708 Heartland Trail
Suite 3000
Madison, WI 53717

608.826.3600 PHONE
608.826.3941 FAX

www.TRCsolutions.com

April 19, 2019

961433

Ms. Demaree Collier
U.S. Environmental Protection Agency
Region 5 (HSRM-7J)
77 West Jackson Blvd.
Chicago, IL 60604

Subject: Final Monitored Natural Attenuation Report for the Lemberger Transport and Recycling, Inc. and Lemberger Landfill Superfund Sites
Groundwater Operable Unit OU-1
Town of Franklin, Manitowoc County, Wisconsin

Dear Ms. Collier:

On behalf of the Lemberger Sites Remediation Group (LSRG), TRC Environmental Corporation (TRC) is submitting the above-referenced report for your review and comment. This report incorporates agency comments provided relative to the December 2018 report. TRC has concluded that Monitored Natural Attenuation (MNA) is an appropriate remedy for the Lemberger sites.

Please review and approve the enclosed report. If you have any questions during your review, please contact me at 608-826-3637.

Sincerely,

TRC Environmental Corporation

Kristopher D. Krause, P.E.
Senior Project Manager

Enclosure

cc: Tauren Beggs – WDNR
Brian Potts – Perkins Coie, LLP
Kristin Jones – Newell Rubbermaid
Nilaksh Kothari – Manitowoc Public Utilities
Scott Karbon – Manitowoc Public Utilities
James Wallner – Red Arrow Products
James Cook – The Manitowoc Company, Inc.
Kathleen McDaniel – City of Manitowoc
David Dougherty – Subterranean Research, Inc.
John Lang – EHS Support, LLC
Tom Sullivan – EHS Support, LLC
Kenny Ogilvie – EHS Support, LLC

Monitored Natural Attenuation Report

Lemberger Transport & Recycling, Inc. (LTR) and Lemberger Landfill (LL), Superfund Sites Groundwater Operable Unit OU-1 Town of Franklin, Manitowoc County, Wisconsin

April 2019

Meredith Westover, P.G.
Project Hydrogeologist

James Wedekind, P.G.
Senior Project Hydrogeologist

Kristopher D. Krause, P.E.
Senior Project Manager

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Executive Summary

This report presents new Monitored Natural Attenuation (MNA) data and interpretations that augment two prior demonstration projects spanning 12 years at the Lemberger Transport & Recycling, Inc. (LTR) and Lemberger Landfill (LL) Superfund Sites (Site). The purpose of these studies was to collect data to evaluate and support MNA as a long-term remedy for chlorinated volatile organic compounds (CVOCs) in groundwater. These previous studies were conducted in accordance with two separate, agency-approved MNA Workplans (RMT, Inc. 2006a; TRC, 2013a) and resulted in two subsequent MNA Study reports (RMT, Inc. 2008; TRC, 2015) that were issued for agency review, comment, and discussion. The initial MNA study (2006-2008) was a comprehensive two-year sampling and analysis program of the entire groundwater plume. The second MNA study (2013-2015) focused on the CVOC source area and "near field plume" area where groundwater concentrations exceed standards. The current report includes new data and interpretations consistent with current science and the latest regulatory guidance.

The studies were conducted in accordance with MNA technical guidance published by the United States Environmental Protection Agency's (USEPA) and Wisconsin Department of Natural Resources (WDNR) (Wiedemeier et al., 1998; WDNR, 2014). In short, the guidance describes the necessary site characterization, data collection, mathematical and statistical analyses, and interpretive tasks recommended to document the viability of MNA as a preferred remedy. This document presents the findings and conclusions of those activities.

The LTR received wastes containing chlorinated solvents including 1,1,1-trichloroethane (TCA) and trichloroethene (TCE) that entered a fractured, porous, dolomite aquifer. Source control remedial measures removed a majority of the waste material at the LTR, but CVOCs remain dissolved in the groundwater and diffused into the bedrock matrix. A groundwater pump-and-treat system that operated for nine years prior to the first MNA study was demonstrated to be technically limited in reducing CVOC mass and could not reach remedial goals within a reasonable timeframe.

The data compiled for this report includes groundwater monitoring data collected over more than 20 years. These data, the historical investigation, and the remedial actions related to the Site support the following conclusions:

- The geology and hydrogeology of the LL and LTR sites have been sufficiently investigated, and the nature and extent of the groundwater impacts are well characterized and understood.

- The overall size of the CVOC groundwater plume has diminished significantly since the remediation activities commenced, as well as since the MNA study began in 2006, and concentrations of CVOCs within the impacted area continue to decrease (**Figure ES-1**). The groundwater monitoring network has been refined over time to provide a three-dimensional arrangement of monitoring locations that are representative of the dissolved plume.
- CVOCs in the groundwater near the identified LTR source have degraded through anaerobic microbial reductive dechlorination to form primary breakdown products such as cis-1,2-dichloroethene (DCE) and 1,1-dichloroethane (DCA). Aerobic conditions downgradient of the LTR inhibited production of alternate degradation compounds (e.g., vinyl chloride (VC) and 1,1-dichloroethene). CVOCs continue to be degraded via abiotic processes.
- Statistical analysis of the historical groundwater data indicates that the concentrations of most CVOC parameters at most locations in the Enforcement Standard (ES) plume will reach the ES in approximately 50 years.
- Geochemical conditions in the aquifer suggest that limited biotic activity continues at the LTR source area. BIOCHLOR model results are consistent with the occurrence of a higher rate of decay near the source area than in the downgradient plume.
- WDNR issued a memo to USEPA in 2010 stating that, given the measured concentrations of chemicals of concern dissolved in groundwater, any potential groundwater discharges to Branch River would not be of concern for aquatic life.
- Legally enforceable institutional and administrative controls are in-place and encompass areas where groundwater exceedances exist and serve as additional protection to restrict the potential for exposure risks to constituents of concern.
- The maximum vertical extent of the impacted groundwater (190 feet) is significantly above the WDNR Special Casing Area requirement (minimum depth of 250 feet below top of ground for newly constructed wells). The Special Casing Area was first established in 1988 and expanded in 2010.
- An Institutional Control Plan for the Site has been in place since 2009, and a Site-Wide Ready for Anticipated Reuse determination was made by USEPA in 2015.

The weight-of-evidence derived from these MNA studies indicates that the CVOC plume is stable or reducing and naturally degrading. Overall, the results of the 12-year MNA study indicate that natural attenuation of the CVOCs in groundwater is occurring at a rate sufficient to contain and further degrade the CVOC plume within a reasonable timeframe. The current groundwater monitoring system is protective to potential receptors and sufficient to adequately monitor the Site constituents.

A MNA remedy supported by weight-of-evidence determinations should, therefore, be identified as the appropriate remedy in a future Record of Decision Amendment.

Section 1
Introduction

1.1 Background

The Lemberger Landfill (LL) and Lemberger Transport and Recycling (LTR) Superfund Sites (Site) are located in Franklin Township, Manitowoc County, Wisconsin (**Figure 1**). The Lemberger Sites are listed on the National Priorities List (NPL) and are being remediated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Lemberger Sites were placed on the NPL in 1984 due to the detection of chlorinated volatile organic compounds (CVOCs) in groundwater at seven nearby residential wells.

The U.S. Environmental Protection Agency (USEPA) completed a remedial investigation and feasibility study (RI/FS) in 1991 to characterize the nature and extent of CVOCs in groundwater and recommend an approach to cleanup. Conclusions of that study led to the selection of groundwater extraction and treatment (pump-and-treat) as the preferred remedy in the 1991 Record of Decision (ROD) for Operable Unit -1 (OU-1). The ROD specified that the groundwater remedy was for groundwater associated with both the LL and LTR, however, subsequent studies determined that the LTR was the leading source of CVOCs (RMT 2004, RMT 2006; TRC 2015). The original ROD-specified cleanup goals for the Site, or Remedial Action Objectives (RAOs), were equivalent to the Wisconsin Department of Natural Resources (WDNR) Preventive Action Limit (PAL) concentrations, with compliance at the waste management boundaries of the LL and LTR. On June 15, 1992, the Lemberger Site Remediation Group (LSRG) members entered into a Consent Decree (CD) with USEPA and then an Administrative Order on Consent (AOC) on May 12, 1993 to undertake certain remedial activities associated with the two Lemberger Sites.

The groundwater pump-and-treat remedy removed some of the contaminant mass in groundwater, but with a declining rate of mass removal. In addition, the limited long-term effectiveness of pump-and-treat technology coupled with an increased understanding and acceptance of monitored natural attenuation (MNA) as a protective remedy has grown since implementation of the ROD. This has prompted USEPA and WDNR (the agencies), and LSRG to consider amending the ROD to include replacement of the pump-and-treat remedy with MNA. To demonstrate viability of MNA as a remedy, the LSRG has compiled over 12 years of monitoring data, which are presented and interpreted in this report.

1.2 Site History

WDNR entered into a consent order with Lemberger Landfills, Inc. to conduct a site investigation in 1982, and issued a subsequent notice of violation in August 1982 when groundwater monitoring requirements were not met. Lemberger Landfills, Inc, filed a petition for bankruptcy in 1983 and the Site was added to the National Priorities List in September 1984. USEPA sampled the residential wells in the vicinity of the Site in 1985 and volatile organic compounds (VOCs) were detected in seven of the wells in excess of WDNR groundwater quality standards. The seven wells were replaced with wells 160 to 220 feet deeper than their previous wells, with casings that extended a minimum of 250 feet below ground surface (USEPA, 2010). The replacement residential wells were sampled in 1985 through 1987 and no contamination was detected.

1.2.1 LTR Source Remediation

The LTR is the source of the CVOCs to groundwater. The primary CVOCs include trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA) and their respective reductive dechlorination products (also known as "breakdown products"). These constituents migrate in the groundwater from the LTR north to the LL and to the northwest toward the Branch River. Pursuant to the AOC, several source control measures were implemented at the LTR in the mid-1990s, including the removal of approximately 1,380 drums, jars, and gas cylinders. Additionally, the disposal areas were protected with a multi-layer soil cover, and a protective fence was constructed around the LTR . The landfill cover and fence are being maintained in accordance with the Final Operation and Maintenance Plan (Malcolm Pirnie, 1997).

1.2.2 Pump-and-Treat System

The groundwater pump-and-treat system operated between 1997 and 2006. By 2006, CVOC concentrations in groundwater had declined significantly. However, as is true for most pump-and-treat systems, the extraction system showed decreasing rates of CVOC mass removal with time, with removal rates eventually approaching rates consistent with natural degradation processes (RMT Inc., 2004).

1.2.3 Previous MNA Evaluations

MNA has been evaluated at the Site for the past 12 years, since the pump-and-treat system was shut down in 2006. During this time, two specific MNA studies were completed: the MNA Engineering Demonstration Study (2006-2008) and the Monitored Natural Attenuation Study for the LTR Near-Field Area (2013-2015). The following summarizes those efforts.

MNA Engineering Demonstration Study (2006-2008)

To assess the degree of attenuation that was occurring at the Site, the USEPA, WDNR, and LSRG agreed to a temporary cessation of groundwater pumping to perform a MNA engineering demonstration project (MNA study), also referred to as the 2006 MNA study. This initial study was conducted from 2006 to 2008.

The 2006 MNA study included collection of groundwater samples from over 50 monitoring wells. Groundwater sampling at these wells included field and/or laboratory analysis for 22 geochemical parameters along with quarterly monitoring for VOCs over the 2-year demonstration period. The results of the 2006 MNA study indicated that biodegradation of the parent compounds (largely TCE and 1,1,1-TCA) had degraded much of the original constituent mass, as initial breakdown products (cis-1,2-DCE and 1,1-DCA) were present throughout the plume, often at concentrations well above the parent compounds (RMT Inc., 2008). Moreover, the extent of CVOCs had remained unchanged throughout the operation of the pump-and-treat system and continues to remain unchanged with the system turned off. Geochemical evidence of biotic activity was also documented in the source area wells, including lower concentrations of dissolved oxygen (DO) and nitrate, and higher concentrations of inorganic carbon and carbon dioxide. Other inorganic parameters that serve as indicators of natural attenuation were inconclusive (RMT Inc., 2008).

In the third 5-year Site review, USEPA (2010) agreed that biodegradation was occurring in the LTR source area but was limited elsewhere in the plume due to low levels of organic carbon and high concentrations of dissolved oxygen. USEPA (2010) categorized the CVOC plume as a mixed Type 1 (reductive dehalogenation driven by degradation of organic material within and below the disposal areas) and Type 3 (generally aerobic conditions; degradation of CVOCs proceeds primarily via abiotic processes) as per criteria established by the Air Force Center for Environmental Excellence (AFCEE, 2004).

In 2012, the agencies agreed in concept to modifying the Remedial Action Objectives (RAOs) at the Lemberger Sites, as follows:

- Revision of the ROD-specified cleanup criteria for the CVOCs from the WDNR NR 140.10 Preventive Action Limit (PAL) to the Enforcement Standard (ES), which is largely equivalent to the USEPA drinking water

standards[1]. The ES is sometimes used for constituents where a USEPA Maximum Contaminant Limit (MCL) has not been established. These revised cleanup criteria still apply and are summarized in **Table 1**.

- Revision of the point of standards application for both of the Lemberger sites from the limits of waste to a Design Management Zone (DMZ) as allowed by Wisconsin Administrative Code (WAC) Chapter NR 140.22 (3).

The DMZ is defined as "a 3-dimensional boundary surrounding each regulated facility" [WAC NR 140.05(6)]. The DMZ concept is used by WDNR in WAC NR 140.22(3) to establishing a horizontal boundary outside the limits of waste material for landfills such as the Lemberger sites. The boundary extends vertically "through all saturated geologic materials". For hazardous waste disposal facilities and landfills, the WDNR specifies that the DMZ extends horizontally 300 feet from the limits of waste. However, the DMZ boundary limits can be extended an additional 50 percent to a total of 450 feet from the limits of waste if approved by the WDNR as per WAC NR 140.22(3)(b). The LSRG requested extension of the DMZ via a letter dated April 11, 2019 (TRC 2019) that included information of determining factors that are considered during such requests as per WAC NR 140.22(3)(c). The extents of the current and potential extended DMZ areas are shown on **Figure 2**.

WDNR suggested that the extension of the DMZ may benefit the Site because the extent of groundwater impacts above the ES were largely confined to the source area. The parties identified a data gap within 450 feet downgradient of the LTR, where no wells had been placed. Modifying the DMZ would result in an area of groundwater between the LTR and LL being above the cleanup criteria. Through discussions with the USEPA and WDNR, it was concluded that additional study of this "near field" area (**Figure 2**) was warranted to better delineate the extent of CVOCs with regards to the possible DMZ expansion and to further assess the effectiveness of MNA immediately outside the source area.

Monitored Natural Attenuation Study for the LTR Near-Field Area (2013-2015)

A second MNA study (TRC, 2015) of the "near field" area was initiated in March 2013 to address USEPA and WDNR concerns with data gaps in the monitoring well network and increasing CVOC concentrations in some near field wells. As part of this investigation, seven additional groundwater monitoring wells were installed near the LTR and added to the monitoring program. Five of those

[1] Except the ES for VC is 0.2 μg/L, whereas the Maximum Contaminant Limit (MCL) is 2.0 μg/L.

wells (RM-410XD, RM-401XXD, RM-402XD, RM-402XXD, and RM-403XD) were specifically installed at the edge of the proposed DMZ (i.e. 450 feet from the limits of waste at the LTR). Monitoring wells were also installed at greater depths to better define the vertical extent of CVOCs. Quarterly sampling was conducted at 23 monitoring wells in the near-field area, including the seven new monitoring wells, for two years as part of this second MNA study (hereinafter referred to as the "2013 MNA study"). Results of the investigation were reported to the agencies in May 2015 (TRC, 2015).

In September 2015, a meeting between the agencies and the LSRG was held to discuss the findings of the 2013 MNA study and the viability of MNA as the preferred remedy for the Site. The study concluded that CVOCs at concentrations above standards were present in groundwater outside the proposed DMZ, and therefore extending the DMZ would not be beneficial at this time. However, future DMZ expansion would remain a consideration if TCE concentrations at wells outside of the potential extended DMZ (RM-003D and RM-008D) remained below the ES.

The 2013 MNA study results supported MNA as a viable remedial alternative, but more supporting documentation was deemed necessary. Specifically, an estimate of the timeframe to meet the cleanup levels would be necessary for monitoring points located outside the boundary of the Lemberger sites (i.e., the property lines of the LTR and LL). Action items from the meeting included: 1) review and revision of the Environmental Monitoring Plan (TRC, 2014) for the Site; 2) evaluation of the need for an additional monitoring well near RM-003; and 3) evaluation of the use of an alternative trend analysis or modeling techniques to determine the timeframe to reach the ES for certain monitoring wells evaluated in the 2015 MNA report.

In January 2016, the agencies and the LSRG conducted a telephone meeting to discuss the location of one additional deep monitoring well to close a data gap between RM-401XXD and RM-212D and conduct another two years of monitoring. The monitoring well (RM-404XXD) was installed in February 2017 and determined to address the data gap in the monitoring well network (TRC, 2017a). In September 2017, the agencies and the LSRG met again to discuss the path forward for the project given the positive results from the monitoring program and the well installation. The parties agreed that the data supported an MNA remedy and the agencies requested that the results of the 12 years of

MNA evaluation be compiled into a single document as presented in this report.

1.3 Report Purpose and Scope

The objective of this MNA Study Report is to evaluate the viability of MNA as a long-term remedy for CVOCs detected in groundwater. This report presents a compilation and evaluation of the groundwater analytical data collected since 1996, including the data collected during the 2006 and 2013 MNA studies. The Conceptual Site Model (CSM) has evolved through data collected during those studies and presented in Section 2. Section 3 presents the MNA evaluation following guidance from Wiedemeier et al. (1998), Wilson (2011), and WDNR (2014), and focuses on the following three-step evaluation process:

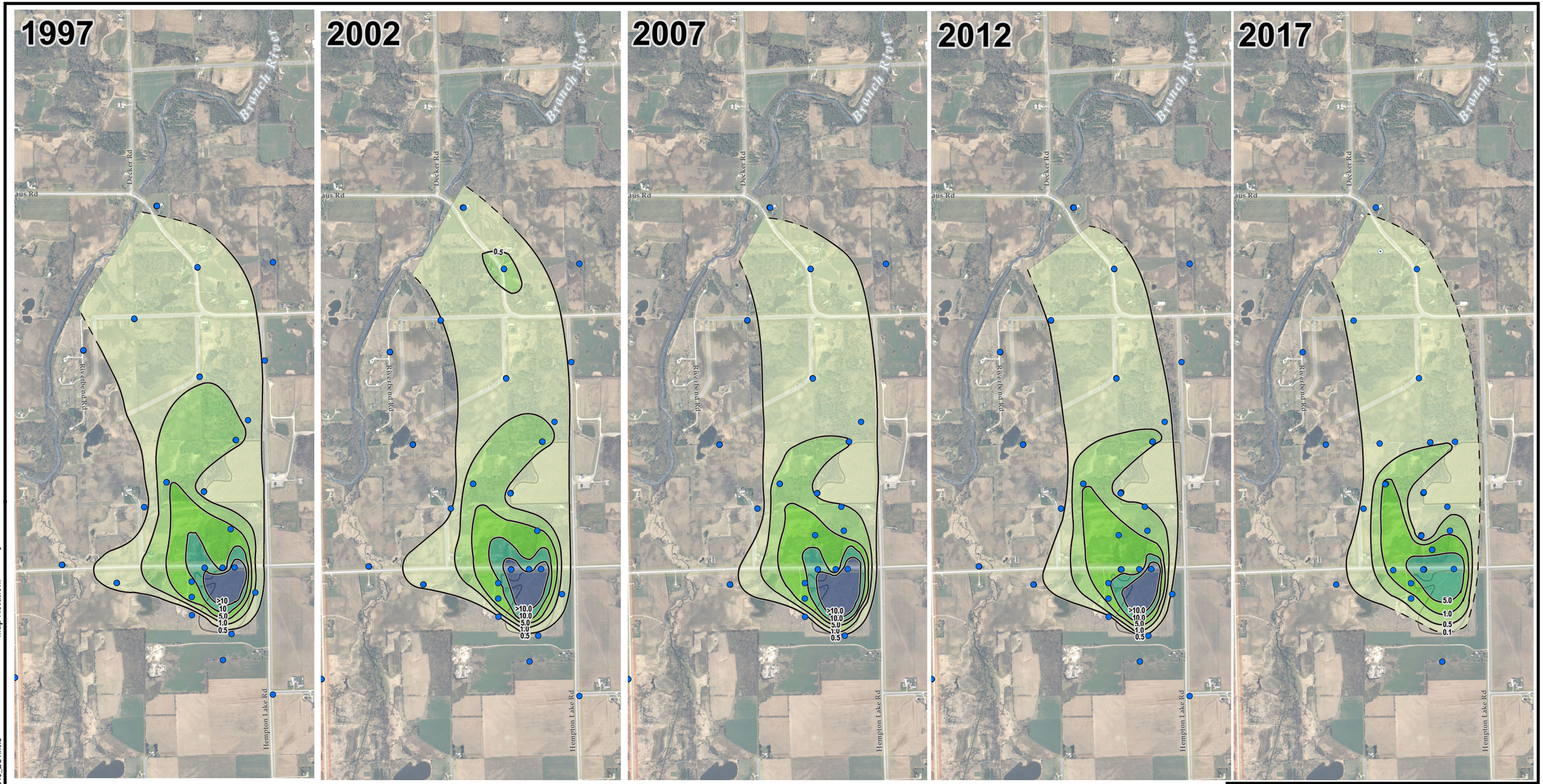
1. An assessment of the behavior of CVOCs in groundwater (i.e., trends in concentrations over time, time to cleanup estimates, and plume stability) (**Section 3.1**),
2. An assessment of the aquifer geochemistry for indirect evidence of bioactivity and/or abiotic degradation, and estimations of decay rates (**Section 3.2**), and
3. An assessment of direct evidence of bioactivity (**Section 3.3**).

Section 4 offers conclusions of the MNA studies and makes recommendations for a path forward.

TRC - GIS

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

Plot Date: 11/14/2018, 13:31:35 PM by SMAJOR -- LAYOUT: ANSI B (11"x17")
Path: E:\LembergerLandfill\2017_268280\268280-006-016_ES1.mxd



LEGEND

CVOC CONCENTRATIONS (µmol/L)

- 0.1 - 0.5 µmol/L
- 0.5 - 1 µmol/L
- 1 - 5 µmol/L
- 5 - 10 µmol/L
- >10 µmol/L

MONITORING WELL (RM)

ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.

2. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, CIS- AND TRANS-,1,2-DCE, VC, 1,1,1-TCA,1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS. NON-DETECT WERE COUNTED AS ZERO IN THE CALCULATION OF TOTAL CVOCS.

3. THE MONITORING WELL LOCATIONS SHOWN ARE THE LOCATIONS WITH DATA USED TO GENERATE THE ISOCONCENTRATION CONTOURS.

4. WELL IDs AND POSTED DATA ARE INCLUDED FOR EACH OF THE INDIVIDUAL PLUME MAPS IN APPENDIX D.

N

0 2,000 4,000 Feet

1 " = 2,000 '
1:24,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
TOTAL CVOC ISOCONCENTRATION MAP OF MOLAR CONCENTRATIONS OVER TIME

DRAWN BY:	J. PAPEZ	PROJ NO.:	268280
CHECKED BY:	M. WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE ES-1**
DATE:	NOVEMBER 2018		

TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

FILE NO.: 268280-006-016_ES1.mxd

Section 2
Conceptual Site Model

2.1 Conceptual Site Model

The conceptual site model (CSM) presented in this section includes a description of the hydrogeologic setting, groundwater flow conditions, and three-dimensional distribution of CVOCs. The Site has been evaluated extensively since the 1991 Remedial Investigation (B&V, 1991), with additional information collected from groundwater modeling (Malcolm Pirnie, 1998), extraction system improvements (RMT Inc., 2004), bedrock investigations (RMT Inc., 2006b), and the 2006 and 2013 MNA studies (RMT, Inc, 2008; TRC, 2015). Given the numerous detailed investigations, the CSM is current, accurate and accepted by the agencies.

2.1.1 Site Location and Topography

The Lemberger Sites are located on the west side of Hempton Lake Road approximately two miles north of Whitelaw, Wisconsin and two miles southeast of the community of Taus. A site features map is provided on **Figure 1**. The area contains rural farms and single-family homes in gently rolling terrain. There are many small wetlands between the hills, several of which have no outlet and form shallow ponds. Ridgeview Landfill (owned by Waste Management, Inc.) is located approximately one-half mile northeast of the LTR atop a north-south running ridge and east of the LL. There is an abandoned limestone quarry located less than 1,000 feet southwest of the LTR.

A topographic map of the site is shown on **Figure 3**. Elevations in the area range from 940 feet National Geodetic Vertical Datum of 1983 (NGVD) on several hilltops south of the LTR to 790 feet NGVD at the Branch River at the bridge on East Taus Road. A small hill (870 feet NGVD) located northwest of the LL site directs surface drainage from the LL Site to the southeast. The Site is at an elevation of approximately 840 to 860 feet NGVD with the topography sloping west and towards the Branch River. Ditches drain the LTR and convey runoff to a wooded wetland north of Sunny Slope Road. That wetland is drained by a ditch that conveys water west to an unnamed creek that flows beneath Sunny Slope Road and discharges to another creek that flows north to the Branch River. Another ditch directs water from wetlands west of the LL to an unnamed creek that flows south-southwest that drains to Branch River. The Branch River flows north in the vicinity of the Lemberger Sites before meandering south to join the Manitowoc River approximately 3 miles southwest of Whitelaw.

2.1.2 Geology

The hydrogeologic setting at the Lemberger Sites is comprised of unconsolidated glacial sediments overlying a bedrock aquifer. The glacial sediments are heterogeneous and grouped into three units: an upper, unconfined perched aquifer system called the upper granular unit (UGU), a confining unit (CU) of clayey glacial till, and a lower granular unit of sand and gravel (LGU) that overlies the bedrock. The LGU and bedrock are hydrologically connected, however, the bedrock unit is of primary importance to the transport of CVOCs and was characterized in detail in the 2006 bedrock investigation (RMT, 2006b). The geology is shown in cross-section in **Figures 4 and 5**.

The glacial units are draped over a buried ridge of shallow, dolomitic bedrock that trends north-south, generally following Hempton Lake Road. The glacial sequence (UGU, CU, and LGU) generally thickens to the west of the ridge. The UGU thins to the south and east and is completely absent at some locations immediately west of the LTR, and at some areas along Hempton Lake Road. The bedrock surface is exposed in an outcrop immediately west of the LTR and at a quarry southwest of the LTR. The outcrop to the west is characteristically smooth from glaciation, but in the subsurface the rock is variably weathered, with some solutionally-enlarged fractures and an irregular bedrock surface. Such features are also exposed in the quarry south of the LTR.

The bedrock is dolomite and dolomitic limestone of the Silurian-aged Niagara Series, a thick sequence (up to 600 feet) of gently (10-60 feet per mile) eastward-dipping carbonates (McLaughlin et al., 2013). An extensive bedrock investigation was conducted (RMT Inc., 2006b) that included fracture measurements (orientation and density) at nearby surface exposures, bedrock coring and downhole geophysics (including: caliper, temperature, resistivity, natural gamma, optical borehole televiewer, and borehole flowmeter) to gain a better understanding of the fabric and fracture characteristics of the bedrock.

The bedrock surface was described as highly weathered and difficult to drill and sample. The most prevailing fracture orientations were found to be N30°W, N45°E, and bedding parallel. The most common fractures with the greatest apertures were found within the upper 15 feet of the bedrock surface and parallel to bedding. Fracture apertures ranged from up to 1.6 feet with the majority being less than 0.1 foot. The larger fractures likely reflect some solutional enlargement. The mixture of vertical and horizontal fractures results in a three-dimensional network of fractures that are locally interconnected.

The bedrock investigation concluded the aquifer is porous, fractured medium. The rock fabric is also highly variable, ranging from highly porous, vuggy, fossiliferous limestone to dolomitized lime mudstone with lower porosity and permeability. Bedrock cores

from beneath the Site describe fossiliferous, vuggy dolomite with some chert and locally abundant coral fossils (RMT Inc., 2006b). Samples of the bedrock matrix found similar concentrations of CVOCs to those found in the groundwater.

At the LTR, the glacial units are thin and unsaturated, with the CU sometimes found directly overlying the shallow bedrock. The UGU thickens to the north and west, however, and is partially saturated within 1,500 feet north of the LTR Site (**Figure 4**) and typically has several feet of saturated material thereafter. Along the north LTR boundary, the LGU is present only in a bedrock trough near the RM-007D/-XD/-XXD well nest. The bedrock is unsaturated to a depth of approximately 40 feet (approximately 815 feet NGVD) beneath the LTR.

2.1.3 Groundwater Flow

Groundwater flow and CVOC transport at the Site occurs in fractured bedrock as described above. ITRC (2017) established a website designed specifically to assist the regulated community in how to address contaminated sites in a fractured rock environment. The following serves as an introduction to understanding groundwater flow and transport in fractured rock:

> *A challenge with managing contaminated fractured rock sites is determining the direction and rate of contaminant transport within the subsurface. Because fractured rock is anisotropic and heterogeneous, fluids travel at variable rates within the rock, including potentially rapid movement of contaminants over long distances through preferential flow paths (secondary porosity). As a result, hydrogeologic and geochemical equations and models developed for homogeneous porous media may fail to characterize or predict contaminant fate and transport for these systems.*

The LSRG was aware of these challenges early in their involvement and conducted investigations to best understand the nature of the fractured rock aquifer. The conceptual site model suggested that the saturated rock functions as a heterogeneous, locally porous, fractured rock aquifer. To test that model, the bedrock investigation (RMT 2006b) also included discrete interval slug testing of fractured intervals and borehole flowmeter measurements. The average hydraulic conductivity of fractured intervals was 1.93×10^{-3} cm/sec (5.5 ft/day), while the average hydraulic conductivity of the porous rock was 7.86×10^{-5} cm/sec (0.2 ft/day). Pumping test results from the extraction wells indicated hydraulic conductivity values ranging from approximately 3.5×10^{-3} cm/sec (10 ft/day) to 1.83×10^{-1} cm/sec (520 ft/day), with an average value of about 1.13×10^{-1} cm/sec (320 ft/day) (ERM, 1995). This wide range of hydraulic conductivity values is

expected with fractured rock aquifers due to the inherent heterogeneity between low permeability rock matrix compared to the highly permeable fracture network (ITRC 2016).

CVOCs in groundwater collected from discrete interval packer testing were consistent with the groundwater concentrations from nearby monitoring wells. These data suggested that the groundwater monitoring network provided data that was a good representation of the extent of impacts. Fractured rock systems may be dominated by flow in the widest fractures with the highest degree of connectivity with other fractures, however, that often does not translate to the individual fractures controlling groundwater flow across the watershed (Hsieh, 1998).

A consistent groundwater flow direction is essential for the determination of contaminant trends (WDNR, 2014). Water table elevation maps for the perched (UGU) aquifer and potentiometric surface maps of the groundwater in the bedrock and LGU have been reported annually to the agencies since 1997. The LSRG has issued isocontour maps of the groundwater in annual Operations and Maintenance Progress Reports. **Figures 6 and 7** show representative groundwater elevation isocontour maps prepared for the Site for the UGU and LGU/bedrock, respectively. The groundwater flow direction in the LGU and bedrock aquifers has remained consistently to the north-northwest throughout the 25 years of monitoring. Groundwater in the UGU flows west towards wetlands and surface drainages. Groundwater in the LGU and bedrock flows north and west away from the LTR towards the Branch River. The LGU and bedrock appear to be in hydrologic connection and are considered the same aquifer despite their contrast in porosity, fabric, and flow mechanisms. This is attributed to the highly weathered nature of the shallow bedrock and the overall porous nature of the vuggy and fossiliferous dolomitic limestone.

No significant changes in flow direction occur seasonally, although water level elevations typically fluctuate by several feet with the change in seasons. Water levels reach their highest elevations in the late spring and their lowest elevations in late fall. Hydrographs for each of the Site wells that have historically been monitored are included in the 2013 MNA report (TRC, 2015).

Water levels did not change significantly as a result of turning off the groundwater extraction system in August 2006 (RMT, Inc., 2008). Water levels actually increased during the period of pump-and-treat at most wells, then increased at a greater rate thereafter. These patterns were observed whether a well was located near a pumping well (e.g., RM-211D, RM-208D) or a well outside of any influence of pumping (e.g.,

RM-205D, RM-101D). There has been a Site-wide increase in groundwater levels in the LGU and bedrock of approximately 0.5 to 2 feet beginning around 2009 (TRC, 2015).

The horizontal gradient from the LTR to the Branch River is approximately 0.0037 (TRC, 2015). Vertical gradients were calculated for each of 16 well nests (32 total wells) for each of the four water level monitoring events during the 2013 MNA study and have been reported annually with the operations and maintenance progress reports. The gradient calculations are summarized in Tables 2, 3, 4, and 5 in the 2013 MNA study report (TRC, 2015). Slight downward-to-horizontal gradients are seen at the source area with downward gradients prevalent at well nests in the far field wells north and northwest of the LTR. Upward gradients are most common in the near field wells (RM-003D/-003XD; RM-005I/-005D; RM-213D/-213XD). As illustrated in cross section (**Figure 4)**, there is a local downward gradient in the shallow bedrock wells in the higher elevations near the LTR, with some upward flow to the LGU where it thickens near the LL. Vertical gradients are nearly flat moving further north, with upward gradients prevalent at the Branch River.

2.1.4 Release and Transport of CVOCs

The LTR was developed on a former gravel quarry that occupied approximately one-sixth of the present Site (LTR and LL). The quarry was excavated through the sand and gravel overburden to the surface of the weathered bedrock. CVOCs were released from liquids disposed of in the LTR from 1969 until 1976 in trenches excavated to a depth of approximately 5 feet – likely to the top of bedrock. Wastes were disposed mainly in the south-central and northeastern portions of the LTR (Figure 3; see also Figure 6 in RMT, 2004).

The shallow bedrock in the LTR area allowed the liquids to readily move into the rock through fractures and migrate into the bedrock matrix through matrix hydraulic diffusivity (Figure 5; see also Figure 7 in RMT, 2004). CVOCs eventually reached the saturated bedrock and migrated as dissolved mass in groundwater, again through fractures and into/from the rock matrix by matrix diffusion (RMT Inc., 2004).

ITRC (2017) describes in detail the various processes that occur to constituents as they encounter and migrate through fractured rock:

> *The fate and transport of contaminants within fractured rock involves complex processes that depend on interactions among the physical and chemical properties of the contaminants and the rock, as well as the hydrology of the fracture flow. As contaminants flow through the subsurface, they are subjected*

to a range of physical, chemical, and biological processes that disperse, transform, or degrade the contaminants.

Attempts to apply traditional site characterization and remedial technologies to fractured bedrock are often met with significant difficulties. Struggles to meet cleanup objectives and goals have meant that sites with fractured bedrock are often considered too difficult to successfully remediate.

Although previous conceptual site models suggested that dense non-aqueous phase liquids (DNAPL) were likely released from the LTR, concentrations of CVOCs detected in source area monitoring wells have never approached the 1% solubility of the key constituents; often cited as the "rule-of-thumb" by USEPA as an indication of the former presence of DNAPL (USEPA, 1992). The maximum concentrations of CVOCs detected in groundwater at the Site and their respective 1% solubilities include: 1,1,1-TCA (3,200 micrograms per liter [µg/L] / 13,340 µg/L), TCE (510 µg/L / 14,720 µg/L), 1, 2-DCE (4,000 µg/L / 35,000 µg/L), and 1,1-DCA (2,200 µg/L / 50,570 µg/L) (USEPA 1991). The apparent lack of DNAPL was critical in limiting the depth of impact of the CVOCs to less than 180 feet below ground surface (bgs).

The CVOC mass was gradually distributed into the rock matrix during transport through the network of horizontal and vertical fractures in the bedrock. Sampling of the rock matrix using the techniques established by Parker (2007) confirmed the presence of CVOCs in the rock matrix (RMT Inc., 2006b). With the introduction of groundwater extraction for the pump-and-treat system, impacted groundwater in the fractured rock system was successfully removed, and CVOC concentrations in monitoring wells declined. Once the CVOC mass in the fractured system was reduced, the CVOC concentrations stabilized with marginal additional mass being recovered. The groundwater in the fractures was replaced with unimpacted groundwater. Once the groundwater extraction was shut down, CVOCs slowly diffused back out of the rock matrix to the groundwater, but at decreased concentrations. Contaminant trend graphs at the LTR source area show groundwater extraction had no impact on the concentration of CVOCs leaving the source area [see graphs for RM-007D (p. 29, 118), RM-007XD (p. 31, 121), RM-209D (p. 58, 148), RM-303D (p. 70, 159), RM-306D (p. 73, 163), and RM-307D (p. 74, 164) in **Appendix A**]. More importantly, CVOC concentrations at the source area have decreased at 10 of 11 monitoring wells. Decreasing concentrations at the source area is clear evidence that the CVOC plume will continue to diminish. CVOC concentrations at downgradient wells also show stable-to-decreasing trends at 37 of 39 monitoring wells – and the two with increasing trends (RM-003I and RM-401XD) are not

expected to exceed standards. Fourteen (14) monitoring wells have never had a detection of CVOCs.

2.1.5 Remedial Actions

Source control remedies were implemented at the LTR in 1993 and 1994 to remove buried drums, install a clay cap and fencing, and implement institutional controls. Approximately 1,380 drums were removed in addition to contaminated soil and other solid waste materials. The cap was converted to a composite (clay and synthetic liner) cap in 1996. A planned soil vapor extraction system was determined to be unnecessary. Institutional controls included restrictive covenants to prohibit development of the Site property and restrict groundwater usage until groundwater quality standards are met. The State of Wisconsin identified a Special Well Casing Depth Area for a large area downgradient of the Site in 1988.

A groundwater pump-and-treat system was designed to remove CVOCs from groundwater over the entire Site. It was estimated at the time that remediation would be accomplished in 16 years (i.e., 2012). The system originally consisted of six extraction wells installed in the bedrock spread across the entire impacted area and four shallow (UGU) groundwater sumps installed at the LTR. The system was designed to operate at a combined pumping rate of 210 gallons per minute (gpm) for 16 years (USEPA, 1991). The system began operations on March 17, 1997. Four additional extraction wells were installed in 2001 to improve the effectiveness of VOC capture near the landfill "source zones" (RMT Inc., 2004). In addition, extraction well EW-5I was permanently shut down because it was determined to be ineffective and unnecessary (RMT Inc., 2004). The modified system went online in December 2001 and operated until August 2006. During that time the design flow rate was never achieved. RMT (2004) estimated that the system of nine extraction wells removed only 5 percent of the total dissolved VOC mass, with approximately 90 percent of the mass being removed through natural processes, and the remaining mass transported in below-detectable concentrations to the Branch River. RMT estimated the mass removal rates based on the extraction system performance to modify the cleanup time to over 50 years – regardless of whether the extraction system remained operational.

2.1.6 Groundwater Monitoring Network

WDNR (2014) stresses the importance of an adequate monitoring network as, "the underpinnings for understanding the hydrogeologic system and lays the basis for assessing natural attenuation". The Site has an extensive network of groundwater monitoring locations that have been in-place beginning with the remedial investigation

which was completed in 1991 (B&V Waste Science & Technology Corp. 1991). The original monitoring network consisted of 110 wells. This network included nested well triplets that placed shallow wells (denoted with a "S" suffix) in the UGU, intermediate wells (denoted with an "I" suffix) installed in the LGU, and deep bedrock wells denoted with a "D" suffix. Deeper bedrock wells installed to determine the vertical extent of impacts are denoted with a "-XD", or "-XXD" suffix. The network includes monitoring wells (prefix of "RM") located throughout the extents of the CVOC plume, with wells also located upgradient, below, and side gradient of the plume extents. Observation wells (prefix "OW") were installed initially to monitor the hydrologic effectiveness of the groundwater extraction well network (prefix "EW") but have been periodically used for groundwater sampling. Residential wells (prefix "GR") provide critical point-of-exposure data. Well designations "LH", "LW", "MW" are used to measure leachate levels and geochemistry within the slurry wall containment area of the LL.

The monitoring network was installed in phases as follows: RM-001I/-D through RM-011D installed in 1989; wells RM-101I/-D through RM-103S installed in 1993; RM-201I/-D through RM-211D installed in 1995 and 1996; RM-301D through RM-308D installed in 1996; RM-212I/-D were installed in 2001; and RM-401XD/XXD through RM-404XXD and several other XD and XXD wells installed between 2012 and 2017. The extraction wells EW-1D through EW-6D and observation wells were installed in 1995, and EW-6D through EW-9D were installed in 2001. Most of the later wells were installed to fill data gaps identified with the evolution of the conceptual site model.

Most of the monitoring wells installed by 1996 and residential wells were sampled quarterly for the first seven years of monitoring. The program was then reviewed, and the monitoring program focused on monitoring wells determined to be most critical as well as the residential wells. Sampling frequency remained on a quarterly basis for the most critical wells with the scheduled reduced for others. Many wells returned to quarterly sampling during the initial MNA study in 2006. In 2012, the sampling program was again modified. Wells in the UGU and LGU were determined to be of limited value to current conditions and are no longer sampled.

The current monitoring network at the Site includes 35 monitoring wells that are sampled at least annually. The network has identified seven (7) sentinel wells (RM-002D, RM-003D, RM-003XXD, RM-210D, RM-401XXD, RM-403XD, and RM-404XXD) that are sampled quarterly to provide an "early warning" to the closest residential wells. Other monitoring wells are sampled semi-annually or annually. Finally, there are 18 residential water supply wells that are sampled annually or semi-annually depending on their proximity to the Site. The Site monitoring program is

sampled under an Environmental Monitoring Plan (TRC, 2014) and Quality Assurance Project Plan (TRC, 2013c).

2.1.7 Nature and Extent of CVOCs in Groundwater

Although the LTR was constructed at least 30 feet above the water table, the shallow depth to rock allowed the disposed waste constituents to rapidly enter the groundwater through intersecting horizontal and vertical fractures. While there are trace concentrations of other VOCs, TCE and its breakdown products [e.g., cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC)] and 1,1,1-TCA and its breakdown products [e.g., 1,1-dichloroethane (1,1-DCA) and chloroethane] are by far the most commonly detected constituents. The distribution (Q3 2017) of these individual CVOCs and PCE are shown in **Figures 8 through 15**.

Concentrations of CVOCs in groundwater at the Site are quite low overall compared to most other chlorinated sites in the Superfund program. In Q3 2018, the maximum concentration of 1,1,1-TCA was 330 µg/L at RM-007D and the current maximum TCE concentration is 69.9 µg/L at RM-303D. The historical maximum concentrations observed in monitoring wells after source removal and containment activities were recorded at LTR source area well RM-303D in 1996, with a 1,1,1-TCA concentration of 3,000 µg/L and a TCE concentration of 190 µg/L. Current concentrations for those CVOCs at RM-303D are 241 µg/L and 69.9 µg/L, respectively. These recent concentrations indicate reductions of 92 percent for 1,1,1-TCA and 63 percent for TCE over the 20-year monitoring period.

Each of the CVOC isoconcentration maps have a similar configuration that is consistent with the historical interpretations and follows the hydrologic gradient to the north-northwest. **Figures 8, 9, 10, and 11** show the distribution of 1,1,1-TCA and its breakdown products and **Figures 12, 13, 14, and 15** show the breakdown products of the chlorinated ethenes (PCE; TCE and its breakdown products). Recent concentrations (Q3 2017) as presented on those figures are summarized as follows:

- **1,1,1-TCA:** Concentrations of 1,1,1-TCA at the source area are above the ES (200 µg/L) at three wells in the northwest corner of the LTR (RM-007D, RM-007XD, and RM-303D), with a recent maximum (Q3 2017) concentration of 357 µg/L at RM-007D. Concentrations of 1,1,1-TCA beyond the LTR decrease steadily downgradient to 1.8 µg/L at RM-203D, located at the far field end of the plume near the Branch River.
- **1,1-DCA:** The distribution of 1,1-DCA closely mimics that of its parent compound 1,1,1-TCA, as the highest concentrations (maximum concentration of 272 µg/L at

RM-007D) are located at the LTR with decreasing concentrations to near the detection limit at the plume extent.

- **1,1-DCE:** The distribution of 1,1-DCE concentrations is also similar to its parent compound. 1,1-DCE has a much lower ES (7 μg/L) than 1,1,1-TCA, but the concentrations of 1,1-DCE are much lower at the source than the parent compounds (highest recent concentration of 29.4 μg/L at RM-007XD). The lower concentrations of 1,1-DCE are likely due to its formation through slower, abiotic processes (Wiedemeier et al, 1998).
- **PCE:** PCE is present at low concentrations only at the source area (concentration 3.2 μg/L at RM-007D). While PCE is typically thought of as a source constituent, its limited extent and low historical concentrations suggest it was likely not a major component of the wastes when they were disposed.
- **TCE:** The distribution of TCE is nearly identical to 1,1,1-TCA, although the concentrations are much lower. Current source area TCE concentrations are consistently below 80 μg/L. The extent of TCE concentrations above the ES (5 μg/L) episodically extends north-northwest to RM-003D; with concentrations fluctuating above and below the ES. Over the last five years, the TCE concentration at RM-003D has been below the ES 11 times and above the ES on nine occasions. Detectable concentrations of TCE gradually diminish to the north (reaching below detection at RM-203D) and with increasing depth (approximately 180 feet bgs; elevation 660 feet NGVD).
- **cis-1,2-DCE:** cis-1,2-DCE is produced through the biotic dechlorination of TCE under ferrous iron reducing conditions (Chapelle et al. 2003). As is common at most CVOC sites, concentrations of cis-1,2-DCE were typically higher than the TCE parent compound. This is typically attributed to the slower rate of dechlorination for DCE versus TCE (AFCEE, 2004 - see graphs of concentrations for RM-002D (p. 18), RM-003D (p.20), RM-007D (p.29), etc. in Appendix A).
- **Vinyl chloride:** The distribution of VC is unlike the other CVOCs in that the compound is rarely detected except at monitoring well RM-214D located adjacent to the LL. VC is sometimes detected at low concentrations (<0.1 μg/L) at the LTR and at RM-401XXD. The persistence of VC at RM-214D is attributed to localized reducing conditions near the LL because municipal solid wastes were originally spread over a slightly wider area and were incorporated into the present boundaries (Figure 1) during remediation.

Historical data and interpretations indicate the overall extent of CVOCs has remained stable although concentrations within the plume have decreased over time. Concentrations of key parent compounds have decreased or remained stable in most wells. Most importantly, the extent of ES exceedances of TCE (i.e., 5 μg/L), have

substantially contracted over time as concentrations at downgradient wells RM-005D, RM-101D, and RM-210D have decreased below that ES level.

Cross-sections including the distribution of CVOCs in the subsurface are shown on **Figures 16 and 17.** The monitoring data indicate that low concentrations of CVOCs extend vertically to an elevation between 690 and 660 feet NGVD (150 to 180 feet bgs). The highest CVOC concentrations are located in the shallow bedrock near the LTR source area, while downgradient of the LTR, CVOC concentrations in wells near the top of the bedrock are slightly lower than concentrations found in adjacent deeper wells. The vertical configuration of the CVOC plume is consistent with the hydrologic gradient. Small downward gradients observed in the LTR source area have allowed CVOCs to migrate downward in the flow system then horizontally to the north. Upward gradients in the vicinity of the LL have limited the downward vertical migration of CVOCs.

Downward migration of CVOCs is limited due to the apparent absence of DNAPL, as discussed in Section 2.1.4.

2.1.8 Conceptual Site Model Summary

The LTR CSM has evolved over the 20-year period following implementation of remedial measures for the Site. CVOCs were released from the LTR from past waste disposal practices. Remedial actions removed the source of the CVOCs and capping of the former disposal area diminished infiltration that may have increased CVOC transport. CVOCs released from the LTR entered the fractured rock aquifer and moved rapidly to the north, following the local hydrologic gradient toward the Branch River.

The areal distribution of CVOCs has incrementally changed since first delineated over 20 years ago, concomitant with a steady decline in concentrations. CVOC concentrations decreased during the operation of the pump-and-treat system; however, wells outside the influence of the extraction well network also showed similar decreases. CVOC concentrations continued to decrease in most monitoring wells after the pump-and-treat system was turned off in 2006. The continued decrease in CVOC concentrations in the absence of any active remedy is evidence that natural attenuation of the plume was largely responsible for the decrease.

A residual mass of CVOCs diffused into the rock matrix below the LTR and at lower concentrations along the length of the plume (**Figure 18**). CVOCs will continue to be slowly released from the matrix to the groundwater through the process of back diffusion until the mass has equilibrated to match the groundwater concentrations in the

fractures or the mass degrades (Parker et al., 1997). Groundwater at the Site is largely aerobic and lacking in organic carbon. This environment limits continued biotic degradation of TCE. Therefore, abiotic processes of dispersion, hydrolysis, and sorption plus aerobic degradation serve to further decrease the constituent mass.

Section 3
MNA Evaluation

MNA relies on processes of natural attenuation of contaminants to achieve site-specific remediation objectives within a reasonable time frame. These processes include physical, chemical, and/or biological processes that act spontaneously when constituents interact with soil, rock, and groundwater. They include dispersion, dilution, sorption, volatilization, chemical or biological stabilization, transformation, or destruction (USEPA, 1999). The USEPA issued Office of Solid Waste and Emergency Response (OSWER) directive 9200.4-17 to clarify the USEPA's policy on the use of MNA as a remedial response to contaminated soil and groundwater. The directive states that EPA does not consider MNA to be a "default or presumptive remedy at any contaminated site" rather it should be "evaluated with other applicable remedies" as long as it meets "all relevant selection criteria, where it will be fully protective of human health and the environment, and where it will meet site remediation objectives within a time frame that is reasonable compared to that offered by other methods." (OSWER, 1997). Technical guidance was not a part the OSWER directive, but a "technical protocol" was prepared for by USEPA (Wiedemeier et al., 1998) to provide a path forward for evaluating chlorinated solvent sites for their suitability for remediation using MNA.

The USEPA technical protocol lays the groundwork to evaluate the site data using a "weight of evidence" approach, founded on three lines of evidence to demonstrate that natural attenuation is occurring. The following lists the three lines of evidence for MNA (Wiedemeier et al. 1998):

1. *Historical ground water and/or soil chemistry data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points. (In the case of a groundwater plume, decreasing concentrations should not be solely the result of plume migration. In the case of inorganic contaminants, the primary attenuating mechanism should also be understood.)*

2. *Hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at the site, and the rate at which such processes will reduce contaminant concentrations to required levels. For example, characterization data may be used to quantify the rates of contaminant sorption, dilution, or volatilization, or to demonstrate and quantify the rates of biological degradation processes occurring at the site.*

   Data from field or microcosm studies (conducted in or with actual contaminated site media) which directly demonstrate the occurrence of a particular natural attenuation process at the site and its ability to degrade the contaminants of concern (typically used to demonstrate biological degradation processes only) (Wiedemeier et al., 1998).

WDNR (2014) has issued guidance drawing on more recent technical approaches including recent advancements in the mechanisms of abiotic degradation of CVOCs. The following subsections present a detailed evaluation of MNA at the site through each line of evidence. The first line of evidence (reduction of concentrations within the plume) is evaluated through a detailed review of the concentration trends for each Site monitoring well. The second line of evidence (indirect evidence of degradation) includes an evaluation of the spatial distribution of CVOCs in groundwater as well as the identification of geochemical conditions within the plume that are either favorable to biodegradation or provide evidence that CVOC degradation is occurring. The last line of evidence, results of analyses of groundwater for microbial DNA, are also presented to provide a direct assessment of biodegradation. Although specific timeframes are not specified in the USEPA (Wiedemeier et al., 1998) or WDNR (2014) guidance, both suggest that reasonable time to cleanup is evaluated relative to other remedial options and must take into consideration what is technically and economically feasible at a site.

3.1 Primary Line of Evidence – Trends in CVOC Concentrations

The primary line of evidence for MNA is decreasing concentrations or decreasing mass over time. USEPA (2001) states that long-term monitoring is essential for estimating whether a plume has reached "steady state". The LSRG implemented in 1997 a long-term monitoring program that fulfills this requirement , and it has been periodically reviewed and modified to improve monitoring coverage and information content. A steady-state plume is a requirement before MNA can effectively serve as a site remedy (WDNR, 2014). WDNR (2014) defines a plume as steady state if it "has reached its maximum extent and concentrations within the plume are constant" and "natural attenuation rates are equal to the source zone contaminant releases". There are several means to determine if a plume is stable, including plotting successive plume maps, mass loss methods, and graphical methods (WDNR, 2014).

Concentration-time graphs of the CVOC data were evaluated at all Site wells to determine the overall plume behavior (e.g., are concentrations increasing, stable, or decreasing). Statistical analysis was performed for each of the wells with current ES exceedances in order to determine if the trends in concentrations were increasing or decreasing with a specified level of statistical significance (using Sen's Slope), and to estimate time-to-cleanup at each well with a recent ES exceedance (using linear regression). Finally, a visual analysis of the temporal trends in overall plume mass is presented using time series plots of molar concentrations for total CVOCs and a select group of individual constituents. The concentration-time graphs, statistical analyses, and temporal trends in plume mass are discussed in detail in the following subsections.

3.1.1 Visual Analysis of Concentration-Time Graphs

Trends of CVOC concentrations over time are a valuable tool to determine if concentrations are increasing or decreasing at particular locations within the plume. Historical data and interpretations indicate the overall extent of CVOCs has remained stable although concentrations within the plume have decreased over time. Concentrations of parent compounds have decreased or remained stable in most wells. Most importantly, the extent of ES exceedances of TCE have substantially contracted, as concentrations at downgradient wells RM-005D, RM-101D, and RM-210D (Figure 13), that once exceeded the ES have decreased and are now below that value. There have been no ES exceedances of CVOCs in any of these wells over the last 14 years.

Concentration-time graphs for selected wells and CVOCs are shown in **Figures 19, 20, 21, and 22**. Trend plots for each of the Site monitoring wells are provided in **Appendix A**. A visual analysis of the concentration trends for the site wells are discussed by area, below.

Source Area Wells

At most of the source area wells, concentrations of most CVOCs exhibit stable-to-decreasing concentrations over the entire monitoring history, including since the extraction system shutdown in 2006 (e.g., RM-303D, RM-306D, RM-307D, and RM-209D). Specifically, TCE concentrations at these wells are generally downward to stable over the entire monitoring history; however, TCE concentrations at three of the source area wells saw some temporary increase (rebound) following the system shutdown. The amount of increase in TCE concentrations is higher in the source area wells than in the plume well locations described in the following sections. The source area wells increased on the order of 10's of µg/L compared to 1's of µg/L in the plume monitoring wells. This is likely due to the overall higher CVOC concentrations in the source area. As discussed in the CSM (Section 2.0), CVOCs that have diffused into the rock matrix at source concentrations will continue to slowly degrade in-place and back-diffuse into groundwater, but at steadily decreasing concentrations. The concentration rebound observed at many of the source area wells is likely the result of this process. The treatment system has been off for over 11 years and CVOC concentrations have resumed downward trends, suggesting a new equilibrium with the rock matrix has been reached.

Concentration-time graphs of TCE at source area wells RM-007D and RM-007XD are shown in **Figure 20**. At source area well RM-007D, TCE concentrations

decreased slightly during the operation of the pump-and-treat system, then returned to the pre-pumping concentrations. However, concentrations of initial TCE breakdown product cis-1,2-DCE; and 1,1,1-TCA and its breakdown products at RM-007D decreased steadily both before and after shutdown of the pump-and-treat system (p.29, **Appendix A**). As shown in **Figure 20**, CVOC concentrations at neighboring deep monitoring well RM-007XD were increasing prior to, and following, the extraction system shutdown. In recent years though, CVOC concentrations at both of these wells show increasing evidence of a trend towards stability (**Figure 20**). The highest TCE concentration observed at RM-007XD was in October 2014. Further evaluation of these source area wells is provided in the Section 3.1.2.

Plume Monitoring Wells

CVOC concentrations at most of the wells in the near-field portion of the plume (e.g., RM-003D, RM-005D, RM-008D, and RM-208D) also have downward or stable trends over the full monitoring history, as well as downward to stable trends following the extraction system shutdown in 2006. At several of these wells, a slight rebound in concentration is observed a few years following the shutdown of the groundwater extraction system, as shown by concentration-time graphs of TCE in monitoring wells RM-003D and RM-008D (**Figure 21**). Concentrations are more variable in the post-extraction time frame at RM-003D and RM-008D, but the overall trends at those wells are downward or stable, and downward trends appear to have resumed following rebound. Further evaluation of TCE concentrations at these wells will be presented in the next section.

The trends in concentrations in the far-field end of the plume are similar to those of the near-field wells. Monitoring wells at the far north end of the plume (e.g., RM-002D, RM-203D, RM-204D, and RM-210D) displayed lower CVOC concentrations with only occasional ES exceedances in the early years of monitoring (1996 – 2005). There have been no ES exceedances for CVOCs in any of these far-field plume wells during the last 14 years. CVOC concentrations at most of these wells have downward trends over the full monitoring history, as well as downward to stable trends when evaluated following the extraction system shutdown in 2006.

Concentration-time graphs for TCE in two of the far-field monitoring wells (RM-204D and RM-210D) are shown in **Figure 22**. These monitoring wells are

located 4,000 feet (RM-204D) and 6,000 feet (RM-210D) downgradient of the LTR along the centerline of the plume axis. Concentrations of TCE at RM-210D remain essentially unaffected by pumping or by the system shutdown, and have been steadily decreasing since approximately 2002. At RM-204D (further upgradient), concentrations have stabilized at levels below the ES following the system shutdown. The stabilization of TCE at this location is likely due to back diffusion from the rock matrix, and indicates that a new equilibrium between the rock matrix and groundwater has been reached. Since CVOC concentrations in these far-field areas were below standards at the beginning of their monitoring history (1997), it is unlikely that the mass and concentration of CVOCs diffused in the rock matrix would be sufficient to cause ES exceedances of any CVOC compound in groundwater through back-diffusion.

3.1.2 Sen's Slope and Ordinary Least Squares (OLS) Regression Analysis

CVOC degradation in the environment generally follows first-order kinetics, which has been demonstrated at many sites (Sorenson et al. 2000). There are three common first-order calculations that are used to evaluate MNA: 1) concentrations vs. time, 2) concentration vs. distance, and 3) biodegradation (Wilson 2002). Sen's slope and ordinary least squares (OLS) regression analysis are both applied to concentration vs. time trends in this section. The Sen's slope analysis is used to determine whether concentrations are stable-to-declining within a two-tailed 90% confidence interval (CI) and the OLS regression analysis was conducted to determine the time to reach cleanup standards. Time-to-cleanup was estimated by determining the date at which the best fit line from the linear regression intersected the applicable cleanup standard.

As discussed in the previous section, visual analysis of the time trend plots indicates concentrations of CVOCs decreasing at most locations within the plume, and that the ES's for individual CVOCs have been attained throughout most of the study area. At such locations, further statistical analysis is not warranted. Regression analysis was performed only on data from wells that are currently in the monitoring program, and that have had one or more CVOC concentration above an ES during at least one event since the end of the 2013 MNA study period.

Since the end of the 2013 MNA Study period (data range starting in March [Q1] of 2015), only 12 Site monitoring wells in the current monitoring program have had exceedances for one or more CVOC compounds: RM-003D, RM-003XXD, RM-007D, RM-007XD, RM-008D, RM-214D, RM-303D, RM-306D, RM-307D, RM-402XD, RM-402XXD, and RM-403D. Concentrations above the ES for samples collected during this time period

are tabulated in **Table B-1**. Of these wells, five are source area wells located on the LTR property (RM-007D/007XD, RM-303D, RM-306D, and RM-307D) within the DMZ where the point of standards application does not apply. The remaining seven wells define the current extent of the CVOC plume, as defined by the ES. These 12 wells were targeted for OLS regression and Sen's Slope analysis to determine the timeframe to reach the ES.

For each of the wells and parameters summarized in **Table B-1**, a Sen's Slope analysis was performed to qualitatively assess the trends at the 90% two-sided confidence level and OLS regression analysis was performed to assess point decay rate constants in accordance with WDNR and USEPA guidance (WDNR, 2014; Wilson, 2011). Both analyses were done for the full monitoring history, and the period since the treatment system shutdown for each well. Slight, transient upward trends were observed at some source area and plume monitoring well locations following the system shutdown, especially since 2009 (**Figure 19**). As stated by Wilson (2011 p.2), "*Care must be taken to avoid making generalizations about clean-up progress without careful consideration of the entire monitoring network*" and *"the trends in the problematic wells may or may not indicate that MNA is inadequate for the plume as a whole".*

For wells that did not show stable to decreasing trends over these two time periods, an additional regression analysis was conducted for the period over which concentrations appear stable based on visual evaluation (RM-007D, RM-007XD, RM-307D, RM-003D, and RM-008D) summarized in **Table B-2**. While the "stable range" for each of these wells varies slightly, no fewer than 8 rounds of data, covering no less than 3.5 years, were used for analysis. For the wells with limited monitoring history, including monitoring well RM-214D, which has only been sampled since 2006, and monitoring wells RM-003XD, RM-402XD/-402XXD, and RM-403XD, which were installed in 2012, statistical evaluation was only completed for the post-shutdown timeframe. The results of the Sen's Slope and OLS regression analyses are summarized in **Table 2** and on **Figure 23**. The Sen's model output and a complete summary of the linear regression equations are included in **Appendix B.** The results of the analysis are discussed by area, below.

Source Area Wells

All of the source area wells are located within the current DMZ. Therefore, the point of standards application does not apply to these wells. The regression analysis was performed in this case to demonstrate that the plume is stable to receding even within the source area.

Three source area wells exhibit clear decreasing trends for most parameters over the full monitoring history: RM-303D (TCE, cis-1,2-DCE, TCA, and 1,1-DCE); RM-306D (TCE), and RM-007D (cis-1,2-DCE, 1,1,1-TCA, and 1,1-DCE). Regression analysis predicts that the ESs for these parameters at these three locations will be reached between the current sampling year[2] and 2069 (**Table 2**). At source area well RM-307D, TCE concentrations have been generally stable over the full monitoring history, including the last 5 years, where TCE concentrations have fluctuated between approximately 5 µg/L and 15 µg/L. OLS regression analysis of TCE data over the last 5 years (since July 2013) indicates the stability, or even slight decreasing trend at this well. Using the OLS trend over the last 5 years, a date to reach the ES of 2070 can be calculated. While the degree of certainty of this estimation is not high due to the limited data set and the variability in the results, it is not unreasonable given that the concentrations have been below the ES twice in the last 5 years. Concentrations of other CVOCs at this well have clearly decreasing trends over the monitoring history.

Concentrations of TCE at RM-007D, and concentrations of TCE, cis-1,2-DCE, 1,1,1-TCA, and 1,1-DCE at RM-007XD had clear upward trends prior to, and immediately following system shutdown; however, concentrations of each of these parameters have stabilized over the last 3 to 5 years (**Table 2**). Using the regression analysis over the last 3 to 5 years, a date to reach the ES could be estimated for TCE at RM-007D (2383 – i.e. essentially stable) and for 1,1,1-TCA at RM-007XD (2030). Concentrations of 1,1-DCE at RM-007XD appear to have stabilized (per the Sen's slope analysis); however due to a slight positive slope of the OLS regression line, a date to reach the ES cannot be calculated directly. In this case, the concentrations of the parent compound (1,1,1-TCA) are clearly decreasing. Assuming that the concentrations of the daughter compound 1,1-DCA will follow, and applying the slope of the 1,1,1-TCA regression line to the 1,1-DCA concentrations, a date to reach the ES can be estimated (2113). At this time, no estimate can be made for TCE at well RM-007XD; however, the slope of the regression line clearly indicates that the TCE concentrations at this well are stabilizing (**Figure 23**).

[2] Calculation of the projected date to reach the ES presented in Table 2 occasionally resulted in a date prior to present day. These values indicate that the concentrations are currently near the ES and/or may periodically be below the ES.

Plume Wells

In the near-field portion of the plume, only TCE, 1,1-DCE, and VC exceed the ES. TCE has exceeded the ES at six of the seven plume monitoring wells (RM-003D, RM-003XXD, RM-008D, RM-402XD, RM-402XXD, and RM-403D); and 1,1-DCE exceeds the ES only at plume wells located closest to the LTR (RM-402XD and RM-403XD). The 1,1-DCE concentrations result from abiotic dechlorination of 1,1,1-TCA. The observed concentrations of 1,1-DCE are approximately an order of magnitude lower than that of 1,1,1-TCA in the source area. However, since the ES for 1,1-DCE (7 μg/L) is also much lower than the ES for 1,1,1-TCA (200 μg/L) due to its relative toxicity, the reported concentrations still result in ES exceedances. Well RM-214D is the only well at the Site that currently exceeds the ES (0.2 μg/L) for VC; however, the most recent concentration (0.28 μg/L) and the preceding concentration (0.68 μg/L) were below the MCL (2.0 μg/L). No other CVOCs exceed the ES at this location (VC at the RM-214D location is discussed in more detail in **Section 3.2**) and the trend in VC concentration is decreasing (p. 67; Appendix A).

Monitoring wells RM-402XD, RM-402XXD, and RM-403XD (p. 78-80; Appendix A) are newer wells with a much shorter monitoring history than most other wells. Regression analysis for these wells indicates stable to decreasing trends for TCE and 1,1-DCE (the only CVOCs with ES exceedances) at RM-402XD and RM-402XXD and for TCE at RM-403XD. The downward trends for 1,1-DCE at RM-403XD and TCE at RM-402XXD were confirmed using the Sen's Slope analysis. The trend in 1,1-DCE at RM-402XD was stable but applying the downward trend in its parent compound (1,1,1-TCA), an estimate to reach the ES could be made. Concentrations of each of these parameters are predicted to reach the ES between 2023 and 2143 (**Table 2**).

The Sen's Slope analysis indicates that TCE concentrations at the downgradient edge of the ES exceedance plume (RM-003D, RM-003XXD, and RM-008D) have decreased through these wells' monitoring history, and with the exception of a slight rebound following the system shutdown, trends have returned to stable or decreasing over the last 3 to 5 years. At wells RM-008D and RM-003D, TCE concentrations are already at or near the ES (**Figure 21**); at RM-003D, the mean TCE concentrations since system shutdown (4.3 μg/L), and since the maximum rebound concentration was in June 2011 (4.95 μg/L), are already below the ES (5 μg/L). There have been no exceedances of TCE at well RM-003XXD since 2015, and both the Sen's analysis and regression analysis indicate that TCE concentrations will remain below the ES at this location (**Table 2**).

VC concentrations at well RM-214D have exhibited a clear decreasing trend over its monitoring history, and concentrations have been less than 1 µg/L since Q3 2016, compared to an ES of 0.2 µg/L. Regression analysis predicts the ES for VC will be achieved at this location in 2036 (**Table 2**).

3.1.3 Plume Time Series Maps

The overall reduction in contaminant mass can be demonstrated by evaluating the spatial distribution of molar concentrations of CVOCs over time. Molar concentrations are directly proportional to the number of molecules of a compound regardless of the compound's molar mass and are therefore useful for comparing concentrations of contaminants that have different molar masses, and to more easily assess the overall changes in contaminant mass. Maps of molar concentrations at 5-year intervals from 1997 through 2007 are shown for total CVOCs in **Figure 24**, and compound specific plots of TCE, cis-1,2-DCE, and 1,1,1-TCA are shown in **Figures 25, 26, and27.** Note that total CVOC concentrations were calculated as the sum of analytical results in micromoles per liter (µmol/L) for PCE, TCE, cis- and trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and chloroethene. Individual plume maps with posted data for each year included in the time series figures are provided in **Appendix C**.

The time series maps of total CVOCs (**Figure 24)** clearly illustrate that the plume mass has decreased over time, and that both the overall footprint of the plume and core of the plume (area with highest concentrations; i.e. the source material) have diminished. The decrease in the plume core concentrations is illustrated by the 10 micromoles per liter (µmol/L) contour, which is present in the 1997 map but not in the 2017 map. The maximum observed total CVOC molar concentration decreased from 24 µmol/L in 1997 (RM-303D), to 7 µmol/L in 2017 (RM-007D), demonstrating a decreasing source mass.

The time series maps of TCE, cis-1,2-DCE, and 1,1,1-TCA also show overall reductions in the plume extent and concentrations within the plume for these individual constituents (**Figures 25-27**). TCE is a leading constituent of the CVOC plume at the site. The TCE time series maps (**Figure 25**) show a slight decrease in both the overall footprint of the plume and the core of the plume between 1997 and 2017. In that timespan, the maximum observed TCE molar concentration decreased from 0.84 µmol/L to 0.55 µmol/L.

The initial biodegradation product of TCE is typically cis-1,2-DCE. The presence of this breakdown product throughout the initial (1997) plume indicates the extensive amount of bioactivity from the outset of the Site monitoring history. The cis-1,2-DCE time series maps (**Figure 26**) show a noticeable decrease in both the overall footprint of the plume and the core of the plume between 1997 and 2017. The decreased plume extent is

demonstrated by the much smaller area of the 0.05 µmol/L contour, which by 2017 no longer extends to the Branch River. Decrease in the plume source is demonstrated by the complete absence of the 1.0 µmol/L contour (darkest shade of brown) in the 2017 isocontour map that shows a gradual reduction through the 20-year timeframe. Between 1997 and 2017, the maximum observed cis-1,2-DCE molar concentration decreased from 3.51 µmol/L to 0.95 µmol/L. Note that in prior to 2007, the 1,2-DCE concentrations reported were analyzed as total 1,2-DCE, but analytical results after 2008 indicate that 1,2-DCE at the Site is predominantly (99%) cis-1,2-DCE.

Like TCE, 1,1,1-TCA is a leading constituent of the CVOC plume at the Site and also a parent compound of commonly detected CVOCs. The 1,1,1-TCA time series maps (**Figure 27**) also show a noticeable decrease in both the overall footprint of the plume and the core of the plume between 1997 and 2017. The decreased plume extent is demonstrated by the smaller area of the 0.1 µmol/L contour, which no longer extends to the Branch River, and the decreased plume core extent is demonstrated by the absence of the 10 µmol/L contour (colored pink) in the 2017 isocontour map. Between 1997 and 2017, the maximum observed 1,1,1-TCA molar concentration decreased from 11.99 µmol/L to 2.68 µmol/L.

3.1.4 Trend Analysis Summary

Contaminant trend graphs at the LTR source area show groundwater extraction had very little impact on the concentration of CVOCs leaving the source area. More importantly, CVOC concentrations at the source area have decreased at most (10 of 11) monitoring wells at the same rate regardless of whether or not the extraction wells were operating. Decreasing concentrations of CVOCs at the source area in the absence of active remediation is clear evidence that the plume will continue to diminish going forward.

Concentrations of CVOCs at 35 of 37 downgradient monitoring wells exhibit decreasing trends when viewed over the full monitoring history and the two exceptions (RM-003I and RM-401XD) are at wells with concentrations below regulatory standards. CVOC concentration trends at the wells within the source area and the downgradient plume are generally downward, both before and after the groundwater extraction system was shut down, and concentrations of most of the CVOCs are predicted to remain below the ES or reach the ES within approximately 50 years.

Trends in TCE concentrations (and in one instance, 1,1-DCE) in and near the source area are stable to decreasing, but very low downward slope of the regression line results in a longer timeline to reach the ES. Three of the five wells where the predicted timeline to

meet the ES is greater than 50 years are located within the current DMZ (RM-007D, RM-007XD, and RM-307D); and two additional wells (RM-402XD and RM-403XD) would be located within an expanded DMZ, if requested and approved by the WDNR. Only two wells located outside of the potential expanded DMZ area (RM-003D and RM-008D) have current ES exceedances for one CVOC (TCE). Concentrations of TCE at these locations are already at or near the ES, and are predicted to reach the ES at these locations between the current monitoring period and 2031.

Concentrations of CVOCs in groundwater at the Site are quite low overall compared to most other chlorinated sites in the Superfund program. The historical maximum concentrations at Site monitoring wells were recorded at LTR source area well RM-303D in 1996, with a 1,1,1-TCA concentration of 3,000 µg/L and a TCE concentration of 190 µg/L. Current concentrations for those CVOCs at RM-303D are 241 µg/L and 69.9 µg/L, respectively. These recent concentrations indicate source reductions of 92 percent for 1,1,1-TCA and 63 percent for TCE.

Finally, the mass reduction of the CVOC plume is best demonstrated by the sequential illustrations of the plumes through time. The overall extent of CVOCs is seen to diminish both in areal extent and magnitude as well. Importantly, the extent of the TCE breakdown product 1,2-DCE also is shown to degrade dramatically. What cannot be shown in these depictions, however is that the degradation of cis-1,2-DCE does not result in production of VC. This geochemical situation makes MNA at the Site more viable, as compared to most other CVOC sites.

3.2 Secondary Line of Evidence – Indirect Evidence of MNA Processes

Natural attenuation of the CVOC plume can be documented through analysis of the physical, biological, and chemical processes that act on it. Degradation of the chlorinated compounds of concern (1,1,1-TCA, TCE, and their respective breakdown compounds) can occur via the following mechanisms (**Figures 28 and 29**):

- Biotically-mediated reductive dechlorination,
- Biotically-mediated aerobic oxidation and aerobic co-metabolism, and
- Abiotic hydrolysis and elimination.

Mechanical attenuation (dilution) of the groundwater plume can also occur via the following mechanisms:

- Dispersion (mixing),

- Sorption, and
- Diffusion into the rock matrix and lower permeability materials.

Indirect evidence of biotic and abiotic attenuation mechanisms may be obtained by evaluation of the temporal and spatial distribution of CVOCs and indicator parameters in the groundwater. Concentrations of individual CVOCs from third quarter (Q3) 2017 sampling are shown in plan view on **Figures 8 through 15**, and in cross-section in **Figures 16 and 17**, as presented in **Section 2.1.7**. Data from Q3 2017 was used to generate the CVOC plume maps as this was the most recent comprehensive (annual) sampling event. **Table F-1** presents the calculated proportions of each CVOC compound (on a molar concentration basis) at each well in the current monitoring program since the end of the previous MNA evaluation, and for select historical events.

Indicator parameters currently in the monitoring program include alkalinity, chloride, sulfate, nitrogen (as nitrate + nitrite), total iron, total manganese, total organic carbon (TOC), and field measurements of pH, temperature, specific conductance, DO, and oxidation-reduction potential (ORP). Concentrations of these individual indicator parameters are shown in plan view in **Appendix D**, and as concentration-time plots in **Appendix E.** Due to the variable nature of the indicator data, the data used to generate the plan view maps are an average of the historical concentrations of each parameter for each well, with non-detects interpreted as half the detection limit. Previous MNA studies included analysis for dissolved gases and field measurement of carbon dioxide (CO_2), and the data for these parameters is included in the 2013 MNA study report (TRC, 2015).

3.2.1 Spatial Distribution of Parent and Daughter Compounds

1,1,1-TCA and Degradation Products

1,1,1-TCA, 1,1-DCA, 1,1-DCE are detected throughout the groundwater plume (**Figures 8, 9, and 10**). Molar concentrations of the chlorinated ethanes are plotted with distance from the source area (RM-007 nest) along the plume centerline (transect shown on **Figure 30**, concentration-distance plot shown in **Figure 31)**. Plots of concentration versus distance for several other profiles are included in **Appendix F**. The highest concentrations of each of these compounds are detected in the source area wells, and concentrations of each parameter decrease with distance from the source. 1,1,1-TCA and 1,1-DCA decrease proportionally with distance from the source area (**Table F-1; Figure 31**), while the relative concentrations of 1,1-DCE and chloroethane increase slightly in the near-field wells adjacent to the source area (e.g.,

RM-402XD), and then decrease proportionally to 1,1,1-TCA and 1,1-DCE downgradient along the flow path.

Chloroethane is commonly detected in source area wells OW-101A, RM-007D, RM-007XD, RM-209D, and RM-303D, and the closest near-field wells RM-402XD and RM-403XD; it is occasionally detected as far downgradient as RM-003D. Chloroethane does not persist in downgradient portions of the plume. Ethene and ethane have been detected occasionally in source area well RM-007D.

Concentrations of 1,1,1-TCA are decreasing in source area wells RM-007D, RM-209D, RM-306D, and RM-307D while concentrations of 1,1-DCA are stable or decreasing at a slower rate than 1,1,1-TCA at these wells (see pp. 118, 148, 163, and 164; **Appendix A**). Source area well RM-303D shows stable-to-decreasing trends for both constituents. Concentrations of both 1,1,1-TCA and 1,1-DCA have stabilized at source area well RM-007XD as discussed previously (**Table 2**). These data suggest that 1,1-DCA is being generated from the breakdown of 1,1,1-TCA in the source area.

Figure 29 shows that biologically-mediated reductive dechlorination is the only significant pathway that will generate 1,1-DCA from 1,1,1-TCA. Similarly, reductive dechlorination is the only significant pathway to generate chloroethane from 1,1-DCA or ethane from chloroethane. Each of these parameters are consistently detected in, and near, the LTR source area (e.g., RM-007D and RM-402XD). These data provide clear and convincing evidence of biodegradation of 1,1,1-TCA occurring within the source and near-field portions of the plume.

The process of aerobic microbial degradation (Lawrence (2006) and abiotic hydrolysis and dehydrohalogenation (McCarty 1997) are also an active component of the 1,1,1-TCA degradation pathway (**Figure 29**). The presence of 1,1-DCE in the source area and within the plume suggests that some of the 1,1,1-TCA is degrading through abiotic elimination. The ratio of 1,1-DCA to 1,1-DCE decreases with distance from the source (**Table F-1; Figure 31**), while the ratio of 1,1,1-TCA to 1,1-DCA stays relatively constant, suggesting that in downgradient portions of the plume abiotic processes play a more significant role in the degradation of 1,1,1-TCA. This interpretation is supported by the lack of chloroethane and ethane production outside of the source area.

PCE, TCE, and Degradation Products

PCE is detected (at concentrations less than 2 μg/L) only in the source area wells and a few of the near-field wells located immediately adjacent to the LTR (e.g., RM-402XD and RM-403XD). This is likely due to low concentrations of PCE that were present in the source waste materials. TCE and cis-1,2-DCE are present throughout the CVOC plume. The highest concentrations of these chlorinated ethenes are detected in the source area wells, and concentrations of each parameter decrease with distance from the source. TCE concentrations are generally stable at all source area wells. Concentrations of cis-1,2-DCE are stable-to-decreasing in all source area wells. These data indicate that degradation of TCE to cis-1,2-DCE is still occurring in the source area. VC is regularly detected only at RM-214D, located on the south side of the LL, and is detected sporadically in LTR source area wells.

Molar concentrations of the chlorinated ethenes are plotted with distance from the source area (RM-007 nest) (transect shown on **Figure 30**, distance-concentration plot shown on **Figure 32)**. The molar ratio of TCE to cis-1,2-DCE decreases from approximately 0.6 to 0.3 between wells RM-007D/XD and RM-401XXD along the centerline of the plume. This suggests that some reductive dechlorination is still occurring in the plume downgradient of the LTR (**Table F-1**).

Biotically-mediated reductive dechlorination is the <u>only</u> significant pathway that will generate cis-1,2-DCE from TCE (**Figure 28**) and is "incontrovertible evidence of chlororespiration within the plume" (Bradley, 2011). The absence of trans-1,2-DCE supports the interpretation that most of the cis-1,2-DCE in the groundwater was formed through biotically-mediated degradation of TCE (Waterloo Educational Services, 2000).

Transformation of cis-1,2-DCE to VC can occur by anaerobes, but at a lower rate than the more chlorinated ethenes. VC is generally absent throughout the CVOC plume at the Lemberger Site. This is likely due to elevated DO in the groundwater. VC oxidizes rapidly in the presence of oxygen through direct oxidation (AFCEE, 2004) and/or biodegradation (Davis and Carpenter, 1990) to carbon dioxide. The presence of VC at RM-214D is somewhat unique when compared to other wells. Downward trends of all CVOCs at this location, as well as favorable geochemical conditions, suggests that this well is located in an area of particularly strong bioactivity, possibly due to municipal waste material associated with the LL. Waste was found outside the limits of the LL (including

the vicinity of RM-214D) during remedial efforts and incorporated into the limits of slurry wall.

Aerobic co-metabolism is also an active component of the TCE degradation pathway (**Figure 28**; Wiedemeier et al, 1998). Oxidation and co-metabolism of the breakdown products of TCE (cis-1,2-DCE and VC) can occur in an aerobic environment, ultimately producing CO_2. Evidence for this degradation pathway includes: the continued reduction in concentration of TCE and cis-1,2-DCE with distance from the source area, the lack of buildup of VC along the flow path, and the lack of ethene/ethane production outside of the source area (TRC, 2015). Further abiotic dechlorination may also occur in the rock matrix as TCE and cis-1,2-DCE have been shown to degrade abiotically in the presence of iron minerals common in most natural materials (Schaefer et al., 2015).

3.2.2 MNA Geochemical Parameters

Wiedemeier et al (1998) defines three types of plume behavior exhibited by chlorinated solvent plumes. The type of behavior exhibited by the plume depends on the amount of solvent present, the amount and type of biologically available organic carbon in the aquifer, and the distribution and concentration of natural electron acceptors. The types of plume behavior are summarized as follows:

- **Type 1 –** microbial degradation is driven by degradation of an anthropogenic carbon source (e.g., solvent or landfill leachate). Type 1 plumes exhibit "rapid and extensive" degradation of highly chlorinated solvents (e.g., PCE, TCE, and 1,1,1-TCA).
- **Type 2 –** microbial degradation is driven by degradation of biologically available native organic carbon (e.g., peat). Type 2 behavior results in degradation of highly chlorinated solvents, although the rate of degradation may be slower than in a Type 1 plume.
- **Type 3 –** The aquifer is characterized by inadequate concentrations of native or anthropogenic organic carbon and aerobic conditions (DO> 1.0 mg/L), or in aquifers where the appropriate microbial colonies do not exist. Under these conditions, the primary attenuation mechanisms for highly chlorinated solvents (e.g., PCE, TCE, and 1,1,1-TCA) are mechanical (advection, dispersion, sorption, and matrix diffusion); however, degradation of some chlorinated compounds (e.g., VC, cis-1,2-DCE, 1,1-DCA, and 1,1-DCE) may proceed under these conditions through the processes of oxidation or aerobic co-metabolism.

A plume may exhibit different types of behavior in different portions of the plume ("mixed behavior") depending on the conditions present at those locations.

The distribution of certain MNA parameters in groundwater identified several geochemical footprints that are expected with both biotic and abiotic degradation processes and suggest that localized anaerobic environments are present within the otherwise aerobic LGU/bedrock aquifer. These geochemical oxidation-reduction reactions occur within the subsurface and determine the rate and pathway that the CVOCs are transformed (Pivetz et al., 2013). The products of these redox reactions are known as terminal electron acceptors (TEAs). Chapelle et al. (2002) state that there are three types of geochemical parameters as they pertain to MNA monitoring:

1. **Redox-indicators** – these parameters include DO, ORP, pH, methane, hydrogen and sulfide. Unfortunately, these are subject to rapid oxidation during sampling and analysis.
2. **Microbial indicators** – these include ions that are either used or co-metabolized to by microbes to consume VOCs such as nitrate, sulfate, and organic carbon.
3. **Degradation indicators** – these include actual end-member breakdown products e.g., chloride, ethane/ethene, specific conductance and inorganic carbon.

Discussion of Individual MNA Parameter Results

Predictable patterns/changes in the oxidative state of the geochemical parameters (MNA parameters) in groundwater can be expected with both reductive dechlorination and aerobic oxidation and co-metabolism.

The following MNA parameter distributions are expected with reductive dechlorination (Wiedemeier et al, 1998; WDNR, 2014):

- Presence of TOC
- Increases in the concentrations of alkalinity, total inorganic carbon (TIC) and CO_2 relative to background
- Depletion of DO
- Depletion of nitrate
- Increase in the concentration of manganese relative to background
- Increase in the concentration of iron relative to background
- Decrease in the concentration of sulfate relative to background

- Increase in the concentration of chloride (twice the background concentration), and
- Presence of ethane and ethene.

Aerobic co-metabolism and oxidation can result in the following MNA parameter distributions:

- Increase in the concentration of CO_2 relative to background,
- Absence of VC, chloroethane, ethene, and ethane, and
- Presence of oxygen/inability of reductive dechlorination to proceed to anaerobic conditions.

Wiedemeier et al. (1998) has developed a preliminary screening process to determine if anaerobic biodegradation is likely to be occurring at a given point by assigning a point value to ranges of results based on the criteria listed above. The 12 downgradient MNA study wells in this demonstration study were evaluated according to the screening criteria, and the results are summarized in **Table 3**. The results were tabulated using the current CVOC concentrations, the average concentrations for each indicator parameter at each well, and average concentrations for background values (where required for comparison). Background values were calculated as the average of all historical concentrations reported at well RM-102D.

Per USEPA guidance, a screening score greater than or equal to 15 points indicates that there is adequate to strong evidence that anaerobic biodegradation is likely to be occurring, while scores between 6 to 14 points indicate limited evidence of anaerobic biodegradation, and less than 6 points indicates inadequate evidence of anaerobic biodegradation. Wells RM-007D and RM-402XD each scored the highest of all the wells with 9 points, making these locations in the source area and near-field portion of the plume the most likely areas for anaerobic biodegradation. Three additional wells located along the plume centerline (RM-003D, RM-204D, and RM-201D also scored within the "limited evidence" of anaerobic biodegradation category. These results indicate that conditions favorable to anaerobic biodegradation exist periodically within the source area and near-field portion of the plume. These results are also generally consistent with the distribution of the products of dechlorination observed within the plume.

There are easily identifiable trends in the MNA data that are consistent with the general requirements for MNA. A parameter-by-parameter discussion of the inorganic MNA parameter results is presented below. The MNA analytical program has changed over time, and not all parameters are currently in the program. Maps with data for parameters that are currently part of the analytical program are included in **Appendix D**. The maps in **Appendix D** represent the average concentrations at each point over time, due to variability within the datasets. Graphs of the available MNA results over time showing all of the available data are included in **Appendix E**. This discussion incorporates all historical data, as appropriate.

Total Organic Carbon

The presence of organic carbon in the subsurface provides bacteria an energy source for respiration. Adequate levels of naturally occurring carbon can result in a robust microbial population that can benefit natural attenuation. TOC has been analyzed in groundwater samples from a subset of the monitoring wells during each of the three MNA evaluation periods. TOC is not typically detected in the aquifer at concentrations over 2 mg/L, except at LTR source area wells OW-101A, RM-007D, RM-303D, and RM-307D; and near-field wells RM-213D and RM-214D. The range of TOC detections for these wells is from approximately 1.0 mg/L to 8.6 mg/L. A plot of the most recent TOC data versus distance, along with the CVOC data (**Figure 33**) is provided.

TOC concentrations in the LGU/bedrock aquifer all are below the USEPA screening criteria of 20 mg/L to support reductive dechlorination (WDNR, 2014). The carbon source at the LL (i.e. RM-214D) and near the LTR may be related to residual waste material and from the plume constituents.

Total Inorganic Carbon and Alkalinity

TIC was part of the analytical program during the first two MNA studies (from 2006 through 2014). According to the WDNR, TIC is perhaps the most accurate indicator of carbon dioxide production related to microbial activity (WDNR, 2014). Carbon compounds that are considered "inorganic carbon" include H_2CO_3, $CaCO_3$, and CO_2. Alkalinity (measured as $CaCO_3$) is also a measure of inorganic carbon. A summary of the TIC data is provided in the 2013 MNA study report (TRC, 2015).

Despite the apparent lack of organic carbon, the CO_2, alkalinity, and TIC concentrations suggest that microbial activity is consuming the only available source of carbon in groundwater (e.g., the LTR source area and the core of the plume of CVOCs). There is no USEPA criterion for comparison of TIC concentrations in guidance, however WDNR (2014) guidance lists an "increase over background" as the comparison criteria. The average TIC concentration detected at background well RM-102D is 65.8 mg/L. Increased concentrations of TIC relative to background are consistently detected at OW-101A, RM-007D, RM-209D, RM-303D, RM-403XD and RM-214D.

Groundwater samples have been analyzed for alkalinity from a subset of the Site monitoring wells during each of the three MNA studies (2006 through 2017). The distribution of alkalinity (**Figure 34**) shows elevated concentrations along the entire length of the plume. EPA (Wiedemeier, 1998) lists the relevant criteria of "2x background" for alkalinity. The background concentration of alkalinity at well RM-102D is 258 mg/L, so concentrations above 516 mg/L exceed the screening level. Monitoring wells in the vicinity of the source area come close to meeting this criterion (e.g., RM-007XD at 1.9x the background level). The recent alkalinity data are generally consistent with the 2006 and 2013 MNA studies (RMT, 2008; TRC, 2015).

Carbon Dioxide

Carbon dioxide is produced as an end member of methanogenesis but also from the aerobic mineralization of less chlorinated CVOCs (AFCEE 2004). CO_2 was part of the analytical program during the first two MNA studies (from 2006 through 2014). The data are summarized in the 2013 MNA study report (TRC, 2015). The highest concentration of CO_2 in groundwater occurs at OW-101A, RM-402XD and RM-214D, but CO_2 is also slightly elevated in most wells downgradient of the LTR source area. The USEPA (Wiedemeier, 1998) MNA screening criterion for CO_2 to demonstrate bioactivity is the measured concentration should be greater than twice the background concentration. The background concentration of CO2 measured at RM-102D is 15 mg/L. Wells in close proximity to the landfills (e.g., RM-007D and RM-402XD) meet that criterion, and wells throughout the near field portion of the plume (e.g., RM-003XXD and RM-214D) are elevated with respect to background.

As noted in the 2013 MNA study report (TRC, 2015), there was a change in measurement technique for CO_2 that occurred between the 2006 study and the 2013 study that affected the measured CO_2 values. While the CO_2 data within each study period are consistent from event to event, the data from the 2006 study cannot be directly compared to data from the 2013 study. Nonetheless, all the data are shown in the concentration-time plots in **Appendix E**.

Dissolved Oxygen and Oxidation Reduction Potential

Oxygen is the most preferred TEA for microbial degradation of CVOCs as it is the most energetically efficient electron acceptor (Chapelle et al., 2003). DO and ORP are measured at every monitoring well in the analytical program at the time of sample collection. Depleted levels of oxygen and low ORP can be an indication of increased biotic activity within the aquifer. The USEPA (Wiedemeier, 1998) MNA screening level for DO is <0.5 mg/L in the most contaminated zone. If DO concentrations are at or above 0.5 mg/L, CVOC degradation will be completely aerobic. However, aerobic respiration by bacteria can occur at DO concentrations as low as 0.02 mg/L (Gossett 2010). The concentration of DO at source area wells at the downgradient edge of the LTR is significantly lower than elsewhere in the LTR (e.g., approximately 2 mg/L on average at RM-007D, RM-209D, and RM-303D compared to >5 mg/L at RM-305D, RM-306, RM-307, and RM-308). DO is sometimes depleted (<0.5 mg/L) at bedrock well RM-214D and within the core of the CVOC plume that extends north (e.g., RM-402XD). DO is also depleted at depth in the aquifer (e.g., RM-007XXD, RM-208XD, and RM-003XXD); however, most of the shallower bedrock plume is considered as aerobic (e.g., DO >0.5 mg/L) based on the field measurements. The MNA screening level for biotic toxicity of DO (>5 mg/L) is met at many wells around the LTR periphery and EW-07D, RM-008D, and RM-213D in the near field portion of the plume. DO apparently is introduced to the aquifer through infiltration of meteoric water in areas of shallow bedrock in the vicinity of the LTR.

Average DO concentrations measured at wells west of the Site near the Branch River are consistently less than 1 mg/L (e.g., RM-201D, RM-202D, RM-205D, and RM-212D). These wells are not located within the CVOC plume. The depleted oxygen at these locations may be the result of biotic activity associated with the Branch River and adjacent wetlands.

ORP exhibits the same general trends within the plume as DO. The EPA (1998) screening criterion for ORP is <50 mV for "possible" and < -100 mV for "likely" evidence for reductive dechlorination. ORP is relatively high in the LTR (>200 mV), except at the downgradient edge at source area wells OW-101A, RM-007D, and RM-209D. Within much of the plume, ORP values are similar to background levels (190 mV); however, ORP appears to be slightly below background at wells along the core of the CVOC plume (e.g., RM-402XD, average of 143 mV) and at well RM-214D (average of 113 mV). The 50-mV criterion is occasionally met at wells along the plume centerline (RM-402XD), and deeper portions of the aquifer (RM-007XXD). Similar to DO, it appears that groundwater in the vicinity of the LTR is being recharged by infiltration of oxygenated meteoric water and the levels are above those criteria.

Also similar to the DO data, average ORP measurements at wells west and northwest of the Site near the Branch River are consistently below zero (e.g., RM-201D, RM-202D, and RM-205D), or frequently meet the EPA criterion (RM-212D, RM-002D, and RM-210D). These wells are either not within the CVOC plume or are located near the downgradient end of the plume (RM-002D and RM-210D). The depleted oxygen at these far field locations may be the result of biotic activity associated with the Branch River and adjacent wetlands and not due to biotic degradation of CVOCs.

Nitrogen (Nitrate & Nitrite)

Denitrification is the next most energetic biotic reaction (after oxygen). At DO concentrations <0.5 mg/L and nitrate levels are greater than 1.0 mg/L nitrate reduction becomes the leading microbial process as nitrate is reduced to nitrogen (Chapelle et al., 2003). Nitrate and nitrite were analyzed as separate nitrogen species during the 2006 MNA study (2006 to 2008). The presence of nitrite is a direct indication of active denitrification, but it is an unstable intermediate product, and thus can be difficult to detect in the field. Nitrite was detected only sporadically in a few Site wells, so the program was modified beginning in 2013 to analyze samples for nitrogen as combined nitrate plus nitrite. The average concentration of nitrogen (as NO_3 + NO_2) is depleted (<1 mg/L) at RM-214D, and nitrogen is generally lower than background concentrations (8 mg/L, average) at many of the source area wells (e.g.,

OW-101A, RM-306D, RM-307D, RM-007D, RM-007XD, etc.). Locations where nitrate is frequently below the USEPA screening criteria (<1 mg/L) include RM-007XD, RM-007XXD and RM-214D near the landfills where conditions are more anaerobic. However, nitrate is elevated at both near-field and far-field wells and are possibly impacted by agricultural practices (e.g., fertilizers and animal wastes).

The most recent nitrogen data were plotted in profile along the centerline of the plume (**Figure 35**). While nitrogen was not "depleted" as defined by the Wiedemeier et al (1998) screening criteria (<1 mg/L) within most of the plume, there is clear evidence that nitrogen concentrations are reduced (below background) within the source area and near field portion of the plume where the CVOC distribution indicates biotically mediated reductive dechlorination is occurring.

Manganese

No manganese was detected in field measurements of any groundwater samples collected in the 2013/2014 study. The concentrations of total manganese by laboratory analysis are variable, perhaps due to natural conditions. The highest concentrations of manganese are consistently detected at RM-214D, and downgradient wells OW-103A and RM-004D, though manganese concentrations at these wells have declined from their initial concentrations. Elevated manganese concentrations have occurred occasionally at source area wells (e.g., OW-101A, RM-007XD, RM-303D) or along the core of the plume (e.g., RM-402XD). Elevated concentrations of manganese near the LTR source area may be an indication of reducing conditions conducive to biologically-mediated reductive dechlorination in this area; however, the variability in the data make manganese a less reliable indicator for the Site.

There is not a MNA screening level for manganese in USEPA (Wiedemeier, 1998) guidance, but WDNR (2014) guidance lists an increase over background as a screening criterion. The distribution of manganese in groundwater at the Site is shown in **Appendix D**. The source area and near field portion of the plume clearly shows an increase in manganese concentrations above background (average of up to 100 µg/L compared to 1.3 µg/L at RM-102D). Elevated manganese concentrations in the far-field area north of the Site is of an unknown

origin. Elevated manganese concentrations along the Branch River are coincident with the depleted DO and ORP measurements at these wells (RM-201D, RM-202D, RM-205D, and RM-212D).

Iron

No ferrous iron (Fe^{+2}) was detected in the field measurements of groundwater samples collected during the 2013/2014 study. The groundwater samples collected for laboratory analysis were collected using low-flow purging techniques, with turbidity generally less than 10 NTU, and analyzed for total iron. While this analysis is not completely analogous the dissolved iron analysis collected during the 2006 MNA study (RMT 2006), the data appear to be similar (**Appendix E**). The average background iron concentration was 31 µg/L.

The distribution of total iron in groundwater is shown in **Appendix D**. Total iron concentrations are consistently elevated (over 100 µg/L) in source area wells (e.g., OW-101A, RM-007D, RM-007XD, RM-209D, RM-303D), as well as downgradient wells OW-103A, OW-104F, RM-004D, RM-010D, and RM-202D. Iron concentrations are not generally elevated above the Wiedemeier et al. (1998) screening level (1,000 µg/L) within the CVOC plume, and the data in the vicinity of the LTR are highly variable. The only area with total iron concentrations above the MNA screening criterion is located in the far-field monitoring wells. It is unlikely that the cause for the elevated iron in this area is related to the LTR CVOC plume.

Sulfate

The EPA MNA screening level concentration for sulfate is <20 mg/L as higher concentrations may compete with the reductive pathway (Wiedemeier, 1998). Sulfate is present in groundwater at concentrations below the screening level and background concentrations (i.e., an average of 4.4 mg/L at RM-102D) at most source area wells and in wells in the near field portion of the plume (**Appendix D**). The detected sulfate is possibly related to previous landfill activity, and trends in sulfate related to reductive dechlorination are not readily apparent. Therefore, sulfate is not a reliable indicator for future MNA monitoring.

Chloride

Chloride is detected in groundwater at concentrations generally greater than the USEPA (Wiedemeier, 1998) screening level (with a diagnostic rule-of-thumb of twice the background concentration) at the LTR source area wells and following the core of the plume downgradient of the LTR (**Appendix D**). The average concentration at background well RM-102D is 4.6 mg/L. The distribution of elevated chloride concentrations closely mimics the distribution of the CVOC plume. This suggests that dechlorination is at least partly responsible for this distribution. When plotted in profile along the plume centerline (**Figure 36**), chloride concentrations appear to increase to more than 2x background levels (meeting the USEPA screening criteria) in the plume downgradient of the LTR source area, which would also be expected if the elevated chloride was the result of reductive dechlorination.

Methane, Ethane, and Ethene

Dissolved gases, methane, ethane, and ethene were analyzed during the 2006 and 2013 MNA studies (2006 through 2014). The data are included in the 2013 MNA study report (TRC, 2015). Methane, ethane, and ethene were detected only sporadically in groundwater samples collected at the Site during the 2006 and 2013 studies. The highest concentrations, and most frequent detections of each parameter were at well RM-007D, which were coincident with the highest CVOC concentrations, and other indicators of reductive dechlorination. Ethane, and ethene were each detected at RM-007D during five of the 17 monitoring events; methane was detected at RM-007D during six of the 17 monitoring events. The lack of detectable concentrations of these dissolved gases outside of the source area is not unexpected since VC and chloroethane do not persist in the plume far beyond the LTR source area wells, and these constituents rapidly degrade under aerobic conditions.

3.2.3 Decay Rate Estimates

Buscheck-Alcantar Method

Concentration-distance profiles for total ethanes and total ethenes were used to calculate decay rate constants for these parameters using the Buscheck-Alcantar method, in accordance with USEPA guidance (Wiedemeier et al, 1998).

Concentration-distance graphs for total ethanes and total ethenes are shown on **Figures 24 and 25**, respectively. Total ethanes were calculated as the sum of molar concentrations for 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and chloroethane. Total ethenes were calculated as the sum of molar concentrations for PCE, TCE, cis-1,2-DCE, and VC. For both chlorinated ethanes and chlorinated ethenes, the log concentration-distance profiles along the centerline of the plume indicated faster rates of decay (corresponding to steeper slopes) near the source area than in the downgradient section of the plume. Therefore, separate rates of decay were calculated by conducting separate log-linear regressions for the source area (approximated using data from wells RM-007D and RM-402XD) and the rest of the plume. The Buscheck-Alcantar decay rate calculations are summarized in **Table 4**. The Buscheck-Alcantar method incorporates an analytical solution for one-dimensional, steady-state contaminant transport that includes advection, dispersion, sorption, and biodegradation (Wiedemeier et al., 1998). This method estimates biodegradation rates that are sometimes referred to as "apparent" biodegradation rates because they reflect the difference between contaminant degradation and production, and may therefore be lower than the actual rates of degradation for daughter products that are being produced by reductive dechlorination of parent compounds (Wiedemeier et al., 1998). Additionally, the Buscheck-Alcantar method does not remove the effects of transverse dispersion, so the decay rate is considered to be more of a hybrid between a bulk attenuation rate constant (k) and a biodegradation rate constant (λ) (USEPA, 2002).

Chlorinated Ethanes

The concentration-distance profile along the centerline of the plume (**Figure 31**) clearly shows the degradation of 1,1,1-TCA through its dechlorination series in the source area and adjacent near-field wells (e.g., RM-402XD). The calculated half-life for chlorinated ethanes in and near the source area is approximately 1 year (degradation rate constant, $\lambda = 0.776\ yr^{-1}$), while the calculated half-life in downgradient portions of the plume is approximately 4 years ($\lambda = 0.189\ yr^{-1}$). This calculation suggests that biodegradation is likely occurring near the LTR source area. Degradation is still occurring downgradient of the LTR, but at a lower rate than values calculated from biodegradation rate constants found in literature, which can range from 1.2 to 1.8 yr^{-1} in microcosm studies or other field data (MPCA, 2006).

Chlorinated Ethenes

The concentration-distance profile along the centerline of the plume (**Figure 32**) clearly shows the degradation of TCE through its dechlorination series in the source area and adjacent near-field wells (e.g., RM-402XD). The apparent degradation rates in the plume are similar to those observed for the chlorinated ethanes. The decay rate for the chlorinated ethenes yields a half-life of approximately 1 year near the source area ($\lambda = 0.882$ yr^{-1}), and approximately 5 years ($\lambda = 0.15$ yr^{-1}) in the far-field portion of the plume. Additional plume attenuation occurs through matrix diffusion along the plume length. Matrix diffusion is particularly high at the Lemberger Site due to the high matrix porosity and length of the plume. Such conditions result in increased dispersion and a slowing of the rate of further plume migration (Lipson et al., 2005).

BIOCHLOR Analysis

BIOCHLOR is a screening model that simulates the natural attenuation of CVOCs. The model incorporates biotic reductive dechlorination and abiotic processes including advection, adsorption and dispersion. One of the intended uses of BIOCHLOR is to determine if MNA is feasible as a remedial alternative at a chlorinated solvent site. The model assumes that reductive dechlorination occurs under anaerobic conditions and that degradation follows a sequential first-order decay process, that groundwater flow conditions are simple, and that hydrogeologic and environmental conditions are uniform over the model area. Additionally, the two-zone mode of the model, which was used here, assumes that the plume is at steady state in the first (upgradient) zone.

As discussed earlier, the conceptual site model describes biotic degradation near the source with higher rates of decay and abiotic degradation downgradient with lower rates of decay. The BIOCHLOR model was used to estimate decay rates and to confirm that the two-zone conceptual site model was consistent with the Site analytical data. The BIOCHLOR model incorporated two zones (Zone 1 and Zone 2) with different decay rates near the source and downgradient. The exact rates of decay were adjusted manually to calibrate the model with the Q3 2017 groundwater analytical data from wells along the plume centerline. In this manner, the model was used to assess the relative contributions of physical mechanisms and biotic degradation at the Site, and to quantify the difference in decay rates between the two zones of the plume. Separate model simulations were conducted for chlorinated ethenes

and chlorinated ethanes. A more detailed description of the model input parameters, calibration methods, and screenshots of the model input and output are included in **Appendix G**.

The decay rates resulting from model calibration are shown in **Table 5**, which also summarizes the calculated decay rates from Buscheck-Alcantar for the purposes of comparison.

For both chlorinated ethenes and chlorinated ethanes in the BIOCHLOR model, the calibrated decay rates in Zone 2 were much lower than (less than 10 percent of) the rates in Zone 1, consistent with the previous discussion of decay occurring primarily in the source area. The high rates of decay for chloroethane and VC likely represent oxidation in the aerobic portion of the plume rather than biotic decay by reductive dechlorination.

Comparison of Decay Rate Estimate Results

Both methods of decay rate estimates calculated separate decay rates for two different parts of the plume intended to correspond approximately to the source area and the remainder of the plume. In general, the BIOCHLOR decay rates for individual constituents in Zone 1 are higher than the decay rates calculated for total ethenes and ethanes in the source area using the Buscheck-Alcantar method (**Table 5**). Both calculation methods resulted in decay rate estimates that were higher in the source area than the rest of the plume. The BIOCHLOR decay rates were about 10 to 100 times higher in Zone 1 than Zone 2, while the Buscheck-Alcantar decay rates were about 4 to 5 times higher in the source area than in the plume tail.

However, a direct comparison of decay rates from these two methods is not possible for several reasons:

- The Buscheck-Alcantar rates were calculated for total ethanes (1,1,1-TCA, 1,1-DCA, 1,1-DCE, and chloroethane) and total ethenes (PCE, TCE, cis-1,2-DCE, and VC) rather than individual CVOCs;
- The Buscheck-Alcantar rates are more "apparent" biodegradation rates because they do not factor out the production of daughter compounds, which the BIOCHLOR model does;
- The Buscheck-Alcantar rates were calculated using only the most recent data rather than assuming a constant source concentration and decay rates over time; and

- The Buscheck-Alcantar source area rates were calculated using data points from the first two wells along the plume centerline (RM-007D and RM-402XD) rather than assuming that the source area zone ends halfway between those points, as done in the BIOCHLOR model.

Regardless of these differences, both analyses indicate that decay rates are at least four to ten times higher in the source area than in the downgradient plume. These results are consistent with the conceptual site model of biotic decay in the source area contributing to high decay rates with abiotic decay in the rest of the plume, associated with lower decay rates.

3.3 Tertiary Line of Evidence – Microbial Study

The results of the DNA testing are presented in the previous MNA study report (TRC, 2015). *Dehalococcoides ssp.*, the genera of bacteria generally associated with TCE degradation, was not detected at any of the seven source area or near-field wells that were sampled. *Dehalobacter ssp.*, that are most associated with the biotic degradation of 1,1,1-TCA were detected at near-field well RM-402XD (507 cells/bead) and detected at low concentrations at RM-403XD (38.1J cells/bead). These results indicate that further reductive dechlorination of TCE to ethane (via *Dehalococcoides*) is unlikely to occur at the source area under the existing conditions. This is likely due in part to the low source concentration of TCE which is insufficient to actively maintain a healthy microbial population. *Dehalobacter* will continue to degrade 1,1,1-TCA where the population is viable, but the low population elsewhere suggests that subsurface conditions may be limiting bacterial growth. DO likely has a role in the lack of these microorganisms in groundwater outside the LTR, as even low concentrations of oxygen are toxic to anaerobes (Adrian, et al. 2007). While this direct measurement of microbial activity indicates low bioactivity in the near LTR area, other indicators such as the presence of biotically-produced 1,1-DCA and cis-1,2-DCE in the plume provide evidence that biologically mediated reductive dechlorination is occurring. Overall, the lack of a robust population of these bacteria is consistent with the discussion of the MNA indicator parameters and do not change the other evidence that suggest that reductive dechlorination is occurring.

3.4 MNA Evaluation Summary

The CVOC and MNA analytical data from the Lemberger Sites confirm that reductive dechlorination and aerobic degradation of CVOCs are taking place at the Site. Reductive dechlorination is evident at the source area and may be active in anaerobic micro-environments within the rock matrix where a residual source of organic carbon is available. Biotic degradation is occurring in the rest of the otherwise aerobic aquifer system. The primary evidence of reductive dechlorination is found in the production of breakdown compounds 1,1-

DCA and cis-1,2-DCE at the LTR source area wells, while the concentrations of parent compounds 1,1,1-TCA and TCE are generally decreasing or are stable. Strong positive correlations are also evident between the distribution of MNA parameters that would be expected with reductive dechlorination and the distribution of CVOC degradation compounds throughout the plume. Aerobic co-metabolism and/or oxidation are also evident in both the CVOC chemistry and MNA parameter results.

The following examples of the relationships between the CVOC analytical data and MNA parameter data are confirming evidence of reductive dechlorination and aerobic degradation of CVOCs at the Site:

- DO is lower, nitrate is depleted, TIC and CO_2 are elevated, and chloride is elevated compared to background, where 1,1-DCA and cis-1,2-DCE are being produced at the LTR source area, all of which support reductive dechlorination.
- Where chloroethane and VC are produced (in the source area), DO is also lower and/or depleted, nitrate is depleted, manganese is possibly elevated, and CO_2 is elevated, again supporting the process of reductive dechlorination in the source area.
- The presence of CO_2 outside of the source area is likely attributed to oxidation and/or co-metabolism of VC, 1,1-DCA, and 1,1-DCE, because ethene is absent.
- DO is possibly depleted and CO_2 elevated throughout the far field portion of the plume, which suggests that microbial activity (related to reductive dechlorination and/or oxidation and co-metabolism) is occurring (or has occurred) outside of the source area.

Reductive dechlorination and aerobic degradation (oxidation and co-metabolism) of CVOCs appear to be occurring simultaneously within different portions of the plume. The data indicate that the CVOC plume at the Lemberger Site exhibits Type 1 behavior in and near the LTR source area, and in localized areas adjacent to the LL (e.g., near RM-214D). The carbon source driving the microbial degradation in these areas may be related to landfill impacts prior to closure, or the low concentrations of plume constituents themselves. In far field portions of the plume, where conditions become generally aerobic, the plume exhibits Type 3 behavior. This combination of plume behaviors results in degradation of the highly chlorinated compounds (PCE, TCE, and 1,1,1-TCA) in and near the source area, and slower degradation of the less chlorinated daughter compounds in far-field portions of the plume. Rapid oxidation of VC outside of the source area prevents accumulation of this degradation product in the aquifer. These results are consistent with USEPA's Site review in the third 5-year review report (USEPA, 2010). Such mixed environments are documented in the literature (e.g., Plattsburgh AFB site in Wiedemeier et al., 1996) where the plume exhibits Type 1 behavior at the source area and Type 3 behavior downgradient (AFCEE, 2004). This scenario is considered by Wiedemeier (1998) to be "best-case" conditions for MNA as follows: "The **most fortuitous scenario** involves a plume

in which PCE, TCE, and DCE are reductively dechlorinated with accumulation of VC near the source area (Type 1 or Type 2 behavior), then VC is oxidized (Type 3 behavior) either aerobically or via iron reduction further downgradient. VC is oxidized to carbon dioxide in this type of plume and does not accumulate."

Research on abiotic degradation pathways (e.g., Brown, et al., 2007) indicates that this often-overlooked pathway can play a significant role in the degradation of CVOCs in environments that are not necessarily conducive to biotically-mediated reductive dechlorination. CVOCs, including the highly chlorinated PCE, TCE and 1,1,1-TCA, may be degraded via abiotic processes in the presence of reduced iron minerals such as magnetite (Fe_3O_4), pyrite (FeS_2), and marcasite (FeS_2) (Pivets, et al. 2013). The abiotic degradation process results in the destruction of compounds such as 1,1,1-TCA and TCE without the sequential production of mono-dechlorinated products. The resulting degradation pattern is a parallel decline in molar concentrations of the CVOCs with distance, with no accumulation of less chlorinated intermediate compounds, which occurs downgradient of the LTR source area.

Section 4
Conclusions and Recommendations

4.1 Conclusions

Based on our analysis of groundwater hydrologic and analytical data collected over a 12-year MNA study period, TRC concludes that MNA is the appropriate remedial alternative for the Lemberger Sites. Our analysis includes consideration of the comprehensive Site investigation, source removal and nine years of active remediation with a groundwater pump and treat system, and over 20 years of monitoring activities.

Biotic degradation of the CVOC plume via reductive dechlorination, aerobic degradation, and mechanical attenuation will continue to reduce the concentrations of CVOCs in groundwater. These natural processes will maintain, if not increase, the current levels of protectiveness of human health and the environment, and concentrations of most CVOCs are predicted to reach the ES at most locations within a reasonable timeframe (i.e. 50 years). As such, MNA is an appropriate remedial option for the LTR groundwater plume and should be used in conjunction with current engineering and institutional controls to form the basis for a ROD amendment.

Below is a summary of the lines of evidence that were analyzed to support our conclusions:

- The CVOC plume has diminished considerably in size and magnitude since remedial actions commenced and that trend has continued since the pump-and-treat was discontinued 12 years ago (**Figure 24**).
- The bulk of waste materials were removed from the LTR over 20 years ago and the site was graded and capped to mitigate continued infiltration through impacted material. Concentrations of residual CVOCs at the LTR never reached one percent of the solubility limit of TCE or 1,1,1 TCA that would suggest evidence of residual DNAPL.
- The groundwater pump-and-treat system, following nine years of operation, was determined to provide limited benefit over natural degradation processes; it was estimated as having removed only five (5) percent of the CVOC mass (RMT 2004).
- The conceptual site model has evolved with increased understanding of the Site hydrogeology and geochemistry. The porous, fractured rock aquifer is poorly suited for groundwater treatment technologies due to heterogeneous, anisotropic groundwater flow inherent to fractured rock aquifers.
- The horizontal extent of CVOCs in the bedrock aquifer follows the horizontal hydraulic gradient and is limited at depth by low source concentrations, decreased permeability with depth, matrix diffusion, and upward gradients near the Branch River.

- Concentrations of CVOCs decline with increasing distance from the LTR. This suggests that natural attenuation is reducing the mass of CVOCs downgradient from the source area.
- Biotically-mediated microbial reductive dechlorination of TCE and 1,1,1-TCA has occurred as shown in the presence of initial biodegradation products (cis-1,2-DCE and 1,1-DCA) in groundwater at and near the LTR. In addition, abiotic dechlorination is evidenced throughout the plume by decreasing concentrations of cis-1,2-DCE and 1,1-DCA without the formation of more toxic intermediate degradation products such as VC or 1,1-DCE.
- Assessment of natural attenuation as a viable remedial option is predicated on whether MNA is capable of attaining remedial objectives within a reasonable timeframe as compared to other alternatives (USEPA, 1999). It is evident from nine years of groundwater extraction that while CVOC concentrations decreased, natural attention has been equally or more effective (**Figures 24-27**).
- WDNR has established an institutional control as a protective measure against future landowners installing drinking water wells into the groundwater in the vicinity of the LTR. This consists of enforcement of WAC Chapter 812 that regulates well placement and construction of drinking water wells. Under WAC Chapter 812, a variance is required to install a well within 1200 feet of a landfill. In addition, the WDNR has codified a "special casing area" under WAC NR 812.09(4)(f) designation that extends throughout (and beyond) the CVOC impacted area at the Site. In the "special casing area" a well is not permitted unless a steel casing is installed to a minimum depth of 250 feet below the ground surface. This depth was chosen based on the known vertical extent of the plume with an adequate "safety factor" to account for uncertainties. The depth of the CVOC plume is approximately 60 feet above the WDNR Special Casing Area requirement depth for new residential wells (250 feet). Wisconsin well drillers must be licensed under requirements of NR 146.04 and drillers must comply with such limits on well construction.
- The current monitoring program is appropriate and comprehensive and provides the necessary level of protection to local water supply wells and to adequately document the future success of the MNA remedy. These protections include downgradient "sentinel wells" and quarterly monitoring of residential wells.
- Current, enforceable institutional (deed restrictions and restrictive covenants) and engineering controls (fencing and capping) provide long term protection to human health and the environment.

4.2 Recommendations

Considering the findings of the data and interpretive analyses presented in this document, MNA is an effective remedy to reach cleanup standards within a reasonable timeframe for CVOCs in groundwater at the Lemberger Sites, and current natural attenuation, monitoring and institutional and administrative controls are both effective and protective.

Therefore, the LSRG recommends that the federal Consent Decree, ROD and related documents for OU-1 be amended to:

1. Remove groundwater pump-and-treat as the preferred remedy for CVOCs in groundwater,
2. Incorporate and select an MNA remedy over the extent of the CVOC impacted area,
3. Develop a long-term groundwater monitoring and reporting program,
4. Continue enforcement and monitoring of existing institutional controls within the impacted area, and
5. Develop a contingency plan for identifying in the future suitable responses to unanticipated conditions or performance.

Continued monitoring will be necessary to routinely refine estimates of when CVOCs will reach cleanup standards and is essential to fully demonstrate the protectiveness of the MNA remedy going forward, and to document any changes in the plume dimensions.

The monitoring program will include routine evaluation of the effectiveness of the spatial, hydrogeologic, and geochemical aspects of the monitoring network in conjunction with the adequacy and performance of institutional controls in accordance with regulatory guidance (Pope, 2004; Wilson, 2011). The LSRG will routinely evaluate the effectiveness of the monitoring network with respect to the progress toward meeting remedial objectives and continue to report findings and recommendations to the USEPA and WDNR in the annual Operations and Maintenance Progress Report.

Institutional controls (ICs) in the form of restrictive covenants, deed restrictions, restrictions on well installations and construction, and development ordinances form multiple layers of administrative protections for the Site. These are codified in an Institutional Control Plan (LSRG, 2009) that ensures long-term stewardship of the program (USEPA, 2015).

Section 5
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Table 1
Cleanup Goals for Chlorinated Volatile Organic Compounds
Lemberger Landfill Sites - 2018 MNA Report

PARAMETER	FORMULA WEIGHT (g/mol)	WDNR 140.10 ENFORCEMENT STANDARD (ES)		
		µg/L	Ln (µg/L)	µmol/L (or µM)
Chlorinated Ethanes				
1,1,1-Trichloroethane	133.396	200	5.30	1.499
1,1-Dichloroethane	98.954	850	6.75	8.590
1,1-Dichloroethene	96.938	7	1.95	0.072
Chloroethane	64.512	400	5.99	6.200
Chlorinated Ethenes				
Tetrachloroethene (PCE)	165.822	5	1.61	0.030
Trichloroethene (TCE)	131.38	5	1.61	0.038
cis-1,2-Dichloroethene	96.938	70	4.25	0.722
trans-1,2-Dichloroethene	96.938	100	4.61	1.032
Vinyl chloride	62.496	0.2	-1.61	0.003

Notes:
g/mol = grams per mole.
µg/L = micrograms per liter.
Ln = natural log.
µmol/L = micromoles per liter.

Table 2
Summary of Sen's Slope and Regression Analysis at Key Wells
Lemberger Landfill Sites - 2018 MNA Report

WELL ID	LOCATION	COMPOUND	FULL RANGE		POST SHUTDOWN (August 2006 to Present)		STABLE RANGE**	
			TREND	PREDICTED DATE TO REACH ES	TREND	PREDICTED DATE TO REACH ES	TREND	PREDICTED DATE TO REACH ES
Wells In Current Design Management Zone (DMZ)								
RM-007D	Source Area	TCE	Up	N/A	Up	N/A	Stable to Decreasing [Beginning 1/2014]	2383
		cis-1,2-DCE	Down	2027	Down	2019	--	
		1,1,1-TCA	Down	2030	Down	2027	--	
		1,1-DCE	Down	2046	Stable to Decreasing	2065	--	
RM-007XD	Source Area	TCE	Up	N/A	Up	N/A	Stable [Beginning 10/2014]	N/A
		cis-1,2-DCE	Up	N/A	Stable to Decreasing	2024	--	
		1,1,1-TCA	Up	N/A	Up	N/A	Stable to Decreasing [Beginning 12/2014]	2030
		1,1-DCE	Up	N/A	Stable	N/A	Stable [Beginning 4/2013]	2113
RM-214D [installed in 2006]	Near LL	VC	NI		Down	2036	--	
RM-303D	Source Area	TCE	Stable to Decreasing	2263	Down	2069	--	
		cis-1,2-DCE	Down	2022	Down	2017	--	
		1,1,1-TCA	Down	2020	Down	2018	--	
		1,1-DCE	Down	2019	Down	2017	--	
RM-306D	Source Area	TCE	Down	2018	Stable to Decreasing	2047	--	
RM-307D	Source Area	TCE	Stable	N/A (rebound)*	Up	N/A (rebound)*	Stable to Decreasing [Beginning 7/2013]	2070
Wells in Potential Expanded DMZ								
RM-402XD [Installed in 2012]	Near Field	TCE	NI		Stable to Decreasing	2114	--	
		1,1-DCE	NI		Stable	2066	--	
RM-402XXD [Installed in 2012]	Near Field	TCE	NI		Down	2023	--	
RM-403XD [Installed in 2012]	Near Field	TCE	NI		Stable to Decreasing	2143	--	
		1,1-DCE	NI		Down	2019	--	

Table 2 (continued)
Summary of Sen's Slope and Regression Analysis at Key Wells
Lemberger Landfill Sites - 2018 MNA Report

WELL ID	LOCATION	COMPOUND	FULL RANGE		POST SHUTDOWN (August 2006 to Present)		STABLE RANGE**	
			TREND	PREDICTED DATE TO REACH ES	TREND	PREDICTED DATE TO REACH ES	TREND	PREDICTED DATE TO REACH ES
Plume Wells								
RM-003D	Near field	TCE	Down	N/A (rebound)*	Stable	N/A (rebound)*	Stable to Decreasing [Beginning 6/2011]	2014
RM-003XXD [Installed in 2012]	Near field	TCE	NI		Down	2014	--	
RM-008D	Near field	TCE	Down	N/A (rebound)*	Up	N/A	Stable to Decreasing [Beginning 6/2011]	2031

Footnotes:

* Concentration rebound following the treatment system shutdown renders date calculation invalid for the specified date range.

** "Stable Range" = period over which concentrations appear to be stable or becoming stable. Performed only on wells and for parameters that do not show a stable to decreasing trend over the full monitoring history and post-system shutdown time-frames. A minimum of 8 rounds of data are included in these analyses.

Notes:

1. Only wells in the current monitoring program and parameters that have exceeded the Enforcement Standard (ES) concentration at any time during the period from March (Q1) 2015 to June (Q2) 2018 are included in this analysis. CVOC concentrations at other site monitoring wells in the monitoring program are already below the ES and are not evaluated.
2. Regression analysis performed using ordinary least squares (OLS) and Sen's Slope Estimator with a two-sided 90% confidence interval (CI).

Explanation of Trend Results:

"Down" = both Sen's and ordinary least squares regression (OLS) show downward trends.

"Stable to Decreasing" = OLS shows downward trend, but Sen's trend analysis indicates no trend at a 90% confidence interval (CI).

"Stable" = Sen's analysis indicates no trend at a 90% CI and OLS slope is positive.

"Up" = both Sens and OLS show upward trends.

-- Analysis over a shorter "Stable Range" not performed due to clear downward trends over a longer time period. Data from wells installed in 2012 were not parsed into shorter date ranges due to the relatively short monitoring history.

NI = Not Installed

N/A = Not applicable

Green highlight	= Regression analysis indicates concentrations are stable to decreasing
Orange highlight	= Regression analysis indicates concentrations are increasing
Blue highlight	= Prediction of date to reach ES for 1,1-DCE is estimated using the slope of the regression line for the parent compound 111-TCA, with the assumption that as concentrations of the parent compound decrease, concentrations of the daughter compounds will follow.

Table 3
Screening for Anaerobic Biodegradation Processes
MNA Wells
Lemberger Landfill Sites - 2018 MNA Report

PARAMETER		CONCENTRATION VALUE	POINT VALUE	1 RM-002D	2 RM-003XXD	3 RM-007D	4 RM-007XD	5 RM-102D	6 RM-203D	7 RM-204D	8 RM-210D	9 RM-402XD
Geochemistry												
Dissolved oxygen (mg/L)	<	0.5	3	0.58	0.97	2.37	5.26	6.82	4.88	0.87	0.86	1.47
	>	5	-3									
Nitrate (mg/L)[1]	<	1	2	1.3	6.6	2.0	1.8	8.4	7.3	3.7	4.0	4.8
Iron (mg/L)[2]	>	1	3	0.037	0.011	0.117	0.054	0.031	0.077	0.050	0.052	0.020
Sulfate (mg/L)	<	20	2	31.214	29.350	97.515	40.743	4.564	25.912	28.518	27.764	297.667
Sulfide (mg/L)	>	1	3	0	0	0	0	0	0	0	0	0
Methane (mg/L)[3]	<	0.5	0	ND	0.0011 J	0.086	ND	ND	ND	ND	ND	ND
	>	0.5	3									
ORP (mV)	<	50	1	94	144	169	195	189	171	140	132	143
	<	-100	2									
pH (Std Units)	>	5	0	7.6	7.4	6.9	7.4	7.5	7.4	7.4	7.4	7.3
	<	9	0									
	<	5	-2									
	>	9	-2									
TOC (mg/L)	>	20	2	1.3	0.6	1.7	0.7	1.2	0.7	0.5	0.8	1.2
Temperature (˚C)	>	20	1	9.1	7.8	9.3	9.6	9.4	9.0	9.4	9.2	7.4
Carbon Dioxide (X background)[4]	>	2	1	NA	1.7	2.3	1.9	1.0	NA	1.3	NA	2.8
Alkalinity (X background)	>	2	1	1.1	1.4	1.9	1.4	1.0	1.3	1.4	1.3	1.5
Chloride (X background)	>	2	2	1.5	4.3	2.3	0.9	1.0	3.4	2.0	2.8	2.3
BTEX (mg/L)	>	0.1	2	0	0	0	0	0	0	0	0	0
Degradation Products												
Tetrachloroethene (µg/L)	-	0	0	<0.5	<0.5	3.2	2.1	<0.5	<0.5	<0.5	<0.5	0.71
Trichloroethene (µg/L)	>	0	0/2[7]	2.4	2.3	59	40.8	<0.33	<0.33	1.6	2.5	15.3
cis 1,2/Total DCE (%)[5]	>	80%	2	100%	100%	100%	100%	NA	NA	100%	100%	100%
VC (µg/L)	>	0	2	<0.18	<0.18	<0.44	<0.35	<0.18	<0.18	<0.18	<0.18	<0.18
DCA (µg/L)[6]	>	0	2	8.4	3	272	193	<0.24	0.42 J	9.3	9.4	52.7
Carbon tetrachloride (µg/L)	-	0	0	<0.5	<0.5	<1.2	<1	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane (µg/L)	>	0	2	<0.37	<0.37	1.6 J	<0.75	<0.37	<0.37	<0.37	<0.37	1.4
Ethene (mg/L)[3]	>	0.01	2	ND	ND	0.0035 J	ND	ND	ND	ND	ND	0.00044 J
Ethane (mg/L)[3]	>	0.1	3	ND	0.00045 J	0.0105	ND	ND	ND	ND	ND	ND
Chloroform (µg/L)	>	0	0/2[7]	<2.5	<2.5	<6.2	<5	<2.5	<2.5	<2.5	<2.5	<2.5
Dichloromethane (µg/L)	>	0	0/2[7]	<0.23	<0.23	<0.58	<0.47	<0.23	<0.23	<0.23	<0.23	<0.23
			Geochemistry Total	0	2	3	-3	-1	2	2	2	3
			Degradation Products Total	4	4	6	4	0	2	4	4	6
			Total	**4**	**6**	**9**	**1**	**-1**	**4**	**6**	**6**	**9**
Level of Evidence for Anaerobic Biodegradation based on Screening Criteria				Inadequate	Limited	Limited	Inadequate	Inadequate	Inadequate	Limited	Limited	Limited

Notes:

1. Table based on **Table 2.3 Analytical Parameters and Weighting for Preliminary Screening of Anaerobic Biodegradation Processes** of *USEPA Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedemeier, 1998).*
2. Geochemistry data are presented as averages of all historical data with nondetects counted as half of the detection limit, except for carbon dioxide and methane (see footnotes).
3. Background concentrations were calculated as an average of all historic data for RM-102D.
4. Degradation product results are from 2017 Q3, except where otherwise specified.

Highlighted values meet the USEPA screening criteria.

Footnotes:

[1] Nitrate + nitrite data are used to represent nitrate.
[2] Total and dissolved iron results included.
[3] Maximum historic values were used for methane, ethane, and ethene results.
[4] Carbon dioxide values are results from 2013 Q3. NA indicates no results for that sampling round.
[5] NA indicates that no DCE was detected.
[6] DCA includes only 1,1-DCA results.
[7] Points awarded only if compound can be shown to be a daughter product.

Prepared by: L. Auner 1/17/2018
Checked by: B. Wachholz 1/18/2018
Revised by: L. Auner, 11/2/2018
Checked by: B. Wachholz 11/2/2018

Table 4
Buscheck-Alcantar Decay Rate Calculations
Lemberger Landfill Sites - 2018 MNA Report

Method:
1. Estimate decay rate using groundwater concentration profile logarithmic decay curve and converting the slope of the decay curve to the decay rate using the Buscheck and Alcantar (1995) methods.

PARAMETER VALUE	UNITS	CHLORINATED ETHENES		CHLORINATED ETHANES	
		SOURCE AREA	PLUME TAIL	SOURCE AREA	PLUME TAIL
INPUT					
Slope from log concentration-distance graphs[1]	1/ft	2.409E-03	4.510E-04	2.145E-03	5.653E-04
Groundwater Velocity (V_c)	ft/year	325	325	325	325
Groundwater Velocity (V_c)	ft/day	0.890	0.890	0.890	0.890
Dispersivity (α_x)[2]	ft	52.6	52.6	52.6	52.6
CALCULATED DECAY RATES					
Decay rate[3] (λ)	day^{-1}	2.42E-03	4.11E-04	2.13E-03	5.18E-04
Decay rate[3] (λ)	$year^{-1}$	0.882	0.150	0.776	0.189
Half Life	years	0.786	4.62	0.893	3.66

Footnotes:
1. Slope from log-linear regression of concentration-distance graphs from Figures 31 and 32.
2. Dispersivity estimated using the modified Xu and Eckstein method with a plume length of 7,650 ft measured from the edge of the LTR to the Branch River following an approximate groundwater flow path.
3. Decay rate calculated using method from Buscheck and Alcantar (1995) as in 1998 EPA Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600R/R-98/128. Expression for decay rate shown below.

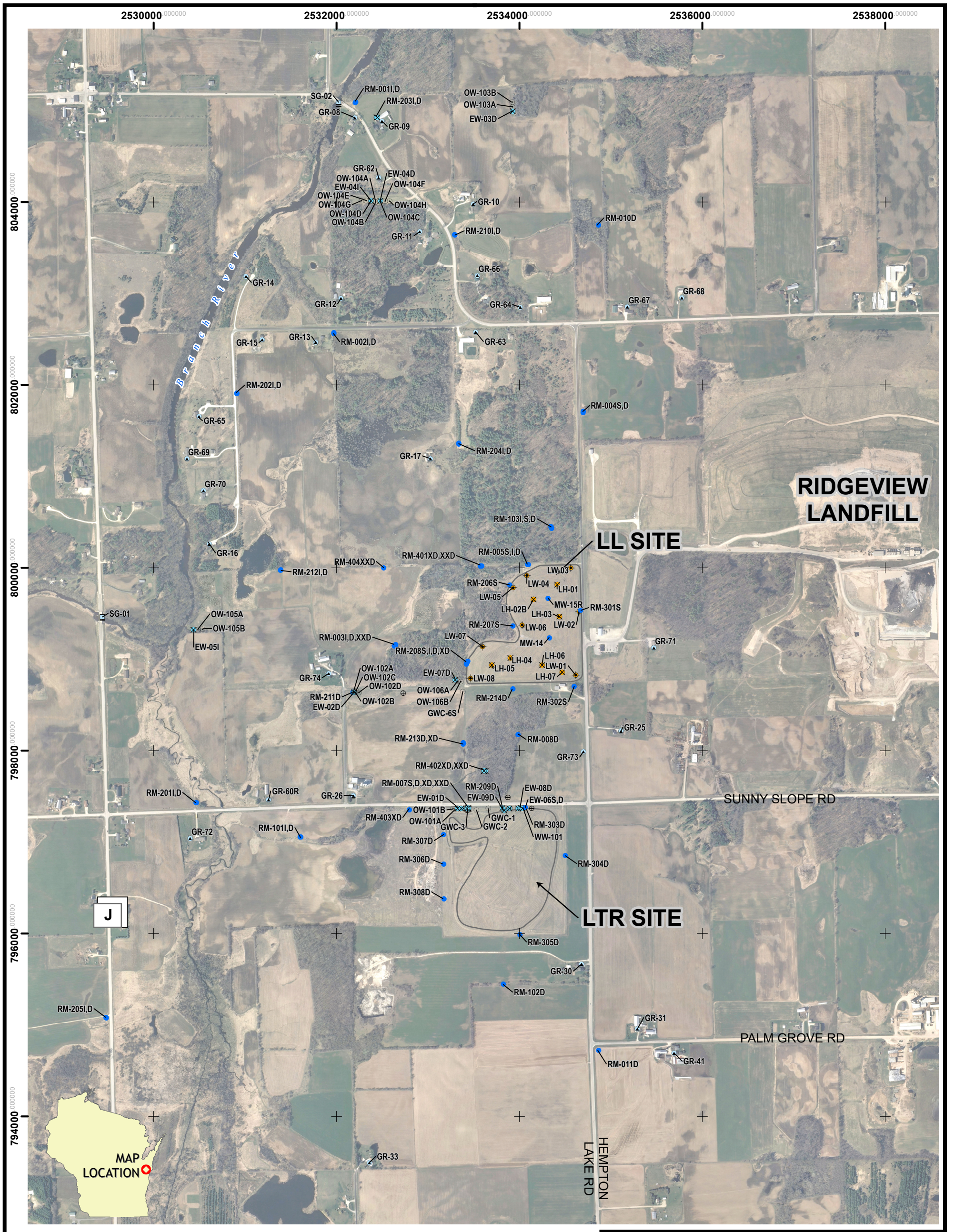
$$\lambda = \frac{v_c}{4\alpha_x}\left(\left[1+2\alpha_x\left(\frac{k}{v_x}\right)\right]^2 - 1\right) \qquad \text{eq. C.3.32}$$

Where:
λ = first-order biological rate constant
v_c = retarded contaminant velocity in the x-direction
α_x = dispersivity
k/v_x = slope of line formed by making a ln-linear plot of contaminant concentration versus distance downgradient along flow path

Table 5
Summary of Decay Rate Estimates
Lemberger Landfill Sites - 2018 MNA Report

CHLORINATED ETHENES	DECAY RATES			
	λ (1/yr)		HALF LIFE (years)	
BUSCHECK-ALCANTAR	**SOURCE AREA**	**PLUME TAIL**	**SOURCE AREA**	**PLUME TAIL**
Total Ethenes	0.882	0.150	0.786	4.62
BIOCHLOR	**ZONE 1**	**ZONE 2**	**ZONE 1**	**ZONE 2**
PCE	5	0.2	0.139	3.47
TCE	3.5	0.09	0.198	7.7
DCE	5.2	0.19	0.133	3.65
VC	450	12	0.00154	0.0578

CHLORINATED ETHANES	DECAY RATES			
	λ (1/yr)		HALF LIFE (years)	
BUSCHECK-ALCANTAR	**SOURCE AREA**	**PLUME TAIL**	**SOURCE AREA**	**PLUME TAIL**
Total Ethanes	0.776	0.189	0.893	3.66
BIOCHLOR	**ZONE 1**	**ZONE 2**	**ZONE 1**	**ZONE 2**
111-TCA	4.5	0.05	0.154	13.9
11-DCA	13	0.2	0.0533	3.47
CA	200	18	0.00347	0.0385



LEGEND

SAMPLE AND MONITORING LOCATIONS

- Bedrock boring
- GW Collection Sump (GWC)
- GW Extraction Well (EW)
- GW Observation Well (OW)
- Leachate Head Well (LH)
- Leachate Withdrawl Well (LW)
- Monitoring Well (RM)
- Residential Well (GR)
- Staff Gauge (SG)
- LANDFILL AREA

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. MAP COORDINATES ARE WISCONSIN STATE PLANE, SOUTH ZONE, NAD 83, US SURVEY FOOT.

0 1,000 FEET

1 " = 1,000 ' 1:12,000

N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **SITE FEATURES MAP**

DRAWN BY:	J PAPEZ	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-001sfm.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 1**
DATE:	NOVEMBER 2018		

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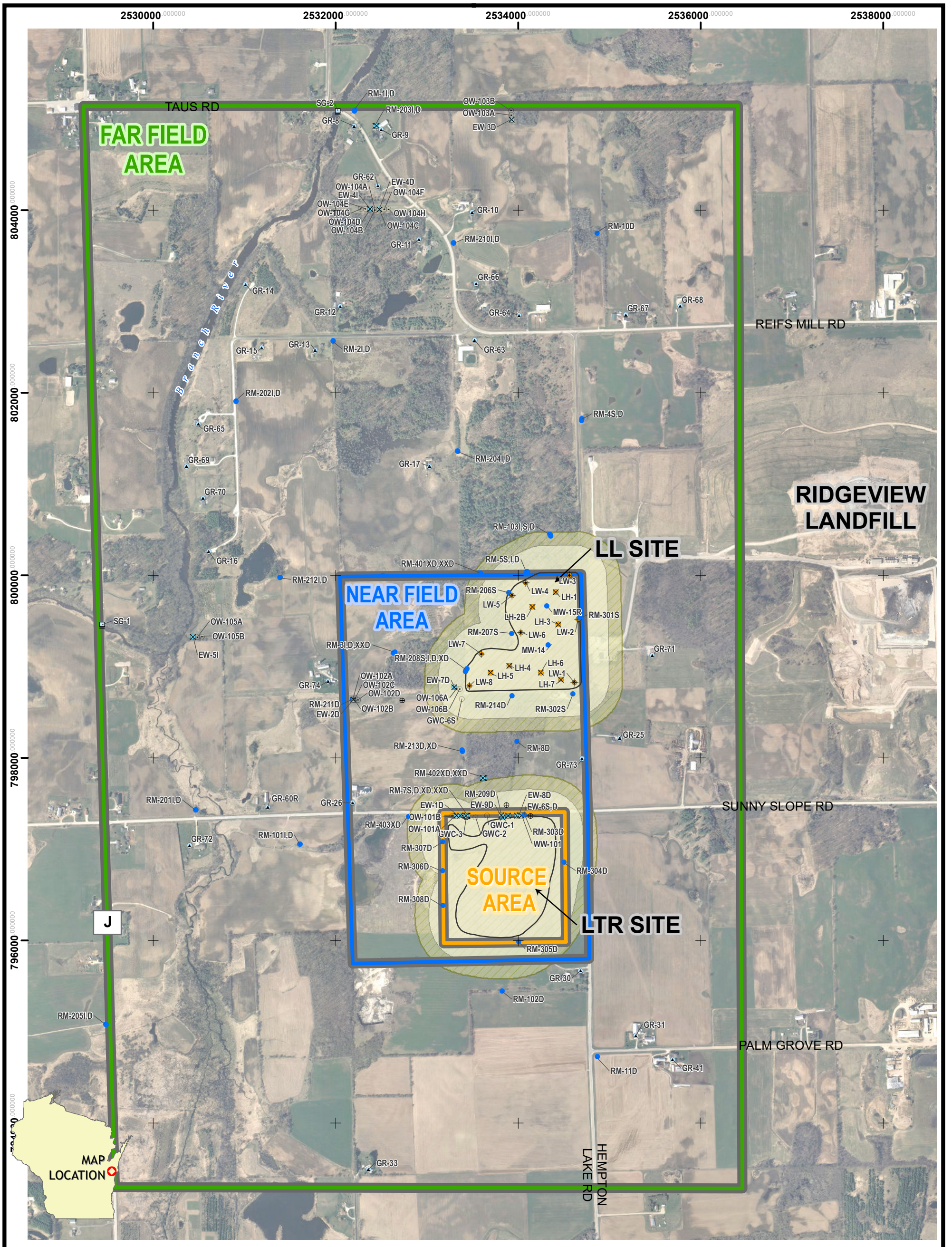

LEGEND

- BEDROCK BORING
- GW COLLECTION SUMP (GWC)
- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- LEACHATE HEAD WELL (LH)
- LEACHATE WITHDRAWL WELL (LW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- STAFF GAUGE (SG)
- LTR SOURCE AREA LIMITS
- FAR FIELD AREA LIMITS
- NEAR FIELD AREA LIMITS
- LANDFILL AREA
- 300 FT DMZ
- 450 FT DMZ

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. MAP COORDINATES ARE WISCONSIN STATE PLANE, SOUTH ZONE, NAD 83, US SURVEY FOOT.

0 1,000 FEET

1 " = 1,000 ' 1:12,000

N

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
MNA REPORT

SHEET TITLE:
SITE MAP SHOWING SITE AREAS

DRAWN BY:	A REIS	SCALE:	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER	1: 12,000	FILE NO. 268280-006-028.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 2**
DATE:	NOVEMBER 2018		

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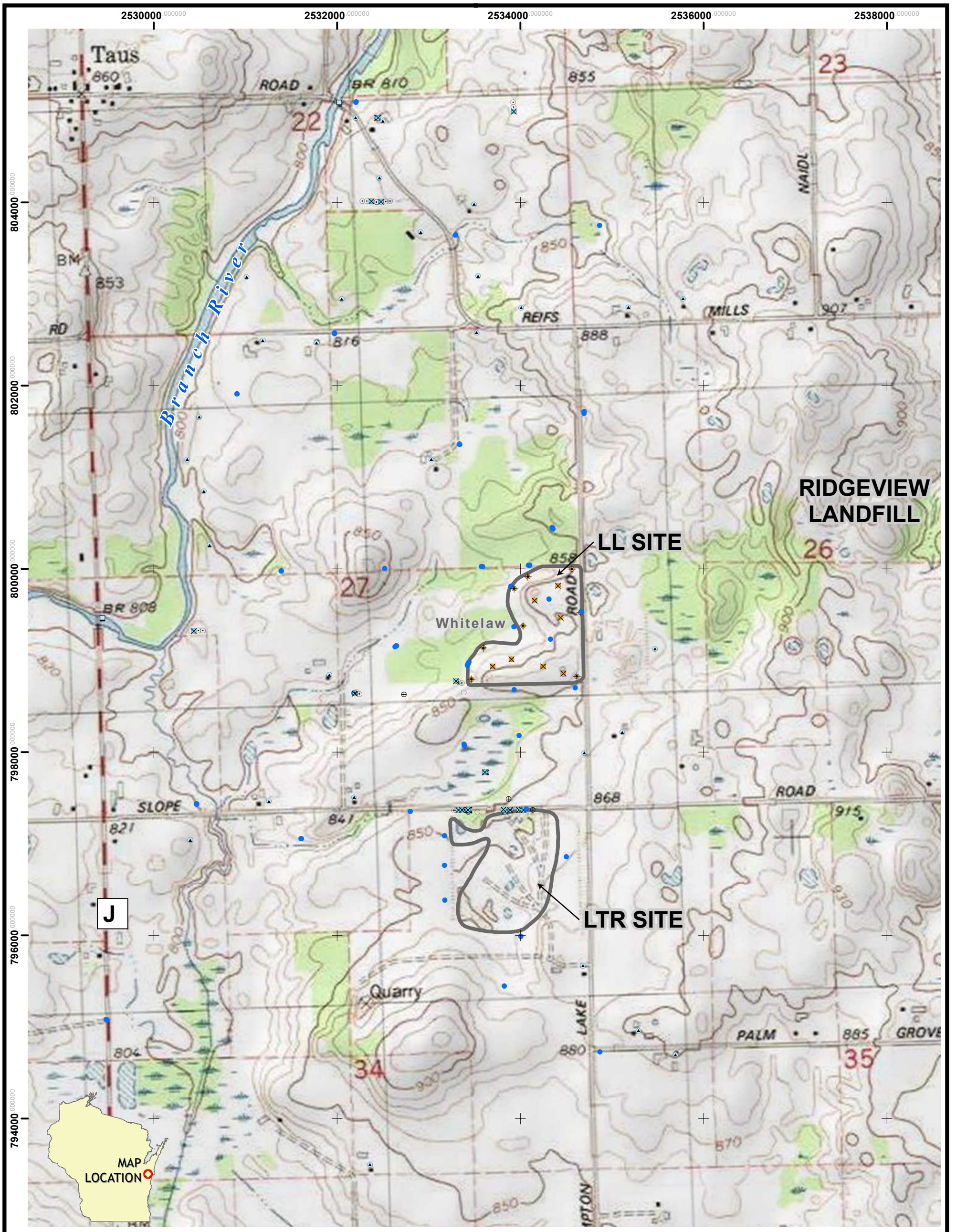
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

SAMPLE AND MONITORING LOCATIONS

- BEDROCK BORING
- GW COLLECTION SUMP (GWC)
- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- LEACHATE HEAD WELL (LH)
- LEACHATE WITHDRAWL WELL (LW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- STAFF GAUGE (SG)
- LANDFILL AREA

NOTES

1. BASEMAP FROM WHITELAW, WISCONSIN USGS 7.5 MINUTE QUADRANGLE.
2. MAP COORDINATES REFERENCE WISCONSIN STATE PLANE SOUTH, NAD 83, US SURVEY FOOT.

0 1,000 FEET

1 " = 1,000 ' 1:12,000

N

PROJECT:	**LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT**
SHEET TITLE:	**SITE TOPOGRAPHIC MAP**

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-001slm.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 3**
DATE:	APRIL 2019		

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NORTH - A

SOUTH - A'

APPROXIMATE EXTENT OF LEMBERGER LANDFILL

APPROXIMATE EXTENT OF LTR LANDFILL

ELEVATION (FEET ABOVE M.S.L.)

RM-11D, RM-203D, GR-62, EW-04D, RM-21D, RM-204 I,D, RM-401 XD, XXD, RM-208S,I,D,XD, EW-7D, RM-213D,XD, RM-402XD,XXD, RM-75,D,XD,XXD, RM-307D, RM-306D, RM-308D, RM-102D

Branch River (1902)

UGU

CU

LGU

DOLOMITE

(NM)

(793.29) (792.07) (793.79) (793.63) (796.94) (794.50) (802.49) (804.50) (804.30) (806.30) (807.31) (808.39) (808.37) (812.10) (812.78) (811.50) (812.29) (810.12) (812.30) (810.38) (841.02) (829.98) (815.90) (814.63) (854.28)

794 796 798 800 802 804 806 808 810 812 814

FILL

CROSS SECTION LOCATION

LEGEND

- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- UGU — UPPER GRANULAR UNIT
- CU — CLAY CONFINING UNIT
- LGU — LOWER GRANULAR UNIT
- DOLOMITE BEDROCK

WELL CONSTRUCTION DETAILS
- WELL CASING
- WELL SEAL
- WELL SCREEN
- OPEN HOLE (NO SCREEN)

(803.70) - GROUNDWATER ELEVATION (JUNE 16, 2014-FT MSL)

- POTENTIOMETRIC SURFACE
- 802 — EQUIPOTENTIAL CONTOUR LINE
- GROUNDWATER FLOW DIRECTION

40 / 20 / 0

Horizontal Scale: 1" = 800 '
Vertical Scale: 1" = 40 '
20x Vertical Exaggeration

0 400 800

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
MNA REPORT

SHEET TITLE:
GEOLOGIC CROSS SECTION A-A'

DRAWN BY:	PAPEZ J	SCALE: AS NOTED	PROJ. NO. 226573
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-030.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 4**
DATE:	NOVEMBER 2018		

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WEST - B

EAST - B'

APPROXIMATE EXTENT OF LEMBERGER LANDFILL

APPROXIMATE EXTENT OF LTR LANDFILL

ELEVATION (FEET ABOVE M.S.L.)

870 860 850 840 830 820 810 800 790 780 770 760 750 740 730 720 710 700 690 680 670 660 650 640 630 620 610 600

RM-21I,D

RM-31D,XXD

RM-213D,XD

RM-402XD,XXD

RM-303D

RM-304D

GR-30

UGU

CU

LGU

CLAY

SAND

FILL

DOLOMITE

(807.53)

(805.63)

(802.11)

(802.75)

(806.16)

(805.61)

(806.59)

(806.57)

(806.33)

(808.31)

(843.72)

LEGEND

STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED

UGU UPPER GRANULAR UNIT

CU CLAY CONFINING UNIT

LGU LOWER GRANULAR UNIT

DOLOMITE BEDROCK

WATER TABLE

WELL CONSTRUCTION DETAILS

WELL CASING

WELL SEAL

WELL SCREEN

OPEN HOLE (NO SCREEN)

NOTES

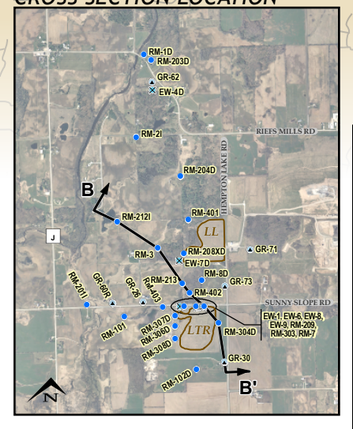
1. GROUNDWATER ELEVATIONS WERE MEASURED DECEMBER 6, 2012.
2. FEATURES SHOWN ARE APPROXIMATE.

40 20 0

0 250 500

Horizontal Scale: 1" = 500'
Vertical Scale: 1" = 40'
12.5x Vertical Exaggeration

CROSS SECTION LOCATION



PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
GEOLOGIC CROSS SECTION B - B'

DRAWN BY:	J. PAPEZ	PROJ NO.:	286280-007
CHECKED BY:	M.WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 5**
DATE:	NOVEMBER 2018		

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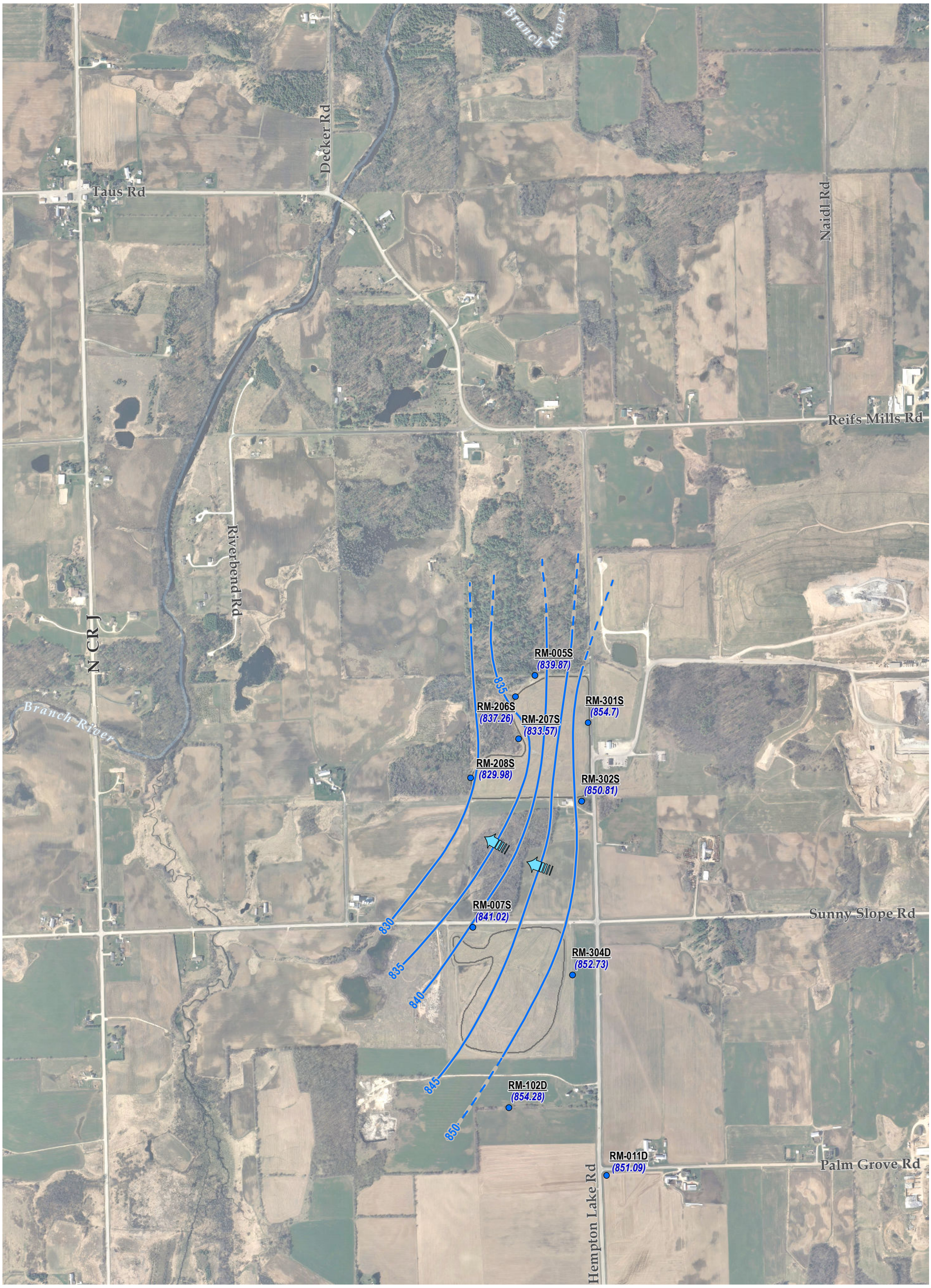

LEGEND

- MONITORING WELL (RM)
- (800.00) GROUNDWATER ELEVATION (FT MSL)
- GROUNDWATER ELEVATION CONTOUR (FT MSL, DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. GROUNDWATER MEASUREMENTS FROM: JUNE 16, 2014.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

UGU WATER TABLE MAP
JUNE 2014

DRAWN BY:	S. MAJOR	SCALE:	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER	1: 12,000	FILE NO. 268280-006-014rptmb.mxd
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DATE:	NOVEMBER 2018		

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Map Rotation: 0

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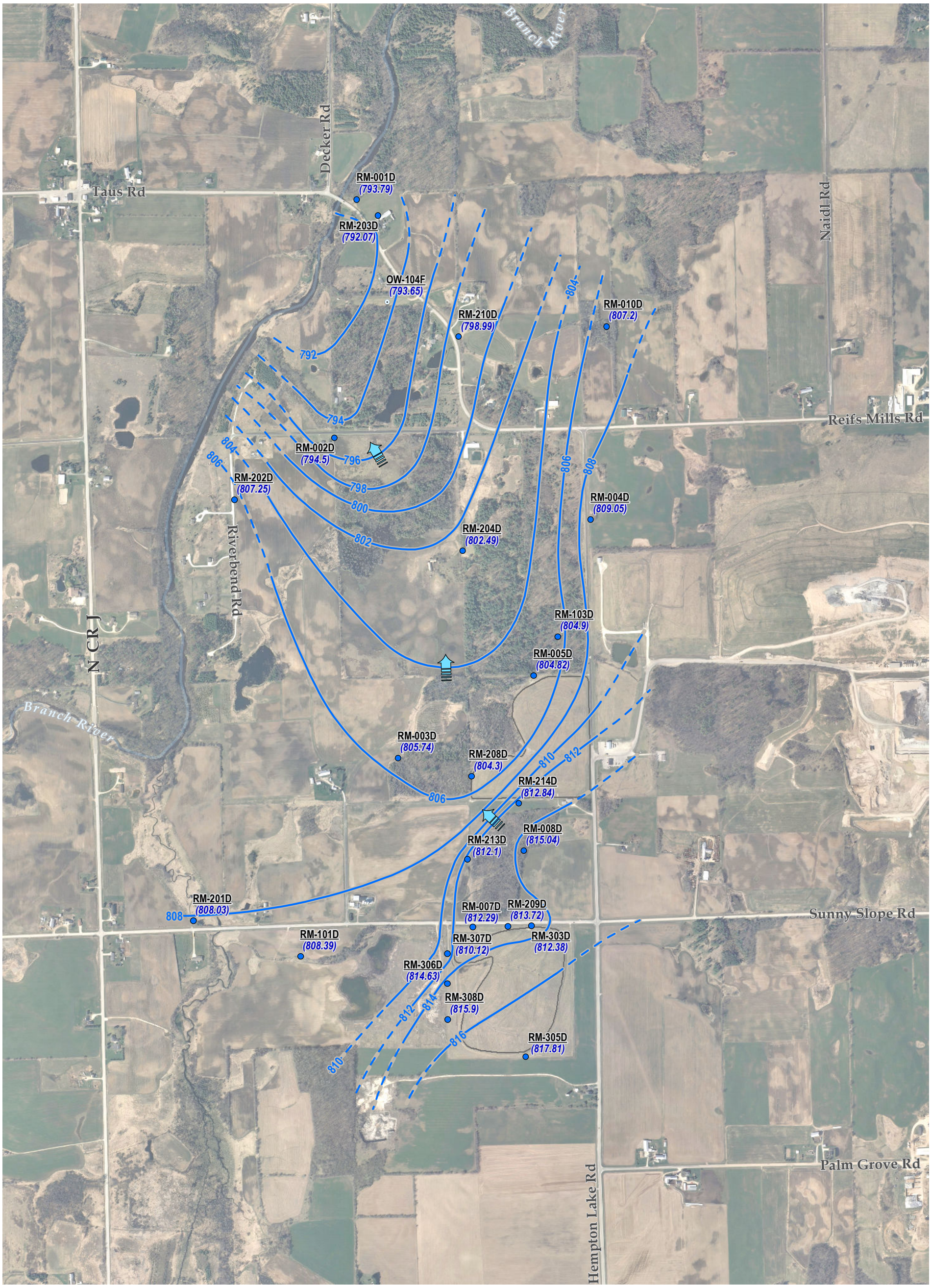

LEGEND

- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- (800.00) GROUNDWATER ELEVATION (FT MSL)
- GROUNDWATER ELEVATION CONTOUR (FT MSL, DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. GROUNDWATER MEASUREMENTS FROM: JUNE 16, 2014.

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

BEDROCK AND LGU POTENTIOMETRIC SURFACE MAP
JUNE 2014

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APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 7**
DATE:	NOVEMBER 2018		

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Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

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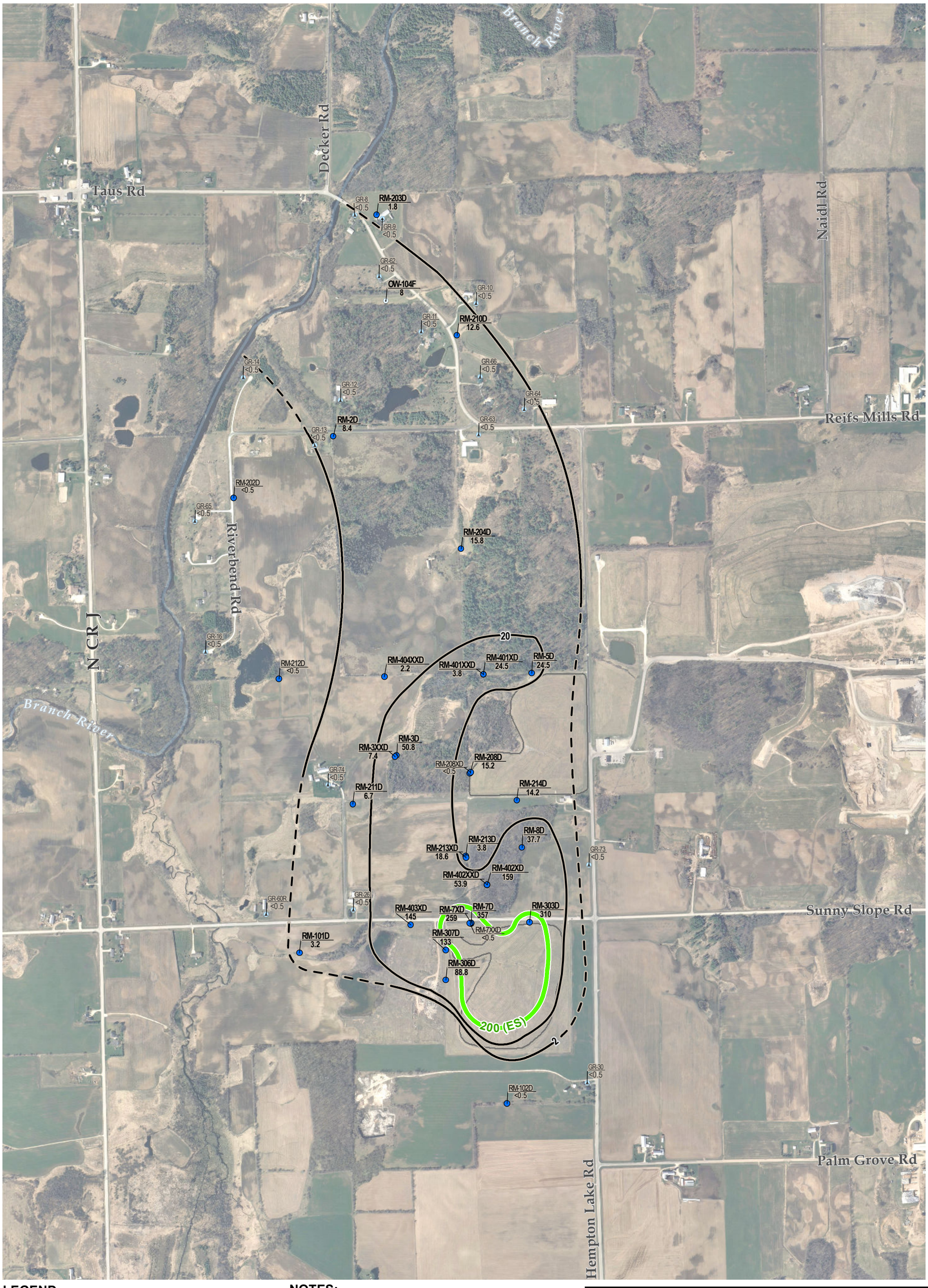

LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- **25** SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)
- ENFORCEMENT STANDARD (ES) CONTOUR (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

1,1,1-TRICHLOROETHANE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

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CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 8**
DATE:	NOVEMBER 2018		

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Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS

LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 25 SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.
7. ENFORCEMENT STANDARD (ES) FOR 1,1-DCA IS 850 µg/L. NONE OF THE ANALYTICAL RESULTS EXCEEDED THE ES.

N

0 1,000 Feet

1 " = 1,000 '
1:12,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

1,1-DICHLOROETHANE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

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CHECKED BY: M. WESTOVER		FILE NO.	268280-006-014rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	**FIGURE 9**	
DATE: NOVEMBER 2018			

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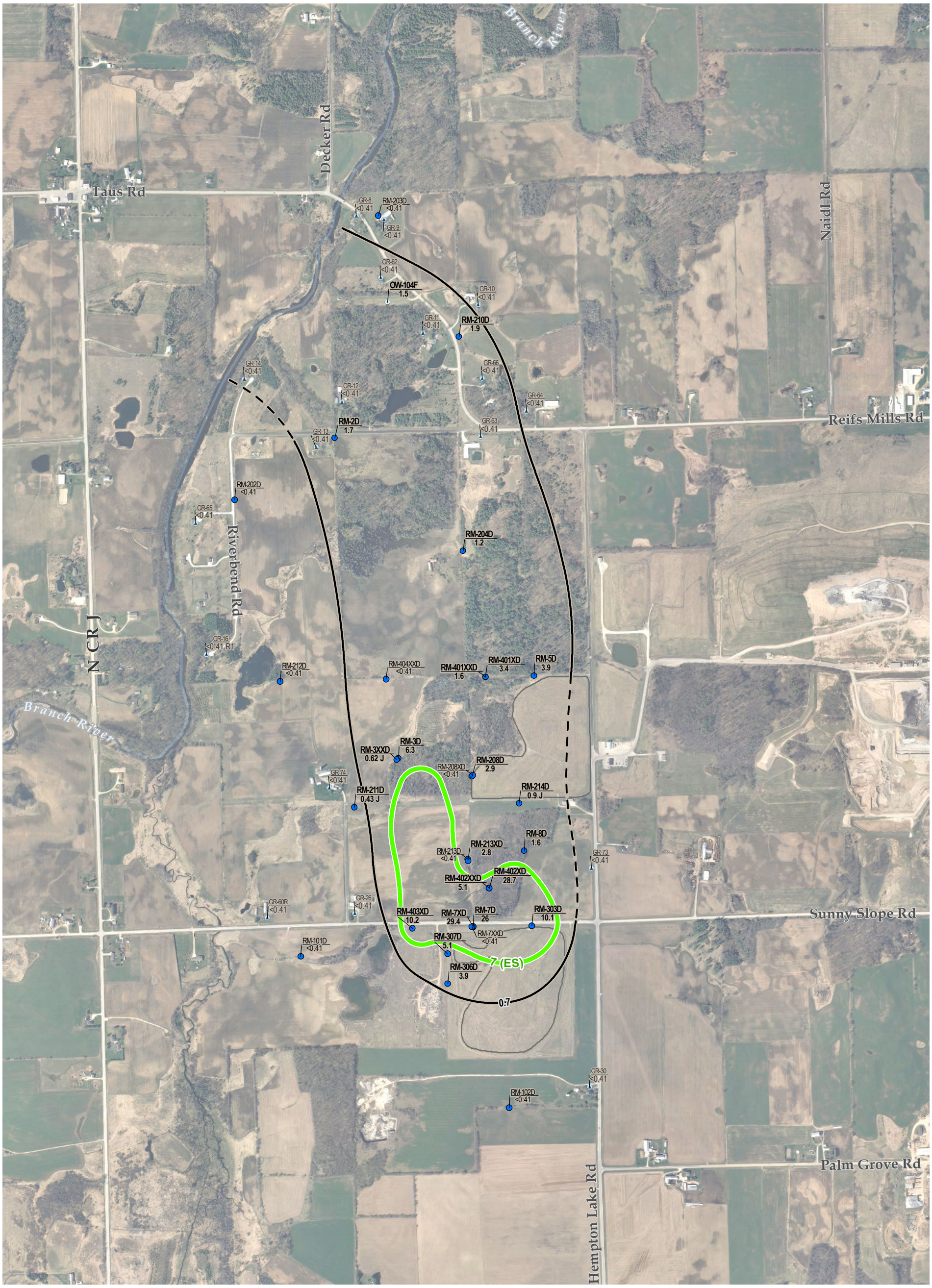
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- **25** SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)
- ENFORCEMENT STANDARD (ES) CONTOUR (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

1,1-DICHLOROETHENE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	S. MAJOR	SCALE:	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER	1: 12,000	FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 10**
DATE:	NOVEMBER 2018		

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Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS

LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- **25** SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.
7. ENFORCEMENT STANDARD (ES) FOR CHLOROETHANE IS 400 µg/L. NONE OF THE ANALYTICAL RESULTS EXCEEDED THE ES.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

CHLOROETHANE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY: S. MAJOR	SCALE:	PROJ. NO.	226573-009
CHECKED BY: M. WESTOVER	1: 12,000	FILE NO.	268280-006-014rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	**FIGURE 11**	
DATE: NOVEMBER 2018			

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Map Rotation: 0

TRC - GIS

LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- **25** SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.
7. ENFORCEMENT STANDARD (ES) FOR PCE IS 5 µg/L. NONE OF THE ANALYTICAL RESULTS EXCEED THE ES.

N

1,000 Feet

1 " = 1,000 '
1:12,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TETRACHLOROETHENE (PCE) CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 12**
DATE:	NOVEMBER 2018		

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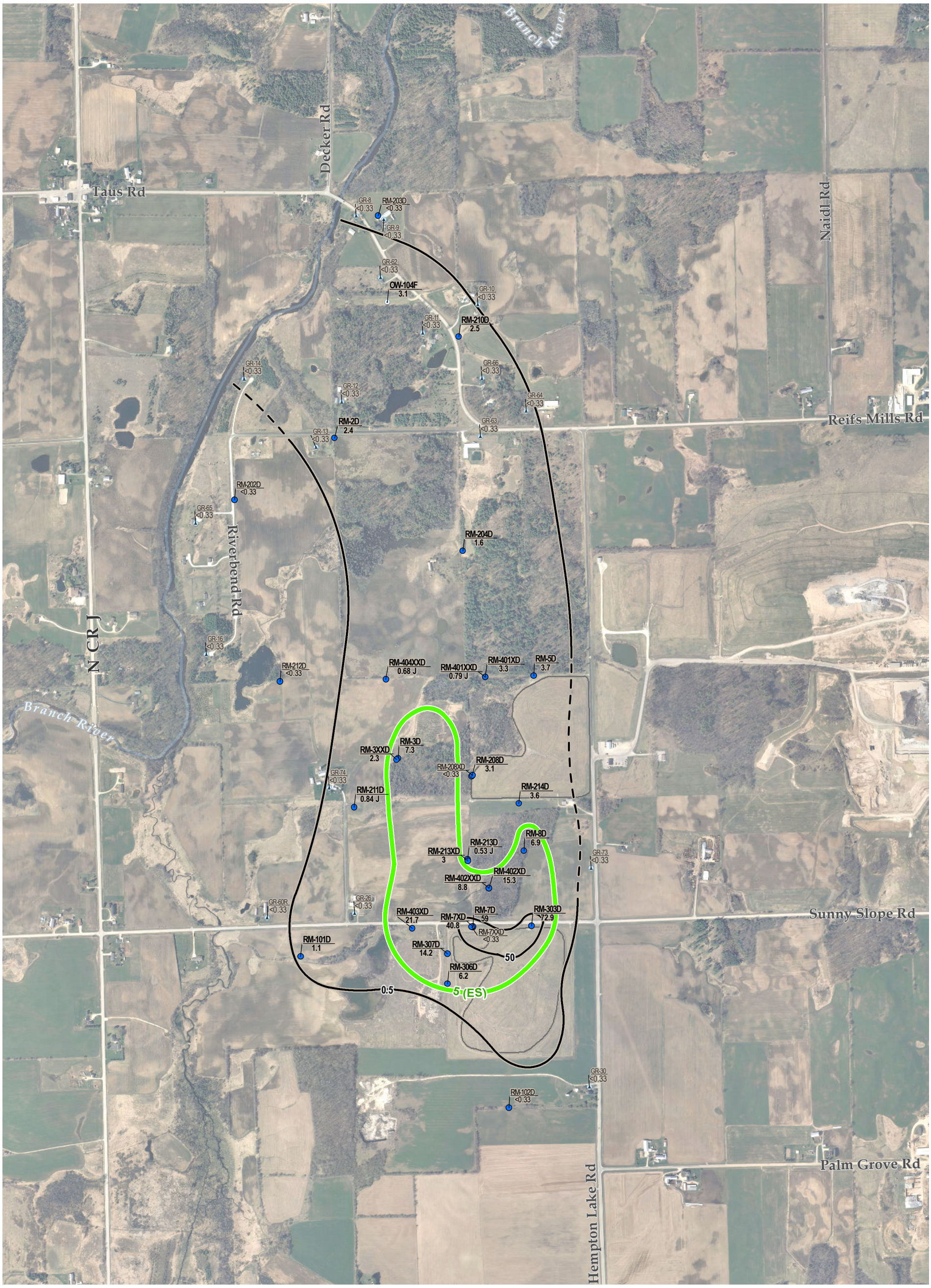
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- **25** SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)
- ENFORCEMENT STANDARD (ES) CONTOUR (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TRICHLOROETHENE (TCE) CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 13**
DATE:	NOVEMBER 2018		

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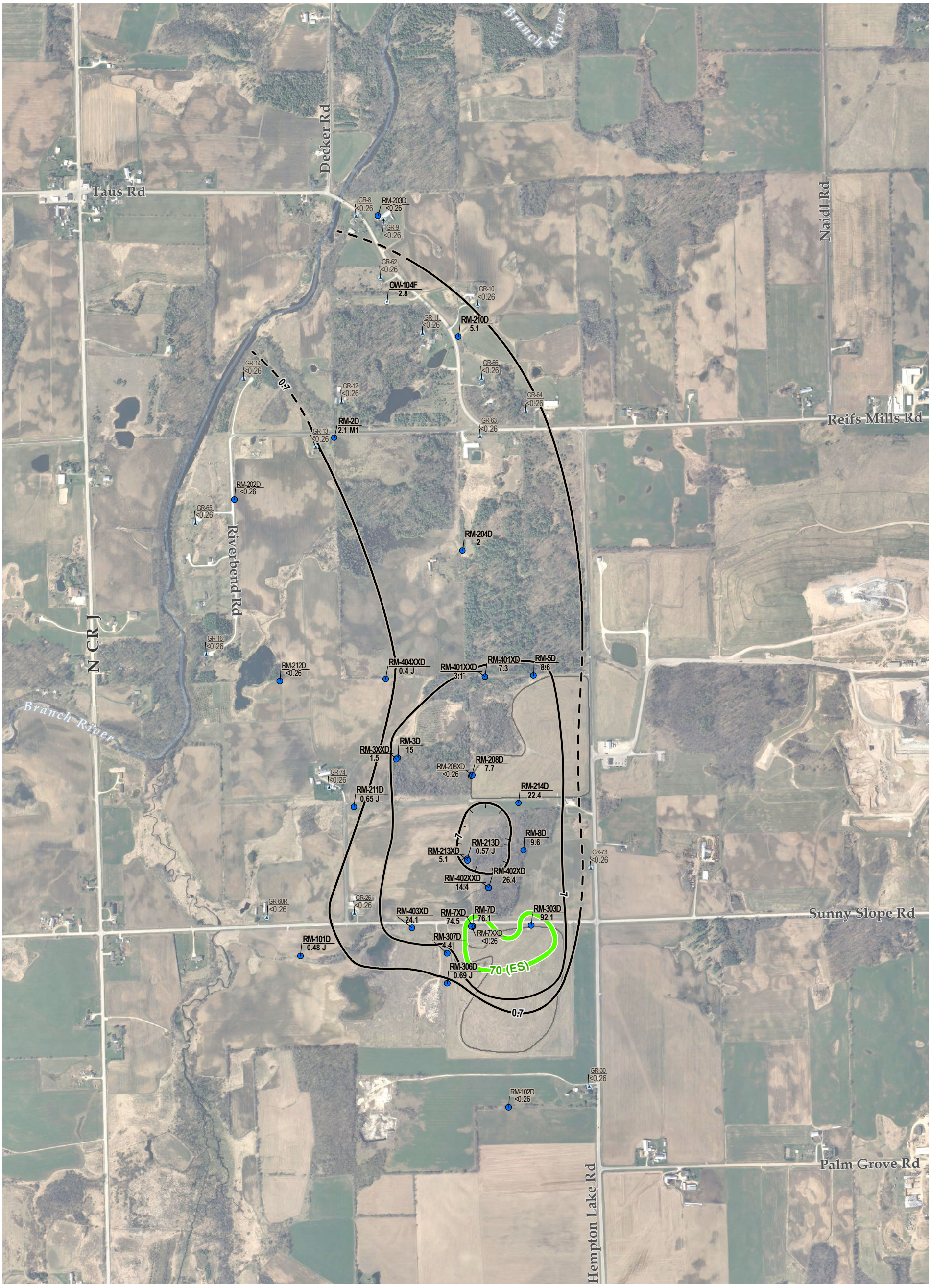
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 25 SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µg/L)
- ENFORCEMENT STANDARD (ES) CONTOUR (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

CIS-1,2-DICHLOROETHENE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	S. MAJOR	SCALE:	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER	1: 12,000	FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 14**
DATE:	NOVEMBER 2018		

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Map Rotation: 0

TRC - GIS

LEGEND

- RESIDENTIAL WELL (GR)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 25 SAMPLE RESULT (µg/L) **BOLD** IF DETECT
- ENFORCEMENT STANDARD (ES) CONTOUR (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µg/L.
3. "J" = RESULT IS BETWEEN THE LIMIT OF DETECTION(LOD) AND THE LIMIT OF QUANTITATION (LOQ).
4. NON-DETECT RESULTS ARE REPORTED AS "<LOD".
5. RESIDENTIAL WELL RESULTS ARE NOT USED FOR CONTOURING.
6. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED TO CONTOUR CONCENTRATIONS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

VINYL CHLORIDE CONCENTRATIONS
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 15**
DATE:	NOVEMBER 2018		

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TRC - GIS

TRC - GIS

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

Saved By: JPAPEZ on 12/7/2018, 12:49:08 PM
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NORTH - A

SOUTH - A'

APPROXIMATE EXTENT OF LEMBERGER LANDFILL

APPROXIMATE EXTENT OF LTR LANDFILL

ELEVATION (FEET ABOVE M.S.L.)

Branch River (NM)

RM-11D
RM-203D
GR-62
EW-04D
RM-21D
RM-204D
RM-404XXD (projected)
RM-401XD, XXD
RM-208S,I,DXD
EW-7D
RM-213D,XD
RM-402XD,XXD
RM-75,D,XD,XXD
RM-307D
RM-306D
RM-308D
RM-102D

UGU
CU
LGU
DOLOMITE
FILL

(793.79) (NM)
(793.29) (NM)
(792.07)
(793.63)
(796.94)
(794.50)
(NM)
(802.49)
(829.98)
(804.50)
(804.30)
(806.30)
(807.31)
(808.39)
(808.37)
(812.10)
(812.78)
(811.50)
(841.02)
(812.29)
(813.04)
(810.12)
(812.30)
(810.38)
(814.63)
(815.90)
(854.28)

RM-203D
1.8 <0.33
0.42 J <0.26
<0.41 <0.18
<0.37

RM-002D
8.4 2.4
8.4 2.1 M1
1.7 <0.18
<0.37

RM-204D
15.8 1.6
9.3 2
1.2 <0.18
<0.37

RM-208D
15.2 3.1
10.1 7.7
2.9 <0.18
<0.37

RM-401XD
24.5 3.3
15.5 7.3
3.4 <0.18
<0.37

RM-404XXD
2.2 0.68 J
0.86 J 0.4 J
<0.41 <0.18
<0.37

RM-401XXD
3.8 0.79 J
2.7 3.1
1.6 <0.18
<0.37

RM-208XD
<0.5 <0.33
<0.24 <0.26
<0.41 <0.18
<0.37

RM-213D
3.8 0.53 J
0.67 J 0.57 J
<0.41 <0.18
<0.37

RM-213XD
18.6 3
6.7 5.1
2.8 <0.18
<0.37

RM-402XD
53.9 8.8
33.2 14.4
5.1 <0.18
<0.37

RM-007D
357 59
272 76.1
26 <0.44
1.6 J

RM-307D
133 14.2
42.6 4.4
5.1 <0.18
<0.37

RM-007XD
259 40.8
193 74.5
29.4 <0.35
<0.75

RM-007XXD
<0.5 <0.33
0.66 J <0.26
<0.41 <0.18
<0.37

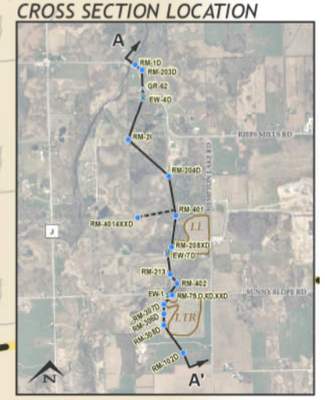
RM-306D
88.8 6.2
12.8 0.69 J
3.9 <0.18
<0.37

RM-102D
<0.5 <0.33
<0.24 <0.26
<0.41 <0.18
<0.37

20
200 (ES)

WDNR Special Casing Area for private water supply wells (250' BGS)

CROSS SECTION LOCATION



LEGEND

- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- UGU — UPPER GRANULAR UNIT
- CU — CLAY CONFINING UNIT
- LGU — LOWER GRANULAR UNIT
- DOLOMITE BEDROCK

WELL CONSTRUCTION DETAILS
- WELL CASING
- WELL SEAL
- WELL SCREEN
- OPEN HOLE (NO SCREEN)

(803.70) - GROUNDWATER ELEVATION (JUNE 16, 2014-FT MSL)
- POTENTIOMETRIC SURFACE
- 802 — EQUIPOTENTIAL CONTOUR LINE
- GROUNDWATER FLOW DIRECTION

VOC RESULTS - 2017 Q3
1,1,1-TCA (µg/L) TCE (µg/L)
1,1-DCA (µg/L) cis-1,2-DCE (µg/L)
1,1-DCE (µg/L) VINYL CHLORIDE (µg/L)
CHLOROETHANE (µg/L)

NS NOT SAMPLED
J COMPOUND DETECTED BETWEEN LIMITS OF DETECTION (LOD) AND LIMIT OF QUANTIFICATION (LOQ)
j SPECIFIC QC CRITERIA ARE OUTSIDE CONTROL LIMITS, REPORTED VALUE IS ESTIMATED

- 1,1,1-TRICHLOROETHANE 2017 Q3 ISOCONCENTRATION CONTOUR
- ENFORCEMENT STANDARD (ES) CONTOUR

Horizontal Scale: 1" = 800 '
Vertical Scale: 1" = 40 '
20x Vertical Exaggeration

0 400 800
0 20 40

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
MNA REPORT

SHEET TITLE:
VERTICAL EXTENT OF 1,1,1-TRICHLOROETHANE 2017 Q3

DRAWN BY: PAPEZ J	SCALE: AS NOTED	PROJ. NO.	226573
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-015rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:		**FIGURE 16**
DATE: NOVEMBER 2018			

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NORTH - A

SOUTH - A'

APPROXIMATE EXTENT OF LEMBERGER LANDFILL

APPROXIMATE EXTENT OF LTR LANDFILL

ELEVATION (FEET ABOVE M.S.L.)

Branch River (NM)

RM-11D · RM-203D · GR-62 · EW-04D · RM-21D · RM-204D · RM-404XXD (projected) · RM-401XD, XXD · RM-208S,I,D,XD · EW-7D · RM-213D,XD · RM-402XD,XXD · RM-75,D,XD,XXD · RM-307D · RM-306D · RM-308D · RM-102D

UGU · CU · LGU · DOLOMITE · FILL

(NM) · (793.29) · (792.07) · (793.79) · (793.63) · (796.94) · (802.49) · (794.50) · (829.98) · (804.50) · (804.30) · (806.30) · (807.31) · (812.10) · (812.78) · (813.04) · (841.02) · (812.29) · (810.12) · (812.30) · (814.63) · (815.90) · (854.28) · (808.39) · (811.50) · (808.37) · (810.38)

RM-203D
1.8 <0.33
0.42 J <0.26
<0.41 <0.18
<0.37

RM-204D
15.8 1.6
9.3 2
1.2 <0.18
<0.37

RM-002D
8.4 2.4
8.4 2.1 M1
1.7 <0.18
<0.37

RM-208D
15.2 3.1
10.1 7.7
2.9 <0.18
<0.37

RM-401XD
24.5 3.3
15.5 7.3
3.4 <0.18
<0.37

RM-213D
3.8 0.53 J
0.67 J 0.57 J
<0.41 <0.18
<0.37

RM-213XD
18.6 3
6.7 5.1
2.8 <0.18
<0.37

RM-007D
357 59
272 76.1
26 <0.44
1.6 J

RM-402XD
159 15.3
52.7 26.4
28.7 <0.18
1.4

RM-307D
133 14.2
42.6 4.4
5.1 <0.18
<0.37

RM-007XD
259 40.8
193 74.5
29.4 <0.35
<0.75

RM-306D
88.8 6.2
12.8 0.69 J
3.9 <0.18
<0.37

RM-102D
<0.5 <0.33
<0.24 <0.26
<0.41 <0.18
<0.37

RM-404XXD (installed 2017)
2.2 0.68 J
0.86 J 0.4 J
<0.41 <0.18
<0.37

RM-401XXD
3.8 0.79 J
2.7 3.1
1.6 <0.18
<0.37

RM-402XXD
53.9 8.8
33.2 14.4
5.1 <0.18
<0.37

RM-208XD
<0.5 <0.33
<0.24 <0.26
<0.41 <0.18
<0.37

RM-007XXD
<0.5 <0.33
0.66 J <0.26
<0.41 <0.18
<0.37

5.0 (ES)

0.5

WDNR Special Casing Area for private water supply wells (250' BGS)

LEGEND

- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- UGU — UPPER GRANULAR UNIT
- CU — CLAY CONFINING UNIT
- LGU — LOWER GRANULAR UNIT
- DOLOMITE BEDROCK

WELL CONSTRUCTION DETAILS
- WELL CASING
- WELL SEAL
- WELL SCREEN
- OPEN HOLE (NO SCREEN)

(803.70) - GROUNDWATER ELEVATION (JUNE 16, 2014-FT MSL)
- POTENTIOMETRIC SURFACE
- 802 — EQUIPOTENTIAL CONTOUR LINE
- GROUNDWATER FLOW DIRECTION

VOC RESULTS - 2017 Q3
1,1,1-TCA (µg/L) TCE (µg/L)
1,1-DCA (µg/L) cis-1,2-DCE (µg/L)
1,1-DCE (µg/L) VINYL CHLORIDE (µg/L)
CHLOROETHANE (µg/L)

NS NOT SAMPLED
J COMPOUND DETECTED BETWEEN LIMITS OF DETECTION (LOD) AND LIMIT OF QUANTIFICATION (LOQ)
j SPECIFIC QC CRITERIA ARE OUTSIDE CONTROL LIMITS, REPORTED VALUE IS ESTIMATED

TRICHLOROETHENE (TCE)
2017 Q3 ISOCONCENTRATION CONTOUR
ENFORCEMENT STANDARD (ES) CONTOUR

Horizontal Scale: 1" = 800 '
Vertical Scale: 1" = 40 '
20x Vertical Exaggeration

0 · 400 · 800
0 · 20 · 40

CROSS SECTION LOCATION

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
MNA REPORT

SHEET TITLE:
VERTICAL EXTENT OF TRICHLOROETHENE (TCE)
2017 Q3

DRAWN BY:	PAPEZ J	SCALE: AS NOTED	PROJ. NO. 226573
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-015rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 17**
DATE:	NOVEMBER 2018		

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NORTH A

SOUTH A'

ELEVATION (FEET ABOVE M.S.L.)

880 870 860 850 840 830 820 810 800 790 780 770 760 750 740 730

CVOCs diffusing from rock matrix to fractures at lower concentrations

Rock matrix permeated with elevated CVOC concentrations

EXTENT OF LTR LANDFILL PROPERTY BOUNDARY

RM-208XD
EW-7D
RW-213D
EW-1D (Projected)
RM-7D, 7XD, 7S
RM-7XD
RM-305D
RM-102D

ENGINEERED CAP

FILL

UGU

CU

LGU

DOLOMITE

Residual CVOCs may continue to reside in the vadose zone

Elevated concentrations of CVOCs in the rock matrix

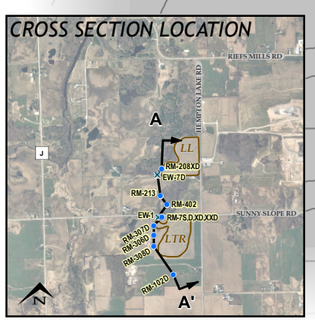
CVOCs in source area undergo biotically-mediated reductive dechlorination

Lower concentrations of CVOCs in the groundwater in the rock fractures

Plume is maintained through "back-diffusion" of low-level CVOCs that have been partially degraded while in the rock matrix

CVOCs have thoroughly diffused from fracture network into bedrock matrix where CVOCs continue to degrade via biotic and abiotic processes

CROSS SECTION LOCATION



LEGEND

- STRATIGRAPHIC BOUNDARY, DASHED WHERE INFERRED
- 801.85 WATER LEVEL ELEVATION (FEET, MSL) SEPTEMBER 2006

WELL CONSTRUCTION

- WELL SEAL
- WELL CASING
- WELL SCREEN
- OPEN HOLE (NO SCREEN)

UGU	UPPER GRANULAR UNIT
CU	COHESIVE UNIT
LGU	LOWER GRANULAR UNIT

PROJECT:
LEMBERGER LANDFILL AND LEMBERGER TRANSPORT AND RECYCLING SITE
TOWN OF FRANKLIN, WISCONSIN

TITLE:
CONCEPTUAL MODEL SHOWING ELEMENTS OF NATURAL ATTENUATION

DRAWN BY:	J. PAPEZ	PROJ NO.:	286280-007
CHECKED BY:	M.WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 18**
DATE:	NOVEMBER 2018		

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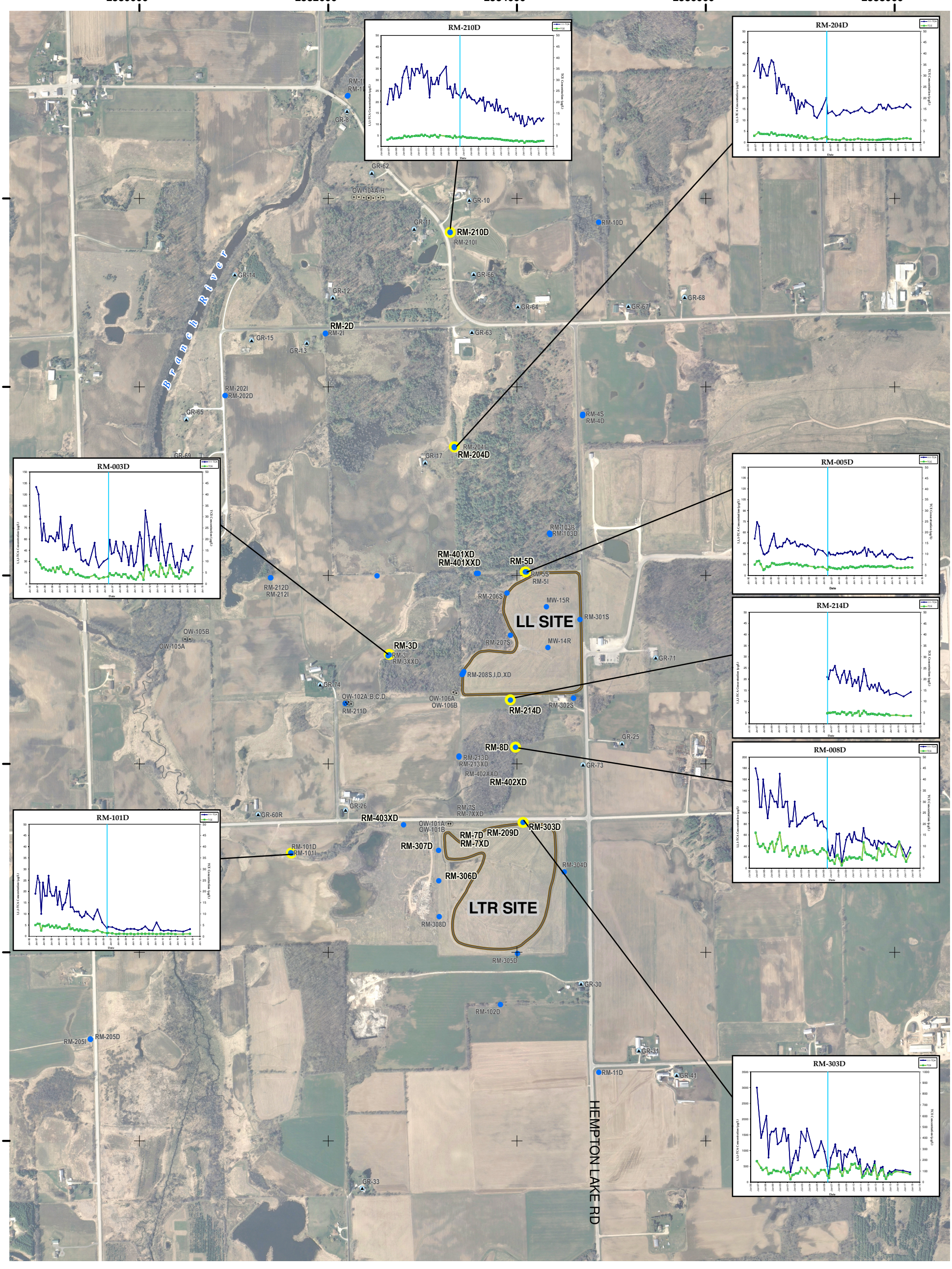
FILE NO.: 268280-AI02.ai

File Path: \\tapb-madison\lmsn-vol8\GIS\LembergerLandfill\2017_268280\ai\268280-ai02.ai



LEGEND

- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- LANDFILL LIMITS OF WASTE

GRAPH SYMBOLS (NON-DETECT RESULTS HAVE OPEN SYMBOL)

- 1,1,1-TCA CONCENTRATION (µg/L)
- TCE CONCENTRATION (µg/L)
- TREATMENT SYSTEM SHUTDOWN AUGUST,1 2006)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. TREND GRAPH Y-AXIS SCALES VARY TO BETTER SHOW DATA TRENDS. SCALES ARE 0-25 µg/L, 0-50 µg/L, 0-100 µg/L, OR 0-500 µg/L, AS NOTED ON EACH GRAPH.

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE:
1,1,1-TCA AND TCE CONCENTRATIONS OVER TIME

DRAWN BY:	S. MAJOR	SCALE:	PROJ. NO. 268280
CHECKED BY:	M. WESTOVER	1: 12,000	FILE NO. 268280-006-15.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 19**
DATE:	NOVEMBER 2018		

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Path: E:\LembergerLandfill\2017_268280\268280-006-15.mxd
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

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Figure 20
Graphs of TCE at Source Area Monitoring Wells RM-007D and RM-007XD
Lemberger Landfill Sites – MNA 2018 Report

Concentrations are in µg/L. Concentrations of TCE at each well have been increasing following the shutdown of the treatment system, but have begun to trend downward or stabilize over the last 4 years.

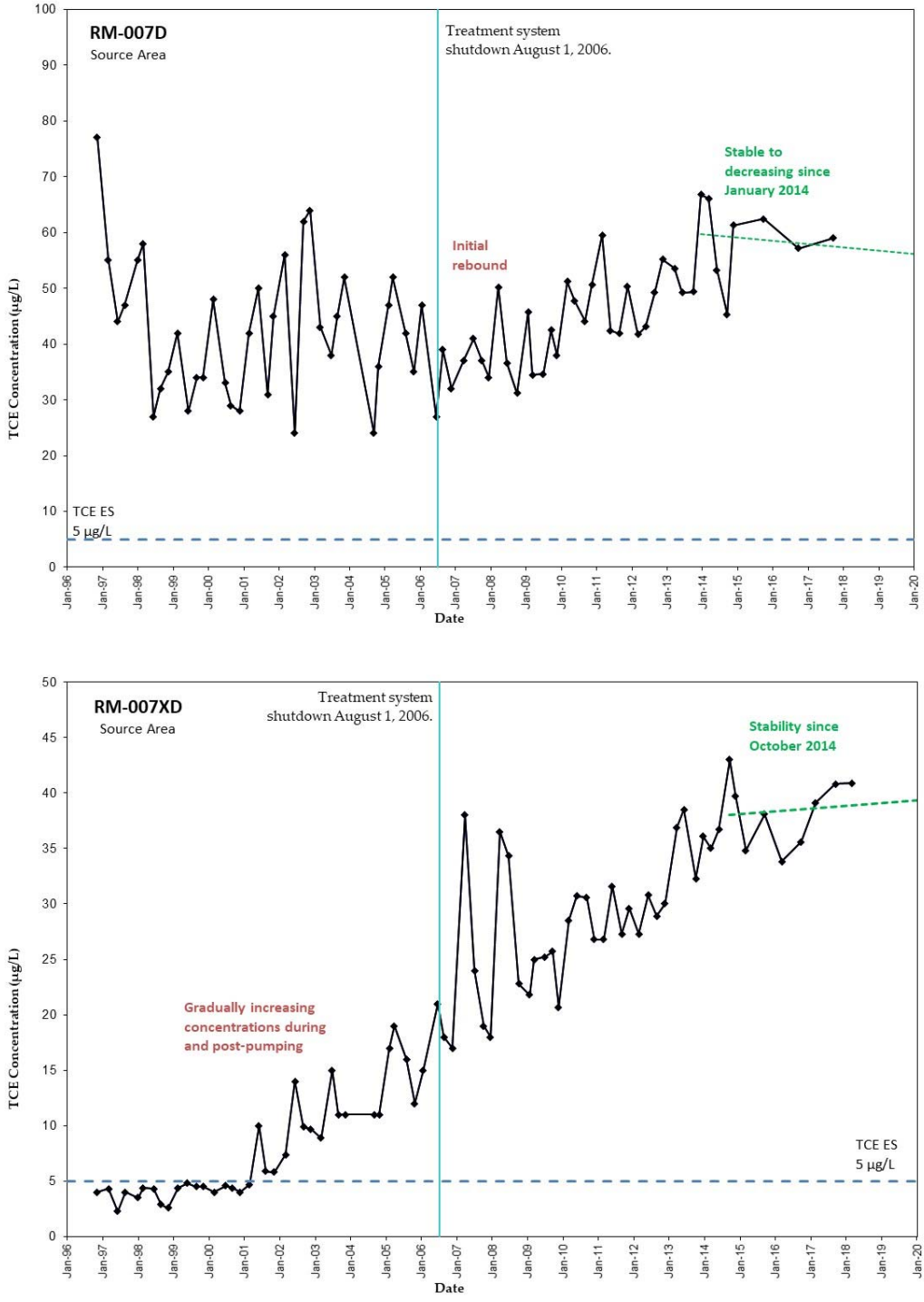
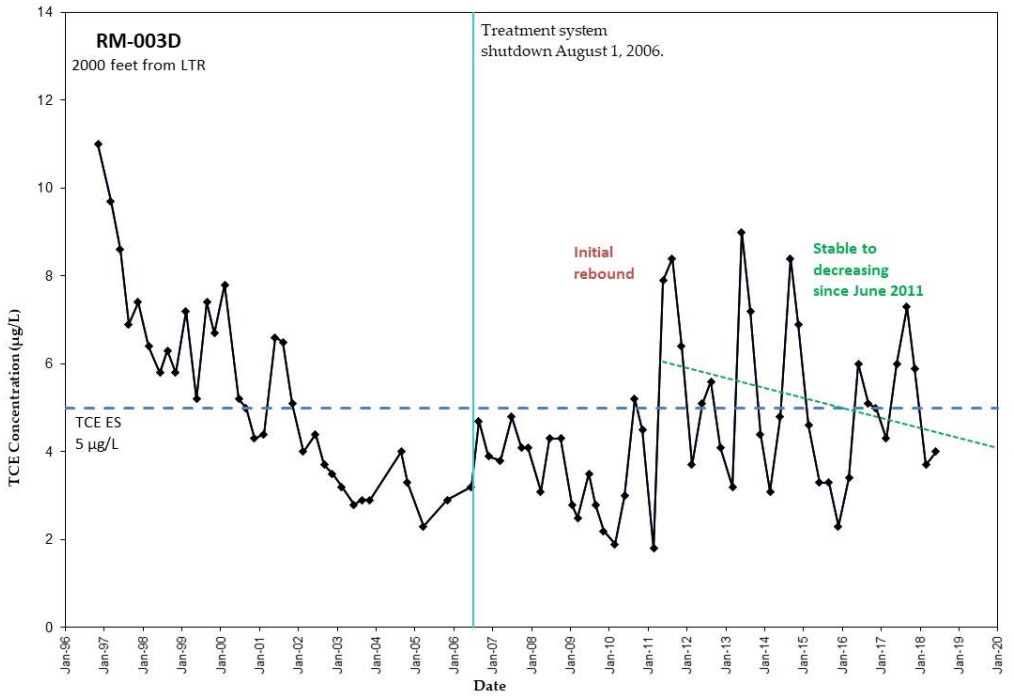


Figure 21
Graphs of TCE at Near-Field Monitoring Wells RM-003D and RM-008D
Lemberger Landfill Sites – MNA 2018 Report

Concentrations are in µg/L. These two wells are located approximately 1,800 feet and 800 feet downgradient of the LTR, respectively, and currently define the downgradient edge of the plume (as defined by the ES). Concentrations of TCE at each well are currently near the ES and have remained essentially stable following the treatment system shutdown after an initial rebound period.



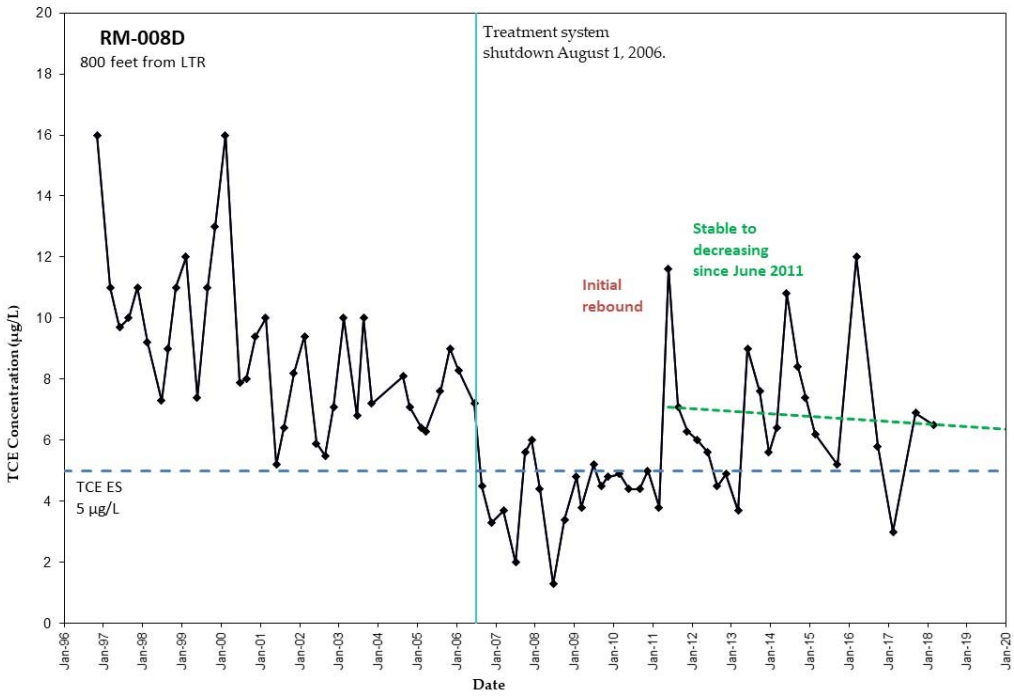
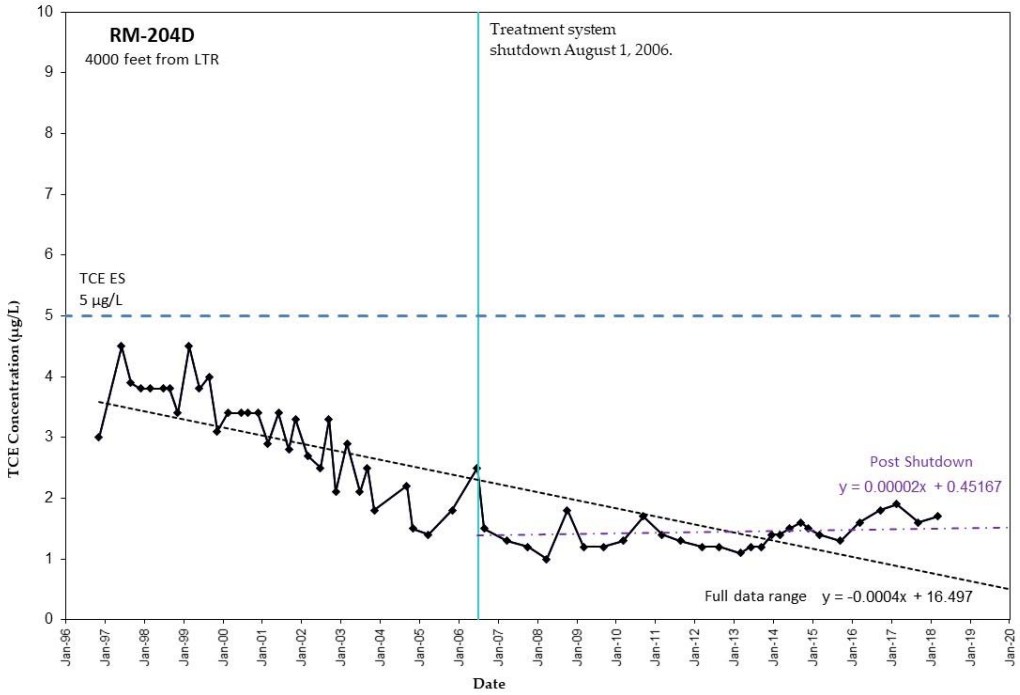
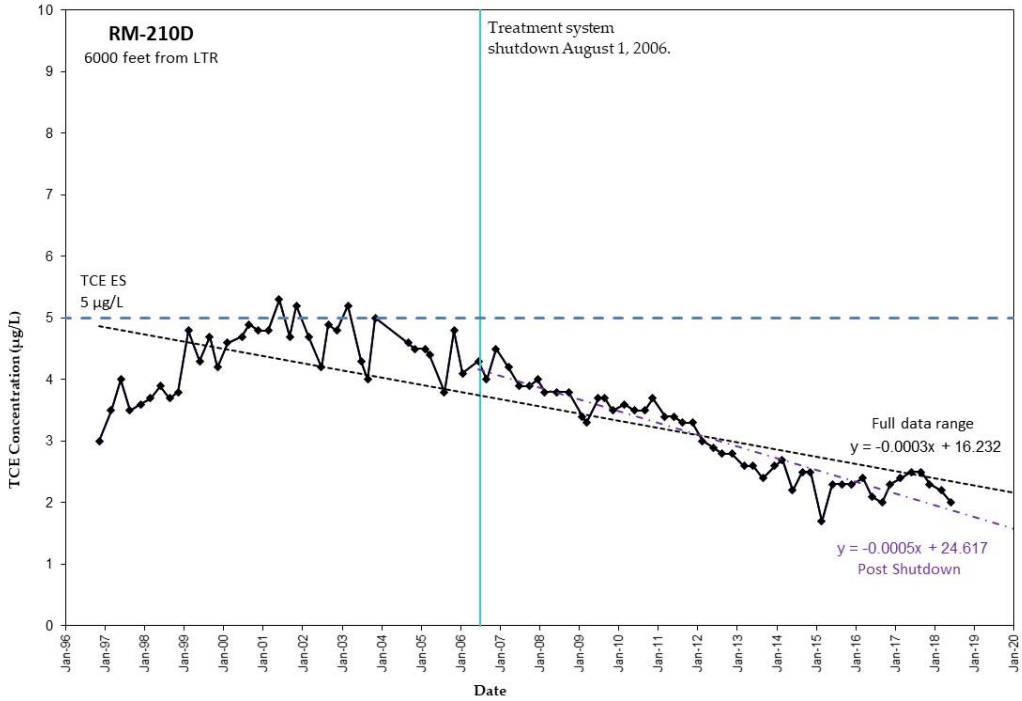
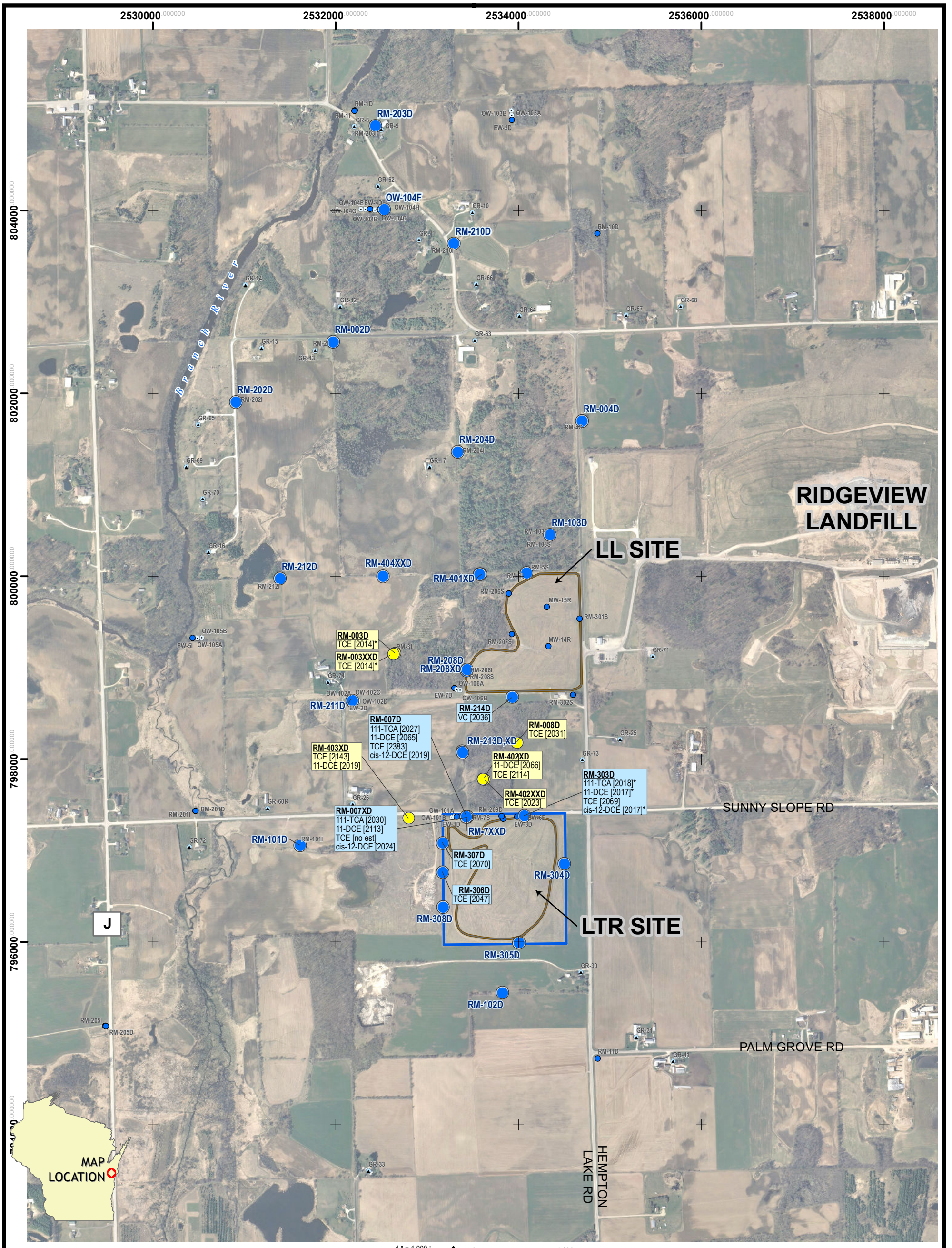


Figure 22
Graphs of TCE at Far-Field Monitoring Wells RM-204D and RM-210D
Lemberger Landfill Sites – MNA 2018 Report

Concentrations are in µg/L. RM-204D is 2,000 feet closer to the LTR than RM-210D. The vertical blue line denotes the shutdown of the groundwater pump-and-treat system. Note CVOCs continue to decrease at RM-210D at the same rate both during and after groundwater extraction, while at RM-204D the trend reverts to a stable trend.







LEGEND

- MONITORING WELL
- GW OBSERVATION WELL
- RESIDENTIAL WELL
- LANDFILL LIMITS OF WASTE
- ES = ENFORCEMENT STANDARD
- ES EXCEEDANCE AND DOWNWARD OR STABLE TREND
- NO ES EXCEEDANCE AND DOWNWARD TRENDS

LABEL FORMAT

SAMPLE ID
PARAMETER [APPROX. DATE TO REACH ES]
[no est] = TIMELINE CANNOT BE CALCULATED, TREND IS EITHER UPWARD OR STABLE

NOTES

1 " = 1,000 '
1:12,000
0 1,000 FEET

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. "111-TCA" = 1,1,1-TRICHLOROETHANE
   "11-DCE" = 1,1-DICHLOROETHENE
   "TCE" = TRICHLOROETHENE
   "cis-12-DCE" = cis-1,2-DICHLOROETHENE
   "VC" = VINYL CHLORIDE
3. *DATES SHOWN PRIOR TO 2018 INDICATE PERIODIC ENFORCEMENT STANDARD EXCEEDANCES, OR THE EXCEEEDANCE HAS BEEN MET.
4. "DOWNWARD" OR "UPWARD" TRENDS ARE DEFINED BY THE SLOPE OF THE REGRESSION LINE (TABLE 2). NO ESTIMATION OF A TIMELINE TO REACH THE ES IS MADE FOR LOCATIONS/ PARAMETERS WHERE THE OLS REGRESSION LINE HAS A POSITIVE SLOPE.
5. PREDICTED DATE TO REACH ES IS FROM POST SHUTDOWN DATA RANGE, OR STABLE RANGE, WHICHEVER IS LONGER (TABLE 2).
6. WELLS LOCATED WITHIN THE DMZ ARE SHOWN AS "NO ES EXCEEDANCE". A TIME TO CLEANUP IS CALCULATED FOR PARAMETERS WITH CONCENTRATIONS ABOVE THE ES.

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE:
TREND ANALYSIS SUMMARY

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 268280
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-029.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE 23**
DATE:	NOVEMBER 2018		

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Saved By: SMAJOR on 11/6/2018, 10:50:27 AM
Path: E:\LembergerLandfill\2017_268280\268280-006-029.mxd
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

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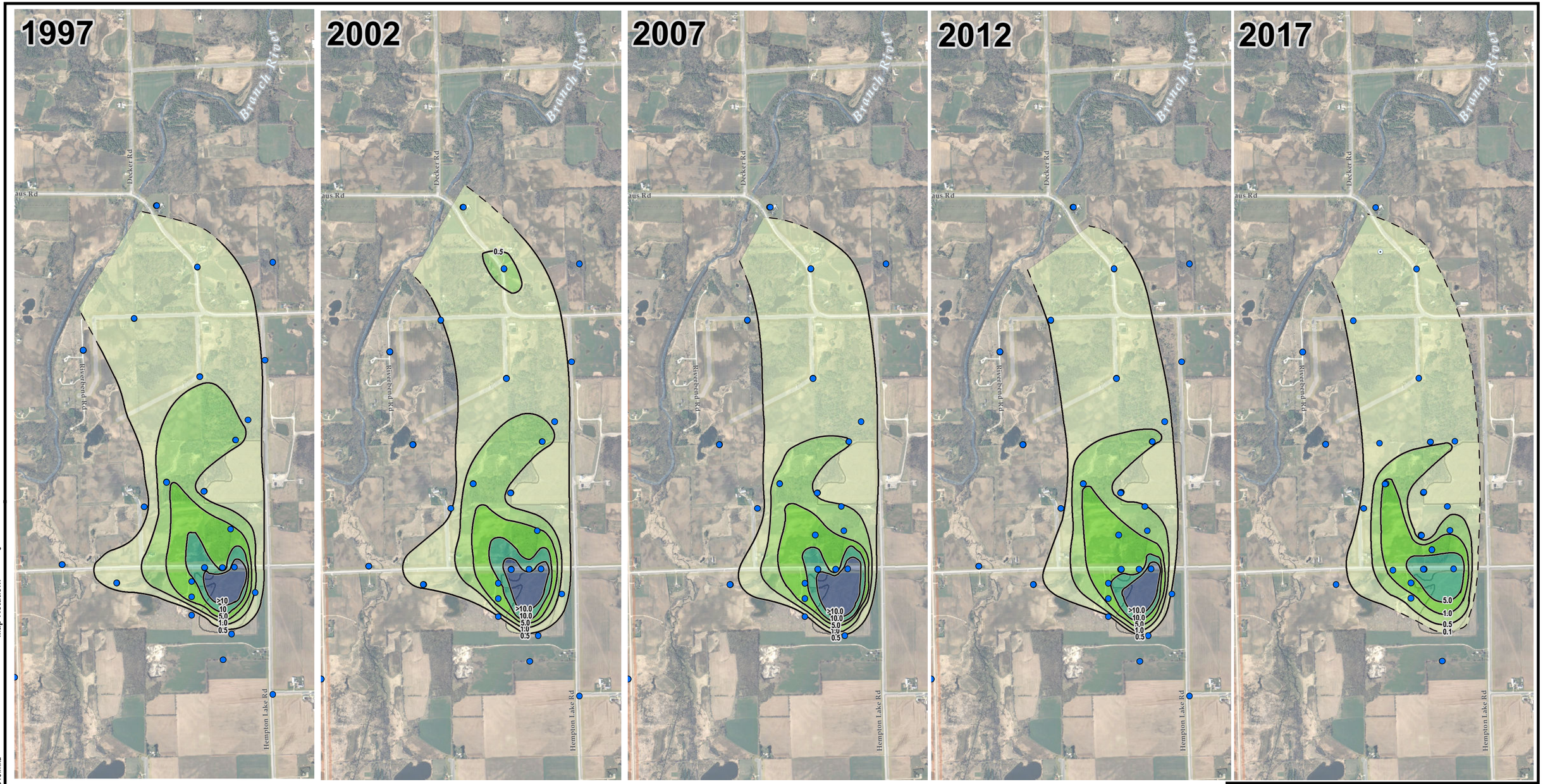
TRC - GIS

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

Plot Date: 11/6/2018, 11:23:34 AM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\Lemberger\Landfill\2017_268280\268280-006-016.mxd



LEGEND

CVOC CONCENTRATIONS (µmol/L)

- 0.1 - 0.5 µmol/L
- 0.5 - 1 µmol/L
- 1 - 5 µmol/L
- 5 - 10 µmol/L
- >10 µmol/L

MONITORING WELL (RM)

ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.

2. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, CIS- AND TRANS-,1,2-DCE, VC, 1,1,1-TCA,1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS. NON-DETECT WERE COUNTED AS ZERO IN THE CALCULATION OF TOTAL CVOCS.

3. THE MONITORING WELL LOCATIONS SHOWN ARE THE LOCATIONS WITH DATA USED TO GENERATE THE ISOCONCENTRATION CONTOURS.

4. WELL IDs AND POSTED DATA ARE INCLUDED FOR EACH OF THE INDIVIDUAL PLUME MAPS IN APPENDIX D.

N

0 2,000 4,000 Feet

1 " = 2,000 '
1:24,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
TOTAL CVOC ISOCONCENTRATION MAP OF MOLAR CONCENTRATIONS OVER TIME

DRAWN BY:	J. PAPEZ	PROJ NO.:	268280
CHECKED BY:	M. WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 24**
DATE:	NOVEMBER 2018		

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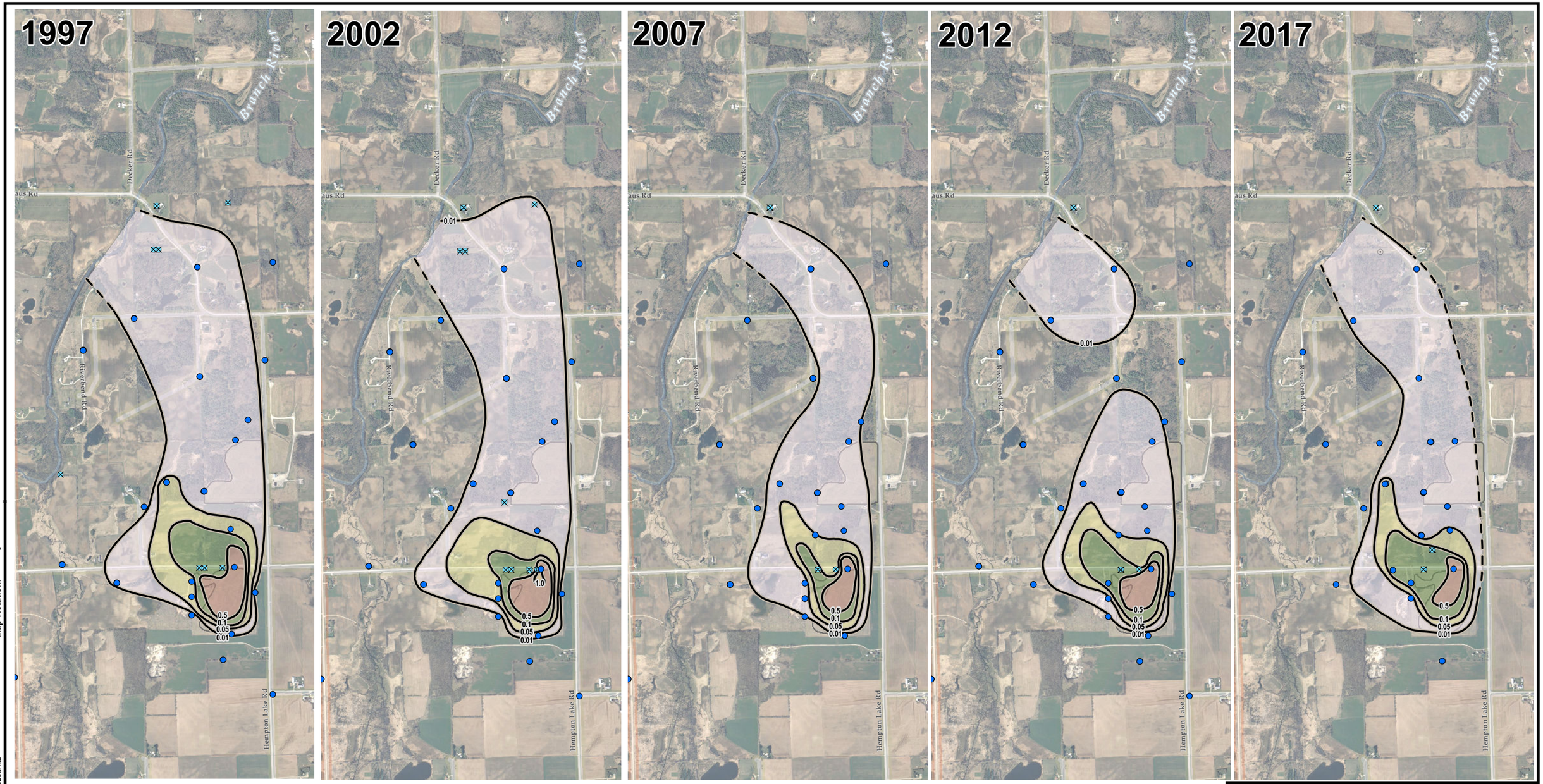
FILE NO.: 268280-006-016.mxd



LEGEND

TCE CONCENTRATIONS (µmol/L)

- 0.01-0.05 µmol/L
- 0.05-0.1 µmol/L
- 0.1-0.5 µmol/L
- 0.5-1.0 µmol/L
- >1.0 µmol/L

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. THE MONITORING WELL LOCATIONS SHOWN ARE THE LOCATIONS WITH DATA USED TO GENERATE THE ISOCONCENTRATION CONTOURS.
3. WELL IDs AND POSTED DATA ARE INCLUDED FOR EACH OF THE INDIVIDUAL PLUME MAPS IN APPENDIX D.

N

0 2,000 4,000 Feet

1 " = 2,000 '
1:24,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
LGU & BEDROCK UNITS
TRICHLOROETHENE MOLAR CONCENTRATIONS OVER TIME

DRAWN BY:	A. REIS	PROJ NO.:	268280
CHECKED BY:	M. WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 25**
DATE:	NOVEMBER 2018		

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FILE NO.: 268280-006-023.mxd

Plot Date: 11/6/2018, 14:58:23 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\Lemberger\Landfill\2017_268280\268280-006-023.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS

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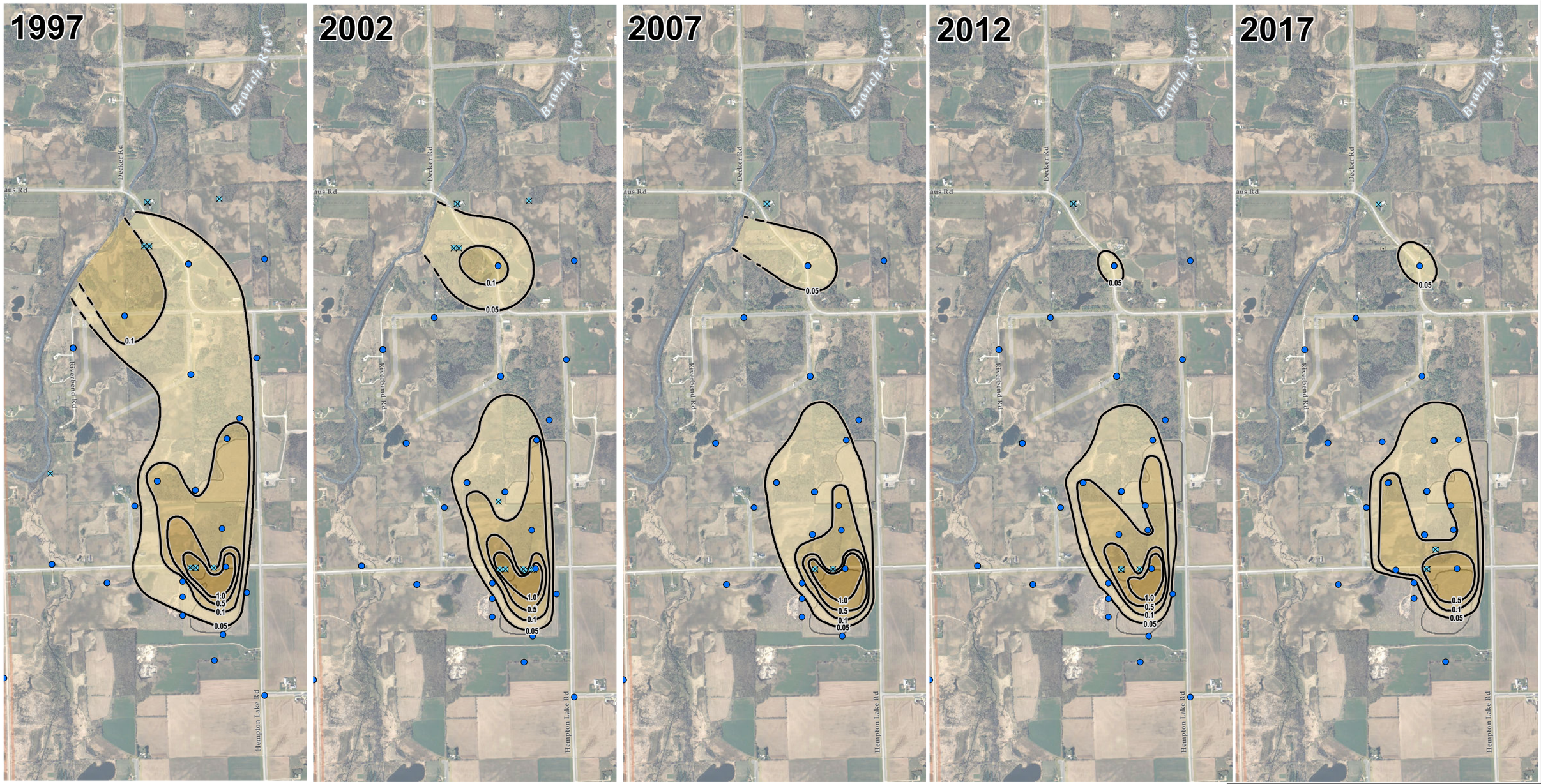

LEGEND

CIS-DCE CONCENTRATION (µmol/L)

- 0.05-0.1 µmol/L
- 0.1-0.5 µmol/L
- 0.5-1.0 µmol/L
- > 1.0 µmol/L

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. THE MONITORING WELL LOCATIONS SHOWN ARE THE LOCATIONS WITH DATA USED TO GENERATE THE ISOCONCENTRATION CONTOURS.
3. WELL IDs AND POSTED DATA ARE INCLUDED FOR EACH OF THE INDIVIDUAL PLUME MAPS IN APPENDIX D.
4. RESULTS FOR 1997 AND 2002 ARE TOTAL 1,2-DCE.

N

0 2,000 4,000 Feet

1 " = 2,000 '
1:24,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
LGU & BEDROCK UNITS
CIS-1,2-DICHLOROETHENE MOLAR CONCENTRATIONS OVER TIME

DRAWN BY:	A. REIS	PROJ NO.:	268280
CHECKED BY:	M. WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 26**
DATE:	NOVEMBER 2018		

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FILE NO.: 268280-006-025.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

Plot Date: 11/6/2018, 12:06:32 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
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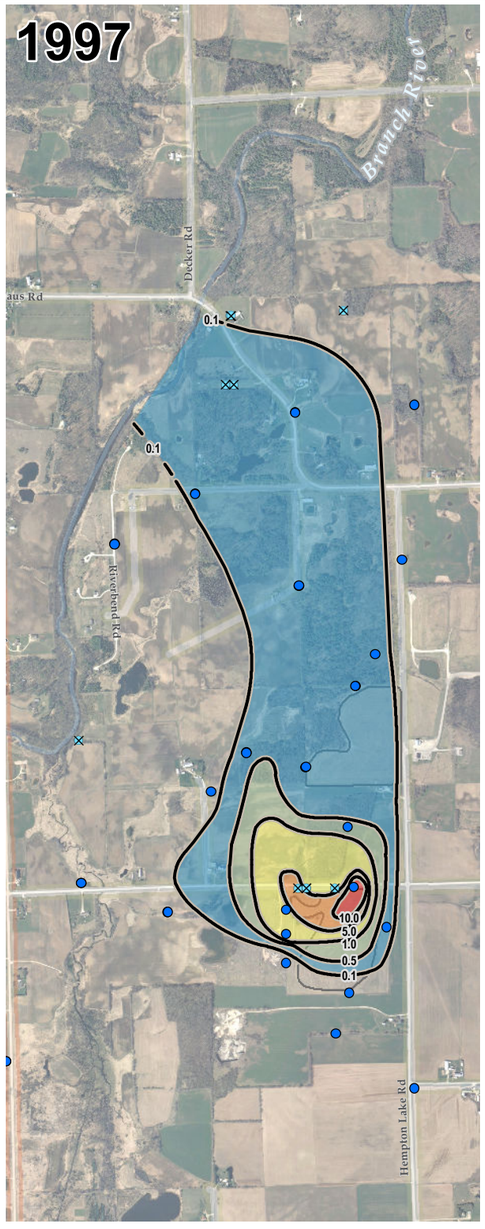

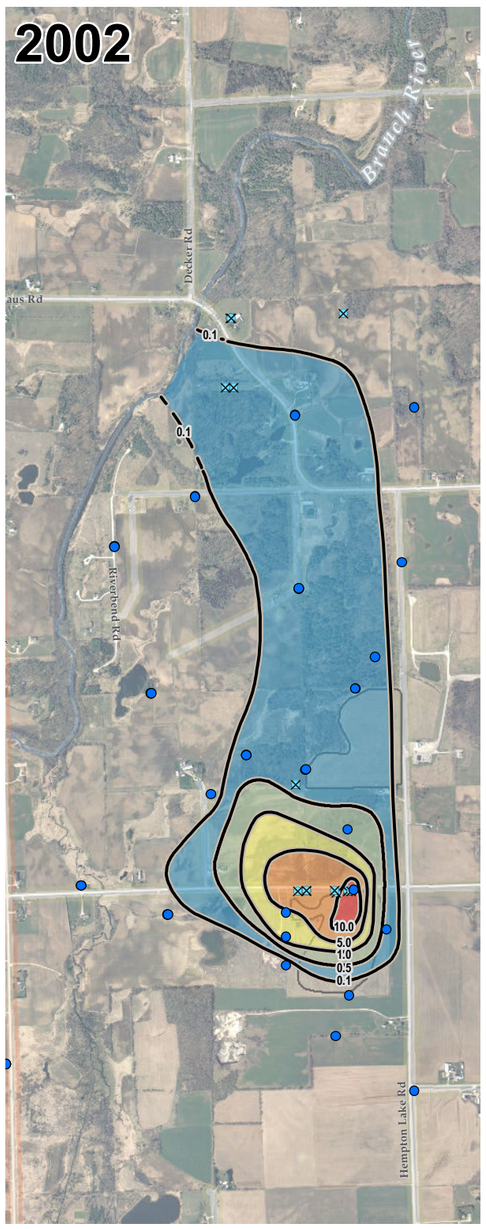

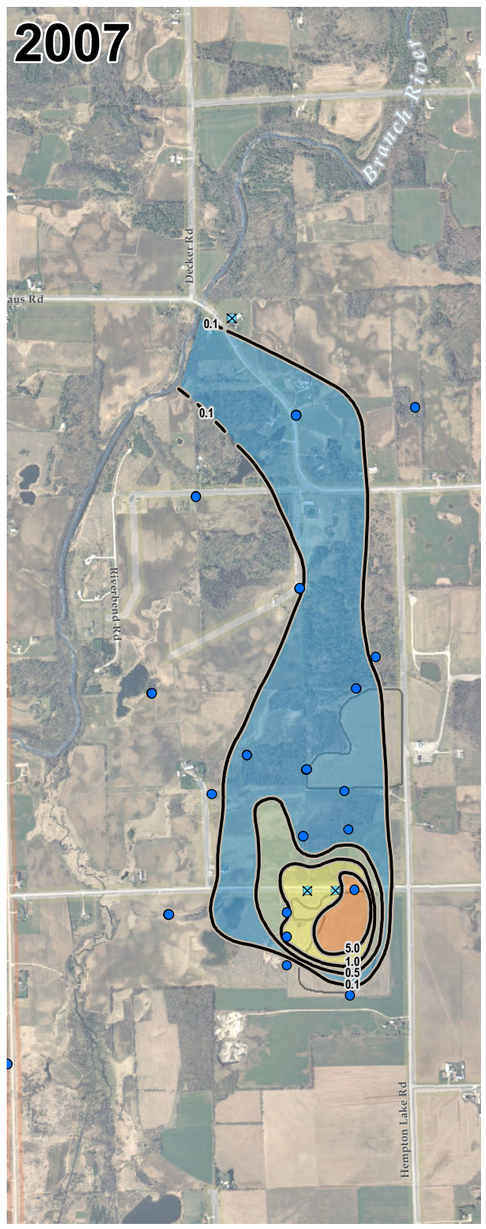

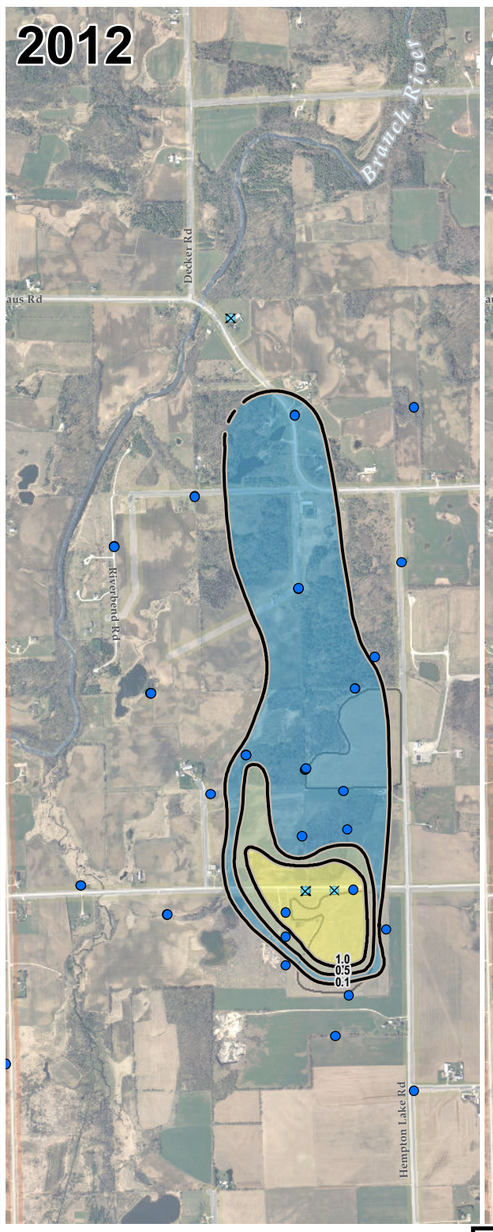

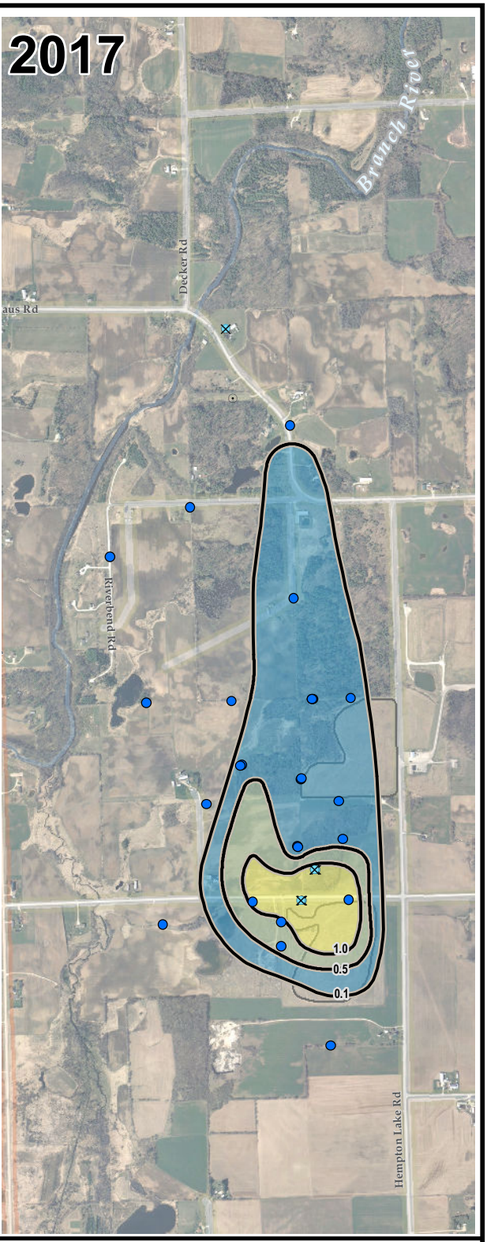

LEGEND

TCA CONCENTRATION (µmol/L)

- 0.1-0.5 µmol/L
- 0.5-1.0 µmol/L
- 1.0-5.0 µmol/L
- 5.0-10.0 µmol/L
- >10.0 µmol/L

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. THE MONITORING WELL LOCATIONS SHOWN ARE THE LOCATIONS WITH DATA USED TO GENERATE THE ISOCONCENTRATION CONTOURS.
3. WELL IDs AND POSTED DATA ARE INCLUDED FOR EACH OF THE INDIVIDUAL PLUME MAPS IN APPENDIX D.

N

0 2,000 4,000 Feet

1 " = 2,000 '
1:24,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TITLE:
LGU & BEDROCK UNITS
1,1,1-TRICHLOROETHANE MOLAR CONCENTRATIONS OVER TIME

DRAWN BY:	A. REIS	PROJ NO.:	268280
CHECKED BY:	M. WESTOVER		
APPROVED BY:	J. WEDEKIND		**FIGURE 27**
DATE:	NOVEMBER 2018		

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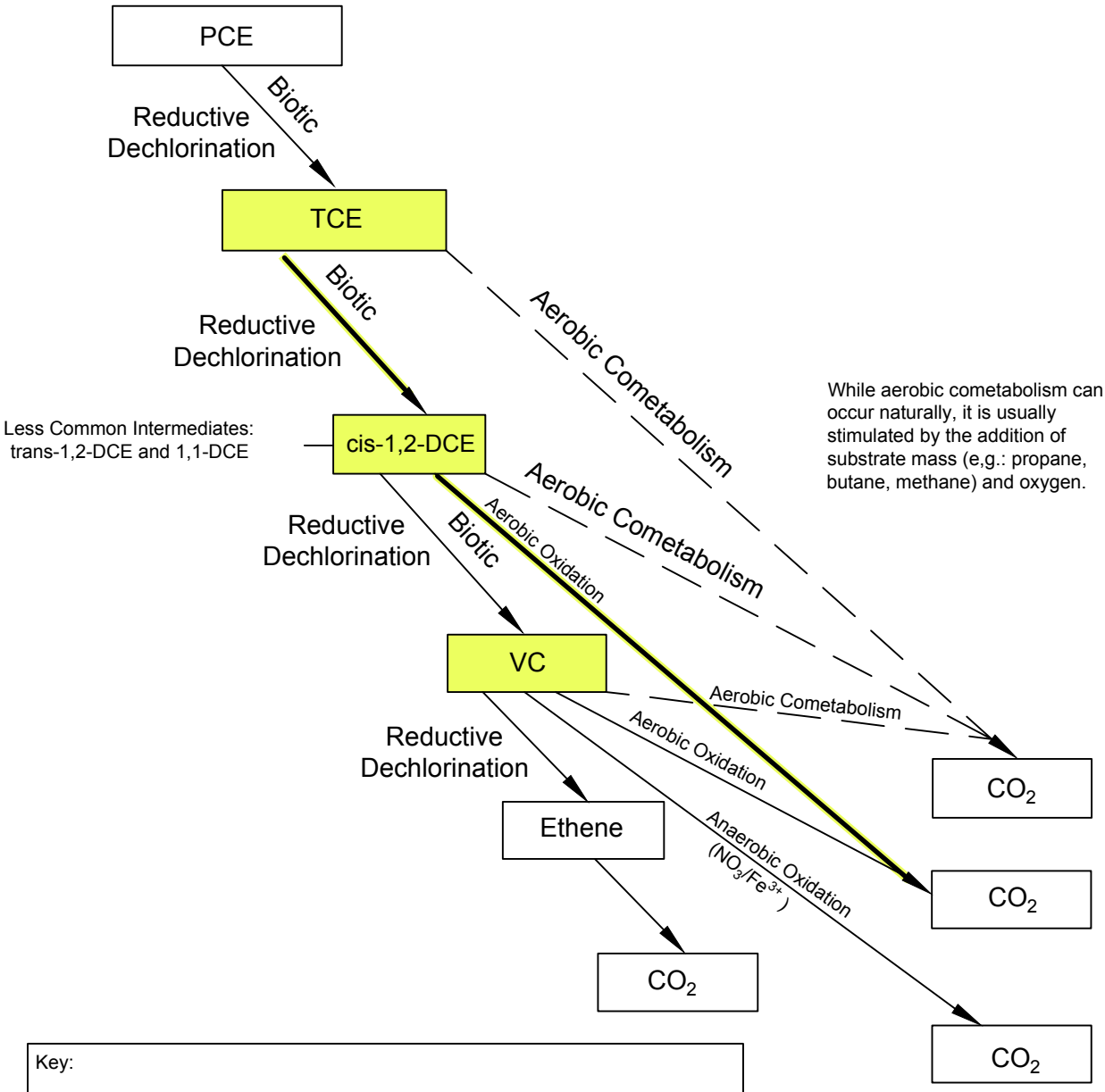
FILE NO.: 268280-006-024.mxd

Plot Date: 11/6/2018, 15:11:01 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\Lemberger\Landfill\2017_268280\268280-006-024.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS

PLOT DATA
Drawing Name: J:\Lemberger\226573 - 2015 Eng Services\0000\000009\ 226573.0000.09.01.DWG
Operator Name: REIS, ANNE Plot Date: OCTOBER 10, 2018 - 1:40PM Attached Xref's:
Drawing Size: 8.5x11 Layout: FIGURE 25 Attached Images:



Key:

DCE - Dichloroethene
PCE - Tetrchloroethene
TCE - Trichloroethene
VC - Vinyl Chloride

Processes indicated by lines that point to the left of compound are abiotic chemical reactions, while those that point to the right involve biotic degradation.

Reference: US EPA (1998)

Note: Thicker lines denote the most common pathway. Highlighted items show degradation pathways with evidence from site geochemistry.

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Phone: 608.826.3600

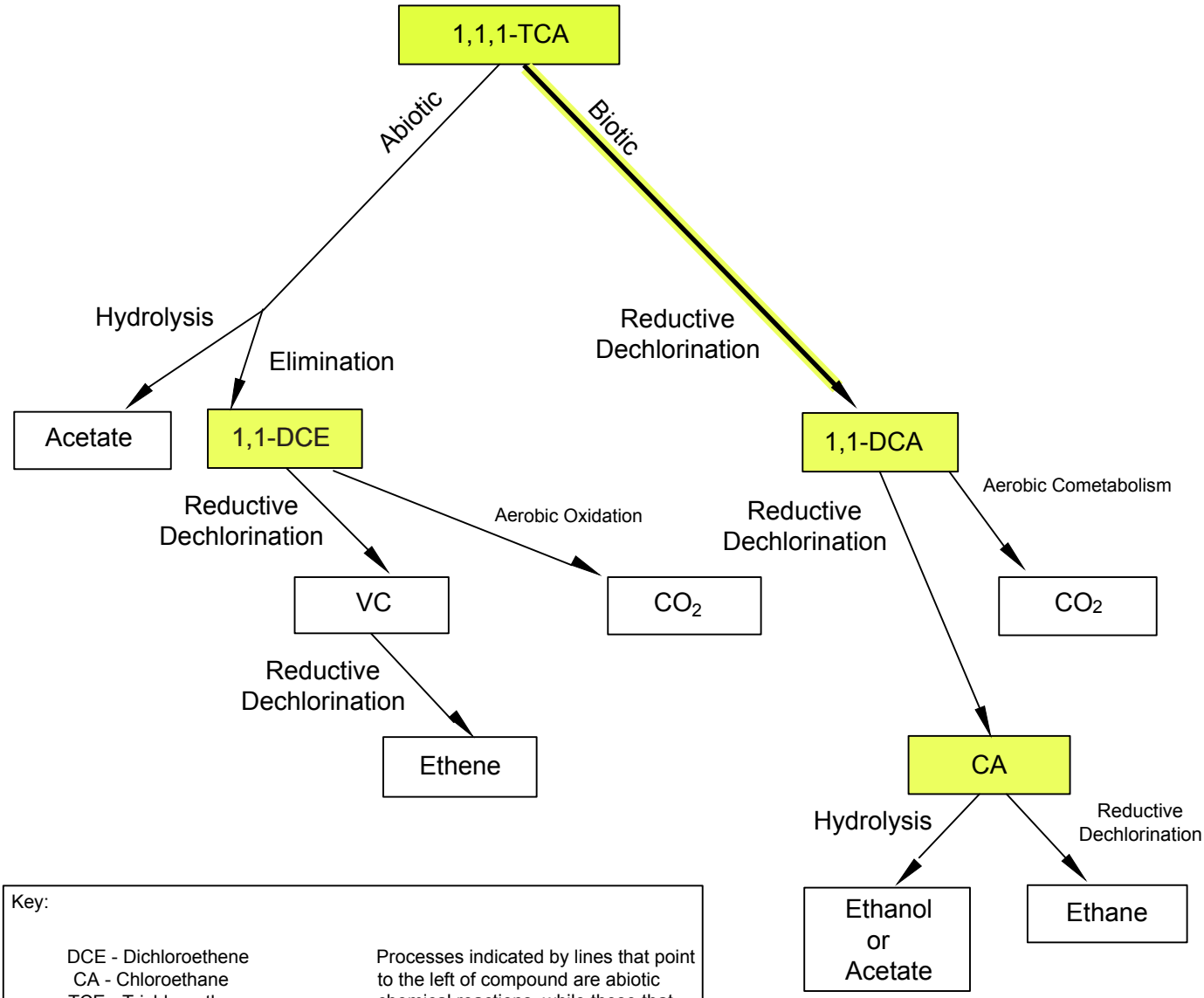
PROJECT:
LEMBERGER TRANSPORT AND RECYCLING SITE
TOWN OF FRANKLIN, WISCONSIN

TITLE:
COMMON DEGRADATION PATHWAYS FOR CHLORINATED ETHENES

DRAWN BY:	AREIS
CHECKED BY:	MW
APPROVED BY:	JW
DATE:	NOVEMBER 2018
PROJ. NO.:	226573.0000 000009
FILE:	226573.0000.09.01.DWG

FIGURE 28

PLOT DATA
Drawing Name: J:\Lemberger\226573 - 2015 Eng Services\0000\000009\ 226573.0000.09.02.DWG
Operator Name: REIS, ANNE Plot Date: OCTOBER 10, 2018 - 1:10 PM Attached Xref's:
Drawing Size: 8.5x11 Layout: FIGURE 24 Attached Images:



Key:

DCE - Dichloroethene
CA - Chloroethane
TCE - Trichloroethene
VC - Vinyl Chloride

Processes indicated by lines that point to the left of compound are abiotic chemical reactions, while those that point to the right involve biotic degradation.

Reference: US EPA (1998)

Note: Thicker lines denote the most common pathway. Highlighted items show degradation pathways with evidence from site geochemistry.

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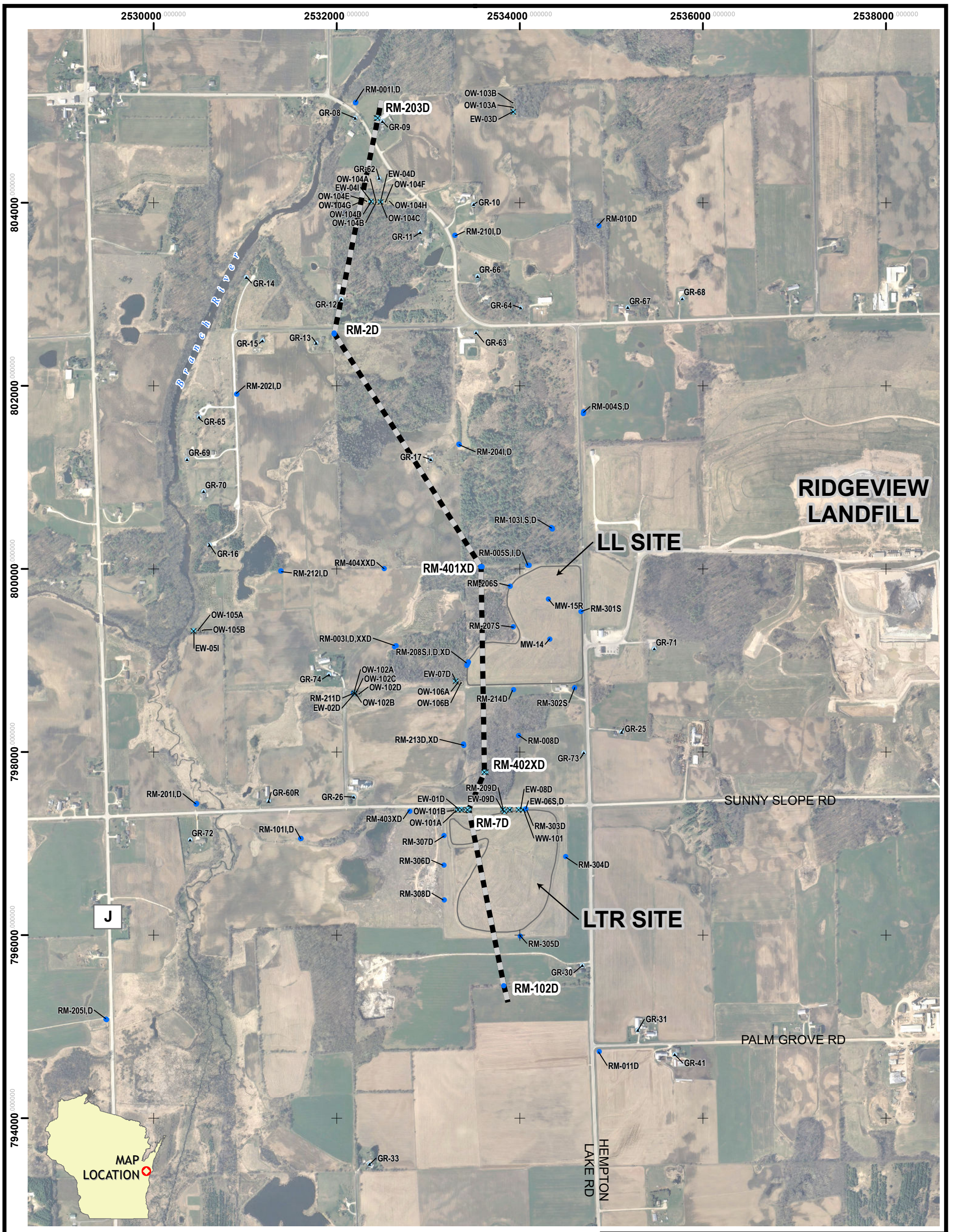
PROJECT:
LEMBERGER TRANSPORT AND RECYCLING SITE
TOWN OF FRANKLIN, WISCONSIN

TITLE:
COMMON DEGRADATION PATHWAYS FOR CHLORINATED ETHANES

DRAWN BY:	A. REIS
CHECKED BY:	MW
APPROVED BY:	JW
DATE:	NOVEMBER 2018
PROJ. NO.:	226573.0000 000009
FILE:	226573.0000.09.02.DWG

FIGURE 29



LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- LANDFILL AREA
- PROFILE 1

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. MAP COORDINATES ARE WISCONSIN STATE PLANE, SOUTH ZONE, NAD 83, US SURVEY FOOT.

0 1,000 FEET

1 " = 1,000 ' 1:12,000

N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT
SHEET TITLE:	PROFILE LOCATOR PROFILE 1 - PLUME CENTERLINE

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-026.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	FIGURE 30
DATE:	NOVEMBER 2018		

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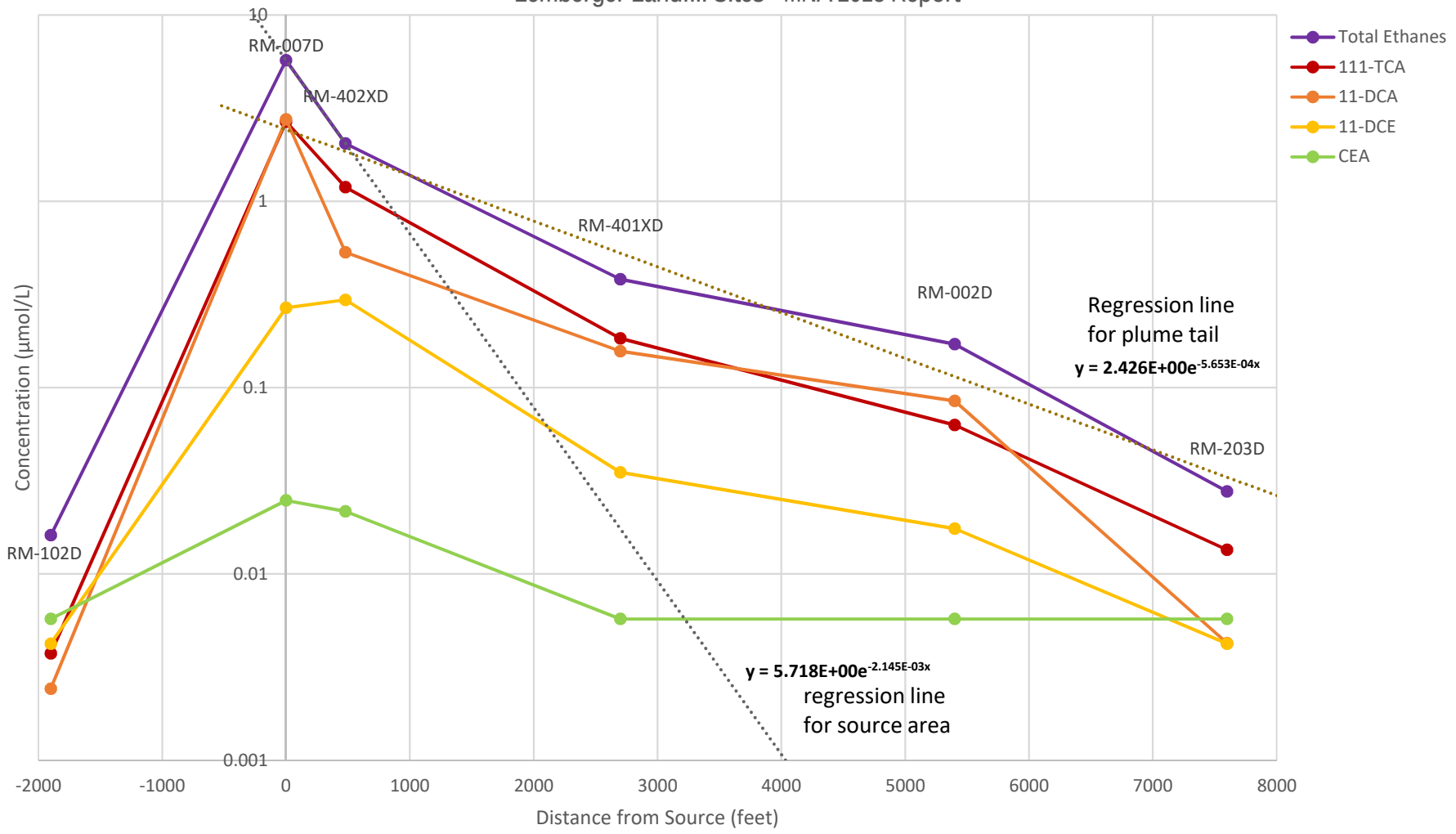
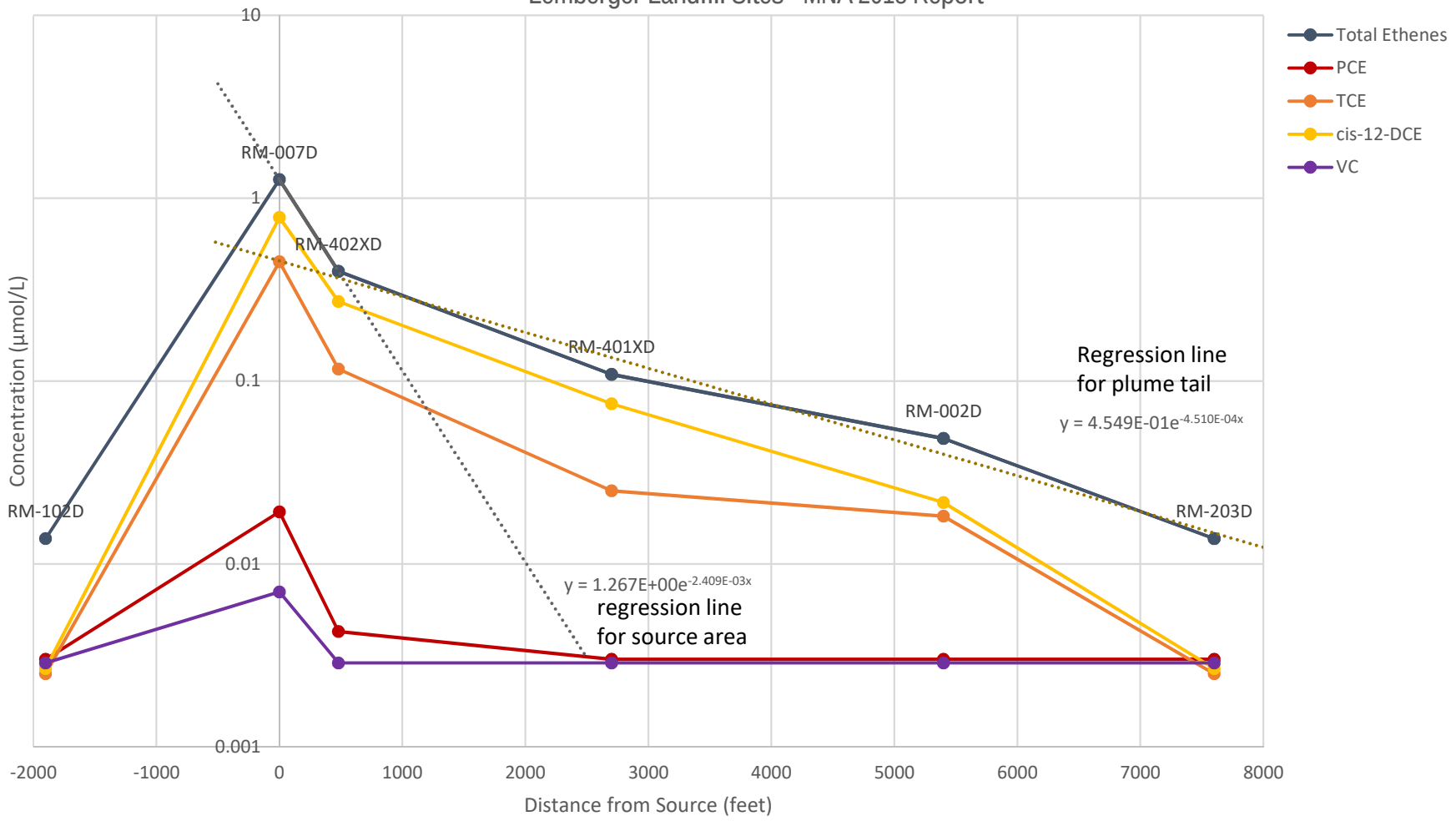
E:\LembergerLandfill\2017_268280\268280-006-026.mxd 11/06/2018 12:35:51 PM

Figure 31
CVOC Concentration vs. Distance Total Ethanes
Q3 2017 Data - Profile 1 (Plume Centerline)
Lemberger Landfill Sites - MNA 2018 Report



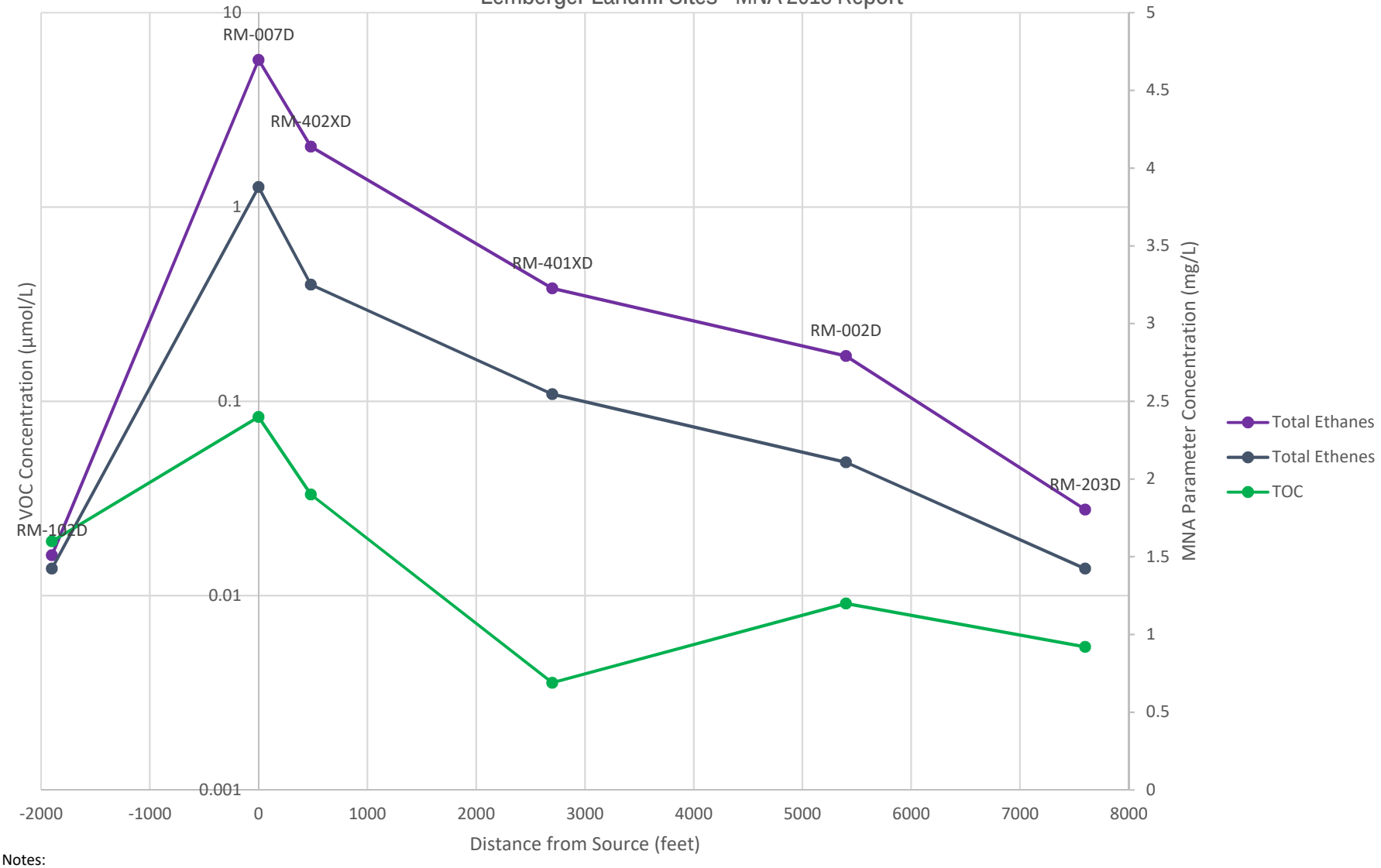
Notes:
"Total Ethanes" is a total of detected concentrations of 111-TCA, 11-DCA, 11-DCE, and CEA. Non-detects were treated as "zero" values for the total ethane calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Figure 32
CVOC Concentration vs. Distance Total Ethenes
Q3 2017 Data - Profile 1 (Plume Centerline)
Lemberger Landfill Sites - MNA 2018 Report



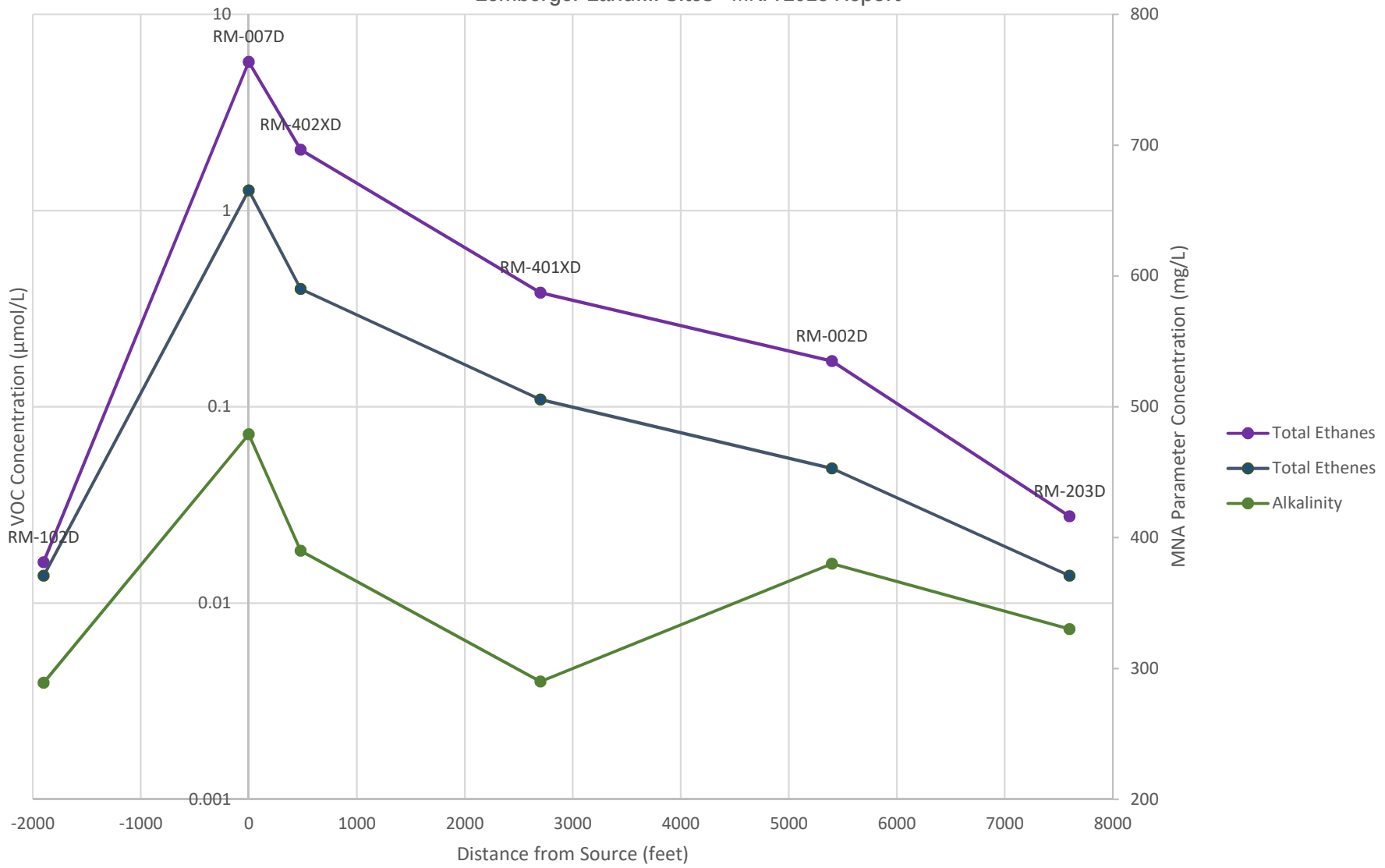
Notes:
"Total Ethenes" is a total of detected concentrations of PCE, TCE, cis-12-DCE, and VC. Non-detects were treated as "zero" values for the total ethene calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Figure 33
CVOC and Total Organic Carbon Concentration vs. Distance
Q3 2017 Data - Profile 1
Lemberger Landfill Sites - MNA 2018 Report



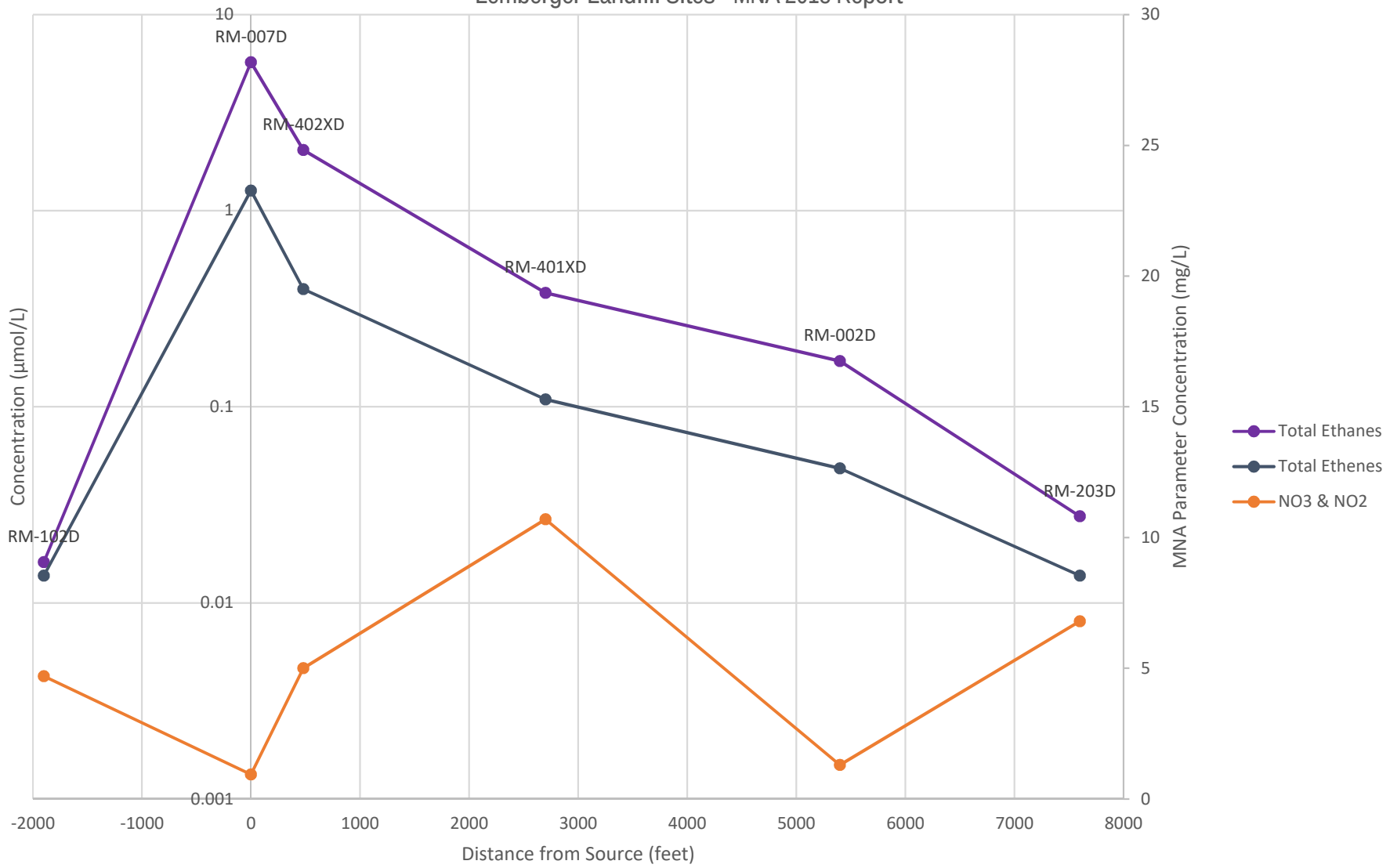
Notes:

Figure 34
CVOC and Alkalinity Concentration vs. Distance
Q3 2017 Data - Profile 1
Lemberger Landfill Sites - MNA 2018 Report



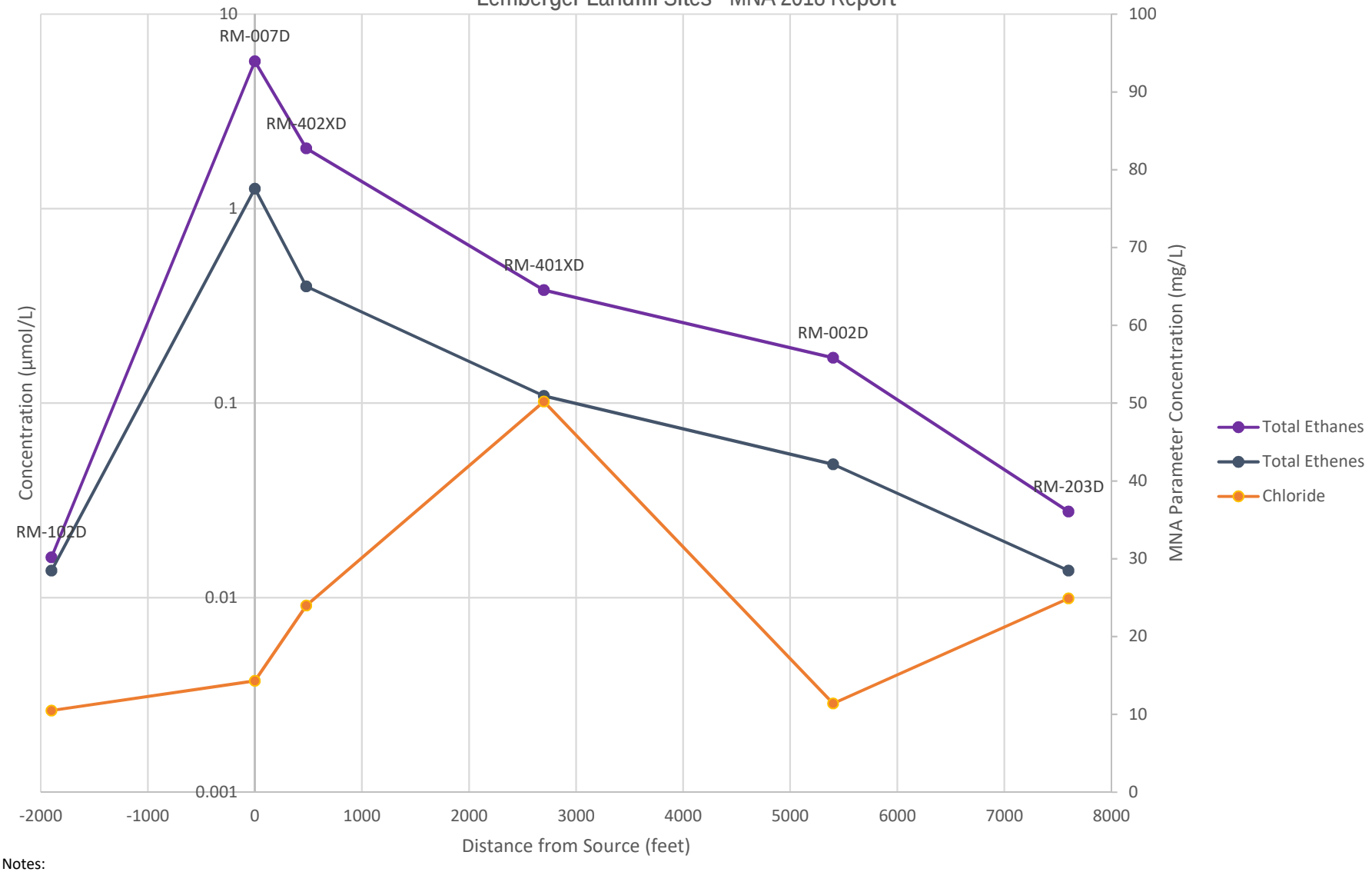
Notes:

Figure 35
CVOC and Nitrogen (as NO_3 + NO_2) Concentration vs. Distance
Q3 2017 Data - Profile 1
Lemberger Landfill Sites - MNA 2018 Report



Notes:

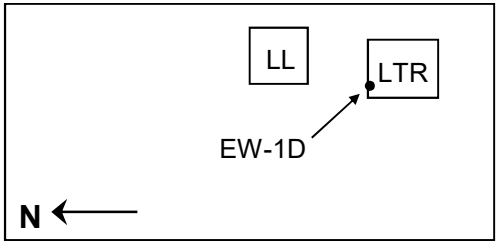
Figure 36
CVOC and Chloride Concentration vs. Distance
Q3 2017 Data - Profile 1
Lemberger Landfill Sites - MNA 2018 Report

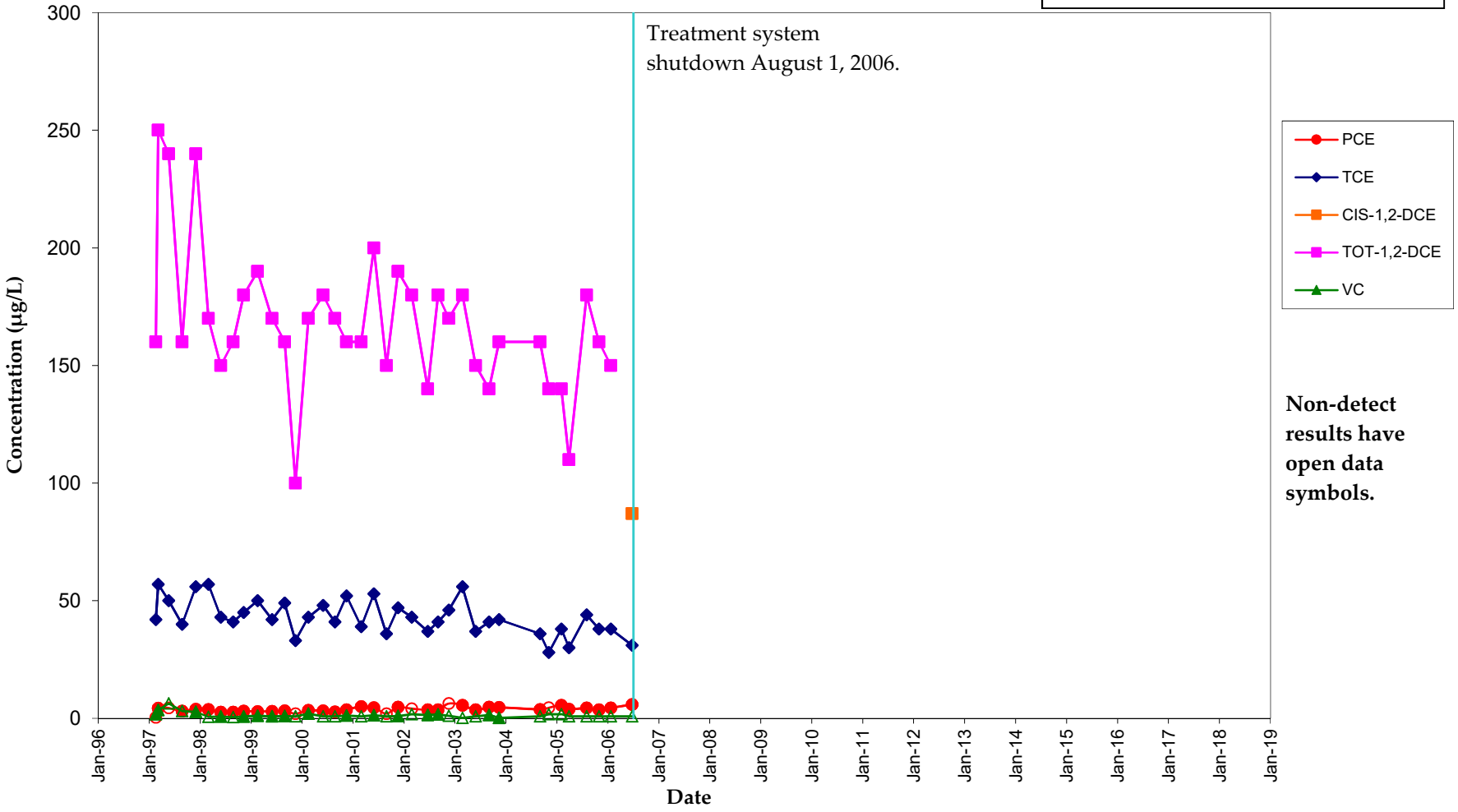


Notes:

Appendix A
CVOC Concentration-Time Graphs

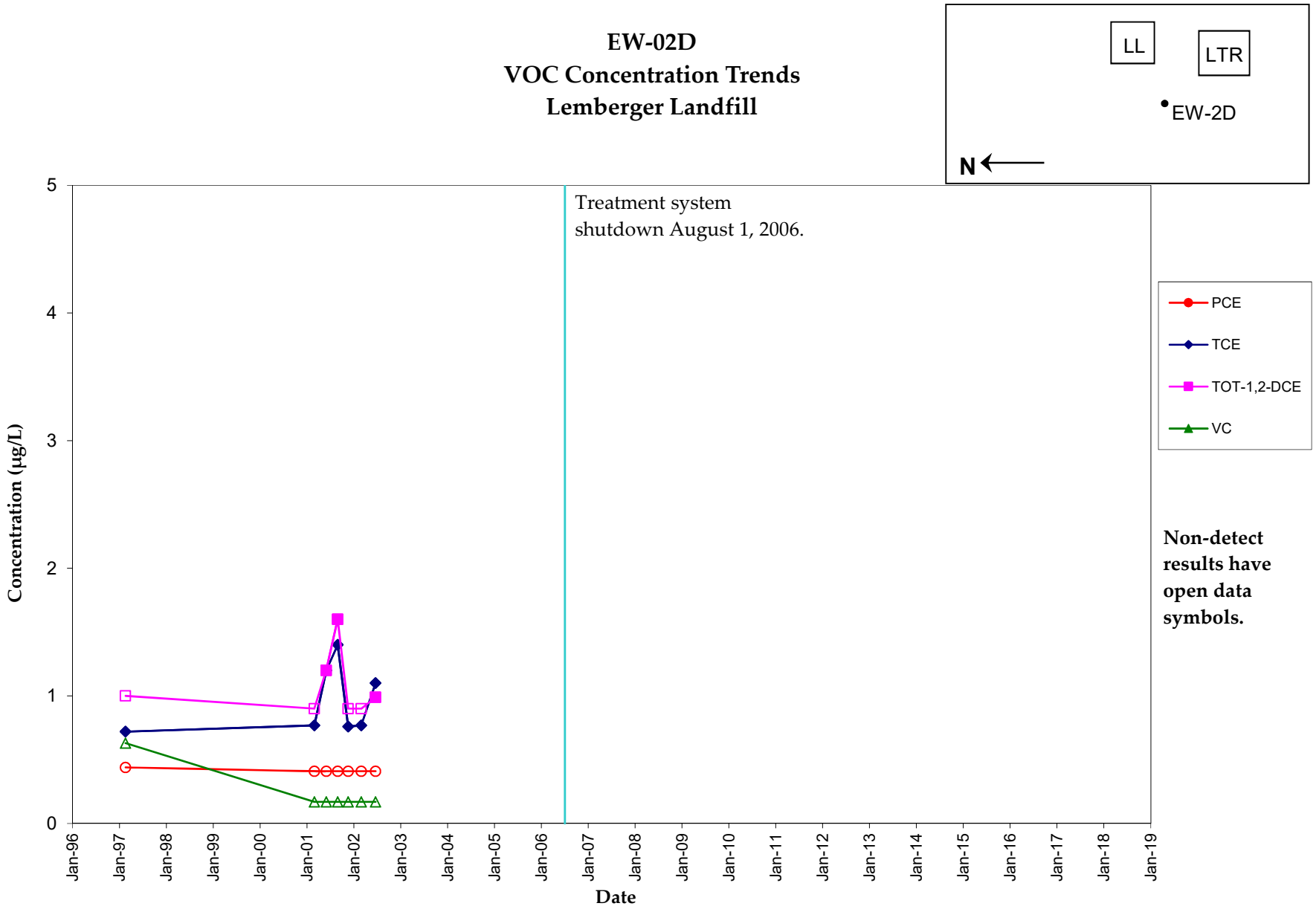
EW-01D
VOC Concentration Trends
Lemberger Landfill



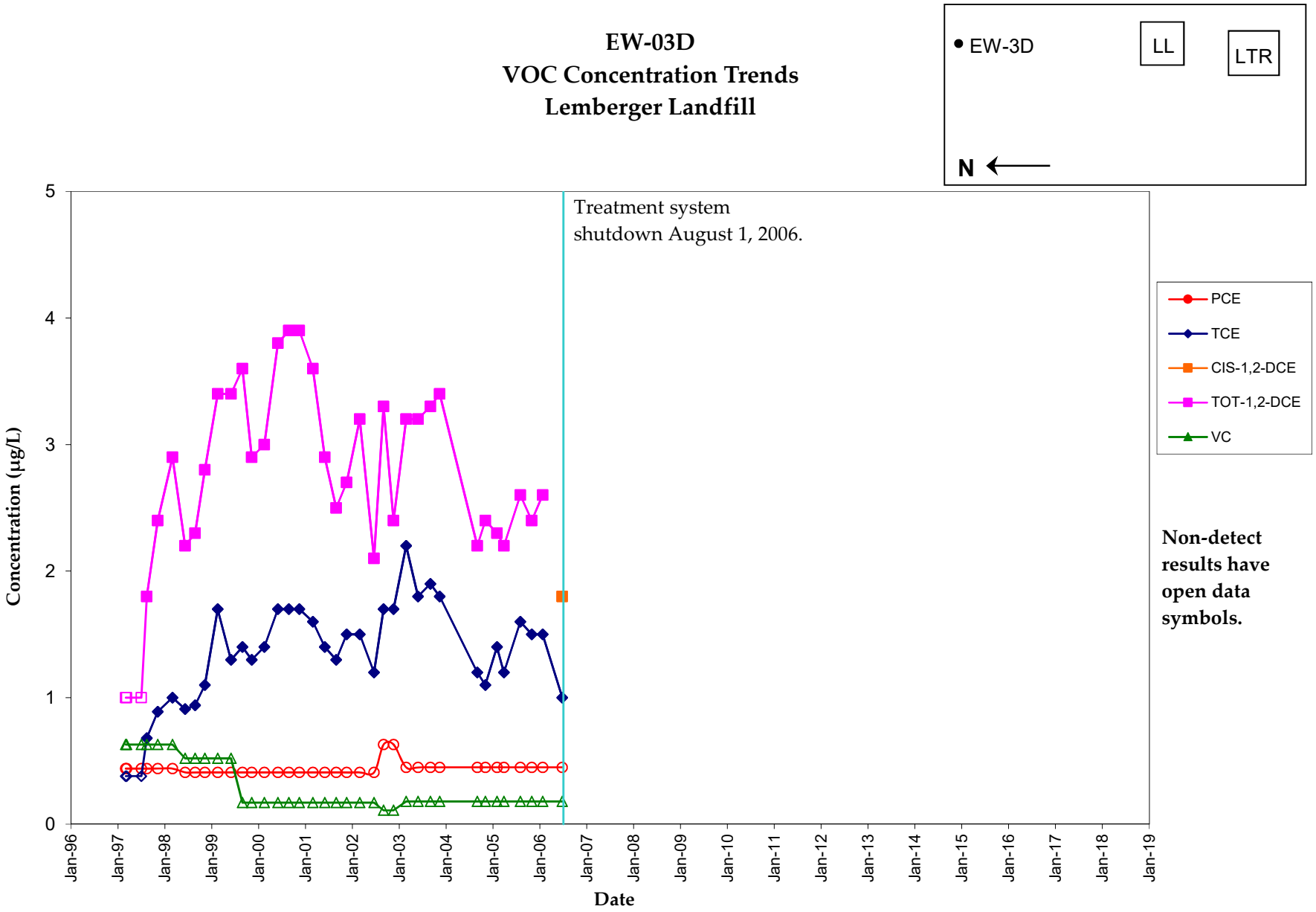


Non-detect results have open data symbols.

EW-02D
VOC Concentration Trends
Lemberger Landfill

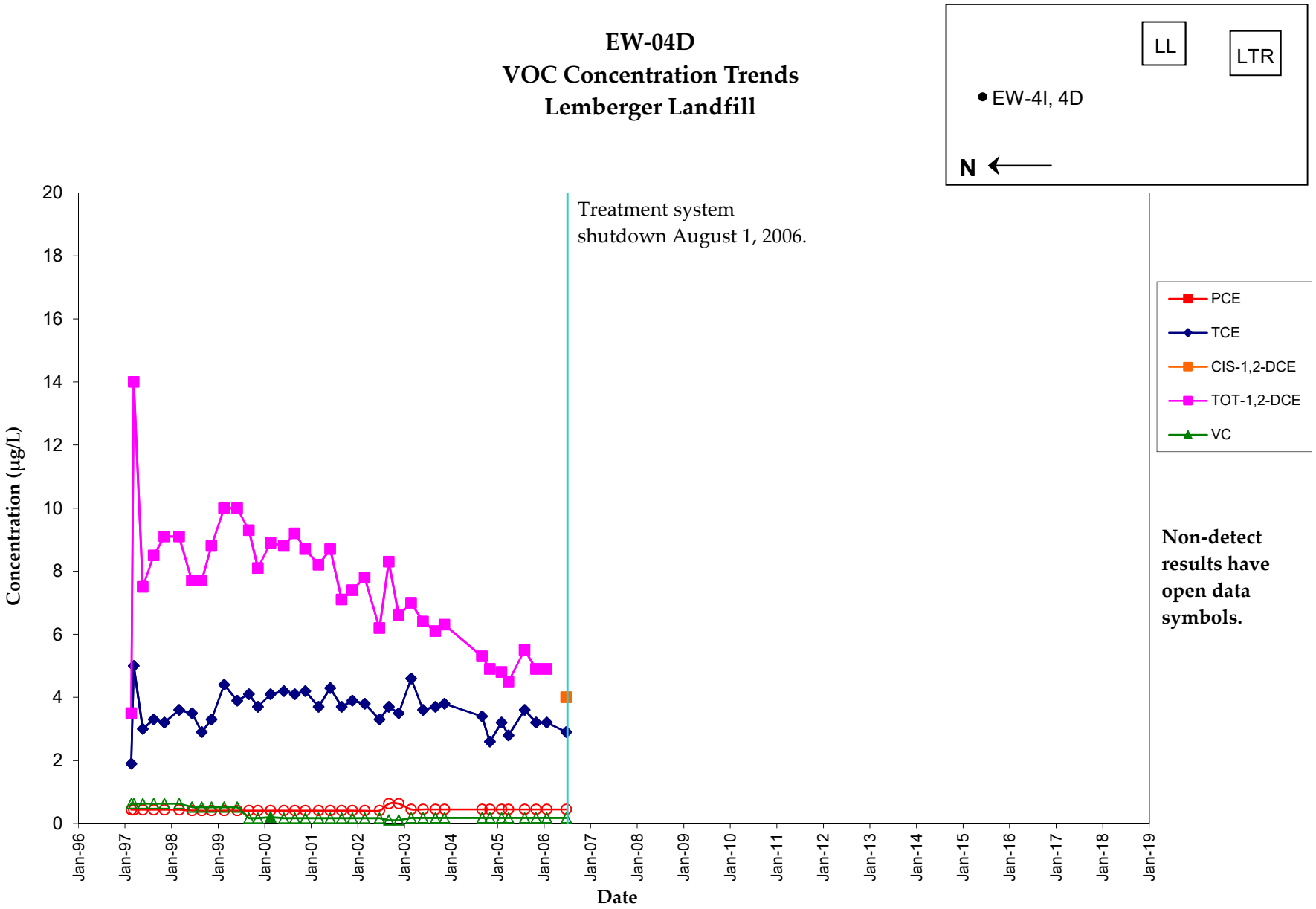


EW-03D
VOC Concentration Trends
Lemberger Landfill



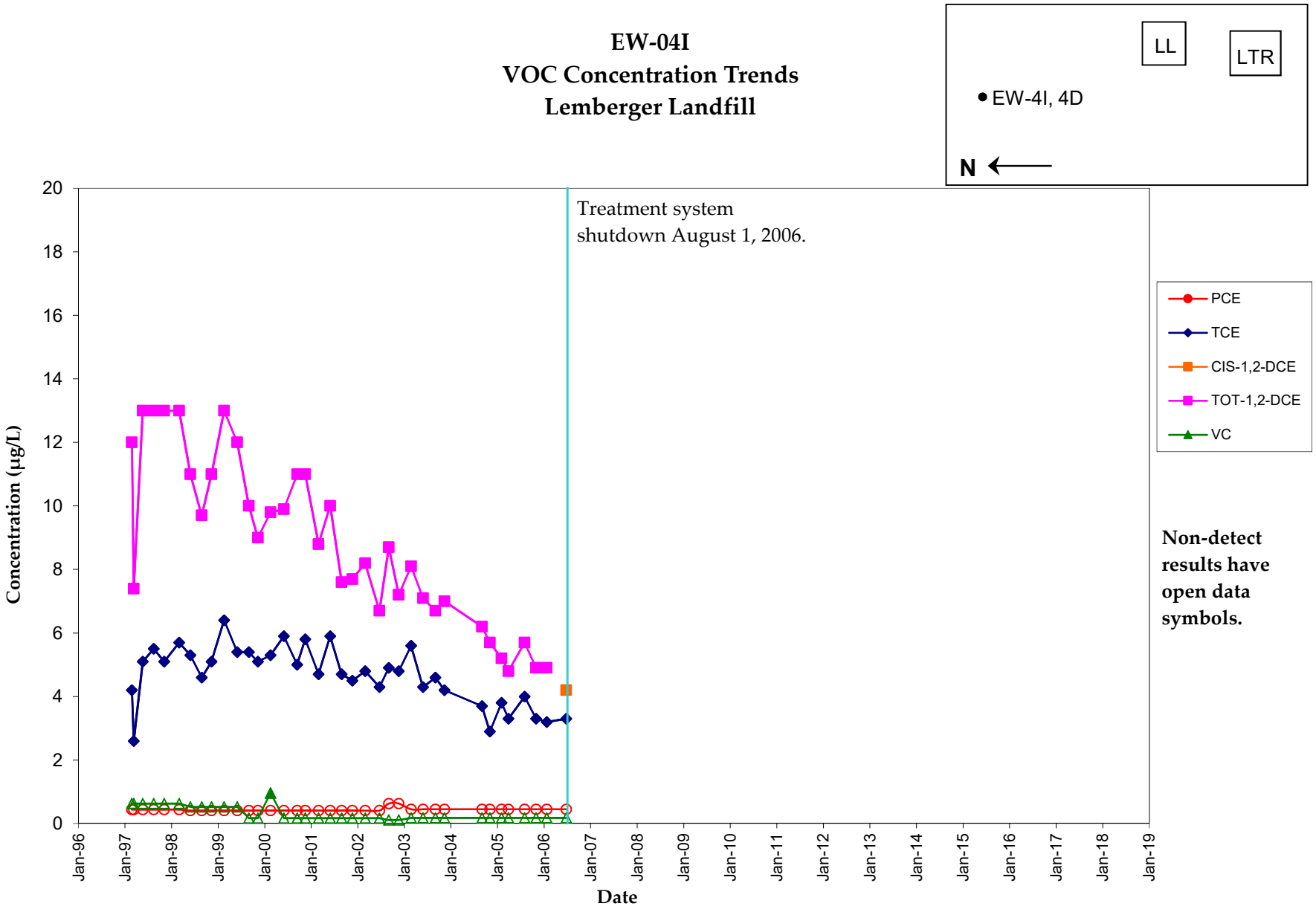
Non-detect results have open data symbols.

EW-04D
VOC Concentration Trends
Lemberger Landfill



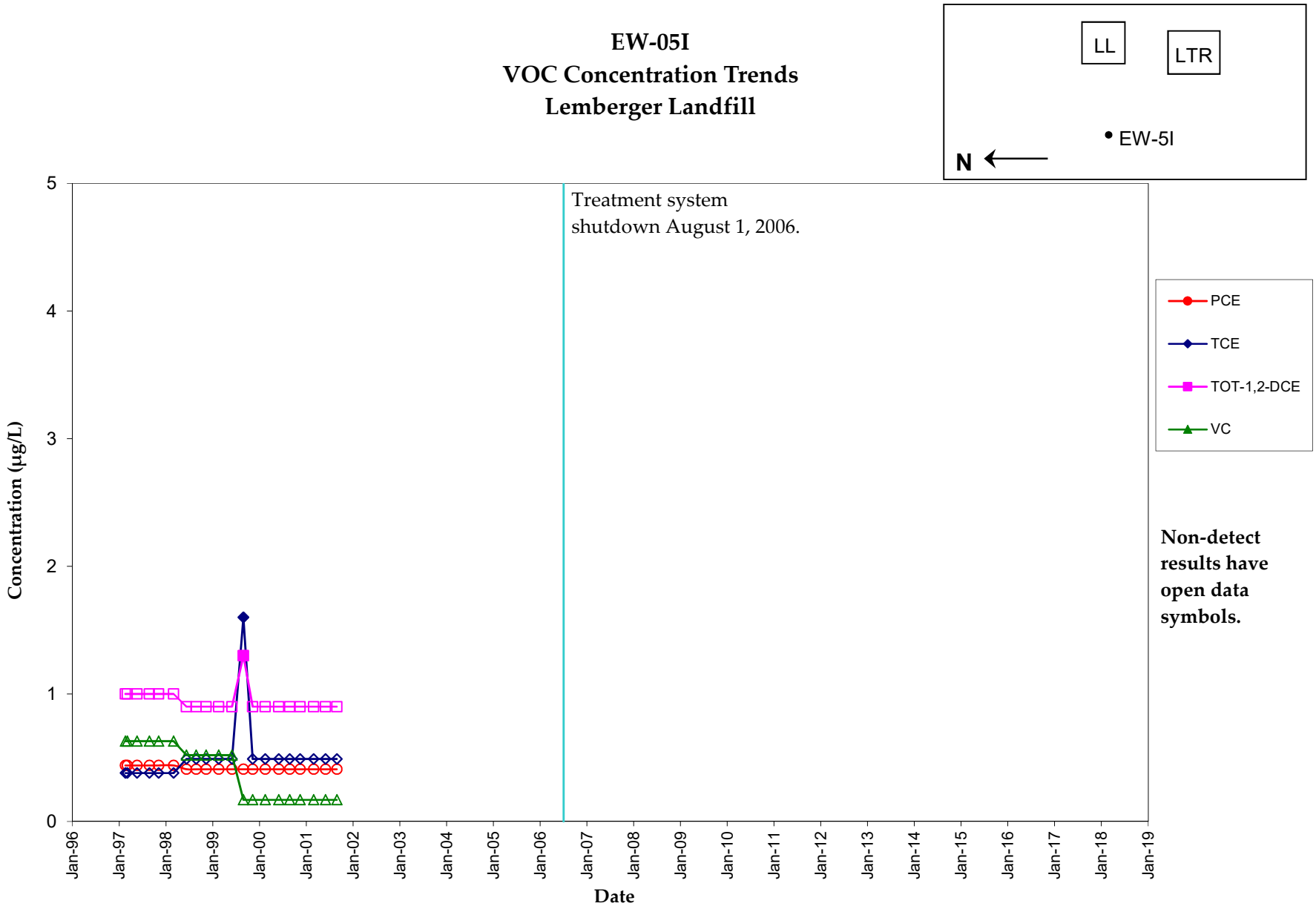
Non-detect results have open data symbols.

EW-04I
VOC Concentration Trends
Lemberger Landfill



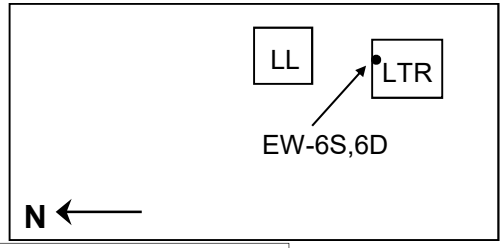
Non-detect results have open data symbols.

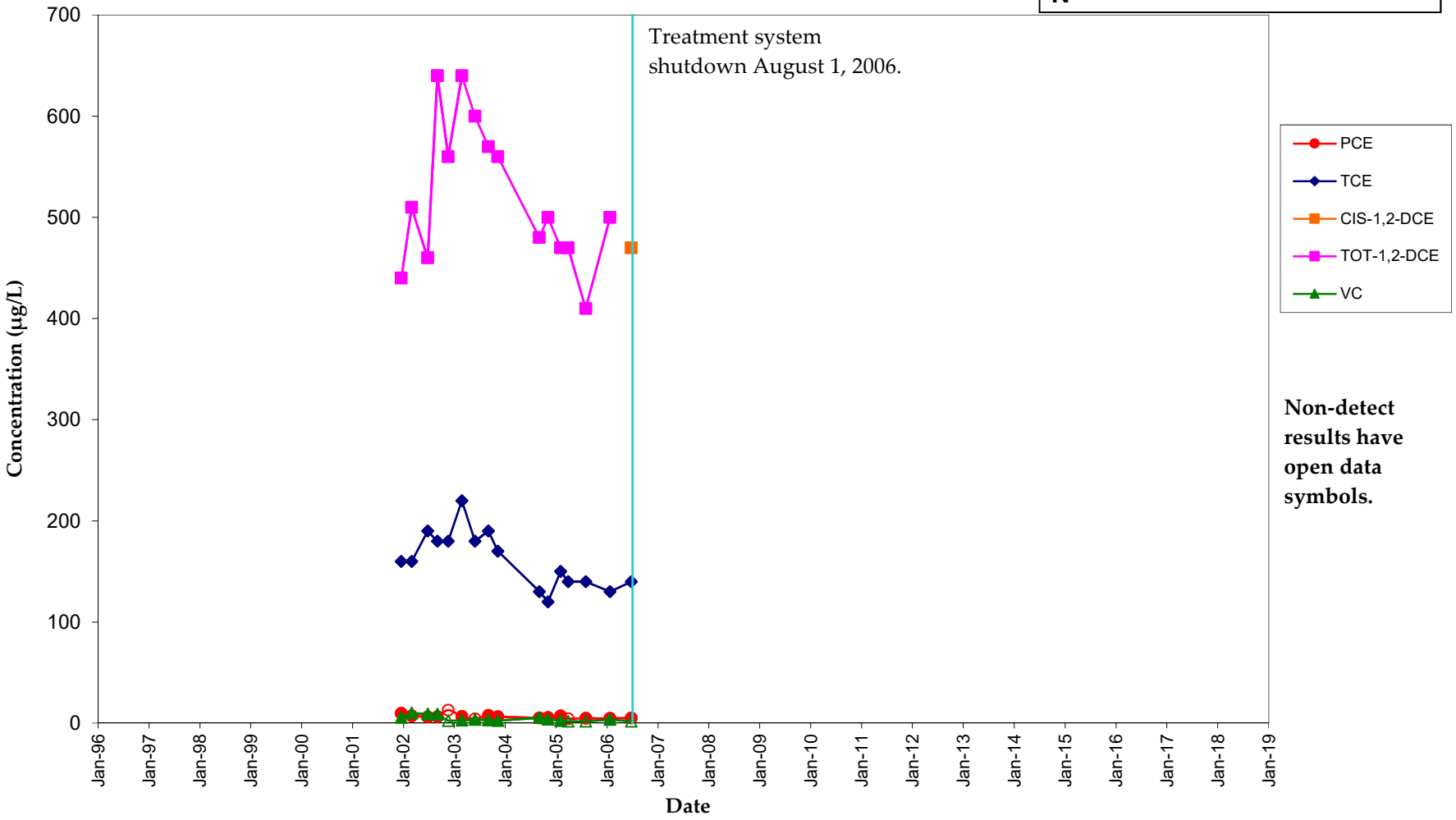
EW-05I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

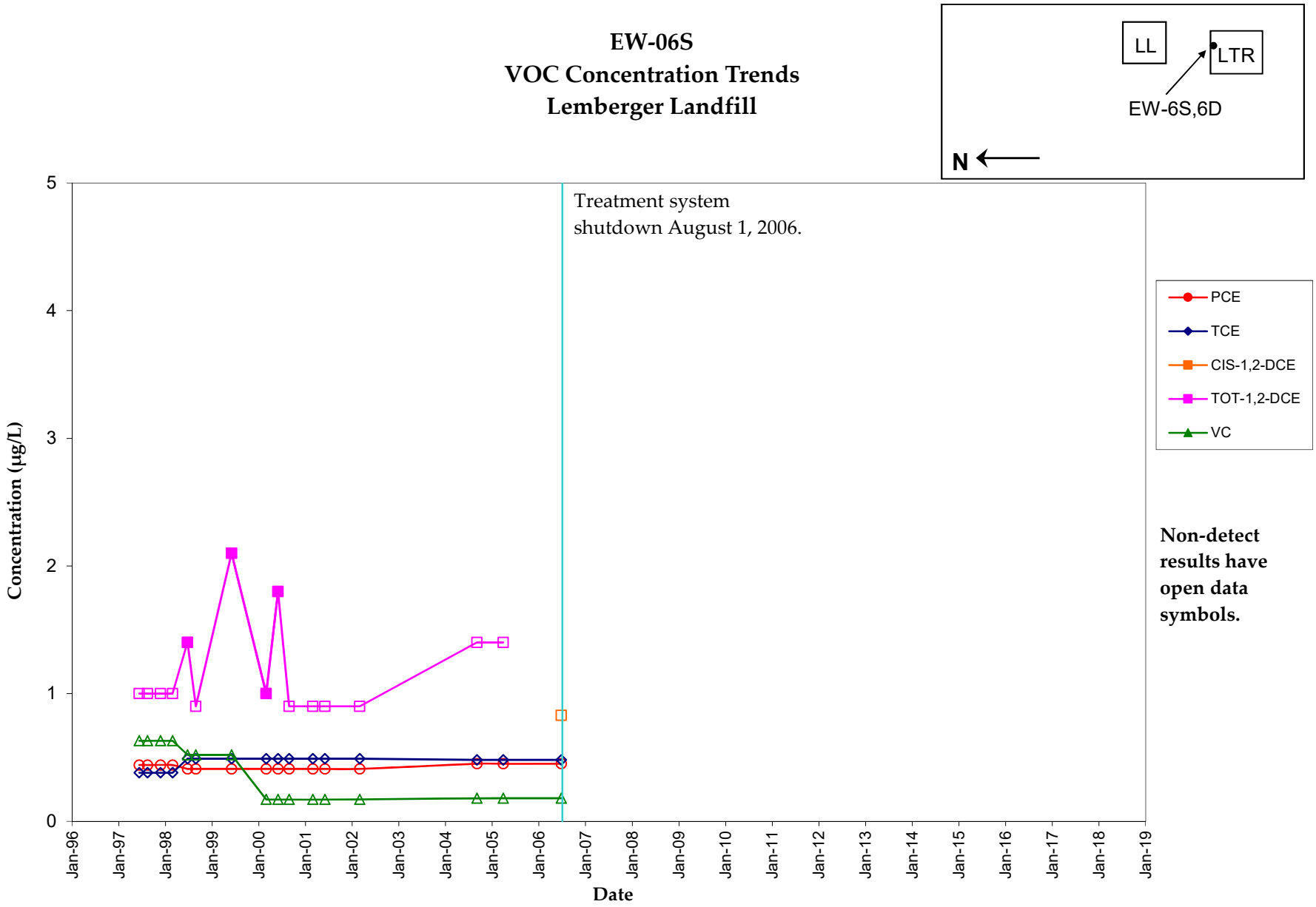
EW-06D
VOC Concentration Trends
Lemberger Landfill





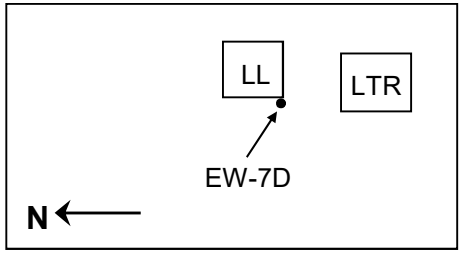
Non-detect results have open data symbols.

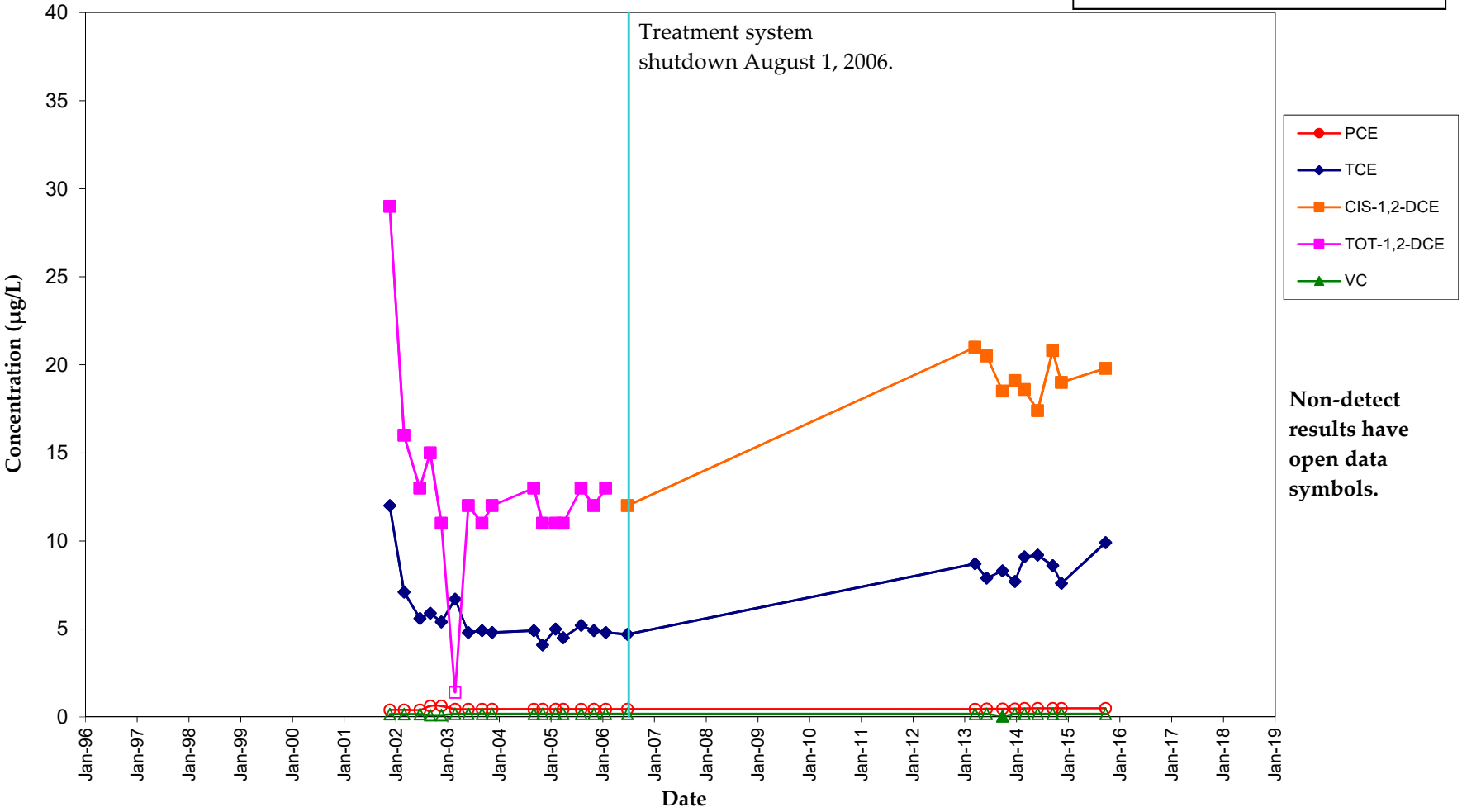
EW-06S
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

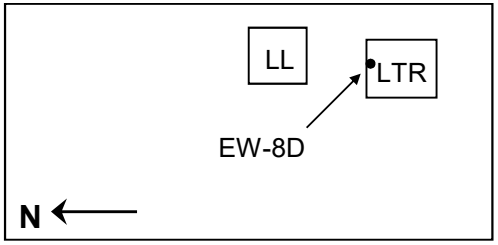
EW-07D
VOC Concentration Trends
Lemberger Landfill

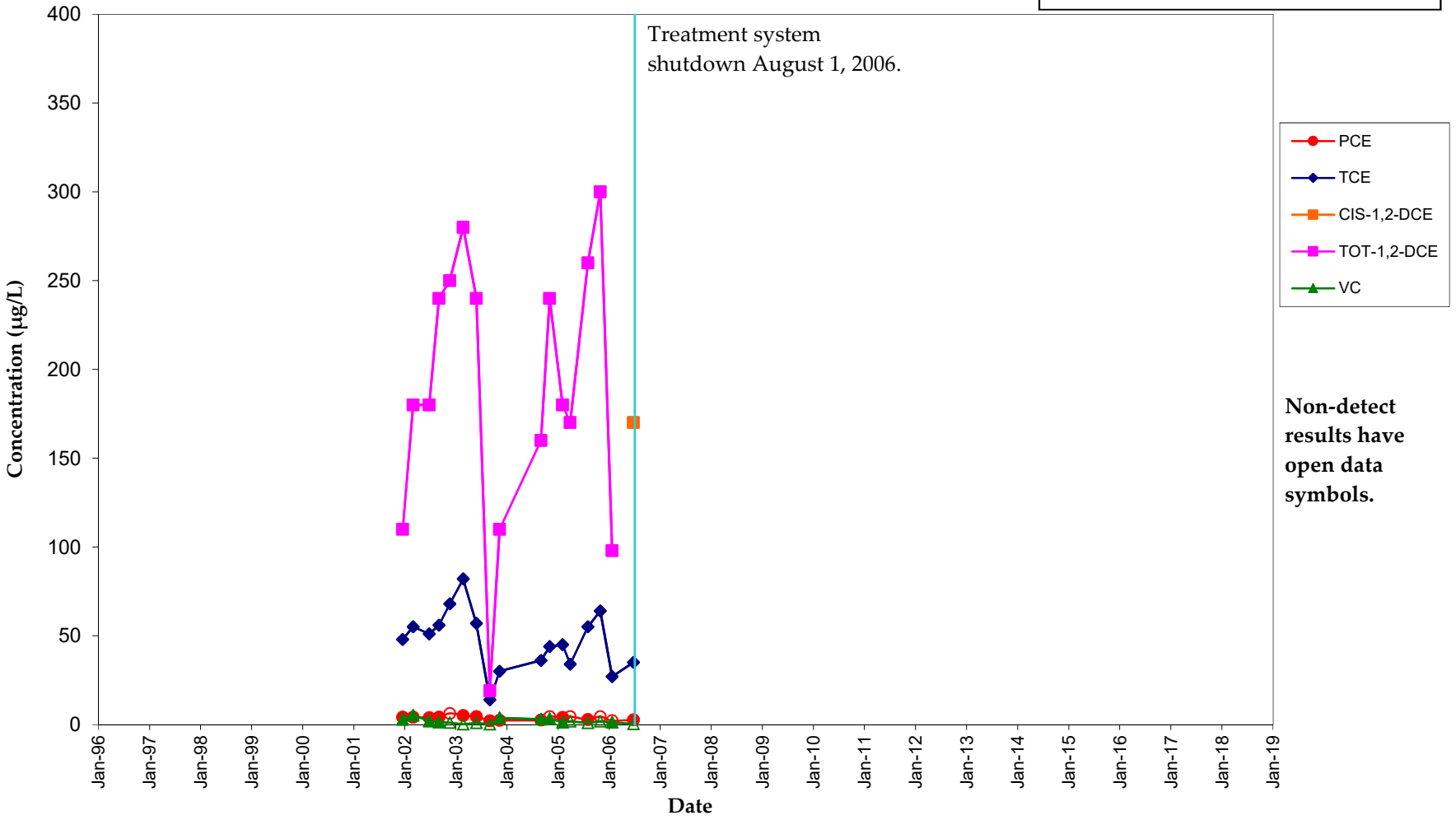




Non-detect results have open data symbols.

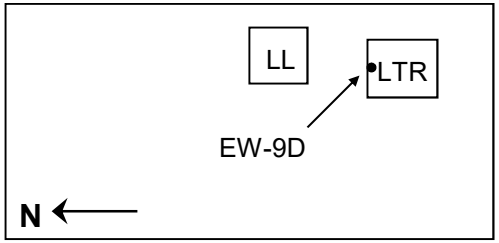
EW-08D
VOC Concentration Trends
Lemberger Landfill

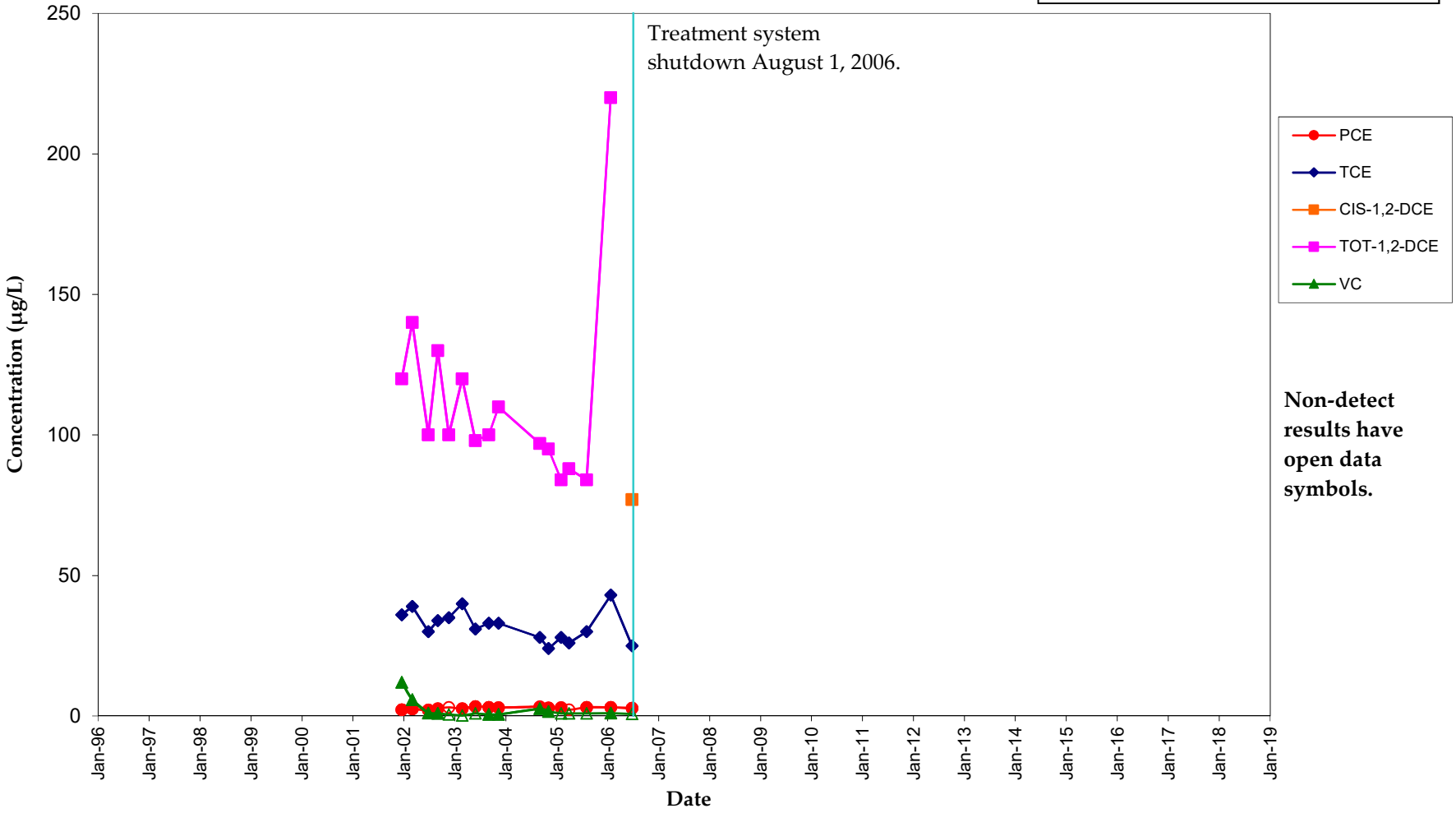




Non-detect results have open data symbols.

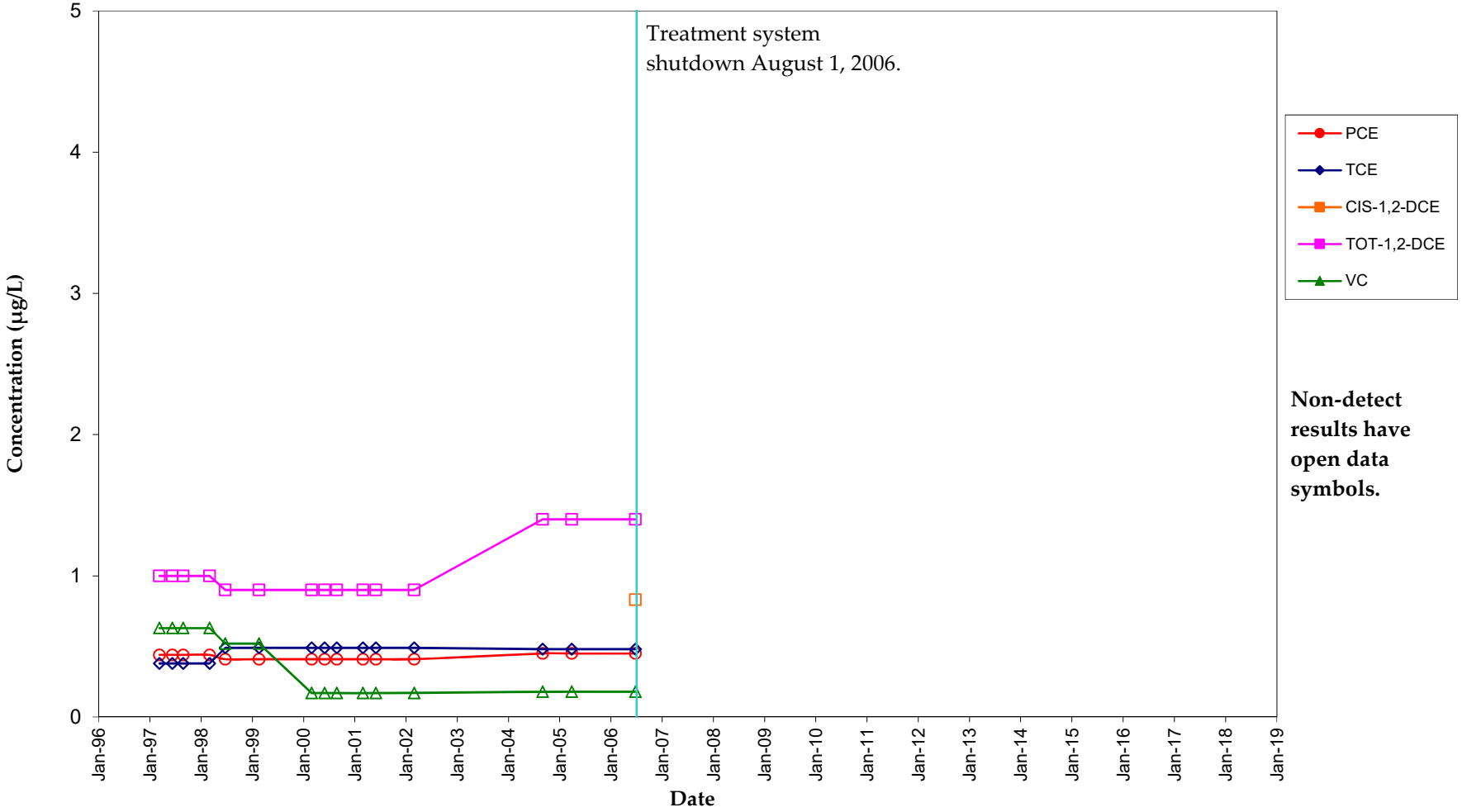
EW-09D
VOC Concentration Trends
Lemberger Landfill





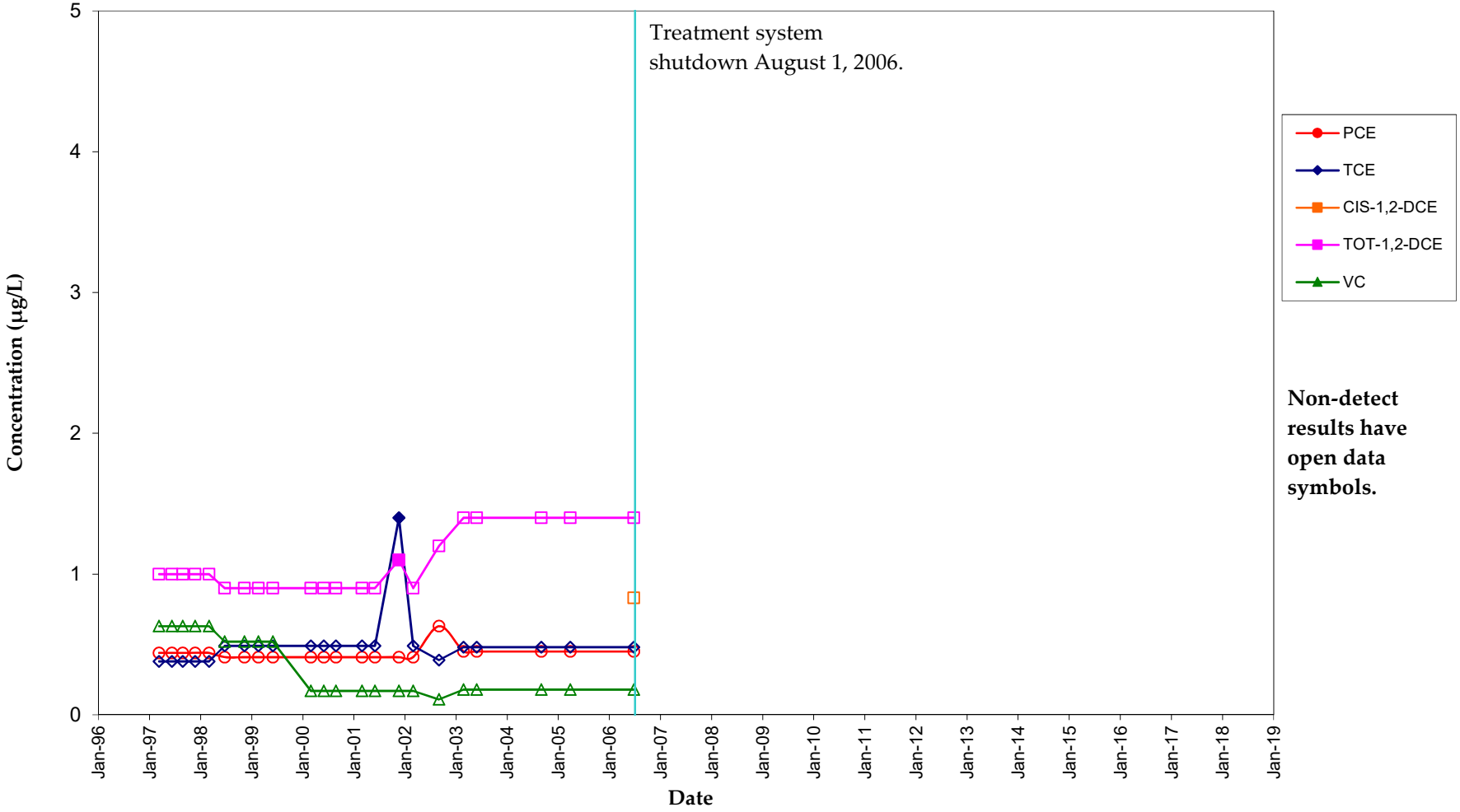
Non-detect results have open data symbols.

GWC-1
VOC Concentration Trends
Lemberger Landfill



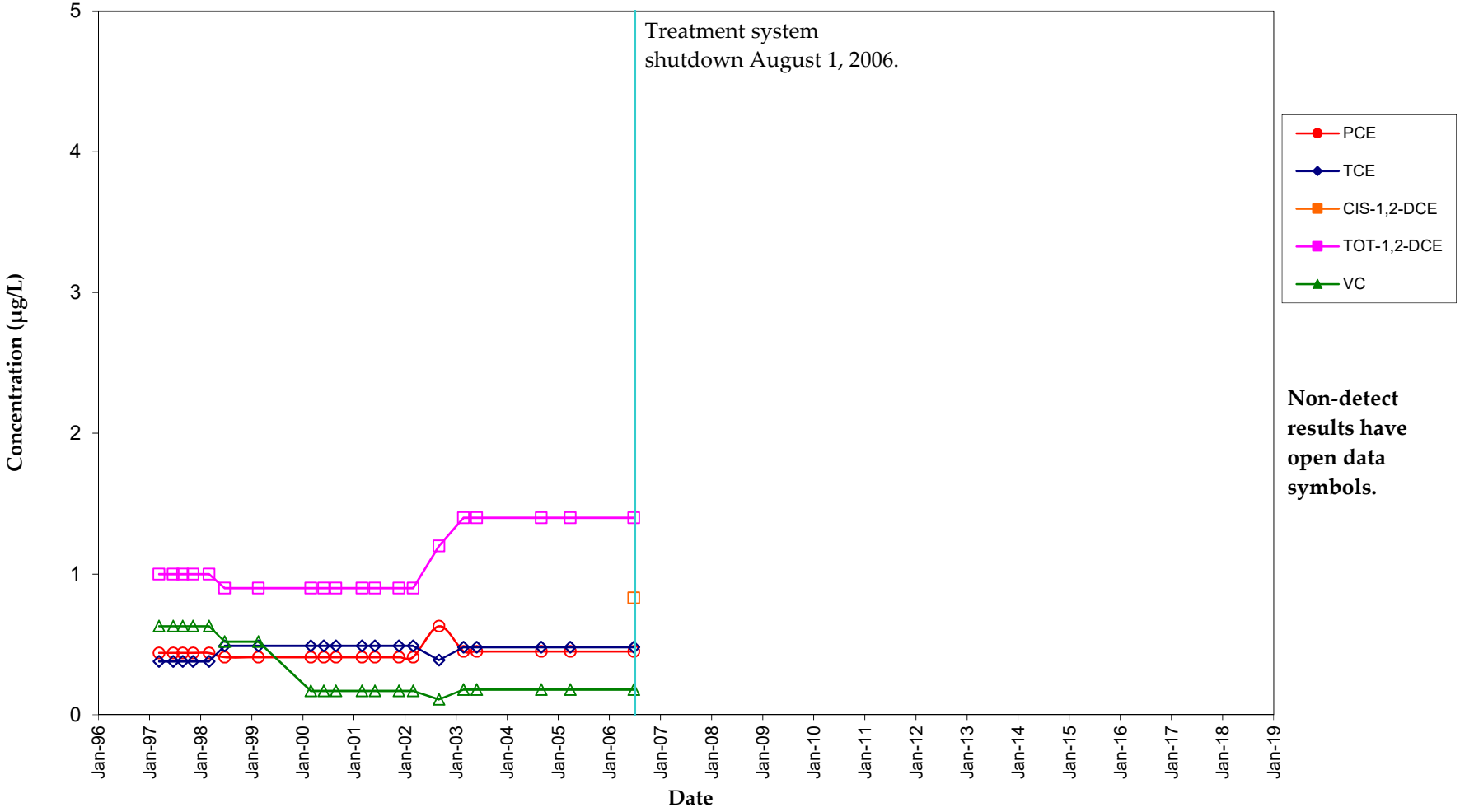
Non-detect results have open data symbols.

GWC-2
VOC Concentration Trends
Lemberger Landfill



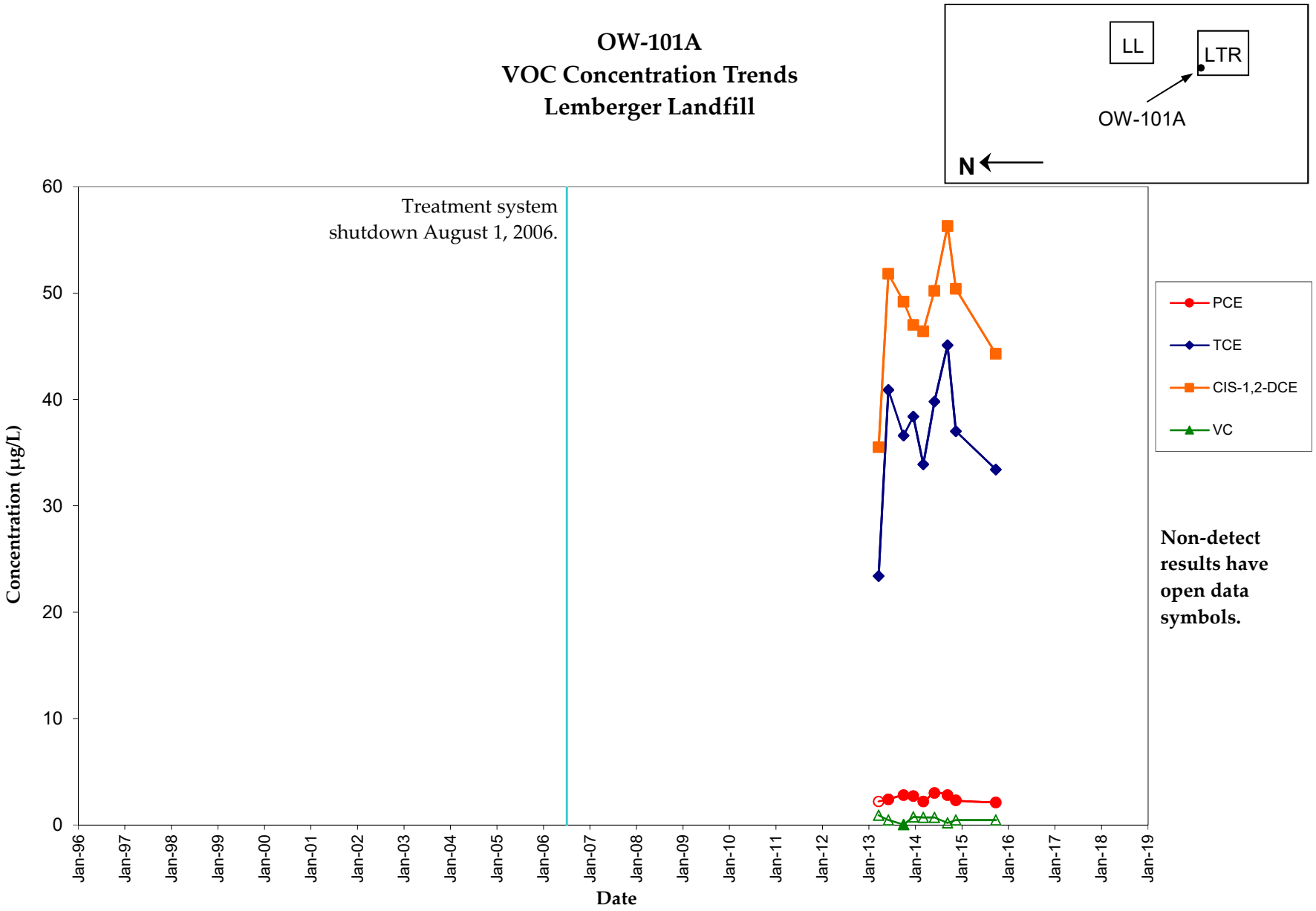
Non-detect results have open data symbols.

GWC-3
VOC Concentration Trends
Lemberger Landfill

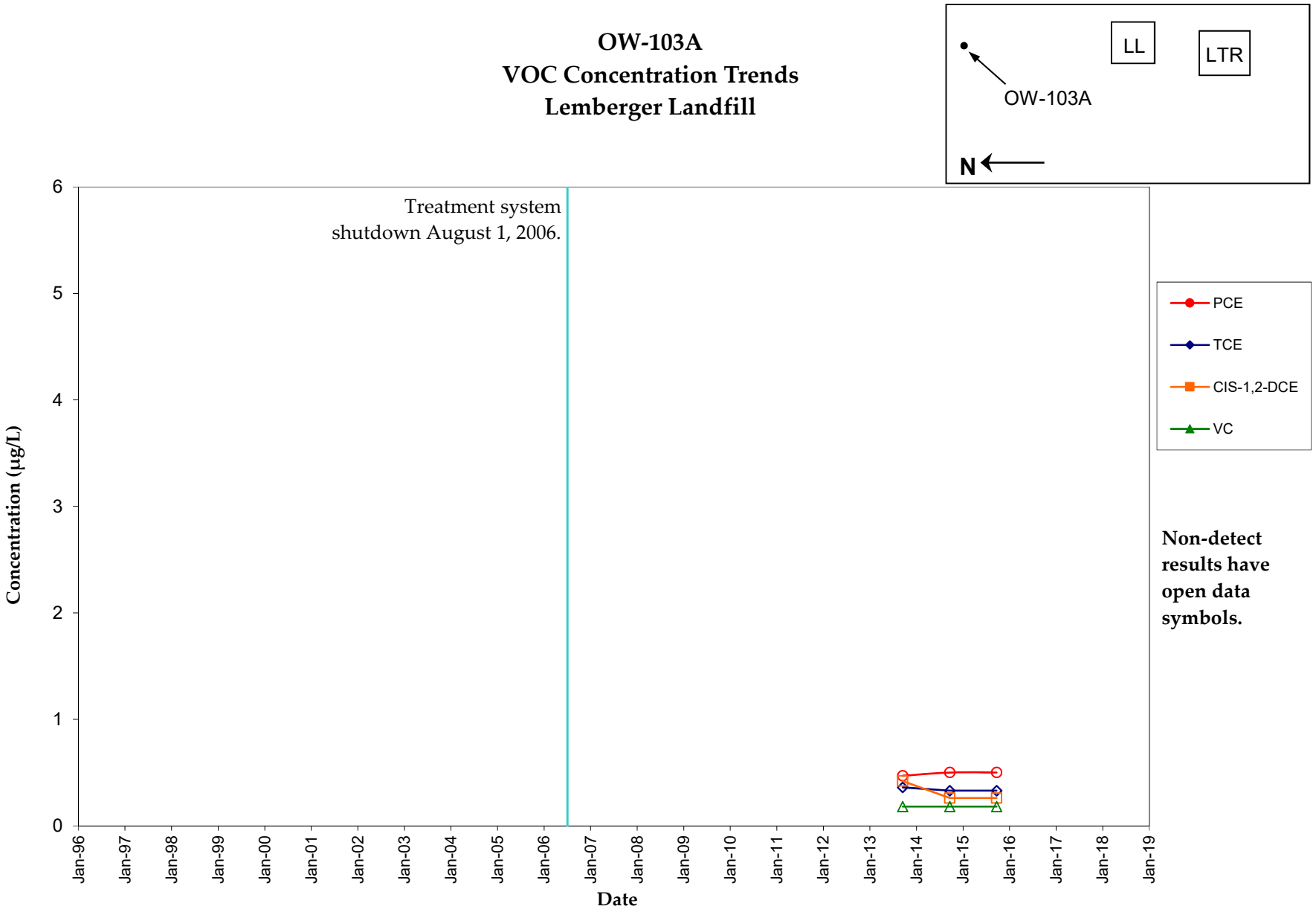


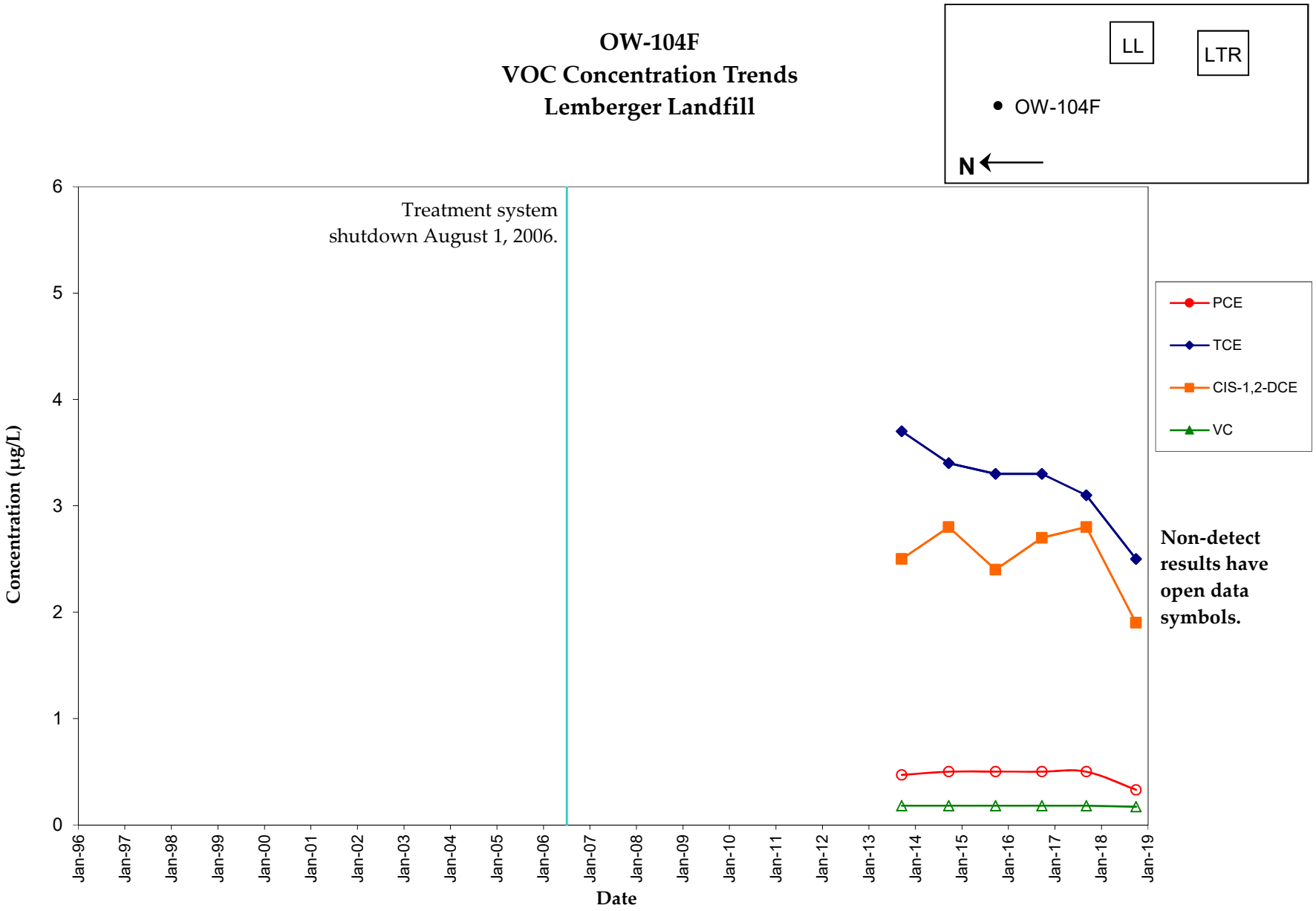
Non-detect results have open data symbols.

OW-101A
VOC Concentration Trends
Lemberger Landfill

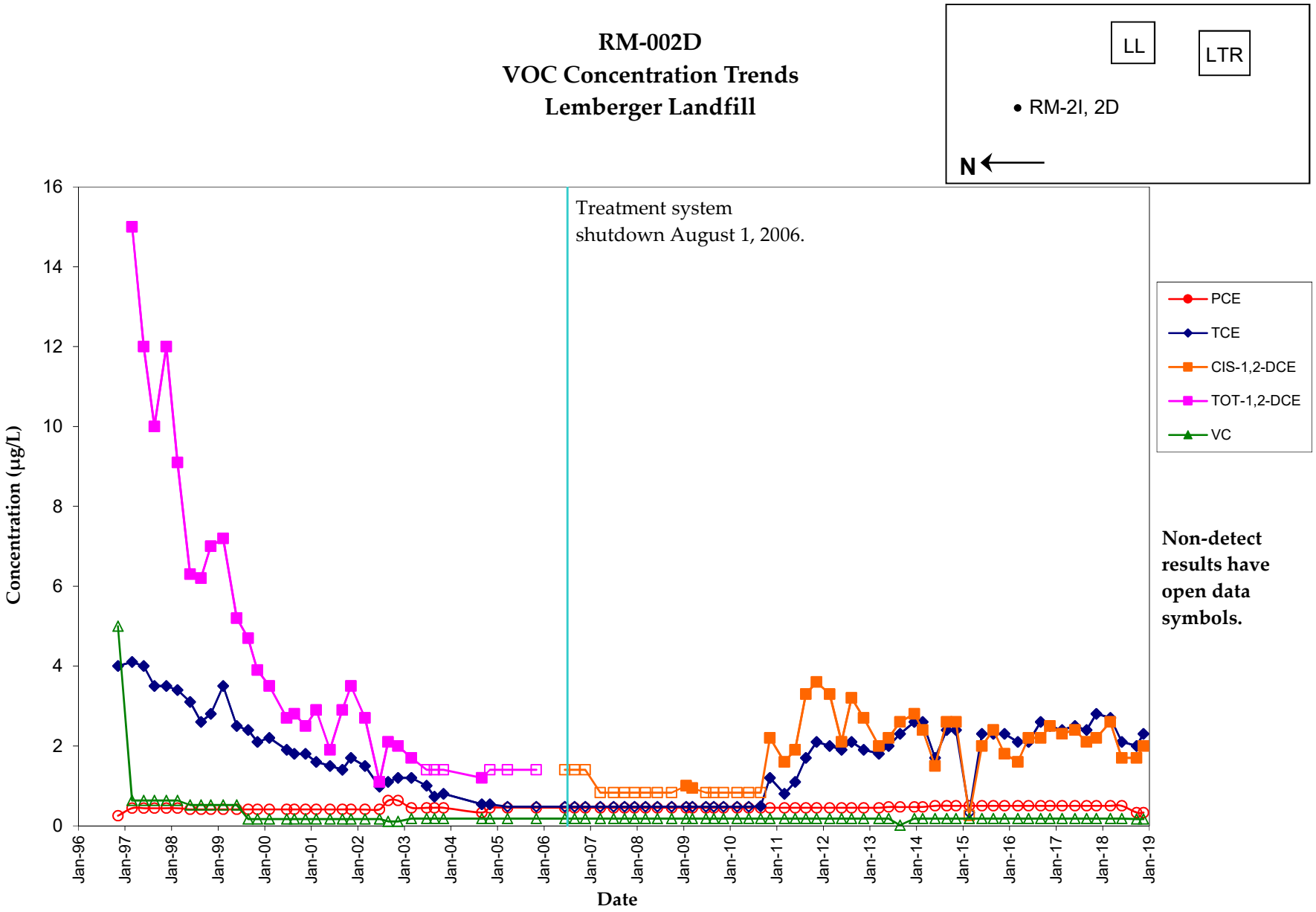


OW-103A
VOC Concentration Trends
Lemberger Landfill



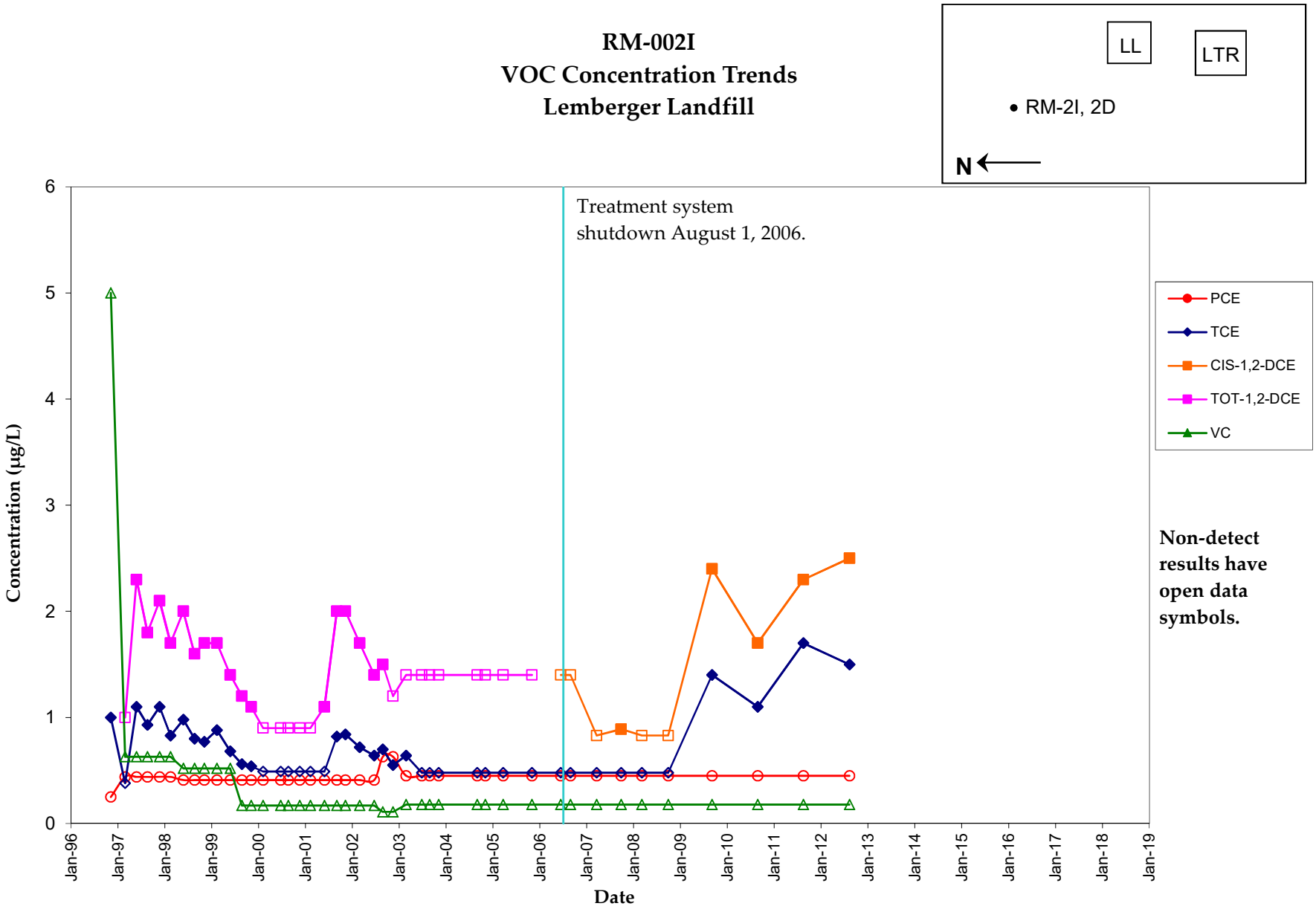

OW-104F
VOC Concentration Trends
Lemberger Landfill
LL
LTR
OW-104F
N
Treatment system shutdown August 1, 2006.
Concentration (µg/L)
Date
PCE
TCE
CIS-1,2-DCE
VC
Non-detect results have open data symbols.
0
1
2
3
4
5
6
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19

RM-002D
VOC Concentration Trends
Lemberger Landfill



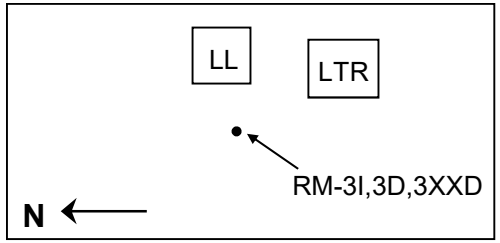
Non-detect results have open data symbols.

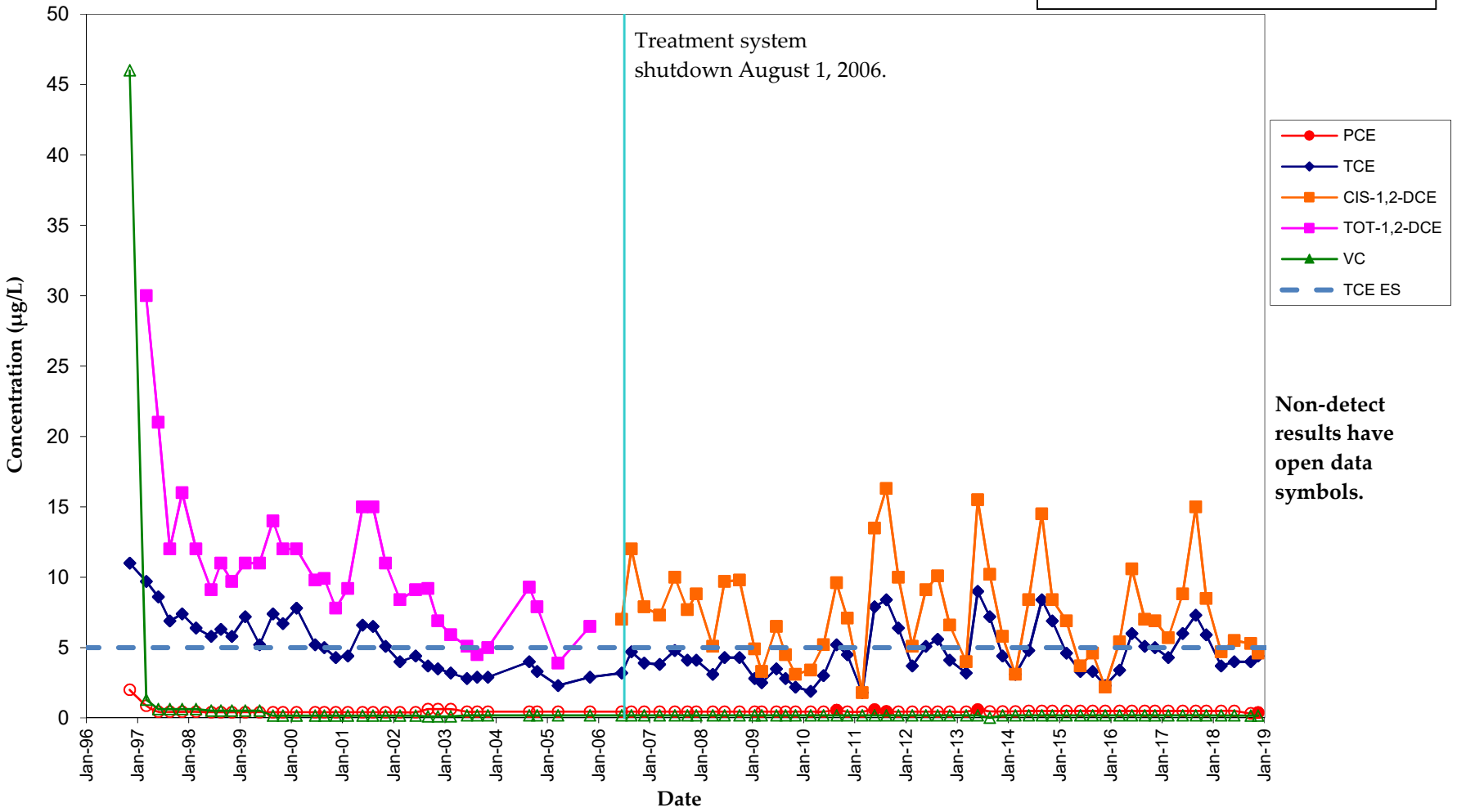
RM-002I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

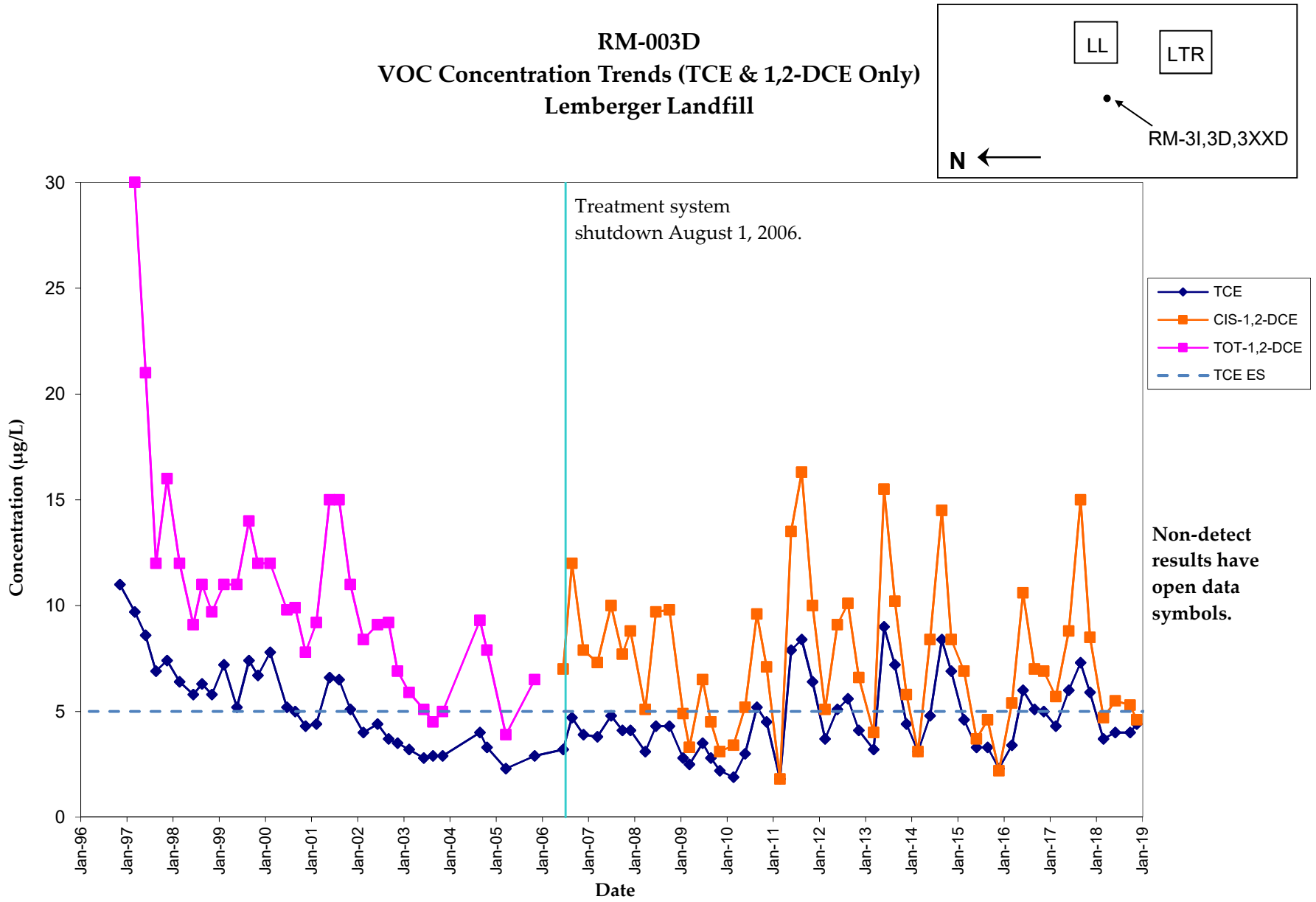
RM-003D
VOC Concentration Trends
Lemberger Landfill





Non-detect results have open data symbols.

RM-003D
VOC Concentration Trends (TCE & 1,2-DCE Only)
Lemberger Landfill



Non-detect results have open data symbols.

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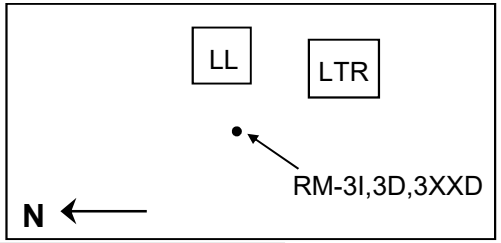
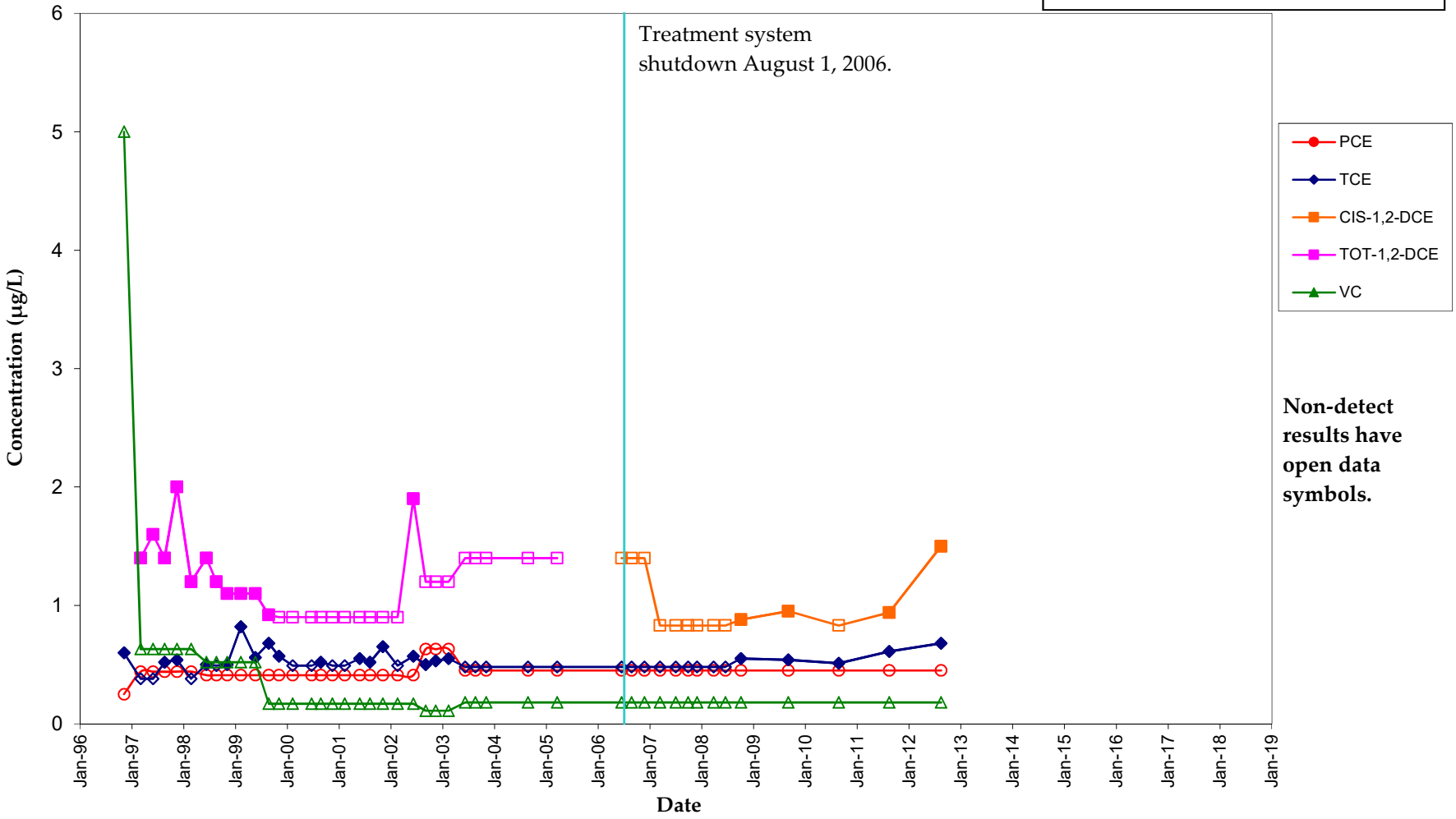
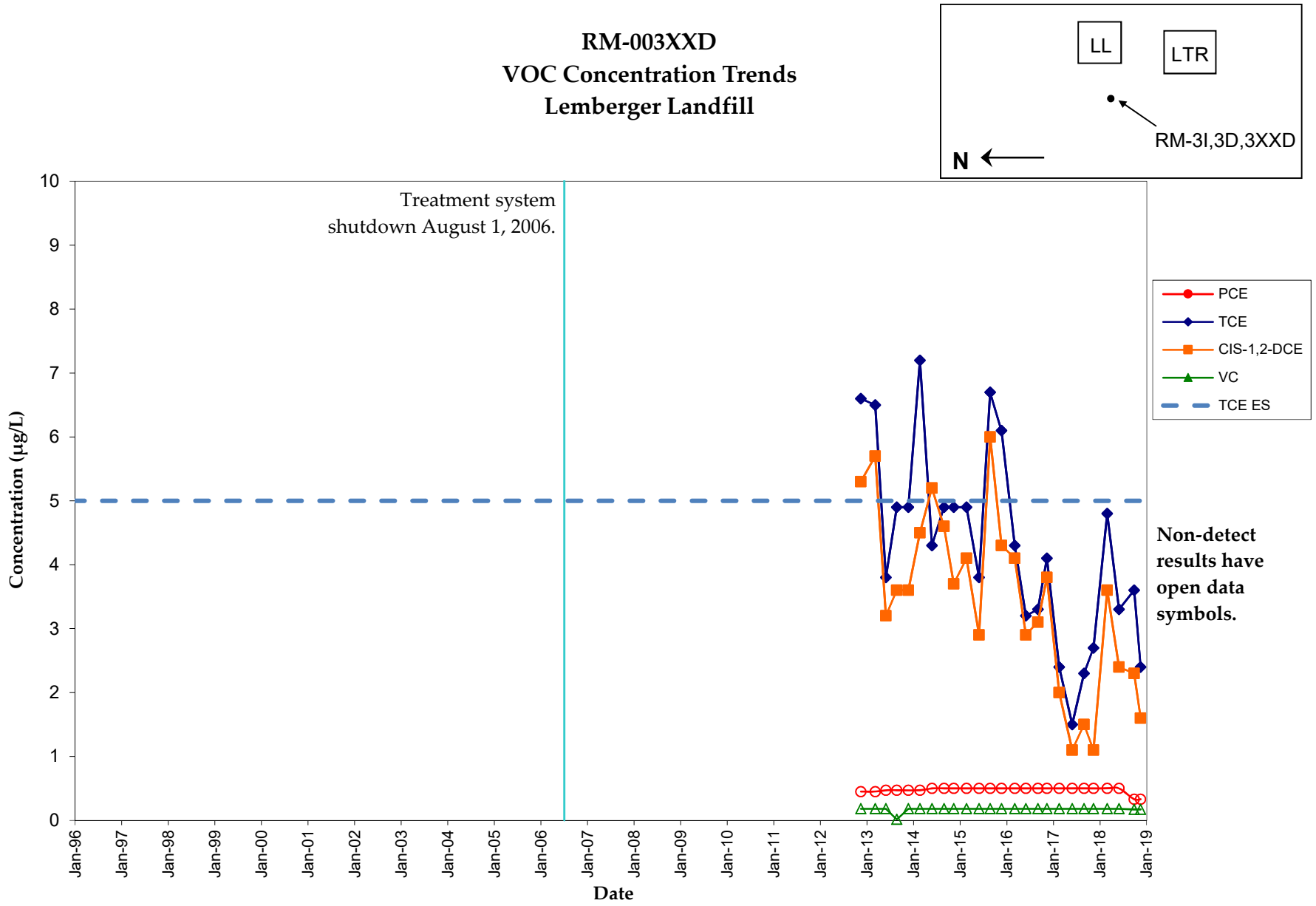
RM-003I
VOC Concentration Trends
Lemberger Landfill



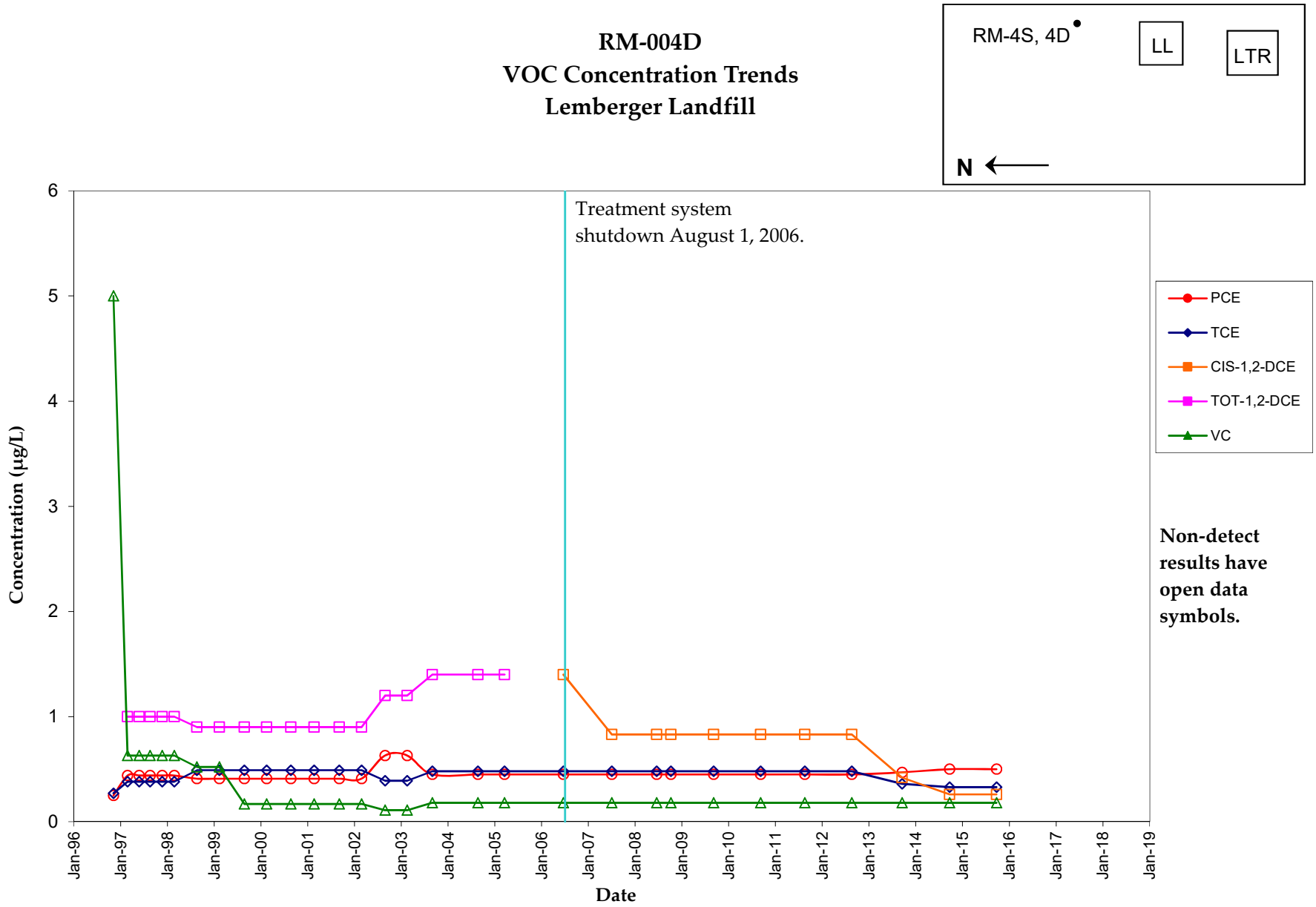


Non-detect results have open data symbols.

RM-003XXD
VOC Concentration Trends
Lemberger Landfill

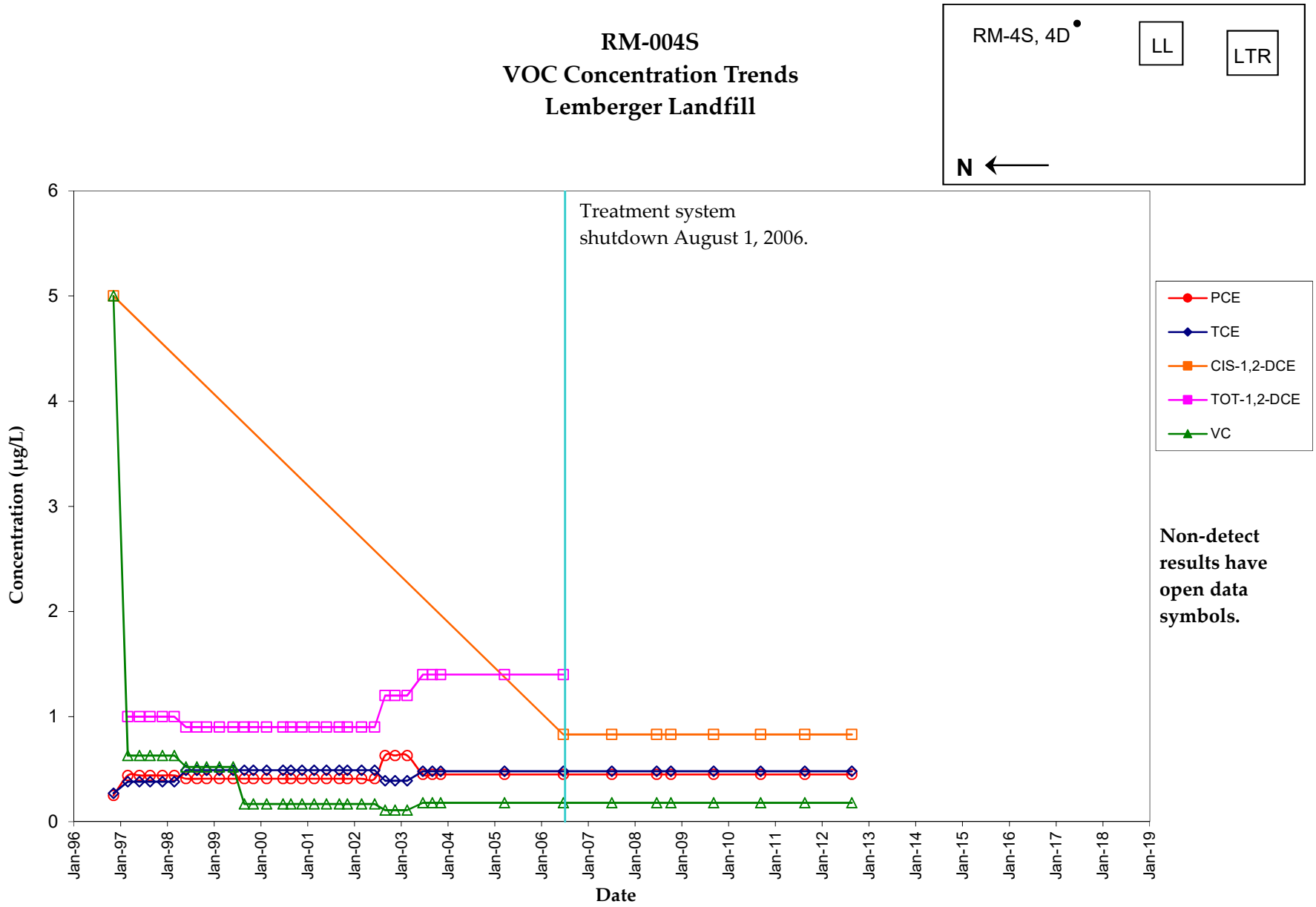


RM-004D
VOC Concentration Trends
Lemberger Landfill



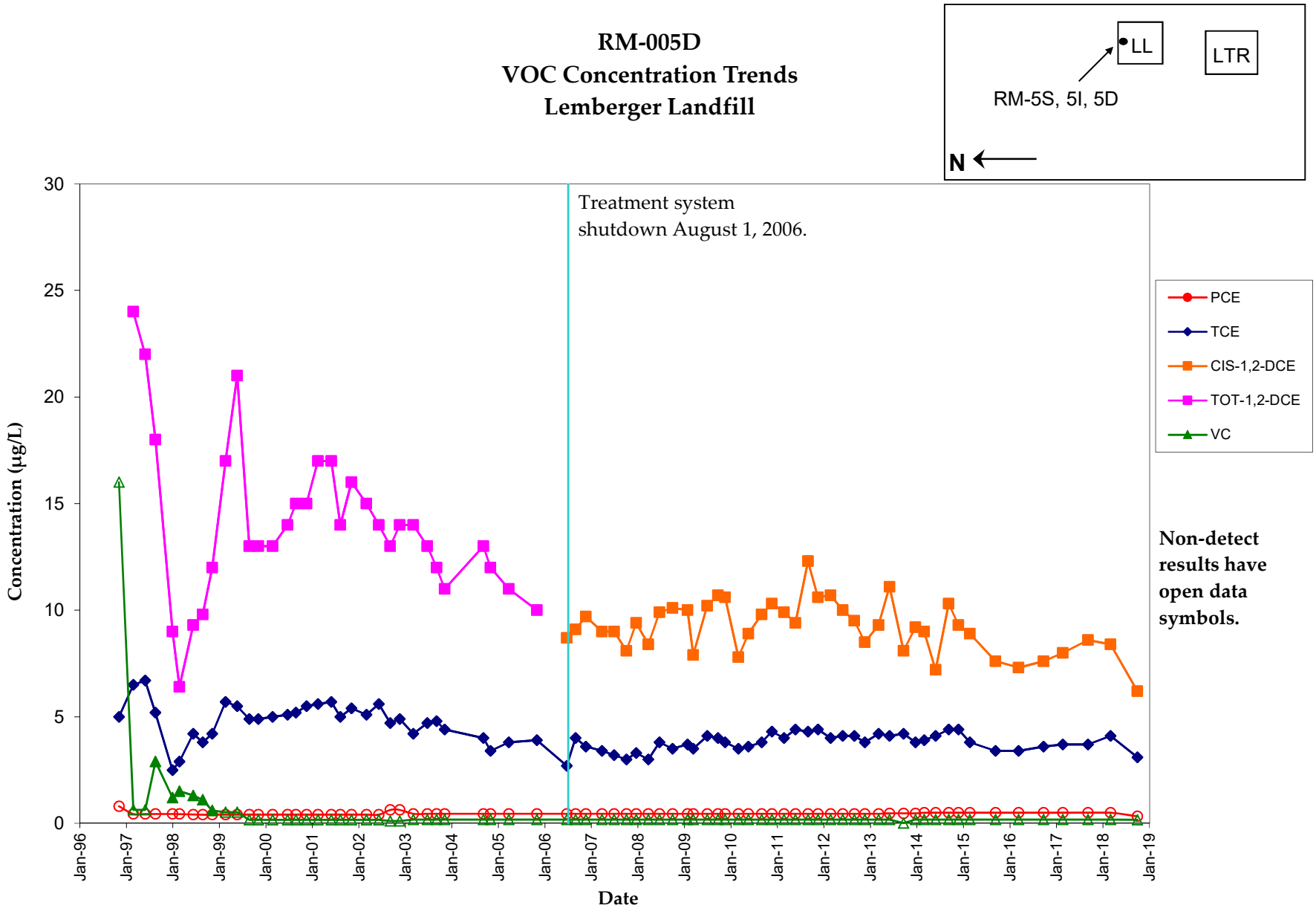
Non-detect results have open data symbols.

RM-004S
VOC Concentration Trends
Lemberger Landfill



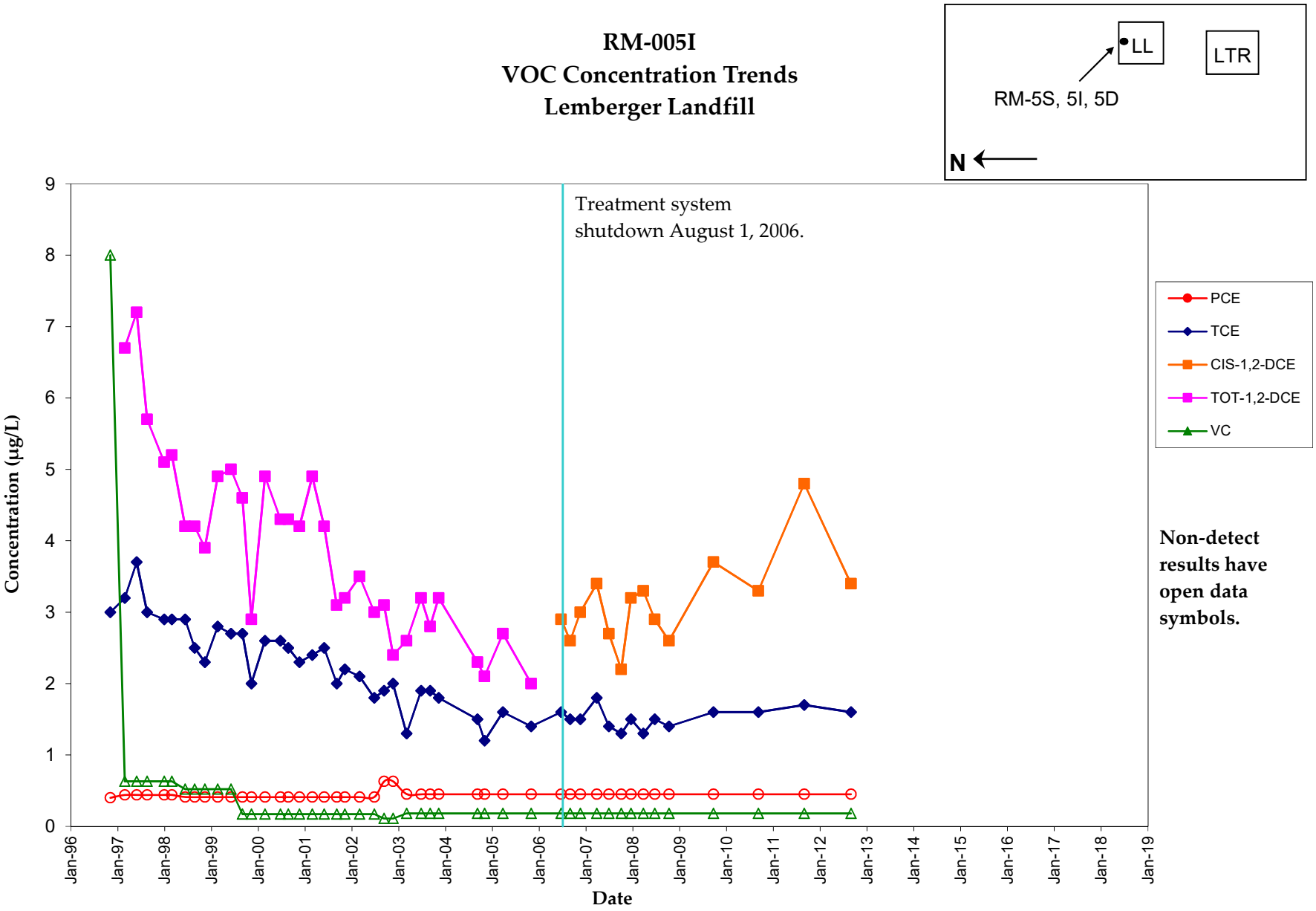
Non-detect results have open data symbols.

RM-005D
VOC Concentration Trends
Lemberger Landfill



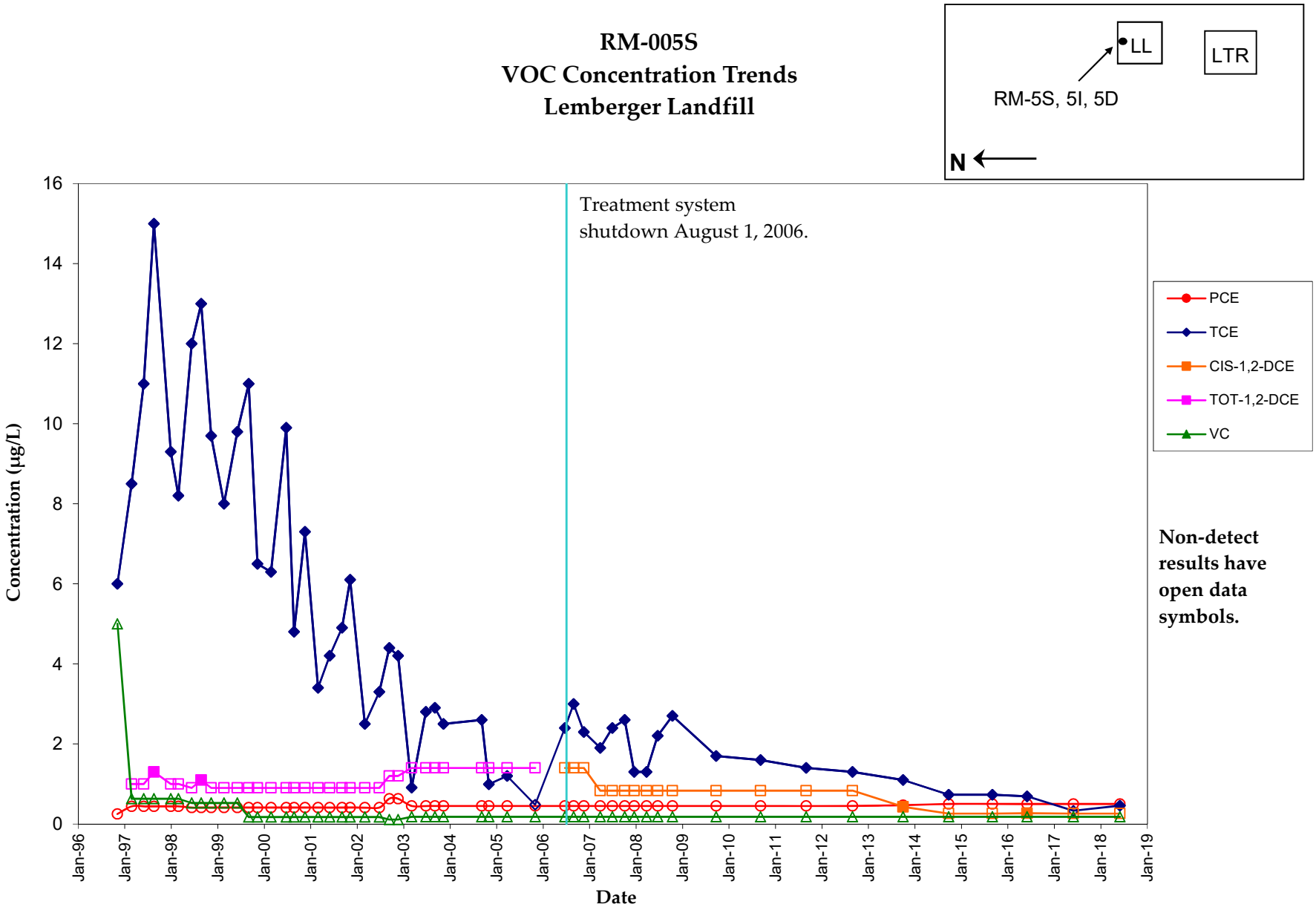
Non-detect results have open data symbols.

RM-005I
VOC Concentration Trends
Lemberger Landfill



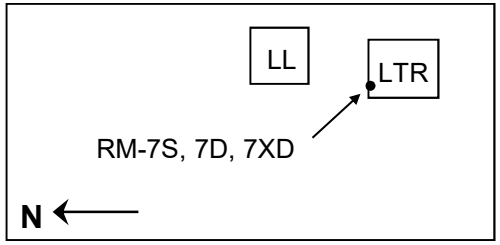
Non-detect results have open data symbols.

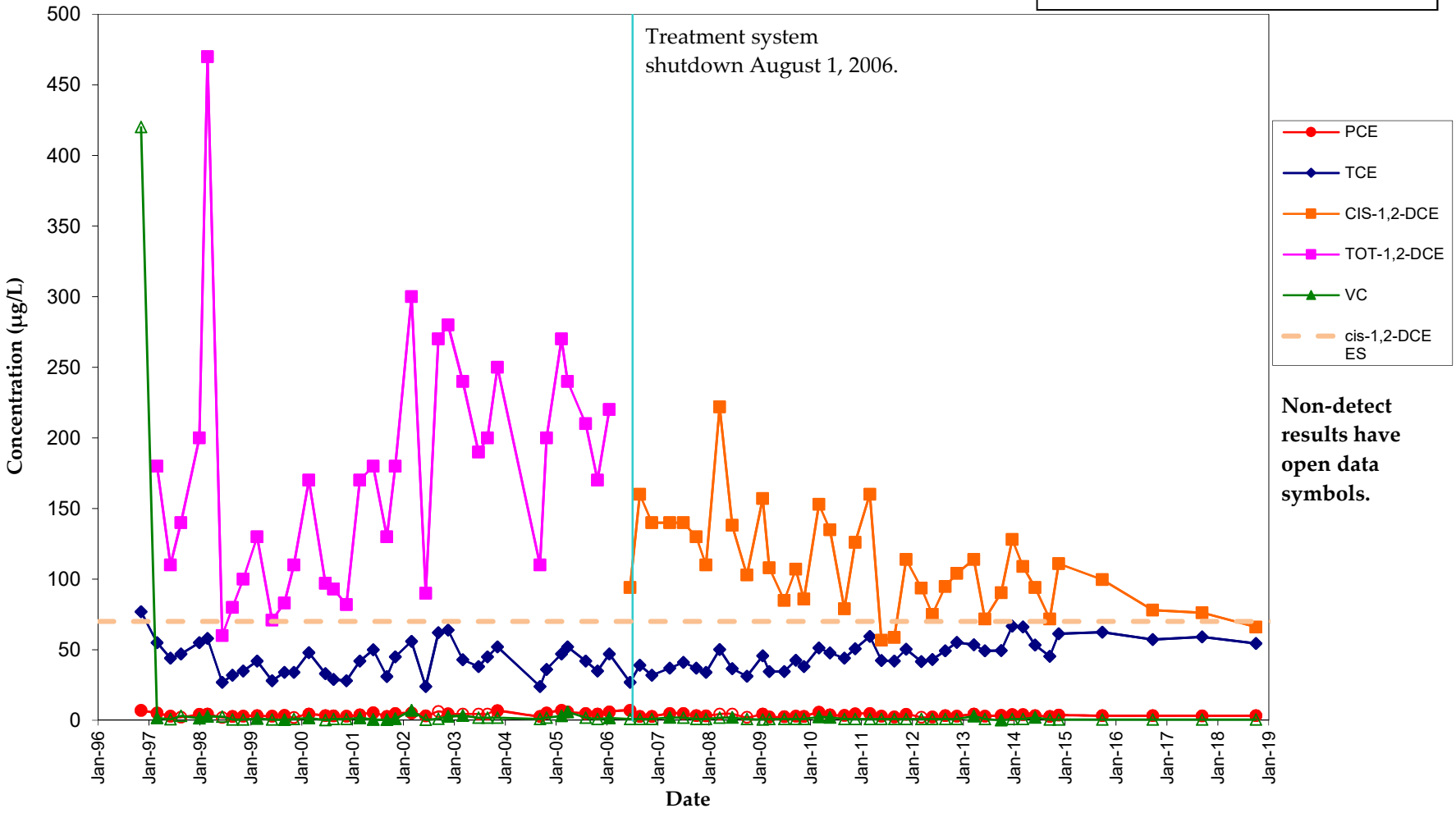
RM-005S
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

RM-007D
VOC Concentration Trends
Lemberger Landfill





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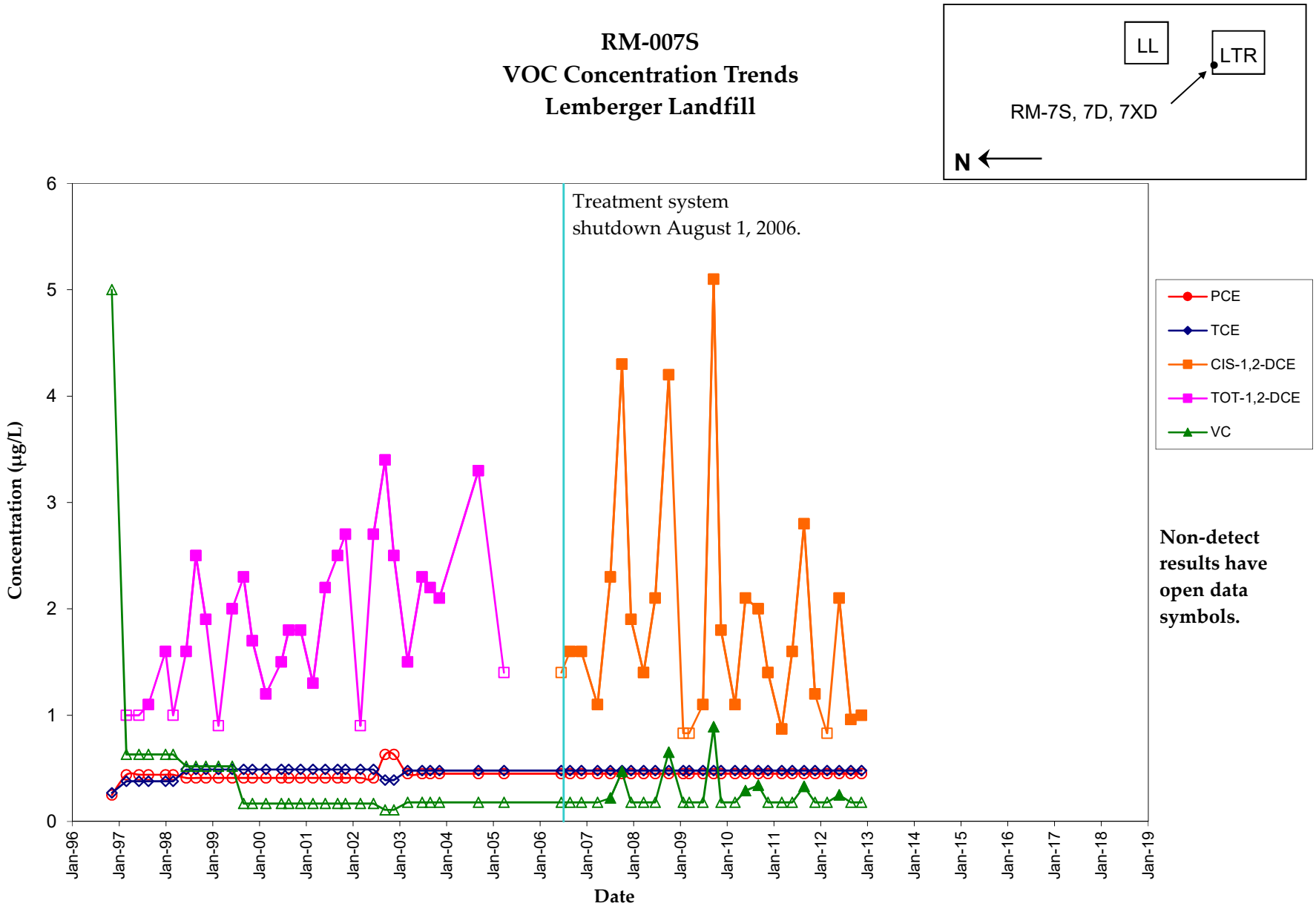
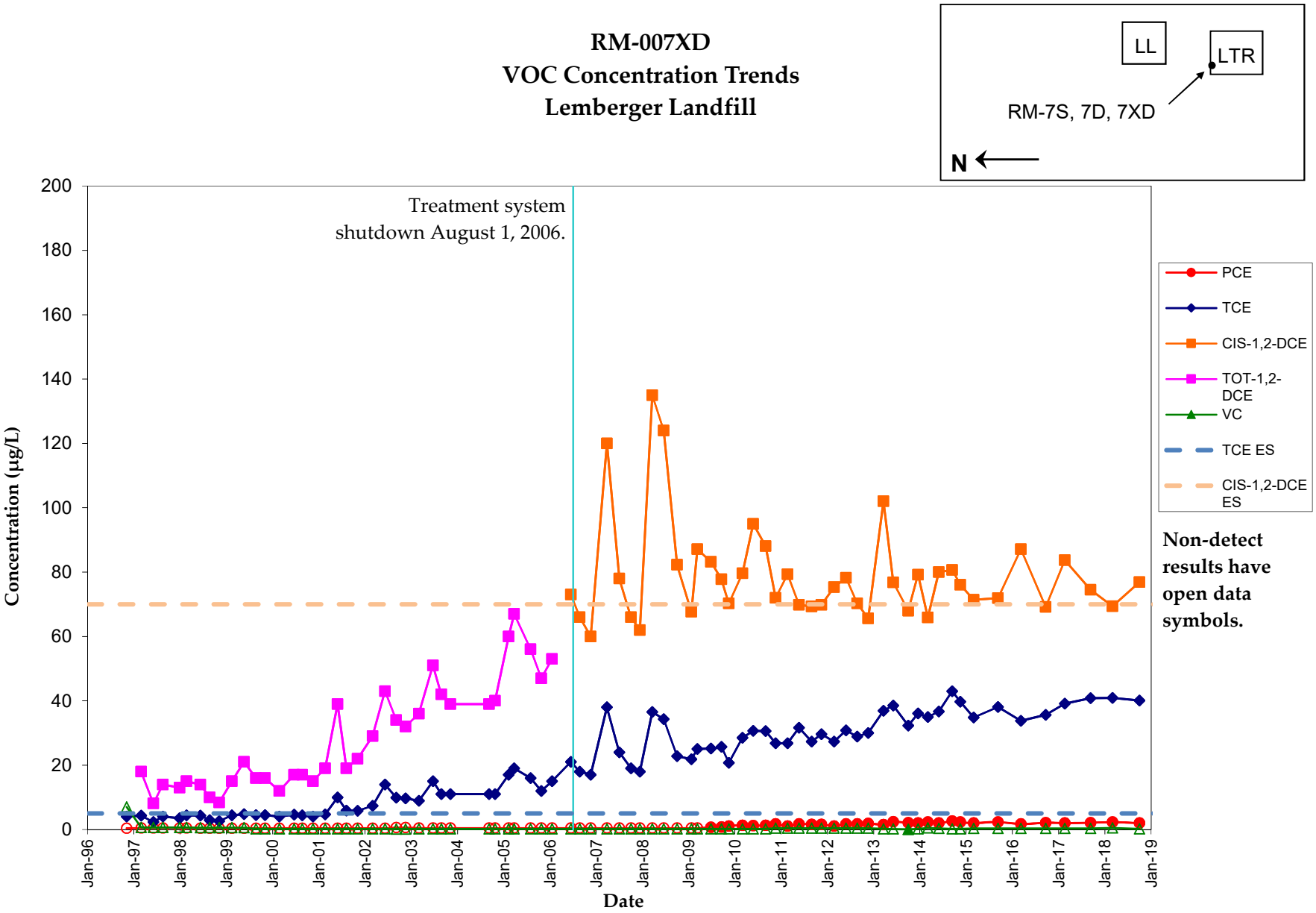
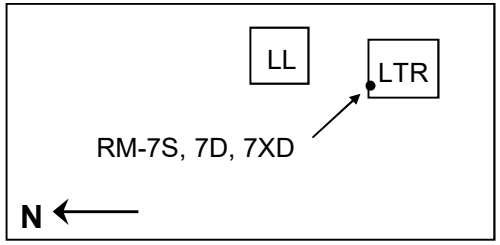
RM-007S
VOC Concentration Trends
Lemberger Landfill

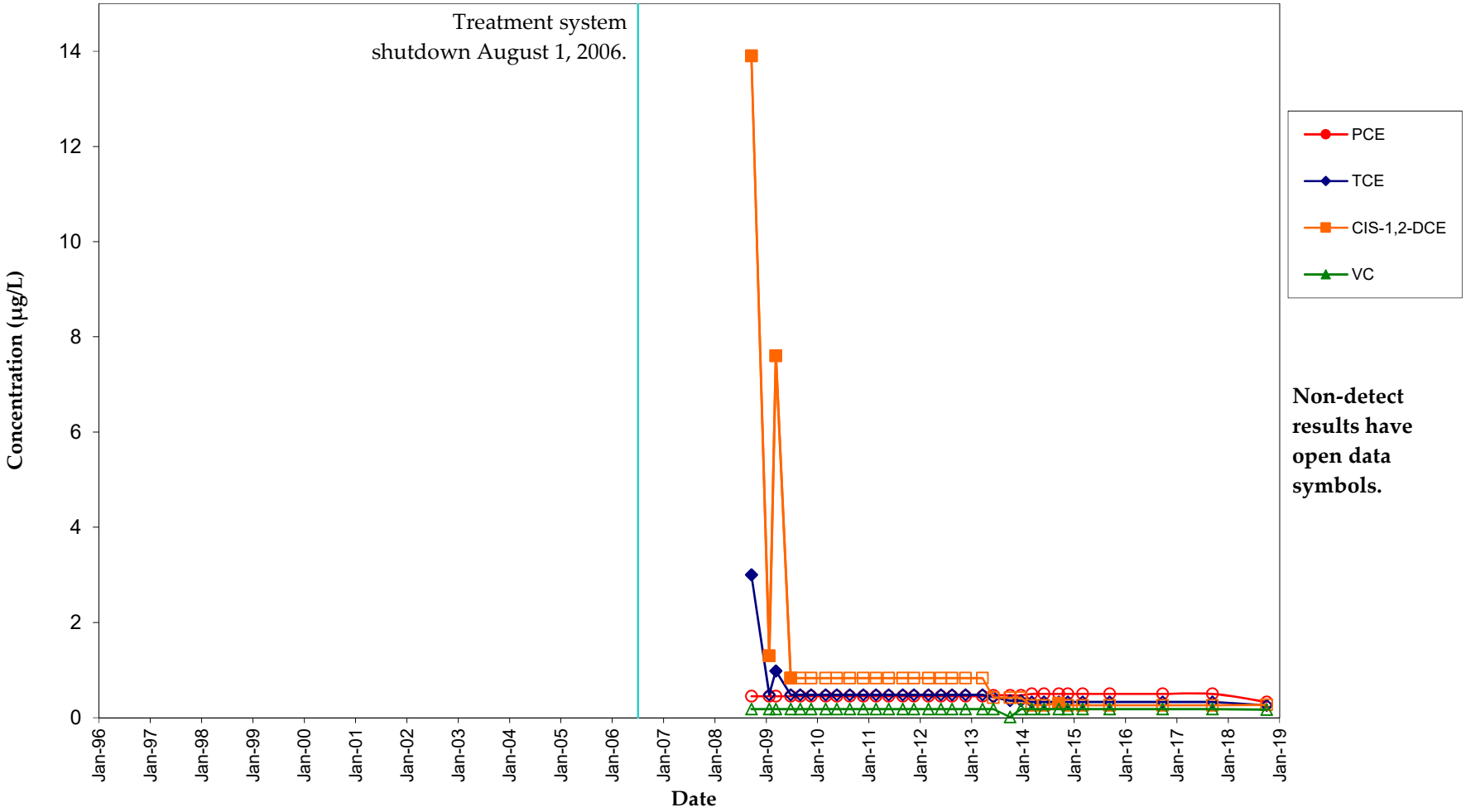


RM-007XD
VOC Concentration Trends
Lemberger Landfill



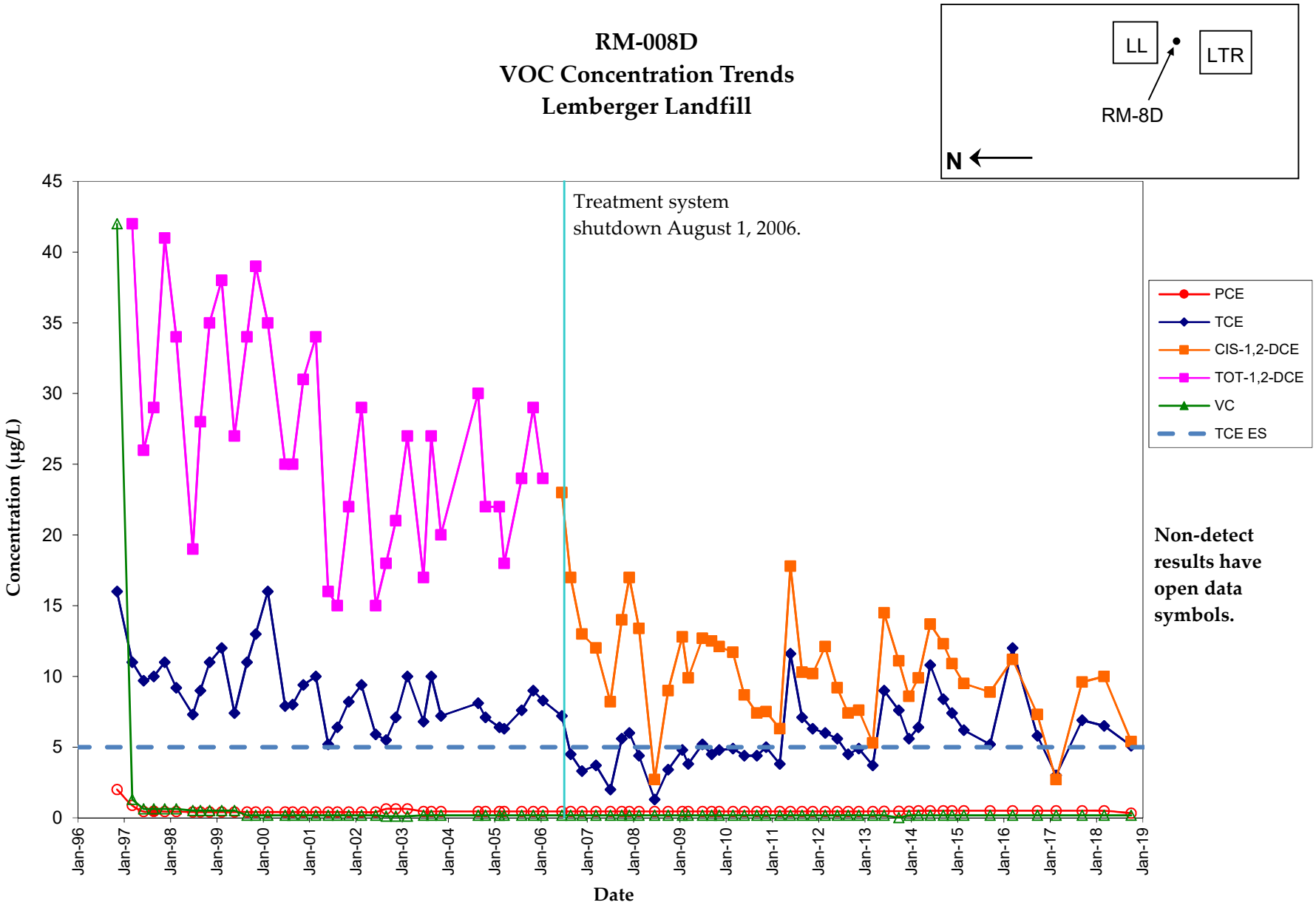
RM-007XXD
VOC Concentration Trends
Lemberger Landfill





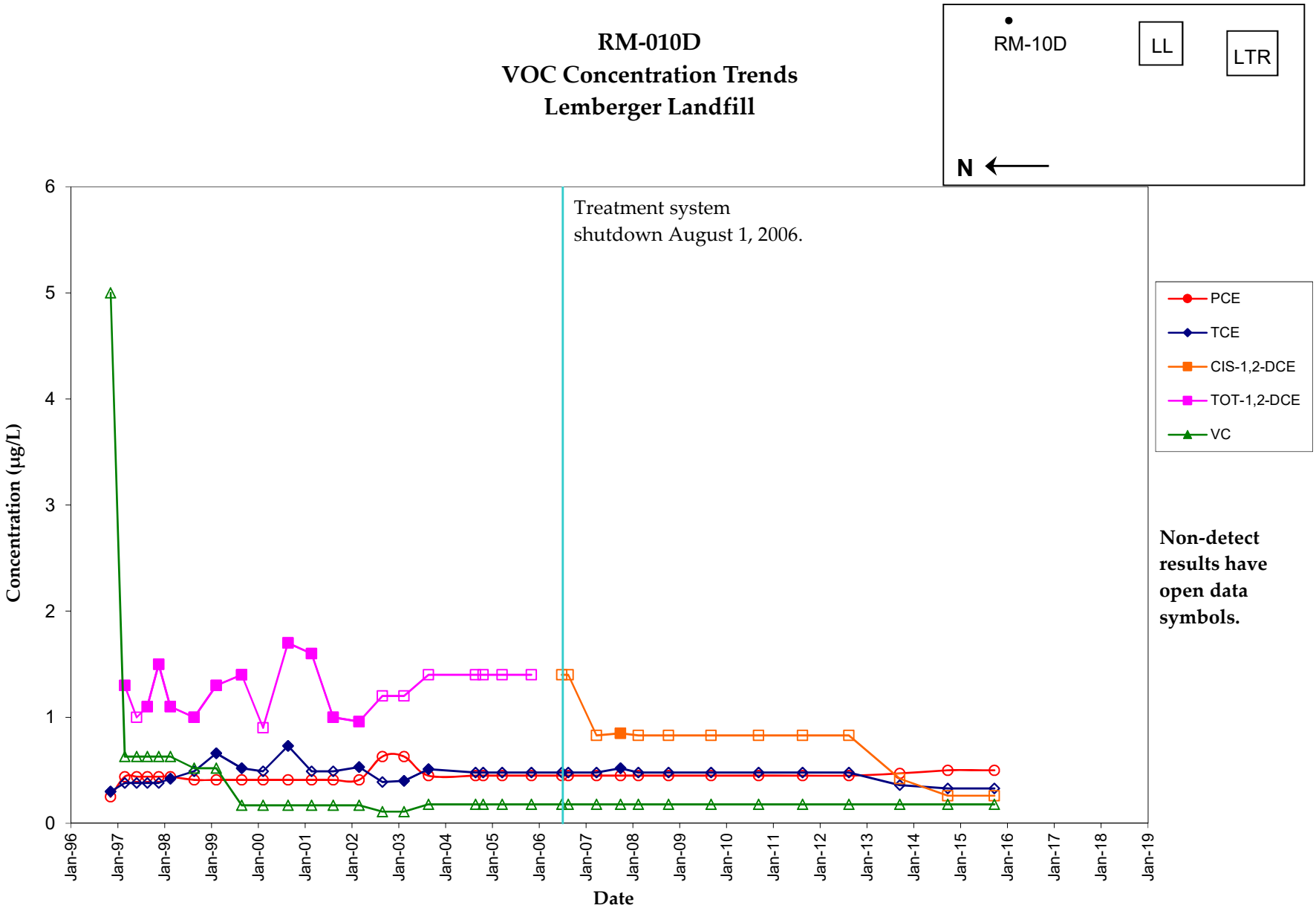
Non-detect results have open data symbols.

RM-008D
VOC Concentration Trends
Lemberger Landfill



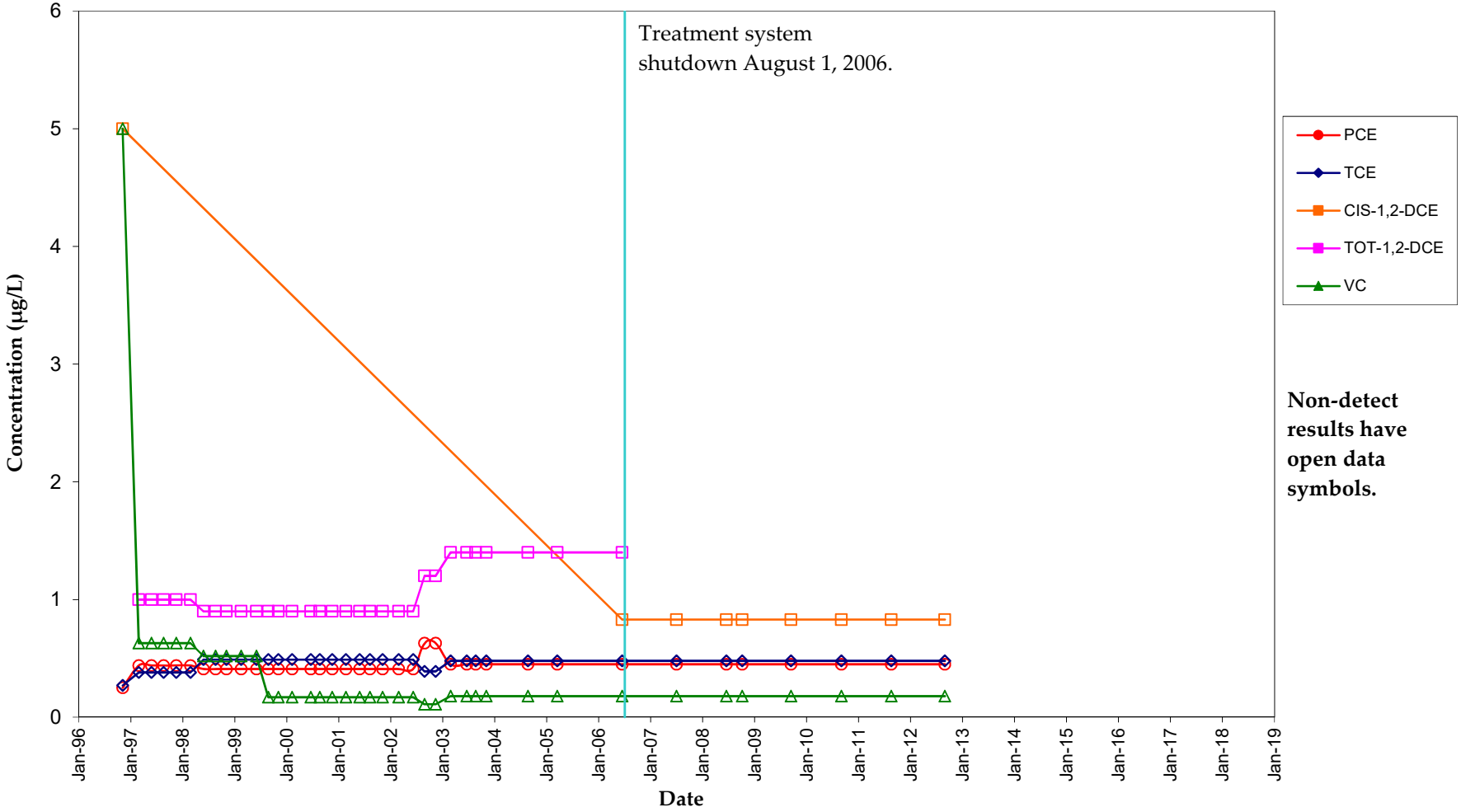
Non-detect results have open data symbols.

RM-010D
VOC Concentration Trends
Lemberger Landfill



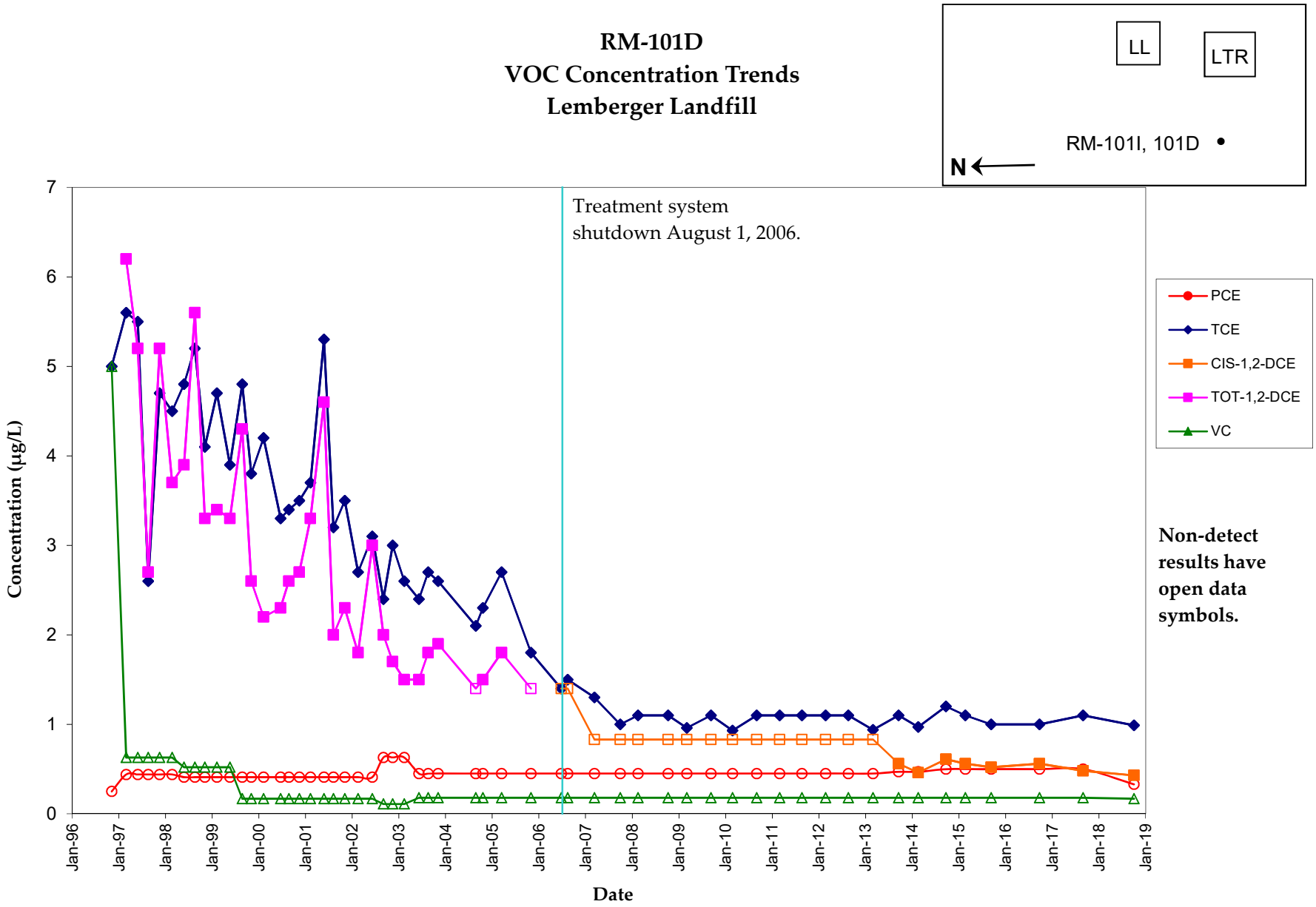
Non-detect results have open data symbols.

RM-011D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

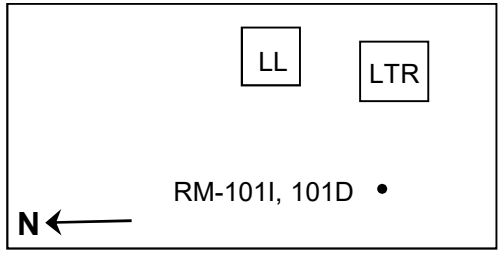
RM-101D
VOC Concentration Trends
Lemberger Landfill

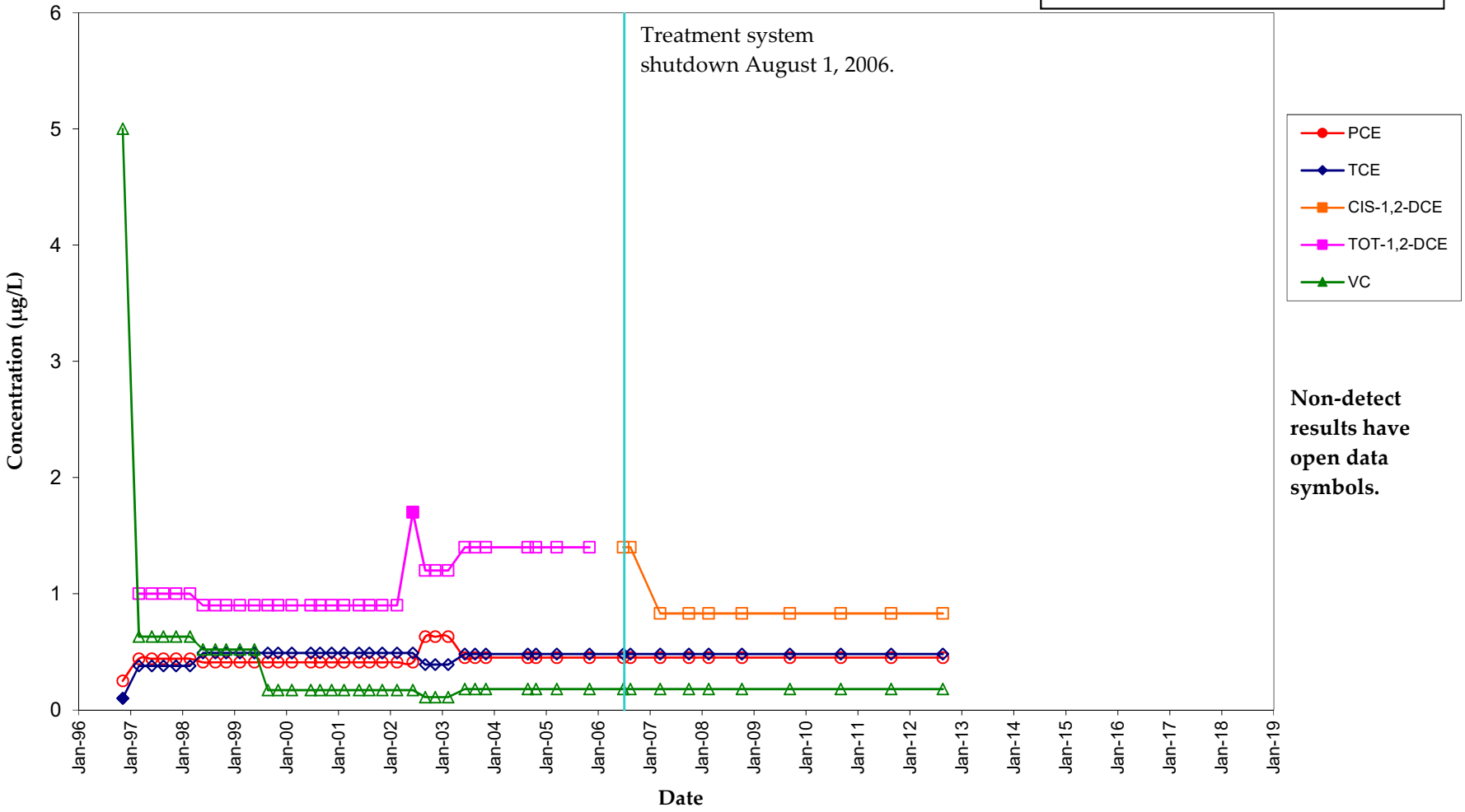


Non-detect results have open data symbols.

L:\ORACLE\LM-Lemberger\MNA\PLOT FILES UPDATED 2018 12\WDNR_VOC-ene TRENDS 12 2018.xlsm 1/14/2019

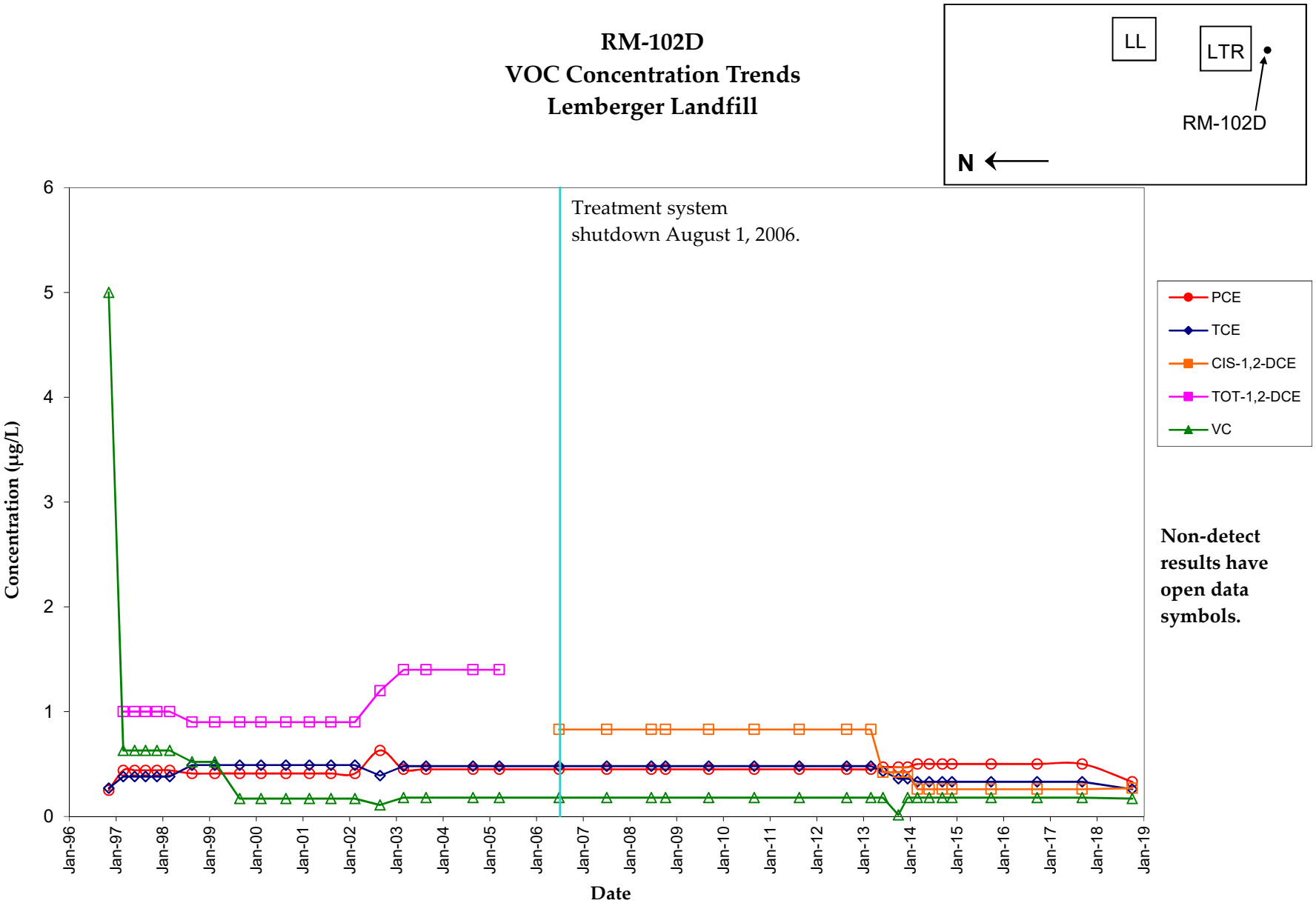
RM-101I
VOC Concentration Trends
Lemberger Landfill





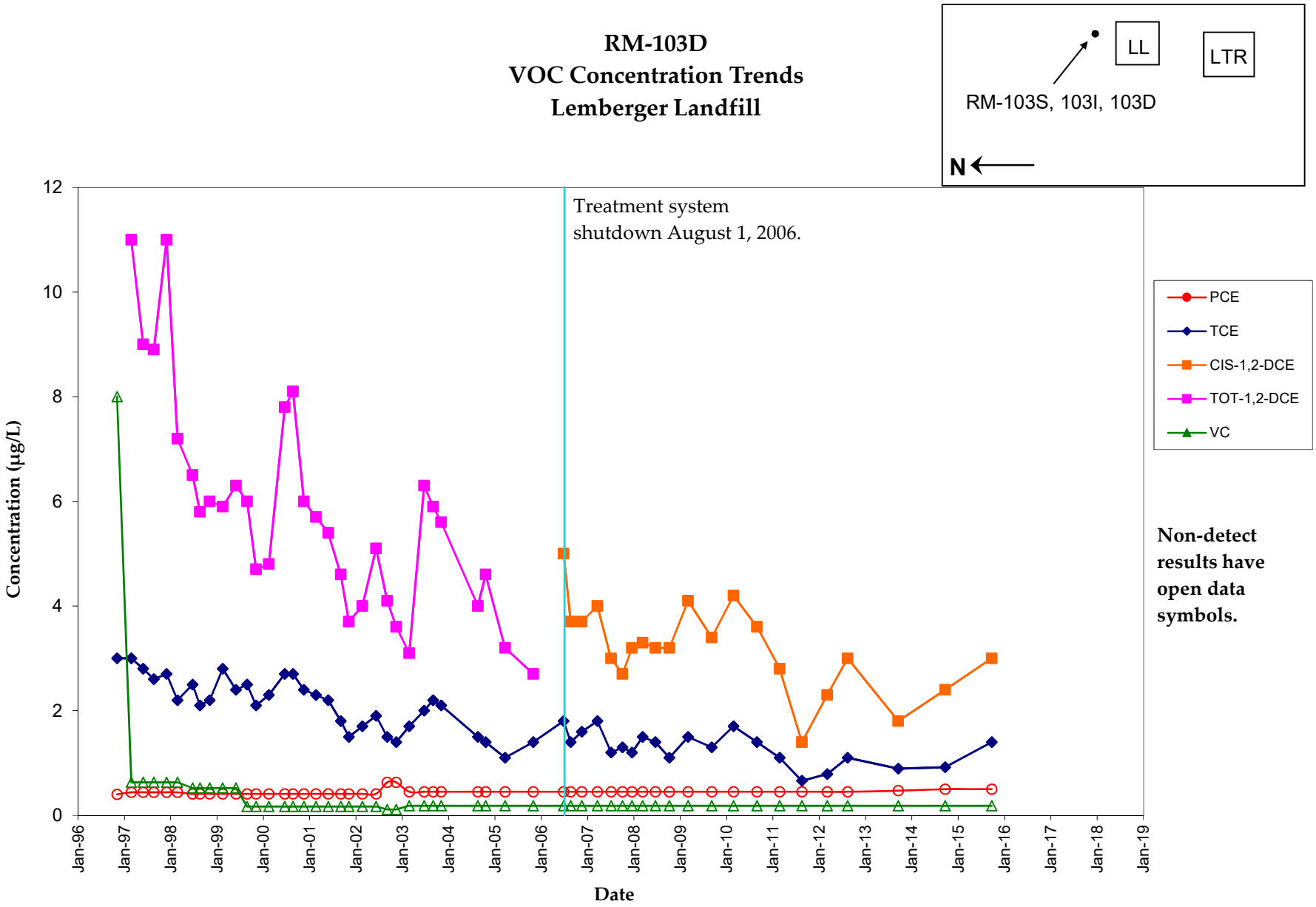
Non-detect results have open data symbols.

RM-102D
VOC Concentration Trends
Lemberger Landfill



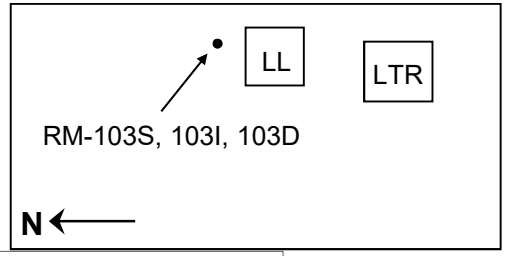
Non-detect results have open data symbols.

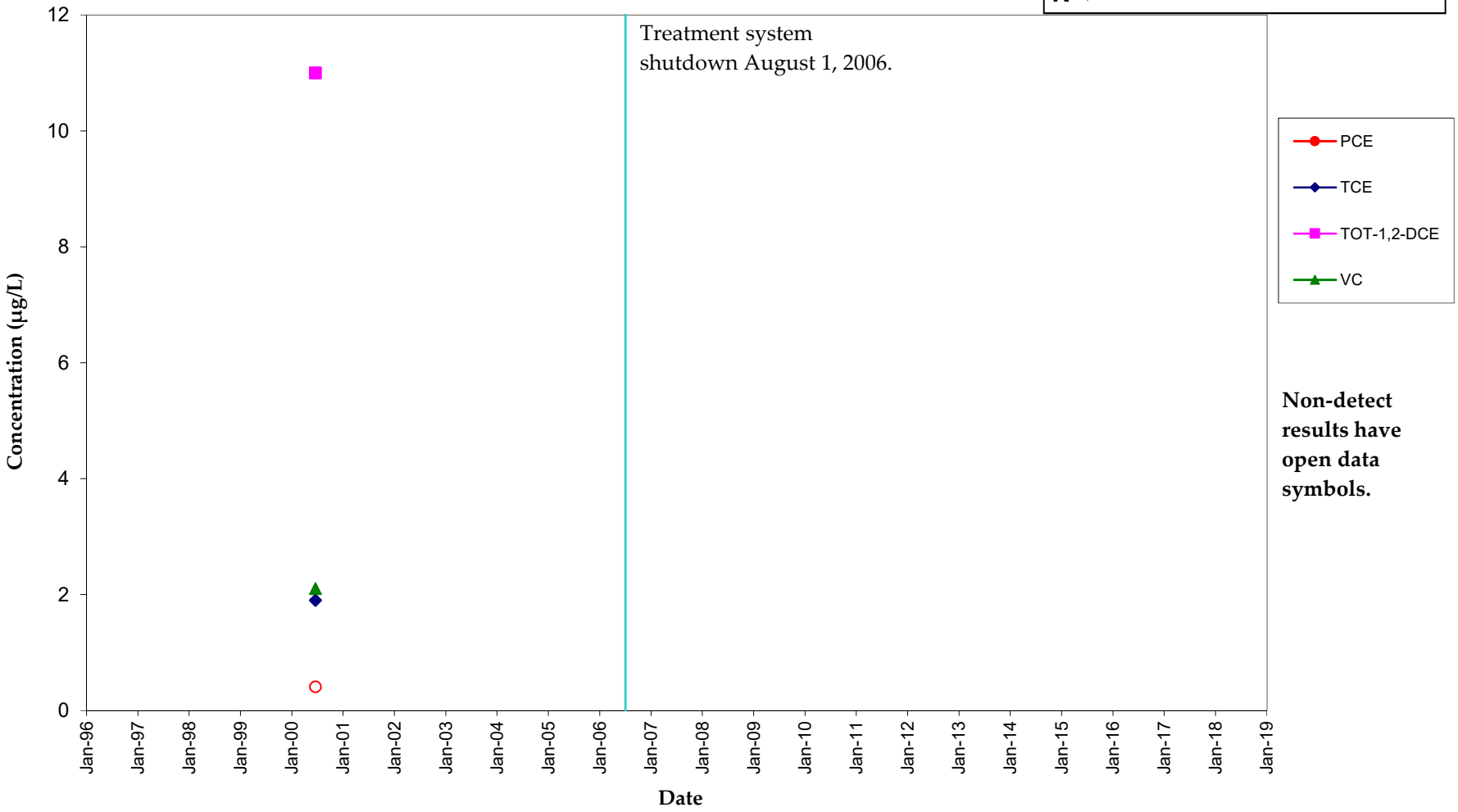
RM-103D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

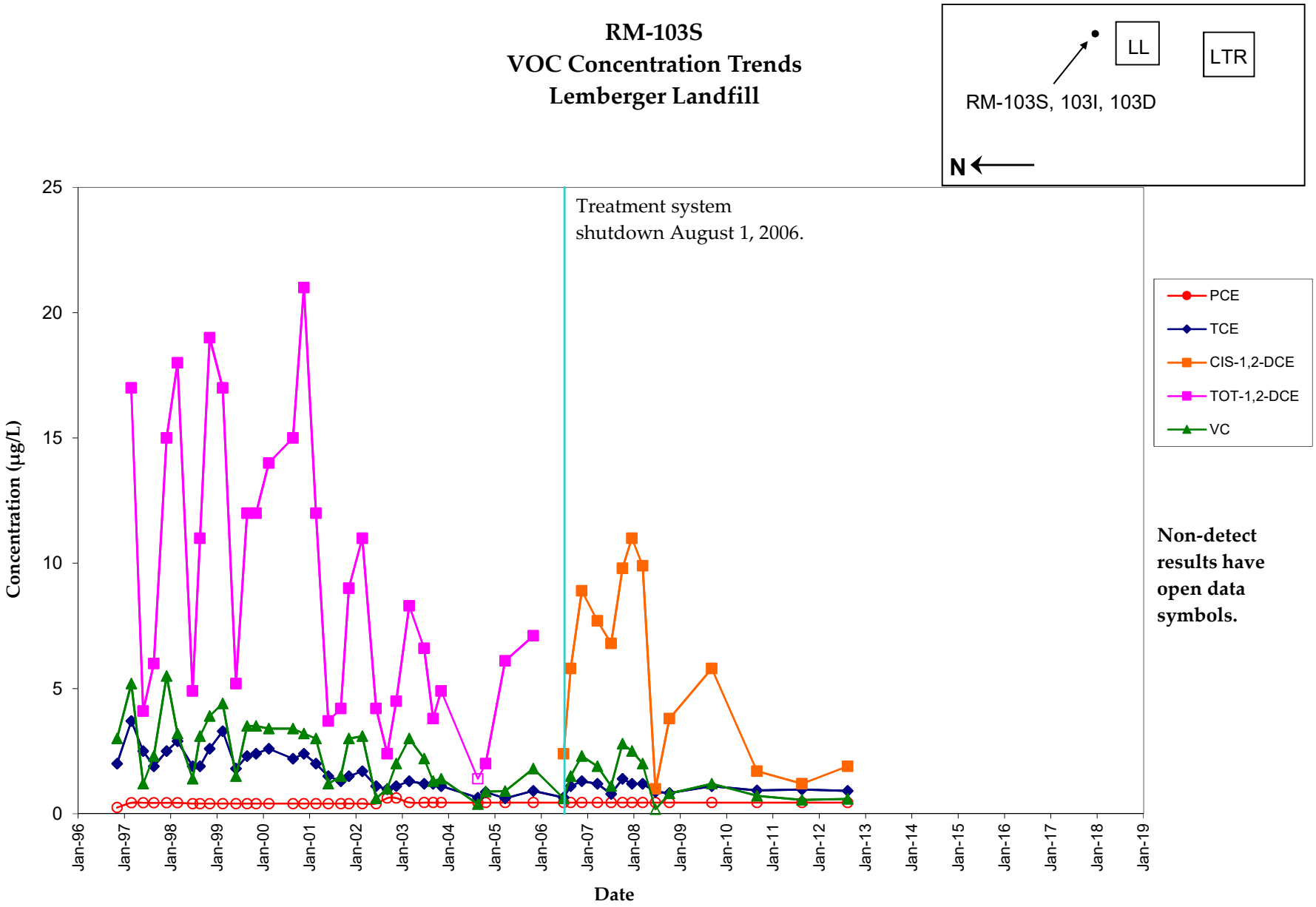
RM-103I
VOC Concentration Trends
Lemberger Landfill





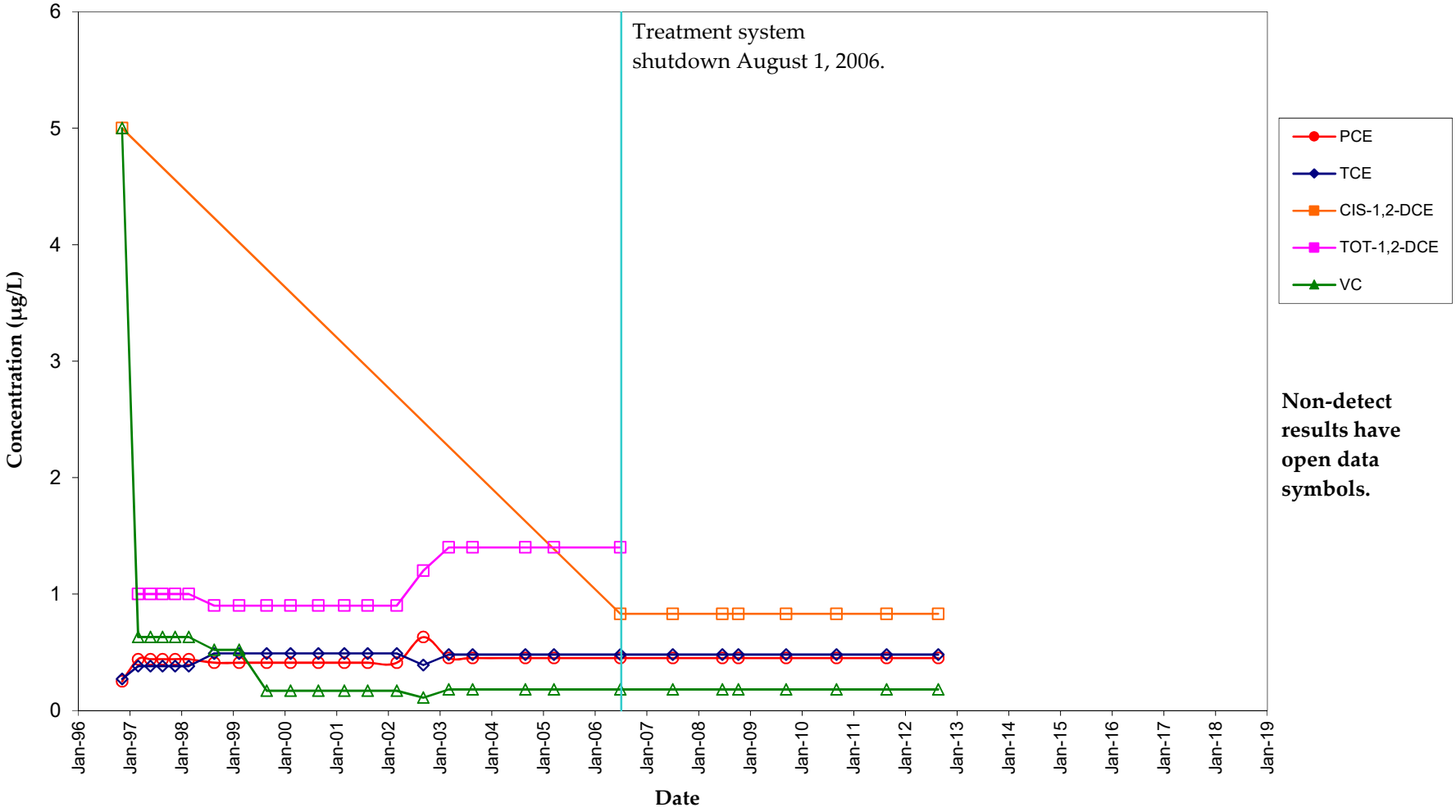
Non-detect results have open data symbols.

RM-103S
VOC Concentration Trends
Lemberger Landfill



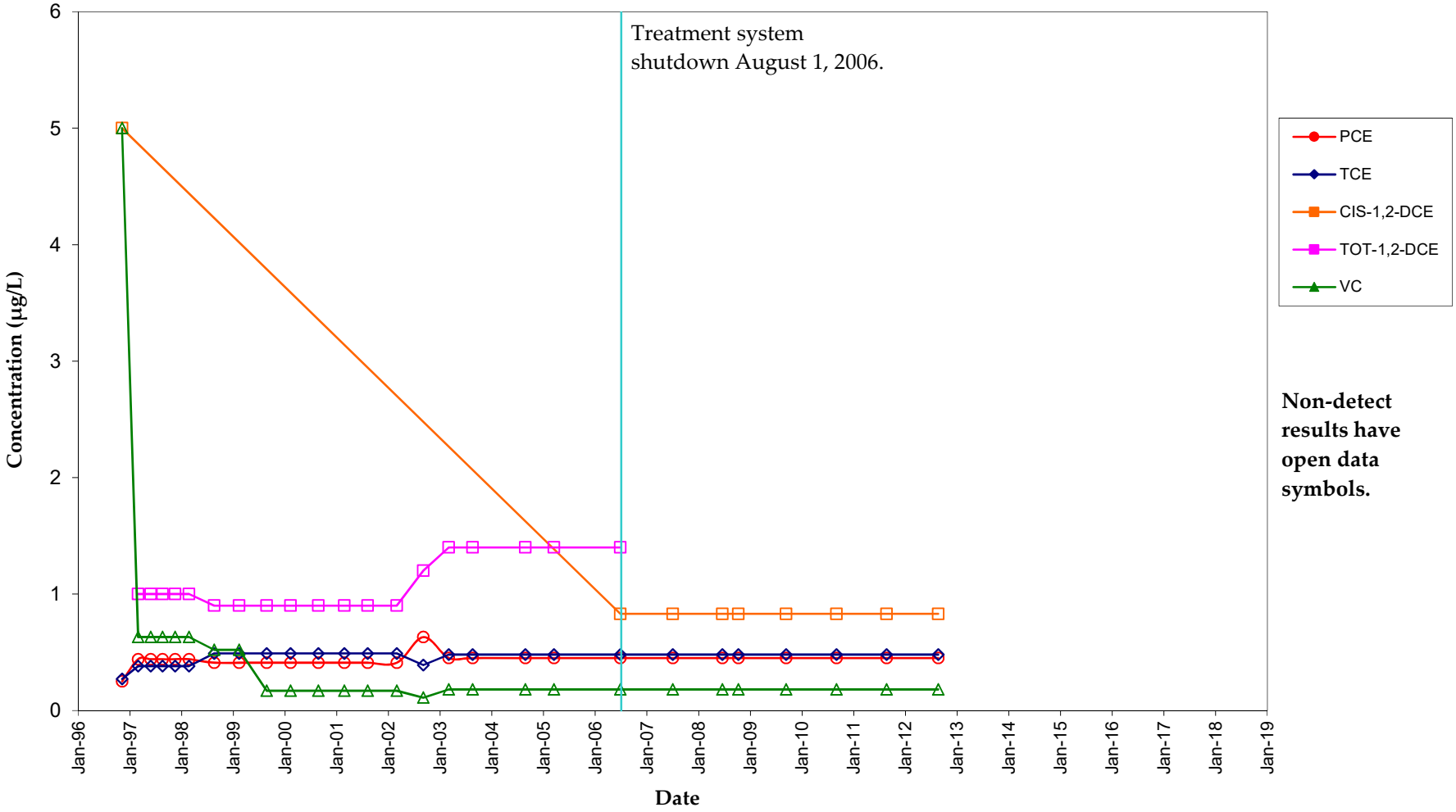
Non-detect results have open data symbols.

RM-201D
VOC Concentration Trends
Lemberger Landfill



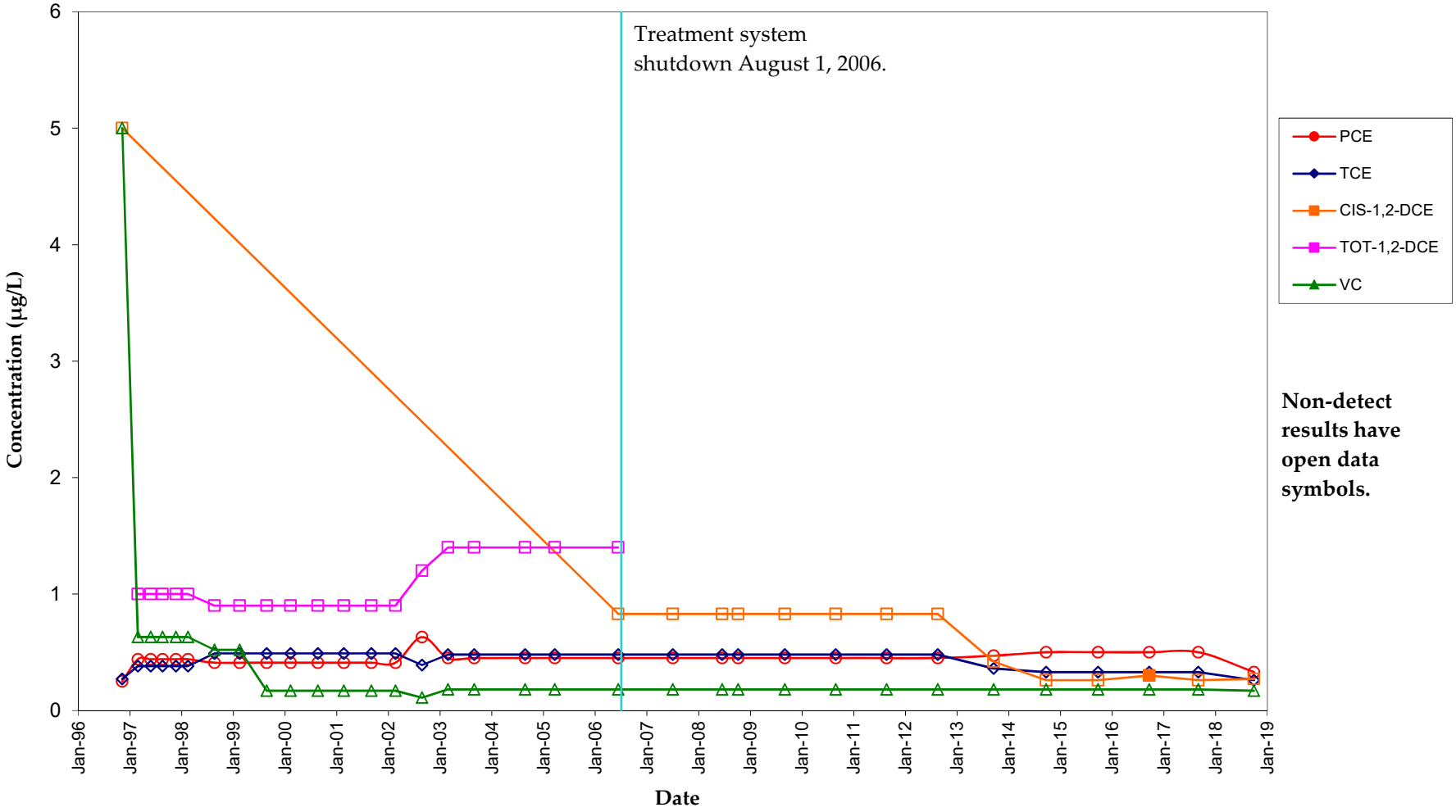
Non-detect results have open data symbols.

RM-201I
VOC Concentration Trends
Lemberger Landfill



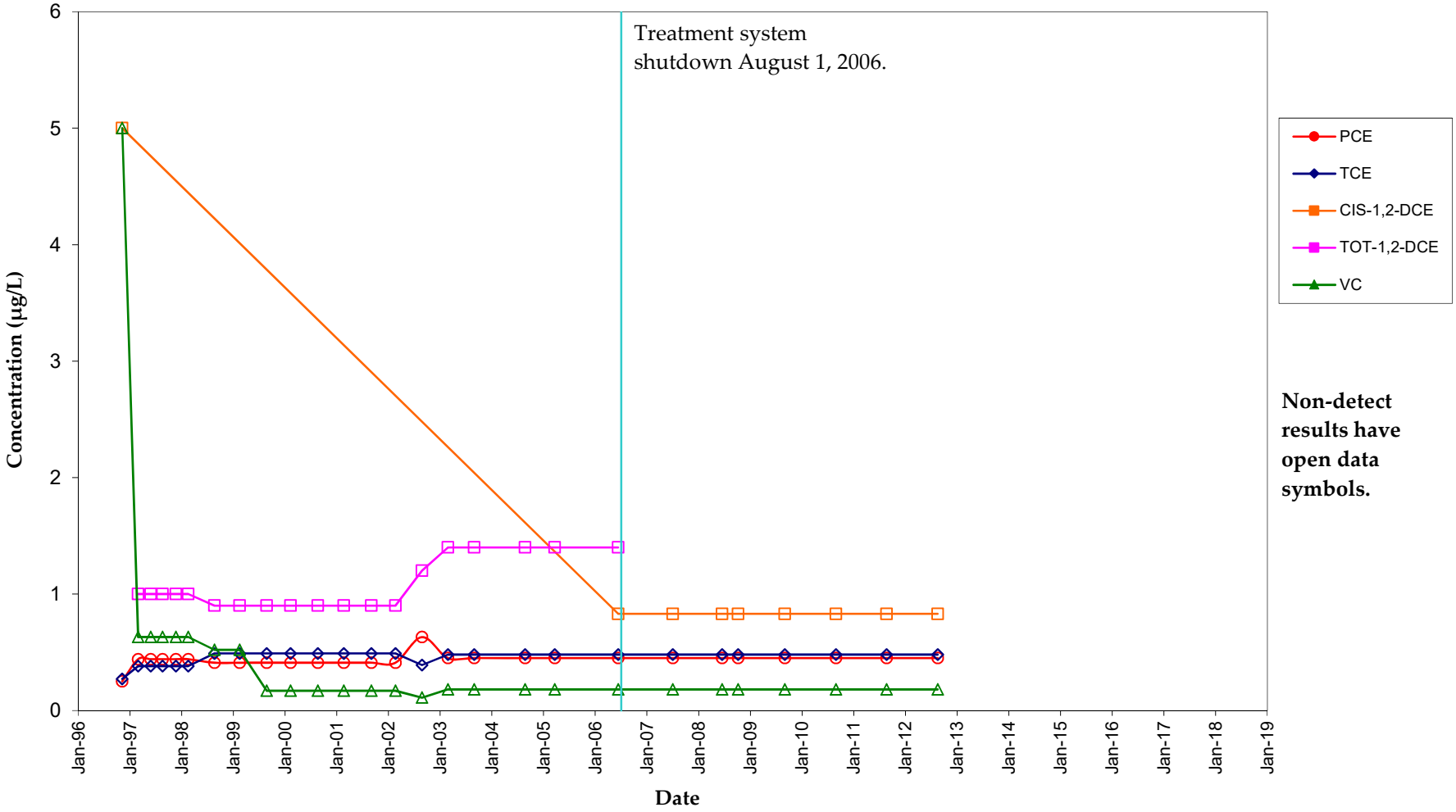
Non-detect results have open data symbols.

RM-202D
VOC Concentration Trends
Lemberger Landfill



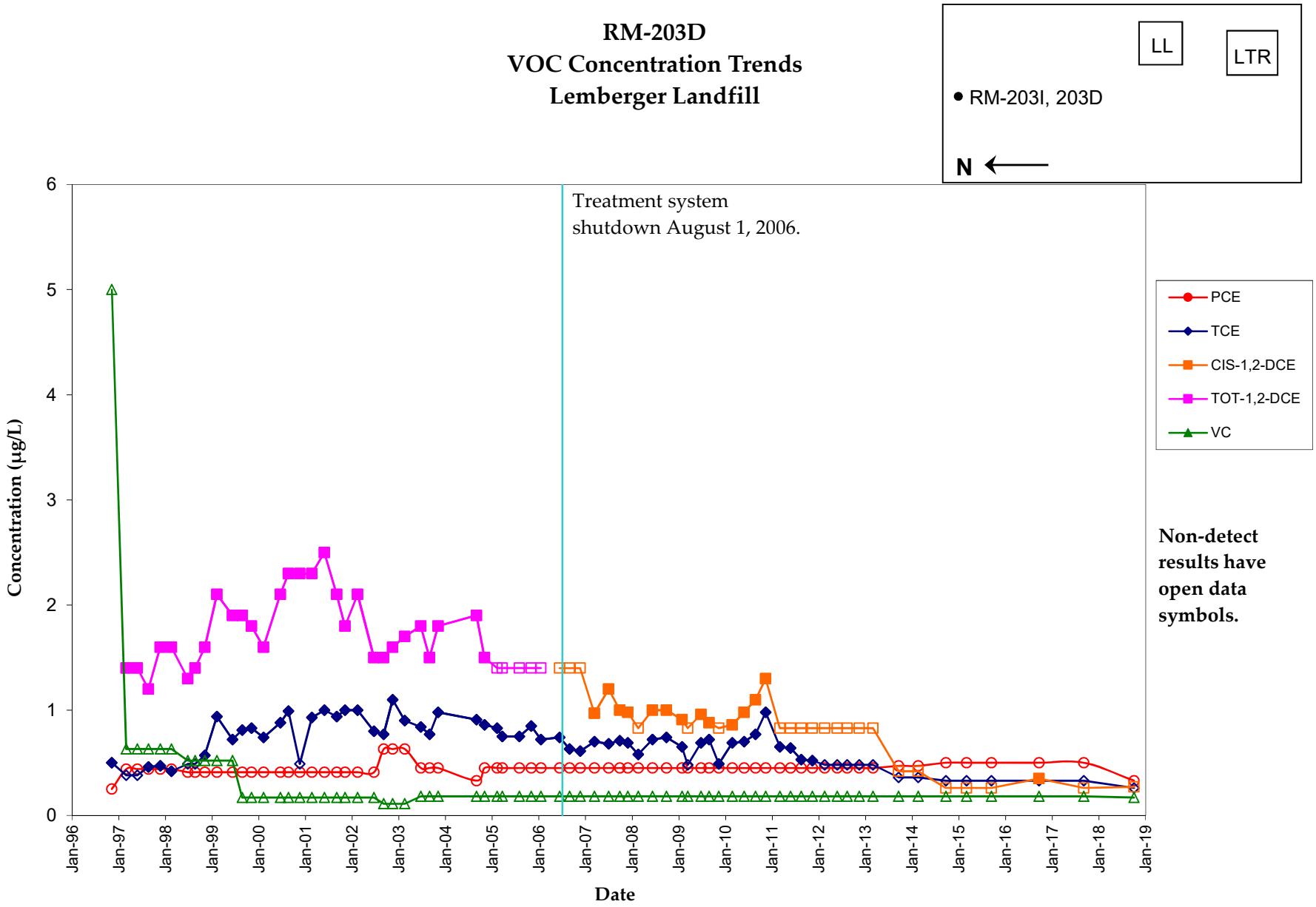
Non-detect results have open data symbols.

RM-202I
VOC Concentration Trends
Lemberger Landfill



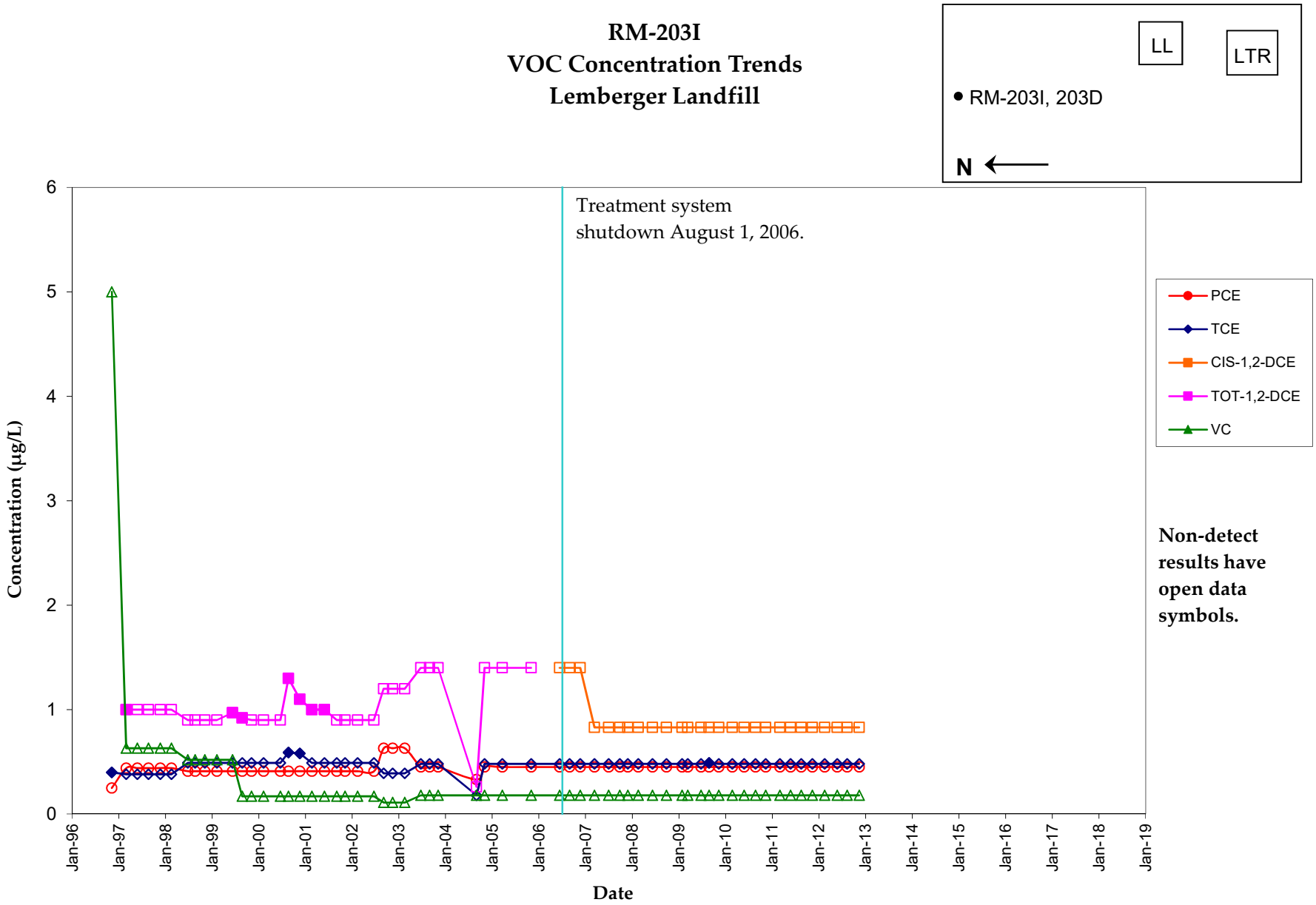
Non-detect results have open data symbols.

RM-203D
VOC Concentration Trends
Lemberger Landfill



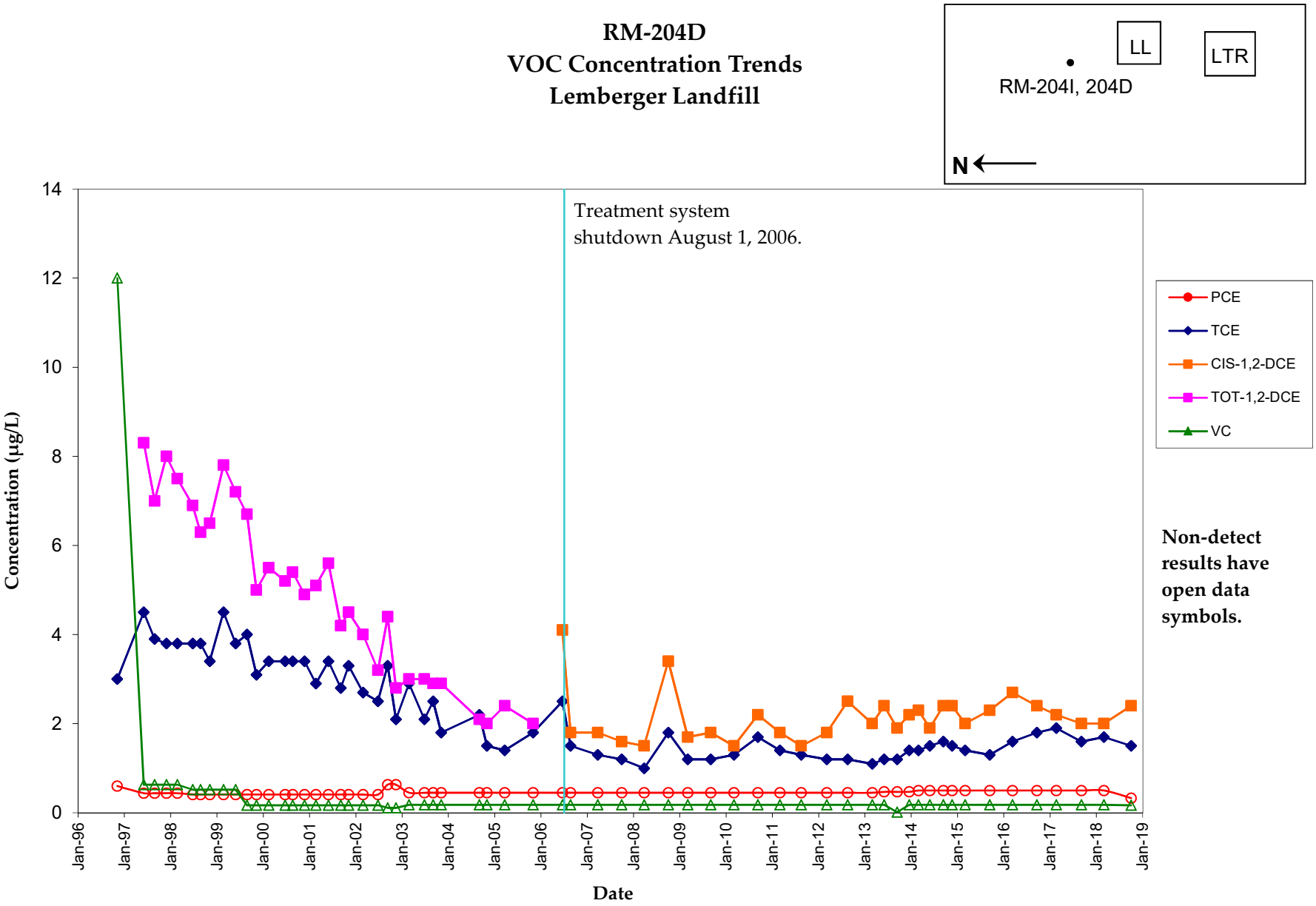
Non-detect results have open data symbols.

RM-203I
VOC Concentration Trends
Lemberger Landfill



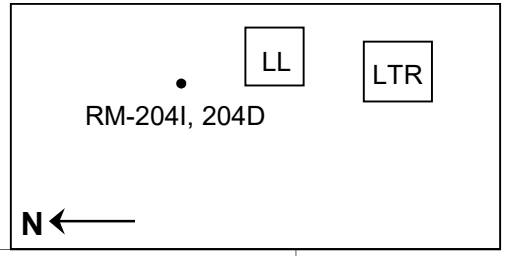
Non-detect results have open data symbols.

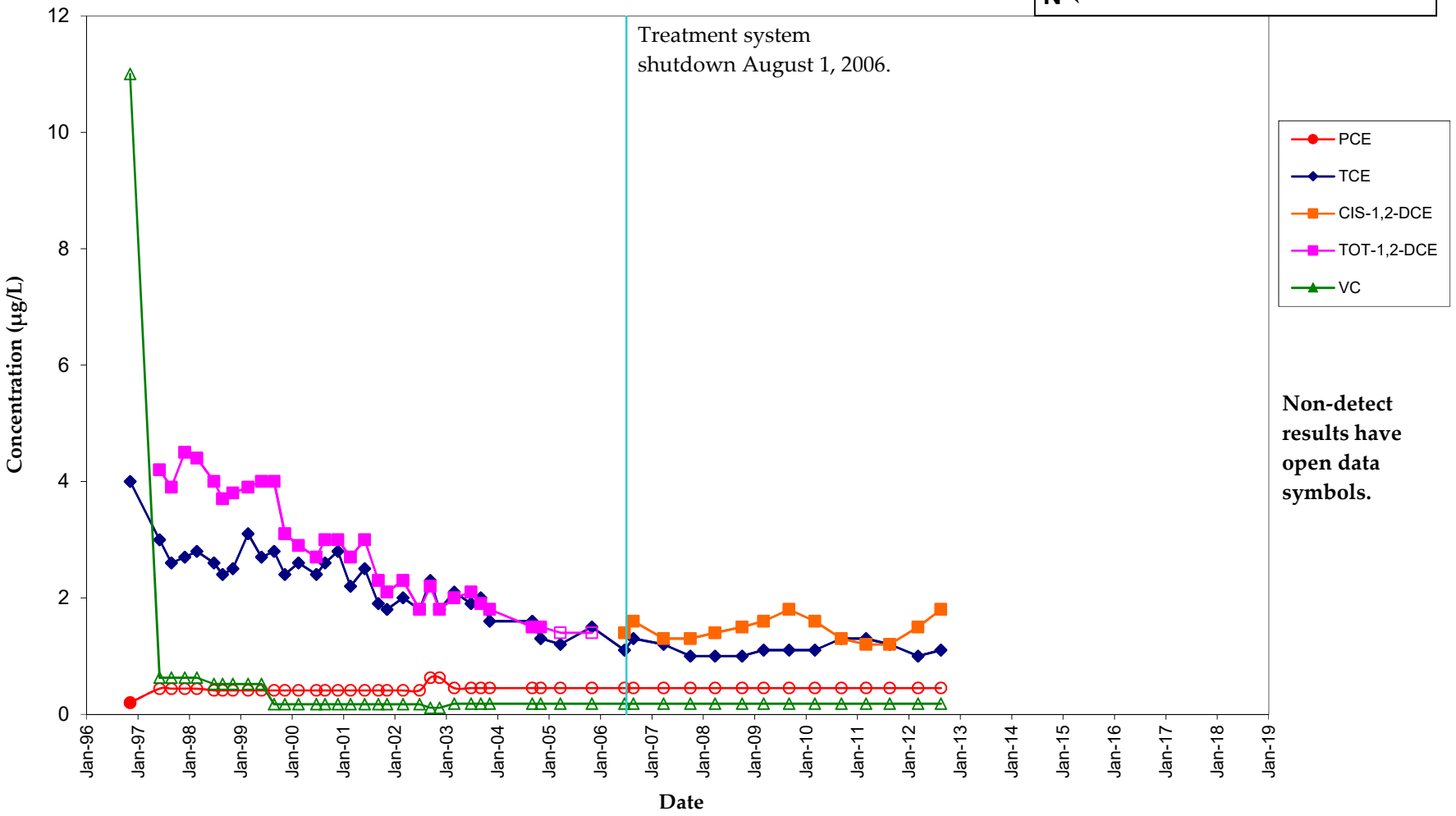
RM-204D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

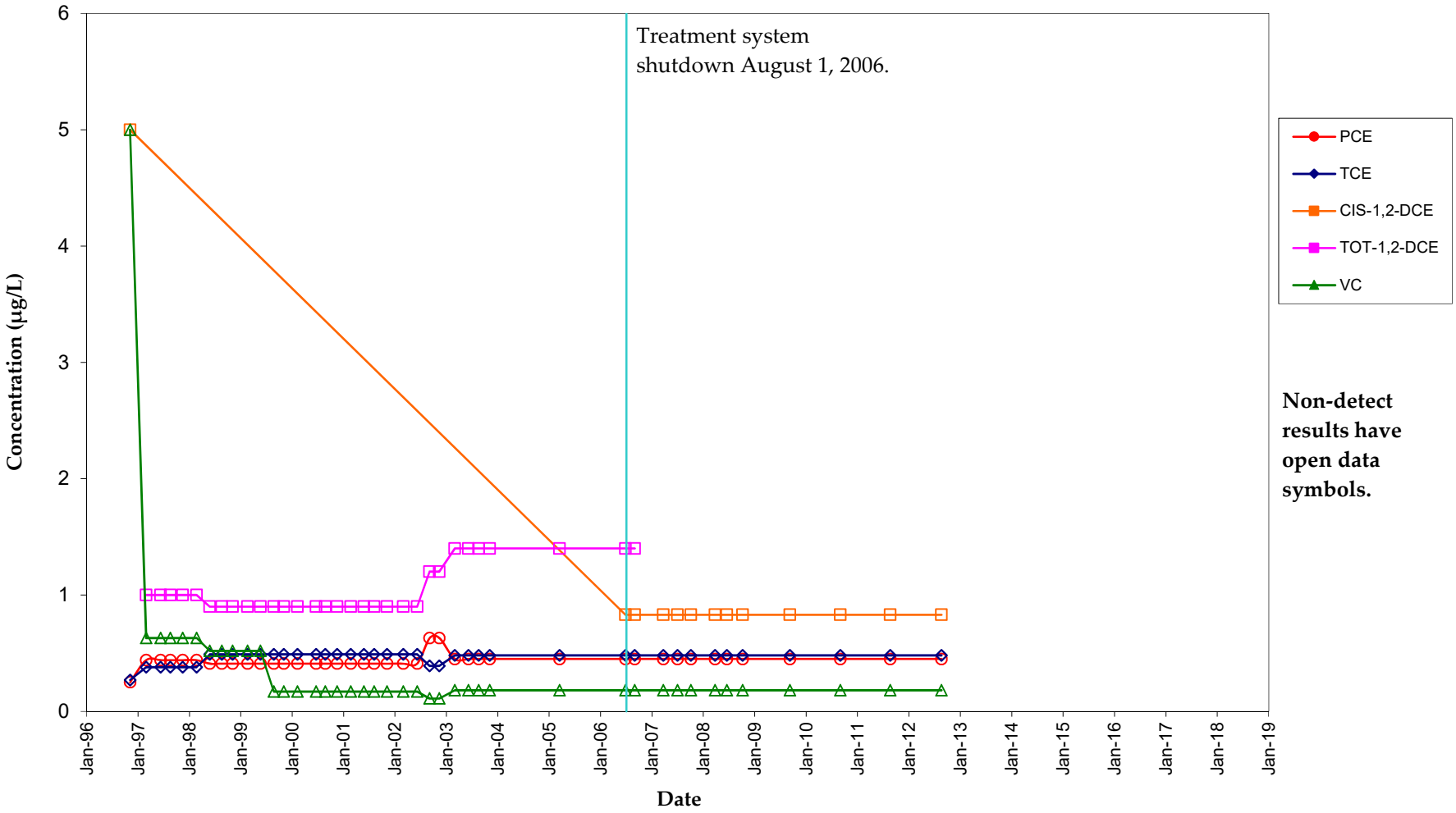
RM-204I
VOC Concentration Trends
Lemberger Landfill





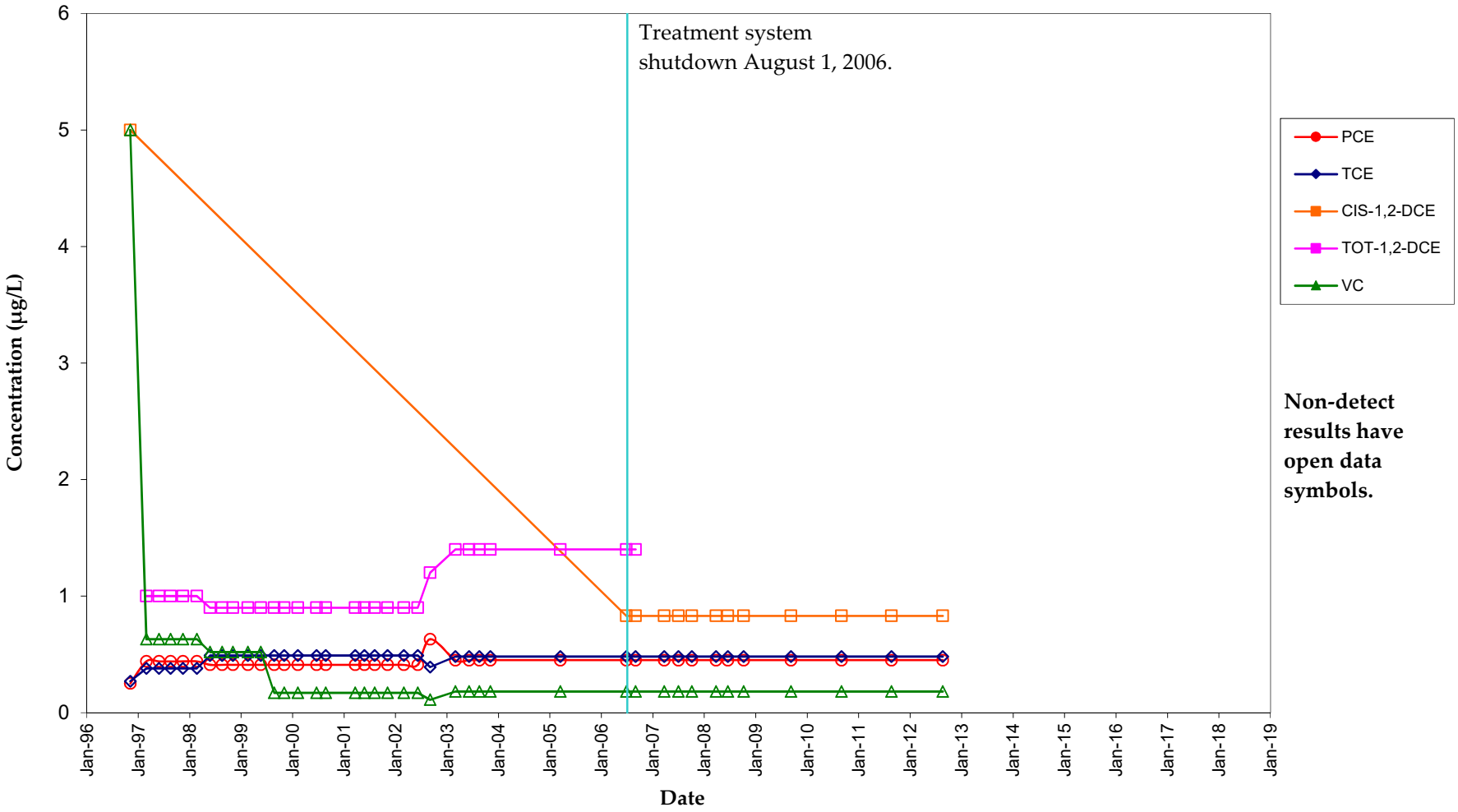
Non-detect results have open data symbols.

RM-205D
VOC Concentration Trends
Lemberger Landfill

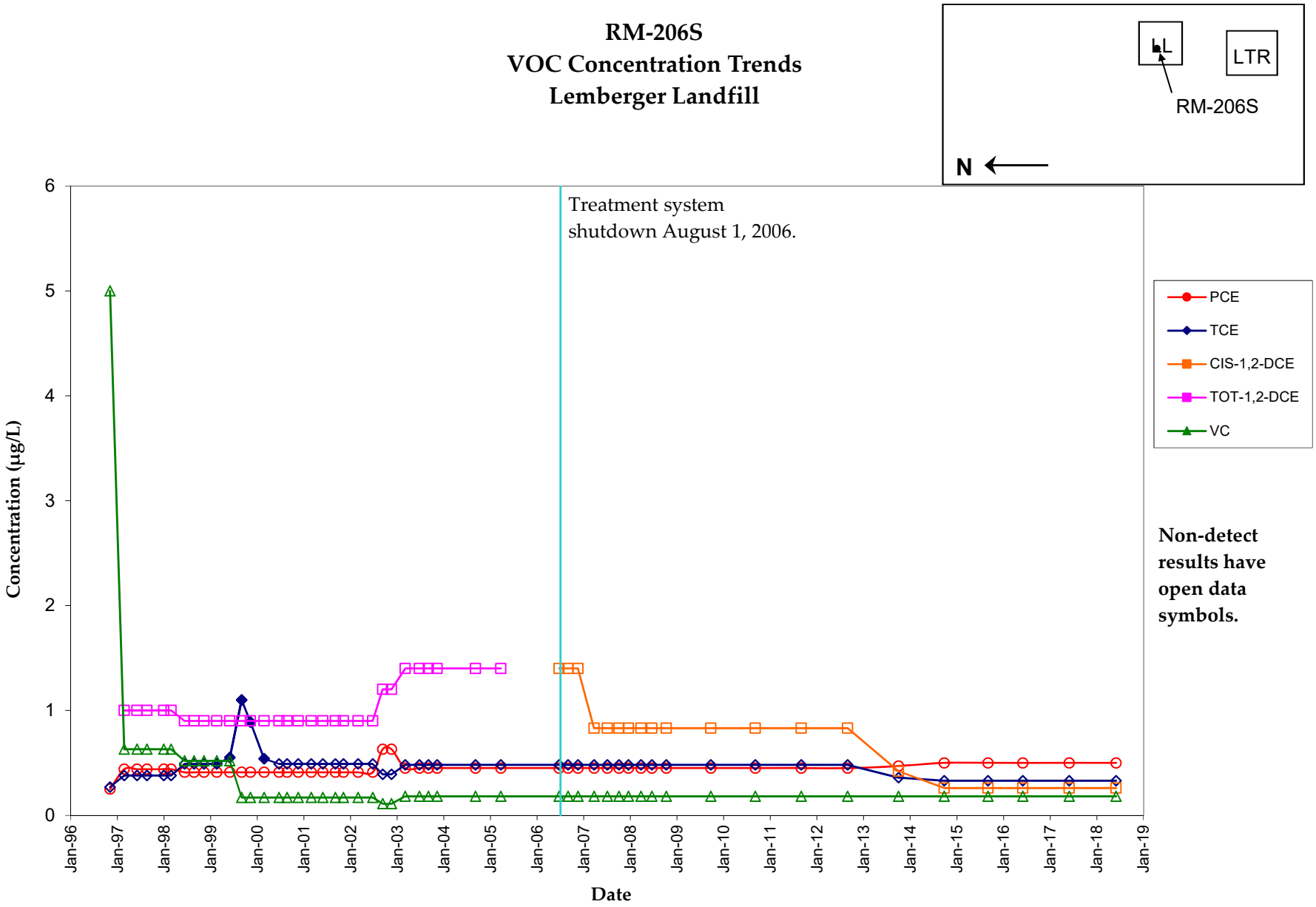


Non-detect results have open data symbols.

RM-205I
VOC Concentration Trends
Lemberger Landfill

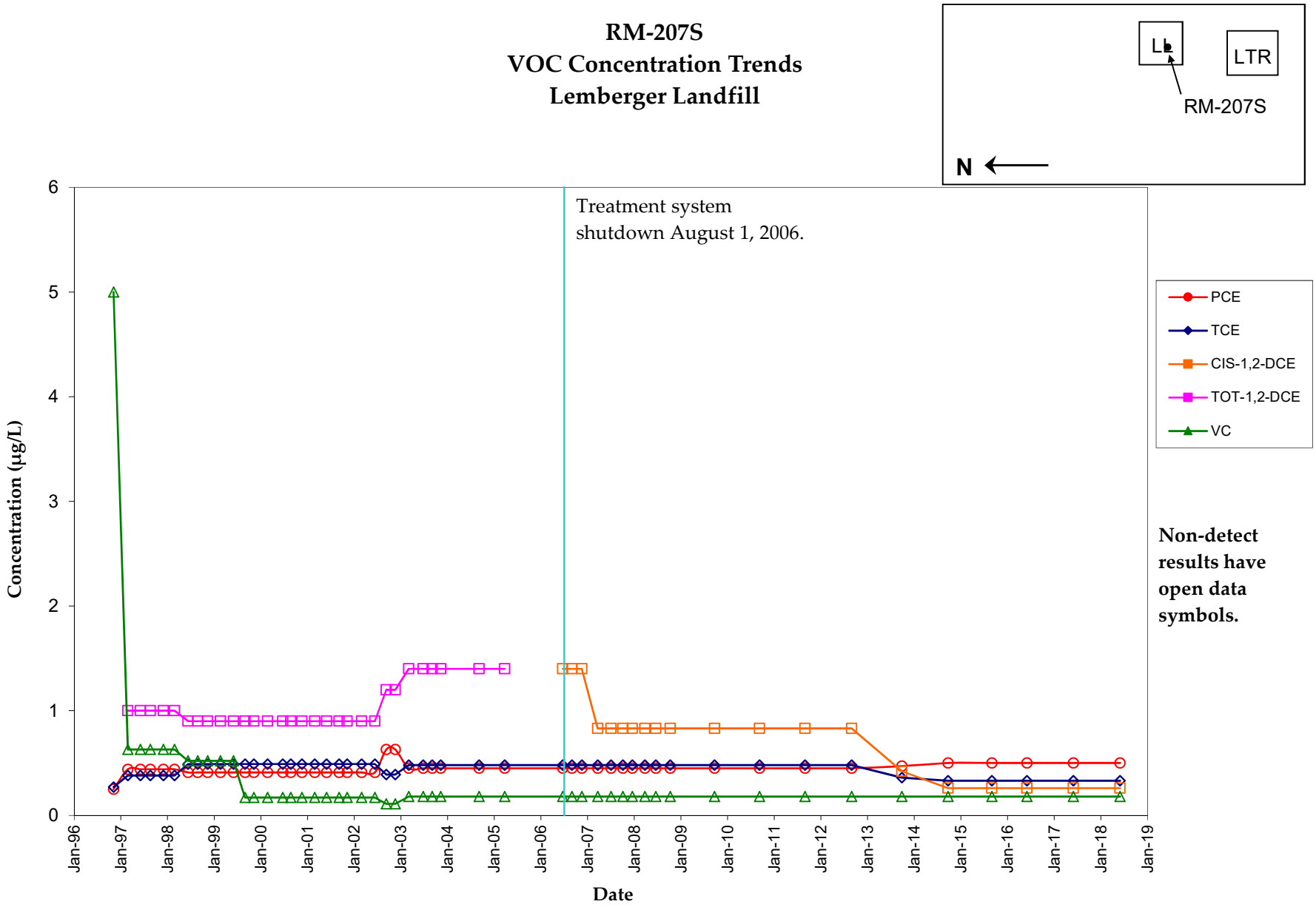


RM-206S
VOC Concentration Trends
Lemberger Landfill



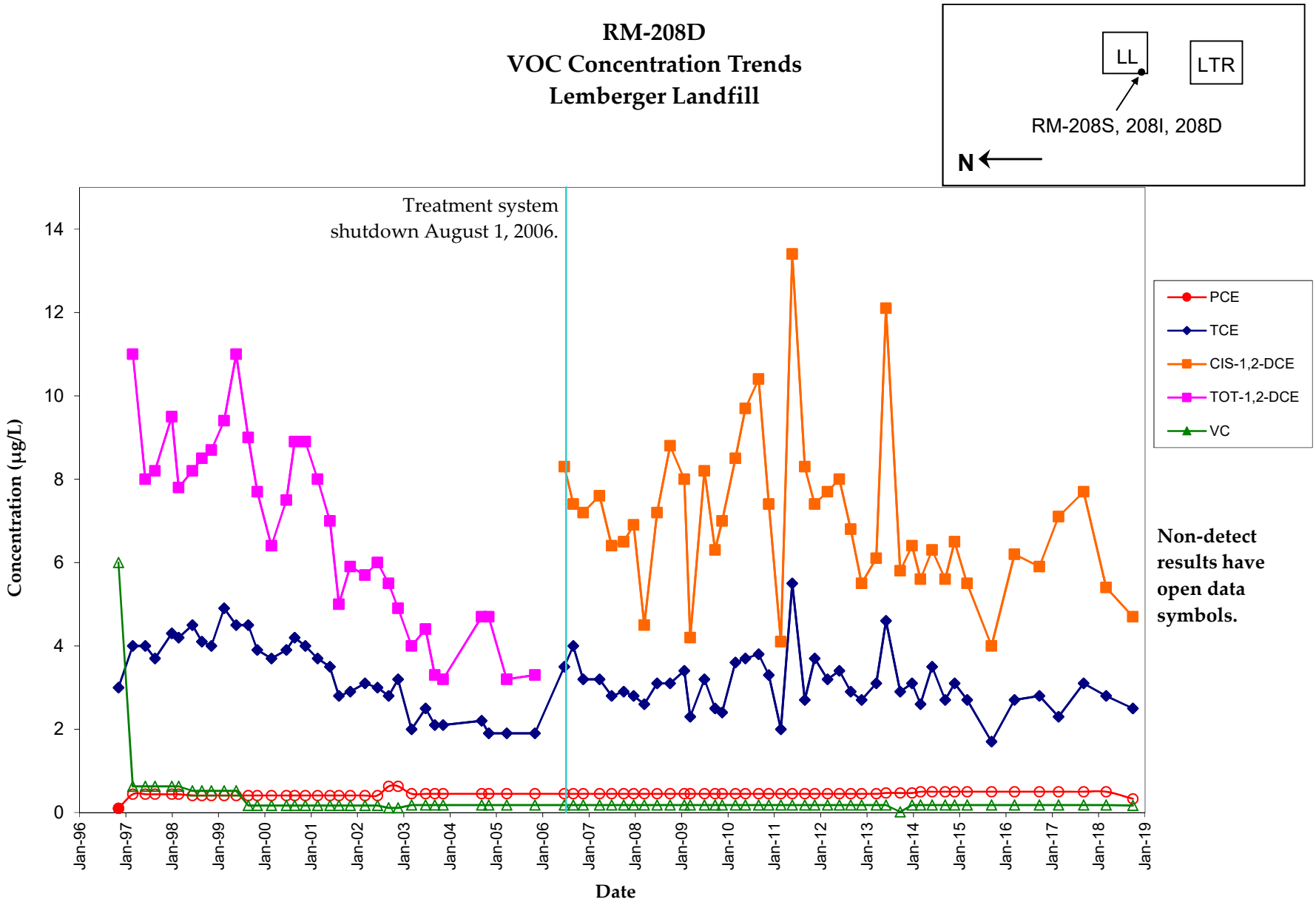
Non-detect results have open data symbols.

RM-207S
VOC Concentration Trends
Lemberger Landfill

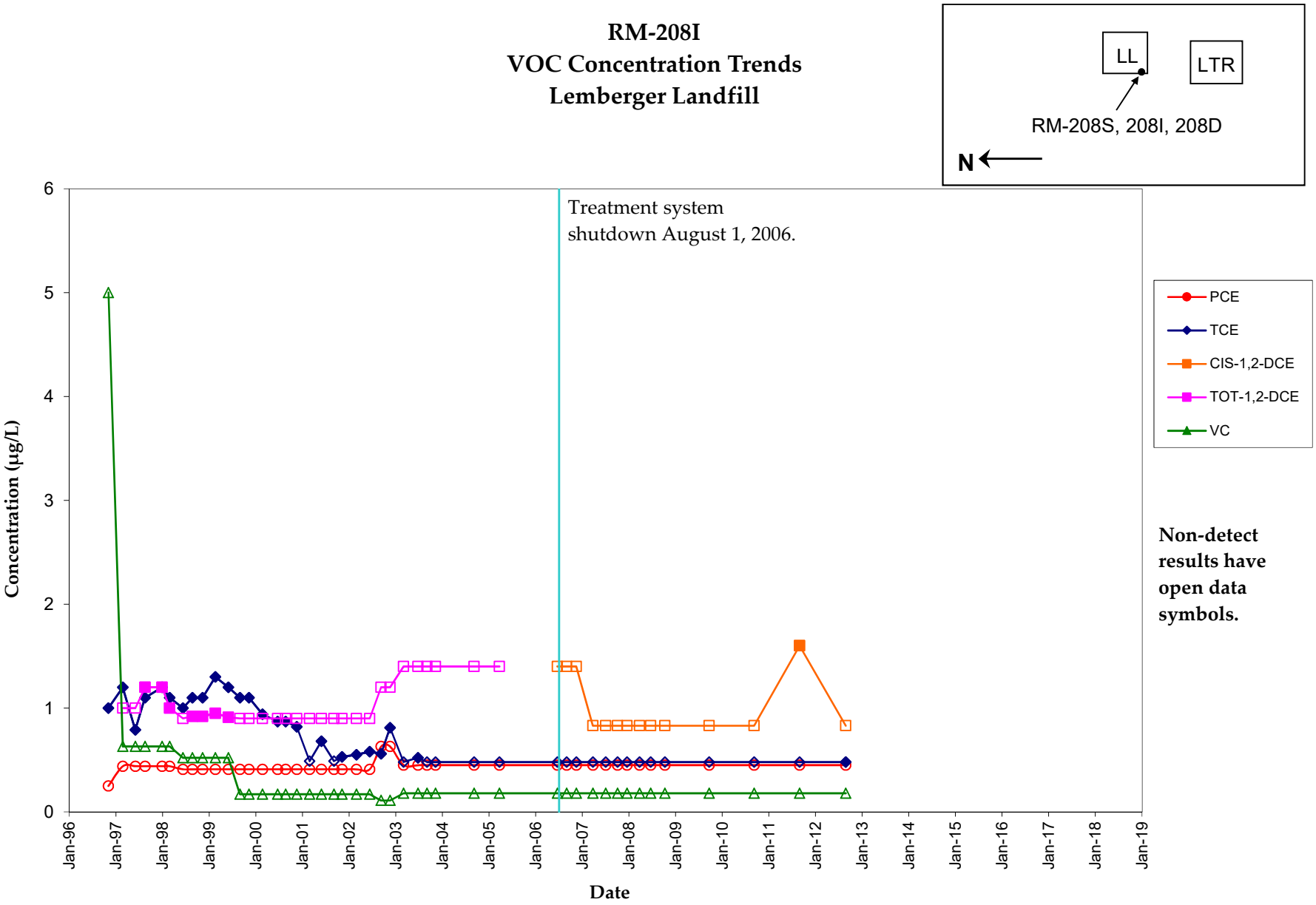


Non-detect results have open data symbols.

RM-208D
VOC Concentration Trends
Lemberger Landfill

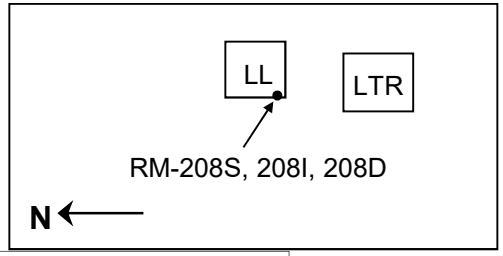


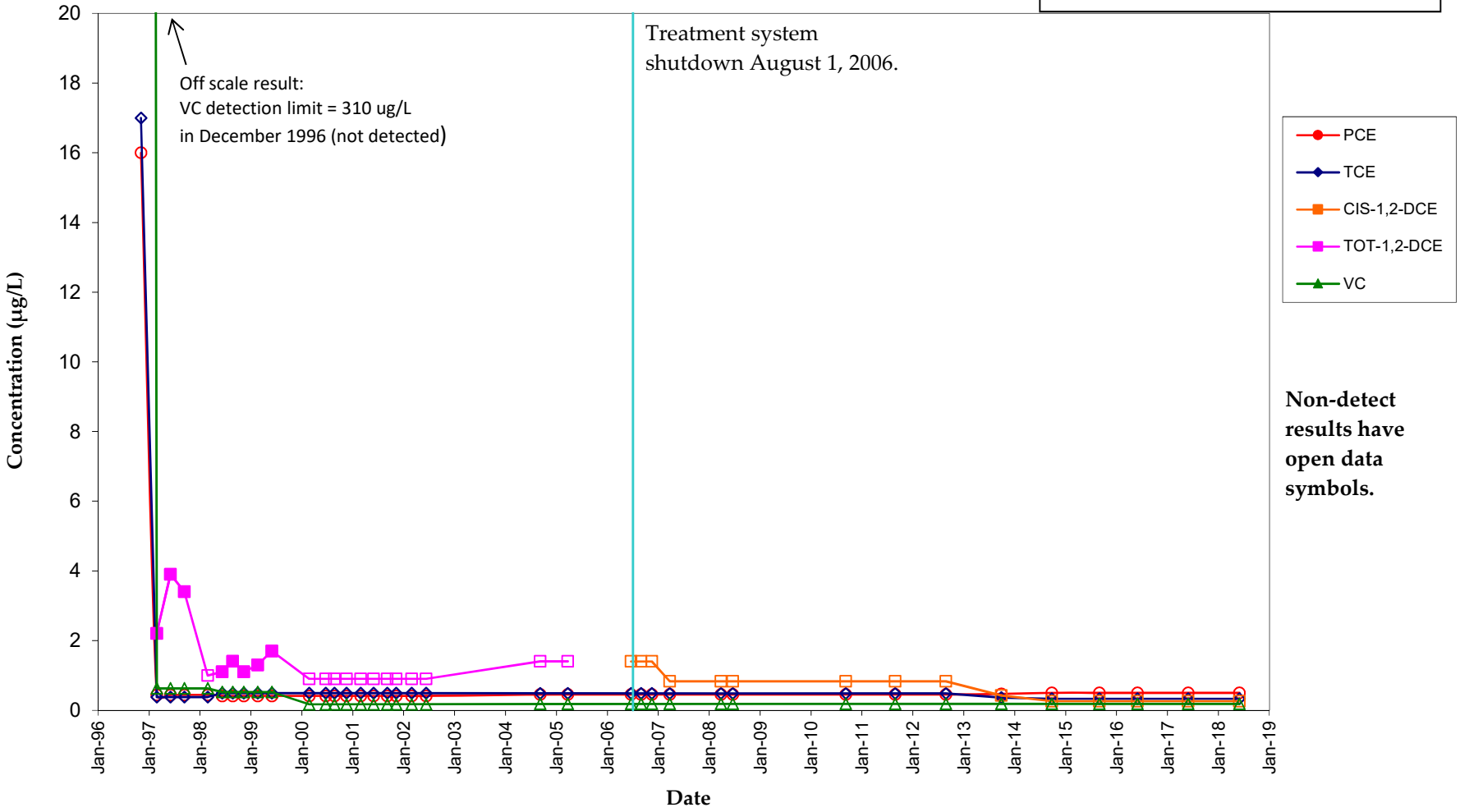
RM-208I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

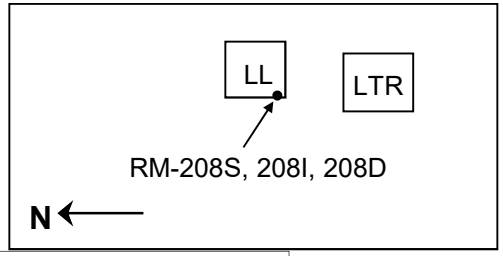
RM-208S
VOC Concentration Trends
Lemberger Landfill

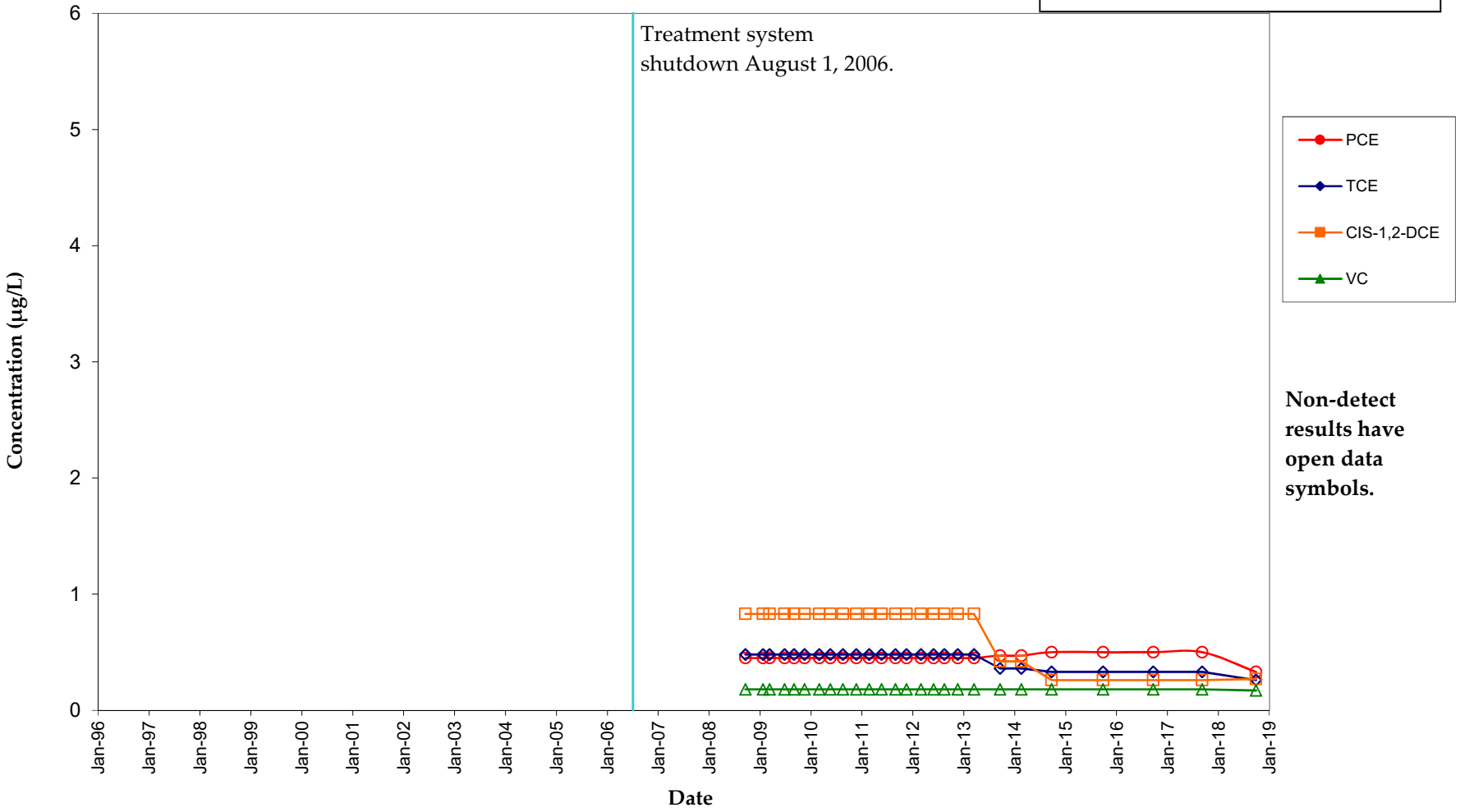




Non-detect results have open data symbols.

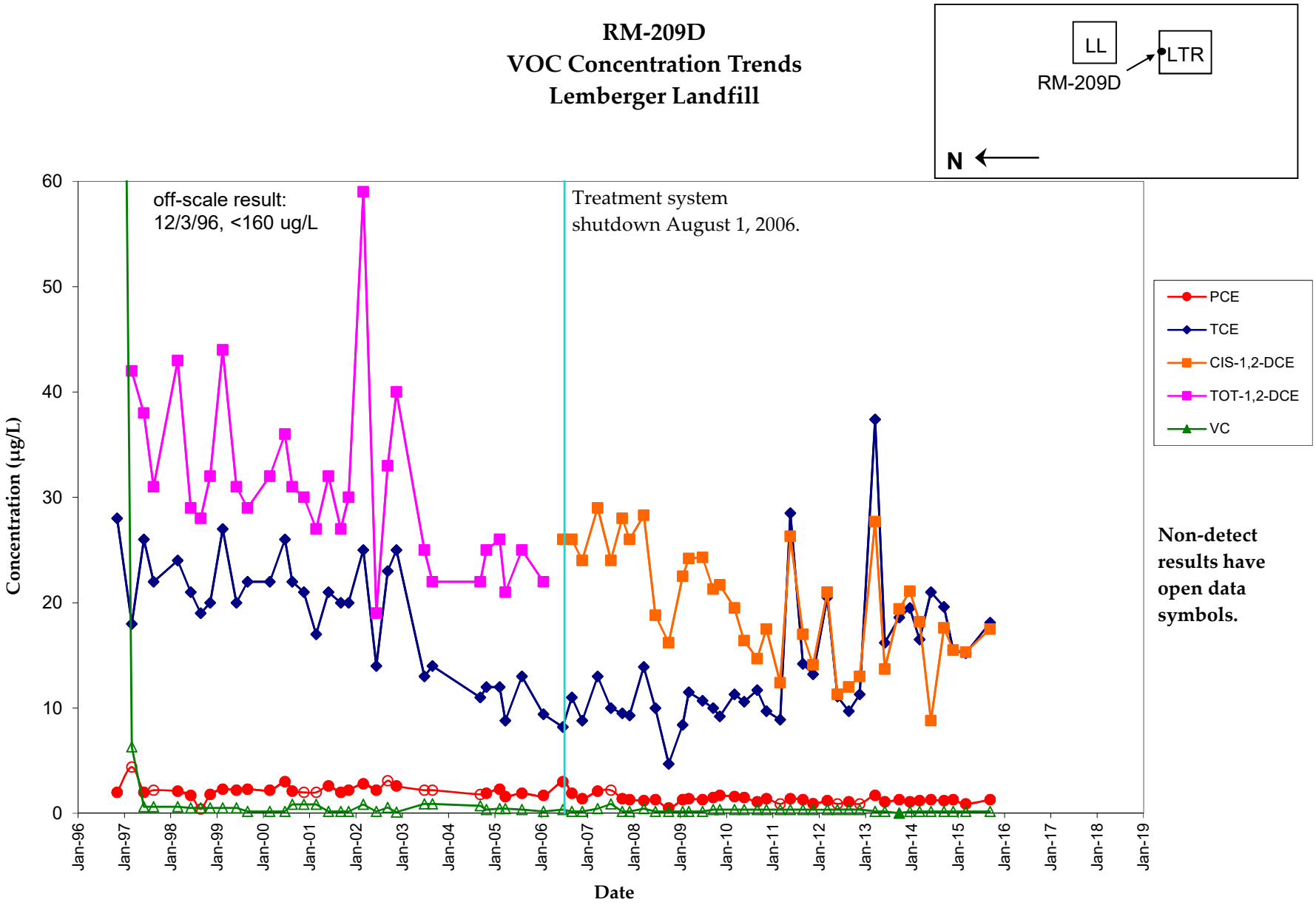
RM-208XD
VOC Concentration Trends
Lemberger Landfill





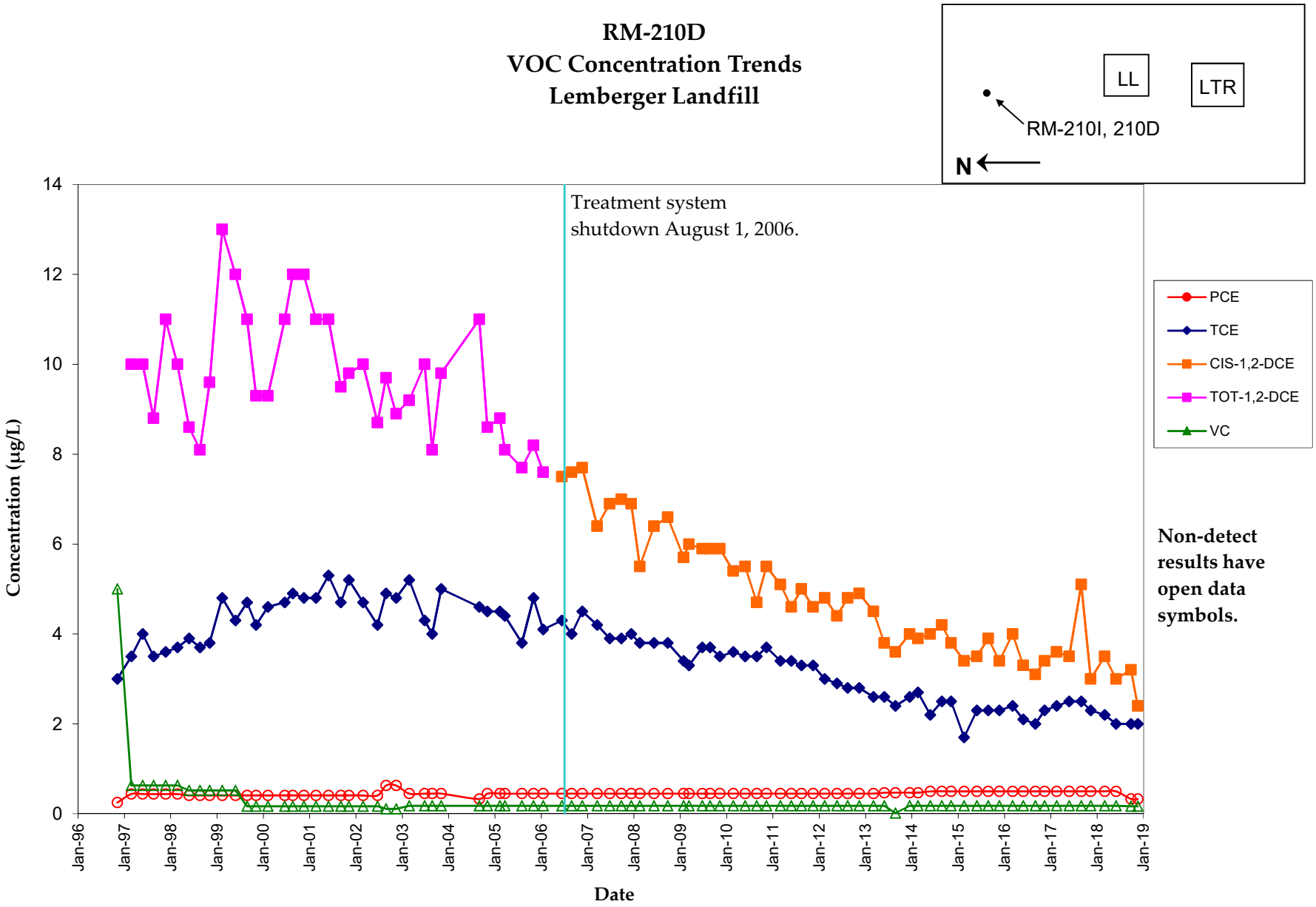
Non-detect results have open data symbols.

RM-209D
VOC Concentration Trends
Lemberger Landfill



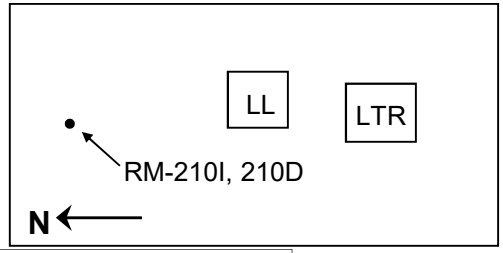
Non-detect results have open data symbols.

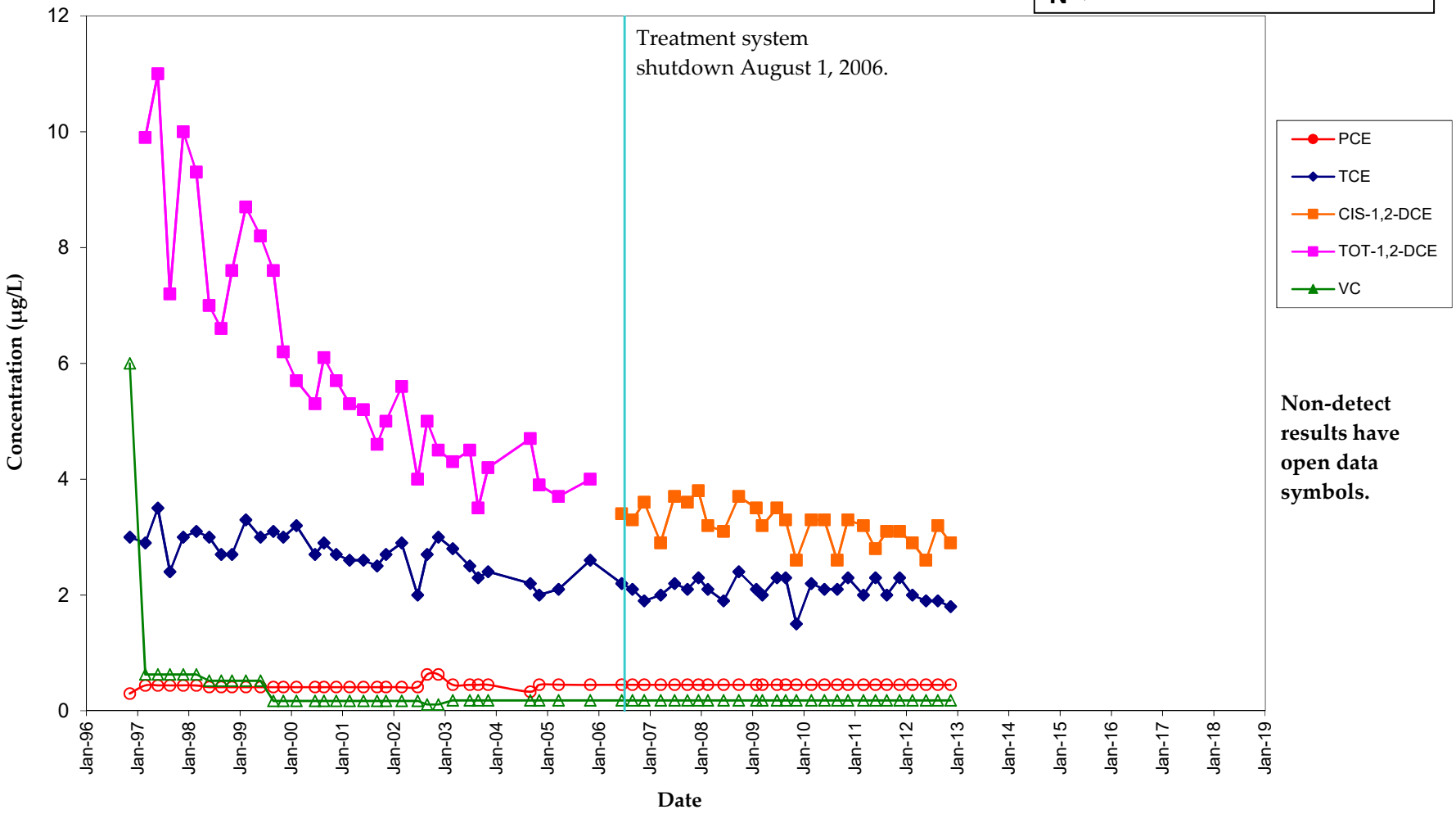
RM-210D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

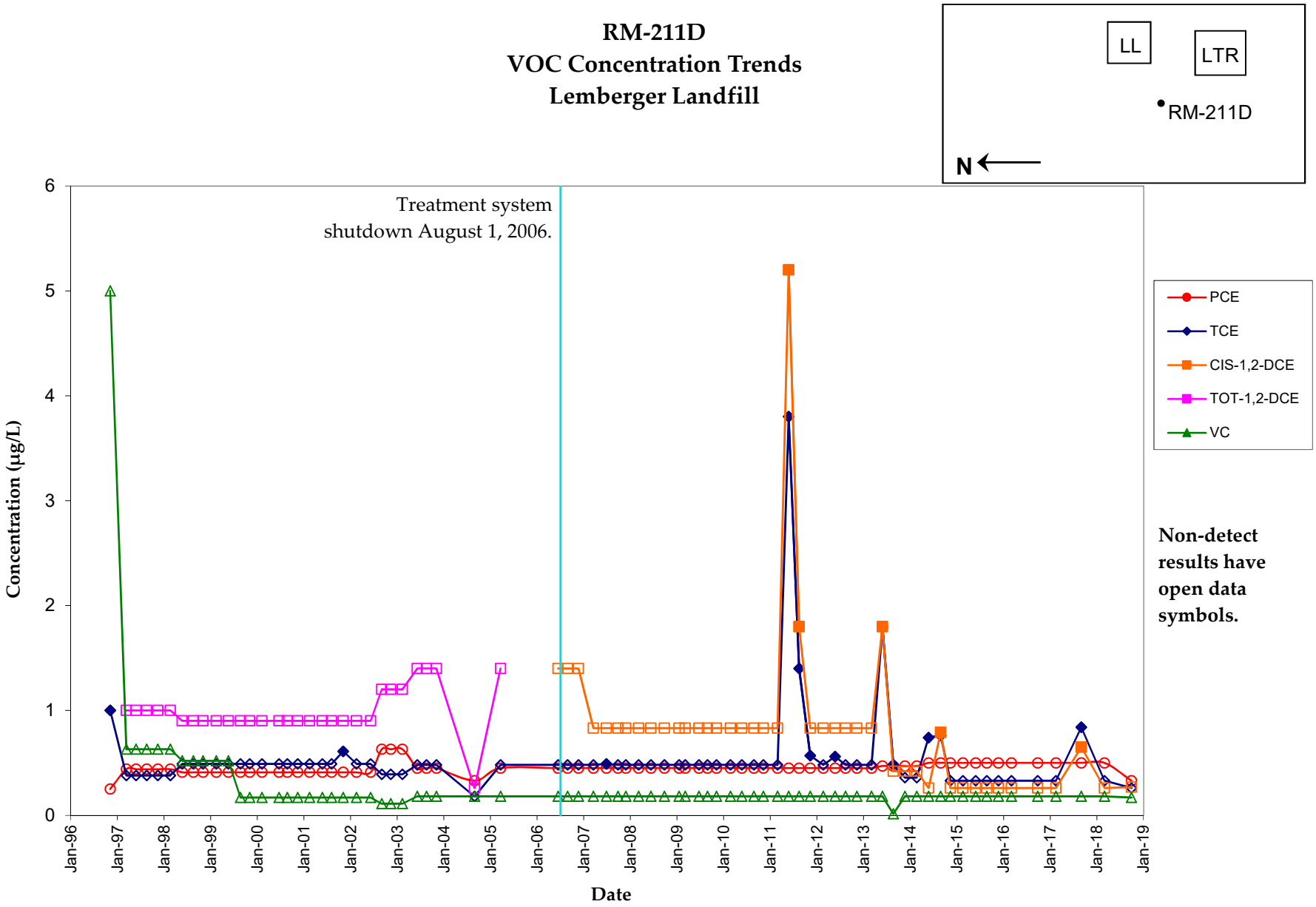
RM-210I
VOC Concentration Trends
Lemberger Landfill





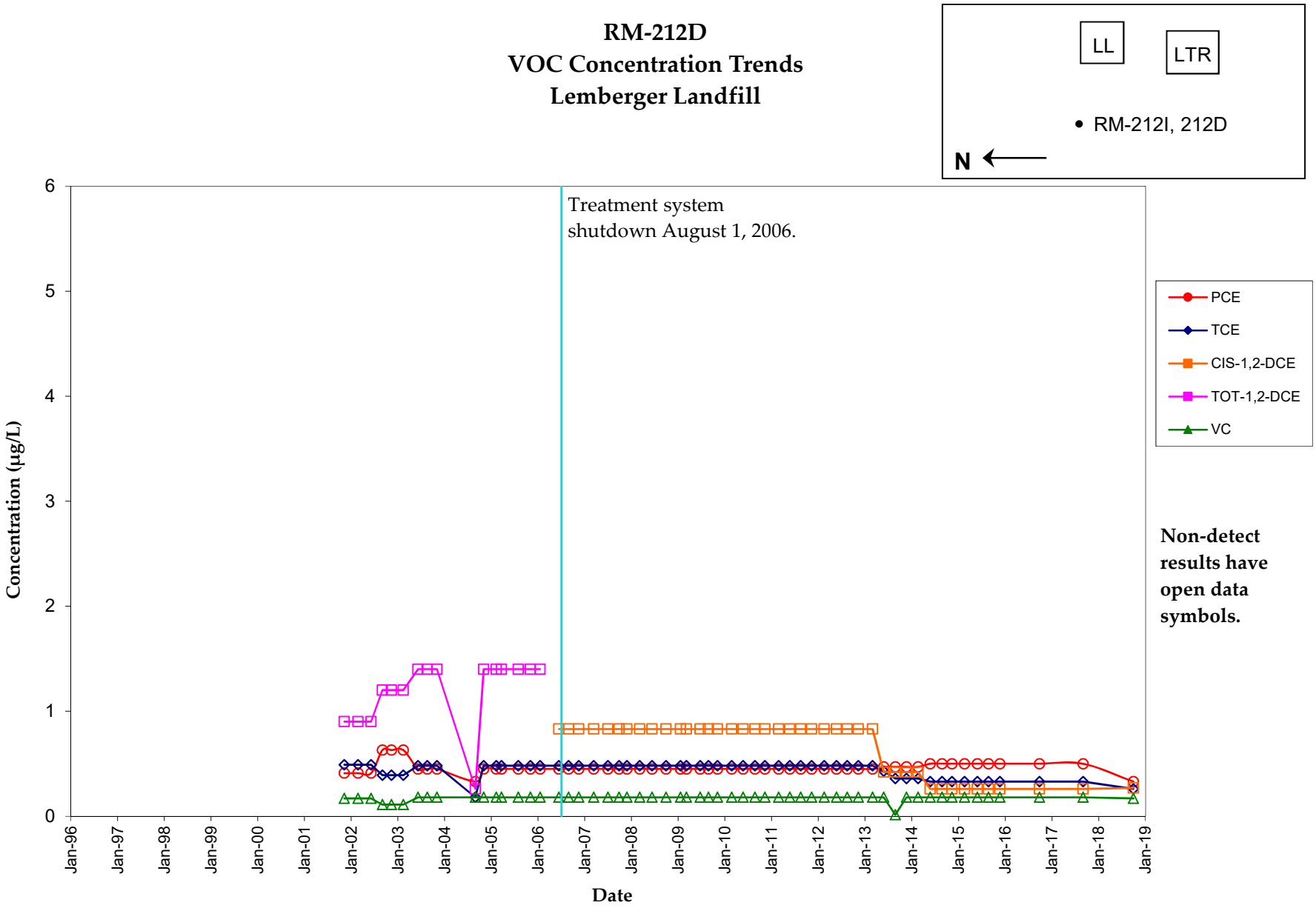
Non-detect results have open data symbols.

RM-211D
VOC Concentration Trends
Lemberger Landfill



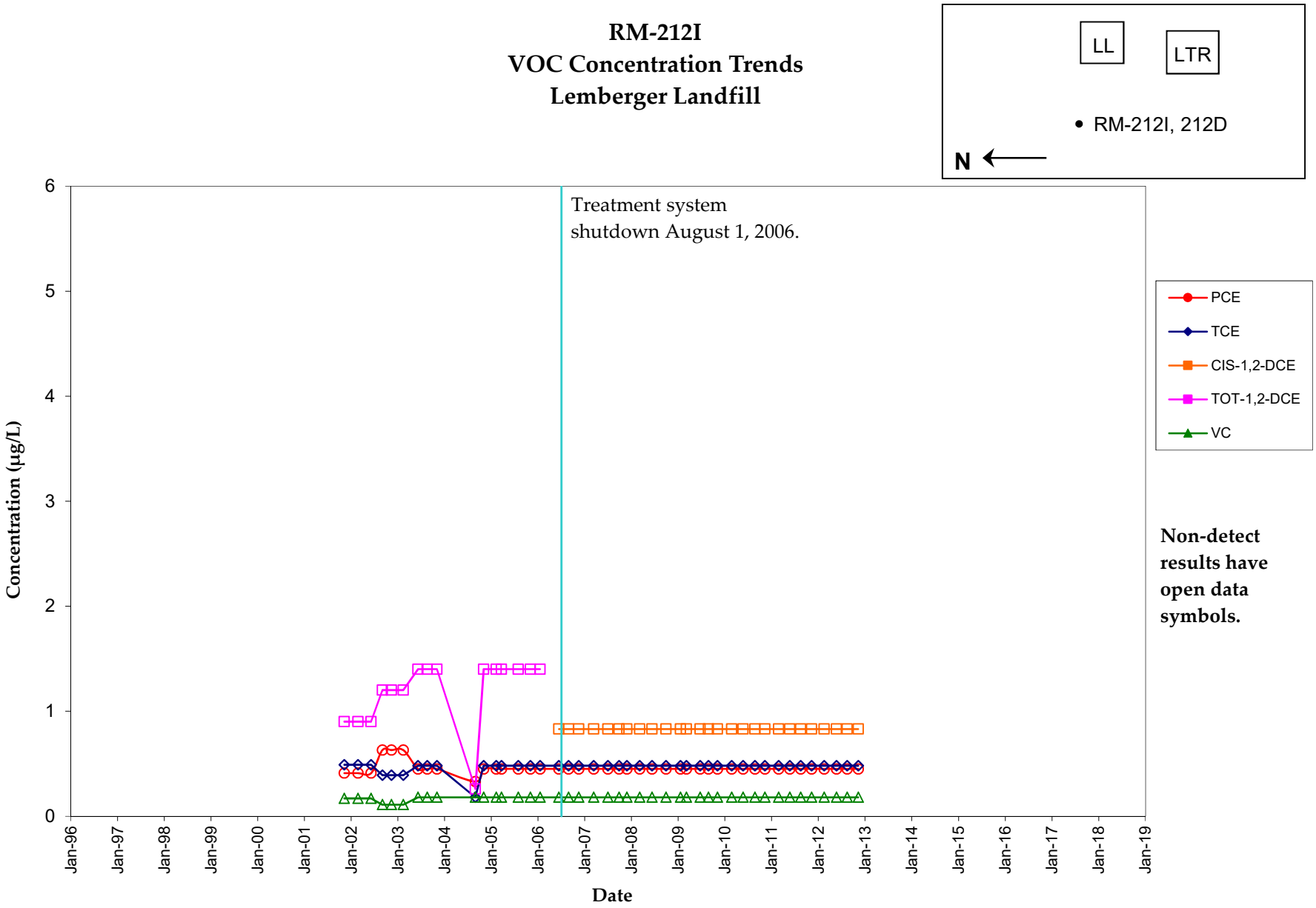
Non-detect results have open data symbols.

RM-212D
VOC Concentration Trends
Lemberger Landfill



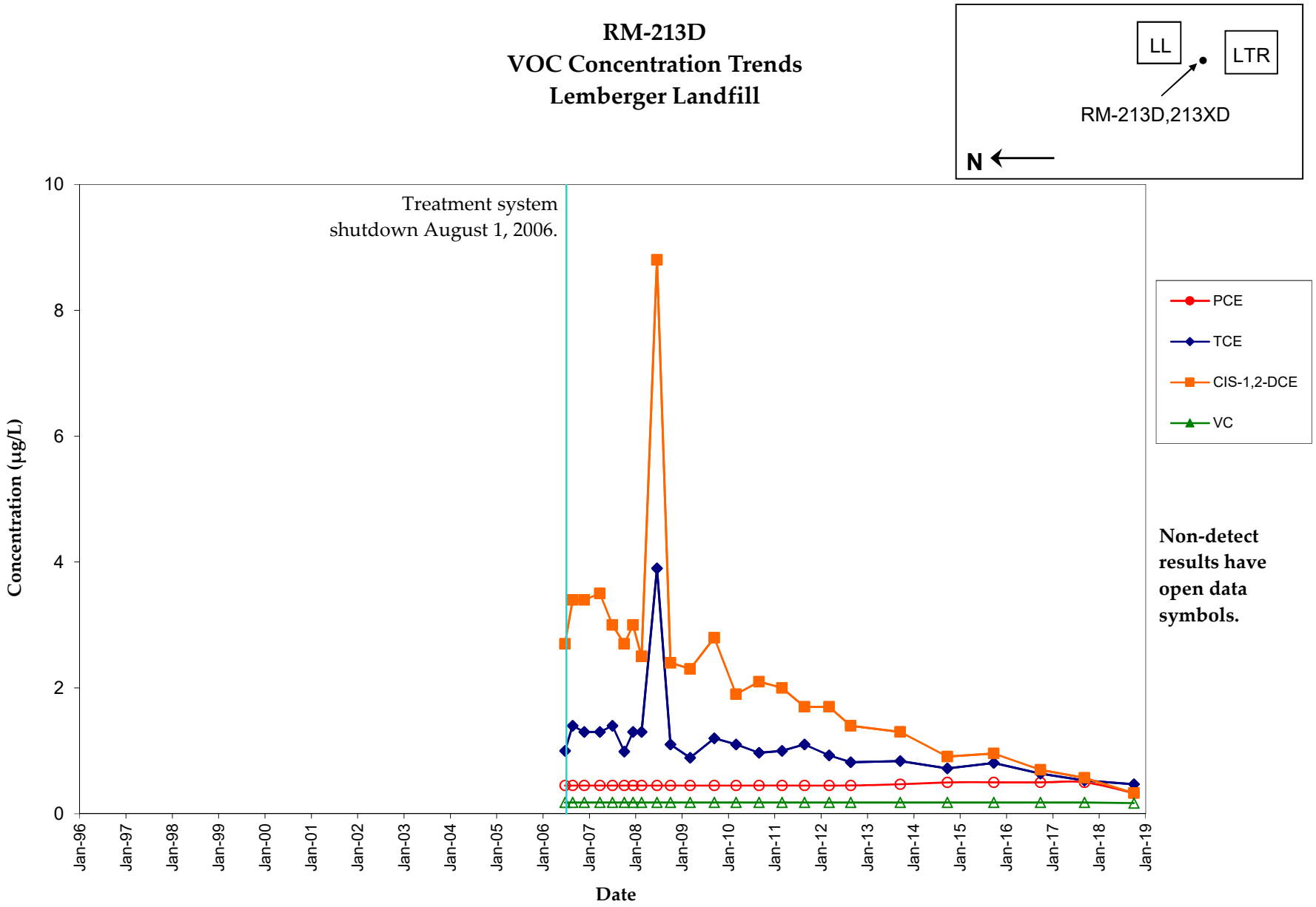
Non-detect results have open data symbols.

RM-212I
VOC Concentration Trends
Lemberger Landfill



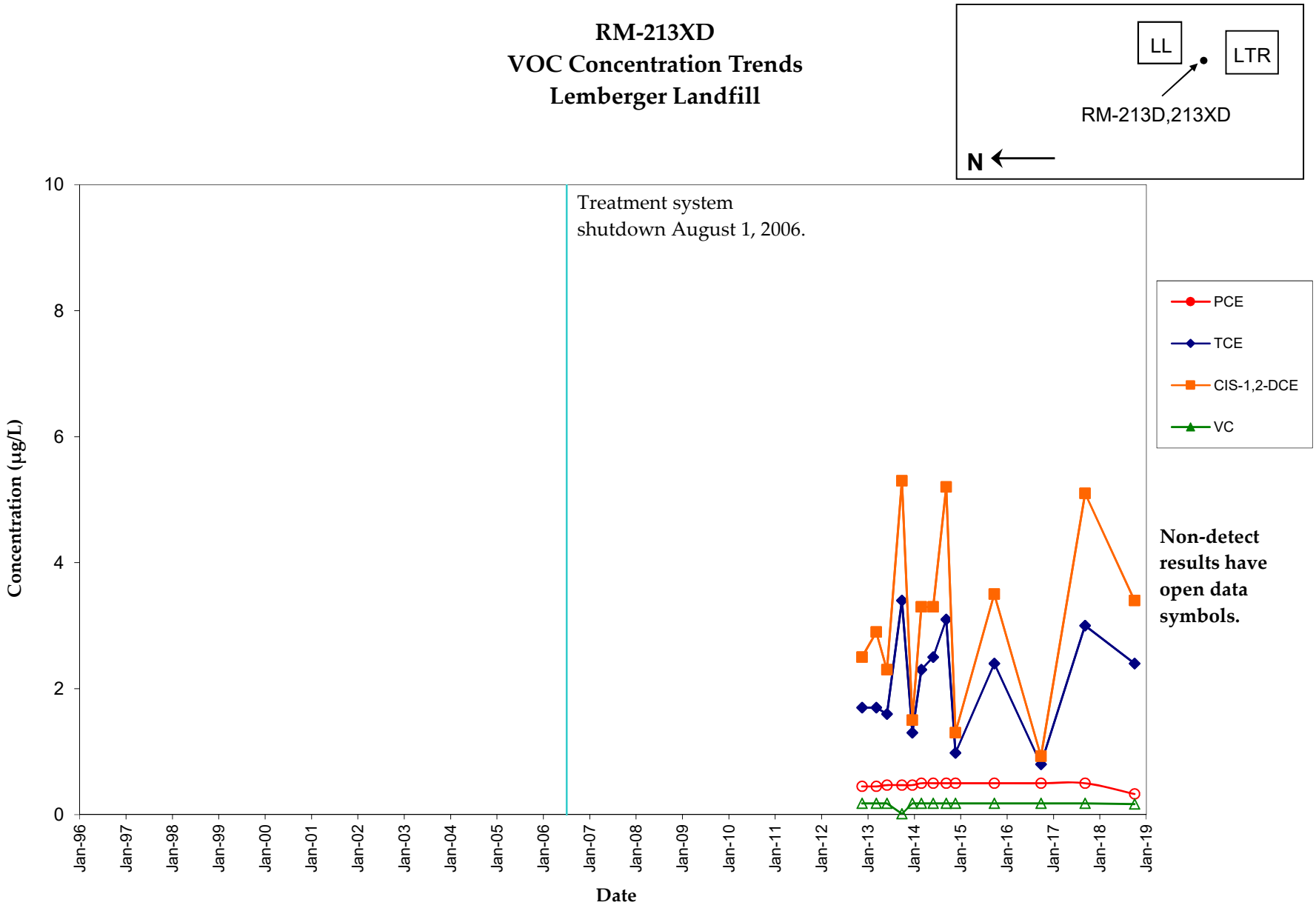
Non-detect results have open data symbols.

RM-213D
VOC Concentration Trends
Lemberger Landfill

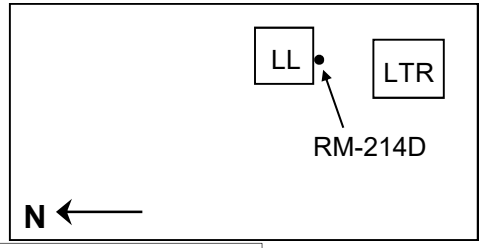


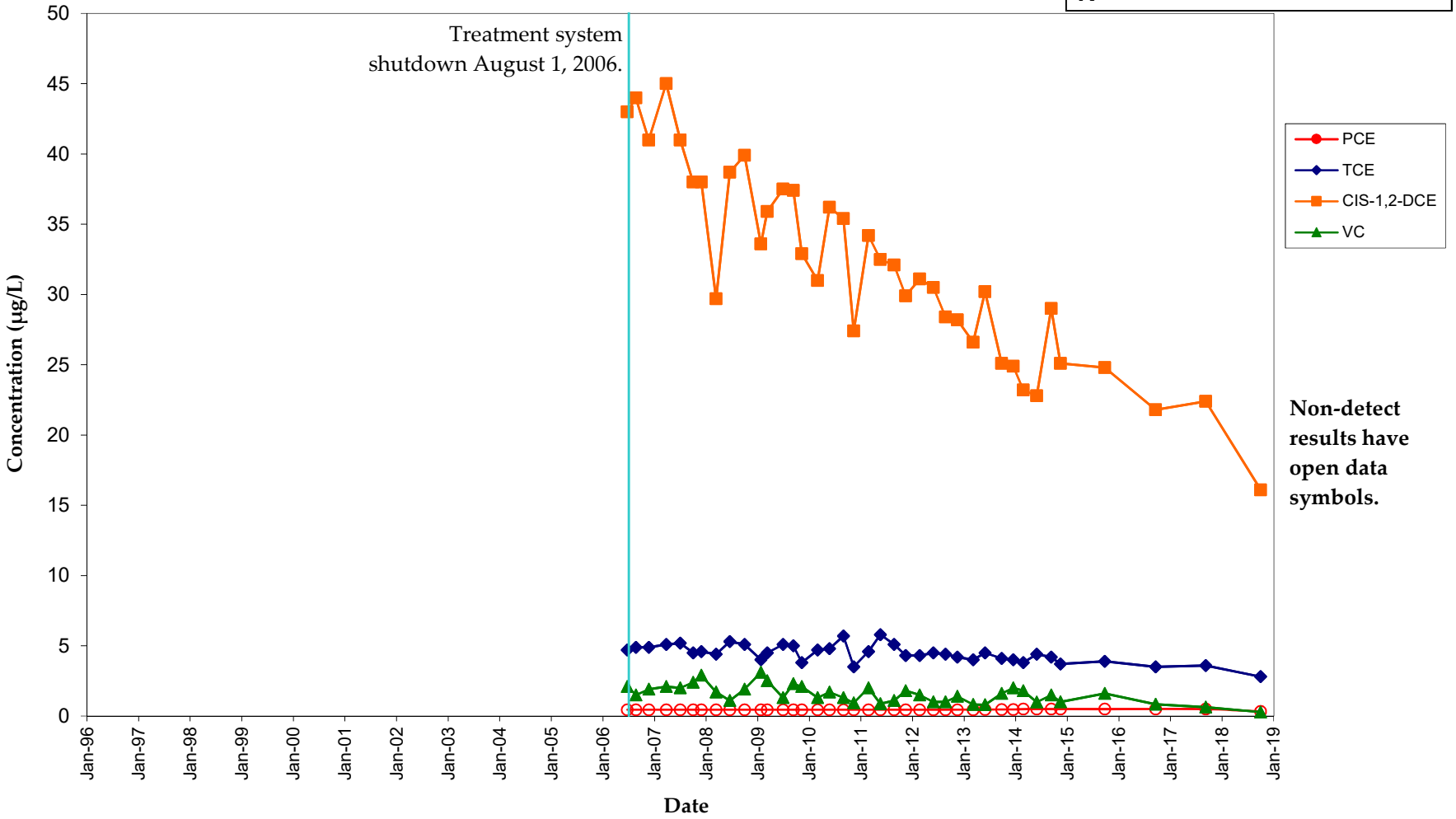
Non-detect results have open data symbols.

RM-213XD
VOC Concentration Trends
Lemberger Landfill

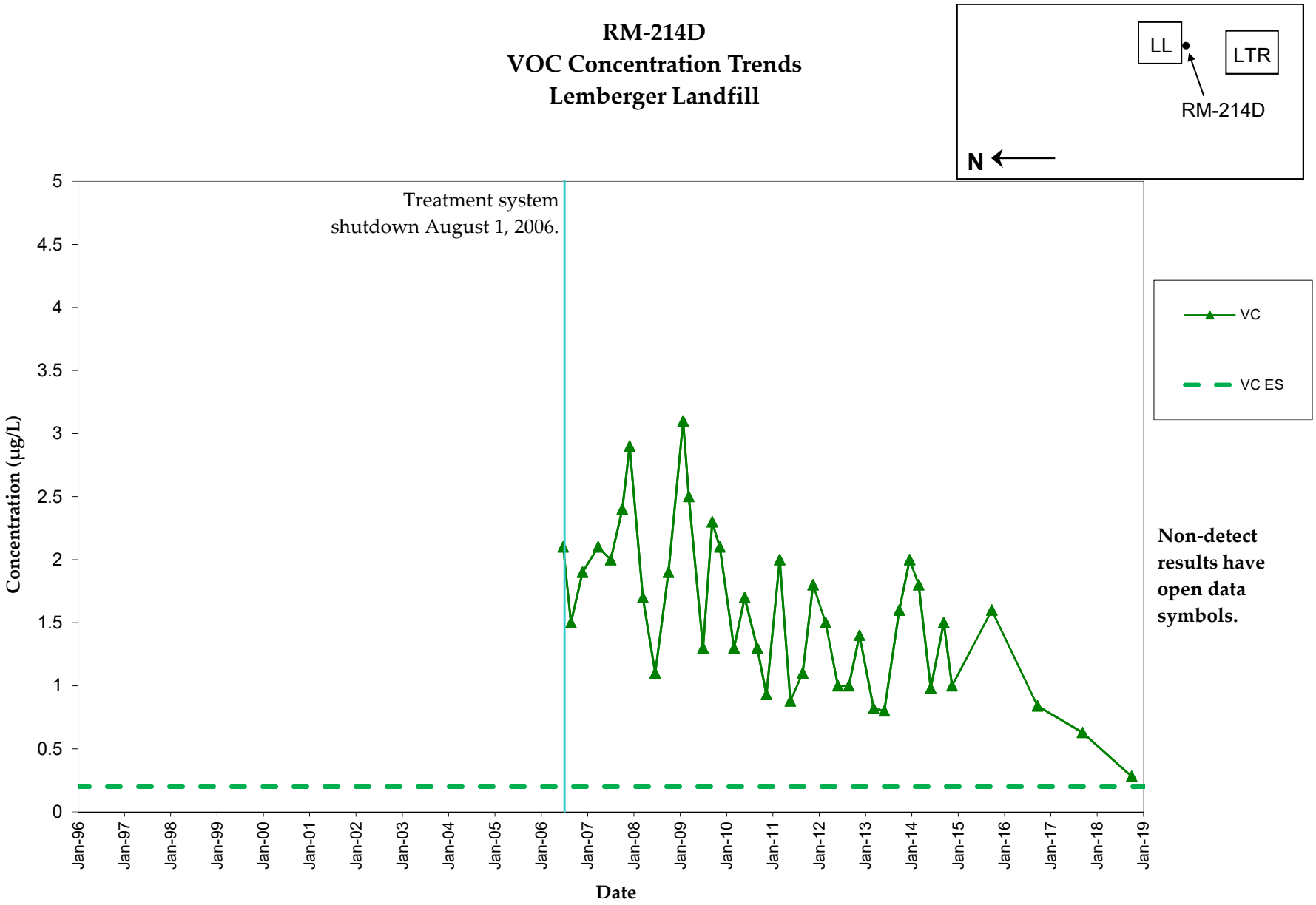


RM-214D
VOC Concentration Trends
Lemberger Landfill

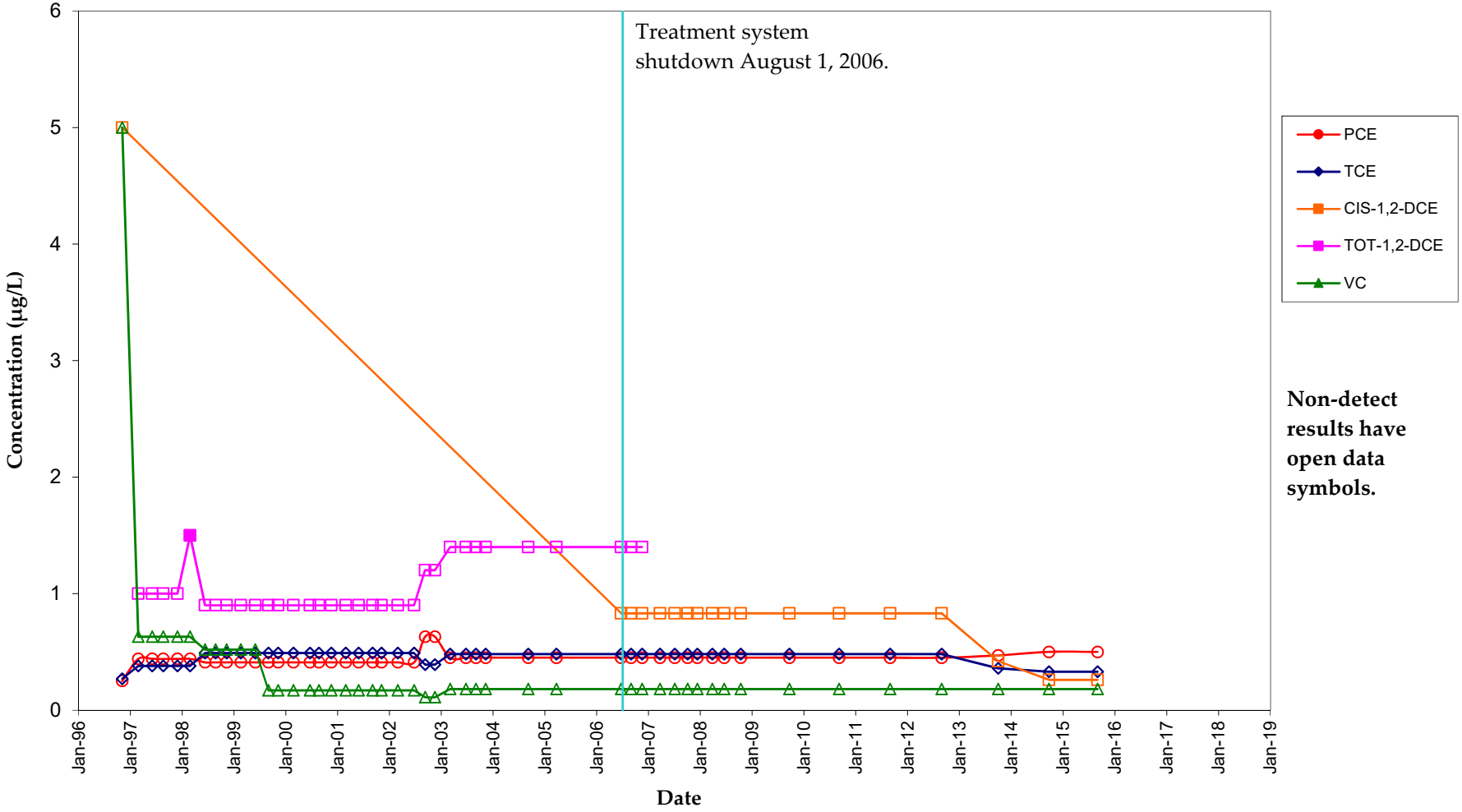




Non-detect results have open data symbols.

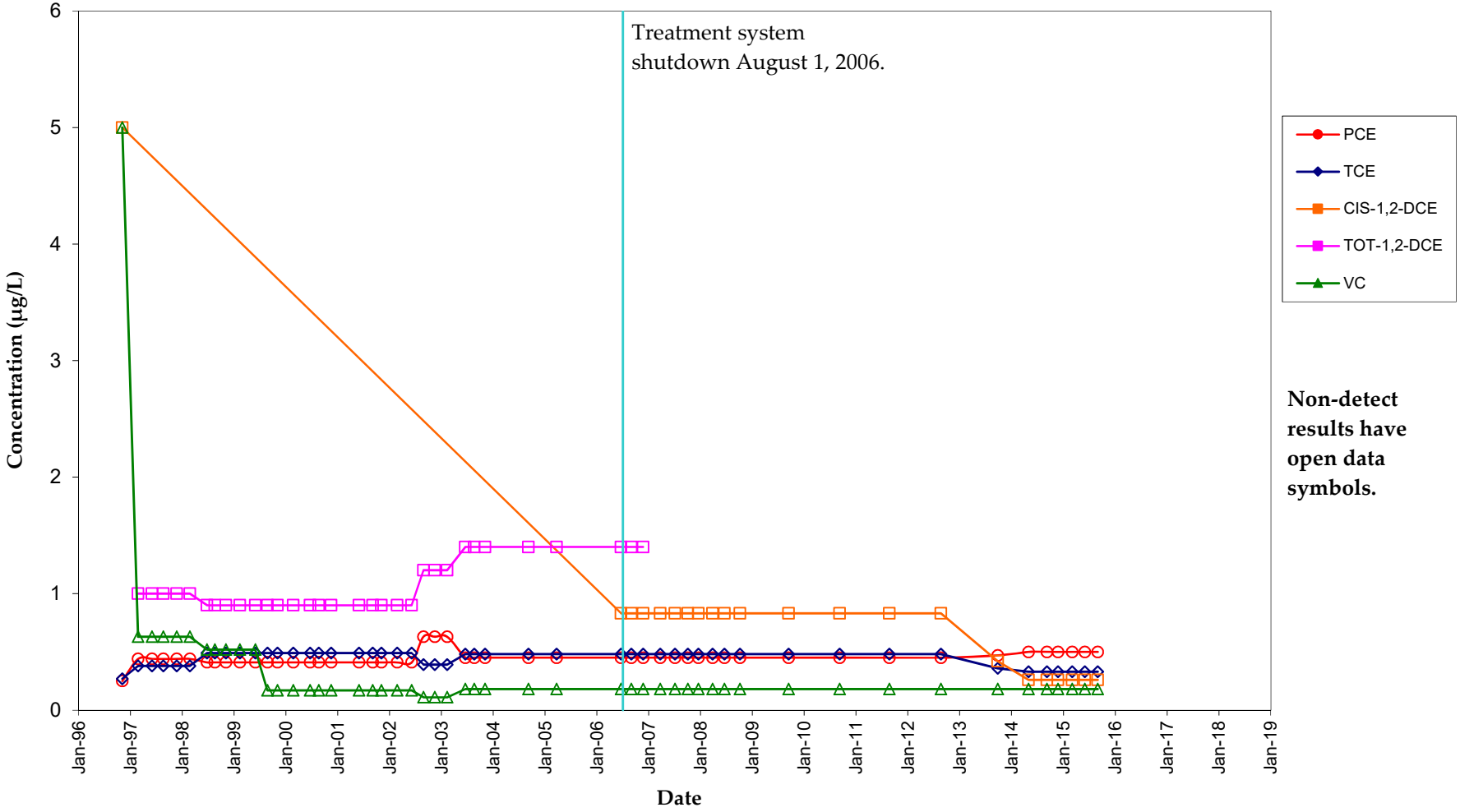

RM-214D
VOC Concentration Trends
Lemberger Landfill
LL
LTR
RM-214D
N
Treatment system shutdown August 1, 2006.
VC
VC ES
Non-detect results have open data symbols.
Concentration (µg/L)
Date
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19

RM-301S
VOC Concentration Trends
Lemberger Landfill



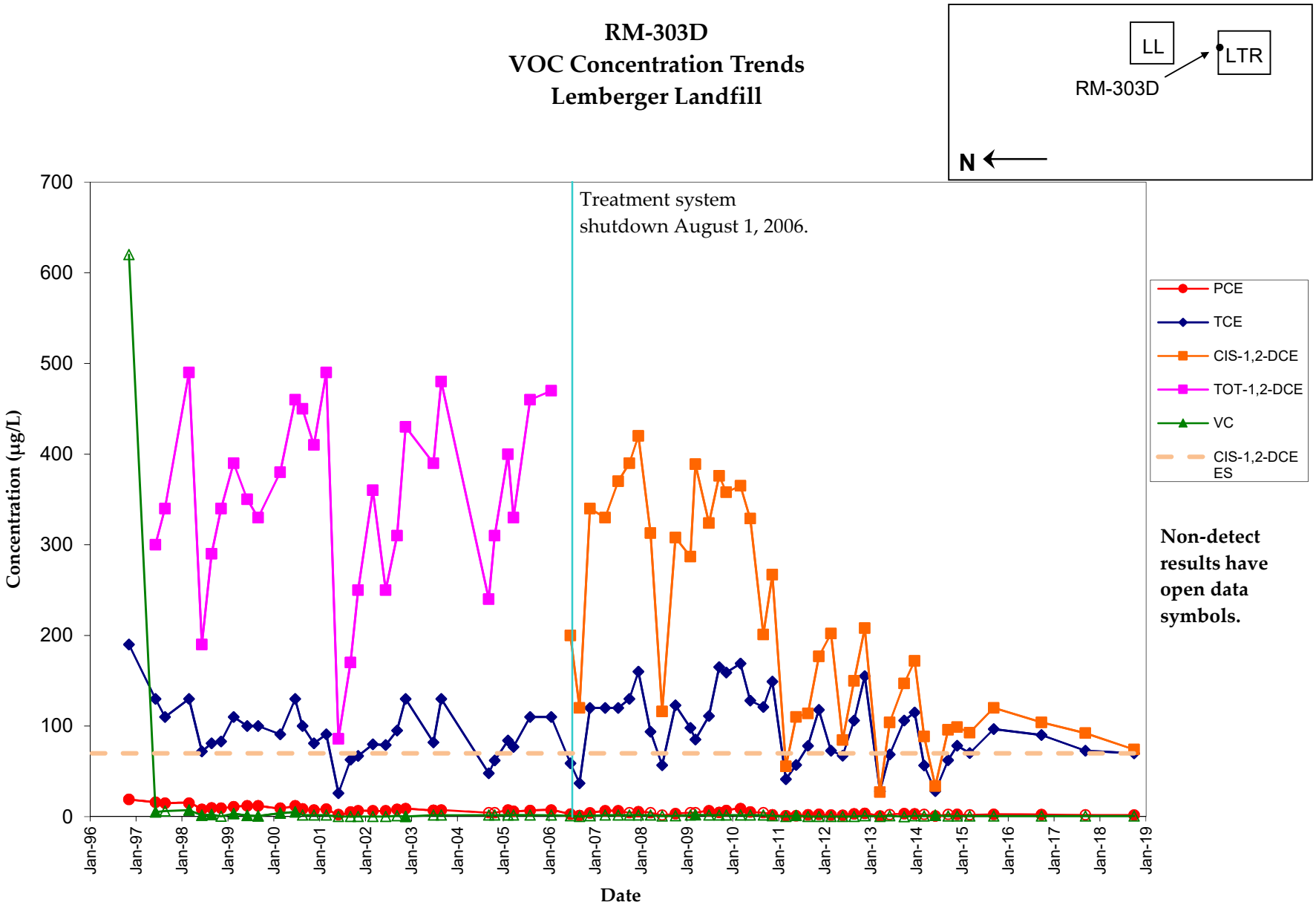
Non-detect results have open data symbols.

RM-302S
VOC Concentration Trends
Lemberger Landfill



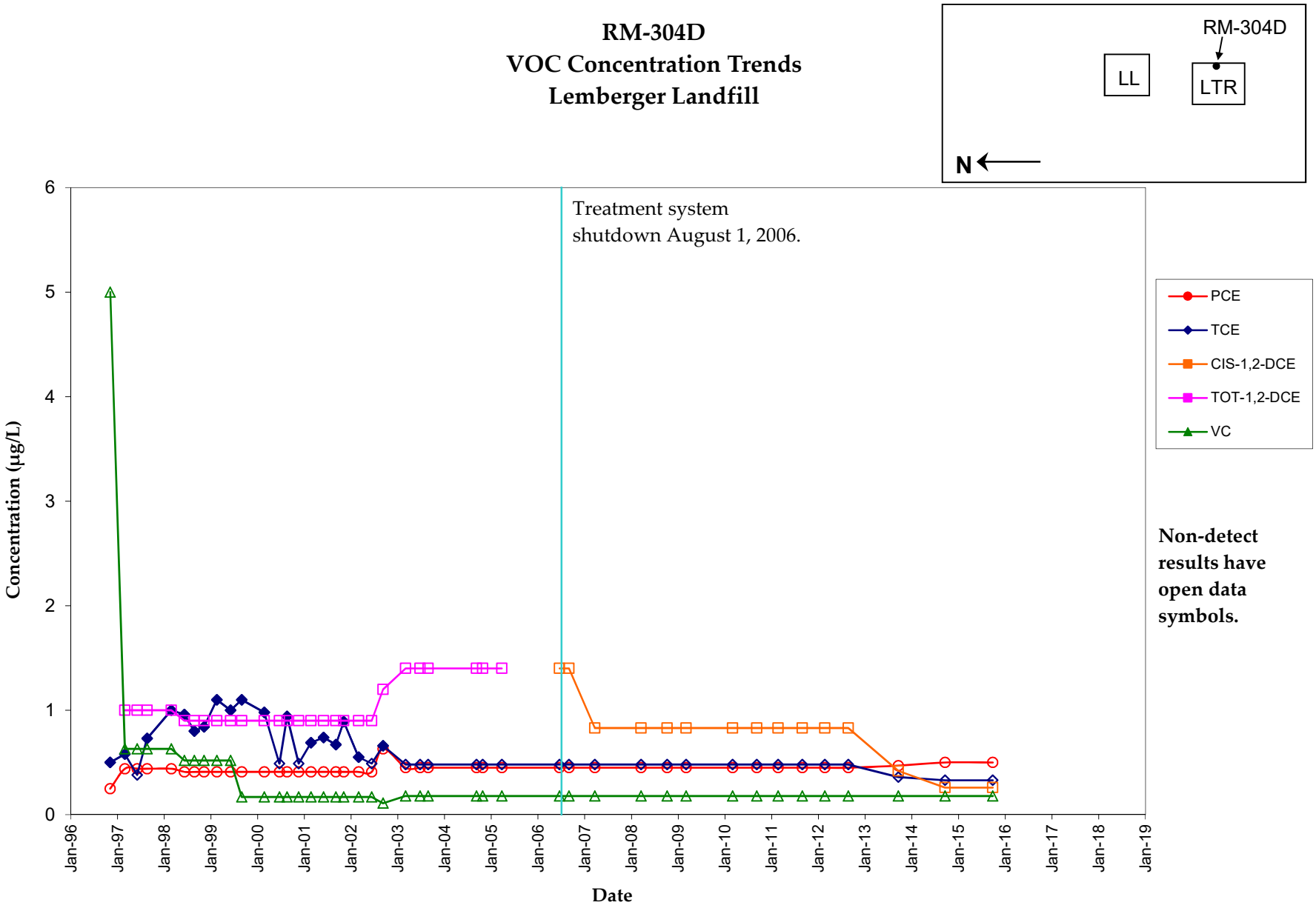
Non-detect results have open data symbols.

RM-303D
VOC Concentration Trends
Lemberger Landfill



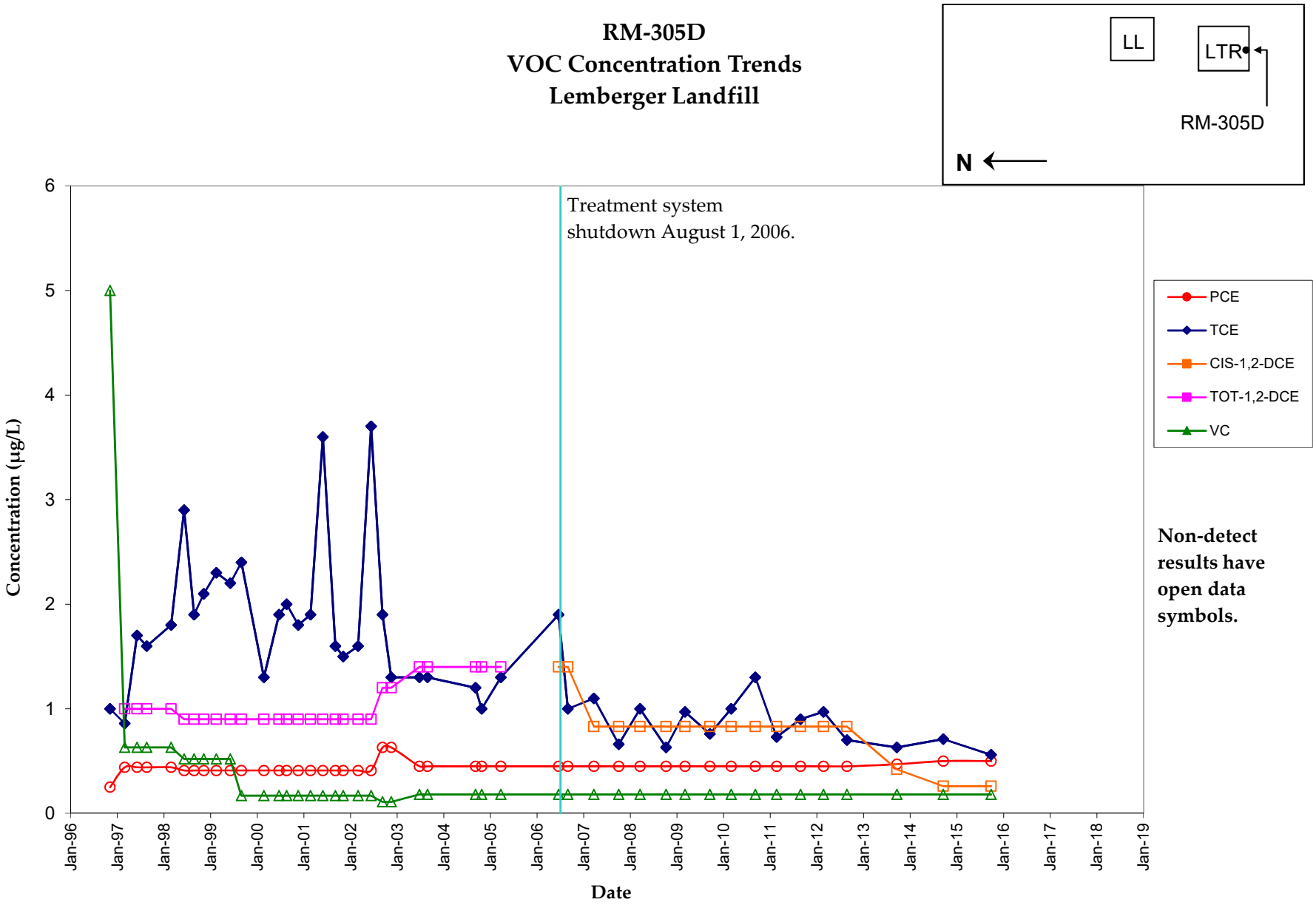
Non-detect results have open data symbols.

RM-304D
VOC Concentration Trends
Lemberger Landfill



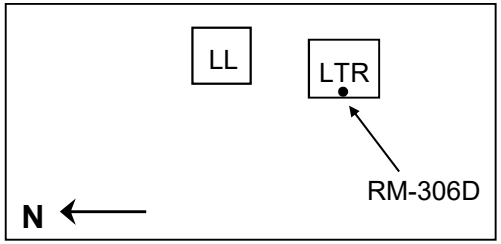
Non-detect results have open data symbols.

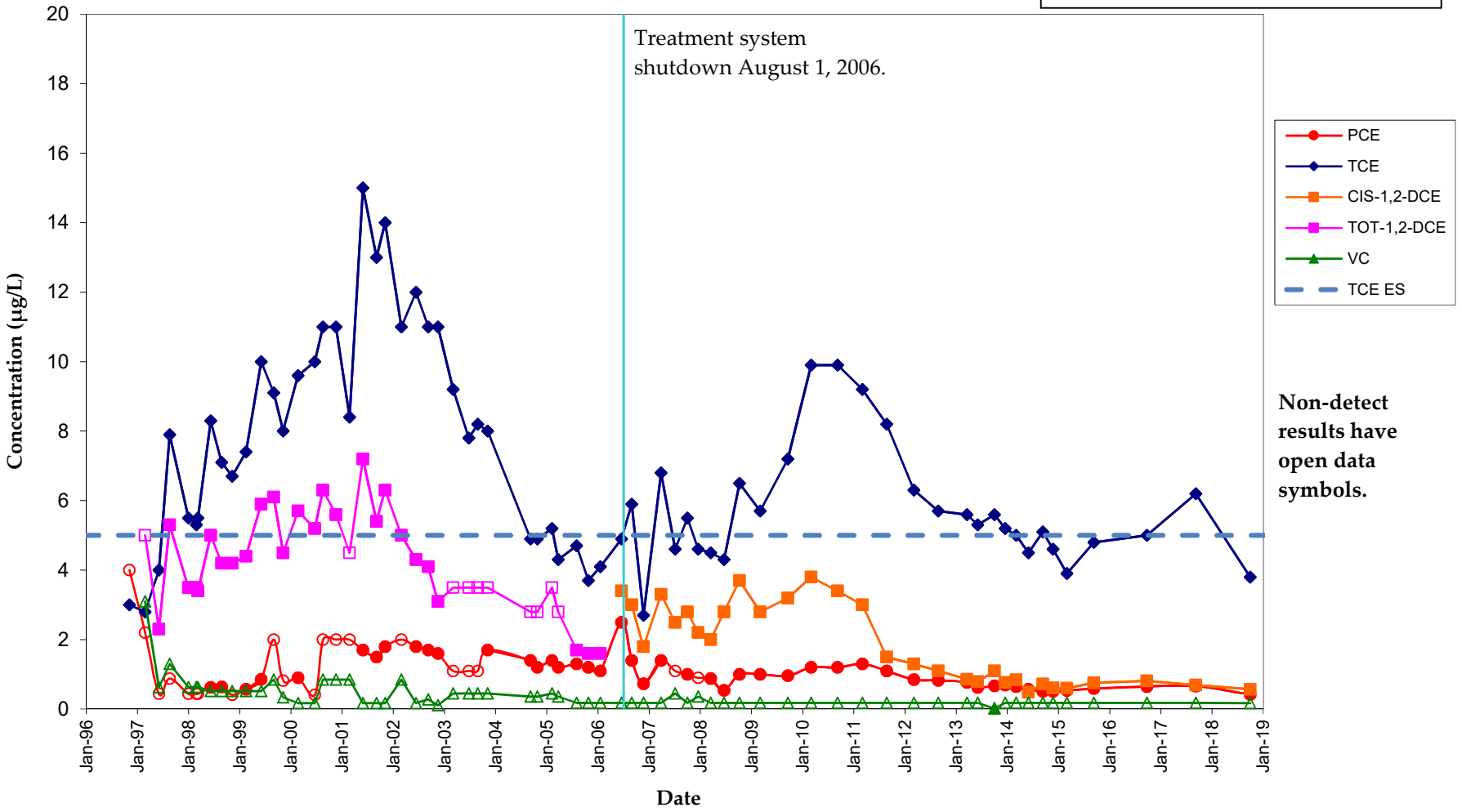
RM-305D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

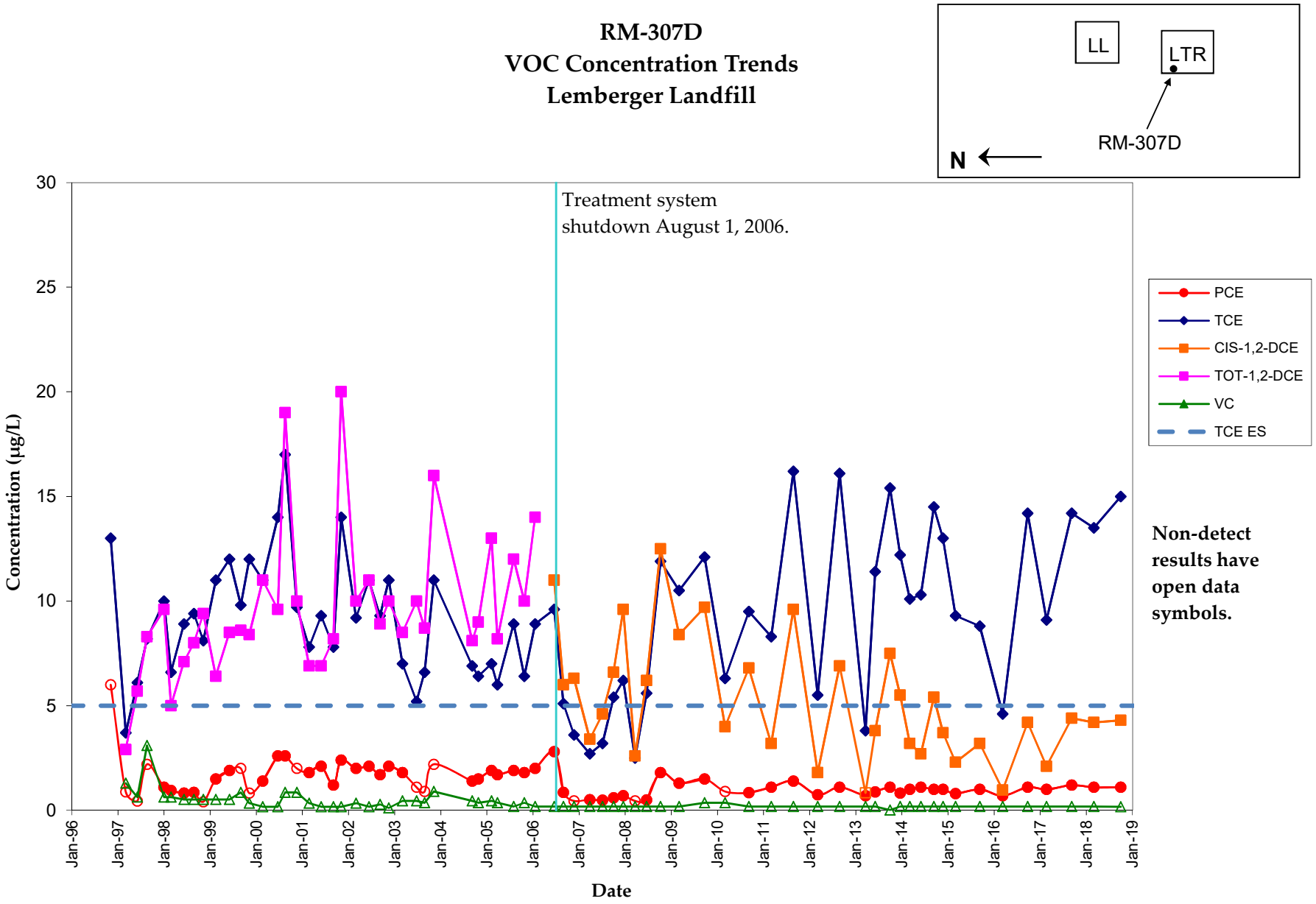
RM-306D
VOC Concentration Trends
Lemberger Landfill





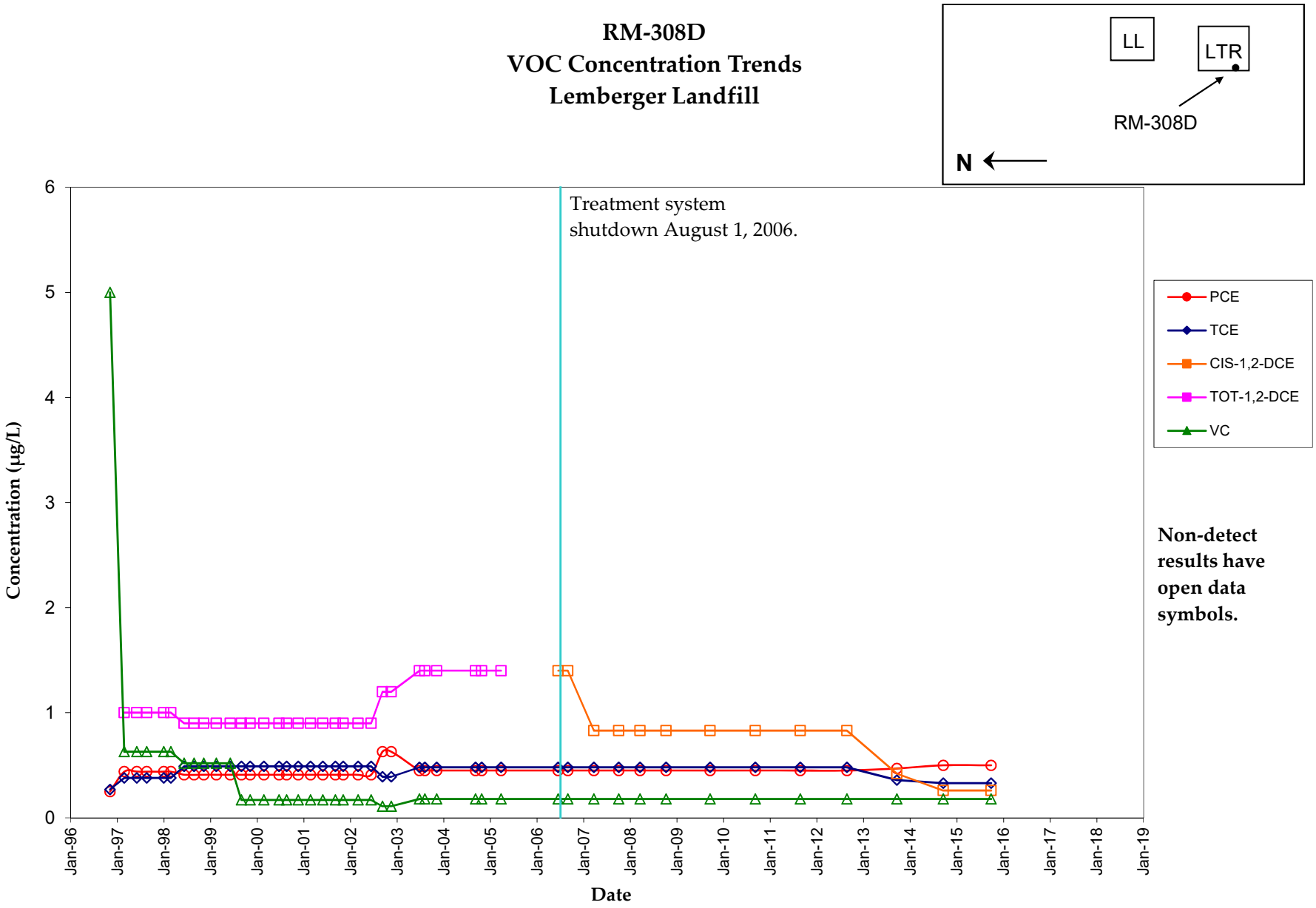
Non-detect results have open data symbols.

RM-307D
VOC Concentration Trends
Lemberger Landfill



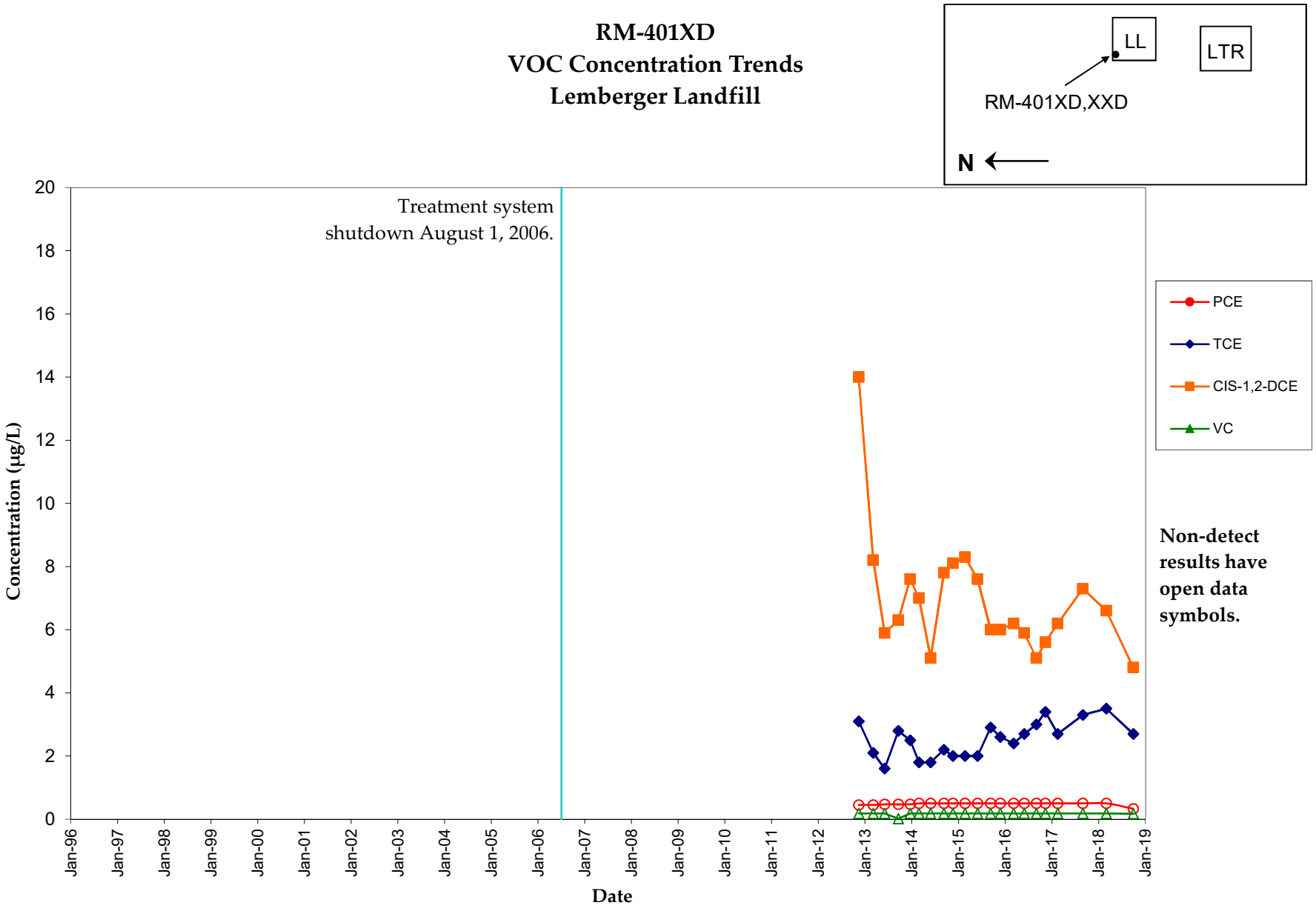
Non-detect results have open data symbols.

RM-308D
VOC Concentration Trends
Lemberger Landfill

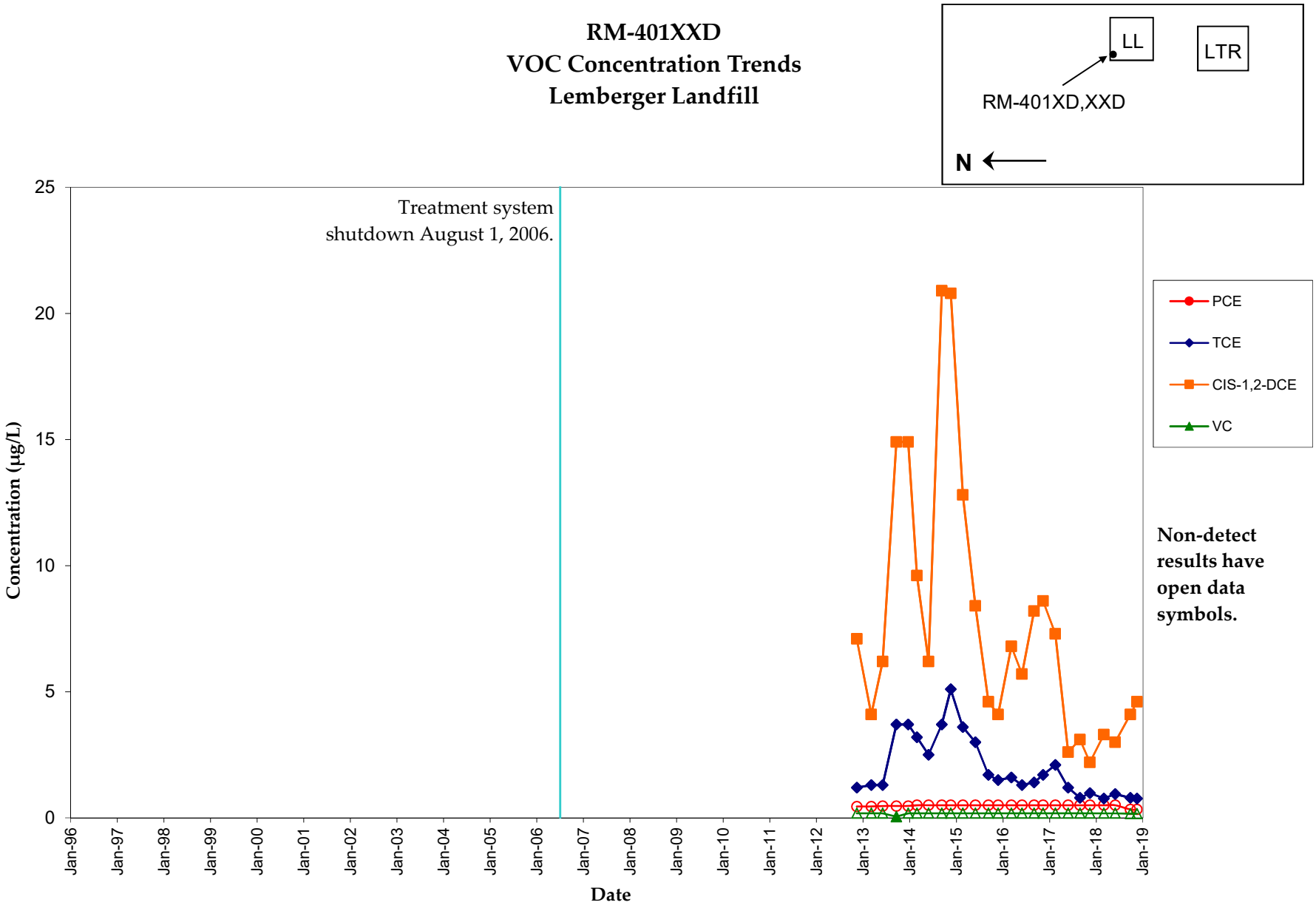


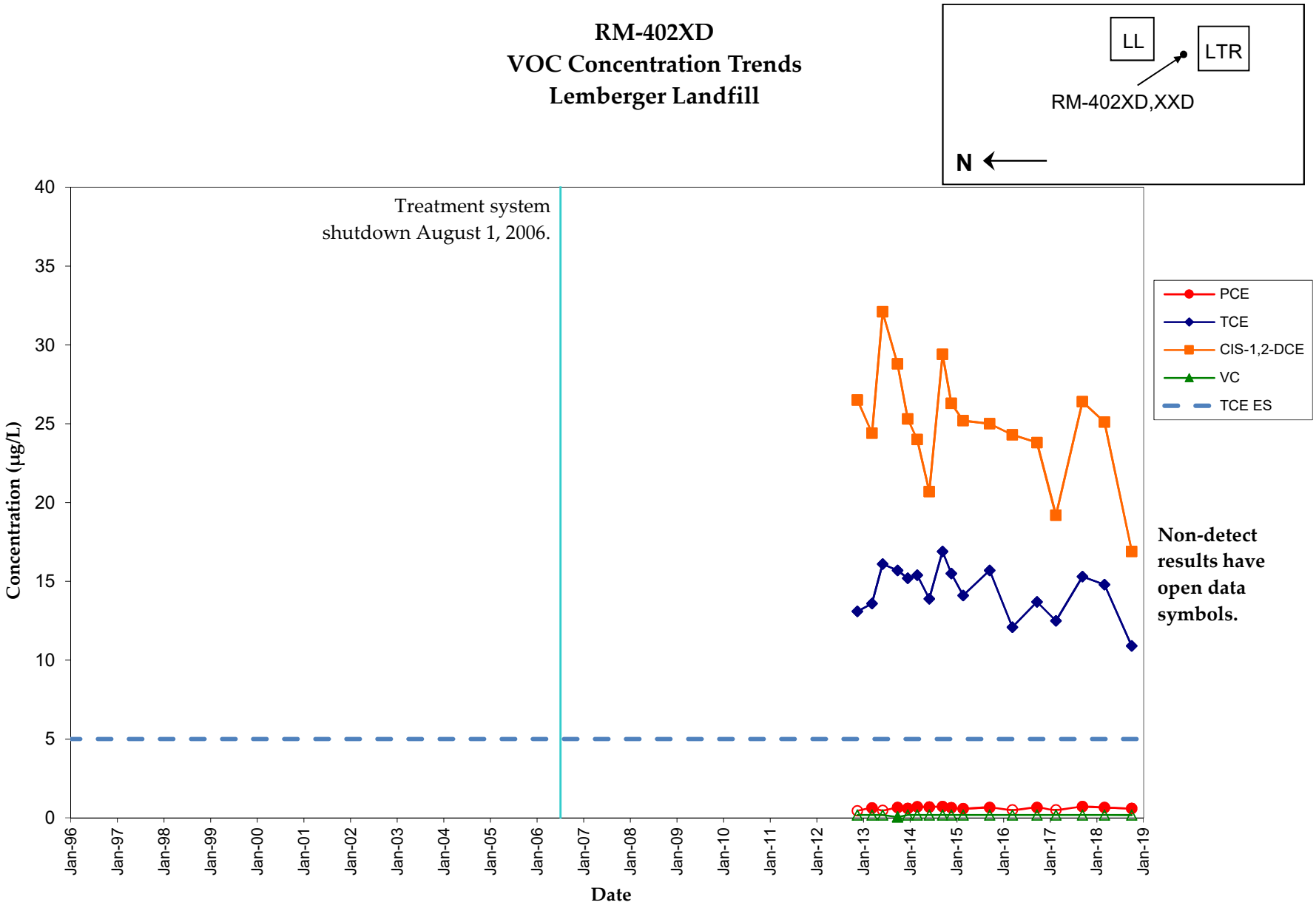
Non-detect results have open data symbols.

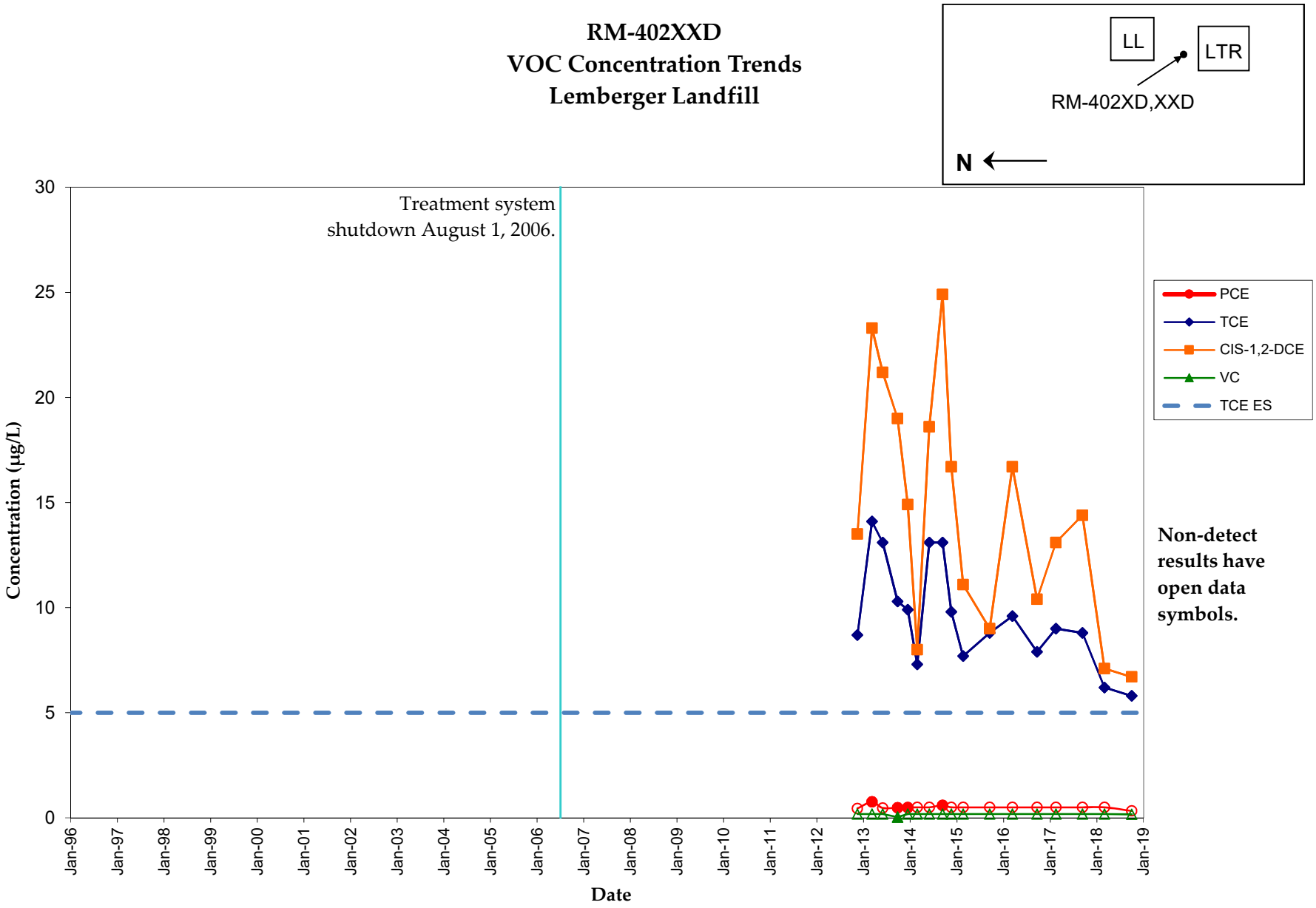
RM-401XD
VOC Concentration Trends
Lemberger Landfill



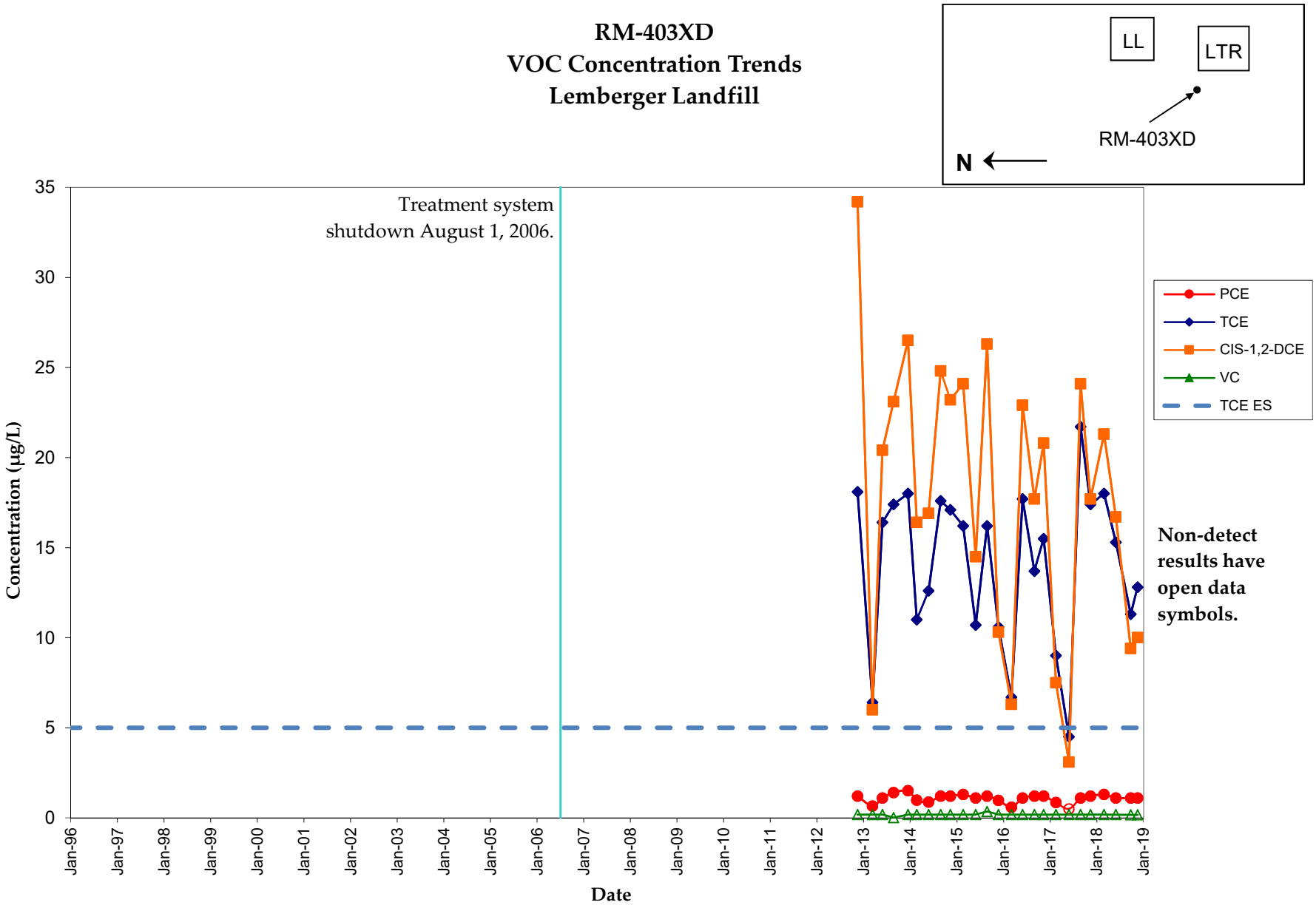
RM-401XXD
VOC Concentration Trends
Lemberger Landfill




RM-402XD
VOC Concentration Trends
Lemberger Landfill
LL
LTR
RM-402XD,XXD
N
Treatment system shutdown August 1, 2006.
PCE
TCE
CIS-1,2-DCE
VC
TCE ES
Non-detect results have open data symbols.
Concentration (µg/L)
Date
0
5
10
15
20
25
30
35
40
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19


RM-402XXD
VOC Concentration Trends
Lemberger Landfill
LL
LTR
RM-402XD,XXD
N
Treatment system shutdown August 1, 2006.
Concentration (µg/L)
30
25
20
15
10
5
0
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Date
PCE
TCE
CIS-1,2-DCE
VC
TCE ES
Non-detect results have open data symbols.

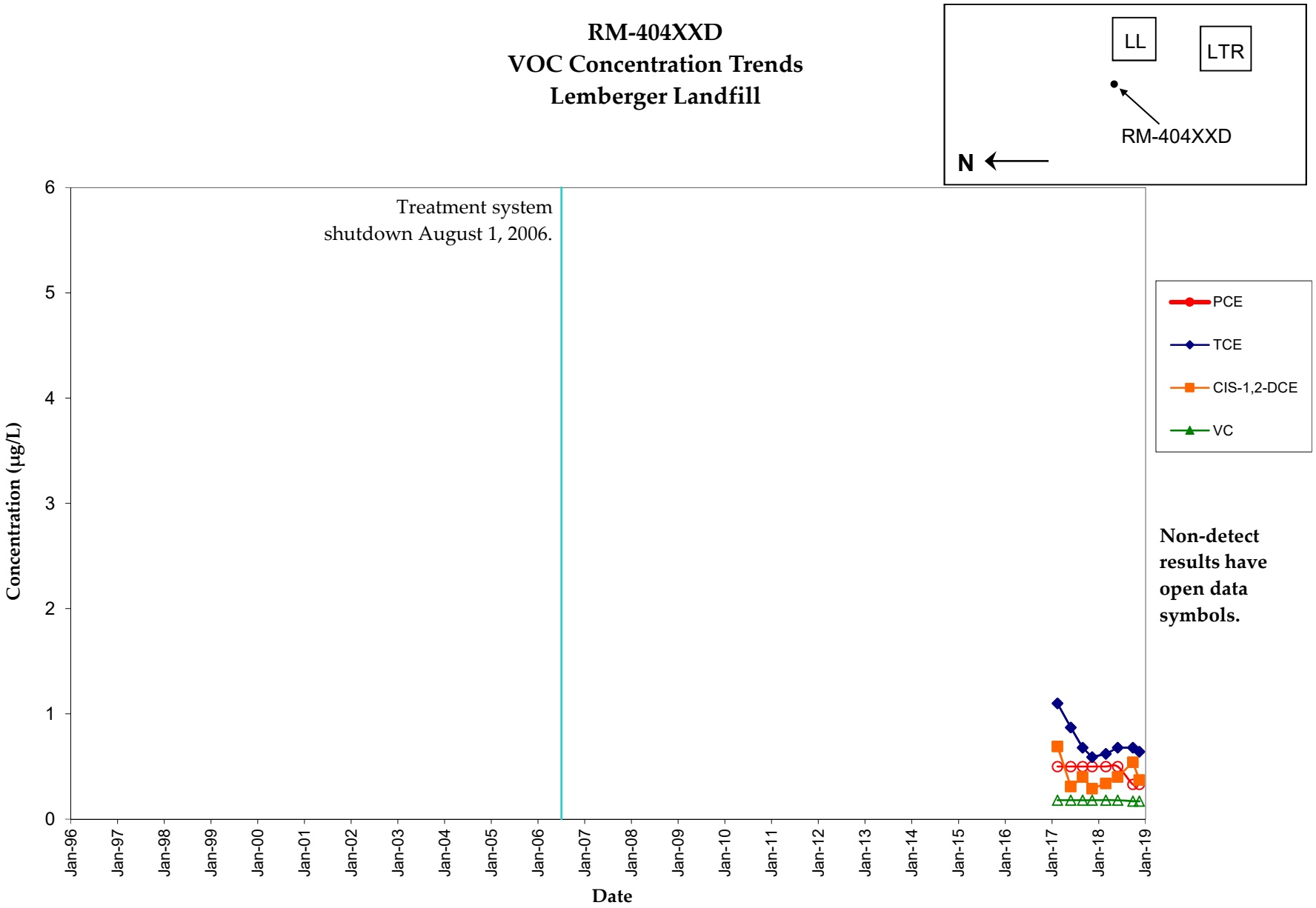
RM-403XD
VOC Concentration Trends
Lemberger Landfill



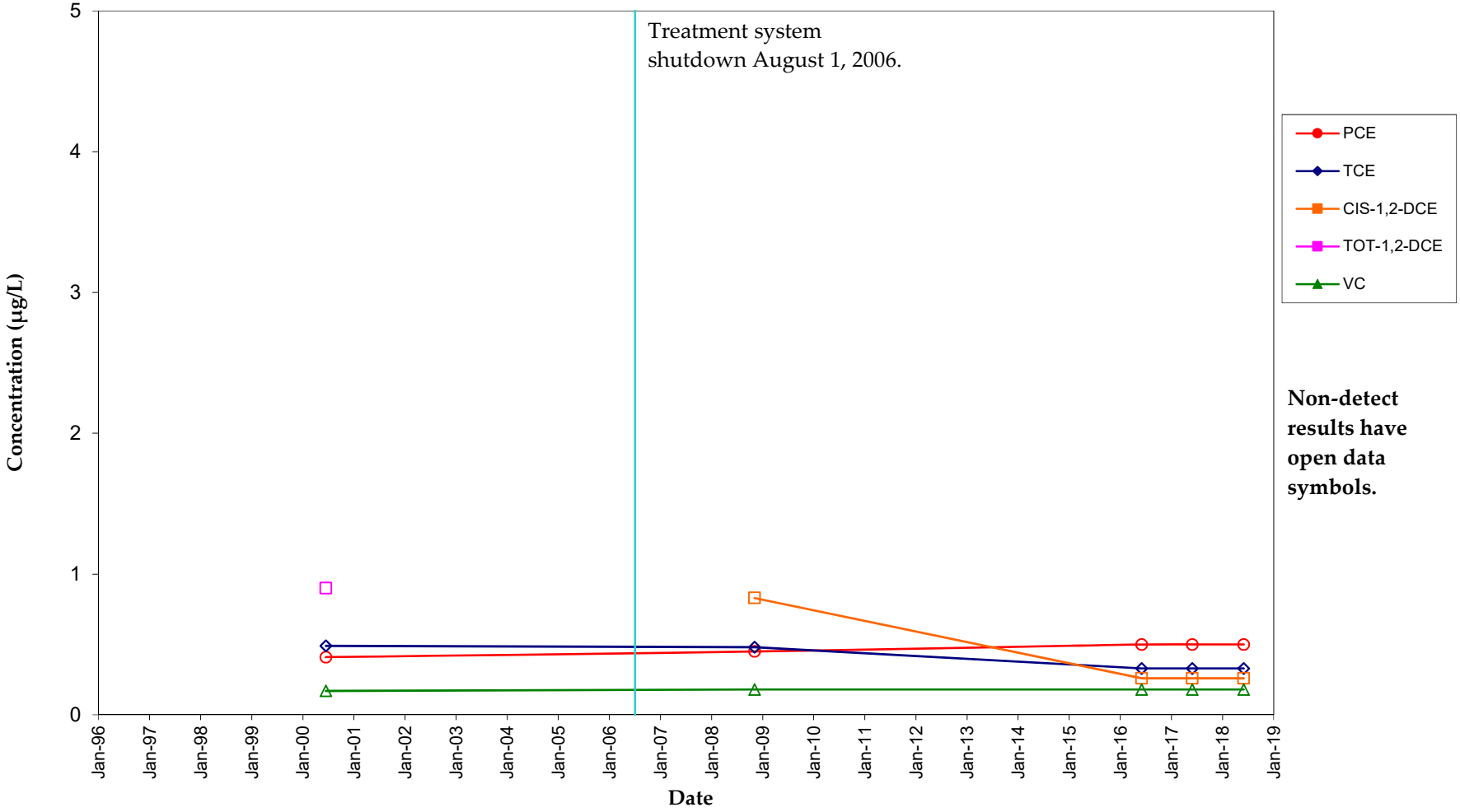
Non-detect results have open data symbols.

L:\ORACLE\LM-Lemberger\MNA\PLOT FILES UPDATED 2018 12\WDNR_VOC-ene TRENDS 12 2018.xlsm 1/14/2019

RM-404XXD
VOC Concentration Trends
Lemberger Landfill

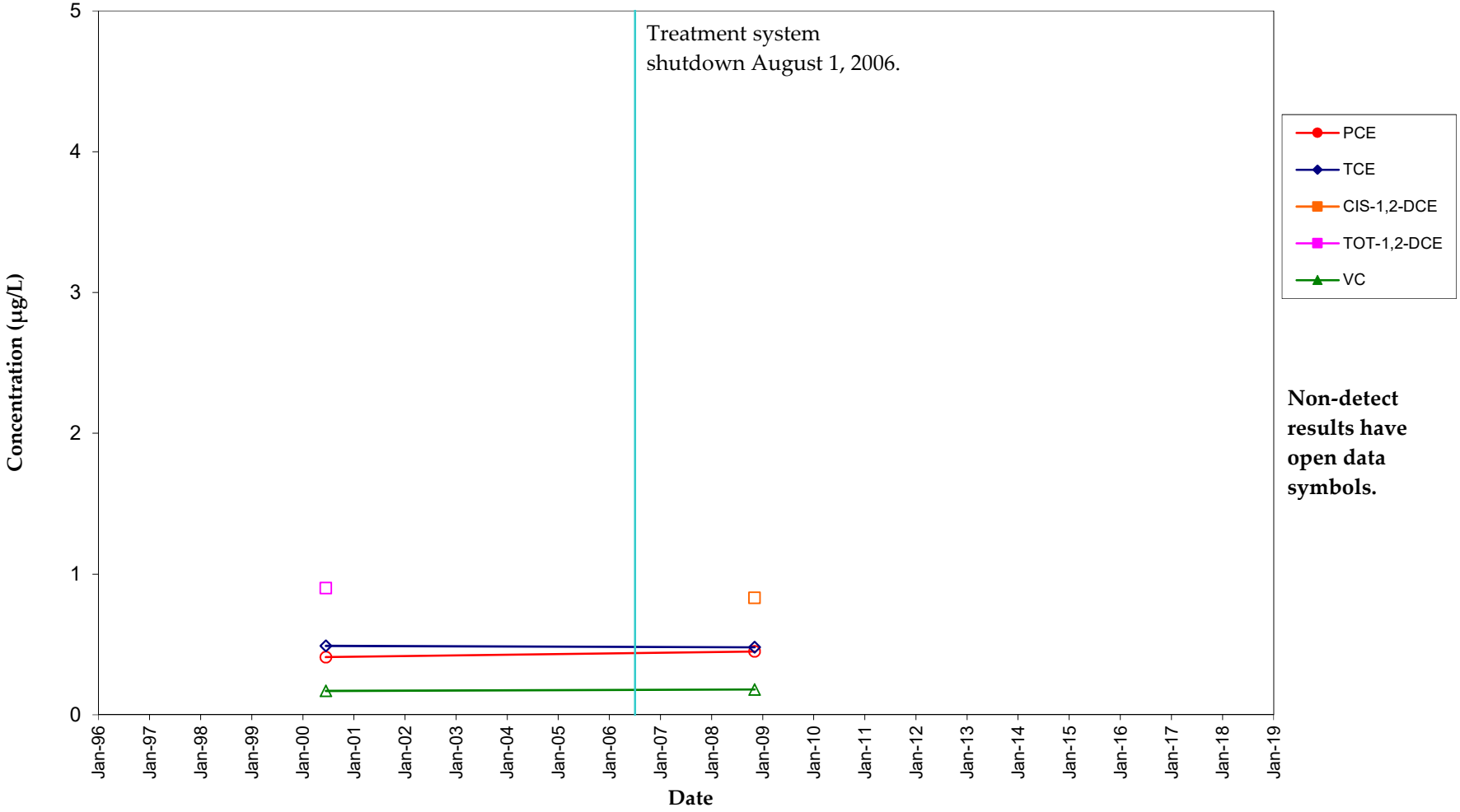


LH-01
VOC Concentration Trends
Lemberger Landfill



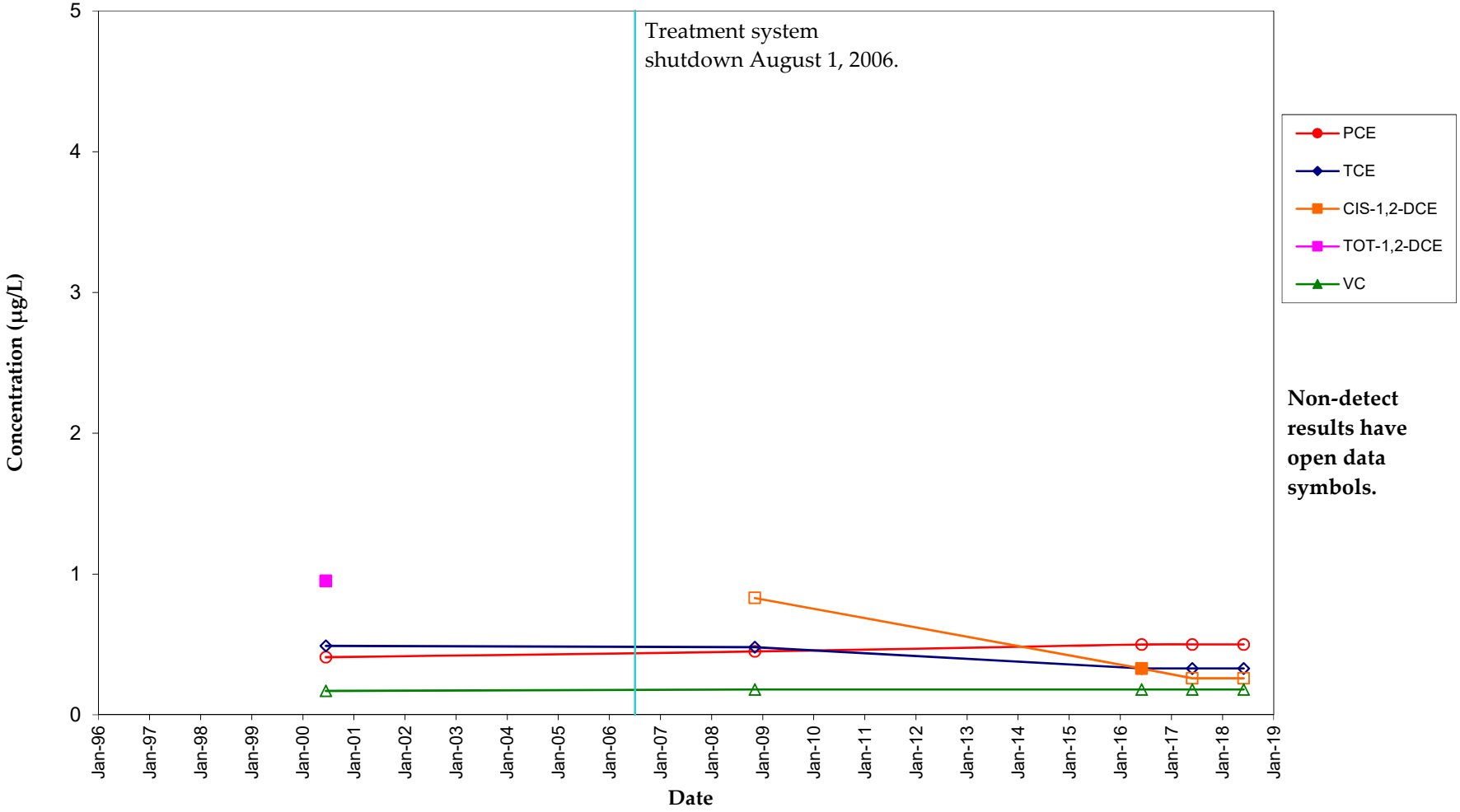
Non-detect results have open data symbols.

LH-02B
VOC Concentration Trends
Lemberger Landfill



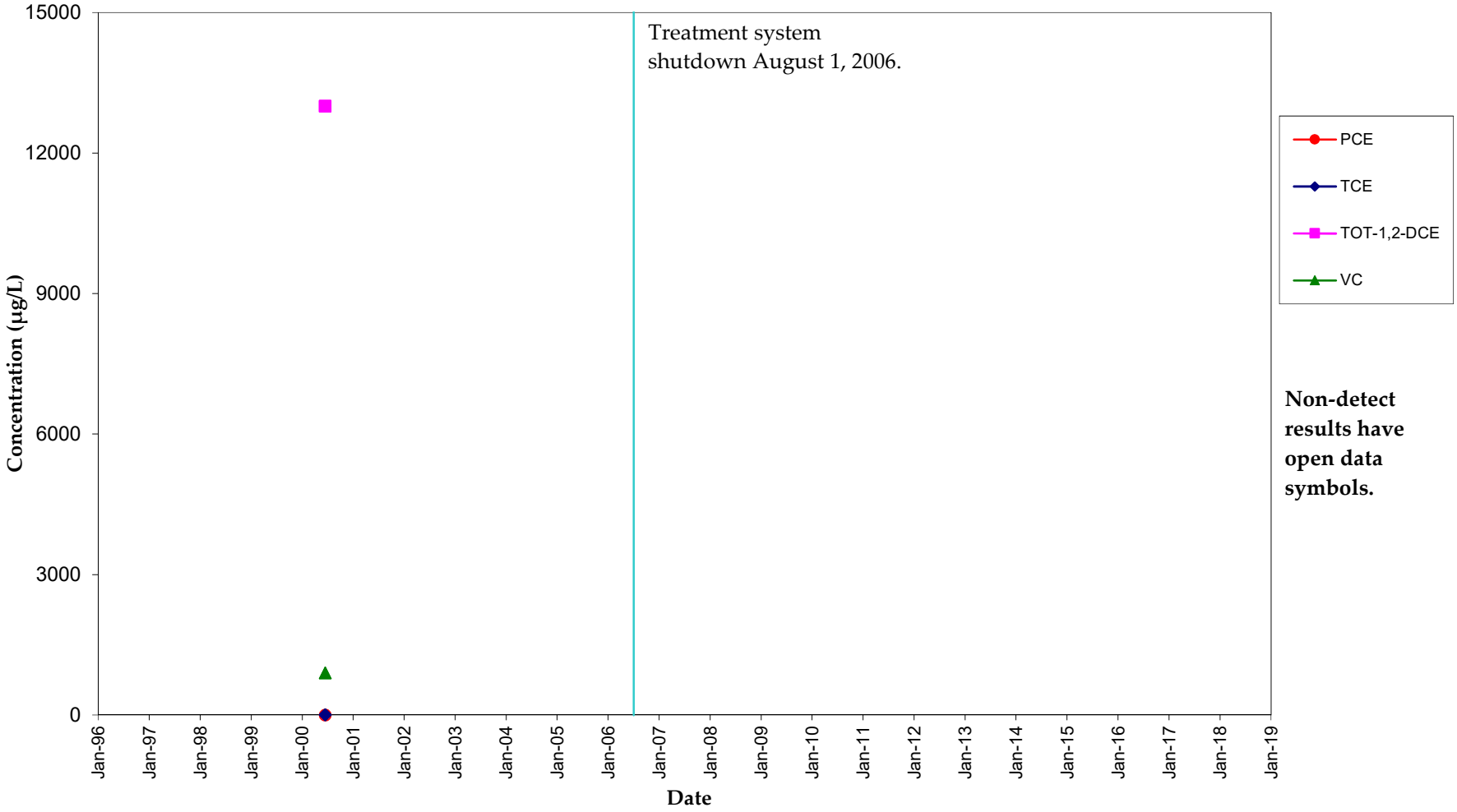
Non-detect results have open data symbols.

LH-03
VOC Concentration Trends
Lemberger Landfill

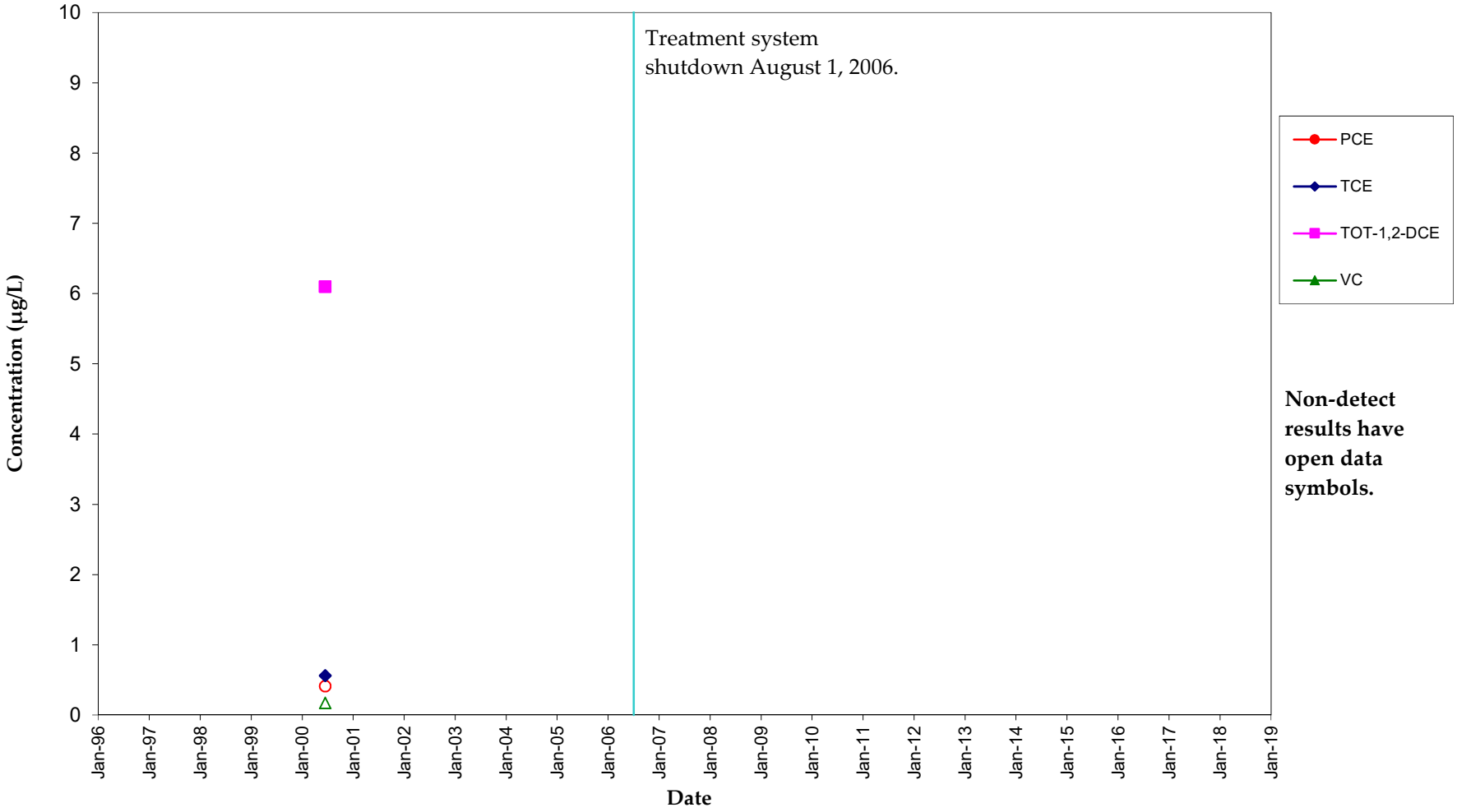


Non-detect results have open data symbols.

LH-04
VOC Concentration Trends
Lemberger Landfill

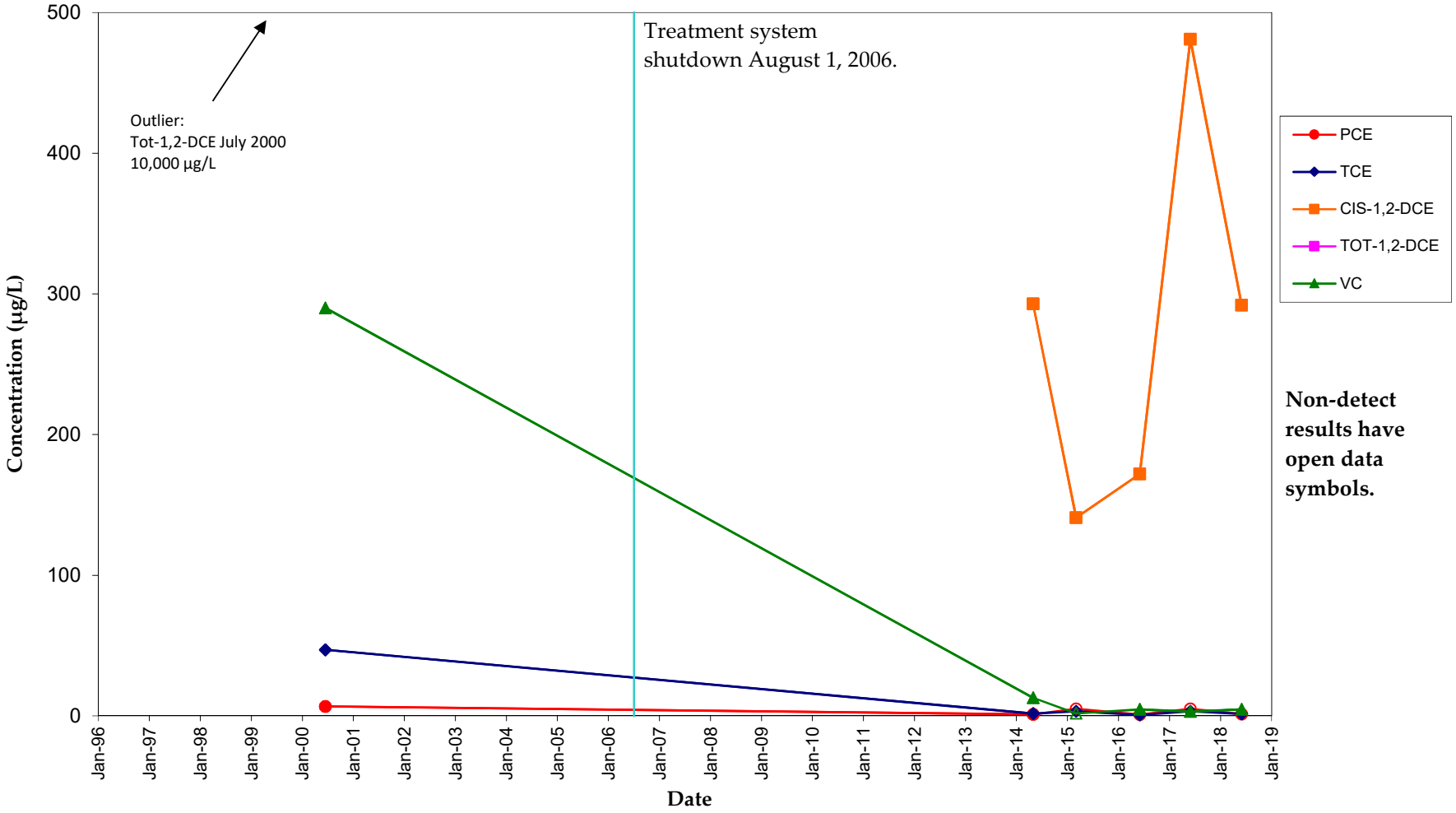


LH-05
VOC Concentration Trends
Lemberger Landfill



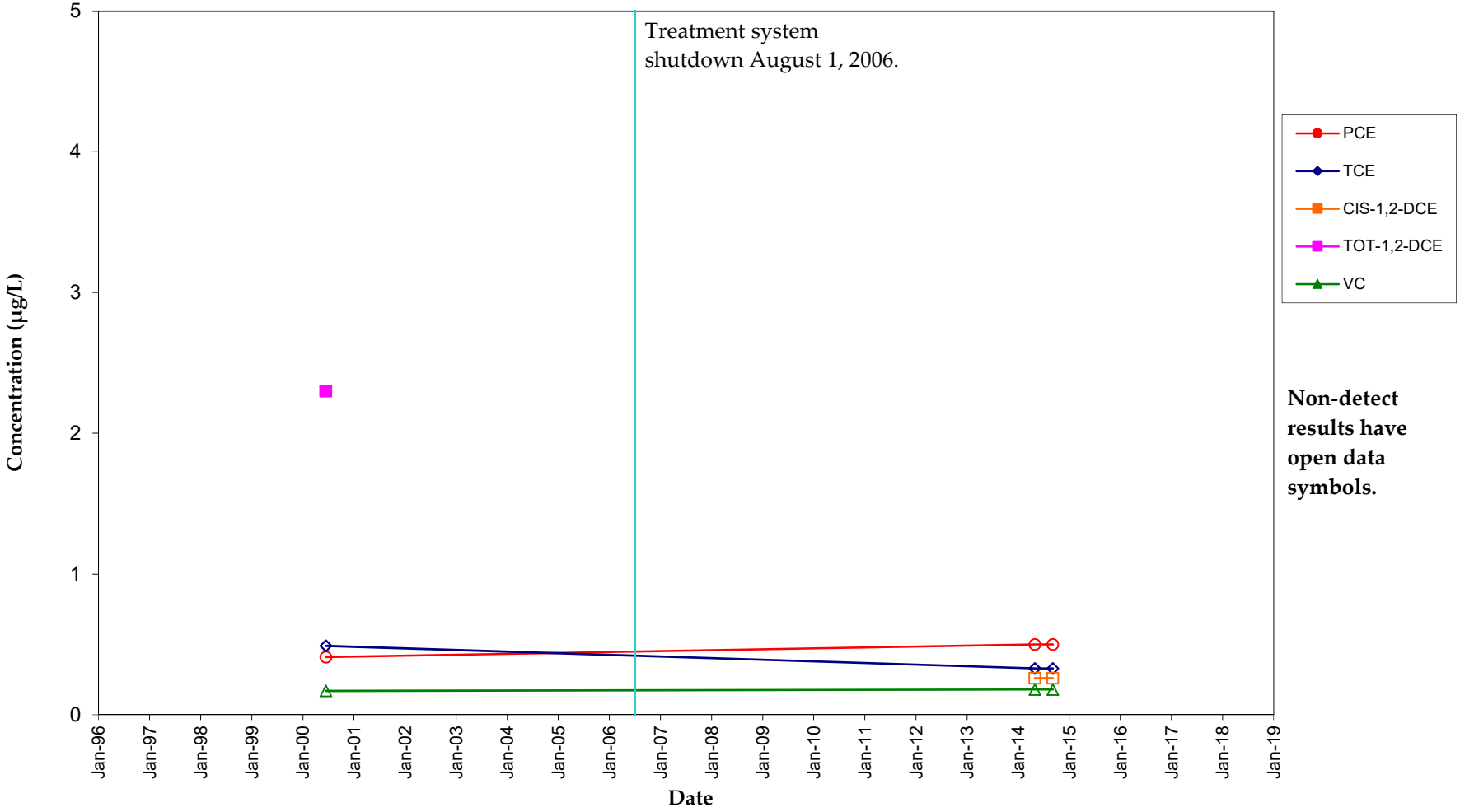
Non-detect results have open data symbols.

LH-06
VOC Concentration Trends
Lemberger Landfill



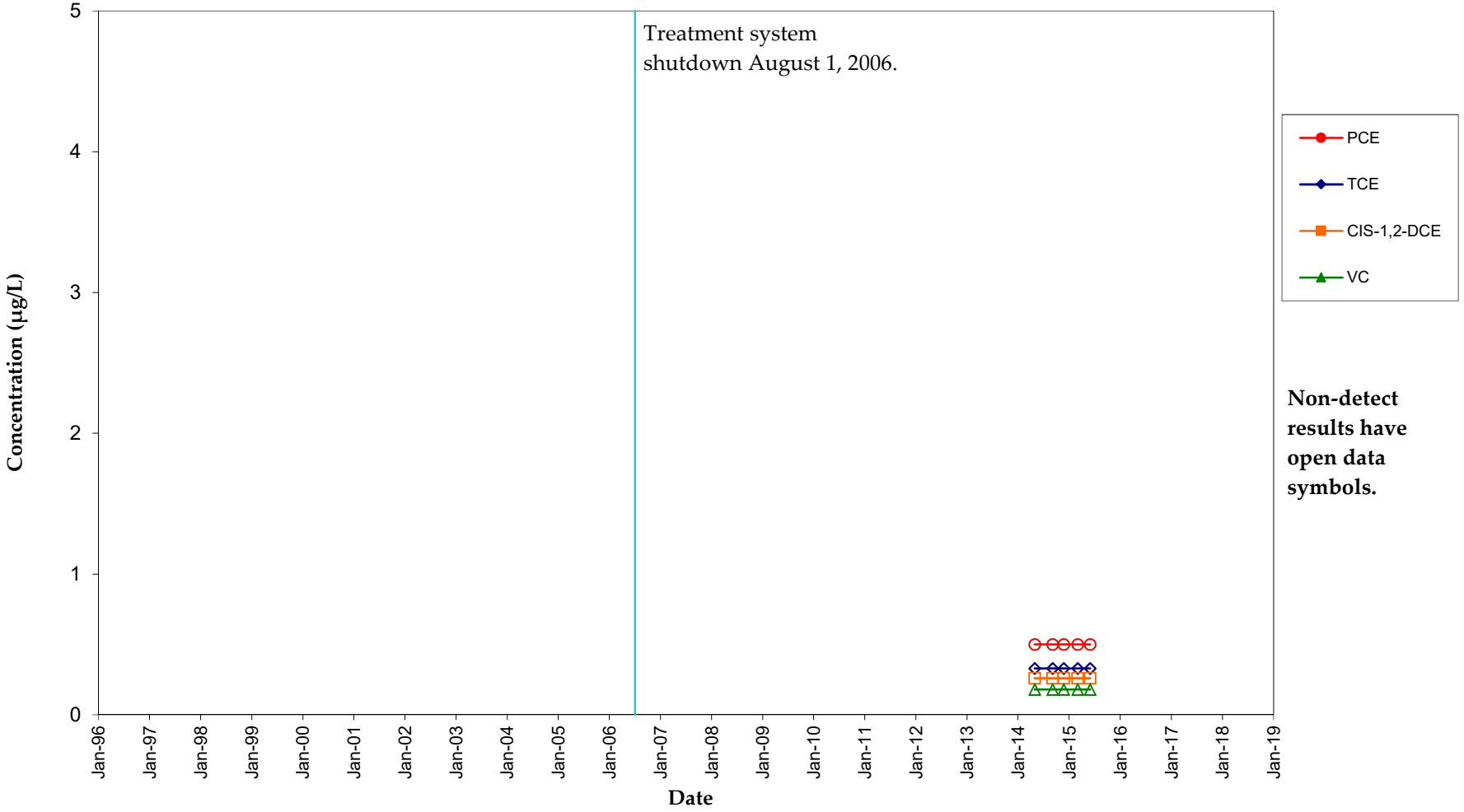
Non-detect results have open data symbols.

LH-07
VOC Concentration Trends
Lemberger Landfill



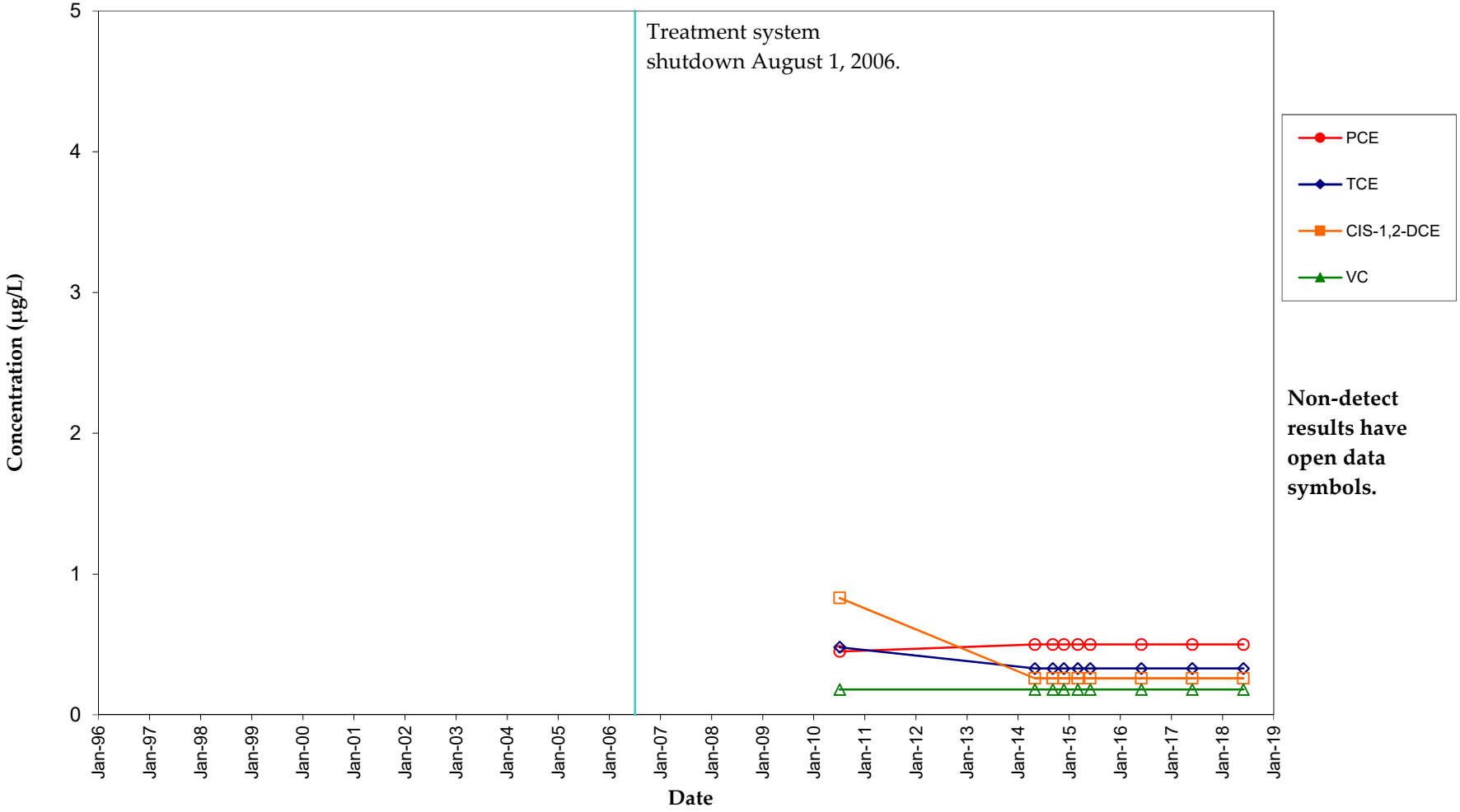
Non-detect results have open data symbols.

LW-01
VOC Concentration Trends
Lemberger Landfill



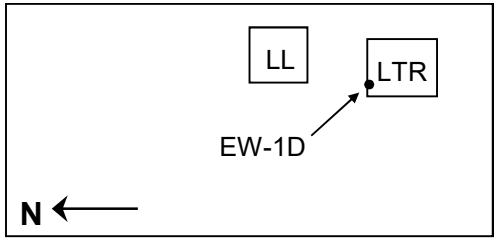
Non-detect results have open data symbols.

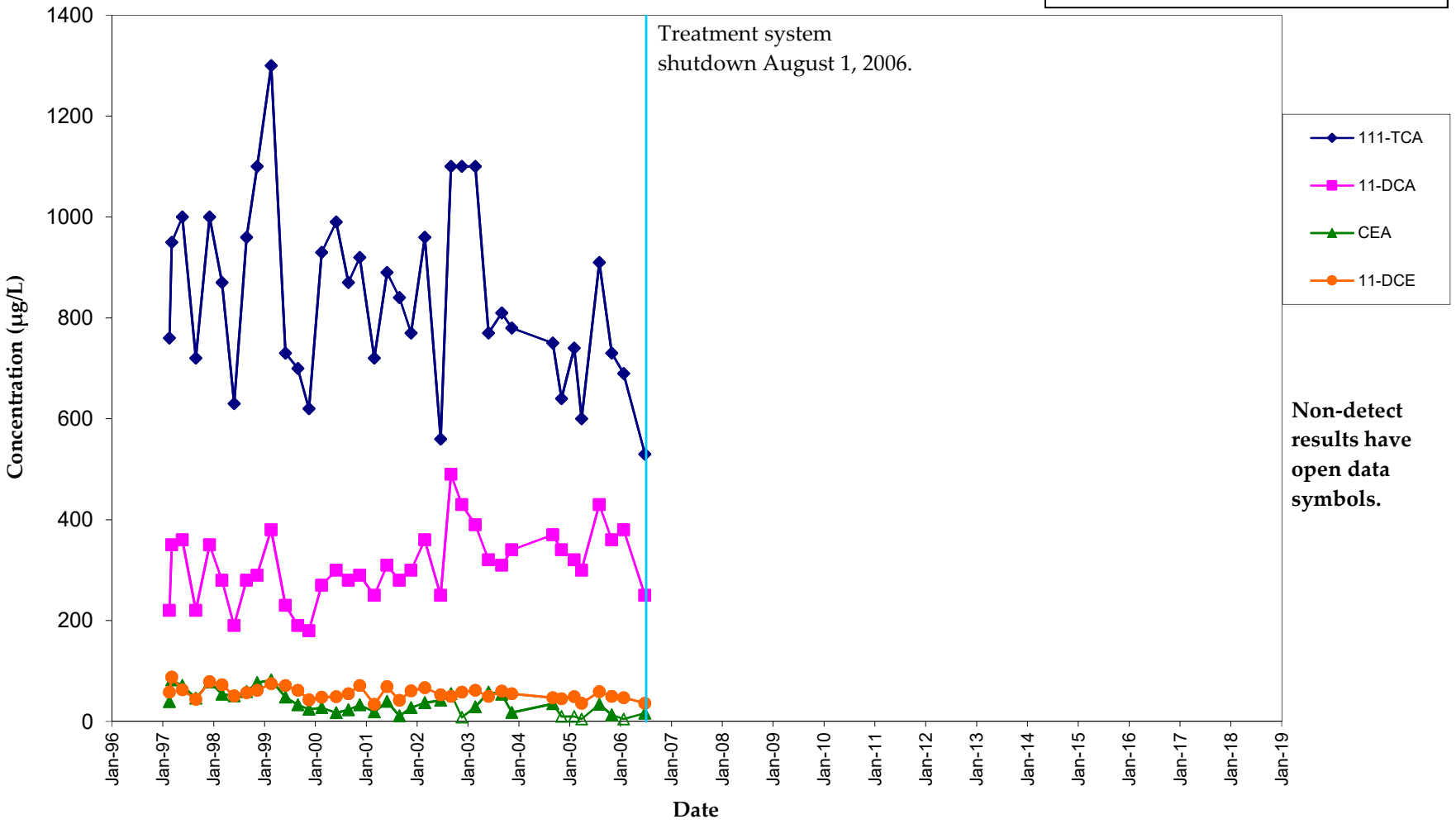
LW-07
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

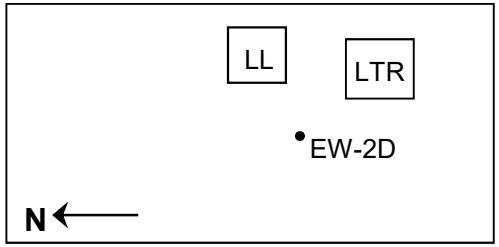
EW-01D
VOC Concentration Trends
Lemberger Landfill

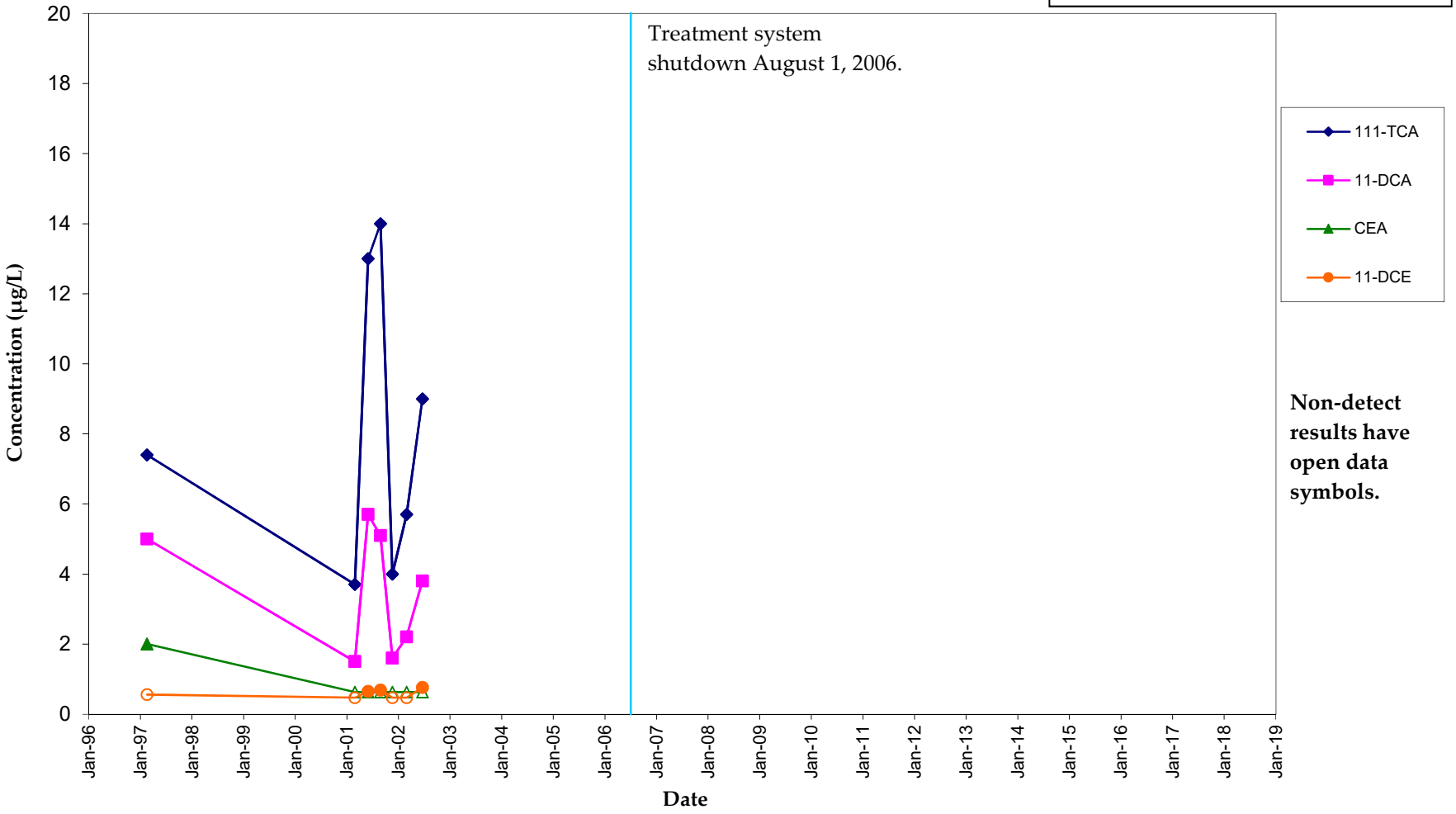




Non-detect results have open data symbols.

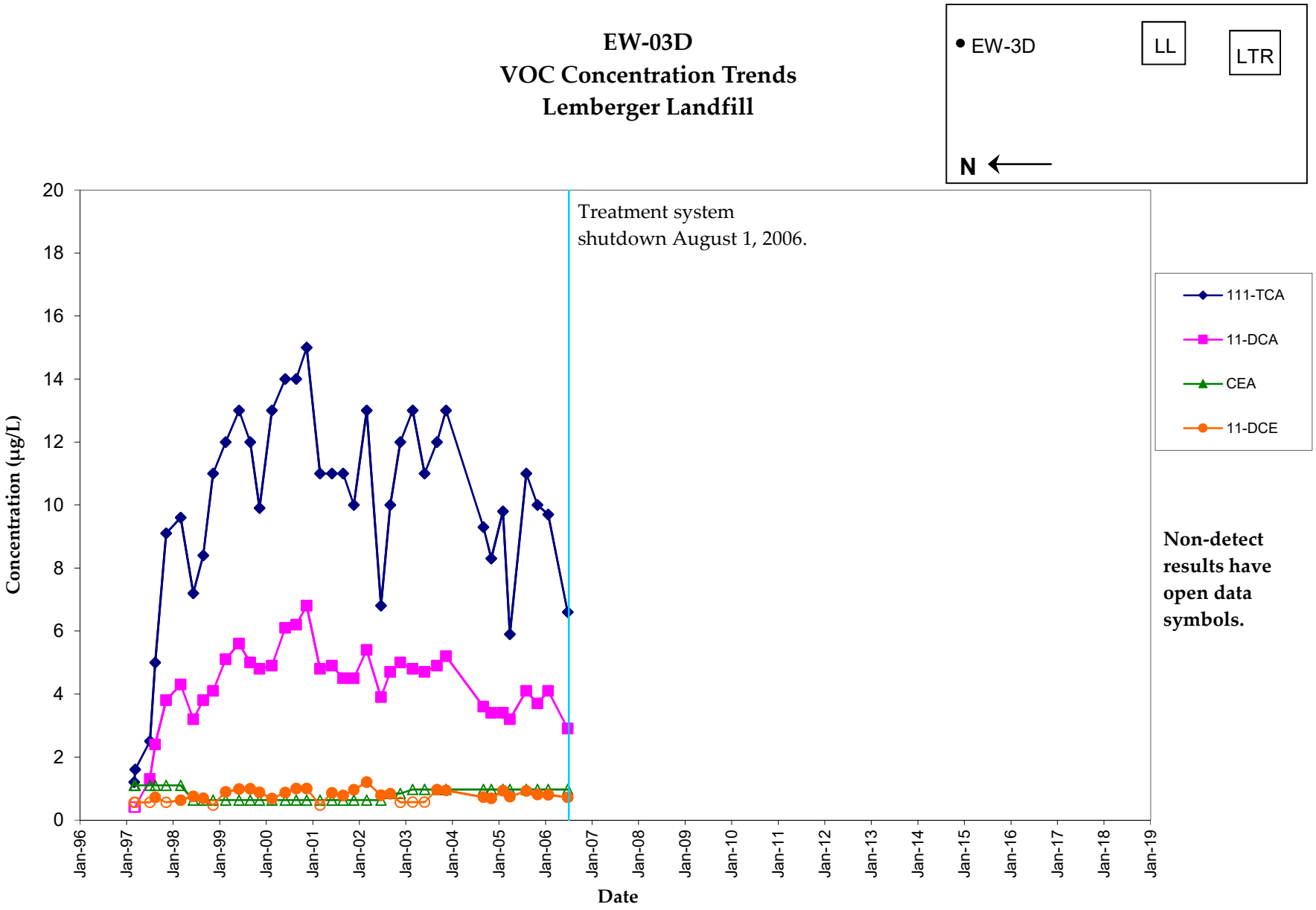
EW-02D
VOC Concentration Trends
Lemberger Landfill



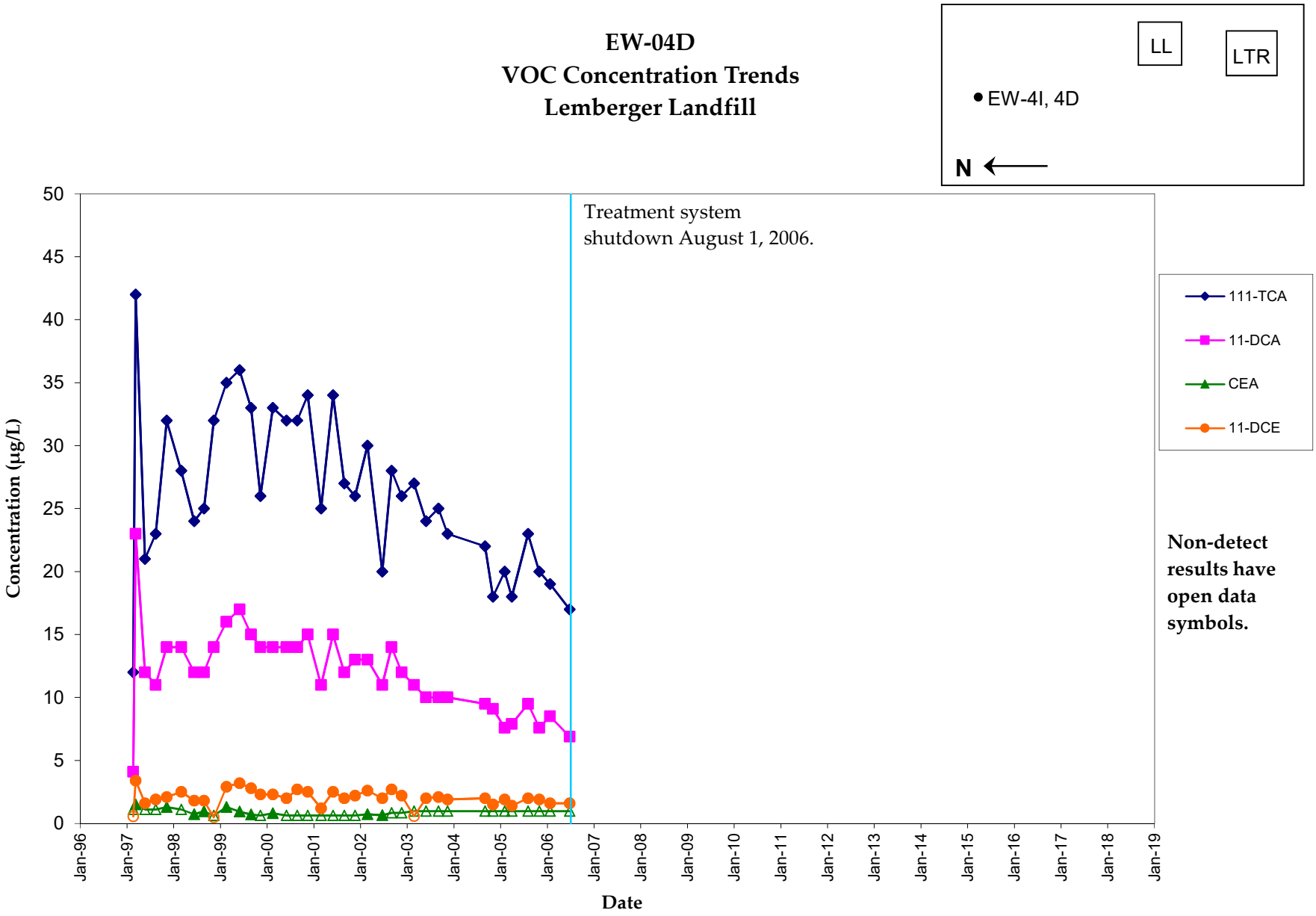


Non-detect results have open data symbols.

EW-03D
VOC Concentration Trends
Lemberger Landfill

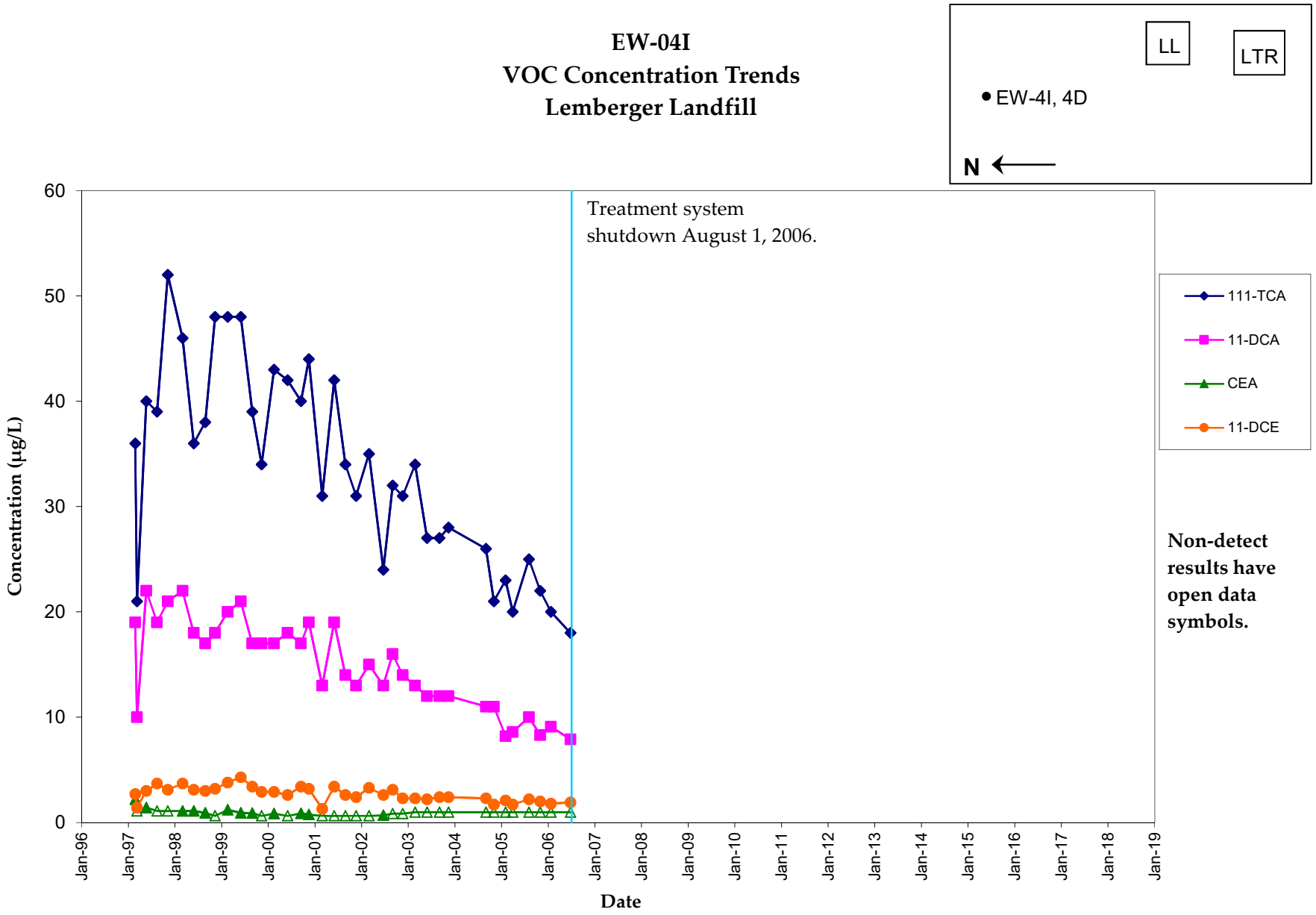


EW-04D
VOC Concentration Trends
Lemberger Landfill

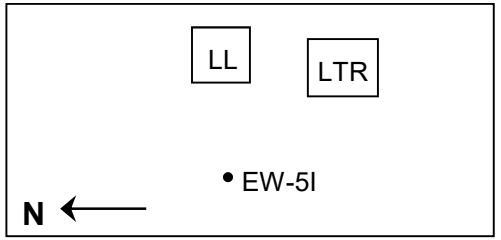


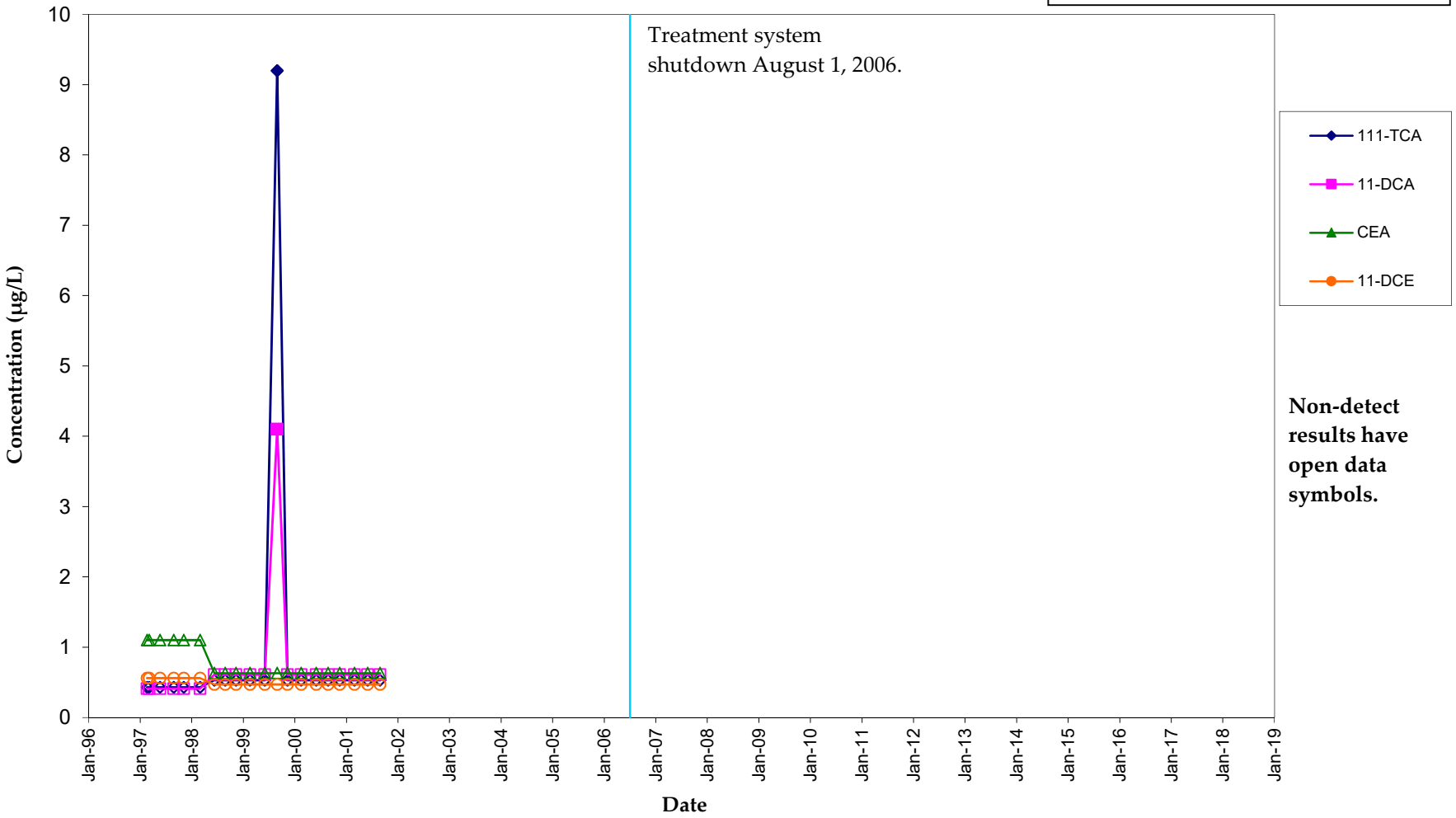
Non-detect results have open data symbols.

EW-04I
VOC Concentration Trends
Lemberger Landfill

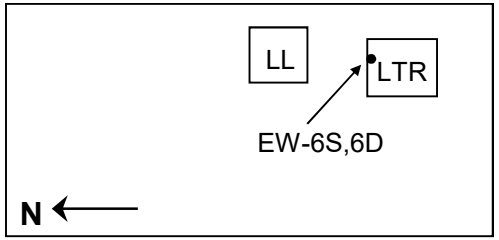


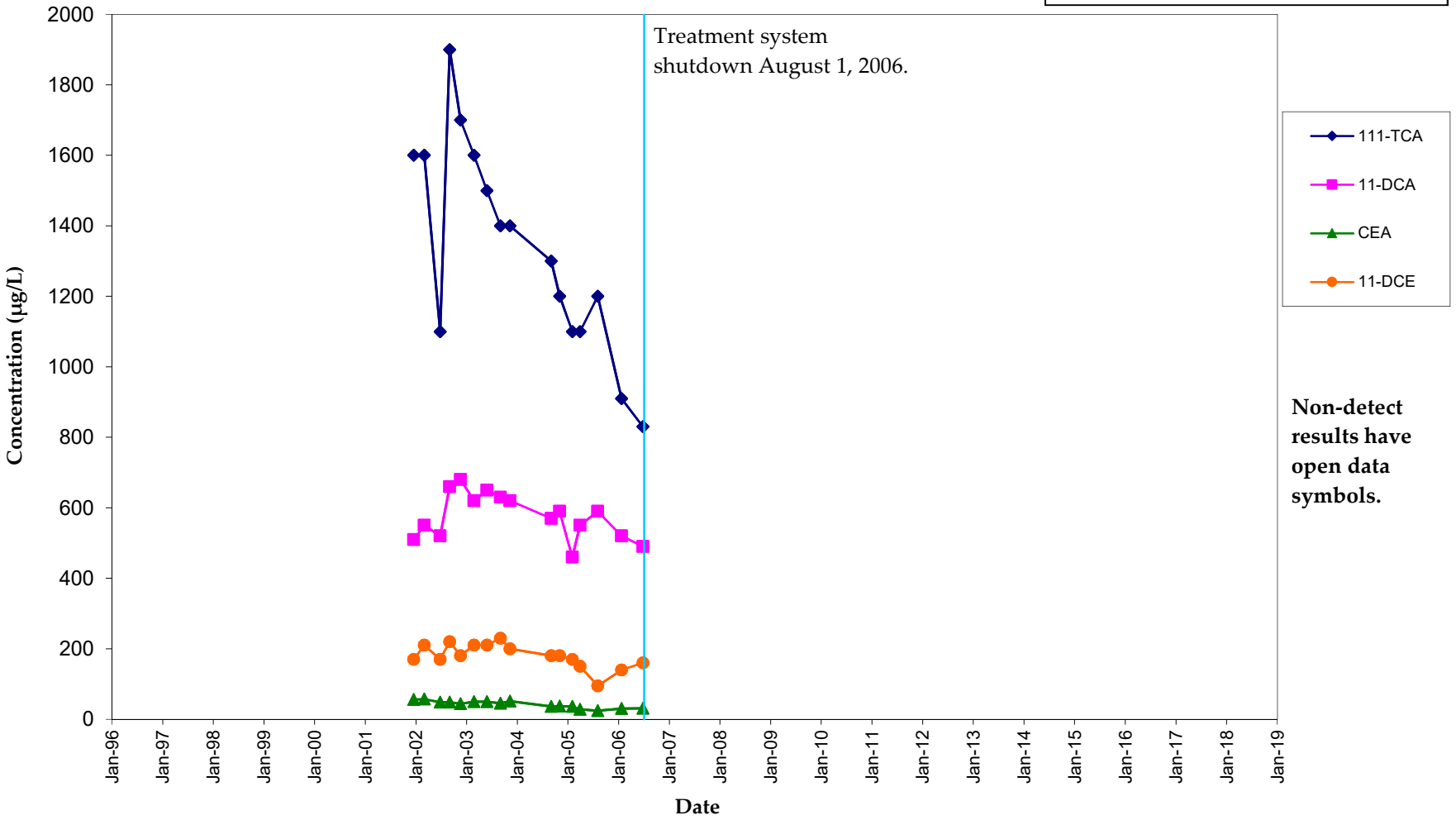
EW-05I
VOC Concentration Trends
Lemberger Landfill





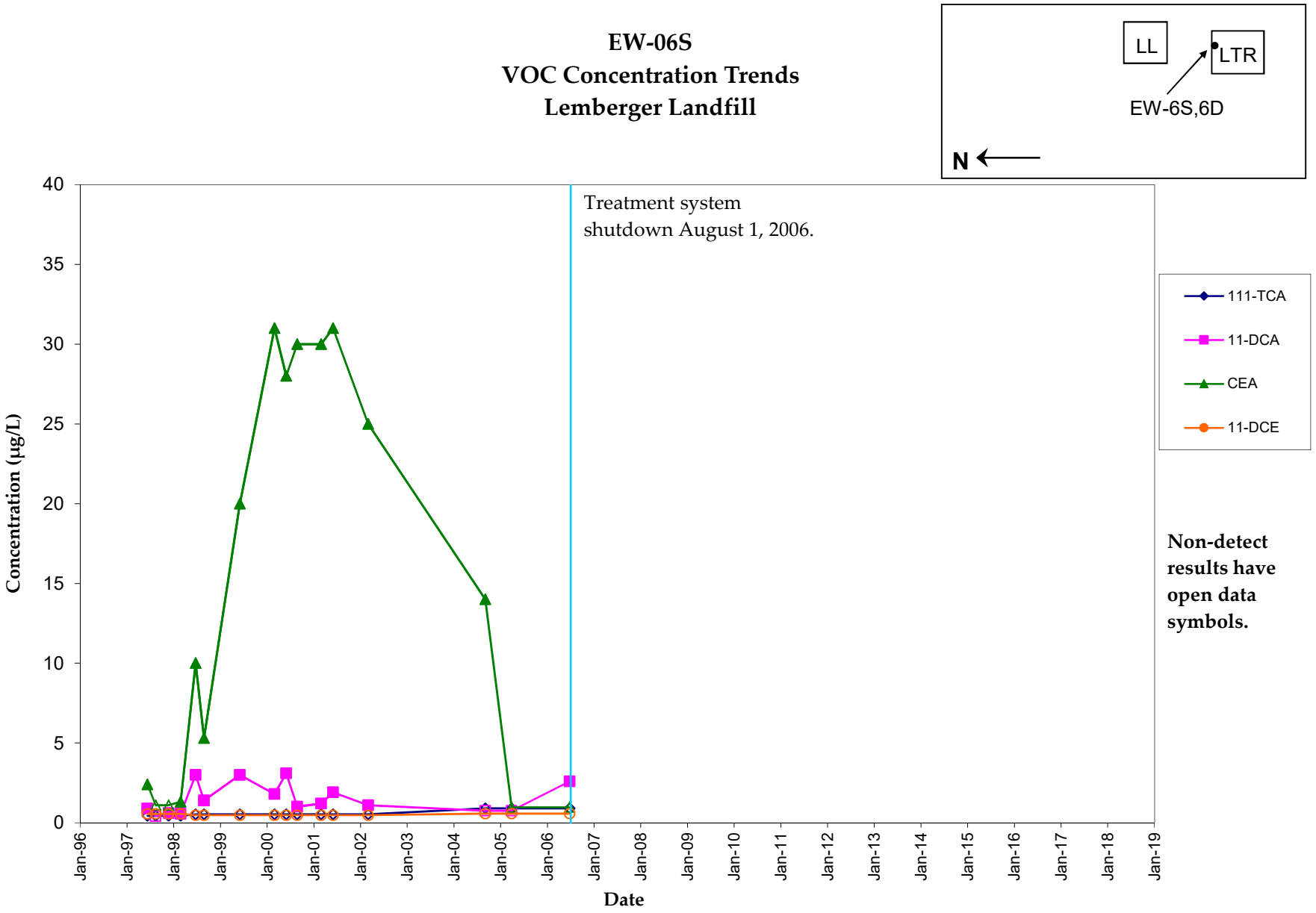
EW-06D
VOC Concentration Trends
Lemberger Landfill



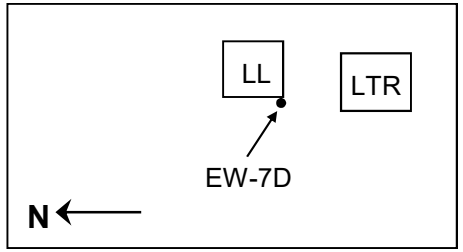


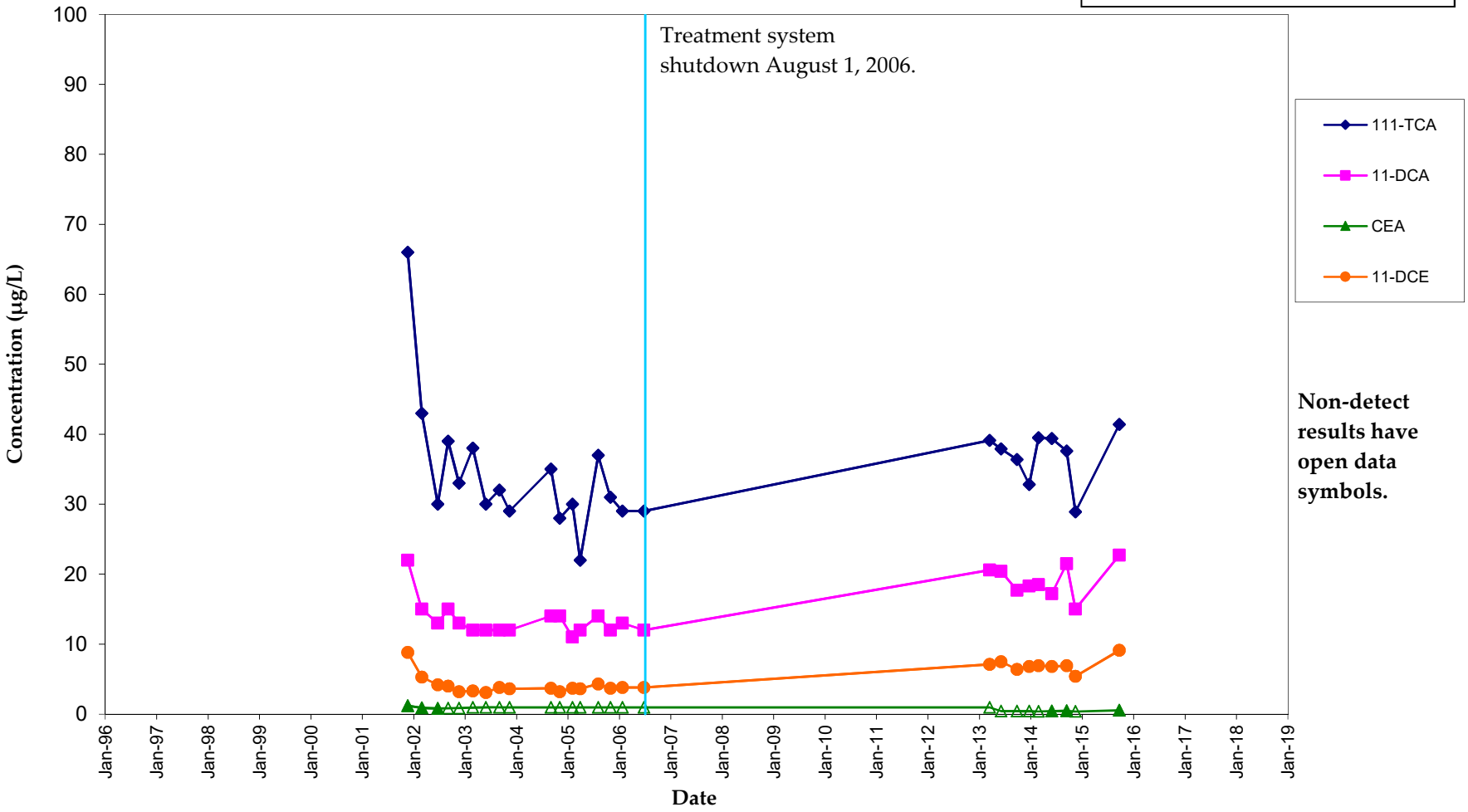
Non-detect results have open data symbols.

EW-06S
VOC Concentration Trends
Lemberger Landfill

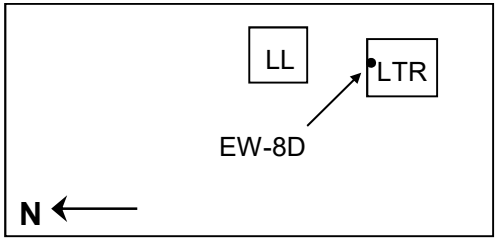


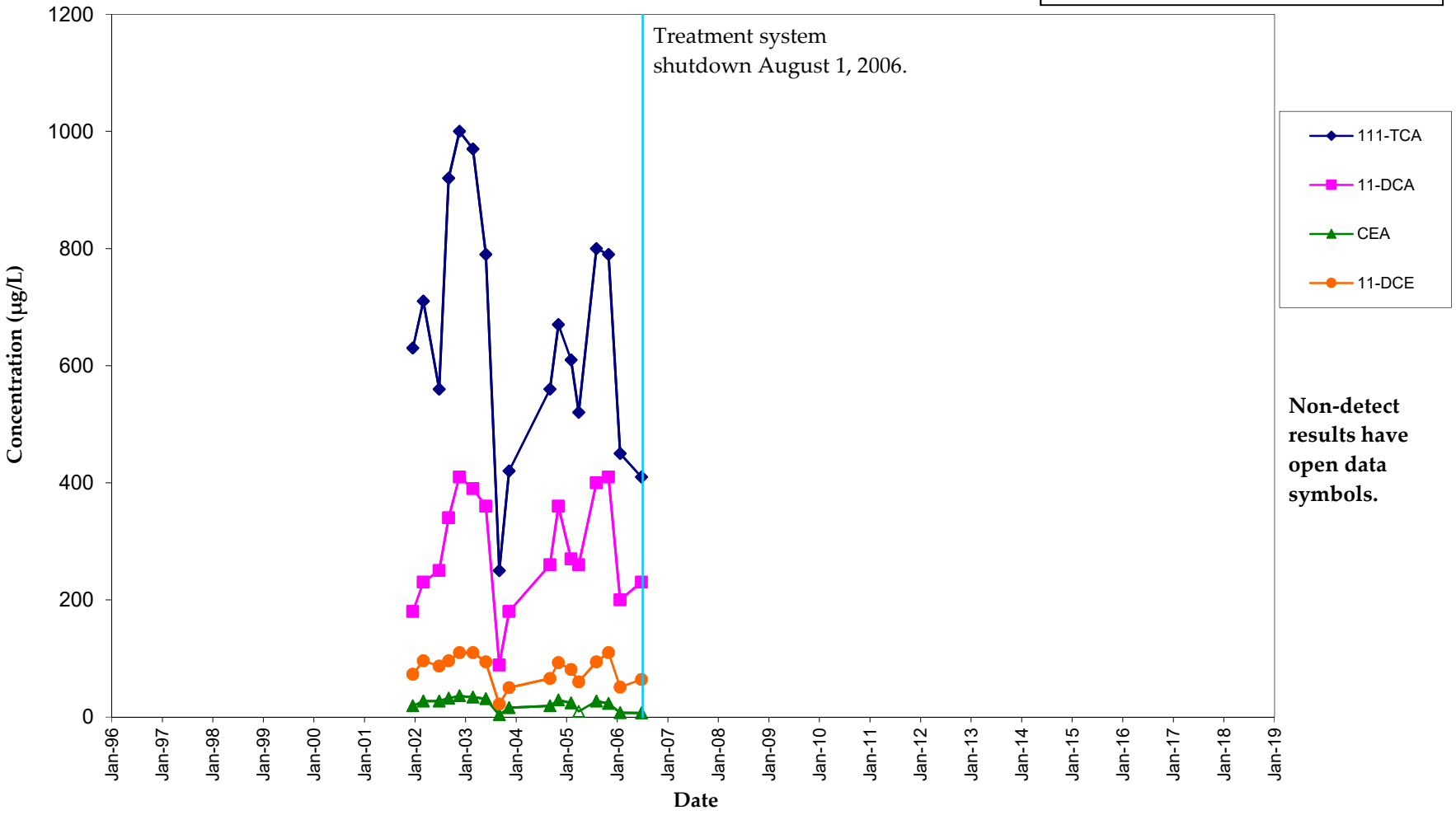
EW-07D
VOC Concentration Trends
Lemberger Landfill





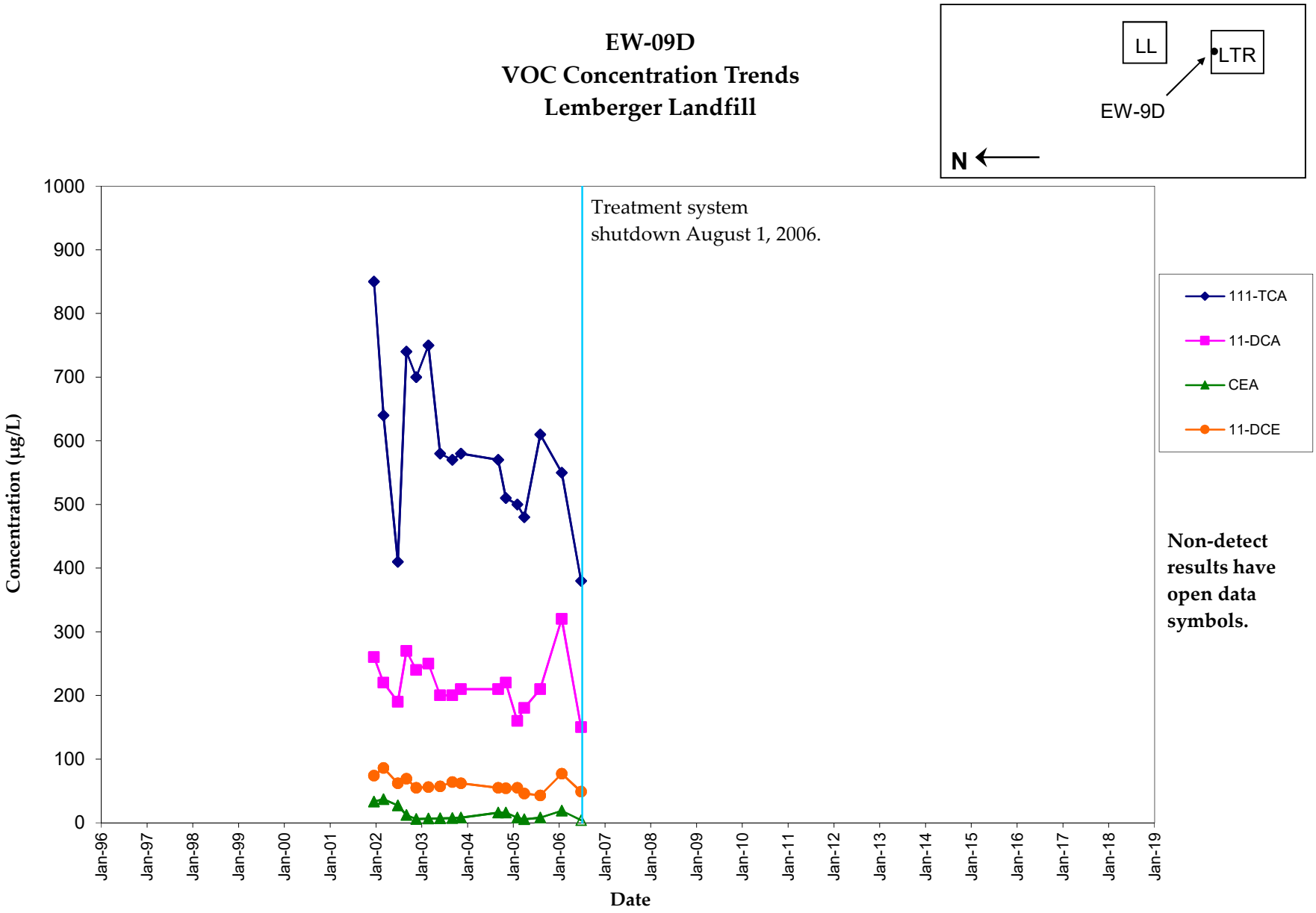
EW-08D
VOC Concentration Trends
Lemberger Landfill





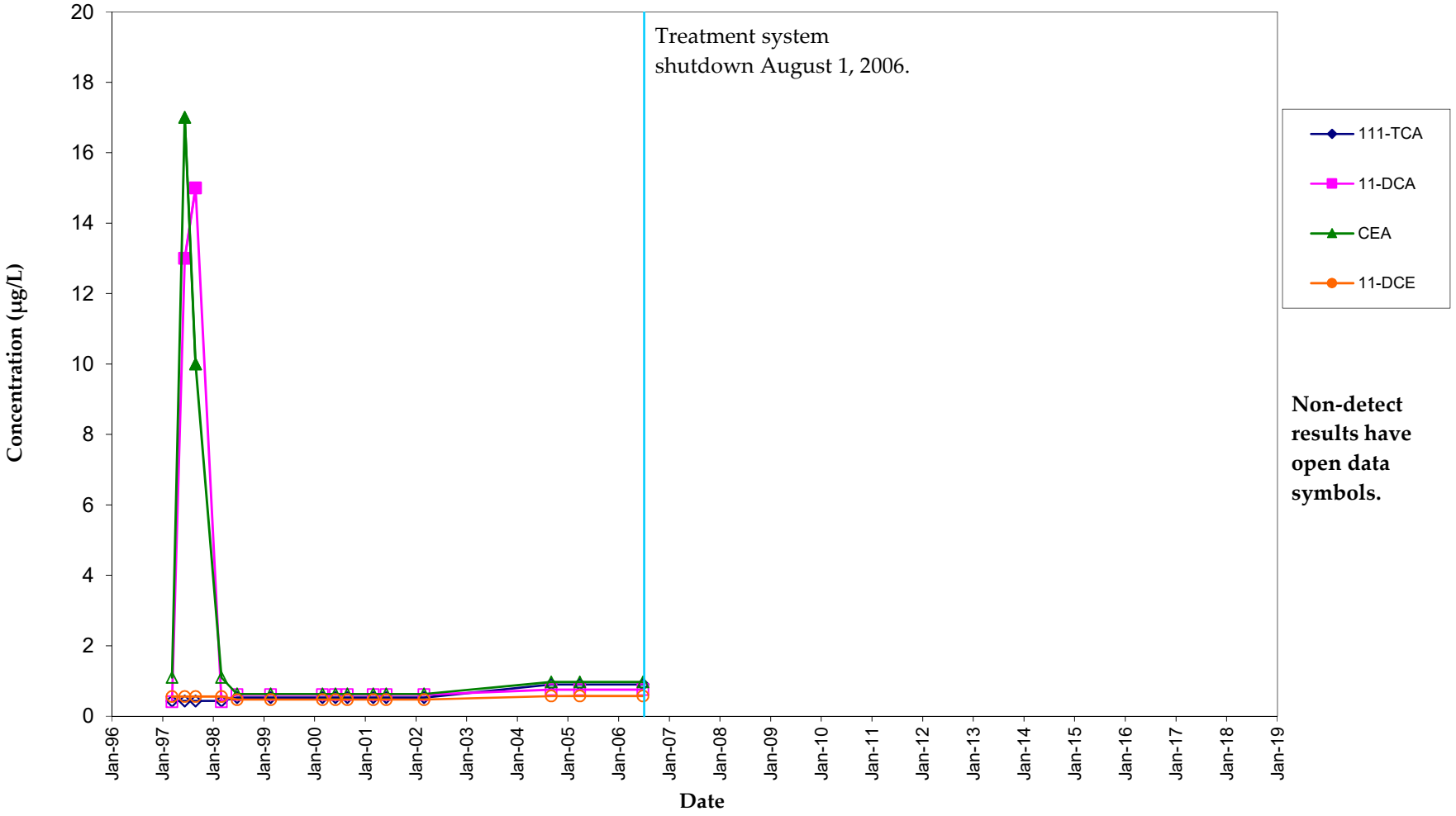
Non-detect results have open data symbols.

EW-09D
VOC Concentration Trends
Lemberger Landfill



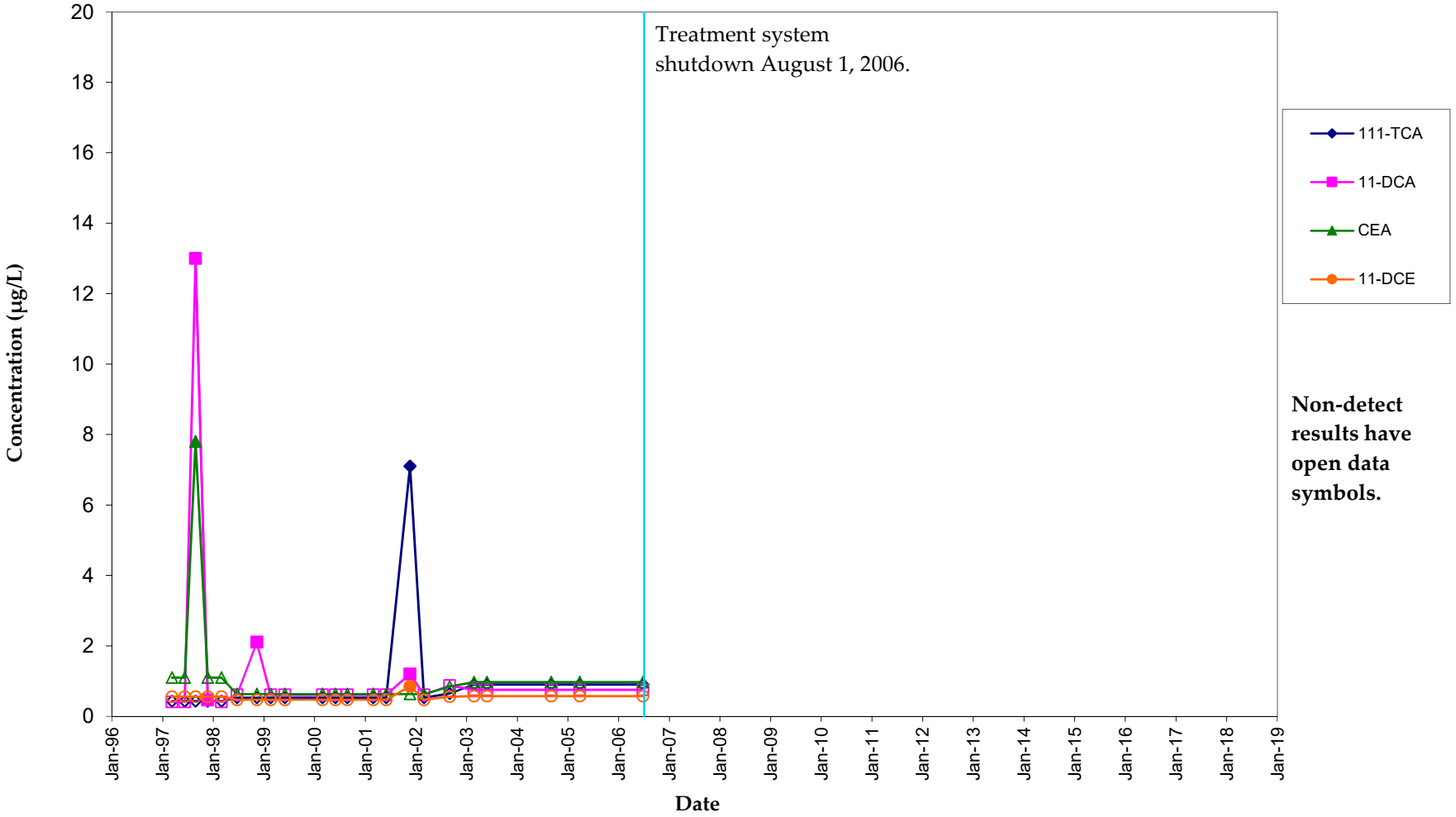
Non-detect results have open data symbols.

GWC-1
VOC Concentration Trends
Lemberger Landfill



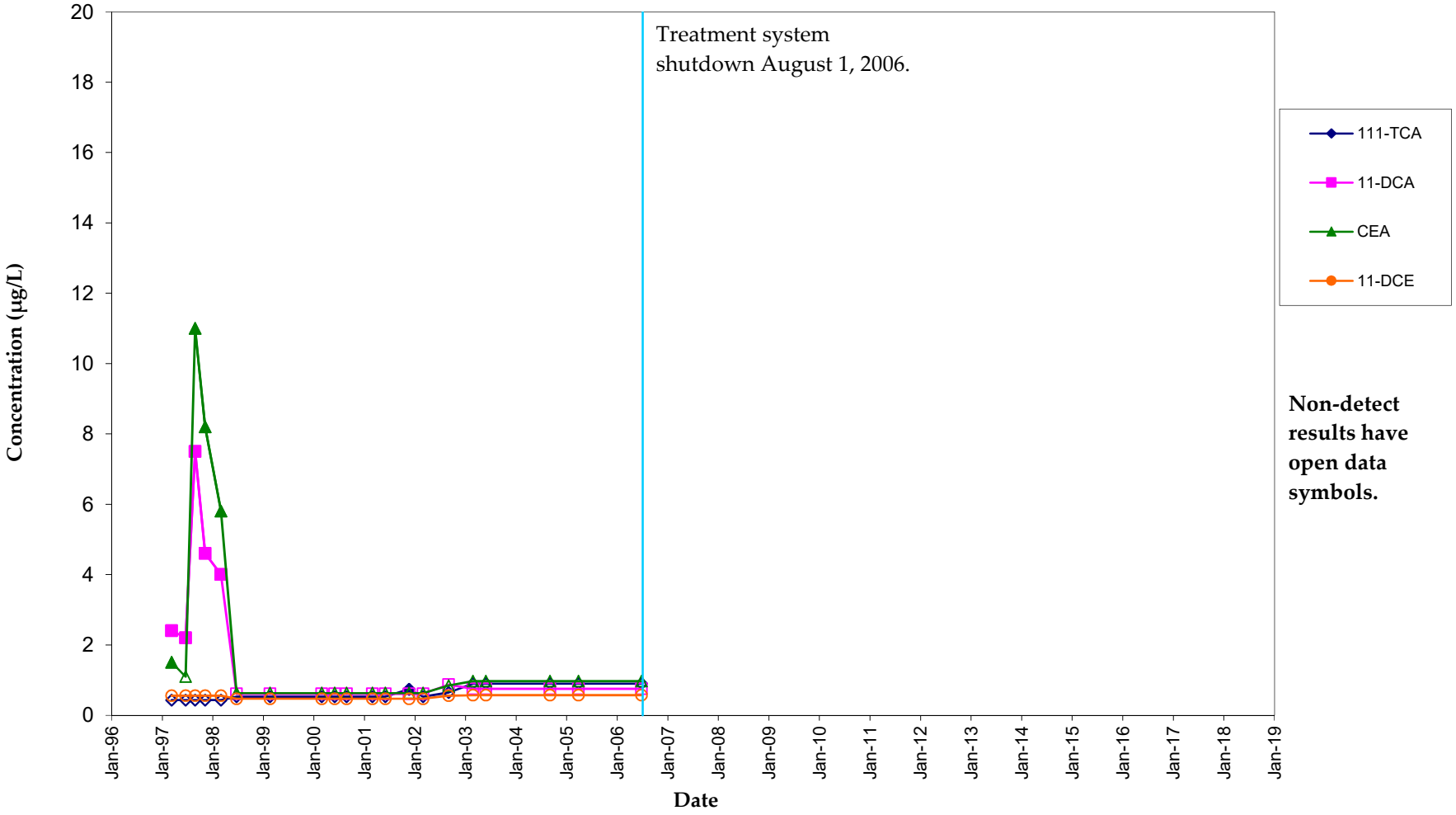
Non-detect results have open data symbols.

GWC-2
VOC Concentration Trends
Lemberger Landfill



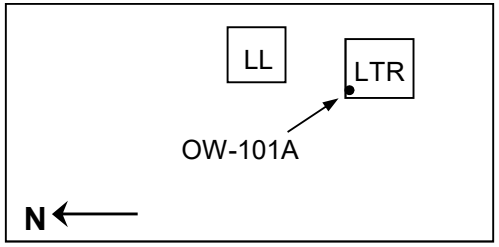
Non-detect results have open data symbols.

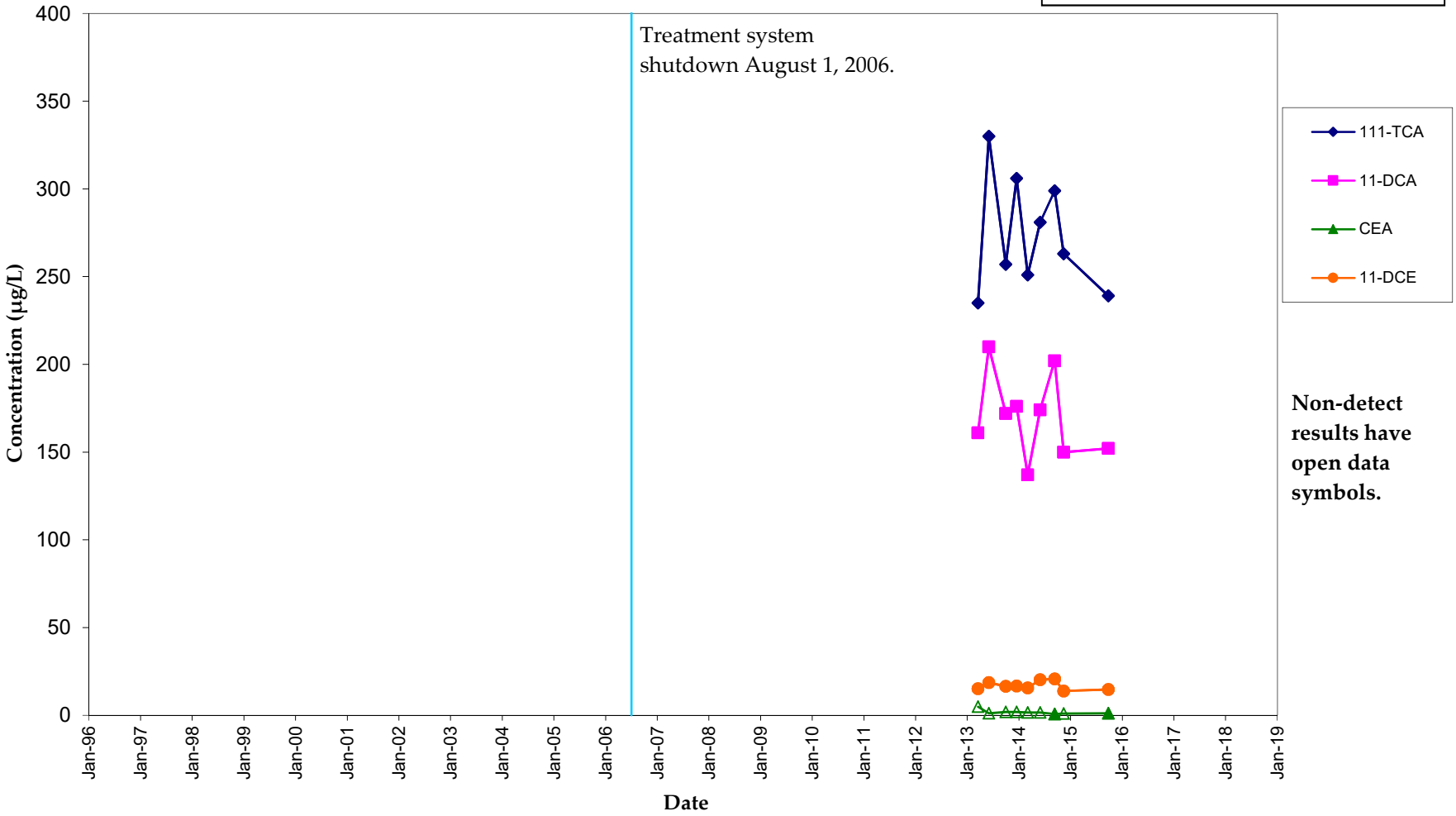
GWC-3
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

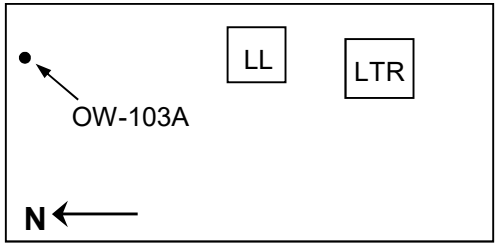
OW-101A
VOC Concentration Trends
Lemberger Landfill

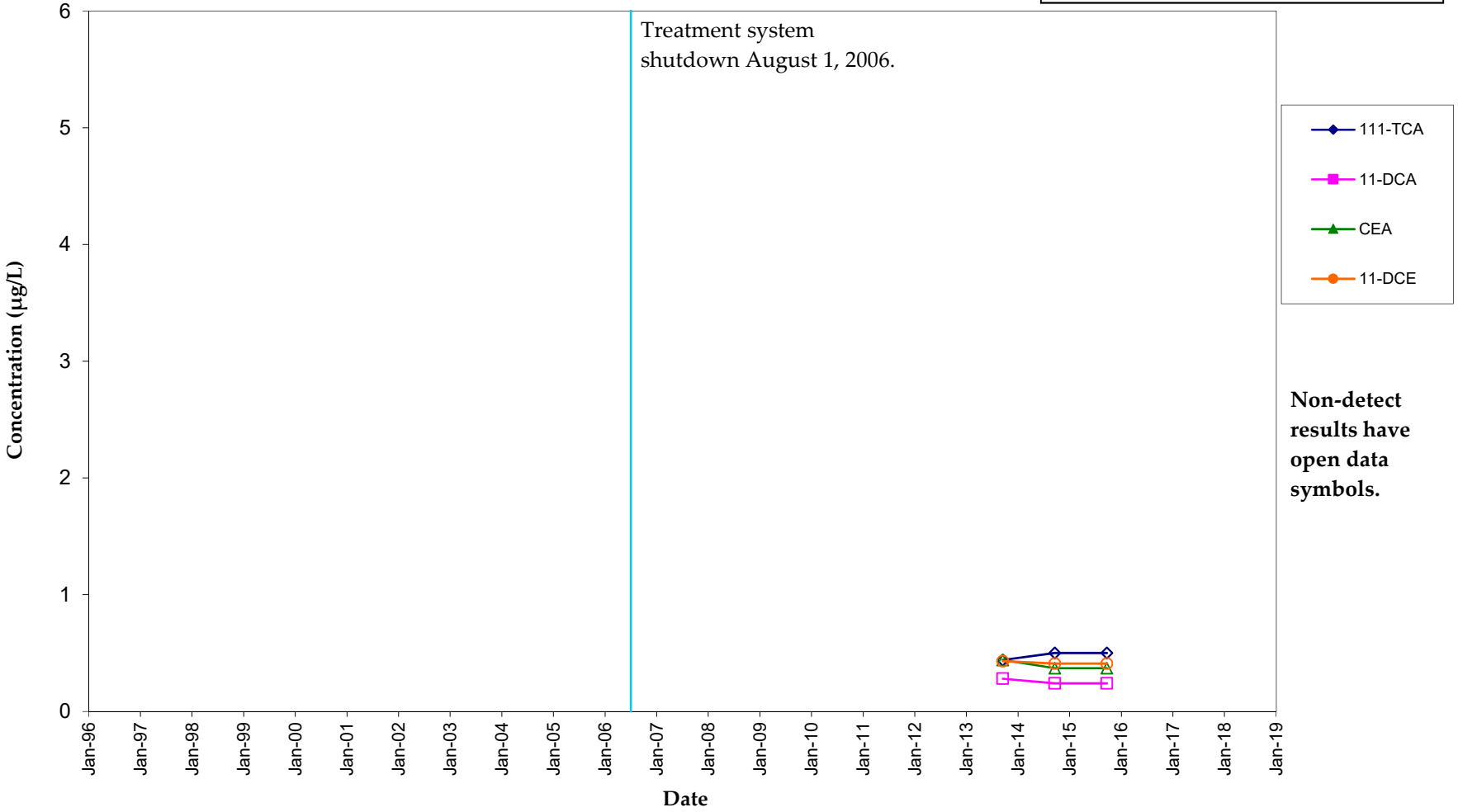




Non-detect results have open data symbols.

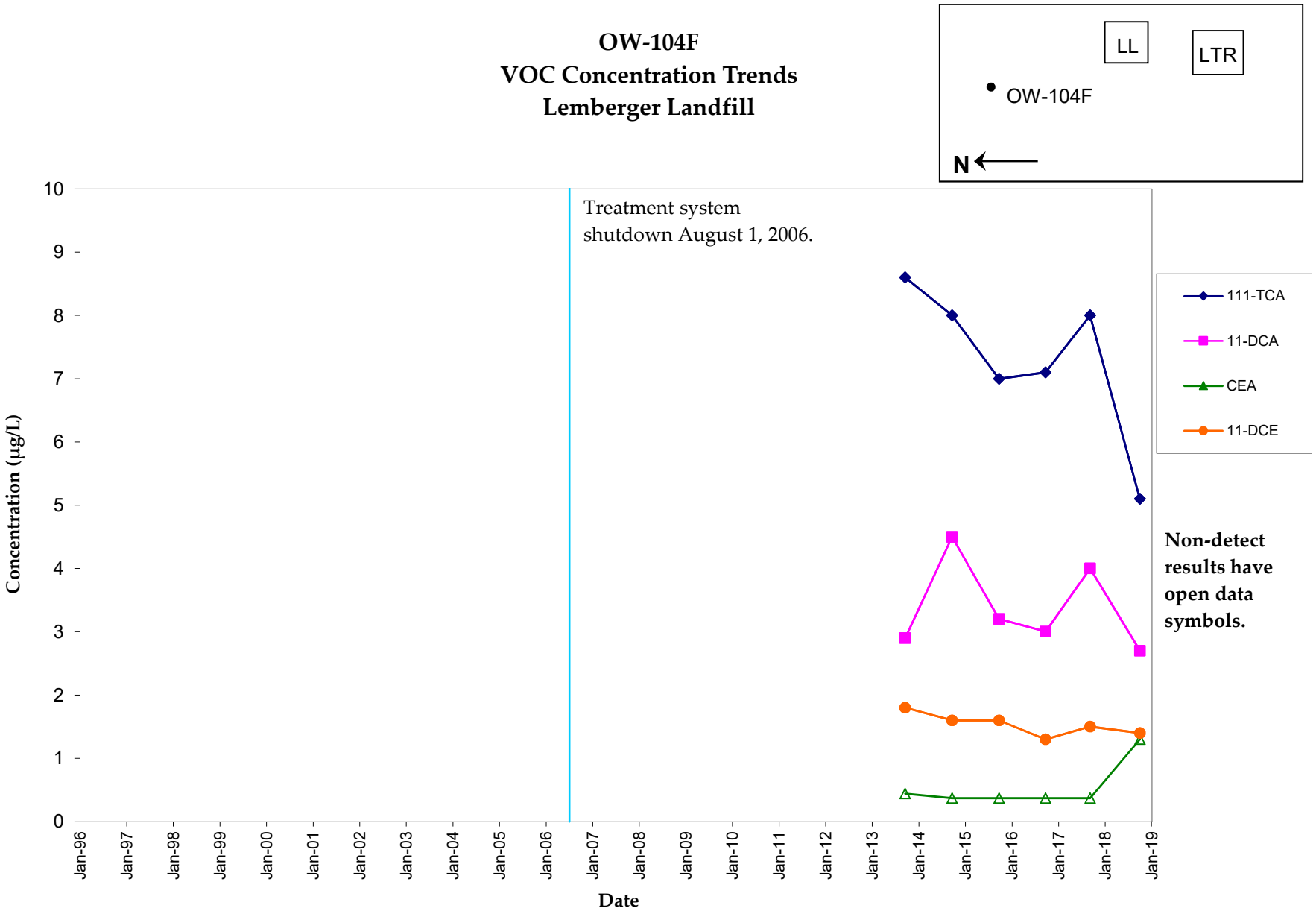
OW-103A
VOC Concentration Trends
Lemberger Landfill



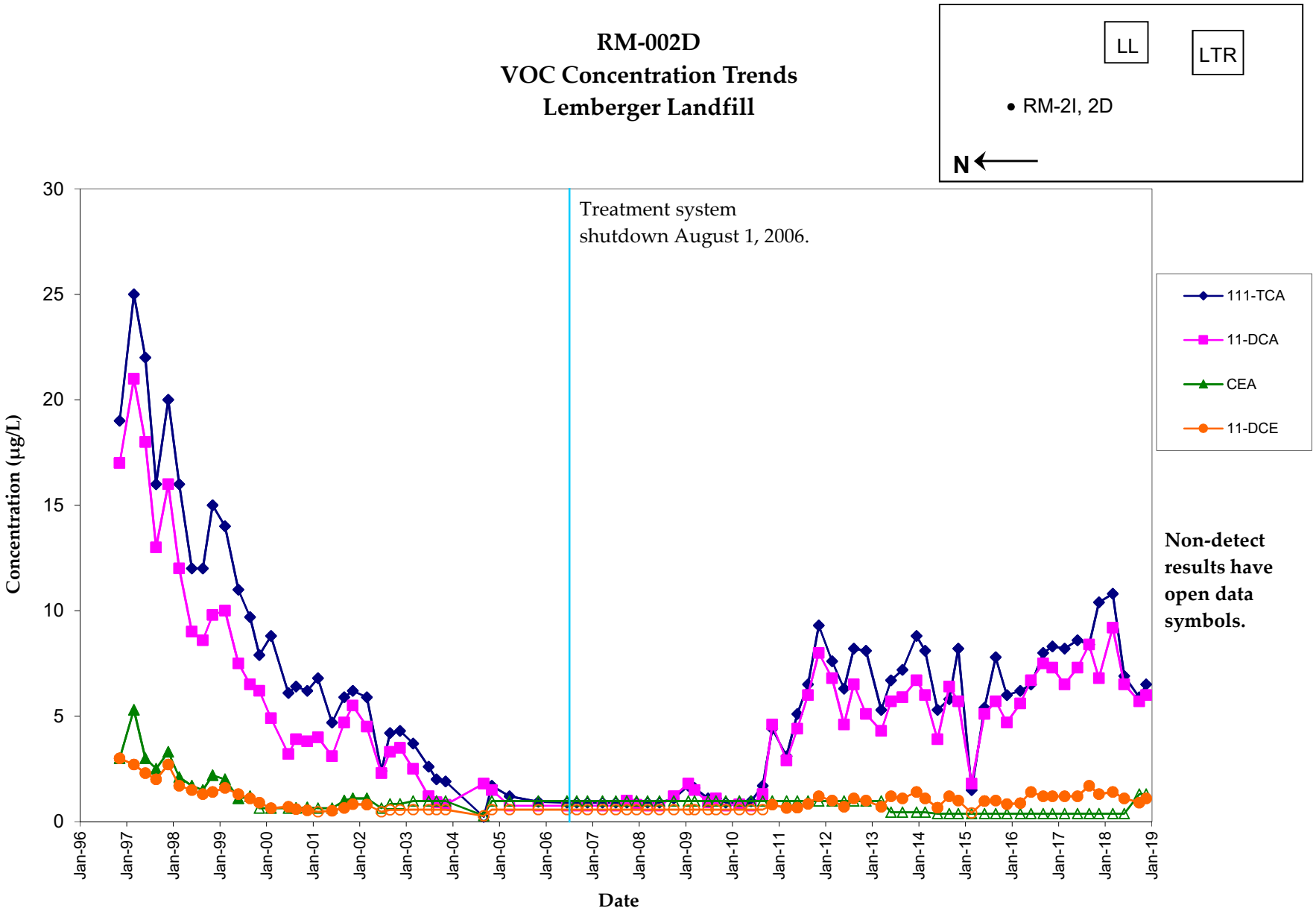


Non-detect results have open data symbols.

OW-104F
VOC Concentration Trends
Lemberger Landfill

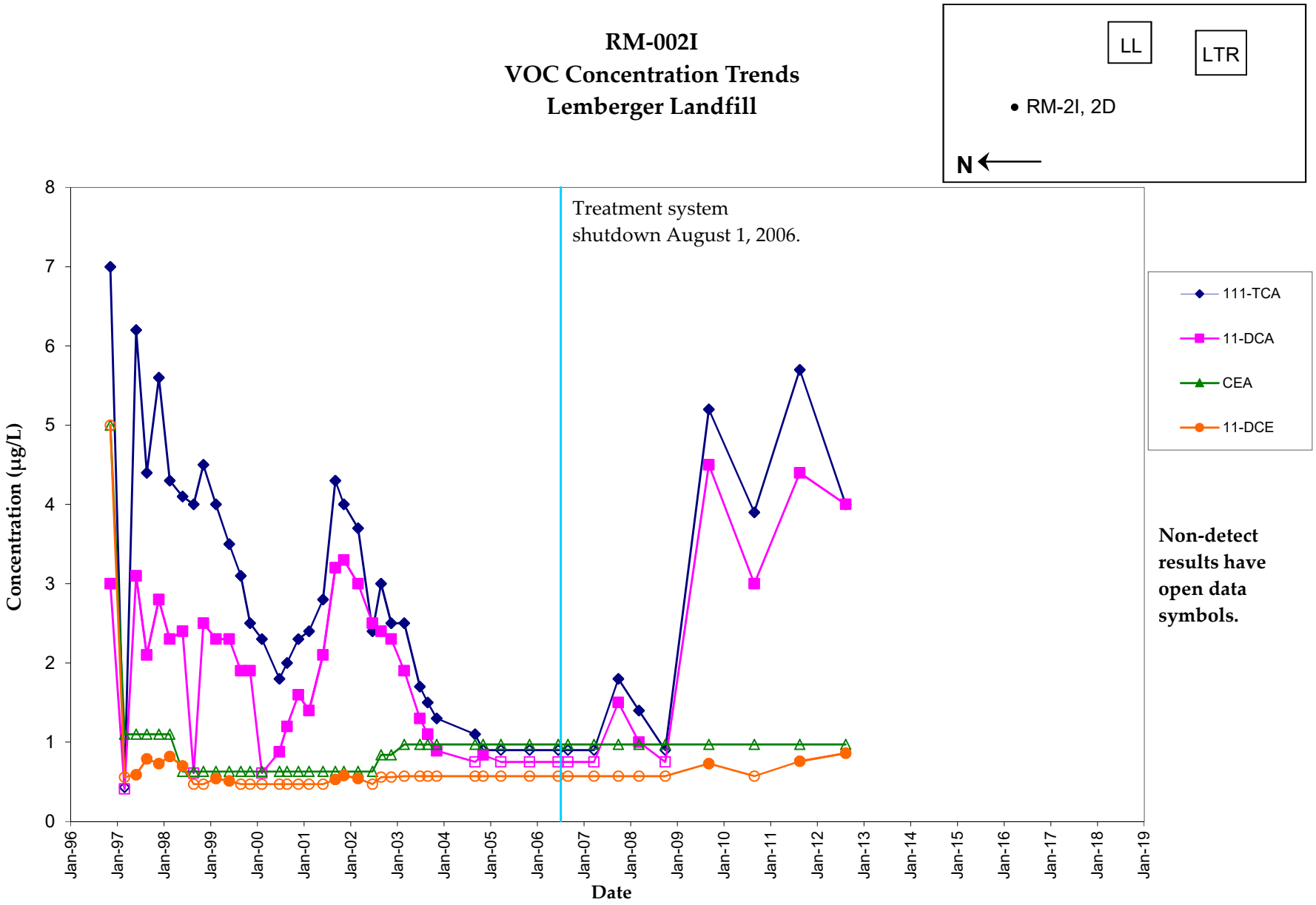


RM-002D
VOC Concentration Trends
Lemberger Landfill



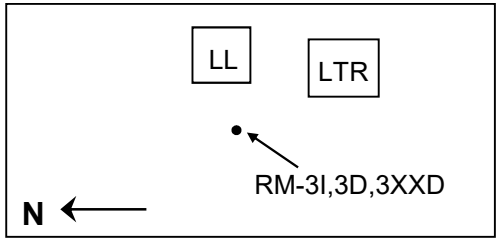
Non-detect results have open data symbols.

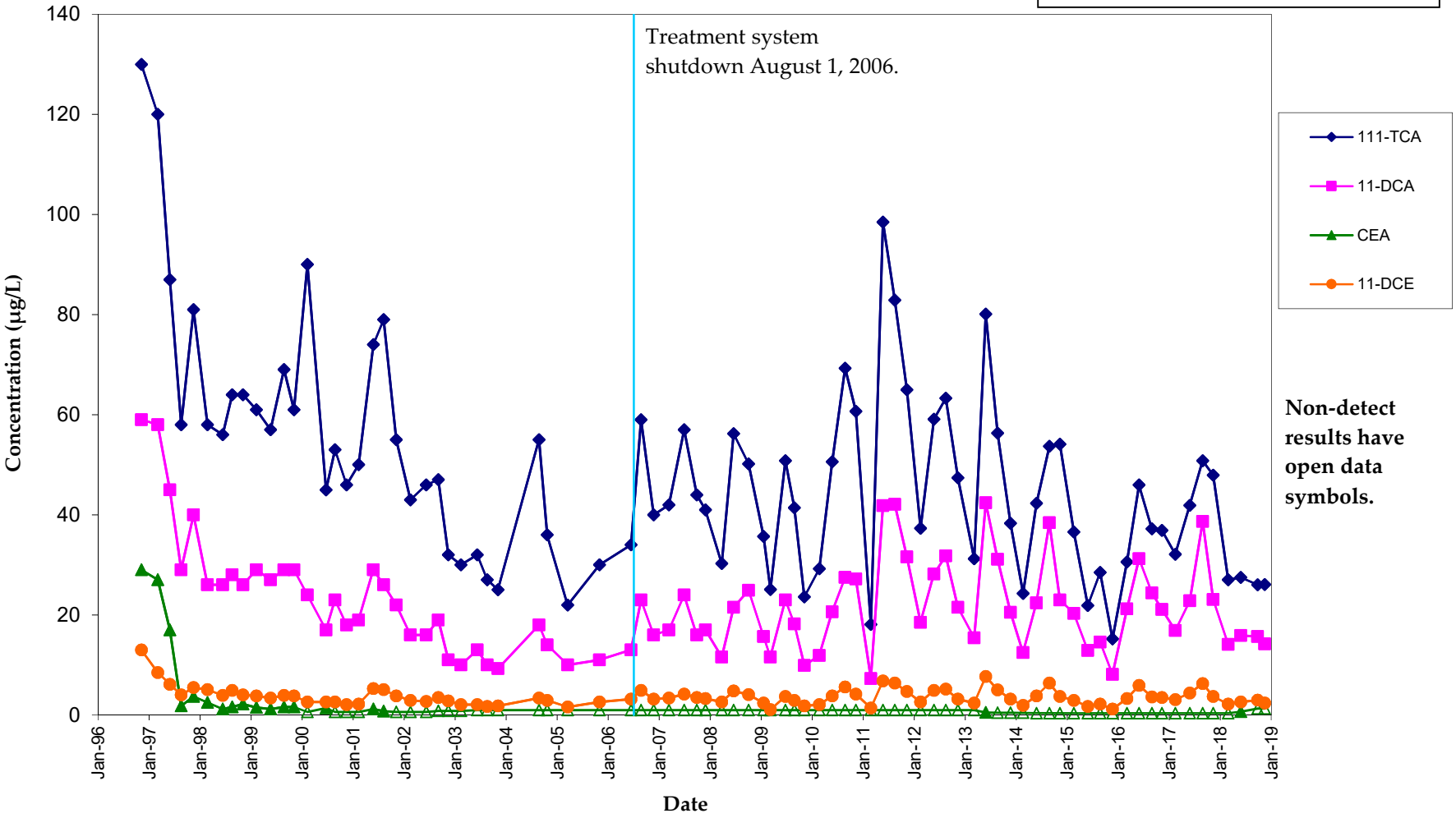
RM-002I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

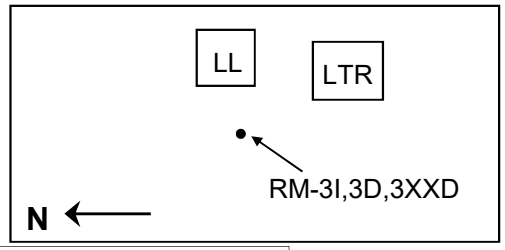
RM-003D
VOC Concentration Trends
Lemberger Landfill

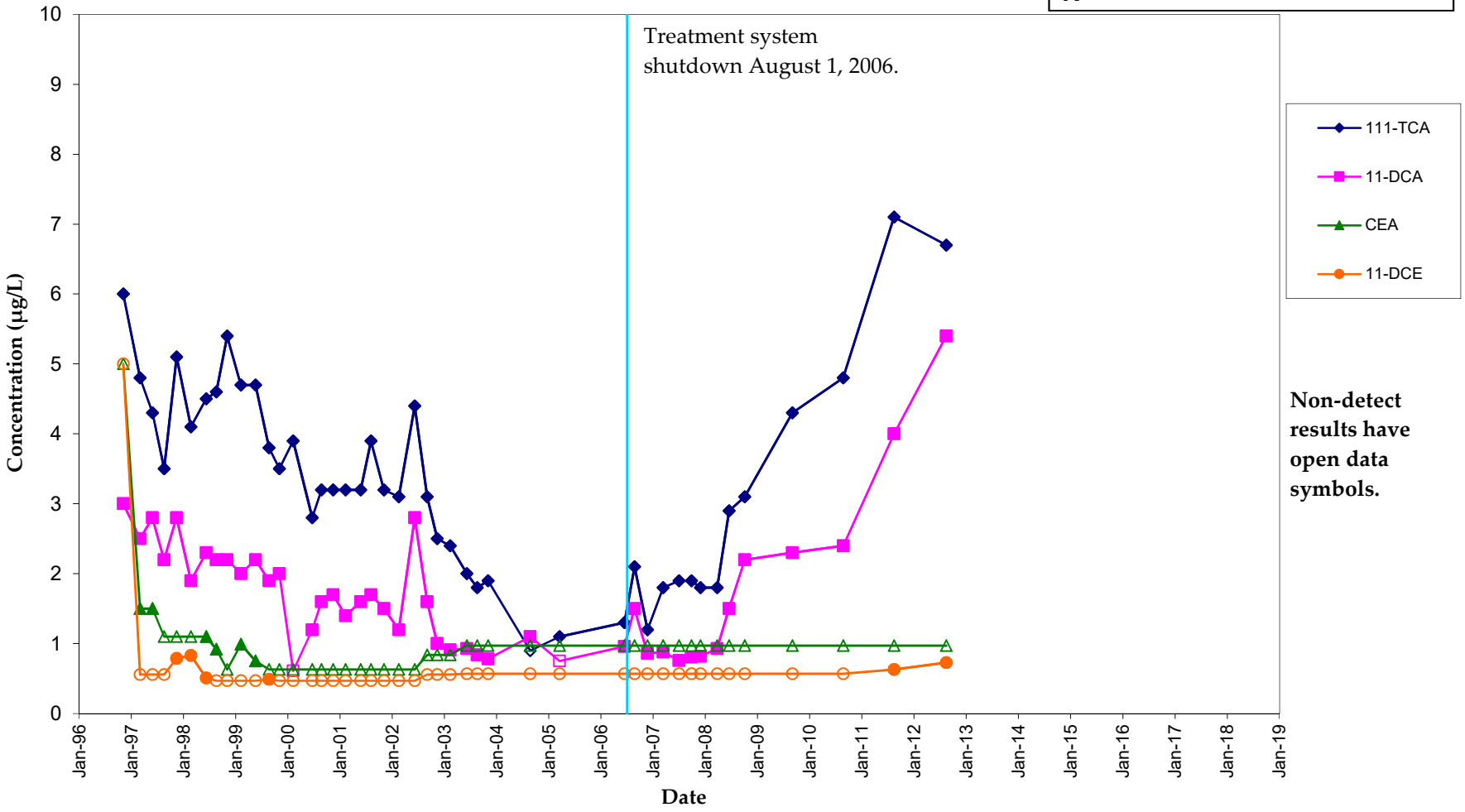




Non-detect results have open data symbols.

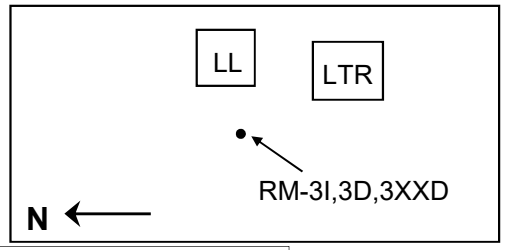
RM-003I
VOC Concentration Trends
Lemberger Landfill

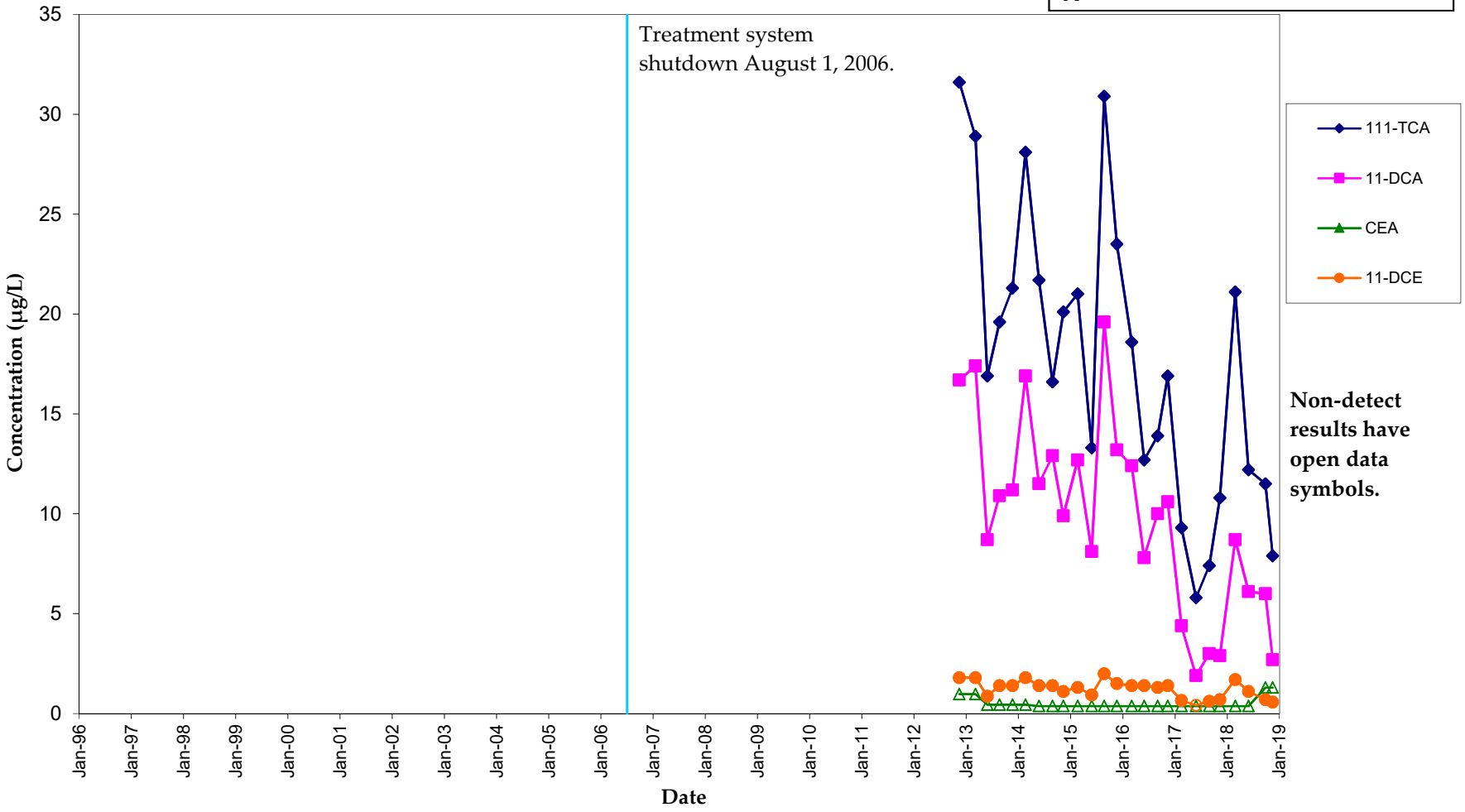




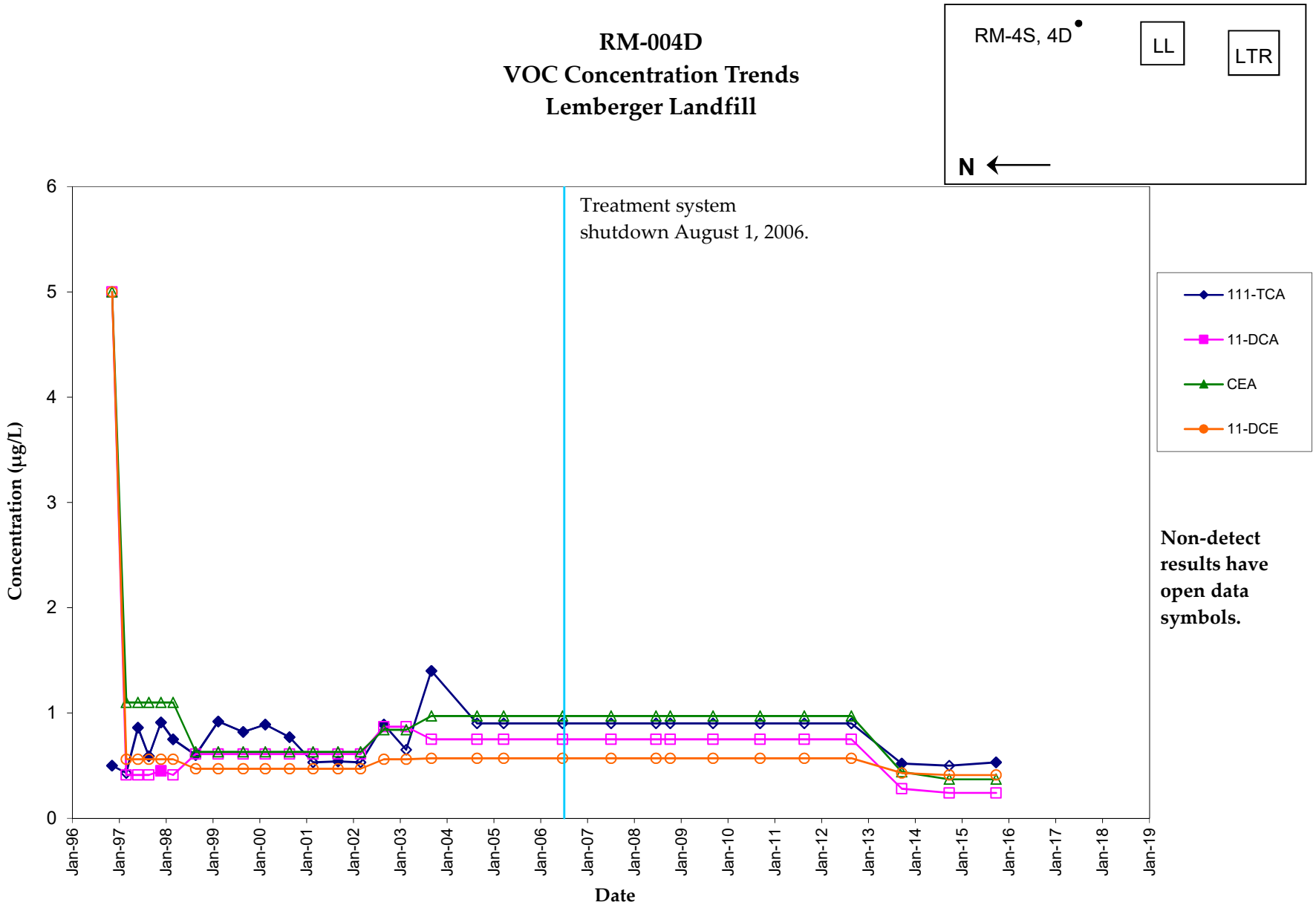
Non-detect results have open data symbols.

RM-003XXD
VOC Concentration Trends
Lemberger Landfill



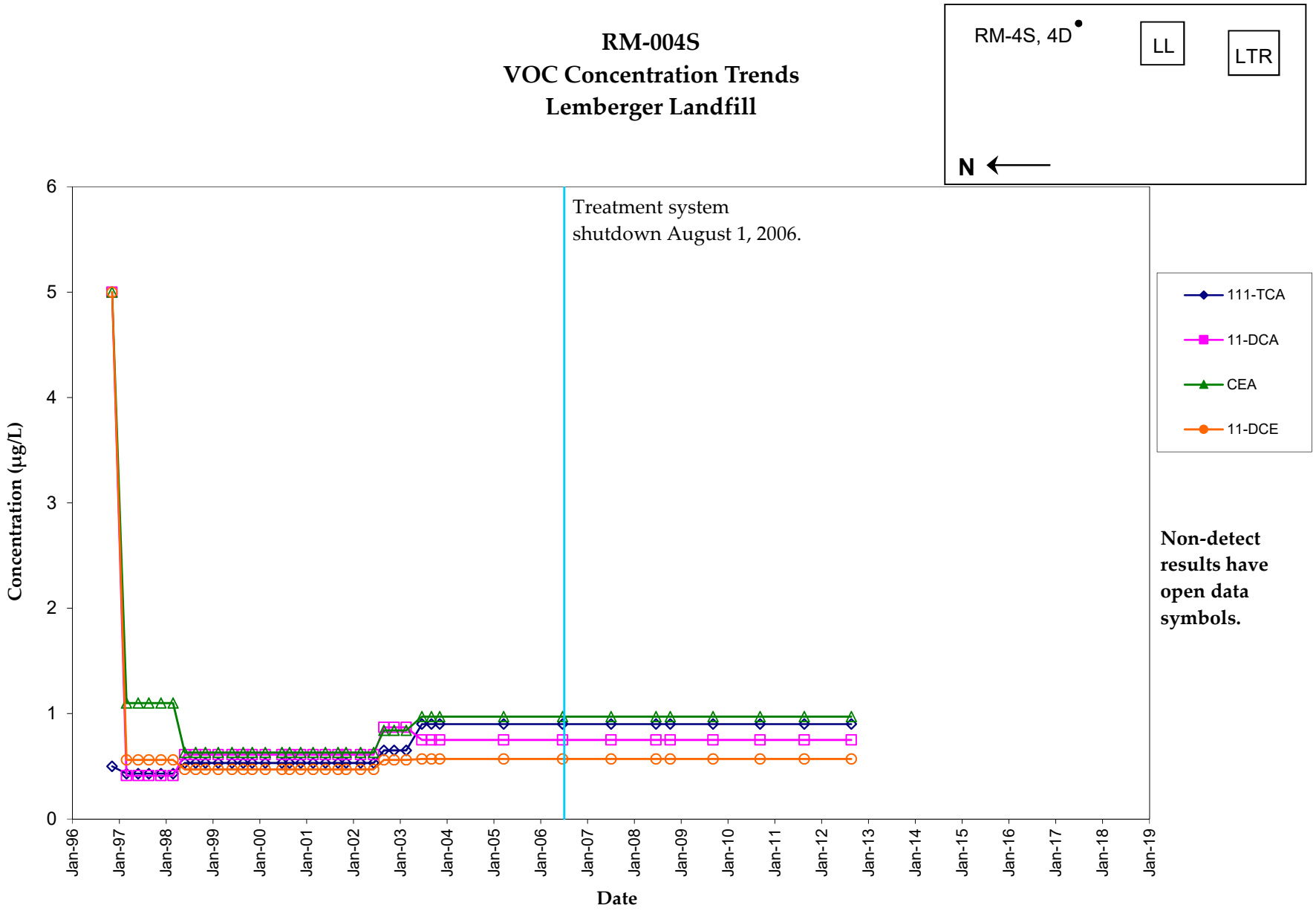


RM-004D
VOC Concentration Trends
Lemberger Landfill



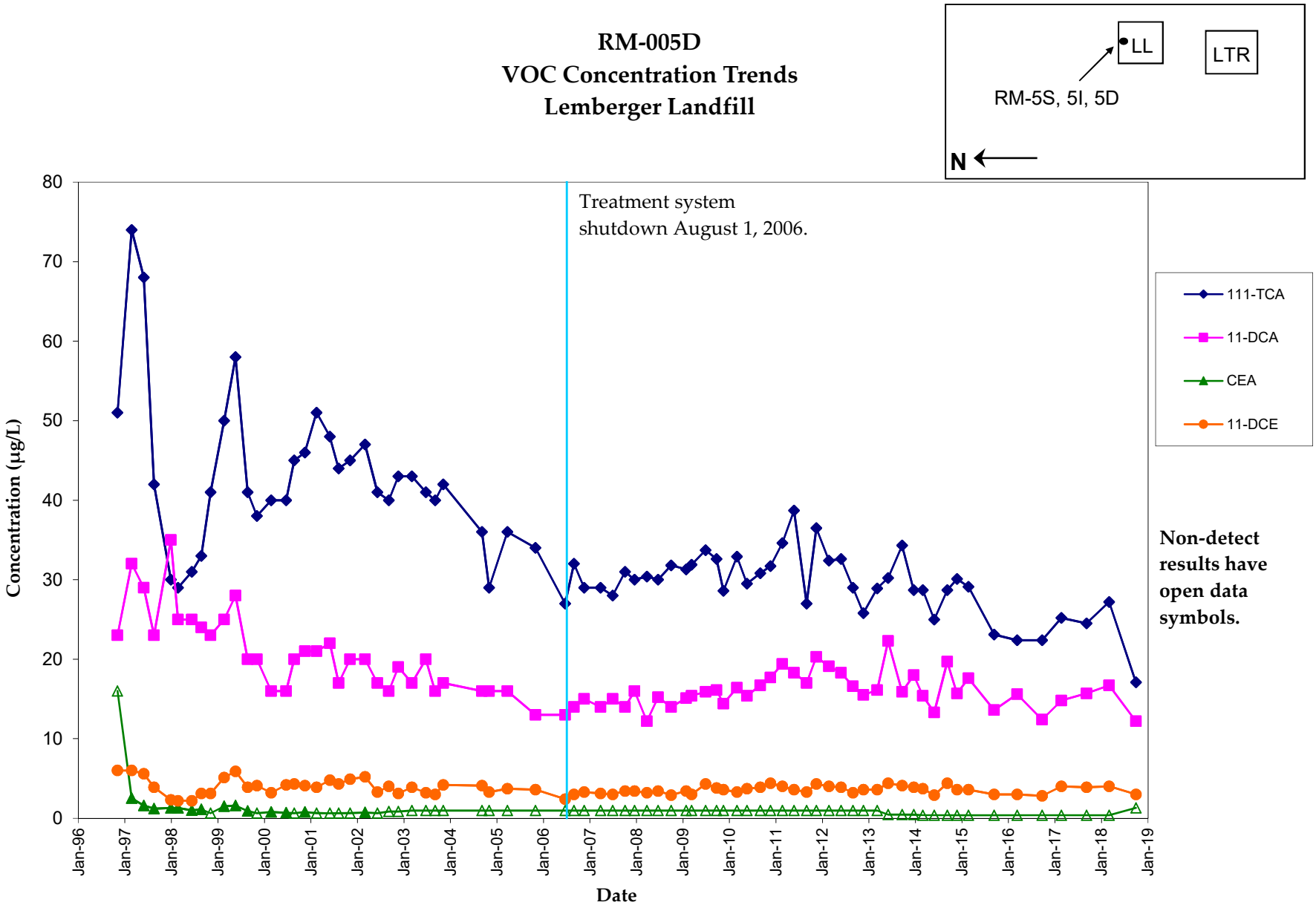
Non-detect results have open data symbols.

RM-004S
VOC Concentration Trends
Lemberger Landfill



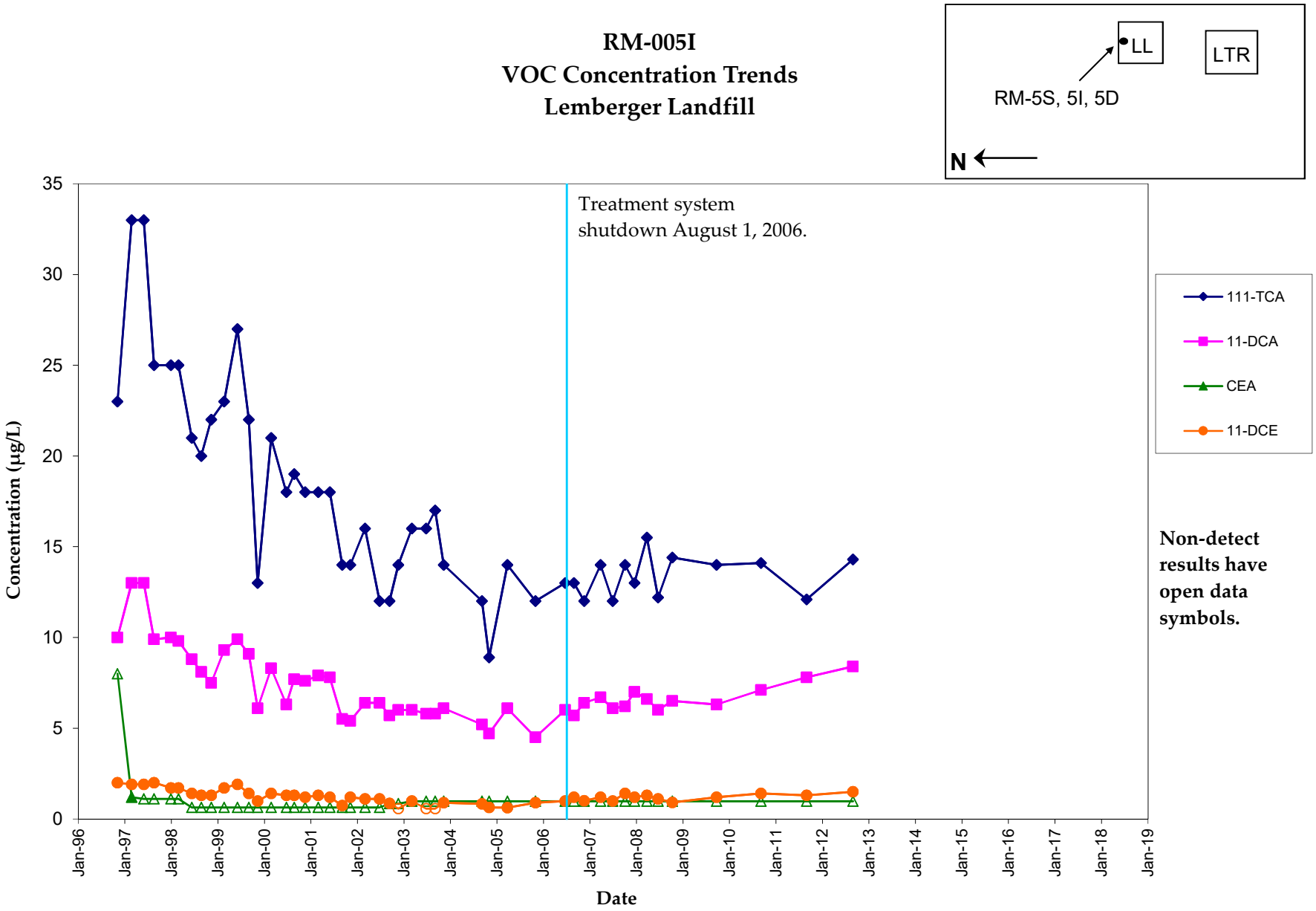
Non-detect results have open data symbols.

RM-005D
VOC Concentration Trends
Lemberger Landfill



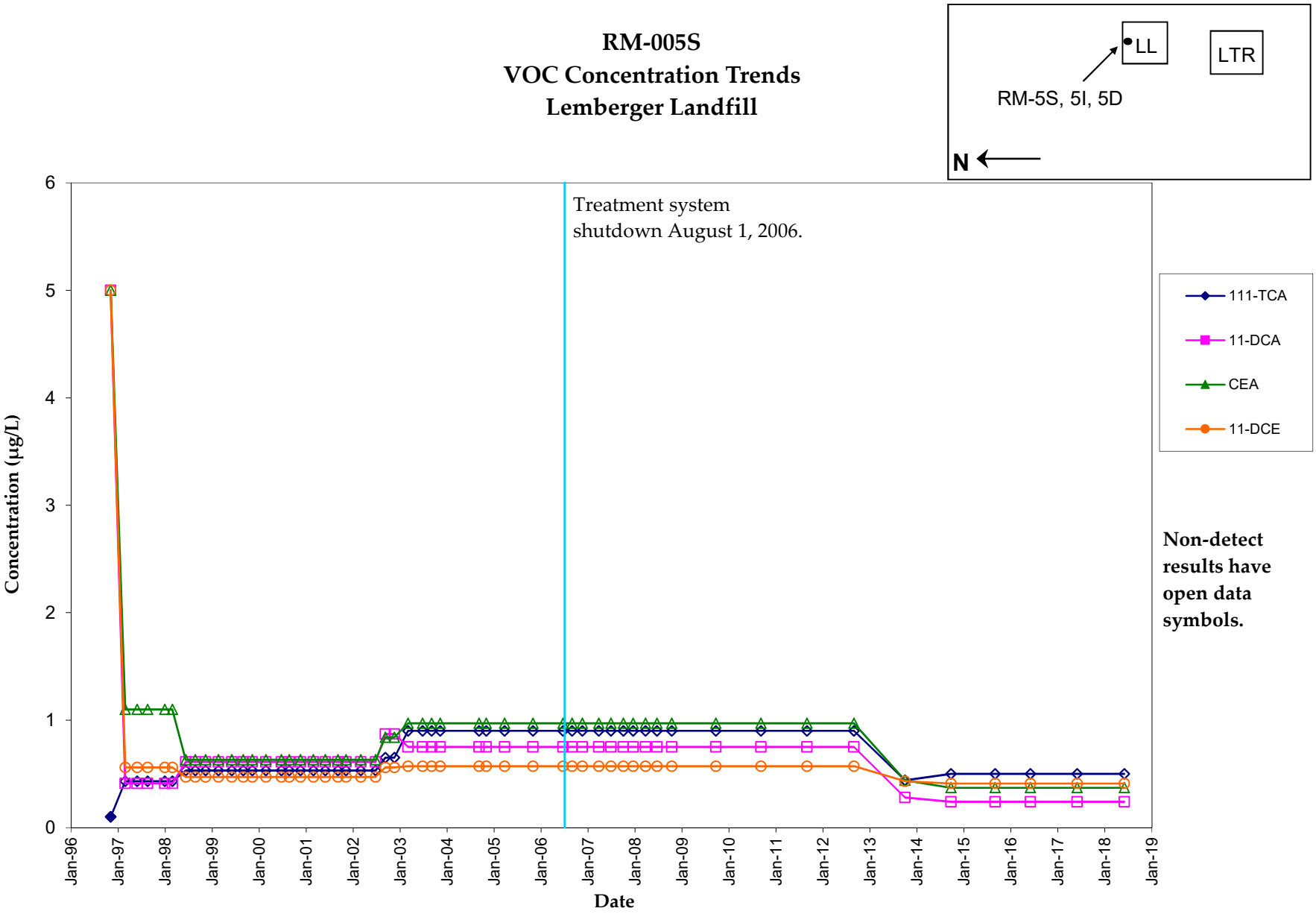
Non-detect results have open data symbols.

RM-005I
VOC Concentration Trends
Lemberger Landfill



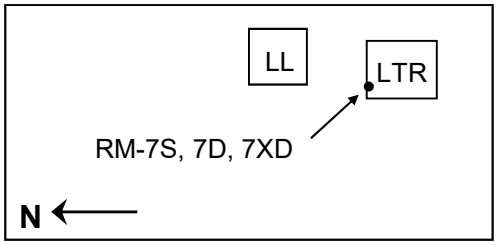
Non-detect results have open data symbols.

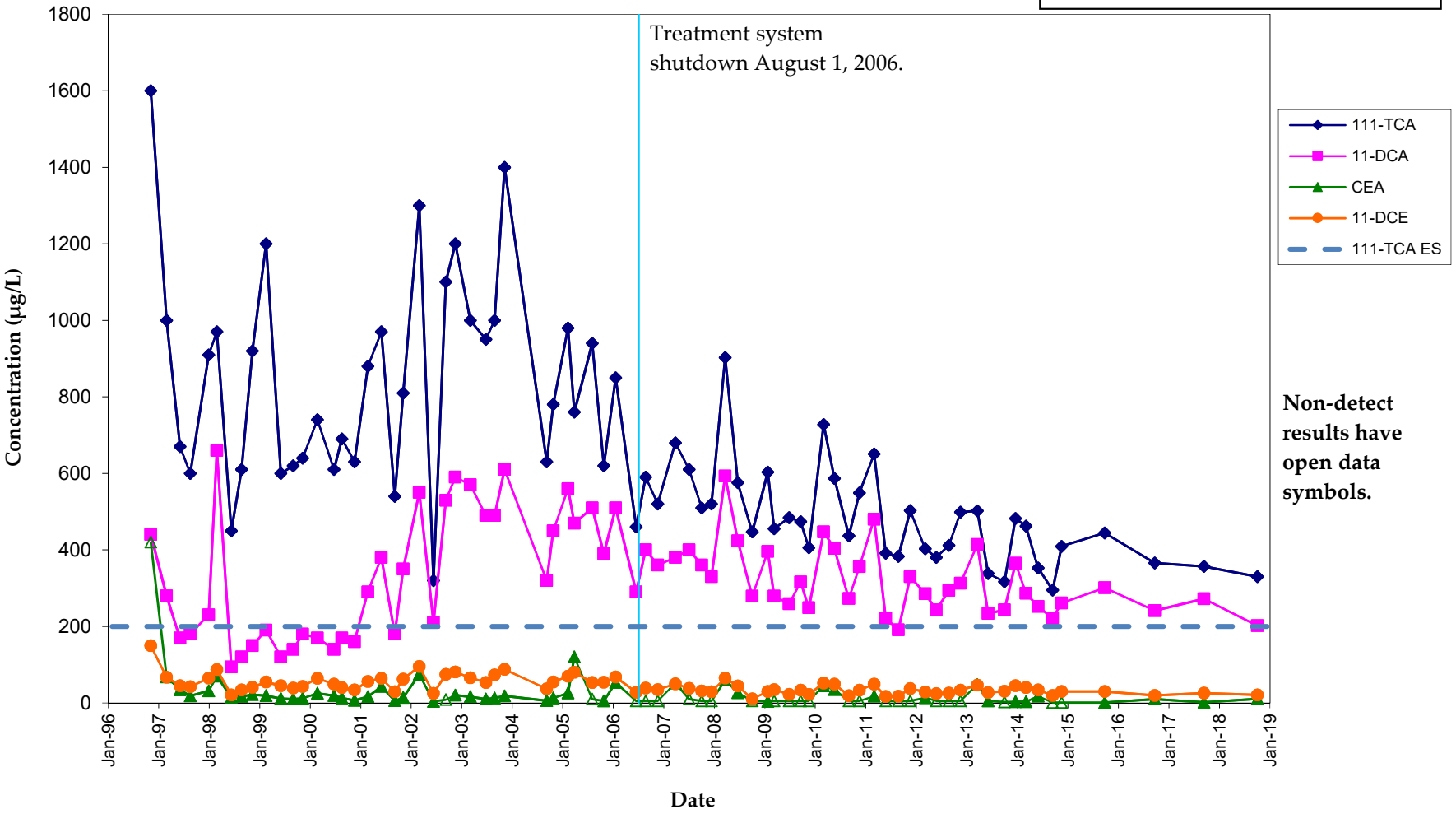
RM-005S
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

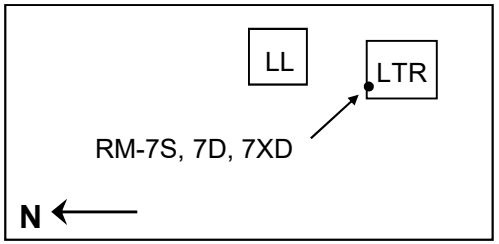
RM-007D
VOC Concentration Trends
Lemberger Landfill

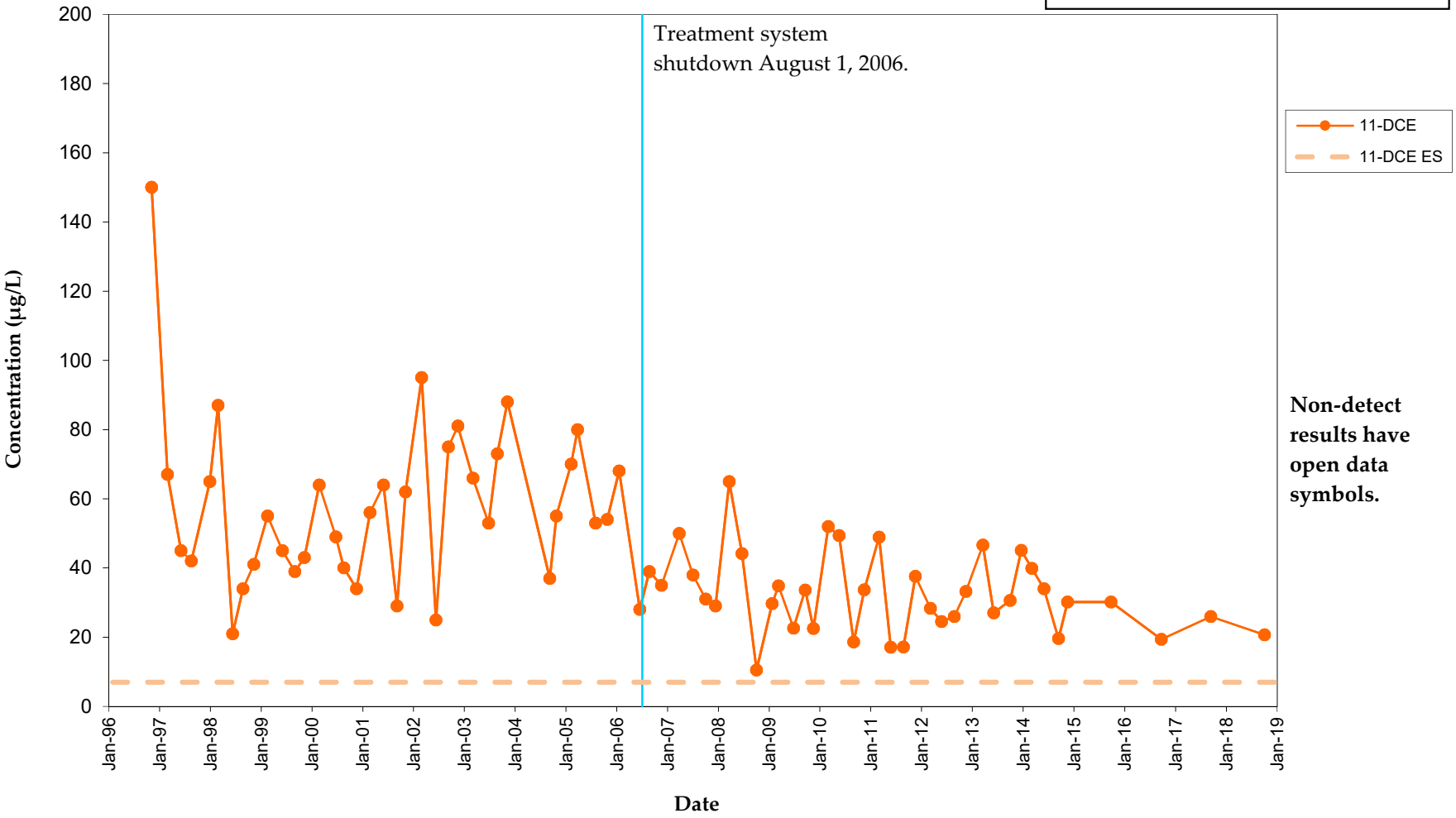




Non-detect results have open data symbols.

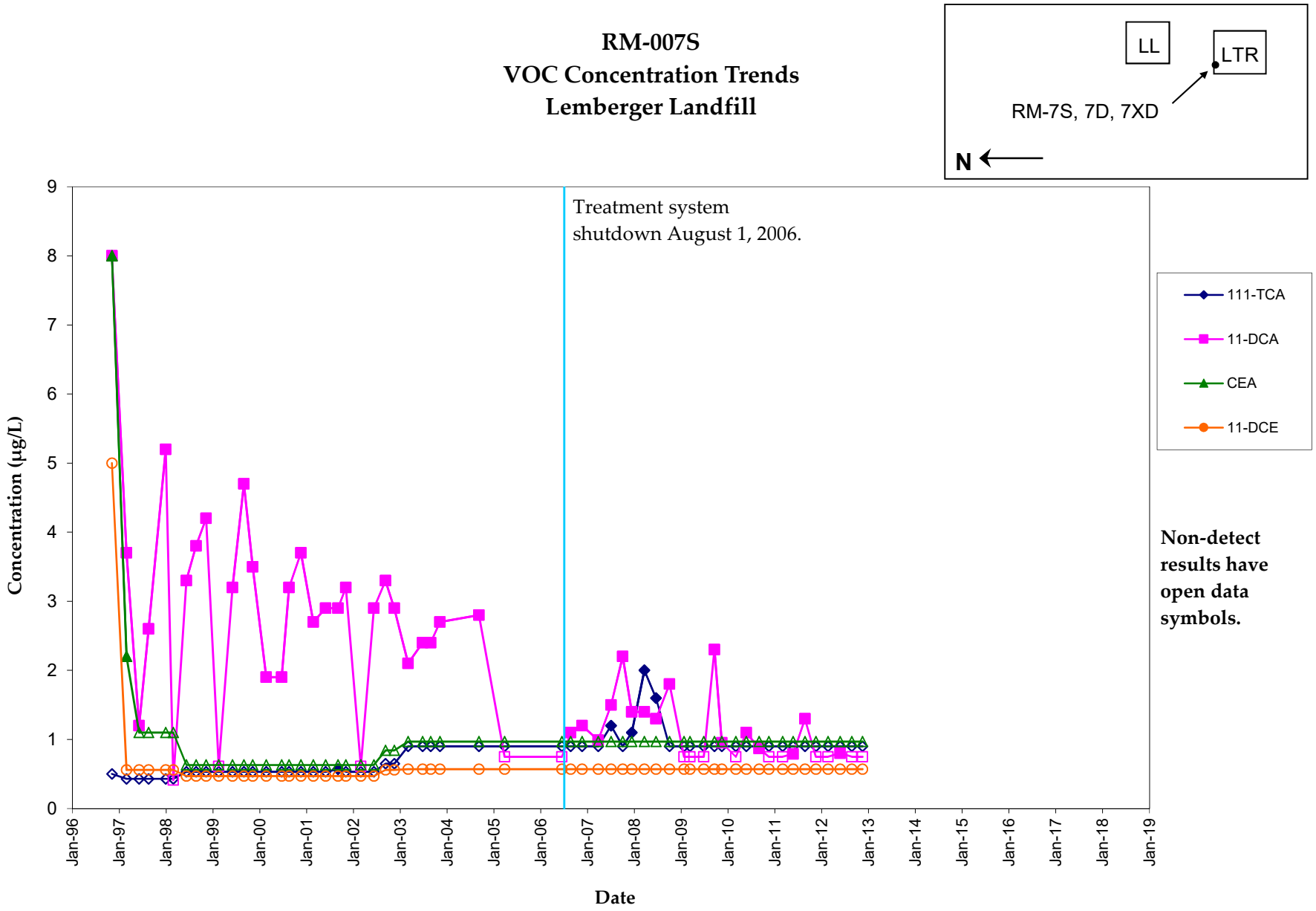
RM-007D
VOC Concentration Trends
Lemberger Landfill





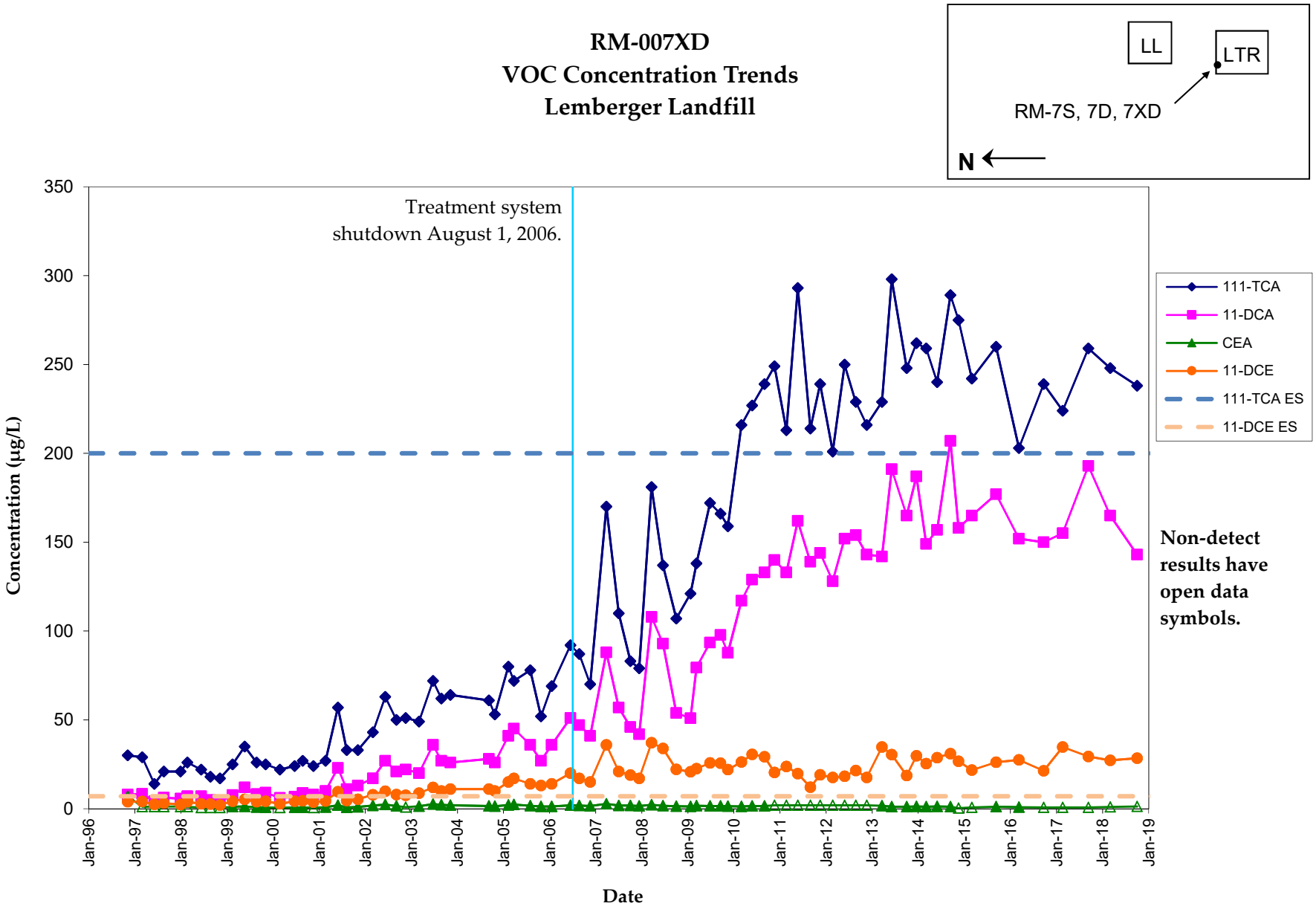
Non-detect results have open data symbols.

RM-007S
VOC Concentration Trends
Lemberger Landfill

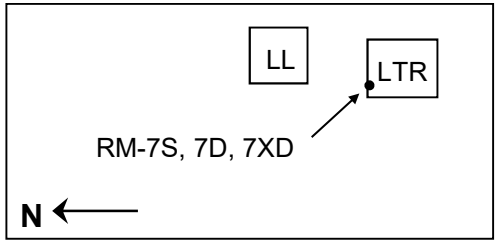


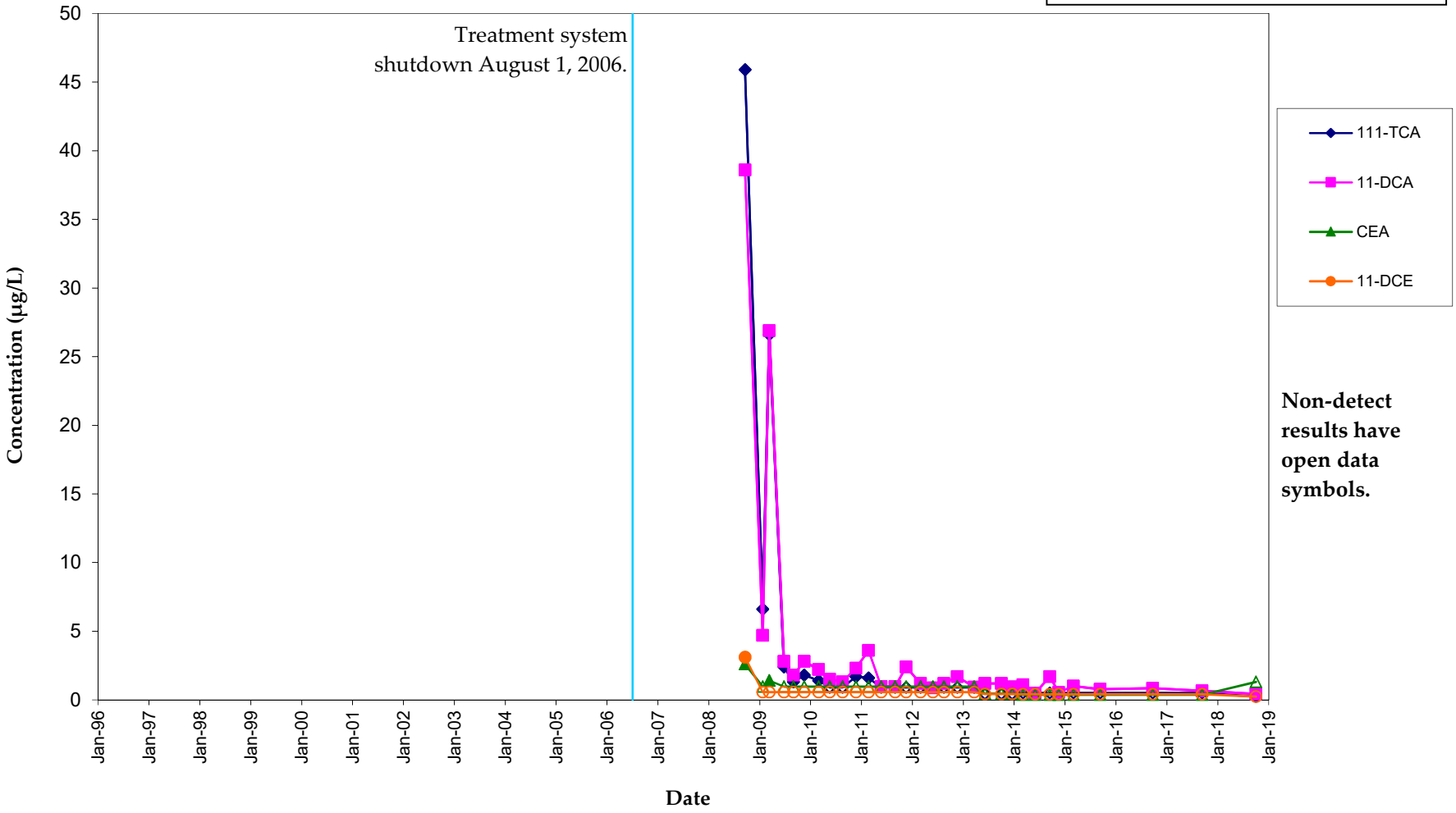
Non-detect results have open data symbols.

RM-007XD
VOC Concentration Trends
Lemberger Landfill



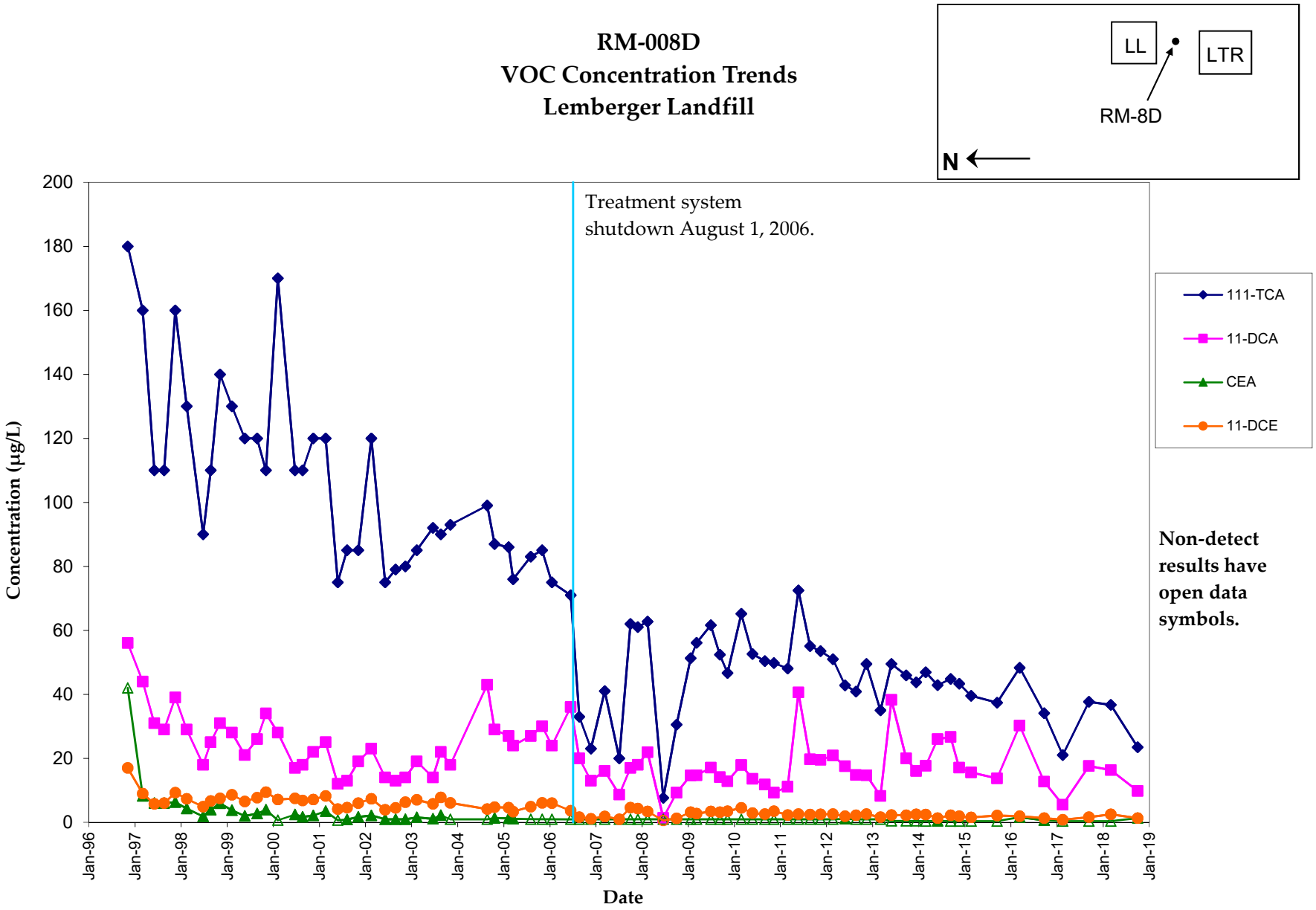
RM-007XXD
VOC Concentration Trends
Lemberger Landfill





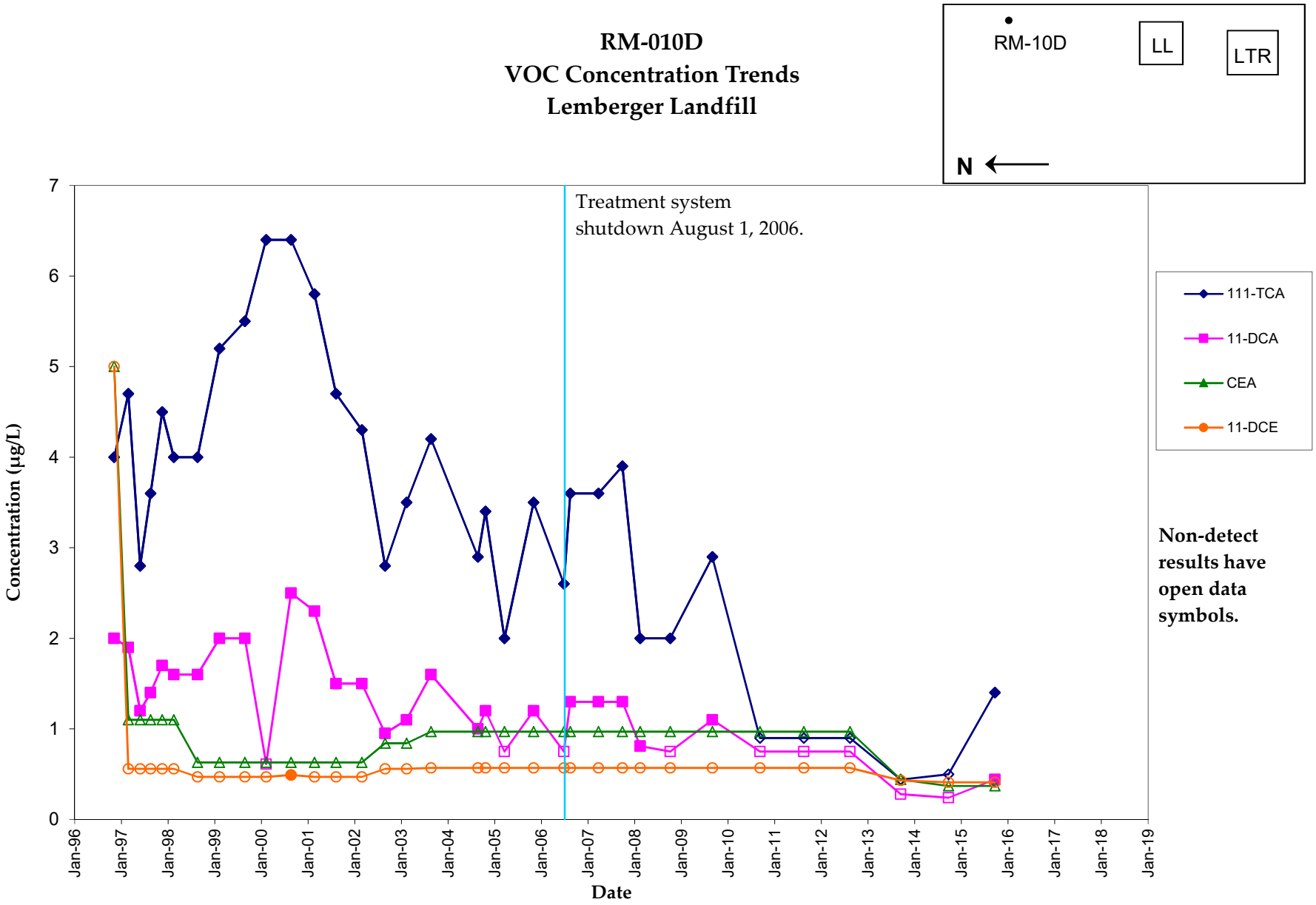
Non-detect results have open data symbols.

RM-008D
VOC Concentration Trends
Lemberger Landfill



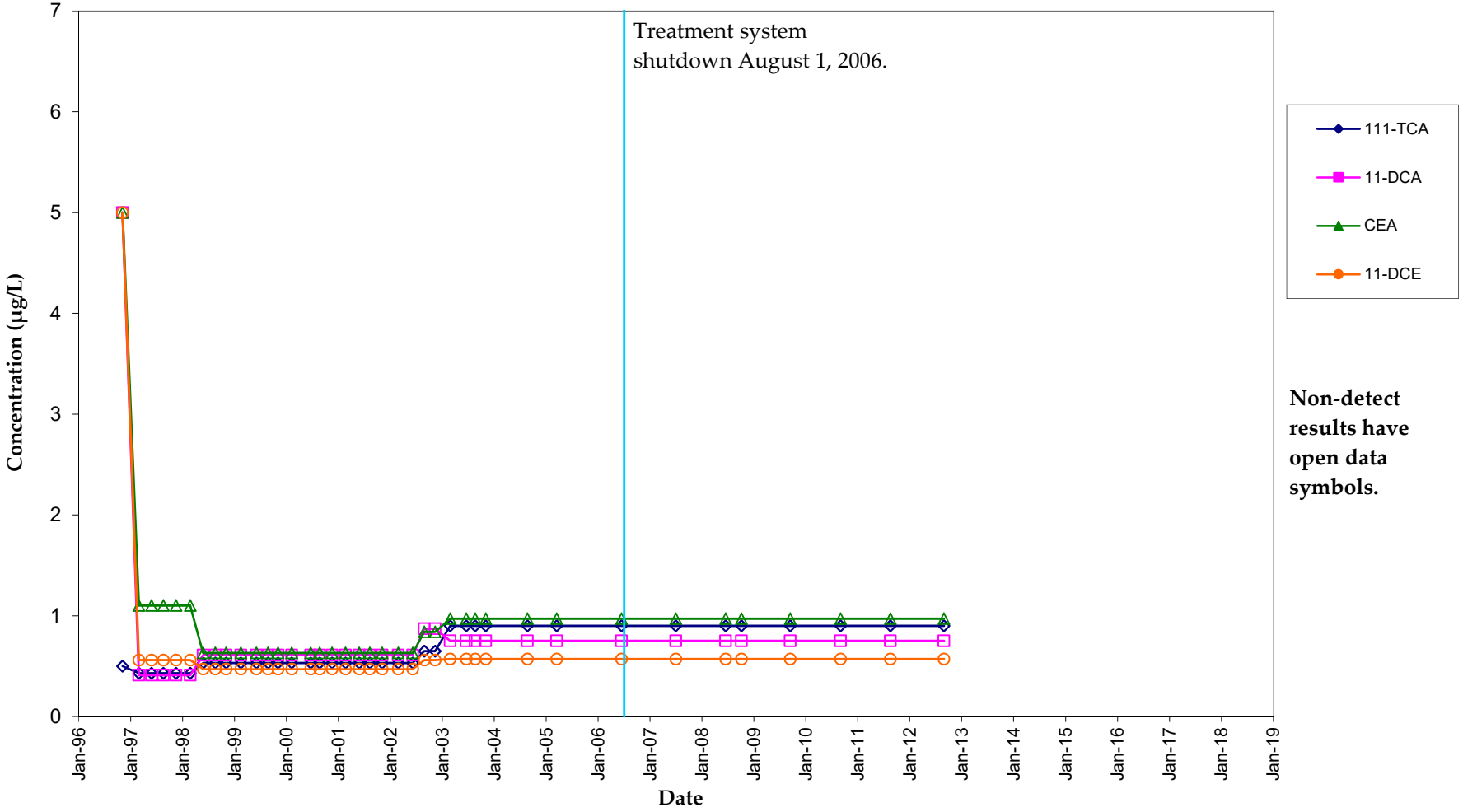
Non-detect results have open data symbols.

RM-010D
VOC Concentration Trends
Lemberger Landfill



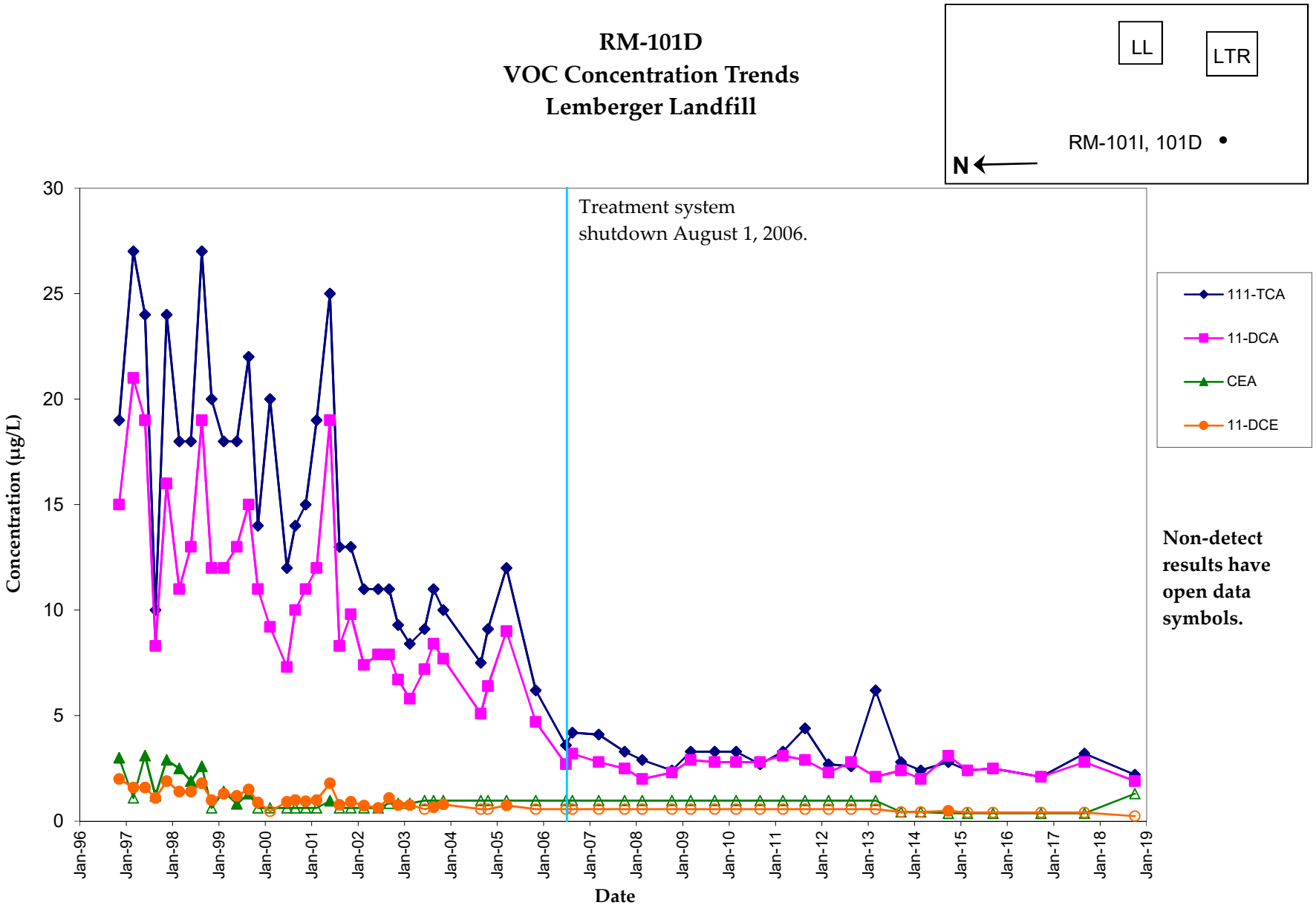
Non-detect results have open data symbols.

RM-011D
VOC Concentration Trends
Lemberger Landfill



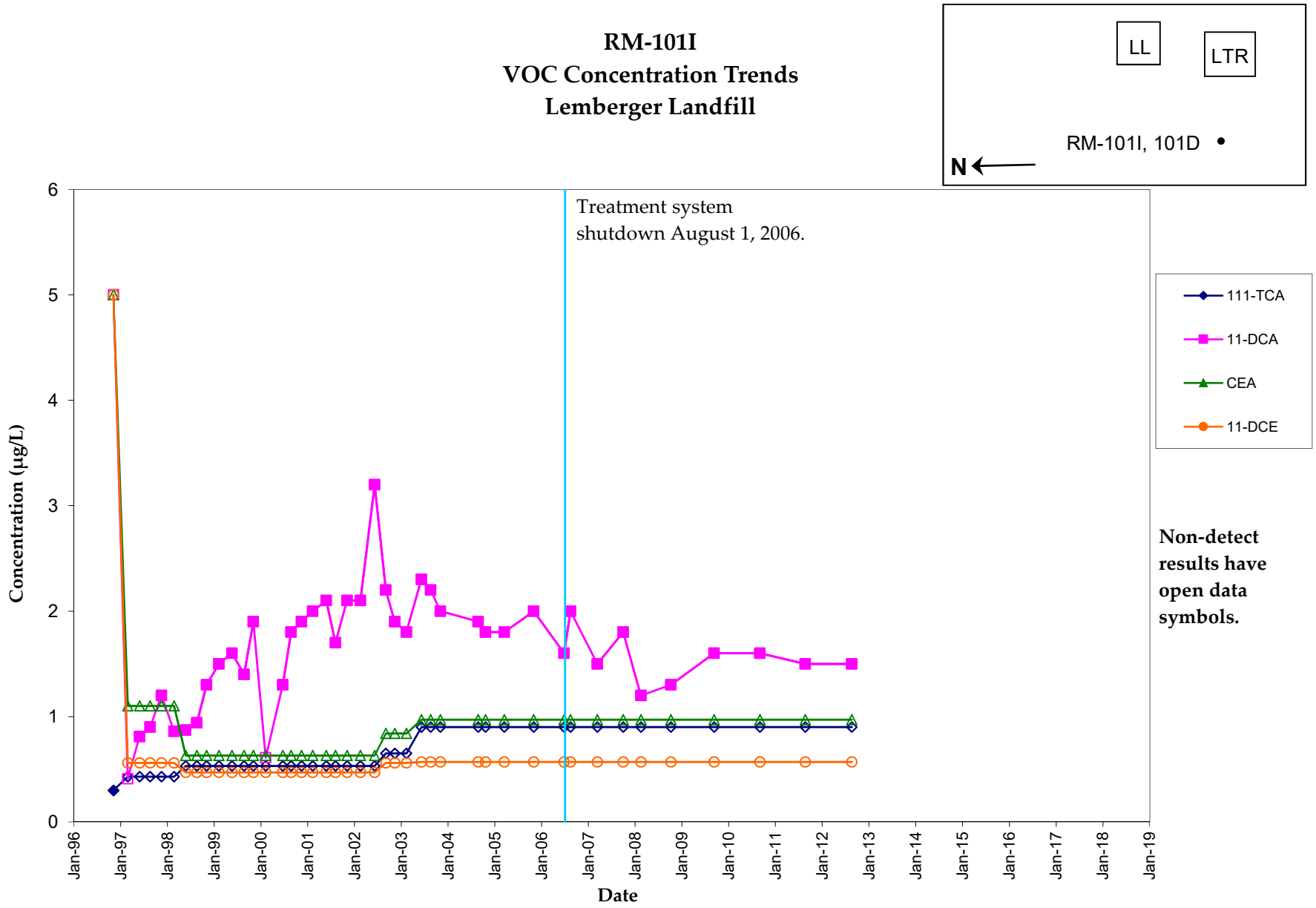
Non-detect results have open data symbols.

RM-101D
VOC Concentration Trends
Lemberger Landfill



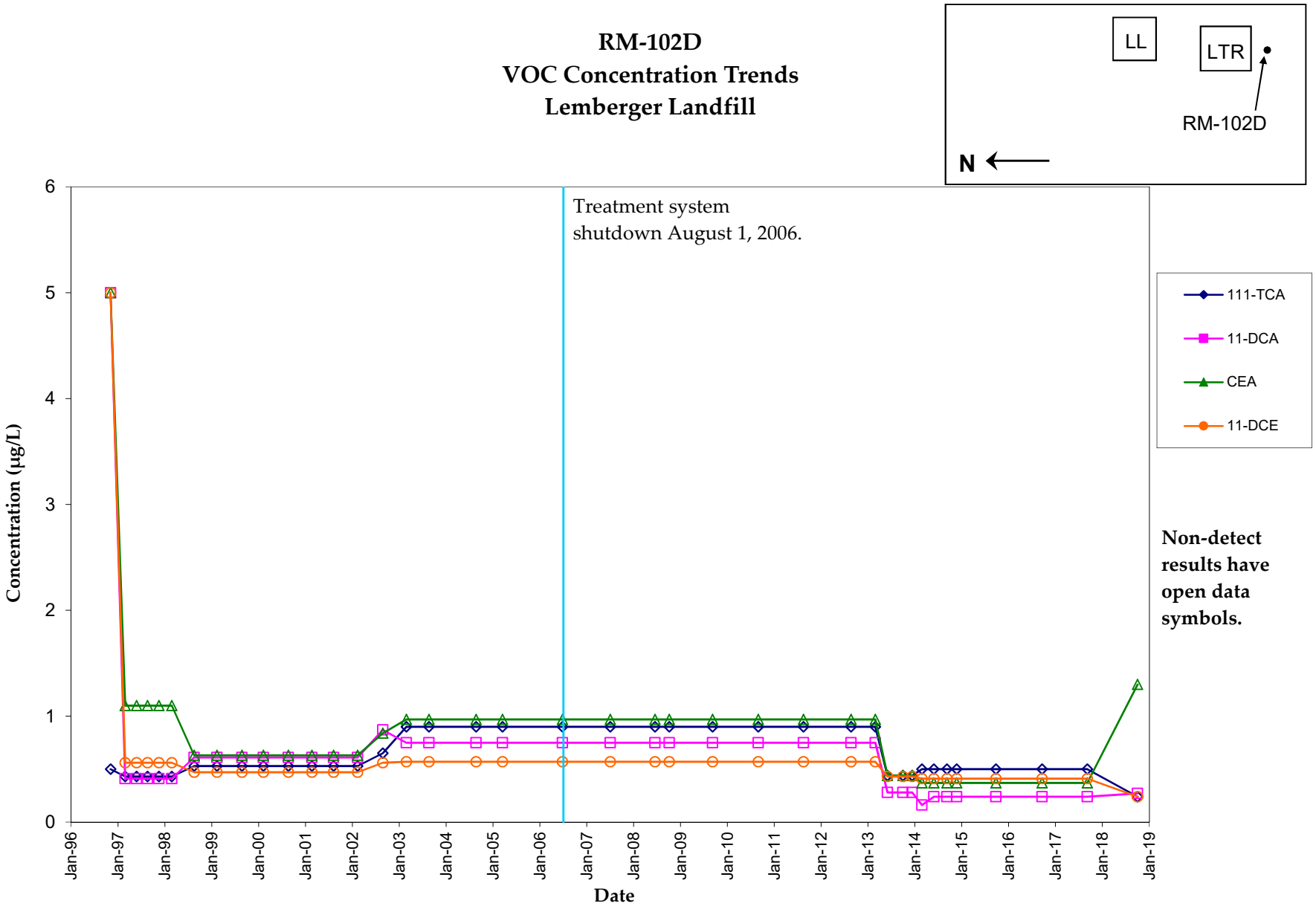
Non-detect results have open data symbols.

RM-101I
VOC Concentration Trends
Lemberger Landfill



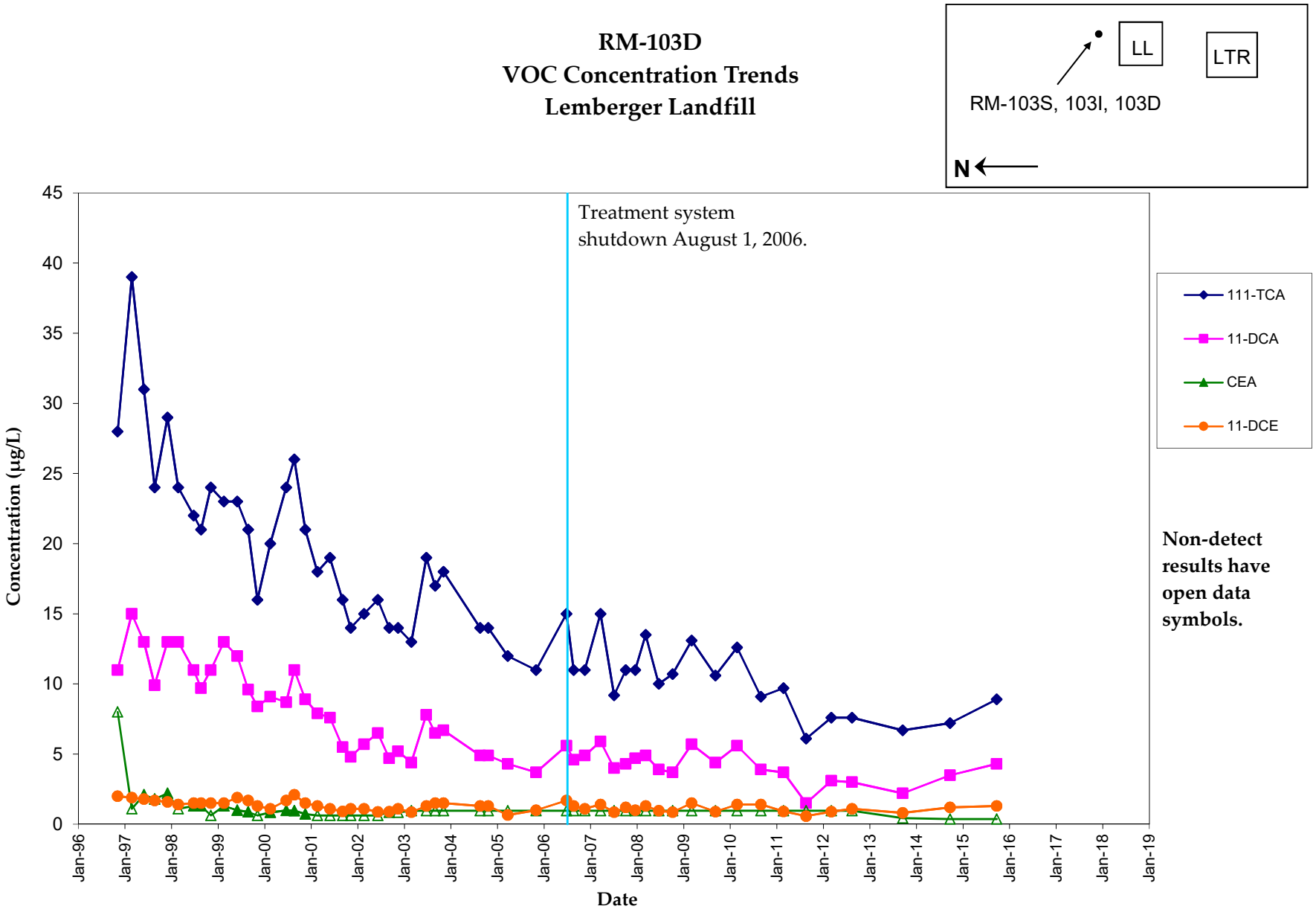
Non-detect results have open data symbols.

RM-102D
VOC Concentration Trends
Lemberger Landfill



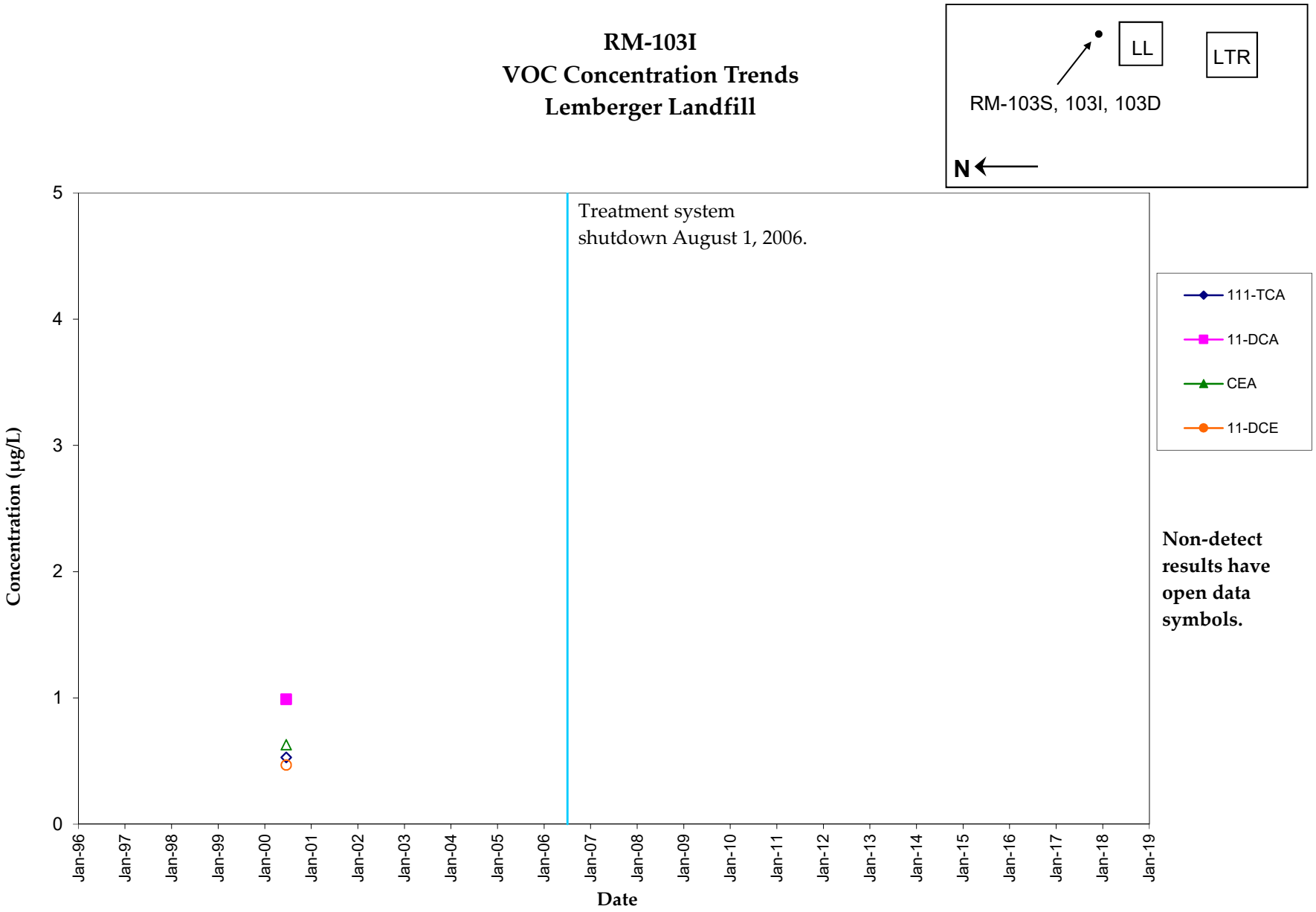
Non-detect results have open data symbols.

RM-103D
VOC Concentration Trends
Lemberger Landfill



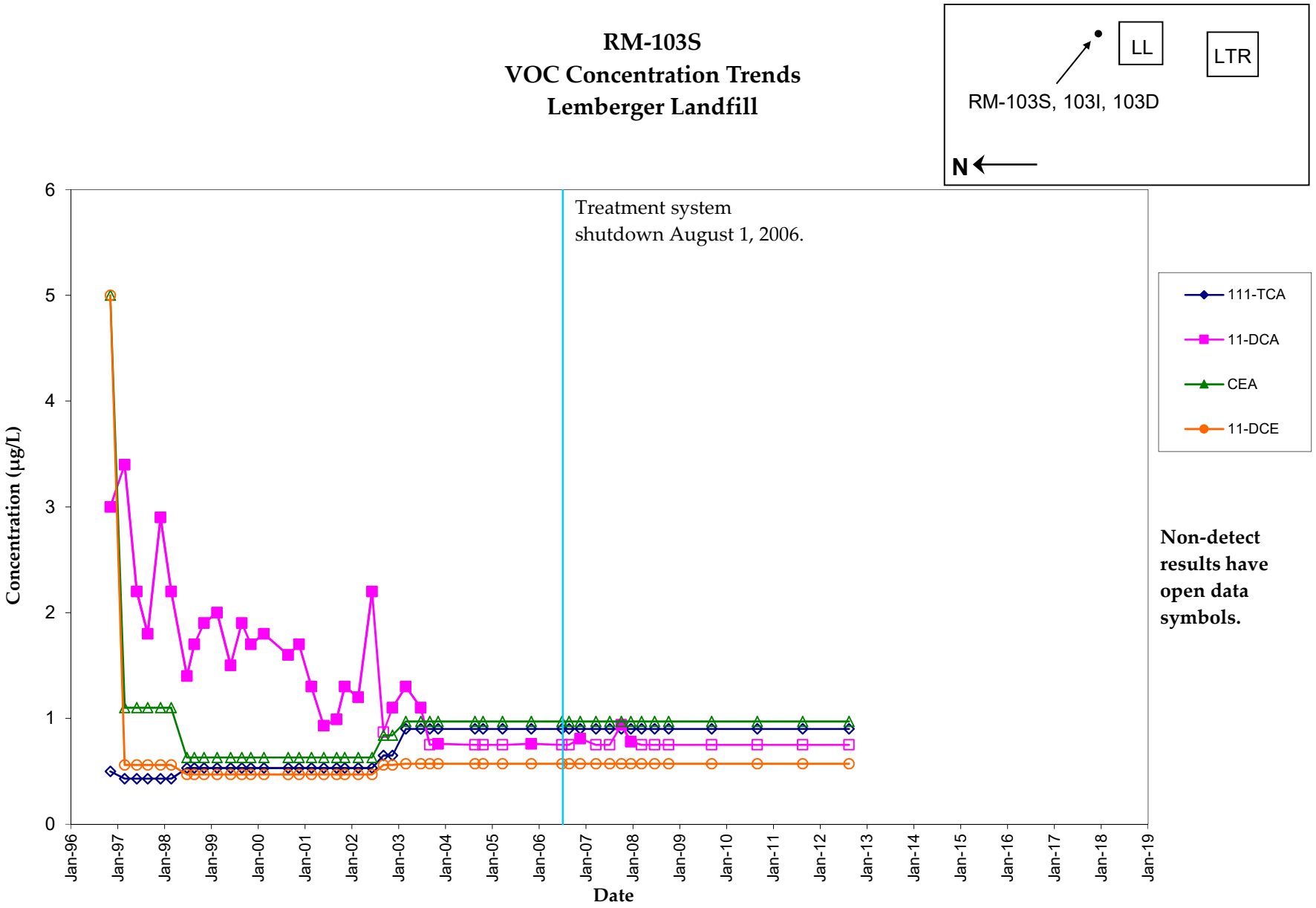
Non-detect results have open data symbols.

RM-103I
VOC Concentration Trends
Lemberger Landfill



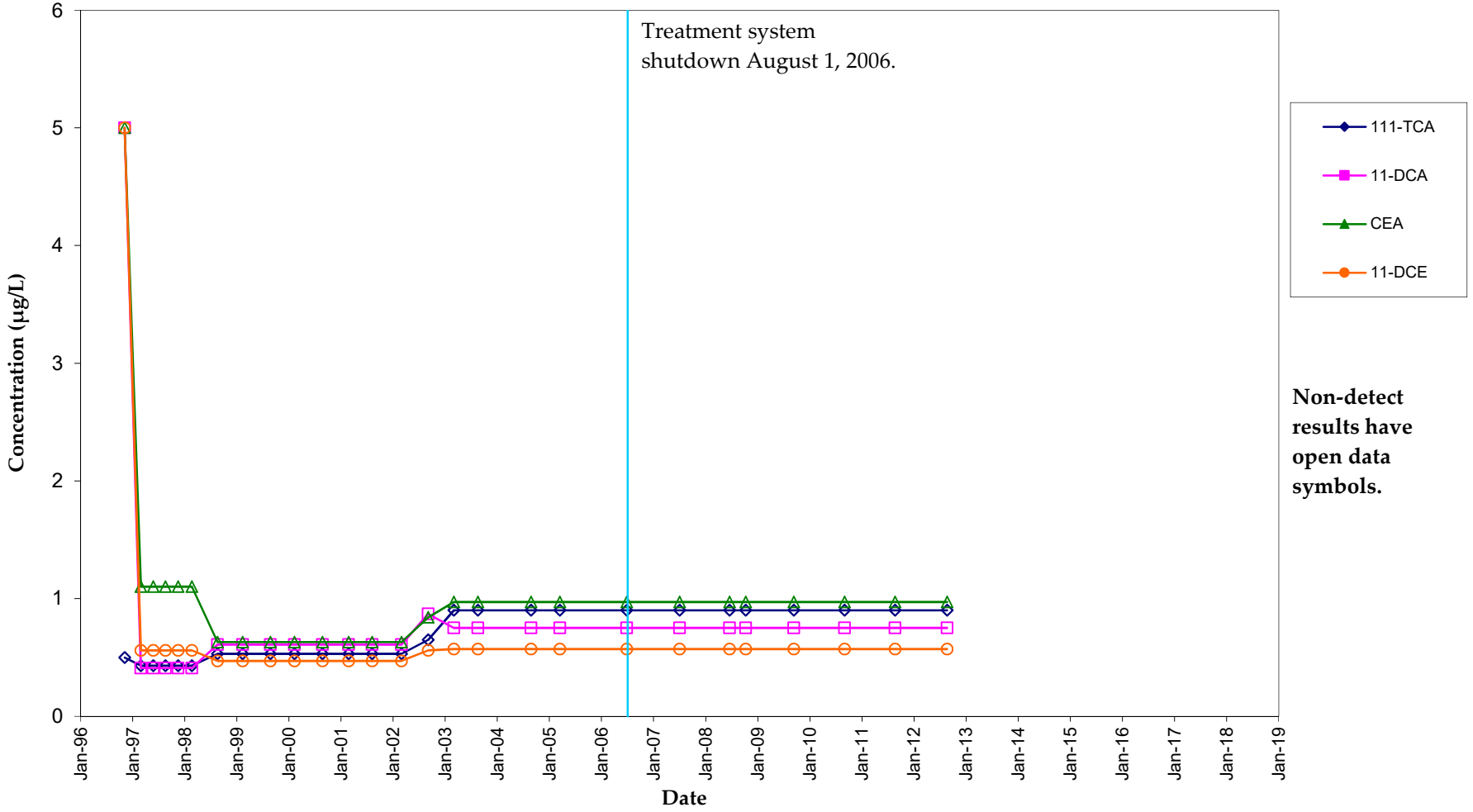
Non-detect results have open data symbols.

RM-103S
VOC Concentration Trends
Lemberger Landfill



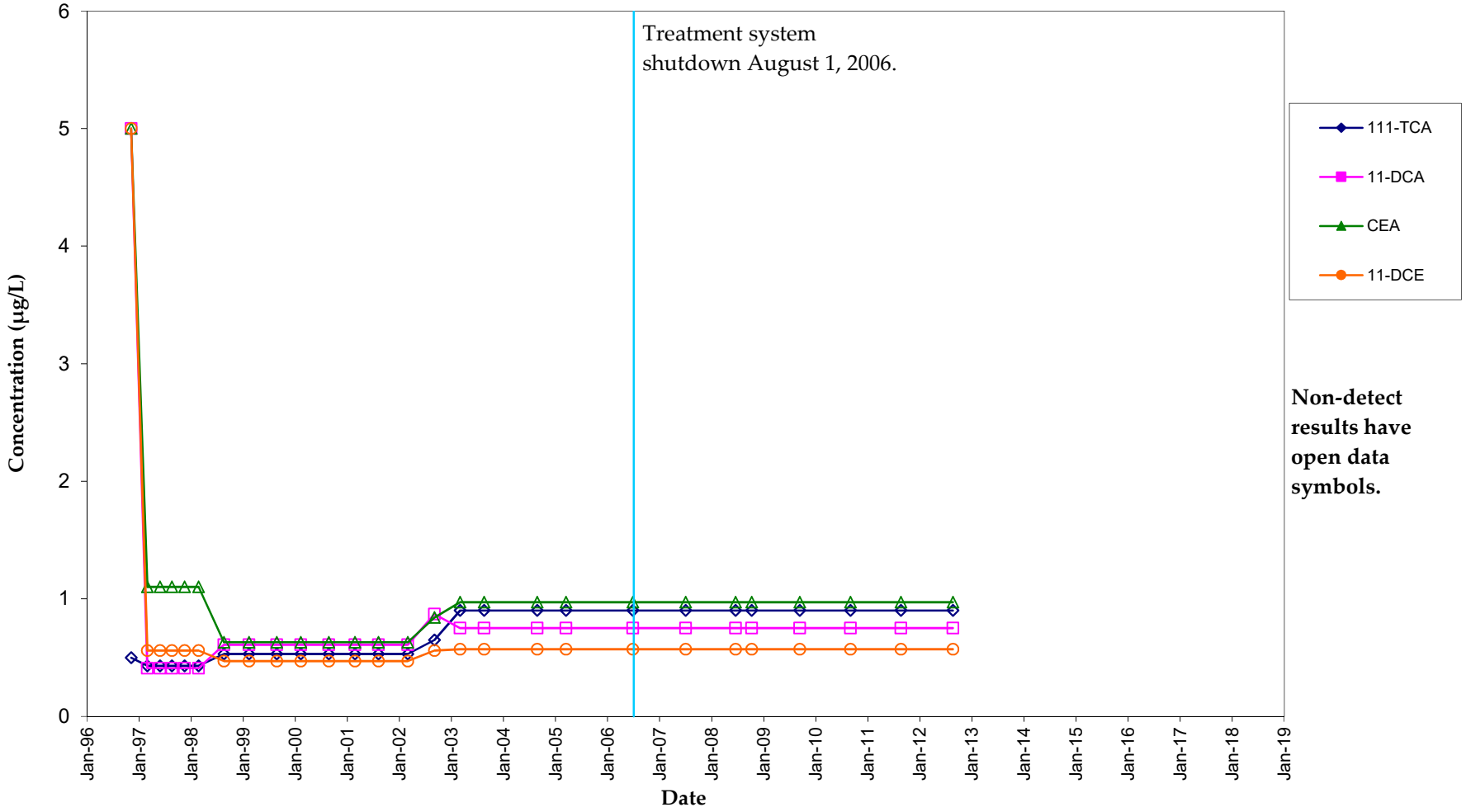
Non-detect results have open data symbols.

RM-201D
VOC Concentration Trends
Lemberger Landfill



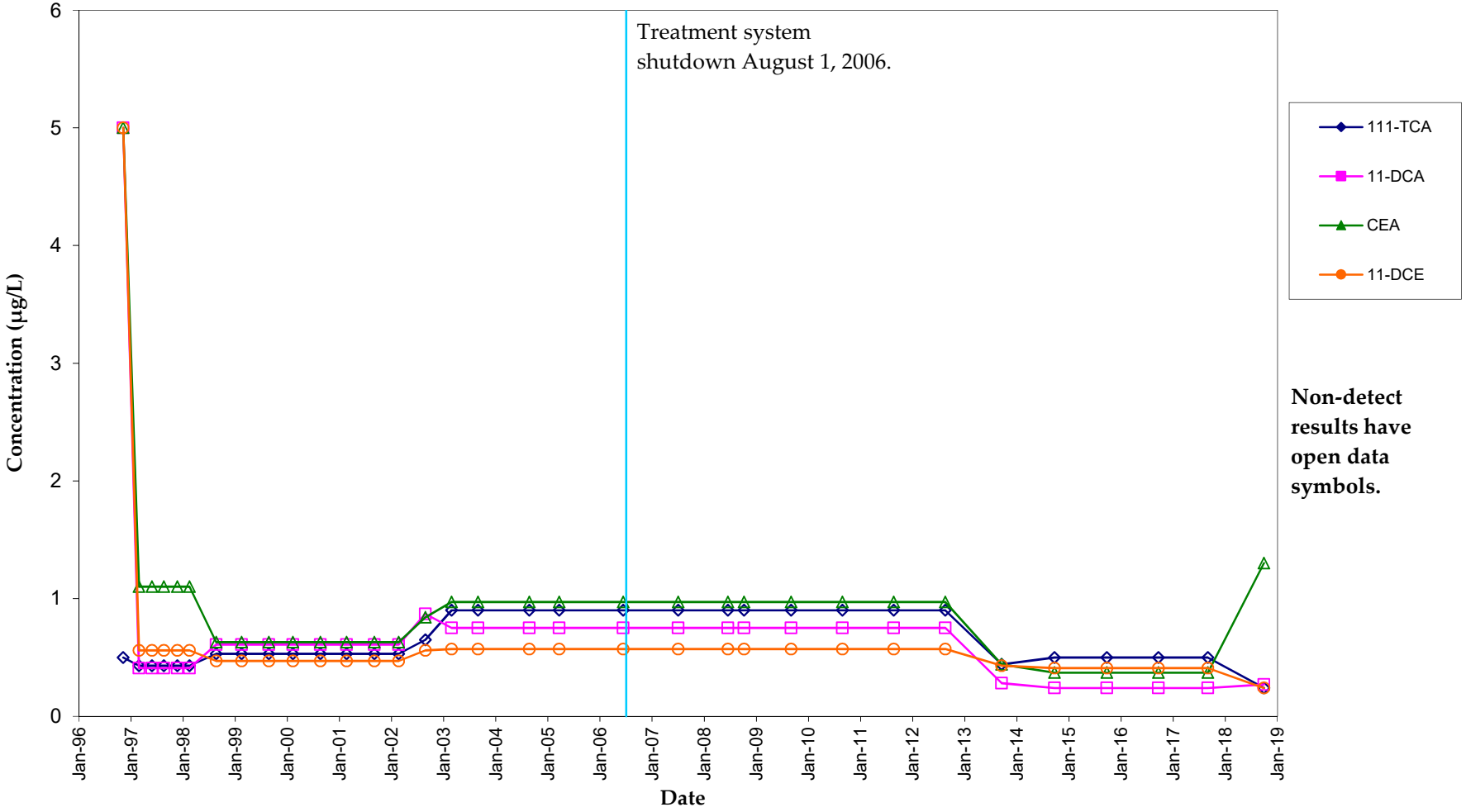
Non-detect results have open data symbols.

RM-201I
VOC Concentration Trends
Lemberger Landfill



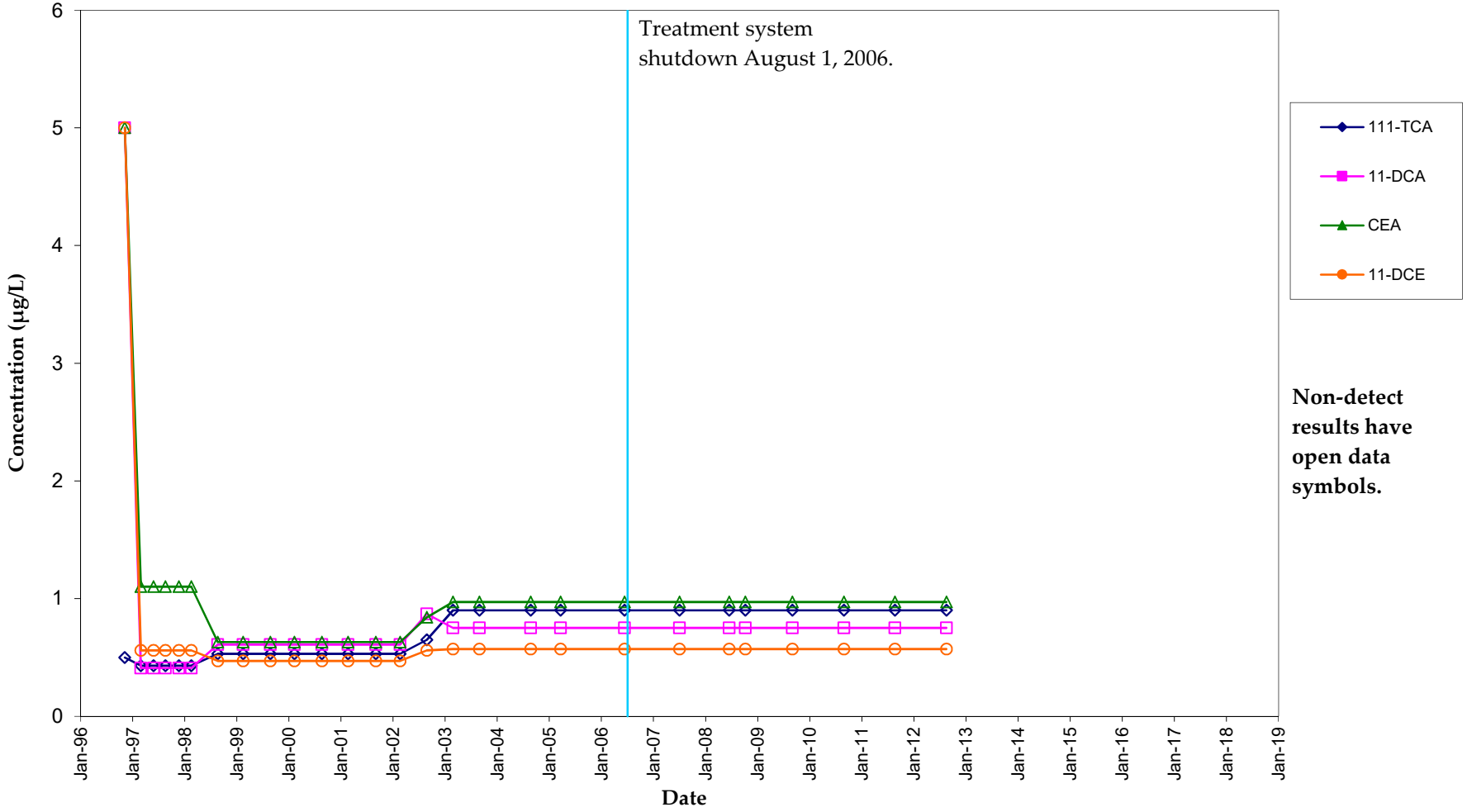
Non-detect results have open data symbols.

RM-202D
VOC Concentration Trends
Lemberger Landfill



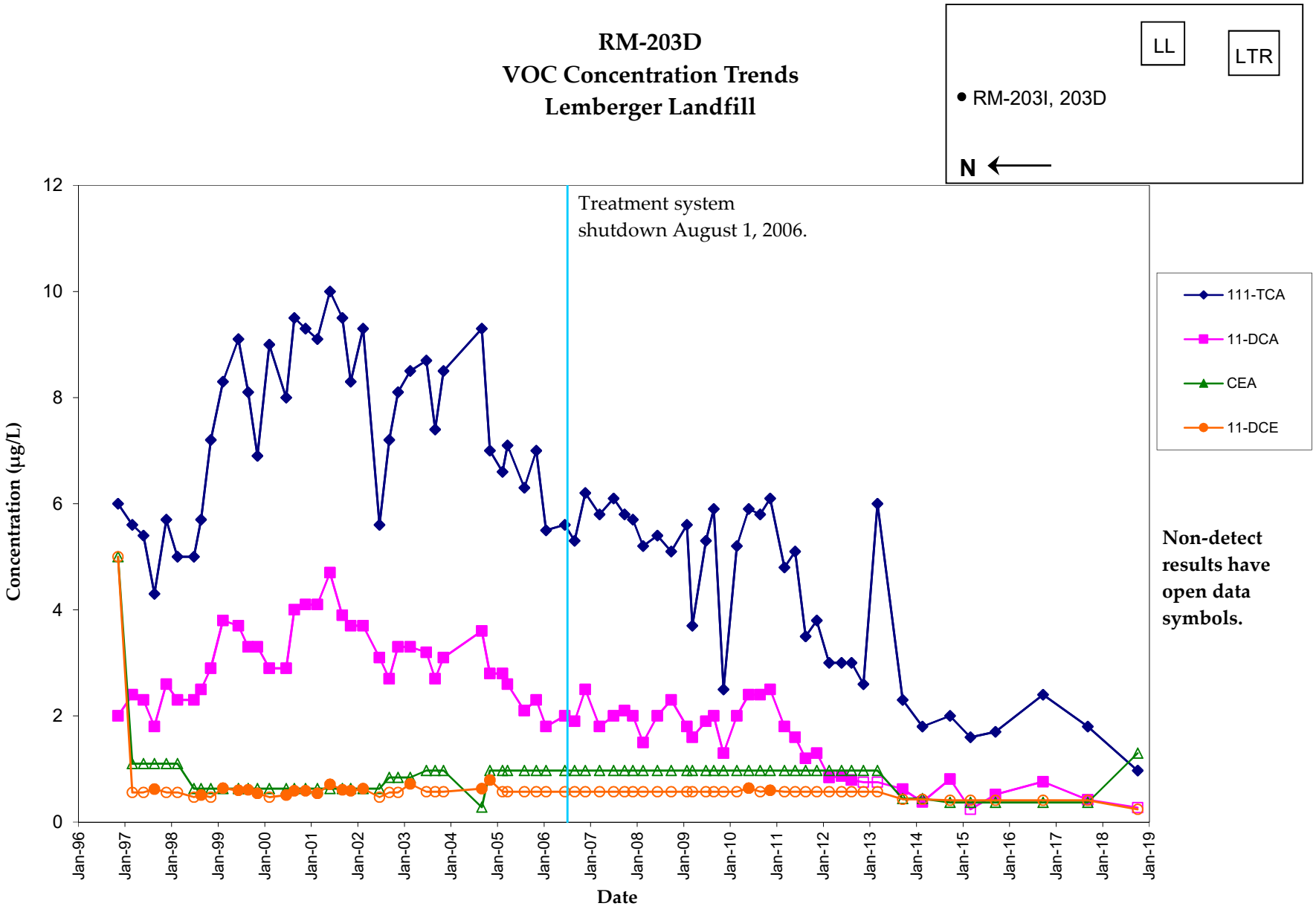
Non-detect results have open data symbols.

RM-202I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

RM-203D
VOC Concentration Trends
Lemberger Landfill



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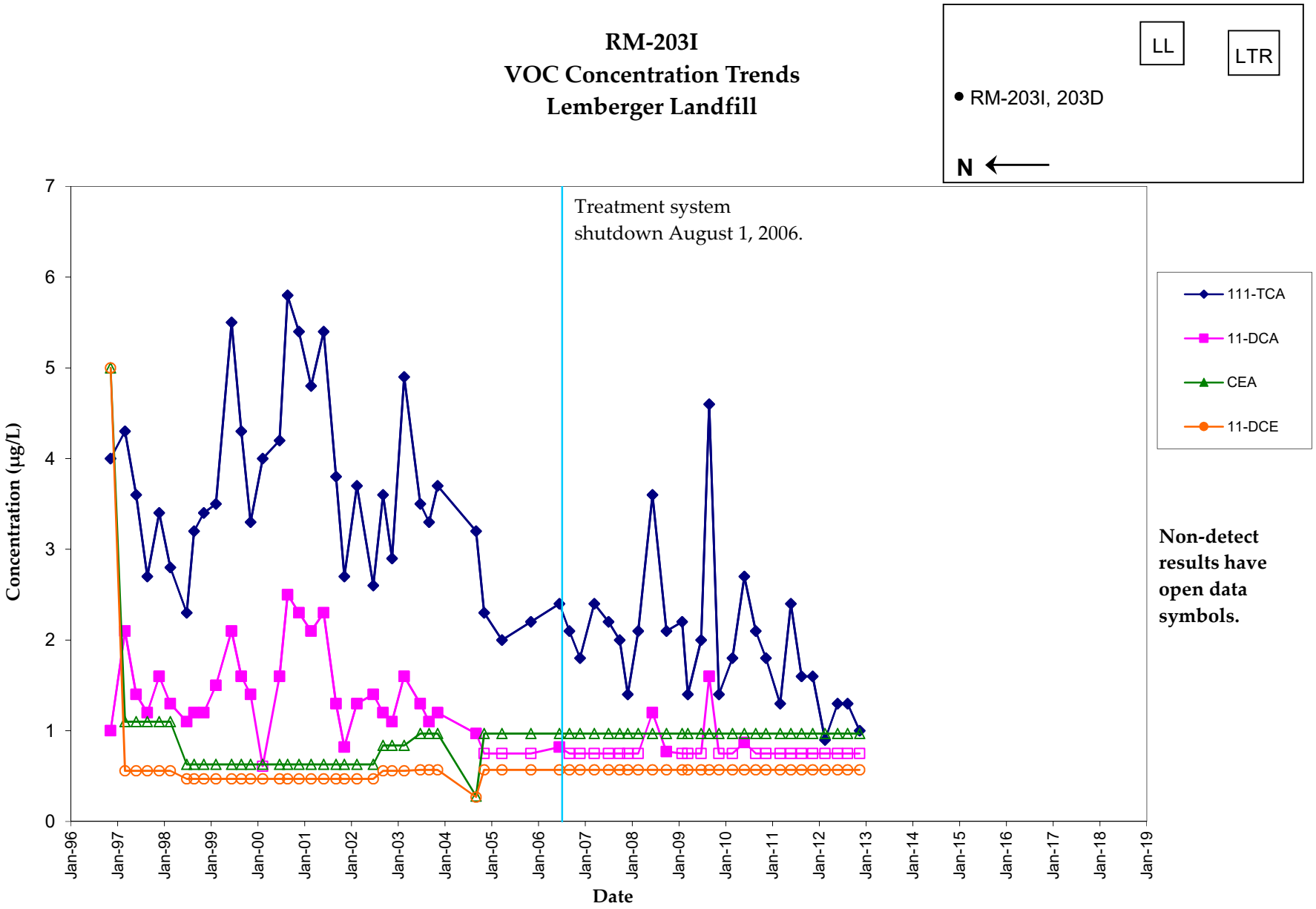
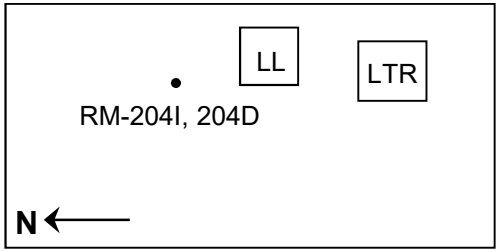
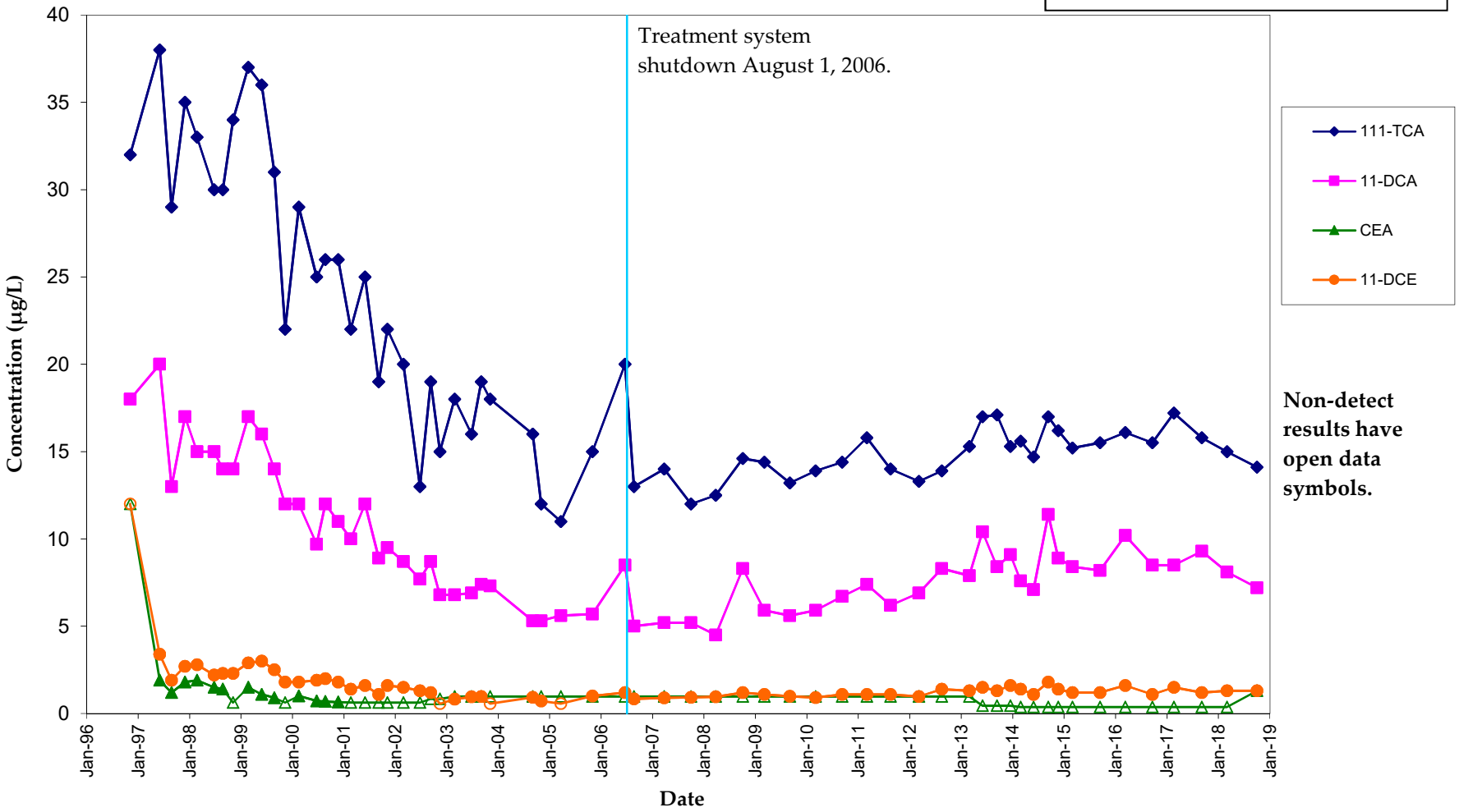
RM-203I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

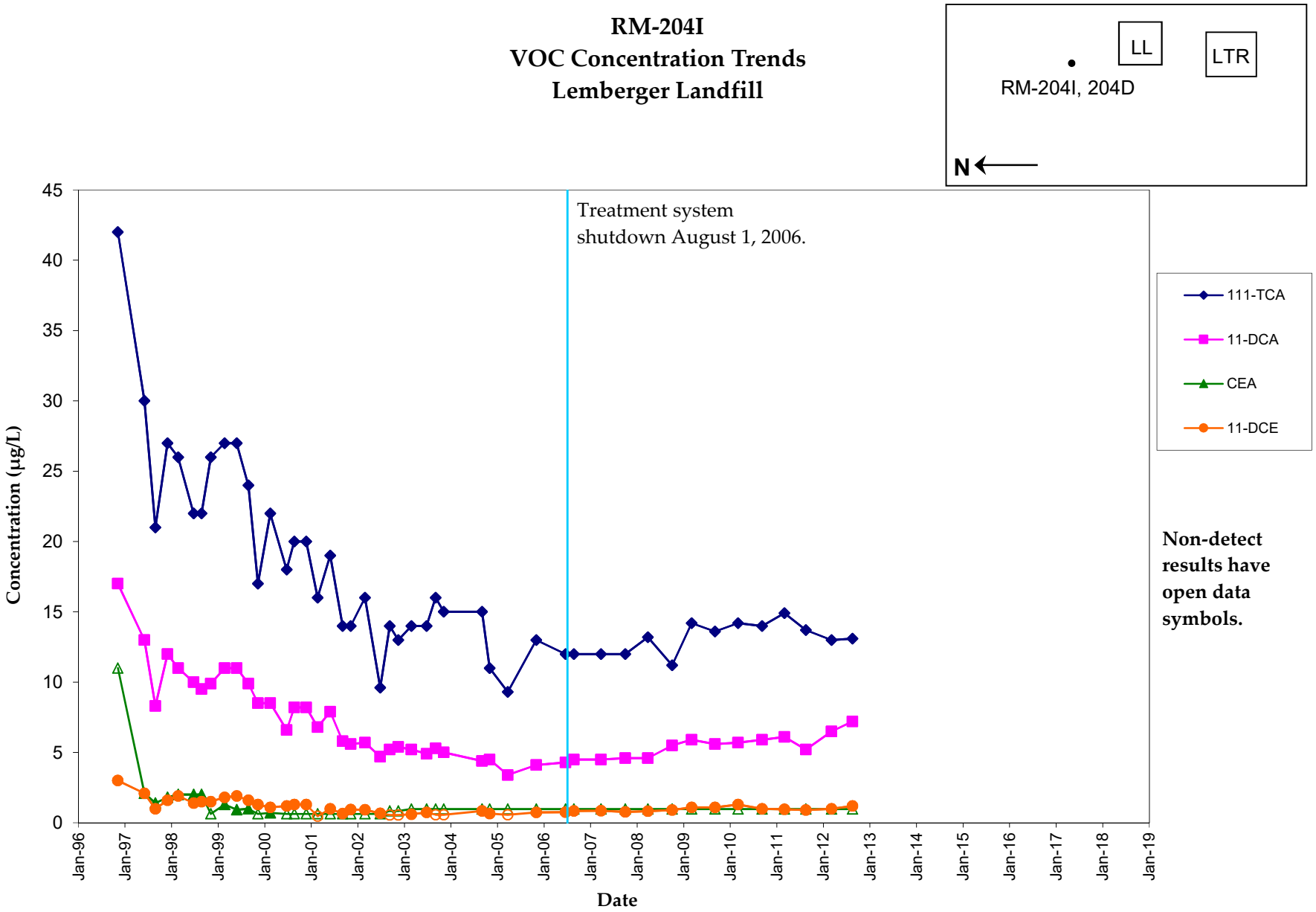
RM-204D
VOC Concentration Trends
Lemberger Landfill





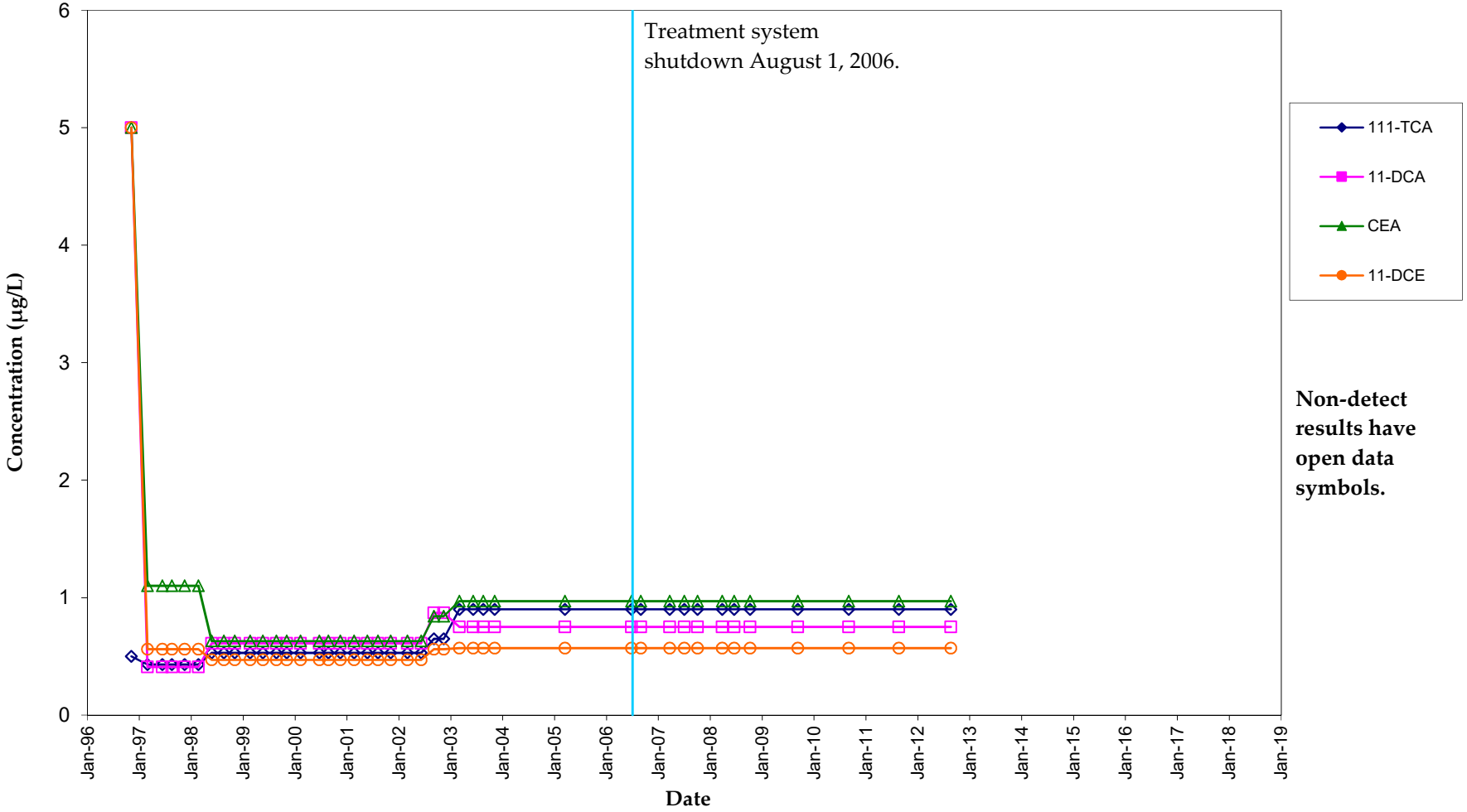
Non-detect results have open data symbols.

RM-204I
VOC Concentration Trends
Lemberger Landfill



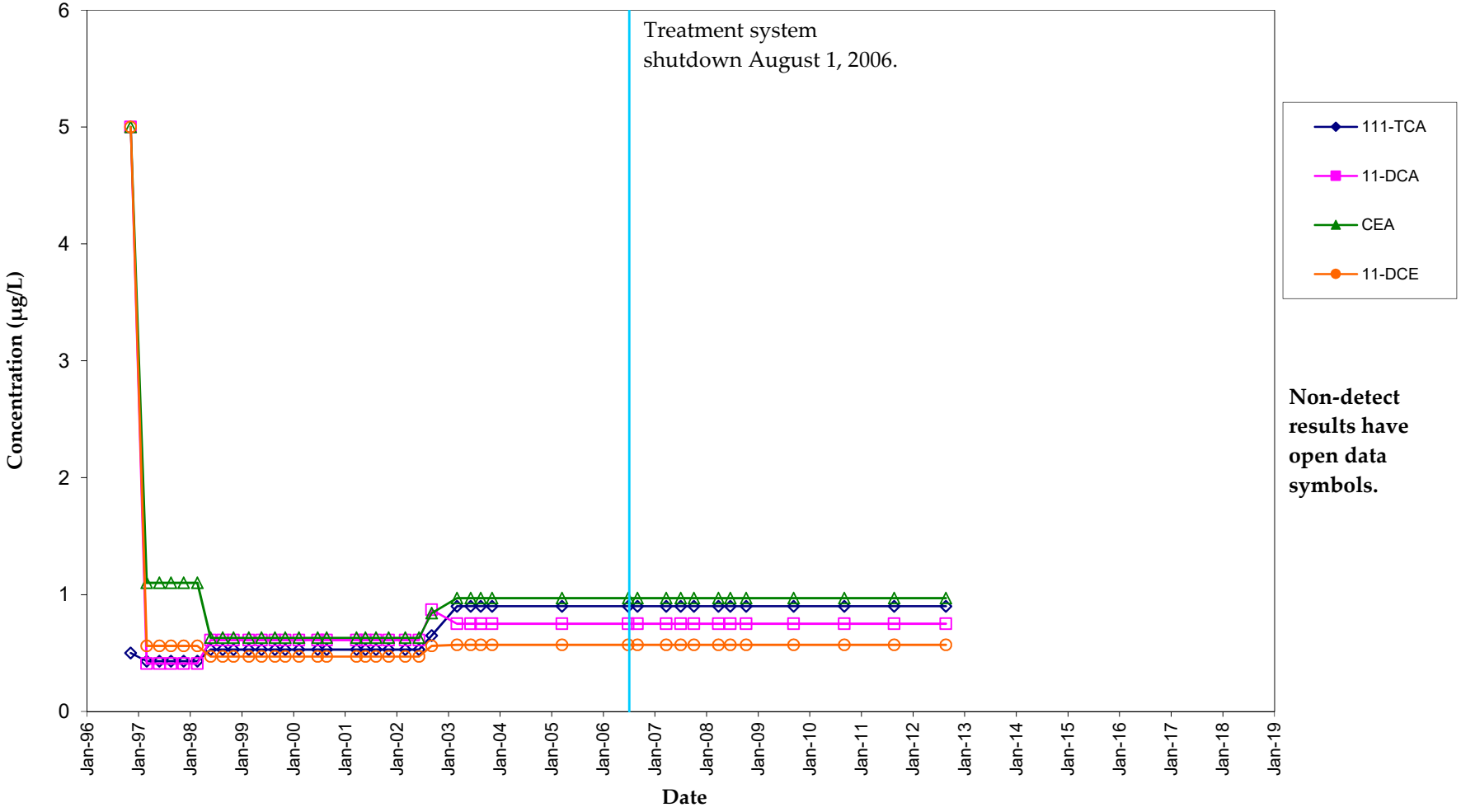
Non-detect results have open data symbols.

RM-205D
VOC Concentration Trends
Lemberger Landfill



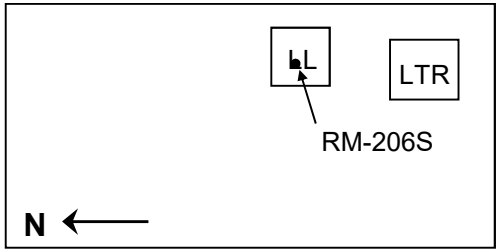
Non-detect results have open data symbols.

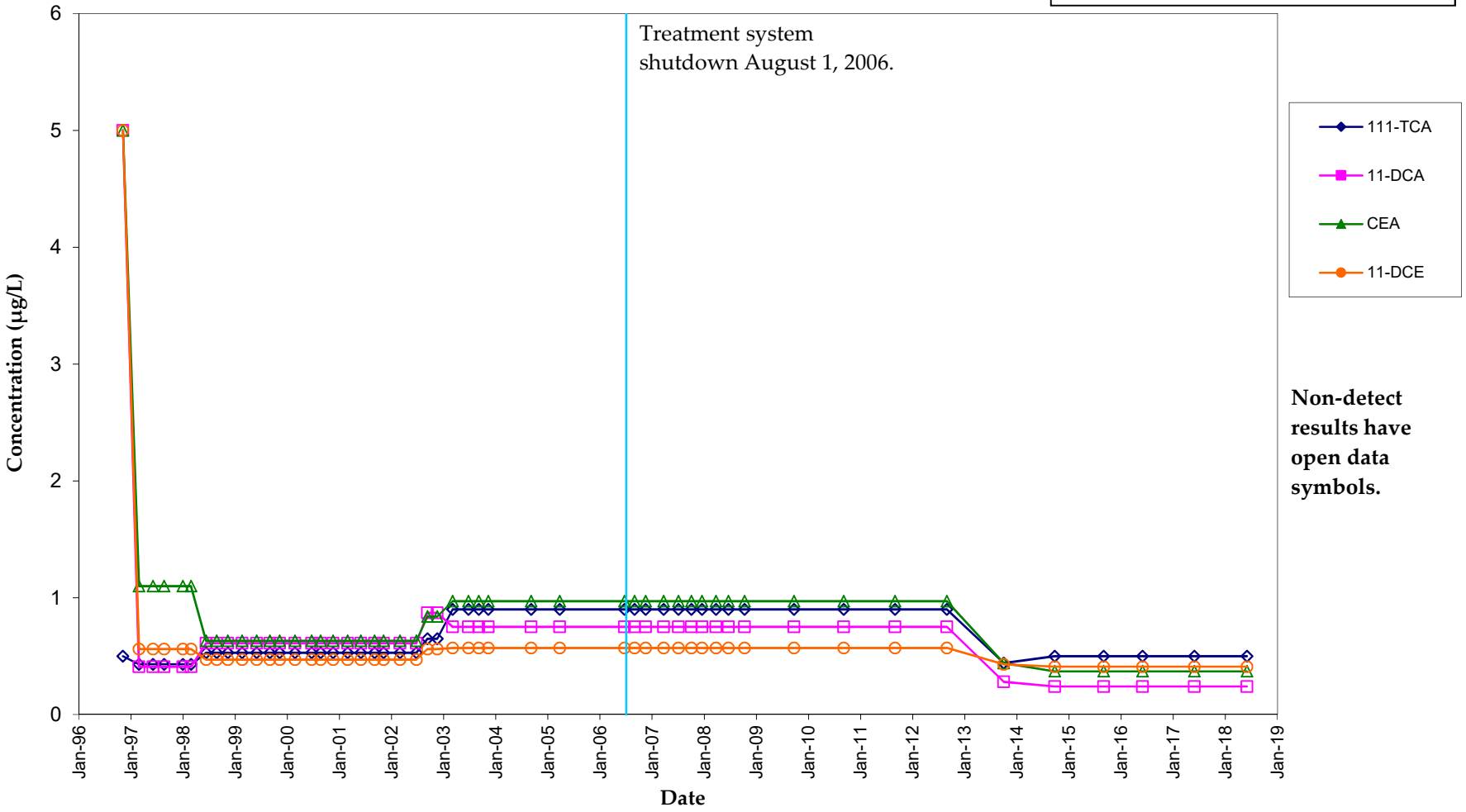
RM-205I
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

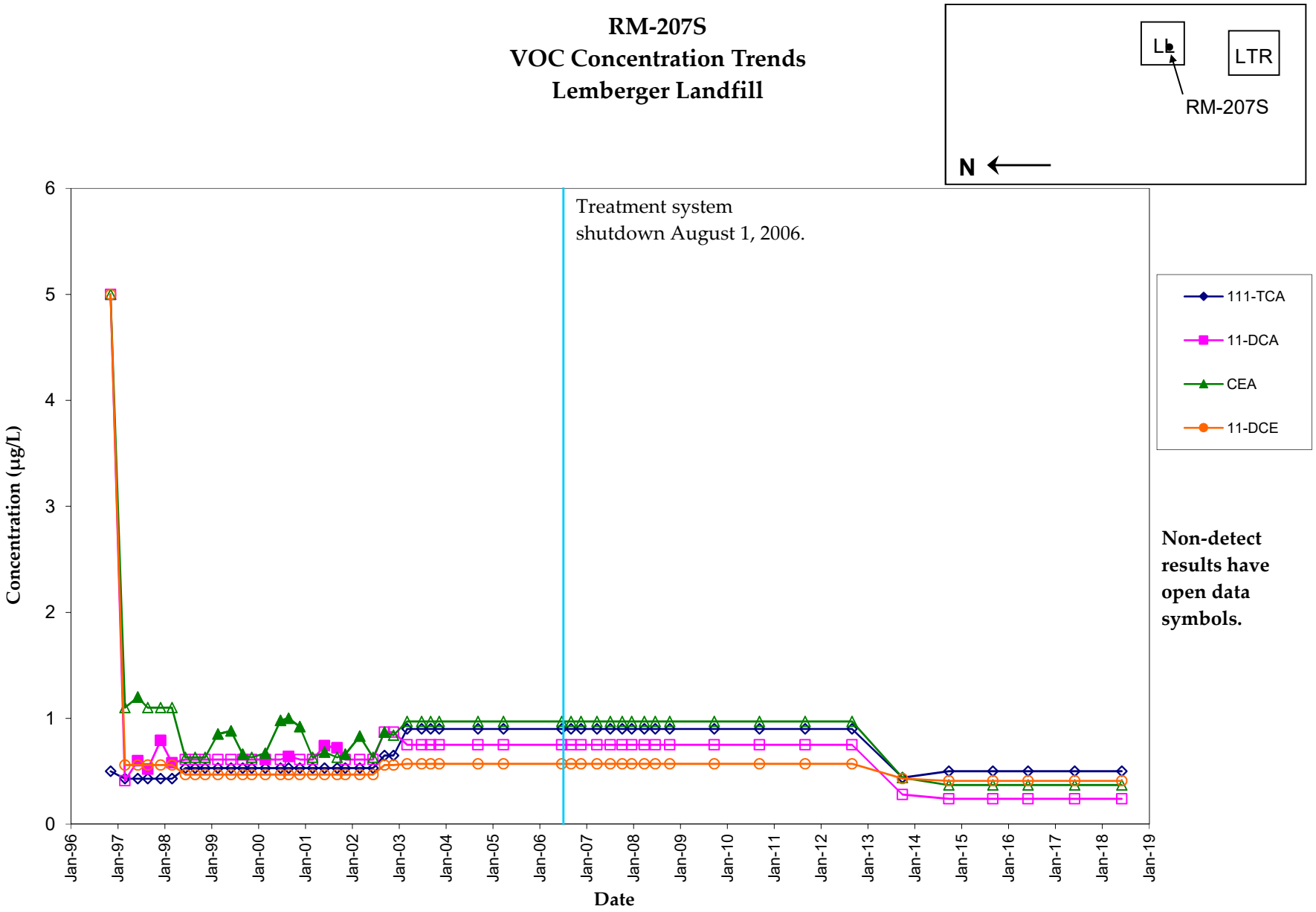
RM-206S
VOC Concentration Trends
Lemberger Landfill





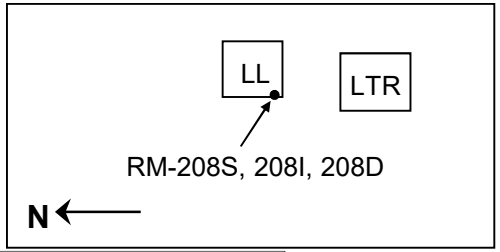
Non-detect results have open data symbols.

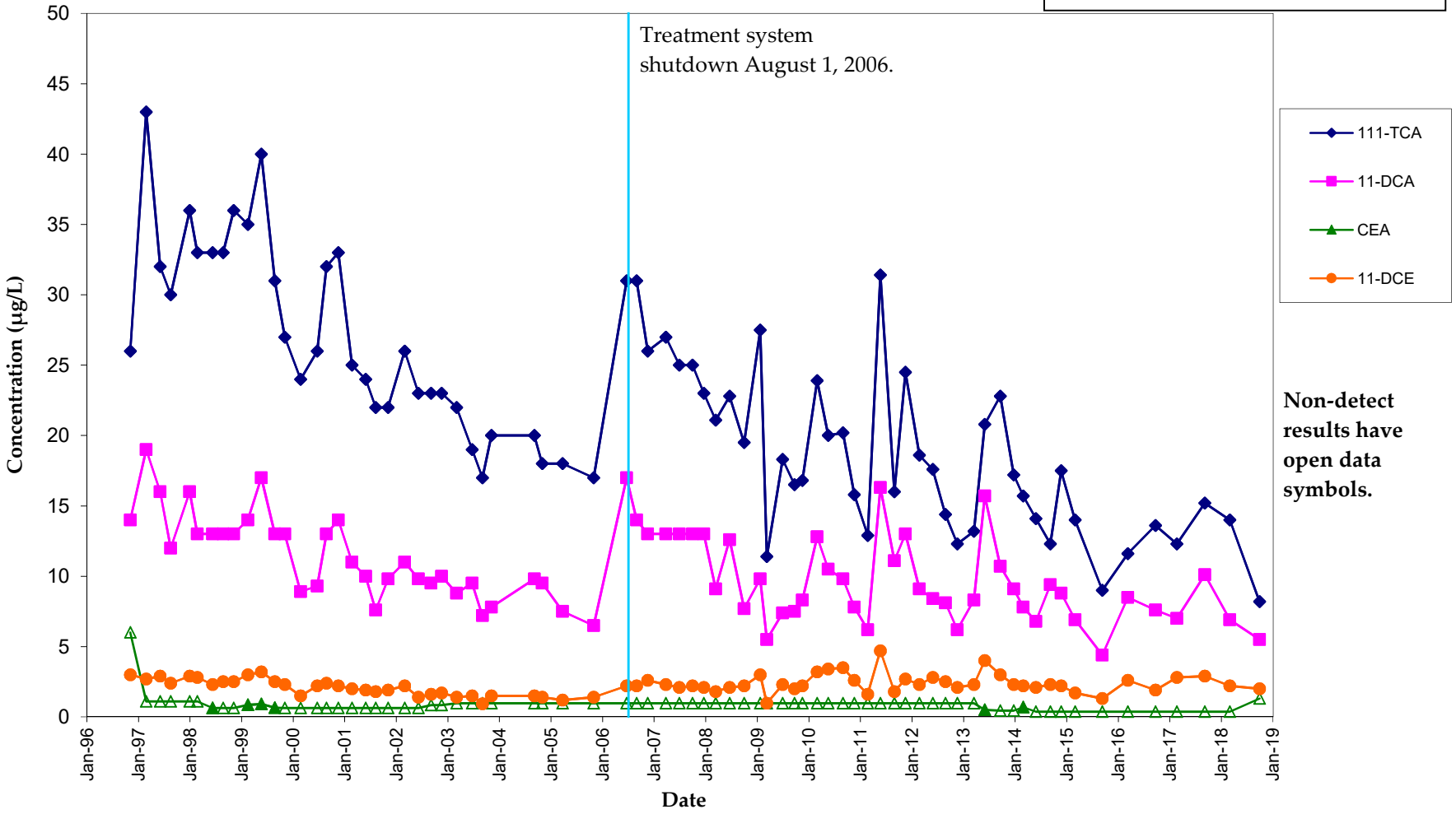
RM-207S
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

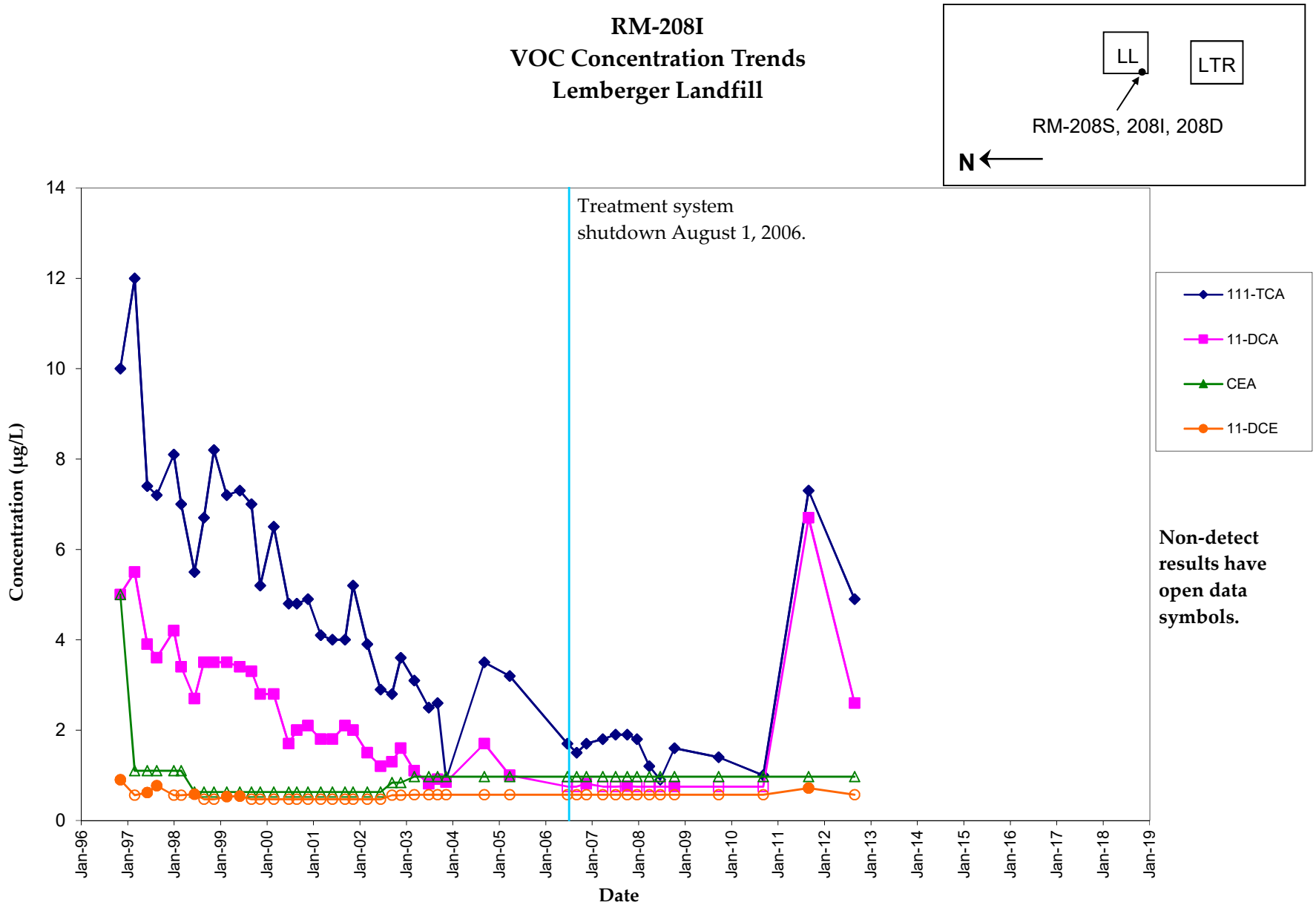
RM-208D
VOC Concentration Trends
Lemberger Landfill





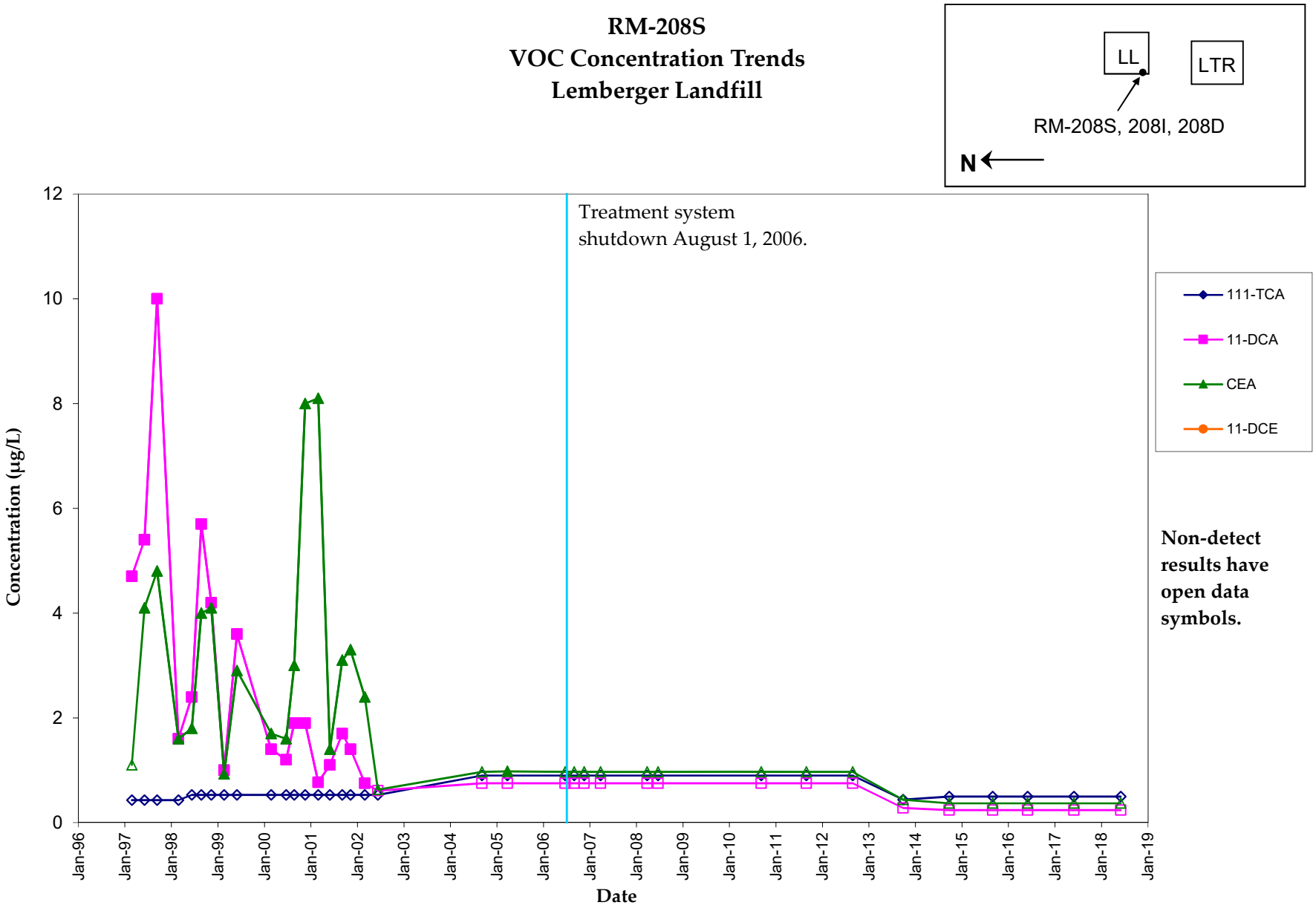
Non-detect results have open data symbols.

RM-208I
VOC Concentration Trends
Lemberger Landfill



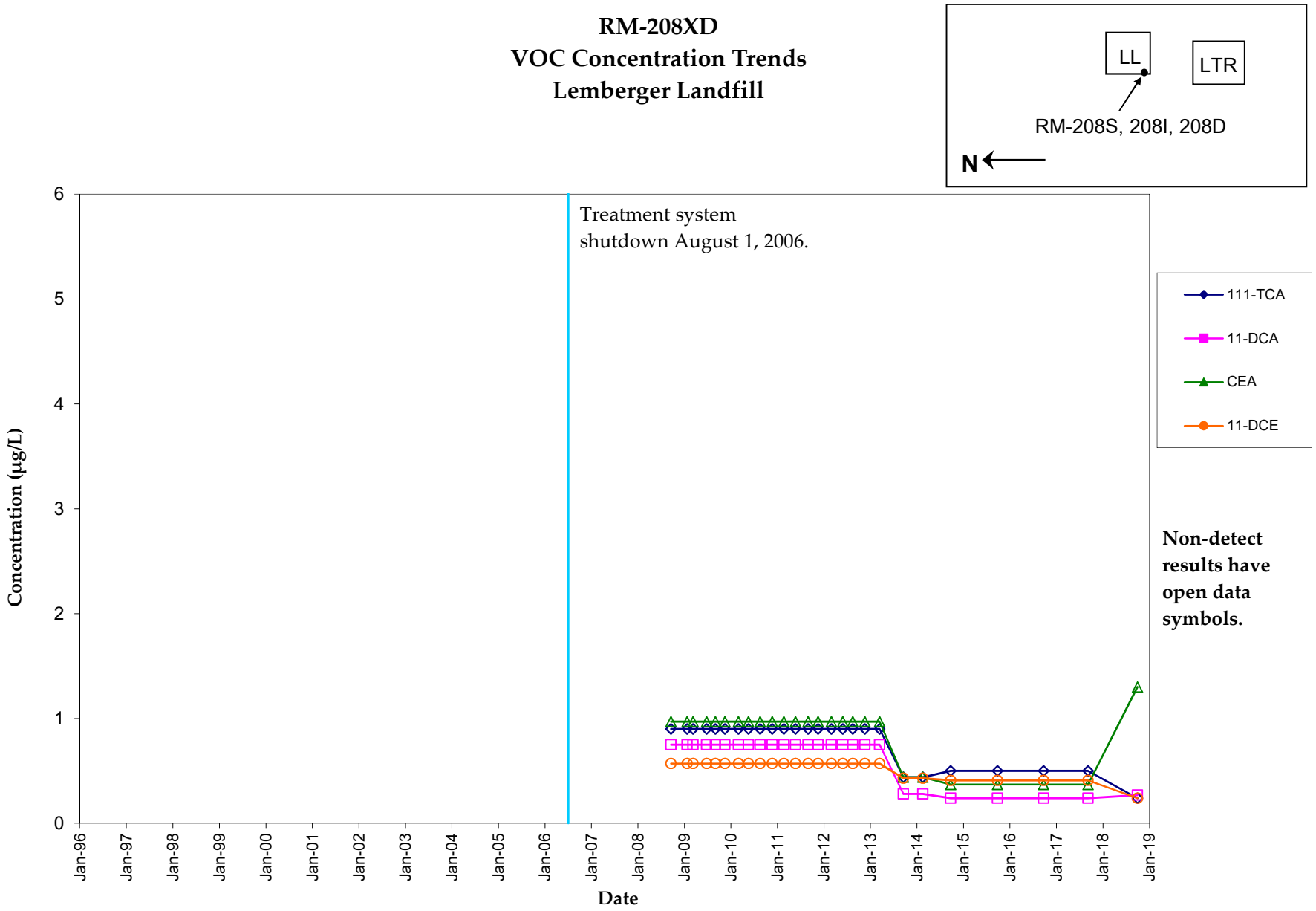
Non-detect results have open data symbols.

RM-208S
VOC Concentration Trends
Lemberger Landfill

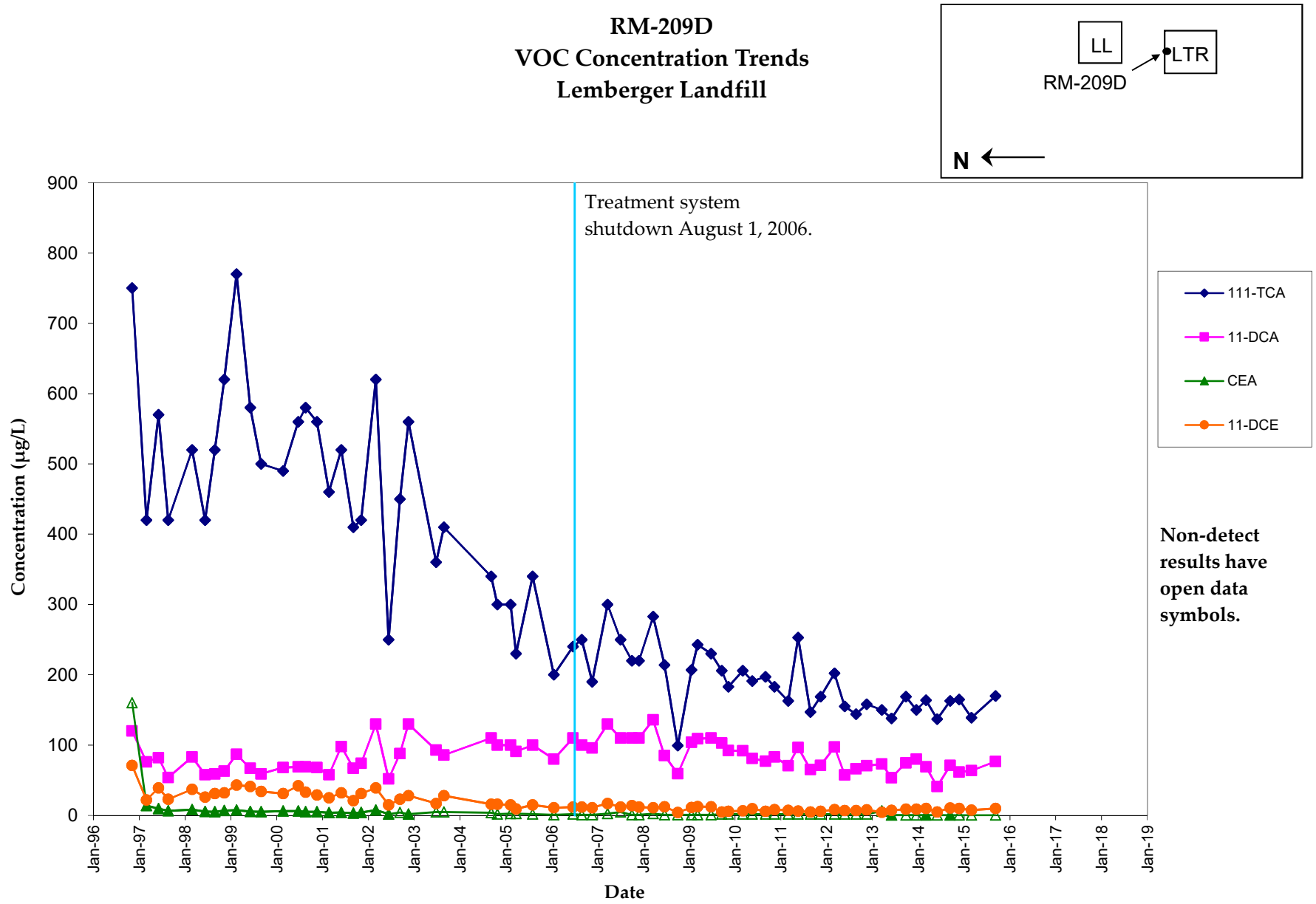


Non-detect results have open data symbols.

RM-208XD
VOC Concentration Trends
Lemberger Landfill

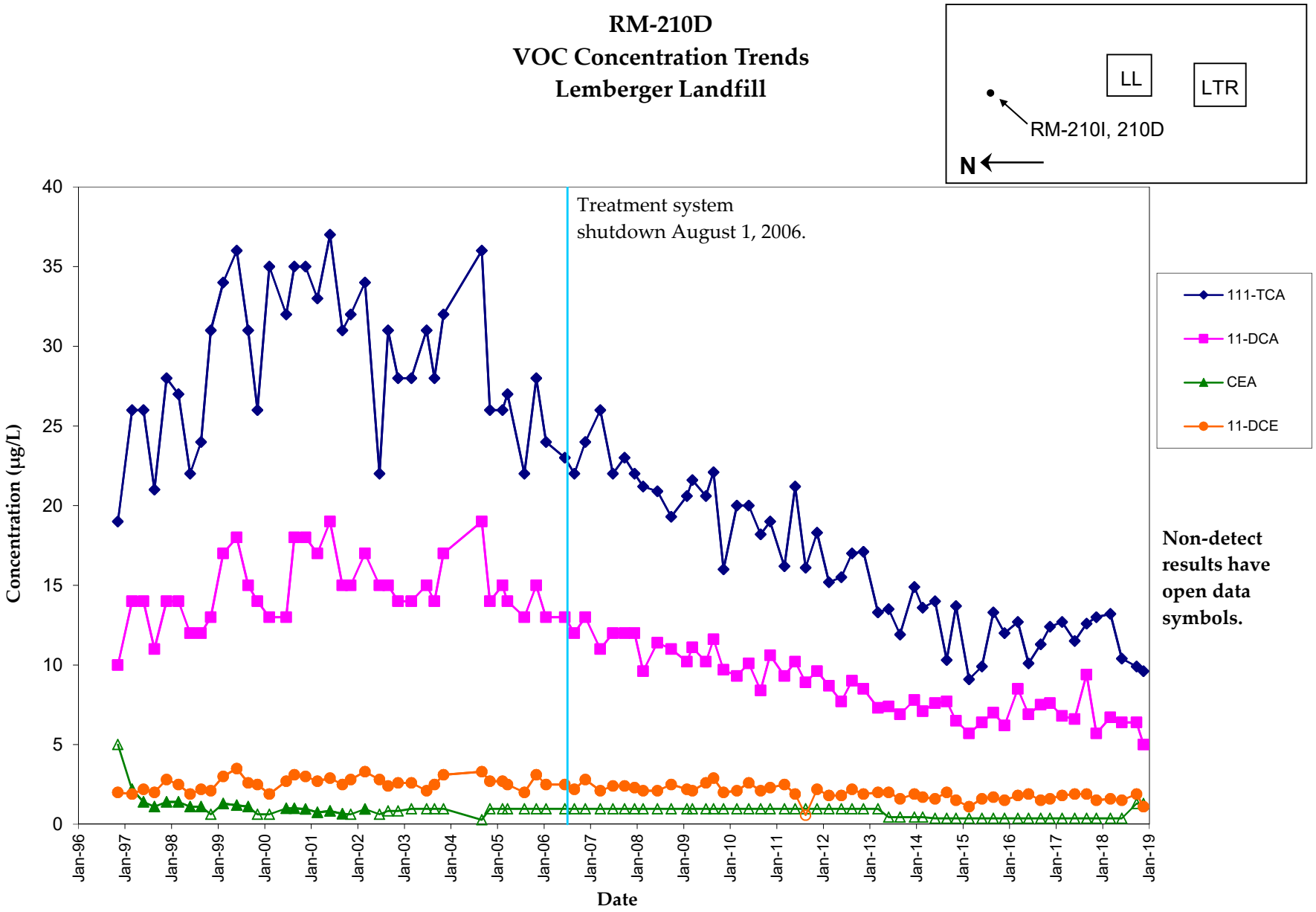


RM-209D
VOC Concentration Trends
Lemberger Landfill



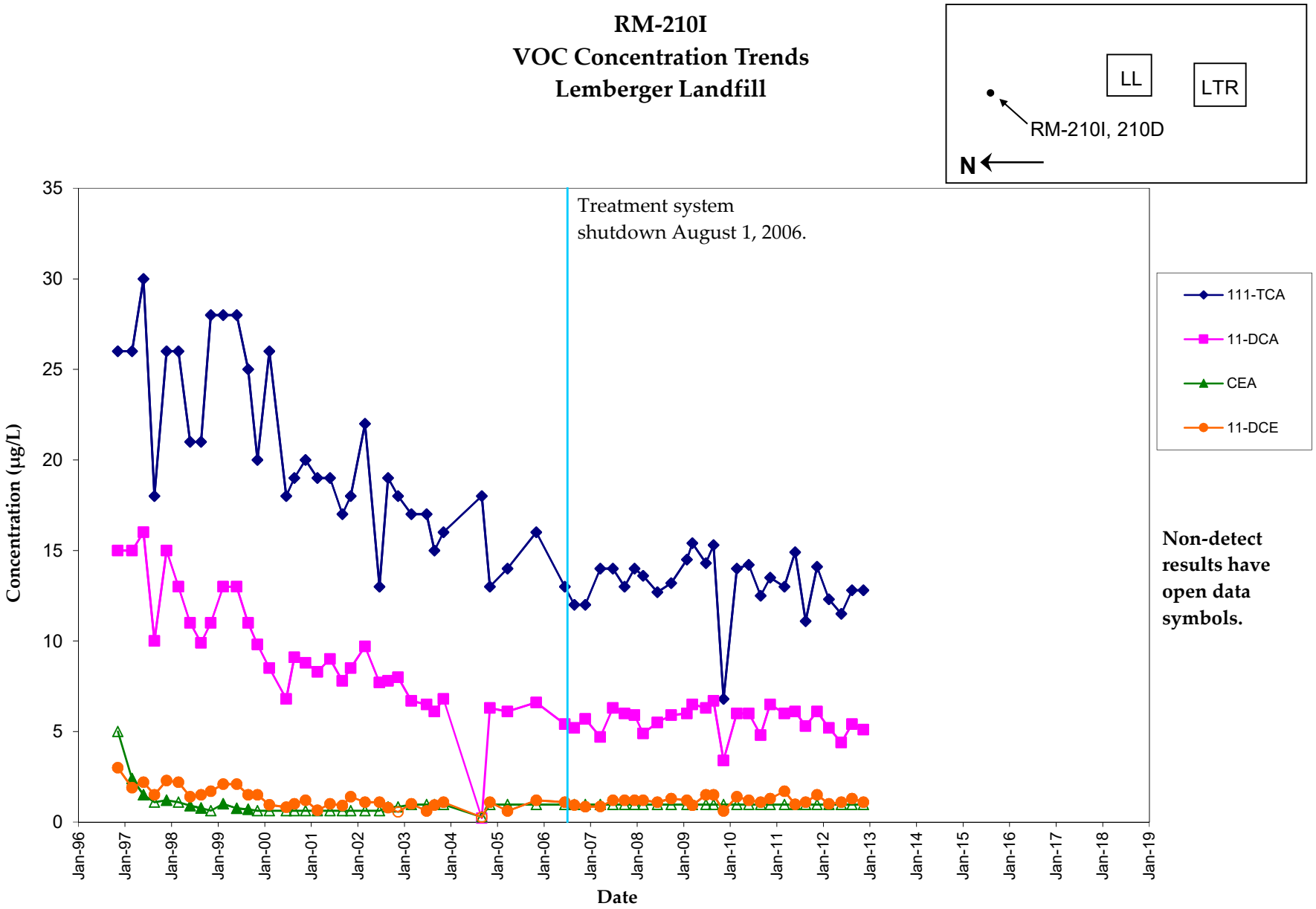
Non-detect results have open data symbols.

RM-210D
VOC Concentration Trends
Lemberger Landfill



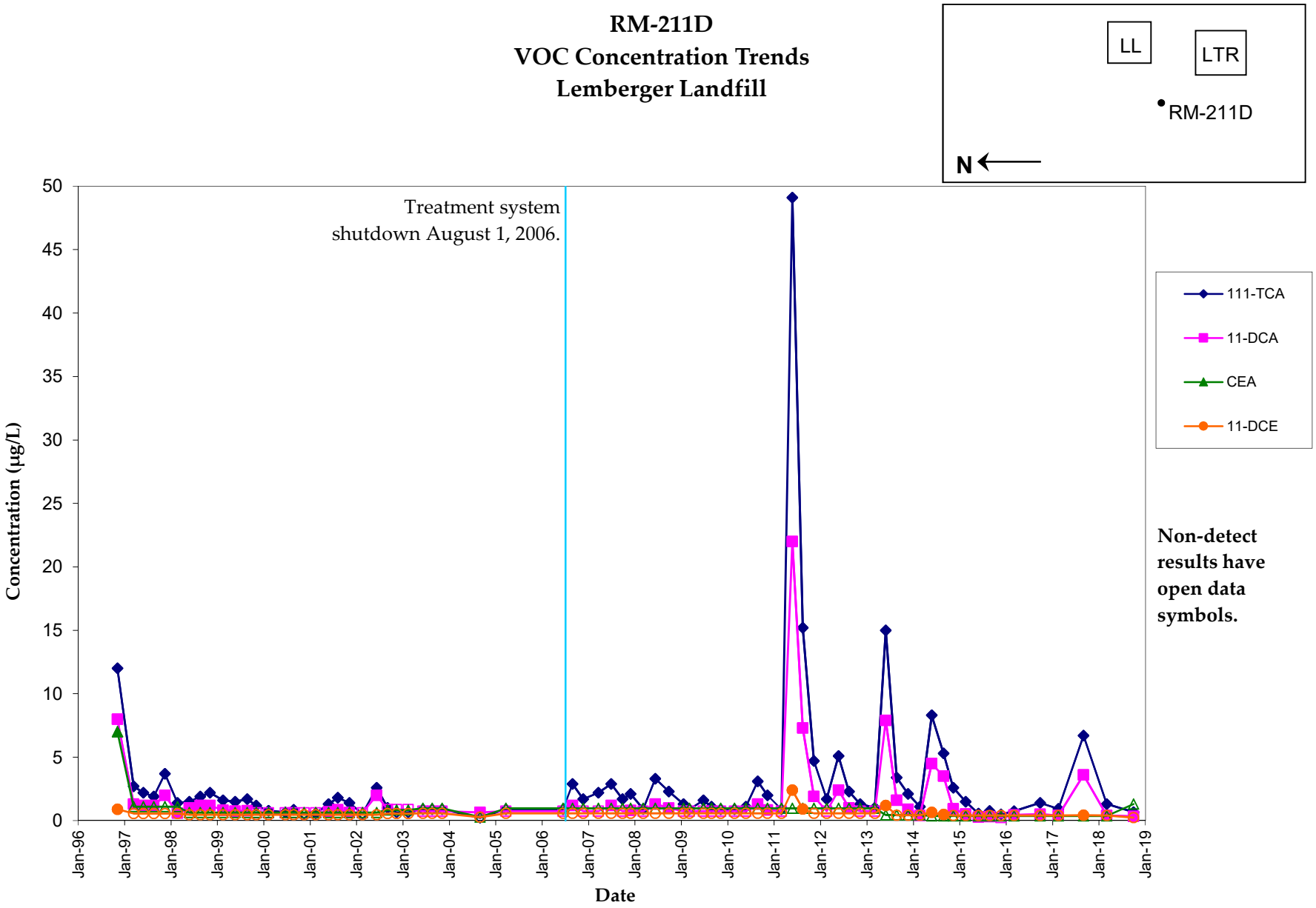
Non-detect results have open data symbols.

RM-210I
VOC Concentration Trends
Lemberger Landfill

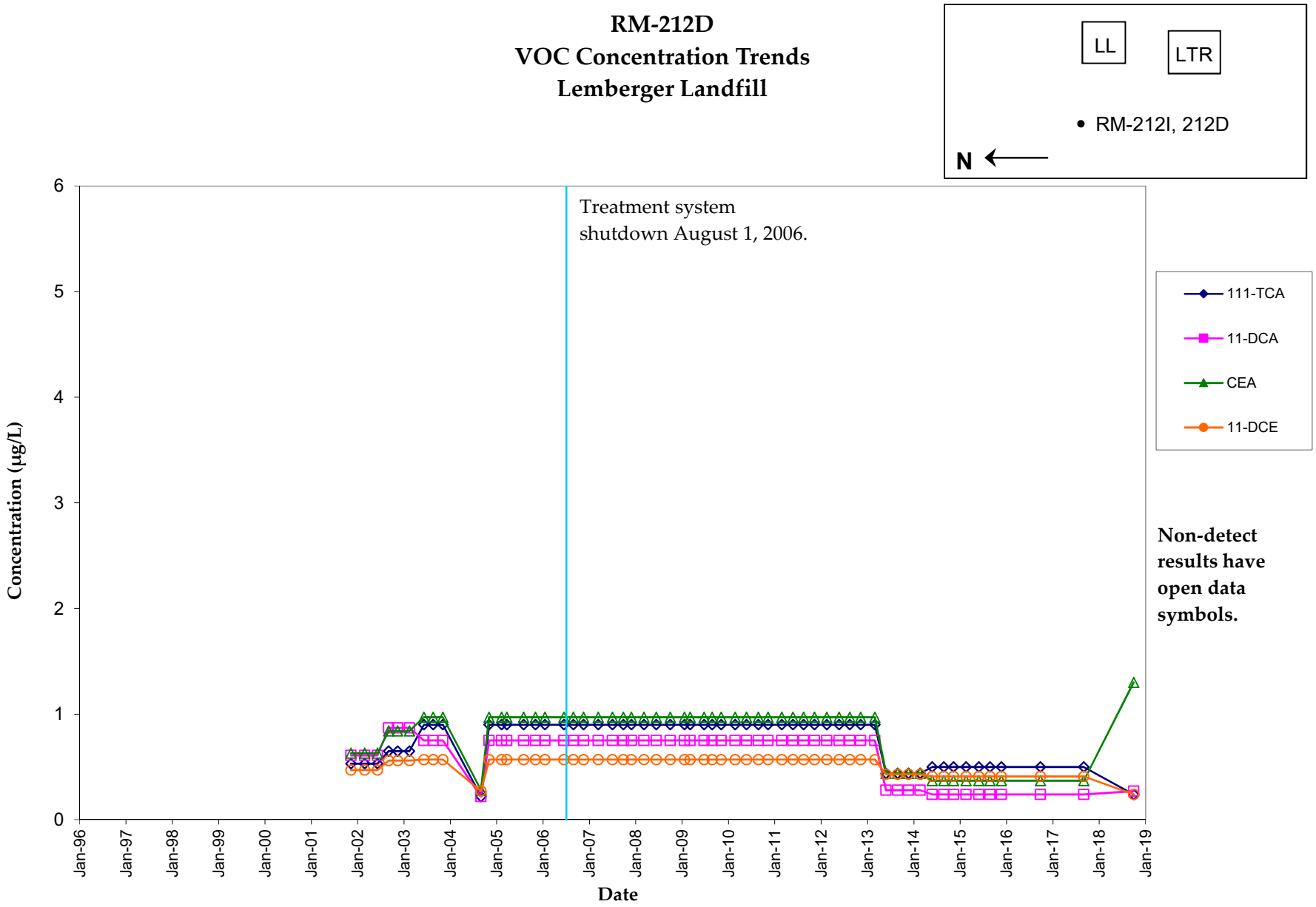


Non-detect results have open data symbols.

RM-211D
VOC Concentration Trends
Lemberger Landfill

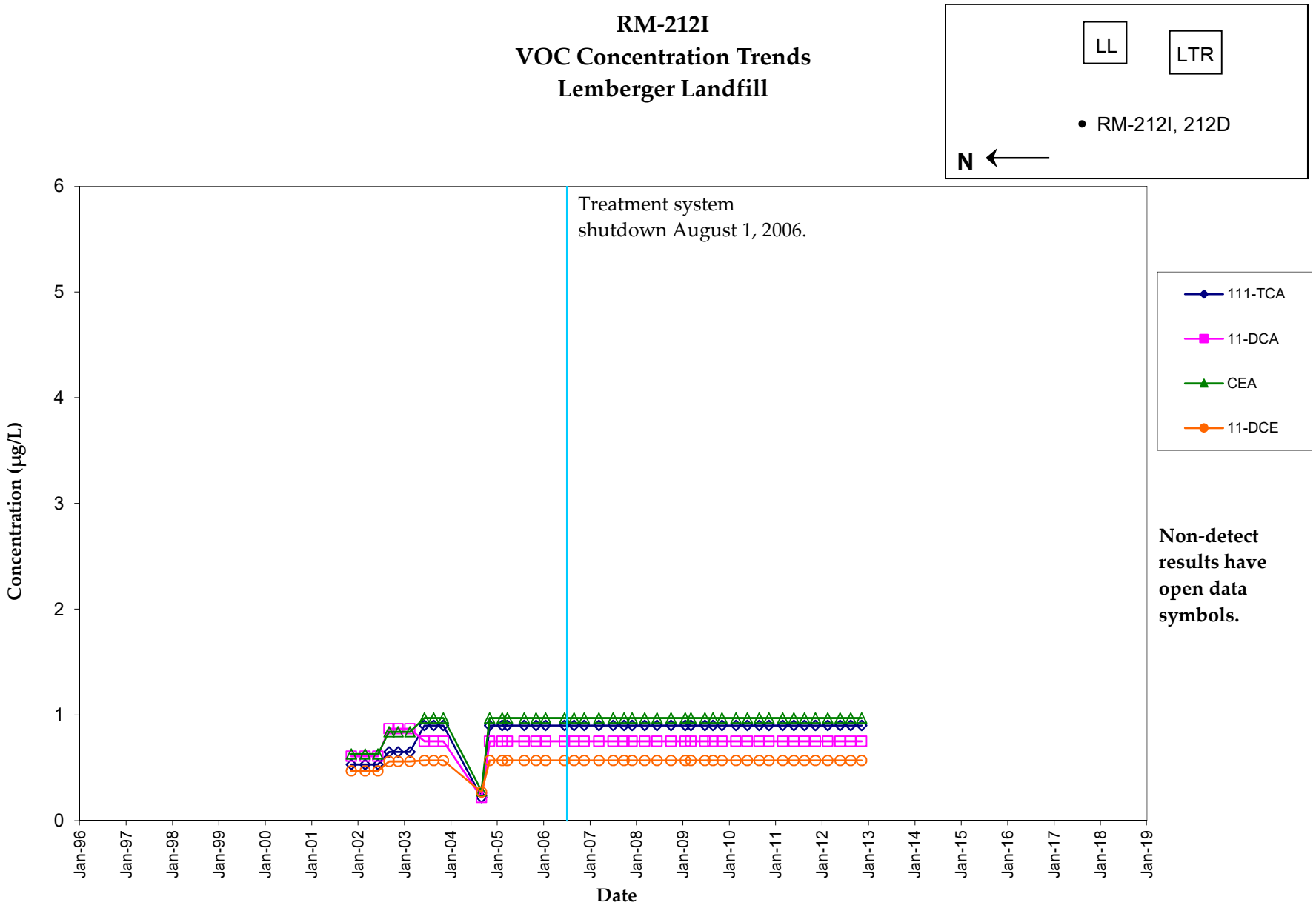


RM-212D
VOC Concentration Trends
Lemberger Landfill

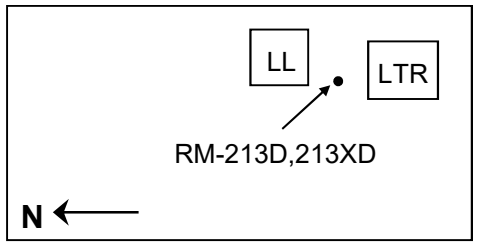


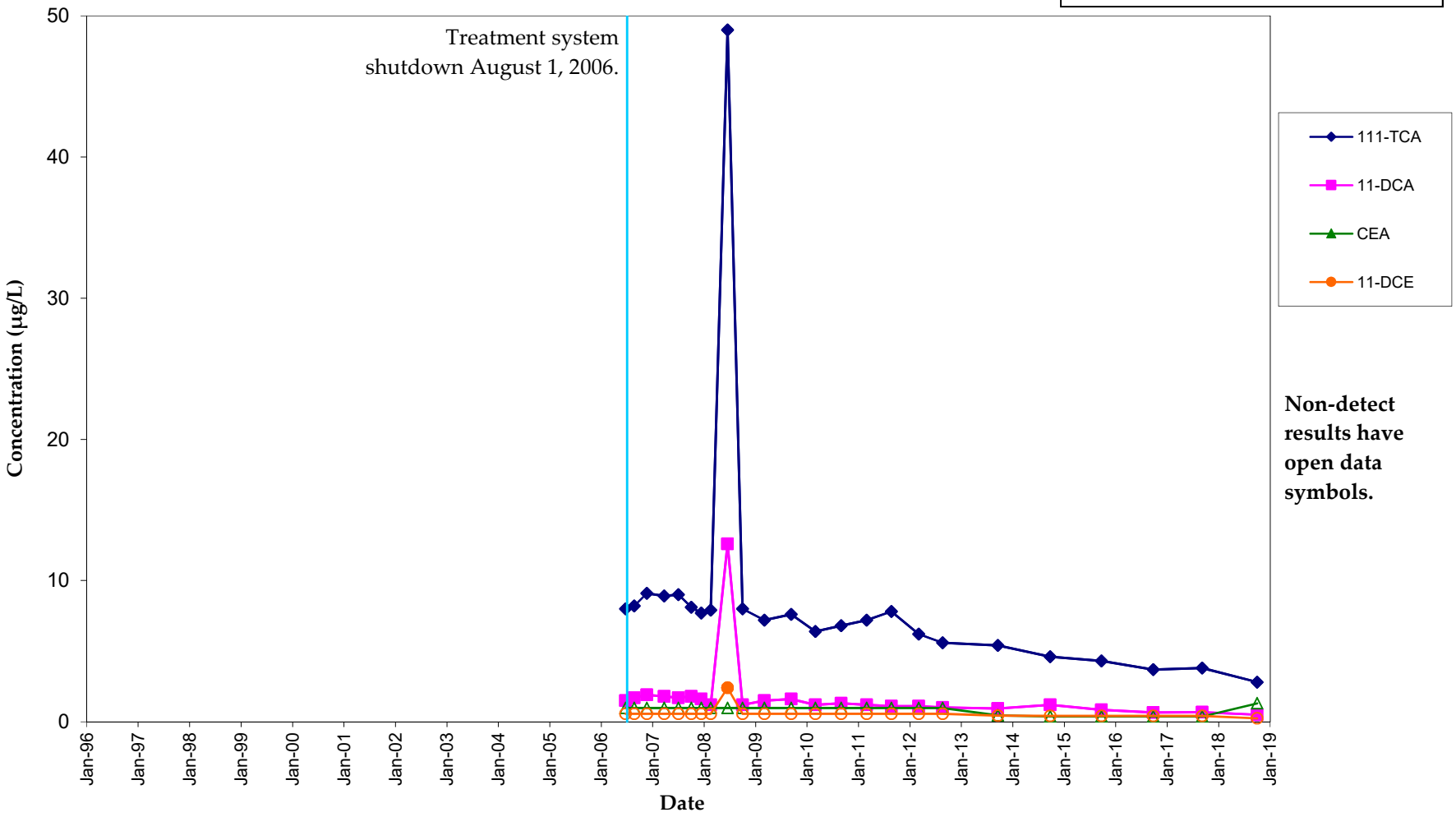
Non-detect results have open data symbols.

RM-212I
VOC Concentration Trends
Lemberger Landfill



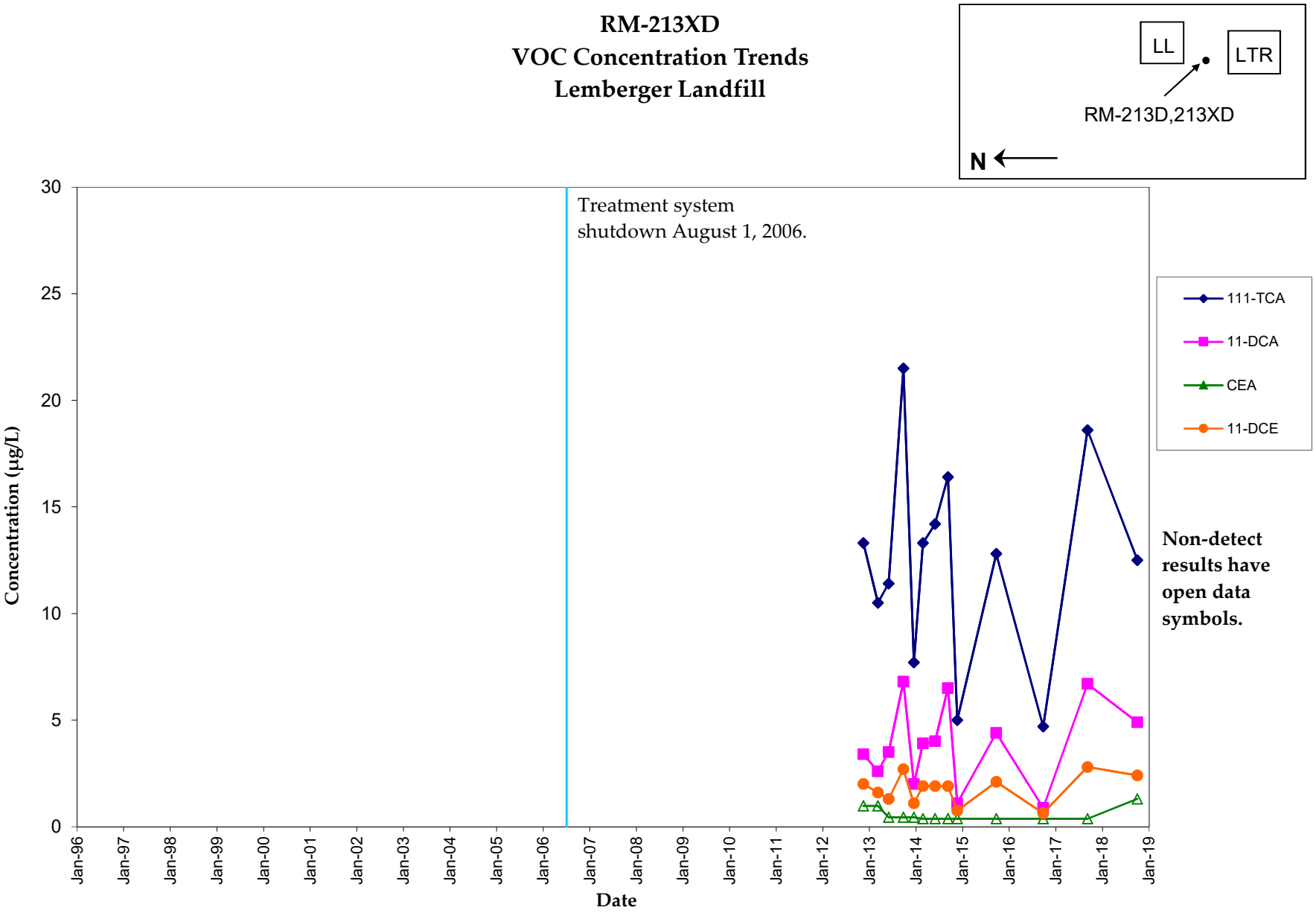
RM-213D
VOC Concentration Trends
Lemberger Landfill



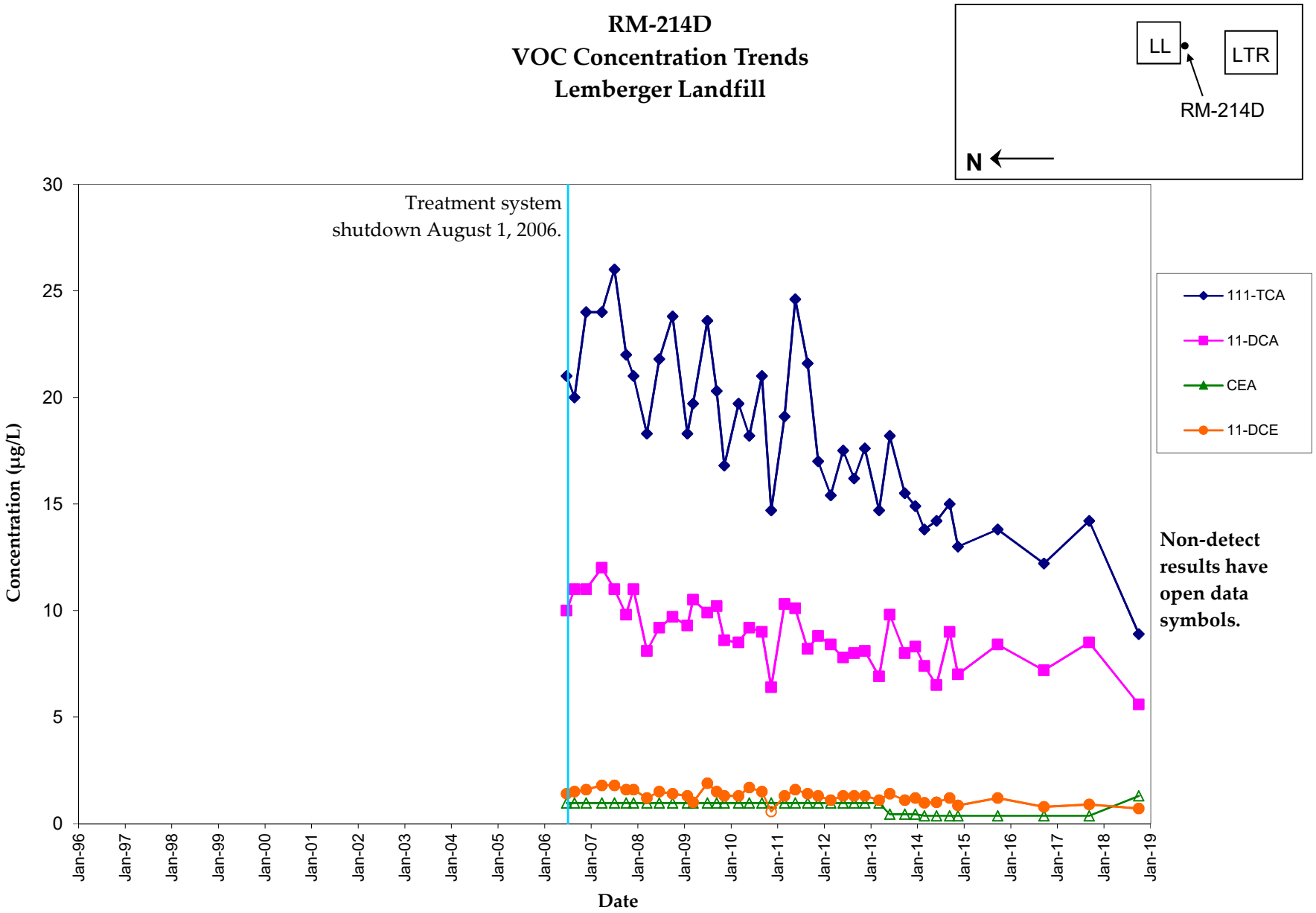


Non-detect results have open data symbols.

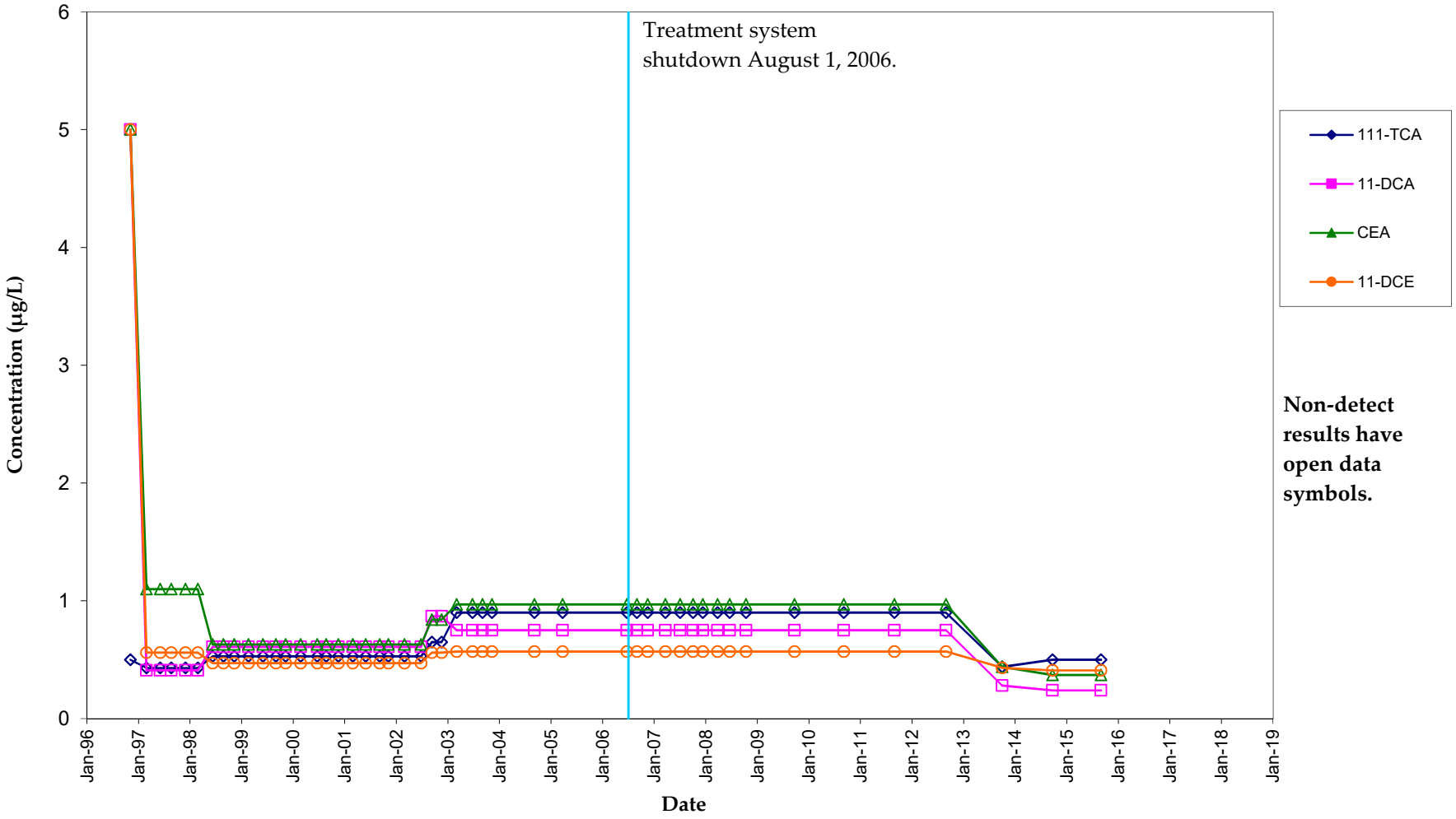
RM-213XD
VOC Concentration Trends
Lemberger Landfill



RM-214D
VOC Concentration Trends
Lemberger Landfill

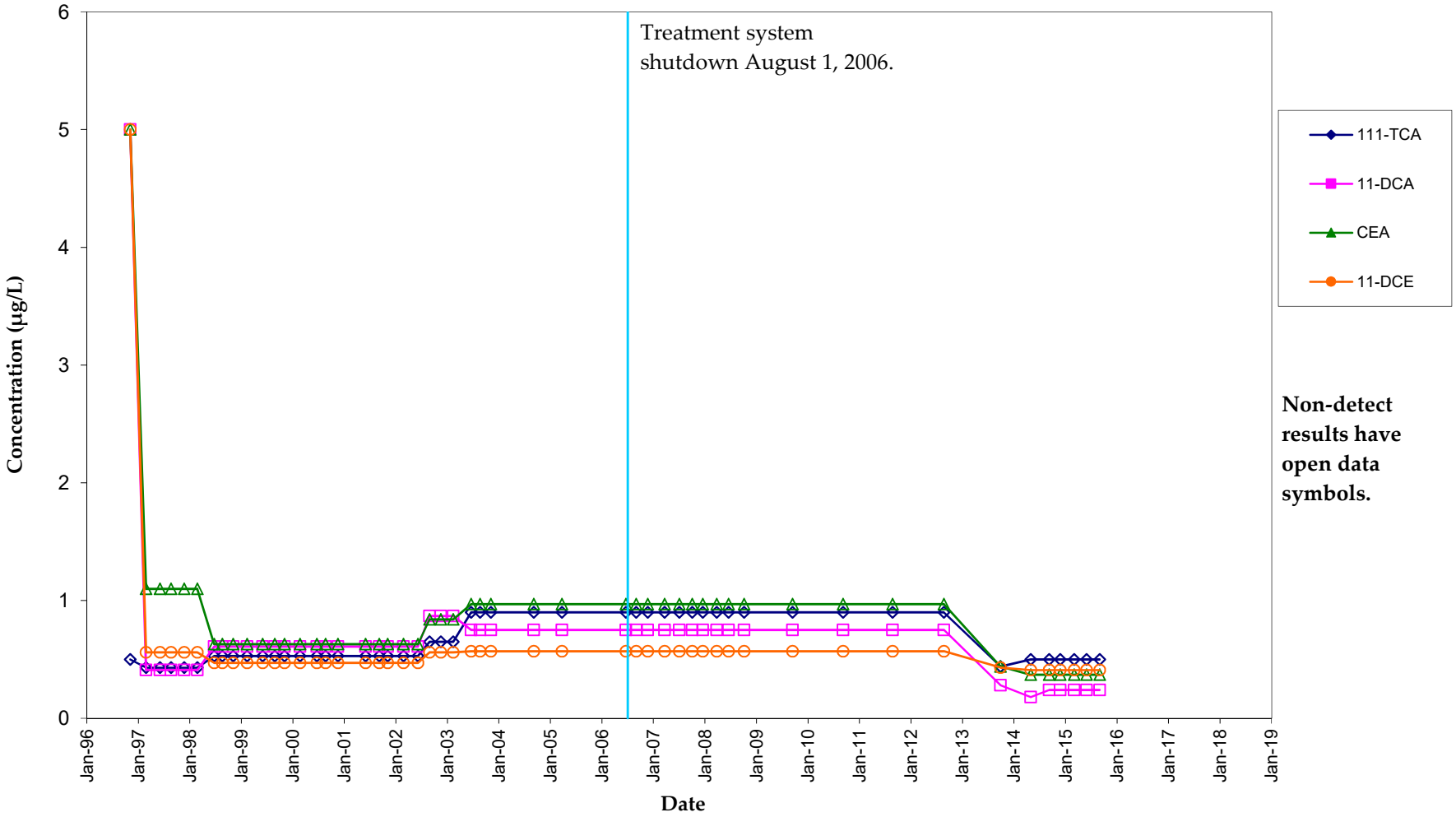


RM-301S
VOC Concentration Trends
Lemberger Landfill



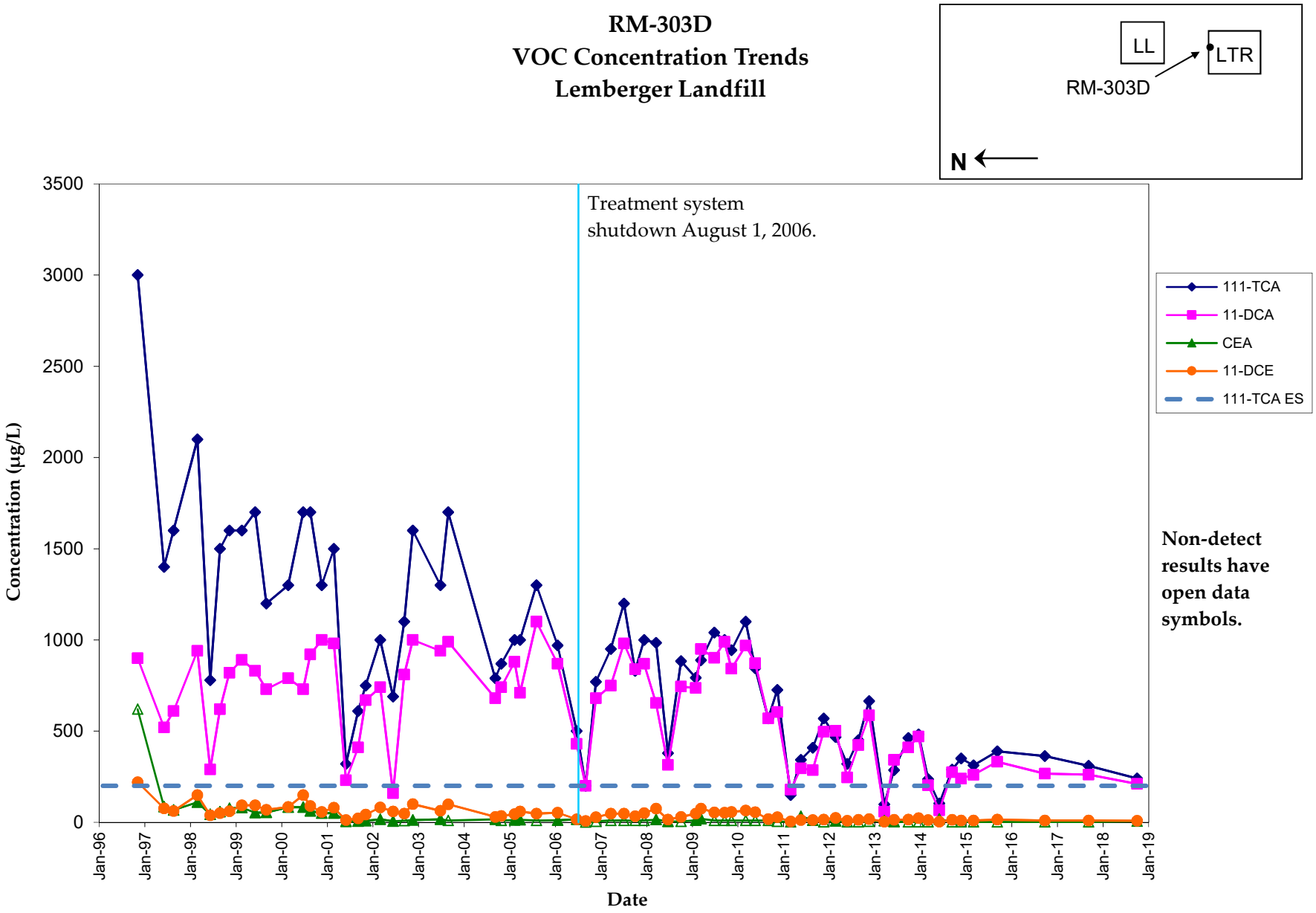
Non-detect results have open data symbols.

RM-302S
VOC Concentration Trends
Lemberger Landfill



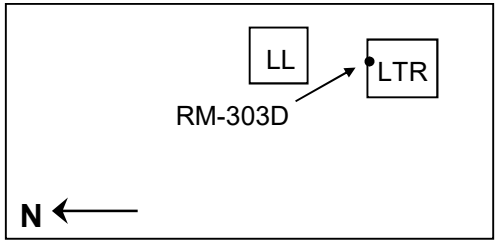
Non-detect results have open data symbols.

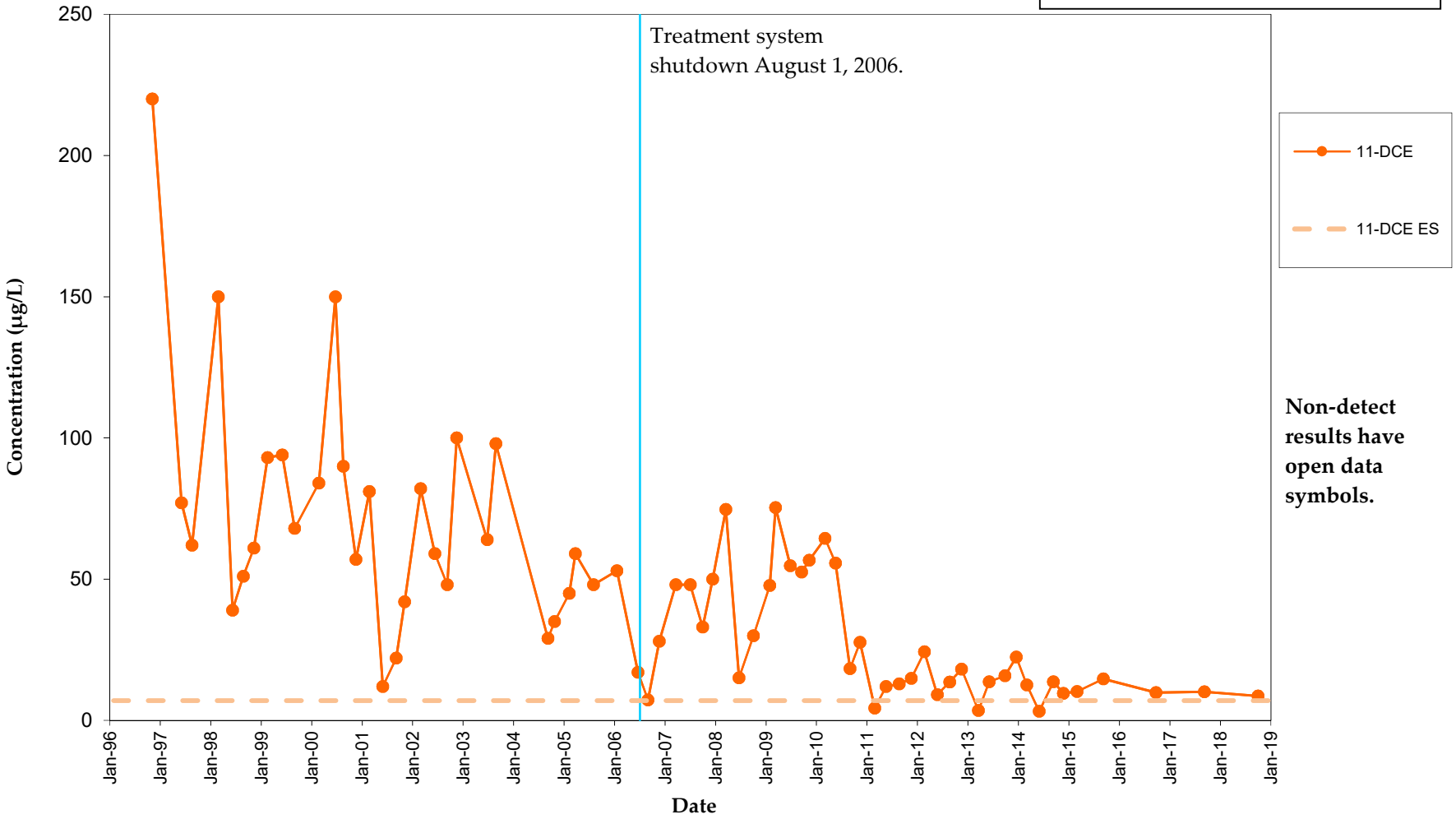
RM-303D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

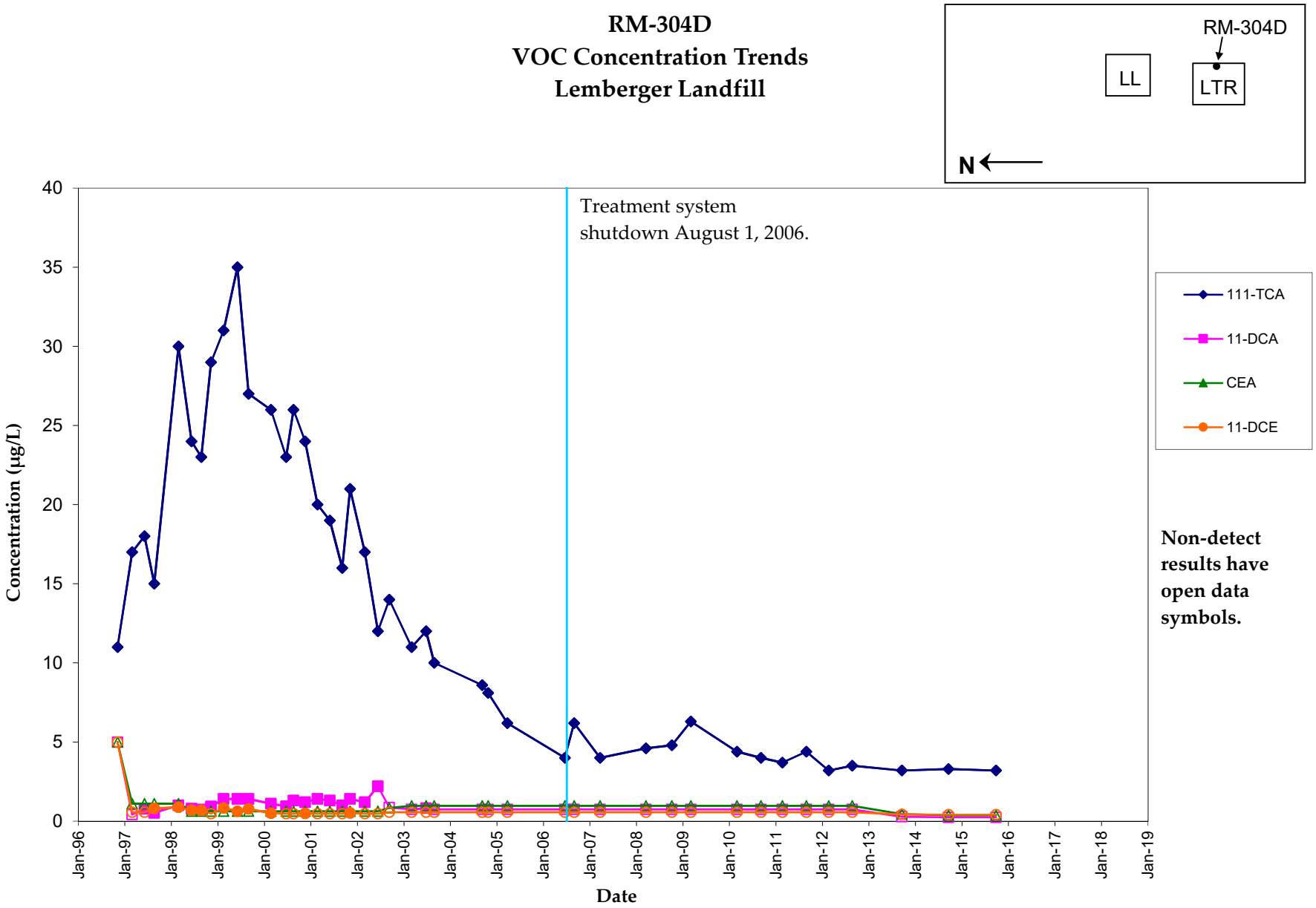
RM-303D
VOC Concentration Trends
Lemberger Landfill





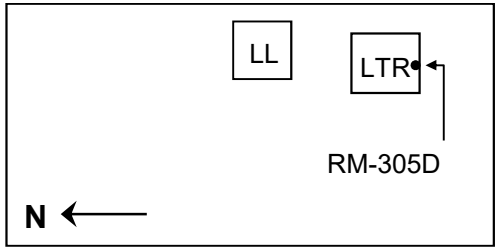
Non-detect results have open data symbols.

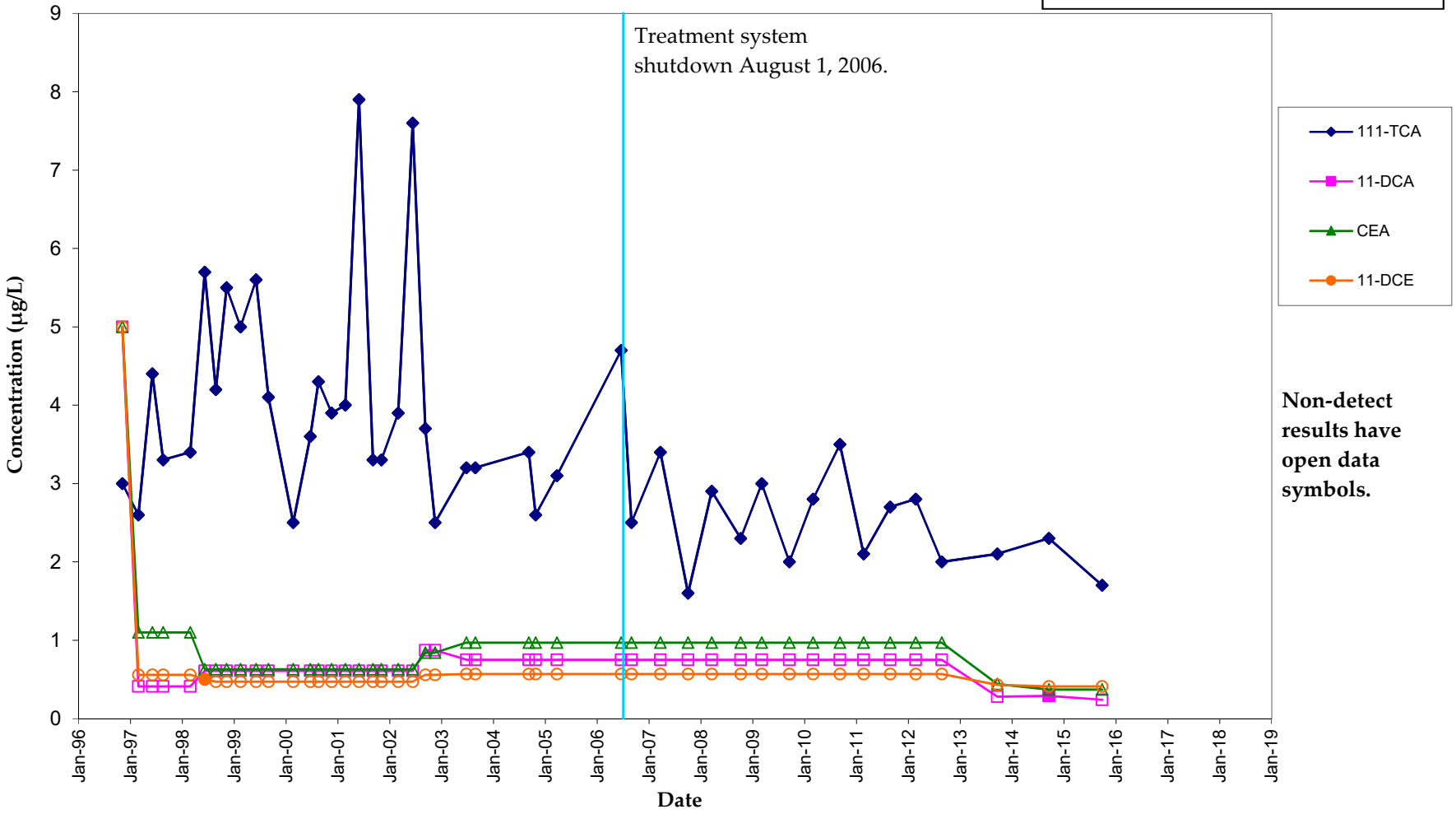
RM-304D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

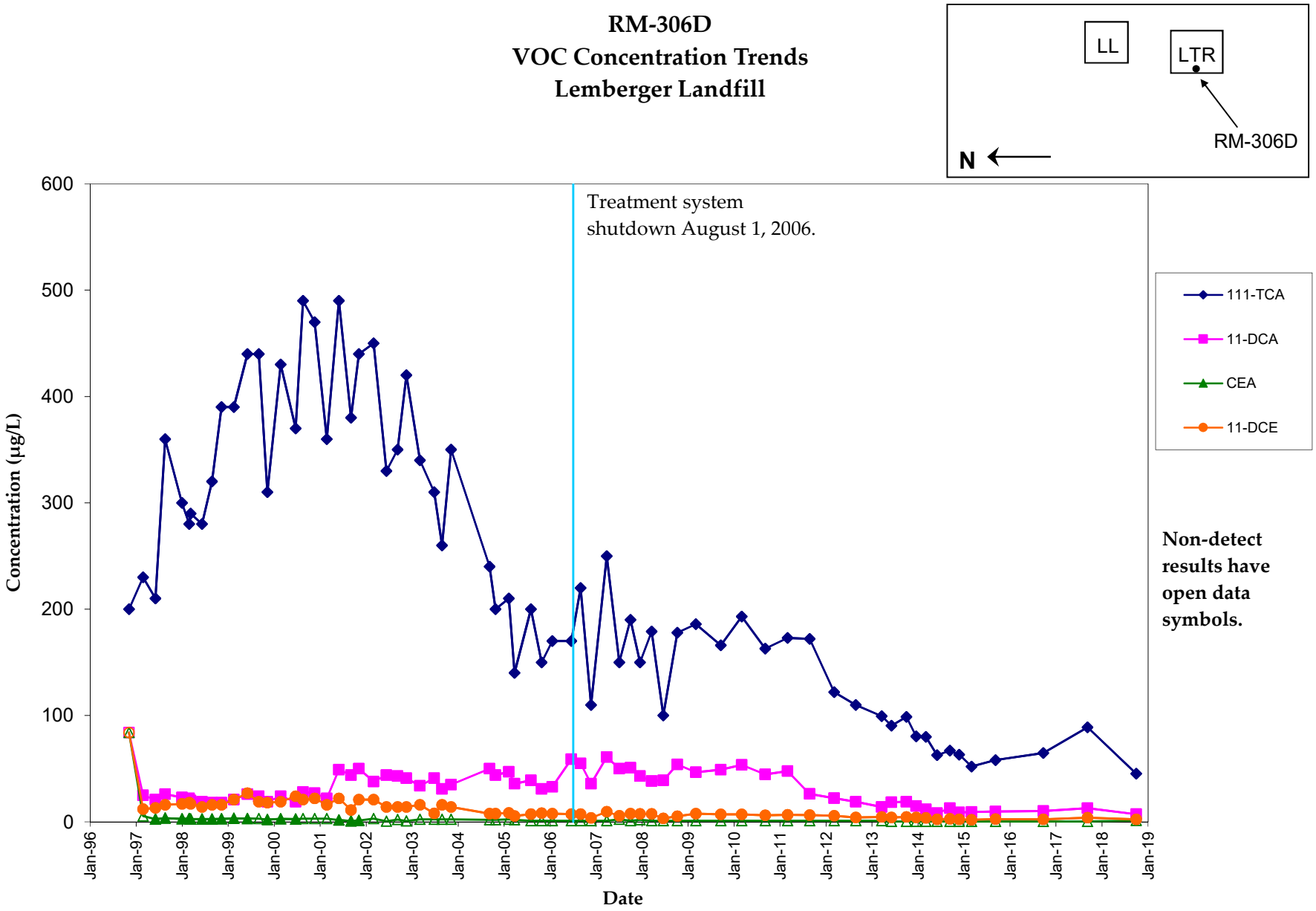
RM-305D
VOC Concentration Trends
Lemberger Landfill





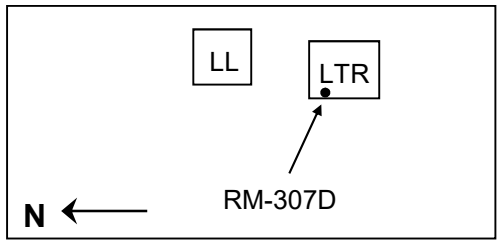
Non-detect results have open data symbols.

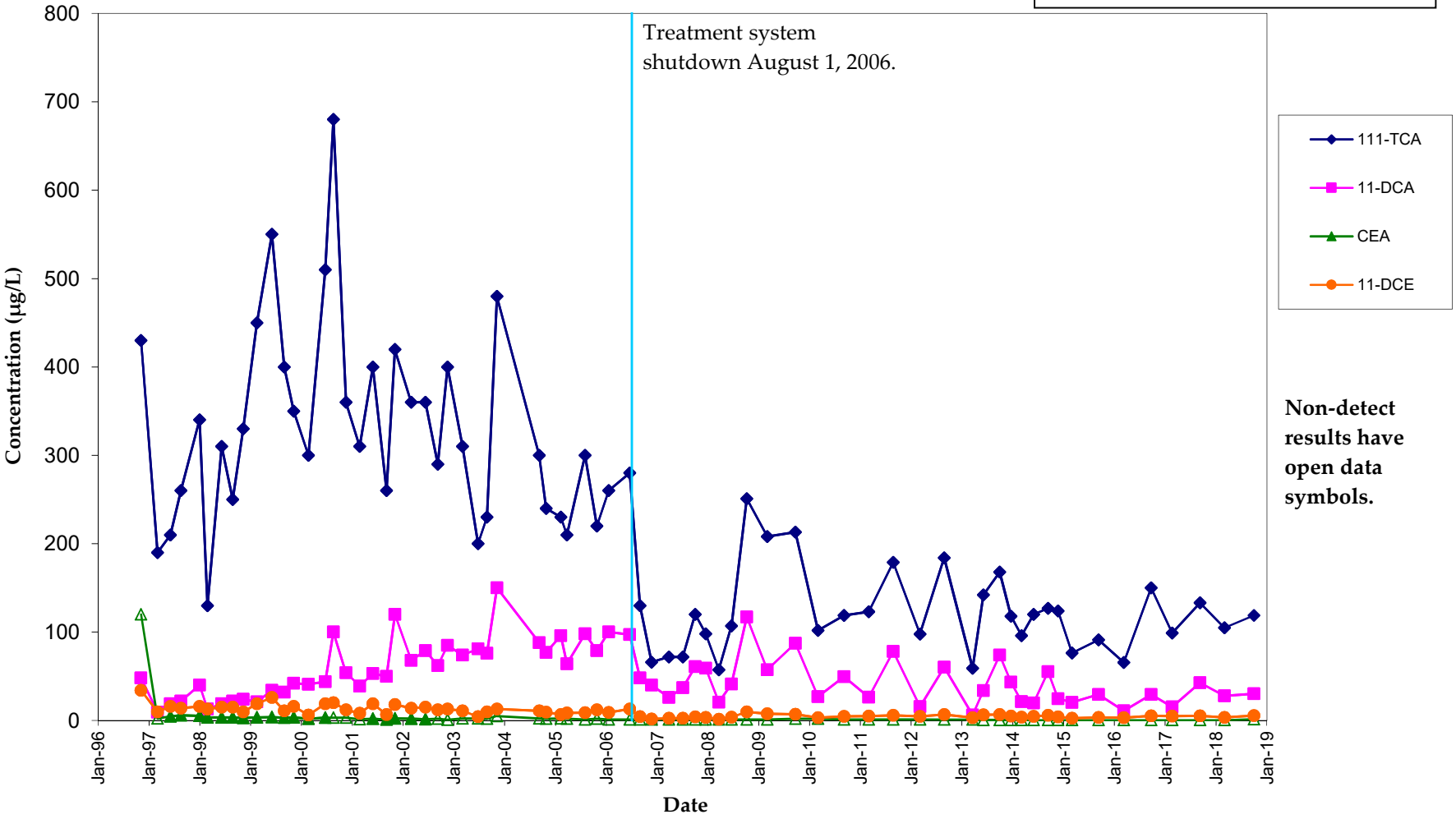
RM-306D
VOC Concentration Trends
Lemberger Landfill



Non-detect results have open data symbols.

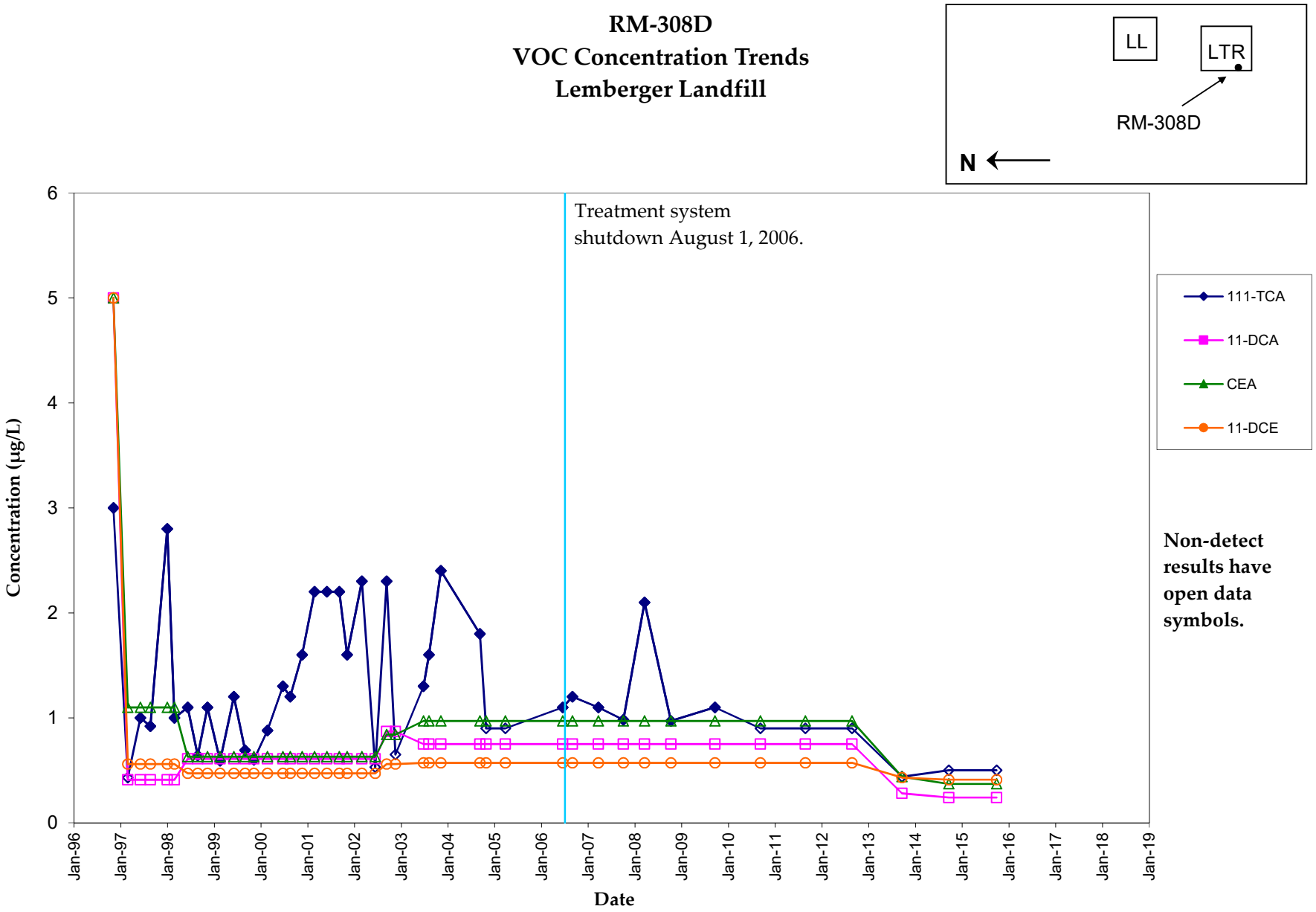
RM-307D
VOC Concentration Trends
Lemberger Landfill





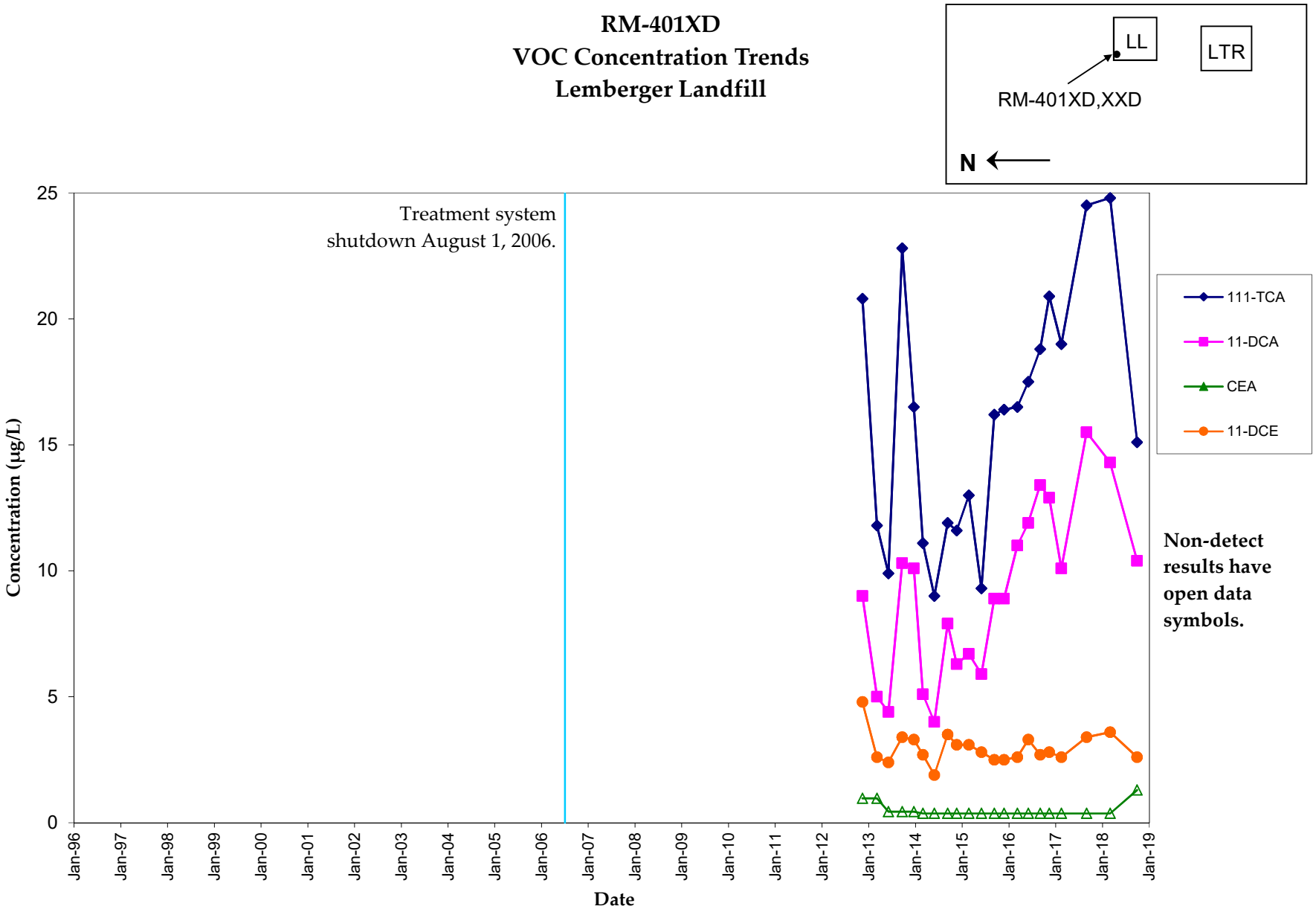
Non-detect results have open data symbols.

RM-308D
VOC Concentration Trends
Lemberger Landfill

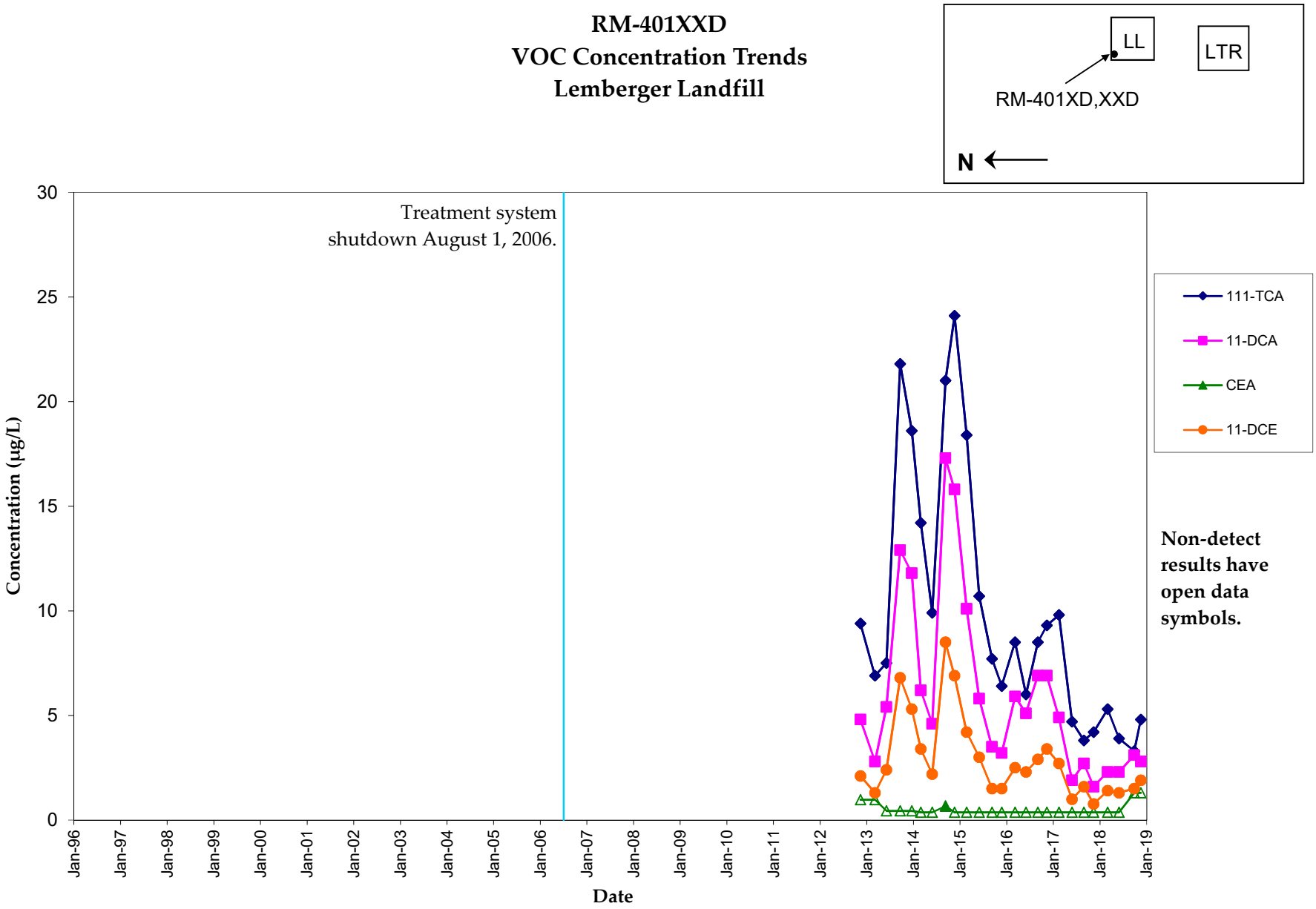


Non-detect results have open data symbols.

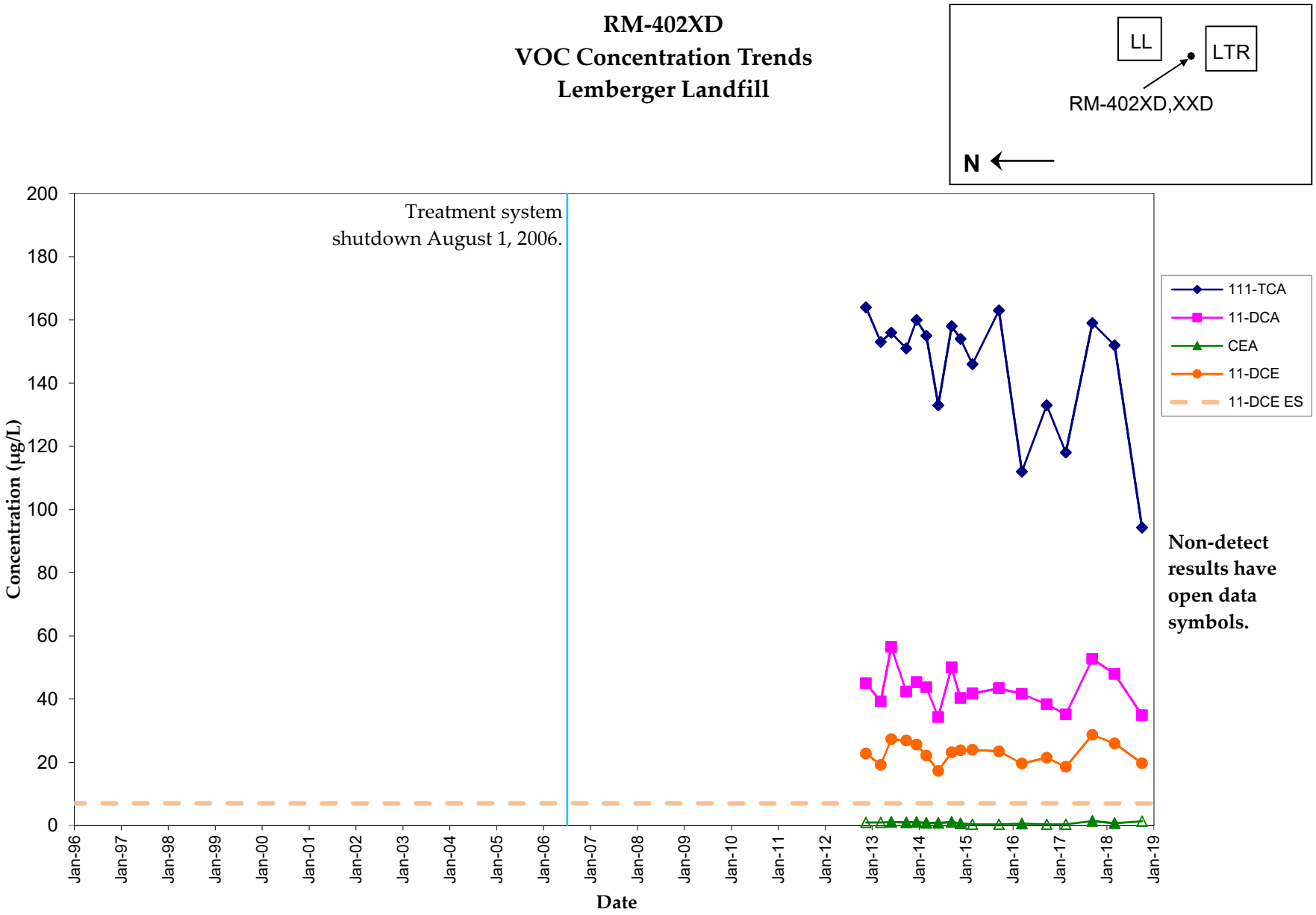
RM-401XD
VOC Concentration Trends
Lemberger Landfill



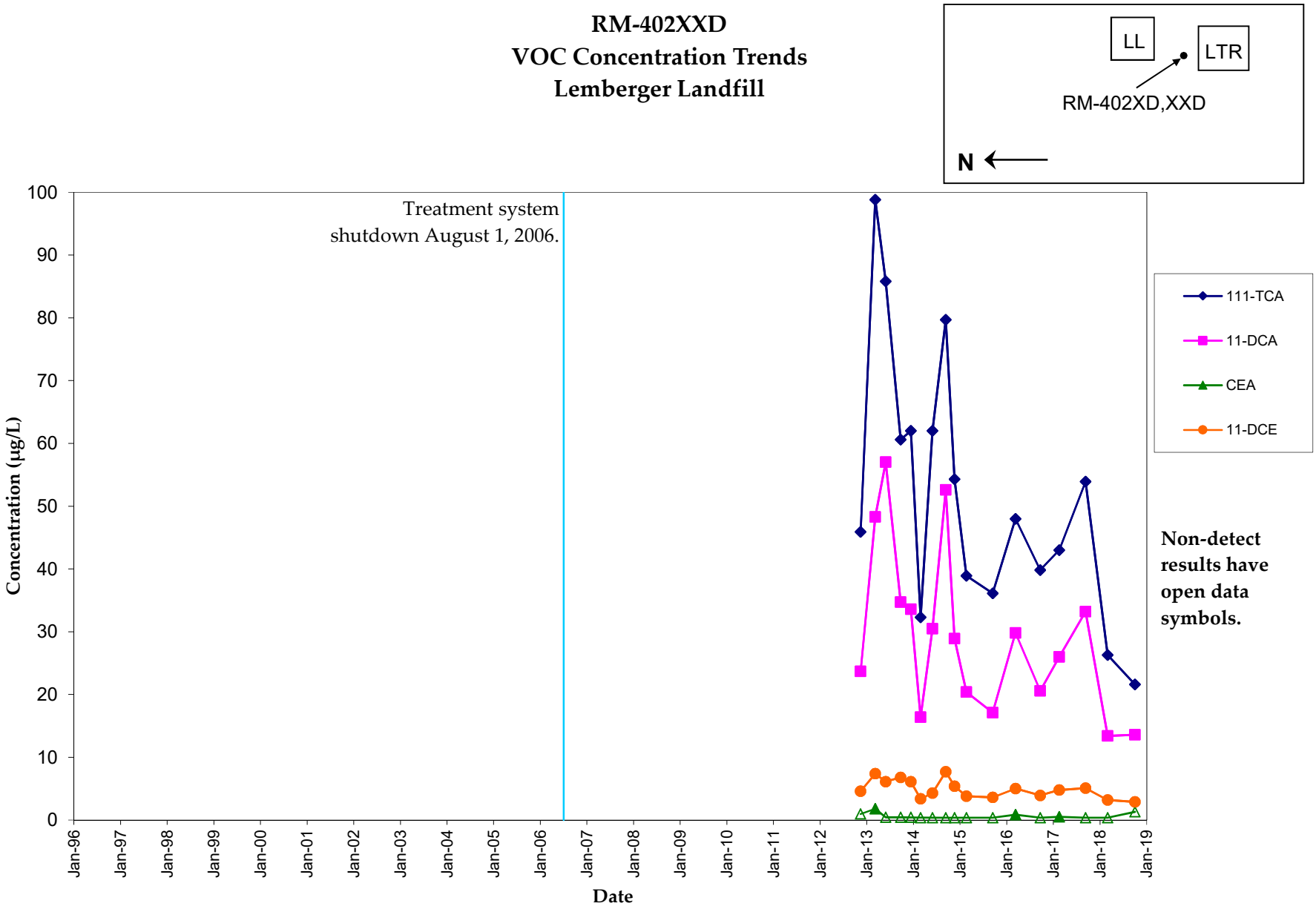
RM-401XXD
VOC Concentration Trends
Lemberger Landfill



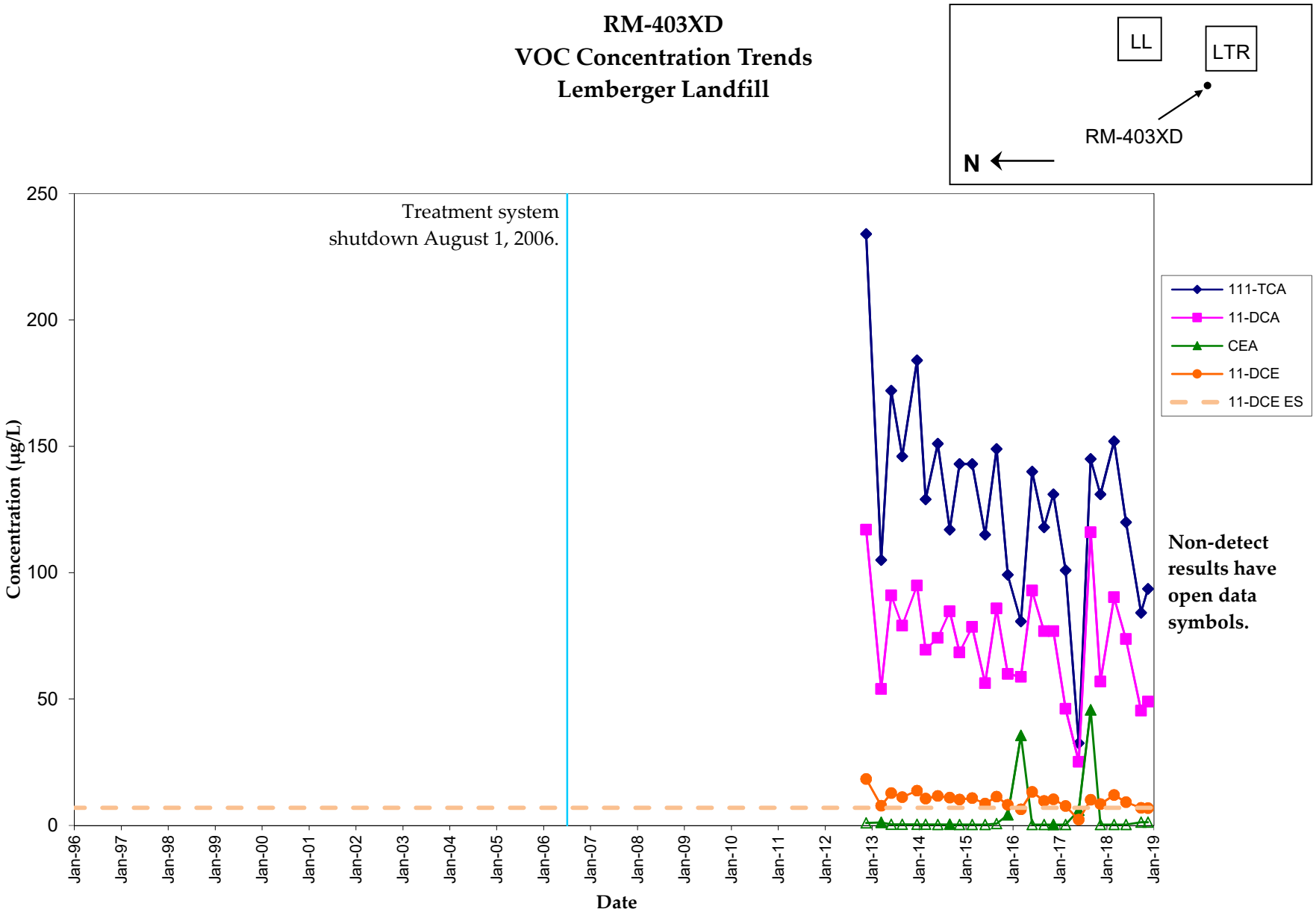
RM-402XD
VOC Concentration Trends
Lemberger Landfill



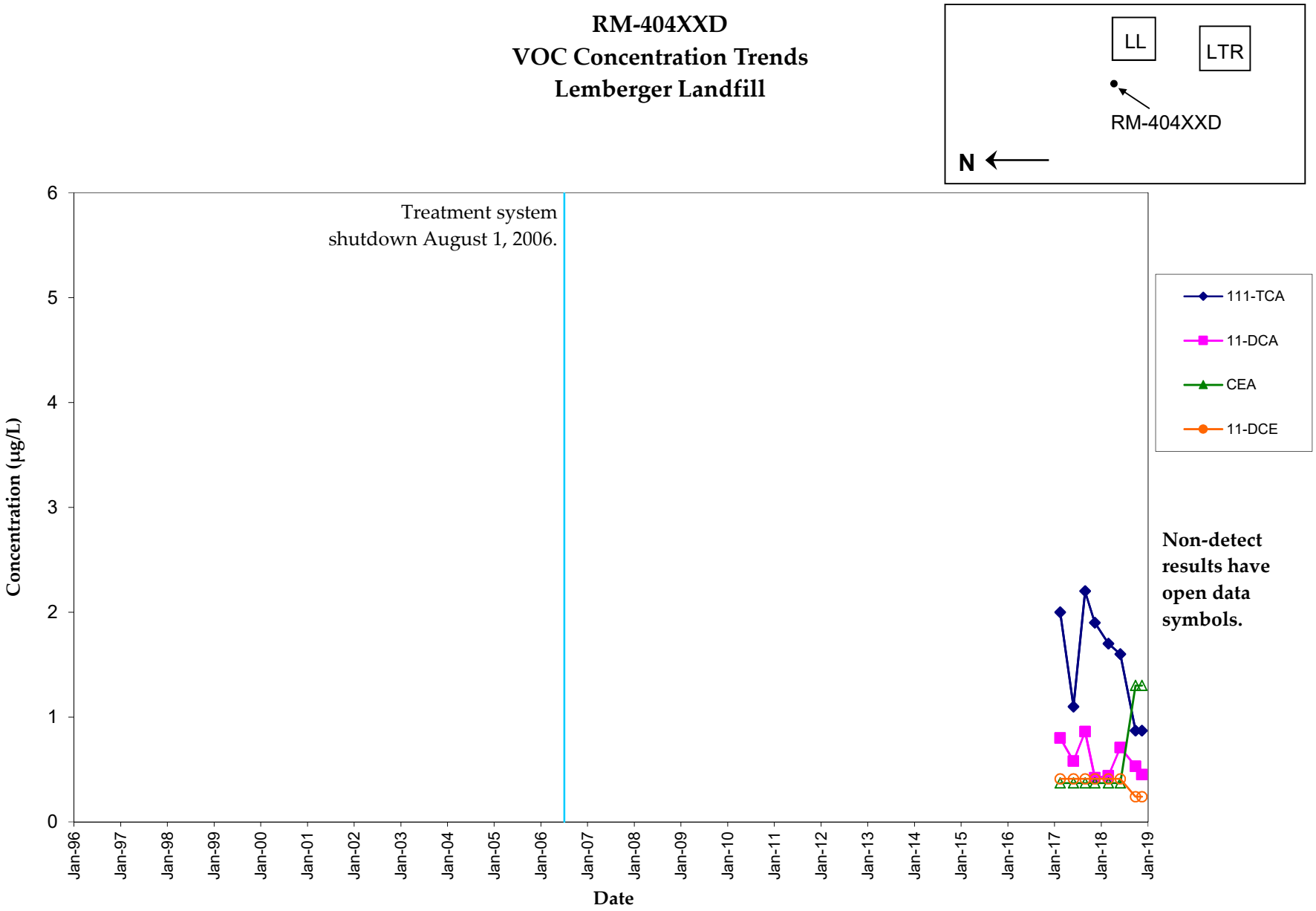
RM-402XXD
VOC Concentration Trends
Lemberger Landfill



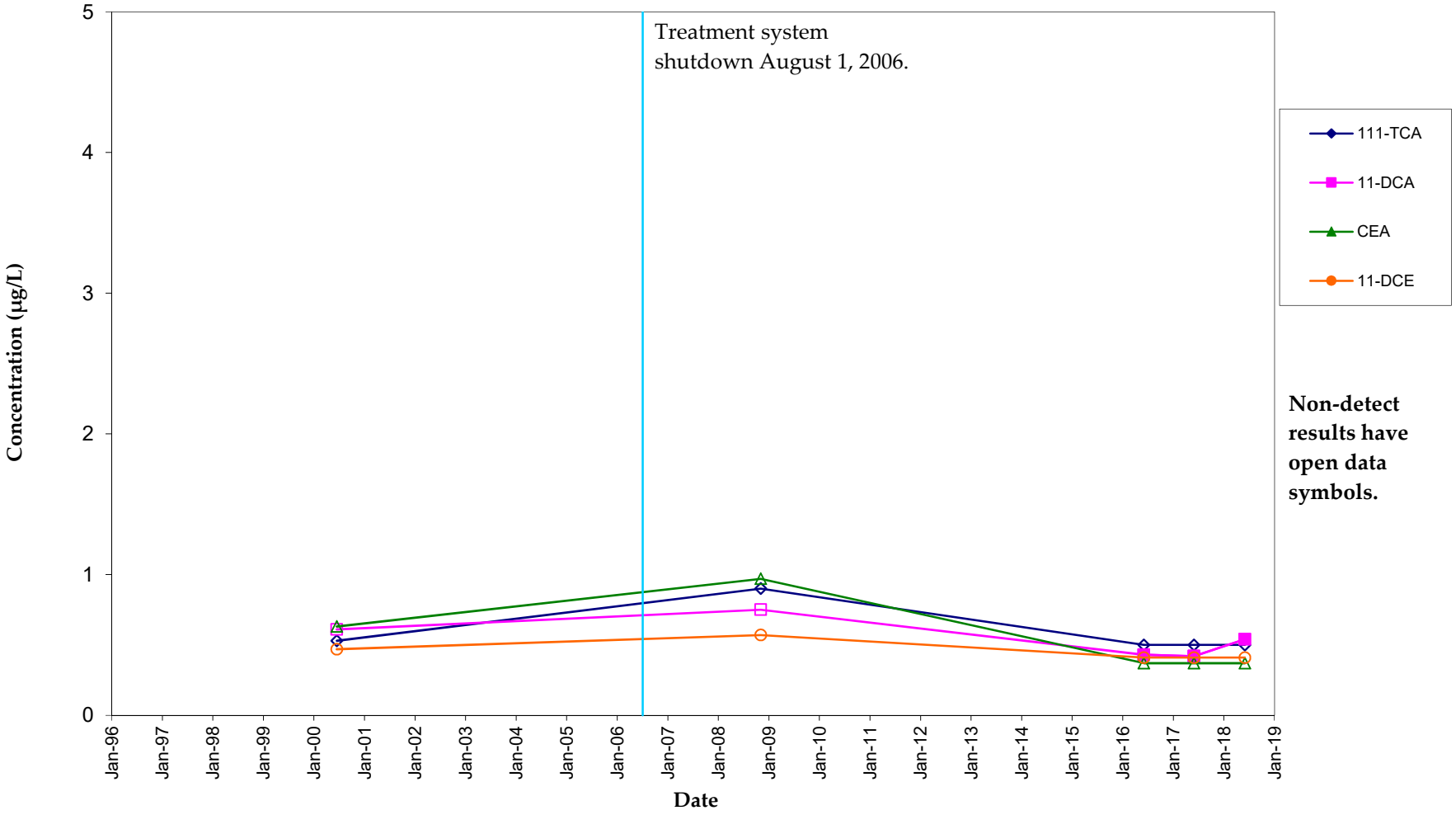
RM-403XD
VOC Concentration Trends
Lemberger Landfill



RM-404XXD
VOC Concentration Trends
Lemberger Landfill

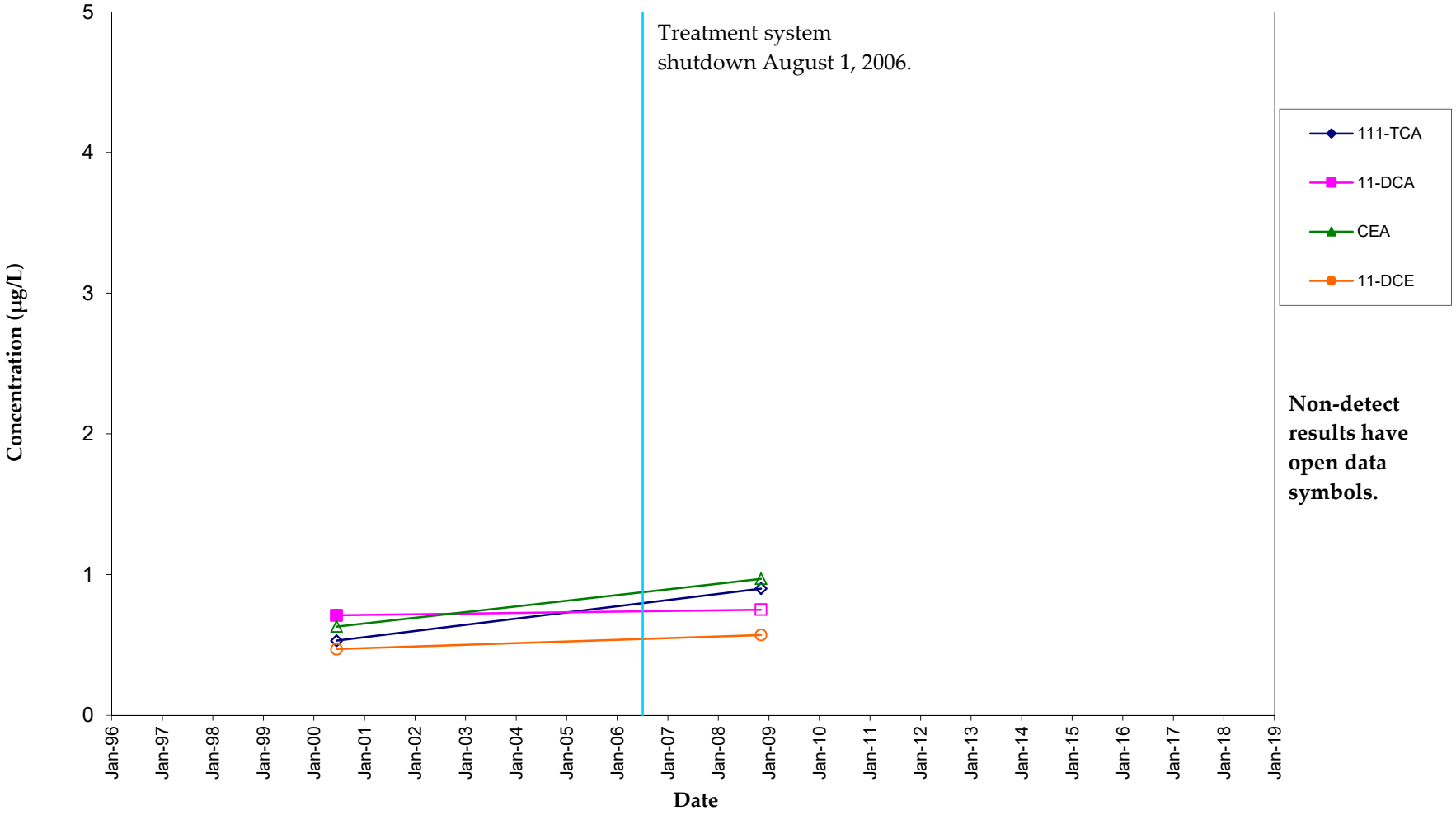


LH-01
VOC Concentration Trends
Lemberger Landfill



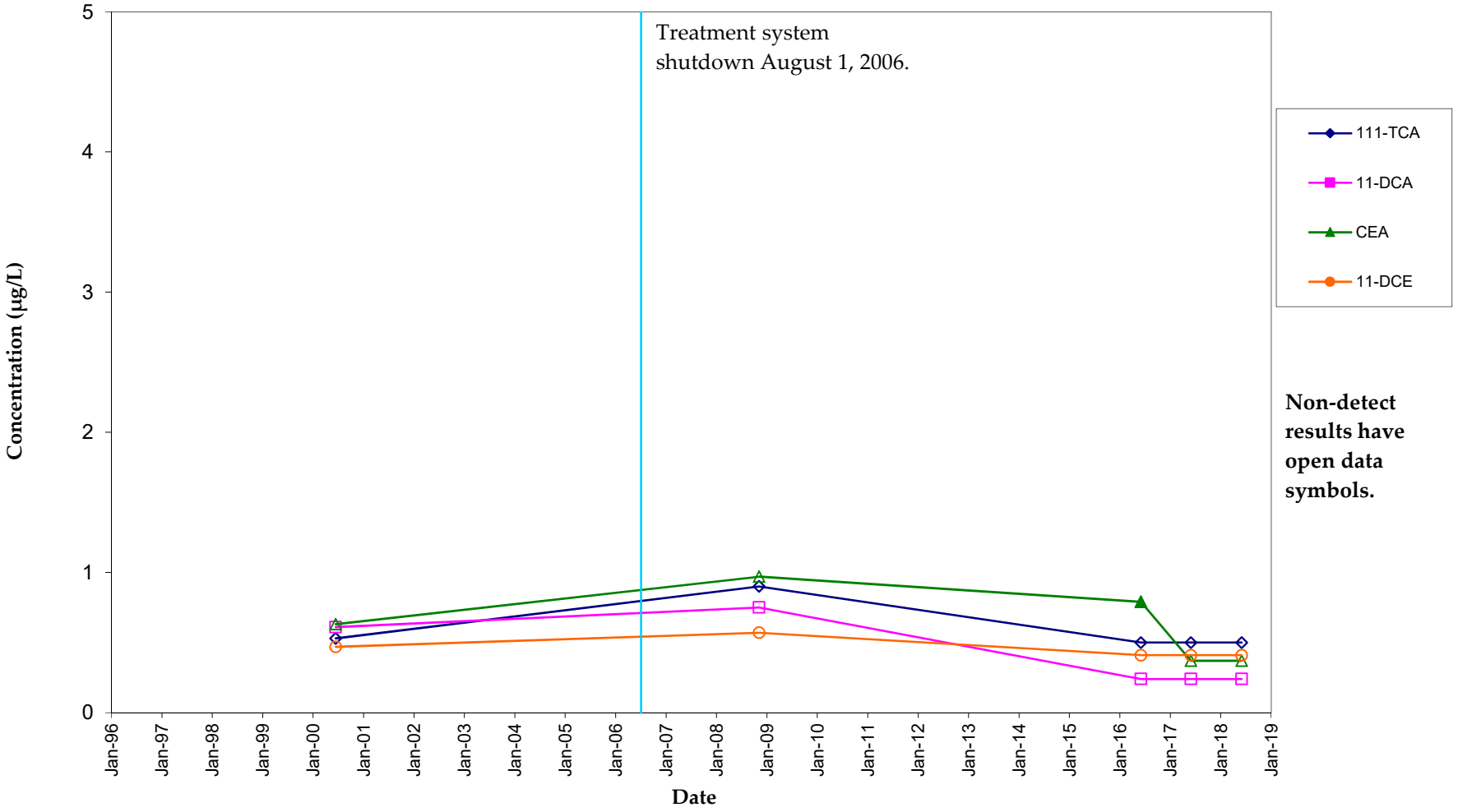
Non-detect results have open data symbols.

LH-02B
VOC Concentration Trends
Lemberger Landfill



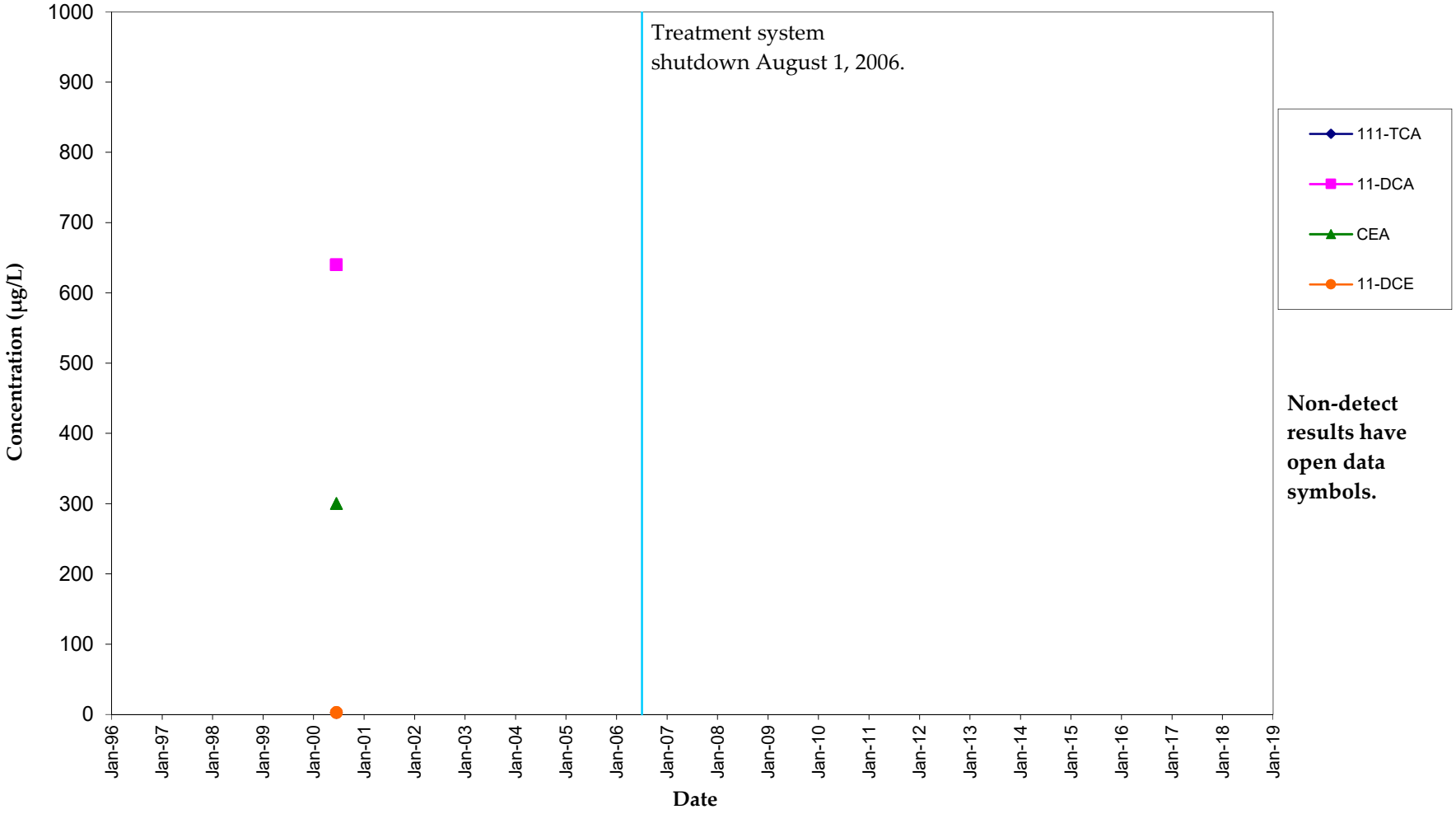
Non-detect results have open data symbols.

LH-03
VOC Concentration Trends
Lemberger Landfill



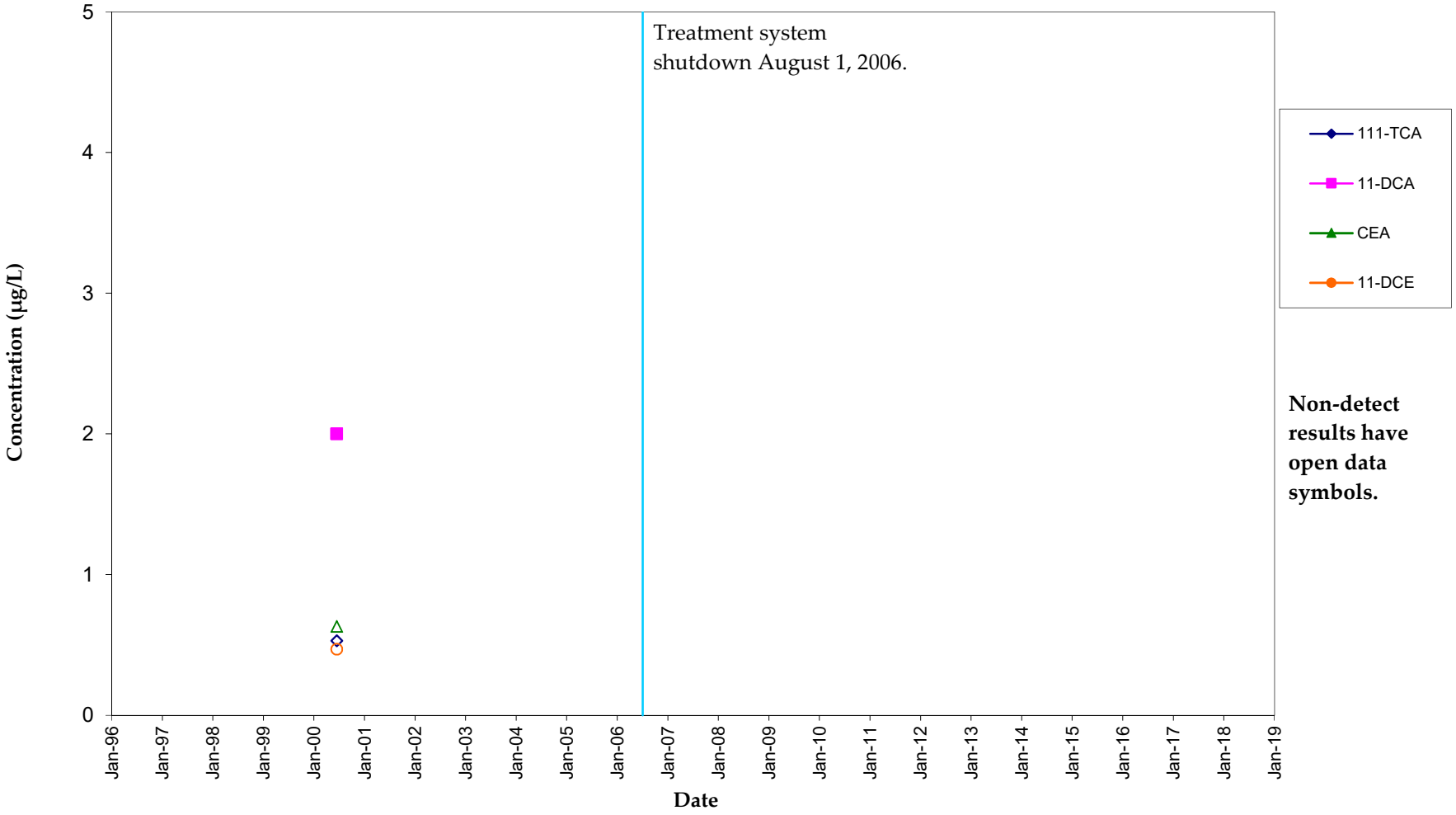
Non-detect results have open data symbols.

LH-04
VOC Concentration Trends
Lemberger Landfill

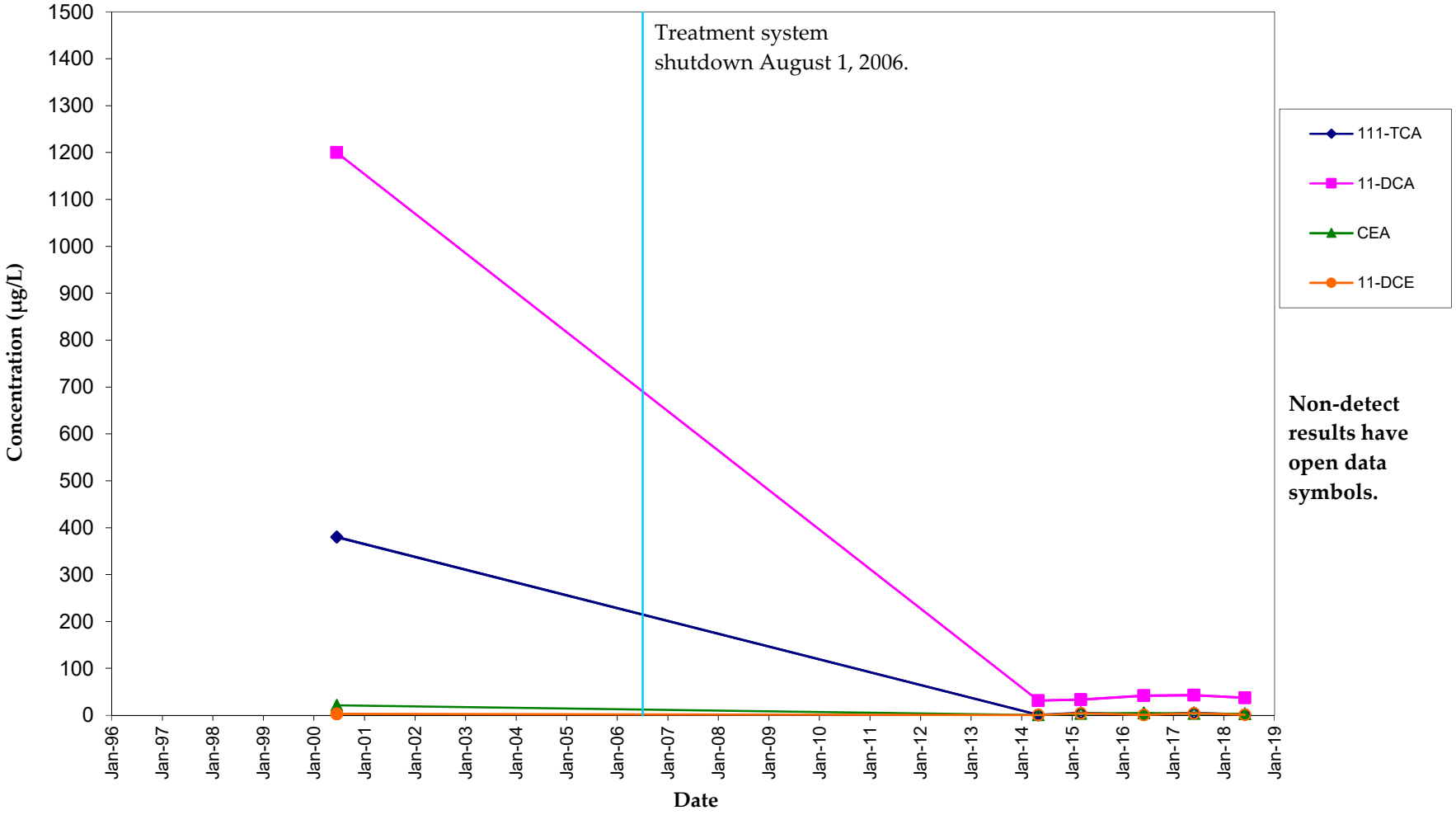


Non-detect results have open data symbols.

LH-05
VOC Concentration Trends
Lemberger Landfill

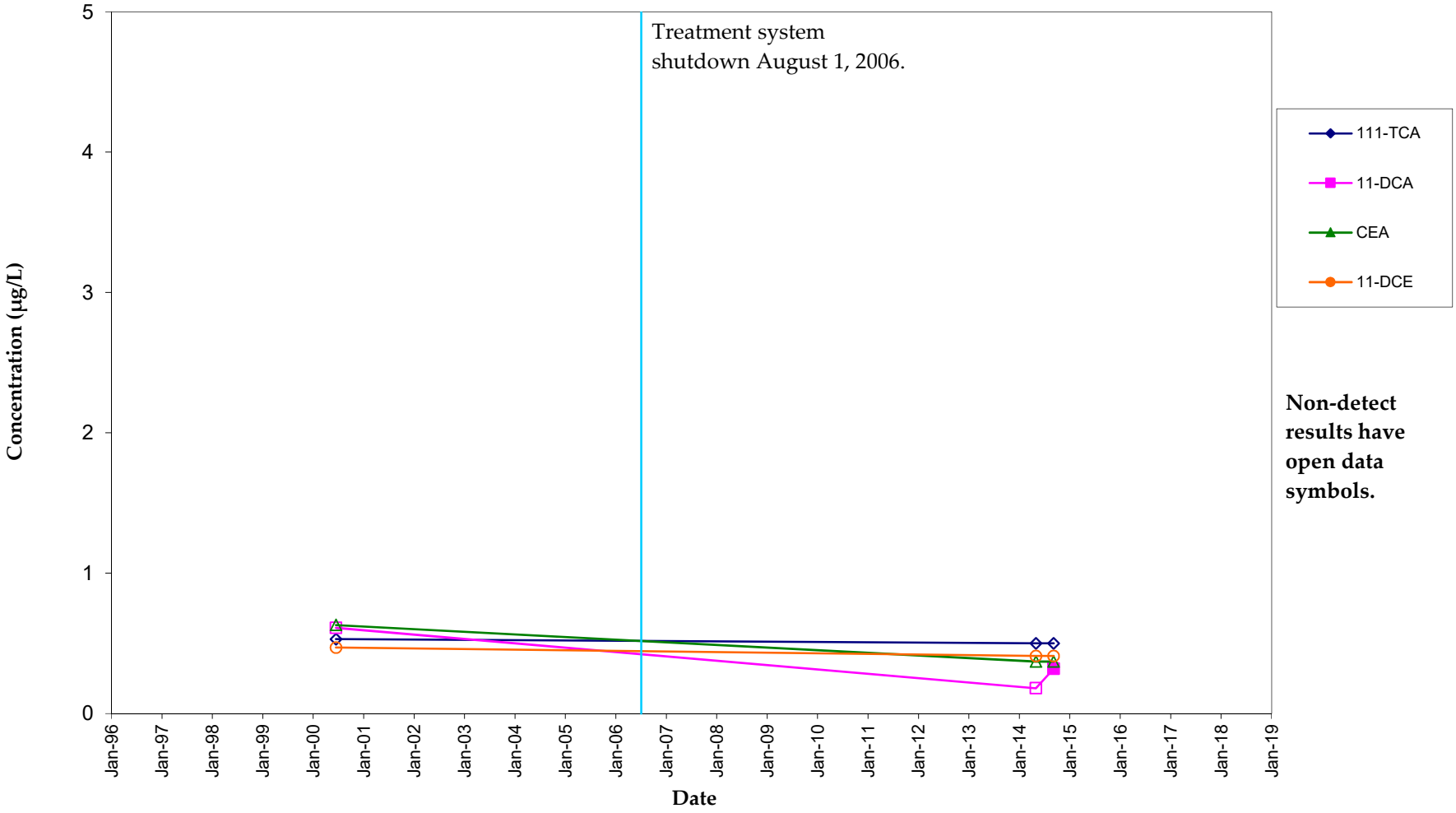


LH-06
VOC Concentration Trends
Lemberger Landfill



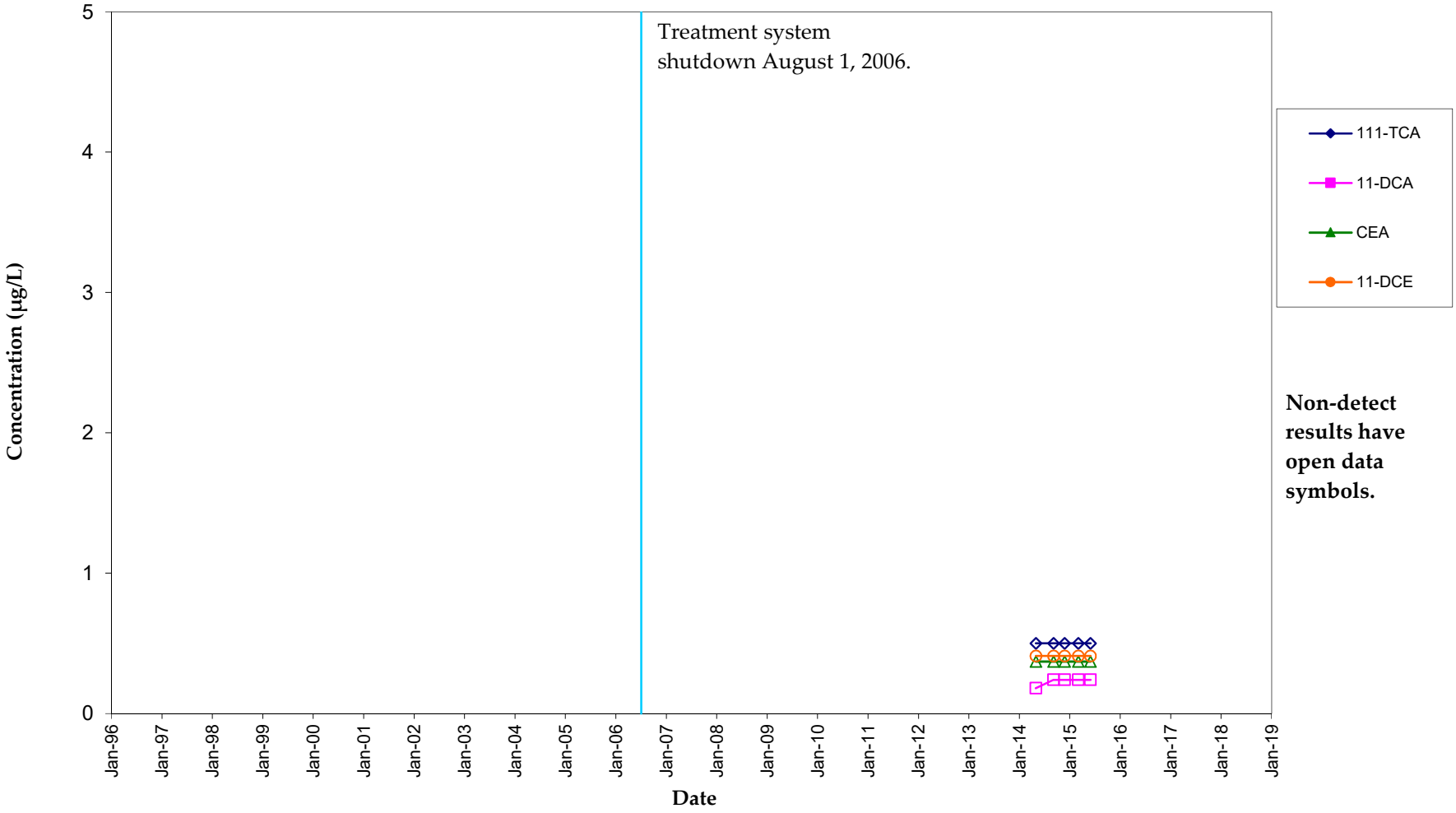
Non-detect results have open data symbols.

LH-07
VOC Concentration Trends
Lemberger Landfill

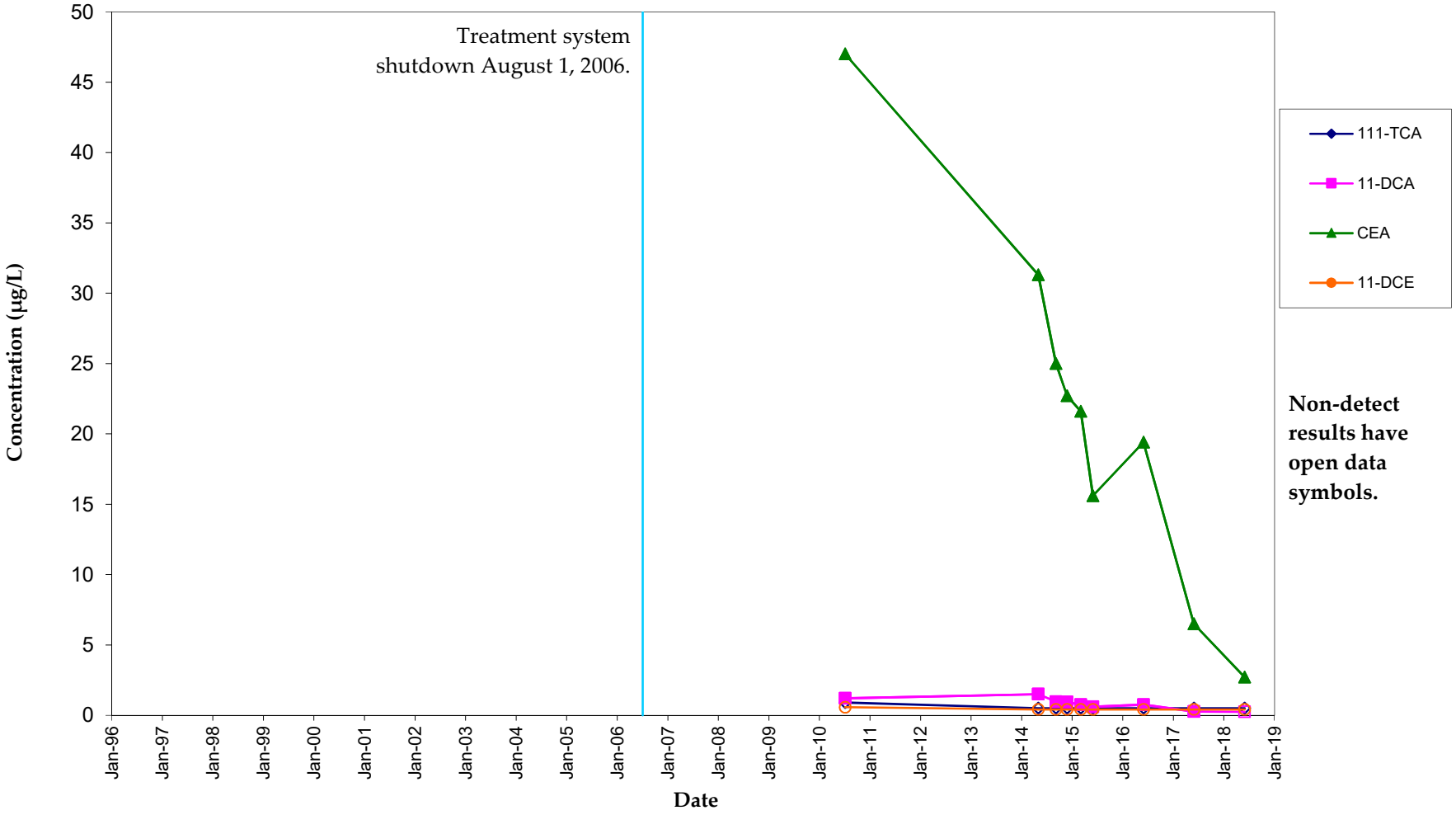


Non-detect results have open data symbols.

LW-01
VOC Concentration Trends
Lemberger Landfill



LW-07
VOC Concentration Trends
Lemberger Landfill



Appendix B
Documentation for Statistical Analysis

Table B-1

Summary of Detections above the Enforcement Standards Since March 2015

Lemberger Landfill Sites - MNA 2018 Report

Well ID	Parameter	Sample Date	Enforcement Standard (µg/L)	Result (µg/L)	Qualifier	UNITS
Wells In Current Design Management Zone (DMZ)						
RM-007D	1,1,1-TRICHLOROETHANE	23-Oct-2015	200	444		UG/L
RM-007D	1,1,1-TRICHLOROETHANE	19-Oct-2016	200	366		UG/L
RM-007D	1,1,1-TRICHLOROETHANE	10-Oct-2017	200	357		UG/L
RM-007D	1,1-DICHLOROETHENE	23-Oct-2015	7	30.2		UG/L
RM-007D	1,1-DICHLOROETHENE	19-Oct-2016	7	19.4		UG/L
RM-007D	1,1-DICHLOROETHENE	10-Oct-2017	7	26		UG/L
RM-007D	CIS-1,2-DICHLOROETHENE	23-Oct-2015	70	99.6		UG/L
RM-007D	CIS-1,2-DICHLOROETHENE	19-Oct-2016	70	78		UG/L
RM-007D	CIS-1,2-DICHLOROETHENE	10-Oct-2017	70	76.1		UG/L
RM-007D	TRICHLOROETHENE	23-Oct-2015	5	62.4		UG/L
RM-007D	TRICHLOROETHENE	19-Oct-2016	5	57.2		UG/L
RM-007D	TRICHLOROETHENE	10-Oct-2017	5	59		UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	31-Mar-2015	200	242	M1, R1j	UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	9-Oct-2015	200	260		UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	7-Apr-2016	200	203		UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	19-Oct-2016	200	239		UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	20-Mar-2017	200	224	M1j	UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	10-Oct-2017	200	259		UG/L
RM-007XD	1,1,1-TRICHLOROETHANE	31-Mar-2018	200	248	M1j	UG/L
RM-007XD	1,1-DICHLOROETHENE	31-Mar-2015	7	21.7		UG/L
RM-007XD	1,1-DICHLOROETHENE	9-Oct-2015	7	26.1		UG/L
RM-007XD	1,1-DICHLOROETHENE	7-Apr-2016	7	27.5		UG/L
RM-007XD	1,1-DICHLOROETHENE	19-Oct-2016	7	21.3		UG/L
RM-007XD	1,1-DICHLOROETHENE	20-Mar-2017	7	34.7		UG/L
RM-007XD	1,1-DICHLOROETHENE	10-Oct-2017	7	29.4		UG/L
RM-007XD	1,1-DICHLOROETHENE	31-Mar-2018	7	27.2		UG/L
RM-007XD	CIS-1,2-DICHLOROETHENE	31-Mar-2015	70	71.4	M1j	UG/L
RM-007XD	CIS-1,2-DICHLOROETHENE	9-Oct-2015	70	71.9		UG/L
RM-007XD	CIS-1,2-DICHLOROETHENE	7-Apr-2016	70	87.1		UG/L
RM-007XD	CIS-1,2-DICHLOROETHENE	20-Mar-2017	70	83.7		UG/L
RM-007XD	CIS-1,2-DICHLOROETHENE	10-Oct-2017	70	74.5		UG/L
RM-007XD	TRICHLOROETHENE	31-Mar-2015	5	34.8	M1j	UG/L
RM-007XD	TRICHLOROETHENE	9-Oct-2015	5	38.1		UG/L
RM-007XD	TRICHLOROETHENE	7-Apr-2016	5	33.8		UG/L
RM-007XD	TRICHLOROETHENE	19-Oct-2016	5	35.6		UG/L
RM-007XD	TRICHLOROETHENE	20-Mar-2017	5	39.1		UG/L
RM-007XD	TRICHLOROETHENE	10-Oct-2017	5	40.8		UG/L
RM-007XD	TRICHLOROETHENE	31-Mar-2018	5	40.9		UG/L
RM-214D	VINYL CHLORIDE	21-Oct-2015	0.2	1.6		UG/L
RM-214D	VINYL CHLORIDE	17-Oct-2016	0.2	0.84	J	UG/L
RM-214D	VINYL CHLORIDE	5-Oct-2017	0.2	0.63	J	UG/L
RM-303D	1,1,1-TRICHLOROETHANE	30-Mar-2015	200	313		UG/L
RM-303D	1,1,1-TRICHLOROETHANE	7-Oct-2015	200	389		UG/L
RM-303D	1,1,1-TRICHLOROETHANE	21-Oct-2016	200	363		UG/L
RM-303D	1,1,1-TRICHLOROETHANE	6-Oct-2017	200	310		UG/L
RM-303D	1,1-DICHLOROETHENE	30-Mar-2015	7	10.2		UG/L
RM-303D	1,1-DICHLOROETHENE	7-Oct-2015	7	14.7		UG/L
RM-303D	1,1-DICHLOROETHENE	21-Oct-2016	7	9.8		UG/L
RM-303D	1,1-DICHLOROETHENE	6-Oct-2017	7	10.1		UG/L
RM-303D	CIS-1,2-DICHLOROETHENE	30-Mar-2015	70	92.7		UG/L
RM-303D	CIS-1,2-DICHLOROETHENE	7-Oct-2015	70	120		UG/L
RM-303D	CIS-1,2-DICHLOROETHENE	21-Oct-2016	70	104		UG/L
RM-303D	CIS-1,2-DICHLOROETHENE	6-Oct-2017	70	92.1		UG/L
RM-303D	TRICHLOROETHENE	30-Mar-2015	5	70.1		UG/L

Table B-1

Summary of Detections above the Enforcement Standards Since March 2015

Lemberger Landfill Sites - MNA 2018 Report

Well ID	Parameter	Sample Date	Enforcement Standard (µg/L)	Result (µg/L)	Qualifier	UNITS
RM-303D	TRICHLOROETHENE	7-Oct-2015	5	96.7		UG/L
RM-303D	TRICHLOROETHENE	21-Oct-2016	5	90.1		UG/L
RM-303D	TRICHLOROETHENE	6-Oct-2017	5	72.9		UG/L
RM-306D	TRICHLOROETHENE	21-Oct-2016	5	5		UG/L
RM-306D	TRICHLOROETHENE	6-Oct-2017	5	6.2		UG/L
RM-307D	TRICHLOROETHENE	31-Mar-2015	5	9.3		UG/L
RM-307D	TRICHLOROETHENE	8-Oct-2015	5	8.8		UG/L
RM-307D	TRICHLOROETHENE	21-Oct-2016	5	14.2		UG/L
RM-307D	TRICHLOROETHENE	20-Mar-2017	5	9.1		UG/L
RM-307D	TRICHLOROETHENE	6-Oct-2017	5	14.2		UG/L
RM-307D	TRICHLOROETHENE	31-Mar-2018	5	13.5		UG/L
Wells in Potential Expanded DMZ						
RM-402XD	1,1-DICHLOROETHENE	20-Mar-2015	7	23.9		UG/L
RM-402XD	1,1-DICHLOROETHENE	13-Oct-2015	7	23.5		UG/L
RM-402XD	1,1-DICHLOROETHENE	8-Apr-2016	7	19.6		UG/L
RM-402XD	1,1-DICHLOROETHENE	19-Oct-2016	7	21.4		UG/L
RM-402XD	1,1-DICHLOROETHENE	16-Mar-2017	7	18.6		UG/L
RM-402XD	1,1-DICHLOROETHENE	9-Oct-2017	7	28.7		UG/L
RM-402XD	1,1-DICHLOROETHENE	31-Mar-2018	7	26		UG/L
RM-402XD	TRICHLOROETHENE	20-Mar-2015	5	14.1		UG/L
RM-402XD	TRICHLOROETHENE	13-Oct-2015	5	15.7		UG/L
RM-402XD	TRICHLOROETHENE	8-Apr-2016	5	12.1		UG/L
RM-402XD	TRICHLOROETHENE	19-Oct-2016	5	13.7		UG/L
RM-402XD	TRICHLOROETHENE	16-Mar-2017	5	12.5		UG/L
RM-402XD	TRICHLOROETHENE	9-Oct-2017	5	15.3		UG/L
RM-402XD	TRICHLOROETHENE	31-Mar-2018	5	14.8		UG/L
RM-402XXD	TRICHLOROETHENE	20-Mar-2015	5	7.7		UG/L
RM-402XXD	TRICHLOROETHENE	13-Oct-2015	5	8.8		UG/L
RM-402XXD	TRICHLOROETHENE	8-Apr-2016	5	9.6		UG/L
RM-402XXD	TRICHLOROETHENE	19-Oct-2016	5	7.9		UG/L
RM-402XXD	TRICHLOROETHENE	16-Mar-2017	5	9		UG/L
RM-402XXD	TRICHLOROETHENE	9-Oct-2017	5	8.8		UG/L
RM-402XXD	TRICHLOROETHENE	31-Mar-2018	5	6.2		UG/L
RM-403XD	1,1-DICHLOROETHENE	19-Mar-2015	7	10.8		UG/L
RM-403XD	1,1-DICHLOROETHENE	26-Jun-2015	7	8.7		UG/L
RM-403XD	1,1-DICHLOROETHENE	24-Sep-2015	7	11.4		UG/L
RM-403XD	1,1-DICHLOROETHENE	21-Dec-2015	7	8.2		UG/L
RM-403XD	1,1-DICHLOROETHENE	27-Jun-2016	7	13.3		UG/L
RM-403XD	1,1-DICHLOROETHENE	28-Sep-2016	7	9.7		UG/L
RM-403XD	1,1-DICHLOROETHENE	10-Dec-2016	7	10.4		UG/L
RM-403XD	1,1-DICHLOROETHENE	15-Mar-2017	7	7.7		UG/L
RM-403XD	1,1-DICHLOROETHENE	25-Sep-2017	7	10.2		UG/L
RM-403XD	1,1-DICHLOROETHENE	11-Dec-2017	7	8.5		UG/L
RM-403XD	1,1-DICHLOROETHENE	27-Mar-2018	7	12.1		UG/L
RM-403XD	1,1-DICHLOROETHENE	27-Jun-2018	7	9.2		UG/L
RM-403XD	TRICHLOROETHENE	19-Mar-2015	5	16.2		UG/L
RM-403XD	TRICHLOROETHENE	26-Jun-2015	5	10.7		UG/L
RM-403XD	TRICHLOROETHENE	24-Sep-2015	5	16.2		UG/L
RM-403XD	TRICHLOROETHENE	21-Dec-2015	5	10.6		UG/L
RM-403XD	TRICHLOROETHENE	1-Apr-2016	5	6.7		UG/L
RM-403XD	TRICHLOROETHENE	27-Jun-2016	5	17.7		UG/L
RM-403XD	TRICHLOROETHENE	28-Sep-2016	5	13.7		UG/L
RM-403XD	TRICHLOROETHENE	10-Dec-2016	5	15.5		UG/L
RM-403XD	TRICHLOROETHENE	15-Mar-2017	5	9		UG/L
RM-403XD	TRICHLOROETHENE	25-Sep-2017	5	21.7		UG/L

Table B-1

Summary of Detections above the Enforcement Standards Since March 2015

Lemberger Landfill Sites - MNA 2018 Report

Well ID	Parameter	Sample Date	Enforcement Standard (µg/L)	Result (µg/L)	Qualifier	UNITS
RM-403XD	TRICHLOROETHENE	11-Dec-2017	5	17.4		UG/L
RM-403XD	TRICHLOROETHENE	27-Mar-2018	5	18		UG/L
RM-403XD	TRICHLOROETHENE	27-Jun-2018	5	15.3		UG/L
Plume Wells						
RM-003D	TRICHLOROETHENE	28-Jun-2016	5	6		UG/L
RM-003D	TRICHLOROETHENE	28-Sep-2016	5	5.1		UG/L
RM-003D	TRICHLOROETHENE	9-Dec-2016	5	5		UG/L
RM-003D	TRICHLOROETHENE	26-Jun-2017	5	6		UG/L
RM-003D	TRICHLOROETHENE	27-Sep-2017	5	7.3		UG/L
RM-003D	TRICHLOROETHENE	10-Dec-2017	5	5.9		UG/L
RM-003XXD	TRICHLOROETHENE	22-Sep-2015	5	6.7		UG/L
RM-003XXD	TRICHLOROETHENE	20-Dec-2015	5	6.1		UG/L
RM-008D	TRICHLOROETHENE	20-Mar-2015	5	6.2		UG/L
RM-008D	TRICHLOROETHENE	13-Oct-2015	5	5.2		UG/L
RM-008D	TRICHLOROETHENE	8-Apr-2016	5	12		UG/L
RM-008D	TRICHLOROETHENE	20-Oct-2016	5	5.8		UG/L
RM-008D	TRICHLOROETHENE	9-Oct-2017	5	6.9		UG/L
RM-008D	TRICHLOROETHENE	31-Mar-2018	5	6.5		UG/L

Notes:

1. This summary table only includes detectiosn from wells that are currently in the monitoring program.

Appendix B-2
Summary of Sen's Slope and Ordinary Least Squares (OLS) Regression Analysis Results - Calculation Input Values
Lemberger Landfill Sites - MNA 2018 Report

Well ID	Compound	Current ES Status**	Date Range	Sen's Slope Trend (median Q)	Ordinary Least Squares (OLS) Regression	Target ES (LN of conc in µg/L)	slope	int	Predicted Date to Reach ES (julian date)	Predicted Date to Reach ES
RM-003D	TCE	Below ES 8 of 14 events; Last exc 12/2017; Mean since 6/2011 = 4.95 µg/L	Full Range	Down	y = -3.962E-05x + 3.075E+00	1.609437912	-3.96E-05	3.08E+00	36990.46	N/A (rebound)
			Post Shutdown	No Trend	y = 8.275E-05x - 1.954E+00	1.609437912	8.28E-05	-1.95E+00	43062.69	N/A
			Stable Range (6/2011)	No Trend	y = -1.054E-04x + 6.028E+00	1.609437912	-1.05E-04	6.03E+00	41921.84	10/9/2014
RM-003XXD	TCE	Below ES 12 of 14 events; Last exc 12/2015	Full Range		N/A [installed in 2012]					
			Post Shutdown	Down	y = -4.065E-04x + 1.860E+01	1.609437912	-4.07E-04	1.86E+01	41797.20	6/7/2014
RM-007D	TCE	Above ES	Full Range	Up	y = 3.977E-05x + 2.219E+00	1.609437912	3.98E-05	2.22E+00	-15327.18	N/A
			Post Shutdown	Up	y = 1.515E-04x - 2.337E+00	1.609437912	1.52E-04	-2.34E+00	26049.10	N/A
			Last 8	No Trend	y = -1.831E-05x + 4.841E+00	1.609437912	-1.83E-05	4.8411	176497.11	3/25/2383
	cis-1,2-DCE	Above ES	Full Range	Down	y = -7.856E-05x + 7.906E+00	4.248495242	-7.86E-05	7.91E+00	46556.83	6/18/2027
			Post Shutdown	Down	y = -1.385E-04x + 1.029E+01	4.248495242	-1.39E-04	1.03E+01	43620.97	6/4/2019
	111TCA	Above ES	Full Range	Down	y = -1.281E-04x + 1.140E+01	5.298317367	-1.28E-04	1.14E+01	47632.18	5/29/2030
			Post Shutdown	Down	y = -1.509E-04x + 1.230E+01	5.298317367	-1.51E-04	1.23E+01	46399.49	1/12/2027
	11DCE	Above ES	Full Range	Down	y = -1.210E-04x + 8.410E+00	1.945910149	-1.21E-04	8.41E+00	53422.23	4/5/2046
			Post Shutdown	No Trend	y = -7.518E-05x + 6.489E+00	1.945910149	-7.52E-05	6.49E+00	60429.50	6/11/2065
RM-007XD	TCE	Above ES	Full Range	Up	y = 3.728E-04x - 1.188E+01	1.609437912	3.73E-04	-1.19E+01	36184.11	N/A
			Post Shutdown	Up	y = 1.591E-04x - 3.110E+00	1.609437912	1.59E-04	-3.11E+00	29663.34	N/A
			Stable Range (10/2014)	No Trend	y = 1.901E-05x + 2.838E+00	1.609437912	1.90E-05	2.84E+00	-64627.15	N/A
	cis-1,2-DCE	Above ES 5 of 8 events	Full Range	Up	y = 2.816E-04x - 7.199E+00	4.248495242	2.82E-04	-7.20E+00	40651.62	N/A
			Post Shutdown	No Trend	y = -2.255E-05x + 5.275E+00	4.248495242	-2.26E-05	5.28E+00	45521.28	8/17/2024
	111TCA	Above ES	Full Range	Up	y = 4.070E-04x - 1.143E+01	5.298317367	4.07E-04	-1.14E+01	41101.52	N/A
			Post Shutdown	Up	y = 2.508E-04x - 4.996E+00	5.298317367	2.51E-04	-5.00E+00	41045.92	N/A
			Last 8	No Trend	y = -3.891E-05x + 7.148E+00	5.298317367	-3.89E-05	7.1483	47545.17	3/3/2030
	11DCE	Above ES	Full Range	Up	y = 3.372E-04x - 1.066E+01	1.945910149	3.37E-04	-1.07E+01	37384.08	N/A
			Post Shutdown	No Trend	y = 5.655E-05x + 8.554E-01	1.945910149	5.66E-05	0.8554	19284.00	N/A
			Stable Range (4/2013)	No Trend	y = 1.185E-06x + 3.252E+00	1.945910149	1.19E-06	3.25E+00	-1102185.53	N/A
			Projected from TCA slope		y = -3.891E-05x + 4.984E+00	1.945910149	-3.89E-05	4.98E+00	78073.24	10/2/2113
RM-008D	TCE	Above ES 7 of 8 events; Mean since 6/2011 = 6.48 µg/L	Full Range	Down	y = -8.869E-05x + 5.352E+00	1.609437912	-8.87E-05	5.35E+00	42198.24	N/A (rebound)
			Post Shutdown	Up	y = 1.820E-04x - 5.793E+00	1.609437912	1.82E-04	-5.79E+00	40672.74	N/A
			Stable Range (6/2011)	No Trend	y = -4.181E-05x + 3.614E+00	1.609437912	-4.18E-05	3.61E+00	47944.56	4/6/2031
RM-214D	VC	Above ES	Full Range		[installed in 2006]					
			Post Shutdown	Down	y = -2.197E-04x + 9.316E+00	-1.609437912	-2.20E-04	9.32E+00	49728.89	2/23/2036
RM-303D	TCE	Above ES	Full Range	No Trend	y = -3.066E-05x + 5.684E+00	1.609437912	-3.07E-05	5.68E+00	132895.05	11/7/2263
			Post Shutdown	Down	y = -1.354E-04x + 1.000E+01	1.609437912	-1.35E-04	1.00E+01	61968.70	8/28/2069
	cis-1,2-DCE	Above ES	Full Range	Down	y = -2.044E-04x + 1.342E+01	4.248495242	-2.04E-04	1.34E+01	44870.38	11/5/2022
			Post Shutdown	Down	y = -4.130E-04x + 2.193E+01	4.248495242	-4.13E-04	2.19E+01	42812.36	3/18/2017
	111TCA	Above ES	Full Range	Down	y = -2.546E-04x + 1.653E+01	5.298317367	-2.55E-04	1.65E+01	44115.01	10/11/2020
			Post Shutdown	Down	y = -3.497E-04x + 2.043E+01	5.298317367	-3.50E-04	2.04E+01	43270.47	6/19/2018
	11DCE	Above ES	Full Range	Down	y = -3.271E-04x + 1.627E+01	1.945910149	-3.27E-04	1.63E+01	43791.16	11/22/2019
			Post Shutdown	Down	y = -4.687E-04x + 2.207E+01	1.945910149	-4.69E-04	2.21E+01	42935.97	7/19/2017

Appendix B-2
Summary of Sen's Slope and Ordinary Least Squares (OLS) Regression Analysis Results - Calculation Input Values
Lemberger Landfill Sites - MNA 2018 Report

Well ID	Compound	Current ES Status**	Date Range	Sen's Slope Trend (median Q)	Ordinary Least Squares (OLS) Regression	Target ES (LN of conc in µg/L)	slope	int	Predicted Date to Reach ES (julian date)	Predicted Date to Reach ES
RM-306D	TCE	Above ES 2 of 4 events	Full Range	Down	y = -5.289E-05x + 3.908E+00	1.609437912	-5.29E-05	3.91E+00	43459.29	12/25/2018
			Post Shutdown	No Trend	y = -8.331E-06x + 2.059E+00	1.609437912	-8.33E-06	2.06E+00	53962.56	9/27/2047
RM-307D	TCE	Above ES 6 of 7 events	Full Range	No Trend	y = 1.702E-05x + 1.474E+00	1.609437912	1.70E-05	1.47E+00	7957.57	N/A (rebound)
			Post Shutdown	Up	y = 2.522E-04x - 8.240E+00	1.609437912	2.52E-04	-8.24E+00	39054.08	N/A (rebound)
			Stable Range	No Trend	y = -3.959E-05x + 4.071E+00	1.609437912	-3.96E-05	4.07E+00	62176.36	3/24/2070
RM-402XD	TCE	Above ES	Full Range		N/A [installed in 2012]					
			Post Shutdown	No Trend	y = -2.943E-05x + 3.915E+00	1.609437912	-2.94E-05	3.92E+00	78340.54	6/26/2114
	111TCA	Below ES; included for est of slope	Full Range		N/A [installed in 2012]					
			Post Shutdown	No Trend	y = -7.479E-05x + 8.138E+00	5.298317367	-7.48E-05	8.138	37968.75	12/13/2003
	11DCE	Above ES	Full Range		N/A [installed in 2012]					
			Post Shutdown	No Trend	y = 1.390E-05x + 2.546E+00	1.945910149	1.39E-05	2.55E+00	-43171.93	N/A
			Projected from TCA slope		y = -7.479E-05x + 6.488E+00	1.945910149	-7.48E-05	6.49E+00	60734.94	4/12/2066
RM-402XXD	TCE	Above ES	Full Range		N/A [installed in 2012]					
			Post Shutdown	Down	y = -2.243E-04x + 1.170E+01	1.609437912	-2.24E-04	1.17E+01	44986.90	3/1/2023
RM-403XD	TCE	Above ES 13 of 14 events	Full Range		N/A [installed in 2012]					
			Post Shutdown	No Trend	y = -2.113E-05x + 3.485E+00	1.609437912	-2.11E-05	3.49E+00	88763.00	1/7/2143
	11DCE	Above ES 12 of 14 events	Full Range		N/A [installed in 2012]					
			Post Shutdown	Down	y = -2.566E-04x + 1.312E+01	1.945910149	-2.57E-04	1.31E+01	43546.73	3/22/2019

Footnotes:
* Concentration rebound following the treatment system shutdown renders date calculation invalid for the specified date range
**"Stable Range" = period over which concentrations appear to be stable or becoming stable. A minimum of 8 rounds of data are included in the analysis.

Notes:
Only wells in the current monitoring program and parameters that have exceeded the Enforcement Standard (ES) concentration at any time during the period from March (Q1) 2015 to June (Q2) 2018 are included in this analysis. CVOC concentrations at other site monitoring wells are already below the ES.

Form of the regression line is Y = mX+b, where:
Y = concentration (natural log of µg/L)
X = time
m = slope of the regression line
b = y-intercept of the regression line

Solving for "X" and inserting the natural log of the ES concentration as "Y" yields the estimated time to reach the ES concentration.

Green highlight = Compound shown does not exceed an ES, but is presented to determine slope to apply to daughter compound.
Blue highlight = Prediction of date to reach ES for 1,1-DCE is estimated using the slope of the regression line for the parent compound 111-TCA, with the assumption that as concentrations of the parent compound decrease, concentrations of the daughter compounds will follow.

Appendix B-3
Calculation of Projected Trends - 1,1-Dichloroethene
Lemberger Landfill Sites - MNA 2018 Report

Well ID	Compound	current status	Date Range	Linear Regression	Target ES (LN of conc in µg/L)	slope	int	Predicted Date to Reach ES (julian date)	Predicted Date to Reach ES	
RM-007XD										
	111TCA	Above ES	Full Range	y = 4.070E-04x - 1.143E+01	5.298317367	4.07E-04	-1.14E+01	41101.52	N/A	
			Post Shutdown	y = 2.508E-04x - 4.996E+00	5.298317367	2.51E-04	-5.00E+00	41045.92	N/A	
			Last 8	y = -3.891E-05x + 7.148E+00	5.298317367	-3.89E-05	7.1483	47545.17		3/3/2030 use this slope to project 11DCE
	11DCE	Above ES	Full Range	y = 3.372E-04x - 1.066E+01	1.945910149	3.37E-04	-1.07E+01	37384.08	N/A	
			Post Shutdown	y = 5.655E-05x + 8.554E-01	1.945910149	5.66E-05	0.8554	19284.00	N/A	
			Stable Range	y = 1.185E-06x + 3.252E+00	1.945910149	1.19E-06	3.25E+00	-1102185.53	N/A	
			Projected from TCA slope	y = -3.891E-05x + 4.984E+00	1.945910149	-3.89E-05	4.98E+00	78073.24		10/2/2113

Y=mX+b
b = Y-(mX)

Where:
- Y = nat log of most recent 11DCE concentration (27.2 µg/L) — 3.303216973 µg/L
- m = slope from 111TCA "last 8" — -3.89E-05
- X = most recent sample date (3/31/18) — 43190.00

b = 4.984

Two points for graphing:	X	Y
	0	4.984
	43190.00	3.303217

Well ID	Compound	current status	Date Range	Linear Regression	Target ES (LN of conc in µg/L)	slope	int	Predicted Date to Reach ES (julian date)	Predicted Date to Reach ES	
RM-402XD										
	111TCA	Below ES; i	Post Shutdown	y = -7.479E-05x + 8.138E+00	5.298317367	-7.48E-05	8.138	37968.75	12/13/2003	use this slope to project 11DCE
	11DCE	Above ES	Post Shutdown	y = 1.390E-05x + 2.546E+00	1.945910149	1.39E-05	2.55E+00	-43171.93	N/A	
			Projected from TCA slope	y = -7.479E-05x + 6.488E+00	1.945910149	-7.48E-05	6.49E+00	60734.94		4/12/2066

Y=mX+b
b = Y-(mX)

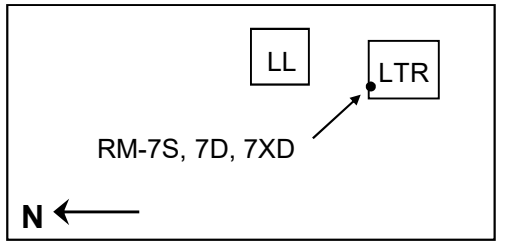
Where:
- Y = nat log of most recent 11DCE concentration (26 µg/L) — 3.258096538
- m = slope from 111TCA "post shutdown" — -7.48E-05
- X = most recent sample date (3/31/18) — 43190.00

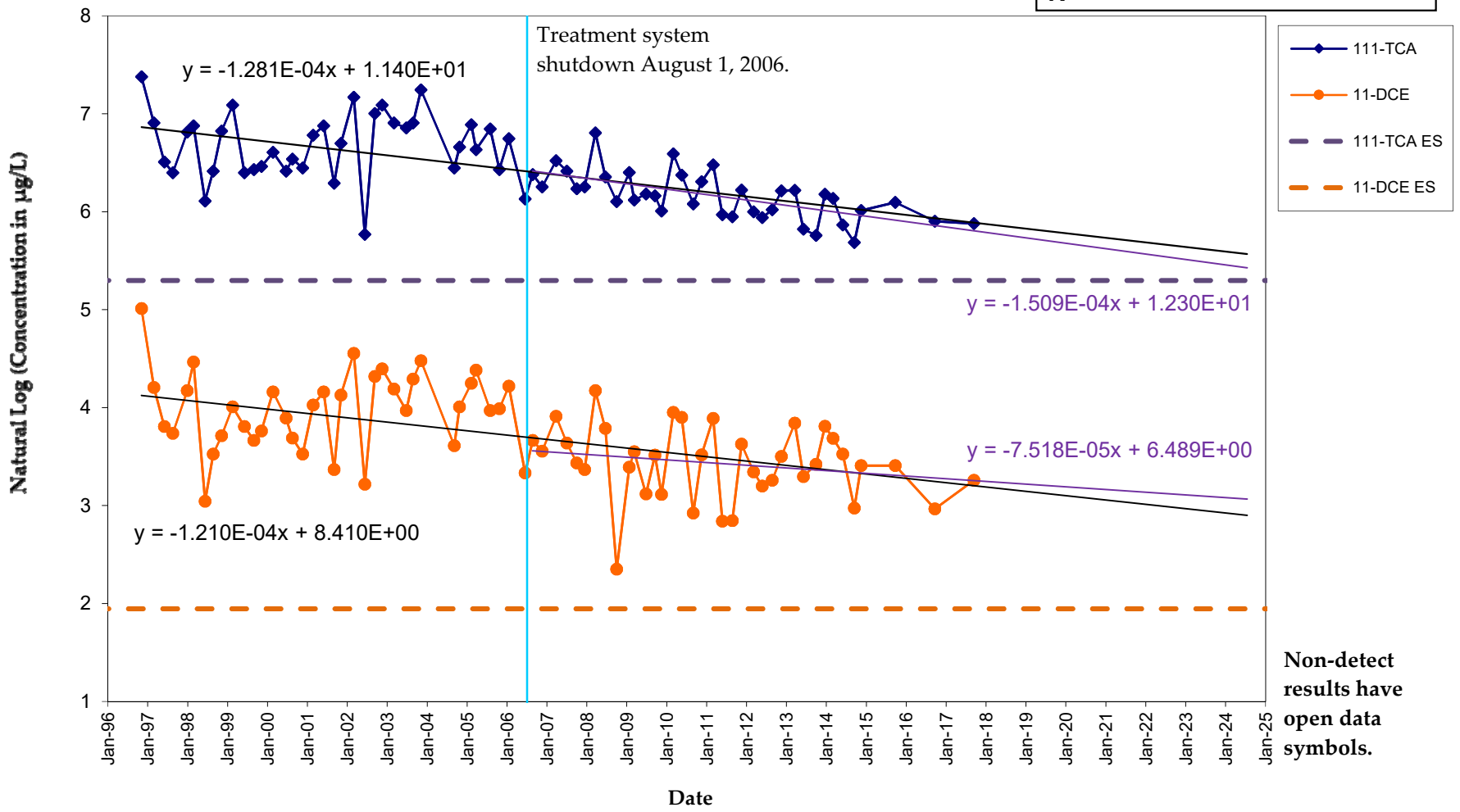
b = 6.488

Two points for graphing:	X	Y
	0	6.488
	43190.00	3.258097

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-007D
VOC Concentration Trends
Lemberger Landfill

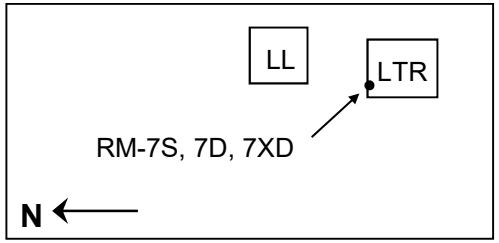


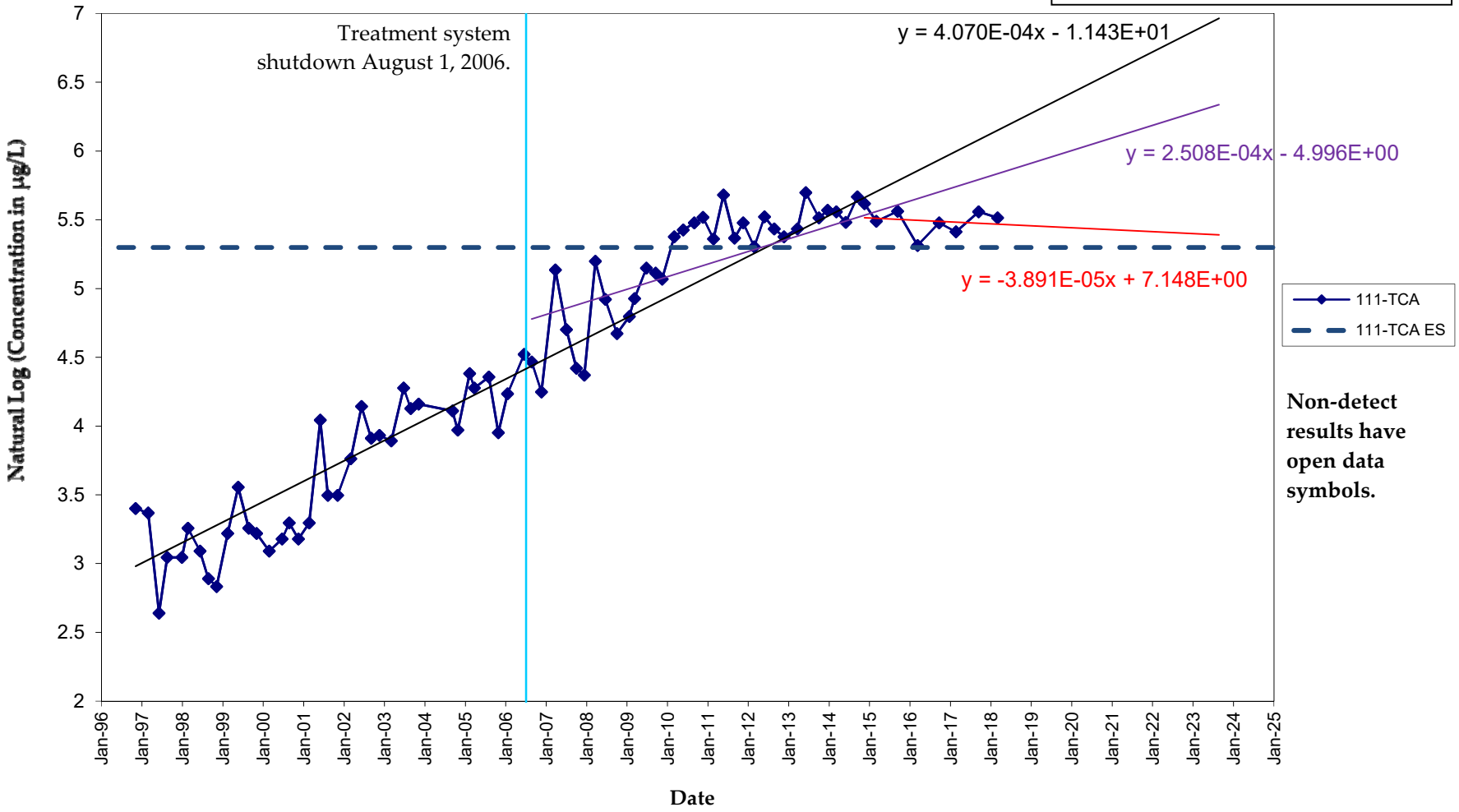


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-007XD
VOC Concentration Trends
Lemberger Landfill

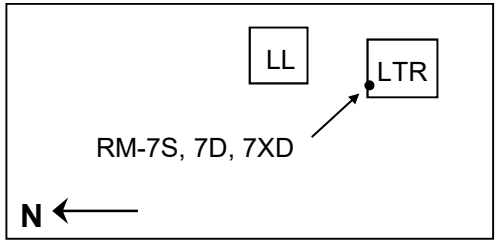


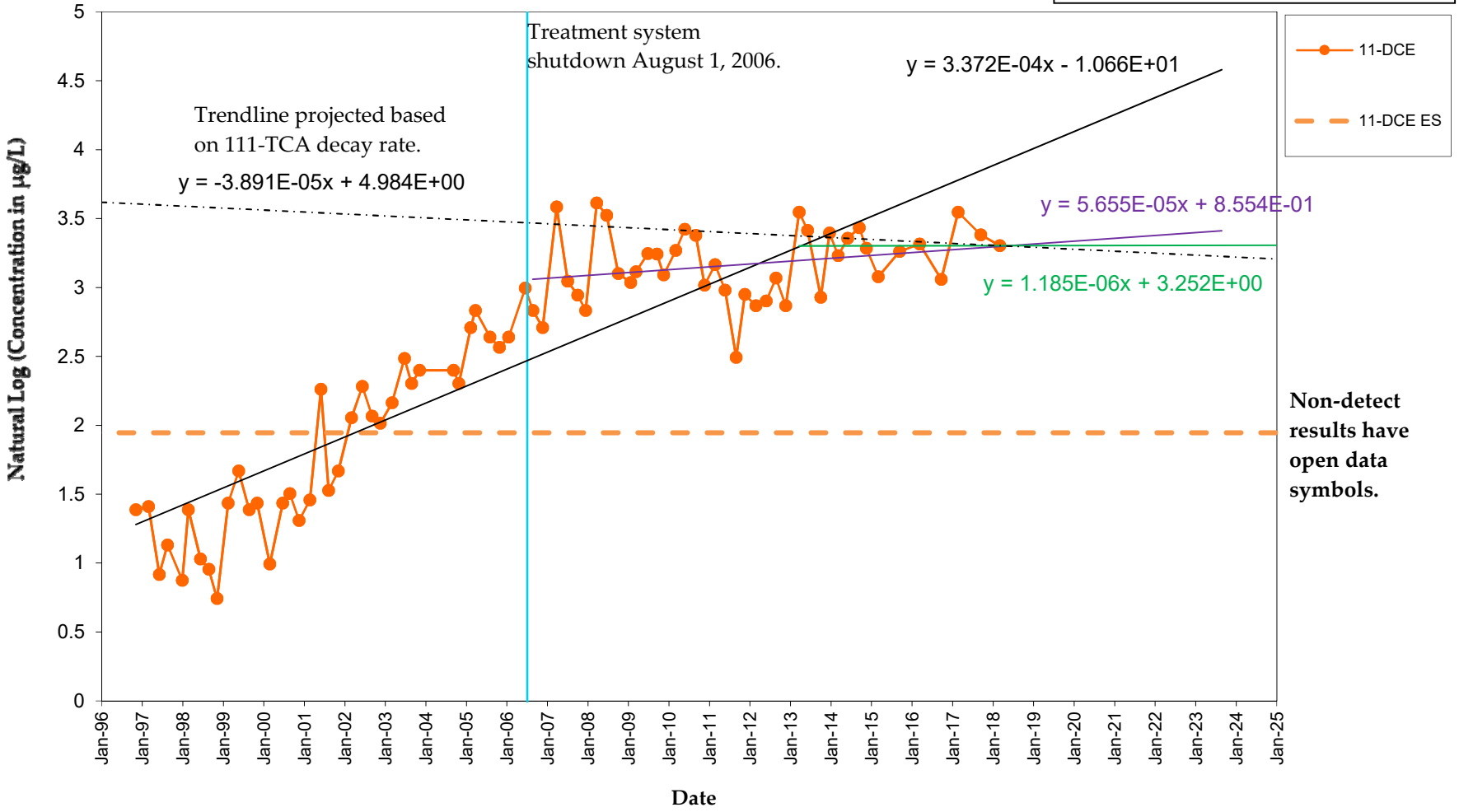


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

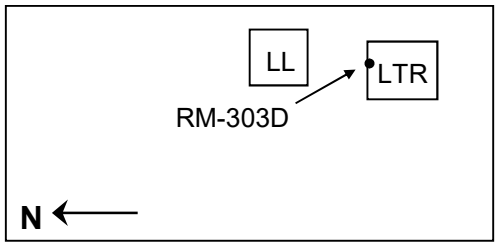
RM-007XD
VOC Concentration Trends
Lemberger Landfill

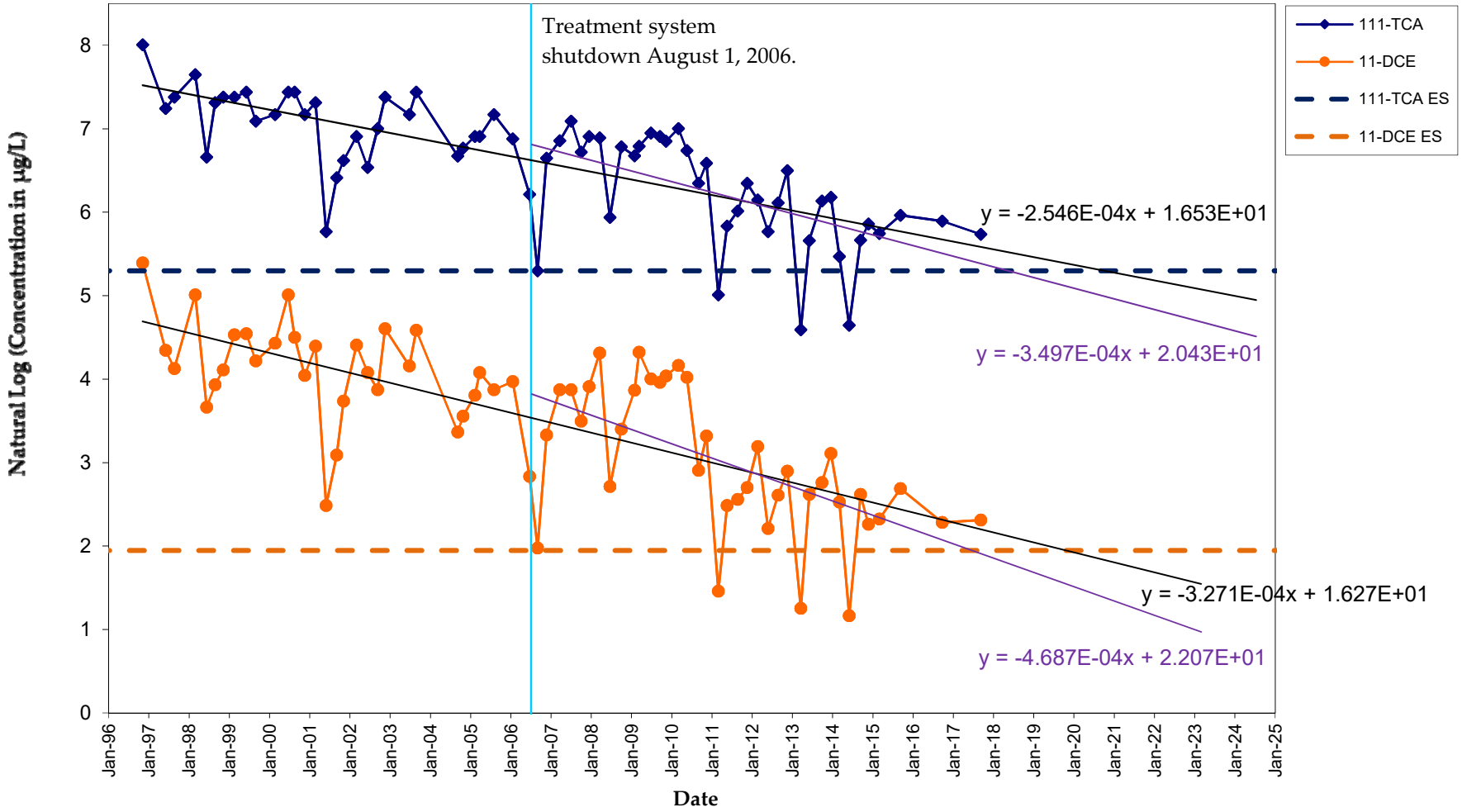




Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

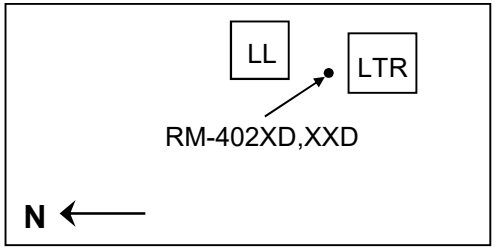
RM-303D
VOC Concentration Trends
Lemberger Landfill

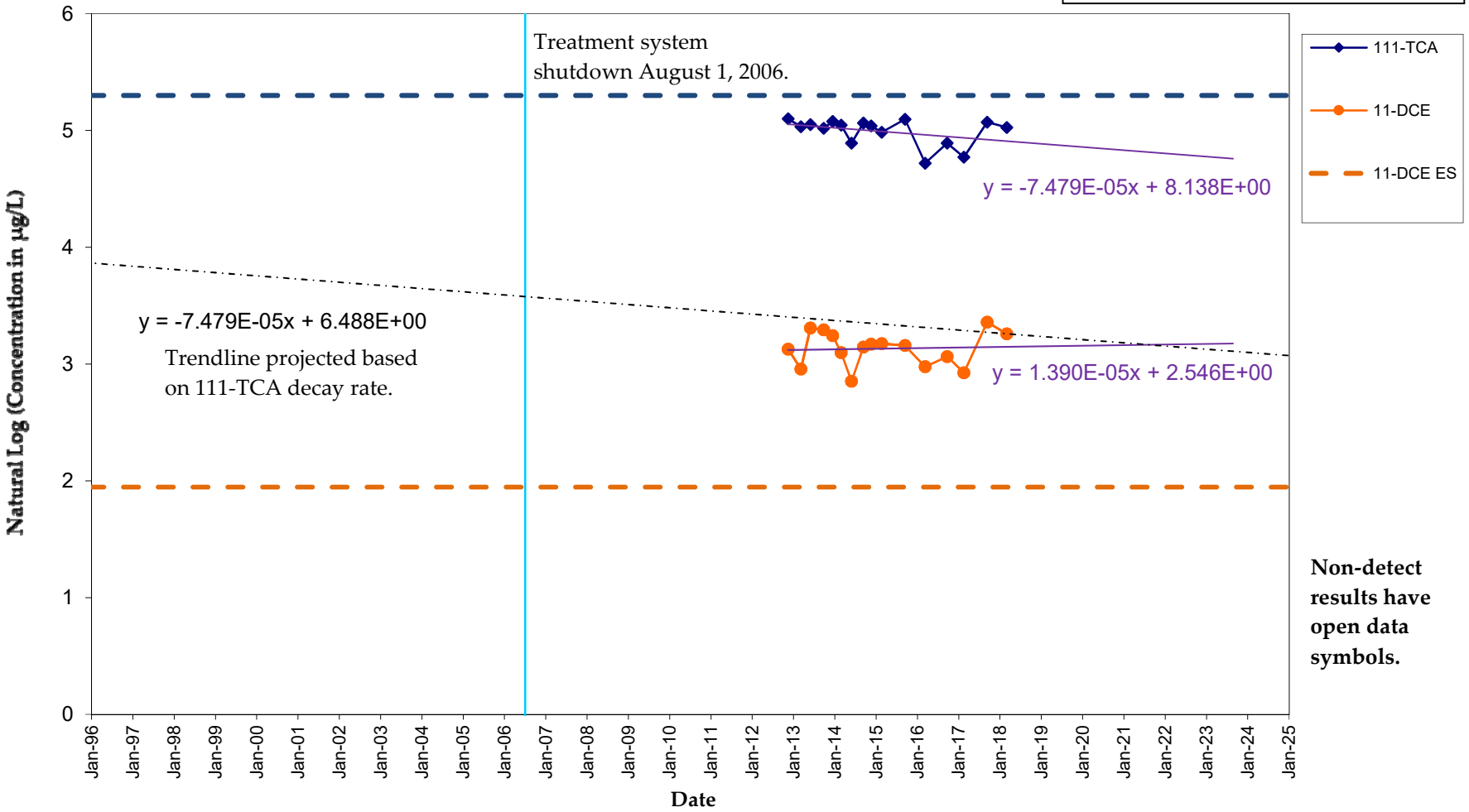




Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-402XD
VOC Concentration Trends
Lemberger Landfill

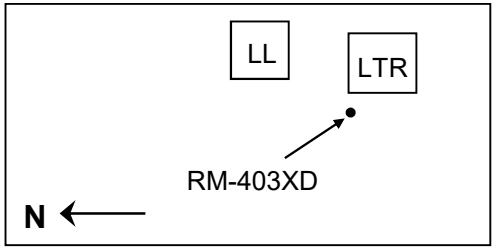


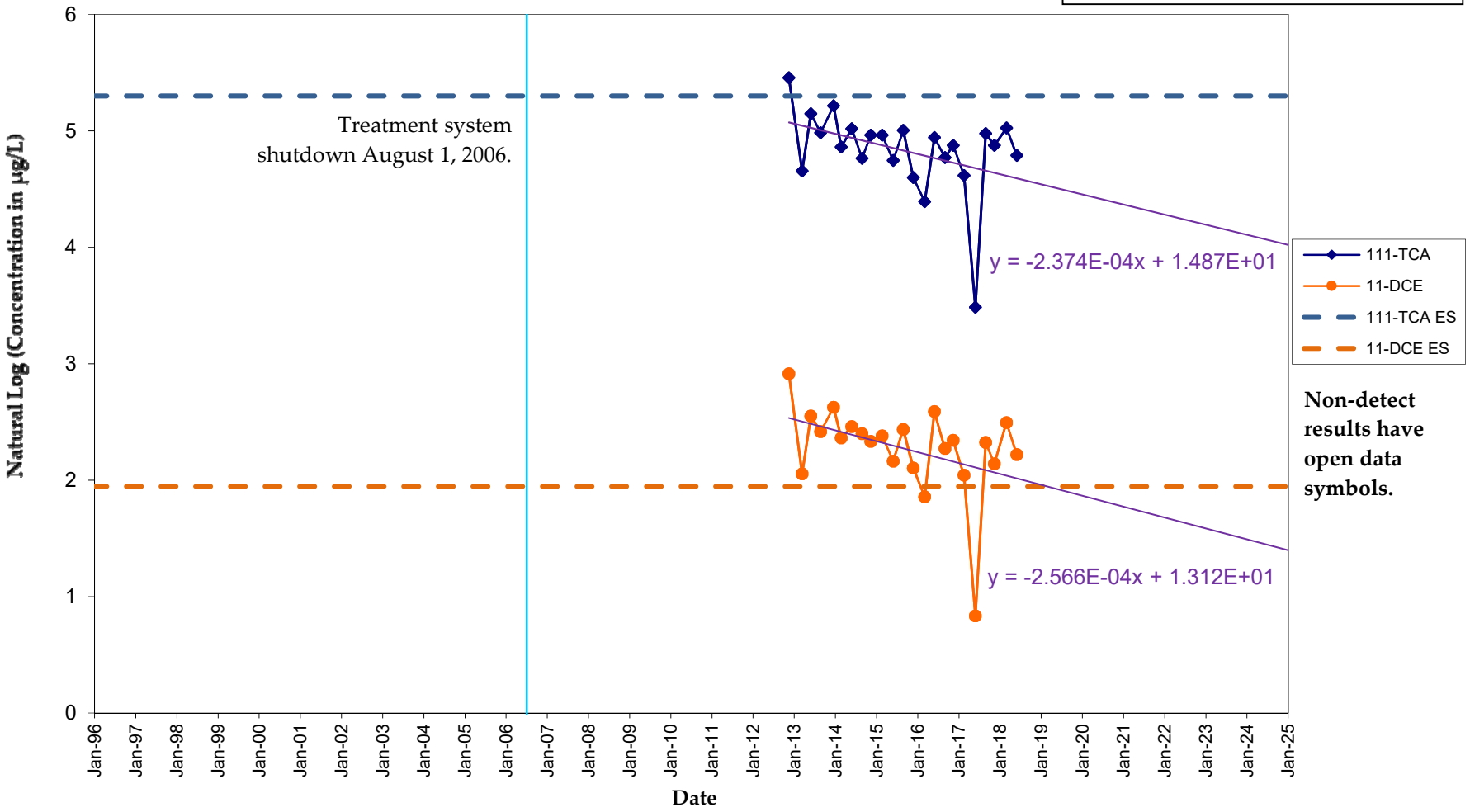


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

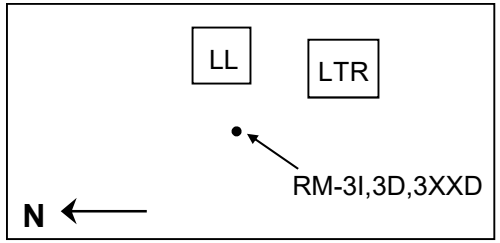
RM-403XD
VOC Concentration Trends
Lemberger Landfill

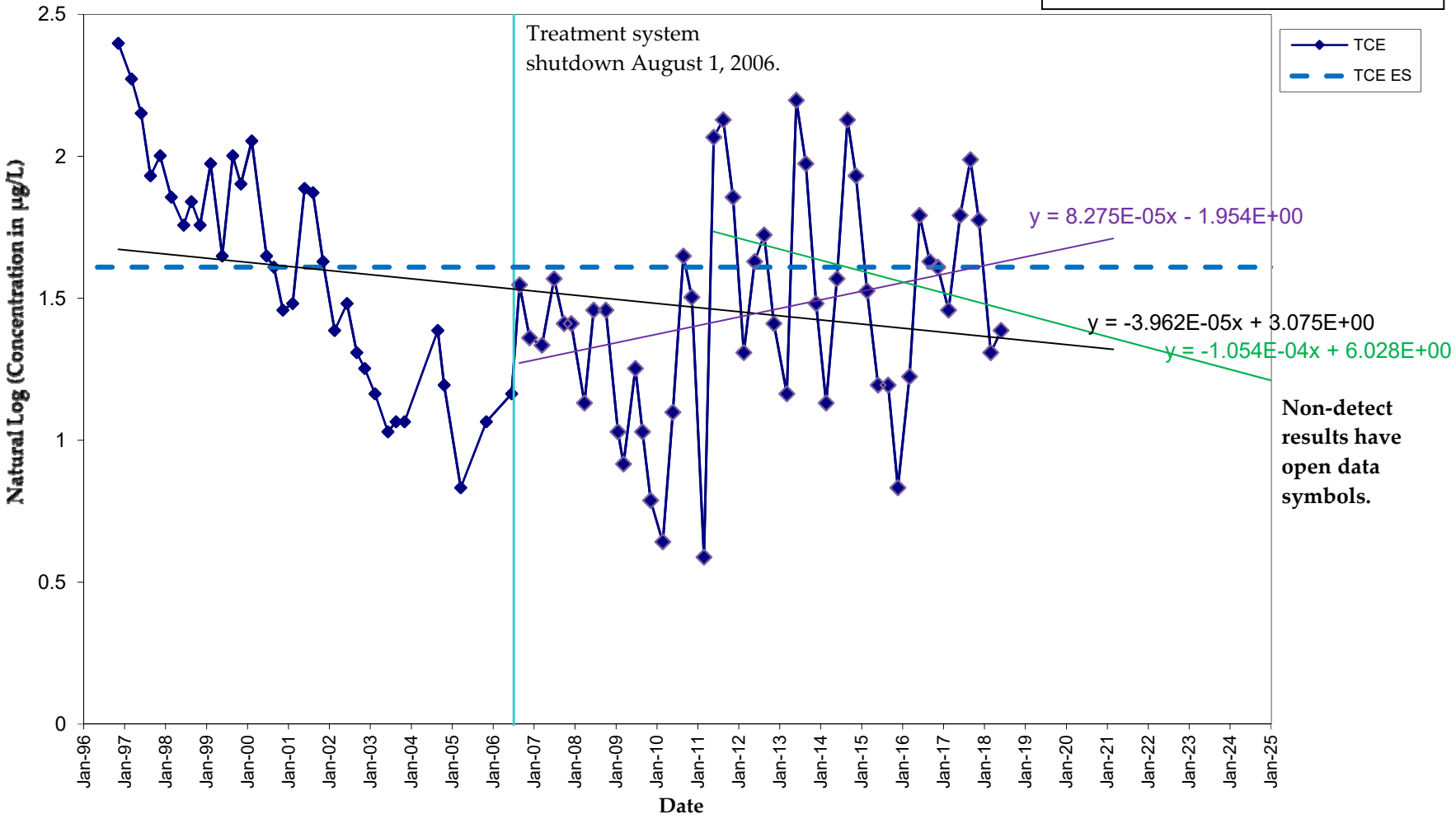




Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-003D
VOC Concentration Trends
Lemberger Landfill

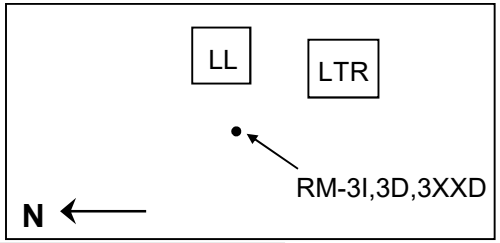


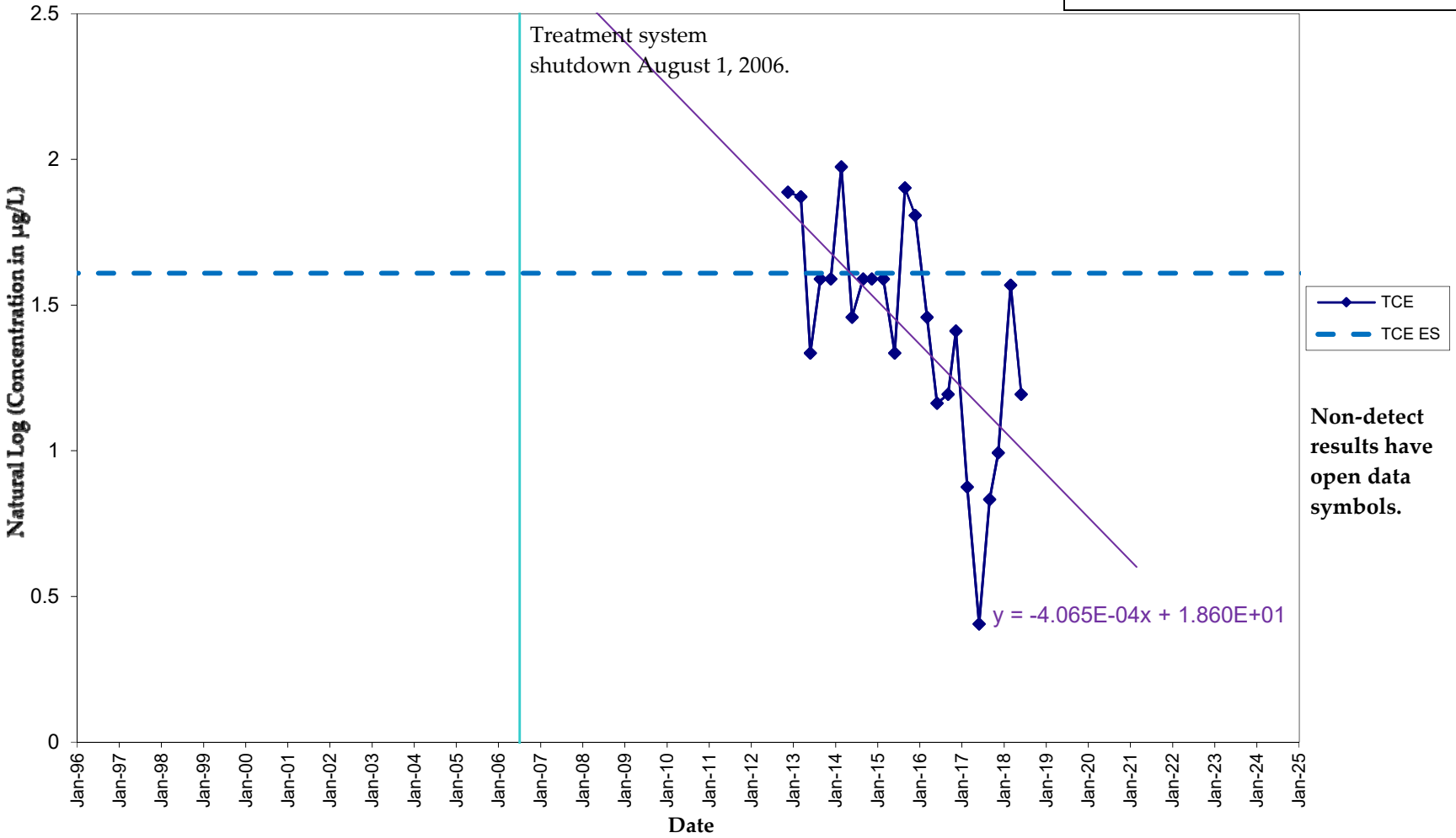


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-003XXD
VOC Concentration Trends
Lemberger Landfill

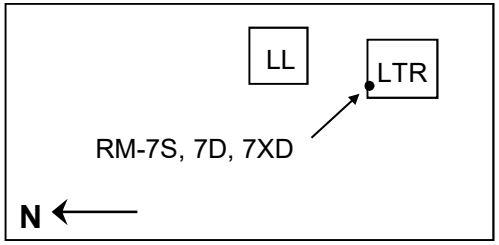


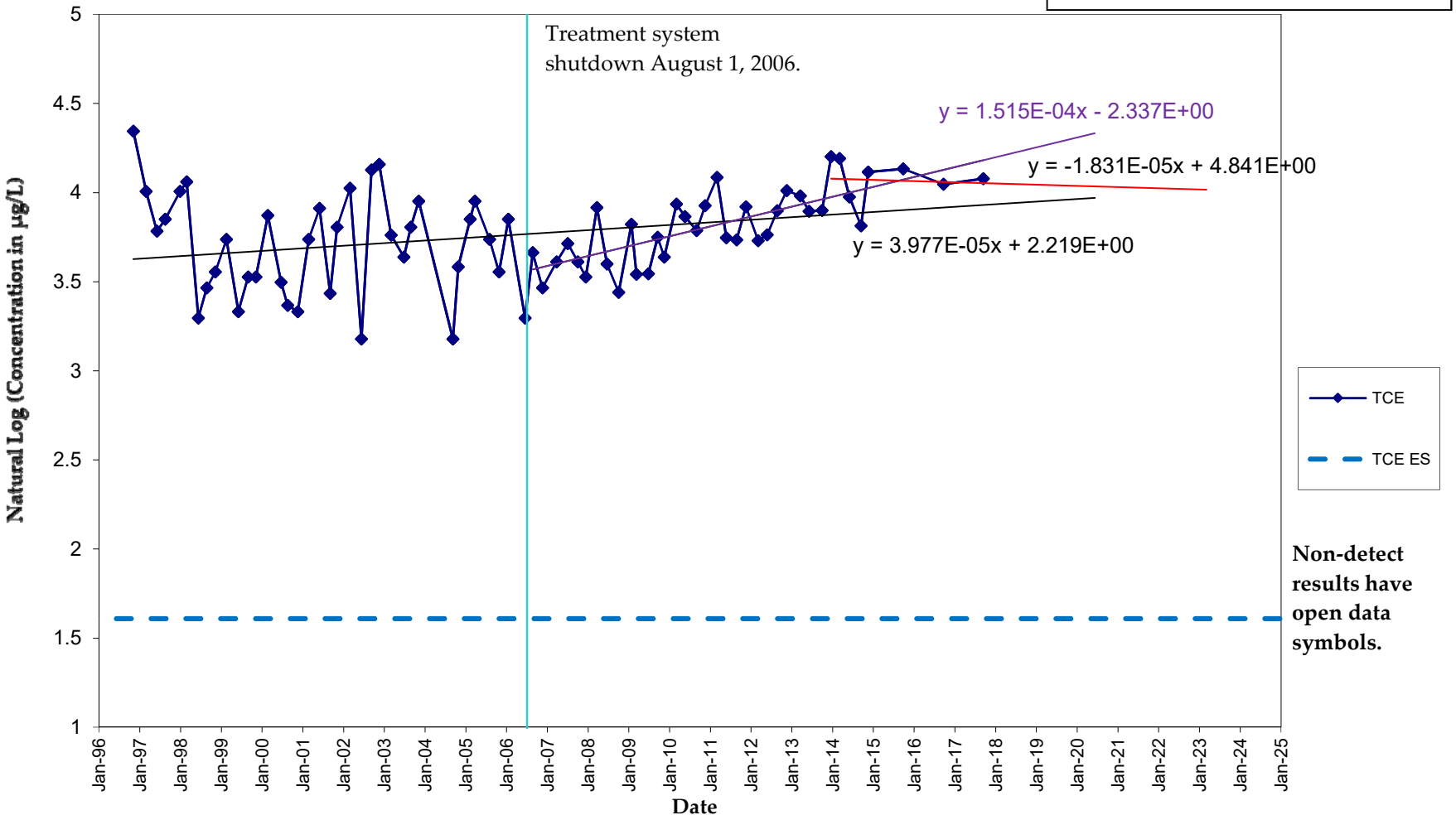


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-007D
VOC Concentration Trends
Lemberger Landfill

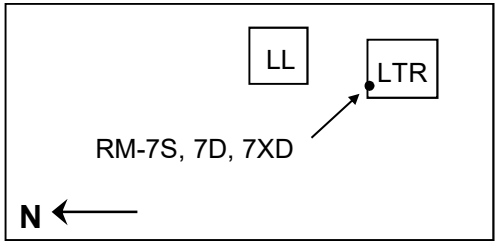


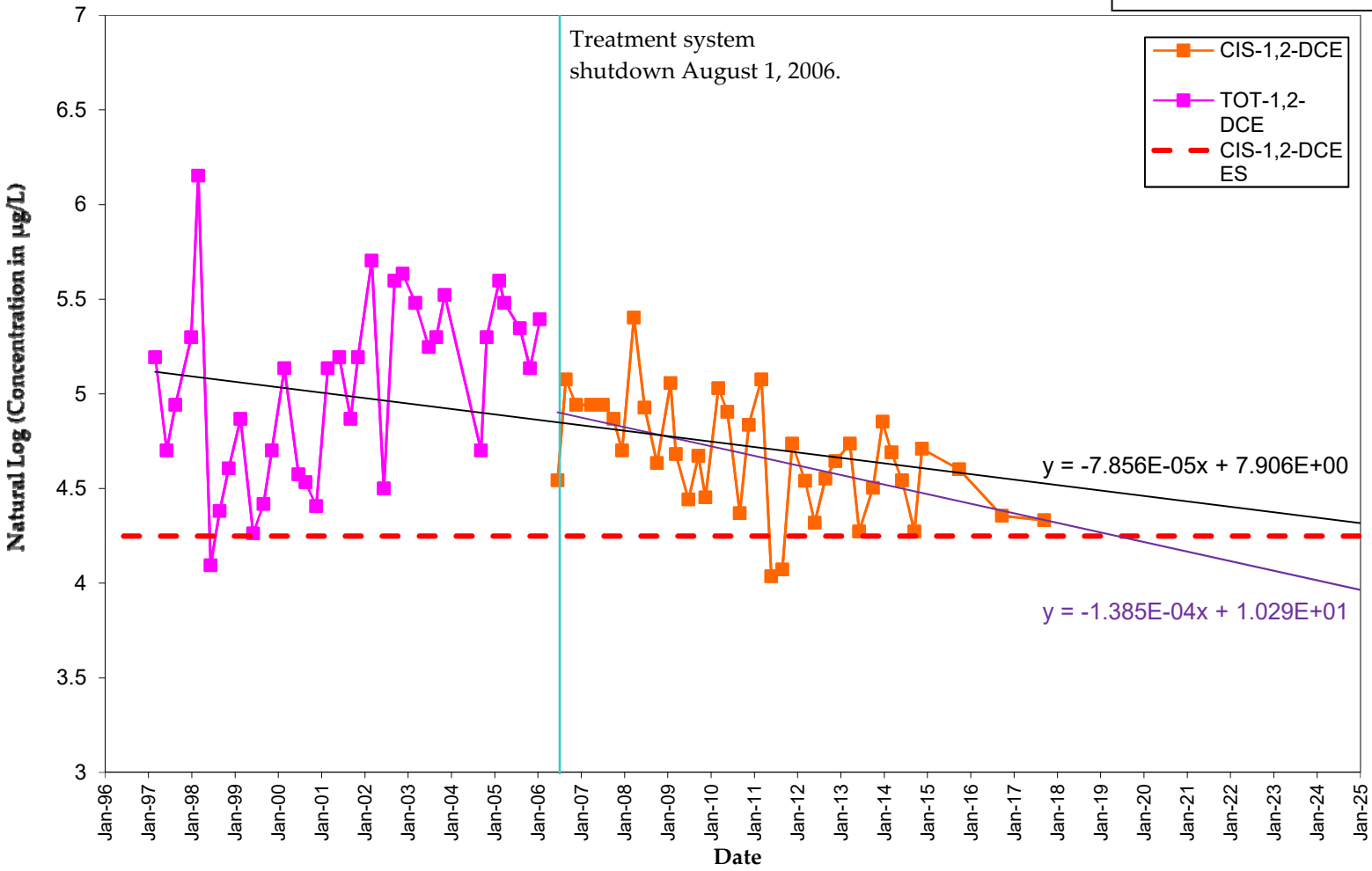


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

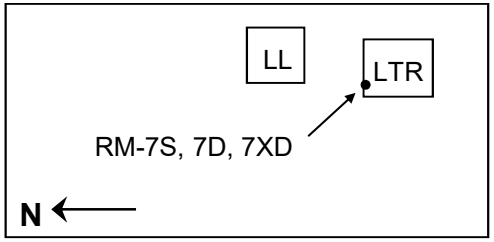
RM-007D
VOC Concentration Trends
Lemberger Landfill

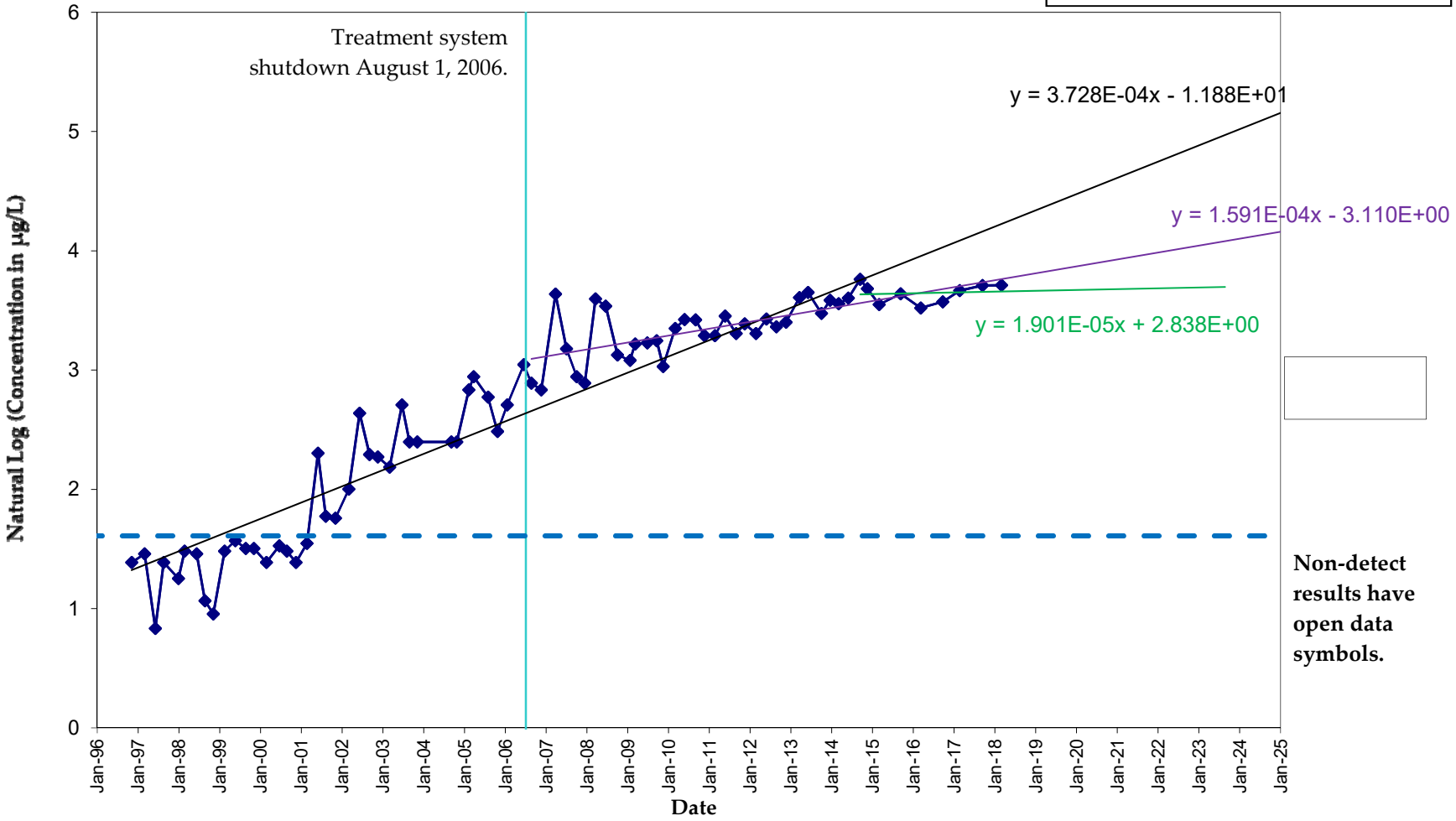




Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-007XD
VOC Concentration Trends
Lemberger Landfill

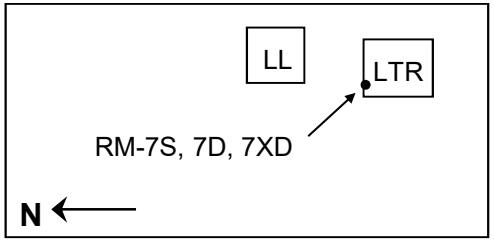


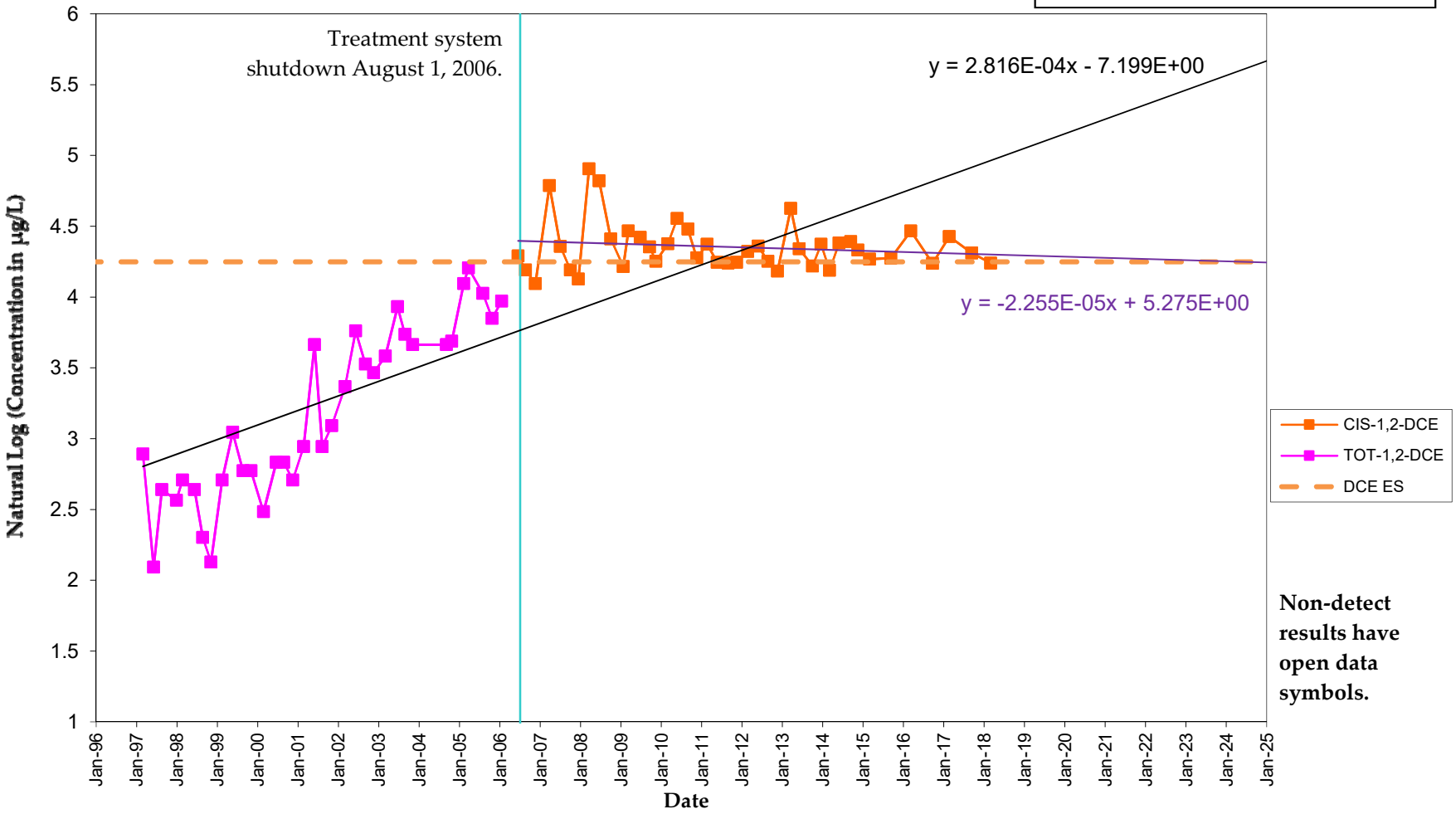


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-007XD
VOC Concentration Trends
Lemberger Landfill

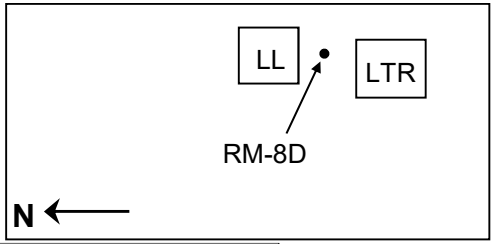


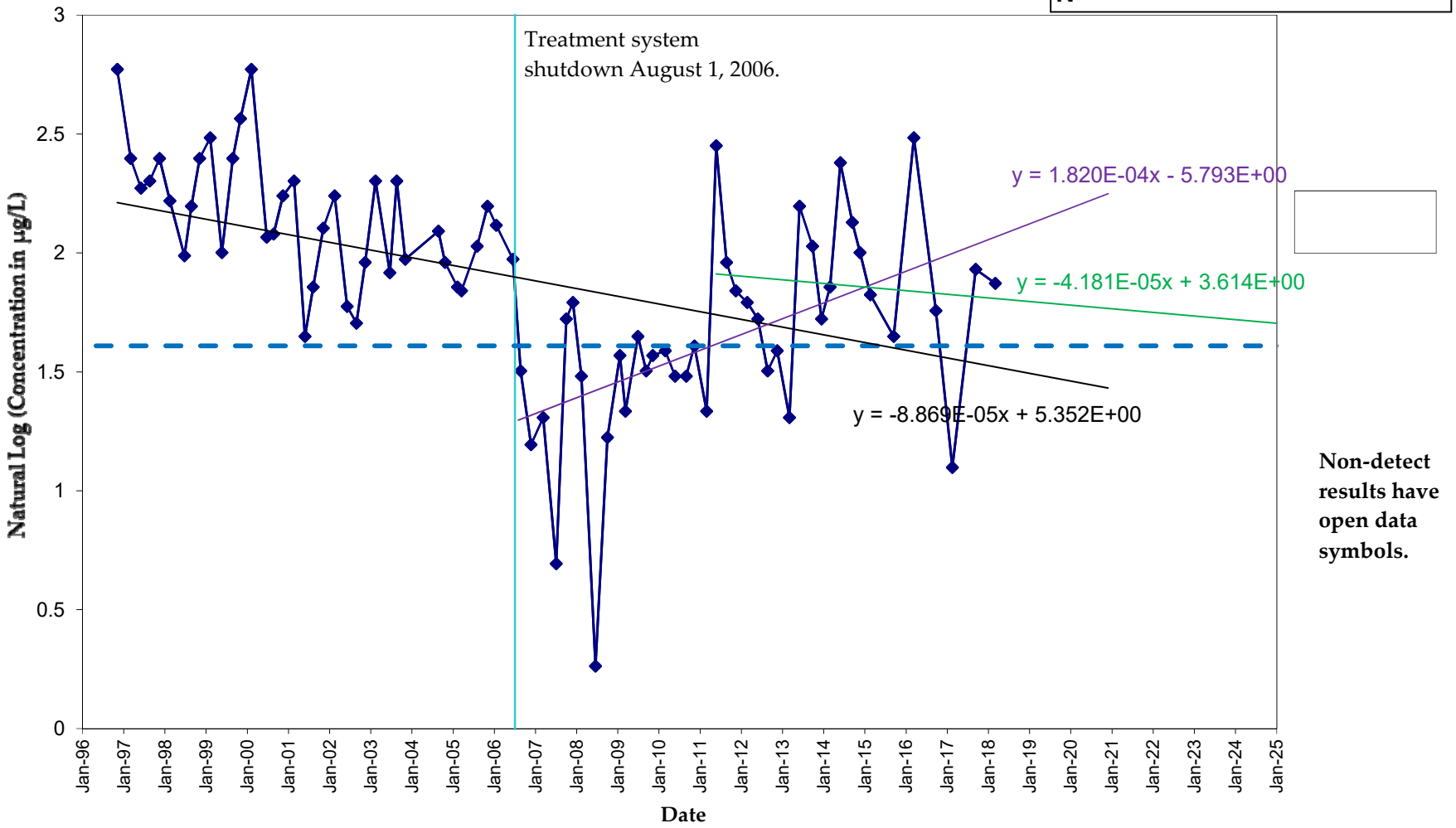


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-008D
VOC Concentration Trends
Lemberger Landfill

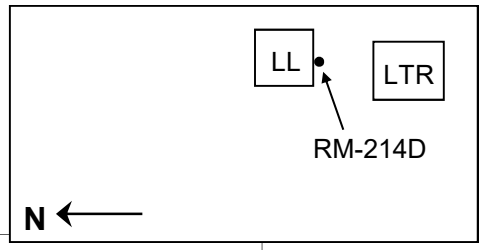


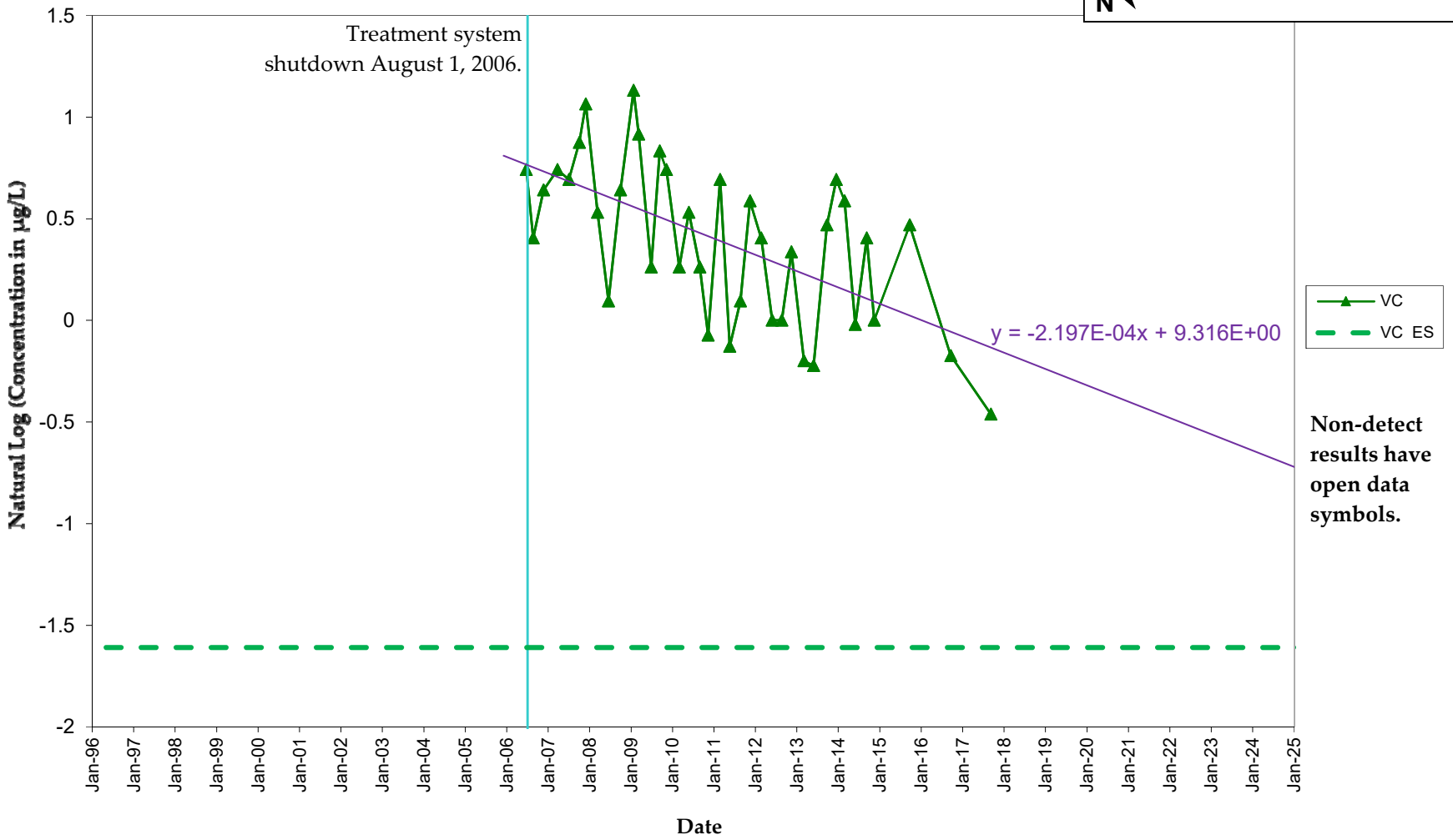


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-214D
VOC Concentration Trends
Lemberger Landfill

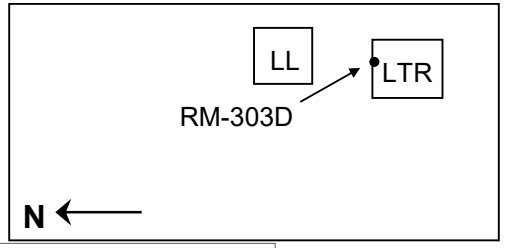


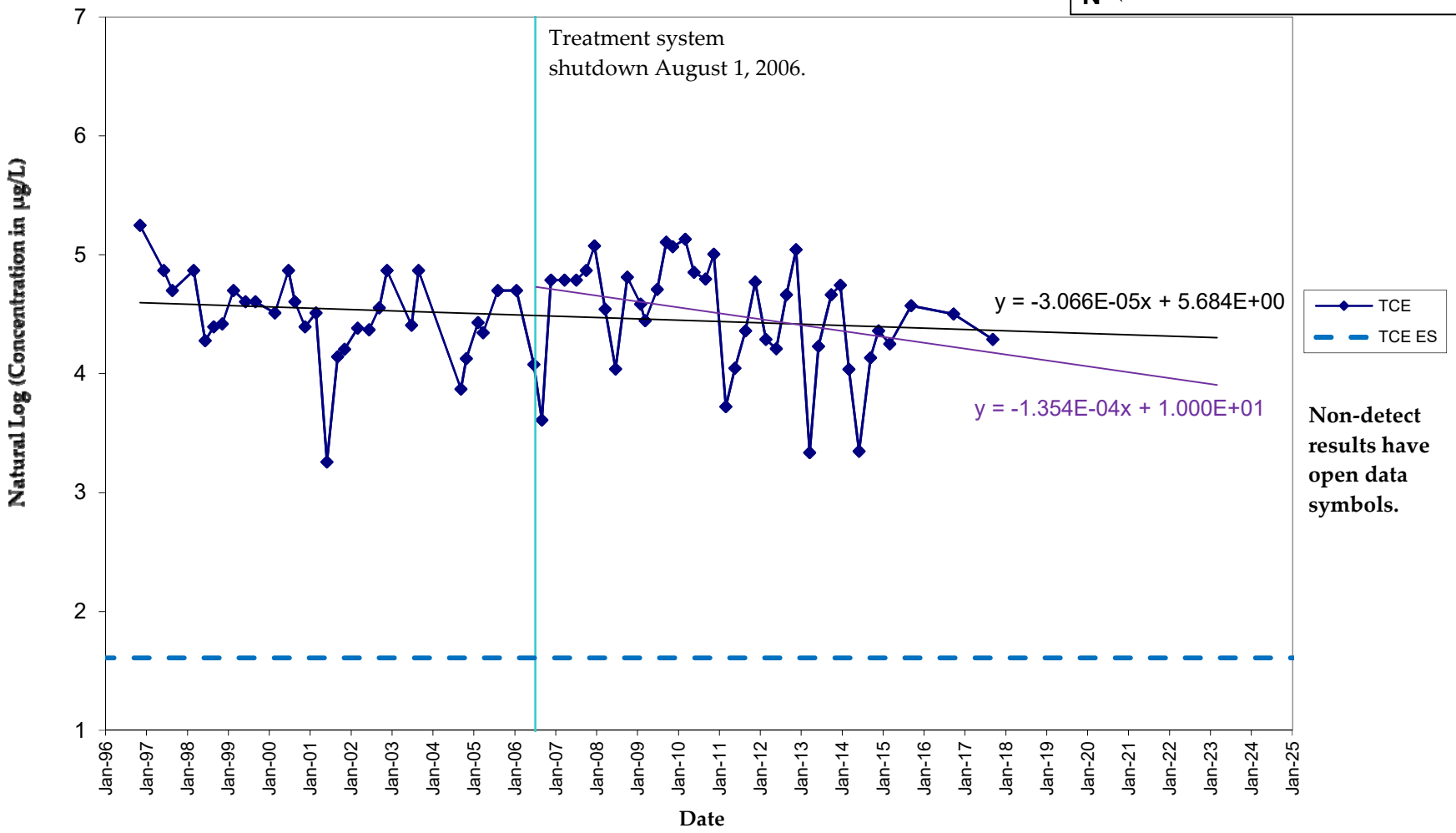


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-303D
VOC Concentration Trends
Lemberger Landfill

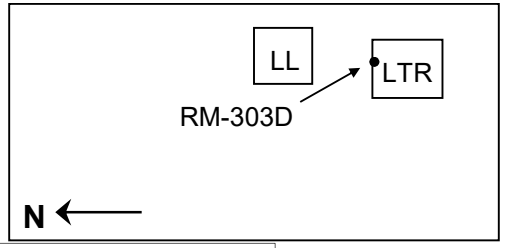


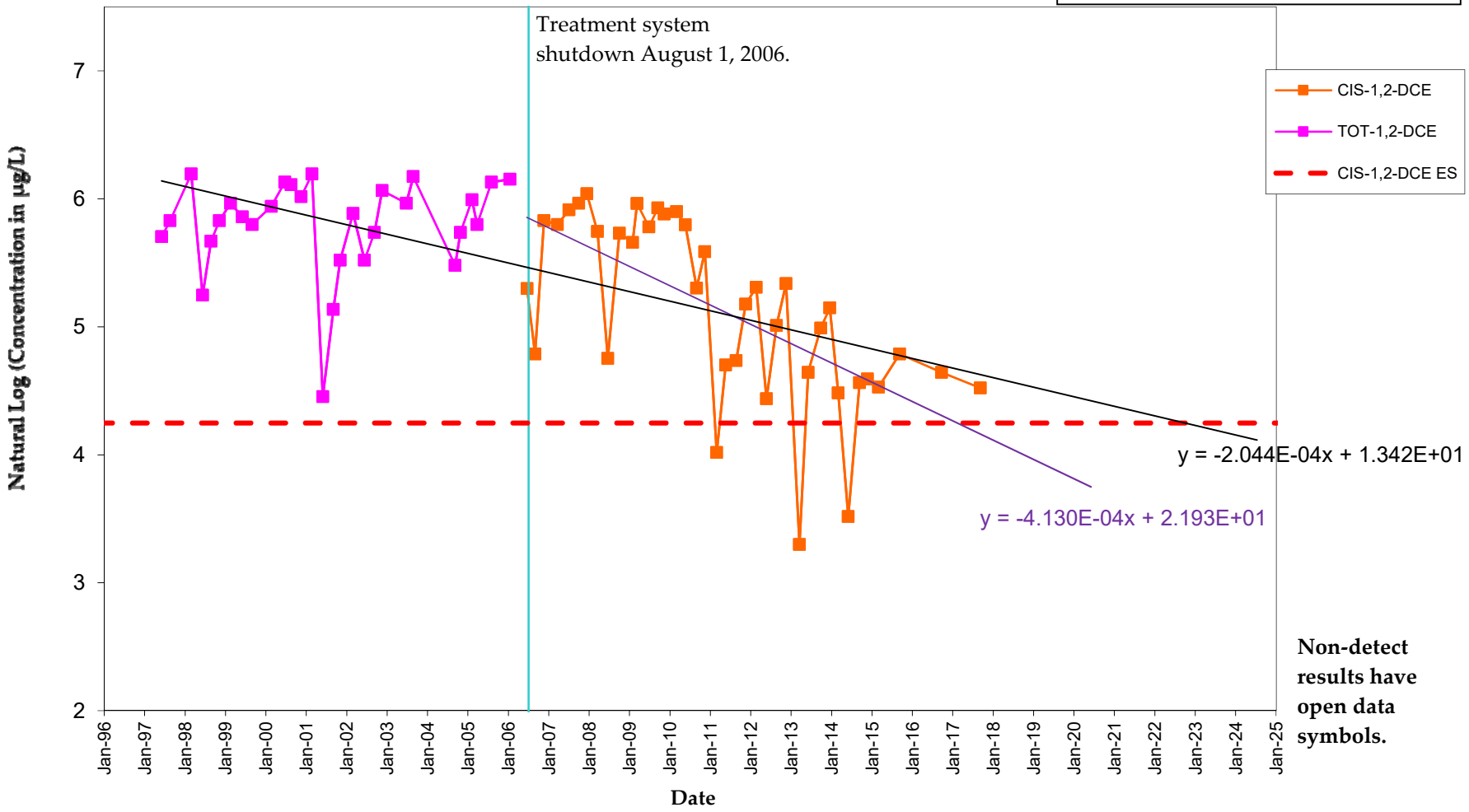


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-303D
VOC Concentration Trends
Lemberger Landfill

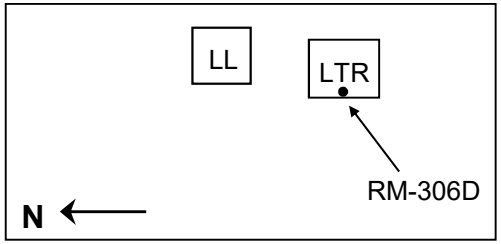


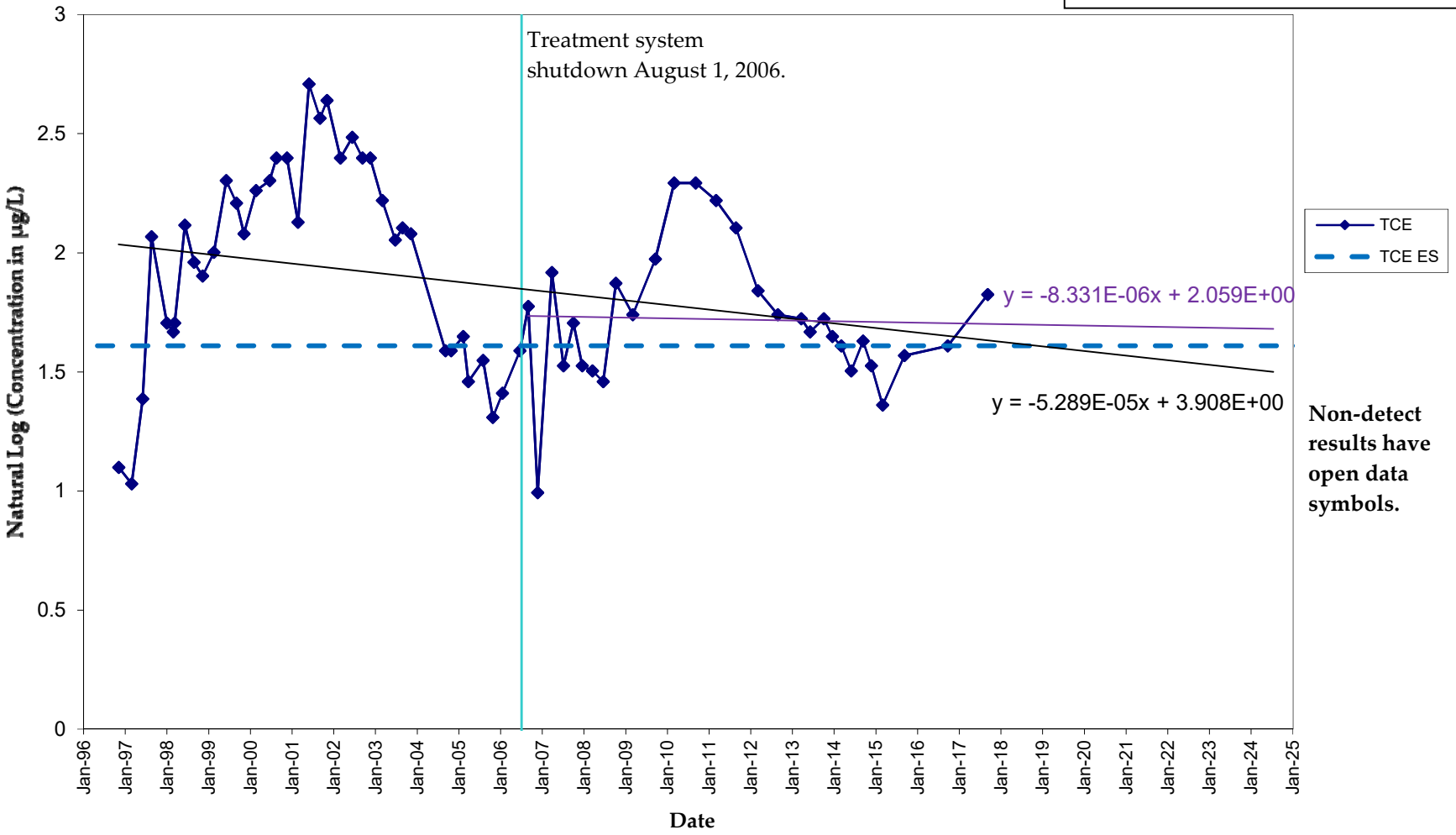


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-306D
VOC Concentration Trends
Lemberger Landfill

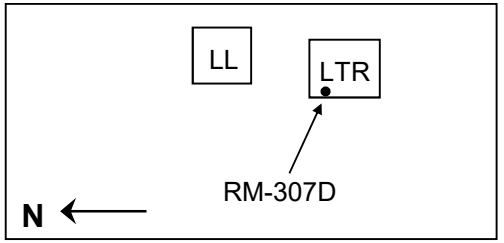


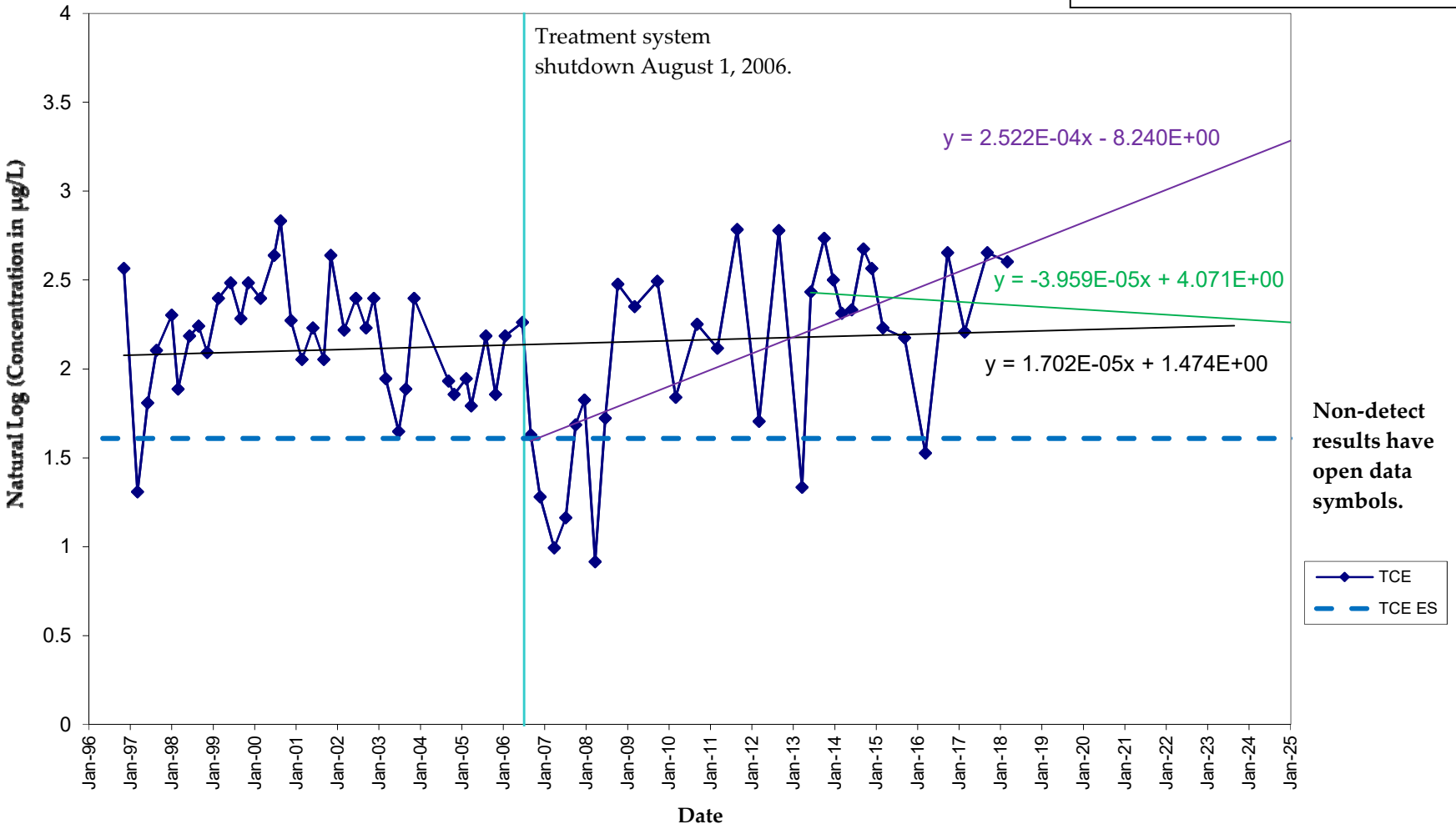


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-307D
VOC Concentration Trends
Lemberger Landfill

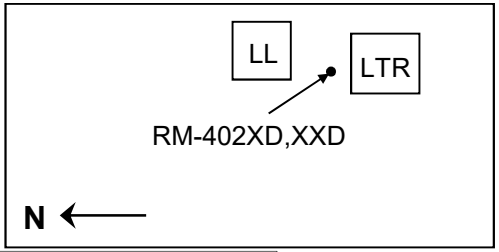


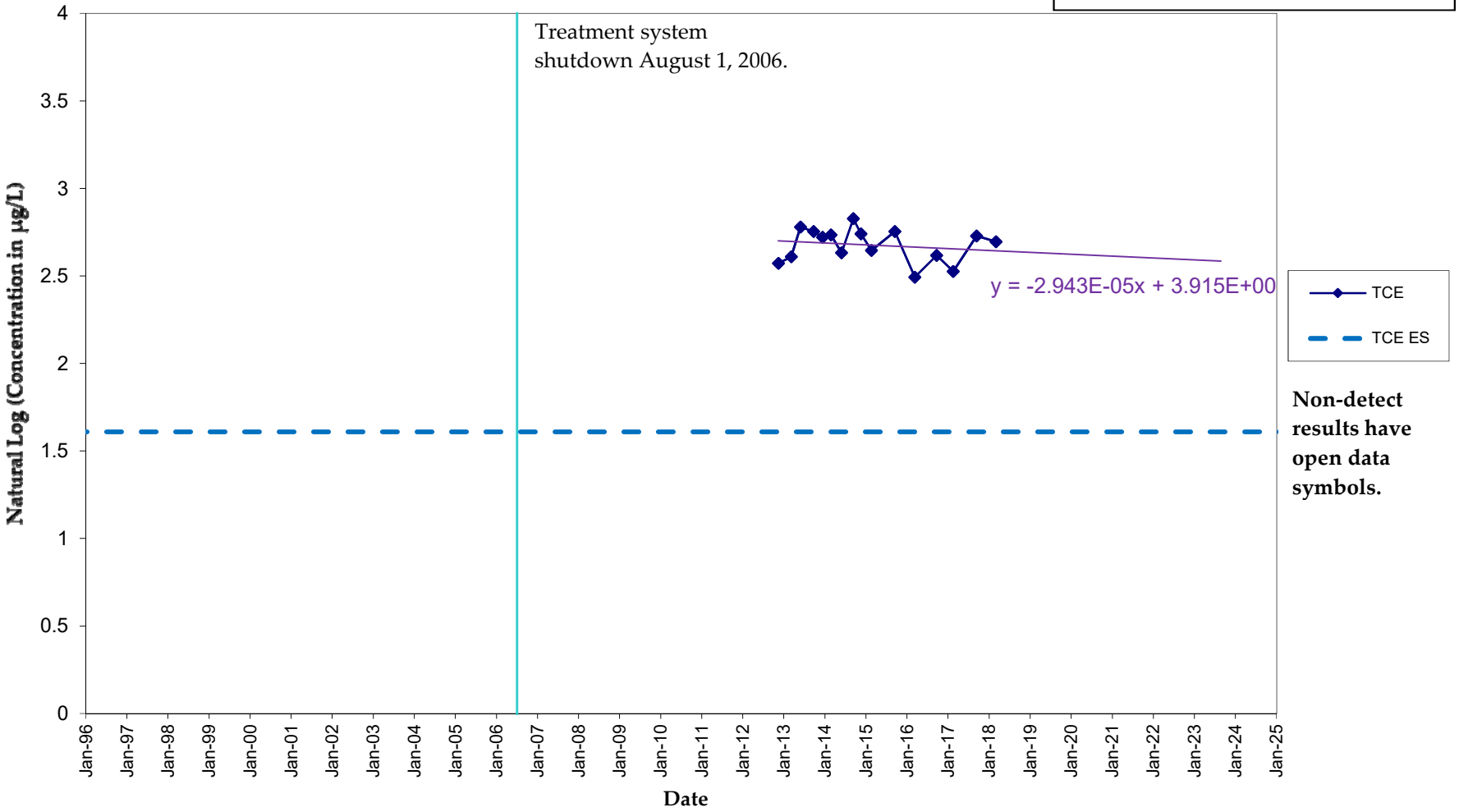


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-402XD
VOC Concentration Trends
Lemberger Landfill

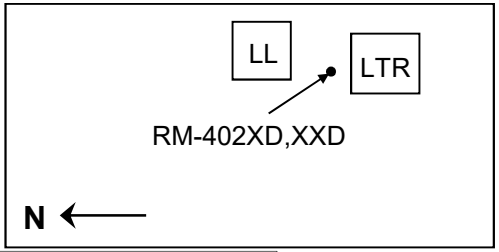


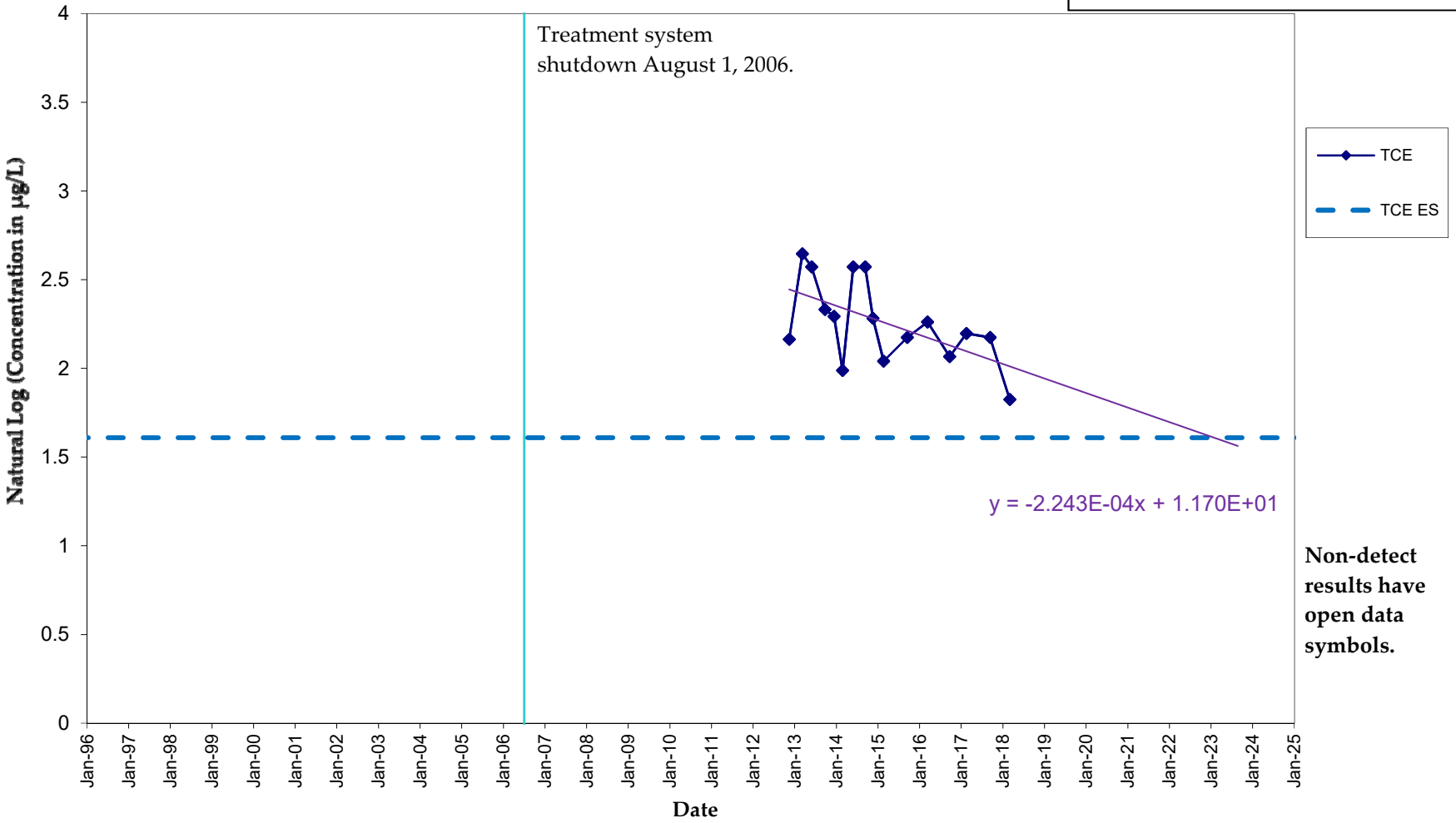


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

RM-402XXD
VOC Concentration Trends
Lemberger Landfill

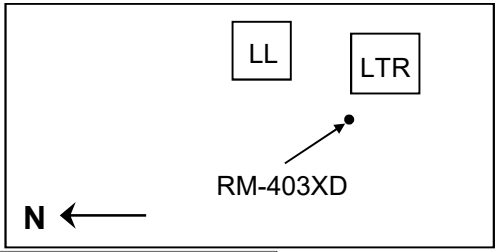


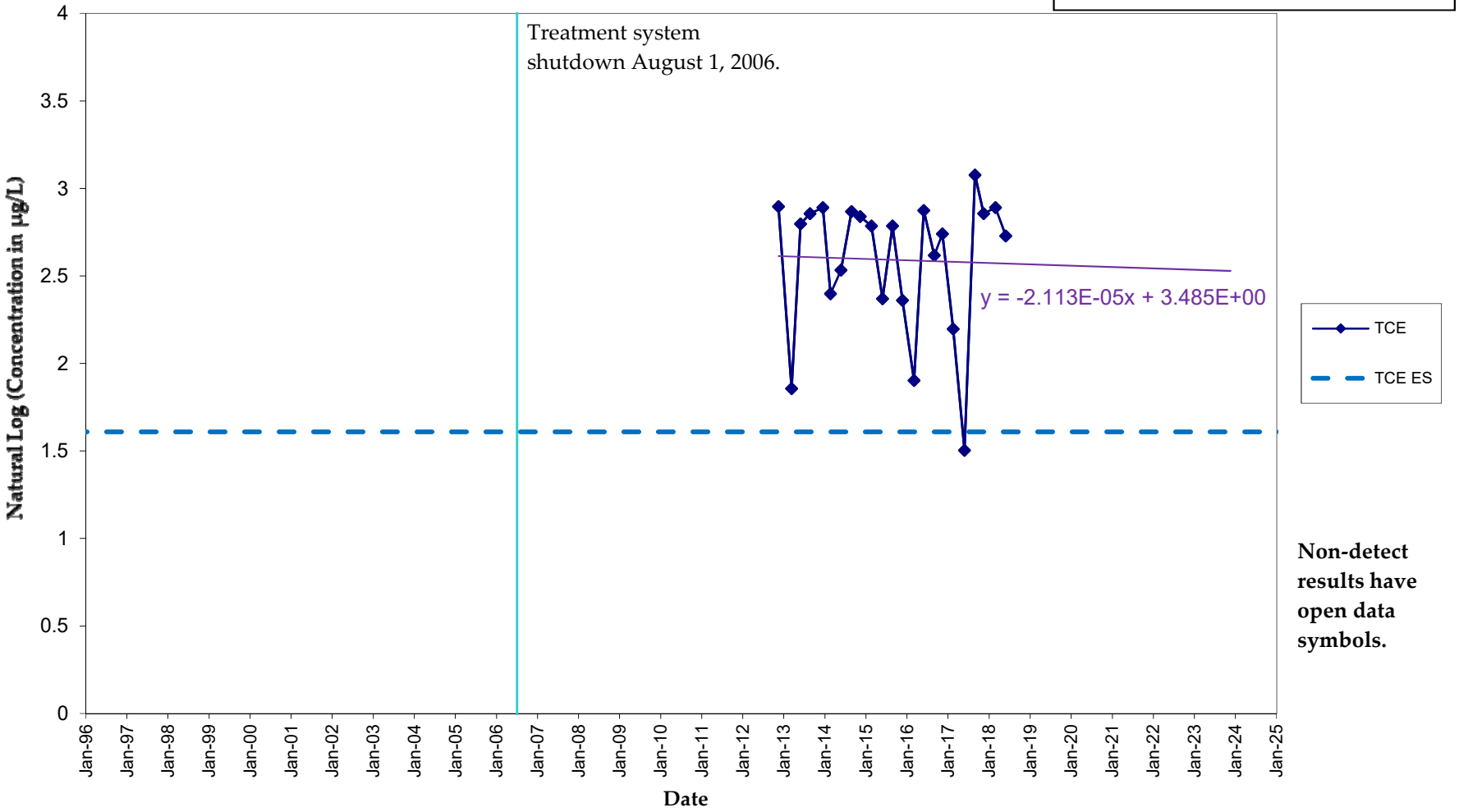


Non-detect results have open data symbols.

Blk = Full Range
Purple = post system shutdown
Red = Last 8 data points
Green = Stable/decreasing range

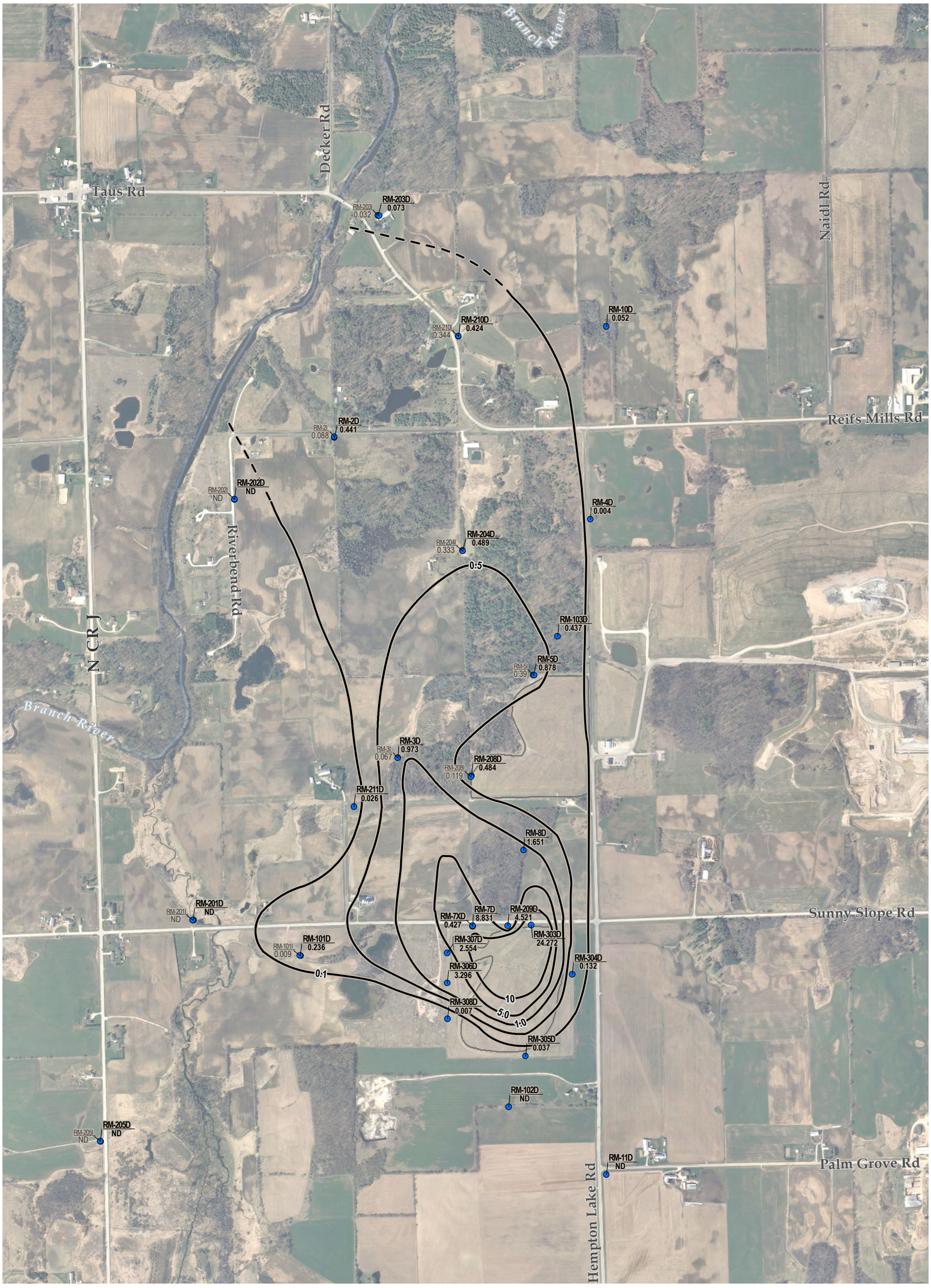
RM-403XD
VOC Concentration Trends
Lemberger Landfill





Non-detect results have open data symbols.

Appendix C
Plume Isocontours 5 Year Intervals



LEGEND

- MONITORING WELL (RM)
- 0.132 SAMPLE RESULT (µmol/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µMOL/L.
3. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, cis- AND trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TOTAL CVOCs (MOLAR CONCENTRATION)
LGU AND BEDROCK UNITS
1997 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-1**
DATE:	NOVEMBER 2018		

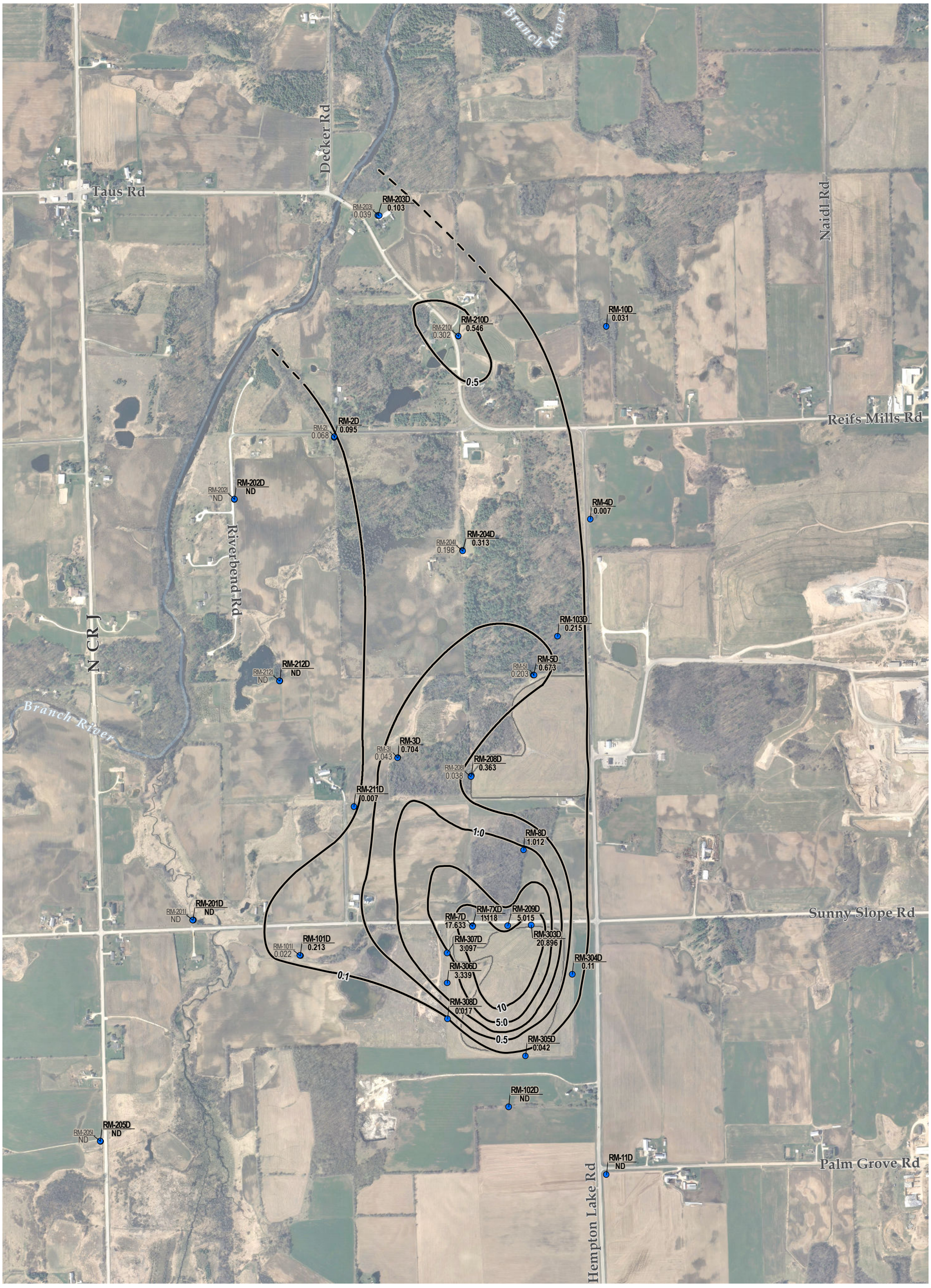
TRC

708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

Saved By: SMAJOR on 11/6/2018, 10:34:06 AM
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- MONITORING WELL (RM)
- 0.132 SAMPLE RESULT (µmol/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µMOL/L.
3. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, cis- AND trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TOTAL CVOCs (MOLAR CONCENTRATION)
LGU AND BEDROCK UNITS
2002 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-2**
DATE:	NOVEMBER 2018		

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Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

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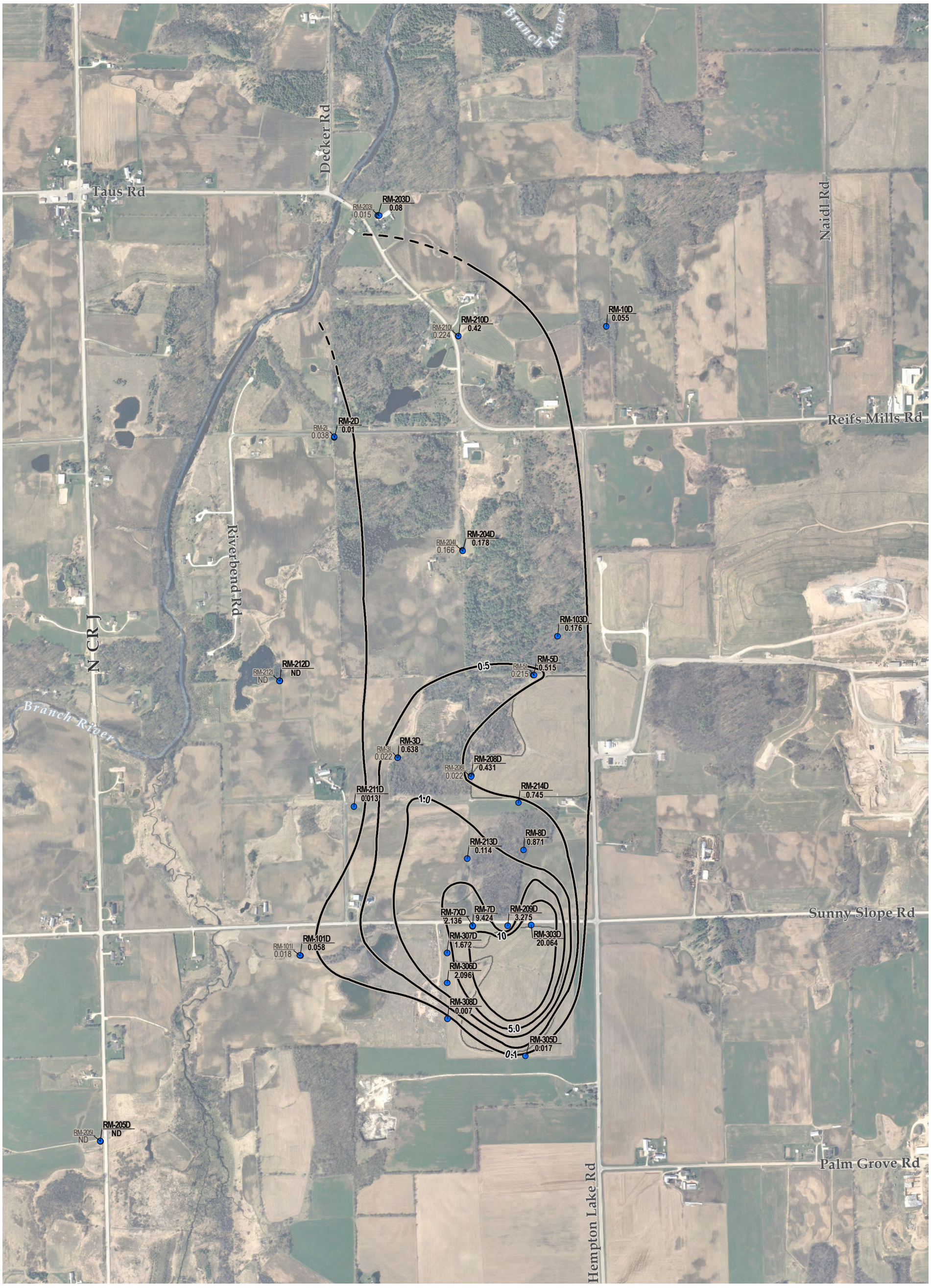
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- MONITORING WELL (RM)
- 0.132 SAMPLE RESULT (µmol/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µMOL/L.
3. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, cis- AND trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TOTAL CVOCs (MOLAR CONCENTRATION)
LGU AND BEDROCK UNITS
2007 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-3**
DATE:	NOVEMBER 2018		

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Phone: 608.826.3600
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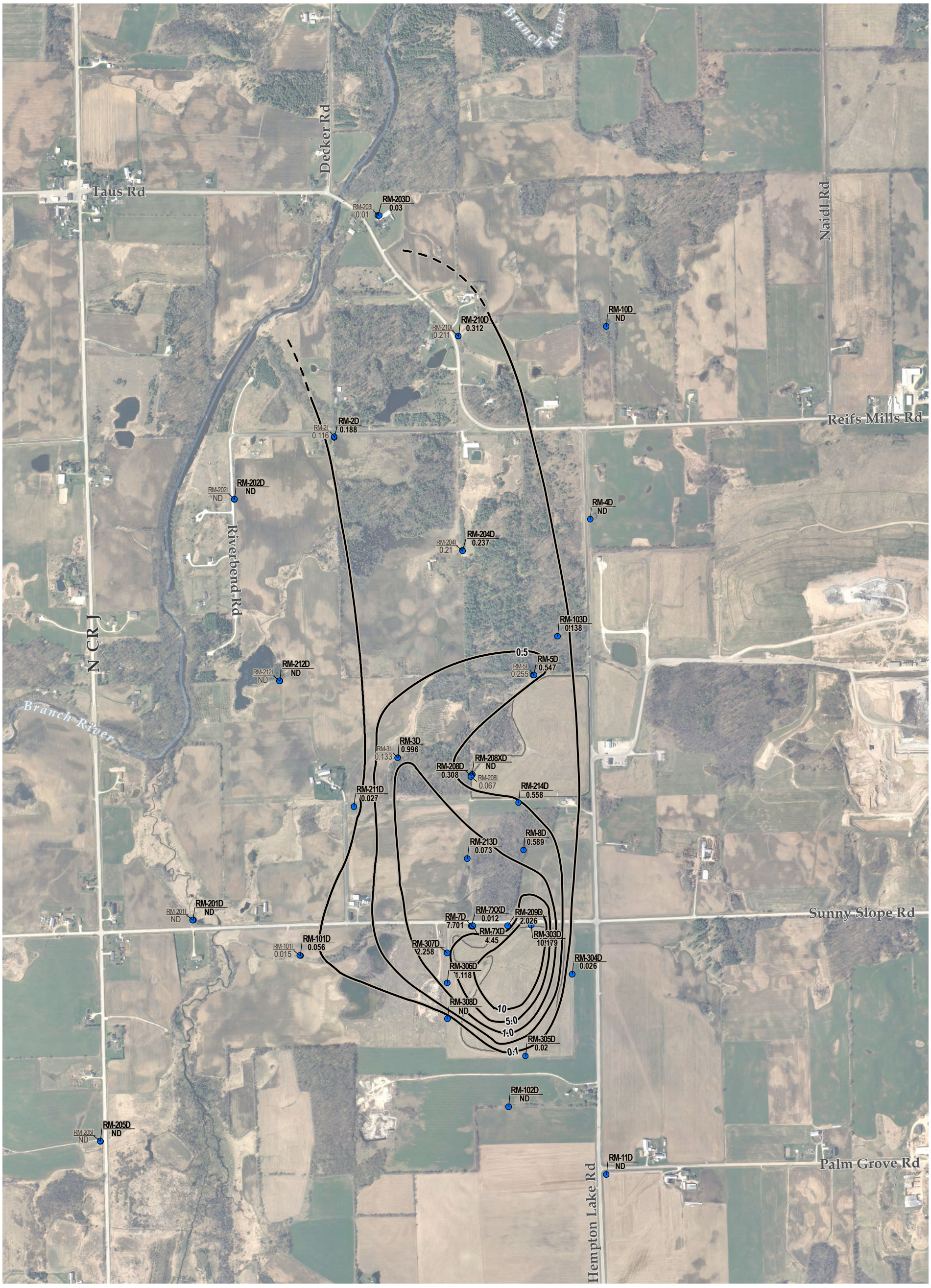
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- MONITORING WELL (RM)
- 0.132 SAMPLE RESULT (µmol/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µMOL/L.
3. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, cis- AND trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TOTAL CVOCs (MOLAR CONCENTRATION)
LGU AND BEDROCK UNITS
2012 Q3

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-4**
DATE:	NOVEMBER 2018		

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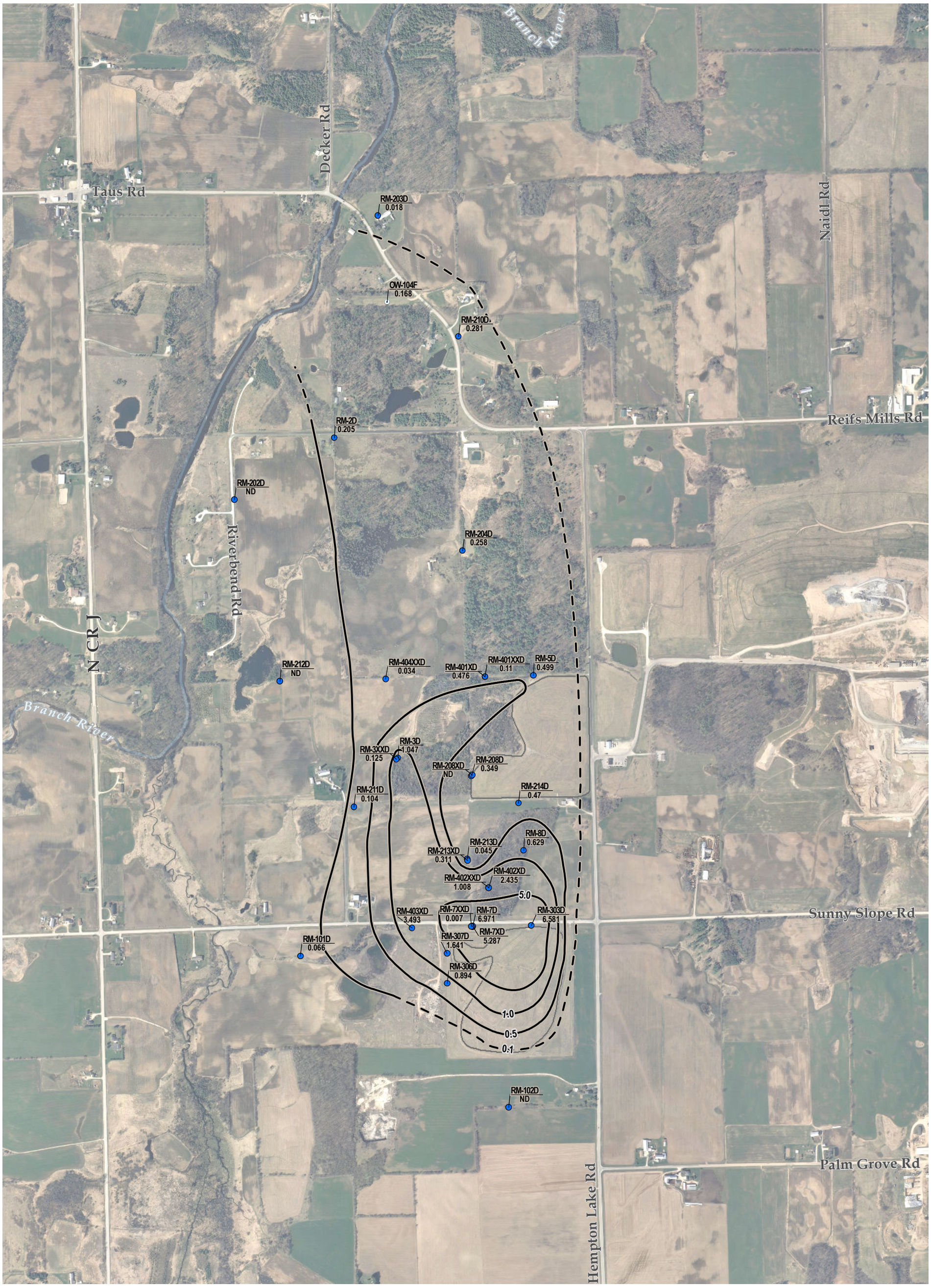
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 0.132 SAMPLE RESULT (µmol/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µmol/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µMOL/L.
3. TOTAL CVOC CONCENTRATIONS INCLUDE THE SUM OF PCE, TCE, cis- AND trans-1,2-DCE, VC, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, AND CHLOROETHENE. TOTALS INCLUDE ESTIMATED ("J"-FLAGGED) RESULTS.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

TOTAL CVOCs (MOLAR CONCENTRATION)
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY: S. MAJOR	SCALE:	PROJ. NO.	226573-009
CHECKED BY: M. WESTOVER	1: 12,000	FILE NO.	268280-006-014rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	**FIGURE C-5**	
DATE: NOVEMBER 2018			

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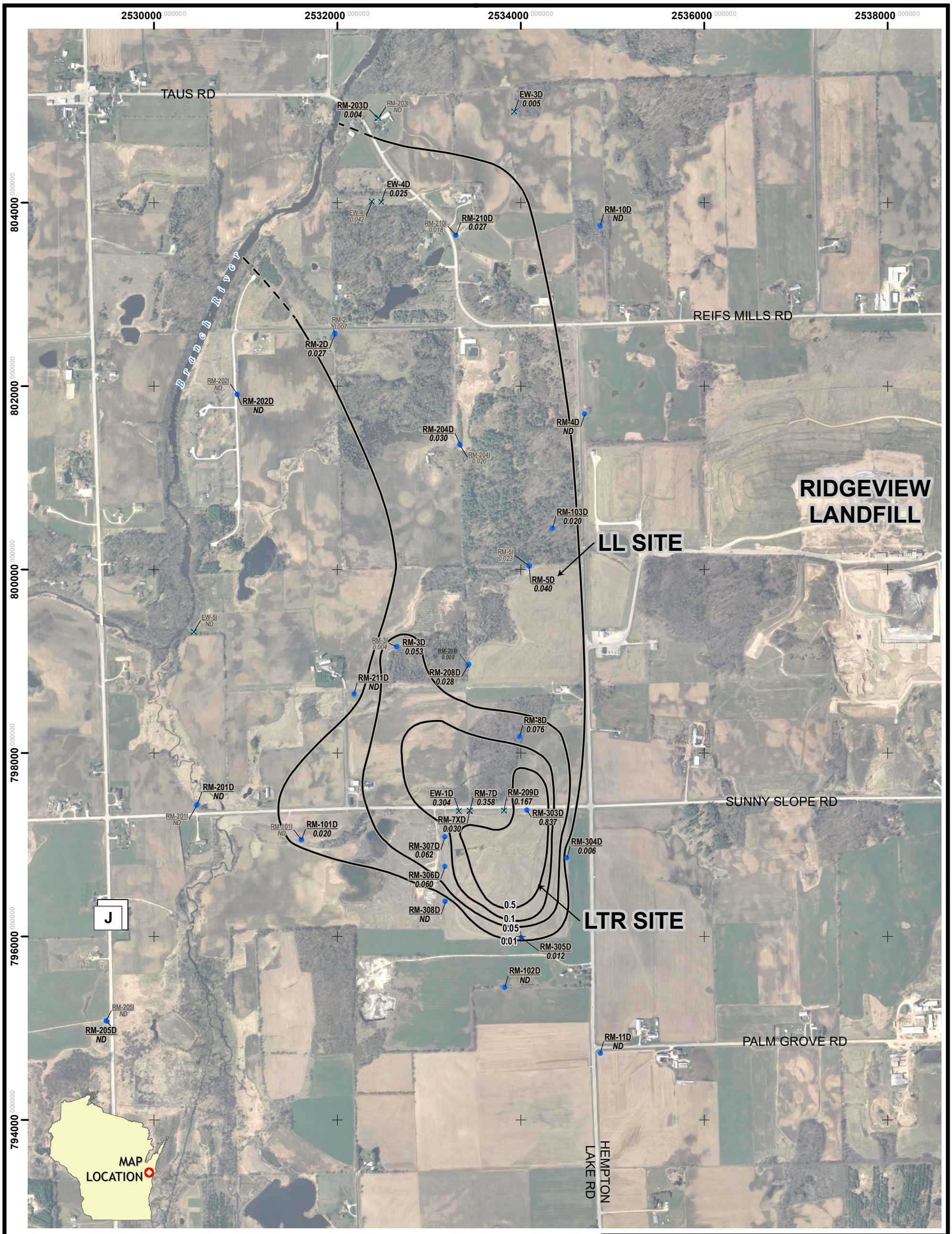
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT		
SHEET TITLE:	TRICHLOROETHENE (MOLAR CONC.) LGU AND BEDROCK UNITS 1997 Q3		
DRAWN BY: A. REIS	SCALE: AS NOTED	PROJ. NO.	268280-006
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-019tce1997.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	FIGURE C-6	
DATE: NOVEMBER 2018			

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804000.000000 802000.000000 800000.000000 798000.000000 796000.000000 794000.000000

TAUS RD

REIFS MILLS RD

SUNNY SLOPE RD

PALM GROVE RD

HEMPTON LAKE RD

Branch River

RIDGEVIEW LANDFILL

LL SITE

LTR SITE

J

RM-203I ND
RM-203D 0.006
EW-3D 0.013
EW-4D 0.028
EW-4I 0.037
RM-210I 0.021
RM-210D 0.037
RM-10D ND
RM-2I 0.005
RM-2D 0.008
RM-202I ND
RM-202D ND
RM-204D 0.025
RM-204I 0.018
RM-4D ND
RM-103D 0.011
RM-5I 0.014
RM-5D 0.036
RM-212I ND
RM-212D ND
RM-3D 0.028
RM-3I 0.004
RM-208I 0.004
RM-208D 0.021
RM-211D ND
EW-7D 0.045
RM-8D 0.042
RM-201I ND
RM-201D ND
RM-7D 0.472
RM-209D 0.175
EW-1D 0.312
EW-8D 0.426
RM-303D 0.723
RM-7XD 0.075
EW-9D 0.259
EW-6D 1.370
RM-101I ND
RM-101D 0.018
RM-307D 0.071
RM-304D 0.005
RM-306D 0.084
RM-308D ND
0.5
0.1
0.05
0.01
RM-305D 0.014
RM-102D ND
RM-205D ND
RM-205I ND
RM-11D ND

MAP LOCATION

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT
SHEET TITLE:	TRICHLOROETHENE (MOLAR CONC.) LGU AND BEDROCK UNITS 2002 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-019tce2002.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	FIGURE C-7
DATE:	NOVEMBER 2018		

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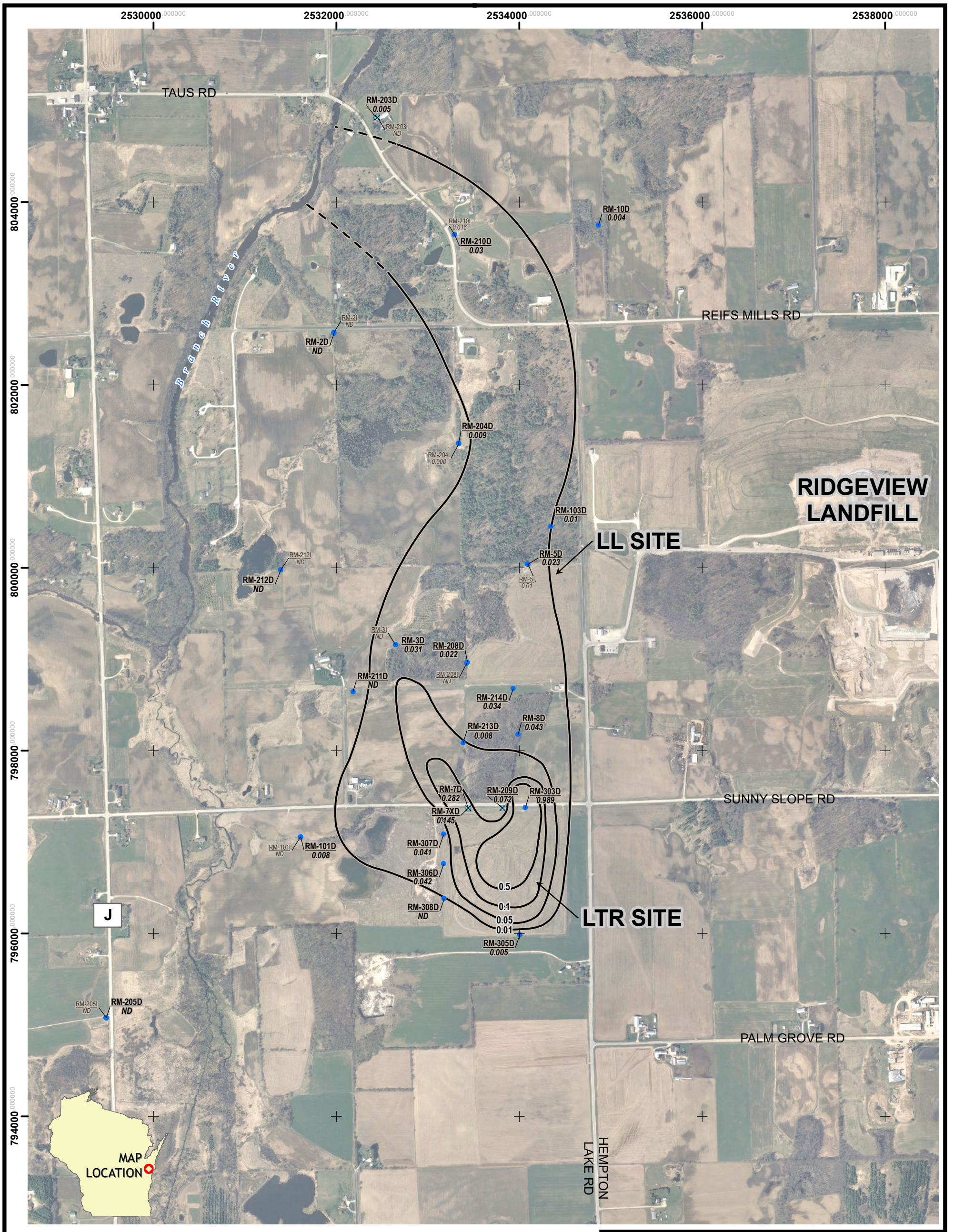

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol /L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING
4. RM-213D RESULT NOT USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT		
SHEET TITLE:	TRICHLOROETHENE (MOLAR CONC.) LGU AND BEDROCK UNITS 2007 Q3		
DRAWN BY: A. REIS	SCALE: AS NOTED	PROJ. NO.	268280-006
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-019tce2007.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	FIGURE C-8	
DATE: NOVEMBER 2018			

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804000.000000 802000.000000 800000.000000 798000.000000 796000.000000 794000.000000

TAUS RD

REIFS MILLS RD

SUNNY SLOPE RD

PALM GROVE RD

HEMPTON LAKE RD

Branch River

RIDGEVIEW LANDFILL

LL SITE

LTR SITE

RM-203D ND
RM-203I ND
RM-10D ND
RM-210I 0.014
RM-210D 0.021
RM-2I 0.011
RM-2D 0.016
0.01
RM-202I ND
RM-202D ND
RM-4D ND
RM-204D 0.009
RM-204I 0.008
RM-103D 0.008
RM-212D ND
RM-212I ND
RM-5I 0.012
RM-5D 0.031
RM-3D 0.043
RM-3I 0.005
RM-208D 0.022
RM-208XD ND
RM-208I 0.004
RM-211D ND
RM-214D 0.033
RM-8D 0.034
RM-213D 0.006
RM-209D 0.074
RM-303D 0.807
RM-201I ND
RM-201D ND
RM-7D 0.375
RM-7XD 0.22
RM-7XXD ND
RM-101I ND
RM-101D 0.008
RM-307D 0.123
RM-304D ND
RM-306D 0.043
0.5
0.1
0.05
0.01
RM-308D ND
RM-305D 0.005
RM-102D ND
RM-205I ND
RM-205D ND
RM-11D ND

J

MAP LOCATION

LEGEND

SAMPLE AND MONITORING LOCATIONS
- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:
SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol /L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.
4. RM-213D RESULT NOT USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **TRICHLOROETHENE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2012 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-019tce2012.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-9**
DATE:	NOVEMBER 2018		

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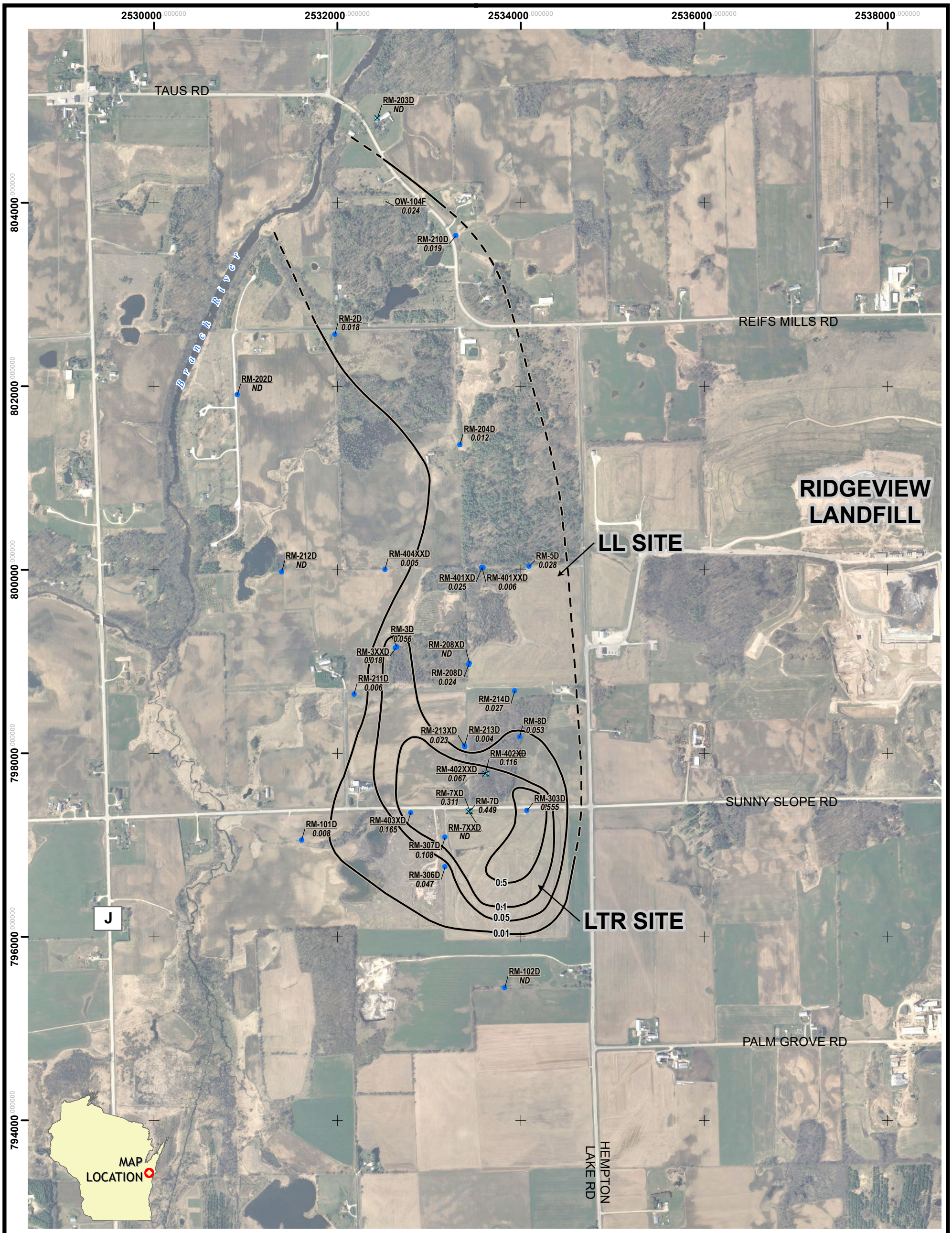

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	**LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT**
SHEET TITLE:	**TRICHLOROETHENE (MOLAR CONC.) LGU AND BEDROCK UNITS 2017 Q3**

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-019tce2017.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-10**
DATE:	NOVEMBER 2018		

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804000.000000 802000.000000 800000.000000 798000.000000 796000.000000 794000.000000

TAUS RD

REIFS MILL RD

SUNNY SLOPE RD

PALM GROVE RD

HEMPTON LAKE RD

Branch River

RIDGEVIEW LANDFILL

LL SITE

LTR SITE

J

RM-203D 0.032
RM-203I 0.020
EW-3D 0.037
EW-4D 0.172
EW-4I 0.292
RM-210I 0.135
RM-210D 0.157
RM-10D 0.027
RM-2I 0.033
RM-2D 0.120
RM-202I ND
RM-202D ND
RM-204D 0.217
RM-204I 0.157
RM-4D 0.004
RM-103D 0.180
RM-5I 0.187
RM-5D 0.315
EW-5I ND
RM-3D 0.435
RM-3I 0.026
RM-208D 0.225
RM-208I 0.054
RM-211D 0.014
RM-8D 0.825
RM-7XD 0.157
RM-7D 4.498
RM-209D 3.149
RM-303D 11.994
EW-1D 5.397
RM-201D ND
RM-201I ND
RM-101D 0.075
RM-101I ND
RM-307D 1.949
RM-306D 2.699
RM-304D 0.112
10.0
5.0
1.0
0.5
0.1
RM-308D 0.007
RM-305D 0.025
RM-102D ND
RM-205D ND
RM-205I ND
RM-11D ND

MAP LOCATION

LEGEND

SAMPLE AND MONITORING LOCATIONS
- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:
SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT		
SHEET TITLE:	1,1,1-TRICHLOROETHANE (MOLAR CONC.) LGU AND BEDROCK UNITS 1997 Q3		
DRAWN BY: A. REIS	SCALE: AS NOTED	PROJ. NO.	268280-006
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-0020tca_1997.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	FIGURE C-11	
DATE: NOVEMBER 2018			

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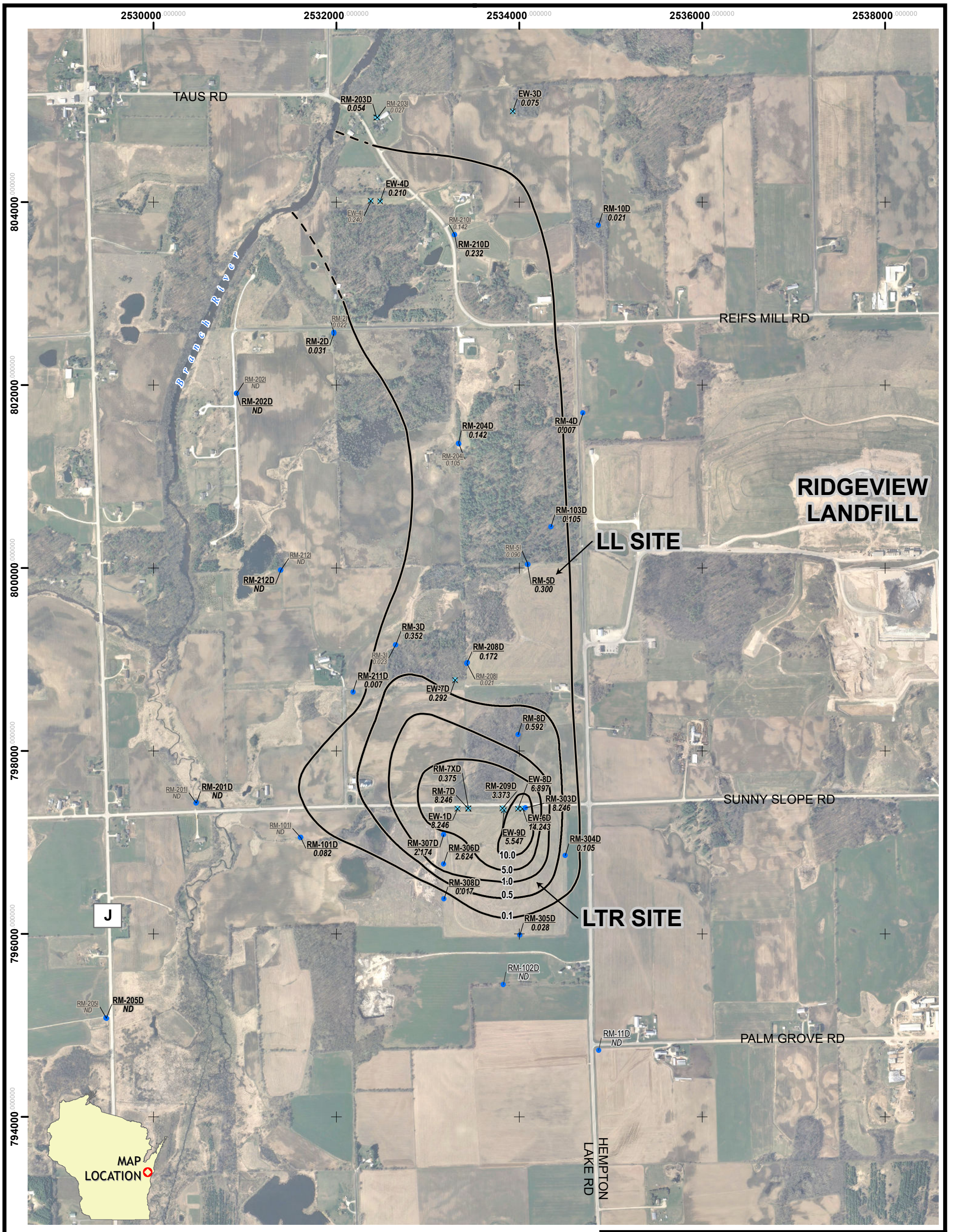

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **1,1,1-TRICHLOROETHANE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2002 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-0020tca_2002.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-12**
DATE:	NOVEMBER 2018		

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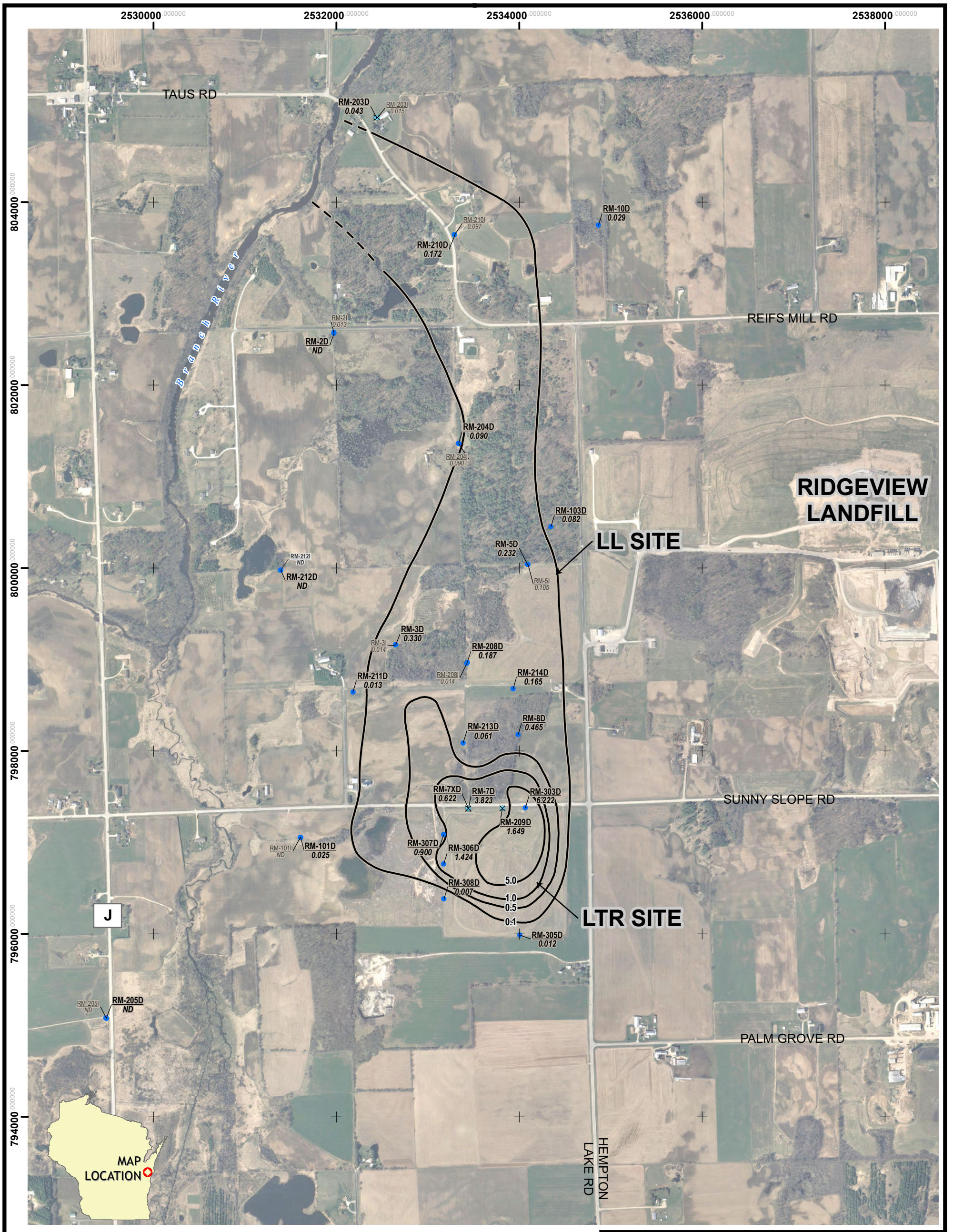

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol /L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.
4. RM-213D RESULT NO USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT
SHEET TITLE:	1,1,1-TRICHLOROETHANE (MOLAR CONC.) LGU AND BEDROCK UNITS 2007 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-0020tca_2007.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	FIGURE C-13
DATE:	NOVEMBER 2018		

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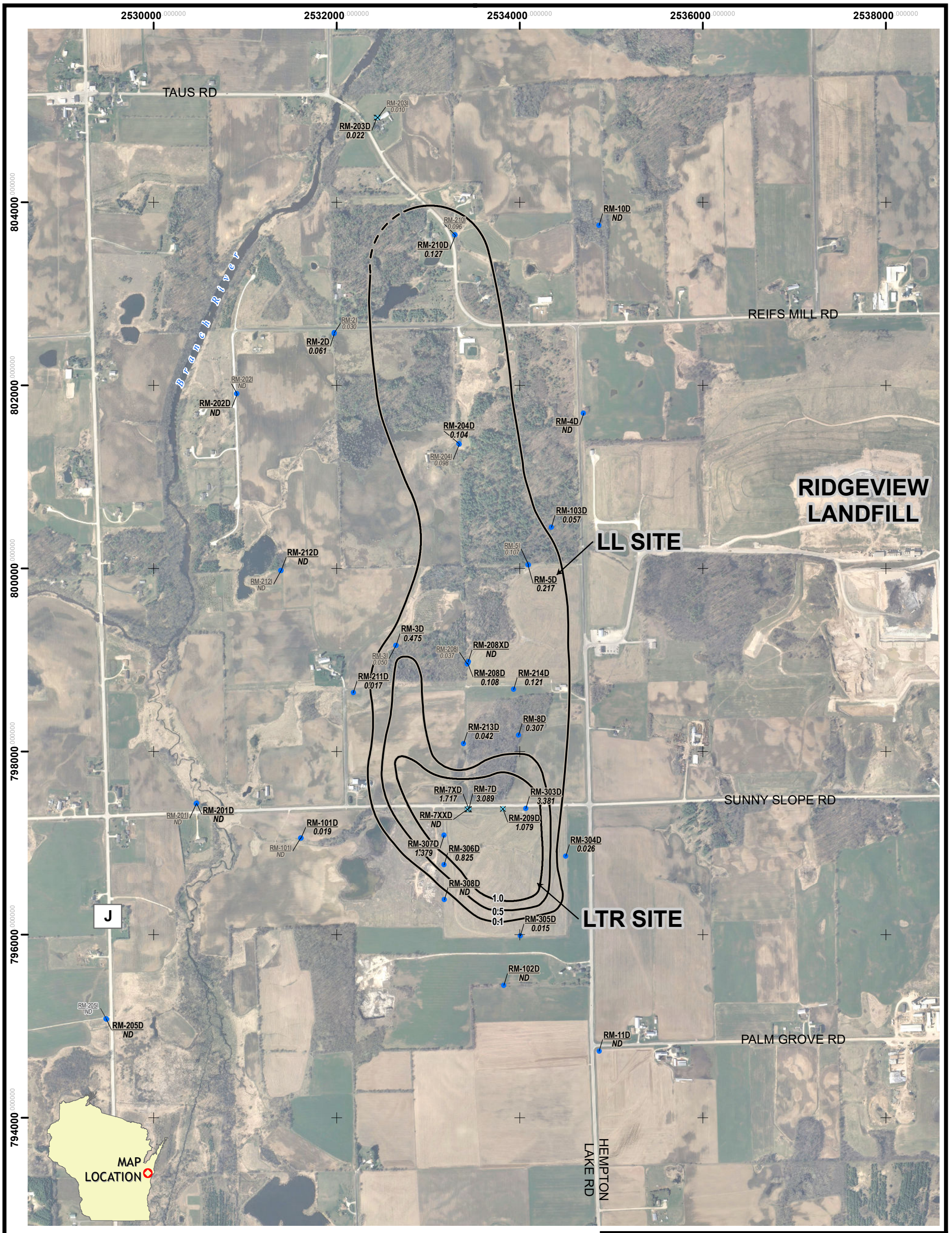

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT		
SHEET TITLE:	1,1,1-TRICHLOROETHANE (MOLAR CONC.) LGU AND BEDROCK UNITS 2012 Q3		
DRAWN BY: A. REIS	SCALE: AS NOTED	PROJ. NO.	268280-006
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-0020tca_2012.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	FIGURE C-14	
DATE: NOVEMBER 2018			

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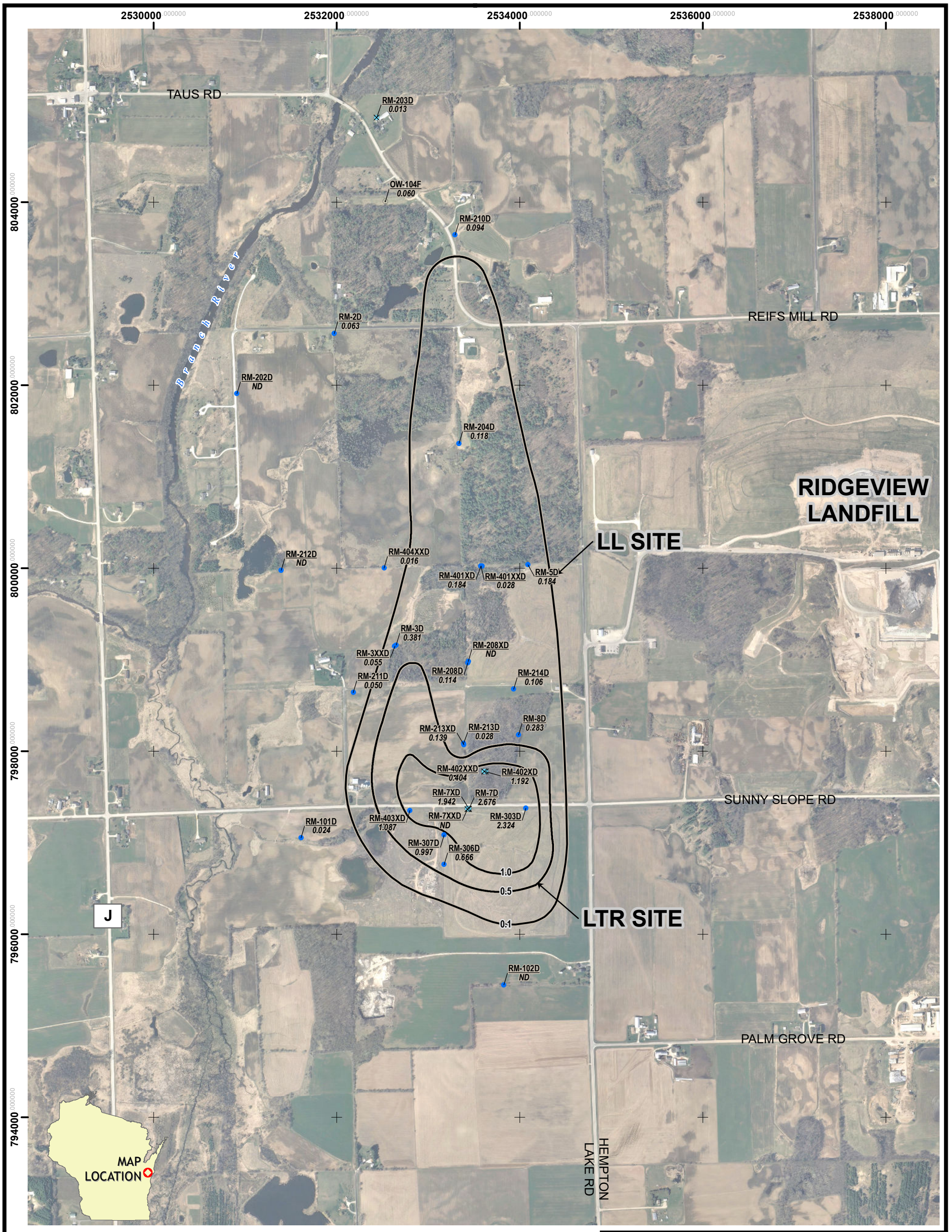

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. THE HIGHEST OBSERVED CONCENTRATION AT EACH WELL NEST WAS USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000

N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **1,1,1-TRICHLOROETHANE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	A. REIS	SCALE: AS NOTED	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-0020tca_2017.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-15**
DATE:	NOVEMBER 2018		

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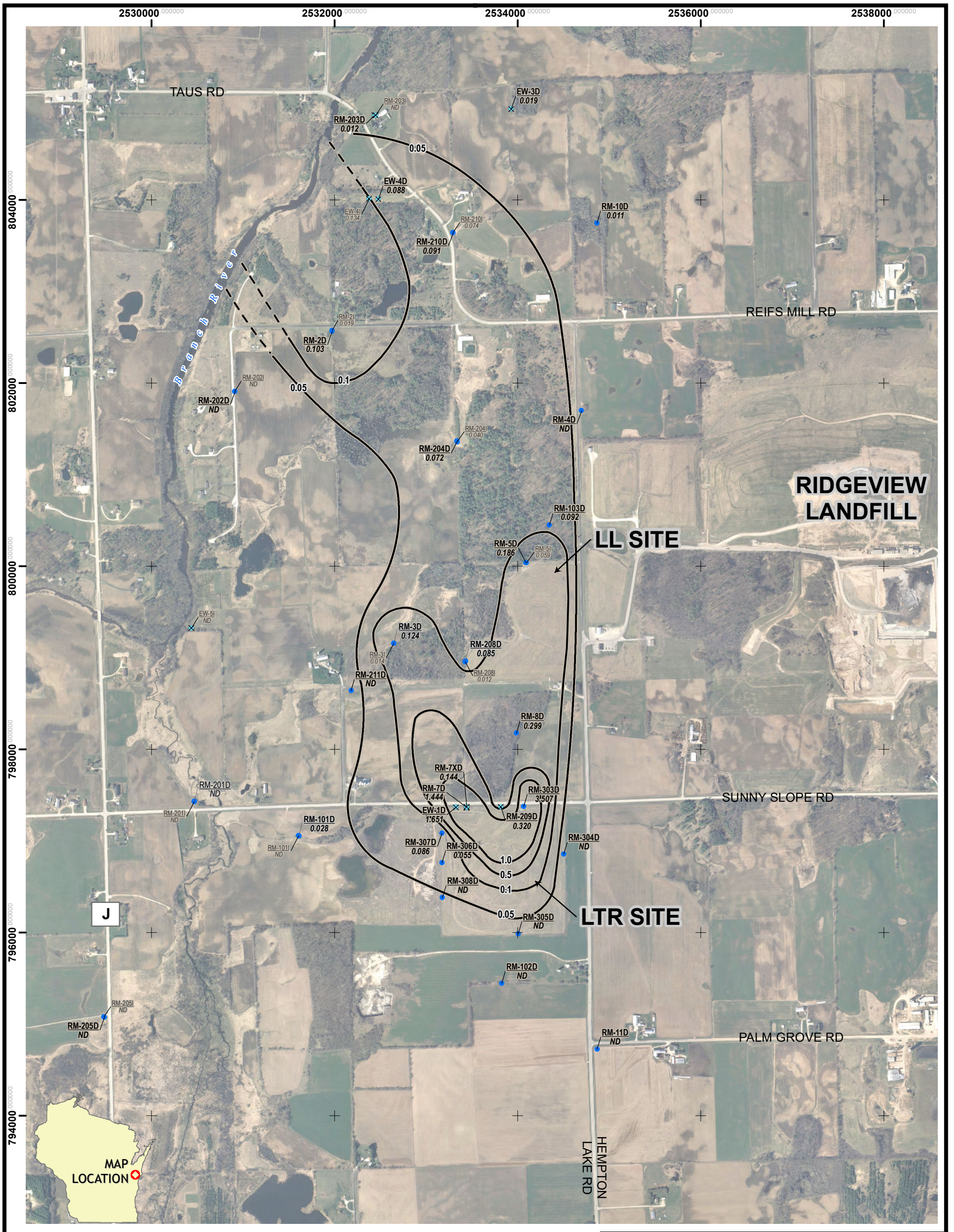

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. PRIOR TO 2007, RESULTS WERE REPORTED AS TOTAL, BUT SUBSEQUENT ANALYSES REVEALED 99.9% WERE CIS.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **CIS-1,2-DICHLOROETHENE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
1997 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-022cis_1997.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-16**
DATE:	NOVEMBER 2018		

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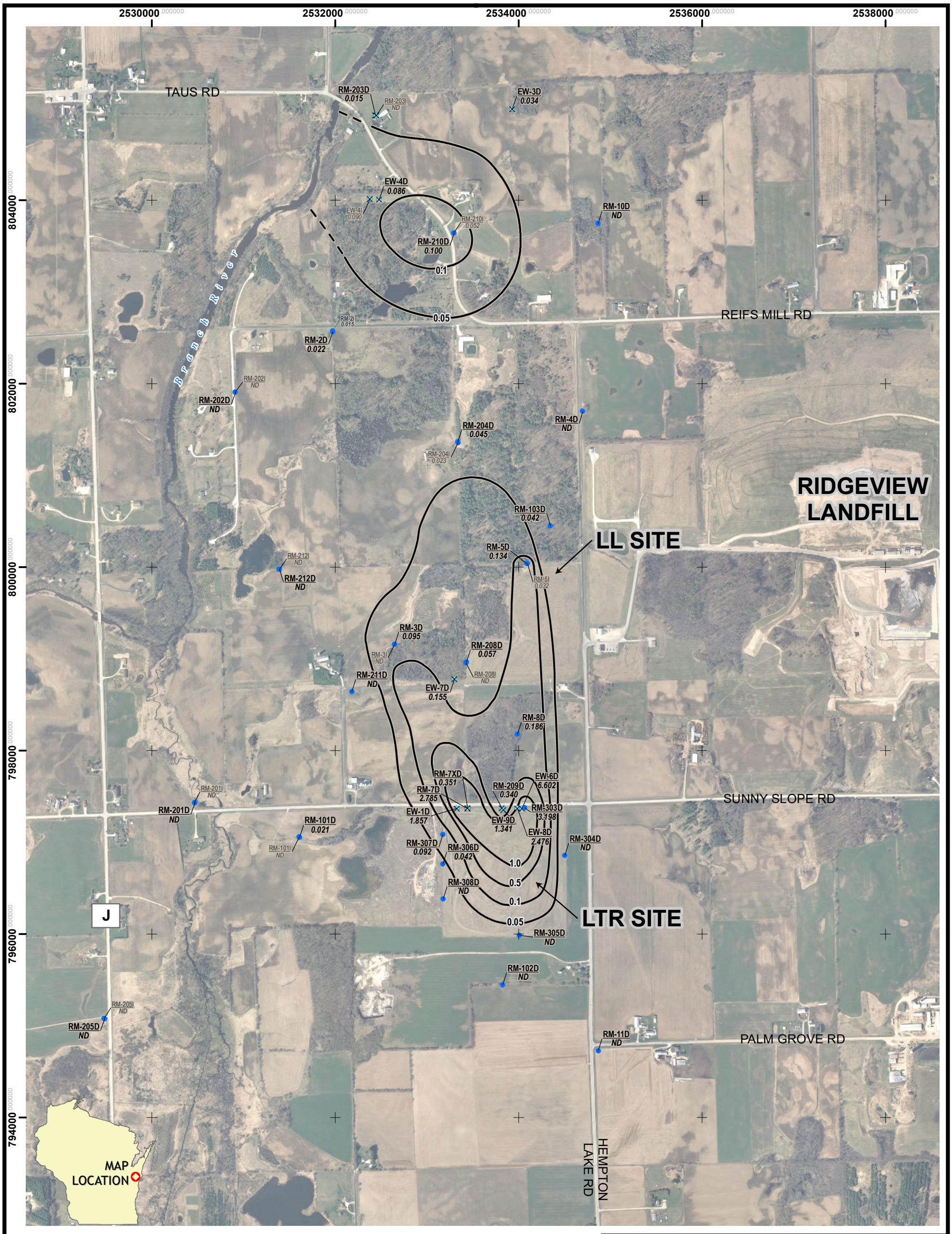

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. PRIOR TO 2007, RESULTS WERE REPORTED AS TOTAL, BUT SUBSEQUENT ANALYSES REVEALED 99.9% WERE CIS.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **CIS-1,2-DICHLOROETHENE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2002 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-022cis_2002.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-17**
DATE:	NOVEMBER 2018		

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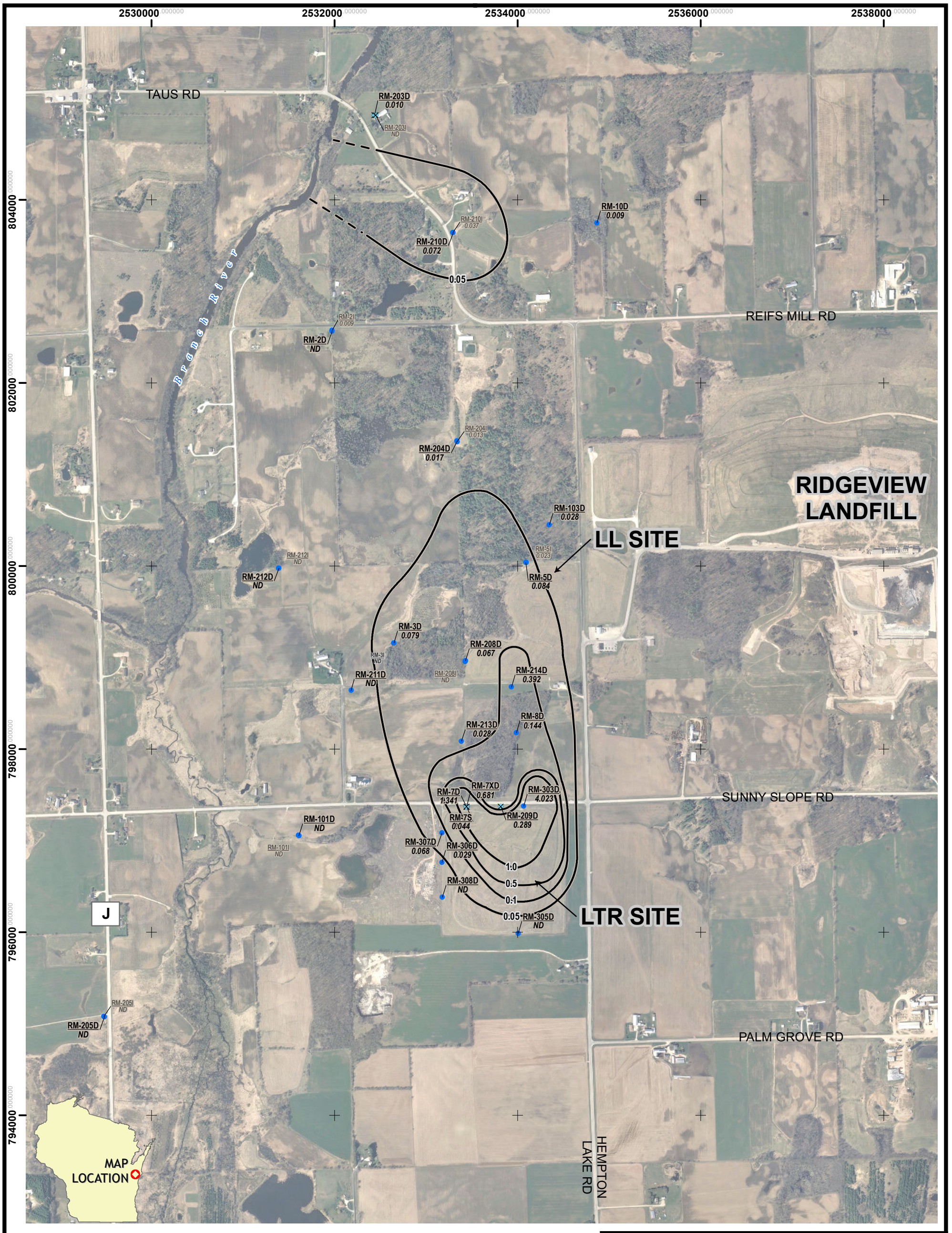

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. PRIOR TO 2007, RESULTS WERE REPORTED AS TOTAL, BUT SUBSEQUENT ANALYSES REVEALED 99.9% WERE CIS.
4. RM-213D RESULTS NO USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000

N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT
SHEET TITLE:	CIS-1,2-DICHLOROETHENE (MOLAR CONC.) LGU AND BEDROCK UNITS 2007 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-022cis_2007.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	FIGURE C-18
DATE:	NOVEMBER 2018		

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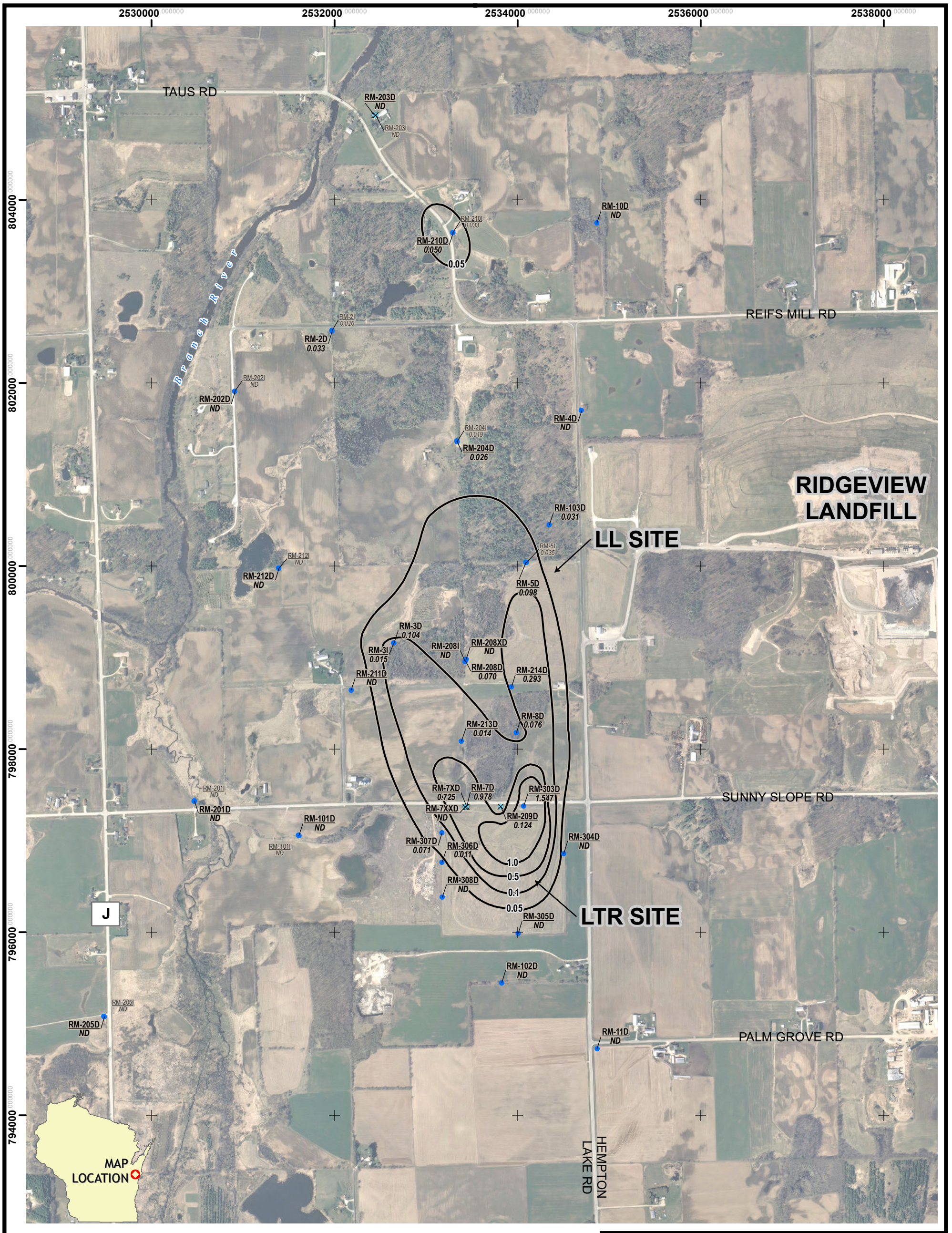

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol/L.
3. PRIOR TO 2007, RESULTS WERE REPORTED AS TOTAL, BUT SUBSEQUENT ANALYSES REVEALED 99.9% WERE CIS.
4. RM-213D RESULTS NOT USED IN CONTOURING.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **CIS-1,2-DICHLOROETHENE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2012 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-022cis_2012.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-19**
DATE:	NOVEMBER 2018		

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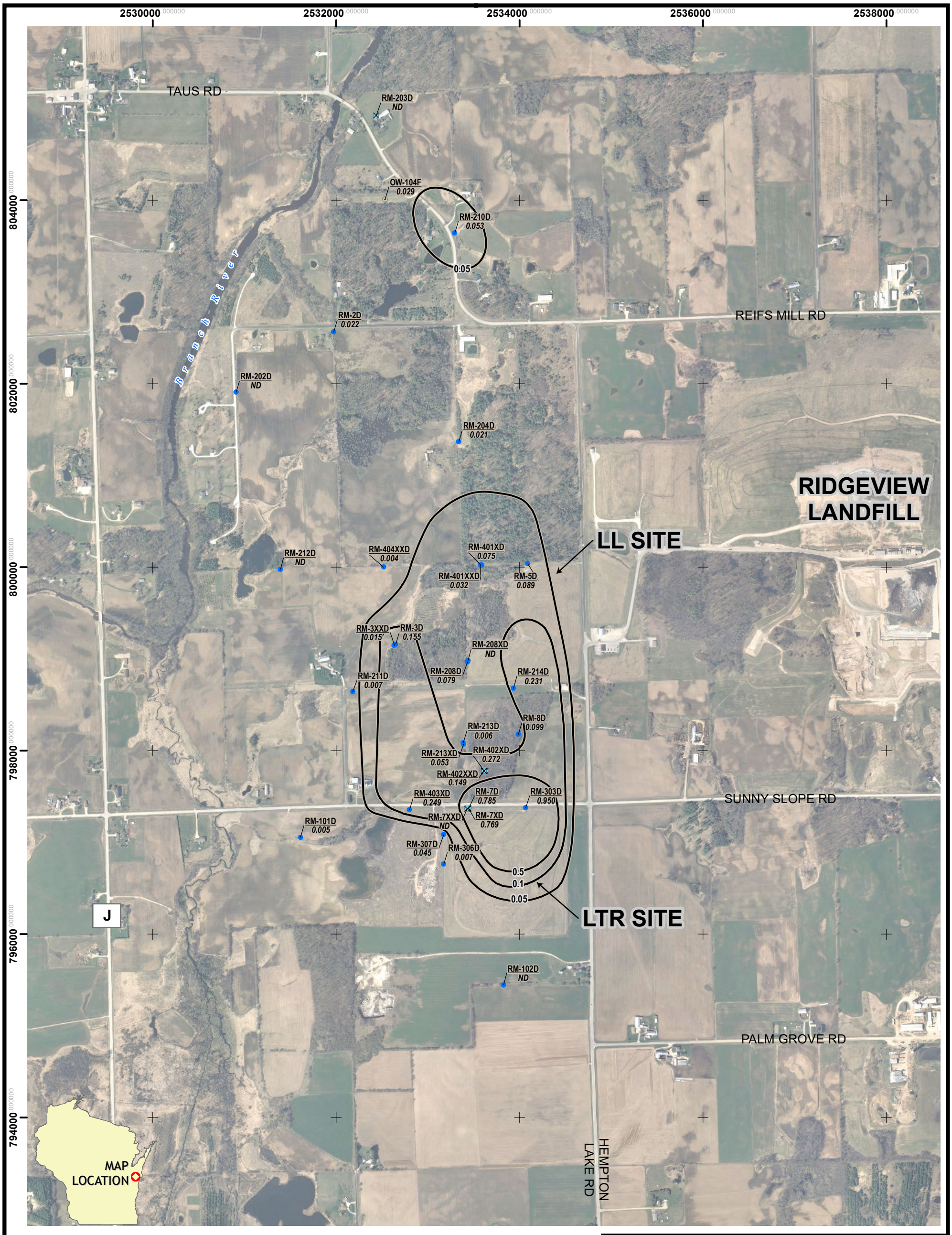

LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED)

LABEL FORMAT:

SAMPLE ID
SAMPLE RESULT (µmol/L)

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. ANALYTICAL RESULTS ARE SHOWN IN: µmol /L.
3. PRIOR TO 2007, RESULTS WERE REPORTED AS TOTAL, BUT SUBSEQUENT ANALYSES REVEALED 99.9% WERE CIS.

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SHEET TITLE: **CIS-1,2-DICHLOROETHENE (MOLAR CONC.)**
LGU AND BEDROCK UNITS
2017 Q3

DRAWN BY:	A. REIS	SCALE:	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER	AS NOTED	FILE NO. 268280-006-022cis_2017.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE C-20**
DATE:	NOVEMBER 2018		

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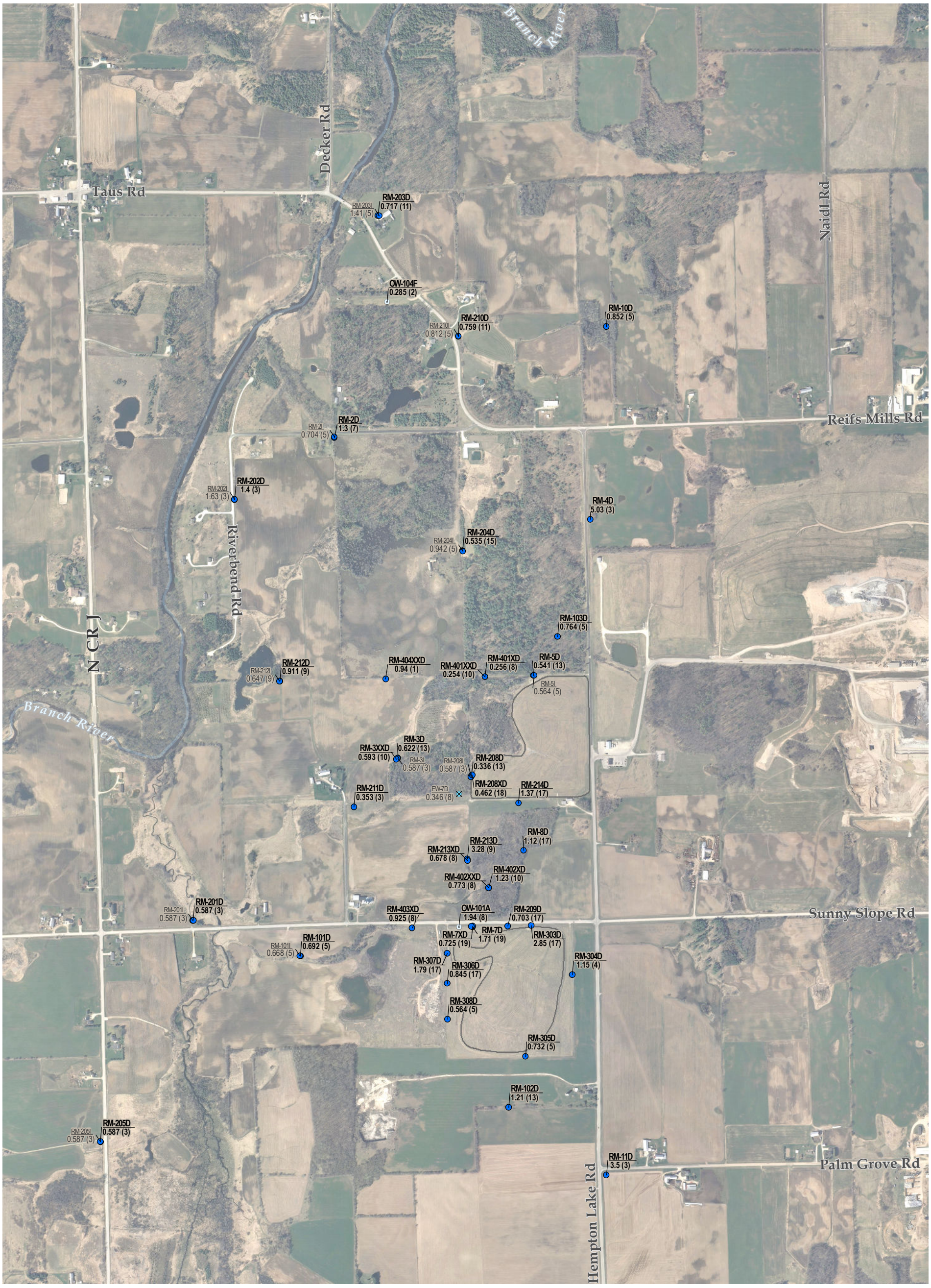
Appendix D
MNA Parameter Maps



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 1.71 (19) SAMPLE RESULT (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL TOC DATA AT EACH WELL LOCATION . NUMBER SHOWN IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION FOR TOC IS > 20 Mg/L AS AN INDICATOR FOR POSSIBLE REDUCTIVE DECHLORINATION.
4. NONE OF POSTED DATA MEET OR EXCEED THE SCREENING CRITERION.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
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2018 MNA REPORT

SUMMARY OF TOTAL ORGANIC CARBON (TOC) CONCENTRATIONS (mg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-1**
DATE:	NOVEMBER 2018		

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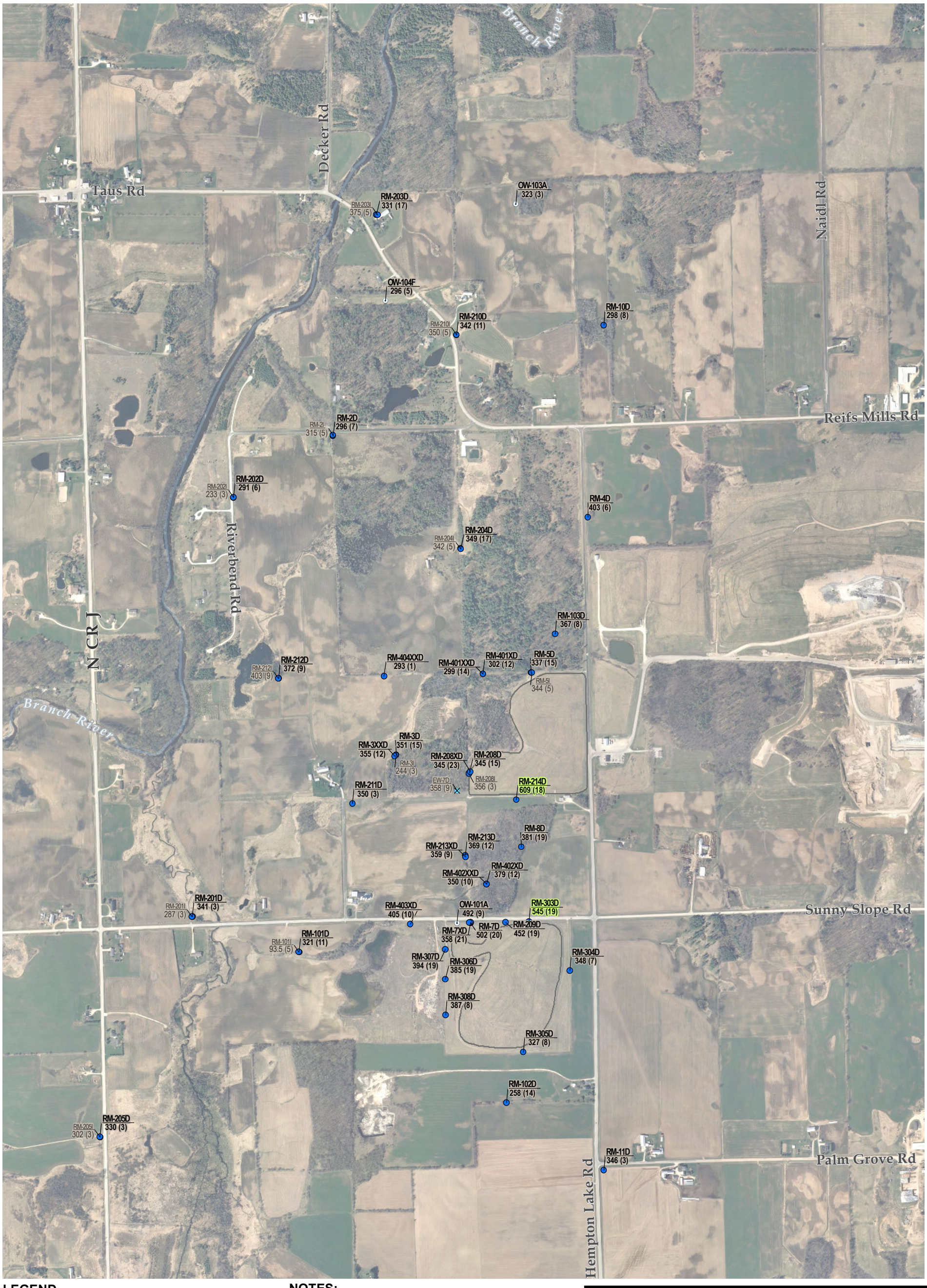
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 502 (20) SAMPLE RESULT (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL AKALINITY DATA AT EACH WELL LOCATION. THE NUMBER SHOWN IN PARENTHESES IS THE TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION FOR ALKALINITY IS 2X BACKGROUND CONCENTRATION AS AN INDICATOR FOR POSSIBLE REDUCTIVE DECHLORINATION.
4. AVERAGE BACKGROUND CONCENTRATION IS 258 mg/L (RM-102D). VALUES GREATER THAN 516 mg/L ARE HIGHLIGHTED

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF ALKALINITY CONCENTRATIONS (mg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-2**
DATE:	NOVEMBER 2018		

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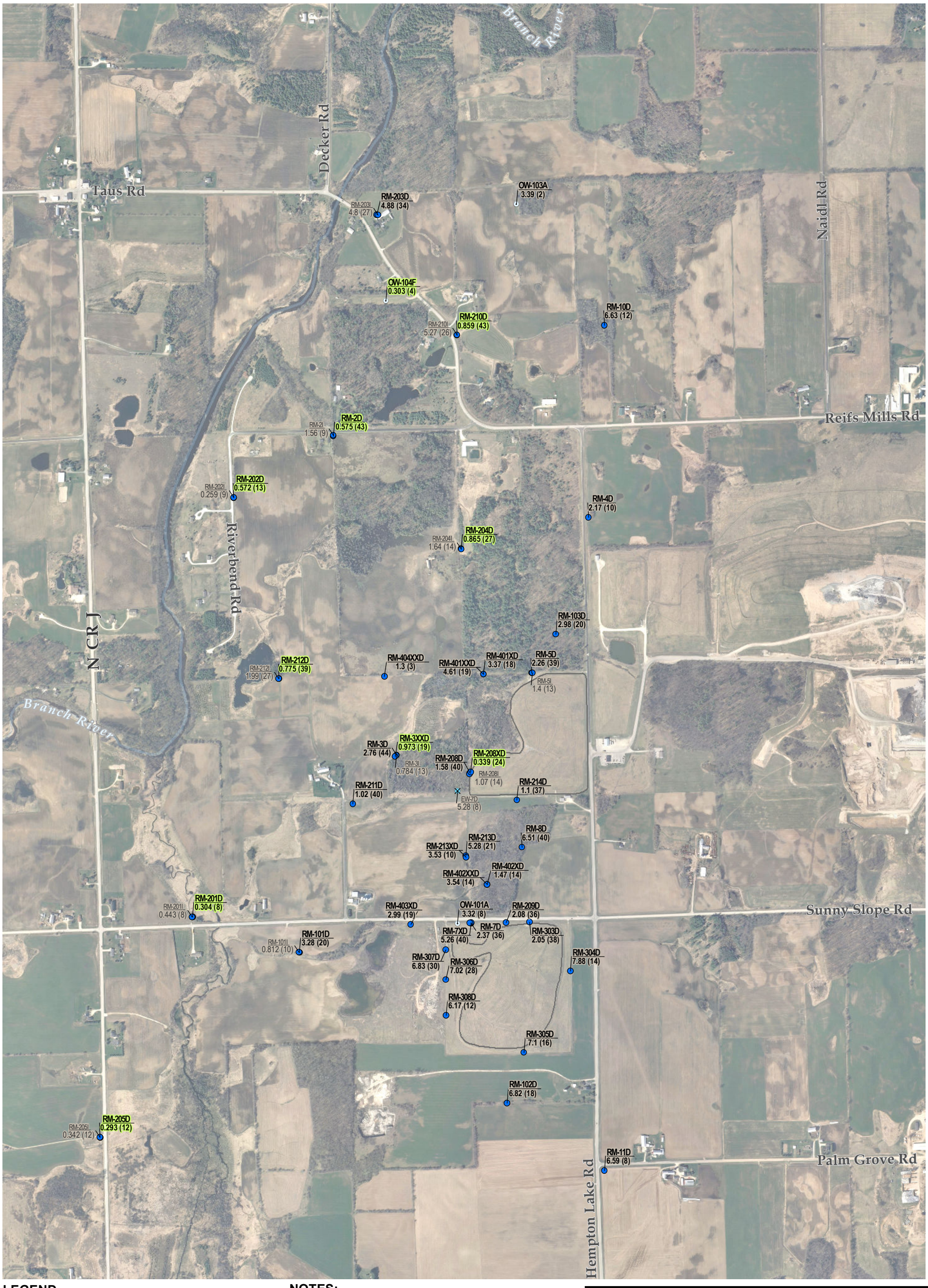
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 237 (36) SAMPLE RESULT (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL DO DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE USPA SCREENING CRITERION IS < 0.5 mg/L AS AN INDICATOR OF POSSIBLE REDUCTIVE DECHLORINATION.
4. CONCENTRATIONS < 1 mg/L ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF DISSOLVED OXYGEN (DO) CONCENTRATIONS (mg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-3**
DATE:	NOVEMBER 2018		

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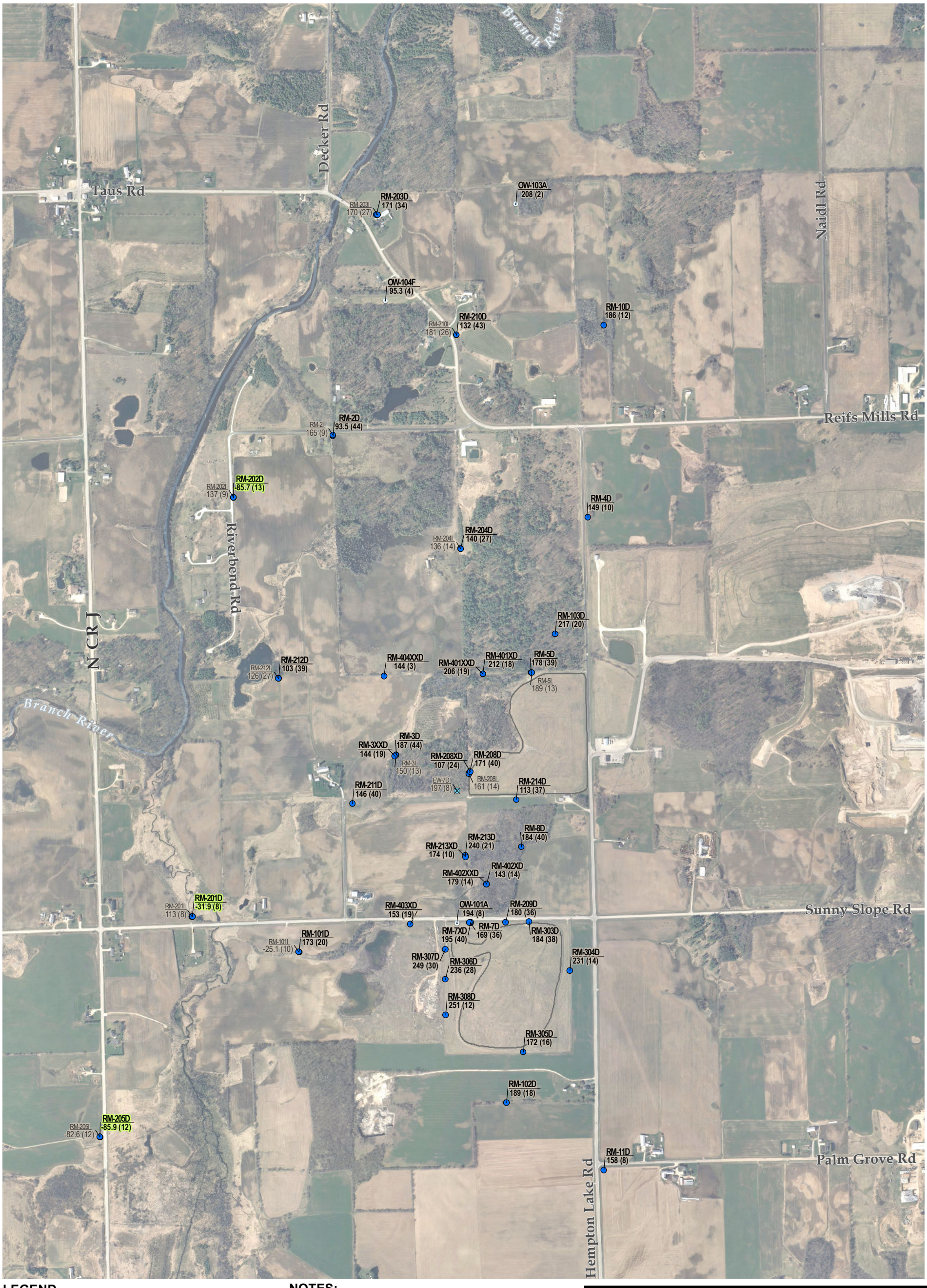
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 169 (36) SAMPLE RESULT (mV)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL ORP DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION IS < 50 mV FOR "POSSIBLE" AND < -100 mV FOR "LIKELY" EVIDENCE OF REDUCTIVE DECHLORINATION.
4. RESULTS < 50 mV ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:
LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF OXIDATION-REDUCTION POTENTIAL (ORP) CONCENTRATIONS (mV)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-4**
DATE:	NOVEMBER 2018		

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Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

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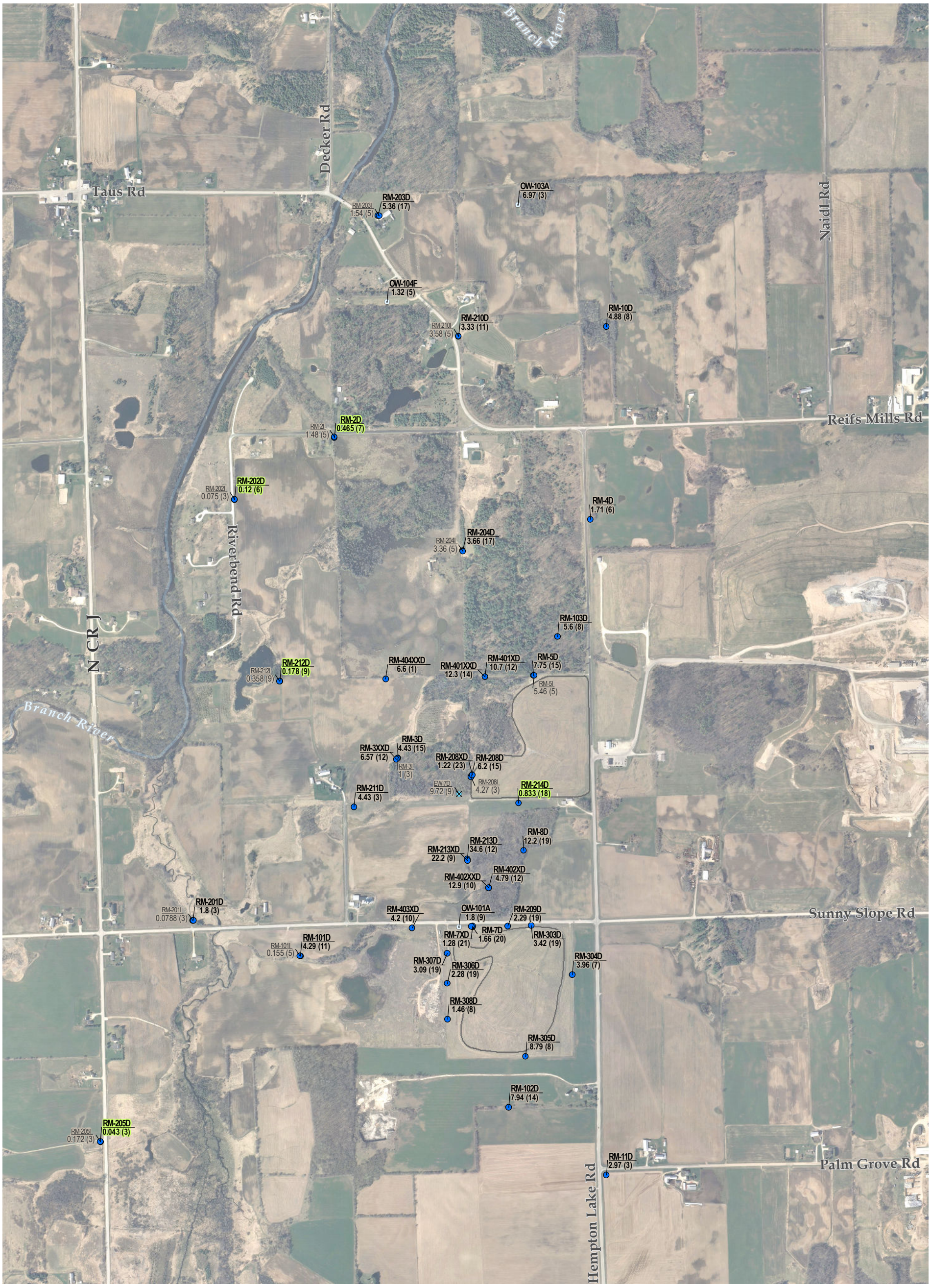

LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 1.66 (20) SAMPLE RESULT (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL NITRATE DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION IS < 1 mg/L AS AN INDICATION OF POSSIBLE REDUCTIVE DECHLORINATION.
4. CONCENTRATIONS < 1 mg/L ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF NITRATE CONCENTRATIONS (mg/L)

DRAWN BY: S. MAJOR	SCALE: 1: 12,000	PROJ. NO.	226573-009
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-014rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	**FIGURE D-5**	
DATE: NOVEMBER 2018			

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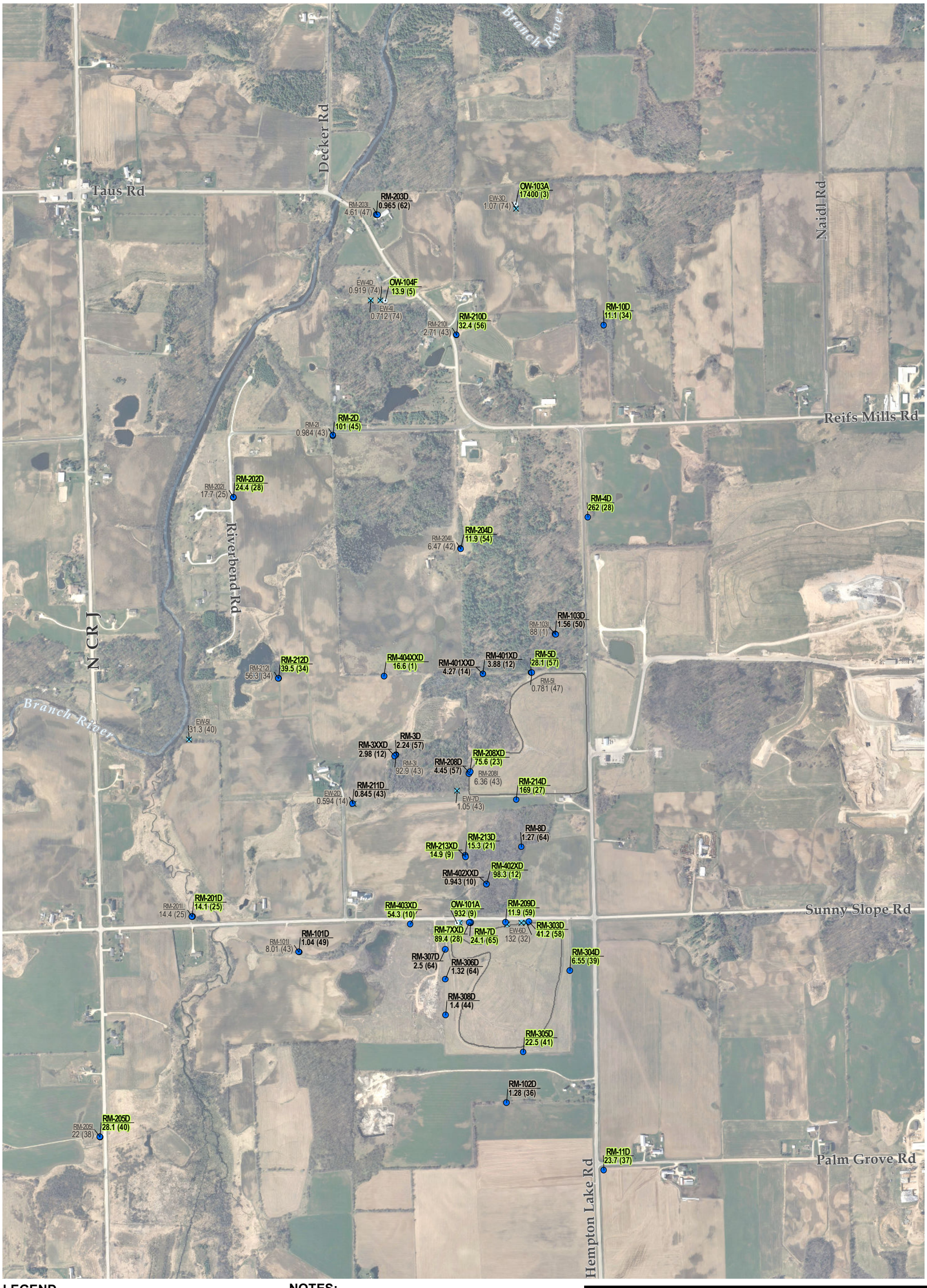
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 24.1 (65) SAMPLE RESULT (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL DATA AT EACH WELL LOCATION. THE NUMBER SHOWN IN PARENTHESES IS THE TOTAL NUMBER OF VALUES REPORTED.
3. THE SCREENING CRITERION FOR MANGANESE IS AN INCREASE OVER BACKGROUND CONCENTRATIONS.
4. THE BACKGROUND CONCENTRATION OF MANGANESE IS 1.3 µg/L (RM-102D). ALL VALUES GREATER THAN 5X BACKGROUND (6.5 µg/L) ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF MANGANESE CONCENTRATIONS (µg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-6**
DATE:	NOVEMBER 2018		

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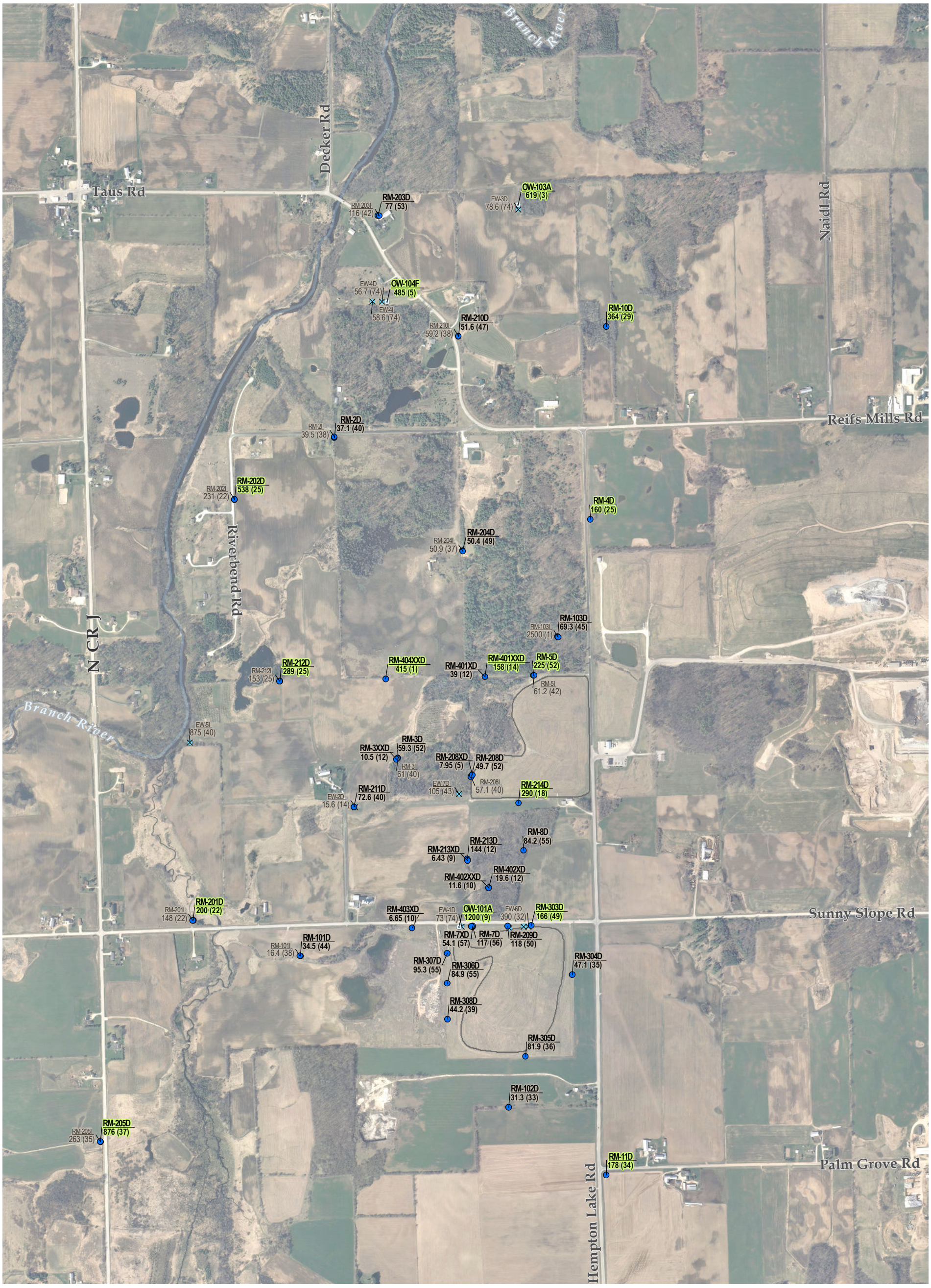
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 117 (56) SAMPLE RESULT (µg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL IRON DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE SCREENING CRITERION FOR IRON IS AN INCREASE OVER BACKGROUND CONCENTRATIONS.
4. THE BACKGROUND CONCENTRATION FOR IRON IS 31.3 µg/L (RM-102D). VALVES GREATER THAN 5X BACKGROUND (156.5 µg/L) ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF IRON CONCENTRATIONS (µg/L)

DRAWN BY: S. MAJOR	SCALE: 1: 12,000	PROJ. NO.	226573-009
CHECKED BY: M. WESTOVER		FILE NO.	268280-006-014rptmb.mxd
APPROVED BY: J. WEDEKIND	DATE PRINTED:	**FIGURE D-7**	
DATE: NOVEMBER 2018			

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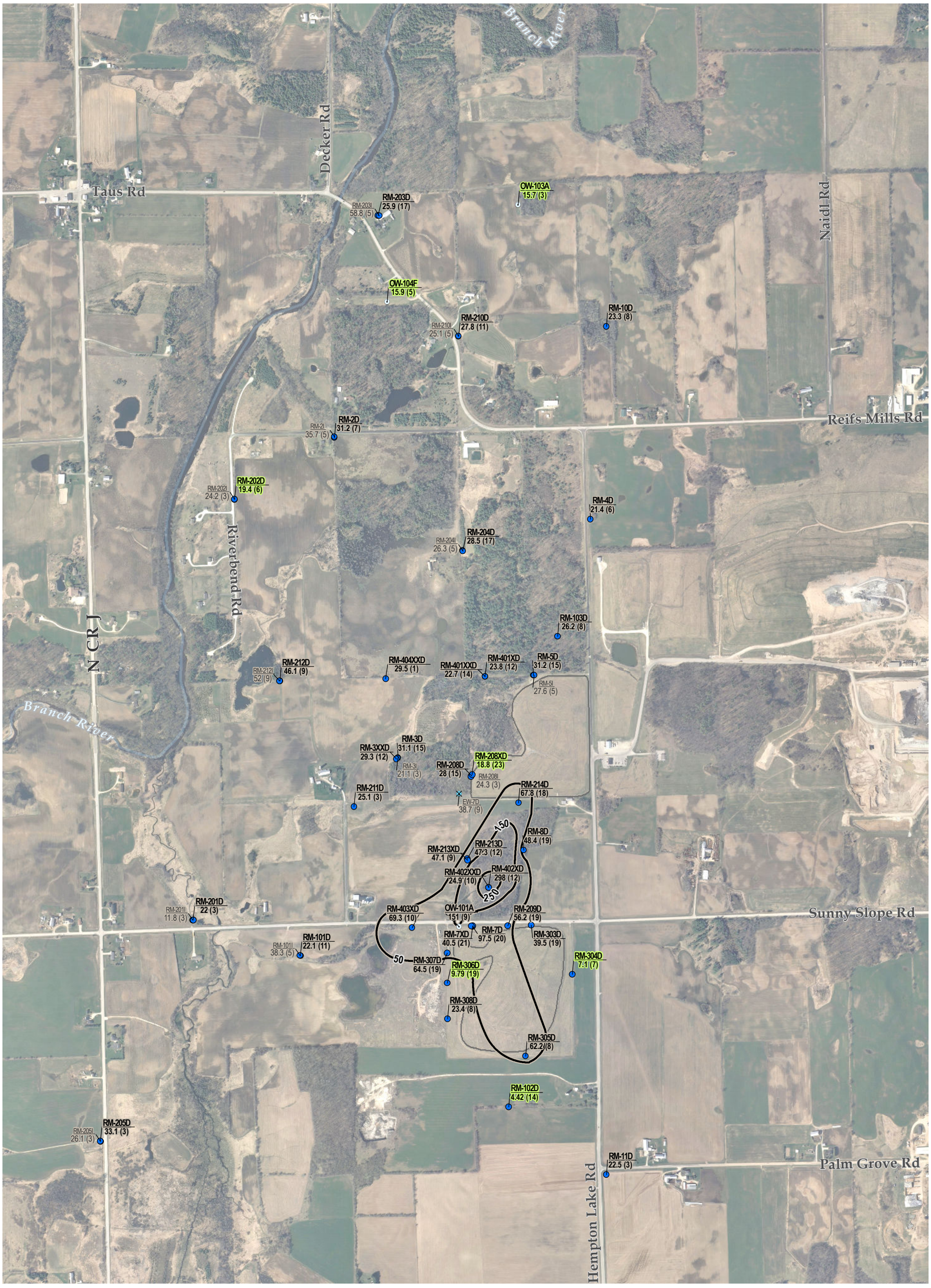
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 97.5 (20) SAMPLE RESULT (mg/L)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AND AVERAGE OF SULFATE DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS THE TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION FOR SULFATE IS < 20 mg/L AS AN INDICATOR OF POSSIBLE REDUCTIVE DECHLORINATION.
4. VALVES < 20 mg/L ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT: **LEMBERGER SITES**
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

ISOCONCENTRATION MAP OF SULFATE CONCENTRATIONS (mg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-8**
DATE:	NOVEMBER 2018		

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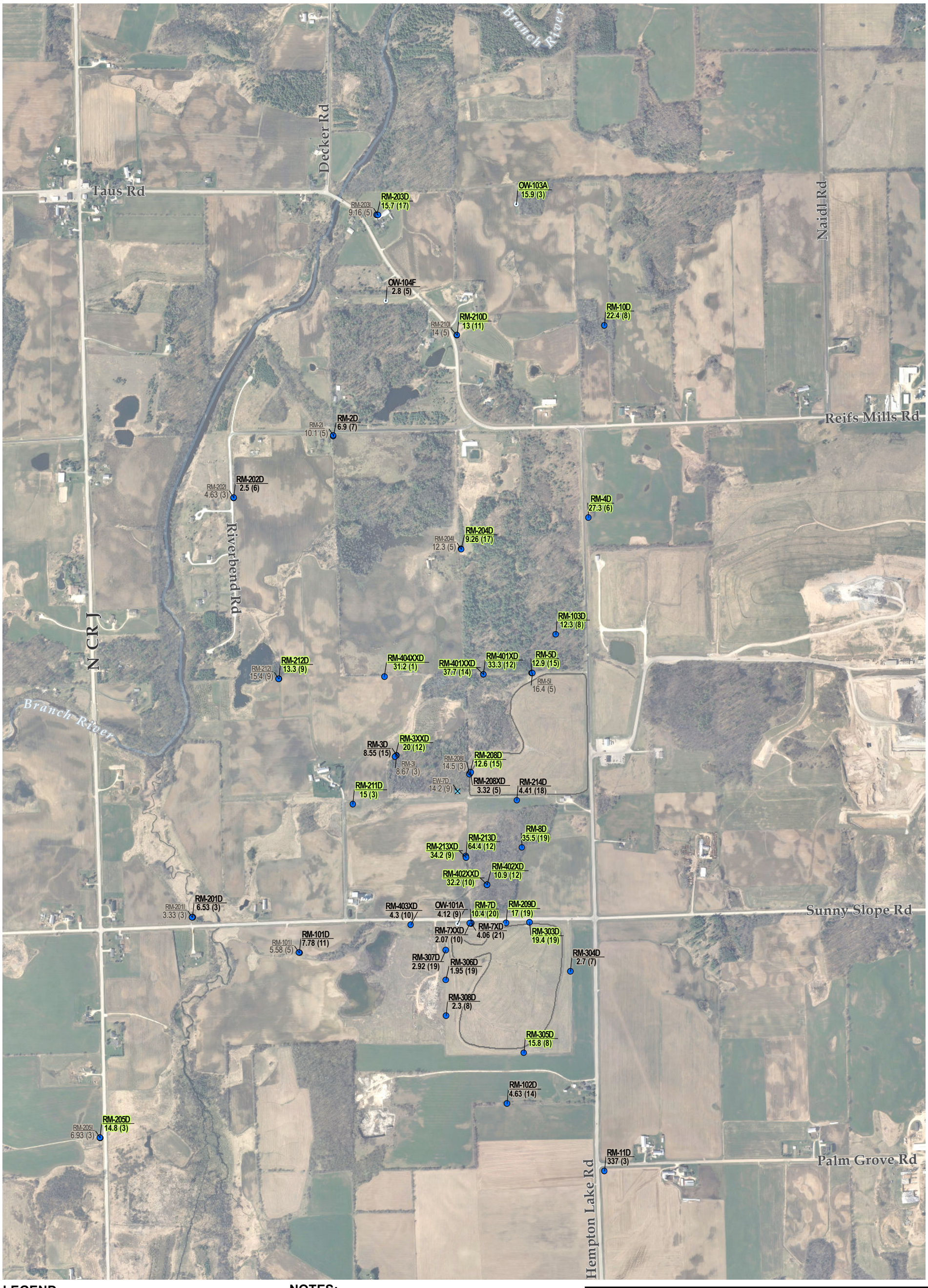
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 10.4 (20) SAMPLE RESULT (mg/L)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF CHLORIDE DATA AT EACH WELL LOCATION. NUMBER IN PARENTHESES IS TOTAL NUMBER OF VALUES REPORTED.
3. THE USEPA SCREENING CRITERION FOR CHLORIDE IS 2X THE BACKGROUND CONCENTRATION AS AN INDICATOR FOR POSSIBLE REDUCTIVE DECHLORINATION.
4. THE AVERAGE BACKGROUND CONCENTRATION IS 4.6 mg/L (RM-102D). VALUES GREATER THAN 2X THE BACKGROUND CONCENTRATION (9.2 mg/L) ARE HIGHLIGHTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

SUMMARY OF CHLORIDE CONCENTRATIONS (mg/L)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-9**
DATE:	NOVEMBER 2018		

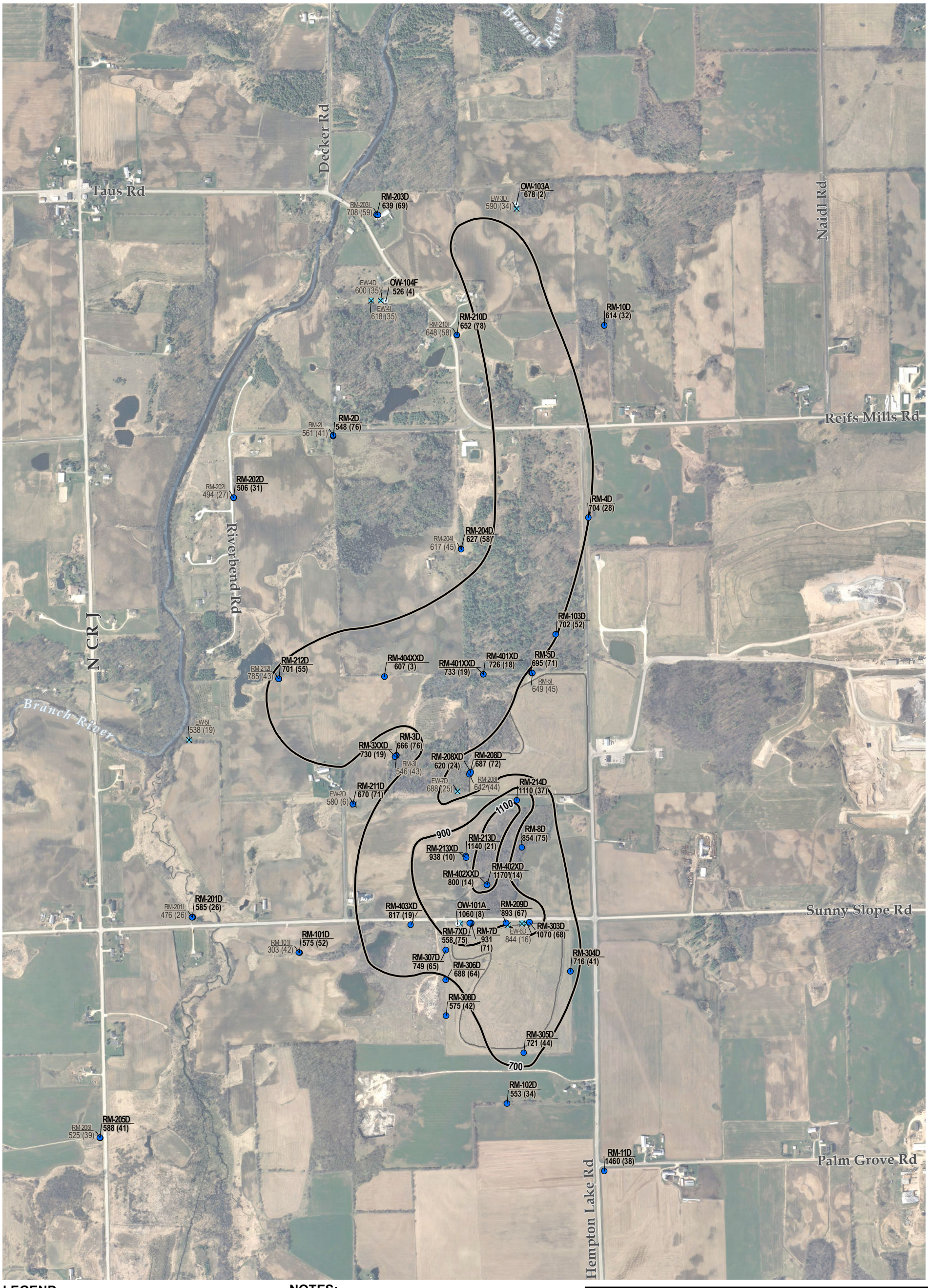
TRC

708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

Saved By: SMAJOR on 11/6/2018, 10:34:06 AM
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- 10.4 (20) SAMPLE RESULT (µS/cm)
- ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED) (µS/cm)

NOTES:

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. DATA SHOWN IS BASED ON AN AVERAGE OF ALL SPECIFIC CONDUCTANCE MEASUREMENTS AT EACH WELL. THE NUMBER IN PARENTHESES IS THE TOTAL NUMBER OF VALUES REPORTED.

N

0 1,000 Feet

1 " = 1,000 '

1:12,000

PROJECT:

LEMBERGER SITES
TOWN OF FRANKLIN, WISCONSIN
2018 MNA REPORT

ISOCONCENTRATION MAP OF SPECIFIC CONDUCTANCE THROUGH TIME (µS/cm)

DRAWN BY:	S. MAJOR	SCALE: 1: 12,000	PROJ. NO. 226573-009
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-014rptmb.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	**FIGURE D-10**
DATE:	NOVEMBER 2018		

TRC

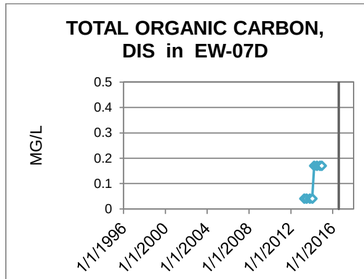
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

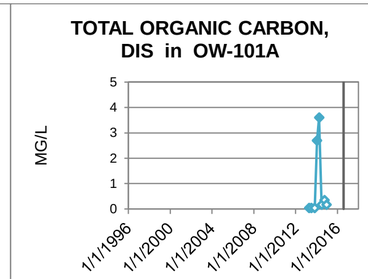
Saved By: SMAJOR on 11/6/2018, 10:34:06 AM
Path: E:\LembergerLandfill\2017_268280\268280-006-014rptmb.mxd

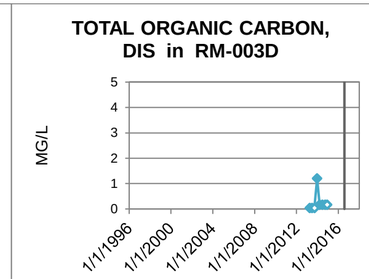
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

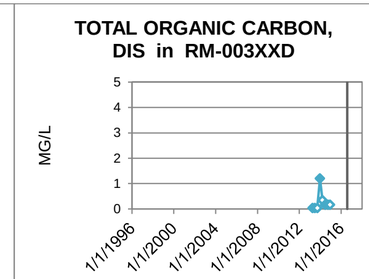
TRC - GIS

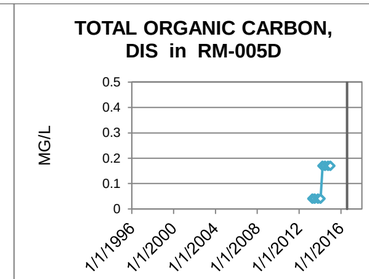
Appendix E
MNA Parameter Graphs

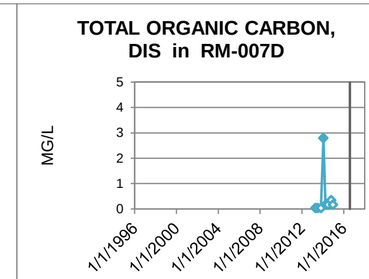

TOTAL ORGANIC CARBON, DIS in EW-07D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

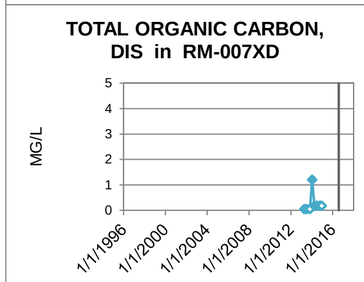

TOTAL ORGANIC CARBON, DIS in OW-101A
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

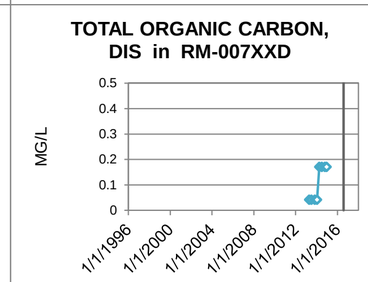

TOTAL ORGANIC CARBON, DIS in RM-003D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

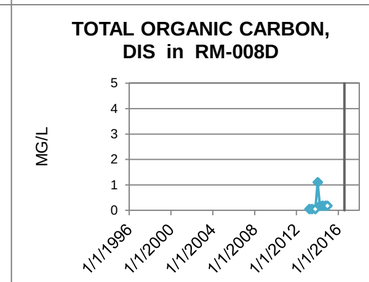

TOTAL ORGANIC CARBON, DIS in RM-003XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

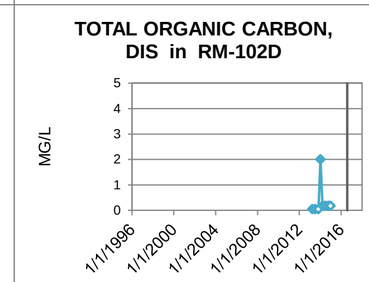

TOTAL ORGANIC CARBON, DIS in RM-005D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

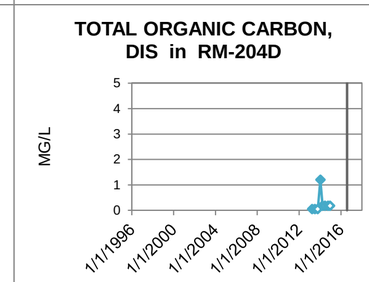

TOTAL ORGANIC CARBON, DIS in RM-007D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

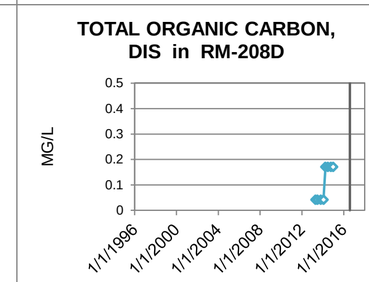

TOTAL ORGANIC CARBON, DIS in RM-007XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

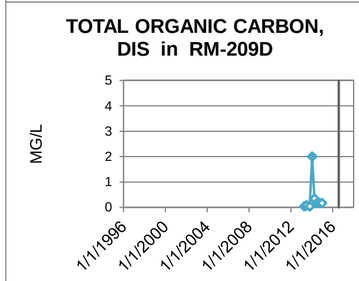

TOTAL ORGANIC CARBON, DIS in RM-007XXD
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

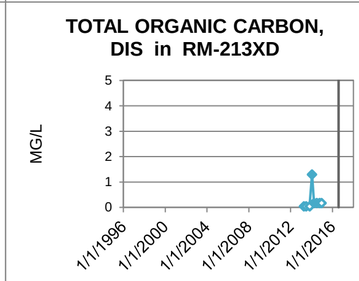

TOTAL ORGANIC CARBON, DIS in RM-008D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

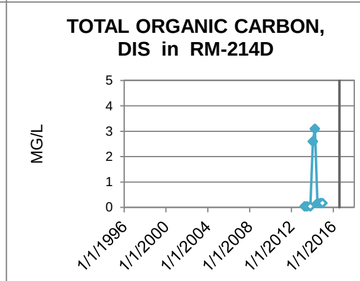

TOTAL ORGANIC CARBON, DIS in RM-102D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

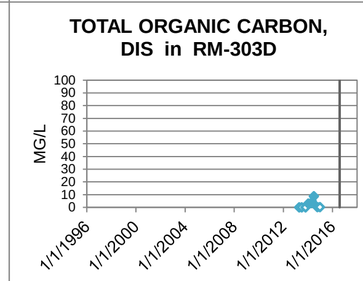

TOTAL ORGANIC CARBON, DIS in RM-204D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

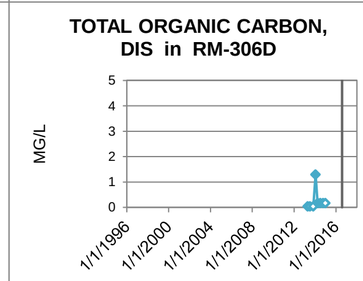

TOTAL ORGANIC CARBON, DIS in RM-208D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

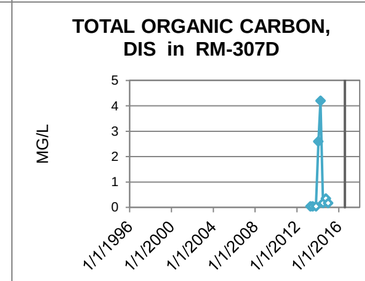

TOTAL ORGANIC CARBON, DIS in RM-209D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

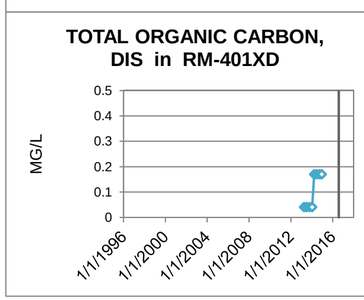

TOTAL ORGANIC CARBON, DIS in RM-213XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

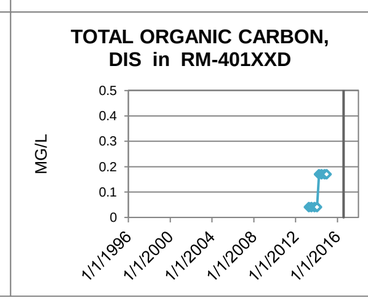

TOTAL ORGANIC CARBON, DIS in RM-214D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

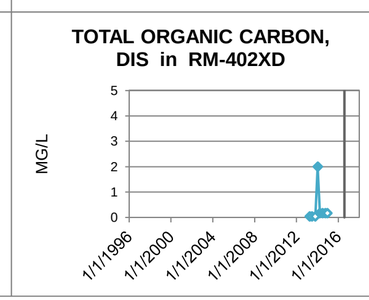

TOTAL ORGANIC CARBON, DIS in RM-303D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

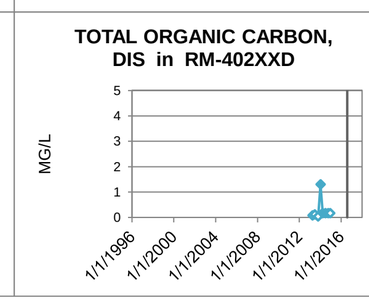

TOTAL ORGANIC CARBON, DIS in RM-306D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

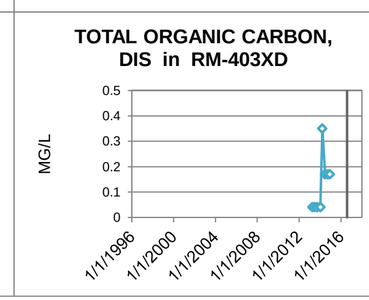

TOTAL ORGANIC CARBON, DIS in RM-307D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

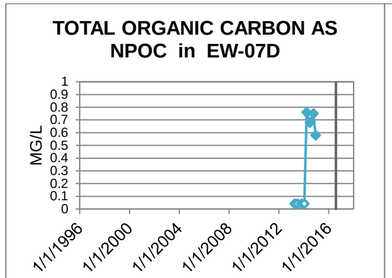

TOTAL ORGANIC CARBON, DIS in RM-401XD
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

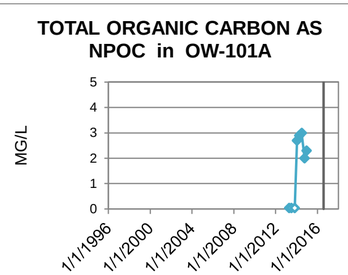

TOTAL ORGANIC CARBON, DIS in RM-401XXD
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

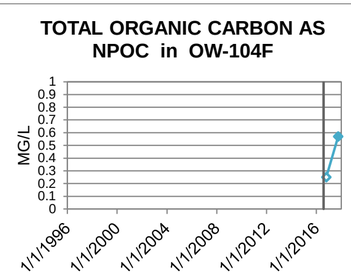

TOTAL ORGANIC CARBON, DIS in RM-402XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

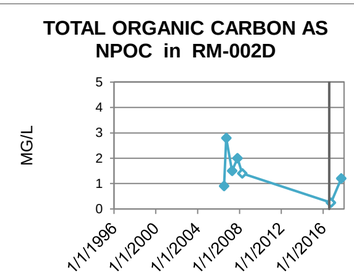

TOTAL ORGANIC CARBON, DIS in RM-402XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

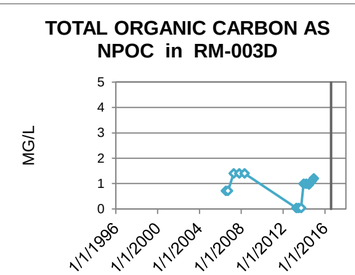

TOTAL ORGANIC CARBON, DIS in RM-403XD
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

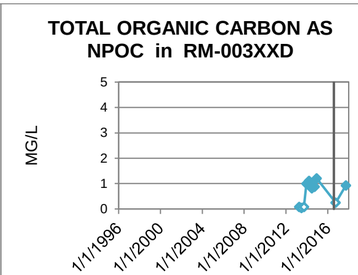

TOTAL ORGANIC CARBON AS NPOC in EW-07D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

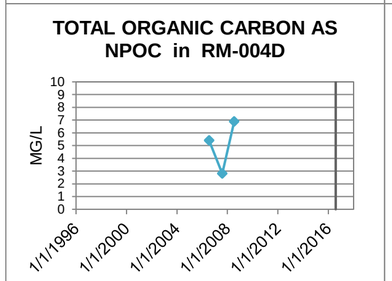

TOTAL ORGANIC CARBON AS NPOC in OW-101A
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

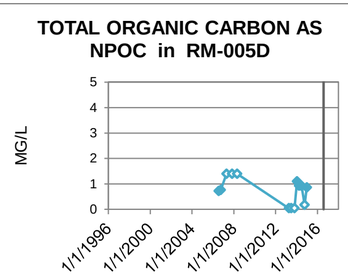

TOTAL ORGANIC CARBON AS NPOC in OW-104F
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

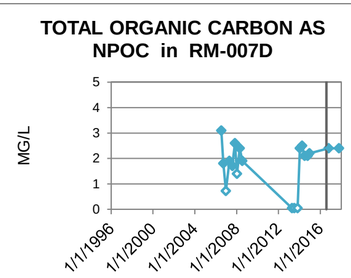

TOTAL ORGANIC CARBON AS NPOC in RM-002D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

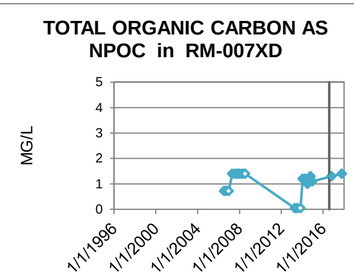

TOTAL ORGANIC CARBON AS NPOC in RM-003D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

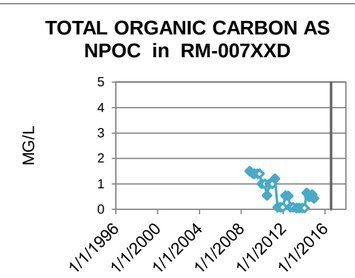

TOTAL ORGANIC CARBON AS NPOC in RM-003XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

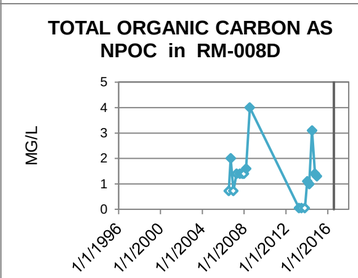

TOTAL ORGANIC CARBON AS NPOC in RM-004D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

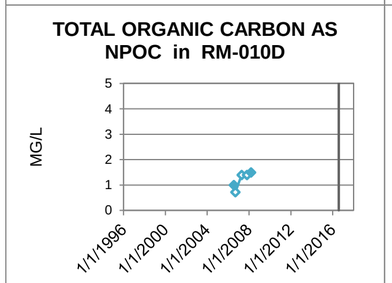

TOTAL ORGANIC CARBON AS NPOC in RM-005D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

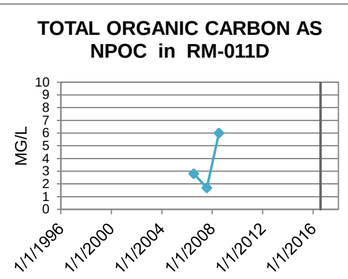

TOTAL ORGANIC CARBON AS NPOC in RM-007D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

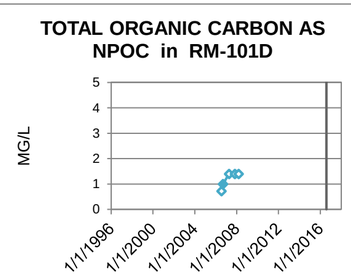

TOTAL ORGANIC CARBON AS NPOC in RM-007XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

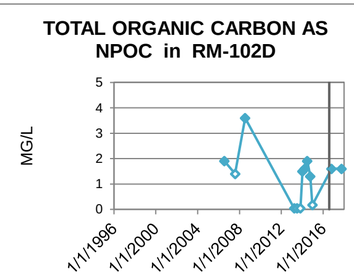

TOTAL ORGANIC CARBON AS NPOC in RM-007XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

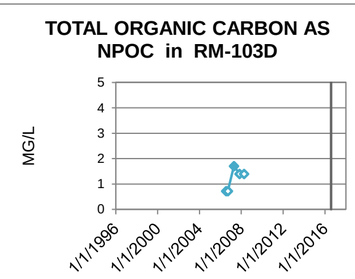

TOTAL ORGANIC CARBON AS NPOC in RM-008D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

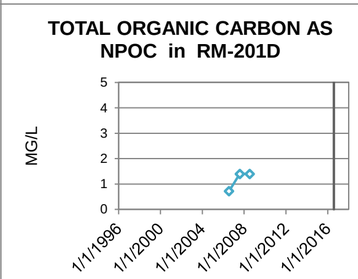

TOTAL ORGANIC CARBON AS NPOC in RM-010D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

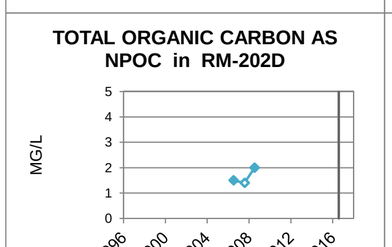

TOTAL ORGANIC CARBON AS NPOC in RM-011D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

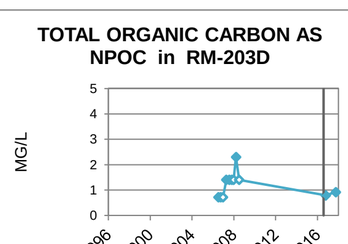

TOTAL ORGANIC CARBON AS NPOC in RM-101D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

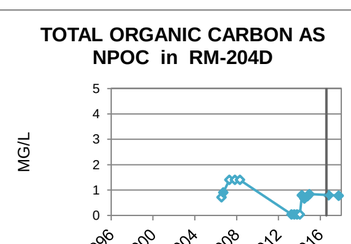

TOTAL ORGANIC CARBON AS NPOC in RM-102D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

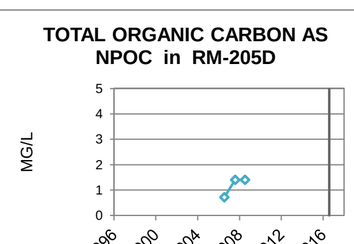

TOTAL ORGANIC CARBON AS NPOC in RM-103D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

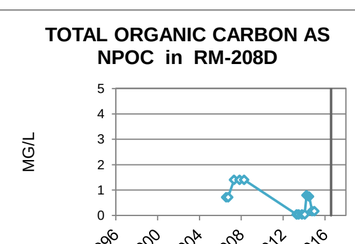

TOTAL ORGANIC CARBON AS NPOC in RM-201D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

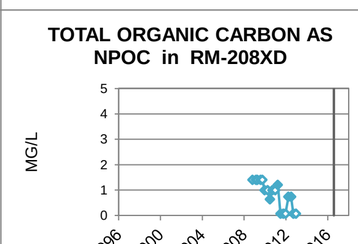

TOTAL ORGANIC CARBON AS NPOC in RM-202D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

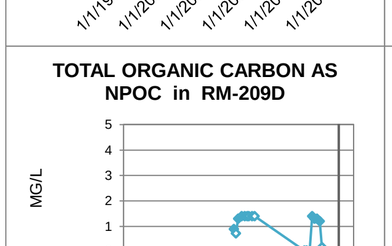

TOTAL ORGANIC CARBON AS NPOC in RM-203D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

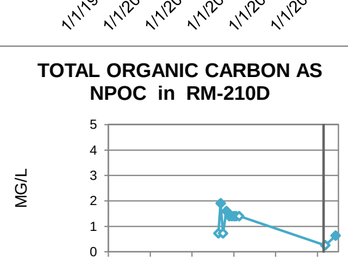

TOTAL ORGANIC CARBON AS NPOC in RM-204D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

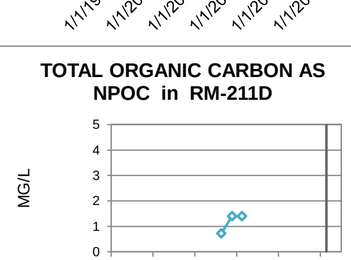

TOTAL ORGANIC CARBON AS NPOC in RM-205D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

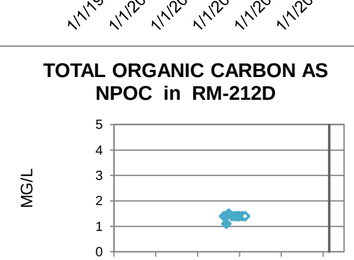

TOTAL ORGANIC CARBON AS NPOC in RM-208D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

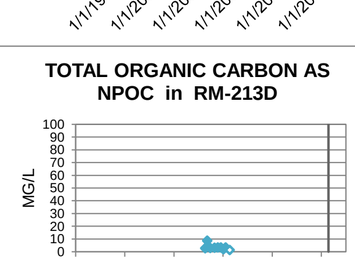

TOTAL ORGANIC CARBON AS NPOC in RM-208XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

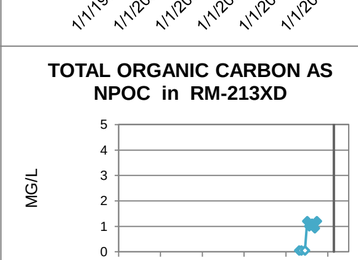

TOTAL ORGANIC CARBON AS NPOC in RM-209D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

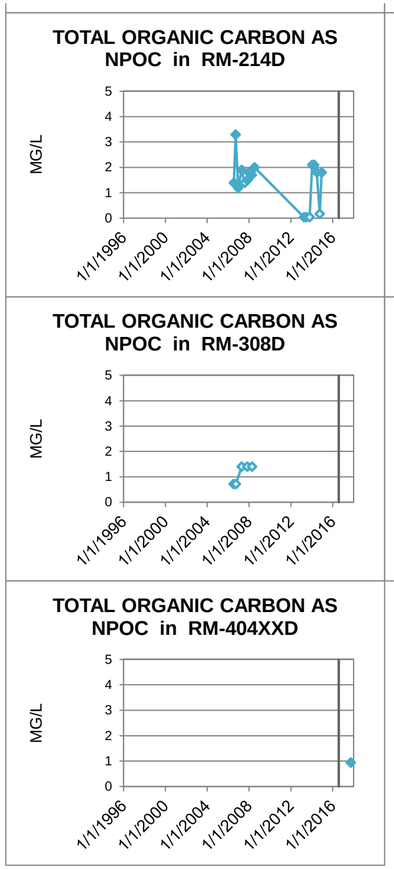

TOTAL ORGANIC CARBON AS NPOC in RM-210D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

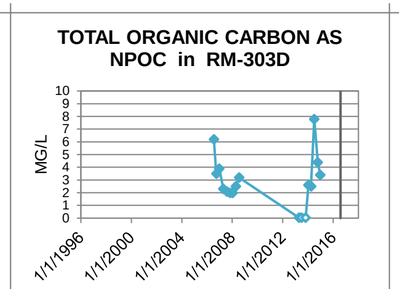

TOTAL ORGANIC CARBON AS NPOC in RM-211D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

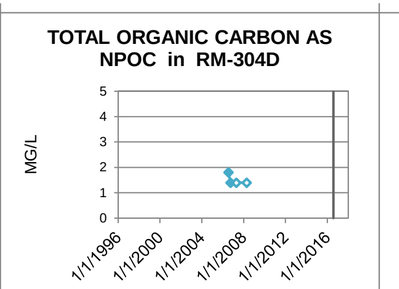

TOTAL ORGANIC CARBON AS NPOC in RM-212D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

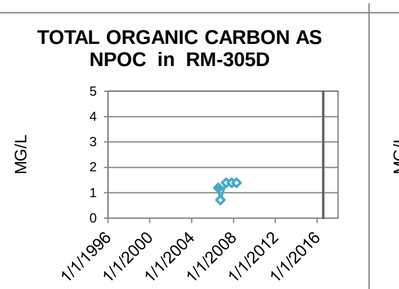

TOTAL ORGANIC CARBON AS NPOC in RM-213D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

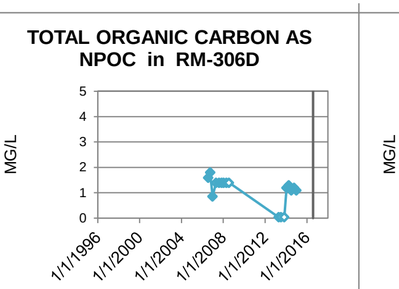

TOTAL ORGANIC CARBON AS NPOC in RM-213XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

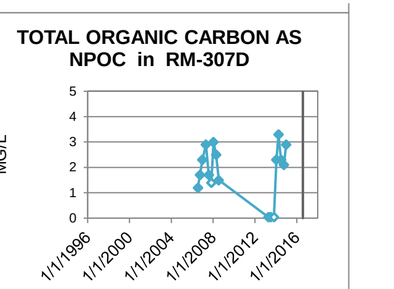

TOTAL ORGANIC CARBON AS NPOC in RM-214D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL ORGANIC CARBON AS NPOC in RM-303D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

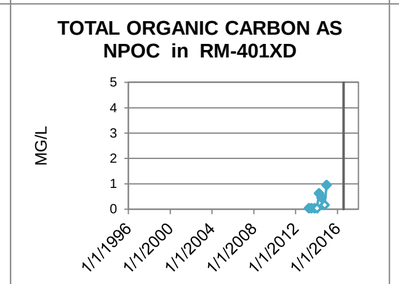

TOTAL ORGANIC CARBON AS NPOC in RM-304D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

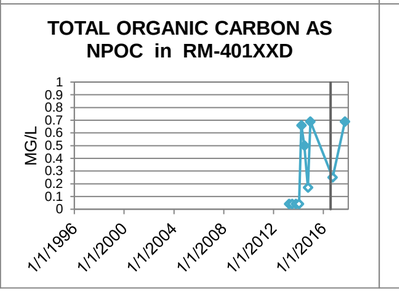

TOTAL ORGANIC CARBON AS NPOC in RM-305D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

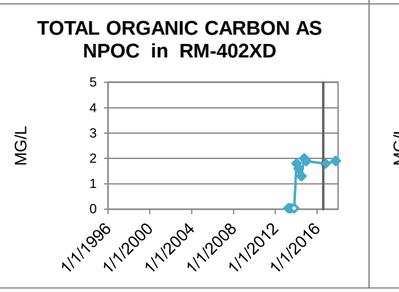

TOTAL ORGANIC CARBON AS NPOC in RM-306D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

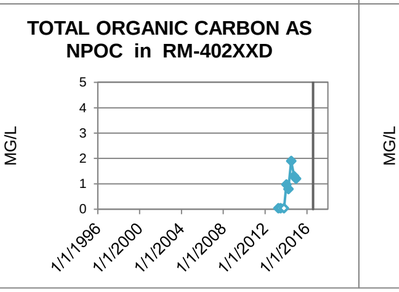

TOTAL ORGANIC CARBON AS NPOC in RM-307D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

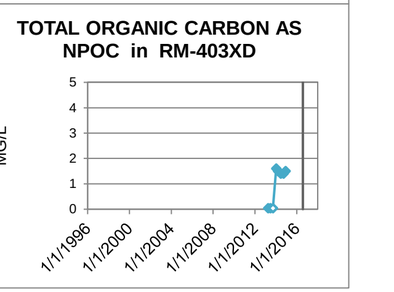
TOTAL ORGANIC CARBON AS NPOC in RM-308D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL ORGANIC CARBON AS NPOC in RM-401XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

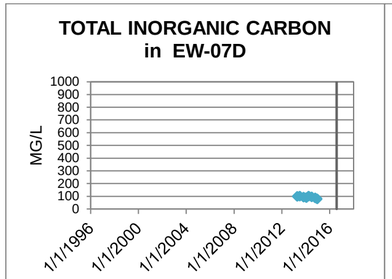

TOTAL ORGANIC CARBON AS NPOC in RM-401XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

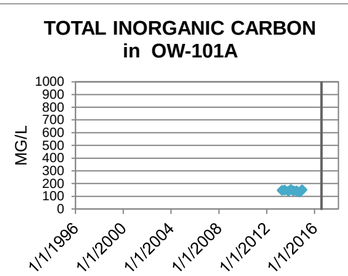

TOTAL ORGANIC CARBON AS NPOC in RM-402XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

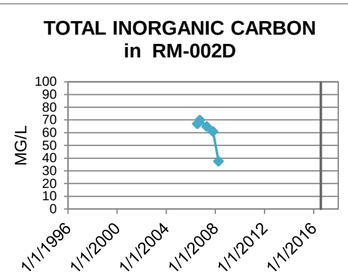

TOTAL ORGANIC CARBON AS NPOC in RM-402XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

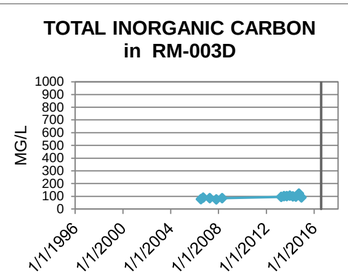

TOTAL ORGANIC CARBON AS NPOC in RM-403XD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

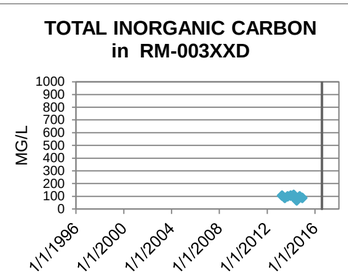
TOTAL ORGANIC CARBON AS NPOC in RM-404XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

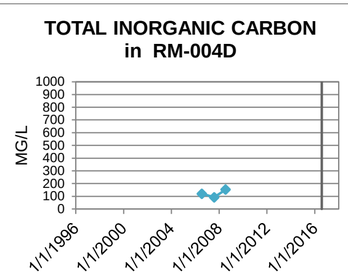

TOTAL INORGANIC CARBON
in EW-07D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

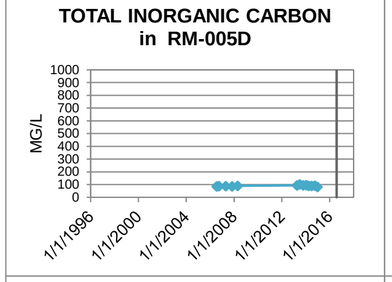

TOTAL INORGANIC CARBON
in OW-101A
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

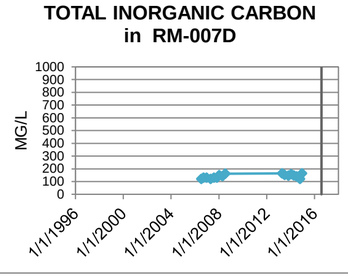

TOTAL INORGANIC CARBON
in RM-002D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

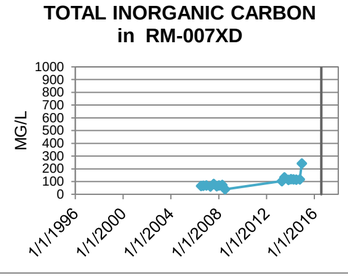

TOTAL INORGANIC CARBON
in RM-003D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

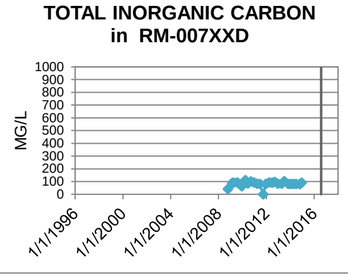

TOTAL INORGANIC CARBON
in RM-003XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

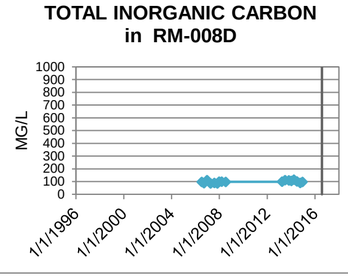

TOTAL INORGANIC CARBON
in RM-004D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

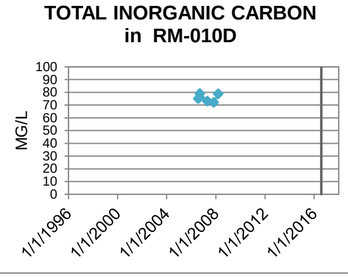

TOTAL INORGANIC CARBON
in RM-005D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

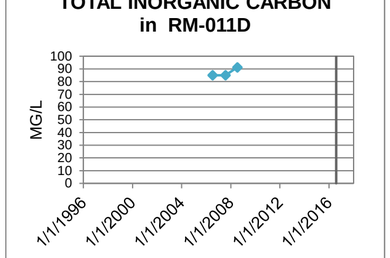

TOTAL INORGANIC CARBON
in RM-007D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

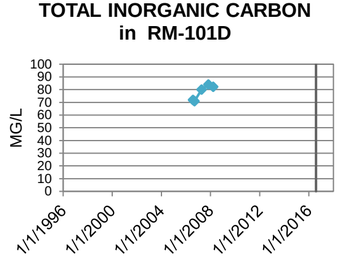

TOTAL INORGANIC CARBON
in RM-007XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

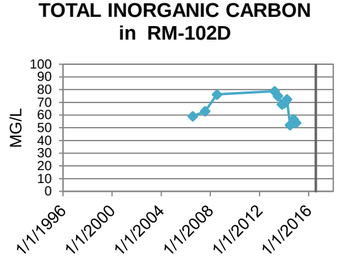

TOTAL INORGANIC CARBON
in RM-007XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

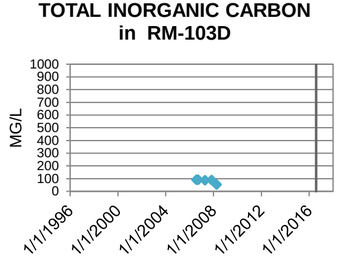

TOTAL INORGANIC CARBON
in RM-008D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

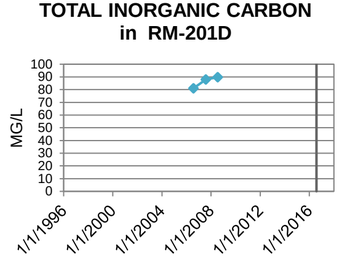

TOTAL INORGANIC CARBON
in RM-010D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

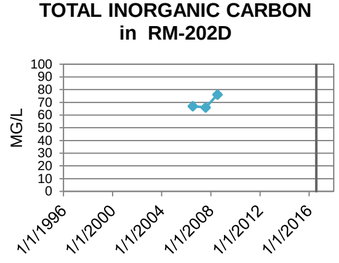

TOTAL INORGANIC CARBON
in RM-011D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

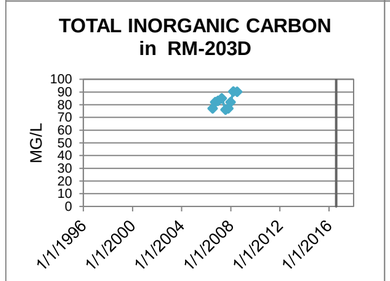

TOTAL INORGANIC CARBON
in RM-101D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

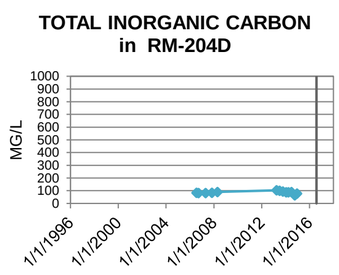

TOTAL INORGANIC CARBON
in RM-102D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

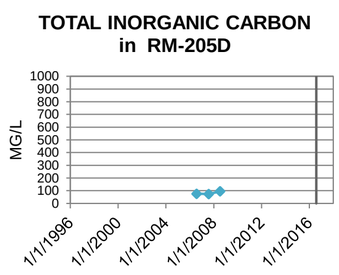

TOTAL INORGANIC CARBON
in RM-103D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

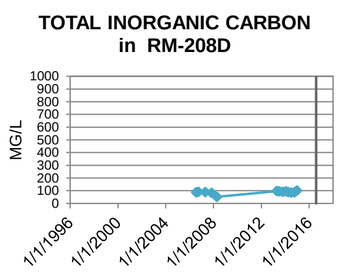

TOTAL INORGANIC CARBON
in RM-201D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

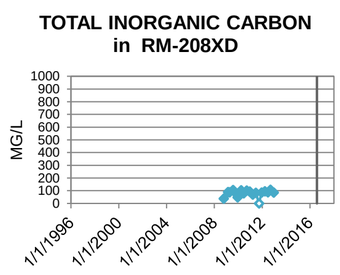

TOTAL INORGANIC CARBON
in RM-202D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

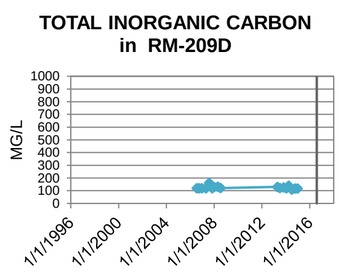

TOTAL INORGANIC CARBON
in RM-203D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

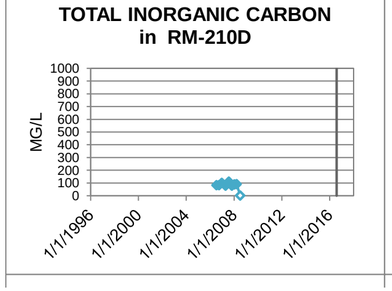

TOTAL INORGANIC CARBON
in RM-204D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

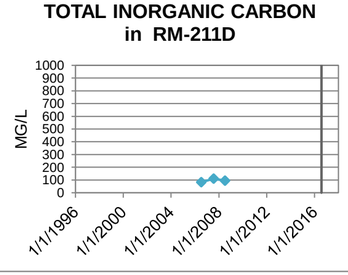

TOTAL INORGANIC CARBON
in RM-205D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

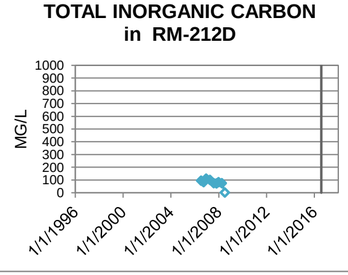

TOTAL INORGANIC CARBON
in RM-208D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

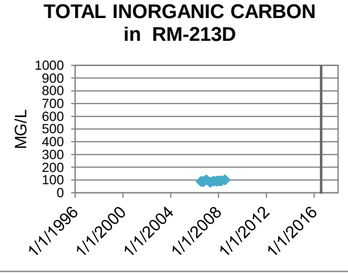

TOTAL INORGANIC CARBON
in RM-208XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

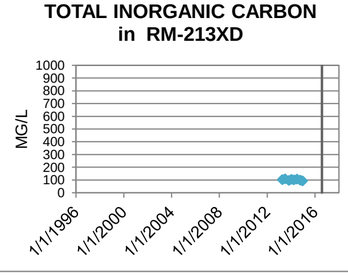

TOTAL INORGANIC CARBON
in RM-209D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

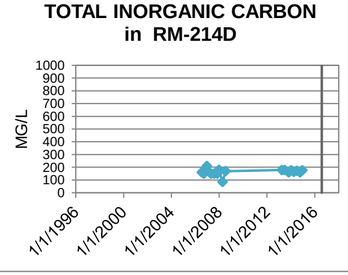

TOTAL INORGANIC CARBON
in RM-210D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

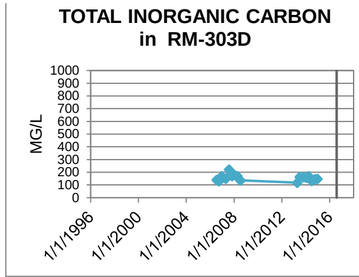

TOTAL INORGANIC CARBON
in RM-211D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

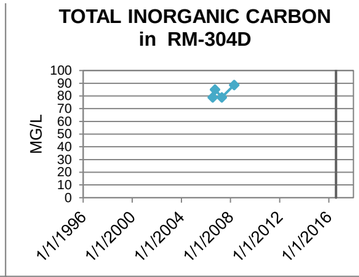

TOTAL INORGANIC CARBON
in RM-212D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

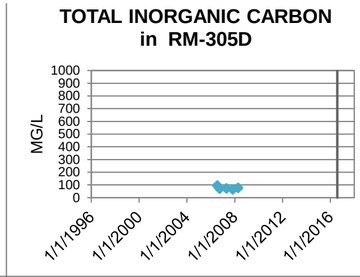

TOTAL INORGANIC CARBON
in RM-213D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

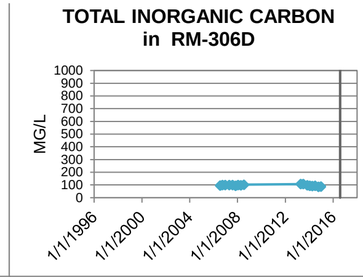

TOTAL INORGANIC CARBON
in RM-213XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

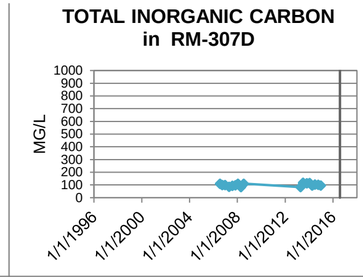

TOTAL INORGANIC CARBON
in RM-214D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

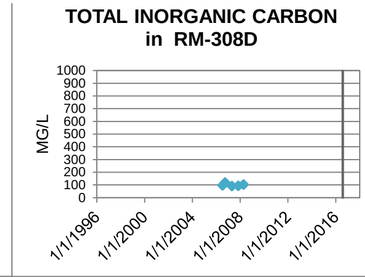

TOTAL INORGANIC CARBON
in RM-303D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

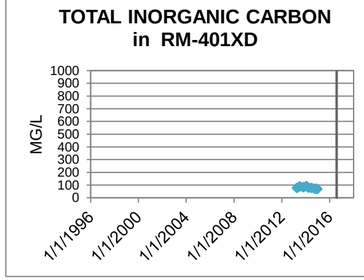

TOTAL INORGANIC CARBON
in RM-304D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

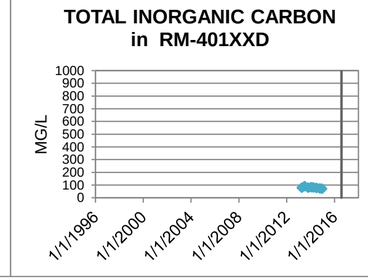

TOTAL INORGANIC CARBON
in RM-305D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

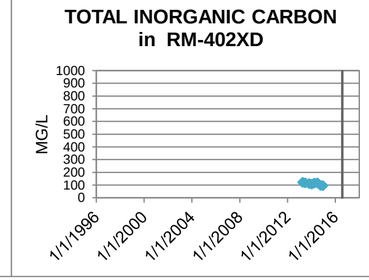

TOTAL INORGANIC CARBON
in RM-306D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

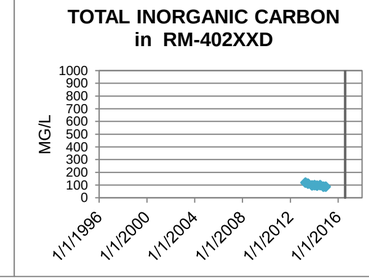

TOTAL INORGANIC CARBON
in RM-307D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

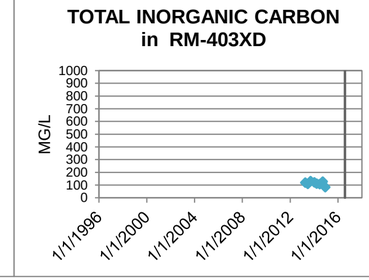

TOTAL INORGANIC CARBON
in RM-308D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

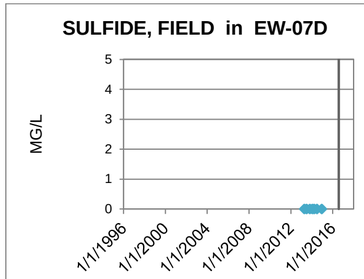

TOTAL INORGANIC CARBON
in RM-401XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL INORGANIC CARBON
in RM-401XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL INORGANIC CARBON
in RM-402XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL INORGANIC CARBON
in RM-402XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


TOTAL INORGANIC CARBON
in RM-403XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in EW-07D
MG/L
5
4
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1
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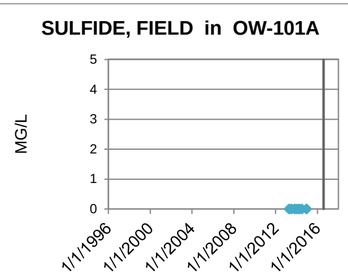
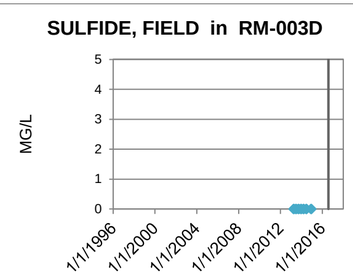
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in OW-101A
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-003D
MG/L
5
4
3
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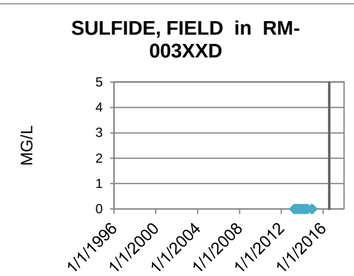
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-003XXD
MG/L
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4
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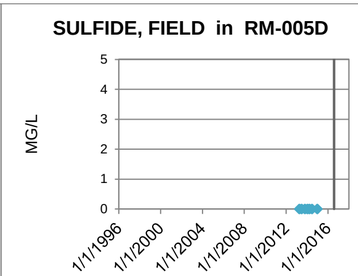
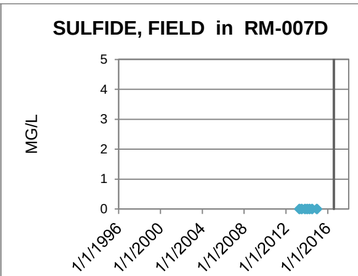
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-005D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-007D
MG/L
5
4
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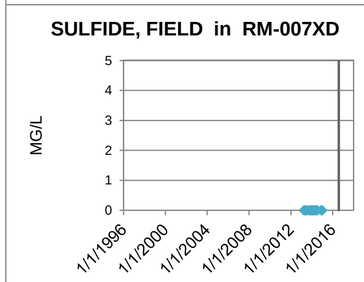
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-007XD
MG/L
5
4
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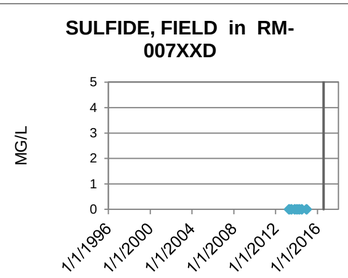
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-007XXD
MG/L
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4
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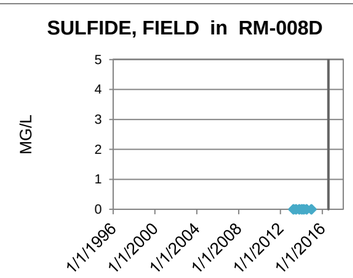
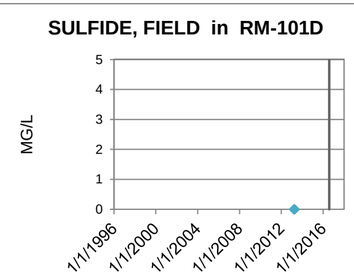
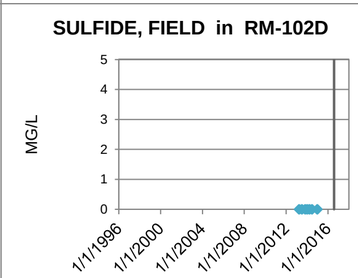
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-008D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-101D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-102D
MG/L
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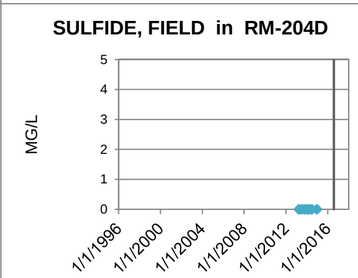
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-204D
MG/L
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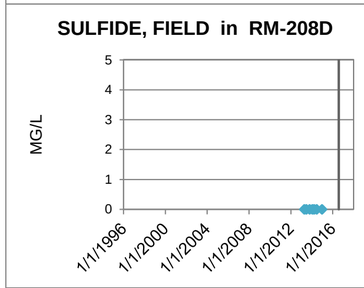
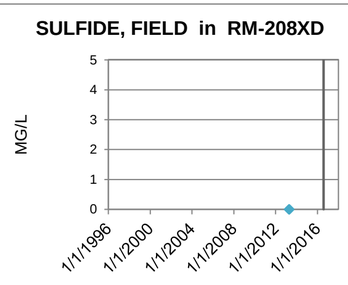
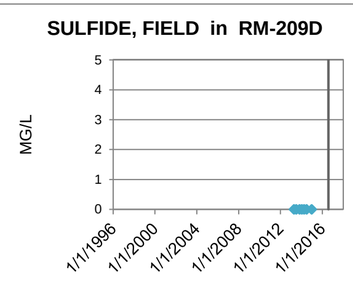
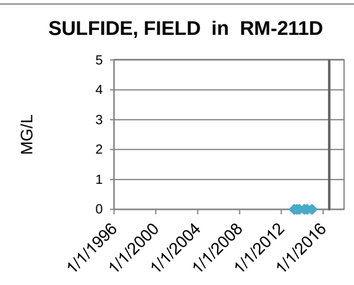
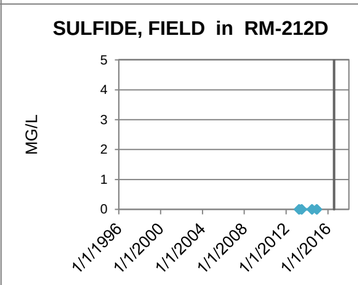
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

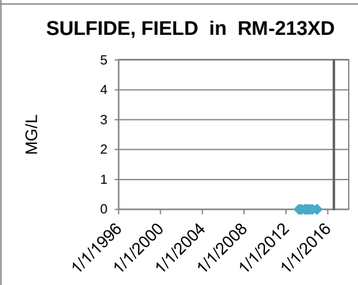

SULFIDE, FIELD in RM-208D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

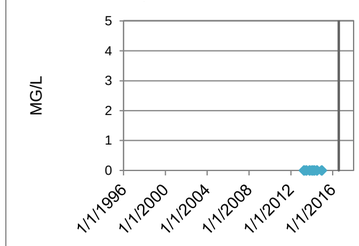

SULFIDE, FIELD in RM-208XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

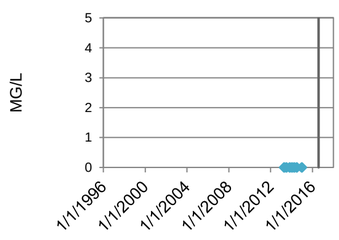

SULFIDE, FIELD in RM-209D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

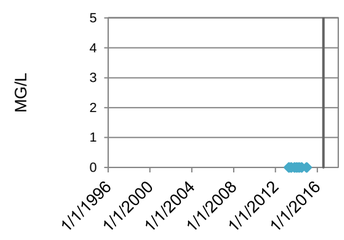

SULFIDE, FIELD in RM-211D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

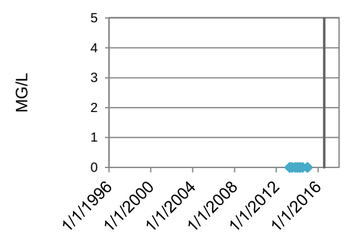

SULFIDE, FIELD in RM-212D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

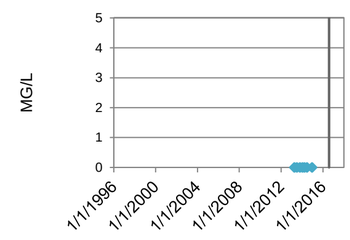

SULFIDE, FIELD in RM-213XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

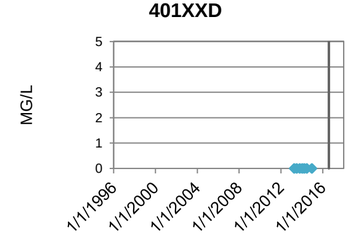

SULFIDE, FIELD in RM-214D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

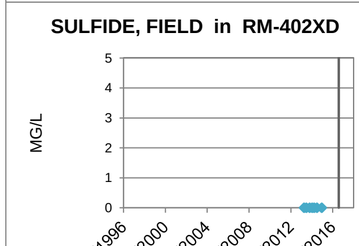

SULFIDE, FIELD in RM-303D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

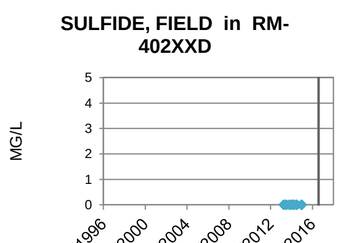

SULFIDE, FIELD in RM-306D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

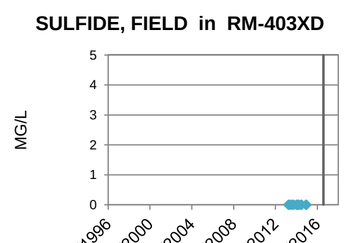

SULFIDE, FIELD in RM-307D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

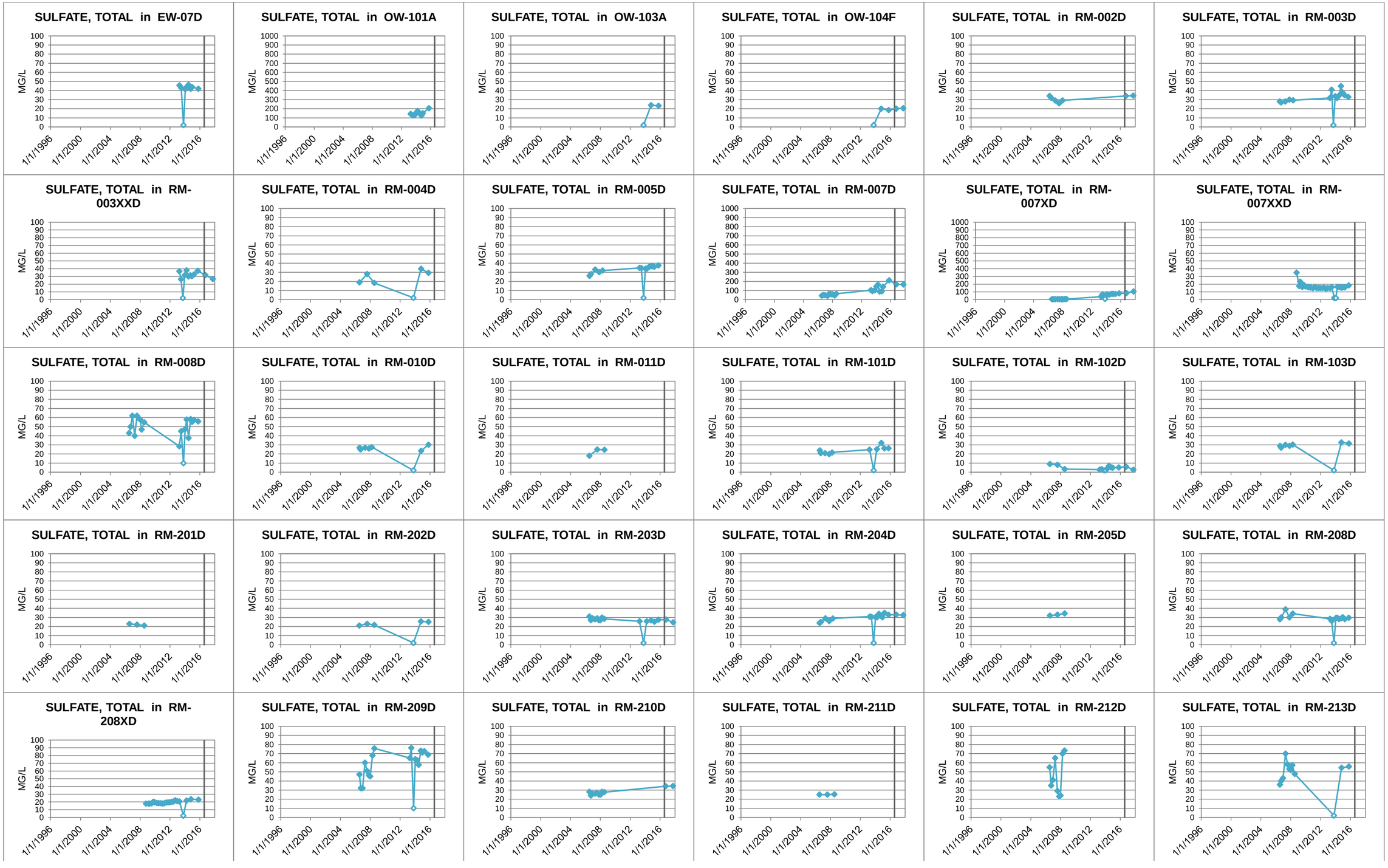

SULFIDE, FIELD in RM-401XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

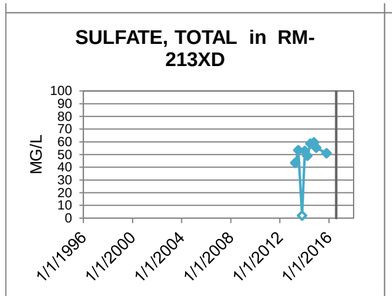

SULFIDE, FIELD in RM-401XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

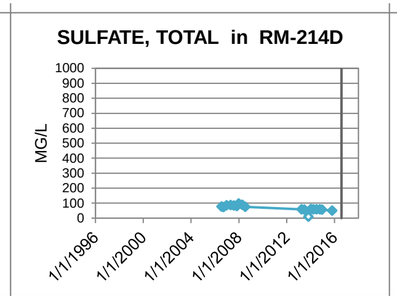

SULFIDE, FIELD in RM-402XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

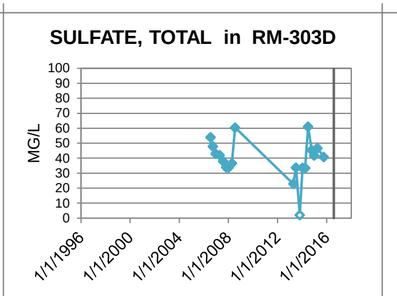

SULFIDE, FIELD in RM-402XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFIDE, FIELD in RM-403XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFATE, TOTAL in EW-07D
SULFATE, TOTAL in OW-101A
SULFATE, TOTAL in OW-103A
SULFATE, TOTAL in OW-104F
SULFATE, TOTAL in RM-002D
SULFATE, TOTAL in RM-003D
SULFATE, TOTAL in RM-003XXD
SULFATE, TOTAL in RM-004D
SULFATE, TOTAL in RM-005D
SULFATE, TOTAL in RM-007D
SULFATE, TOTAL in RM-007XD
SULFATE, TOTAL in RM-007XXD
SULFATE, TOTAL in RM-008D
SULFATE, TOTAL in RM-010D
SULFATE, TOTAL in RM-011D
SULFATE, TOTAL in RM-101D
SULFATE, TOTAL in RM-102D
SULFATE, TOTAL in RM-103D
SULFATE, TOTAL in RM-201D
SULFATE, TOTAL in RM-202D
SULFATE, TOTAL in RM-203D
SULFATE, TOTAL in RM-204D
SULFATE, TOTAL in RM-205D
SULFATE, TOTAL in RM-208D
SULFATE, TOTAL in RM-208XD
SULFATE, TOTAL in RM-209D
SULFATE, TOTAL in RM-210D
SULFATE, TOTAL in RM-211D
SULFATE, TOTAL in RM-212D
SULFATE, TOTAL in RM-213D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFATE, TOTAL in RM-213XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFATE, TOTAL in RM-214D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


SULFATE, TOTAL in RM-303D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
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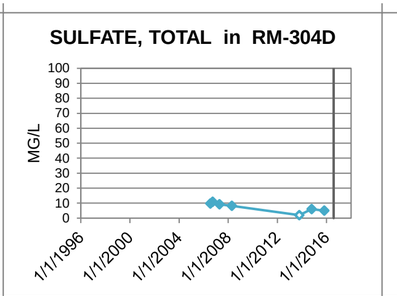
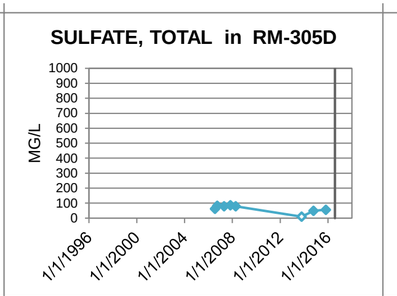
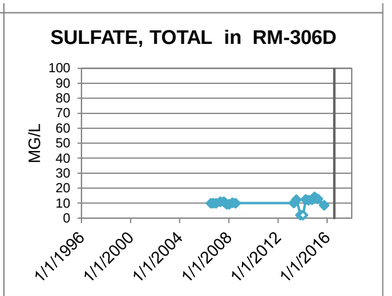
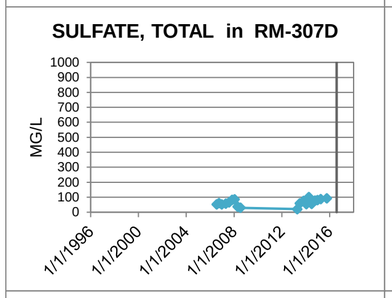
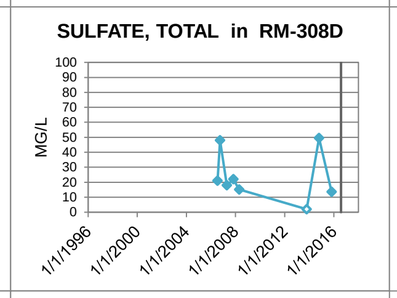
1/1/2012
1/1/2016

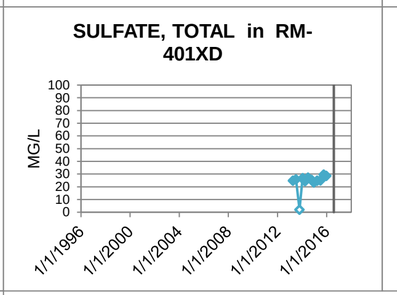

SULFATE, TOTAL in RM-304D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

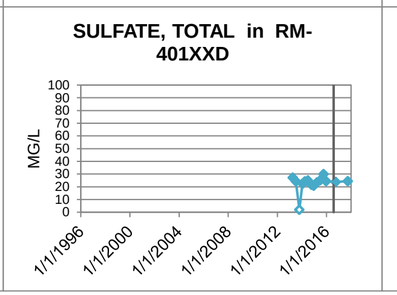

SULFATE, TOTAL in RM-305D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

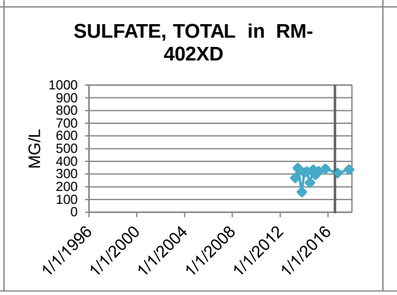

SULFATE, TOTAL in RM-306D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

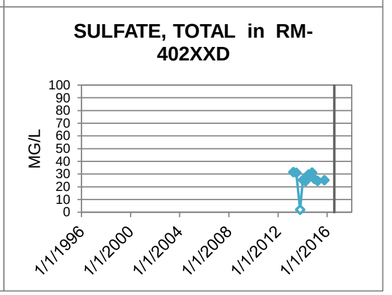

SULFATE, TOTAL in RM-307D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

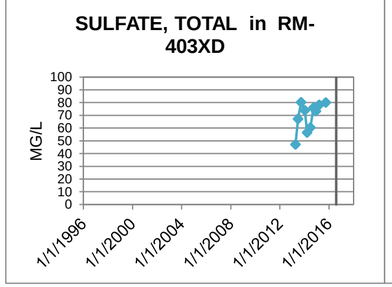

SULFATE, TOTAL in RM-308D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

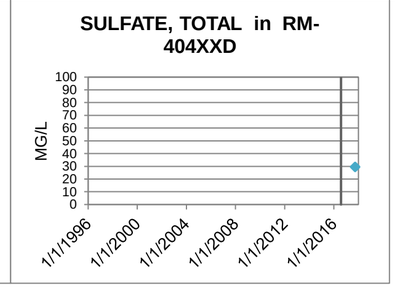

SULFATE, TOTAL in RM-401XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

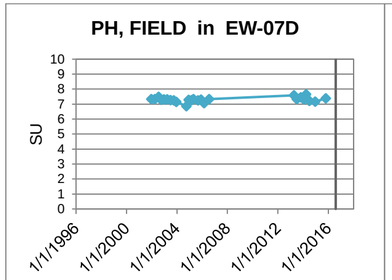

SULFATE, TOTAL in RM-401XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

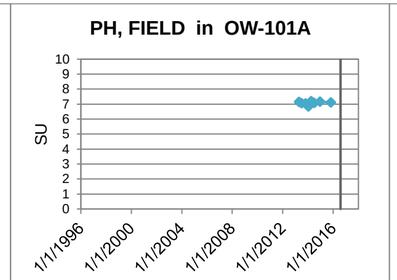

SULFATE, TOTAL in RM-402XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

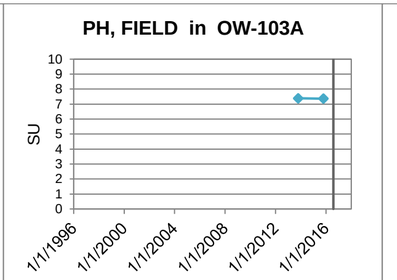

SULFATE, TOTAL in RM-402XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

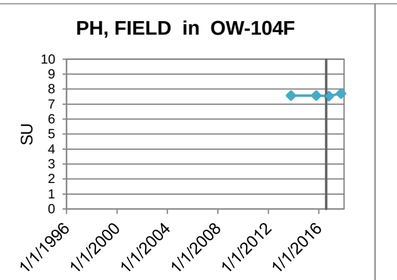

SULFATE, TOTAL in RM-403XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

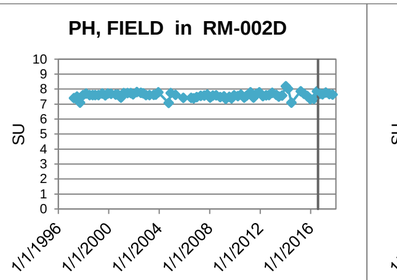

SULFATE, TOTAL in RM-404XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

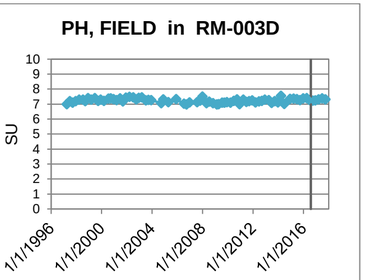

PH, FIELD in EW-07D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

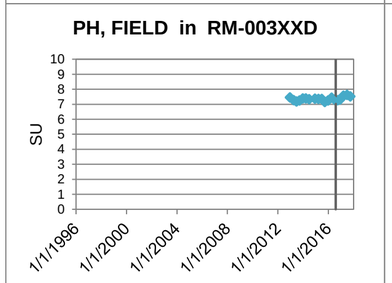

PH, FIELD in OW-101A
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

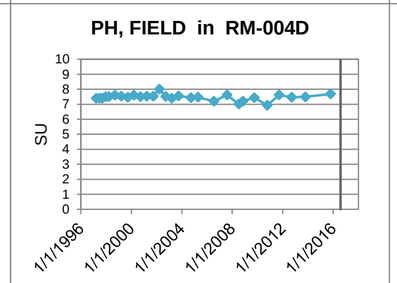

PH, FIELD in OW-103A
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

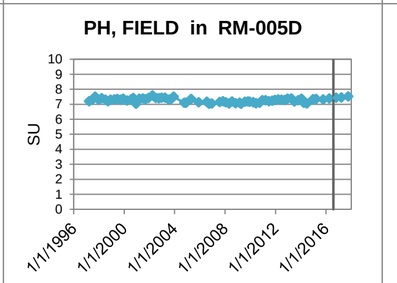

PH, FIELD in OW-104F
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

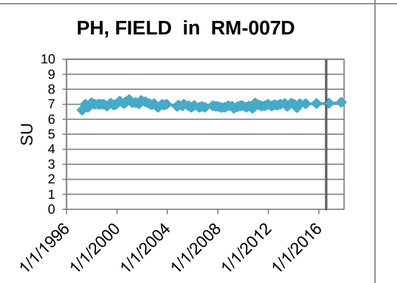

PH, FIELD in RM-002D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

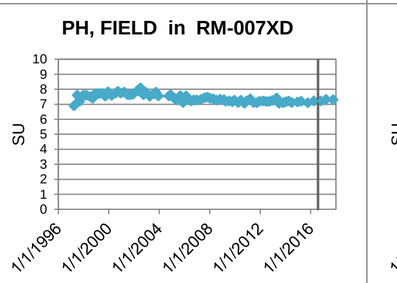

PH, FIELD in RM-003D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

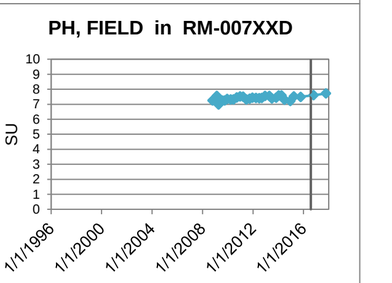

PH, FIELD in RM-003XXD
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

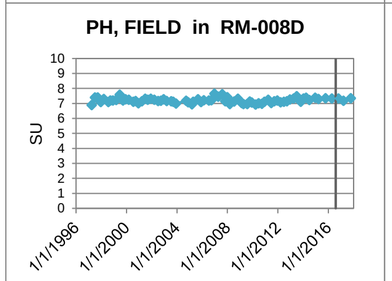

PH, FIELD in RM-004D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

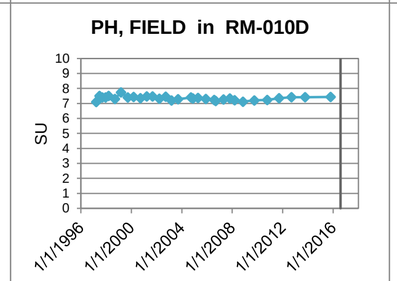

PH, FIELD in RM-005D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

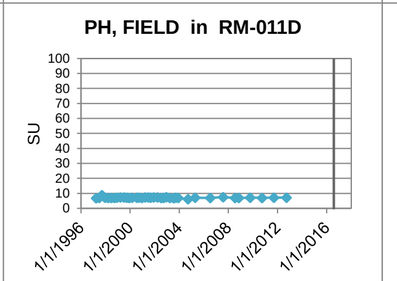

PH, FIELD in RM-007D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

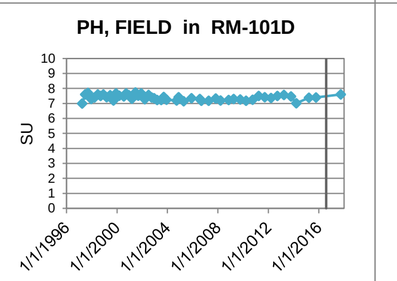

PH, FIELD in RM-007XD
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

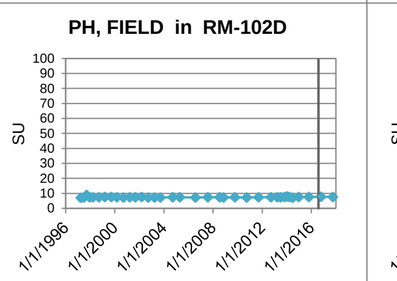

PH, FIELD in RM-007XXD
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

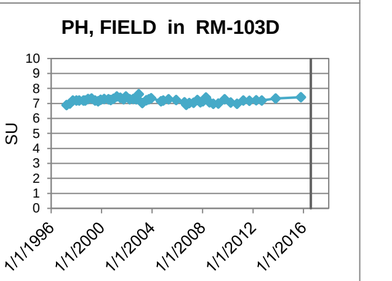

PH, FIELD in RM-008D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

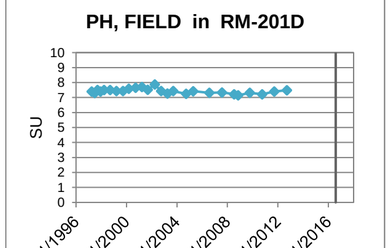

PH, FIELD in RM-010D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

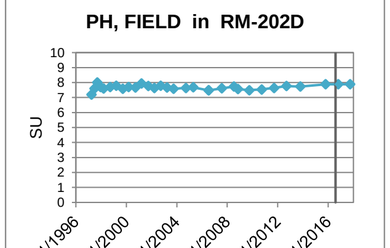

PH, FIELD in RM-011D
SU
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

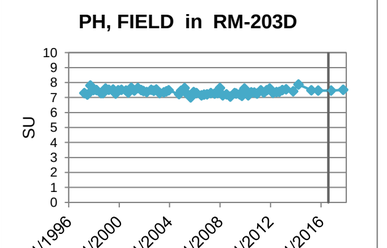

PH, FIELD in RM-101D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

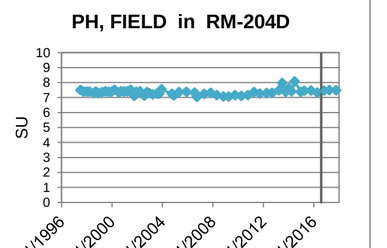

PH, FIELD in RM-102D
SU
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

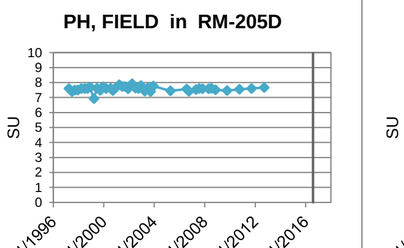

PH, FIELD in RM-103D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

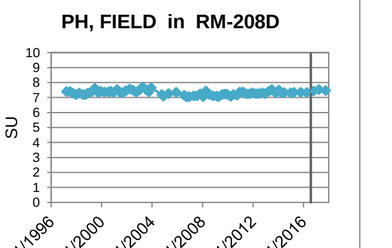

PH, FIELD in RM-201D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

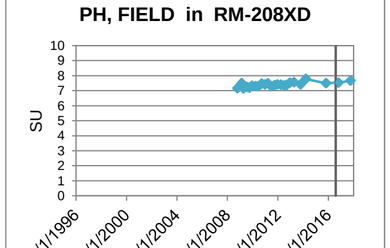

PH, FIELD in RM-202D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

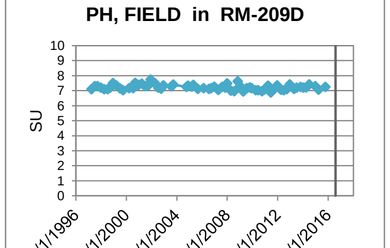

PH, FIELD in RM-203D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

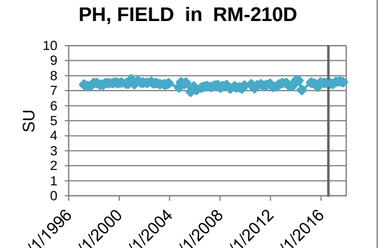

PH, FIELD in RM-204D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

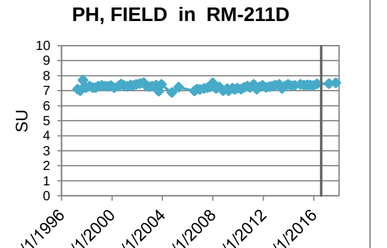

PH, FIELD in RM-205D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

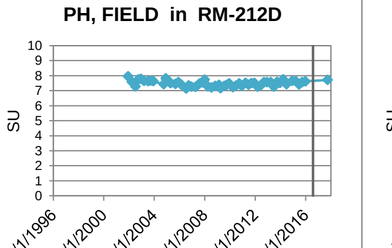

PH, FIELD in RM-208D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

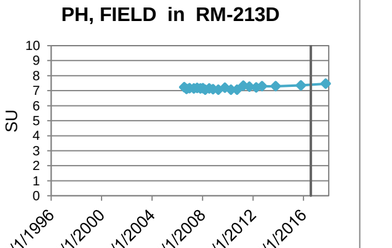

PH, FIELD in RM-208XD
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

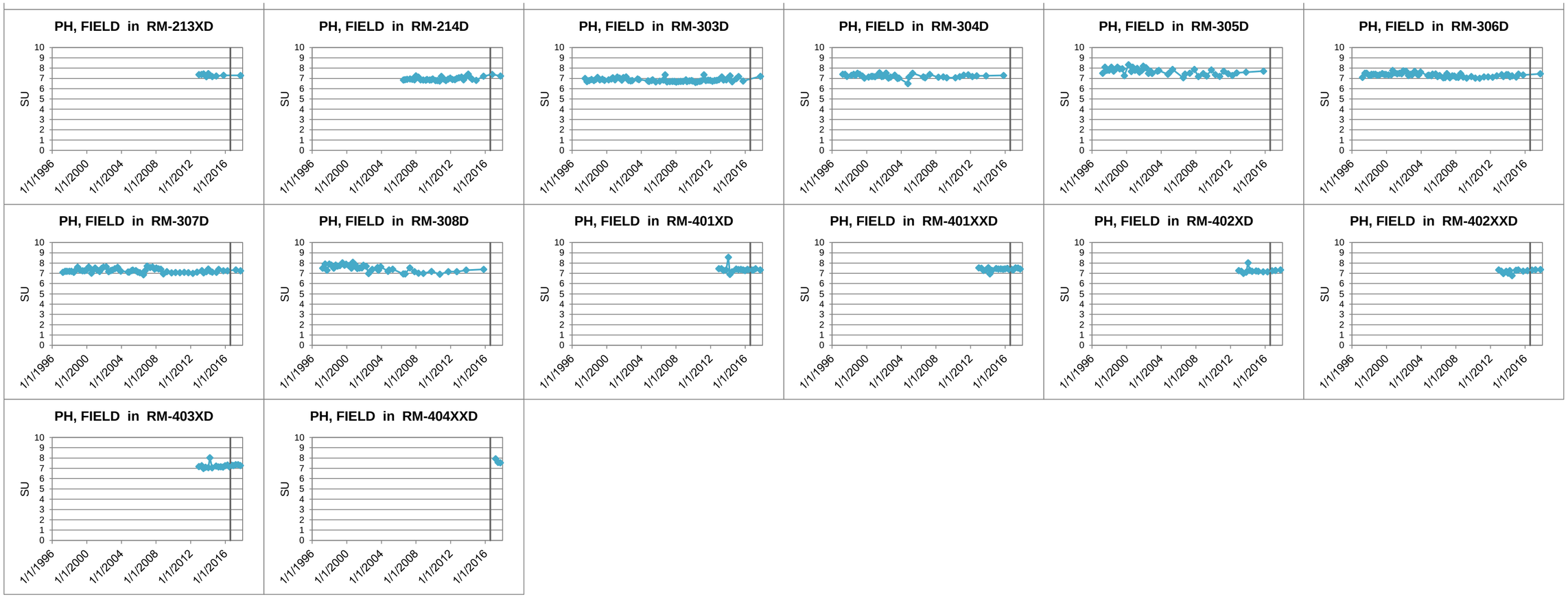

PH, FIELD in RM-209D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016


PH, FIELD in RM-210D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016


PH, FIELD in RM-211D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016


PH, FIELD in RM-212D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016


PH, FIELD in RM-213D
SU
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016


PH, FIELD in RM-213XD
PH, FIELD in RM-214D
PH, FIELD in RM-303D
PH, FIELD in RM-304D
PH, FIELD in RM-305D
PH, FIELD in RM-306D
PH, FIELD in RM-307D
PH, FIELD in RM-308D
PH, FIELD in RM-401XD
PH, FIELD in RM-401XXD
PH, FIELD in RM-402XD
PH, FIELD in RM-402XXD
PH, FIELD in RM-403XD
PH, FIELD in RM-404XXD
SU
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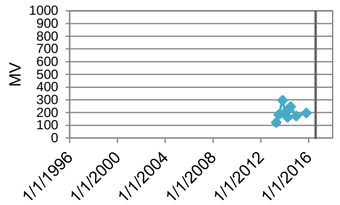
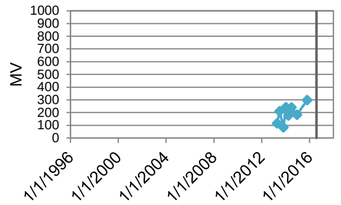
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

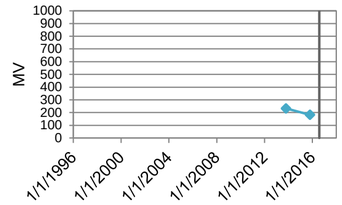
OXIDATION REDUCTION POTENTIAL in EW-07D



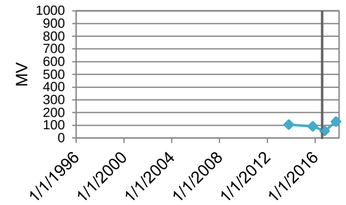
OXIDATION REDUCTION POTENTIAL in OW-101A



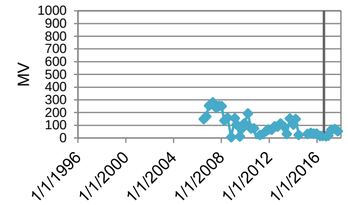
OXIDATION REDUCTION POTENTIAL in OW-103A



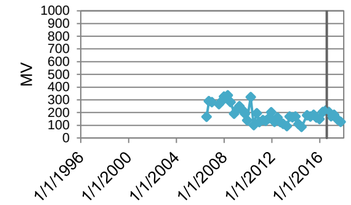
OXIDATION REDUCTION POTENTIAL in OW-104F



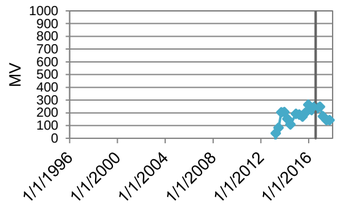
OXIDATION REDUCTION POTENTIAL in RM-002D



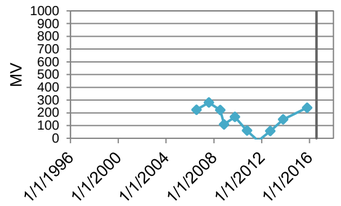
OXIDATION REDUCTION POTENTIAL in RM-003D



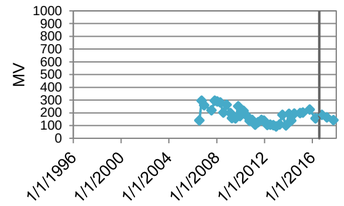
OXIDATION REDUCTION POTENTIAL in RM-003XXD



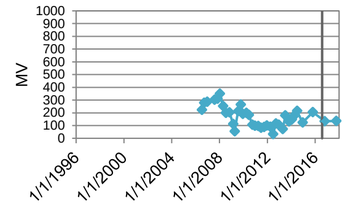
OXIDATION REDUCTION POTENTIAL in RM-004D



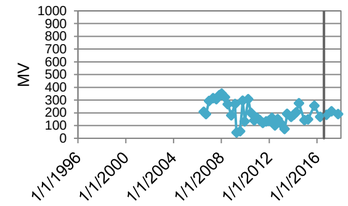
OXIDATION REDUCTION POTENTIAL in RM-005D



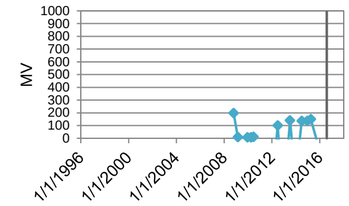
OXIDATION REDUCTION POTENTIAL in RM-007D



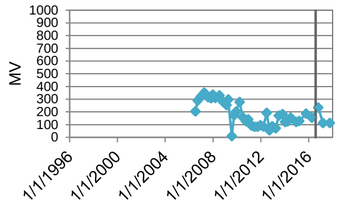
OXIDATION REDUCTION POTENTIAL in RM-007XD



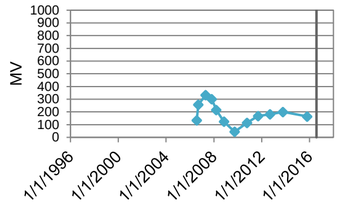
OXIDATION REDUCTION POTENTIAL in RM-007XXD



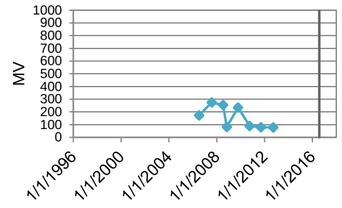
OXIDATION REDUCTION POTENTIAL in RM-008D



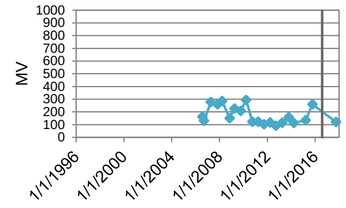
OXIDATION REDUCTION POTENTIAL in RM-010D



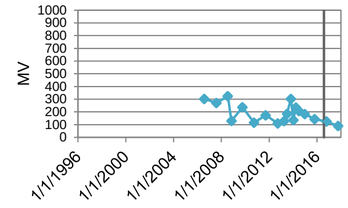
OXIDATION REDUCTION POTENTIAL in RM-011D



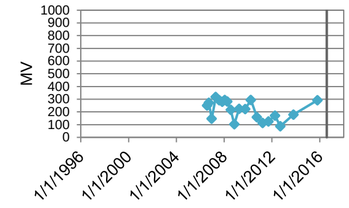
OXIDATION REDUCTION POTENTIAL in RM-101D



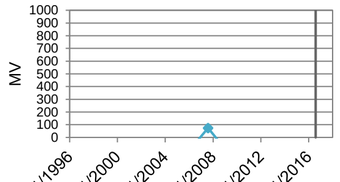
OXIDATION REDUCTION POTENTIAL in RM-102D



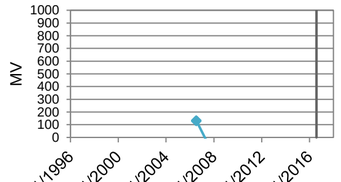
OXIDATION REDUCTION POTENTIAL in RM-103D



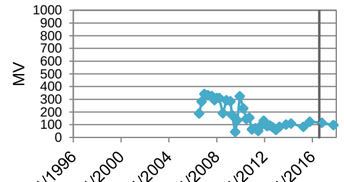
OXIDATION REDUCTION POTENTIAL in RM-201D



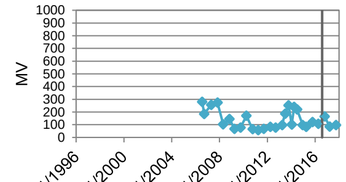
OXIDATION REDUCTION POTENTIAL in RM-202D



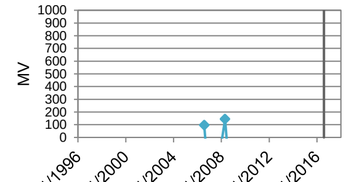
OXIDATION REDUCTION POTENTIAL in RM-203D



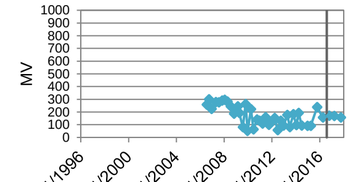
OXIDATION REDUCTION POTENTIAL in RM-204D



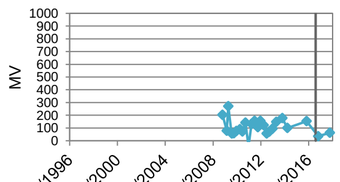
OXIDATION REDUCTION POTENTIAL in RM-205D



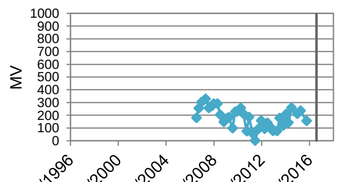
OXIDATION REDUCTION POTENTIAL in RM-208D



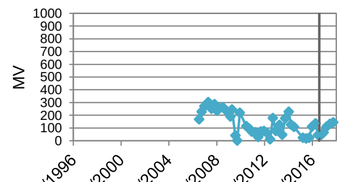
OXIDATION REDUCTION POTENTIAL in RM-208XD



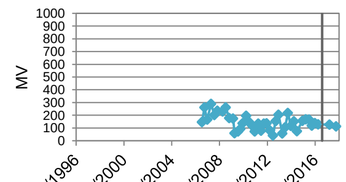
OXIDATION REDUCTION POTENTIAL in RM-209D



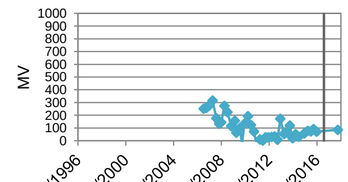
OXIDATION REDUCTION POTENTIAL in RM-210D



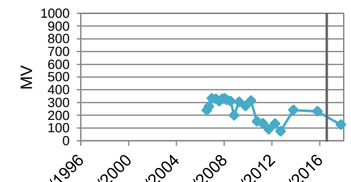
OXIDATION REDUCTION POTENTIAL in RM-211D

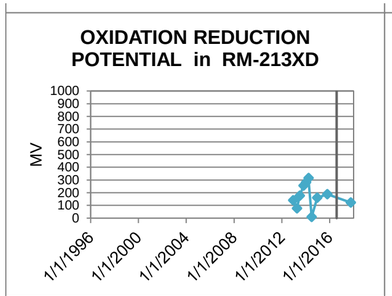


OXIDATION REDUCTION POTENTIAL in RM-212D



OXIDATION REDUCTION POTENTIAL in RM-213D




OXIDATION REDUCTION POTENTIAL in RM-213XD
MV
1000
900
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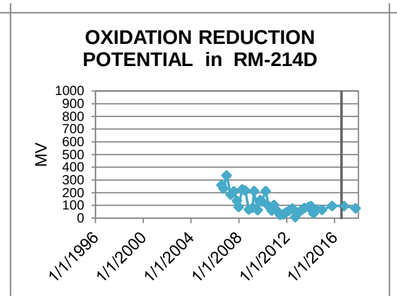
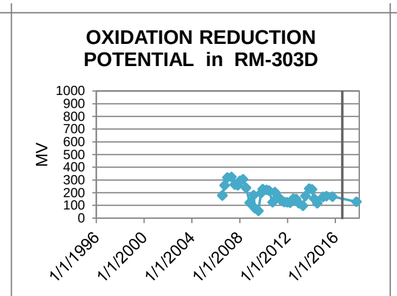
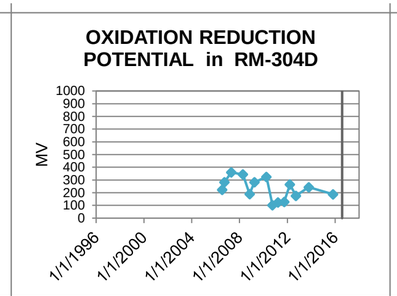
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-214D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-303D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-304D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
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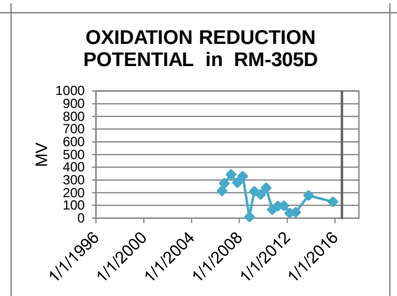
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-305D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
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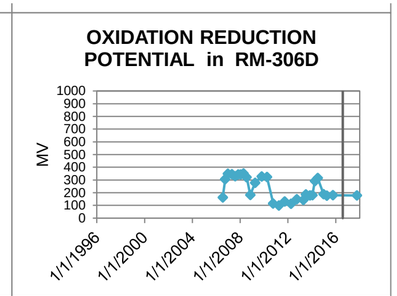
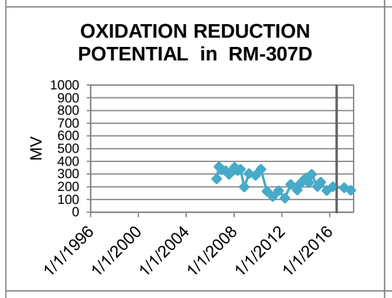
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-306D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-307D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
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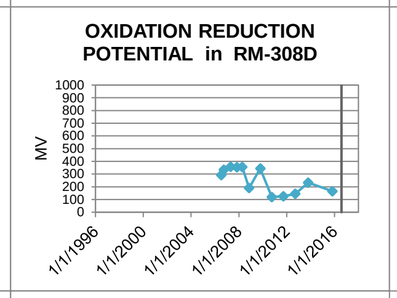
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-308D
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
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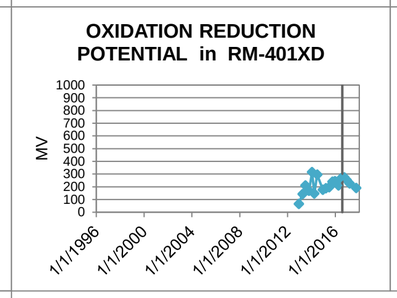
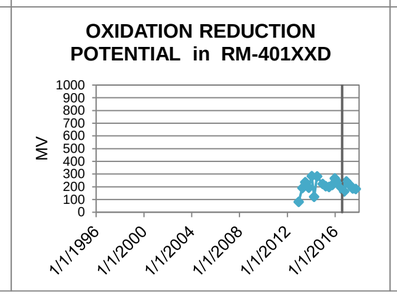
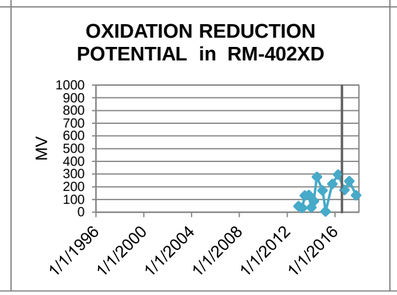
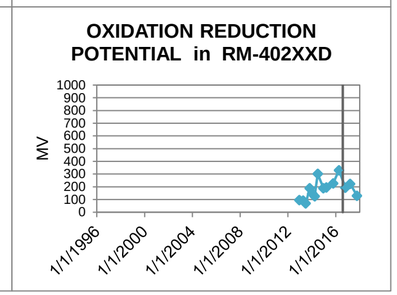
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-401XD
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-401XXD
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-402XD
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


OXIDATION REDUCTION POTENTIAL in RM-402XXD
MV
1000
900
800
700
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100
0
1/1/1996
1/1/2000
1/1/2004
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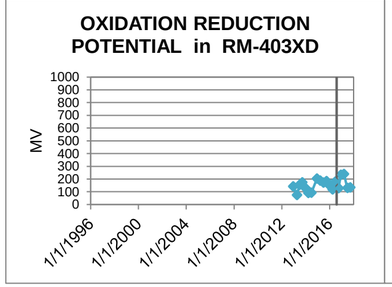
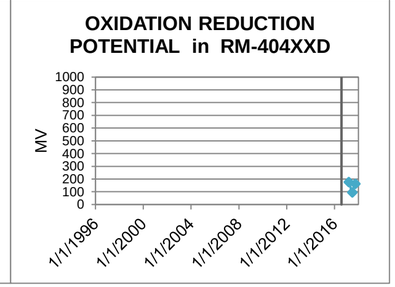
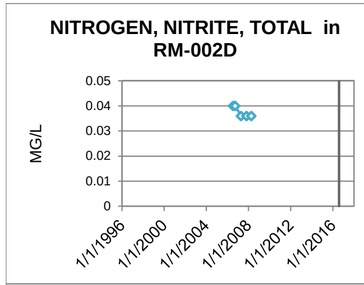
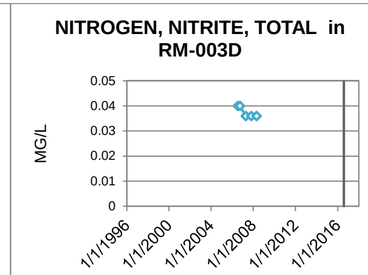
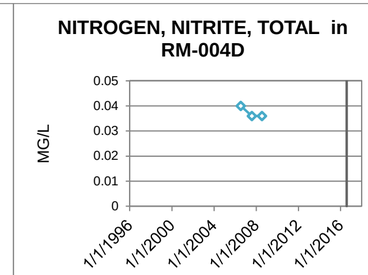
1/1/2012
1/1/2016

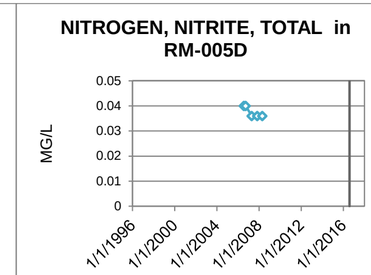

OXIDATION REDUCTION POTENTIAL in RM-403XD
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

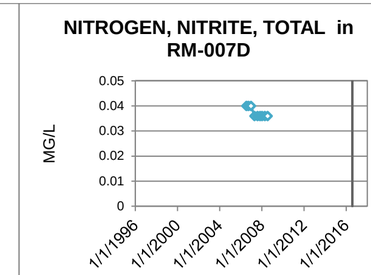

OXIDATION REDUCTION POTENTIAL in RM-404XXD
MV
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

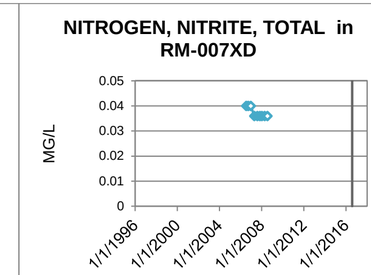

NITROGEN, NITRITE, TOTAL in RM-002D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

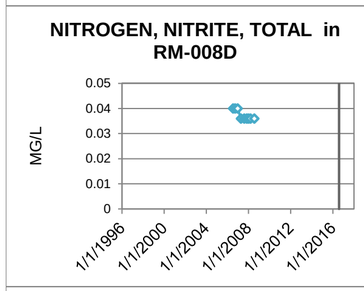

NITROGEN, NITRITE, TOTAL in RM-003D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

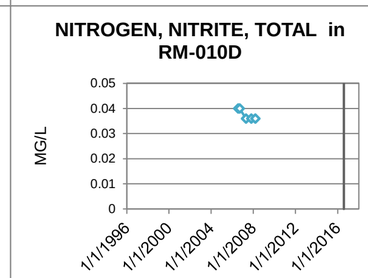

NITROGEN, NITRITE, TOTAL in RM-004D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

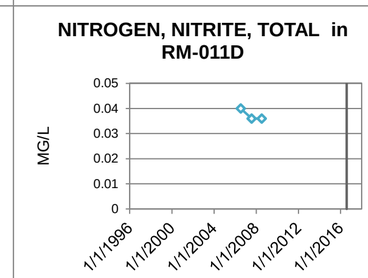

NITROGEN, NITRITE, TOTAL in RM-005D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

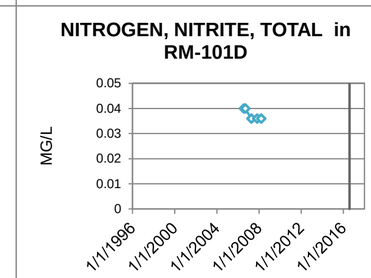

NITROGEN, NITRITE, TOTAL in RM-007D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

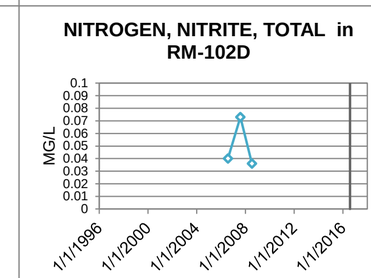

NITROGEN, NITRITE, TOTAL in RM-007XD
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

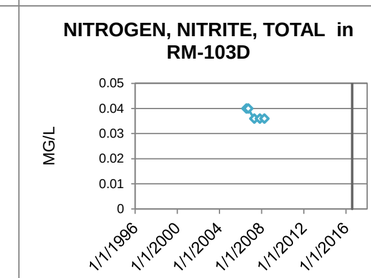

NITROGEN, NITRITE, TOTAL in RM-008D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

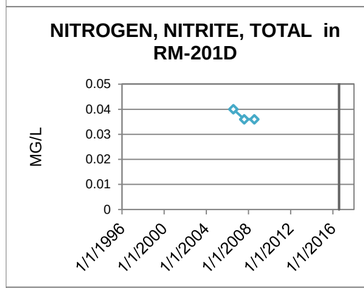

NITROGEN, NITRITE, TOTAL in RM-010D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

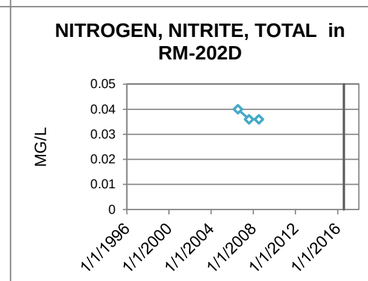

NITROGEN, NITRITE, TOTAL in RM-011D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

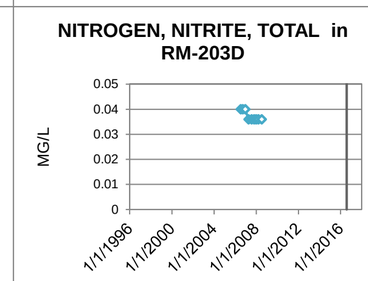

NITROGEN, NITRITE, TOTAL in RM-101D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

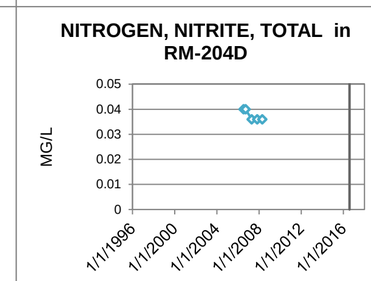

NITROGEN, NITRITE, TOTAL in RM-102D
MG/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

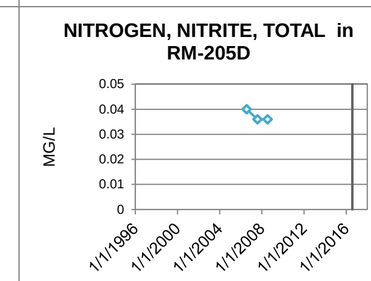

NITROGEN, NITRITE, TOTAL in RM-103D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

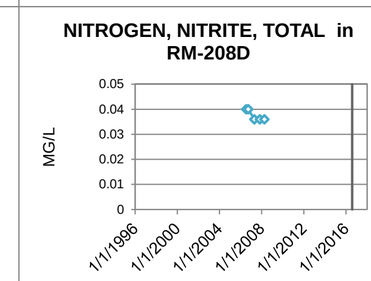

NITROGEN, NITRITE, TOTAL in RM-201D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

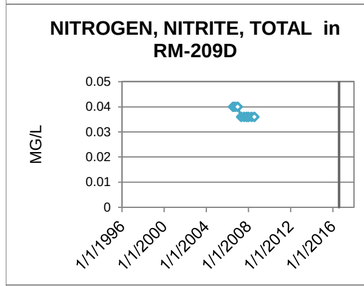

NITROGEN, NITRITE, TOTAL in RM-202D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

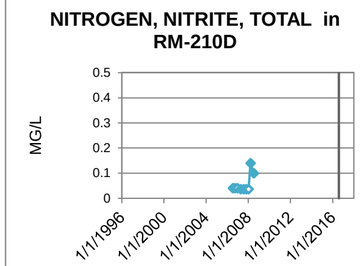

NITROGEN, NITRITE, TOTAL in RM-203D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

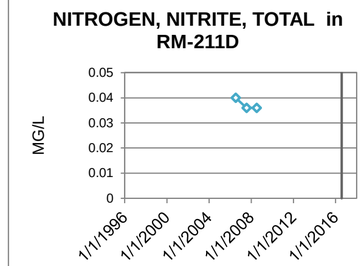

NITROGEN, NITRITE, TOTAL in RM-204D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

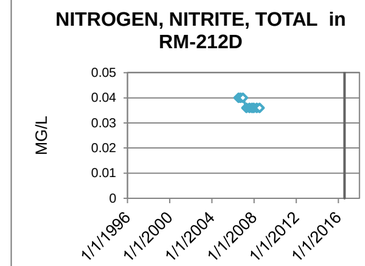

NITROGEN, NITRITE, TOTAL in RM-205D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

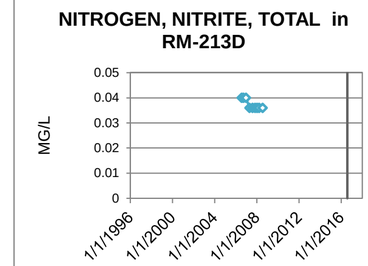

NITROGEN, NITRITE, TOTAL in RM-208D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

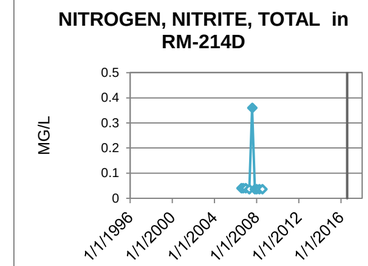

NITROGEN, NITRITE, TOTAL in RM-209D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

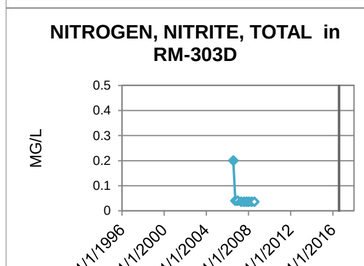

NITROGEN, NITRITE, TOTAL in RM-210D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

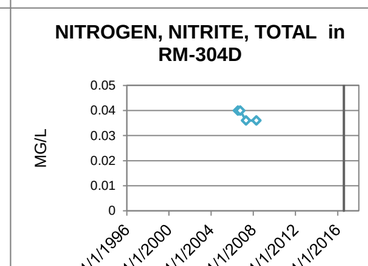

NITROGEN, NITRITE, TOTAL in RM-211D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

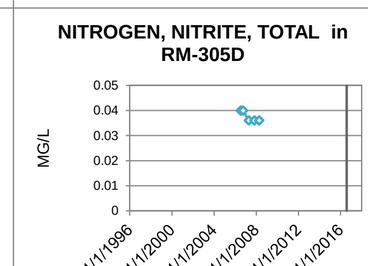

NITROGEN, NITRITE, TOTAL in RM-212D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

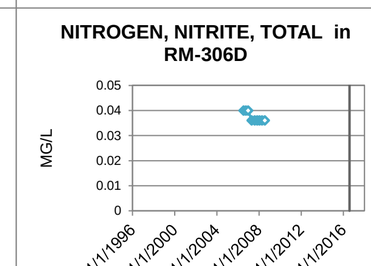

NITROGEN, NITRITE, TOTAL in RM-213D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

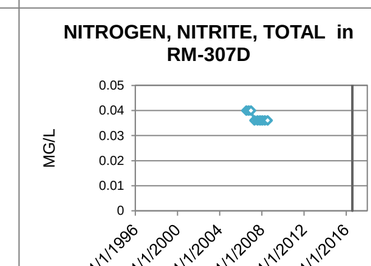

NITROGEN, NITRITE, TOTAL in RM-214D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

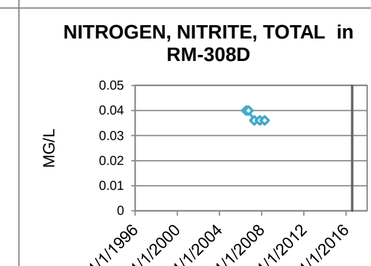

NITROGEN, NITRITE, TOTAL in RM-303D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

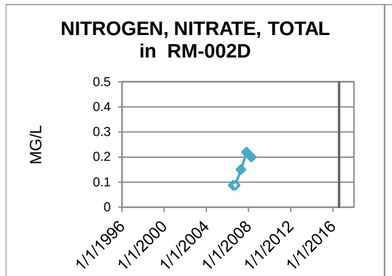

NITROGEN, NITRITE, TOTAL in RM-304D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

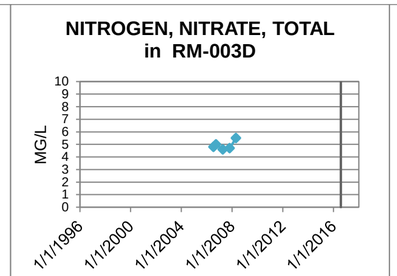

NITROGEN, NITRITE, TOTAL in RM-305D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

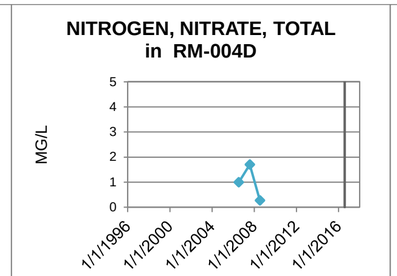

NITROGEN, NITRITE, TOTAL in RM-306D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

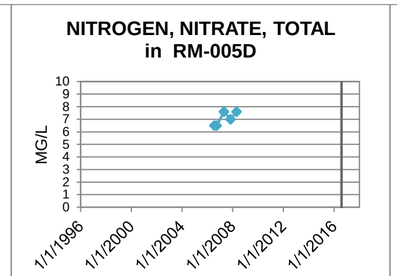

NITROGEN, NITRITE, TOTAL in RM-307D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

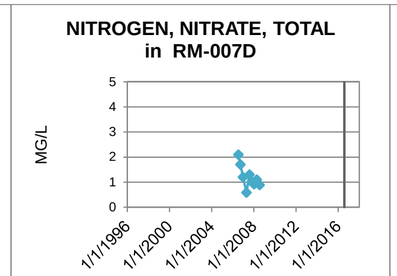

NITROGEN, NITRITE, TOTAL in RM-308D
MG/L
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

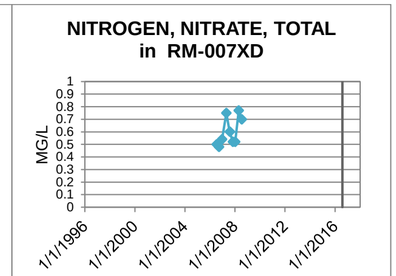

NITROGEN, NITRATE, TOTAL
in RM-002D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

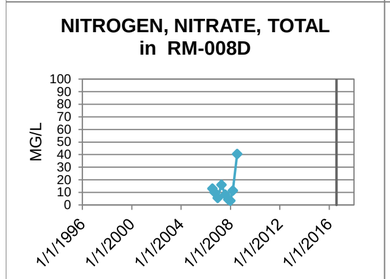

NITROGEN, NITRATE, TOTAL
in RM-003D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

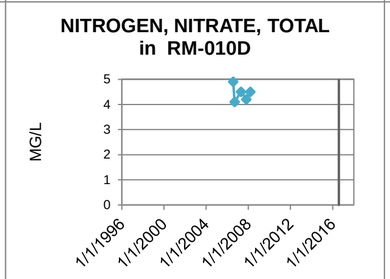

NITROGEN, NITRATE, TOTAL
in RM-004D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

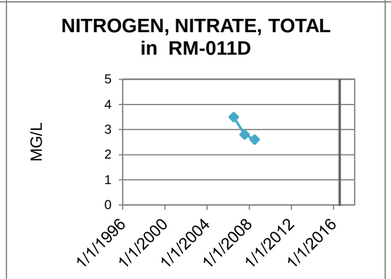

NITROGEN, NITRATE, TOTAL
in RM-005D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

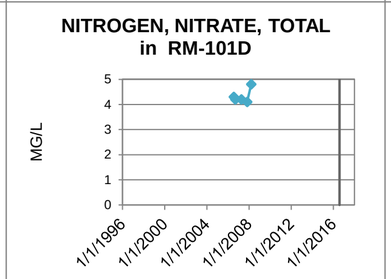

NITROGEN, NITRATE, TOTAL
in RM-007D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

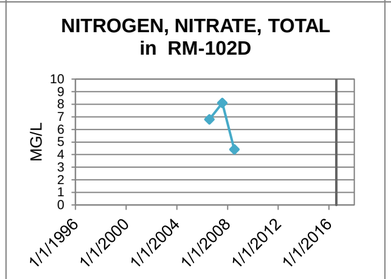

NITROGEN, NITRATE, TOTAL
in RM-007XD
MG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

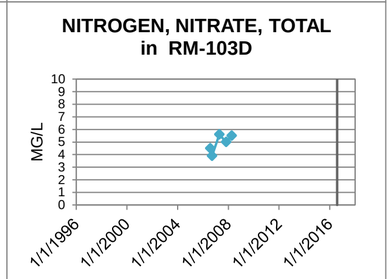

NITROGEN, NITRATE, TOTAL
in RM-008D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

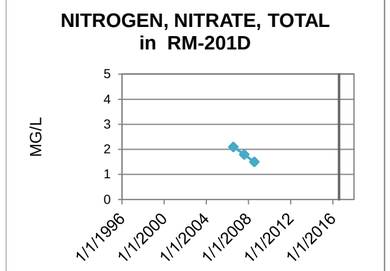

NITROGEN, NITRATE, TOTAL
in RM-010D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

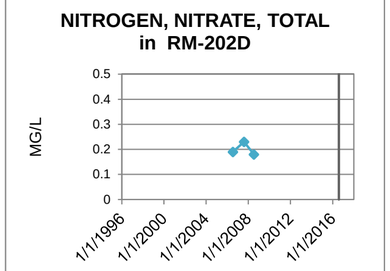

NITROGEN, NITRATE, TOTAL
in RM-011D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

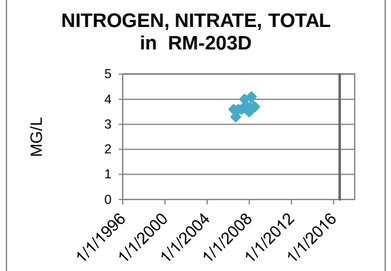

NITROGEN, NITRATE, TOTAL
in RM-101D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

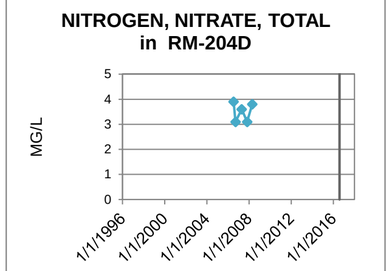

NITROGEN, NITRATE, TOTAL
in RM-102D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

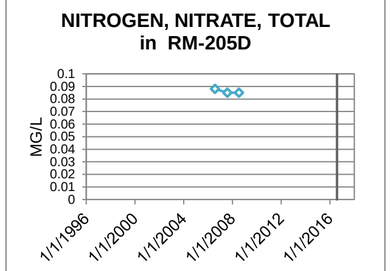

NITROGEN, NITRATE, TOTAL
in RM-103D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

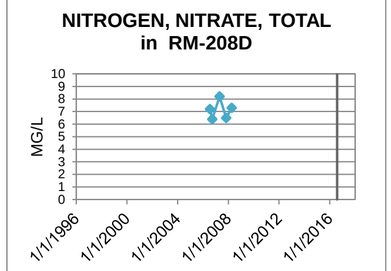

NITROGEN, NITRATE, TOTAL
in RM-201D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

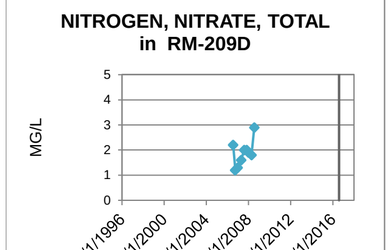

NITROGEN, NITRATE, TOTAL
in RM-202D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

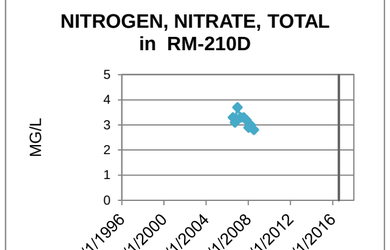

NITROGEN, NITRATE, TOTAL
in RM-203D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

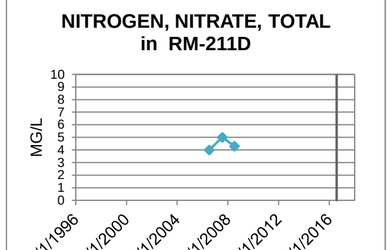

NITROGEN, NITRATE, TOTAL
in RM-204D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

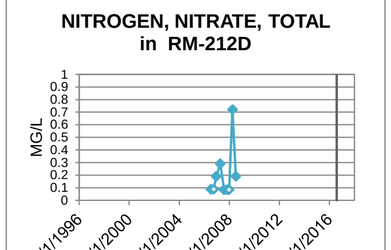

NITROGEN, NITRATE, TOTAL
in RM-205D
MG/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

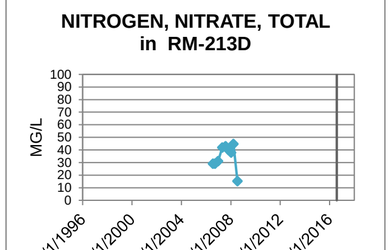

NITROGEN, NITRATE, TOTAL
in RM-208D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

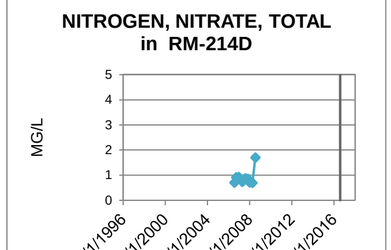

NITROGEN, NITRATE, TOTAL
in RM-209D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

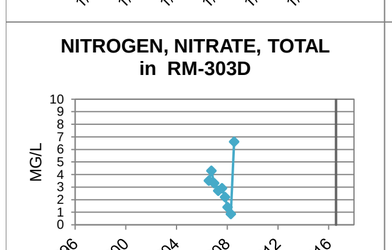

NITROGEN, NITRATE, TOTAL
in RM-210D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

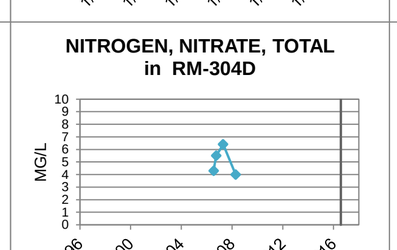

NITROGEN, NITRATE, TOTAL
in RM-211D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

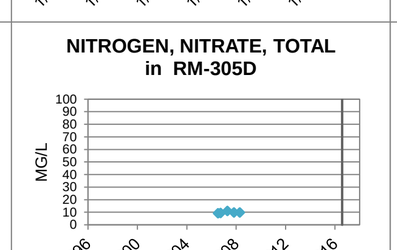

NITROGEN, NITRATE, TOTAL
in RM-212D
MG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

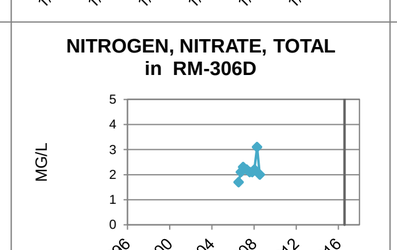

NITROGEN, NITRATE, TOTAL
in RM-213D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

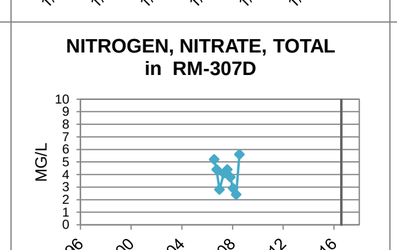

NITROGEN, NITRATE, TOTAL
in RM-214D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

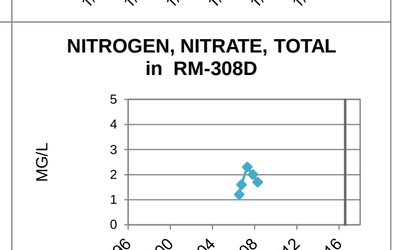

NITROGEN, NITRATE, TOTAL
in RM-303D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

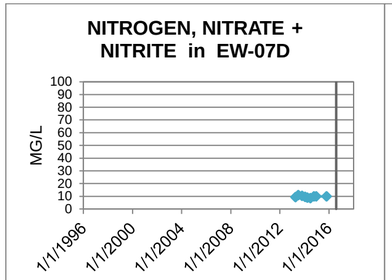

NITROGEN, NITRATE, TOTAL
in RM-304D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

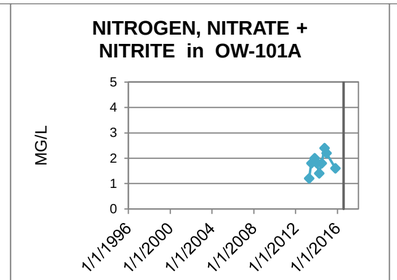

NITROGEN, NITRATE, TOTAL
in RM-305D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

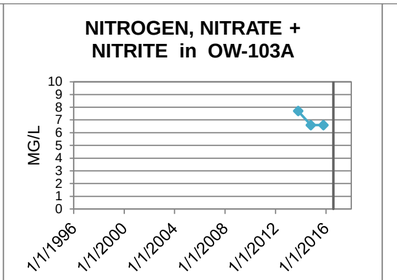

NITROGEN, NITRATE, TOTAL
in RM-306D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

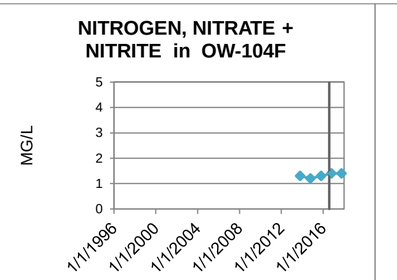

NITROGEN, NITRATE, TOTAL
in RM-307D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

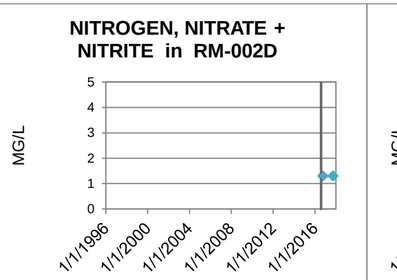

NITROGEN, NITRATE, TOTAL
in RM-308D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

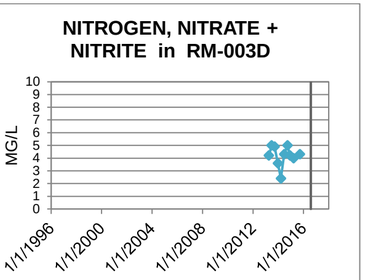

NITROGEN, NITRATE + NITRITE in EW-07D
MG/L

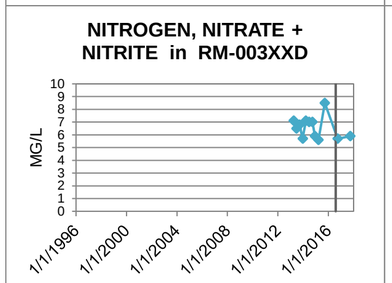

NITROGEN, NITRATE + NITRITE in OW-101A
MG/L

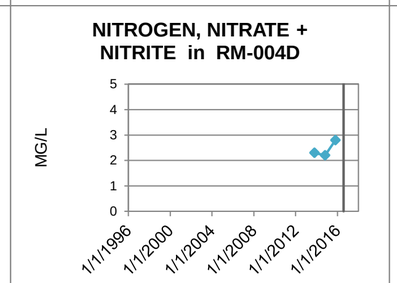

NITROGEN, NITRATE + NITRITE in OW-103A
MG/L

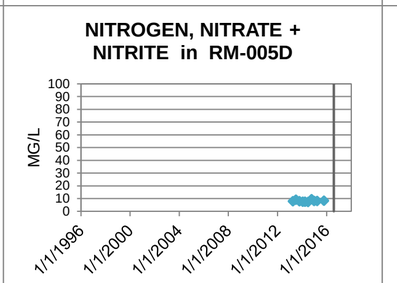

NITROGEN, NITRATE + NITRITE in OW-104F
MG/L

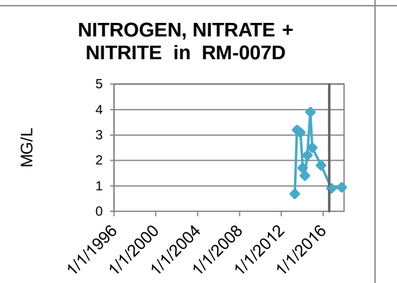

NITROGEN, NITRATE + NITRITE in RM-002D
MG/L

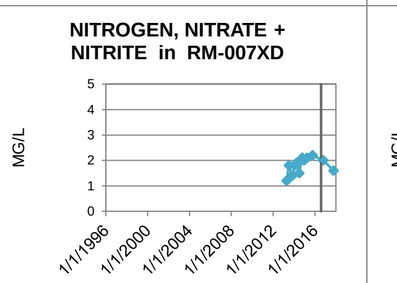

NITROGEN, NITRATE + NITRITE in RM-003D
MG/L

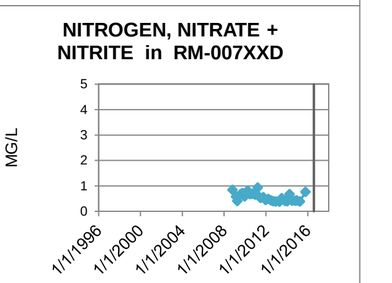

NITROGEN, NITRATE + NITRITE in RM-003XXD
MG/L

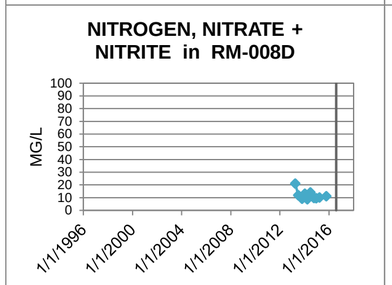

NITROGEN, NITRATE + NITRITE in RM-004D
MG/L

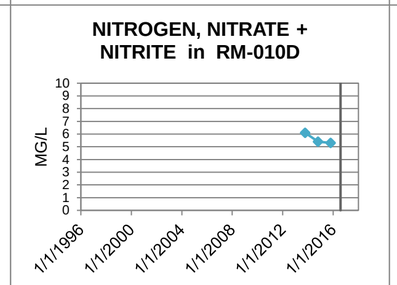

NITROGEN, NITRATE + NITRITE in RM-005D
MG/L

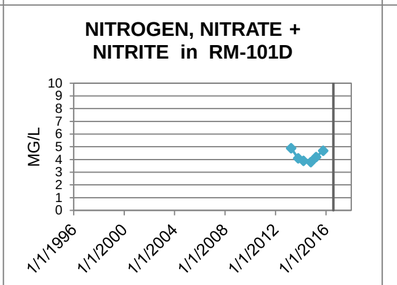

NITROGEN, NITRATE + NITRITE in RM-007D
MG/L

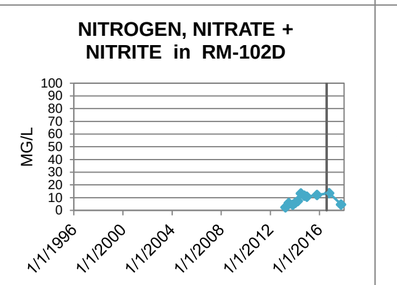

NITROGEN, NITRATE + NITRITE in RM-007XD
MG/L

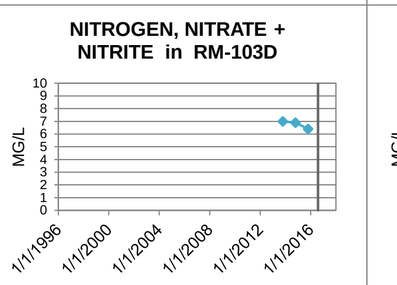

NITROGEN, NITRATE + NITRITE in RM-007XXD
MG/L

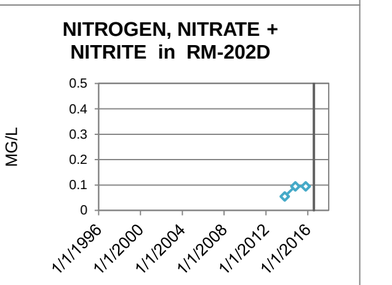

NITROGEN, NITRATE + NITRITE in RM-008D
MG/L

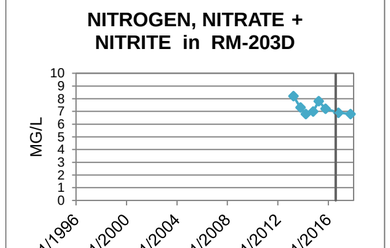

NITROGEN, NITRATE + NITRITE in RM-010D
MG/L

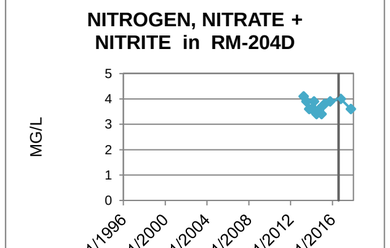

NITROGEN, NITRATE + NITRITE in RM-101D
MG/L

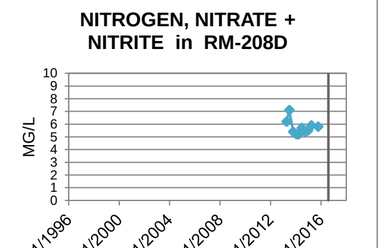

NITROGEN, NITRATE + NITRITE in RM-102D
MG/L

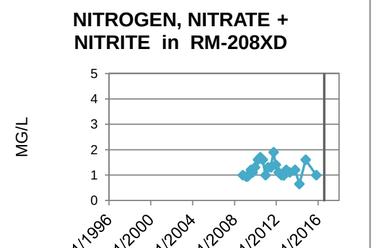

NITROGEN, NITRATE + NITRITE in RM-103D
MG/L

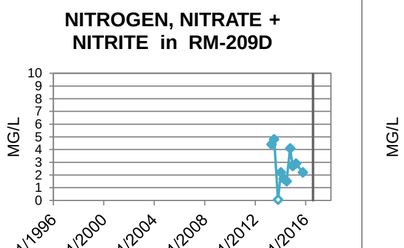

NITROGEN, NITRATE + NITRITE in RM-202D
MG/L

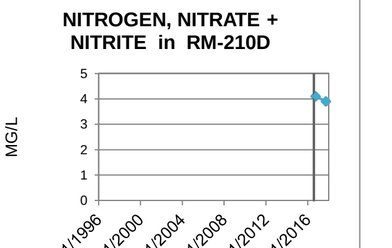

NITROGEN, NITRATE + NITRITE in RM-203D
MG/L

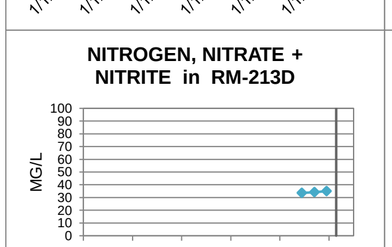

NITROGEN, NITRATE + NITRITE in RM-204D
MG/L

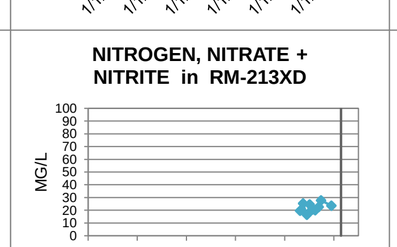

NITROGEN, NITRATE + NITRITE in RM-208D
MG/L

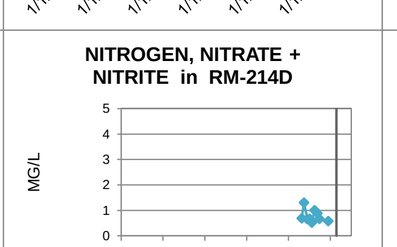

NITROGEN, NITRATE + NITRITE in RM-208XD
MG/L

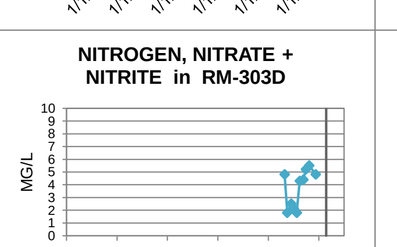

NITROGEN, NITRATE + NITRITE in RM-209D
MG/L

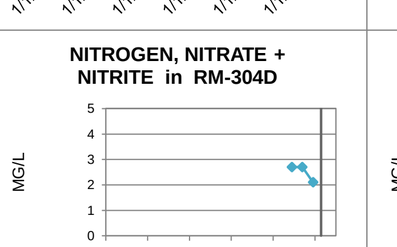

NITROGEN, NITRATE + NITRITE in RM-210D
MG/L

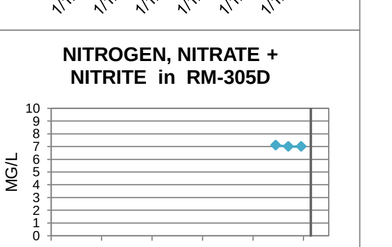

NITROGEN, NITRATE + NITRITE in RM-213D
MG/L

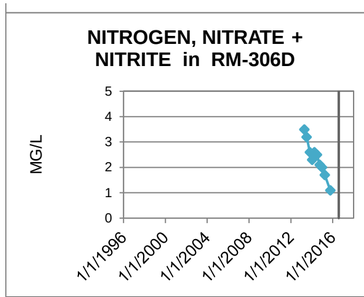

NITROGEN, NITRATE + NITRITE in RM-213XD
MG/L

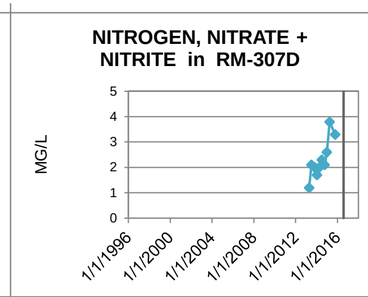

NITROGEN, NITRATE + NITRITE in RM-214D
MG/L

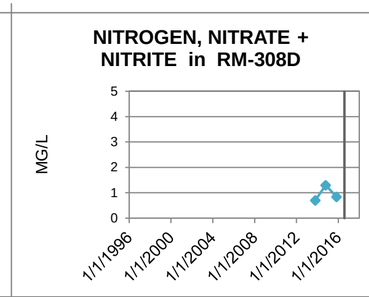

NITROGEN, NITRATE + NITRITE in RM-303D
MG/L

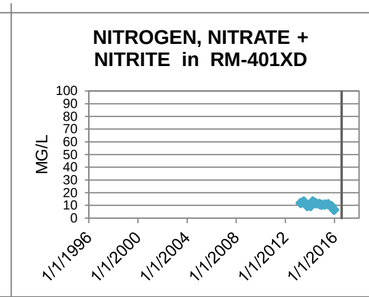

NITROGEN, NITRATE + NITRITE in RM-304D
MG/L

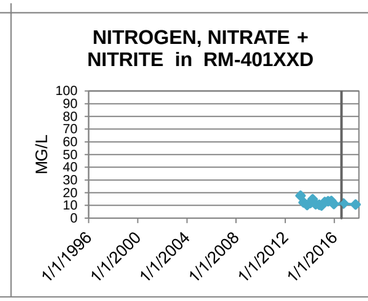

NITROGEN, NITRATE + NITRITE in RM-305D
MG/L

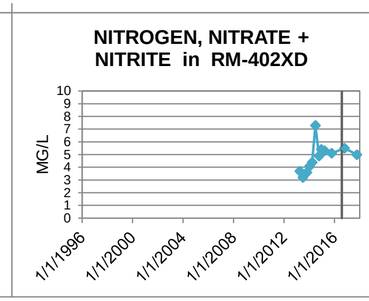

NITROGEN, NITRATE + NITRITE in RM-306D
MG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

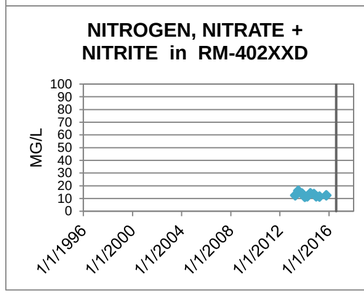

NITROGEN, NITRATE + NITRITE in RM-307D
MG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

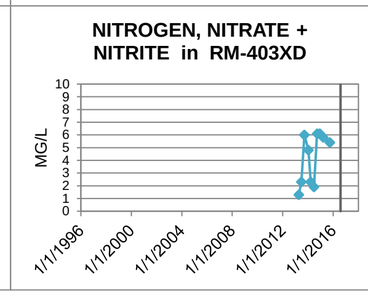

NITROGEN, NITRATE + NITRITE in RM-308D
MG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

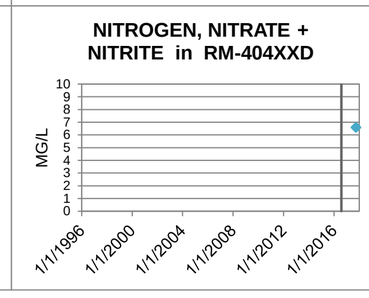

NITROGEN, NITRATE + NITRITE in RM-401XD
MG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

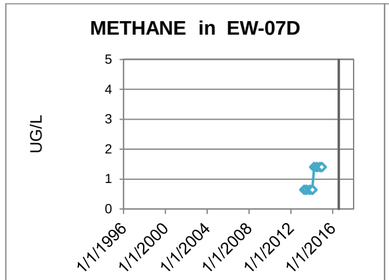

NITROGEN, NITRATE + NITRITE in RM-401XXD
MG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

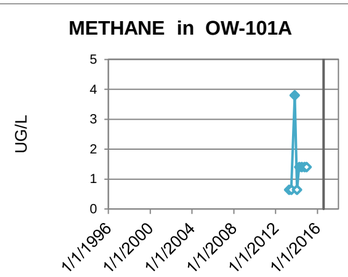

NITROGEN, NITRATE + NITRITE in RM-402XD
MG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

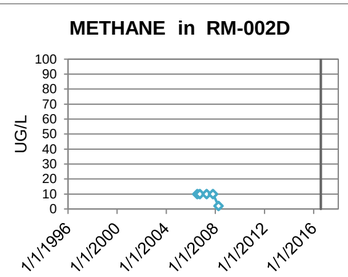

NITROGEN, NITRATE + NITRITE in RM-402XXD
MG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

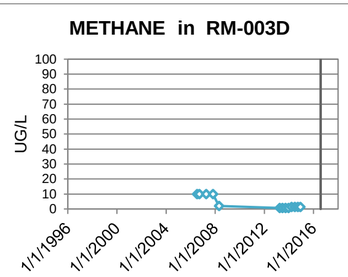

NITROGEN, NITRATE + NITRITE in RM-403XD
MG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

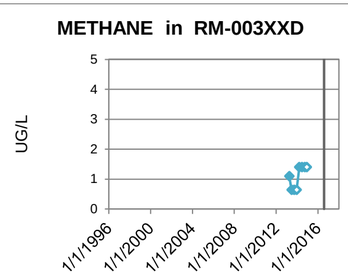

NITROGEN, NITRATE + NITRITE in RM-404XXD
MG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

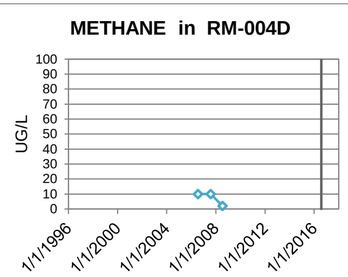

METHANE in EW-07D
UG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

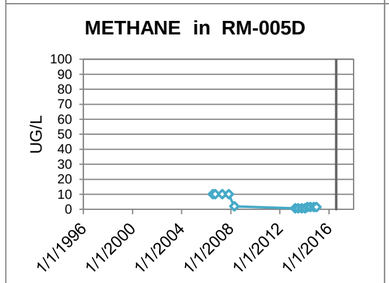

METHANE in OW-101A
UG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

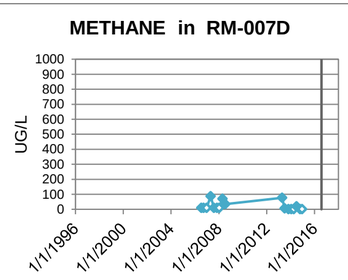

METHANE in RM-002D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-003D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-003XXD
UG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-004D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-005D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-007D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
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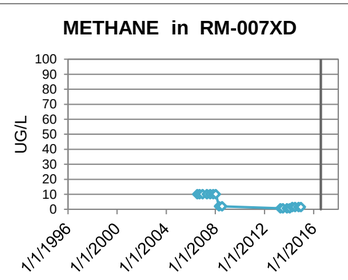
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-007XD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
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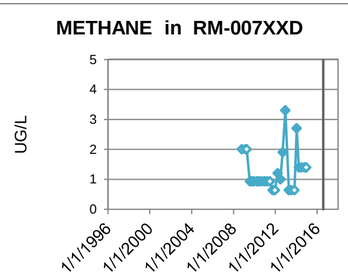
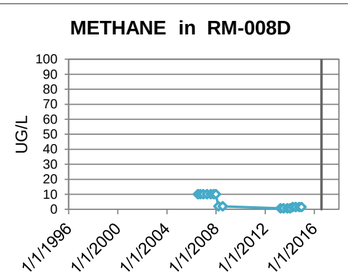
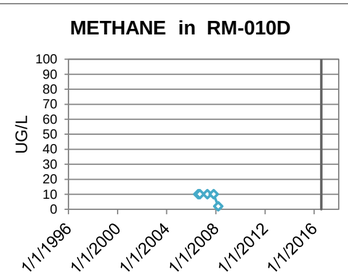
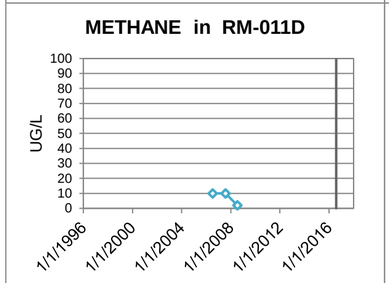
1/1/2012
1/1/2016


METHANE in RM-007XXD
UG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-008D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-010D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-011D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
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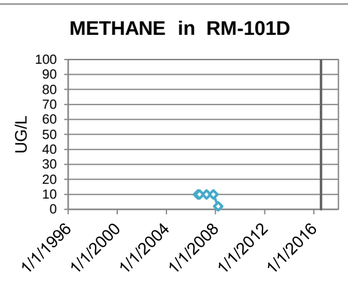
1/1/2012
1/1/2016


METHANE in RM-101D
UG/L
100
90
80
70
60
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1/1/2004
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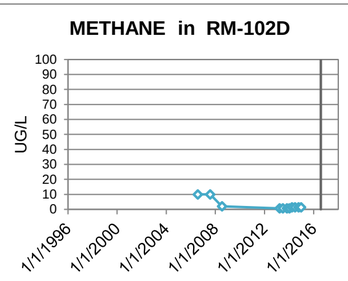
1/1/2012
1/1/2016


METHANE in RM-102D
UG/L
100
90
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70
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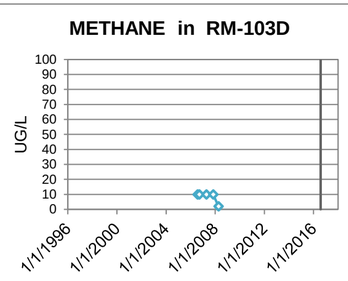
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-103D
UG/L
100
90
80
70
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1/1/2008
1/1/2012
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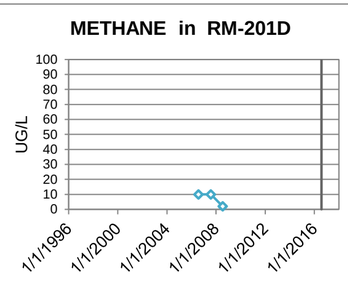
METHANE in RM-201D
UG/L
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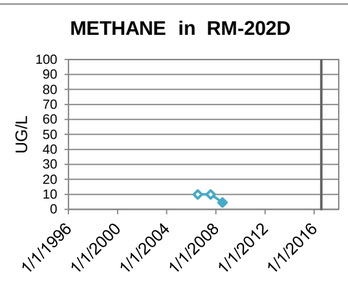
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-202D
UG/L
100
90
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70
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1/1/1996
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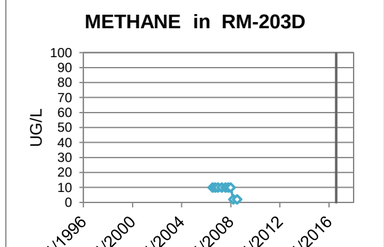
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-203D
UG/L
100
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70
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1/1/1996
1/1/2000
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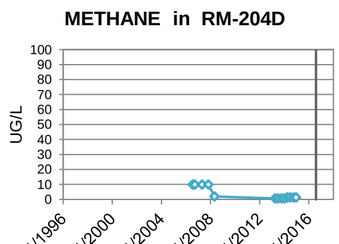
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-204D
UG/L
100
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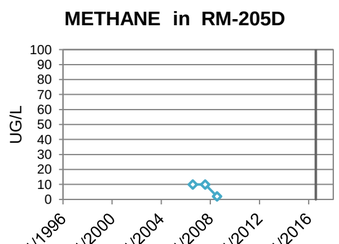
1/1/2012
1/1/2016


METHANE in RM-205D
UG/L
100
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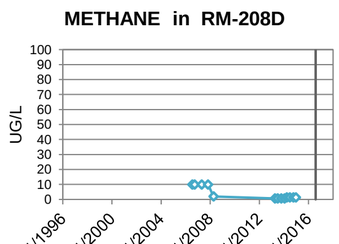
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-208D
UG/L
100
90
80
70
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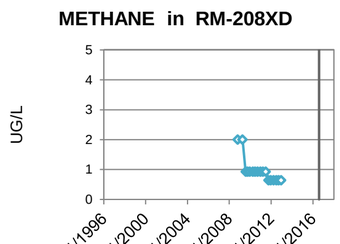
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-208XD
UG/L
5
4
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1
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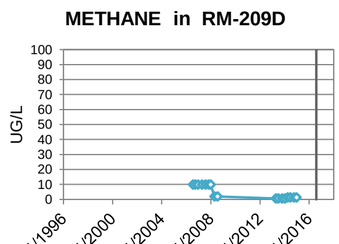
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-209D
UG/L
100
90
80
70
60
50
40
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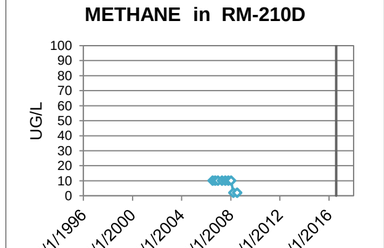
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-210D
UG/L
100
90
80
70
60
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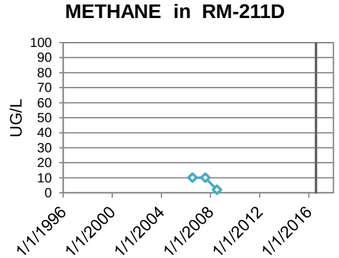
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-211D
UG/L
100
90
80
70
60
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40
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10
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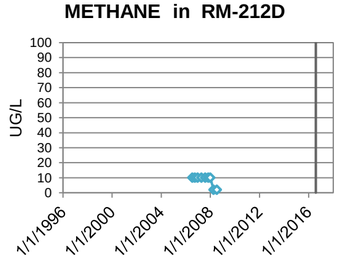
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-212D
UG/L
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90
80
70
60
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40
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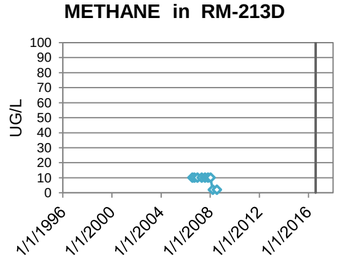
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-213D
UG/L
100
90
80
70
60
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40
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10
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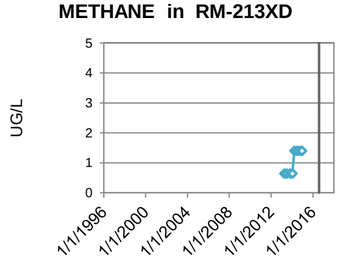
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-213XD
UG/L
5
4
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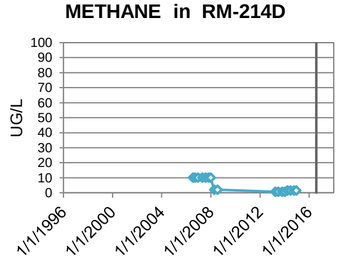
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-214D
UG/L
100
90
80
70
60
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40
30
20
10
0
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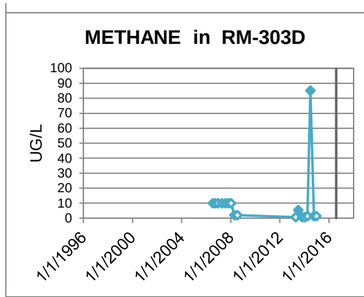
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-303D
UG/L
100
90
80
70
60
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40
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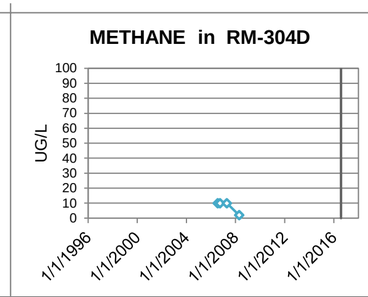
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-304D
UG/L
100
90
80
70
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10
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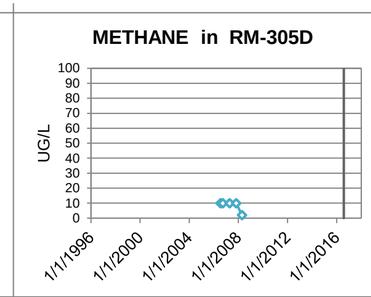
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-305D
UG/L
100
90
80
70
60
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10
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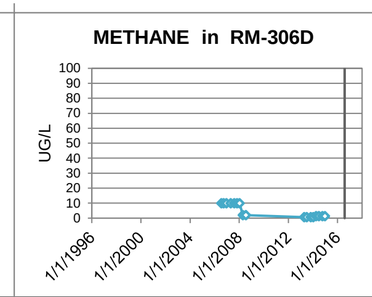
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-306D
UG/L
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80
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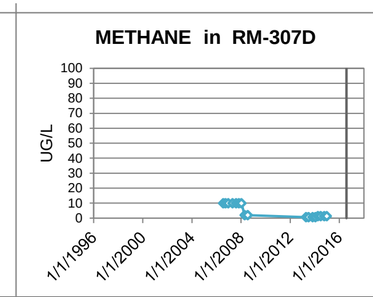
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-307D
UG/L
100
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80
70
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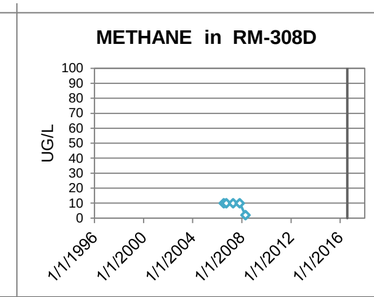
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-308D
UG/L
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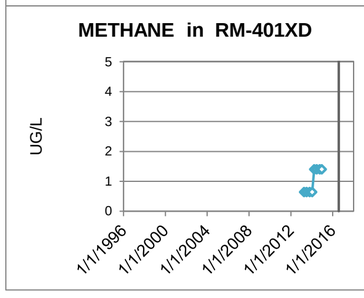
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-401XD
UG/L
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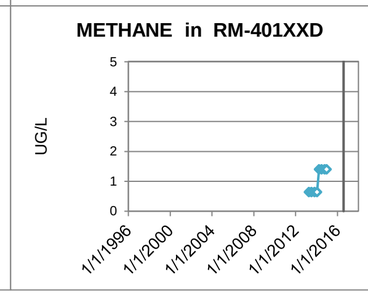
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-401XXD
UG/L
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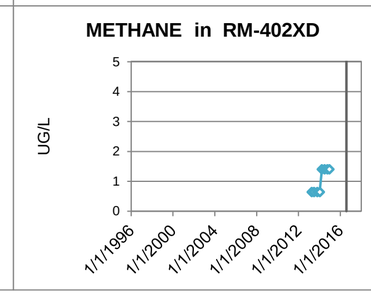
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-402XD
UG/L
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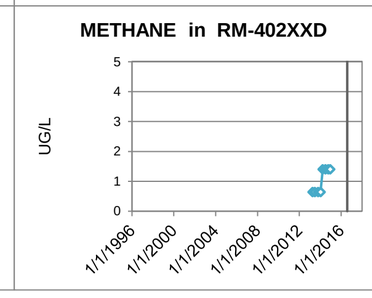
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-402XXD
UG/L
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4
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1
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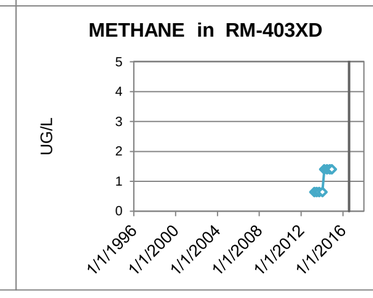
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


METHANE in RM-403XD
UG/L
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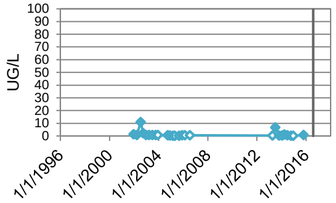
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in EW-07D
UG/L
100
90
80
70
60
50
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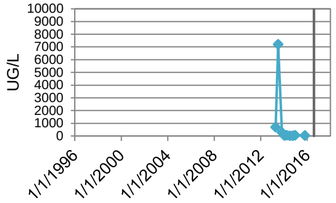
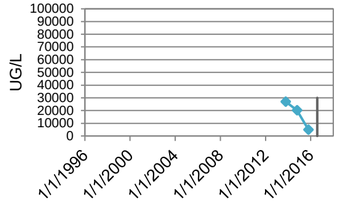
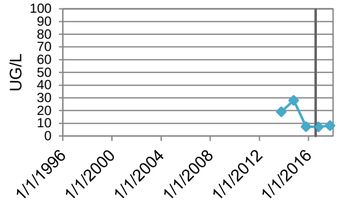
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in OW-101A
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in OW-103A
UG/L
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in OW-104F
UG/L
100
90
80
70
60
50
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10
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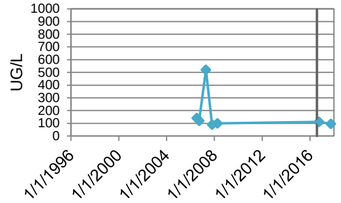
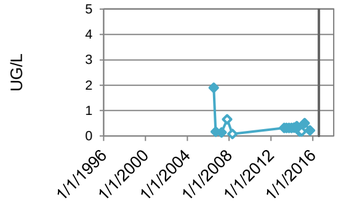
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-002D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-003D
UG/L
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4
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1
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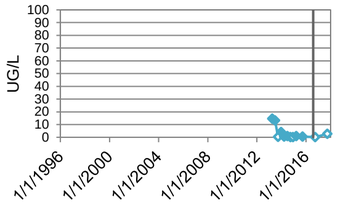
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-003XXD
UG/L
100
90
80
70
60
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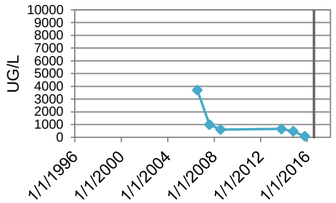
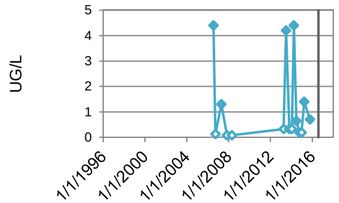
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-004D
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-005D
UG/L
5
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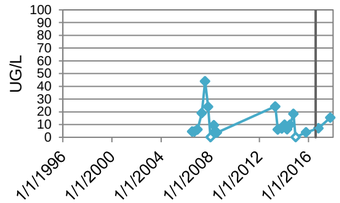
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-007D
UG/L
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90
80
70
60
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1/1/2000
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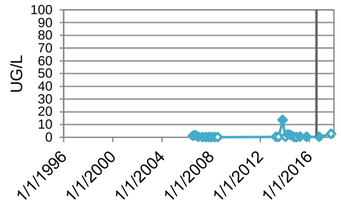
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-007XD
UG/L
100
90
80
70
60
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1/1/2000
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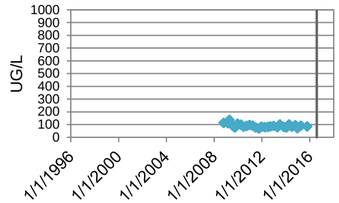
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-007XXD
UG/L
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900
800
700
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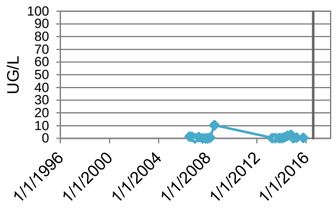
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-008D
UG/L
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90
80
70
60
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1/1/1996
1/1/2000
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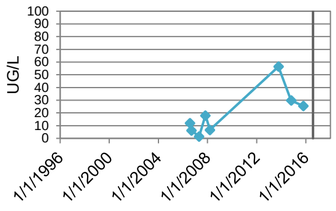
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-010D
UG/L
100
90
80
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60
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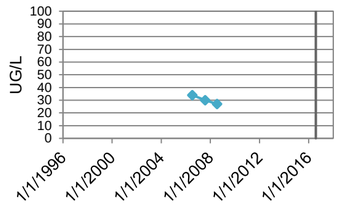
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-011D
UG/L
100
90
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70
60
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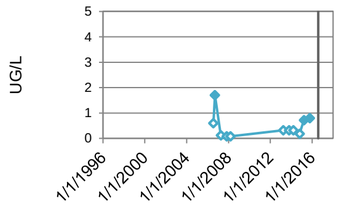
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-101D
UG/L
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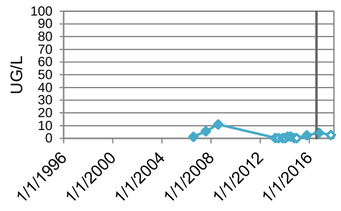
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-102D
UG/L
100
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80
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60
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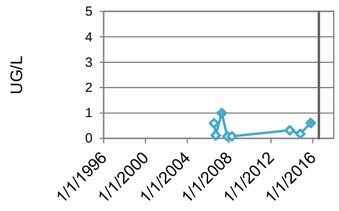
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-103D
UG/L
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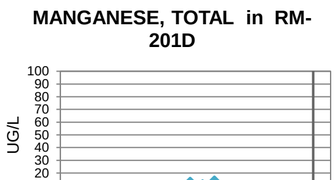
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-201D
UG/L
100
90
80
70
60
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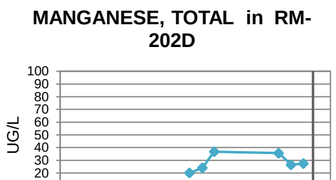
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-202D
UG/L
100
90
80
70
60
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1/1/2000
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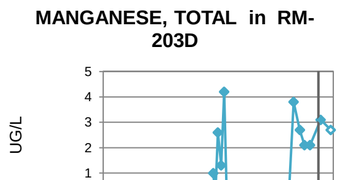
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-203D
UG/L
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4
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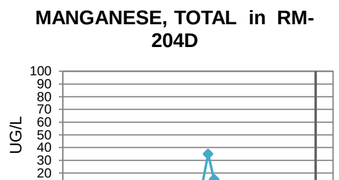
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-204D
UG/L
100
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80
70
60
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1/1/1996
1/1/2000
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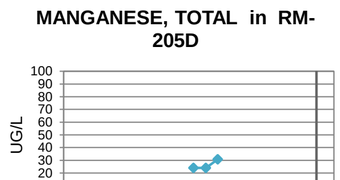
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-205D
UG/L
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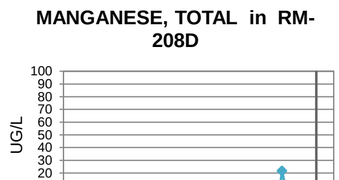
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-208D
UG/L
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80
70
60
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40
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0
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1/1/2000
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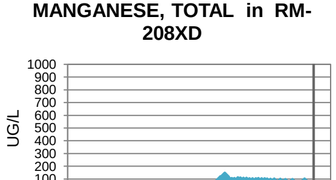
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-208XD
UG/L
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900
800
700
600
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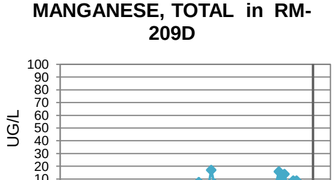
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-209D
UG/L
100
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80
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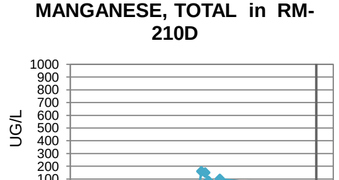
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-210D
UG/L
1000
900
800
700
600
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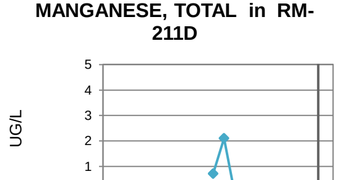
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-211D
UG/L
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4
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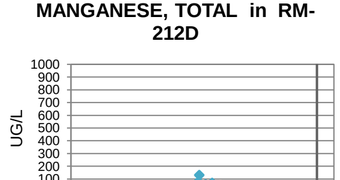
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-212D
UG/L
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1/1/1996
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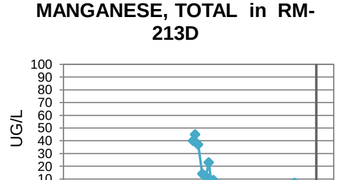
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-213D
UG/L
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1/1/2000
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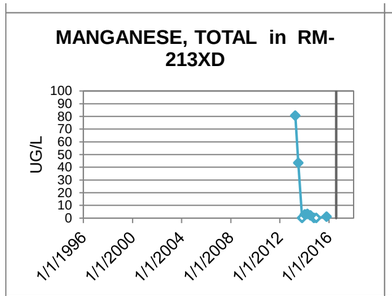
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-213XD
UG/L
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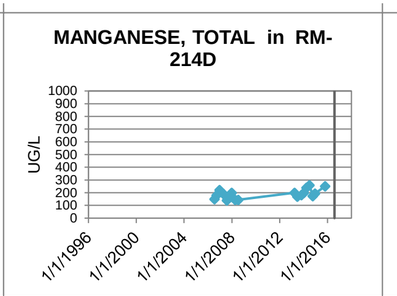
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-214D
UG/L
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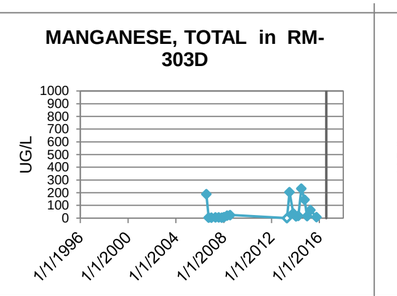
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-303D
UG/L
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900
800
700
600
500
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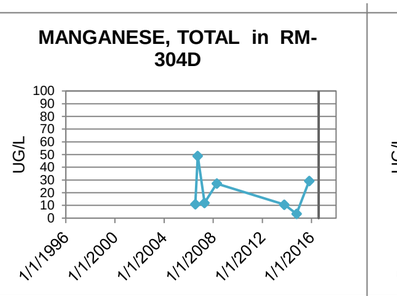
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-304D
UG/L
100
90
80
70
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10
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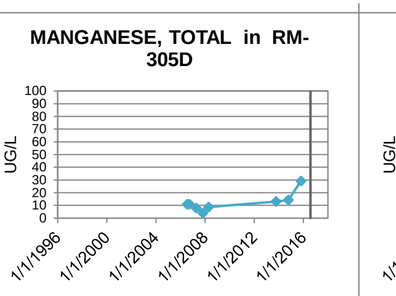
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-305D
UG/L
100
90
80
70
60
50
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10
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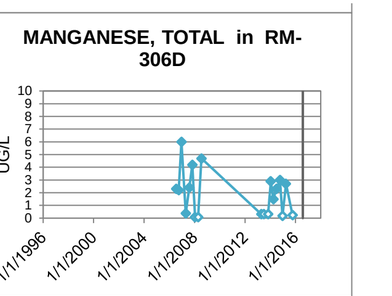
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-306D
UG/L
10
9
8
7
6
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1
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1/1/1996
1/1/2000
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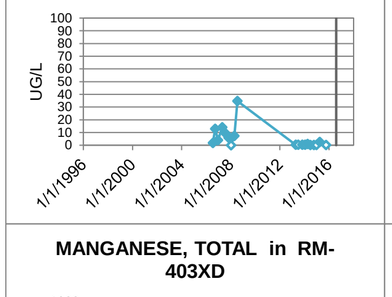
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-307D
UG/L
100
90
80
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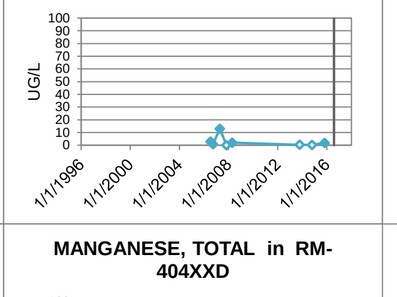
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-308D
UG/L
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90
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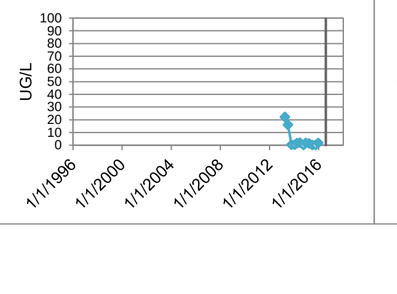
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-401XD
UG/L
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90
80
70
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10
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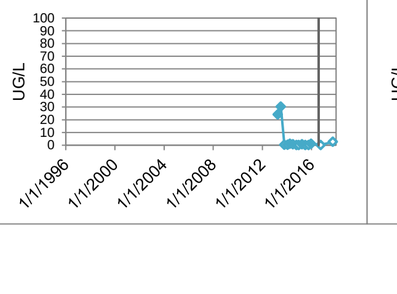
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-401XXD
UG/L
100
90
80
70
60
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1/1/1996
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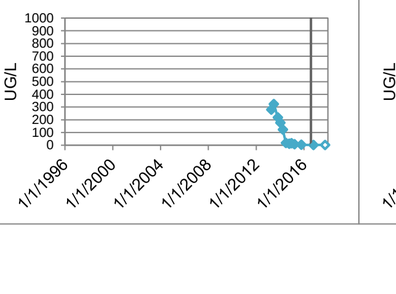
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-402XD
UG/L
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900
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700
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100
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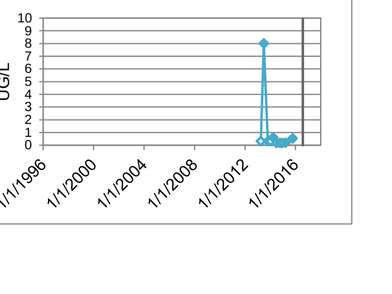
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-402XXD
UG/L
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9
8
7
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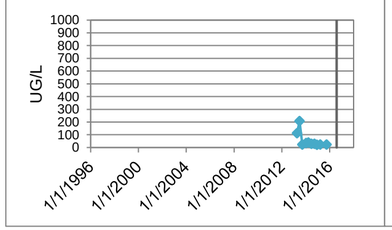
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-403XD
UG/L
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700
600
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200
100
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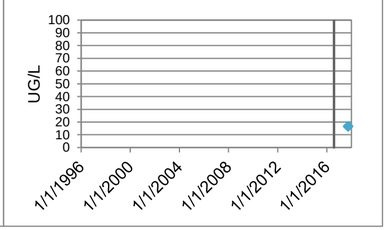
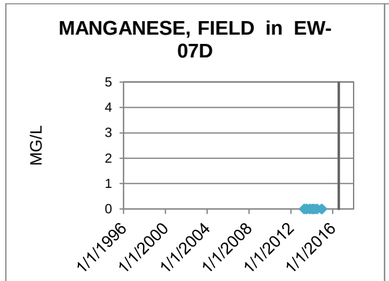
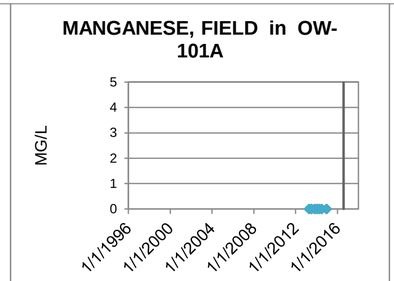
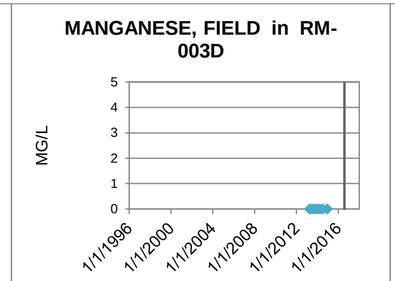
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, TOTAL in RM-404XXD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in EW-07D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in OW-101A
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-003D
MG/L
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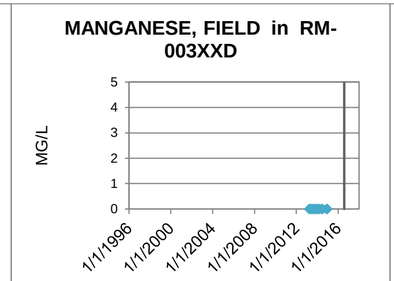
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-003XXD
MG/L
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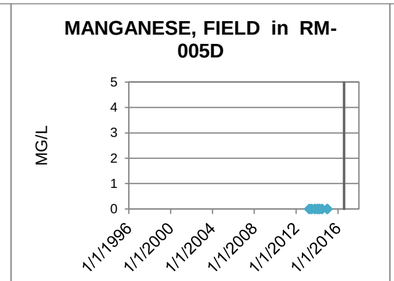
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-005D
MG/L
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4
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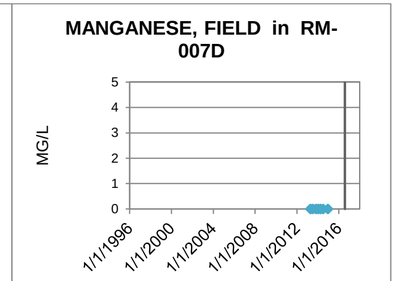
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-007D
MG/L
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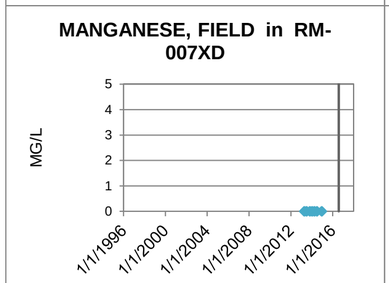
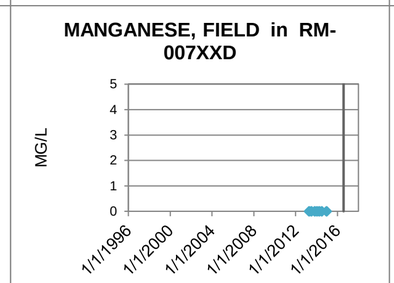
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-007XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-007XXD
MG/L
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4
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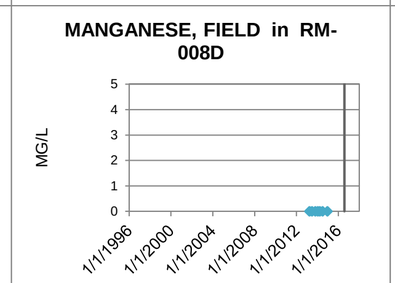
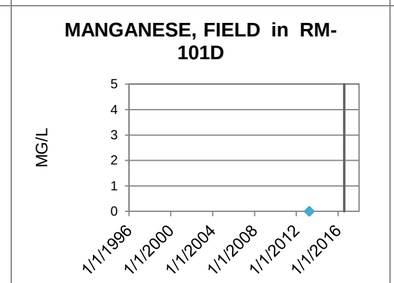
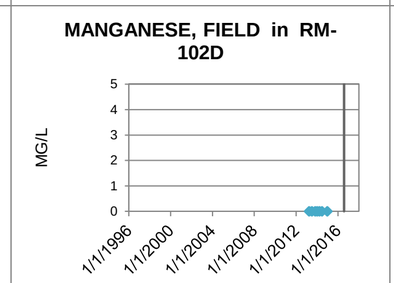
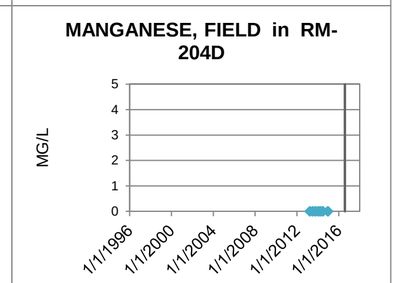
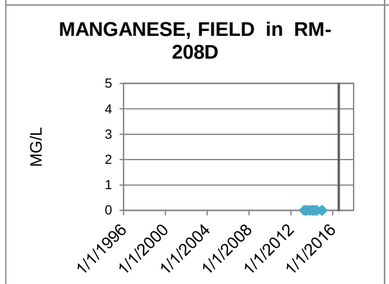
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

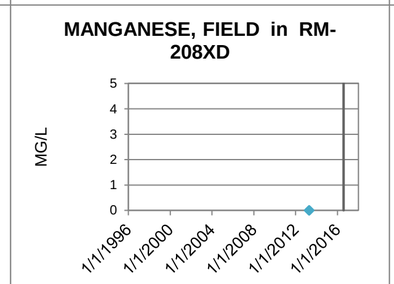

MANGANESE, FIELD in RM-008D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

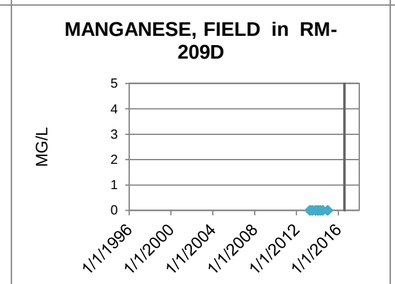

MANGANESE, FIELD in RM-101D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

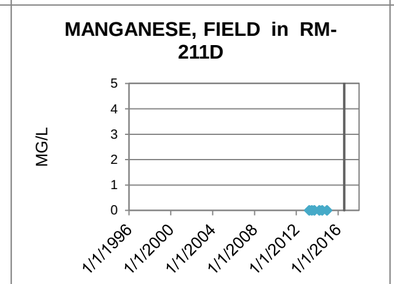

MANGANESE, FIELD in RM-102D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

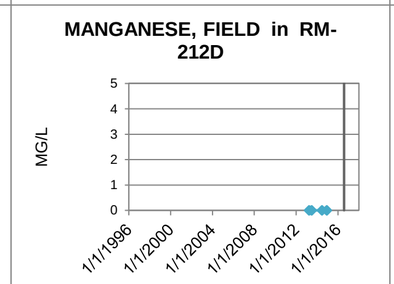

MANGANESE, FIELD in RM-204D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

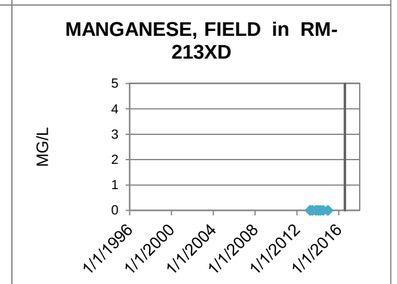

MANGANESE, FIELD in RM-208D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

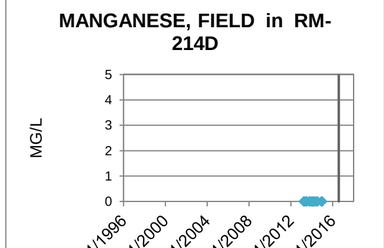

MANGANESE, FIELD in RM-208XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-209D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-211D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-212D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-213XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-214D
MG/L
5
4
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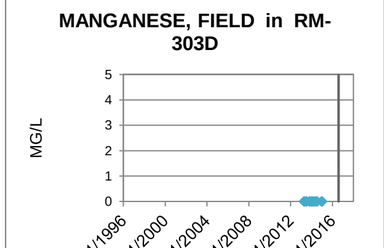
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-303D
MG/L
5
4
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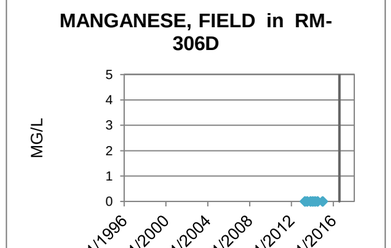
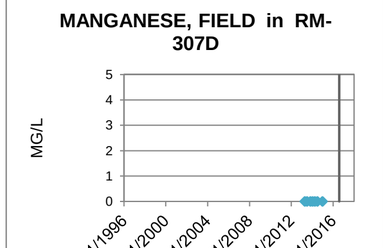
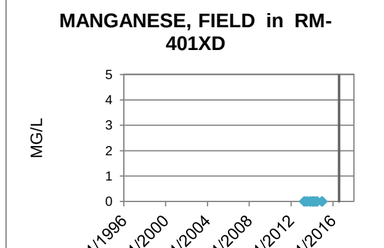
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-306D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-307D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-401XD
MG/L
5
4
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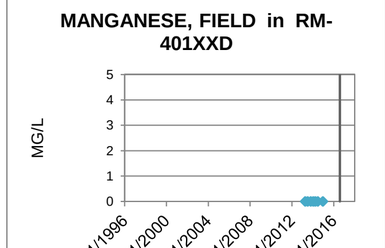
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-401XXD
MG/L
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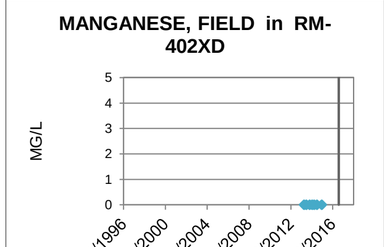
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-402XD
MG/L
5
4
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1
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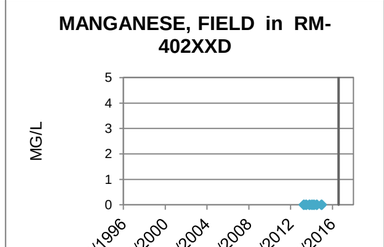
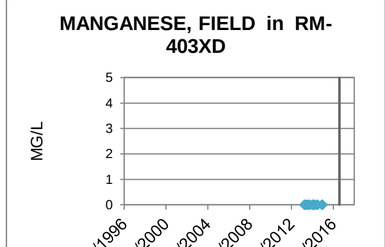
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-402XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


MANGANESE, FIELD in RM-403XD
MG/L
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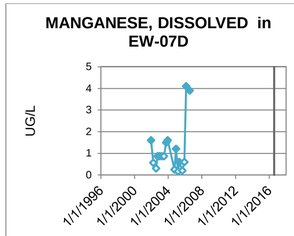
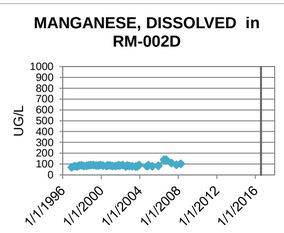
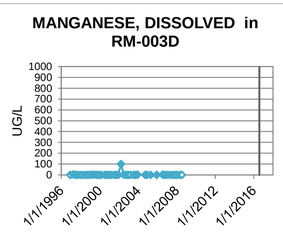
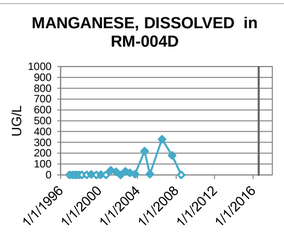
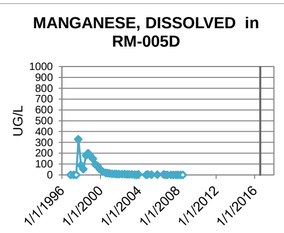
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

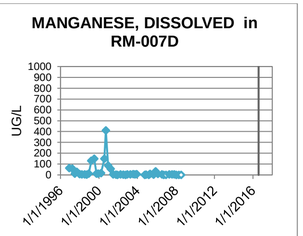

MANGANESE, DISSOLVED in EW-07D
UG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

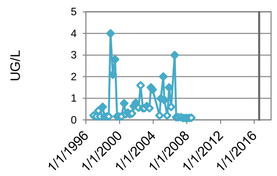

MANGANESE, DISSOLVED in RM-002D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

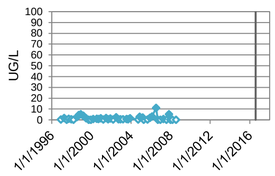

MANGANESE, DISSOLVED in RM-003D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

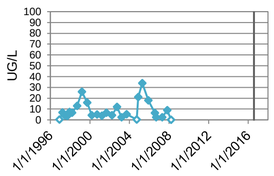

MANGANESE, DISSOLVED in RM-004D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

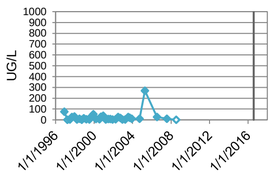

MANGANESE, DISSOLVED in RM-005D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

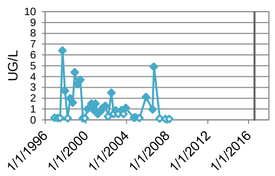

MANGANESE, DISSOLVED in RM-007D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

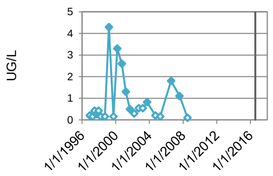

MANGANESE, DISSOLVED in RM-007XD
UG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

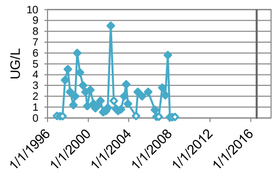

MANGANESE, DISSOLVED in RM-008D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

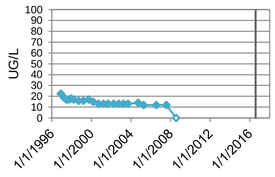

MANGANESE, DISSOLVED in RM-010D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

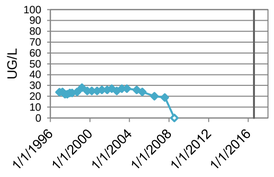

MANGANESE, DISSOLVED in RM-011D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

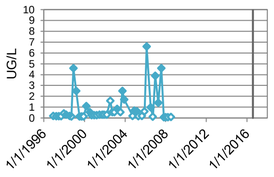

MANGANESE, DISSOLVED in RM-101D
UG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

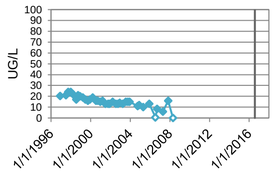

MANGANESE, DISSOLVED in RM-102D
UG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

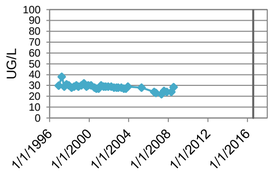

MANGANESE, DISSOLVED in RM-103D
UG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

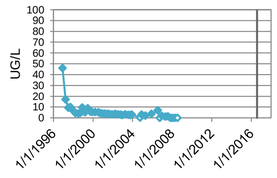

MANGANESE, DISSOLVED in RM-201D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

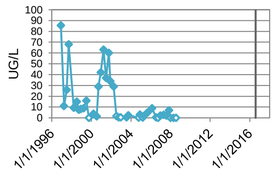

MANGANESE, DISSOLVED in RM-202D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

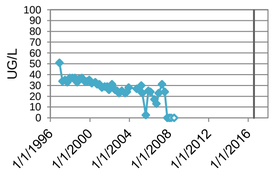

MANGANESE, DISSOLVED in RM-203D
UG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

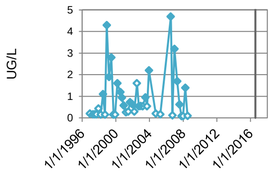

MANGANESE, DISSOLVED in RM-204D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

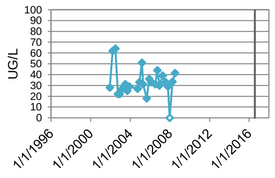

MANGANESE, DISSOLVED in RM-205D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

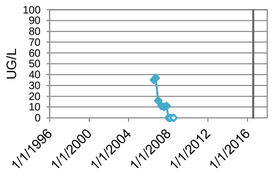

MANGANESE, DISSOLVED in RM-208D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

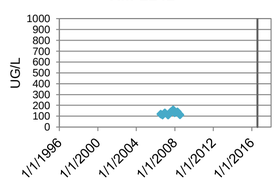

MANGANESE, DISSOLVED in RM-209D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

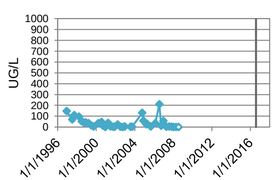

MANGANESE, DISSOLVED in RM-210D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

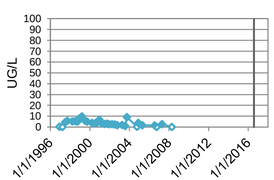

MANGANESE, DISSOLVED in RM-211D
UG/L
0 1 2 3 4 5
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

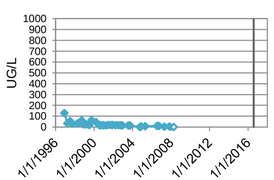

MANGANESE, DISSOLVED in RM-212D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

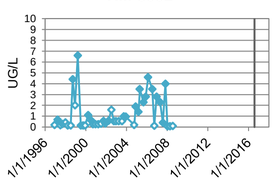

MANGANESE, DISSOLVED in RM-213D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

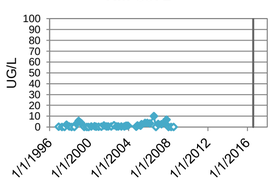

MANGANESE, DISSOLVED in RM-214D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

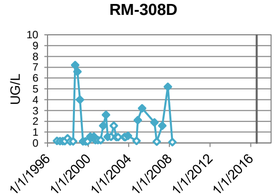

MANGANESE, DISSOLVED in RM-303D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

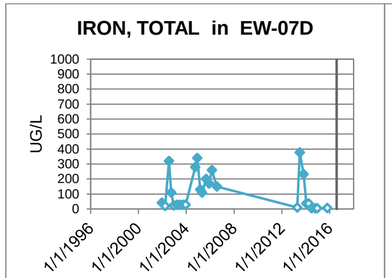

MANGANESE, DISSOLVED in RM-304D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

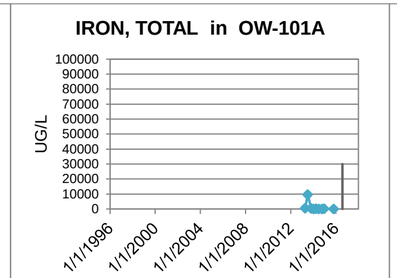

MANGANESE, DISSOLVED in RM-305D
UG/L
0 100 200 300 400 500 600 700 800 900 1000
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

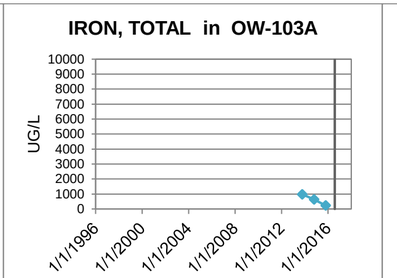

MANGANESE, DISSOLVED in RM-306D
UG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

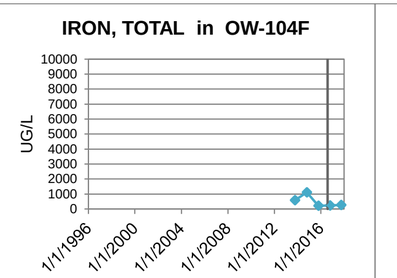

MANGANESE, DISSOLVED in RM-307D
UG/L
0 10 20 30 40 50 60 70 80 90 100
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

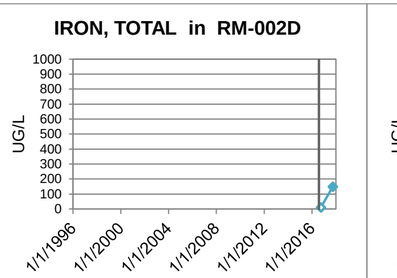

MANGANESE, DISSOLVED in RM-308D
UG/L
0 1 2 3 4 5 6 7 8 9 10
1/1/1996 1/1/2000 1/1/2004 1/1/2008 1/1/2012 1/1/2016

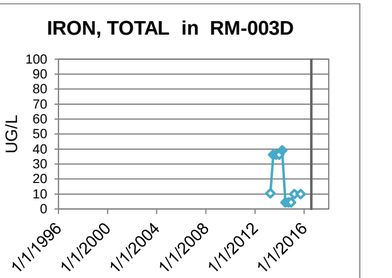

IRON, TOTAL in EW-07D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

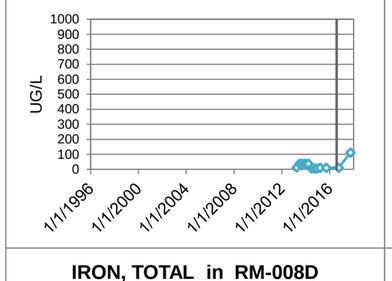

IRON, TOTAL in OW-101A
UG/L
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

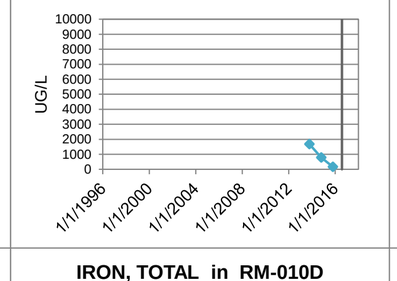

IRON, TOTAL in OW-103A
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

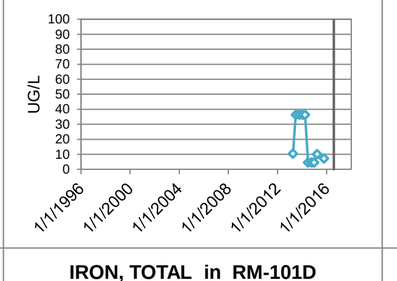

IRON, TOTAL in OW-104F
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

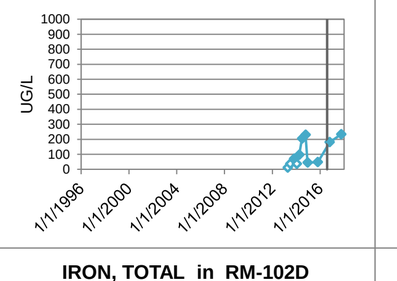

IRON, TOTAL in RM-002D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

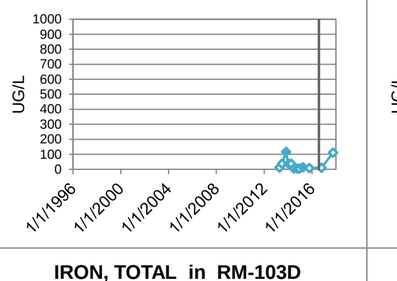

IRON, TOTAL in RM-003D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

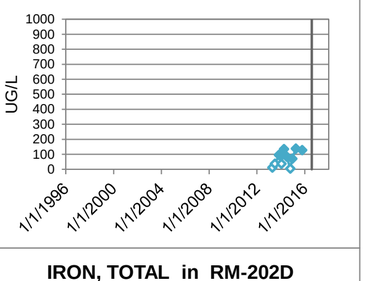

IRON, TOTAL in RM-003XXD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

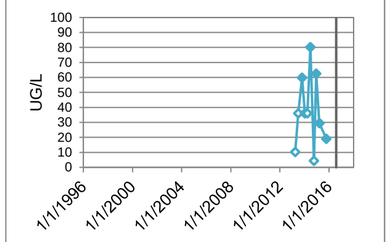

IRON, TOTAL in RM-004D
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

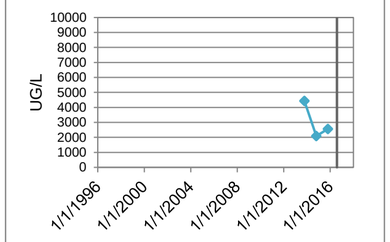

IRON, TOTAL in RM-005D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

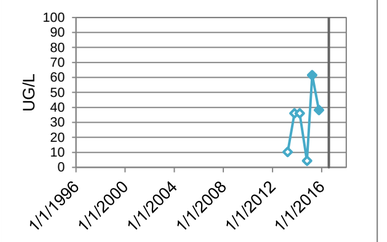

IRON, TOTAL in RM-007D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

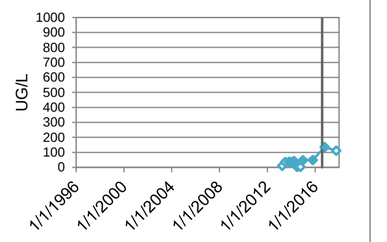

IRON, TOTAL in RM-007XD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

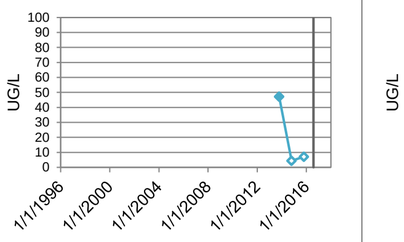

IRON, TOTAL in RM-007XXD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

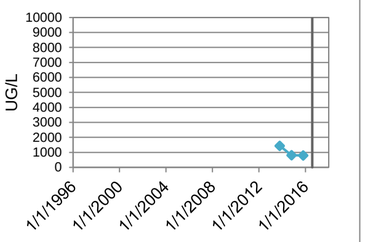

IRON, TOTAL in RM-008D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

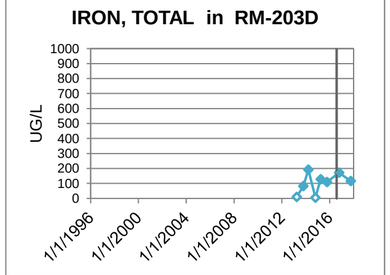

IRON, TOTAL in RM-010D
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

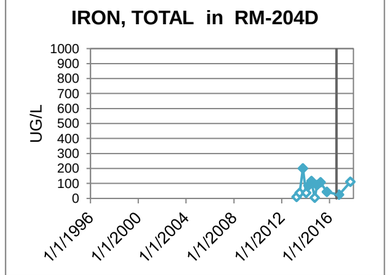

IRON, TOTAL in RM-101D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

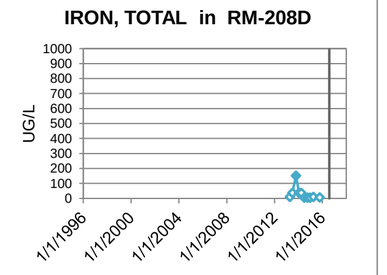

IRON, TOTAL in RM-102D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

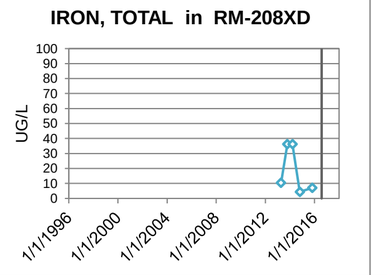

IRON, TOTAL in RM-103D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

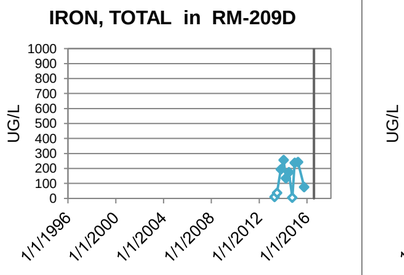

IRON, TOTAL in RM-202D
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

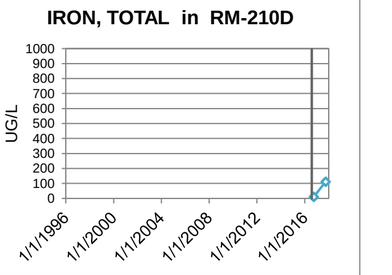

IRON, TOTAL in RM-203D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

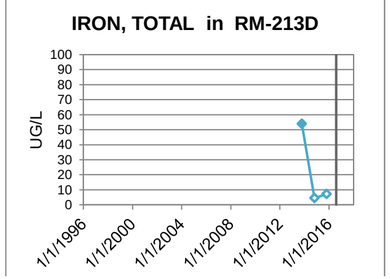

IRON, TOTAL in RM-204D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

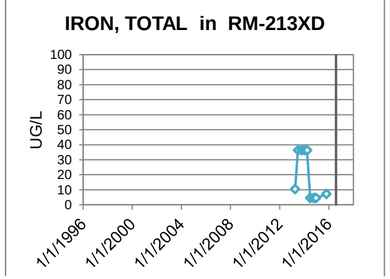

IRON, TOTAL in RM-208D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

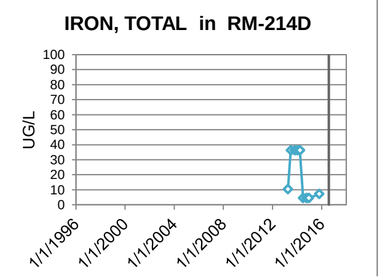

IRON, TOTAL in RM-208XD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

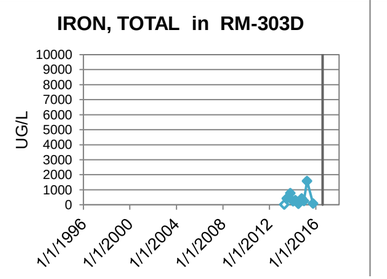

IRON, TOTAL in RM-209D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

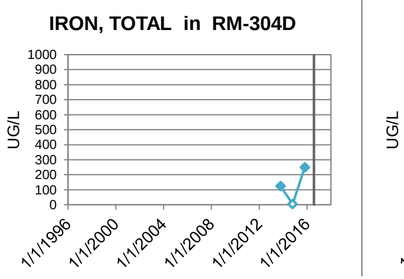

IRON, TOTAL in RM-210D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

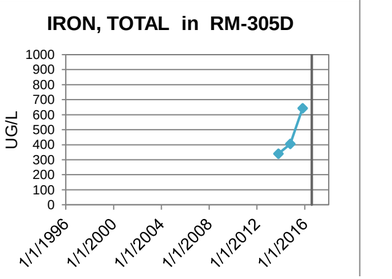

IRON, TOTAL in RM-213D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

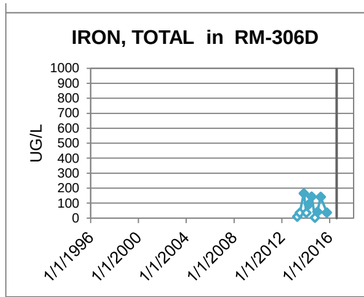

IRON, TOTAL in RM-213XD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

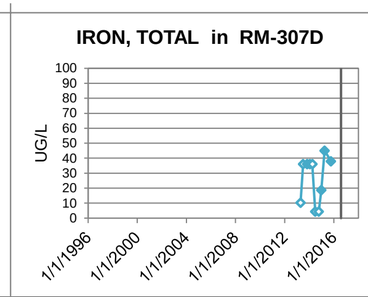

IRON, TOTAL in RM-214D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

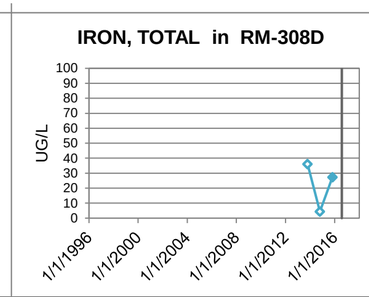

IRON, TOTAL in RM-303D
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

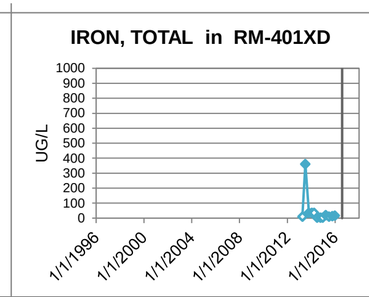

IRON, TOTAL in RM-304D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

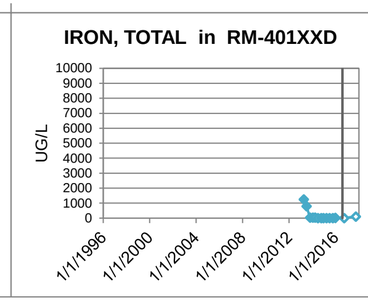

IRON, TOTAL in RM-305D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

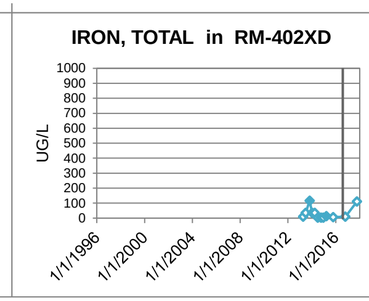

IRON, TOTAL in RM-306D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

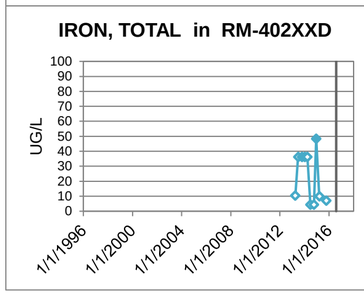

IRON, TOTAL in RM-307D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

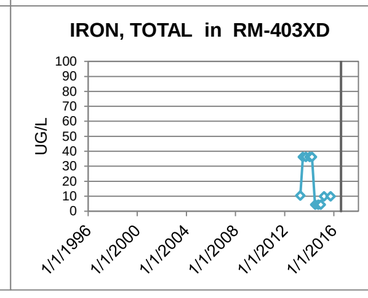

IRON, TOTAL in RM-308D
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

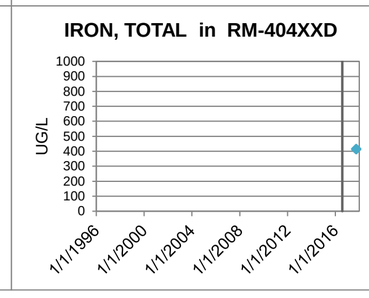

IRON, TOTAL in RM-401XD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

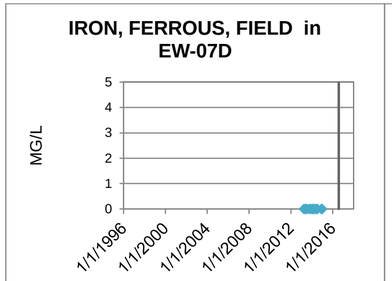

IRON, TOTAL in RM-401XXD
UG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

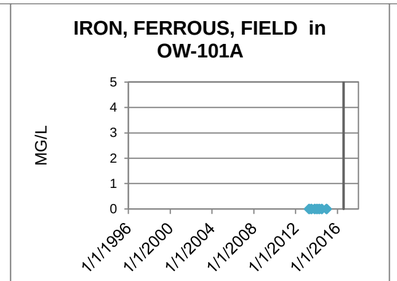

IRON, TOTAL in RM-402XD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

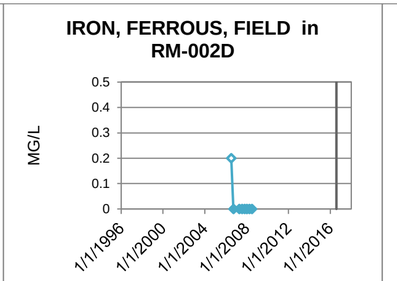

IRON, TOTAL in RM-402XXD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

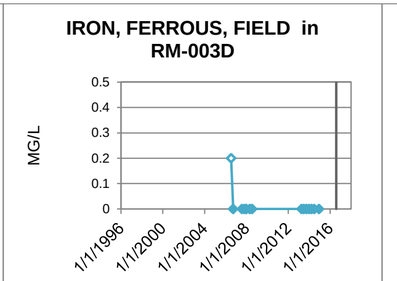

IRON, TOTAL in RM-403XD
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

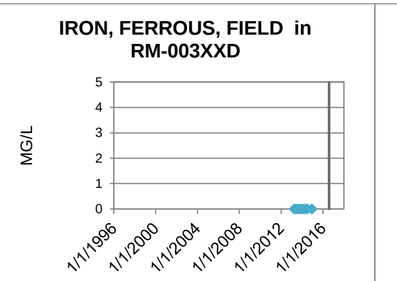

IRON, TOTAL in RM-404XXD
UG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

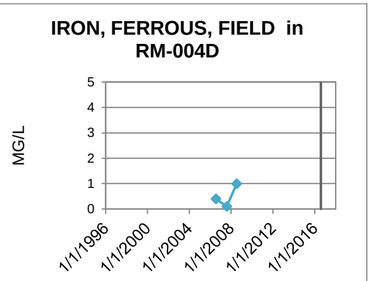

IRON, FERROUS, FIELD in EW-07D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

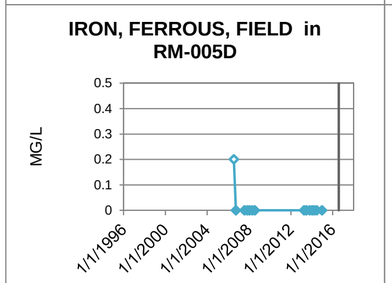

IRON, FERROUS, FIELD in OW-101A
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

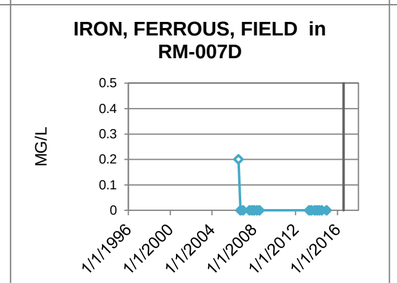

IRON, FERROUS, FIELD in RM-002D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

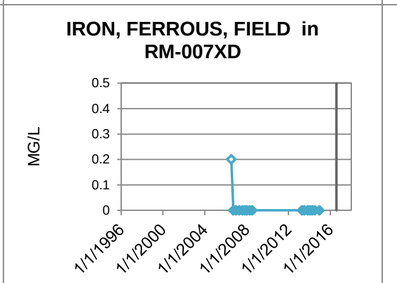

IRON, FERROUS, FIELD in RM-003D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

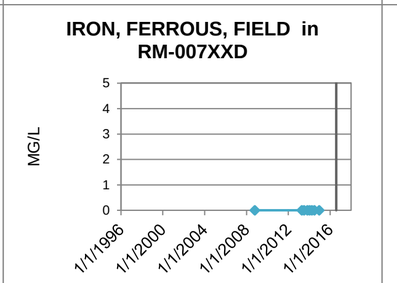

IRON, FERROUS, FIELD in RM-003XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

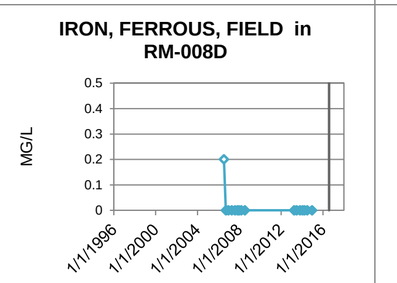

IRON, FERROUS, FIELD in RM-004D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

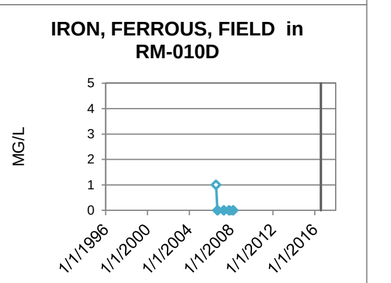

IRON, FERROUS, FIELD in RM-005D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

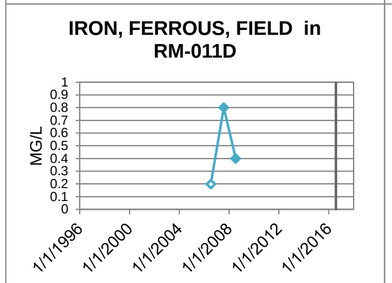

IRON, FERROUS, FIELD in RM-007D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

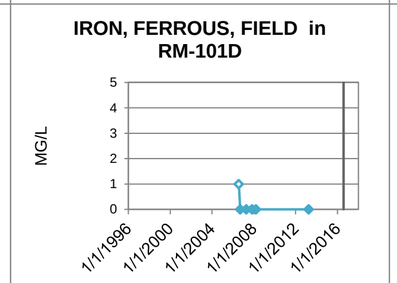

IRON, FERROUS, FIELD in RM-007XD
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

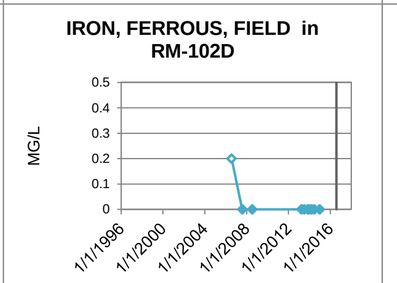

IRON, FERROUS, FIELD in RM-007XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

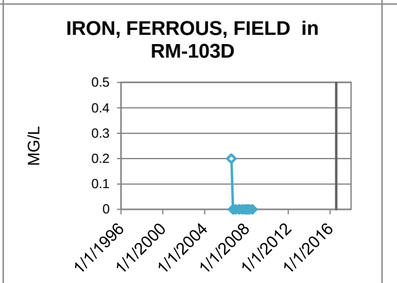

IRON, FERROUS, FIELD in RM-008D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

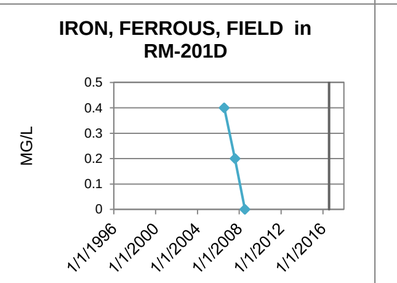

IRON, FERROUS, FIELD in RM-010D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

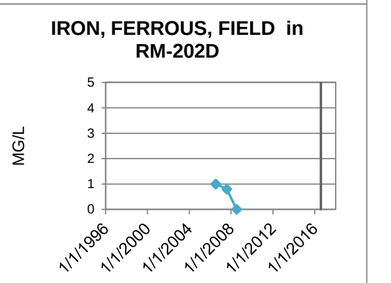

IRON, FERROUS, FIELD in RM-011D
MG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

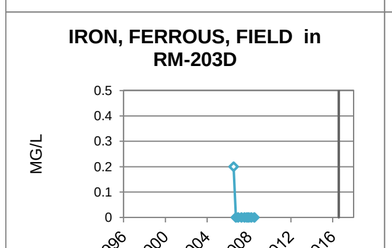

IRON, FERROUS, FIELD in RM-101D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

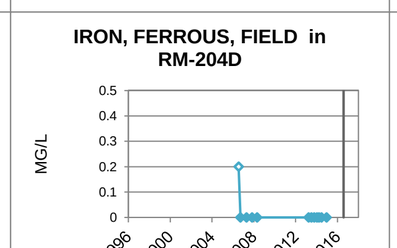

IRON, FERROUS, FIELD in RM-102D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

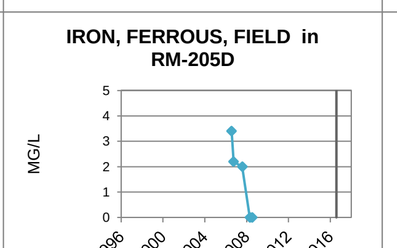

IRON, FERROUS, FIELD in RM-103D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

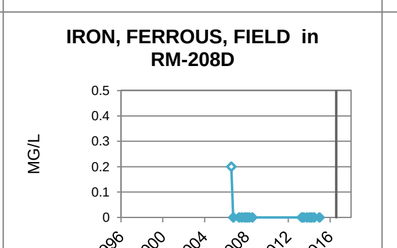

IRON, FERROUS, FIELD in RM-201D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

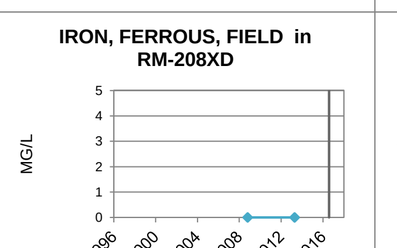

IRON, FERROUS, FIELD in RM-202D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

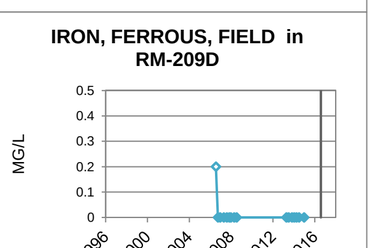

IRON, FERROUS, FIELD in RM-203D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

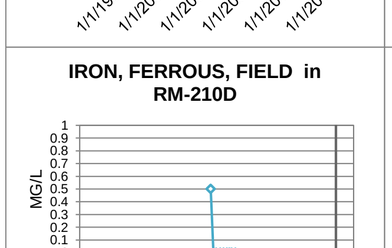

IRON, FERROUS, FIELD in RM-204D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

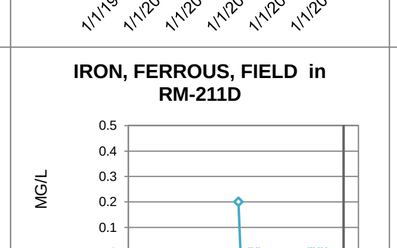

IRON, FERROUS, FIELD in RM-205D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

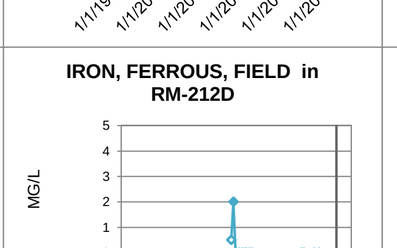

IRON, FERROUS, FIELD in RM-208D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

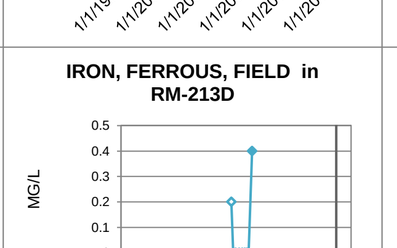

IRON, FERROUS, FIELD in RM-208XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

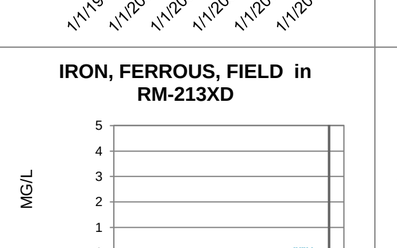

IRON, FERROUS, FIELD in RM-209D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

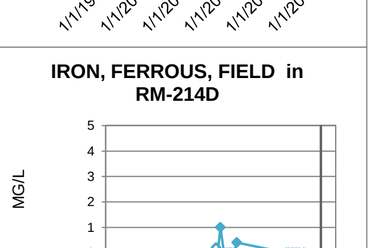

IRON, FERROUS, FIELD in RM-210D
MG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

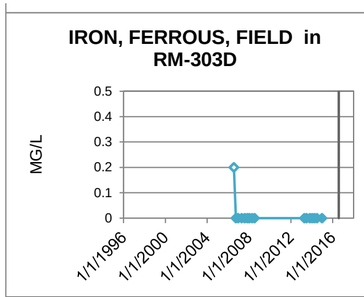

IRON, FERROUS, FIELD in RM-211D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

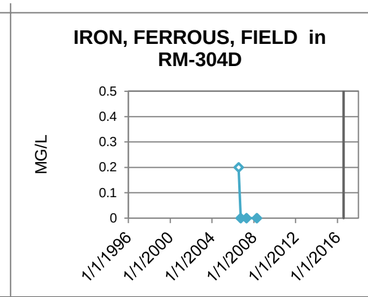

IRON, FERROUS, FIELD in RM-212D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

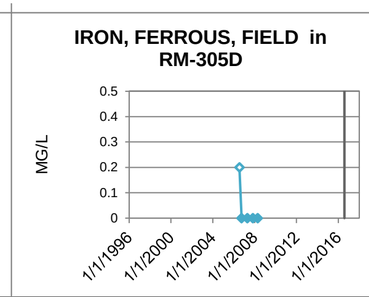

IRON, FERROUS, FIELD in RM-213D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

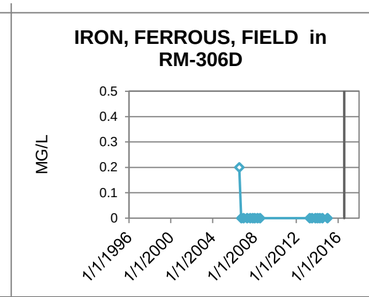

IRON, FERROUS, FIELD in RM-213XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

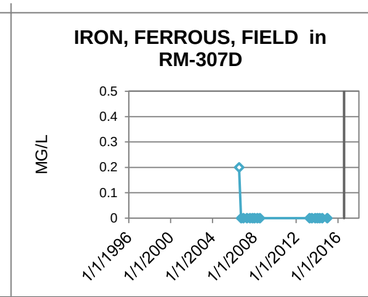

IRON, FERROUS, FIELD in RM-214D
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

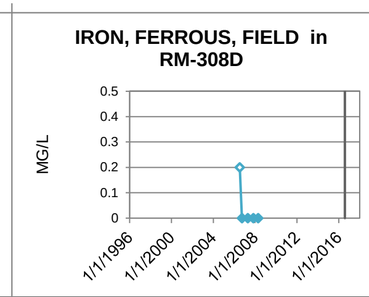

IRON, FERROUS, FIELD in RM-303D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

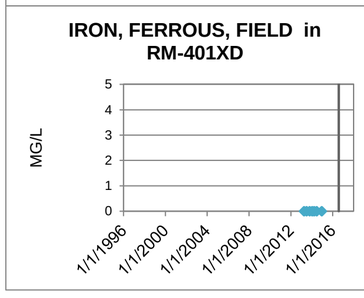

IRON, FERROUS, FIELD in RM-304D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

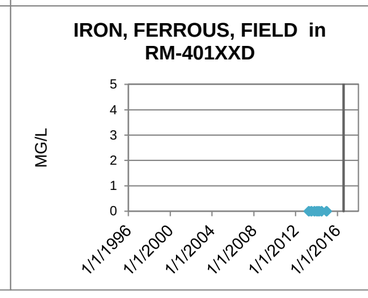

IRON, FERROUS, FIELD in RM-305D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

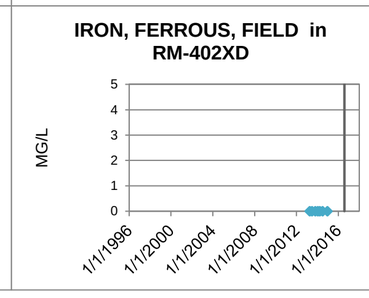

IRON, FERROUS, FIELD in RM-306D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

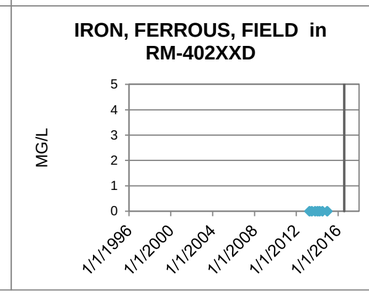

IRON, FERROUS, FIELD in RM-307D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

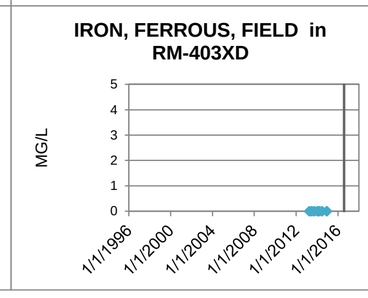

IRON, FERROUS, FIELD in RM-308D
MG/L
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

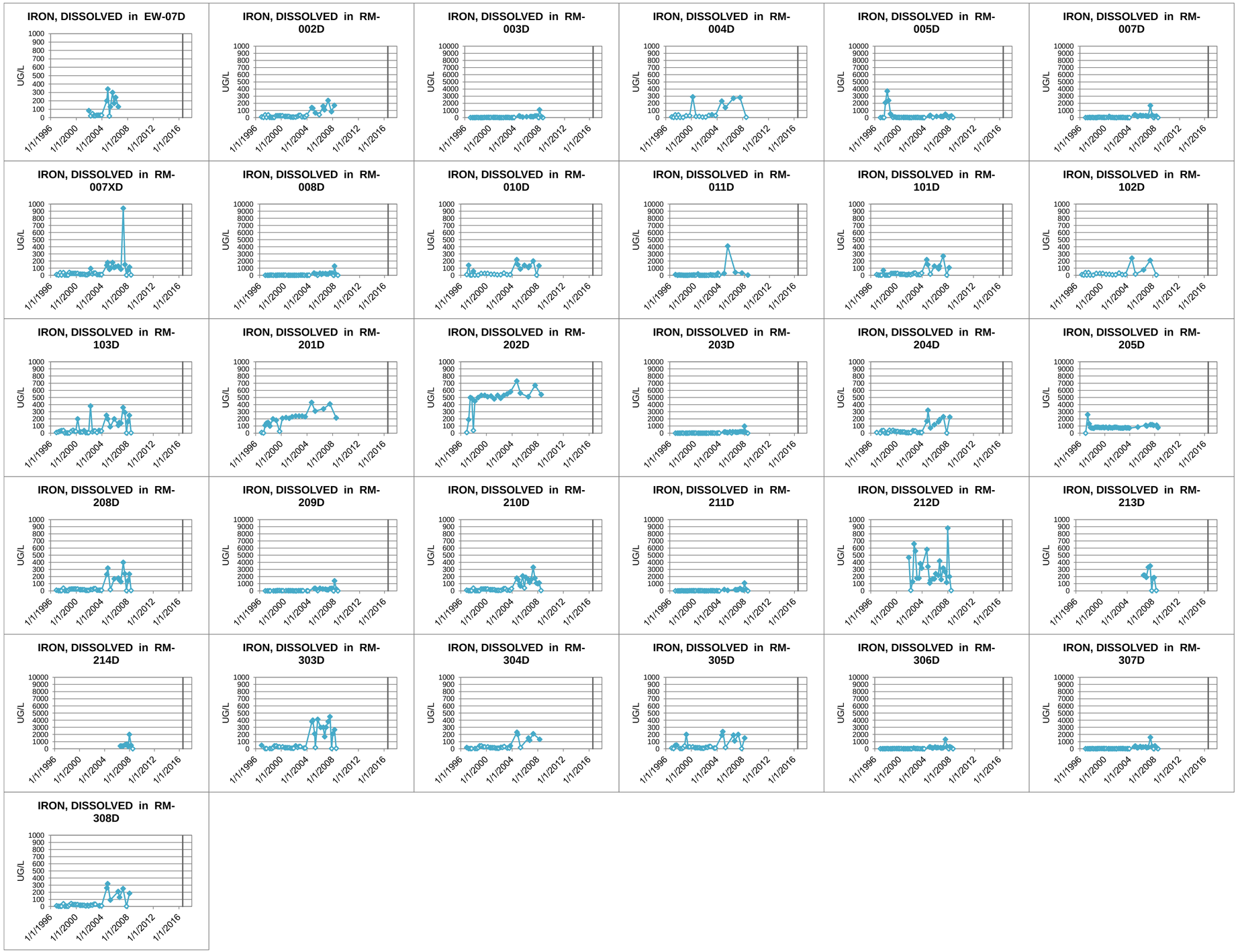

IRON, FERROUS, FIELD in RM-401XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

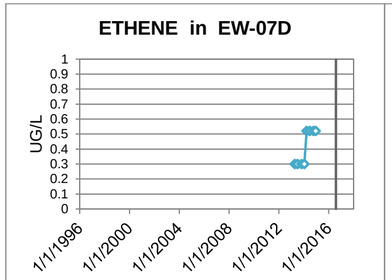

IRON, FERROUS, FIELD in RM-401XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

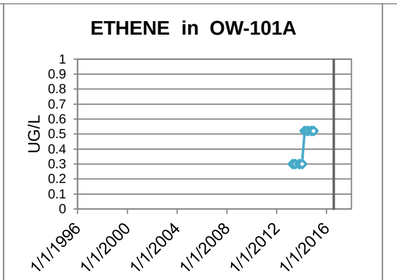

IRON, FERROUS, FIELD in RM-402XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

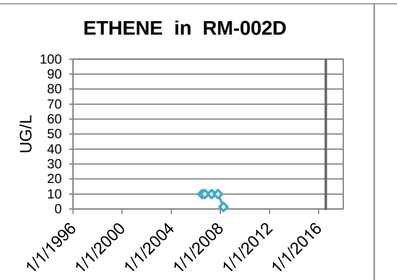

IRON, FERROUS, FIELD in RM-402XXD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

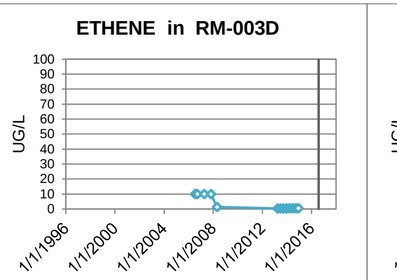

IRON, FERROUS, FIELD in RM-403XD
MG/L
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


IRON, DISSOLVED in EW-07D
IRON, DISSOLVED in RM-002D
IRON, DISSOLVED in RM-003D
IRON, DISSOLVED in RM-004D
IRON, DISSOLVED in RM-005D
IRON, DISSOLVED in RM-007D
IRON, DISSOLVED in RM-007XD
IRON, DISSOLVED in RM-008D
IRON, DISSOLVED in RM-010D
IRON, DISSOLVED in RM-011D
IRON, DISSOLVED in RM-101D
IRON, DISSOLVED in RM-102D
IRON, DISSOLVED in RM-103D
IRON, DISSOLVED in RM-201D
IRON, DISSOLVED in RM-202D
IRON, DISSOLVED in RM-203D
IRON, DISSOLVED in RM-204D
IRON, DISSOLVED in RM-205D
IRON, DISSOLVED in RM-208D
IRON, DISSOLVED in RM-209D
IRON, DISSOLVED in RM-210D
IRON, DISSOLVED in RM-211D
IRON, DISSOLVED in RM-212D
IRON, DISSOLVED in RM-213D
IRON, DISSOLVED in RM-214D
IRON, DISSOLVED in RM-303D
IRON, DISSOLVED in RM-304D
IRON, DISSOLVED in RM-305D
IRON, DISSOLVED in RM-306D
IRON, DISSOLVED in RM-307D
IRON, DISSOLVED in RM-308D
UG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHENE in EW-07D
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHENE in OW-101A
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHENE in RM-002D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHENE in RM-003D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
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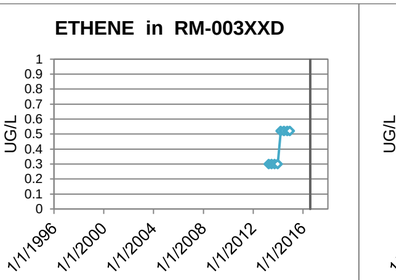
ETHENE in RM-003XXD
UG/L
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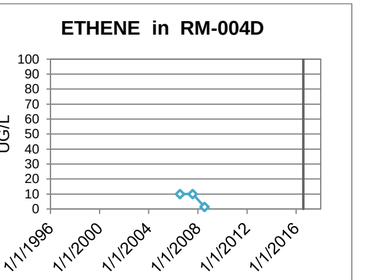
ETHENE in RM-004D
UG/L
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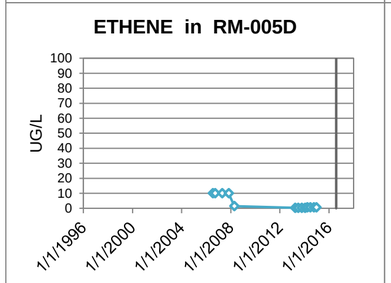
ETHENE in RM-005D
UG/L
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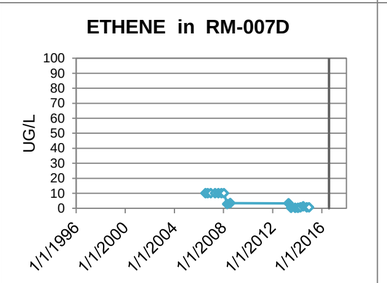
ETHENE in RM-007D
UG/L
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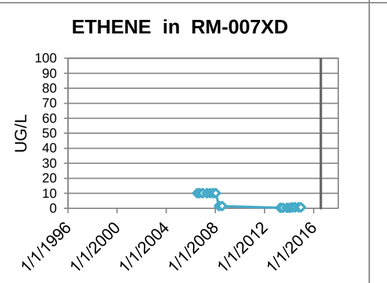
ETHENE in RM-007XD
UG/L
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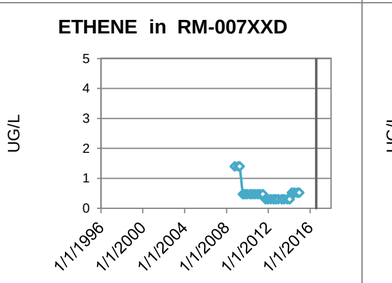
ETHENE in RM-007XXD
UG/L
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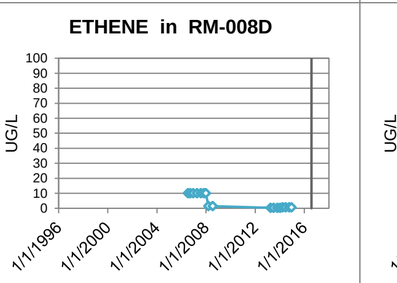
ETHENE in RM-008D
UG/L
100
90
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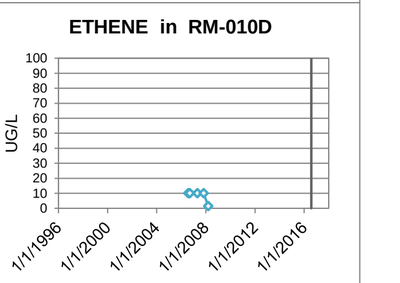
ETHENE in RM-010D
UG/L
100
90
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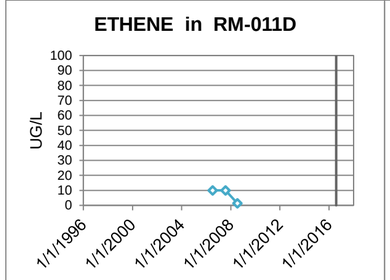
ETHENE in RM-011D
UG/L
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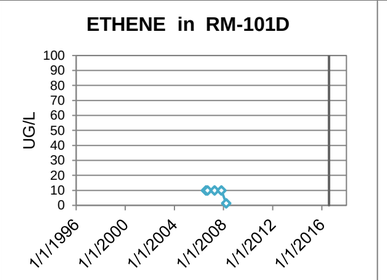
ETHENE in RM-101D
UG/L
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90
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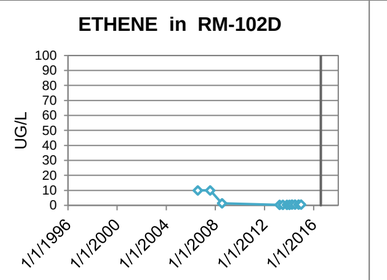
1/1/2012
1/1/2016


ETHENE in RM-102D
UG/L
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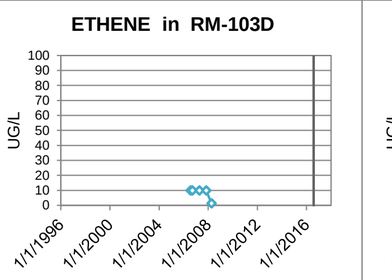
1/1/2012
1/1/2016


ETHENE in RM-103D
UG/L
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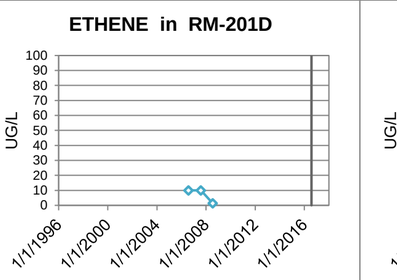
ETHENE in RM-201D
UG/L
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90
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1/1/2012
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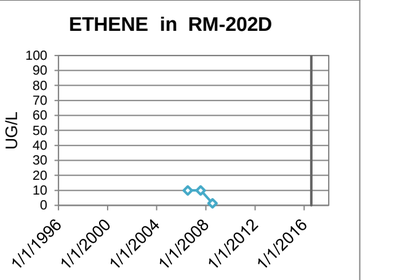
ETHENE in RM-202D
UG/L
100
90
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1/1/2012
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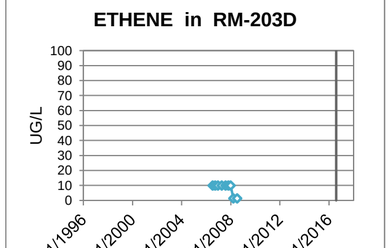
ETHENE in RM-203D
UG/L
100
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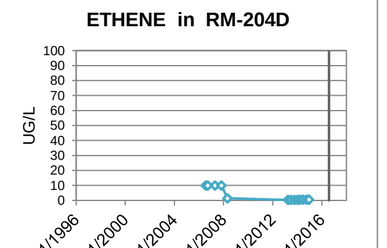
ETHENE in RM-204D
UG/L
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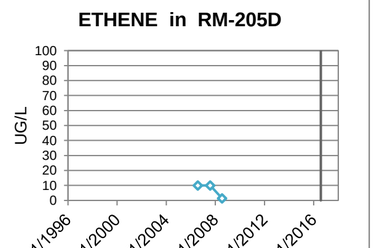
ETHENE in RM-205D
UG/L
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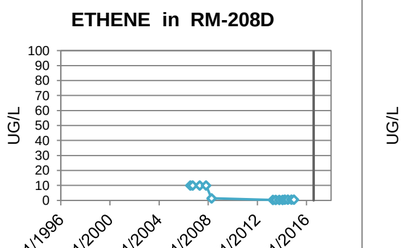
ETHENE in RM-208D
UG/L
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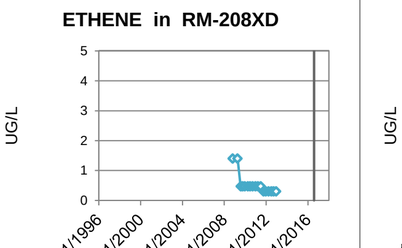
ETHENE in RM-208XD
UG/L
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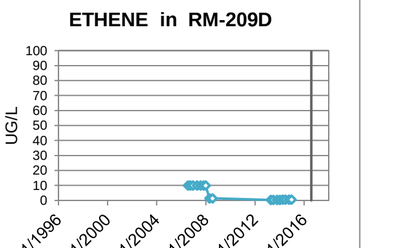
ETHENE in RM-209D
UG/L
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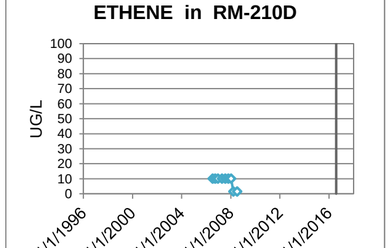
ETHENE in RM-210D
UG/L
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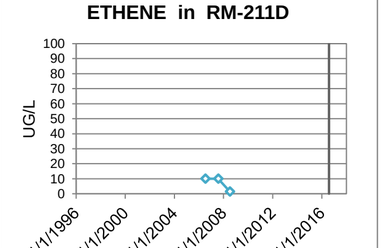
ETHENE in RM-211D
UG/L
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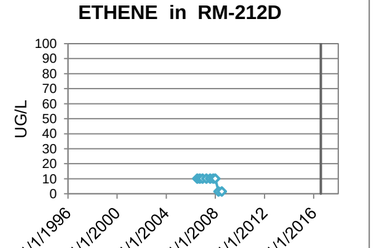
ETHENE in RM-212D
UG/L
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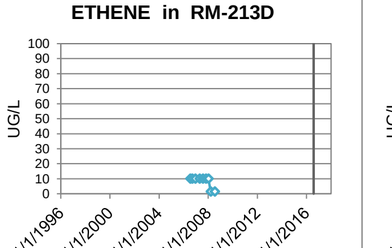
ETHENE in RM-213D
UG/L
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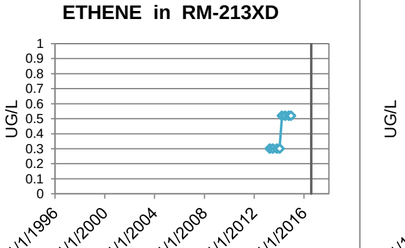
ETHENE in RM-213XD
UG/L
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0.8
0.7
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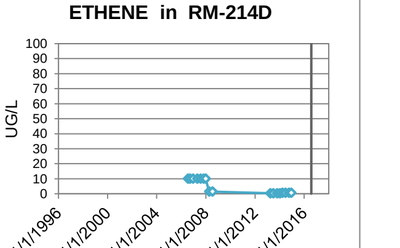
ETHENE in RM-214D
UG/L
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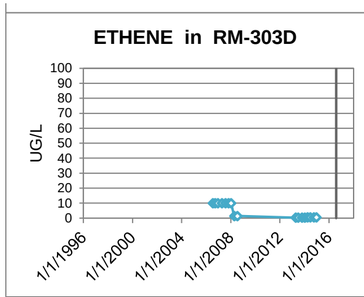
ETHENE in RM-303D
UG/L
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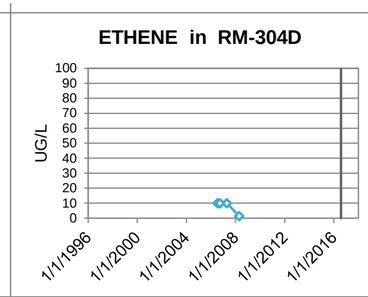
1/1/2012
1/1/2016


ETHENE in RM-304D
UG/L
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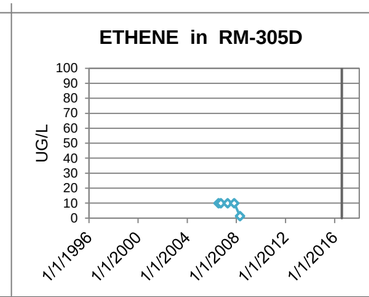
ETHENE in RM-305D
UG/L
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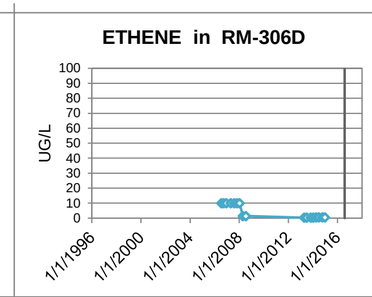
ETHENE in RM-306D
UG/L
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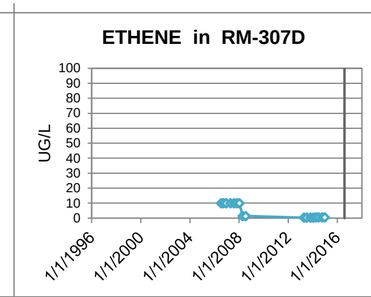
ETHENE in RM-307D
UG/L
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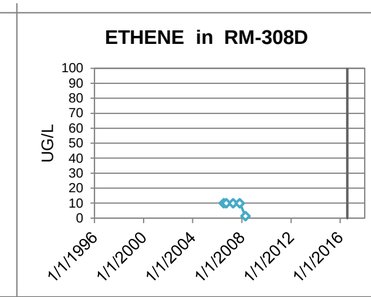
ETHENE in RM-308D
UG/L
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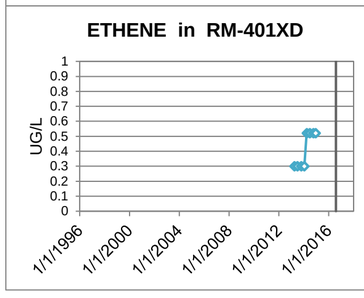
ETHENE in RM-401XD
UG/L
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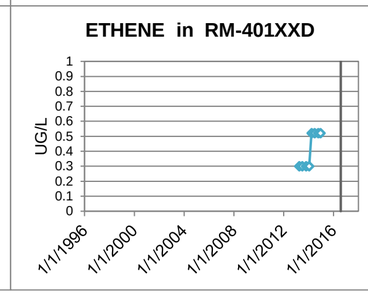
1/1/2016


ETHENE in RM-401XXD
UG/L
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1/1/2000
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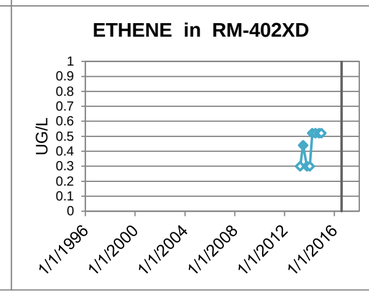
1/1/2016


ETHENE in RM-402XD
UG/L
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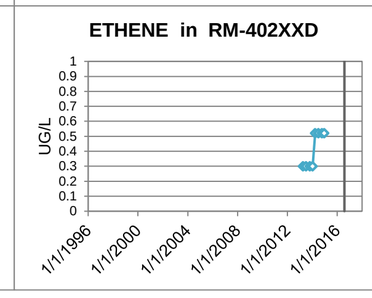
1/1/2012
1/1/2016


ETHENE in RM-402XXD
UG/L
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0.9
0.8
0.7
0.6
0.5
0.4
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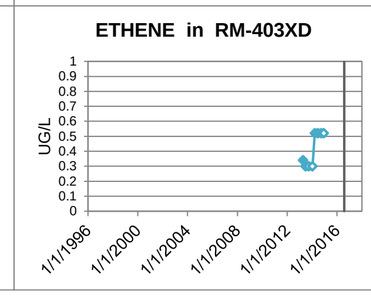
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHENE in RM-403XD
UG/L
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0.9
0.8
0.7
0.6
0.5
0.4
0.3
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1/1/1996
1/1/2000
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1/1/2012
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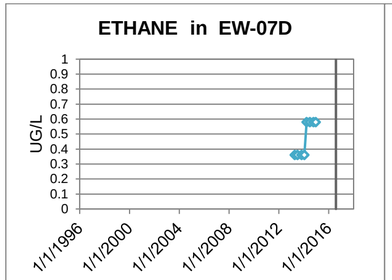
ETHANE in EW-07D
UG/L
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0.9
0.8
0.7
0.6
0.5
0.4
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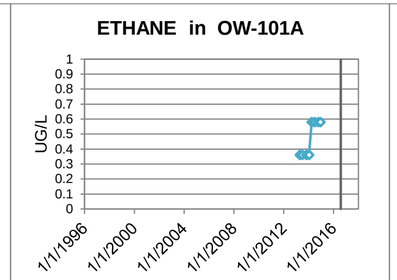
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHANE in OW-101A
UG/L
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0.9
0.8
0.7
0.6
0.5
0.4
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1/1/2000
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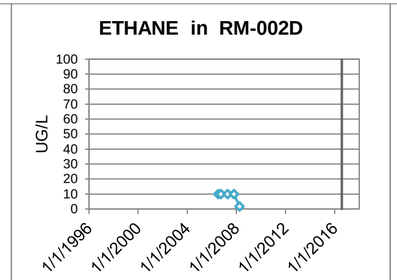
1/1/2012
1/1/2016


ETHANE in RM-002D
UG/L
100
90
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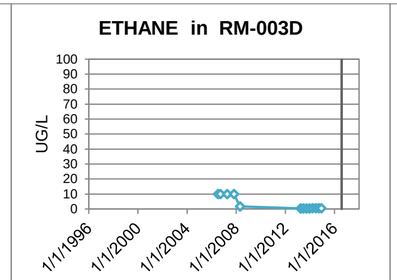
1/1/2016


ETHANE in RM-003D
UG/L
100
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1/1/1996
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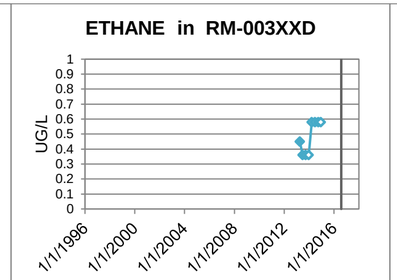
1/1/2012
1/1/2016


ETHANE in RM-003XXD
UG/L
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0.9
0.8
0.7
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0.5
0.4
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1/1/1996
1/1/2000
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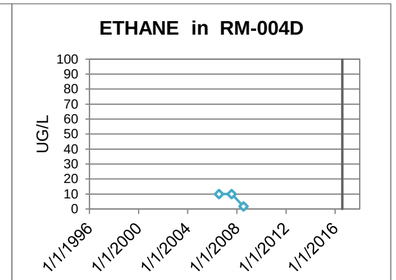
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-004D
UG/L
100
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1/1/1996
1/1/2000
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1/1/2012
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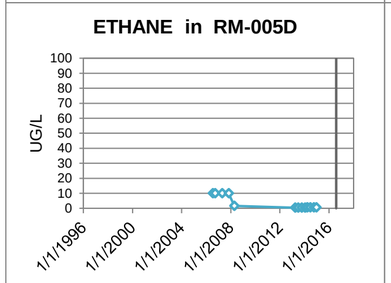
ETHANE in RM-005D
UG/L
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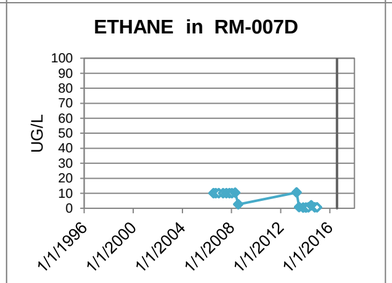
1/1/2012
1/1/2016


ETHANE in RM-007D
UG/L
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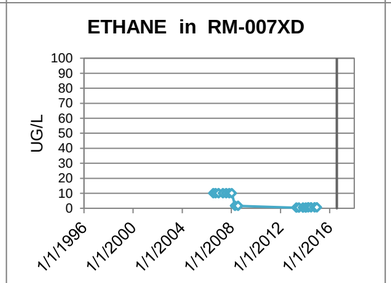
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-007XD
UG/L
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1/1/1996
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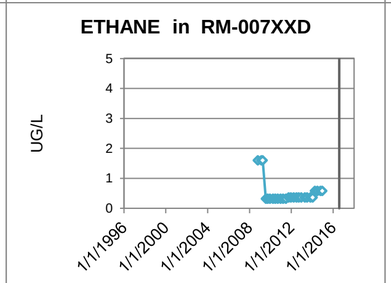
1/1/2012
1/1/2016


ETHANE in RM-007XXD
UG/L
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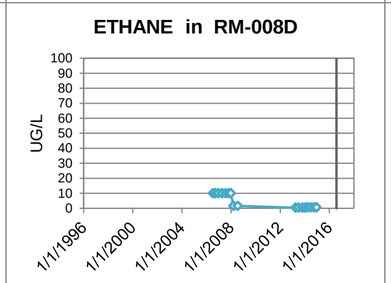
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-008D
UG/L
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90
80
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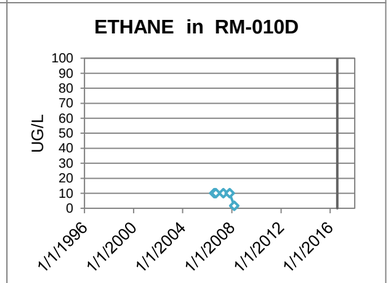
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-010D
UG/L
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90
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1/1/1996
1/1/2000
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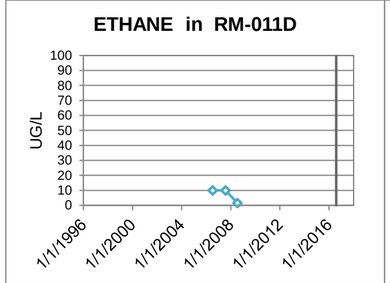
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-011D
UG/L
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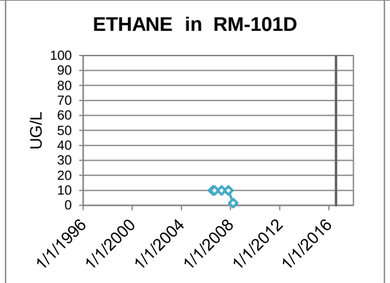
1/1/2012
1/1/2016


ETHANE in RM-101D
UG/L
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1/1/2008
1/1/2012
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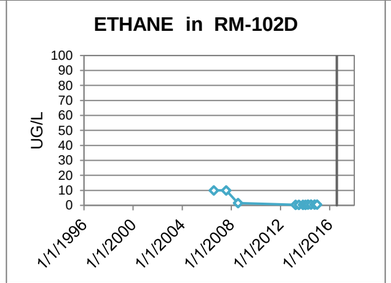
ETHANE in RM-102D
UG/L
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1/1/2012
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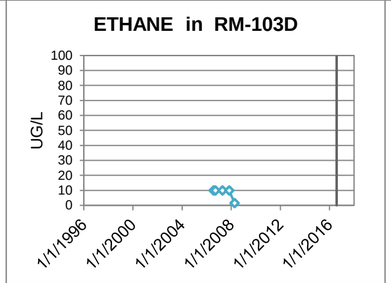
ETHANE in RM-103D
UG/L
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1/1/2012
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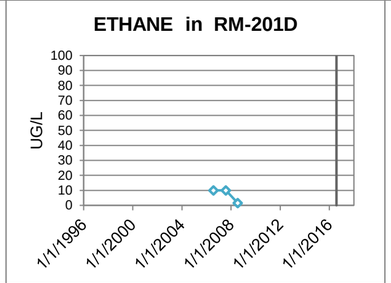
ETHANE in RM-201D
UG/L
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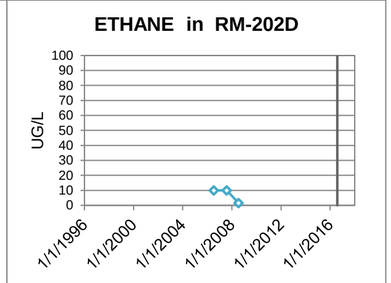
1/1/2012
1/1/2016


ETHANE in RM-202D
UG/L
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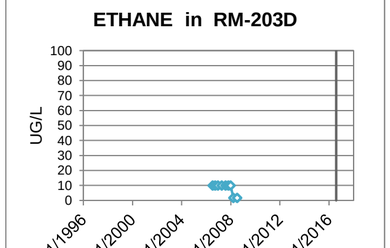
1/1/2012
1/1/2016


ETHANE in RM-203D
UG/L
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1/1/2008
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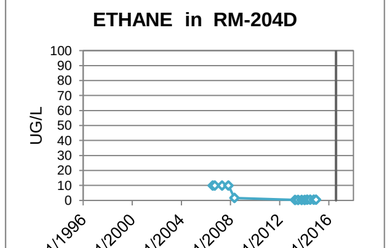
1/1/2016


ETHANE in RM-204D
UG/L
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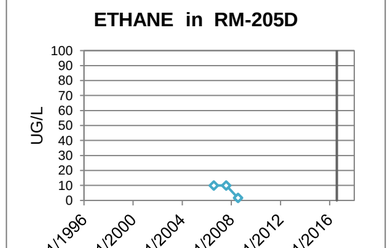
1/1/2016


ETHANE in RM-205D
UG/L
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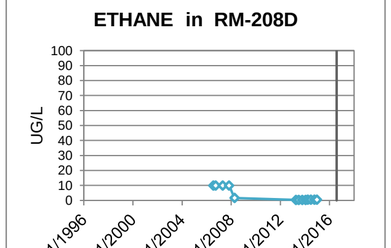
ETHANE in RM-208D
UG/L
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1/1/2012
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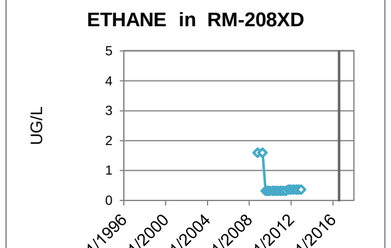
ETHANE in RM-208XD
UG/L
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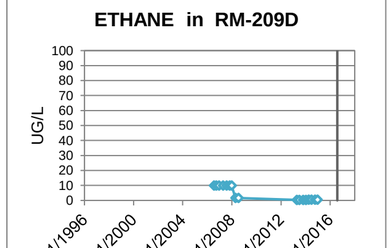
ETHANE in RM-209D
UG/L
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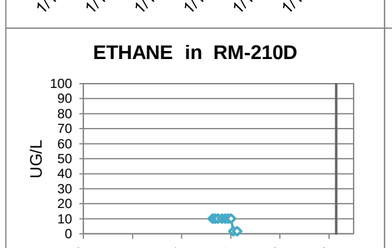
1/1/2012
1/1/2016


ETHANE in RM-210D
UG/L
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1/1/2012
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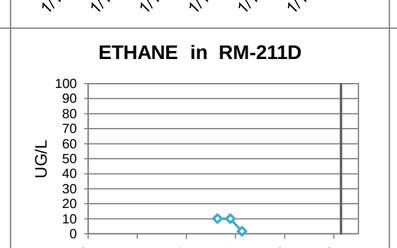
ETHANE in RM-211D
UG/L
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1/1/2012
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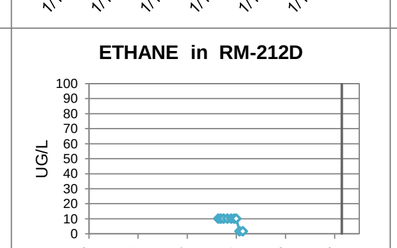
ETHANE in RM-212D
UG/L
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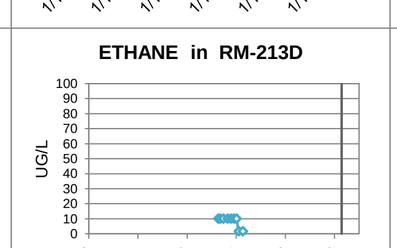
ETHANE in RM-213D
UG/L
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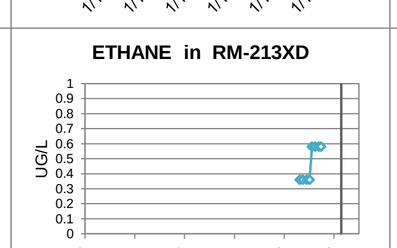
ETHANE in RM-213XD
UG/L
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0.9
0.8
0.7
0.6
0.5
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1/1/2000
1/1/2004
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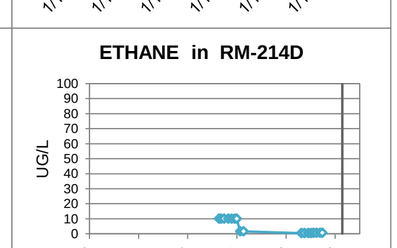
1/1/2012
1/1/2016


ETHANE in RM-214D
UG/L
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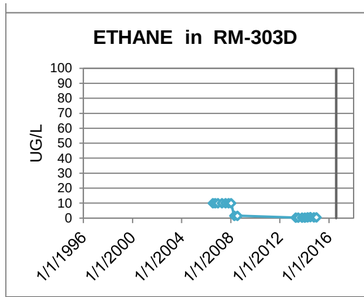
1/1/2012
1/1/2016


ETHANE in RM-303D
UG/L
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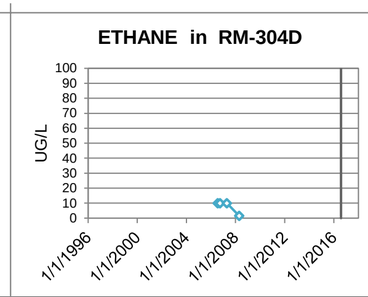
1/1/2012
1/1/2016


ETHANE in RM-304D
UG/L
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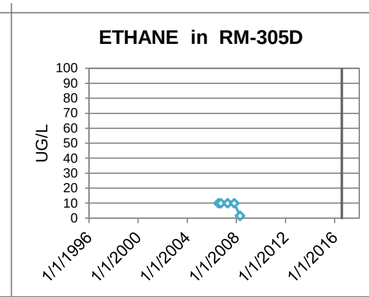
1/1/2012
1/1/2016


ETHANE in RM-305D
UG/L
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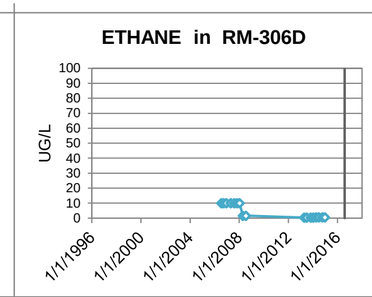
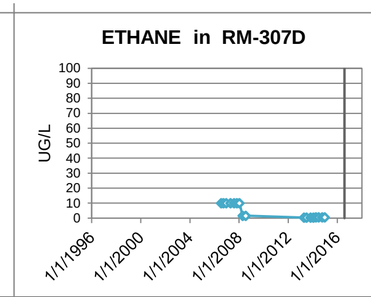
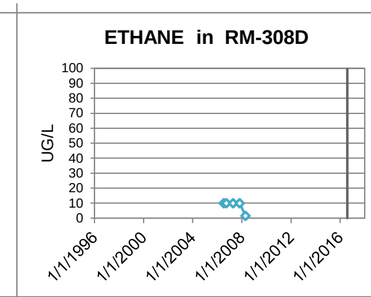
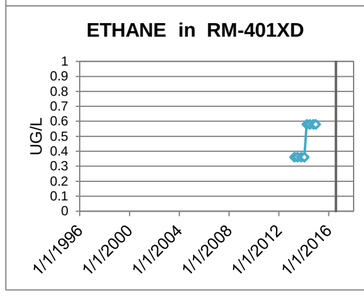
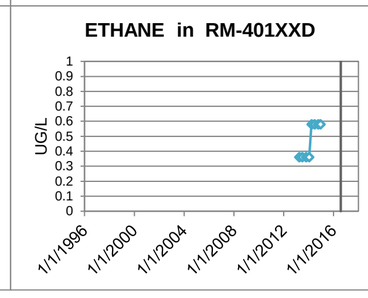
1/1/2008
1/1/2012
1/1/2016

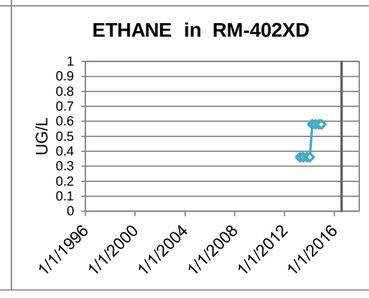

ETHANE in RM-306D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

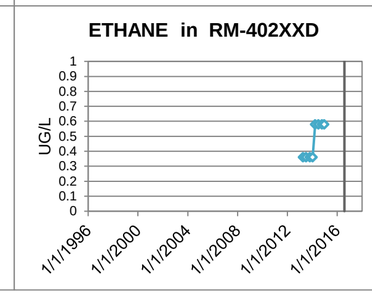

ETHANE in RM-307D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

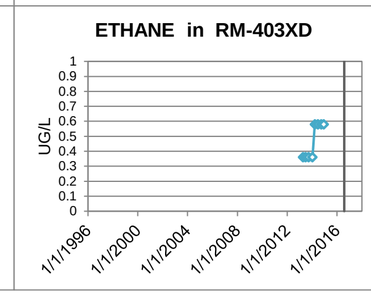

ETHANE in RM-308D
UG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

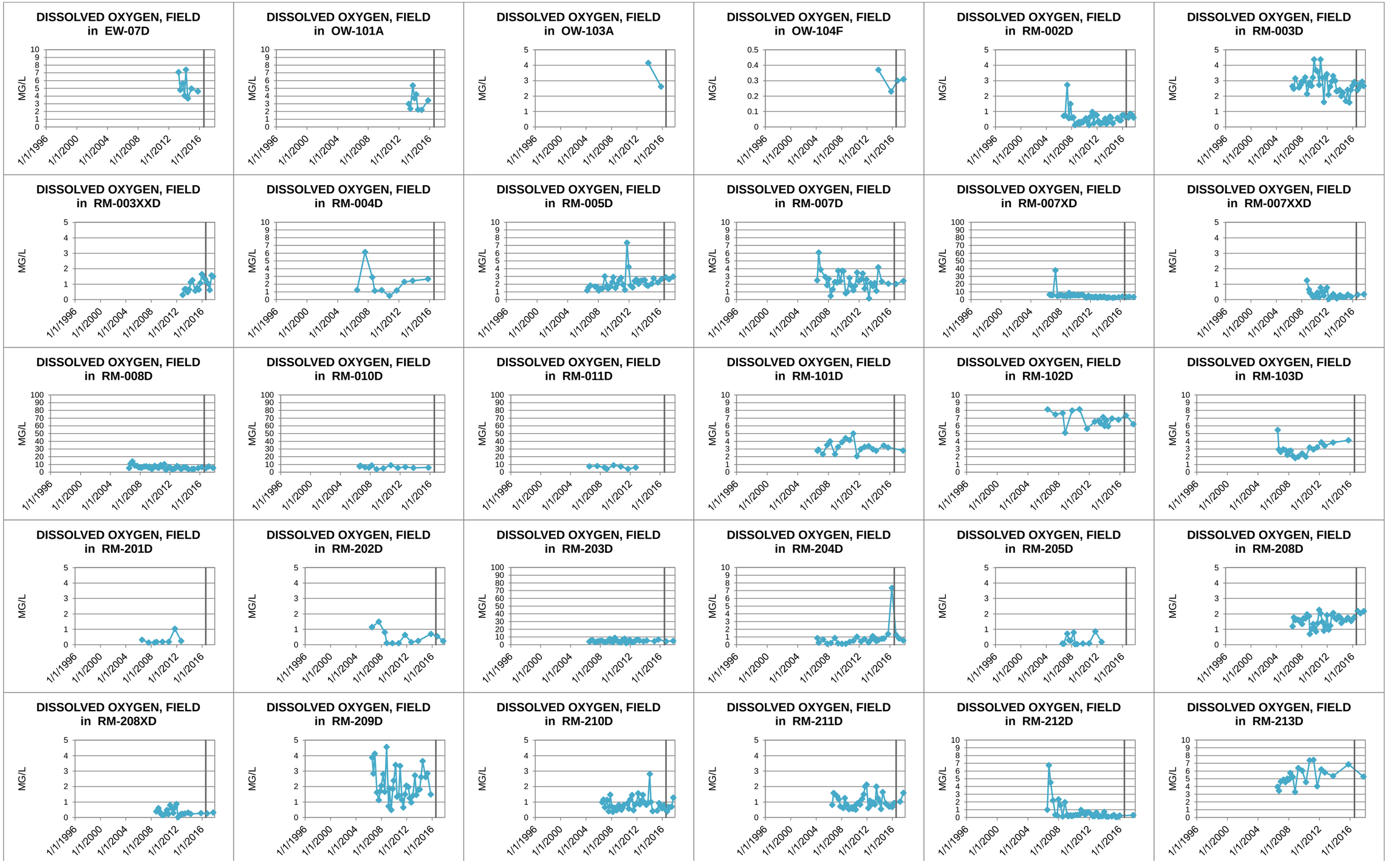

ETHANE in RM-401XD
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

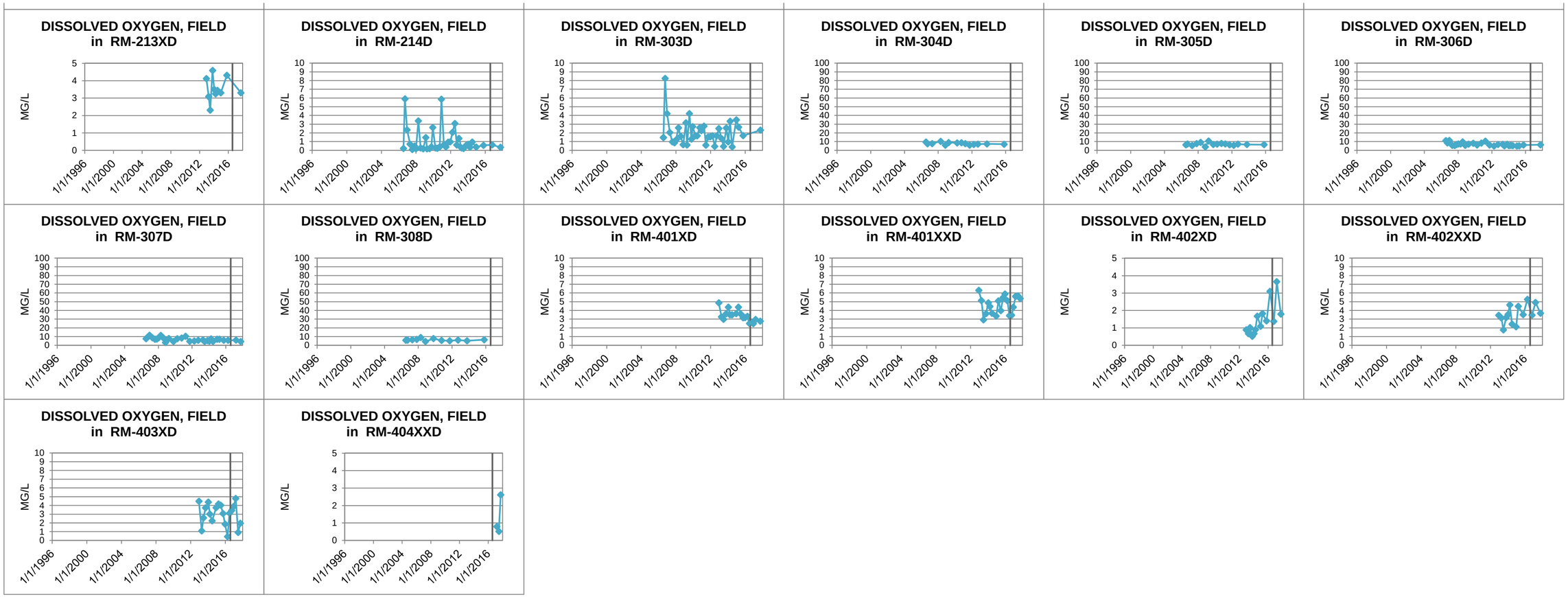

ETHANE in RM-401XXD
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-402XD
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

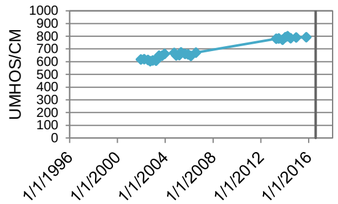

ETHANE in RM-402XXD
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ETHANE in RM-403XD
UG/L
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

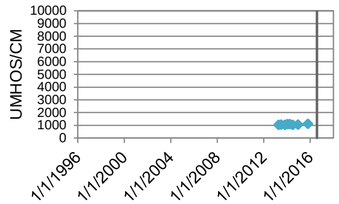

DISSOLVED OXYGEN, FIELD in EW-07D
DISSOLVED OXYGEN, FIELD in OW-101A
DISSOLVED OXYGEN, FIELD in OW-103A
DISSOLVED OXYGEN, FIELD in OW-104F
DISSOLVED OXYGEN, FIELD in RM-002D
DISSOLVED OXYGEN, FIELD in RM-003D
DISSOLVED OXYGEN, FIELD in RM-003XXD
DISSOLVED OXYGEN, FIELD in RM-004D
DISSOLVED OXYGEN, FIELD in RM-005D
DISSOLVED OXYGEN, FIELD in RM-007D
DISSOLVED OXYGEN, FIELD in RM-007XD
DISSOLVED OXYGEN, FIELD in RM-007XXD
DISSOLVED OXYGEN, FIELD in RM-008D
DISSOLVED OXYGEN, FIELD in RM-010D
DISSOLVED OXYGEN, FIELD in RM-011D
DISSOLVED OXYGEN, FIELD in RM-101D
DISSOLVED OXYGEN, FIELD in RM-102D
DISSOLVED OXYGEN, FIELD in RM-103D
DISSOLVED OXYGEN, FIELD in RM-201D
DISSOLVED OXYGEN, FIELD in RM-202D
DISSOLVED OXYGEN, FIELD in RM-203D
DISSOLVED OXYGEN, FIELD in RM-204D
DISSOLVED OXYGEN, FIELD in RM-205D
DISSOLVED OXYGEN, FIELD in RM-208D
DISSOLVED OXYGEN, FIELD in RM-208XD
DISSOLVED OXYGEN, FIELD in RM-209D
DISSOLVED OXYGEN, FIELD in RM-210D
DISSOLVED OXYGEN, FIELD in RM-211D
DISSOLVED OXYGEN, FIELD in RM-212D
DISSOLVED OXYGEN, FIELD in RM-213D
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


DISSOLVED OXYGEN, FIELD in RM-213XD
DISSOLVED OXYGEN, FIELD in RM-214D
DISSOLVED OXYGEN, FIELD in RM-303D
DISSOLVED OXYGEN, FIELD in RM-304D
DISSOLVED OXYGEN, FIELD in RM-305D
DISSOLVED OXYGEN, FIELD in RM-306D
DISSOLVED OXYGEN, FIELD in RM-307D
DISSOLVED OXYGEN, FIELD in RM-308D
DISSOLVED OXYGEN, FIELD in RM-401XD
DISSOLVED OXYGEN, FIELD in RM-401XXD
DISSOLVED OXYGEN, FIELD in RM-402XD
DISSOLVED OXYGEN, FIELD in RM-402XXD
DISSOLVED OXYGEN, FIELD in RM-403XD
DISSOLVED OXYGEN, FIELD in RM-404XXD
MG/L
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

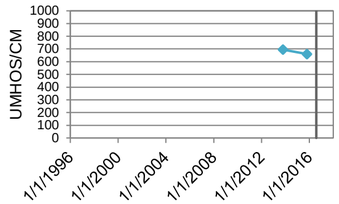
CONDUCTANCE, SPECIFIC in EW-07D



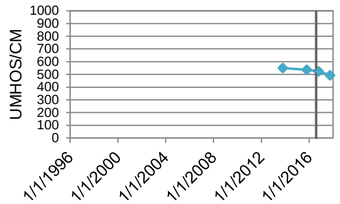
CONDUCTANCE, SPECIFIC in OW-101A



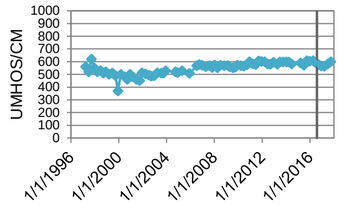
CONDUCTANCE, SPECIFIC in OW-103A



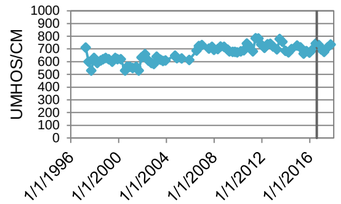
CONDUCTANCE, SPECIFIC in OW-104F



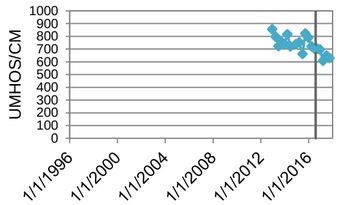
CONDUCTANCE, SPECIFIC in RM-002D



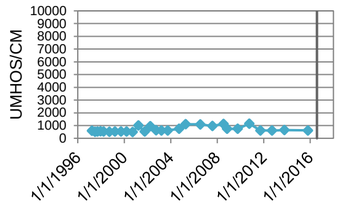
CONDUCTANCE, SPECIFIC in RM-003D



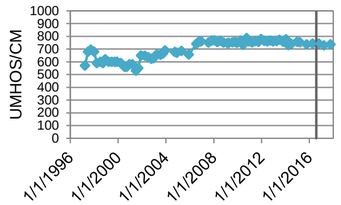
CONDUCTANCE, SPECIFIC in RM-003XXD



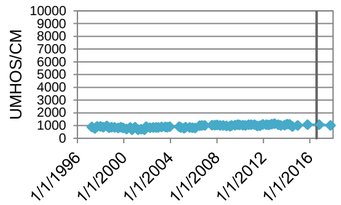
CONDUCTANCE, SPECIFIC in RM-004D



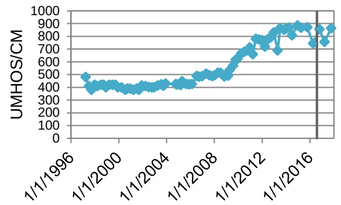
CONDUCTANCE, SPECIFIC in RM-005D



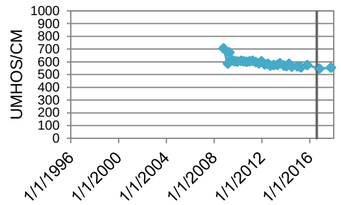
CONDUCTANCE, SPECIFIC in RM-007D



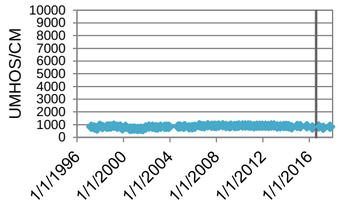
CONDUCTANCE, SPECIFIC in RM-007XD



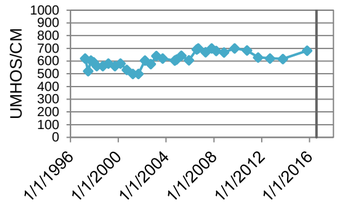
CONDUCTANCE, SPECIFIC in RM-007XXD



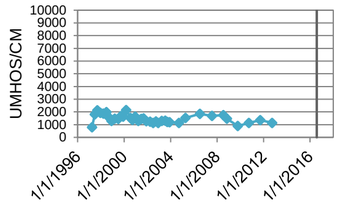
CONDUCTANCE, SPECIFIC in RM-008D



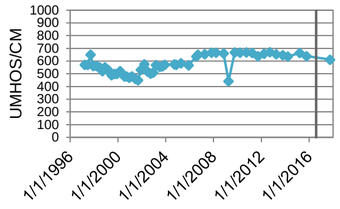
CONDUCTANCE, SPECIFIC in RM-010D



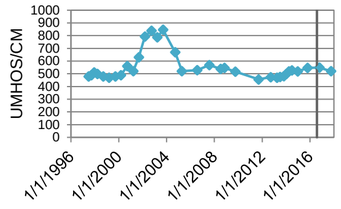
CONDUCTANCE, SPECIFIC in RM-011D



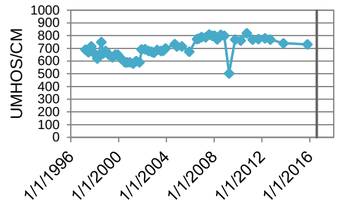
CONDUCTANCE, SPECIFIC in RM-101D



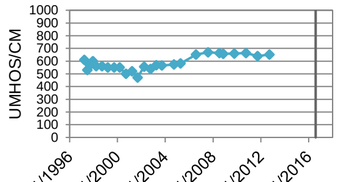
CONDUCTANCE, SPECIFIC in RM-102D



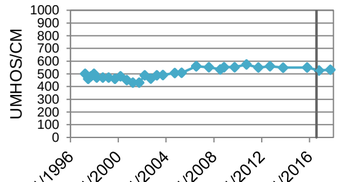
CONDUCTANCE, SPECIFIC in RM-103D



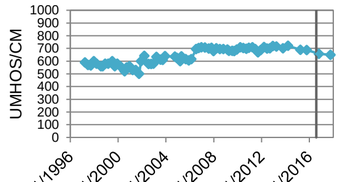
CONDUCTANCE, SPECIFIC in RM-201D



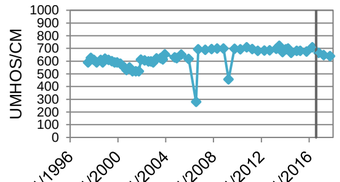
CONDUCTANCE, SPECIFIC in RM-202D



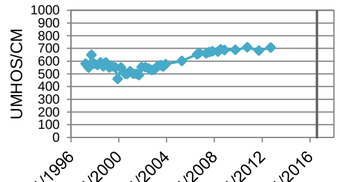
CONDUCTANCE, SPECIFIC in RM-203D



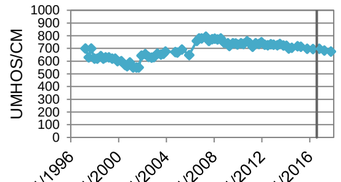
CONDUCTANCE, SPECIFIC in RM-204D



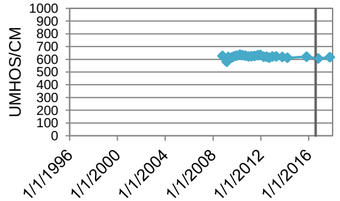
CONDUCTANCE, SPECIFIC in RM-205D



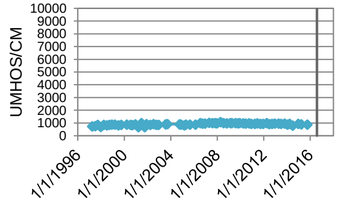
CONDUCTANCE, SPECIFIC in RM-208D



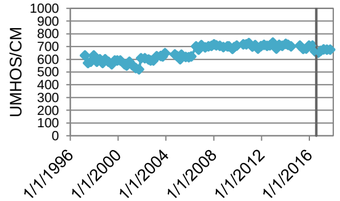
CONDUCTANCE, SPECIFIC in RM-208XD



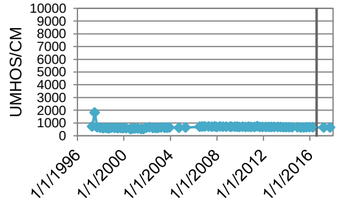
CONDUCTANCE, SPECIFIC in RM-209D



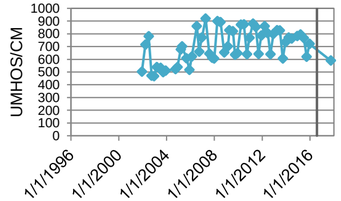
CONDUCTANCE, SPECIFIC in RM-210D



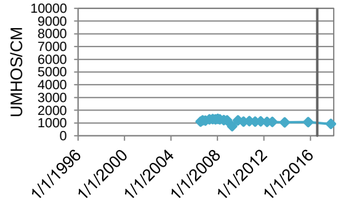
CONDUCTANCE, SPECIFIC in RM-211D

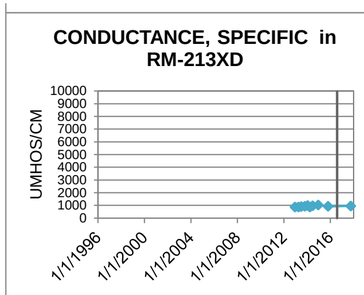


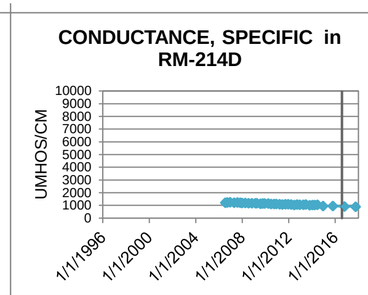
CONDUCTANCE, SPECIFIC in RM-212D

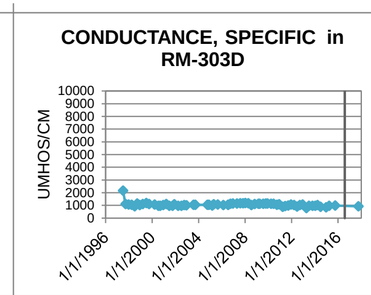


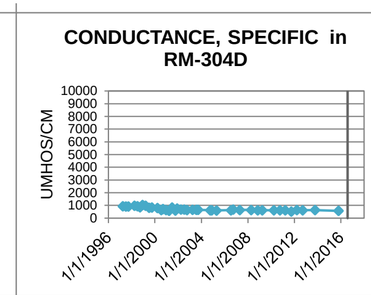
CONDUCTANCE, SPECIFIC in RM-213D

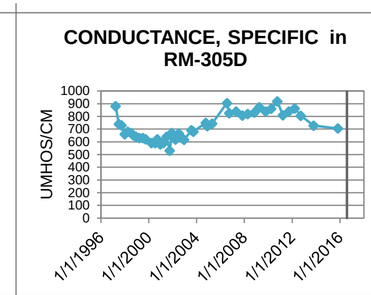


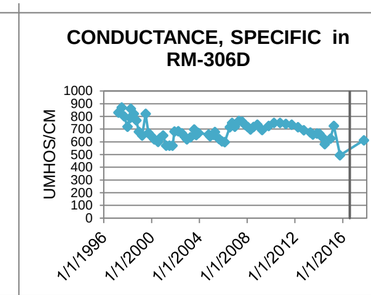

CONDUCTANCE, SPECIFIC in RM-213XD
UMHOS/CM
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

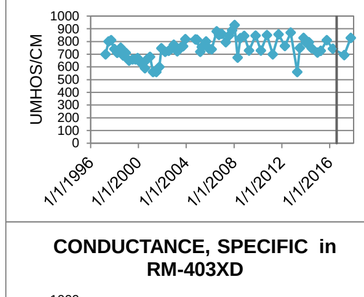

CONDUCTANCE, SPECIFIC in RM-214D
UMHOS/CM
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

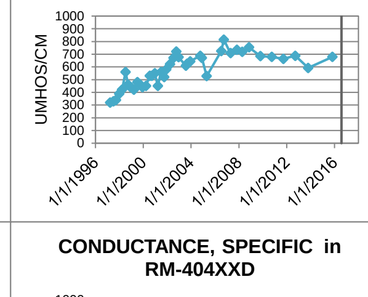

CONDUCTANCE, SPECIFIC in RM-303D
UMHOS/CM
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

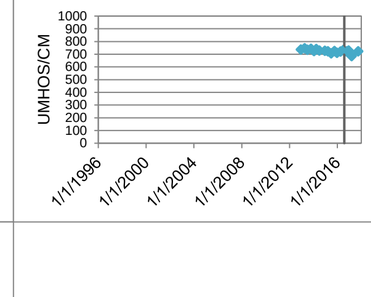

CONDUCTANCE, SPECIFIC in RM-304D
UMHOS/CM
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

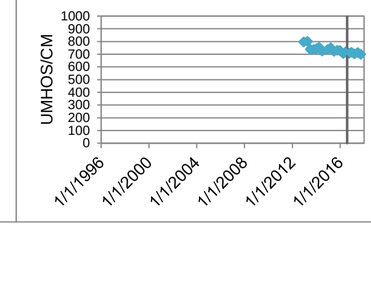

CONDUCTANCE, SPECIFIC in RM-305D
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

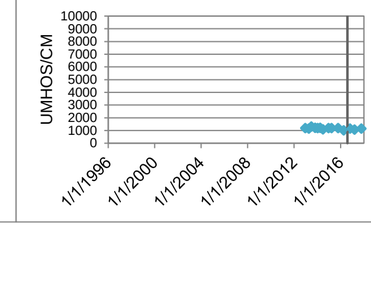

CONDUCTANCE, SPECIFIC in RM-306D
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

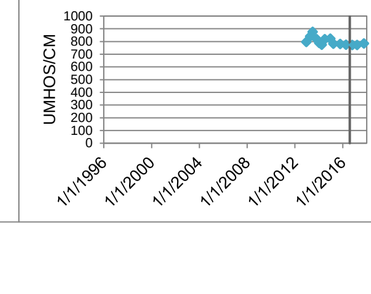

CONDUCTANCE, SPECIFIC in RM-307D
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

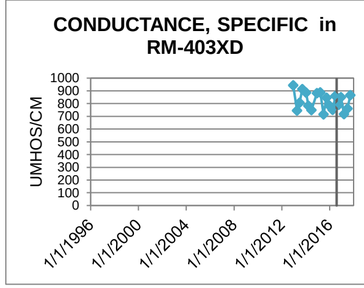

CONDUCTANCE, SPECIFIC in RM-308D
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

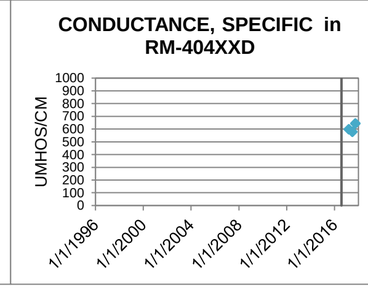

CONDUCTANCE, SPECIFIC in RM-401XD
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

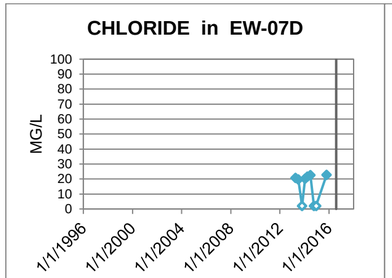

CONDUCTANCE, SPECIFIC in RM-401XXD
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

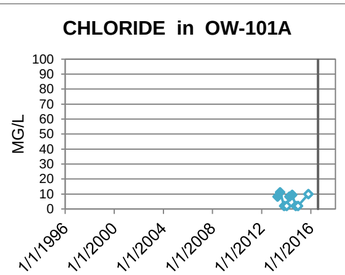

CONDUCTANCE, SPECIFIC in RM-402XD
UMHOS/CM
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

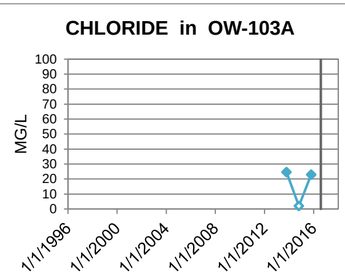

CONDUCTANCE, SPECIFIC in RM-402XXD
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

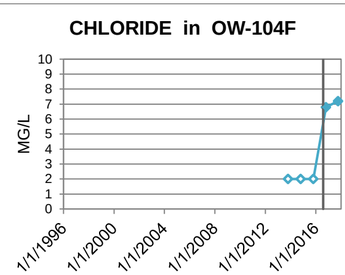

CONDUCTANCE, SPECIFIC in RM-403XD
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

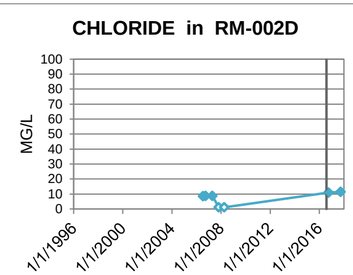

CONDUCTANCE, SPECIFIC in RM-404XXD
UMHOS/CM
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

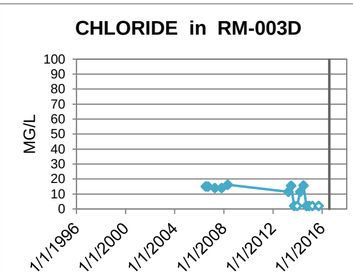

CHLORIDE in EW-07D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

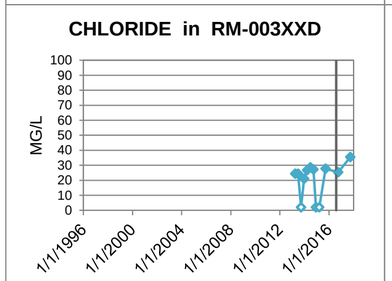

CHLORIDE in OW-101A
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

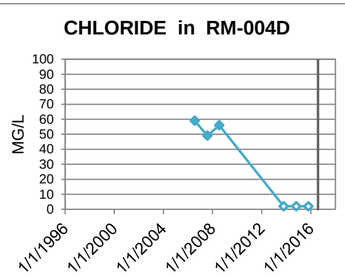

CHLORIDE in OW-103A
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

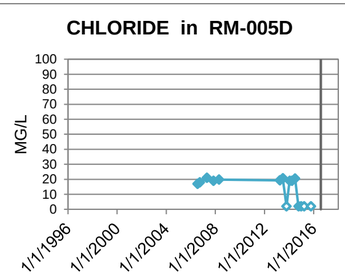

CHLORIDE in OW-104F
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

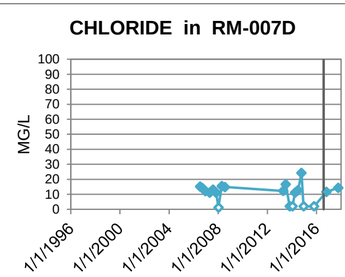

CHLORIDE in RM-002D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

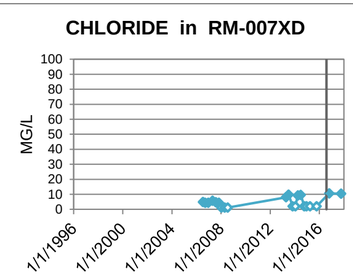

CHLORIDE in RM-003D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

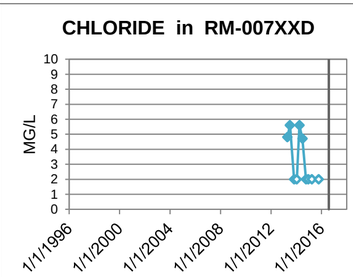

CHLORIDE in RM-003XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

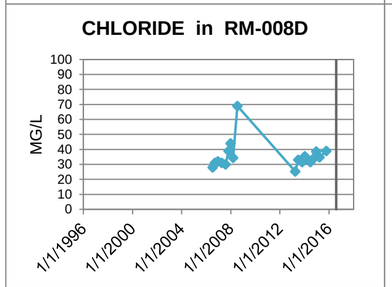

CHLORIDE in RM-004D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

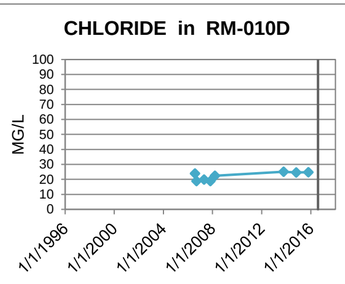

CHLORIDE in RM-005D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

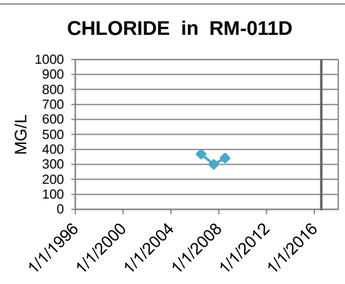

CHLORIDE in RM-007D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

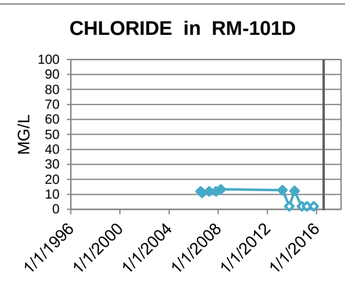

CHLORIDE in RM-007XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

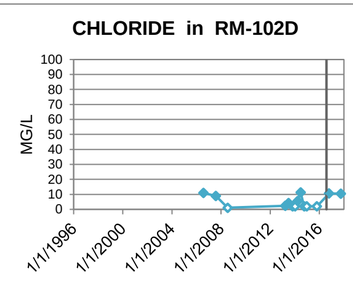

CHLORIDE in RM-007XXD
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

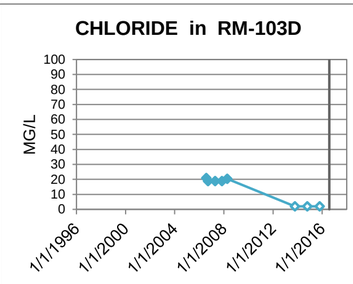

CHLORIDE in RM-008D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

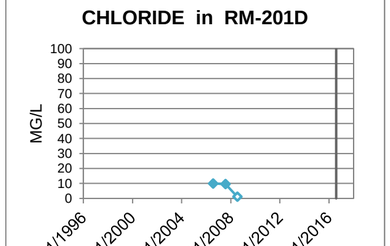

CHLORIDE in RM-010D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

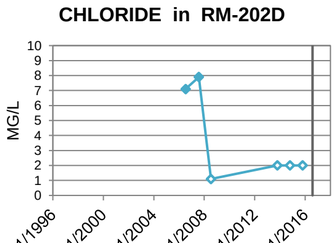

CHLORIDE in RM-011D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

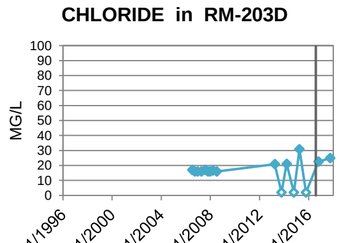

CHLORIDE in RM-101D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

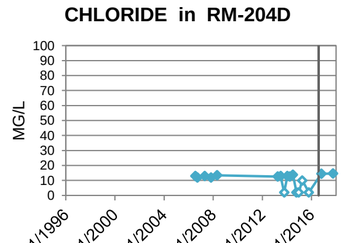

CHLORIDE in RM-102D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

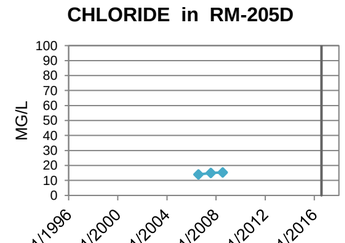

CHLORIDE in RM-103D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

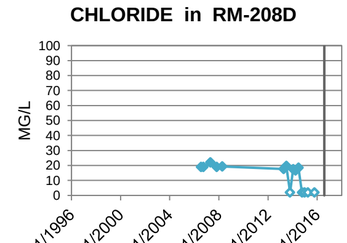

CHLORIDE in RM-201D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

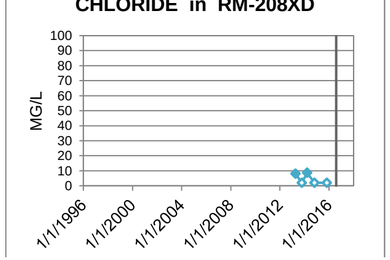

CHLORIDE in RM-202D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

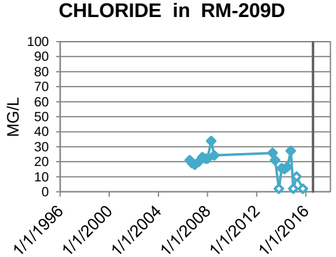

CHLORIDE in RM-203D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

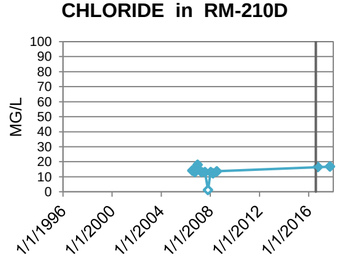

CHLORIDE in RM-204D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

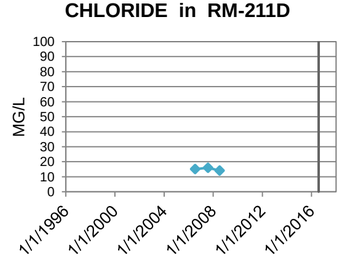

CHLORIDE in RM-205D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

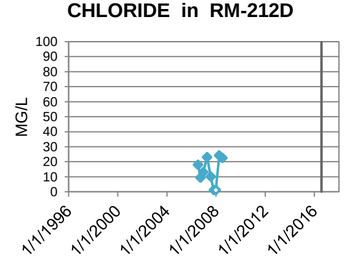

CHLORIDE in RM-208D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

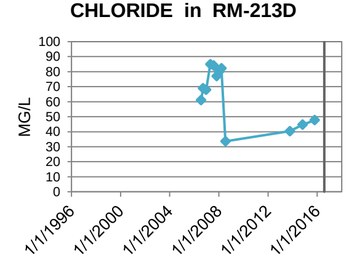

CHLORIDE in RM-208XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

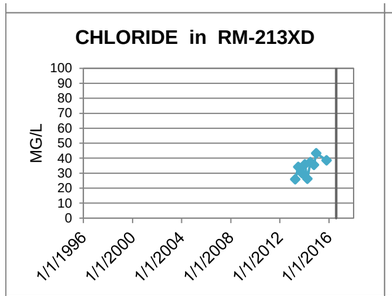

CHLORIDE in RM-209D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

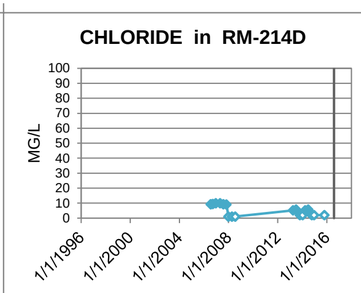

CHLORIDE in RM-210D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

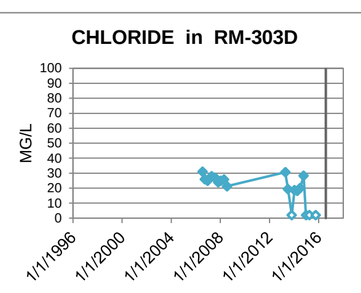

CHLORIDE in RM-211D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

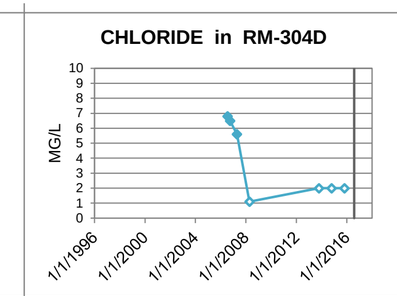

CHLORIDE in RM-212D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

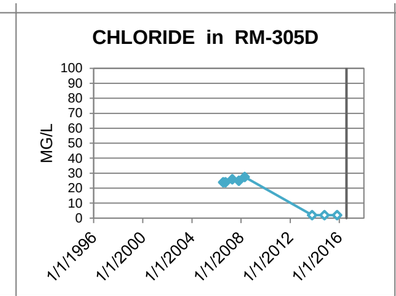

CHLORIDE in RM-213D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

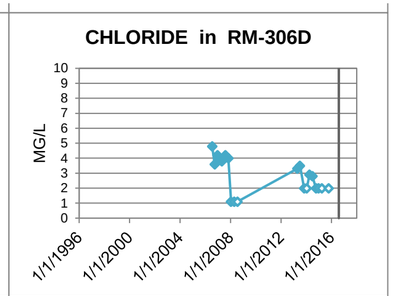

CHLORIDE in RM-213XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

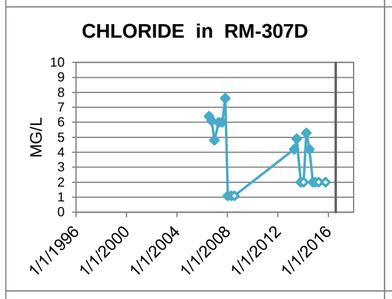

CHLORIDE in RM-214D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

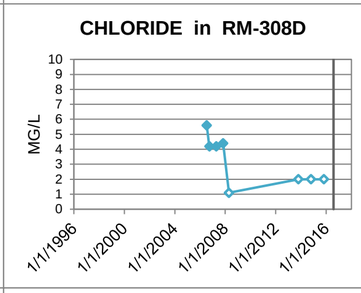

CHLORIDE in RM-303D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

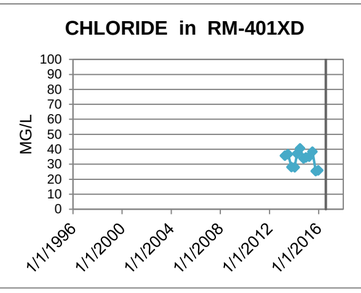

CHLORIDE in RM-304D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

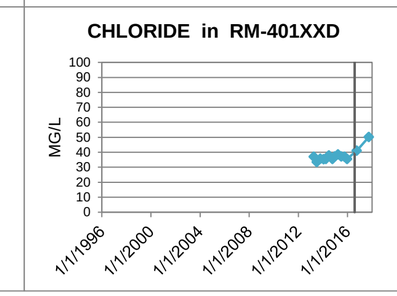

CHLORIDE in RM-305D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

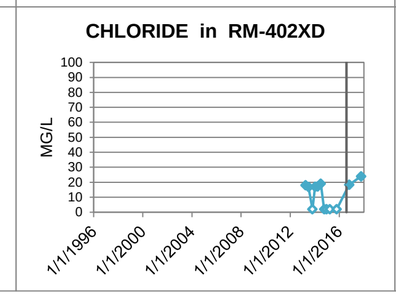

CHLORIDE in RM-306D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

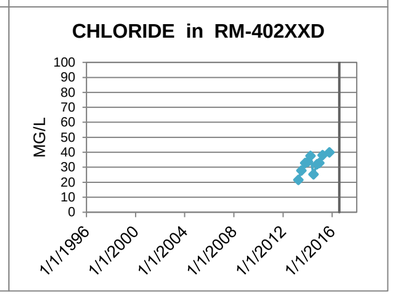

CHLORIDE in RM-307D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

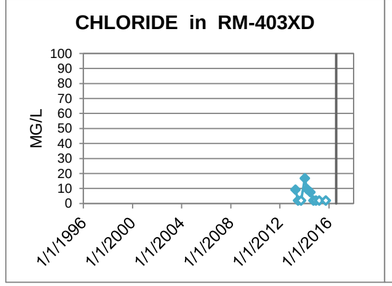

CHLORIDE in RM-308D
MG/L
10
9
8
7
6
5
4
3
2
1
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

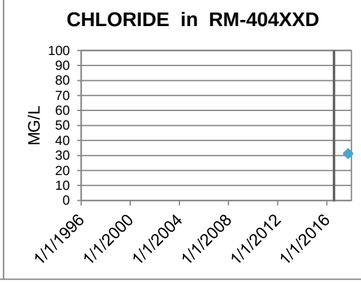

CHLORIDE in RM-401XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

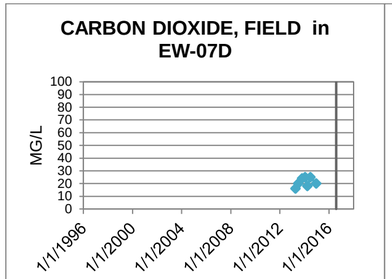

CHLORIDE in RM-401XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

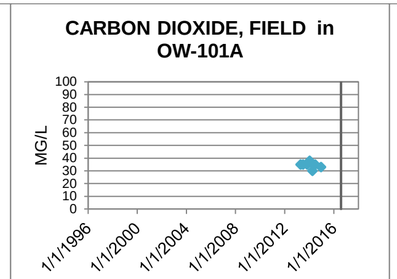

CHLORIDE in RM-402XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

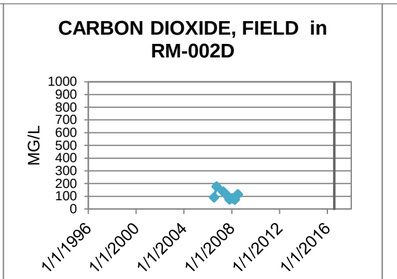

CHLORIDE in RM-402XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

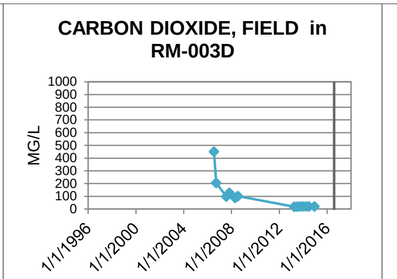

CHLORIDE in RM-403XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

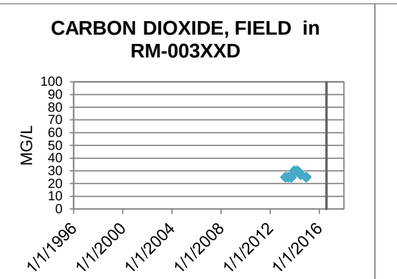

CHLORIDE in RM-404XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

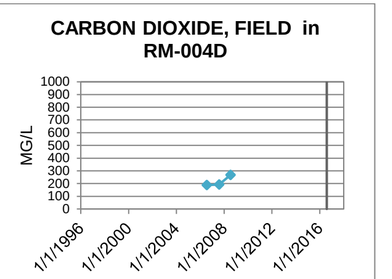

CARBON DIOXIDE, FIELD in EW-07D
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

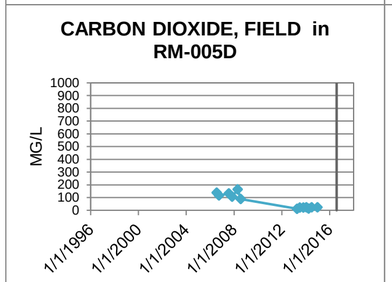

CARBON DIOXIDE, FIELD in OW-101A
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

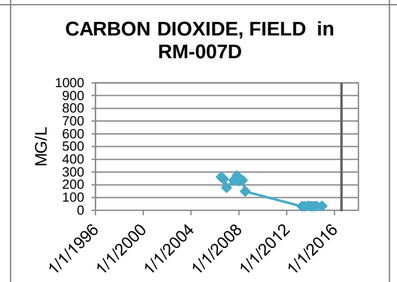

CARBON DIOXIDE, FIELD in RM-002D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

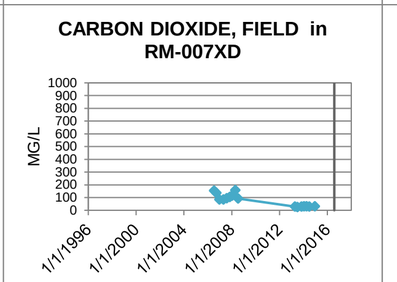

CARBON DIOXIDE, FIELD in RM-003D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

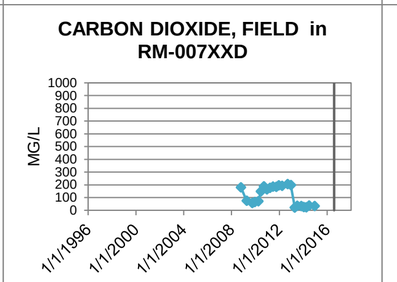

CARBON DIOXIDE, FIELD in RM-003XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

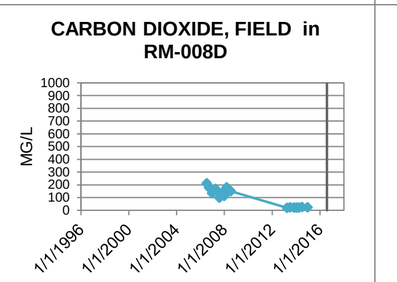

CARBON DIOXIDE, FIELD in RM-004D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

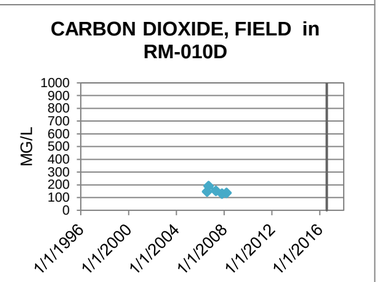

CARBON DIOXIDE, FIELD in RM-005D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

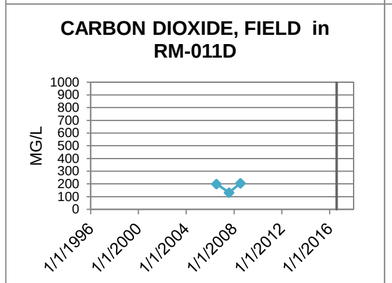

CARBON DIOXIDE, FIELD in RM-007D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

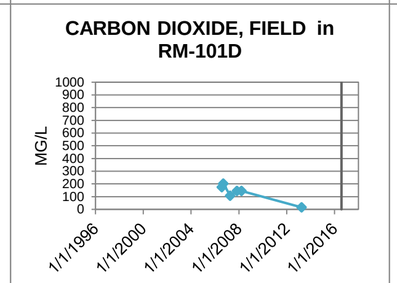

CARBON DIOXIDE, FIELD in RM-007XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

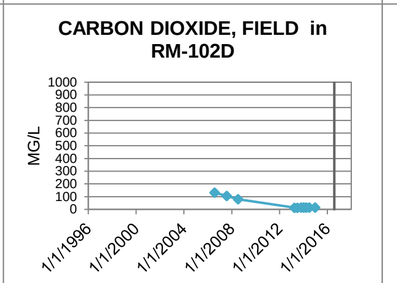

CARBON DIOXIDE, FIELD in RM-007XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

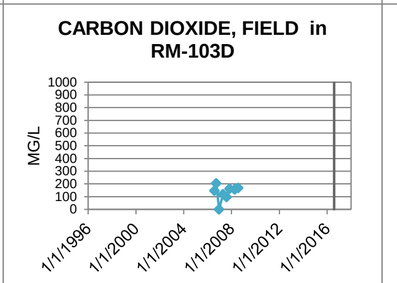

CARBON DIOXIDE, FIELD in RM-008D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

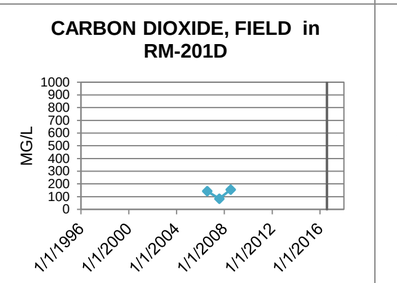

CARBON DIOXIDE, FIELD in RM-010D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

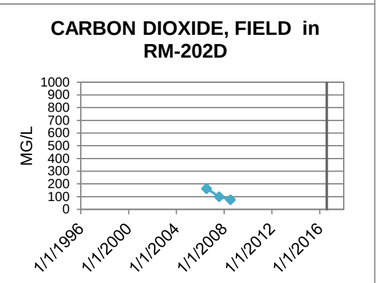

CARBON DIOXIDE, FIELD in RM-011D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

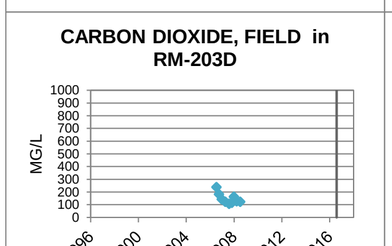

CARBON DIOXIDE, FIELD in RM-101D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

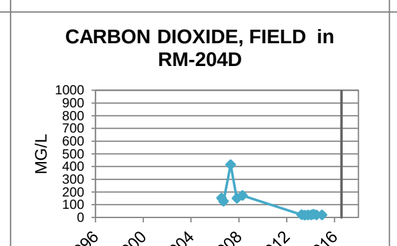

CARBON DIOXIDE, FIELD in RM-102D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

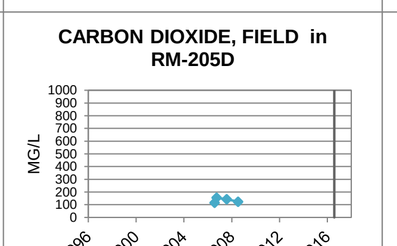

CARBON DIOXIDE, FIELD in RM-103D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

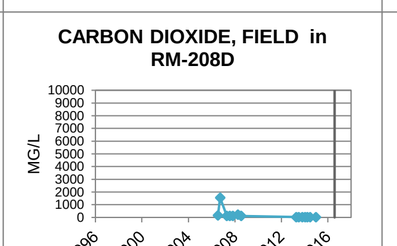

CARBON DIOXIDE, FIELD in RM-201D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

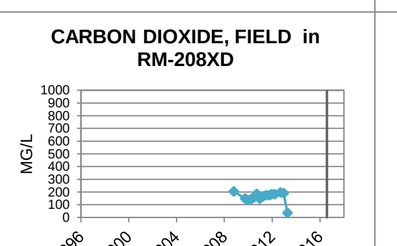

CARBON DIOXIDE, FIELD in RM-202D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

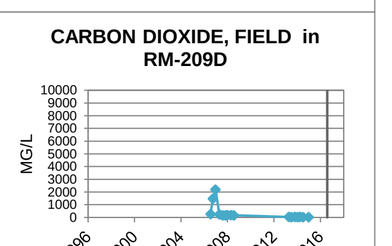

CARBON DIOXIDE, FIELD in RM-203D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

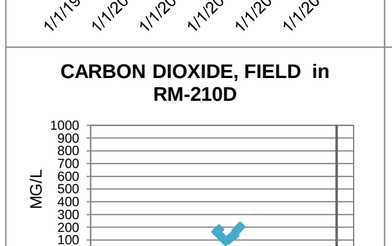

CARBON DIOXIDE, FIELD in RM-204D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

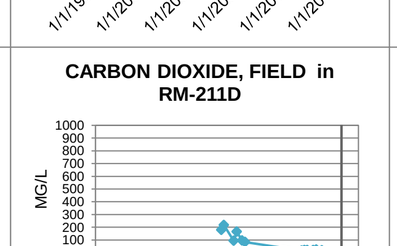

CARBON DIOXIDE, FIELD in RM-205D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

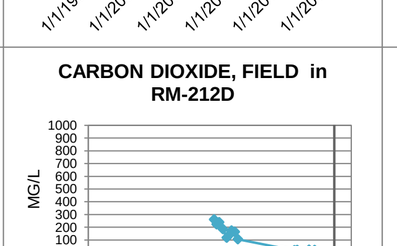

CARBON DIOXIDE, FIELD in RM-208D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

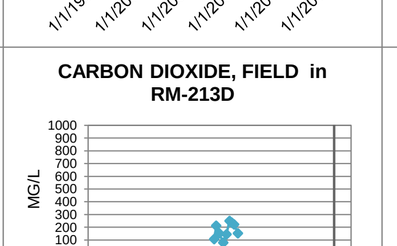

CARBON DIOXIDE, FIELD in RM-208XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

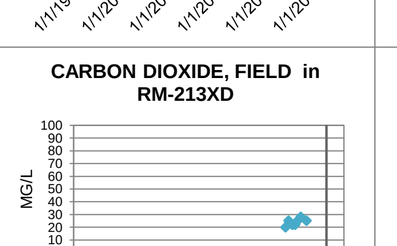

CARBON DIOXIDE, FIELD in RM-209D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

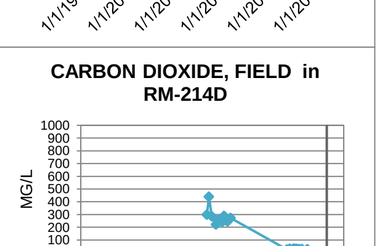

CARBON DIOXIDE, FIELD in RM-210D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

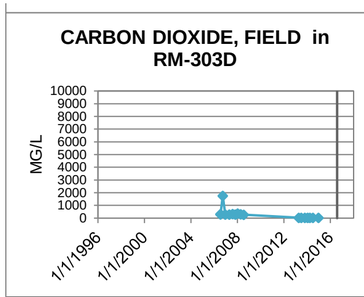

CARBON DIOXIDE, FIELD in RM-211D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

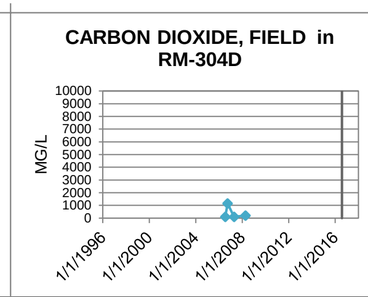

CARBON DIOXIDE, FIELD in RM-212D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

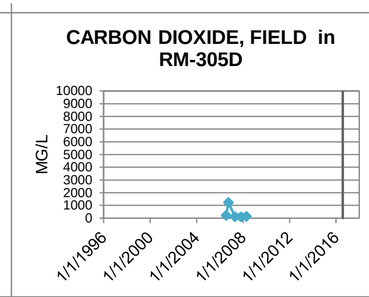

CARBON DIOXIDE, FIELD in RM-213D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

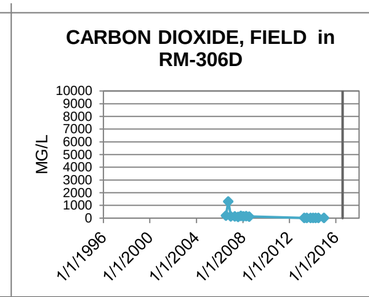

CARBON DIOXIDE, FIELD in RM-213XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

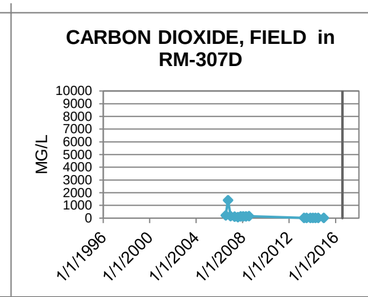

CARBON DIOXIDE, FIELD in RM-214D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

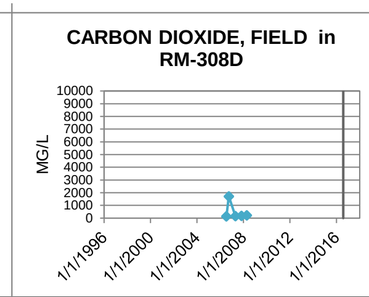

CARBON DIOXIDE, FIELD in RM-303D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

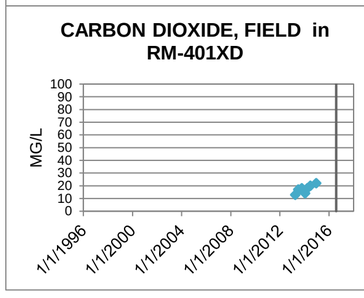

CARBON DIOXIDE, FIELD in RM-304D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

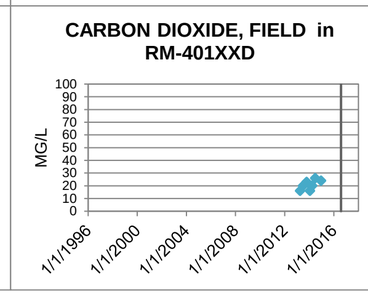

CARBON DIOXIDE, FIELD in RM-305D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

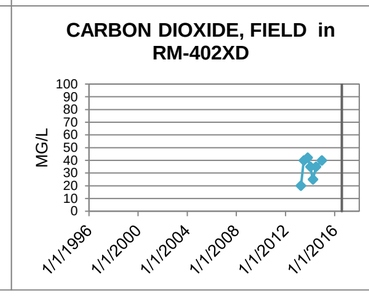

CARBON DIOXIDE, FIELD in RM-306D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

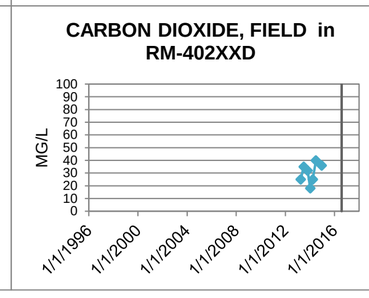

CARBON DIOXIDE, FIELD in RM-307D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

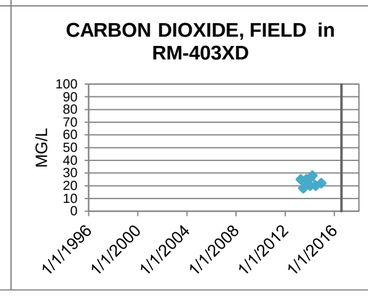

CARBON DIOXIDE, FIELD in RM-308D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

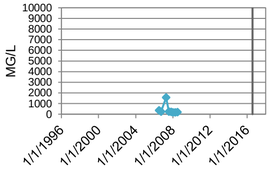

CARBON DIOXIDE, FIELD in RM-401XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

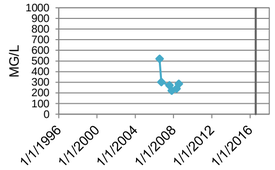

CARBON DIOXIDE, FIELD in RM-401XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

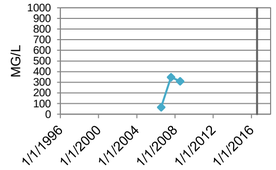

CARBON DIOXIDE, FIELD in RM-402XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

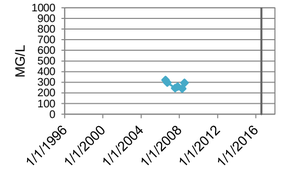

CARBON DIOXIDE, FIELD in RM-402XXD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

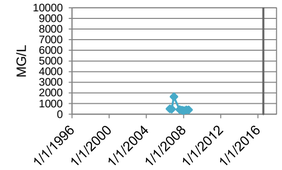

CARBON DIOXIDE, FIELD in RM-403XD
MG/L
100
90
80
70
60
50
40
30
20
10
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

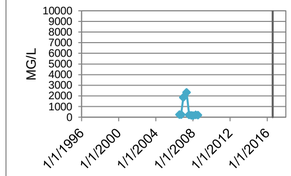

ALKALINITY, FIELD in RM-002D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

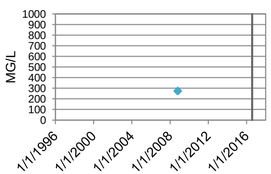

ALKALINITY, FIELD in RM-003D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

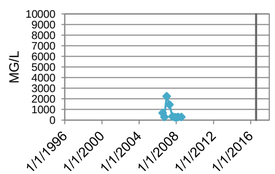

ALKALINITY, FIELD in RM-004D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

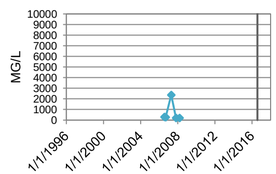

ALKALINITY, FIELD in RM-005D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-007D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-007XD
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-007XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-008D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-010D
MG/L
10000
9000
8000
7000
6000
5000
4000
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2000
1000
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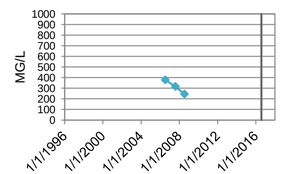
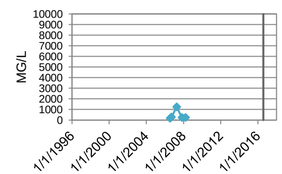
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-011D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-101D
MG/L
10000
9000
8000
7000
6000
5000
4000
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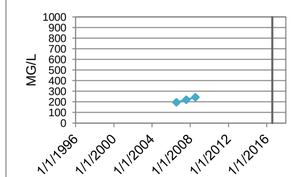
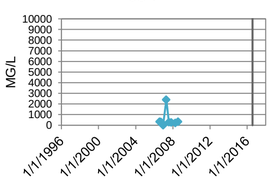
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-102D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-103D
MG/L
10000
9000
8000
7000
6000
5000
4000
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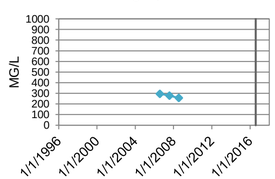
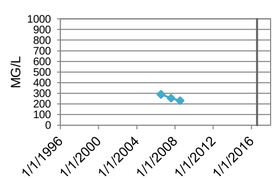
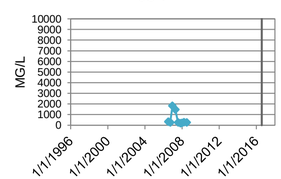
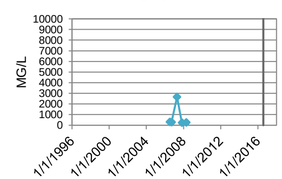
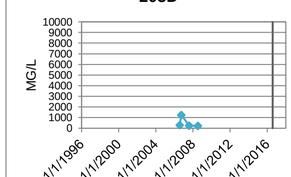
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

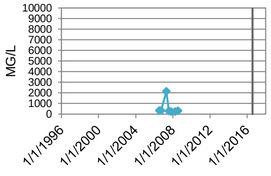

ALKALINITY, FIELD in RM-201D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

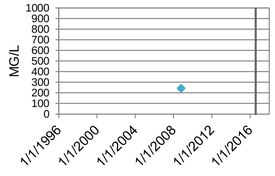

ALKALINITY, FIELD in RM-202D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

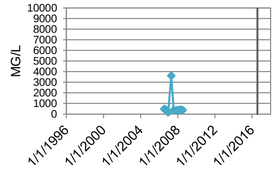

ALKALINITY, FIELD in RM-203D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

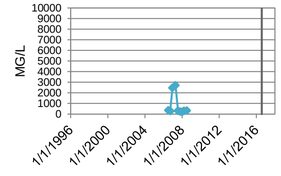

ALKALINITY, FIELD in RM-204D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

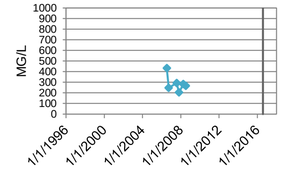

ALKALINITY, FIELD in RM-205D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

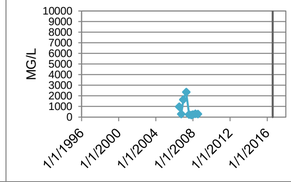

ALKALINITY, FIELD in RM-208D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

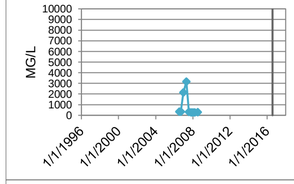

ALKALINITY, FIELD in RM-208XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

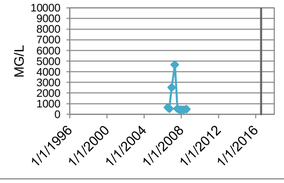

ALKALINITY, FIELD in RM-209D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-210D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-211D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-212D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-213D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-214D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
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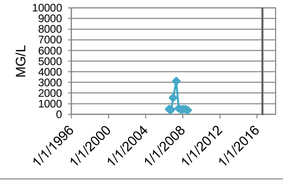
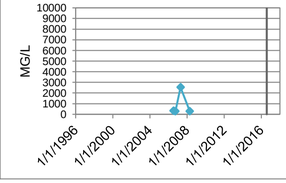
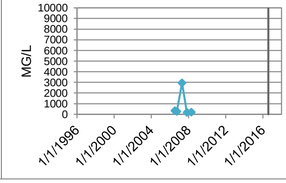
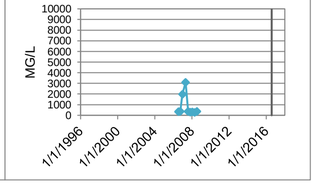
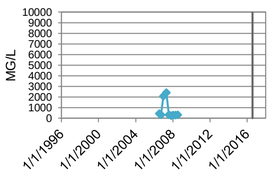
1/1/2012
1/1/2016

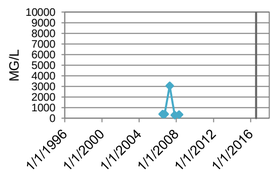

ALKALINITY, FIELD in RM-303D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-304D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-305D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-306D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-307D
MG/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY, FIELD in RM-308D
MG/L
10000
9000
8000
7000
6000
5000
4000
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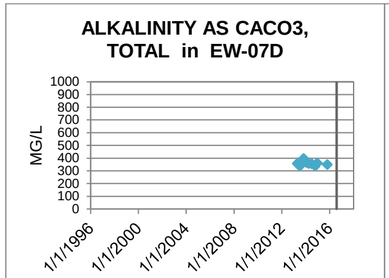
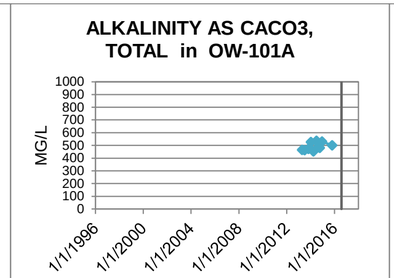
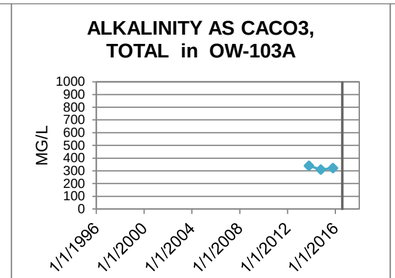
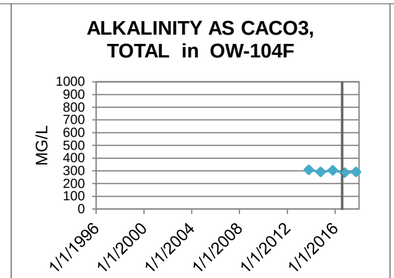
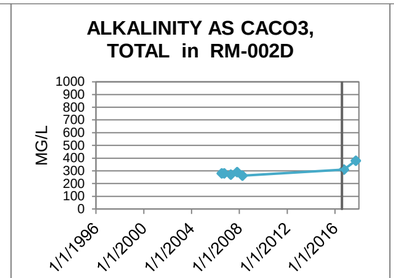
2000
1000
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

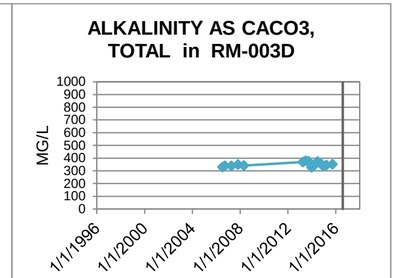

ALKALINITY AS CACO3, TOTAL in EW-07D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

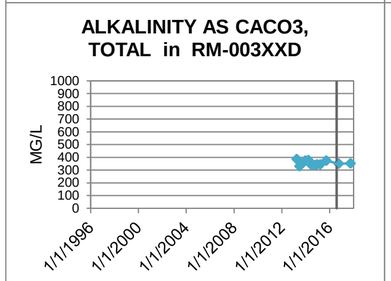

ALKALINITY AS CACO3, TOTAL in OW-101A
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in OW-103A
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in OW-104F
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-002D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-003D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-003XXD
MG/L
1000
900
800
700
600
500
400
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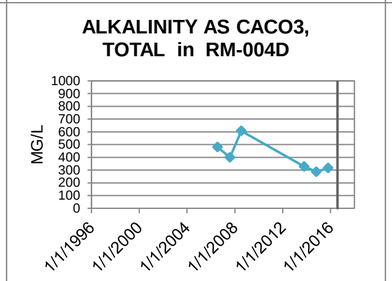
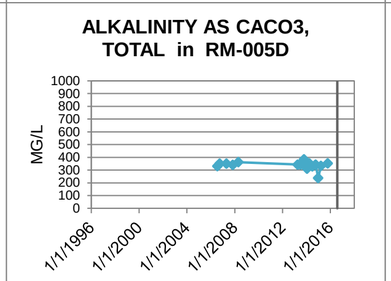
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-004D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-005D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
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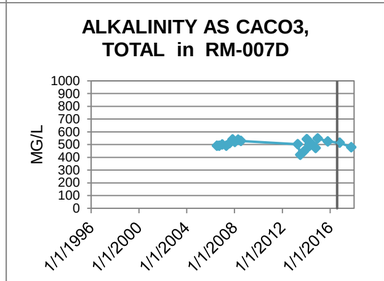
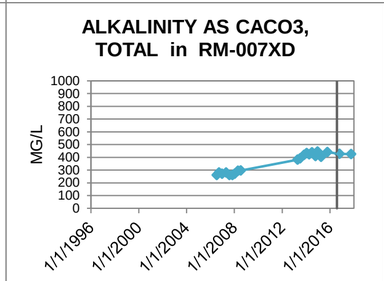
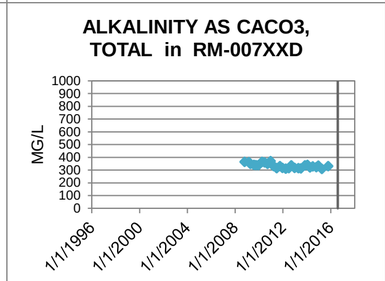
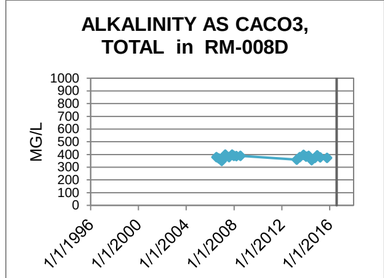
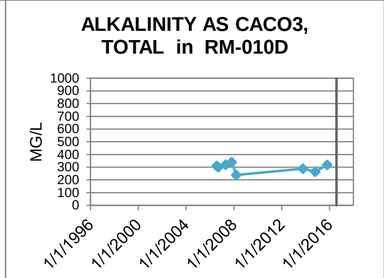
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-007D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-007XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-007XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-008D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-010D
MG/L
1000
900
800
700
600
500
400
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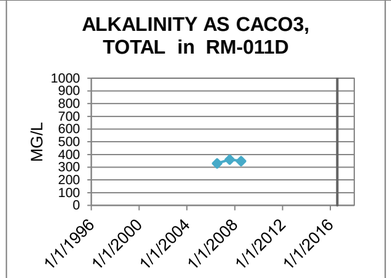
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-011D
MG/L
1000
900
800
700
600
500
400
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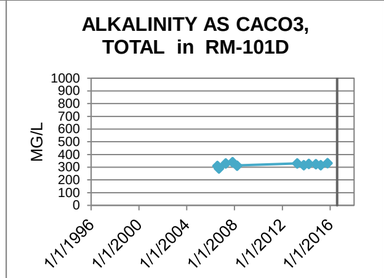
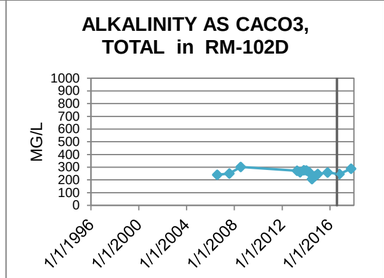
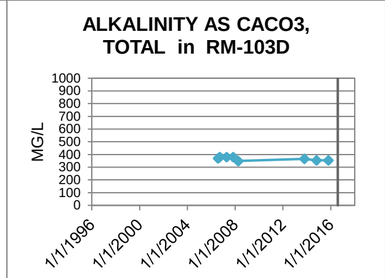
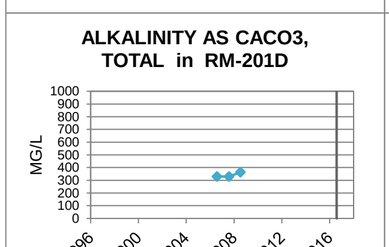
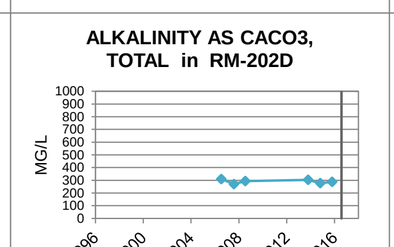
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

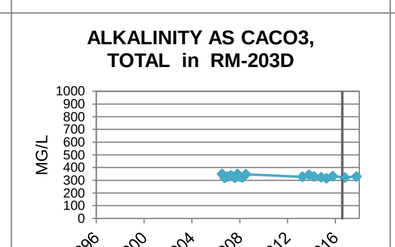

ALKALINITY AS CACO3, TOTAL in RM-101D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

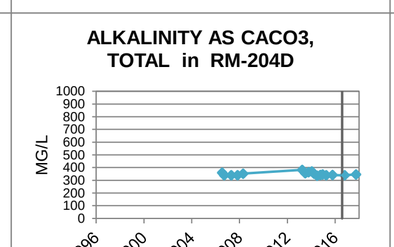

ALKALINITY AS CACO3, TOTAL in RM-102D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

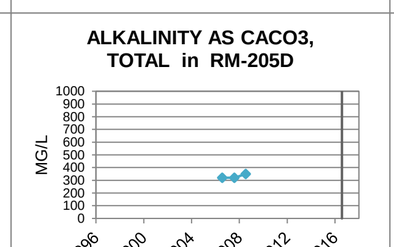

ALKALINITY AS CACO3, TOTAL in RM-103D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

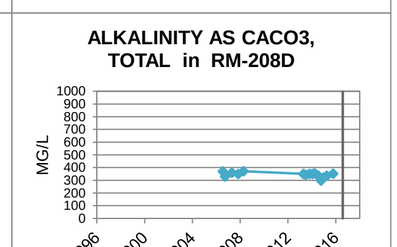

ALKALINITY AS CACO3, TOTAL in RM-201D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

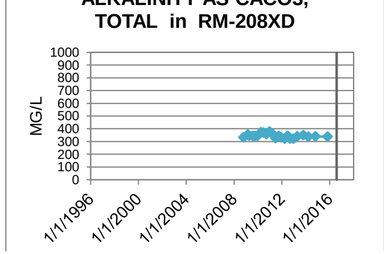

ALKALINITY AS CACO3, TOTAL in RM-202D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

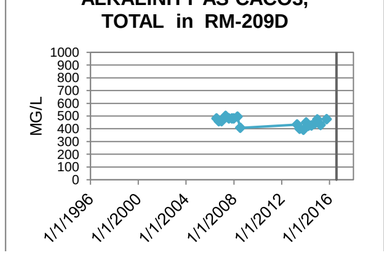

ALKALINITY AS CACO3, TOTAL in RM-203D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

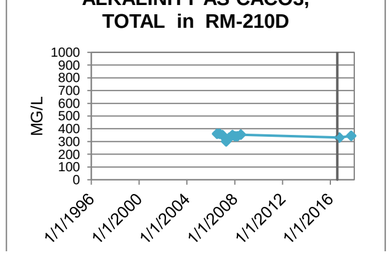

ALKALINITY AS CACO3, TOTAL in RM-204D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

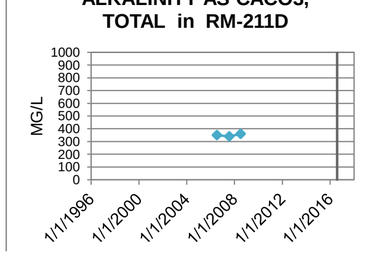

ALKALINITY AS CACO3, TOTAL in RM-205D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

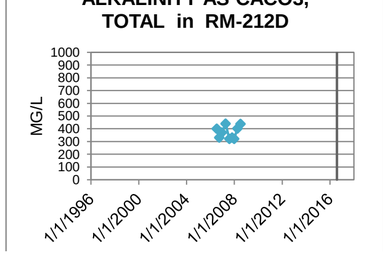

ALKALINITY AS CACO3, TOTAL in RM-208D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

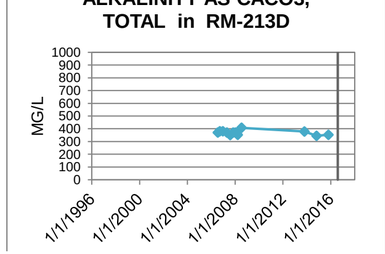

ALKALINITY AS CACO3, TOTAL in RM-208XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

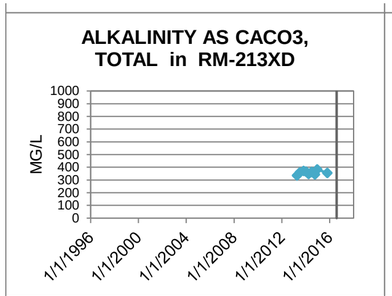

ALKALINITY AS CACO3, TOTAL in RM-209D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-210D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-211D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-212D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-213D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-213XD
MG/L
1000
900
800
700
600
500
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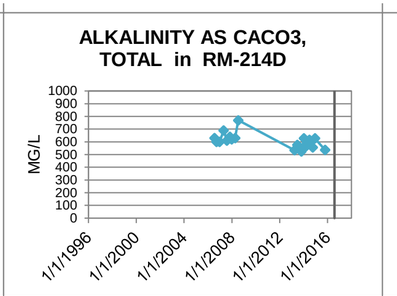
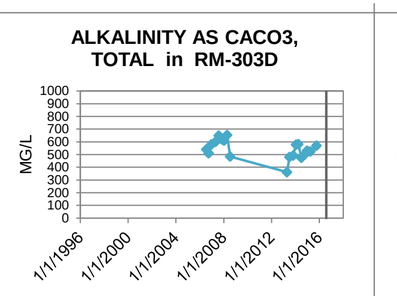
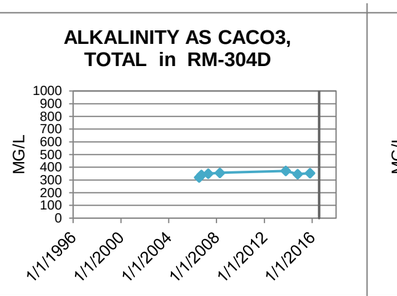
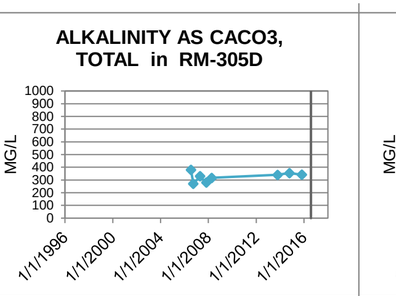
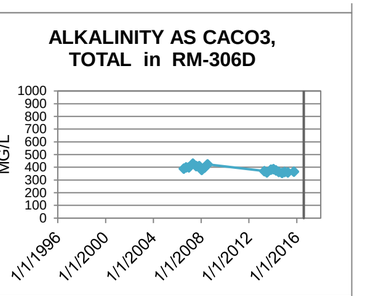
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

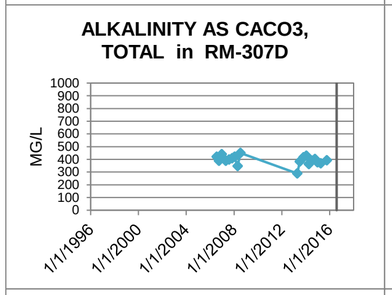

ALKALINITY AS CACO3, TOTAL in RM-214D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-303D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-304D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-305D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-306D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-307D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
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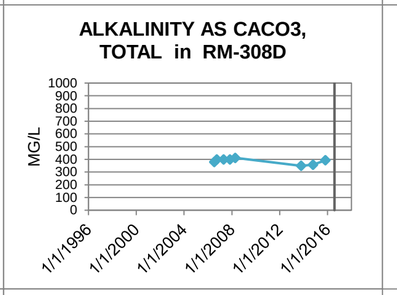
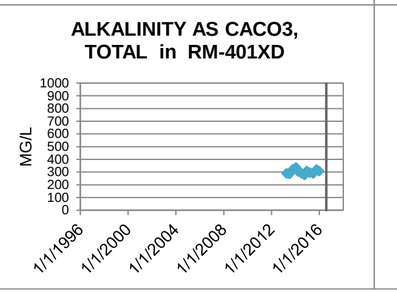
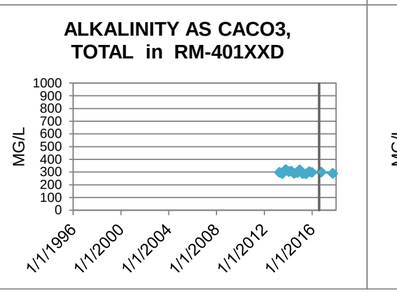
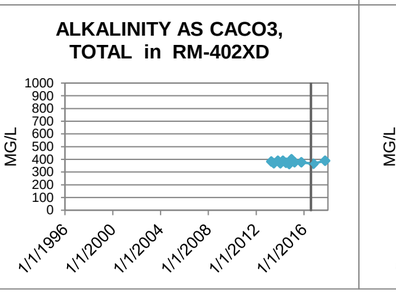
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-308D
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-401XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-401XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-402XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
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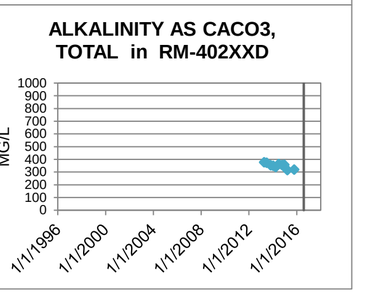
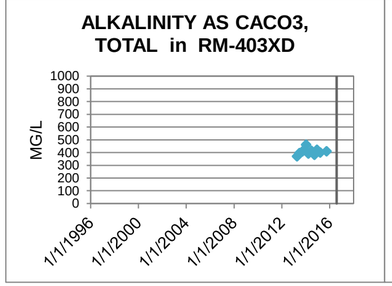
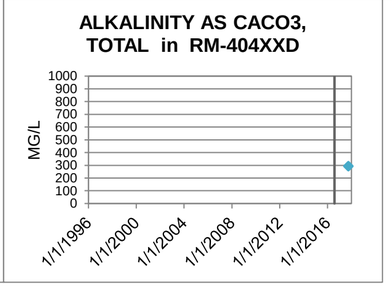
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-402XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-403XD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016


ALKALINITY AS CACO3, TOTAL in RM-404XXD
MG/L
1000
900
800
700
600
500
400
300
200
100
0
1/1/1996
1/1/2000
1/1/2004
1/1/2008
1/1/2012
1/1/2016

Appendix F
Concentration-Distance Profiles and Molar Ratios Table

Table F-1
Molar Concentrations of CVOCs and Source to Degradation Product Compound Concentration Ratios
Monitoring Years 2015 through 2017 and Selected Historical Events
Lemberger Landfill Sites - MNA 2018 Report

SAMPLE ID	SAMPLE DATE	APPROXIMATE DISTANCE FROM SOURCE AREA (feet)	TOTAL CVOC CONCENTRATION (µmol/L)	111-TCA CONC (µmol/L)	11-DCA CONC (µmol/L)	11-DCE CONC (µmol/L)	CEA CONC (µmol/L)	PCE CONC (µmol/L)	TCE CONC (µmol/L)	CIS-12-DCE CONC (µmol/L)	TRANS-12-DCE CONC (µmol/L)	VC CONC (µmol/L)
			Cleanup Goals:	1.499	8.590	0.072	6.200	0.030	0.038	0.722	1.032	0.003
SOURCE AREA WELLS												
RM-007D	7-Oct-02	NA	17.63	8.246	5.356	0.774	0.000	0.000	0.472	2.79	--	0.000
RM-007D	31-Oct-07	NA	9.42	3.823	3.638	0.320	0.000	0.020	0.282	1.34	0.000	0.000
RM-007D	21-Sep-12	NA	7.70	3.089	2.971	0.268	0.000	0.020	0.375	0.978	0.000	0.000
RM-007D	23-Oct-15	NA	8.23	3.328	3.042	0.312	0.017	0.020	0.475	1.03	0.011	0.000
RM-007D	19-Oct-16	NA	6.81	2.744	2.435	0.200	0.155	0.020	0.435	0.805	0.019	0.000
RM-007D	10-Oct-17	NA	6.97	2.676	2.749	0.268	0.025	0.019	0.449	0.785	0.000	0.000
RM-007XD	3-Oct-02	NA	1.12	0.375	0.212	0.081	0.023	0.000	0.075	0.351	--	0.000
RM-007XD	31-Oct-07	NA	2.14	0.622	0.465	0.196	0.028	0.000	0.145	0.681	0.000	0.000
RM-007XD	21-Sep-12	NA	4.45	1.717	1.556	0.222	0.000	0.010	0.220	0.725	0.000	0.000
RM-007XD	31-Mar-15	NA	4.72	1.814	1.667	0.224	0.000	0.012	0.265	0.737	0.000	0.000
RM-007XD	9-Oct-15	NA	5.07	1.949	1.789	0.269	0.017	0.014	0.290	0.742	0.000	0.000
RM-007XD	7-Apr-16	NA	4.53	1.522	1.536	0.284	0.013	0.010	0.257	0.899	0.008	0.000
RM-007XD	19-Oct-16	NA	4.53	1.792	1.516	0.220	0.000	0.013	0.271	0.714	0.010	0.000
RM-007XD	20-Mar-17	NA	4.78	1.679	1.566	0.358	0.000	0.012	0.298	0.863	0.000	0.000
RM-007XD	10-Oct-17	NA	5.29	1.942	1.950	0.303	0.000	0.013	0.311	0.769	0.000	0.000
RM-209D	7-Oct-02	NA	5.02	3.373	0.889	0.237	0.000	0.000	0.175	0.340	--	0.000
RM-209D	30-Oct-07	NA	3.27	1.649	1.112	0.144	0.000	0.008	0.072	0.289	0.000	0.000
RM-209D	20-Sep-12	NA	2.03	1.079	0.670	0.072	0.000	0.007	0.074	0.124	0.000	0.000
RM-209D	30-Mar-15	NA	2.04	1.042	0.642	0.078	0.000	0.005	0.116	0.158	0.000	0.000
RM-209D	8-Oct-15	NA	2.48	1.274	0.777	0.103	0.000	0.008	0.138	0.181	0.000	0.000
RM-303D	7-Oct-02	NA	20.90	8.246	8.186	0.495	0.000	0.048	0.723	3.20	--	0.000
RM-303D	30-Oct-07	NA	20.06	6.222	8.489	0.340	0.000	0.000	0.989	4.02	0.000	0.000
RM-303D	20-Sep-12	NA	10.18	3.381	4.285	0.140	0.000	0.019	0.807	1.55	0.000	0.000
RM-303D	30-Mar-15	NA	6.58	2.346	2.638	0.105	0.000	0.000	0.534	0.956	0.000	0.000
RM-303D	7-Oct-15	NA	8.41	2.916	3.355	0.152	0.000	0.016	0.736	1.24	0.000	0.000
RM-303D	21-Oct-16	NA	7.29	2.721	2.698	0.101	0.000	0.014	0.686	1.07	0.000	0.000
RM-303D	6-Oct-17	NA	6.58	2.324	2.648	0.104	0.000	0.000	0.555	0.950	0.000	0.000
RM-306D	7-Oct-02	NA	3.34	2.624	0.435	0.144	0.000	0.010	0.084	0.042	--	0.000
RM-306D	30-Oct-07	NA	2.10	1.424	0.515	0.079	0.000	0.006	0.042	0.029	0.000	0.000
RM-306D	23-Sep-12	NA	1.12	0.825	0.191	0.042	0.000	0.005	0.043	0.011	0.000	0.000
RM-306D	30-Mar-15	NA	0.544	0.390	0.094	0.021	0.000	0.003	0.030	0.006	0.000	0.000
RM-306D	8-Oct-15	NA	0.608	0.435	0.099	0.026	0.000	0.004	0.037	0.008	0.000	0.000
RM-306D	21-Oct-16	NA	0.664	0.485	0.104	0.025	0.000	0.004	0.038	0.008	0.000	0.000
RM-306D	6-Oct-17	NA	0.894	0.666	0.129	0.040	0.000	0.004	0.047	0.007	0.000	0.000
RM-307D	7-Oct-02	NA	3.10	2.174	0.627	0.124	0.000	0.010	0.071	0.092	--	0.000
RM-307D	30-Oct-07	NA	1.67	0.900	0.616	0.043	0.000	0.004	0.041	0.068	0.000	0.000

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Lemberger Landfill Sites - MNA 2018 Report

SAMPLE ID	SAMPLE DATE	APPROXIMATE DISTANCE FROM SOURCE AREA (feet)	TOTAL CVOC CONCENTRATION (µmol/L)	111-TCA CONC (µmol/L)	11-DCA CONC (µmol/L)	11-DCE CONC (µmol/L)	CEA CONC (µmol/L)	PCE CONC (µmol/L)	TCE CONC (µmol/L)	CIS-12-DCE CONC (µmol/L)	TRANS-12-DCE CONC (µmol/L)	VC CONC (µmol/L)
RM-307D	23-Sep-12	NA	2.26	1.379	0.610	0.068	0.000	0.007	0.123	0.071	0.000	0.000
RM-307D	31-Mar-15	NA	0.905	0.572	0.207	0.027	0.000	0.005	0.071	0.024	0.000	0.000
RM-307D	8-Oct-15	NA	1.12	0.683	0.295	0.036	0.000	0.006	0.067	0.033	0.000	0.000
RM-307D	7-Apr-16	NA	0.685	0.493	0.109	0.034	0.000	0.004	0.035	0.010	0.000	0.000
RM-307D	21-Oct-16	NA	1.63	1.124	0.296	0.054	0.000	0.007	0.108	0.043	0.000	0.000
RM-307D	20-Mar-17	NA	1.05	0.742	0.157	0.051	0.000	0.006	0.069	0.022	0.000	0.000
RM-307D	6-Oct-17	NA	1.64	0.997	0.431	0.053	0.000	0.007	0.108	0.045	0.000	0.000
PLUME MONITORING WELLS												
RM-002D	24-Sep-02	5500	0.095	0.031	0.033	0.000	0.000	0.000	0.008	0.022	--	0.00
RM-002D	24-Oct-07	5500	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-002D	7-Sep-12	5500	0.188	0.061	0.066	0.011	0.000	0.000	0.016	0.033	0.000	0.000
RM-002D	19-Mar-15	5500	0.029	0.011	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-002D	27-Jun-15	5500	0.140	0.040	0.052	0.010	0.000	0.000	0.018	0.021	0.000	0.000
RM-002D	24-Sep-15	5500	0.169	0.058	0.058	0.010	0.000	0.000	0.018	0.025	0.000	0.000
RM-002D	21-Dec-15	5500	0.137	0.045	0.047	0.009	0.000	0.000	0.018	0.019	0.000	0.000
RM-002D	4-Apr-16	5500	0.145	0.046	0.057	0.009	0.000	0.000	0.016	0.017	0.000	0.000
RM-002D	27-Jun-16	5500	0.170	0.049	0.068	0.014	0.000	0.000	0.016	0.023	0.000	0.000
RM-002D	29-Sep-16	5500	0.191	0.060	0.076	0.012	0.000	0.000	0.020	0.023	0.000	0.000
RM-002D	11-Dec-16	5500	0.193	0.062	0.074	0.012	0.000	0.000	0.019	0.026	0.000	0.000
RM-002D	16-Mar-17	5500	0.182	0.061	0.066	0.012	0.000	0.000	0.018	0.024	0.000	0.000
RM-002D	25-Jun-17	5500	0.194	0.064	0.074	0.012	0.000	0.000	0.019	0.025	0.000	0.000
RM-002D	26-Sep-17	5500	0.205	0.063	0.085	0.018	0.000	0.000	0.018	0.022	0.000	0.000
RM-003D	1-Oct-02	1900	0.704	0.352	0.192	0.036	0.000	0.000	0.028	0.095	--	0.000
RM-003D	25-Oct-07	1900	0.638	0.330	0.162	0.036	0.000	0.000	0.031	0.079	0.000	0.000
RM-003D	12-Sep-12	1900	0.996	0.475	0.321	0.054	0.000	0.000	0.043	0.104	0.000	0.000
RM-003D	19-Mar-15	1900	0.616	0.274	0.205	0.030	0.000	0.000	0.035	0.071	0.000	0.000
RM-003D	26-Jun-15	1900	0.375	0.164	0.130	0.018	0.000	0.000	0.025	0.038	0.000	0.000
RM-003D	22-Sep-15	1900	0.456	0.214	0.148	0.023	0.000	0.000	0.025	0.047	0.000	0.000
RM-003D	20-Dec-15	1900	0.248	0.114	0.082	0.012	0.000	0.000	0.018	0.023	0.000	0.000
RM-003D	1-Apr-16	1900	0.559	0.229	0.214	0.034	0.000	0.000	0.026	0.056	0.000	0.000
RM-003D	28-Jun-16	1900	0.876	0.345	0.315	0.061	0.000	0.000	0.046	0.109	0.000	0.000
RM-003D	28-Sep-16	1900	0.674	0.279	0.247	0.037	0.000	0.000	0.039	0.072	0.000	0.000
RM-003D	9-Dec-16	1900	0.635	0.277	0.213	0.036	0.000	0.000	0.038	0.071	0.000	0.000
RM-003D	15-Mar-17	1900	0.535	0.241	0.171	0.032	0.000	0.000	0.033	0.059	0.000	0.000
RM-003D	26-Jun-17	1900	0.726	0.314	0.230	0.045	0.000	0.000	0.046	0.091	0.000	0.000
RM-003D	27-Sep-17	1900	1.05	0.381	0.391	0.065	0.000	0.000	0.056	0.155	0.000	0.000
RM-003XXD	19-Mar-15	1900	0.379	0.157	0.128	0.013	0.000	0.000	0.037	0.042	0.000	0.000

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RM-003XXD	26-Jun-15	1900	0.250	0.100	0.082	0.010	0.000	0.000	0.029	0.030	0.000	0.000
RM-003XXD	22-Sep-15	1900	0.563	0.232	0.198	0.021	0.000	0.000	0.051	0.062	0.000	0.000
RM-003XXD	20-Dec-15	1900	0.416	0.176	0.133	0.015	0.000	0.000	0.046	0.044	0.000	0.000
RM-003XXD	1-Apr-16	1900	0.354	0.139	0.125	0.014	0.000	0.000	0.033	0.042	0.000	0.000
RM-003XXD	28-Jun-16	1900	0.243	0.095	0.079	0.014	0.000	0.000	0.024	0.030	0.000	0.000
RM-003XXD	30-Sep-16	1900	0.276	0.104	0.101	0.013	0.000	0.000	0.025	0.032	0.000	0.000
RM-003XXD	9-Dec-16	1900	0.319	0.127	0.107	0.014	0.000	0.000	0.031	0.039	0.000	0.000
RM-003XXD	15-Mar-17	1900	0.160	0.070	0.044	0.007	0.000	0.000	0.018	0.021	0.000	0.000
RM-003XXD	26-Jun-17	1900	0.085	0.043	0.019	0.000	0.000	0.000	0.011	0.011	0.000	0.000
RM-003XXD	27-Sep-17	1900	0.125	0.055	0.030	0.006	0.000	0.000	0.018	0.015	0.000	0.000
RM-005D	3-Oct-02	2600	0.673	0.300	0.162	0.041	0.000	0.000	0.036	0.134	--	0.000
RM-005D	1-Nov-07	2600	0.515	0.232	0.141	0.035	0.000	0.000	0.023	0.084	0.000	0.000
RM-005D	26-Sep-12	2600	0.547	0.217	0.168	0.033	0.000	0.000	0.031	0.098	0.000	0.000
RM-005D	22-Mar-15	2600	0.554	0.218	0.178	0.037	0.000	0.000	0.029	0.092	0.000	0.000
RM-005D	9-Oct-15	2600	0.446	0.173	0.137	0.031	0.000	0.000	0.026	0.078	0.000	0.000
RM-005D	7-Apr-16	2600	0.458	0.168	0.158	0.031	0.000	0.000	0.026	0.075	0.000	0.000
RM-005D	20-Oct-16	2600	0.428	0.168	0.125	0.029	0.000	0.000	0.027	0.078	0.000	0.000
RM-005D	20-Mar-17	2600	0.490	0.189	0.150	0.041	0.000	0.000	0.028	0.083	0.000	0.000
RM-005D	4-Oct-17	2600	0.499	0.184	0.159	0.040	0.000	0.000	0.028	0.089	0.000	0.000
RM-007XXD	12-Sep-12	NA	0.012	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-007XXD	31-Mar-15	NA	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-007XXD	9-Oct-15	NA	0.008	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-007XXD	19-Oct-16	NA	0.009	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-007XXD	10-Oct-17	NA	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-008D	25-Sep-02	800	1.01	0.592	0.131	0.046	0.014	0.000	0.042	0.186	--	0.000
RM-008D	29-Oct-07	800	0.871	0.465	0.172	0.047	0.000	0.000	0.043	0.144	0.000	0.000
RM-008D	19-Sep-12	800	0.589	0.307	0.150	0.023	0.000	0.000	0.034	0.076	0.000	0.000
RM-008D	20-Mar-15	800	0.614	0.296	0.158	0.015	0.000	0.000	0.047	0.098	0.000	0.000
RM-008D	13-Oct-15	800	0.572	0.280	0.138	0.022	0.000	0.000	0.040	0.092	0.000	0.000
RM-008D	8-Apr-16	800	0.919	0.362	0.305	0.020	0.025	0.000	0.091	0.116	0.000	0.000
RM-008D	20-Oct-16	800	0.527	0.256	0.128	0.013	0.010	0.000	0.044	0.075	0.000	0.000
RM-008D	16-Mar-17	800	0.272	0.157	0.056	0.008	0.000	0.000	0.023	0.028	0.000	0.000
RM-008D	9-Oct-17	800	0.629	0.283	0.178	0.017	0.000	0.000	0.053	0.099	0.000	0.000
RM-010D	24-Sep-02	6400	0.031	0.021	0.010	0.000	0.000	0.000	0.000	0.000	--	0.000
RM-010D	26-Oct-07	6400	0.055	0.029	0.013	0.000	0.000	0.000	0.004	0.009	0.000	0.000
RM-010D	10-Sep-12	6400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-010D	20-Oct-15	6400	0.015	0.010	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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RM-101D	1-Oct-02	1500	0.213	0.082	0.080	0.011	0.000	0.000	0.018	0.021	--	0.000
RM-101D	29-Oct-07	1500	0.058	0.025	0.025	0.000	0.000	0.000	0.008	0.000	0.000	0.000
RM-101D	17-Sep-12	1500	0.056	0.019	0.028	0.000	0.000	0.000	0.008	0.000	0.000	0.000
RM-101D	22-Mar-15	1500	0.056	0.018	0.024	0.000	0.000	0.000	0.008	0.006	0.000	0.000
RM-101D	9-Oct-15	1500	0.057	0.019	0.025	0.000	0.000	0.000	0.008	0.005	0.000	0.000
RM-101D	21-Oct-16	1500	0.050	0.016	0.021	0.000	0.000	0.000	0.008	0.006	0.000	0.000
RM-101D	28-Sep-17	1500	0.066	0.024	0.028	0.000	0.000	0.000	0.008	0.005	0.000	0.000
RM-103D	3-Oct-02	3000	0.215	0.105	0.047	0.009	0.000	0.000	0.011	0.042	--	0.000
RM-103D	1-Nov-07	3000	0.176	0.082	0.043	0.012	0.000	0.000	0.010	0.028	0.000	0.000
RM-103D	11-Sep-12	3000	0.138	0.057	0.030	0.011	0.000	0.000	0.008	0.031	0.000	0.000
RM-103D	21-Oct-15	3000	0.165	0.067	0.043	0.013	0.000	0.000	0.011	0.031	0.000	0.000
RM-203D	3-Oct-02	7500	0.103	0.054	0.027	0.000	0.000	0.000	0.006	0.015	--	0.000
RM-203D	24-Oct-07	7500	0.080	0.043	0.021	0.000	0.000	0.000	0.005	0.010	0.000	0.000
RM-203D	7-Sep-12	7500	0.030	0.022	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-203D	30-Mar-15	7500	0.012	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-203D	12-Oct-15	7500	0.018	0.013	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-203D	18-Oct-16	7500	0.029	0.018	0.008	0.000	0.000	0.000	0.000	0.004	0.000	0.000
RM-203D	4-Oct-17	7500	0.018	0.013	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-204D	7-Oct-02	4000	0.313	0.142	0.088	0.012	0.000	0.000	0.025	0.045	--	0.000
RM-204D	29-Oct-07	4000	0.178	0.090	0.053	0.010	0.000	0.000	0.009	0.017	0.000	0.000
RM-204D	14-Sep-12	4000	0.237	0.104	0.084	0.014	0.000	0.000	0.009	0.026	0.000	0.000
RM-204D	31-Mar-15	4000	0.243	0.114	0.085	0.012	0.000	0.000	0.011	0.021	0.000	0.000
RM-204D	12-Oct-15	4000	0.245	0.116	0.083	0.012	0.000	0.000	0.010	0.024	0.000	0.000
RM-204D	8-Apr-16	4000	0.280	0.121	0.103	0.017	0.000	0.000	0.012	0.028	0.000	0.000
RM-204D	18-Oct-16	4000	0.252	0.116	0.086	0.011	0.000	0.000	0.014	0.025	0.000	0.000
RM-204D	20-Mar-17	4000	0.267	0.129	0.086	0.015	0.000	0.000	0.014	0.023	0.000	0.000
RM-204D	3-Oct-17	4000	0.258	0.118	0.094	0.012	0.000	0.000	0.012	0.021	0.000	0.000
RM-208D	3-Oct-02	1600	0.363	0.172	0.096	0.017	0.000	0.000	0.021	0.057	--	0.000
RM-208D	29-Oct-07	1600	0.431	0.187	0.131	0.023	0.000	0.000	0.022	0.067	0.000	0.000
RM-208D	23-Sep-12	1600	0.308	0.108	0.082	0.026	0.000	0.000	0.022	0.070	0.000	0.000
RM-208D	31-Mar-15	1600	0.270	0.105	0.070	0.018	0.000	0.000	0.021	0.057	0.000	0.000
RM-208D	9-Oct-15	1600	0.180	0.067	0.044	0.013	0.000	0.000	0.013	0.041	0.000	0.000
RM-208D	7-Apr-16	1600	0.284	0.087	0.086	0.027	0.000	0.000	0.021	0.064	0.000	0.000
RM-208D	20-Oct-16	1600	0.281	0.102	0.077	0.020	0.000	0.000	0.021	0.061	0.000	0.000
RM-208D	20-Mar-17	1600	0.283	0.092	0.071	0.029	0.000	0.000	0.018	0.073	0.000	0.000
RM-208D	4-Oct-17	1600	0.349	0.114	0.102	0.030	0.000	0.000	0.024	0.079	0.000	0.000
RM-210D	24-Sep-02	6000	0.546	0.232	0.152	0.025	0.000	0.000	0.037	0.100	--	0.000

Table F-1
Molar Concentrations of CVOCs and Source to Degradation Product Compound Concentration Ratios
Monitoring Years 2015 through 2017 and Selected Historical Events
Lemberger Landfill Sites - MNA 2018 Report

SAMPLE ID	SAMPLE DATE	APPROXIMATE DISTANCE FROM SOURCE AREA (feet)	TOTAL CVOC CONCENTRATION (µmol/L)	111-TCA CONC (µmol/L)	11-DCA CONC (µmol/L)	11-DCE CONC (µmol/L)	CEA CONC (µmol/L)	PCE CONC (µmol/L)	TCE CONC (µmol/L)	CIS-12-DCE CONC (µmol/L)	TRANS-12-DCE CONC (µmol/L)	VC CONC (µmol/L)
RM-210D	23-Oct-07	6000	0.420	0.172	0.121	0.025	0.000	0.000	0.030	0.072	0.000	0.000
RM-210D	10-Sep-12	6000	0.312	0.127	0.091	0.023	0.000	0.000	0.021	0.050	0.000	0.000
RM-210D	18-Mar-15	6000	0.185	0.068	0.058	0.011	0.000	0.000	0.013	0.035	0.000	0.000
RM-210D	27-Jun-15	6000	0.209	0.074	0.065	0.017	0.000	0.000	0.018	0.036	0.000	0.000
RM-210D	24-Sep-15	6000	0.246	0.100	0.071	0.018	0.000	0.000	0.018	0.040	0.000	0.000
RM-210D	21-Dec-15	6000	0.221	0.090	0.063	0.015	0.000	0.000	0.018	0.035	0.000	0.000
RM-210D	4-Apr-16	6000	0.259	0.095	0.086	0.019	0.000	0.000	0.018	0.041	0.000	0.000
RM-210D	27-Jun-16	6000	0.215	0.076	0.070	0.020	0.000	0.000	0.016	0.034	0.000	0.000
RM-210D	29-Sep-16	6000	0.223	0.085	0.076	0.015	0.000	0.000	0.015	0.032	0.000	0.000
RM-210D	11-Dec-16	6000	0.239	0.093	0.077	0.017	0.000	0.000	0.018	0.035	0.000	0.000
RM-210D	16-Mar-17	6000	0.238	0.095	0.069	0.019	0.000	0.000	0.018	0.037	0.000	0.000
RM-210D	24-Jun-17	6000	0.228	0.086	0.067	0.020	0.000	0.000	0.019	0.036	0.000	0.000
RM-210D	26-Sep-17	6000	0.281	0.094	0.095	0.020	0.000	0.000	0.019	0.053	0.000	0.000
RM-211D	1-Oct-02	1600	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.000	--	0.000
RM-211D	25-Oct-07	1600	0.013	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	10-Sep-12	1600	0.027	0.017	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	18-Mar-15	1600	0.016	0.011	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	26-Jun-15	1600	0.007	0.004	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	22-Sep-15	1600	0.014	0.006	0.003	0.000	0.000	0.000	0.000	0.000	0.005	0.000
RM-211D	21-Dec-15	1600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	1-Apr-16	1600	0.010	0.006	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	23-Oct-16	1600	0.016	0.010	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	16-Mar-17	1600	0.011	0.007	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-211D	29-Sep-17	1600	0.104	0.050	0.036	0.004	0.000	0.000	0.006	0.007	0.000	0.000
RM-213D	31-Oct-07	700	0.114	0.061	0.018	0.000	0.000	0.000	0.008	0.028	0.000	0.000
RM-213D	19-Sep-12	700	0.073	0.042	0.010	0.000	0.000	0.000	0.006	0.014	0.000	0.000
RM-213D	21-Oct-15	700	0.057	0.032	0.008	0.000	0.000	0.000	0.006	0.010	0.000	0.000
RM-213D	23-Oct-16	700	0.046	0.028	0.007	0.000	0.000	0.000	0.005	0.007	0.000	0.000
RM-213D	5-Oct-17	700	0.045	0.028	0.007	0.000	0.000	0.000	0.004	0.006	0.000	0.000
RM-213XD	21-Oct-15	700	0.216	0.096	0.044	0.022	0.000	0.000	0.018	0.036	0.000	0.000
RM-213XD	23-Oct-16	700	0.066	0.035	0.009	0.006	0.000	0.000	0.006	0.010	0.000	0.000
RM-213XD	5-Oct-17	700	0.311	0.139	0.068	0.029	0.000	0.000	0.023	0.053	0.000	0.000
RM-214D	31-Oct-07	1300	0.745	0.165	0.099	0.017	0.000	0.000	0.034	0.392	0.000	0.038
RM-214D	19-Sep-12	1300	0.558	0.121	0.081	0.013	0.000	0.000	0.033	0.293	0.000	0.016
RM-214D	21-Oct-15	1300	0.512	0.103	0.085	0.012	0.000	0.000	0.030	0.256	0.000	0.026
RM-214D	17-Oct-16	1300	0.437	0.091	0.073	0.008	0.000	0.000	0.027	0.225	0.000	0.013
RM-214D	5-Oct-17	1300	0.470	0.106	0.086	0.009	0.000	0.000	0.027	0.231	0.000	0.010

Table F-1
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Monitoring Years 2015 through 2017 and Selected Historical Events
Lemberger Landfill Sites - MNA 2018 Report

SAMPLE ID	SAMPLE DATE	APPROXIMATE DISTANCE FROM SOURCE AREA (feet)	TOTAL CVOC CONCENTRATION (µmol/L)	111-TCA CONC (µmol/L)	11-DCA CONC (µmol/L)	11-DCE CONC (µmol/L)	CEA CONC (µmol/L)	PCE CONC (µmol/L)	TCE CONC (µmol/L)	CIS-12-DCE CONC (µmol/L)	TRANS-12-DCE CONC (µmol/L)	VC CONC (µmol/L)
RM-304D	7-Oct-02	NA	0.110	0.105	0.000	0.000	0.000	0.000	0.005	0.000	--	0.000
RM-304D	20-Sep-12	NA	0.026	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-304D	25-Oct-15	NA	0.024	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-305D	7-Oct-02	NA	0.042	0.028	0.000	0.000	0.000	0.000	0.014	0.000	--	0.000
RM-305D	30-Oct-07	NA	0.017	0.012	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000
RM-305D	20-Sep-12	NA	0.020	0.015	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000
RM-305D	25-Oct-15	NA	0.017	0.013	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000
RM-308D	7-Oct-02	NA	0.017	0.017	0.000	0.000	0.000	0.000	0.000	0.000	--	0.000
RM-308D	31-Oct-07	NA	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-308D	21-Sep-12	NA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-308D	25-Oct-15	NA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RM-401XD	22-Mar-15	1600	0.298	0.097	0.068	0.032	0.000	0.000	0.015	0.086	0.000	0.000
RM-401XD	28-Jun-15	1600	0.252	0.070	0.060	0.029	0.000	0.000	0.015	0.078	0.000	0.000
RM-401XD	7-Oct-15	1600	0.324	0.121	0.090	0.026	0.000	0.000	0.022	0.062	0.003	0.000
RM-401XD	22-Dec-15	1600	0.320	0.123	0.090	0.026	0.000	0.000	0.020	0.062	0.000	0.000
RM-401XD	4-Apr-16	1600	0.344	0.124	0.111	0.027	0.000	0.000	0.018	0.064	0.000	0.000
RM-401XD	28-Jun-16	1600	0.367	0.131	0.120	0.034	0.000	0.000	0.021	0.061	0.000	0.000
RM-401XD	30-Sep-16	1600	0.380	0.141	0.135	0.028	0.000	0.000	0.023	0.053	0.000	0.000
RM-401XD	10-Dec-16	1600	0.400	0.157	0.130	0.029	0.000	0.000	0.026	0.058	0.000	0.000
RM-401XD	15-Mar-17	1600	0.356	0.142	0.102	0.027	0.000	0.000	0.021	0.064	0.000	0.000
RM-401XD	28-Sep-17	1600	0.476	0.184	0.157	0.035	0.000	0.000	0.025	0.075	0.000	0.000
RM-401XXD	22-Mar-15	1600	0.443	0.138	0.102	0.043	0.000	0.000	0.027	0.132	0.000	0.000
RM-401XXD	28-Jun-15	1600	0.279	0.080	0.059	0.031	0.000	0.000	0.023	0.087	0.000	0.000
RM-401XXD	7-Oct-15	1600	0.169	0.058	0.035	0.015	0.000	0.000	0.013	0.047	0.000	0.000
RM-401XXD	22-Dec-15	1600	0.150	0.048	0.032	0.015	0.000	0.000	0.011	0.042	0.000	0.000
RM-401XXD	4-Apr-16	1600	0.231	0.064	0.060	0.026	0.000	0.000	0.012	0.070	0.000	0.000
RM-401XXD	28-Jun-16	1600	0.189	0.045	0.052	0.024	0.000	0.000	0.010	0.059	0.000	0.000
RM-401XXD	30-Sep-16	1600	0.259	0.064	0.070	0.030	0.000	0.000	0.011	0.085	0.000	0.000
RM-401XXD	10-Dec-16	1600	0.276	0.070	0.070	0.035	0.000	0.000	0.013	0.089	0.000	0.000
RM-401XXD	15-Mar-17	1600	0.242	0.073	0.050	0.028	0.000	0.000	0.016	0.075	0.000	0.000
RM-401XXD	24-Jun-17	1600	0.101	0.035	0.019	0.010	0.000	0.000	0.009	0.027	0.000	0.000
RM-401XXD	25-Sep-17	1600	0.110	0.028	0.027	0.017	0.000	0.000	0.006	0.032	0.000	0.000
RM-402XD	20-Mar-15	400	2.13	1.094	0.422	0.247	0.000	0.003	0.107	0.260	0.000	0.000
RM-402XD	13-Oct-15	400	2.28	1.222	0.439	0.242	0.000	0.004	0.120	0.258	0.000	0.000
RM-402XD	8-Apr-16	400	1.81	0.840	0.420	0.202	0.009	0.000	0.092	0.251	0.000	0.000
RM-402XD	19-Oct-16	400	1.96	0.997	0.388	0.221	0.000	0.004	0.104	0.246	0.000	0.000
RM-402XD	16-Mar-17	400	1.72	0.885	0.355	0.192	0.000	0.000	0.095	0.198	0.000	0.000

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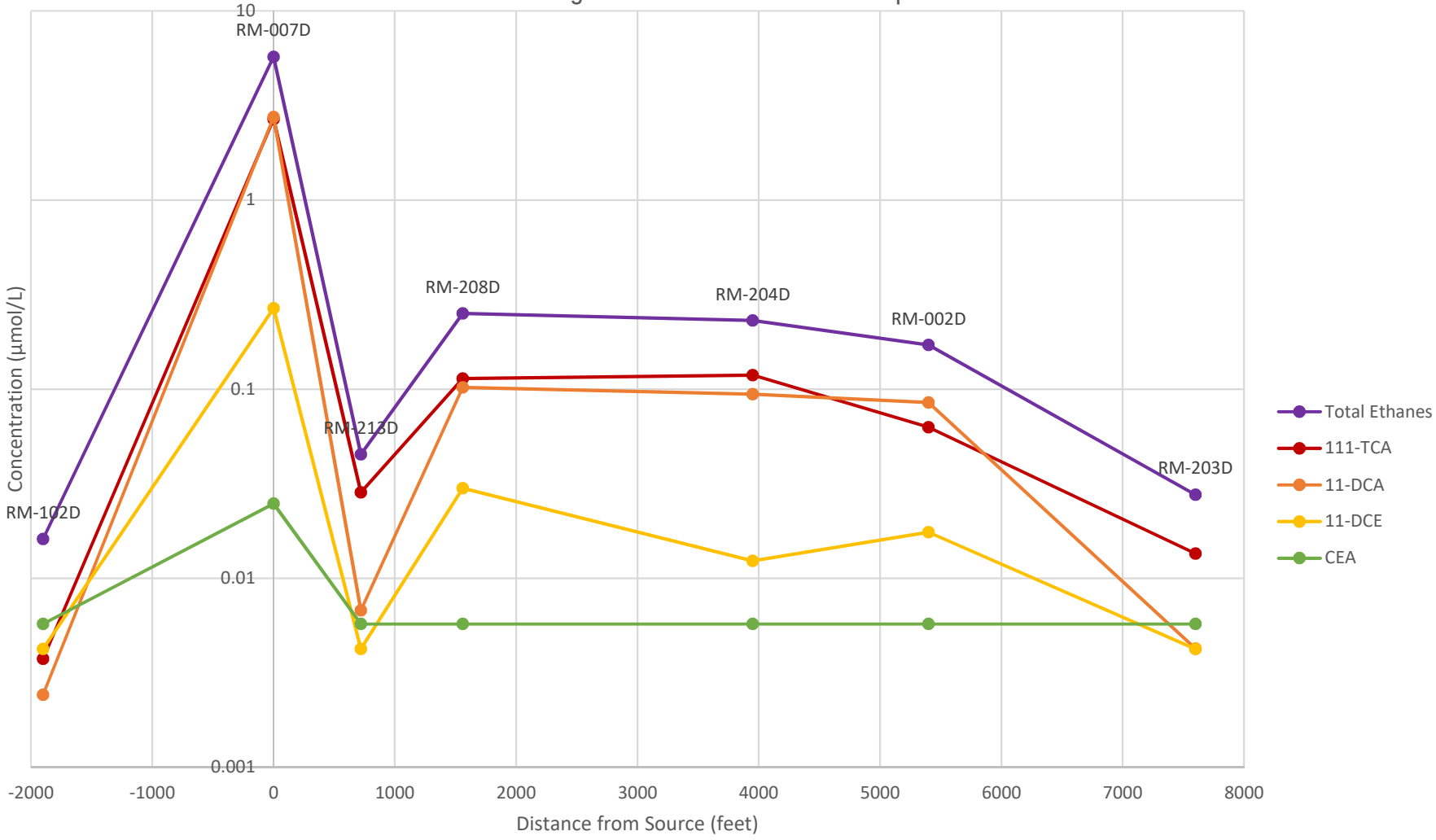
Lemberger Landfill Sites - MNA 2018 Report

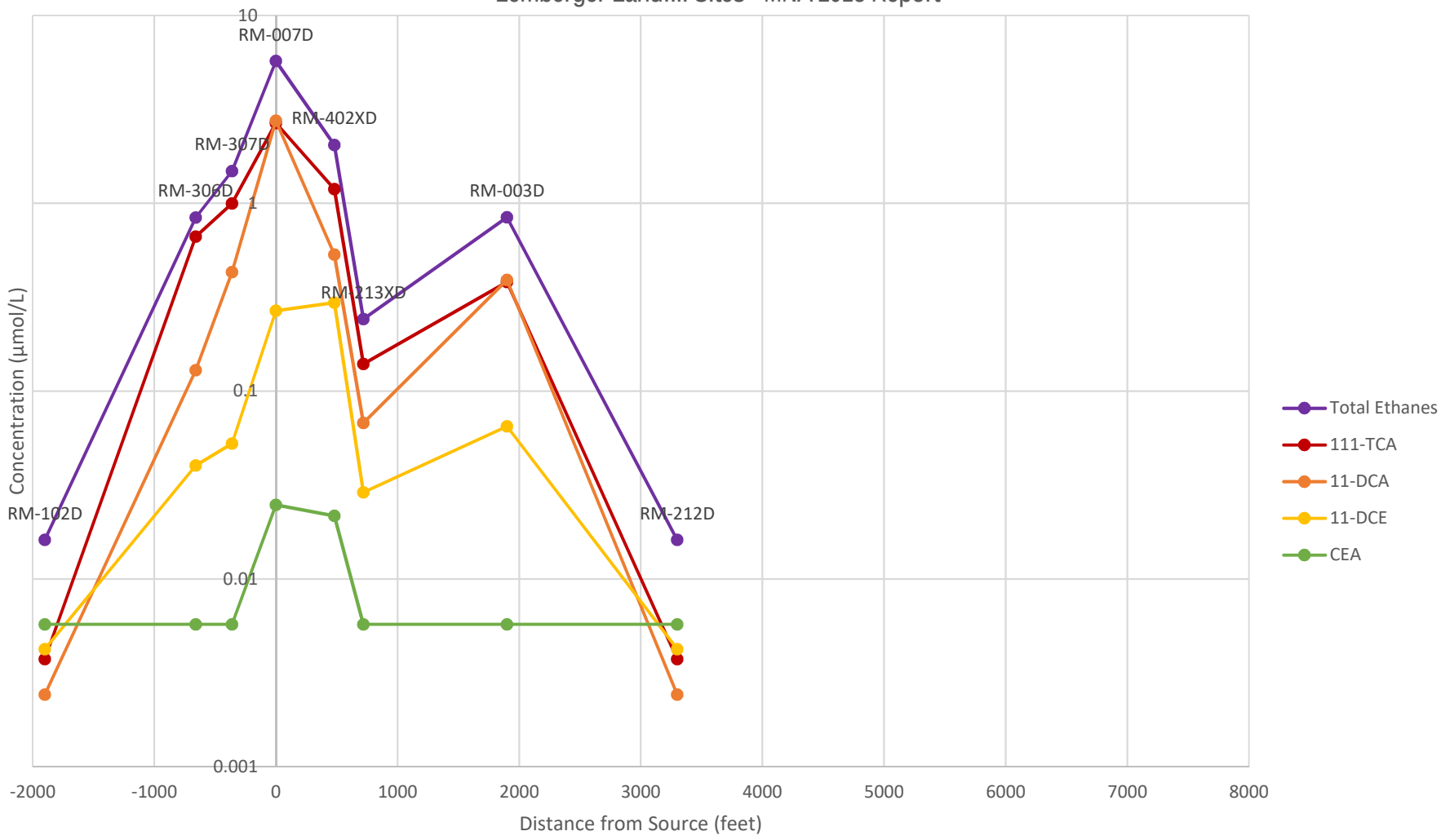
SAMPLE ID	SAMPLE DATE	APPROXIMATE DISTANCE FROM SOURCE AREA (feet)	TOTAL CVOC CONCENTRATION (µmol/L)	111-TCA CONC (µmol/L)	11-DCA CONC (µmol/L)	11-DCE CONC (µmol/L)	CEA CONC (µmol/L)	PCE CONC (µmol/L)	TCE CONC (µmol/L)	CIS-12-DCE CONC (µmol/L)	TRANS-12-DCE CONC (µmol/L)	VC CONC (µmol/L)
RM-402XD	9-Oct-17	400	2.44	1.192	0.533	0.296	0.022	0.004	0.116	0.272	0.000	0.000
RM-402XXD	20-Mar-15	400	0.710	0.292	0.206	0.039	0.000	0.000	0.059	0.115	0.000	0.000
RM-402XXD	13-Oct-15	400	0.640	0.271	0.173	0.037	0.000	0.000	0.067	0.093	0.000	0.000
RM-402XXD	8-Apr-16	400	0.971	0.360	0.301	0.052	0.013	0.000	0.073	0.172	0.000	0.000
RM-402XXD	19-Oct-16	400	0.714	0.298	0.208	0.040	0.000	0.000	0.060	0.107	0.000	0.000
RM-402XXD	16-Mar-17	400	0.846	0.322	0.263	0.050	0.008	0.000	0.069	0.135	0.000	0.000
RM-402XXD	9-Oct-17	400	1.01	0.404	0.336	0.053	0.000	0.000	0.067	0.149	0.000	0.000
RM-403XD	19-Mar-15	400	2.36	1.072	0.794	0.111	0.000	0.008	0.123	0.249	0.000	0.000
RM-403XD	26-Jun-15	400	1.76	0.862	0.569	0.090	0.000	0.007	0.081	0.150	0.000	0.000
RM-403XD	24-Sep-15	400	2.51	1.117	0.867	0.118	0.000	0.007	0.123	0.271	0.005	0.000
RM-403XD	21-Dec-15	400	1.69	0.744	0.606	0.085	0.065	0.006	0.081	0.106	0.000	0.000
RM-403XD	1-Apr-16	400	1.94	0.605	0.594	0.066	0.552	0.004	0.051	0.065	0.000	0.000
RM-403XD	27-Jun-16	400	2.50	1.050	0.939	0.137	0.000	0.007	0.135	0.236	0.000	0.000
RM-403XD	28-Sep-16	400	2.06	0.885	0.777	0.100	0.000	0.007	0.104	0.183	0.000	0.000
RM-403XD	10-Dec-16	400	2.21	0.982	0.777	0.107	0.006	0.007	0.118	0.215	0.000	0.000
RM-403XD	15-Mar-17	400	1.45	0.757	0.467	0.079	0.000	0.005	0.069	0.077	0.000	0.000
RM-403XD	25-Jun-17	400	0.682	0.244	0.255	0.024	0.093	0.000	0.034	0.032	0.000	0.000
RM-403XD	25-Sep-17	400	3.49	1.087	1.172	0.105	0.708	0.007	0.165	0.249	0.000	0.000
RM-404XXD	14-Mar-17	2700	0.039	0.015	0.008	0.000	0.000	0.000	0.008	0.007	0.000	0.000
RM-404XXD	26-Jun-17	2700	0.024	0.008	0.006	0.000	0.000	0.000	0.007	0.003	0.000	0.000
RM-404XXD	26-Sep-17	2700	0.034	0.016	0.009	0.000	0.000	0.000	0.005	0.004	0.000	0.000

Appendix F-1
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 2 (Upper Portion of LGS)
Lemberger Landfill Sites - MNA 2018 Report



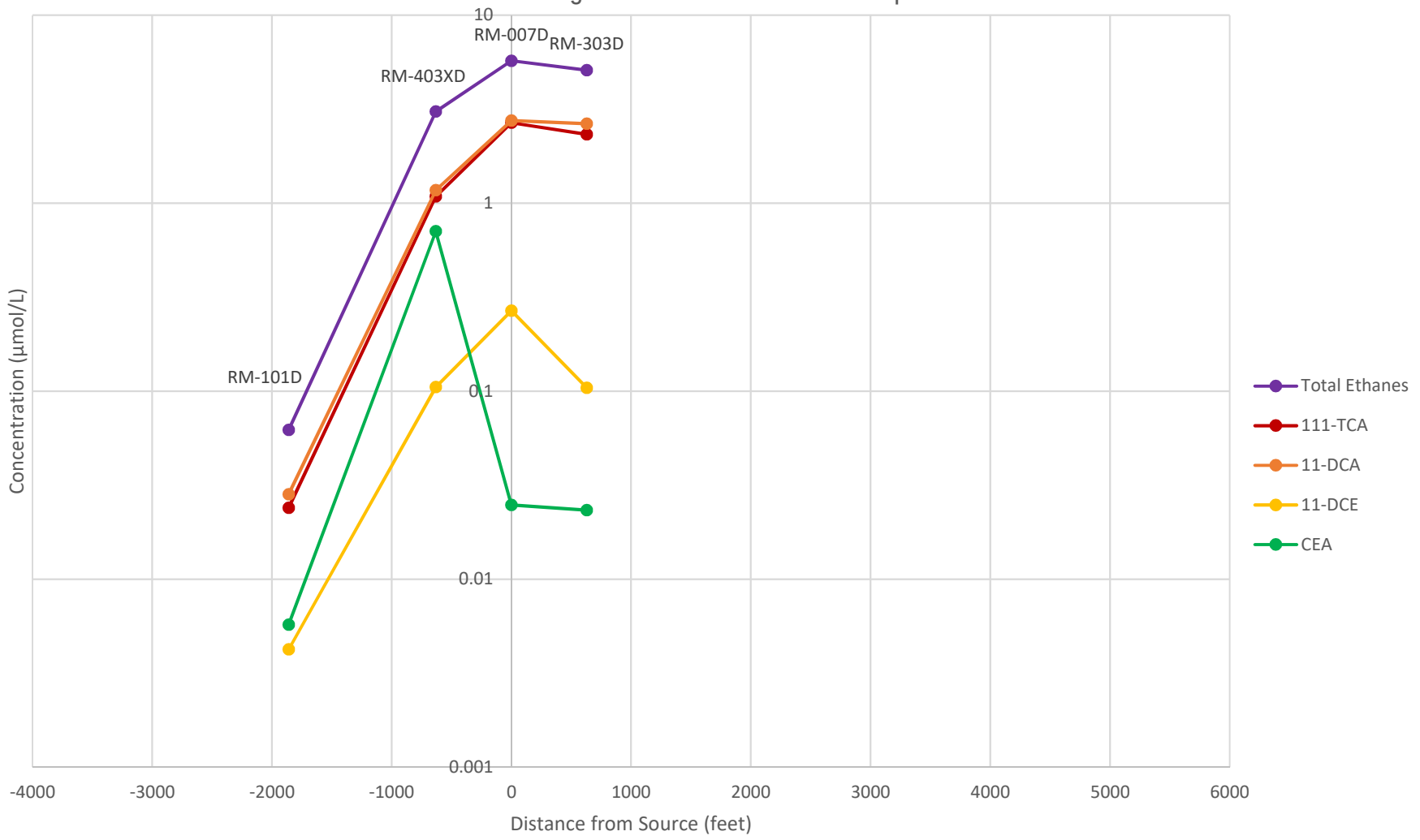
Notes:
"Total Ethanes" is a total of detected concentrations of 111-TCA, 11-DCA, 11-DCE, and CEA. Non-detects were treated as "zero" values for the total ethane calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Appendix F-2
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 3 (RM3 Direction)
Lemberger Landfill Sites - MNA 2018 Report



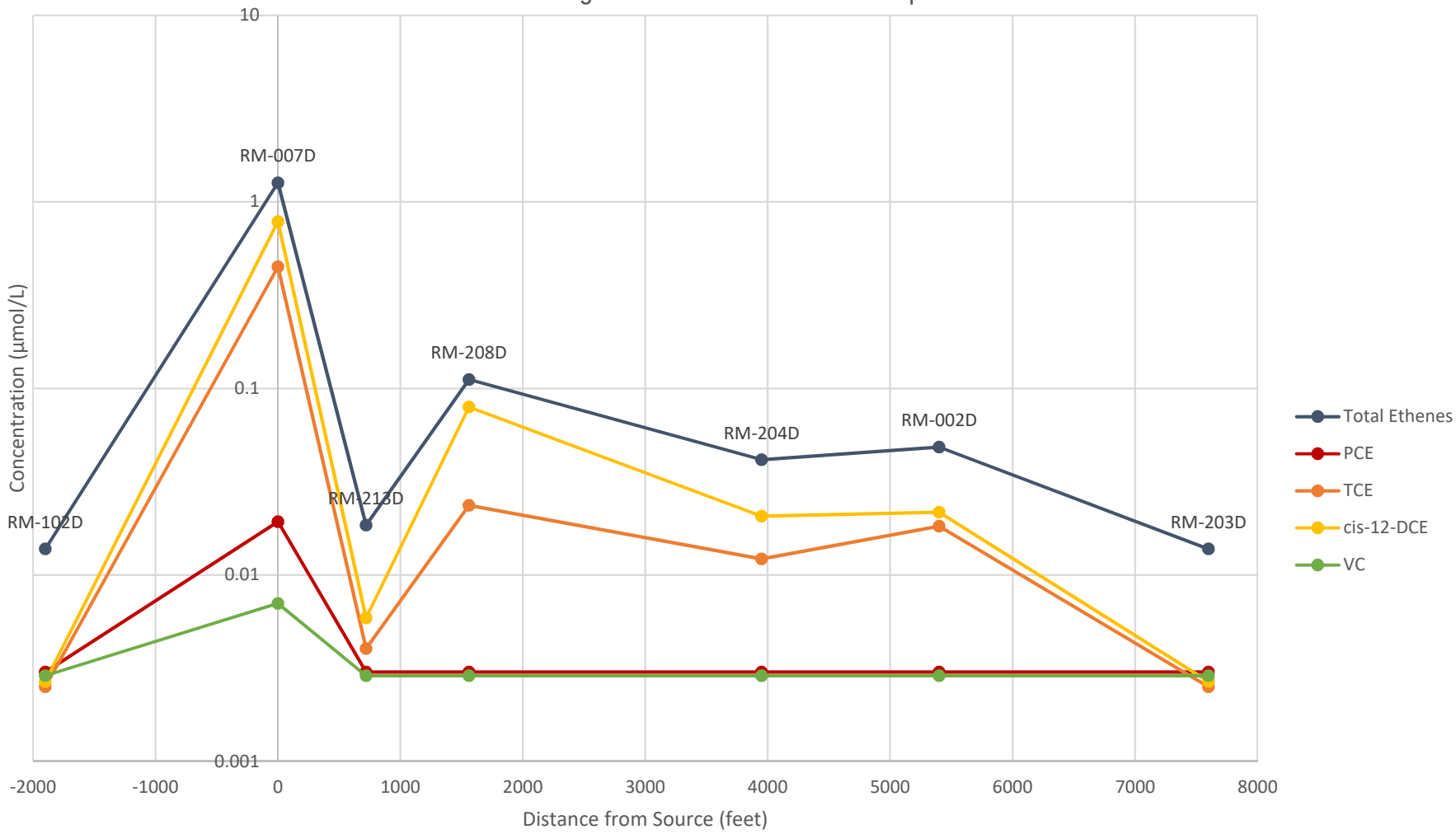
Notes:
"Total Ethanes" is a total of detected concentrations of 111-TCA, 11-DCA, 11-DCE, and CEA. Non-detects were treated as "zero" values for the total ethane calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Appendix F-3
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 4 (Source Transect, Perpendicular to Flow)
Lemberger Landfill Sites - MNA 2018 Report



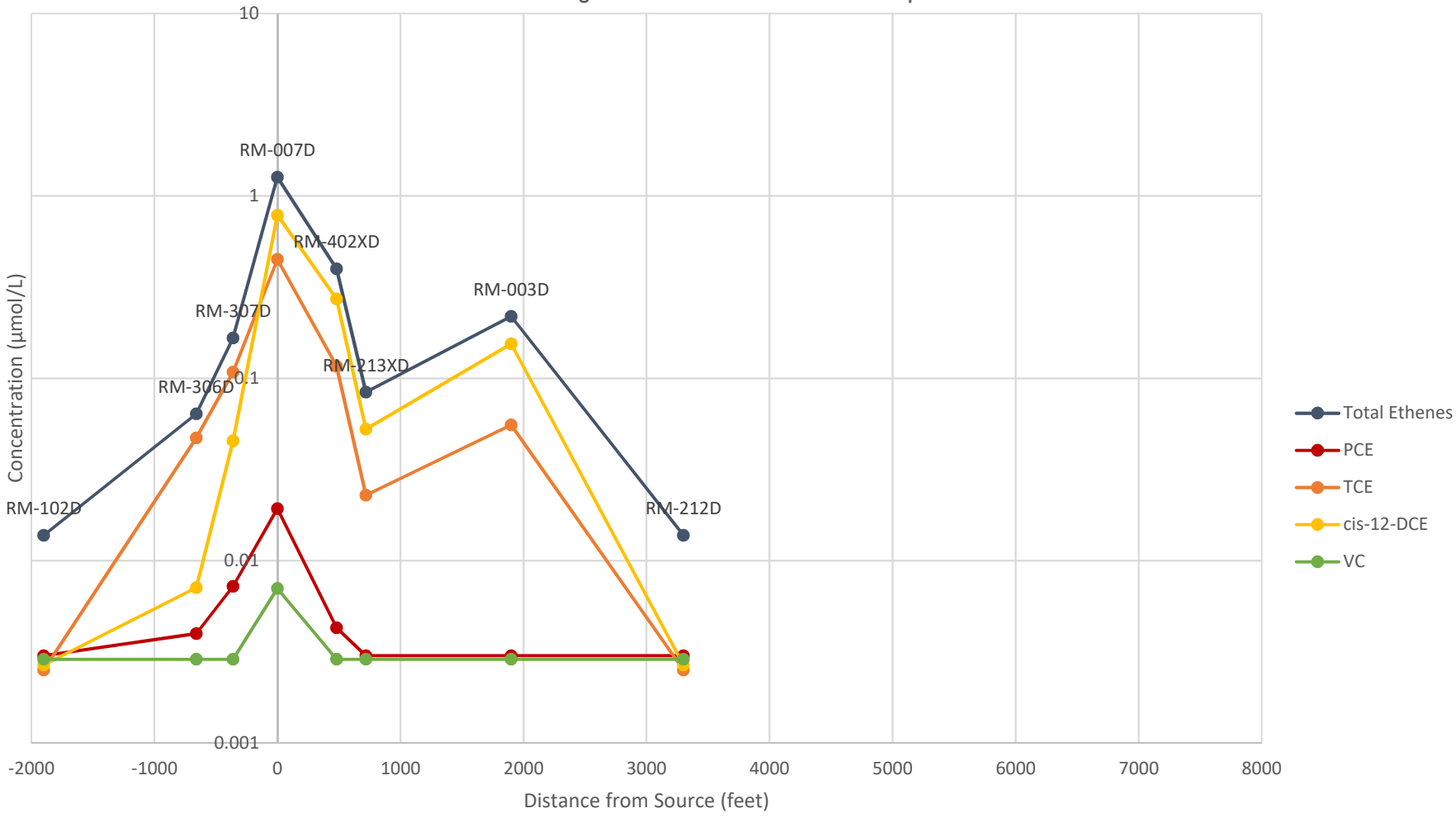
Notes:
"Total Ethanes" is a total of detected concentrations of 111-TCA, 11-DCA, 11-DCE, and CEA. Non-detects were treated as "zero" values for the total ethane calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Appendix F-4
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 2 (Upper Portion of LGS)
Lemberger Landfill Sites - MNA 2018 Report



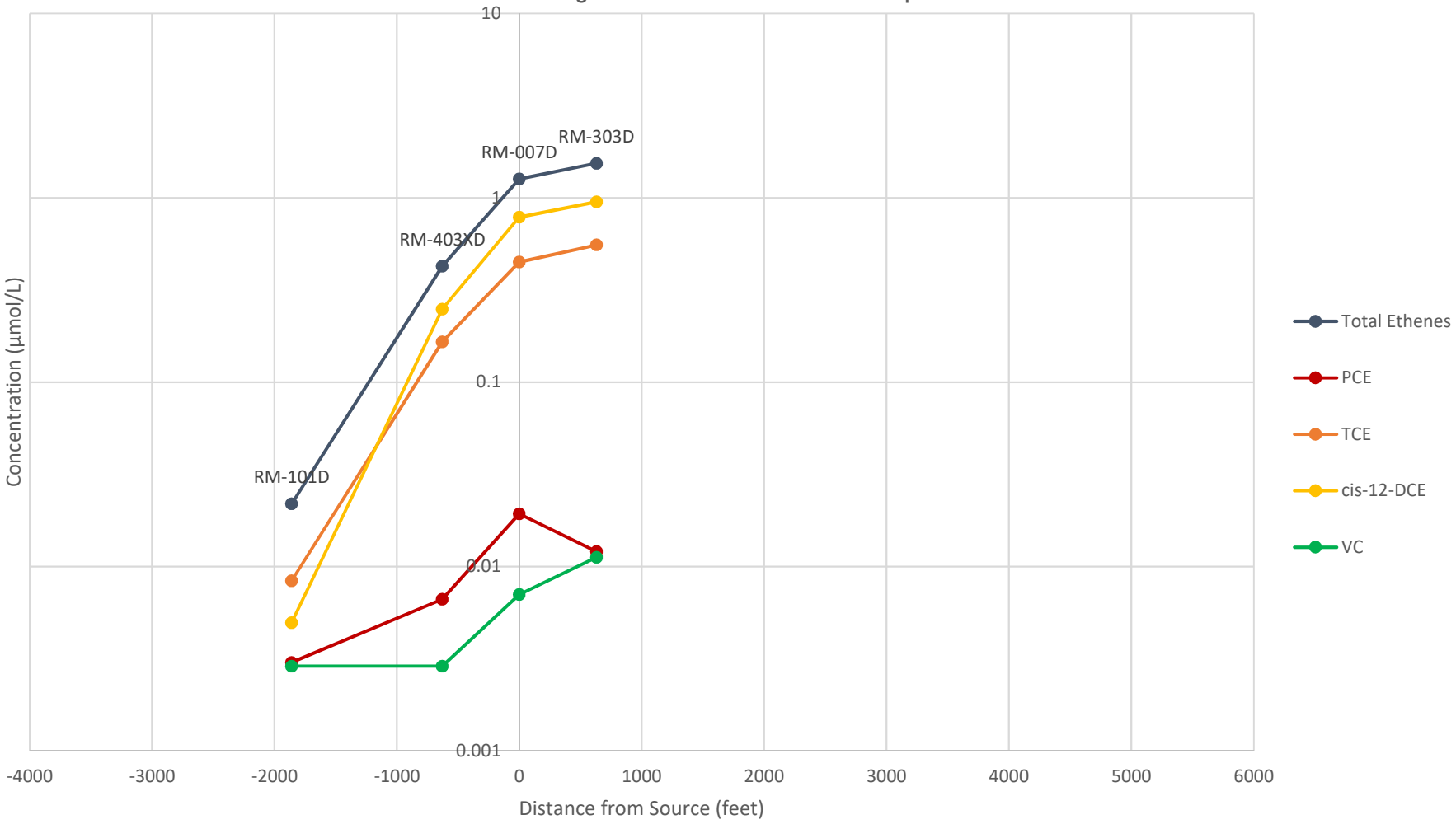
Notes:
"Total Ethenes" is a total of detected concentrations of PCE, TCE, cis-12-DCE, and VC. Non-detects were treated as "zero" values for the total ethene calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Appendix F-5
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 3 (RM3 Direction)
Lemberger Landfill Sites - MNA 2018 Report

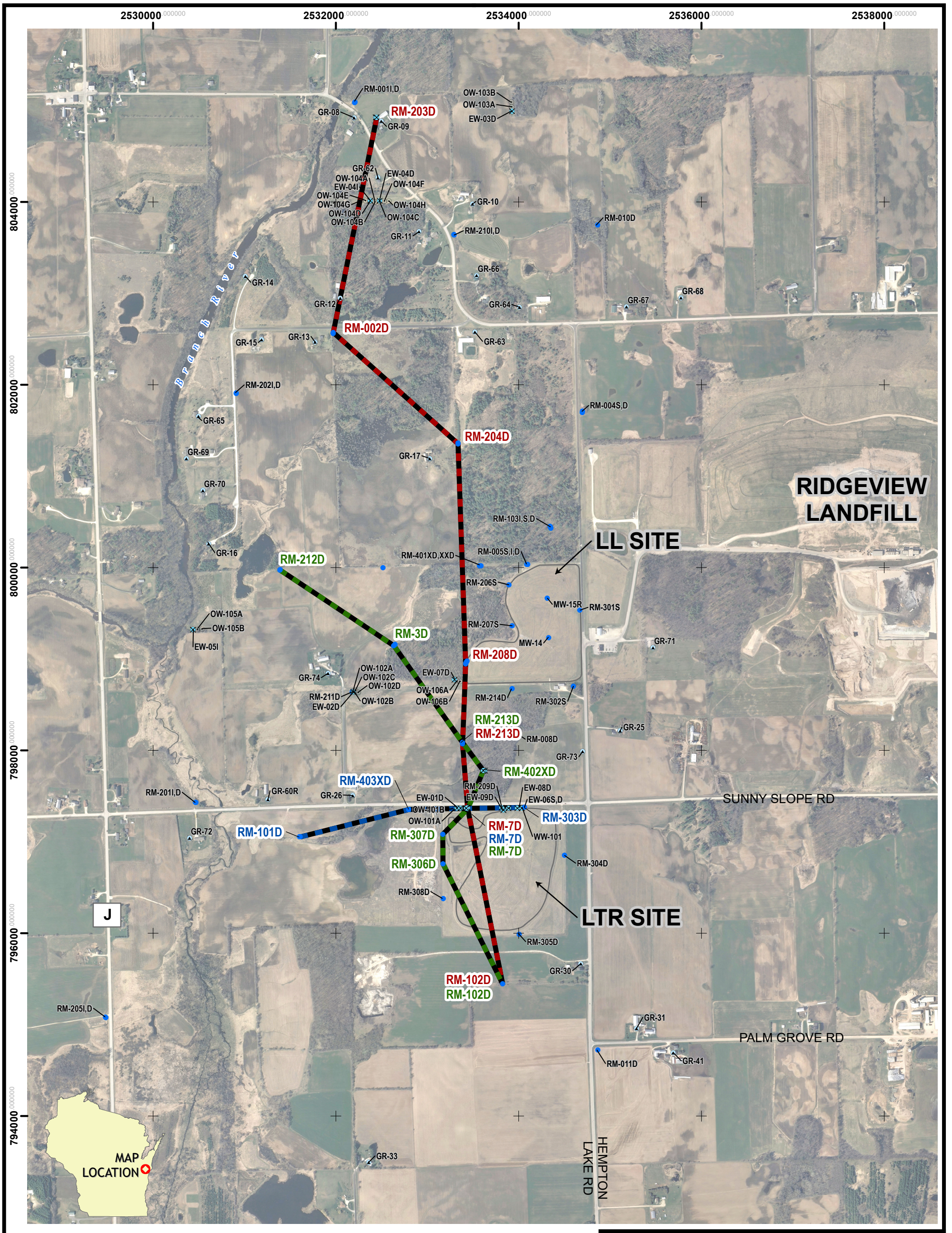


Notes:
"Total Ethenes" is a total of detected concentrations of PCE, TCE, cis-12-DCE, and VC. Non-detects were treated as "zero" values for the total ethene calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.

Appendix F-6
CVOC Concentration vs. Distance
Q3 2017 Data - Profile 4 (Source Transect, Perpendicular to Flow)
Lemberger Landfill Sites - MNA 2018 Report



Notes:
"Total Ethenes" is a total of detected concentrations of PCE, TCE, cis-12-DCE, and VC. Non-detects were treated as "zero" values for the total ethene calculation. For the individual parameter plots, non-detect values were plotted at the detection limit.



LEGEND

SAMPLE AND MONITORING LOCATIONS

- GW EXTRACTION WELL (EW)
- GW OBSERVATION WELL (OW)
- MONITORING WELL (RM)
- RESIDENTIAL WELL (GR)
- LANDFILL AREA
- PROFILE 2
- PROFILE 3
- PROFILE 4

NOTES

1. AERIAL IMAGERY FROM MANITOWOC COUNTY, 2010.
2. MAP COORDINATES ARE WISCONSIN STATE PLANE, SOUTH ZONE, NAD 83, US SURVEY FOOT.
3. PROFILE NOTES:
   PROFILE 2 = UPPER POTRION OF LGS
   PROFILE 3 = RM003 DIRECTION
   PROFILE 4 = SOURCE AREA, PERPENDICULAR TO FLOW

0 1,000 FEET
1 " = 1,000 ' 1:12,000
N

PROJECT:	LEMBERGER SITES TOWN OF FRANKLIN, WISCONSIN 2018 MNA REPORT
SHEET TITLE:	PROFILE LOCATOR PROFILES 2, 3, AND 4

DRAWN BY:	A. REIS	SCALE: AS NOTED	PROJ. NO. 268280-006
CHECKED BY:	M. WESTOVER		FILE NO. 268280-006-027.mxd
APPROVED BY:	J. WEDEKIND	DATE PRINTED:	APPENDIX F-7
DATE:	NOVEMBER 2018		

TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

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Appendix G
BIOCHLOR Details

BIOCHLOR Model Description

G.1 Input Parameters

Site-specific parameters were used in the model where possible, otherwise typical values from the BIOCHLOR User's Manual or other literature values were used, as described below.

G.1.1 Seepage Velocity

An approximate seepage velocity of 325 ft/yr was calculated based on the presence of CVOCs including TCE, 1,1,1-TCA, and 1,1-DCA at downgradient wells RM-203I and RM-203D in the 1996 sample results. Assuming those CVOCs originated from the LTR Site after the period of waste disposal from 1969 to 1976 (RMT, 2004), they would have been transported approximately 7,650 ft from the northern boundary of the LTR Site to the RM-203 wells in 20 to 27 years. For the purpose of the calculation, a mid-range value of 23.5 years was used. The estimated value of 325 ft/yr is effectively a retarded contaminant velocity, however, it is used as a proxy for seepage velocity in the BIOCHLOR model.

Additionally, a seepage velocity of >280 ft/yr was required for the BIOCHLOR model to simulate the presence of chloroethanes detected at RM-203D in 1996, even assuming no biological decay, given the other model input values.

G.1.2 Dispersion

- **Alpha x (longitudinal dispersivity)** – 52.6 ft, calculated using the modified Xu and Eckstein method with a plume length of 7,650 ft measured from the edge of the LTR to the Branch River following an approximate groundwater flow path (Xu and Eckstein, 1995; Al-Suwaiyan, 2006).
- **Alpha y/alpha x (ratio of transverse to longitudinal dispersivity)** – 0.1, as suggested in BIOCHLOR manual (USEPA, 2000).
- **Alpha z/alpha x (ratio of vertical dispersivity to longitudinal dispersivity)** – 1E-99, as suggested in BIOCHLOR manual to yield a conservative estimate of vertical dispersion (USEPA, 2000).

G.1.3 Adsorption

- **Soil bulk density** – 2.68 kg/L, the mean bulk density of bedrock according to the 2006 Bedrock Investigation Report (RMT 2006b).

- **Fraction organic carbon** – 0.0001, estimated assuming very low levels of organic carbon present in the dolomite bedrock. This value is close to the low end of the typical range suggested in the BIOCHLOR manual (USEPA, 2000).
- **Partition coefficients** – Used water/organic carbon partition coefficient (K_{oc}) values from Pankow and Cherry (1996) where available, otherwise USGS (USDOI, USGS, 2006) values or BIOCHLOR default values (USEPA, 2000).

PARAMETER	PARTITION COEFFICIENT (L/kg)	DATA SOURCE
PCE	364	Pankow and Cherry, 1996 (p. 508)
TCE	126	Pankow and Cherry, 1996 (p. 508)
DCE	86	Pankow and Cherry, 1996, for *cis* isomer (p. 508)
VC	30	BIOCHLOR User's Manual (p. 11)
1,1,1-TCA	152	Pankow and Cherry, 1996 (p. 508)
1,1-DCA	30	Pankow and Cherry, 1996 (p. 508)
CA	56.2	USDOI, USGS, 2006

G.1.4 Biotransformation

These values were adjusted to calibrate the model to analytical data from 2017 Q3. See discussion of model calibration in **Section 4.3**.

G.1.5 General

- **Simulation Time** – 20 years for model calibration, based on the time elapsed between initial groundwater results in 1996/1997 and the most recent results from 2017.
- **Modeled Area Width** – 5000 ft
- **Modeled Area Length** – 7650 ft
- **Zone 1 Length** – 225 ft, based on the halfway point between RM-007D and RM-402XD, the first and second wells along the plume centerline. As discussed earlier, the plume has been characterized as having two different types of degradation conditions: biotic degradation in the source area associated with the degradation of organic material, and aerobic conditions with degradation via abiotic processes in the downgradient portion of the plume. The two zones in the model are used to accommodate this difference in modes of degradation at the Site.
- **Zone 2 Length** – 7425 ft, based on the remaining distance from the end of Zone 2 to the Branch River.

G.1.6 Source Data

- **Source Thickness** – 150 ft in saturated zone, based on the maximum vertical extent of the plume to 190 ft bgs, with a saturated zone starting at about 40 ft bgs.
- **Source Width** – 1430 ft, based on extent of LTR as measured perpendicular to groundwater flow.
- **Source Concentrations** – Source concentrations were based on those from RM-007D in December 1996, with one exception: March 1997 data were used for chloroethane because the December 1996 result was nondetect with a high detection limit (420 µg/L). Source concentrations were assumed to be constant over time.

Ethenes:

- PCE: 7 µg/L
- TCE: 77 µg/L
- cis-1,2-DCE: 180 µg/L
- VC: 1.7 µg/L

Ethanes:

- 1,1,1-TCA: 1600 µg/L
- 1,1-DCA: 440 µg/L
- CA: 68 µg/L µg/L

G.1.7 Analytical Data for Calibration

The model was calibrated using sample results from 2017 Q3 from wells along the approximate plume centerline, as shown below.

WELL	RM-007D	RM-402XD	RM-401XXD	RM-002D	RM-203D
Distance (ft)	0	450	2650	5400	7650
PCE (µg/L)	3.2	0.71	<0.5	<0.5	<0.5
TCE (µg/L)	59	15.3	0.79	2.4	<0.33
cis-1,2-DCE (µg/L)	76.1	26.4	3.1	2.1	<0.26
VC (µg/L)	<0.44	<0.18	<0.18	<0.18	<0.18

WELL	RM-007D	RM-402XD	RM-401XXD	RM-002D	RM-203D
Distance (ft)	0	450	2650	5400	7650
1,1,1-TCA (µg/L)	357	159	3.8	8.4	1.8
1,1-DCA (µg/L)	272	52.7	2.7	8.4	0.42
CA (µg/L)	1.6	1.4	<0.37	<0.37	<0.37

G.2 Method of Model Calibration

The BIOCHLOR model was calibrated to fit the 2017 Q3 data at the centerline wells by adjusting the decay rate parameters incrementally in a manual, iterative process until the best fit of the model was achieved based on a visual assessment. Decay rates were adjusted individually for each CVOC in order from parent products to daughter products. For sample results that were non-detect, the detection limit was used as a point of comparison, and the model was calibrated to predict concentrations that were below the detection limit where non-detect results were present (non-detect results are highlighted on the model output graphs with a yellow circle). In cases where it was not possible to fit the model prediction curve to all the field data points, the model was calibrated to match the highest field results relative to the modeled concentration-distance trend (except for non-detect results). For example, in the ethanes simulations for TCA and DCA, the decay rates were adjusted to match the concentrations detected at RM-203D, even though the resulting model output overpredicted concentrations at some of the closer wells (see **Appendix G**, pages 7-8).

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Lemberger
Ethenes Calibration
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	325.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	52.429	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	2.68	(kg/L)		
FractionOrganicCarbon, foc	1.0E-4	(-)		
Partition Coefficient	Koc			
PCE	364	(L/kg)	1.65	(-)
TCE	126	(L/kg)	1.23	(-)
DCE	86	(L/kg)	1.15	(-)
VC	30	(L/kg)	1.05	(-)
ETH	302	(L/kg)	1.54	(-)
Common R (used in model)* =			**1.23**	

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	5.000		0.79
TCE → DCE	3.500		0.74
DCE → VC	5.200		0.64
VC → ETH	450.000		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.200		
TCE → DCE	0.090		
DCE → VC	0.190		
VC → ETH	12.000		

λ HELP

5. GENERAL

Simulation Time*	20	(yr)
Modeled Area Width*	5000	(ft)
Modeled Area Length*	7650	(ft)
Zone 1 Length*	225	(ft)
Zone 2 Length*	7425	(ft)

L, W

Zone 2=

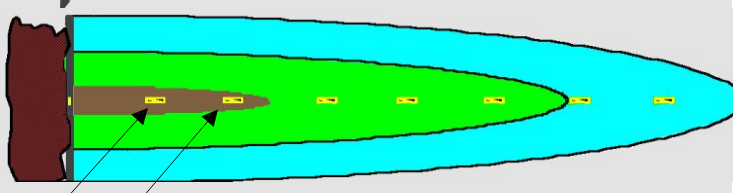
6. SOURCE DATA TYPE: Continuous Single Planar

Source Options

Source Thickness in Sat. Zone* 150 (ft)

	Y1	k_s* (1/yr)
Width* (ft)	1430	
Conc. (mg/L)*	C1	
PCE	.007	0
TCE	.077	0
DCE	.18	0
VC	.002	0
ETH		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	.003	.001	.001	.001	.001						
TCE Conc. (mg/L)	.059	.015	.001	.002	.0						
DCE Conc. (mg/L)	.076	.026	.003	.002	.0						
VC Conc. (mg/L)	0.0	.0	.0	.0	.0						
ETH Conc. (mg/L)											
Distance from Source (ft)	0	450	2650	5400	7650						
Date Data Collected	2017										

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

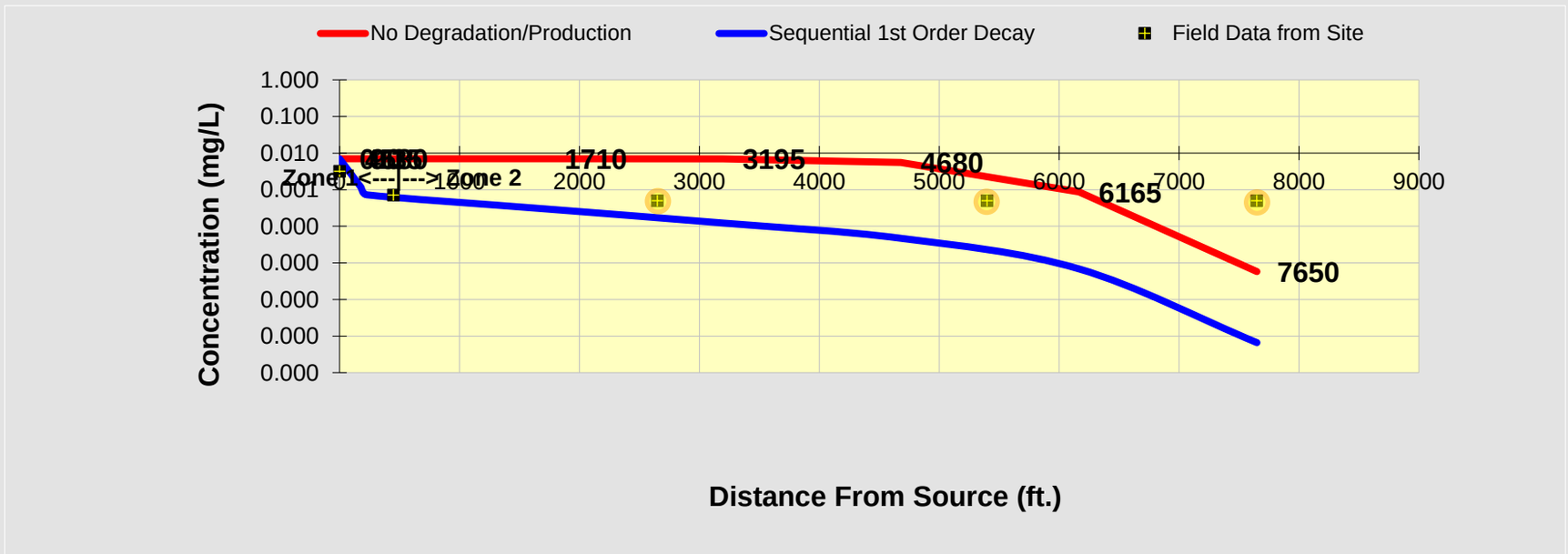
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

PCE	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.001	0.000
Biotransformation	0.0070	0.004	0.003	0.002	0.001	0.001	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	0.003	0.001	0.001	0.001	0.001						



See PCE

See TCE

See DCE

See VC

See ETH

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

= non-detect, plotted at detection limit

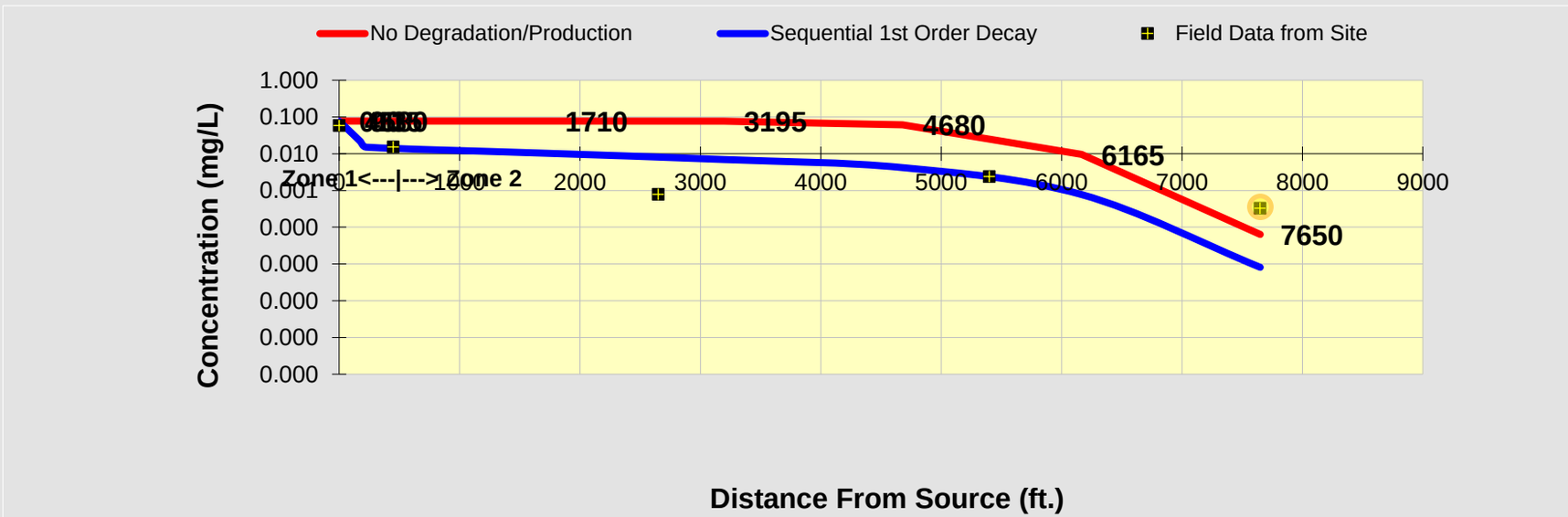
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

TCE	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.061	0.010	0.000
Biotransformation	0.0770	0.056	0.040	0.029	0.021	0.015	0.010	0.007	0.004	0.001	0.000

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	0.059	0.015	0.001	0.002	0.000						



See PCE | See TCE | See DCE | See VC | See ETH

Time:

20.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

= non-detect, plotted at detection limit

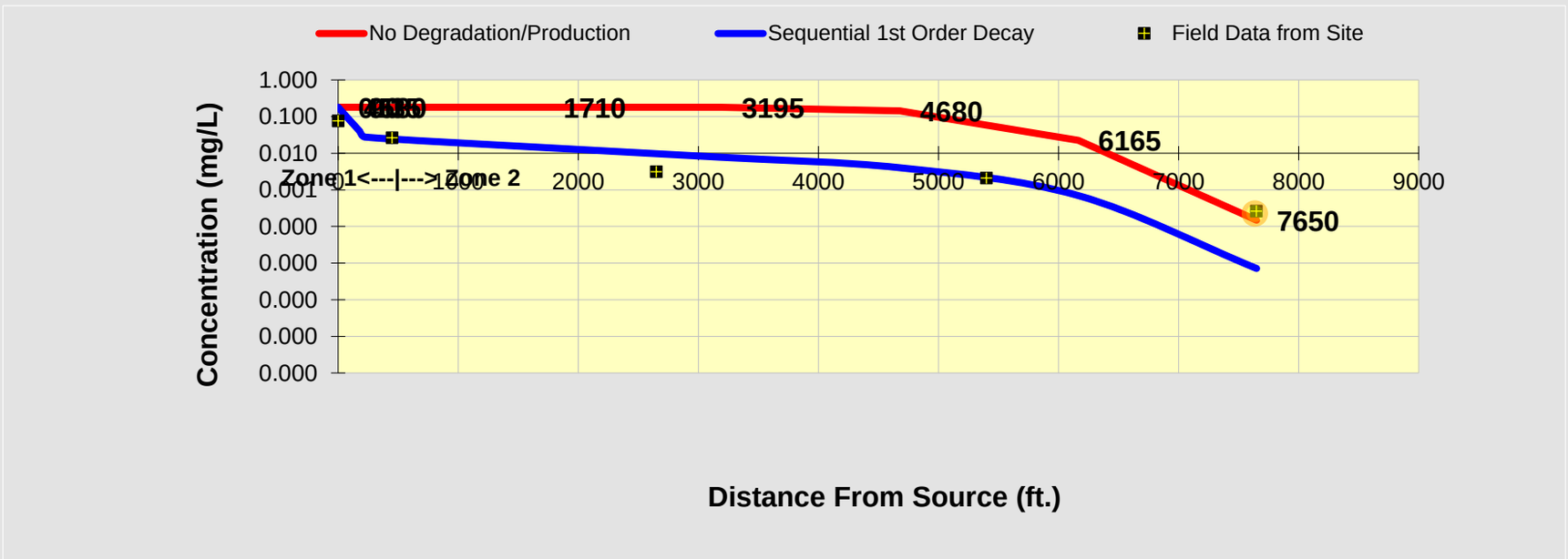
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCE	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.144	0.022	0.000
Biotransformation	0.1800	0.123	0.084	0.058	0.040	0.028	0.014	0.008	0.004	0.001	0.000

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	0.076	0.026	0.003	0.002	0.000						



See PCE

See TCE

See DCE

See VC

See ETH

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

= non-detect, plotted at detection limit

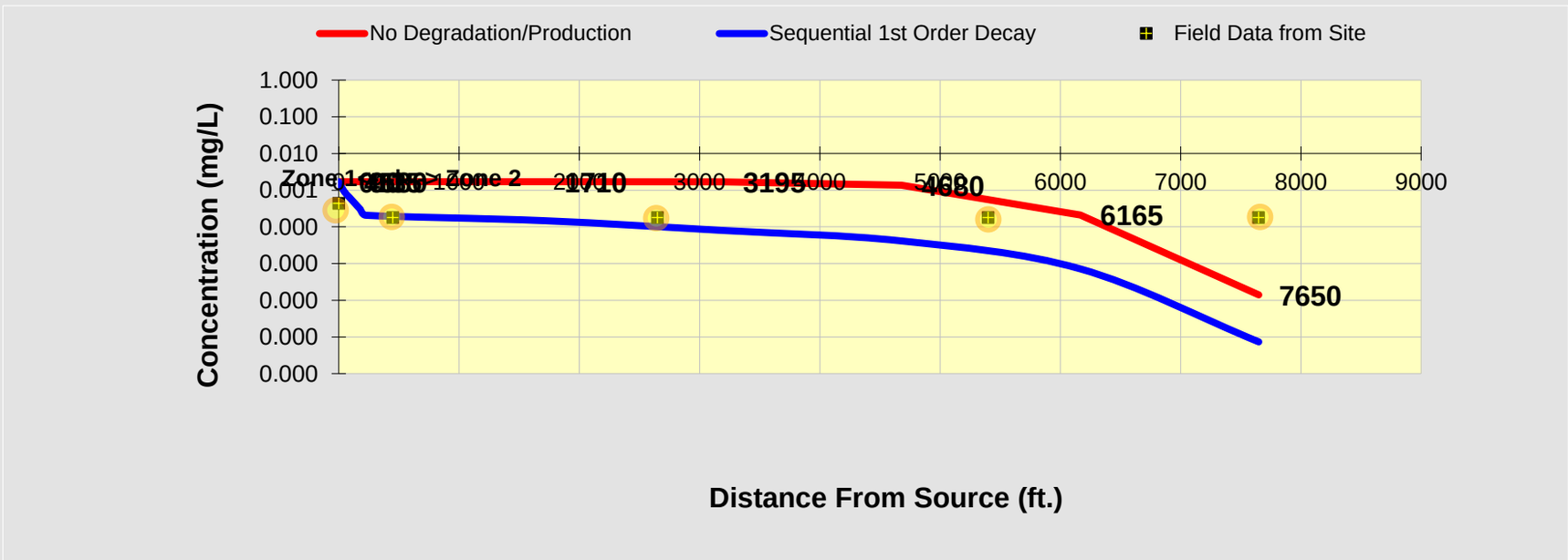
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

VC	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.000	0.000
Biotransformation	0.0017	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	0.000	0.000	0.000	0.000	0.000						



See PCE

See TCE

See DCE

See VC

See ETH

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

= non-detect, plotted at detection limit

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Lemberger
Ethanes Calibration
Run Name

Data Input Instructions:
115 → 1. Enter value directly....or
or ↑ 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation

TYPE OF CHLORINATED SOLVENT: Ethenes ○ Ethanes ●

1. ADVECTION

Seepage Velocity*	Vs	325.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.15	(-)

2. DISPERSION

Alpha x*	52.644	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc.

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	2.68	(kg/L)		
FractionOrganicCarbon, foc	1.0E-4	(-)		
Partition Coefficient	Koc			
TCA	152	(L/kg)	1.27	(-)
DCA	30	(L/kg)	1.05	(-)
CA	56	(L/kg)	1.10	(-)

Common R (used in model)* = 1.10

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1

	λ (1/yr)	half-life (yrs)	Yield
TCA → DCA	4.500		0.74
DCA → CA	13.000		0.65
CA → Ethane	200.000		0.47

Zone 2

	λ (1/yr)	half-life (yrs)
TCA → DCA	0.050	
DCA → CA	0.200	
CA → Ethane	18.000	

λ HELP

5. GENERAL

Simulation Time*	20	(yr)	L
Modeled Area Width*	5000	(ft)	W
Modeled Area Length*	7650	(ft)	
Zone 1 Length*	225	(ft)	
Zone 2 Length*	7425	(ft)	Zone 2=

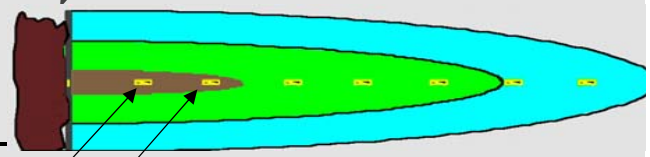
6. SOURCE DATA TYPE: Continuous / Single Planar

Source Options

Source Thickness in Sat. Zone* 150 (ft)

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

	Y1	k_s*
Width* (ft)	1430	
Conc. (mg/L)*	C1	(1/yr)
TCA	1.6	0
DCA	.44	0
CA	.068	0



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

TCA Conc. (mg/L)	.357	.159	.004	.008	.002							
DCA Conc. (mg/L)	.272	.053	.003	.008	.0							
CA Conc. (mg/L)	.002	.001	.0	.0	.0							
Distance from Source (ft)	0	450	2650	5400	7650							
Date Data Collected	2017											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

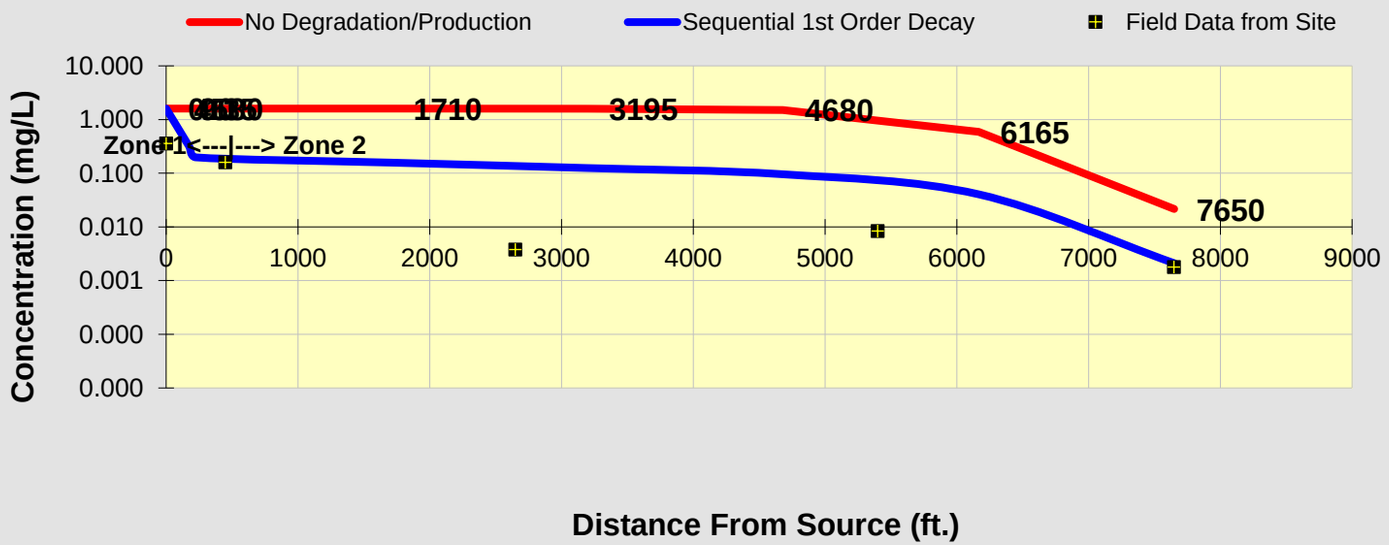
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

TCA	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.60E+00	1.50E+00	5.93E-01	2.16E-02
Biotransformation	1.60E+00	1.05E+00	6.93E-01	4.56E-01	3.00E-01	1.98E-01	1.57E-01	1.25E-01	9.56E-02	4.05E-02	2.11E-03

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	3.57E-01	1.59E-01	3.80E-03	8.40E-03	1.80E-03						



See TCA

See DCA

See CA

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

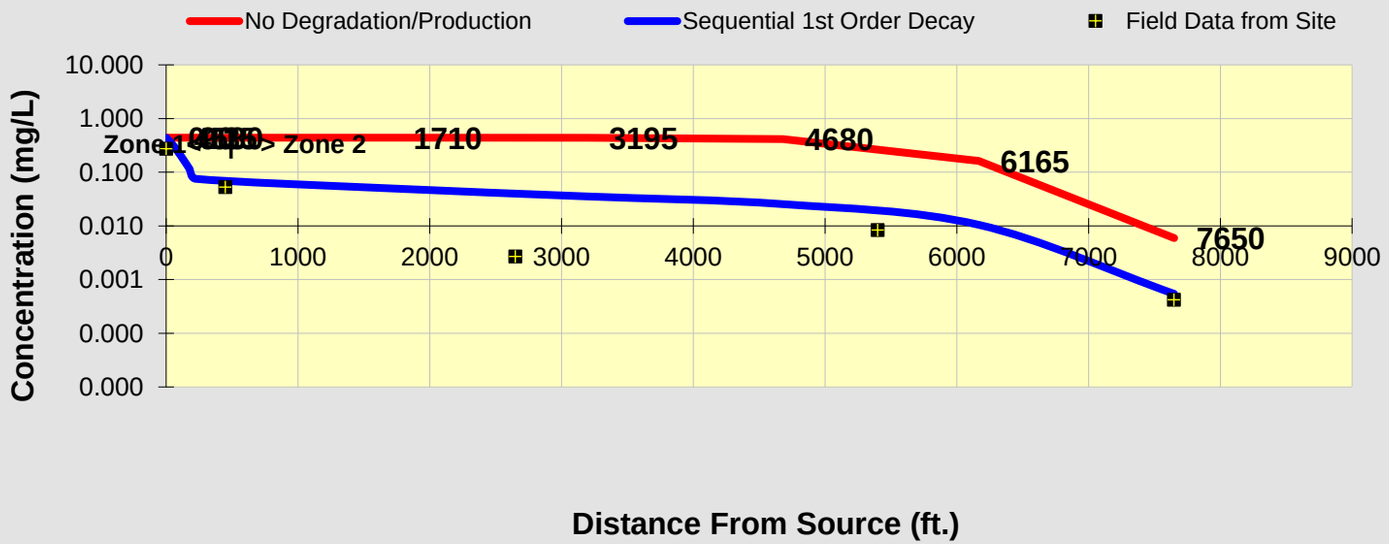
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

DCA	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	4.40E-01	4.40E-01	4.40E-01	4.40E-01	4.40E-01	4.40E-01	4.40E-01	4.40E-01	4.13E-01	1.63E-01	5.93E-03
Biotransformation	4.40E-01	3.36E-01	2.40E-01	1.66E-01	1.12E-01	7.53E-02	4.99E-02	3.54E-02	2.54E-02	1.05E-02	5.43E-04

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	2.72E-01	5.27E-02	2.70E-03	8.40E-03	4.20E-04						



See TCA

See DCA

See CA

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

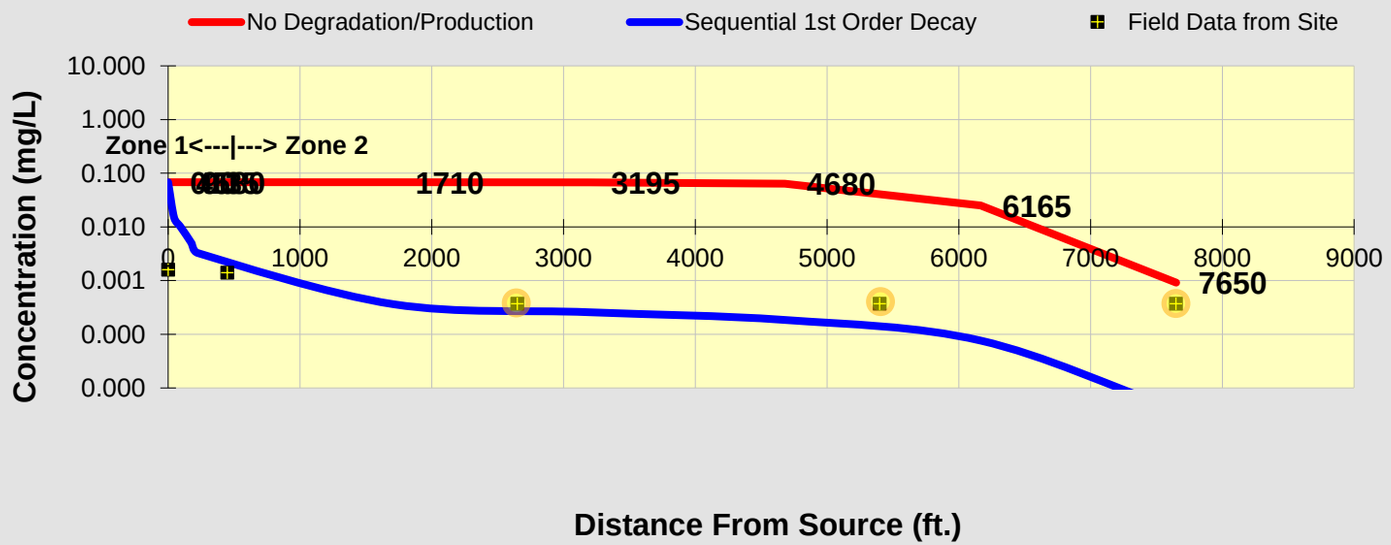
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Distance from Source (ft)

CA	0	45	90	135	180	225	1710	3195	4680	6165	7650
No Degradation	6.80E-02	6.80E-02	6.80E-02	6.80E-02	6.80E-02	6.80E-02	6.80E-02	6.80E-02	6.39E-02	2.52E-02	9.17E-04
Biotransformation	6.80E-02	1.50E-02	1.03E-02	7.16E-03	4.86E-03	3.26E-03	3.63E-04	2.57E-04	1.85E-04	7.64E-05	3.94E-06

Monitoring Well Locations (ft)

	0	450	2650	5400	7650						
Field Data from Site	1.60E-03	1.40E-03	3.70E-04	3.70E-04	3.70E-04						



See TCA

See DCA

See CA

Time:

20.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

○ = non-detect, plotted at detection limit

Attachment 1
CD with Data and Chemstat Files