



**United States Department of Energy**

**Savannah River Site**

**Effectiveness Monitoring Report for the  
Monitored Natural Attenuation (MNA) at  
the Chemicals, Metals, and Pesticides (CMP) Pits  
Operable Unit (OU) (U)**

**April 2024 through March 2025**

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## LIST OF ACRONYMS AND ABBREVIATIONS

1,1,2-TCA	1,1,2-trichloroethane
1,1-DCE	1,1-dichloroethylene
bgs	below ground surface
amsl	above mean sea level
c-1,2-DCE	cis-1,2-dichloroethylene
CCl <sub>4</sub>	carbon tetrachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMCOC	contaminant migration constituent of concern
CMP	chemicals, metals, and pesticides
COC	constituent of concern
CSM	conceptual site model
CY	calendar year
DCM	dichloromethane (methylene chloride)
DEHP	bis-(2-ethylhexyl) phthalate
DNAPL	dense non-aqueous phase liquid
EMP	Effectiveness Monitoring Plan
EMR	Effectiveness Monitoring Report
ERH	electrical resistance heating
ft	feet
GA	Gordon aquifer
GCCZ	Green Clay Confining Zone
gpm	gallons per minute
GWPS	groundwater protection standard
HDPE	high-density polyethylene
LAZ	lower aquifer zone
m	meters
µg/L	microgram per liter
µg/kg	microgram per kilogram
MAZ	middle aquifer zone
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MNA	monitored natural attenuation
OU	operable unit
PCE	tetrachloroethylene
PDB	passive diffusion bag
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RG	remedial goal
ROD	Record of Decision
RSL	Regional Screening Level

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**LIST OF ACRONYMS AND ABBREVIATIONS** (*continued, end*)

SCDES	South Carolina Department of Environmental Services <sup>1</sup>
SCSU	South Carolina State University
SRNL	Savannah River National Lab
SRNS	Savannah River Nuclear Solutions LLC
SRS	Savannah River Site
SVE	soil vapor extraction
TCCZ	Tan Clay Confining Zone
TCLC	Tan Clay Lower Clay
TCE	trichloroethylene
t-1,2-DCE	trans-1,2-dichloroethylene
TZ	transmissive zone
USEPA	U.S. Environmental Protection Agency
UTRA	Upper Three Runs aquifer
VC	vinyl chloride
VOC	volatile organic compound
VU	verified and unvalidated
WSRC	Westinghouse Savannah River Company LLC (before October 2005)
WSRC	Washington Savannah River Company LLC (October 2005- July 2008)

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<sup>1</sup> South Carolina Department of Environmental Services (SCDES) was known as South Carolina Department of Health and Environmental Control (SCDHEC) prior to July 1, 2024.

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## 1.0 INTRODUCTION

This Effectiveness Monitoring Report (EMR) addresses the Monitored Natural Attenuation (MNA) groundwater remedy at the Chemicals, Metals, and Pesticides (CMP) Pits Operable Unit (OU) for the period from April 2024 through March 2025. The monitoring requirements for the CMP Pits OU are identified in the Effectiveness Monitoring Plan (EMP) (WSRC 2006b).

### 1.1 Operable Unit Background

The CMP Pits OU is located in the central portion of the Savannah River Site (SRS) approximately one mile north of L Area (Figure 1). The CMP Pits were identified as a Resource Conservation and Recovery Act/Comprehensive Environmental Response, Compensation and Liability Act (RCRA/CERCLA) unit in the Savannah River Site Federal Facility Agreement in 1989. The subunits of the CMP Pits OU were evaluated in the *RCRA Facility Investigation/Remedial Investigation Addendum with Baseline Risk Assessment for the CMP Pits (U)* (WSRC 2003). The CMP Pits OU is comprised of the following subunits: Ballast Area soils; CMP Pits and associated vadose zone (Field A); vadose zone (Field B); groundwater; and surface water (e.g., Pen Branch) and sediment (Figure 2).

The CMP Pits consist of seven former, unlined pits placed in two rows that were designed to receive non-radioactive wastes (chemicals, metals, and pesticides) and operated from August 1971 until February 1979. Once the pits stopped receiving waste, all the open pits were covered with clay and graded. Contaminated soil and debris at the CMP Pits posed a contaminant migration and human health risk and were partially excavated in 1984. A second phase of excavation was performed at Pit 080-183G to remove a portion of significantly contaminated soil that also contained dense non-aqueous phase liquid (DNAPL) (Figure 2). As a maintenance action, the excavation was followed by backfilling of the pit area with clean soil and then capped across the whole pits area with a black plastic high-density polyethylene (HDPE) cover and overlying soil cover. Because the CMP Pits were not yet identified as a RCRA/CERCLA unit, the installation of the HDPE cover was not part of an interim or final remedial action and therefore was not designed to meet current infiltration/permeability specifications for RCRA/CERCLA closure at the CMP Pits. Although the highest levels of contaminated soil were removed, some contaminated soils were left in place. The previous waste in the pits and associated contaminated soils located

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in the CMP Pits vadose zone (Field A) were determined to be the source of groundwater contamination.

Electrical Resistance Heating (ERH) with Soil Vapor Extraction (SVE) was selected as the final remedial action (RA) for the CMP Pits vadose zone in and around Field A (Figure 2). This remedy targeted the deeper contaminated soil at Pit 080-183G that was underneath the previous soil excavations. This remedy also addressed the remaining DNAPL that was present in the clay horizons beneath the pits. The contaminant migration constituents of concern (CMCOCs) that were identified in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) Addendum (WSRC 2003) are tetrachloroethylene (PCE) and dichloromethane (DCM) or methylene chloride.

Groundwater contamination has occurred as a result of contaminants leaching from the source area soils. Following remediation of the CMP Pits vadose zone (Field A) source area, MNA was selected as the RA for the contaminated groundwater.

Additionally, surface soil contamination in the Ballast Area and vadose zone contamination in Field B have been successfully remediated via interim RAs. There is no problem warranting action and no RA objective for the surface water and sediment; however, surface water sampling is included as part of the MNA sampling.

## **1.2 Nature and Extent of Contamination**

PCE and DCM were identified as CMCOCs and as principal threat source material for mobility (i.e., transport from the source zone to the aquifer in less than 10 years) in the vadose zone beneath the CMP Pits. The volatile organic compound (VOC) contamination was highest in the northwest pit (Pit 080-183G) at depths between 20 and 60 feet (ft) (6.10 and 18.29 meters [m]) below ground surface (bgs). PCE was the most abundant contaminant at CMP Pits. No constituents of concern (COCs) were identified in the surface soils (0-1 ft [0-0.3 m] bgs) in the CMP Pits subunit.

In accordance with the Record of Decision (ROD) (WSRC 2004), an ERH/SVE remedy was selected to remove the DNAPL from the vadose zone. Based on the limited lateral and vertical extent of PCE contamination in the vadose zone and the intent of the selected remedy defined in the ROD, the ERH treatment area included the extent of PCE contamination above the DNAPL

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threshold concentrations (60 milligram per kilogram [mg/kg]) and comprised an area of approximately 0.05 acres (0.02 hectares) in Field A (Figure 2). Further details of the DNAPL remediation are available in the 2009 EMR (SRNS 2009).

The following VOCs and pesticides were identified as human health COCs in the groundwater for the future industrial worker and/or resident: alpha-benzene hexachloride, beta-benzene hexachloride, delta-benzene hexachloride, dieldrin, lindane, bis-(2-ethylhexyl) phthalate (DEHP), bromodichloromethane, carbon tetrachloride, chloroform, DCM, PCE, and trichloroethylene (TCE). Following the EMP for the CMP Pits, both groundwater and surface water have been sampled and analyzed for Target Compound List VOCs and/or lindane (WSRC 2006b). DEHP is a common laboratory artifact and is not believed to be present in the groundwater subunit. As of 2010, the constituent DEHP is no longer required to be sampled and/or reported. In 2013, emerging contaminant 1,4-dioxane was added to the list of monitored constituents on an annual sampling basis due to its presence in groundwater.

Early groundwater data indicated two VOC groundwater plumes exist at the CMP Pits, designated as the main plume (near the CMP Pits source area) and the northeast distal plume (near Pen Branch). These plumes are moving northward toward Pen Branch. Groundwater modeling indicated that the CMP Pits were the source for the main plume. Particle tracking toward and from the northeast plume suggested that its source was different from that of the main plume (WSRC 2002). A drainage ditch located approximately 361 ft (110 m) north of CMP Pits is a possible previous source area (Figure 2). It is possible that this ditch was used as a dumping location prior to the use of the actual CMP Pits. Additional characterization for the source of the distal plume using soil gas surveys was presented in the RFI/RI Addendum (WSRC 2003). Results indicated that if a source was previously present in the vadose zone, it has been depleted. It is also plausible, due to the dry zone areas within the transmissive zone (TZ) and to some degree the middle aquifer zone (MAZ), that one plume separated into two distinct plumes due to the groundwater flow paths and discharge to Pen Branch. Upwelling of the MAZ as it discharges to the wetland area and stream most likely brings some contamination up into the TZ. A combination of these three explanations is probable.

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As discussed below, the vertical extent of the VOC plume is mostly within the Upper Three Runs aquifer (UTRA) and includes three distinct horizons: the TZ, the MAZ, and the lower aquifer zone (LAZ). The lateral extent of the 2008 VOC plume throughout the UTRA was estimated at 46 acres (18.6 hectares), extending from the pit area to Pen Branch. In 2019, a new Gordon aquifer (GA) well, CMP010A, was installed directly southeast of the CMP Pits. Initial samples indicated that the GA may be contaminated with VOCs above maximum contaminant levels (MCLs) at CMP010A. These 2019 results were the first occurrence of GA contamination above MCLs at the CMP Pits; however, it was suspected this contamination is not representative of groundwater conditions in the GA and further investigations in March 2023 confirmed well CMP010A was compromised. Well CMP010A was abandoned and replaced with well CMP010AR in July 2024.

The contaminant plumes at the CMP Pits are mature as there has been approximately 50 years for contamination to move through the aquifers, resulting in contaminants likely partitioning onto clay particles and/or diffusing into less permeable layers, not only near the original source area at the CMP Pits, but also throughout the aquifer system, acting as secondary sources of contamination to groundwater. In addition, the significant time over which contaminant transport has occurred likely resulted in maximum lateral plume extent terminating at Pen Branch, a hydraulic barrier for the shallowest aquifers. Figure 3 shows the CMP Pits Groundwater OU Conceptual Site Model (CSM) and potential sources of contamination.

### **1.3 Observed Hydrostratigraphy at the CMP Pits OU**

In the vicinity of the CMP Pits OU, the aquifers of interest include the UTRA and the underlying GA. Horizontal flow within the UTRA is divided into three discrete horizons that are separated by two semi-continuous confining zones, which can be comprised of sandy clays in areas and are therefore potentially discontinuous and leaky (Figure 3). The horizons are: 1) the TZ – a thin aquifer feature that lies above the top portion of the tan clay, the tan clay confining zone (TCCZ), 2) the MAZ – a thin aquifer horizon between the TCCZ and the lower portion of the tan clay, the tan clay lower clay (TCLC), and 3) the LAZ - the most substantial portion of the UTRA in the area, which extends to the green clay confining zone (GCCZ) with a thickness up to 100 ft (30.48 m). The GCCZ separates the UTRA from the GA and is comprised of single or multiple layers of dark greenish grey to black clay to sandy clay. Fine- to medium-grained sands to silty/clayey sands

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exist in-between the GCCZ clay layers. The confining zones are hummocky, vary in thickness, and can be almost non-existent or leaky in areas. In general, the TCCZ is thinner in the UTRA than the TCLC.

Above the UTRA, the vadose zone is comprised of a portion of the transmissive zone and overlying sediments of the A- and AA-Horizons. Those sediments overlying the TZ are typically in the unsaturated zone and during rain events may contain areas of perched water for a limited time. These geologic layers are characterized by a higher abundance of clays and silts compared to the underlying transmissive zone.

Using the data collected from cone penetrometer lithology pushes done for the 2002 modeling effort and from well installation records, the confining zone surfaces of the TCCZ and TCLC were spatially mapped (Figure 4) and compared to the most current second quarter 2024 (2Q2024) water elevation surfaces. Areas where the TZ and MAZ are suspected to be dry were delineated and are shown on Figure 4, as well as on all TZ and MAZ figures, and can be seen in the cross sections (See Section 2.2.2). The top of the TCCZ forms a semi-circular ridge at and north of the CMP Pits (shown as white and light pink shaded elevations in Figure 4), which causes much of the TZ to be dry. This shape is mimicked in the top of the TCLC, but the subsequent dry zone is not as extensive. The dry zones at CMP Pits are not a recent occurrence. Review of water elevation data from the 1980's and 1990's from abandoned wells suggests similar dry zones have existed for decades.

Figure 5 shows the locations of the 87 monitoring wells and eight (8) surface water stations associated with the CMP Pits OU. The map also shows corresponding cross-section lines which depict the local hydrostratigraphic lithology and major contaminant plumes at the CMP Pits OU. The stratigraphy, aquifers, and plumes are all, in general, gently sloping towards Pen Branch. However, the confining units appear to slope towards the south in some areas at the main CMP Pits area (Figure 4 and cross-sections B-B' [See Section 2.2.2]). Although the TCCZ and the TCLC are depicted as continuous units in the cross-sections, the aquifer behavior in this area shows various elevation heads and contaminant pathways that indicate the confining horizons are discontinuous and/or intermixed with sandy clays in many areas. This is further supported by core descriptions of the units. The TZ, TCCZ, MAZ, TCLC, and LAZ units are eventually incised by

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Pen Branch itself and/or the local topography. In the CMP Pits OU area of interest (extent of the maps), the TZ is incised by Pen Branch on the east side of the stream reach, the MAZ is incised in the central portion of the stream reach, and the LAZ is partially incised by Pen Branch at the western portion of the stream. The horizontal extent of the TZ and MAZ are depicted on all TZ and MAZ maps.

#### **1.4 Observed Hydrology at the CMP Pits OU**

Regional groundwater flow for the UTRA and GA was determined from using data from other nearby wells. This was done to provide an overview of regional flow beyond the CMP Pits. Regional flow in the UTRA, as depicted in Figure 6, is to the northwest towards Pen Branch from CMP Pits. Regional groundwater flow for the GA is to the south/southwest (Figure 6). The latest compiled potentiometric surfaces specific to the CMP Pits from the calendar year (CY) 2Q2024 are displayed for each of the aquifer zones in Figure 7 and Figure 8. These potentiometric surfaces do not show any unusual pattern of flow from previous measurements.

Monthly rainfall levels from the closest monitoring station in nearby L Area for 2021 – March 2025 and the 20-year average are shown on Figure 9. Rainfall during 2024 (total of 58.43 inches) measured 8.77 inches less than the 2023 measurements but was also above the 20-year average (49.42 inches). The months of March, July, August, September, and November experienced the highest rainfall totals in the year. October was the driest month. In 2025, January and February rainfall was below average and March was above average. In general, monitoring wells showed slightly higher water elevations in 2024 than 2023, and higher 2Q2024 measurements as compared to measurements in 4Q2024 despite the high rainfall measurements in the second half of 2024. 4Q2024 was a period of periodic high rainfall events, such as which is seen with hurricanes and heavy rain storms which increase stormwater runoff and limit groundwater infiltration. Hydrographs of each well are presented in Appendix A.

A small region of radial flow appears to be superimposed upon the northwestward flow beneath the knoll on which the CMP Pits are located and is depicted by the groundwater flow direction arrows in Figure 7. This pattern is due to the locally high topography at CMP Pits (Figure 2) as well as the bowl-like structure of the Tan Clay, especially in the upper TCCZ (Figure 4). Based

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on water elevations in the MAZ not being fully saturated, it appears the TZ may consist of perched water tables in many locations. The bowl-like structure of the tan clay, as depicted in Figure 4, further supports this conclusion as the lower elevation of the TCCZ in the eastern portion of the CMP Pits may locally funnel groundwater to the south and southeast following the slope of the TCCZ before eventually flowing to the north and northwest. Water may mound up in the bowl-like structure as water is pushed towards the northwest from the overall regional groundwater flow. As water flows downslope, as shown in Figure 7 in the TZ at the wells located directly around CMP Pits (CMP 34D, CMP 13D, CMP 35D, CMP 10D, and CMP 11D), a radial groundwater flow path may occur with an additional south or southwest gradient. Some years display a more pronounced southerly flow gradient than others. With higher than average rainfall totals in 2024, flow patterns have not changed significantly from 2023.

The flow pattern in the MAZ generally resembles that of the TZ. Flow directions in the LAZ and GA are less defined due to the horizontal gradients being less across the area, as discussed below. In the area around the CMP Pits and towards the west and north, the water elevations in the LAZ are generally very similar and vary by up to 2 ft (Figure 8). Measurements show that groundwater in the vicinity of Pen Branch flows south towards Pen Branch on the northern side of the stream, further supporting that contaminants originating from CMP Pits are not flowing underneath Pen Branch towards the north. Figure 6 depicts the regional potentiometric surface of the UTRA illustrating the groundwater flow from both sides of Pen Branch. Water elevations in the LAZ on the north side of Pen Branch are higher than elevations on the south side of Pen Branch.

Estimated horizontal groundwater linear velocities have been calculated for the following groundwater flow paths:

- Figure 7 - TZ aquifer flow paths A – A', B – B', and C – C';
- Figure 7 - MAZ flow paths A – A' and B – B';
- Figure 8 – LAZ flow paths A – A', B – B', C – C' and D-D'; and
- Figure 8 – GA flow path A – A', B – B'.

Estimated horizontal groundwater linear velocities were calculated for each of the above flow paths using the following equation:

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$$\text{Linear Velocity} \left( \frac{\text{ft}}{\text{day}} \right) = \frac{\text{Hydraulic Conductivity} \left( \frac{\text{ft}}{\text{day}} \right)}{\text{Porosity (unitless)}} \times \frac{dh \text{ (ft)}}{dl \text{ (ft)}}$$

The hydraulic conductivity constants (8, 50, and 30 ft/day for the TZ, MAZ, and LAZ, respectively) and porosity values (all 30%) used in the calculations are taken from the final calibrated 2017 modeling effort (SRNS 2017). For the GA, the hydraulic conductivity constant of 35 ft/day and porosity value of 25% is used based on investigations in other nearby groundwater/waste sites at SRS (WSRC 1999a). The value  $dh$  is the difference in head;  $dl$  is the length of the groundwater flow paths shown on Figures 7 and 8. The ratio  $dh/dl$  is the horizontal gradient. The gradient, linear velocity per day, and average linear velocity per year were each determined and are provided in Table 2 and described below.

Estimated velocities vary within the TZ between 0.25 ft/day on the western side of the CMP Pits and 0.4 ft/day on the eastern side. This variation could be caused by a combination of factors including the large dry zone area and the radial groundwater flow paths at the CMP Pits knoll, as discussed above. The average for the TZ is 0.35 ft/day, or 126.07 ft/year. The MAZ is more uniform in its rates and averages at 1.7 ft/day, or 621.17 ft/year. The LAZ's rate is much less than the MAZ near the CMP Pits with a rate of 0.21 ft/day, or 76.63 ft/year (LAZ A – A' Flow Path). Flow is greater near Pen Branch, especially on the north side of Pen Branch with a flow velocity of 1.61 ft/day, or 586.59 ft/year (LAZ C – C' Flow Path). The GA potentiometric surface is extremely flat compared to the UTRA aquifer as the water elevations only vary slightly in elevation across the whole CMP Pits monitored area. Horizontal flow velocity for the GA was calculated to be an average of 0.17 ft/day, or 60.54 ft/year. Flow direction is towards the south/southwest and is consistent with the regional GA flow as shown in Figure 6.

There is a significant downward component to groundwater flow throughout the UTRA. Water level measurements collected from well clusters during 2024 show an average head drop of 11.27 ft (3.44 m) across the TCCZ and an average of 14.26 ft (4.35 m) across the TCLC. There is an average of a 14.15 ft (4.31 m) drop in head across the GCCZ from the LAZ to the GA. The newly installed shallow Pen Branch Wells (CMP-PB-##) screened between ~1 ft and 6.2 ft bgs show slightly lower water elevations across all aquifer water elevations, although many of the other

CMP monitoring wells are located extremely upslope of the stream, and Pen Branch is believed to mainly be a gaining stream as it rarely has no flow.

Other wells, CMP 8 and CMP 8B, located near and upgradient of the wetland area display a much lower than average downward gradient of approximately 4.9 ft (1.2 m) across the TCLC. This is to be expected as vertical gradients in shallow aquifers typically reverse to upward flow near discharge zones. In addition, the TCCZ and TCLC are not considered thick competent confining clays, but rather are hummocky, vary in thickness, and can be almost non-existent or leaky in areas allowing some degree of flow between aquifers. The steep topography south of Pen Branch incises the TCCZ and TCLC, the sediment around the stream has been reworked over time as the stream has meandered, and trees and roots have penetrated the clay layers allowing more interchange between aquifers at lower elevations.

SRS installed a permanent and continual (every 15 minutes) electronic stream flow data logger at the upgradient and the downgradient end of Pen Branch at CMP Pits in August 2024 in existing culverts (Figure 5). Calibration of the stream flow gauge was conducted through October 9, 2024, thus readings after this date are considered accurate. This allows constant real-time monitoring of the flow within Pen Branch and will be useful in trending measurements, identifying changes that may occur, and will provide data for future modeling efforts. Graphs of the stream flow data are provided in Figure 37. The stream flow gauge on the south tributary along C Road (CMP-SW-23) appears to have a baseflow of around 225 gallons per minute (gpm). On the western side of Pen Branch two culverts exist (CMP-SW-24; pipe 1 and pipe 2). Most flow goes through pipe 1, but pipe 2 does contain water most of the time; however, flow in pipe 2 drops too low to measure at times. Baseflow at CMP-SW-24 appears to be around 400 gpm. In 2025, SRS plans to install an additional stream gauge system on the northern arm of Pen Branch along Road C. Additional stream gauge data will be included in future EMRs. Please note that the baseflow values presented here represent a seasonal baseflow and should not be taken as an annual average since one year of data collection has not been completed. Moreover, baseflow can be highly correlated with precipitation especially in shallower aquifers. Therefore, long-term annual average measurements are considered to be more representative of baseflow conditions.

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## 2.0 REMEDIAL ACTIONS

This EMR documents the performance of the MNA remedy for the groundwater. Remedial activities for the vadose zone and Ballast Area Soils subunits were performed under an interim RA in 2001 and 2005, respectively (WSRC 1999b and WSRC 2006a). ERH combined with SVE was implemented from 2007 through 2009 to remove DNAPL from the vadose zone (Figure 2). This interim RA mitigated the source within the vadose zone for the groundwater subunit which allows for the MNA remedy.

### 2.1 CMP Pits Vadose Zone Remedial Action

The ERH/SVE RA performed for the CMP Pits vadose zone was implemented to mitigate the CMCOCs PCE and DCM. Details of system construction are provided in the Post-Construction Report (SRNS 2008). ERH/SVE operation began on March 17, 2008. Heating via ERH continued until November 2008. Two SVE systems provided the VOC removal at the CMP Pits well field. SVE well effluent vapor concentrations and soil temperature data were analyzed to determine when the source/DNAPL had been depleted. Operating data from the ERH system was provided in the EMR submitted in June 2009 (SRNS 2009).

In accordance with the EMP, confirmation samples were collected from three core locations. All sample results were below the remedial goal (i.e., cleanup level) for PCE (30.7 mg/kg) and DCM (0.2 mg/kg) (SRNS 2010), meeting the objective of the RA. All remedial equipment and SVE units have been removed. Even though the RA was successful and confirmation samples were below cleanup levels, there is residual contamination trapped within clay horizons and/or pore space in the vadose zone, in or out of the ERH/SVE zone, that is a secondary source for groundwater contamination, albeit much smaller contaminant concentrations than the original source. Since ERH was used to mobilize VOCs in the vadose zone and out of low permeability layers to facilitate removal by SVE, it is expected that a portion of VOC mass was mobilized outside the capture zones and made available for transport to groundwater. Over time since completion of the ERH/SVE source remedy, residual VOCs in the vadose zone have migrated to groundwater increasing the concentrations locally in the area around the CMP Pits. Analysis of time series plots (Appendix B) supports this as increasing concentration trends are observed in TZ and MAZ wells close to the disposal trenches after completion of the ERH remedial action. This

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is especially noticeable in wells CMP 35D and CMP 47D. The residual vadose zone VOC mass appears to be depleted or the flux of VOCs has stabilized as groundwater concentrations at the pits have stabilized in recent years as seen in the time series plots. Concentration trends for each aquifer are discussed in more detail in Section 2.2.2.2.

## **2.2 Groundwater Monitored Natural Attenuation Remedy**

### **2.2.1 Groundwater Aquifers**

As described above, groundwater analysis has been performed around the CMP Pits in four distinct aquifer zones of the UTRA and the GA. These zones in descending order are 1) the TZ of the UTRA, 2) the MAZ of the UTRA, 3) the LAZ of the UTRA, and 4) the GA.

Groundwater within these aquifers is currently monitored by the 87 wells which have been sampled or have water elevations measured on a semi-annual or annual basis (Table 1, Figure 5). The TZ includes 13 monitoring wells, the MAZ includes 27 monitoring wells, the LAZ includes 29 monitoring wells, and the GA includes seven (7) monitoring wells. The Pen Branch monitoring wells are not identified to a specific aquifer as they're within the hyporeic zone under the stream. All wells are used for water level measurements and the majority (67) are sampled for VOCs and/or lindane. Eight surface water stations north of the CMP Pits located in the Pen Branch stream were used to monitor any discharge of VOCs to the stream (Figure 5). Table 1 indicates the monitoring network required sampling frequency and the constituents that are monitored. Any additional samples collected during the April 2024 through March 2025 timeframe are shaded in green and any omitted samples are shaded in orange and described in the following sections.

Based on the evaluation of monitoring data, advection and dispersion are the main MNA processes occurring along transport pathways from the source to the wetlands at the CMP Pits. Based on sampling analysis, biodegradation is occurring in the wetland area near Pen Branch, although it is not a significant factor outside the wetland area. The original 2002 groundwater model only accounted for advection and dispersion and estimated the plumes would remain above MCLs for a minimum of 50 years (~2050) and as long as 130 years (~2130) even if the vadose zone source was completely remediated (WSRC 2002). An updated model conducted in 2017 added sorption and continuing secondary VOC sources in clays and estimated the plumes will remain above

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MCLs for approximately 100 years (~2117). The increase in minimum time is mostly attributed to sorption but is within the range of timeframes calculated in the original 2002 model (50 – 130 years [CY 2050 – 2130]). A model update in 2024/2025 incorporating recent groundwater data and soil data collected in 2021, predicted a 104 year (from CY 2023) expected cleanup timeframe. More information on the updated model is provided in section 3.0.

### **2.2.2 Groundwater Sampling Results**

Groundwater samples are required to be collected from a total of 78 monitoring wells as listed in Table 1 (77 VOCs, 75 1,4-dioxane, and 31 lindane). Groundwater samples were collected from 78 monitoring wells at the CMP Pits during CY 2Q2024 and 4Q2024. GA well CMP010A was not sampled during 2024 since the well was previously determined to be compromised. CMP010A was abandoned and a replacement well, CMP010AR, was installed in July 2024. Eleven (11) shallow wells were installed in the Pen Branch Stream in July and August 2024. Sampling of all the new wells started in 4Q2024.

Additional or omitted sampling that occurred in 2024 is shown in Table 1 and described as follows:

- CMP 12A was sampled for VOCs and 1,4-dioxane during 4Q2024 since non-estimated detections of VOCs and 1,4-dioxane were observed in 2Q2024.
  - CMP 46D was sampled for VOCs during 2Q2024 to supplement coverage of the VOC plume due to increases observed in the source area the previous few years.
  - CMP066B and CMP067B were sampled in 2Q2024 for VOCs since detections of PCE and TCE were observed during 2019 (non-estimated value) and 2022 (estimated value).
  - GA well CMP011A was sampled for lindane in 2Q2024 to continue expanded GA sampling due to contamination previously detected in compromised well CMP010A.
  - CMP035B was not sampled for lindane during 2Q2024.
  - CMP062D, CMP062C, and CMP062B were not sampled for 1,4-dioxane in 2Q2024.
  - Replacement well CMP010AR was not sampled in 2Q2024 as it was installed in July 2024.
  - 4Q2024 split samples at wells CMP010AR, CMP 12A, CMP 34D, and CMP-PB-003D2 were not analyzed for 1,4-dioxane by method 522 as SRS did not have a second contracted lab for the analyses.
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All groundwater results from April 2024 through March 2025 are provided in Table 3. Although not required by the EMP, the analytical data presented in this EMR include data quality level of verified and validated (VV). Splits and field duplicate samples were collected and those results are also provided in Table 3. Plume maps are based on the maximum concentration from the data collected between April 2024 through March 2025. Details on specific contaminants are described in the following subsections.

#### 2.2.2.2 PCE and TCE

PCE and TCE contamination has been identified in the TZ, MAZ, and LAZ above MCLs. The PCE plumes comprise approximately 42 acres (17 hectares) (Figures 10 and 11), and the TCE plumes comprise approximately 39 acres (15.8 hectares) (Figures 17 and 18). The majority of the horizontal plume movement occurs in the MAZ, which is consistent with modeling estimates. Vertical movement of the plumes are occurring as shown by an overall trend of decreasing concentrations in the MAZ, and an increasing trend in portions of the LAZ (Appendix B and Figures 15, 16, and 32). This is also consistent with modeling, as concentrations in the LAZ are predicted to increase over time as contamination migrates from the TZ to the MAZ and eventually to the LAZ. Seventy-eight (78) monitoring wells were sampled in 2024 for VOCs; this includes the extra VOC analyses taken at well CMP 46D. Thirty-eight (38) wells had PCE concentrations above the MCL of 5.0 micrograms per liter ( $\mu\text{g/L}$ ) and 33 wells had TCE concentrations above the MCL of 5.0  $\mu\text{g/L}$ .

Monitoring wells were analyzed using GSI Mann-Kendall trend analysis for data post-ERH/SVE remediation (2010-2022 data, as available) and updated to include 2023 and 2024 data if data indicated changes to those trends (as displayed in Appendix B). Figure 32 summarizes these trends. Most of the monitoring wells (77%) show a declining or steady (including consistent non-detects and no-trend) trend in PCE and TCE over the past 14 years as shown in the time-series plots for all the wells in Appendix B, Figure 32, and summarized below. Additional information is provided with the included Excel file (CMP\_EMR\_2024\_Table3\_Figure32) located on the supplied CD with this report and in the electronic submission.

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The following is a summary of the PCE and TCE contaminant trends by aquifer for the April 2024 through March 2025 reporting period.

**Transmissive Zone:**

The maximum concentrations of PCE and TCE found in the TZ were 2,900 µg/L for PCE (Figure 10) and 1,600 µg/L for TCE (Figure 17) both at monitoring well CMP 35D adjacent to the disposal pits. There were seven monitoring wells (out of 11 sampled) screened in the TZ that had PCE and/or TCE concentrations above the MCL in 2024. Upgradient wells CMP062D and CMP063D were non-detect for both PCE and TCE.

Through 2009, wells CMP 10D and CMP 11D (on the south side of the CMP Pits) had consistently high concentrations of PCE and TCE ; however, as shown in Appendix B, the trends for these wells over the past 16 years have declined significantly. Declining trends at these wells indicate cleaner groundwater conditions, plume contraction on the south side of the disposal trenches, and depletion of source mass entering the groundwater. Contamination in these two wells is a result of contaminants being transported by localized radial groundwater flow at the CMP Pits knoll, as described in Section 1.4 and shown in Figure 7, or by contaminants following the slopes of the confining units (Figure 4). Due to the shape of the TCCZ surface and the subsequent dry area that is created in the TZ, contamination may have been funneled towards the south and southeast towards CMP 10D and CMP 11D. Well clusters CMP062 and CMP063 remain below MCLs and were non-detect during 2024 indicating that contamination has not spread substantially to the south/southeast.

In 2024, concentrations at well CMP 35D remained stable at levels similar to 2023 concentrations. Since 2010, CMP 35D has had an increasing concentration trend that started at the completion of the ERH/SVE remediation; however, PCE levels have recently stabilized beginning in 2021 and continue to remain steady through 2024. This recent stable trend may indicate the depletion of readily mobile VOC mass in the source area.

Inversely related trends in wells CMP 10D and CMP 35D (Figure 31), for both VOCs and lindane, suggest concentration trends could also be tied to hydrogeologic processes associated with the complex radial groundwater flow patterns due to the surface shape of the TCCZ and resulting dry

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zones in the TZ. Water elevation increases due to above average precipitation in recent years possibly provided a mechanism for increased flow towards the northwest in the CMP 10D and CMP 35D area. This may also provide more opportunity for dispersion and diffusion from CMP 10D as there is more water volume available in the TZ. Additionally, the increased water elevations may allow release of trapped secondary sourced contamination in clay horizons or pore space into the groundwater since well CMP 35D is located downgradient of the CMP Pits. Soil sampling conducted in 2021 at the CMP 35D location indicated that residual VOC contamination is present in the vadose zone and upper aquifer and TCCZ (SRNS 2022). Since CMP 35D is located directly outside of the low permeability HDPE cover at the CMP Pits, the cover may retard infiltration and the effect of water elevation increases may be more pronounced. Figure 31 shows a possible correlation between water elevation and contaminant levels of PCE at well CMP 35D.

Due to the past increases observed at well CMP 35D, PCE and TCE have been additionally analyzed at well CMP34D to the west of the CMP Pits. This well had previously shown high levels of PCE (1,460 µg/L) and TCE (417 µg/L) in 2001 but was not included in the CMP OU EMP for VOC analyses and therefore, no VOC results were available since 2009. SRS began sampling well CMP 34D for VOCs starting in 2019 and concentrations were observed at levels of 1,940 µg/L for PCE. SRS has added CMP 34D to the regular semi-annual monitoring (Table 1). The 2024 results decreased to a maximum result of 1,700 µg/L for PCE and 11 µg/L for TCE (Appendix B Pages B-90 and B-146). The elevated results in the TZ since 2010, for wells CMP 34D and CMP 35D indicate that VOC source material was present within the vadose zone or pore space above the water table; however, it only appears to have a localized effect on the overall TZ plume and is not leading to plume expansion in the TZ, but is likely causing limited increases in the in the MAZ and LAZ. It is noted that the PCE/TCE ratios are significantly different in the two wells, indicating a complex disposal history and source composition.

The TZ plume geometry is shown in Figure 10 for PCE and in Figure 17 for TCE. Cross-sectional views of the PCE plumes are available in crosssections A – A', B – B', and C-C' (Figures 12, 13, and 14, respectively). The main plume at and around the CMP Pits has remained roughly the same in size with concentrations near the actual pits area continuing to decrease on the south side at well CMP 10D and remaining elevated but stable on the north side at wells CMP 34D and CMP 35D as

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previously discussed. The highest concentrations in the TZ have remained relatively confined near these two wells, which may indicate that the mass of residual contaminants is not extensive. PCE concentrations at well CMP 11D have generally decreased since 2010 whereas TCE concentrations at well CMP 11D have generally remained stable (Appendix B). Concentrations of PCE north of the pits at CMP 13D exceeded the MCL during 2024 and PCE displays an increasing trend since the ERH/SVE remediation, similar to well CMP 35D. Concentrations on the south west side at well CMP 30D were non-detect for PCE and TCE.

Concentrations in the distal portion of the plume remain relatively low, although some variability is observed between 2Q and 4Q samples in wells CMP 36D and CMP 37D. Well CMP 37D has decreased from 546 µg/L PCE in 2007 to now averaging around the MCL. Well CMP 36D shows a similar decreasing trend. CMP38D shows a slight downward trend but is still consistently above MCLs. The distal plume was initially thought to originate from an alternative source other than the CMP Pits. Particle track modeling indicated it was potentially from a previously contaminated drainage ditch north of the CMP Pits (WSRC 2002) (located on all planar figures). As previously mentioned, characterization results of this area indicated that if a source was previously present in the vadose zone, it has been depleted (WSRC 2003). Due to the dry zone areas within the TZ, it is plausible that bifurcation of the plume into two separate plumes occurred over time, or that some contaminant flow went around the dry zone to the east. Discharging of the MAZ and LAZ into the Pen Branch stream likely brings some contamination up into the TZ as the water discharges into Pen Branch. The clay horizons between the aquifers can be thin and/or leaky and the TCCZ and TCLC are at or near ground surface at the location of the distal plume. The steep topography near Pen Branch incises the TCCZ and other clay layers, the sediment around the stream has been reworked over time as the stream meanders, and trees and roots have penetrated the clay layers allowing more interchange between aquifers. All of these factors are probable explanations for the disconnect between the groundwater plumes at the distal plume and source area.

A comparison of changes in PCE plume concentrations over the last 16 years (2024 values compared to 2008 values [Pre ERH/SVE]) can be seen in Figure 15 and Table 4. Additionally, a GSI Mann-Kendall trend assessment was done in 2023 for all wells using the post-ERH/SVE data (2010-2022 data, as available) (SRNS 2023) and updated to include any 2023 and 2024 data if it

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showed any changes to the trends (as displayed in Appendix B). Figure 32 summarizes these trends. Overall, in the TZ, plume concentrations have decreased or are steady indicating the plume is not expanding. However, the area directly north of the CMP Pits, including monitoring wells CMP 34D, CMP 35D, and CMP 13D, has experienced increases in PCE concentrations from around 2010 through 2021 when levels stabilized and continue to remain stable. Concentrations to the south of the CMP Pits at wells CMP 10D and CMP 11D have both decreased more than 95% from their peak levels and show a large reduction in total mass for the TZ. Concentrations to the west at CMP 30D remain non-detect. Concentrations at CMP 35D and CMP 34D will continue to be monitored. The distal plume has decreased in both size and core concentrations indicating that the total mass being transported downgradient has decreased appreciably. TCE trends are similar to PCE; therefore 2008/2024 plume comparisons for TCE are not mapped.

### **Middle Aquifer Zone**

The maximum concentrations found in the MAZ were 930 µg/L for PCE at well CMP 47D (Figure 10), and 190 µg/L for TCE at well CMP059C (Figure 17), located north of CMP Pits. The concentration of PCE and TCE detected at CMP 47D and CMP059C both decreased from 2023 concentrations. Similar to well CMP 35D in the TZ, well CMP 47D historically had a decreasing trend from 2001 to 2015. In 2017, PCE began increasing until concentrations stabilized in 2022. Similar concentration trends between upgradient well CMP 35D and CMP 47D illustrate the interconnection between the TZ and MAZ and the contaminant transport pathway through the hydrologic system.

There are 13 monitoring wells (out of 21 sampled) screened in the MAZ that had PCE concentrations above the MCL in 2024, and 13 monitoring wells had TCE exceedances above the MCL. The monitoring wells with TCE detections corresponds to monitoring wells with PCE detections. The majority of the MAZ wells display a steady or decreasing trend in concentrations (Figure 32). Well CMB 24I displays a slight increasing trend due to mass transport from the overlying TZ; however, the overall plume footprint has not increased. Two downgradient locations towards Pen Branch (CMP 40D and CMP 43D) were all below MCLs or either non-detect for both PCE and TCE; CMP 41D was just above the MCLs for both PCE and TCE. Also, downgradient well CMP 8 displays a decreasing trend. The remaining MAZ wells show

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decreasing or no significant change in PCE concentrations. Similar trends were observed for TCE in these wells.

PCE and TCE concentrations rapidly decrease once the plume reaches the wetland area near Pen Branch where VOC degradation is occurring (also see section 2.2.4). Cross-sectional views of the PCE plumes are available in crosssections A – A', B – B', and C – C' (Figures 12, 13, and 14, respectively).

A comparison of changes in PCE plume concentrations over the last 16 years (2024 values compared to 2008 values [Pre ERH/SVE]) can be seen in Figure 15 and Table 4. Additionally, a GSI Mann-Kendall trend assessment has been done in 2023 for all wells using the post-ERH/SVE data (2010-2022 data, as available) (SRNS 2023) and updated to include any 2023 and 2024 data if it showed any changes to the trends (as displayed in Appendix B). These trends are summarized in Figure 32. In the MAZ, core plume concentrations are similar to 2008 concentrations due to increases near the pits from 2017 to 2022 at CMP 47D; however, the area of concentrations >100 µg/L has also decreased in size. In the comparison between plume change maps (2008 vs 2024), the plume footprint above the MCL appears to have expanded horizontally, but this is due to the new monitoring well data points collected starting in 2016, which further defined the plume to the east. Additionally, samples have recently been collected from well CMP 31C, located to the west, further defining the plume in that direction. Concentrations near Pen Branch at well CMP 8 and in the wetland area at wells CMP 39D and CMP 40D have decreased, indicating that the flux of VOCs from the source area are decreasing and that VOC degradation in the wetland area is attenuating the plume. TCE trends are similar to PCE; therefore 2008/2024 plume comparisons for TCE are not mapped.

### **Lower Aquifer Zone**

There are 11 monitoring wells (out of 27 sampled) in the LAZ that had PCE concentrations above the MCL in 2024. Nine (9) of those wells also corresponded to the locations in the LAZ having TCE concentrations above the MCL. The LAZ maximum values for PCE slightly decreased from 2023 concentrations and TCE maximum concentrations slightly increased. The 2023 maximum concentrations of PCE and TCE within the LAZ were 320 µg/L at well CMP 32C for PCE and

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170 µg/L at well CMP 52BU for TCE (Figure 11). The higher concentrations observed in the LAZ are at wells located in the upper LAZ, directly below the TCLC where contaminants are likely migrating from the MAZ and/or diffusing from the clays above. Concentrations at CMP 32C and CMP 52BU appear to have stabilized over the last eight years. Concentrations of PCE and TCE at CMP 10C display decreasing trends (Appendix B).

Concentrations at five wells (CMP 8B, CMP 32C, CMP035B, CMP 52BU, and CMP058B) display historically increasing trends that have stabilized over the last 16 years, except for well CMP035B which has only 4 years of data, and are located in the upper or mid-LAZ aquifer (Appendix B and Figure 32). PCE and TCE concentrations in mid-LAZ plume wells CMP CMP 13B decreased from 2023 levels. CMP 10B decreased in 2Q2024 and increased in 4Q2024 and the concentrations have been stable the past five years at about 10 µg/L. Contamination in the LAZ is mostly limited to the upper half of the aquifer as seen in the three cross sections, A – A', B – B', and C – C' (Figures 12, 13, and 14, respectively). Other wells vertically located mid-plume and deeper remain steady, below MCLs or non-detect indicating the plume is not migrating deeper over the majority of the LAZ. Newer monitoring well CMP035B, vertically located in the upper LAZ, had a maximum PCE concentration of 46.5 µg/L and TCE concentration of 44.7 µg/L during 2024; which is similar to 2023 concentrations. These concentrations are consistent with other plume concentrations and fit with the known plume geometry as can be seen in the plume maps (Figures 11 and 18) and cross section A-A' (Figure 12). This is not unexpected since the previous soil boring completed at CMP 35D indicated the presence of PCE and TCE in soil where CMP035B was installed. Higher VOC concentrations were observed in the overlying vadose zone and TZ (SRNS 2023).

Upgradient wells CMP062B and CMP063B were non-detect for PCE and TCE during 2024. Downgradient wells CMP060B and CMP061B remain non-detect for PCE and TCE. Concentrations slightly exceeded the PCE MCL at downgradient well CMP 8B. During both 2Q2024 and 4Q2024 PCE and TCE were not detected at wells CMP066B and CMP067B, which are located north of Pen Branch (Figures 11 and 12).

Similar to the location of the northeast distal plume in the TZ and MAZ aquifers, VOC contaminants are present in the LAZ. Some upward vertical water elevation heads are present in

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the LAZ closer to Pen Branch (i.e., CMP064BU and CMP064B) which suggests the vertical downward migration of contaminants may be reduced in some areas (Figure 8).

A comparison of changes in PCE plume concentrations over the last 16 years (2024 values compared to 2008 values [Pre ERH/SVE]) can be seen in Figure 16 and Table 4. Additionally, a GSI Mann-Kendall trend assessment has been done in 2023 for all wells using the post-ERH/SVE data (2010-2022 data, as available) (SRNS 2023) and updated to include any 2023 and 2024 data if it showed any changes to the trends (as displayed in Appendix B). These trends are summarized in Figure 32. LAZ plume concentrations have historically increased in the upper half of the aquifer from early 2000s to 2010-2017. Since 2017, concentration trends have been stable and are no longer increasing overall. Historical increases in the LAZ are expected, as both the previous 2002 modeling effort and the more recent 2017 and 2024 modeling effort predicted initial increases in the LAZ over time as VOC mass moved through the system. The area southeast of CMP Pits in the upper LAZ (well CMP 10C) is currently on a decreasing trend over the previous 15 years, suggesting the majority of source contaminants have been remediated. Concentrations on the western edge of the plume (well CMP 33D) have also been decreasing since 2007 indicating the LAZ plume is contracting to the west within the LAZ.. The downgradient wells (CMP060B and CMP061B) remain below MCLs. The LAZ plume is most likely reaching Pen Branch and the wetland area east and downgradient of CMP 8B, which also correlates to the TZ and MAZ contaminants near Pen Branch. TCE trends are similar to PCE; therefore 2008/2024 plume comparisons for TCE are not mapped.

### **Gordon Aquifer**

There are seven monitoring wells screened within the GA and all were sampled during 2024. CMP010A was not sampled during 2Q2024 since the well was previously determined to be compromised and was likely causing contaminated groundwater from above aquifers to enter the well. CMP010A was abandoned and a replacement well, CMP010AR, was installed in July 2024; sampling of the new well began in 4Q2024. No GA monitoring wells exceeded the PCE and TCE MCLs.

Non-estimated detections were observed in 2Q2024 in one well, CMP 12A, with a maximum concentrations of 2.6 µg/L for PCE and 1.1 µg/L for TCE. Since the concentrations were non-

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estimated, well CMP 12A was also sampled during 4Q2024. PCE was detected at a concentration of 1.38 µg/L and TCE at 0.478 µg/L. All other GA monitoring wells were non-detect for PCE and TCE.

As stated above, contamination generally remains in the UTRA and extends down to the upper portion of the LAZ. The GA screened wells are in place to confirm contamination has not migrated farther downward than expected as described in the EMP (WSRC 2006b). Modeling did not predict contamination to reach the GA at levels above MCLs (WSRC 2002, SRNS 2017, SRNS 2025). However, low levels of PCE and TCE below MCLs have been recently observed in monitoring well CMP 12A and rarely at CMP 8A. Contamination previously observed at CMP010A was believed to be caused by in-well leakage of contaminated groundwater at around 105 ft bgs due to bends in the well causing the casing seal/joint to be compromised. Data from the new replacement well, CMP010AR, confirms the contamination was not of the GA aquifer as PCE and TCE were not detected. Semi-annual monitoring of the new well will continue through 2025.

### **New Pen Branch Shallow Wells**

Eleven (11) new shallow groundwater wells were installed below the Pen Branch stream bed in July and August 2024 via hand augering. These wells are 2-inch PVC wells with 1 ft pre-packed screens and were installed at six locations spread across the CMP Pits Pen Branch area (Figure 5). Five of the locations include two wells, one with an upper screen zone and one a few feet lower (Table 1). The first location, CMP-PB-001 only includes one well CMP-PB-001D1 as deeper intervals were composed of clay where a well could not be installed. These wells were installed to provide long-term data on the hypheic zone and groundwater directly before discharge to Pen Branch.

Sampling of these new wells began in 4Q2024. Results indicate that seven of the 11 wells exceed MCLs for PCE and/or TCE. This includes CMP-PB-002D1, CMP-PB-002D2, CMP-PB-003D1, CMP-PB-003D2, CMP-PB-004D2, CMP-PB-006D1, and CMP-PB-006D2. The maximum concentrations for PCE and TCE occurs at CMP-PB-003-D2 with concentrations of 83.9 µg/L and 27.1 µg/L, respectively. Location CMP-PB-003-D2 was expected to have the highest

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concentrations as it is located in the core transport pathway from the CMP Pits to Pen Branch. These new wells will be monitored semiannually for VOCs.

#### 2.2.2.3 Cis-1,2-Dichloroethylene (c-1,2-DCE)

C-1,2-DCE was detected in 12 wells in 2024 (CMP 10C, CMP 11D, CMP 35D, CMP 36D, CMP 37D, CMP 39D, CMP 40D, and CMP 41D, CMP-PB-003-D1, CMP-PB-003-D2, CMP-PB-004-D1, CMP-PB-004-D2). Concentrations were mostly all low values less than 5 µg/L; however, the maximum was 25.2 µg/L at wetland well CMP 37D. All results were below the 70 µg/L MCL. Ten (10) of the 12 wells with detections of c-1,2-DCE are located in the wetland area near Pen Branch, providing evidence of degradation of PCE and TCE in the Pen Branch wetlands. The expansive wetland, high organic matter, anaerobic conditions provide ideal conditions for reductive dechlorination, and wetland vegetation attenuation. Data collected by South Carolina State University in support of providing data for MNA conditions suggests natural attenuation is occurring (see Section 2.2.4 *Additional Data from Independent Analysis*). The preferential degradation pathway for TCE is c-1,2-DCE as both trans-1,2-dichloroethylene (t-1,2-DCE) and 1,1-DCE are mainly non-detect as discussed below.

The lack of high c-1,2-DCE results in monitoring wells away from the wetlands indicates that VOC degradation might not be widely occurring throughout the aquifers and plume and that advection and dispersion are the main MNA processes occurring. However, c-1,2-DCE is not a persistent compound and can easily degrade and therefore not be detected in high concentrations. Overall data indicates that VOC degradation is certainly occurring in the wetland areas near Pen Branch.

#### 2.2.2.4 Trans-1,2-Dichloroethylene (t-1,2-DCE)

No detections of t-1,2-DCE were observed during 2024.

#### 2.2.2.5 1,1-Dichloroethylene (1,1-DCE)

One detection of 1,1-DCE was observed at well CMP-PB-003D1 at an estimated concentration of 0.34 µg/L. All other 1,1-DCE results were non-detect for 2024.

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#### 2.2.2.6 Vinyl Chloride (VC)

During 2024, VC was detected at 3 wells, CMP 15A, CMP-PB-003D1, and CMP-PB-004D1. The maximum concentration was 2.95 µg/L at Pen Branch well CMP-PB-003D1, above the MCL of 2 µg/L. The presence of VC in Pen Branch wetland wells confirms dechlorination of the VOCs is occurring at the CMP Pits.

#### 2.2.2.7 1,4-Dioxane

1,4-Dioxane is analyzed annually at CMP Pits at 75 monitoring wells. Well cluster CMP062 was mistakenly not sampled for 1,4-dioxane in 2024, so 72 wells were monitored for 1,4-dioxane in 2024. There is currently no MCL for 1,4-dioxane, and the current United States Environmental Protection Agency (USEPA) tap water regional screening level (RSL) of 0.46 µg/L is used for contouring plume maps (Figures 19 and 20) and cross-sections (Figures 21, 22, and 23). During the 2024 monitoring period, 1,4-dioxane was analyzed with two analytical methods, USEPA SIM Method (EPA8260BSIM, EPA8260DSIM, or EPA8270ESIM) and USEPA 522. As in past years, the USEPA SIM method detection limits and sample quantitation limits could not meet the current USEPA tap water RSL of 0.46 µg/L. However, the USEPA 522 method limits are below the USEPA tap water RSL. Annual samples were collected for 1,4-dioxane and analyzed using both methods and are compared in Table 3.

Due to the lower detection limits using the USEPA 522 method, there were more detections of 1,4-dioxane than with the USEPA SIM methods. Detections of 1,4-dioxane occurred in 49 of the 75 wells sampled (65%) using the USEPA 522 method compared to 18 wells (24%) using the USEPA 8260DSIM method. There was close agreement in the results between the two methods in the majority of samples.

The 1,4-dioxane plume mimics the distribution of the PCE and TCE plumes in all aquifers as detections and exceedances of the USEPA tap water RSL occurred in the TZ, MAZ (Figure 19), LAZ, and GA (Figure 20). The maximum concentration was 472 µg/L at well CMP 35D, which increased from 2023 levels. It was detected at many of the new CMP-PB series wells, but at lower concentrations (< 3 µg/L) and was also detected at one well north of Pen Branch (CMP066B) with an estimated concentration of 0.0542 µg/L. One GA well, CMP 12A, exceeded the RSL with a

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concentration of 0.53 µg/L in 2Q2024; the 4Q2024 result was below the RSL with an estimated concentration of 0.257.

As seen in Appendix B, which presents plots with the maximum 1,4-dioxane results for each sampling event, many concentrations in wells that have had detections within the last eight years have remained steady or generally decreased. However, wells near CMP Pits in the MAZ and LAZ, as well as TZ well CMP 35D have shown a general increase in 1,4-dioxane due to residual mass from the source area or release from secondary sources.

There is no South Carolina certified lab that has detection limits for 1,4-dioxane that can meet the current USEPA tap water RSL. SRS will continue to look for and work with the labs to try to achieve the lowest possible detection limits. SRS will continue to utilize the USEPA 522 method that can meet the USEPA tap water RSL, in addition to the current South Carolina Department of Environmental Services (SCDES) approved method. If a lab or method has South Carolina accreditation and can meet the USEPA tap water RSL, then that would be the preferable analysis method used.

#### 2.2.2.8 Carbon Tetrachloride (CCl<sub>4</sub>)

CCl<sub>4</sub> was detected in 22 wells during 2024, but only exceeded the MCL of 5.0 µg/L in three wells: CMP 10D, CMP 35D, and CMP064BU with a maximum concentration of 35 µg/L at well CMP 35D, which decreased from 2023 concentrations. Plume maps were not created due to the limited number of exceedances.

#### 2.2.2.9 Chloroform

Chloroform was detected in 29 wells during 2024. None of the results exceeded the MCL of 80 µg/L. The maximum result was at well CMP 35D with a value of 54 µg/L. The detections coincide with wells that have CCl<sub>4</sub> contamination as chloroform is a degradation product of CCl<sub>4</sub>.

#### 2.2.2.10 Dichloromethane (DCM)

During 2024, all DCM results were non-detect except for three wells that had low estimated detections: CMP 11B, CMP035B, and CMP066B. The maximum concentration was 1.24 µg/L at

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well CMP 11B, below the 5 µg/L MCL. Dichloromethane is a degradation product of chloroform indicating the occurrence of natural attenuation of chloromethanes at the CMP Pits.

#### 2.2.2.11 Bromodichloromethane

During 2024, bromodichloromethane was detected at four wells CMP 10C, CMP 32C, CMP 35D, CMP064BU, and CMP-PB-003D2 with the highest value detected at CMP 35D at 8.71 µg/L, significantly lower than the MCL of 100 µg/L MCL. All other results were non-detect for bromodichloromethane.

#### 2.2.2.12 1,1,2-Trichloroethane (1,1,2-TCA)

During 2024, 1,1,2-TCA was detected at two wells, CMP 12B and CMP 35D. The maximum concentration was at CMP 35D with an estimated concentration of 0.63 µg/L, below the MCL of 5 µg/L.

#### 2.2.2.13 Lindane

Thirty (30) out of 31 wells were analyzed for lindane in 2024. CMP035B was mistakenly not included for lindane analyses. Additionally CMP011A was also analyzed for lindane. The MCL for lindane is 0.2 µg/L and four wells near the CMP Pits (CMP 46D, CMP 47D, and CMP 35D, CMP059C) had lindane concentrations that exceeded this level (Figures 24 and 25). Cross-sections with lindane plumes and concentrations are provided in Figures 26 through 28. Most wells monitored for lindane show slightly decreasing or steady trends in concentrations as shown in Appendix B and Figures 29, 30, and 32.

The highest lindane concentration for 2024 was 6.8 µg/L found in CMP 35D. This well has shown fluctuations in concentrations over the years, but displayed a general increase from 2013 through 2020. Concentrations in 2021 decreased and started to increase again in 2022; however, concentrations have been decreasing since then (Appendix B, page B-63). Factors contributing to the increase in concentration include the complex hydrogeology of groundwater flow paths, surface shape of the TCCZ (Section 1.3 and Figure 4), perched water table conditions, and water elevation increases (Section 1.4, Figure 7, and Figure 9). Increases at CMP 35D have occurred as concentrations at well CMP 10D have decreased. The inversely related trends in wells CMP 10D

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and CMP 35D for both lindane and VOCs (Figure 31) suggest the increases could be tied to hydrogeologic processes associated with the radial groundwater flow patterns due to surface shape of the TCCZ and dry zones in the TZ. Higher water table elevations have possibly provided a mechanism to release contamination trapped in the vadose zone pore space or capillary fringe, as well as for groundwater to flow towards the northwest providing more opportunity for dispersion and diffusion from CMP 10D and the CMP Pits. The low permeability cap retards infiltration so the effect of water table elevation increases may be more pronounced since CMP 35D is located directly outside the capped area. Figure 31 indicates a possible correlation between water elevation and contaminant levels of lindane at CMP 35D.

CMP 10C, in the Upper LAZ, shows concentrations have generally been decreasing over the past 10 years. Well CMP 10B, which is screened in the middle of the LAZ (Figure 26), did not have any detections of lindane. Due to the shape of the TCCZ surface and the subsequent dry area that is created in the TZ (Figure 4), contamination may have been funneled towards the south and southeast towards CMP 10D from the high concentration area around CMP 35D and the CMP Pits. Fluctuating water elevations could move groundwater back and forth between CMP 10D and CMP 35D or potentially release contaminants into the water table that were trapped in pore space or clay zones.

The lindane plume is estimated at approximately 2.5 acres (1.0 hectares) in the UTRA (Figures 24 and 25) which is less than the 2023 area and significantly smaller than the VOC plumes. The majority of the plume (including the highest concentrations) resides in the TZ around well CMP 35D as lindane has limited mobility in the subsurface compared to PCE. The MAZ contained three wells, CMP 46D, CMP 47D, and CMP059C all slightly above the MCL with concentrations of 0.26 µg/L, 0.38 µg/L, and 0.207 µg/L, respectively (Figure 24). Lindane was not detected above the MCL within the LAZ, or the GA including new replacement well CMP010AR. Lindane was not detected in any of the 11 new Pen Branch monitoring wells.

A comparison of lindane plume concentrations over the last 16 years (2024 values compared to 2008 values) can be seen in Figures 29 and 30 and Table 5. Additionally, a GSI Mann-Kendall trend assessment has been done for all wells using the post-ERH/SVE data (2010-2022 data, as

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available) and updated to include any 2023 and 2024 data if it showed any changes to the trends (as displayed in Appendix B). Figure 32 summarizes these trends. In the TZ, lindane concentrations above the MCL are currently limited to one well, CMP 35D. The actual TZ plume may appear larger than actual conditions on the maps due to the contour line size and scale of the maps. In the MAZ, the area to the north and northwest of the CMP Pits has experienced minor fluctuations in concentration over the past 16 years, but concentrations continue a downward trend. There was one small plume above the MCL in 2024 at wells CMP 46D, CMP 47D, and CMP059C.

Beginning in 2008, the LAZ experienced an initial increase in concentrations southeast of the CMP Pits at well CMP 10C; however, lindane concentrations at this location have decreased since 2015; concentrations in 4Q2023 dropped to below the MCL. The increase first seen at CMP 10C in 2008 is believed to be due to the shape of the surface of the Tan Clay, localized radial groundwater flow around the CMP Pits knoll, and leaky conditions within the TCCZ and TCLC. Contamination does not extend deeper than MAZ of the UTRA (Figures 26 and 28). Although lindane does not diffuse in aquifers as quickly as VOCs, the factors mentioned above may be further hindering contaminant advection and dispersion.

### **2.2.3 Surface Water Sampling Results**

Surface water in Pen Branch is sampled semi-annually at eight locations along the groundwater discharge boundary (Figure 5). Two of these stations are collected in a tributary leading to Pen Branch (CMP-SW-20 and CMP-SW-21).

VOCs are analyzed semi-annually and 1,4-dioxane is analyzed annually during the fourth quarter. Table 3 and Figures 10, 11, 17, and 18 show the PCE/TCE results at each station. Modeling results predicted VOC discharge to groundwater under the Pen Branch above MCLs. 1,4-Dioxane was analyzed with both the USEPA SIM methods and the USEPA 522 method, as discussed above in Section 2.2.2.6, *1,4-Dioxane*. In 2024, all surface water stations had detections of 1,4-dioxane with the USEPA 522 method, but most were estimated values and all were below the RSL; the USEPA SIM method result was non-detect (Table 3 and Figures 19 and 20). The maximum concentration was 0.281 at station CMP-SW-20. All other surface water results were non-detect for all other VOCs, indicating no impact to surface water.

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The CMP Pits VOC and 1,4-dioxane groundwater plume effects on Pen Branch surface water are negligible as they are generally not detected, with any detections remaining below regulatory levels of concern. Dispersion, advection, and wetland area VOC degradation are all contributing factors that reduce the groundwater plume impact to Pen Branch and support the effectiveness of the MNA remedy at the CMP Pits.

#### **2.2.4 Additional Data from Independent Analysis**

Sampling for VOCs has been conducted in and around Pen Branch by South Carolina State University (SCSU) for several years under a grant provided by the United States Department of Energy (USDOE). The focus of their studies is the MNA processes occurring in the stream and wetlands around Pen Branch as the VOC plume moves towards and discharges into Pen Branch. Many of the SCSU samples are collected from the groundwater immediately before discharge into Pen Branch and surface water within Pen Branch. Sometimes they collect sediment and biota (tree cores and other vegetative media) samples. Their 2024 efforts were focused on groundwater and sediment at the location where higher levels of VOC discharge were observed (upstream of SRS surface water station CMP-SW-22) and also included collection of sediment samples for VOC and microbial analyses.

During 2024, SCSU sampled seven (7) groundwater stations beneath the Pen Branch stream. Multiple samples (duplicates) were collected for statistical purposes and samples were collected at multiple times of the year. This included 39 groundwater samples within the hyporheic sediments below the stream bed within Pen Branch. Groundwater samples were collected from temporary wells up to 80 centimeters (cm) (31.5 inches) below the stream bottom. Samples were collected by peristaltic pumping. Surface water samples were not collected in 2024.

Groundwater results indicated that the VOC plume is discharging above MCLs to the hyporheic zone and mixing upgradient of the SRS CMP-SW-22 surface water station, from SCSU stations 5DB80 through station 5D1B. The maximum groundwater concentration results are as follows: PCE – 26.2 µg/L at SCSU station 5DB80; TCE – 8.6 µg/L at 5DB80; c-1,2-DCE – 22.4 µg/L at 5DZ3; and VC – 9.6 µg/L at 5DZ3. 1,1-DCE and T-1,2-DCE were not detected in groundwater. Table 6 displays the groundwater results and the average per each triplicate sample. Figure 33

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displays the SCSU sample locations and the maximum PCE concentrations in their groundwater and surface water stations.

SCSU has been sampling at CMP Pits Pen Branch for multiple years and have been collecting samples from some of the same locations to monitor changes in contaminants over time. Their data shows that contaminant concentrations have been decreasing over time and that VOC degradation is occurring more in the downgradient, wetland/stream sample locations (Figure 34). This evidence supports the conceptual model that conditions in the wetlands are favorable for the degradation of PCE and TCE.

Sediment samples were collected at seven (7) locations and at multiple depths up to 80 cm (31.5 inches) below the stream bottom for VOC and microbial analysis. Multiple sediment samples (triplicates) were also collected (Table 7). The maximum sediment concentration results are as follows: PCE – 26.3 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ) at SCSU station 5DB80B; TCE – 10.8  $\mu\text{g}/\text{kg}$  at 5DB80B; and c-1,2-DCE – 43.5  $\mu\text{g}/\text{kg}$  at 5DZ3B. 1,1-DCE, t-1,2-DCE, and VC were not detected in sediment.

Additionally, SCSU continued to expanded their efforts in 2024 with microbial studies to determine the VOC natural attenuation processes occurring in the Pen Branch wetlands. Microbial methods utilized 16S rRNA-DNA extractions and gene sequencing with quantitative polymerase chain reaction (qPCR) analyses conducted at Savannah River National Laboratory (SRNL) with parallel analyses conducted at SCSU using the same methodologies. Bacterial genera were then identified using DNA sequencing libraries. Results showed that bacteria known to support VOC degradation (*Dehalococcoidaceae* and *Dehalogenimonas*) are present and abundant in Pen Branch wetlands at stations 5DB80 and 5DZ3.

Gas chromatography-isotope ratio mass spectrometry (GC-IRMS) with compound specific isotope analysis (CSIA) was conducted at Michigan State University on sediments collected at multiple depth intervals during temporary groundwater well installations. In general, results for stable carbon isotope ratios for 2024 were inconclusive due to lower than required VOC concentration in the sediment.

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SCSU has future ground water and microbial studies planned for 2025. Results will be supplied in future EMRs.

### 3.0 ADDITIONAL SAMPLING AND EFFORTS

#### Additional Cation-Anion Groundwater Sampling

SRS expanded upon the cation-anion groundwater sampling that was previously done in 2021 and 2022 near the CMP Pits trench area and upgradient area to include wells across the larger CMP Pits groundwater unit. Additional cation-anion samples were collected at a total of 25 additional existing wells, including clusters with wells in multiple aquifer zones, wells downgradient towards Pen Branch, and wells on the north side of Pen Branch (Figure 35). The selected wells were sampled and analyzed for cations to include aluminum, calcium, iron, potassium magnesium, manganese, and sodium. Anions include chloride, fluoride, nitrate, carbonate, and sulfate. Results indicated most wells fit the aquifers of choice but a few discrepancies were found. Additional information from both the 2021/2022 and 2024 cation-anion sampling is described in Appendix C of this report.

#### Updated Modeling Report

In recent years, SRS has received comments associated with increasing concentrations near the source area (CMP Pits trenches area), specifically with increasing contaminant concentrations at well CMP 35D and CMP 34D. The ERH/SVE remedial action conducted in 2008/2009 targeted the residual DNAPL and high VOC contamination remaining within the vadose zone beneath the CMP Pits. Although the remediation effort was successful (i.e., cleanup levels were met), residual contamination in the vadose zone remains and VOC mass was mobilized from storage in low permeability layers due to subsurface heating. Increasing VOC and lindane concentrations in groundwater have been observed after completion of the ERH/SVE remediation over the last 10-15 years to the north of the CMP Pits. Wells near the pits exhibiting increasing concentrations have since stabilized beginning in 2021. It is expected that increasing water elevations have released the residual contamination from within the capillary fringe and vadose zone. It is also likely that the ERH action created a contaminant front that emanated from the treatment zone and

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helped mobilize contaminants to groundwater at the disposal pits. This effect is apparent in the PCE time series trend beginning in 2010 at well CMP 35D.

The 2017 modeling effort factored in continuing sources from residual contamination/desorption from low permeable zones located beneath the CMP Pits knoll area. With the continuing source additions to the updated model, the cleanup timeframe (approximately 100 years [~CY 2117] was similar to what was developed in the original model in 2002 (50-130 years [CY 2050-2130]). The 2021 additional sampling effort collected numerous soil VOC headspace samples to quantify the current contamination around the CMP Pits knoll area (SRNS 2022). Additional groundwater data was also collected as new LAZ monitoring well CMP035B was installed.

During fiscal year 2024 and 2025, SRS compiled updated data from the monitoring well network, soil borings, surface data, as well as data collected from the SCSU efforts. These data were incorporated into the updated model to provide a refined prediction of plume transport (SRNS 2025). Four constituents were included in the model, PCE, TCE, 1,4-dioxane, and lindane. The cleanup timeframe for PCE was calculated at 104 years (CY 2126) which is slightly longer than the 2017 updated model, but within the range of the original model. For all constituents except PCE, predictive simulations indicate that plume discharges are not anticipated to impact the surface water in Pen Branch over the MCLs. The updated model does not include the processes representing the attenuation of VOCs shown to be occurring in the wetlands. However, when factoring in the wetlands degradation near Pen Branch PCE is likely to not impact Pen Branch above the MCL. SCSU trend data suggest that the contaminant load from groundwater to Pen Branch is decreasing (Figure 34). The full model report is provided as an attachment to this EMR (SRNS 2025).

#### **4.0 SUMMARY**

A simple graphical CSM (Figure 3) has been presented to aid in the understanding of potential sources of contamination and the subsequent groundwater transport pathways. Surface maps of the tan clay (both the TCCZ and the TCLC) have been presented to aid in the understanding of radial groundwater flow at the CMP Pits and probable contaminant transport mechanisms (Figure 4). In general, monitoring wells showed slightly higher water elevations compared to 2023

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measurements due to above average rainfall during 2024. The areas estimated to be dry in the TZ and MAZ are similar in size and location to last year. Perched water tables most likely exist in parts of the TZ and MAZ. The shape of the tan clay layer and the level of the water table restrict horizontal groundwater flow movement in the TZ and MAZ and cause complex localized groundwater flow paths.

SRS installed a permanent and continual (every 15 minutes) electronic stream flow data loggers at the upgradient and downgradient end of Pen Branch at CMP Pits in August 2024 in existing culverts (Figure 5). Calibration of the stream flow gauge was conducted through October 9, 2024, thus readings after this date are considered accurate. This allows constant real-time monitoring of the flow within Pen Branch and will be useful in trending measurements, identifying changes that may occur, and will provide data for future modeling efforts. Graphs of the stream flow data are provided in Figure 37. The stream flow gauge on the south tributary along C Road (CMP-SW-23) appears to have a baseflow of around 225 gpm. On the western side of Pen Branch baseflow at CMP-SW-24 appears to be around 400 gpm. In 2025, SRS plans to install an additional stream gauge system on the northern arm of Pen Branch along Road C. Long-term stream gauge data will be more representative of baseflow conditions at CMP Pits and will be included in future EMRs as it becomes available.

Advection and dispersion are the main MNA processes occurring at CMP Pits, with anaerobic biodegradation occurring in the hyporheic zone and within the wetlands around Pen Branch. The majority of groundwater and surface water results are consistent with modeling predictions (WSRC 2002, SRNS 2017, SRNS 2025), and the effectiveness monitoring data collected through March 2025 indicates that the MNA remedy is working as predicted as the majority of wells (77%) display steady or decreasing trends or remain non-detect. Previously observed increases (from 2010 to 2021) in PCE, TCE, 1,4-dioxane, and lindane adjacent to the CMP Pits in well CMP 35D have recently stabilized from 2021 through 2024. The PCE concentration at CMP 35D was 2,900 µg/L in 2024 which is similar to levels in 2001 prior to the ERH/SVE remediation. PCE on the west side of the pits at well CMP 34D decreased in 2024 to 1,700 µg/L. The localized contamination increase at the pits appears to be related to mass mobilized during the ERH/SVE remedy and water elevation rise associated with rainfall infiltration releasing residual

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contamination trapped in the vadose zone near the CMP Pits. The recent stabilization of PCE in the TZ adjacent to the disposal pits likely indicates depletion of residual source mass.

Due to increasing groundwater concentrations near the source area (CMP Pits trenches area) from 2010 to 2021, during fiscal year 2024 and 2025, SRS used the 2021 data soil sampling data, as well as recent groundwater data, to update the source term (and plumes) in the 2017 model. The improved model was used to update simulated cleanup timeframes. The cleanup timeframe for PCE was calculated at 104 years (CY 2126) which is slightly longer than the 2017 updated model, but within the range of the original model from 2002. Predictive simulations indicate that groundwater discharge concentrations for all constituents except for PCE are not anticipated to impact the surface water in Pen Branch over the MCLs. However, the model does not consider the attenuation capacity of the wetlands. When factoring in the wetlands degradation near Pen Branch PCE is likely to not impact Pen Branch. This conclusion is supported by current trend data collected by SCSU that suggest the contaminant load for all constituents from groundwater to Pen Branch is decreasing over time.

Due to GA well CMP010A being identified as compromised, it is believed that contaminated groundwater from the above LAZ is leaking in the CMP010A well causing the elevated TCE, PCE, and lindane levels that were seen in the groundwater samples. In July 2024, well CMP010A was abandoned and a new replacement well, CMP010AR, was installed. Sample results from 4Q2024 indicate that the GA is not contaminated at this location (the GCCZ is a competent layer) as all VOC and lindane results were non-detect. 1,4-dioxane was detected with an estimated concentration of 0.0642 µg/L. Eleven (11) shallow wells were also installed at six locations within the Pen Branch stream to monitor groundwater before discharge to surface water. Sampling of the new wells began in 4Q2024. Results indicate that seven of the 11 wells exceed MCLs for PCE and/or TCE. Degradation products were also present. The maximum concentrations for PCE and TCE in groundwater occurs at CMP-PB-003-D2 with concentrations of 83.9 µg/L and 27.1 µg/L, respectively. This location is also where SCSU has identified the highest location of contaminants near Pen Branch. These new wells and the new GA well CMP010AR will be monitored semiannually for all CMP constituents throughout 2025.

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Wells located in the distal plume area towards the northeast show a possible preferential pathway for groundwater as relatively high levels of VOCs exist to the northeast. Dry zones may be slightly redirecting groundwater flow, which could explain elevated concentrations to the northeast.

The two LAZ wells north of Pen Branch, CMP066B and CMP067B, continued to be sampled semi-annually in 2Q2024 and 4Q2024 due to a detection of PCE and TCE below MCLs at well CMP067B in 2019 and 2022. At CMP066B, DCM was detected at a low estimated value of 1.1 µg/L in 2Q2024 and 1,4-dioxane was detected at low estimated concentration of 0.0542 µg/L in 4Q2024. No other VOCs were detected in the 2024 sampling events or at CMP067B. These two wells will continue semi-annual sampling.

1,4-Dioxane was analyzed at a majority of the CMP Pits wells and at surface water stations in 2024 using two analytical methods, USEPA SIM methods and USEPA 522. The 1,4-dioxane plume mimics the distribution of the PCE and TCE plumes in all aquifers. The maximum 1,4-dioxane concentration was 472 µg/L at TZ well CMP 35D. 1,4-Dioxane was detected at all surface water stations with the USEPA 522 method, almost all at low estimated concentrations. The maximum was seen at CMP-SW-20 with a concentration of 0.281 µg/L, which is below the USEPA tap water RSL of 0.46 µg/L.

Screening level data that was collected in 2024 by SCSU demonstrate that VOCs are present in shallow (<2.5 ft) groundwater beneath Pen Branch in discrete areas, mainly upgradient of SRS surface water station CMP-SW-22. The data also show that VOC degradation is occurring as higher concentrations of cis-1,2-DCE and VC are present in groundwater near Pen Branch. Groundwater trend data over many years indicates decreasing contaminant discharge to Pen Branch. SCSU expanded their sampling in 2024 to include additional sediment samples from the borings of the temporary monitoring well stations underneath the Pen Branch stream bed and were collected for VOCs and microbial analysis. Microbial methods utilized 16S rRNA-DNA extractions and gene sequencing with (qPCR) analyses conducted at SRNL with parallel analyses conducted at SCSU using the same methodologies. Bacterial genera were then identified using DNA sequencing libraries. Results showed that bacteria that's known to support VOC degradation (*Dehalococcoidaceae* and *Dehalogenimonas*) were present and abundant in samples.

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Lindane only exceeded the MCL (0.2 µg/L) in four wells near the CMP Pits (CMP 35D – TZ, CMP 46D and CMP 47D – MAZ, and CMP 52C – MAZ) with a maximum concentration of 6.8 µg/L at CMP 35D, which decreased from 2023 concentrations. All other wells were below the MCL or non-detect.

The most important indicator of the MNA remedy performing as predicted is an evaluation of the long-term concentration trends and an interpolation of the data showing decrease in plume size over time. Although the overall plume size has minimally changed since the completion of the source zone RA 16 years ago the extent hasn't increased, many higher concentration areas of the plume continue to decline, and surface water continues to be protected as no VOCs were detected in 2024. VOC biodegradation in the wetlands around Pen Branch is reducing the flux of VOCs into Pen Branch. SRS will continue to sample the monitoring network to track performance of the MNA remedy and ensure protection of Pen Branch surface water.

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WSRC, 2006a. *Interim Post-Construction Report (IPCR) for the Chemicals, Metals, and Pesticides (CMP) Pits Operable Unit – Ballast Area (080-170G, 080-171G, 080-180G, 080-181G, 080-182G, 080-183G and 080-190G) (U)*, WSRC-RP-2005-4065, Rev. 1, January, Washington Savannah River Company, Savannah River Site, Aiken, SC

WSRC, 2006b. *Effectiveness Monitoring Plan for the Electrical Resistance Heating (ERH)/Soil Vapor Extraction (SVE) System and Monitored Natural Attenuation at the Chemicals, Metals, and Pesticides Pits Operable Unit (U)*, WSRC-RP-2005-4077, Rev. 1, February, Washington Savannah River Company, Savannah River Site, Aiken, SC

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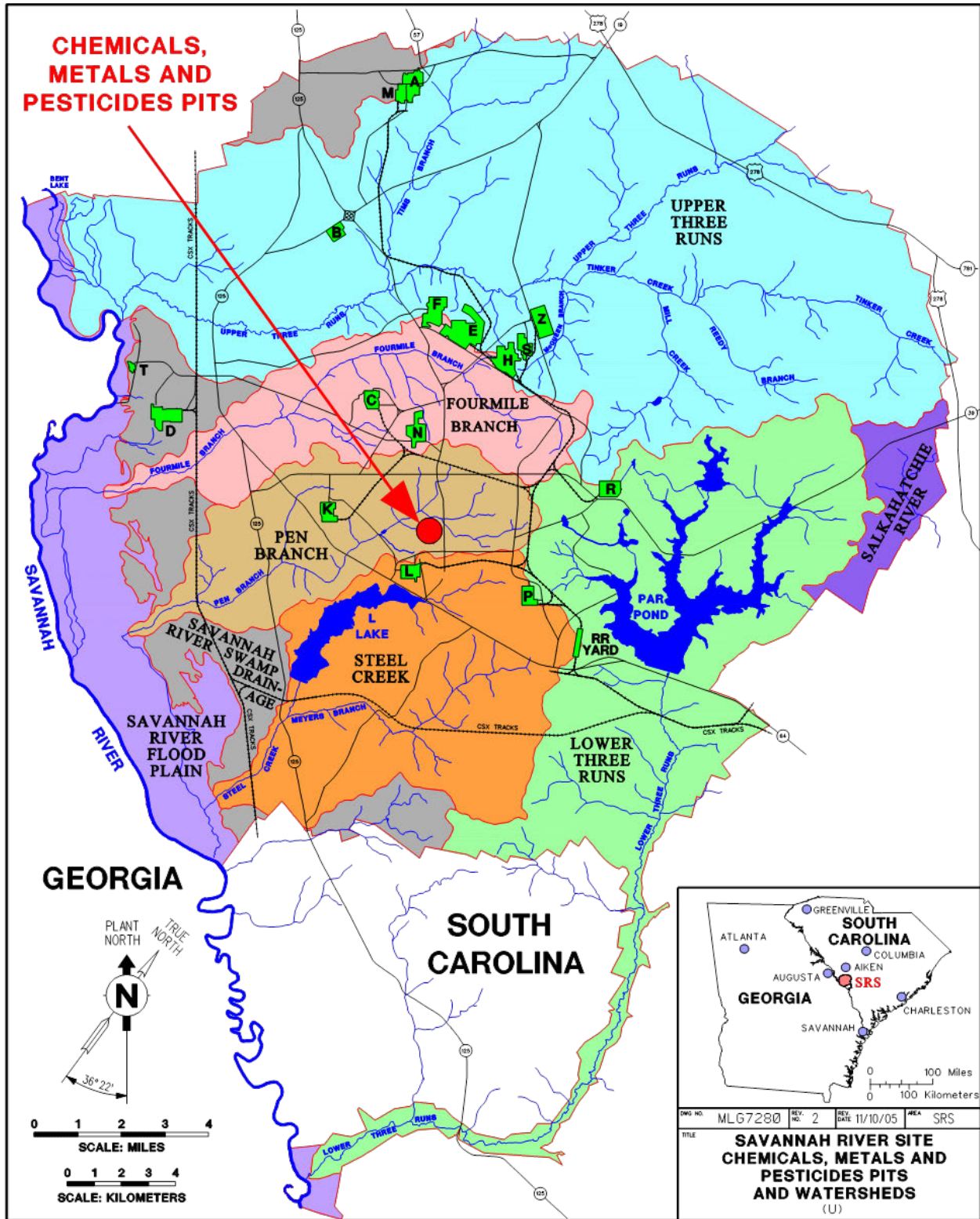


Figure 1. Location of the CMP Pits OU within the Savannah River Site

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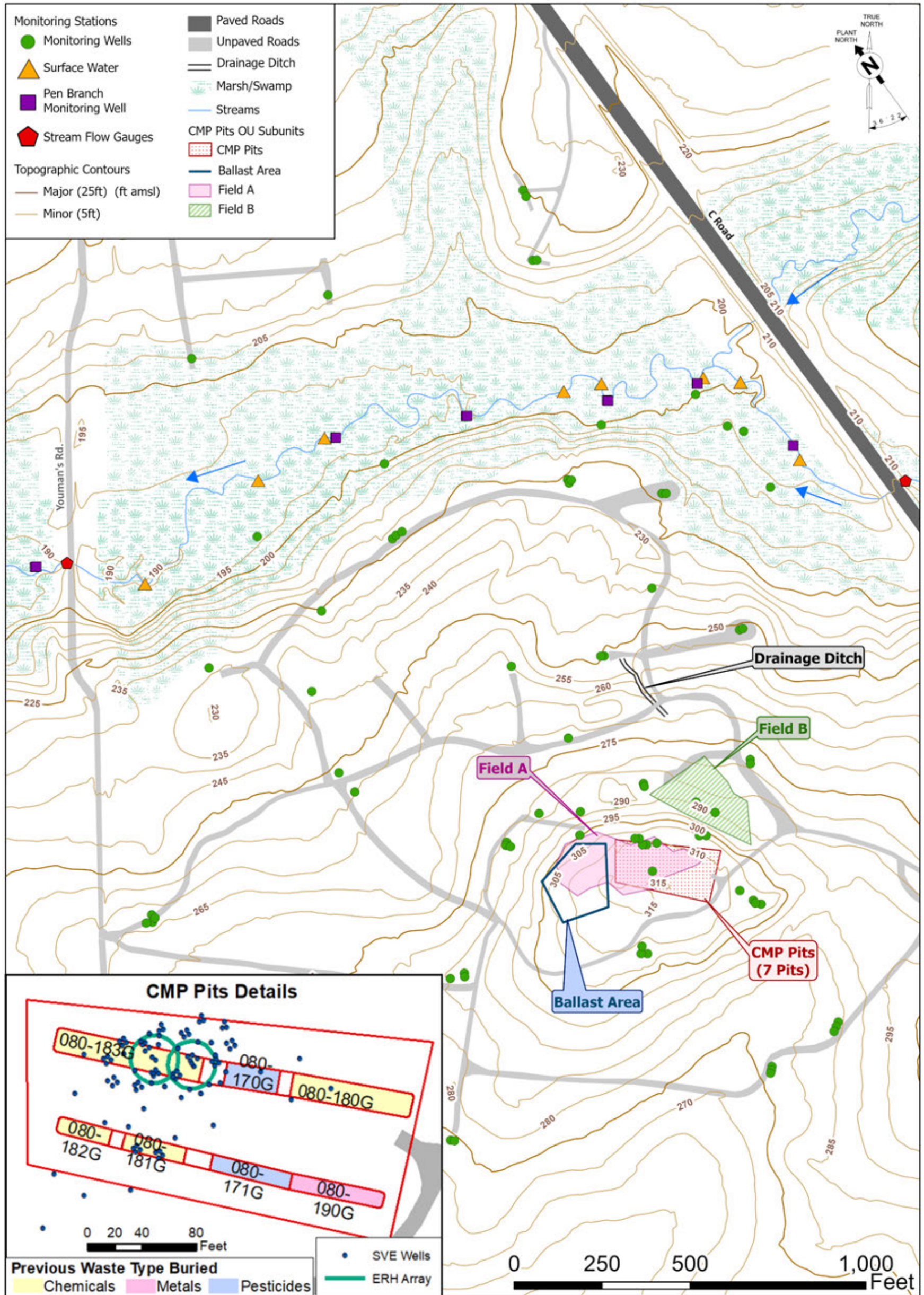
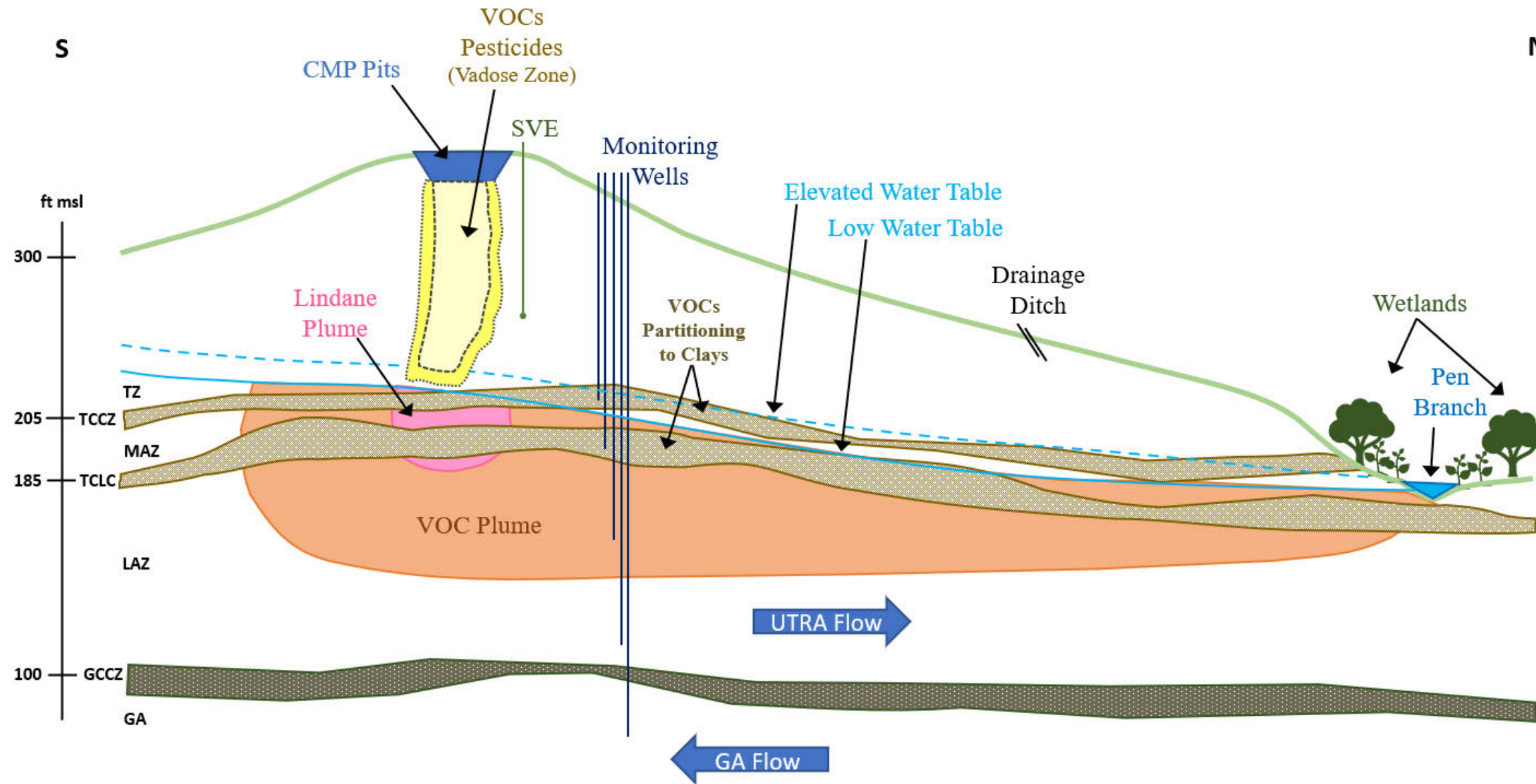


Figure 2. CMP Pits OU Subunits

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Notes: The TCCZ, TCLC, and GCCZ may not be competent clay units and may be hummocky, discontinuous, and/or leaky in some areas.  
Not drawn to scale.

Figure 3. CMP Pits Groundwater OU Conceptual Site Model (CSM)

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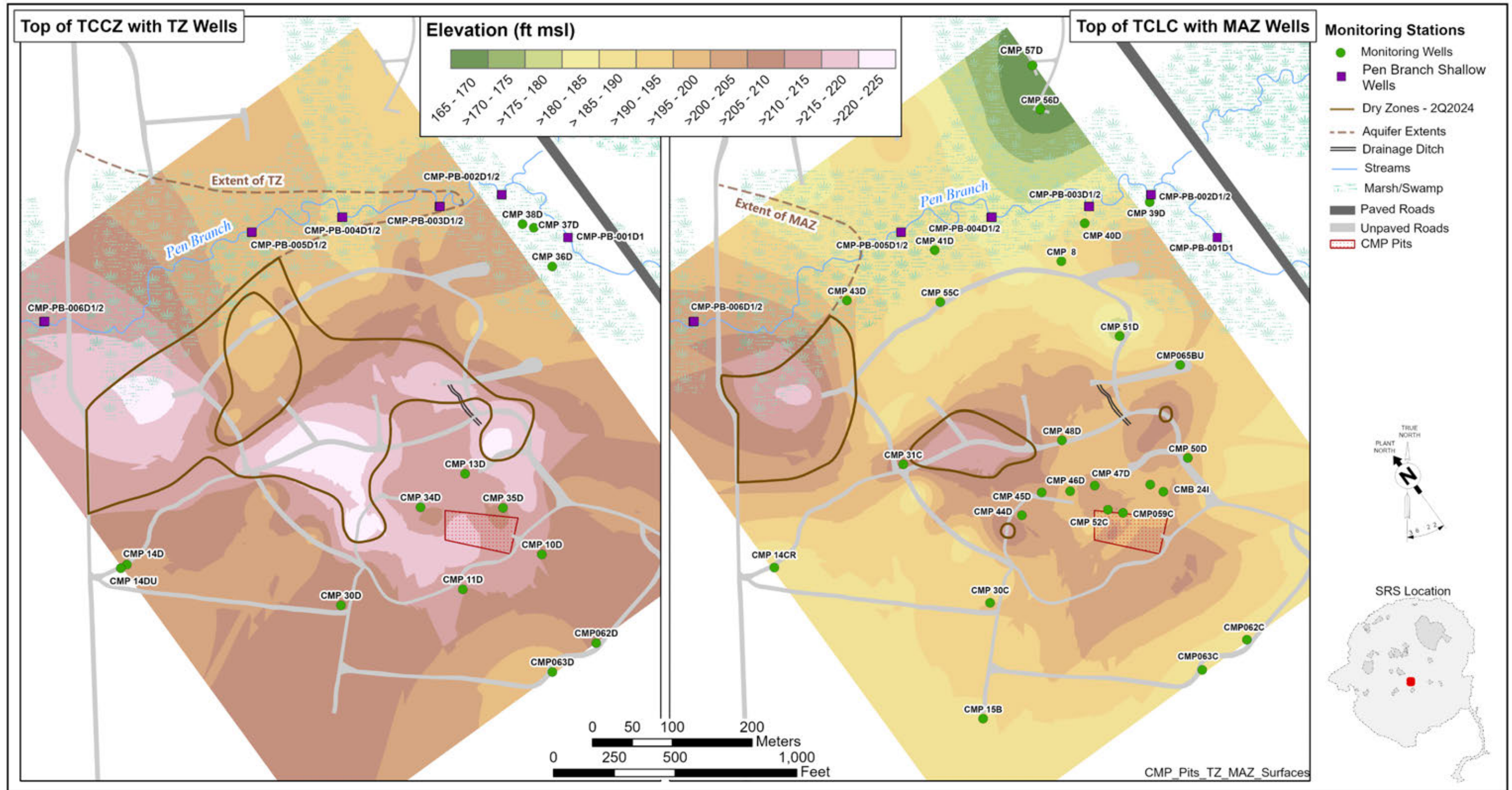


Figure 4. Stratigraphic Surfaces of the TCCZ and TCLC with 2Q2024 Dry Zones of the TZ and MAZ

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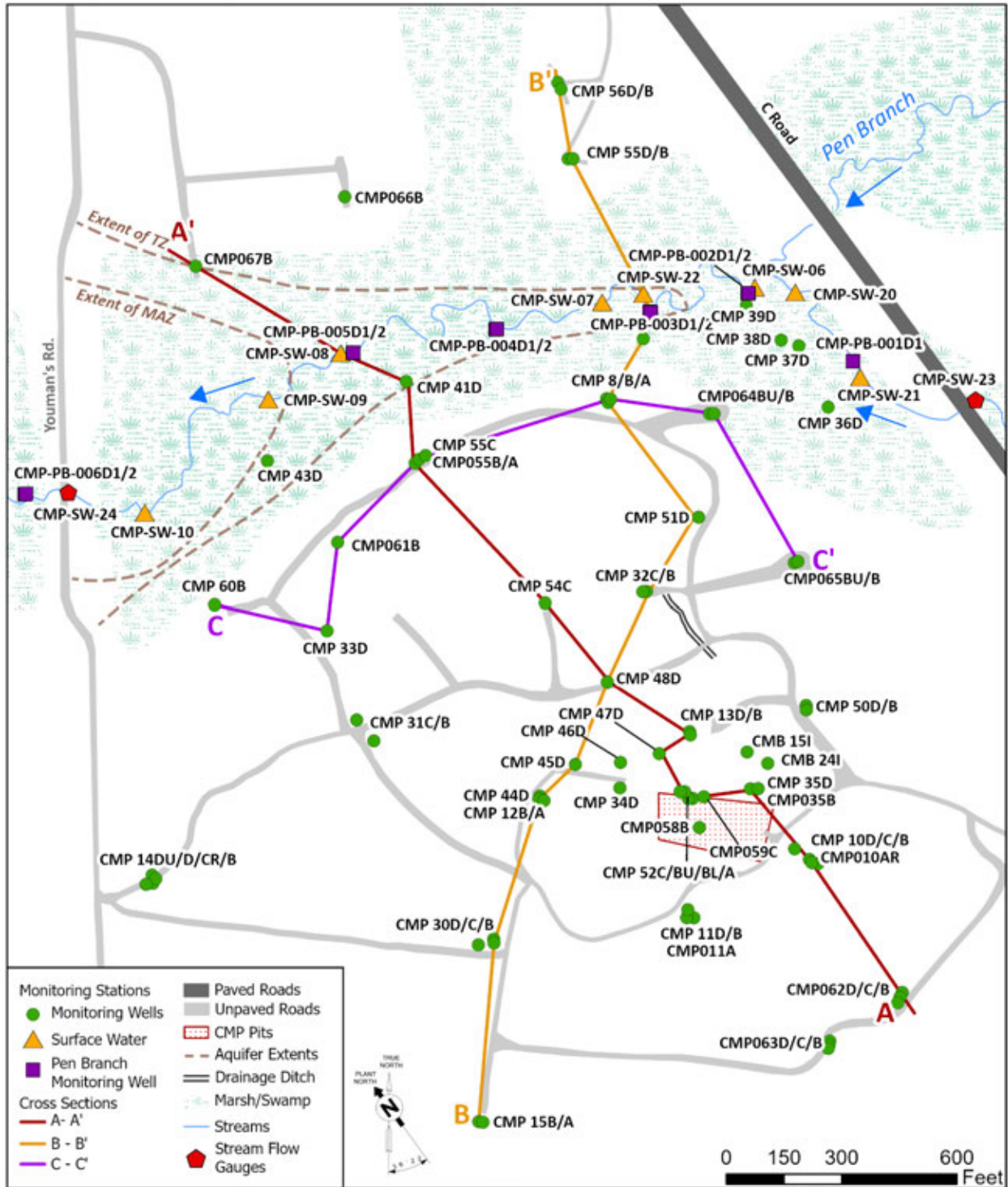


Figure 5. CMP Pits OU Monitoring Network, and Cross Section Lines

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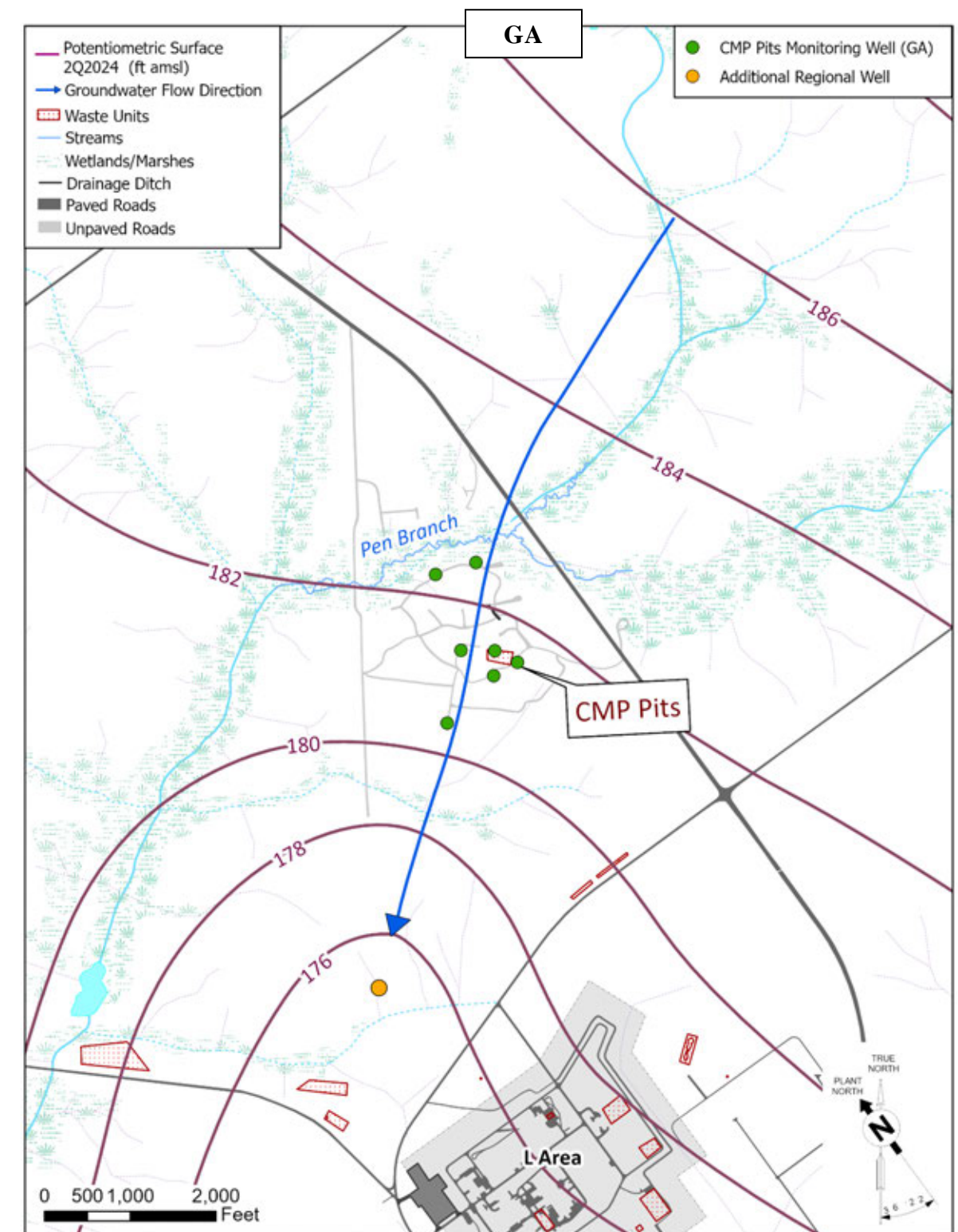
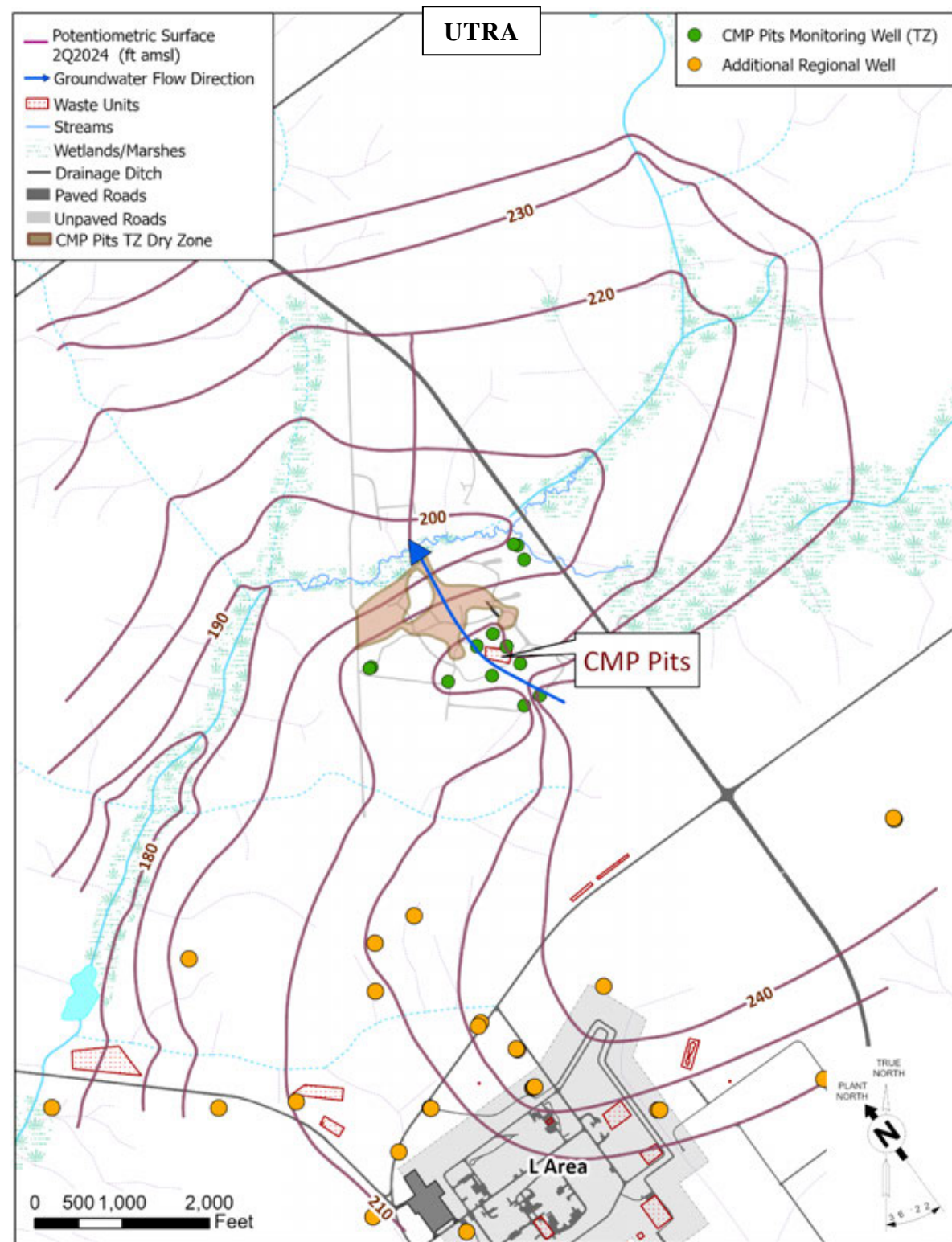


Figure 6. Regional Water Table and GA Potentiometric Surface, 2Q2024

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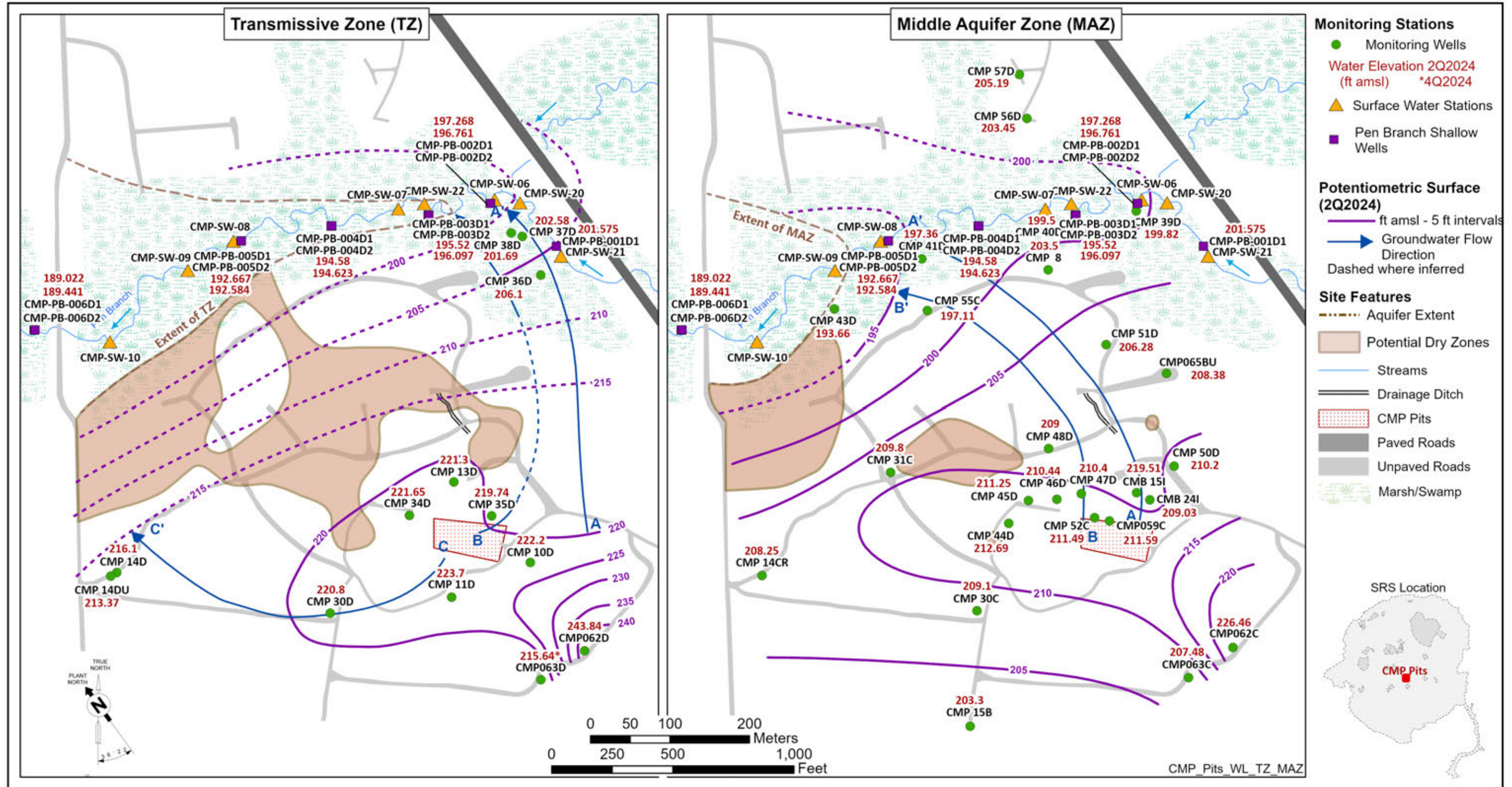


Figure 7. 2024 Potentiometric Surface for the TZ and MAZ

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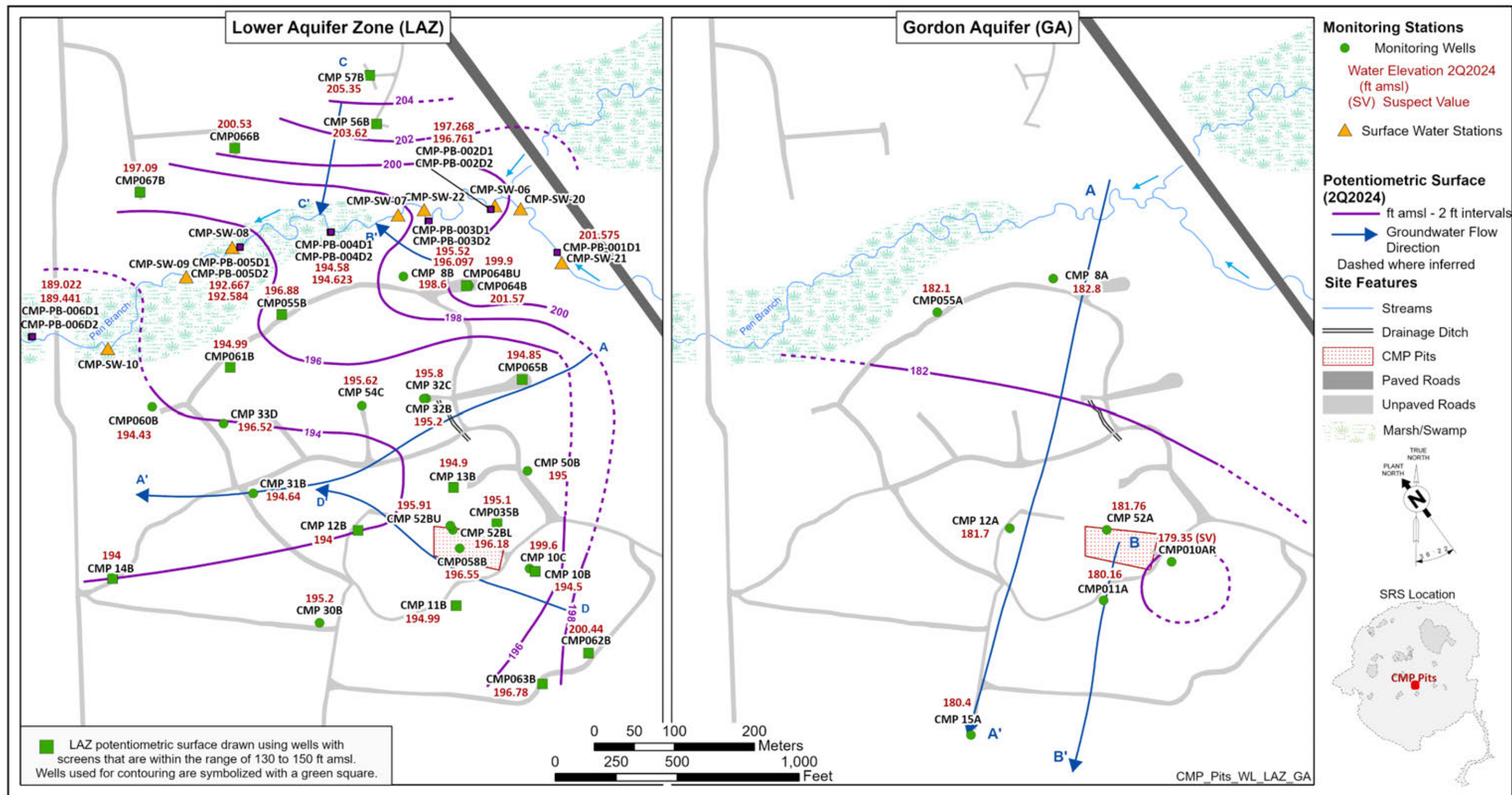


Figure 8. 2024 Potentiometric Surface for the LAZ and GA

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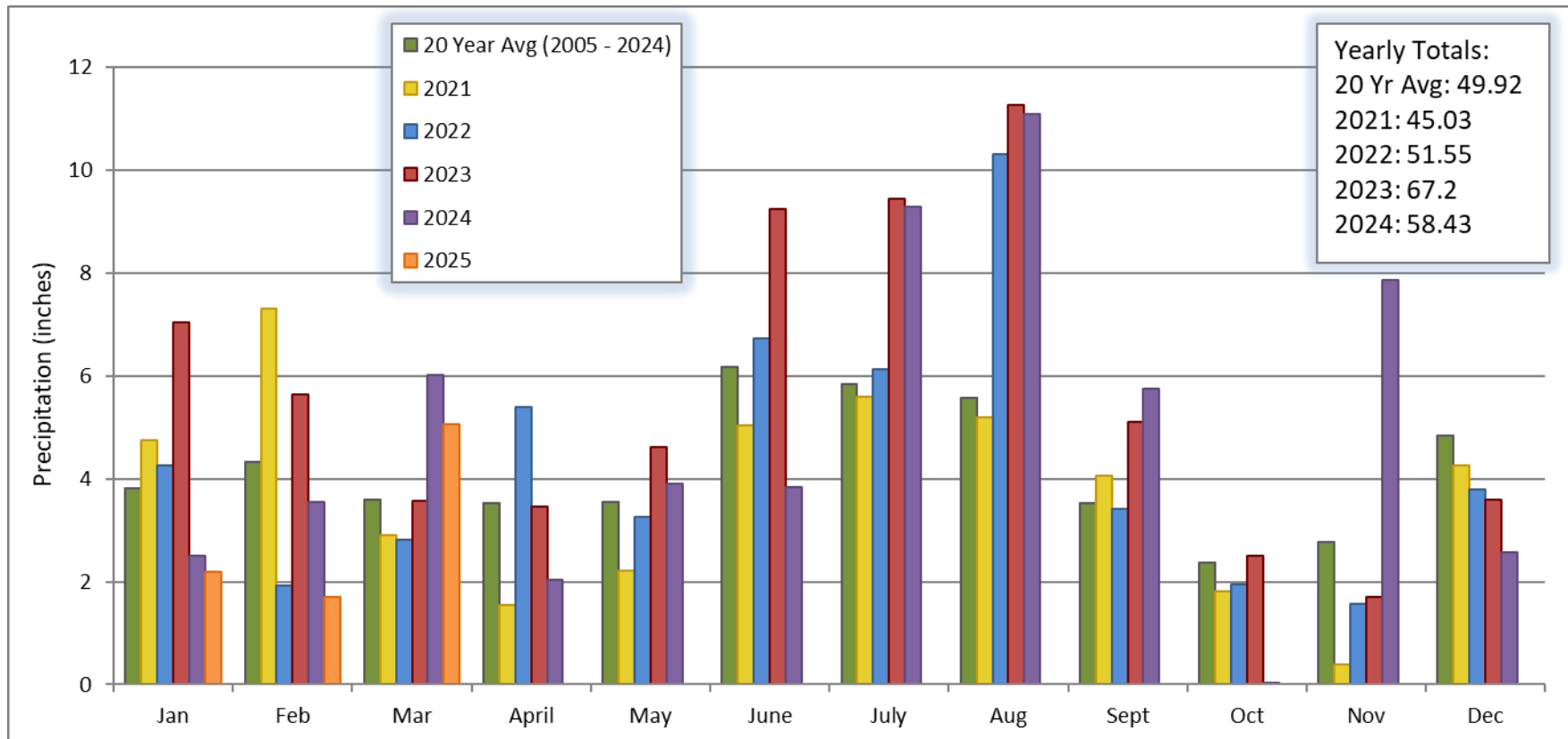


Figure 9. Monthly Rainfall Measurements in L-Area for 2025, 2024, 2023, 2022, 2021, and the 20-Year Average

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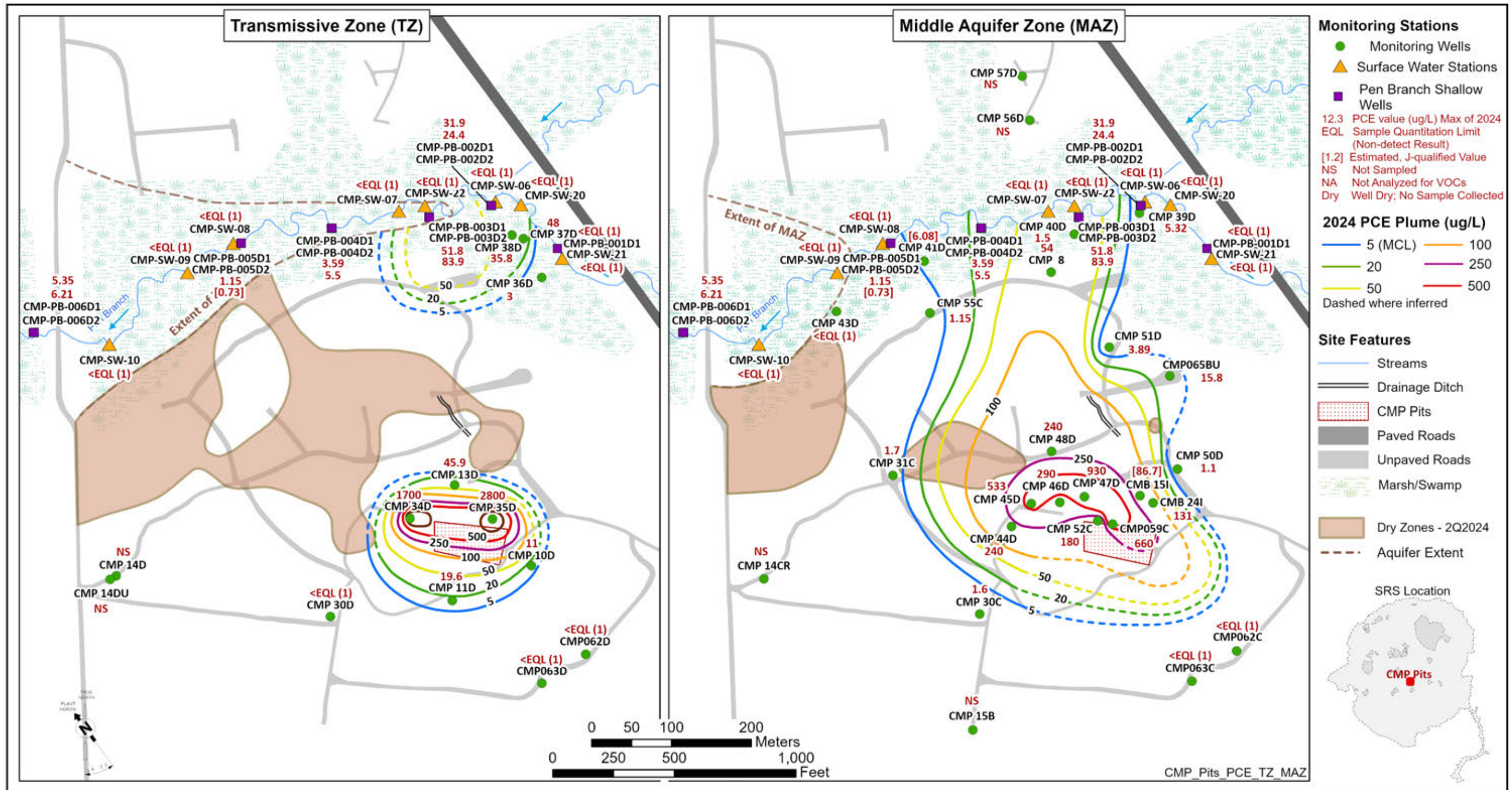


Figure 10. 2024 PCE Plume and Groundwater and Surface Water Results for the TZ and MAZ

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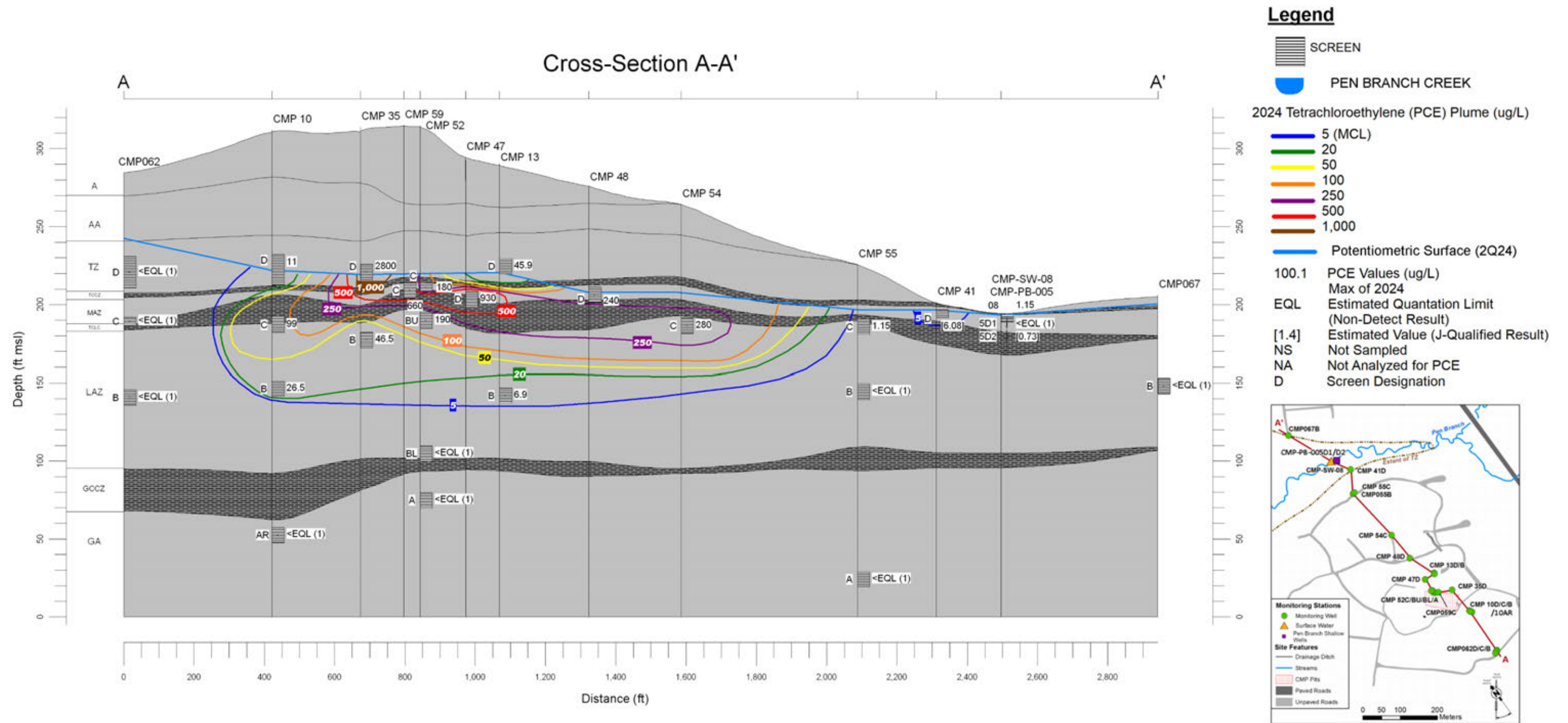


Figure 12. Cross Section A - A' at the CMP Pits OU Area with 2024 PCE Plume and Results

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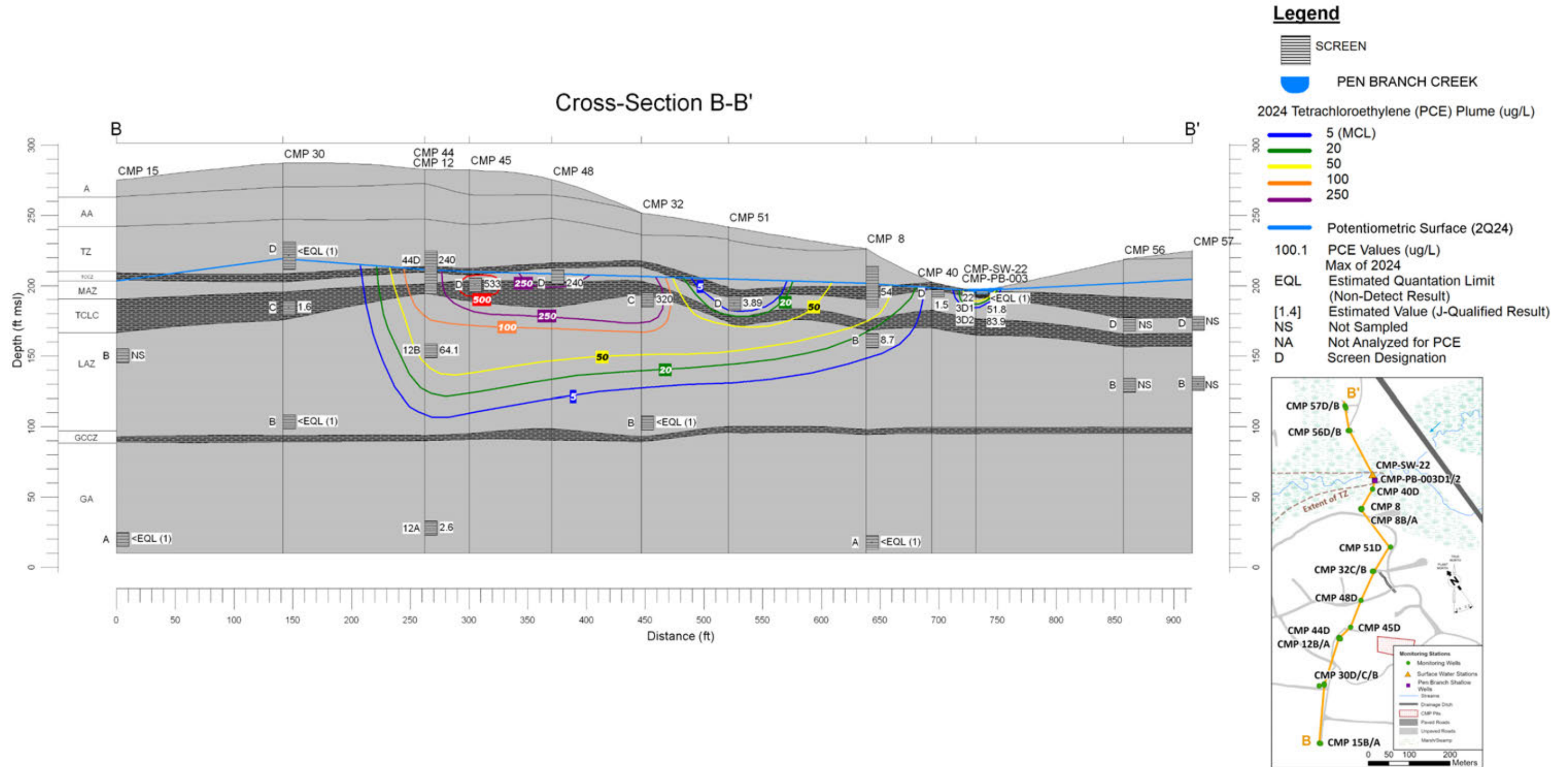


Figure 13. Cross Section B - B' at the CMP Pits OU Area with 2024 PCE Plume and Results

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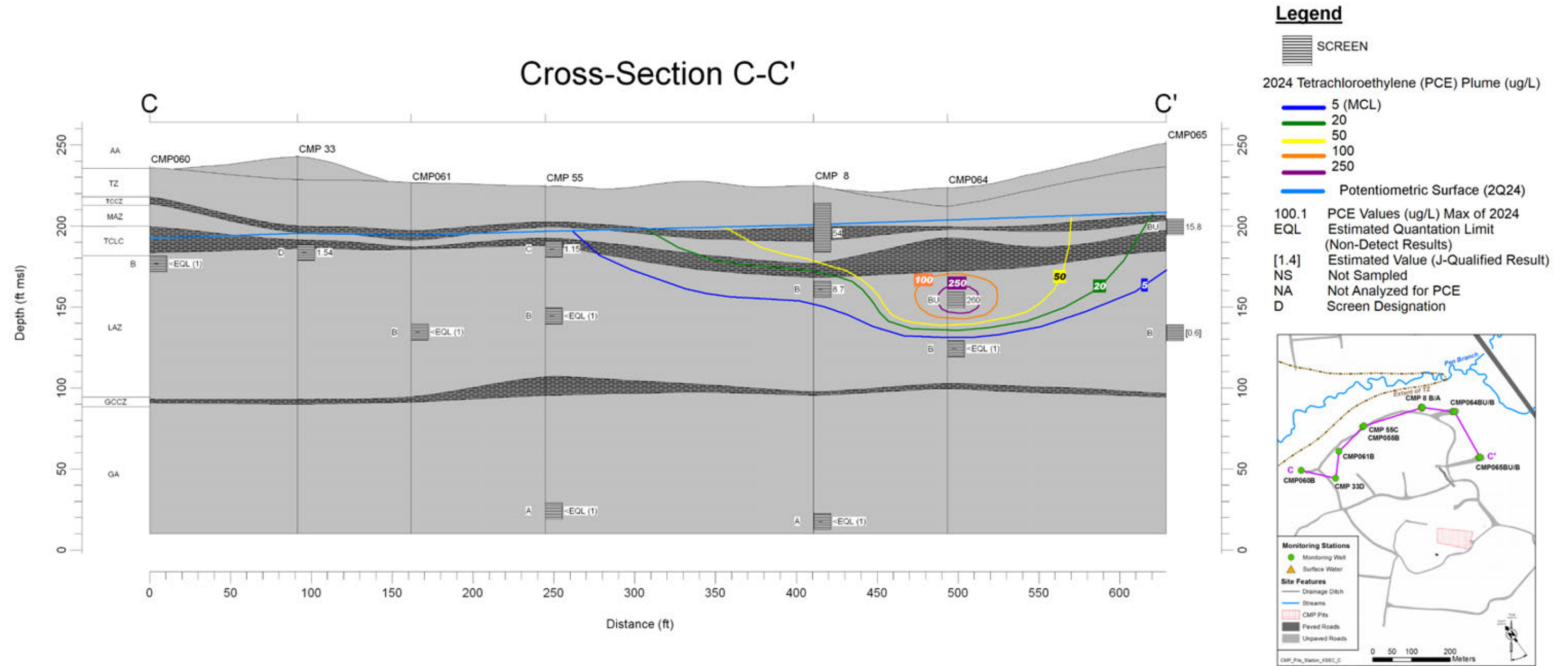


Figure 14. Cross Section C - C' at the CMP Pits OU Area with 2024 PCE Plume and Results

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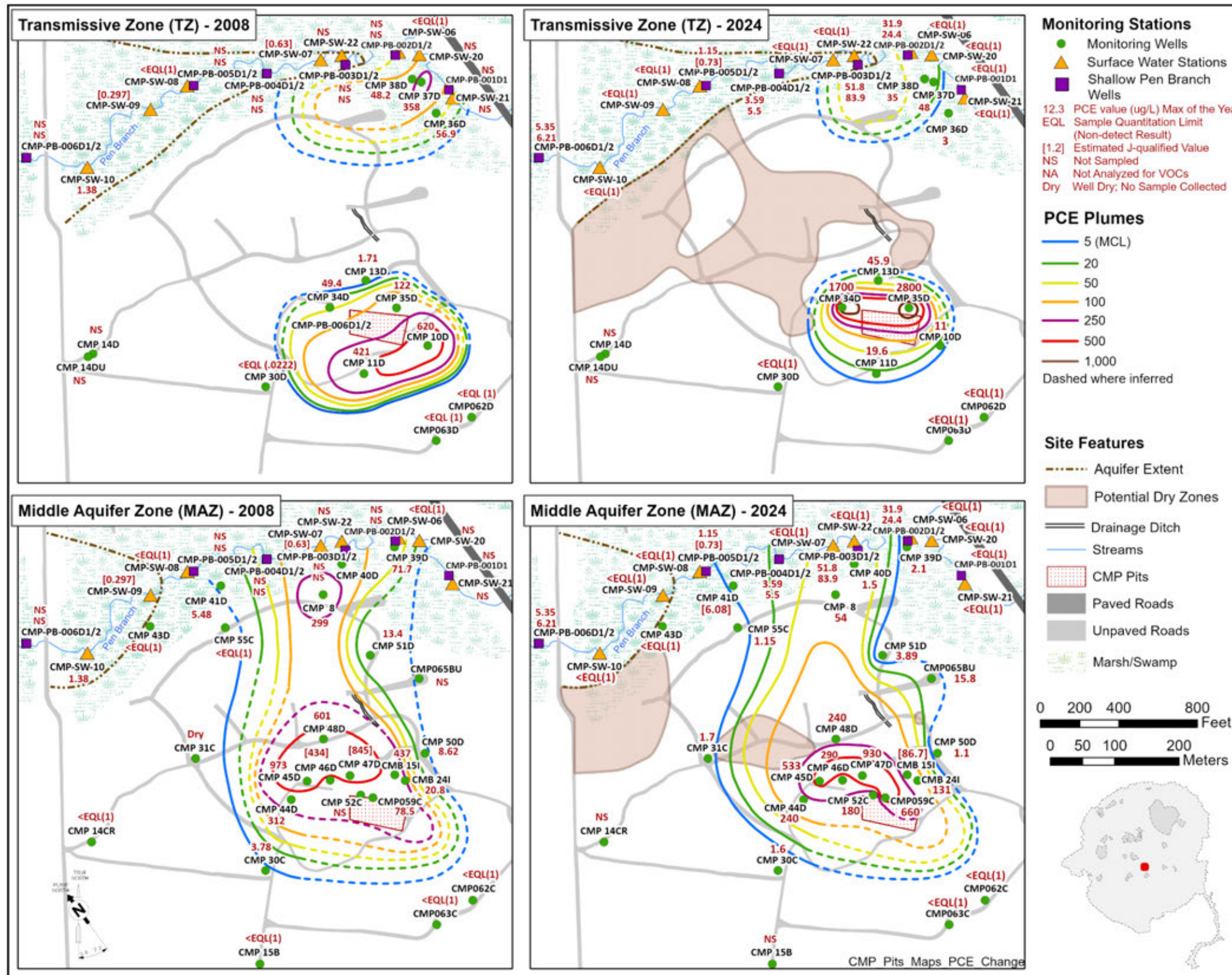


Figure 15. PCE Plume Comparison from 2008 and 2024 in the TZ and MAZ

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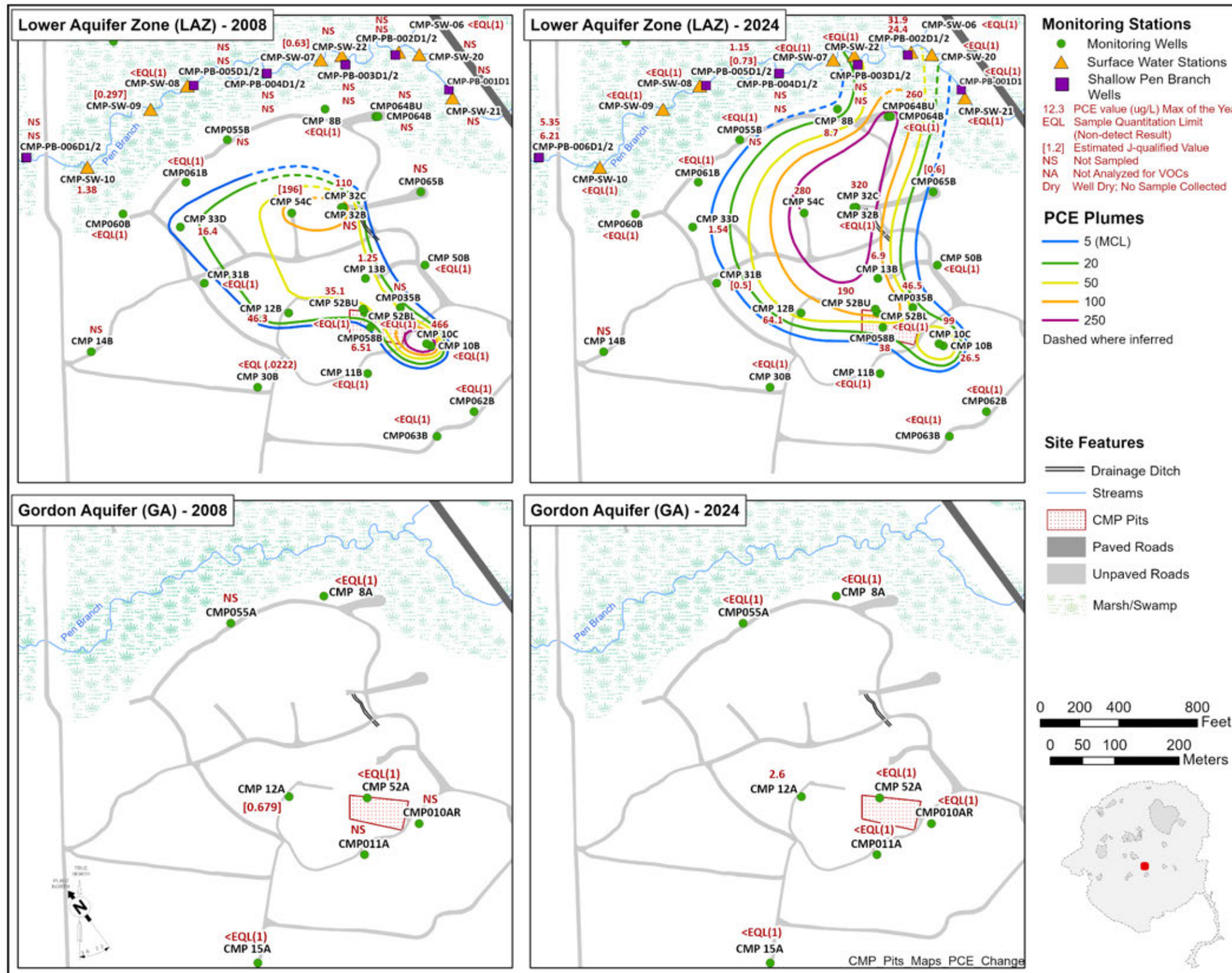


Figure 16. PCE Plume Comparison from 2008 and 2024 in the LAZ and GA

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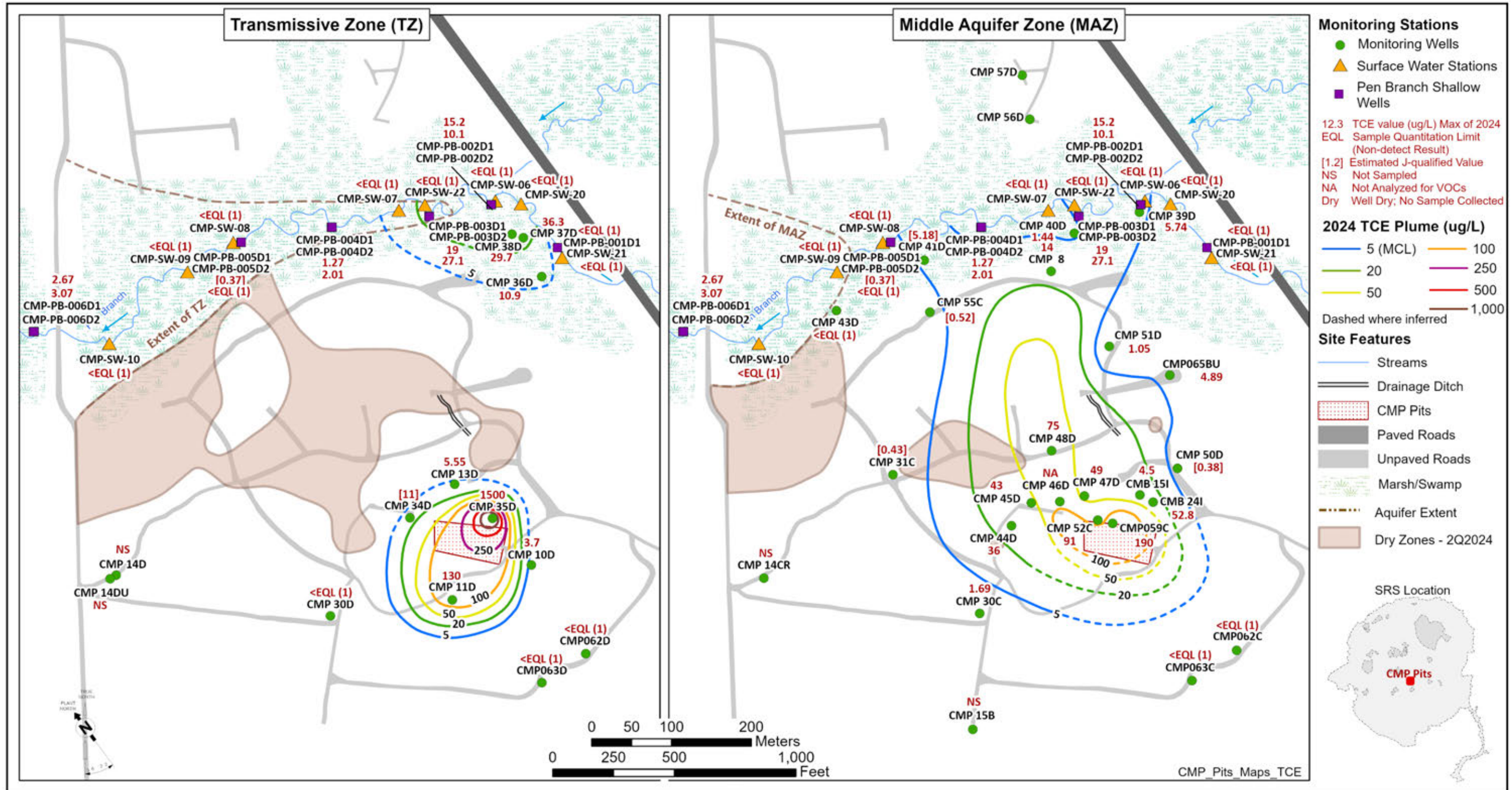


Figure 17. 2024 TCE Plume and Groundwater and Surface Water Results in the TZ and MAZ

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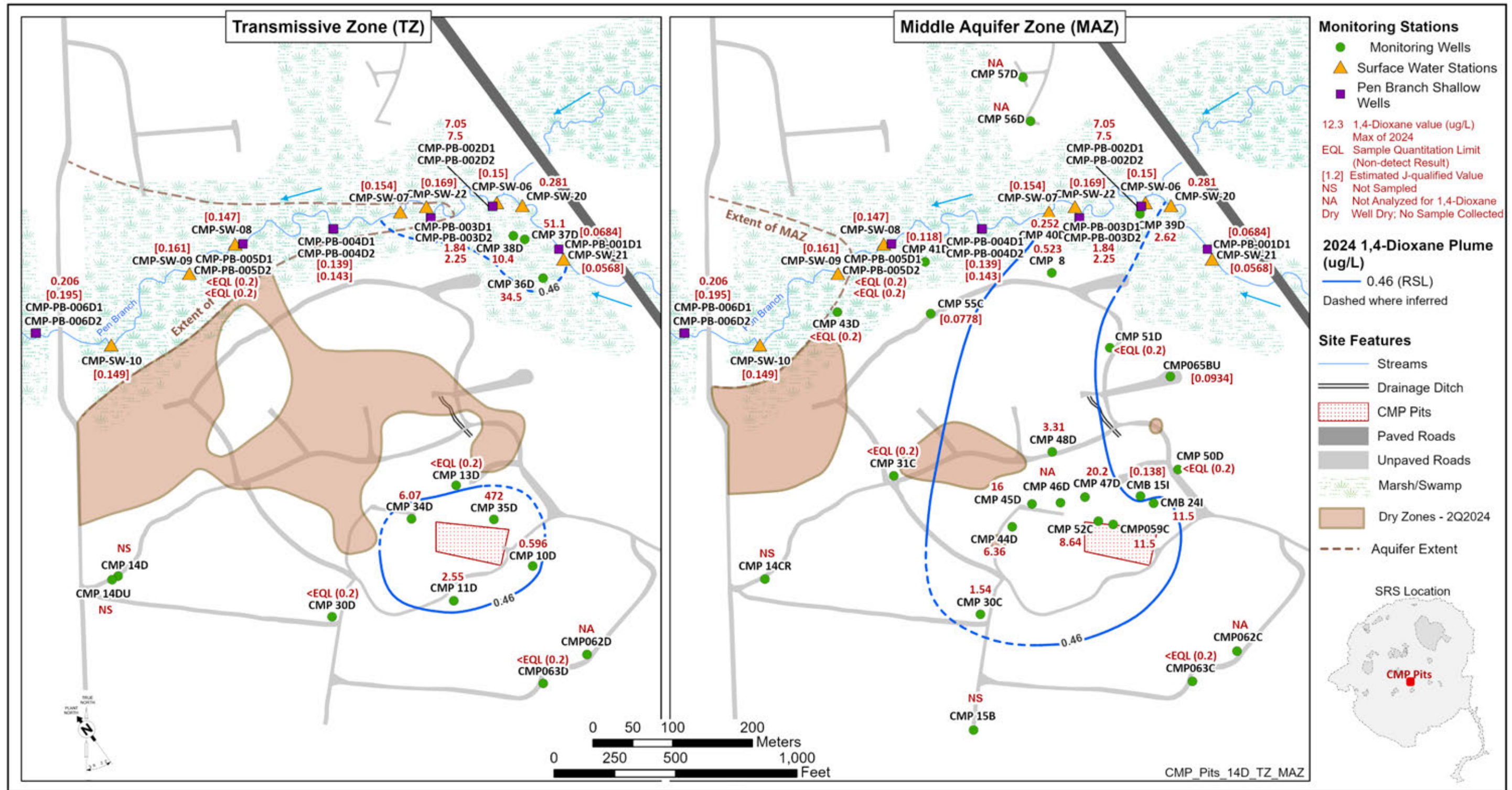


Figure 19. 2024 1,4-Dioxane Plume and Groundwater Results for the TZ and MAZ

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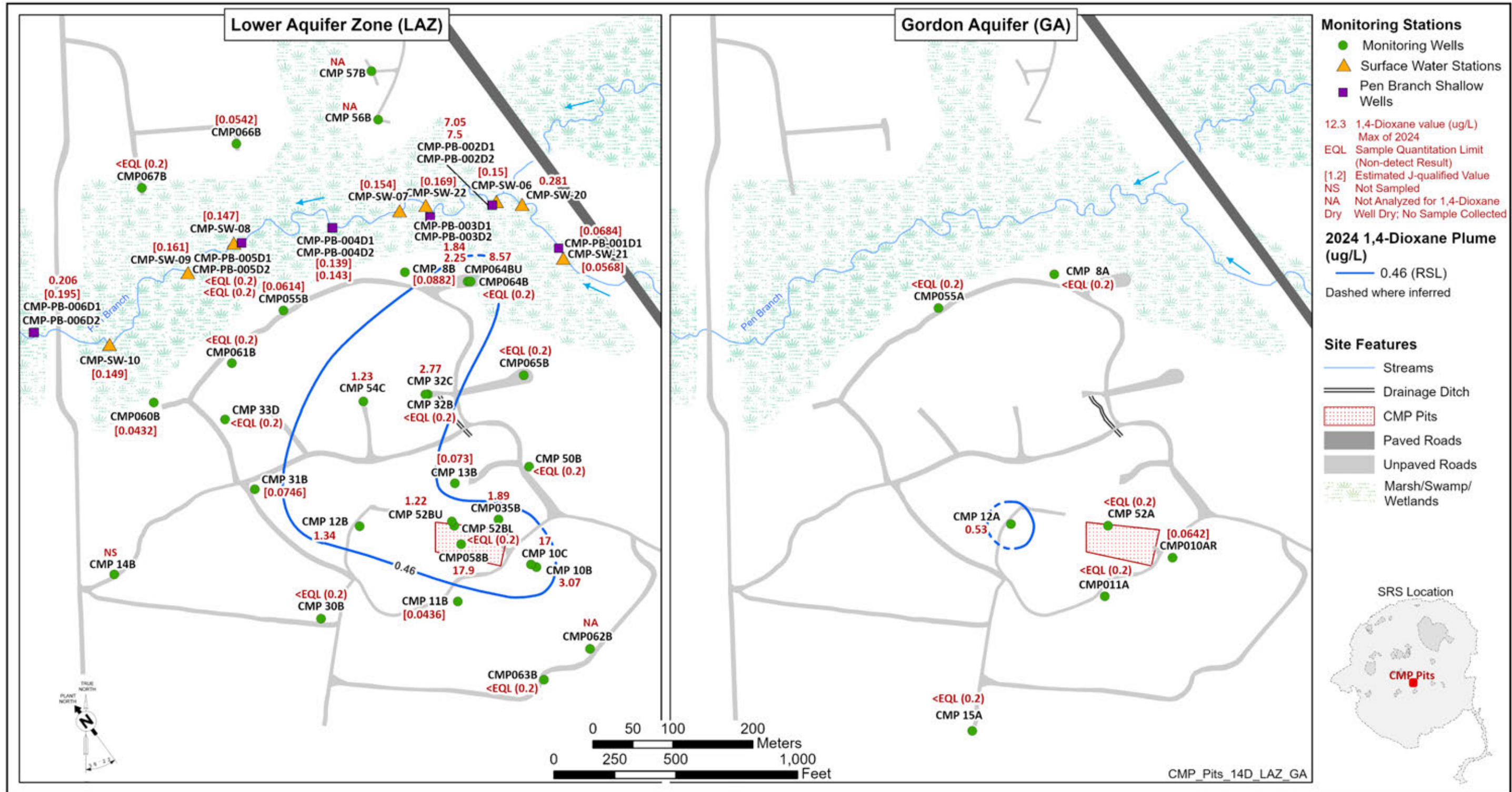


Figure 20. 2024 1,4-Dioxane Plume and Groundwater Results for the LAZ and GA

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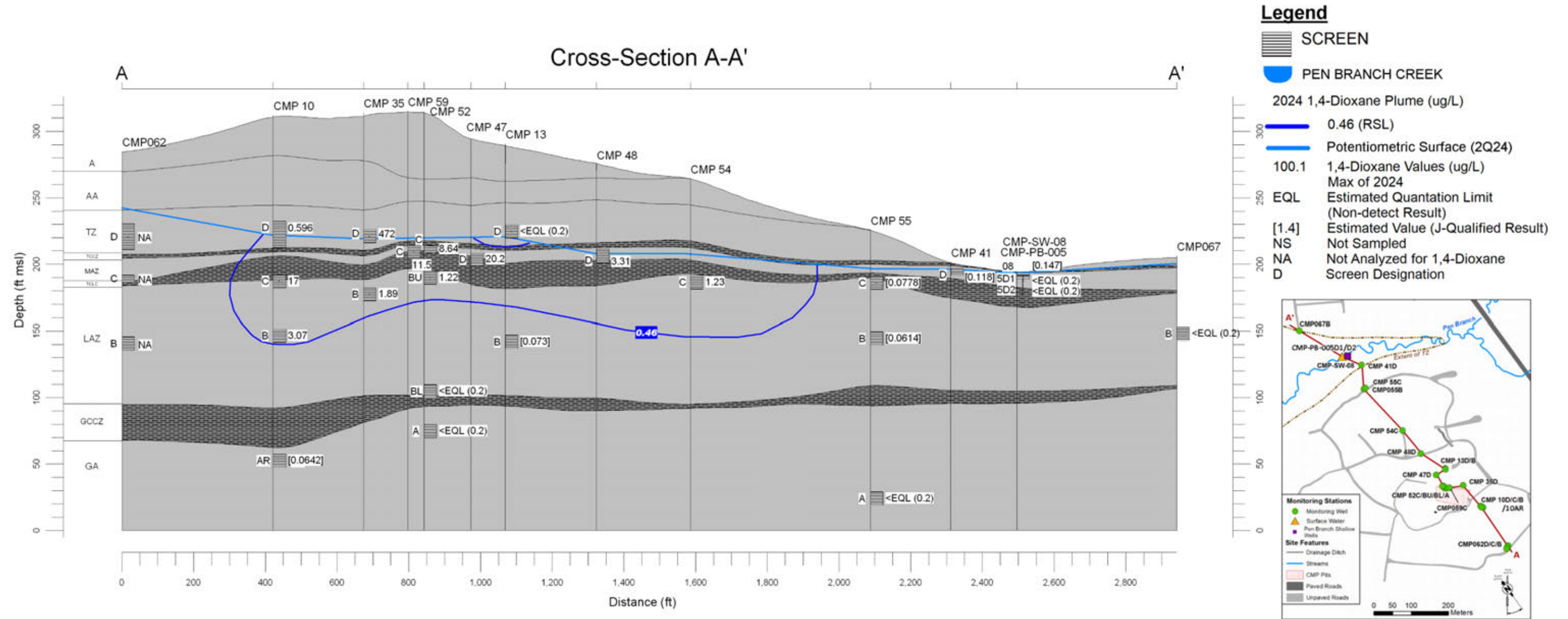


Figure 21. Cross Section A - A' at the CMP Pits OU Area with 2024 1,4-Dioxane Plume and Results

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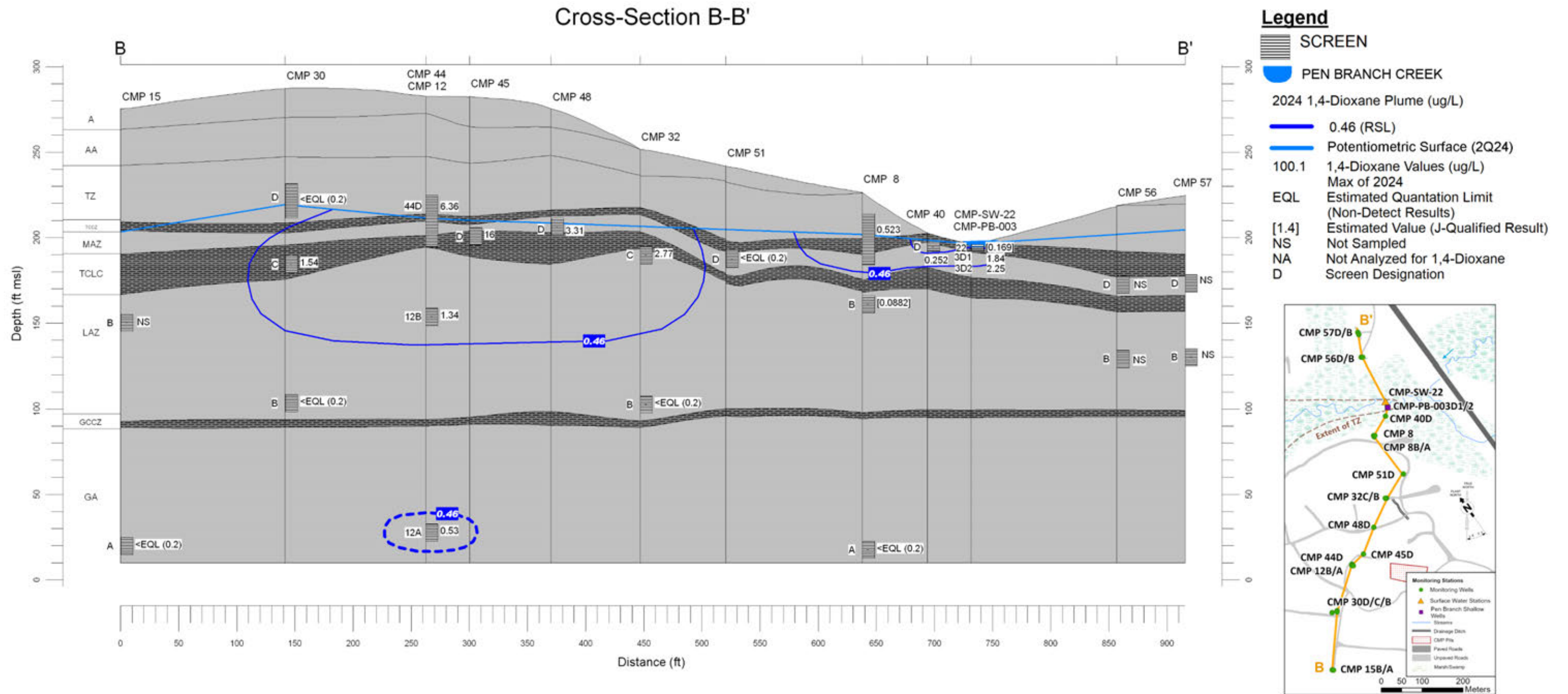


Figure 22. Cross Section B - B' at the CMP Pits OU Area with 2024 1,4-Dioxane Plume and Results

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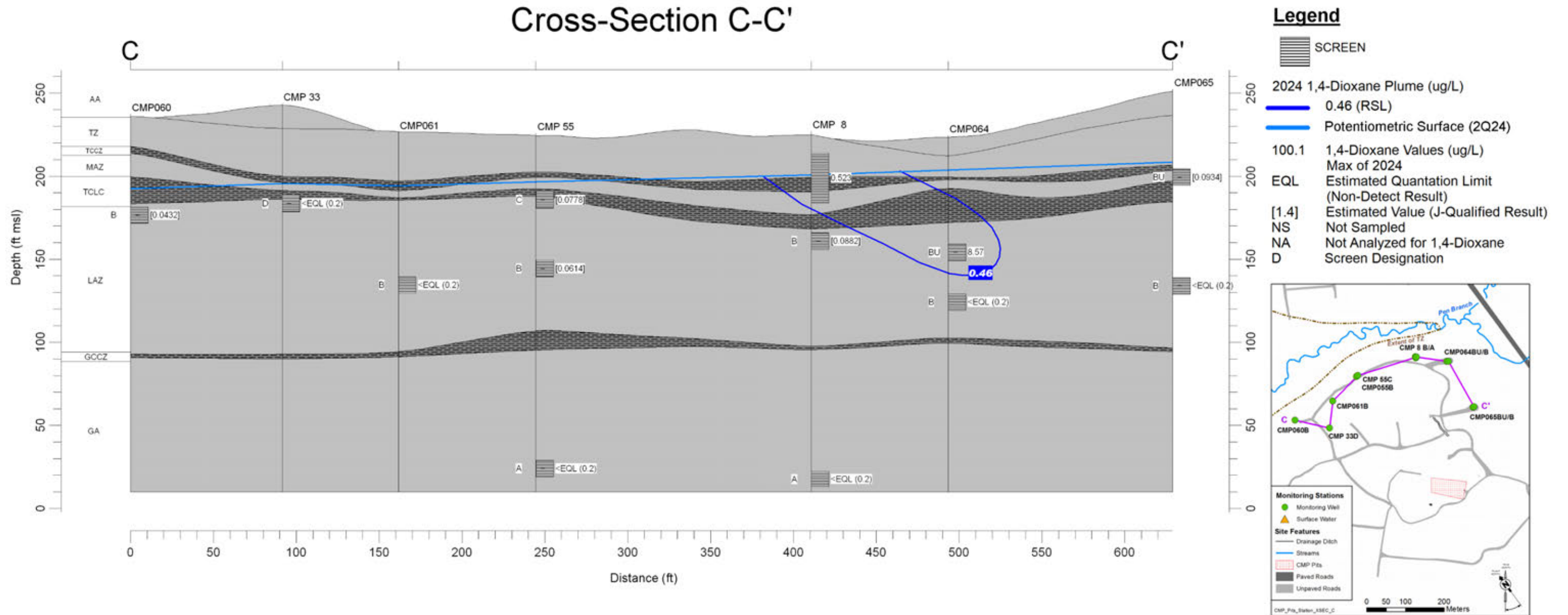


Figure 23. Cross Section C - C' at the CMP Pits OU Area with 2024 1,4-Dioxane Plume and Results

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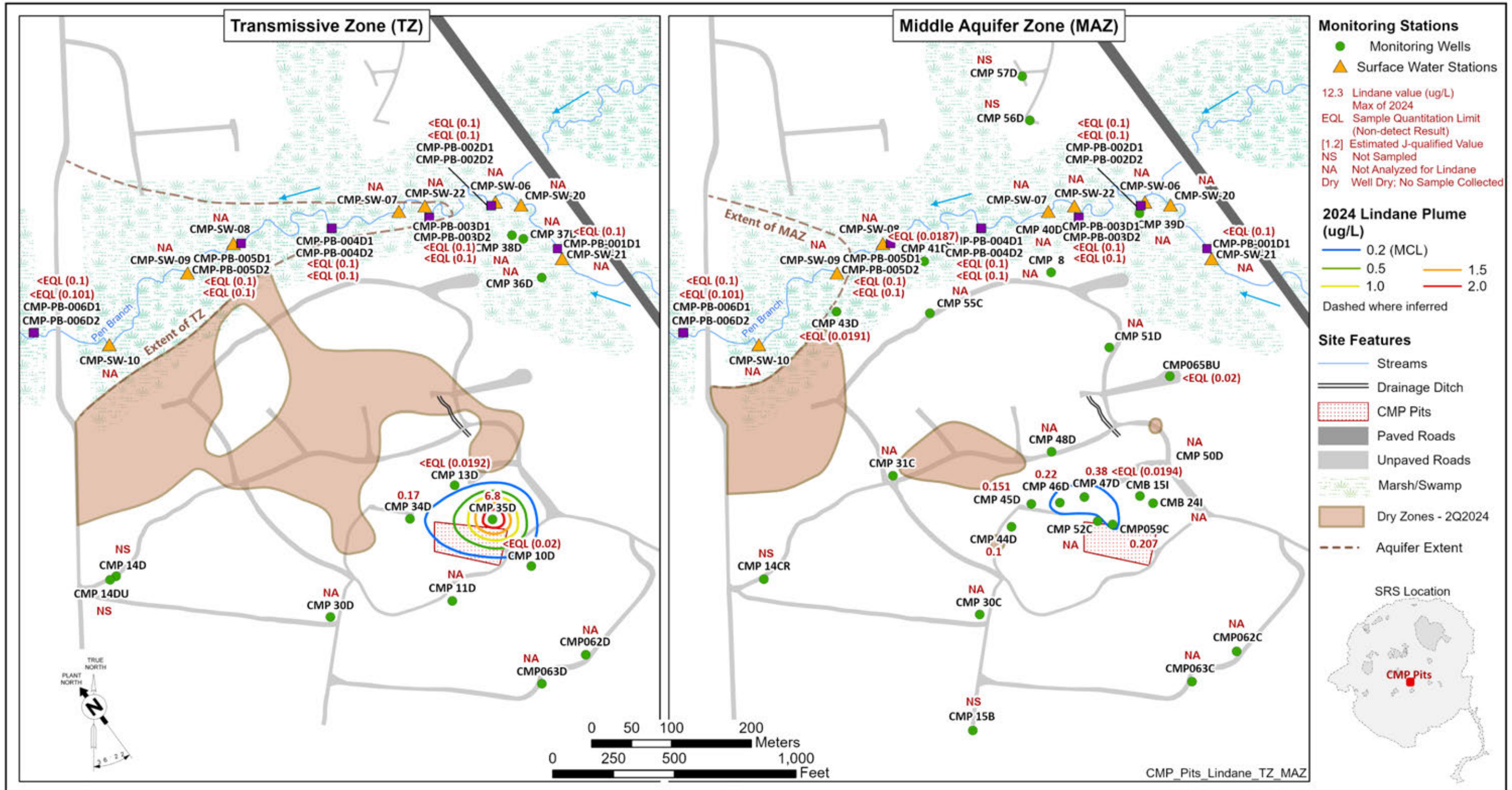


Figure 24. 2024 Lindane Plume and Groundwater Results for the TZ and MAZ

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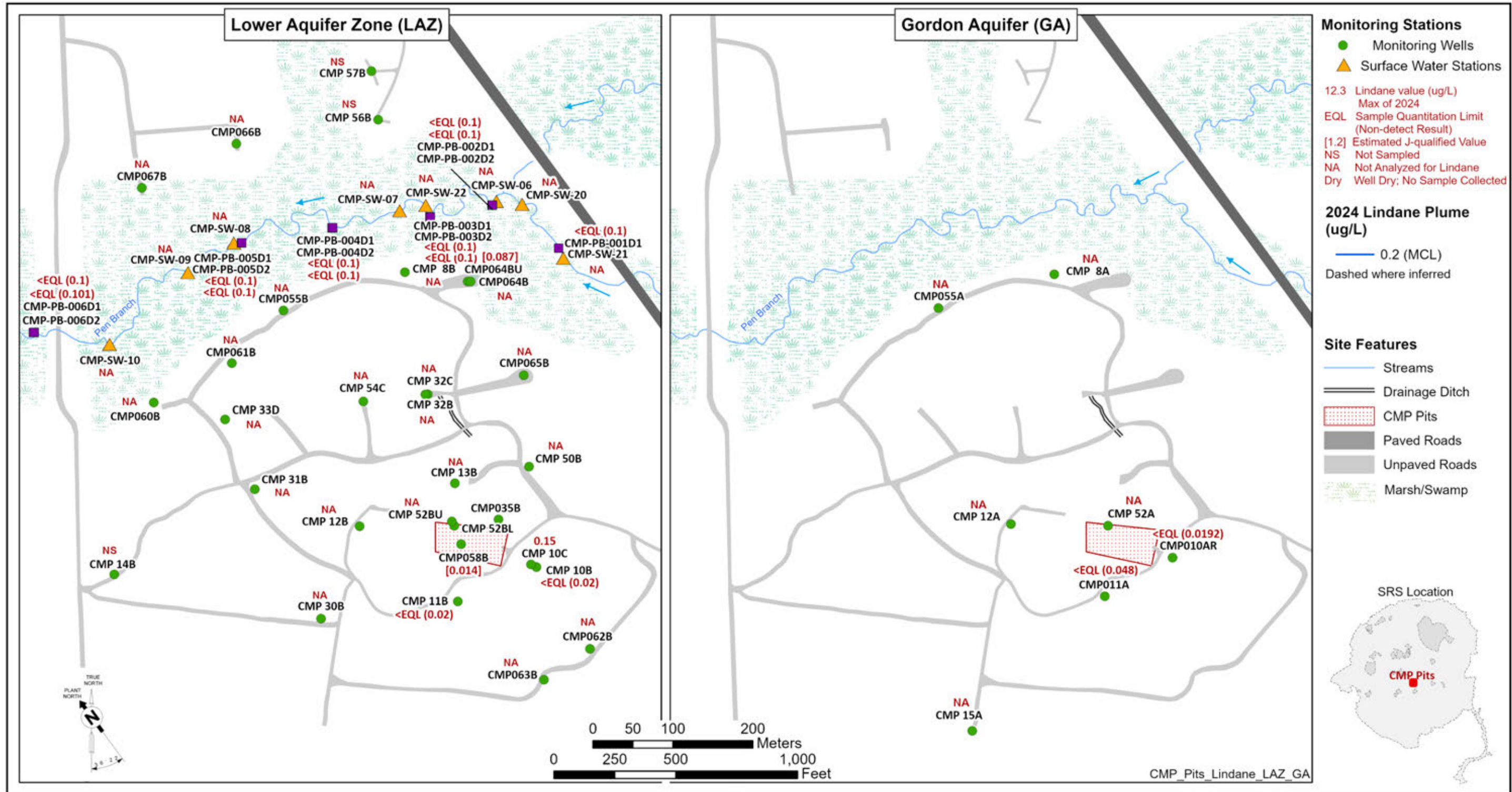


Figure 25. 2024 Lindane Plume and Groundwater Results for the LAZ and GA

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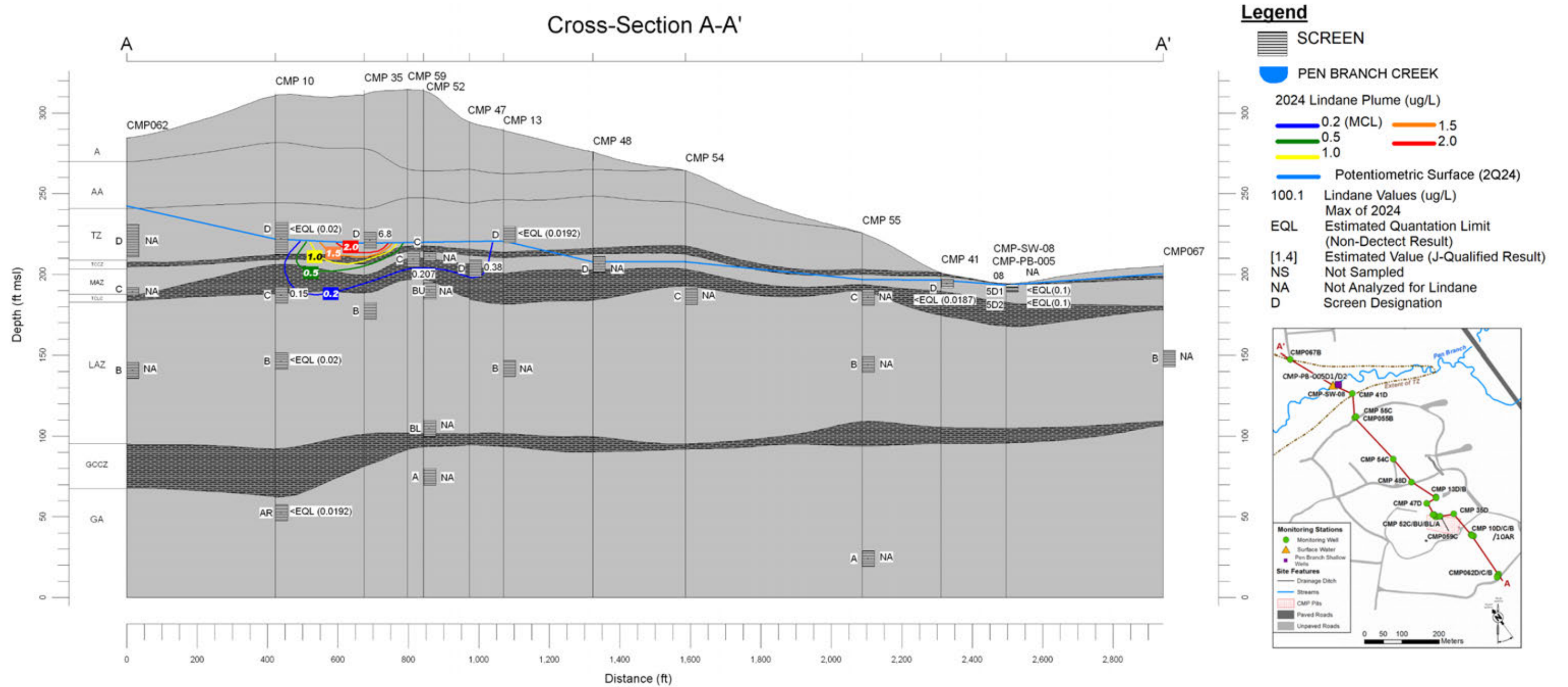


Figure 26. Cross Section A - A' at the CMP Pits OU Area with 2024 Lindane Plume and Results

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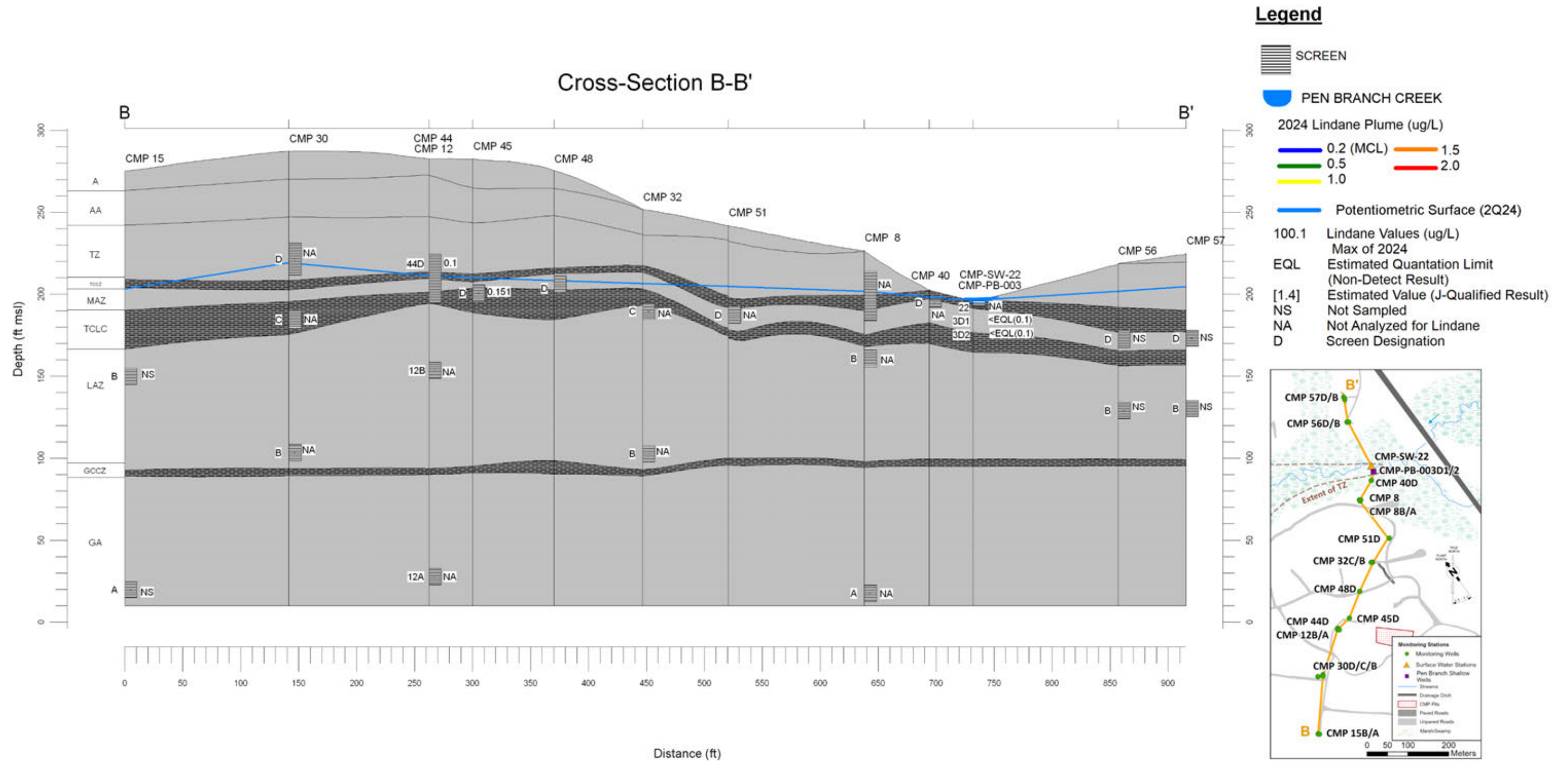


Figure 27. Cross Section B - B' at the CMP Pits OU Area with 2024 Lindane Plume and Results

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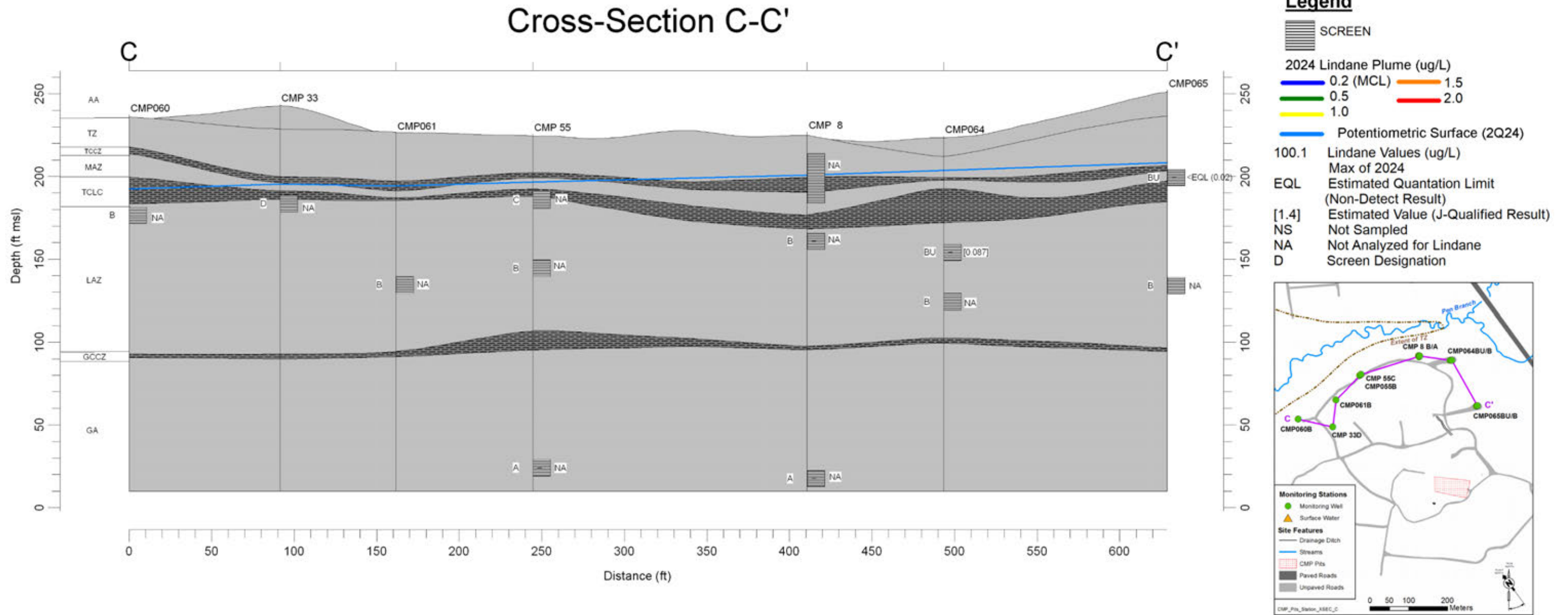


Figure 28. Cross Section C - C' at the CMP Pits OU Area with 2024 Lindane Plume and Results

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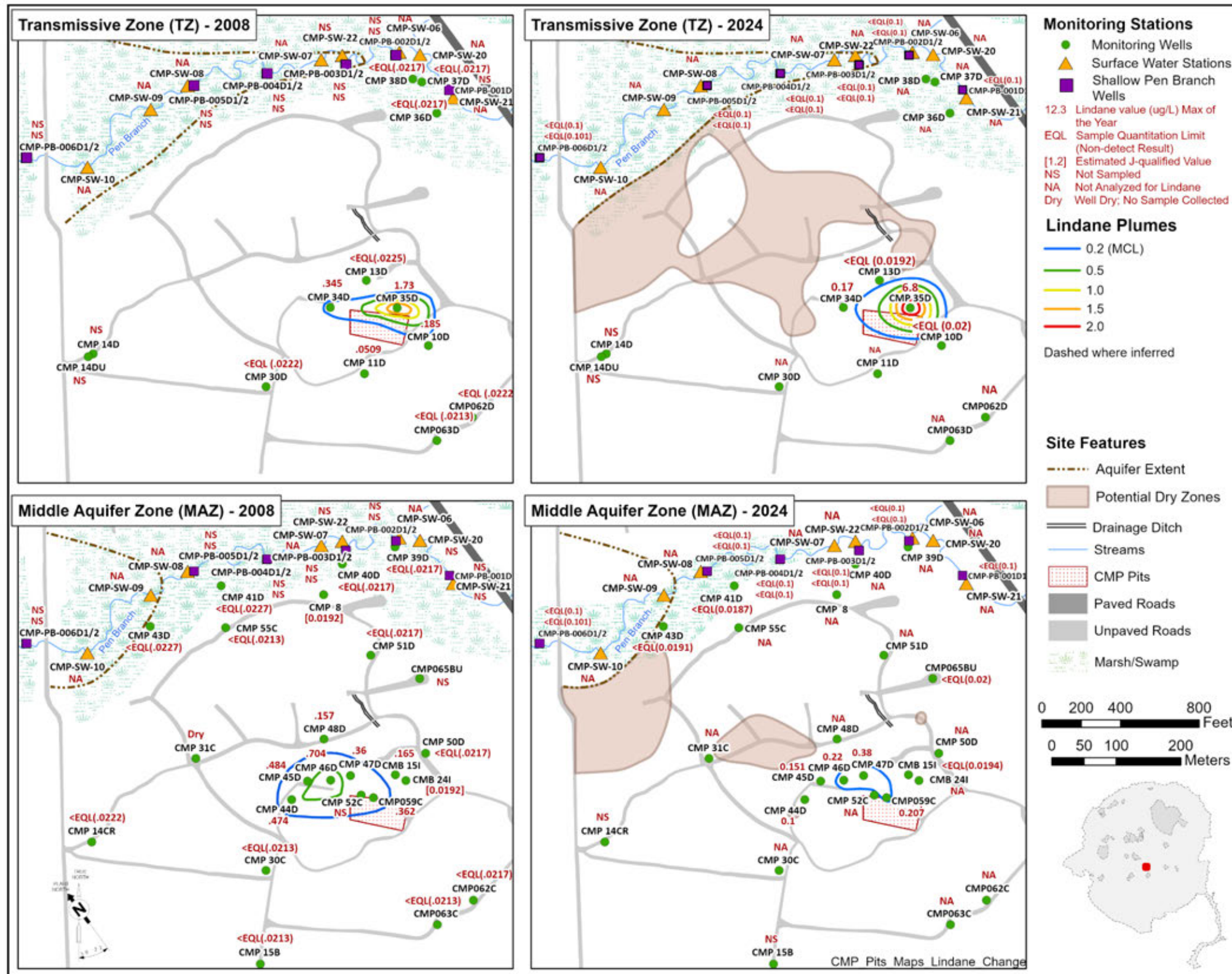


Figure 29. Lindane Plume Comparison from 2008 and 2024 in the TZ and MAZ

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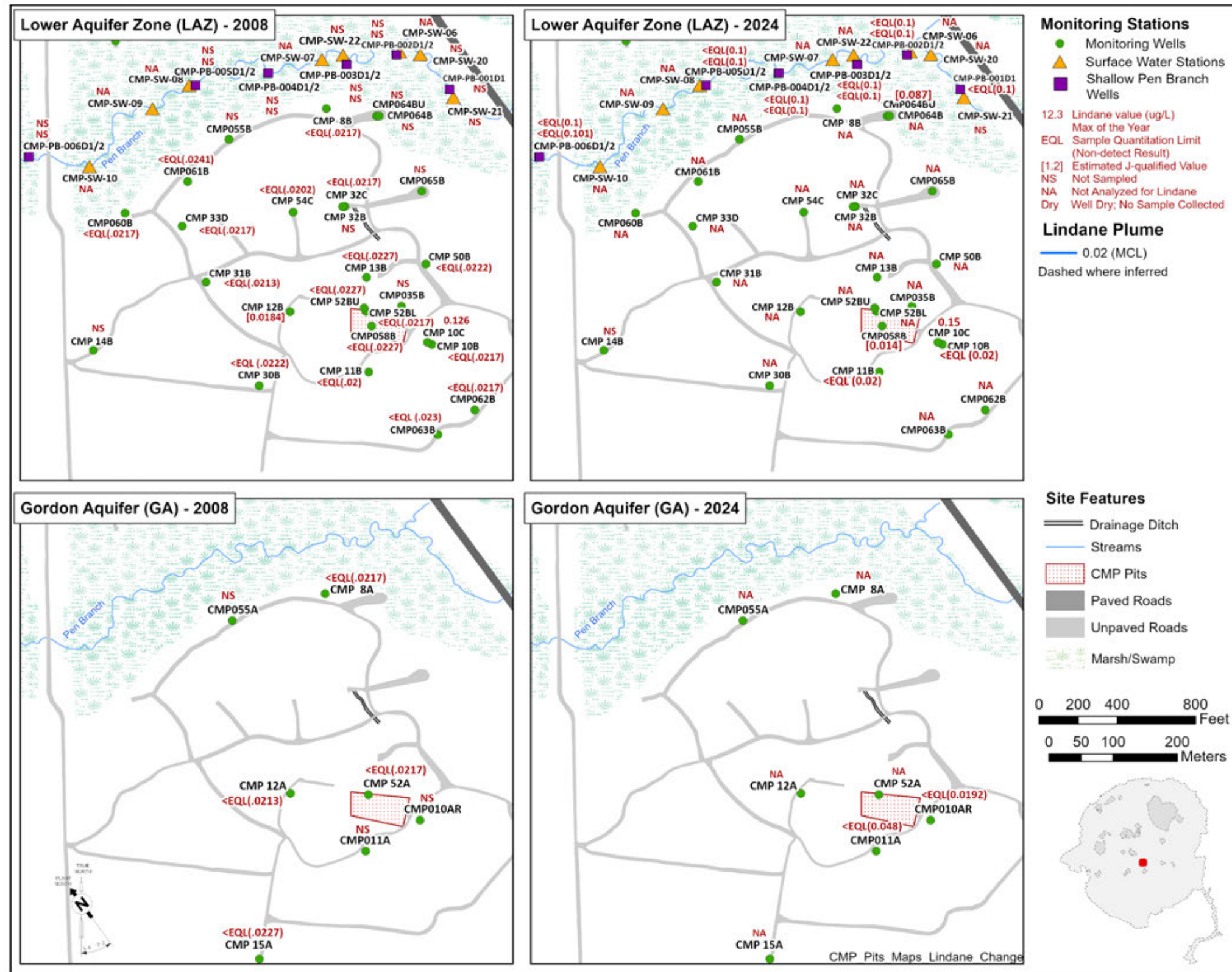


Figure 30. Lindane Plume Comparison from 2008 and 2024 in the LAZ and GA

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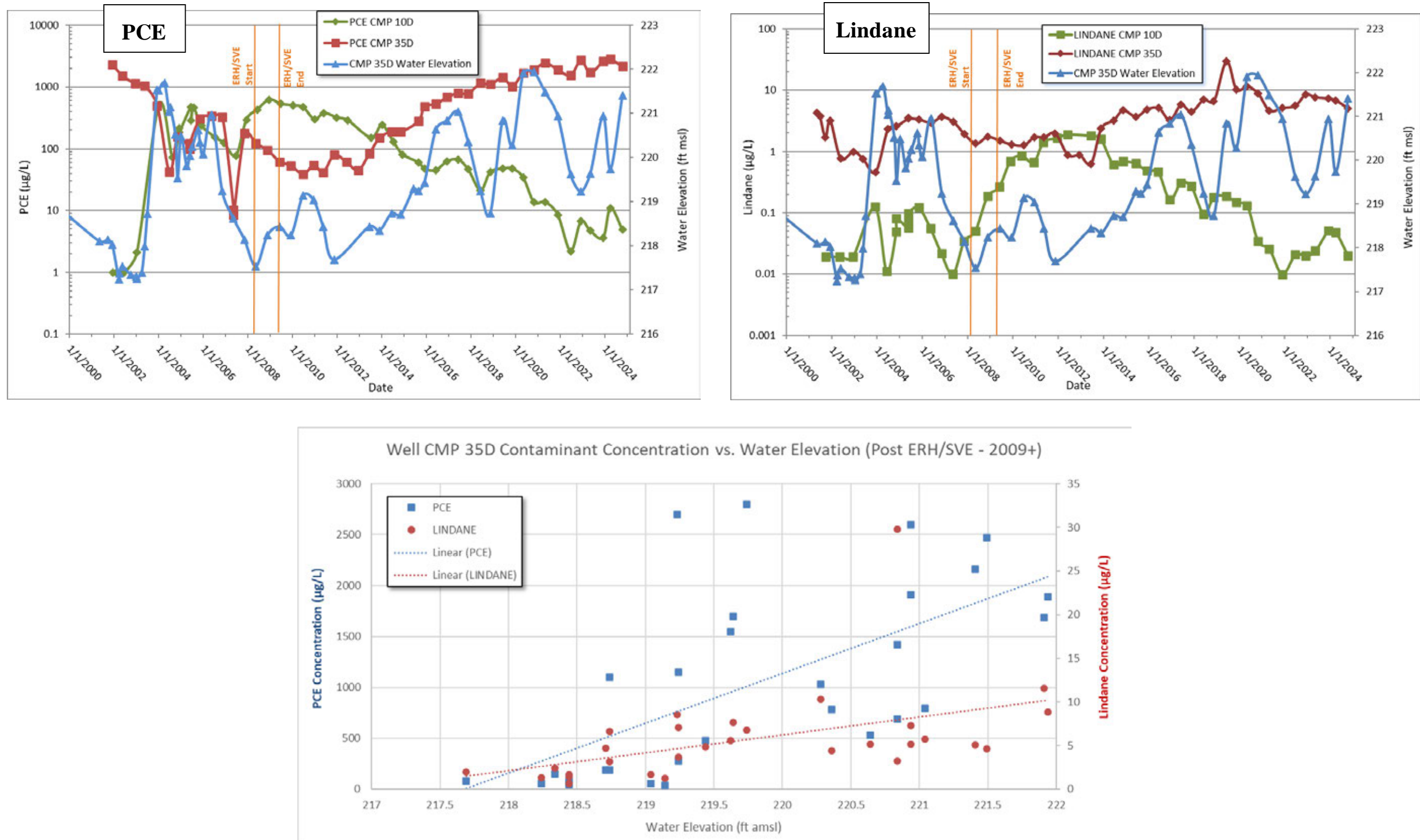
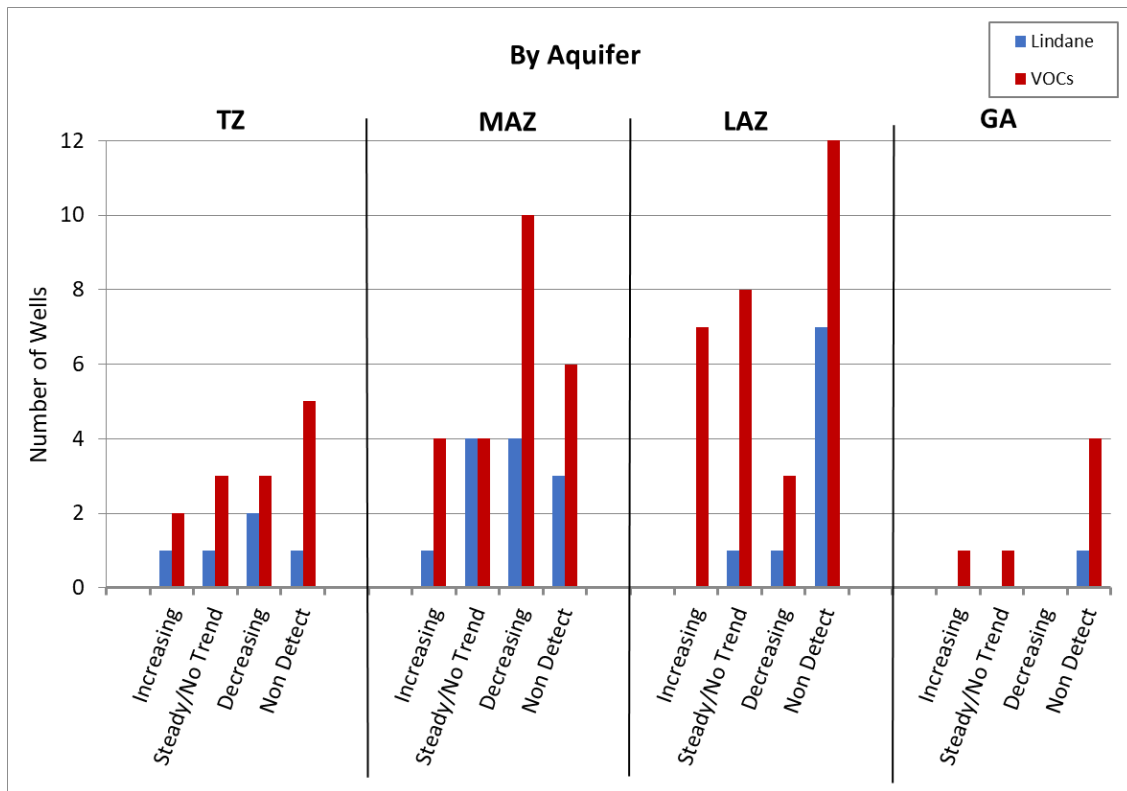
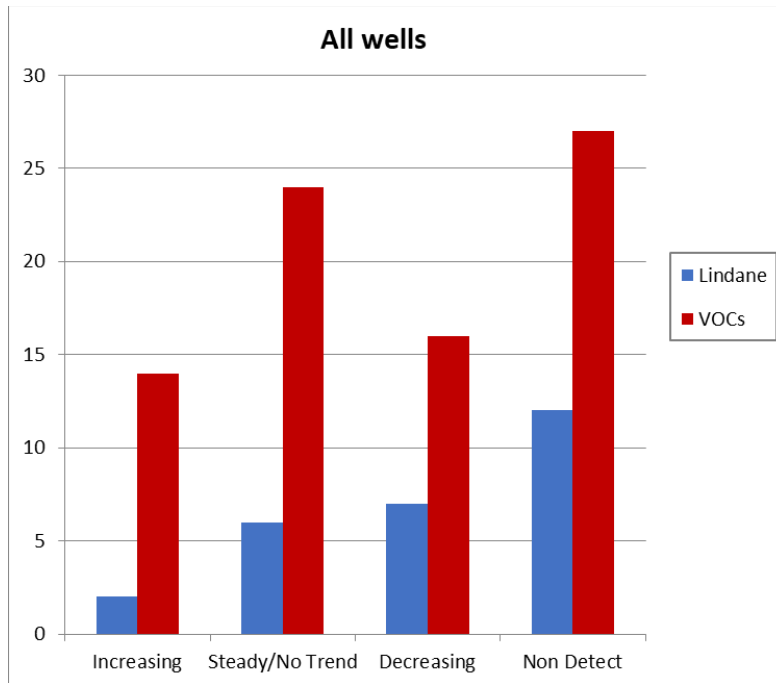


Figure 31. Comparison of PCE and Lindane Trends in CMP 10D and CMP 35D

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Identification of the wells trend type can be found on the “Trends” tab in the Excel file (CMP\_EMR\_2024\_Table3\_Figure32) located on the CD supplied with this report and in the electronic submission.

**Figure 32. Contaminant Concentration Well Trends and Well Trends by Aquifer**

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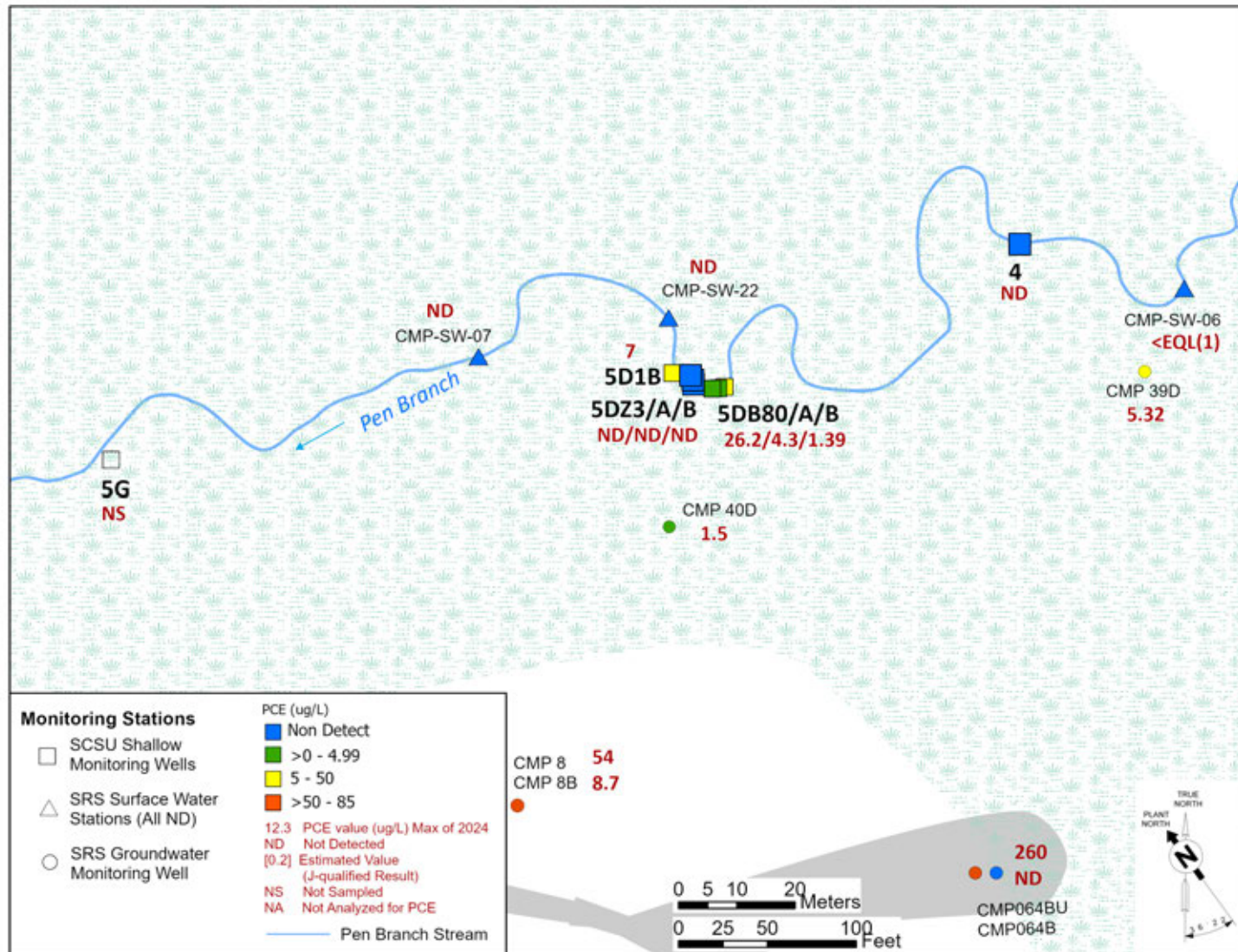


Figure 33. SCSU 2024 PCE Groundwater and Surface Water Results

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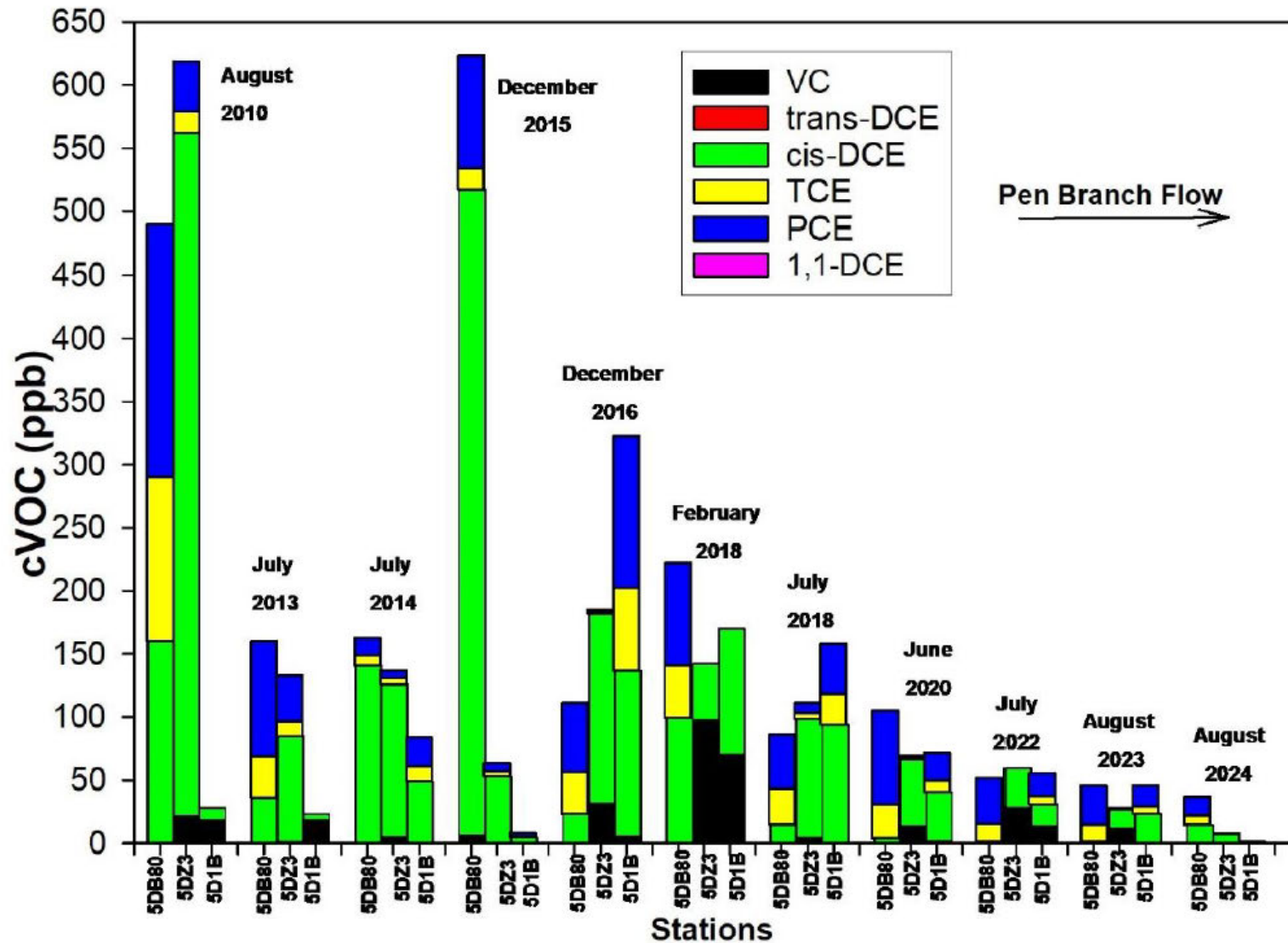


Figure 34. SCSU Long Term VOC Trends

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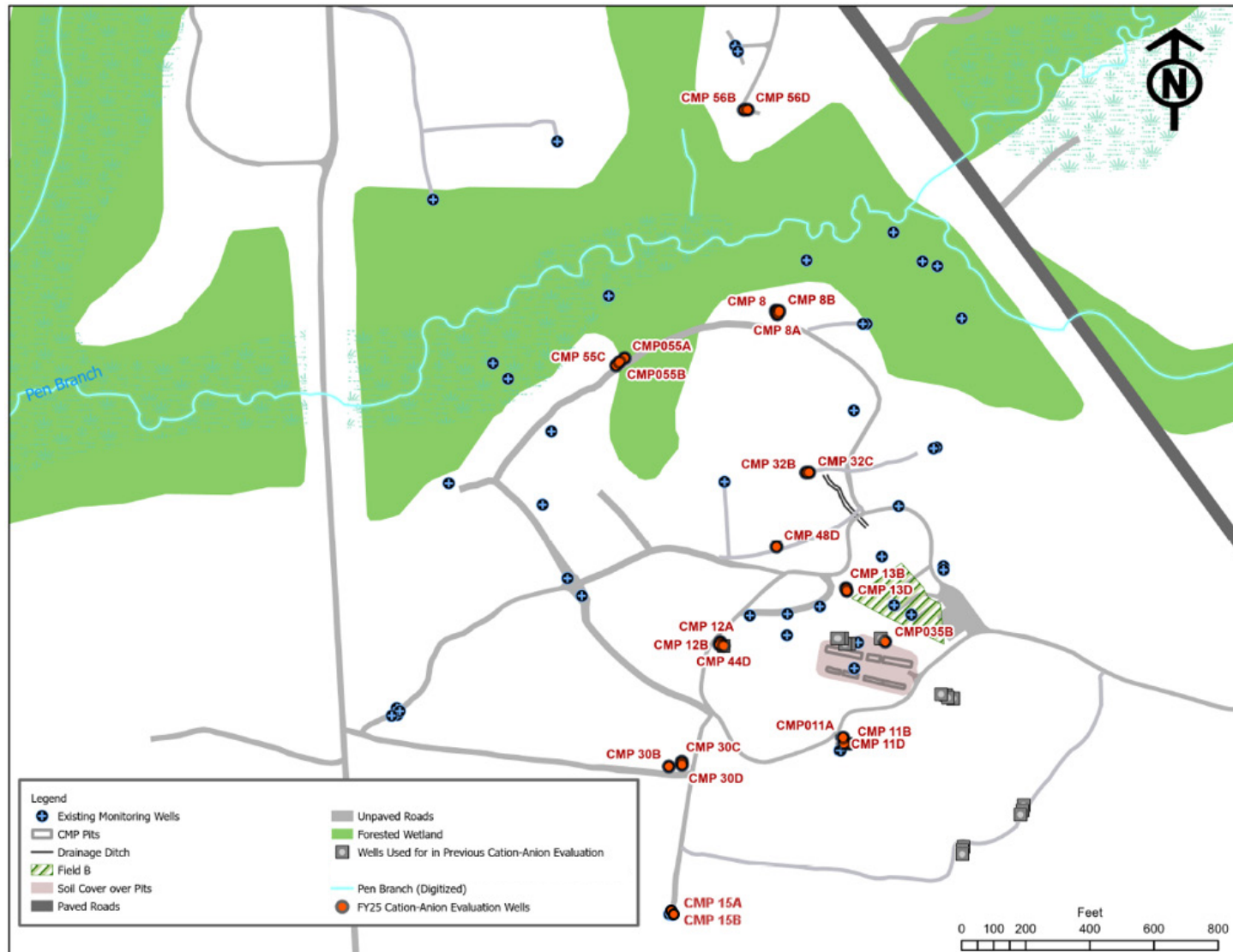


Figure 35. FY2025 Cation-Anion Evaluation Wells

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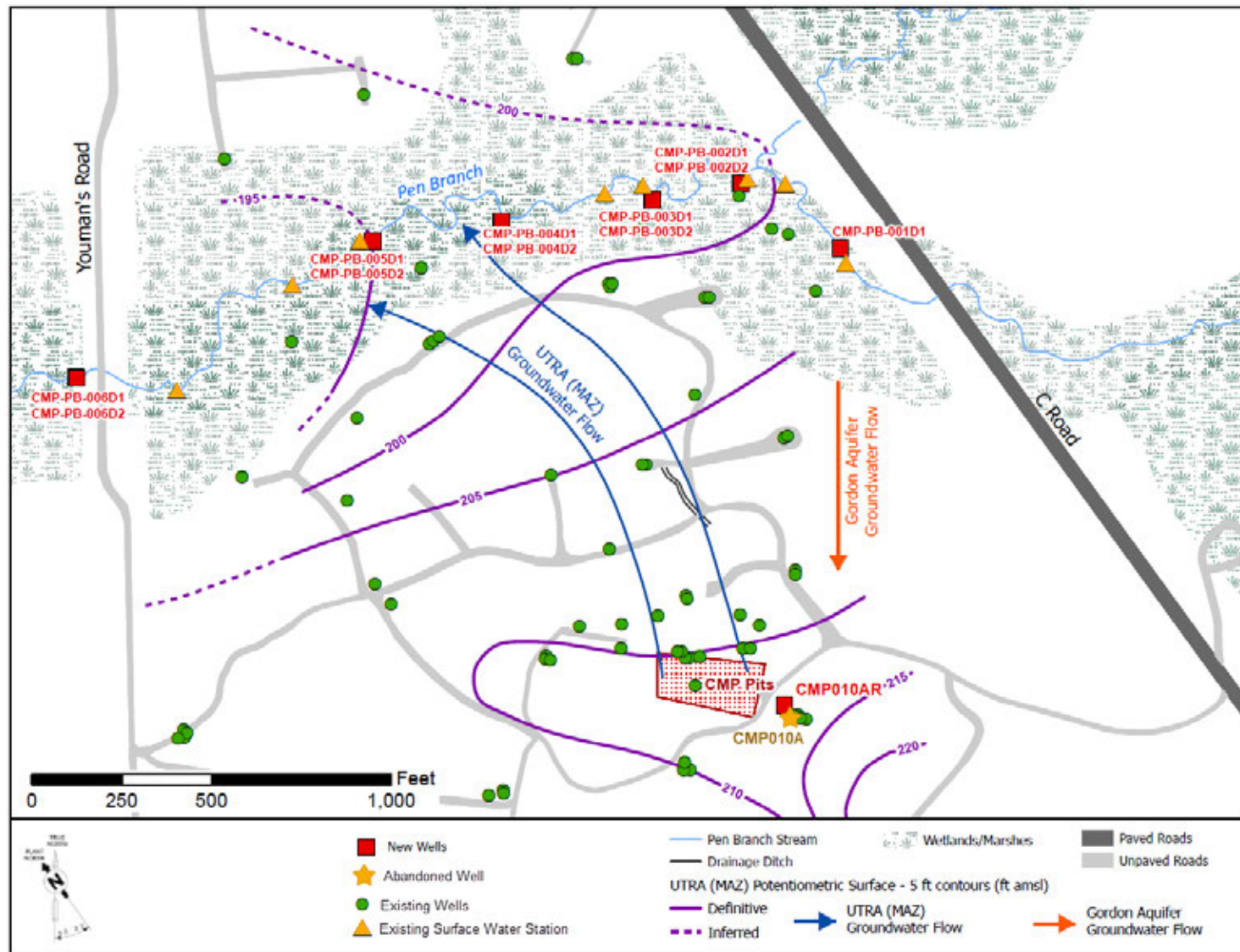


Figure 36. Monitoring Wells Installed/Abandoned in 2024

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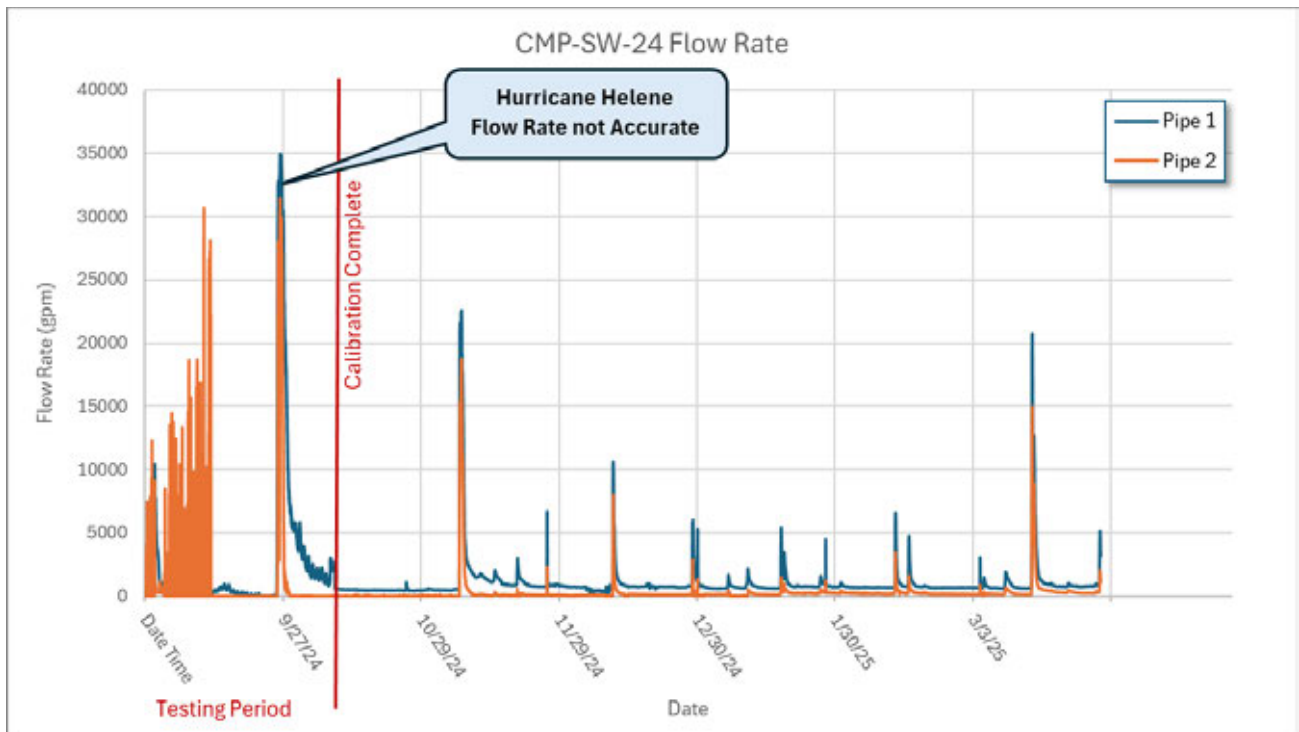
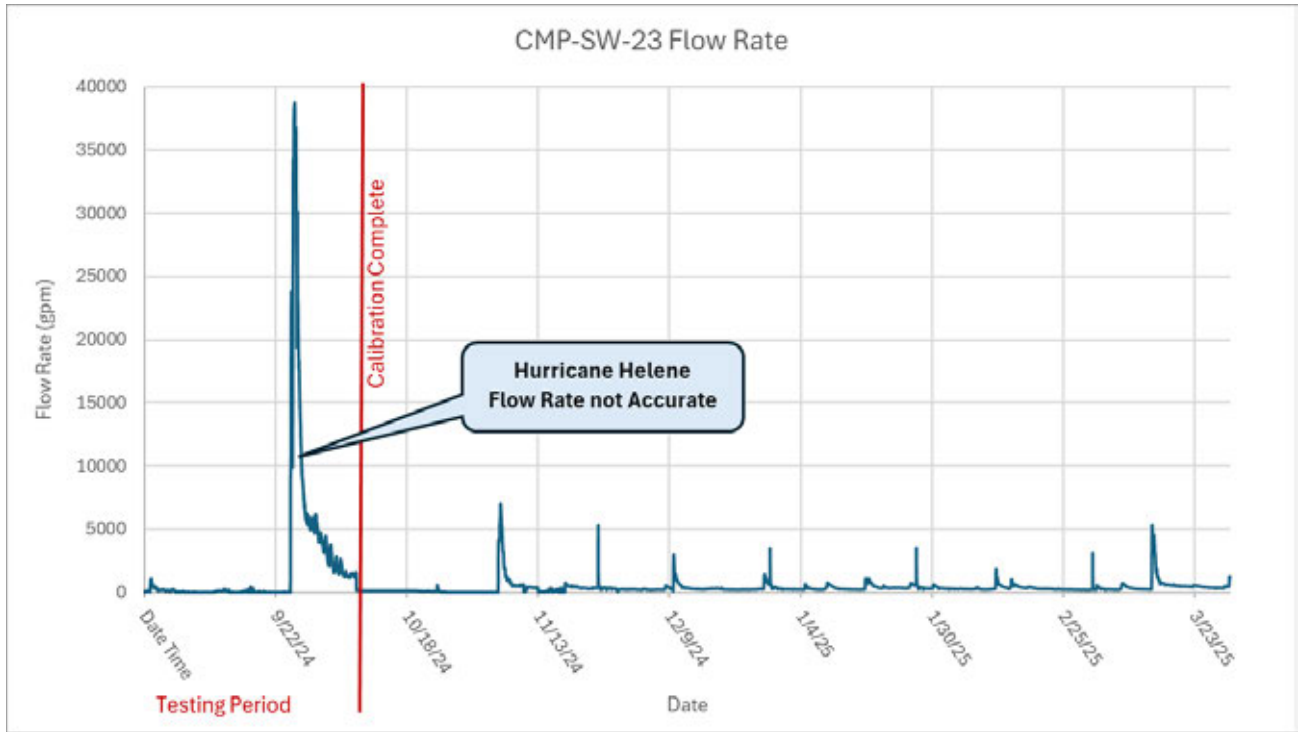


Figure 37. Stream Flow Rate at CMP-SW-23 and CMP-SW-24

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Table 1. CMP Pits OU MNA Monitoring Network

Station	Aquifer Unit	Lab Analyses						Screen Zone (ft amsl)		Screen Length (ft)
		VOCs		1,4-Dioxane	Lindane		Bottom	Top		
CMB 15I	MAZ	2Q	4Q		4Q	2Q	4Q	210.7	212.4	1.7
CMB 24I	MAZ	2Q	4Q		4Q			201	203	2
CMP 8	MAZ	2Q	4Q		4Q			184	214	30
CMP 8A	GA	2Q		2Q				13.7	23.5	9.8
CMP 8B	LAZ (Upper)	2Q	4Q		4Q			156.6	166.6	10
CMP010AR	GA	2Q	4Q	2Q	4Q	2Q	4Q	45.07	55.06	10
CMP 10B	LAZ (Mid)	2Q	4Q		4Q	2Q	4Q	137.4	147.4	10
CMP 10C	LAZ (Upper)	2Q	4Q		4Q	2Q	4Q	179.6	189.6	10
CMP 10D	TZ	2Q	4Q		4Q	2Q	4Q	209.6	229.6	20
CMP011A	GA	2Q		2Q		2Q		46.2	56.2	10
CMP 11B	LAZ (Mid)	2Q	4Q		4Q	2Q	4Q	139.7	149.7	10
CMP 11D	TZ	2Q	4Q		4Q			209.47	229.87	20.4
CMP 12A	GA	2Q	4Q	2Q	4Q			22.1	32.1	10
CMP 12B	LAZ (Mid)	2Q	4Q		4Q			148	158	10
CMP 13B	LAZ (Mid)	2Q	4Q		4Q			134.2	144.2	10
CMP 13D	TZ	2Q	4Q		4Q			217.5	227.5	10
CMP 14B	LAZ (Mid)							130	140	10
CMP 14CR	MAZ							186.49	196.49	10
CMP 14D	TZ							204.1	224.5	20.4
CMP 14DU	TZ							202.57	212.57	10
CMP 15A	GA	2Q		2Q				14.2	24.2	10
CMP 15B	MAZ							145.1	155.1	10
CMP 30B	LAZ (Lower)	2Q	4Q		4Q			97.4	107.5	10.1
CMP 30C	MAZ	2Q	4Q		4Q			179.5	189.5	10
CMP 30D	TZ	2Q	4Q		4Q			211.6	231.6	20
CMP 31B	LAZ (Lower)	2Q	4Q		4Q			110.03	120.03	10
CMP 31C	MAZ	2Q	4Q		4Q			197.9	207.9	10
CMP 32C	LAZ (Upper)	2Q	4Q		4Q			185.2	195.2	10
CMP 32B	LAZ (Lower)	2Q						97.7	107.7	10
CMP 33D	LAZ (Upper)	2Q	4Q		4Q			178.6	188.6	10
CMP 34D	TZ	2Q	4Q			2Q	4Q	215.6	225.6	10
CMP 35D	TZ	2Q	4Q		4Q	2Q	4Q	213.8	223.8	10
CMP035B	LAZ (Upper)	2Q	4Q		4Q	2Q		169.4	179.4	10
CMP 36D	TZ	2Q	4Q		4Q			199.2	204.2	5
CMP 37D	TZ	2Q	4Q		4Q			193.3	198.3	5
CMP 38D	TZ	2Q	4Q		4Q			196.7	201.7	5
CMP 39D	MAZ	2Q	4Q		4Q			190.9	195.9	5
CMP 40D	MAZ	2Q	4Q		4Q			192.13	197.13	5
CMP 41D	MAZ	2Q	4Q		4Q	2Q		191.7	196.7	5
CMP 43D	MAZ	2Q	4Q		4Q	2Q		187.8	192.8	5
CMP 44D	MAZ	2Q	4Q		4Q	2Q	4Q	204.06	214.06	10
CMP 45D	MAZ	2Q	4Q		4Q	2Q	4Q	195.84	205.84	10

additional samples ; omitted samples

Table 1. CMP Pits OU MNA Monitoring Network (continued)

Station	Aquifer Unit	Lab Analyses						Screen Zone (ft amsl)		Screen Length (ft)
		VOCs		1,4-Dioxane	Lindane		Bottom	Top		
CMP 46D	MAZ	2Q				2Q	4Q	198.44	208.44	10
CMP 47D	MAZ	2Q	4Q		4Q	2Q	4Q	196.37	206.37	10
CMP 48D	MAZ	2Q	4Q		4Q		4Q – 3 <sup>rd</sup> year*	198.83	208.83	10
CMP 50B	LAZ (Upper)	2Q	4Q		4Q			167.33	172.33	5
CMP 50D	MAZ	2Q	4Q		4Q			202.99	212.99	10
CMP 51D	MAZ	2Q	4Q		4Q			182.27	192.27	10
CMP 52A	GA	2Q		2Q				66.65	76.65	10
CMP 52BL	LAZ (Lower)	2Q	4Q		4Q			96.59	106.59	10
CMP 52BU	LAZ (Upper)	2Q	4Q		4Q			180.91	190.91	10
CMP 52C	MAZ	2Q	4Q		4Q			204.69	209.69	5
CMP 54C	LAZ (Upper)	2Q	4Q		4Q			178.34	188.34	10
CMP055A	GA	2Q		2Q				16.92	26.92	10
CMP055B	LAZ (Mid)	2Q	4Q		4Q			136.4	146.4	10
CMP 55C	MAZ	2Q	4Q		4Q			177.62	187.62	10
CMP 56B	LAZ (Mid)							124.6	134.6	10
CMP 56D	MAZ							167.55	177.55	10
CMP 57B	LAZ (Mid)							125.25	135.25	10
CMP 57D	MAZ							168.21	178.21	10
CMP058B	LAZ (Upper)	2Q	4Q		4Q	2Q	4Q	182.7	192.6	9.9
CMP059C	MAZ	2Q	4Q		4Q	2Q	4Q	200.8	210.7	9.9
CMP060B	LAZ (Upper)	2Q	4Q		4Q			171.6	181.6	10
CMP061B	LAZ (Mid)	2Q	4Q		4Q			129.5	139.5	10
CMP062B	LAZ (Mid)	2Q		2Q				136	146	10
CMP062C	MAZ	2Q		2Q				186.8	191.8	5
CMP062D	TZ	2Q		2Q				210.6	230.6	20
CMP063B	LAZ (Mid)		4Q		4Q			126.1	136.1	10
CMP063C	MAZ		4Q		4Q			184.4	189.4	5
CMP063D	TZ		4Q		4Q			195.7	215.7	20
CMP064BU	LAZ (Upper)	2Q	4Q		4Q	2Q	4Q	149.2	159.2	10
CMP064B	LAZ (Lower)	2Q	4Q		4Q			118.8	128.8	10
CMP065BU	MAZ	2Q	4Q		4Q	2Q	4Q	194.37	204.37	10
CMP065B	LAZ (Mid)	2Q	4Q		4Q			128.94	138.94	10
CMP066B	LAZ (Mid)	2Q	4Q		4Q			138.7	148.7	10
CMP067B	LAZ (Mid)	2Q	4Q		4Q			143.1	153.1	10
CMP-PB-001D1	SW	2Q	4Q	2Q	4Q	2Q	4Q	193.815	194.945	1
CMP-PB-002D1	SW	2Q	4Q	2Q	4Q	2Q	4Q	193.836	194.836	1
CMP-PB-002D2	SW	2Q	4Q	2Q	4Q	2Q	4Q	192.075	193.205	1
CMP-PB-003D1	SW	2Q	4Q	2Q	4Q	2Q	4Q	192.11	193.11	1
CMP-PB-003D2	SW	2Q	4Q	2Q	4Q	2Q	4Q	190.559	191.619	1
CMP-PB-004D1	SW	2Q	4Q	2Q	4Q	2Q	4Q	191.597	192.597	1
CMP-PB-004D2	SW	2Q	4Q	2Q	4Q	2Q	4Q	186.691	187.731	1

\*Lindane is analyzed every third year (i.e., 2023, 2026, 2029, etc.); additional samples ; omitted samples

**Table 1. CMP Pits OU MNA Monitoring Network (continued; end)**

Station	Aquifer Unit	Lab Analyses						Screen Zone (ft amsl)		Screen Length (ft)
		VOCs		1,4-Dioxane		Lindane		Bottom	Top	
CMP-PB-005D1	SW	2Q	4Q	2Q	4Q	2Q	4Q	189.15	190.28	1
CMP-PB-005D2	MAZ	2Q	4Q	2Q	4Q	2Q	4Q	187.309	188.439	1
CMP-PB-006D1	LAZ (Mid)	2Q	4Q	2Q	4Q	2Q	4Q	186.694	187.694	1
CMP-PB-006D2	LAZ (Mid)	2Q	4Q	2Q	4Q	2Q	4Q	185.652	186.652	1
CMPSW-06	SW	2Q	4Q		4Q					
CMPSW-07	SW	2Q	4Q		4Q					
CMPSW-08	SW	2Q	4Q		4Q					
CMPSW-09	SW	2Q	4Q		4Q					
CMPSW-10	SW	2Q	4Q		4Q					
CMP-SW-20	SW	2Q	4Q		4Q					
CMP-SW-21	SW	2Q	4Q		4Q					
CMP-SW-22	SW	2Q	4Q		4Q					

additional samples ; omitted samples

**Table 2. CMP Pits OU Horizontal Groundwater Flow Velocities (2Q2024)**

GW Flow Line	dh	dl	Conductivity	Porosity	Velocity (ft/day)	Velocity (ft/year)
<b>TZ</b>						
A - A'	20	1412	8	0.3	<b>0.38</b>	137.96
B - B'	22.5	1484	8	0.3	<b>0.40</b>	147.68
C - C'	14	1473	8	0.3	<b>0.25</b>	92.57
<b>TZ Avg.</b>					<b>0.35</b>	<b>126.07</b>
<b>MAZ</b>						
A - A'	15	1625	50	0.3	<b>1.54</b>	561.92
B - B'	15	1342	50	0.3	<b>1.86</b>	680.42
<b>MAZ Avg.</b>					<b>1.70</b>	<b>621.17</b>
<b>LAZ</b>						
A - A'	4.2	2002	30	0.3	<b>0.21</b>	76.63
B - B'	3	373	30	0.3	<b>0.80</b>	293.77
C - C'	7.5	467	30	0.3	<b>1.61</b>	586.59
D - D'	4.2	1183	30	0.3	<b>0.36</b>	129.67
<b>LAZ Avg.</b>					<b>0.74</b>	<b>271.66</b>
<b>GA</b>						
A - A'	2.4	2351	35	0.25	<b>0.14</b>	<b>52.20</b>
B - B'	1.3	965	35	0.25	<b>0.19</b>	<b>68.89</b>
<b>GA Avg.</b>					<b>0.17</b>	<b>60.54</b>

dh= difference in head; dl= difference in length

**Table 3. CMP Pits OU Annual MNA Results, April 2024 through March 2025**

*See insert on the next page*

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Table 4. CMP Pits OU PCE Max Results from 2008 and 2024 (µg/L)

Station ID	Aquifer	PCE	
		2008 Max (Pre ERH/SVE)	2024 Max
CMP 10D	TZ	620	11
CMP 11D	TZ	421	19.6
CMP 13D	TZ	1.71	45.9
CMP 14DU	TZ	NS	NS
CMP 14D	TZ	NS	NS
CMP 30D	TZ	<EQL(1)	<EQL(1)
CMP 34D	TZ	49.4	1700
CMP 35D	TZ	122	2900
CMP 36D	TZ	56.9	3
CMP 37D	TZ	358	48
CMP 38D	TZ	48.2	35.8
CMP062D	TZ	<EQL(1)	<EQL(1)
CMP063D	TZ	<EQL(1)	<EQL(1)
CMB 15I	MAZ	437	[86.7]
CMB 24I	MAZ	20.8	131
CMP 8	MAZ	299	54
CMP 14CR	MAZ	<EQL(1)	NS
CMP 15B	MAZ	<EQL(1)	NS
CMP 30C	MAZ	3.78	1.6
CMP 31C	MAZ	NS	1.7
CMP 39D	MAZ	71.7	5.32
CMP 40D	MAZ	135	1.5
CMP 41D	MAZ	5.48	[6.08]
CMP 43D	MAZ	<EQL(1)	<EQL(1)
CMP 44D	MAZ	312	240
CMP 45D	MAZ	973	533
CMP 46D	MAZ	[434]	290
CMP 47D	MAZ	[845]	930
CMP 48D	MAZ	601	240
CMP 50D	MAZ	8.62	1.1
CMP 51D	MAZ	13.4	3.89
CMP 52C	MAZ	NS	180
CMP 55C	MAZ	<EQL(1)	1.15
CMP 56D	MAZ	NS	NS
CMP 57D	MAZ	NS	NS
CMP059C	MAZ	78.5	660
CMP062C	MAZ	<EQL(1)	<EQL(1)
CMP063C	MAZ	<EQL(1)	<EQL(1)
CMP065BU	MAZ	NS	16.7
CMP 8B	LAZ (Upper)	<EQL(1)	8.7
CMP 10B	LAZ (Mid)	<EQL(1)	26.5
CMP 10C	LAZ (Upper)	466	99

Station ID	Aquifer	PCE	
		2008 Max (Pre ERH/SVE)	2024 Max
CMP 11B	LAZ (Mid)	<EQL(1)	<EQL(1)
CMP 12B	LAZ (Mid)	46.3	64.1
CMP 13B	LAZ (Mid)	1.25	6.9
CMP 14B	LAZ (Mid)	<EQL(1)	NS
CMP 30B	LAZ (Lower)	<EQL(1)	<EQL(1)
CMP 31B	LAZ (Lower)	<EQL(1)	[0.5]
CMP 32C	LAZ (Upper)	110	320
CMP 33D	LAZ (Upper)	16.4	1.54
CMP035B	LAZ (Upper)	NS	46.5
CMP 50B	LAZ (Upper)	<EQL(1)	<EQL(1)
CMP 52BU	LAZ (Upper)	35.1	190
CMP 52BL	LAZ (Lower)	<EQL(1)	<EQL(1)
CMP 54C	LAZ (Upper)	[196]	280
CMP055B	LAZ (Mid)	NS	<EQL(1)
CMP 56B	LAZ (Mid)	NS	NS
CMP 57B	LAZ (Mid)	NS	NS
CMP058B	LAZ (Upper)	6.51	38
CMP060B	LAZ (Upper)	<EQL(1)	<EQL(1)
CMP061B	LAZ (Mid)	<EQL(1)	<EQL(1)
CMP062B	LAZ (Mid)	<EQL(1)	<EQL(1)
CMP063B	LAZ (Mid)	<EQL(1)	<EQL(1)
CMP064BU	LAZ (Upper)	NS	260
CMP064B	LAZ (Lower)	NS	<EQL(1)
CMP065B	LAZ (Mid)	NS	[0.6]
CMP066B	LAZ (Mid)	NS	NS
CMP067B	LAZ (Mid)	NS	NS
CMP 8A	GA	<EQL(1)	<EQL(1)
CMP010AR	GA	NS	<EQL(1)
CMP011A	GA	NS	<EQL(1)
CMP 12A	GA	[0.679]	2.6
CMP 15A	GA	<EQL(1)	<EQL(1)
CMP 52A	GA	<EQL(1)	<EQL(1)
CMP055A	GA	NS	<EQL(1)
CMP-SW-06	SW	<EQL(1)	<EQL(1)
CMP-SW-07	SW	[0.63]	<EQL(1)
CMP-SW-08	SW	<EQL(1)	<EQL(1)
CMP-SW-09	SW	[0.297]	<EQL(1)
CMP-SW-10	SW	1.38	<EQL(1)
CMP-SW-20	SW	NS	<EQL(1)
CMP-SW-21	SW	NS	<EQL(1)
CMP-SW-22	SW	NS	<EQL(1)

EQL=Sample Quantitation Limit (Non-detect Result); [##]=Estimated Value (J-qualified Result); NS = Not Sampled; NA= Not analyzed for VOCs; >MCL of 5 µg/L

Table 5. CMP Pits OU Lindane Max Results from 2008 and 2024 (µg/L)

Station ID	Aquifer	Lindane	
		2008 Max (Pre ERH/SVE)	2024 Max
CMP 10D	TZ	0.185	<EQL (0.02)
CMP 11D	TZ	0.0509	NA
CMP 13D	TZ	<EQL(0.0225)	<EQL (0.0192)
CMP 14DU	TZ	NS	NS
CMP 14D	TZ	NS	NS
CMP 30D	TZ	<EQL(0.0222)	NA
CMP 34D	TZ	0.345	0.17
CMP 35D	TZ	1.73	6.8
CMP 36D	TZ	<EQL(0.0217)	NA
CMP 37D	TZ	<EQL(0.0217)	NA
CMP 38D	TZ	<EQL(0.0217)	NA
CMP062D	TZ	<EQL(0.0222)	NA
CMP063D	TZ	<EQL(0.0213)	NA
CMB 15I	MAZ	0.165	<EQL (0.0194)
CMB 24I	MAZ	[0.0192]	NA
CMP 8	MAZ	[0.0192]	NA
CMP 14CR	MAZ	<EQL(0.0222)	NS
CMP 15B	MAZ	<EQL(0.0213)	NA
CMP 30C	MAZ	<EQL(0.0213)	NA
CMP 31C	MAZ	NS	NA
CMP 39D	MAZ	<EQL(0.0217)	NA
CMP 40D	MAZ	<EQL(0.0217)	NA
CMP 41D	MAZ	<EQL(0.0227)	<EQL (0.0187)
CMP 43D	MAZ	<EQL(0.0227)	<EQL (0.0191)
CMP 44D	MAZ	0.474	0.1
CMP 45D	MAZ	0.484	0.151
CMP 46D	MAZ	0.704	0.22
CMP 47D	MAZ	0.36	0.38
CMP 48D	MAZ	0.157	NA
CMP 50D	MAZ	<EQL(0.0217)	NA
CMP 51D	MAZ	<EQL(0.0217)	NA
CMP 52C	MAZ	NS	NA
CMP 55C	MAZ	<EQL(0.0213)	NA
CMP 56D	MAZ	NS	NS
CMP 57D	MAZ	NS	NS
CMP059C	MAZ	0.362	0.207
CMP062C	MAZ	<EQL(0.0217)	NA
CMP063C	MAZ	<EQL(0.0213)	NA
CMP065BU	MAZ	NS	<EQL (0.02)
CMP 8B	LAZ (Upper)	<EQL(0.0217)	NA
CMP 10B	LAZ (Mid)	<EQL(0.0217)	<EQL (0.02)
CMP 10C	LAZ (Upper)	0.126	0.15

Station ID	Aquifer	Lindane	
		2008 Max (Pre ERH/SVE)	2024 Max
CMP 11B	LAZ (Mid)	<EQL(0.02)	<EQL (0.02)
CMP 12B	LAZ (Mid)	[0.0184]	NA
CMP 13B	LAZ (Mid)	<EQL(0.0227)	NA
CMP 14B	LAZ (Mid)	<EQL(0.0222)	NA
CMP 30B	LAZ (Lower)	<EQL(0.0213)	NA
CMP 31B	LAZ (Lower)	<EQL(0.0213)	NA
CMP 32C	LAZ (Upper)	<EQL(0.0217)	NA
CMP 33D	LAZ (Upper)	<EQL(0.0217)	NA
CMP035B	LAZ (Upper)	NS	NA
CMP 50B	LAZ (Upper)	<EQL(0.0222)	NA
CMP 52BU	LAZ (Upper)	<EQL(0.0217)	NA
CMP 52BL	LAZ (Lower)	<EQL(0.0217)	NA
CMP 54C	LAZ (Upper)	<EQL(0.0202)	NA
CMP055B	LAZ (Mid)	NS	NA
CMP 56B	LAZ (Mid)	NS	NS
CMP 57B	LAZ (Mid)	NS	NS
CMP058B	LAZ (Upper)	<EQL(0.0227)	[0.014]
CMP060B	LAZ (Upper)	<EQL(0.0217)	NA
CMP061B	LAZ (Mid)	<EQL(0.0241)	NA
CMP062B	LAZ (Mid)	<EQL(0.0217)	NA
CMP063B	LAZ (Mid)	<EQL(0.023)	NA
CMP064BU	LAZ (Upper)	NS	[0.087]
CMP064B	LAZ (Lower)	NS	NA
CMP065B	LAZ (Mid)	NS	NA
CMP066B	LAZ (Mid)	NS	NA
CMP067B	LAZ (Mid)	NS	NA
CMP 8A	GA	<EQL(0.0217)	NA
CMP010AR	GA	NS	<EQL (0.0192)
CMP011A	GA	NS	<EQL (0.048)
CMP 12A	GA	<EQL(0.0213)	NA
CMP 15A	GA	<EQL(0.0227)	NA
CMP 52A	GA	<EQL(0.0217)	NA
CMP055A	GA	NS	NA
CMP-SW-06	SW	NA	NA
CMP-SW-07	SW	NA	NA
CMP-SW-08	SW	NA	NA
CMP-SW-09	SW	NA	NA
CMP-SW-10	SW	NA	NA
CMP-SW-20	SW	NS	NA
CMP-SW-21	SW	NS	NA
CMP-SW-22	SW	NS	NA

EQL=Sample Quantitation Limit (Non-detect Result); [##]=Estimated Value (J-qualified Result); NS = Not Sampled; NA= Not Analyzed for lindane; >MCL of 0.2 µg/L

Table 6. SCSU Groundwater Results from 2024

PEN BRANCH	COLLECTION	SAMPLE	SAMPLE	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans1,2-DCE	VC
STATION ID	DATE	TYPE	LOCATION	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
			MCL	5	5	7	70	100	2
SCSU-CMP-4	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.5	ND	2.7
SCSU-CMP-4	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.4	ND	2.8
SCSU-CMP-4	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.2	ND	2.8
<b>SCSU-CMP-4</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>3.4</b>	<b>ND</b>	<b>2.8</b>
SCSU-CMP-5DB80	4/17/2024	GW - Pump	80 cm BSB	24.4	8.3	ND	1.8	ND	ND
SCSU-CMP-5DB80	4/17/2024	GW - Pump	80 cm BSB	26.1	8.6	ND	1.8	ND	ND
SCSU-CMP-5DB80	4/17/2024	GW - Pump	80 cm BSB	26.2	8.3	ND	1.9	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>4/17/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>25.6</b>	<b>8.4</b>	<b>ND</b>	<b>1.8</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	8/27/2024	GW - Pump	80 cm BSB	13.7	7.2	ND	13.8	ND	ND
SCSU-CMP-5DB80	8/27/2024	GW - Pump	80 cm BSB	15.1	7.6	ND	14.5	ND	ND
SCSU-CMP-5DB80	8/27/2024	GW - Pump	80 cm BSB	14.9	7.6	ND	15.0	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>14.6</b>	<b>7.5</b>	<b>ND</b>	<b>14.4</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80A	4/17/2024	GW - Pump	80 cm BSB	4.2	1.5	ND	3.0	ND	ND
SCSU-CMP-5DB80A	4/17/2024	GW - Pump	80 cm BSB	3.9	1.5	ND	3.3	ND	ND
SCSU-CMP-5DB80A	4/17/2024	GW - Pump	80 cm BSB	4.3	1.4	ND	3.0	ND	ND
<b>SCSU-CMP-5DB80A</b>	<b>4/17/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>4.1</b>	<b>1.5</b>	<b>ND</b>	<b>3.1</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80A	8/27/2024	GW - Pump	65 cm BSB	2.4	3.8	ND	18.2	ND	2.1
SCSU-CMP-5DB80A	8/27/2024	GW - Pump	65 cm BSB	2.2	3.8	ND	17.2	ND	2.1
SCSU-CMP-5DB80A	8/27/2024	GW - Pump	65 cm BSB	2.3	3.8	ND	18.4	ND	2.2
<b>SCSU-CMP-5DB80A</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>2.3</b>	<b>3.8</b>	<b>ND</b>	<b>17.9</b>	<b>ND</b>	<b>2.1</b>
SCSU-CMP-5DB80B	9/10/2024	GW - Pump	65 cm BSB	1.1	ND	ND	3.96	ND	ND
SCSU-CMP-5DB80B	9/10/2024	GW - Pump	65 cm BSB	1.39	ND	ND	4.3	ND	ND
SCSU-CMP-5DB80B	9/10/2024	GW - Pump	65 cm BSB	1.21	ND	ND	4.35	ND	ND
<b>SCSU-CMP-5DB80B</b>	<b>9/10/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>1.2</b>	<b>ND</b>	<b>ND</b>	<b>4.2</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	4/17/2024	GW - Pump	80 cm BSB	ND	2.6	ND	22.4	ND	9.3
SCSU-CMP-5DZ3	4/17/2024	GW - Pump	80 cm BSB	ND	2.7	ND	22.2	ND	9.6
SCSU-CMP-5DZ3	4/17/2024	GW - Pump	80 cm BSB	ND	2.5	ND	21.6	ND	9.1
<b>SCSU-CMP-5DZ3</b>	<b>4/17/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>ND</b>	<b>2.6</b>	<b>ND</b>	<b>22.1</b>	<b>ND</b>	<b>9.3</b>
SCSU-CMP-5DZ3	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	7.6	ND	ND
SCSU-CMP-5DZ3	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	7.8	ND	ND
SCSU-CMP-5DZ3	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	7.4	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>7.6</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3A	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.16	ND	ND
SCSU-CMP-5DZ3A	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	3	ND	ND
SCSU-CMP-5DZ3A	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.36	ND	ND
<b>SCSU-CMP-5DZ3A</b>	<b>9/10/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>3.2</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3A	4/17/2024	GW - Pump	80 cm BSB	ND	ND	ND	10.4	ND	ND
SCSU-CMP-5DZ3A	4/17/2024	GW - Pump	80 cm BSB	ND	ND	ND	10.6	ND	ND
SCSU-CMP-5DZ3A	4/17/2024	GW - Pump	80 cm BSB	ND	ND	ND	10.2	ND	ND
<b>SCSU-CMP-5DZ3A</b>	<b>4/17/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>10.4</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3B	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	2.6	ND	1.93
SCSU-CMP-5DZ3B	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	3.12	ND	1.92
SCSU-CMP-5DZ3B	9/10/2024	GW - Pump	65 cm BSB	ND	ND	ND	2.63	ND	1.83
<b>SCSU-CMP-5DZ3B</b>	<b>9/10/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>2.8</b>	<b>ND</b>	<b>1.9</b>
SCSU-CMP-5D1B	4/17/2024	GW - Pump	65 cm BSB	6.6	2.1	ND	2.1	ND	ND
SCSU-CMP-5D1B	4/17/2024	GW - Pump	65 cm BSB	6.9	2.2	ND	2.3	ND	ND
SCSU-CMP-5D1B	4/17/2024	GW - Pump	65 cm BSB	7.0	2.5	ND	2.2	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>4/17/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>6.8</b>	<b>2.3</b>	<b>ND</b>	<b>2.2</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	1.3	ND	ND
SCSU-CMP-5D1B	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	1.5	ND	ND
SCSU-CMP-5D1B	8/27/2024	GW - Pump	65 cm BSB	ND	ND	ND	1.4	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>1.4</b>	<b>ND</b>	<b>ND</b>

**Average of Triplicate Samples**

BSB = Below Stream Bottom

GW = Groundwater

ND = not detected; detection >MCL

Table 7. SCSU Sediment Results from 2024

PEN BRANCH	COLLECTION	SAMPLE	SAMPLE	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans1,2-DCE	VC
STATION ID	DATE	TYPE	LOCATION	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
SCSU-CMP-4	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-4	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-4	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-4</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-4	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-4	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-4	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-4</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	2/13/2024	Sediment	15 cm BSB	22.7	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	2/13/2024	Sediment	15 cm BSB	19.6	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	2/13/2024	Sediment	15 cm BSB	19.9	ND	ND	ND	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>2/13/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>20.7</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	2/13/2024	Sediment	40 cm BSB	42.7	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	2/13/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	2/13/2024	Sediment	40 cm BSB	45.4	ND	ND	ND	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>2/13/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>29.4</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	4/2/2024	Sediment	15 cm BSB	ND	ND	ND	37.0	ND	ND
SCSU-CMP-5DZ3	4/2/2024	Sediment	15 cm BSB	ND	ND	ND	18.8	ND	24.0
SCSU-CMP-5DZ3	4/2/2024	Sediment	15 cm BSB	11.0	ND	ND	21.1	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>4/2/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>3.7</b>	<b>ND</b>	<b>ND</b>	<b>25.6</b>	<b>ND</b>	<b>8.0</b>
SCSU-CMP-5DZ3	4/2/2024	Sediment	40 cm BSB	119.0	17.5	ND	37.5	ND	ND
SCSU-CMP-5DZ3	4/2/2024	Sediment	40 cm BSB	34.1	ND	ND	17.5	ND	ND
SCSU-CMP-5DZ3	4/2/2024	Sediment	40 cm BSB	72.7	ND	ND	48.1	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>4/2/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>75.3</b>	<b>5.8</b>	<b>ND</b>	<b>34.4</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	4/2/2024	Sediment	65 cm BSB	44.4	ND	ND	20.3	ND	ND
SCSU-CMP-5DZ3	4/2/2024	Sediment	65 cm BSB	28.9	ND	ND	11.8	ND	ND
SCSU-CMP-5DZ3	4/2/2024	Sediment	65 cm BSB	49.9	ND	ND	19.4	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>4/2/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>41.1</b>	<b>ND</b>	<b>ND</b>	<b>17.2</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	4/9/2024	Sediment	15 cm BSB	42.6	18.5	ND	146.0	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	15 cm BSB	ND	ND	ND	14.4	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	15 cm BSB	186.0	43.0	ND	72.3	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>4/9/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>76.2</b>	<b>20.5</b>	<b>ND</b>	<b>77.6</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	6/26/2024	Sediment	15 cm BSB	52.7	8.5	ND	41.5	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	15 cm BSB	57.9	6.3	ND	47.5	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	15 cm BSB	62.3	8.9	ND	53.9	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>6/26/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>57.6</b>	<b>7.9</b>	<b>ND</b>	<b>47.6</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	4/9/2024	Sediment	40 cm BSB	133.0	14.9	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	40 cm BSB	127.0	16.2	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	40 cm BSB	68.9	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>4/9/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>109.6</b>	<b>10.4</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	6/26/2024	Sediment	40 cm BSB	50.8	ND	ND	12.3	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	40 cm BSB	65.8	7.6	ND	12.4	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	40 cm BSB	61.1	7.3	ND	9.3	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>6/26/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>59.2</b>	<b>5.0</b>	<b>ND</b>	<b>11.3</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	4/9/2024	Sediment	65 cm BSB	82.3	19.1	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	65 cm BSB	78.0	14.3	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	65 cm BSB	120.0	17.9	ND	ND	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>4/9/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>93.4</b>	<b>17.1</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	6/26/2024	Sediment	65 cm BSB	95.5	6.5	ND	ND	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	65 cm BSB	43.4	6.6	ND	ND	ND	ND
SCSU-CMP-5DB80	6/26/2024	Sediment	65 cm BSB	47.1	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>6/26/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>62.0</b>	<b>4.4</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80	4/9/2024	Sediment	80 cm BSB	77.1	21.7	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	80 cm BSB	42.5	13.0	ND	ND	ND	ND
SCSU-CMP-5DB80	4/9/2024	Sediment	80 cm BSB	86.7	20.5	ND	ND	ND	ND
<b>SCSU-CMP-5DB80</b>	<b>4/9/2024</b>	<b>AVERAGE</b>	<b>80 cm BSB</b>	<b>68.8</b>	<b>18.4</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80A	8/13/2024	Sediment	15 cm BSB	ND	ND	ND	37.1	ND	22.1
SCSU-CMP-5DB80A	8/13/2024	Sediment	15 cm BSB	ND	ND	ND	87.6	ND	37.0
SCSU-CMP-5DB80A	8/13/2024	Sediment	15 cm BSB	ND	ND	ND	58.1	ND	21.2
<b>SCSU-CMP-5DB80A</b>	<b>8/13/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>60.9</b>	<b>ND</b>	<b>26.8</b>
SCSU-CMP-5DB80A	8/13/2024	Sediment	40 cm BSB	26.8	7.6	ND	75.5	ND	ND
SCSU-CMP-5DB80A	8/13/2024	Sediment	40 cm BSB	22.4	ND	ND	61.6	ND	ND
SCSU-CMP-5DB80A	8/13/2024	Sediment	40 cm BSB	35.7	11.3	ND	112.0	ND	ND
<b>SCSU-CMP-5DB80A</b>	<b>8/13/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>28.3</b>	<b>6.3</b>	<b>ND</b>	<b>83.0</b>	<b>ND</b>	<b>ND</b>

ND = not detected; detection

Table 7. SCSU Sediment Results from 2024 (continued/end)

PEN BRANCH	COLLECTION	SAMPLE	SAMPLE	PCE	TCE	1,1-DCE	cis-1,2-DCE	trans1,2-DCE	VC
STATION ID	DATE	TYPE	LOCATION	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
SCSU-CMP-5DB80A	8/13/2024	Sediment	65 cm BSB	28.4	8	ND	19.6	ND	ND
SCSU-CMP-5DB80A	8/13/2024	Sediment	65 cm BSB	24.6	7.5	ND	19.7	ND	ND
SCSU-CMP-5DB80A	8/13/2024	Sediment	65 cm BSB	13.8	7.1	ND	ND	ND	ND
<b>SCSU-CMP-5DB80A</b>	<b>8/13/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>22.3</b>	<b>7.5</b>	<b>ND</b>	<b>13.1</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80B	7/16/2024	Sediment	40 cm BSB	25.0	8.9	ND	27.3	ND	ND
SCSU-CMP-5DB80B	7/16/2024	Sediment	40 cm BSB	17.8	7.0	ND	24.1	ND	ND
SCSU-CMP-5DB80B	7/16/2024	Sediment	40 cm BSB	36.2	10.8	ND	25.9	ND	ND
<b>SCSU-CMP-5DB80B</b>	<b>7/16/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>26.3</b>	<b>8.9</b>	<b>ND</b>	<b>25.8</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DB80B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DB80B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DB80B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DB80B</b>	<b>7/16/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	7/9/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>7/9/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	7/9/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>7/9/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3	7/9/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3	7/9/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3</b>	<b>7/9/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3A	8/15/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	15 cm BSB	ND	ND	ND	7.1	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	15 cm BSB	ND	ND	ND	8.3	ND	ND
<b>SCSU-CMP-5DZ3A</b>	<b>8/15/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>5.1</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3A	8/15/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3A</b>	<b>8/15/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3A	8/15/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3A	8/15/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3A</b>	<b>8/15/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3B	7/16/2024	Sediment	40 cm BSB	ND	ND	ND	43.5	ND	ND
SCSU-CMP-5DZ3B	7/16/2024	Sediment	40 cm BSB	ND	ND	ND	40.6	ND	ND
SCSU-CMP-5DZ3B	7/16/2024	Sediment	40 cm BSB	ND	ND	ND	41.8	ND	ND
<b>SCSU-CMP-5DZ3B</b>	<b>7/16/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>42.0</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5DZ3B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5DZ3B	7/16/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5DZ3B</b>	<b>7/16/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	7/11/2024	Sediment	15 cm BSB	ND	ND	ND	6.8	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>7/11/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>2.3</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	7/11/2024	Sediment	40 cm BSB	ND	ND	ND	27.0	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	40 cm BSB	ND	ND	ND	7.5	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	40 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>7/11/2024</b>	<b>AVERAGE</b>	<b>40 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>11.5</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5D1B	7/11/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	65 cm BSB	7.4	ND	ND	ND	ND	ND
SCSU-CMP-5D1B	7/11/2024	Sediment	65 cm BSB	11.0	ND	ND	ND	ND	ND
<b>SCSU-CMP-5D1B</b>	<b>7/11/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>6.1</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5G	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5G	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5G	8/27/2024	Sediment	15 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5G</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>15 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
SCSU-CMP-5G	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5G	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
SCSU-CMP-5G	8/27/2024	Sediment	65 cm BSB	ND	ND	ND	ND	ND	ND
<b>SCSU-CMP-5G</b>	<b>8/27/2024</b>	<b>AVERAGE</b>	<b>65 cm BSB</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>

ND = not detected; detection

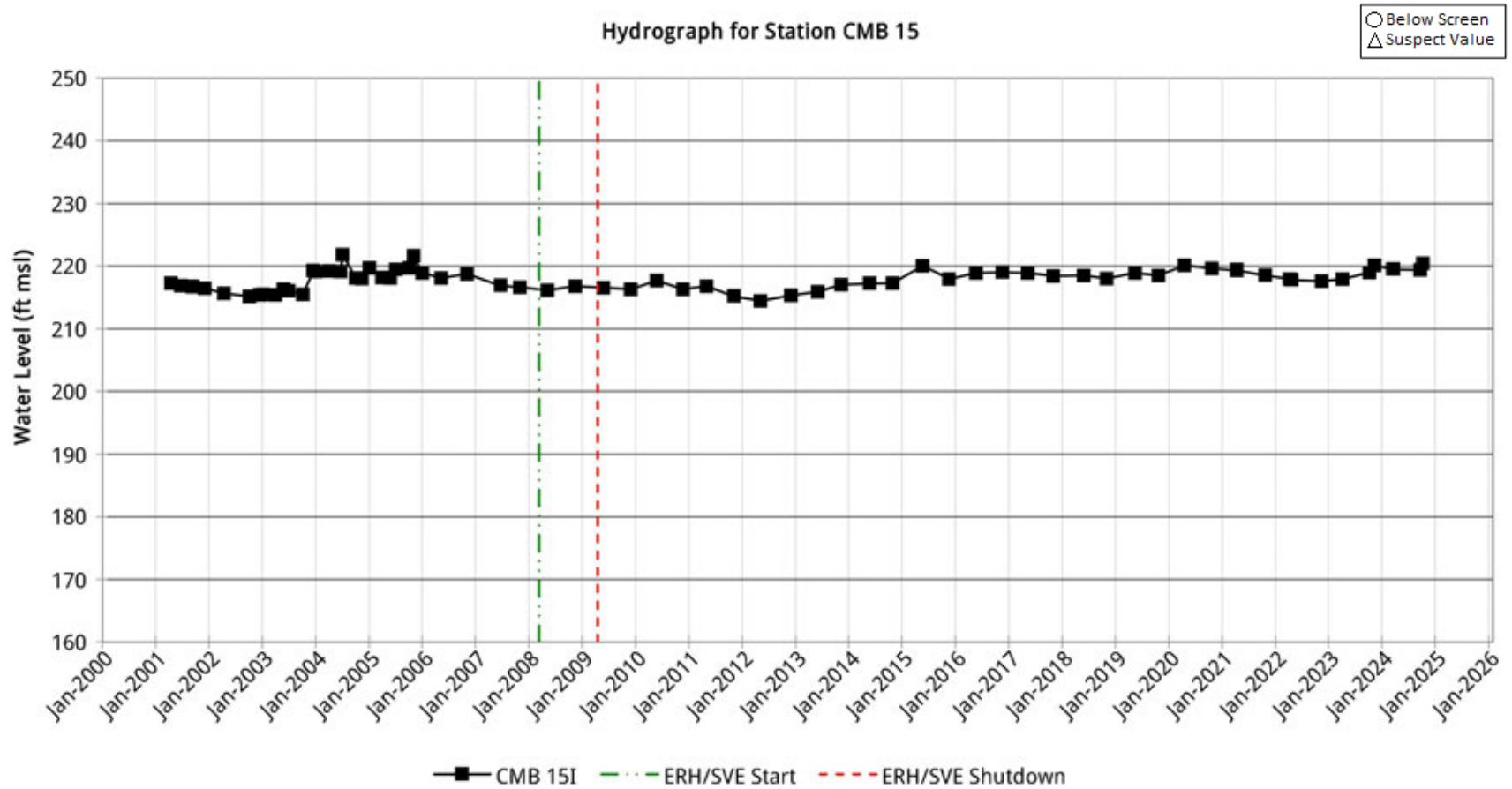
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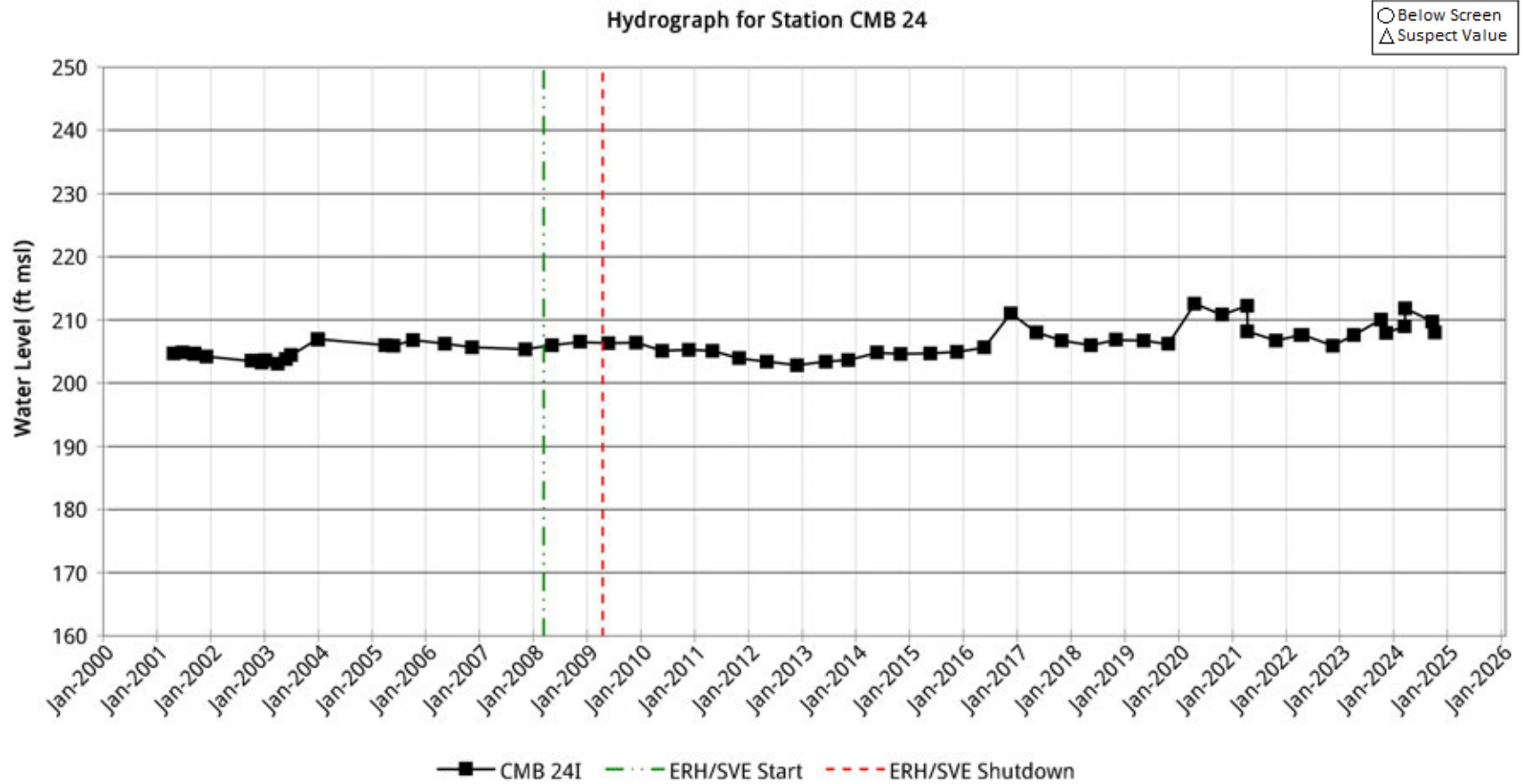
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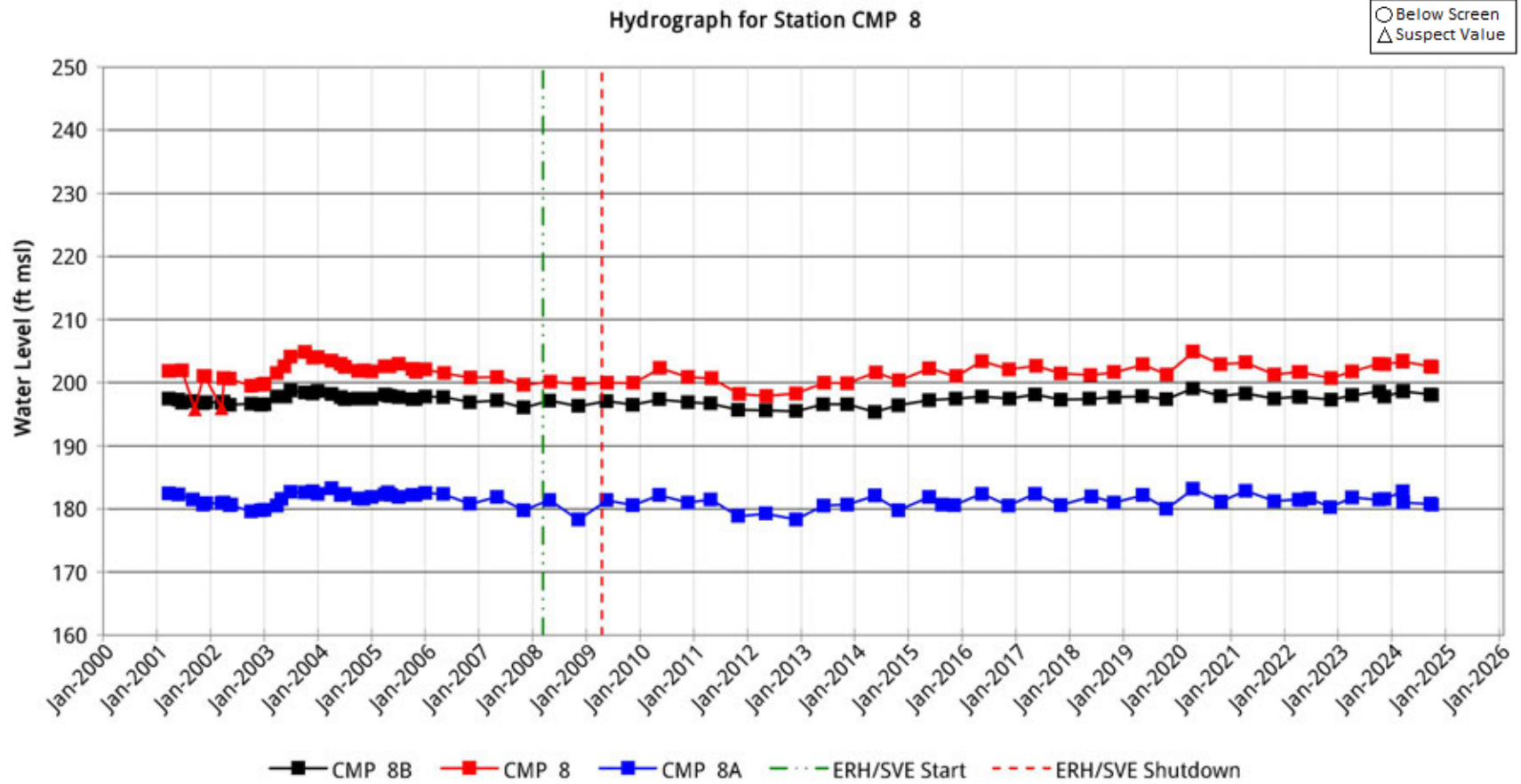
**Appendix A**  
**Hydrographs**

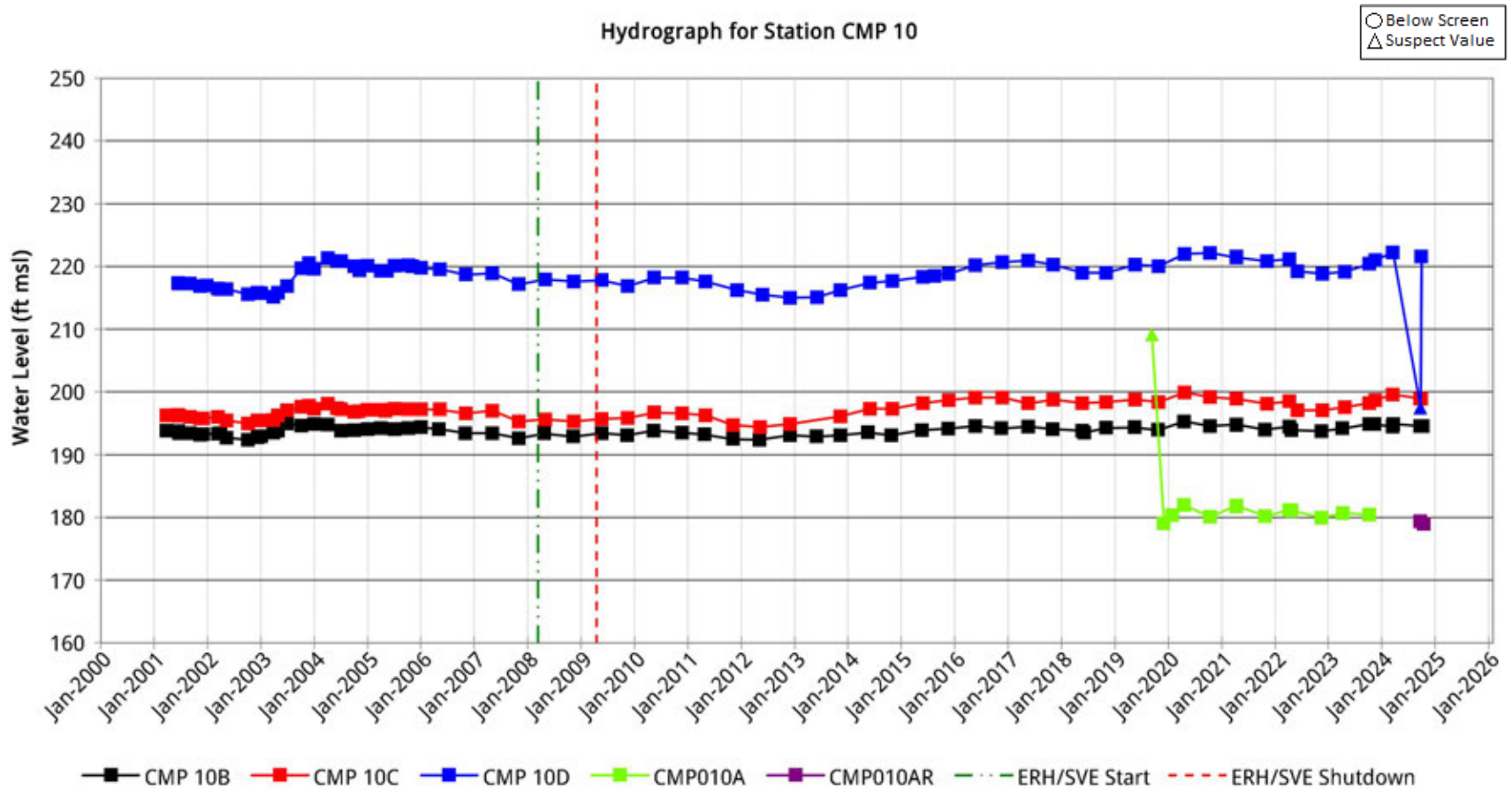
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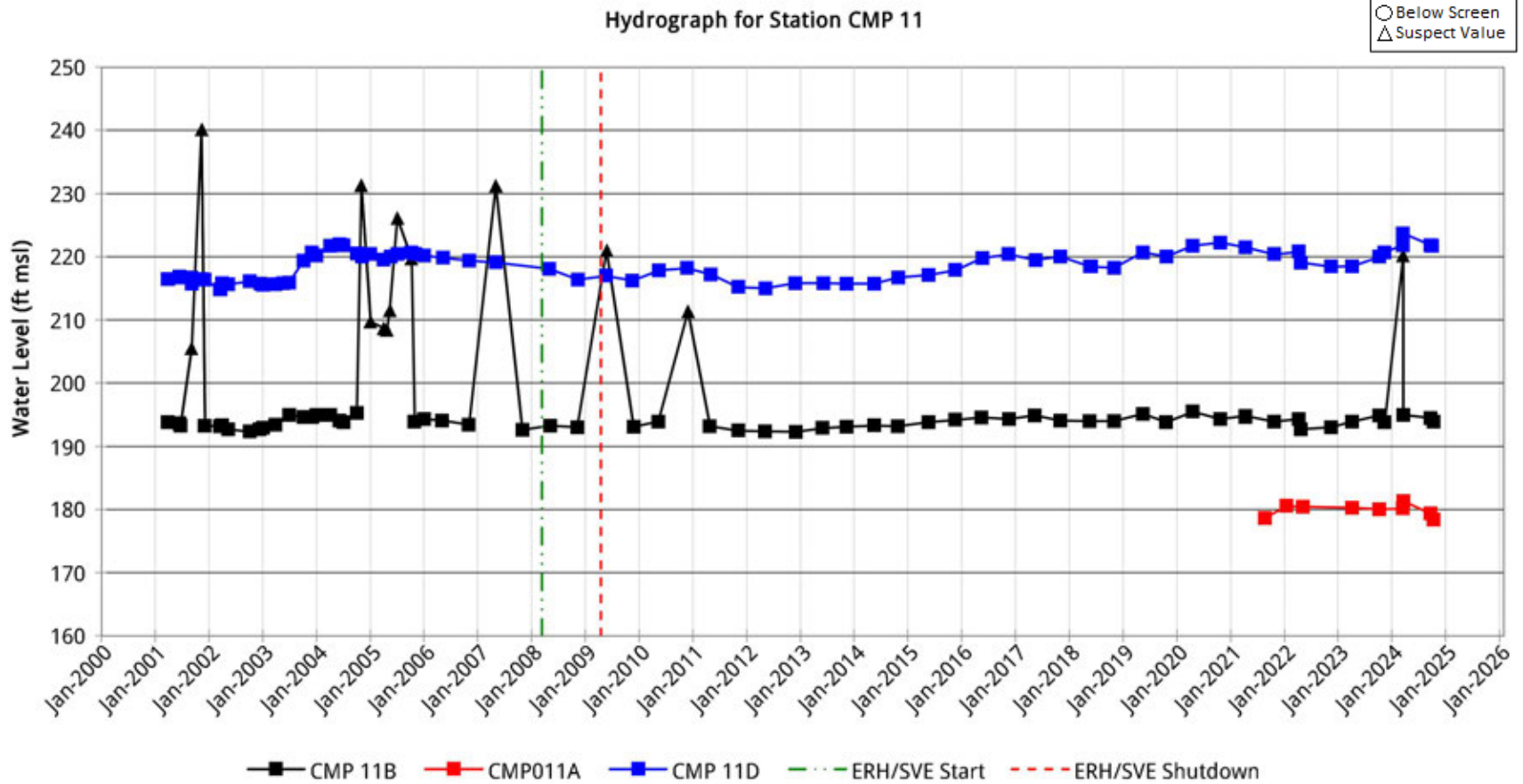
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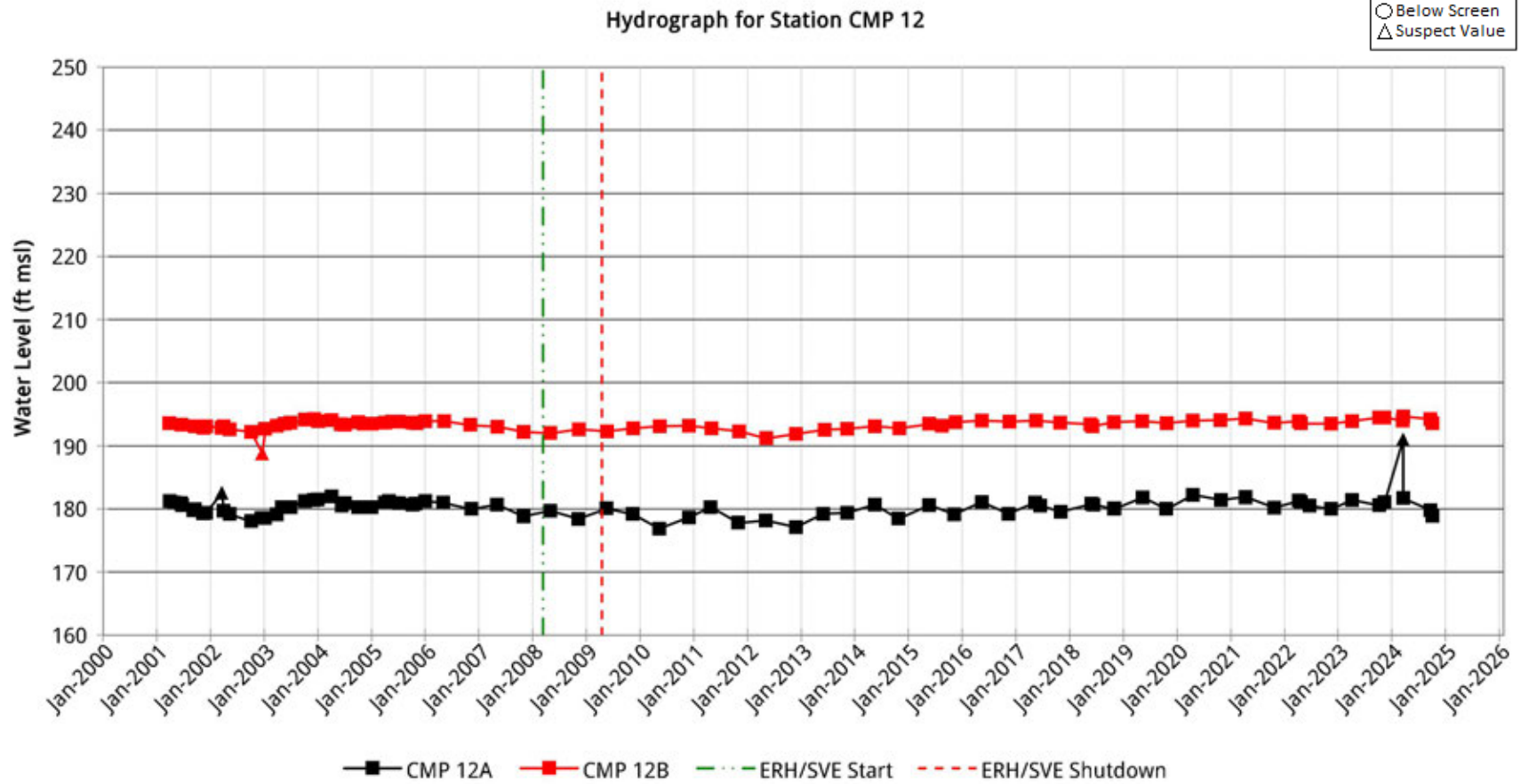


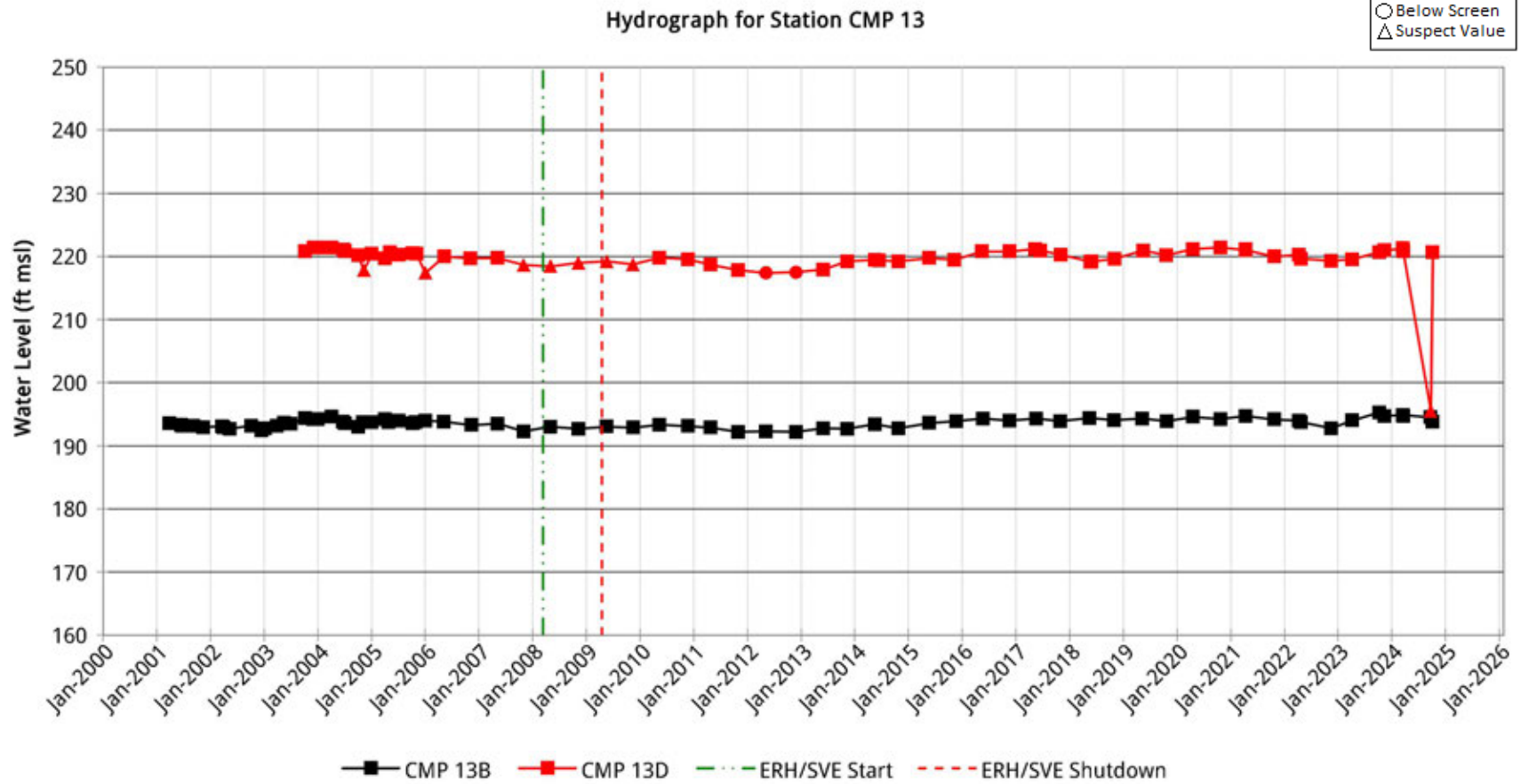


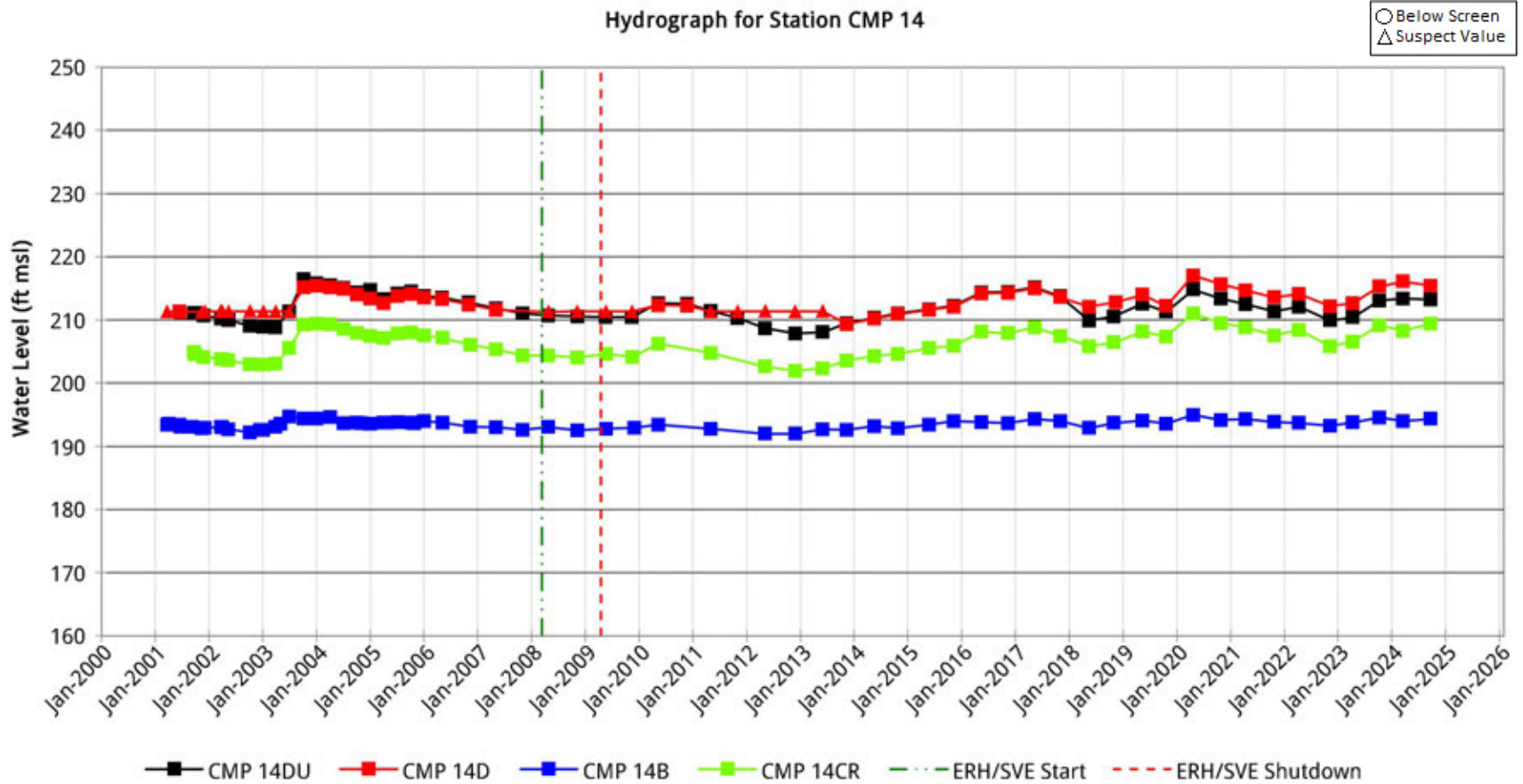


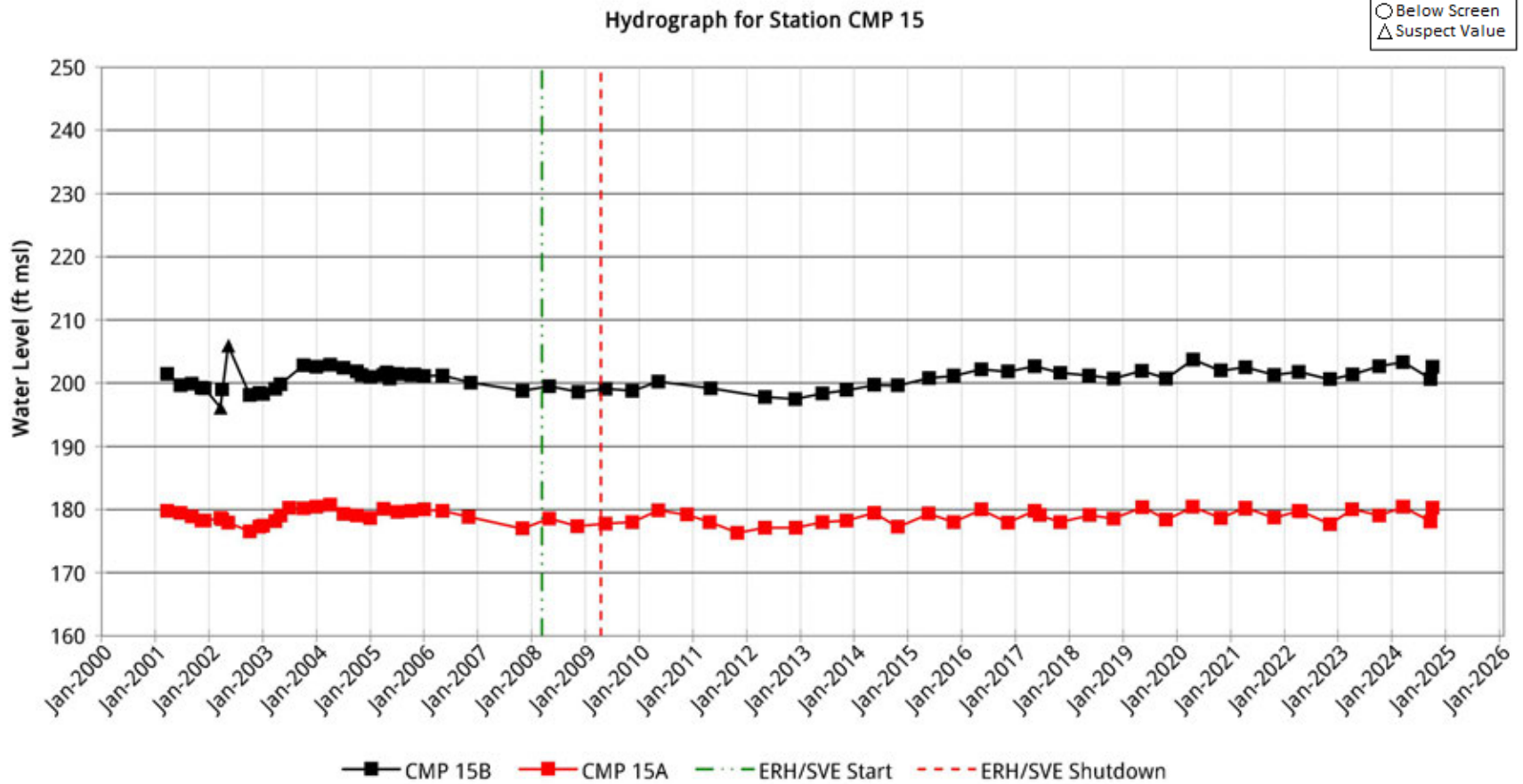


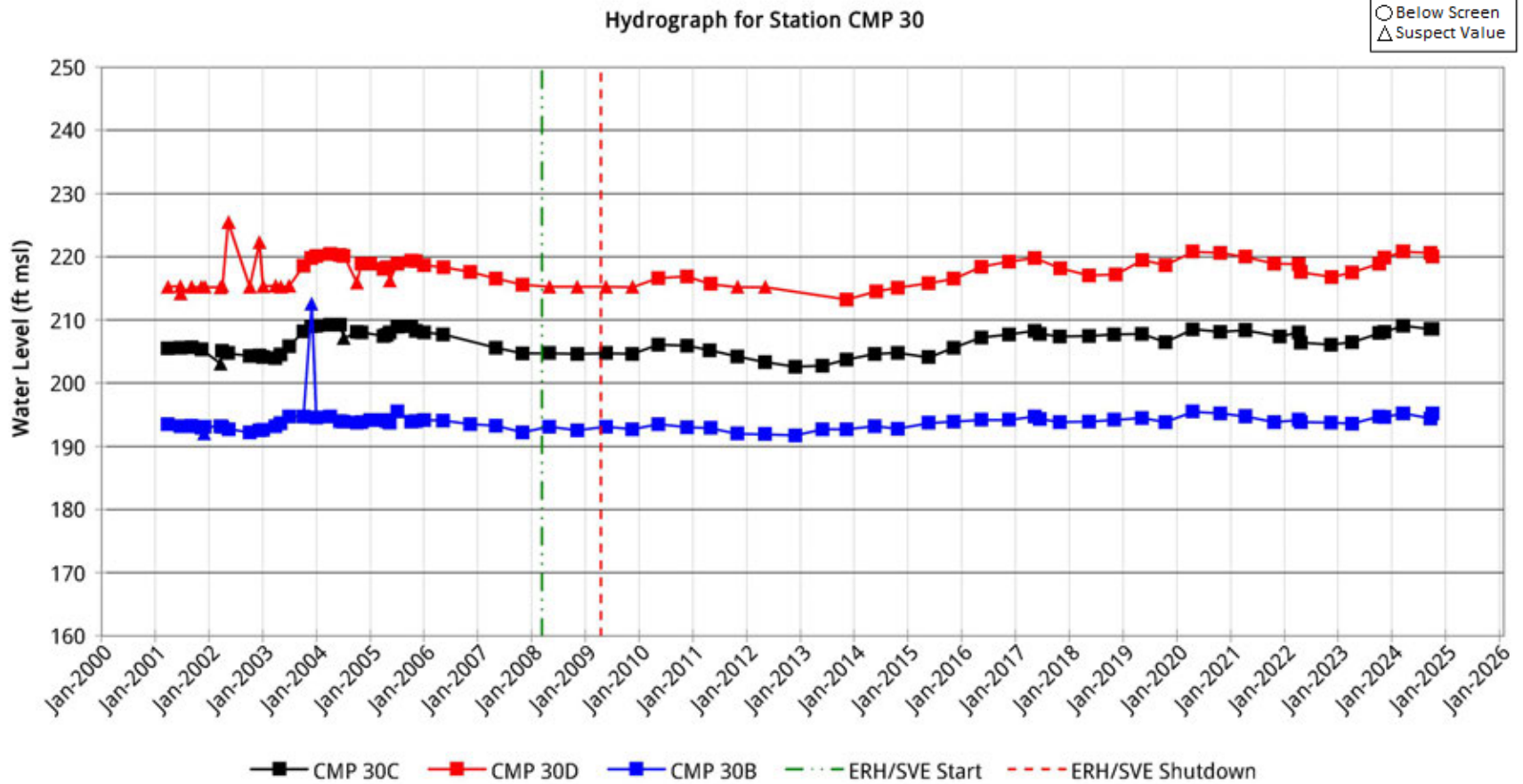


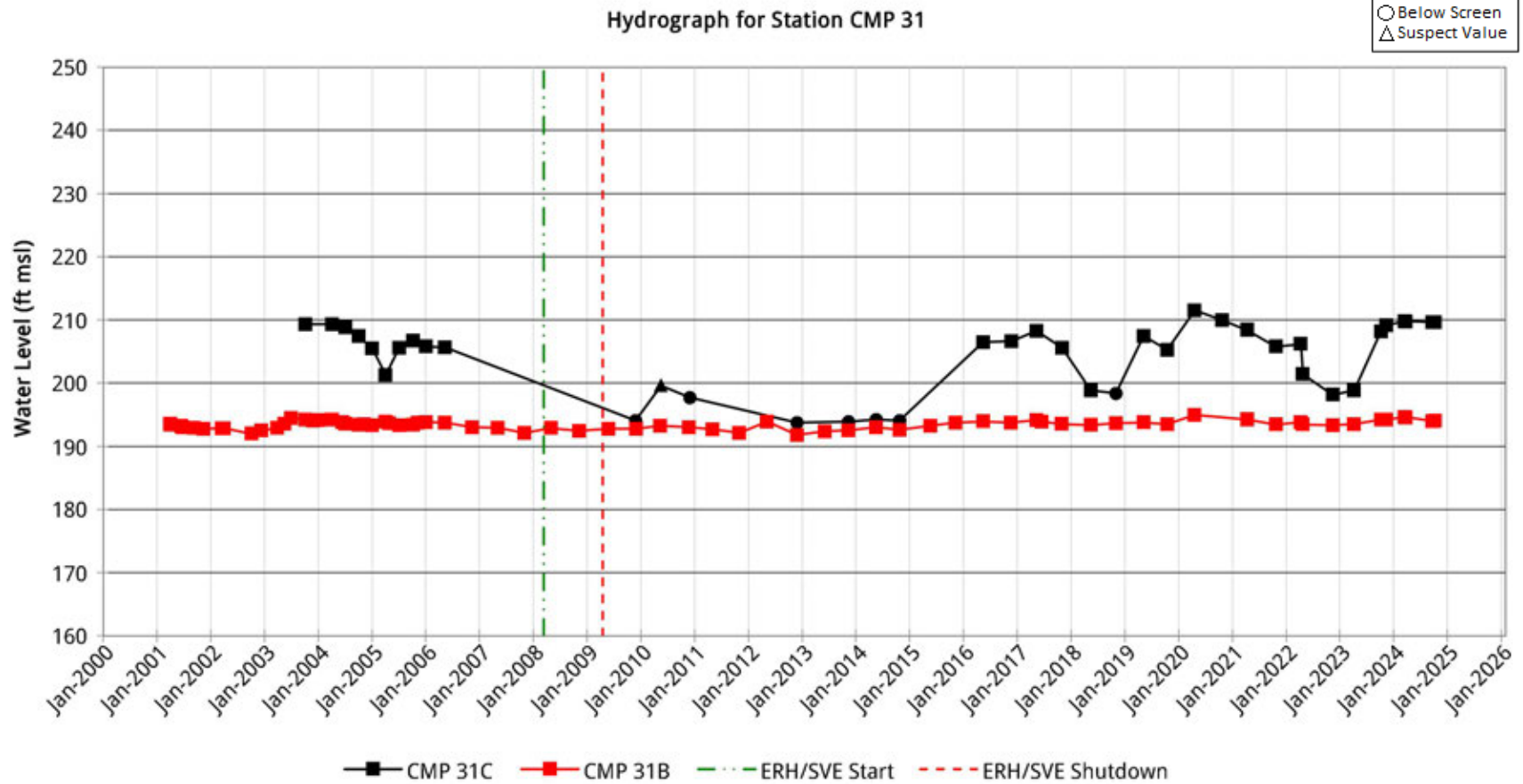


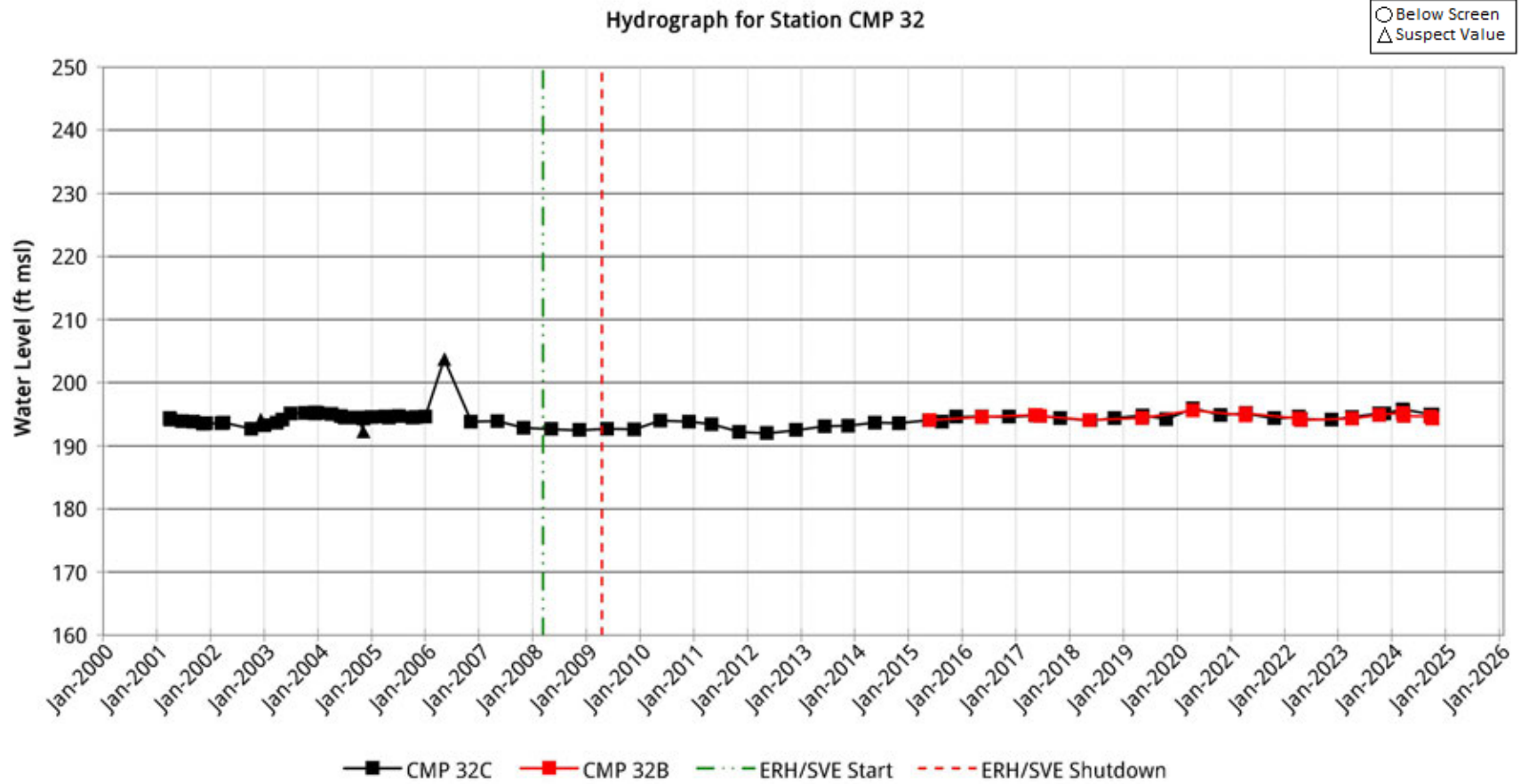


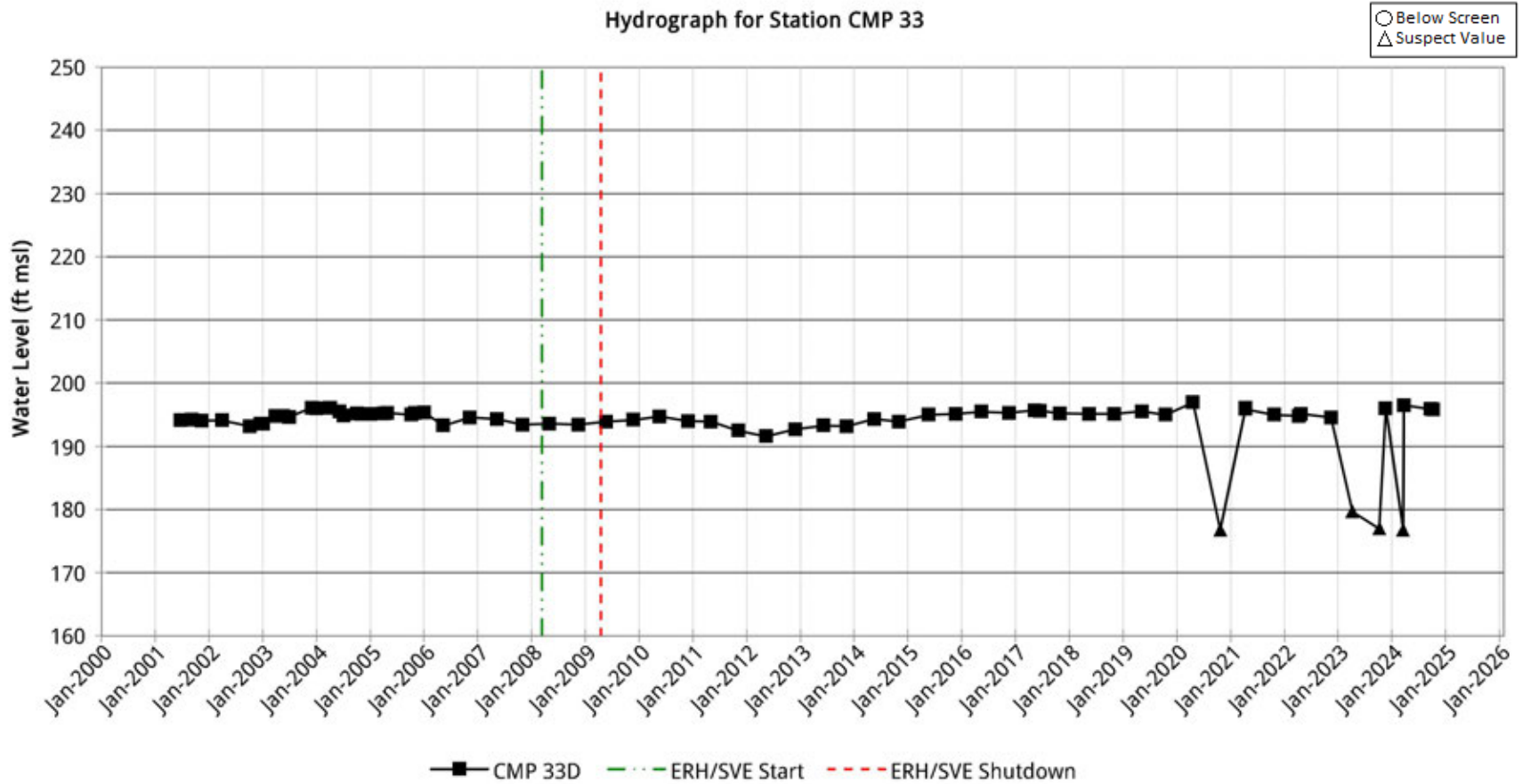


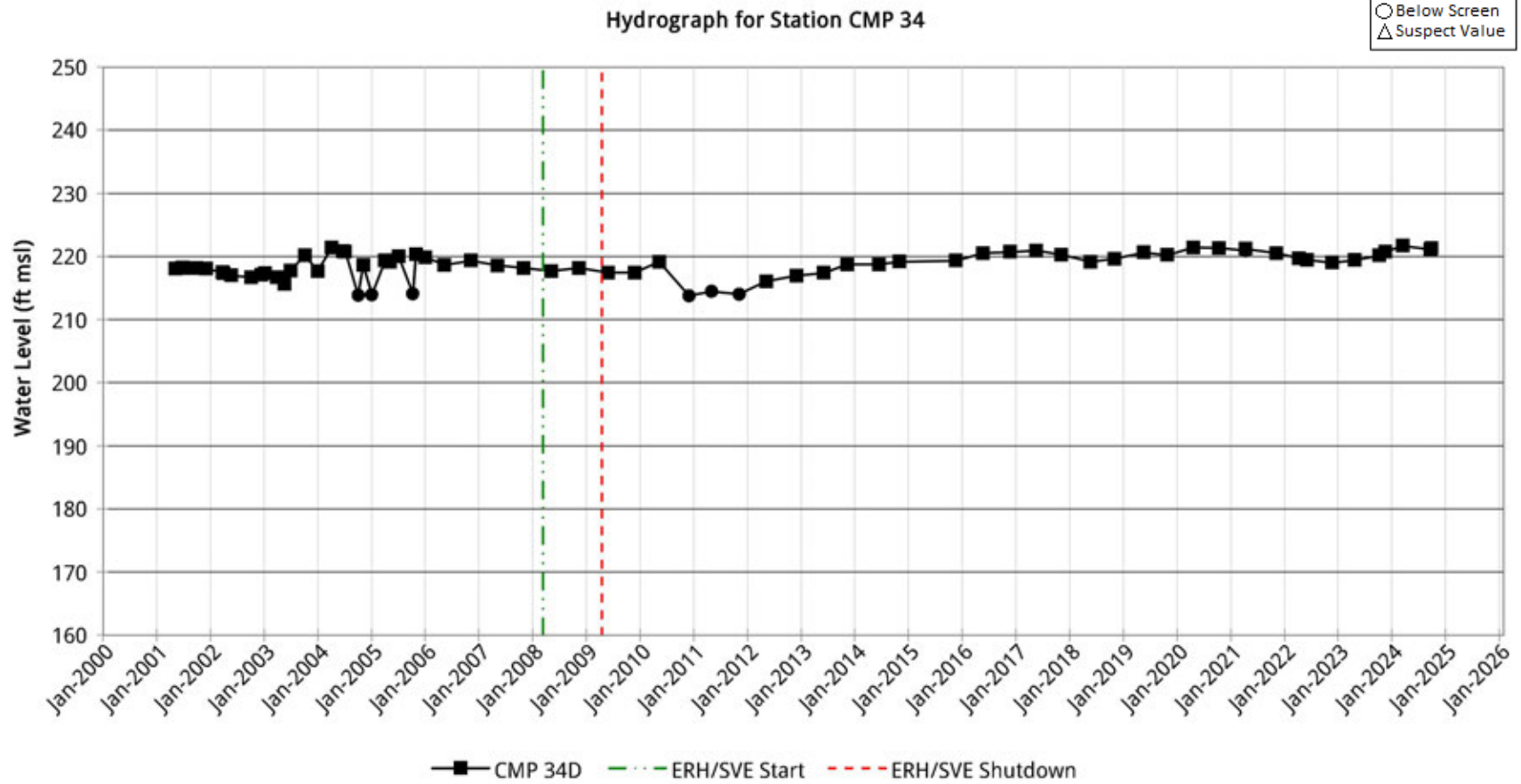


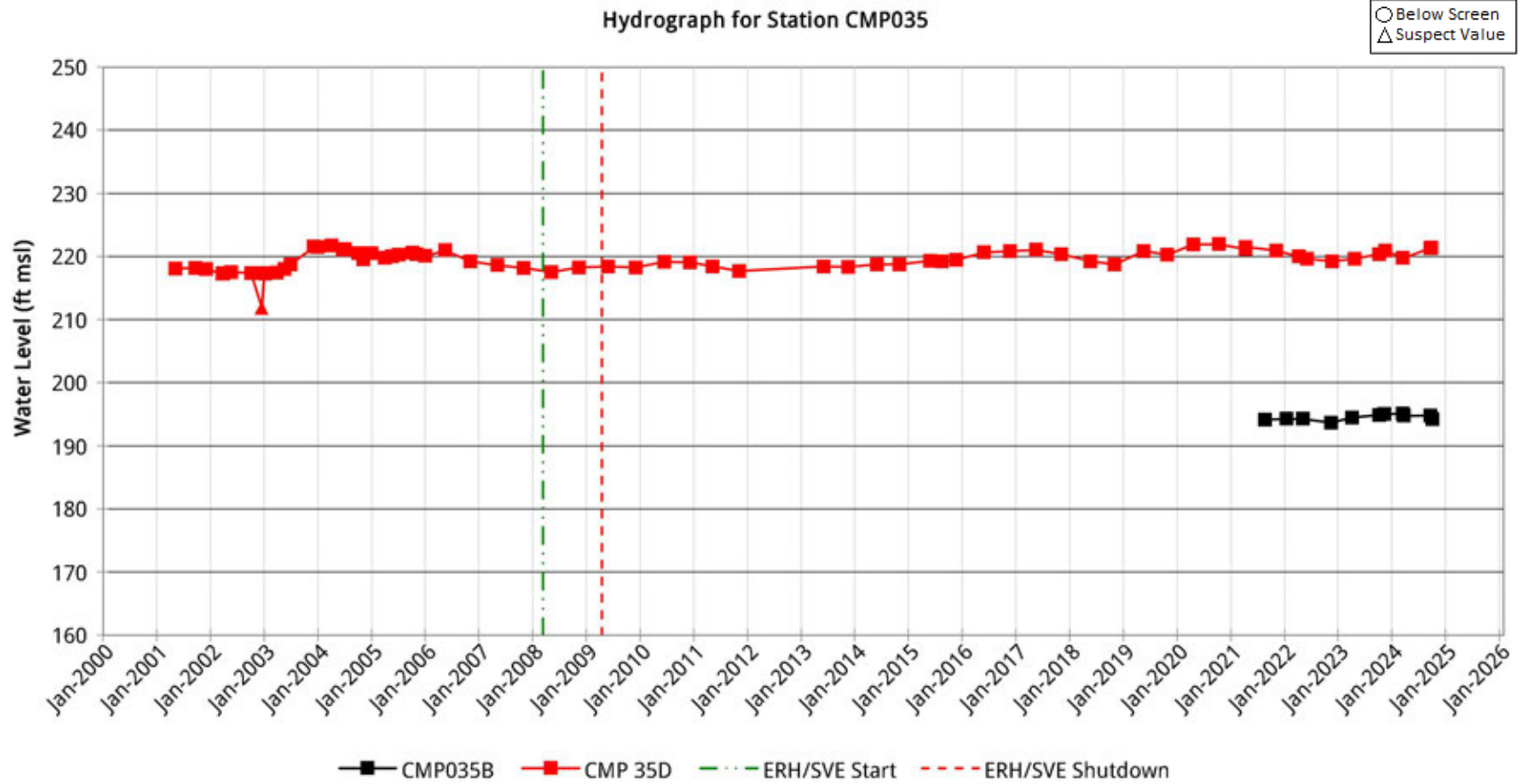


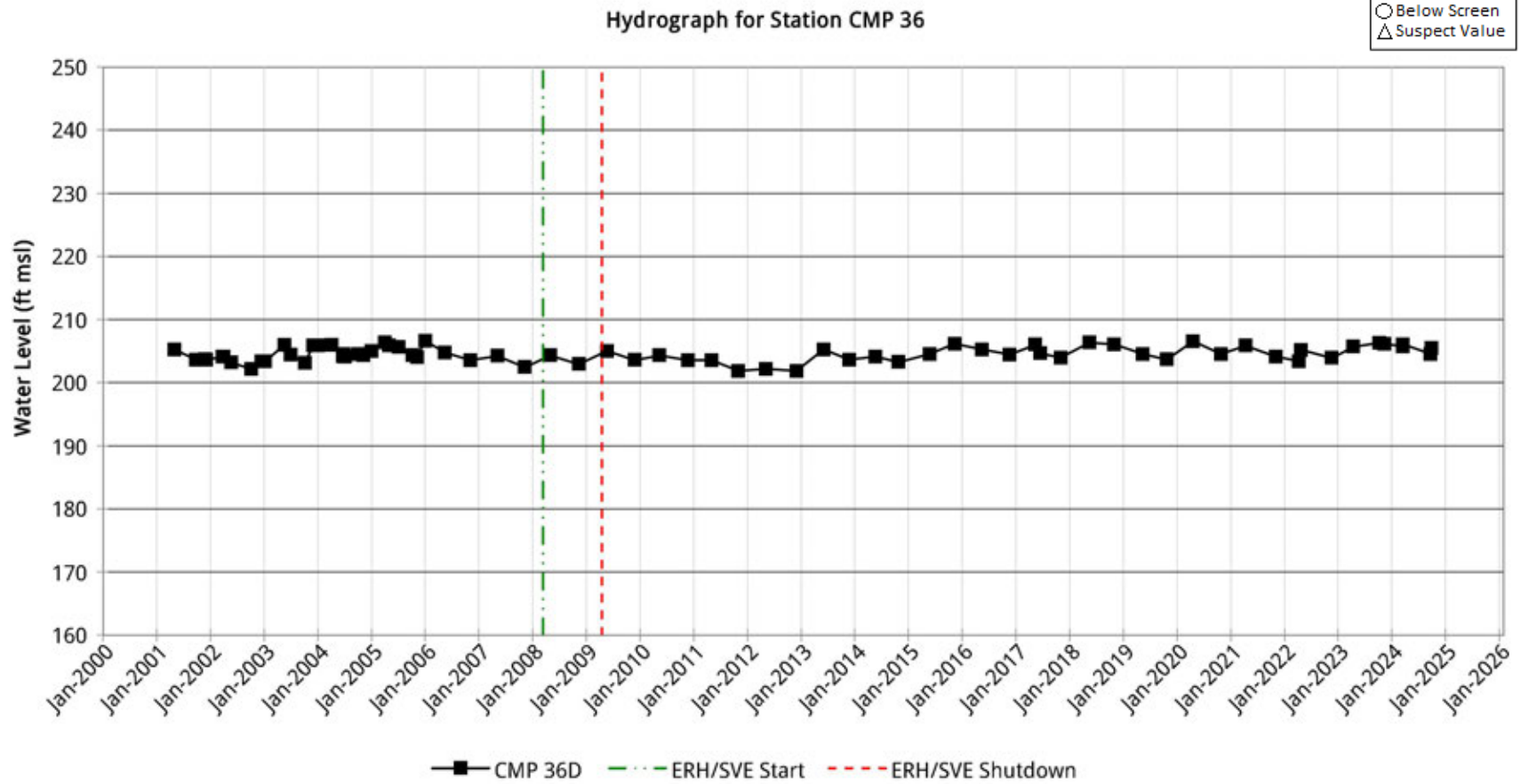


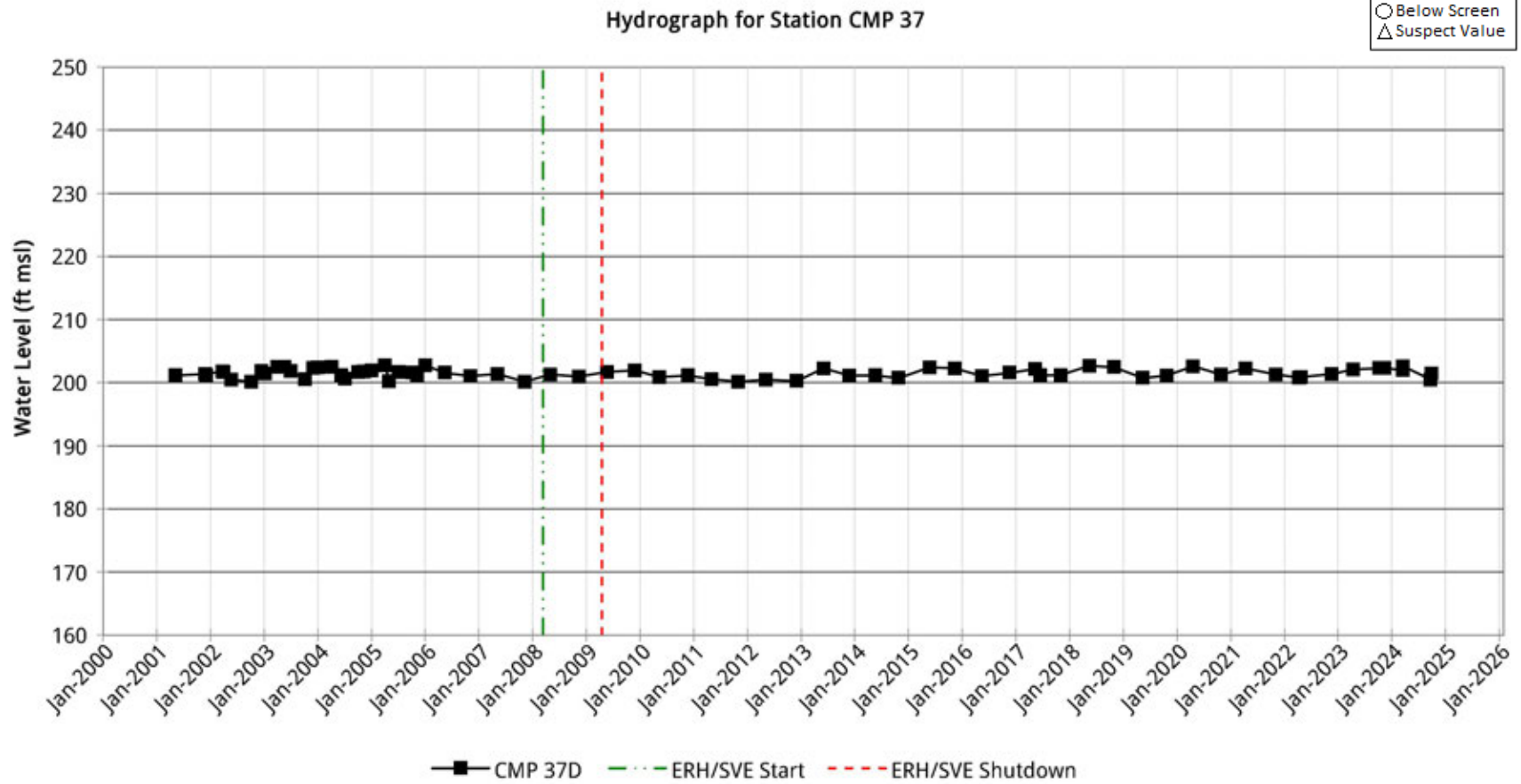


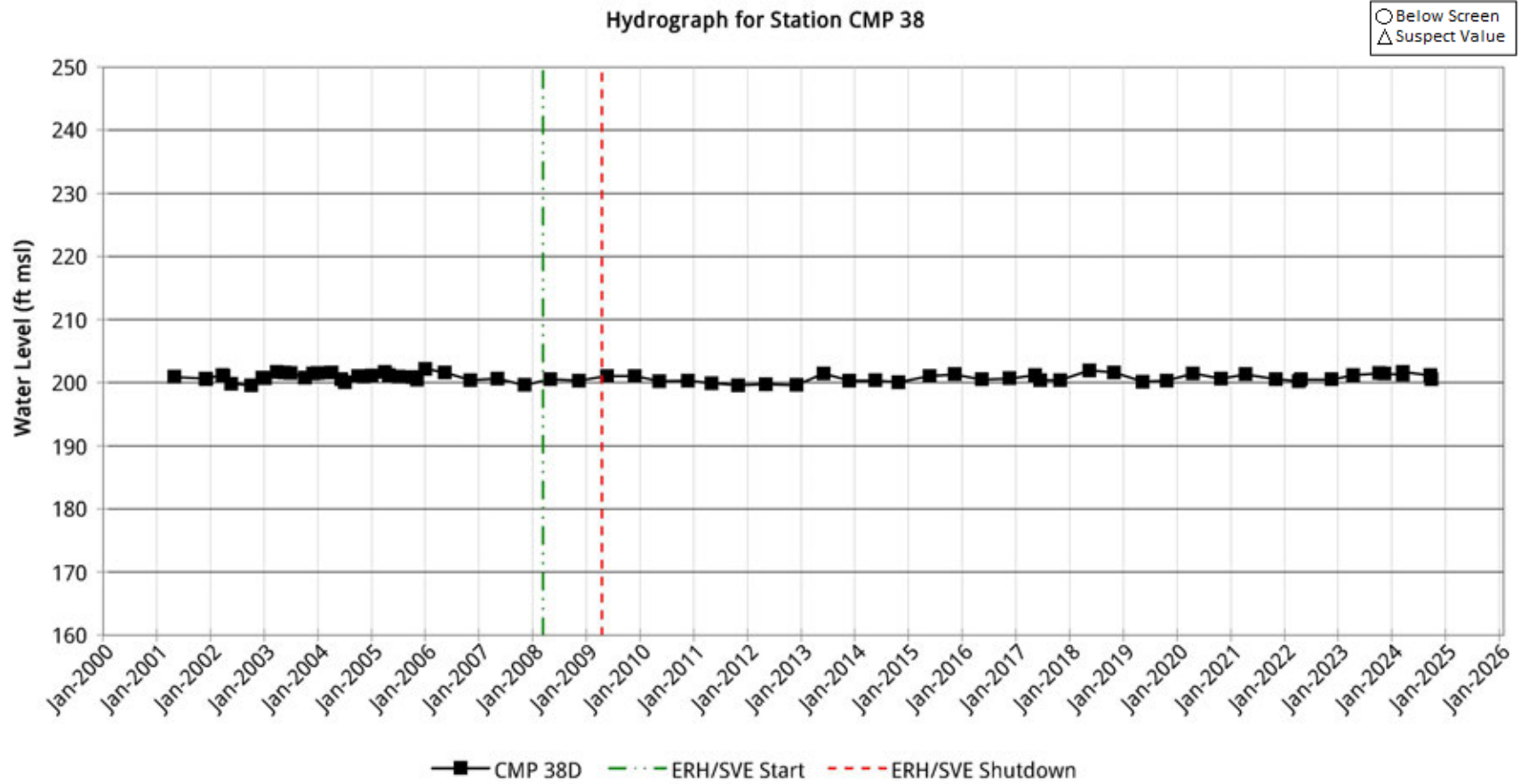


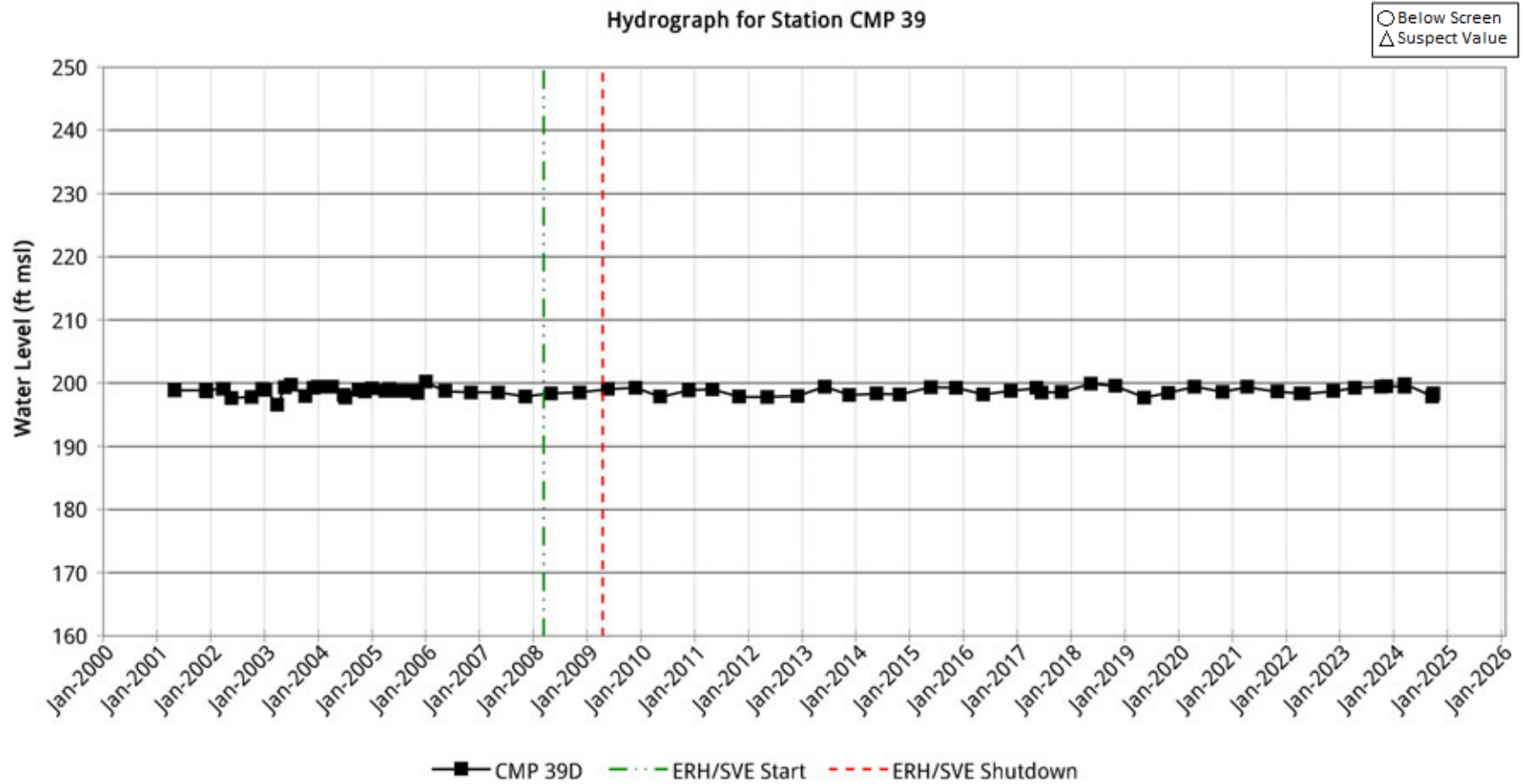


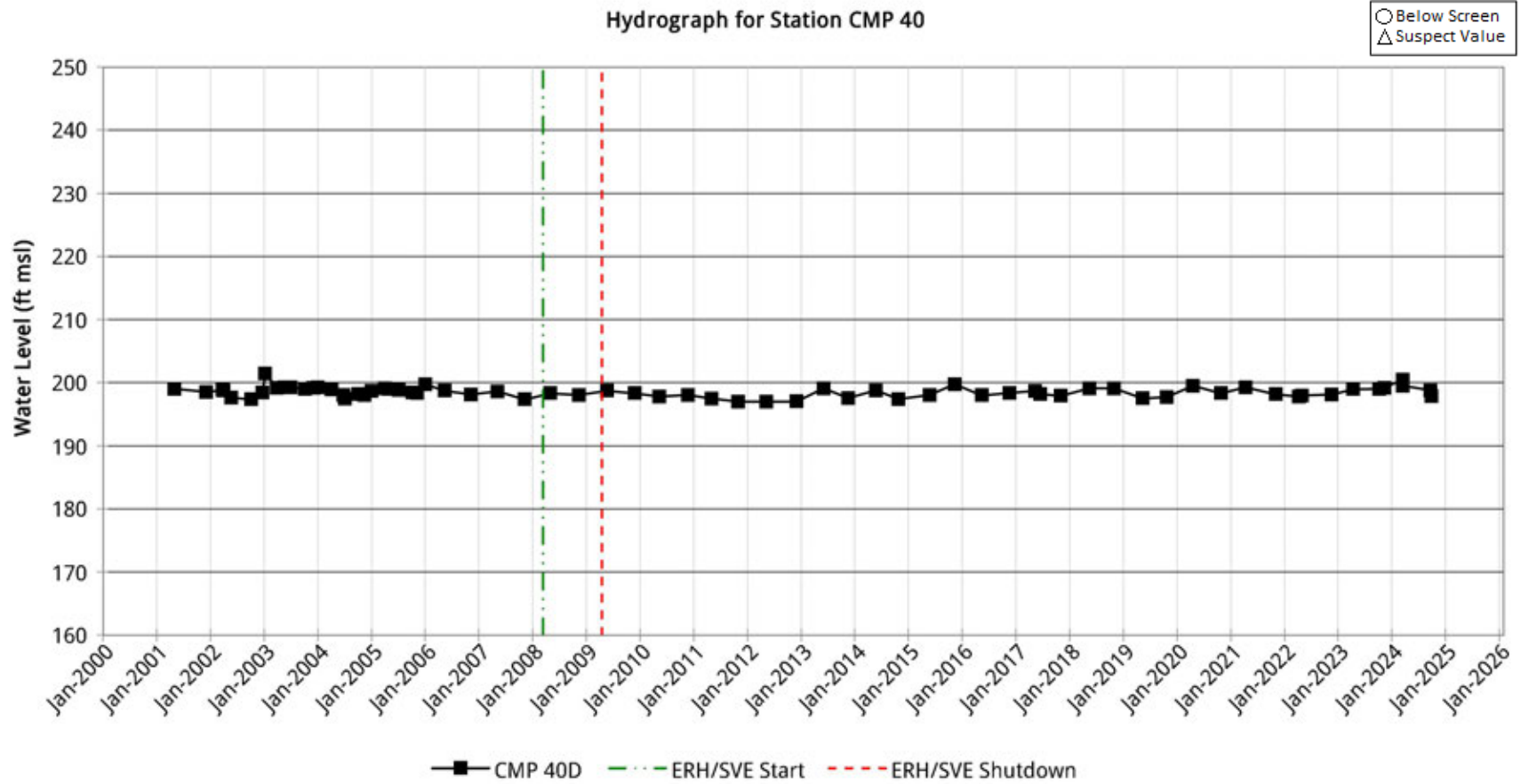


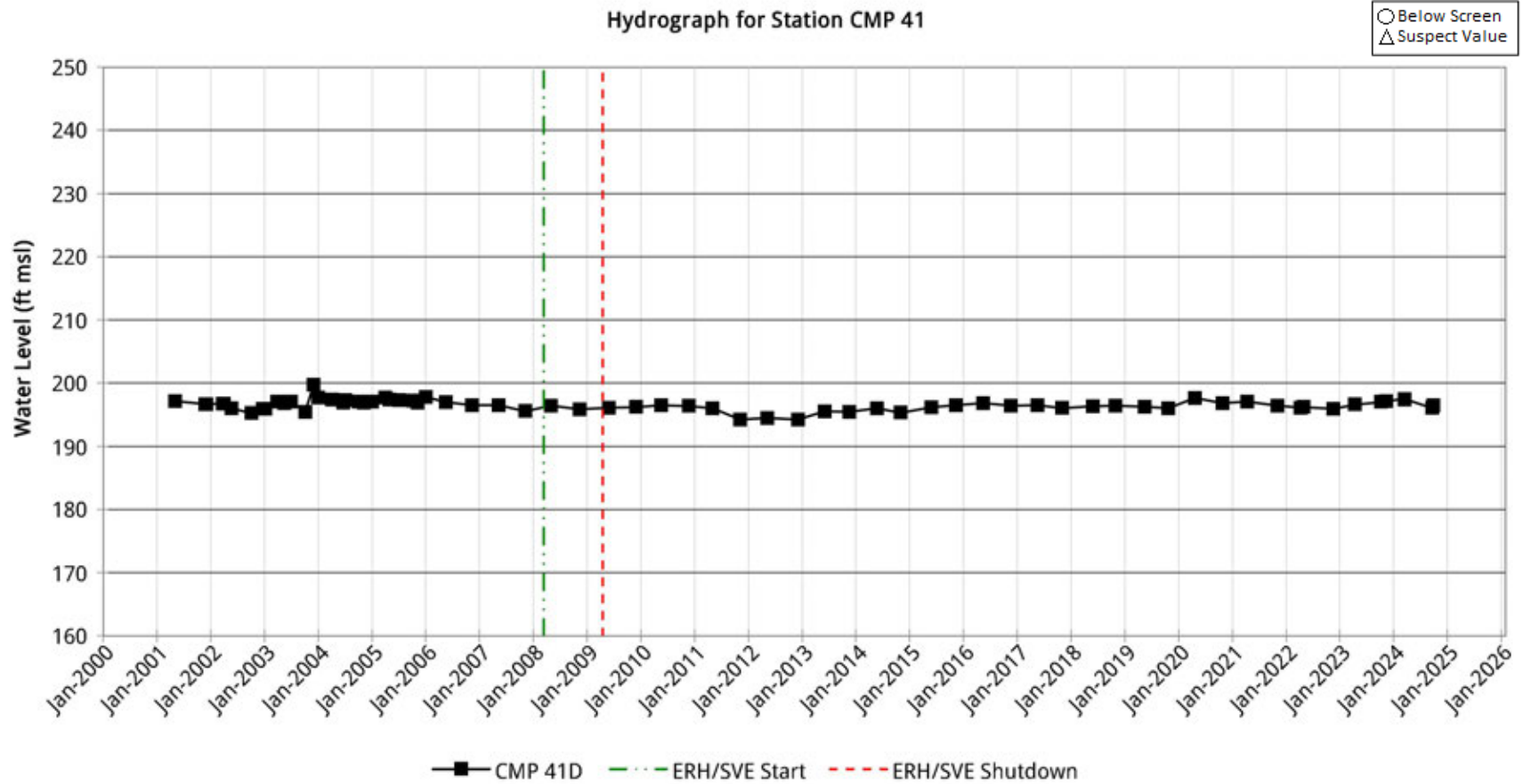


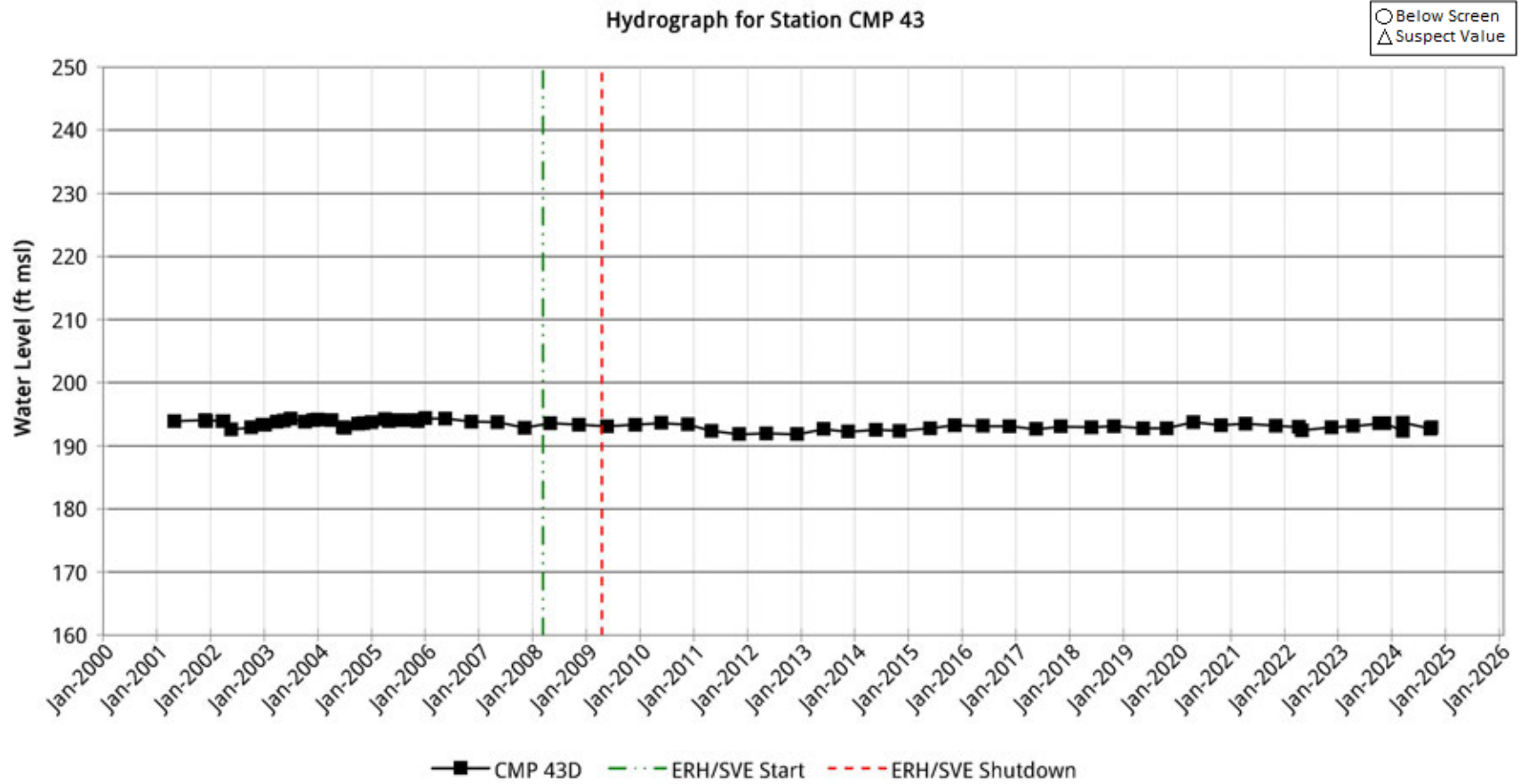


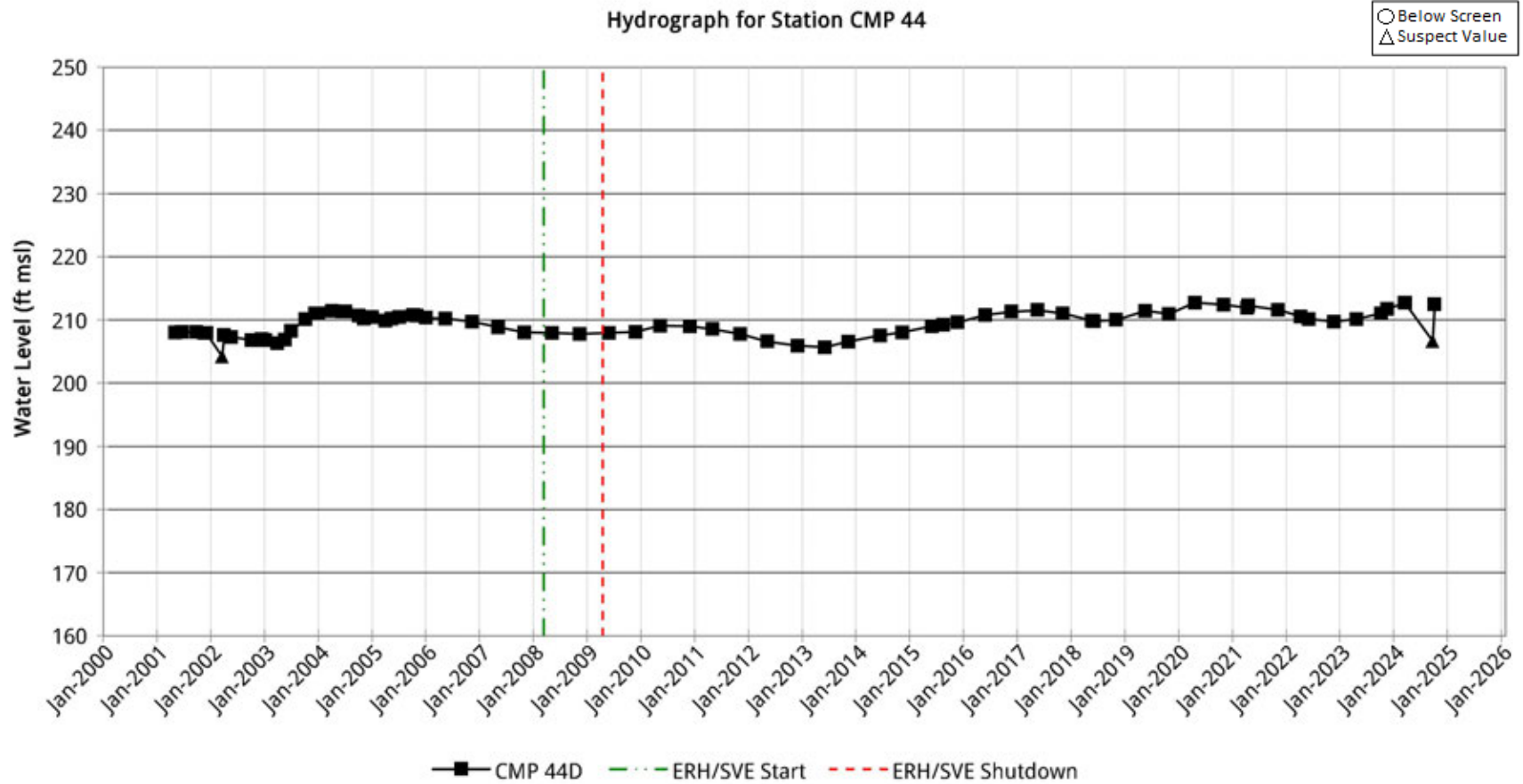


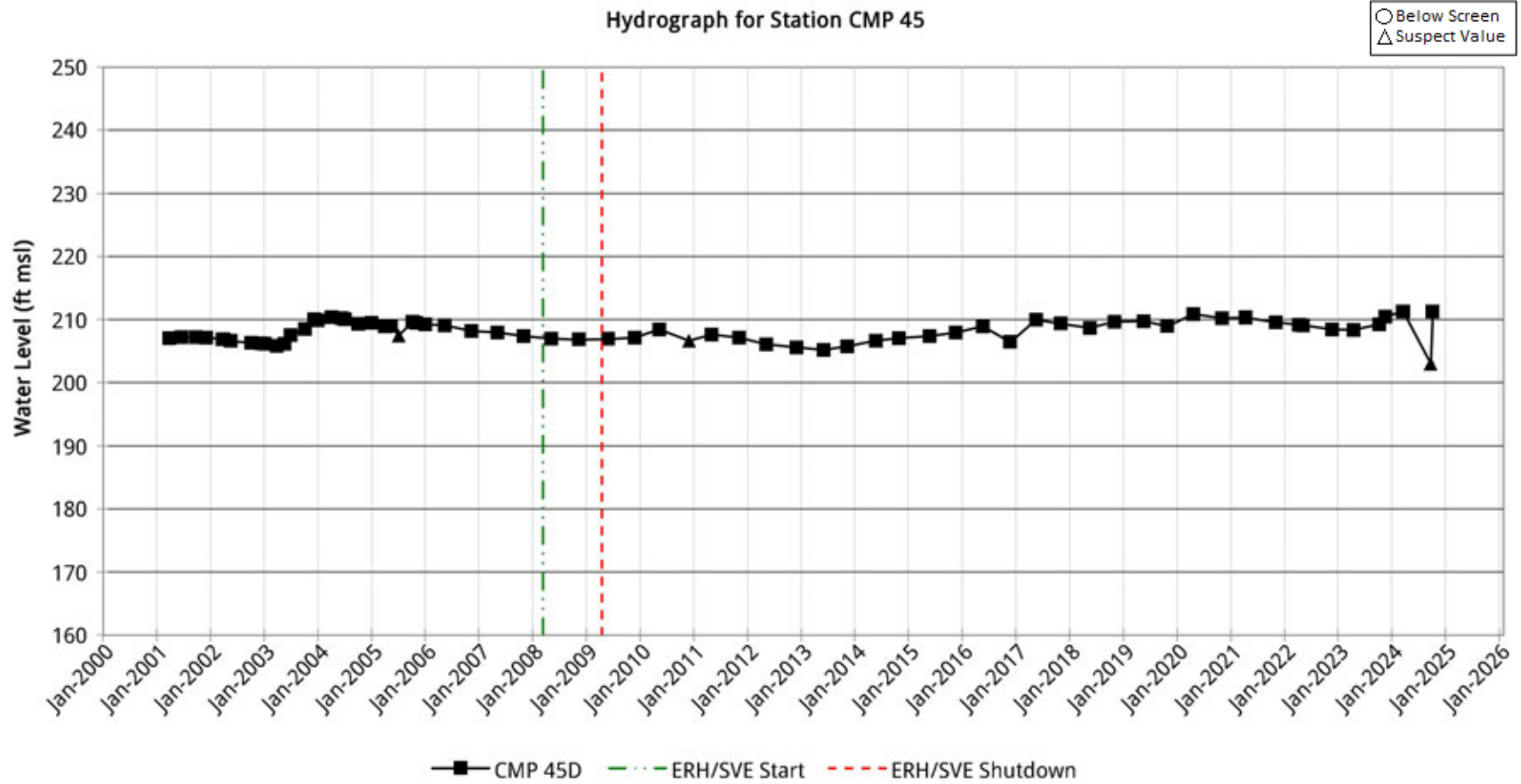


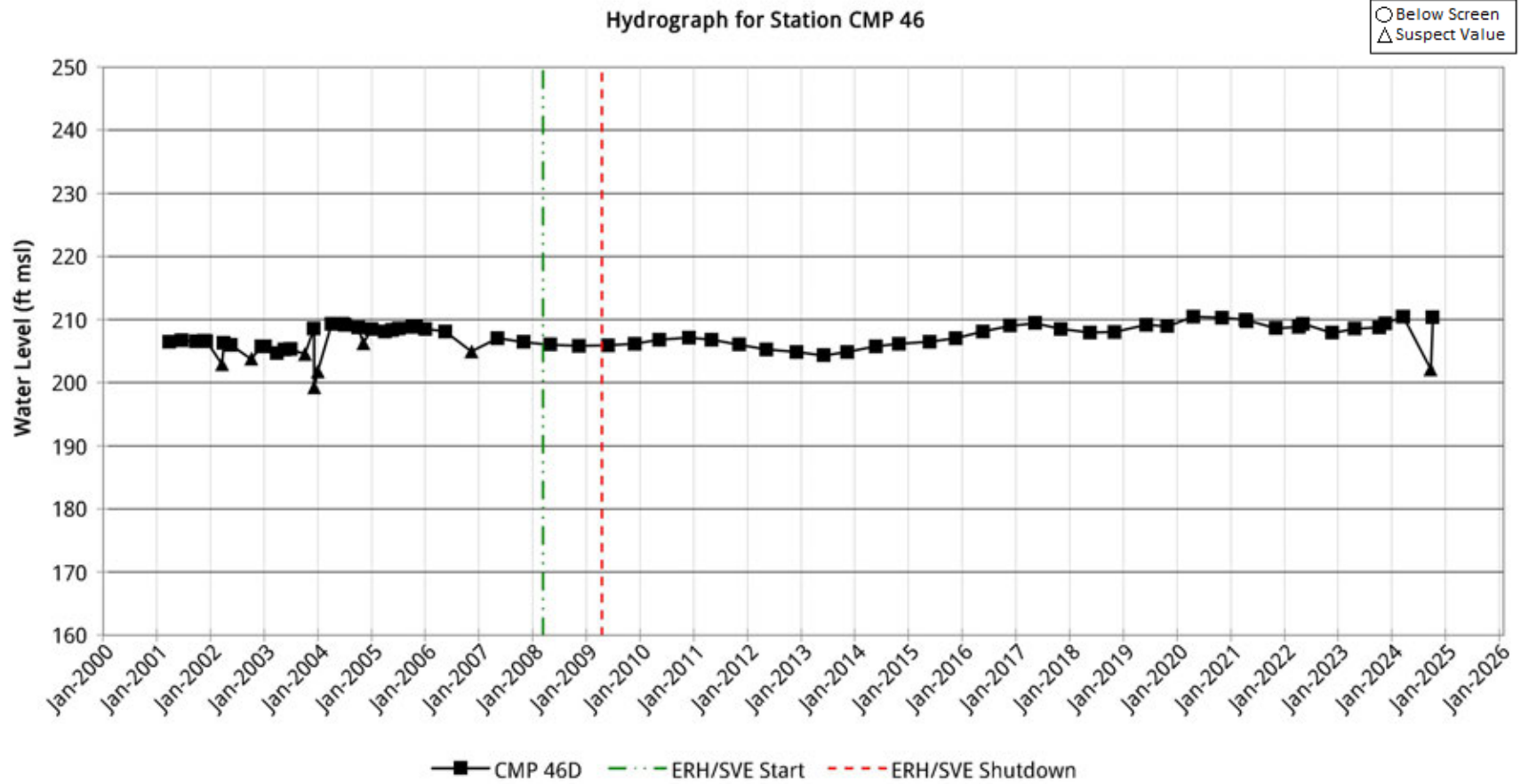


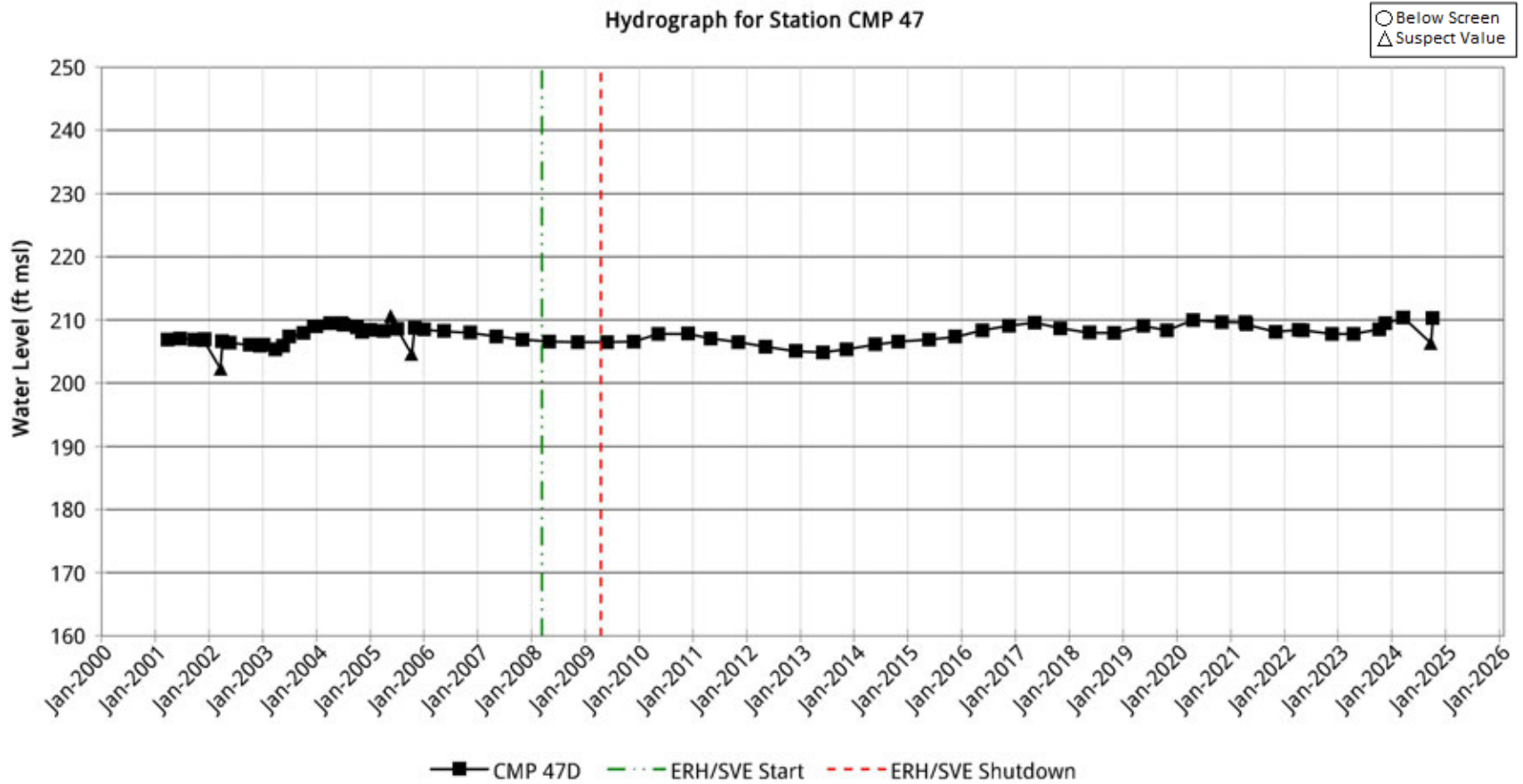


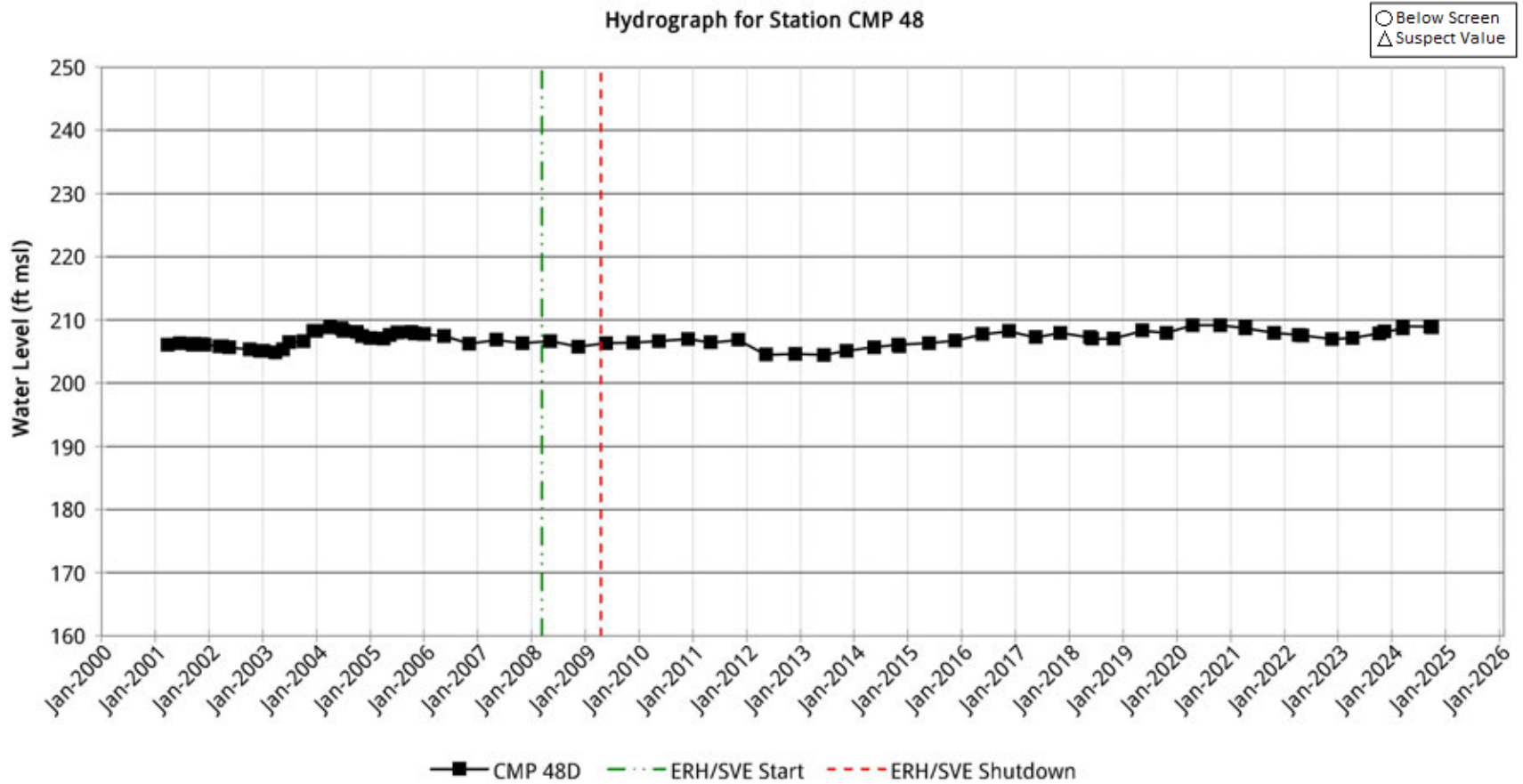


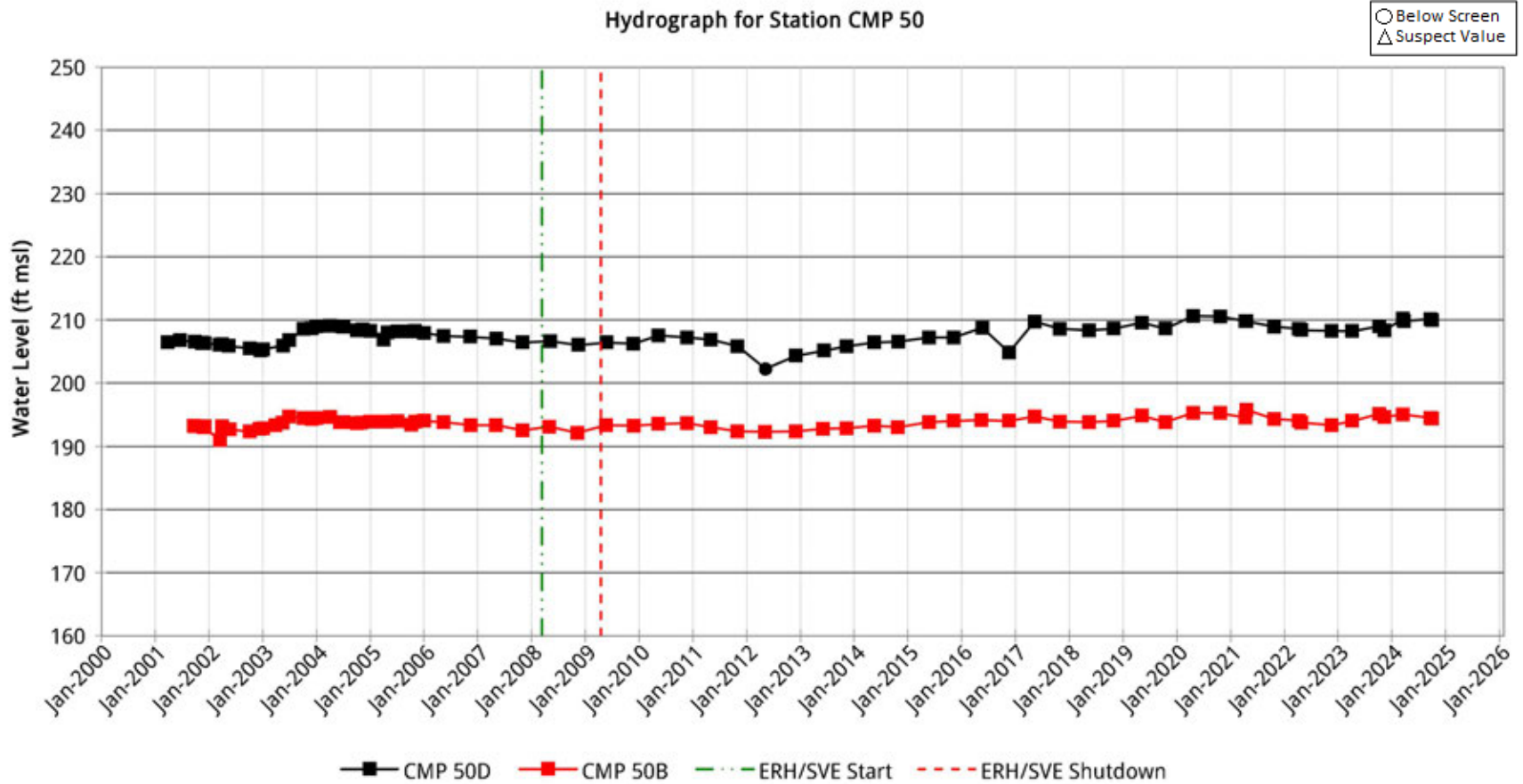


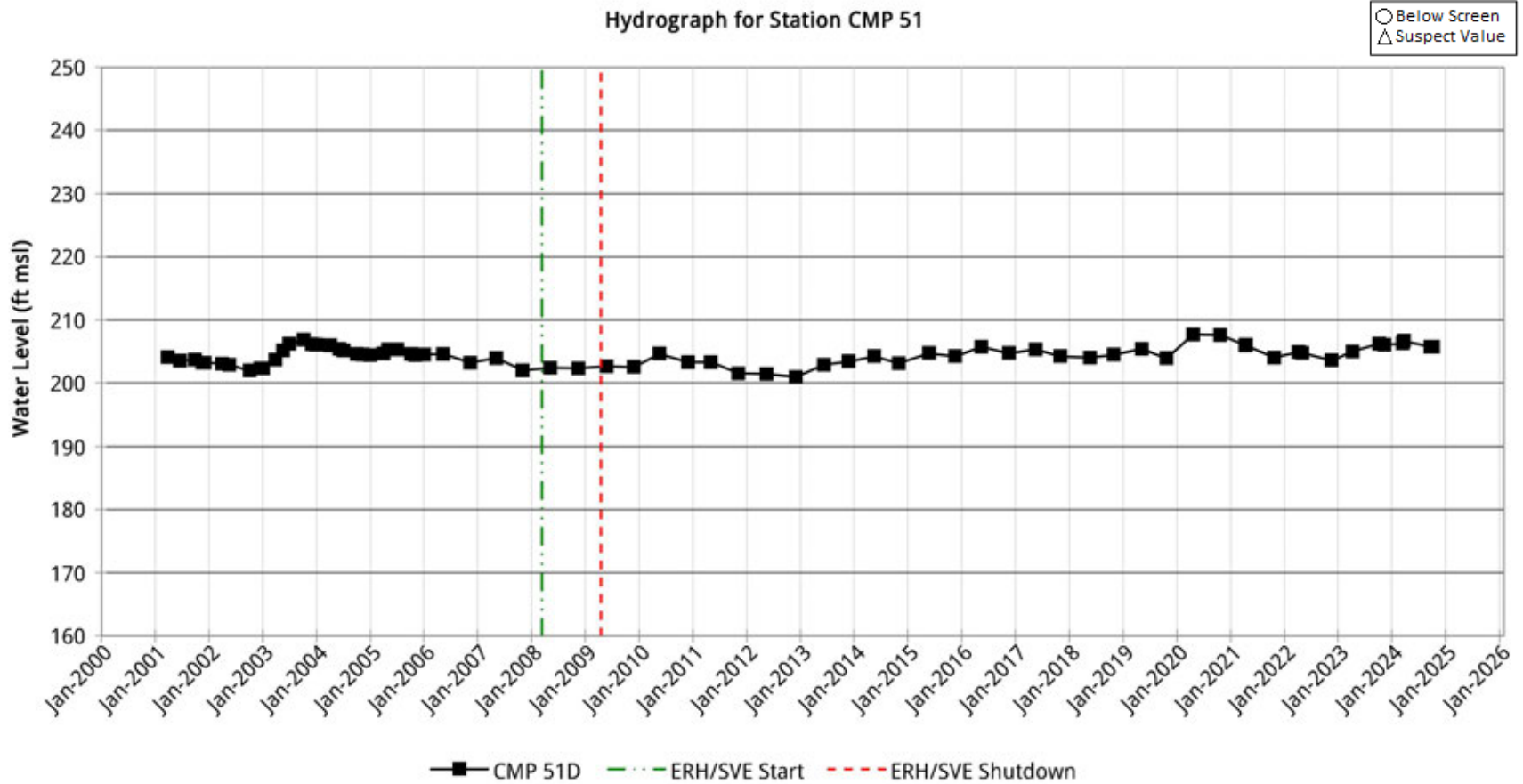


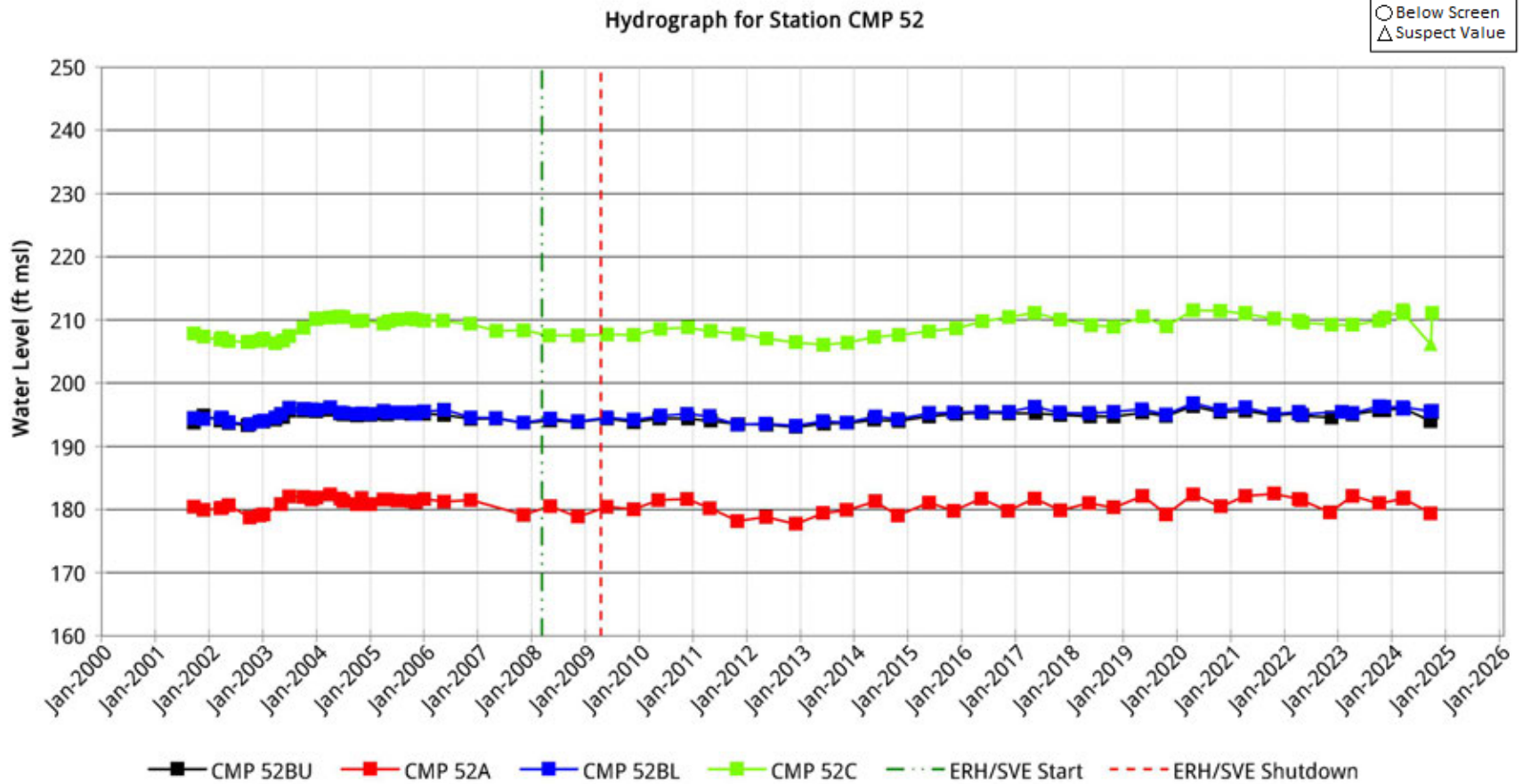


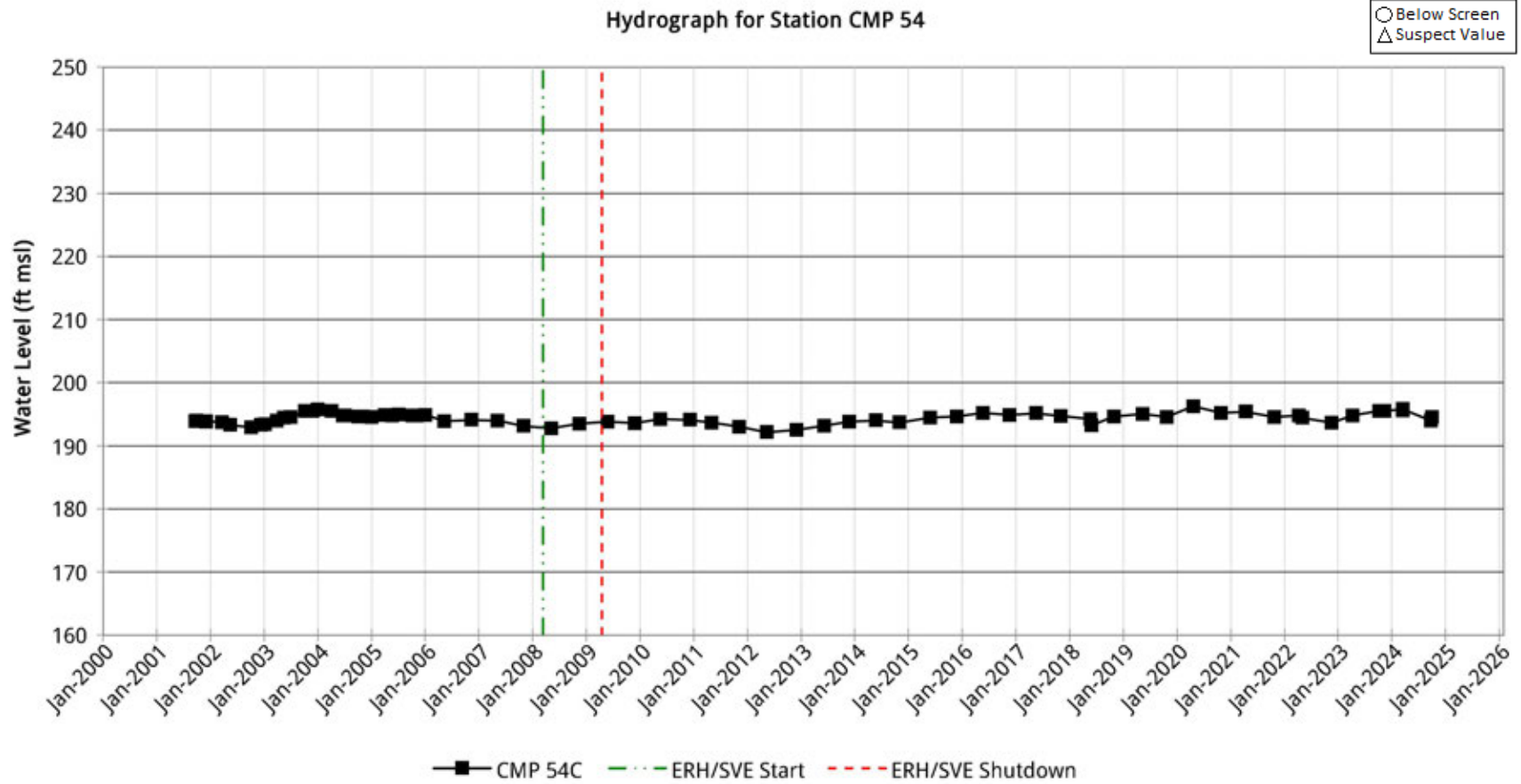


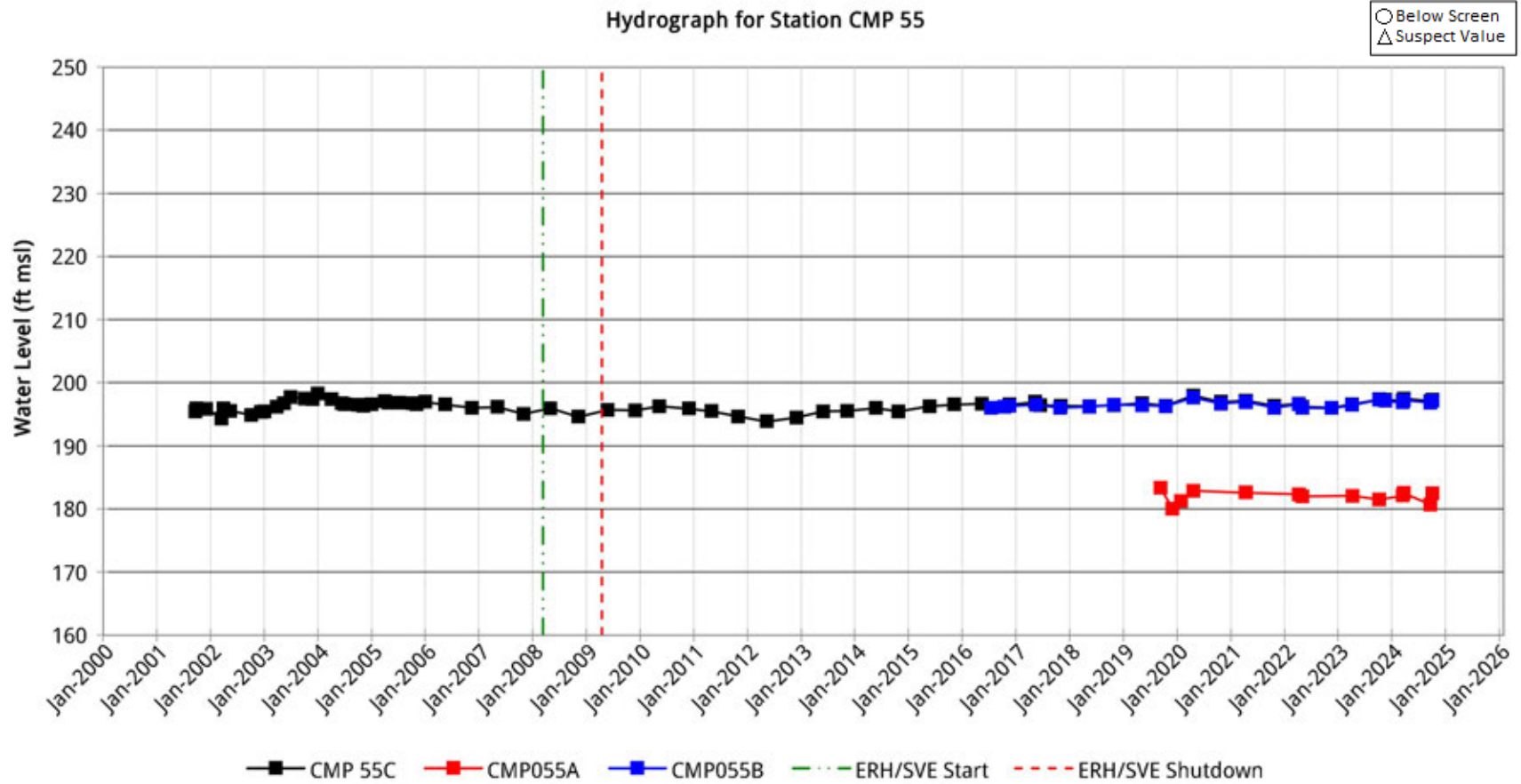


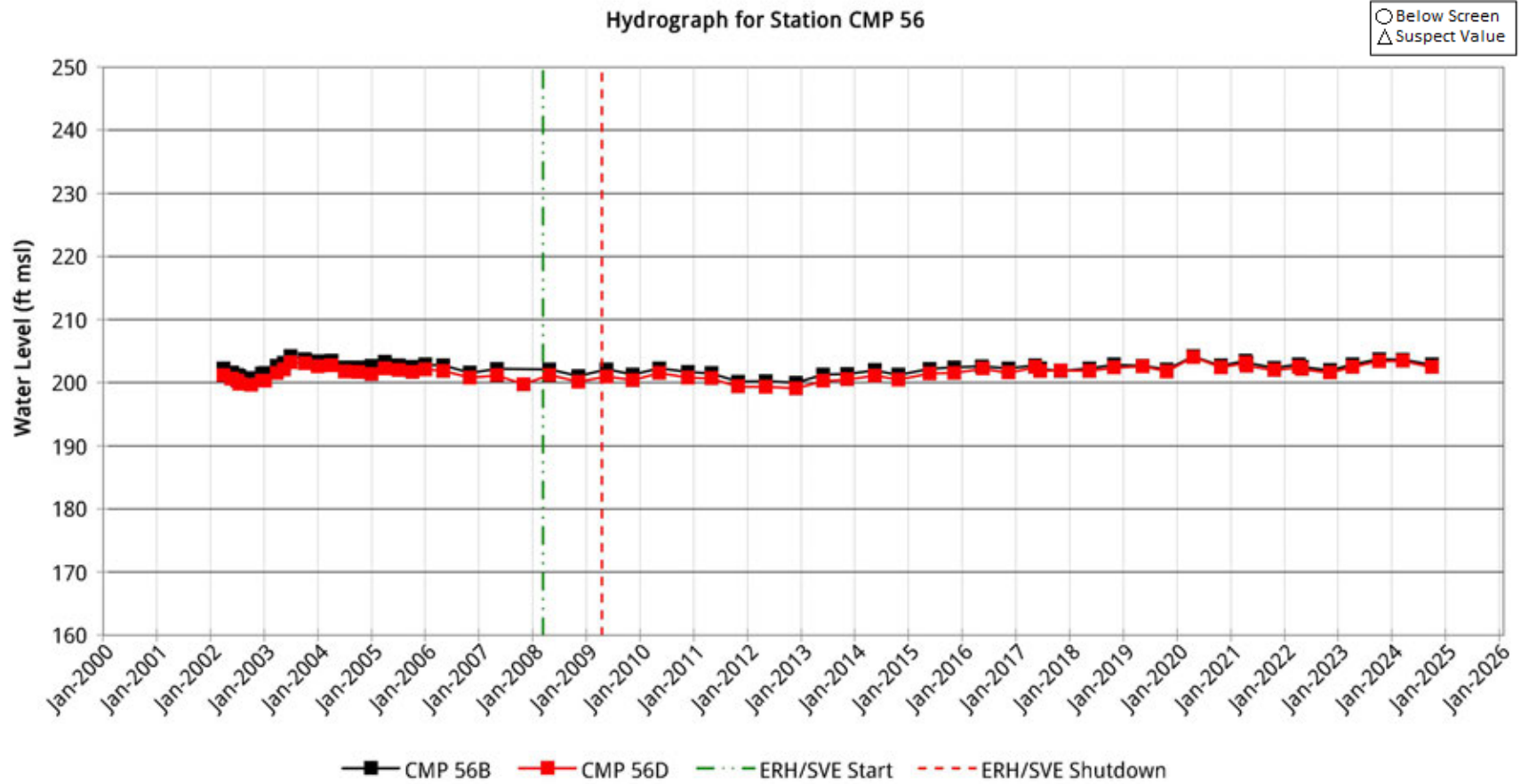


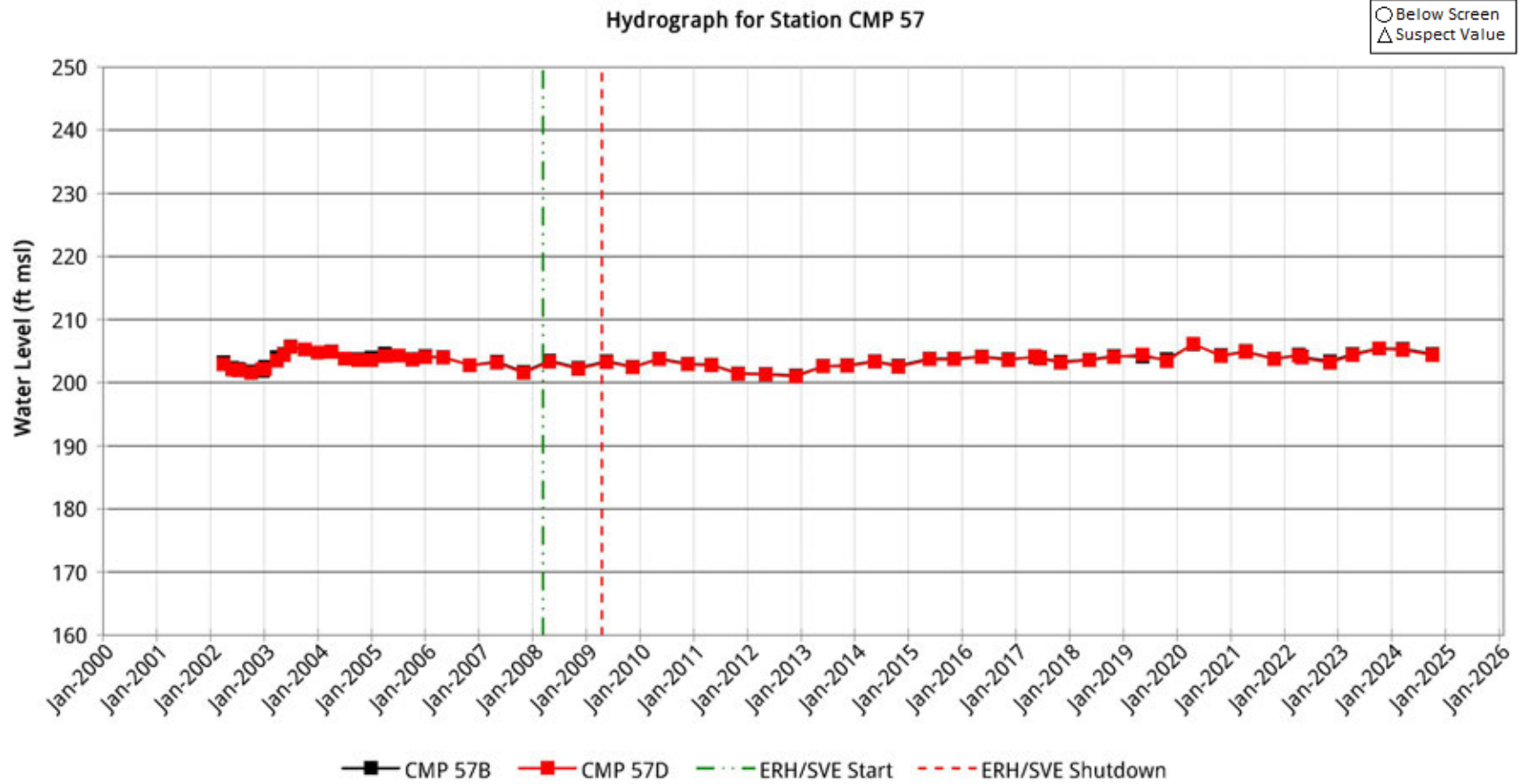


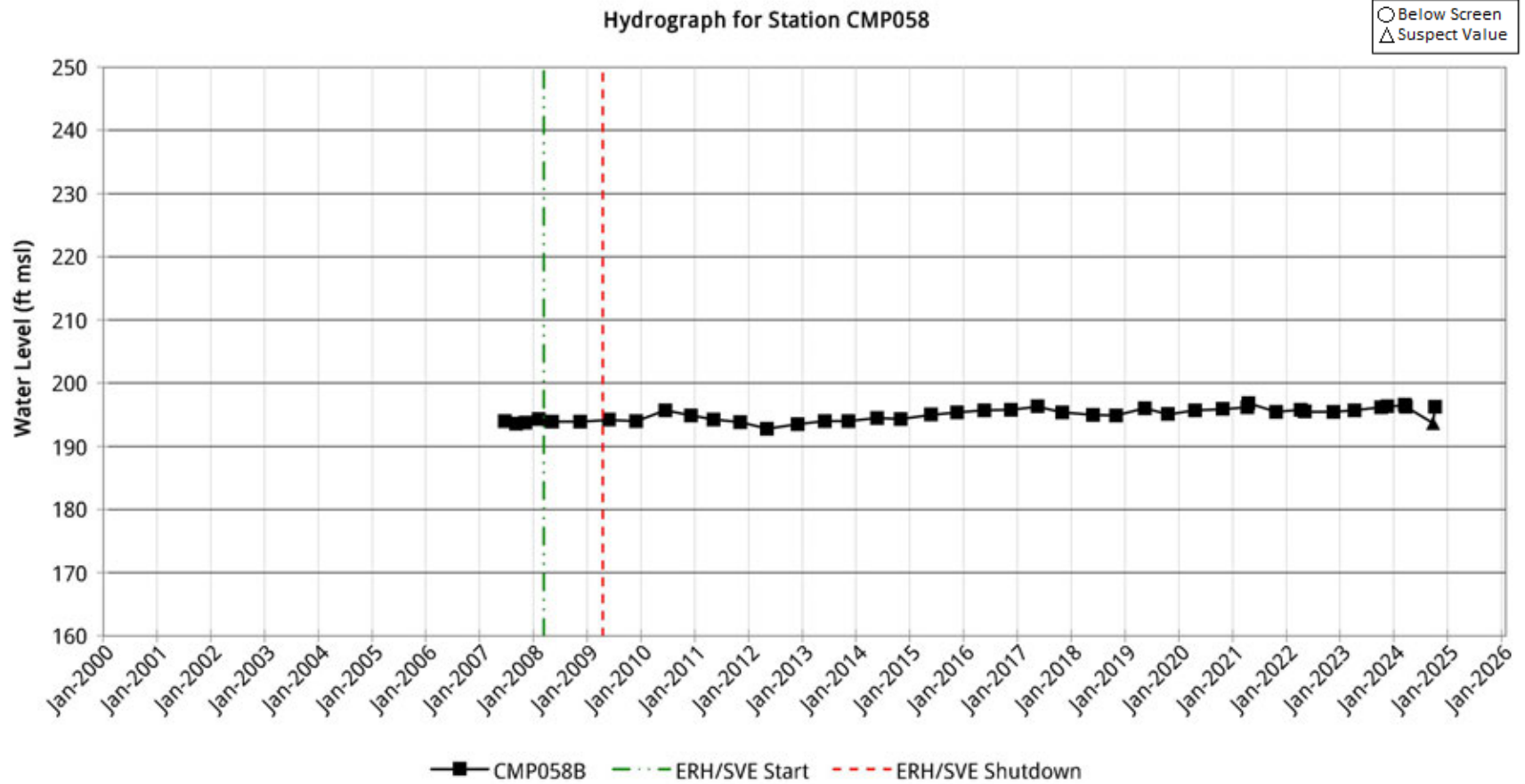


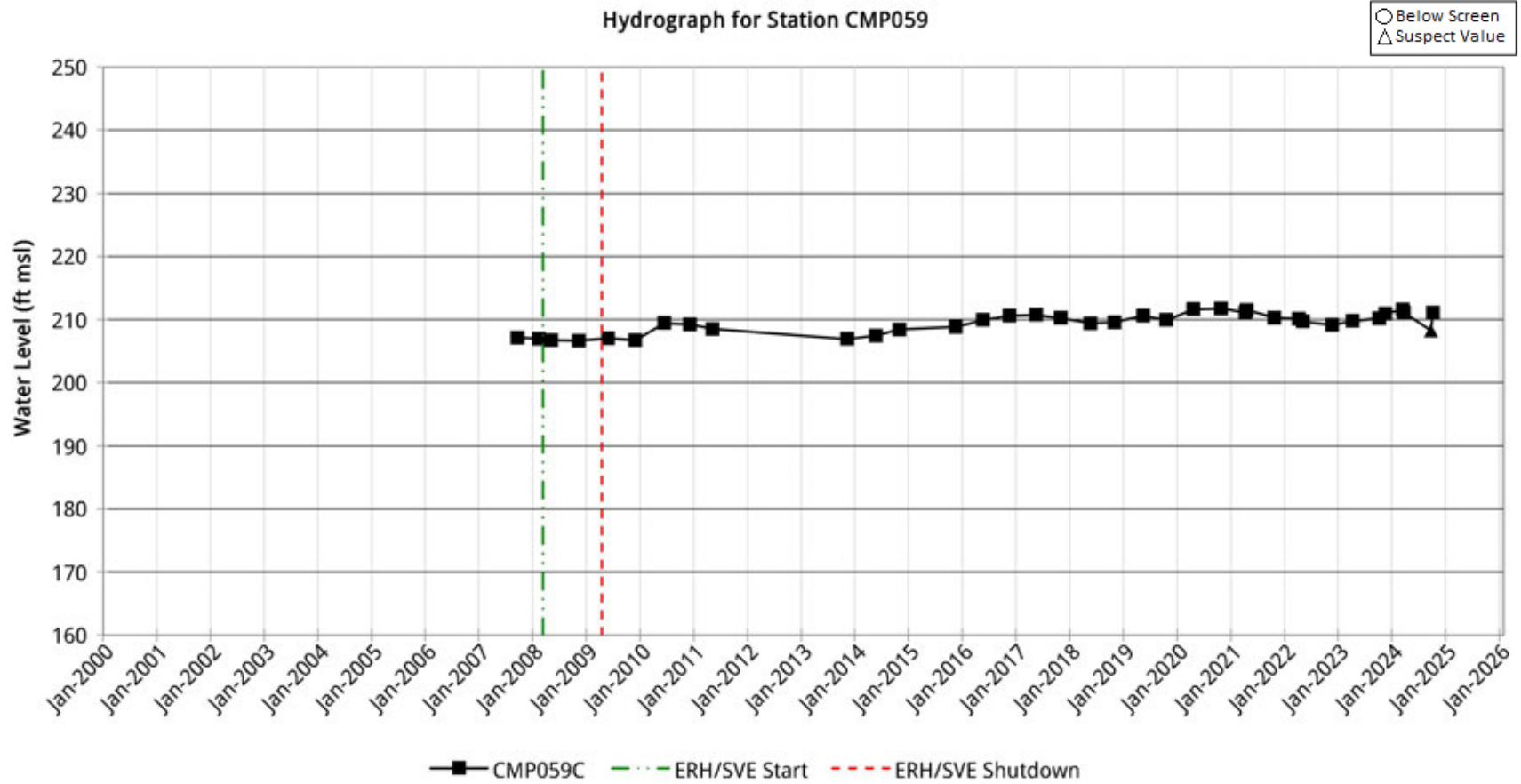


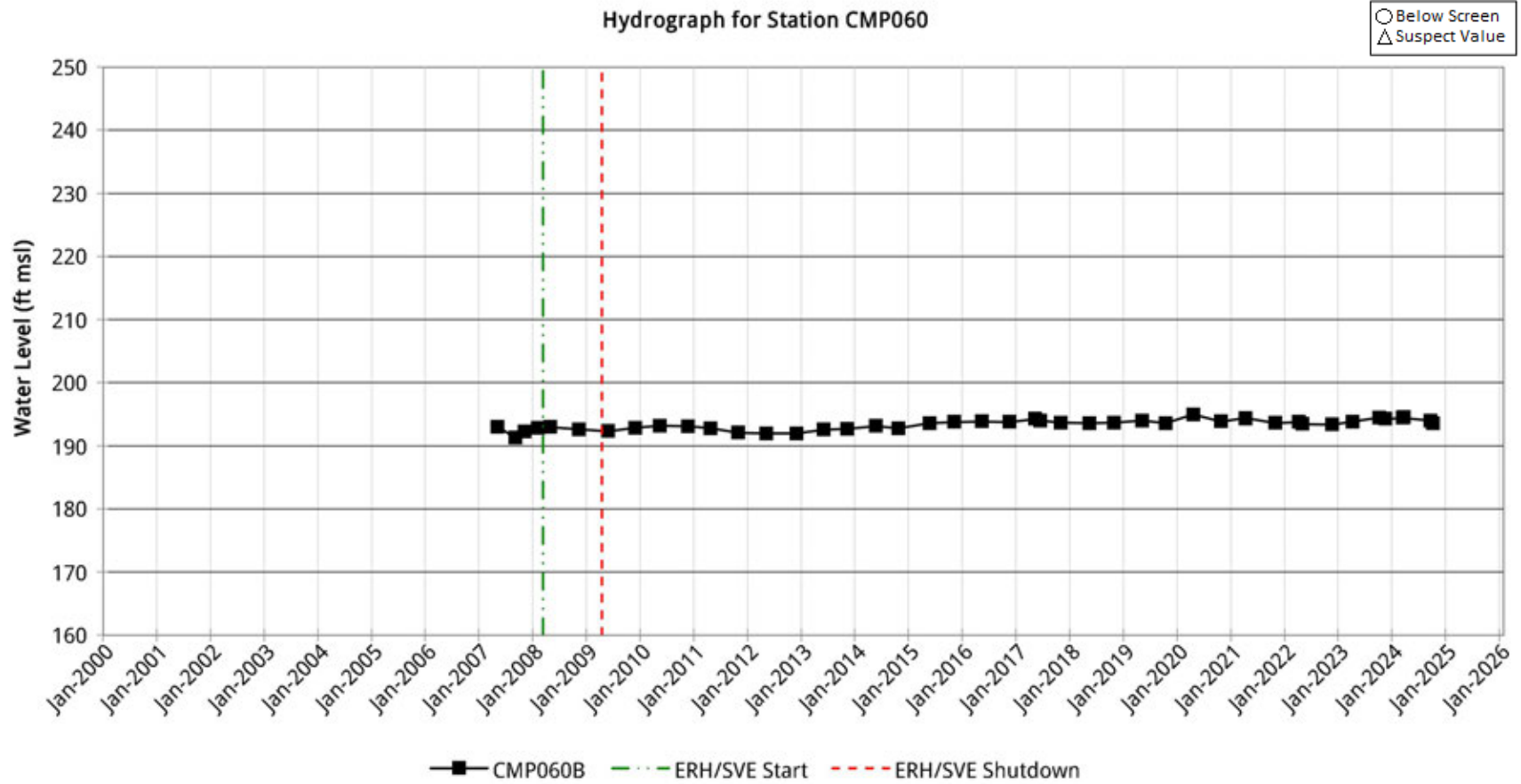


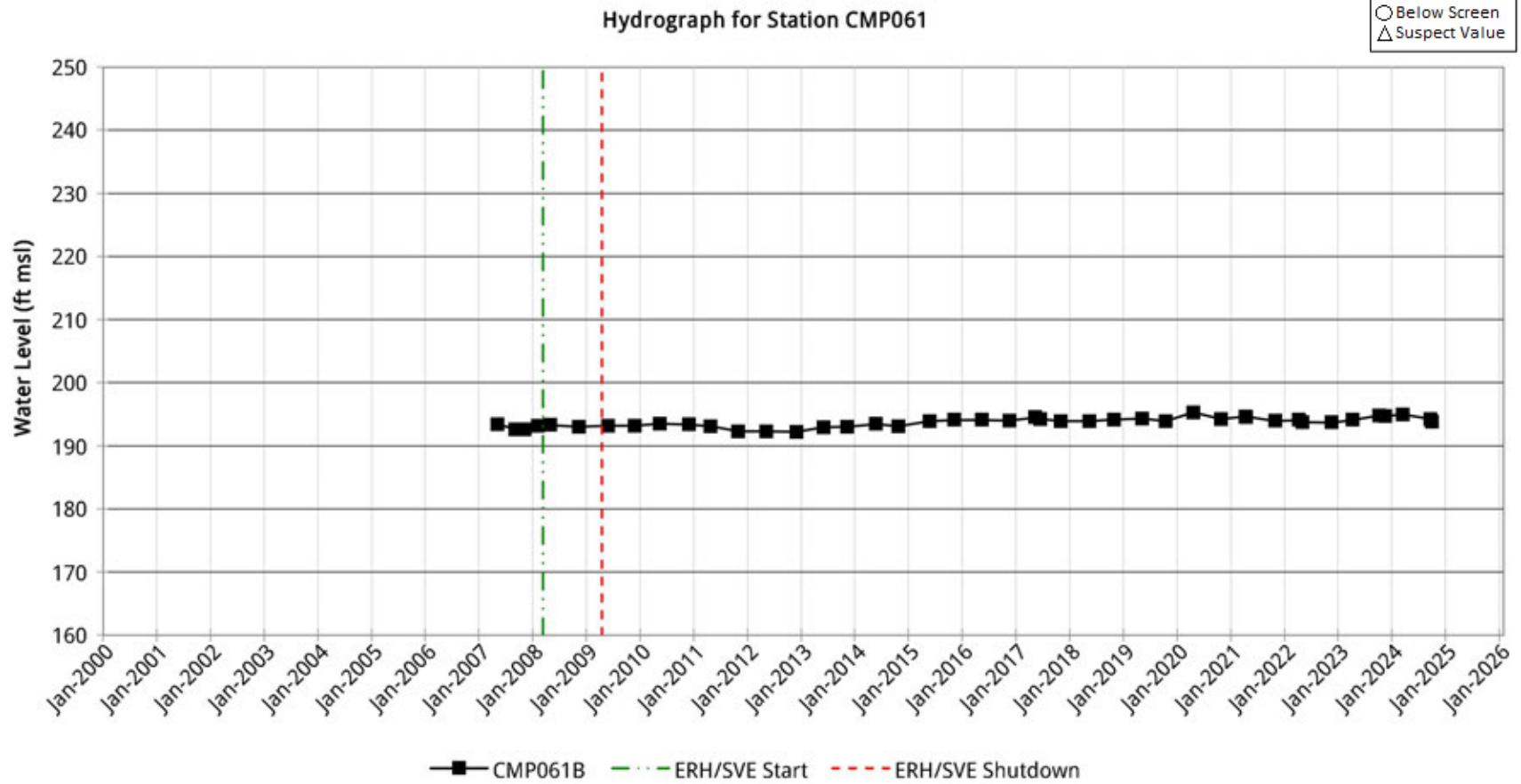


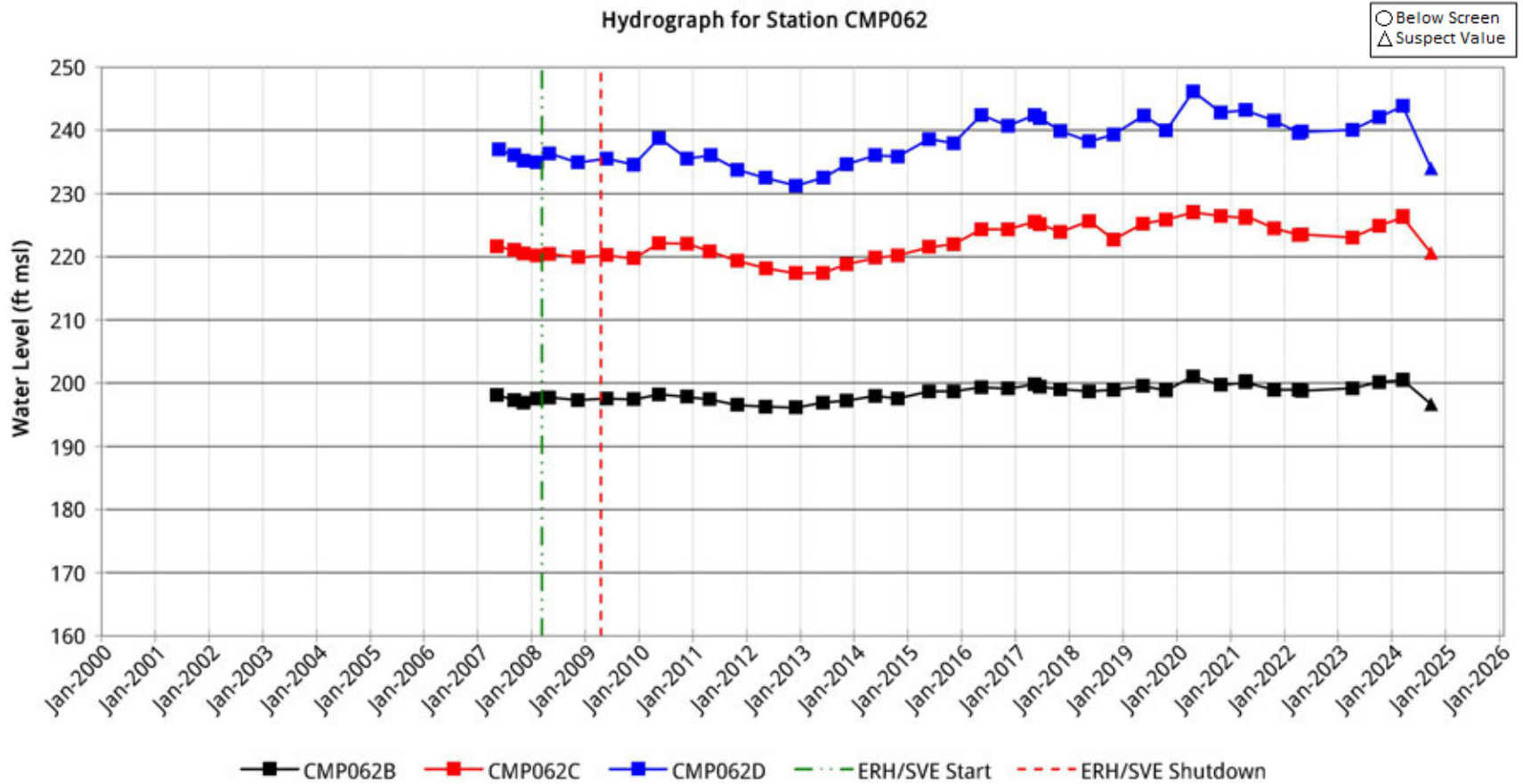


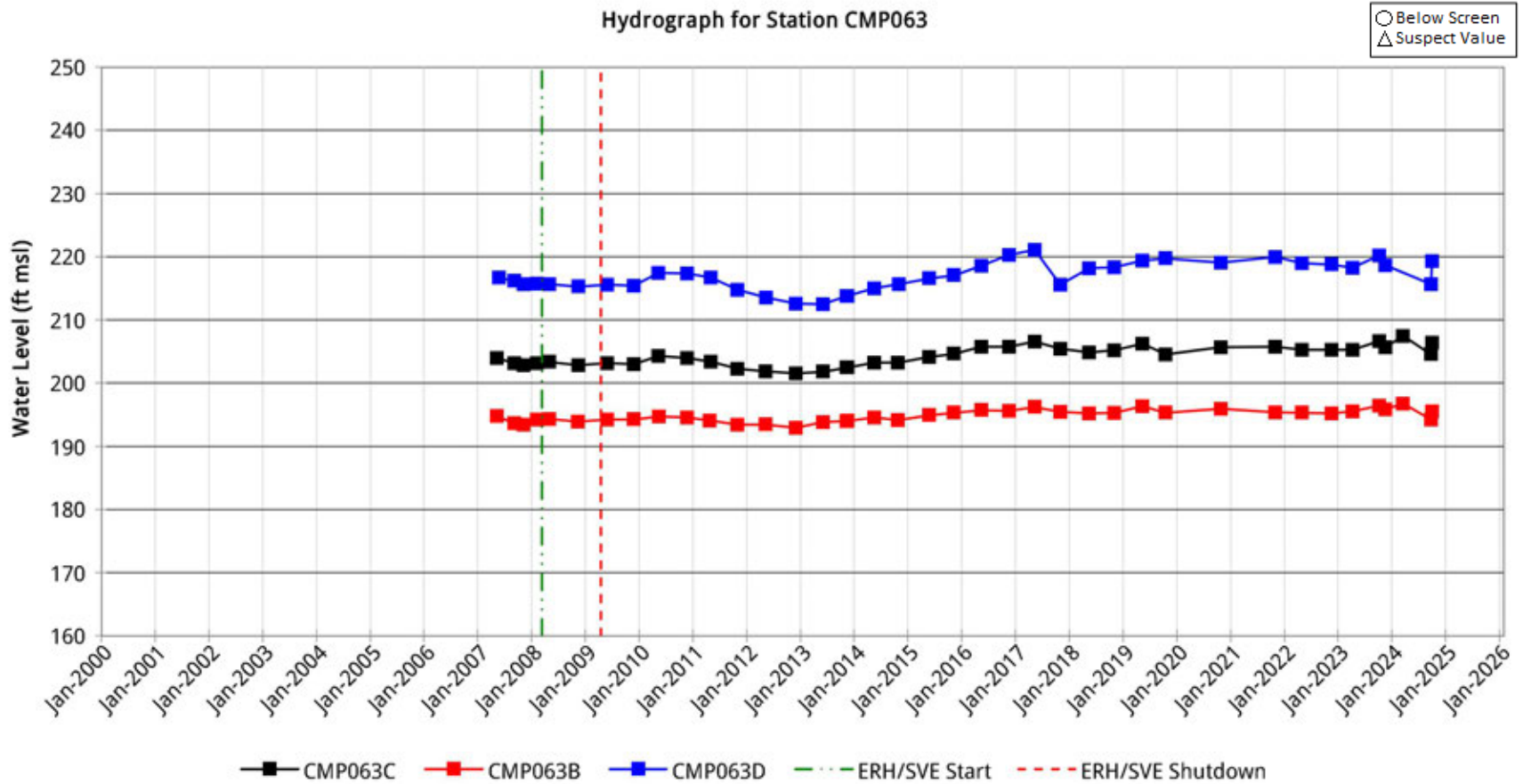


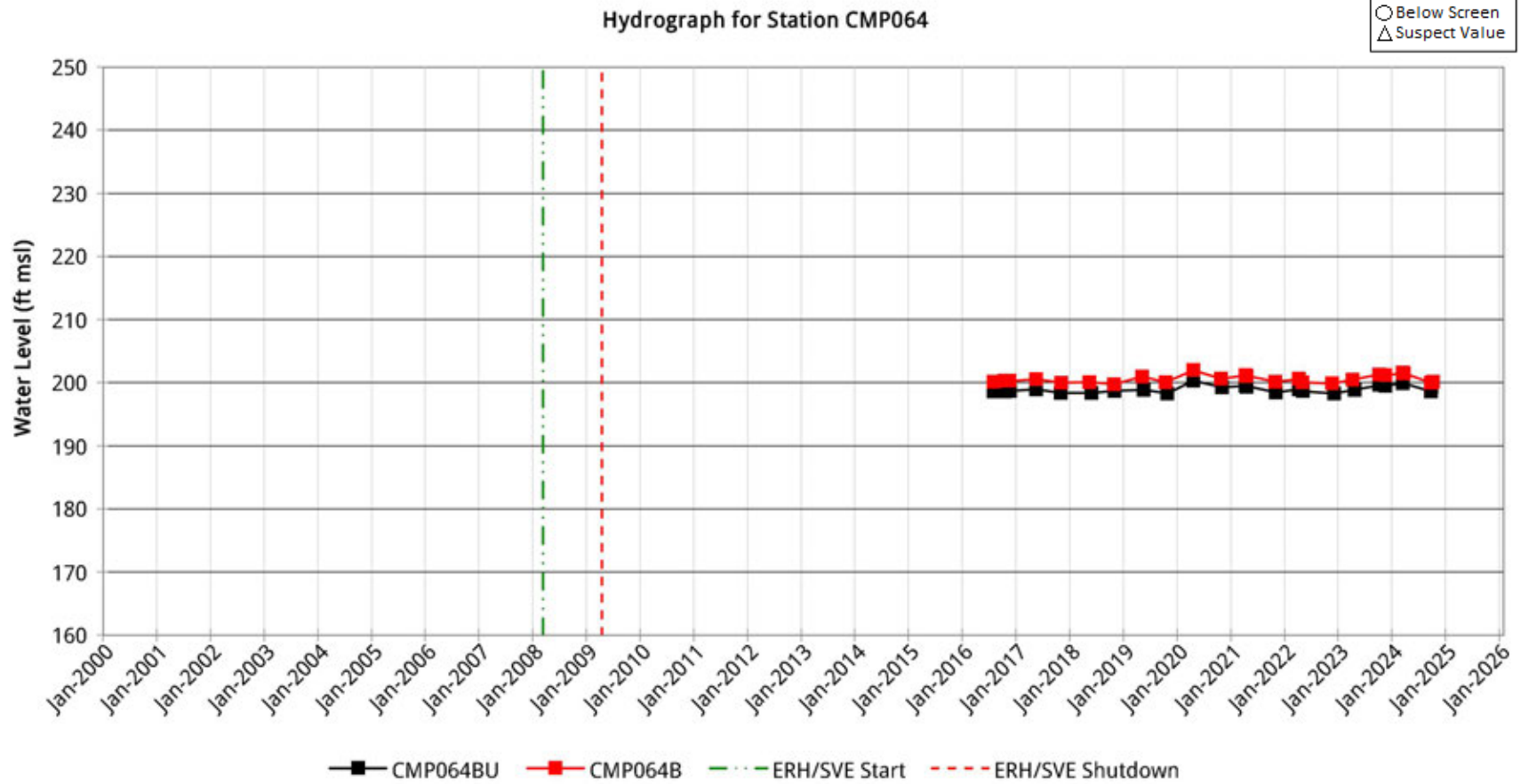


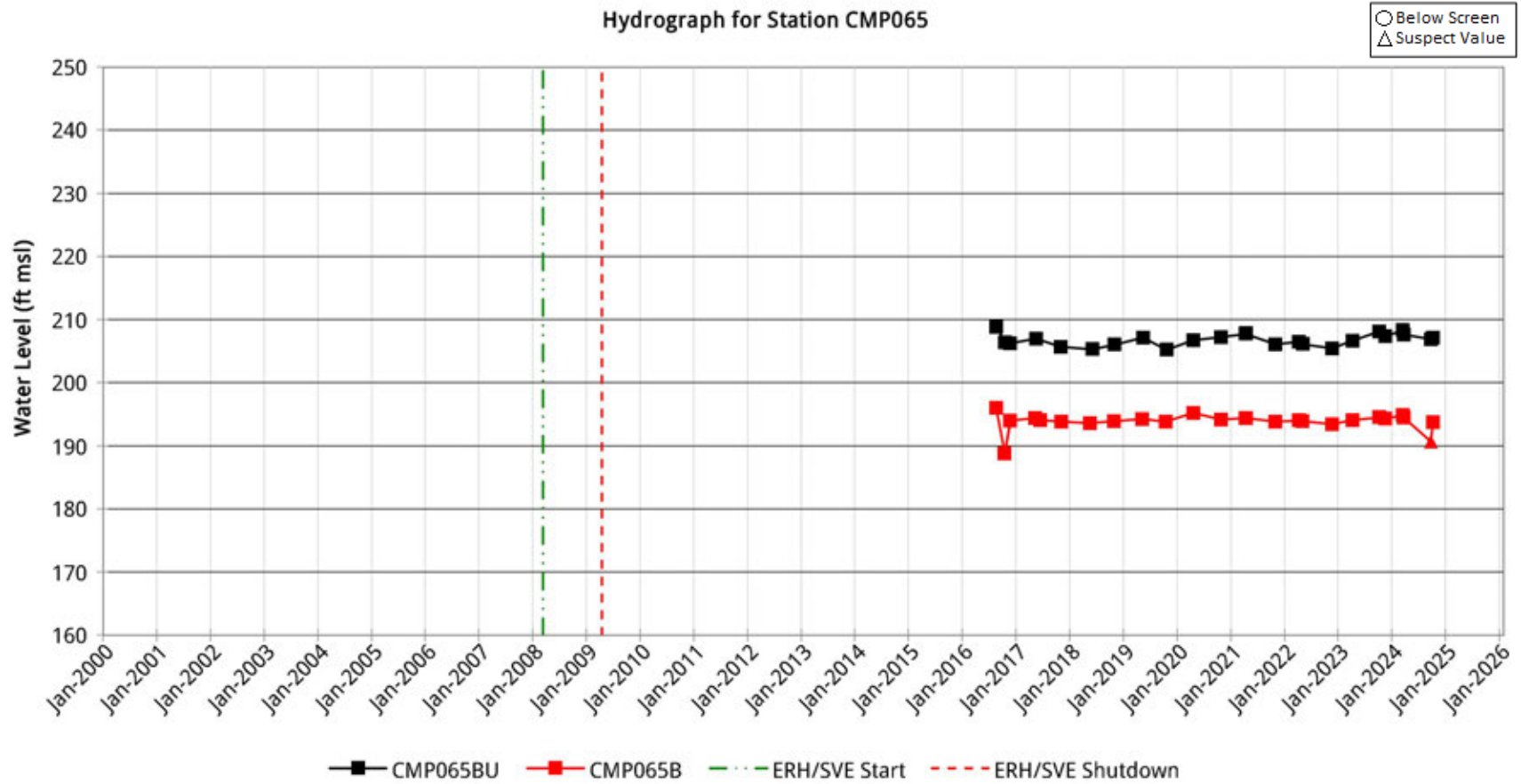


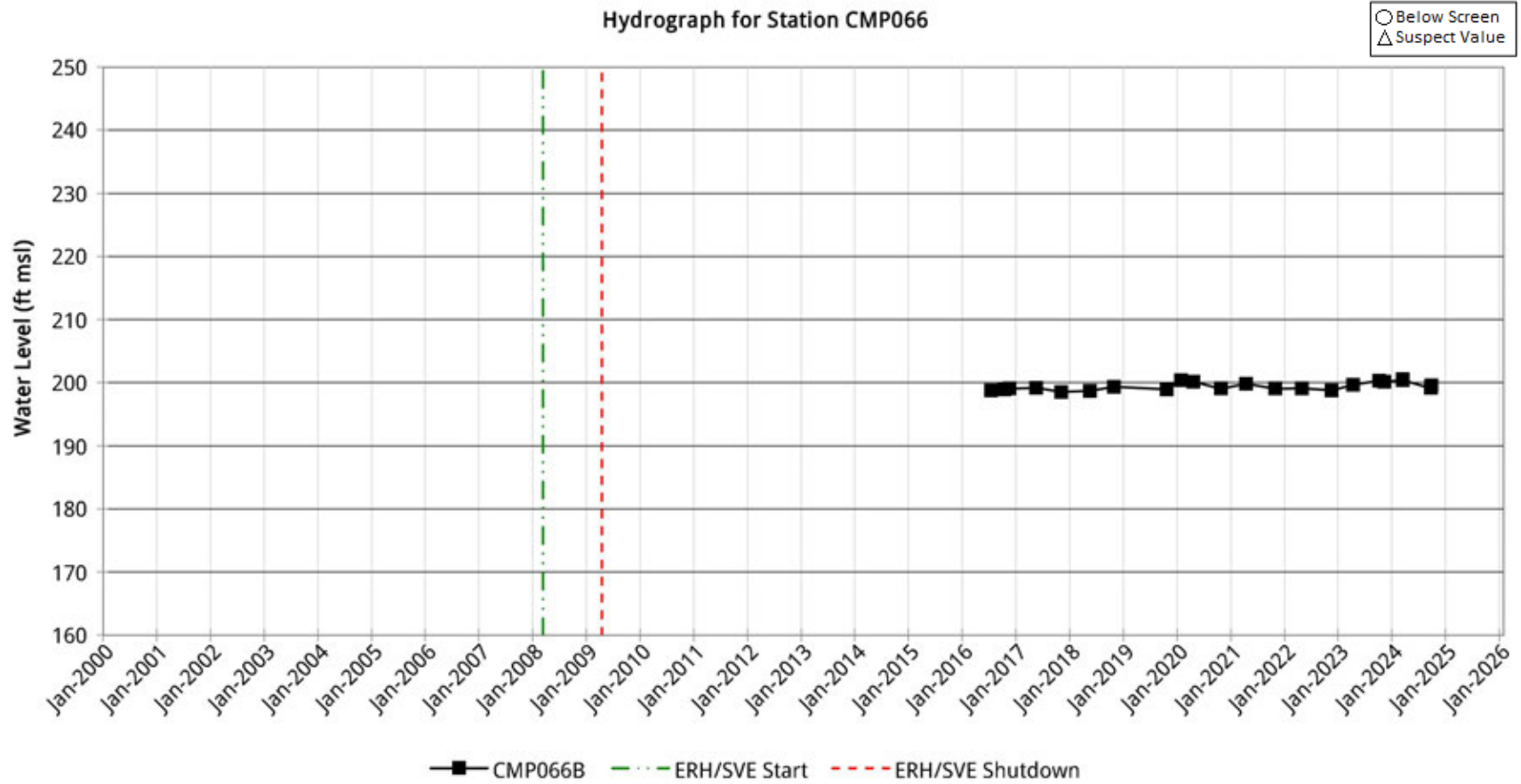


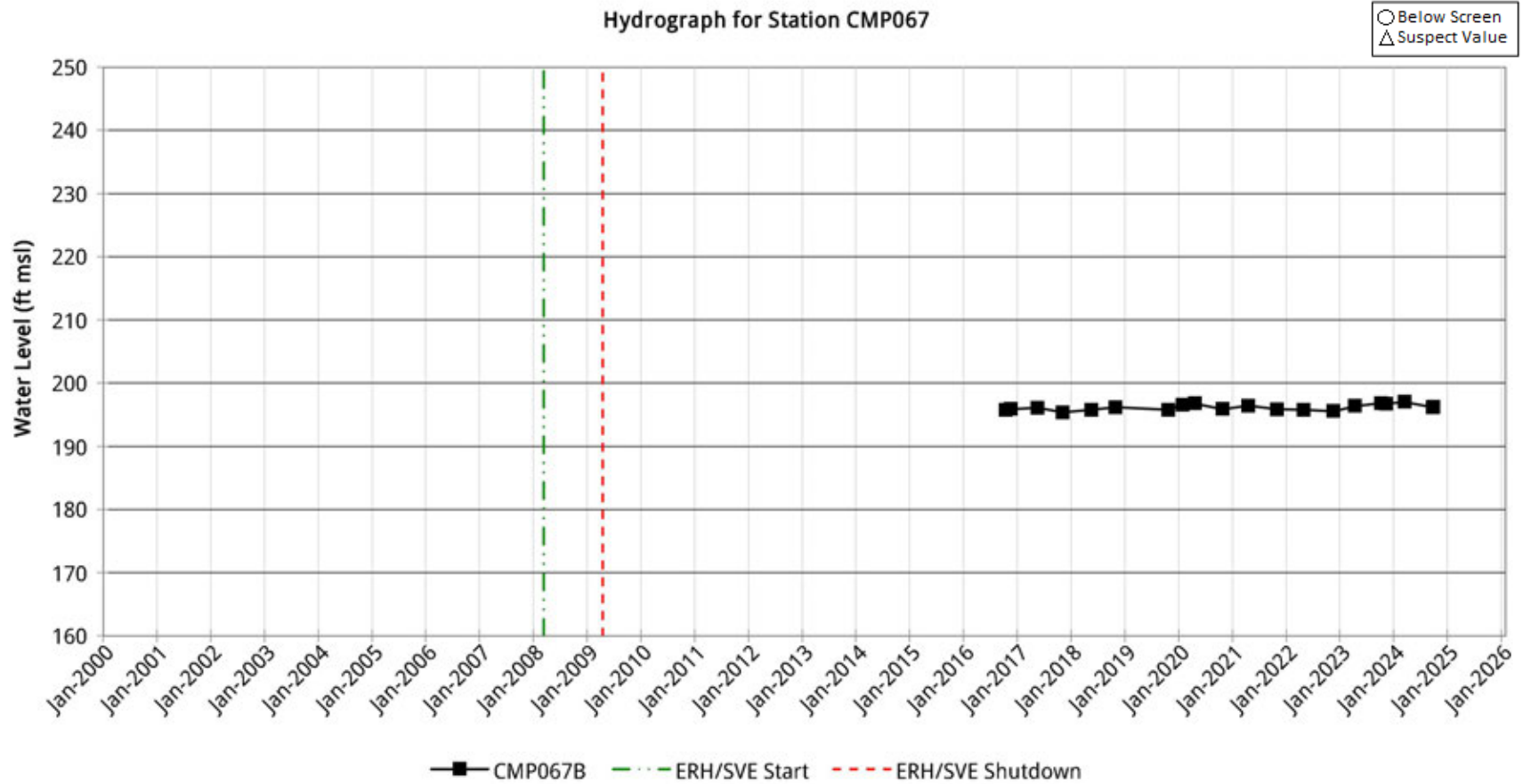


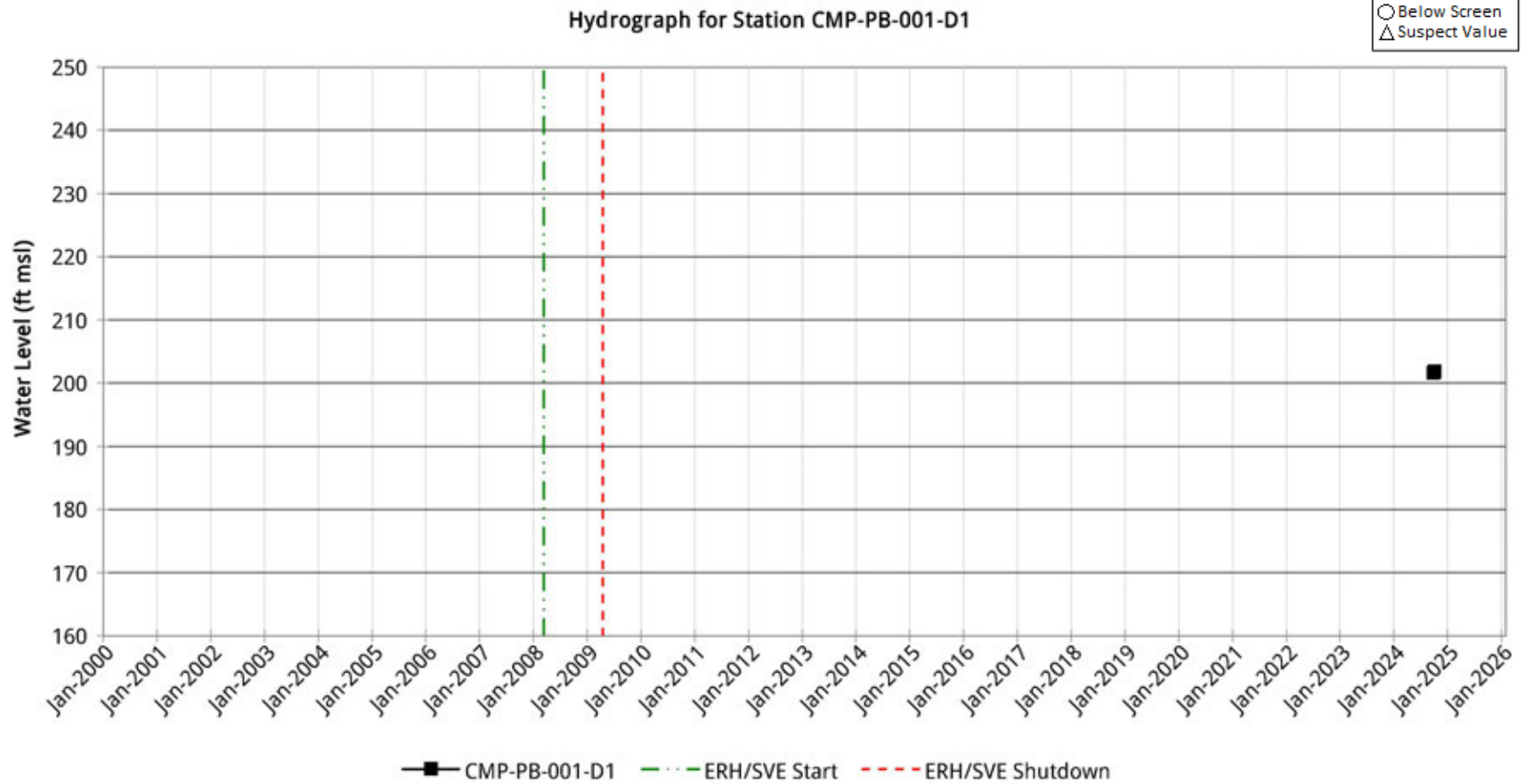


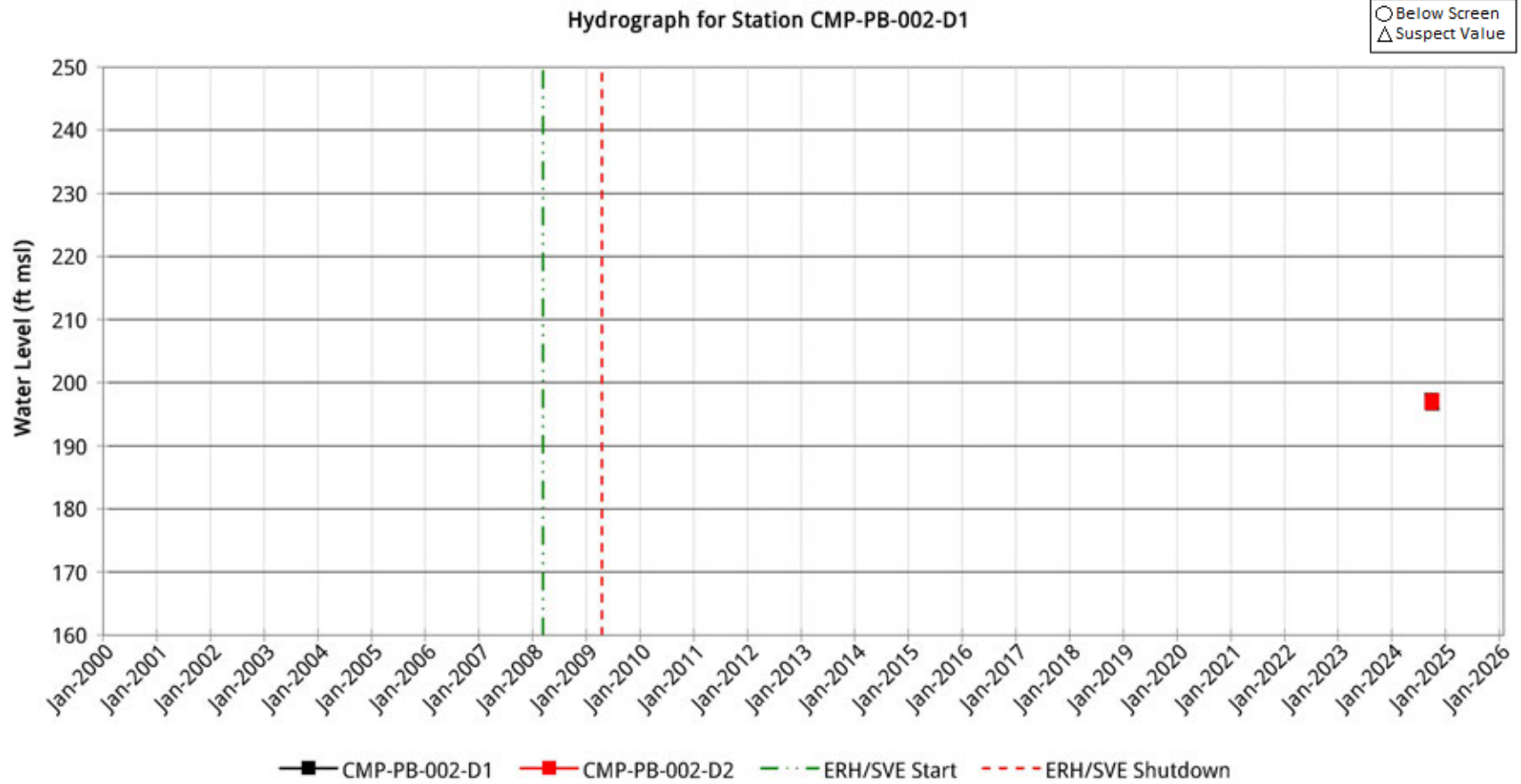


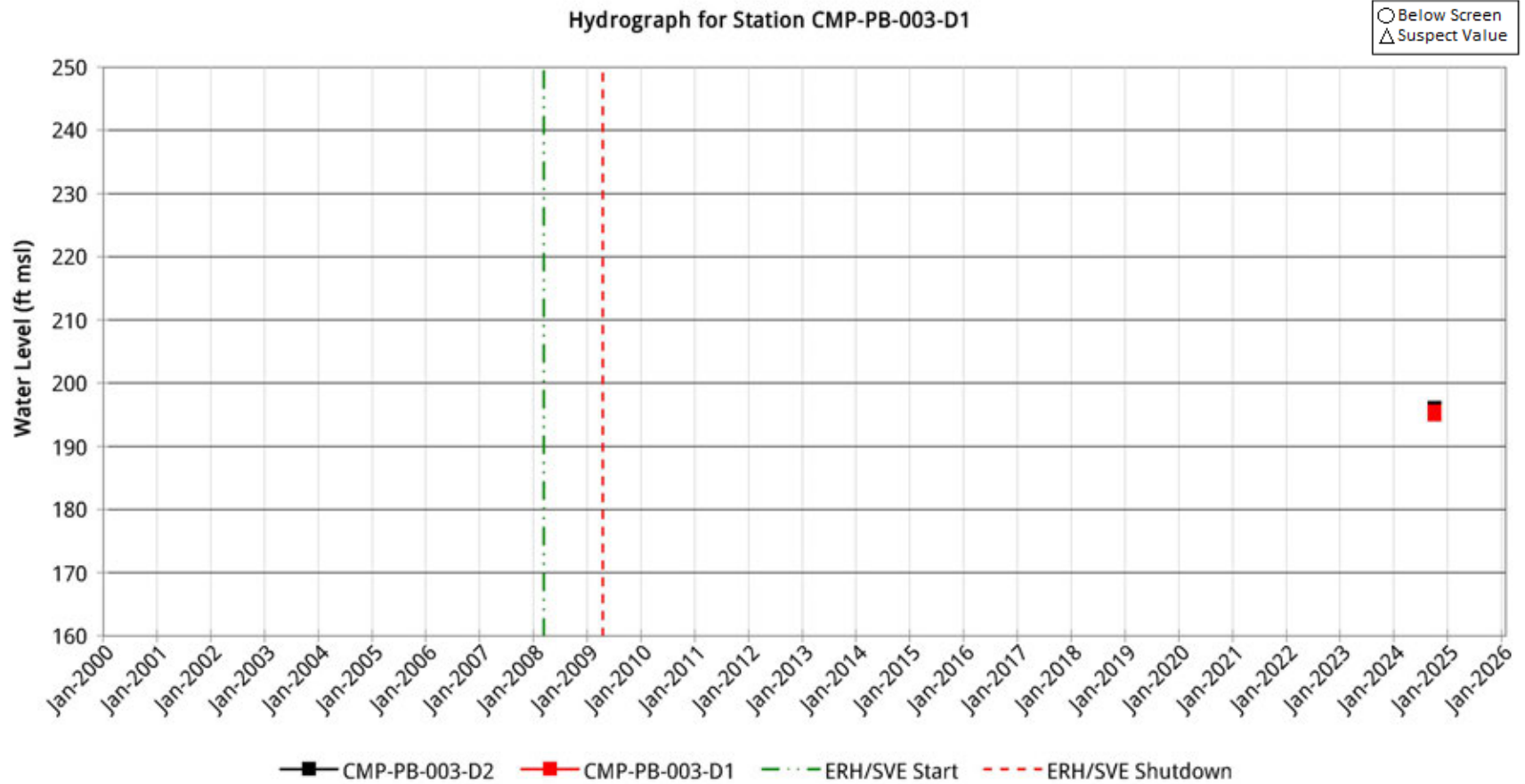


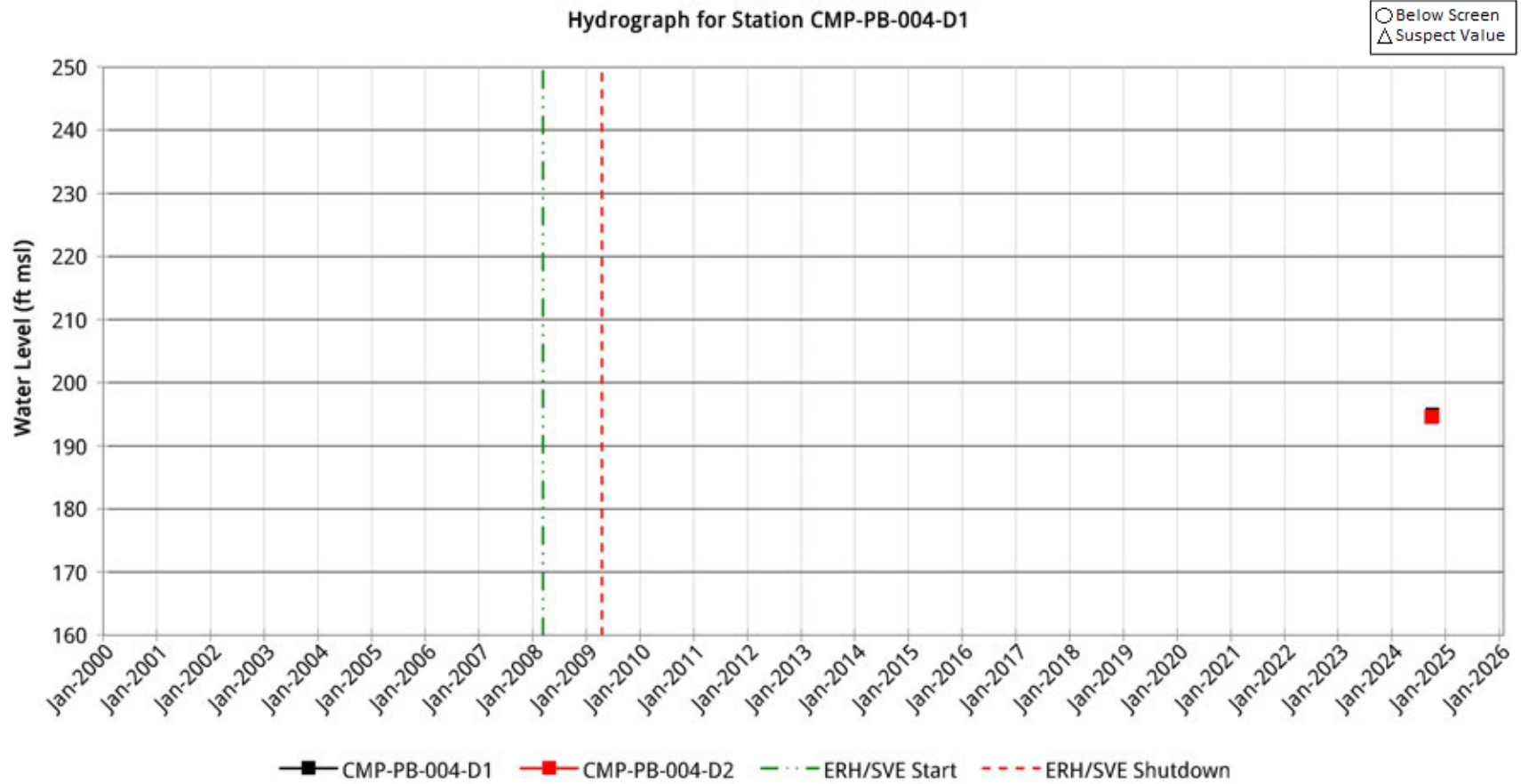


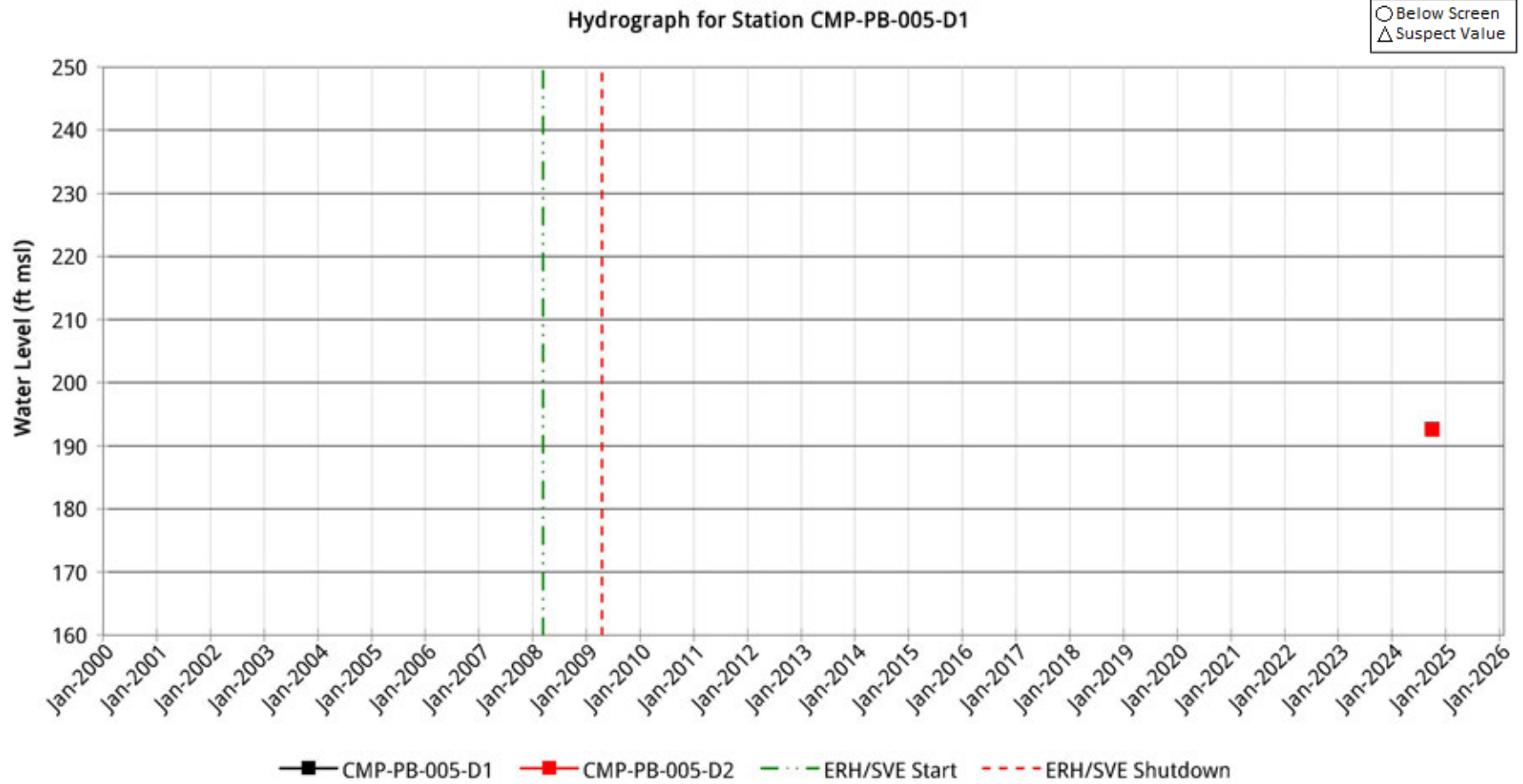


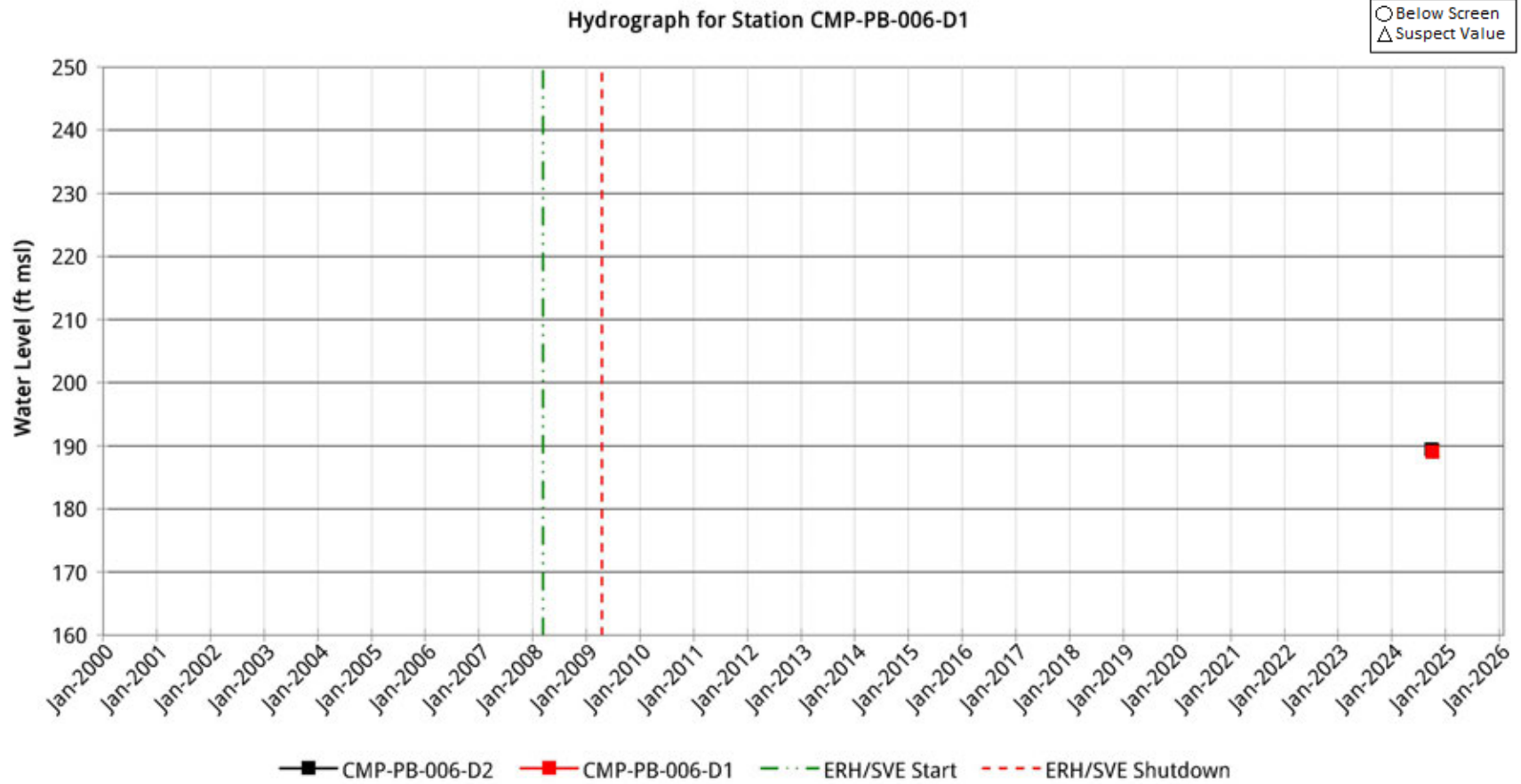












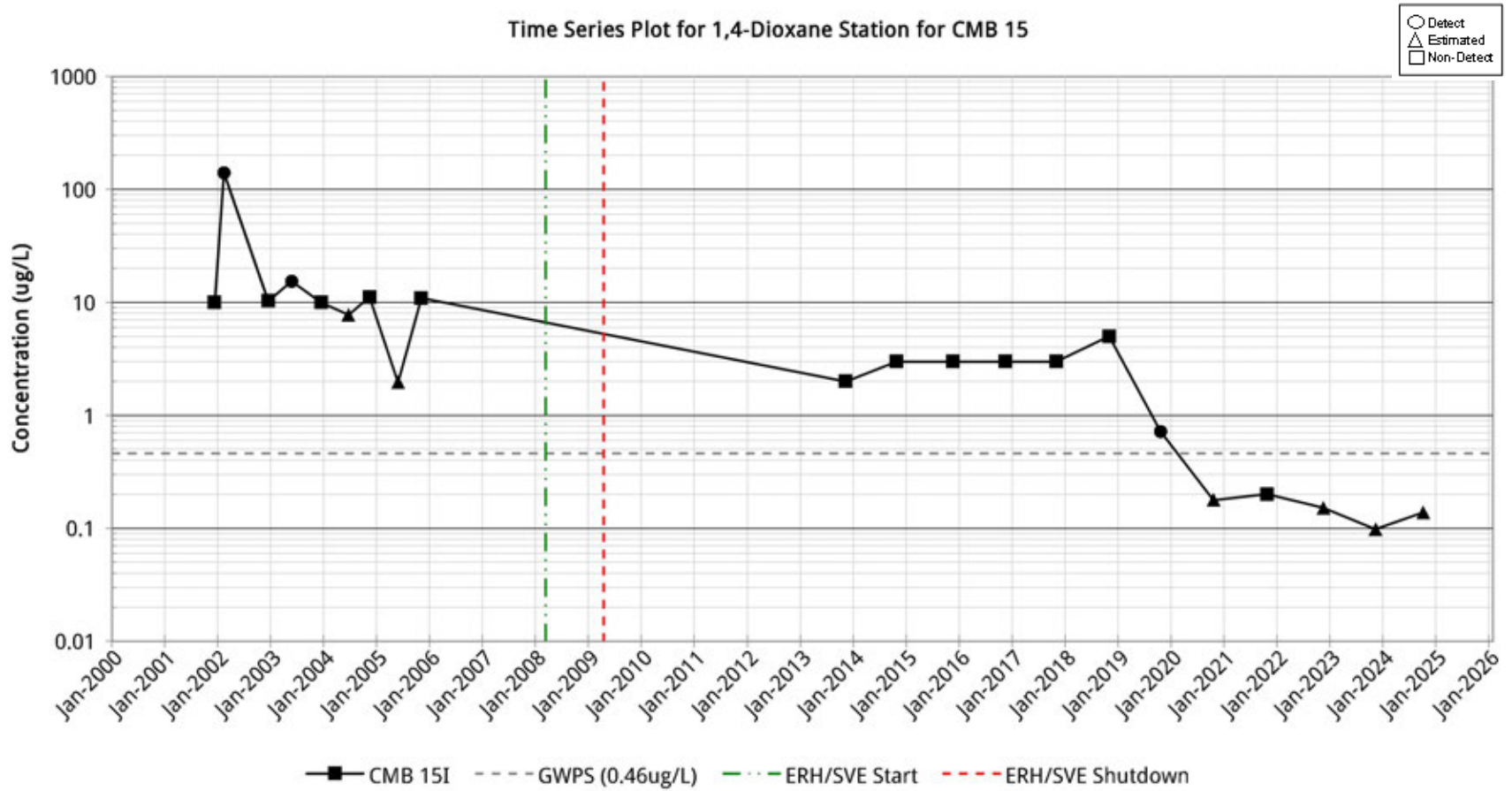
## Appendix B

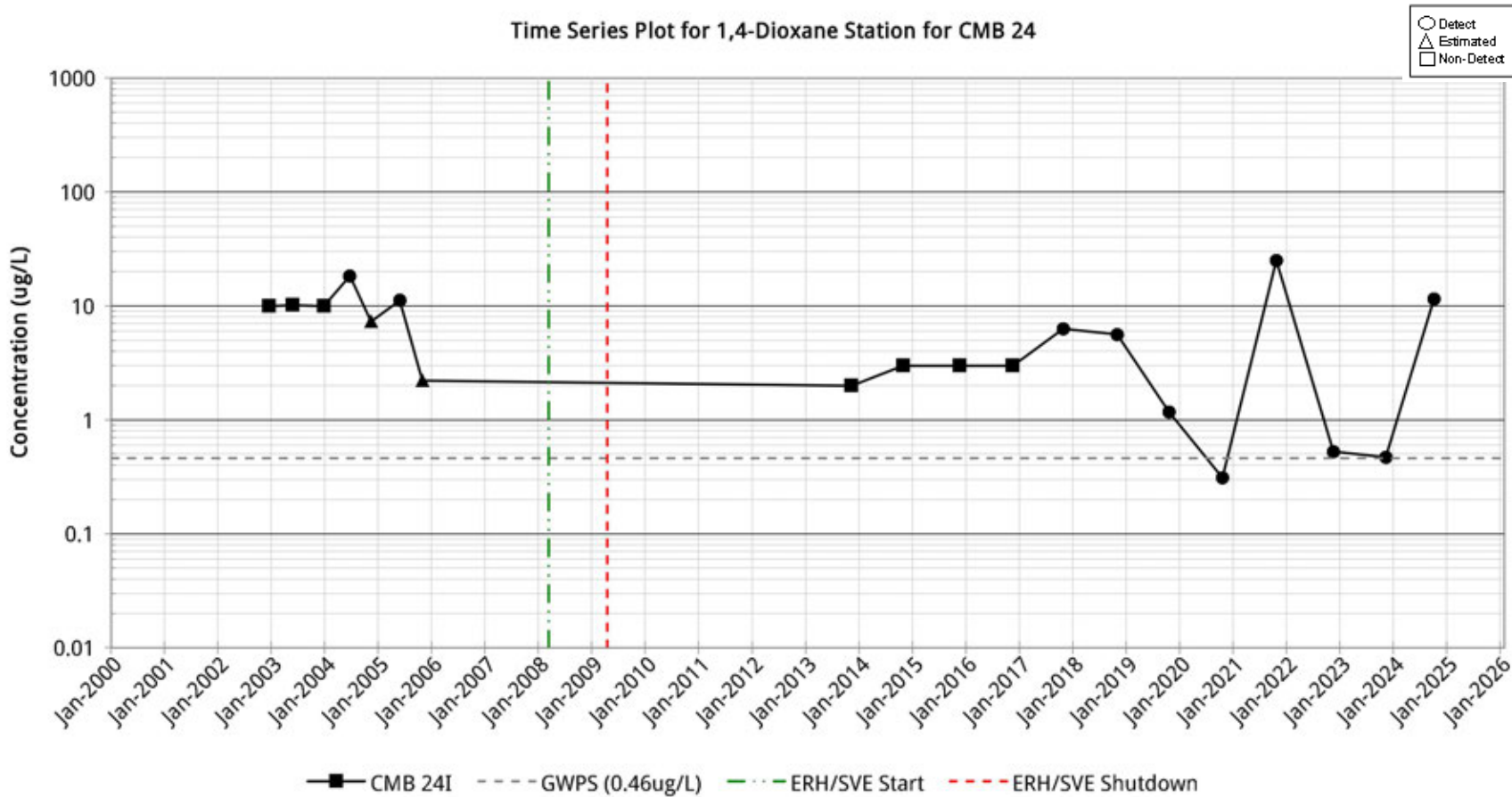
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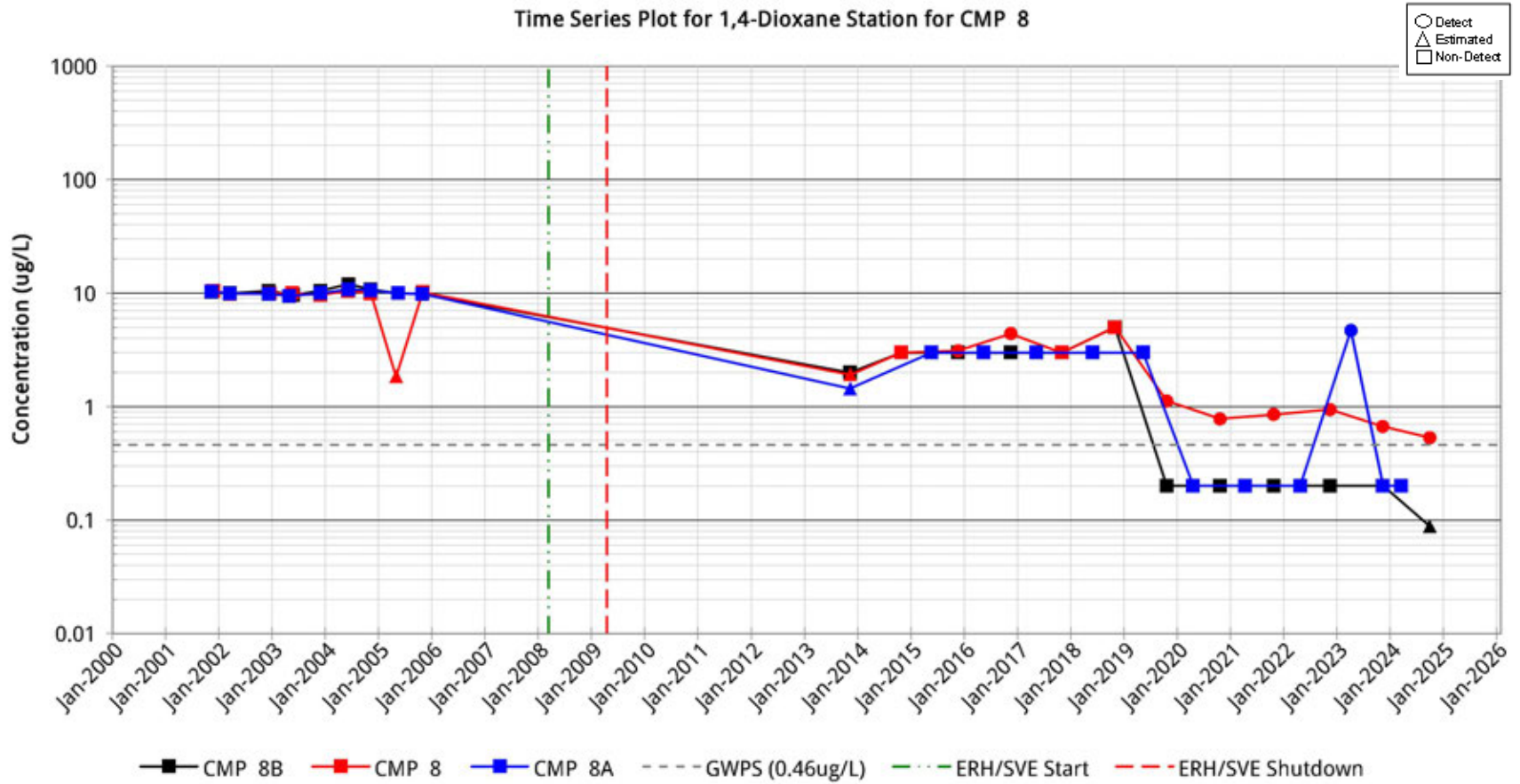
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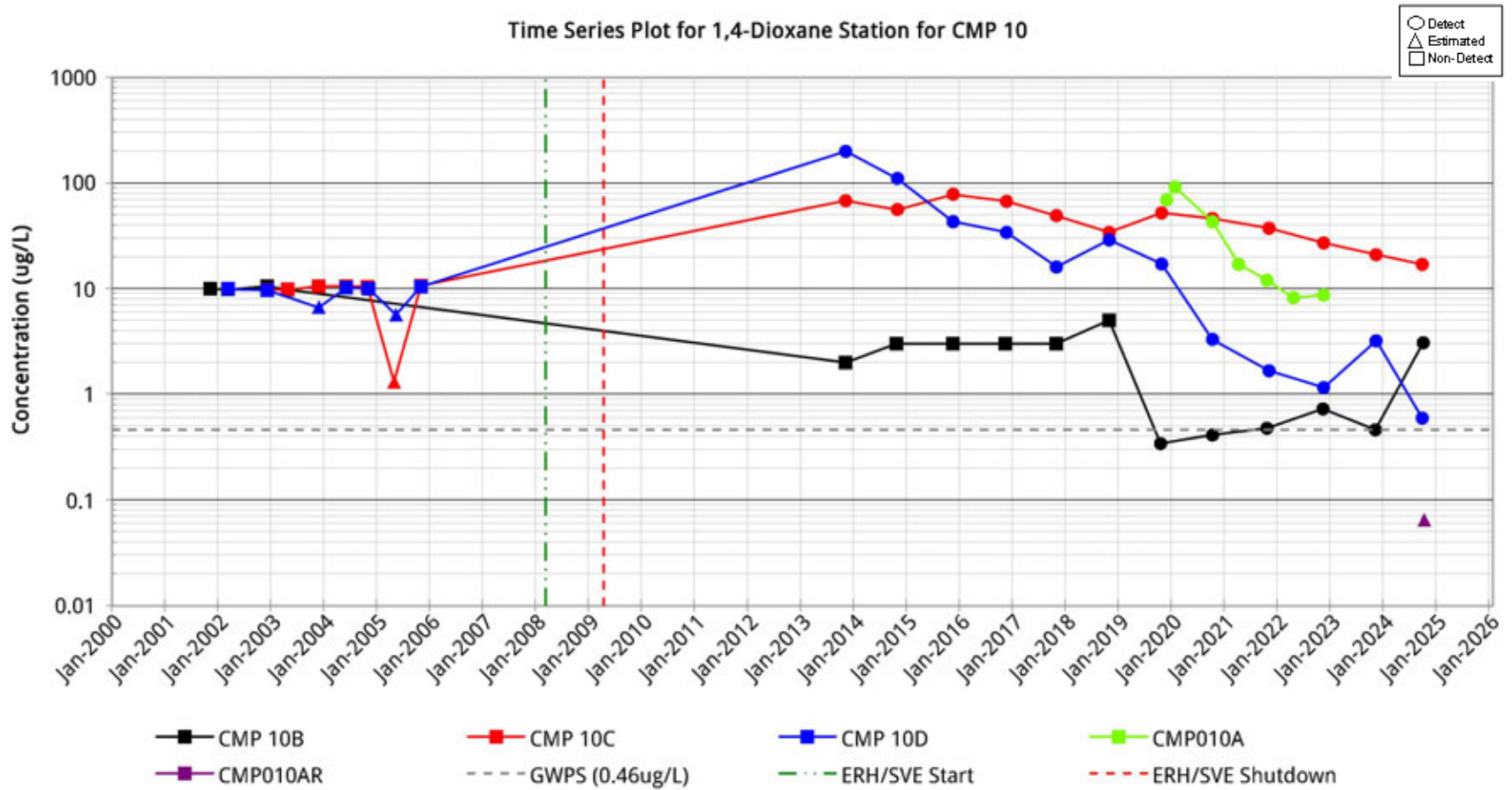
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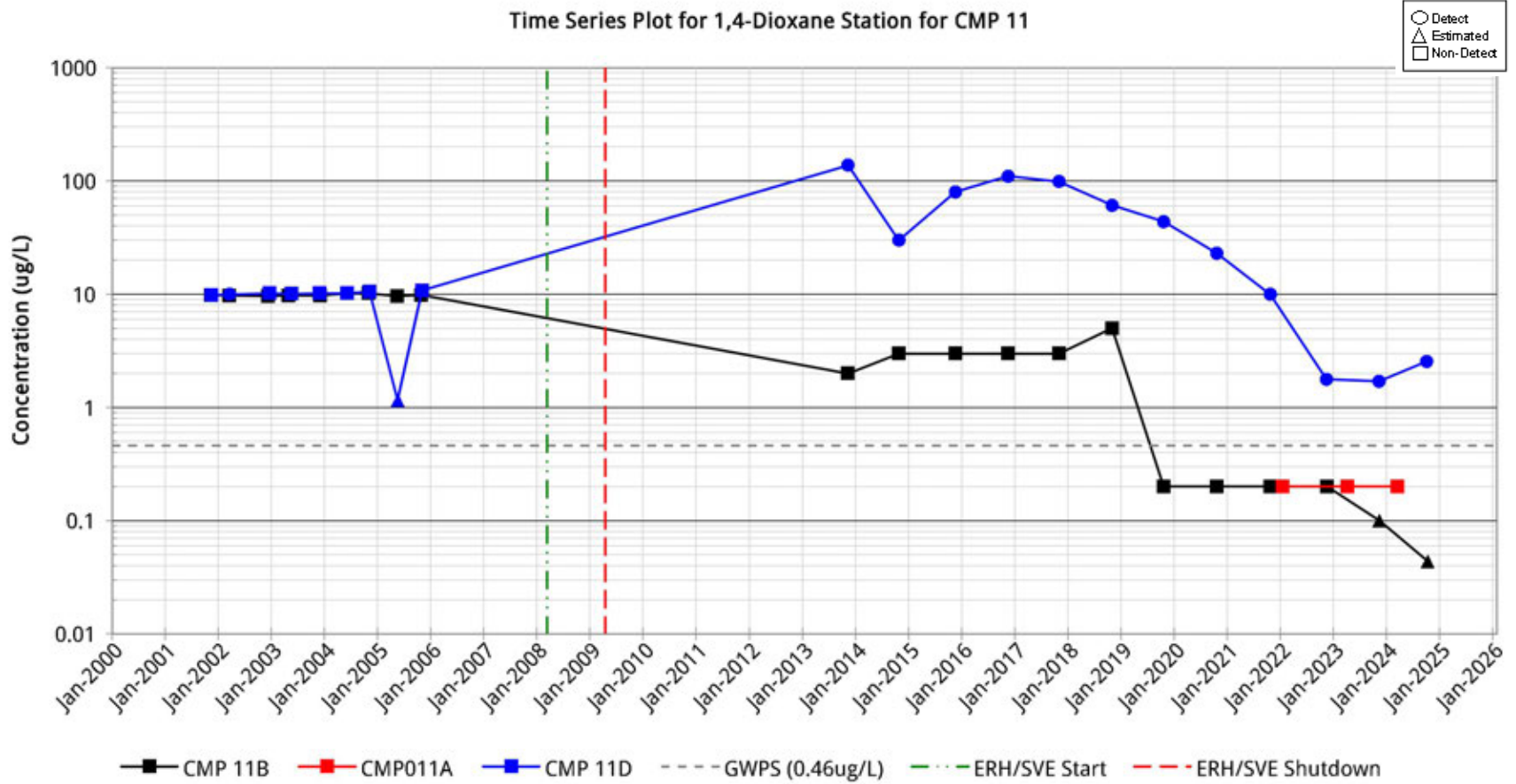
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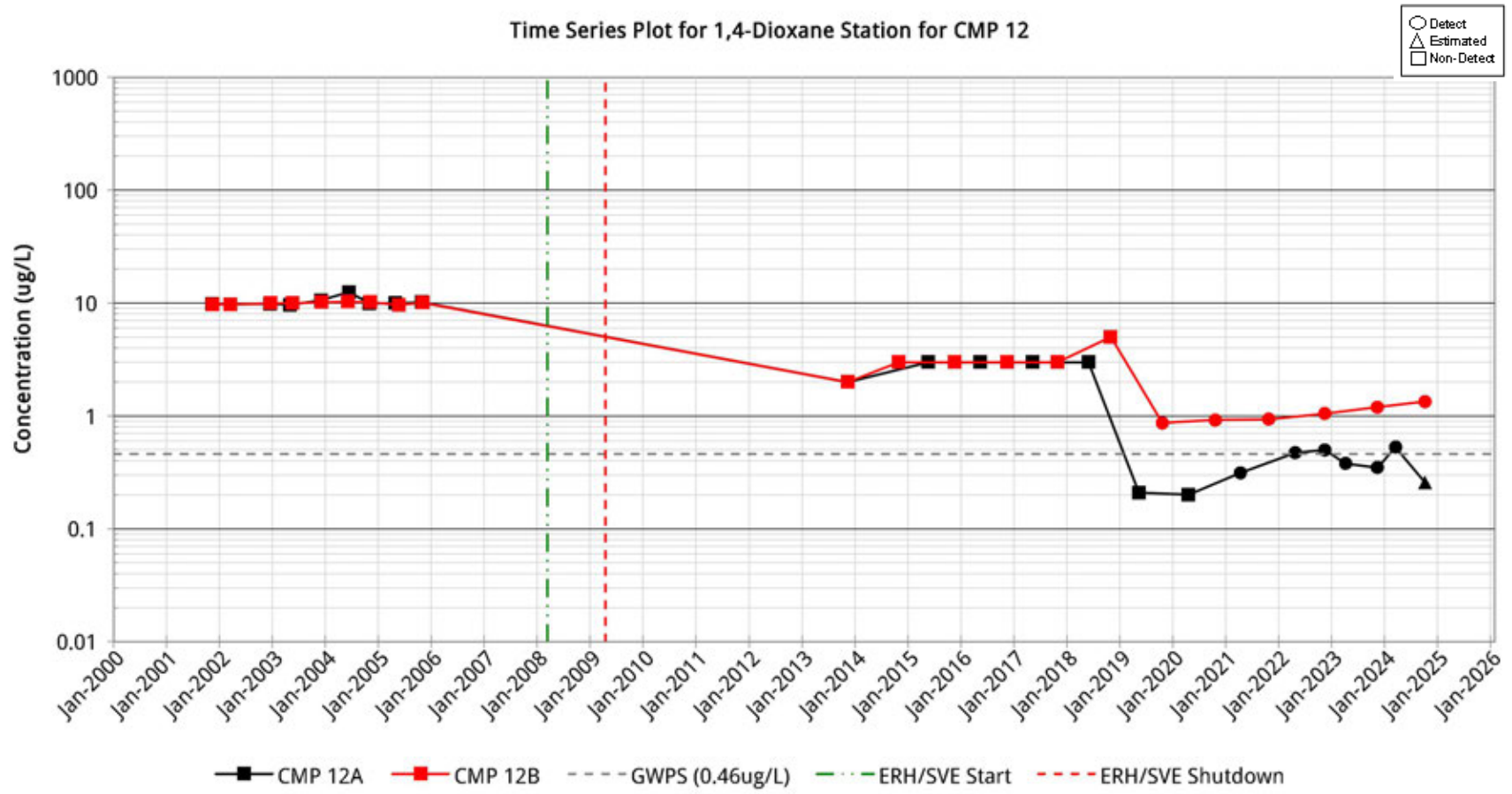


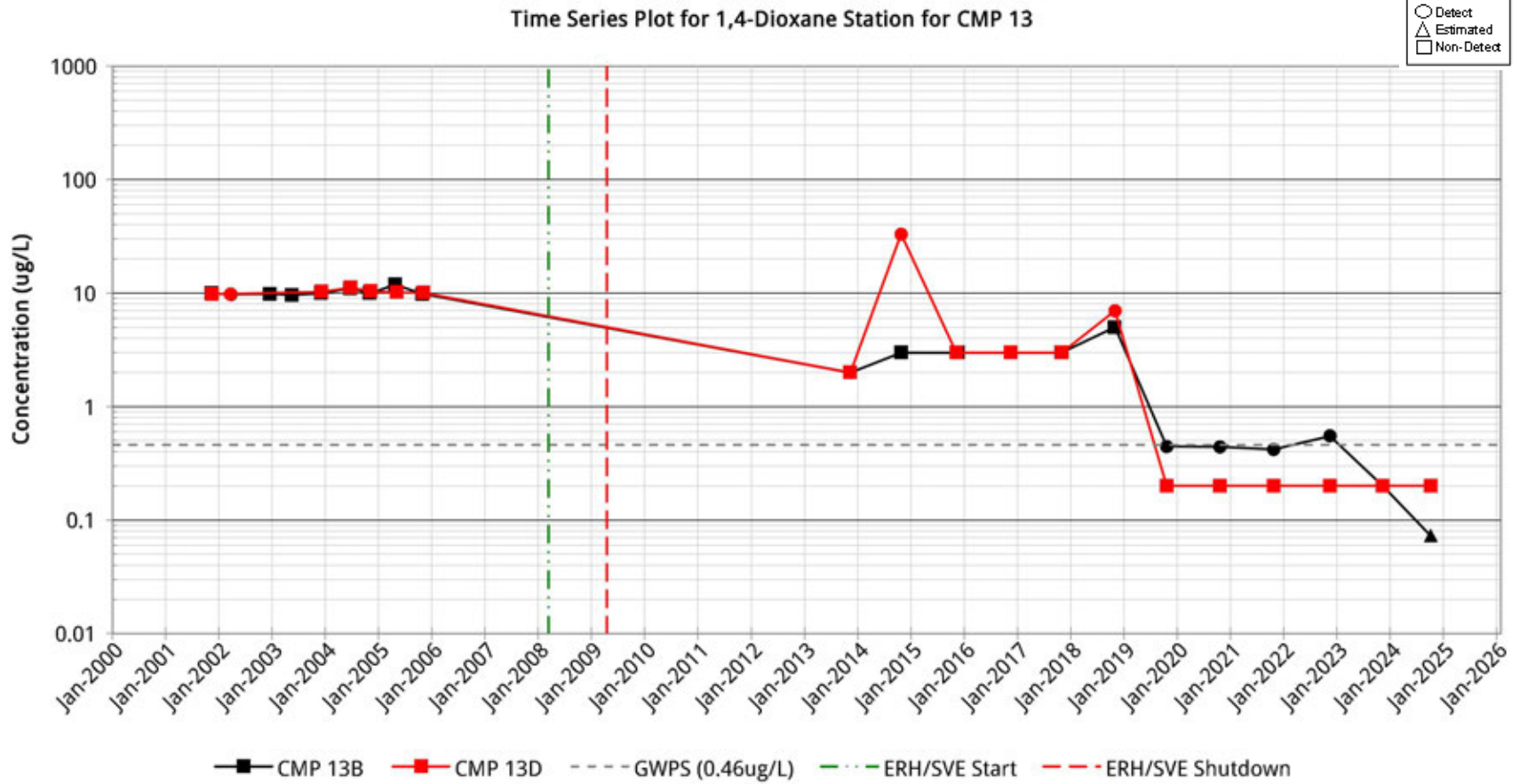


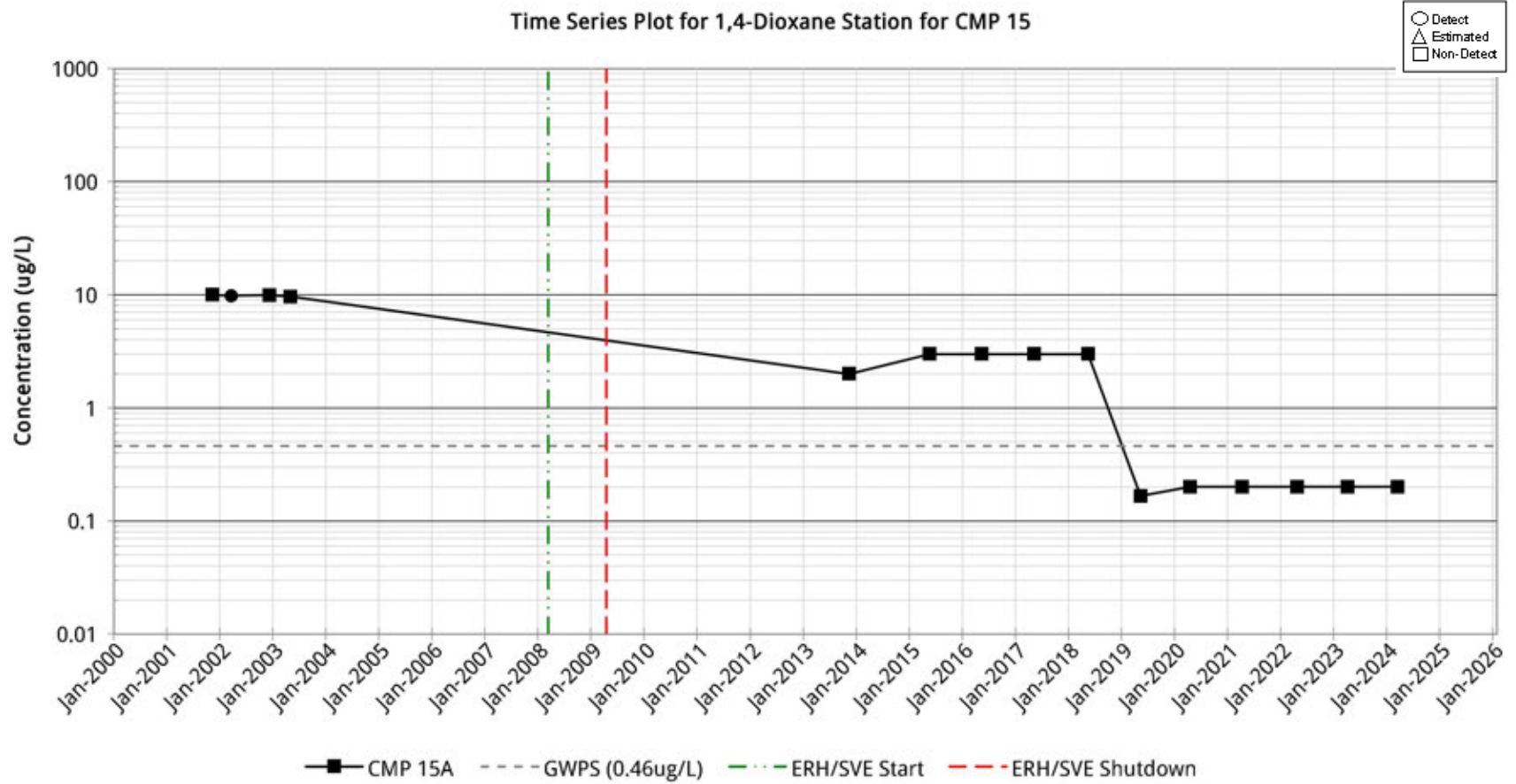


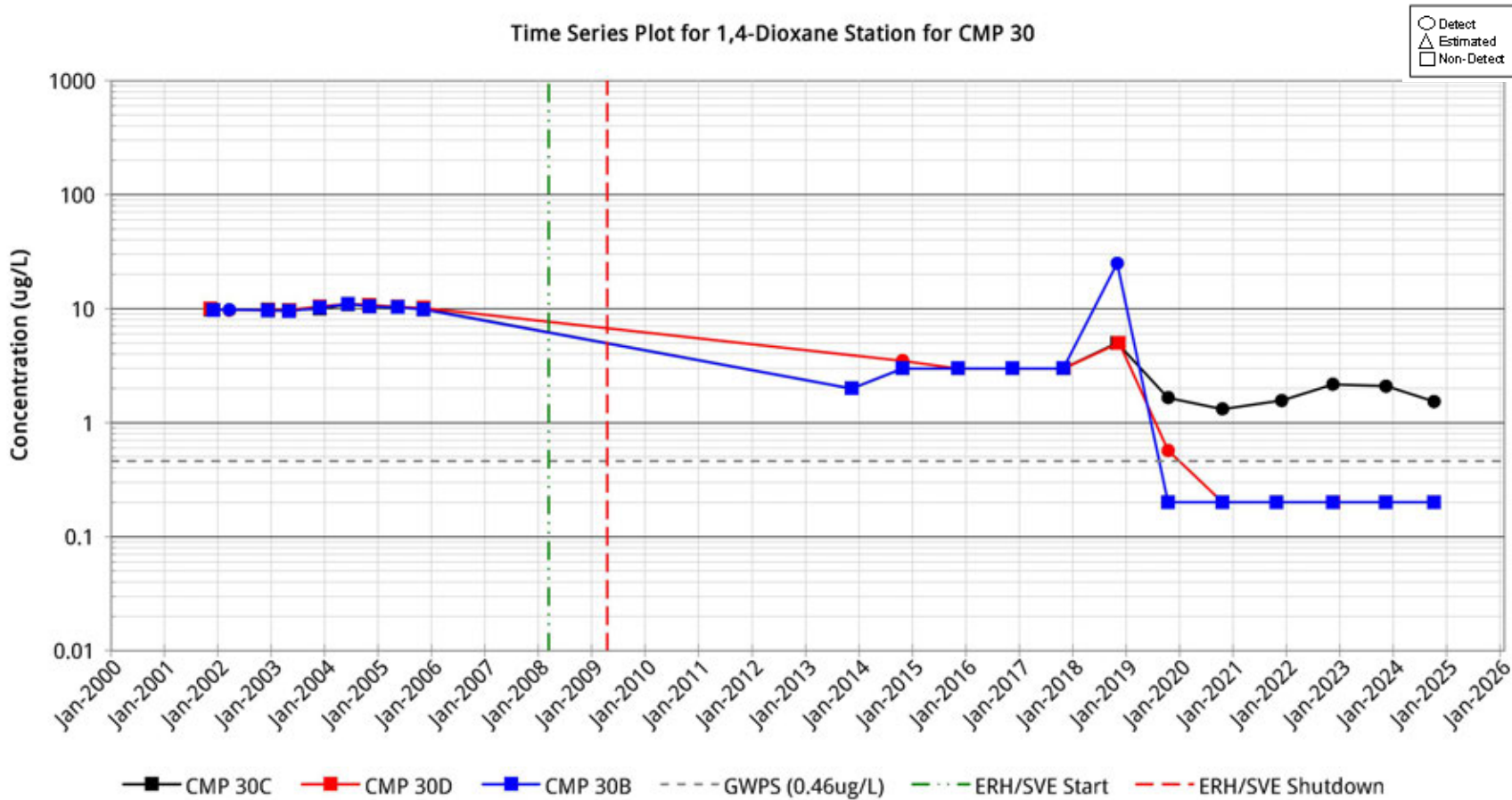


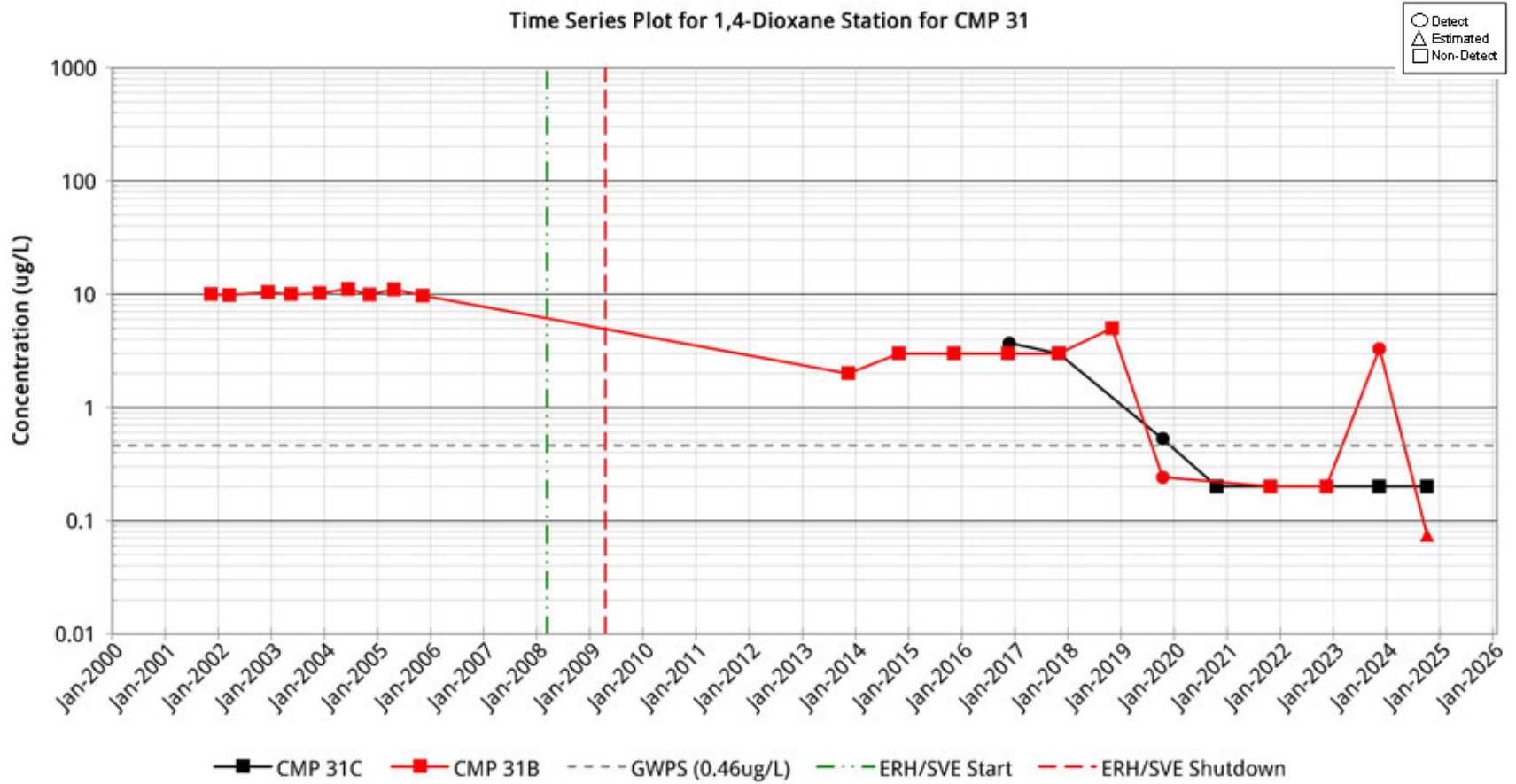


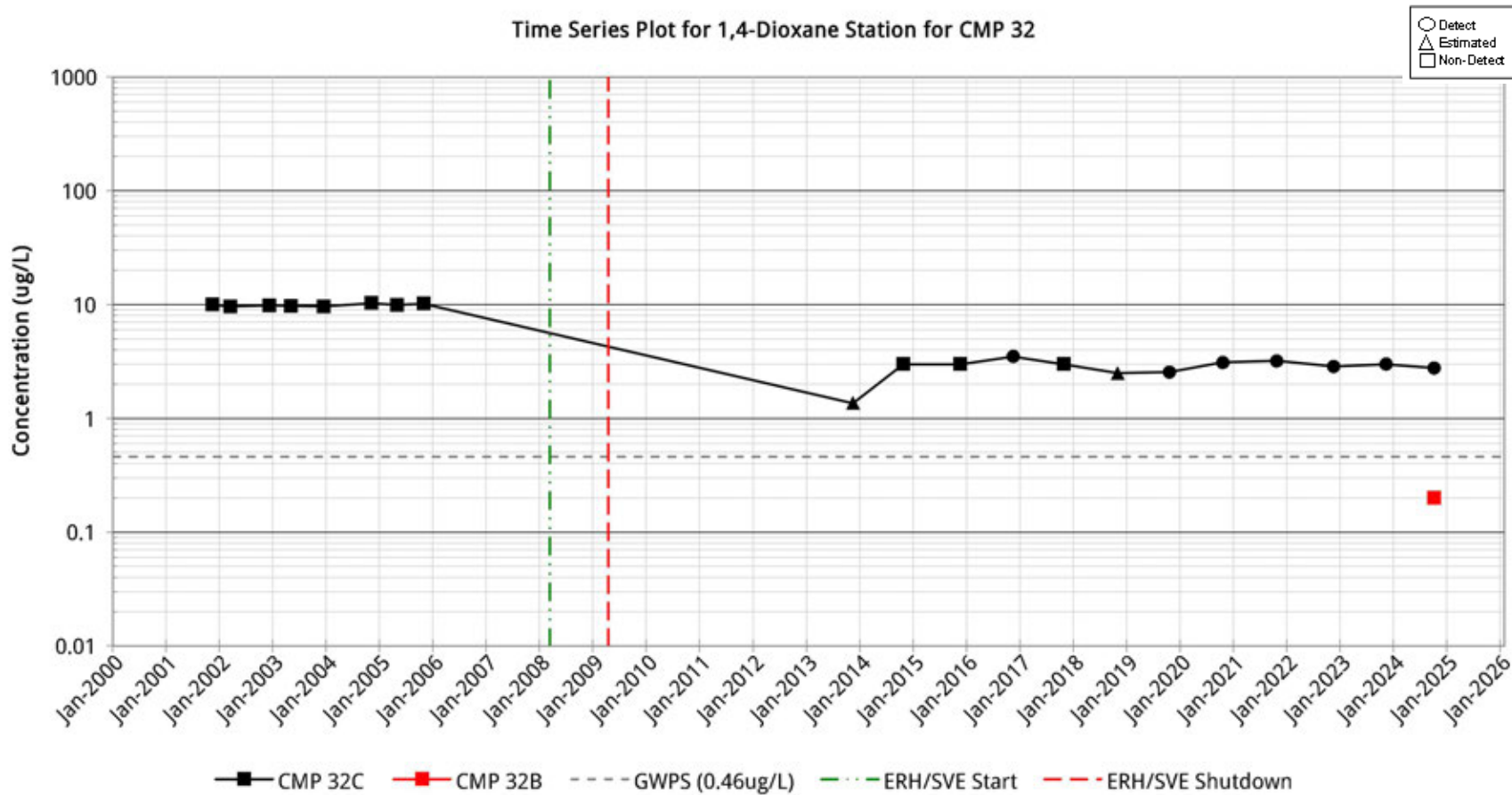


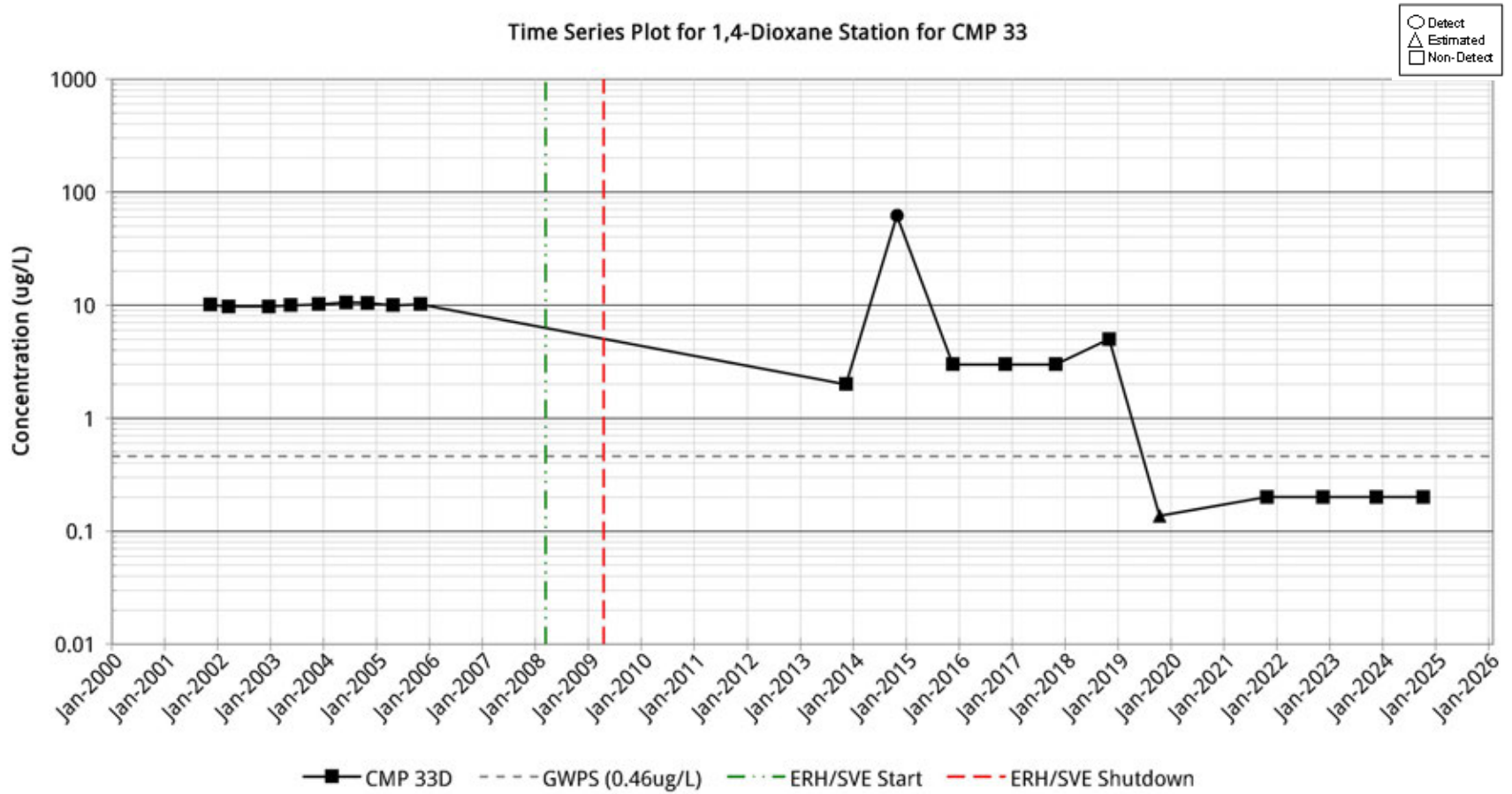


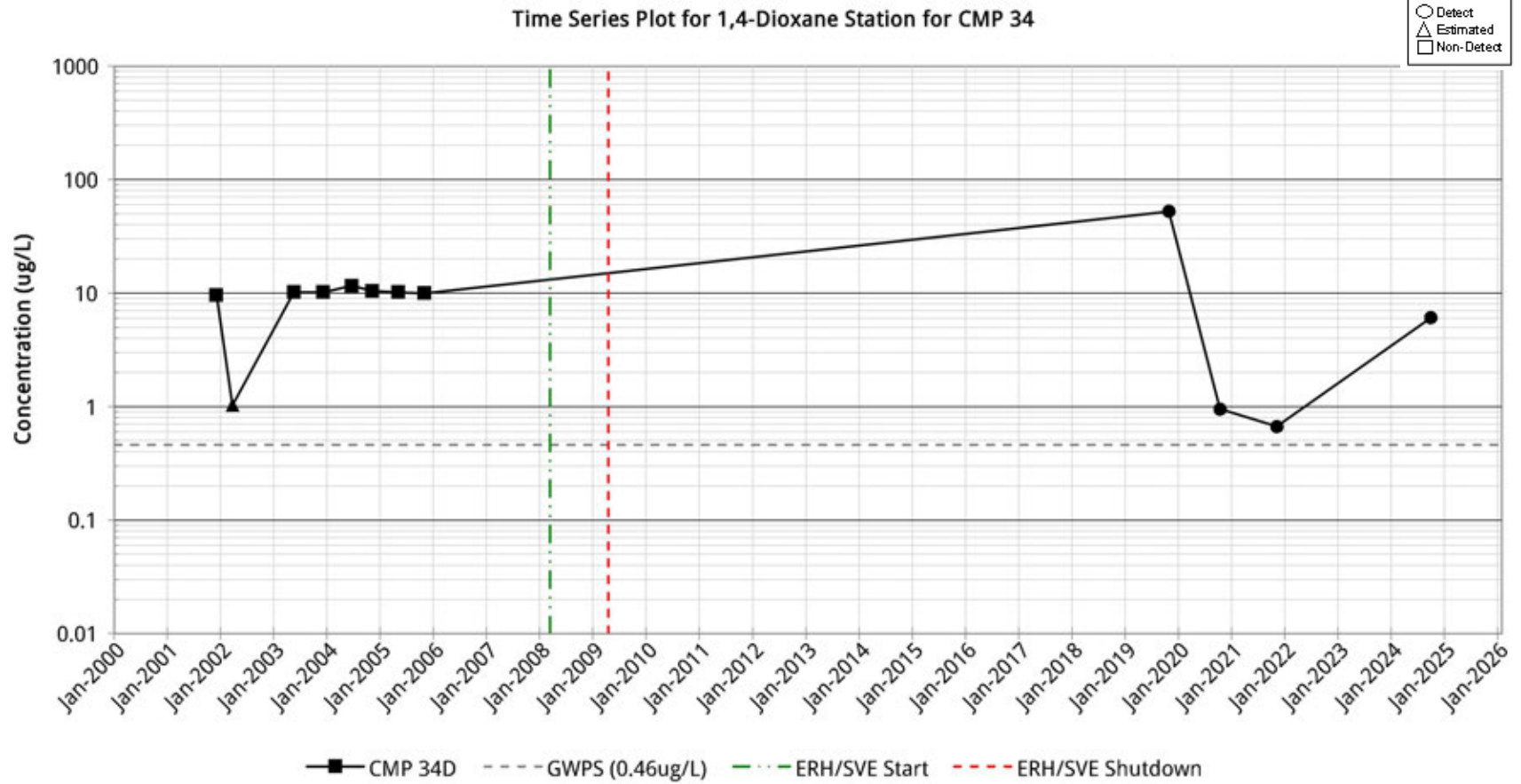


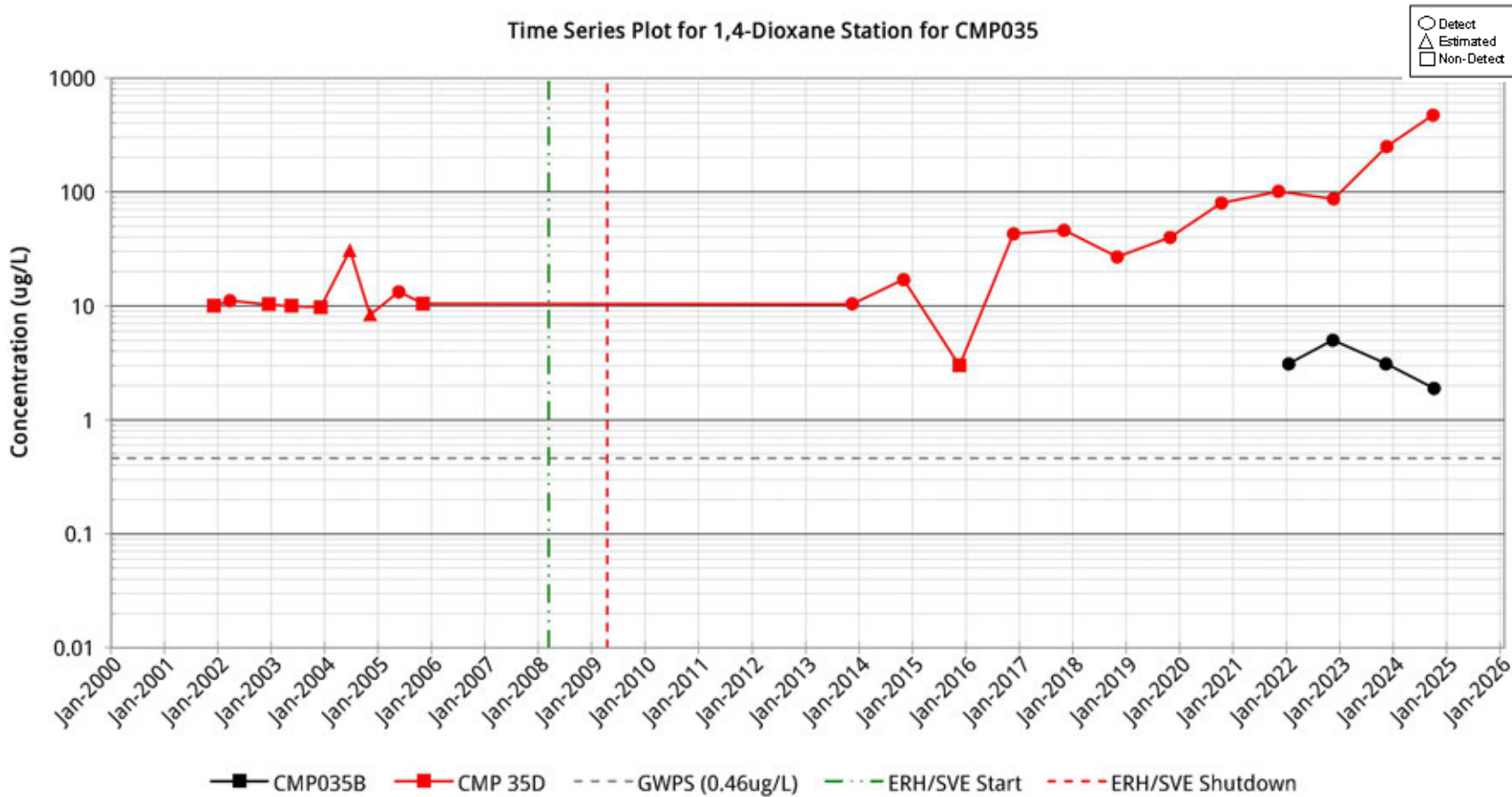


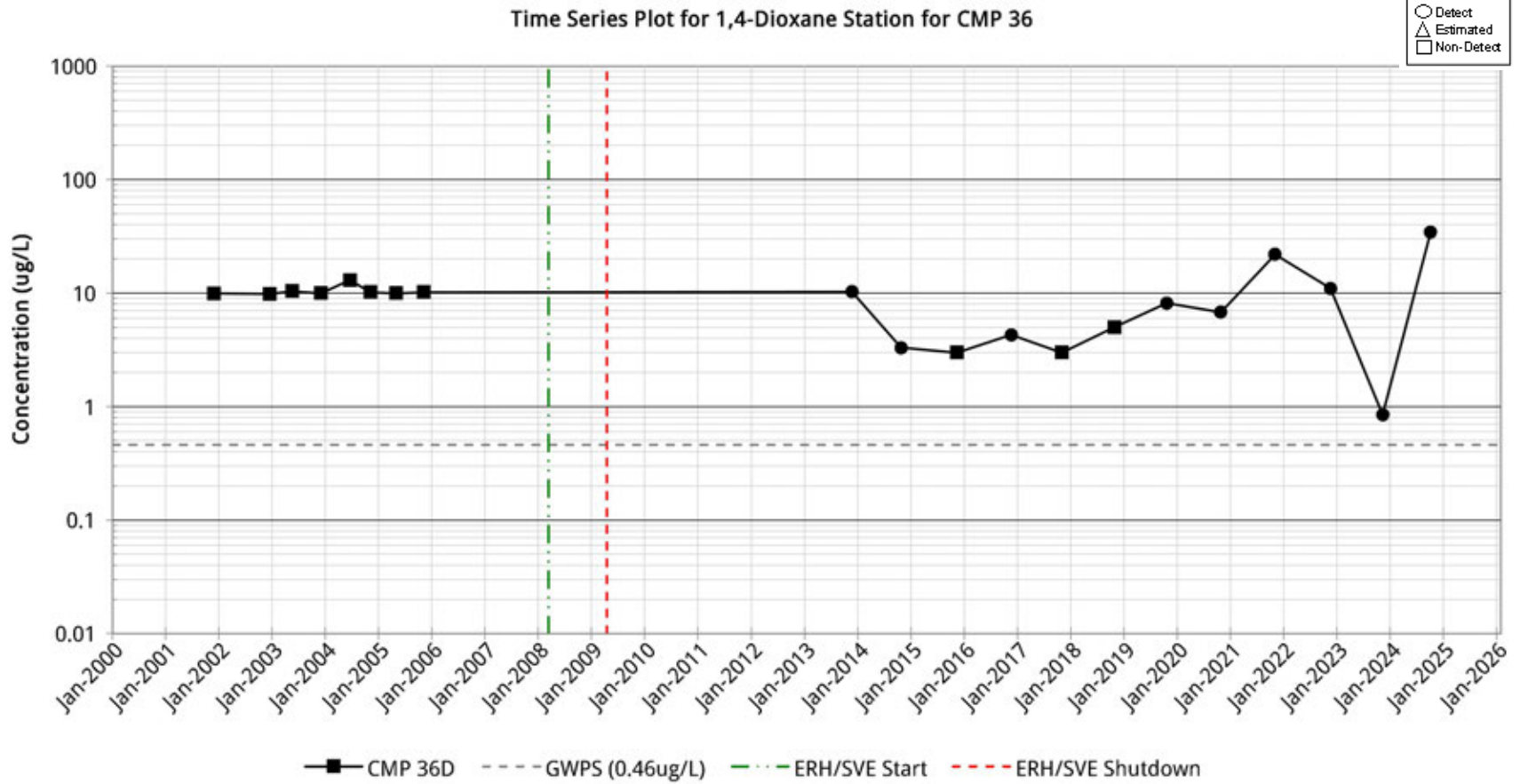


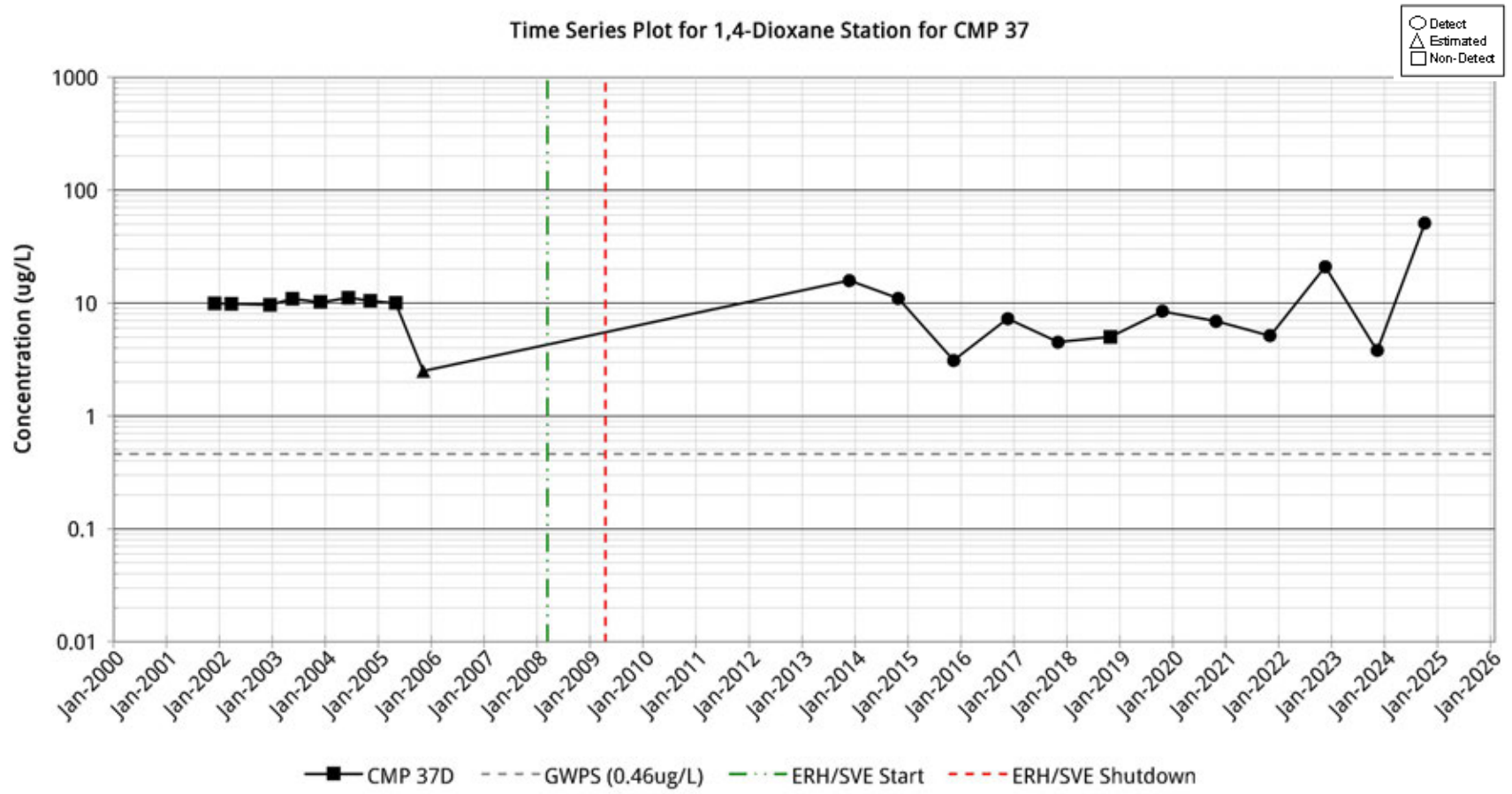


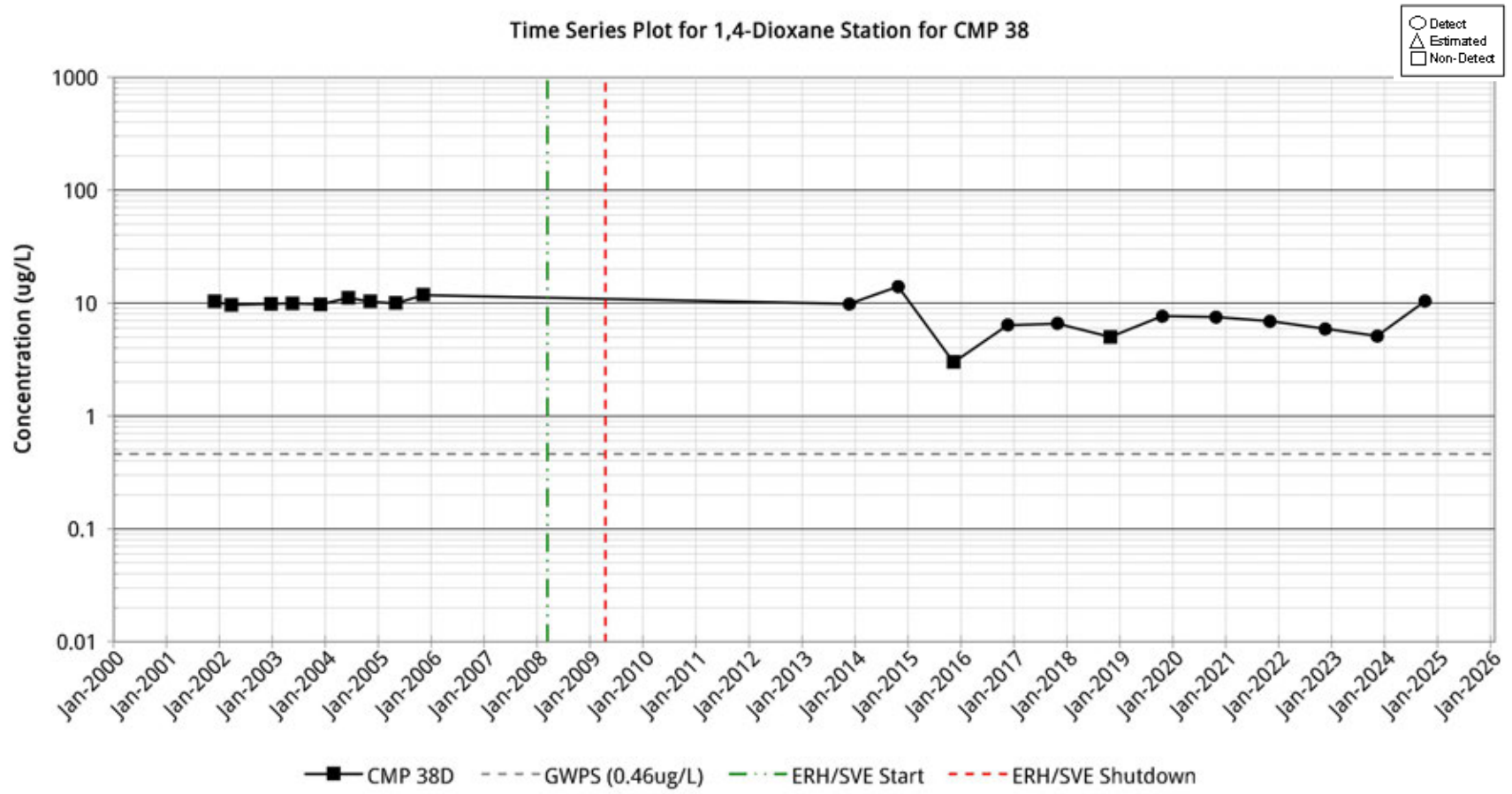


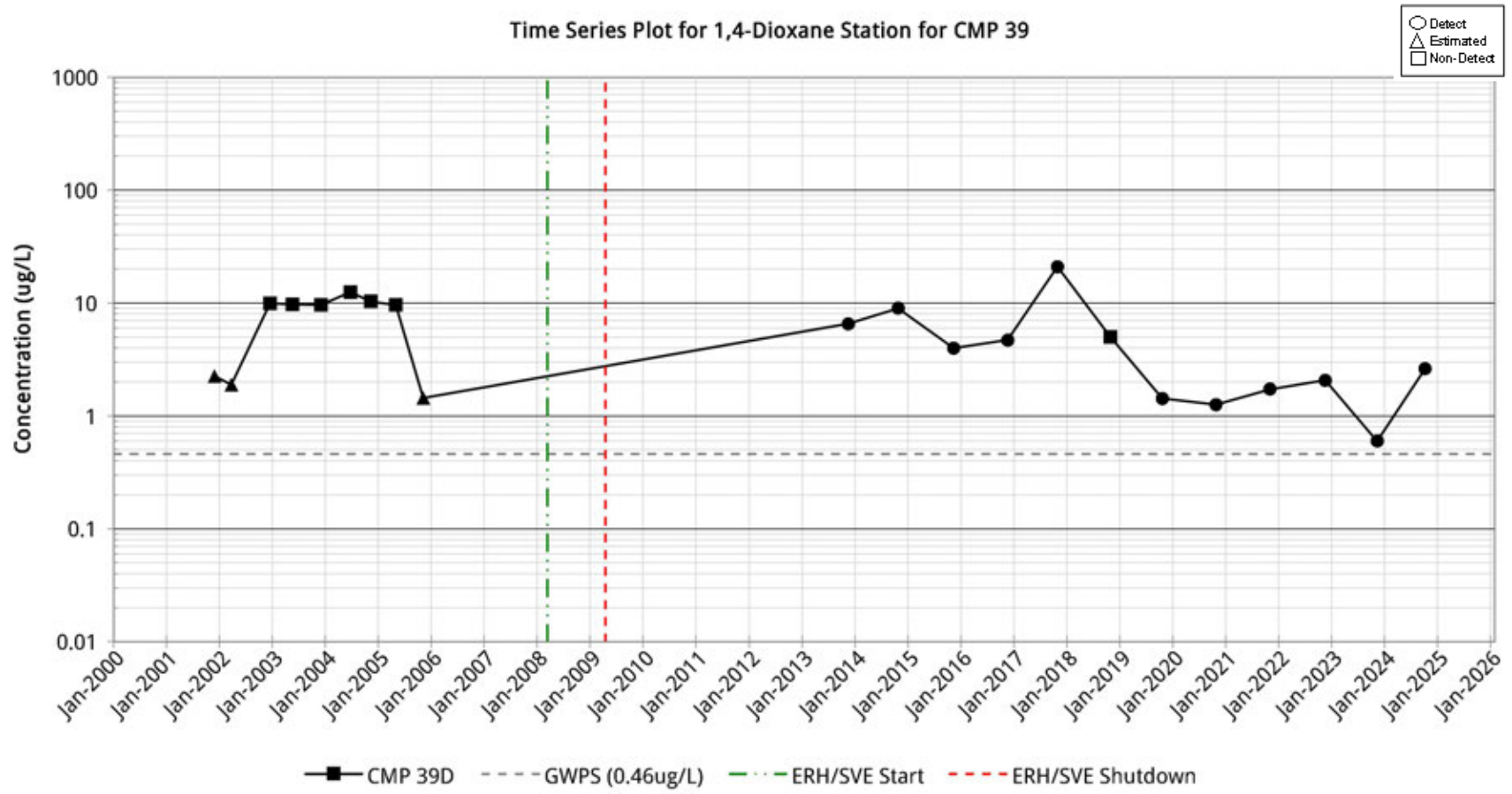


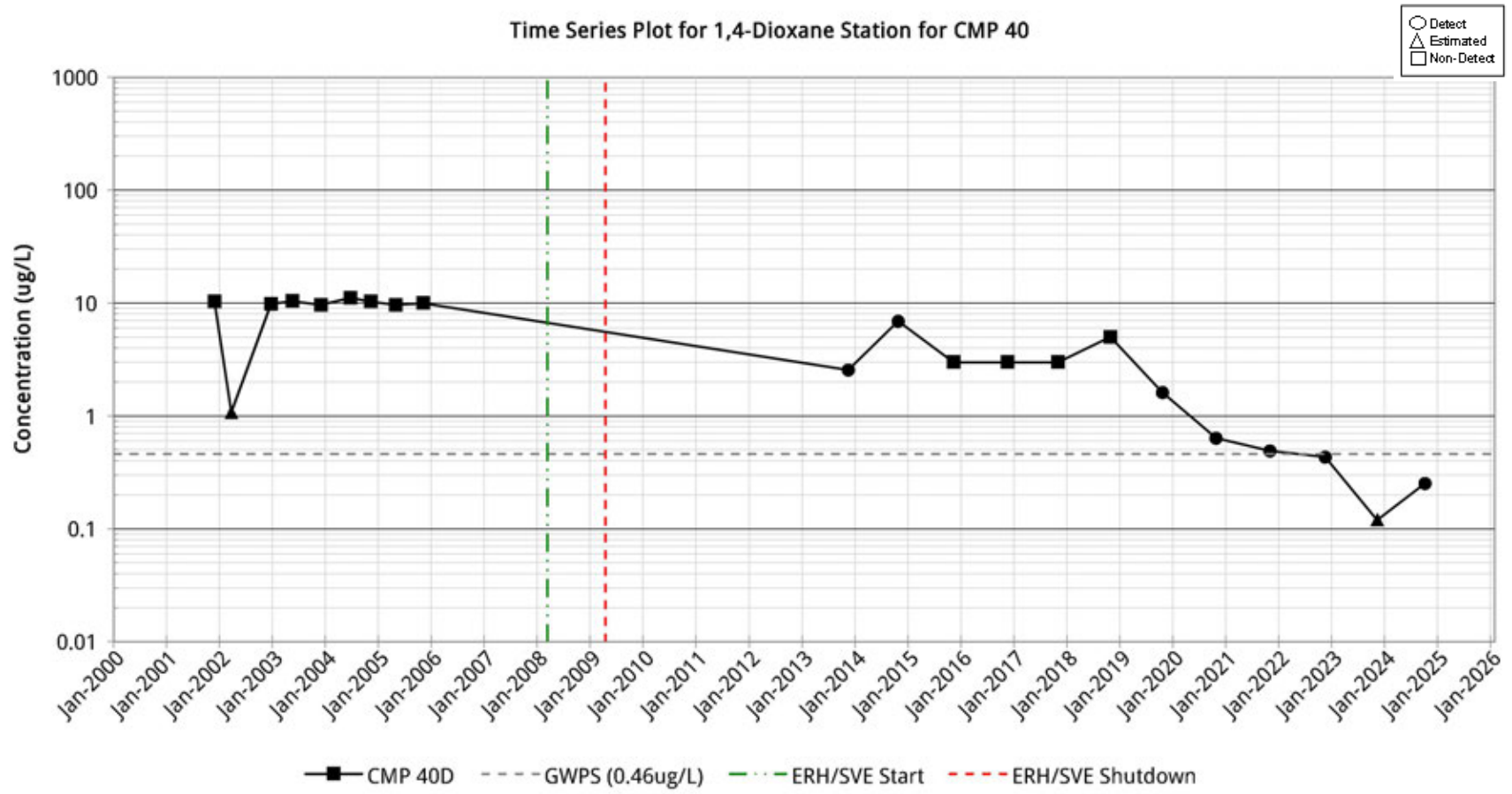


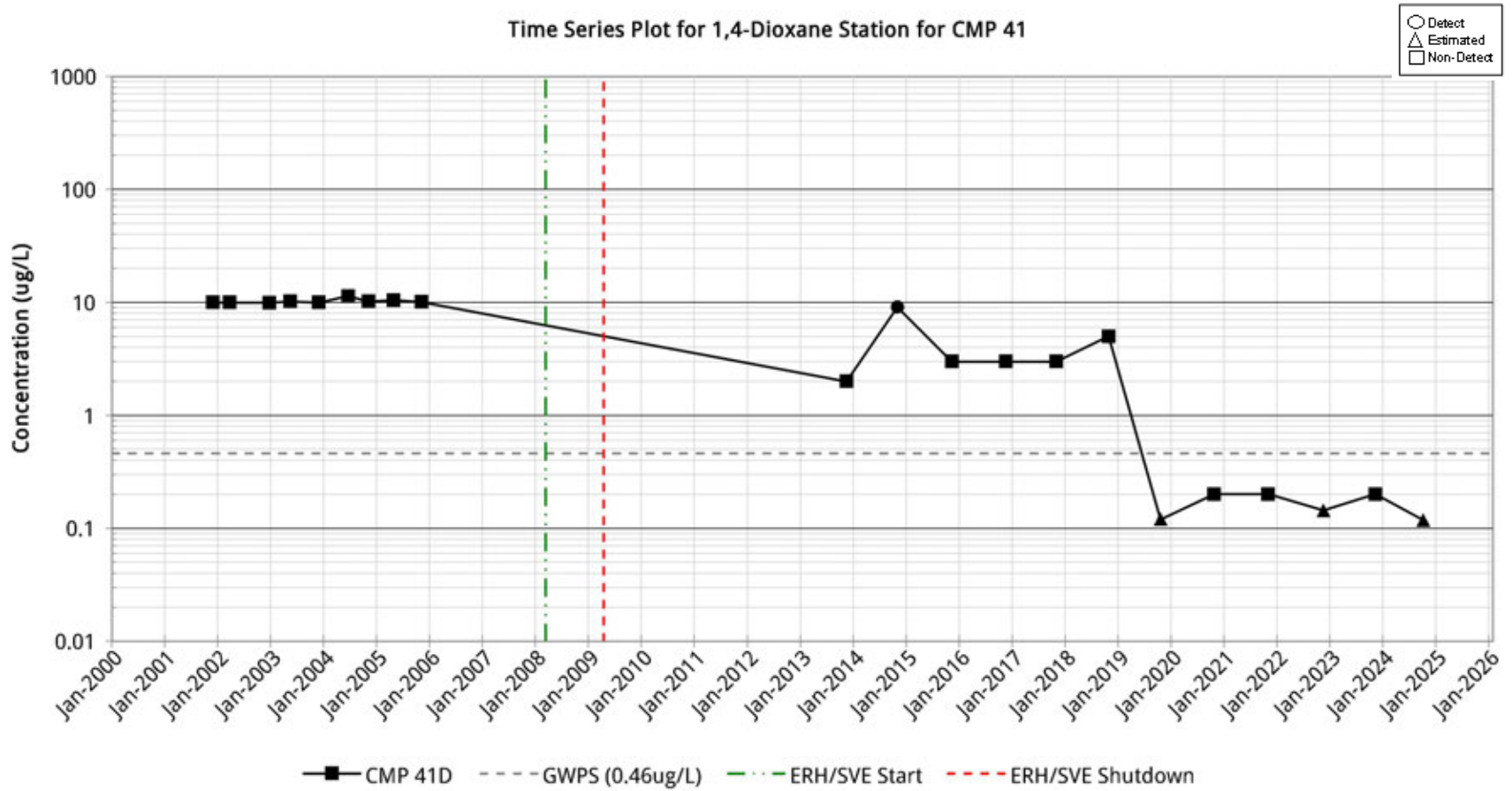


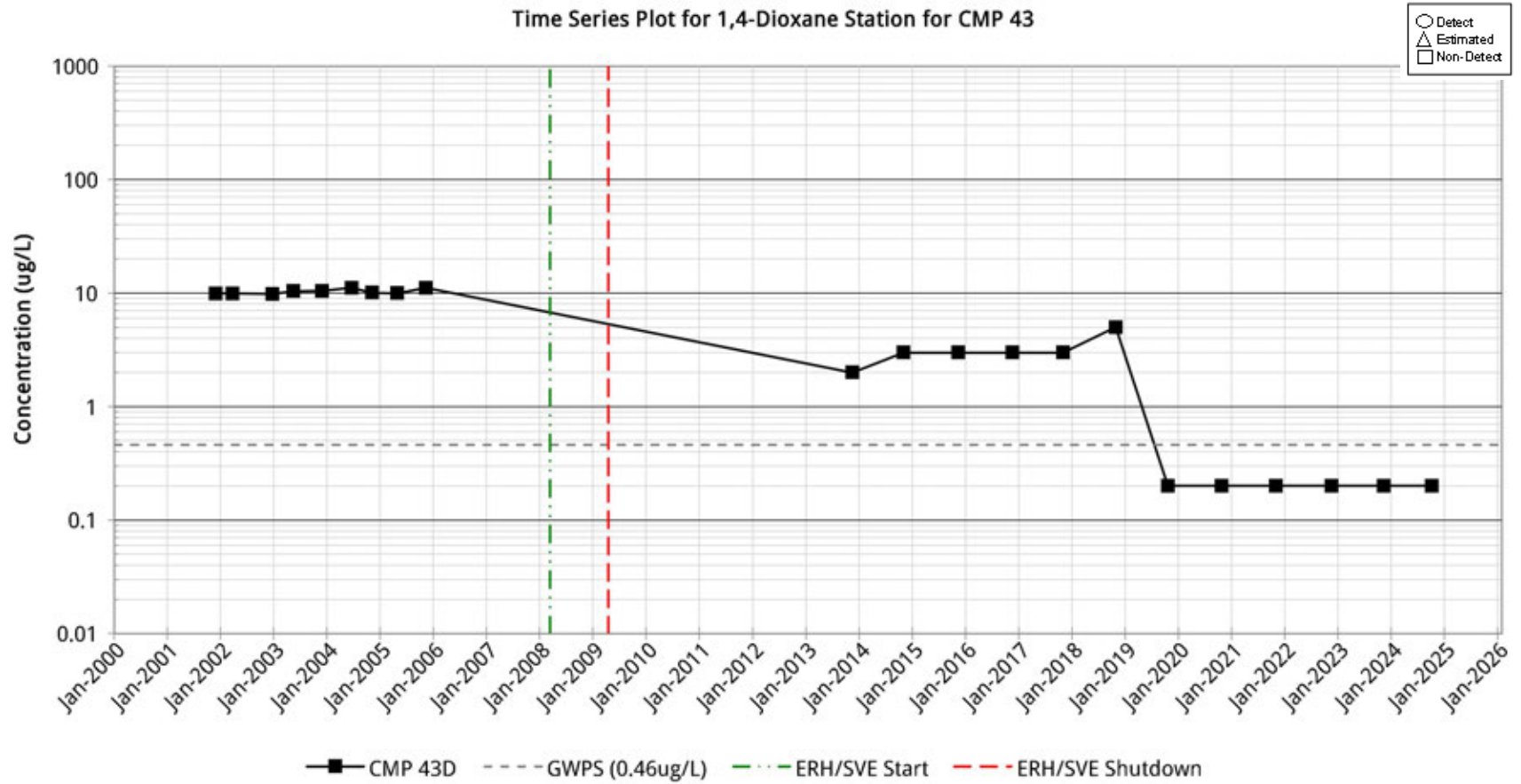


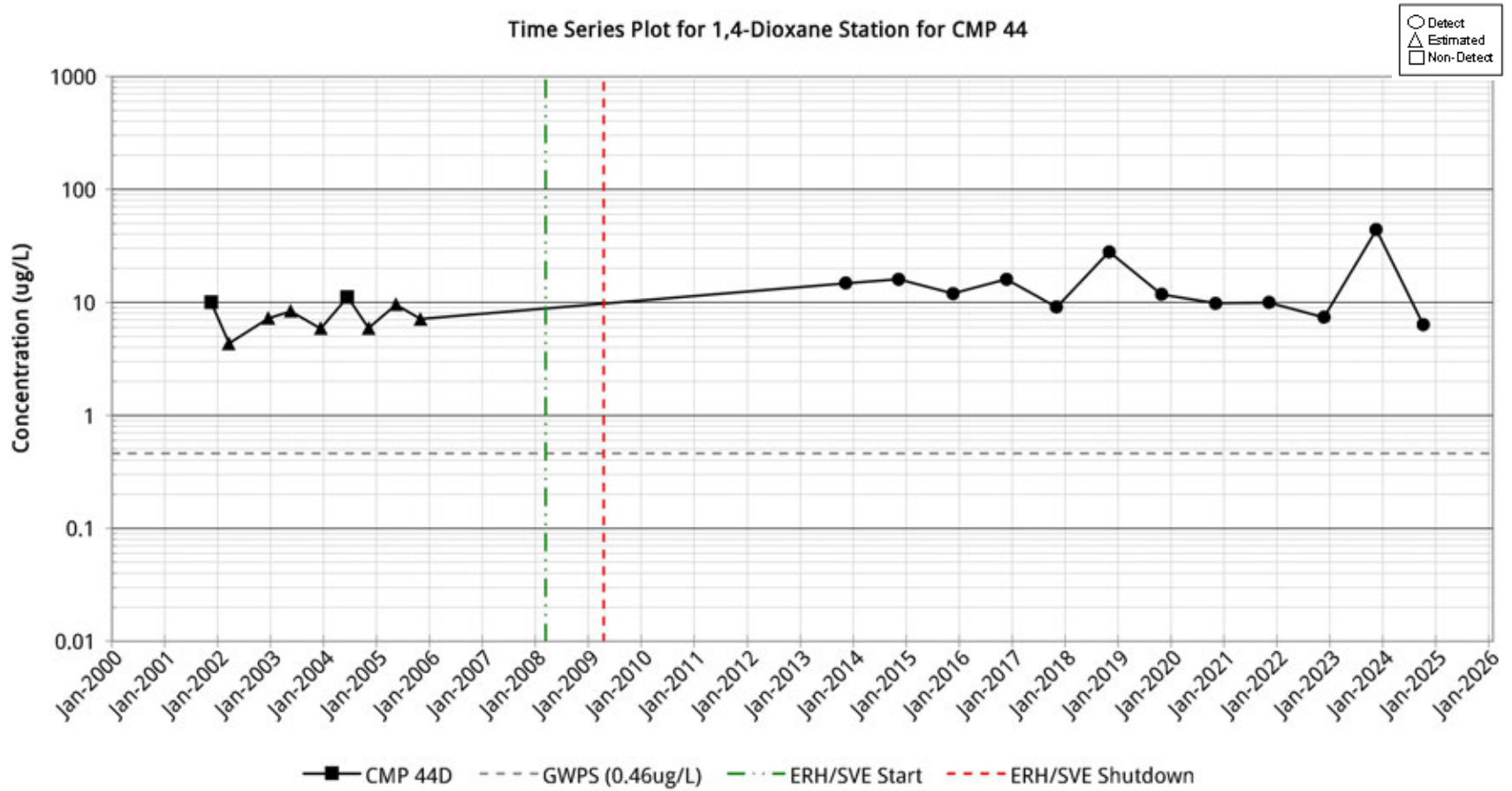


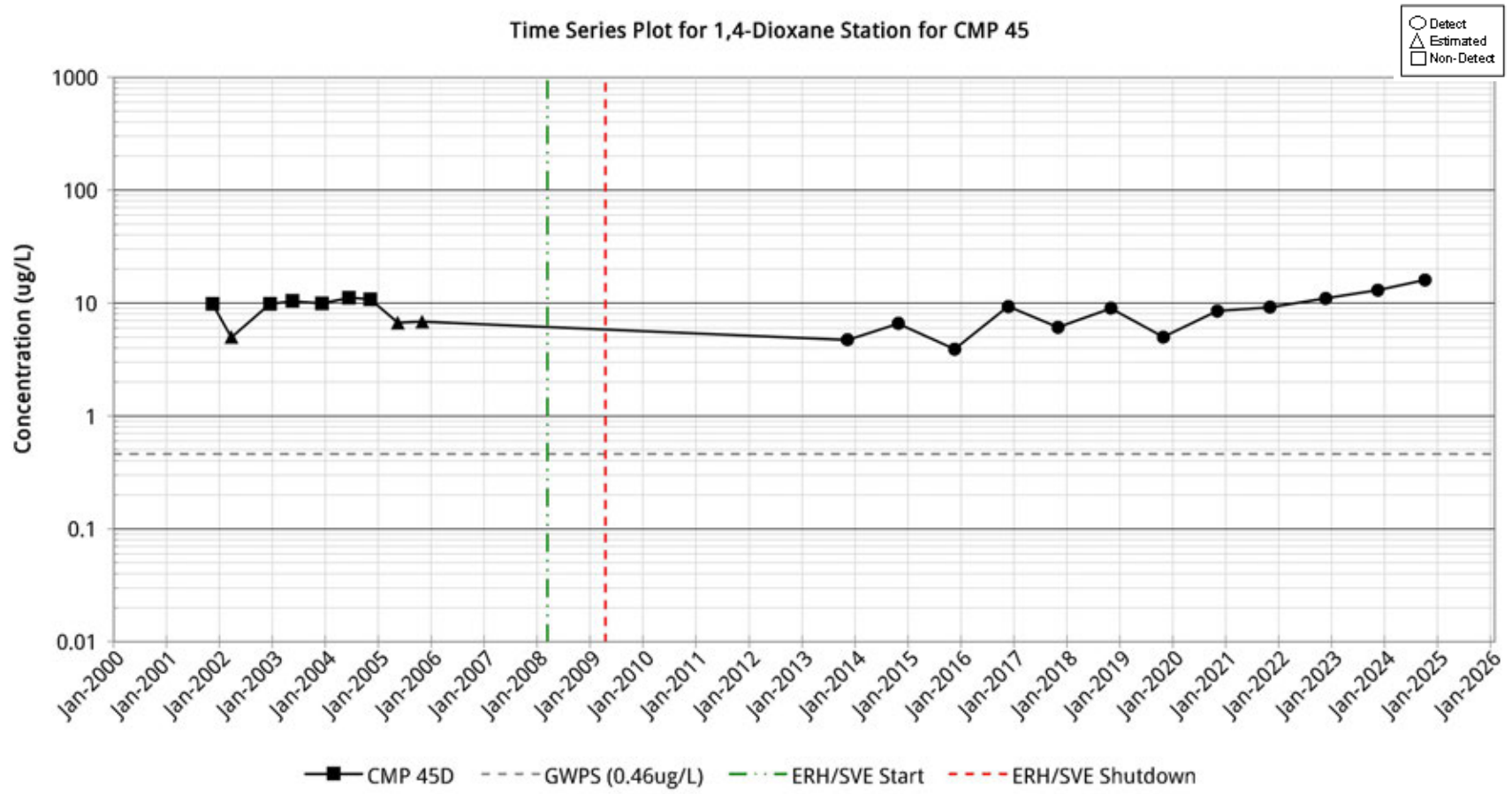


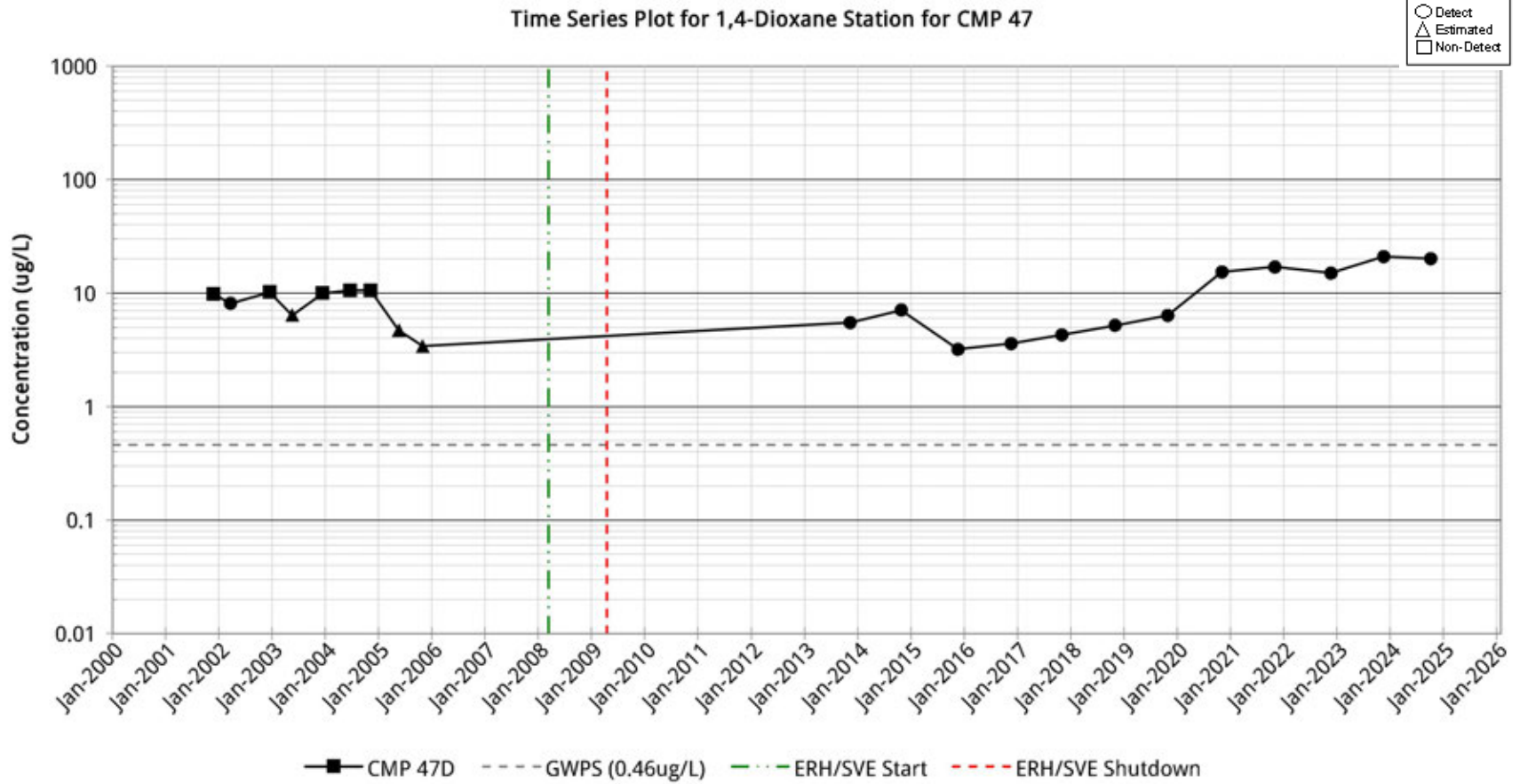


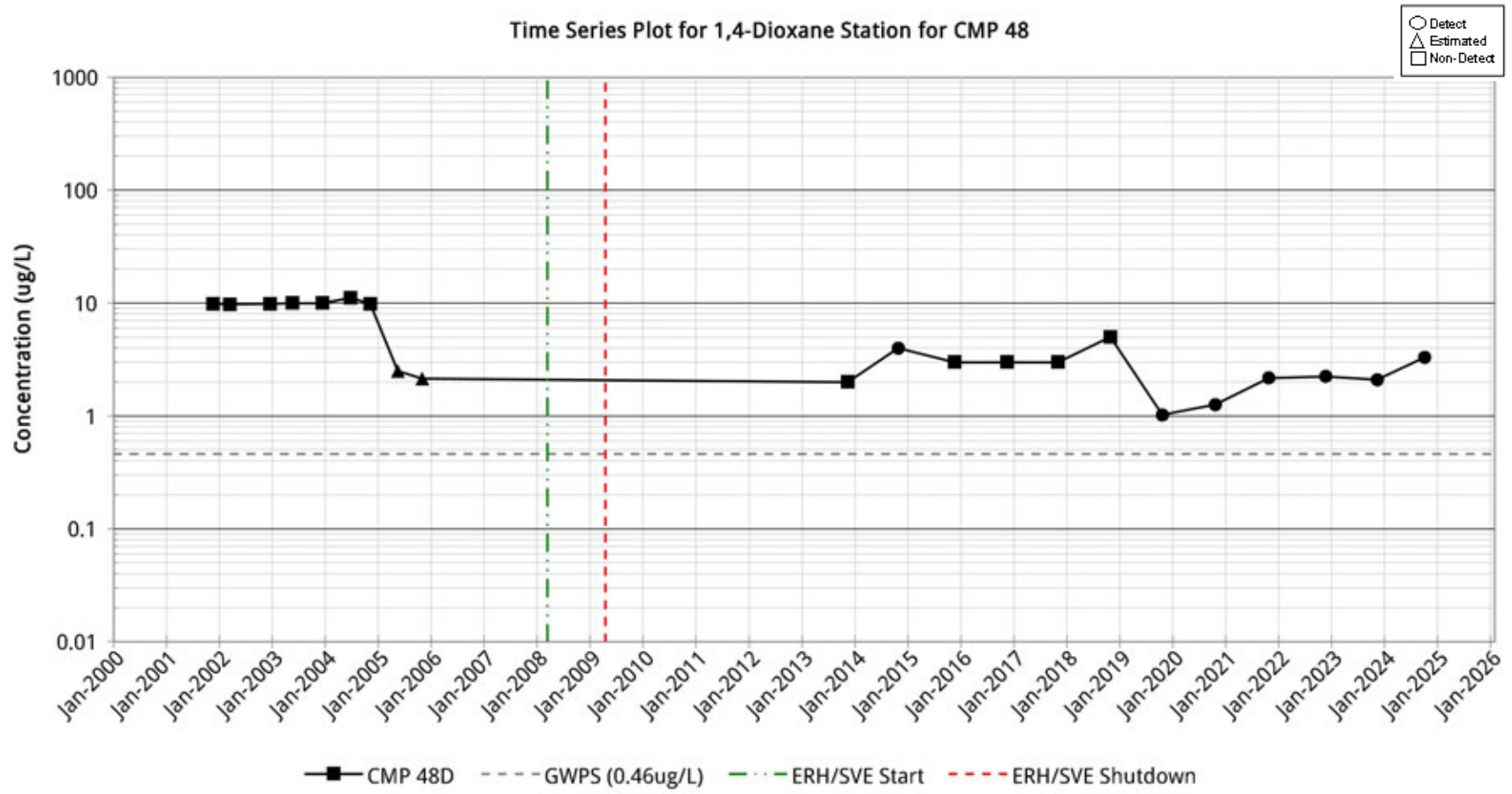


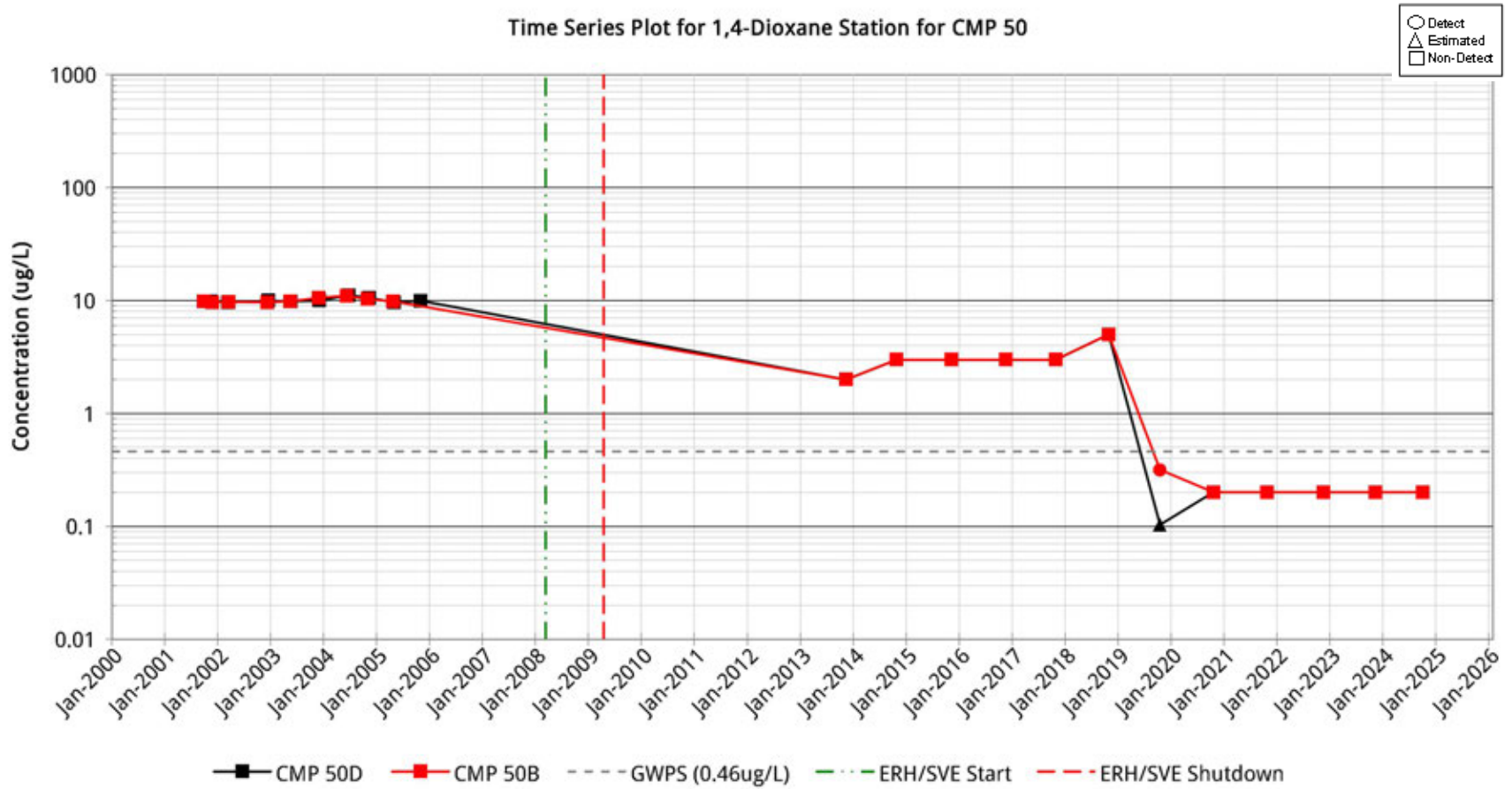


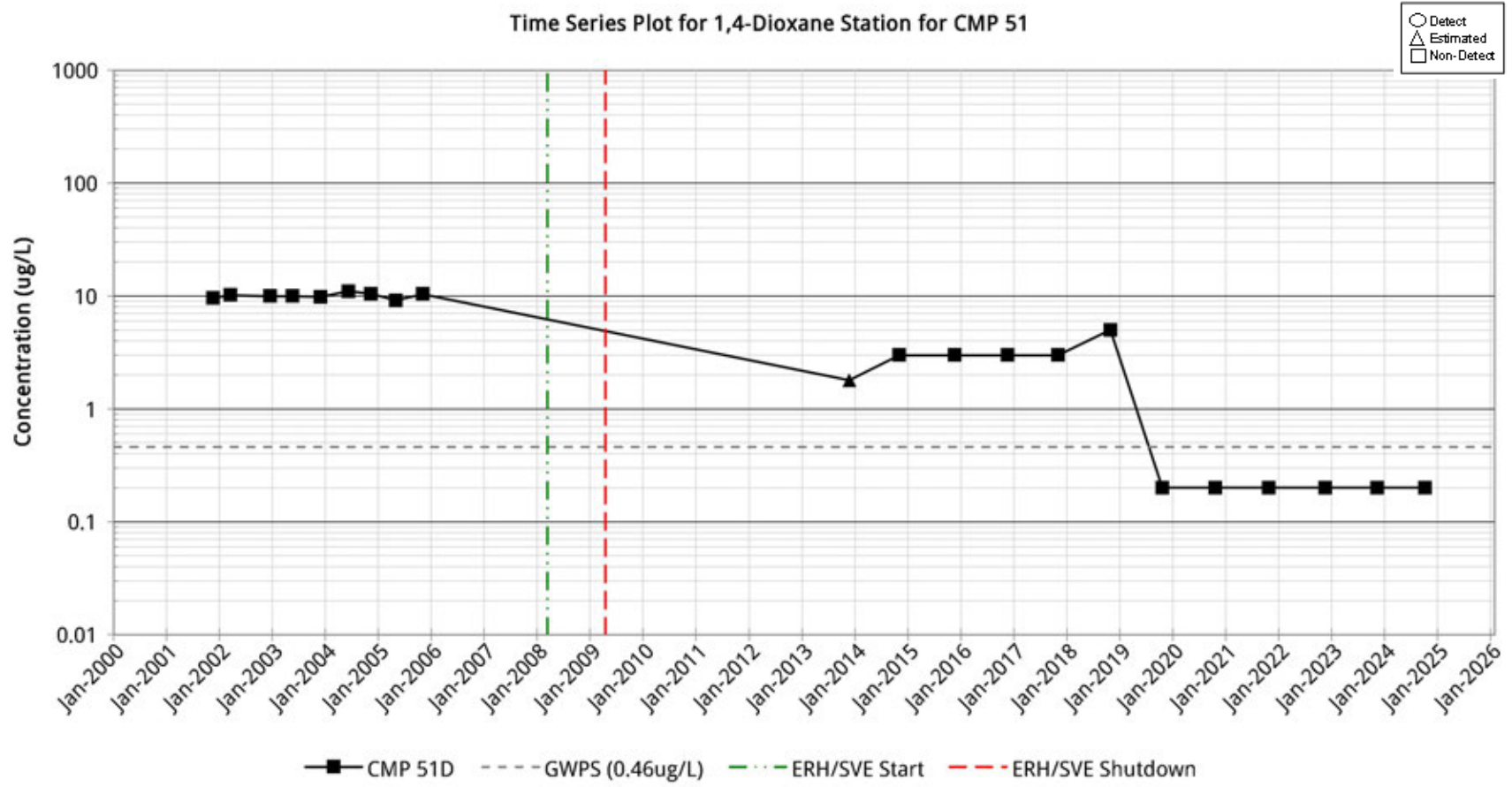


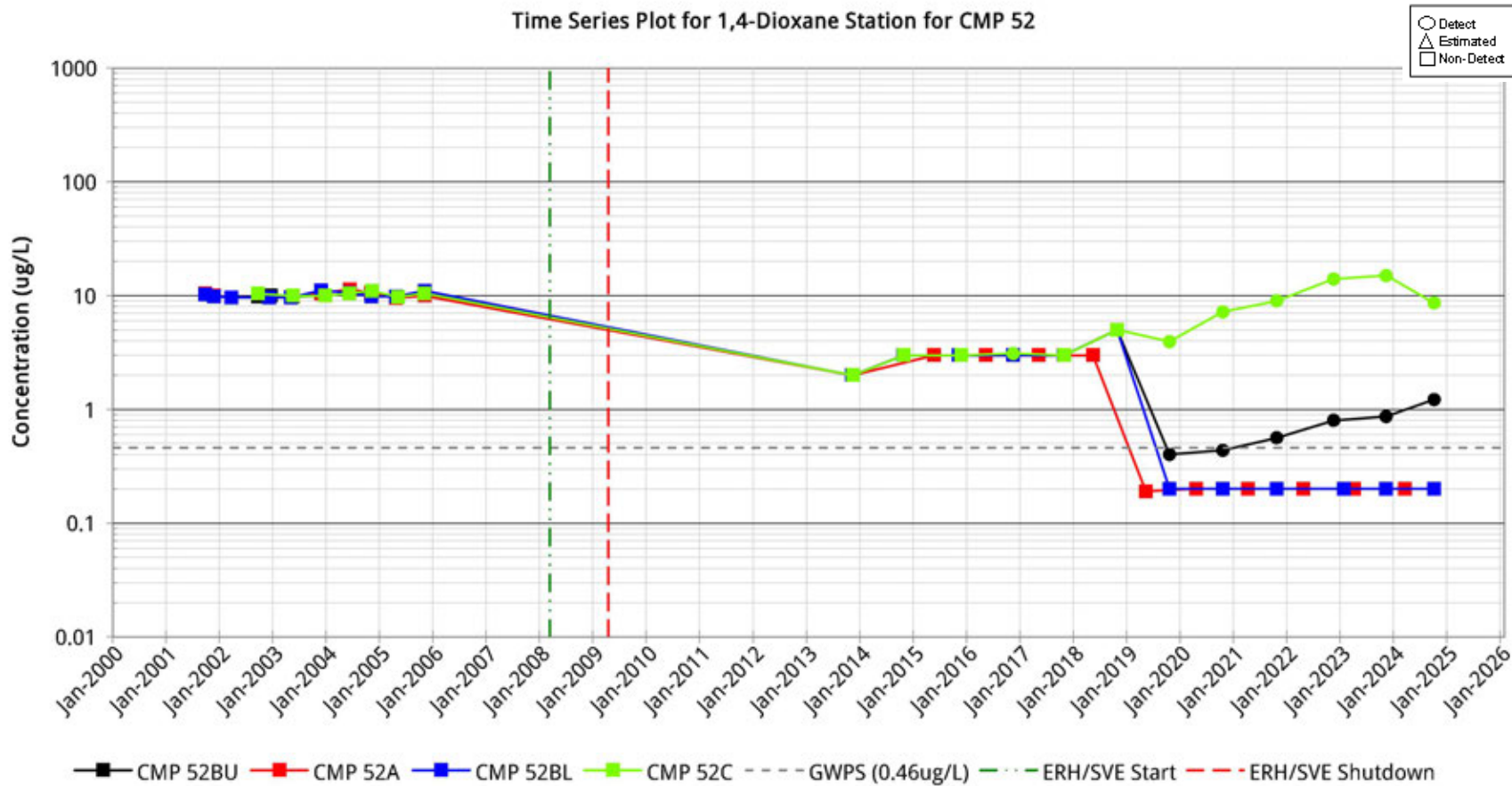


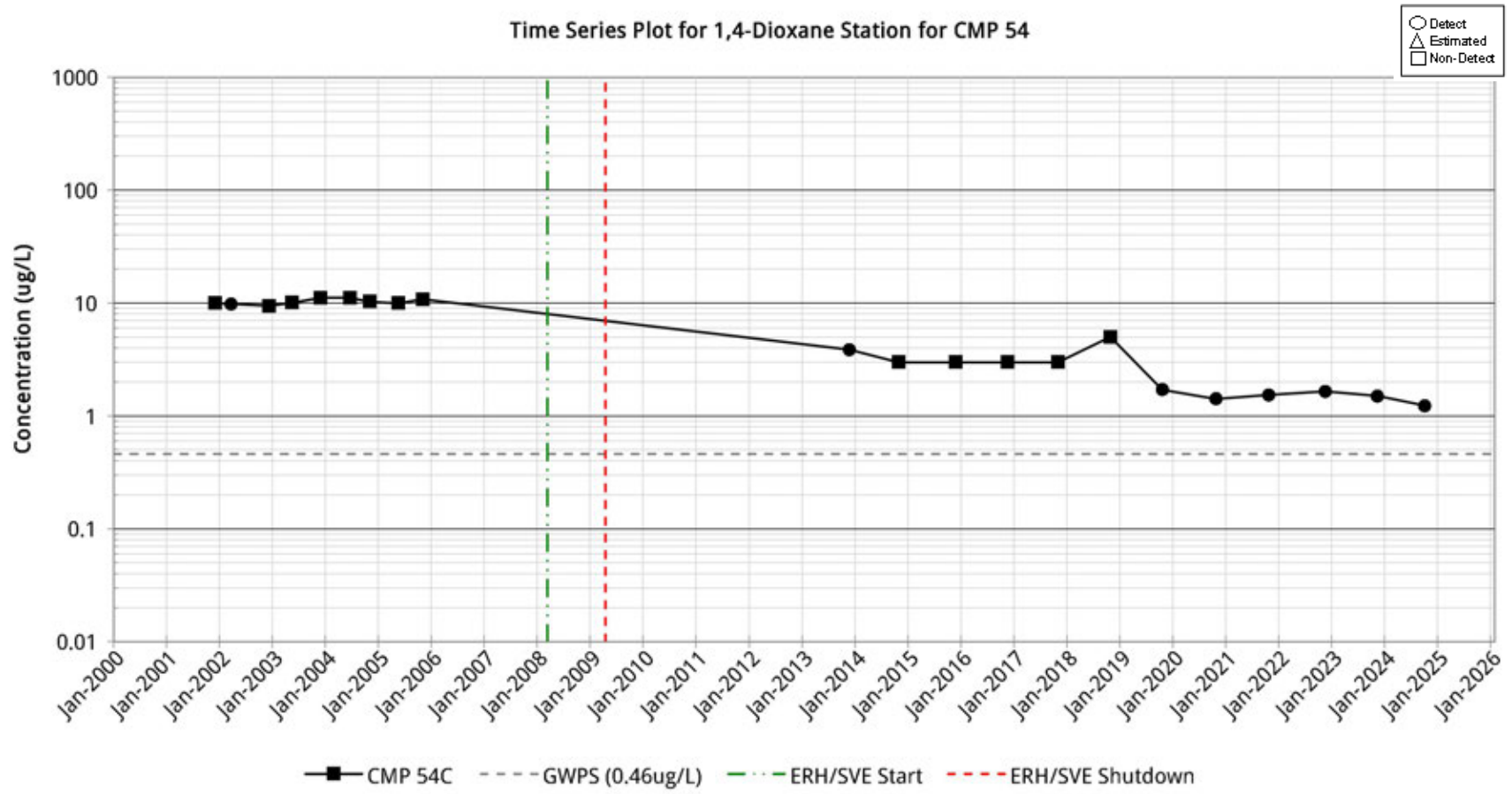


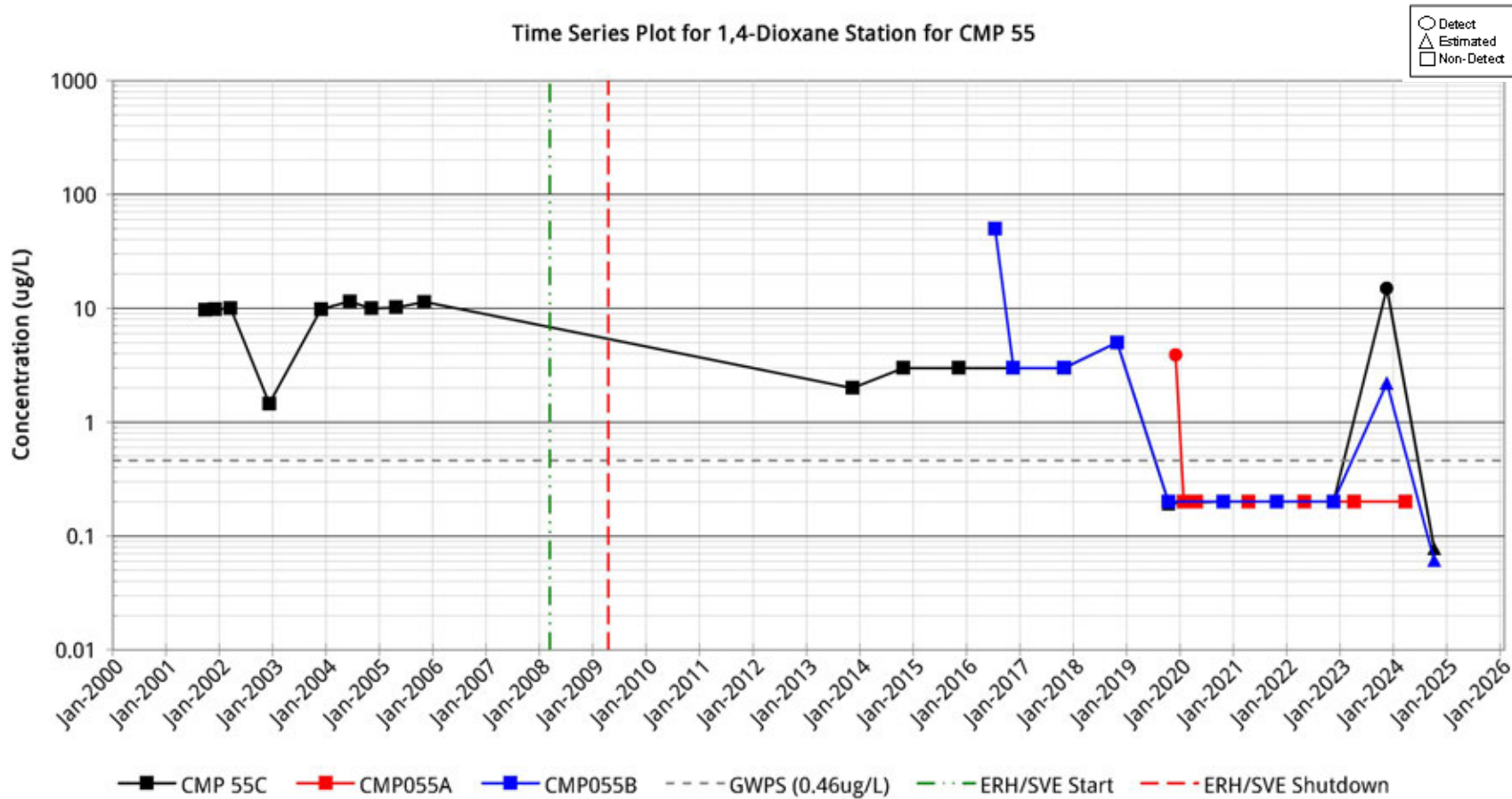


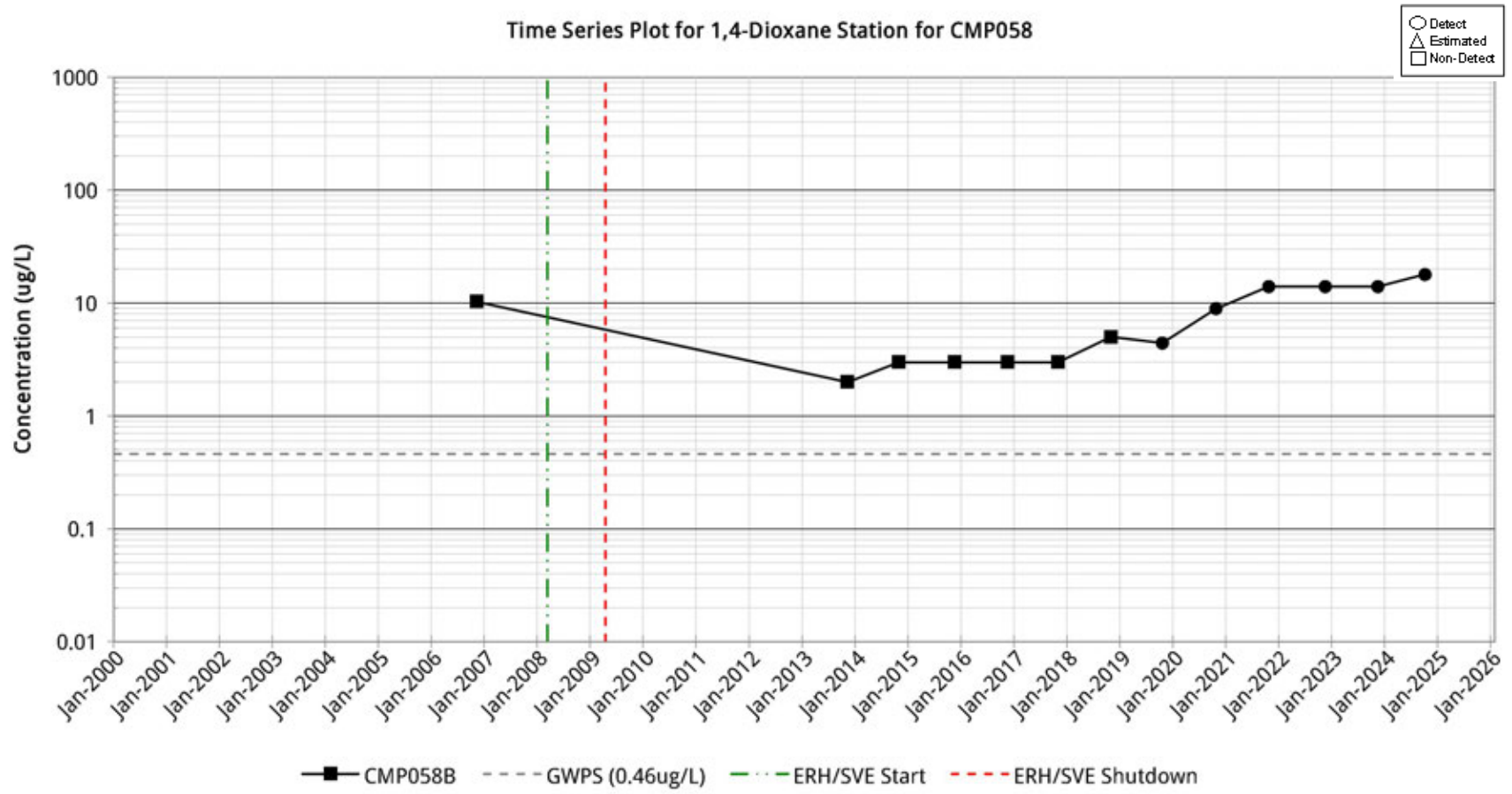


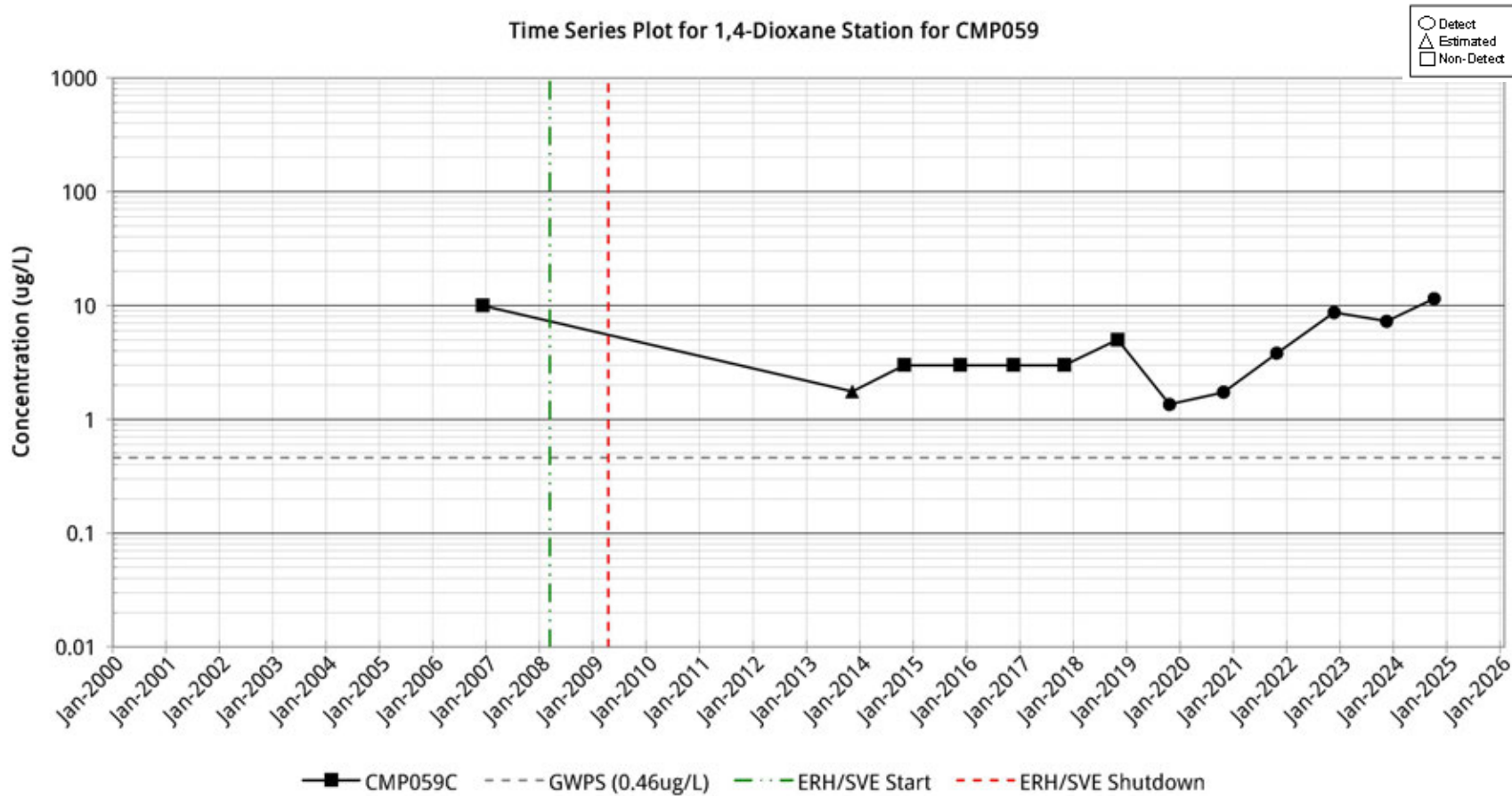


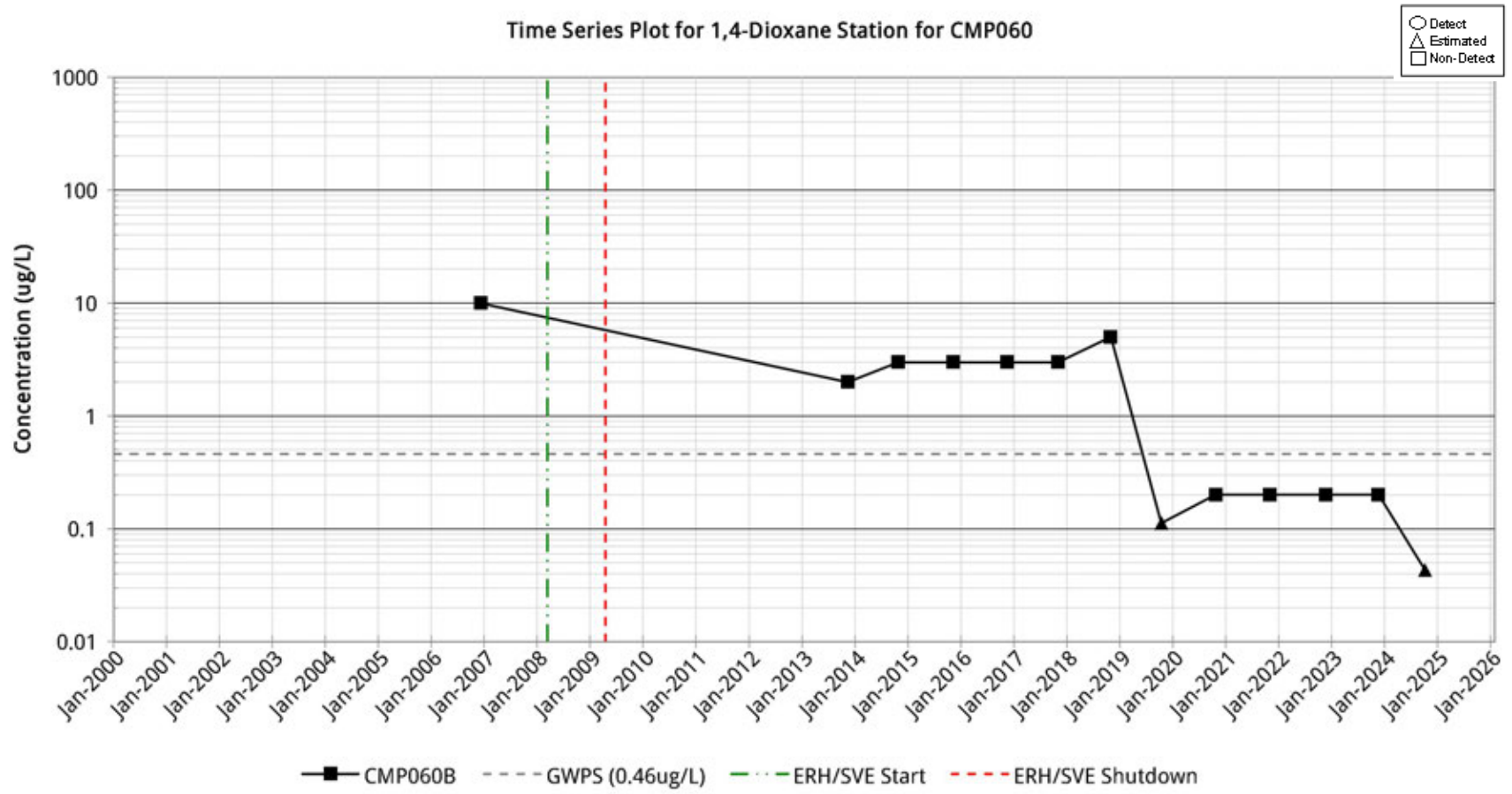


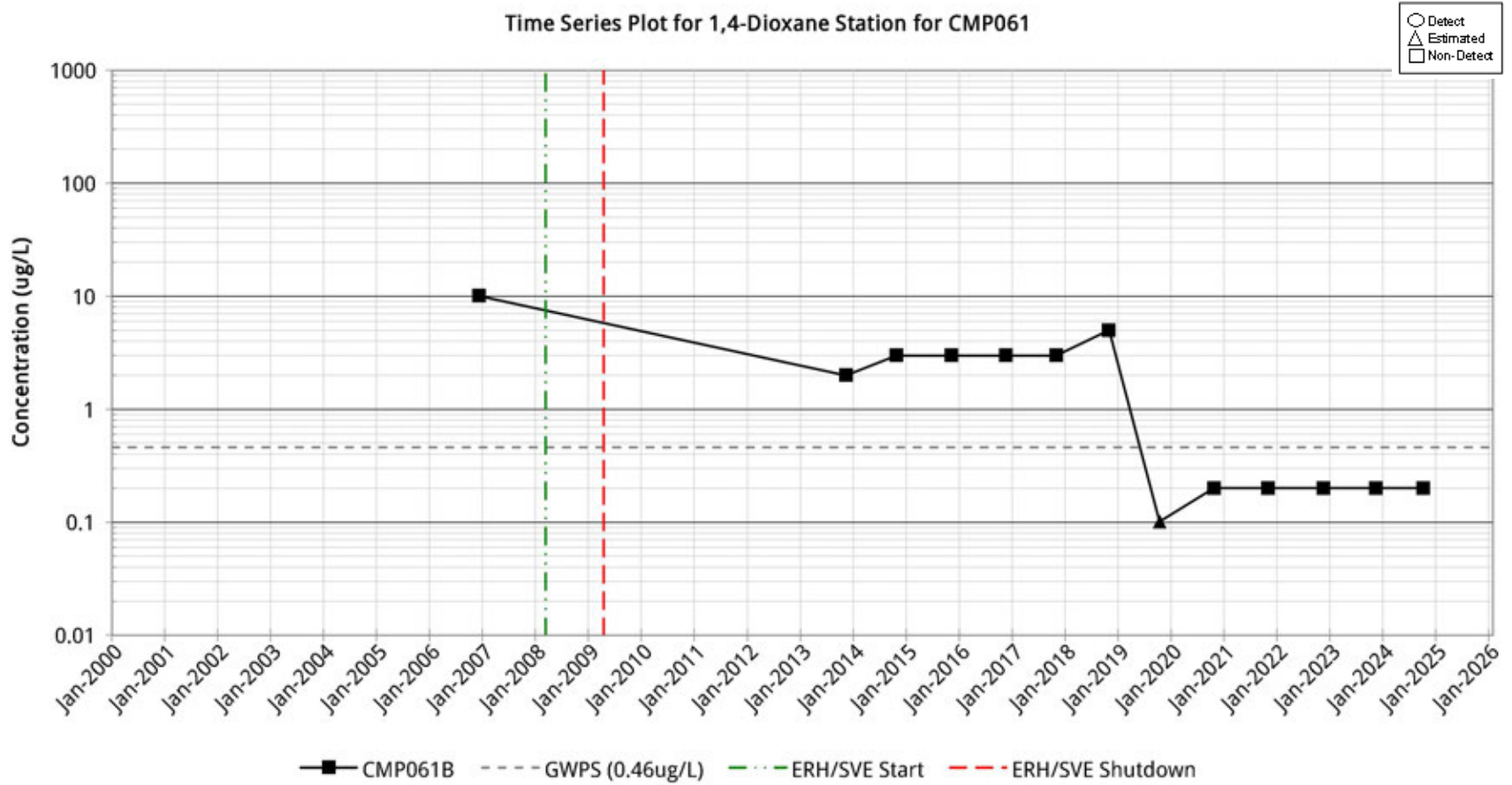


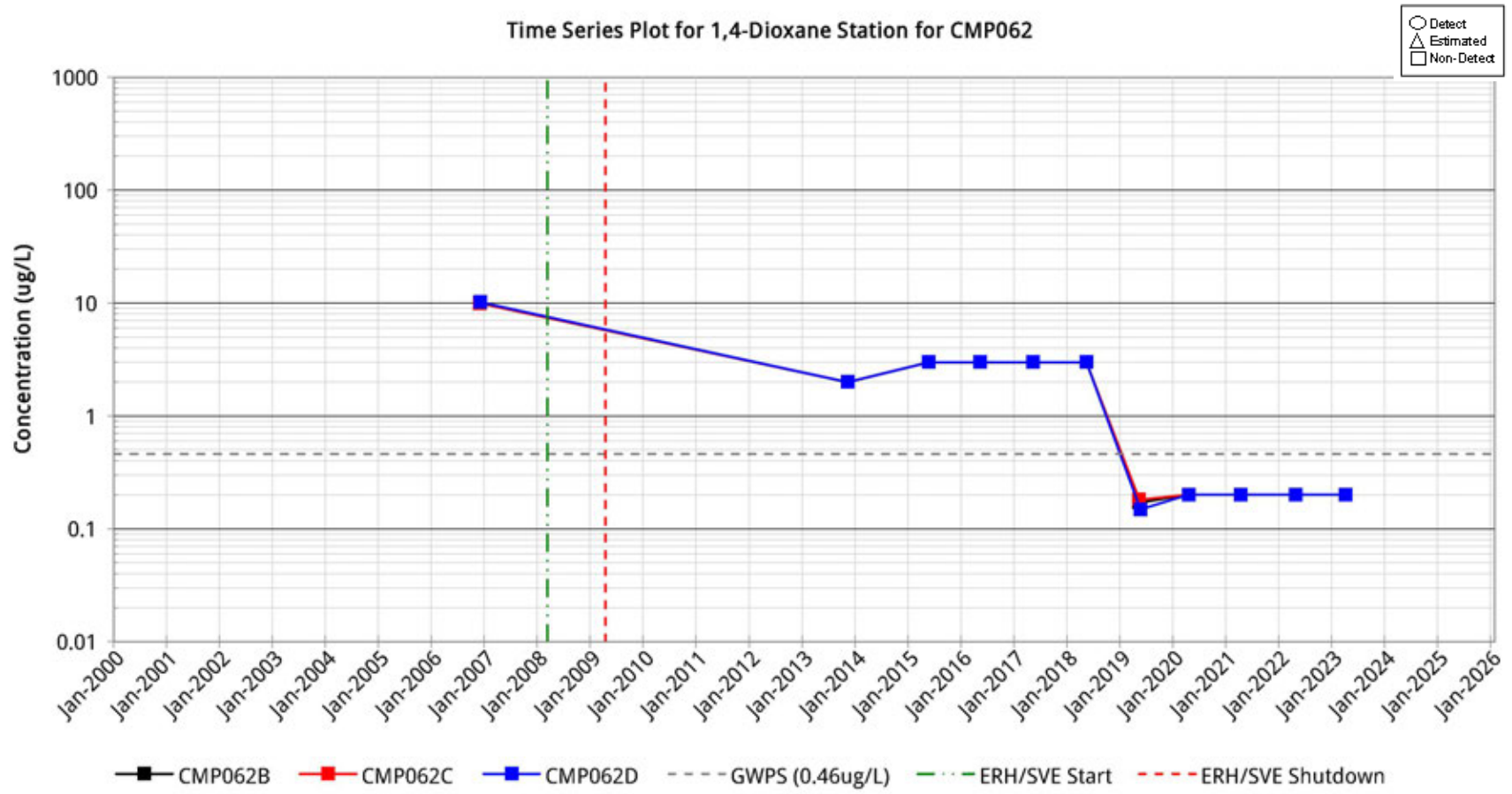


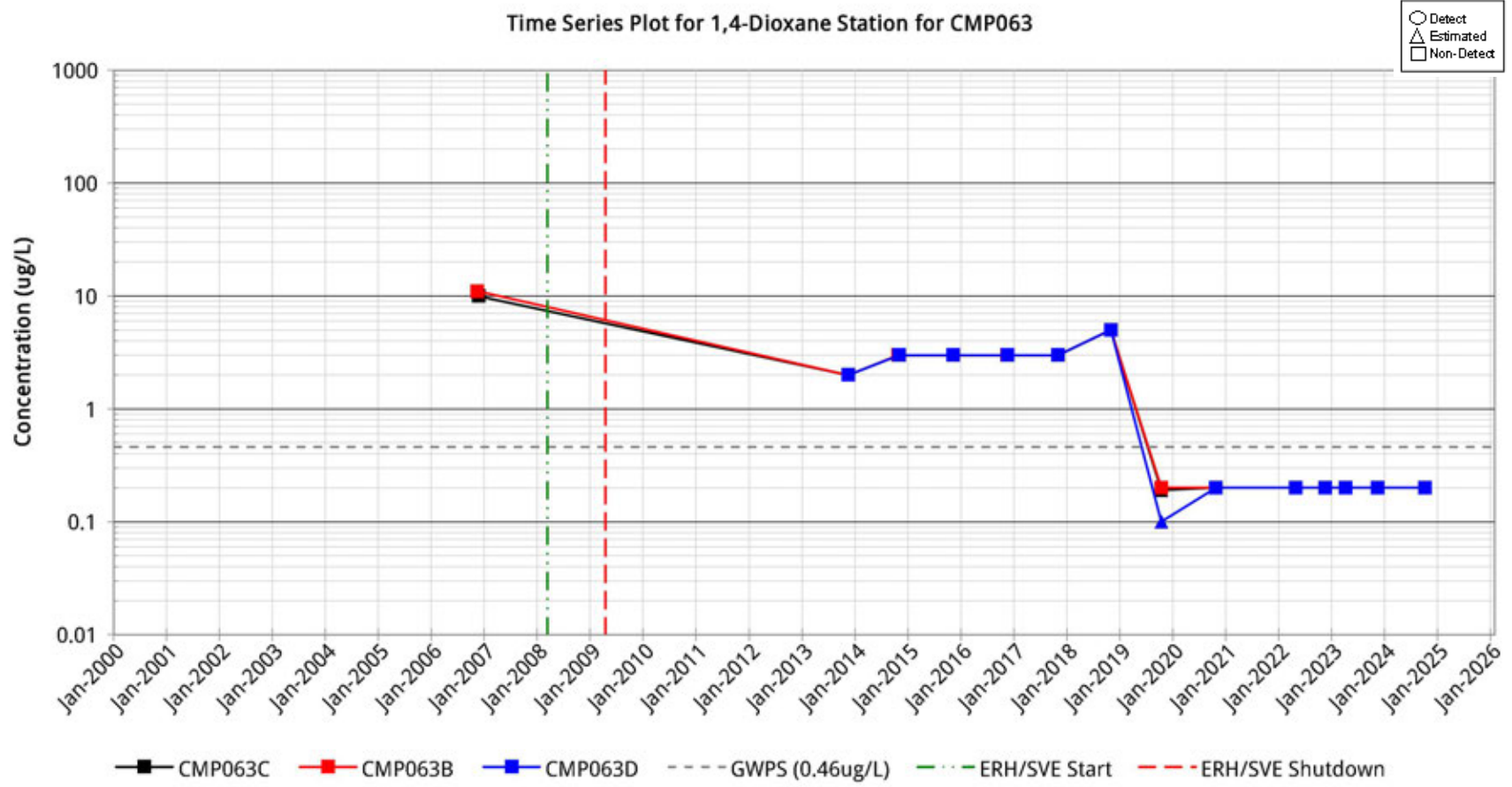


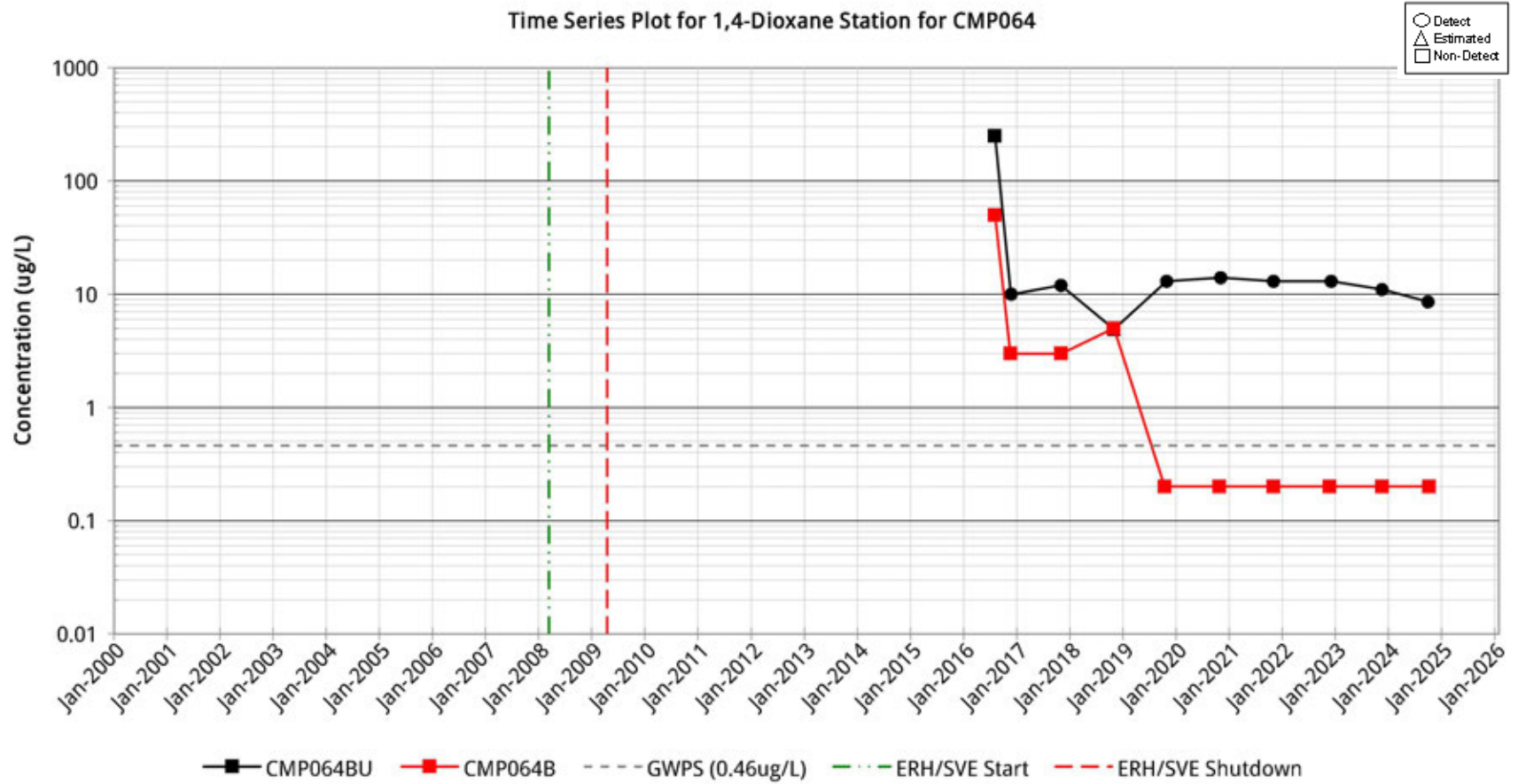


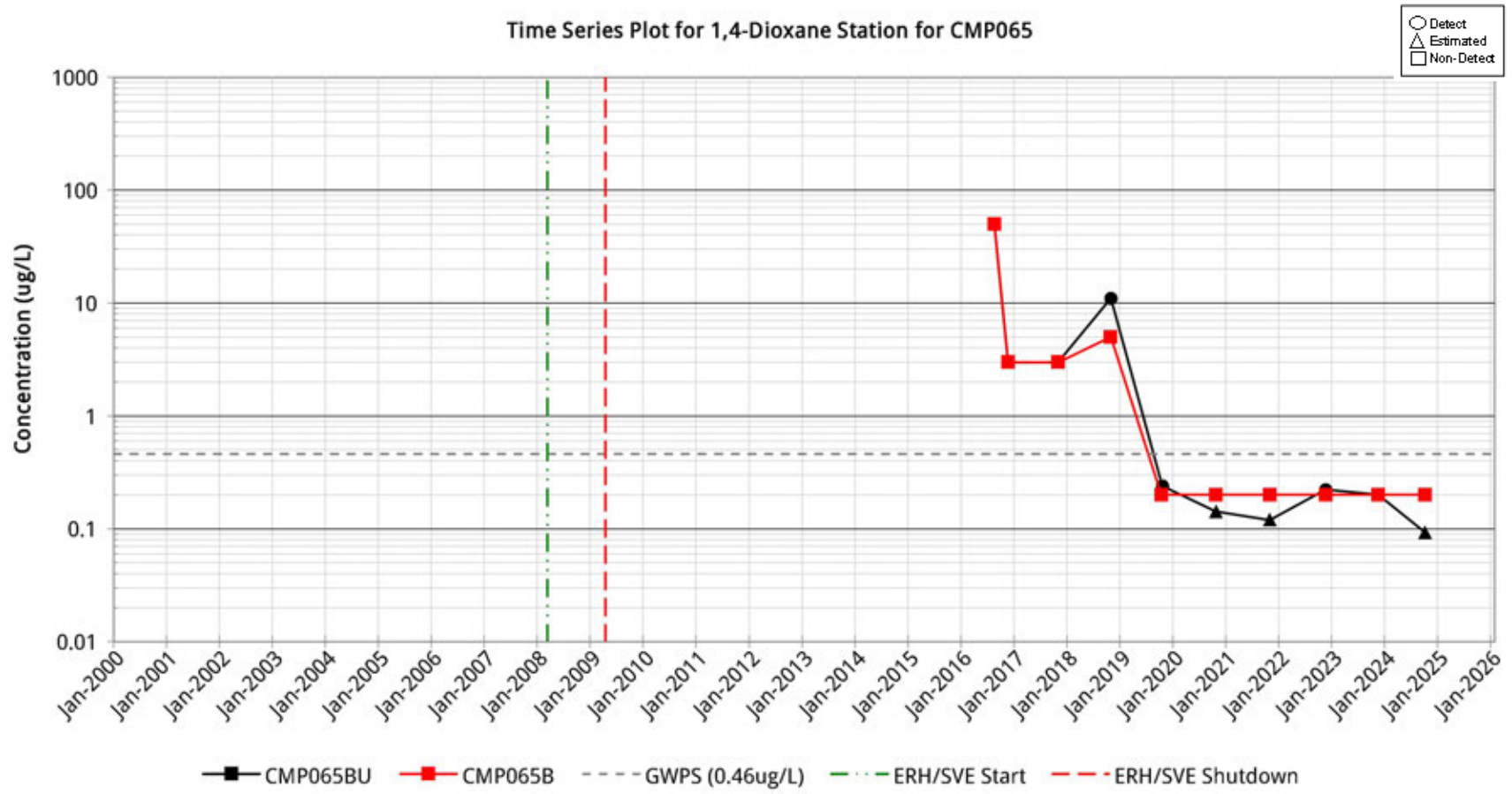


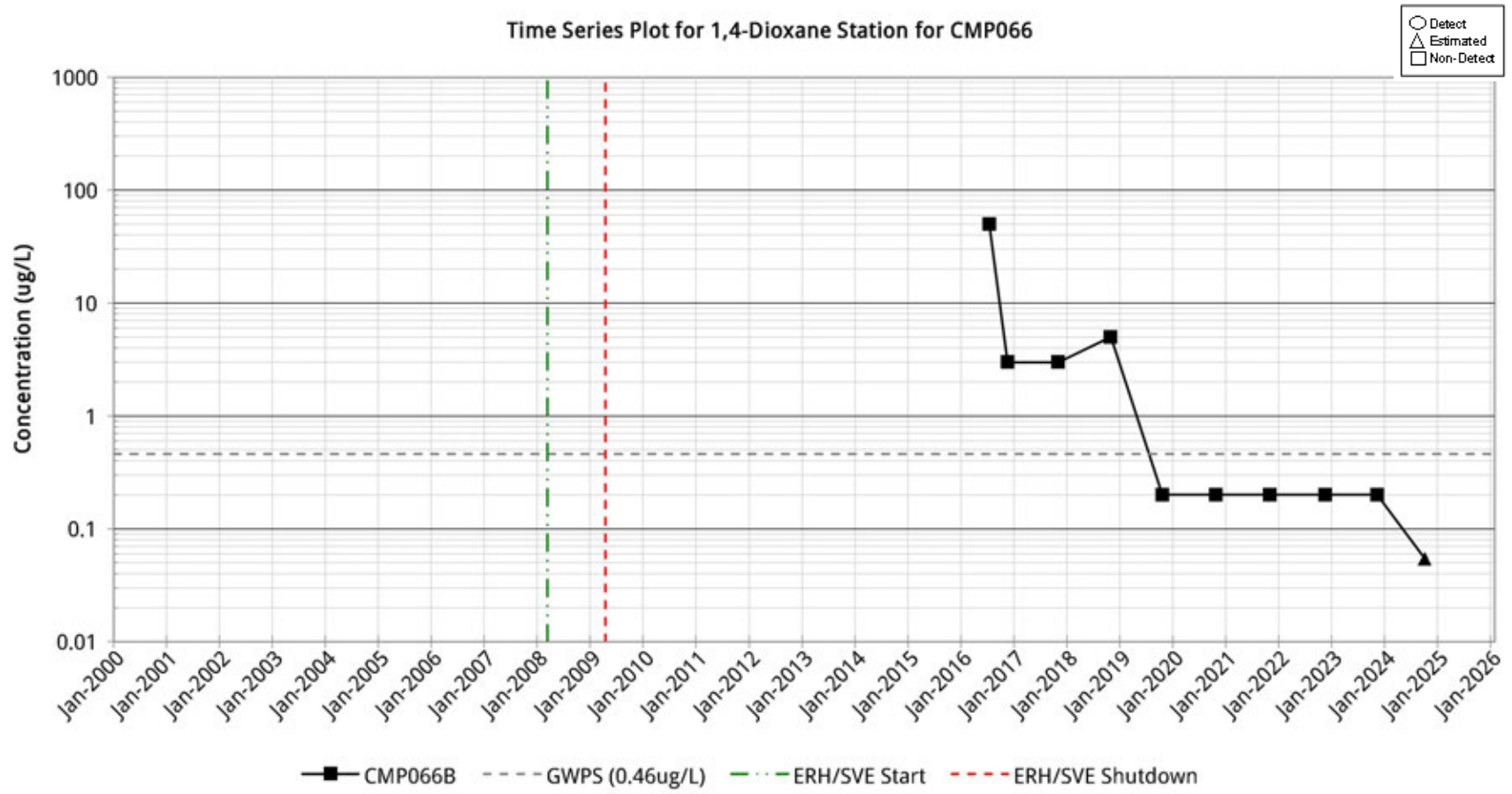


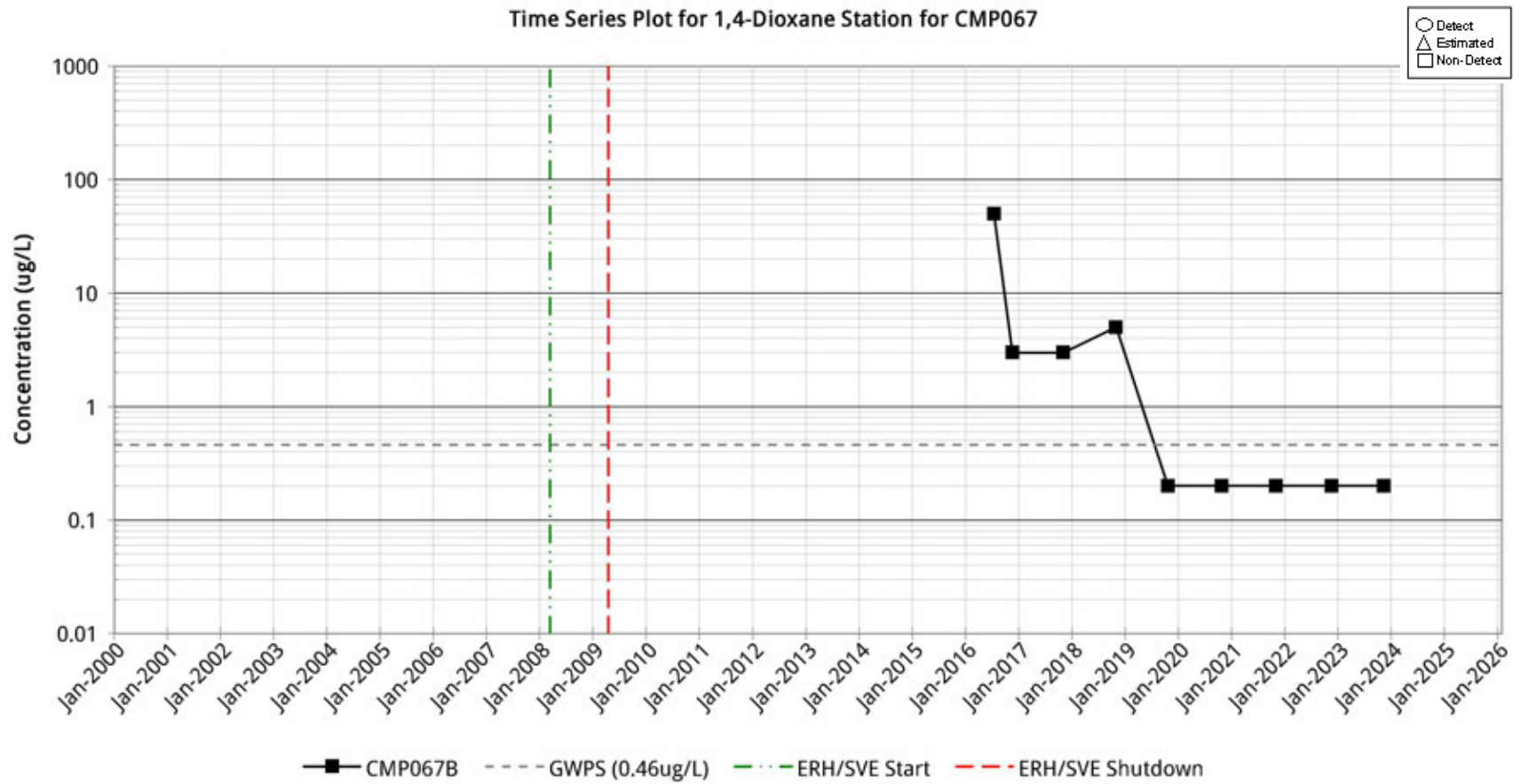


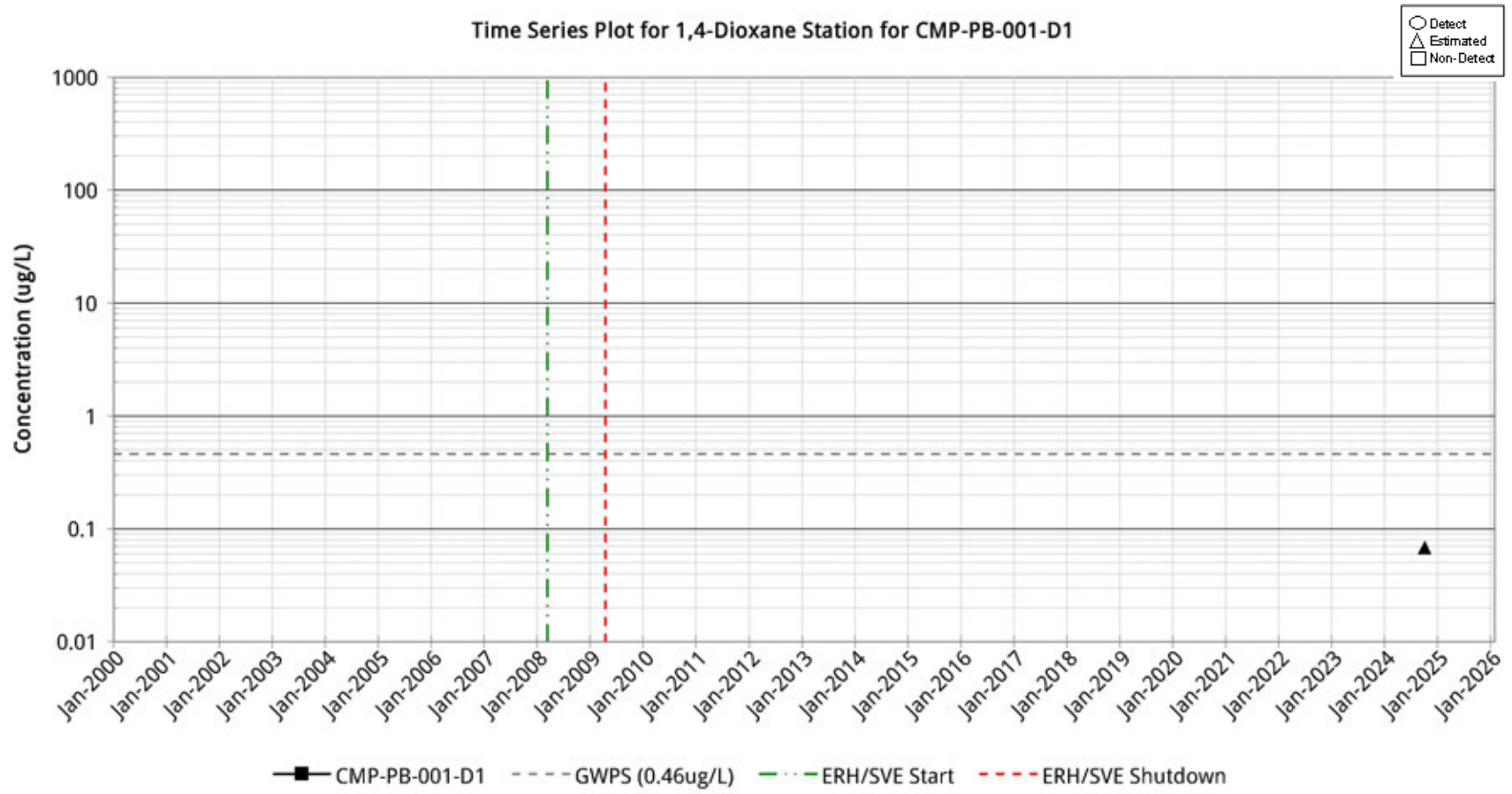


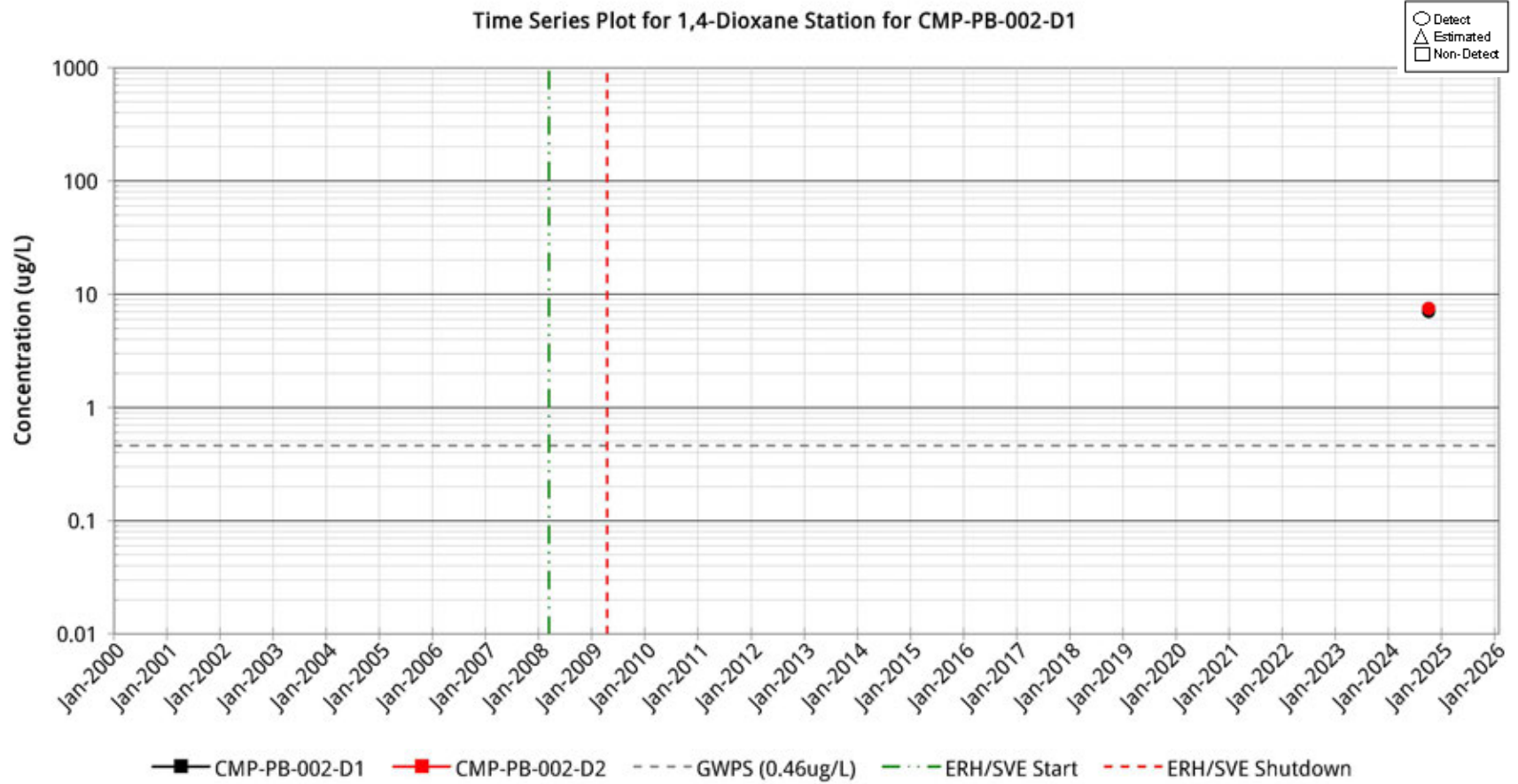


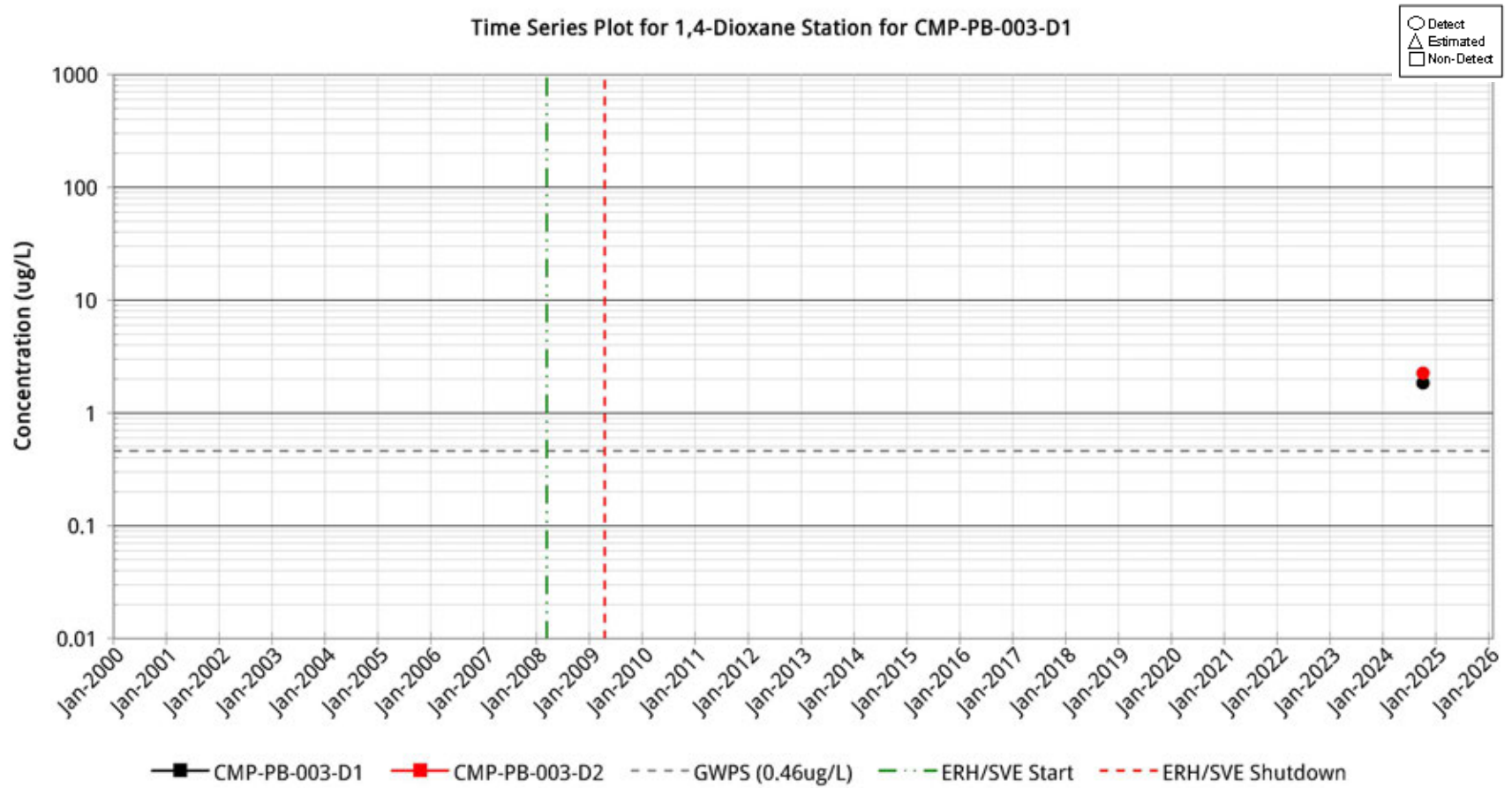


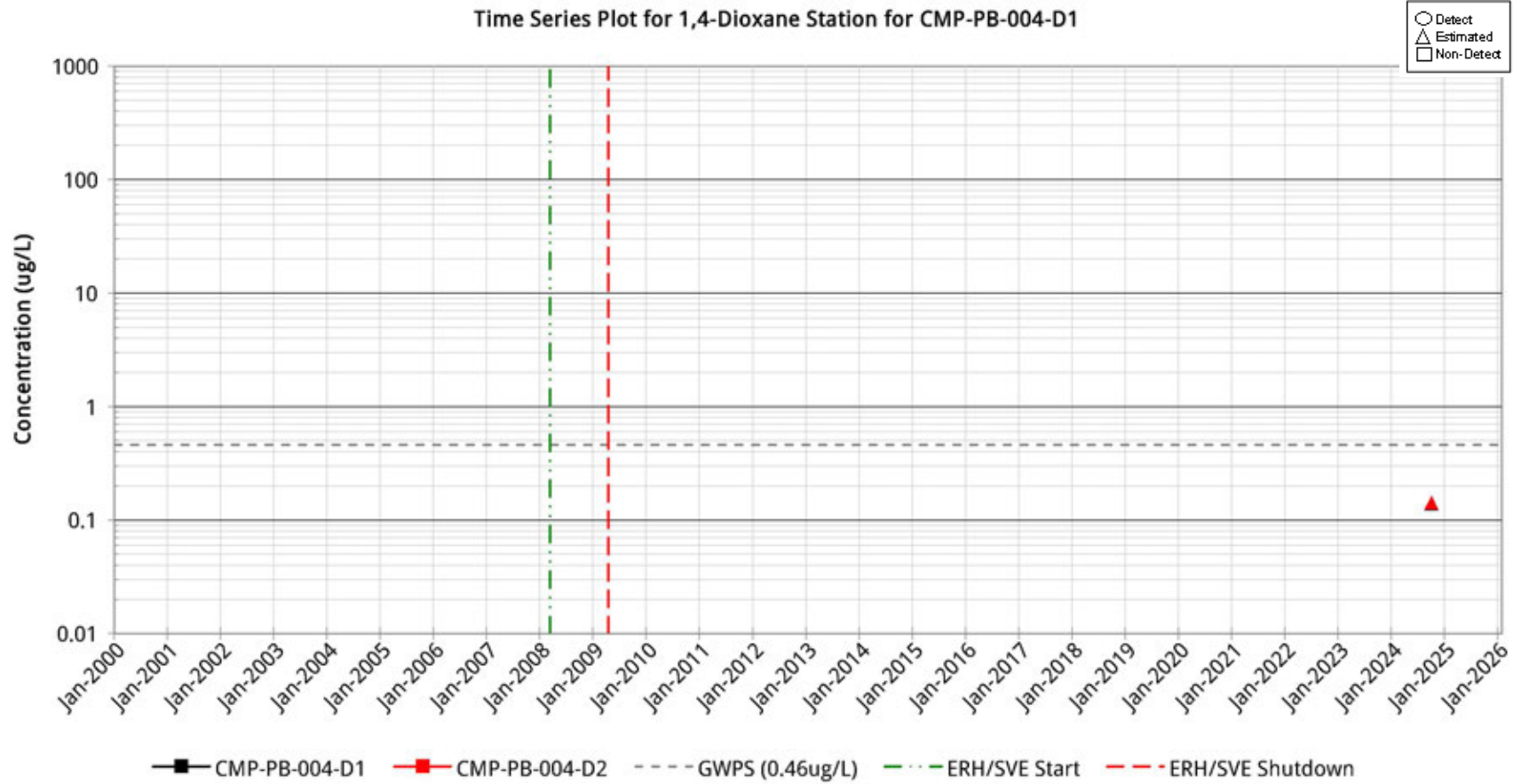


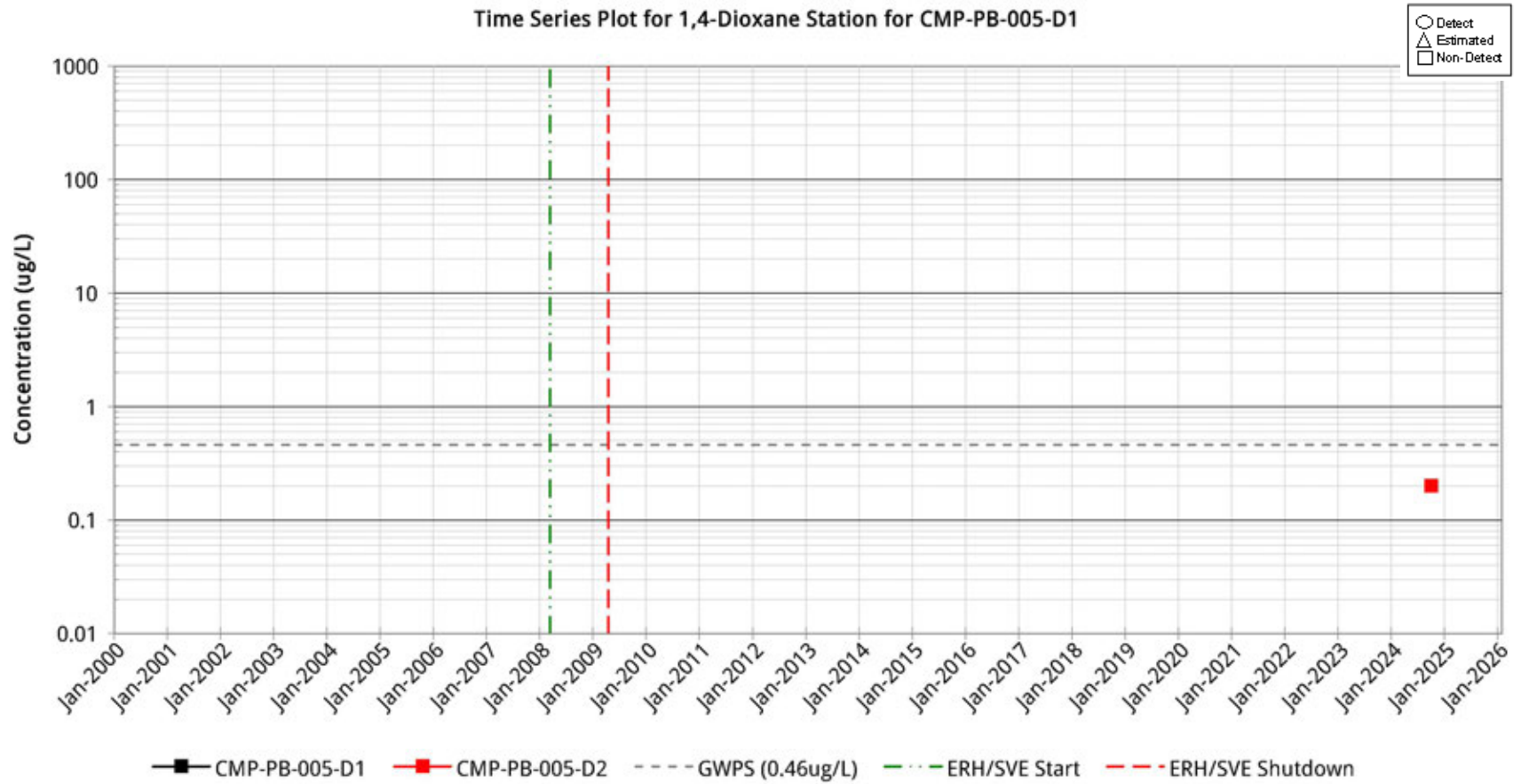


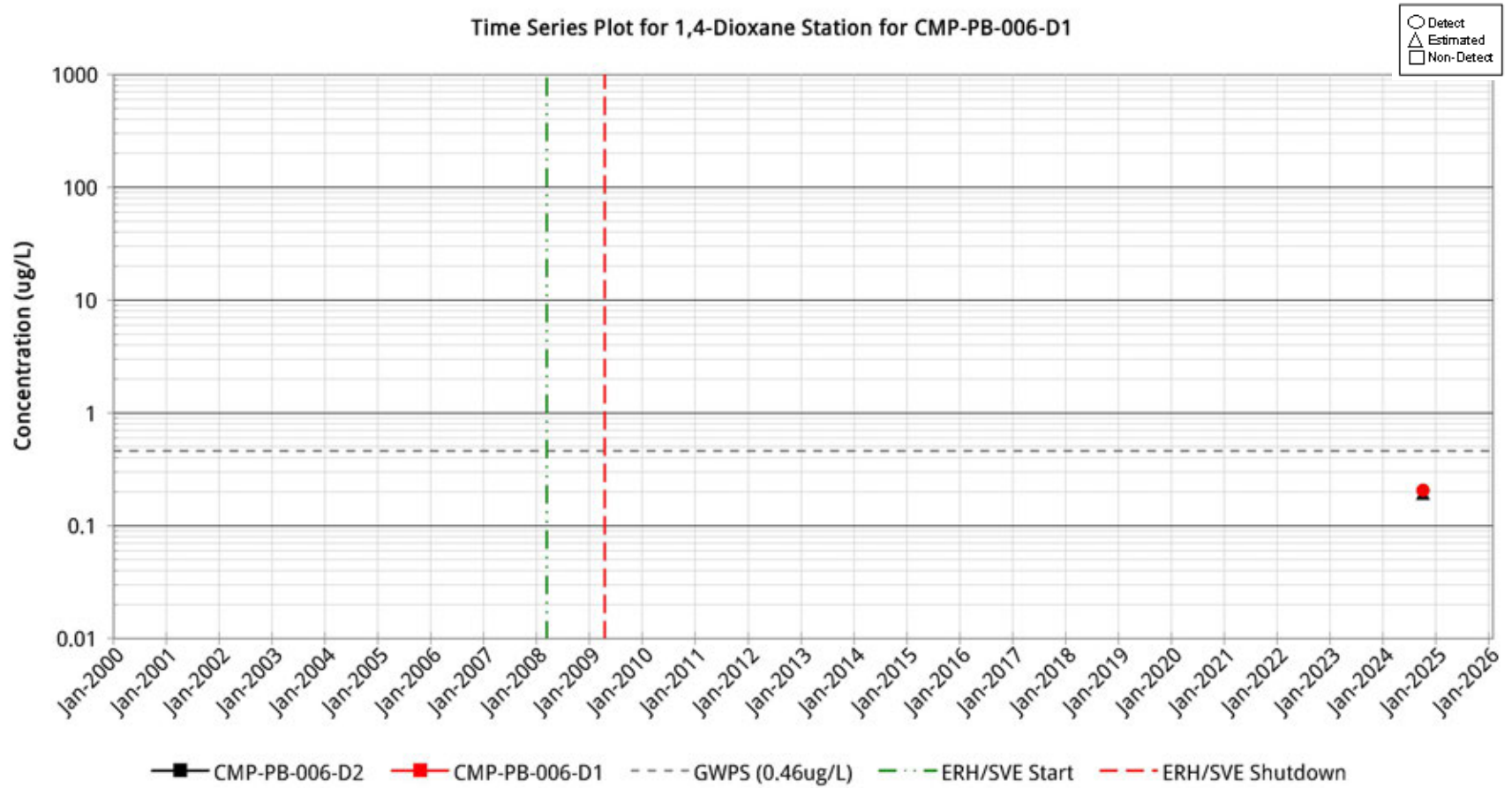


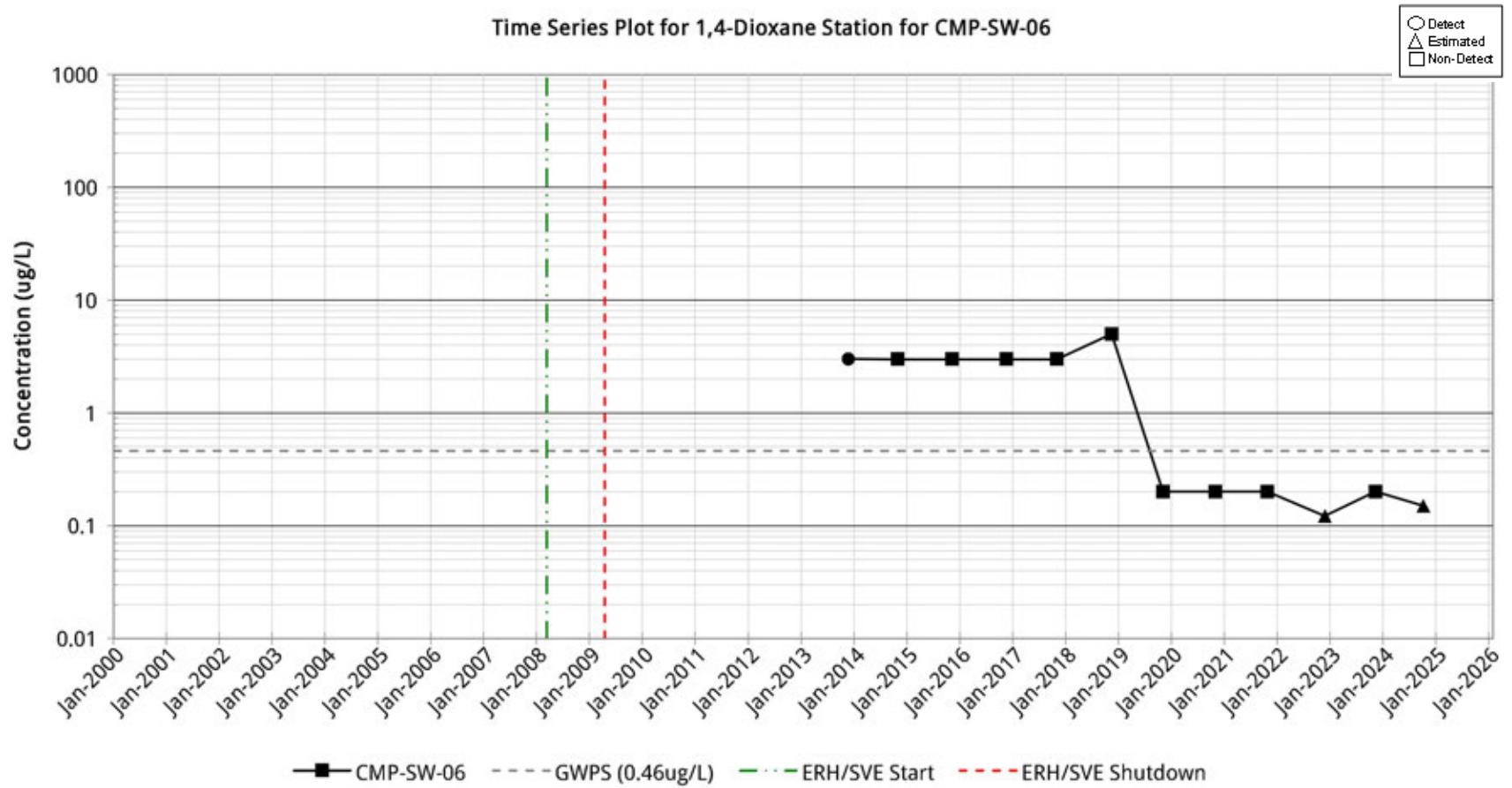


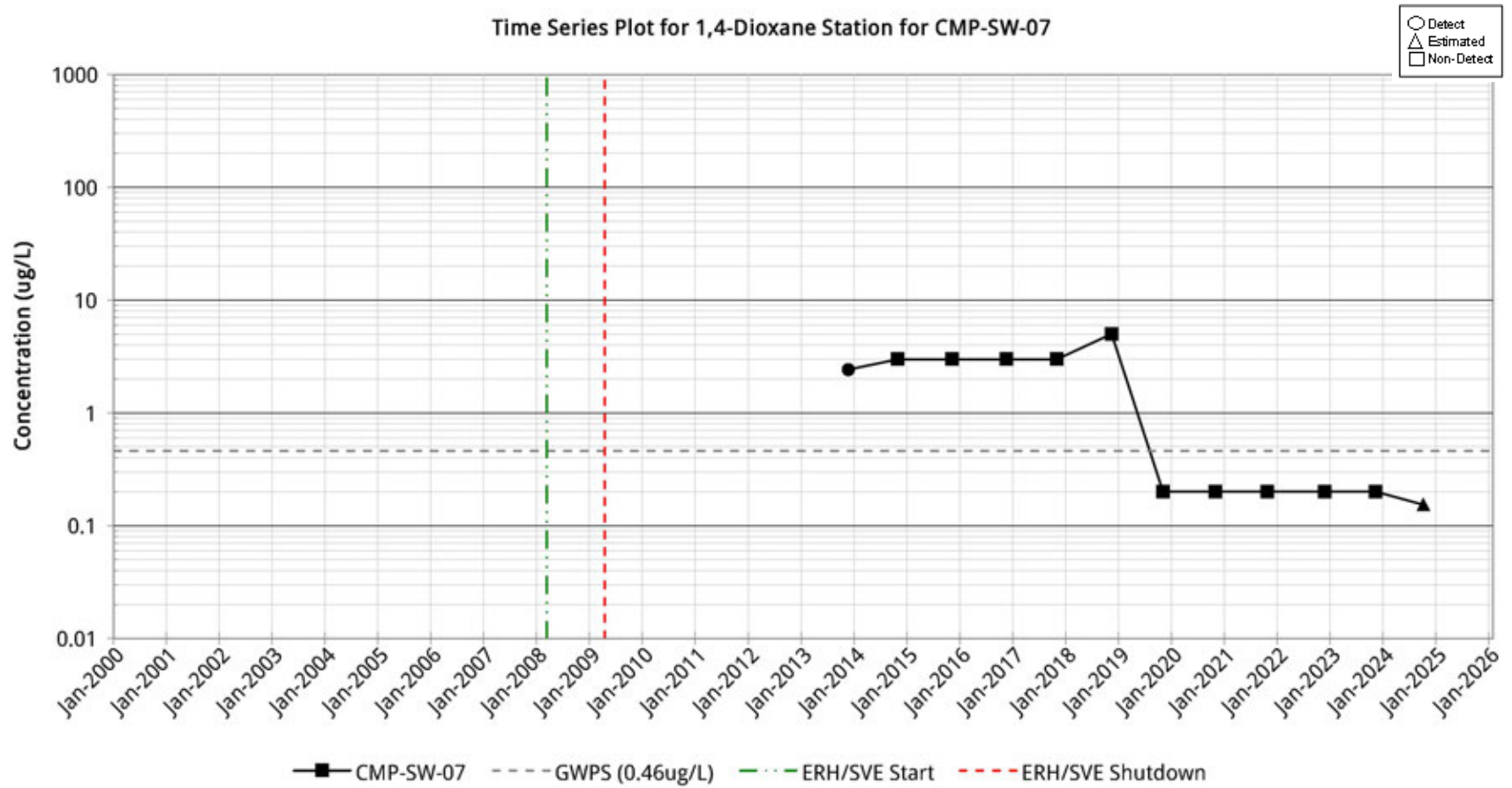


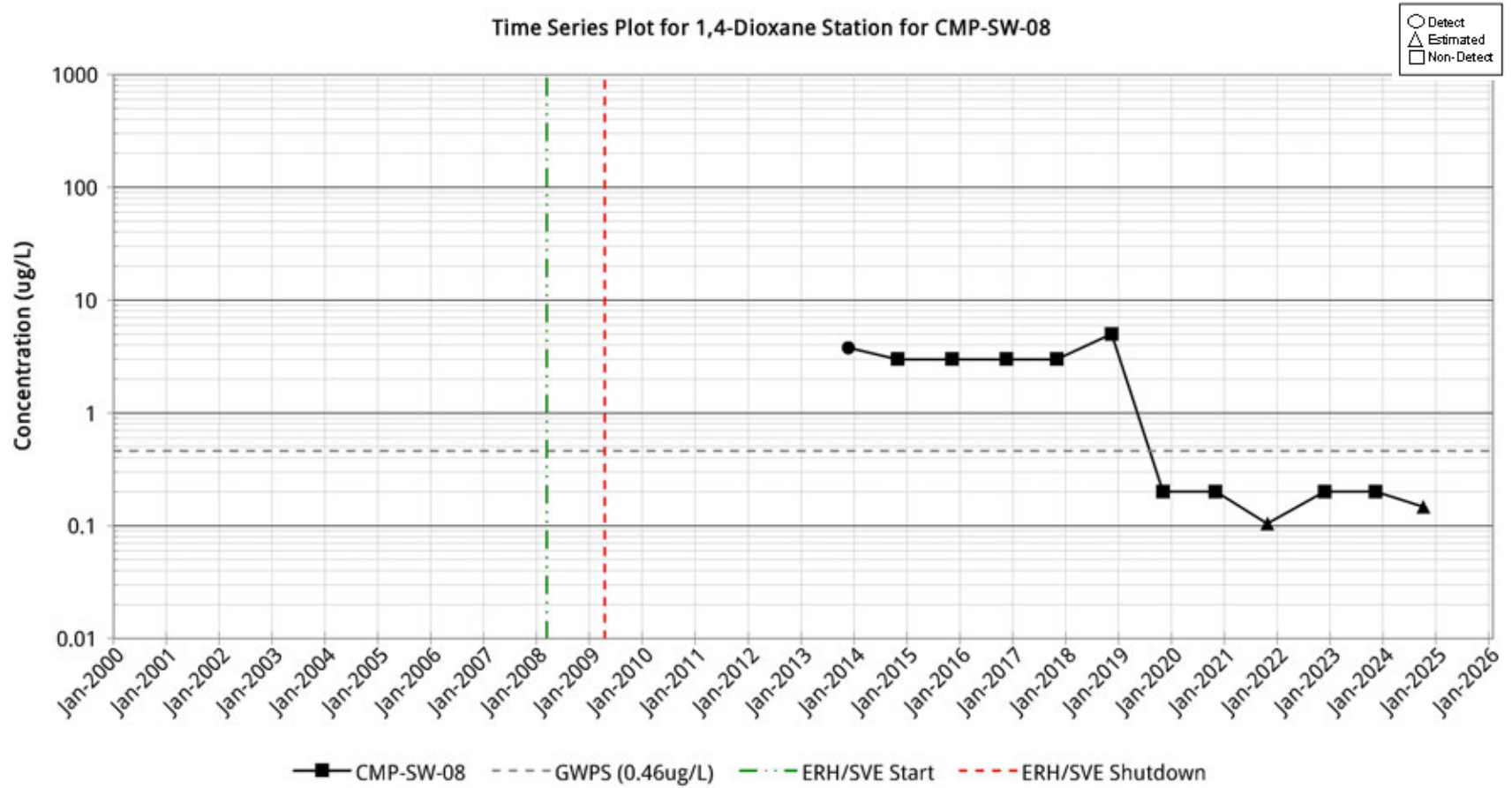


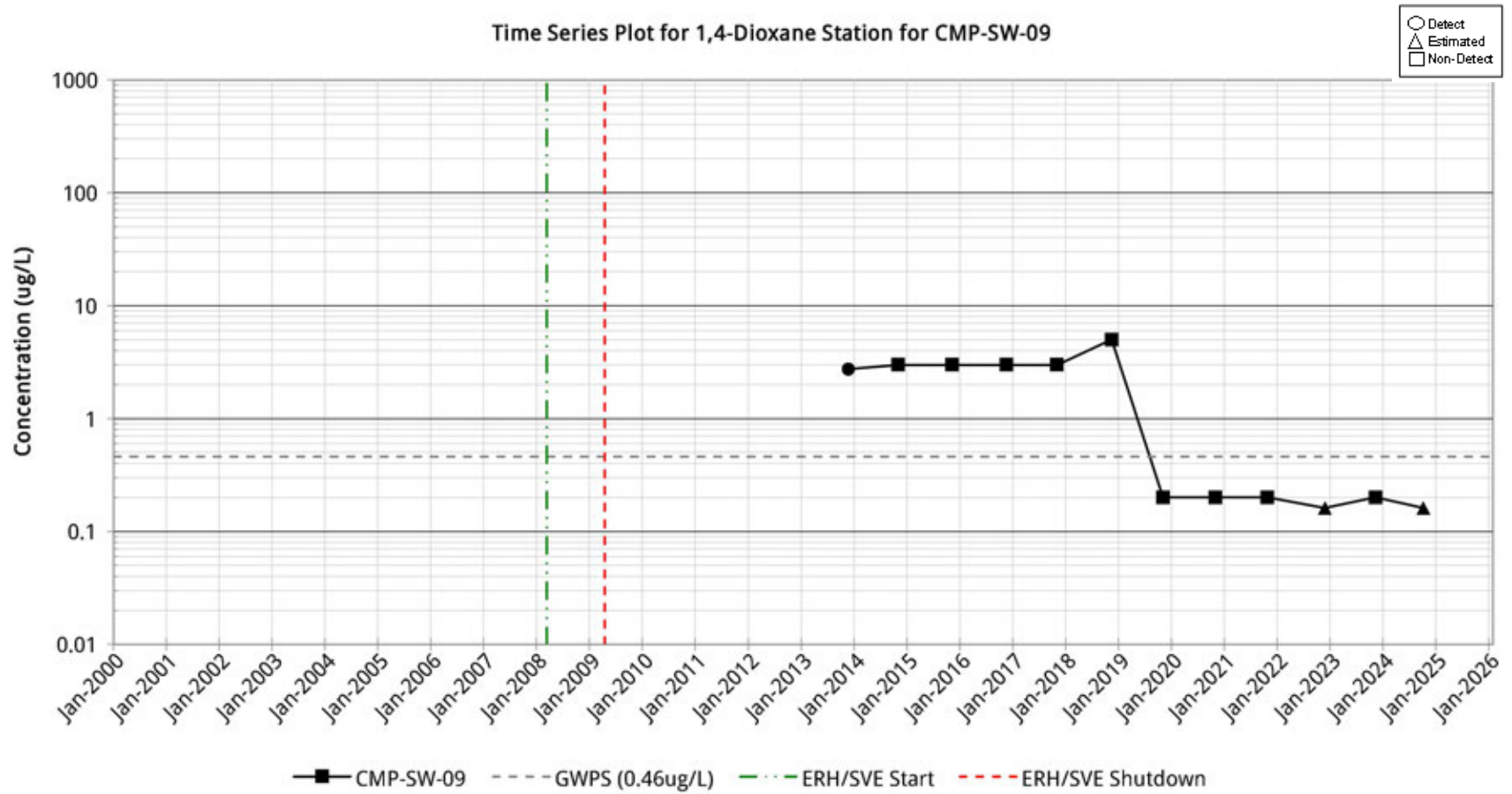


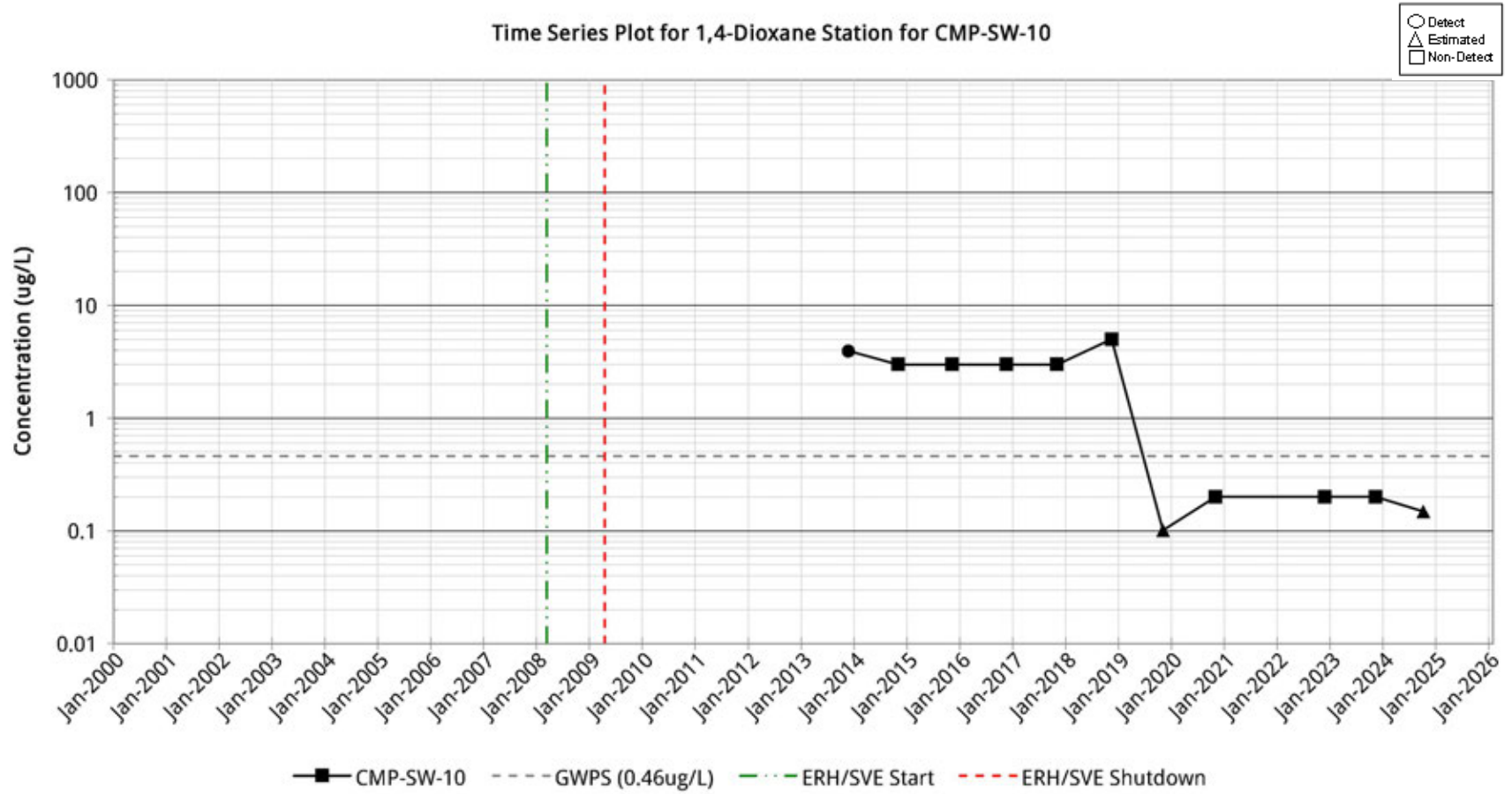


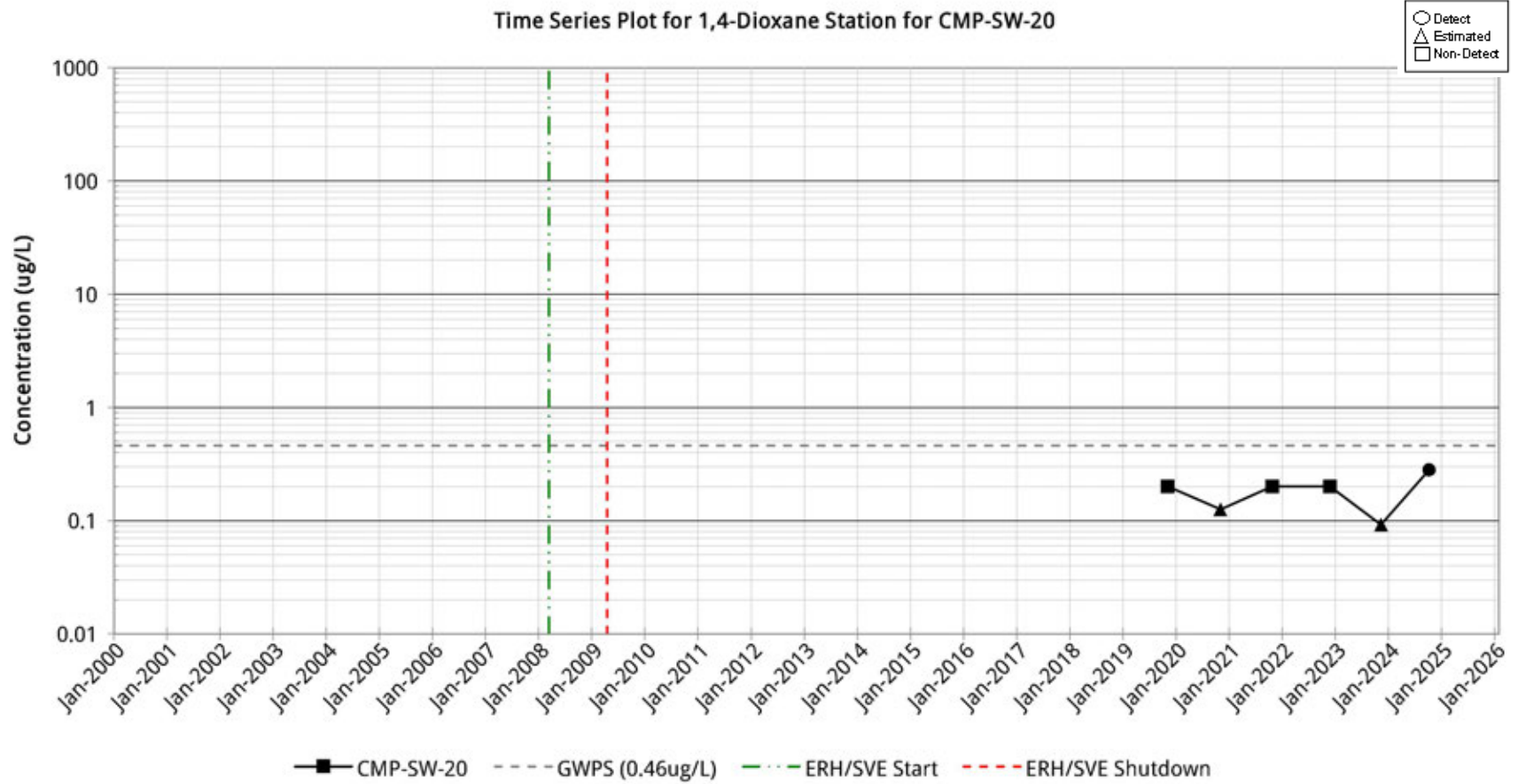


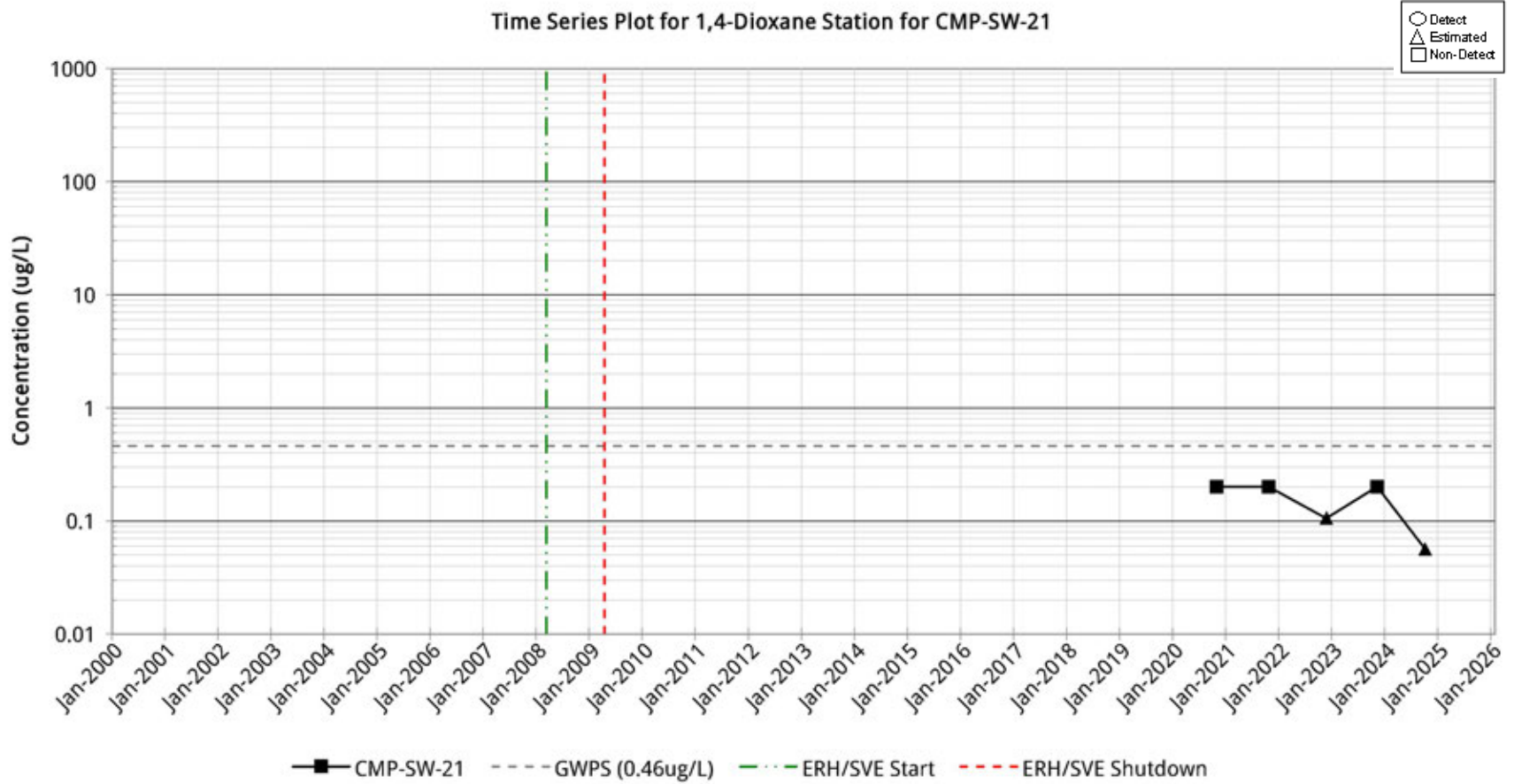


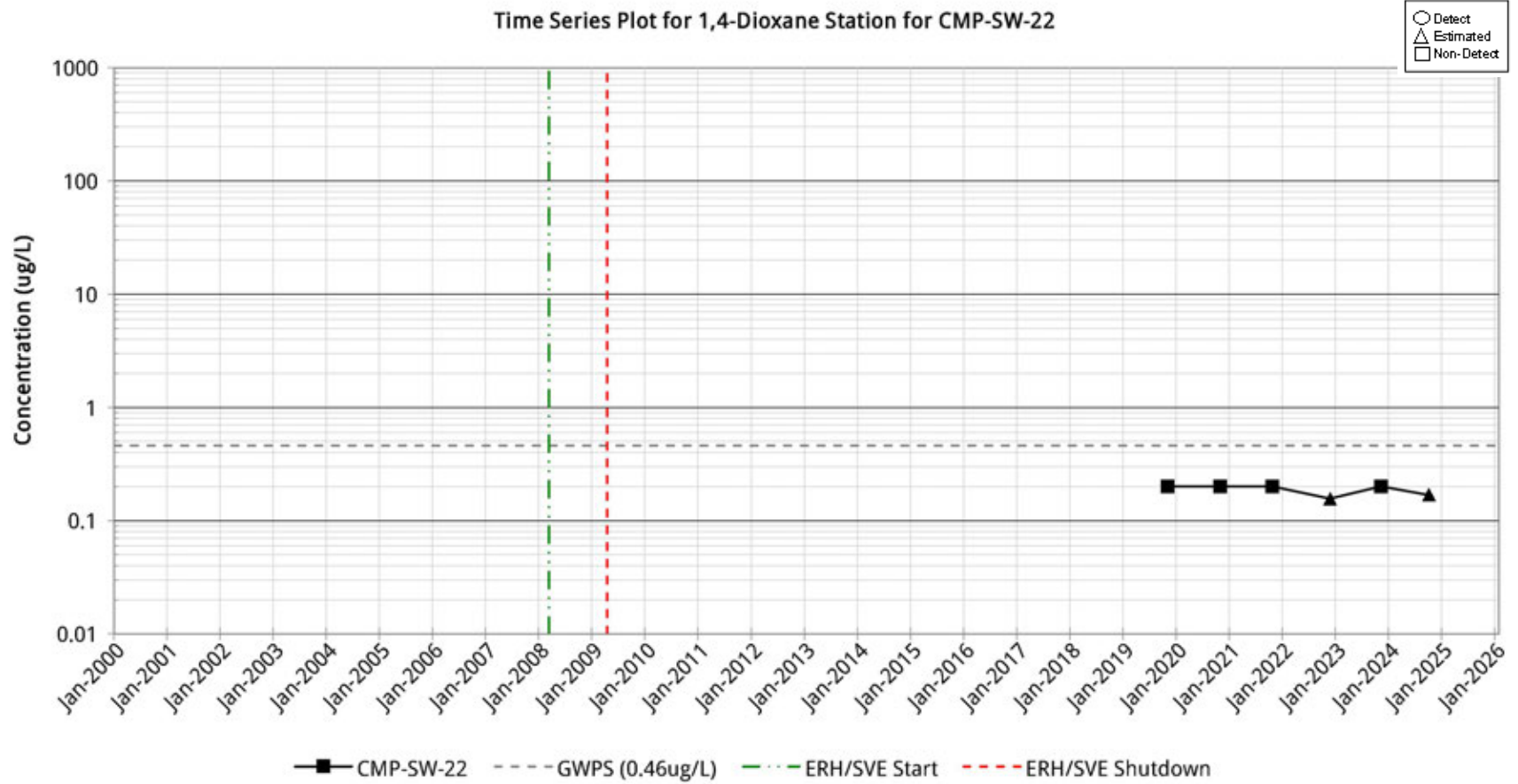


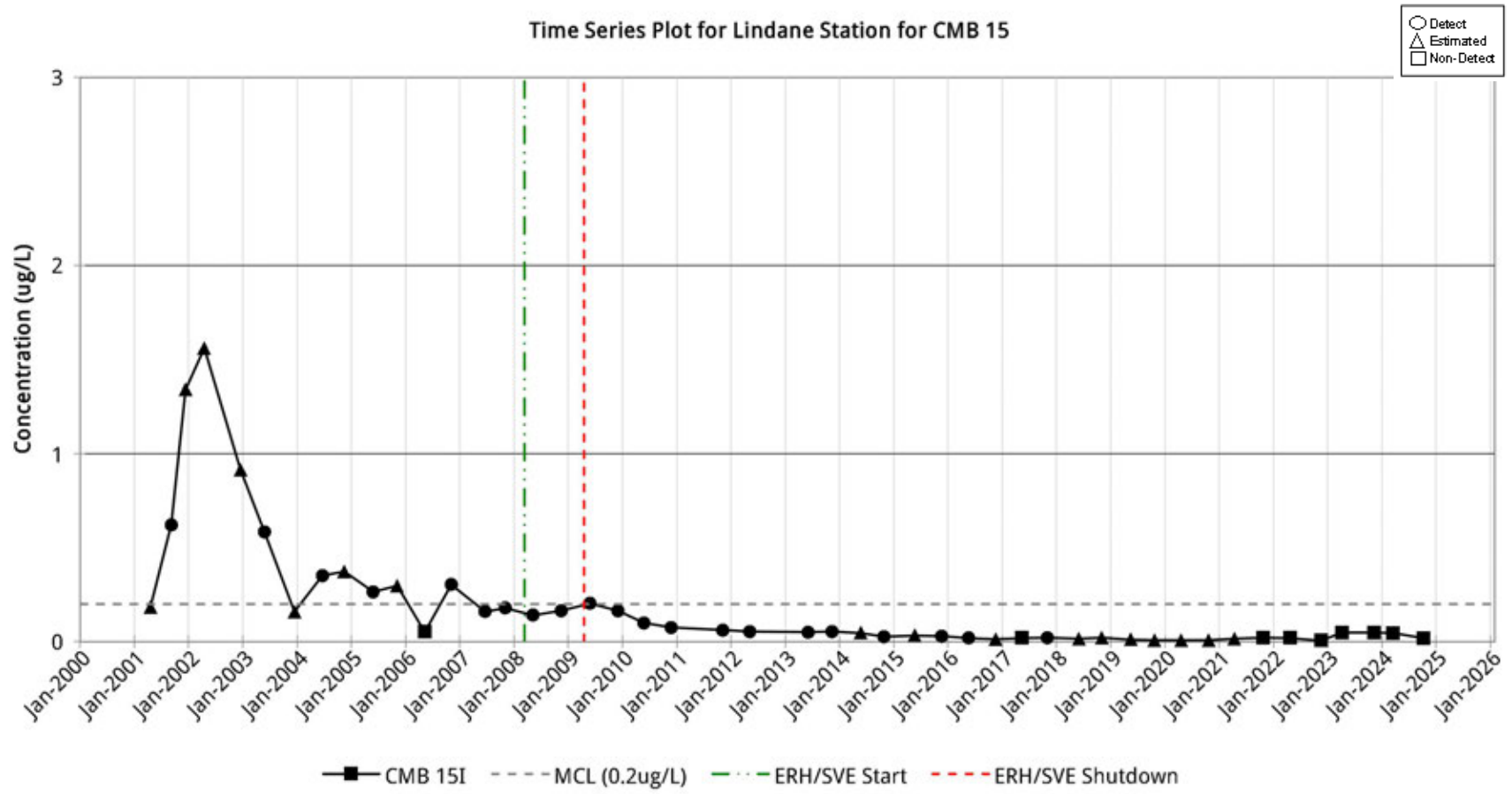


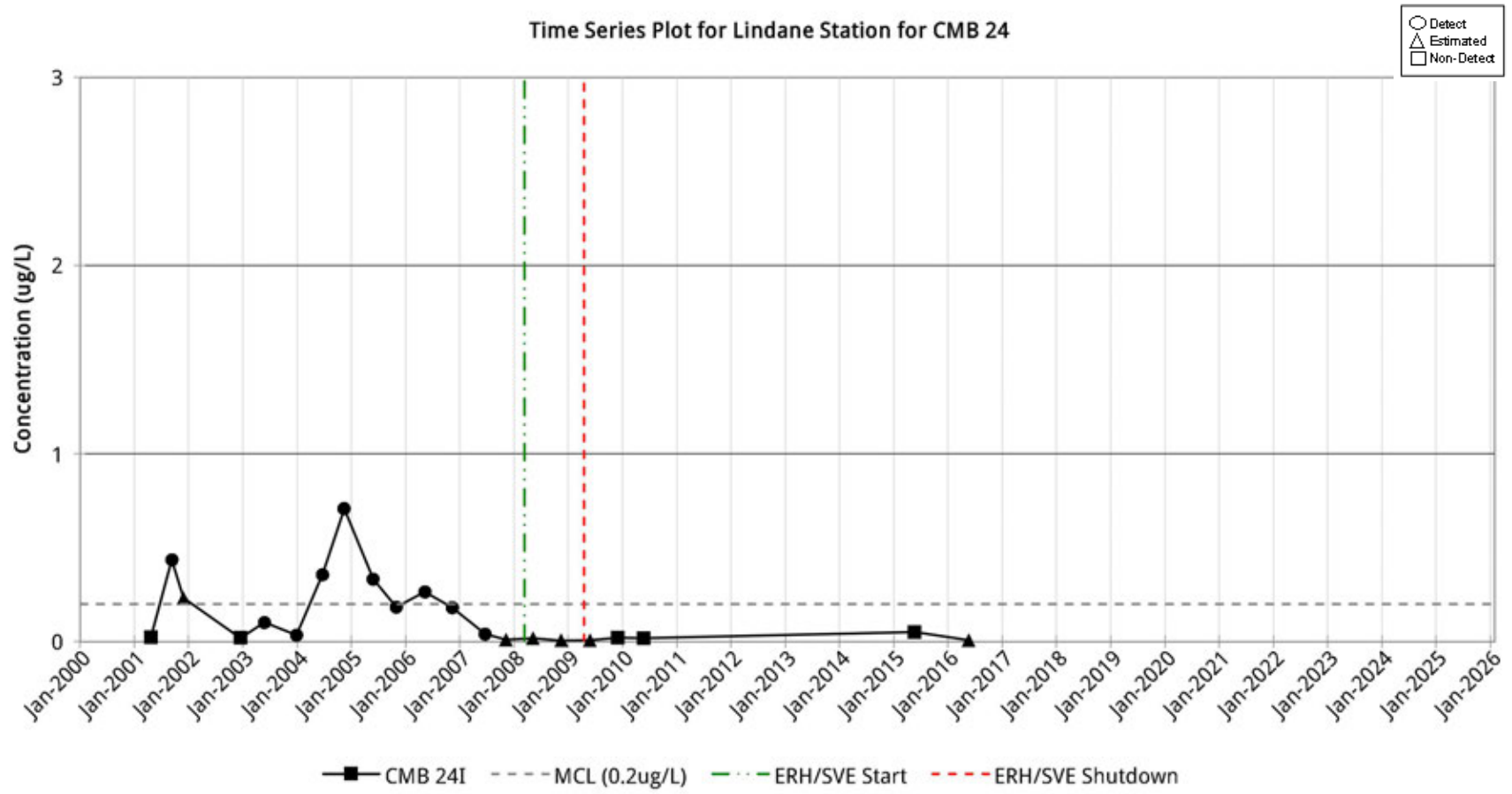


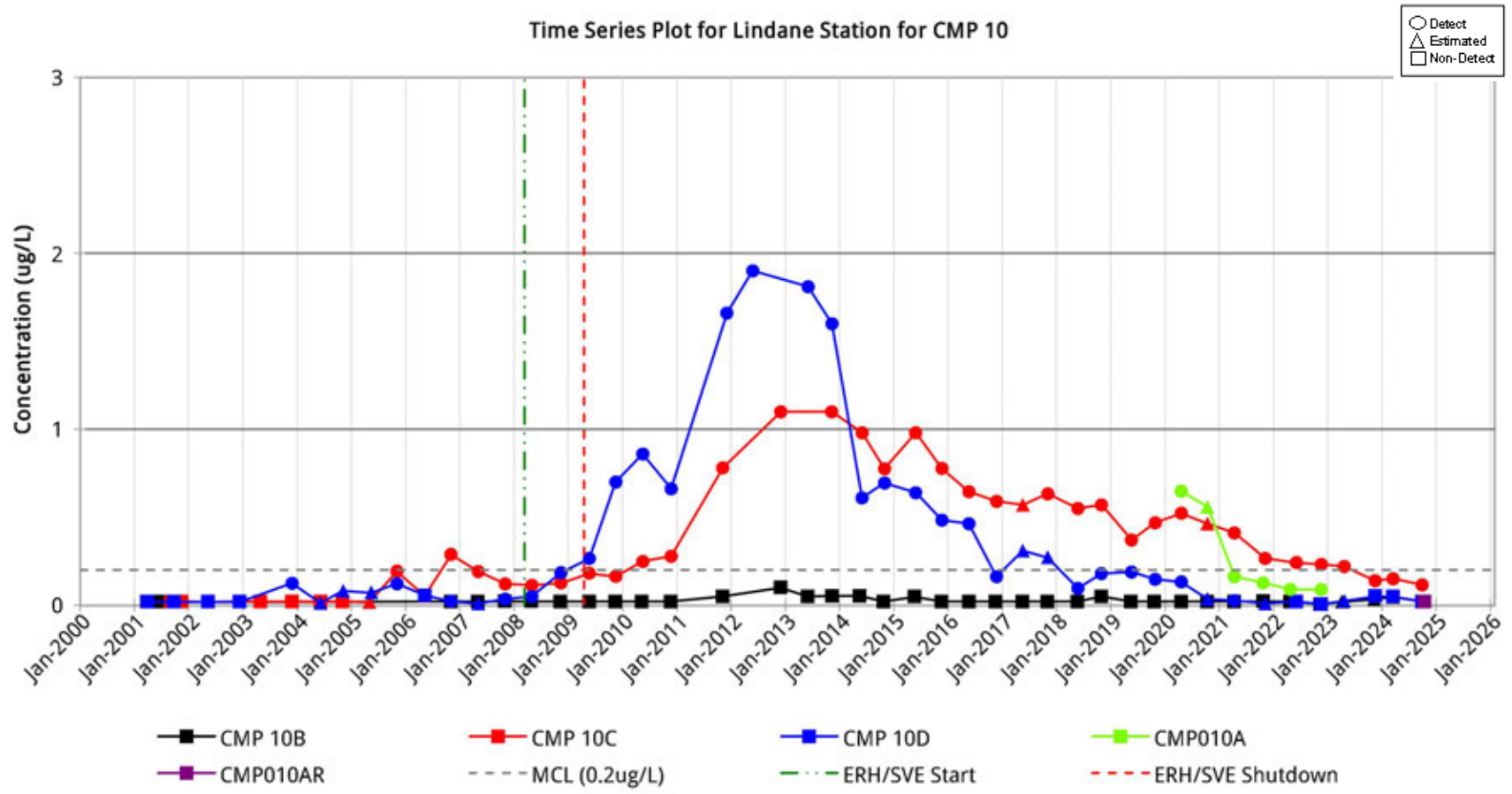


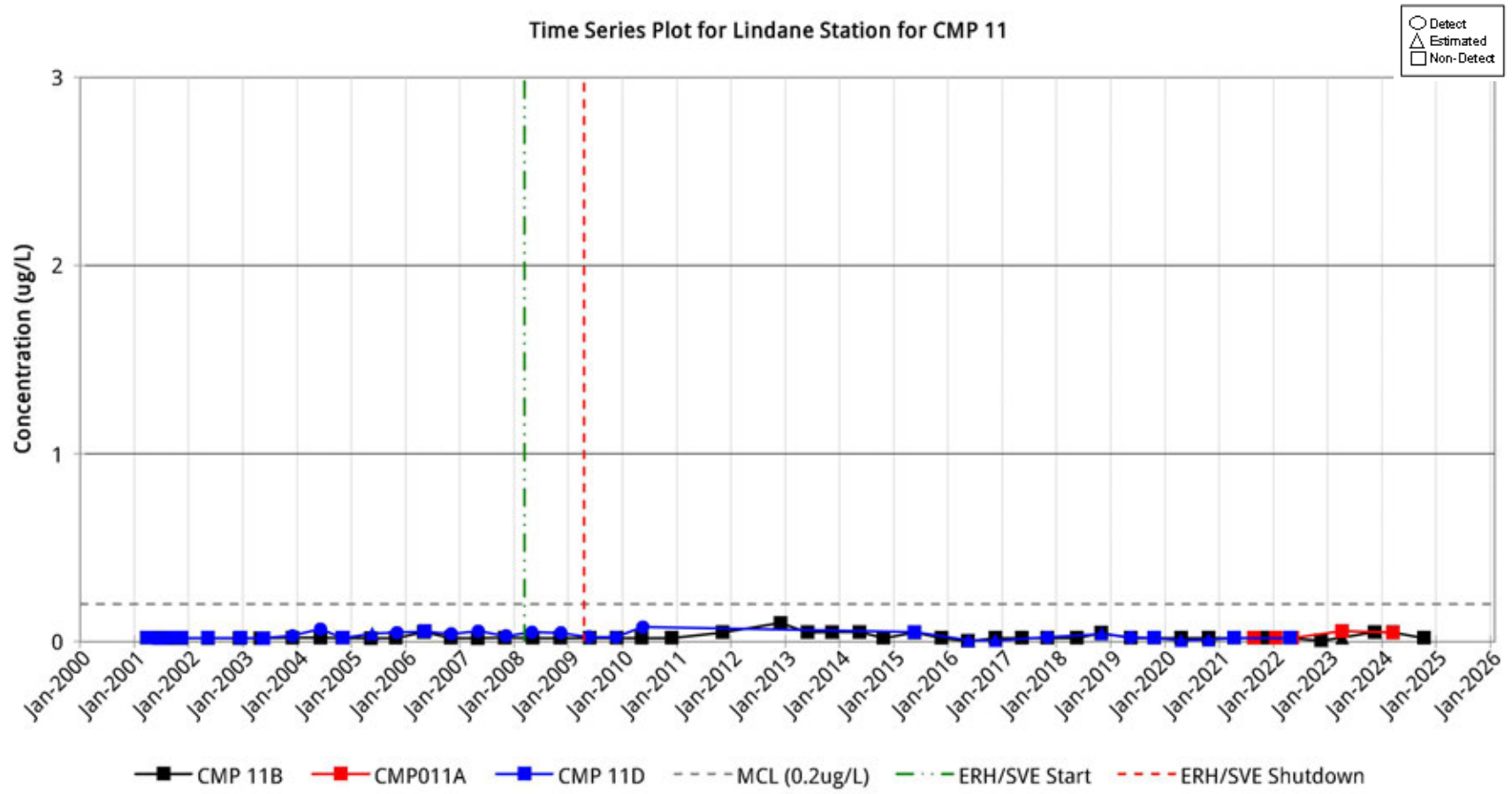


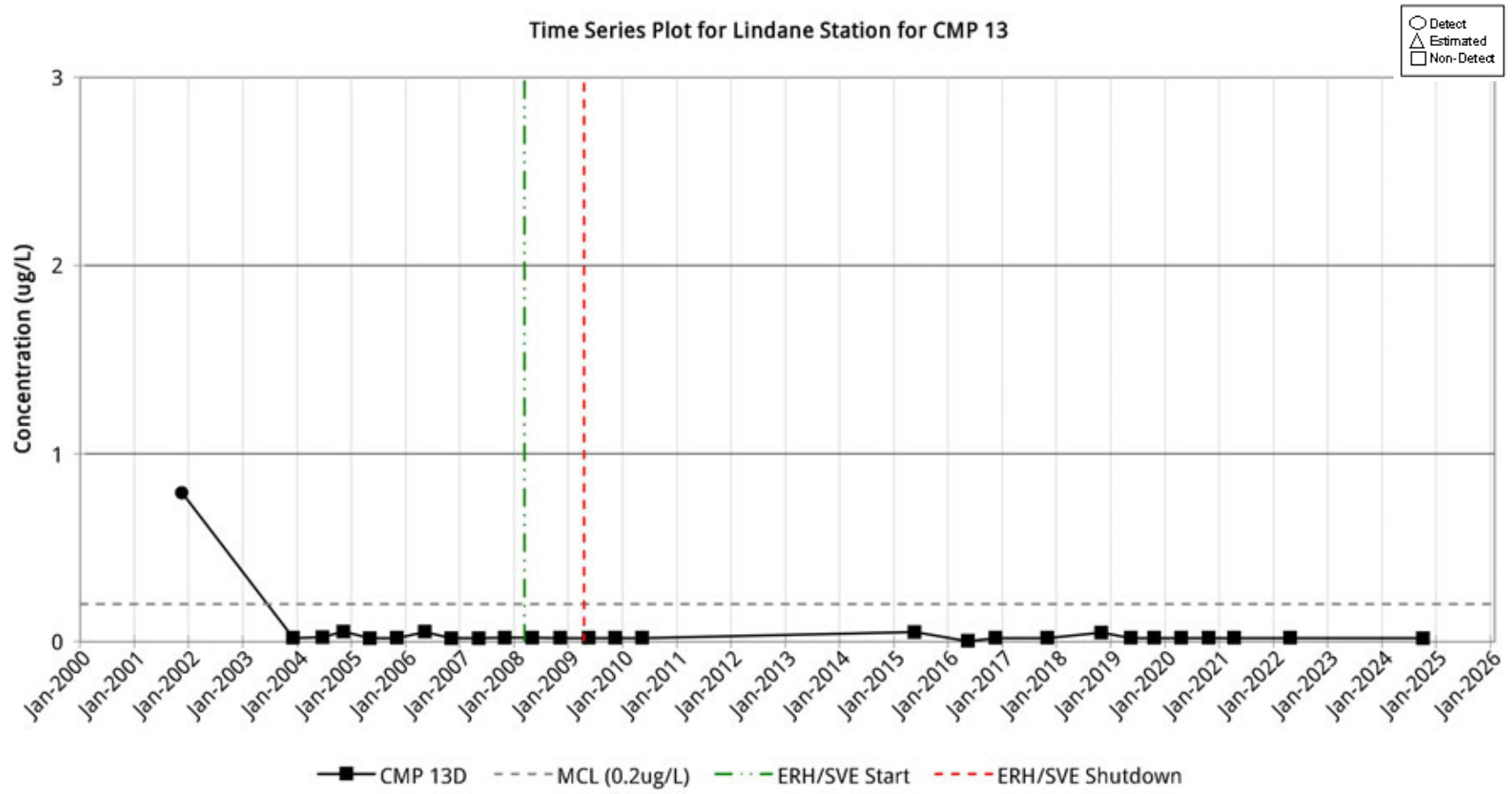


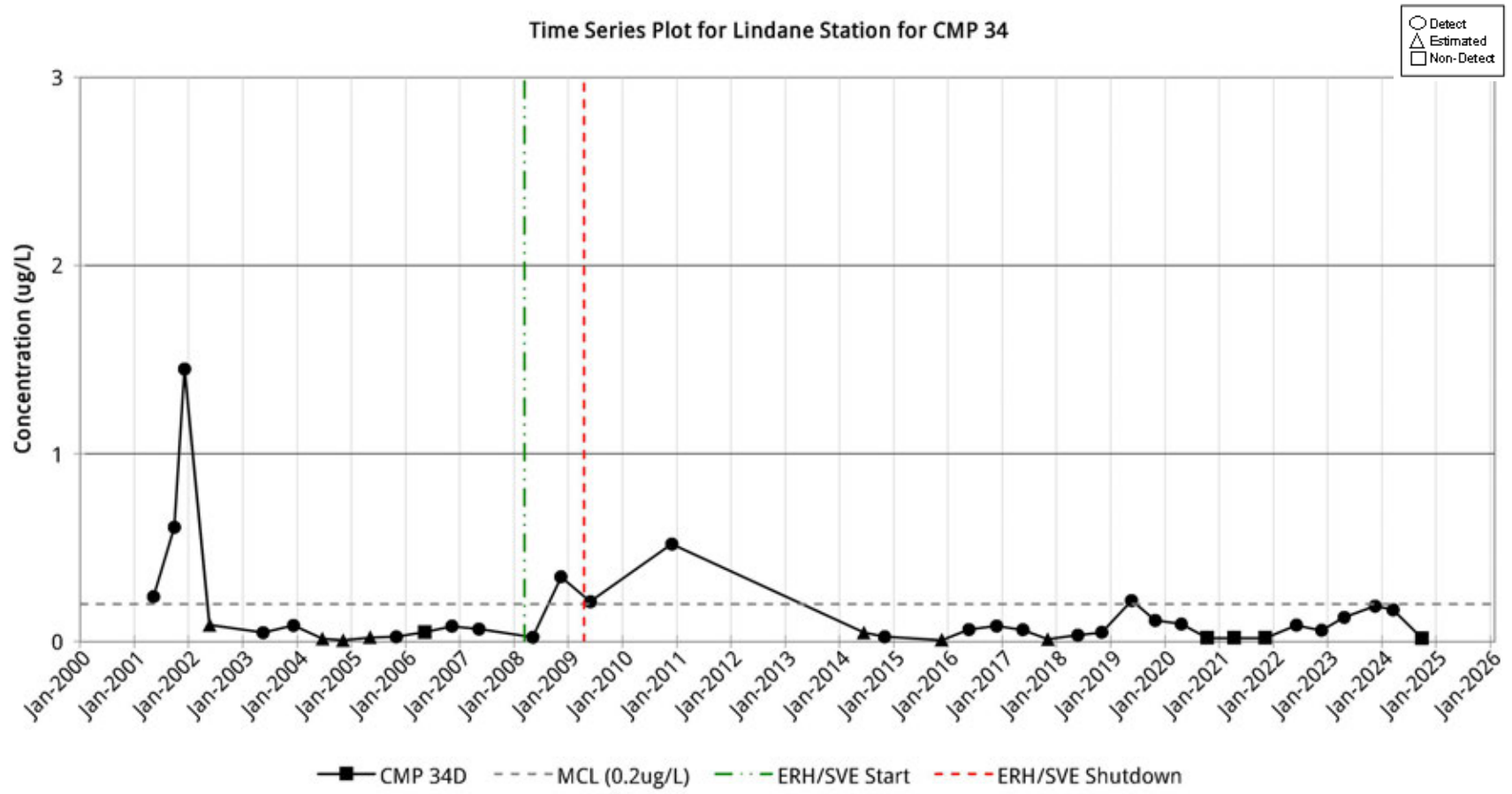


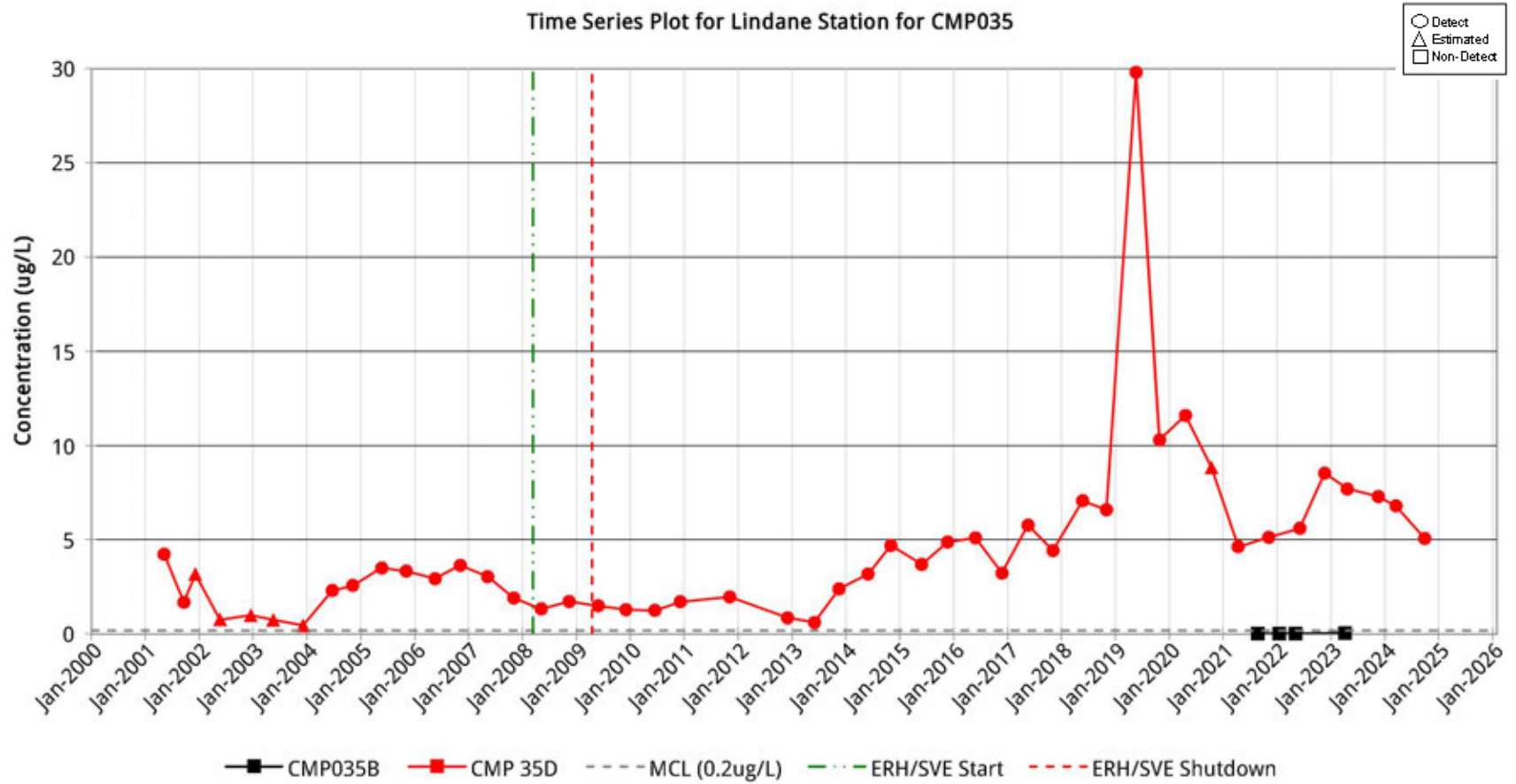


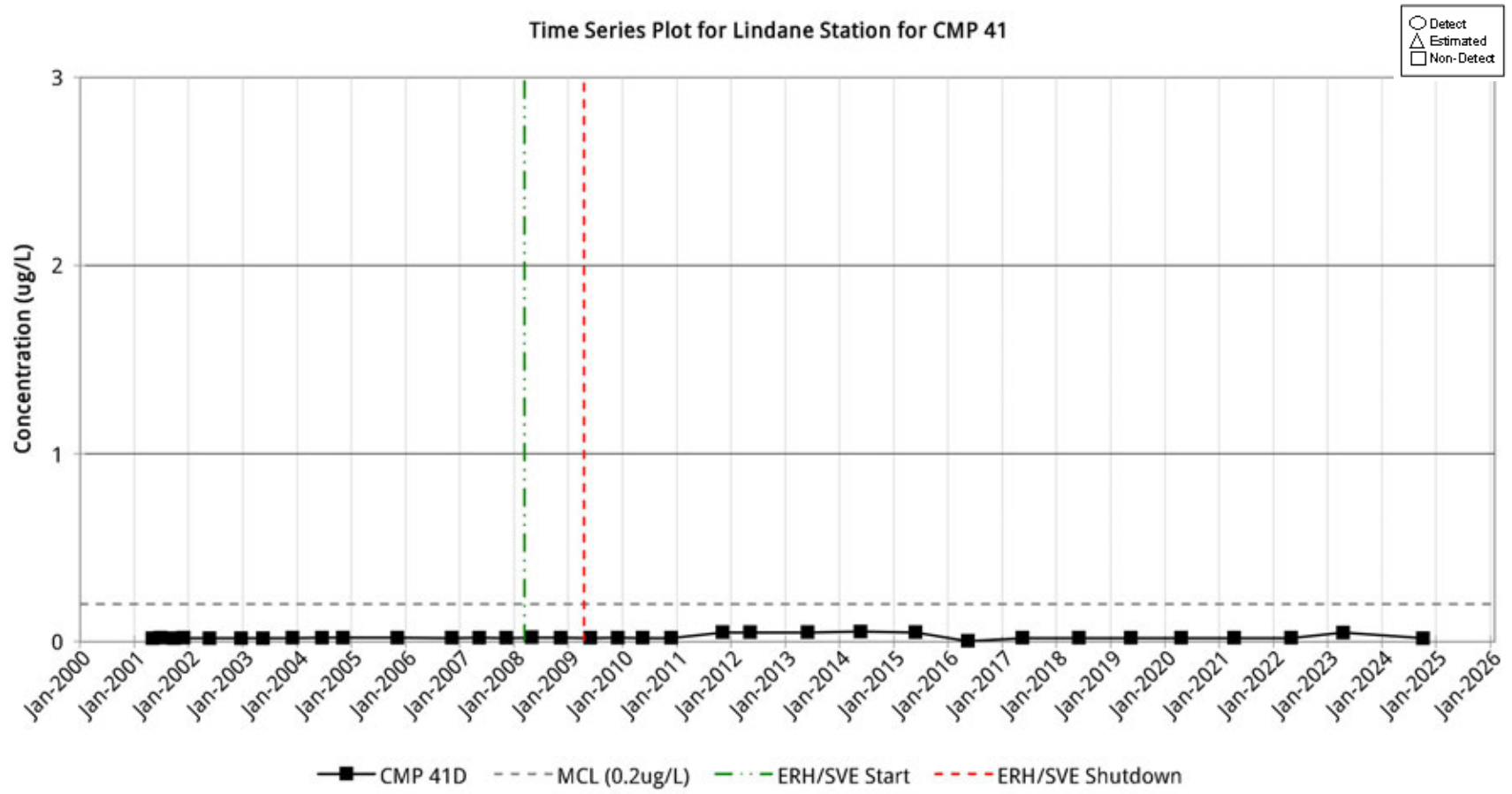


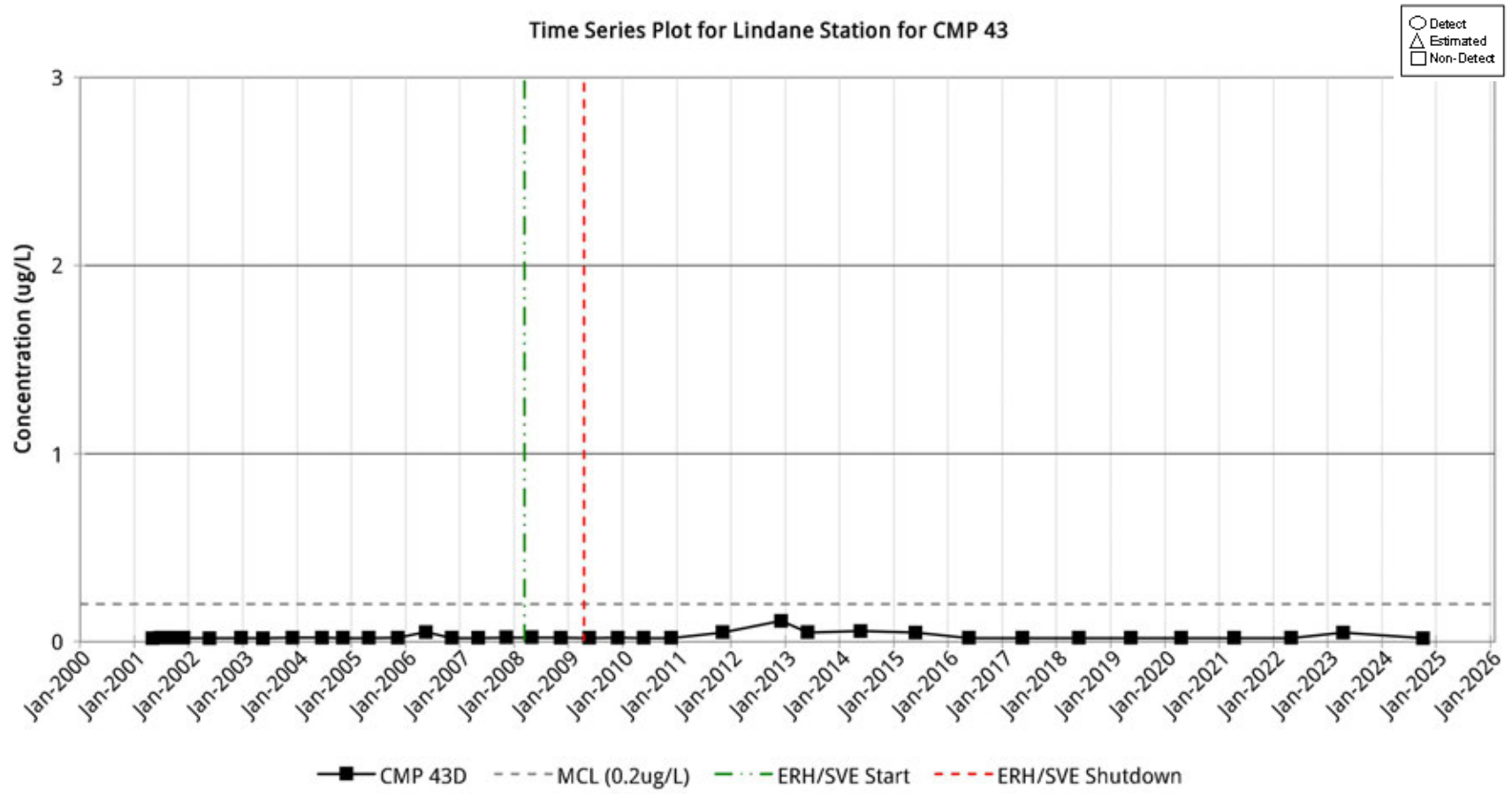


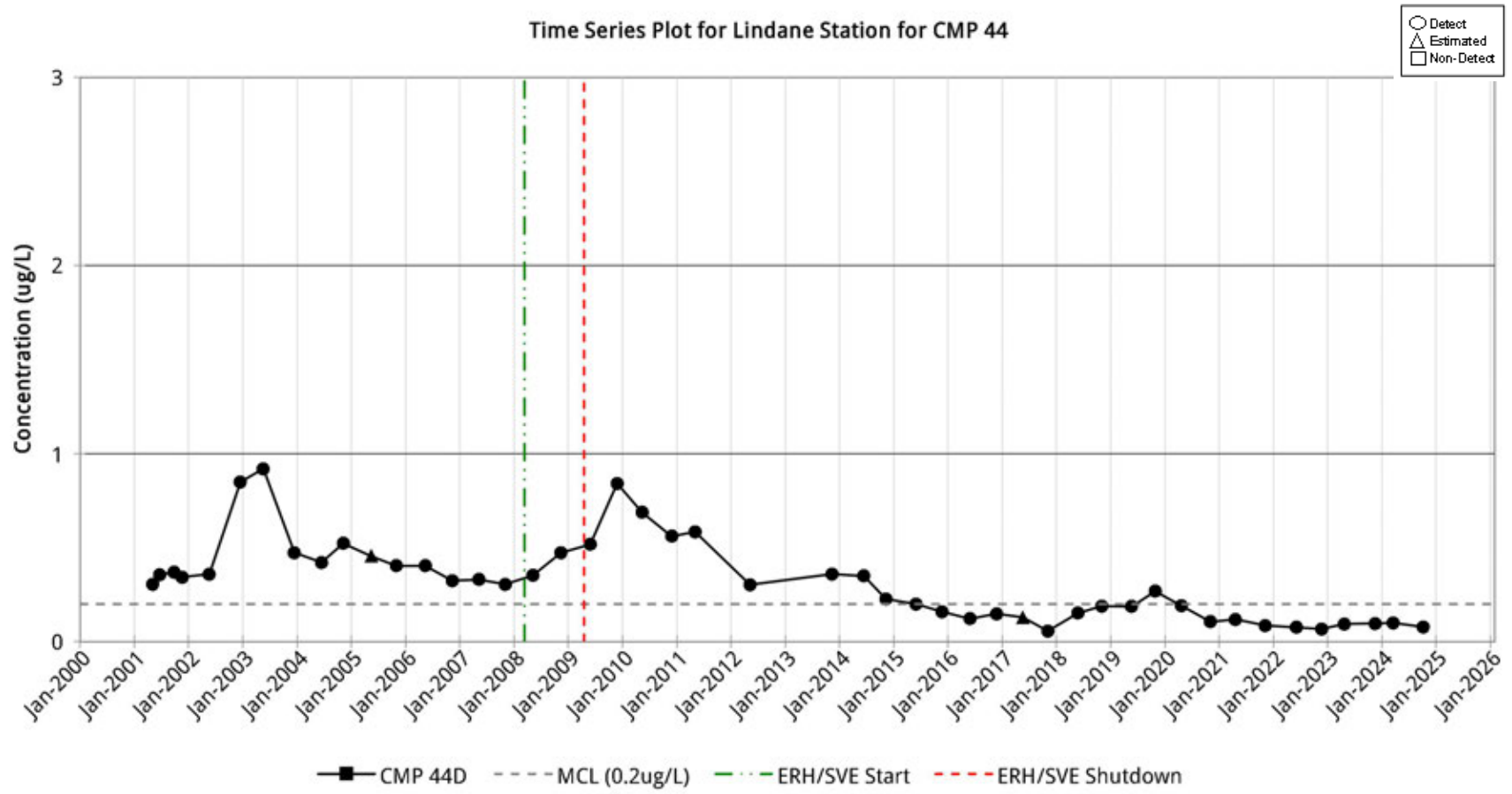


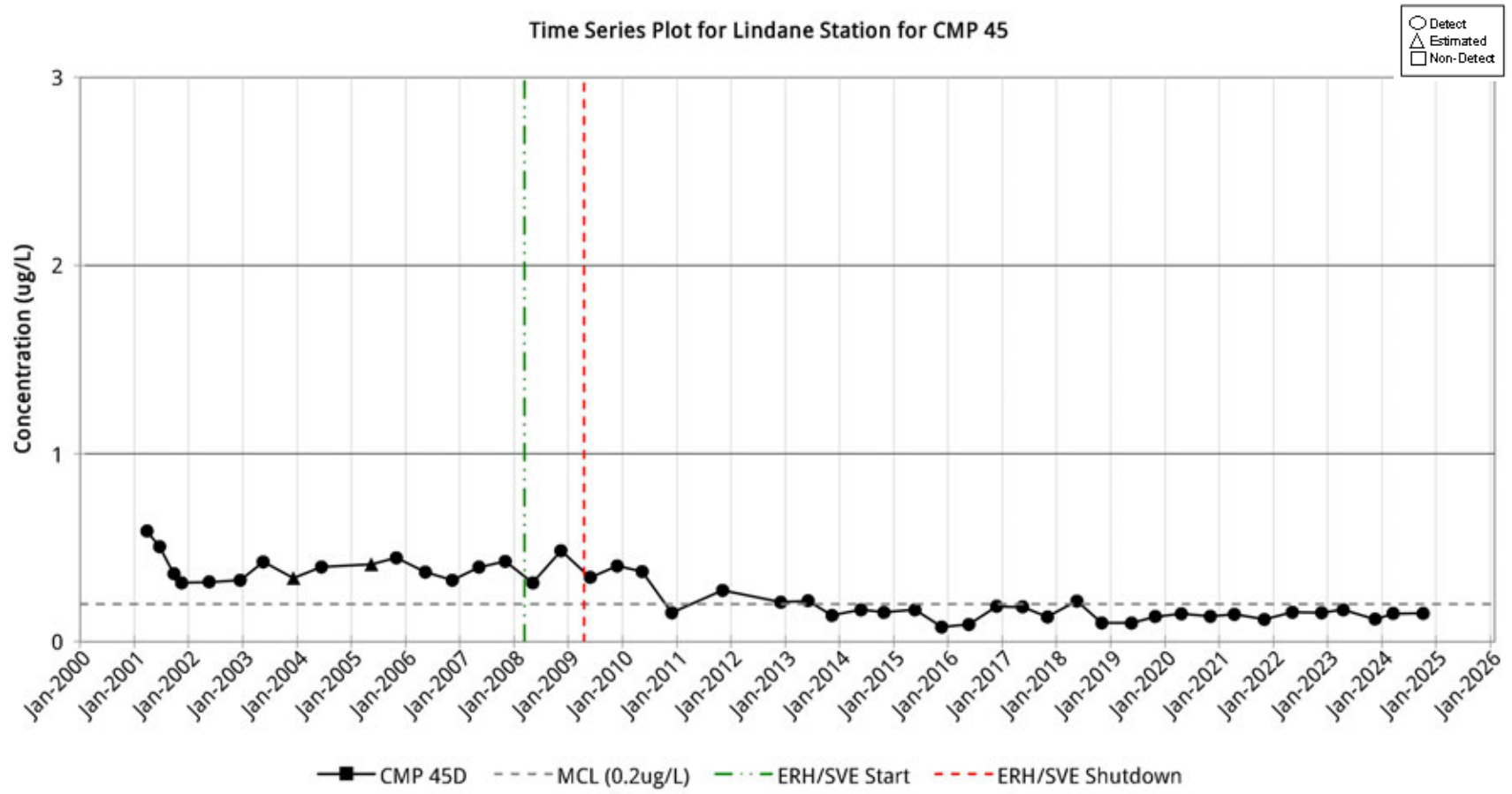


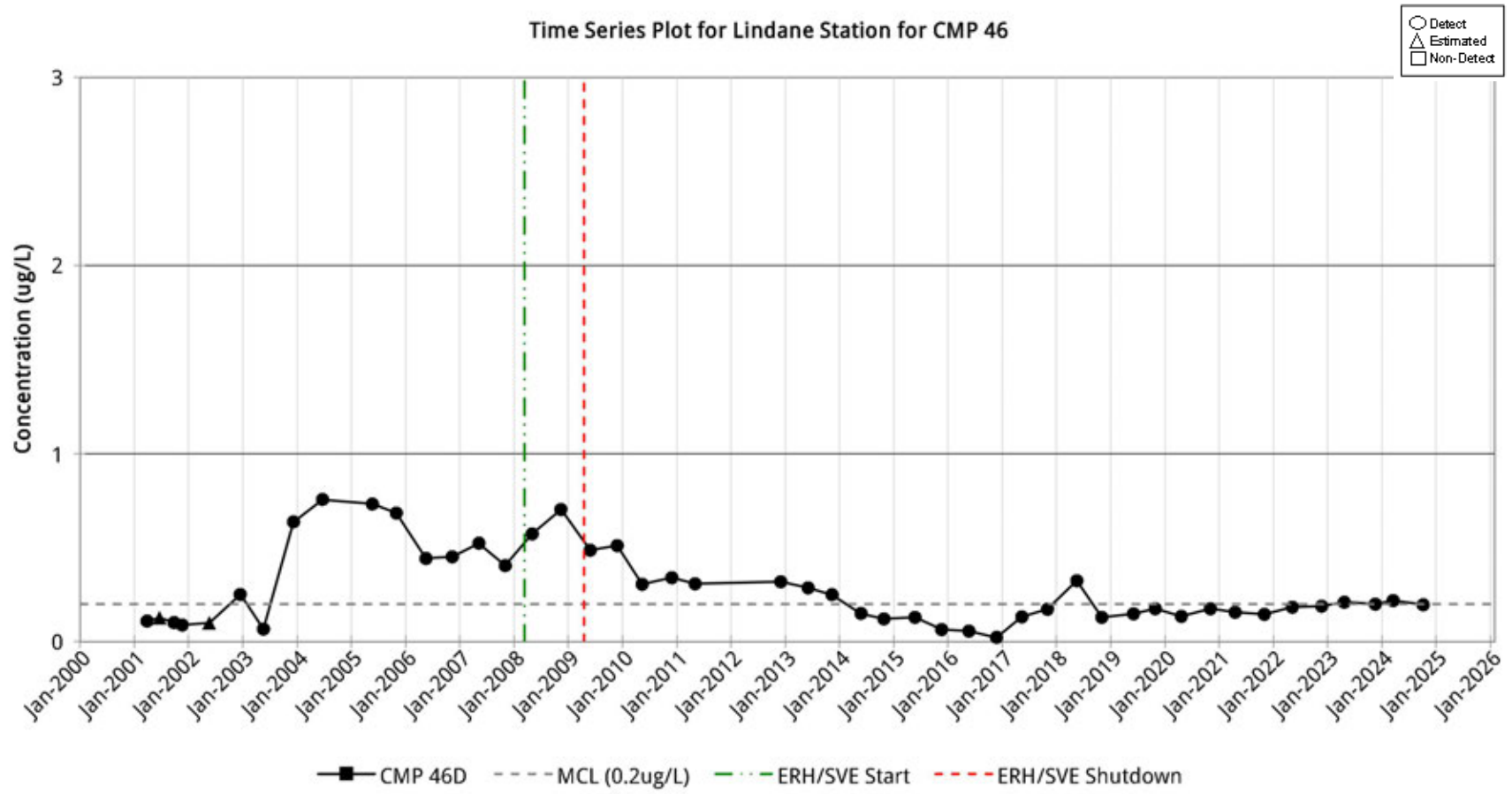


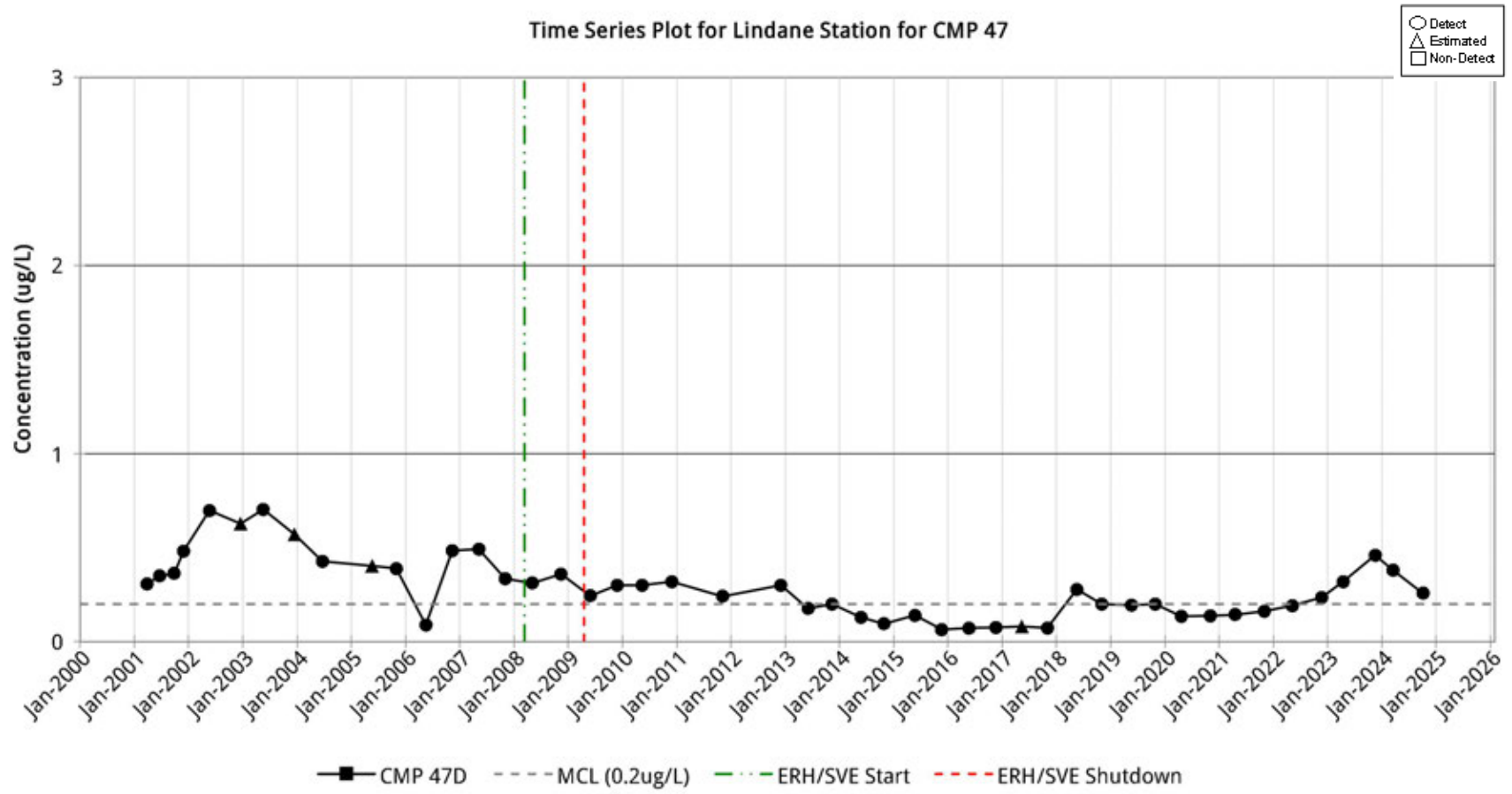


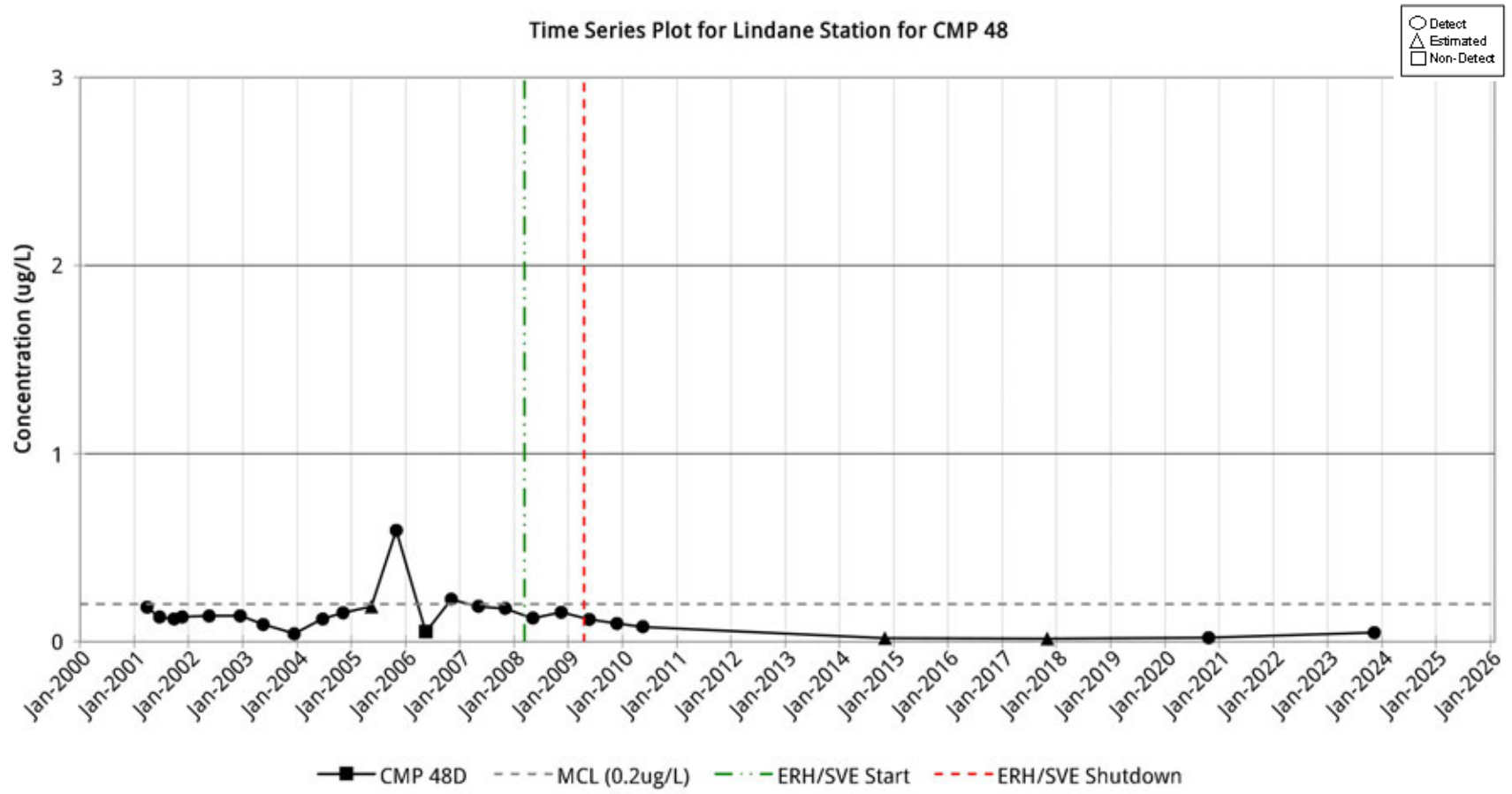


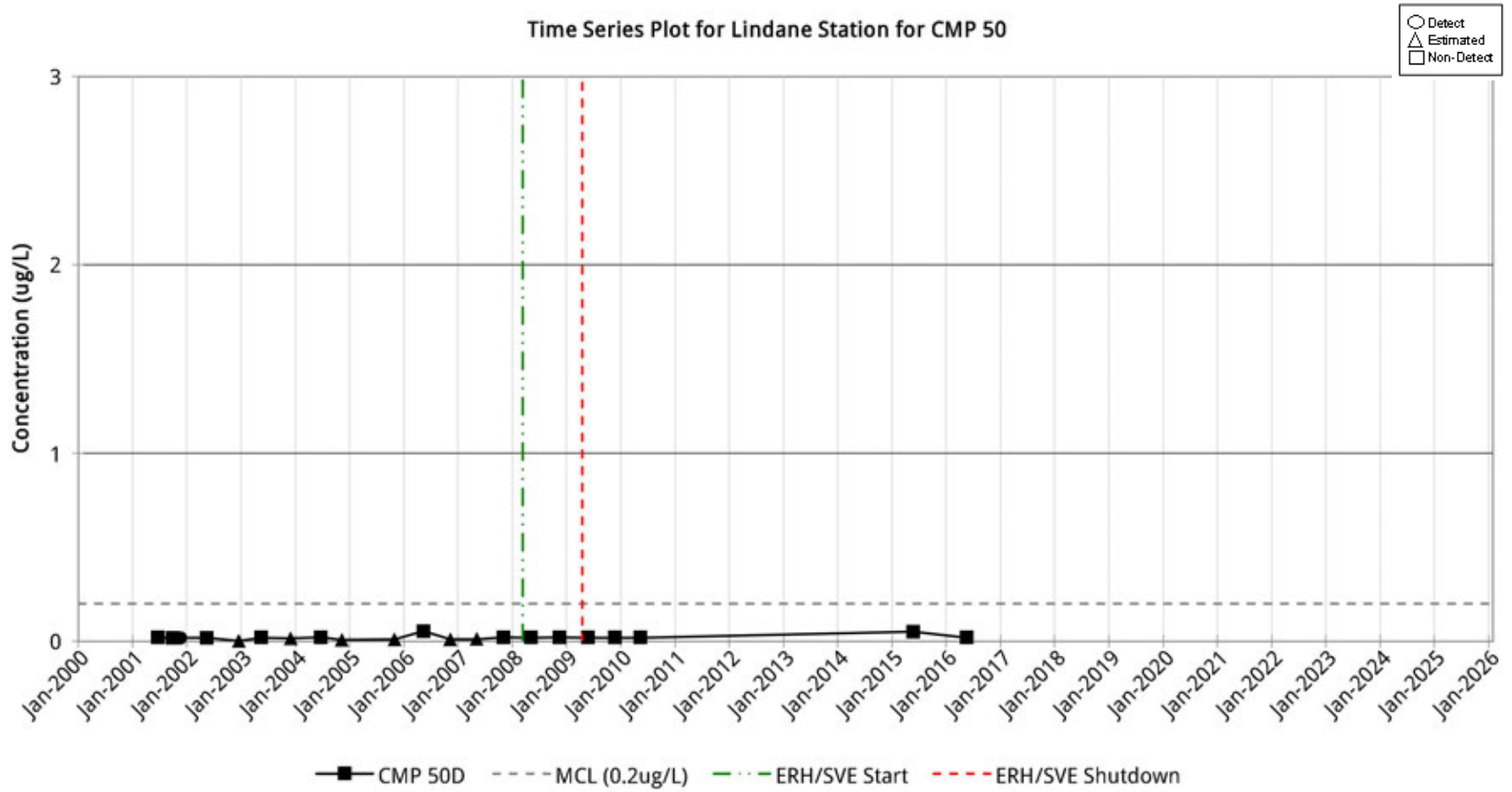


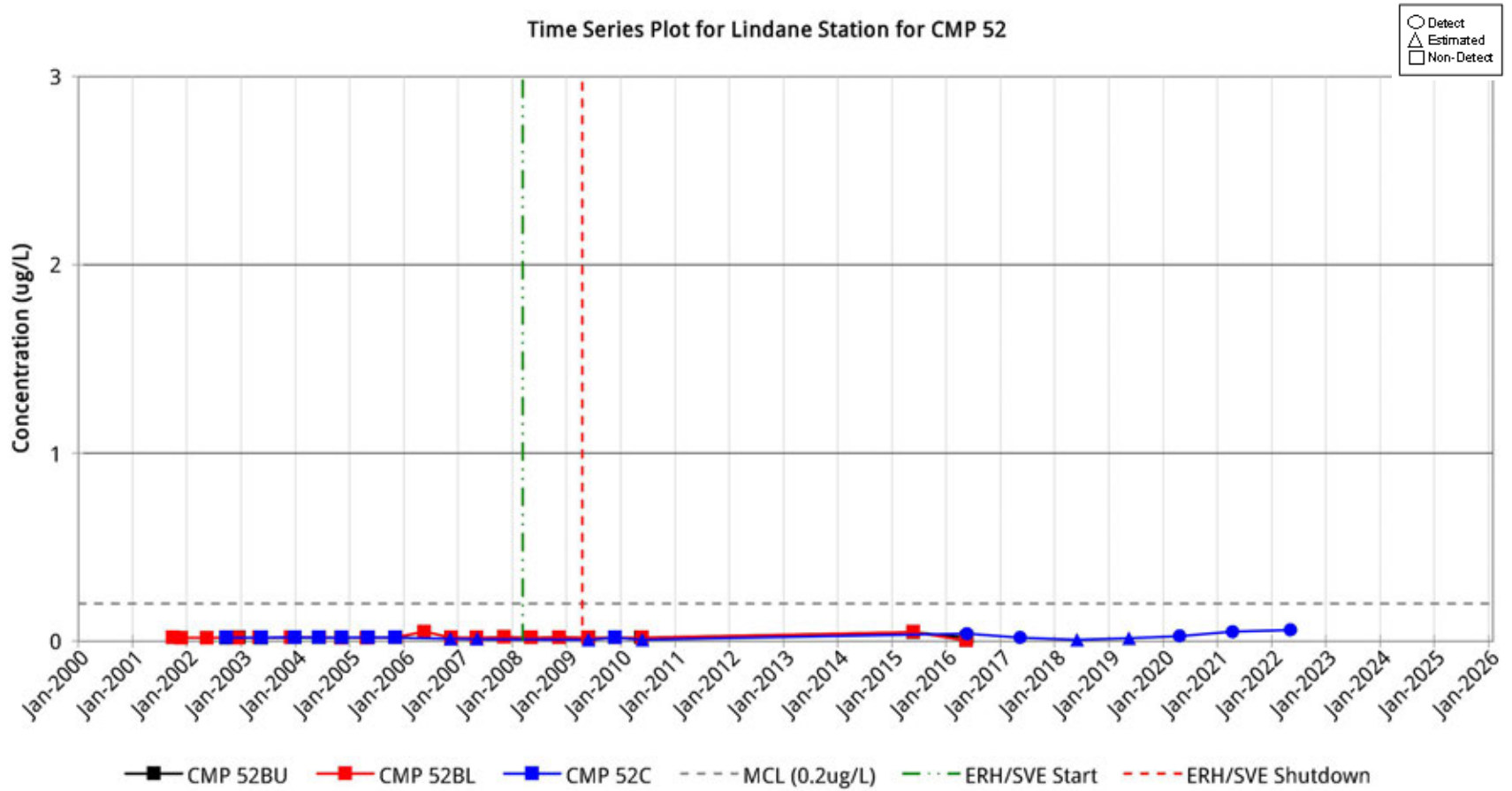


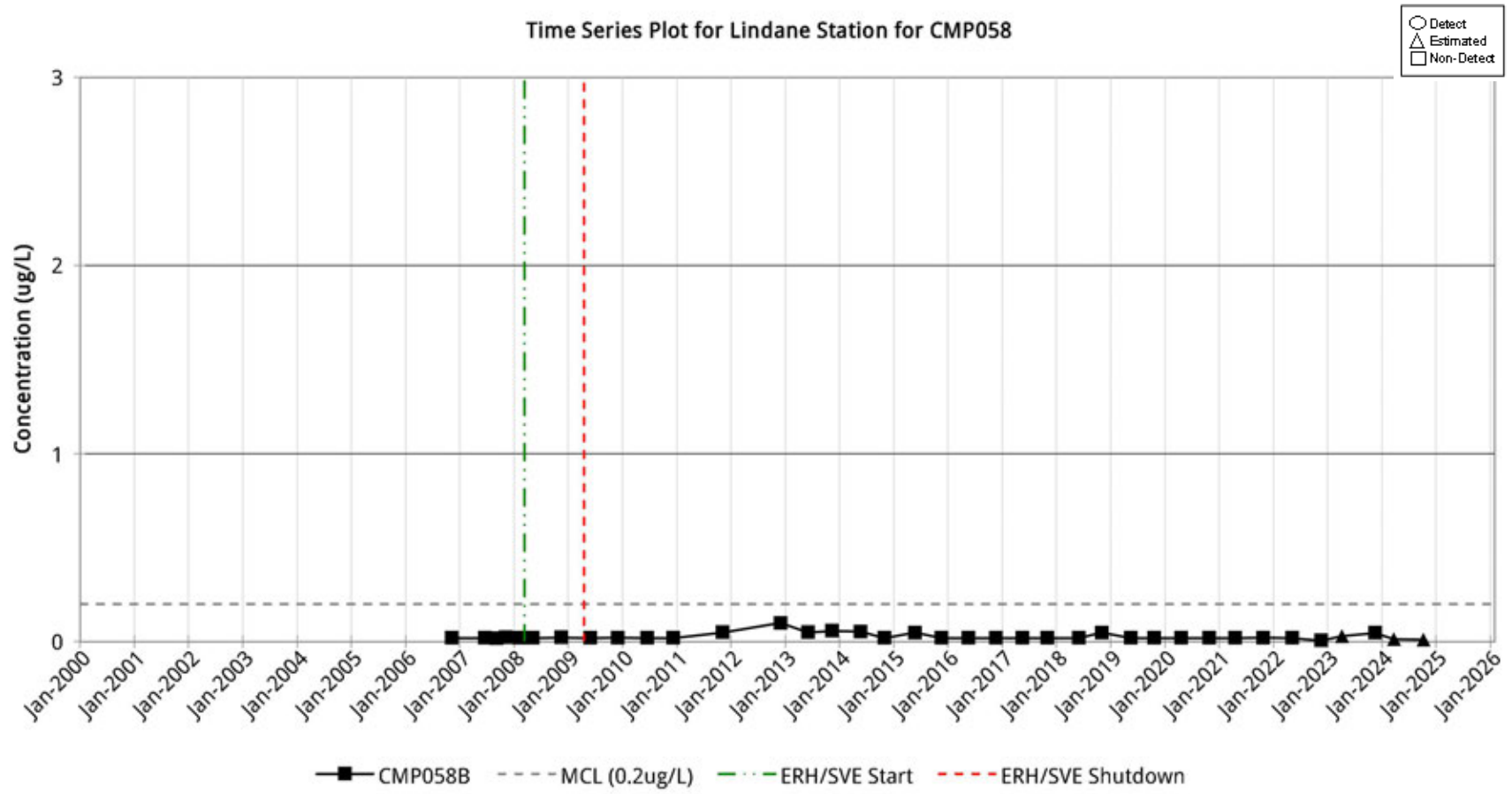


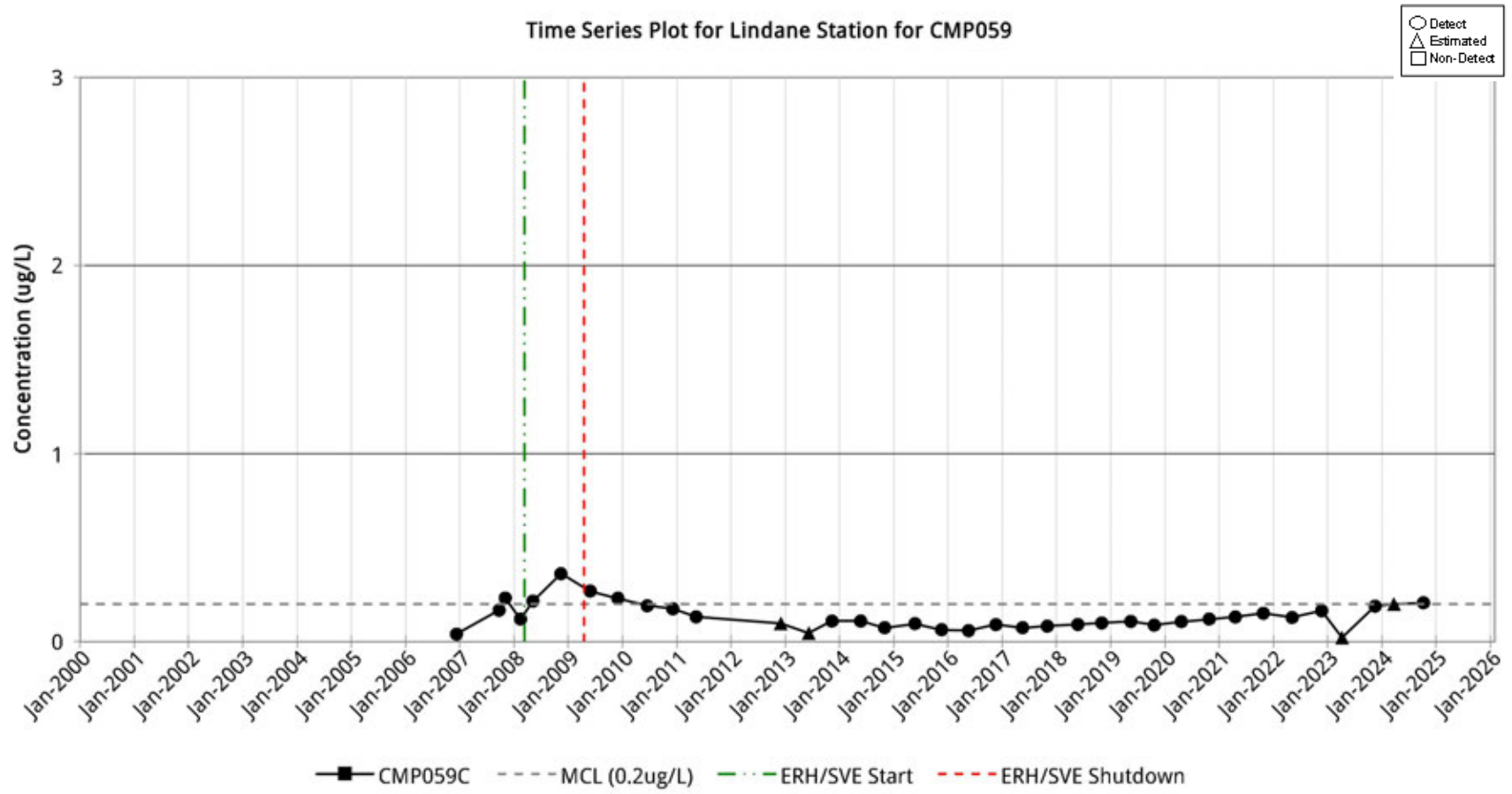


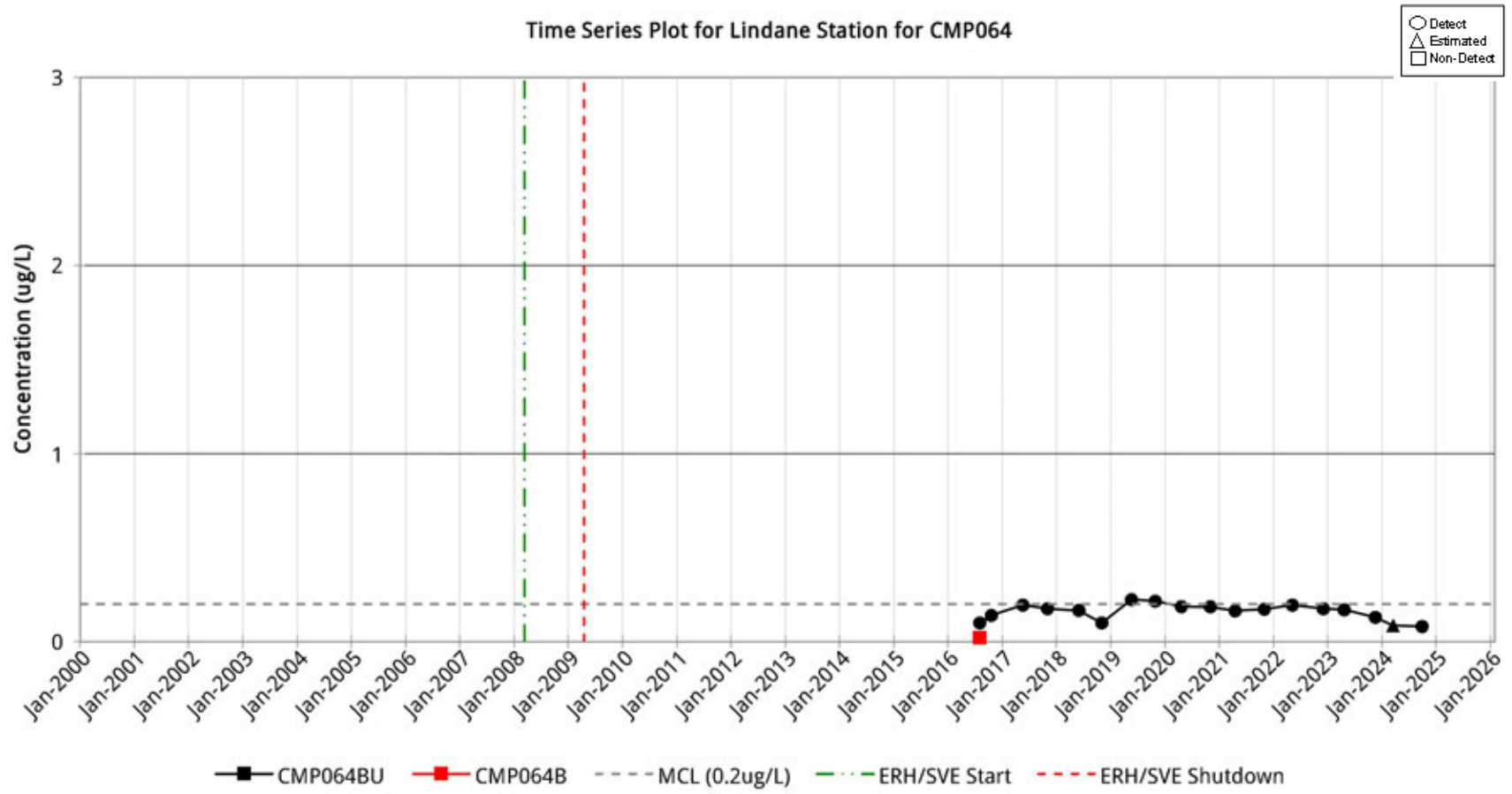


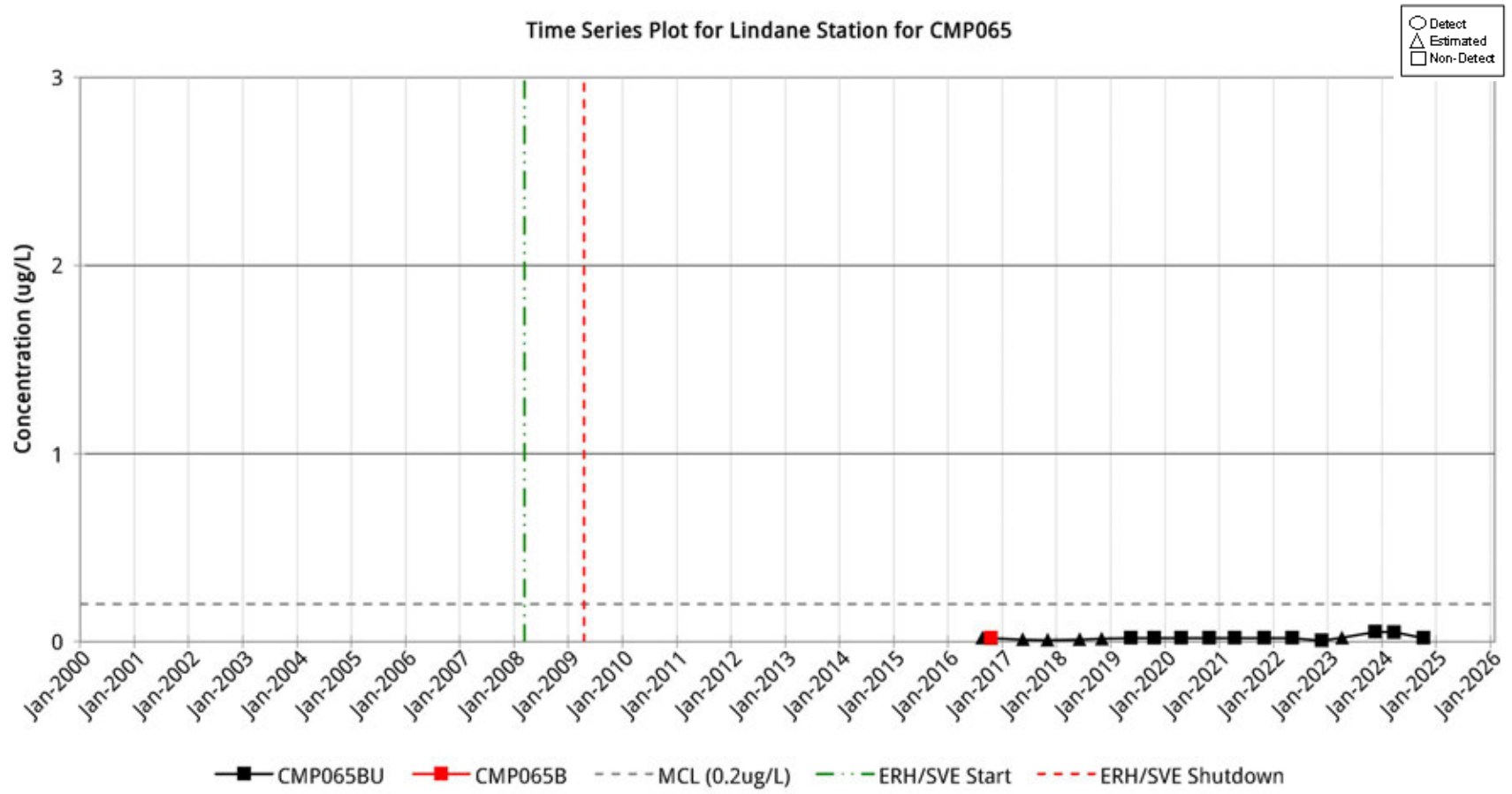


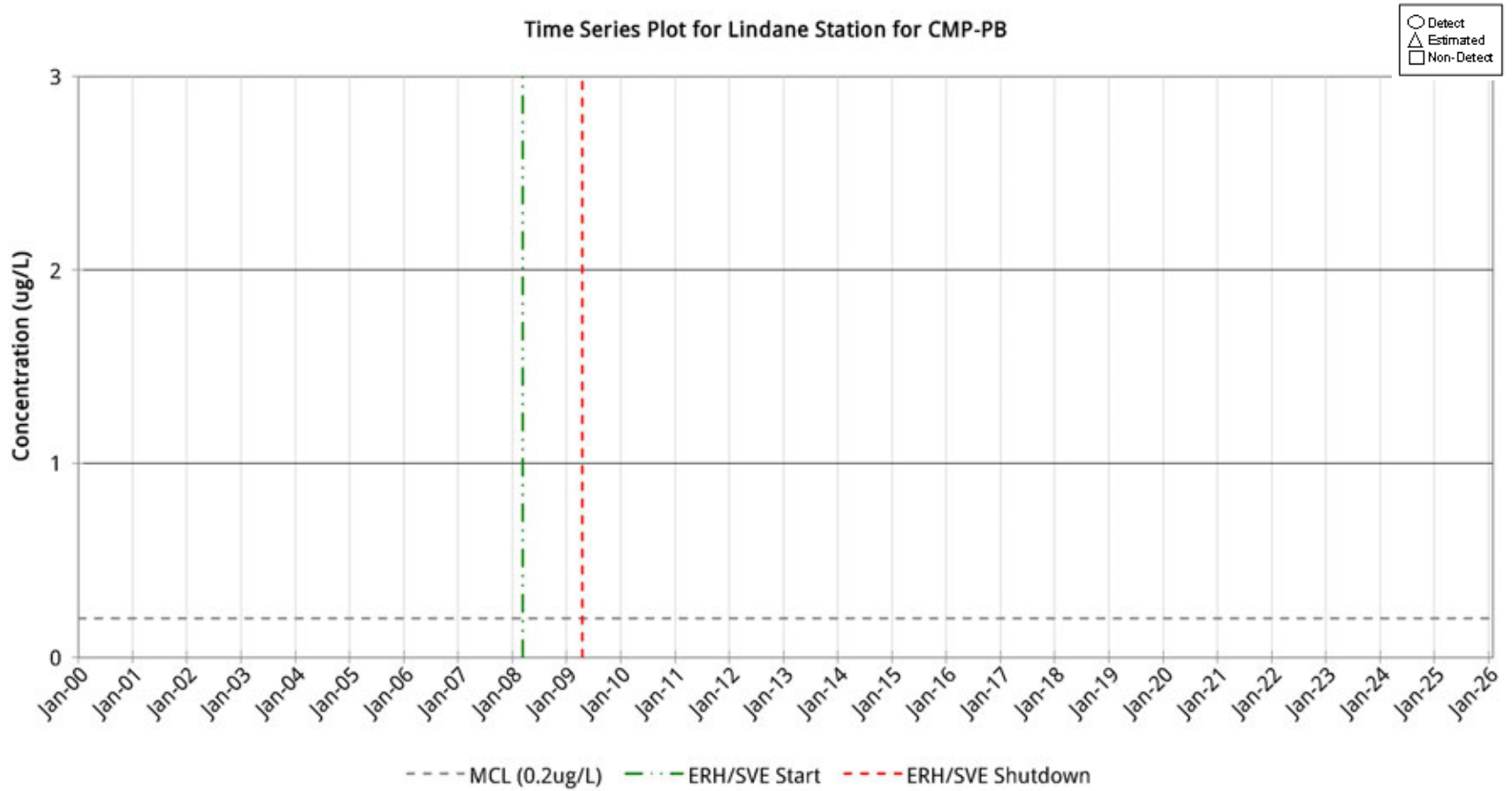


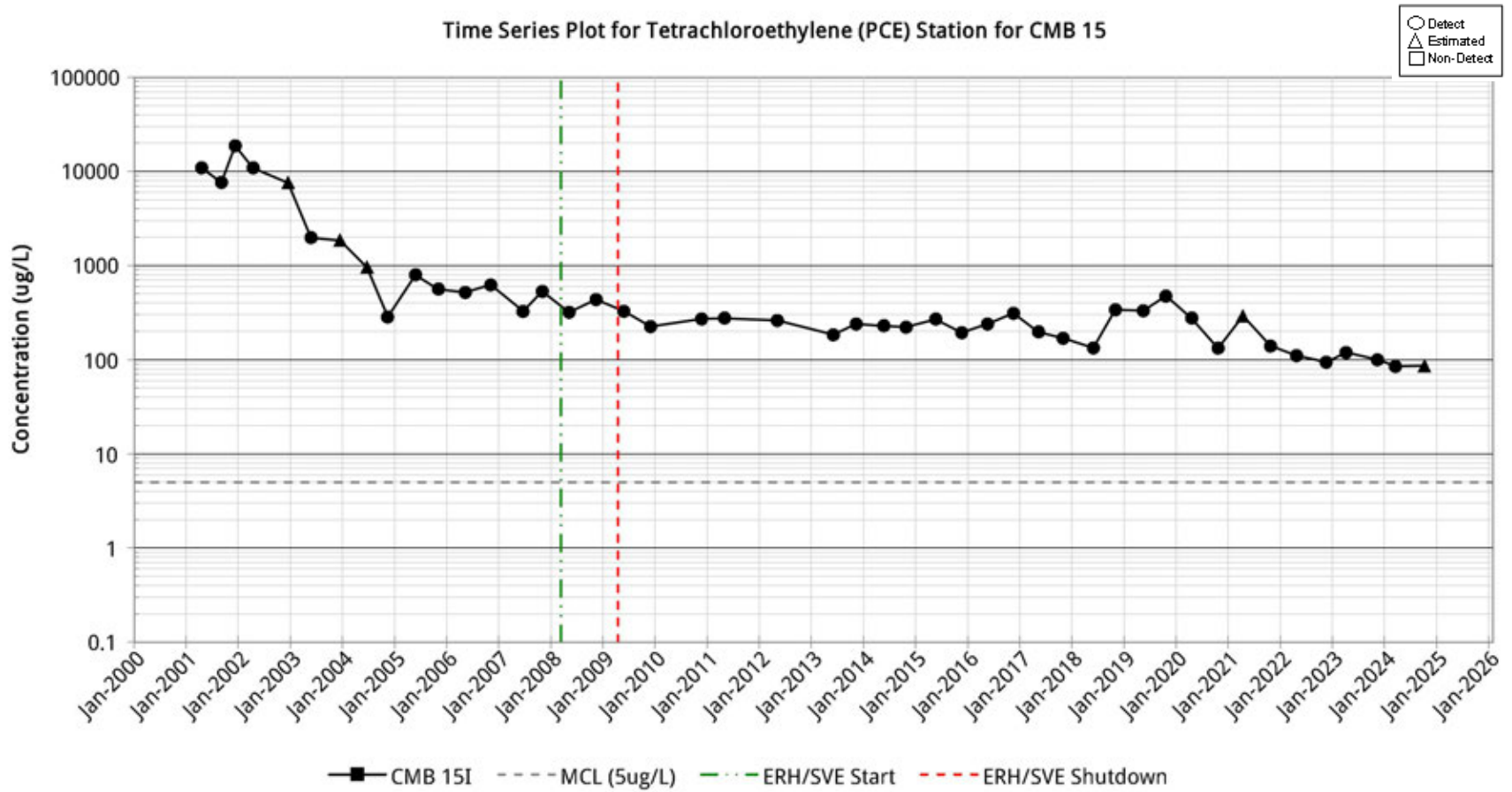


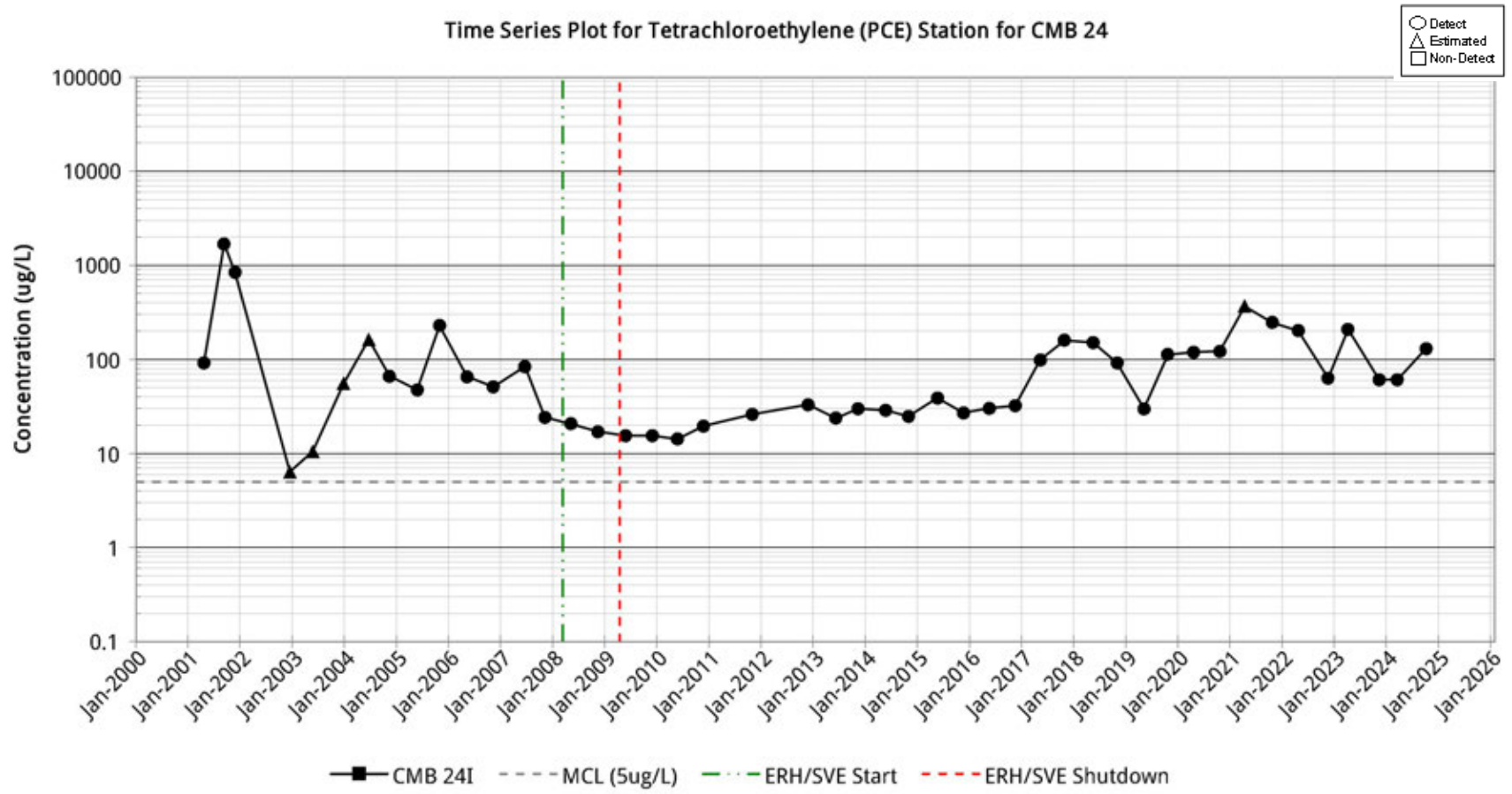


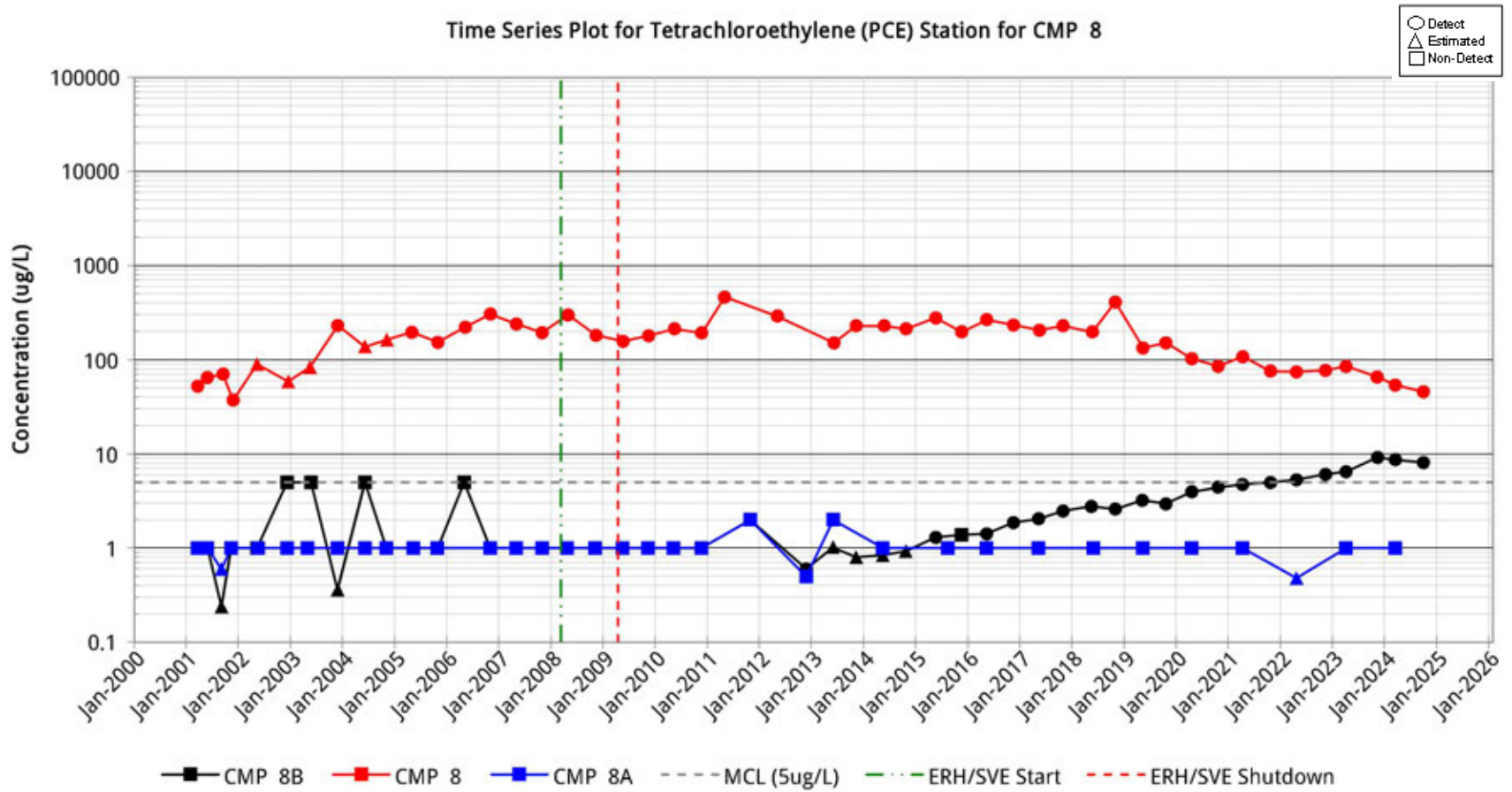


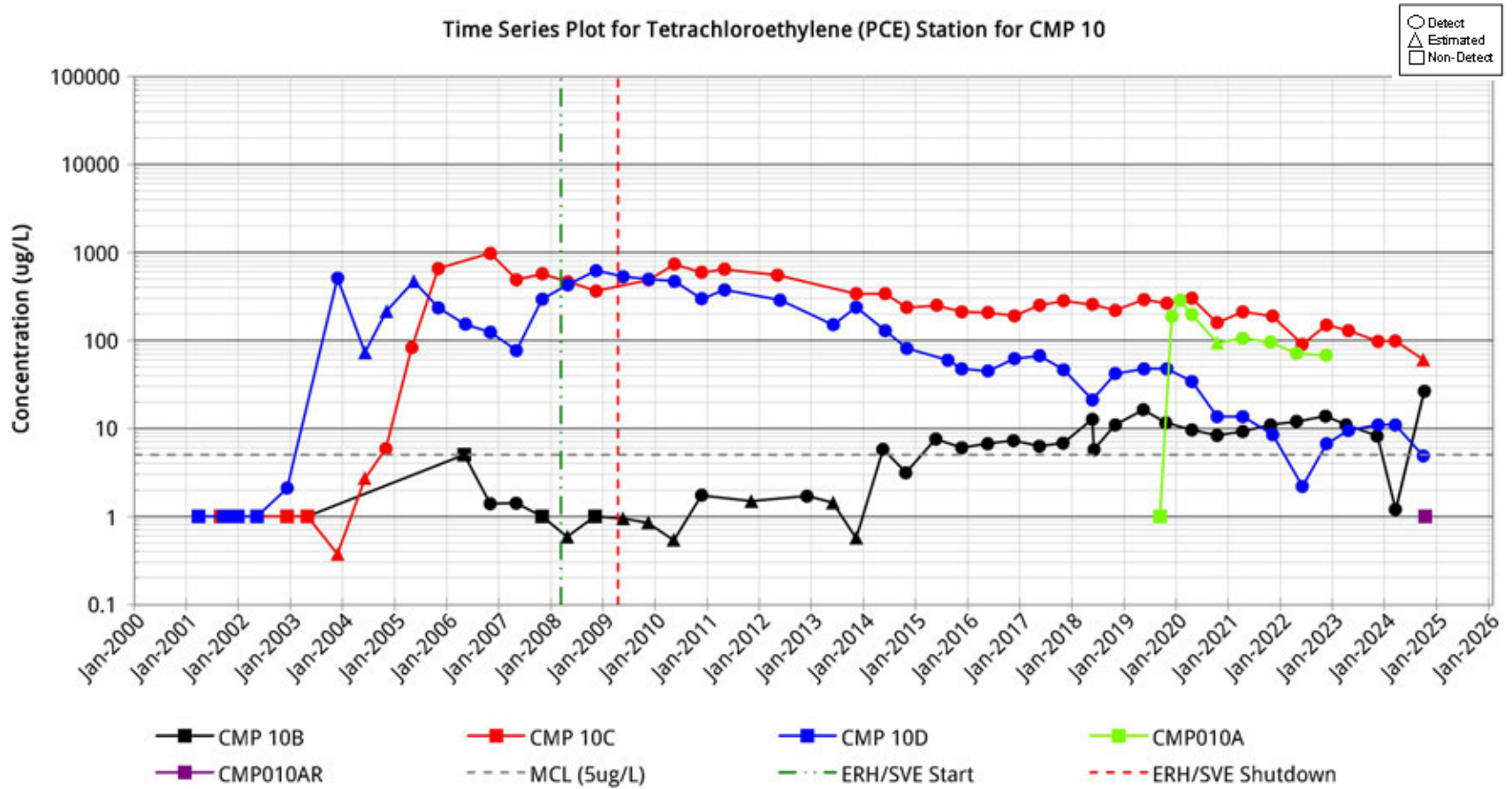


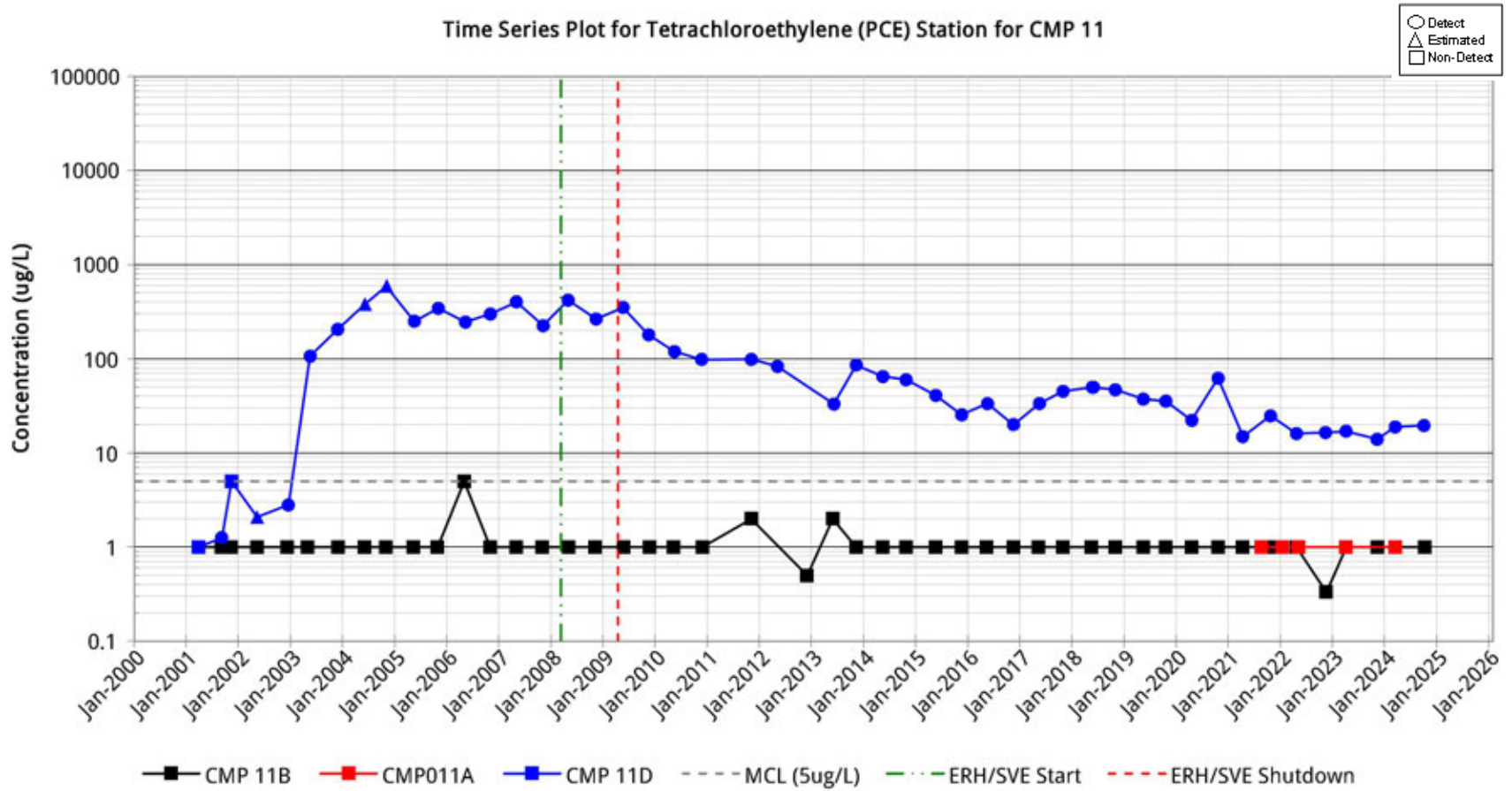


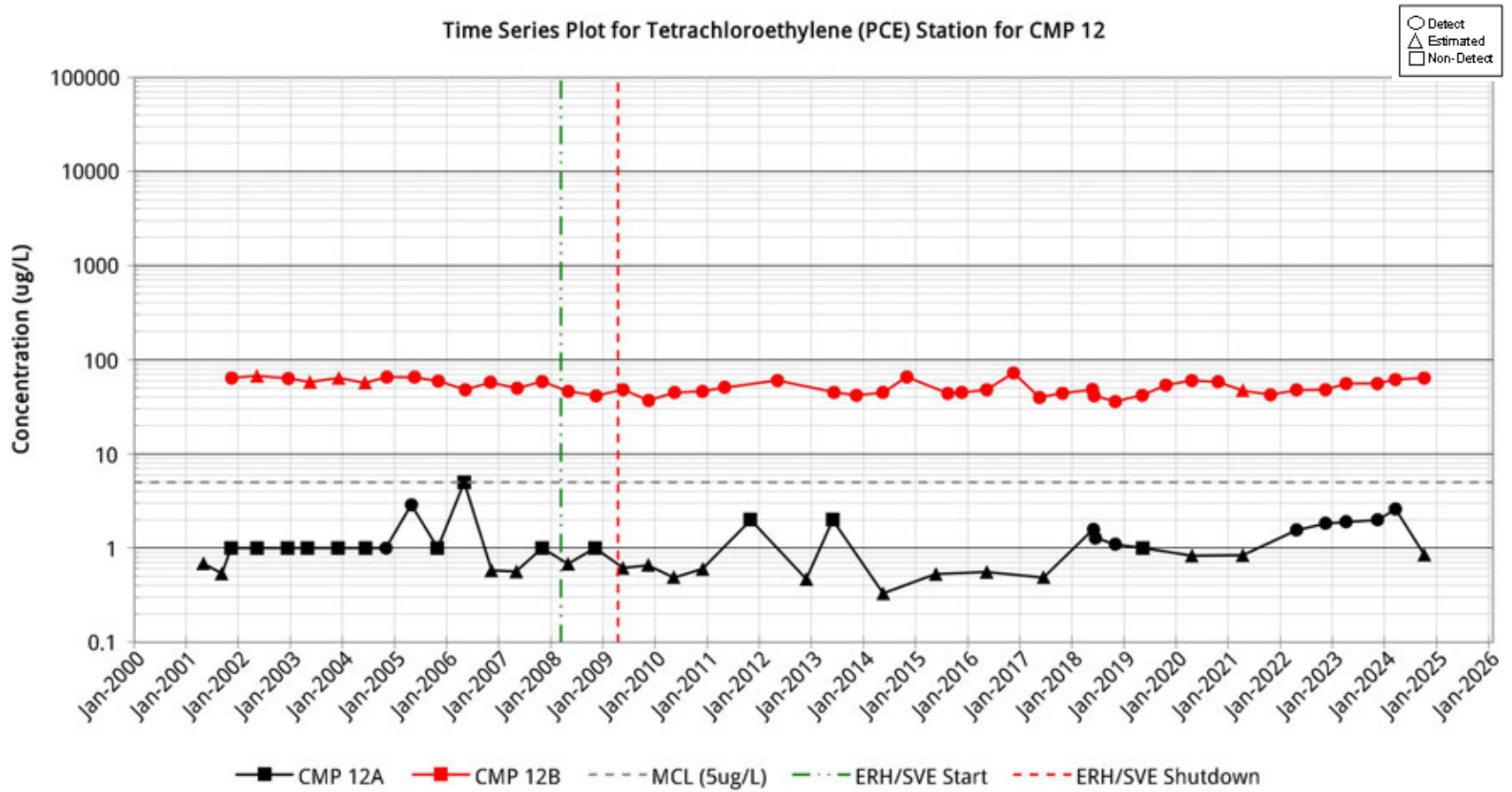


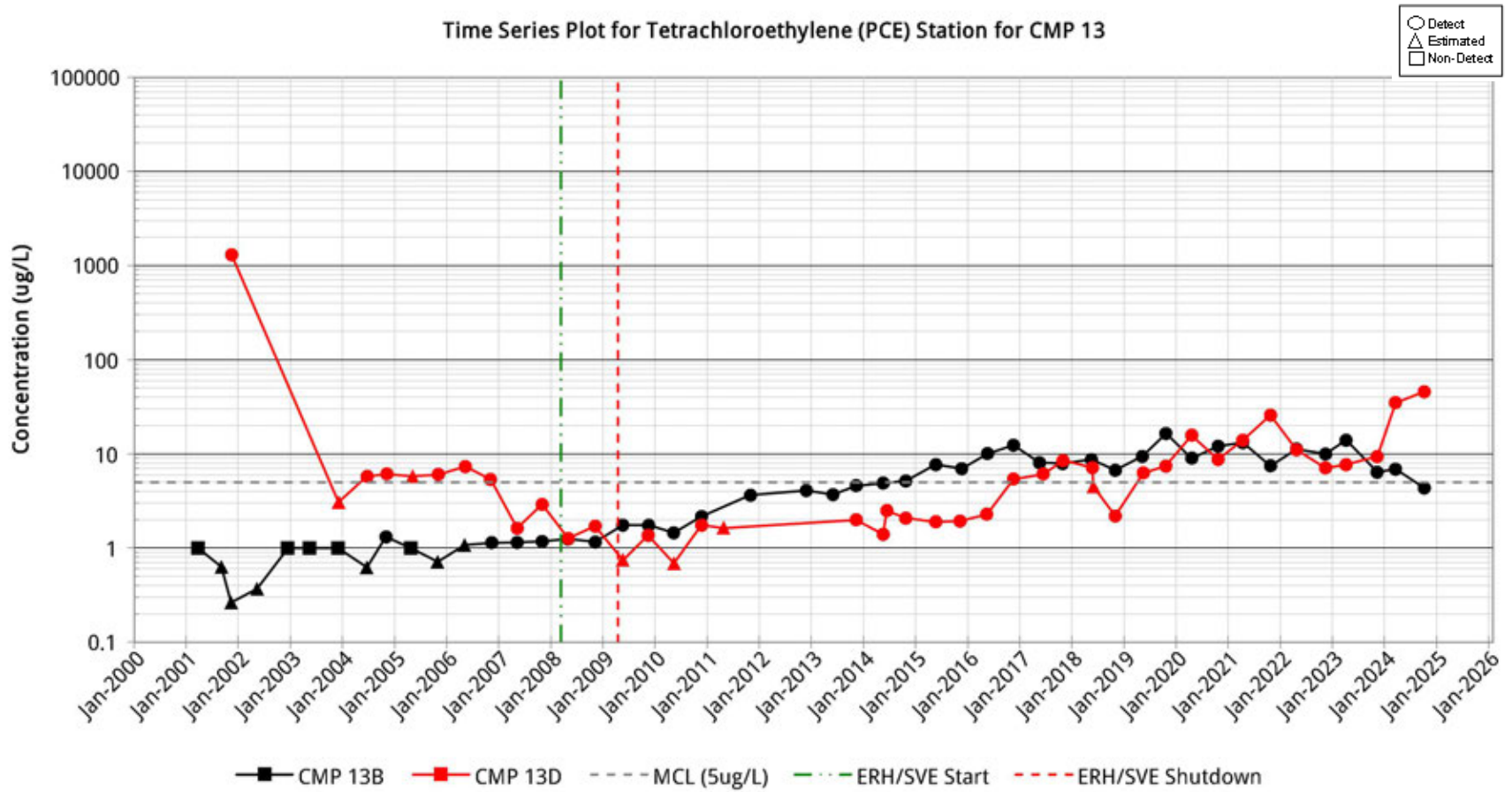


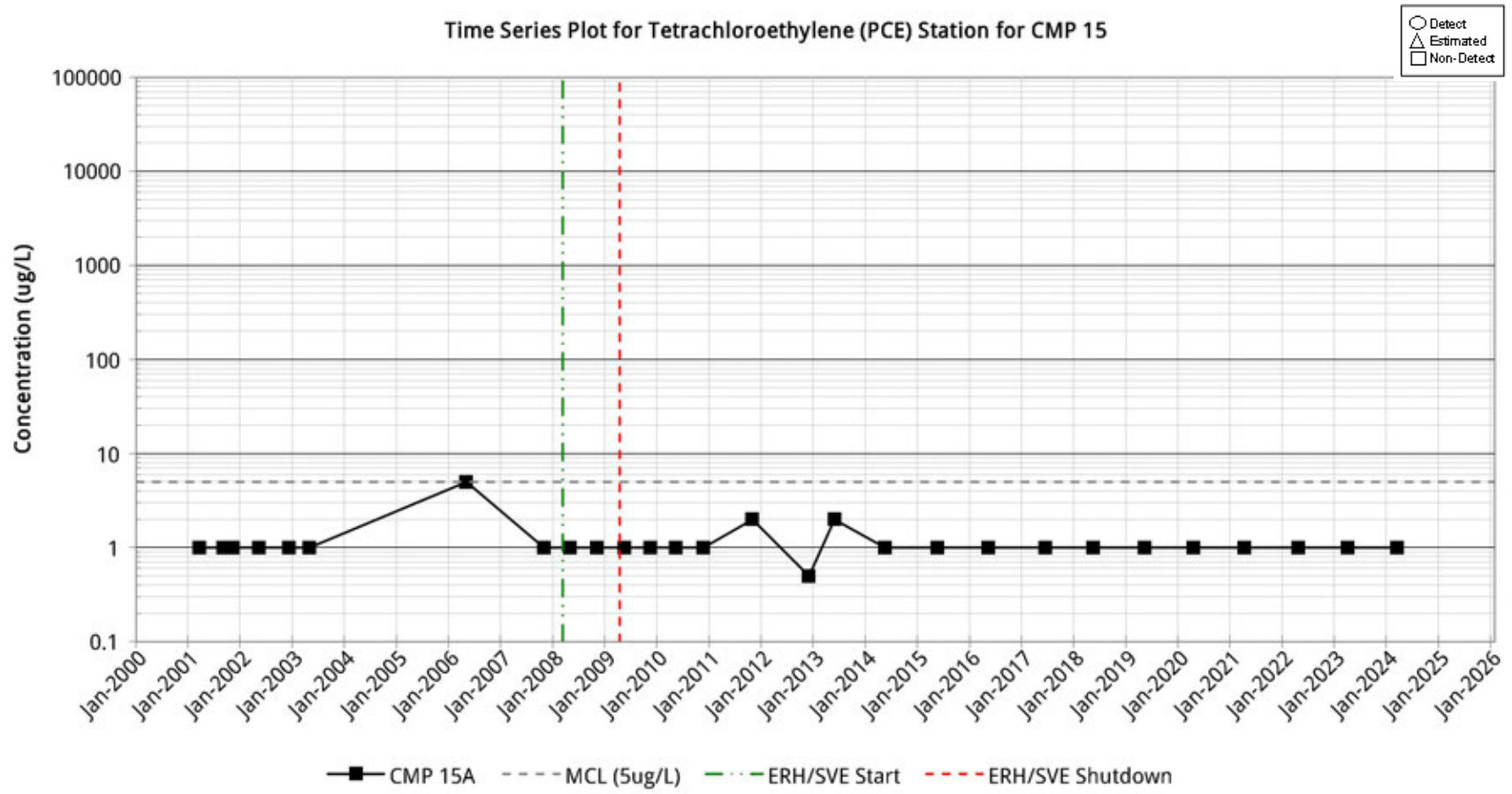


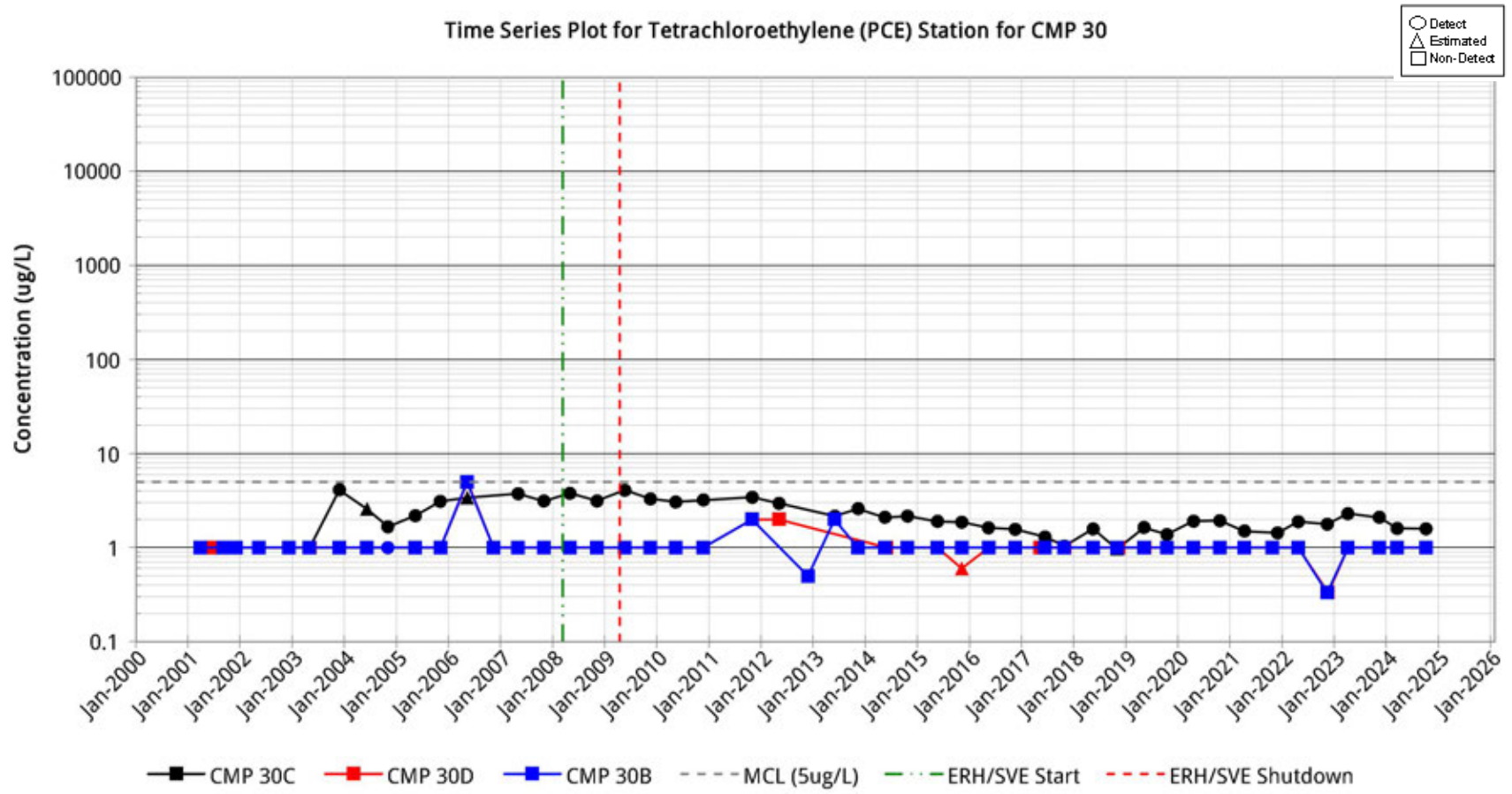


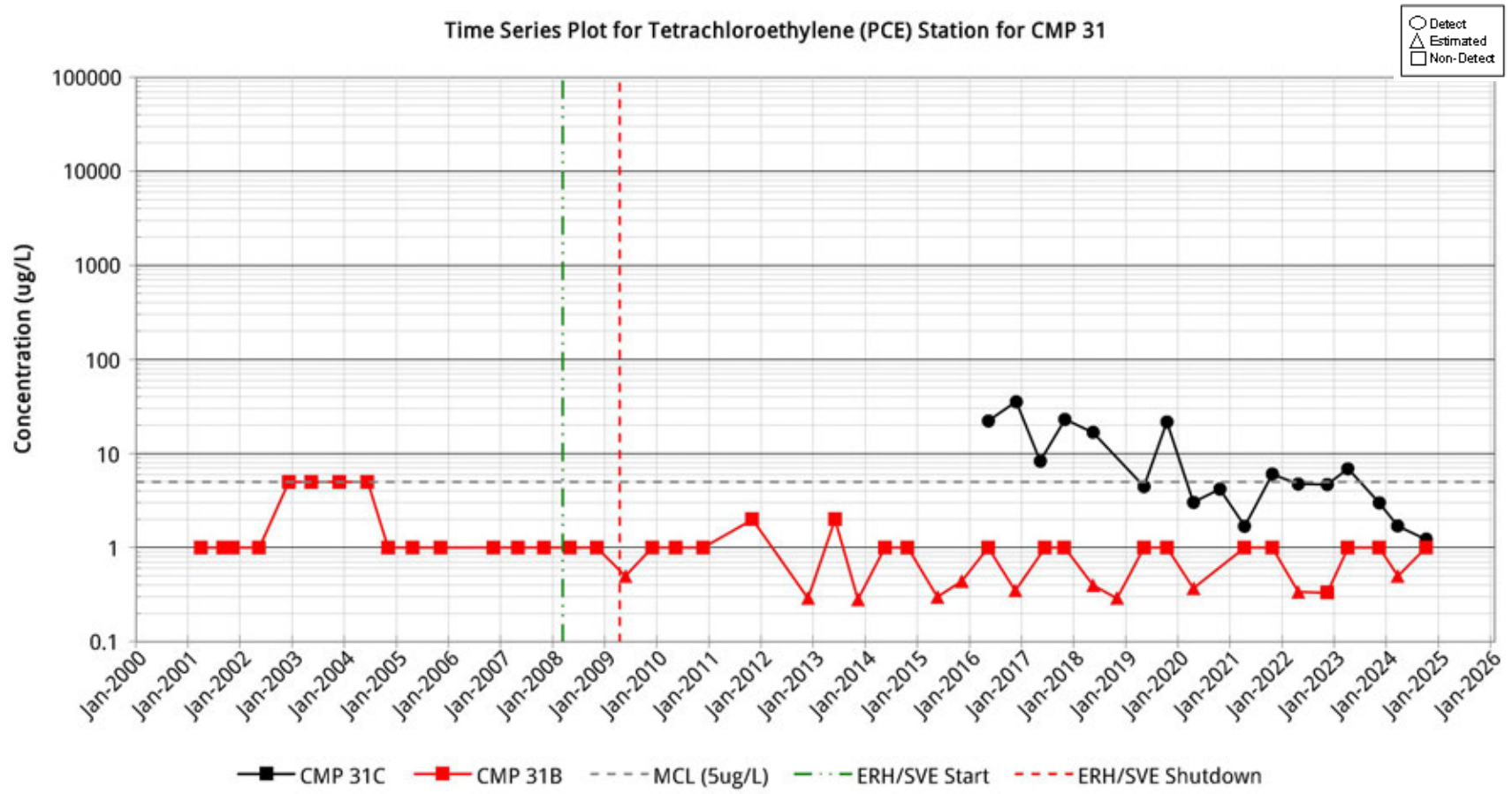


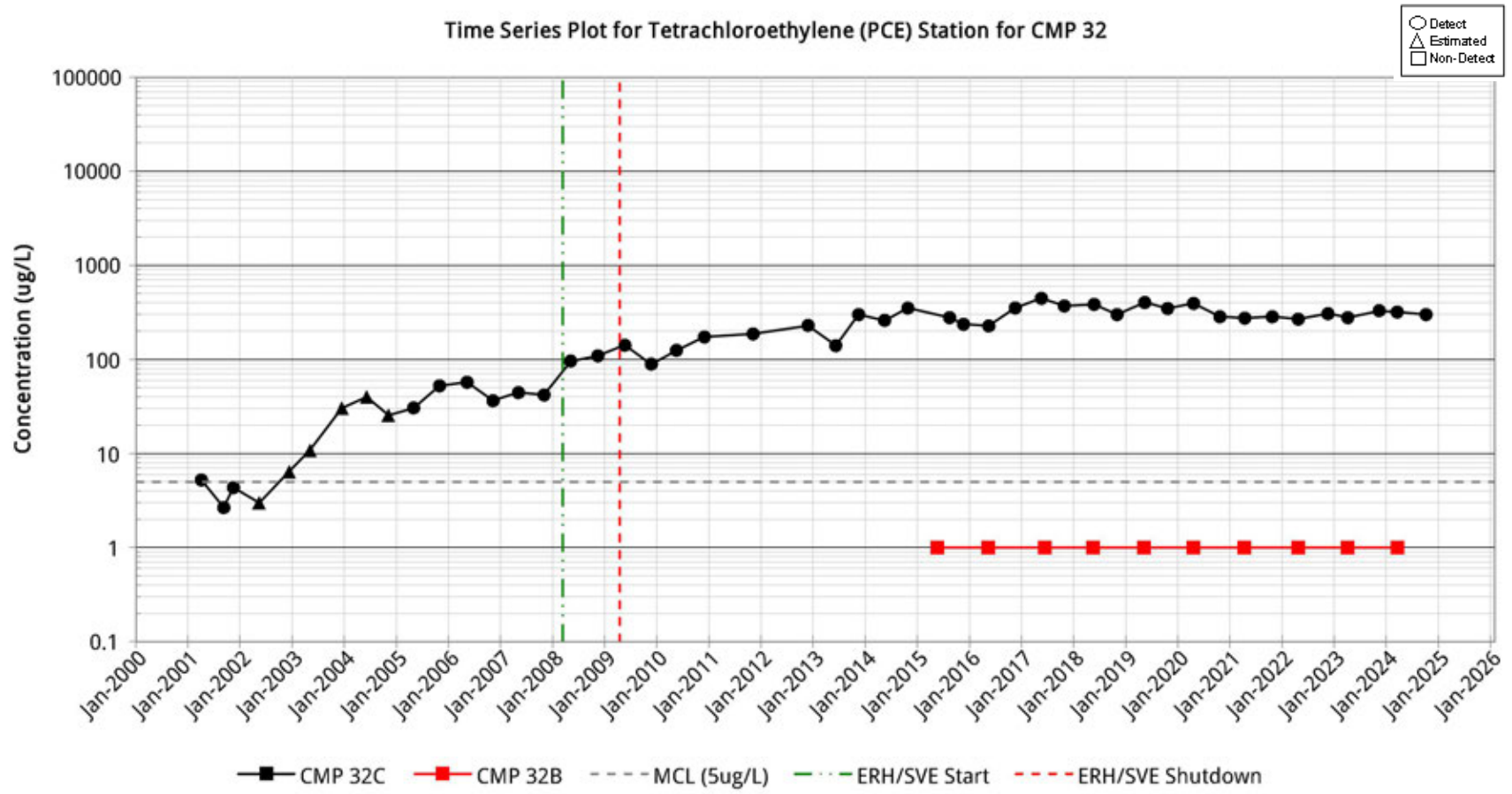


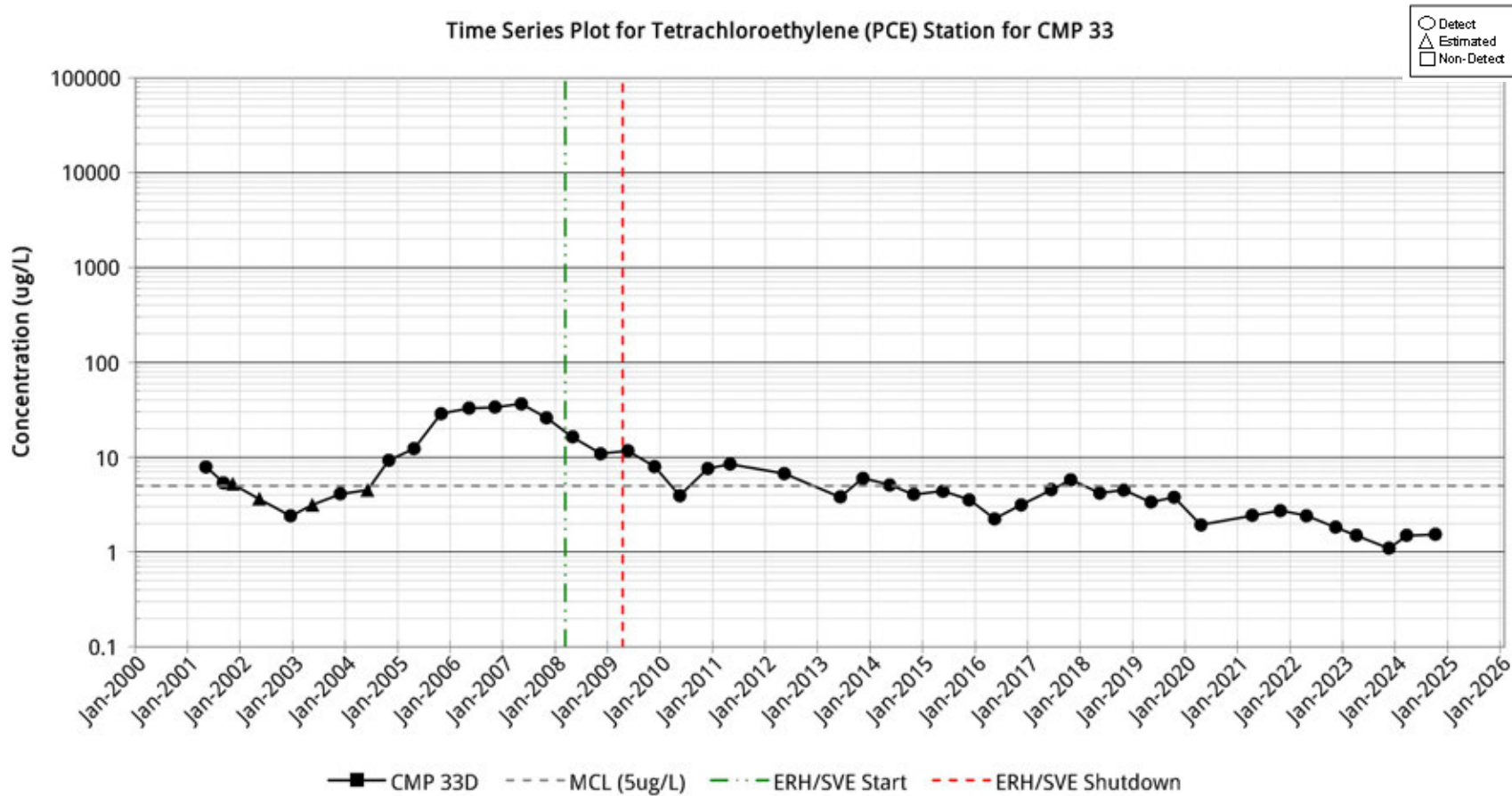


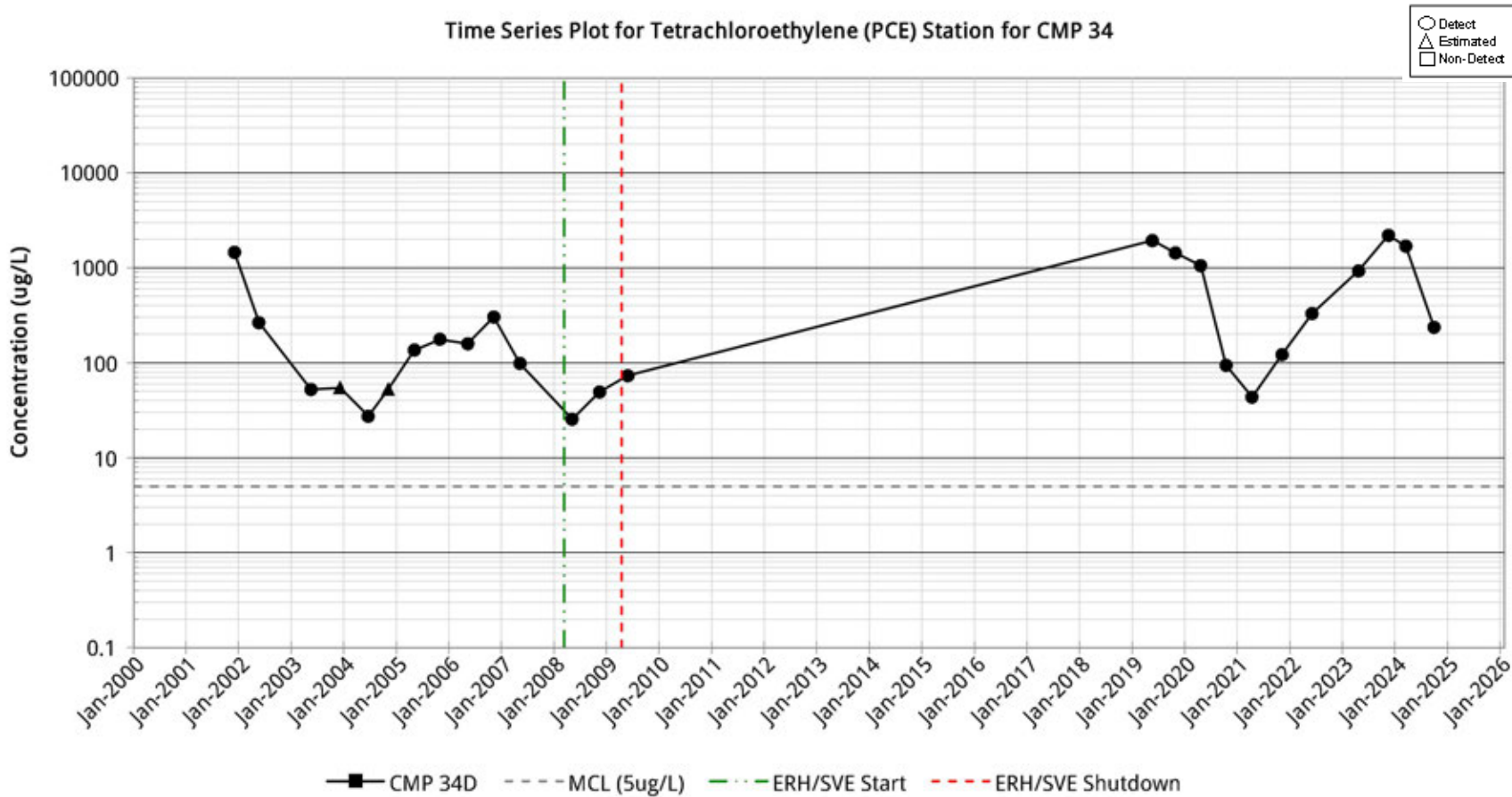


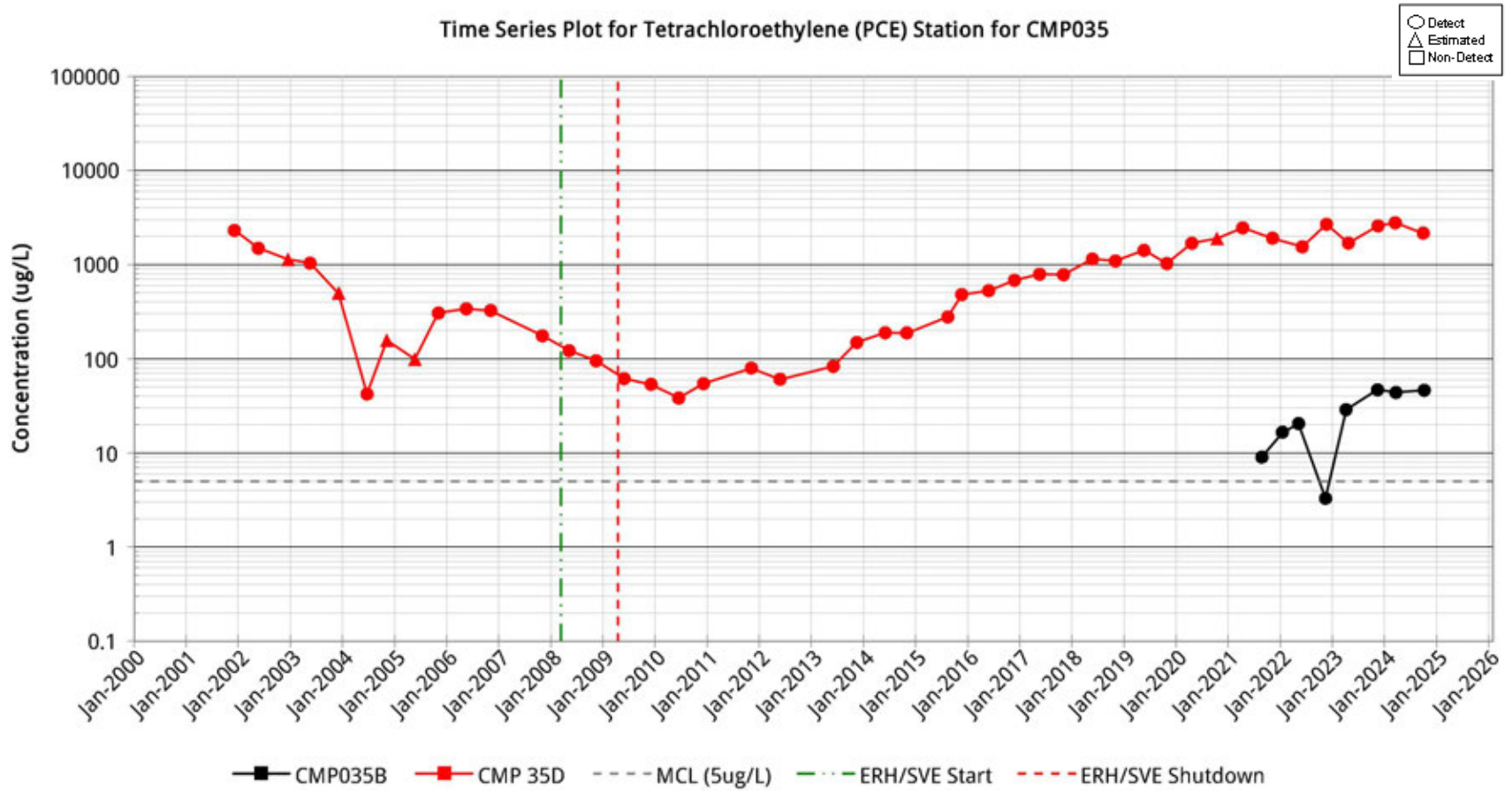


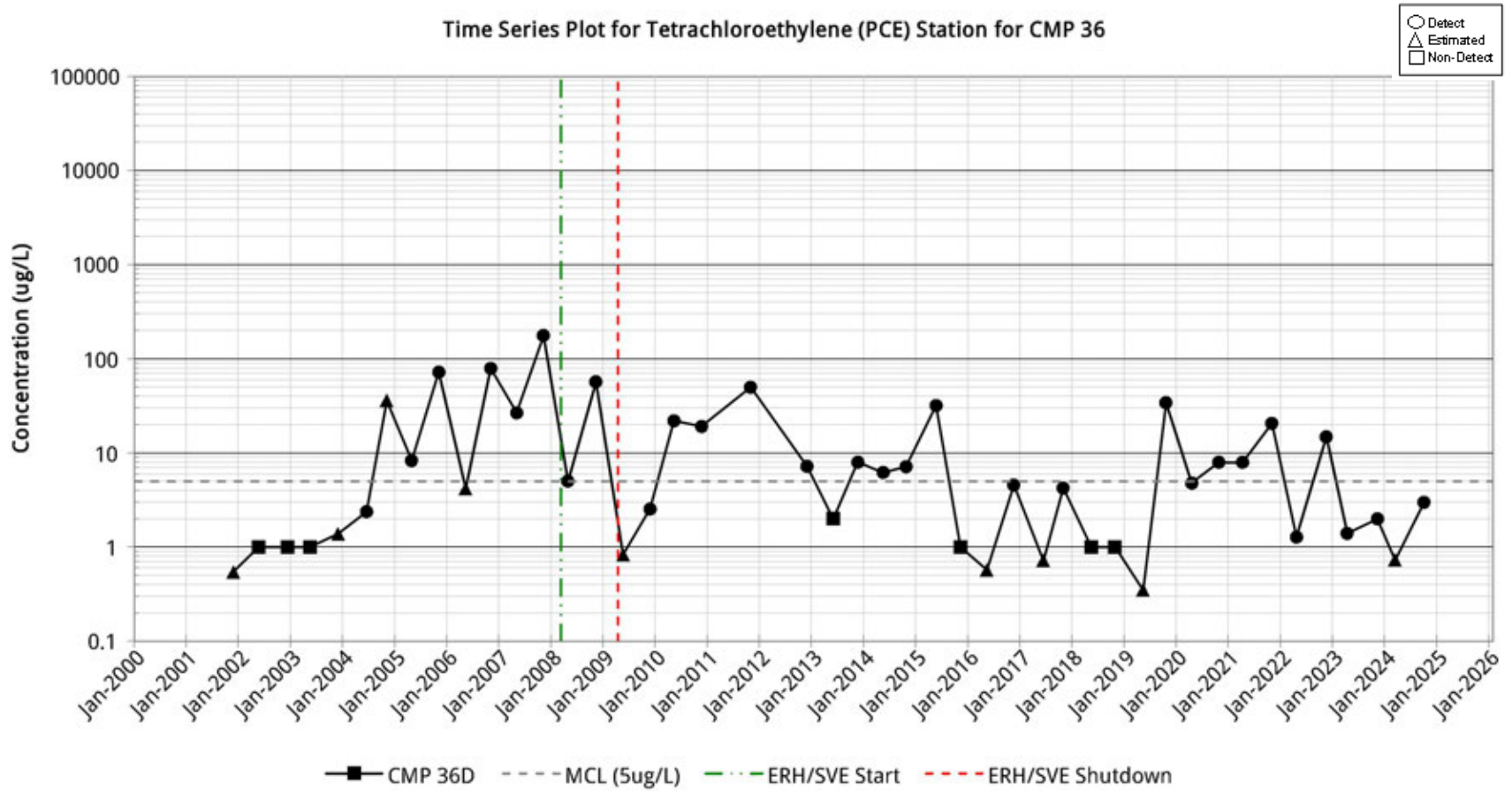


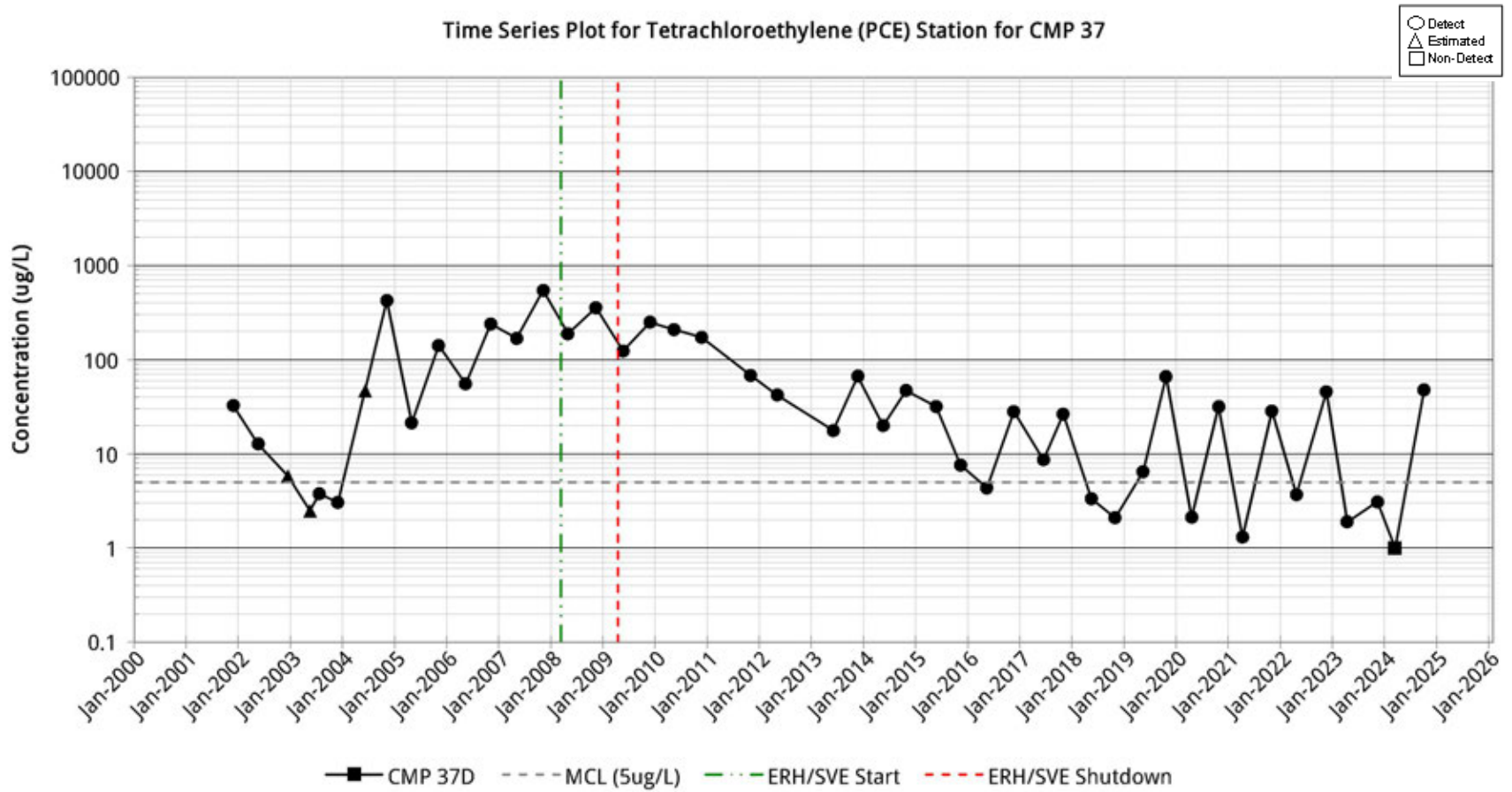


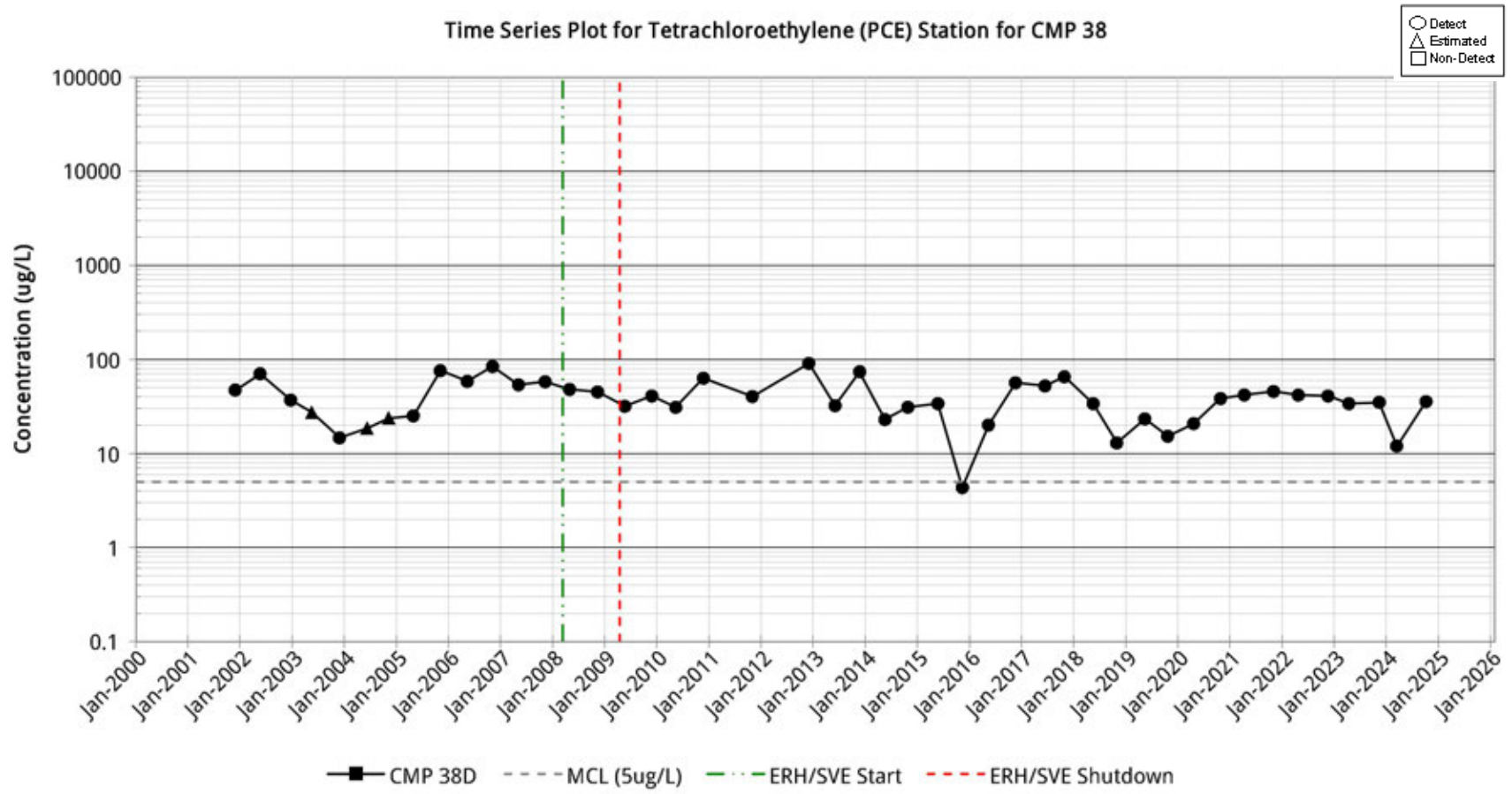


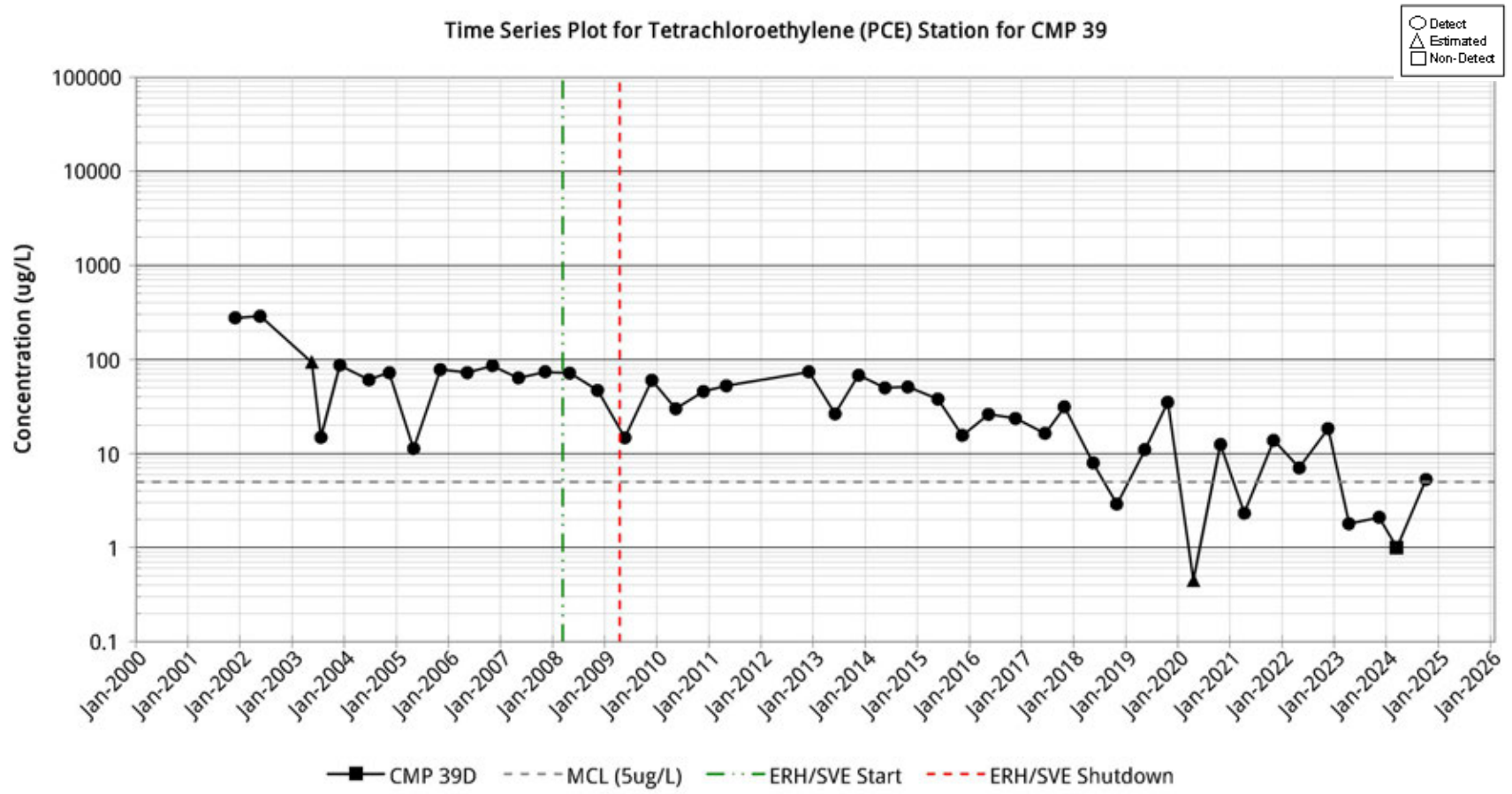


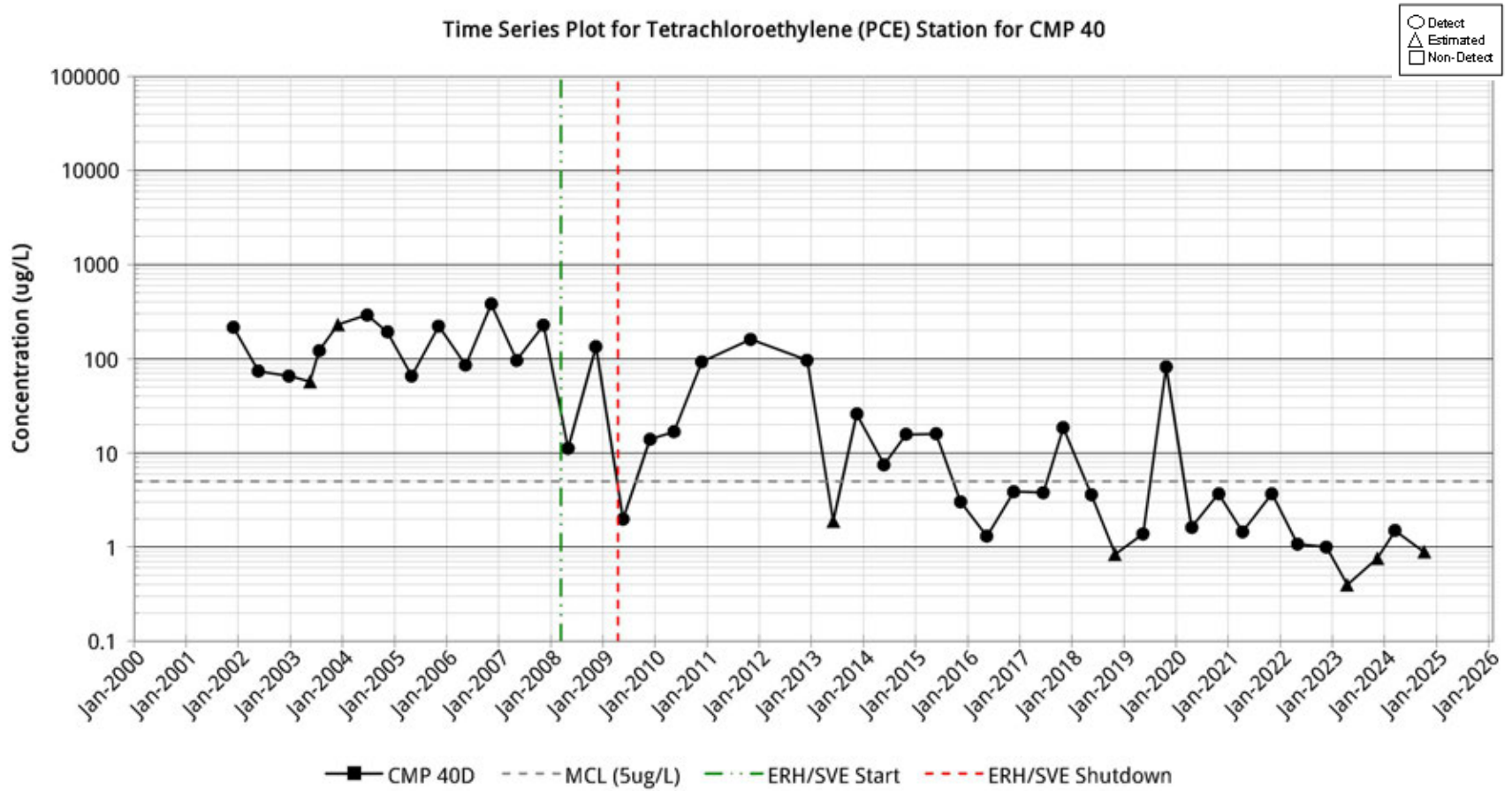


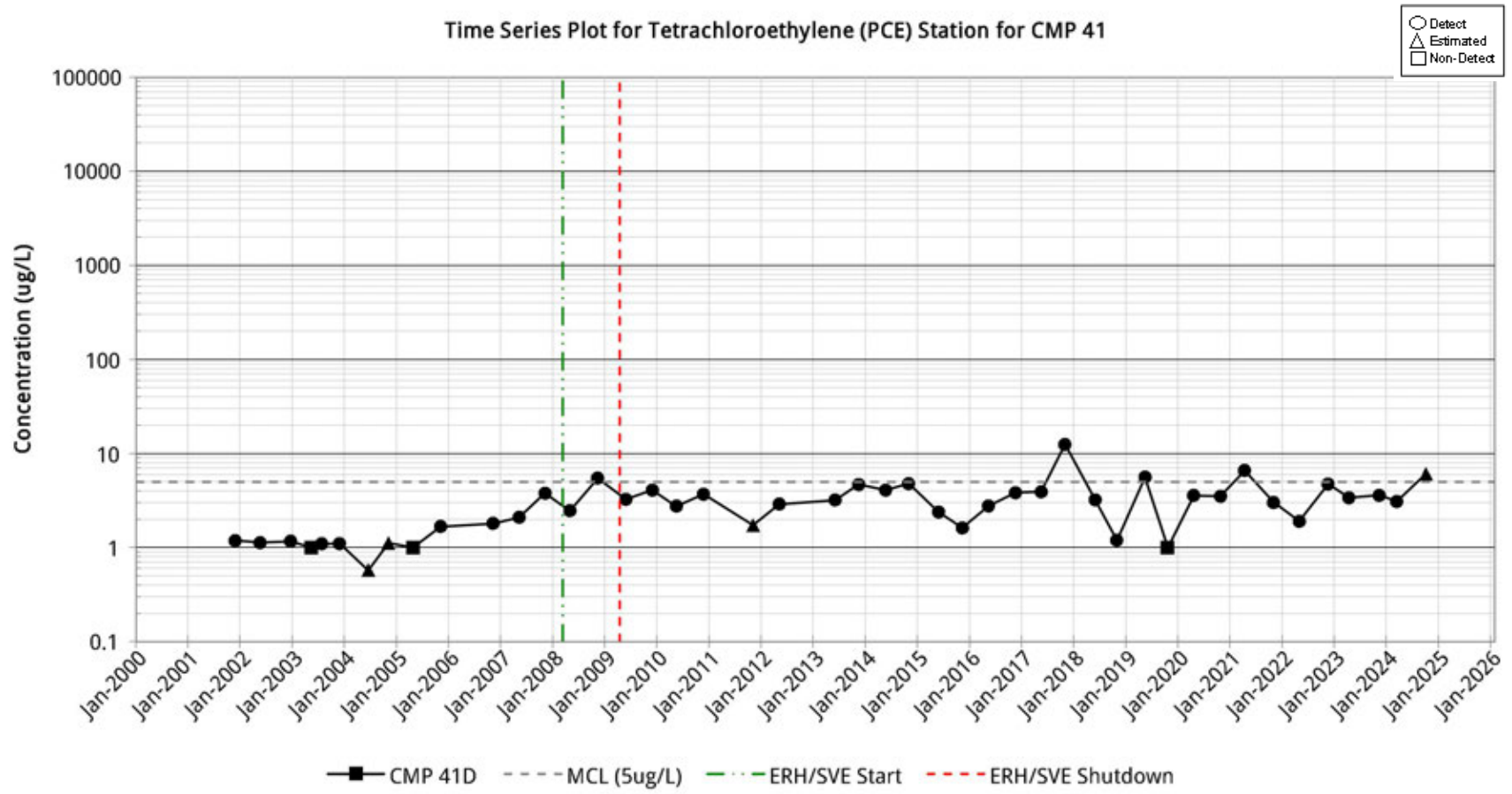


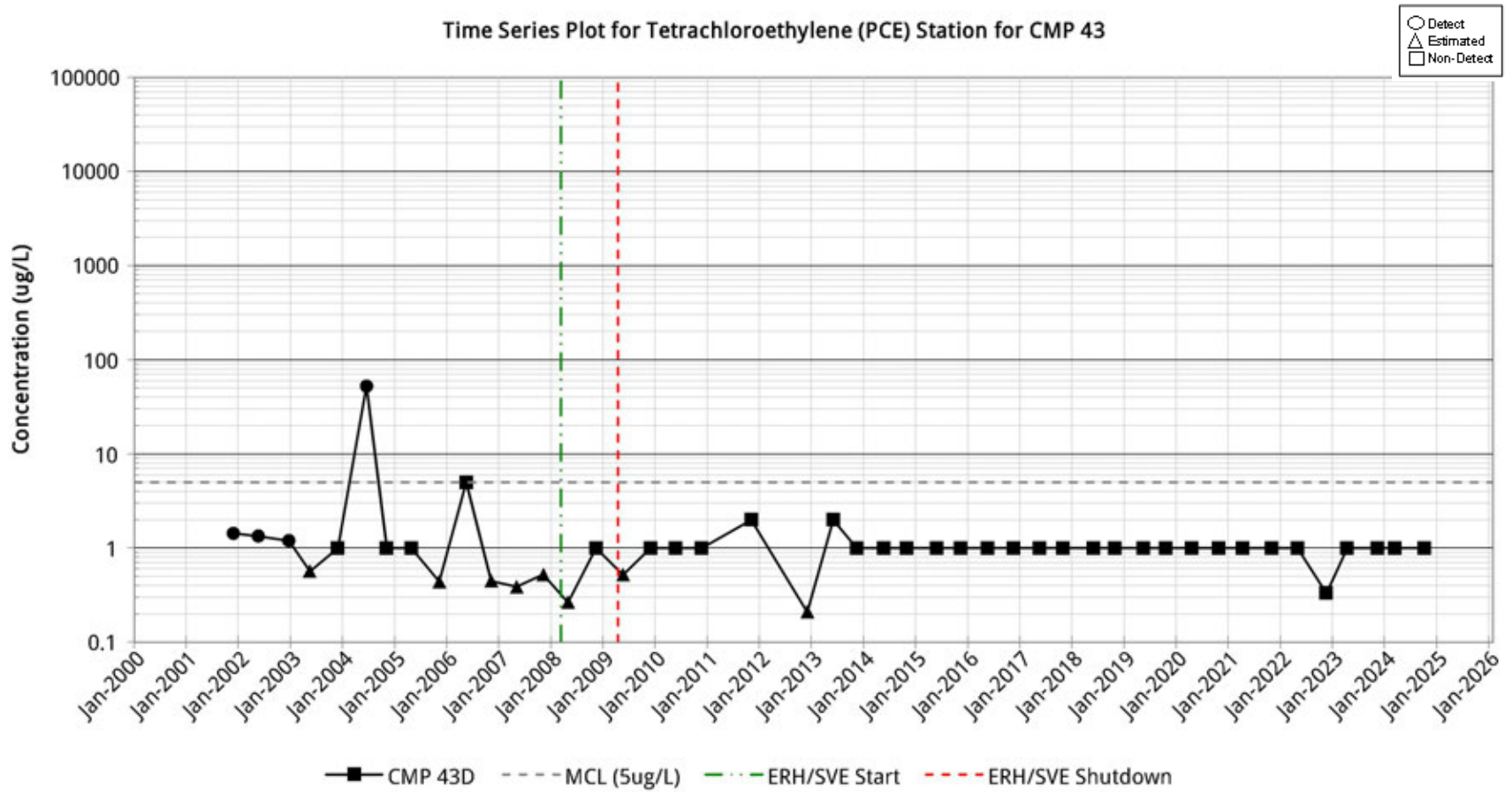


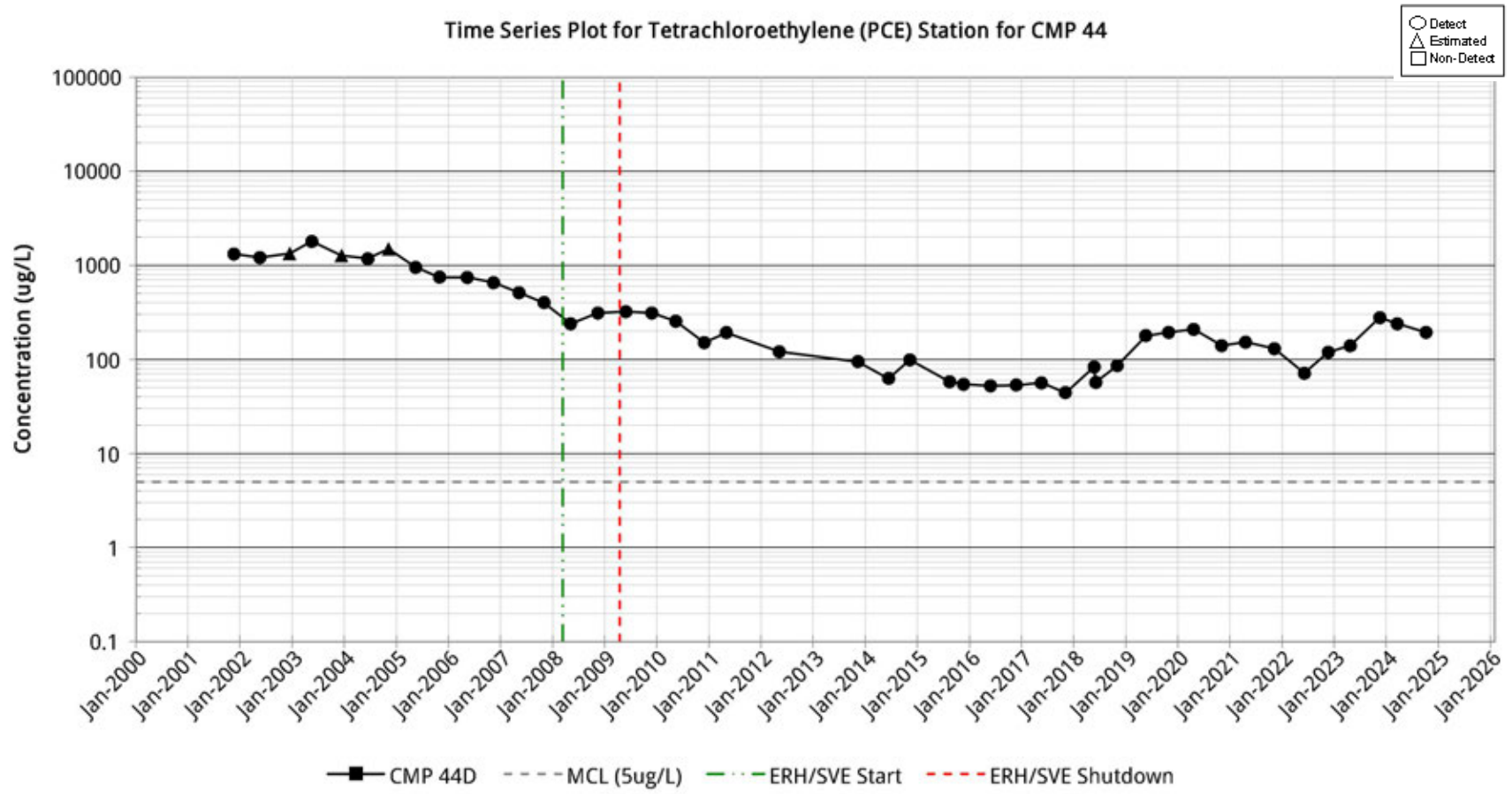


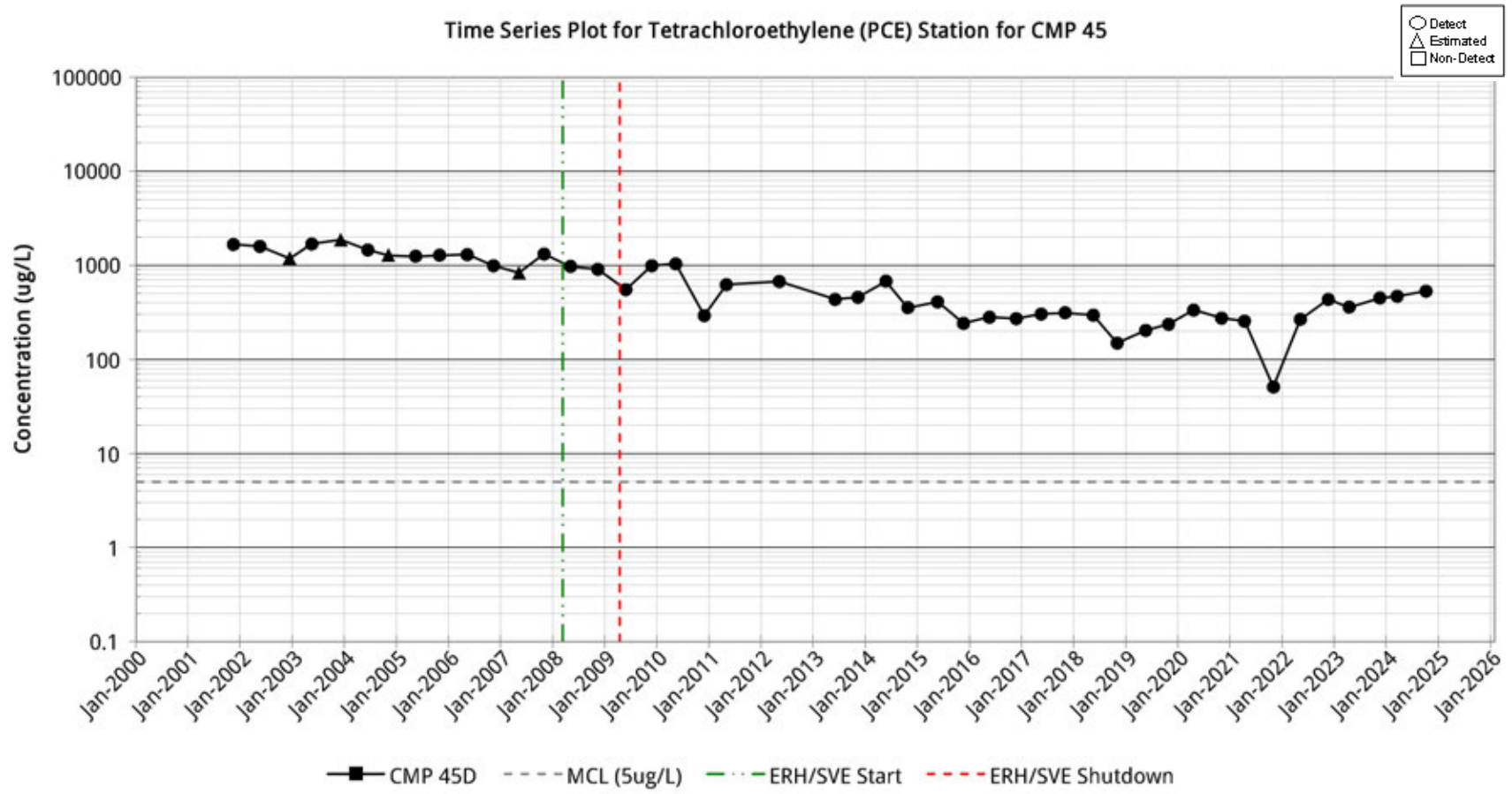


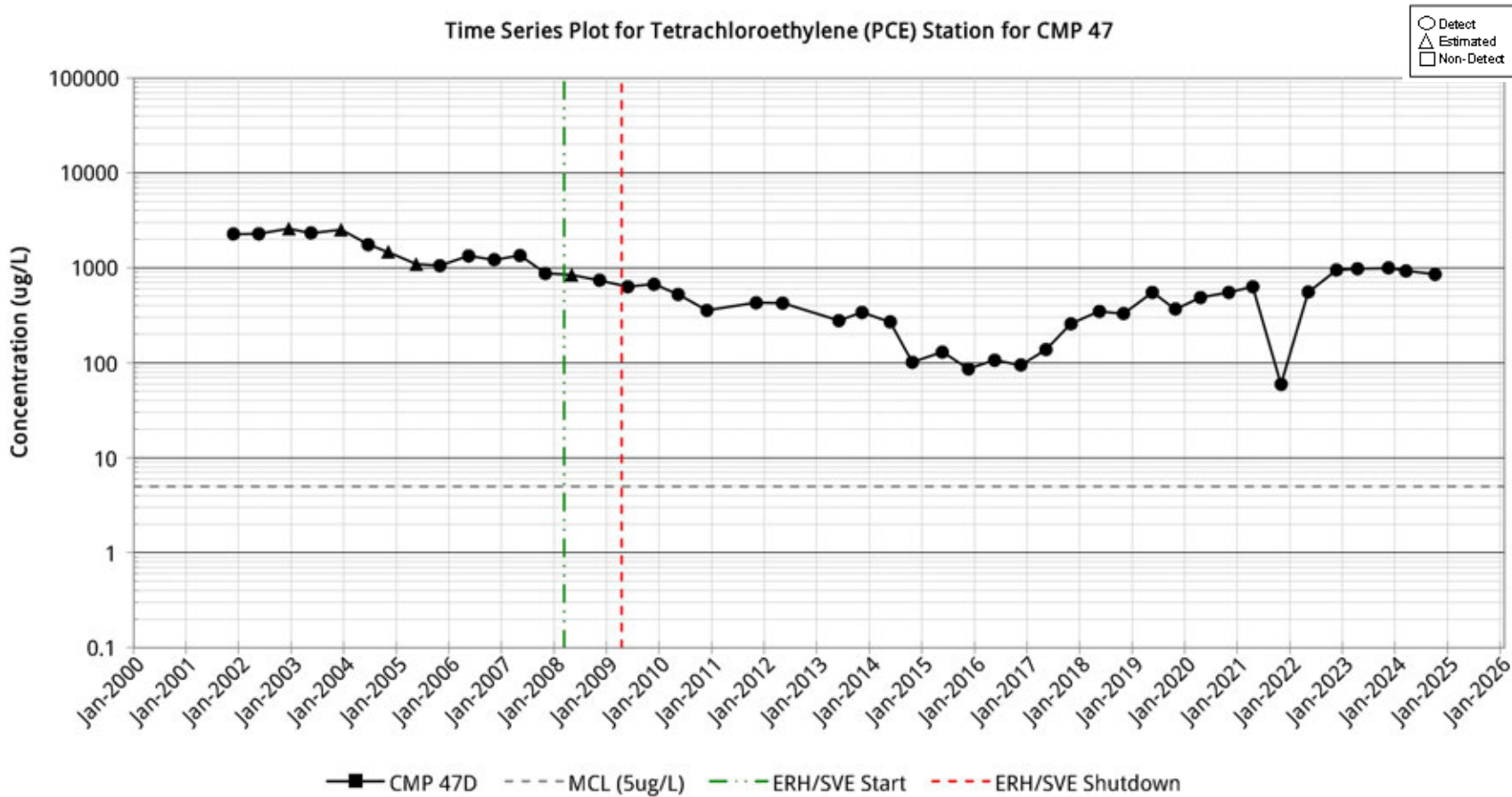


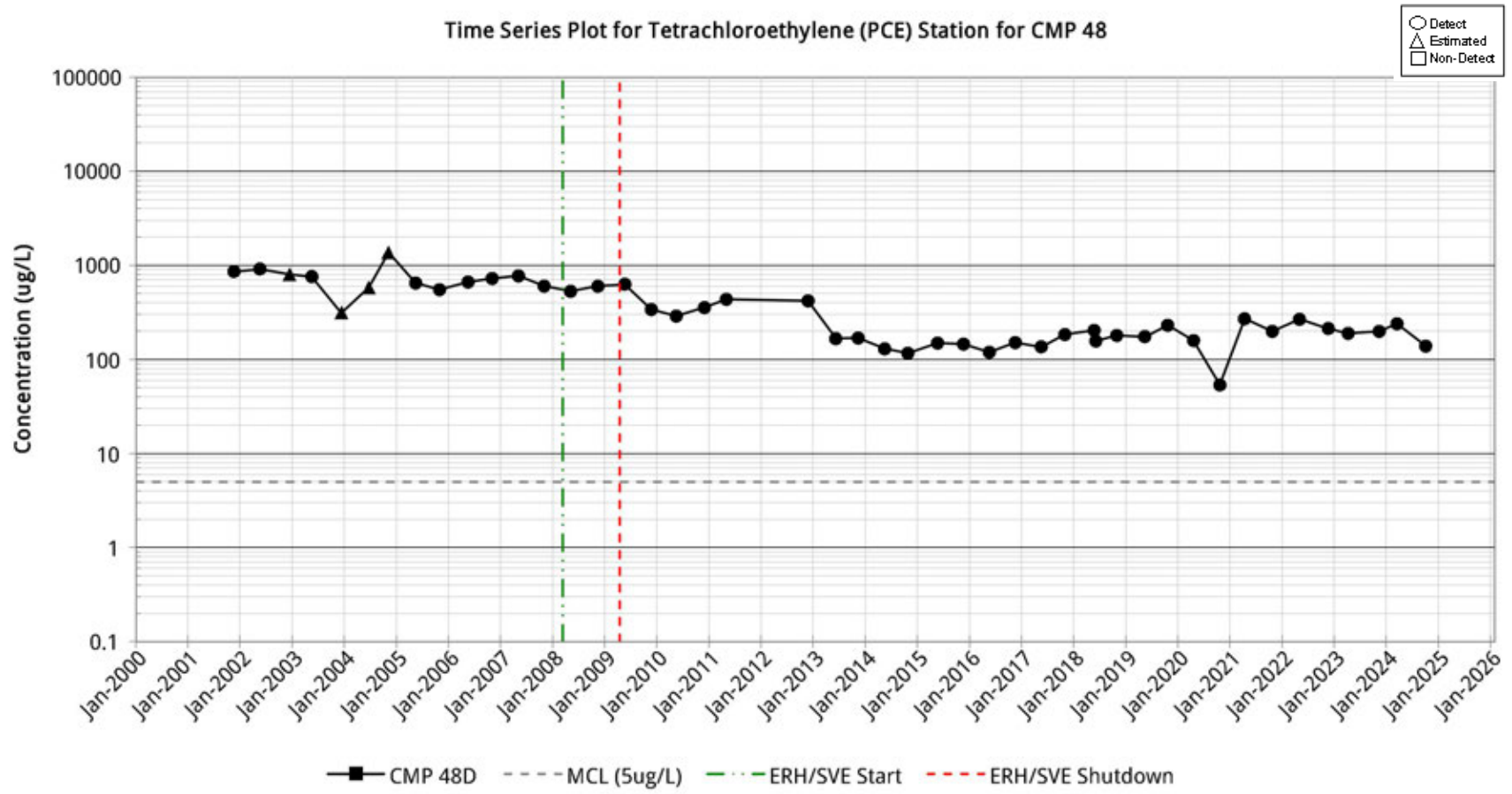


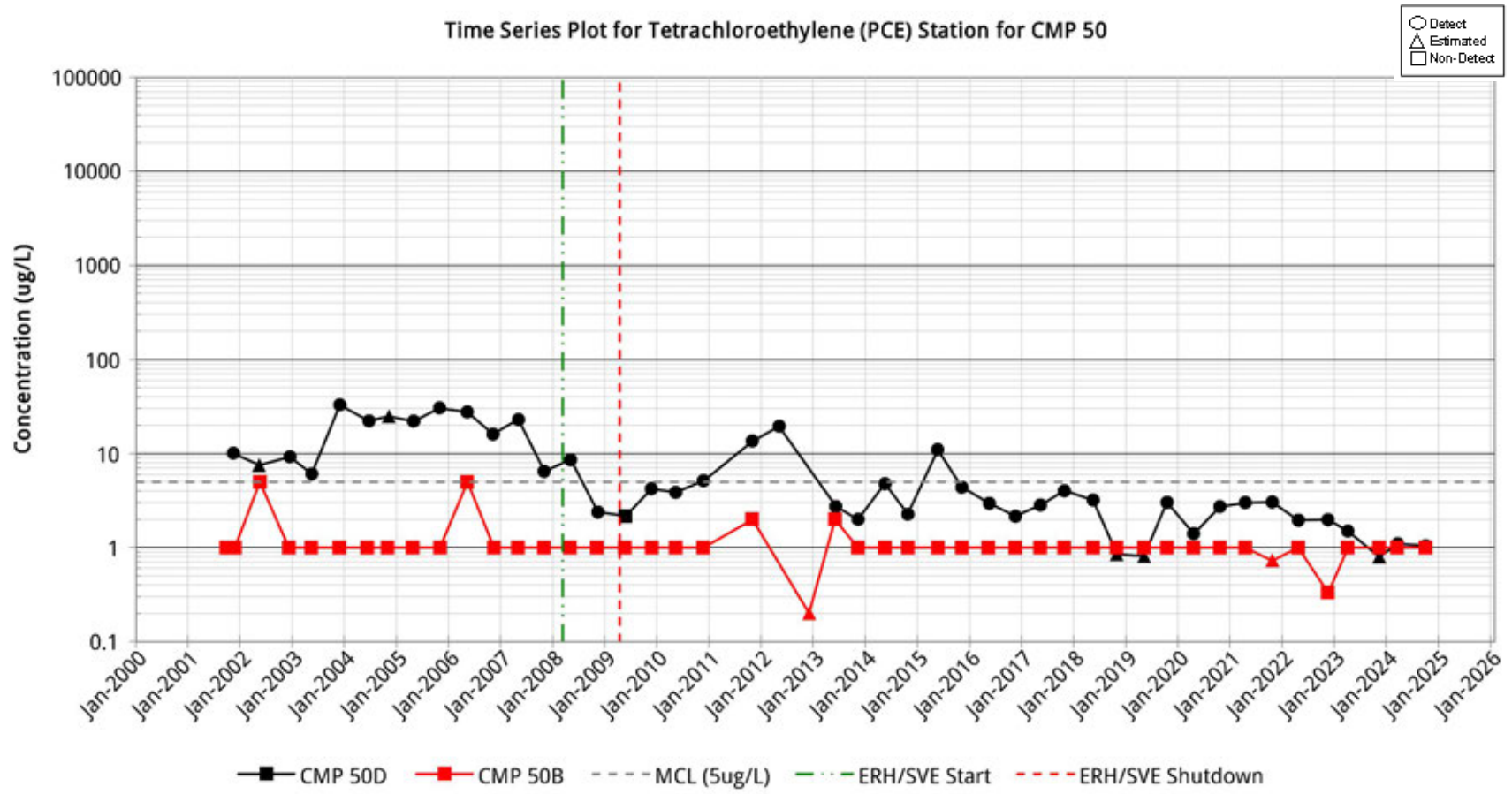


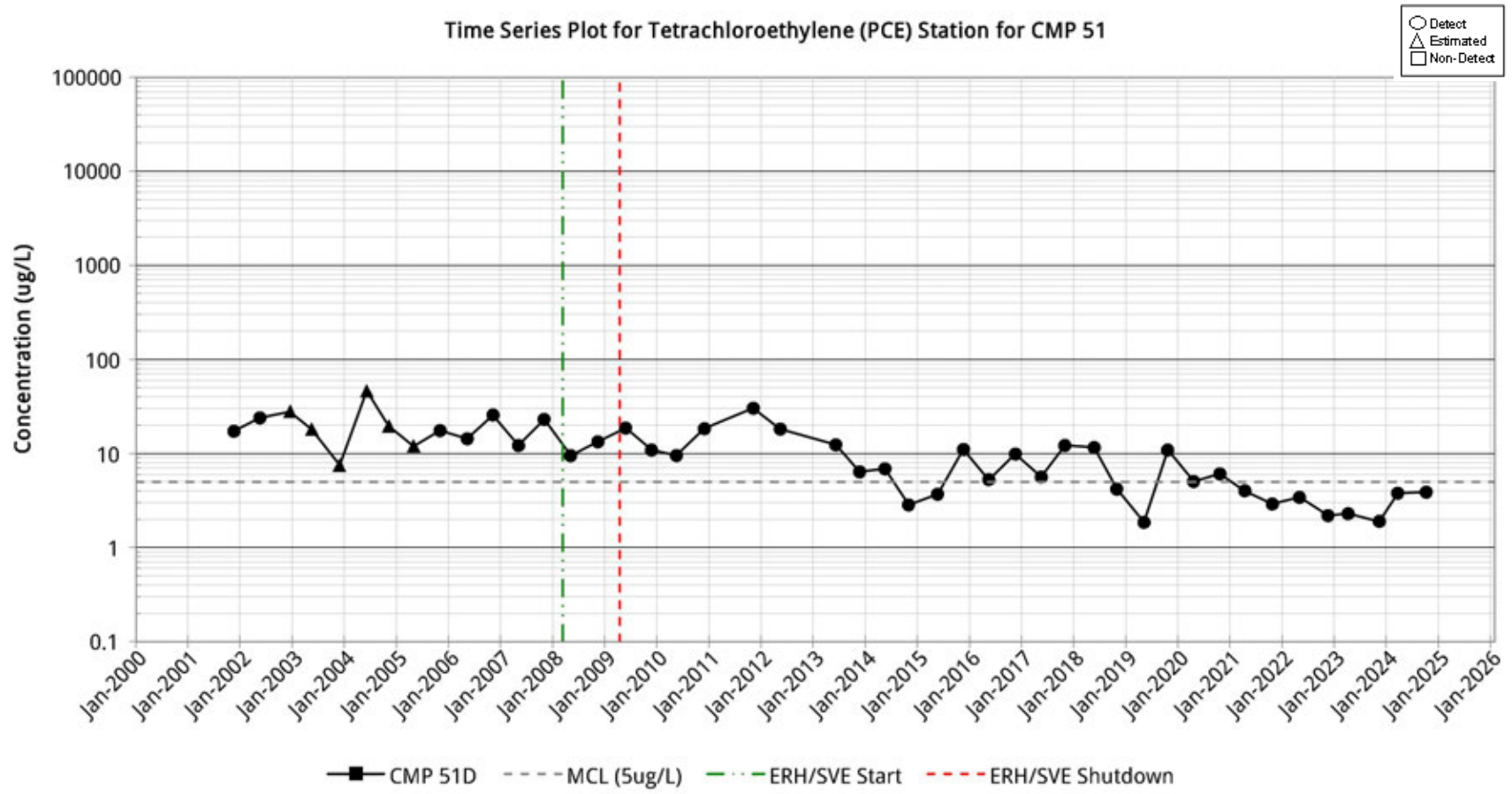


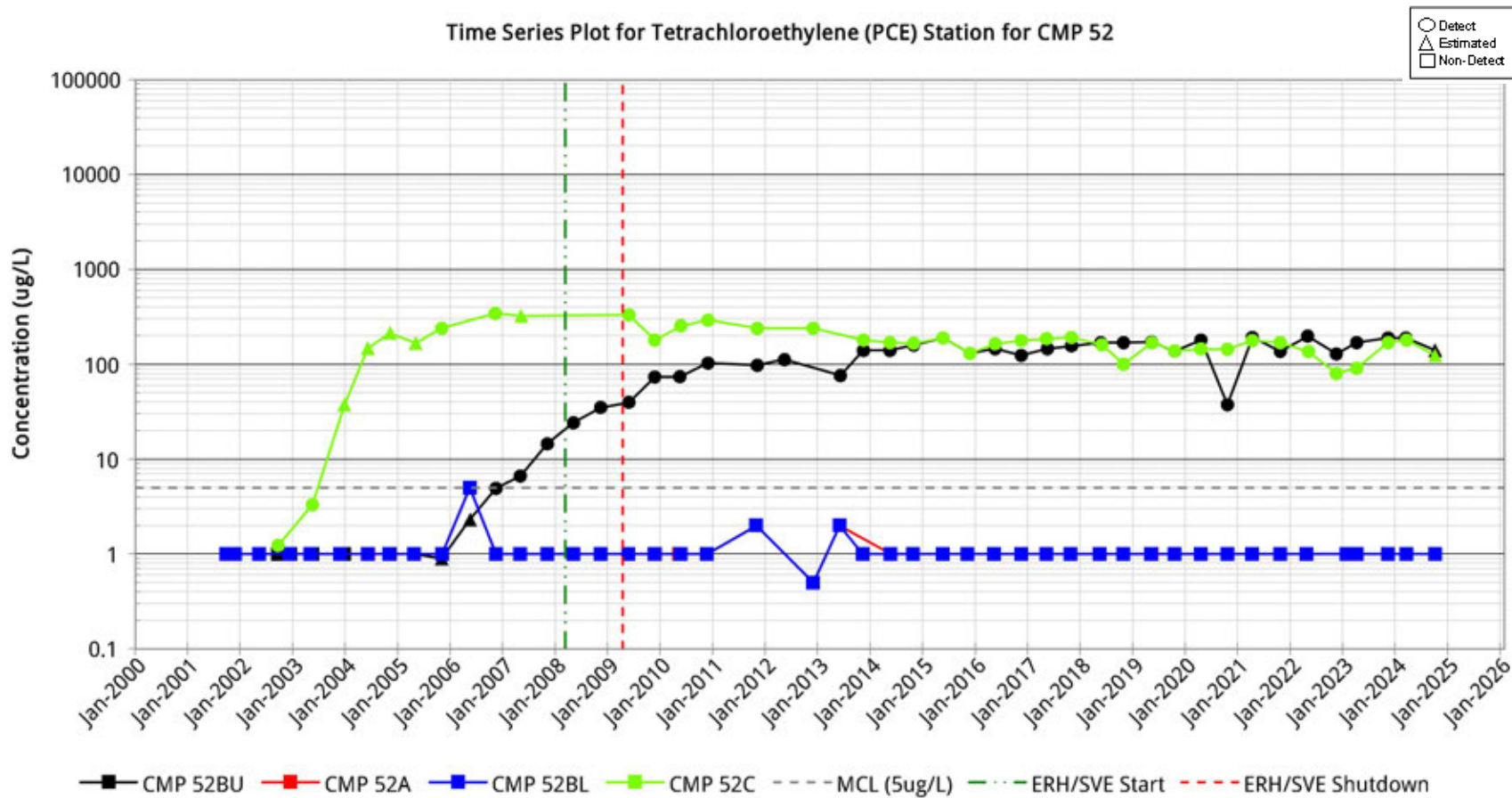


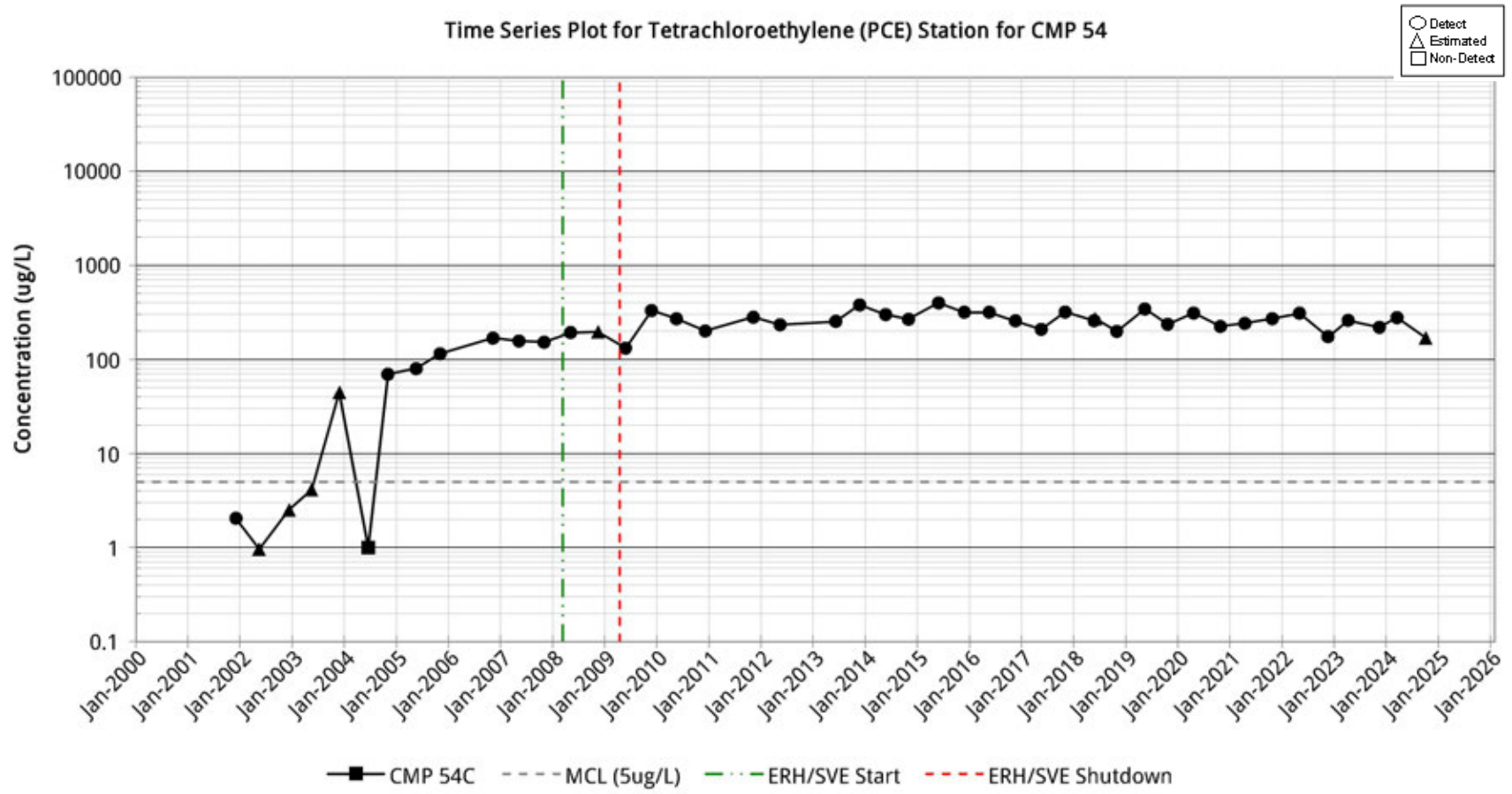


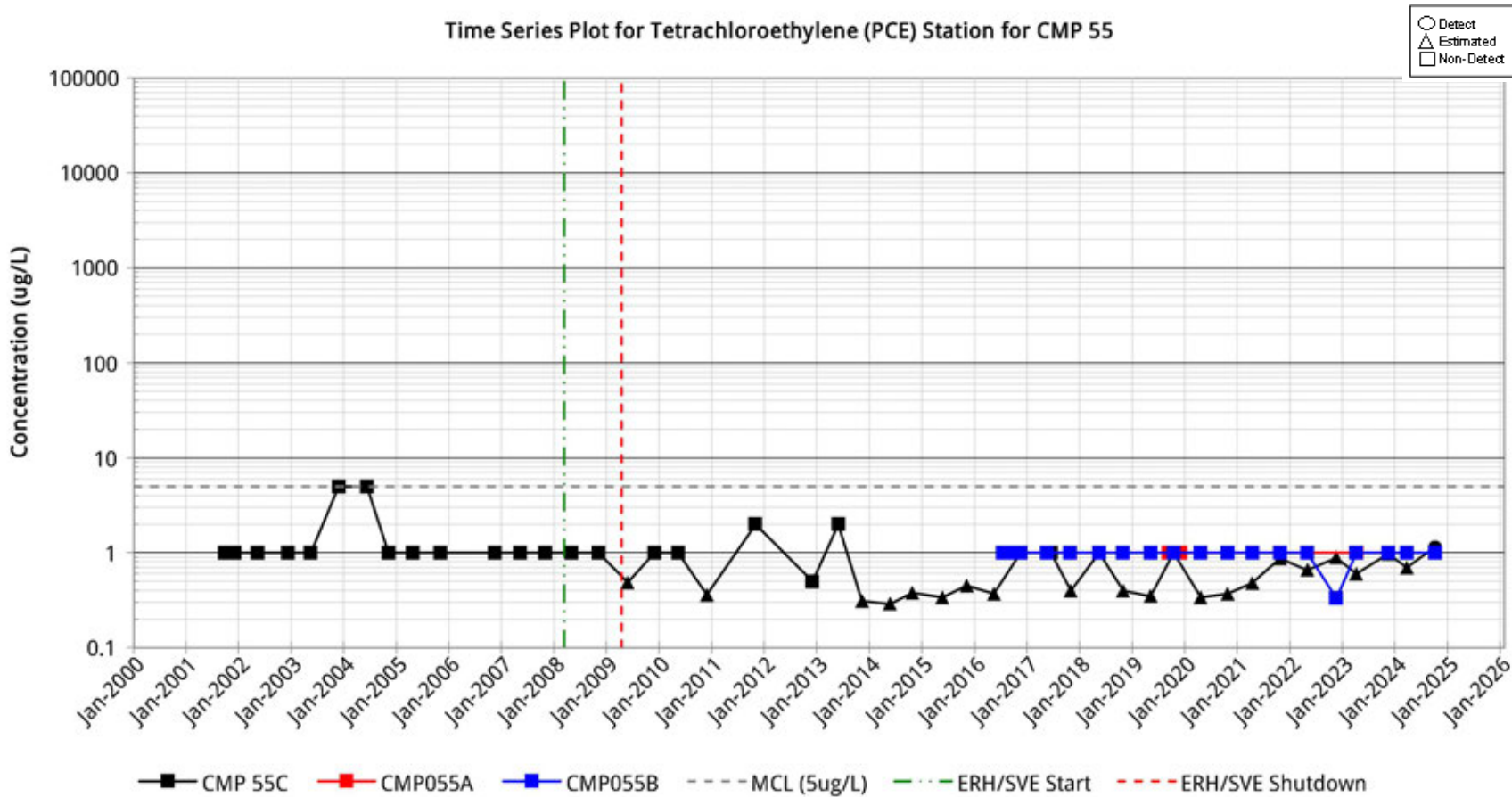


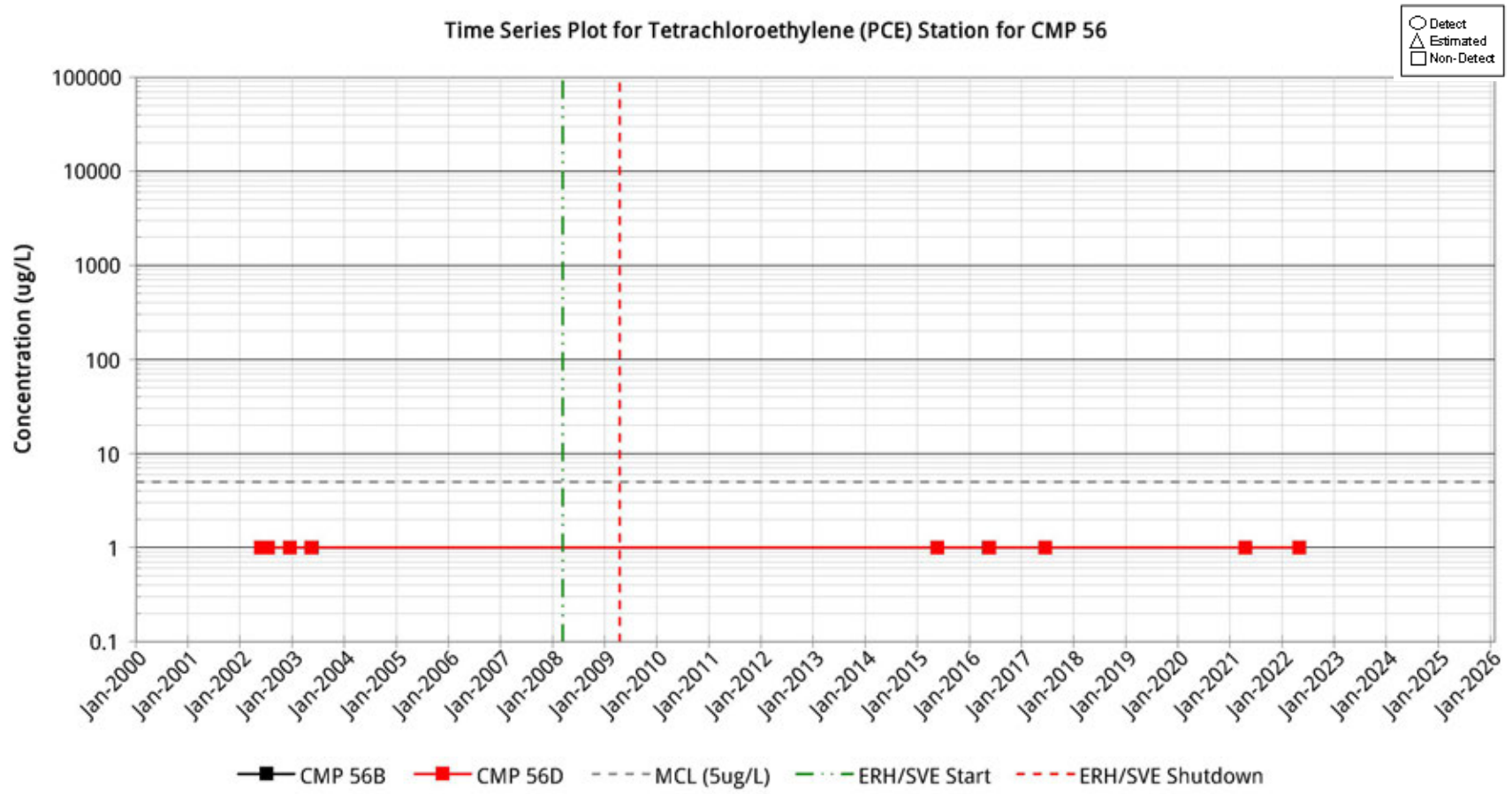


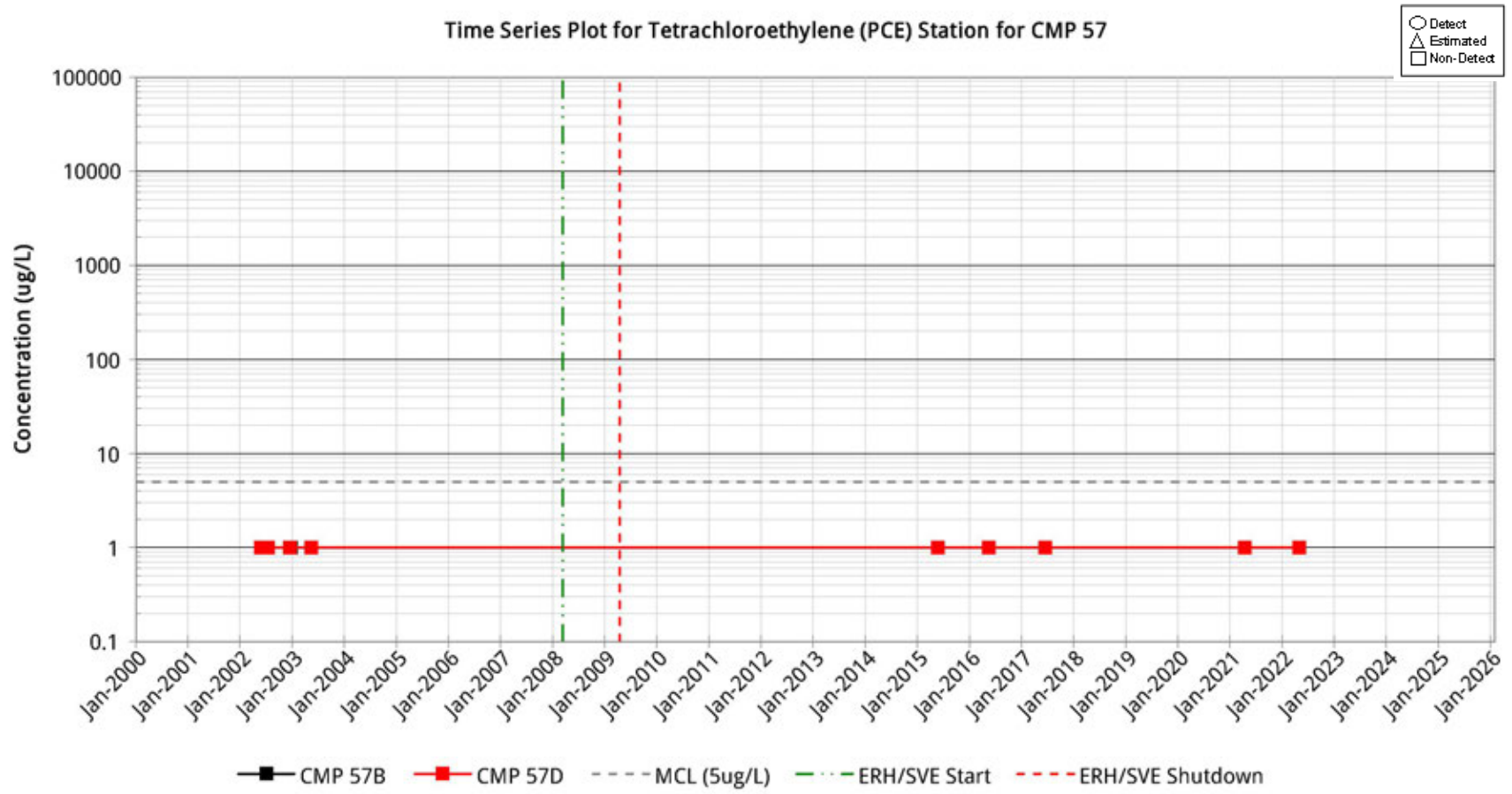


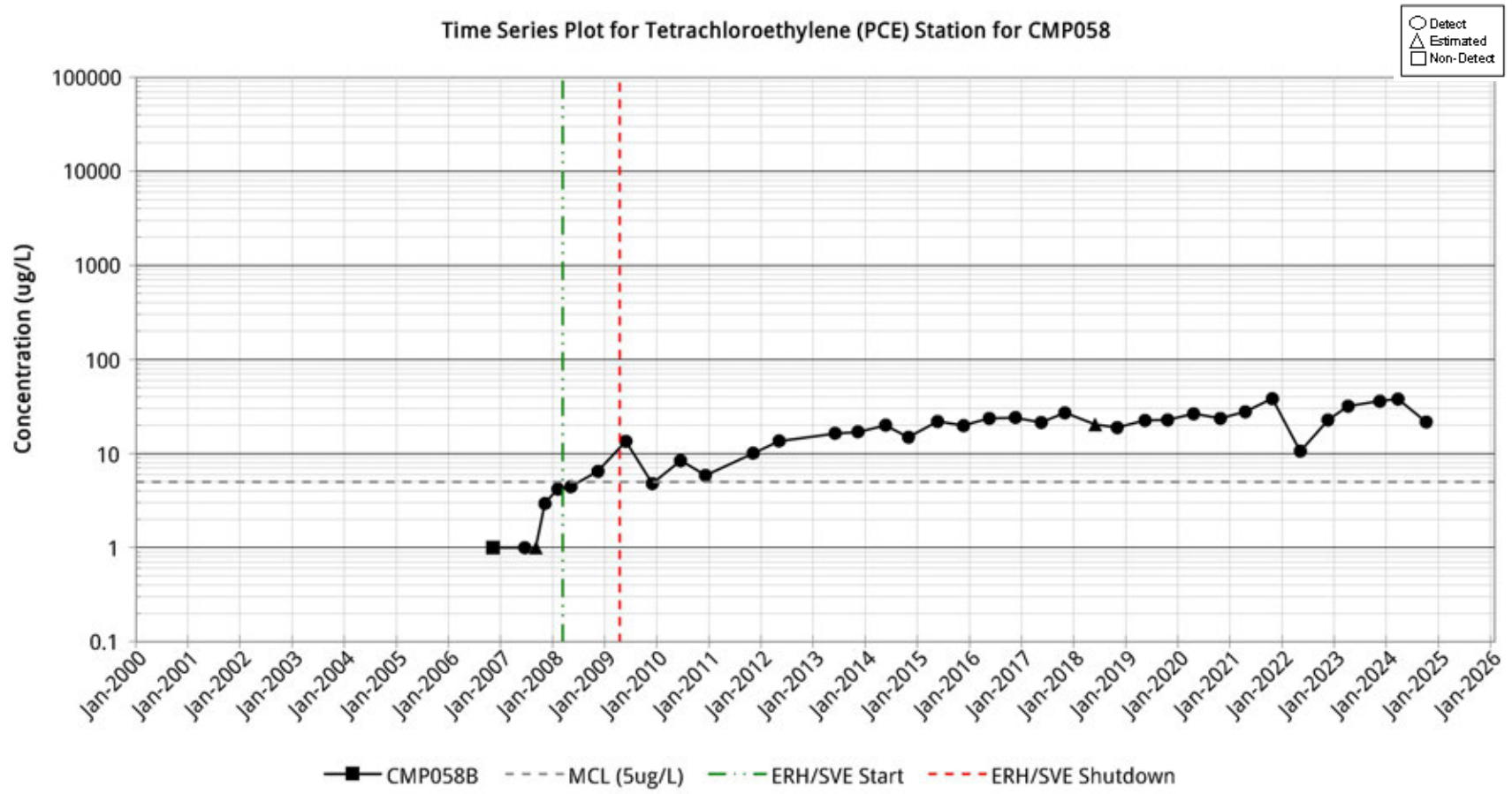


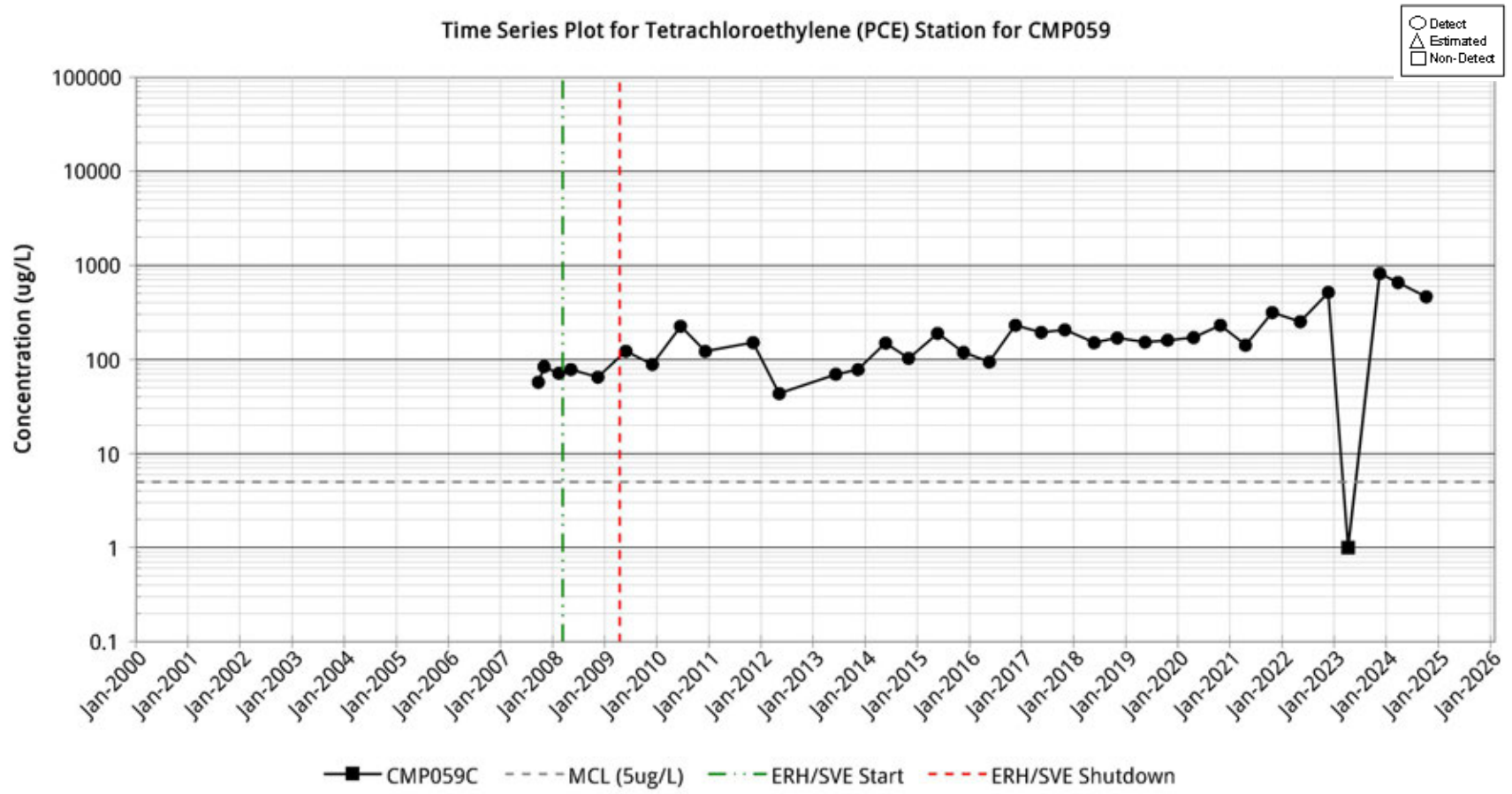


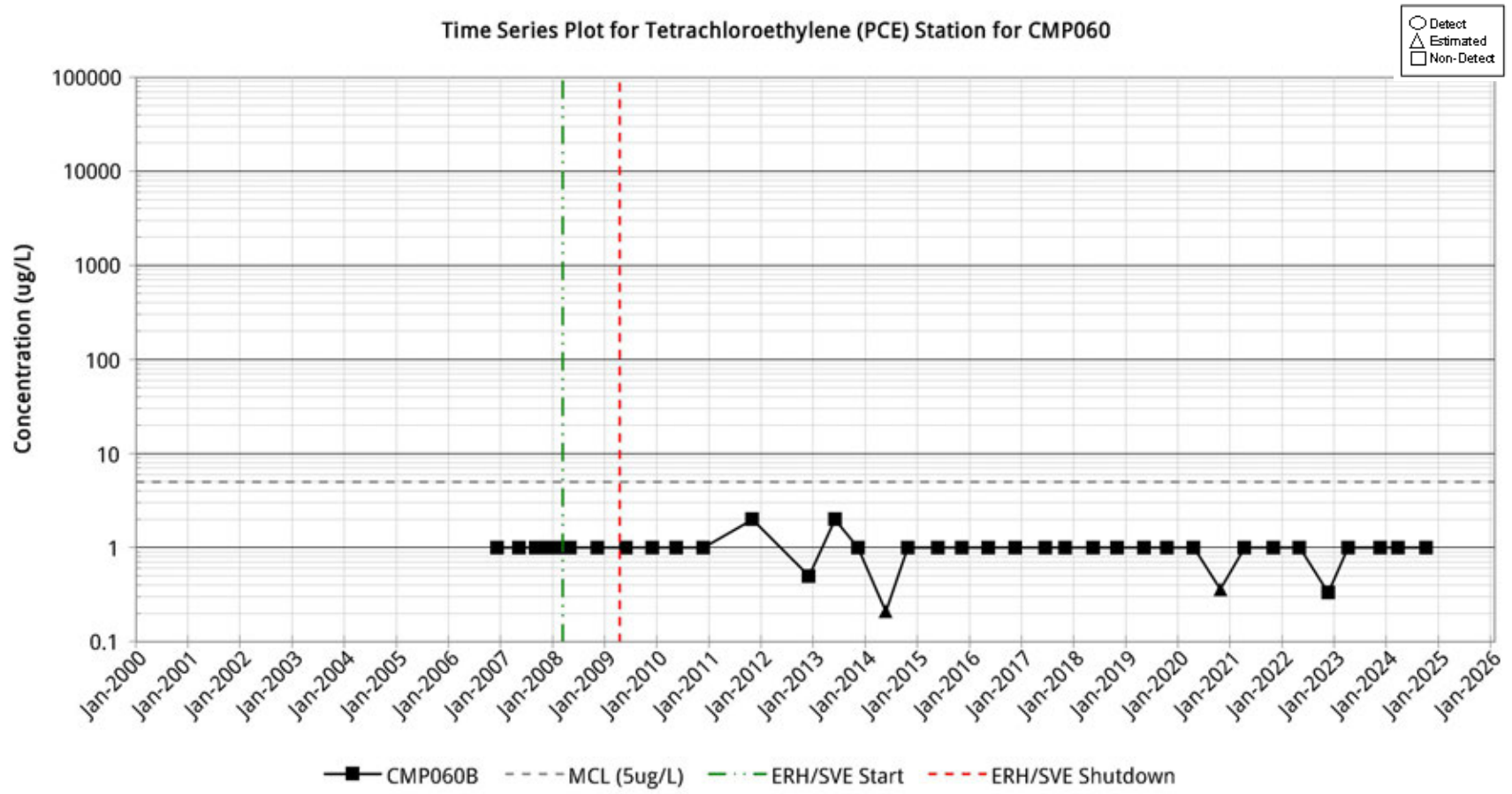


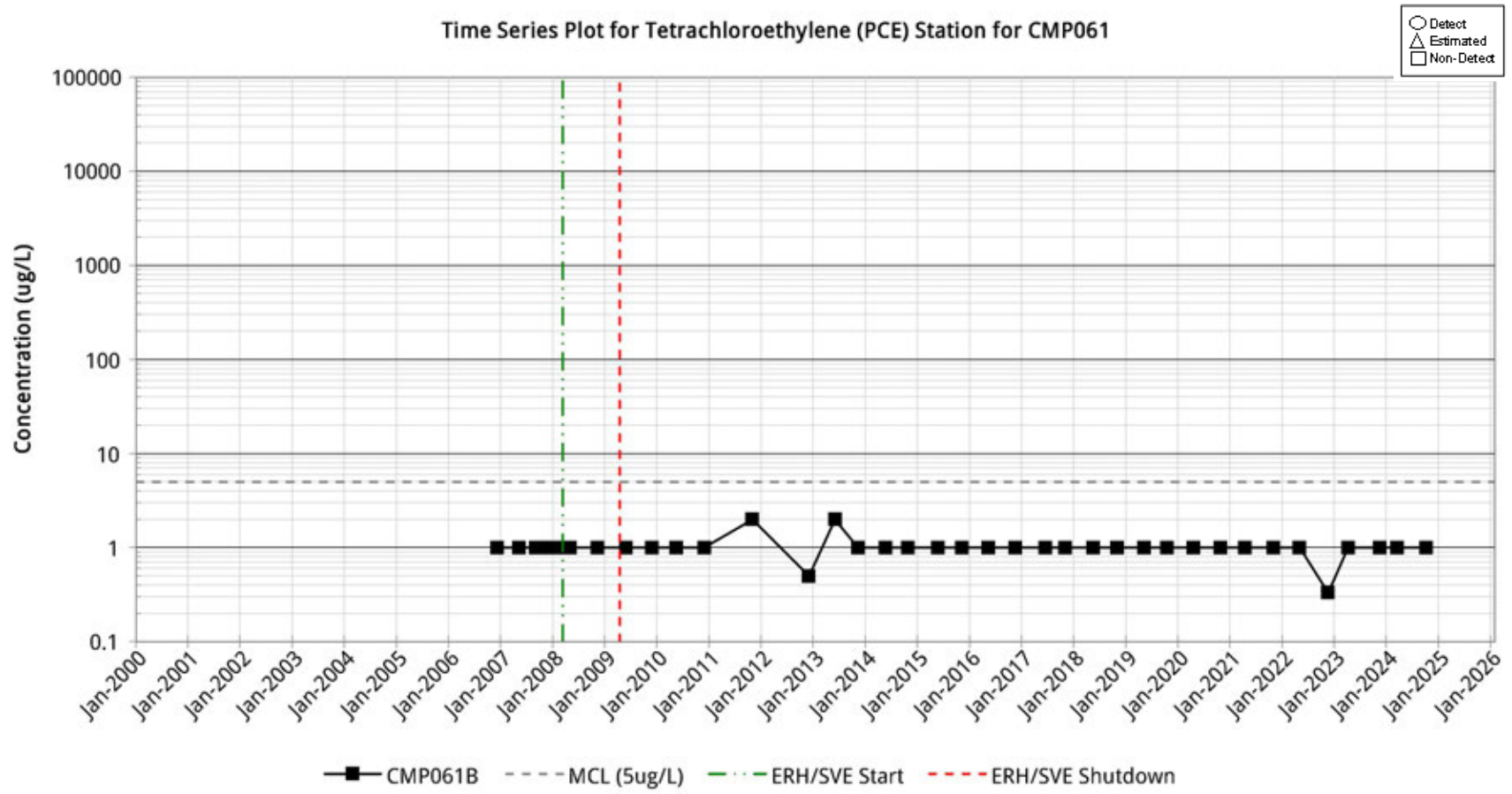


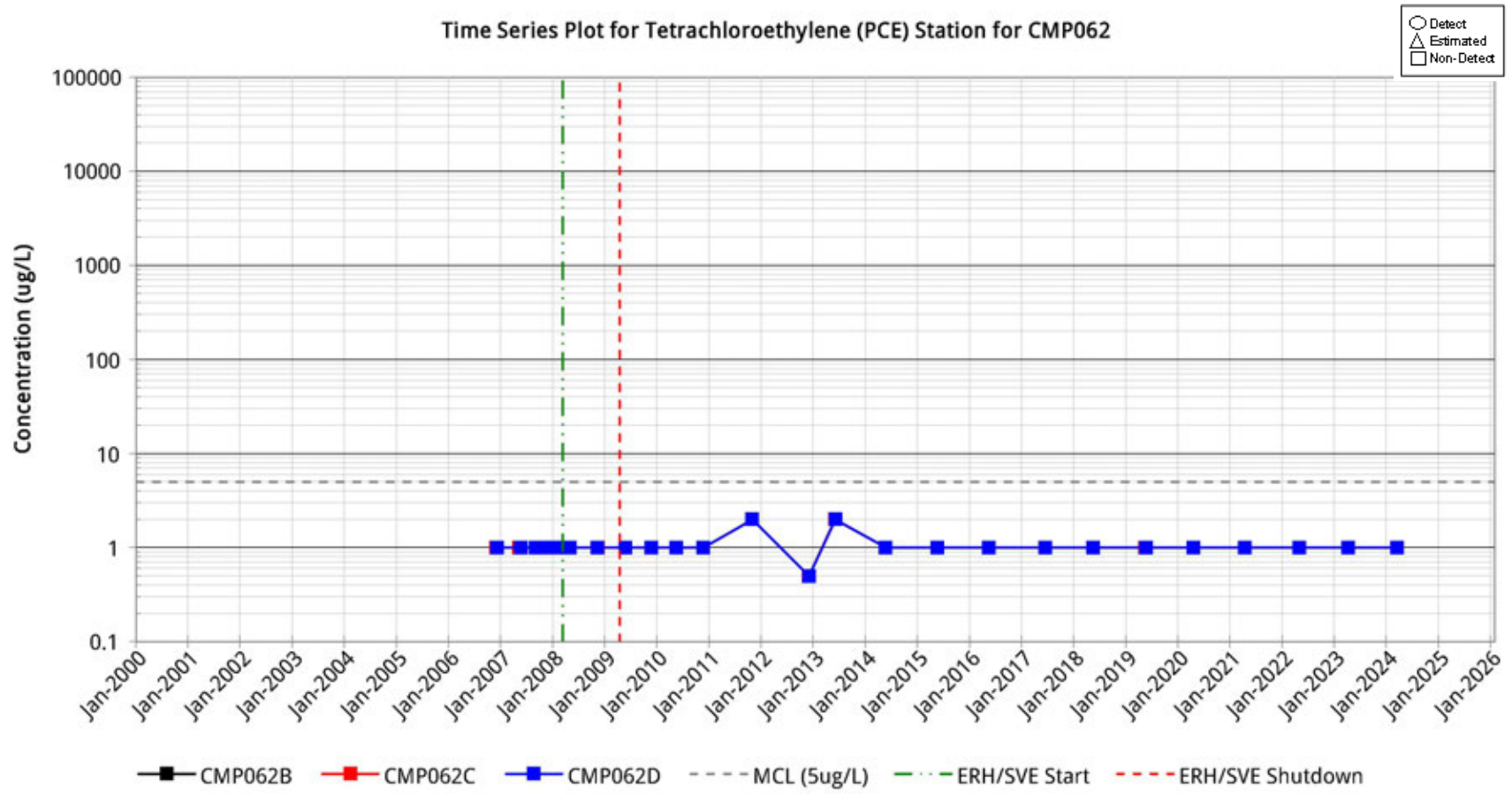


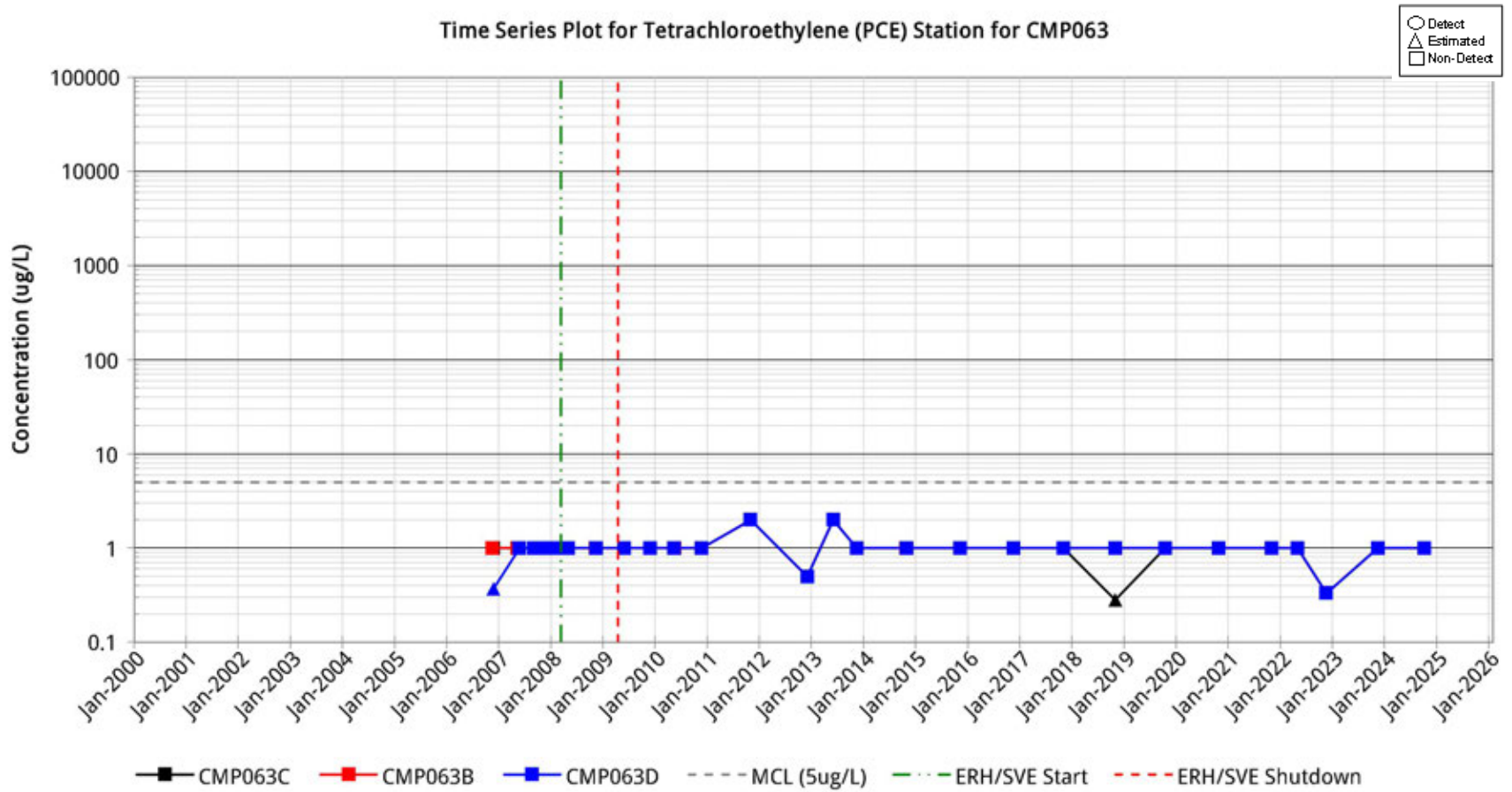


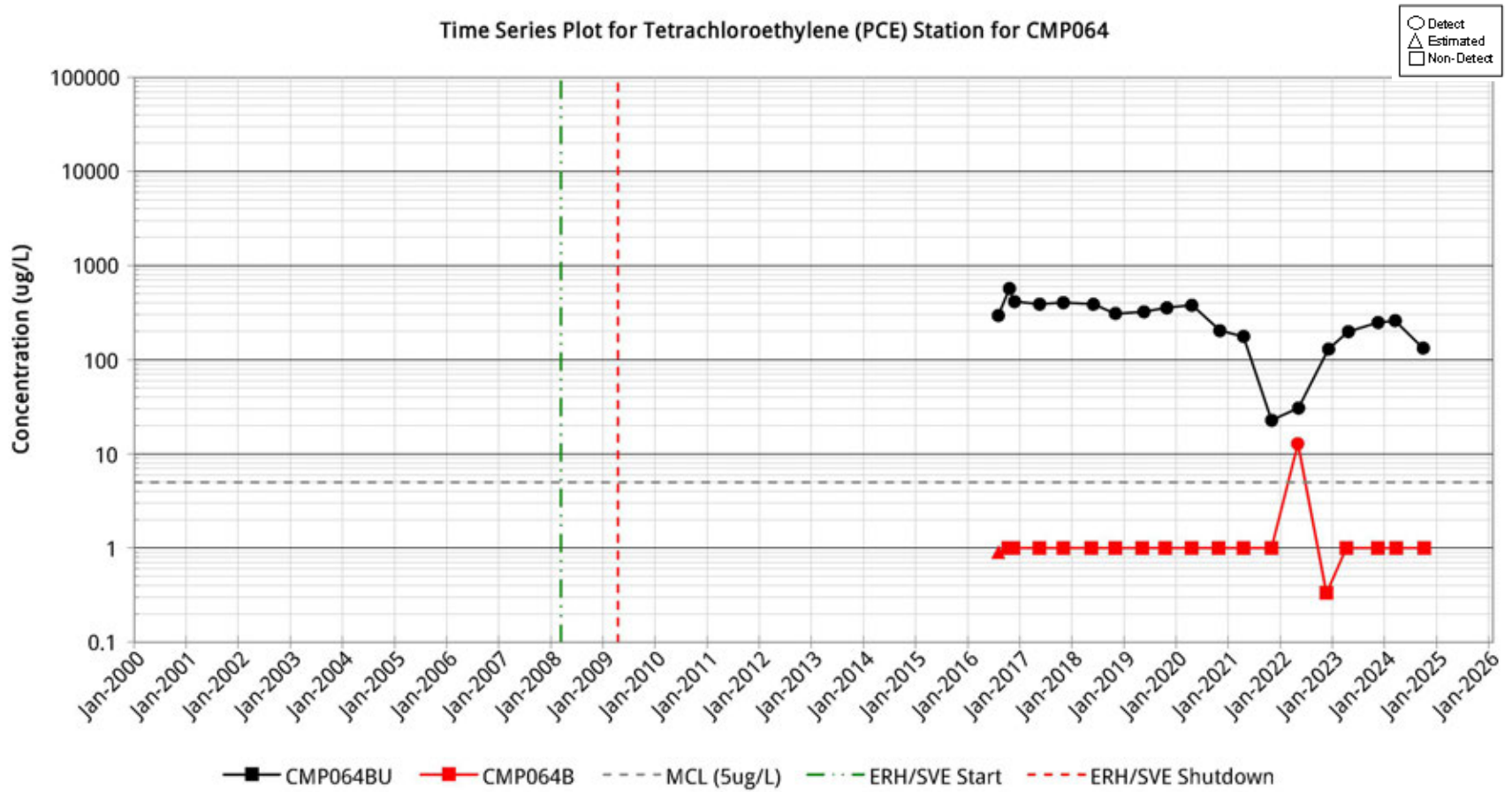


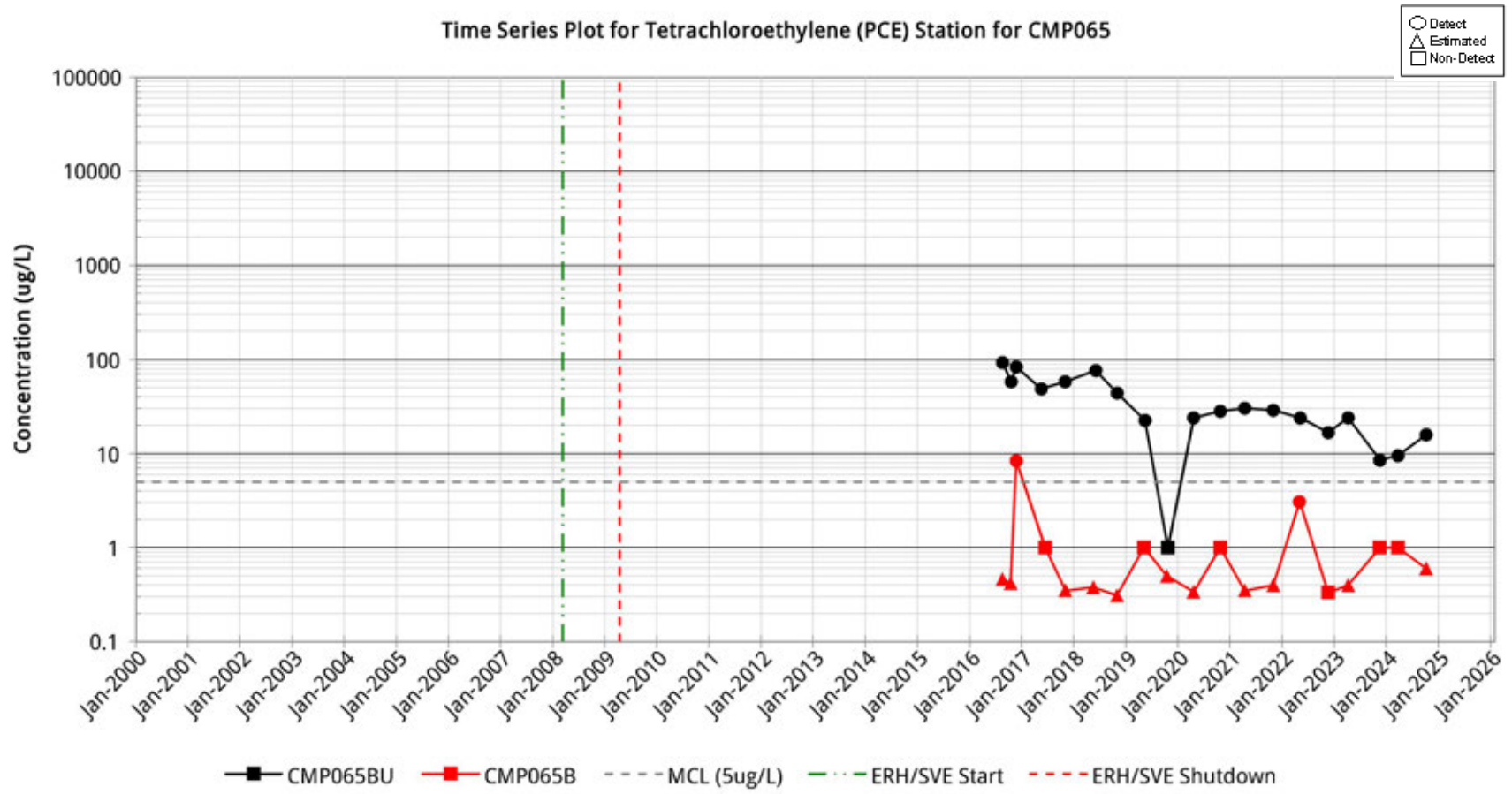


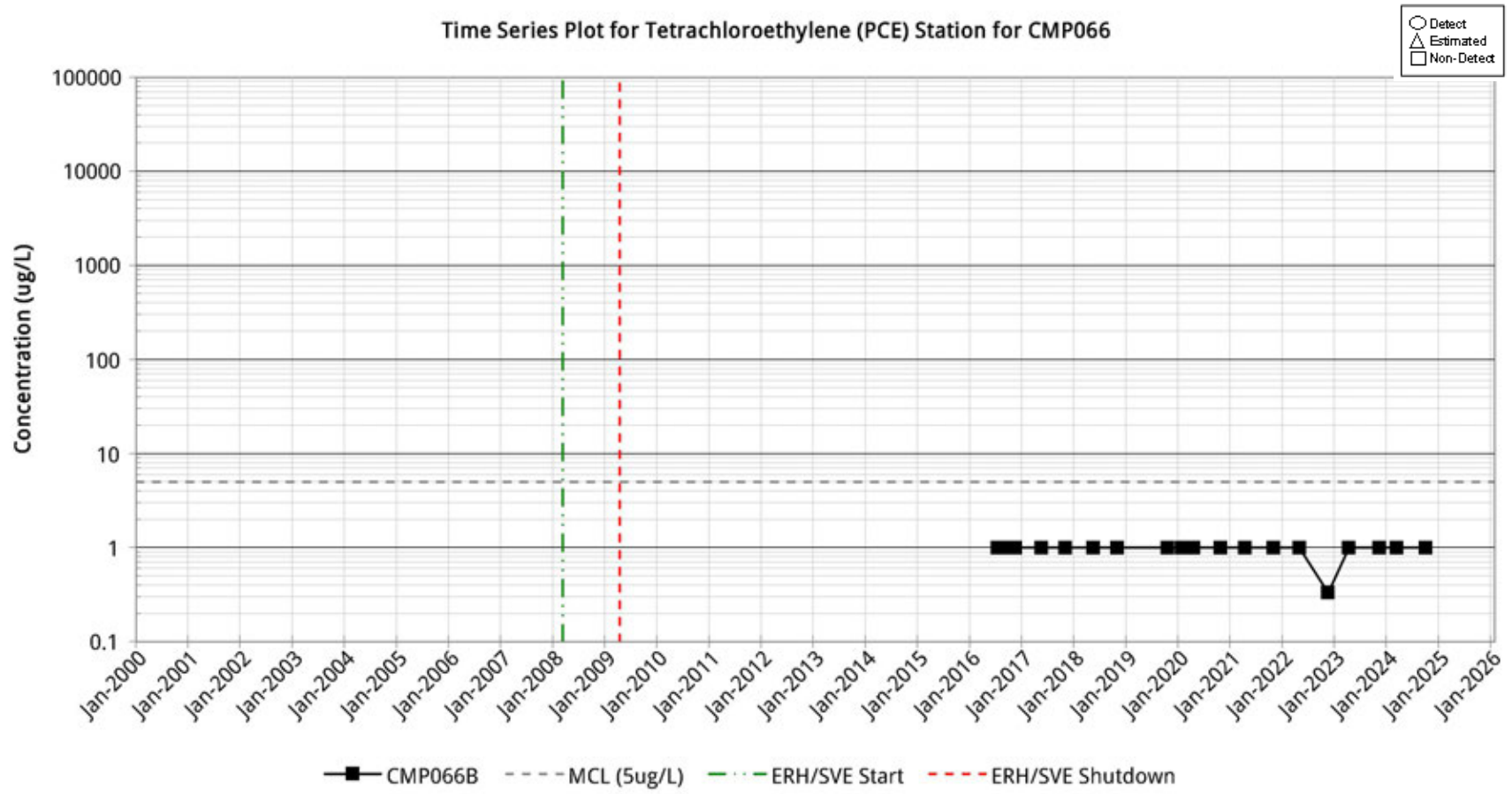


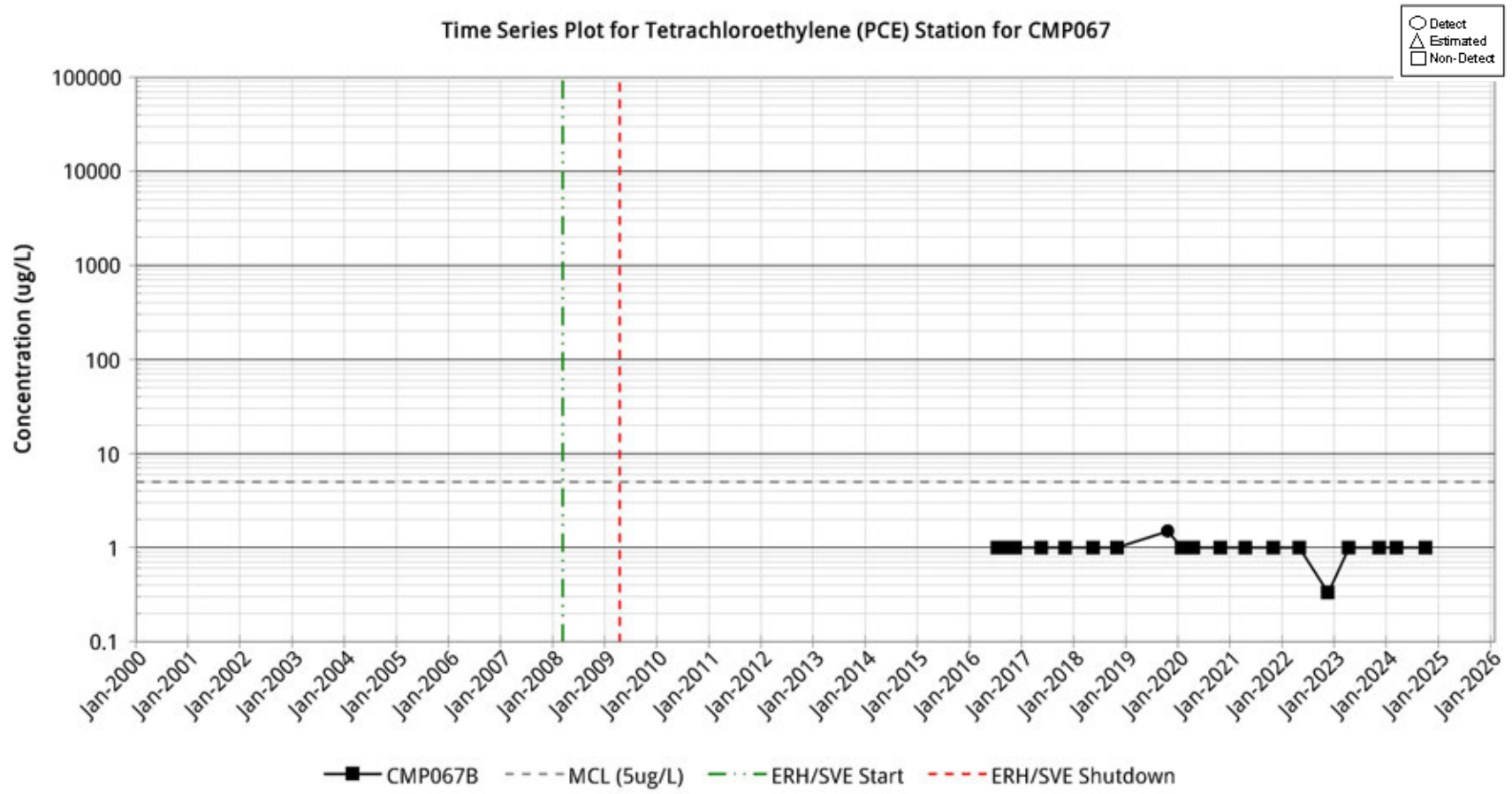


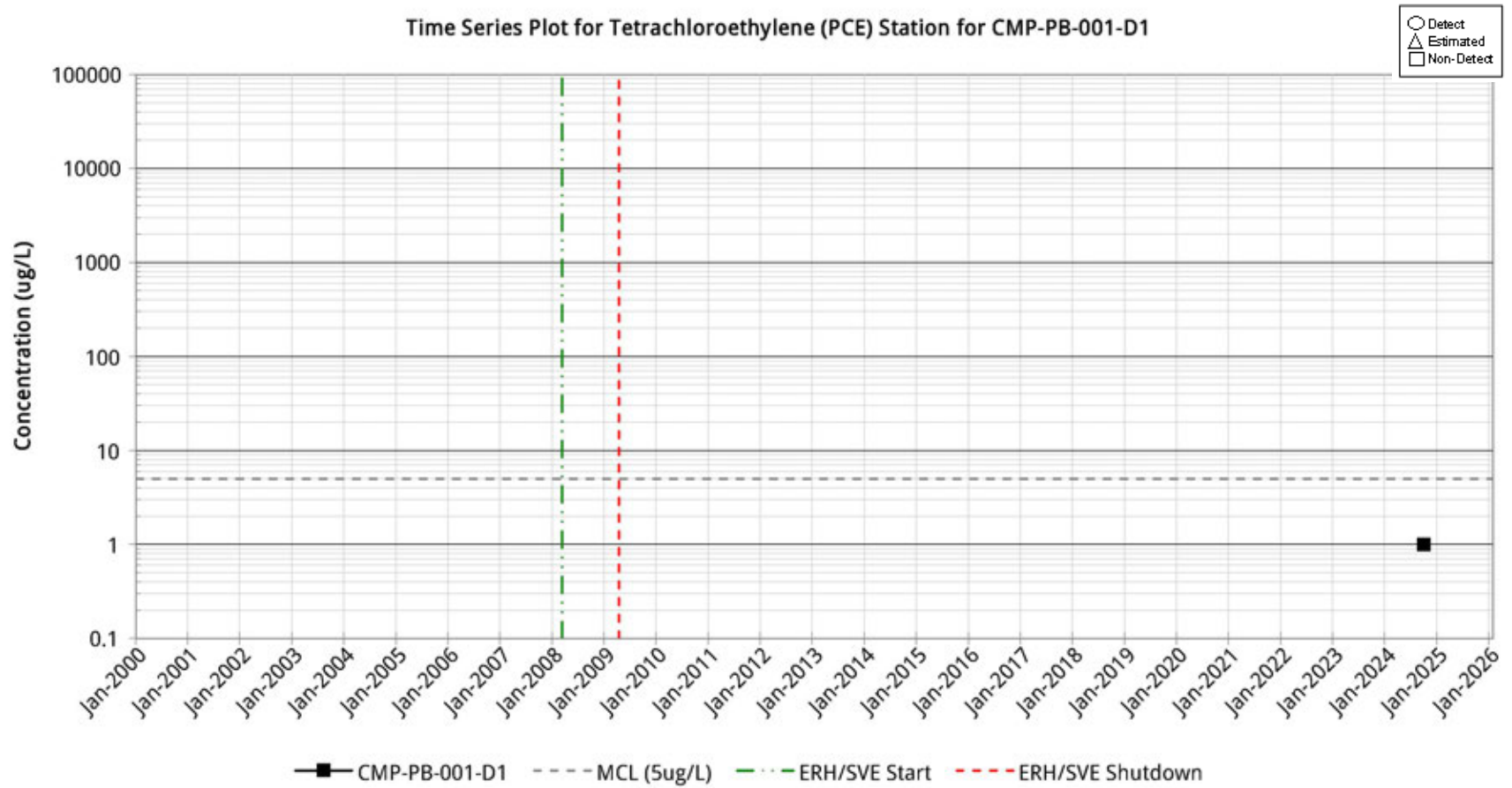


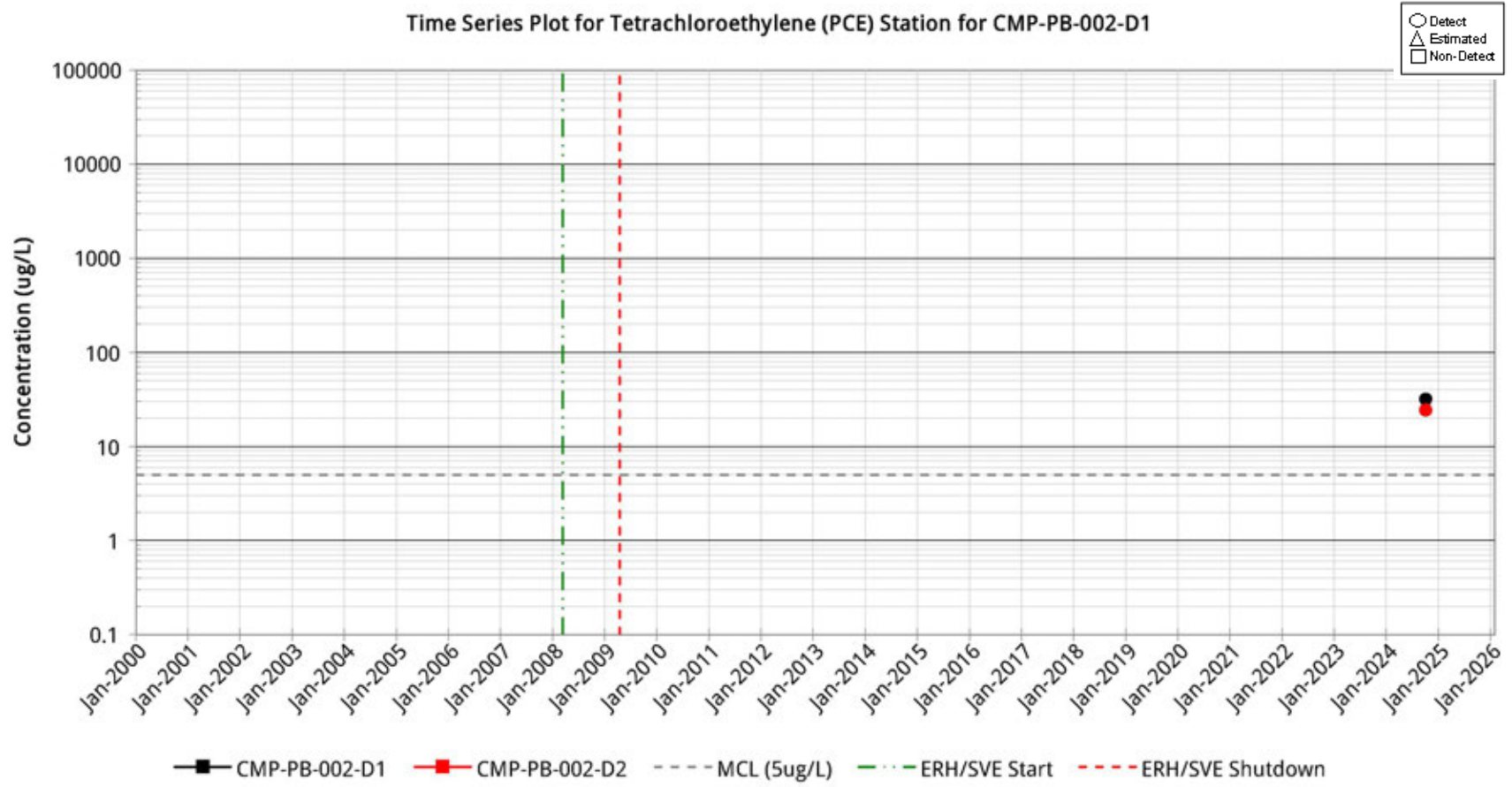


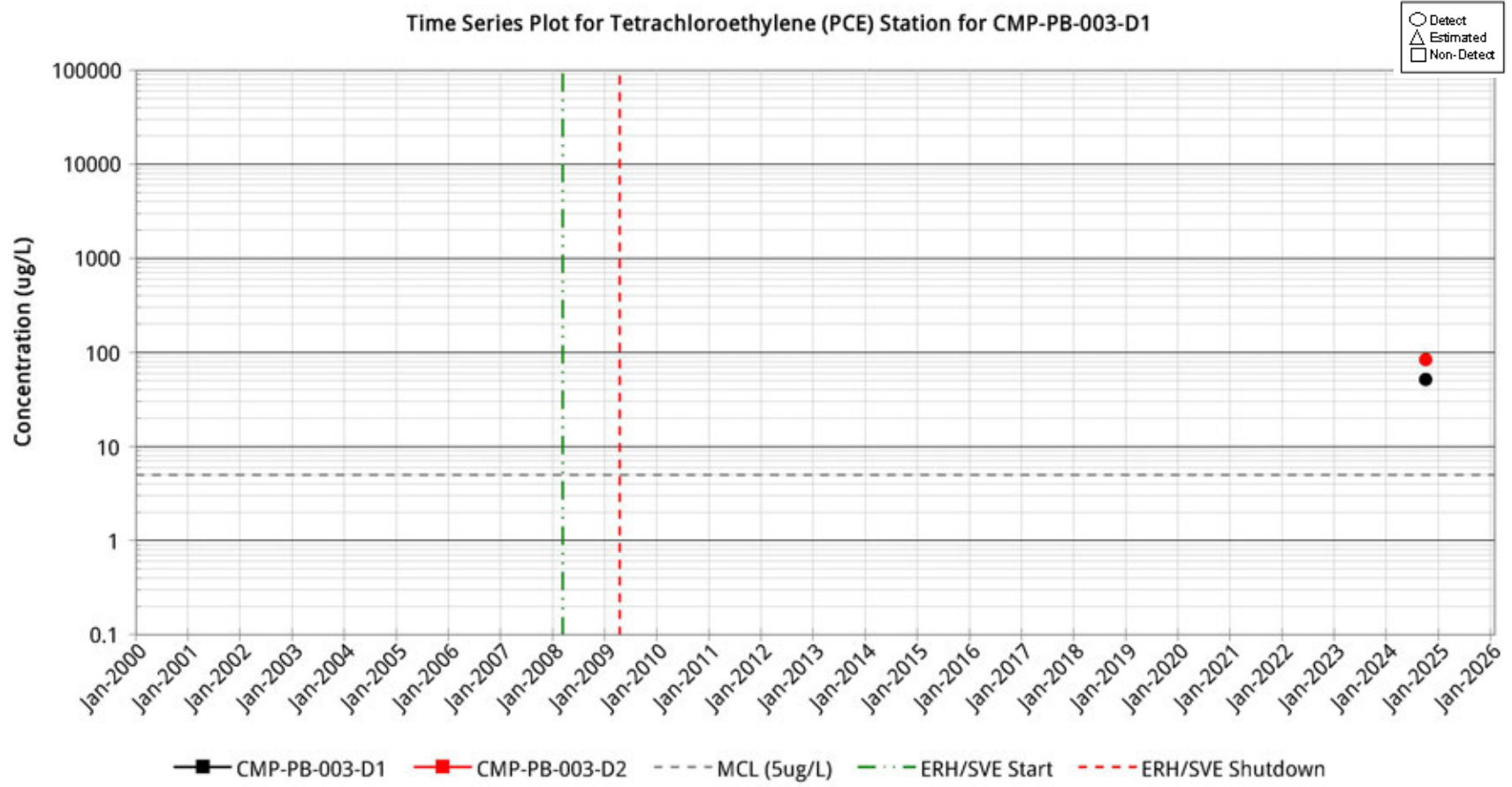


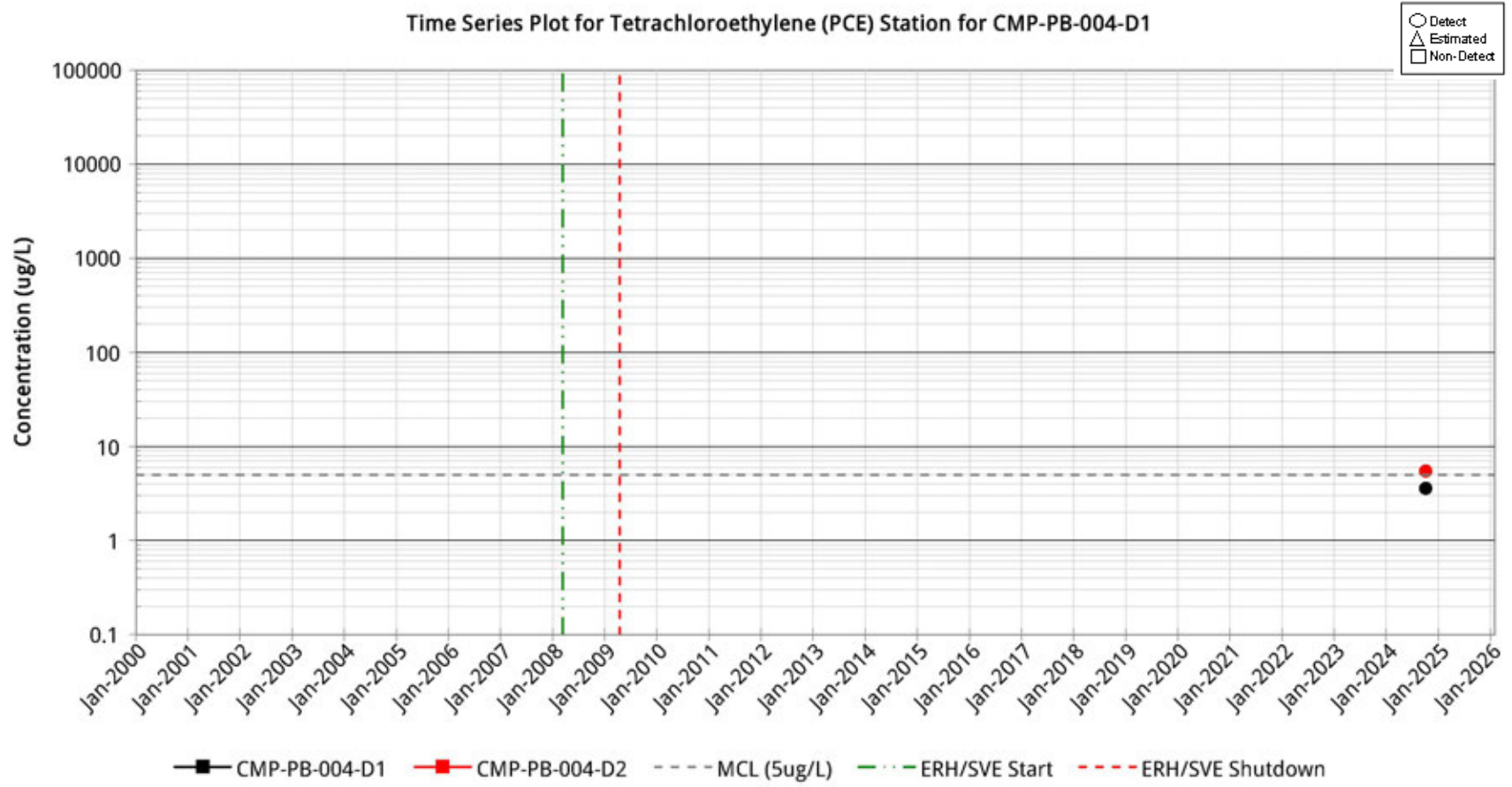


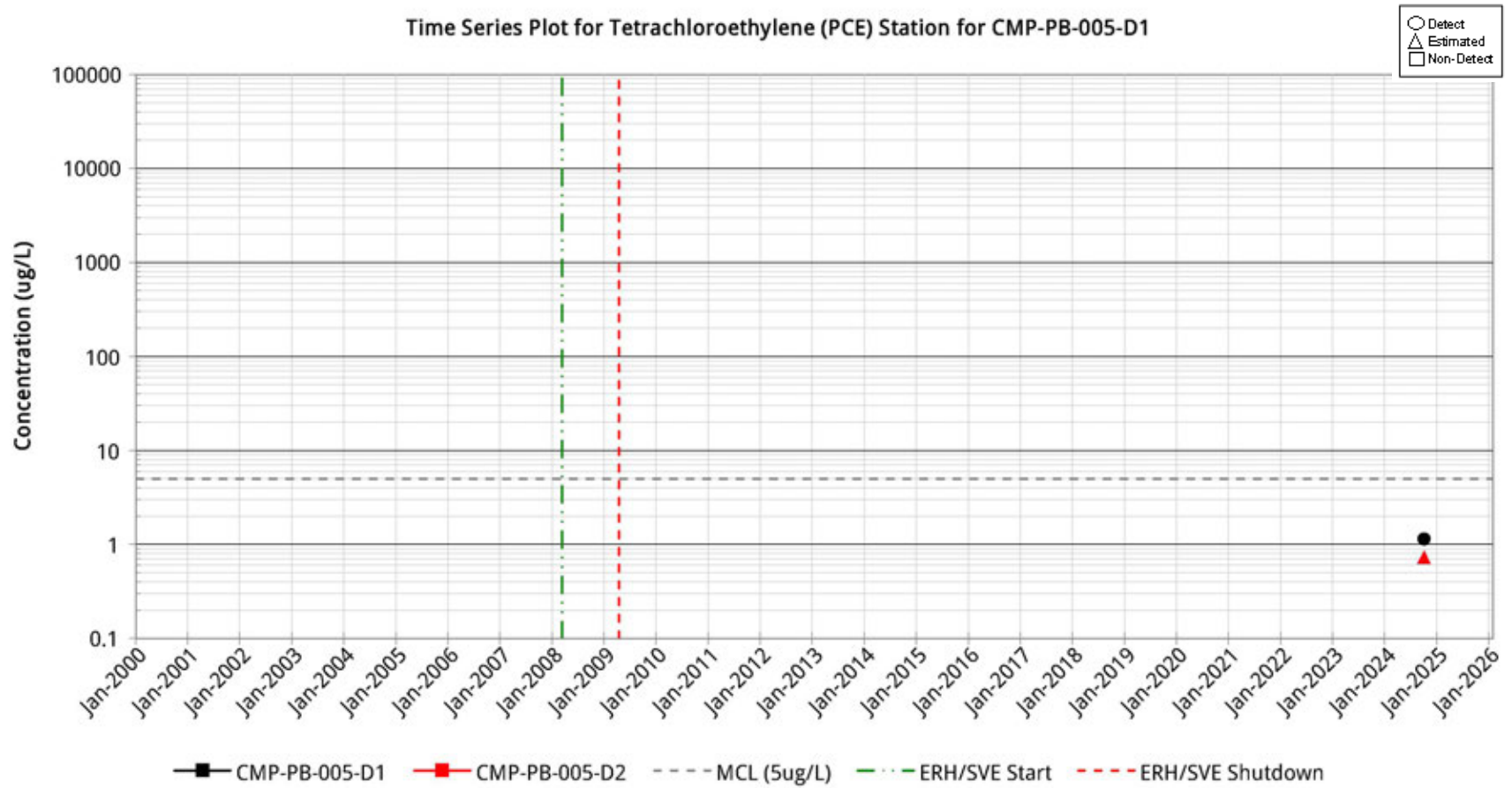


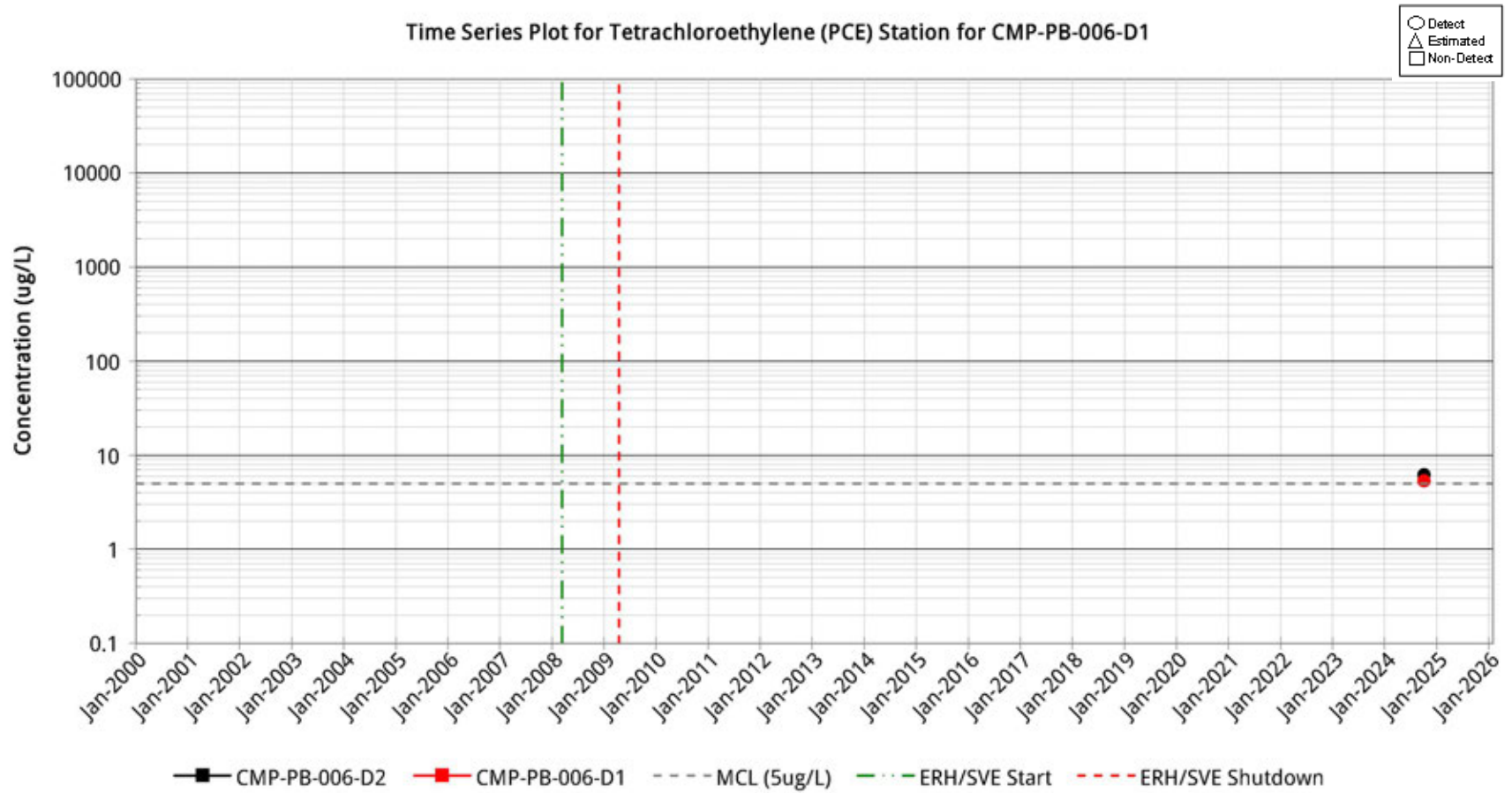


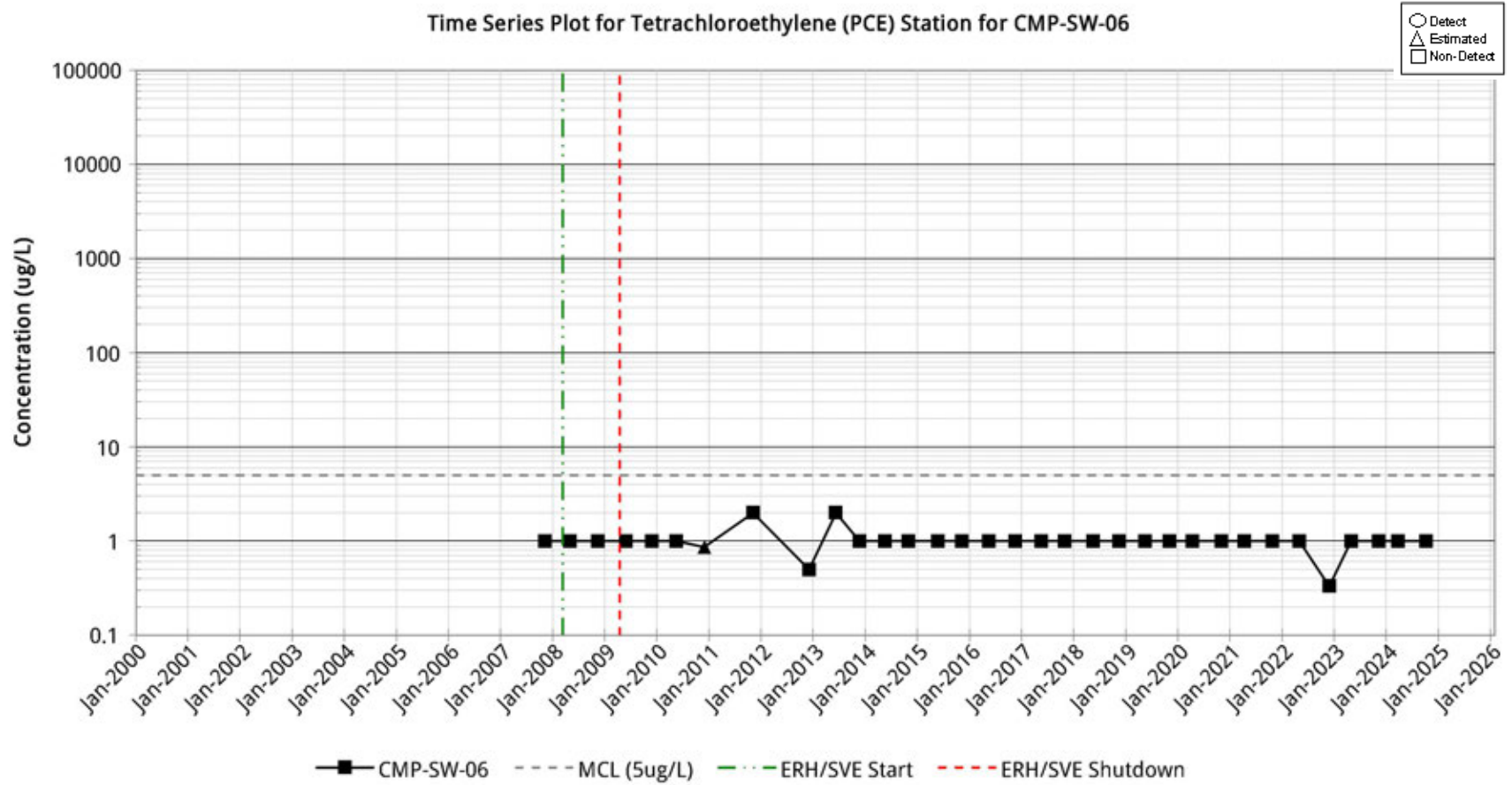


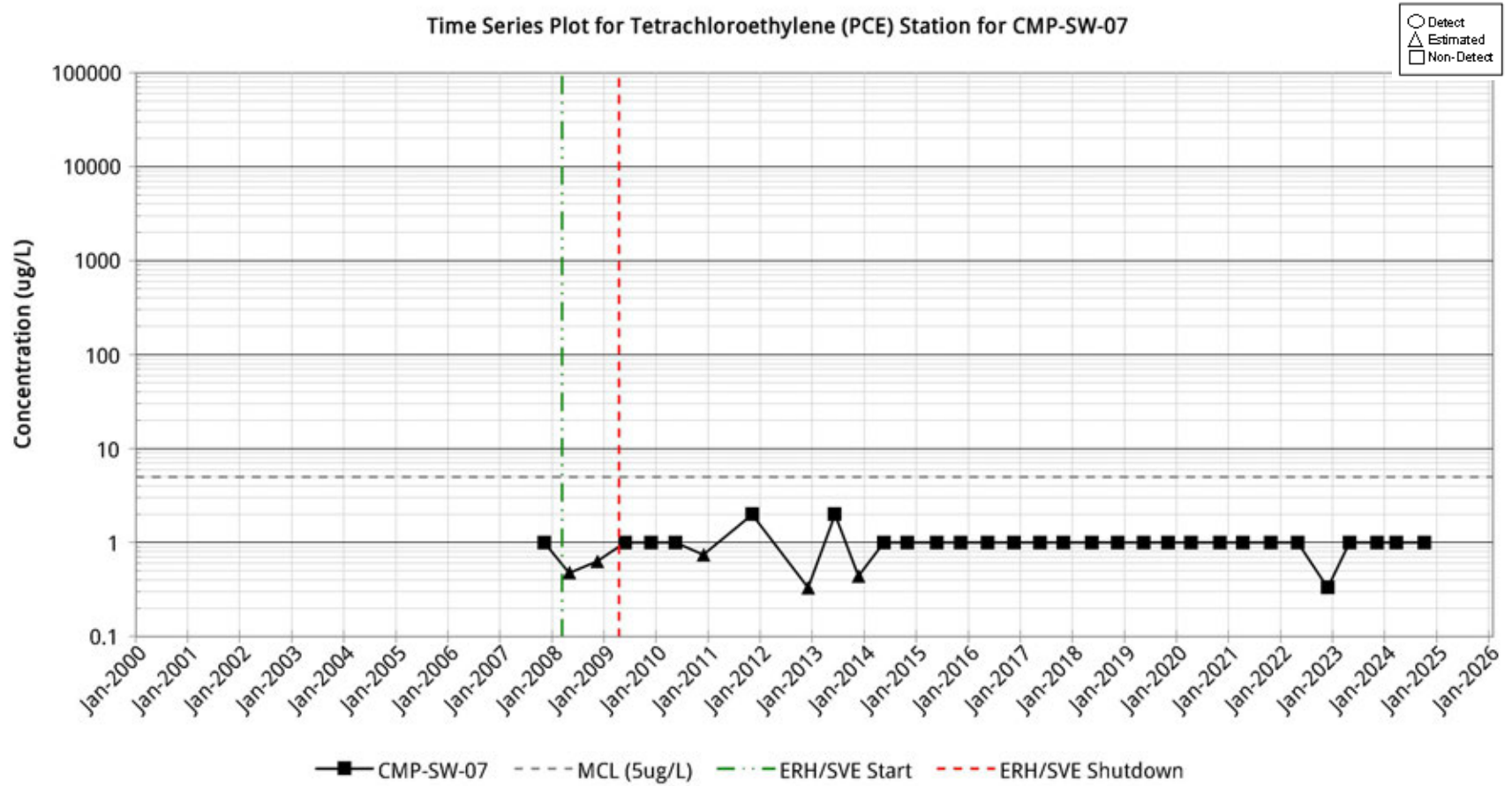


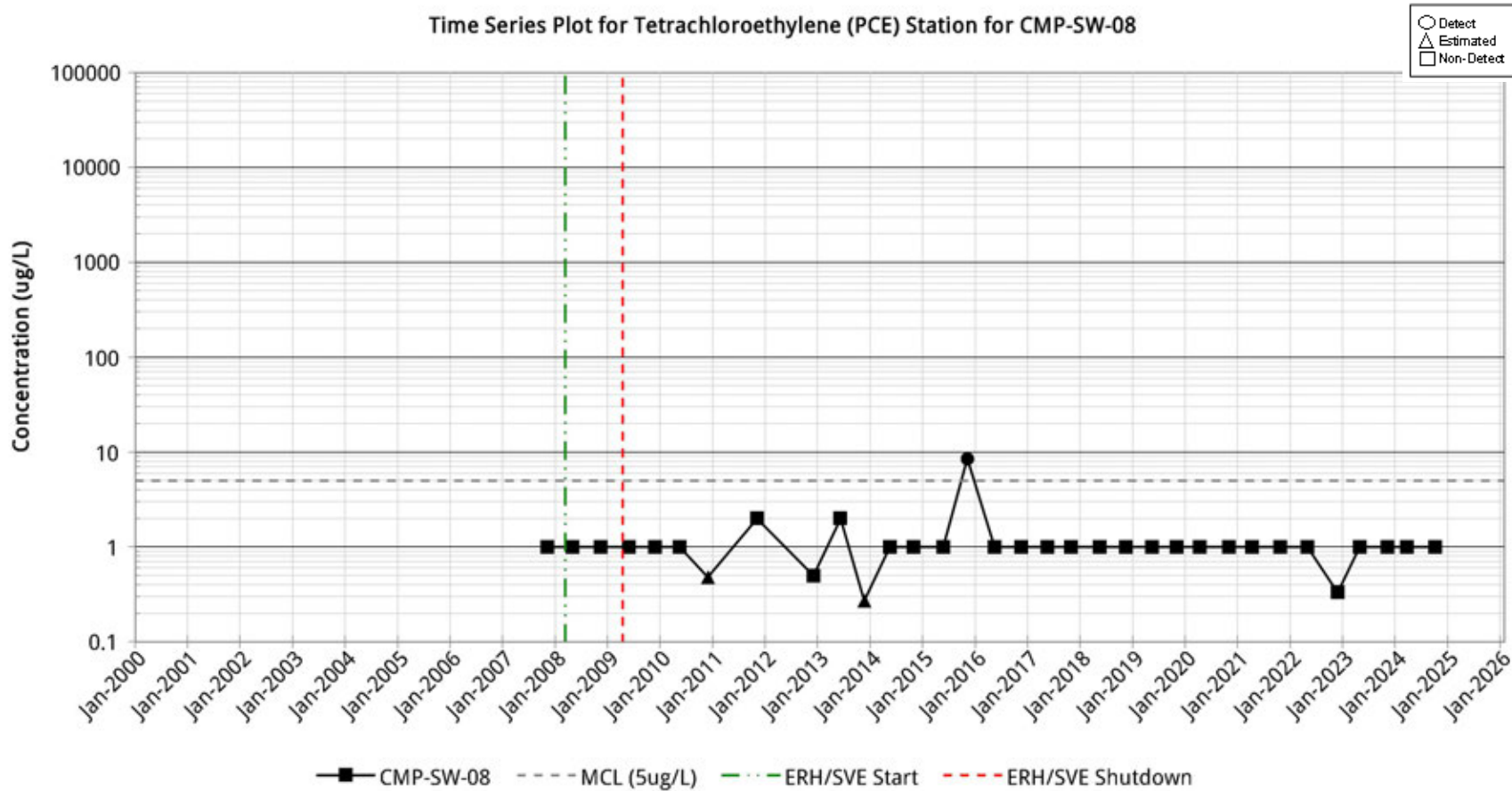


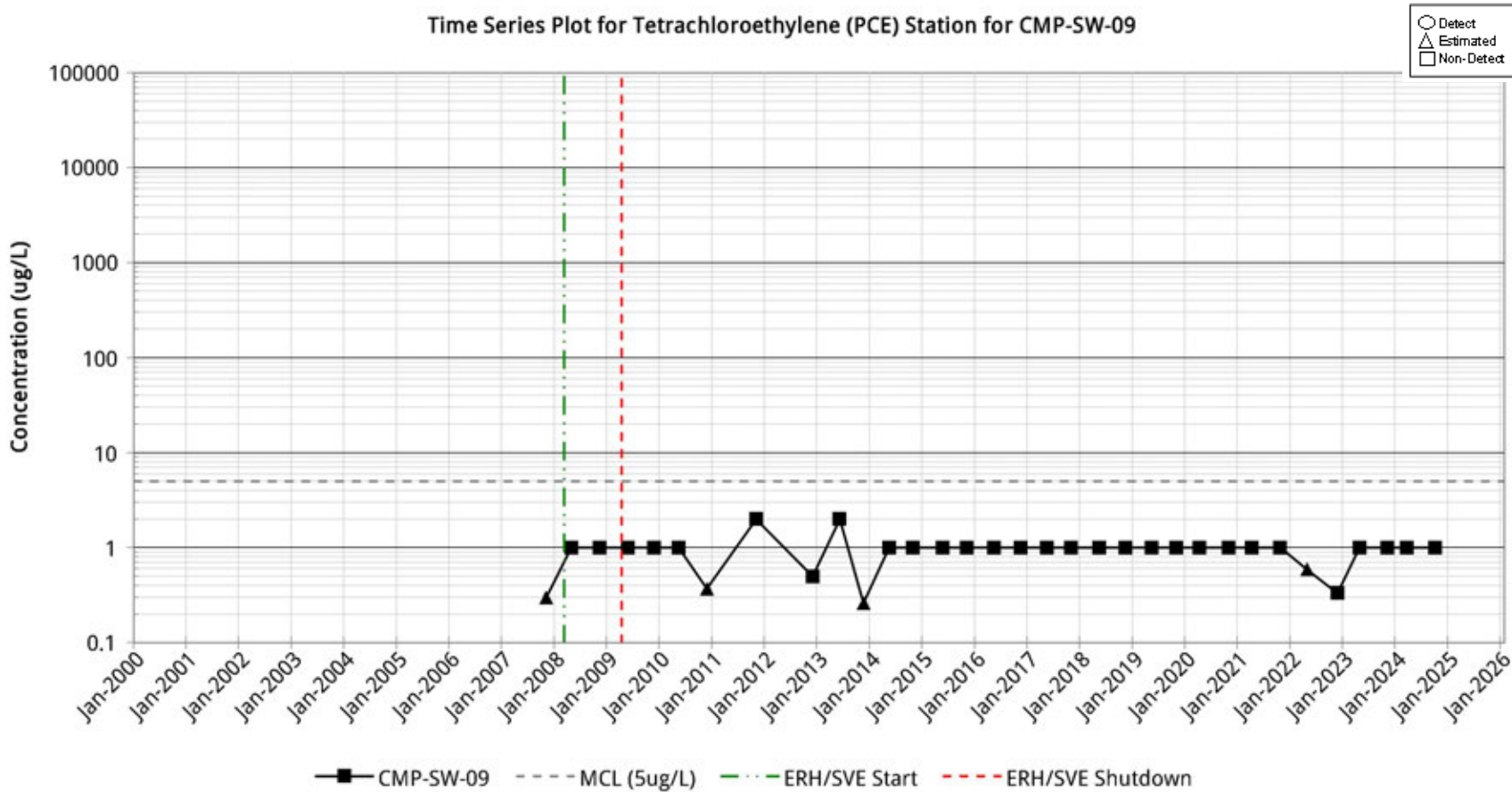


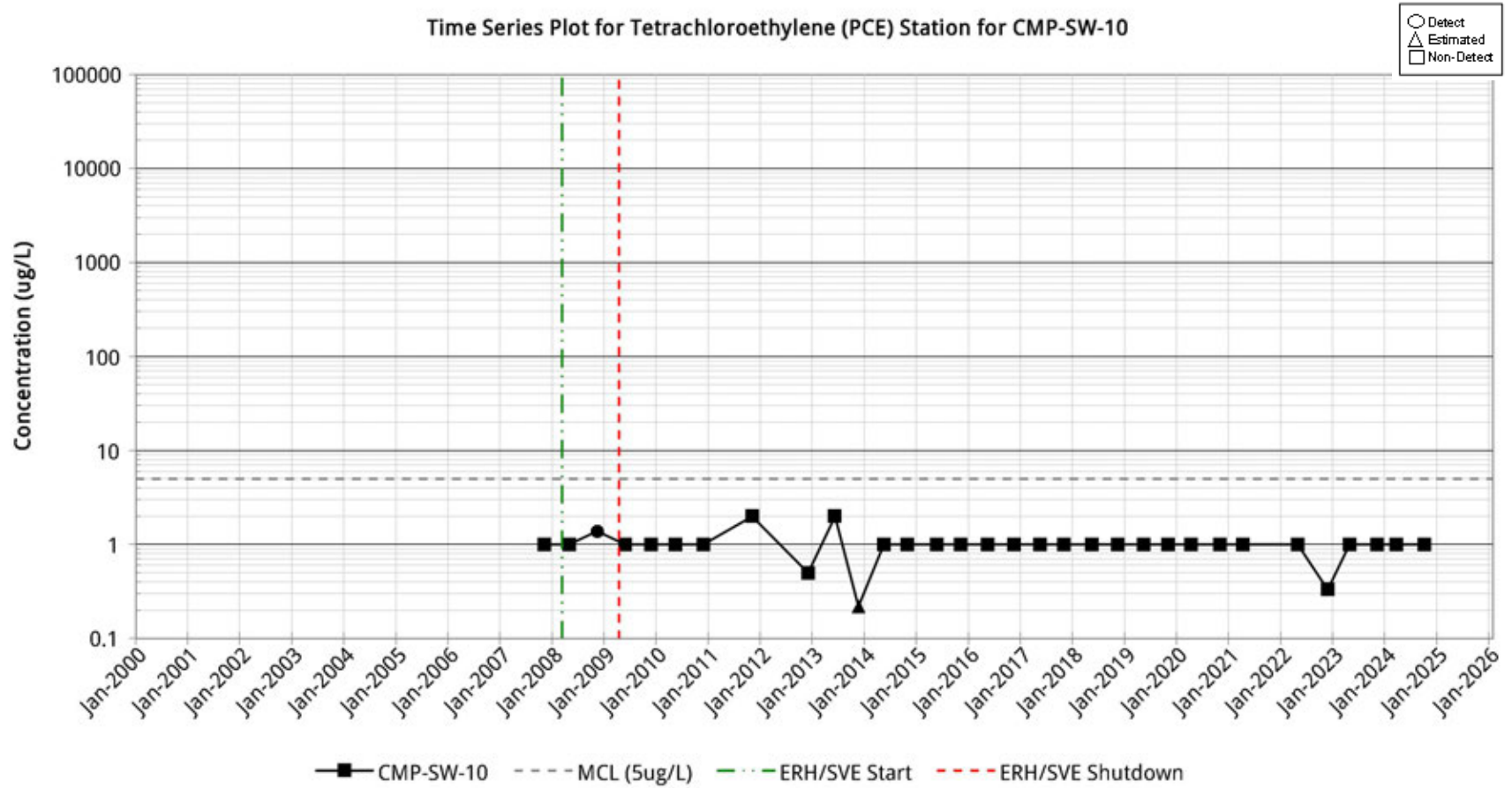


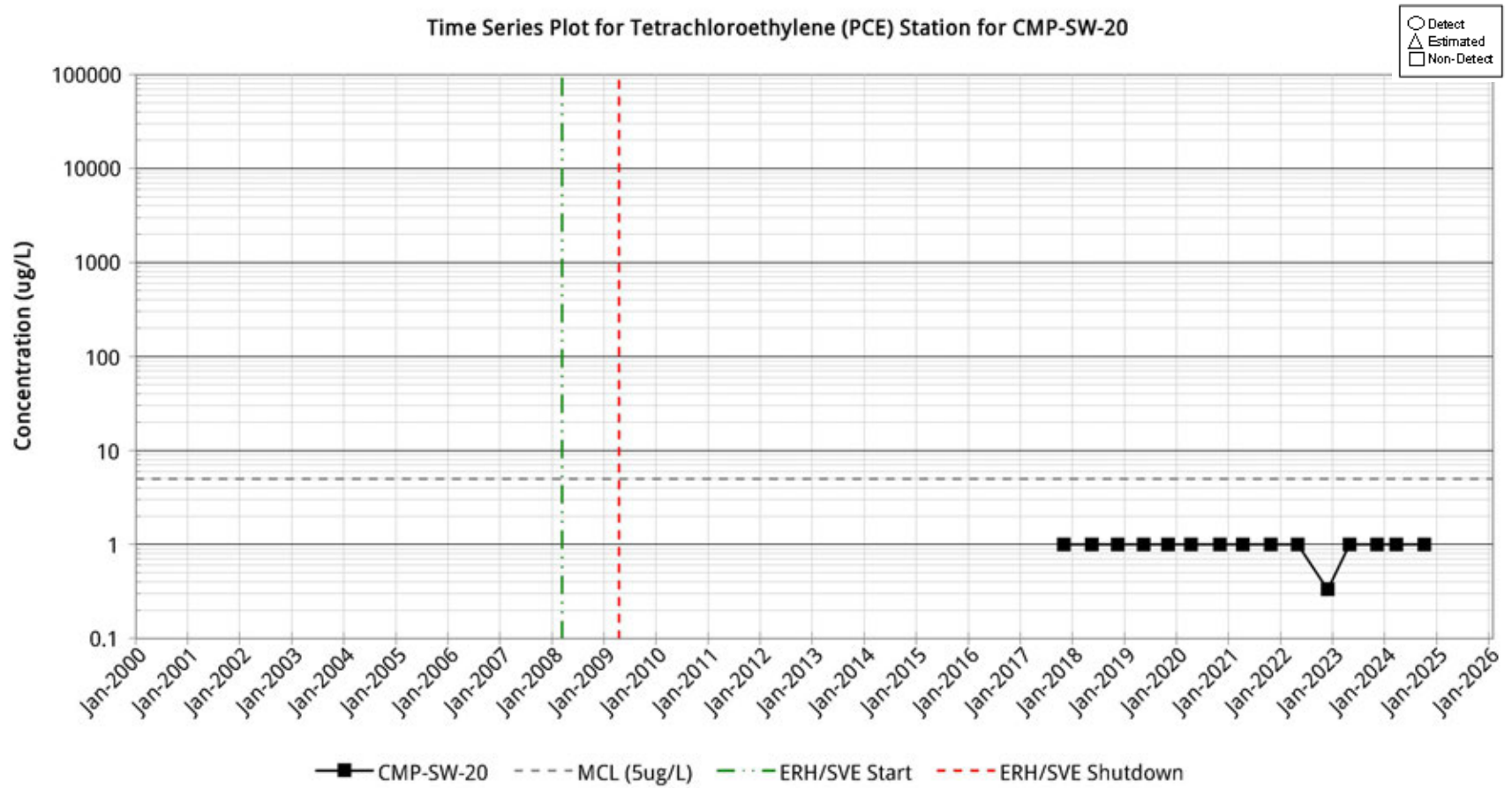


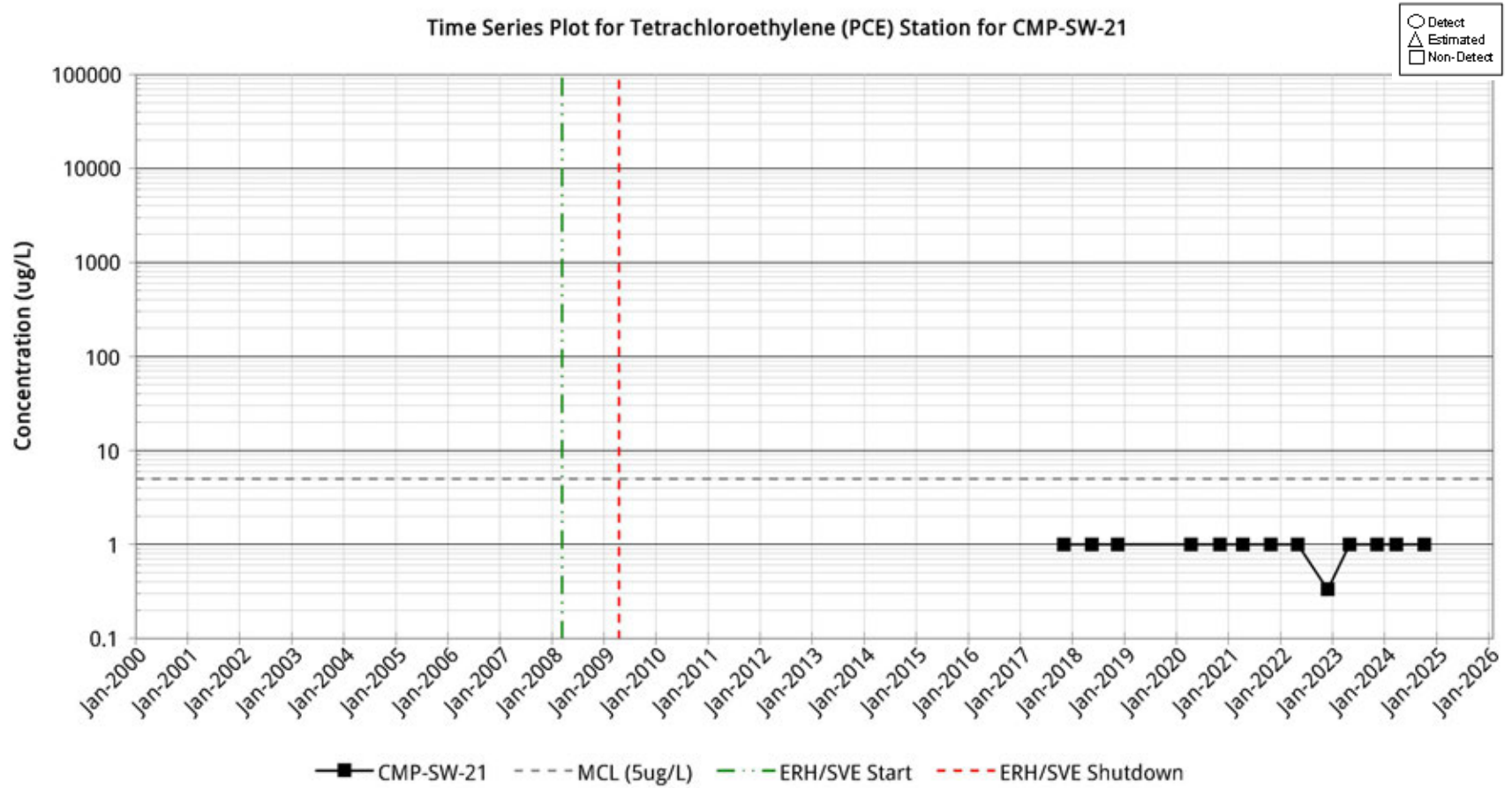


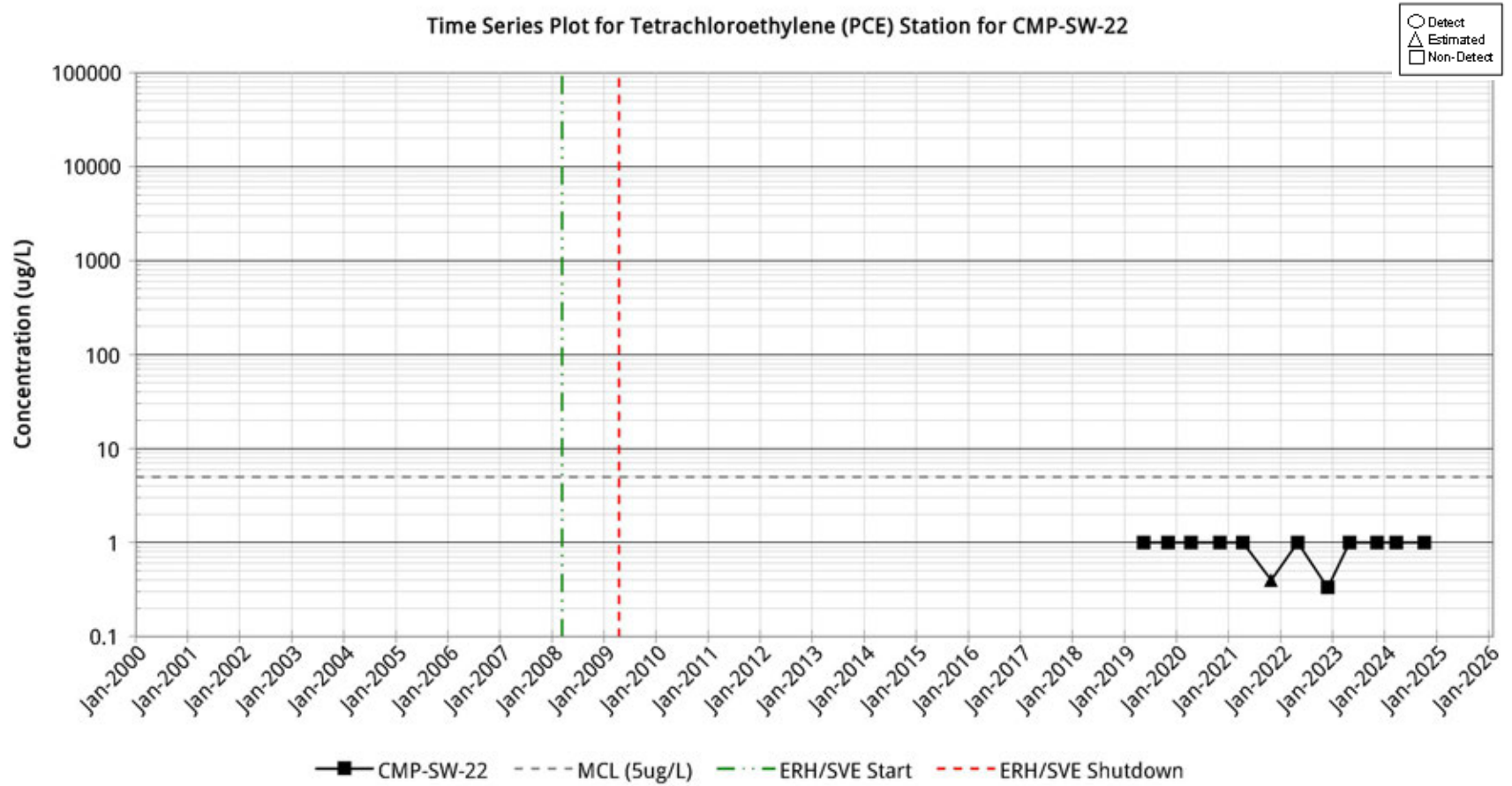


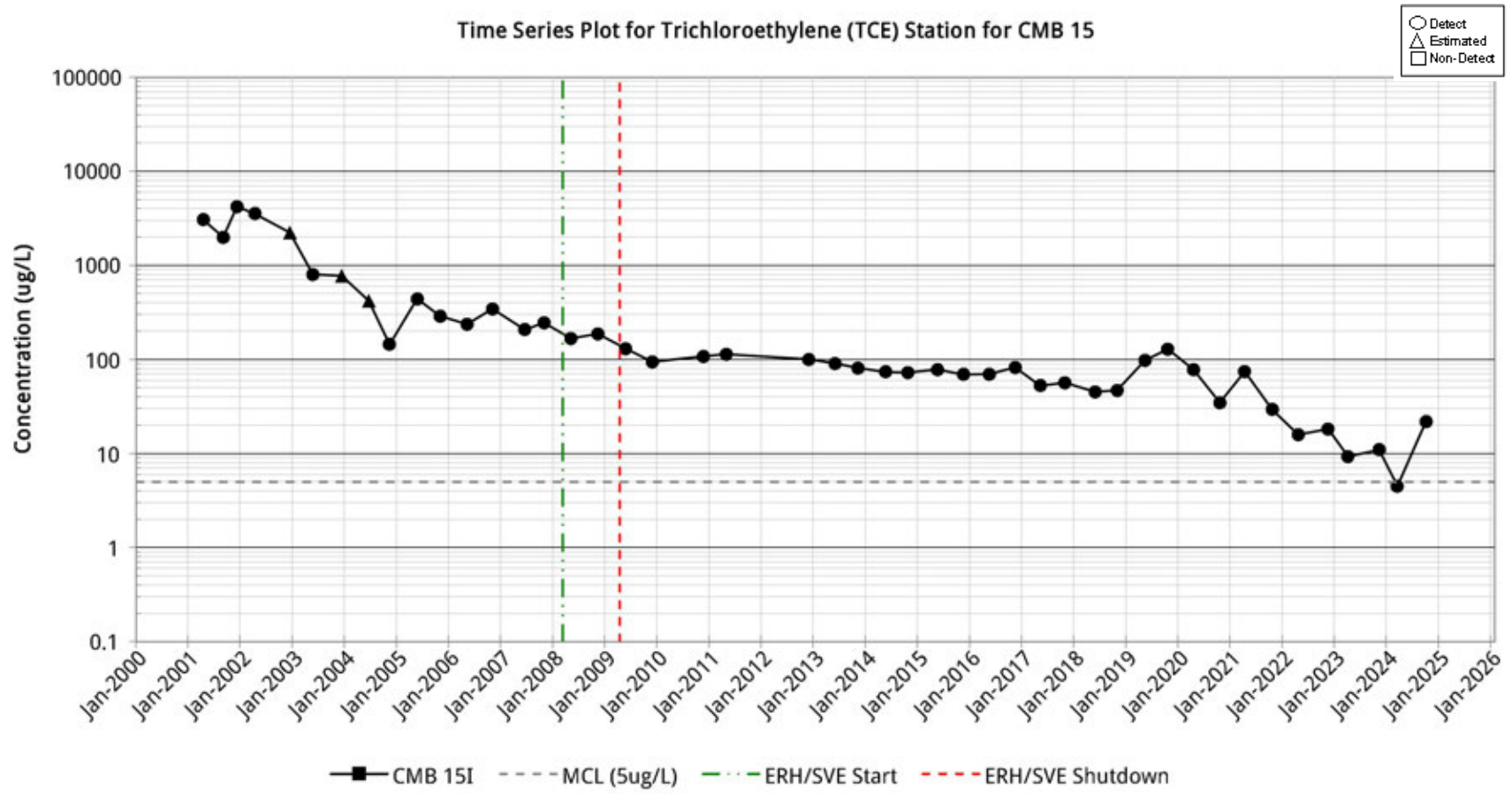


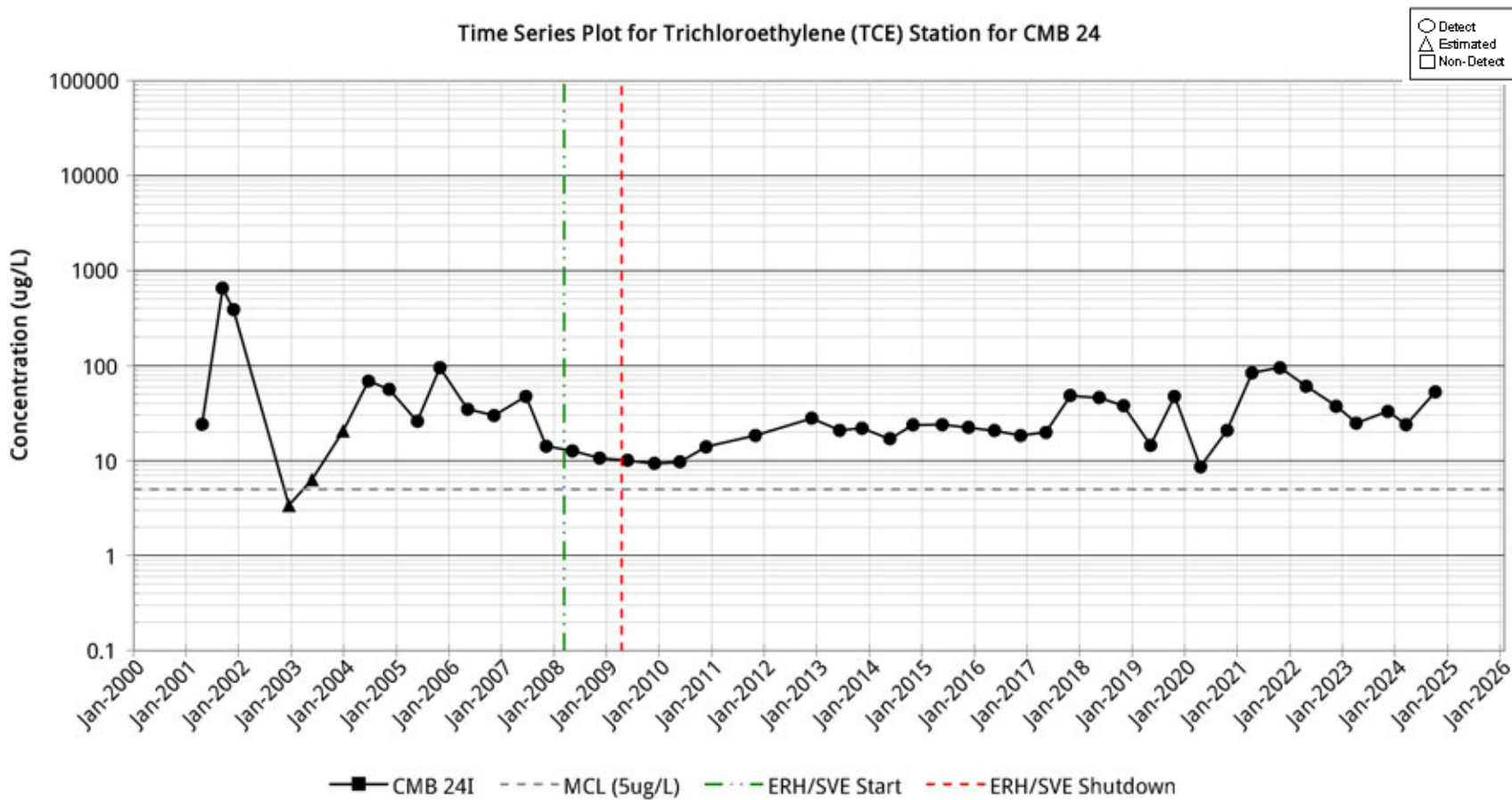


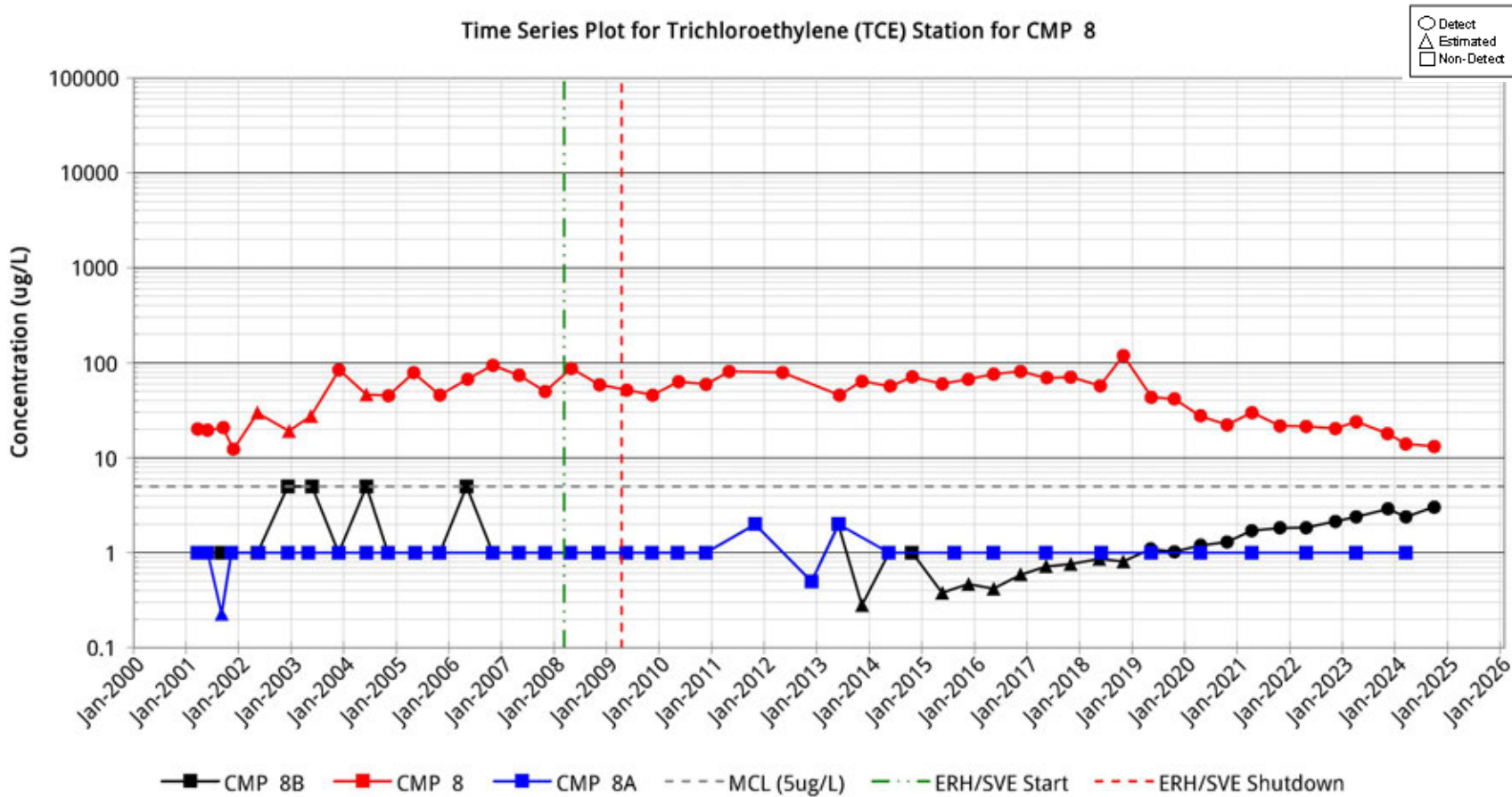


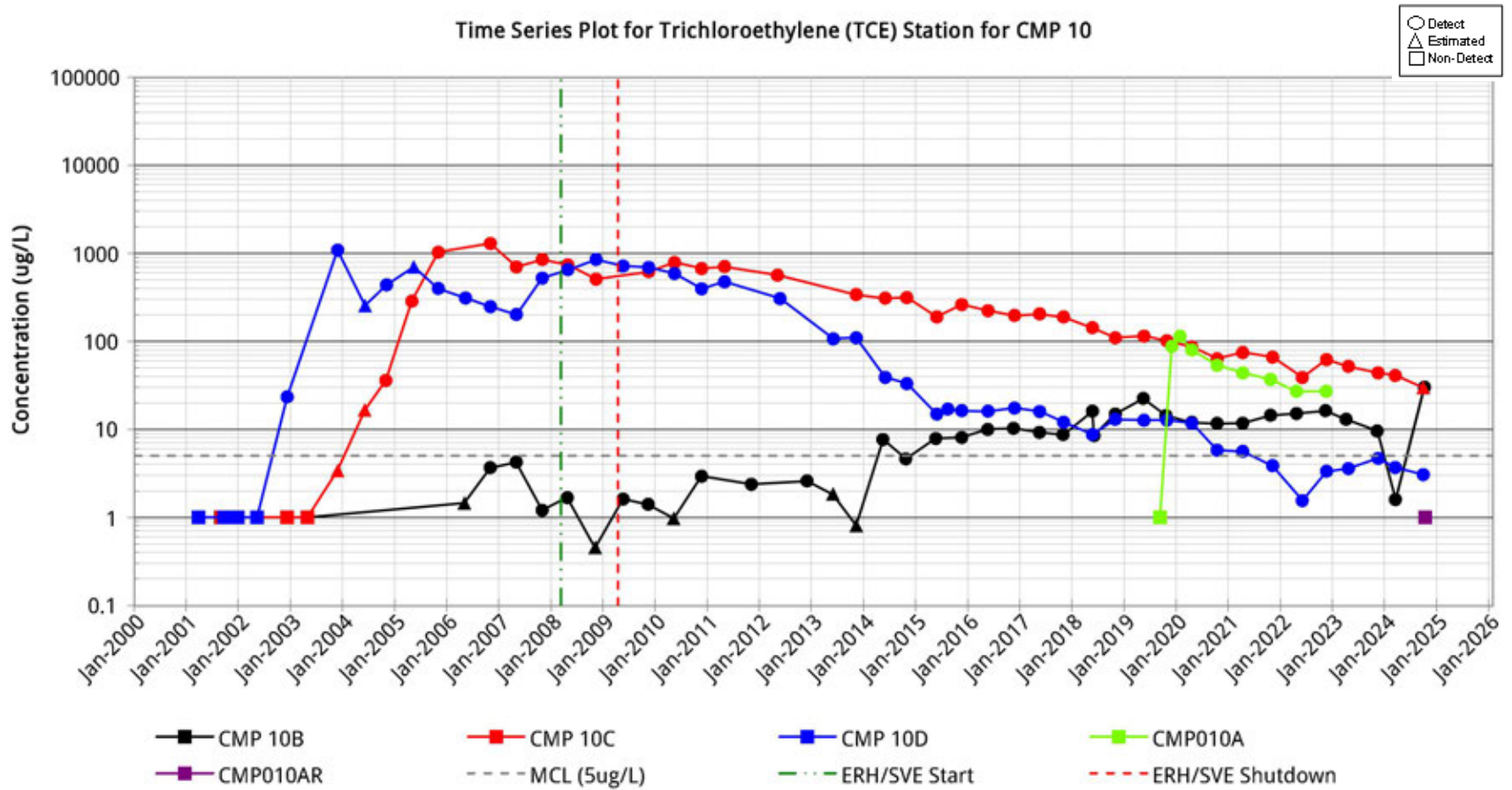


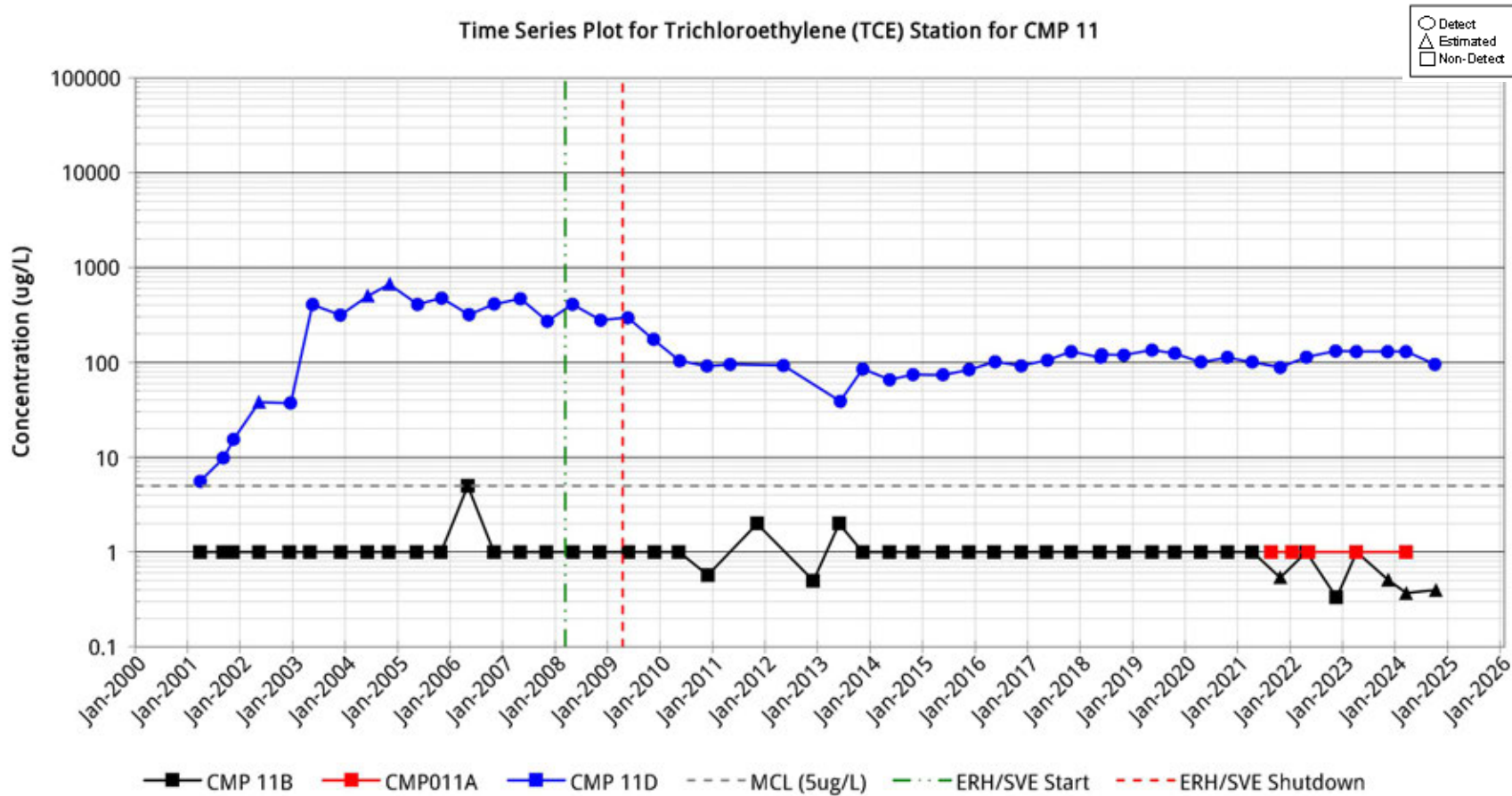


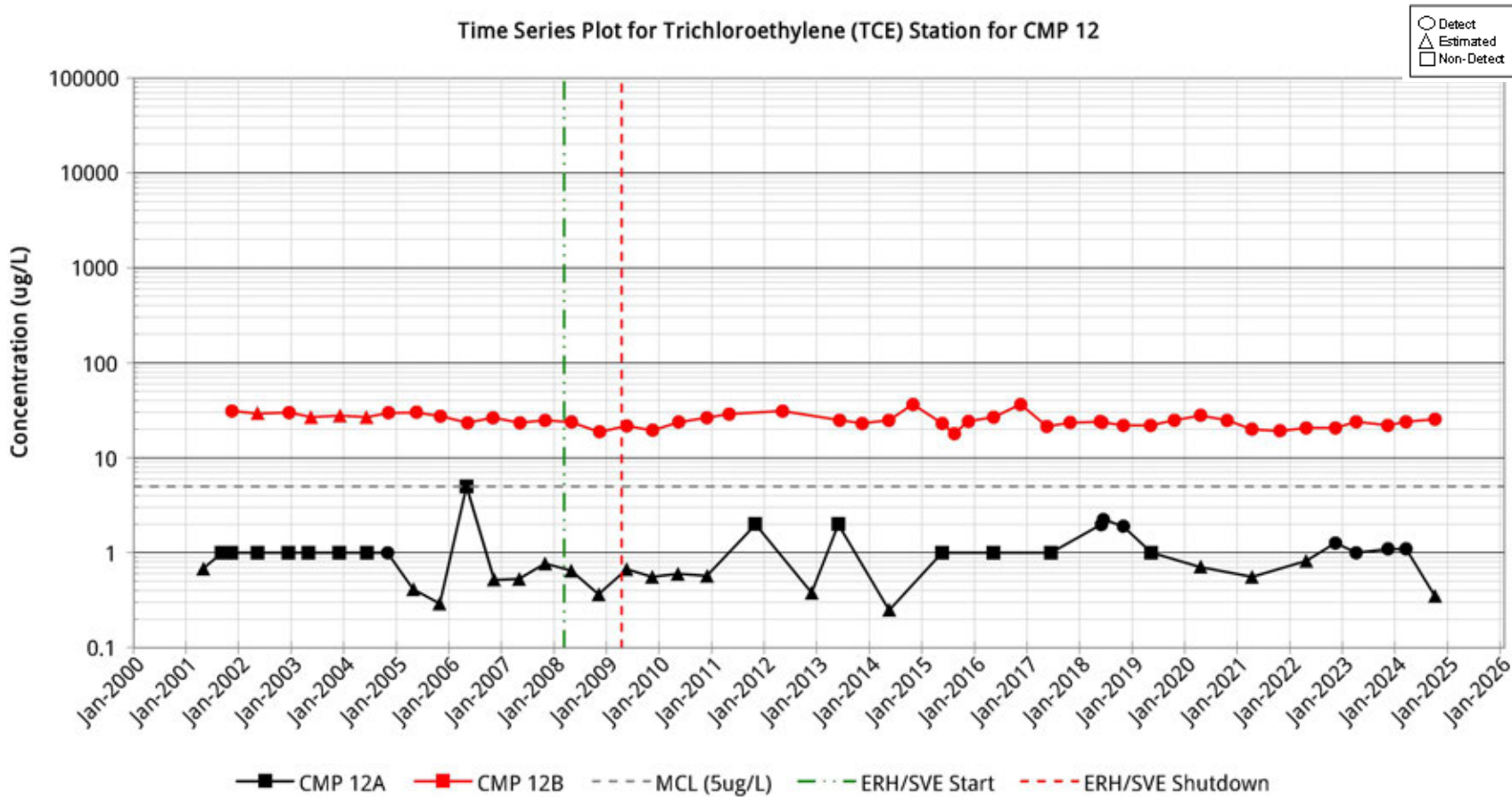


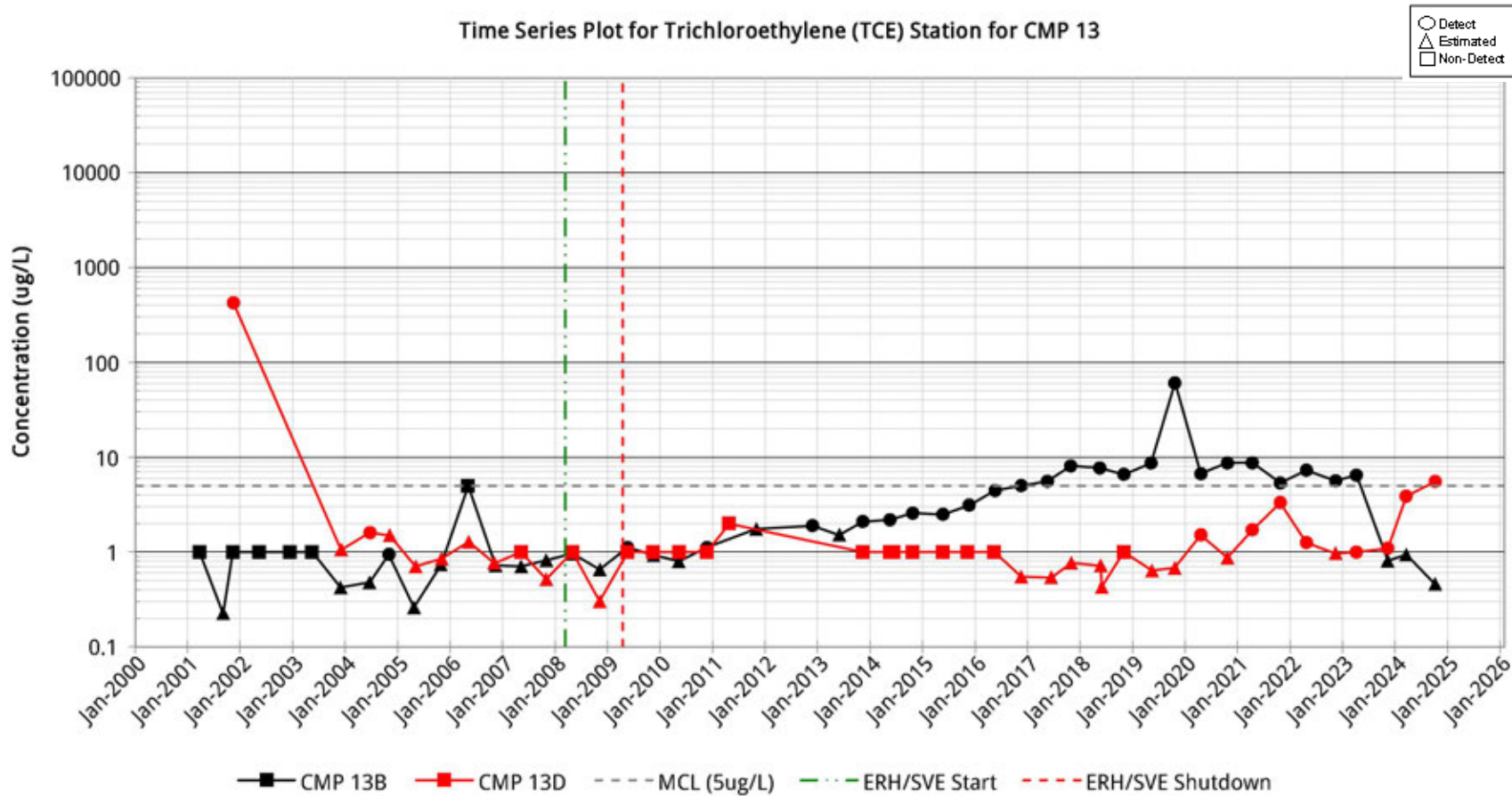


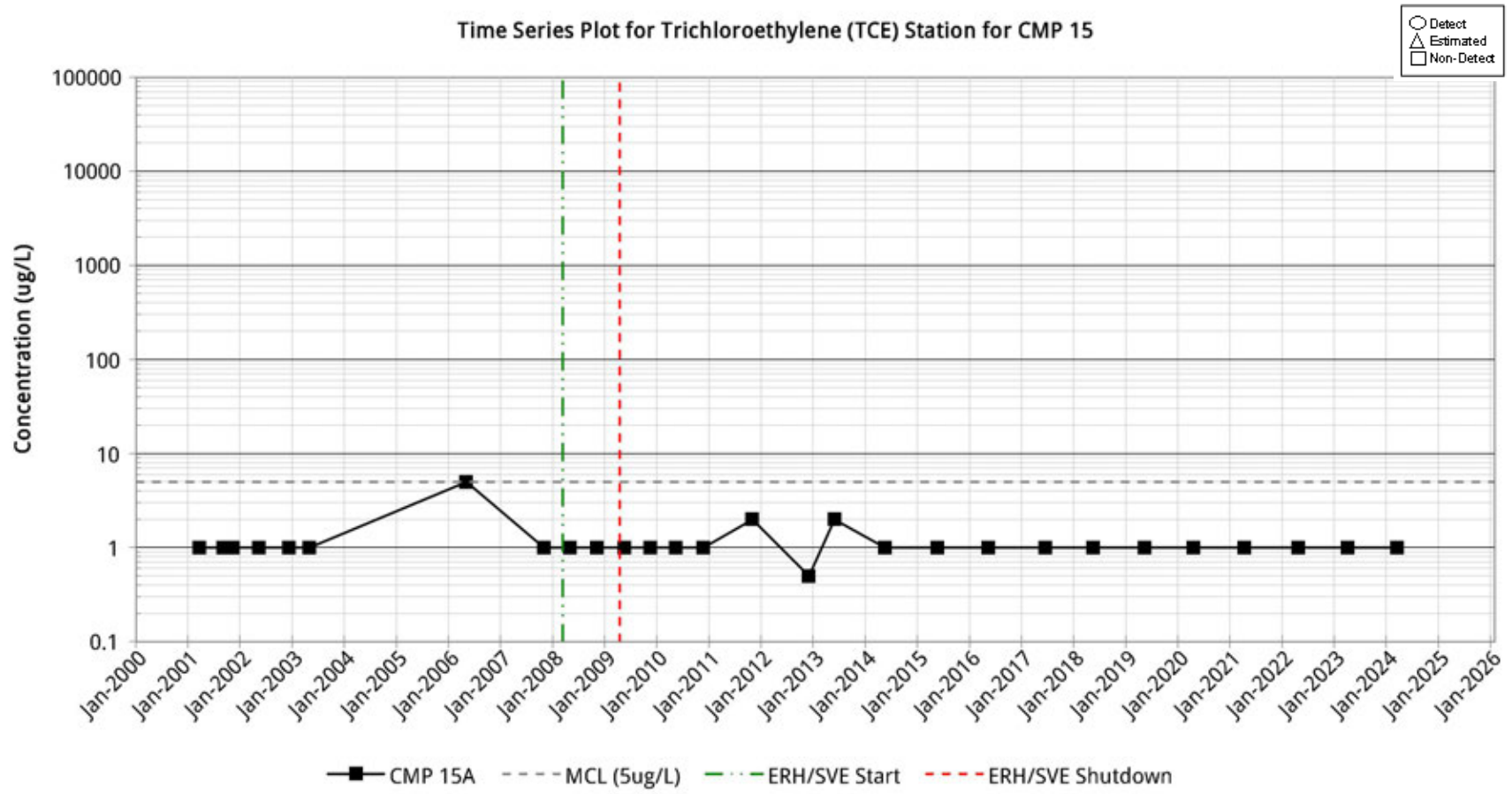


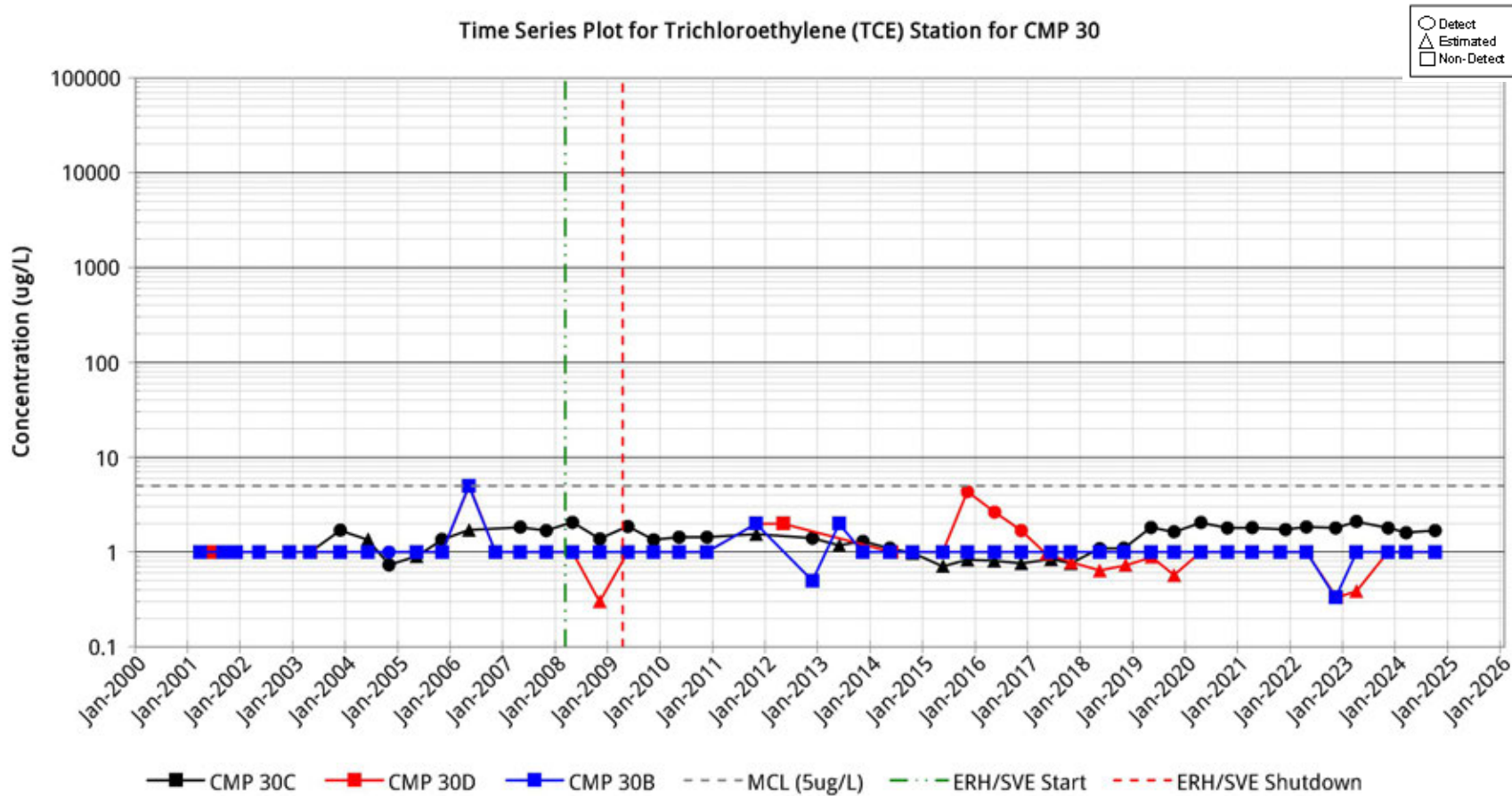


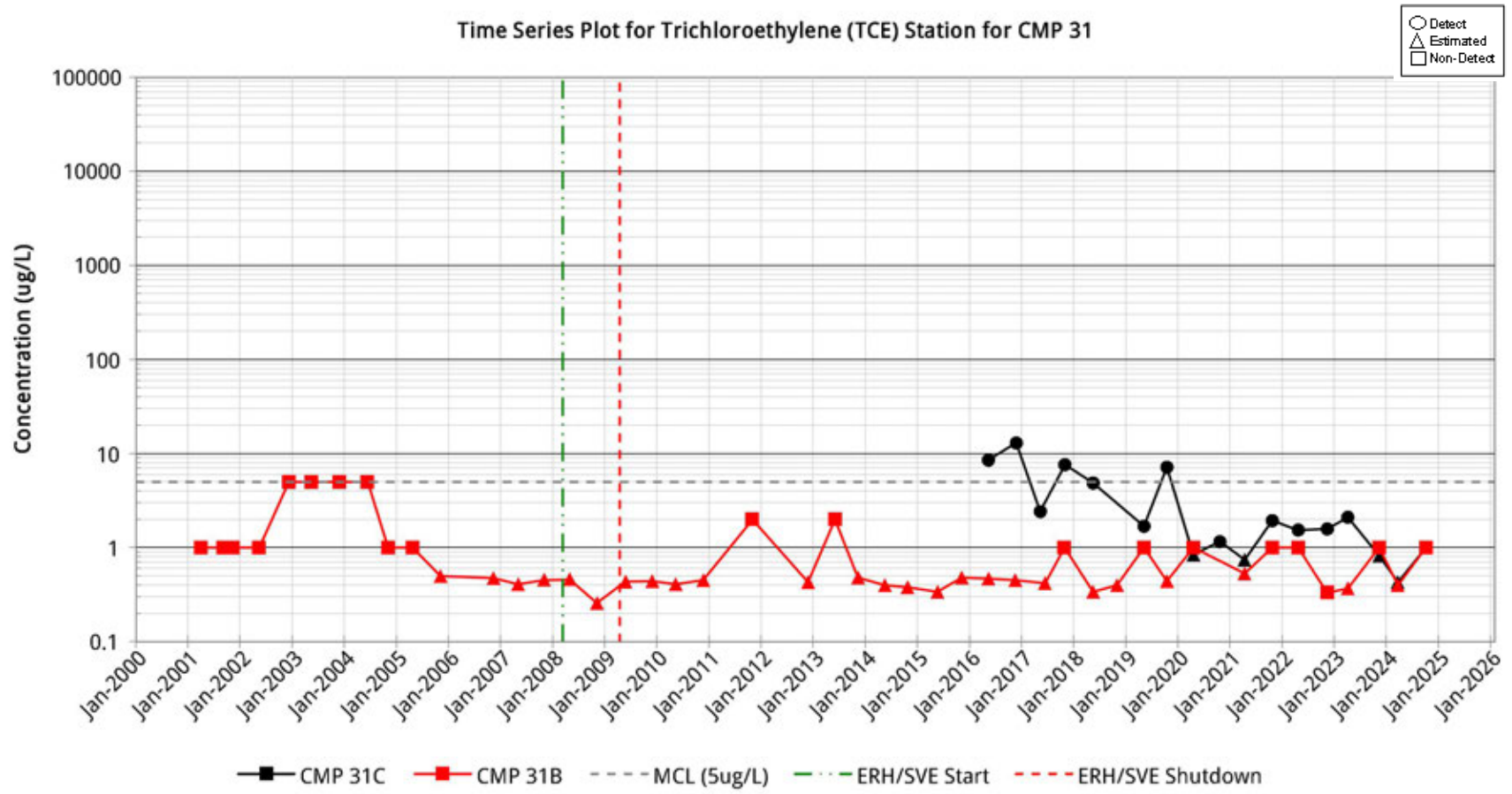


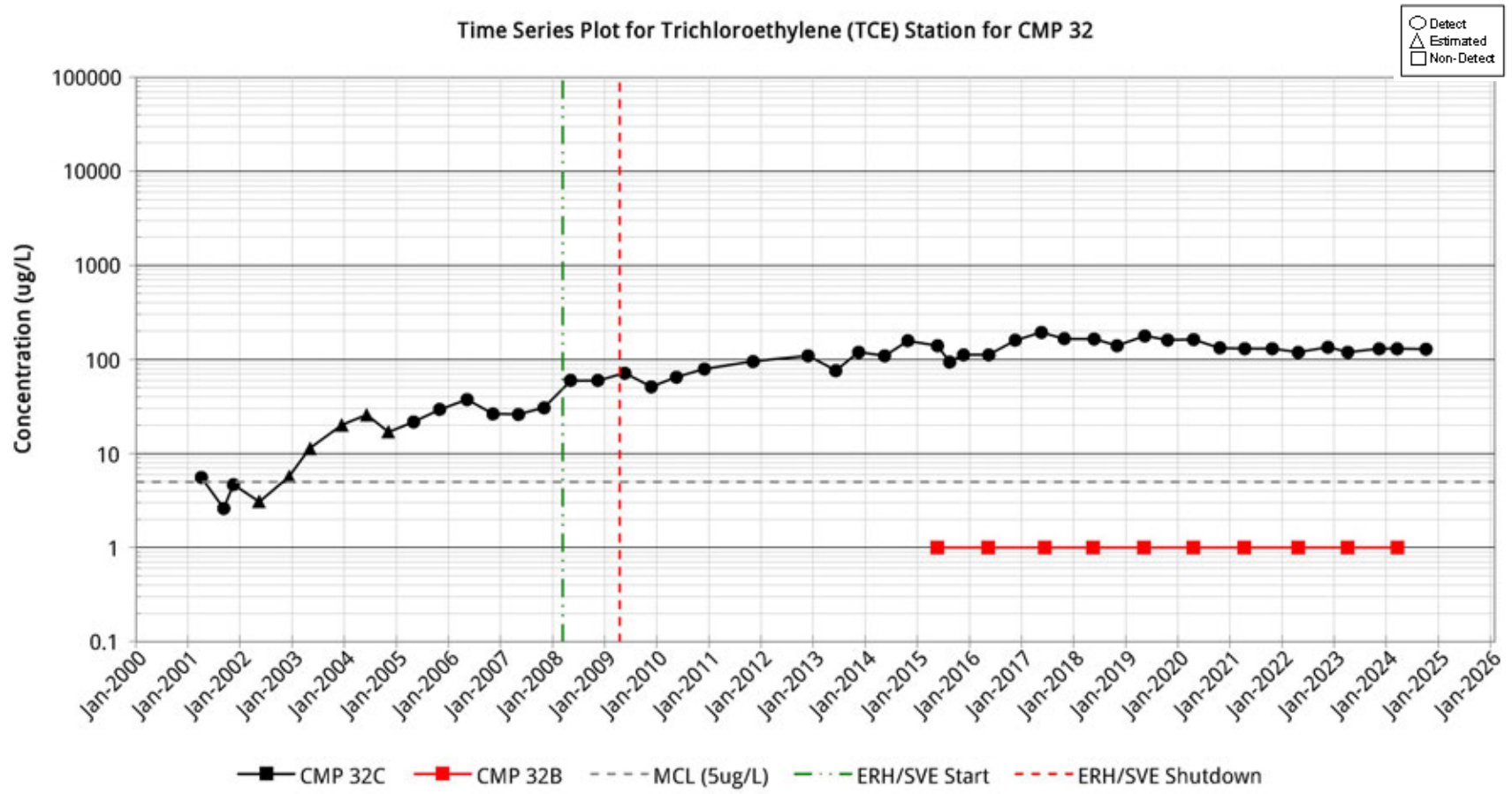


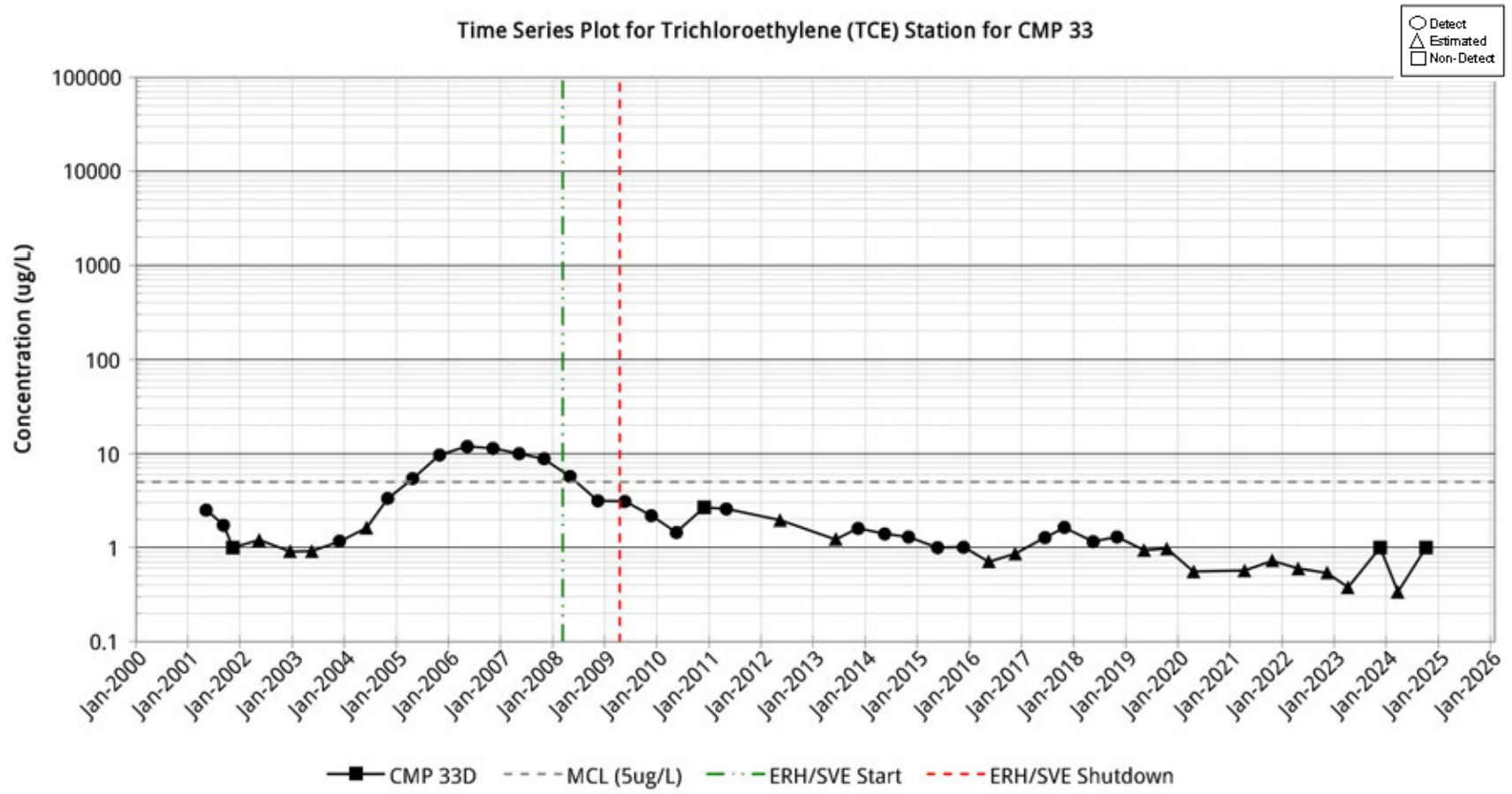


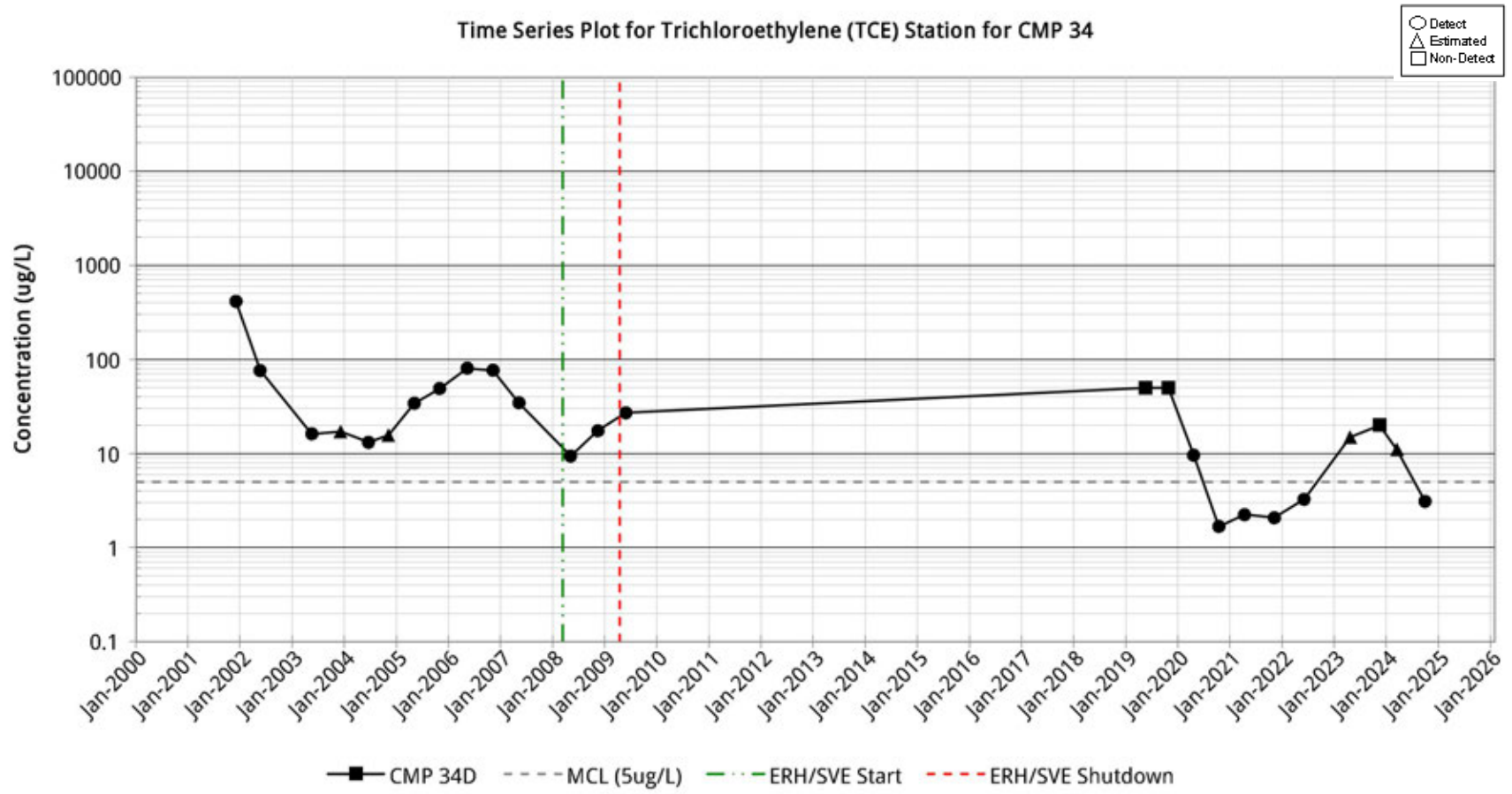


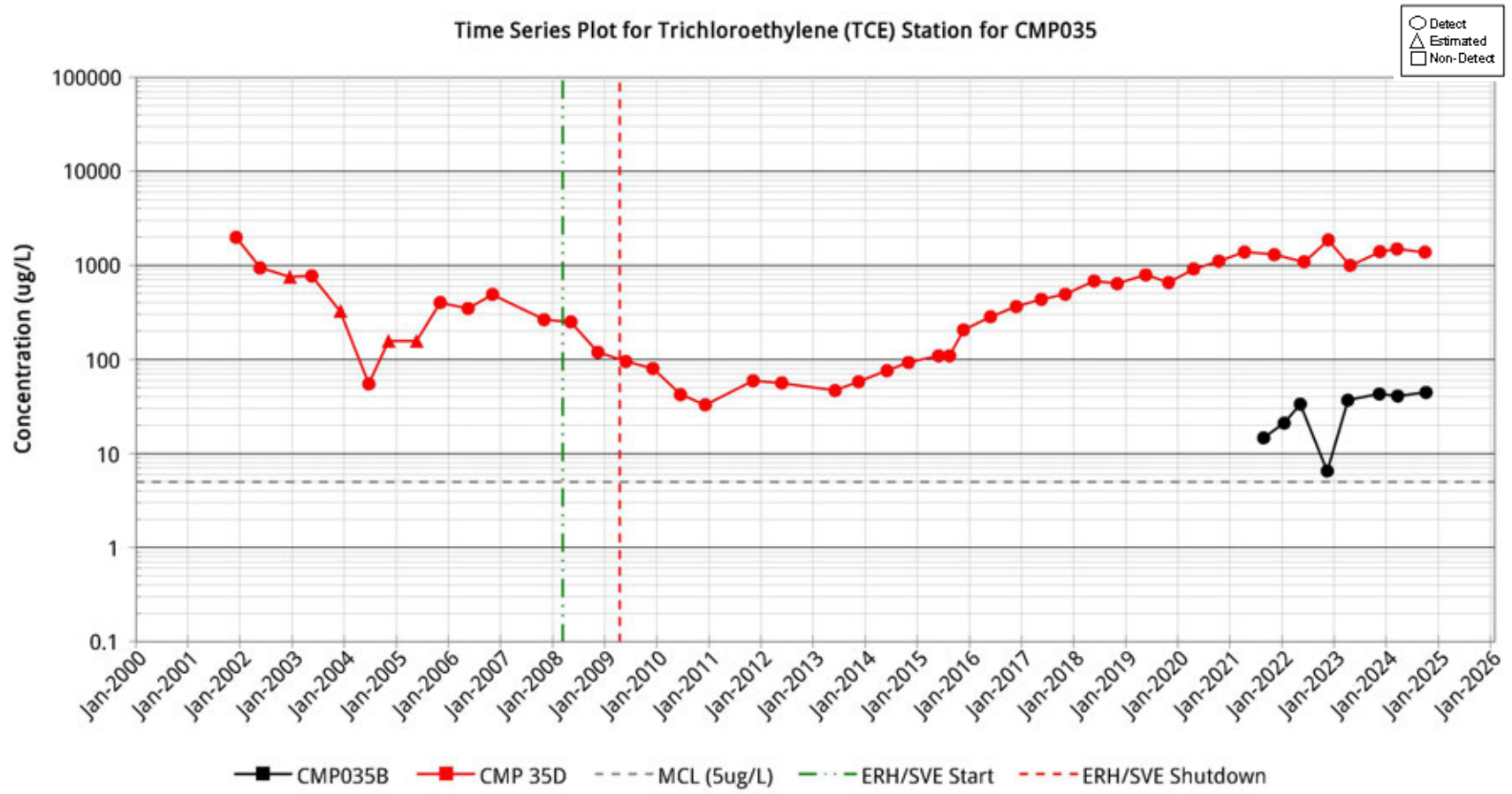


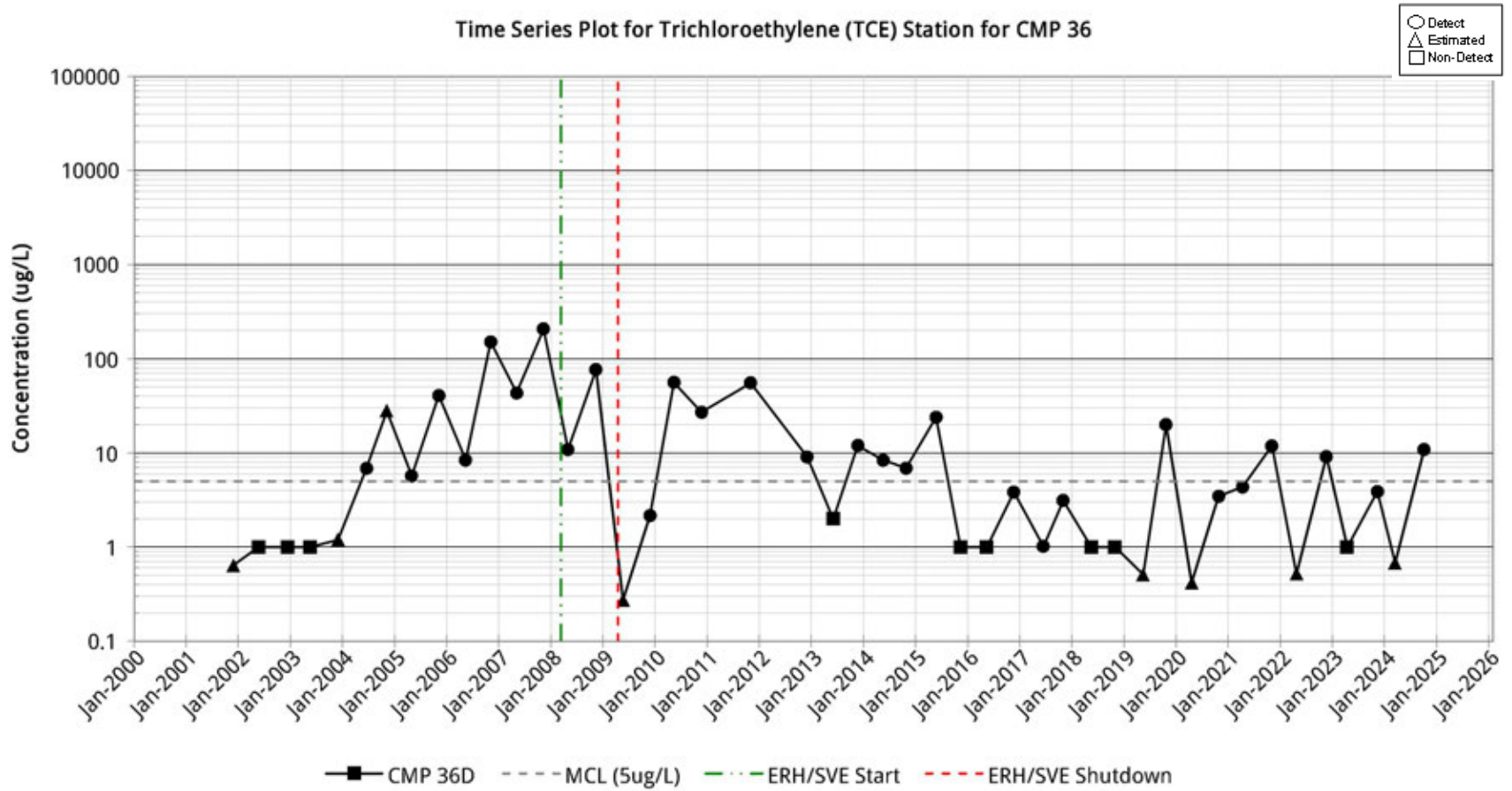


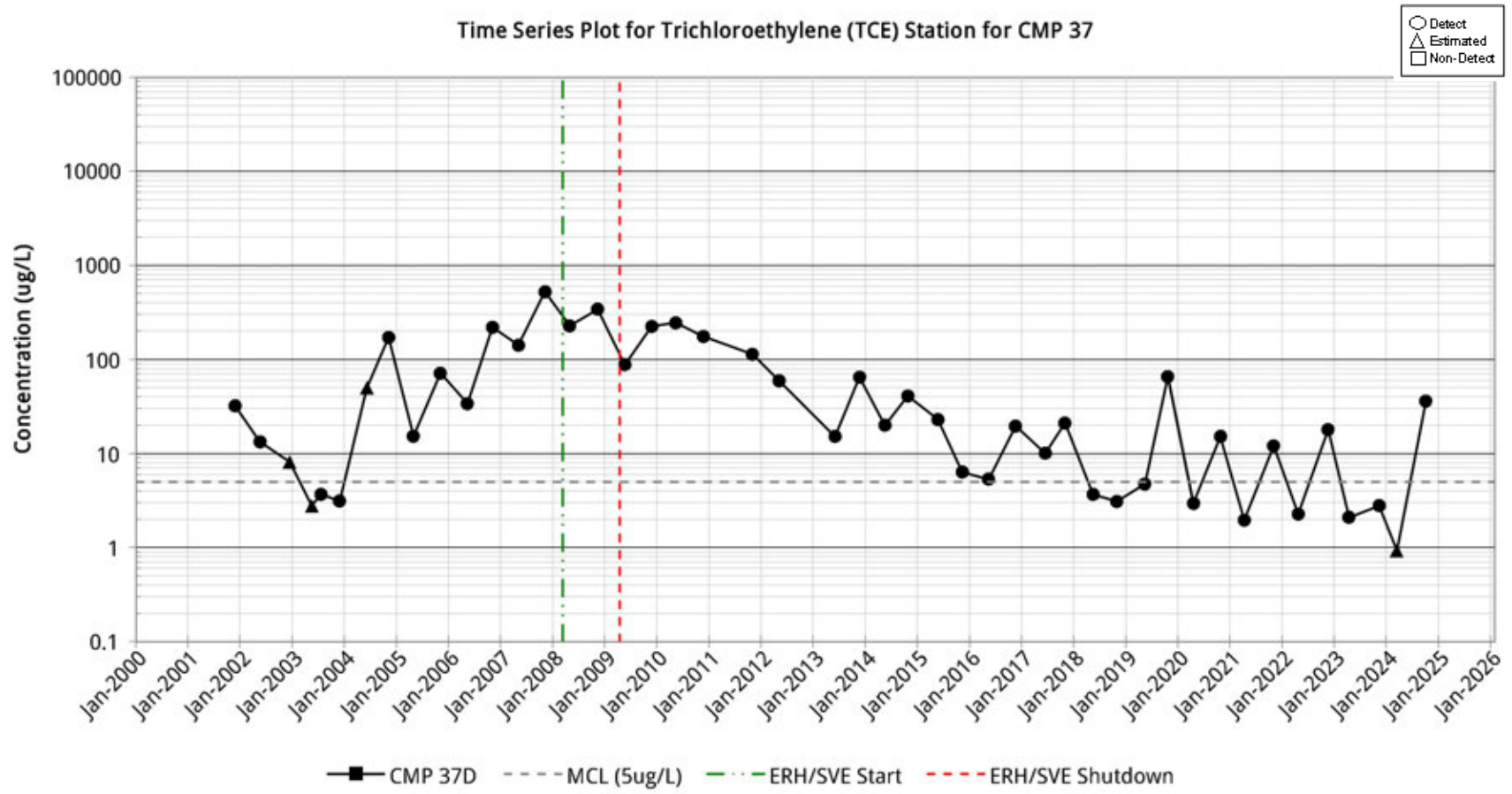


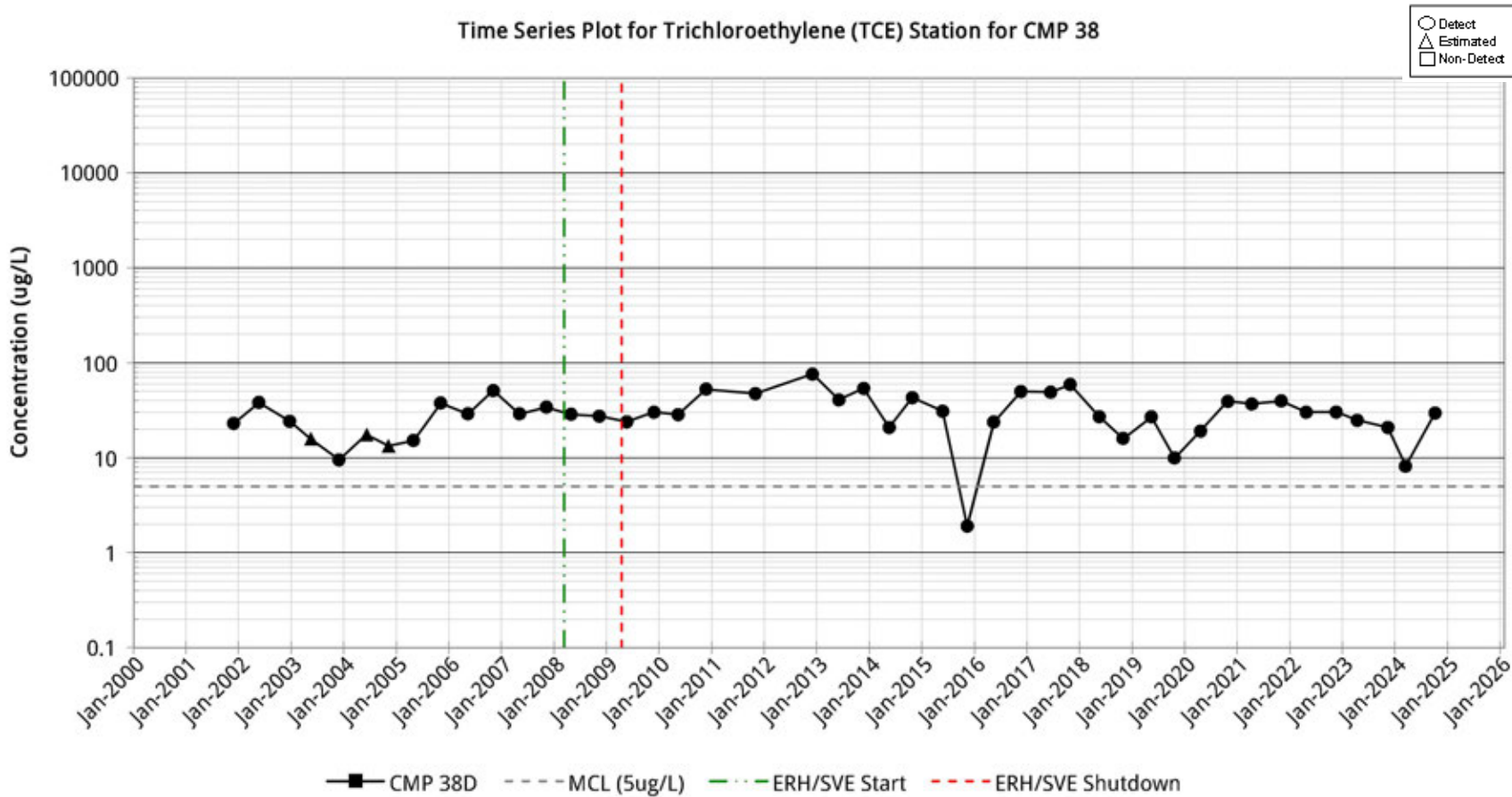


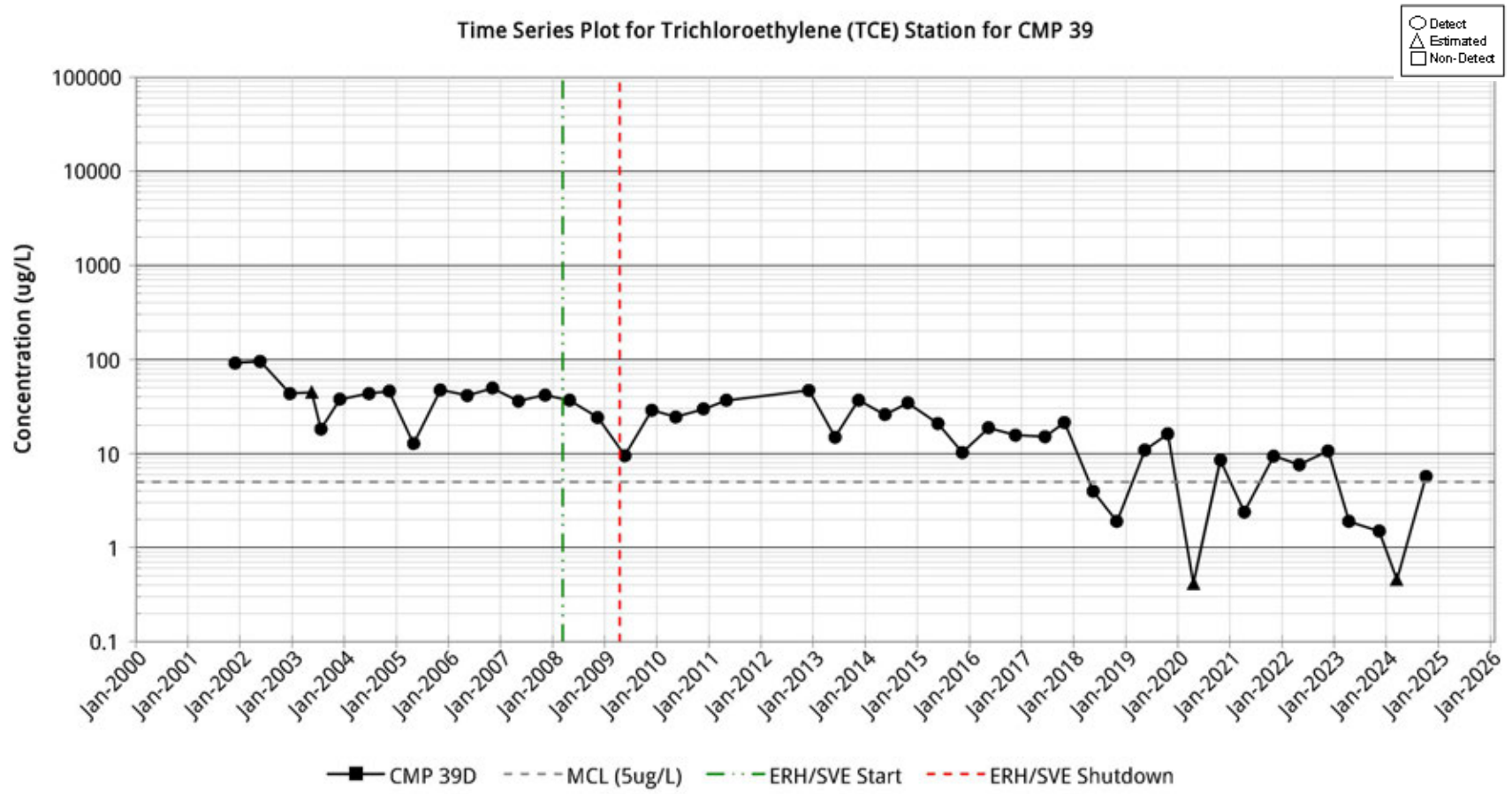


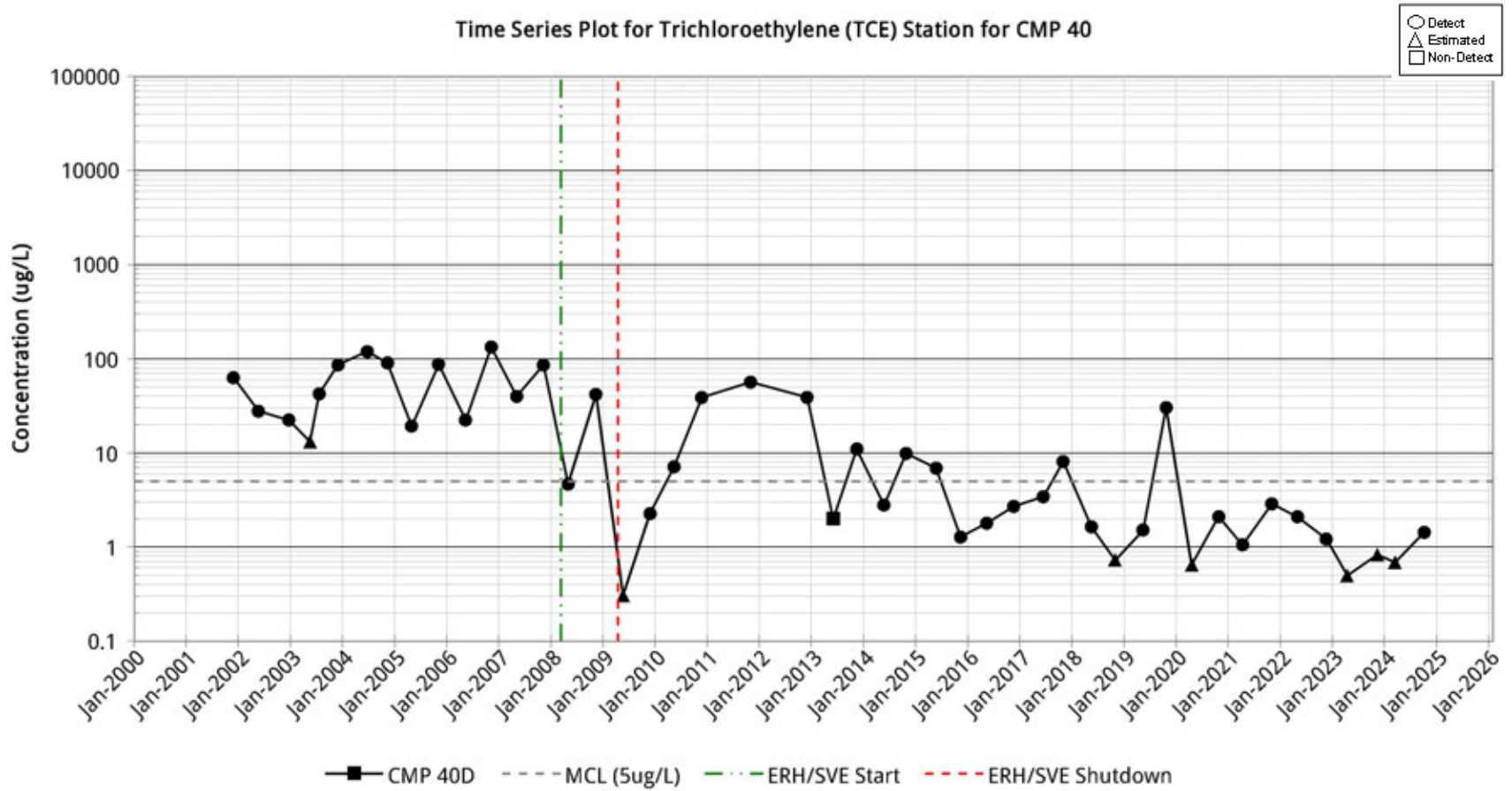


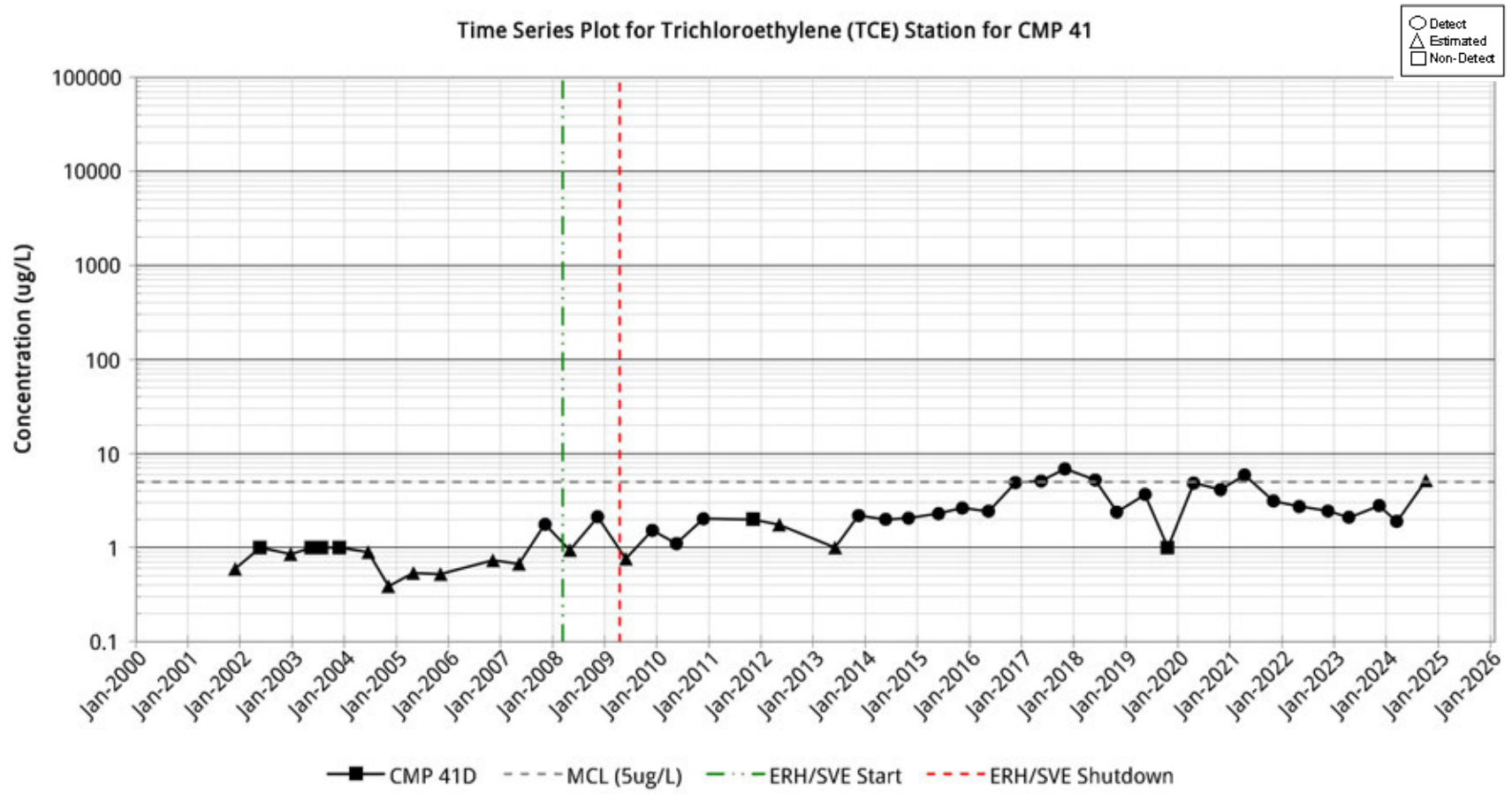


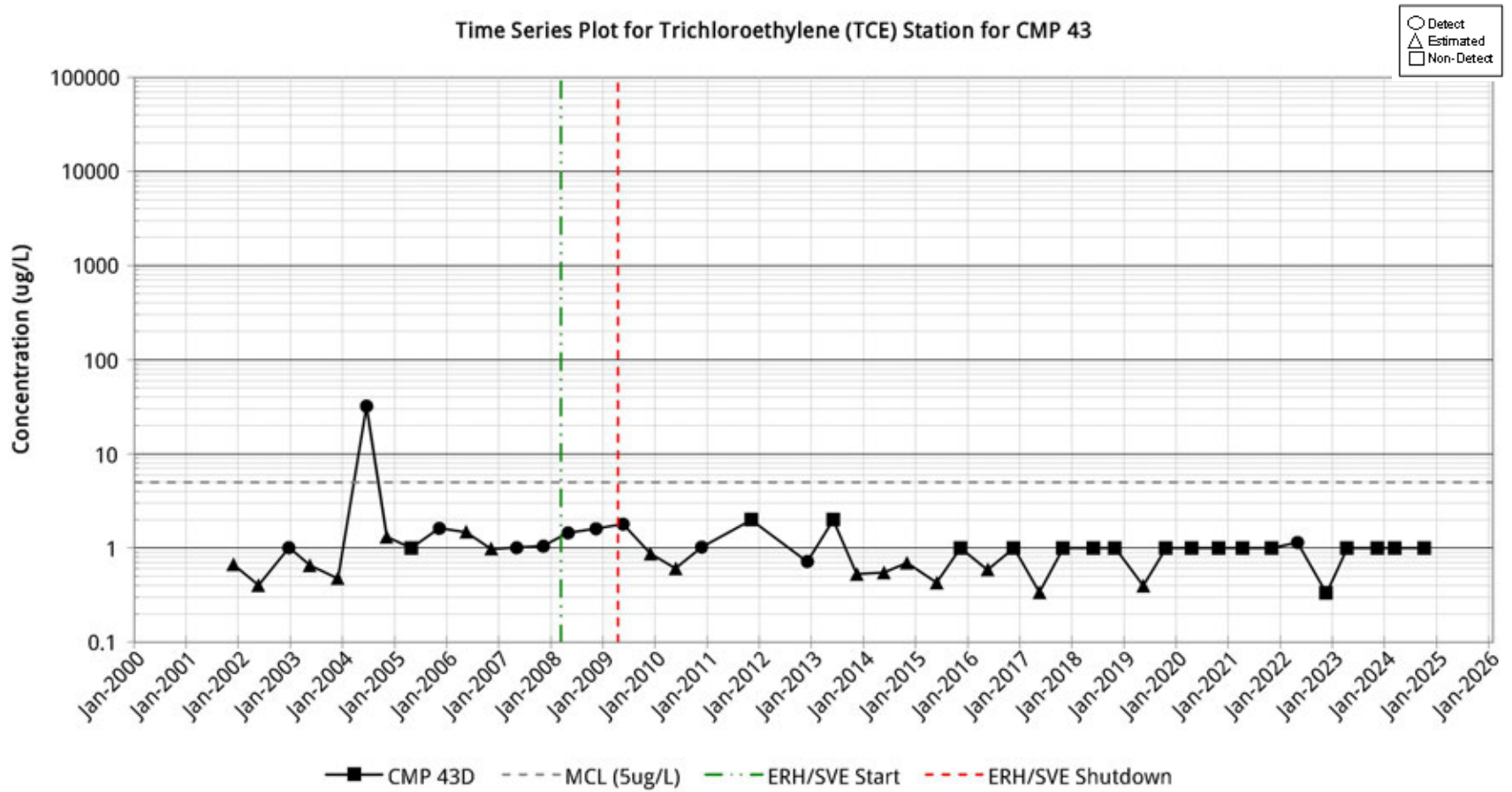


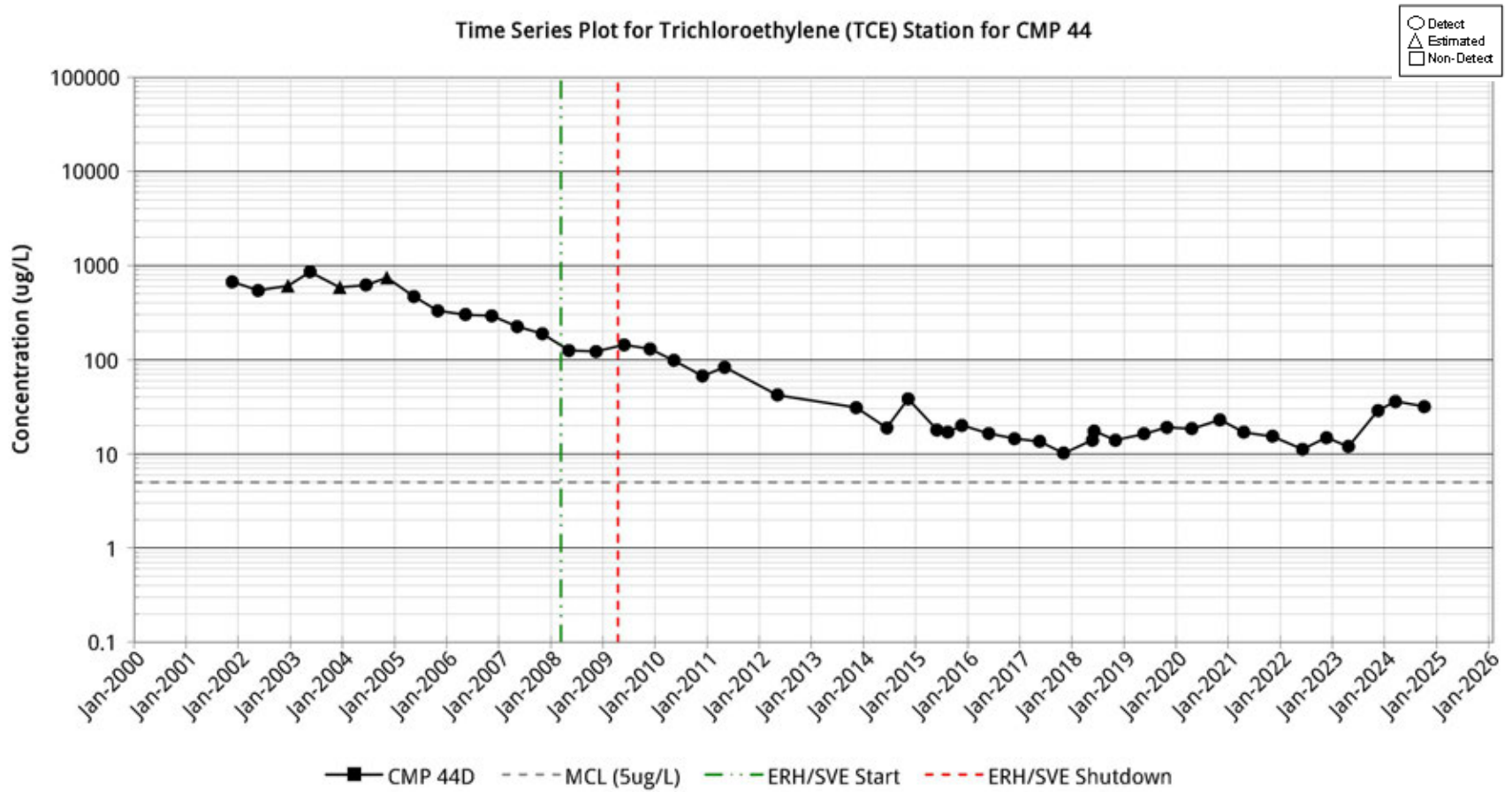


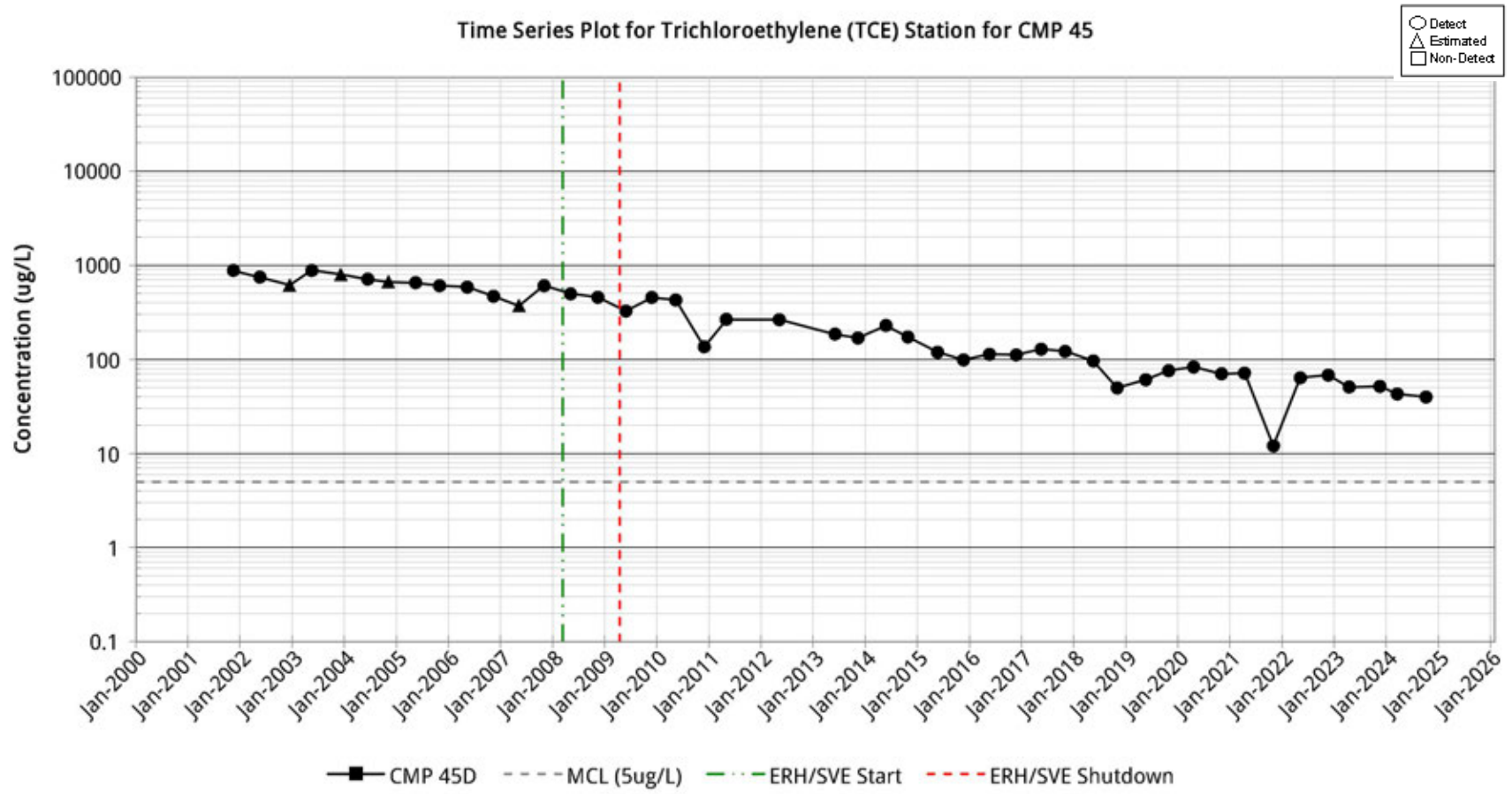


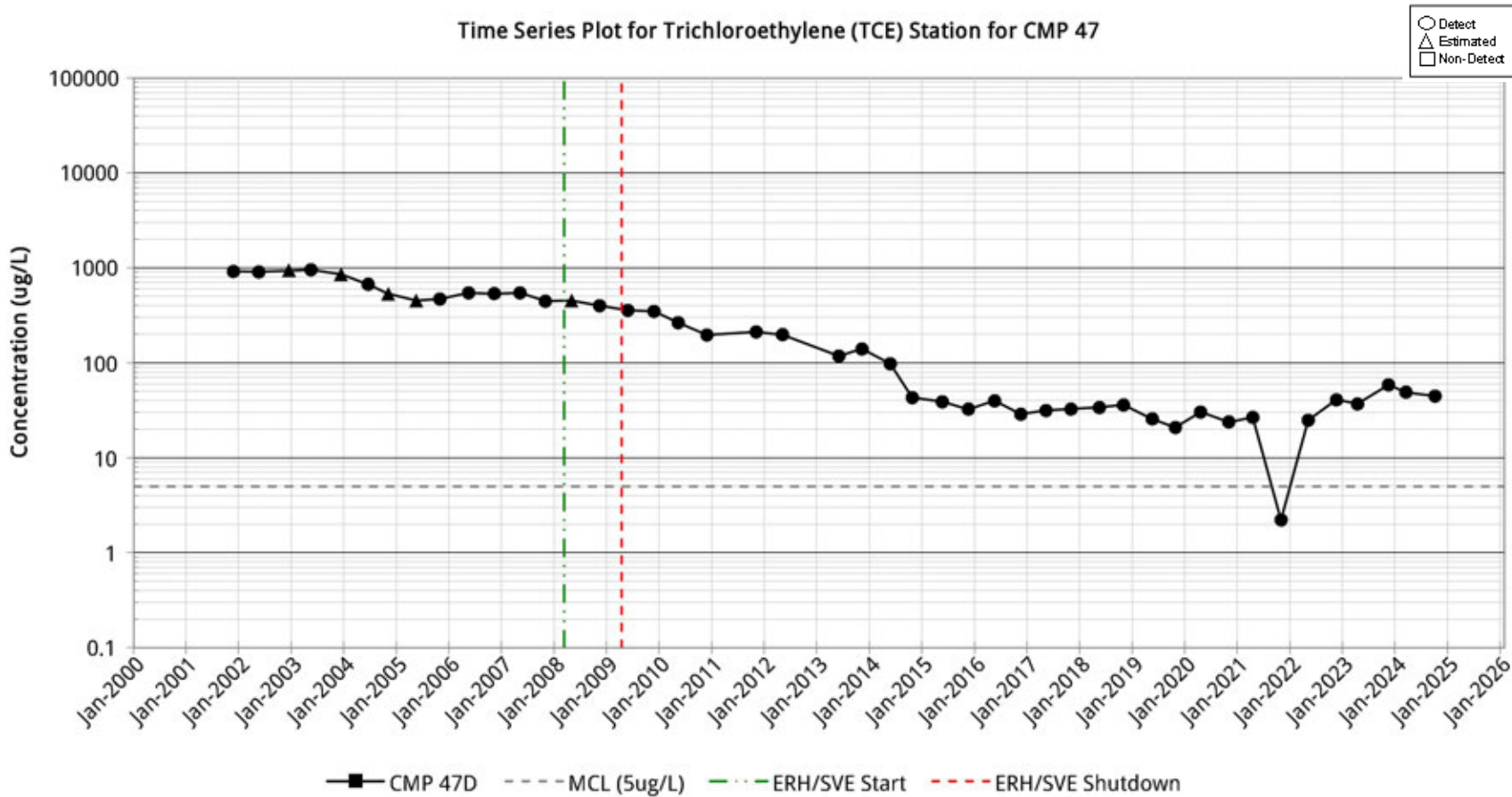


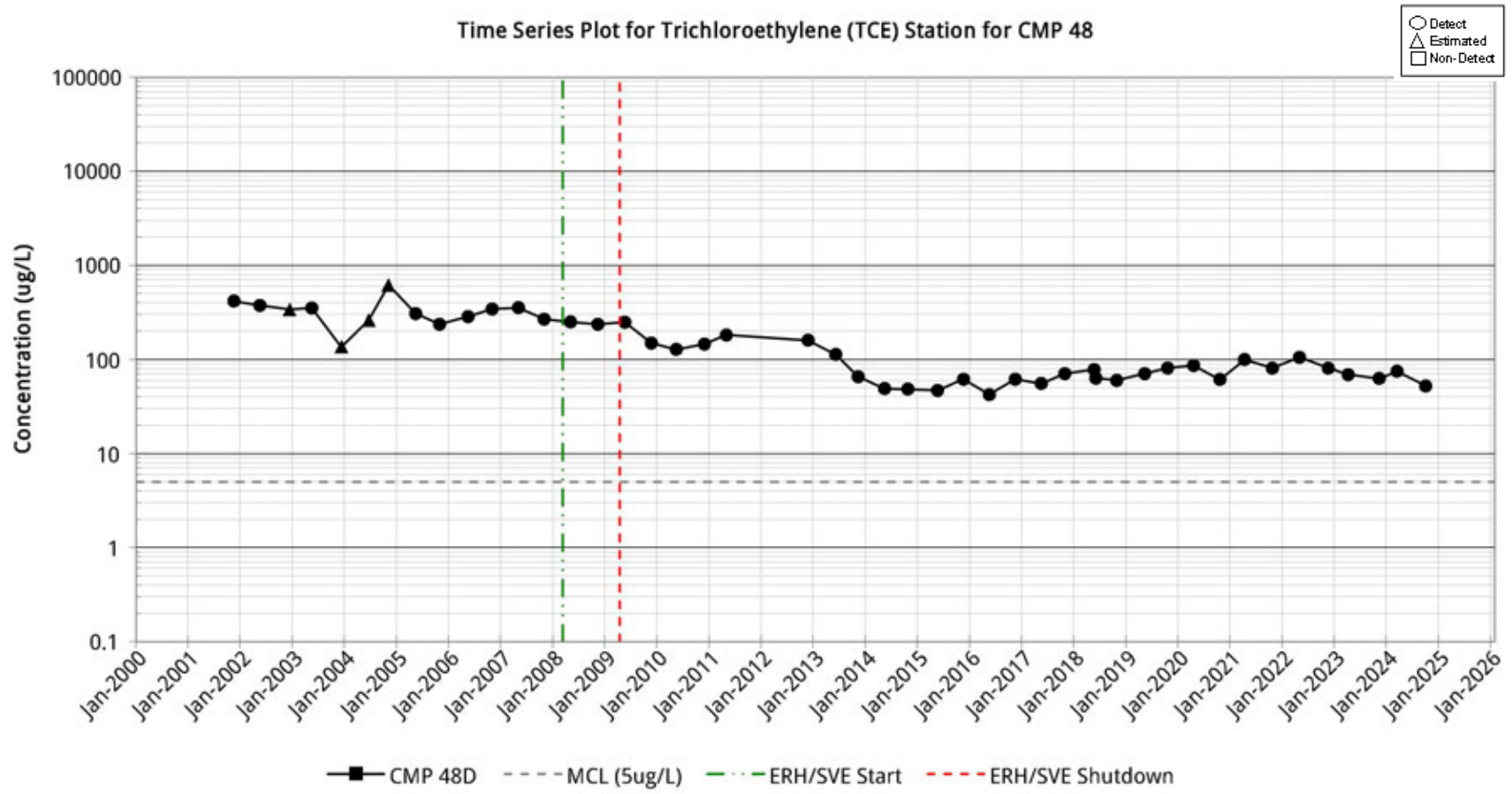


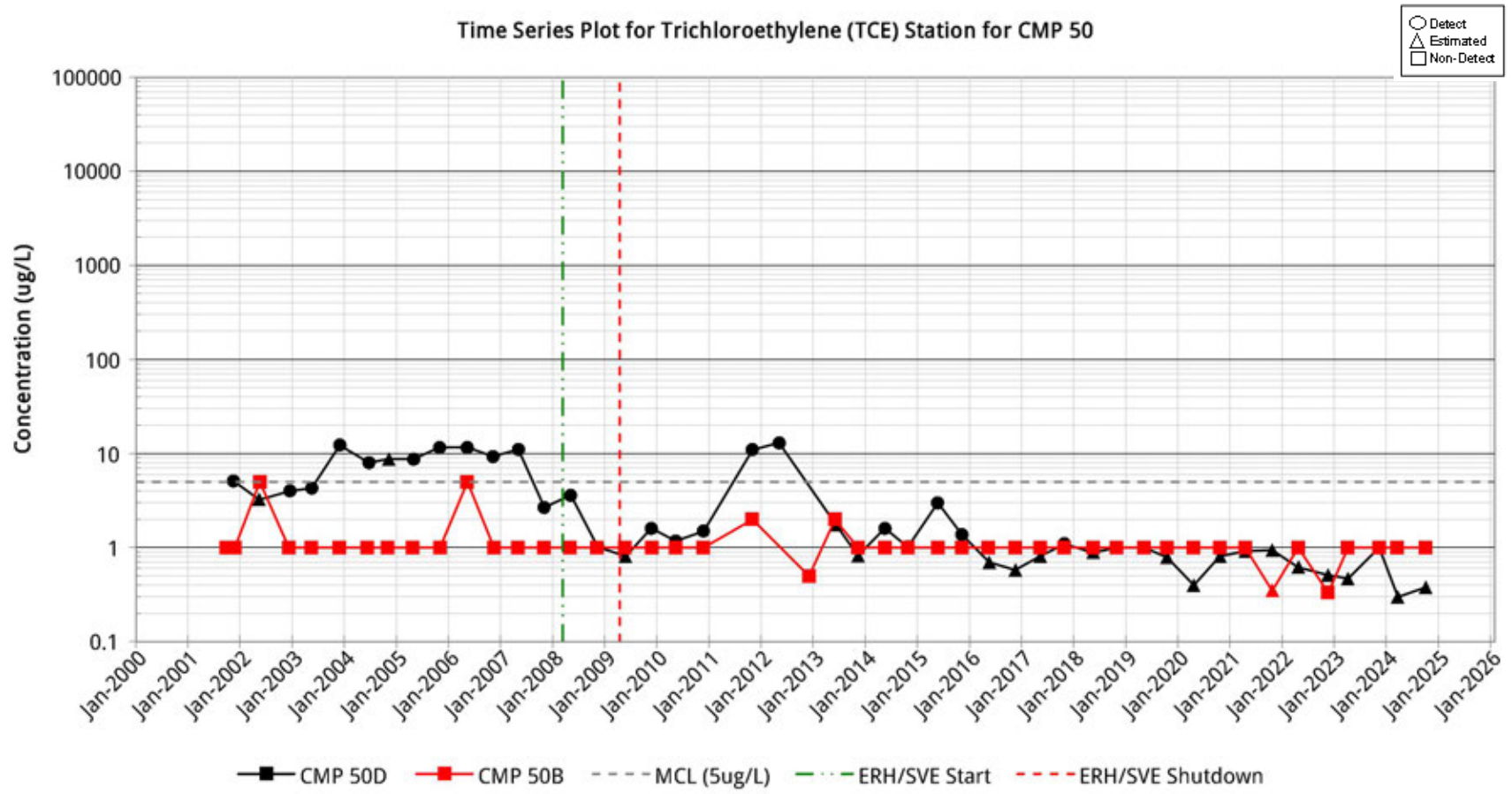


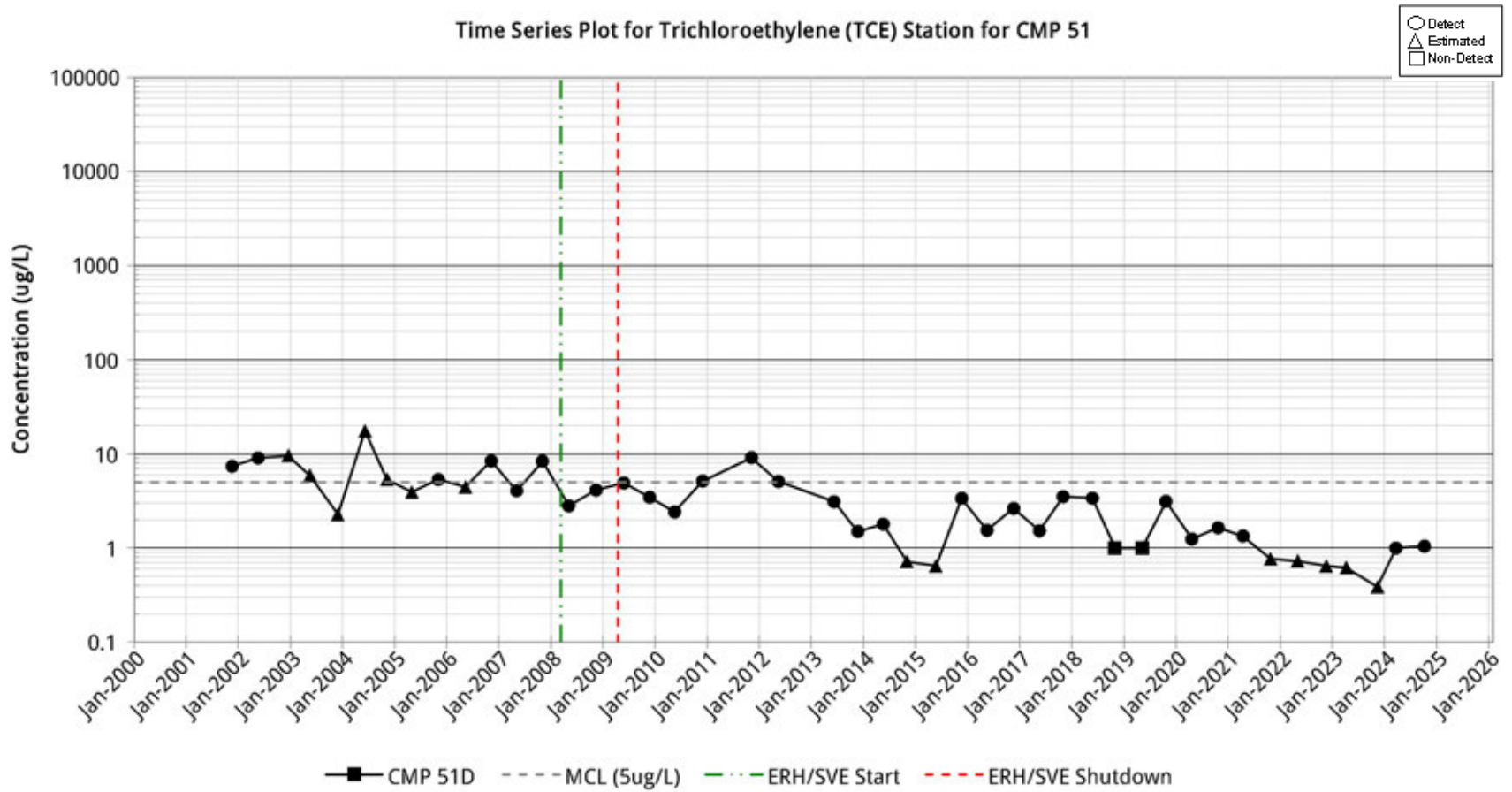


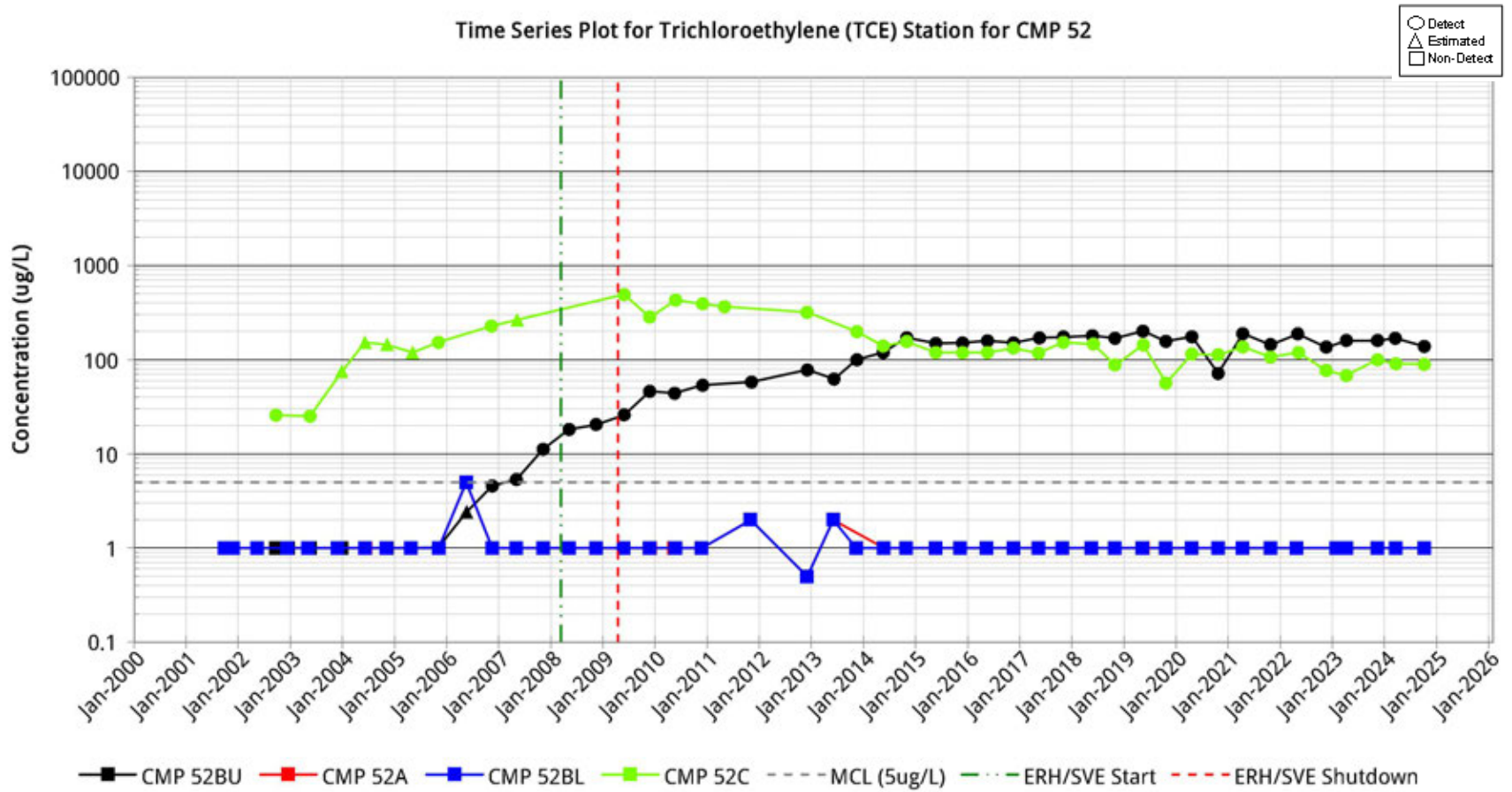


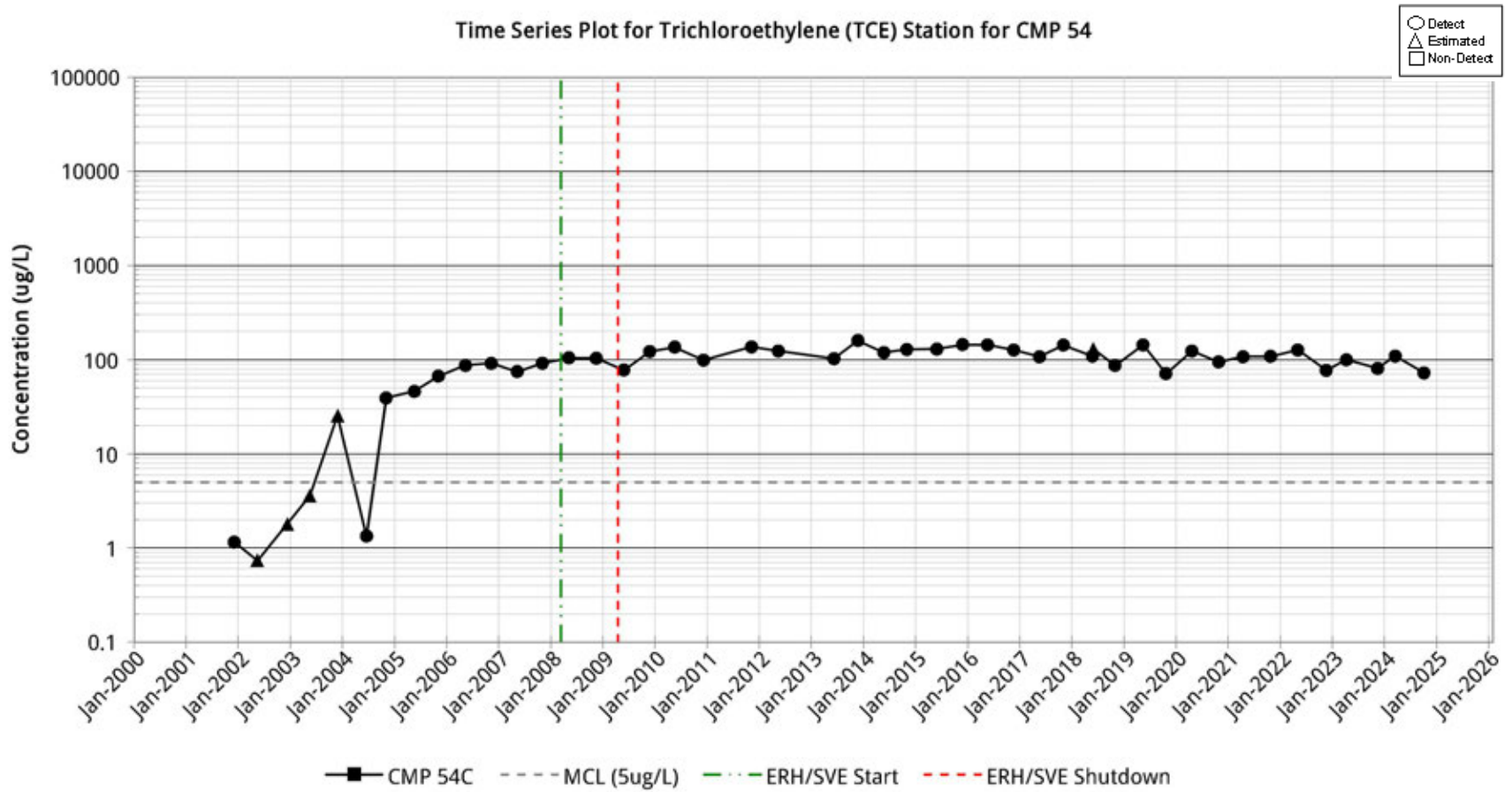


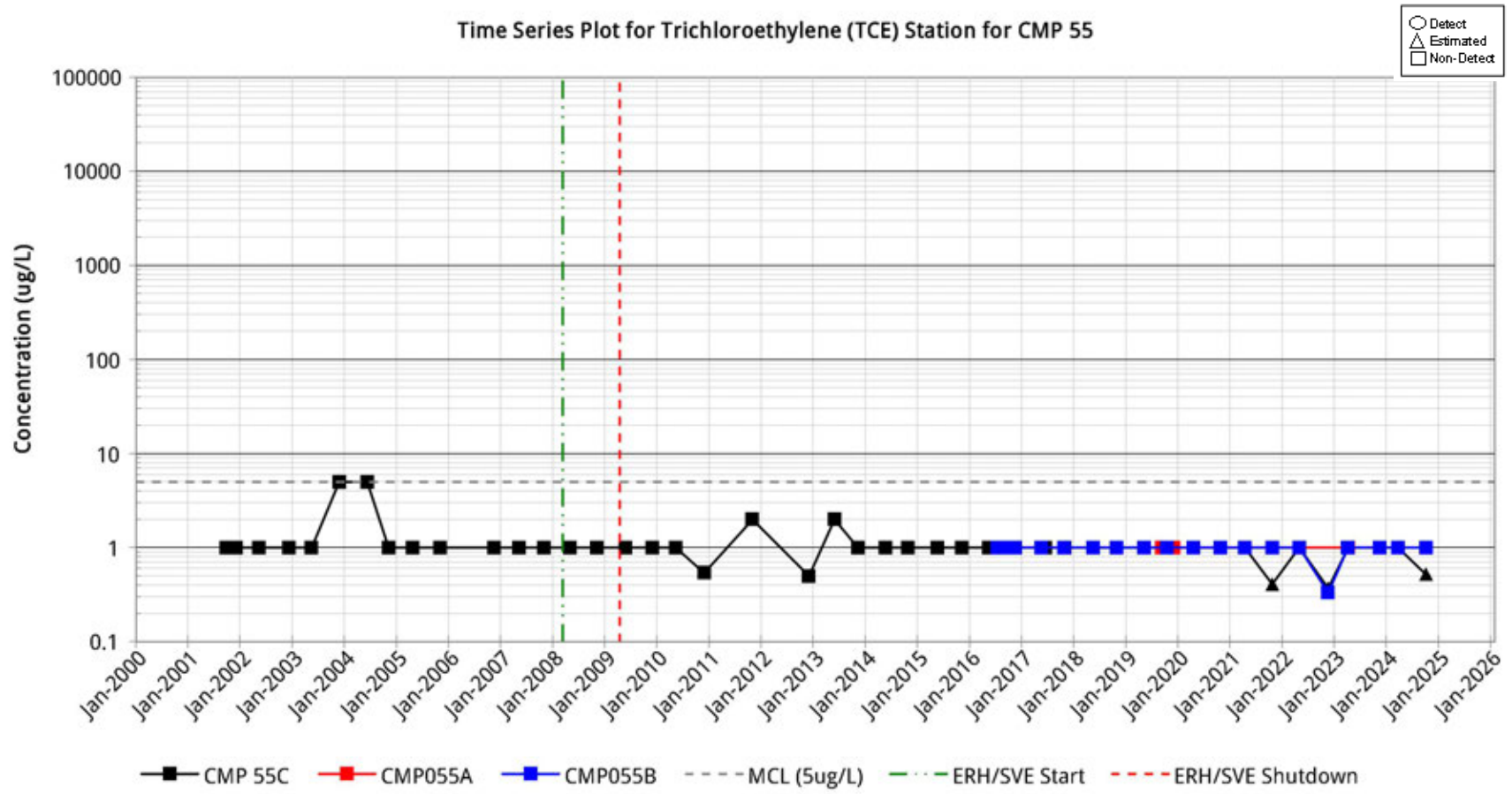


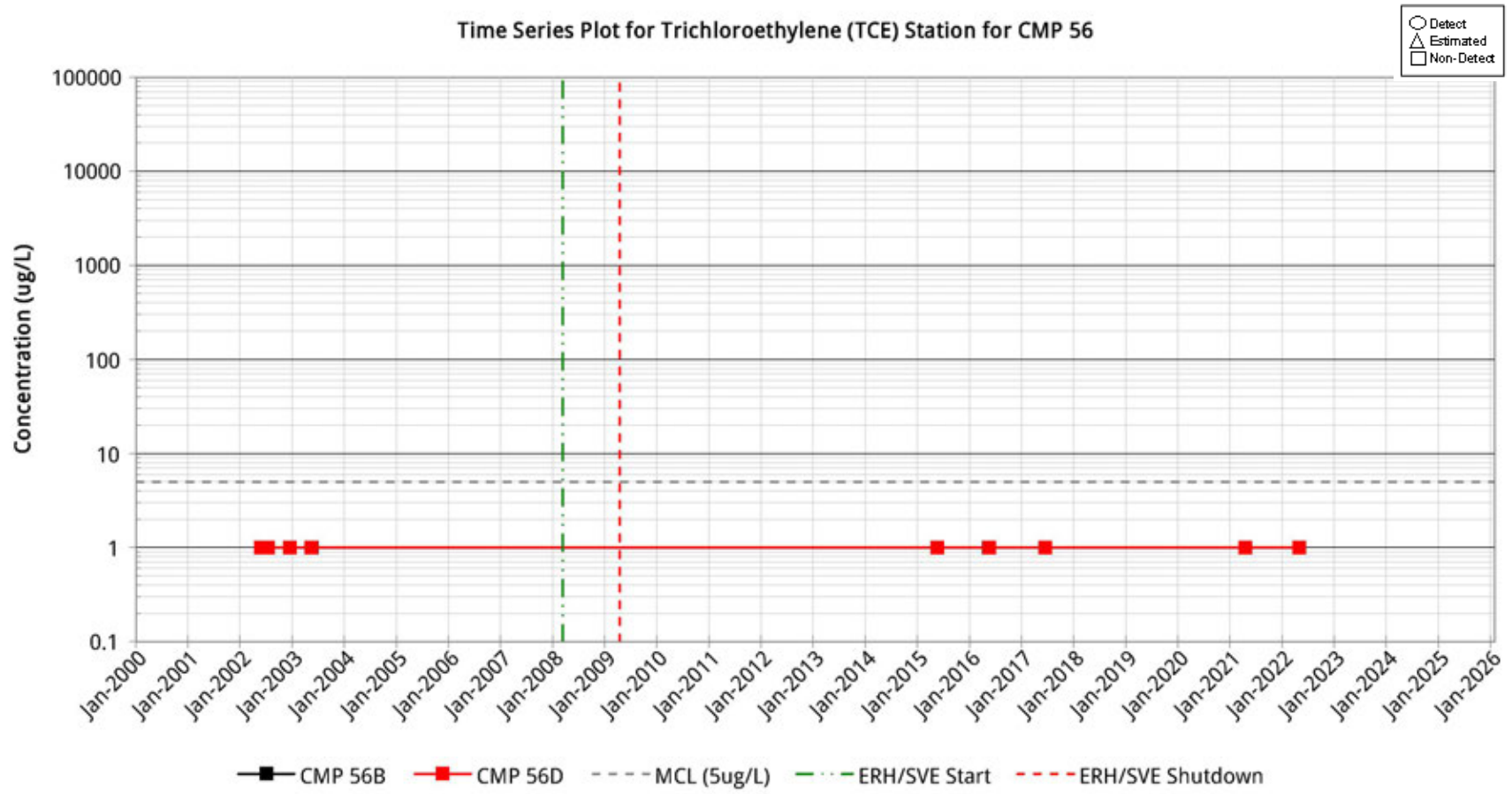


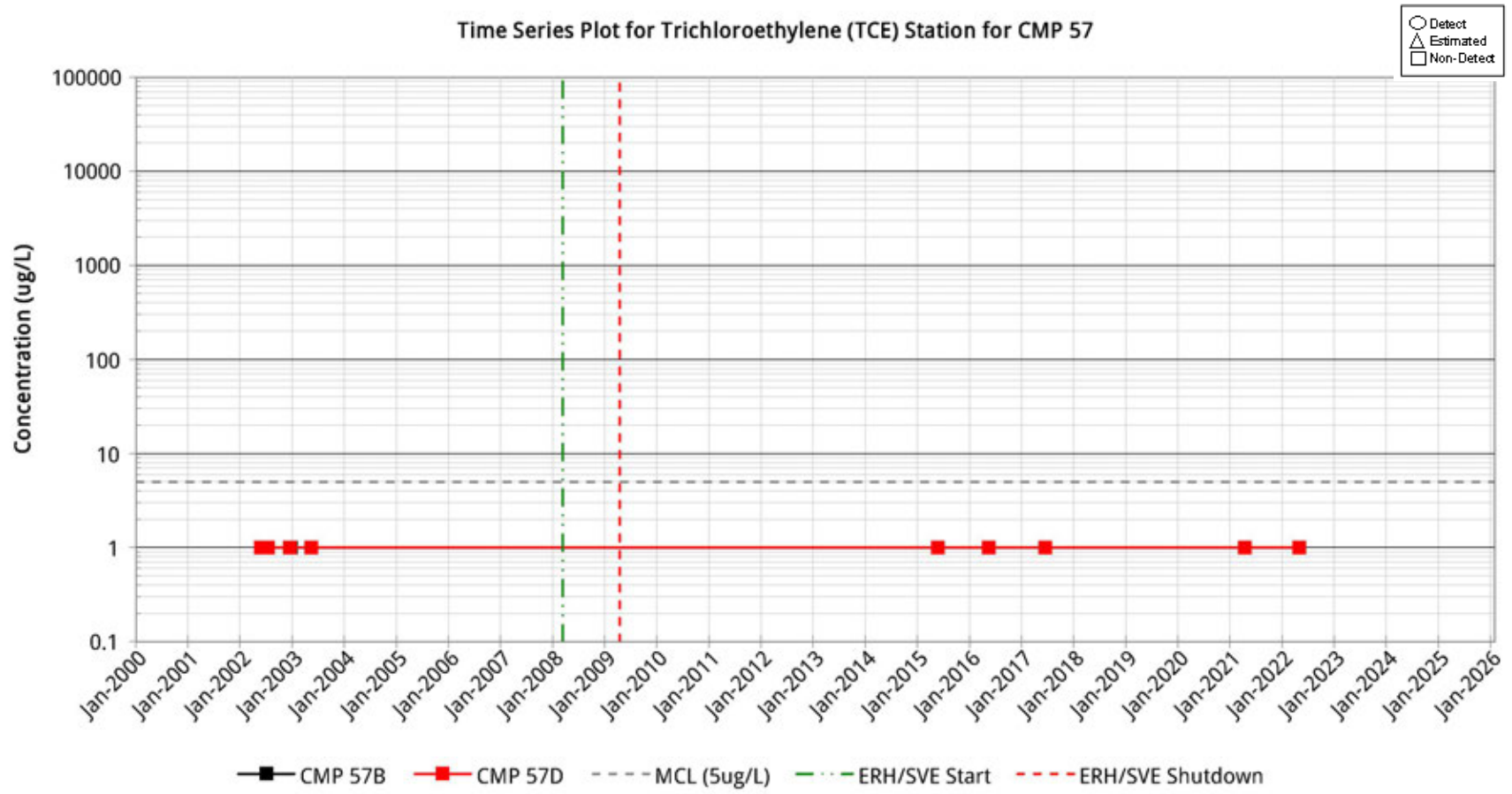


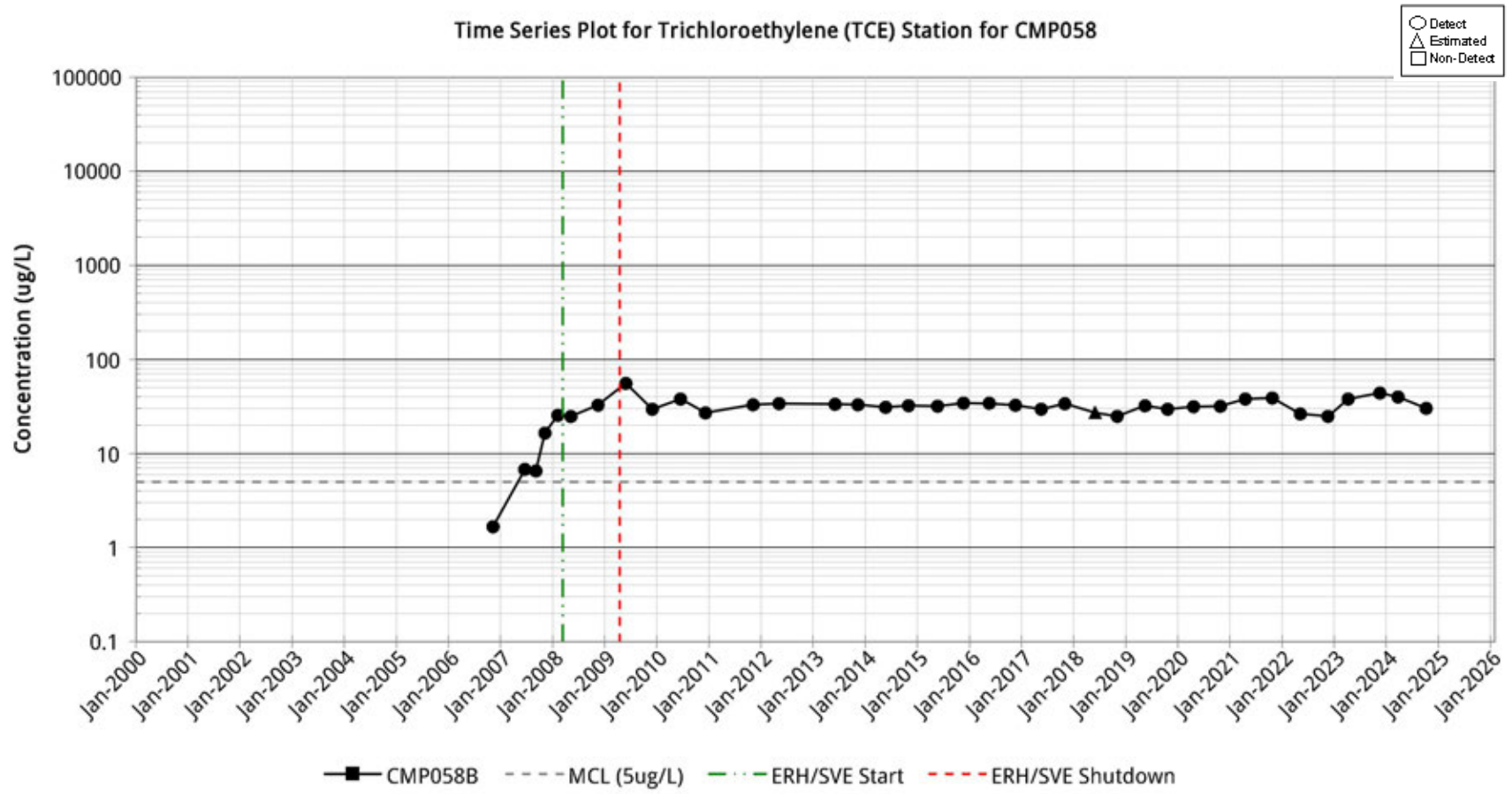


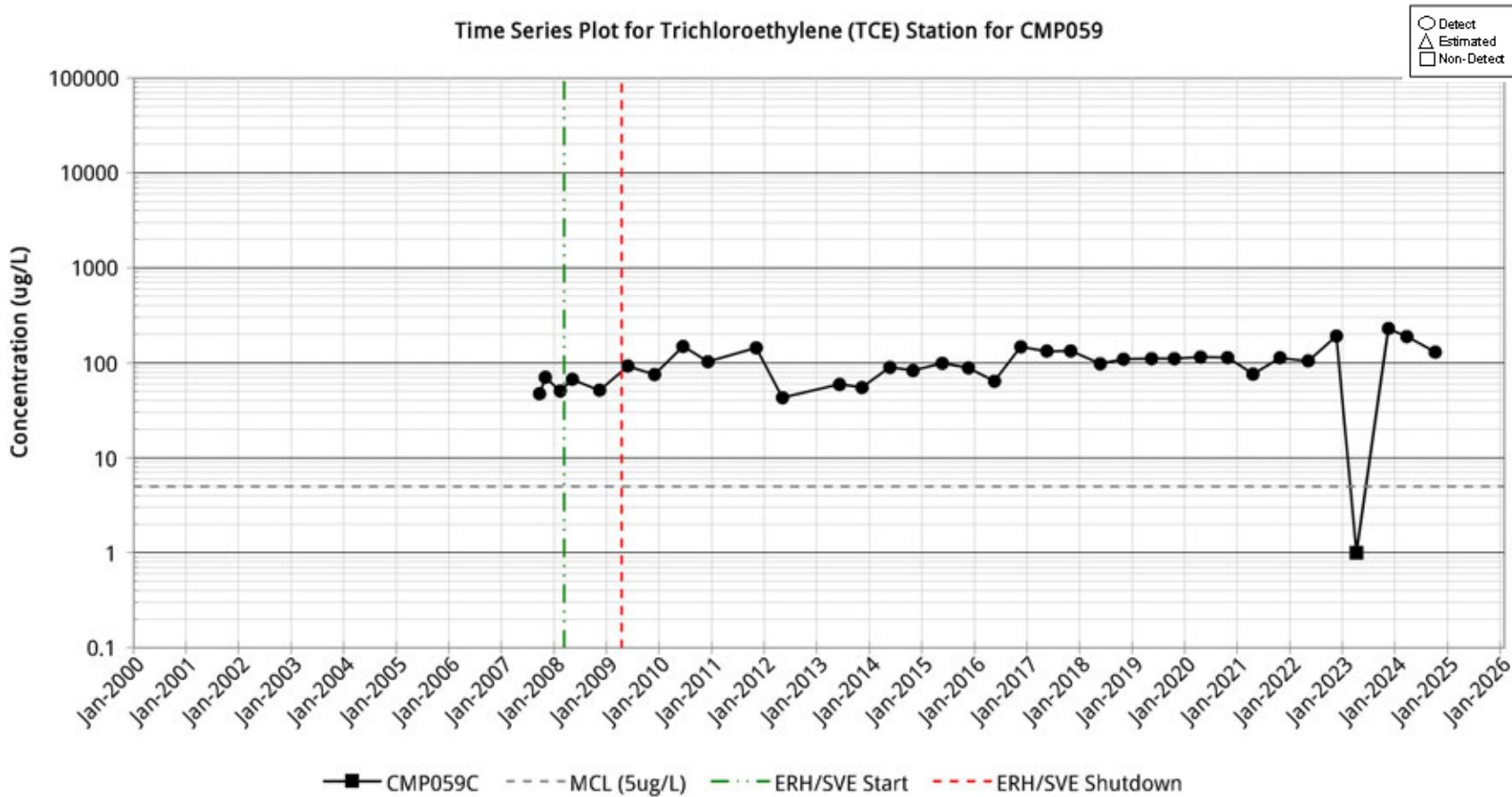


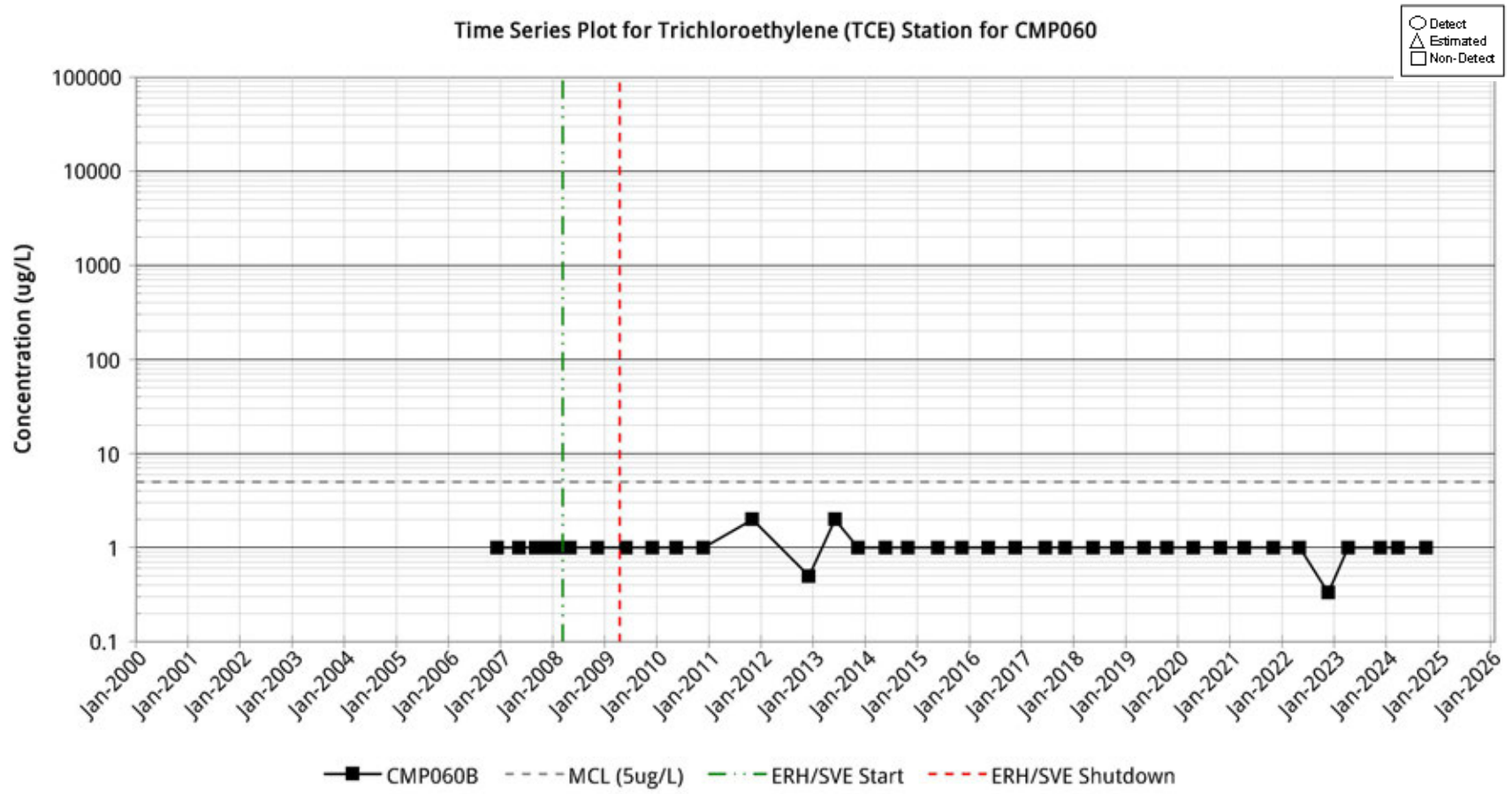


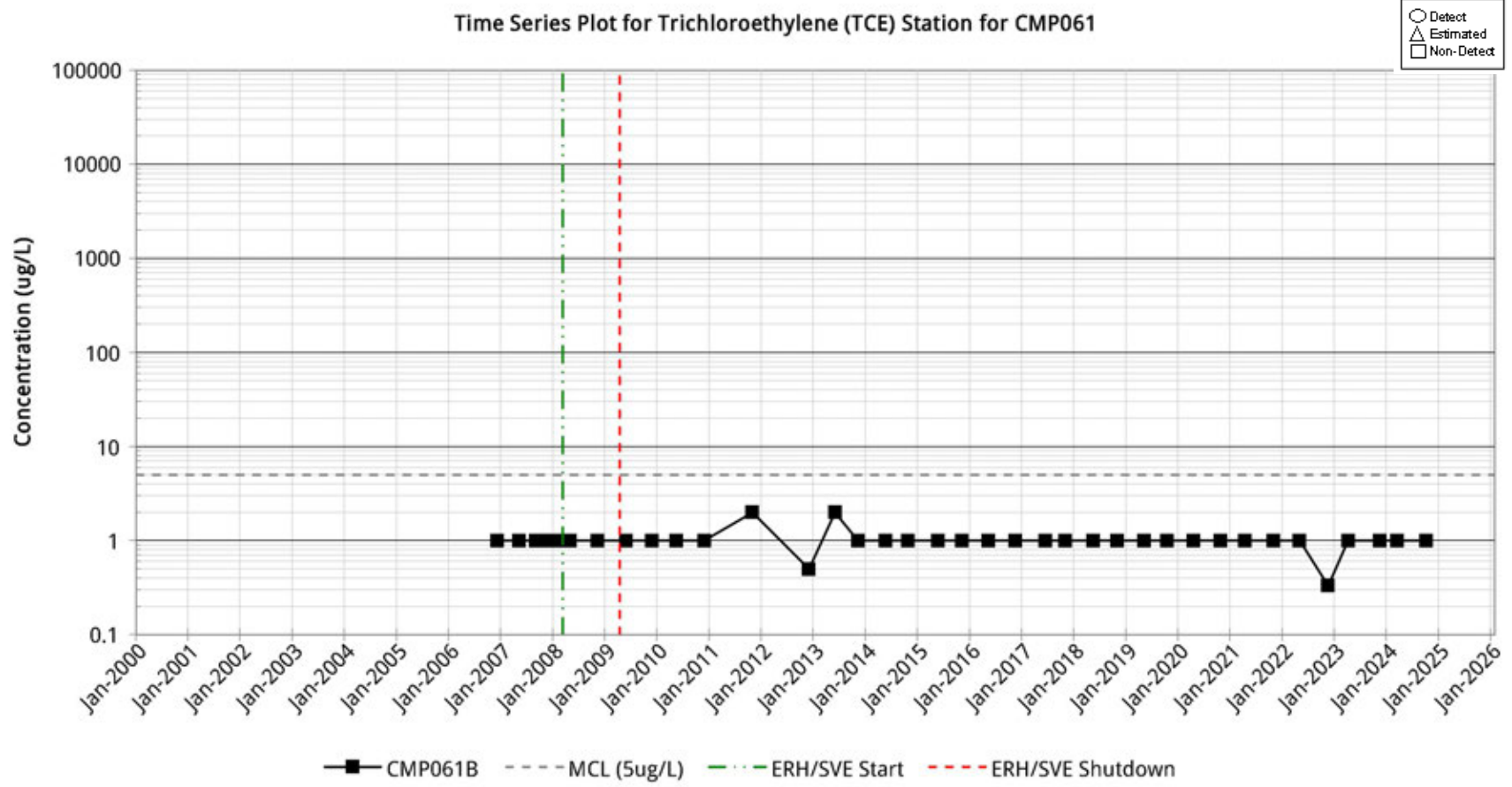


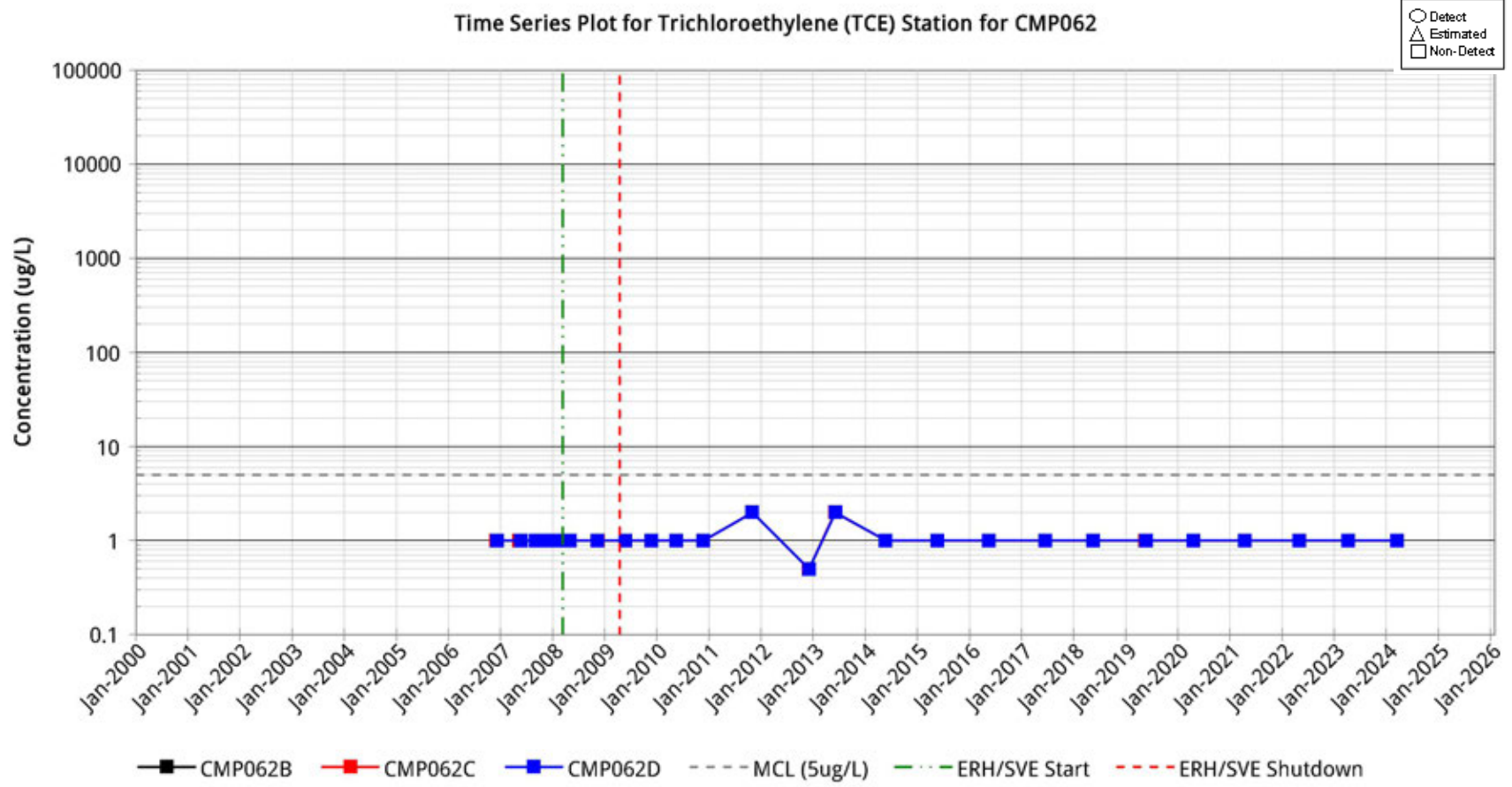


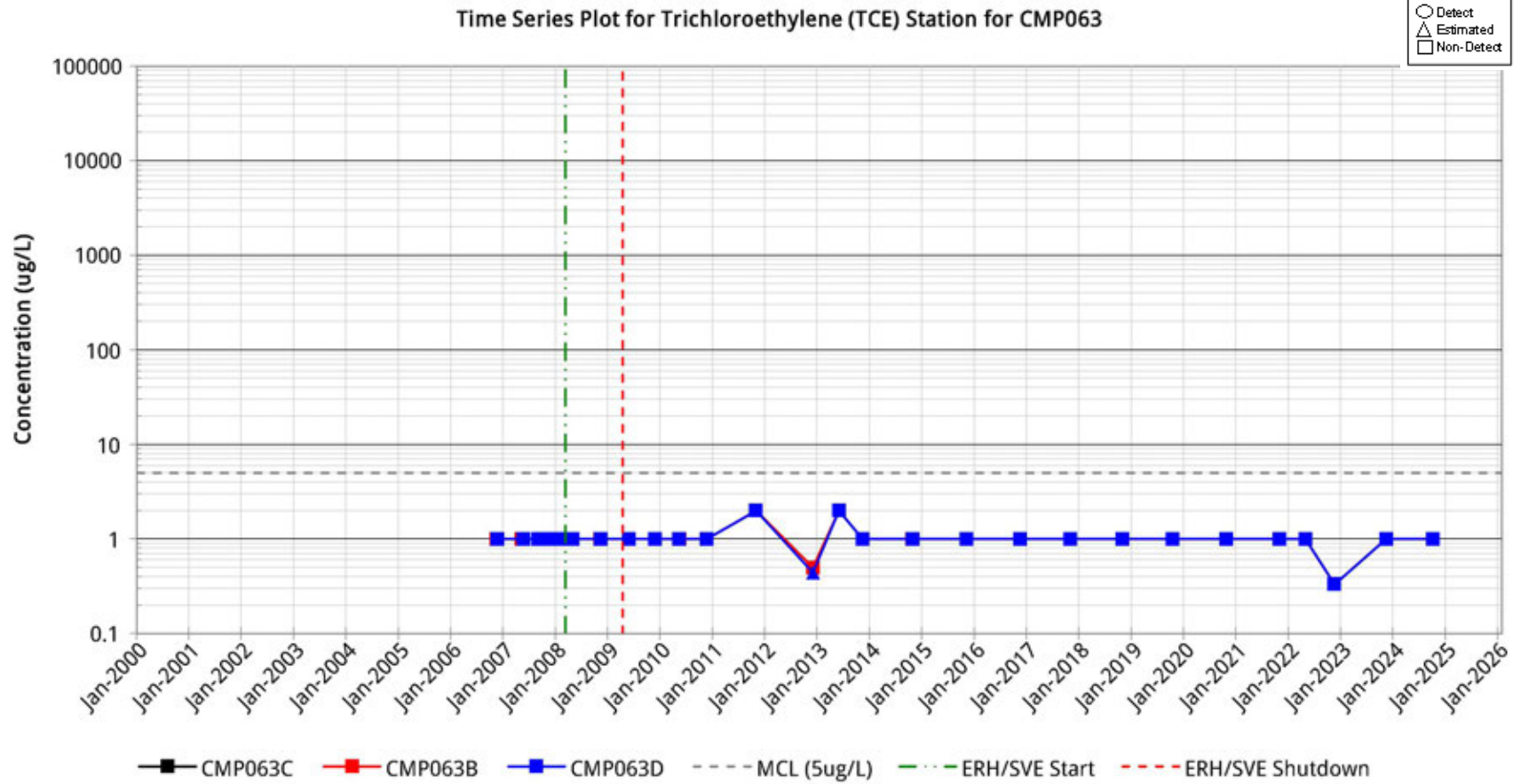


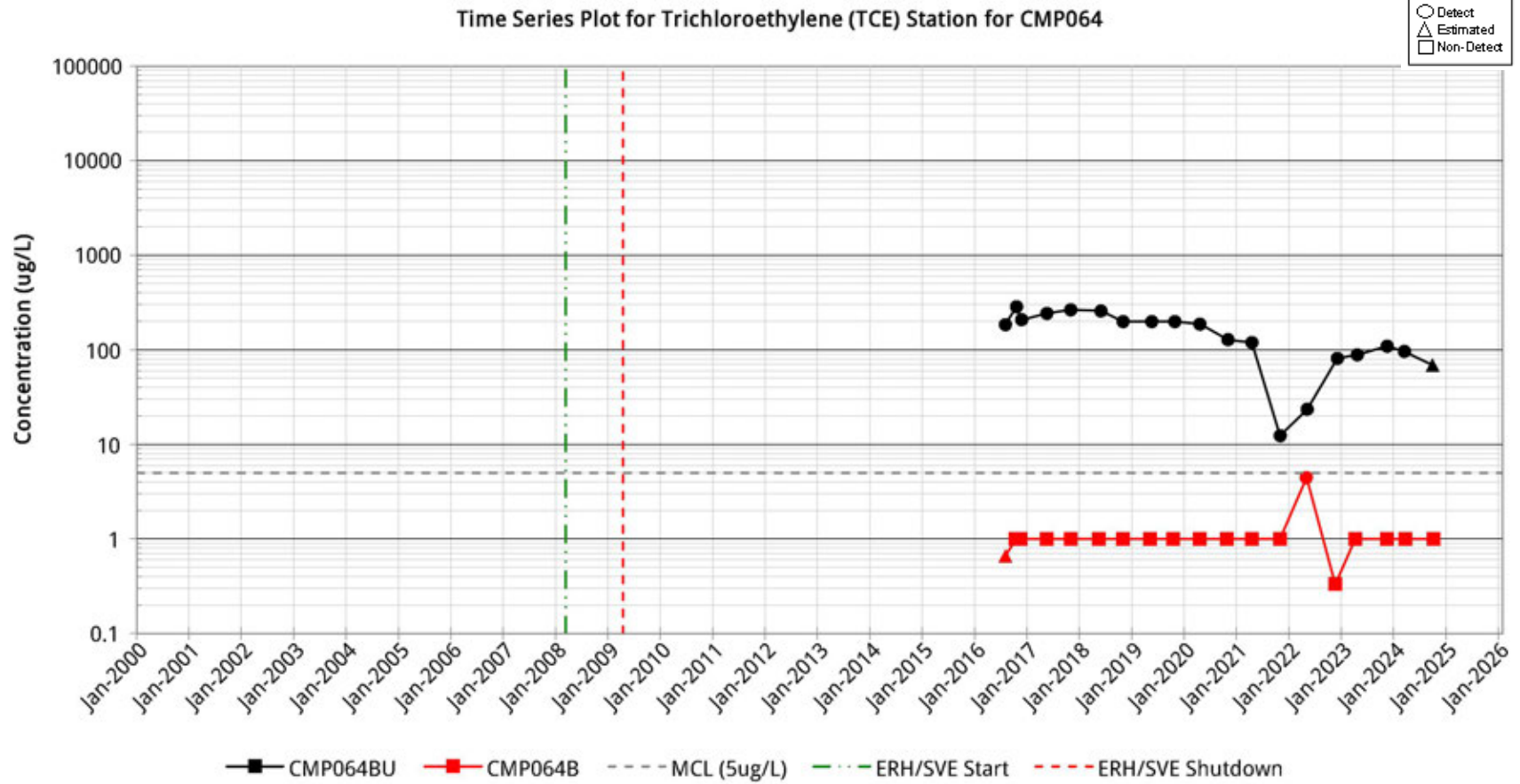


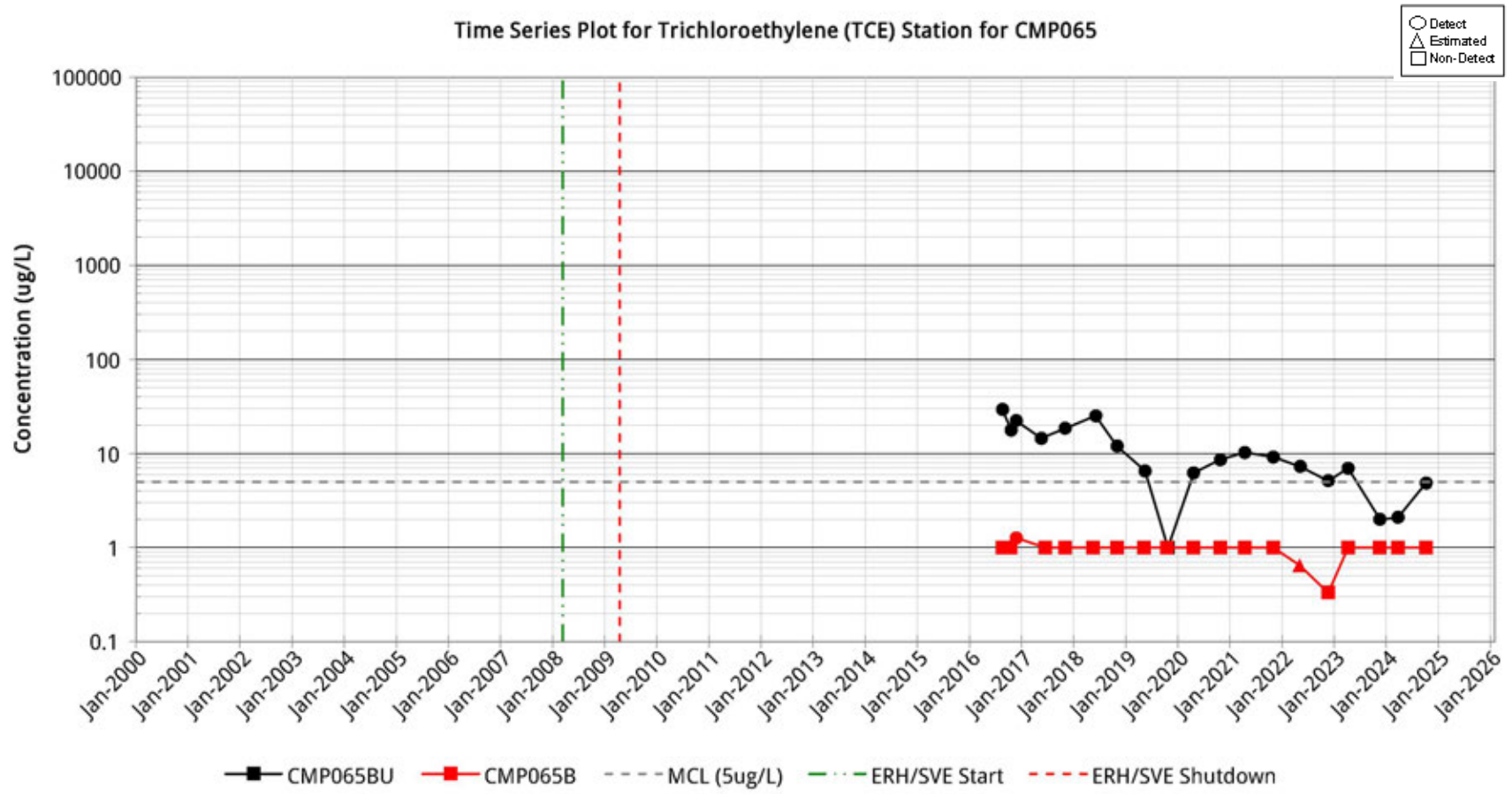


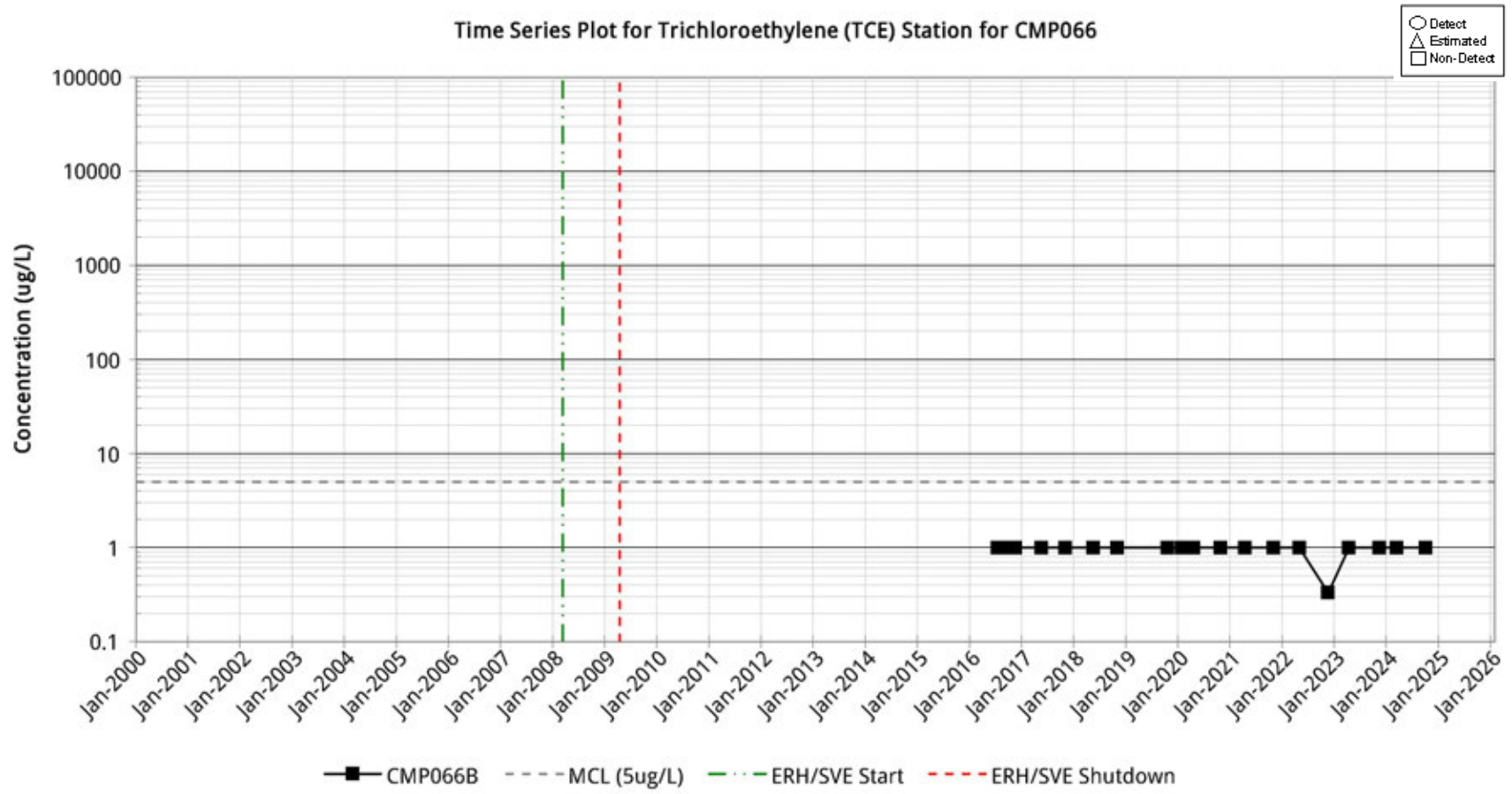


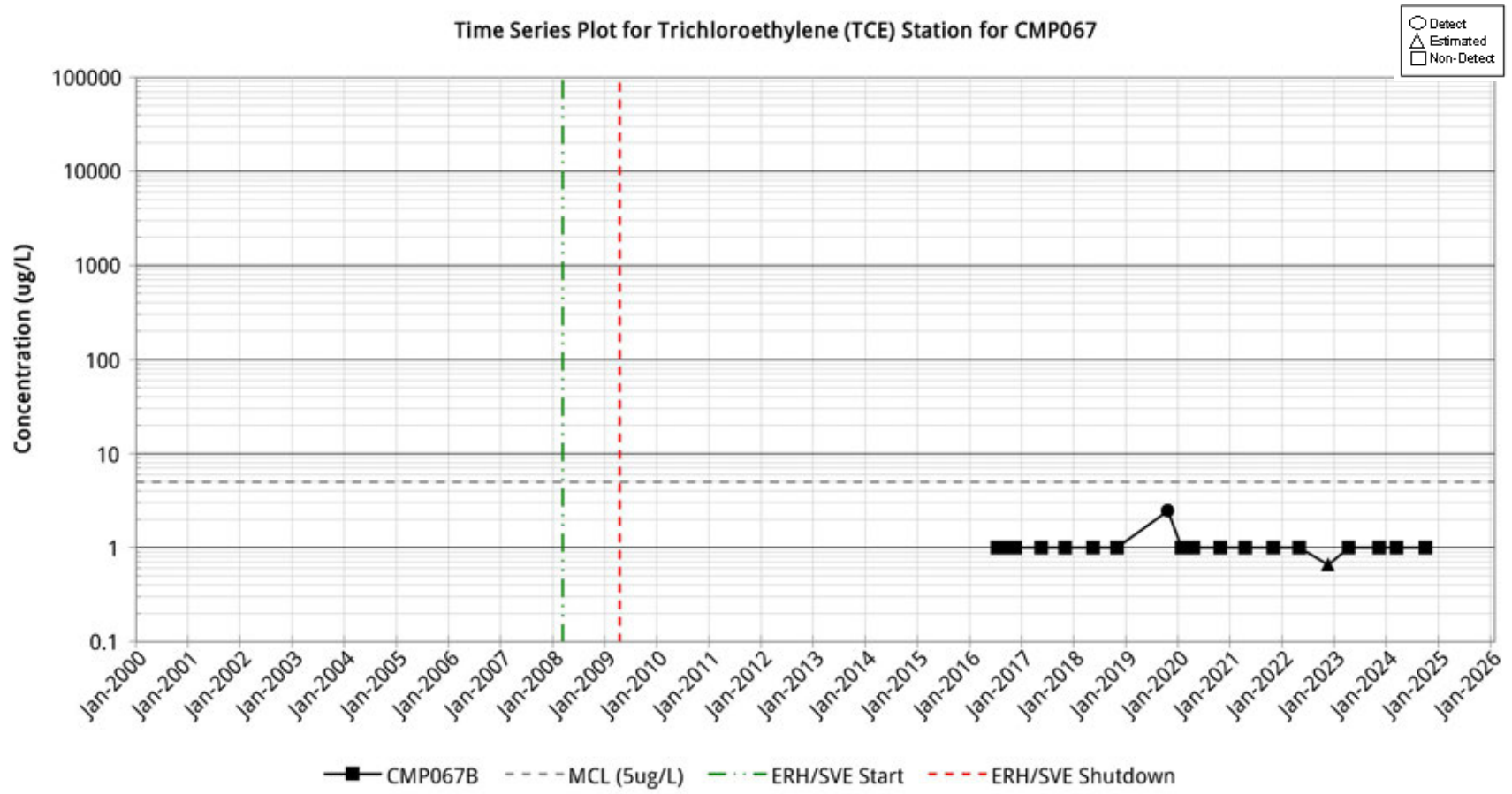


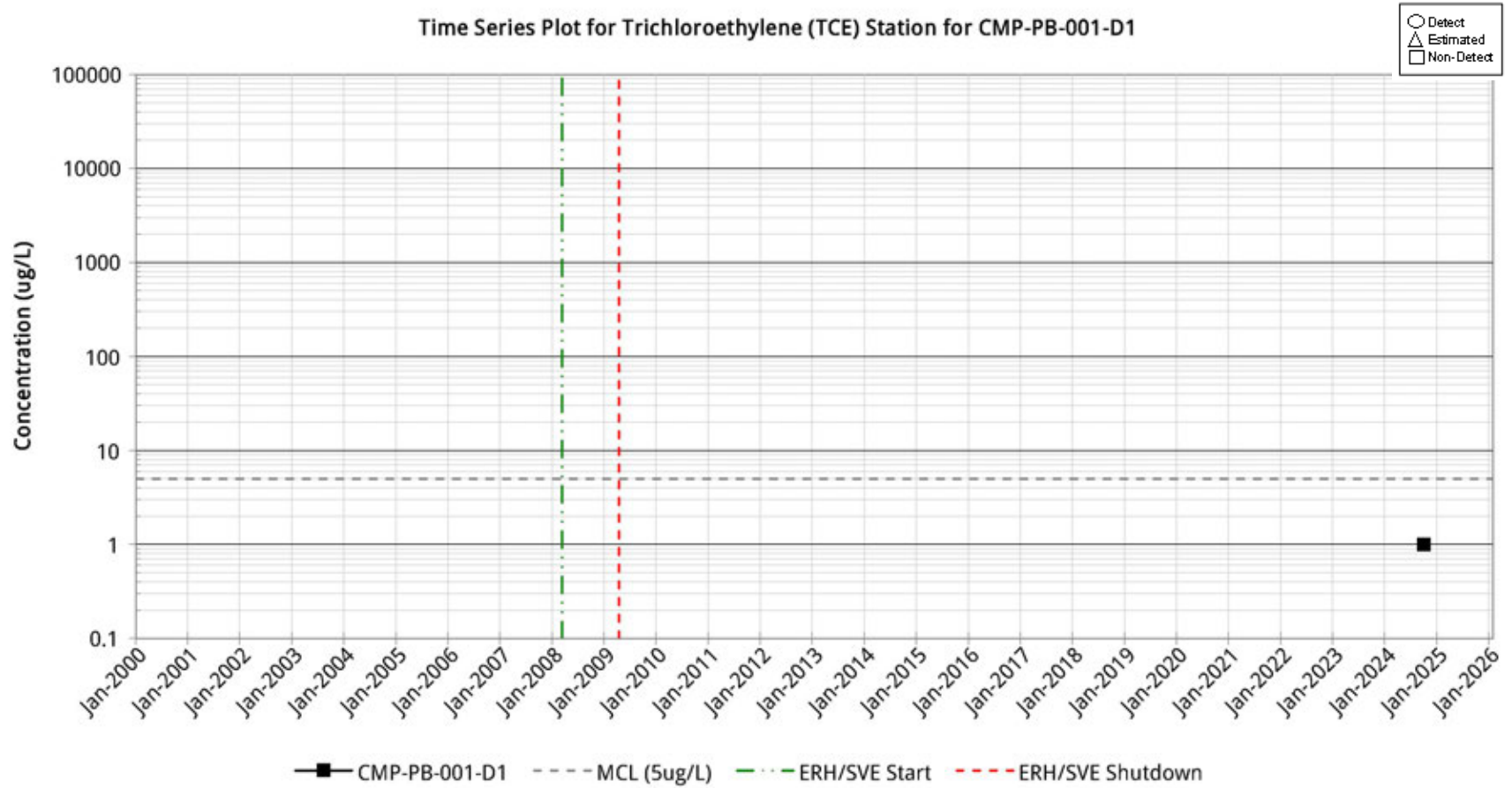


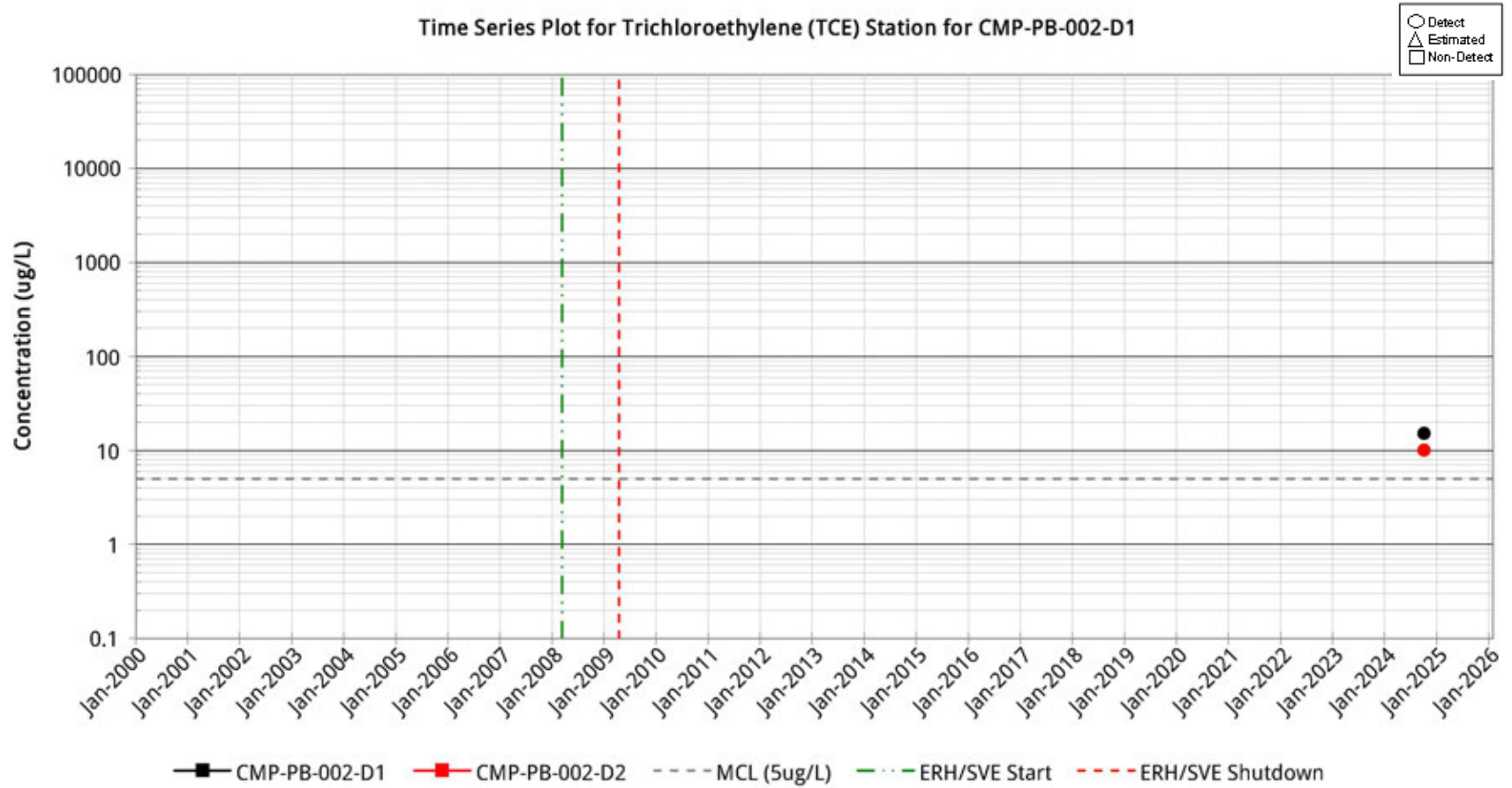


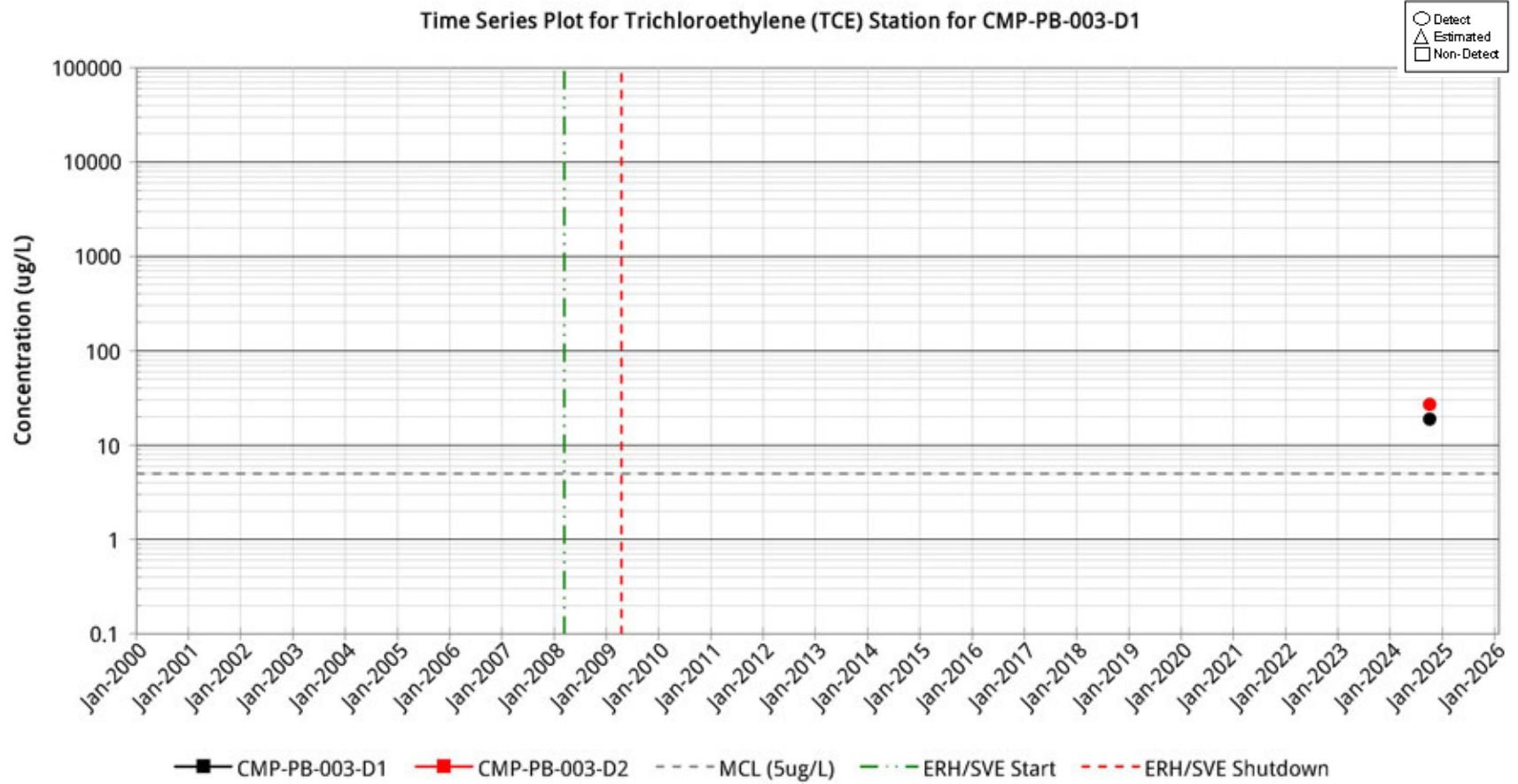


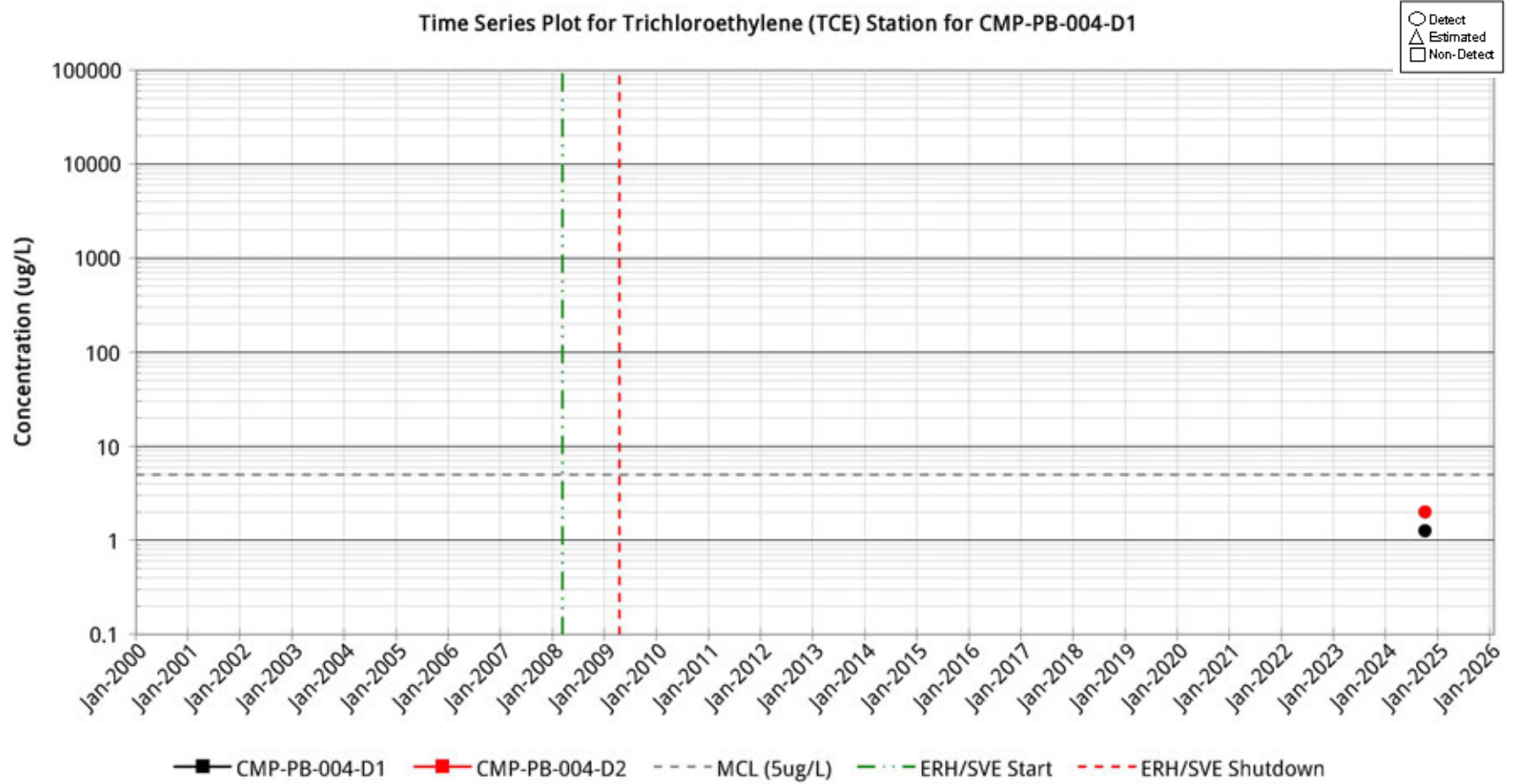


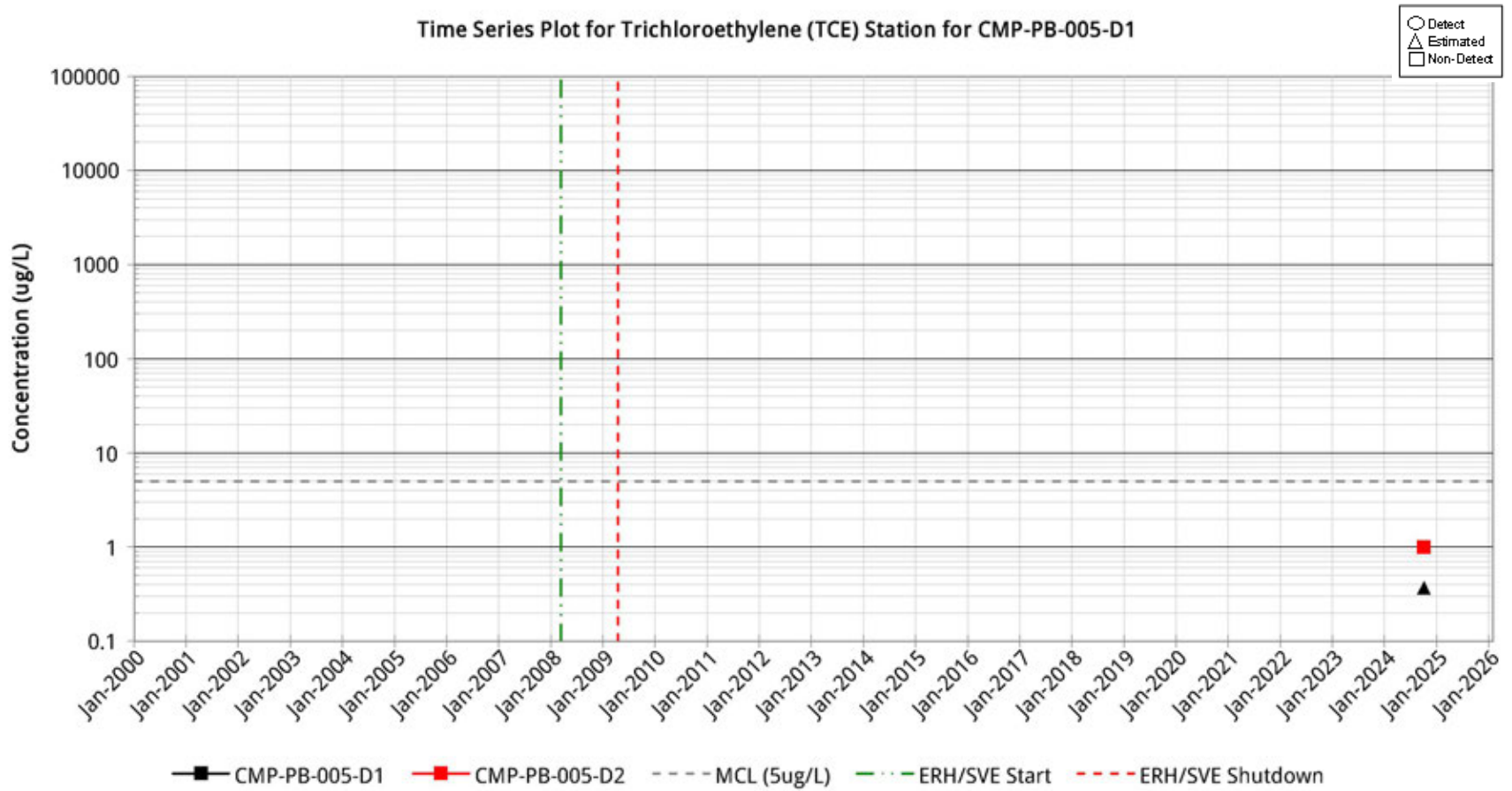


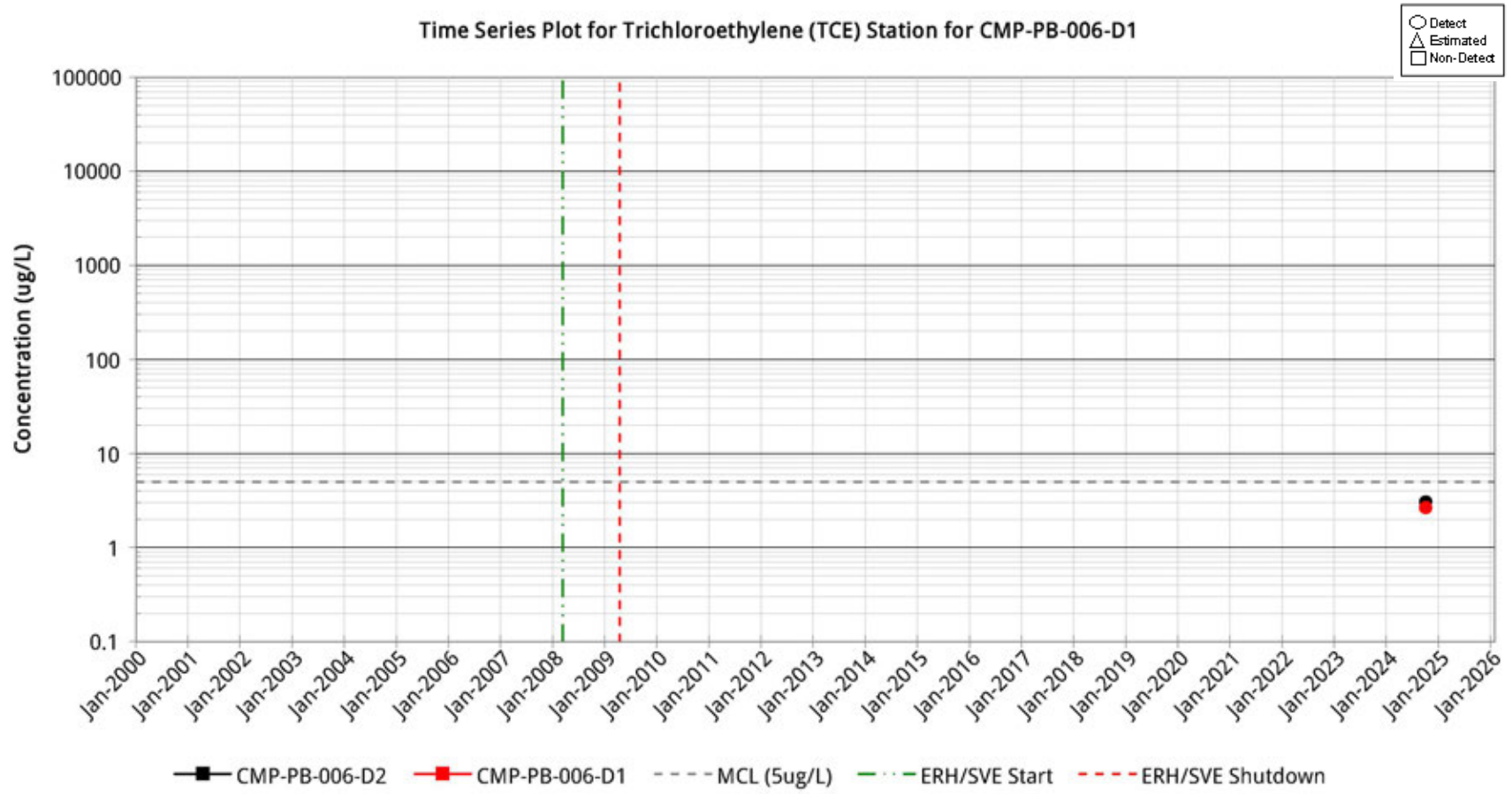


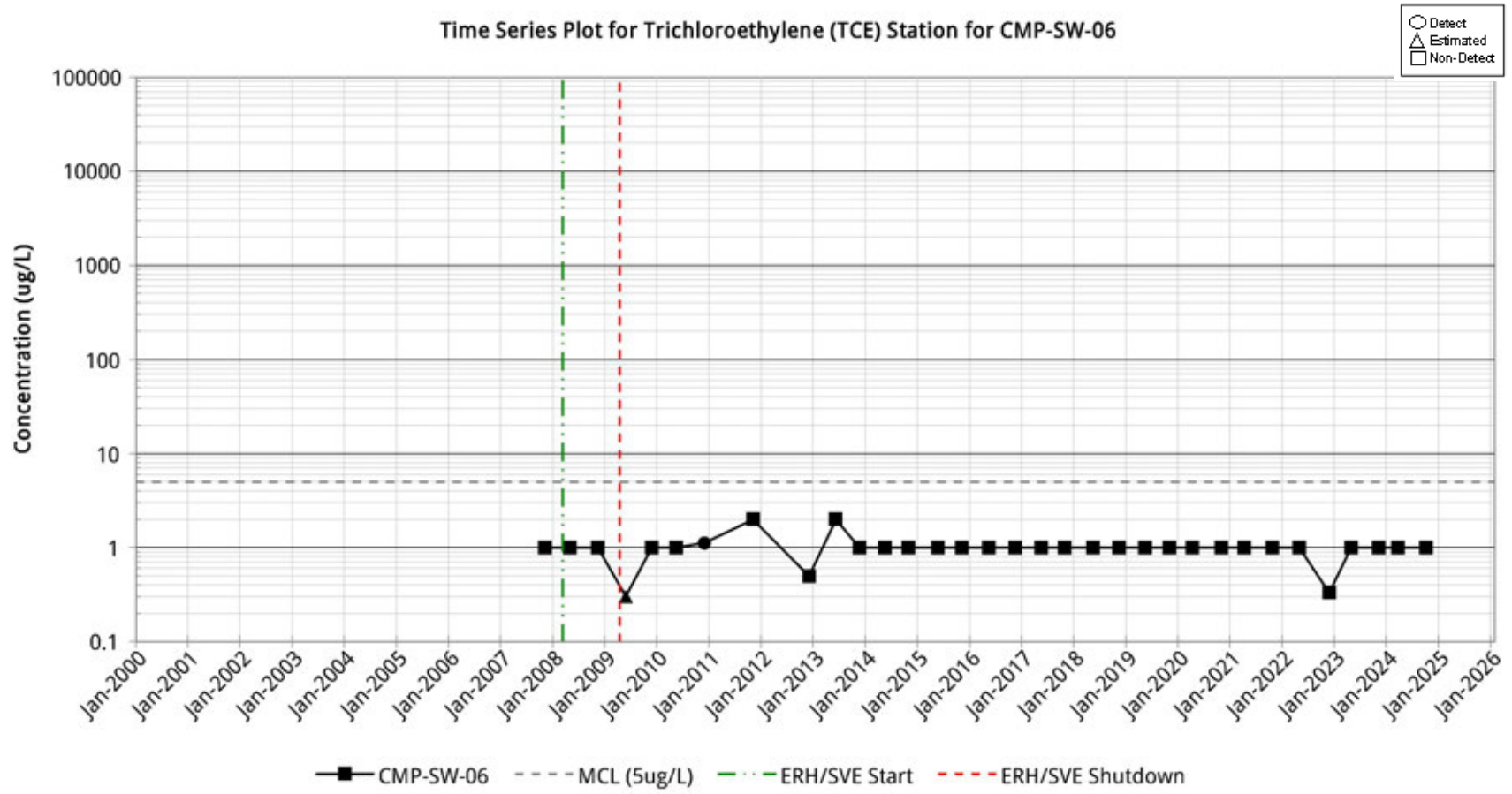


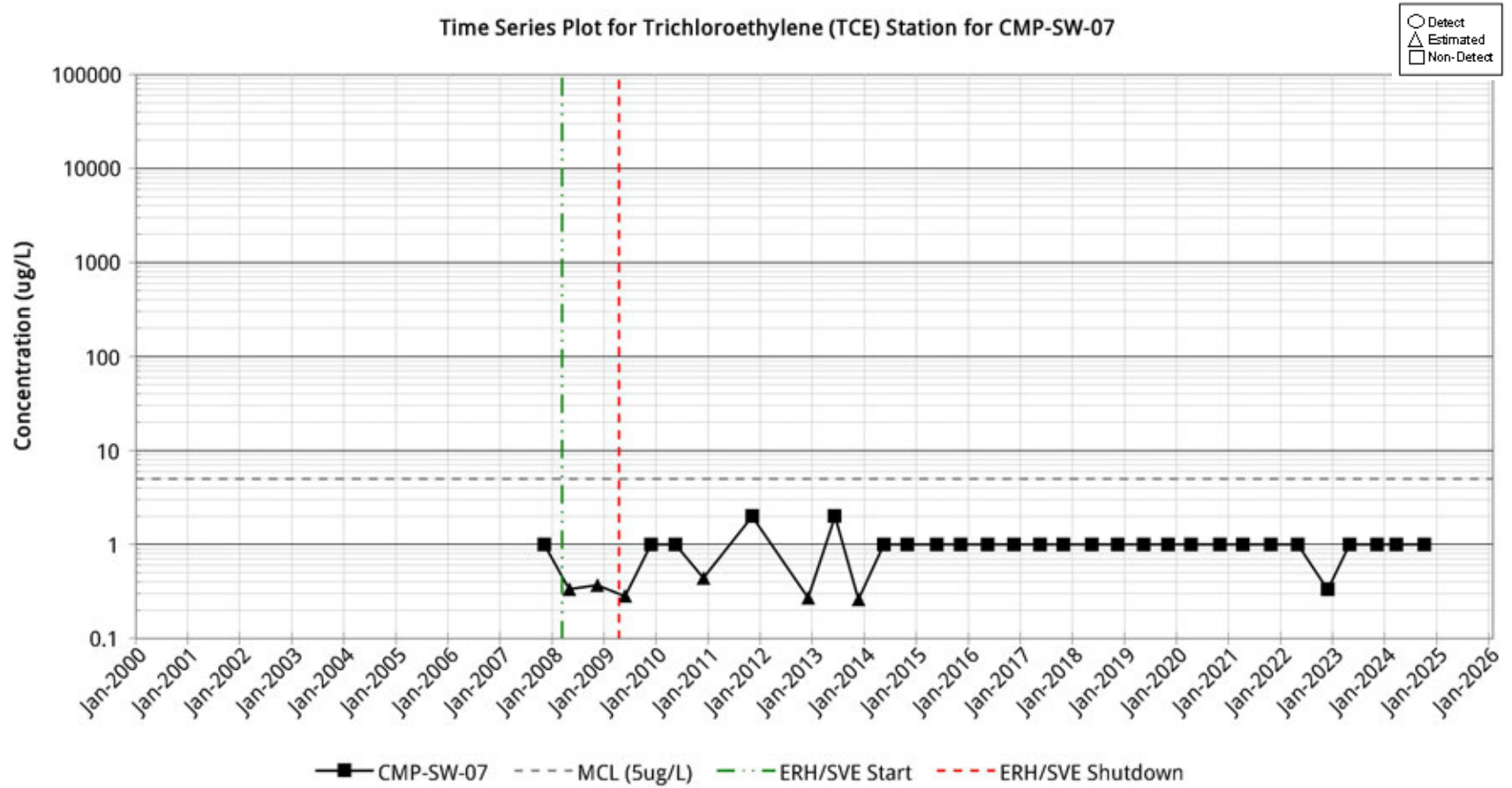


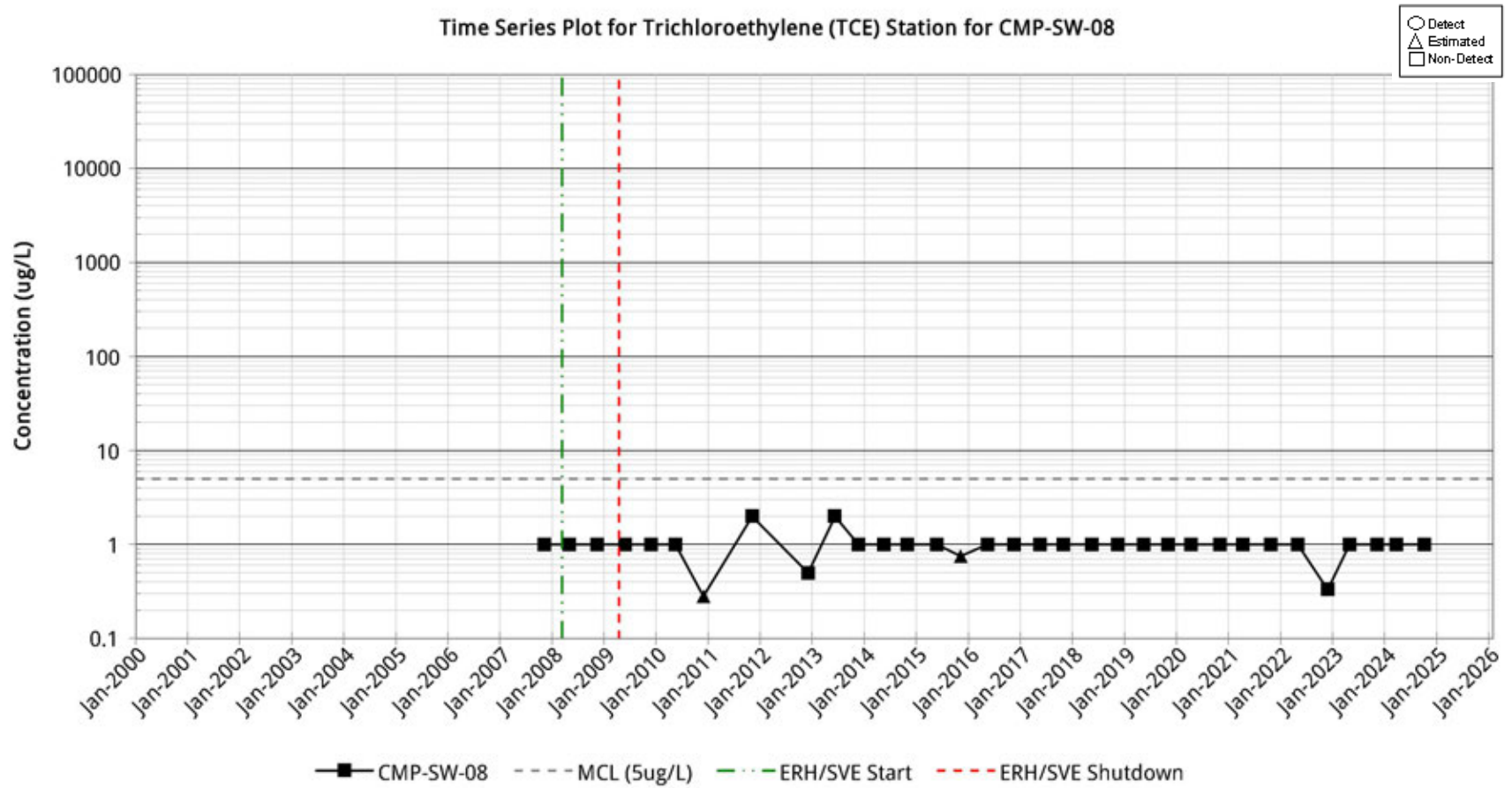


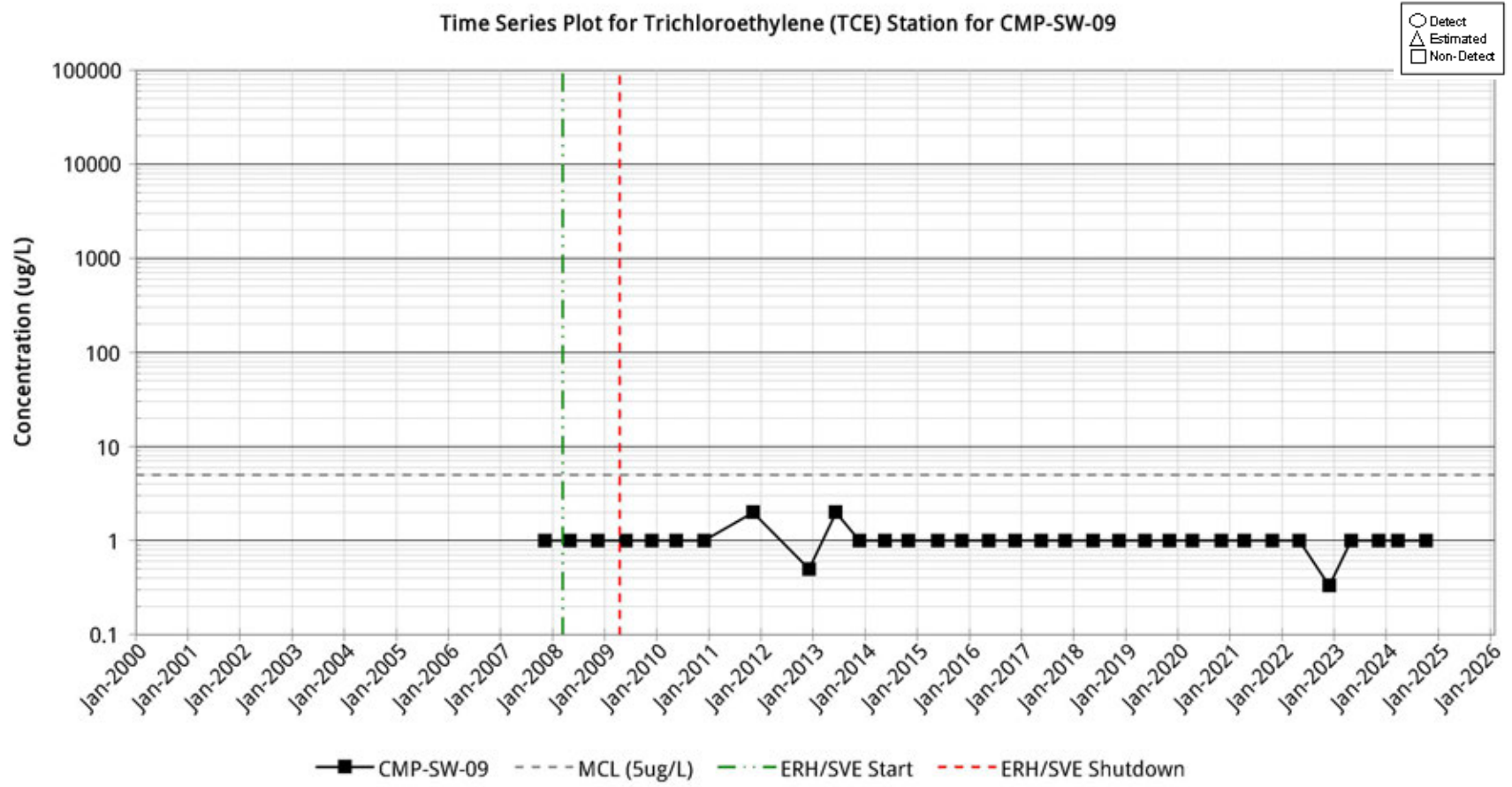


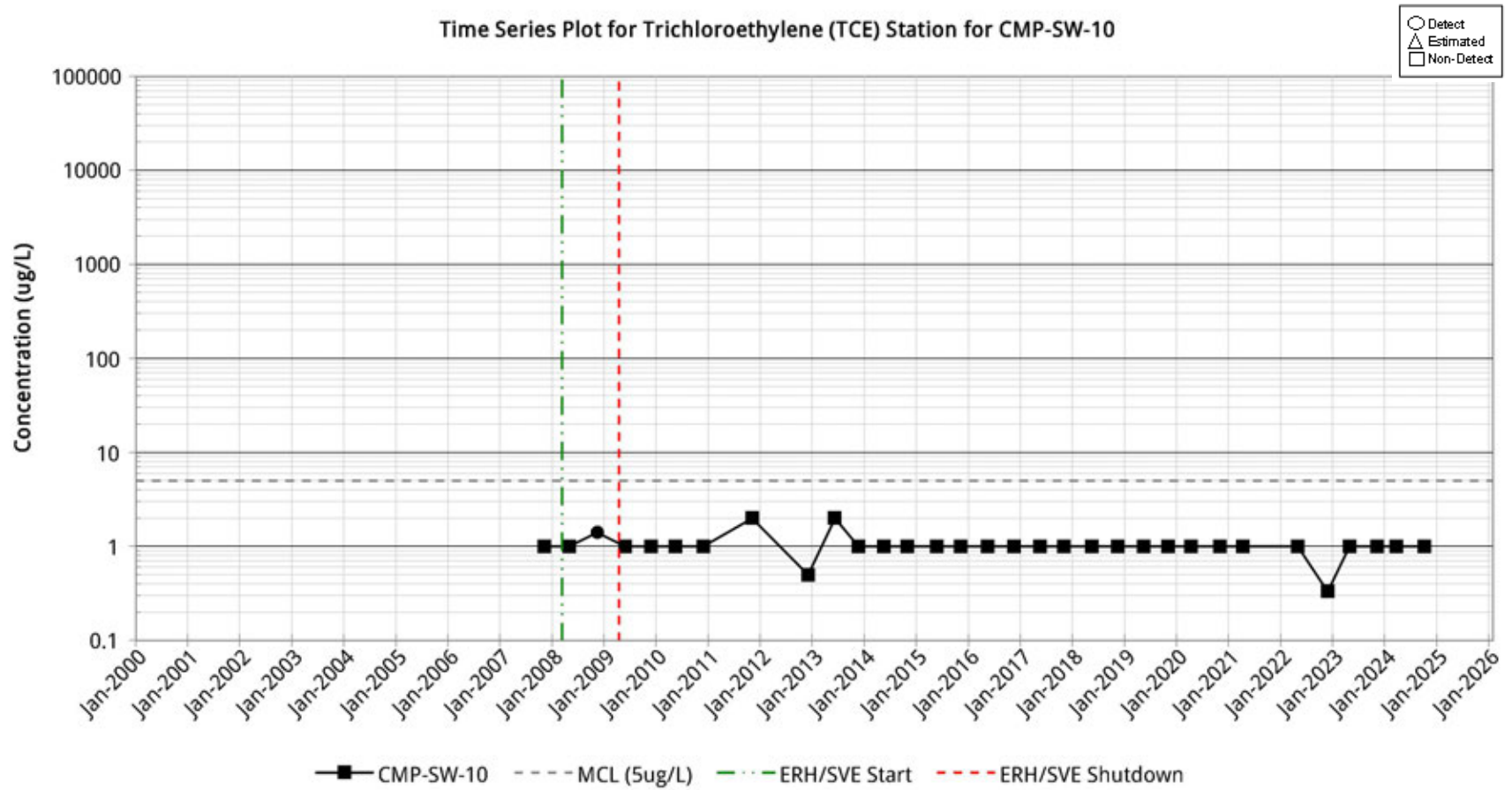


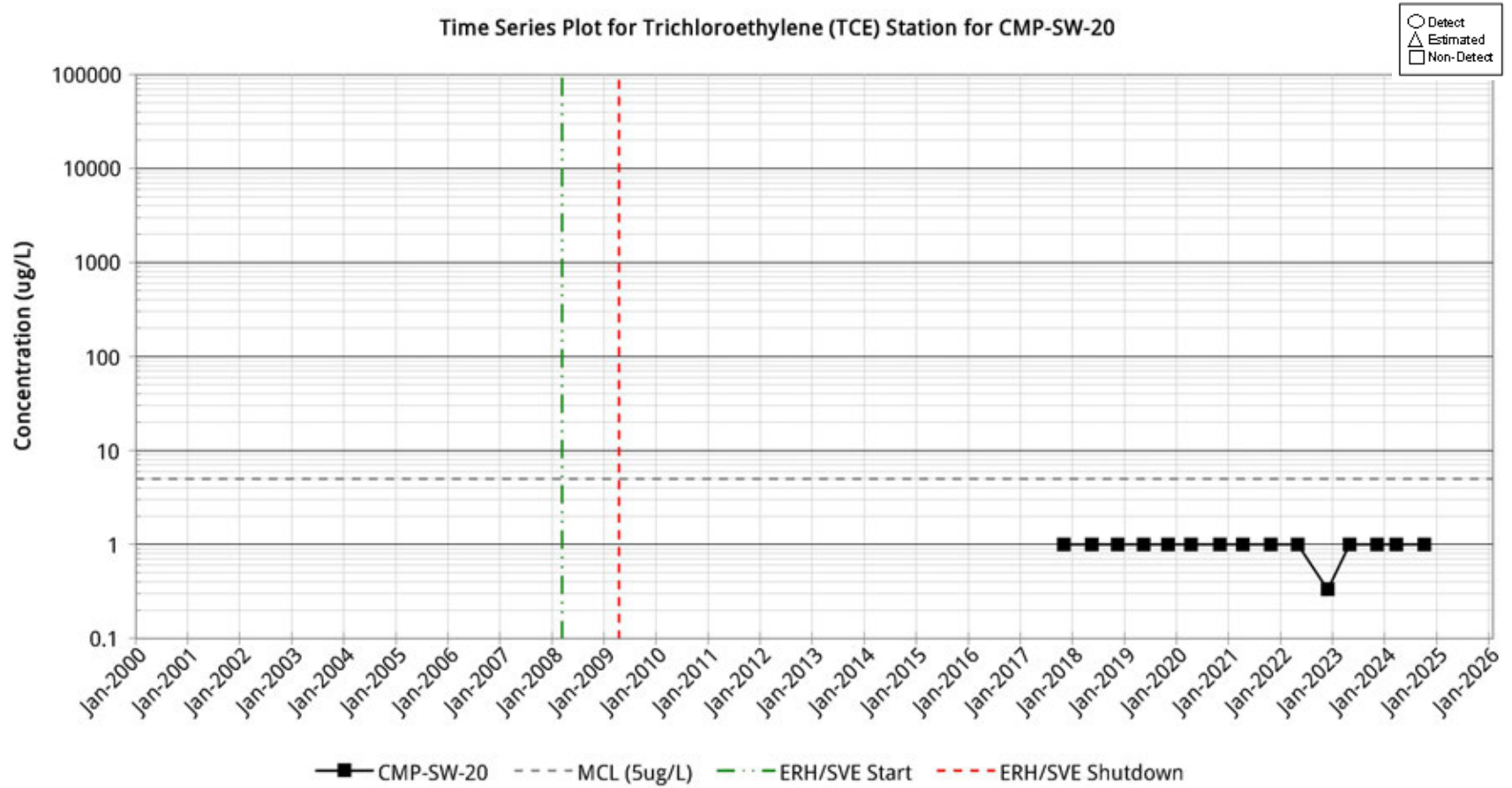


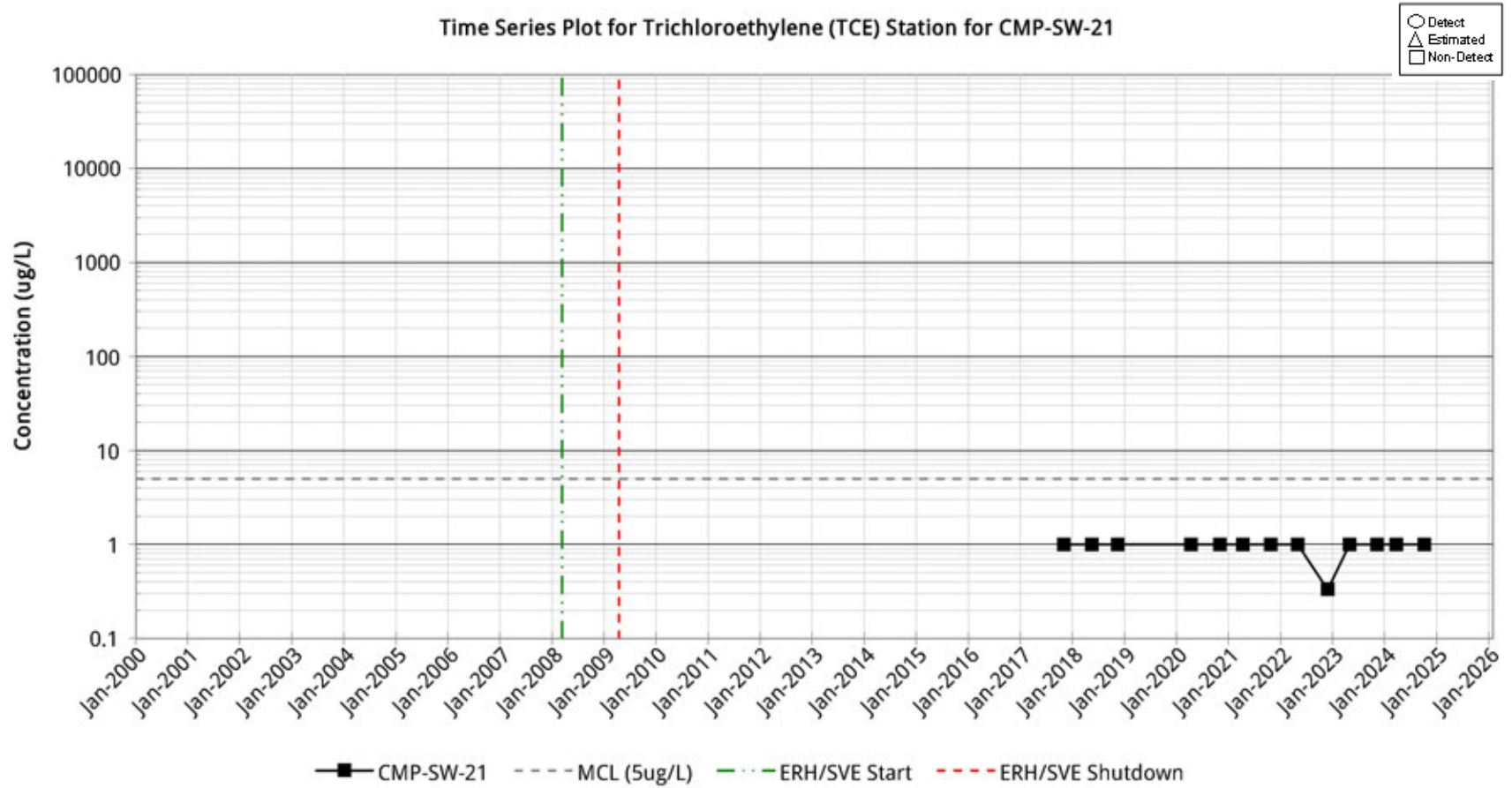


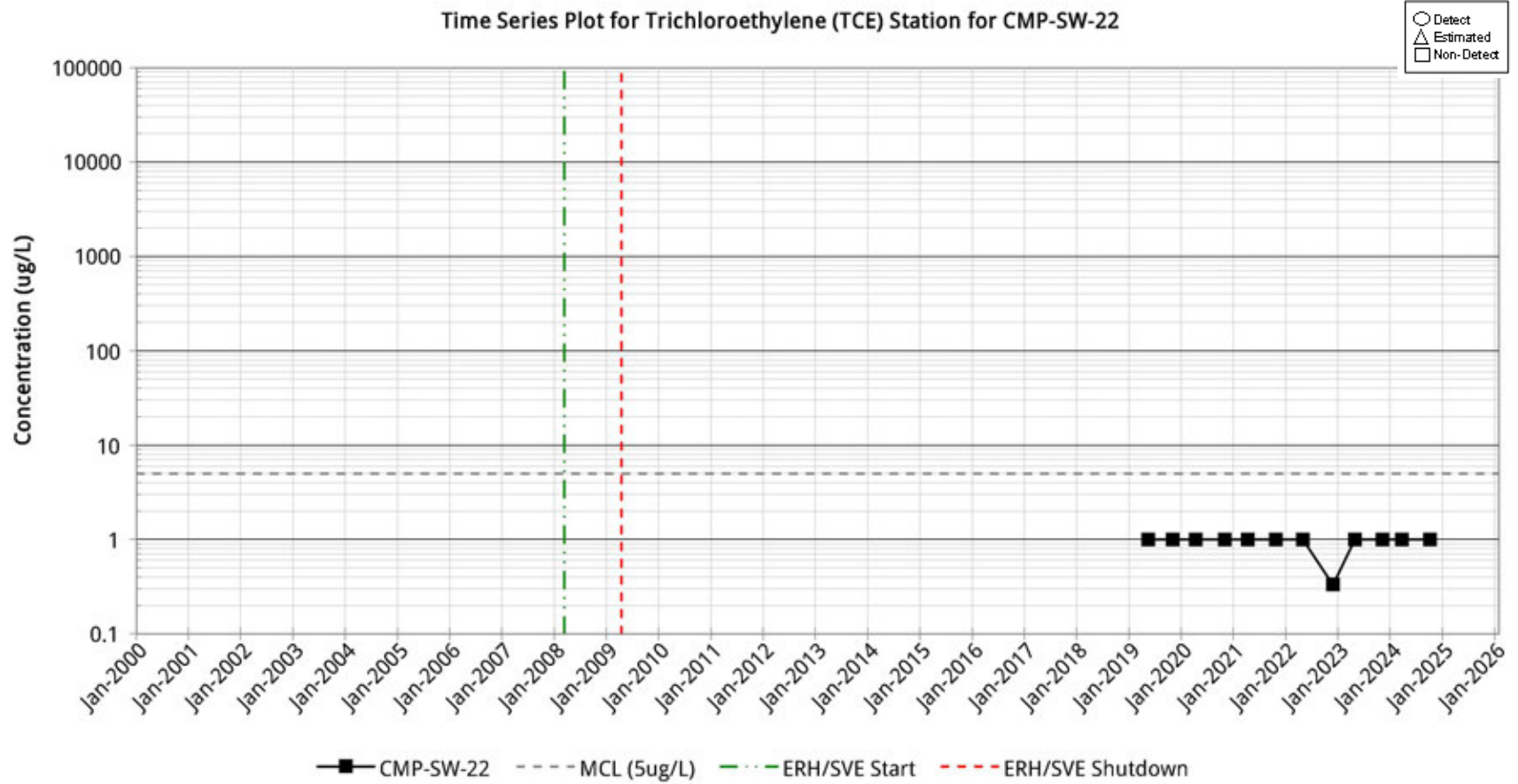












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## Appendix C

### Cation-Anion Sampling Results

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### 2024 Cation-Anion Groundwater Sampling

In 2024, SRS performed cation-anion speciation at 11 well clusters comprising 25 individual wells to aid in evaluating groundwater geochemistry (Figure C-1). Aquifers sampled include the Transmissive Zone (TZ), Middle Aquifer Zone (MAZ), Lower Aquifer Zone (LAZ), and Gordon Aquifer (GA). Samples were analyzed for cations to include aluminum, calcium, iron, potassium magnesium, manganese, and sodium. Anions include chloride, fluoride, nitrate, carbonate, bicarbonate, and sulfate.

To aid in evaluating the cation and anion data, Stiff diagrams were developed to graphically display the data. Stiff diagrams are created by plotting the equivalent concentration of the cations to the left of the center axis and anions to the right. In determining the equivalent concentration, reported lab concentration data (e.g., mass/volume) are first converted to a standard unit of measure (e.g., mg/L) and then converted to milliequivalents per liter (meq/L). Stiff diagrams were developed using RockWorks™, a commercial software from RockWare Inc. The posted data are connected to form a shape allowing for an evaluation on the different waters sampled. The data can be used to “fingerprint” aquifers in that there is a unique shape for the unit sampled based on the results for the basic cation and anions. Additionally, impact vertically into underlying aquifer units can also be evaluated, especially if there is a prominent vertical component with groundwater flow, allowing for mixing of groundwaters from overlying water-bearing units.

Figure C-2 depicts Stiff diagrams for the 25 wells sampled for cations and anions in 2024. The diagrams are organized by aquifer unit and generally represent, from left to right, groundwater flow from the source areas to Pen Branch.

The geochemistry in the TZ is similar with little geochemical differences in the three (3) wells sampled. The TZ wells are all located on top of the knoll in proximity to the source area. The MAZ is represented by six (7) wells spanning from upgradient of the source to across Pen Branch. The geochemistry of the MAZ is generally consistent although water at wells CMP015B, CMP030C, CMP055C, and CMP056D show slightly higher carbonate and bicarbonate levels than

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the rest of the wells. The higher carbonate/bicarbonate levels could be caused by local thinning of the confining layer resulting in leakage of water from the overlying TZ.

In the LAZ, the calcium values are all significantly higher in concentration than the overlying MAZ, which is indicative of the calcareous bearing sediments of the geologic formation of the LAZ. Most of the LAZ wells have low levels of sodium/potassium and chloride. The Stiff diagram for CMP035B shows significantly more sodium/potassium and slightly more chloride and sulfate than the others wells in the LAZ. This is consistent with the Stiff diagram for the overlying TZ well CMP035D. It is likely that water at the CMP035 cluster has been impacted by leaching of waste in the past into the subsurface and possible geochemical changes that may have occurred with Electrical Resistance Heating (ERH). This effect appears to be localized as water from downgradient wells CMP013B and CMP013D do not show the same geochemical changes.

Comparison of Stiff diagrams for the TZ to the other wells indicate similarity to geochemistry depicted at CMP 10D. This may indicate an expected geochemical fingerprinting of the TZ; at least upgradient of the pits. The stiff diagram from CMP 35D is not similar to the other wells and depicts higher values for sodium + potassium, chloride, and sulfate. It could be the geochemistry at this well, due to its proximity to the pits, may be impacted from leaching of waste in the past into the subsurface and possible geochemical changes that may have occurred with Electrical Resistance Heating (ERH). Without data from wells downgradient of the pits, it is unknown if the geochemistry of the TZ is similar to other wells downgradient of the pits. The Stiff diagram for well CMP056B, located on the north side of Pen Branch, shows a similar shape as the other LAZ wells although levels of calcium and carbonate/bicarbonate are lower than waters on the CMP Pits side of Pen Branch.

In the GA five (5) wells were sampled for geochemical parameters. Generally, water in the GA has a similar geochemical signature to the LAZ. All GA wells indicate a similar geochemical signature suggesting a “fingerprint” for GA water. The Stiff diagrams show that the GA is characterized by elevated levels of calcium, carbonate/bicarbonate, and sulfate with low levels of sodium/potassium and chloride.

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**2021 and 2022 Cation-Anion Groundwater Sampling**

In 2021 and 2022, geochemistry samples were collected from 16 wells representing all four (4) aquifers (Figure C-1 [Wells used in previous cation-anion evaluation]). Stiff diagrams showing the distribution of cation-anions is shown in Figure C-3 for the 2021 and 2022 results.

In the TZ and MZ, all wells show similar water chemistry except for CMP035D and CMP052C which both indicate evidence of alteration most likely from the ERH remediation efforts. In general, water chemistry in the UAZ-TA and UAZ-MZ is characterized by low concentrations of all cations and anions. The geochemical signatures for the MAZ wells sampled in 2021 and 2022 match the signatures of the 2024 sampling. In contrast, wells in the TZ sampled in 2024 (CPM011D, CMP013D, and CMP030D) show different geochemistry than the rest of the wells sampled due to higher levels of carbonate/bicarbonate.

Samples from the LAZ in 2021, 2022, and 2024, all exhibit the same geochemistry except for wells CMP035B, CMP010C, and CMP062B. Overwhelmingly the LAZ is characterized by higher calcium and carbonate/bicarbonate. The stiff diagram for CMP035B is discussed in detail above. The outlier well CMP010C contains elevated levels of calcium, but much lower carbonate/bicarbonate than the other UAZ-LAZ wells. The Stiff diagram for well CMP062B looks very similar to the geochemistry of the MAZ (CMP062C), perhaps indicating vertical downward flow at this well location.

In the GA, only two (2) wells were sampled for cations-anions in 2021. Well CMP052A has the same geochemical profile as the GA wells sampled in 2024. Well CMP010A has geochemistry similar to the rest of the GA wells for most of the cations-anions except the calcium and carbonate/bicarbonate levels are slightly lower and the sodium and potassium levels are higher.

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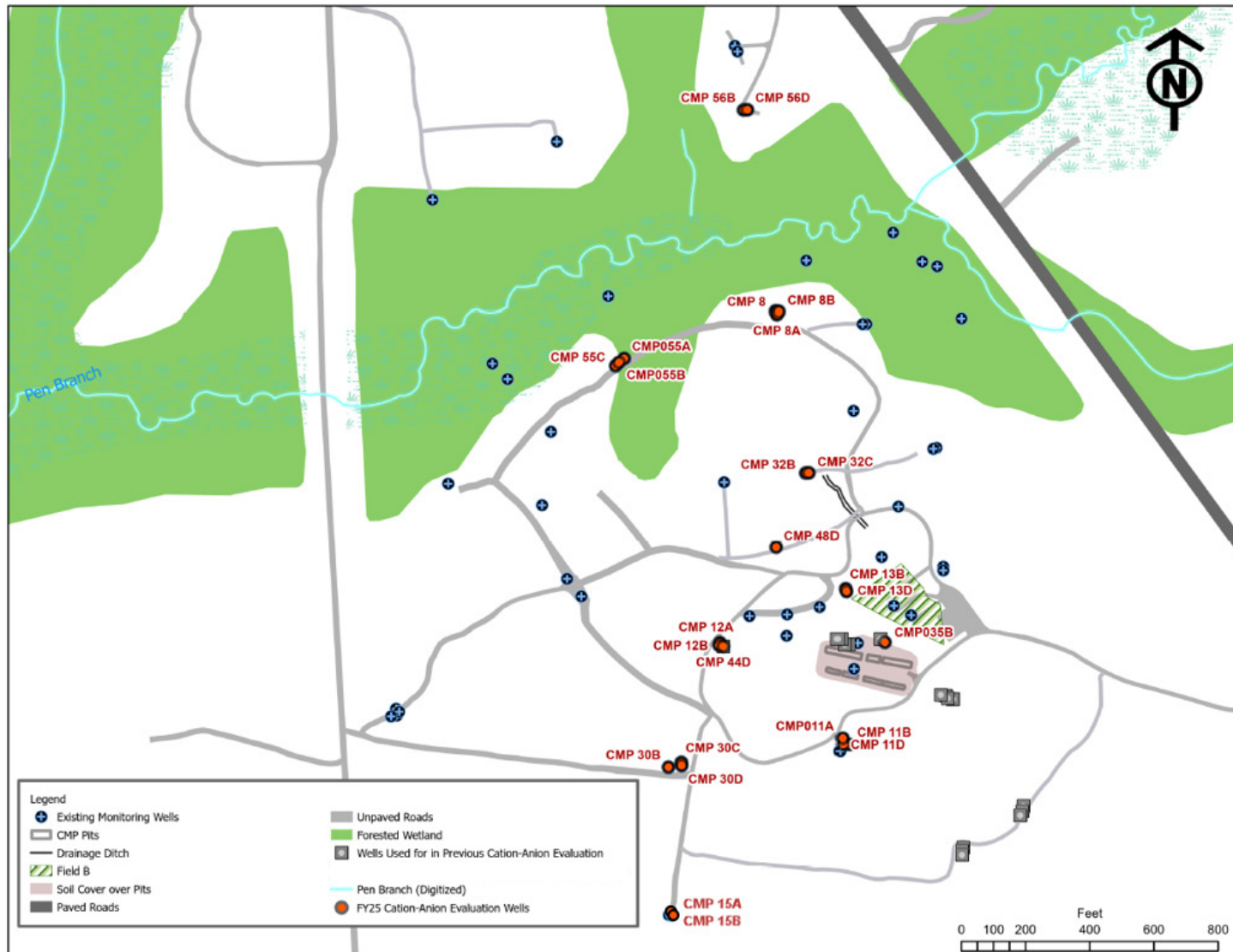


Figure C-1: Location of Wells Used in Cation-Anion Analysis

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**Figure C-2: 2024 Cation-Anion Stiff Diagrams**

*See insert diagram on next pages.*

**Figure C-2: 2021/2022 Cation-Anion Stiff Diagrams**

*See insert diagram on next pages.*

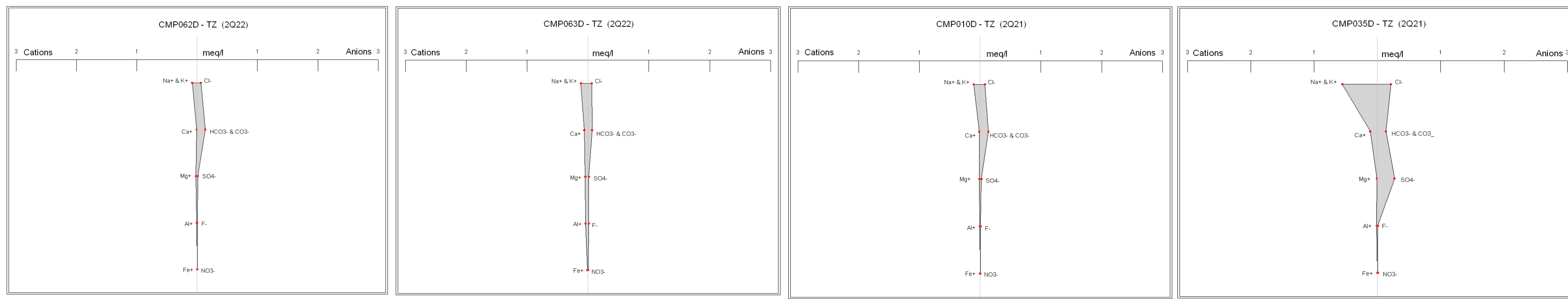
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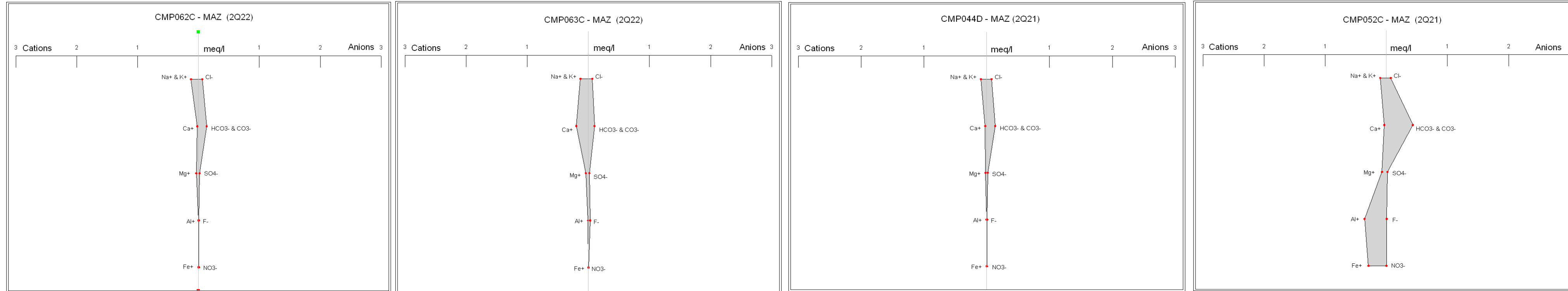
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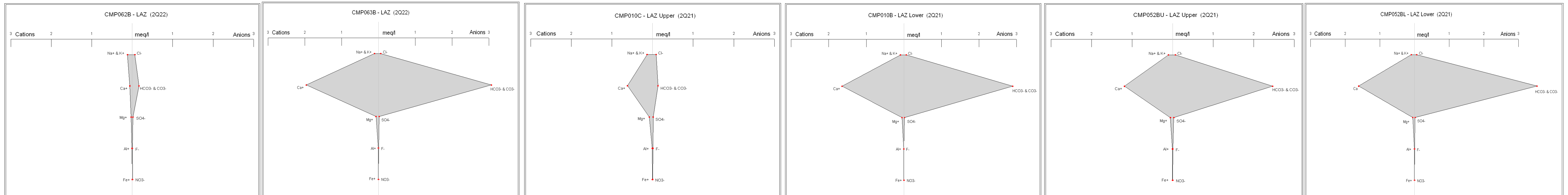
### Transmissive Zone



### Middle Aquifer Zone



### Lower Aquifer Zone



### Gordon Aquifer

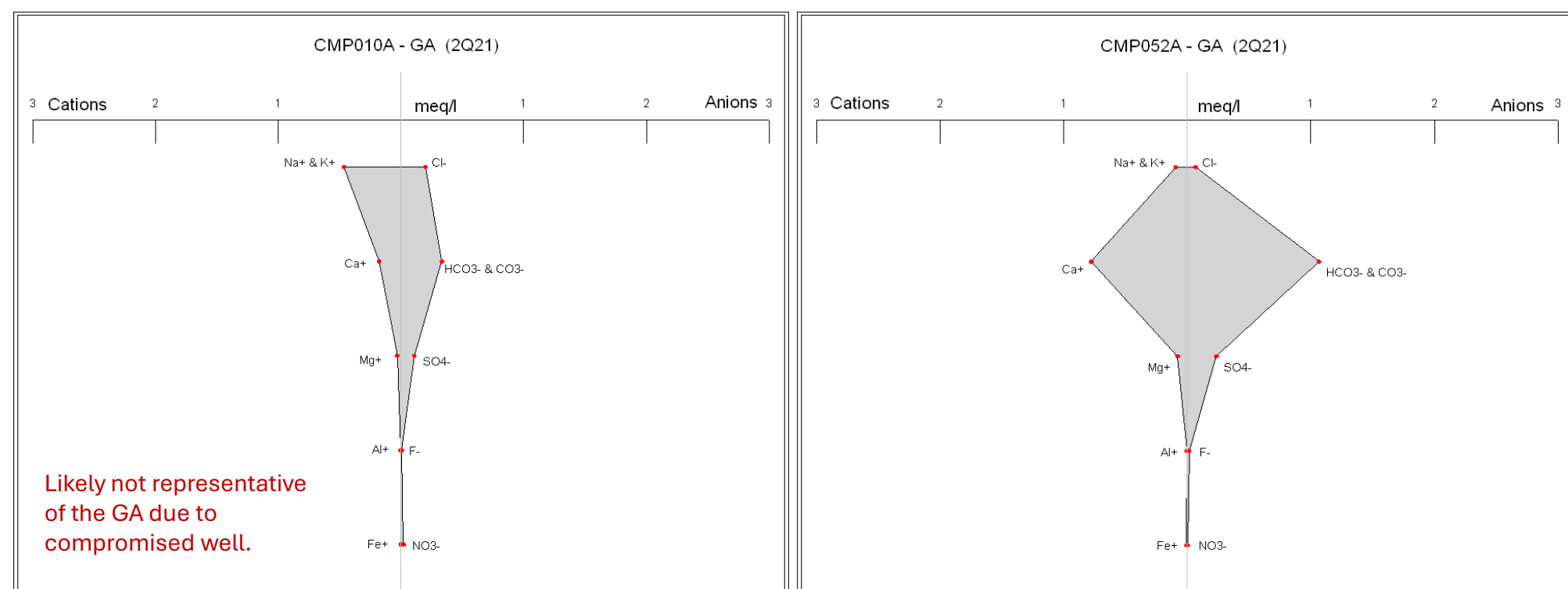


Figure C-3. 2021-2022 Cation/Anion Stiff Diagrams