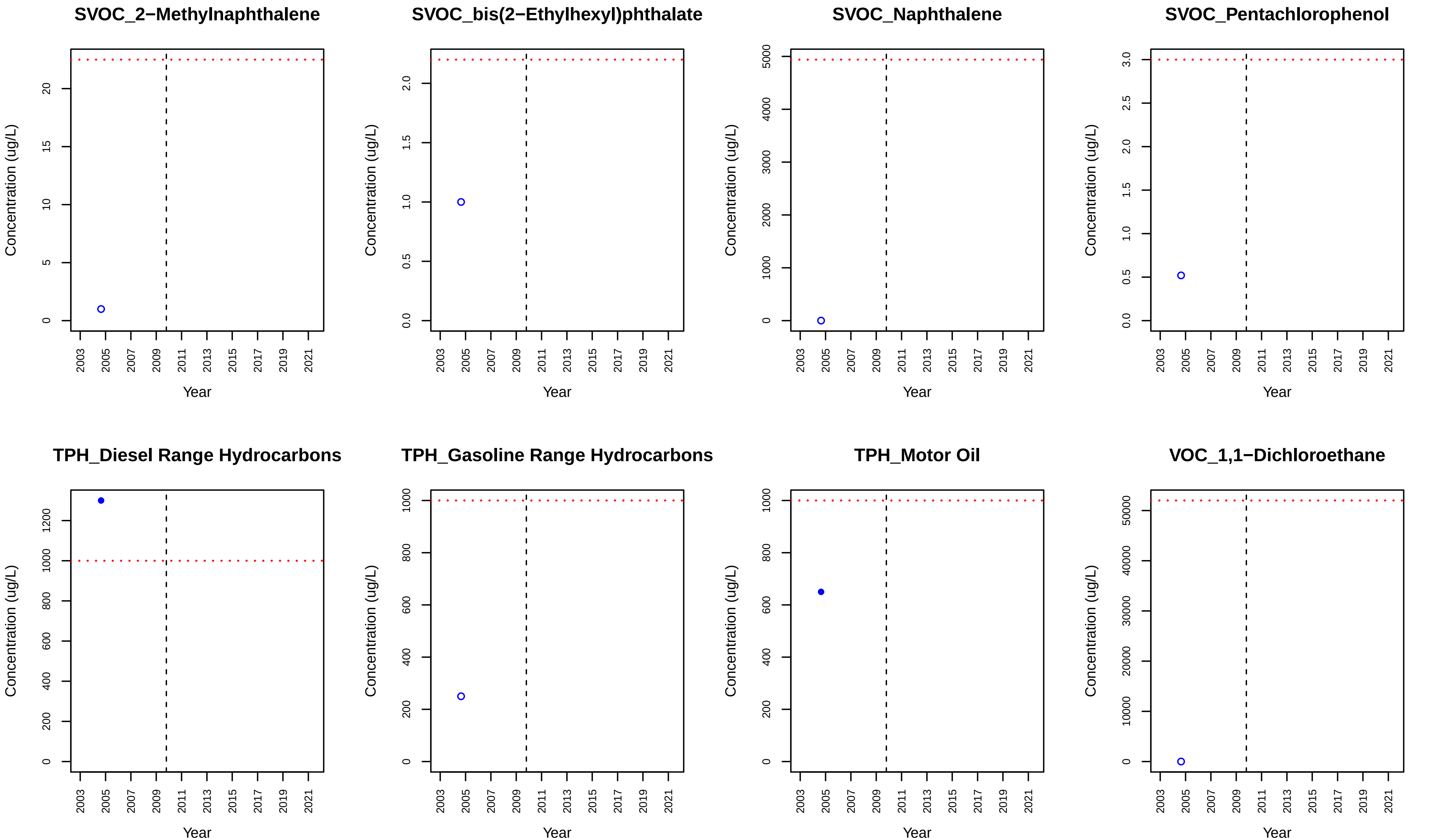

VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## MW−11



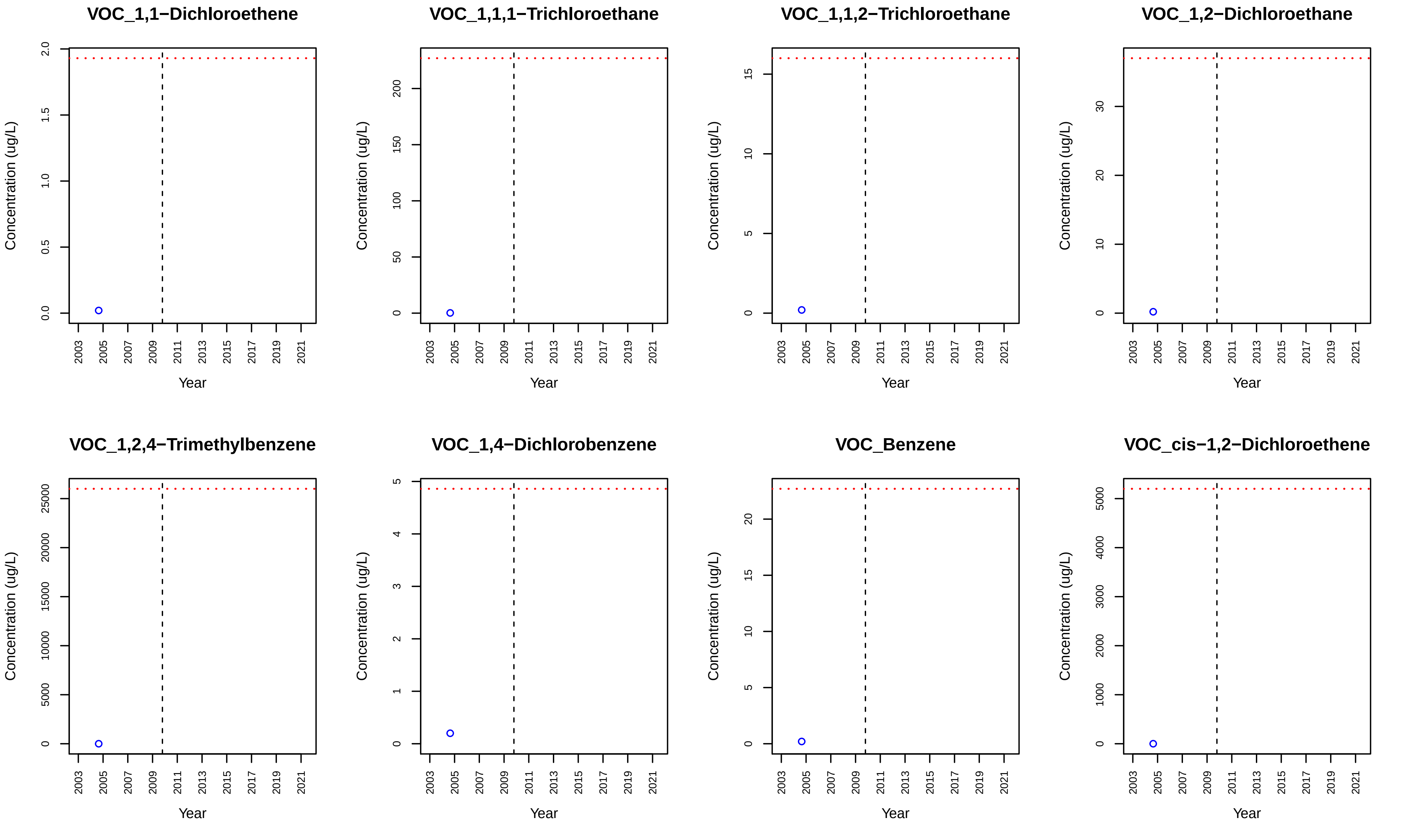
VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year

# MW−12

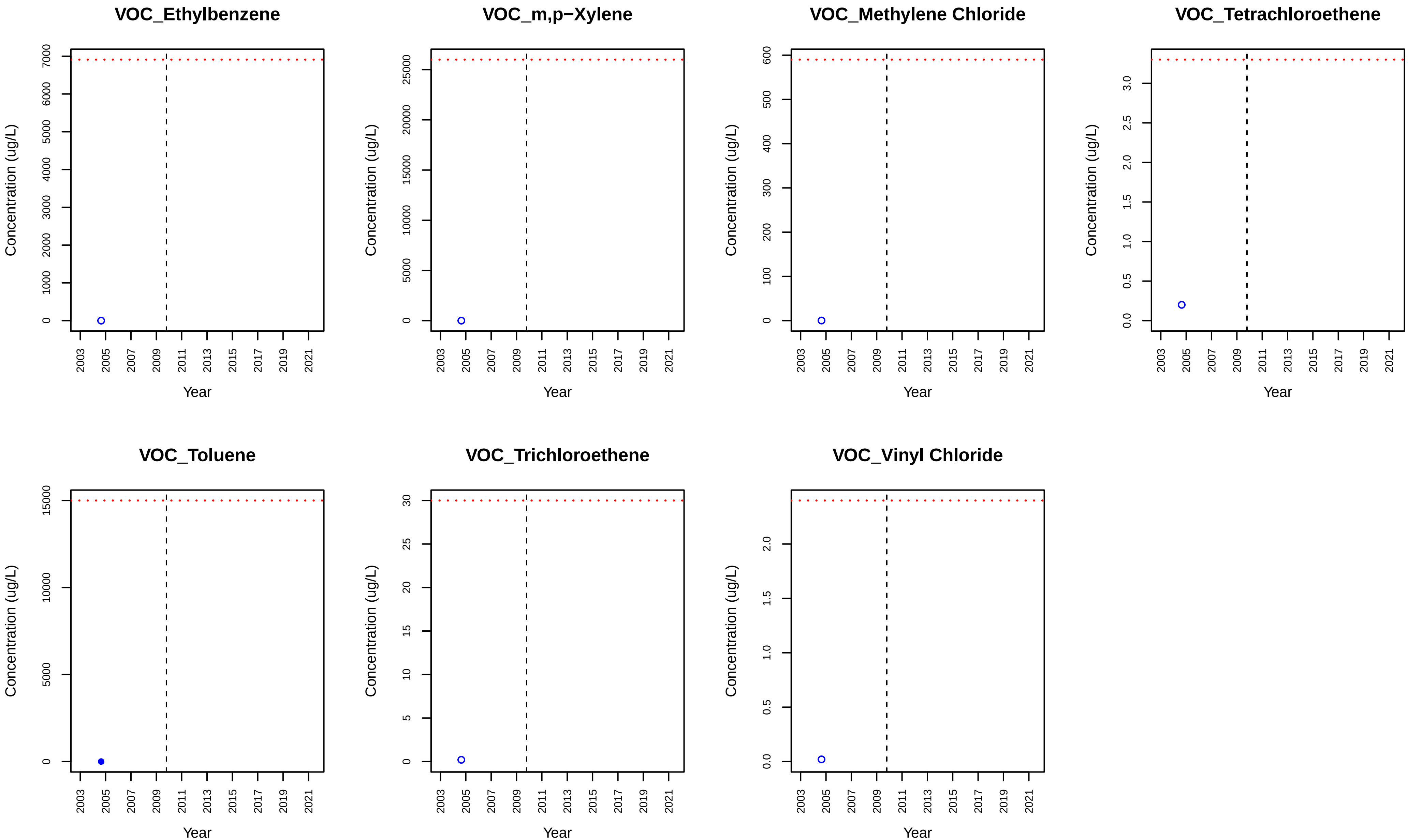


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

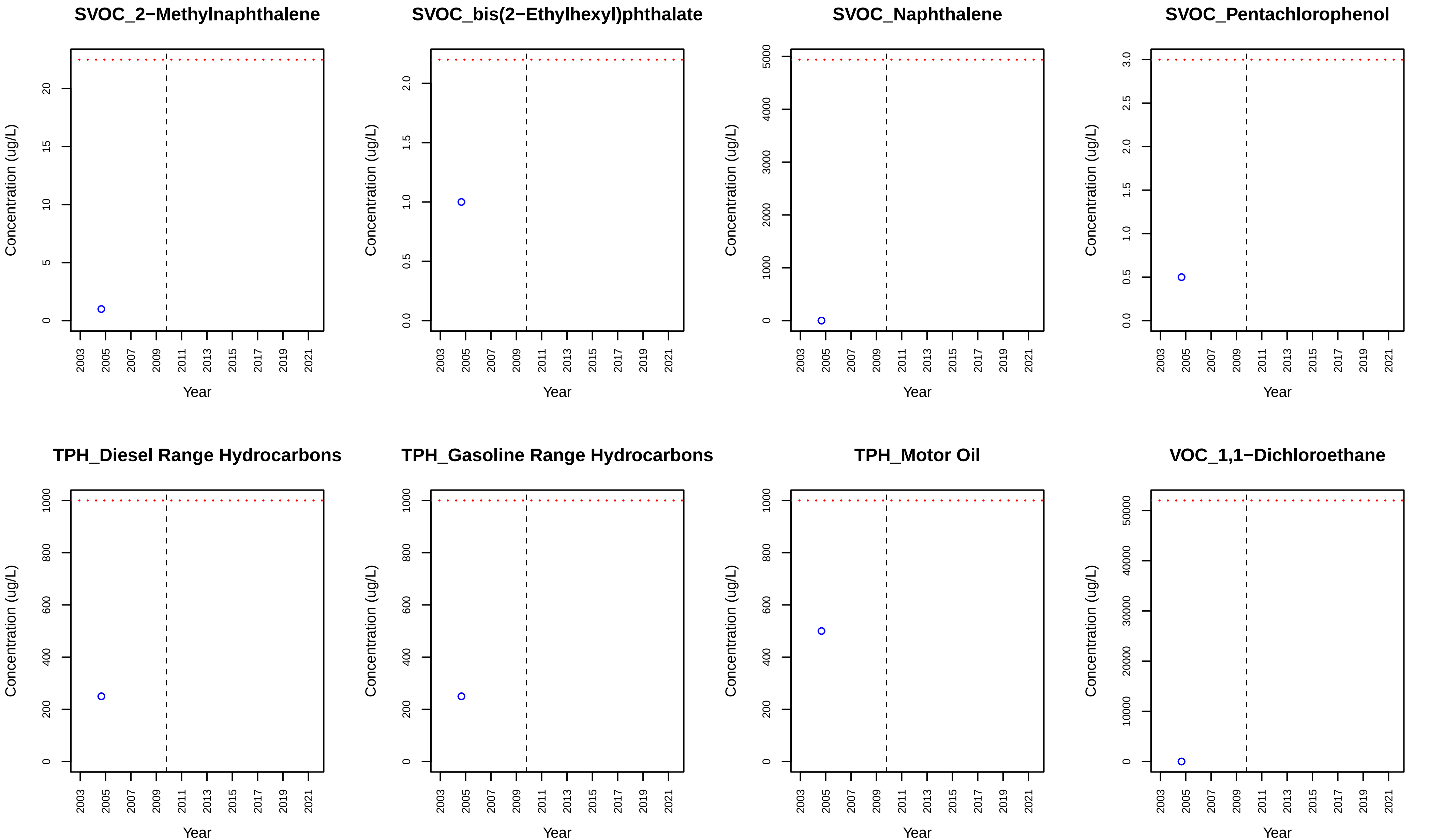
**MW−12**


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

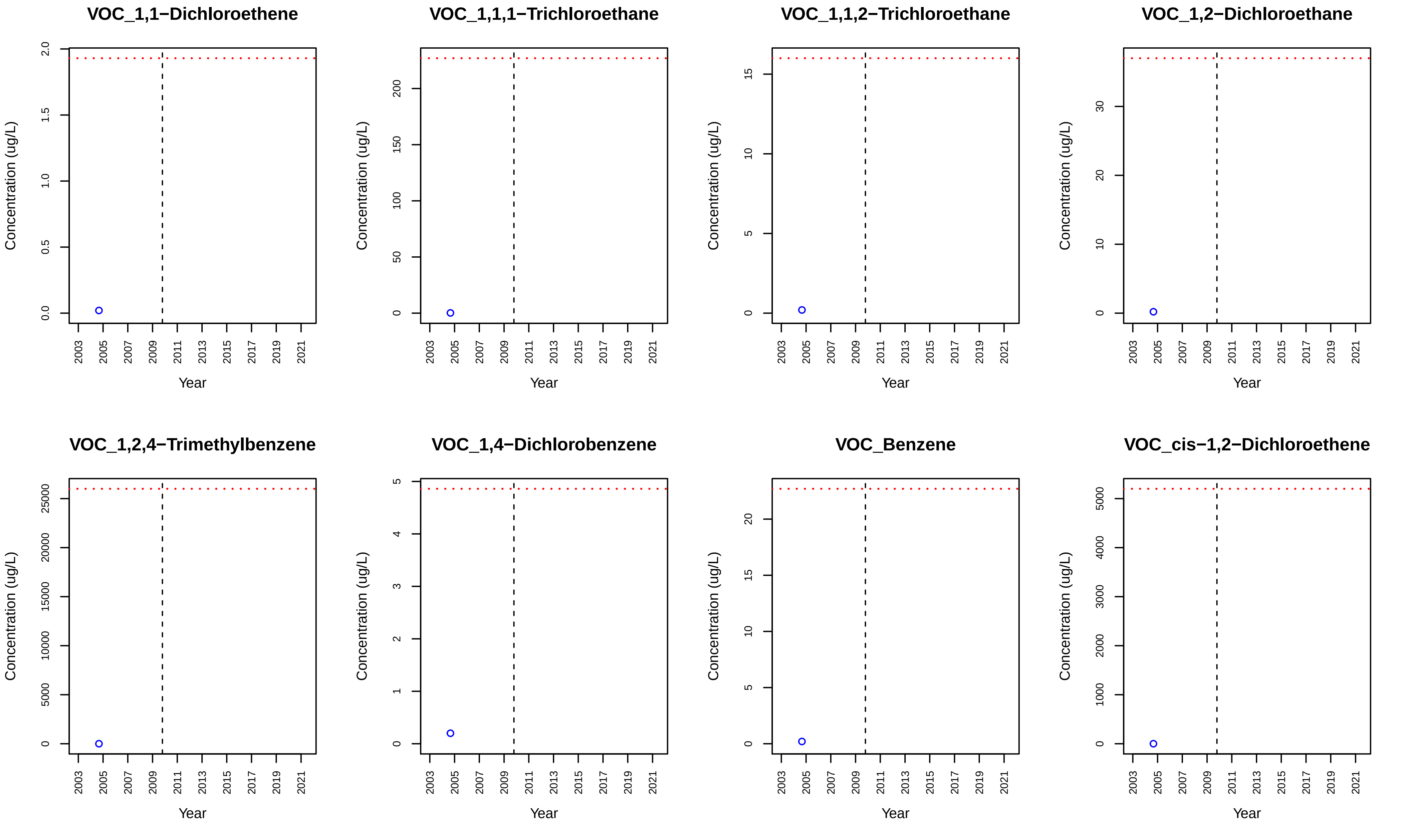
**MW−12**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

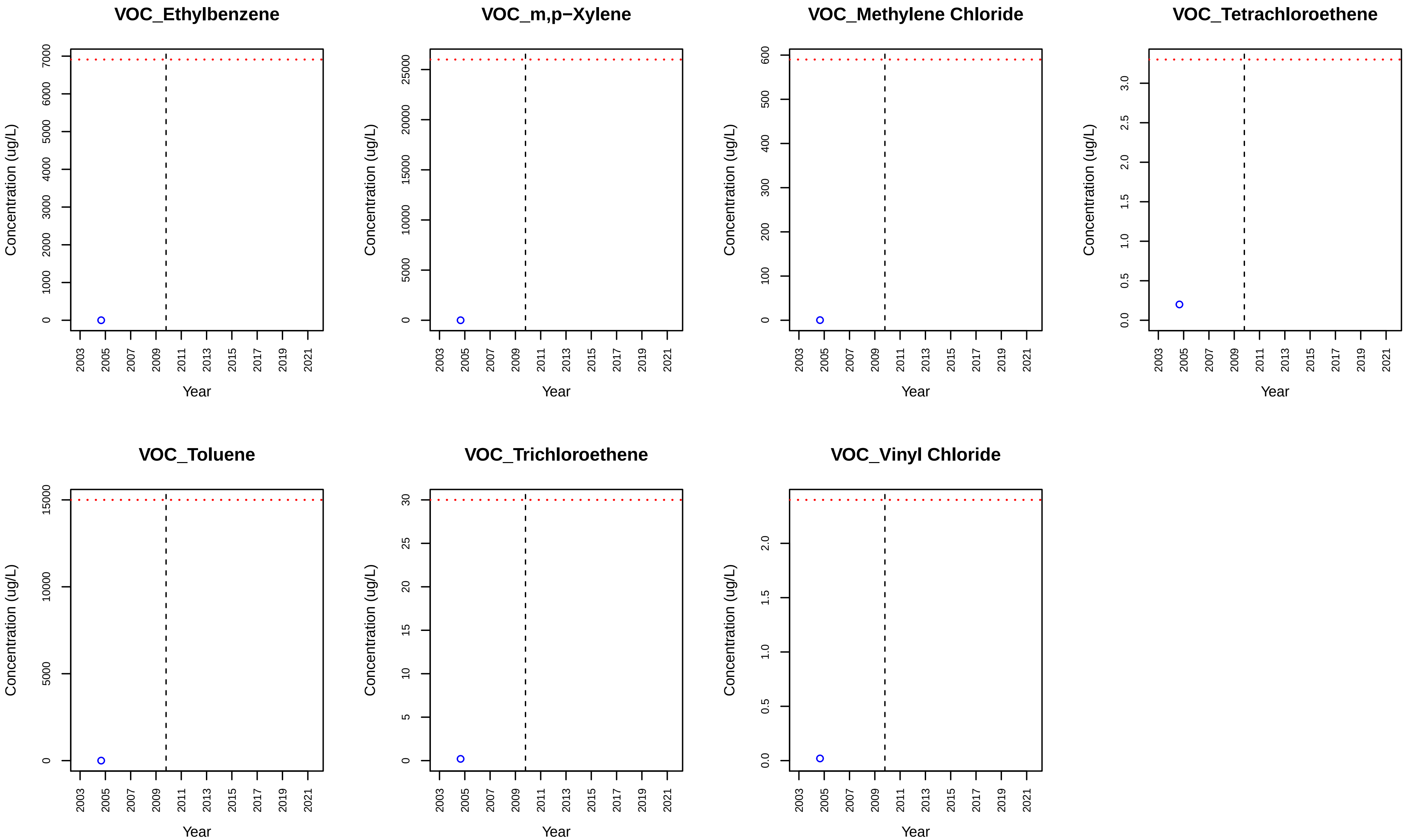
**MW−14D**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

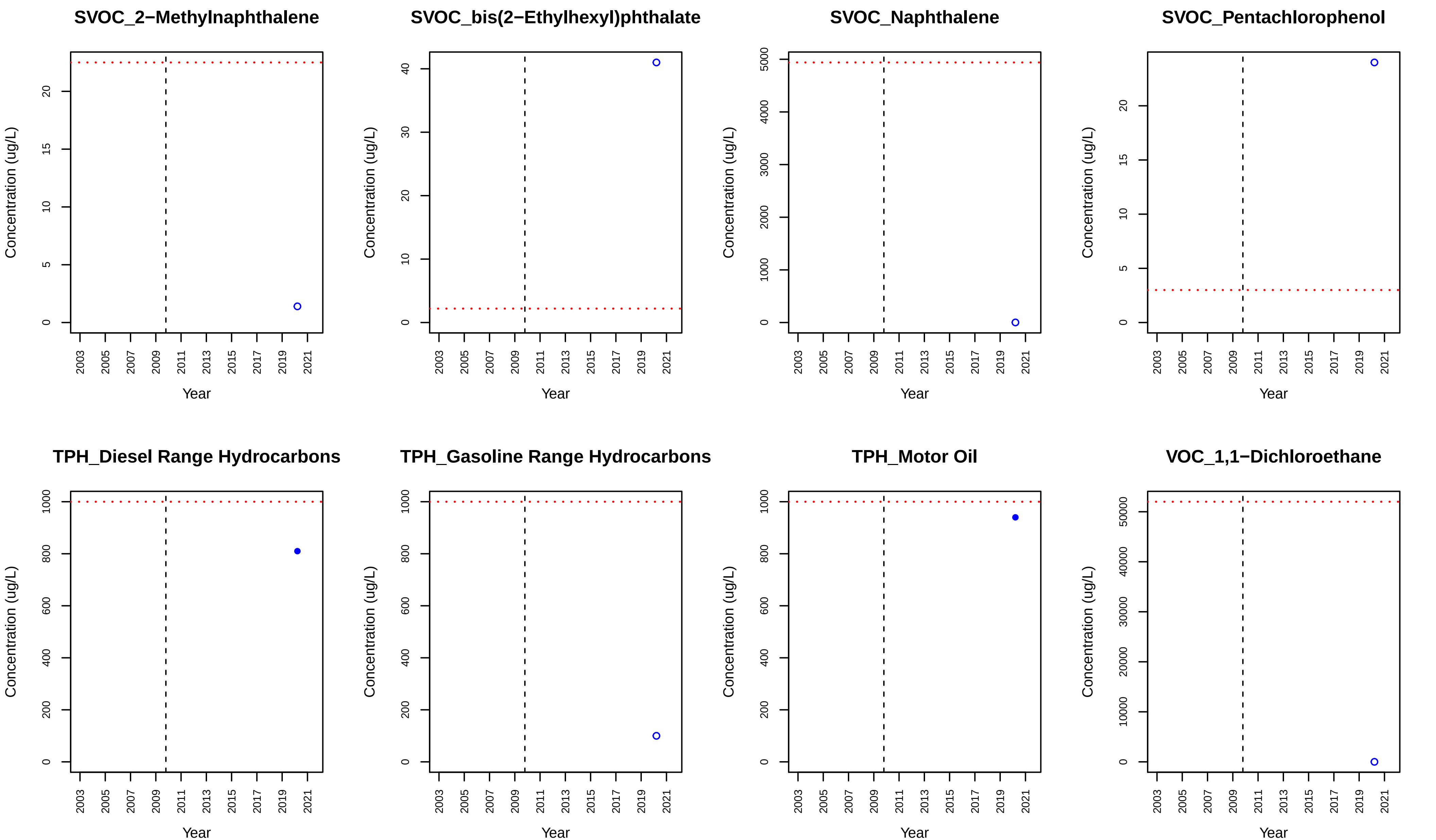
## MW−14D


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# MW−14D

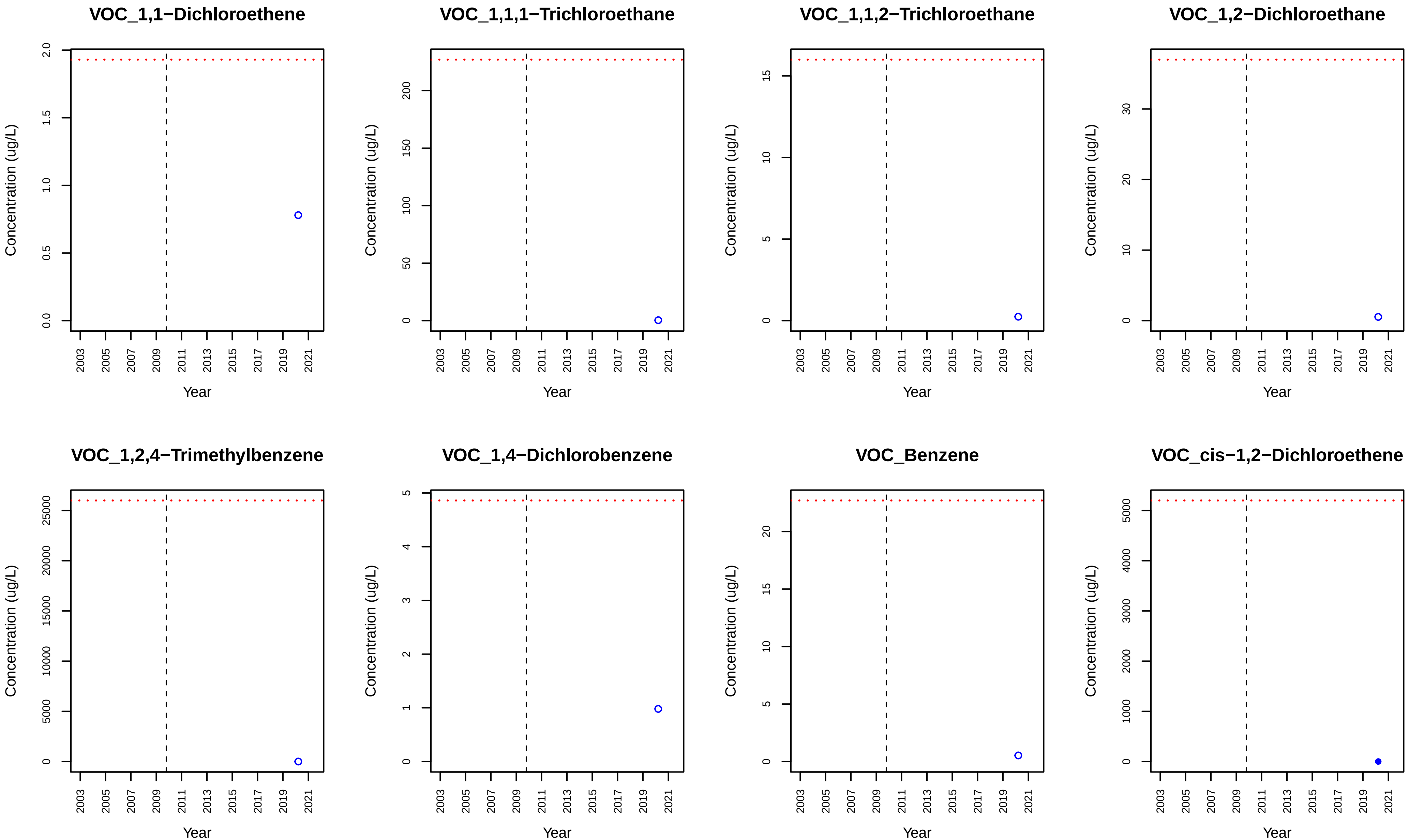

VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# P−4B



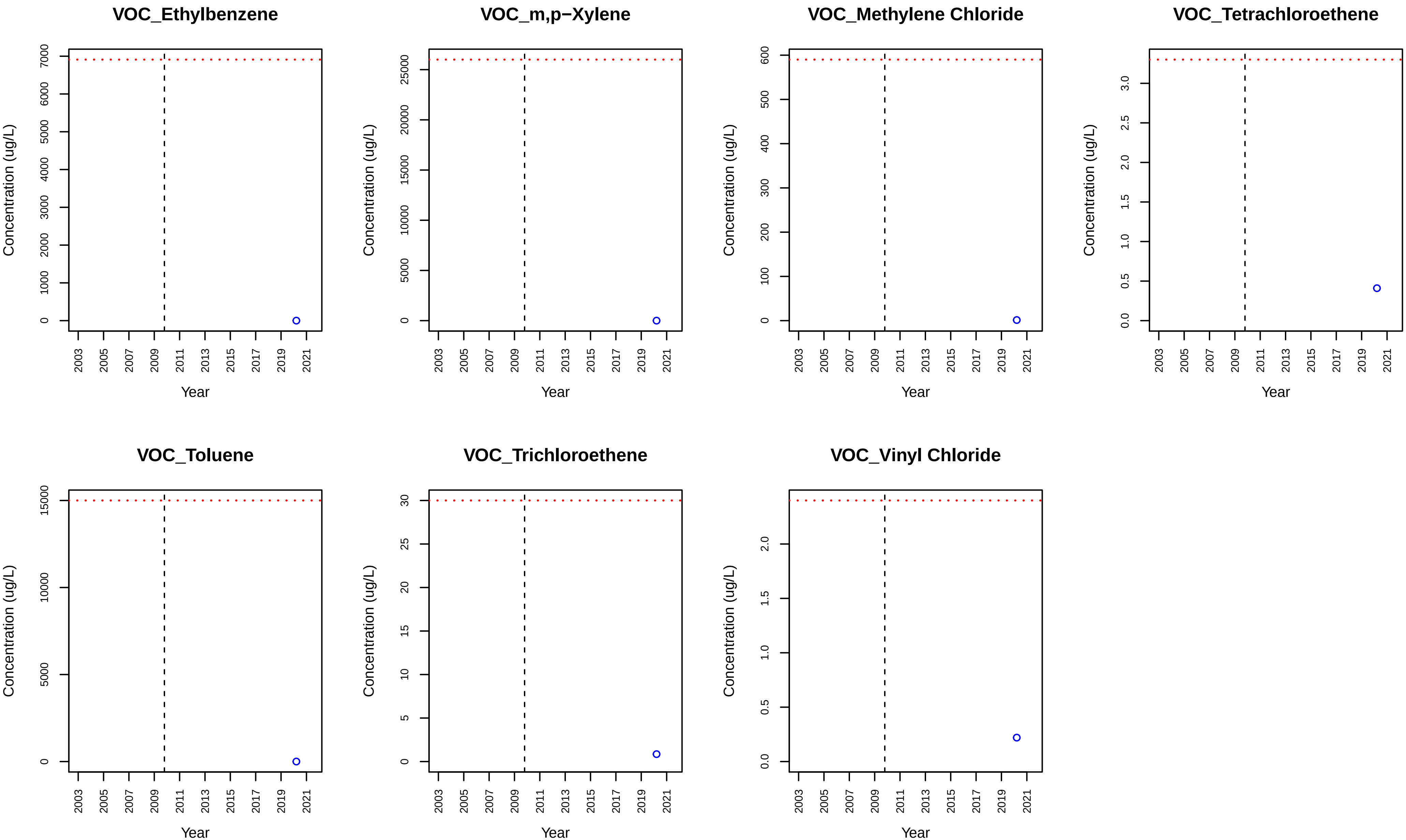
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

**P−4B**

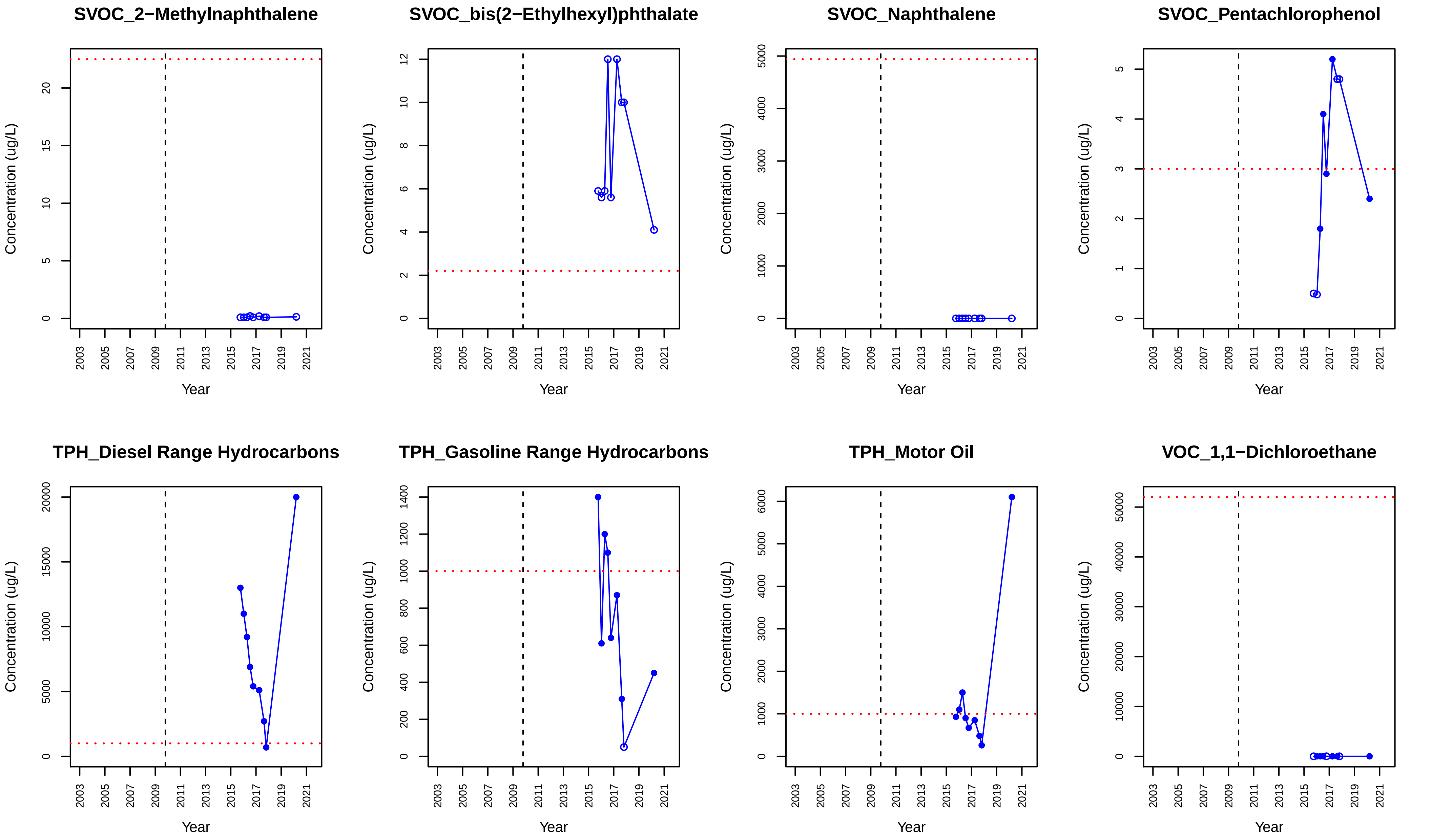


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

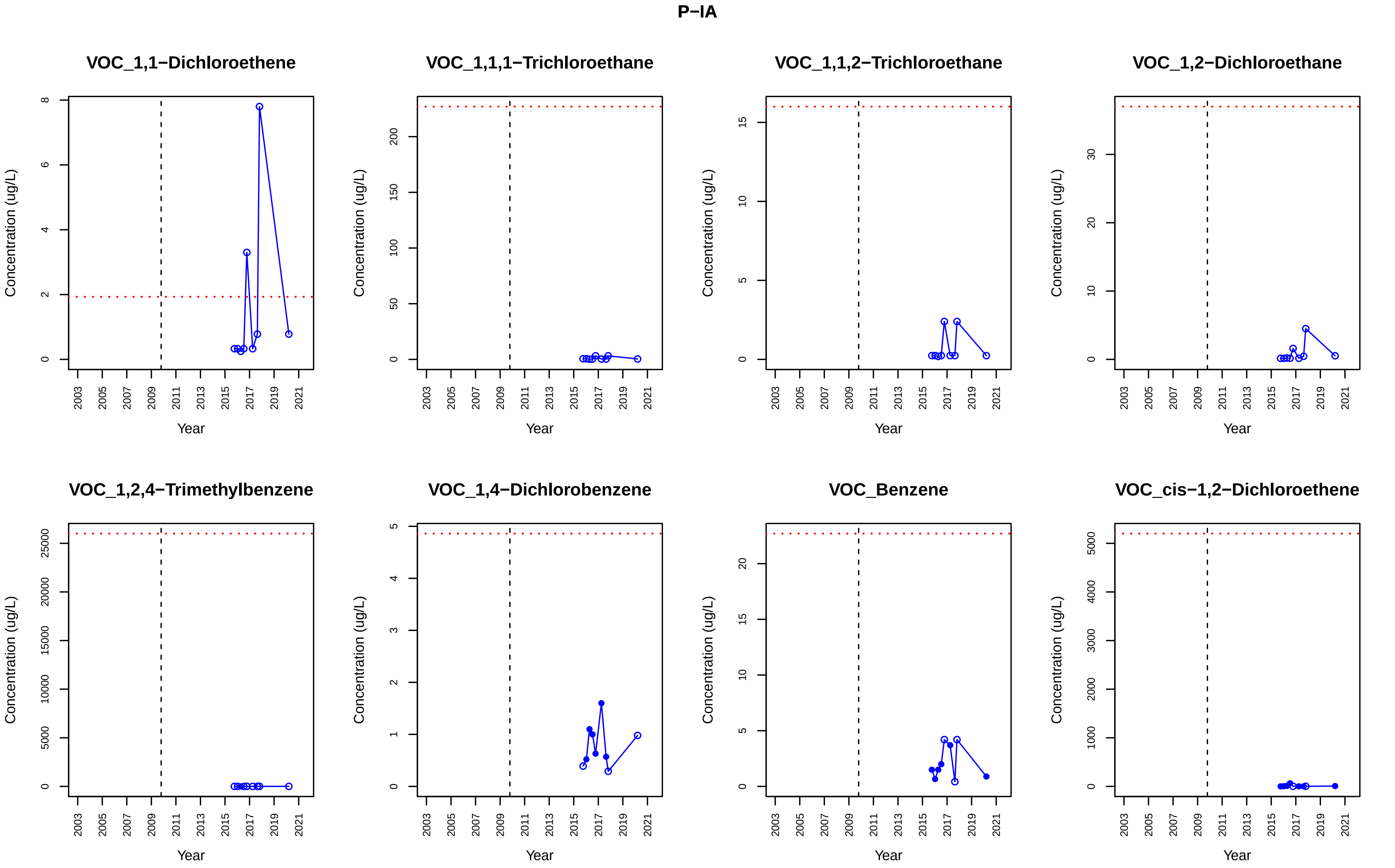
# P−4B


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021
0
1000
2000
3000
4000
5000
6000
7000
5000
10000
15000
20000
25000
100
200
300
400
500
600
0.0
0.5
1.0
1.5
2.0
2.5
3.0
10
15
20
25
30

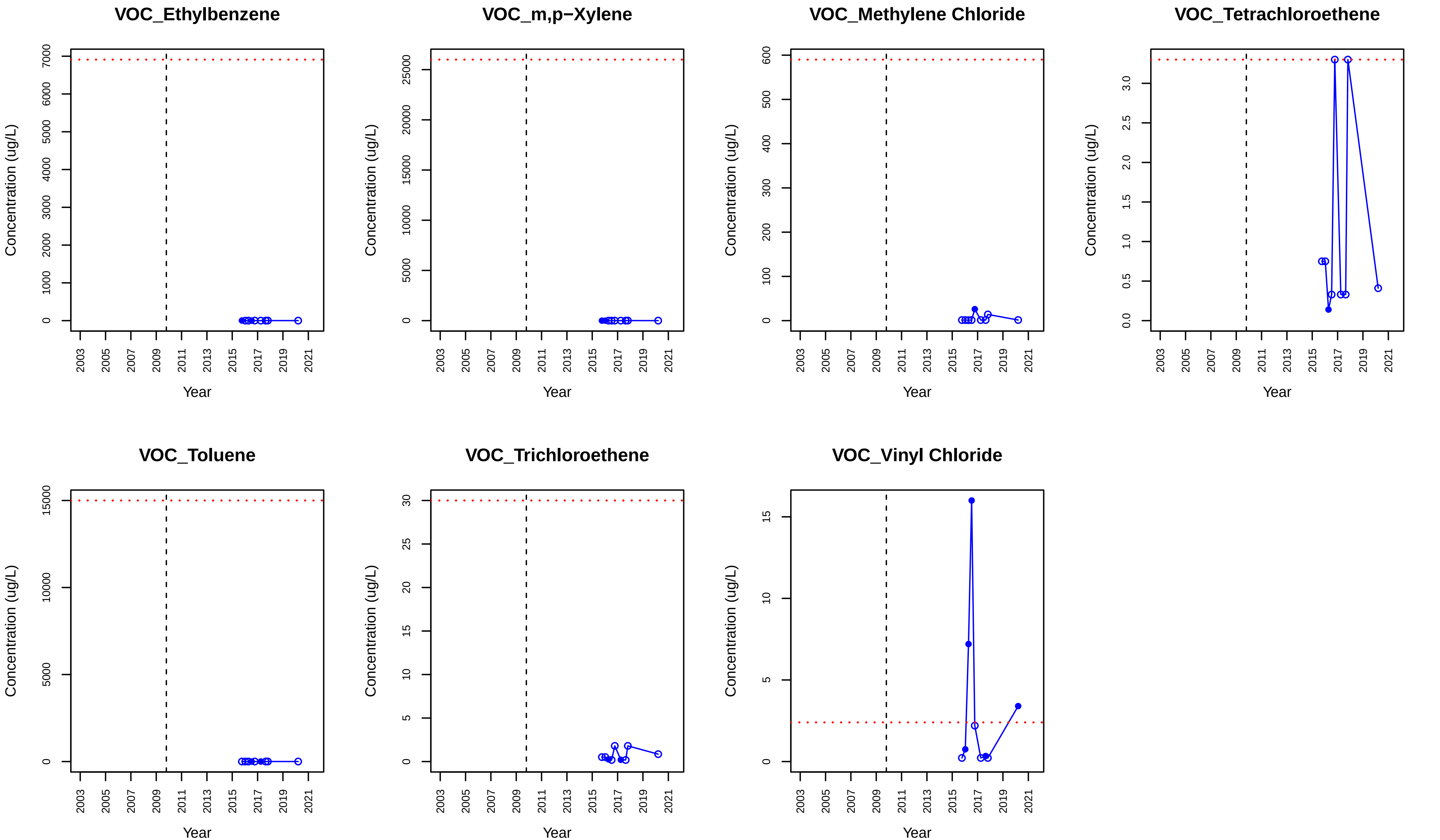
## P−IA



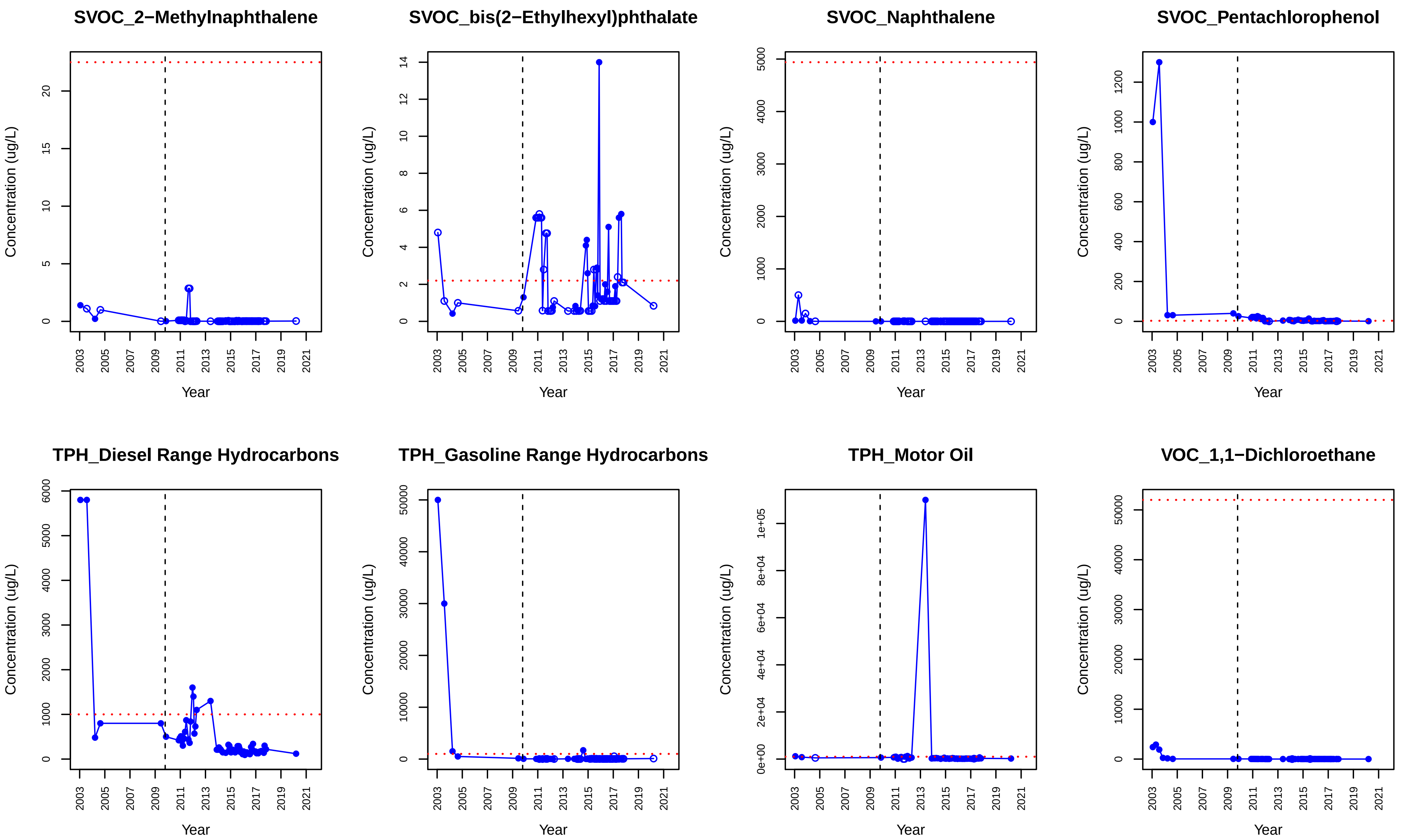
SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021


P−IA
VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

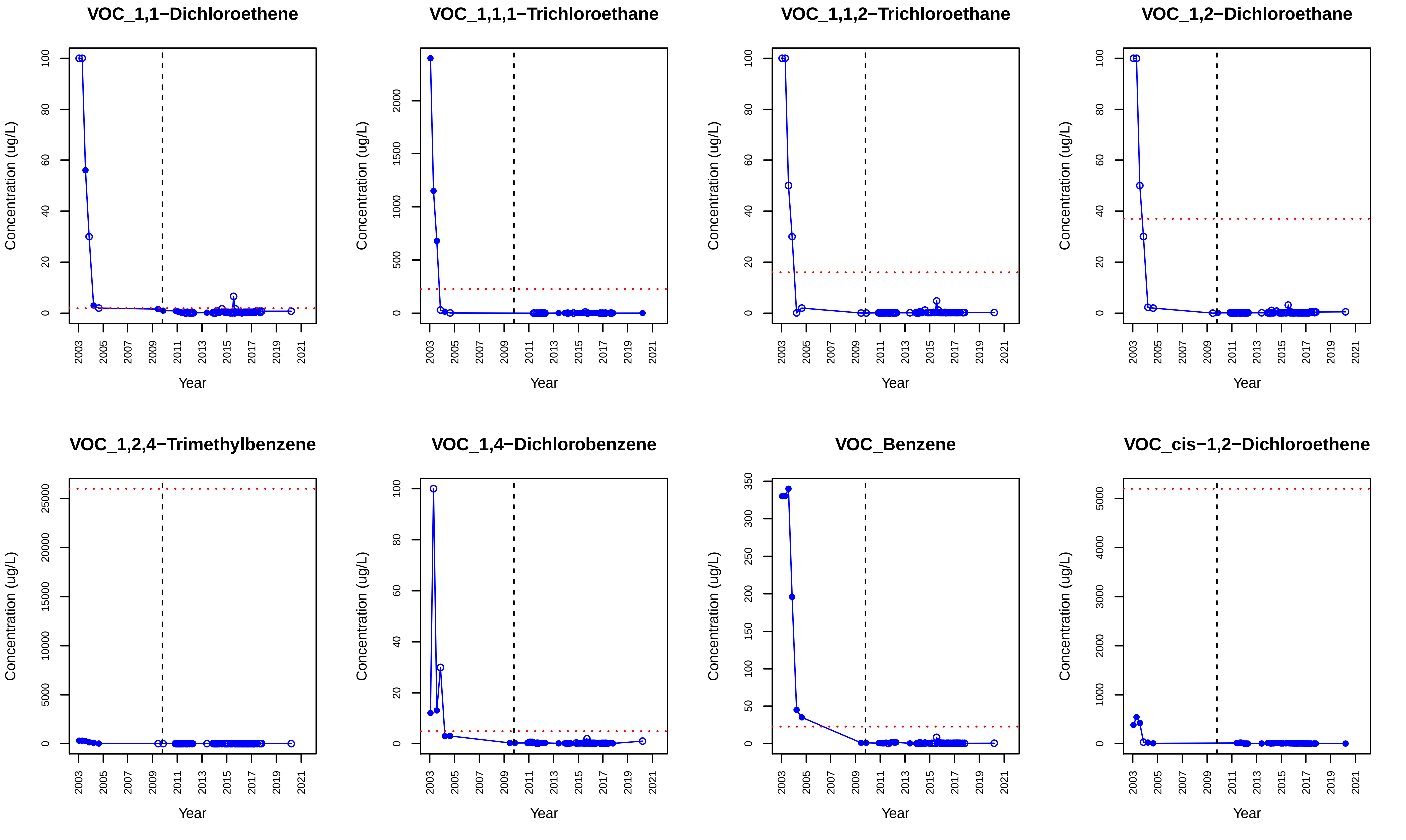
**P−IA**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

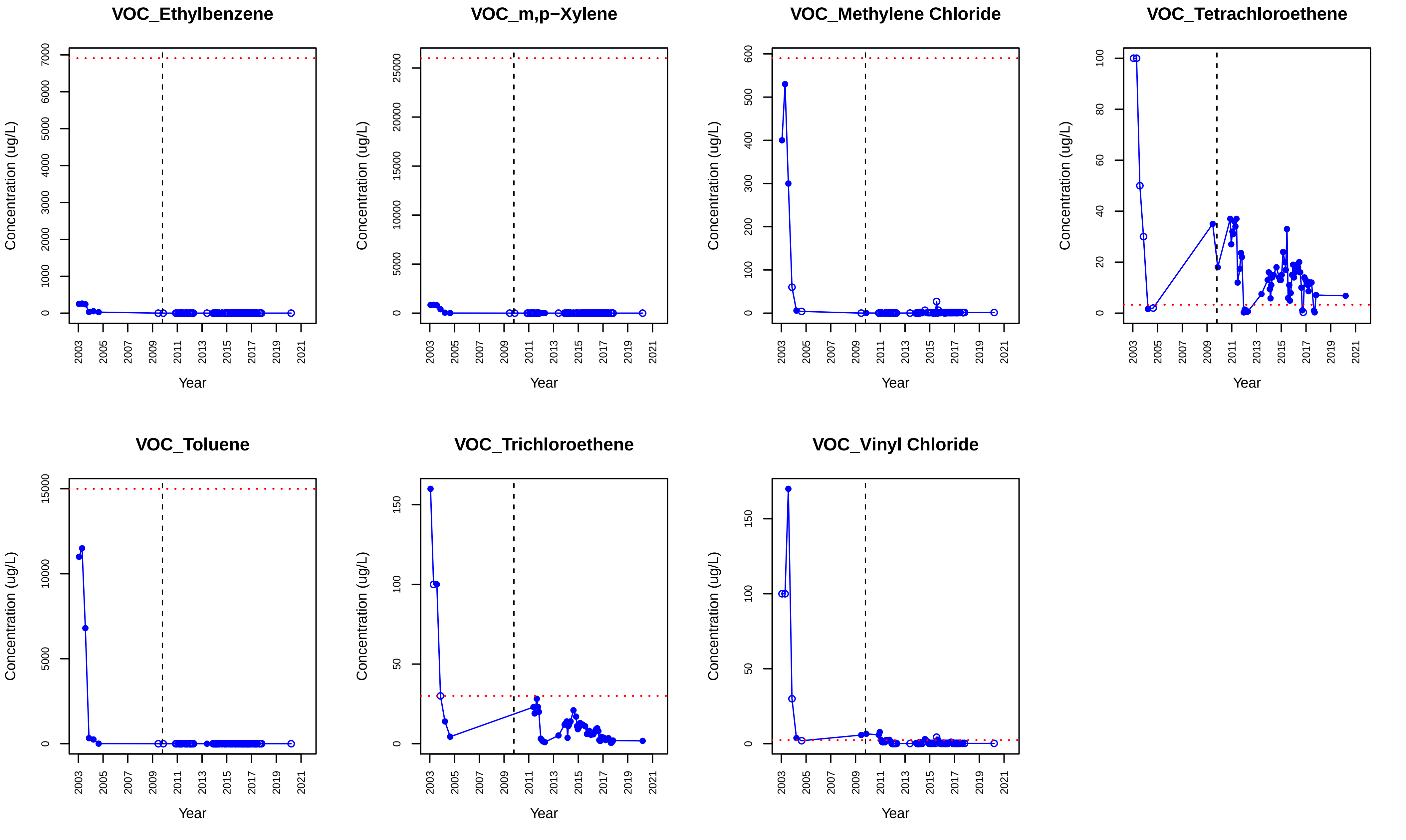
**SP−04**


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

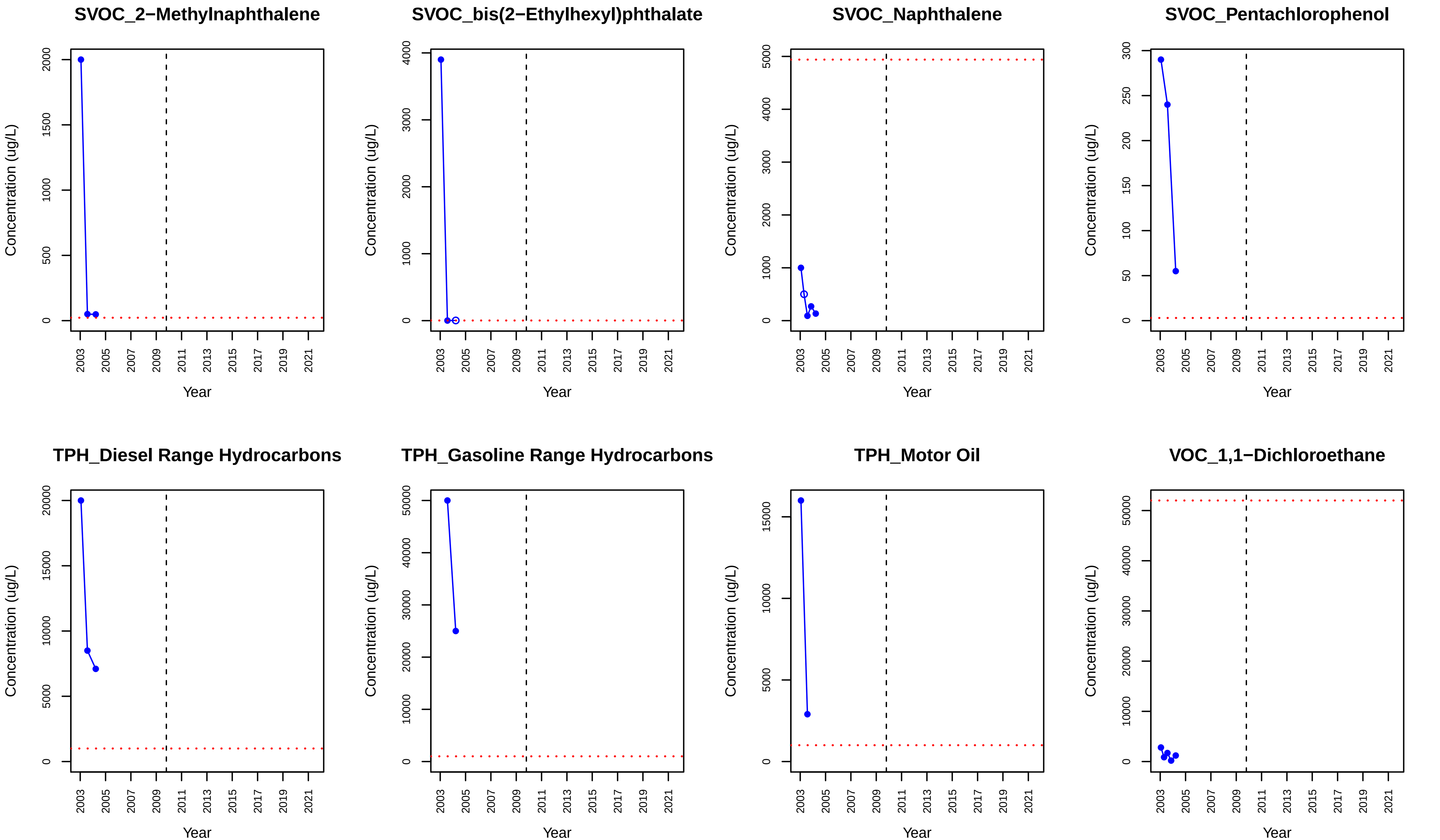
## SP−04


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021
0 20 40 60 80 100
0 500 1000 1500 2000
0 5000 10000 15000 20000 25000
0 50 100 150 200 250 300 350
0 1000 2000 3000 4000 5000

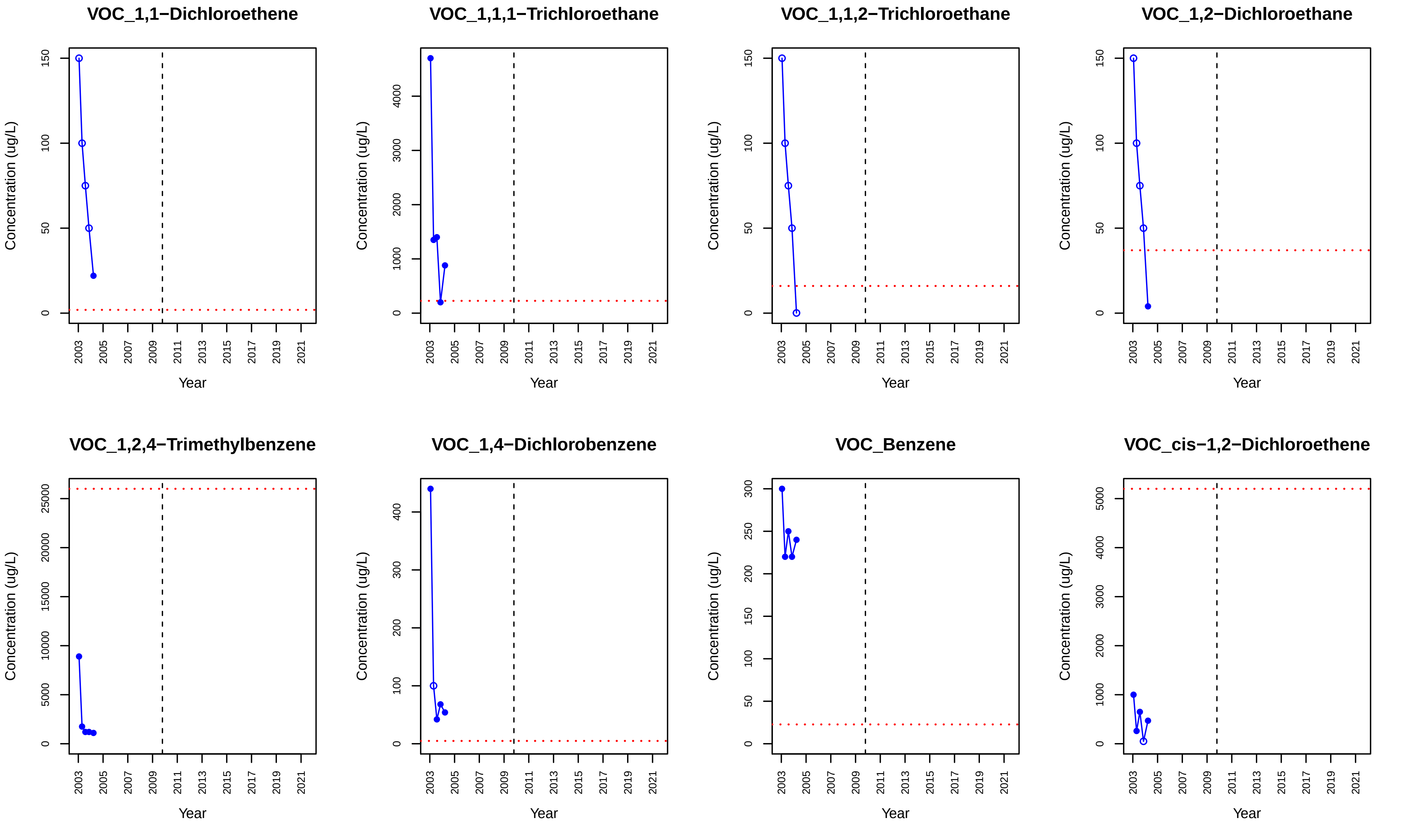
**SP−04**


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003 2005 2007 2009 2011 2013 2015 2017 2019 2021

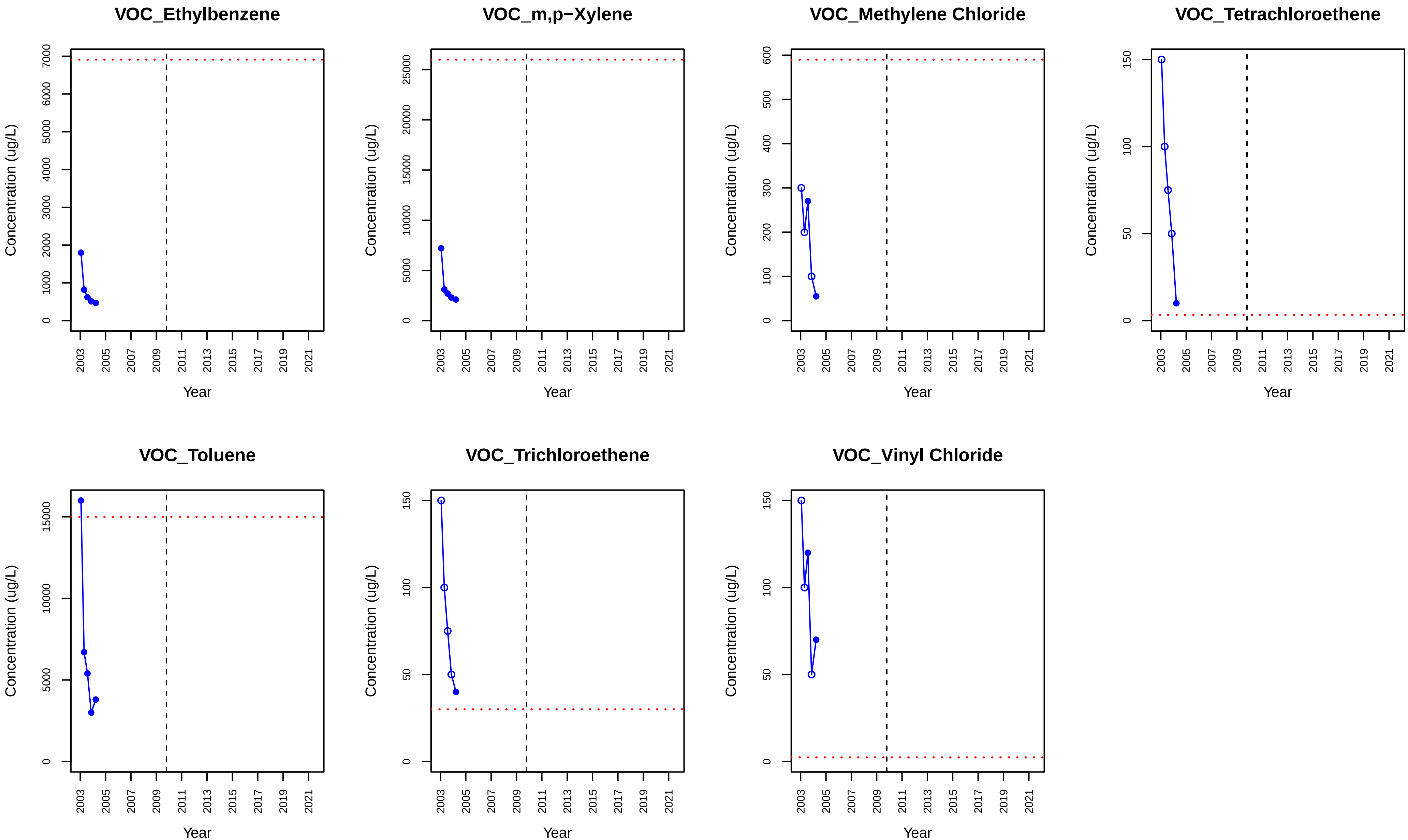
# SP−05


SVOC_2−Methylnaphthalene
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year

## SP−05


VOC_1,1−Dichloroethene
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# SP−05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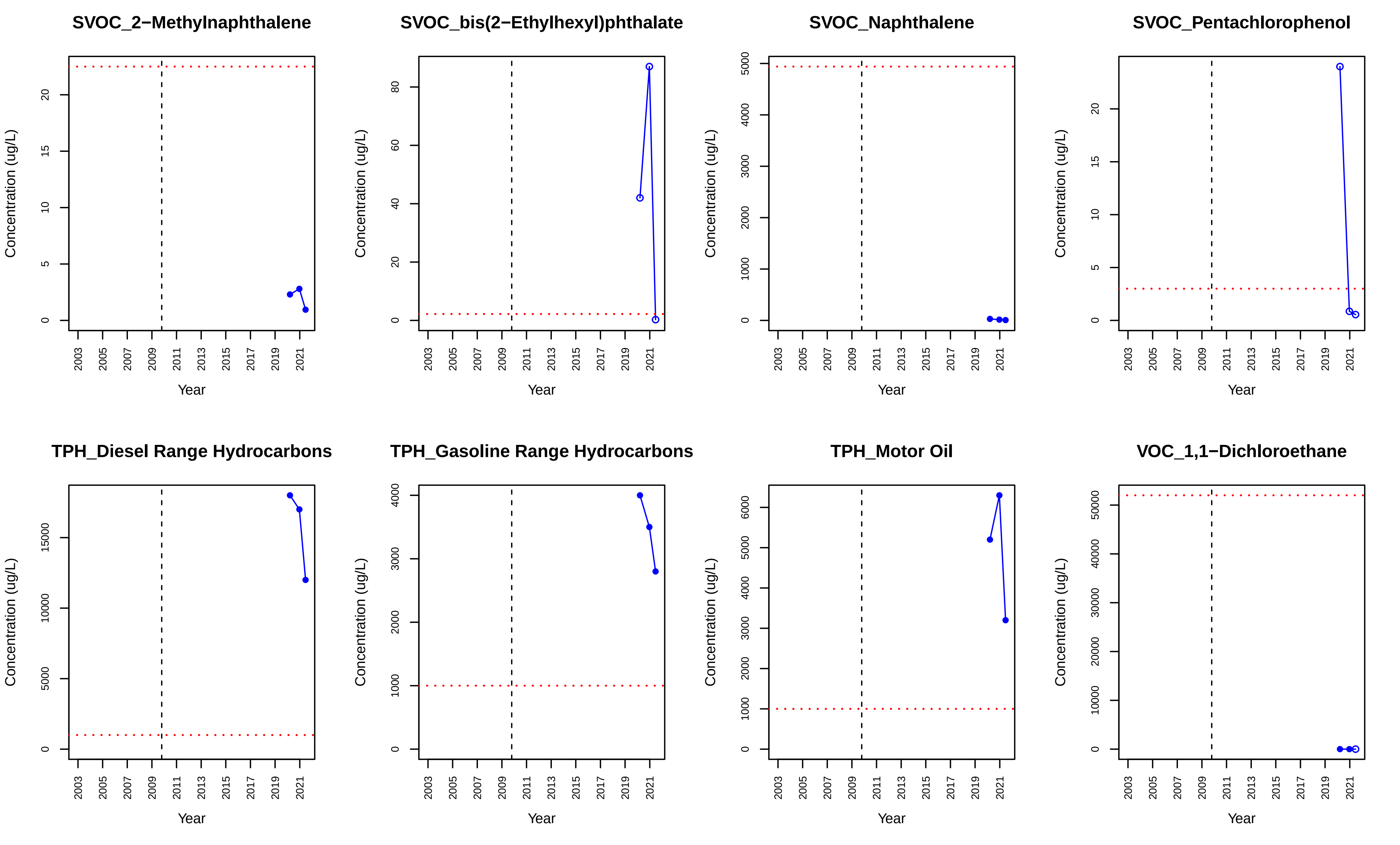
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

## SP−06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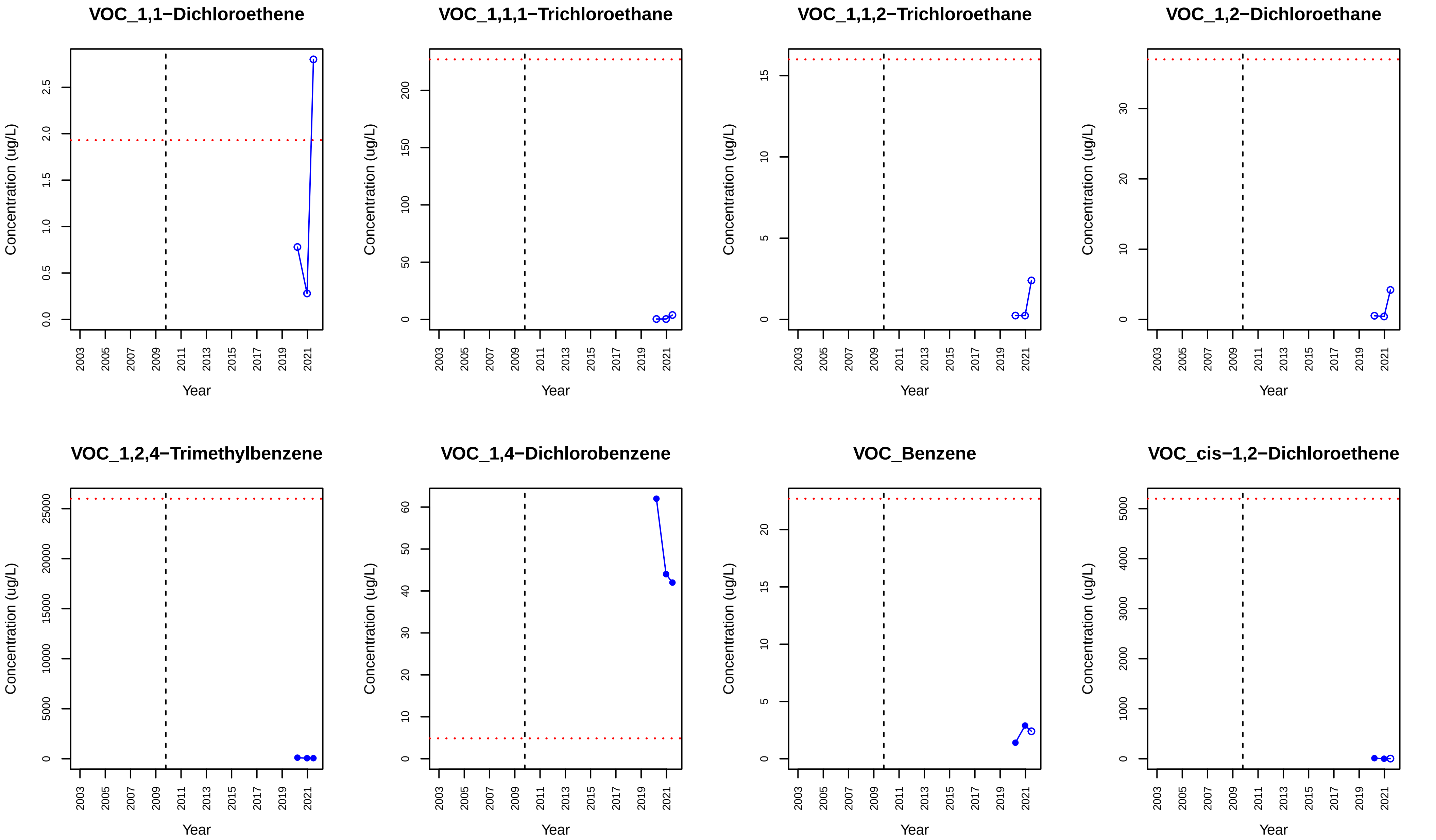
SVOC_bis(2−Ethylhexyl)phthalate
SVOC_Naphthalene
SVOC_Pentachlorophenol
TPH_Diesel Range Hydrocarbons
TPH_Gasoline Range Hydrocarbons
TPH_Motor Oil
VOC_1,1−Dichloroethane
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# SP−06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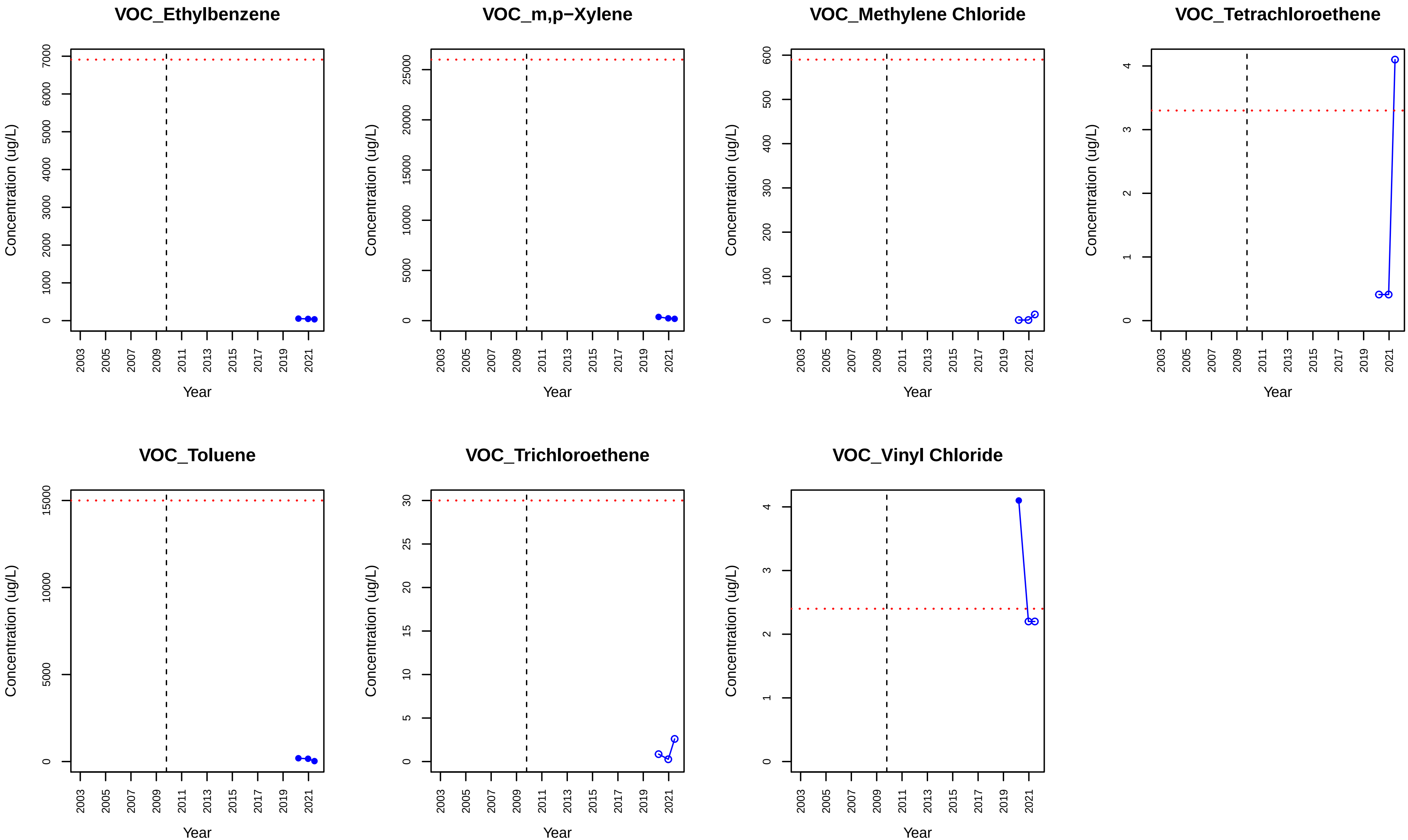
VOC_1,1,1−Trichloroethane
VOC_1,1,2−Trichloroethane
VOC_1,2−Dichloroethane
VOC_1,2,4−Trimethylbenzene
VOC_1,4−Dichlorobenzene
VOC_Benzene
VOC_cis−1,2−Dichloroethene
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# SP−06


VOC_Ethylbenzene
VOC_m,p−Xylene
VOC_Methylene Chloride
VOC_Tetrachloroethene
VOC_Toluene
VOC_Trichloroethene
VOC_Vinyl Chloride
Concentration (ug/L)
Year
2003
2005
2007
2009
2011
2013
2015
2017
2019
2021

# APPENDIX C

## NSZD Rate Evaluation Summary

**Washington State Department of Ecology**
300 Desmond Drive SE
Lacey, WA 98503

# Appendix C
# NSZD Rate Evaluation Summary

**Former Lilyblad Site,**
**Tacoma, Washington**

*Prepared by*

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Project Number: PNR0697

April 2022

Geosyntec consultants

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Attachment 3 MicroTox Laboratory Analytical Report

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Bio-sparge Pilot | Bio-sparge Pilot Study |
| $CO_2$ | carbon dioxide |
| COC | constituent of concern |
| CULs | cleanup levels |
| DPE | dual-phase extraction |
| DPT | direct-push technology |
| Ecology | Washington State Department of Ecology |
| ft bgs | feet below ground surface |
| Geosyntec | Geosyntec Consultants, Inc. |
| Lilyblad | Former Lilyblad Petroleum Inc |
| LNAPL | light non-aqueous phase liquid |
| MTCA | Model Toxics Control Act |
| NSZD | natural source zone depletion |
| ORP | oxidation-reduction potential |
| PID | photoionization detector |
| PVC | polyvinyl chloride |
| RCRA | Resource Conservation and Recovery Act |
| Site | Lilyblad Facility |
| TPH | total petroleum hydrocarbons |
| VOCs | volatile organic compounds |

# 1. INTRODUCTION

## 1.1 Site Background

The former Lilyblad Petroleum Inc. (Lilyblad) site is located at 2244 Port of Tacoma Road in Tacoma, Washington, and consists of the Lilyblad Property and adjacent properties that have been affected by historical releases from the Lilyblad facility (Site). Lilyblad began operation in 1972 as a distributor of gasoline, diesel, solvents, and packaged petroleum products. In 1981, Lilyblad notified the Washington State Department of Ecology (Ecology) of its waste management activities, applied for an Ecology Resource Conservation and Recovery Act (RCRA) permit and was granted interim status. By November 1994, Ecology received authorization for RCRA corrective action and notified Lilyblad it would proceed with corrective action via the Model Toxics Control Act (MTCA) process, and in 1995, an agreed Order was signed for the facility (Ecology, 1995).

In 2003, a supplemental remedial investigation was conducted by CH2M Hill, and in 2009, a full-scale dual-phase extraction (DPE) system was installed along with piping for nutrient injections into the ground (CH2M Hill, 2004 and PSCAA, 2009). The nutrient injection lines were never used at the Site until in April 2021 Geosyntec utilized the existing piping to inject air into the ground as part of a Bio-sparge Pilot Study (Bio-sparge Pilot). The results of the Bio-sparge Pilot are reported in Appendix E.

## 1.2 Objectives and Scope

As part of the 2021 Site Remedy Review and associated focused feasibility study, Geosyntec Consultants, Inc. (Geosyntec) preformed a natural source zone depletion (NSZD) rate estimation study, which occurred in two monitoring events between April and June 2021. The two field events were scheduled to occur immediately prior to the 2021 Bio-sparge Pilot, after the DPE system had been off for over approximately two years and in the final two weeks of the six-week-long Bio-sparge Pilot. The objectives of the NSZD rate estimation study were to accomplish the following:

1. Provide insight into the intrinsic rate and extent of anticipated NSZD of total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs) constituents of concern (COCs) in groundwater related to the Site; and

2. Provide supporting data to assess and quantify the effect of bio-sparging on the rate of petroleum hydrocarbon attenuation at the Site, in conjunction with the other data collected as part of the Bio-sparge Pilot.

To accomplish these objectives, Geosyntec selected the collected of carbon dioxide ($CO_2$) flux data at the Site using in-situ microcosms to estimate NSZD rates. In order to estimate the $CO_2$ flux data associated with biological activity, only $CO_2$ with a 14/12C isotope ratio associated with fossil fuel degradation was used in NSZD rate calculations. The scope for the NSZD Rate Estimation Study is outlined in the *Work Plan for NSZD Rate Evaluation using In-Situ Microcosms Lilyblad Cleanup Site* (Geosyntec, 2021a). These NSZD rate estimates will also be used to evaluate cleanup timeframes for the Site in the Site Remedy Review.

### 1.3 In-Situ Microcosm Placement and Rationale

In order to have representative monitoring throughout the Site, in-situ microcosm locations were selected to provide geographical coverage of the Site, while also targeting locations with COC concentrations that have been found to exceed the Site-specific cleanup levels (CULs) and accounting for Site access constraints. Using these criteria, Geosyntec isolated eight target areas within the Pacific Functional Fluids, Platinum Lease (former Chambers Bay RV), and TriPak, Inc. properties, as seen in Figure 1. Seven in-situ microcosm locations were selected to target regions where TPH as gasoline, motor oil, and/or #2 diesel exceed the respective Site-specific CULs. Of these seven locations, three were selected within the 1,4-dichlorobenzene Site-specific CUL exceedance area and one in-situ microcosm location was selected within the vinyl chloride Site-specific CUL exceedance area. To assess the Bio-parge Pilot, two in-situ microcosm locations are located adjacent to the newly installed bio-sparge injection wells, and two in-situ microcosm locations are located adjacent to converted DPE wells used in the Bio-sparge Pilot. One in-situ microcosm location was selected to be outside all known Site-specific CUL exceedance areas; this location will be used as the background location. Specific rationale for each in-situ microcosm location can be found in Table 1.

## 2. FIELD IMPLEMENTATION

### 2.1 Field Preparation

On 28 January 2021, Geosyntec conducted a Site visit with four drillers and a private utility locator to evaluate each proposed in-situ microcosms location on the Pacific Functional Fluids property for installation logistics, effect on Site operations, and potential conflicts with Site utilities. This Site visit also included a hand-auger soil boring to 5 feet below ground surface (ft bgs) to allow drillers to observe the soil composition and assess ability to install the microcosm casing via direct-push technology. The evaluation of the logistical and utility location information collected during this Site visit aided in the selection of the eight in-situ microcosm locations, as seen in Figure 1.

Prior to the installation of the in-situ microcosms, Geosyntec worked with Platinum Lease and TriPak, Inc. to obtain or amend access agreements for installation and monitoring of the microcosms. The property owners and tenants were informed of the installation plan and schedule to coordinate access to the working area and minimize impact on facility operations.

Geosyntec marked planned subsurface work locations with white paint and requested an Underground Service Alert Site survey (Washington Ticket Number 21029970) more than two business days in advance of subsurface activities. A private utility locator also performed a geophysical survey at each in-situ microcosm location to identify and mark the locations of potential subsurface utilities, pipelines, or other obstructions in advance of subsurface activities.

## 2.2 In-Situ Microcosm Installation

In-situ microcosms were installed between 24 to 31 March 2021 in the eight locations across the Site. Installation of the in-situ microcosms was performed by Holt Services, Inc. (Holt) of Edgewood, Washington, using direct-push technology (DPT). Drilling activities were conducted under the oversight of a Geosyntec field geologist. In-situ microcosms were constructed using 4-inch-diameter Schedule 120 polyvinyl chloride (PVC) pipe with an open bottom. A 6-inch concrete corer was used to remove the concrete pavement, where present at ground surface, at each microcosm, as well as at the bollard locations installed around the microcosms for protection (see below). The microcosm casings were advanced using a direct-push drill rig, directly pushing the open PVC casing into the ground, until reaching a target depth of approximately 7 ft bgs. Due to the composition of the soil, confirmed during the hand-auger sample collected 28 January 2021, large cobbles were located within the first 5 ft bgs, which resulted in refusal being encountered. In the event that refusal was encountered during microcosm installation, Holt would raise the casing, allowing soil already in the casing to remain within. Holt would then use a pry bar to remove any cobbles from the microcosm location before returning the casing to the hole and advancing the installation. Each of the microcosms was completed so that the base the microcosm extends at least 2 feet into the saturated zone, based on measurement of groundwater levels in nearby monitoring wells. Approximately 2 feet of the casing remained aboveground (i.e., stick up) at each in-situ microcosm location.

Up to three protective bollards were installed around in-situ microcosm locations that needed protection from traffic and Site activities, as selected by the Geosyntec field geologist. If a microcosm was located along a wall or within an open grass area, fewer to no bollards were installed to protect the microcosm. These bollards were installed by the driller, using an air-knife vacuum truck. Investigation-derived waste and soil cuttings were containerized in 55-gallon drums and staged on site, pending profiling and removal from the Site on 23 September 2021 as non-hazardous/non-dangerous waste.

## 2.3 $CO_2$ Flux Sampler Installation

Two E-Flux Fossil Fuel Trap™ monitoring events occurred between April and June 2021. The first deployment occurred 5 April to 19 April 2021, immediately following the installation of in-situ microcosms, prior to the Bio-Sparge Pilot. The second deployment occurred 18 May to 1 June 2021, within the final two weeks of the six-week-long Bio-sparge Pilot. Repeating the NSZD data collection and NSZD rate calculations was intended to aid in the assessment and quantification of the effect of bio-sparging on the rate of petroleum hydrocarbon attenuation, as well as to evaluate seasonal changes in NSZD rates using microcosm located at a distance from the Bio-sparge Pilot wells.

The E-Flux Fossil Fuel Traps™ attached directly atop of each of the in-situ microcosms using a flexible collar connector secured with screw-down clamps that provided a gas tight friction seal at each measurement location. The Fossil Fuel Traps™ were covered by a rain cover, provided by E-Flux, throughout the duration of each monitoring event. At the end of the two-week deployment period, the Fossil Fuel Traps™ (including a travel blank trap) were collected, placed inside a clean Ziplock bag, placed inside the original packaging, and shipped to E-Flux lab of Fort Collins, Colorado. Samples were submitted via chain of custody and analyzed in accordance with ASTM Method D4373-14 for $CO_2$ quantification and ASTM D6866-18 for radiocarbon analysis.

After the removal of the Fossil Fuel Traps™ following each monitoring event, each microcosm was capped with a PVC well cap.

## 2.4 Vapor Pin Installation and Monitoring

Consistent with the NSZD Rate Estimation Work Plan (Geosyntec, 2021a) and the Standard Operating Procedure for E-Flux Fossil Fuel Trap™ Installation and Deployment (E-Flux, 2021), Geosyntec installed one VAPOR PIN® in the pavement adjacent to all paved in-situ microcosm location. A hammer drill with a 5/8-inch drill bit was be used to drill a hole through the slab and approximately 1 inch into the underlying soil to form a void. The VAPOR PIN® was then be placed into the hole and a plastic cover was placed over the VAPOR PIN® opening.

The purpose of the VAPOR PIN® was to allow for optional connection of the VAPOR PIN® to the E-Flux Fossil Fuel Traps™ during sample collection. The VAPOR PIN® would have allowed for correction of pressure that may be present beneath the asphalt associated with soil degassing beneath the asphalt and barometric pressure changes. However, the soil moisture and the weather at the time of sampling increased the risk that the VAPOR PIN® would clog with moisture during the study, inhibiting the soil gas flux through the E-Flux Fossil Fuel Traps™ and potentially compromising the results of the study. The VAPOR PIN®'s were therefore not connected to the E-Flux Fossil Fuel Traps™ during sample collection and were instead used to monitor field data during the Bio-sparge Pilot. The results of the VAPOR PIN® monitoring during the Bio-sparge Pilot (Appendix D, Table 4) indicated that there was marginal difference between pressure beneath the asphalt and barometric (i.e., the asphalt at the Site is leaky), and therefore a correction for pressure was not needed at this Site.[1]

[1] Differential pressure was measured at select VAPOR PIN®s co-located with microcosms ($CO_2$-01, $CO_2$-03, $CO_2$-5, and $CO_2$-07) before, during, and after the Bio-sparge Pilot. With the exception of a couple anomalous readings, the differential pressure readings were less than 0.010 inches of water.

### 2.5 Microtox Assay

On 1 July 2021, Geosyntec personnel performed a groundwater monitoring and sampling event at the Site for a microbial toxicity (MicroTox) assay sample collection. The MicroTox analysis uses the bacteria vibrio fischeri as an indicator of general microbial toxicity of the groundwater samples. The results of this test are only for the purposes of evaluating groundwater microbial toxicity and are not an indicator of aquatic toxicity.

Geosyntec accessed wells AGI-07, AGI-45, B-19, B-25, B-30, CDM-16, CDM-19, CDM-21, CDM-22, and SP-06 to collect samples for MicroTox analysis based on these wells' proximities to wells that are within an area of the contaminant plume that may be inhibiting microbial growth and biodegradation, or for background/baseline purposes. These sampling locations can be found in Figure 1. The following activities were conducted at these 10 wells:

- Measurement of static water level and light non-aqueous phase liquid (LNAPL) monitoring, if present, using a multiphase meter;
- Monitoring of groundwater field parameters, including conductivity, temperature, pH, dissolved oxygen, and oxidation-reduction potential (ORP); and
- Collection of groundwater samples, using a peristaltic pump and low-flow sampling techniques, for MicroTox assay analysis.

For this sampling event, Geosyntec used a peristaltic pump and low-flow sampling to collect water samples from the 10 wells. Prior to sample collection, field parameters were measured using a multi-parameter meter (YSI 556) equipped with a flow-through cell and a turbidimeter, allowing groundwater chemistry to stabilize within the acceptable parameters for low-flow sampling. Once stabilization was reached, the flow-through cell was disconnected from the tubing and a sample was collected directly from the well. Samples were collected in laboratory-provided sterile 40-milliliter ampoules and labeled according to the well from which the sample was collected. Samples were placed in a cooler on wet ice for preservation. Following sample collection, Geosyntec shipped the samples to the laboratory, EMSL Analytical, Inc. of Cinnaminson, New Jersey, for analysis.

## 3. RESULTS

The baseline E-Flux laboratory report is provided as Attachment 1, the Bio-sparge Pilot E-Flux laboratory report is provided as Attachment 2, the MicroTox laboratory report is provided as Attachment 3. Results are summarized in Table 2.

### 3.1 Baseline NSZD Rate Estimation

During the baseline NSZD rate estimation monitoring event, which took place between 5 April and 19 April 2021, the E-Flux Fossil Fuel Traps™ results can be summarized as follows:

- The background in-situ microcosm ($CO_2$-04) had equivalent NSZD rates of 67 gallons of fossil fuels degraded per acre per year. Background levels are likely a result of low levels of residual hydrocarbons in the subsurface, given the heavy industrial operations in the area, and/or from advection or diffusion of low levels of hydrocarbons from the plume at the Site.
- In-situ microcosm locations with motor oil and #2 diesel concentrations exceeding the respective Site-specific CULs, but 1,4-dichlorobenzene and vinyl chloride concentrations below the respective Site-specific CULs ($CO_2$-03 and $CO_2$-05) had equivalent NSZD rates ranging from 1,172 to 6,827 gallons of fossil fuels degraded per acre per year.
- In-situ microcosm locations with motor oil, #2 diesel, and 1,4-dichlorobenzene concentrations exceeding the respective Site-specific CULs ($CO_2$-06, $CO_2$-07, and $CO_2$-08) exhibited reduced equivalent NSZD rates of between 318 gallons of fossil fuels degraded per acre per year and not reported above the detection limit of 30 gallons of fossil fuel degraded per acre per year.
- In-situ microcosm locations within or adjacent to motor oil, #2 diesel, and vinyl chloride concentrations exceeding the respective Site-specific CULs ($CO_2$-01 and $CO_2$-02) were not reported above the detection limit of 30 gallons of fossil fuel degraded per acre per year.

### 3.2 Bio-Sparge Pilot NSZD Rate Estimation

During the Bio-Sparge Pilot NSZD rate estimation monitoring event, which took place 18 May to 1 June 2021, the E-Flux Fossil Fuel Traps™ results can be summarized as follows:

- The background in-situ microcosm had equivalent NSZD rates of 92 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 37% between the two monitoring events. This increase is assumed to be a result of increased temperatures between the April 2021 Baseline event and this June 2021 Bio-sparge Pilot event. As mentioned above, background levels are likely a result of low levels of residual hydrocarbons in the subsurface, given the heavy industrial operations in the area, and/or from advection or diffusion of low levels of hydrocarbons from the plume at the Site.
- In-situ microcosm locations with motor oil and #2 diesel concentrations exceeding the respective Site-specific CULs, but 1,4-dichlorobenzene and vinyl chloride concentrations below the respective Site-specific CULs ($CO_2$-03 and $CO_2$-05) had equivalent NSZD rates ranging from 9,083 and 12,834 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 33% and 995%, respectively, between the two monitoring events. The rate increase observed at $CO_2$-03, which was not located in proximity to a Bio-Spare Pilot well, is consistent with the increase in background levels likely due to temperature changes.

- In-situ microcosm locations with motor oil, #2 diesel, and 1,4-dichlorobenzene concentrations exceeding the respective Site-specific CULs ($CO_2$-06, $CO_2$-07, and $CO_2$-08) exhibited reduced equivalent NSZD rates of between 841 and 277 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 79% to 3233% between the two monitoring events.
- In-situ microcosm locations within or adjacent to motor oil, #2 diesel, and vinyl chloride concentrations exceeding the respective Site-specific CULs ($CO_2$-01 and $CO_2$-02) exhibited reduced equivalent NSZD rates of between 49 and 93 gallons of fossil fuels degraded per acre per year. NSZD rates increased by approximately 227% to 520% between the two monitoring events.

### 3.3 MicroTox Assay

On 1 July 2021, Geosyntec personnel performed a groundwater monitoring and sampling event at the Site for a MicroTox assay sample collection. Geosyntec accessed wells AGI-07, AGI-45, B-19, B-25, B-30, CDM-16, CDM-19, CDM-21, CDM-22, and SP-06 to collect samples for MicroTox analysis based on these wells' proximities to wells that are within an area of the contaminant plume that may be inhibiting microbial growth and biodegradation, or for background/baseline purposes. The MicroTox laboratory reports reported the associated EC50 value, which is half of the maximal effective concentration or the percent concentration of a sample required to obtain a 50% decrease in luminescence by the indicator bacteria of vibrio fischeri after a specified exposure time. As such, higher EC50 results indicate low or no toxicity, compared to lower EC50 results, which indicate higher toxicity of the groundwater. Each in-situ microcosm was paired with the nearest MicroTox monitoring location to add context to the NSZD rate results.

- $CO_2$-01, an in-situ microcosm location outside of the expected radius of influence for pilot bio-sparge wells, was closest to MicroTox monitoring well B-30, which showed an EC50 value of 21.45% after 5 minutes and 21.92% after 15 minutes. These MicroTox EC50 values showed moderate-high toxicity and suggested low NSZD rates at this location were likely partially the result of toxicity.
- $CO_2$-02, an in-situ microcosm location within the expected radius of influence for a newly installed pilot bio-sparge well, was closest to MicroTox monitoring well CDM-19, which showed an EC50 value of 33.93% after 5 minutes and 36.95% after 15 minutes. These MicroTox EC50 values showed moderate toxicity and suggested low NSZD rates at this location were likely partially the result of toxicity.
- $CO_2$-03, an in-situ microcosm location outside of the expected radius of influence for pilot bio-sparge wells, was closest to MicroTox monitoring well CDM-21, which showed an EC50 value of more than 81.90%. These MicroTox EC50 values showed low toxicity and suggested that NSZD rates were not affected by toxicity.

- $CO_2$-04, the off-site, background in-situ microcosm location, was closest to MicroTox monitoring well AGI-45, which showed an EC50 value of more than 81.90%. These MicroTox EC50 values showed low toxicity and suggested that NSZD rates were not affected by toxicity.
- $CO_2$-05, an in-situ microcosm location within the expected radius of influence for a former DPE pilot bio-sparge well, was closest to MicroTox monitoring wells B-19 (which showed an EC50 value of 30.46% after 5 minutes and 32.51% after 15 minutes), AGI-07 (which showed an EC50 value of 3.512% after 5 minutes and 2.804% after 15 minutes), and CDM-16 (which showed an EC50 value of 23.99% after 5 minutes and 23.82% after 15 minutes). These MicroTox EC50 values showed moderate to high toxicity and suggested NSZD rates for this location were likely affected by toxicity.
- $CO_2$-06, an in-situ microcosm location within the expected radius of influence for a former DPE pilot bio-sparge well, was closest to MicroTox monitoring well SP-06, which showed an EC50 value of 12.38% after 5 minutes and 12.33% after 15 minutes. These MicroTox EC50 values showed high-moderate toxicity and suggested low NSZD rates at this location were likely partially the result of toxicity.
- $CO_2$-07, an in-situ microcosm location within the expected radius of influence for a newly installed pilot bio-sparge well, was closest to MicroTox monitoring well CDM-22 (which showed an EC50 value of 22.56% after 5 minutes and 22.53% after 15 minutes), and SP-06 (which showed an EC50 value of 12.38% after 5 minutes and 12.33% after 15 minutes). These MicroTox EC50 values showed moderate-high to high-moderate toxicity and suggested low NSZD rates at this location were likely partially the result of toxicity.
- $CO_2$-08, an in-situ microcosm location outside of the expected radius of influence for pilot bio-sparge wells, was closest to MicroTox monitoring well B-25, which showed an EC50 value of 29.90% after 5 minutes and 32.99% after 15 minutes. These MicroTox EC50 values showed moderate toxicity and suggested low NSZD rates at this location were likely partially the result of toxicity.

# 4. NSZD RATE EXTRAPOLATION

Following the Baseline and the Bio-Sparge Pilot NSZD rate estimation monitoring events, the Site was divided into 100 grid cells, numbered from A1 to J10, as shown in Figure 3. Each grid cell was analyzed individually to evaluate whether interpolated COC concentration data existed from recent groundwater sampling events (December 2020 and June 2021). Grid cells not containing interpolated COC concentration data were not considered for additional modeling purposes. The 76 grid cells that contained COC concentration data were then compared to the conditions of each in-situ microcosm location. Each of the 76 grid cells were assigned one or two of the in-situ microcosm locations to be the representative NSZD rate, as seen in Figure 3. Using the NSZD rates from the assigned in-situ microcosm(s) for each cell, an area-weighted average NSZD rate was calculated for the Site under baseline and anticipated bio-sparge conditions, using the following equation:

$$Q_{Site} = \frac{\sum Q_{Cell} * A_{Cell}}{\sum A_{Cell}} \quad (1)$$

*where:*

$Q_{Site}$ = *Area-weighted NSZD rate from the Site in gallons per acre per year*

$Q_{Cell}$ = *NSZD rate in gallons per acre per year from the microcosm number assigned to an individual cell, as shown in Figure 3. If two microcosm numbers are assigned, the average rate is used for that cell (e.g. for Cell B1, a "1" is shown in Figure 3 and the results from microcosm $CO_2$-01 are used; for Cell D4, a "2/5" is shown in Figure 3 and the average results from microcosms $CO_2$-02 and $CO_2$-05 are used). If a NSZD rate was no detected, such as in the case of the baseline results at $CO_2$-01 and $CO_2$-07, half of the reporting limit was used.*

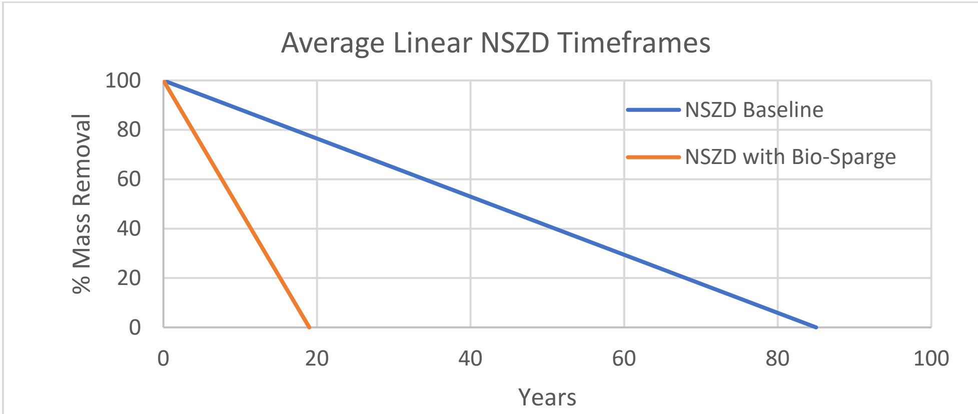
$A_{Cell}$ = *Area of cell impacted with hydrocarbons over the Site CULs (i.e., areas within isoconcentration contours shown in Figure 3. If cell fully within isoconcentration contours, cell size is approximately 2,598 square feet)*

The average NSZD rates across the Site under baseline and anticipated bio-sparge conditions were calculated to be approximately 2,073 gallons of fossil fuels degraded per acre per year and 5,795 gallons of fossil fuels degraded per acre per year, respectively.

The petroleum hydrocarbon mass remaining at the Site was estimated using a combination of recent groundwater monitoring data to estimate mass and gallons in the dissolved phase and partitioning ratios between historical COC concentrations in groundwater, unsaturated soil, capillary fringe soil, and saturated soil at the Site to estimate current mass remaining that is sorbed to soil.

Mass estimates were then compared to the assigned NSZD rates under baseline and anticipated bio-sparge conditions at each grid cell to evaluate areas that showed potential for enhanced cleanup timelines using the bio-sparge remedy. These identified regions are shown in Figure 3 and were generally located in the vicinity of in-situ microcosms $CO_2$-01, $CO_2$-02, $CO_2$-05, $CO_2$-06, and $CO_2$-07 and monitoring wells B-30, CDM-16, B-29, AGI-07, CDM-15, CDM-22, and B-19.

Overall, for the purposes of estimation, mass removal approximations were developed assuming a linear degradation rate over time, projecting cleanup to non-detect levels. Cleanup timeframes with bio-sparge are estimated to be approximately 25% of the timeframe for NSZD alone. The average estimated cleanup time frame under bio-sparge and NSZD were approximately 19 and 85 years, respectively, with some grid wells expected to clean up faster or slower than these averages. This linear degradation is conceptually depicted on the plot below.




However, it should be noted that degradation rates are nonlinear and influenced by factors such as bio-sparge operations and COC concentration changes. Bio-sparge degradation rates are likely to be faster than estimated based on the current rates, because the current rates are estimated using $CO_2$ flux results after only four to six weeks of bio-sparge operation at only six wells. NSZD depletion rates are likely to be slower than estimated because degradation rates tend to decline with time, as COC concentrations decline.

## 5. REFERENCES

Ecology, 1995. Agreed Order No. DE 95HS-2292 for Facility ID WAD027543032. Washington State Department of Ecology. 30 October 1995.

E-Flux, 2021. Innovative application: Estimation of Natural Source Zone Depletion (NSZD) under a Concrete Cover Using Passive Fossil Fuel $CO_2$ Traps. 2011.

Geosyntec, 2021a. Work Plan for NSZD Rate Evaluation using In-situ Microcosms Lilyblad Cleanup Site (Contract No. C2000120). 8 April 2021.

# TABLES

# Table 1
## In Situ Microcosm Locations and Objectives
Lilyblad Cleanup Site, Tacoma, Washington

| CO2 Microcosm Location ID | Property | Location Description | Objective |
|---|---|---|---|
| $CO_2$-01 | Platinum Lease (former Chambers Bay RV) | * Near the Port of Tacoma Road, eastern extent of Tripak property.<br>* Within the Diesel Range Organics and Motor Oil CUL contours, potentially within the vinyl chloride CUL contour. | Evaluation of natural source zone depletion - outside of expected biosparge well ROI. |
| $CO_2$-02 | Pacific Functional Fluids, LLC | * Northern extent of the Pacific Functional Fluids property, within the DPE treatment compound.<br>* Within the Diesel Range Organics and Motor Oil CUL contours.<br>* Near new bio-sparging well that will be used in the bio-sparging pilot study. | Evaluation of natural source zone depletion - in vicinity of newly installed biosparge well. |
| $CO_2$-03 | Pacific Functional Fluids, LLC | * East of the main Pacific Functional Fluids building.<br>* Within the Diesel Range Organics CUL contours. | Evaluation of natural source zone depletion - outside of expected biosparge well ROI. |
| $CO_2$-04 | Tripak Industries, Inc. | * Target location near the Port of Tacoma Road, Northeast of Tripak building.<br>* Not within known CUL contours. | Background evaluation of natural source zone depletion - outside of expected biosparge well ROI and outside of COC plumes. |
| $CO_2$-05 | Pacific Functional Fluids, LLC | * Center of the Pacific Fluids property, south of central tank farm.<br>* Within the Diesel Range Organics and Motor Oil CUL contours.<br>* Near former DPE well that will be used in the bio-sparging pilot study. | Evaluation of natural source zone depletion - in vicinity of existing DPE/biosparge well. |
| $CO_2$-06 | Pacific Functional Fluids, LLC | * South of the main Pacific Functional Fluids building.<br>* Within the 1,4-dichlorobenzene, Gasoline Range Organics, Motor Oil, and Diesel Range Organics CUL contours.<br>* Near former DPE well that will be used in the bio-sparging pilot study. | Evaluation of natural source zone depletion - in vicinity of existing DPE/biosparge well. |
| $CO_2$-07 | Pacific Functional Fluids, LLC | * Southern extent of Pacific Functional Fluids property.<br>* Within the 1,4-dichlorobenzene, Motor Oil, and Diesel Range Organics CUL contours.<br>* Near new bio-sparging well that will be used in the bio-sparging pilot study. | Evaluation of natural source zone depletion - in vicinity of newly installed biosparge well. |
| $CO_2$-08 | Tripak Industries, Inc. | * South of main Tripak building.<br>* Southern extent of the 1,4-dichlorobenzene and Gasoline Range Organics CUL contours. | Evaluation of natural source zone depletion - outside of expected biosparge well ROI. |

Notes:
In situ microcosm locations were selected to provide geographical coverage of the impacted area.
CUL = Cleanup level
DPE = Dual phase extraction
ROI = Radius of influence
$CO_2$ = Carbon dioxide

# Table 2
## NSZD Rate Estimation and MicroTox Assay Results
Lilyblad Cleanup Site, Tacoma, Washington

| $CO_2$ Microcosm Location ID | $CO_2$ Microcosm Objective | Monitoring Event | Total $CO_2$ Mass (g) | Fossil Fuel $CO_2$ Mass (g) | Equivalent NSZD Rate[1] (gal $C_8H_{18}$ * $acre^{-1}$ * $yr^{-1}$) | Increase from Baseline to Bio-Sparge Event (%) | Adjacent Microbial Toxicity Well Location ID | Approximate Distance from $CO_2$ Microcosm to Microbial Toxicity Well Location (ft) | EC50 [3] (%) |
|---|---|---|---|---|---|---|---|---|---|
| $CO_2$-01 | Outside of expected biosparge well ROI | Baseline Event | ND | ND | < 30 | 520% [2] | B-30 | 33 | 21.45 / 21.92 |
| | | Bio-Sparge Event | 0.12 | 0.06 | 93 | | | | |
| $CO_2$-02 | In vicinity of newly installed biosparge well | Baseline Event | 0.04 | ND | <30 | 227% [2] | CDM-19 | 45 | 33.93 / 36.95 |
| | | Bio-Sparge Event | 0.12 | 0.03 | 49 | | | | |
| $CO_2$-03 | Outside of expected biosparge well ROI | Baseline Event | 7.19 | 4.75 | 6,827 | 33% | CDM-21 | 45 | > 81.90 |
| | | Bio-Sparge Event | 7.77 | 6.17 | 9,083 | | | | |
| $CO_2$-04 | Background | Baseline Event | 1.67 | 0.05 | 67 | 37% | AGI-45 | 96 | > 81.90 |
| | | Bio-Sparge Event | 2.19 | 0.06 | 92 | | | | |
| $CO_2$-05 | In vicinity of existing DPE/biosparge well | Baseline Event | 2.1 | 0.81 | 1,172 | 995% | B-19 | 48 | 30.46 / 32.51 |
| | | | | | | | AGI-07 | 51 | 3.512 / 2.804 |
| | | Bio-Sparge Event | 13.04 | 8.72 | 12,834 | | CDM-16 | 71 | 23.99 / 23.82 |
| $CO_2$-06 | In vicinity of existing DPE/biosparge well | Baseline Event | 0.15 | 0.11 | 155 | 79% | SP-06 | 8 | 12.38 / 12.33 |
| | | Bio-Sparge Event | 0.22 | 0.19 | 277 | | | | |
| $CO_2$-07 | In vicinity of newly installed biosparge well | Baseline Event | ND | ND | < 30 | 3233% [2] | CDM-22 | 54 | 22.56 / 22.53 |
| | | Bio-Sparge Event | 0.34 | 0.34 | 500 | | SP-06 | 69 | 12.38 / 12.33 |
| $CO_2$-08 | Outside of expected biosparge well ROI | Baseline Event | 0.93 | 0.22 | 318 | 164% | B-25 | 54 | 29.90 / 32.99 |
| | | Bio-Sparge Event | 2.08 | 0.57 | 841 | | | | |

Notes:
$CO_2$ = Carbon dioxide
NSZD = Natural Source Zone Depletion
g = grams
gal C8H18 * $acre^{-1}$ * $yr^{-1}$ = gallons of petroleum hydrocarbons degraded per acre per year
< = Not detected above the laboratory reporting limit, shown
ND = Not detected; no laboratory reporting limit
(1) Equations and assumptions used to calculate the Equivalent NSZD rate are shown in Attachement 1 and 2.
(2) Percentage NSZD rate increases for microcosms with non-detect baseline NSZD rates were calculated using half of the detection limit, shown.

(3) EC50 = Half maximal effective concentration; the percent concentration of a sample required to obtain a 50% decrease in luminescence by the bacteria vibrio fischeri after 5 minutes and 15 minutes incubation, respecitvely.
Baseline Event occurred 5 April 2021, prior to the Bio-sparge Pilot.
Bio-sparge Event occurred 18 May 2021 to 1 June 2021, within the final two weeks of the Bio-sparge Pilot.
Microbial Toxicity sampling event occurred 1 July 2021, following the Bio-sparge Pilot.

# FIGURES


**Legend**

- New Biosparge Well
- $CO_2$ Microcosm with Co-Located Vapor Pin
- Retrofitted DPE current wells
- Pilot Study and Groundwater Monitoring Well
- Groundwater Monitoring Well
- Microbial Toxicity Assay Sampling Locations
- TPH as Gasoline> 1mg/l (GW CUL)
- Vinyl Chloride> 2.4 μg/l (GW CUL)
- 1,4-Dichlorobenzene> 4.86μg/l (GW CUL)
- #2 Diesel > 1mg/l (GW CUL)
- Motor Oil> 1mg/l (GW CUL)

Notes:
CUL = Clean-up Level
GW = Groundwater
μg/l = micrograms per liter
mg/l = milligrams per liter
$CO_2$ = Carbon Dioxide

Isocontours based on sampling data from 20 December 2020

N

0 80 Feet

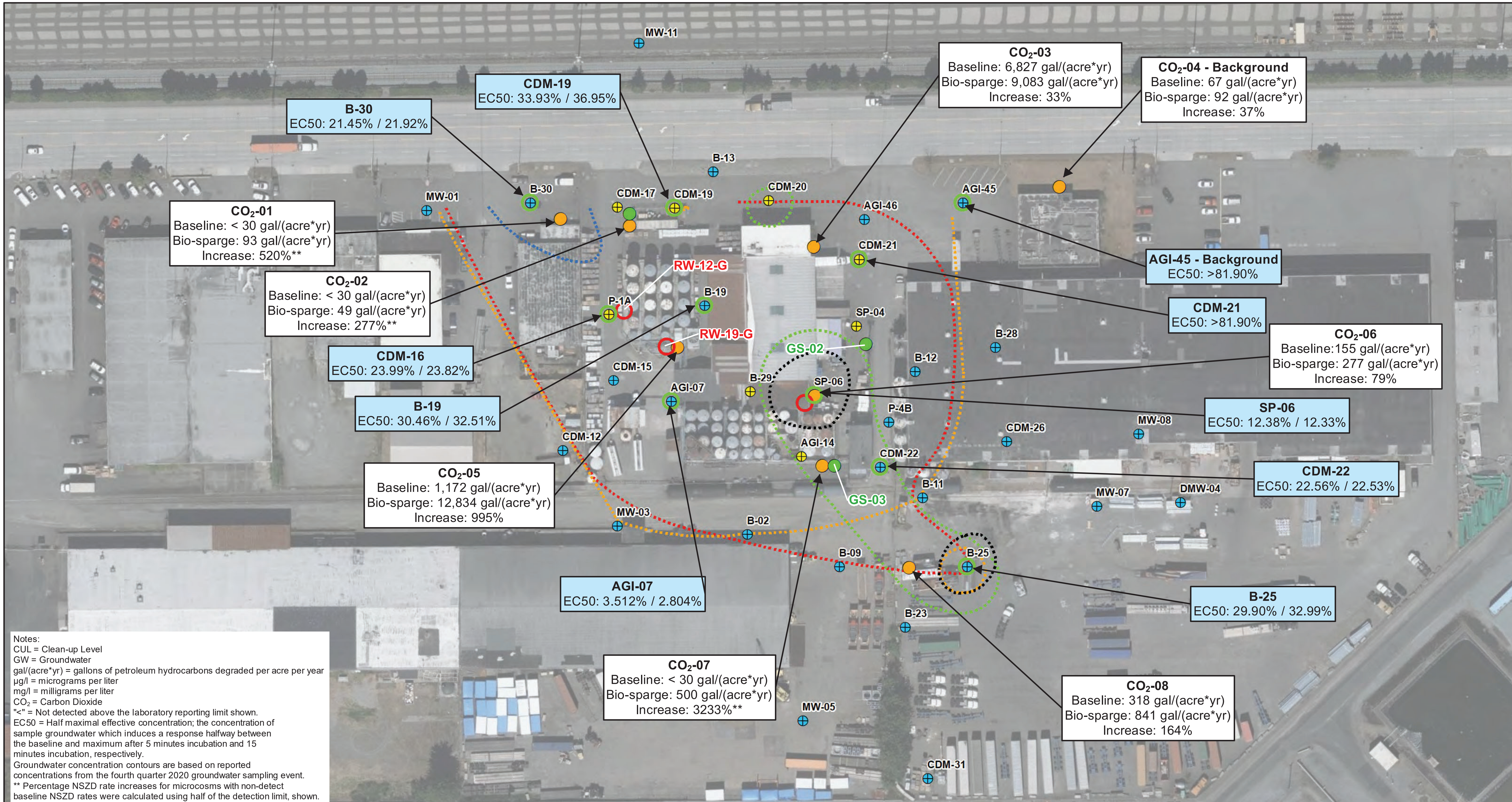
**In-Situ Microcosm and MicroTox Assay Sampling Locations**

2244 Port of Tacoma Road,
Tacoma, Washington

Geosyntec consultants

| PNR0697 | February 2022 | Figure 1 |
|---|---|---|

P:\Projects\Lilybiad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Q2_2021\Figure 2In-Situ Microcosm and Microbial Toxicity Assay Sampling Locations.mxd 7/30/2021 10:02:17 AM




Notes:
CUL = Clean-up Level
GW = Groundwater
gal/(acre*yr) = gallons of petroleum hydrocarbons degraded per acre per year
µg/l = micrograms per liter
mg/l = milligrams per liter
$CO_2$ = Carbon Dioxide
"<" = Not detected above the laboratory reporting limit shown.
EC50 = Half maximal effective concentration; the concentration of sample groundwater which induces a response halfway between the baseline and maximum after 5 minutes incubation and 15 minutes incubation, respectively.
Groundwater concentration contours are based on reported concentrations from the fourth quarter 2020 groundwater sampling event.
** Percentage NSZD rate increases for microcosms with non-detect baseline NSZD rates were calculated using half of the detection limit, shown.

**Legend**

- New Biosparge Well
- $CO_2$ Microcosm with Co-Located Vapor Pin
- Retrofitted DPE current wells
- Pilot Study and Groundwater Monitoring Well
- Groundwater Monitoring Well
- Microbial Toxicity Assay Sampling Locations
- TPH as Gasoline> 1mg/l (GW CUL)
- Vinyl Chloride> 2.4 µg/l (GW CUL)
- 1,4-Dichlorobenzene> 4.86µg/l (GW CUL)
- #2 Diesel > 1mg/l (GW CUL)
- Motor Oil> 1mg/l (GW CUL)

N

0 80 Feet

**Estimated NSZD Rate and MicroTox Results**

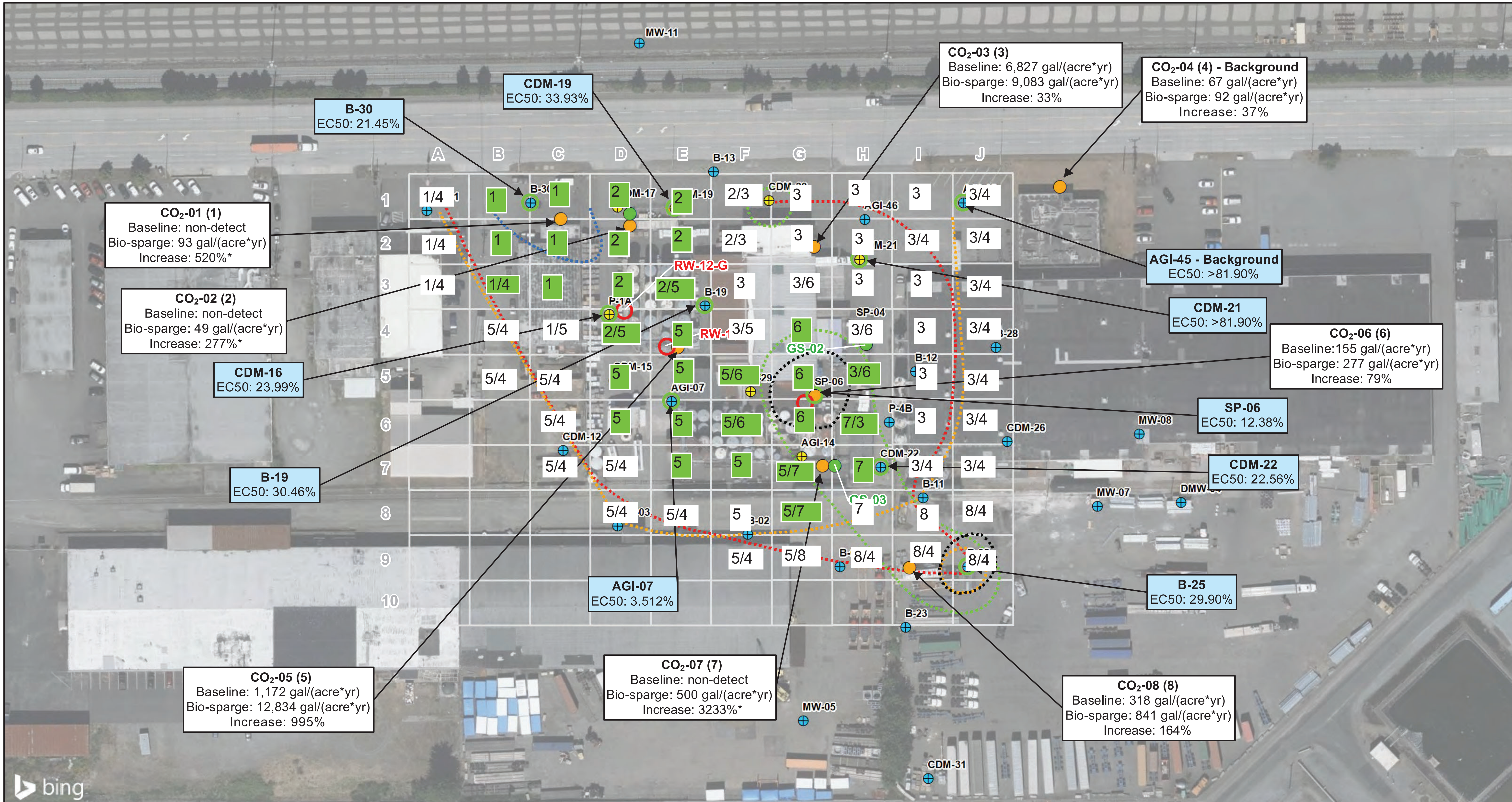
2244 Port of Tacoma Road, Tacoma, Washington

Geosyntec consultants

PNR0697 | February 2022

**Figure 2**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Q2_2021\Figure 3 Estimated NSZD Rate and Microbial Toxicity Results.mxd 8/4/2021 9:38:42 AM




**Legend**

- New Biosparge Well
- $CO_2$ Microcosm with Co-Located Vapor Pin
- Retrofitted DPE current wells
- Pilot Study and Groundwater Monitoring Well
- Groundwater Monitoring Well
- Microbial Toxicity Assay Sampling Locations
- TPH as Gasoline> 1mg/l (GW CUL)
- Vinyl Chloride> 2.4 µg/l (GW CUL)
- 1,4-Dichlorobenzene> 4.86µg/l (GW CUL)
- #2 Diesel > 1mg/l (GW CUL)
- Motor Oil> 1mg/l (GW CUL)
- NSZD Extrapolation Grid (2,598 Sq Ft)

#/# Numbers in cells represent associated microcosm CO2 flux trap used to calculate NZSD rates for that cell. Where two numbers are shown, an average of the CO2 flux rates was used for those microcosms. Where NSZD rates are not detected, half of the reporting limit was used.

Grid cell to be considered for future bio-sparge.

* Percentage NSZD rate increases for microcosms with non-detect baseline NSZD rates were calculated using half of the detection limit.

Notes:
CUL = Clean-up Level
GW = Groundwater
µg/l = micrograms per liter
mg/l = milligrams per liter
$CO_2$ = Carbon Dioxide
EC50 = Half maximal effective concentration; the concentration of sample groundwater which induces a response halfway between the baseline and maximum after 5 minutes incubation

N

0 80 Feet

**Estimated NSZD Rate and MicroTox Results with Extrapolation Grid**

2244 Port of Tacoma Road, Tacoma, Washington

Geosyntec consultants

PNR0697 | February 2022

**Figure 3**

P:\Projects\Lilyblad\PNR0697_LILYBLAD CLEANUP OMM\900 GIS and CAD\920 GIS\MXDs\Q2_2021\Figure 4 Estimated NSZD Rate and Microbial Toxicity Results and Grid.mxd 7/30/2021 1:11:33 PM

# ATTACHMENT 1

Baseline $CO_2$ Flux Monitoring Event

Laboratory Analytical Report

# Confidential Report
# $CO_2$ Flux and NSZD Rate Results

TREVOR CARLSON
AND MICHELLE MYERS
GEOSYNTEC CONSULTANTS, INC.
TACOMA, WA, USA
SAMPLING DATES:
4/5/2021 - 4/19/2021


**For technical support questions contact:**

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Report Date: 5/18/2021

**The purpose of this document is to provide sample calculations for the reported results and to explain the method for differentiating petroleum hydrocarbon-derived $CO_2$ from that produced from natural soil respiration processes. The value of the $^{14}C$ analysis, site-specific study results and applicable notes, calculation explanations, and references are included.**

## The Value of the $^{14}C$ Analysis

**How to differentiate between petroleum hydrocarbon-derived $CO_2$ and natural process-derived $CO_2$ using $CO_2$ flux traps:**

Unimpacted soils naturally produce $CO_2$ due to microbial root zone activity and/or the degradation of natural organic matter. Thus, the total measured $CO_2$ flux at an impacted location is a function of the rates of both natural soil respiration and LNAPL degradation (Sihota and Mayer, 2012). The latter, which is caused by Natural Source Zone Depletion (NSZD), can be estimated by subtracting measured $CO_2$ fluxes at unimpacted locations from the total measured $CO_2$ fluxes at LNAPL-impacted locations (Sihota and Mayer, 2012). This spatial "background correction" assumes that bio-based $CO_2$ fluxes are similar at both impacted and unimpacted locations. This approach is complicated to implement, given that at many industrial facilities it is difficult to find unimpacted areas and vegetation cover can vary across a site. Alternatively, carbon isotope analysis can be used to carry out a location-specific correction for total measured $CO_2$ fluxes, and this approach effectively overcomes the limitations of the background correction.

**Theory of Carbon Isotope Analysis:**

Our method for NSZD rate estimation relies on the analysis of $^{14}C$, an unstable carbon isotope with an absolute half-life of 5,730 years. $^{14}C$ is generated by cosmic rays in the atmosphere and is quickly oxidized to $^{14}CO_2$; thus, bio-based living carbon is $^{14}C$-rich, while ancient fossil fuel carbon is completely $^{14}C$-depleted. Additionally, bio-based organic carbon and the atmosphere have the same characteristic amount of $^{14}C$. The short half-life of $^{14}C$ only allows for dating of samples younger than 60,000 years using accelerator mass spectrometry (Stuiver and Polach, 1977). $^{14}C$ analysis can therefore be used to differentiate between anthropogenic (i.e., fossil fuel) and natural sources of atmospheric carbon (see Klouda and Connolly, 1995; Levin et al., 1995; Avery et al., 2006), and this analysis is the basis for ASTM D6866-18.

For samples that contain both bio-based and fossil fuel-derived carbon, such as E-Flux's fossil fuel traps, measurement of $^{14}C$ enables quantitation of *both* source contributions. The fossil fuel-derived percentage of the sample ($ff_{sample}$) and the bio-based percentage ($1-ff_{sample}$, or $bb_{sample}$) are related by the following two-component mass balance (modified from Avery, Jr. et al., 2006):

$$Fm_{sample} = (ff_{sample})(Fm_{ff}) + (1 - ff_{sample})(Fm_{atm})$$

Here, $Fm_x$ represents the fraction modern, a measure of how close the present $^{14}C/^{12}C$ ratio of the sample is to the ratio from 1950, which is derived from a pre-industrial era standard. $Fm_{sample}$ is the total measured fraction modern of the sample. $Fm_{ff}$ is the fraction modern of only the fossil fuel portion of the sample. This number is 0, as there is no $^{14}C$ in fossil fuel-derived $CO_2$. $Fm_{atm}$ is the fraction modern of the part of the sample derived from natural soil respiration processes. This value, currently equal to **1.02** (Cerling et al., 2016, Larsen et al., 2018), has been experimentally determined and is a fixed value at each point in time. By convention, the results of carbon isotope analysis are reported based on a 1950 NBS oxalic acid standard, and so $Fm_{sample}$ is reported as if the analysis took place in 1950. Due to nuclear testing, current $^{14}C$ atmospheric levels are now higher than they were in 1950. This means that $Fm_{atm}$ is counter-intuitively larger than 1, as the $^{14}C/^{12}C$ sample ratio is higher now than it would have been in 1950.



E FLUX

**$^{14}$C Calculations:**

*Conversion of Fraction Modern Carbon to Fossil Fuel Carbon:*

The equation for calculating the percentage of fossil fuel carbon ($ff_{sample}$) is derived from the following mass balance:

$$Fm_{sample} = (ff_{sample})(Fm_{ff}) + (1 - ff_{sample})(Fm_{atm})$$

Solving for $ff_{sample}$ yields:

$$ff_{sample} = 1 - \frac{Fm_{sample}}{Fm_{atm}}$$

Fraction modern ($Fm_{sample}$, from $^{14}$C analysis) is reported by convention based on $^{14}$C levels from 1950. Because of atomic testing, current environmental $^{14}$C levels are approximately 2% higher than they were in 1950 (Cerling et al., 2016, Larsen et al., 2018) and $Fm_{atm}$ is equal to 1.02. This equation then becomes:

$$ff_{sample} = 1 - \frac{Fm_{sample}}{1.02}$$

As percentages must add to 1, the percentage of bio-based carbon ($bb_{sample}$) can then be calculated using the following equivalence:

$$bb_{sample} = 1 - ff_{sample} = 1 - \left(1 - \frac{Fm_{sample}}{1.02}\right) = \frac{Fm_{sample}}{1.02}$$

*Converting Carbon Flux to Equivalent LNAPL Loss Rate:*

The intermediate reactions for LNAPL mineralization include methanogenesis, leading to production of methane and $CO_2$, and the subsequent aerobic oxidation of methane into $CO_2$:

$$C_8H_{18} + 3.5\,H_2O \rightarrow 6.25\,CH_4 + 1.75\,CO_2 \text{ (methanogenesis)}$$

$$6.25\,CH_4 + 12.5\,O_2 \rightarrow 6.25\,CO_2 + 12.5\,H_2O \text{ (methane oxidation)}$$

$$C_8H_{18} + 12.5\,O_2 \rightarrow 9H_2O + 8\,CO_2 \text{ (overall reaction)}$$

Assuming a conservative LNAPL density of 0.77 g $mL^{-1}$ (upper range of gasoline) and using the molecular weight of $C_8H_{18}$ (octane, 114.23 g $mol^{-1}$), µmol $m^{-2}$ $s^{-1}$ of $CO_2$ can then be converted into gal. $acre^{-1}$ $yr^{-1}$ of LNAPL:

$$1\,\frac{\mu\text{mol CO}_2}{\text{m}^2\text{ s}} \cdot \left(\frac{1\,\mu\text{mol C}_8\text{H}_{18}}{8\,\mu\text{mol CO}_2}\right)\left(\frac{1\text{ mol C}_8\text{H}_{18}}{1\times10^6\,\mu\text{mol C}_8\text{H}_{18}}\right)\left(\frac{114\text{ g C}_8\text{H}_{18}}{1\text{ mol C}_8\text{H}_{18}}\right)\left(\frac{1\text{ mL C}_8\text{H}_{18}}{0.77\text{ g C}_8\text{H}_{18}}\right)$$
$$\left(\frac{1\text{ L}}{1000\text{mL}}\right)\left(\frac{1\text{ gal.}}{3.785\text{ L}}\right)\left(\frac{4{,}046\text{ m}^2}{1\text{ acre}}\right)\left(\frac{3600\text{ s}}{1\text{ h}}\right)\left(\frac{24\text{ h}}{1\text{ d}}\right)\left(\frac{365\text{ d}}{1\text{ yr}}\right).$$

$$= 625.2\,\frac{\text{gal. C}_8\text{H}_{18}}{\text{acre}\cdot\text{yr}}$$

Note that both the LNAPL formula and its density are assumed, and so this conversion is subject to uncertainty. However, site-specific data can be used if available. Using alternative representative hydrocarbon formulas and densities generally results in conversion factors that are within 10-15% of 625.2 gal. $acre^{-1}$ $yr^{-1}$. Therefore, the uncertainty associated with these values does not preclude an acceptable estimate.

**Expected Results and Recommendations:**

$^{14}C$-based techniques offer a built-in, location-specific correction as an alternative to the standard background location correction. Early work on a limited number of samples suggested that $^{14}C$-corrected results are equivalent to background-corrected results (Sihota and Mayer, 2012; McCoy et al., 2015). However, a more recent comparison spanning 4 different sites suggests that measured carbon fluxes can differ by up to five times among different locations within the same site (Zimbron and Kasyon, 2015). Depending on the location, the resulting difference between background-corrected and $^{14}C$-corrected NSZD rate estimates can be up to one order of magnitude. In contrast, the background correction assumes that the non-fossil fuel $CO_2$ flux is constant across an entire site; large errors in final estimated NSZD rates might therefore be introduced if the background correction is used. Because the $^{14}C$ measurement is co-located with the $CO_2$ flux measurement, it is unbiased by spatial uncertainties related to the background location(s) (e.g., vegetation, lithology, unknown impacts, different gas transport regimes, soil moisture).

The fossil fuel $CO_2$ content of unexposed sorbent as used in the traps is typically around 30% (as of today) and likely results from material processing and handling (e.g., exposure to fossil fuel fumes). This small mass of fossil fuel $CO_2$ is removed from samples by carrying out a $^{14}C$ travel blank correction. $^{14}C$ analysis is performed on $CO_2$ sorbent sub-samples after homogenization of the entire bottom sorbent layer (see McCoy et al., 2015). The mass of fossil fuel $CO_2$ in the unexposed travel blank trap (TB) is then subtracted from the mass of fossil fuel $CO_2$ in each field-deployed trap.

The results in this report are based on proprietary technology used to measure soil gas efflux. All information contained herein is strictly confidential to the customer.



E FLUX

This report contains Confidential Information and is to be delivered only to the indicated Customer.

**Project:** Tacoma, WA, USA
**Customer:** Geosyntec Consultants, Inc.
**Customer Contact:** Trevor Carlson and Michelle Myers
**Report Date:** 18-May-2021

| Sample ID | Sampling Information | | | Raw Results[a] | | | | Final $CO_2$ Results[b] | | | $^{14}C$ Results[a] | | | NSZD Results[b] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Deployed | Retrieved | Days in Field | Moisture content (%) | Dry Sorbent Mass (g) | Avg. % $CO_2$[c] | CV[d] $CO_2$ (%) | $CO_2$ content (%) | $CO_2$ mass (g) | $CO_2$ Flux (µmol $m^{-2}$ $s^{-1}$) | *Fm* sample As Reported[e] | *bb* sample As of Today[f] | *ff* sample As of Today[f] | Bio-based $CO_2$ Flux (µmol $m^{-2}$ $s^{-1}$) | *ff* sample As of Today (TB-corrected) | Fossil Fuel $CO_2$ (g) | Fossil Fuel $CO_2$ Flux (µmol $m^{-2}$ $s^{-1}$) | Equivalent NSZD Rate (gal. $acre^{-1}$ $yr^{-1}$) |
| 10204-R1-CO2-TB | N/A | N/A | N/A | 20.0% | 41.14 | 1.13% | 1.40% | - | - | - | 53.21 | 52.17% | 47.83% | - | - | - | - | - |
| 10204-R1-CO2-01 | 4/5/21 8:30 | 4/19/21 10:30 | 14.1 | 14.8% | 41.42 | 1.07% | 2.51% | ND | ND | ND | 55.93 | 54.84% | 45.16% | ND | ND | ND | ND | ND total CO2 |
| 10204-R1-CO2-02 | 4/5/21 8:33 | 4/19/21 10:40 | 14.1 | 16.8% | 41.36 | 1.23% | 0.36% | 0.10% | 0.04 | 0.09 | 57.10 | 55.98% | 44.02% | 0.09 | ND | ND | ND | ND ff CO2 flux |
| 10204-R1-CO2-03 | 4/5/21 8:53 | 4/19/21 11:25 | 14.1 | 16.8% | 45.86 | 16.82% | 3.10% | 15.69% | 7.19 | 16.54 | 35.93 | 35.22% | 64.78% | 5.62 | 66.00% | 4.75 | 10.92 | 6827 |
| 10204-R1-CO2-04 | 4/5/21 9:10 | 4/19/21 11:20 | 14.1 | 14.6% | 42.57 | 5.05% | 2.05% | 3.92% | 1.67 | 3.84 | 88.82 | 87.08% | 12.92% | 3.73 | 2.80% | 0.05 | 0.11 | 67 |
| 10204-R1-CO2-05 | 4/5/21 8:38 | 4/19/21 10:45 | 14.1 | 20.2% | 43.22 | 5.99% | 0.15% | 4.86% | 2.10 | 4.83 | 60.70 | 59.51% | 40.49% | 2.96 | 38.78% | 0.81 | 1.87 | 1172 |
| 10204-R1-CO2-06 | 4/5/21 8:46 | 4/19/21 11:00 | 14.1 | 21.6% | 41.59 | 1.49% | 2.02% | 0.35% | 0.15 | 0.34 | 46.94 | 46.02% | 53.98% | 0.09 | 73.79% | 0.11 | 0.25 | 155 |
| 10204-R1-CO2-07 | 4/5/21 8:44 | 4/19/21 10:53 | 14.1 | 19.7% | 41.80 | 1.12% | 1.23% | ND | ND | ND | 51.47 | 50.47% | 49.53% | ND | ND | ND | ND | ND total CO2 |
| 10204-R1-CO2-08 | 4/5/21 9:00 | 4/19/21 11:10 | 14.1 | 21.3% | 41.84 | 3.35% | 1.77% | 2.22% | 0.93 | 2.14 | 69.44 | 68.08% | 31.92% | 1.63 | 23.78% | 0.22 | 0.51 | 318 |

- The flux equivalence is **1** µmol $m^{-2}$ $s^{-1}$ = **625.2** gallons $acre^{-1}$ $yr^{-1}$, assuming a representative hydrocarbon density of **0.77** g $mL^{-1}$ with the formula **$C_8H_{18}$**.Trap cross-sectional area is **8.11 × $10^{-3}$** $m^2$ (based on a **4-inch** receiver pipe).
- Carbonate analysis of each trap/sample is based on method ASTM 4373-14, which does do not provide variability (CV) standards. Similar methods (e.g., ASTM D513-16) typically allow CV ≤ 20%. Duplicate analysis must be <5%, or otherwise repeated.
- NA = Not Applicable; ND $_{\text{total CO2 flux}}$ = non-detectable blank-corrected carbonate (detection limit for carbonate content is 0.1% based on replicates data). ND $_{\text{ff CO2 flux}}$ = detectable carbonate, but non detectable blank-corrected fossil fuel carbonate (ND fossil fuel CO2 flux is 0.04% fossil fuel carbonate content, based on the variability of the carbonate and the $^{14}C$ analysis) (Ambruster and Pry, 2008 ; US EPA 2016). The equivalent ND NSZD rate=30 gallons per acre per year.

**a.** Raw and $^{14}C$ Results are not TB-corrected.
**b.** Final $CO_2$ and NSZD Results are TB-corrected.
**c.** Refers to the measured weight percentage of $CO_2$ with respect to the total dry sorbent mass.
**d.** Refers to the coefficient of variation of $CO_2$ measurements for each sample: CV = [standard deviation of %$CO_2$ measurements] / [average %$CO_2$ measurement]
**e.** Refers to the reported fraction modern ($Fm_{sample}$). As is standard in radiocarbon reporting, this value has not been corrected to account for present-day $^{14}C$ atmospheric levels. This number is originally reported as pMC (percent modern carbon) and is converted into *Fm* for our calculations using the relation 100.0 pMC = 1.0 *Fm* = 100% *Fm*.
**f.** "As of Today" means that the value has been adjusted to account for the difference between atmospheric $^{14}C$ levels from the 1950s and today (Stenström et al., 2011). $bb_{sample}$ is the percentage of the total $CO_2$ that is derived from bio-based (non-fossil fuel) sources. $ff_{sample}$ refers to the percentage of $CO_2$ that is derived from fossil fuels. The values reported in the $^{14}C$ Results section are not TB-corrected, but those in the NSZD Results section are.

**Results Snapshot:**

- The Travel Blank (TB) concentration is **1.13%**; typically, this number is < 2%.
- Trap tops are not saturated with $CO_2$ (sorbent saturation is 30%). The maximum measured (raw) top concentration is ***3.50%*** (sample **10204-R1-CO2-01 top**).
- Bio-based carbon fluxes represent the $CO_2$ contributions from natural soil respiration processes to the total carbon flux; the $^{14}C$ analysis corrects for this contribution. Average bio-based $CO_2$ flux is **1.76** µmol $m^{-2}$ $s^{-1}$, and the coefficient of variation is **122%**. The range of bio-based $CO_2$ fluxes is between **-0.02** and **5.62** µmol $m^{-2}$ $s^{-1}$. If these interferences were not removed using the results of the radiocarbon analysis, the errors in the NSZD rate estimates would be between **-15**- and **3516**-gallons $acre^{-1}$ $yr^{-1}$.
- Samples **10204-R1-CO2-01, 10204-R1-CO2-02,** and **10204-R1-CO2-07** show non-detectable (ND) fossil fuel $CO_2$ flux. The entire $CO_2$ flux for these samples is likely derived from non-fossil fuel sources.

**Site-specific Sample Calculations:**

*Grams of Fossil Fuel $CO_2$:*

The mass of fossil fuel-derived $CO_2$ in each trap is calculated by subtracting the total fossil fuel $CO_2$ in the travel blank (TB) from the total fossil fuel $CO_2$ in the trap. Only data that are ***not*** TB-corrected (i.e., $ff_{sample}$ As of Today and raw % $CO_2$) are used in this calculation. Using sample **10204-R1-CO2-03** as an example:

$$\left(\text{g CO}_{2(\text{ff})}\right)_{sample\ 3} = \text{g}_{\text{sorbent}} \cdot \left[\left((\%\ \text{CO}_2)_{\text{sample}}\left(ff_{sample}\right)\right) - \left((\%\ \text{CO}_2)_{\text{TB}}\left(ff_{TB}\right)\right)\right]$$

$$\left(\text{g CO}_{2(\text{ff})}\right)_{sample\ 3} = \mathbf{45.86}\ \text{g} \cdot \left[(\mathbf{16.82}\ \% \cdot \mathbf{64.78}\ \%) - (\mathbf{1.13}\ \% \cdot \mathbf{47.83}\ \%)\right]$$

$$\left(\text{g CO}_{2(\text{ff})}\right)_{sample\ 3} = \mathbf{4.7475}\ \text{g}$$

Here, $g_{sorbent}$ is the mass of sorbent used in the bottom layer of the trap, $(\%CO_2)_{sample}$ is the average weight percentage of $CO_2$ in the sample, $ff_{sample}$ is the percentage of carbon in the sample derived from fossil fuels, $(\%CO_2)_{TB}$ is the average weight percentage of $CO_2$ in the travel blank, and $ff_{TB}$ is the percentage of carbon in the travel blank that is derived from fossil fuels. In this example, sample **10204-R1-CO2-03** contains **4.7475 g** of fossil-fuel derived $CO_2$.

*Fossil Fuel $CO_2$ Flux:*

Converting grams of $CO_2$ to $CO_2$ flux requires the cross-sectional area of the receiver (**8.11 × 10$^{-3}$** $m^2$ for a **4**-inch receiver), the number of days that the trap was deployed in the field, and the molecular weight of $CO_2$ (44 g $mol^{-1}$). Using trap **10204-R1-CO2-03** as an example:

$$\text{Fossil Fuel CO}_2\ \text{Flux} = \frac{\text{g fossil fuel CO}_2 \cdot \frac{1\ \text{mol CO}_2}{44\ \text{g CO}_2} \cdot \frac{1{,}000{,}000\ \mu\text{mol CO}_2}{1\ \text{mol CO}_2}}{\text{days in the field} \cdot \frac{24\ \text{hr}}{\text{day}} \cdot \frac{3600\ \text{s}}{\text{hr}} \cdot (\text{receiver area})}$$

$$\text{Fossil Fuel CO}_2\ \text{Flux} = \frac{\mathbf{4.7475}\ \text{g fossil fuel CO}_2 \cdot \frac{1\ \text{mol CO}_2}{44\ \text{g CO}_2} \cdot \frac{1{,}000{,}000\ \mu\text{mol CO}_2}{\text{mol CO}_2}}{\mathbf{14.1}\ \text{days} \cdot \frac{24\ \text{hr}}{\text{day}} \cdot \frac{3600\ \text{s}}{\text{hr}} \cdot (\mathbf{8.11} \times \mathbf{10^{-3}}\ \text{m}^2)}$$

$$\text{Fossil Fuel CO}_2\ \text{Flux} = \mathbf{10.92}\ \frac{\mu\text{mol CO}_2}{\text{m}^2 \cdot \text{s}}$$

 

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E FLUX

# ATTACHMENT 2

Bio-Sparge $CO_2$ Flux Monitoring Event

Laboratory Analytical Report

# Confidential Report
# $CO_2$ Flux and NSZD Rate Results

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AND MICHELLE MYERS
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TACOMA, WA, USA
SAMPLING DATES:
5/18/2021 - 6/1/2021

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Report Date: 6/30/2021

**The purpose of this document is to provide sample calculations for the reported results and to explain the method for differentiating petroleum hydrocarbon-derived $CO_2$ from that produced from natural soil respiration processes. The value of the $^{14}C$ analysis, site-specific study results and applicable notes, calculation explanations, and references are included.**

## The Value of the $^{14}C$ Analysis

**How to differentiate between petroleum hydrocarbon-derived $CO_2$ and natural process-derived $CO_2$ using $CO_2$ flux traps:**

Unimpacted soils naturally produce $CO_2$ due to microbial root zone activity and/or the degradation of natural organic matter. Thus, the total measured $CO_2$ flux at an impacted location is a function of the rates of both natural soil respiration and LNAPL degradation (Sihota and Mayer, 2012). The latter, which is caused by Natural Source Zone Depletion (NSZD), can be estimated by subtracting measured $CO_2$ fluxes at unimpacted locations from the total measured $CO_2$ fluxes at LNAPL-impacted locations (Sihota and Mayer, 2012). This spatial "background correction" assumes that bio-based $CO_2$ fluxes are similar at both impacted and unimpacted locations. This approach is complicated to implement, given that at many industrial facilities it is difficult to find unimpacted areas and vegetation cover can vary across a site. Alternatively, carbon isotope analysis can be used to carry out a location-specific correction for total measured $CO_2$ fluxes, and this approach effectively overcomes the limitations of the background correction.

**Theory of Carbon Isotope Analysis:**

Our method for NSZD rate estimation relies on the analysis of $^{14}C$, an unstable carbon isotope with an absolute half-life of 5,730 years. $^{14}C$ is generated by cosmic rays in the atmosphere and is quickly oxidized to $^{14}CO_2$; thus, bio-based living carbon is $^{14}C$-rich, while ancient fossil fuel carbon is completely $^{14}C$-depleted. Additionally, bio-based organic carbon and the atmosphere have the same characteristic amount of $^{14}C$. The short half-life of $^{14}C$ only allows for dating of samples younger than 60,000 years using accelerator mass spectrometry (Stuiver and Polach, 1977). $^{14}C$ analysis can therefore be used to differentiate between anthropogenic (i.e., fossil fuel) and natural sources of atmospheric carbon (see Klouda and Connolly, 1995; Levin et al., 1995; Avery et al., 2006), and this analysis is the basis for ASTM D6866-18.

For samples that contain both bio-based and fossil fuel-derived carbon, such as E-Flux's fossil fuel traps, measurement of $^{14}C$ enables quantitation of *both* source contributions. The fossil fuel-derived percentage of the sample ($ff_{sample}$) and the bio-based percentage ($1\text{-}ff_{sample}$, or $bb_{sample}$) are related by the following two-component mass balance (modified from Avery, Jr. et al., 2006):

$$Fm_{sample} = (ff_{sample})(Fm_{ff}) + (1 - ff_{sample})(Fm_{atm})$$

Here, $Fm_x$ represents the fraction modern, a measure of how close the present $^{14}C/^{12}C$ ratio of the sample is to the ratio from 1950, which is derived from a pre-industrial era standard. $Fm_{sample}$ is the total measured fraction modern of the sample. $Fm_{ff}$ is the fraction modern of only the fossil fuel portion of the sample. This number is 0, as there is no $^{14}C$ in fossil fuel-derived $CO_2$. $Fm_{atm}$ is the fraction modern of the part of the sample derived from natural soil respiration processes. This value, currently equal to **1.02** (Cerling et al., 2016, Larsen et al., 2018), has been experimentally determined and is a fixed value at each point in time. By convention, the results of carbon isotope analysis are reported based on a 1950 NBS oxalic acid standard, and so $Fm_{sample}$ is reported as if the analysis took place in 1950. Due to nuclear testing, current $^{14}C$ atmospheric levels are now higher than they were in 1950. This means that $Fm_{atm}$ is counter-intuitively larger than 1, as the $^{14}C/^{12}C$ sample ratio is higher now than it would have been in 1950.



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## $^{14}C$ Calculations:

*Conversion of Fraction Modern Carbon to Fossil Fuel Carbon:*

The equation for calculating the percentage of fossil fuel carbon ($ff_{sample}$) is derived from the following mass balance:

$$Fm_{sample} = (ff_{sample})(Fm_{ff}) + (1 - ff_{sample})(Fm_{atm})$$

Solving for $ff_{sample}$ yields:

$$ff_{sample} = 1 - \frac{Fm_{sample}}{Fm_{atm}}$$

Fraction modern ($Fm_{sample}$, from $^{14}C$ analysis) is reported by convention based on $^{14}C$ levels from 1950. Because of atomic testing, current environmental $^{14}C$ levels are approximately 2% higher than they were in 1950 (Cerling et al., 2016, Larsen et al., 2018) and $Fm_{atm}$ is equal to 1.02. This equation then becomes:

$$ff_{sample} = 1 - \frac{Fm_{sample}}{1.02}$$

As percentages must add to 1, the percentage of bio-based carbon ($bb_{sample.}$) can then be calculated using the following equivalence:

$$bb_{sample} = 1 - ff_{sample} = 1 - \left(1 - \frac{Fm_{sample}}{1.02}\right) = \frac{Fm_{sample}}{1.02}$$

*Converting Carbon Flux to Equivalent LNAPL Loss Rate:*

The intermediate reactions for LNAPL mineralization include methanogenesis, leading to production of methane and $CO_2$, and the subsequent aerobic oxidation of methane into $CO_2$:

$$C_8H_{18} + 3.5\ H_2O \rightarrow 6.25\ CH_4 + 1.75\ CO_2 \text{ (methanogenesis)}$$

$$6.25\ CH_4 + 12.5\ O_2 \rightarrow 6.25\ CO_2 + 12.5\ H_2O \text{ (methane oxidation)}$$

$$C_8H_{18} + 12.5\ O_2 \rightarrow 9H_2O + 8\ CO_2 \text{ (overall reaction)}$$

Assuming a conservative LNAPL density of 0.77 g $mL^{-1}$ (upper range of gasoline) and using the molecular weight of $C_8H_{18}$ (octane, 114.23 g $mol^{-1}$), µmol $m^{-2}$ $s^{-1}$ of $CO_2$ can then be converted into gal. $acre^{-1}$ $yr^{-1}$ of LNAPL:

$$1\ \frac{\mu\text{mol CO}_2}{\text{m}^2\ \text{s}} \cdot \left(\frac{1\ \mu\text{mol C}_8\text{H}_{18}}{8\ \mu\text{mol CO}_2}\right)\left(\frac{1\ \text{mol C}_8\text{H}_{18}}{1\times10^6\ \mu\text{mol C}_8\text{H}_{18}}\right)\left(\frac{114\ \text{g C}_8\text{H}_{18}}{1\ \text{mol C}_8\text{H}_{18}}\right)\left(\frac{1\ \text{mL C}_8\text{H}_{18}}{0.77\ \text{g C}_8\text{H}_{18}}\right)$$
$$\left(\frac{1\ \text{L}}{1000\text{mL}}\right)\left(\frac{1\ \text{gal.}}{3.785\ \text{L}}\right)\left(\frac{4{,}046\ \text{m}^2}{1\ \text{acre}}\right)\left(\frac{3600\ \text{s}}{1\ \text{h}}\right)\left(\frac{24\ \text{h}}{1\ \text{d}}\right)\left(\frac{365\ \text{d}}{1\ \text{yr}}\right).$$
$$= 625.2\ \frac{\text{gal. C}_8\text{H}_{18}}{\text{acre} \cdot \text{yr}}$$

Note that both the LNAPL formula and its density are assumed, and so this conversion is subject to uncertainty. However, site-specific data can be used if available. Using alternative representative hydrocarbon formulas and densities generally results in conversion factors that are within 10-15% of 625.2 gal. $acre^{-1}$ $yr^{-1-}$. Therefore, the uncertainty associated with these values does not preclude an acceptable estimate.

**Expected Results and Recommendations:**

$^{14}C$-based techniques offer a built-in, location-specific correction as an alternative to the standard background location correction. Early work on a limited number of samples suggested that $^{14}C$-corrected results are equivalent to background-corrected results (Sihota and Mayer, 2012; McCoy et al., 2015). However, a more recent comparison spanning 4 different sites suggests that measured carbon fluxes can differ by up to five times among different locations within the same site (Zimbron and Kasyon, 2015). Depending on the location, the resulting difference between background-corrected and $^{14}C$-corrected NSZD rate estimates can be up to one order of magnitude. In contrast, the background correction assumes that the non-fossil fuel $CO_2$ flux is constant across an entire site; large errors in final estimated NSZD rates might therefore be introduced if the background correction is used. Because the $^{14}C$ measurement is co-located with the $CO_2$ flux measurement, it is unbiased by spatial uncertainties related to the background location(s) (e.g., vegetation, lithology, unknown impacts, different gas transport regimes, soil moisture).

The fossil fuel $CO_2$ content of unexposed sorbent as used in the traps is typically around 30% (as of today) and likely results from material processing and handling (e.g., exposure to fossil fuel fumes). This small mass of fossil fuel $CO_2$ is removed from samples by carrying out a $^{14}C$ travel blank correction. $^{14}C$ analysis is performed on $CO_2$ sorbent sub-samples after homogenization of the entire bottom sorbent layer (see McCoy et al., 2015). The mass of fossil fuel $CO_2$ in the unexposed travel blank trap (TB) is then subtracted from the mass of fossil fuel $CO_2$ in each field-deployed trap.

The results in this report are based on proprietary technology used to measure soil gas efflux. All information contained herein is strictly confidential to the customer.

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**Project:** Tacoma, WA, USA
**Customer:** Geosyntec Consultants, Inc.
**Customer Contact:** Trevor Carlson and Michelle Myers
**Report Date:** 30-Jun-2021

| Sample ID | Sampling Information | | | Raw Results[a] | | | | Final $CO_2$ Results[b] | | | $^{14}C$ Results[a] | | | NSZD Results[b] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Deployed | Retrieved | Days in Field | Moisture content (%) | Dry Sorbent Mass (g) | Avg. % $CO_2$[c] | CV[d] $CO_2$ (%) | $CO_2$ content (%) | $CO_2$ mass (g) | $CO_2$ Flux ($\mu$mol $m^{-2}$ $s^{-1}$) | $Fm_{sample}$ As Reported[e] | $bb_{sample}$ As of Today[f] | $ff_{sample}$ As of Today[f] | Bio-based $CO_2$ Flux ($\mu$mol $m^{-2}$ $s^{-1}$) | $ff_{sample}$ As of Today (TB-corrected) | Fossil Fuel $CO_2$ (g) | Fossil Fuel $CO_2$ Flux ($\mu$mol $m^{-2}$ $s^{-1}$) | Equivalent NSZD Rate (gal. $acre^{-1}$ $yr^{-1}$) |
| 10204-R2-CO2-TB | N/A | N/A | N/A | 19.7% | 40.76 | 1.16% | 1.71% | - | - | - | 61.86 | 60.65% | 39.35% | - | - | - | - | - |
| 10204-R2-CO2-01 | 5/18/21 14:45 | 6/1/21 8:28 | 13.7 | 23.8% | 41.67 | 1.45% | 4.34% | 0.28% | 0.12 | 0.28 | 59.05 | 57.89% | 42.11% | 0.13 | 53.37% | 0.06 | 0.15 | 93 |
| 10204-R2-CO2-02 | 5/18/21 13:09 | 6/1/21 8:35 | 13.8 | 27.7% | 40.84 | 1.46% | 1.74% | 0.29% | 0.12 | 0.28 | 64.28 | 63.02% | 36.98% | 0.20 | 27.61% | 0.03 | 0.08 | 49 |
| 10204-R2-CO2-03 | 5/18/21 14:35 | 6/1/21 9:05 | 13.8 | 21.2% | 46.01 | 18.06% | 0.08% | 16.89% | 7.77 | 18.32 | 23.71 | 23.25% | 76.75% | 3.79 | 79.33% | 6.17 | 14.53 | 9083 |
| 10204-R2-CO2-04 | 5/18/21 14:25 | 6/1/21 9:17 | 13.8 | 21.4% | 42.37 | 6.33% | 0.43% | 5.17% | 2.19 | 5.16 | 92.27 | 90.46% | 9.54% | 5.01 | 2.84% | 0.06 | 0.15 | 92 |
| 10204-R2-CO2-05 | 5/18/21 13:53 | 6/1/21 8:42 | 13.8 | 17.3% | 49.65 | 27.42% | 0.14% | 26.26% | 13.04 | 30.69 | 34.96 | 34.27% | 65.73% | 10.16 | 66.89% | 8.72 | 20.53 | 12834 |
| 10204-R2-CO2-06 | 5/18/21 13:29 | 6/1/21 8:59 | 13.8 | 23.3% | 41.36 | 1.70% | 0.80% | 0.54% | 0.22 | 0.53 | 47.38 | 46.45% | 53.55% | 0.08 | 83.92% | 0.19 | 0.44 | 277 |
| 10204-R2-CO2-07 | 5/18/21 13:43 | 6/1/21 8:50 | 13.8 | 26.7% | 41.66 | 1.97% | 0.88% | 0.81% | 0.34 | 0.79 | 36.11 | 35.40% | 64.60% | ND | 100.78% | 0.34 | 0.80 | 500 |
| 10204-R2-CO2-08 | 5/18/21 14:18 | 6/1/21 9:10 | 13.8 | 24.2% | 42.69 | 6.02% | 1.22% | 4.86% | 2.08 | 4.88 | 71.60 | 70.20% | 29.80% | 3.54 | 27.52% | 0.57 | 1.34 | 841 |

- The flux equivalence is **1** µmol $m^{-2}$ $s^{-1}$ = **625.2** gallons $acre^{-1}$ $yr^{-1}$, assuming a representative hydrocarbon density of **0.77** g $mL^{-1}$ with the formula $\mathbf{C_8H_{18}}$.Trap cross-sectional area is $\mathbf{8.11 \times 10^{-3}}$ $m^2$ (based on a **4-inch** receiver pipe).
- Carbonate analysis of each trap/sample is based on method ASTM 4373-14, which does do not provide acceptable variability (CV) standards. Similar methods (e.g., ASTM D513-16) allow typical errors of ≤ 20%. Analysis is therefore conducted in duplicate if the coefficient of variation (CV) of the duplicates is < 5%. If CV ≥ 5%, duplicate analyses are repeated until CV < 5%.

  NA = Not Applicable; ND = Not Detectable. Based on the project capture area, sorbent mass and deployment time, and the variability of the total carbon and fossil fuel carbon analysis, the limit of detection for the NSZD rate is **49** gallons $acre^{-1}$ $yr^{-1}$.

**a.** Raw and $^{14}C$ Results are not TB-corrected.
**b.** Final $CO_2$ and NSZD Results are TB-corrected.
**c.** Refers to the measured weight percentage of $CO_2$ with respect to the total dry sorbent mass.
**d.** Refers to the coefficient of variation of $CO_2$ measurements for each sample: CV = [standard deviation of %$CO_2$ measurements] / [average %$CO_2$ measurement]
**e.** Refers to the reported fraction modern ($Fm_{sample}$). As is standard in radiocarbon reporting, this value has not been corrected to account for present-day $^{14}C$ atmospheric levels. This number is originally reported as pMC (percent modern carbon) and is converted into *Fm* for our calculations using the relation 100.0 pMC = 1.0 *Fm* = 100% *Fm*.
**f.** "As of Today" means that the value has been adjusted to account for the difference between atmospheric $^{14}C$ levels from the 1950s and today (Stenström et al., 2011). $bb_{sample}$ is the percentage of the total $CO_2$ that is derived from bio-based (non-fossil fuel) sources. $ff_{sample}$ refers to the percentage of $CO_2$ that is derived from fossil fuels. The values reported in the $^{14}C$ Results section are not TB-corrected, but those in the NSZD Results section are.



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**Results Snapshot:**

- The Travel Blank (TB) concentration is **1.16%**; typically, this number is < 2%.
- Trap tops are not saturated with $CO_2$ (sorbent saturation is 30%). The maximum measured (raw) top concentration is ***2.65%*** (sample **10204-R2-CO2-07 top**).
- Trap **10204-R2-CO2-07** had a non-detectable amount of modern carbon. The entire mass of sorbed $CO_2$ should be considered of fossil fuel carbon origin.
- Bio-based carbon fluxes represent the $CO_2$ contributions from natural soil respiration processes to the total carbon flux; the $^{14}C$ analysis corrects for this contribution. Average bio-based $CO_2$ flux is **2.86** µmol $m^{-2}$ $s^{-1}$, and the coefficient of variation is **125%**. The range of bio-based $CO_2$ fluxes is between **0** and **10.16** µmol $m^{-2}$ $s^{-1}$. If these interferences were not removed using the results of the radiocarbon analysis, the errors in the NSZD rate estimates would be between **0**- and **6352**-gallons $acre^{-1}$ $yr^{-1}$.

**Site-specific Sample Calculations:**

*Grams of Fossil Fuel $CO_2$:*

The mass of fossil fuel-derived $CO_2$ in each trap is calculated by subtracting the total fossil fuel $CO_2$ in the travel blank (TB) from the total fossil fuel $CO_2$ in the trap. Only data that are ***not*** TB-corrected (i.e., $ff_{sample}$ As of Today and raw % $CO_2$) are used in this calculation. Using sample **10204-R2-CO2-01** as an example:

$$\left(\mathrm{g\ CO_{2(ff)}}\right)_{sample\ 1} = \mathrm{g_{sorbent}} \cdot \left[\left((\%\ \mathrm{CO_2})_{\mathrm{sample}}\left(ff_{sample}\right)\right) - \left((\%\ \mathrm{CO_2})_{\mathrm{TB}}(ff_{TB})\right)\right]$$

$$\left(\mathrm{g\ CO_{2(ff)}}\right)_{sample\ 1} = \mathbf{41.67}\ \mathrm{g} \cdot \left[(\mathbf{1.45}\ \% \cdot \mathbf{42.11}\ \%) - (\mathbf{1.16}\ \% \cdot \mathbf{39.35}\ \%)\right]$$

$$\left(\mathrm{g\ CO_{2(ff)}}\right)_{sample\ 1} = \mathbf{0.0632}\ \mathrm{g}$$

Here, $g_{sorbent}$ is the mass of sorbent used in the bottom layer of the trap, $(\%CO_2)_{sample}$ is the average weight percentage of $CO_2$ in the sample, $ff_{sample}$ is the percentage of carbon in the sample derived from fossil fuels, $(\%CO_2)_{TB}$ is the average weight percentage of $CO_2$ in the travel blank, and $ff_{TB}$ is the percentage of carbon in the travel blank that is derived from fossil fuels. In this example, sample **10204-R2-CO2-01** contains **0.0632 g** of fossil-fuel derived $CO_2$.

*Fossil Fuel $CO_2$ Flux:*

Converting grams of $CO_2$ to $CO_2$ flux requires the cross-sectional area of the receiver (**8.11 × 10$^{-3}$** $m^2$ for a **4**-inch receiver), the number of days that the trap was deployed in the field, and the molecular weight of $CO_2$ (44 g $mol^{-1}$). Using trap **10204-R2-CO2-01** as an example:

$$\text{Fossil Fuel CO}_2\text{ Flux} = \frac{\mathrm{g\ fossil\ fuel\ CO_2} \cdot \frac{1\ \mathrm{mol\ CO_2}}{44\ \mathrm{g\ CO_2}} \cdot \frac{1{,}000{,}000\ \mu\mathrm{mol\ CO_2}}{1\ \mathrm{mol\ CO_2}}}{\text{days in the field} \cdot \frac{24\ \mathrm{hr}}{\mathrm{day}} \cdot \frac{3600\ \mathrm{s}}{\mathrm{hr}} \cdot (\text{receiver area})}$$

$$\text{Fossil Fuel CO}_2\text{ Flux} = \frac{\mathbf{0.0632}\ \mathrm{g\ fossil\ fuel\ CO_2} \cdot \frac{1\ \mathrm{mol\ CO_2}}{44\ \mathrm{g\ CO_2}} \cdot \frac{1{,}000{,}000\ \mu\mathrm{mol\ CO_2}}{\mathrm{mol\ CO_2}}}{\mathbf{13.7}\ \mathrm{days} \cdot \frac{24\ \mathrm{hr}}{\mathrm{day}} \cdot \frac{3600\ \mathrm{s}}{\mathrm{hr}} \cdot (\mathbf{8.11} \times \mathbf{10^{-3}}\ \mathrm{m^2})}$$

$$\text{Fossil Fuel CO}_2\text{ Flux} = \mathbf{0.15}\ \frac{\mu\mathrm{mol\ CO_2}}{\mathrm{m^2 \cdot s}}$$

## References


ASTM (2014) Method D4373-14, Rapid Determination of Carbonate Content of Soils.

ASTM (2016) Method D513-16, Total and Dissolved Carbon Dioxide in Water.

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E-FLUX

# ATTACHMENT 3

MicroTox Laboratory Analytical Report

# *EMSL Analytical, Inc.*

*200 Route 130 North, Cinnaminson, NJ 08077. 856.858.4800*

**Attn.** Michelle Myers
**Client:** Geosyntec Consultants Inc
520 Pike Street
Suite 2600
Seattle, WA 98101
**Phone:** (916) 899-7944
**Project:** Microtox Microbial Toxicology Assay for Groundwater

**EMSL Order:** **372110361**
**Received:** **07/03/21**
**Analysis Date:** **07/06/21**
**Report Date:** **08/05/21**

## M699 Special project
## Microtox Testing

| Lab Sample Number | Client Sample ID | Location | 5 minutes incubation | | | 15 minutes incubation | | |
|---|---|---|---|---|---|---|---|---|
| | | | EC50 (%) | 95% Confidence Range (%) | Coefficient of Determination ($R^2$) | EC50 (%) | 95% Confidence Range (%) | Coefficient of Determination ($R^2$) |
| 372110361-1 | 1 | CDM-19 | **33.93** | 17.07-67.48 | 0.9940 | **36.95** | 14.70-92.91 | 0.9907 |
| 372110361-2 | 2 | CDM-22 | **22.56** | 17.38-29.29 | 0.9898 | **22.53** | 18.18-27.93 | 0.9931 |
| 372110361-4 | 4 | B-19 | **30.46** | 23.57-39.36 | 0.9931 | **32.51** | 25.67-41.18 | 0.9946 |
| 372110361-5 | 5 | B-25 | **29.90** | 25.53-35.00 | 0.9973 | **32.99** | 27.53-39.52 | 0.9969 |
| 372110361-6 | 6 | AGI-07 | **3.512** | 1.343-9.185 | 0.9246 | **2.804** | 0.9899-7.941 | 0.9337 |
| 372110361-8 | 8 | SP-06 | **12.38** | 10.24-14.97 | 0.9941 | **12.33** | 9.923-15.32 | 0.9924 |
| 372110361-9 | 9 | B-30 | **21.45** | 16.17-28.45 | 0.9875 | **21.92** | 14.28-33.65 | 0.9719 |
| 372110361-10 | 10 | CDM-16 | **23.99** | 20.69-27.82 | 0.9969 | **23.82** | 20.63-27.50 | 0.9971 |

| | | | 5 minutes incubation | | 15 minutes incubation | |
|---|---|---|---|---|---|---|
| | | | Concentration % | % Effect | Concentratio n % | % Effect |
| 372110361-3* | 3 | CDM-21 | 81.90 | 27.86 | 81.90 | 22.43 |
| 372110361-7* | 7 | AGI-45 | 81.90 | 11.55 | 81.90 | 10.26 |

**Definition: EC50 (Half maximal effective concentration) for this project refers to the % concentration of a sample required to obtain a 50% decrease in luminescence by the bacteria vibrio fischeri after a specified exposure time.**

**Note: * The EC50 values were not found for these samples because of relative low toxicity. The 81.90% screening tests were therefore performed. The results are the % inhibition (effect) at the 81.90% of the water sample concerntration.**

**Initialy reported:** **7/12/2021** **Revised:** **8/5/2021** **Reason:** **Added definition of EC50**



Bin Wang
**Aquatic Sciences Laboratory Manager**
or Approved EMSL Signatory