INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

FISCAL YEAR 2006 ANNUAL PERFORMANCE REPORT

Prepared for:

**Commander
Twin Cities Army Ammunition Plant
4700 Highway 10, Suite A
ATTN: DAIM-BD-TW
Arden Hills, Minnesota 55112-3928**

WENCK ASSOCIATES, INC.

**ALLIANT TECHSYSTEMS INC.
CONESTOGA-ROVERS & ASSOCIATES, INC.
SECOR INTERNATIONAL, INC.**

**September 2007
FINAL REPORT**

Minnesota Pollution Control Agency

520 Lafayette Road North | St. Paul, MN 55155-4194 | 651-296-6300 | 800-675-3843 | 651-282-5332 TTY | www.pca.state.mn.us

August 27, 2007

Mr. Mike Fix
Commander's Representative
Twin Cities Army Ammunition Plant
4700 Highway 10, Suite A
Arden Hills, MN 55112-3928

RE: Consistency Test for the Fiscal Year 2006 Annual Performance Report,
Twin Cities Army Ammunition Plant (TCAAP), Arden Hills, Minnesota

Dear Mr. Fix:

Staff at the Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (U.S. EPA) have completed review of the Fiscal Year 2006 Annual Performance Report (Report). Our review of the Report included the following documents and communications:

- Fiscal Year 2006 Annual Performance Report, Installation Restoration Program, Twin Cities Army Ammunition Plant, Wenck Associates, Inc. February 2007 (Draft Report);
- U.S. EPA comments to the Report dated April 5, 2007;
- MPCA staff comments to the Report dated April 5, 2007;
- Army's responses dated May 11, 2007 to MPCA staff and U.S. EPA comments;
- Comments resolution meeting on May 31, 2007;
- Army redlines dated June 21, 2007 to the Report;
- Meeting among Army, MPCA and U.S. EPA on July 10, 2007 for the TGRS Reporting in Future Annual Performance Reports;
- Additional comments dated July 19, 2007 from MPCA to the redline revisions;
- Army's responses dated July 30, 2007 and August 13, 2007 to the MPCA staff comments;
- E-mail concurrence by MPCA staff dated August 13, 2007 and by U.S. EPA dated August 20, 2007 with the redline changes to the Report.

Based upon MPCA staff and U.S. EPA's review, you are herby advised that, in accordance with Chapter XIV of the Federal Facility Agreement, the TCAAP Plant Fiscal year 2006 Annual Performance Report passes the Consistency Test.

Please feel free to contact Tom Barounis at 312-353-5577 or me at 651-296-7776 if there are questions or you wish additional information.

Sincerely,

Dagmar Romano
Dagmar Romano
Project Manager
Superfund Unit 2
Superfund and Emergency Response Section
Remediation Division

for Dagmar Romano
Tom Barounis
Remedial Project Manager
U.S. Environmental Protection Agency
Region V

DR/TB:csa

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APPENDICES

List of Acronyms

Alliant	-	Alliant Techsystems Inc.
APR	-	Annual Performance Report
Army	-	United States Army
AS/SVE	-	Air Sparging/Soil Vapor Extraction
AWC	-	Area Weighted Concentration
Barr	-	Barr Engineering
BGRS	-	Boundary Groundwater Recovery System
COC	-	Chemical of Concern
CRA	-	Conestoga-Rovers & Associates, Inc.
CRDL	-	Contract Required Detection Limit
DNAPL	-	Dense Non-Aqueous Phase Liquid
DOD	-	Department of Defense
ECV	-	Electrical Control Valve
EE/CA	-	Engineering Evaluation/Cost Analysis
ERIS	-	Environmental Restoration Information System
EW	-	Extraction Well
FFA	-	Federal Facilities Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
GOS	-	TGRS Global Operation Strategy
gpm	-	gallons per minute
HBV	-	Health Based Value
HRC	-	Hydrogen Release Compound
HRL	-	Health Risk Limits
IRA	-	Interim Remedial Action
IRAP	-	Interim Response Action Plan
IRP	-	Installation Restoration Program

List of Acronyms (Cont.)

LUC	-	Land Use Control
LUCIP	-	Land Use Control Implementation Plan
MCES	-	Metropolitan Council Environmental Services
MCLs	-	Maximum Contaminant Levels
MCLGs	-	Maximum Contaminant Level Goals
MDH	-	Minnesota Department of Health
MDL	-	Method Detection Limit
mg/l	-	Milligrams per liter
MOS	-	TGRS Micro Operation Strategy
MPCA	-	Minnesota Pollution Control Agency
MW	-	Monitoring Well
NBCGRS	-	New Brighton Contaminated Groundwater Recovery System
NBM	-	New Brighton Municipal
NPL	-	National Priorities List
O&M	-	Operation and Maintenance
OM	-	Operating Minimum
OS	-	TGRS Operating Strategy
OU	-	Operable Unit
OU1TG	-	OU1 Technical Group
PAR	-	Performance Assessment Report
PCBs	-	Polychlorinated Biphenyls
PGAC	-	Permanent Granular Activated Carbon
PGRS	-	Plume Groundwater Recovery System
PLC	-	Programmable Logic Controller
PM	-	Preventative Maintenance
POTW	-	Publicly-Owned Treatment Works

List of Acronyms (Cont.)

ppb	-	parts per billion
QAPP	-	Quality Assurance Project Plan
RD/RA	-	Remedial Design/Remedial Action
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Records of Decision
scfm	-	Standard Cubic Feet per Minute
SDWA	-	Safe Drinking Water Act
SECOR	-	SECOR International, Inc.
Shaw	-	Shaw Environmental & Infrastructure, Inc. (formerly Stone & Webster)
SVE	-	Soil Vapor Extraction
SW	-	Surface Water
TCAAP	-	Twin Cities Army Ammunition Plant
Tecumseh	-	Tecumseh Professional Associates, Inc.
TGRS	-	TCAAP Groundwater Recovery System
TSCA	-	Toxic Substances Control Act
TWISS	-	Tecumseh/Wenck Installation Support Services
µg/l	-	Micrograms per liter
USAEC	-	United States Army Environmental Center
USEPA	-	United States Environmental Protection Agency
VOC	-	Volatile Organic Compound
Wenck	-	Wenck Associates, Inc.
WWP	-	Wet Well Pump

List of Chemical Abbreviations

Note: The abbreviations below are those that were required for data entry into the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS), which was replaced by the USAEC Environmental Restoration Information System (ERIS) in November 2001. These abbreviations, though not used in ERIS, are still used in some tables and appendices presented in this report.

111TCE	-	1,1,1-Trichloroethane
112TCE	-	1,1,2-Trichloroethane
11DCE	-	1,1-Dichloroethene
11DCLE	-	1,1-Dichloroethane
12DCE	-	1,2-Dichloroethenes (*cis* and *trans* isomers)
12DCLB	-	1,2-Dichlorobenzene
12DCLE	-	1,2-Dichloroethane
12DCLP	-	1,2-Dichloropropane
13DCLB	-	1,3-Dichlorobenzene
14DCLB	-	1,4-Dichlorobenzene
2CLEVE	-	2-Chloroethyl vinyl ether
AG	-	Silver
BRDCLM	-	Bromodichloromethane
C12DCE	-	cis-1,2-Dichloroethene
C13DCP	-	cis-1,3-Dichloropropene
C2H3CL	-	Vinyl chloride
C2H5CL	-	Chloroethane
C6H6	-	Benzene
CCL3F	-	Trichlorofluoromethane
CCL4	-	Carbon tetrachloride
CH2CL2	-	Methylene chloride
CH3CL	-	Chloromethane
CHBR3	-	Bromoform

List of Chemical Abbreviations (Cont.)

CHCL3	-	Chloroform
CLC6H5	-	Chlorobenzene
CU	-	Copper
CYN	-	Cyanide
DBRCLM	-	Dibromochloromethane
EDTA	-	Ethylenediaminetetraacetic Acid
EE/CA	-	Engineering Evaluation/Cost Analysis
ETC6H5	-	Ethylbenzene
HG	-	Mercury
MEC6H5	-	Toluene
P4	-	Phosphorus
PB	-	Lead
SB	-	Antimony
T12DCE	-	trans-1,2-Dichloroethene
T13DCP	-	trans-1,3-Dichloropropene
TCLEA	-	Tetrachloroethane
TCLEE	-	Tetrachloroethene
TCLTFE	-	1,1,2-Trichloro-1,2,2-trifluoroethane
TRCLE	-	Trichloroethene
XYLEN	-	Xylenes
ZN	-	Zinc

1.0 Executive Summary

This Fiscal Year 2006 (FY 2006) Annual Performance Report:

- Summarizes the status of remedy implementation; and
- Addresses how the remedies are performing,

for each of the three operable units related to the Twin Cities Army Ammunition Plant (TCAAP). Fiscal Year 2006 is defined as the period from October 1, 2005, through September 30, 2006.

Records of Decision (RODs) have been signed for each of the three operable units (OUs):

- OU1 ROD signed September 1993, Amended May 2006
- OU2 ROD signed October 1997
- OU3 ROD signed September 1992, Amended July 2006

The RODs present the major components of the final remedies for the media of concern. This report looks at each of the major components and addresses:

1. *Are the remedies being implemented? (Compliance check with the RODs and ROD Amendments)*
2. *Are the remedies doing what they are supposed to?*

Table 1-1, at the end of this section, summarizes the status of remedial actions at the end of FY 2006. Following are highlights of the accomplishments for each operable unit.

Operable Unit 1 (OU1): Deep Groundwater

OU1 consists of the "north" plume of Volatile Organic Compound (VOC) groundwater contamination off the TCAAP installation. The final remedy for OU1 consists of pumping three primary municipal wells (New Brighton Municipal wells NBM #4, #14, and #15) and treating the extracted groundwater through the Permanent Granular Activated Carbon (PGAC) system. Treated water is piped to the New Brighton water supply system for distribution as potable water. Other remedy components include providing alternate water supply and/or well abandonment to affected private wells, and drilling advisories for new well construction. Highlights for FY 2006 are:

- The Minnesota Department of Health (MDH) Special Well Construction Area remains in effect. The MDH has the regulatory responsibility to assure that wells constructed in the advisory area meet appropriate well construction and human health requirements. In FY 2006, there were no new recommendations for abandonment or alternate water supply needed.
- In June 2006, the United States Environmental Protection Agency (USEPA) and the Minnesota Pollution Control Agency (MPCA) signed the OU1 ROD Amendment. The ROD amendment formalized the use of the statistical analysis of groundwater quality trends included in the Annual Performance Reports since FY 2003. The amended ROD requires demonstration of decreasing contaminant trends and a stable or shrinking geographic plume extent using the statistical analysis developed by the OU1 Technical Group (OU1TG) in 2003.

Highlights of the OU1 remediation activities are:

- The PGAC treated 1.44 billion gallons of water and removed 709 pounds of VOCs during FY 2006. Approximately 18,909 pounds of VOCs have been removed since system startup.

- The effluent of the PGAC was in compliance with the applicable Safe Drinking Water Act criteria for the OU1 chemicals of concern.
- The treated groundwater was beneficially used in the New Brighton and Fridley municipal water supply systems.
- The overall chemical monitoring data, using the statistical analysis as developed by the OU1TG, indicate that aquifer restoration is occurring and that the extent and magnitude of contamination in the Prairie du Chien aquifer are stable or improving.

Operable Unit 2 (OU2): On-Site Contamination

OU2 is defined as the original TCAAP property, including the groundwater beneath it. The OU2 ROD, which was signed in December 1997, documents the final remedies. ROD Amendments are being prepared for individual sites within OU2. The ROD Amendments await resolution of land use controls related to the re-development portions of TCAAP.

Highlights for activities within OU2 during FY 2006 are:

- Shallow Soil Sites
  - Closeout Reports for Sites A (including VOC-contaminated soils), E, H, 129-3, 129-5, and 129-15 (which received regulatory approval prior to FY 2005) continued to await final consistency based on resolution of land use controls.
  - Groundwater monitoring at the shallow soil sites showed no contaminant concentrations of concern. FY 2007 is expected to be the last year (the final of the required 5 years) of groundwater monitoring at these sites.
  - In FY 2004, the Minnesota Pollution Control Agency (MPCA), USEPA, and Army agreed to incorporate the shallow groundwater response action at Site C into the TCAAP Federal Facilities Agreement (FFA). The groundwater contamination was an inadvertent result from a demonstration project for phytoremediation of soils. In 2006, the groundwater extraction system

extracted 637,707 gallons of groundwater and removed 2.42 pounds of lead. The total lead mass removed is 101.6 pounds. The monitoring requirements for demonstrating containment were met. A ROD Amendment is anticipated.

- Deep Soil Sites
  - The Site D Closeout Report received regulatory approval (in FY 2004), but final consistency will not be provided until concurrence of the land use control section of the report is reached between the Army and the regulators. A modification to the OU2 ROD documenting the remedy selection for Site D shallow soils was being prepared at the end of FY 2006.
  - Cover construction was completed over the Site G dump in early FY 2004. The Site G Closeout Report received regulatory approval (in FY 2004), but final consistency will not be provided until concurrence of the land use control section of the report is reached between the Army and the regulators. A modification to the OU2 ROD documenting the remedy selection for Site G was being prepared at the end of FY 2006.

- Site A Shallow Groundwater
  - Four extraction wells continued to provide containment and mass removal.
  - The system pumped at an average rate of 16.8 gallons per minute (gpm), just above the 15 gpm target rate.
  - The system removed approximately 3.95 pounds of VOCs during FY 2006, with a cumulative mass removal of 48.78 pounds since system start-up on May 31, 1994.
  - The extracted water was discharged to the sanitary sewer system in compliance with all discharge criteria.
  - Overall, the groundwater extraction system has reduced contaminant concentrations in groundwater. The area where chemicals of concern exceed cleanup levels is between monitoring well 01U108 (source area) and 01U126

for tetrachloroethene. Extraction wells 01U352 and 01U353 were just below the cleanup standard for cis-1,2-dichloroethene for the first time.

- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 2006. USEPA requested monitoring four additional wells (01U632, 01U666, 01U667, and 01U668) during FY 2004. Monitoring wells 01U632 and 01U667 were sampled in FY 2006; attempts to sample wells 01U666 and 01U668 will continue in FY 2007. Five of the twelve wells scheduled for sampling were dry.
  - A Five-Year Review was performed during FY 2004. The review concluded that the remedy was functioning as intended, and that the components of the remedy remain protective of human health and the environment.

- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 6,053,220 gallons of water and maintained a continuous zone of capture downgradient of Building 103. A total of 17.4 pounds of VOCs were removed in FY 2006.
  - The extracted water was treated and discharged to Rice Creek in compliance with all discharge criteria.
  - A Five-Year Review was performed during FY 2004. The review concluded that the remedy was functioning as intended, and that the components of the remedy remain protective of human health and the environment.

- Deep Groundwater
  - The TCAAP Groundwater Recovery System (TGRS) operated in accordance with the OU2 ROD.
  - The TGRS operated at a rate sufficient to support the conclusion that the 5-μg/l TRCLE contour is hydraulically contained. In FY 2006, the total extraction well water pumped averaged 1,769 gpm, greater than the Global Operation Strategy (GOS) Operating Minimum (OM) (1,745 gpm).
  - In FY 2006, the TGRS extracted approximately 929,715,560 gallons of water. The mass of VOCs removed was 2,552 pounds and is slightly less than that achieved in FY 2005. The total VOC mass removed by the TGRS through FY 2006 is 194,483 pounds.
  - The TGRS Operating Strategy (OS) was approved by the regulatory agencies and finalized in FY 2003 with the latest modification (#3) implemented in 2004. The OS presents a Global Operation Strategy (GOS) for the entire TGRS extraction system and a Micro Operation Strategy (MOS) for well groups.
  - Groundwater analytical data of the source area shows a general decrease in TRCLE concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer.
  - Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

<u>Operable Unit 3 (OU3): Deep Groundwater</u>

- A ROD Amendment was finalized in August 2006 that eliminates the requirement for groundwater extraction and treatment by the Plume Groundwater Recovery System (PGRS).
- Groundwater monitoring in FY 2006 was limited to five wells during this annual event. Overall, based on the limited data collected in FY 2006, the statistical evaluation showed the

South Plume is decreasing in concentration at its center and stable at its edge. In addition, there is evidence of the North Plume commingling with the South Plume at the boundary between the two plumes.

Building 102 Groundwater Monitoring

FY 2006 is the first year that the monitoring data from the Building 102 VOC plume is included in the Annual Performance Report (APR). Building 102 is not part of the OU2 ROD or Quality Assurance Project Plan (QAPP), so there are no specific requirements for the Site. Quarterly monitoring was started in June 2006 to begin creating a groundwater database on the Unit 1 VOC plume at Building 102. An Engineering Evaluation/Cost Analysis (EE/CA) and QAPP are scheduled for 2007 to address the monitoring and remedial requirements at this Site.

Voluntary Rice Creek Sampling

In FY 2007, the Army will discontinue the voluntary monitoring of Rice Creek as it enters and leaves TCAAP (see Appendix I). Sampling has been conducted since before 1990. The purpose of this sampling was to establish a set of baseline data for Rice Creek. This objective has been achieved to the Army's satisfaction. There have been no data of concern resulting from this sampling effort.

Table 1-1

Status of Remedial Actions: FY 2006

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 1: Deep Groundwater					
#1:	Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#2:	Drilling Advisories	Yes	Yes	No	
#3:	Extracting Groundwater from the North Plume using the NBCGRS	Yes	Yes	No	Item 3 modified based on OU1 ROD Amendment completed in 2006
#4:	Removal of VOCs by GAC (Discharge Quality)	Yes	Yes	No	
#5:	Discharge of Treated Water	Yes	Yes	No	
#6:	Groundwater Monitoring	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	
Operable Unit 2: Shallow Soil Sites					
#1-7:	Soil Remediation				
	Site A	Yes	Yes	Partially	Closeout Report for metals was partially approved; however, see Note 1 at the end of the OU2 section of this table. See OU2 Site A Shallow Groundwater (below) for status on VOC soils.
	Site C	Yes	Partially	No	The system is operating under the existing agreements with the MPCA. A ROD amendment to include the groundwater remediation under OU2 was in progress at the end of FY2006.
	Site E	Yes	Yes	Partially	Closeout Report was partially approved; however, see Note 1 at the end of the OU2 section of this table.

Table 1-1 (continued)

Status of Remedial Actions: FY 2006

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Shallow Soil Sites (continued)				
#1-7: Soil Remediation (continued)				
Site H	Yes	Yes	Partially	Closeout Report was partially approved; however, see Note 1 at the end of the OU2 section of this table.
Site 129-3	Yes	Yes	Partially	Closeout Report was partially approved; however, see Note 1 at the end of the OU2 section of this table.
Site 129-5	Yes	Yes	Partially	Closeout Report was partially approved; however, see Note 1 at the end of the OU2 section of this table.
#8: Groundwater Monitoring	Yes	Yes	No	The 5-year monitoring was started in FY 2003, and will tentatively end in FY 2007.
#9: Characterization of Dumps:				
Site B	Yes	Yes	Yes	
Site 129-15	Yes	Yes	Partially	Closeout Report was partially approved in FY 2003; however, see Note 1 at the end of the OU2 section of this table. A modification to the ROD was being prepared at end of FY 2004.
Overall Remedy	Yes	Yes	Partially	

Note 1: Closeout report has been approved, but final consistency will not be provided until concurrence on the land use control section of the report has been reached between the Army and the regulators.

Table 1-1 (continued)

Status of Remedial Actions: FY 2006

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Soil Sites					
#1:	Groundwater Monitoring	Yes	Yes	No	
#2:	Restrict Site Access	Yes	Yes	No	
#3:	SVE Systems (Deep)	NA	NA	Partially	Deep SVE systems will not be required at Sites D or G. The Site D VOC Closeout Report received consistency in FY 2002. The Site G VOC Closeout Report is in progress.
#4:	Enhancements to SVE Systems	NA	NA	Yes	Neither system required operation with enhancements. The Site D SVE system was dismantled in FY 2001. The Site G SVE was dismantled in FY 2003.
#5:	Maintain Existing Site Caps	Yes	Yes	No	
#6:	Maintain Surface Drainage Controls	Yes	Yes	No	
#7:	Characterize Shallow Soils and Dump	Yes	Partially	No	For Site D and G, a Closeout Report and a modification to the ROD were under review at the end of FY 2006. For Site G, cover construction was completed in FY 2004.
Overall Remedy		Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2006

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site A Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Groundwater Containment/Mass Removal	Yes	Yes	No	
#3: Drilling Advisory/Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#4: Discharge of Extracted Water	Yes	Yes	No	
#5: Source Characterization/Remediation	Yes	Yes	No	SVE system operation was ceased near the end of FY 2002, due to minimal VOC removal rates. In FY 2003, a work plan to excavate the contaminated soil received regulatory approval. The SVE system was removed and 688 cubic yards of contaminated soil were excavated and transported off-site for disposal. A Closeout Report for the Former 1945 Trench soils received regulatory approval in FY 2004.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2006

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site I Shallow Groundwater					
#1:	Groundwater Monitoring	Yes	Yes	No	
#2:	Groundwater Extraction	No	No	No	Pilot study determined that extraction remedies are not feasible. An amendment to the OU2 ROD is being pursued to change to a monitoring based remedy.
#3:	POTW Discharge	No	No	No	See above.
#4:	Additional Investigation	NA	NA	No	See above.
Overall Remedy		NA	NA	No	See above.
Operable Unit 2: Site K Shallow Groundwater					
#1:	Groundwater Monitoring	Yes	Yes	No	
#2:	Sentinel Wells	Yes	Yes	NA	
#3:	Hydraulic Containment	Yes	Yes	No	
#4:	Groundwater Treatment	Yes	Yes	No	
#5:	Treated Water Discharge	Yes	Yes	No	
#6:	Discharge Monitoring	Yes	Yes	No	
#7:	Additional Investigation	Yes	Yes	Yes	Well 03U621 was added as a sentinel well and is sampled annually, as listed in the monitoring plan
Overall Remedy		Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2006

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Groundwater					
#1:	Hydraulic Containment and Contaminant Mass Removal	Yes	Yes	No	
#2:	Groundwater Treatment	Yes	Yes	No	
#3:	Treated Water Discharge	Yes	Yes	No	
#4:	Institutional Controls	Yes	Yes	No	
#5:	Review of New Technologies	Yes	Yes	No	
#6:	Groundwater Monitoring	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	
Operable Unit 3: Deep Groundwater					
#1:	Monitored Natural Attenuation	Yes	Yes	No	
#2:	Groundwater Monitoring	Yes	Yes	No	
#3:	Drilling Advisories	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	

2.0 Introduction

2.1 PURPOSE

This Fiscal Year 2006 Annual Performance Report is intended to:

- Summarize the status of remedy implementation; and
- Address how the remedies are doing,

for remedial actions at the New Brighton/Arden Hills Superfund Site. Fiscal Year 2006 (FY 2006) extended from October 1, 2005, through September 30, 2006.

For purposes of remediation, the areas contaminated by activities at TCAAP have been divided into three areas designated “Operable Units.” Operable Unit 1 (OU1) encompasses the deep groundwater “North Plume” of off-TCAAP contaminated groundwater. Operable Unit 2 (OU2) includes all soil, sediment, surface water, and groundwater contamination on the original TCAAP property. OU2 also includes the shallow Site A plume that extends off the north end of TCAAP in the Unit 1 aquifer. Operable Unit 3 (OU3) consists of the deep groundwater “South Plume” of off-TCAAP contaminated groundwater.

The report addresses remedial actions for the following media as prescribed in the Record of Decision (ROD) for each Operable Unit:

- Operable Unit 1
  - Deep Groundwater

- Operable Unit 2
  - Shallow Soil Sites
  - Deep Soil Sites
  - Site A Shallow Groundwater
  - Site I Shallow Groundwater
  - Site K Shallow Groundwater
  - Deep Groundwater

- Operable Unit 3
  - Deep Groundwater

In addition, the response action for shallow groundwater at Site C has been included since the FY 2004 report. The remedial action started under the regulatory framework of a State enforcement action. In April 2004, it was agreed to conduct further actions under the framework of the TCAAP Federal Facilities Agreement. The parties anticipate a future amendment to the OU2 ROD addressing the remedy selection for groundwater, surface water, soil, and sediment at Site C.

Also, FY 2006 is the first year the monitoring data from the Building 102 VOC plume is included in the APR (see Section 13.0). Building 102 is not part of the OU2 ROD or QAPP, so there are no specific requirements for the Site. Quarterly monitoring was started in June 2006 to begin creating a groundwater database on the VOC plume. An EE/CA and QAPP are scheduled for 2007 to address the monitoring and remedial requirements at this Site.

Monitoring activities and submittal of this report are in fulfillment of the Federal Facilities Agreement (FFA) signed August 12, 1987, between the United States Army (Army), United States Environmental Protection Agency (USEPA), and Minnesota Pollution Control Agency (MPCA). These parties agreed to minor modifications to the FFA on:

- October 12, 1990
- February 5, 1992
- March 3, 1992
- November 23, 1993
- January 9, 1998
- May 12, 1998
- June 30, 1998

The requirements have been fulfilled for FFA Attachment 2 (Interim Remedial Actions), Attachment 3 (Remedial Investigation), and Attachment 4 (Feasibility Study). Activities are now geared towards fulfilling the requirements of FFA Attachment 5 (Remedial Design and Remedial Action).

Assessment of performance is answered with two questions:

1. *Are all of the remedies being implemented? (Compliance check with the RODs and ROD Amendments)*
2. *Are the remedies doing what they are supposed to?*

To address these two questions, this report is broken into the three Operable Units. Using each ROD, the report is broken down to the major components of the selected remedy for each of the media described previously. Performance standards are then presented for each of the major remedy components. The performance standards are the "what they are supposed to" part of the question, "Are the remedies doing what they are supposed to?" The performance standards are the yardstick against which performance is measured, and are used to determine when a remedy component has been successfully implemented and/or completed.

For some of the remedy components, the performance standards are clearly defined in the RODs (e.g., soil or groundwater cleanup levels). For other remedy components (e.g., alternate water supply) the performance standards are less clear in the RODs, but may have been agreed to through Work Plans or design documents.

With the performance standards identified, this report then addresses the two questions described above, often through a series of sub-questions. The questions are written in the text in an attempt to make the report focused, streamlined, and user friendly. To the extent possible, answers are in the form of pictures (figures, graphs, etc.) versus words.

In addition to the performance evaluation, another objective of making the report focused is to make the monitoring program focused and efficient. With specific questions identified, it is easier to develop the monitoring needs. In addition to reporting on FY 2006, this document presents proposed monitoring for future years (Appendix A). Monitoring locations or frequencies that are new in this year's report are shown in red color. The monitoring plan shows FY 2006 through FY 2010. The FY 2006 monitoring plan indicates the work that generated the results presented in this report. The FY 2007 monitoring plan is in progress. The monitoring plan covers a moving 5-year time span (i.e., next year FY 2006 will drop off and FY 2011 will be added).

This report represents the collaboration of work performed by the Army and Alliant Techsystems Inc. (Alliant). On behalf of the Army, Wenck Associates, Inc. (Wenck) prepared Sections 2.0 through 6.0, and 11.0 of this report. On behalf of Alliant, SECOR International, Inc. (SECOR) prepared Sections 7.0, 8.0, and 10.0, and Conestoga-Rovers & Associates, Inc. (CRA) prepared Section 9.0. Wenck, SECOR, and CRA all contributed to Section 1.0.

2.2 SITE DESCRIPTION

The Twin Cities Army Ammunition Plant is a government-owned facility located in the northern portion of the Minneapolis – St. Paul metropolitan area, in Ramsey County, and is surrounded by the cities of New Brighton, Arden Hills, Mounds View, and Shoreview, Minnesota (Figure 2-1). For purposes of the TCAAP restoration program, the facility occupied approximately a four square mile area (approximately 2,370 acres) immediately east of U.S. Interstate Highway 35W and north of Ramsey County Highway 96 (i.e., this was the original TCAAP boundary). Alliant has been the prime tenant on the installation; however, they discontinued manufacturing operations at TCAAP in 2004. Wenck Associates, Inc. was the contracted operator for environmental support in FY 2006.

TCAAP was constructed between August 1941 and January 1943, and formerly included 323 buildings with associated utilities and services to support production activities. TCAAP produced small-caliber ammunition and related materials, proof-tested small-caliber ammunition and items as required, and handled/stored strategic and critical materials for other government agencies. Production began in 1941 and then alternated between periods of activity and standby. The size of TCAAP has periodically shrunk as a result of property transfers. Most recently, between 2000 and 2002, approximately 1,521 acres were reassigned to the National Guard Bureau. Additional portions of the original TCAAP have been determined to be surplus to the needs of the federal government and are in the process of being transferred out of federal control.

During periods of activity, solvents were utilized as part of the manufacturing process. Disposal of solvents and other wastes at the TCAAP site resulted in soil contamination and also groundwater contamination, which has migrated beyond the site boundary. Groundwater contamination was first discovered in July 1981, and the site was placed on the National Priorities List (NPL) in 1983.

A number of known and potential contaminant source areas have been identified on the TCAAP property: Sites A, B, C, D, E, F, G, H, I, J, K, 129-3, 129-5, 129-15, and Building 102 (see Figure 2-2 for locations). Site F was remediated and Site J was determined not to have a release prior to the 1997 OU2 ROD, while the remaining sites are addressed in the OU2 ROD. Surface water and sediment on TCAAP are being addressed separately from the OU2 ROD.

Five other sites (the Grenade Range, the Outdoor Firing Range, the Trap Range, and the 135 and 535 Primer/Tracer Areas) are being addressed as Removal Actions separate from the OU2 ROD.

2.3 HYDROGEOLOGIC UNITS AND WELL NOMENCLATURE

On- and off-post wells have been installed in four hydrogeologic units beneath the site: Unit 1 through Unit 4. Descriptions of these four units are presented in Appendix B, along with a description of the nomenclature system used for well designations (e.g., 03U704). A well-designation cross-reference guide (sorted two different ways) is included in Tables B-1 and B-2 in Appendix B. The well index lists wells of concern, including the TCAAP designation, Minnesota unique number, and any other name(s) the wells may have. Locations of wells that are included in the TCAAP monitoring plan are shown on Figure B-2 (off-TCAAP wells) and Figure B-3 (on-TCAAP wells) in Appendix B (on the included CD). With a known well name, the location of that well can be determined using the "Edit, Find" or "Edit, Search" function and typing in the well name, which will highlight the desired well name on the figure. Available well logs can be viewed by selecting the well of interest in Table B-3 (on-TCAAP wells) and Table B-4 (off-TCAAP wells) in Appendix B (click on the well name with the mouse).

See the instructions on the attached CD for more information on using Appendix B.

2.4 DATA COLLECTION, MANAGEMENT, AND PRESENTATION

Performance monitoring data was collected in accordance with the:

- FY 2006 Monitoring Plan for Groundwater Monitoring Wells
- FY 2006 Monitoring Plan for Remedial Treatment Systems
- FY 2006 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

Data was collected principally by four parties: Wenck on behalf of the Army, SECOR, and CRA on behalf of Alliant, and Barr Engineering on behalf of the City of New Brighton. Appendix C presents information on data collection, management, and presentation. Tables showing FY

2006 data are presented following the text at the end of each section in which it is referenced. The comprehensive groundwater level and groundwater quality databases from 1987 to present are contained in Appendix D.1. Groundwater quality trend graphs for the primary chemical of concern (trichloroethene) can be viewed by selecting the well of interest on Figure B-2 (off-TCAAP wells) and B-3 (on-TCAAP wells) in Appendix B (click on the well name with the mouse). The trend graphs for Site A also include tetrachloroethene and cis-1,2-dichloroethene, in addition to trichloroethene.

Is the data complete and representative (are we making decisions based on complete and technically-sound information)?

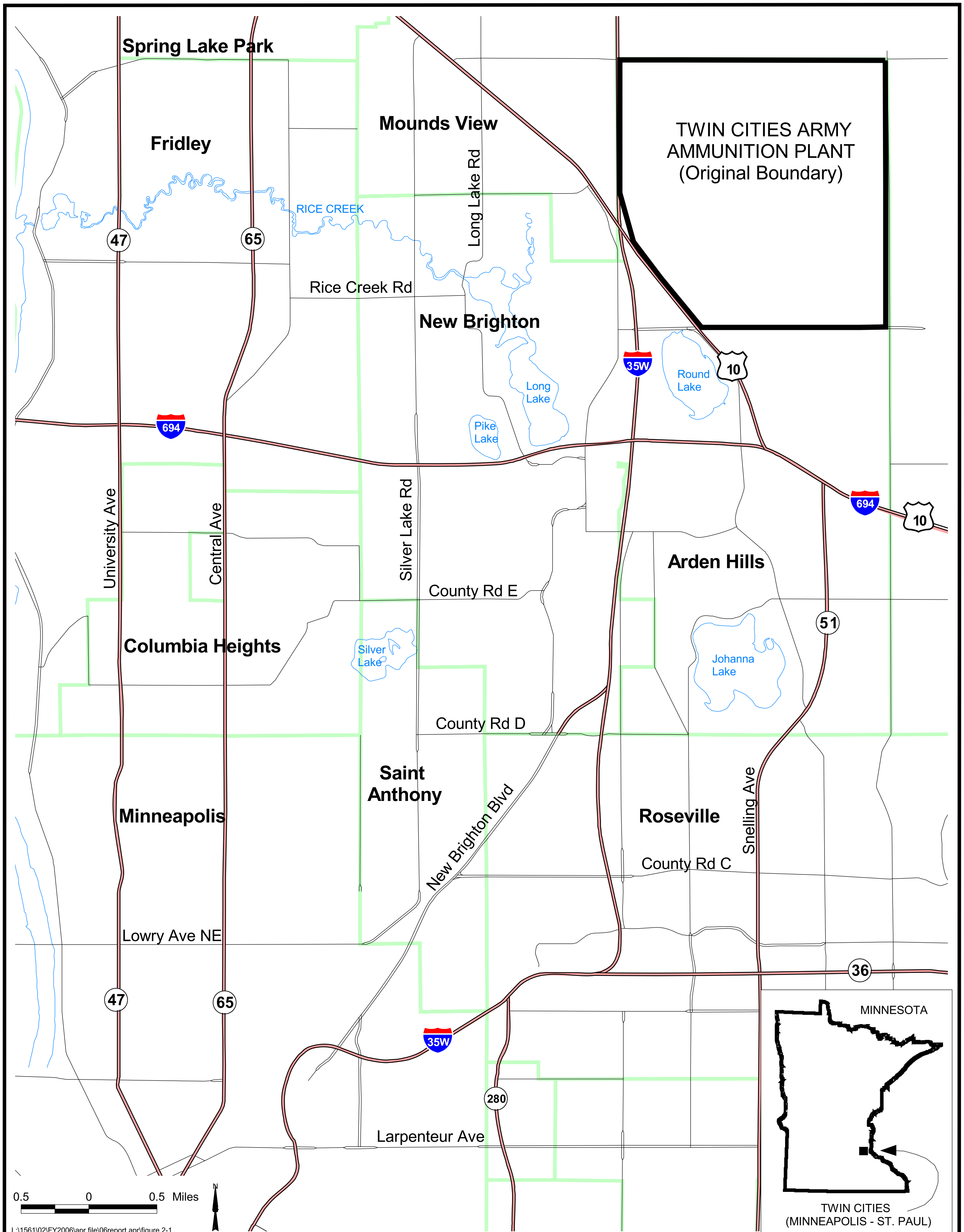
Yes. The data was collected in accordance with the FY 2006 Monitoring Plan. Data was collected, assessed, and validated in accordance with the "Quality Assurance Project Plan for Performance Monitoring, Revision 3, December 10, 2003, (TWISS, 2003). Appendix C.1 discusses data collection, management, and presentation.

The data tables in the various report sections and the comprehensive water quality databases (Appendix D.1) show the data qualifiers and flagging codes that were assigned to the data as a result of data assessment/validation. The data qualifiers and flagging codes applied to FY 2006 data are explained in footnotes on the data tables in the various report sections. Data assessments (performed on 100 percent of the data) and "full validation" (performed on at least 10 percent of the data) were provided to the MPCA and USEPA in submittals during FY 2006. MPCA and USEPA approval letters for these submittals are included in Appendix C.3.

With regard to completeness, Appendix C.2 summarizes a few minor deviations from the FY 2006 Monitoring Plan. The completeness goals are the same in both the 1996 and 2003 Quality Assurance Project Plans (QAPPs). Field completeness for FY 2006 was 100% and laboratory completeness was 100% (wells that were dry or inoperative were not considered as missed samples), meeting the QAPP completeness goal of 95%. Field duplicates, equipment rinse blanks, and matrix spike/matrix spike duplicates were collected at overall frequencies of exceeding the QAPP-specified frequencies of 10%, 10%, and 5%, respectively. For the subset of metals analyses, matrix spike/matrix spike duplicates were collected at an overall frequency of 13%, also meeting the QAPP-specified frequency. Data validation was performed on 22% of the data, exceeding the QAPP-specified requirement of 10%. No problems with analytical procedures/reporting were identified in the data validations.

The 2003 QAPP additionally identified critical samples and set a completeness goal of 100%. The critical samples are: TGRS effluent, Site K effluent, and well inventory sampling. These were all complete in FY 2006.

The data for FY 2006 is deemed to be representative and meet data quality objectives based on: 1) adherence to QAPP-specified sampling and laboratory analytical procedures; 2) completion of data assessments and data validation; and 3) comparability to historical results (any substantial deviations from historical/anticipated results are discussed within the site-specific sections of this report).



TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2006
Site Location Map	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	Figure 2-1

TWIN CITIES ARMY AMMUNITION PLANT

TCAAP Site Boundaries

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Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2006

Figure 2-2

3.0 Operable Unit 1: Deep Groundwater

The reference for the OU1 ROD is:

RECORD OF DECISION
Groundwater Remediation
Operable Unit 1
At New Brighton/Arden Hills Superfund Site
September 1993, Amended May 2006

Operable Unit 1 ROD was amended in FY 2006. The ROD amendment was signed by the USEPA and MPCA on June 7, 2006. The ROD amendment formalized the adoption of the statistical analysis of groundwater quality presented in the Annual Performance Reports since FY 2003.

Following are the six primary elements of the amended ROD, with the changed elements highlighted:

1. Providing alternate water supplies to residents with private wells within the North Plume.

2. Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area.

3. Extracting groundwater from the North Plume using the New Brighton Contaminated Groundwater Recovery System (NBCGRS), subject to the following:
   a. the initial aggregate groundwater extraction rate shall be consistent with

the long-term operating history of the NBCGRS;

b. future decreases in the aggregate extraction rate shall be determined by the Army, USEPA, and MPCA using a transparent public process and rational engineering, scientific, and economic analyses at least as rigorous as those employed in the feasibility study that was the basis for the original remedy selection;

c. future changes to the aggregate or individual well extraction rates shall be made so as to assure that the rate of restoration of the aquifer will not be slowed or result in a duration of remedy longer than was contemplated by the original ROD;

d. the facilities comprising the NBCGRS may be modified as necessary to assure the restoration of the full areal and vertical extent of the aquifer in a timeframe as contemplated in 3.c, above.

4. Pumping the extracted groundwater to the PGAC Water Treatment Facility in New Brighton for removal of VOCs by a pressurized granular activated carbon (GAC) system.

5. Discharging all of the treated water to the New Brighton municipal distribution system.

6. Monitoring the groundwater to verify effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrations.

The last requirement (No. 6) will be met by evaluating the groundwater chemical data according to statistical methods contained in the "OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1", dated December 2004 (and any subsequent addendums or revisions approved by the USEPA and MPCA). The statistical analysis will be conducted annually and will be reported in the Annual Performance Reports.

Groundwater containment is provided by three primary municipal wells: New Brighton Municipal (NBM) #4, #14, and #15. NBM #3, which is located next to NBM #4, also contributes to containment, especially when one of the other three wells is off. The extracted water is treated in the Permanent Granular Activated Carbon (PGAC) treatment facility for removal of VOCs, and is then used as part of the municipal water supply. NBM #3 and #4 were pre-existing wells. NBM #14 and NBM #15 began pumping in December 1996 and March 1998, respectively.

The remedy also relies on institutional controls (drilling advisory, alternate water supply, and well abandonment) to manage risks, including downgradient of the containment system.

Section 1.4 of the ROD prescribes six major components of the remedy, which are described and evaluated in the following sections.

3.1 REMEDY COMPONENT #1: ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: "Providing an alternative water supply to residents with private wells within the North Plume." (OU1 ROD, page 2)

- Clarified by the OU1 Alternate Water Supply Plan (Montgomery Watson, October 1995) to delete "residents with" since the remedy applies to other wells in addition to residential wells. This plan also identifies the criteria for determining what wells are eligible for an alternate water supply.
- Clarified by the OU1 Alternate Water Supply Plan to also include well abandonment.
- Clarified by the OU1 Alternate Water Supply Plan (page i-2) to also encompass OU3 and the OU2 Site A shallow groundwater plume.

Performance Standard (how do you know when you're done):

- For alternate water supply, when the owners of all wells that meet all of the following criteria have been offered and provided with an alternate water supply (or when the well owners have rejected the offers):
    i. The well is located within the area affected by groundwater plumes that originate at TCAAP, as shown on Figures E-2 and E-3; and
    ii. The well is completed in an affected aquifer; and
    iii. The well contains detectable concentrations of the TCAAP-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and
    iv. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan); and
    v. The well owner does not already have an alternate water supply.

  If eligible well owners refuse the offer to have an alternate water supply provided, this also satisfies the performance standard.

- For well abandonment, when the owners of all wells that meet all of the following criteria have been offered and provided abandonment (or when the well owners have rejected the offers):
    i. The well is located within the area affected by groundwater plumes that originate at TCAAP; and
    ii. The well is completed in an affected aquifer; and
    iii. The well contains detectable concentrations of the TCAAP-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and

iv. The well was constructed prior to the Minnesota Department of Health (MDH) Special Well Construction Area advisory; and

v. The well is being used by the well owner or use was discontinued due to contamination; and

vi. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan).

If eligible well owners refuse the offer for abandonment, this also satisfies the performance standard. An exception to abandonment would be if the well is needed for groundwater monitoring.

Is this remedy component being implemented?

Yes. The Alternate Water Supply and Well Abandonment Program has been implemented and is an ongoing program maintained by the Army. The process of identifying wells eligible for alternate water supply and/or abandonment is accomplished by maintaining a "well inventory." The well inventory is a database that was initially developed in 1992, and which has been periodically updated since then. For the purposes of the well inventory, a study area was established which encompasses the groundwater plume (the study area boundary is the same as the MDH Special Well Construction Area). The well inventory is intended to include all wells within the study area. Within the study area, areas of concern are defined by the edge of the groundwater plume, plus additional buffer area. The wells are grouped into categories based on factors such as location relative to the area of concern, type of use, active/non-active status, sealed, etc. Wells in categories with the potential to be impacted are periodically sampled to see if they qualify for alternate water supply and/or abandonment.

Thus, maintenance of the well inventory consists of the following tasks:

1. Check if the area of concern needs to be adjusted based on the extent of contamination,

2. Check if there are any previously unknown wells to be added to the database (in coordination with the MDH as described in Appendix E),
3. Sample wells on a prescribed schedule,
4. Take the appropriate course of action depending on the results,
5. Update the well inventory database with any new information (e.g., water quality results, owner information, construction information, well re-categorizing),
6. Report findings through the Annual Performance Report.

Additional information on the well inventory is presented in Appendix E. The following questions and answers summarize developments since the last Annual Performance Report with respect to Operable Unit 1.

Did the area of concern within OU1 change during FY 2006, as defined by the 1 mg/l contour line?

No. There was not a comprehensive sampling round conducted in FY 2006. The 1 µg/l contour line is assumed to have remained essentially the same as in FY 2005, which was the last comprehensive sampling round (see Figure 3-1).

Were any additional water supply wells discovered within the area of concern for OU1 that are completed within an aquifer of concern?

No (see Appendix E for additional information).

Were any water supply wells within the area of concern for OU1 sampled during FY 2006 (outside of those included in the OU1 performance monitoring plan)? If yes, what were the findings?

No. FY 2006 was a non-sampling year.

Were any well owners offered an alternate water supply and/or well abandonment during FY 2006? No.

For OU1, are there any well owners that meet the criteria, but have not yet been provided an alternate water supply? No.

For OU1, are there any wells that meet the criteria, but have not yet been abandoned? No.

Is any sampling of water supply wells (excluding those included in the OU1 performance monitoring plan) proposed prior to the next report?
No. FY 2007 is a non-sampling event for well inventory wells as shown in Appendix A.1. The next major event is in FY 2009.

Are there any changes or additional actions required for this remedy component? No.

3.2 REMEDY COMPONENT #2: DRILLING ADVISORIES

Description: "Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When the Minnesota Department of Health (MDH) has issued a Special Well Construction Area Advisory.

Has the MDH issued a Special Well Construction Area Advisory?
Yes. It was issued in June 1996. In addition to covering OU1, the Special Well Construction Area also encompasses OU3 and the OU2 Site A shallow groundwater plume. In June 1999, the MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The current boundary is shown on Figure E-1 (Appendix E).

Are any changes or additional actions required for this remedy component? No.

3.3 REMEDY COMPONENT #3: EXTRACTING GROUNDWATER FROM THE NORTH PLUME USING THE NBCGRS

Description: Extracting Groundwater from the North Plume using the NBCGRS, subject to the conditions of the 2006 ROD amendment.

- This remedy component consists of recovering deep (Unit 4) groundwater using three City of New Brighton municipal wells: NBM #4, #14, and #15. New Brighton municipal well #4 (NBM #4) was an existing well completed in both the Prairie du Chien and Jordan. NBM #14 and NBM #15 were constructed in the Prairie du Chien as part of the remedy and began pumping in December 1996 and March 1998, respectively. The locations of the three recovery wells are shown on Figure 3-1.
- NBM #3 has been designated as an alternate containment/production well for times when one of the three primary wells is not in operation. NBM #5 and NBM #6 are considered secondary alternates.

The extracted groundwater is used as part of the New Brighton water supply system, and as such, New Brighton took the lead on design and construction of the system, and is responsible for operation of the system. New Brighton contracted Barr Engineering to provide design and construction oversight services. The Army is paying for the OU1 remedy.

Performance Standard (how do you know when you're done):
When the NBCGRS is operating consistent with the long term operational history of the system.

During FY 2006, did the OU1 extraction system operate consistent with the long term operating history of the NBCGRS?

Yes. The NBCGRS is operated by the City of New Brighton according to a operational plan designed to meet both municipal water needs and the remediation needs. Following is a discussion of the NBCGRS operation in FY 2006:

Pumping Rates

Table 3-1 presents the monthly pumping volumes for each extraction well and Figure 3-2 illustrates the average monthly pumping rate targets and actual monthly volumes pumped for NBM #3/4, #15, and #14 (west to east order). The pumping targets were derived by Barr Engineering (Barr) based on their Final Conceptual Design Report, Containment/Production Wells (Barr, 1995). The operating system devised by Barr includes different operational conditions (named A thru G), which were designed to respond to maintenance issues by altering the target rates at each extraction well. Condition A is the normal operating condition for when NBM #4, #14, and #15 are all in operation, and has pumping targets (lower limits) of 1.19, 0.99, and 0.99 million gallons per day, respectively. Conditions B through F have different pumping targets for when different wells are out of service (e.g., a pumping target for NBM #3 is added whenever NBM #4, #14, or #15 are out of service, and pumping targets for NBM #5 and #6 are added whenever both NBM #3 and #4 are out of service). Condition G is unique from the other conditions because it does not have a pumping target (i.e., the targets for all wells are zero). Condition G primarily applies during carbon change-outs for the granular activated carbon (GAC) treatment system. Hence, the daily pumping targets can vary depending on what operating condition the system is in. The targets depicted on Figure 3-2 represent a collective or cumulative monthly target based on the daily operating conditions.

For FY 2006, the New Brighton Contaminated Groundwater Recovery System (NBCGRS) was in the normal operating condition (Condition A) approximately 75 percent of the time. The system was in Condition G (primarily for carbon change-outs) for 16 percent of the time, with other operating conditions comprising the remaining 9 percent of the time.

Figure 3-2 indicates that the NBCGRS, as a whole, exceeded the monthly targets in all months during FY 2006. The graph shows much lower targets in October 2005 and April 2006. For substantial portions of the months cited above, the NBCGRS was in Condition G due to GAC change-outs that were performed in October/November and April. Looking at the total NBCGRS pumping volume for FY 2006 of 1.437 billion gallons, the average monthly pumping volume (if pumping was at a uniform rate) would be about 120 million gallons. Compared with the typical monthly pumping target of about 100 million gallons (for the normal operating condition), it is clear that the NBCGRS pumped substantially more than the minimum target rate.

The graphs for the extraction wells on Figure 3-2 show that all of the wells generally exceeded targets throughout the year, indicating that the pumping was appropriately distributed. NBM #3 was slightly below its target in March 2006.

The overall adherence to the pumping targets supports the interpretation that the extraction system is operating in compliance with the amended ROD and is providing substantial containment in the Prairie du Chien.

Extraction Well Water Quality

Trend graphs for trichloroethene in NBM #3, #4, #14, and #15 are shown on Figure 3-3. At both NBM #3 and NBM #4, trichloroethene decreased dramatically between 1991 and 1998, and has been relatively stable since then.

While not conclusive in and of itself, the long-term decreasing water quality trends at the extraction wells, while pumping remains essentially constant, support the interpretation that the OU1 system is making progress towards aquifer restoration. The shorter term stability needs to be observed in the context of the overall plume behavior discussed in Section 3.7.

Monitoring Well Water Quality

As discussed above, the OU1TG developed and reported a method for analyzing groundwater quality trends over time. Section 3.7 below, presents a discussion of the statistical analysis and presents the FY 2006 monitoring well data.

Are any changes or additional actions required for this remedy component? No.

3.4 REMEDY COMPONENT #4: REMOVAL OF VOCS BY GAC

Description: "Pumping the extracted groundwater to the Permanent Granular Activated Carbon (PGAC) Water Treatment Facility in New Brighton for removal of VOCs by a pressurized GAC system." (OU1 ROD, page 2)

- Treatment by the PGAC (along with iron and manganese removal and chlorination) makes the recovered groundwater suitable for municipal drinking water purposes. The PGAC is located approximately one-third mile south of Interstate 694 near Silver Lake Road. The City of New Brighton is responsible for operation and maintenance of the PGAC, with cost reimbursement from the Army for the operations related to the remedy.

Performance Standard (how do you know when you're done):

When the treated water meets the Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) established by the Safe Drinking Water Act (SDWA) for the chemicals of concern, as identified on page 18 of the OU1 ROD.

Did the treated water meet the MCLs and non-zero MCLGs established by the SDWA for the OU1 chemicals of concern?

Yes. Table 3-2 shows that the PGAC effluent met the performance standard during FY 2006.

Each of the 8 pairs of GAC Contractors (labeled A and B) is normally run in series (i.e., water passes through A then B, or B then A, depending on whether the most recent carbon change-out was the A or B vessel). The sampling data is not from a combined effluent after the GAC vessels; instead, it is from sampling ports between the lead and lag GAC vessel *and/or* after the lag GAC vessel for each of the 8 GAC vessel pairs in the PGAC. The sampling between the lead and lag vessels is performed every month and determines when breakthrough of the lead GAC vessels has occurred. When there are no contaminant detections between the lead and lag vessels, there is no reason to sample after the lag vessels. When breakthrough of a lead vessel has occurred, a carbon change-out of all 8 lead vessels is scheduled. Until the change-out occurs, monthly samples are collected after each lag vessel (in addition to the monthly between-vessel samples) to ensure that water leaving the PGAC meets the treatment requirements. When the carbon change-out of the lead vessels is completed, the lead vessels are switched to the lag position and vice versa. Monthly sampling then reverts to only between the lead and lag vessels until a contaminant detection occurs, whereupon the process repeats.

Table 3-2 shows that two carbon change-outs occurred in FY 2006: one in October/November 2005 and one in April 2006. The sampling results that represent PGAC effluent water quality are highlighted in Table 3-2 for ease of viewing the compliance portion of the data. There were no detections of VOCs in the samples representing PGAC effluent water quality.

Is any sampling of the treated water proposed prior to the next report?
Yes. Sampling will continue to be performed by the City of New Brighton or their contractor.

Are any changes or additional actions required for this remedy component? No.

3.5 REMEDY COMPONENT #5: DISCHARGE OF TREATED WATER

Description: "Discharging all of the treated water to the New Brighton municipal distribution system." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When the connection to the New Brighton municipal supply system has been completed and water is being discharged.

Is the treated water being discharged to the New Brighton municipal distribution system?
Yes.

Are any changes or additional actions required for this remedy component? No.

3.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

Description: "Monitoring the groundwater to verify the effectiveness of the remedy." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Performance monitoring programs have been established to collect the data required to verify the effectiveness of remedy components #1 through #5. Table 3-3 summarizes the performance monitoring requirements, implementing parties, and the specific documents that contain the monitoring plans.

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes.

- Monitoring of the extraction wells and treatment system effluent will be performed by the City of New Brighton in accordance with the "New Brighton Water System Sampling and Analysis Plan," June 1997.
- Other groundwater monitoring will be in accordance with the Groundwater Monitoring Plan included as Appendix A.1. The next "major" event will be in FY 2007.

Are any changes or additional actions required for this remedy component? No.

3.7 OVERALL REMEDY FOR OU1 DEEP GROUNDWATER

Has the OU1 remedy been completed (i.e., have the cleanup levels on page 18 of the OU1 ROD been attained throughout the areal and vertical extent of the North Plume)? No.

What impact is the groundwater extraction system having on contaminant concentrations?

As discussed in Section 3.3 above, the OU1 ROD was amended to include statistical methods specifically selected to evaluate the long-term progress of remediation and plume evolution in OU1. The OU1 Technical Memorandum states the objective of the statistical evaluation as follows:

> "Verify progress in cleanup of the plume through measurement of overall geographic plume shrinkage and decreasing contaminant concentrations."

The OU1TG identified five issues that need to be statistically addressed, now and over time, to achieve this objective:

1. Measure changing concentrations immediately downgradient of the TGRS, as this area is the first to be affected by any potential escape of contaminants from TCAAP.

2. Measure changes in the geographical size of the plume over time.

3. Measure changes in concentrations immediately downgradient of the NBCGRS, as this is the first area to be affected by any potential escape of contaminants from NBCGRS capture.

4. Measure any unforeseen changes in plume configuration. This addresses the possibility that changing flow patterns may cause a shift in the plume but not necessarily any change in size. A plume shift may require a redistribution of pumping.

5. Measure the long-term trends in overall VOC concentrations (as an indicator of contaminant mass). This provides an overall picture of remedial progress.

The OU1TG developed a series of five well groups designed to address each of the issues listed above. For each group, the appropriate statistical tools were specified and the statistical response threshold was identified that would trigger closer scrutiny by the Army and regulators (MPCA and USEPA). The five groups, corresponding to the five issues discussed above, are:

1. Group 1: Downgradient of the TGRS. This zone is the area downgradient of the TGRS capture zone. This zone should show overall reductions over time in response to TGRS mass removal and containment. However, it is also the stagnation zone of the TGRS so groundwater velocities are reduced and response

may be slow. Furthermore, individual wells near the stagnation zone may show increases in contaminant concentrations during some points in time, as the plume shifts in response to changes in pumping.

2. Group 2: Plume Edge Wells. This zone includes wells that define the edges of the plume downgradient of the TGRS. These are wells with low concentrations of VOCs (<100 µg/l) that will indicate a reduction in overall plume size if VOC concentrations continue to decline.

3. Group 3: Downgradient Sentinel Wells. This is a zone downgradient of the NBCGRS stagnation zone. This group includes three wells but more accurately is defined as a geographic area immediately downgradient of the NBCGRS. This group should help demonstrate improvement due to the VOC mass removal by the NBCGRS over time, analogous to Group 1 and the TGRS.

4. Group 4: Lateral Sentinel Wells. These are “clean” wells downgradient of the TGRS that are beyond the current plume boundaries. These wells should help identify large, unexpected, lateral changes in plume configuration, such as a shifting or expansion of the plume boundary.

5. Group 5: Global Plume Mass Wells. This group includes all the monitoring wells necessary to construct a contour map of the VOC plume. Production wells are not used in Group 5 since the data may not be comparable to monitoring well data. Some wells on TCAAP are included in Group 5 to support the contouring near the TCAAP boundary. This group reflects the overall VOC mass in the aquifer and should show an overall reduction in VOC mass over time.

In October 2005, the Army received a consistency determination on:

Modification #1 to:
OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1" prepared by the Army, Dated December 2004.

This modification created well Group 6 to address the Jordan portion of the Unit 4 aquifer.

6. Group 6: Jordan Wells: The group includes all Jordan monitoring wells, the Prairie du Chien wells nested with them, and New Brighton Municipal Wells 3, 4, 5, and 6. The inclusion of the Prairie du Chien wells is to facilitate comparing the trends between it and the Jordan at these locations. This group will help identify any changes in the plume occurring in the Jordan portion of the aquifer.

FY 2006 was a minor sampling year, so new comprehensive plume mapping was not completed. Figures 3-5, 3-6, and 3-7 show the plume mapping completed for the FY 2005 Annual Performance Report.

Six wells were sampled in FY 2006, in support of continuing data needs for statistical Groups 1 and 6. Table 3-4 presents groundwater quality data for OU1. Graphs of historical trichloroethene concentrations at any well can be viewed from Figure B-2 (Appendix B). The graphs help illustrate the long-term changes that have occurred throughout OU1 and provide a visual aid for examining the trichloroethene history at any well.

The statistical analysis in Appendix D.2 follows the format described in the OU1 Technical Memorandum (and the modification) for Group 1 and the Group 6 Jordan wells. The other group data were not analyzed in FY 2006, but will be again in FY 2007.

Table 3-5 presents a summary of the statistical results, reflecting the data collected through FY 2006. Table 3-5 includes an assessment of the statistical thresholds that were triggered in the analysis and brief comments addressing these threshold triggers. Further discussion is presented below.

Group 1:

The Group 1 (downgradient of the TGRS) response threshold was triggered for the north plume and south plume (based on a "stable" outcome). In both cases, these Area Weighted Concentrations (AWCs) were unchanged for FY 2006.

The South Plume threshold was triggered with a stable AWC of 5 ug/l since 2001. This suggests that although stable, the South Plume is at a low average concentration and improvement can be expected to be occurring slowly.

It should be noted however, that the data set for Group 1 was incomplete (due to different monitoring frequencies in the past), so some data points were interpolated (03M806 for 1999 and 2001). Pre-1999 interpolated data was eliminated this year with the new sampling rounds. The Group 1 North plume trend, therefore, needs to be confirmed through future monitoring and evaluation. The monitoring plan has been adjusted to eliminate this problem over time.

Group 2:

There was no sampling for Group 2 in FY 2006.

Group 3:

There was no sampling for Group 3 in FY 2006.

Group 4:

One well was sampled from Group 4, as per an agreement with the MPCA and USEPA due to recent new detections. The well is 03U831, located on the boundary between OU1 and OU3. This well is showing new detections of VOCs with an apparent upward trend. A Mann-Kendall analysis was done for this well (consistent with Group 2 analysis) and found a "probably increasing" trend (see graph in Appendix D). There have been two detections in 2005 and 2006, with a recent history of generally non-detect. The FY 2006 sampling appears to have confirmed the trend. This well will continue to be sampled annually and will be evaluated in FY 2007 as part of the overall round. The recent detections do not pose a risk to uncontaminated areas or indicate a problem with the remedial system; rather, they suggest a mingling of the lateral boundaries of the North and South plumes. Further monitoring is warranted to confirm the trend.

Group 5:

No statistical analyses were performed for Group 5 in FY 2006.

Group 6:

With respect to the Jordan, the three new wells installed in FY 2005 were the only wells sampled in FY 2006. These wells provide additional data points between TCAAP and the NBCGRS to help complete the understanding of the extent and magnitude of VOC concentrations in the Jordan. This, the second year of Group 6 analysis, shows mixed results. Well 04J822 shows an increasing trend, based on six rounds of data over two years. This well is in the central part of the plume, so the trend does not suggest horizontal expansion of the plume, but continues to provide long-term data on the vertical extent of the plume. Well 04J847 shows a stable trend (which triggered the threshold). This well is also in the center of the plume and relatively close to TCAAP so the trend does not trigger a concern for additional exposure. As a whole, the Group 6 wells require additional monitoring to reflect a longer time frame for evaluation.

The locations of these wells are directly upgradient of the NBCGRS. Thus, the VOCs here are moving toward the NBCGRS. The trends observed in the Jordan do not suggest modifying the remedial system. In FY 2007, the entire Group 6 well network will be sampled. This will afford an opportunity to examine these trends in relation to all the Jordan monitoring well data.

Overall Statistical Assessment:

The data from FY 2006 represents a minor sampling year so extensive comment is not warranted. The OU3 plume statistics are addressed in Section 11.0.

There were individual threshold triggers identified in Group 1 and 6, and a new trend identified in Group 4 well 03U831. These trends will be evaluated again in FY 2007 as part of the comprehensive statistical analysis for FY 2007. The thresholds triggered do not suggest any problems with the remedial systems, but suggest movement within the established plumes. The threshold triggers are appropriately addressed in the continuing monitoring plan.

How much VOC mass has been removed (at each well and total)?

Table 3-1 shows that the NBCGRS removed 709 pounds of VOCs during FY 2006. The total cumulative VOCs removed by the NBCGRS is 18,909 pounds. The relative contribution from each extraction well is also shown on Table 3-1. As the table shows, over 76% of the VOC mass is removed by wells NBM #4 and NBM #15.

Figure 3-4 shows the annual VOC mass removed (listed at the top of the graph), annual pumping volumes, and the trend in annual mass removal per unit volume pumped since FY 1997 (when NBM #14 was brought online). The mass removal in FY 2006 increased slightly compared to FY 2005, which is due mainly to an increase in pumping. The trend in annual mass removal per unit volume pumped was unchanged from FY 2005 to FY 2006 and has been on a decreasing trend since FY 1998, when the last extraction well was brought online (NBM #15). This overall decline in the mass removal trend agrees with the trichloroethene trends in OU1 deep groundwater, which generally show a decreasing trend, and suggests that aquifer restoration is progressing.

Besides the changes already discussed, are any other changes or additional actions required for OU1? No.

TABLE 3-1
OU1 Pumping / VOC Mass Removal Data

FISCAL YEAR 2006

	WELL #3			WELL #4			WELL #5			WELL #6			WELL #14			WELL #15			System Totals		
MONTH	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (ug/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	TOTAL VOC EFFLUENT (ug/l)	TOTAL WATER TREATED BY EXTRACTION SYSTEM (Mgallons)	TOTAL VOC'S REMOVED BY EXTRACTION SYSTEM (lbs)
TOTAL GALLONS PUMPED AND VOC'S REMOVED THROUGH SEPTEMBER 30, 2005																				15,808.590	18,200
OCTOBER	63	0.294	0.155	67	29.339	16.406	150	0.000	0.000	110	0.175	0.161	22	20.735	3.807	92	32.118	24.661	0	82.661	45.19
NOVEMBER	59	1.044	0.514	73	32.069	19.538	150	0.001	0.001	100	0.103	0.086	21	21.264	3.727	77	36.506	23.460	0	90.987	47.33
DECEMBER	61	1.068	0.544	65	43.314	23.497	175	0.268	0.391	106	0.179	0.158	14	30.621	3.578	87	41.261	29.960	0	116.711	58.13
JANUARY	60	1.600	0.801	61	42.016	21.391	165	0.197	0.271	106	0.007	0.006	25	36.961	7.712	93	37.719	29.277	0	118.500	59.46
FEBRUARY	56	1.050	0.491	61	40.140	20.436	170	0.498	0.707	106	0.000	0.000	27	35.077	7.904	100	31.489	26.281	0	108.254	55.82
MARCH	54	6.939	3.127	60	45.506	22.788	170	0.153	0.217	106	0.000	0.000	32	38.434	10.265	110	30.889	28.358	0	121.921	64.76
APRIL	52	18.115	7.862	54	41.428	18.671	140	0.818	0.956	106	0.257	0.227	30	39.743	9.951	110	0.000	0.000	0	100.361	37.67
MAY	49	14.823	6.062	51	44.100	18.771	129	1.112	1.197	106	0.845	0.748	26	39.396	8.549	82	41.566	28.447	0	141.842	63.78
JUNE	50	11.883	4.959	50	42.559	17.760	150	2.394	2.997	110	2.733	2.509	38	36.205	11.482	89	42.988	31.931	0	138.762	71.64
JULY	41	14.772	5.055	42	44.223	15.502	130	0.157	0.170	87	15.160	11.008	42	40.889	14.333	77	44.619	28.674	0	159.820	74.75
AUGUST	34	10.446	2.964	39	44.156	14.373	130	2.671	2.898	78	1.984	1.292	37	37.684	11.637	72	38.801	23.316	0	135.742	56.48
SEPTEMBER	49	3.780	1.546	54	41.707	18.797	200	0.248	0.414	120	0.340	0.341	51	33.857	14.411	110	41.370	37.980	0	121.302	73.49
Subtotal			34.079			227.928			10.220			16.535			107.356			312.345			
% of Total Mass			4.8			32.2			1.4			2.3			15.2			44.1			
TOTAL GALLONS TREATED AND VOC'S REMOVED FOR FISCAL YEAR 2006																				1,436.863	708.51
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP																				17,245.453	18,909

Note: The mass of VOCs removed from Well No. 5 in October 2005 were calculated using analytical results from the previously sampled month (August 2005).
Note: The mass of VOCs removed from Well No. 5 in November 2005 were calculated using analytical results from the previously sampled month (August 2005).
Note: The mass of VOCs removed from Well No. 6 in January 2006 were calculated using analytical results from the previously sampled month (December 2005).
Note: The mass of VOCs removed from Well No. 6 in February 2006 were calculated using analytical results from the previously sampled month (December 2005).
Note: The mass of VOCs removed from Well No. 6 in March 2006 were calculated using analytical results from the previously sampled month (December 2005).
Note: The mass of VOCs removed from Well No. 6 in April 2006 were calculated using analytical results from the previously sampled month (December 2005).
Note: The mass of VOCs removed from Well No. 15 in April 2006 were calculated using analytical results from the previously sampled month (March 2006).
Note: The mass of VOCs removed from Well No. 6 in May 2006 were calculated using analytical results from the previously sampled month (December 2005).

Table 3-2

OU1, PGAC Effluent Water Quality
Fiscal Year 2006

	Influent Well Monitoring						Operational Performance Monitoring															
							Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
Sampling Date	Well #3	Well #4	Well #5	Well #6	Well #14	Well #15	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
"A" Vessels are the Lead Vessels.																						
31-Oct-05	63	67	NS	110	22	92	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
GAC replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between October 4, 2005 and November 15, 2005. "B" Vessels become the Lead Vessels.																						
30-Nov-05	59	73	NS	100	21	77	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Dec-05	61	65	175	106	14	87	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Jan-06	60	61	165	NS	25	93	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
28-Feb-06	56	61	170	NS	27	100	NS	NS	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Mar-06	54	60	170	NS	32	110	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
30-Apr-06	52	54	140	NS	30	110	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
GAC replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between April 11, 2006 and April 30,, 2006 "A" Vessels become the Lead Vessels.																						
31-May-06	49	51	129	NS	26	82	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Jun-06	50	50	150	110	38	89	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Jul-06	41	42	130	87	42	77	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Aug-06	34	39	130	78	37	72	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Sep-06	49	54	200	120	51	110	0	NS	0	NS	1.5	NS	1.4	NS	0	NS	0	NS	0	NS	0	NS

Notes:

1) All water quality results shown are for Total VOCs (ug/l).

2) NS = Not Sampled.

3) The highlighted results indicate those results that are representative of effluent water quality for the given pair of contactor vessels (only the A or B vessel result is highlighted since vessels are operating in series).

Table 3-3

Summary of OU1 Monitoring Requirements
Fiscal Year 2006

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Alternate Water Supply/Well Abandonment	a. Water quality data for the perimeter of the plume to define the area of concern	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	b. Water quality data for water supply wells to determine eligibility for alternate supply/abandonment	Army	Well Inventory Report
#2: Drilling Advisories	a. Verification that drilling advisories are in place and functioning as intended	Army/MDH	N/A
#3: Extracting Groundwater with the NBCGRS	a. Pumping volume and rates for each extraction well for comparison to design flowrates	New Brighton	New Brighton Water System Sampling and Analysis Plan
	b. Water levels from monitoring wells to draw contour maps showing the influences of pumping	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	c. Water quality, to assist in evaluation of statistical improvements in groundwater quality.	Army	OU1 Groundwater Monitoring Plan in the Annual Report
#4: Removal of VOCs	a. Effluent water quality to demonstrate compliance with the Safe Drinking Water Act	New Brighton	New Brighton Water System Sampling and Analysis Plan
#5: Discharge of Treated Water	a. Verification of discharge	New Brighton	N/A
#6: Groundwater Monitoring	Outlined above and below		
OR: Overall Remedy (Attainment of cleanup goals)	a. Water quality data throughout the North Plume to evaluate remedial progress	Army	OU1 Groundwater Monitoring Plan in the Annual Report

Table 3-4
OU1 Groundwater Quality Data

Fiscal Year 2006

			Trichloro-ethene (ug/l)	1,1-Dichloro-ethene (ug/l)	cis-1,2-Dichloro-ethene (ug/l)	1,1,1-Trichloro-ethane (ug/l)	1,1,2-Trichloro-ethane (ug/l)	1,1-Dichloro-ethane (ug/l)
OU1 Cleanup Level [1]			5	6	70	200	3	70
03U831		2/1/06	**31**	JP 0.90	12	<1	<1	1.6
03U831	D	2/1/06	**32**	JP 0.81	12	<1	<1	1.5
04U871		6/6/06	**32**	2.6	JP 0.28	2.4	<1	2.7
04U871	D	6/6/06	**32**	2.5	JP 0.29	2.4	<1	2.9
04U872		6/5/06	**11**	JP 0.84	<1	JP 0.64	<1	JP 0.95
04U877		6/5/06	JP 0.80 (UB0.3)	<1	<1	<1	<1	JP 0.65
04J822		1/11/06	**58** (JS129)	**10**	1.2	12	<1	6.6
04J822		6/6/06	**87**	**18**	1.8	20	<1	10
04J847		1/11/06	**850** (JS129)	**68**	9.2	60	<2	45
04J847	D	1/11/06	**840** (JS129)	**58**	8.9	50	<2	42
04J847		6/6/06	**980**	**76**	9.6	68	<2	49
04J849		1/11/06	<1	<1	<1	<1	<1	<1
04J849		6/5/06	<1	<1	<1	<1	<1	<1

Notes:

(1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD. Bolding (in red color) indicates exceedance of the cleanup level.

D Duplicate sample.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

JS The percent recovery for the matrix spike was above the upper QC limit (the percent recovery is listed after "JS"). The sample result could be biased high.

UB The sample result was less than 5 times the level detected in a blank (the result for the blank is listed after "UB"). The sample result can be considered non detect at an elevated detection limit.

Table 3-5

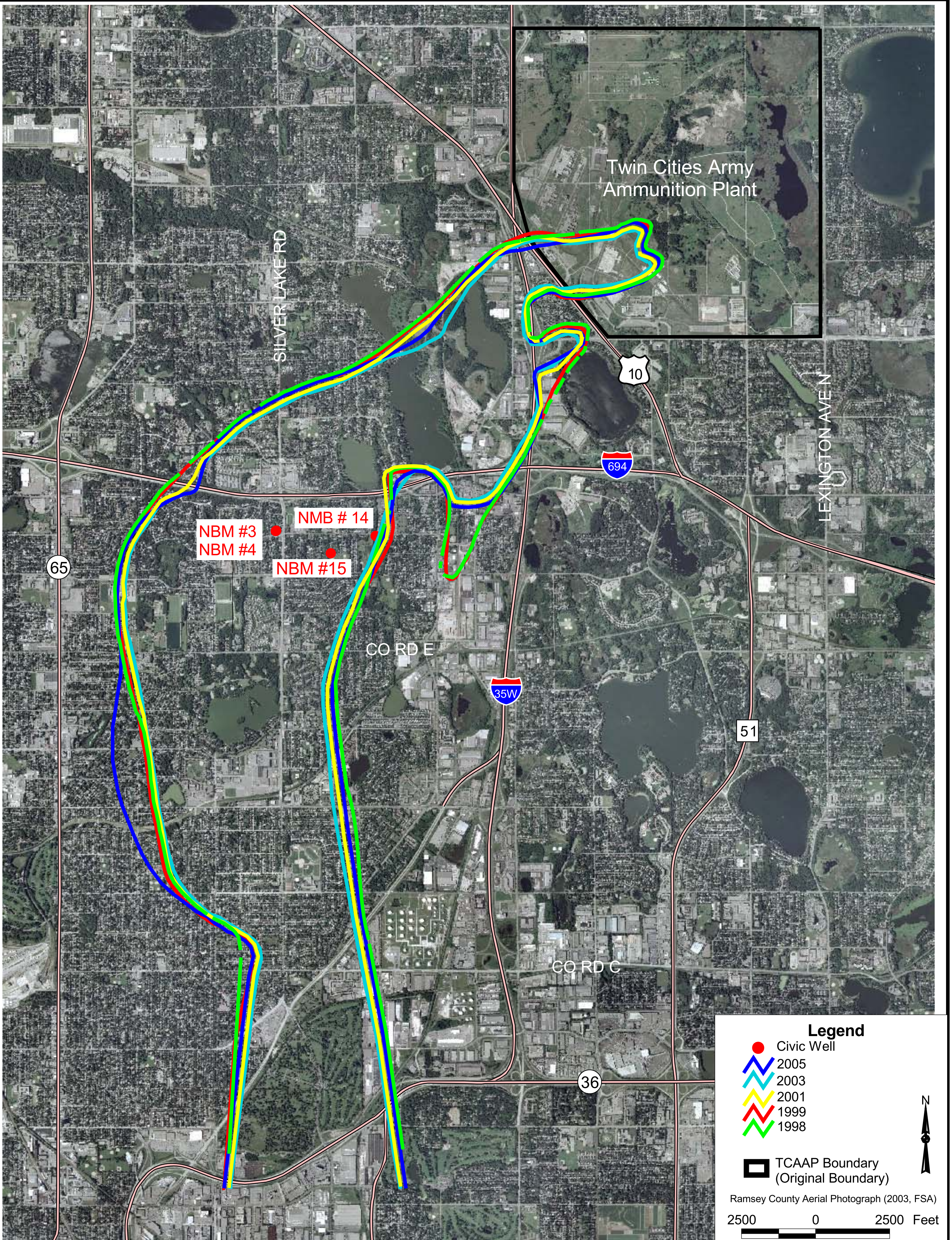
Group 1, 2, 3, 5, and 6 Mann-Kendall Summary and MAROS Conlusion
FY 2006

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 1 NP	-4	6	Decreasing	76.50%	0.2834	S or NT	**Stable**	yes	Likely decreasing, confidence low
Group 1 SP	-7	6	Decreasing	86.40%	0.1521	S or NT	**Stable**	yes	Likely decreasing, confidence low
Group 2	--	--	--	--	--	--	--	--	Not Sampled in FY 2006
Group 3	--	--	--	--	--	--	--	--	Not Sampled in FY 2006
Group 5	--	--	--	--	--	--	--	--	Not Sampled in FY 2006
Group 6 OU1 Jordan Wells:									
04J822	12	6	Increasing	98.00%	0.9544	Definite	**Increasing**	Yes	Based on 2 years of data
04J847	-5	6	Decreasing	76.50%	0.0832	S or NT	**Stable**	Yes	Based on 2 years of data
04J849	0	6	Zero	50.00%	#DIV/0!	S or NT	**#DIV/0!**	No	All conc. ND

Notes:
S or NT = Stable or No Trend
N = number of data points
COV = Coefficient of Variance

MAROS Decsion Matrix

M-K S	Confidence	Trend
S > 0	> 95%	Increasing
S > 0	90-95%	Pr. Incr.
S > 0	< 90%	No Trend
S</= 0	< 90%	No Trend
S </= 0	< 90%	Stable
S < 0	90-95%	Pr. Decr.
S < 0	>95%	Decreasing



TWIN CITIES ARMY AMMUNITION PLANT

Upper Unit 4,
1 ug/l Trichloroethene Isoconcentration Map

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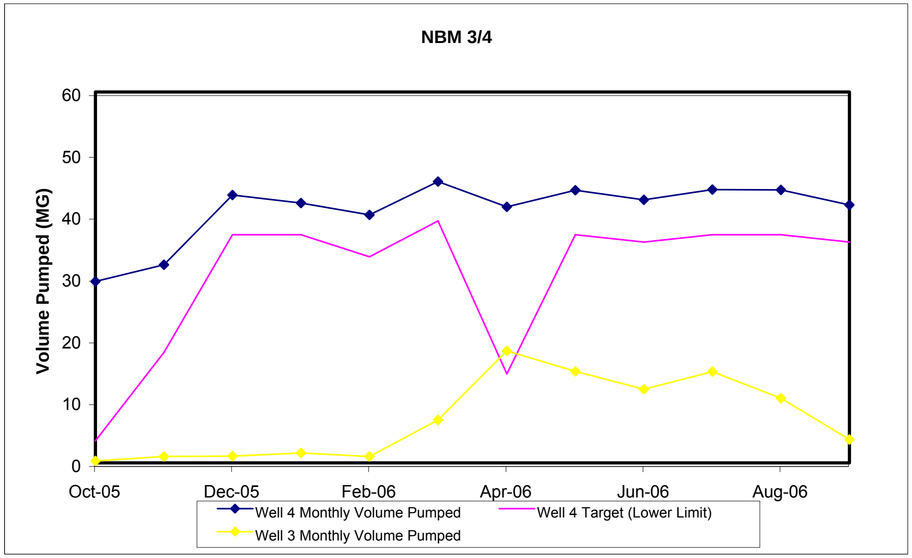
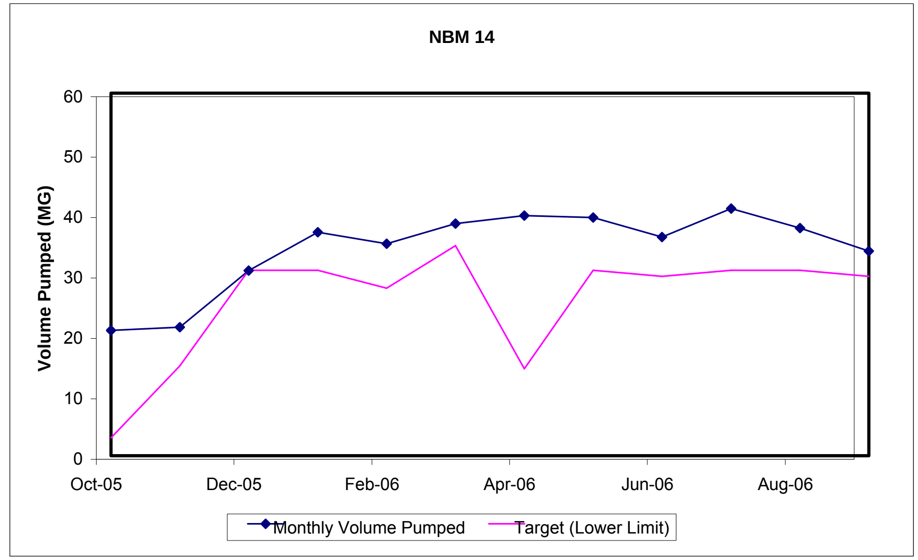
Maple Plain, MN 55359-0429

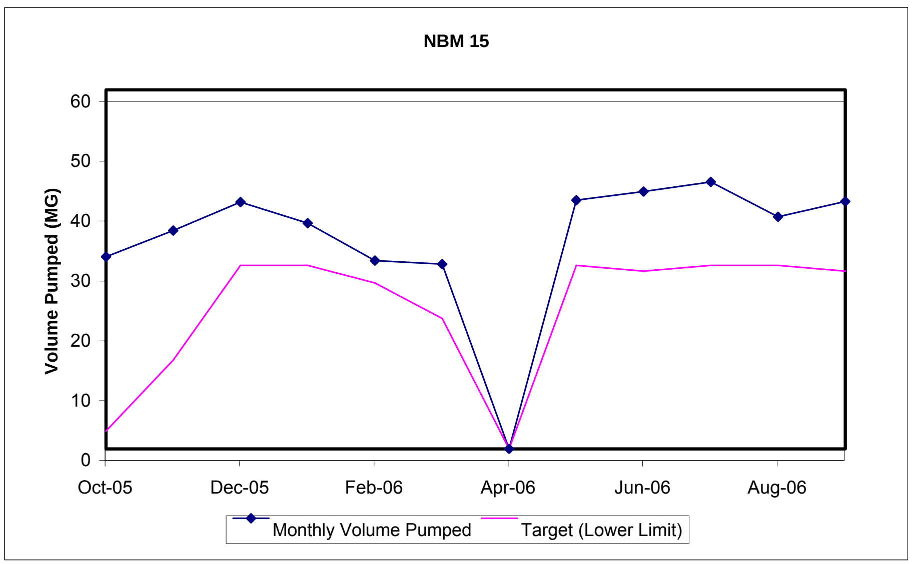
FY 2006

Figure 3-1

FIGURE 3-2
OU1 WELL PUMPING RATES VS. TARGETS
TWIN CITIES ARMY AMMUNITION PLANT







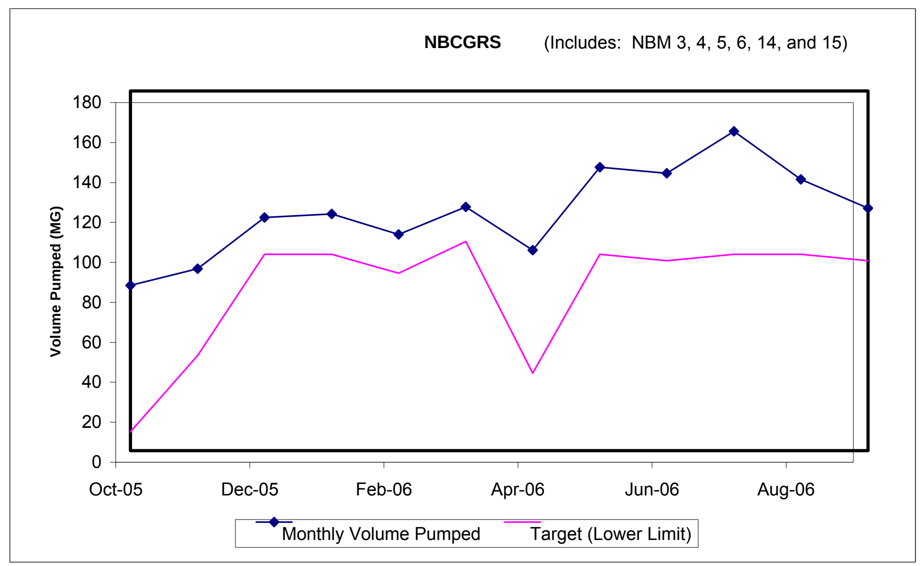
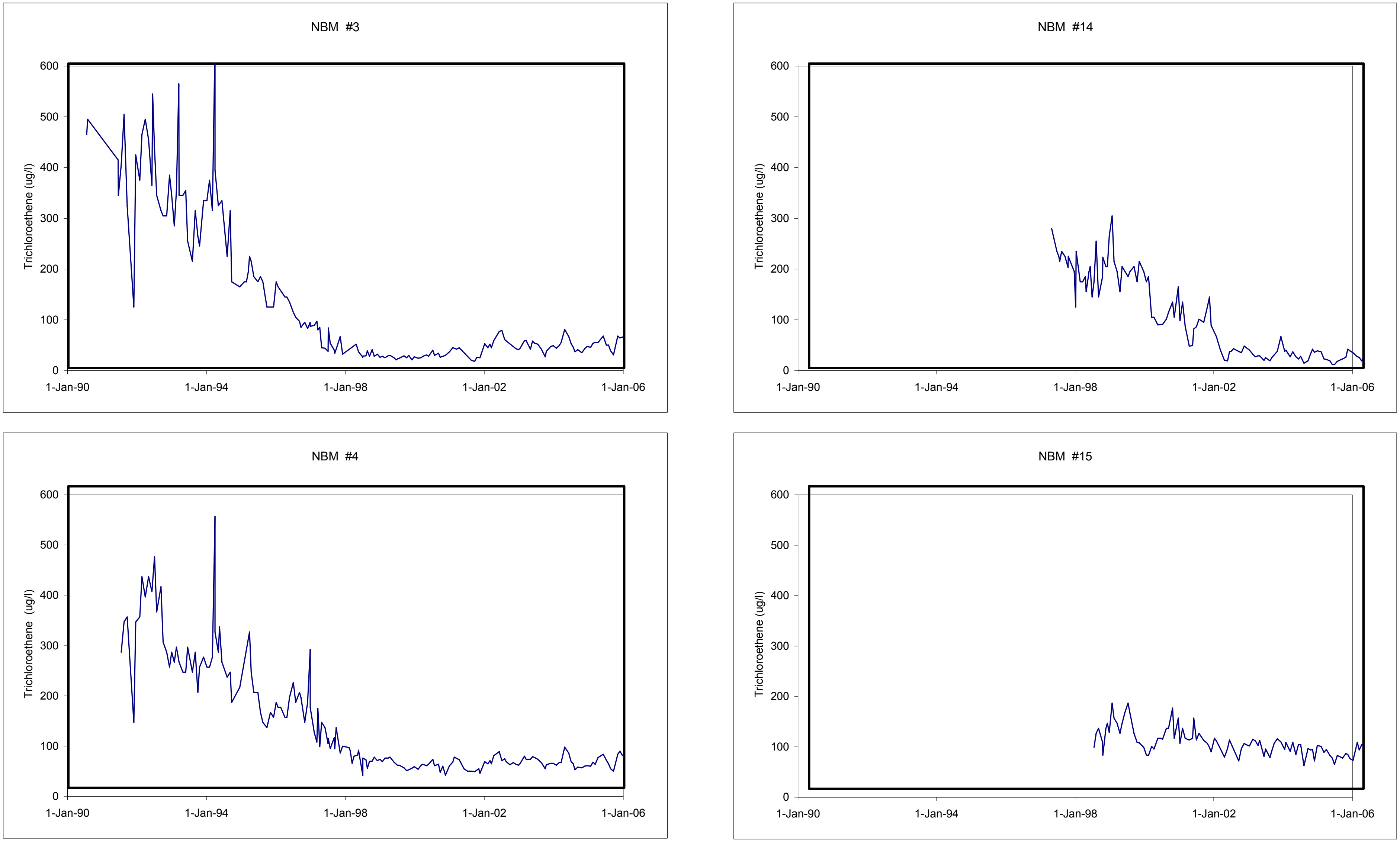


FIGURE 3-3
NEW BRIGHTON MUNICIPAL WELLS: TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT



C:\Files\Lisa\FY 2006 APR\Figures\Figure 3-3

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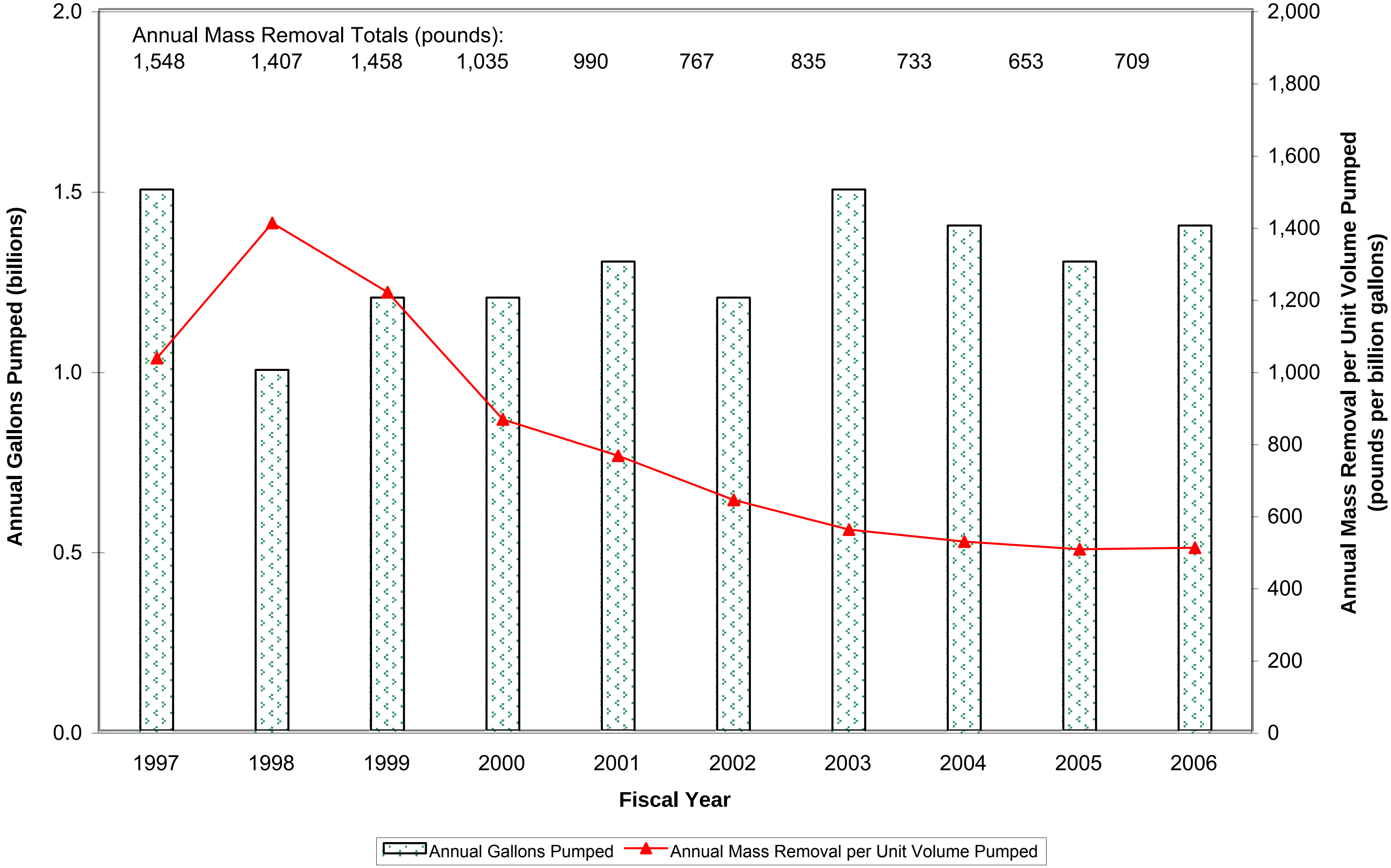
FIGURE 3-4
OU1, NBCGRS MASS REMOVAL HISTORY
Twin Cities Army Ammunition Plant



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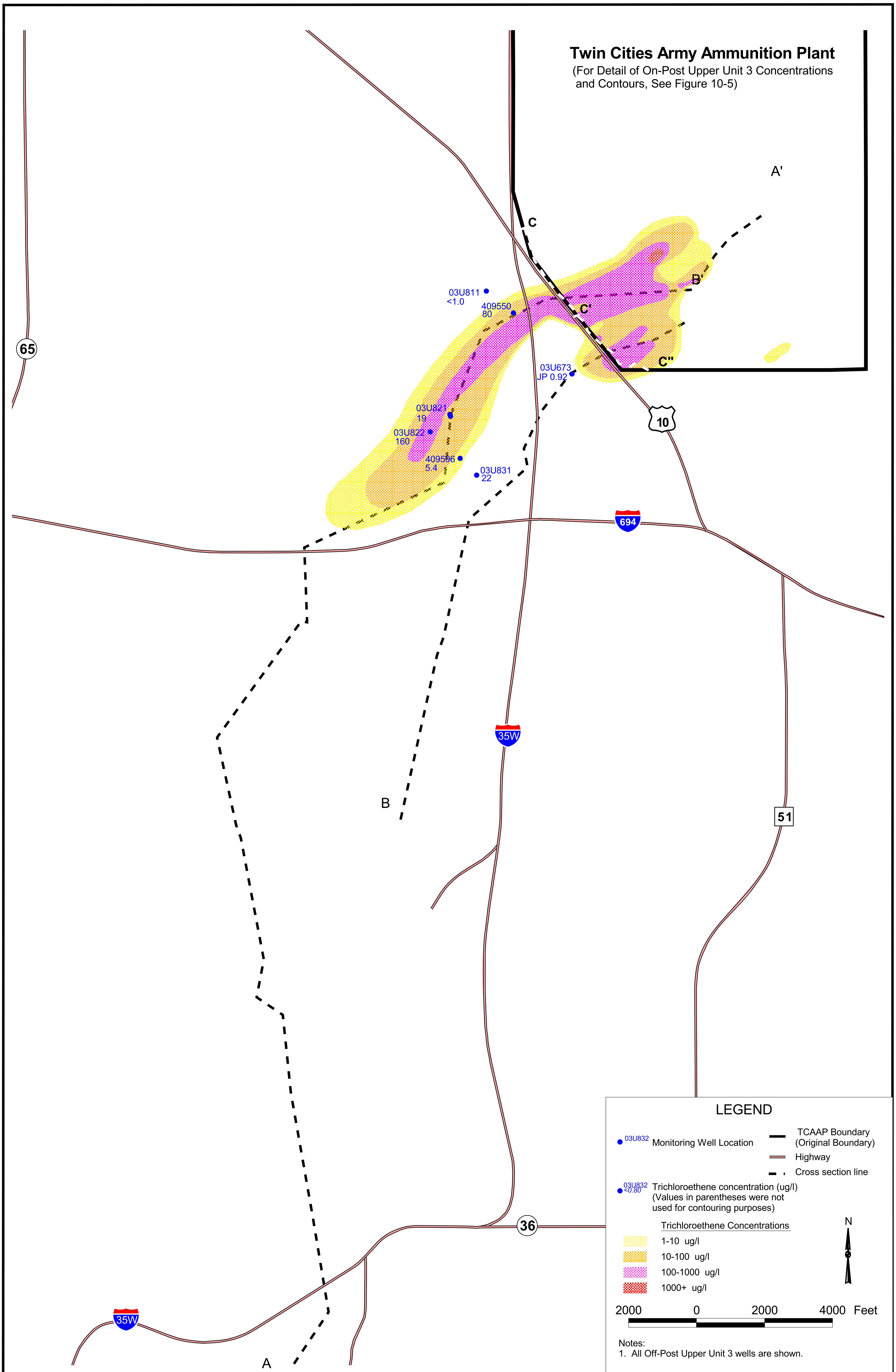

TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3, Upper Unit 3, Trichloroethene Isoconcentration Map
Summer 2005

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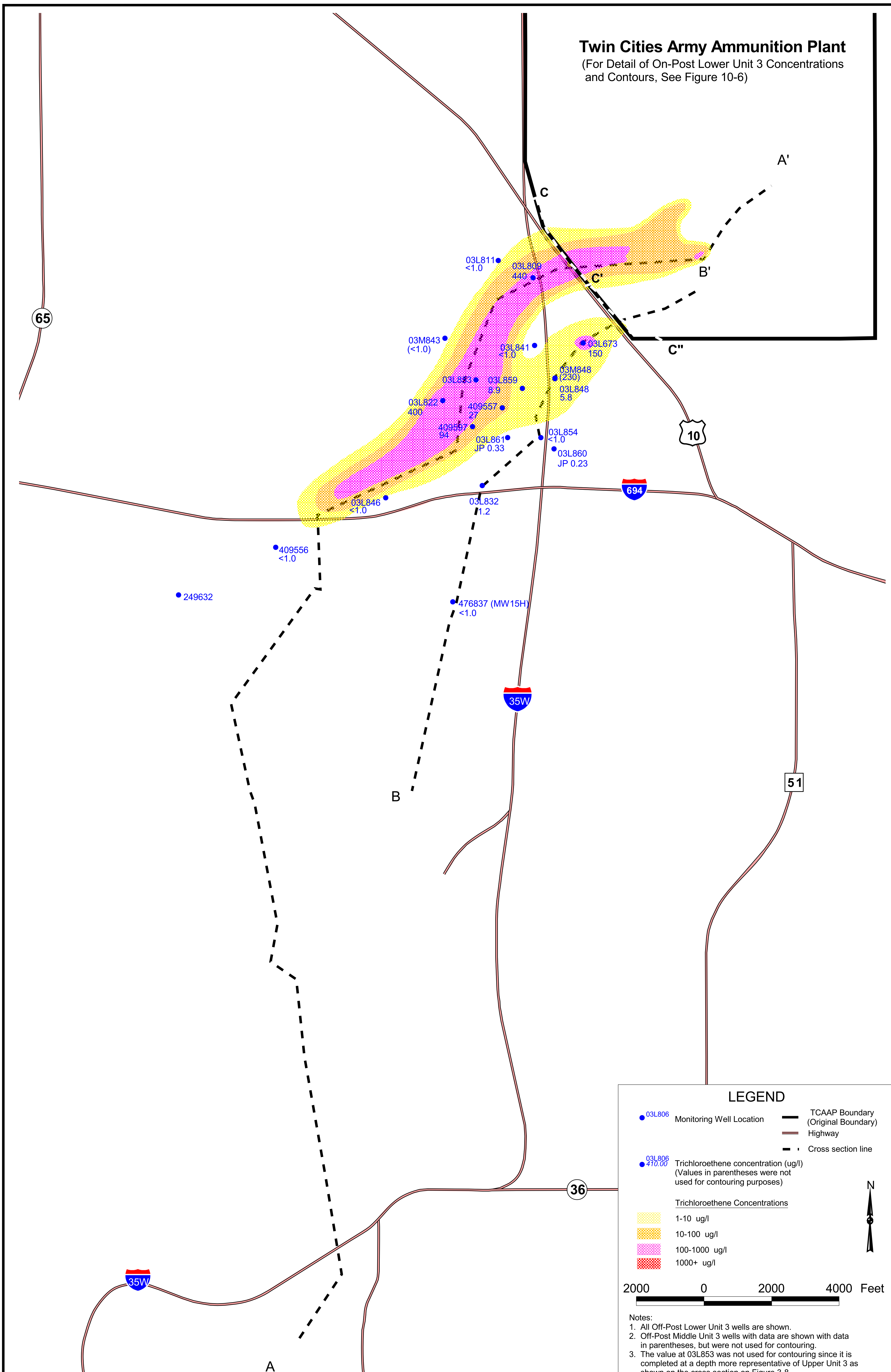
FY 2006

Figure 3-5



TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3, Lower Unit 3, Trichloroethene Isoconcentration Map
Summer 2005

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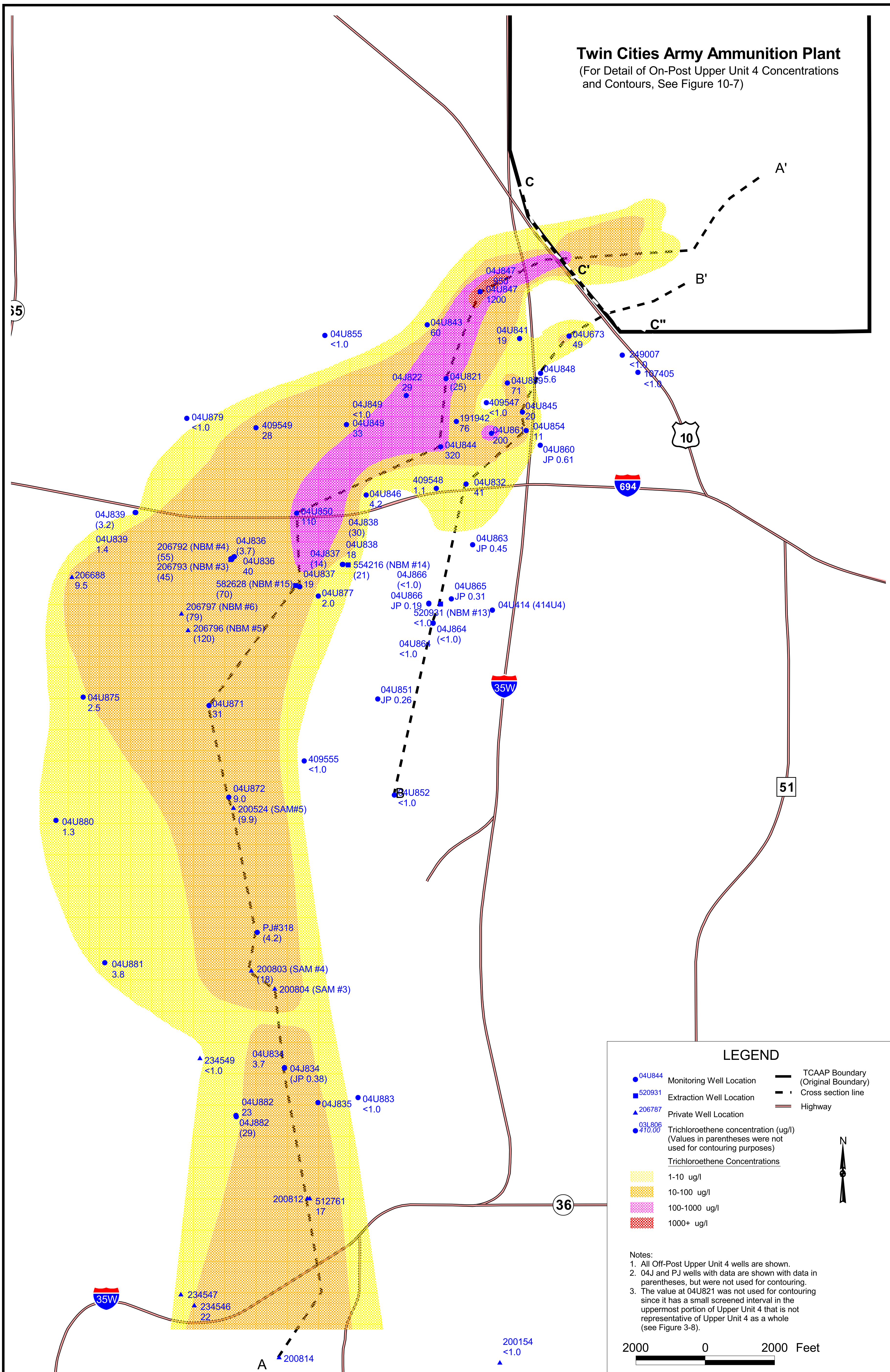
Figure 3-6



TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3, Upper Unit 4, Trichloroethene Isoconcentration Map
Summer 2005

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FY 2006

Figure 3-7

4.0 Operable Unit 2: Shallow Soil Sites

The reference for the OU2 ROD is:

Twin Cities Army Ammunition Plant
New Brighton/Arden Hills Superfund Site
Operable Unit 2
RECORD OF DECISION
October 1997

There have been no subsequent ROD Amendments or Explanations of Significant Differences.

Section 1.4 of the ROD prescribes major remedy components for each of four media as described in Sections 4.0 through 9.0 of this report. Section 4.0 addresses the shallow soil sites.

Through the Remedial Investigation/Feasibility Study (RI/FS) process, Sites A, C, E, H, 129-3, and 129-5 were found to have inorganic and/or organic contaminants above the cleanup goals specified in Table 1 of the OU2 ROD. Unpermitted landfills, or dumps, were identified within Sites A, B, E, H, and 129-15. The OU2 ROD (page 2) describes nine remedy components to address the shallow soil sites. Site C is addressed in Section 7.0.

4.1 REMEDY COMPONENTS #1 THROUGH 7: SOIL REMEDIATION

Description: These seven components collectively address the characterization, excavation, sorting, treatment, disposal, site restoration, and site access restrictions for the shallow soils and dumps at Sites A, E, H, 129-3, and 129-5.

Performance Standard (how do you know when you're done):
When the soils at these sites have been remediated such that the contaminant concentrations are below the cleanup levels specified in Table 1 of the OU2 ROD.

Are these remedy components being implemented?
Yes. Soil remediation field work was completed at Sites A, E, H, 129-3, and 129-5 prior to FY 2005. The Closeout Reports for each of these sites (prepared by Shaw Environmental & Infrastructure, Inc. (Shaw)) has received regulatory approval, but final consistency will not be provided until concurrence on the land use control section of each report has been reached between the Army and the regulators (see Section 12.0 for information on land use controls).

Field work at Site C started in FY 2000, but was suspended while technical issues were being resolved. It is anticipated that field work will be completed after the ROD Amendment is signed in FY 2007.

Are any changes or additional actions required for this remedy component?
Yes. Land use control issues need to get resolved in order to complete final consistency approval on the various closeout reports.

4.2 REMEDY COMPONENT #8: GROUNDWATER MONITORING

Description: "Five-year period of groundwater monitoring to verify no adverse remedy impacts at Sites A, C, E, H, 129-3, and 129-5." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):
When five years have elapsed with groundwater monitoring results below the groundwater cleanup levels.

Is this remedy component being implemented?

Yes. The intent of this remedy component is to verify that soil remediation activities did not somehow cause impacts to groundwater. As such, the five-year monitoring period was intended to start after completion of remedy components #1 through #7 described in the previous section. With the exception of Site C, the shallow soil remediation has been completed and this groundwater monitoring component was started in FY 2003 (and will tentatively end in FY 2007). As discussed in Section 5.7, shallow soil remediation work was also completed at Site D (for non-VOC contaminants) in early FY 2003, and the Closeout Report (prepared by Shaw) indicated that Site D should also be monitored for any impacts to groundwater that could have resulted from soil remediation activities. Site D was, therefore, added to the list of sites to be monitored under this remedy component.

The monitoring plan for each of the sites is presented below (these monitoring activities are included in the monitoring plan for groundwater monitoring wells presented in Appendix A.1). In general, the well most likely to be affected from a hypothetical release from the soil was selected for each Site. Thus, several wells are in the middle of the Site, since this would be the most likely location to see an impact under an assumption that impact would be due to vertical leaching from the soil. A monitoring well in the first encountered aquifer was selected at each Site. For Sites A and H, Unit 1 wells were selected. At Sites on the kame (D, E, 129-3, and 129-5), where Unit 1 is not present, upper Unit 3 wells were selected. The groundwater parameter list for each Site mirrors the chemicals of concern in soil for the respective Site.

There are no groundwater cleanup standards in the ROD for the chemicals of concern in soils at these Sites, with the exception of antimony at Site A, so the data collected under this monitoring program are screened against TCAAP background values that were developed during the OU2 Feasibility Study (as presented in the OU2 ROD). For chemicals not expected to be naturally occurring (VOCs and explosives), the results are screened against the Minnesota Health Risk Limits (HRLs). Since there are not any expected groundwater impacts, the screening will serve to identify possible concerns.

Monitoring Plan:

Site A

Monitoring point: 01U119

Rationale for selected location: Well is located in Unit 1 near to and downgradient of the area of soil excavation at Site A.

Parameters: Antimony, barium, copper, lead

Frequency: Annual

Site C

Shallow groundwater at Site C is known to be impacted and there is an ongoing Corrective Action for Site C groundwater. See Section 7.0 below.

Site D

Monitoring point: 03U093

Rationale for selected location: Well is a shallow Unit 3 well (the first encountered aquifer) located near and downgradient of the soil remediation area.

Parameters: Antimony, lead, nitroglycerine

Frequency: Annual

Site E

Monitoring point: 03U089

Rationale for selected location: Well is a shallow Unit 3 well (the first encountered aquifer) located near and downgradient of the soil remediation area.

Parameters: Antimony, barium, copper, lead, manganese

Frequency: Annual

Site H

Monitoring point: 01U060

Rationale for selected location: Well is on the downgradient edge of Site H and is also the only available Unit 1 monitoring well at the Site.

Parameters: Antimony, arsenic, copper, lead, manganese

Frequency: Annual

129-3

Monitoring point: 03U087

Rationale for selected location: Well is a Unit 3 well (the first encountered aquifer) located in the center of the Site and below the area of soil remediation.

Parameters: Antimony, lead, manganese, nitroglycerine, VOCs

Frequency: Annual

129-5

Monitoring point: 03U097

Rationale for selected location: Well is a Unit 3 well (the first encountered aquifer) located in the center of the Site and below the area of soil remediation.

Parameters: Antimony, barium, lead

Frequency: Annual

Monitoring Results for FY 2006:

Results for the June 2006 sampling event are summarized in Table 4-1 (see Section 7.0 for discussion of Site C). There were no exceedances of screening criteria at Sites A, D, E, 129-3, or 129-5. At Site H, copper exceeded the background value (9.38 µg/l versus background of 4 µg/l). This well showed similar results (6.35 µg/l) in FY 2005. The HRL for copper is 1,000 µg/l. The surface water chronic standard would fall between 6.3 and 23 ug/l, depending on hardness. Thus, the groundwater results are above the lower end of the surface water standard range (hardness is not available for FY 2006). The Tier II Ecological Risk Assessment Report (USACHPPM, Final Report, December 2004) evaluated metals, including copper in Sunfish Lake (the surface water body at Site H). Copper was eliminated as a contaminant of concern based on water and sediment sampling in Sunfish Lake. Other metals that were retained were eliminated as concerns later in the Tier II Assessment.

Although the Tier II Risk Assessment did not show evidence of any copper related effects in Sunfish Lake, the surface water chronic standard still applies. Copper in groundwater will continue to be monitored and surface water hardness in Sunfish Lake will be added to the monitoring plan.

Manganese was above the Minnesota HRL, but well below the background for the Unit 1 aquifer at TCAAP. At Site 129-5, barium exceeded the background value in FY 2003, but was below the background value from FY 2004 through FY 2006. Overall, the results suggest that there were no impacts to groundwater due to soil remediation activities.

Are any changes or additional actions required for this remedy component? No.

4.3 REMEDY COMPONENT #9: CHARACTERIZATION OF DUMPS

Description: "Characterization of dumps at Sites B and 129-15 to determine their contents. If contents are found to be toxic, hazardous, or contaminated, then a remedy for the landfill will be utilized and documented through a post-ROD amendment. If the contents are not toxic, hazardous or contaminated, a no further action remedy would be employed." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):
When characterization has been sufficient to determine if the contents are toxic, hazardous, or contaminated, and if they are, when the remedy is in place.

Is this remedy component being implemented?

Yes. Field work was performed at both sites in early FY 1999. At Site B, characterization revealed that a no further action remedy was appropriate. A Closeout Report (prepared by Stone & Webster) received consistency in FY 2001 ("Site B Dump Investigation, Characterization, and Closeout Report"). At Site 129-15, characterization led to construction of a soil cover in FY 2002. The Closeout Report for Site 129-15 (prepared by Shaw) received regulatory approval in FY 2003, but final consistency will not be provided until concurrence on the land use control section of each report has been reached between the Army and the regulators (see Section 12.0 for information on land use controls). A modification to the ROD that will document the remedy selection for Site 129-15 was being prepared at the end of FY 2006.

Are any changes or additional actions required for this remedy component? No.

Table 4-1
Groundwater Quality Data for OU2 Shallow Soil Site
5-Year Groundwater Monitoring

Fiscal Year 2006

	Unit 1 Wells		Unit 3 Wells					TCAAP	TCAAP	
	01U060 (Site H)	01U119 (Site A)	03U087 (Site 129-3)	03U087 D (Site 129-3)	03U089 (Site E)	03U093 (Site D)	03U097 (Site 129-5)	Unit 1 GW Background (1)	Units 3/4 GW Background (1)	MDH HRL
	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06			
VOCs (ug/L)										
1,1,1-Trichloroethane			<1	<1				None	None	600
1,1,2,2-Tetrachloroethane			<1	<1				None	None	2
1,1,2-Trichloroethane			<1	<1				None	None	3
1,1-Dichloroethane			<1	<1				None	None	70
1,1-Dichloroethene			<1	<1				None	None	6
1,2-Dichloroethane			<1	<1				None	None	4
1,2-Dichloropropane			<1	<1				None	None	5
2-Butanone			<5	<5				None	None	4000
2-Hexanone			<5	<5				None	None	(Note 2)
4-Methyl-2-Pentanone			<5	<5				None	None	300
Acetone			<5	<5				None	None	700
Benzene			<1	<1				None	None	10
Bromodichloromethane			<1	<1				None	None	6
Bromoform			<1	<1				None	None	40
Bromomethane			<1	<1				None	None	10
Carbon Disulfide			<1	<1				None	None	700
Carbon Tetrachloride			<1	<1				None	None	3
Chlorobenzene			<1	<1				None	None	100
Chloroethane			<1	<1				None	None	280
Chloroform			<1	<1				None	None	60
Chloromethane			<1	<1				None	None	80
cis-1,2-Dichloroethene			<1	<1				None	None	70
cis-1,3-Dichloropropene			<1	<1				None	None	2
Dibromochloromethane			<1	<1				None	None	80
Ethylbenzene			<1	<1				None	None	700
m&p-Xylene			<2	<2				None	None	10,000
Methylene Chloride			<1	<1				None	None	50
o-Xylene			<1	<1				None	None	10,000
Styrene			<1	<1				None	None	(Note 2)
Tetrachloroethene			JP 0.19 (UB 0.3)	<1				None	None	7
Toluene			<1	<1				None	None	1000
trans-1,2-Dichloroethene			<1	<1				None	None	100
trans-1,3-Dichloropropene			<1	<1				None	None	2
Trichloroethene			1.5 (UB 0.3)	1.5 (UB 0.3)				None	None	30
Vinyl Chloride			<1	<1				None	None	0.2

Table 4-1
Groundwater Quality Data for OU2 Shallow Soil Site
5-Year Groundwater Monitoring

Fiscal Year 2006

	Unit 1 Wells		Unit 3 Wells					TCAAP	TCAAP	
	01U060 (Site H)	01U119 (Site A)	03U087 (Site 129-3)	03U087 D (Site 129-3)	03U089 (Site E)	03U093 (Site D)	03U097 (Site 129-5)	Unit 1 GW Background (1)	Units 3/4 GW Background (1)	MDH HRL
	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06	6/7/06			
Metals (ug/L)										
Antimony	B 3.2	<5	B 0.87 (UB 0.6)	B 0.48 (UB 0.6)	B 0.69 (UB 0.6)	<2	<5	<10	<10	6 (3)
Arsenic	B 1.7							6.80	14	(Note 2)
Barium		102			28.2		110	240	206	2000
Copper	**9.38**	B 2.8			B 1.7			4	27	1000
Lead	B 0.26 (UB 0.088)	B 0.30 (UB 0.088)	B 0.37 (UB 0.088)	B 0.31 (UB 0.088)	B 0.29 (UB 0.088)	B 0.43 (UB 0.088)	B 0.22 (UB 0.088)	4.2	3.8	15 (4)
Manganese	2040		B 0.25 (UB 0.41)	B 0.27 (UB 0.41)	B 0.76 (UB 0.41)			7,500	760	1000
Zinc										
Explosives (ug/L)										
Nitroglycerine			< 0.97 (JH 12)	< 0.97 (JH 12)		< 0.97 (JH 12)		None	None	(Note 2)

Notes:

(1) Background values for Unit 1 groundwater from Appendix C, Table 6 in the OU2 ROD.
Background values for Unit 3/4 groundwater from Appendix C, Table 7 in the OU2 ROD.
Bolding (in red color) indicates exceedance of the respective background value.
(2) No HRL has been established for this analyte.
(3) For Site A Shallow Groundwater, this is also the Cleanup level from Table 1 of the OU2 ROD.
(4) No HRL has been established for this analyte. MDH utilizes 15 ug/l as the Action Level "at the tap".
D Duplicate sample.
B The value is below the reporting level, but above the method detection limit. Results should be considered estimated.
JH Holding time exceeded (the number of days beyond the holding time is listed after "JH"). Results should be considered estimated.
JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.
UB The sample result was less than 5 times the level detected in a blank (the result for the blank is listed after "UB").
The sample result can be considered non detect at an elevated detection limit.

5.0 Operable Unit 2: Deep Soil Sites

Sites D and G were impacted primarily by VOC contaminants at depths extending to between 50 and 170 feet. Some additional shallow soil contaminants were also present at Site D, and Site G also contains a dump. The OU2 ROD (pages 2-3) describes seven remedy components for these two sites. The final remedy incorporated the use of existing soil vapor extraction (SVE) systems and site caps, which were installed in 1986.

5.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater Monitoring." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):
When groundwater monitoring results from wells adjacent to each site are below the cleanup levels for deep groundwater specified in Table 1 of the OU2 ROD, and shown on Table 5-1 in this report.

Is this remedy component being implemented? Yes.

Were the groundwater monitoring requirements of this remedy met?
Yes. Samples were collected and analyzed from the wells that are nearest to Sites D and G in accordance with the FY 2006 Monitoring Plan.

What impact did the SVE systems have on contaminant concentrations in groundwater adjacent to Sites D and G?

Figure 5-1 shows the wells nearest to Sites D and G. Figure 5-2 and Figure 5-3 present trichloroethene trend graphs for these wells. Trichloroethene trends in other nearby wells can also be viewed from Figure B-3 (Appendix B).

Downgradient of Site D, at 03U093 (Figure 5-2), the concentrations over the past five years show a stable trend through FY 2006.

Downgradient of Site G, at 03U094 (Figure 5-3), the concentrations over the past five years show a decreasing trend through 2003 followed by a slight increase, and down again in FY 2006.

Table 5-1 presents the FY 2006 data for the deep groundwater chemicals of concern for the two wells nearest to Sites D and G. The table shows that these wells still exceed the cleanup level for trichloroethene. There are no other cleanup level exceedances among these wells.

During the years of SVE operation (1986 to 1998), trichloroethene concentrations in groundwater decreased from 10,000's to less than 800 µg/l. The most dramatic improvement has been at 03U093 (Figure 5-2). Overall, these results indicate that SVE systems at Sites D and G effectively minimized (or eliminated) further contamination of the deep groundwater beneath these sites. However, the contaminant concentrations are still much greater than the cleanup levels. This suggests that residual contamination is acting as an ongoing source for groundwater contamination. The residual source has not been defined and could be in either the saturated or unsaturated zone. It is possible that natural attenuation will cause reductions in contaminant concentrations in the future, as suggested by the findings of the USEPA's Natural Attenuation Study (U.S. EPA 2001. "Evaluation of the Protocol for Natural Attenuation of Chlorinated Solvents: Case Study at the Twin Cities Army Ammunition Plant. Office of Research and Development, Washington DC EPA/600/R-01/025).

Is any groundwater sampling proposed prior to the next report?

Yes. As shown in Appendix A.1, wells 03U093 (Site D) and 03U094 (Site G) will be sampled in June 2007 for VOC analysis.

Are any changes or additional actions required for this remedy component? No.

5.2 REMEDY COMPONENT #2: RESTRICT SITE ACCESS

Description: "Restrict site access and use during remedy implementation." (OU2 ROD, page 2)

Performance Standard (how do you know when you're done):

When site access is adequately restricted to protect human health.

Is this remedy component being implemented?

Yes (see Section 12.0 for information on land use controls).

Are any changes or additional actions required for this remedy component? No.

5.3 REMEDY COMPONENT #3: SVE SYSTEMS

Description: "Install and operate deep soil vapor extraction (SVE) systems with modified shallow SVE." (OU2 ROD, page 2)

SVE systems were installed at Sites D and G in 1986 as Interim Remedial Actions to address soil contamination, which were then incorporated into the final remedy. The Site D system included 39 shallow vents (depths of 33-54 feet) and one deep vent (depth of 150 feet). The Site G system included 89 shallow vents (depths of 23-55 feet). The systems removed a combined total of over

220,000 pounds of VOCs from both shallow and deep soils between startup in 1986 and shutdown in 1998 (116,199 pounds for Site D and 104,418 pounds for Site G).

Performance Standard (how do you know when you're done):
When the soil concentrations are below the cleanup levels specified in Table 8 of the OU2 ROD.

Is this remedy component being implemented?
This remedy component has been completed. The Site D SVE system was dismantled in FY 2001, and the Site G SVE system was dismantled in FY 2003. The Site D Shallow and Deep Soil VOC Investigation and Closeout Report received regulatory approval in FY 2002. The Site G Closeout Report received regulatory approval in FY 2005.

Are any changes or additional actions required for this remedy component? No.

5.4 REMEDY COMPONENT #4: ENHANCEMENTS TO THE SVE SYSTEMS

Description: "Evaluate and potentially use enhancements to the SVE systems." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When an adequate evaluation has been completed.

Is this remedy component being implemented?
This remedy component has been completed. No enhancements to either SVE system were required, since soil cleanup levels were reached without the need for any such modifications.

Are any changes or additional actions required for this remedy component? No.

5.5 REMEDY COMPONENT #5: MAINTAIN EXISTING SITE CAPS

Description: "Maintain existing site caps." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the cap is maintained in adequate condition.

Is this remedy component being implemented?
Yes. The caps for Sites D and G were originally intended to minimize infiltration of precipitation and to minimize short-circuiting of air during SVE system operation. With achievement of the soil cleanup goals at Site D, there is no longer a need for a cap relative to VOCs in the soil. At Site G, the revised cleanup goal for trichloroethene was based on maintaining a cap with a specified permeability over the area with trichloroethene contamination (see Section 12.0 for information on land use controls and long-term operation and maintenance (O&M)). An annual inspection of the cap was performed on July 20, 2006 (see Appendix J). There was no erosion or other damage observed that would necessitate any repairs to the cap.

Are any changes or additional actions required for this remedy component? No.

5.6 REMEDY COMPONENT #6: MAINTAIN SURFACE DRAINAGE CONTROLS

Description: "Maintain surface [drainage] controls." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When surface water does not pond on the cap, and surface water flows off at a rate that does not cause erosion problems with the cap.

Is this remedy component being implemented?
Yes. As discussed above, drainage controls are no longer required for Site D relative to VOCs in the soil, but still apply for Site G (see Section 12.0 for information on land use controls and long-term O&M).

Are any changes or additional actions required for this remedy component? No.

5.7 REMEDY COMPONENT #7: CHARACTERIZE SHALLOW SOILS AND DUMP

Description: "Following completion of SVE remediation of deep soils, characterize Site D shallow soils and Site G dump to determine appropriate action." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the characterizations have provided answers necessary to determine if additional remediation is required, and if remediation is required, when it has been completed.

Is this remedy component being implemented?
Yes. For Site D, shallow soil characterization work was completed in FY 2002. In FY 2003, 1,381 cubic yards of soils contaminated with metals and nitroglycerin were excavated by Shaw and transported off-site for disposal at a permitted disposal facility. The Site D Closeout Report received regulatory approval in FY 2004, but final consistency will not be provided until concurrence of the land use control section of the report is reached between the Army and the regulators. A modification to the OU2 ROD documenting the remedy selection for Site D shallow soils was being prepared at the end of FY 2006.

For Site G, a technical memorandum recommending improvements to the Site G cover received regulatory approval in FY 2003. A work plan for the cover design also received regulatory approval in FY 2003. Cover construction was completed over the Site G dump in early FY 2005. The Site G Closeout Report received regulatory approval, but final consistency will not be provided until concurrence of the land use control section of the report is reached between the Army and the regulators. A modification to the OU2 ROD documenting the remedy selection for Site G was being prepared at the end of FY 2006.

Are any changes or additional actions required for this remedy component? No.

5.8 OVERALL REMEDY FOR DEEP SOIL SITES

Has the SVE remediation been completed (i.e., have the soil cleanup levels in Table 8 of the OU2 ROD been attained throughout the areal and vertical extent of Sites D and G)?
Yes, subject to the revised Site G cleanup levels cited previously.

Has it been determined that remediation of shallow soils at Site D and/or the dump at Site G is not required, or if required, has the remediation been completed?
For Site D, the additional soil removal that was determined to be required has been completed. For Site G, construction of the improvements to the cover were completed in FY 2004.

Table 5-1

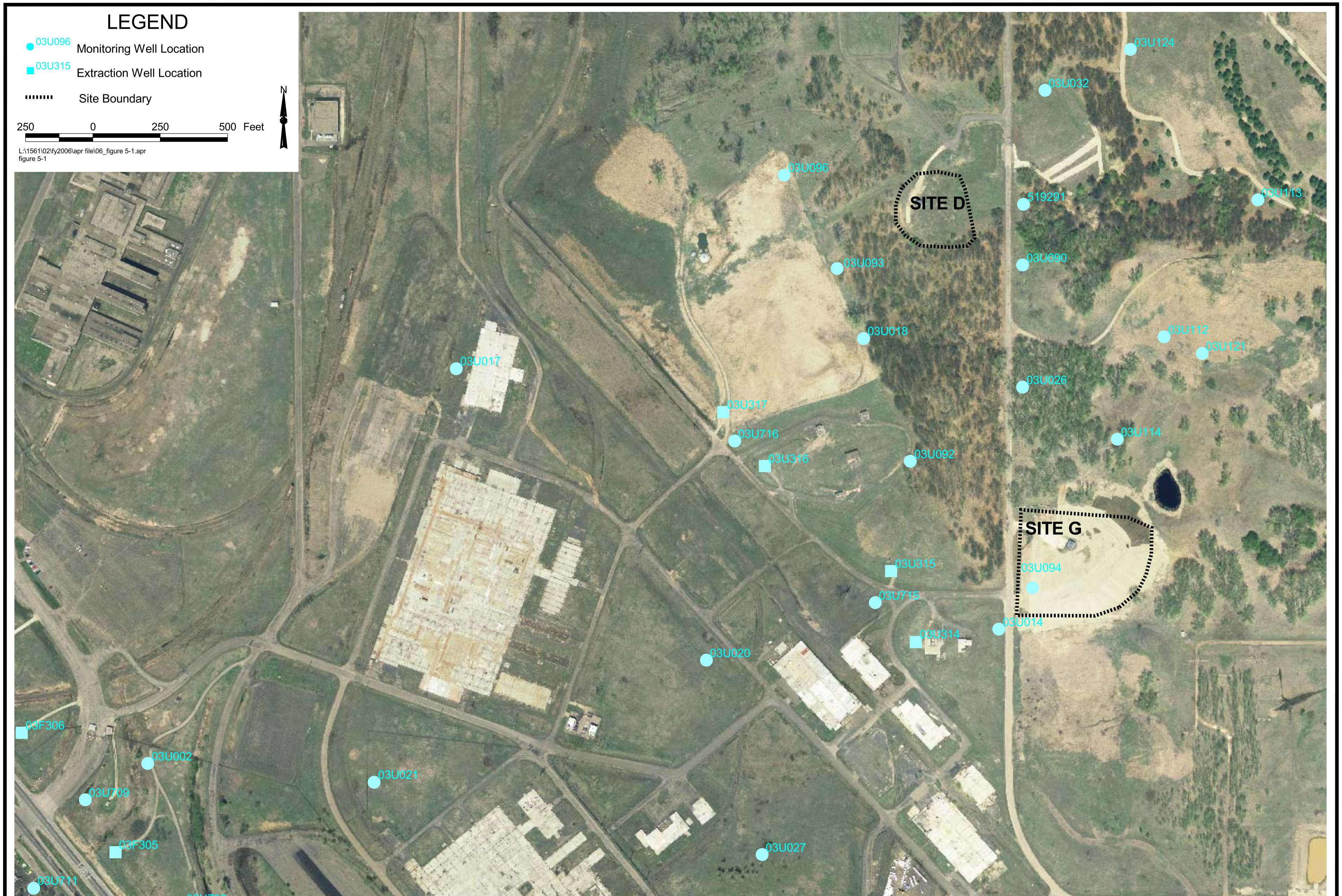
Deep Groundwater Data Near Sites D and G
Fiscal Year 2006

		Tetrachloro-ethene (ug/l)	Trichloro-ethene (ug/l)	1,1-Dichloro-ethene (ug/l)	cis-1,2-Dichloro-ethene (ug/l)	1,1-Dichloro-ethane (ug/l)	1,1,1-Trichloro-ethane (ug/l)	1,2-Dichloro-ethane (ug/l)
OU2 Cleanup Level [(1)]		5	5	6	70	70	200	4
Site D								
03U093	6/14/06	<1	**77**	2.9	1.2	0.4JP	35	<1
Site G								
03U094	6/14/06	0.51 JP	**180**	7.3	1.8	3.0	70	<1

Notes:

(1) Cleanup levels for Deep Groundwater are from Table 1 of the OU2 ROD. Bolding (in red color) indicates exceedance of the cleanup level.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.



TWIN CITIES ARMY AMMUNITION PLANT

Location of Wells Nearest to Sites D and G

Wenck

Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

FY 2006

Figure 5-1

FIGURE 5-2

SITE D, WELL 03U093, TRICHLOROETHENE WATER QUALITY TRENDS

TWIN CITIES ARMY AMMUNITION PLANT

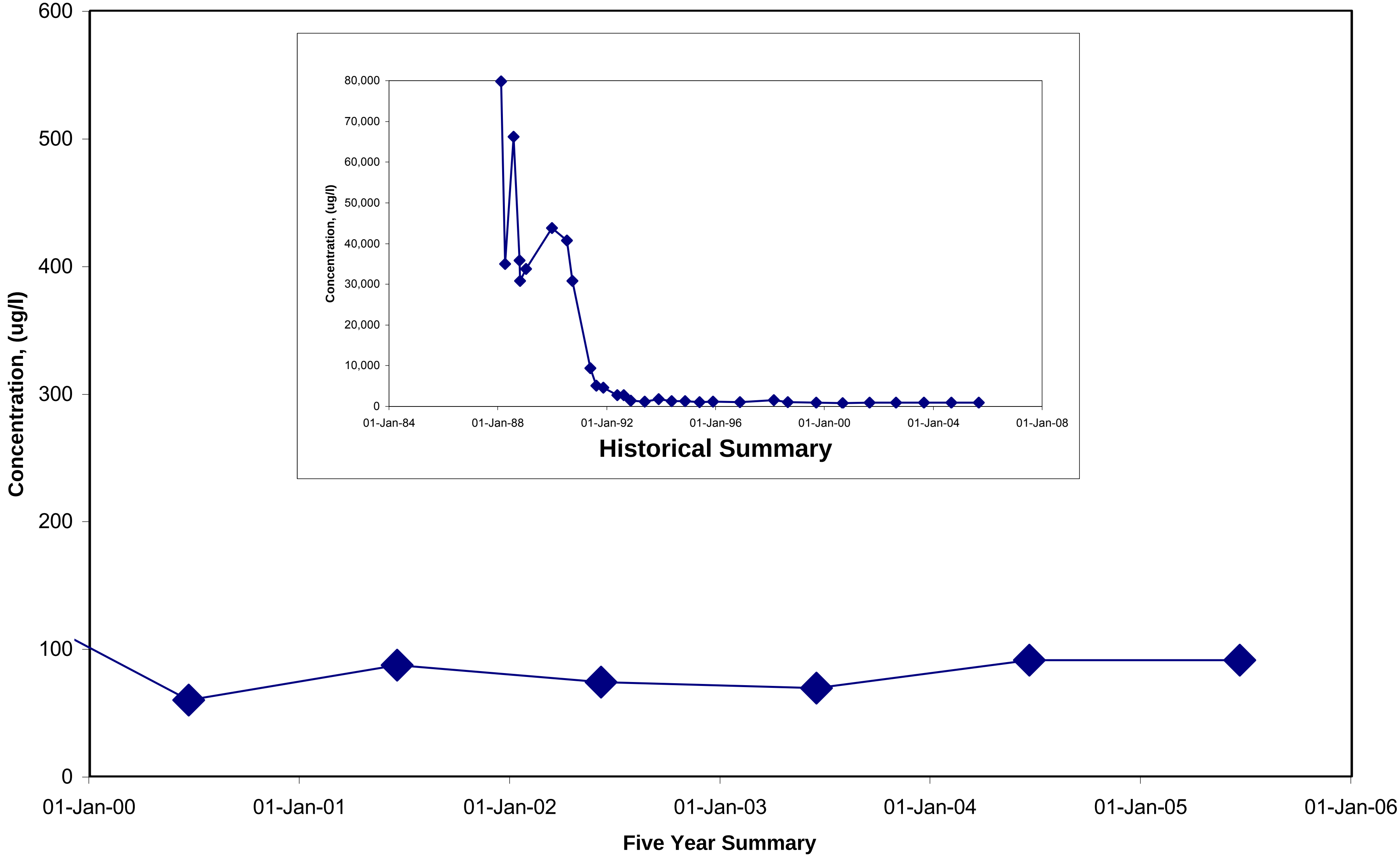
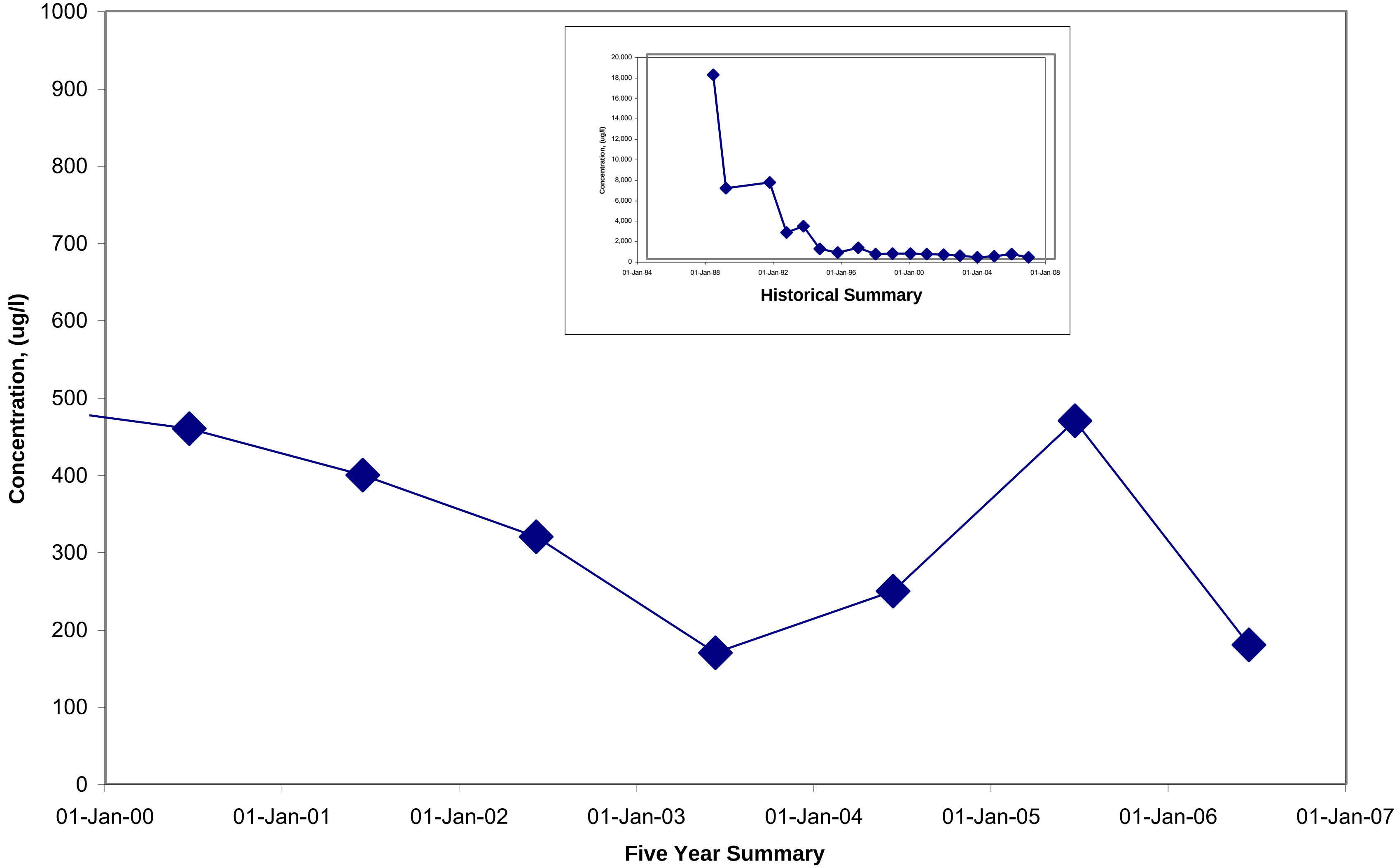


FIGURE 5-3
SITE G, WELL 03U094, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT



C:\Files\Lisa\FY 2006 APR\Figures\Figure 5-3

Wenck Associates, Inc.

6.0 Operable Unit 2: Site A Shallow Groundwater

Shallow groundwater at Site A has been impacted by VOCs and antimony. The selected remedy in the OU2 ROD incorporates the use of a groundwater extraction system, which began operation May 31, 1994. The containment system originally consisted of eight extraction wells installed along two lines downgradient of the source area. Only four of the eight extraction wells currently need to be operated to provide the necessary containment. Extracted groundwater is discharged to the sanitary sewer for treatment at a Publicly-Owned Treatment Works (POTW). The ROD prescribes five major components of the remedy that are described and evaluated in the following sections.

6.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track plume migration and remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Performance monitoring programs have been established to collect the data required for remedy components #2 to #4 and evaluation of the overall remedy. Table 6-1 summarizes the performance monitoring requirements, the implementing parties, and the documents that contain the monitoring plans. The FY 2006 Monitoring Plan is included in Appendix A. Figure 6-1 illustrates the wells and piezometers associated with Site A, and highlights the wells that were sampled in FY 2006.

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes.

- Groundwater sampling of water supply wells related to alternate water supply and well abandonment will be in accordance with recommendations in Appendix E. No wells are recommended for FY 2007. The next "major" event will be in FY 2009.
- Monitoring of the extraction wells (pumping volumes, water levels, and water quality) and treatment system effluent will be in accordance with Appendix A.2.
- Other groundwater monitoring will be in accordance with the Groundwater Monitoring Plan included as Appendix A.1.

Are any changes or additional actions required for this remedy component? No.

6.2 REMEDY COMPONENT #2: GROUNDWATER CONTAINMENT AND MASS REMOVAL

Description: "Use of existing gradient control wells to contain the contaminant plume and remove mass." (OU2 ROD, page 3)

- Eight extraction wells (EWs), 01U351 – 01U358 (EW-1 – EW-8), were installed in two capture lines as shown on Figure 6-1. Seven of the eight extraction wells fully penetrate the Unit 1 aquifer and range in depth from 31 to 48 feet, as shown in cross-sectional view on Figure 6-2. The one partially penetrating well, 01U353 (EW-3), was completed in silt to sandy clay units that were resistant to drilling and determined to be the top of Unit 2 by the field geologist. The well log does not note the presence of silt (Fuller, 1994).

The partially penetrating well is illustrated on cross-section B-B' on Figure 6-2.

- Wells 01U355 – 01U358 (EW-5 – EW-8), the line of extraction wells downgradient of the "first line" of extraction wells, were shut off (with regulatory approval) on July 11, 2000, and have remained off since that time. These wells were shut off because: 1) they were below the cleanup levels, and 2) the known area of groundwater having cleanup goal exceedances was within the capture area of the first line of extraction wells.

Performance Standard (how do you know when you're done):
When the extraction system is providing complete capture of all groundwater exceeding the cleanup levels specified in Table 1 of the OU2 ROD, and shown in Table 6-2 of this report.

Is the Site A groundwater extraction system providing complete capture of all groundwater exceeding the cleanup levels specified in Table 1 of the OU2 ROD?
Yes. Table 6-3 shows the monthly average pumping rate for each extraction well and the combined system total, along with the target pumping rate for containment. The original target pumping rate for wells 01U351 – 01U355 (EW-1 – EW-5) was 15 gpm. The average pumping rate for FY 2006 was 16.8 gpm, slightly above the target. Additional development and cleaning are scheduled in FY 2007 to maintain the flow rates.

Water level data collected at Site A on June 12, 2006, is shown in Table 6-4, and a water level contour map prepared from this data is presented on Figure 6-3. This figure shows the influence from pumping the four extraction wells and the interpreted capture boundary, which supports the statement that the system is providing complete capture of all groundwater exceeding the Site A cleanup levels.

Table 6-2 (and also Figure 6-4 and Figure 6-5) show that the locations where groundwater exceeds cleanup levels continue to be at and upgradient of the first line of recovery wells. Two wells, 01U108 and 01U126 exceeded the cleanup level for tetrachloroethene. Cis-1,2-dichloroethene was below the cleanup standard at all monitoring well locations. Only 1 extraction well (EW-2) was above the cleanup standards for cis-1,2-dichloroethene and benzene. In FY 2005, two extraction wells (EW-2 and EW-3) exceeded the cleanup standards.

Were there any significant operation and maintenance problems (greater than 24-hour shutdown)?

Yes. Table 6-5 summarizes O&M notes for FY 2006.

Are any changes or additional actions required for this remedy component? No.

6.3 REMEDY COMPONENT #3: DRILLING ADVISORY/ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: "Institutional controls to restrict new well installations and provide alternate water supplies and well abandonment as necessary." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the MDH has issued a Special Well Construction Area Advisory and when well owners who qualify have been offered and provided with alternate water supply and/or have had their wells abandoned (or the offers have been rejected).

Is the remedy component being implemented?

Yes. The OU1 Alternate Water Supply and Well Abandonment Program is underway and was expanded to cover the area affected by the OU2 Site A shallow groundwater plume. See Section 3.1 of this report for more information on this program.

Has the MDH issued a Special Well Construction Area Advisory for the area impacted by Site A?

Yes, it was issued in June 1996 and revised in December 1999; however, this revision did not affect the boundary for the Site A vicinity.

Did the boundary of the Site A plume get any bigger during FY 2006, as defined by the 1 mg/l contour?

No. Figure 6-4 shows the 1 μg/l contour line for cis-1,2-dichloroethene (the chemical of concern at Site A with the biggest plume footprint). There were no significant increases in the plume footprint from last year.

Were any additional water supply wells discovered within the area of concern for the Site A plume that are completed within the aquifer of concern? No.

Were any water supply wells within the Site A plume sampled during FY 2006? If yes, what were the findings? No.

Were any well owners offered an alternate supply and/or well abandonment in FY 2006? No.

Within the Site A plume, are there any well owners that meet the criteria, but have not yet been provided an alternate water supply? No.

Within the Site A plume, are there any wells that meet the criteria, but have not yet been abandoned? No.

Is any sampling of water supply wells proposed prior to the next report? No.

Are any changes or additional actions required for this remedy component? No.

6.4 REMEDY COMPONENT #4: DISCHARGE OF EXTRACTED WATER

Description: "Discharge of extracted groundwater to a publicly-owned treatment works (POTW)." (OU2 ROD, page 3)

- The recovered groundwater is piped to a sewer discharge manhole (Shoreview sanitary sewer discharge manhole #229) located approximately 150 feet north of the TCAAP boundary as shown on Figure 6-1. The recovered groundwater is conveyed via a City of Shoreview sanitary sewer to the Metropolitan Council Environmental Services (MCES) Treatment Plant located at 2400 Childs Road in St. Paul, Minnesota. Discharge is in accordance with Industrial Discharge Permit Number 2194 from the MCES.

Performance Standard (how do you know when you're done):
When the concentrations of contaminants in the extracted groundwater and the flow rate are below the criteria in the Industrial Discharge Permit, as shown in Table 6-6.

During FY 2006, was the discharge water in compliance with the Industrial Discharge Permit requirements?
Yes. Table 6-6 shows that the effluent water quality was below the discharge criteria in every month of FY 2006.

Is any sampling of the discharge water proposed prior to the next report?
Yes. In accordance with the permit requirements, the discharge will be sampled monthly for 1,2-dichloroethene (cis and trans), trichloroethene, 1,1,1-trichloroethane, and mercury (see Appendix A.2).

Are any changes or additional actions required for this remedy component? No.

6.5 REMEDY COMPONENT #5: SOURCE CHARACTERIZATION/ REMEDIATION

Description: “Source characterization/remediation.” (OU2 ROD, page 3)

Performance Standard (how do you know when you’re done):
For characterization, when the investigation has answered the questions needed to prepare remedial design documents. For remediation, when the contaminant concentrations in soil are below the cleanup levels specified in Table 1 of the OU2 ROD.

Is this remedy component being implemented?
Yes. Characterization work has been completed. Stone & Webster performed investigation work in 1997 and the final “Site A Investigation Report” was issued December 12, 1997. The report delineated the extent of both VOC-contaminated and metal-contaminated soils requiring remediation.

Remediation has been completed. Shaw completed removal of metal-contaminated soils in FY 1999. Construction of an air sparging/soil vapor extraction (AS/SVE) system to remediate VOC-contaminated soils was completed by Stone & Webster in FY 2000, which began operation in early FY 2001. The AS system was operated minimally in FY 2001 and was shut off permanently in June 2001 due to a lack of increase in SVE VOC levels and due to concern regarding potential plume spreading. The AS system was being implemented voluntarily and was not a requirement of the OU2 ROD. Soil samples were collected within the source area in July 2002 (and previously in August 2001). In both events, the results showed minimal reduction in soil VOC concentrations. Since it appeared that many years of SVE system operation would be required before cleanup levels would be reached (if ever), the Army ceased SVE system operation on August 21, 2002, and submitted a work plan clarification to the USEPA and MPCA for excavation of the VOC-contaminated soils in the source area. The work plan clarification received regulatory approval in early FY 2003, and 688 cubic yards of contaminated soil were excavated by Shaw and transported off-site to a permitted disposal facility. The Site A Former 1945 Trench Closeout Report (prepared by Shaw) received regulatory consistency in FY 2004.

Are any changes or additional actions required for this remedy component? No.

6.6 OVERALL REMEDY FOR SITE A SHALLOW GROUNDWATER

Performance Standard (how do you know when you're done):

When the cleanup levels in Table 1 of the OU2 ROD have been attained throughout the areal and vertical extent of the Site A plume within the anticipated ten-year lifespan of the remedy. If the remedy has not been completed within ten years, additional remedial measures will be addressed (OU2 ROD, page 54).

Has the Site A shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD been attained throughout the areal and vertical extent of the Site A plume)?

No. Table 6-2 shows the exceedances in wells at Site A during FY 2006. Figure 6-5 shows that the area with tetrachloroethene exceedances (greater than 7 µg/l) extends from the source area (near 01U108) downgradient to near 01U126. The tetrachloroethene exceedances do not extend to the first line of extraction wells. There were no cis-1,2-dichloroethene exceedances (greater than 70 µg/l) at monitoring wells in the Summer 2006 event (Figure 6-4). However, Table 6-2 shows that extraction well EW-2 was above the cleanup standard (140 µg/l) and EW-3 dropped to below the cleanup standard (14 µg/l). These wells have been fluctuating near the cleanup standard for several years. This suggests that an area with cis-1,2-dichloroethene exceedances (greater than 70 µg/l) persists in the vicinity of EW-2 and EW-3, though it does not extend back to the source area. The presence of 1,2 dichloroethene in this area is consistent with the breakdown of trichloroethene and perchloroethene with distance from the source area. The benzene concentration in EW-2 was just above the cleanup level of 10 µg/l in the June 2006 event, consistent with FY 2005. The benzene cleanup level was not exceeded in any other wells.

What impact is the groundwater extraction system having on contaminant concentrations?
Groundwater contaminant concentrations at Site A were generally comparable to last year's data, with the cis-1,2-dichloroethene tetrachloroethene concentrations decreasing slightly at some locations with the plume extent remaining about the same.

All wells downgradient of the first line of extraction wells had water quality results that remained below the cleanup levels. In FY 2003, the well adjacent to the source area (01U108) showed a considerable increase in tetrachloroethene (from 7.6 to 65 µg/l); and it was concluded that the result was likely an artifact of sporadic air sparging efforts. The subsequent reduction in FY 2004 to 11 µg/l, and confirmation in FY 2005 and FY 2006 (14 µg/l and 12 µg/l) indicates remedial progress in this area.

The following figures present trend graphs of cis-1,2-dichloroethene, trichloroethene, and tetrachloroethene for representative wells that illustrate these points:

- Figure 6-6 01U902 (downgradient of the extraction system)
- Figure 6-7 Extraction Wells EW-1 to EW-4 (the first line of extraction wells) (cis-1,2-dichloroethene only)
- Figure 6-8 01U108 (near the source area)

Note that some of the data points prior to FY 1999 may be showing total 1,2-dichloroethene (cis and trans isomers combined), since analysis of the cis isomer alone has not always been performed.

What impact is source removal having on contaminant concentrations?
Since the contaminated soils from the Former 1945 Trench were removed from the site in early FY 2003, the source removal appears to be beginning to influence the FY 2006 monitoring data. At 01U108, the closest monitoring well downgradient of the source area, the concentration of tetrachloroethene decreased from FY 2003. Monitoring well 01U126 decreased from 56 µg/l to 12 µg/l tetrachloroethene. The cis-1,2-dichloroethene decreased at extraction wells EW-2 and

EW-3, which may also reflect degradation of the tetrachloroethene observed at 01U108 and 01U126.

How much VOC mass has been removed?
Based on the calculated VOC mass removal rates for the total effluent, the groundwater extraction system removed approximately 3.95 pounds of VOCs in FY 2006, with a cumulative VOC mass removal of approximately 48.78 pounds since system startup on May 31, 1994 (Table 6-7).

Has 10 years elapsed since signing of the OU2 ROD? No. The June 2006 sampling event marked nine years of extraction system operation since the signing of the OU2 ROD. The ROD states, "should aquifer restoration not be attained within the anticipated ten-year lifespan of the remedy, additional remedial measures will be addressed". Based on the FY 2003 through FY 2006 contaminant concentrations and trends, it appears that cleanup levels could potentially be reached throughout the areal extent of the plume by the tenth year. However, even if cleanup levels are not reached by the tenth year, the situation might be that exceedances will persist only in the source area vicinity and will not extend to the first line of recovery wells, and natural attenuation process (with monitoring) are a sufficient remedy for the future.

Do additional remedial measures need to be addressed? No. However, a discussion with the MPCA and USEPA will be initiated in FY 2007 to address the approaching ten-year anniversary.

6.7 OTHER ACTIVITIES IN FY 2006

There we no other activities conducted at Site A in FY 2006.

Table 6-1

Summary of Site A Shallow Groundwater Monitoring Requirements
Fiscal Year 2006

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Groundwater Monitoring	Outlined below		
#2: Containment and Mass Removal	a. Pumping volumes and rates for each extraction well for comparison to design flowrates for containment	Army	Site A Monitoring Plan in the Annual Report
	b. Water levels from monitoring wells to draw contour maps showing the influences of pumping	Army	Site A Monitoring Plan in the Annual Report
	c. Water quality data for each extraction well to determine VOC mass removal	Army	Site A Monitoring Plan in the Annual Report
#3: Drilling Advisory/Alternate Water Supply/Well Abandonment	See OU1, Remedy Component #1 which also includes the area north of Site A		
#4: Discharge of Extracted Water	a. Water quality data for total system effluent to demonstrate compliance with the Industrial Discharge Permit	Army	Site A Monitoring Plan in the Annual Report
#5: Source Characterization/ Remediation	a. AS/SVE system flowrates and air quality data to evaluate system effectiveness and emissions (this system was permanently shut down on August 21, 2001)	Army	Site A Monitoring Plan in the Annual Report
OR: Overall Remedy (Attainment of cleanup goals)	a. Water quality data throughout the Site A plume to evaluate attainment	Army	Site A Monitoring Plan in the Annual Report

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2006

			Tetra-chloro-ethene (ug/l)	Tri-chloro-ethene (ug/l)	1,1-Di-chloro-ethene (ug/l)	1,2-Di-chloro-ethane (ug/l)	cis-1,2-Di-chloro-ethene (ug/l)	Cholor-form (ug/l)	Benzene (ug/l)	Antimony (ug/l)
Site A Cleanup Level [1]			7	30	6	4	70	60	10	6
01U039		6/13/06	<1	<1	<1	<1	<1	<1	<1	
01U102		6/14/06	1.1	JP 0.27	<1	<1	JP 0.72	<1	<1	
01U102	D	6/14/06	1.2	JP 0.24	<1	<1	JP 0.67	<1	<1	
01U103		6/14/06	<1	<1	<1	<1	<1	<1	<1	2.89
01U108		6/14/06	**12**	1.5	<1	<1	JP 0.64	<1	<1	
01U115		6/13/06	<1	JP 0.21	<1	<1	JP 0.33	<1	<1	
01U116		6/13/06	<1	JP 0.20	<1	<1	JP 0.26	<1	<1	
01U117		6/14/06	3.0	JP 0.93	<1	<1	11	<1	<1	
01U126		6/14/06	**12**	<1	<1	<1	<1	<1	<1	
01U127		6/14/06	<1	<1	<1	<1	<1	<1	<1	
01U138		6/13/06	JP 0.22 (UB 0.16)	JP 0.34	<1	<1	JP 0.97	<1	<1	
01U139		6/14/06	<1	JP 0.40	<1	<1	16	<1	JP 0.90	
01U140		6/14/06	<1	<1	<1	<1	2.5	<1	JP 0.77	
01U157		6/13/06	<1	JP 0.45	<1	<1	1.3	<1	<1	
01U158		6/13/06	<1	JP 0.33	<1	<1	1.0	<1	<1	
01U901		6/14/06	<1	<1	<1	<1	JP 0.28	<1	<1	
01U902		6/14/06	<1	<1	<1	<1	4.6	<1	<1	<2
01U902	D	6/14/06	<1	<1	<1	<1	4.7	<1	<1	
01U903		6/14/06	<1	<1	<1	<1	JP 0.46	<1	<1	
01U904		6/14/06	<1	<1	<1	<1	2.2	<1	<1	<2
01U904	D	6/14/06	---	---	---	---	---	---	---	<2

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2006

			Tetra-chloro-ethene (ug/l)	Tri-chloro-ethene (ug/l)	1,1-Di-chloro-ethene (ug/l)	1,2-Di-chloro-ethane (ug/l)	cis-1,2-Di-chloro-ethene (ug/l)	Cholor-form (ug/l)	Benzene (ug/l)	Antimony (ug/l)
Site A Cleanup Level (1)			7	30	6	4	70	60	10	6
Extraction Wells:										
01U351 (EW1)		6/14/06	JP 0.80 (UB 0.16)	JP 0.79	<1	<1	1.5	<1	<1	
01U352 (EW2)		6/14/06	JP 0.46 (UB 0.16)	1.0	JP 0.23	<1	**180**	<1	**14**	
01U352 (EW2)	D	6/14/06	JP 0.27	JP 0.82	<1	<1	**150**	JP 0.55	**14**	
01U353 (EW3)		6/14/06	JP 0.36 (UB 0.16)	JP 0.84	<1	<1	14	<1	JP 0.47	
01U354 (EW4)		6/14/06	<1	JP 0.36	<1	<1	JP 0.88	<1	<1	

Notes:

(1) Cleanup levels for Site A Shallow Groundwater are from Table 1 of the OU2 ROD. Bolding (in red color) indicates exceedance of the cleanup level.

D Duplicate sample.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

UB The sample result was less than 5 times the level detected in a blank (the result for the blank is listed after "UB"). The sample result can be considered non detect at an elevated detection limit.

Table 6-3

Site A Removal Action Pumping Data
Fiscal Year 2006

Month	01U351	01U352	01U353	01U354	01U351-354 Subtotal
Target Flowrate (gpm):					**15.0**
	Average Flowrate (gpm)				
Oct-05	6.0	1.6	2.8	2.9	13.4
Nov-05	7.0	2.3	3.0	3.3	15.6
Dec-05	5.4	2.4	3.1	3.4	14.2
Jan-06	5.0	3.4	3.0	3.7	15.1
Feb-06	7.9	4.1	3.3	4.9	20.2
Mar-06	8.0	3.3	2.7	5.3	19.3
Apr-06	6.6	0.7	3.2	5.7	16.3
May-06	7.0	4.3	3.6	3.8	18.6
Jun-06	4.4	6.2	4.0	2.2	16.8
Jul-06	5.9	6.0	3.8	3.6	19.3
Aug-06	5.7	4.9	3.5	3.7	17.9
Sep-06	5.4	3.1	3.5	3.4	15.3
FY06 Average	**6.2**	**3.5**	**3.3**	**3.8**	**16.8**

Table 6-4

Site A Groundwater Level Data
Fiscal Year 2006

Well ID	TOS (ft)	Stickup (ft)	GW Meas. 2006 (ft)	GW elev. 2005 (ft)
O1U038	900.30	1.69	9.61	892.38
O1U039	897.50	2.23	14.83	884.90
O1U040	892.54	2.43	10.50	884.47
O1U041	898.33	2.25	8.26	892.32
O1U063	892.61	2.40	11.34	883.67
O1U067	897.40	2.76	7.48	892.68
O1U102	905.20	2.28	17.84	889.64
O1U103	904.14	2.48	15.83	890.79
O1U104	899.12	2.41	8.74	892.79
O1U105	901.39	2.40	9.82	893.97
O1U106	896.80	2.88	9.46	890.22
O1U107	899.16	1.69	9.72	891.13
O1U108	904.30	2.14	16.01	890.43
O1U110	897.22	2.63	5.87	893.98
O1U115	900.33	1.67	15.95	886.05
O1U116	902.71	1.85	18.33	886.23
O1U117	902.69	1.81	17.07	887.43
O1U118	901.79	1.94	13.85	889.88
O1U119	898.08	2.00	7.64	892.44
O1U120	902.15	1.81	14.04	889.92
O1U126	903.34	2.33	16.83	888.84
O1U127	902.93	2.35	14.87	890.41
O1U133	900.73	2.46	11.20	891.99
O1U135	899.94	1.94	18.12	883.76
O1U136	898.84	2.42	21.31	879.95
O1U137	900.51	2.12	14.02	888.61
O1U138	904.38	2.14	20.47	886.05
O1U139	901.15	2.10	17.31	885.94
O1U140	898.83	1.82	15.56	885.09
O1U141	897.74	1.91	13.13	886.52
O1U145	902.56	2.57	17.52	887.61
O1U146	902.89	2.53	19.78	885.64

Table 6-4

Site A Groundwater Level Data
Fiscal Year 2006

Well ID	TOS (ft)	Stickup (ft)	GW Meas. 2006 (ft)	GW elev. 2005 (ft)
O1U147	902.80	2.44	18.30	886.94
O1U148	902.60	2.65	18.76	886.49
O1U149	901.30	2.71	17.66	886.35
O1U150	901.30	2.27	17.62	885.95
O1U151	904.70	2.49	roots	roots
O1U152	901.00	2.80	17.75	886.05
O1U153	899.90	2.69	16.84	885.75
O1U154	898.90	2.51	16.15	885.26
O1U155	897.90	3.09	16.46	884.53
O1U156	897.80	2.48	16.23	884.05
O1U157	901.90	2.78	18.66	886.02
O1U158	901.10	2.48	17.81	885.77
O1U351	904.00	2.70	22.98	883.72
O1U352	901.00	3.33	21.88	882.45
O1U353	902.00	2.82	29.21	875.61
O1U354	903.80	3.22	21.55	885.47
O1U901	901.48	2.79	21.17	883.10
O1U902	901.29	2.25	18.05	885.49
O1U903	903.70	3.04	19.88	886.86
O1U904	899.40	2.56	17.84	884.12

TOS = Top of Surface which represents the ground surface elevation in feet above mean sea level (MSL). The TOS elevations were retrieved from USAEC IRDMIS.

roots = Roots in the well casing prevented water levels from being taken.

Groundwater measurements taken on 12 June 2006

Table 6-5

Site A Removal Action Monthly Operation and Maintenance Notes
Fiscal Year 2006

October
During the month of October, operational parameters were recorded daily on business days.
10/27-28/05; System being treated with acid. System down time: 38 hours.

November
During the month of November, operational parameters were recorded daily on business days.

December
During the month of December, operational parameters were recorded daily on business days.
12/21-22/05; System being acid-washed. System down time: 33 hours.

January
During the month of January, operational parameters were recorded daily on business days.
1/30/06; Four flow meters were replaced. System down time: 2.5 hours.

February
During the month of February, operational parameters were recorded daily on business days.
2/6-8/06; System being acid-washed. System down time: 48 hours.

March
During the month of March, operational parameters were recorded daily on business days. The system continued to operate as designed.

April
During the month of April, operational parameters were recorded daily on business days. The system continued to operate as designed.
4/26-27/06; System being acid washed. System down time: 27.5 hours.

May
During the month of May, operational parameters were recorded daily on business days. The system continued to operate as designed.
compressor to blow out effluent lines from EW-352 and EW353. Down time: EW-352, 3 hours; EW-353, 0.5 hours.

June
During the month of June, operational parameters were recorded daily on business days. The system continued to operate as designed.

Table 6-5

Site A Removal Action Monthly Operation and Maintenance Notes
Fiscal Year 2006

July

During the month of July, operational parameters were recorded daily on business days.
7/10-13/06; System being acid washed and treated with welgicide. System down time: 77 hours.
7/31/06; Cleaned flow meters. System down time: 1 hour.
7/31/06; EW-354 is leaking inside building after the flow meter. Well shutdown pending repair. EW-354 down time: 17 hours.

August

During the month of August, operational parameters were recorded daily on business days.
8/1/06; EW-354 is leaking inside building after the flow meter. Well shutdown pending repair. EW-354 down time: 17 hours.
8/15/06; Cleaned flow meters. System down time: 1 hour.

September

During the month of September, operational parameters were recorded daily on business days.
9/5/06; Cleaned flow meters. System down time: 1 hour.
9/18-19/06; System being acid-washed. System down time: 33 hours.

Table 6-6
Site A Effluent Water Quality

Fiscal Year 2006

	cis-1,2-Dichloroethene (ug/l)	trans-1,2-Dichloroethene (ug/l)	Trichloroethene (ug/l)	1,1,1-Trichloroethane (ug/l)	Mercury (ug/l)
Discharge Limits:	3000	3000	3000	3000	2
13-Oct-05	30	JP 0.68	JP 0.64	<1	<0.100
21-Nov-05	56	JP 0.68	JP 0.83	<1	<0.100
19-Dec-05	42	JP 0.57	JP 0.74	<1	<0.100
25-Jan-06	58	JP 0.71	JP 0.84	<1	<0.100
17-Feb-06	54	JP 0.51	JP 0.67	<1	<0.100
6-Mar-06	49	JP 0.78	JP 0.85	<1	<0.100
17-Apr-06	12	JP 0.62	JP 0.81	<1	<0.100
23-May-06	110	JP 0.99	JP 0.84	<1	<0.100
19-Jun-06	54	JP 0.87	JP 0.71	<1	<0.100
20-Jul-06	58	JP 0.85	JP 0.66	<1	<0.100
21-Aug-06	45	JP 0.73	JP 0.63	<1	<0.100
14-Sep-06	34	JP 0.65	JP 0.65	<1	<0.100

Notes:
JP The value is below the reporting limit, but above the method detection limit. Results should be considered estimated.

TABLE 6-7
SITE A Removal Action Monthly VOC Removal

FISCAL YEAR 2006

MONTH	1,2-DCE (ug/l)	TRCLE (ug/l)	TOTAL VOC EFFLUENT (ug/l)	CONVERSION FACTOR (l*lb)/(ug*gal)	WATER PUMPED (gallons)	TOTAL VOC'S REMOVED BY EXTRACTION SYSTEM (lbs)
TOTAL GALLONS PUMPED AND VOC'S REMOVED THROUGH SEPTEMBER 30, 2005					146,145,789	44.84
OCTOBER	30.68	0.64	31.32	8.35E-09	594,935	0.16
NOVEMBER	56.68	0.83	57.51	8.35E-09	677,711	0.33
DECEMBER	42.57	0.74	43.31	8.35E-09	610,248	0.22
JANUARY	58.71	0.84	59.55	8.35E-09	696,655	0.35
FEBRUARY	54.51	0.67	55.18	8.35E-09	816,374	0.38
MARCH	49.78	0.85	50.63	8.35E-09	863,395	0.36
APRIL	12.62	0.81	13.43	8.35E-09	656,007	0.07
MAY	110.99	0.84	111.83	8.35E-09	883,108	0.82
JUNE	54.87	0.71	55.58	8.35E-09	725,635	0.34
JULY	58.85	0.66	59.51	8.35E-09	854,991	0.42
AUGUST	45.73	0.63	46.36	8.35E-09	801,035	0.31
SEPTEMBER	34.65	0.65	35.30	8.35E-09	639,766	0.19
TOTAL GALLONS PUMPED AND VOC'S REMOVED FOR FISCAL YEAR 2006					8,819,860	3.95
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP					154,965,649	48.78

Notes:

1) VOC concentrations do not include estimated concentrations for compounds detected below the reporting limit.

TWIN CITIES ARMY AMMUNITION PLANT

Site A, Well Location Map

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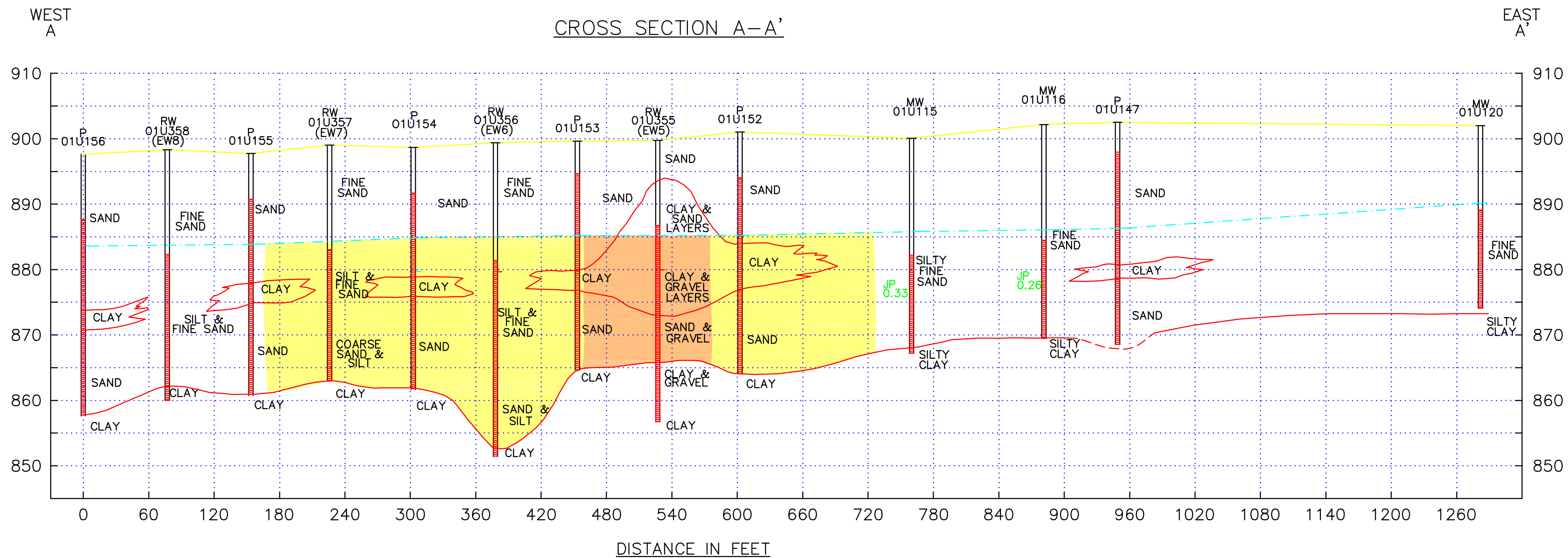
Wenck

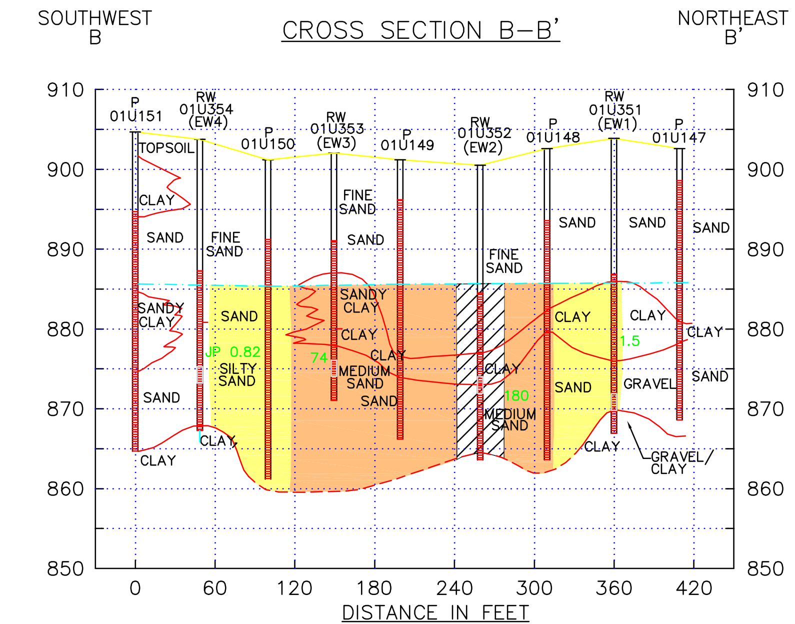
Wenck Associates, Inc.
Environmental Engineers

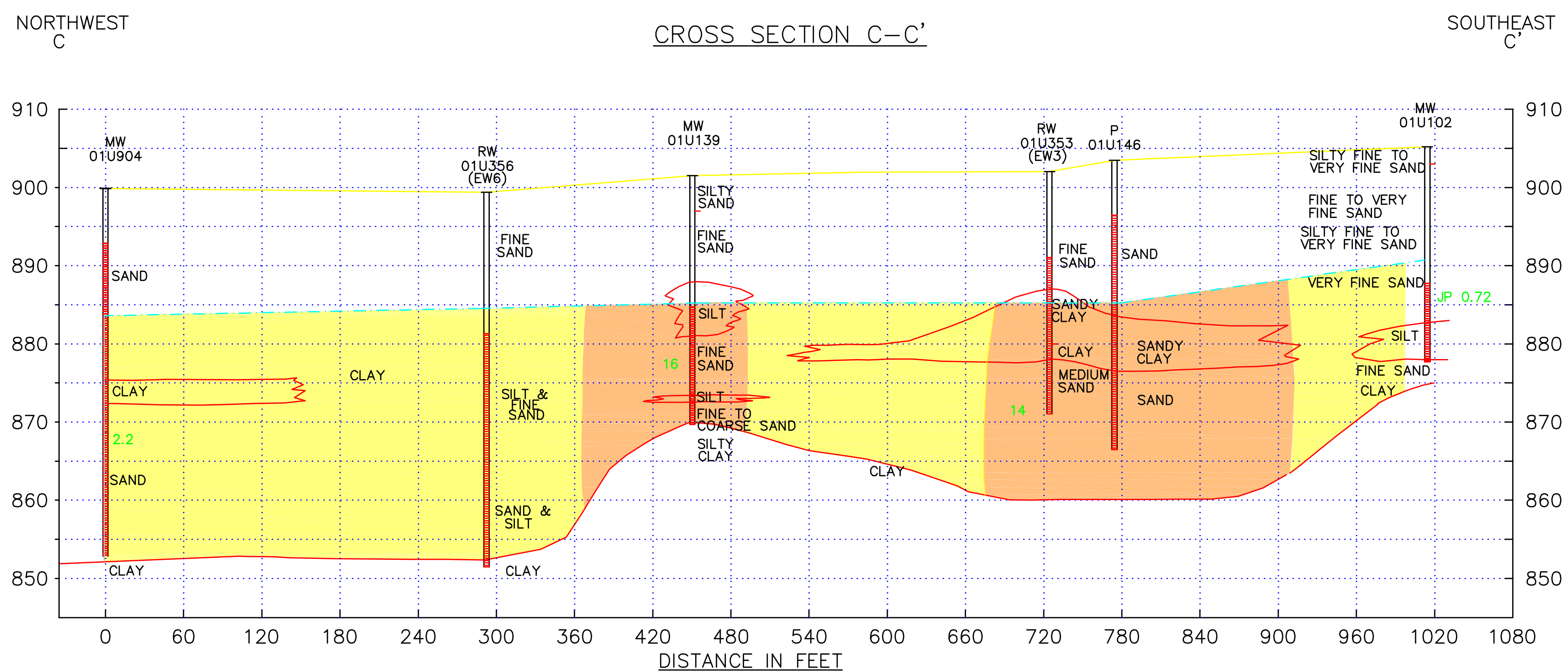
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

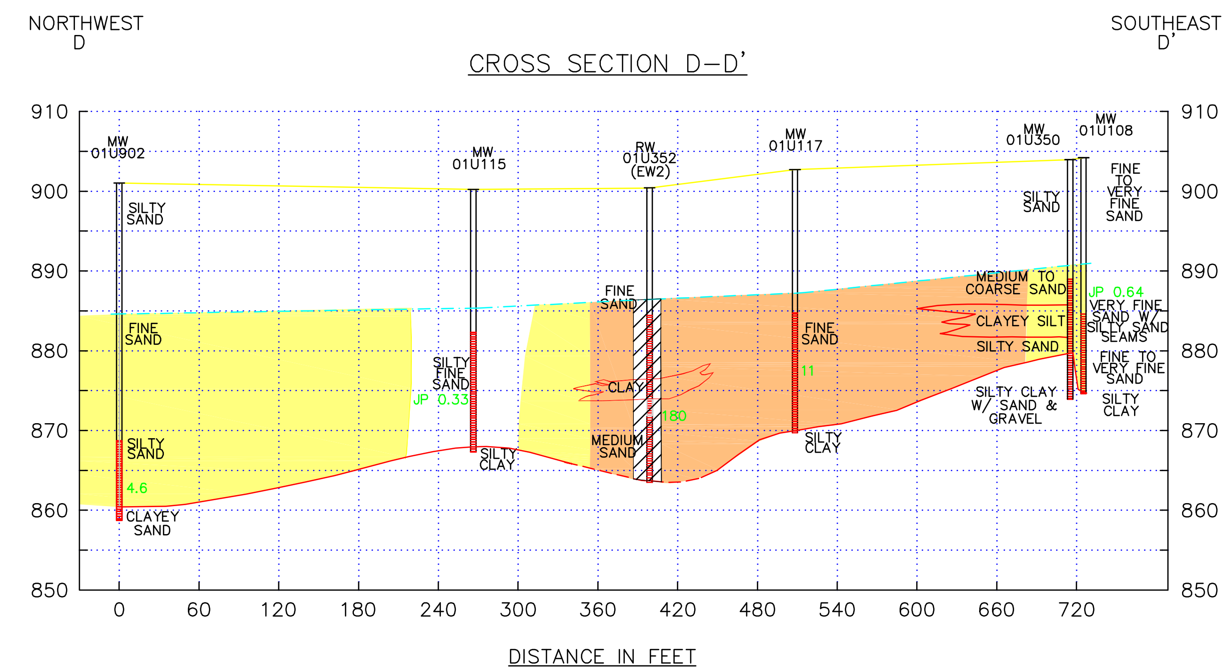
FY 2006

Figure 6-1









NOTES:

1. RESULTS ARE FROM GROUNDWATER SAMPLES COLLECTED JUNE 14, 2006.

2. CONSTRUCTION INFORMATION ON RECOVERY WELLS AND PIEZOMETERS WAS GENERATED BY DAHL AND ASSOCIATES, INC. AS PART OF THE SITE A REMOVAL ACTION SYSTEM CONSTRUCTION. CONSTRUCTION INFORMATION ON MONITORING WELLS WAS PROVIDED BY FEDERAL CARTRIDGE COMPANY.

LEGEND

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- SCREENED INTERVAL OF WELL
- PUMP LOCATION
- 885.0 WATER LEVEL SURFACE
- SLIGHT CHANGE IN GEOLOGIC UNIT (MARK LOCATED ALONG WELL STAFF)
- MW MONITORING WELL
- RW RECOVERY WELL
- P PIEZOMETER
- MW 01U117 26 cis–1,2–DICHLOROETHENE CONCENTRATION (ug/l) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)

cis–1,2–DICHLOROETHENE CONCENTRATIONS

- 1–10 ug/l
- 10–100 ug/l
- >100 ug/l

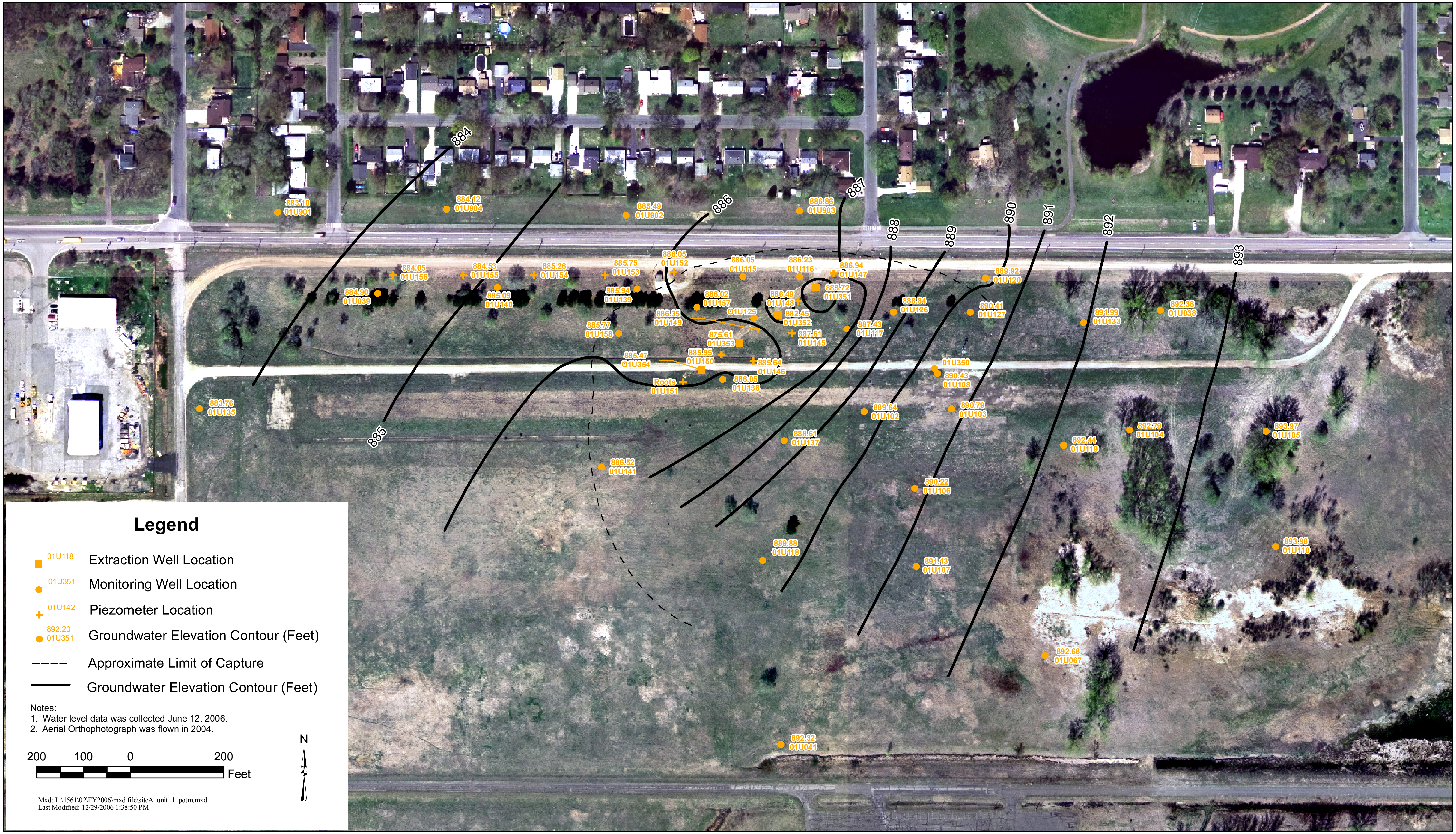
M: /1561/TCAX02B6.DWG

TWIN CITIES ARMY AMMUNITION PLANT

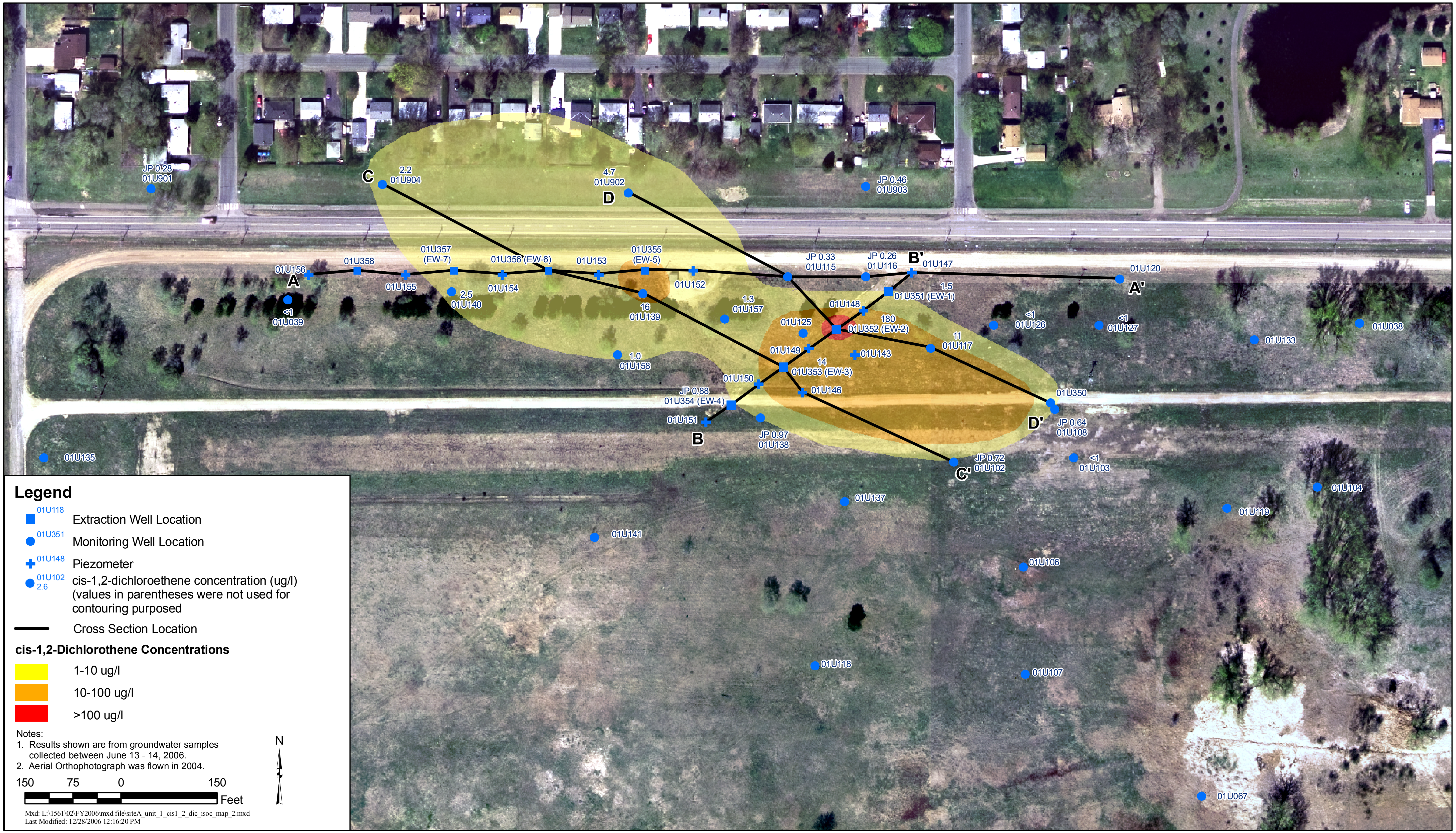
Site A, cis–1,2–Dichloroethene Cross Sections A–A', B–B', C–C' and D–D' June 2006

FY 2006

Figure 6–2



TWIN CITIES ARMY AAMUNITION PLANT	COPYRIGHT Wenck	FY 2006
Site A, Unit 1, Potentiometric Map - Summer 2006	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 6-3



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1, cis-1,2-Dichloroethene Isoconcentration Map, Summer 2006

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2006

Figure 6-4

TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 Tetrachloroethene Isocentration Map, Summer 2006

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Environmental Engineers

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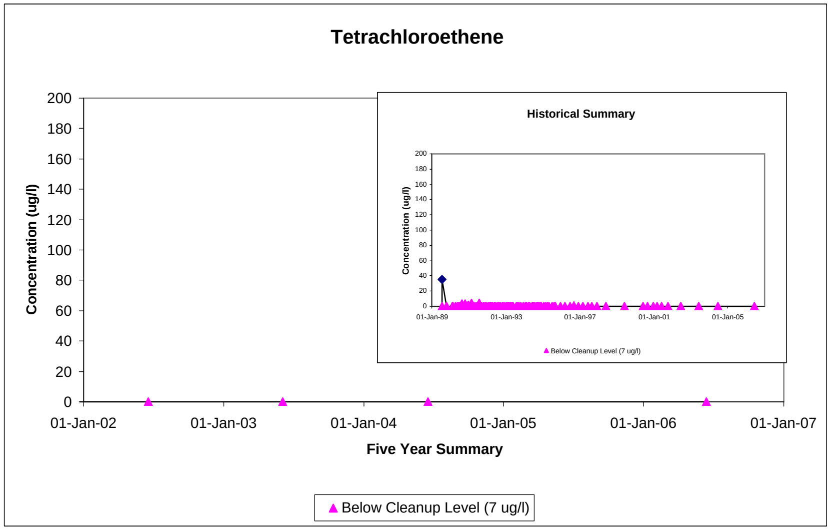
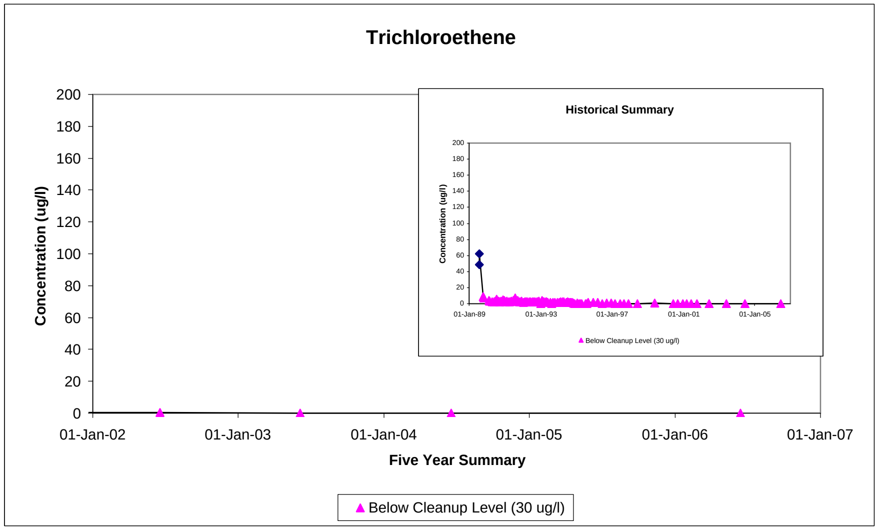
Maple Plain, MN 55359-0429

FY 2006

Figure 6-5

FIGURE 6-6
SITE A, WELL 01U902, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT





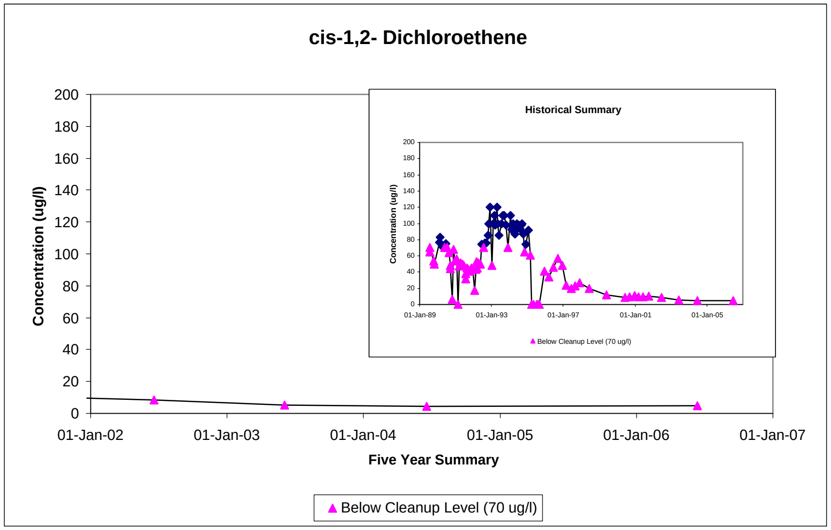
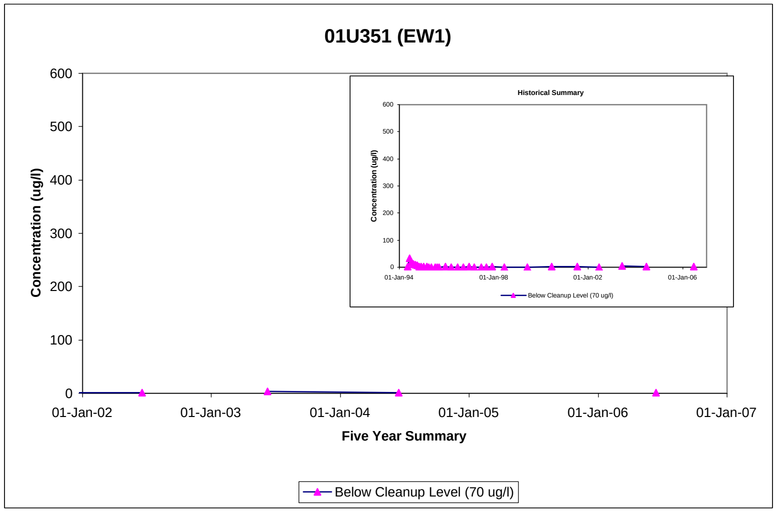
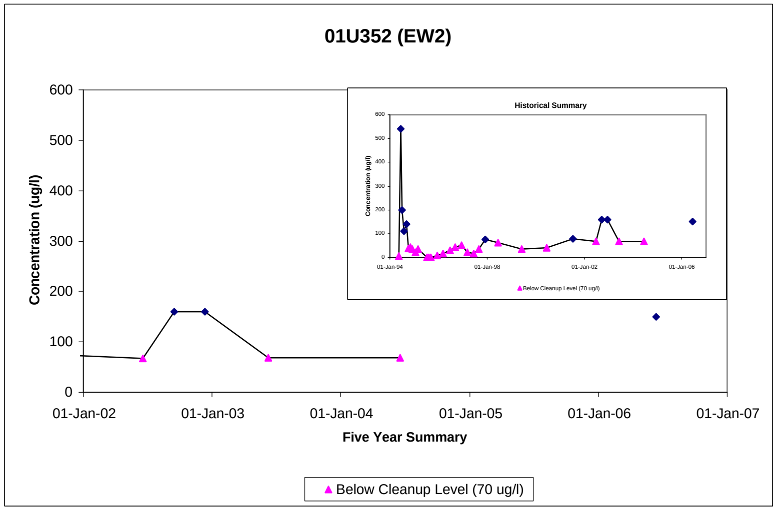


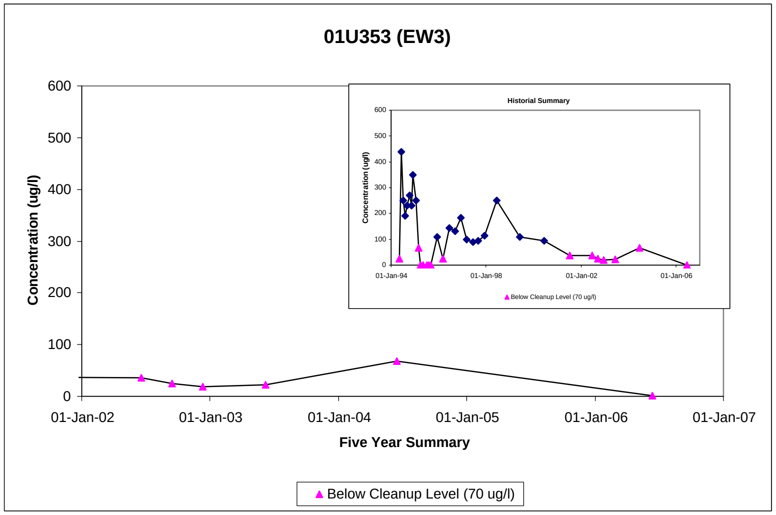
FIGURE 6-7

SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: RECOVERY WELLS

TWIN CITIES ARMY AMMUNITION PLANT







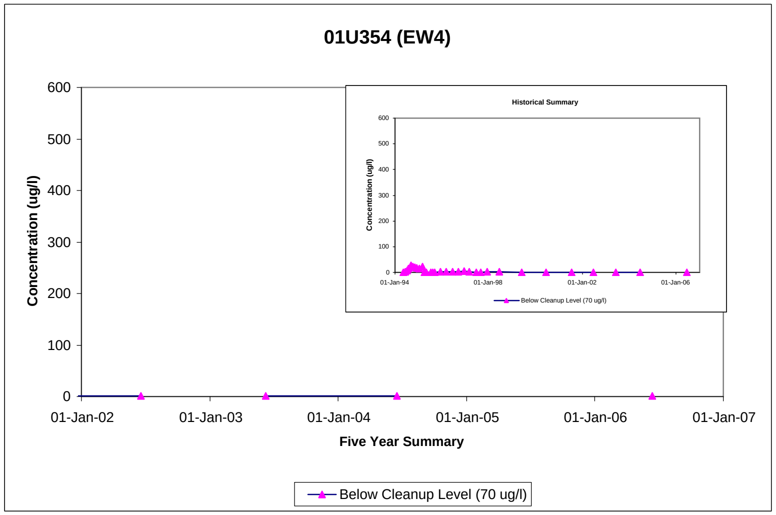
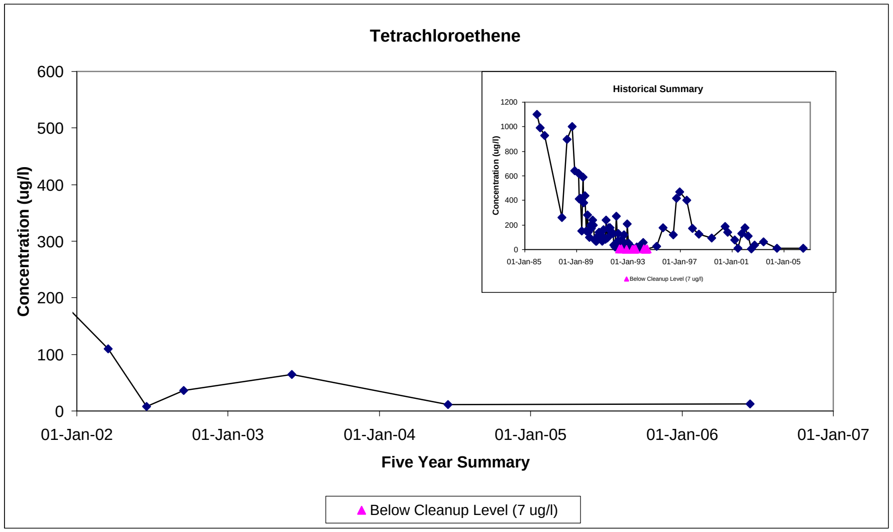
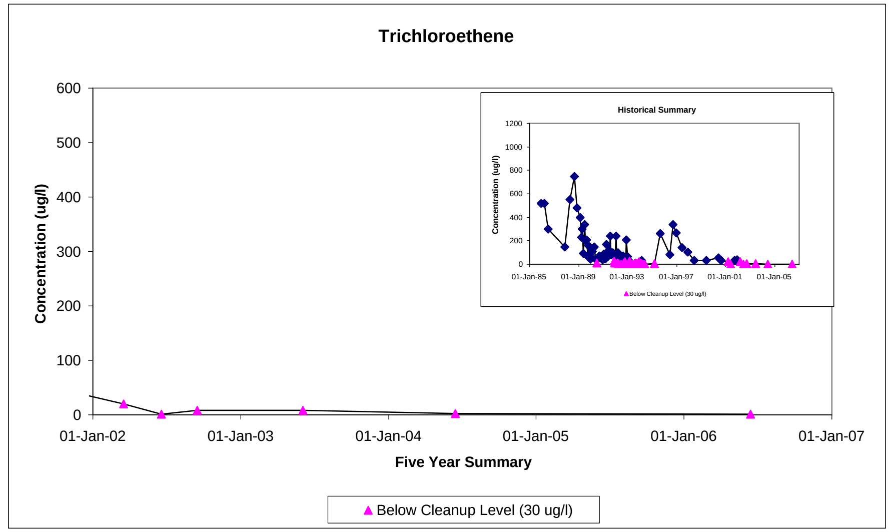
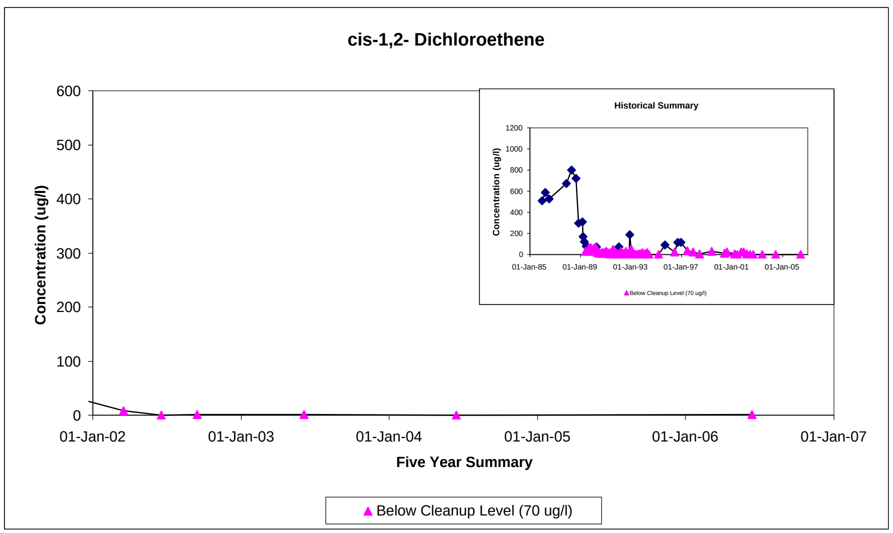


FIGURE 6-8
SITE A, WELL 01U108, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT







7.0 Site C Groundwater Response Action

7.1 BACKGROUND

This site had been used for burning of scrap wooden boxes, solvents, oils, and production materials, and also had been used for land disposal and open storage. The remedial investigation/feasibility study process conducted for Site C, as documented in the OU2 ROD, identified six chemicals of concern (COCs) in Site C soils (antimony, arsenic, beryllium, lead, manganese, and thallium, with lead having the highest concentration and most prevalent detection), but did not identify any groundwater COCs.

In FY 1997, the U.S. Army Environmental Center (USAEC) funded a technology demonstration study of phytoremediation of contaminated soil at Site C. Corn and mustard crops were planted and harvested during the two growing seasons in FY 1998 and FY 1999. During the growing seasons, EDTA was applied to the soils to improve the metals uptake by the crops, and had the unintended consequence of causing migration of lead from the soils into the shallow groundwater, which is present within a few feet from the ground surface. On August 10, 2000, the MPCA issued a Notice of Violation to the Army for the impacts to Site C shallow groundwater caused by the phytoremediation demonstration project, requiring that the Army implement corrective actions.

At Site C, Unit 1 contains groundwater, but the aquifer yield is low and the water is not used as a municipal water supply source by any of the surrounding communities. Groundwater in Unit 1 generally flows north beneath Site C and then turns westward, ultimately discharging to Rice Creek. Unit 2 lies beneath Unit 1 and is a glacial till deposit that behaves as an aquitard at TCAAP, preventing downward migration of contaminants. Additional hydrogeologic information is presented in “Hydrogeologic Investigation of Site C”, Shaw Environmental & Infrastructure, March 9, 2001.

The Army installed a groundwater recovery trench to contain the plume, which was operated between November 2000 and July 2001. On July 6, 2001, the Army began operating three extraction wells, located as shown on Figure 7-1, to contain the plume (replacing recovery trench operation). At the start of extraction well operation, extracted groundwater met the MCES requirements for direct discharge to the sanitary sewer (without treatment). On July 15, 2002, due to elevated lead concentrations in EW-3, the Army began pre-treating water from EW-3 using two types of filter media, and has continued to discharge extracted groundwater to the sanitary sewer under an MCES permit.

Man-made ditches are present north and west of the phytoremediation demonstration plot area, and are monitored, as shown on Figure 7-2. The ditches ultimately discharge into Rice Creek, which is also monitored.

Figures 7-3 and 7-4 present cross-sections showing the geological features of the shallow soil and aquifer (the cross-section alignments are shown on Figure 7-1). The cross-sections show the complex geology of the Site, including significant accumulations of peat, consistent with the nearby wetlands and location in a drainage area.

In February 2002, a contingency plan was prepared to address the operation of the groundwater response action. The monitoring requirements are driven by the contingency plan. The monitoring plan for Site C is presented in Appendix A.5. It includes 16 monitoring wells and three extraction wells, as shown on Figure 7-1, and 8 surface water sampling locations, as shown on Figure 7-2.

The parameters being monitored at this site are copper, lead, total hardness, and EDTA, which were all cited in the Notice of Violation. Lead is the primary chemical of concern (COC) in both the soil and groundwater. Five of the six COCs in Site C soils (antimony, arsenic, beryllium, manganese, and thallium) are not currently being monitored. These analytes were routinely monitored in groundwater and surface water through April 2002; however, since this monitoring data indicated that these analytes were not of concern, the MPCA approved discontinuing monitoring of these five analytes. Copper has continued to be monitored because concentrations have exceeded the respective surface water standard near the phytoremediation demonstration area at Site C. The complete historical water quality database is presented in Appendix D.3 (during FY 2004 and prior thereto, the historical water quality database was included with the Site C monthly data reports that were submitted electronically by the Army to the MPCA and USEPA).

The action levels for lead and copper are the State of Minnesota surface water standards (chronic), as defined in Minnesota Rules Chapter 7050.0222, that are applicable to the ditches and Rice Creek. The action levels are different for the ditches and Rice Creek because the standard is dependent on the ambient hardness of the surface water. These action levels are based on total hardness levels of 257 and 155 milligrams per liter (mg/l) for the ditches and Rice Creek, respectively. Thus, hardness itself does not have an action level, but is monitored annually in surface water to document these values in relation to the values that were used in calculating the lead and copper standards. EDTA is monitored because its concentrations are known to be elevated in groundwater; however, there are no applicable surface water or groundwater standards, and no decisions are being made based on the data. The EDTA data are thus considered “screening data” that are being collected for informational purposes only.

In lieu of an actual ROD requirement at this time, the elements of the contingency plan are described in the following subsections in a format consistent with the other Sites addressed in this document. The parties anticipate a future amendment to the OU2 ROD to document the final selected remedy for groundwater and surface water at Site C. Following completion of the ROD amendment, subsequent Annual Performance Reports will address the remedy components, as they will appear in the ROD.

7.2 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: Monitor groundwater to track progress of the remedy and identify potential exceedances at compliance points.

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. The groundwater monitoring program is ongoing. The Monitoring Plan for Site C is included in Appendix A.5. Unit 3 well 03U083 was added, with MPCA and USEPA approval, to the monitoring program for FY 2005 through FY 2007. This well will be sampled and analyzed for lead to verify that migration downward into the Unit 3 aquifer is not occurring.

7.3 REMEDY COMPONENT #2: SURFACE WATER MONITORING

Description: Monitor surface water to identify potential exceedances of the chronic standards.

Performance Standard (how do you know when you're done):
When a performance surface water monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. The surface water monitoring program is ongoing. The Monitoring Plan for Site C is included in Appendix A.5.

7.4 REMEDY COMPONENT #3: GROUNDWATER CONTAINMENT

Description: Operate extraction wells to contain the lead plume.

Performance Standard (how do you know when you're done):
When a groundwater containment system is operating consistent with the requirements of the "Groundwater Extraction and Remediation System Design," by Shaw Environment and Infrastructure (Draft), and the concentrations at specified monitoring points are within the requirements of the contingency plan.

Is this remedy component being implemented?
Yes. Three extraction wells (EW-1, EW-2 and EW-3) are currently in operation. After the system was started, Shaw developed an operating criteria that specified that the pumping water levels in the extraction wells be maintained at least 14 feet below the top of casing. This criteria was agreed to with the MPCA. These drawdowns are being achieved.

Figure 7-5 presents the groundwater contours from July 2006. Appendix D.3 includes the historical groundwater level database for Site C. The hydraulic effect of the extraction well operation can be seen in the northern portion of the Site. The groundwater contours for the Site are complex, likely related to the heterogeneous nature of the geology (see cross-sections). In addition, the previously used groundwater extraction trench may be having a local influence on groundwater flow. The trench is aligned roughly parallel to the groundwater flow and upgradient of the extraction wells. Because of this alignment it does not pose a risk to capture and containment but does appear to influence the groundwater contours immediately around it.

Figure 7-6 presents the lead data from July 2006. The areas of exceedances are upgradient of the extraction wells and within the likely area of capture shown on Figure 7-5. The lack of lead exceedances in surface water (see discussions below) indicates that the system is capturing groundwater effectively.

7.5 REMEDY COMPONENT #4: EXTRACTED WATER TREATMENT AND DISCHARGE

Performance Standard (how do you know when you're done):
When the extracted groundwater is treated to meet the requirements of the MCES discharge permit.

Are the permit discharge requirements being met?
Yes. Table 7-1 presents the effluent analytical results for FY 2006 and the MCES discharge limits. The combined effluent is labeled "Effluent-C" on Table 7-1. The MCES requirements, which apply to the combined effluent, for lead, mercury, and pH were met. The other compounds listed are not regulated in the MCES permit.

7.6 REMEDY COMPONENT #5: CONTINGENCY PLAN FOR GROUNDWATER

Description: Contain and treat groundwater if trigger points are exceeded.

Performance Standard (how do you know when you're done):
The triggers for implementing contingency actions with respect to groundwater at Site C are:

- When the groundwater sample results from monitoring wells (MW) MW-6, MW-12, and MW-16 at the north end of the site are above the surface water chronic standard for the ditch during the same sampling event, or
- When the groundwater sample results from monitoring wells MW-4, MW-8, MW-9, MW-10, and MW-11 are above the surface water chronic standard for the ditch during the same sampling event.

If one of the triggers discussed above is met, the extraction system will be modified to increase the total volume of water extracted. The extraction and treatment system will continue to operate in the contingency plan mode (i.e., increased extracted water) until the hydraulic containment is re-evaluated.

Have groundwater concentrations remained below the trigger points?

Yes. Table 7-2 presents the FY 2006 analytical results for groundwater. In FY 2006, the lead chronic standard for the ditch was 6.9 µg/l. There were no exceedances of the triggers in FY 2006. Appendix D.3 presents the historical database for groundwater. In addition, lead trend graphs for the individual monitoring wells are presented in Appendix B (Figure B-3).

Monitoring well MW-11 individually exhibited lead concentrations above the chronic standard from November 2005 through March 2006, with the highest detection at 38.4 µg/l. The other wells in the contingency group remained below the trigger. These results (which are similar to FY 2005) suggest, especially with the low to non-detectable concentrations at nearby MW-8, that the elevated detections at MW-11 are isolated and do not indicate an overall increase in the lead concentrations. These results do not indicate a problem with the containment remedy. The existing monitoring program is adequate to continue to monitor the anomalous concentrations at MW-11.

7.7 REMEDY COMPONENT #6: CONTINGENCY PLAN FOR SURFACE WATER

Description: Contain and treat surface water if trigger points are exceeded.

Performance Standard (how do you know when you're done):

When a contingency plan for surface water is in place and monitoring is in compliance with the program.

The triggers for implementation of contingency actions with respect to surface water at Site C are:

- When the average concentration of the 3-day monthly sampling event at sample location SW-6 is above the current surface water chronic standard for the ditch for one quarter (i.e., three consecutive months).
- When the average concentration of the 3-day monthly sampling event is above the surface water chronic standard for Rice Creek at sample location SW-8. The surface water chronic standard for Rice Creek is 4.0 µg/l.

If the trigger at SW-6 or SW-8 is met, then the surface water at SW-6 will be contained and collected. Collected surface water will be treated, if necessary, and discharged to the sanitary sewer. The surface water at SW-6 will continue to be contained and collected until the average concentration of the 3-day monthly sampling event at sample location SW-6 is below the current surface water chronic standard for one quarter (i.e., three consecutive months).

Have surface water concentrations remained below the trigger points?

Yes. Table 7-3 presents the FY 2006 analytical results for surface water. The surface water chronic standard for the ditch (SW-6) is 6.9 µg/l and the chronic standard for Rice Creek is 4 µg/l. No surface water triggers were exceeded in FY 2006. Appendix D.3 presents the historical database for surface water samples.

7.8 OVERALL REMEDY FOR SITE C SHALLOW GROUNDWATER

The groundwater containment remedy for Site C is operating as required by the contingency plan and subsequent agreements, and the data trends indicate that progress towards the remedial objectives is being achieved. In particular, the three wells with the highest lead concentrations (MW-3, MW-13, and MW-14) showed continuing decreases in FY 2006. The mean concentration at MW-3 decreased from 0.49 mg/l to 0.16 mg/l. The mean concentration at MW-13 decreased from 1.96 mg/l to 0.67 mg/l. The mean concentration at MW-14 remained similar to FY 2005 at 0.14 mg/l compared to 0.10 mg/l.

Table 7-4 presents a summary of the lead mass removal and pumped volumes through FY 2006. In FY 2006, the system treated 637,707 gallons of water and removed 2.42 pounds of lead. The lead mass removal decreased from 8.41 pounds of lead in FY 2005. Overall, the system has treated 10.107 million gallons of water and removed 101.6 pounds of lead

Are any changes proposed for the remedy? No. However, the contingency plan and monitoring plan will be revised after the ROD Amendment is signed, which is expected in FY 2007.

Table 7-1

Site C FY 2006 Extraction Well / Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Data Qualifier L	Data Qualifier D	Mercury (MCES Discharge Limit: 0.002) mg/L	pH (MCES Discharge Limit: 5-11)	COD mg/L	TSS mg/L	Copper	Data Qualifier L	Data Qualifier D	EDTA as EDTA mg/L
EFFLUENT-C	10/24/2005	9:30	Legend	0.014			<0.00020	6.7						
EW1	10/26/2005	4:15	CompuChem	0.00044	B	UB0.2								
EW2	10/26/2005	4:20	CompuChem	0.0002	B	UB0.2								
EW3	10/26/2005	4:25	CompuChem	0.955										
EFFLUENT-C	11/21/2005	8:00	Legend	0.068			<0.00020	6.8						
EW1	11/22/2005	8:10	CompuChem	0.0065										
EW2	11/22/2005	8:15	CompuChem	0.000049	B	UB0.07								
EW3	11/22/2005	8:20	CompuChem	1.43										
EW1	12/15/2005	2:30	CompuChem	0.00053	B									
EW2	12/15/2005	2:35	CompuChem	0.00011	B									
EW3	12/15/2005	2:40	CompuChem	1.03										
EFFLUENT-C	12/19/2005	10:00	Legend	<0.0030			<0.00020	6.7						
EW1	1/18/2006	3:00	CompuChem	0.0234										
EW2	1/18/2006	3:05	CompuChem	0.00012	B	UB0.05								
EW3	1/18/2006	3:15	CompuChem	1.37										
EFFLUENT-C	1/23/2006	10:30	Legend	0.036			<0.00020	6.8						
EFFLUENT-C	2/13/2006	10:30	Legend	0.037			<0.00020	6.7						
EW1	2/22/2006	2:00	CompuChem	0.0024										
EW2	2/22/2006	2:05	CompuChem	0.00057	B									
EW3	2/22/2006	2:10	CompuChem	0.906										
EFFLUENT-C	3/14/2006	10:00	Legend	0.17			<0.00020	7.0						
EW1	3/22/2006	7:00	CompuChem	0.0032		UB3.4								
EW2	3/22/2006	7:15	CompuChem	0.00023	B	UB3.4								
EW3	3/22/2006	7:30	CompuChem	0.854										
EFFLUENT-C	4/10/2006	10:00	Legend	0.20			<0.00040	7.5						7.86
EW1	4/19/2006	11:20	CompuChem	0.00010	B						0.00084	B		7.44
EW2	4/19/2006	11:25	CompuChem	0.00016	B						0.00057	B		7.88
EW3	4/19/2006	11:30	CompuChem	0.677							0.00052	B		380
EFFLUENT-C	5/8/2006	10:15	Legend	0.081			<0.00020	6.8						
EW1	5/18/2006	12:00	CompuChem	0.00012	B									
EW2	5/18/2006	12:05	CompuChem	0.00011	B									
EW3	5/18/2006	12:10	CompuChem	1.14										
EFFLUENT-C	6/15/2006	10:15	Legend						20.9	18.0				
EFFLUENT-C	6/22/2006	9:00	Legend	0.33			<0.00020	6.7						
EW1	6/22/2006	11:05	CompuChem	0.00015	B									
EW2	6/22/2006	11:08	CompuChem	0.00037	B									
EW3	6/22/2006	11:10	CompuChem	0.721										
EFFLUENT-C	7/10/2006	12:00	Legend	0.036			<0.00020	7.1						
EW1	7/20/2006	8:15	CompuChem	0.00014	B									
EW2	7/20/2006	8:20	CompuChem	0.00016	B									
EW3	7/20/2006	8:25	CompuChem	0.647										
EFFLUENT-C	8/14/2006	8:45	Legend	0.010			<0.00020	6.8						
EW1	8/15/2006	9:00	CompuChem	0.0014										

Table 7-1

Site C FY 2006 Extraction Well / Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Data Qualifier L	Data Qualifier D	Mercury (MCES Discharge Limit: 0.002) mg/L	pH (MCES Discharge Limit: 5-11)	COD mg/L	TSS mg/L	Copper	Data Qualifier L	Data Qualifier D	EDTA as EDTA mg/L
EW2	8/15/2006	9:05	CompuChem	0.001										
EW3	8/15/2006	9:10	CompuChem	0.458										
EFFLUENT-C	9/11/2006	10:30	Legend	0.099			<0.00020	7.0						
EW1	9/12/2006	10:30	CompuChem	0.0002	B									
EW2	9/12/2006	10:35	CompuChem	0.00036	B									
EW3	9/12/2006	10:40	CompuChem	0.33										

Notes:
D duplicate sample

Laboratory Concentration Qualifiers (L):
U analyte was not detected above the Instrument Detection Limit (IDL)
B reported value is between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL)

Data Validation Qualifiers (D):
J estimated
JS# surrogate or matrix spike recovery, # = value of the percent recovery of the spike

R rejected data
UB# blank contamination, # = highest concentration of blank affecting data

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D
MW 1	10/26/05	0.11	B	UB0.09		NS			NS	
MW 1	1/17/06	0.17	B	UB0.06		NS			NS	
MW 1	4/19/06	0.021	U		0.18	B	UB0.099	<1.00		
MW 1	7/18/06	0.012	B	UB0.63		NS			NS	
MW 2	10/26/05	0.10	B	UB0.2		NS			NS	
MW 2	1/18/06	0.23	B	UB0.06		NS			NS	
MW 2	4/19/06	0.021	U		0.10	B	UB0.099	<1.00		
MW 2D	4/19/06	0.021	U		0.039	U		<1.00		
MW 2	7/18/06	0.012	B	UB0.63		NS			NS	
MW 3	10/27/05	163				NS			NS	
MW 3	1/18/06	214				NS			NS	
MW 3D	1/18/06	226				NS			NS	
MW 3	4/20/06	197			0.13	B	UB0.099	41.6		
MW 3	7/18/06	89.5				NS			NS	
MW 3D	7/18/06	93.0				NS			NS	
MW 4	10/26/05	0.084	B	UB0.09		NS			NS	
MW 4	11/22/05	0.035	U			NS			NS	
MW 4D	11/22/05	0.051	B	UB0.07		NS			NS	
MW 4	12/14/05	0.043	B			NS			NS	
MW 4	1/18/06	0.23	B	UB0.06		NS			NS	
MW 4	2/21/06	0.77	B			NS			NS	
MW 4	3/21/06	0.031	B	UB3.4		NS			NS	
MW 4	4/19/06	0.021	U		0.41	B	UB0.099	1.99		
MW 4	5/18/06	0.024	B	UB0.08		NS			NS	
MW 4	6/22/06	0.012	B	UB0.06		NS			NS	
MW 4	7/18/06	0.94	B	UB0.63		NS			NS	
MW 4	8/14/06	0.028	B	UB0.02		NS			NS	
MW 4	9/13/06	0.044	B	UB0.02		NS			NS	
MW 5	10/26/05	0.20	B	UB0.2		NS			NS	
MW 5	1/17/06	0.28	B	UB0.06		NS			NS	
MW 5	4/19/06	0.021	U		1.5	B		<1.00		
MW 5	7/18/06	0.31	B	UB0.63		NS			NS	
MW 6	10/25/05	0.12	B	UB0.09		NS			NS	
MW 6	11/22/05	0.035	U			NS			NS	
MW 6	12/14/05	0.037	B			NS			NS	
MW 6	1/17/06	1.0	U			NS			NS	
MW 6	2/21/06	0.094	B	UB0.07		NS			NS	
MW 6D	2/21/06	0.11	B	UB0.07		NS			NS	
MW 6	3/21/06	0.65	B	UB3.4		NS			NS	
MW 6D	3/21/06	0.27	B	UB3.4		NS			NS	
MW 6	4/18/06	0.021	U		0.13	B	UB0.099	11.5		
MW 6	5/18/06	0.021	U			NS			NS	

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D
MW 6D	5/18/06	0.037	B	UB0.08		NS			NS	
MW 6	6/22/06	0.024	B	UB0.06		NS			NS	
MW 6	7/18/06	0.015	B	UB0.63		NS			NS	
MW 6	8/15/06	0.022	B	UB0.02		NS			NS	
MW 6D	8/15/06	0.028	B	UB0.02		NS			NS	
MW 6	9/12/06	0.020	B	UB0.02		NS			NS	
MW 7	10/25/05	0.24	B	UB0.09		NS			NS	
MW 7	1/17/06	0.27	B	UB0.06		NS			NS	
MW 7	4/18/06	0.021	U		0.15	B	UB0.099	7.18		
MW 7	7/18/06	0.068	B	UB0.63		NS			NS	
MW 7D	7/18/06	0.17	B	UB0.63		NS			NS	
MW 8	10/25/05	0.097	B	UB0.09		NS			NS	
MW 8	11/22/05	0.035	U			NS			NS	
MW 8	12/14/05	0.040	B			NS			NS	
MW 8	1/17/06	2.7				NS			NS	
MW 8	2/21/06	0.25	B	UB0.07		NS			NS	
MW 8	3/21/06	0.17	B	UB3.4		NS			NS	
MW 8	4/18/06	0.021	U		0.11	B	UB0.099	4.49		
MW 8	5/18/06	0.021	U			NS			NS	
MW 8	6/22/06	0.016	B	UB0.06		NS			NS	
MW 8	7/18/06	0.33	B	UB0.63		NS			NS	
MW 8	8/15/06	0.016	B	UB0.02		NS			NS	
MW 8	9/13/06	0.014	B	UB0.02		NS			NS	
MW 9	10/26/05	0.10	B	UB0.09		NS			NS	
MW 9	11/22/05	0.066	B	UB0.07		NS			NS	
MW 9	12/14/05	0.035	U			NS			NS	
MW 9	1/17/06	1.0	U			NS			NS	
MW 9	2/22/06	0.13	B	UB0.07		NS			NS	
MW 9	3/21/06	0.093	B	UB3.4		NS			NS	
MW 9	4/19/06	0.021	U		0.17	B	UB0.099	<1.00		
MW 9	5/18/06	0.021	U			NS			NS	
MW 9	6/22/06	0.015	B	UB0.06		NS			NS	
MW 9	7/18/06	0.53	B	UB0.63		NS			NS	
MW 9	8/14/06	0.014	B	UB0.02		NS			NS	
MW 9	9/13/06	0.058	B	UB0.02		NS			NS	
MW 10	10/26/05	0.12	B	UB0.09		NS			NS	
MW 10	11/22/05	0.040	B	UB0.07		NS			NS	
MW 10	12/14/05	0.084	B			NS			NS	
MW 10D	12/14/05	0.13	B			NS			NS	
MW 10	1/18/06	0.86	B			NS			NS	
MW 10	2/22/06	1.3				NS			NS	
MW 10	3/21/06	1.5		UB3.4		NS			NS	

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D
MW 10	4/19/06	0.021	U		0.20	B	UB0.099	<1.00		
MW 10	5/18/06	0.027	B	UB0.08		NS			NS	
MW 10	6/22/06	0.11	B	UB0.06		NS			NS	
MW 10	7/18/06	0.21	B	UB0.63		NS			NS	
MW 10	8/14/06	0.027	B	UB0.02		NS			NS	
MW 10D	8/14/06	0.017	B	UB0.02		NS			NS	
MW 10	9/14/06	0.022	B	UB0.02		NS			NS	
MW 11	10/25/05	1.8				NS			NS	
MW 11	11/22/05	38.4				NS			NS	
MW 11	12/14/05	17.4				NS			NS	
MW 11D	12/14/05	18.5				NS			NS	
MW 11	1/17/06	18.2				NS			NS	
MW 11	2/22/06	20.0				NS			NS	
MW 11	3/21/06	22.8				NS			NS	
MW 11	4/18/06	2.4			0.31	B	UB0.099	8.84		
MW 11	5/18/06	0.56	B			NS			NS	
MW 11	6/22/06	0.95	B			NS			NS	
MW 11	7/18/06	0.19	B	UB0.63		NS			NS	
MW 11	8/15/06	0.044	B	UB0.02		NS			NS	
MW 11	9/13/06	0.044	B	UB0.02		NS			NS	
MW 12	10/25/05	0.089	B	UB0.09		NS			NS	
MW 12	11/22/05	0.035	U			NS			NS	
MW 12	12/14/05	0.13	B			NS			NS	
MW 12	1/17/06	0.20	B	UB0.06		NS			NS	
MW 12	2/21/06	0.83	B			NS			NS	
MW 12	3/21/06	0.13	B	UB3.4		NS			NS	
MW 12	4/18/06	0.021	U		0.44	B	UB0.099	8.52		
MW 12	5/18/06	0.041	B	UB0.08		NS			NS	
MW 12	6/22/06	0.017	B	UB0.06		NS			NS	
MW 12D	6/22/06	0.019	B	UB0.06		NS			NS	
MW 12	7/18/06	0.38	B	UB0.63		NS			NS	
MW 12	8/15/06	0.032	B	UB0.02		NS			NS	
MW 12	9/12/06	0.021	B	UB0.02		NS			NS	
MW 13	10/27/05	577				NS			NS	
MW 13	1/18/06	1080				NS			NS	
MW 13	4/20/06	441			23.7			190		
MW 13	7/18/06	596				NS			NS	
MW 14	10/27/05	62.1				NS			NS	
MW 14D	10/27/05	66.8				NS			NS	
MW 14	1/18/06	334				NS			NS	
MW 14	4/20/06	66.3			0.13	B	UB0.099	13.9		
MW 14	7/19/06	183				NS			NS	

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)	L	D	Copper (Dissolved) (ug/l)	L	D	EDTA as EDTA (mg/l)	L	D
MW 15	10/26/05	6.8				NS			NS	
MW 15D	10/26/05	7.2				NS			NS	
MW 15	1/18/06	13.7				NS			NS	
MW 15	4/20/06	9.3			0.20	B	UB0.099	2.69		
MW 15D	4/20/06	10.1			0.073	B	UB0.099	2.82		
MW 15	7/19/06	40.8				NS			NS	
MW 16	10/25/05	0.098	B	UB0.09		NS			NS	
MW 16	11/22/05	0.058	B	UB0.07		NS			NS	
MW 16D	11/22/05	0.096	B	UB0.07		NS			NS	
MW 16	12/14/05	0.12	B			NS			NS	
MW 16	1/17/06	0.17	B	UB0.06		NS			NS	
MW 16	2/21/06	0.13	B	UB0.07		NS			NS	
MW 16	3/22/06	1.1		UB3.4		NS			NS	
MW 16	4/18/06	0.051	B	UB0.021	0.17	B	UB0.099	9.71		
MW 16	5/18/06	0.12	B	UB0.08		NS			NS	
MW 16D	5/18/06	0.14	B	UB0.08		NS			NS	
MW 16	6/22/06	0.060	B	UB0.06		NS			NS	
MW 16	7/18/06	0.17	B	UB0.63		NS			NS	
MW 16	8/14/06	0.069	B	UB0.02		NS			NS	
MW 16	9/12/06	0.054	B	UB0.02		NS			NS	
MW 16D	9/12/06	0.040	B	UB0.02		NS			NS	
EW 1	10/26/05	0.44	B	UB0.2		NS			NS	
EW 1	11/22/05	6.5				NS			NS	
EW 1	12/15/05	0.53	B			NS			NS	
EW 1	1/18/06	23.4				NS			NS	
EW 1	2/22/06	2.4				NS			NS	
EW 1	3/22/06	3.2		UB3.4		NS			NS	
EW 1	4/19/06	0.10	B	UB0.04	0.84	B		7.44		
EW 1	5/18/06	0.12	B	UB0.08		NS			NS	
EW 1	6/22/06	0.15	B	UB0.06		NS			NS	
EW 1	7/20/06	0.14	B			NS			NS	
EW 1	8/15/06	1.4				NS			NS	
EW 1	9/12/06	0.20	B			NS			NS	
EW 2	10/26/05	0.20	B	UB0.2		NS			NS	
EW 2	11/22/05	0.049	B	UB0.07		NS			NS	
EW 2	12/15/05	0.11	B			NS			NS	
EW 2	1/18/06	0.12	B	UB0.05		NS			NS	
EW 2	2/22/06	0.57	B			NS			NS	
EW 2	3/22/06	0.23	B	UB3.4		NS			NS	
EW 2	4/19/06	0.16	B	UB0.04	0.57	B		7.88		
EW 2	5/18/06	0.11	B	UB0.08		NS			NS	

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D
EW 2	6/22/06	0.37	B			NS			NS	
EW 2	7/20/06	0.16	B			NS			NS	
EW 2	8/15/06	1.0				NS			NS	
EW 2	9/12/06	0.36	B			NS			NS	
EW 3	10/26/05	955				NS			NS	
EW 3	11/22/05	1430				NS			NS	
EW 3	12/15/05	1030				NS			NS	
EW 3	1/18/06	1370				NS			NS	
EW 3D	1/18/06	1460				NS			NS	
EW 3	2/22/06	906				NS			NS	
EW 3	3/22/06	854				NS			NS	
EW 3	4/19/06	677			0.52	B		380		
EW 3	5/18/06	1140				NS			NS	
EW 3	6/22/06	721				NS			NS	
EW 3D	6/22/06	806				NS			NS	
EW 3	7/20/06	647				NS			NS	
EW 3	8/15/06	458				NS			NS	
EW 3	9/12/06	330				NS			NS	
EW 3D	9/12/06	336				NS			NS	
03U083	6/7/06	0.21	B	UB0.06		NS			NS	

Notes:

Laboratory Concentration Qualifiers (L):

U Analyte was not detected above the Instrument Detection Limit (IDL).

B Reported value is between the Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL).

Data Validation Qualifiers (D):

UB# The sample result was less than 5 times the level detected in a blank (the result for the blank is listed after "UB"). The sample result can be considered non detect at an elevated detection limit.

Other Notes:

D Duplicate

NS Not Sampled

EDTA Ethylenediaminetetraacetic Acid

Table 7-3
Water Quality Data for Site C Surface Water

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)	L	D	Copper (Dissolved) (ug/l)	L	D	Hardness (mg/l)	L	D	EDTA as EDTA (mg/l)	L	D
SW 1	10/25/05	0.30	B	UB0.07	NS			NS			NS		
SW 1	10/26/05	0.32	B	UB0.24	NS			NS			NS		
SW 1	10/27/05	0.36	B	UB0.24	NS			NS			NS		
SW 1	4/18/06	0.16	B	UB0.1	2.6			418			<1.00		
SW 1	4/19/06	0.15	B	UB.09	2.4		UB0.49	506			NS		
SW 1	4/20/06	0.13	B	UB.09	2.4		UB0.49	412			NS		
SW 1	5/16/06	0.063	B	UB0.05	NS			NS			NS		
SW 1	5/17/06	0.14	B	UB0.05	NS			NS			NS		
SW 1D	5/17/06	0.25	B		NS			NS			NS		
SW 1	5/18/06	0.065	B	UB0.05	NS			NS			NS		
SW 1	6/20/06	0.079	B	UB0.03	NS			NS			NS		
SW 1	6/21/06	0.17	B	UB0.06	NS			NS			NS		
SW 1	6/22/06	0.12	B	UB0.06	NS			NS			NS		
SW 2	10/25/05	1.5			NS			NS			NS		
SW 2	10/26/05	1.8			NS			NS			NS		
SW 2D	10/26/05	1.6			NS			NS			NS		
SW 2	10/27/05	1.4			NS			NS			NS		
SW 2	4/18/06	0.54	B		7.4			472			<1.00		
SW 2	4/19/06	0.74	B		4.2			456			NS		
SW 2	4/20/06	0.57	B		5.0			697			NS		
SW 2	5/16/06	0.24	B		NS			NS			NS		
SW 2	5/17/06	0.53	B		NS			NS			NS		
SW 2	5/18/06	0.29	B		NS			NS			NS		
SW 2	6/20/06	2.2			NS			NS			NS		
SW 2	6/21/06	2.2			NS			NS			NS		
SW 2D	6/21/06	1.4			NS			NS			NS		
SW 2	6/22/06	2.4			NS			NS			NS		
SW 3	10/25/05	0.16	B	UB0.07	NS			NS			NS		
SW 3D	10/25/05	0.18	B	UB0.07	NS			NS			NS		
SW 3	10/26/05	0.13	B	UB0.24	NS			NS			NS		
SW 3	10/27/05	0.15	B	UB0.24	NS			NS			NS		
SW 3	4/18/06	0.12	B	UB0.1	1.6	B	UB0.48	241			<1.00		
SW 3	4/19/06	0.18	B	UB.09	1.5	B	UB0.49	224			NS		
SW 3	4/20/06	0.081	B	UB.09	1.4	B	UB0.49	418			NS		
SW 3	5/16/06	0.073	B	UB0.05	NS			NS			NS		
SW 3D	5/16/06	0.081	B	UB0.05	NS			NS			NS		
SW 3	5/17/06	0.075	B	UB0.05	NS			NS			NS		
SW 3	5/18/06	0.086	B	UB0.05	NS			NS			NS		
SW 3	6/20/06	0.30	B		NS			NS			NS		
SW 3	6/21/06	0.12	B	UB0.06	NS			NS			NS		
SW 3	6/22/06	0.076	B	UB0.06	NS			NS			NS		
SW 3	7/18/06	0.45	B	UB0.28	NS			NS			NS		
SW 3	7/19/06	1.3		JE15	NS			NS			NS		
SW 3	7/20/06	0.15	B	UB0.22, JE15	NS			NS			NS		
SW 3	8/14/06	7.2			NS			NS			NS		

Table 7-3
Water Quality Data for Site C Surface Water

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)	L	D	Copper (Dissolved) (ug/l)	L	D	Hardness (mg/l)	L	D	EDTA as EDTA (mg/l)	L	D
SW 3	8/15/06	3.5				NS			NS			NS	
SW 3	8/16/06	0.14	B	UB0.17		NS			NS			NS	
SW 3	9/12/06	1.2		UB0.35		NS			NS			NS	
SW 3	9/13/06	0.11	B	UB0.02		NS			NS			NS	
SW 3	9/14/06	0.19	B	UB0.05		NS			NS			NS	
SW 4	10/25/05	0.44	B			NS			NS			NS	
SW 4	10/26/05	0.52	B	UB0.24		NS			NS			NS	
SW 4	10/27/05	0.51	B	UB0.24		NS			NS			NS	
SW 4	4/18/06	0.52	B		2.5			226			<1.00		
SW 4	4/19/06	0.51	B		2.3		UB0.49	333				NS	
SW 4D	4/19/06	0.51	B		3.0			317				NS	
SW 4	4/20/06	0.46	B		2.6			519				NS	
SW 4	5/16/06	0.17	B	UB0.05		NS			NS			NS	
SW 4	5/17/06	0.29	B			NS			NS			NS	
SW 4	5/18/06	0.13	B	UB0.05		NS			NS			NS	
SW 4	6/20/06	0.23	B			NS			NS			NS	
SW 4	6/21/06	0.21	B	UB0.06		NS			NS			NS	
SW 4	6/22/06	0.17	B	UB0.06		NS			NS			NS	
SW 4D	6/22/06	0.20	B	UB0.06		NS			NS			NS	
SW 4	7/18/06	0.11	B	UB0.28		NS			NS			NS	
SW 4	7/19/06	2.8		JE15, JD		NS			NS			NS	
SW 4D	7/19/06	1.0		UB0.22, JE15, JD		NS			NS			NS	
SW 4	7/20/06	0.16	B	UB0.22, JE15		NS			NS			NS	
SW 4	8/14/06	4.8				NS			NS			NS	
SW 4	8/15/06	2.7				NS			NS			NS	
SW 4	9/12/06	1.0		UB0.35		NS			NS			NS	
SW 4	9/13/06	0.54	B			NS			NS			NS	
SW 4D	9/13/06	0.54	B			NS			NS			NS	
SW 4	9/14/06	0.35	B			NS			NS			NS	
SW 5	10/25/05	1.2				NS			NS			NS	
SW 5	10/26/05	1.2				NS			NS			NS	
SW 5	10/27/05	1.2				NS			NS			NS	
SW 5	4/18/06	1.2			1.4	B	UB0.48	269			<1.00		
SW 5D	4/18/06	1.3			1.5	B	UB0.48	301			<1.00		
SW 5	4/19/06	1.3			1.8	B	UB0.49	359				NS	
SW 5	4/20/06	0.60	B		1.0	B	UB0.49	503				NS	
SW 5	5/16/06	0.56	B			NS			NS			NS	
SW 5	5/17/06	0.36	B			NS			NS			NS	
SW 5	5/18/06	0.26	B			NS			NS			NS	
SW 5	6/20/06	0.18	B			NS			NS			NS	
SW 5D	6/20/06	0.26	B			NS			NS			NS	
SW 5	6/21/06	0.28	B			NS			NS			NS	
SW 5	6/22/06	0.16	B	UB0.06		NS			NS			NS	
SW 5	7/18/06	0.054	B	UB0.28		NS			NS			NS	
SW 5D	7/18/06	0.35	B	UB0.28		NS			NS			NS	

Table 7-3
Water Quality Data for Site C Surface Water

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			Hardness (mg/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D		L	D
SW 5	7/19/06	0.35	B	UB0.22, JE15		NS			NS			NS	
SW 5	7/20/06	0.53	B	UB0.22, JE15		NS			NS			NS	
SW 5	8/14/06	2.0				NS			NS			NS	
SW 5D	8/14/06	1.3				NS			NS			NS	
SW 5	8/15/06	2.4				NS			NS			NS	
SW 5	8/16/06	0.20	B	UB0.17		NS			NS			NS	
SW 5	9/12/06	0.79	B	UB0.35		NS			NS			NS	
SW 5D	9/12/06	0.31	B	UB0.35		NS			NS			NS	
SW 5	9/13/06	0.14	B			NS			NS			NS	
SW 5	9/14/06	0.15	B	UB0.05		NS			NS			NS	
SW 6	10/25/05	1.2				NS			NS			NS	
SW 6	10/26/05	1.2				NS			NS			NS	
SW 6	10/27/05	1.0	B	UB0.24		NS			NS			NS	
SW 6D	10/27/05	0.87	B	UB0.24		NS			NS			NS	
SW 6	4/18/06	1.3			1.1	B	UB0.48	326			<1.00		
SW 6	4/19/06	1.4			1.4	B	UB0.49	368				NS	
SW 6	4/20/06	1.2			1.2	B	UB0.49	521		JD43		NS	
SW 6D	4/20/06	1.1			0.98	B	UB0.49	336		JD43		NS	
SW 6	5/16/06	1.2				NS			NS			NS	
SW 6	5/17/06	0.88	B			NS			NS			NS	
SW 6	5/18/06	0.74	B			NS			NS			NS	
SW 6	6/20/06	0.25	B			NS			NS			NS	
SW 6	6/21/06	0.21	B	UB0.06		NS			NS			NS	
SW 6	6/22/06	1.1				NS			NS			NS	
SW 6	7/18/06	0.34	B	UB0.28		NS			NS			NS	
SW 6	7/19/06	0.90	B	UB0.22, JE15		NS			NS			NS	
SW 6	7/20/06	0.28	B	UB0.22, JE15		NS			NS			NS	
SW 6D	7/20/06	0.30	B	UB0.22, JE15		NS			NS			NS	
SW 6	8/14/06	0.89	B	UB0.23		NS			NS			NS	
SW 6	8/15/06	1.8				NS			NS			NS	
SW 6	8/16/06	0.075	B	UB0.17		NS			NS			NS	
SW 6D	8/16/06	0.090	B	UB0.17		NS			NS			NS	
SW 6	9/12/06	0.27	B	UB0.35		NS			NS			NS	
SW 6	9/13/06	0.098	B	UB0.02		NS			NS			NS	
SW 6	9/14/06	0.10	B	UB0.05		NS			NS			NS	
SW 6D	9/14/06	0.13	B	UB0.05		NS			NS			NS	
SW 7	10/25/05	0.15	B	UB0.07		NS			NS			NS	
SW 7	10/26/05	0.14	B	UB0.24		NS			NS			NS	
SW 7	10/27/05	0.19	B	UB0.24		NS			NS			NS	
SW 7	4/18/06	0.10	B	UB0.1	0.85	B	UB0.48	188			<1.00		
SW 7	4/19/06	0.081	B	UB.09	1.2	B	UB0.49	192				NS	
SW 7	4/20/06	0.31	B	UB.09	0.90	B	UB0.49	350				NS	
SW 7	5/16/06	0.15	B	UB0.05		NS			NS			NS	
SW 7	5/17/06	0.12	B	UB0.05		NS			NS			NS	
SW 7	5/18/06	0.14	B	UB0.05		NS			NS			NS	

Table 7-3
Water Quality Data for Site C Surface Water

Fiscal Year 2006

Sample Location	Date Collected	Lead (Dissolved) (ug/l)			Copper (Dissolved) (ug/l)			Hardness (mg/l)			EDTA as EDTA (mg/l)		
			L	D		L	D		L	D		L	D
SW 7D	5/18/06	0.14	B	UB0.05		NS			NS			NS	
SW 7	6/20/06	0.32	B			NS			NS			NS	
SW 7	6/21/06	0.31	B			NS			NS			NS	
SW 7	6/22/06	1.8				NS			NS			NS	
SW 7	7/18/06	0.42	B	UB0.28		NS			NS			NS	
SW 7	7/19/06	0.97	B	UB0.22, JE15		NS			NS			NS	
SW 7	7/20/06	0.47	B	UB0.22, JE15		NS			NS			NS	
SW 7	8/14/06	1.9				NS			NS			NS	
SW 7	8/15/06	2.8		JD		NS			NS			NS	
SW 7D	8/15/06	0.98	B	JD		NS			NS			NS	
SW 7	8/16/06	0.76	B	UB0.17		NS			NS			NS	
SW 7	9/12/06	0.62	B	UB0.35		NS			NS			NS	
SW 7	9/13/06	0.21	B			NS			NS			NS	
SW 7	9/14/06	0.34	B			NS			NS			NS	
SW 8	10/25/05	0.15	B	UB0.07		NS			NS			NS	
SW 8	10/26/05	0.20	B	UB0.24		NS			NS			NS	
SW 8	10/27/05	0.12	B	UB0.24		NS			NS			NS	
SW 8	4/18/06	0.12	B	UB0.1	1.6	B	UB0.48	171			<1.00		
SW 8	4/19/06	0.091	B	UB.09	1.2	B	UB0.49	216				NS	
SW 8	4/20/06	0.10	B	UB.09	0.93	B	UB0.49	294				NS	
SW 8	5/16/06	0.19	B	UB0.05		NS			NS			NS	
SW 8	5/17/06	0.11	B	UB0.05		NS			NS			NS	
SW 8	5/18/06	0.16	B	UB0.05		NS			NS			NS	
SW 8	6/20/06	0.39	B			NS			NS			NS	
SW 8	6/21/06	0.31	B			NS			NS			NS	
SW 8	6/22/06	0.30	B			NS			NS			NS	
SW 8	7/18/06	0.39	B	UB0.28		NS			NS			NS	
SW 8	7/19/06	3.4		JE15		NS			NS			NS	
SW 8	7/20/06	0.45	B	UB0.22, JE15		NS			NS			NS	
SW 8	8/14/06	0.81	B	UB0.23		NS			NS			NS	
SW 8	8/15/06	2.0				NS			NS			NS	
SW 8	8/16/06	1.2				NS			NS			NS	
SW 8	9/12/06	0.45	B	UB0.35		NS			NS			NS	

TABLE 7-4

SITE C Removal Action Monthly Lead Removal

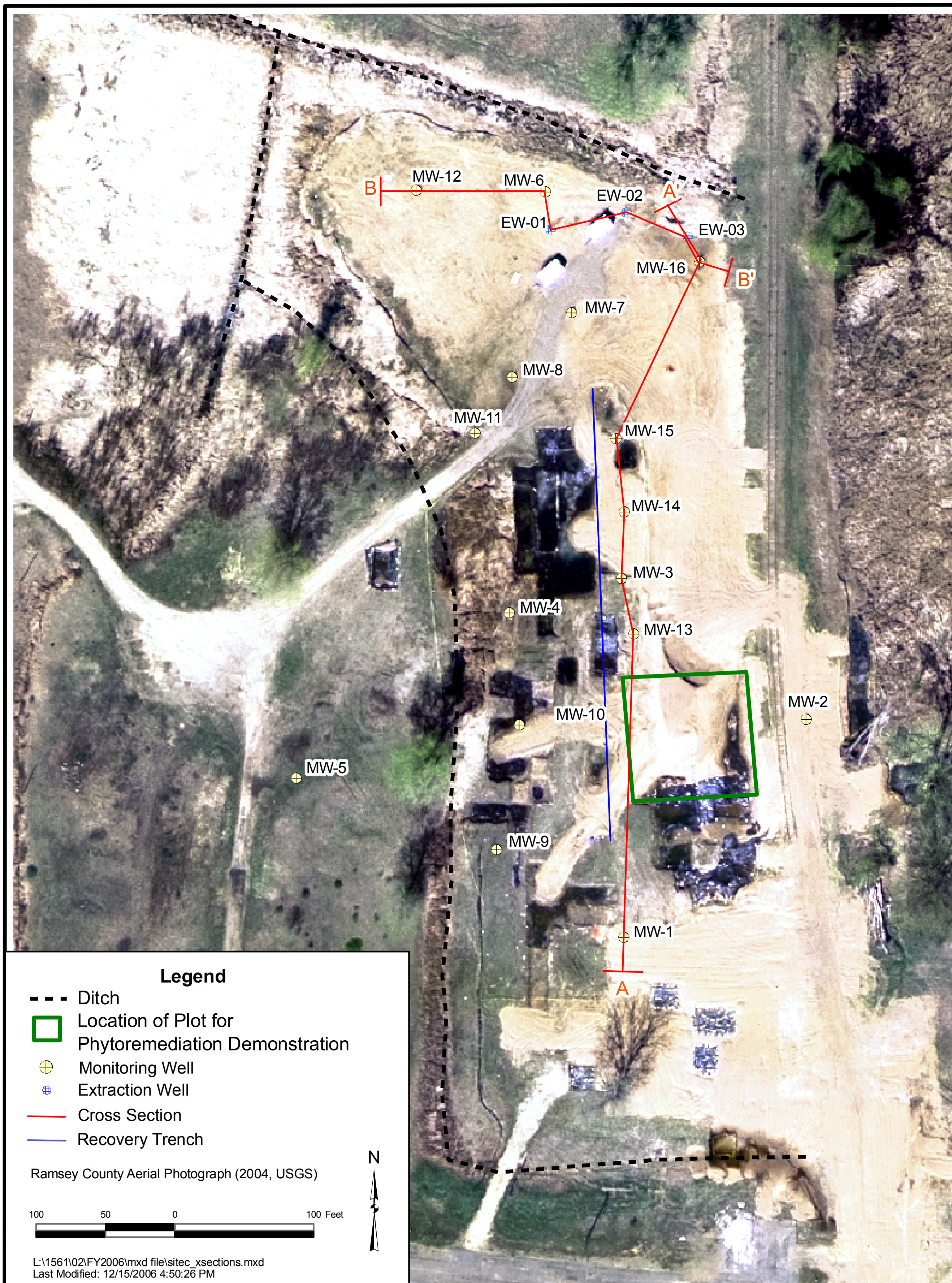
FISCAL YEAR 2006

MONTH	EW-3		CONVERSION FACTOR	TOTAL LEAD REMOVED BY EXTRACTION SYSTEM (EW-3)	SYSTEM EFFLUENT
	Average Lead Concentration (mg/L)	Volume (gallons)	(l*lb)/(mg*gal)	(lbs)	Volume (gallons)
WATER AND LEAD REMOVED (TO 9/30/05)		3,052,166		99.19	9,469,500
OCTOBER	0.955	35,018	8.35E-06	0.28	76,795
NOVEMBER	1.43	28,473	8.35E-06	0.34	63,284
DECEMBER	1.03	27,898	8.35E-06	0.24	52,989
JANUARY	1.37	29,115	8.35E-06	0.33	48,156
FEBRUARY	0.906	35,828	8.35E-06	0.27	41,790
MARCH	0.854	28,132	8.35E-06	0.20	50,973
APRIL	0.677	22,657	8.35E-06	0.13	41,917
MAY	1.14	25,045	8.35E-06	0.24	48,835
JUNE	0.721	19,345	8.35E-06	0.12	41,112
JULY	0.647	19,410	8.35E-06	0.10	40,741
AUGUST	0.458	27,647	8.35E-06	0.11	69,548
SEPTEMBER	0.33	23,596	8.35E-06	0.07	61,567
WATER AND LEAD REMOVED (FY 2006)		322,164		2.42	637,707
WATER AND LEAD REMOVED (TOTAL)		3,374,330		101.61	10,107,207

Notes:

1) EW-1 and EW-2 remain at or near non-detect lead levels and do not provide a significant source of removed

2) This summary table began in June 2002



TWIN CITIES ARMY AMMUNITION PLANT

Site C: Site Plan and Cross Section Locations

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FY 2006

Figure 7-1

TWIN CITIES ARMY AMMUNITION PLANT

Surface Water Monitoring Locations
Related to Site C

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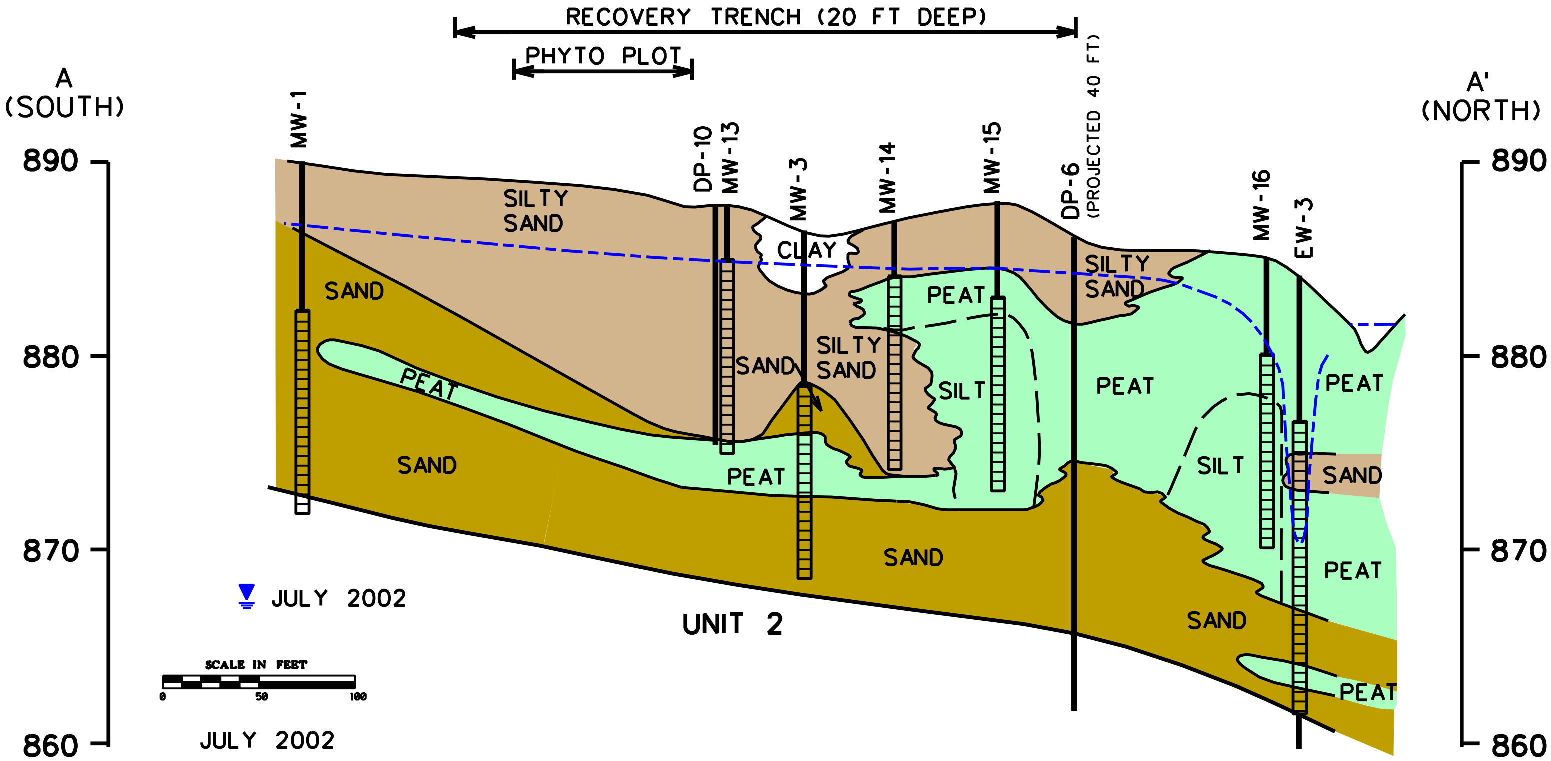
FY 2006

Figure 7-2



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TWIN CITIES ARMY AMMUNITION PLANT

Site C: Cross-Section A-A'

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FY 2006

Fig. 7-3

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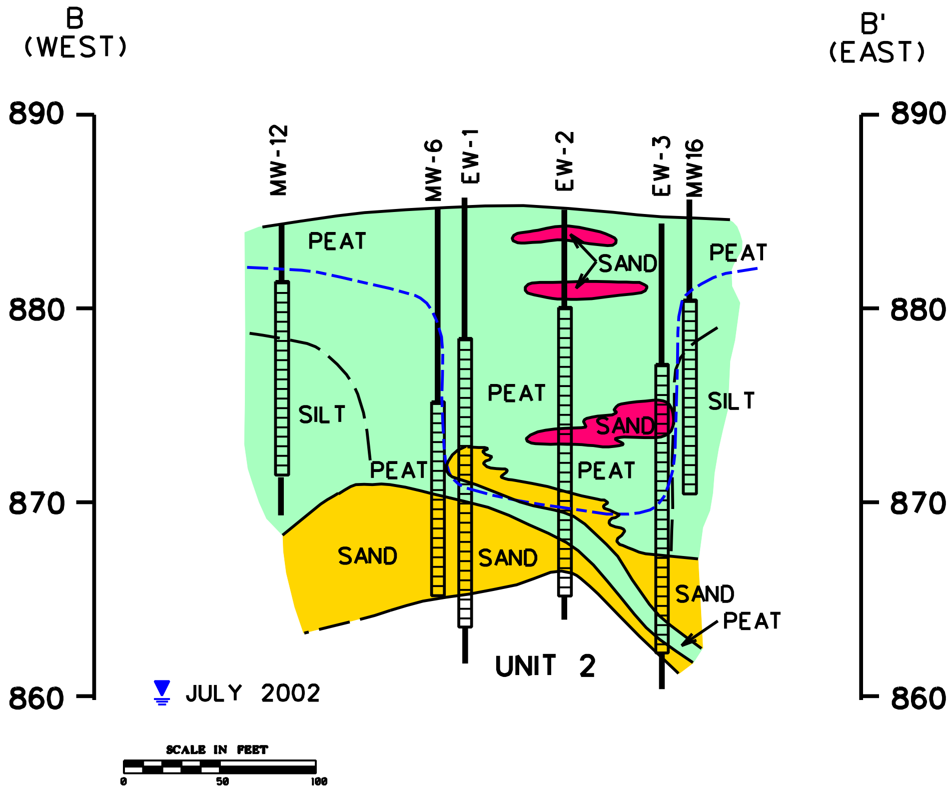

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TWIN CITIES ARMY AMMUNITION PLANT	FY 2006
Site C: Cross-Section B-B'	Fig. 7-4

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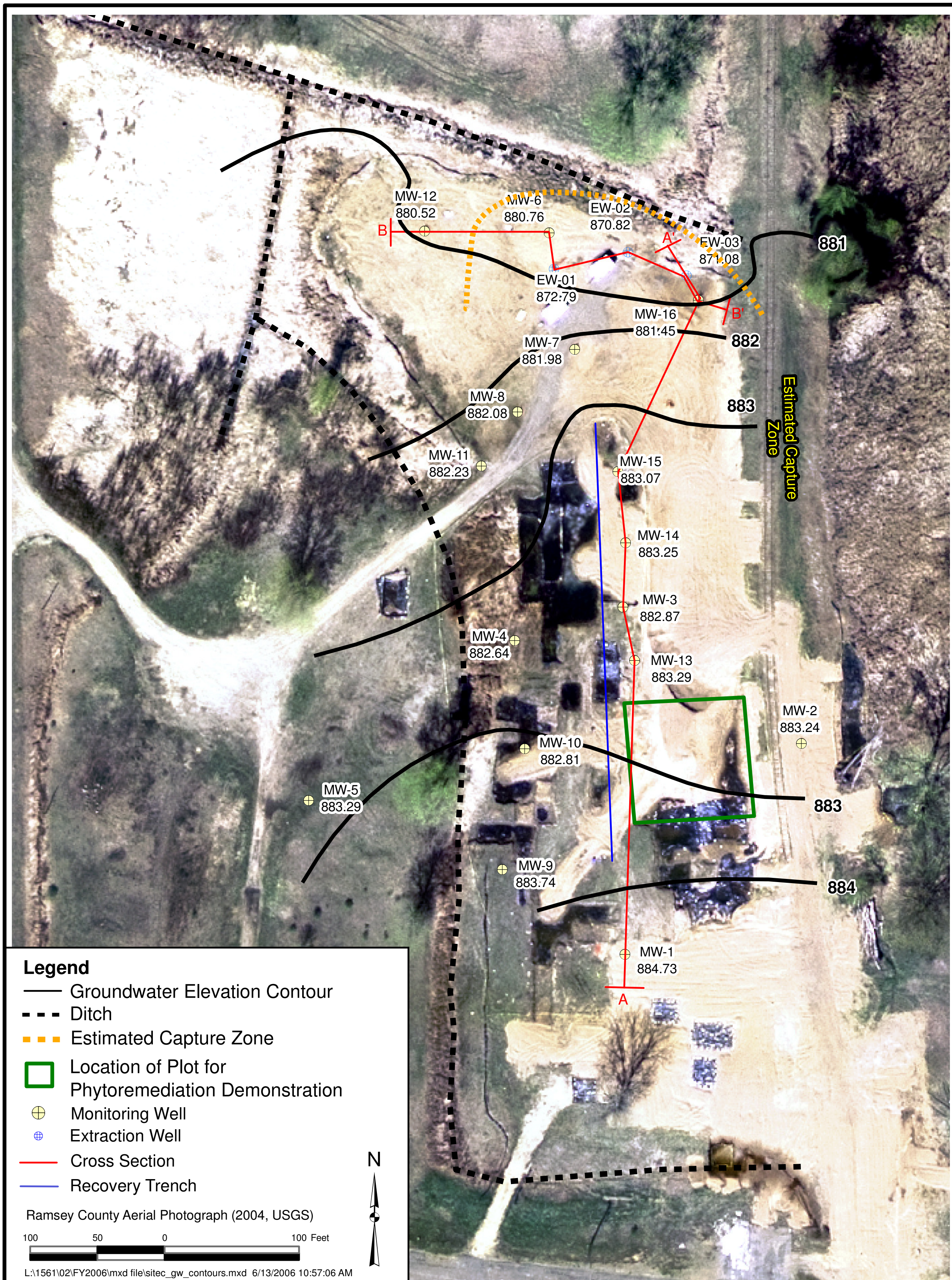

TWIN CITIES ARMY AMMUNITION PLANT

Site C: July 2006

Groundwater Elevation Contours

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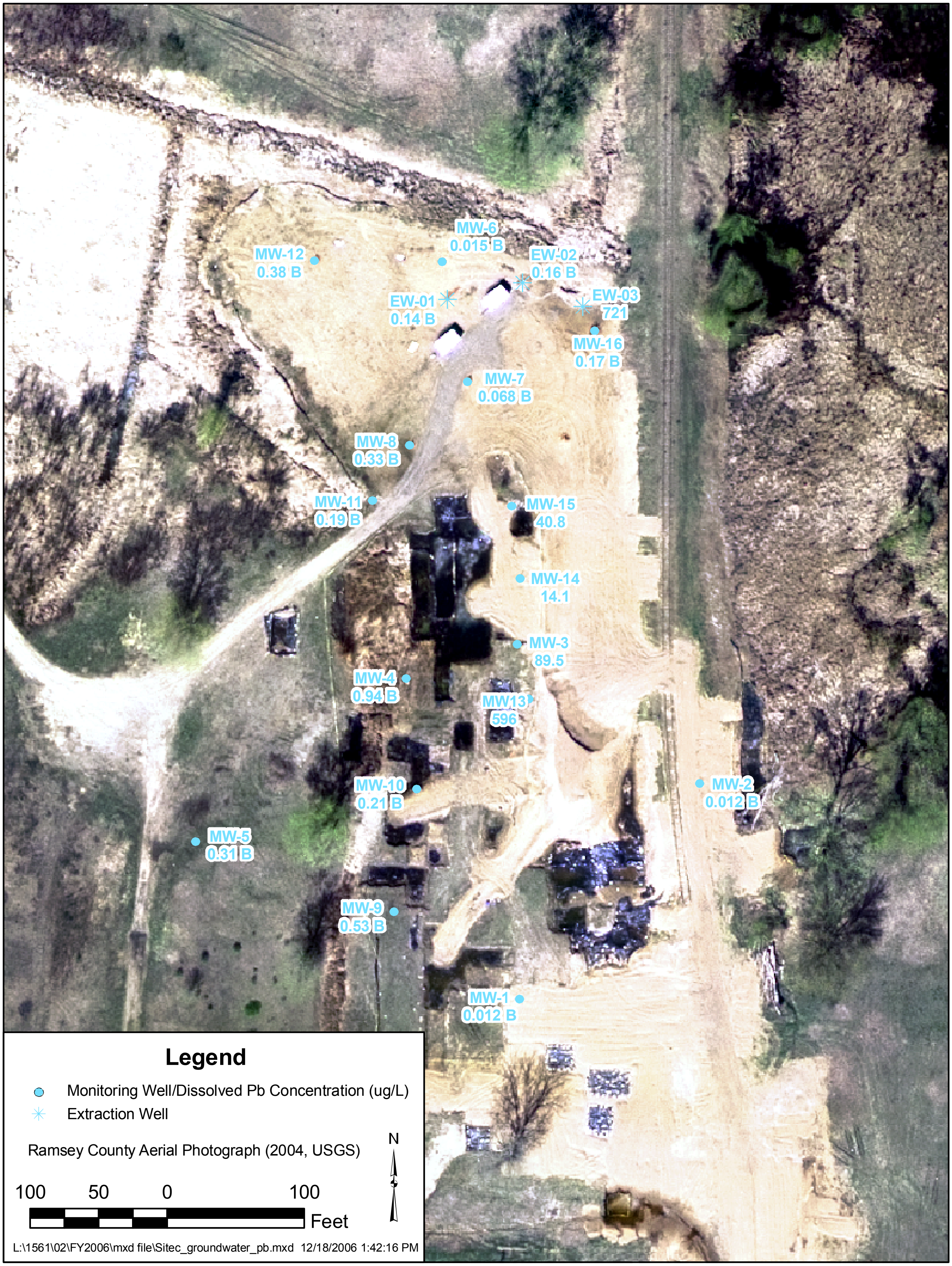
FY 2006

Figure 7-5



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center, Maple Plain, MN 55359-0429	FY 2006
Site C Lead in Groundwater July 2006		Figure 7-6

8.0 Operable Unit 2: Site I Shallow Groundwater

VOCs have been identified in the Unit 1 groundwater at Site I. Polychlorinated biphenyls (PCBs) have been identified in soils east of Building 502.

PCB-contaminated soils east of Building 502 were excavated in 1986. These soils were stored in a storage building built as part of the PCB Interim Remedial Action (IRA) at Site I. During August and September 1996, these soils were removed and disposed of at a Toxic Substances Control Act (TSCA) landfill with approval of the MPCA and USEPA. Groundwater monitoring was conducted for PCBs through FY 1997. PCBs were not detected in groundwater and the monitoring was discontinued. Information on this work is included in the OU2 Remedial Investigation (Argonne National Laboratory 1991).

Monitoring in FY 2006 addressed the VOCs identified in the Unit 1 groundwater beneath the western portion of Building 502. The selected remedy in the OU2 ROD consists of four components that incorporate the use of an existing well for groundwater extraction as well as additional investigation beneath the building slab. The additional investigation and Predesign Investigation Work Plan (Work Plan) were completed in FY 2000. Based on these documents, the selected remedy was modified to consist of a dual-phase vacuum extraction system, which combines groundwater extraction with soil vapor extraction, to be installed beneath Building 502. A pilot test of dual-phase extraction subsequently determined that the technology was not feasible due to the low permeability of the Unit 1 aquifer beneath the building.

8.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan has been established and ongoing monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Monitoring at Site I in FY 2006 was conducted according to the monitoring plan for FY 2006. Appendix A summarizes the FY 2006 monitoring plan and any deviations are explained in Appendix C.2.

Monitoring was performed in accordance with the TCAAP Remedial Design/Remedial Action (RD/RA) QAPP (1996) and a new QAPP. The *IRP-QAPP for Performance Monitoring*, TWISS, dated June 7, 2005, was accepted by the USEPA and MPCA as passing the Consistency Test on October 14, 2005. The new QAPP was implemented on December 1, 2005, the beginning of the 2nd quarter FY 2006.

Eleven Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during FY 2006. These wells were 01U064, 01U632, 01U636, 01U639, 01U640, 01U666, 01U667, 01U668, I01MW, I02MW, I04MW, and I05MW. Figure 8-1 shows these well locations. As requested by USEPA, wells 01U632, 01U666, 01U667, and 01U668 were added to the FY 2004 monitoring event for groundwater sampling on a "one-time" basis and annual groundwater level measurements. In FY 2004 and 2005, monitoring wells 01U632, 01U666, and 01U668 were dry at the time of sampling. As a result, those monitoring wells were included for sampling in FY 2006. For FY 2006, monitoring wells 01U639 and 482089 (I04MW) were also included on the list of monitoring locations. Of the two wells, well 01U639 will be the primary sampling location and 482089 (I04MW) will be the alternate sampling location. If it is not possible to collect a groundwater sample from 01U639, then an attempt will be made to collect a sample from 482089 (I04MW). Well 01U639 is selected as the primary location because there is more analytical data associated with this location.

Wells 01U639, 01U666, 01U668, I01MW, I02MW, and I03MW were dry at the time of sampling (June, 2006). Wells 01U632 and 01U667 bailed dry after collecting between one and three well volumes; however, there was sufficient groundwater to collect samples for analysis. Monitoring well 01U640 did not have sufficient groundwater to collect samples for analysis. Groundwater samples were analyzed using EPA Method 8260 for VOCs. Attempts to sample wells 01U666, and 01U668 will continue during the FY 2007 sampling event and well 01U632 will be added to the annual groundwater monitoring schedule.

Monitoring well 01U667 will be sampled during the next annual sampling round (June 2007). This additional year of sampling will provide a four-year trend for MW 01U667. The downgradient and perimeter wells, which have showed decreasing trends in contaminants of concern, will continue to be monitored on an annual basis.

What were the monitoring results for FY 2006?

Table 8-1 presents the results of the FY 2006 analyses. Monitoring well 01U064 continues to show overall declines in concentrations of trichloroethene since the early 1990s. Well I05MW remains below the cleanup standards for Site I. Well 01U064 remains slightly above the Site I cleanup standards for vinyl chloride in FY 2006. The results for well 01U636 are non-detect for site-specific required analytes. Well 482089 (I04MW) analytical results for trichloroethene were above the cleanup standards for Site I and 1,2-dichloroethene was below cleanup standards for Site I; vinyl chloride was non-detect. Well 01U632 analytical results for trichloroethene were above the cleanup standards for Site I and below the cleanup standards for 1,2-dichloroethene; vinyl chloride was non-detect. Well 01U667 had concentrations of 1,2-dichloroethene and vinyl chloride above cleanup standards for Site I. Figure 8-2 presents the groundwater elevations.

Monitoring wells 01U632, 01U666, 01U667, and 01U668 were added to the FY 2004 monitoring event for groundwater sampling on a “one-time” basis and annual groundwater level measurements. As a result of wells 01U632, 01U666, and 01U668 being dry in FY 2004 and 2005, attempts to sample them carried over into FY 2006. In FY 2006, a sample was collected from 01U632. The analytical results from this sample indicate that 1,2-dichloroethene, trichloroethene, and vinyl chloride remain below the cleanup standards for Site I. Well 01U632 will not be sampled in FY 2007. Monitoring wells 01U666 and 01U668 remain dry, and attempts to sample these monitoring wells will continue in FY 2007. Samples were collected from well 01U667 in 2004, 2005, and 2006, and will be collected in 2007 to show a 4-year trend for this monitoring well. Analytical results from the previous three sampling events indicate consistent results for 1,2-dichloroethene with a concentration range of 19,000 ug/l to 43,000 ug/l, and vinyl chloride with a concentration range of 39,000 ug/l to 57,000 ug/l, with the highest concentrations for each compound exhibited in groundwater collected in 2005. Trichloroethene was detected in groundwater from 01U667 in 2004, at a concentration of 16 ug/l. It was not detected in 2005 or 2006, however due to sample dilution at the laboratory, the detection limits were higher than 16 ug/l in both 2005 and 2006 (50 ug/l and 100 ug/l, respectively).

8.2 REMEDY COMPONENT #2: GROUNDWATER EXTRACTION

Description: "Use of an existing well to remove impacted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the equipment has been installed and is operating according to the Remedial Design approved by the regulators.

Has the remedy component been implemented?
No. The report on the dual-phase vacuum extraction pilot test was submitted to the Agencies and received a consistency determination on March 16, 2000. The report concluded that neither dual-phase extraction nor groundwater extraction is feasible. The pilot test found that the soil permeability is low. As a result, the test yielded only approximately 1 gallon per hour. The

report recommended that no further remedial action is considered until the building is demolished.

8.3 REMEDY COMPONENT #3: POTW DISCHARGE

Description: "POTW discharge of extracted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the discharge component has been implemented.

Has the remedy component been implemented?
No. As discussed above, the report on dual-phase vacuum extraction determined that extraction remedies are not currently feasible.

8.4 REMEDY COMPONENT #4: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the Unit 1 and Unit 2 soil and groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the work has been completed according to an Agency approved work plan.

Has the remedy component been implemented?
Yes. The results of the additional investigation were included in the Work Plan. The additional investigation resulted in a pilot study to evaluate the applicability of dual-phase vacuum extraction technology to the site.

Overall Remedy for Site I Shallow Groundwater

The remedy specified in the OU2 ROD was modified in the RD work plan. Based on the results presented in the dual-phase pilot test report, the preferred remedy is in need of further modification so as to only consist of groundwater monitoring. This is acceptable, in large part, due to the fact that groundwater in the Unit 1 aquifer does not flow off-site. Contaminants from the Unit 1 leak downward into the Unit 3. The deeper Unit 3 aquifer is hydraulically contained by the TGRS.

Monitoring in FY 2006 was consistent with the FY 2006 monitoring plan. The following conclusions are made for FY 2006:

- VOCs continue to be present in the Unit 1 aquifer beneath the western portion of Building 502.
- The additional investigation work identified the sources of VOCs in the Unit 1 aquifer beneath Building 502 and allowed for an evaluation of dual-phase vacuum extraction technology to be completed. The evaluation determined that extraction technologies are not feasible beneath the building.

Is additional monitoring proposed prior to the next report?

Yes. Appendix A presents the FY 2006 – FY 2010 Monitoring Plan. Table 8-2 presents the monitoring requirements for Site I. Unit 3 and Unit 4 groundwater monitoring at Site I is addressed as part of the deep groundwater portion of the monitoring plan. The monitoring plan for Site I will be subject to review based on the anticipated OU2 ROD amendment.

Based on a USEPA request made in FY 2003, water levels will continue to be measured at wells 01U632, 01U666, 01U667, and 01U668 on an annual basis.

8.5 OTHER ACTIVITY

During FY 2004, a Five-Year Review of the remedy was performed. The review concluded that the remedy was functioning as intended, and that the components of the remedy remain protective of human health and the environment. The Review also recommended:

- Monitoring the trichloroethene HRL for any changes due to the USEPA's potential update of the trichloroethene health risk assessment; and
- Preparing a ROD amendment for the change from a pump and treat remedy to a monitoring based remedy.

Eight monitoring wells (01U004, 01U054, 01U634, 01U635, 01U638, 01U642, 01U652, and 01U675) were abandoned in FY 2004. Well abandonment is documented in the *Well Abandonment Report, Sites I and K, TCAAP*, SECOR, dated December 15, 2003.

TABLE 8-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2006
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	*1,1,1-Trichloroethane* 111TCE	*1,1,2-Trichloroethane* 112TCE	*1,1-Dichloroethylene* 11DCE	*1,1-Dichloroethane* 11DCLE	*cis-1,2-Dichloroethylene* C12DCE	*Vinyl chloride* C2H3CL	*Chloroform* CHCL3	*trans-1,2-Dichloroethylene* T12DCE	*Tetrachloroethylene* TCLEE	*Trichloroethylene* TRCLE	*1,2-Dichloroethane* 12DCLE
01U064	6/14/2006	<1	<1	<1	0.53 (J)	58	7.1	0.16 (J)	3.3	<1	0.83 (J)	<1
01U064 D	6/14/2006	<1	<1	<1	0.56 (J)	61	7.9	0.66 (J)	3.5	<1	0.91 (J)	<1
01U632	6/14/2006	160	6.5	21	56	67	<1	5.8	0.57 (J)	<1	160	3.4
01U636	6/14/2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
01U639	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I04MW	6/14/2006	<1	<1	<1	<1	1.1	<1	<1	<1	<1	42	<1
01U640	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U666	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U667(1)	6/14/2006	<100	<100	80 (J)	110	28000 (2)	39000(2)	<100	140	<100	<100	<100
01U668	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
482086 (I01MW)	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

TABLE 8-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2006
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	*1,1,1-Trichloroethane* 111TCE	*1,1,2-Trichloroethane* 112TCE	*1,1-Dichloroethylene* 11DCE	*1,1-Dichloroethane* 11DCLE	*cis-1,2-Dichloroethylene* C12DCE	*Vinyl chloride* C2H3CL	*Chloroform* CHCL3	*trans-1,2-Dichloroethylene* T12DCE	*Tetrachloroethylene* TCLEE	*Trichloroethylene* TRCLE	*1,2-Dichloroethane* 12DCLE
482088 (I02MW)	6/14/2006	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
482087 (I05MW)	6/14/2006	<1	<1	<1	<1	1	<1	0.34 (J)	<1	<1	2.9	<1

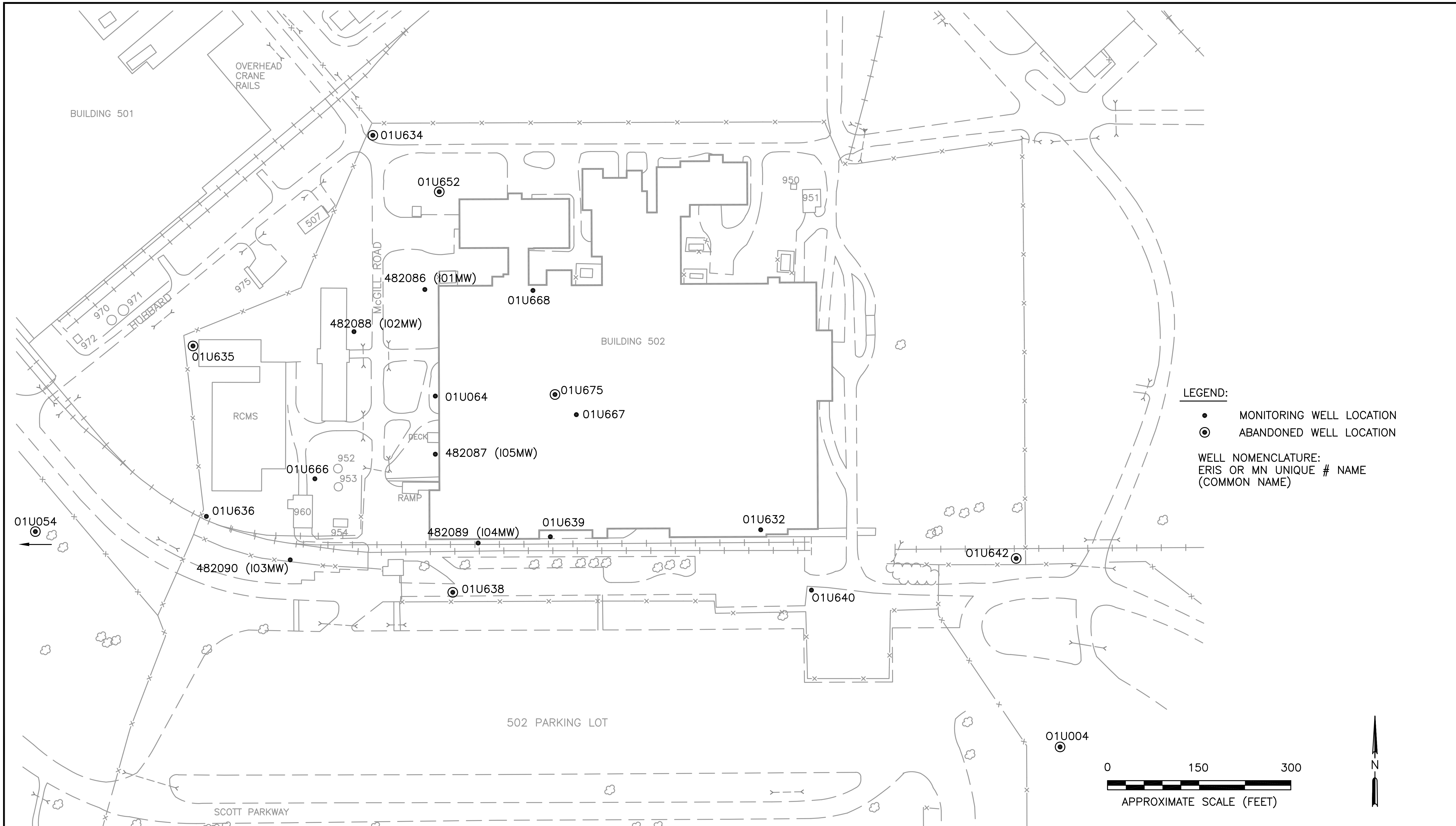
Notes:
Concentrations in ug/L.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
(1) Sample dilution = 100
(2) Sample dilution = 1000

TABLE 8-2

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
FISCAL YEAR 2006
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

	Remedy Component		Monitoring Requirements	Responsible Party	Document Containing the Monitoring Plan
#1	Groundwater Monitoring	a.	Groundwater quality and water levels to track remedy progress.	Alliant	Site I Monitoring Plan in Annual Performance Report
#2	Groundwater Extraction (1)	a.	Extracted water volumes and rates.	Alliant	Not applicable (1)
#3	POTW Discharge (1)	a.	Water quality data for system effluent to demonstrate compliance with discharge requirement.	Alliant	Not applicable (1)
#4	Additional Investigation	a.	As per work plan (completed).	Alliant	Not applicable
	Overall Remedy	a.	Water quality data to evaluate attainment.	Alliant	Site I Monitoring Plan in Annual Performance Report

Note:
(1) Currently there is no pumping required based on results of additional investigation and pilot test results.



SECOR

4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55119
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PREPARED FOR:

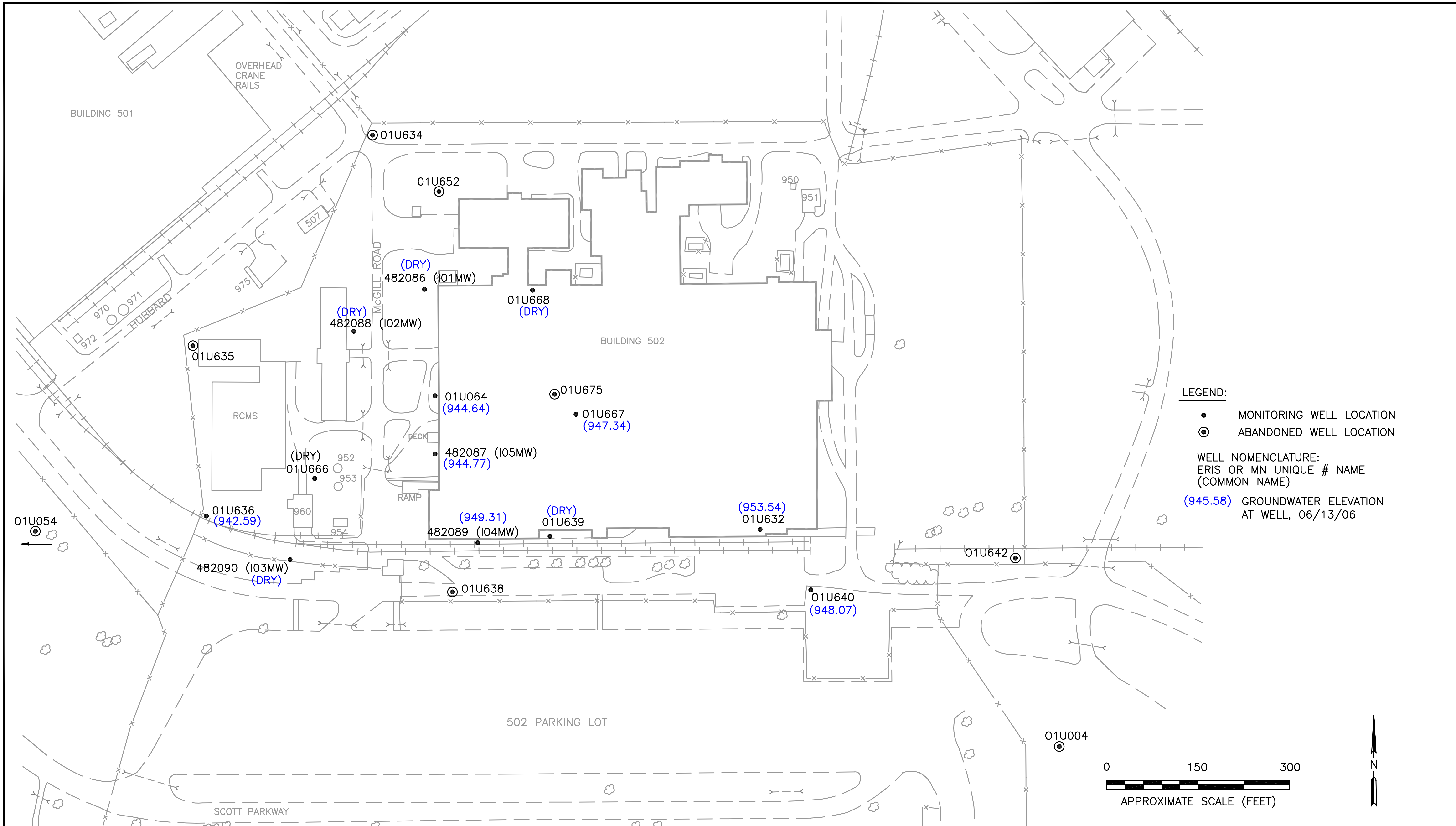
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE I, UNIT 1
GROUNDWATER QUALITY
MONITORING LOCATIONS

FIGURE:
8-1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
03OT.18508.00.0462	KM	AG	AG	01/05/07

SITE-I-06-A



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ARDEN HILLS, MINNESOTA

SITE I, UNIT 1
GROUNDWATER ELEVATION
MAP, 06/13/06

FIGURE:
8-2

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
03OT.18508.00.0462	KM	SB	AG	01/05/07

SITE-I-06-A

9.0 Operable Unit 2: Site K Shallow Groundwater

VOC contamination has been identified in the Unit 1 (perched aquifer) at Building 103. The limits of the VOC plume in the perched groundwater have been defined to be beneath and immediately northwest of Building 103.

The remedy selected in the OU2 ROD consists of seven components that incorporate the existing groundwater extraction trench and air stripper, which began operation in August 1986. The remedy also includes additional investigation of the unsaturated soils beneath the building slab.

9.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2006 monitoring plan and any deviations are explained in Appendix C.2.

Monitoring was performed in accordance with the TCAAP RD/RA QAPP (1996) and a new QAPP. The *IRP-QAPP for Performance Monitoring*, TWISS, dated June 7, 2005, was accepted by the USEPA and MPCA as passing the Consistency Test on October 14, 2005. The new QAPP was implemented on December 1, 2005, the beginning of the 2nd quarter FY 2006.

Water levels are collected annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. FY 2006 monitoring was performed in accordance with the Monitoring Plan included as Appendix A. The comprehensive monitoring well sampling round was conducted in June 2006. Figure 9-1 presents the sampling and water level monitoring locations. Figure 9-1 also shows the cross-section alignment.

9.2 REMEDY COMPONENT #2: SENTINEL WELLS

Description: "Installation of sentinel wells at the bottom of Unit 1 and top of Unit 3." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the wells have been installed according to a regulator approved work plan.

Is the remedy component being implemented?
Yes. The OU2 ROD was signed in December 1997 (FY 1998). The Predesign Investigation Work Plan for Site K was approved in February 1999. The upper Unit 3 sentinel well was installed in February 2000.

Existing piezometers were used to accomplish the deep Unit 1 sentry monitoring. Piezometers 01U625D, 01U626D, 01U627D, and 01U628D were used since they monitor the base of the Unit 1 aquifer near the trench. The issue is the potential for Dense Non-Aqueous Phase Liquids (DNAPLs) to migrate beneath the trench along the Unit 1/Unit 2 interface. These four piezometers are screened at that interface.

Figure 9-1 shows the location of the upper Unit 3 sentinel well (03U621) and the piezometers. The sentinel well was installed to monitor the potential for VOCs to migrate through the Unit 2 till and into the Unit 3 aquifer.

What are the results of the Unit 1 piezometer and Unit 3 sentinel well sampling?

The piezometers (Unit 1 sentinel wells) were sampled in March 2000 and the results were discussed in the FY 2000 APR. The results did not indicate the presence of DNAPLs at the Unit 2/Unit 3 interface. This was a one-time sampling event, as required by the MPCA/USEPA approved Predesign Investigation Work Plan, Site K, TCAAP, CRA, February 1999, and as documented in the Predesign Investigation Report, Site K, TCAAP, CRA, December 2001, for which concurrence was received.

The Unit 3 sentinel well (03U621) was sampled in March, July, and September 2000, of FY 2000, and in January 2001 for the quarterly sampling required by the Work Plan. After that, the well was incorporated into the regular TCAAP monitoring plan. The well was sampled in June 2006 for FY 2006. The results of the sample collected during FY 2006 are presented in Table 9-1. VOCs were not detected in the Unit 3 sentinel well.

9.3 REMEDY COMPONENT #3: HYDRAULIC CONTAINMENT

Description: "Use of existing interceptor/recovery trench to contain the plume and remove impacted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the trench is operating as designed and capturing all groundwater exceeding the cleanup levels presented in Table 1 of the OU2 ROD, as described below.

Is the remedy component being implemented?

Yes. The groundwater collection system continues to provide capture (as described later) of the Unit 1 groundwater, upgradient of the trench and beneath Building 103, as designed.

Is the system providing hydraulic capture of the plume?

Yes. Water level data are presented in Table 9-2. Figure 9-2 presents a plan view of the groundwater contours from the June 2006 round of groundwater level measurements. At nested wells, the numerically lowest water elevation was used to create the plan view contours. Monitoring wells downgradient of the extraction trench show consistently higher water levels than those near and upgradient of the trench. This demonstrates that the horizontal hydraulic gradient has been reversed toward the extraction trench due to system operation.

Vertical capture was also effective as illustrated on Figure 9-3. As seen in the figure, groundwater both upgradient and downgradient of the trench is captured and collected. The upward gradient beneath the trench indicates that groundwater does not migrate below the trench. The monitoring coverage provided by the bundle piezometers, demonstrates complete vertical and horizontal hydraulic capture.

Figure 9-4 presents the trichloroethene concentrations from the June 2006 annual sampling event. Trichloroethene concentrations range from non-detect to 3,400 μg/l. The FY 2006 concentrations at wells 01U615 and 01U611, which monitor the core of the plume, showed an increase from 2,700 μg/l to 3,400 μg/l in 01U615 and an increase from 140 μg/l to 1,200 μg/l in 01U611 compared to the concentrations measured in FY 2005. The FY 2006 concentration of trichloroethene in 01U615 compares with historical concentrations from the last ten years of sampling, which have ranged from 1,800 μg/l to 7,100 μg/l. Although the FY 2006 increase in trichloroethene in 01U611 is an order of magnitude greater that FY 2005 sampling, the overall trend has shown a gradual decrease in trichloroethene concentrations over the last fifteen years of sampling. Water levels measured during the FY 2006 monitoring were 0.38 feet higher at 01U615 and 0.9 feet higher at 01U611 compared to FY 2005 elevations. These wells have historically exhibited fluctuating concentrations.

Comparison of Figure 9-4 to the groundwater contour maps indicates that the VOC plume is hydraulically contained by the treatment system. Table 9-1 presents the monitoring well sampling data. The plume was originally defined based on data from all of the monitoring wells.

The current monitoring well network is used to confirm the plume contours and measure the progress of remediation. Thus, the contours on Figure 9-4 were drawn with consideration of the extensive historical data.

Three wells (01U128, 01U617, and 01U621) exhibit low concentrations of 1,2-dichloroethene downgradient of the groundwater collection system's capture zone. Two of these wells (01U128 and 01U617) have exhibited reasonably consistent concentrations of 1,2-dichloroethene since 1987, indicating that it migrated prior to the establishment of the capture zone. The third well, 01U621, has exhibited 1,2-dichloroethene since September 1993. The concentrations at these wells were consistent with those measured in FY 2005 and previous years.

9.4 REMEDY COMPONENT #4: GROUNDWATER TREATMENT

Description: "Treatment of contaminated groundwater using air stripping."
(OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the air stripping facility is treating water to the cleanup standards.

Is the remedy component being implemented?
Yes. See discussion below.

Were there any major operational changes during the year?
No. The original air stripping tower and controls were replaced with a new fluidized bed type air stripper system on June 21, 1999. During FY 2006, the treatment system functioned properly. The new air stripper is less prone to fouling and requires less maintenance. The treatment system was operational 94.65% of the time in FY 2006. The decrease in operational efficiency in FY 2006 was the result of 19 days of system down time from August 31, 2006 to September 18,

2006. During FY 2006, a regular maintenance schedule was maintained. Appendix F.1 summarizes operational data and events at the groundwater extraction and treatment system.

9.5 REMEDY COMPONENT #5: TREATED WATER DISCHARGE

Description: "Discharge of treated groundwater to Rice Creek." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the system is operating as designed with treated water discharge to the storm sewer that, in turn, discharges to Rice Creek. The water is required to meet the substantive requirements of Document No. MNU000579 (MPCA), which contains the state-accepted discharge limits for surface water. Sampling and analysis are performed to monitor performance (see below).

Is the remedy component being implemented?
Yes. See discussion in Section 9.6.

9.6 REMEDY COMPONENT #6: DISCHARGE MONITORING

Description: "Monitoring to track compliance with discharge requirements." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and is being implemented in accordance with the plan.

Is the remedy component being implemented?
Yes. Treatment system monitoring consisted of quarterly influent and effluent sampling. Influent and effluent analytical results are presented in Table 9-3 and Table 9-4. The discharge met all the treatment requirements.

Table 9-5 presents the VOC mass removal and monthly flow rates. A total of 6,053,220 gallons of water and 17.4 pounds of VOCs were removed from the aquifer in FY 2006. The cumulative mass removal is 177.2 pounds of VOCs.

9.7 REMEDY COMPONENT #7: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the unsaturated Unit 1 soil." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the additional investigation has been completed according to a regulator approved work plan.

Is the remedy component being implemented?
Yes. The Work Plan was approved in FY 1999. Work began in February 2000. A report of the investigation results was submitted in November 2001 and received a consistency determination from the Agencies on December 6, 2001. The report defined the extent of VOC contaminated soils beneath Building 103 and refined the location of the source area. The report and subsequent follow up sampling resolved anomalous dissolved zinc, lead, and nickel data at two monitoring wells. Zinc, lead, and nickel are no longer groundwater concerns.

9.8 OVERALL REMEDY FOR SITE K

Overall, the remedy for Site K continued to operate consistent with past years and in compliance with the required performance criteria.

Is additional monitoring proposed prior to the next report? No.

9.9 OTHER ACTIVITY

Alliant conducted pilot scale tests of two new technologies at Site K. These are Hydrogen Release Compound™ (HRC), and direct hydrogen injection with gas-permeable membranes. Both technologies are intended to enhance natural anaerobic degradation of chlorinated VOCs. These tests were completed in late FY 2000 and a report of the results was issued in FY 2001. The report determined that HRC was not effective under the specific conditions beneath the building slab at Site K. The direct hydrogen injection test yielded promising results but more research is needed for full-scale operation.

In FY 2002, no research field work was conducted; however, Alliant allowed the University of Minnesota to continue its research into direct hydrogen injection by making the test plot available for its use.

In June 2002, a Remedial Action Report for Site K, TCAAP, CRA, was submitted to the USEPA and MPCA. The purpose of the report was to document the remedial action implementation as required by the FFA. The report discussed implementation of the components required by the TCAAP OU2 ROD. A consistency letter for this report was received in FY 2003.

During the June 2004 monitoring, a groundwater sample was collected from well 01U615 and analyzed for 1,4-dioxane using EPA method 8270c. The laboratory analytical result for 1,4-dioxane was estimated to be 0.64 µg/l, which is below the MDH Health Based Value (HBV) of 30 µg/l. The method detection limit (MDL) was 0.11 µg/l and the contract required detection limit (CRDL) was 1.0 µg/l.

Two monitoring wells (01U622 and 01U623) were abandoned in FY 2004. Well abandonment is documented in the *Well Abandonment Report, Sites I and K, TCAAP*, SECOR, dated December 15, 2003.

During FY 2004, a Five-Year Review of the remedy was performed. The review concluded that the remedy was functioning as intended, and that the components of the remedy remain protective of human health and the environment. The Review also recommended monitoring the trichloroethene HRL for any changes due to the USEPA's potential update of the trichloroethene health risk assessment.

During FY 2005, the groundwater collection system trench was cleaned using a high-pressure water jetting technique. Pre-cleaning and post-cleaning video documentation was used to assess the effectiveness of the high pressure jetting. Pre-cleaning (June 2005) and post-cleaning (November 2005) groundwater contouring and groundwater elevations were used to further assess the trench cleanings effectiveness on hydraulic containment within the VOC plume. Results of both effectiveness assessments indicate that the jet cleaning improved the hydraulic containment compared to pre-cleaned conditions.

During FY 2006, Building 103 was demolished, leaving in place the concrete slab (floor) of the building. The Building 103 concrete slab will remain in place and continue to act as a Site K cap.

TABLE 9-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	Trichloroethylene TRCLE	1,1,1-Trichloroethane 111TCE	1,1,2-Trichloroethane 112TCE	1,1-Dichloroethylene 11DCE	1,1-Dichloroethane 11DCLE	cis-1,2-Dichloroethylene C12DCE	Vinyl chloride C2H3CL	Chloroform CHCL3	trans-1,2-Dichloroethylene T12DCE	Tetrachloroethylene TCLEE	1,2-Dichloroethane 12DCLE
01U128	6/15/2006	0.28 (J)	<1	<1	<1	<1	5.0	<1	<1	0.66 (J)	<1	<1
OW103 (01U603)	6/15/2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
01U604	6/15/2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
OW111 (01U611)	6/15/2006	1200	<1	<1	<1	<1	110	1.6 (J)	<1	43	<1	<1
OW115 (01U615) (1)	6/15/2005	3400 (2)	<10	<10	1.8 (J)	<10	1100	2.2 (J)	<10	340	<10	<10
OW117 (01U617)	6/15/2006	0.27 (J)	<1	<1	<1	<1	3.1	<1	<1	0.61 (J)	<1	<1
OW117 (01U617) D	6/15/2006	0.20 (J)	<1	<1	<1	<1	2.5	<1	<1	0.41 (J)	<1	<1
OW118 (01U618)	6/15/2006	1.1	<1	<1	<1	<1	0.44 (J)	<1	<1	<1	<1	<1
OW119 (01U619)	6/15/2006	0.4 (J)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
OW121 (01U621)	6/15/2006	0.34 (J)	<1	<1	<1	<1	3.4	<1	<1	0.24 (J)	<1	<1
03U621	6/16/2006	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
482083 (K04MW)	6/15/2006	0.75 (J)	<1	<1	<1	1.8	<1	<1	<1	<1	<1	<1

Notes:
Concentrations in ug/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
Sample dilution = 1, unless noted otherwise.
(1) Sample dilution =10.
(2) Sample dilution = 100.

Table 9-2

GROUNDWATER ELEVATION MONITORING
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Well ID	*TOC Elevation*	*Depth to Water (ft BGS)*	*Groundwater Elevation 6/13/2006*
01U047	880.31	6.66	873.65
01U048	885.32	11.18	874.14
01U052	886.51	11.70	874.81
01U065	883.90	9.98	873.92
01U128	883.69	9.41	874.28
01U601	892.68	7.88	884.80
01U602	889.35	5.53	883.82
01U603	887.31	9.38	877.93
01U604	888.98	11.95	877.03
01U605	887.76	9.49	878.27
01U607	891.01	6.27	884.74
01U608	889.30	4.65	884.65
01U609	889.33	4.78	884.55
01U611	889.29	4.82	884.47
01U612	886.91	8.69	878.22
01U613	892.07	7.61	884.46
01U615	888.66	12.00	876.66
01U616	890.37	10.40	879.97
01U617	887.72	10.38	877.34
01U618	891.52	11.67	879.85
01U619	891.75	8.05	883.70
01U620	888.65	9.86	878.79
01U621	886.57	8.21	878.36
01U622	889.43	Monitoring well abandoned	
01U623	889.44	Monitoring well abandoned	
01U624A	889.88	11.44	878.44
01U624B	889.88	11.45	878.43
01U624C	889.91	11.47	878.44
01U624D	889.89	11.45	878.44
01U625A	886.92	9.46	877.46
01U625B	886.91	9.50	877.41
01U625C	886.91	9.50	877.41
01U625D	886.92	9.51	877.41
01U626A	886.87	9.46	877.41
01U626B	886.88	9.85	877.03
01U626C	886.88	9.81	877.07
01U626D	886.88	9.76	877.12
01U627A	886.46	8.27	878.19
01U627B	886.47	9.17	877.30
01U627C	886.47	9.24	877.23
01U627D	886.48	9.24	877.24
01U628A	887.82	9.71	878.11
01U628B	887.83	9.96	877.87
01U628C	887.82	10.31	877.51
01U628D	887.84	10.34	877.50
482085 (K01MW)	891.24	5.08	886.16
482084 (K02MW)	891.35	6.12	885.23
482083 (K04MW)	887.66	6.27	881.39
03U621	887.01	34.14	852.87

Notes:
ft BGS - feet below ground surface

TABLE 9-3

TREATMENT SYSTEM CONCENTRATIONS (ORGANICS)
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	Sample Date	1,1-Dichloroethane 11DCLE		1,1-Dichloroethene 11DCE		1,2-Dichloroethane 12DCLE		cis-1,2-Dichloroethene C12DCE		trans-1,2-Dichloroethene T12DCE		Trichloroethene TRCLE		Vinyl chloride C2H3CL	
Effluent	12/8/2005	ND		ND		ND		0.18	JP	ND		0.21	JP	ND	
Effluent	12/8/2005	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D
Effluent	3/15/2006	ND		ND		ND		ND		ND		ND		ND	
Effluent	6/16/2006	ND		ND		ND		0.9	J	ND		3.1		ND	
Effluent	6/16/2006	ND	D	ND	D	ND	D	0.89	D,J	ND	D	3.4	D	ND	D
Effluent	9/20/2006	ND		ND		ND		0.44	J	ND		0.51	J	ND	
Effluent	9/20/2006	ND	D	ND	D	ND	D	0.42	D,J	ND	D	0.42	D,J	ND	D
Influent	12/8/2005	ND		ND		ND		110		17		140		2	
Influent	3/15/2006	ND		ND		ND		6.1		0.87	JP	7.9		ND	
Influent	3/15/2006	ND	D	ND	D	ND	D	4.4	D	0.62	D,JP	5.9	D	ND	D
Influent	6/16/2006	ND		ND		ND		120		13		440		1	
Influent	9/20/2006	ND		ND		ND		160		33		240		4.2	
MDL		0.355		0.199		0.297		0.171		0.168		0.195		0.456	
CRDL		1		1		1		1		1		1		1	
REQ.		--		7.0		3.8		70		100		10		0.18	

Notes:

Results are reported in µg/L unless otherwise noted.
CRDL - Contract Required Detection Limit
D - Duplicate Analysis
J - Value Estimated
MDL - Method Detection Limit
ND - Not Detected
P - Results less than reporting level but greater than instrument detection limit.
REQ - Substantive Requirement Document Concentration Limit, Maximum Daily Concentration

TABLE 9-4

TREATMENT SYSTEM CONCENTRATIONS (INORGANICS)
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	Sample Date	Phosphorus Total	Copper		Cyanide		Lead		Mercury		Silver		Zinc	
Effluent	12/8/05	943	11.4		ND	U	1.6	B	ND	U	ND	U	60.4	JE12
Effluent	3/15/06	396	6.4		1.6	B	1.8	B	ND	U	1.300	B	61.6	
Effluent	6/16/06	210	4.4	B	ND	U	1.43	B	ND	U	ND	U	32.9	
Effluent	9/20/06	630	4.18	B	ND		0.423	B	ND	U	1.090	B, JS73	50.5	JE17
MDL	12/8/05	56.2	0.341		1.41		0.0798		0.0126		0.221		0.580	
MDL	3/15/06	56.2	0.443		1.41		0.0520		0.0304		0.844		0.436	
MDL	6/16/06	170.0	0.341		2.97		0.0798		0.0304		0.221		0.580	
MDL	9/20/06	170.0	0.433		2.97		0.0520		0.0304		0.844		0.436	
CRDL		20	5		10		2		0		2		5	
REQ.		1000	21		17		106		0.2		3.4		134	

Notes:
Results are reported in ug/L unless otherwise noted.
CRDL - Contract Required Detection Limit
MDL - Method Detection Limit
ND - Not Detected
REQ - Substantive Requirement Document Concentration Limit, Maximum Daily Conc.
U - Not detected at or above the MDL or IDL.
B - Value is between the MDL and PQL
JE# - Serial dilution percent difference out of control limits; %difference = 12 on 12/8/05 and 17 on 9/20/06
JS# - Percent recovery of matrix spike is below lower recovery limit; %recovery = 73.4%

TABLE 9-5

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

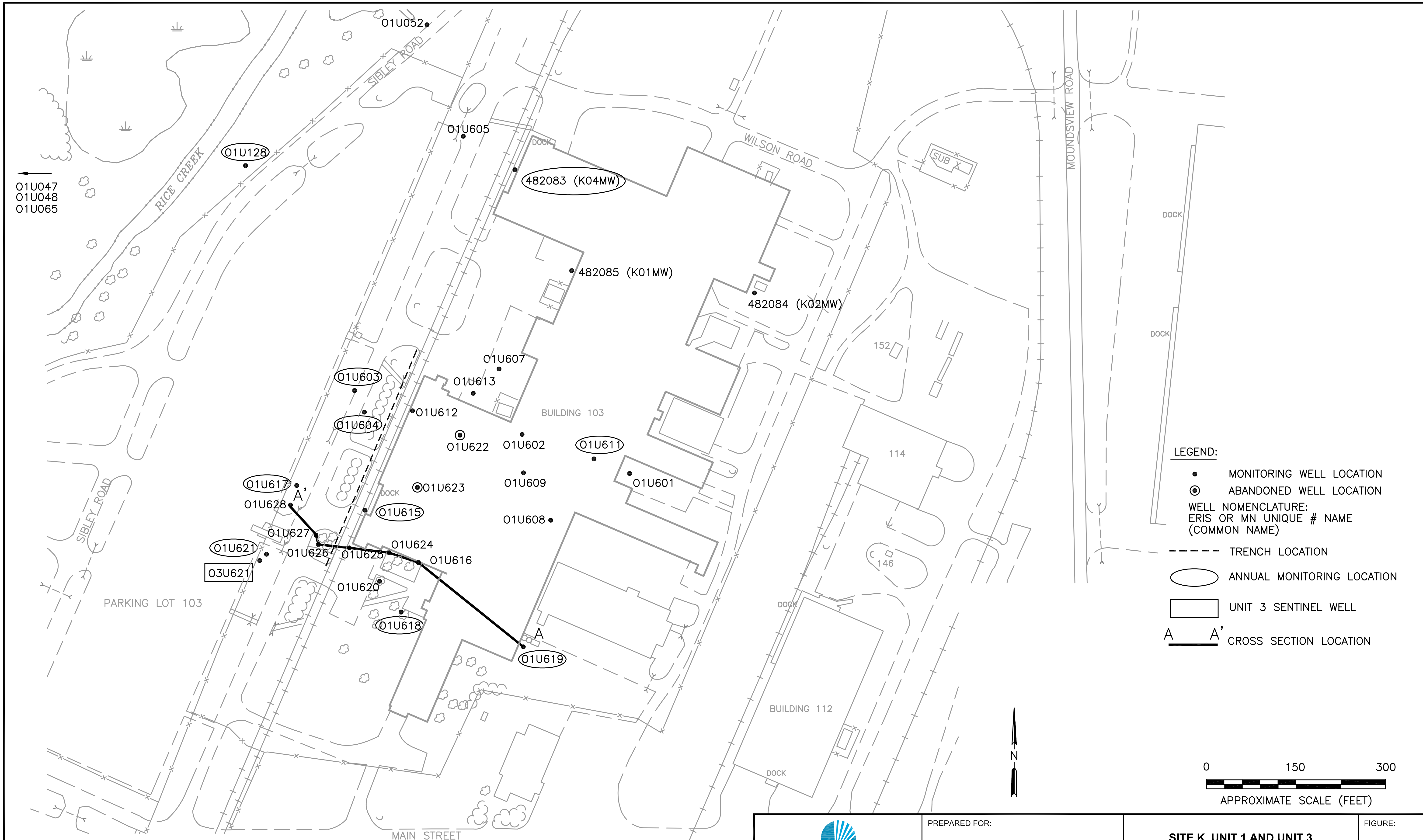
Month	Total Monthly Flow (million gallons)	Total VOC Influent Concentration	Total VOC Effluent Concentration	Total VOCs in Treatment Center Discharge (g)	Total VOC Mass Removed (g)	Total VOC Mass Removed (lb)
Cumulative As Of October 2005 (FY05)						159.8
October[(1)]	0.65479	271	0.39	0.97	669.78	1.48
November[(1)]	0.63251	271	0.39	0.93	647.00	1.43
December	0.50238	271	0.39	0.74	513.88	1.13
January[(1)]	0.43177	14.9	0	0.00	24.27	0.05
February[(1)]	0.35468	14.9	0	0.00	19.94	0.04
March	0.37273	14.9	0	0.00	20.95	0.05
April[(1)]	0.49299	574.0	4	7.45	1062.20	2.34
May[(1)]	0.65873	574.0	4	9.96	1419.30	3.13
June	0.61503	574.0	4	9.30	1325.15	2.92
July[(1)]	0.58441	437.2	0.95	2.10	963.71	2.12
August[(1)]	0.50751	437.2	0.95	1.82	836.89	1.84
September	0.24570	437.2	0.95	0.88	405.17	0.89
Totals - FY06	6.05322			34.2	7908.2	17.4
Cumulative To Date						177.2

Notes:
[(1)] Influent and Effluent VOC concentrations from 12/08/05, 3/15/06, 6/16/06 and 9/20/06 quarterly samples, respectively.
Calculations based on compounds with concentrations above the CRDL only.
Analytical data has not received Level IV review and may be revised after completion of review.

TABLE 9-6

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

	Remedy Component		Monitoring Requirements	Responsible Party	Documents Containing the Monitoring Plan
#1	Groundwater Monitoring		Outlined below	Alliant	Site K Monitoring Plan in Annual Performance Report
#2	Sentinel Wells	a.	Water quality to monitor potential migration.	Alliant	Site K Monitoring Plan in Annual Performance Report
#3	Hydraulic Containment	a.	Water levels for use in drawing contour maps showing capture.	Alliant	Site K Monitoring Plan in Annual Performance Report
		b.	Pumping volumes and rates for reporting and mass removal calculation.	Alliant	Site K Monitoring Plan in Annual Performance Report
#4	Groundwater Treatment		None	Alliant	Site K Monitoring Plan in Annual Performance Report
#5	Treated Water Discharge		None	Alliant	Site K Monitoring Plan in Annual Performance Report
#6	Discharge Monitoring	a.	Treated effluent water quality for comparison to substantive requirements criteria for discharge maximum daily concentration.	Alliant	Site K Monitoring Plan in Annual Performance Report
#7	Additional Investigation	a.	As per work plan (completed).	Alliant	Site K Monitoring Plan in Annual Performance Report



SECOR

4463 WHITE BEAR PARKWAY, SUITE 106
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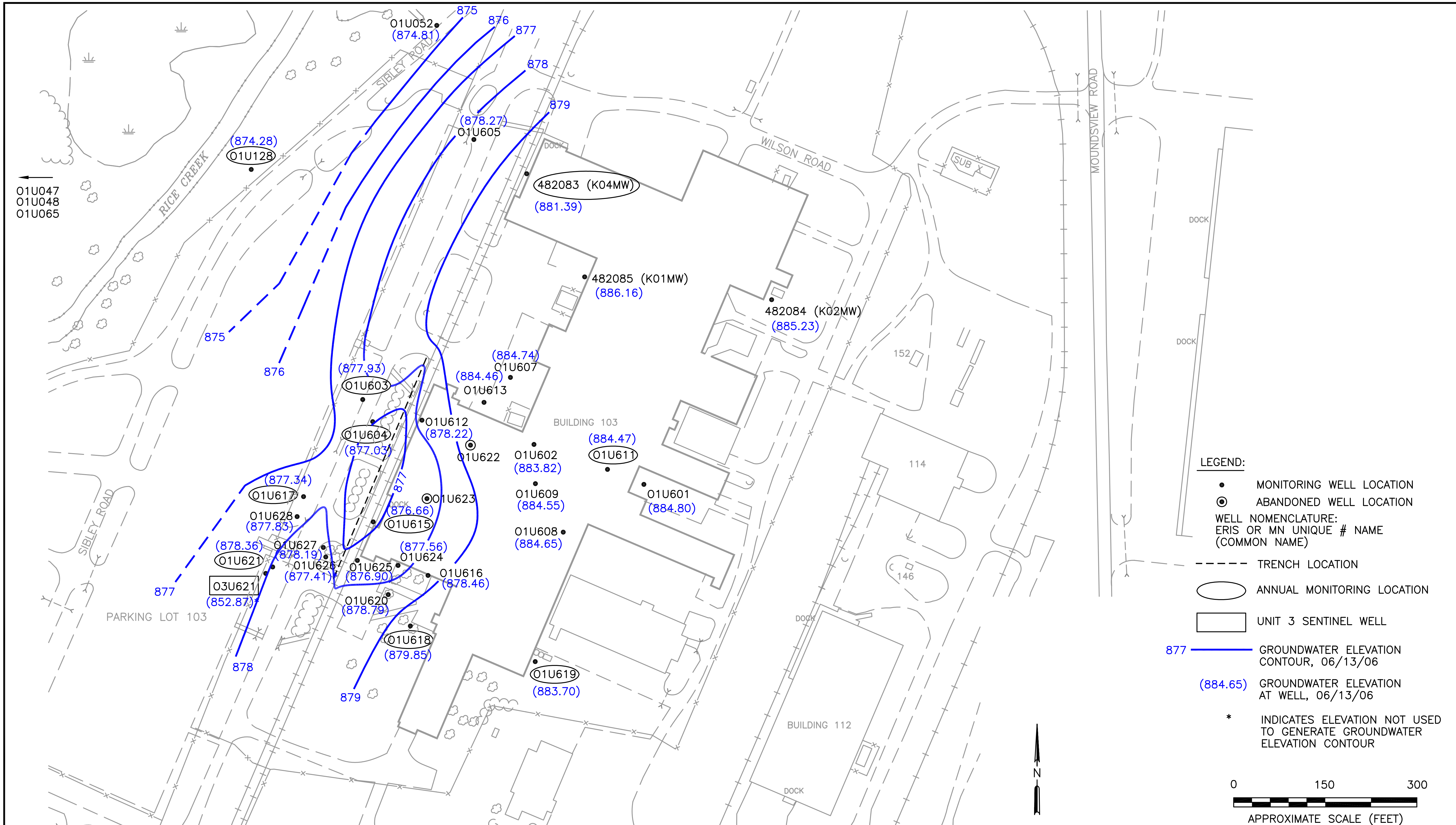
PHONE (651) 653-9112 FAX (651) 653-1751

PREPARED FOR:				FIGURE:
TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA		**SITE K, UNIT 1 AND UNIT 3 GROUNDWATER MONITORING LOCATIONS**		**9-1**
JOB NUMBER: 03OT.18508.00.0462	DRAWN BY: KM	CHECKED BY: AG	APPROVED BY: AG	DATE: 01/05/07

SITE-K-06-A



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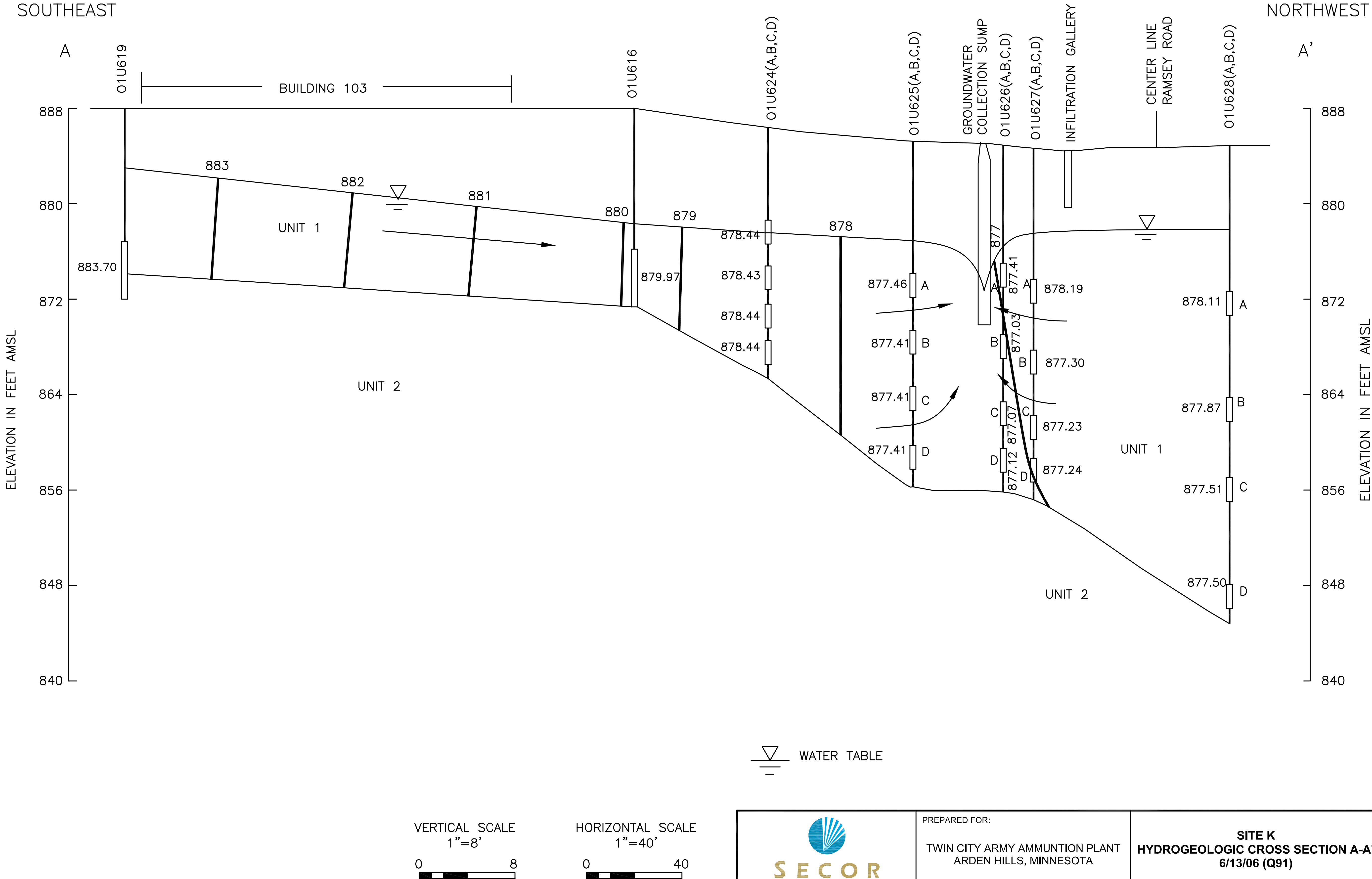
PREPARED FOR:		TITLE	FIGURE:
TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA		**SITE K, UNIT 1 AND UNIT 3 GROUNDWATER ELEVATION DATA 06/13/06**	**9-2**
JOB NUMBER: 03OT.18508.	DRAWN BY: KM	CHECKED BY: AG / APPROVED BY: AG	DATE: 01/06/07

SITE-K-06-A



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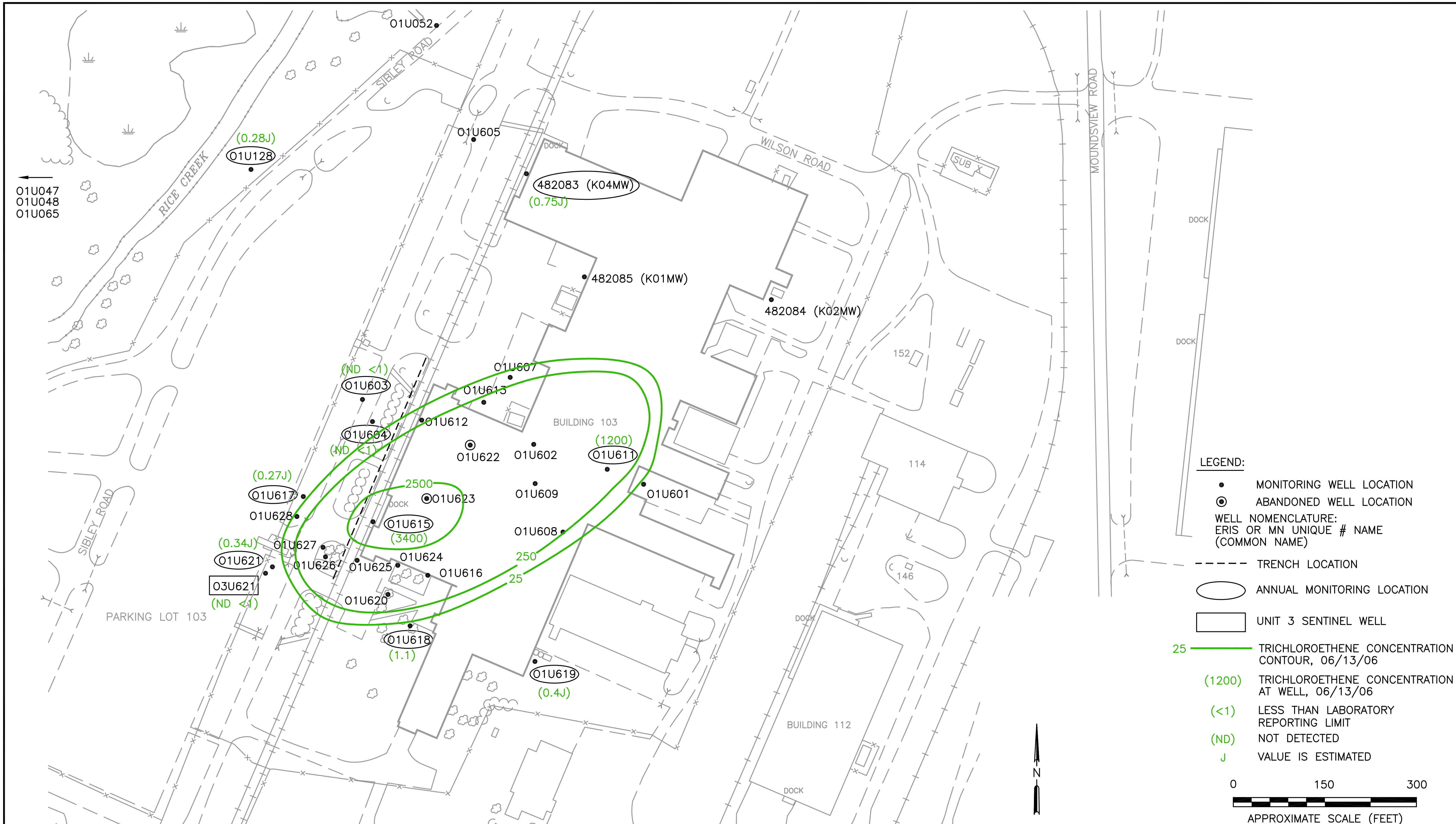
PREPARED FOR:
TWIN CITY ARMY AMMUNTION PLANT
ARDEN HILLS, MINNESOTA

SITE K
HYDROGEOLOGIC CROSS SECTION A-A'
6/13/06 (Q91)

FIGURE: **9-3**

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
03OT.18508.00.0462	KM	AG	AG	01/05/07

CROSS-06-A



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PREPARED FOR:				FIGURE:
TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA		**SITE K, UNIT 1 AND UNIT 3 TRICHLOROETHENE CONCENTRATION MAP- 06/13/06 (Q91)**		**9-4**
JOB NUMBER: 03OT.18508.	DRAWN BY: KM	CHECKED BY: AG	APPROVED BY: AG	DATE: 01/06/07

SITE-K-06-A

10.0 Operable Unit 2: Deep Groundwater

The selected remedy for the Deep Groundwater in the OU2 ROD consists of five remedial components that include continued use of the TGRS, with modifications to improve VOC contaminant removal from the source area. It also includes an annual review of new and emerging technologies potentially applicable to the Deep Groundwater. This report documents all performance and monitoring data collected from October 2005 through September 2006.

Historical Design and Evaluation of TGRS Remedial Action

In September 1987, a Record of Decision (1987 ROD) was prepared by the USEPA in order to implement the Interim Response Action Plan (IRAP) for TCAAP. The 1987 ROD provided specific criteria for the Boundary Groundwater Recovery System (BGRS). Following extensive interagency negotiations on the FFA and the ROD, the BGRS was started on October 19, 1987.

The BGRS consisted of six Unit 3 extraction wells (B1 through B6) that were connected by forcemain to an air stripping treatment facility. The initial six BGRS extraction wells (B1 through B6) were installed and pumping tests were conducted prior to start up of the BGRS. These pumping tests were documented in the BGRS Extraction Well Pumping Test Report.

Following the initial 90-day operation of the BGRS, the IRA–BGRS Performance Assessment Report (PAR) was prepared. The PAR assessed the hydraulic and treatment performance of the BGRS. The PAR presented an extensive database collected during the initial 90-day period of BGRS operation and prior pertinent data. The PAR also included a summary of the geology, hydrogeology, and remediation history for TCAAP. The PAR was subsequently approved by the MPCA and USEPA.

A pumping test on well B9 was conducted in August 1988 and formed the basis of the final design of the TGRS. This test, and the previous pumping tests, were utilized to determine the pumping rate required to achieve the necessary zone of capture for the TGRS; based on the plume size at that time. The PAR stated that the overall pumping rate needed for the 17 extraction wells was 2,450 gpm. During the detailed design of the TGRS, the system was designed with the capacity to operate at a maximum theoretical rate of 2,900 gpm. The additional pumpage was included to provide a safety margin for the calculations and to allow for fluctuations in system operation.

The PAR made recommendations for expansion of the BGRS into the TGRS in order to meet the Phase II remediation criteria established in the 1987 ROD. These modifications were completed and the expanded system began operation on January 31, 1989.

The 1989 Annual Monitoring Report was the first report covering the fully configured TGRS. It concluded that the TGRS develops a continuous zone of capture that was approximately 4,500 feet wide at the TCAAP boundary. The zone of capture widened to approximately 8,300 feet upgradient of the boundary. This zone of capture was demonstrated at average system pumping rates of 2,400 to 2,700 gpm.

The 1989 Annual Monitoring Report was wider in scope than subsequent annual monitoring reports for the TGRS. The 1989 report was both a performance assessment report and a monitoring report. The 1989 report represented the first year of operation of the expanded TGRS. Thus, a more detailed and exhaustive performance assessment was appropriate and possible, as there were data available from non-pumping conditions for detailed comparison with pumping conditions. Between 1990 and 2002, the system continued to operate at an essentially steady state condition, so the TGRS was evaluated by comparing the pumping rates to those achieved for the 1989 evaluation.

In FY 2003, the Army received agency approval on the TGRS Operating Strategy (OS) document. The OS was based in part on findings from the 1989 Annual Monitoring Report and presented a Global Operation Strategy (GOS) for the entire TGRS extraction system and a Micro Operation Strategy (MOS) for selected well groups. Evaluations now consider and compare actual pumping rates to the GOS and MOS rates presented in the Final TGRS OS.

TGRS Modifications

Since 1990, a number of modifications have been made to the TGRS operation in response to changes in plume configuration or operational issues. A brief summary of the major changes is presented below:

1. Source control well SC4 was shut down in November 1996 in response to insignificant VOC mass removal by this well. SC4 operated at an average extraction rate of 29 gpm in 1989 and 45 gpm prior to shut down.
2. Boundary extraction well B12 was shut down in November 1996. The plume in the B12 area had dropped below cleanup standards for several years. Well B12 operated at an average extraction rate of 139 gpm in 1989 and 190 gpm prior to shut down.
3. As per the OS, boundary extraction well B2 was shutdown and replaced with well B13 that began production in December 2002. The well screen in B2 became fouled and flow rates decreased from an average of nearly 200 gpm in the early 1990s to 52 gpm in 2002. During FY 2003, well B13 operated at maximum pumping capacity of nearly 100 gpm. The original design capacity for B13 was 200 gpm.
4. As per the OS, boundary extraction wells B7 and B10, and source control well SC3 were officially shut down in December 2002 due to the low TRCLE concentrations.
5. As per the OS, a larger capacity pump was installed at well B9 in December 2002 to raise the pumping rate from 150 gpm to approximately 300 gpm.
6. In July 2004, the TGRS was modified (Modification #3) as approved by the Agencies in May 2004. Pumps in Wells B1 and B13 were replaced and the pump in Well B13 was lowered to allow pumping below the well screen.
7. Flow rates at individual wells have been modified from time to time due to plume configuration changes, operational issues, and to maintain the OS.

10.1 REMEDY COMPONENT #1: HYDRAULIC CONTAINMENT AND CONTAMINANT REMOVAL FROM THE SOURCE AREA

Description: "Groundwater extraction to hydraulically contain the contaminated source area to the 5-µg/l TRCLE concentration contour and optimize the removal of contaminants from the source area through pumping of select wells." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the TGRS is containing the contaminated source area to the 5-µg/l TRCLE contour and the system is operated to maximize the contaminant removal from the source area.

Is the remedy component being implemented?
Yes. The TGRS was operated in FY 2006 consistent with the requirements of the OU2 ROD. Table 10-1 presents the cleanup requirements for the TGRS from the OU2 ROD.

During FY 2006, the total extraction well water pumped was approximately 1,769 gpm. The total extraction well water pumped was above the GOS Total System Operational Minimum (1,745 gpm) where the Army and the agencies agree that OU2 ROD requirements are met with an adequate safety factor. Additionally, all of the individual well groupings were above their respective MOS minimums for FY 2006.

How is the system operated and what preventative maintenance measures were conducted during the year?

<u>Summary of Operations</u>
Beginning in FY 2003, the system operation changed to conform to the OS. Under the OS, groundwater is extracted from 8 wells along the southwest boundary of TCAAP (B1, B3 through B6, B8, B9, B11, and B13) and three wells downgradient of interior source areas on TCAAP (SC1, SC2, and SC5). Prior to this, wells B2, B7, B10, and SC3 were also operating components

of the system. Submersible pumps in the extraction wells discharge into a common pressurized forcemain that carries the water to the treatment system. The treatment system is located adjacent to Building 116. The TGRS layout is presented on Figure 10-1.

The TGRS is designed and constructed with three options for treated water discharge: recharge at the Arsenal Sand and Gravel Pit, discharge to Rice Creek, and discharge to the TCAAP elevated water tank. Water stored in the elevated tank is "softened" and then "polished" with granular activated carbon (GAC) prior to distribution at TCAAP. Currently, the Arsenal Sand and Gravel Pit option is utilized for the majority of treated water. The TCAAP, through its distribution system, uses a small portion of the water to supply offices at Building 105.

System Operation Specifications

In general, the influent and effluent water flow rates at the treatment plant are designed to be equal, thereby providing continuous operation of all processes and equipment. The following is a summary of the system design parameters:

- The groundwater extraction system, including the treatment center and 17 TGRS extraction wells, was originally designed to provide a theoretical hydraulic capacity of 2,900 gpm and a sustained daily average capacity of 2,730 gpm.
- The influent to the treatment plant is divided between Towers 1 and 2, each receiving up to a maximum of 1,450 gpm.
- Wet Well Pumps 1 and 2 (WWP#1 and WWP#2 located in Wet Wells 1 and 2) transfer water to Towers 4 and 3, respectively. Each pump and tower handles up to a maximum of 1,450 gpm.
- Wet Well Pumps 3 and 4 (WWP#3 and WWP#4 located in Wet Well 3) discharge treated water to an end use at a combined rate of up to a maximum of 2,900 gpm.
- Air blowers provide air to the towers. The blowers for Towers 1 and 2 are designed to provide 6,000 – 7,000 standard cubic feet per minute (scfm) each. The blowers for Towers 3 and 4 are designed to provide 9,000 – 14,000 scfm each.

Water level sensors within the wet wells communicate with the programmed logic controller (PLC) according to changing water levels. A complete and balanced operation should provide continuing water levels above the low-level sensors and below the high-level sensors. However, given the probability of unbalanced flows for any number of reasons (e.g., changing hydraulic heads, maintenance, repairs, temporary malfunctions), the PLC has provisions within its program to cycle-off the extraction well(s) or wet well pumps according to high water levels occurring in the wet wells; and in turn, cycle-off the wet well pumps according to low levels occurring within these wet wells.

The system operates such that the wet well pumps cycle rather than the extraction well pumps. The rationale behind this is that there are a relatively small number of motors, starters, and electrically controlled valves associated with the wet wells when compared with the extraction well field. This also provides for more continuous and complete hydraulic capture within the aquifer units. However, the extraction well field will cycle if necessary, starting with the least contaminated extraction well, B7 (if operating), and followed by the other extraction wells in a predetermined sequence.

In summary, the priority of operation is as follows:

- Maintain constant operation of all extraction wells and air stripping towers above the operating minimum;
- Maintain the desired flow rates at individual wells;
- Maintain treatment center WWP#1 and WWP#2 pumping rate equal to or slightly above the combined pumping rate of the extraction well field;
- Maintain treatment center WWP#3 and WWP#4 pumping rate equal to or slightly above WWP#1 and #2; and
- Provide water to the TCAAP water supply system.

FY 2006 Maintenance and Inspection Activity

During FY 2006, the following inspection and maintenance activities occurred:

Preventive Maintenance (PM): The extensive PM program allowed the operations staff to identify and repair or replace equipment to avoid a down time failure. The program consists of monthly, quarterly, and annual maintenance tasks. When required, further repair work was scheduled rather than waiting for the failure to occur. A broad range of system-specific information was collected during this year's PM. This information is used to direct future repair work.

Electrical Inspection and Temperature Survey: A system-wide electrical inspection and infrared temperature survey was performed to identify loose connections and overheating components. Component overheating often precedes equipment failure. Electrical components that were identified as failing were replaced.

Verification of Flow Meters: As part of the routine PM, flow meters in the pumphouses were compared to a factory-calibrated flow meter. Flow volume measurements before and after conducting maintenance on the meters were compared to verify the consistency of measurements. Meters found to be out of calibration were replaced or recalibrated.

Daily Tracking of Flow Rates: Pumphouse and treatment center meter readings were recorded in the course of the daily inspections. Daily meter readings were entered into a computer and the flow rates were calculated and reviewed by the operations staff. Early detection of changes in flow rate was critical in early identification of failing equipment. By early detection of flow rate changes, equipment repair was typically scheduled before a failure occurred.

Did the system operate at a rate sufficient for complete capture?

Yes. At 1,769 gpm, the total extraction well water pumped was above the GOS Total System Operational Minimum (1,745 gpm) where the Army and the agencies agree that capture is achieved with an adequate safety factor. Figure 10-2 plots the daily average flow rate since October 1, 2005, and shows that the TGRS operated above the OM for the majority of the time (305 days or 83.6 percent of the time) in FY 2006. On a monthly basis, total TGRS extraction rates were below 1,745 gpm during the following months:

- October 2005 (1,611 gpm, lower flow due to a power outage and Wet Well 3 cleaning);
- November 2005 (1,693 gpm, lower flow due to malfunctions with electrical control valve (ECV) 3);
- May 2006 (1,734 gpm, lower flow due to a power outage between May 29 and May 30; and
- June 2006 (1,696 gpm, lower flow due to failure in treatment system discharge pump 4).

Appendix F.2 provides additional information on the various down times throughout FY 2006.

The monthly and annual volume of water pumped is presented in Table 10-2 and 10-3. Table 10-2 presents the pumphouse metered monthly flow volumes of each extraction well. The individual pumphouse flow meters are used to determine the amount of groundwater extracted from the various MOS well groups, individual extraction wells, and the total amount of groundwater extracted during the fiscal year. Table 10-3 presents the combined pumphouse-metered flow volume (extraction wells) and the flow volumes metered at various stages in the treatment center along with historical data. These flow meters are used to evaluate the flow of water through the treatment process to ensure proper system operation. In addition, treatment center meters #1 and #2, located after the first set of air stripping towers, are used in conjunction with monthly influent and effluent VOC concentrations to calculate the total mass of VOCs removed from extracted groundwater.

As shown on Table 10-3, the TGRS successfully captured and treated approximately 929,715,590 gallons of contaminated water in FY 2006 based on the sum of the individual pumphouse flow meters. This converts to an average flow rate of 1,769 gpm.

The TGRS as a whole was operational 94.5 percent of the time (i.e., 344.8 days out of 365 days in FY 2006).

<u>Monthly Flow Reports</u>

Each month a Monthly Flow Report is prepared. The report includes the month's meter totalizer readings, calculated flow volumes, and operational notes. Flow volumes are presented on a daily basis and are totaled to provide a monthly flow volume. A compilation of FY 2006 operational notes is presented in Appendix F.2. During FY 2006, the sum of the individual pumphouse flow meters was used to measure total flow volumes in monthly reports for comparison with Operating Strategy limits. Daily variation in readings at individual wells is primarily due to differences in the time of day when meter readings were taken.

How much down time occurred during the year?

The down time for each extraction well, over the last five years, is presented in Table 10-4. A summary of average down time for the pumphouses and the treatment center by the category of failure is presented in Table 10-5. A description of each down time event, organized chronologically, is presented in Appendix F.2. The same descriptions organized by affected pumphouse, treatment center, and forcemain is presented in Appendix F.3.

Treatment center and extraction well down times resulted primarily from failure and subsequent repair of components in the pumphouses, treatment center, and electrical service. The treatment center and extraction wells were shut down for repairs slightly more in FY 2006 than they were in FY 2005. However, the number of down time days due to electrical service interruptions was again much higher than the historical average, accounting for about 21 percent of the down time in FY 2006.

Description of Down Time Categories

Pumphouse component failures accounted for an average of 6.5 days down time per pumphouse. Down times due to pumphouse maintenance were similar in FY 2006 to FY 2005. The major pumphouse repairs causing down time were:

- Well redevelopment, motor replacement, and multiple communication problems at Pumphouse SC5;
- Faulty SN card and I/O adapter card at Pumphouse B8 caused down time at Pumphouses B8, B11, B13, SC1, and SC5; and
- Motor replacement and well redevelopment at Pumphouse B5.

Treatment center component failures and repairs that caused pumphouse down time consisted of electric check valve maintenance, malfunctions and repairs, and electrical control equipment failures and subsequent repairs. Treatment center component failures, repairs, and adjustments accounted for an average of 9.1 days down time per pumphouse. The major treatment center repairs causing substantial down time were multiple failures of ECV 3 in October and November and Wet Well Pump 4 failure and replacement in June. The ECV 3 and Wet Well Pump 4 repairs alone caused 97 percent of the treatment center component down time.

Electrical service system failures accounted for an average of 4.1 days down time per pumphouse. Electrical storm damage was the primary cause of down time.

Preventative maintenance procedures accounted for an average of 0.3 days of down time per pumphouse. Preventative maintenance procedures are described in the project Operation and Maintenance Manual.

System modifications accounted for an average of 0.0 days down time per pumphouse. There were no modifications to the system in FY 2006.

Forcemain issues accounted for an average of 0.1 days down time per pumphouse. Down time due to forcemain issues was down considerably from FY 2005 and did not account for a significant amount of down time in FY 2006.

Were there any major operational changes during the year? No.

Did the system achieve hydraulic capture?

Yes. The total extraction well water pumped was above the GOS Operational Minimum (1,745 gpm) where the Army and the agencies agree that capture is achieved with an adequate safety factor. A positive sign with respect to capture is the generally stable or decreasing TRCLE concentrations evident at many well across the TGRS boundary since FY 2001.

Groundwater elevation measurements were collected in June 2006. Appendix D contains the water level database for the monitoring wells. Figures 10-3 through 10-5 present the groundwater elevations for Upper Unit 3, Lower Unit 3, and Unit 4 during this time period. These figures present the potentiometric contours from three vertical portions of the aquifer. The groundwater elevation contours and limits of capture in the three portions of the aquifer are similar to those observed in FY 2003 after the modification to the OS was implemented. The zone of capture created by the TGRS very likely extends beyond the 5 μg/l TRCLE contour, in both the Unit 3 and the Unit 4 aquifers.

How much VOC mass was removed by the system and how is it changing with time?

As discussed above, the TGRS extracted approximately 929,715,590 gallons of water from October 2005 through September 2006. Based on the monthly influent and effluent VOC concentrations and the monthly flow totals measured with meters #1 and #2, the TGRS removed a total of 2,552 pounds of VOCs from October 2005 through September 2006. The VOC mass removal is 4 percent lower than the FY 2005 VOC mass removal of 2,663 pounds. The decrease in FY 2006 reflects an overall decrease in plume concentration. Average VOC influent concentrations decreased from 364 μg/l in FY 2005 to 337 μg/l in FY 2006 (7.4 percent lower). Table 10-6 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed 194,483 pounds of VOCs from the aquifers since 1987.

The total mass removed is based on the monthly TGRS influent and effluent sampling and flow through the treatment system. The monthly sampling of the treatment system provides the best estimate of overall mass removal, compared to the individual extraction well sampling, due to the larger number of samples and consistency in the month-to-month analytical results. The percent contributions for each well are based on the average flows from each well and the semi-annual VOC results from each well.

To calculate the number of pounds of VOCs for each well, the flows and concentrations were normalized to the treatment center flows and concentrations to correct for variance between flow meters in the well houses and for consistency between VOC concentrations at the wells and monthly VOC concentrations in the influent and effluent.

VOC samples were collected semi-annually from the operating extraction wells that comprise the TGRS. Wells B2 and B7 are shut down, but were temporarily operated for June 2006 sampling. Wells B10, B12, SC3, and SC4 are shut down, and were not sampled, as they are now sampled biennially (next event in 2007). Table 10-7 presents a summary of these sampling results. Variations in detection limits from round to round are the result of varying sample dilution performed by the laboratory. Dilutions are required due to the high concentrations of some analytes. The location of the extraction wells is presented on Figure 10-1.

Appendix G.1 presents TRCLE versus time graphs for each extraction well. Wells B1, B2, B6, B7, B8, B9, B10, B11, B12, SC2, SC3, and SC5 exhibit declining TRCLE concentrations over time. As is typical, these wells exhibit asymptotic decreases over time. In the past, wells B3 and B4 exhibited rising TRCLE concentrations with time, but now B3 appears to be leveling off and B4 is declining. Well B5 was increasing through 1992 and has been decreasing since then. Well B10 showed an elevated TRCLE concentration of 10 µg/l in the June 2004 sampling, but has now fallen back to a level consistent with its declining trend. TRCLE concentrations have been gradually declining at SC1 since 1993. TRCLE concentrations peaked at SC4 in 1999, and then leveled off. Since its installation in November 2002, TRCLE concentrations at B13 first increased, but now appear to be decreasing since they peaked in December 2003. Overall, the trends indicate a long-term decrease in VOC concentrations.

Extraction well B6 exhibited a slight concentration increase in FY 1998 and has been stable or slightly declining through FY 2006. This is probably due to plume redistribution following the shutdown of B12 in FY 1996. Extraction well B7 has been stable and below the contaminant-specific requirement for TRCLE (5 μg/l), and all other VOCs from March 1995 through FY 2006.

These trends reflect the overall decline in OU2 deep groundwater contaminant concentrations. In addition, as discussed below, there has been a reduction in overall TGRS influent concentrations over the previous several years.

As Table 10-6 illustrates, eight wells, B1, B4, B5, B6, B9, B13, SC1, and SC5, that are located in the centers of the plume, achieve the largest rates of VOC removal. These eight wells together accounted for nearly 99 percent of the VOC mass removed.

The source control wells, SC1 through SC5, together accounted for over 61 percent of the VOC mass removed while accounting for only 8 percent of the water pumped by the system. SC5, in particular, removed almost 57 percent of the total VOC mass at a rate of only approximately 91 gpm (5 percent of the total water pumped by the system). This illustrates the efficiency of extracting groundwater from near the source areas.

What do the long-term trends in the monitoring wells show?

Appendix B presents the TRCLE graphs over time for monitoring wells on- and off-TCAAP. Although a formal statistical analysis has not been conducted, the large majority of these graphs reflect downward trends in TRCLE concentration, indicating an overall improvement in water quality both upgradient and downgradient of the TGRS. Due to the complexity of the flow system, changes in flow direction over time, and the variation in chemical transport properties across the study area, the graphs may not reflect a uniform or easily predictable pattern.

Several wells were identified in previous APRs or when reviewing the FY 2006 database that have inconsistent or upward trends in TRCLE concentrations that warrant further observation and discussion:

Well	**Trend Observation**
03U003	Trend identified during FY 2004 data review. Dropped from 1,000's of parts per billion (ppb) in early 1990s to recently stable in 100's of ppb; however, increased from 78 ppb in 2003 to 120 ppb in 2004, 110 ppb in 2005, and 130 ppb in 2006. Maintain annual sampling frequency.
03U030	Trend identified during FY 2003 data review. Under 30 ppb through 1998, peaked over 60 ppb in 1999, recently at 42 ppb. Maintain biennial sampling frequency (next event 2007).
03U806, 03L806, and 04U806	Trend identified in FY 2001 APR. Dropped from 1000's of ppb in mid 1990s, recently showing marked decrease in TRCLE since 2001. Maintain sampling frequency.
03U094	Trend identified during FY 2004 data review. Dropped from 1,000's of ppb in late 1980s and early 1990s, recently stable in 100's of ppb; however, increased from 170 ppb in 2003 to 470 ppb in 2005, and back down to 180 ppb in 2006. Maintain annual sampling frequency.

Well	Trend Observation
03M806	Trend identified during FY 2003 data review. Dropped from near 900 ppb in 1987, to below 100 ppb from 1993 through 1996. Increased to 1,300 ppb, a historical high concentration, in 2003. Decreased to 910 ppb in 2006. Maintain annual sampling frequency.
03U708	TRCLE concentrations have decreased since 2002 from 270 ppb to 93 ppb in 2006.
03U711	Trend identified in FY 2001 APR. Dropped from near 1,000 ppb in 1994, to 75 ppb in 1999, increased to 250 ppb in 2004, and has decreased to 140 ppb in 2006. Maintain annual sampling frequency.
03U710	Trend identified during FY 2004 data review. Dropped from over 3,000 ppb in late 1980s, to 100's during the 1990s, recently decreased to 61 ppb in 2006, a historical low concentration. Maintain biennial sampling frequency (next event 2007).
03L014	Trend identified during FY 2003 data review. Increased from near non-detect in late 1980s to over 800 ppb in 1999, recently at 240 ppb. Maintain biennial sampling frequency (next event 2007).
03L809	Trend identified in FY 2001 APR. Dropped from over 3,000 ppb to 67 ppb through 1998, recently at 440 ppb. Maintain biennial sampling frequency (next event 2007).

Well	Trend Observation
04U861	Trend identified in FY 2001 APR. Below 10 ppb during late 1980s through 1993, increased to high 20's during 1999, recently increased to 200 ppb. Maintain biennial sampling frequency (next event 2007).
04U843	Trend identified in FY 2001 APR. Below 15 ppb from late 1980s through 1997, increased to between 22 ppb and 38 ppb from 1998 through 2001, dropped to below 1 ppb in 2003, and recently peaked at 60 ppb in 2005. Maintain biennial sampling frequency (next event 2007).
04U841	Trend identified in FY 2001 APR. Below 10 ppb through 1995, increased to 25 ppb in 2001, decreased to 5 ppb in 2003, and increased to 19 ppb in 2005. Maintain biennial sampling frequency (next event 2007).
03U822	Trend identified during FY 2003 data review. Below 25 ppb through 1998, peaked at 375 ppb in 1999, decreased to 160 ppb in 2005. Maintain biennial sampling frequency (next event 2007).

Well	Trend Observation
03L822	Trend identified in FY 2001 APR. Increased from below 5 ppb during early 1990s to over 600 ppb from 1999 through 2003. Decreased to 400 ppb in 2005. Approximately 1 mile from TGRS. Well historically showed 1,1,1-trichloroethane as major contaminant. Maintain biennial sampling frequency (next event 2007).
04U832	Issue identified in FY 2006. Prior to FY 2000 concentrations decreased to 29 ppb. Much lower concentrations observed for FY 2001 (3.5 ppb) and FY 2003 (4.1 ppb). FY 2005 (41 ppb) and FY 2006 (52 ppb) concentrations are similar to those for FY 1995 and FY 1996. No apparent trend is observed at this time. Maintain annual sampling frequency (next event 2007).
04U847	Issue identified in FY 2006. Since FY 1999 concentrations range between 600 ppb and 1,300 ppb (FY 2005 concentrations = 1,100 ppb and 1,200 ppb). No apparent trend is observed at this time.

10.2 REMEDY COMPONENT # 2: GROUNDWATER TREATMENT

Description: "Groundwater treatment using air stripping." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the air stripping treatment facility is treating water and meeting the clean up requirements in Table 1 of the OU2 ROD.

Is the remedy component being implemented?
Yes. The air stripping treatment facility has been operating since 1986.

Did the treatment system meet the treatment requirements in the OU2 ROD?
Yes. Influent and effluent water was sampled on a monthly basis during FY 2006. The influent/effluent database for FY 2006 is contained in Appendix G.2. Figure 10-6 presents a graph of influent TRCLE versus time. This graph is cumulative and includes data from before 1989, when the system consisted of only six extraction wells. The average FY 2006 influent TRCLE concentration was 259 μg/l, down from 280 μg/l in FY 2005. FY 2006 represents the fourth year since the TGRS was reconfigured to achieve greater pumping in the centers of the VOC plumes and less pumping on the edges of the plumes where VOC concentrations are much lower. The decreasing TRCLE concentration could be due in part to the system stabilizing to the new configuration and to an overall decrease in plume concentration.

Figure 10-6 also presents a graph of the effluent TRCLE concentration versus time. As indicated, the effluent was below 5-μg/l TRCLE for all sampling events in FY 2006. A review of the FY 2006 database indicates that the effluent has also remained below the treatment requirements for all other VOC compounds specified in the OU2 ROD. Comparison of influent and effluent TRCLE concentrations indicates average removal efficiency over 99.9 percent.

What was the mass of VOCs emitted into the air?

The air stripping towers remove VOCs with an efficiency of approximately 99.9 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 10-6. Air emissions therefore averaged 7.0 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 2005 through September 2006 were 2,552 pounds.

10.3 REMEDY COMPONENT #3: TREATED WATER DISCHARGE

Description: "Discharge of treated water to the on-site gravel pit." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the gravel pit is accommodating the discharge from the treatment system and allowing it to recharge to the aquifer.

Is the remedy component being implemented?

Yes. Based on visual observation during FY 2006, there were no noticeable changes in Gravel Pit performance. The Gravel Pit is accommodating the TGRS discharge as designed.

10.4 REMEDY COMPONENT #4: INSTITUTIONAL CONTROLS

Description: "Institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater." (OU2 ROD, page 4)

Performance Standard (how do you know when you're done):

When a special well construction area and alternate water supply have been established and private wells in impacted areas have been sealed.

Is the remedy component being implemented?

Yes, although, the institutional controls have not been formally adopted for OU2. There are no private users of groundwater on TCAAP and the TCAAP potable water supply is treated by the TGRS prior to distribution. TCAAP is a government reservation, is fenced, and access is restricted to authorized personnel.

10.5 REMEDY COMPONENT #5: REVIEW OF NEW TECHNOLOGIES

Description: "Reviews of new and emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Reviews shall be performed by the Army and reported annually in accordance with the consistency provisions of the TCAAP FFA." (OU2 ROD, page 4)

- The intent is to consider new technologies of merit, which is not on any set schedule. To have merit, a new technology must have promise in reducing cost and the time for cleanup. There may be years where no technologies are considered. It is envisioned that at any time, any interested party (Army, USEPA, and MPCA) can suggest new technologies for consideration. At a minimum, the Technical Review Committee meetings can serve as a forum for discussion of possible technologies. If a technology is agreed to have merit by the Army, USEPA, and MPCA, then the Army will evaluate the technology. The level of effort for evaluations can range from simple literature searches to extensive treatability studies. On an annual basis, the Army will report on:

  - Whether or not any new technologies were identified and considered to have merit that year;
  - The progress or results of any evaluations during that year; and
  - Any planned evaluations for the following year.

Performance Standard (how do you know when you're done):

When the Army reports on the status of any reviews of emerging technologies in the annual monitoring report.

Is the remedy component being implemented?

Yes. Beginning with the FY 1997 Annual Performance Report, the Army reports annually on the status of any reviews of emerging technologies.

- In September 2002, the MPCA and USEPA announced they would be conducting a natural attenuation microcosm study using carbon dating. In October 2002, Army drilled a boring at Site G to collect soil for the study. The study results were published in 2004.
- "New technologies" is an ongoing agenda item for the quarterly Technical Review Committee meetings between the Army, USEPA, and MPCA. No emerging technologies were identified through the process during FY 2006.
- The MPCA identified a study involving the addition of vegetable oil to groundwater that is being monitored at the Navy site in Fridley, Minnesota, as a potential technology of interest.

Were any new technologies identified and considered to have merit during FY 2006?

No. The Army's review did not identify any new or emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration.

What is the status and/or findings of any previously initiated reviews of emerging technologies?

MPCA continued its research into natural attenuation processes at TCAAP. The MPCA and USEPA published the results of the microcosm study for deep groundwater sediments in 2004 showing that abiotic degradation of cis-DCE is an important factor contributing to the natural attenuation of this compound at the site. (*Non-biological Removal of cis-dichloroethylene and*

1,1-dichloroethylene in aquifer sediment containing magnetite. Environmental Science and Technology, 38: 1746-1752.)

Are any new reviews planned at this time for the coming year?

No. The Army will continue to have new technologies on the agenda for the quarterly Technical Review Committee meeting, and attend conferences that highlight emerging and new technologies. However, reviews of specific technologies are not planned in FY 2007.

10.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 4)

Performance Standard (how do you know when you're done):

When a regulator approved monitoring plan is in place and monitoring is conducted according to the plan.

Is the remedy component being implemented?

Yes. Monitoring in FY 2006 was consistent with the OU2 ROD. Water level measurements and water quality samples were collected as stated in Appendix A.1. Appendix A summarizes the FY 2006 monitoring plan and any deviations are explained in Appendix C.2. Monitoring was as follows:

<u>Groundwater</u>

TGRS groundwater level measurements were collected during December 2005 and June/July 2006 according to the monitoring plan. Appendix D contains the comprehensive groundwater quality and water level database for the TGRS monitoring wells. Water quality samples were collected from TGRS wells according to the monitoring plan. Groundwater samples were collected at wells stated in Appendix A.1. All wells were sampled for volatile organic compound

(VOC) (8260B) analysis. FY 2006 was an "off year" in the biennial sample program, so only a select list of wells was sampled. Table 10-8 presents the groundwater quality data for FY 2006.

Results from the 2006 groundwater sampling showed similar or decreasing TRCLE concentrations at most wells sampled. The decreases were most notable at 03U094 (decreased from 470 µg/l to 180 µg/l), 03U710 (steady decrease from 260 µg/l in 2003 to 61 µg/l in 2006), and 04J077 (steady decrease from 530 µg/l in 2003 to 55 µg/l in 2006). Well PJ#806 had a slight increase in TRCLE concentration from 35 µg/l in 2005 to 49 and 50 µg/l in 2006. The overall trend in this well is still decreasing since 1994.

Treatment System

The TGRS treatment system influent and effluent was sampled monthly during FY 2006 in accordance with the FY 2006 monitoring plan. Groundwater samples from the extraction wells were collected in December 2005 and June 2006 in accordance with the FY 2006 monitoring plan.

Is additional monitoring proposed prior to the next report? No.

10.7 OVERALL REMEDY FOR DEEP GROUNDWATER

Did the TGRS meet the requirements of the OU2 ROD? Yes.

- Hydraulic capture in Unit 3 extends beyond the 5-µg/l TRCLE contour. This meets the VOC capture criterion in the OU2 ROD. Hydraulic capture in Unit 4 extends beyond the 5-µg/l TRCLE contour. This meets the VOC capture criterion in the OU2 ROD.
- The total extraction well water pumped was above the Total System Operational Minimum (1,745 gpm). The FY 2006 extraction well water pumped was approximately 1,769 gpm.

- The TGRS extracted approximately 929,715,590 gallons of water and removed 2,552 pounds of VOCs from October 2005 to September 2006. Average VOC influent concentrations decreased by 7.8% from FY 2005.
- Groundwater analytical data of the source area shows a general decrease in TRCLE concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer.
- Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

Do any additional measures need to be addressed?

Not at this time.

TABLE 10-1

GROUNDWATER CLEANUP LEVELS
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Substance	***Expected Level in Discharge (ppb)***	***Operable Unit 2 ROD Requirements (ppb)***
Volatile Organic Compounds (VOCs)		
cis-1,2-Dichloroethene plus trans-1,2-Dichloroethene	<1	70
1,1-Dichloroethene	<1	6
1,1,1-Trichloroethane	<1	200
1,2-Dichloroethane	<1	4
Trichloroethene	<5	5
1,1-Dichloroethane	<1	70
Tetrachloroethene	<1	5

TABLE 10-2

EXTRACTION WELL WATER PUMPED
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)												
	B1	***B3***	***B4***	***B5***	***B6***	***B8***	***B9***	***B11***	***B13***	***SC1***	***SC2***	***SC5***	***TOTAL***
October 2005	9,685,200	8,667,000	8,377,000	6,907,700	9,567,000	4,320,200	10,621,200	3,297,300	4,874,300	1,231,000	1,582,900	2,843,100	71,973,900
(gpm)	217	194	188	155	214	97	238	74	109	28	35	64	1,612
November 2005	10,470,300	6,805,400	9,956,800	7,284,900	9,947,000	4,448,900	10,502,700	3,154,100	4,719,200	1,288,300	1,533,600	2,473,100	72,584,300
(gpm)	242	158	230	169	230	103	243	73	109	30	36	57	1,680
December 2005	10,895,300	7,906,400	9,558,300	7,603,600	10,889,900	5,700,900	13,459,100	4,035,200	5,125,000	1,369,400	1,304,100	4,479,500	82,326,700
(gpm)	244	177	214	170	244	128	302	90	115	31	29	100	1,844
January 2006	10,824,200	8,070,500	9,360,400	7,412,000	10,609,300	5,984,100	13,420,500	4,275,500	4,774,900	1,362,600	1,250,200	4,536,300	81,880,500
(gpm)	242	181	210	166	238	134	301	96	107	31	28	102	1,834
February 2006	9,659,500	7,472,700	7,992,300	6,588,100	9,501,700	5,603,900	12,091,700	4,122,500	4,241,300	1,236,200	1,040,200	4,022,900	73,573,000
(gpm)	240	185	198	163	236	139	300	102	105	31	26	100	1,825
March 2006	10,658,000	8,240,700	9,109,400	4,216,500	10,566,200	6,132,700	13,355,600	4,657,000	4,635,700	1,374,400	1,100,900	4,833,000	78,880,100
(gpm)	239	185	204	94	237	137	299	104	104	31	25	108	1,767
April 2006	10,206,800	7,670,400	8,232,100	7,377,100	10,083,900	5,936,600	12,950,400	4,906,900	4,425,300	1,321,200	936,300	5,121,100	79,168,100
(gpm)	236	178	191	171	233	137	300	114	102	31	22	119	1,833
May 2006	10,153,100	6,340,200	8,062,200	8,892,400	9,786,300	4,753,900	12,662,600	5,238,100	4,191,200	1,323,900	902,700	4,276,700	76,583,300
(gpm)	227	142	181	199	219	106	284	117	94	30	20	96	1,716
June 2006	10,000,600	5,609,700	8,456,000	9,164,000	9,309,300	5,329,600	10,095,300	4,526,400	3,796,400	1,132,100	673,550	4,177,140	72,270,090
(gpm)	231	130	196	212	215	123	234	105	88	26	16	97	1,673
July 2006	10,648,500	7,750,200	8,573,700	10,140,800	10,194,900	5,398,300	13,232,600	4,685,900	4,325,000	1,250,100	766,300	3,048,200	80,014,500
(gpm)	239	174	192	227	228	121	296	105	97	28	17	68	1,792
August 2006	10,432,900	7,357,600	7,992,100	10,167,900	10,398,000	6,426,700	13,245,700	5,441,800	4,368,600	1,480,800	797,100	3,993,500	82,102,700
(gpm)	234	165	179	228	233	144	297	122	98	33	18	89	1,839
September 2006	10,132,200	6,639,400	7,265,600	9,752,800	9,886,700	6,145,800	12,685,800	5,602,000	4,125,900	1,300,400	684,800	4,137,000	78,358,400
(gpm)	235	154	168	226	229	142	294	130	96	30	16	96	1,814
TOTAL FY 2006	**123,766,600**	**88,530,200**	**102,935,900**	**95,507,800**	**120,740,200**	**66,181,600**	**148,323,200**	**53,942,700**	**53,602,800**	**15,670,400**	**12,572,650**	**47,941,540**	**929,715,590**
Operational Minimum	225	170	195	195	210	135	275	80	110	20	30	100	1,745

	B11, B1, B13	B4, B5, B6	B4, B5, B6, B8, B9	Total System
FY06 Average Flow Rate (gpm)	440	607	1015	1,769
MOS Operational Minimum (gpm)	415	600	1,010	1,745

TABLE 10-3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)									
	Extraction Wells	*Meter 1*	*Meter 2*	*Total Meters 1 & 2*	*Meter 3*	*Meter 4*	*Total Meters 3 & 4*	*Meter 5*	*Meter 6*	*Total Meters 5 & 6*
October 2005	71,973,900	41,435,000	28,773,000	70,208,000	16,984,000	52,341,000	69,325,000	0	0	0
November 2005	72,584,300	39,674,000	30,682,000	70,356,000	15,837,000	55,343,000	71,180,000	0	0	0
December 2005	82,326,700	47,811,000	32,934,000	80,745,000	26,014,000	58,657,000	84,671,000	0	0	0
January 2006	81,880,500	47,666,000	33,023,000	80,689,000	23,184,000	61,759,000	84,943,000	0	0	0
February 2006	73,573,000	42,232,000	30,067,000	72,299,000	20,371,000	55,823,000	76,194,000	0	0	0
March 2006	78,880,100	45,192,000	32,855,000	78,047,000	27,521,000	54,007,000	81,528,000	0	0	0
April 2006	79,168,100	45,770,000	32,373,000	78,143,000	26,795,000	51,384,000	78,179,000	0	0	0
May 2006	76,583,300	43,751,000	31,245,000	74,996,000	23,827,000	50,488,000	74,315,000	0	0	0
June 2006	72,270,090	41,989,000	28,413,000	70,402,000	25,269,000	46,832,000	72,101,000	0	0	0
July 2006	80,014,500	45,885,000	32,331,000	78,216,000	18,095,000	62,724,000	80,819,000	0	0	0
August 2006	82,102,700	47,478,000	33,271,000	80,749,000	24,328,000	58,891,000	83,219,000	0	0	0
September 2006	78,358,400	45,422,000	31,532,000	76,954,000	18,074,000	61,651,000	79,725,000	0	0	0
TOTAL FY 2006	929,715,590	534,305,000	377,499,000	911,804,000	266,299,000	669,900,000	936,199,000	0	0	0

FY89	1,033,353,676	501,826,000	560,836,000	1,062,662,000	383,736,000	587,596,000	971,332,000	493,681,000	582,955,000	1,076,636,000
FY90	1,008,415,750	493,915,000	526,417,000	1,020,332,000	371,391,000	588,642,000	960,033,000	487,946,000	543,726,000	1,031,672,000
FY91	1,382,327,590	666,166,000	708,313,000	1,374,479,000	523,702,000	789,947,000	1,313,649,000	601,307,000	649,621,000	1,250,928,000
FY92	1,401,346,600	68,289,000	724,328,000	1,407,227,000	557,169,000	772,509,000	1,329,678,000	767,707,000	677,735,000	1,445,442,000
FY93	1,388,206,172	666,814,000	725,341,000	1,392,155,000	504,027,000	651,149,000	1,155,176,000	729,078,000	762,791,000	1,491,869,000
FY94	1,245,663,275	660,700,000	659,953,000	1,320,653,000	457,210,000	715,668,000	1,172,878,000	653,913,000	550,131,000	1,204,044,000
FY95	1,369,361,500	706,114,000	683,982,000	1,390,096,000	500,275,000	739,744,000	1,240,019,000	495,616,000	274,507,000	770,123,000
FY96	1,341,763,220	734,443,000	629,327,000	1,363,770,000	503,518,000	754,399,000	1,257,917,000	4,000	600,035,000	600,039,000
FY97	1,213,035,110	688,312,000	568,804,600	1,257,116,600	538,625,000	586,515,000	1,125,140,000	13,000	578,900,000	578,913,000
FY98	1,196,007,900	624,784,000	540,353,000	1,220,604,000	511,065,000	603,871,000	1,114,936,000	58,000	178,076,000	178,134,000
FY99	1,158,224,870	623,500,000	496,773,200	1,177,206,200	398,620,000	718,384,000	1,117,004,000	26,000	17,000	43,000
FY 2000	1,148,448,350	635,724,000	489,669,000	1,183,258,000	389,709,000	663,807,000	1,053,516,000	0	0	0
FY 2001	1,113,163,360	614,341,000	443,167,000	1,113,164,000	318,517,000	718,661,000	1,037,178,000	0	0	0
FY 2002	917,318,879	491,082,800	434,959,700	926,042,500	225,460,000	650,839,000	876,299,000	0	0	0
FY 2003	904,295,450	545,281,000	345,993,000	891,274,000	125,965,000	750,518,000	876,483,000	0	0	0
FY 2004	908,718,760	518,391,900	376,889,660	895,281,560	216,177,000	680,633,000	896,810,000	0	0	0
FY 2005	895,339,710	520,073,000	363,275,000	883,348,000	224,823,000	658,405,000	883,228,000	0	0	0
FY 2006	929,715,590	534,305,000	377,499,000	911,804,000	266,299,000	669,900,000	936,199,000	0	0	0

TABLE 10-4

PUMPHOUSE DOWN TIME (DAYS)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well Name	*FY06 Down Time (Days)*	*FY05 Down Time (Days)*	*FY04 Down Time (Days)*	*FY03 Down Time (Days)*	*FY02 Down Time (Days)*	*FY01 Down Time (Days)*
B1	6.9	11.5	7.1	46	22.4	3.4
B2	(1)	(1)	(1)	1	63.2	3.9
B3	23.5	34.0	11.3	26	117.9	1.8
B4	10.4	26.2	7.6	21	11.8	1.7
B5	27.1	13.9	7.6	29	9.4	3.3
B6	11.9	15.6	15.4	19	10.8	1.6
B7	(1)	(1)	(1)	(1)	109.4	2.9
B8	34.6	18.5	10.0	18	107.6	1.3
B9	20.8	23.1	8.4	15	51.3	1.3
B10	(1)	(1)	(1)	(1)	109.9	2.4
B11	24.9	22.7	15.5	23	90.8	1.5
B12	(1)	(1)	(1)	(1)	(1)	(1)
B13	14.1	13.7	12.8	19	(1)	(1)
SC1	13.4	21.8	17.8	29	35.9	2.9
SC2	17.5	13.9	11.4	27	107.7	3.0
SC3	(1)	(1)	(1)	(1)	108.1	1.5
SC4	(1)	(1)	(1)	(1)	(1)	(1)
SC5	37.1	11.9	24.8	18	5.9	2.0

Note:
(1) The extraction well was not in operation during the fiscal year.

TABLE 10-5

DOWN TIME (DAYS) BY CATEGORY
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Category	***Down Time (Days)***
Pumphouse Component	6.5
Treatment Center Component	9.1
Electrical Service	4.1
Miscellaneous	0.0
Preventive Maintenance	0.3
System Modification	0.0
Forcemain	0.1
Total System Equivalent	20.2

Anticipated Down Time for Fiscal Year 2007

Pumphouse Component	3.5
Treatment Center Component	3.0
Electrical Service	1.0
Miscellaneous	0.1
Preventive Maintenance	3.5
System Modification	1.0
Forcemain	2.0

TABLE 10-6

VOC MASS LOADING SUMMARY
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well	*Percent Contribution to VOC Mass Removal*	*FY 2006 Total Pounds VOCs Mass Removed*
B1	4.6%	117.1
B2	0.0%	0.0
B3	0.3%	8.5
B4	9.7%	248.8
B5	8.2%	210.0
B6	4.9%	125.6
B7	0.0%	0.0
B8	0.5%	13.4
B9	7.2%	184.1
B10	0.0%	0.0
B11	0.0%	1.0
B13	3.2%	81.1
SC1	4.3%	109.0
SC2	0.2%	6.3
SC3	0.0%	0.0
SC4	0.0%	0.0
SC5	56.7%	1,447
Fiscal Year 2006 Total (lbs)		***2,552***
Daily Average (lbs/day)		***7.0***

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
2006		2,552
2005		2,663
2004		3,291
2003		3,041
2002		2,852
2001		3,418
2000		4,499
1999		4,878
1998		6,132
1997		6,210
1996		10,655
1995		13,355
1994		15,070
1993		20,165
1992		24,527
1991		26,760
1990		18,005
1989	(First year of full scale system)	19,510
1988		4,800
1987		2,100
Total		***194,483***

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Alias	Date	Dup	1,1,1-Trichloroethane µg/L	1,1,2-Trichloroethane µg/L	1,1-Dichloroethane µg/L	1,1-Dichloroethene µg/L	1,2-Dichloroethane µg/L	Carbon Tetrachloride µg/L	Chloroform µg/L
03F302	B1	12/20/05		5	0.43 JP	1.2	1.4	< 1	< 1	< 1
03F302	B1	6/6/06		6.6	0.49 JP	1.4	1.8	< 1	< 1	< 1
03F303	B2	6/6/06		0.36 JP	2.7	0.8 JP	2.1	0.25 JP	< 1	< 1
03F304	B3	12/20/05		1	< 1	1 JP	1.2	< 1	< 1	< 1
03F304	B3	6/6/06		1.4	< 1	1.2	1.7	< 1	< 1	< 1
03F305	B4	12/20/05		20	< 1	14	12	0.36 JP	< 1	< 1
03F305	B4	12/20/05	D	21	< 1	14	13	0.32 JP	< 1	< 1
03F305	B4	6/6/06		20	< 1	12	12	< 1	< 1	< 1
03F306	B5	12/20/05		9.7	< 1	7.3	6.1	0.3 JP	< 1	< 1
03F306	B5	6/6/06		16	< 1	6.7	7.9	< 1	< 1	< 1
03F307	B6	12/20/05		2	< 1	3.2	2.9	< 1	< 1	< 1
03F307	B6	6/6/06		2.3	< 1	3.4	3.8	< 1	< 1	< 1
03F308	B7	6/6/06		0.21 JP	< 1	< 1	< 1	< 1	< 1	< 1
PJ#309	B8	12/20/05		1.5	< 1	0.88 JP	0.81 JP	< 1	< 1	< 1
PJ#309	B8	6/6/06		2	< 1	1.1	1.4	< 1	< 1	< 1
PJ#310	B9	12/20/05		14	< 1	8.1	8	0.35 JP	< 1	< 1
PJ#310	B9	6/6/06		16	< 1	8.4	10	< 1	< 1	< 1
03F312	B11	12/20/05		< 1	< 1	< 1	< 1	< 1	< 1	< 1
03F312	B11	6/6/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Alias	Date	Dup	1,1,1-Trichloroethane µg/L	1,1,2-Trichloroethane µg/L	1,1-Dichloroethane µg/L	1,1-Dichloroethene µg/L	1,2-Dichloroethane µg/L	Carbon Tetrachloride µg/L	Chloroform µg/L
03F319	B13	12/20/05		4.7	< 1	1.6	1.4	< 1	< 1	< 1
03F319	B13	6/6/06		4.2	< 1	1.3	1.4	< 1	< 1	< 1
03U301	SC1	12/20/05		13	< 2	1.2 JP	2.2	< 2	< 2	< 2
03U301	SC1	6/6/06		13	< 2	1.3 JP	2.4	< 2	< 2	0.39 JP
03U314	SC2	12/20/05		14	< 1	1.1	1.4	< 1	< 1	< 1
03U314	SC2	6/6/06		4.1	< 1	0.95 JP	0.77 JP	< 1	< 1	< 1
03U314	SC2	6/6/06	D	4	< 1	0.89 JP	0.71 JP	< 1	< 1	< 1
03U317	SC5	12/20/05		1100	3.1 JP	28	44	4.1 JP	< 10	< 10
03U317	SC5	6/6/06		590	< 10	14	25	< 10	< 10	< 10

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Alias*	*Date*	*Dup*	*cis-1,2-Dichloroethene µg/L*	*Freon 113 µg/L*	*Methylene Chloride µg/L*	*Tetrachloroethene µg/L*	*trans-1,2-Dichloroethene µg/L*	*Trichloroethene µg/L*	*Vinyl Chloride µg/L*
03F302	B1	12/20/05		5.2	< 1	< 1	1.9	< 1	79	< 1
03F302	B1	6/6/06		5.5	< 1	< 1 UB 1.0,JP	3	< 1	100	< 1
03F303	B2	6/6/06		1.6	< 1	< 1 UB 1.0,JP	< 1.4 UB 0.31	< 1	30	0.36 JP
03F304	B3	12/20/05		0.29 JP	< 1	< 1	< 1	< 1	5.8	< 1
03F304	B3	6/6/06		0.39 JP	< 1	< 1 UB 1.0,JP	< 1	< 1	7.8	< 1
03F305	B4	12/20/05		6.6	< 1	< 1	< 1	< 1	220	< 1
03F305	B4	12/20/05	D	6.5	< 1	< 1	< 1	< 1	220	< 1
03F305	B4	6/6/06		5.2	< 1	< 1 UB 1.0,JP	< 1	< 1	220	< 1
03F306	B5	12/20/05		1.3	< 1	< 1	0.78 JP	< 1	190	< 1
03F306	B5	6/6/06		1.2	0.62 JP	< 1 UB 1.0,JP	7.6	< 1	230	< 1
03F307	B6	12/20/05		0.7 JP	< 1	< 1	< 1	< 1	95	< 1
03F307	B6	6/6/06		0.86 JP	< 1	< 1 UB 1.0,JP	< 1	< 1	120	< 1
03F308	B7	6/6/06		< 1	< 1	< 1 UB 1.0,JP	< 1	< 1	2.4	< 1
PJ#309	B8	12/20/05		0.32 JP	< 1	< 1	< 1	< 1	16	< 1
PJ#309	B8	6/6/06		0.45 JP	< 1	< 1 UB 1.0,JP	< 1	< 1	21	< 1
PJ#310	B9	12/20/05		2.9	< 1	< 1	< 1	< 1	88	< 1
PJ#310	B9	6/6/06		2.9	< 1	< 1 UB 1.0,JP	< 1	< 1	120	< 1
03F312	B11	12/20/05		< 1	< 1	< 1	< 1	< 1	1.9	< 1
03F312	B11	6/6/06		< 1	< 1	< 1 UB 1.0,JP	< 1	< 1	2.3	< 1

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Alias*	*Date*	*Dup*	*cis-1,2-Dichloroethene µg/L*		*Freon 113 µg/L*		*Methylene Chloride µg/L*		*Tetrachloroethene µg/L*		*trans-1,2-Dichloroethene µg/L*	*Trichloroethene µg/L*	*Vinyl Chloride µg/L*
03F319	B13	12/20/05		7.8		< 1		< 1		0.63	JP	< 1	160	< 1
03F319	B13	6/6/06		6.3		< 1		< 1	UB 1.0,JP	< 1	UB 0.31	< 1	150	< 1
03U301	SC1	12/20/05		57		< 2		< 2		< 2		< 2	700	< 2
03U301	SC1	6/6/06		63		< 2		< 2	UB 1.0,JP	< 2	UB 0.31	< 2	710	< 2
03U314	SC2	12/20/05		0.47	JP	< 1		< 1		< 1		< 1	44	< 1
03U314	SC2	6/6/06		0.45	JP	< 1		< 1	UB 1.0,JP	< 1		< 1	43	< 1
03U314	SC2	6/6/06	D	0.45	JP	< 1		< 1	UB 1.0,JP	< 1		< 1	42	< 1
03U317	SC5	12/20/05		< 10		18		< 10		7.8	JP	< 10	3100	< 10
03U317	SC5	6/6/06		2	JP	8.7	JP	< 10	UB 1.0,JP	< 10	UB 0.31	< 10	1900	< 10

<u>Notes:</u>
D - Duplicate analysis
JP - Results less than reporting level but greater than instrument detection limit.
UB# - Blank Contamination, # = highest concentration of blank affecting data.

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	Dup	1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane
TGRS Cleanup Level [1]			200 µg/L	µg/L	70 µg/L	6 µg/L	4 µg/L
03L802	6/8/06		< 1	< 1	< 1	< 1	< 1
03L806	6/7/06		7.4	0.38 JP	24	21	< 1
03M003	6/14/06		< 1	< 1	0.78 JP	0.53 JP	< 1
03M802	6/8/06		< 1	< 1	< 1	< 1	< 1
03M806	6/7/06		0.63 JP	< 2	170	89	< 2
03U003	6/14/06		61	< 1	7.4	9.5	< 1
03U093	6/14/06		35	< 1	0.39 JP	2.9	< 1
03U094	6/14/06		70	< 1	3	7.3	< 1
03U099	6/9/06		1.7	< 1	< 1	< 1	< 1
03U099	6/9/06	D	1.8	< 1	< 1	0.16 JP	< 1
03U708	6/9/06		23	< 1	4.4	8.3	< 1
03U710	6/14/06		8.1	< 1	0.66 JP	1.5	< 1
03U711	6/8/06		24	< 1	7.1	6.1	< 1
03U801	6/8/06		0.16 JP	< 1	< 1	< 1	< 1
03U803	6/14/06		< 1	< 1	< 1	< 1	< 1
03U806	6/7/06		< 1	< 1	2.8	2.3	< 1
04J077	6/9/06		6.8	< 1	4.7	5.5	< 1

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

				1,1,1-Trichloroethane		***1,1,2-Trichloroethane***		***1,1-Dichloroethane***		***1,1-Dichloroethene***		***1,2-Dichloroethane***
TGRS Cleanup Level (1)				***200 µg/L***		***µg/L***		***70 µg/L***		***6 µg/L***		***4 µg/L***
Location	***Date***	***Dup***										
04U711	6/8/06		<	1	<	1	<	1	<	1	<	1
04U802	6/7/06		<	1	<	1	<	1	<	1	<	1
04U806	6/7/06			11	<	1		15		15	<	1
04U833	6/9/06		<	1	<	1	<	1	<	1	<	1
PJ#806	6/7/06			2.8	<	1		2.8		3	<	1
PJ#806	6/7/06	D		3	<	1		3		3.3	<	1

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

			Carbon Tetrachloride	Chloroform	cis-1,2-Dichloroethene	Freon 113	Methylene Chloride
TGRS Cleanup Level [1]					70		
			µg/L	µg/L	µg/L	µg/L	µg/L
Location	**Date**	**Dup**					
03L802	6/8/06		< 1	< 1	< 1	< 1	< 1 UB 1.0,JP
03L806	6/7/06		< 1	0.23 JP	1.5	< 1	< 1 UB 1.0,JP
03M003	6/14/06		< 1	< 1	0.72 JP	< 1	< 1
03M802	6/8/06		< 1	< 1	0.21 JP	< 1	< 1 UB 1.0,JP
03M806	6/7/06		< 2	< 2	9.1	< 2	< 2
03U003	6/14/06		< 1	0.75 JP	19	0.3 JP	< 1
03U093	6/14/06		< 1	< 1	1.2	< 1	< 1 UB 0.96,JP
03U094	6/14/06		< 1	0.23 JP	1.8	< 1	< 1 UB 0.96,JP
03U099	6/9/06		< 1	< 1	< 1	< 1	< 1 UB 0.96,JP
03U099	6/9/06	D	< 1	< 1	< 1	< 1	< 1 UB 0.96,JP
03U708	6/9/06		< 1	1.3	2	< 1	< 1 UB 0.96,JP
03U710	6/14/06		< 1	< 1	2.1	< 1	< 1
03U711	6/8/06		< 1	0.29 JP	2.2	< 1	< 1 UB 1.0,JP
03U801	6/8/06		< 1	< 1	0.61 JP	< 1	< 1 UB 1.0,JP
03U803	6/14/06		< 1	< 1	< 1	< 1	< 1
03U806	6/7/06		< 1	< 1	0.45 JP	< 1	< 1 UB 1.0,JP
04J077	6/9/06		< 1	< 1	1.6	< 1	< 1 UB 0.96,JP

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	Dup		Carbon Tetrachloride		Chloroform		cis-1,2-Dichloroethene		Freon 113		Methylene Chloride
TGRS Cleanup Level [1]								70				
				µg/L		µg/L		µg/L		µg/L		µg/L
04U711	6/8/06		<	1	<	1	<	1	<	1	<	1 UB 1.0,JP
04U802	6/7/06		<	1	<	1	<	1	<	1	<	1
04U806	6/7/06		<	1	<	1		1.6	<	1	<	1 UB 1.0,JP
04U833	6/9/06		<	1	<	1	<	1	<	1	<	1 UB 0.96,JP
PJ#806	6/7/06		<	1	<	1		0.62 JP	<	1	<	1 UB 1.0,JP
PJ#806	6/7/06	D	<	1	<	1		0.65 JP	<	1	<	1 UB 1.0,JP

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

				Tetrachloroethene		trans-1,2-Dichloroethene		Trichloroethene		Vinyl Chloride
TGRS Cleanup Level [1]				5				5		
				µg/L		µg/L		µg/L		µg/L
Location	*Date*	*Dup*								
03L802	6/8/06		<	1	<	1		3.3	<	1
03L806	6/7/06		<	1 UB 0.23	<	1		160	<	1
03M003	6/14/06		<	1	<	1		0.7 JP	<	1
03M802	6/8/06		<	1	<	1		12	<	1
03M806	6/7/06		<	2	<	2		910		1.5 JP
03U003	6/14/06		<	1	<	1		130	<	1
03U093	6/14/06		<	1	<	1		77	<	1
03U094	6/14/06			0.24 JP	<	1		180	<	1
03U099	6/9/06		<	1	<	1		6.1	<	1
03U099	6/9/06	D	<	1	<	1		6.1	<	1
03U708	6/9/06			2.7	<	1		93	<	1
03U710	6/14/06			0.26 JP	<	1		61	<	1
03U711	6/8/06			1.6	<	1		140	<	1
03U801	6/8/06		<	1	<	1		31		0.58 JP
03U803	6/14/06		<	1	<	1	<	1	<	1
03U806	6/7/06			1.6	<	1		91	<	1
04J077	6/9/06		<	1	<	1		55	<	1

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

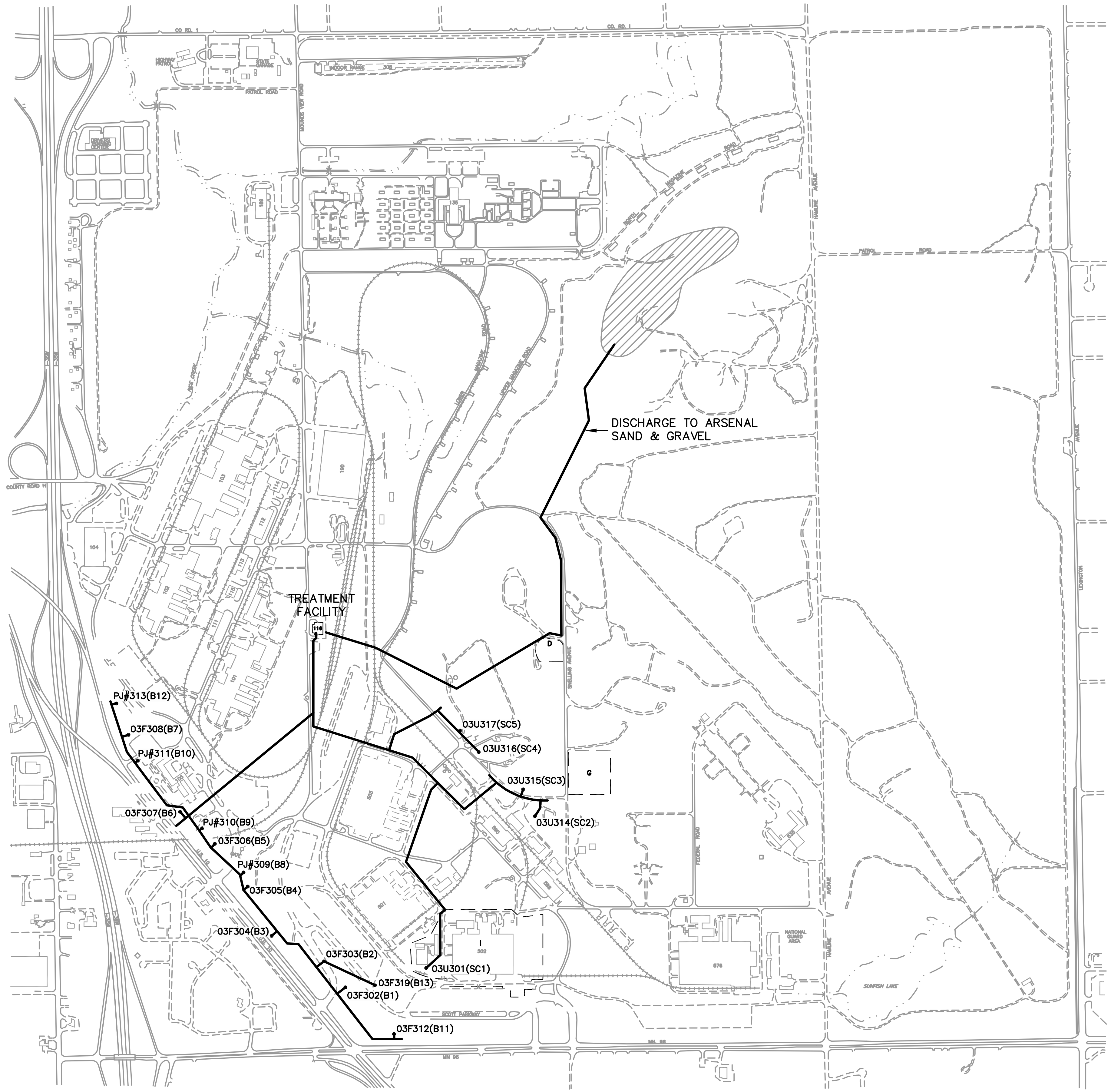
				Tetrachloroethene		trans-1,2-Dichloroethene		Trichloroethene		Vinyl Chloride
TGRS Cleanup Level [1]				5				5		
				µg/L		µg/L		µg/L		µg/L
Location	Date	Dup								
04U711	6/8/06		<	1	<	1	<	1 UB 0.19	<	1
04U802	6/7/06		<	1	<	1	<	1 UB 0.19	<	1
04U806	6/7/06		<	1 UB 0.23	<	1		130	<	1
04U833	6/9/06		<	1	<	1		1.8	<	1
PJ#806	6/7/06		<	1	<	1		49	<	1
PJ#806	6/7/06	D	<	1	<	1		50	<	1

Notes:
(1) Cleanup levels for TGRS are from the OU2 ROD. Shading indicates exceedence of the cleanup level.
D - Duplicate Analysis
J - Value is estimated
JP - Results less than reporting level but greater than instrument detection limit.
UB# - Blank Contamination, # = highest concentration of blank affecting data.

TABLE 10-9

SUMMARY OF OU2 DEEP GROUNDWATER MONITORING REQUIREMENTS
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Implementing Party*	*Documents Containing the Monitoring Plan*
#1 Hydraulic Containment and Mass Removal	a. Water levels to draw contour maps showing hydraulic zone of capture	Alliant / Army	Deep groundwater monitoring plan in Annual Report
	b. Pumping volumes and rates for comparison to design rates	Alliant / Army	Deep groundwater monitoring plan in Annual Report
	c. Influent and extraction well water quality for overall mass removal calculations	Alliant / Army	Deep groundwater monitoring plan in Annual Report
#2 Groundwater Treatment	• Outlined below	Alliant / Army	Deep groundwater monitoring plan in Annual Report
#3 Treated Water Discharge	• Effluent monitoring to verify attainment of treatment requirements	Alliant / Army	Deep groundwater monitoring plan in Annual Report
#4 Institutional Controls	• None	Alliant / Army	Deep groundwater monitoring plan in Annual Report
#5 Review of New Technologies	• None	Alliant / Army	Deep groundwater monitoring plan in Annual Report
#6 Groundwater Monitoring	• As above	Alliant / Army	Deep groundwater monitoring plan in Annual Report
Overall Remedy	a. Groundwater quality to verify attainment of clean up goals	Alliant / Army	Deep groundwater monitoring plan in Annual Report



LEGEND

PRIMARY ROAD
SECONDARY ROAD
RAILROAD
DRAINAGE
BUILDING
BUILDING REMOVED
SOURCE AREA
WELL LOCATION

EXTRACTION WELL NAME CROSS REFERENCE

B1	03F302
B2	03F303
B3	03F304
B4	03F305
B5	03F306
B6	03F307
B7	03F308
B8	PJ#309
B9	PJ#310
B10	PJ#311
B11	03F312
B12	PJ#313
B13	03F319
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

figure 10–1

TGRS LAYOUT
Twin Cities Army Ammunition Plant

CRA

43774–43(002)GN–SP002 JAN 02/2007

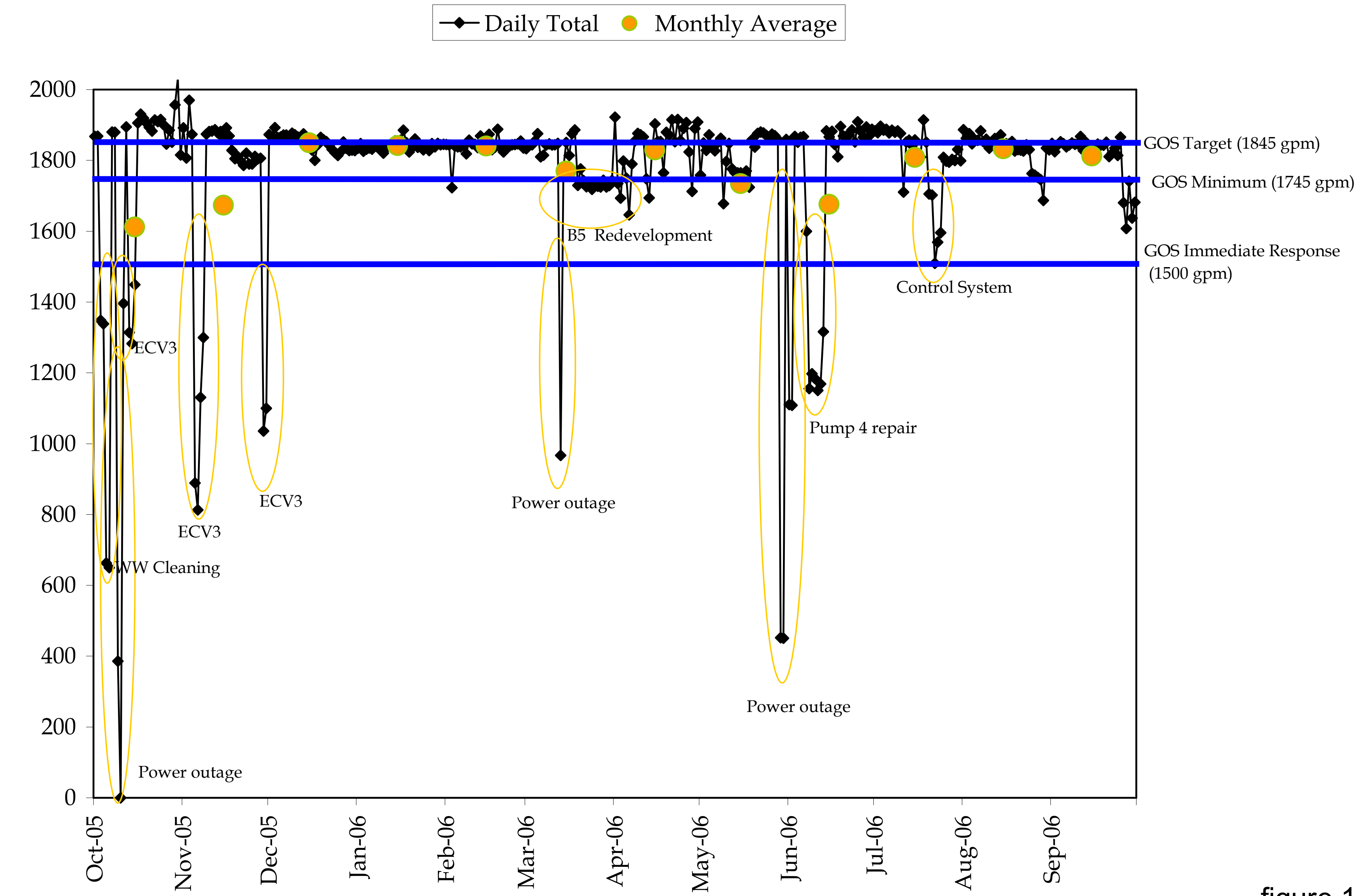


figure 10-2

TGRS FY2006 TOTAL DAILY FLOW RATES
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

43774-43(002)GIS-SP001 JAN 3/2007

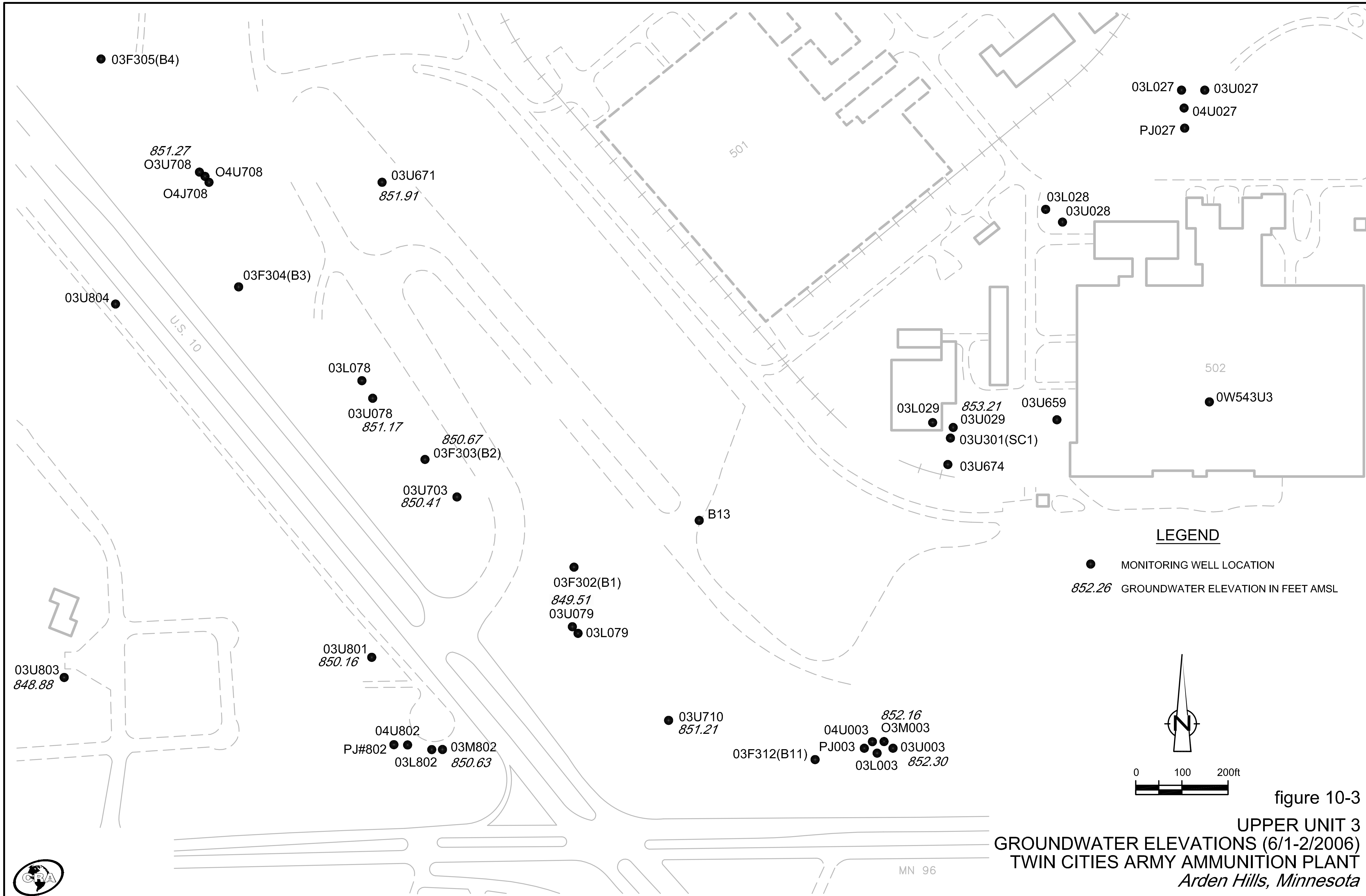


figure 10-3

UPPER UNIT 3
GROUNDWATER ELEVATIONS (6/1-2/2006)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

43774-43(002)GN-SP003 JAN 02/2007

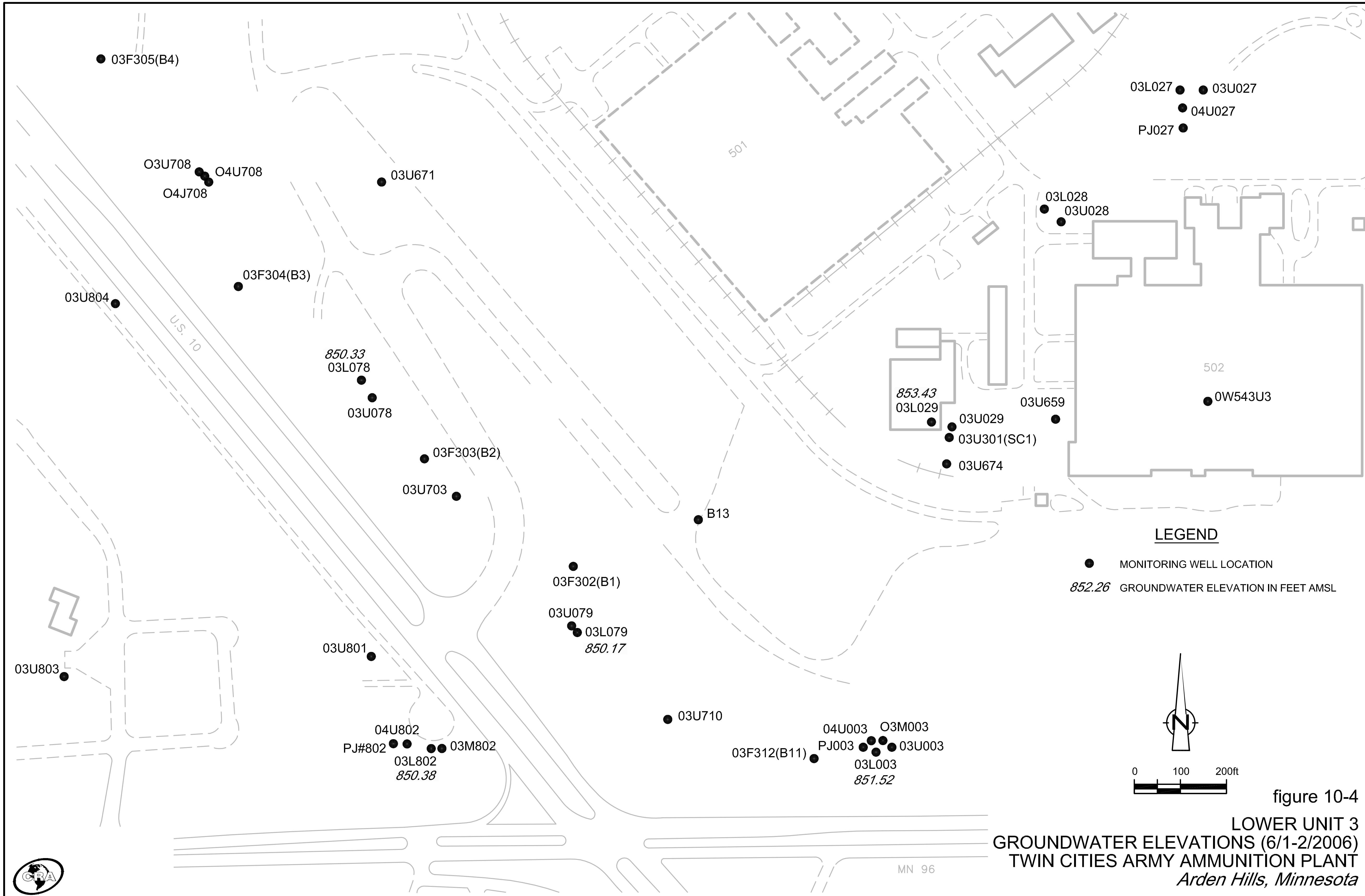


figure 10-4

LOWER UNIT 3
GROUNDWATER ELEVATIONS (6/1-2/2006)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

43774-43(002)GN-SP004 JAN 02/2007

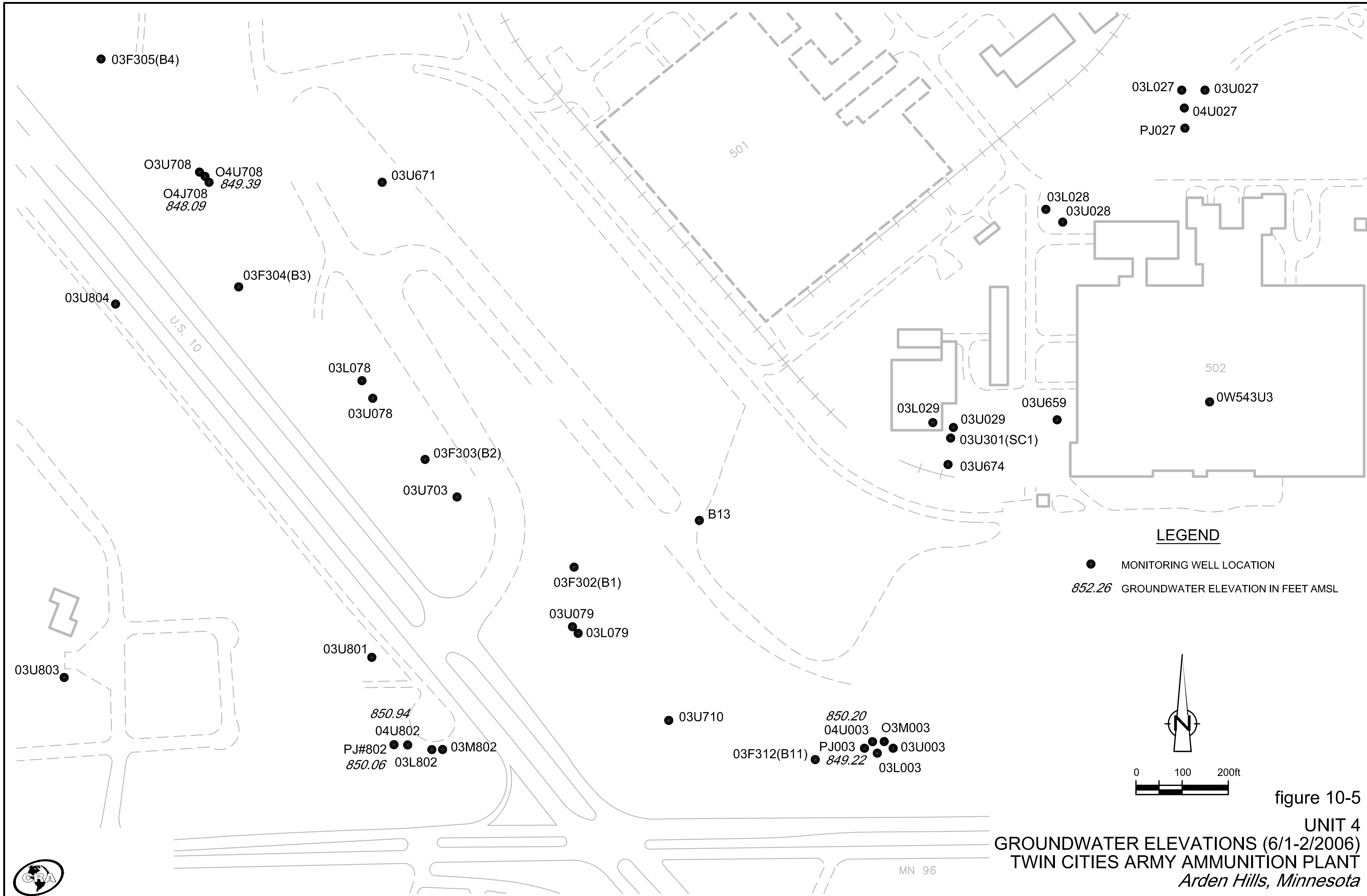


figure 10-5

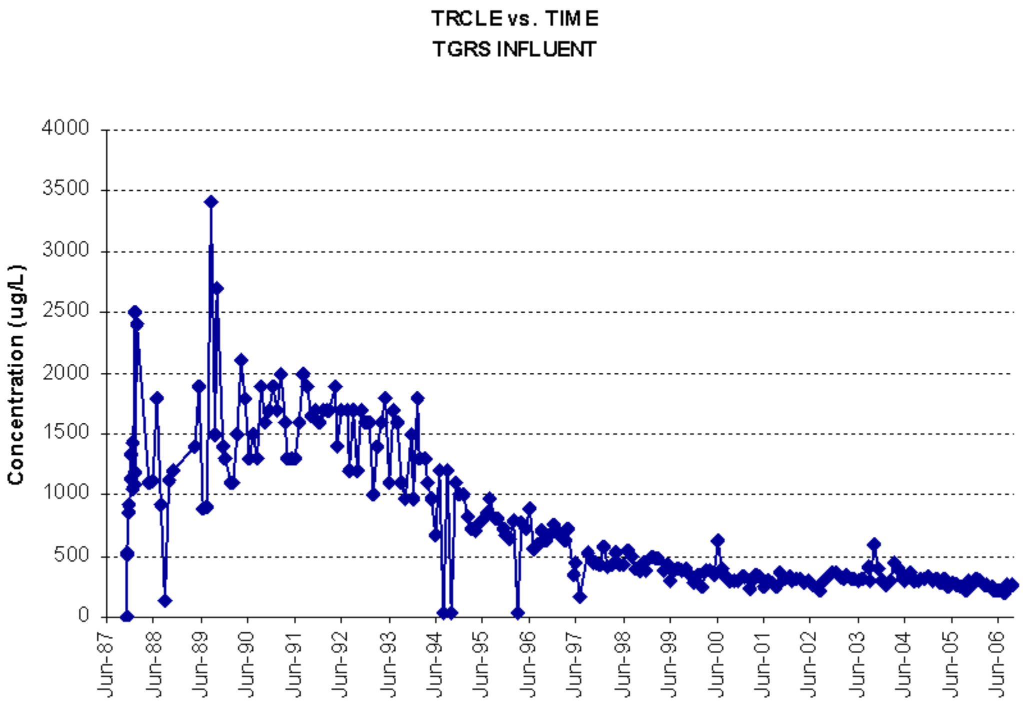
UNIT 4

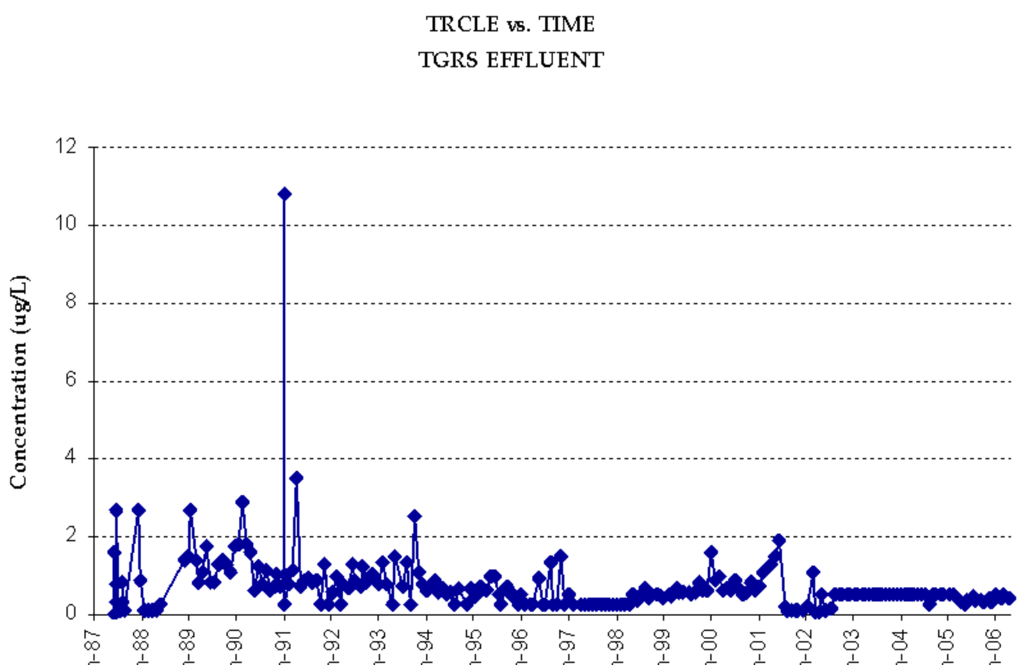
GROUNDWATER ELEVATIONS (6/1-2/2006)

TWIN CITIES ARMY AMMUNITION PLANT

Arden Hills, Minnesota

43774-43(002)GN-SP005 JAN 02/2007





NOTE: SAMPLES REPORTING CONCENTRATIONS LESS THAN THE DETECTION LIMIT WERE PLOTTED AS HALF THE DETECTION LIMIT. WHEN DUPLICATE SAMPLES WERE COLLECTED, THE HIGHER CONCENTRATION WAS PLOTTED.

figure 10–6

TGRS TREATMENT SYSTEM PERFORMANCE
Twin Cities Army Ammunition Plant

CRA

11.0 Operable Unit 3: Deep Groundwater

RECORD OF DECISION
Groundwater Remediation
Operable Unit 3
at New Brighton/Arden Hills Superfund Site
September 1992

RECORD OF DECISION AMENDMENT
For Operable Unit 3
New Brighton/Arden Hills Superfund Site
July 2006

A ROD Amendment was finalized in August 2006 that significantly changed the remedy for OU3. The basis for the OU3 ROD Amendment was the "Groundwater Statistical Evaluation, OU3" technical memorandum, which received consistency on May 2, 2005. This document presented a statistical evaluation showing that the South Plume has been receding since at least 1996, including the period after the Plume Groundwater Recovery System (PGRS) was shut off in 2001. The South Plume had receded well upstream of the PGRS and the PGRS was basically pumping clean water. The ROD Amendment removed the need for a pump and treat remedy, eliminating the PGRS extraction well and treatment train.

The PGRS was an off-post groundwater extraction and treatment system and municipal potable water supply. The PGRS consisted of New Brighton Municipal Well #13 (NBM #13) and a GAC treatment plant. New Brighton used the water for municipal supply. The PGRS was designed to contain the South Plume of VOC contamination emanating from TCAAP and to prevent further downgradient migration. Recovered groundwater was treated and used by the City of New Brighton to fulfill its municipal water supply demand. Figure 11-1 presents an OU3 site plan.

The PGRS began operations on May 3, 1994. In 1997, the PGRS influent dropped to below the ROD required limits for all VOCs. In December 1999, under an agreement with the Agencies, the PGRS pumping rate was reduced from a nominal rate of 1,000 gpm to 400 gpm to help determine if the reductions in concentration were the result of actual plume decreases or the result of dilution from over pumping. In conjunction with the flow rate decrease, a quarterly monitoring program was undertaken to monitor for potential "rebound" in VOC concentrations. As of the end of FY 2000, no rebound was observed and a review of the historical database for all of OU3 and the associated source area in OU2 revealed that the entire South Plume had dramatically decreased in size and concentration since the early 1990s. The concentration decreases were such that the leading edge of the South Plume, at the PGRS, dropped below the ROD requirements.

The results of this evaluation were presented to the Agencies on September 6, 2000, and a report titled "Plume History Evaluation, Operable Unit 3", CRA, was submitted to the Agencies on October 10, 2000. The report documents the history of plume size and concentration reductions throughout OU3. Based on the dramatic reductions in plume size and concentration, the report recommended shutting down the PGRS. The Agencies subsequently accepted the recommendation. The City of New Brighton stopped significant pumping in August 2001 and the PGRS was maintained in standby status. During the period May 2003 through September 2003, the PGRS was operated solely to satisfy peak water supply demands and then was placed back into standby status. The PGRS remained in standby status throughout FY 2004, FY 2005, and FY 2006. The City conducted an evaluation of its municipal system to, in part, determine the future use of the PGRS extraction well and treatment system. The City has decided the PGRS treatment system and well NBM #13 are not part of the City's long-term water supply plan.

11.1 REMEDY COMPONENT #1: MONITORED NATURAL ATTENUATION

Description: "Monitored natural attenuation."
(OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):
When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2006 monitoring plan and any deviations are explained in Appendix C.2. Details of the groundwater monitoring program are discussed in Section 11.2.

11.2 REMEDY COMPONENT #2: GROUNDWATER MONITORING

Description: "Monitoring of the groundwater for VOCs to verify the effectiveness of the selected remedy and the natural attenuation of the South Plume."
(OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):
When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2006 monitoring plan and any deviations are explained in Appendix C.2.

Groundwater was collected from five OU3 wells in 2006 as part of the OU1, OU2, and OU3 annual sampling round. Two of the wells are part of the ongoing annual schedule; 03M848 is at the center of the South Plume and 04U863 is beyond the downgradient edge of the South Plume. Two edge-of-plume wells (04U832 and 04U845) were sampled as a contingency action (as proposed in the FY 2005 APR) because of stable statistical trends observed in wells at the edge of the South Plume in 2005. In addition, well 04U861, which was abandoned in February 2006 to accommodate construction activities proposed by the City of New Brighton, was sampled in February before it was abandoned. Well locations are shown on Figure 11-1. The specific role of each well is provided in Appendix A. Water elevations were gathered during monitoring events and are presented in Appendix D.1.

All samples were analyzed for VOCs using SW846 8260. Table 11-1 presents a summary of the analytical results. Trichloroethylene concentrations in the downgradient sentry well, 04U863, remained less than 1 µg/l, as it has been since December 1999. The other four wells had trichloroethylene concentrations above the cleanup standard of 5µg/l.

What were the results of the Statistical Analyses?

The Mann-Kendall statistical analysis was updated for all of the wells sampled in 2006, except for 04U863. Well 04U863 is a sentry well downgradient of the south edge of the plume and because of consistent trichloroethylene concentrations less than 1 µg/l since 1999 is reclassified as outside of the plume. A summary of the statistical analysis for the other four wells, updated with FY 2006 data, is presented in Table 11-2. Individual spreadsheets presenting the Mann-Kendall test results for each well are provided in Appendix H.

The two center-of-plume wells had opposing trends. The trend for 03M848, which has historically been the center of the South Plume, changed from stable in 2005 to definitely decreasing. The trichloroethylene concentration has decreased from 700 µg/l in 1999 to 190 µg/l in 2006. The statistical analysis for Well 04U861, which is at the boundary with OU1, indicates an increasing trend since June 1998; although, the trichloroethylene concentration decreased from 200 µg/l in 2005 to 160 µg/l. 1,1,1-Trichloroethane, and its degradation product 1,1-dichloroethane were present in 04U861 again in 2006, indicating a commingling of the North Plume with the South Plume.

The statistical analysis of the two edge-of-plume wells (04U845 and 04U832), that were sampled in 2006 as contingency actions because they had stable results in 2005, resulted in a stable trend and no trend, respectively. Well 04U845, which is on the east edge of the South Plume, retained a stable trend as the trichloroethylene concentration decreased to 14 µg/l from 20 µg/l in 2005. The statistical conclusion for 04U832 changed from stable to no trend as the concentration of trichloroethylene increased to 54 µg/l from 41 µg/l in 2005. The long-term trend (beyond the six sample events included in the statistical evaluation) of 04U832 is very consistent, with results between 41 µg/l and 57 µg/l since 1991, except for results in 2001 and 2003 of approximately 4 µg/l that cause the no trend statistical conclusion. In addition, 1,1,1-trichloroethane was present in 04U832, which it historically has been, except for 2001 and 2003, indicating that the North Plume is commingling with the South Plume at this well also.

In summary, based on the limited data collected in 2006, the center of the South Plume, represented by 03M848, exhibits a trend of decreasing concentrations, while the edge of the South Plume appears stable. In addition, there is strong evidence of the North Plume commingling with the South Plume at the boundary between the two plumes.

Are contingency actions warranted?

The OU3 ROD Amendment requires contingency actions to be considered when the Mann-Kendall statistical analysis shows that a well at the edge of the South Plume has an increasing trend. The edge-of-plume and center-of-plume wells analyzed in 2006 are identified on Table 11-2.

The 2007 groundwater monitoring event will be a comprehensive biennial event. Wells that were added to the 2006 sampling event as a contingency action will again be sampled in 2007, resulting in three consecutive years of sampling. A more comprehensive evaluation of the South Plume will be completed at that time. No additional contingency actions are recommended for FY 2007.

Is additional monitoring proposed prior to the next report?

Yes. The existing OU3 monitoring requirements are presented in Table 11-3. Appendix A presents the FY 2006 – FY 2010 monitoring plan.

11.3 REMEDY COMPONENT #3: DRILLING ADVISORIES

Description: "Continued implementation of the drilling advisories that regulates the installation of new private wells within OU3 as a Special Well Construction Area." (OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):

When the Minnesota Department of Health (MDH) has issued a Special Well Construction Area Advisory.

Has the MDH issued a Special Well Construction Area Advisory?

Yes. It was issued in June 1996. The Special Well Construction Area encompasses OU1, OU3, and the OU2 Site A shallow groundwater plume. In June 1999, the MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The current boundary is shown on Figure E-1 (Appendix E).

Are any changes or additional actions required for this remedy component? No.

11.4 OVERALL REMEDY FOR OU3

Is the Remedy for OU3 Operating in Compliance with the OU3 ROD and OU3 ROD Amendment?

Yes. In FY 2006, groundwater monitoring took place as prescribed in the Annual Monitoring Plan. The smaller annual sampling round of FY 2006 indicates that the South Plume remains stable.

Are any changes or additional actions required for OU3?

Yes. In FY 2007, the Army is proposing to discontinue sampling three wells, abandon four wells, and change the monitoring frequency of two wells that are downgradient of the south edge of the South Plume. The wells and the rationale for the change to each well are presented below (see Figure 11-1 for well locations). These changes are reflected in Appendix A.1:

- MW15H (476837), discontinue monitoring – This lower Unit 3 well is near NBM#13. The south edge of the lower Unit 3 plume is more than a mile north of MW15H. This well is a McGillis Gibbs well and the Army does not have authority to abandon it.
- 04U865, discontinue monitoring and abandon – There are a cluster of wells near NBM#13 that were installed for the purpose of monitoring the immediate vicinity of the extraction well. Now that NBM#13 is being abandoned, there is no need for so many wells in this area. The Army proposes that only two wells (04U866 and 04J866), of the six wells surrounding NBM#13, remain in place and continue to be monitored.
- 04U864 and 04J864, abandon – Monitoring of these two wells was discontinued in 2005 for the reason cited above for 04U865.
- 04U852, discontinue sampling and abandon – This well is far downgradient of NBM#13 and serves no purpose in monitoring the extent of the South Plume.
- 04U851 and 04U414, change monitoring frequency – The monitoring frequency for these two wells will be changed such that they are monitored during the biennial events immediately preceding five year reviews. Well 04U414 has not been

monitored since 2001 and 04U851 had been monitored biennially. The next time they will be monitored is June 2009.

Monitoring well 04U861 was abandoned in February 2006 at the request of the City of New Brighton to allow for property redevelopment. The Army has committed to replacing 04U861 when the City completes property redevelopment. The schedule for redevelopment is uncertain; however, redevelopment is not expected to progress enough to allow for a replacement well to be installed in FY 2007.

TABLE 11-1

GROUNDWATER QUALITY DATA (mg/L)
OPERABLE UNIT 3, TCAAP
FISCAL YEAR 2006

Well		Date	*Trichloroethene*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*cis-1,2-Dichloroethene*	*Vinyl Chloride*	*Carbon Tetrachloride*	*Chloroform*	*Freon 113*	*Methylene Chloride*	*Tetrachloroethene*	*trans-1,2-Dichloroethene*	*1,2-Dichloroethane*
OU3 Cleanup Level [1]			***5***	***200***	***3***	***6***	***70***	***70***	***--***	***--***	***--***	***--***	***--***	***--***	***--***	***--***
03M848		6/13/06	190	0.23 JP	< 1	0.64 JP	1	8								
04U832		6/13/06	54	3.8	< 1	4.1	5.9	3.9								
04U845		6/13/06	14	< 1	< 1	< 1	< 1	0.73 JP								
04U845	D	6/13/06	14	< 1	< 1	< 1	< 1	0.68 JP								
04U861		2/8/06	160	0.98 JP	< 1	3.3	3.2	16	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U861	D	2/8/06	150	0.99 JP	< 1	3.2	3.2	15	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U863		12/21/05	0.33 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U863		6/13/06	0.33 JP	< 1	< 1	< 1	< 1	< 1								

Notes:

(1) Cleanup levels for OU3 are from the OU3 ROD. Shading indicates exceedance of the cleanup level.

D - Duplicate analysis.

JP - Results are less than the reporting limit, but greater than the instrument detection limit. Value is estimated.

TABLE 11-2

MANN-KENDALL STATISTICAL SUMMARY
OPERABLE UNIT 3, TCAAP

FISCAL YEAR 2006

Well	*Kendall S*	*Number of Data Points*	*Raw Trend*	*Confidence*	*Coefficient of Varience*	*Raw Trend Decision*	*MAROS Conclusion*	*June 2006 TRCLE Conc. (µg/L)*
Edge of Plume Wells								
04U832	5	6	Increasing	76.50%	0.7298	Stable or No Trend	No Trend	54
04U845	-5	6	Decreasing	76.50%	0.7361	Stable or No Trend	Stable	14
Center of Plume Wells								
03M848	-11	6	Decreasing	97.20%	0.4921	Definite	Decreasing	190
04U861	11	6	Increasing	97.20%	1.0198	Definite	Increasing	160*

Note:

* Sample collected in February 2006, before well was abandoned.

TABLE 11-3

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
OPERABLE UNIT 3, TCAAP

FISCAL YEAR 2006

	Remedy Component		***Monitoring Requirements***	***Implementing Party***	***Documents Containing the Monitoring Plan***
#1	Monitored Natural Attenuation		Outlined below.		
#2	Groundwater Monitoring	a.	Water levels for use in drawing contour maps.	Alliant	OU3 Monitoring Plan in Annual Report
		b.	Groundwater sampling to track progress of clean-up and attenuation of plume.	Alliant	OU3 Monitoring Plan in Annual Report
#3	Drilling Advisories	a.	Verification that drilling advisories are in place and functioning as intended.	Army / MDH	NA
OR:	Overall Remedy	a.	Water quality monitoring to verify attainment of clean-up goals.	Alliant	OU3 Monitoring Plan in Annual Report

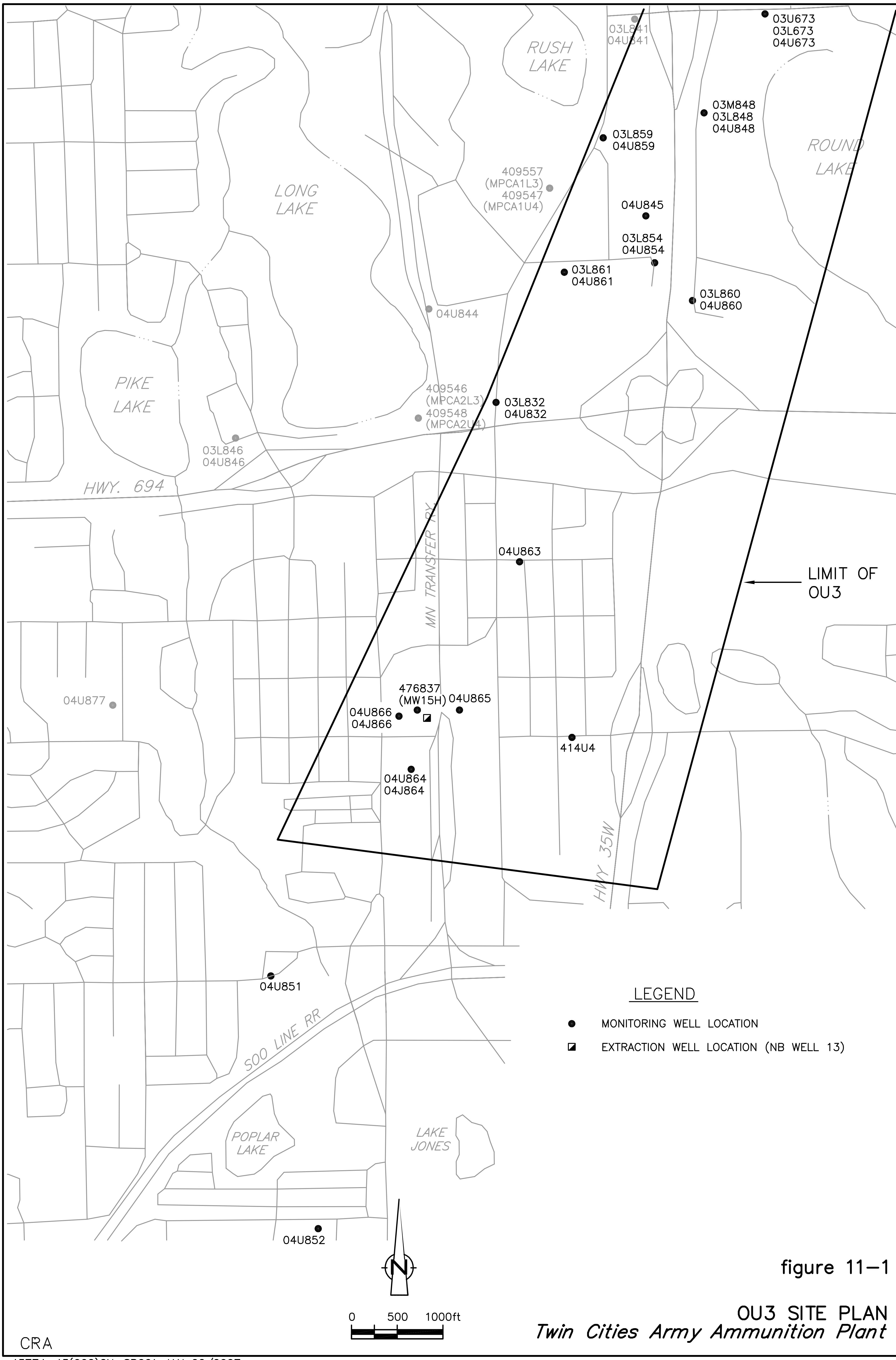


figure 11–1

OU3 SITE PLAN
Twin Cities Army Ammunition Plant

43774-43(002)GN-SP001 JAN 02/2007

12.0 Land Use Controls

Has a Land Use Control Implementation Plan (LUCIP) been prepared to address land use control (LUC) issues and is it being implemented?

The Army prepared a LUCIP for TCAAP, dated February 2003. During FY 2006, the Army and National Guard implemented the LUCIP. Although the LUCIP is already being implemented, it has not been approved by the MPCA and USEPA. In light of apparent resolution in 2005 of a national-level debate between the USEPA and Department of Defense (DOD) regarding LUC enforcement, TCAAP needs to resolve installation LUC issues with the MPCA and USEPA (Region V). It is expected that these issues will be resolved in FY 2007.

Was the annual site inspection for land use controls conducted in FY 2006, as specified in the LUCIP?

On July 20, 2006, the Army, National Guard, and Wenck conducted the annual inspection of TCAAP sites. The checklist that was completed during the inspection is included as Appendix J.

Were any items requiring additional actions identified in the annual site inspection?

The soil remedy needs to be completed at Site C, and if the remedy involves a cover, then signs need to be installed around the cover area.

13.0 Other Installation Restoration Activities During FY 2006

Appendix I briefly summarizes the status of other activities at TCAAP that are related to the Installation Restoration Program, but are not required in the RODs for OU1 through OU3.

13.1 BUILDING 102

In FY 2005 a report was prepared documenting the existence of a VOC plume in the Unit 1 aquifer at Building 102. The findings are documented in a report titled:

> *"Groundwater Investigation Report for Building102, Twin Cities Army Ammunition Plant, Prepared by Wenck Associates Inc. and Keres Consulting Inc., January 2006"*

It was agreed to by the Army, USEPA, and MPCA that quarterly groundwater monitoring would be conducted beginning in June 2006. It was also agreed that the FY 2006 report would begin to document the results at Building 102. There is currently not a remedy in place for Building 102 and it is not addressed as part of the OU2 ROD or the OU2 QAPP. An Engineering Evaluation/Cost Analysis (EE/CA) is scheduled to be prepared for Building 102 in FY 2007. The EE/CA will formalize the monitoring requirements and remedy selection for Building 102. For FY 2006, this section is intended only to document the sampling results.

Figure 13-1 shows the location of Building 102 at TCAAP. Table 13-1 presents the groundwater monitoring data for FY 2006 and Figure 13-2 shows the VOC plume, represented by trichloroethene. The plume exists within the Unit 1 aquifer at Building 102. The investigation report evaluated natural attenuation factors for the plume and found contradictory evidence. As such, the recommendation was made, and agreed upon, to conduct an EE/CA for the Building 102 site (including a site-specific QAPP). The work plan for the EE/CA will be prepared following discussion with the USEPA, MPCA, and the Restoration Advisory Board.

TABLE 13-1
BUILDING 102 SHALLOW GROUNDWATER

Fiscal Year 2006

	01L581 6/9/06	01L581 9/14/06	01U578 6/9/06	01U578 9/14/06	01U579 6/9/06	01U579 9/14/06	01U580 6/9/06	01U580D 6/9/06	01U580 9/14/06	01U580D 9/14/06
1,1,1-Trichloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
1,1,2-Trichloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
1,1-Dichloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
1,1-Dichloroethene	<1	<1	<1	<1	<10	<1	**8.4**	**8.6**	**JP 2.1**	<10
1,2-Dichloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
1,2-Dichloropropane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
2-Butanone	<5	<5	<5	<5	<50	<5	<5	<5	<50	<50
2-Hexanone	<5	<5	<5	<5	<50	<5	<5	<5	<50	<50
4-Methyl-2-Pentanone	<5	<5	<5	<5	<50	<5	<5	<5	<50	<50
Acetone	<5	**7.1**	<5	**8.4**	<50	<5	<5	<5	<50	<50
Benzene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Bromodichloromethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Bromoform	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Bromomethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Carbon Disulfide	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Carbon Tetrachloride	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Chlorobenzene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Chloroethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Chloroform	<1	<1	<1	<1	<10	<1	**JP 0.22**	**JP 0.21**	<10	<10
Chloromethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
cis-1,2-Dichloroethene	**6.0**	**5.0**	<1	<1	**27**	**2.3**	**E 2600**	**E 2600**	**2300**	**2300**
cis-1,3-Dichloropropene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Dibromochloromethane	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Ethylbenzene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
m&p-Xylene	<2	<2	<2	<2	<20	<2	<2	<2	<20	<20
Methylene Chloride	<1	<1	**JP 0.25** (UB 0.3)	<1	<10	<1	<1	<1	<10	<10
o-Xylene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Styrene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Tetrachloroethene	<1	<1	<1	<1	<10	<1	**1.0**	**1.0**	<10	<10
Toluene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
trans-1,2-Dichloroethene	**10**	**8.0**	<1	<1	<10	<1	**28**	**29**	**JP 5.8**	**JP 4.9**
trans-1,3-Dichloropropene	<1	<1	<1	<1	<10	<1	<1	<1	<10	<10
Trichloroethene	**9.1** (JS 156)	**7.5**	<1	<1	**100** (JS 156)	**15**	**E 2600** (JS 156)	**E 2600** (JS 156)	**5500**	**5400**
Vinyl Chloride	**JP 0.28**	<1	<1	<1	<10	<1	**8.3**	**8.5**	<10	<10

TABLE 13-1
BUILDING 102 SHALLOW GROUNDWATER

Fiscal Year 2006

	01U581 6/9/06	01U581 9/14/06	01U582 6/9/06	01U582 9/14/06	01U583 6/9/06	01U583 9/14/06	01U584 6/9/06	01U584 9/14/06
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1
2-Butanone	<5	<5	<5	<5	<5	<5	<5	<5
2-Hexanone	<5	<5	<5	<5	<5	<5	<5	<5
4-Methyl-2-Pentanone	<5	<5	<5	<5	<5	<5	<5	<5
Acetone	<5	**7.2**	<5	<5	<5	**8.9**	<5	<5
Benzene	<1	<1	<1	**JP 0.42**	<1	<1	<1	<1
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Disulfide	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Tetrachloride	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	**JP 0.22**	**JP 0.52**	<1	<1	<1	<1	<1	<1
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1
m&p-Xylene	<2	<2	<2	<2	<2	<2	<2	<2
Methylene Chloride	<1	<1	**JP 0.32** (UB 0.3)	<1	<1	<1	**JP 0.25** (UB 0.3)	<1
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	<1	<1	<1	<1	**JP 0.84**	**JP 0.57**	<1	<1
Toluene	<1	<1	<1	**JP 0.17**	<1	**JP 0.19**	<1	<1
trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	<1	<1	<1	<1	**JP 0.22** (JS 156)	**JP 0.22**	<1	<1
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1

Notes:

Bolding (in red color) indicates detection of the compound.

D Duplicate sample.

E The value exceeded the linear range of the curve.

JP The value is below the reporting level, but above the method detection limit. Results should be conside

JS The percent recovery for the matrix spike was above the upper QC limit (the percent recovery is listed a
The sample result could be biased high.

UB The sample result was less than 5 times the level detected in a blank (the result for the blank is listed a
The sample result can be considered non detect at an elevated detection limit.

TWIN CITIES ARMY AMMUNITION PLANT

Location of Building 102

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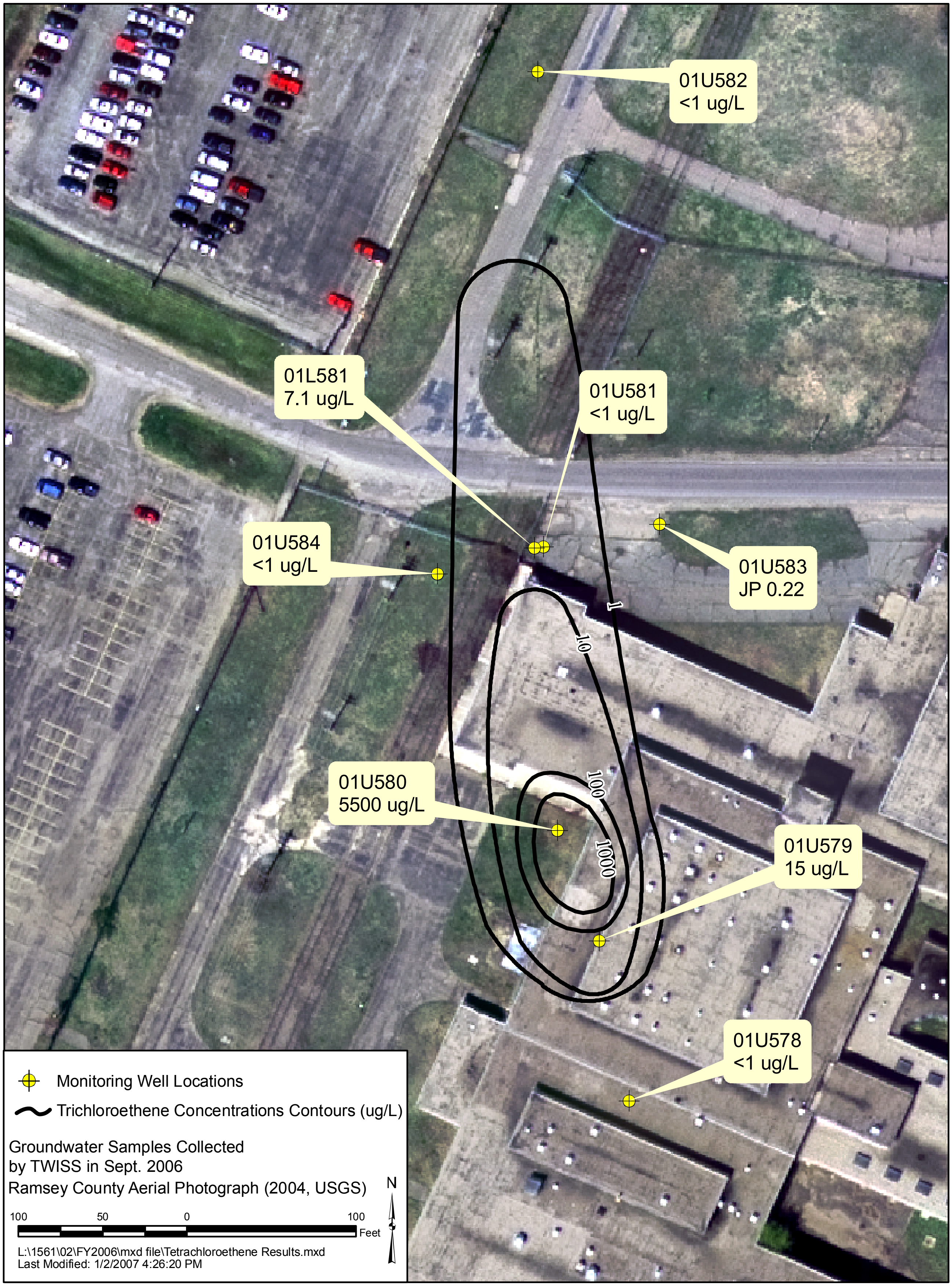
Wenck

Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

FY 2006

Figure 13-1



TWIN CITIES ARMY AMMUNITION PLANT

Tetrachloroethene Results

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Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2006

Figure 13-2

14.0 References

Argonne National Laboratory, 1991. "Installation Restoration Program: Remedial Investigation Report for the Twin Cities Army Ammunition Plant." Final Report, April 1991.

Barr Engineering Company, 1995. "Final Conceptual Design Report, Containment/Production Wells." February 1995.

Conestoga-Rovers & Associates, 1986. "Groundwater Remediation Program Plan (GRPP)." June 1986.

Conestoga-Rovers & Associates, 1987. "BGRS Extraction Well Pumping Test." April 1987.

Conestoga-Rovers & Associates, 1988. "IRA-BGRS Performance Assessment Report." August 1988.

Conestoga-Rovers & Associates, 1991. "IRA-TGRS: 1989 Annual Monitoring Report and Monitoring Plan." June 1991.

Conestoga-Rovers & Associates, 1999. "Predesign Investigation Work Plan, Site K." February 1999.

Conestoga-Rovers & Associates, 2001. "Predesign Investigation Report, Site K." December 2001.

"Federal Facility Agreement." August 12, 1997.

Fuller, D.B., 1994. Personal Communication from David Fuller, Federal Cartridge Company to William P. Johnsen, Wenck Associates, Inc. December 13, 1994.

Montgomery Watson, 1995. "Operable Unit 1 Alternate Water Supply Plan." Final Report, October 1995.

Montgomery Watson, 1996. "Remedial Design/Remedial Action, Quality Assurance Project Plan." September 1996.

Montgomery Watson, 1997. "Operable Unit 2 Feasibility Study." Final Report, March 1997.

Montgomery Watson, 1999. “Final Alternate Water Supply Construction Report for Period 1997 through 1998”. March 1999 (updated April 17, 2000 and August 2, 2000).

OU1 Technical Group, 2005. “Technical Memorandum, Statistical Evaluation Method for Operable Unit 1 Water Quality Data.” Final Report, December 2005.

“Record of Decision (ROD) for Gradient Control System for TCAAP.” September 1987.

“Record of Decision, Groundwater Remediation Operable Unit 3 at New Brighton/Arden Hills Superfund Site.” September 1992. Amended July 2006.

“Record of Decision, Groundwater Remediation Operable Unit 1 at New Brighton/Arden Hills Superfund Site.” September 1993. Amended May 2006.

Tecumseh/Wenck Installation Support Services, 2003. “Land Use Control Implementation Plan.” February 2003.

Tecumseh/Wenck Installation Support Services, 2003. “Quality Assurance Project Plan for Performance Monitoring.” Revision 3, December 10, 2003.

“Twin Cities Army Ammunition Plant, New Brighton/Arden Hills Superfund Site, Operable Unit 2, Record of Decision.” October 1997.

Appendix A

FY 2006 – FY 2010 Monitoring Plans

A.1 Groundwater Monitoring Wells

APPENDIX A.1
FY 2006 – FY 2010 MONITORING PLAN
FOR GROUNDWATER MONITORING WELLS

Unit Designations:

01U	- Upper Fridley Formation	03L	- Lower Hillside Formation	SL	- St. Lawrence
01L	- Lower Fridley Formation	SP	- St. Peter	UNK	- Unknown
03U	- Upper Hillside Formation	PC	- Prairie du Chien		
03M	- Middle Hillside Formation	J	- Jordan		

Notes:

(A) Indicates that the monitoring is the responsibility of Alliant.
(B) Indicates that the monitoring is the responsibility of the Army.
(1) "L (A or B)" denotes a water level measurement by the appropriate party.
(2) "Q (A or B)" denotes a water quality sampling by the appropriate party. The required analyte list for each specific site is shown in Appendix A.4.
(3) The designations refer to the following purposes:

- ❖ Operable Unit 1 Water Quality
  - – 1.a = To contour the perimeter of the plume which defines the area of concern for alternate water supply/well abandonment
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 1 Water Levels
  - – 3.b = To contour water levels for evaluation of containment
- ❖ Site A Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site A Water Levels
  - – 2.b = To contour water levels for evaluation of containment
- ❖ Site I Water Quality
  - – 1.a = To track remedy progress
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site I Water Levels
  - – 1.a = To track remedy progress
- ❖ Site K Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site K Water Levels
  - – 3.a = To contour water levels for evaluation of containment
- ❖ TGRS Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ TGRS Water Levels
  - – 1.a = To contour water levels for evaluation of containment
- ❖ Operable Unit 3 Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 3 Water Levels
  - – 2.a = To contour water levels

(4) Sample if in production at time of sample collection.
(5) Sample extraction well annually or biennially, as shown, since it is no longer being pumped.
(6) (Deleted)
(7) Sample annually for five years (FY 2003 through FY 2007) to verify that there have been no adverse impacts to groundwater due to shallow soil remediation work.
(8) Of the two wells, well 01U639 will be the primary sampling location and 482089 (I04MW) will be the alternate sampling location. If it is not possible to collect a groundwater sample from 01U639, then an attempt will be made to collect a sample from 482089 (I04MW).

APPENDIX A.1

FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
Operable Unit 1			Note: Changes from the monitoring plan presented in the previous Annual Performance Report are highlighted in this appendix.								
03U	03U811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U821			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U822			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	03U831			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	409550	PCA 6U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03U	409596	BS118U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03M	03M843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03L	03L822			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L832			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L841			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L846			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L853			---	---	---	---	---	OR	None	
03L	409556	PCA4L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409557	PCA1L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409597	BS118L3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U821			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U836	MW-1		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U837	MW-3		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U838	MW-5		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U839	MW-7		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U841			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U844			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U846			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U847			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U849			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U850			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U855			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
PC	04U871			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U872			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U875			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U877			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U879			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U880			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U881			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	04U882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U883			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	191942	BS118U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	200154	UM Golf Course		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC	200814	American Linen		---	---	---	---	---	---	---	
PC	206688	Cloverpond		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC	234547	Hnywell Ridgway		---	---	---	---	---	---	---	
PC	409547	PCA1U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409548	PCA2U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409549	PCA3U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409555	PCA5U4		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	512761	Gross Golf Course #2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	554216	New Brighton #14									See Appendix A.2
PC	582628	New Brighton #15									See Appendix A.2
J	04J822			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	04J835			---	---	---	---	---	---	---	
J	04J836	MW-2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J837	MW-4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J838	MW-6		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J839	MW-8		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J847			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J849			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	200524	St. Anthony #5	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
J	200803	St. Anthony #4	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
J	206796	New Brighton #5									See Appendix A.2
J	206797	New Brighton #6									See Appendix A.2
PC/J	200804	St. Anthony #3	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
PC/J	200812	Gross Golf #1		---	---	---	---	---	---	---	
PC/J	206792	New Brighton #4									See Appendix A.2
PC/J	206793	New Brighton #3									See Appendix A.2
PC/J	233221	R&D Systems, N. Well		---	---	---	---	---	---	---	
PC/J	234549	Reiner		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC/J	PJ#318			---	Q,L(B)	---	Q,L(B)	---	OR	None	
UNK	234546	Hnywell Ridgway		---	Q(B)	---	Q(B)	---	OR	---	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments

Operable Unit 2

Site A Removal Action

Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
01U	01U038			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U039			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U040			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U041			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U063			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U067			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U102			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U103			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U104			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U105			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U106			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U107			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U108			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U110			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U115			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U116			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U117			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U118			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U119		(7)	Q,L(B)	Q,L(B)	L(B)	Q,L(B)	L(B)	(Note 7)	2.b	See Page 2 of Appendix A.4
01U	01U120			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U125			---	---	---	---	---	OR	2.b	
01U	01U126			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U127			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U133			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U135			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U136			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U137			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
01U	01U138			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U139			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U140			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U141			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U145	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U146	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U147	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U148	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U149	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U150	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U151	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U152	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U153	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U154	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U155	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U156	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U157			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U158			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U350			---	---	---	---	---	---	---	
01U	01U351	EW-1									See Appendix A.2
01U	01U352	EW-2									See Appendix A.2
01U	01U353	EW-3									See Appendix A.2
01U	01U354	EW-4									See Appendix A.2
01U	01U355	EW-5		---	---	---	---	---	---	---	
01U	01U356	EW-6		---	---	---	---	---	---	---	
01U	01U357	EW-7		---	---	---	---	---	---	---	
01U	01U358	EW-8		---	---	---	---	---	---	---	
01U	01U901			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U902			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U903			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U904			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
Site I Remedial Action											
01U	01U064			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U632			L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	
01U	01U636			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U639		(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U640			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U666			L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	
01U	01U667			Q,L(A)	Q,L(A)	L(A)	L(A)	L(A)	---	1a, OR	
01U	01U668			L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	
01U	482086	I01MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482087	I05MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482088	I02MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482089	I04MW	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482090	I03MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
Site K Remedial Action											
01U	01U047			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U048			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U052			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U065			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U128			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U601			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U602			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U603			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U604			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U605			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U607			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U608			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U609			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U611			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U612			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U613			L(A)	L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U615			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U616			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U617			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U618			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U619			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U620			L(A)	L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U624			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U625			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U626			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U627			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U628			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
01U	482083	K04-MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	482084	K02-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	482085	K01-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
03U	03U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
TCAAP Groundwater Recovery System											
03F	03F302	B1									See Appendix A.2
03F	03F303	B2	(5)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03F	03F304	B3									See Appendix A.2
03F	03F305	B4									See Appendix A.2
03F	03F306	B5									See Appendix A.2
03F	03F307	B6									See Appendix A.2
03F	03F308	B7	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03F	03F312	B11									See Appendix A.2
03F	03F319	B13									See Appendix A.2
03U	03U001			---	L(A)	---	L(A)	---	---	1.a	
03U	03U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U003			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U004			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U005			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U008			---	L(A)	---	L(A)	---	---	1.a	
03U	03U009			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U010			---	L(A)	---	L(A)	---	---	1.a	
03U	03U011			---	L(A)	---	L(A)	---	---	1.a	
03U	03U012			---	L(A)	---	L(A)	---	---	1.a	
03U	03U013			---	L(A)	---	L(A)	---	---	1.a	
03U	03U014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U015			---	L(A)	---	L(A)	---	---	1.a	
03U	03U016			---	L(A)	---	L(A)	---	---	1.a	
03U	03U017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U019			---	L(A)	---	L(A)	---	---	1.a	
03U	03U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
03U	03U021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U022			---	L(A)	---	L(A)	---	---	1.a	
03U	03U023			---	L(A)	---	L(A)	---	---	1.a	
03U	03U024			---	L(A)	---	L(A)	---	---	1.a	
03U	03U025			---	L(A)	---	L(A)	---	---	1.a	
03U	03U026			---	L(A)	---	L(A)	---	---	1.a	
03U	03U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U028			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U029			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U030			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U031			---	L(A)	---	L(A)	---	---	1.a	
03U	03U032			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U075			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U076			---	L(A)	---	L(A)	---	---	1.a	
03U	03U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U082			---	L(A)	---	L(A)	---	---	1.a	
03U	03U083			---	L(A)	---	L(A)	---	---	1.a	
03U	03U084			---	L(A)	---	L(A)	---	---	1.a	
03U	03U087		(7)	Q(B)	Q(B),L(A)	---	Q(B),L(A)	---	(Note 7)	1.a	See Page 2 of Appendix A.4
03U	03U088			---	L(A)	---	L(A)	---	---	1.a	
03U	03U089		(7)	Q(B)	Q(B),L(A)	---	Q(B),L(A)	---	(Note 7)	1.a	See Page 2 of Appendix A.4
03U	03U090			---	L(A)	---	L(A)	---	---	1.a	
03U	03U092			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U093		(7)	Q,L(A),Q(B)	Q,L(A),Q(B)	Q,L(A)	Q,L(A),Q(B)	Q,L(A)	OR, (Note 7)	1.a	See Page 2 of Appendix A.4
03U	03U094			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U096			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U097		(7)	Q(B)	Q(B)	---	Q(B)	---	(Note 7)	---	See Page 2 of Appendix A.4
03U	03U099			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U111			---	L(A)	---	L(A)	---	---	1.a	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
03U	03U112			---	L(A)	---	L(A)	---	---	1.a	
03U	03U113			---	L(A)	---	L(A)	---	---	1.a	
03U	03U114			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U121			---	---	---	---	---	---	---	
03U	03U129			---	---	---	---	---	---	---	
03U	03U301	SC1									See Appendix A.2
03U	03U314	SC2									See Appendix A.2
03U	03U315	SC3	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U316	SC4	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U317	SC5									See Appendix A.2
03U	03U521			---	---	---	---	---	---	---	
03U	03U647			---	L(A)	---	L(A)	---	---	1.a	
03U	03U648			---	L(A)	---	L(A)	---	---	1.a	
03U	03U658			---	L(A)	---	L(A)	---	---	1.a	
03U	03U659			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U671			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U672			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U674			---	L(A)	---	L(A)	---	---	1.a	
03U	03U675			---	---	---	---	---	---	---	
03U	03U676			---	L(A)	---	L(A)	---	---	1.a	
03U	03U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U703			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U704			---	L(A)	---	L(A)	---	---	1.a	
03U	03U705			---	L(A)	---	L(A)	---	---	1.a	
03U	03U706			---	L(A)	---	L(A)	---	---	1.a	
03U	03U707			---	L(A)	---	L(A)	---	---	1.a	
03U	03U708			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U710			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U711			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
03U	03U715			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U716			---	L(A)	---	L(A)	---	---	1.a	
03U	03U801			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U803			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U804			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U805			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	519288	E101-MW		---	---	---	---	---	---	---	
03U	519289	E102-MW		---	---	---	---	---	---	---	
03U	519290	E103-MW		---	---	---	---	---	---	---	
03M	03M001			---	L(A)	---	L(A)	---	---	1.a	
03M	03M002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M003			---	L(A)	---	L(A)	---	---	1.a	
03M	03M004			---	L(A)	---	L(A)	---	---	1.a	
03M	03M005			---	L(A)	---	L(A)	---	---	1.a	
03M	03M007			---	L(A)	---	L(A)	---	---	1.a	
03M	03M010			---	L(A)	---	L(A)	---	---	1.a	
03M	03M012			---	L(A)	---	L(A)	---	---	1.a	
03M	03M013			---	L(A)	---	L(A)	---	---	1.a	
03M	03M017			---	L(A)	---	L(A)	---	---	1.a	
03M	03M020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M713			---	L(A)	---	L(A)	---	---	1.a	
03M	03M802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03M	03M806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L001			---	L(A)	---	L(A)	---	---	1.a	
03L	03L002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L003			---	L(A)	---	L(A)	---	---	1.a	
03L	03L004			---	L(A)	---	L(A)	---	---	1.a	
03L	03L005			---	L(A)	---	L(A)	---	---	1.a	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
03L	03L007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03L	03L010			---	L(A)	---	L(A)	---	---	1.a	
03L	03L012			---	L(A)	---	L(A)	---	---	1.a	
03L	03L013			---	L(A)	---	L(A)	---	---	1.a	
03L	03L014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L027			---	L(A)	---	L(A)	---	---	1.a	
03L	03L028			---	L(A)	---	L(A)	---	---	1.a	
03L	03L029			---	L(A)	---	L(A)	---	---	1.a	
03L	03L077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L080			---	L(A)	---	L(A)	---	---	1.a	
03L	03L081			---	L(A)	---	L(A)	---	---	1.a	
03L	03L084			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L113			---	L(A)	---	L(A)	---	---	1.a	
03L	03L802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L809			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L833			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U001			---	L(A)	---	L(A)	---	---	1.a	
PC	04U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U003			---	L(A)	---	L(A)	---	---	1.a	
PC	04U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U012			---	L(A)	---	L(A)	---	---	1.a	
PC	04U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
PC	04U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U510			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U711			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U714			---	L(A)	---	L(A)	---	---	1.a	
PC	04U802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U833			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J077			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J714			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#003			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#027			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#309	B8									See Appendix A.2
PC/J	PJ#310	B9									See Appendix A.2
PC/J	PJ#311	B10	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC/J	PJ#313	B12	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC/J	PJ#802			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
---	Staff Gauges			---	L(A)	---	L(A)	---	---	---	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
Unit 1 Wells											
01U	01U035			---	---	---	---	---	---	---	
01U	01U043			---	---	---	---	---	---	---	
01U	01U044			---	---	---	---	---	---	---	
01U	01U045			---	---	---	---	---	---	---	
01U	01U046			---	---	---	---	---	---	---	
01U	01U060		(7)	Q(B)	Q(B)	Q(B)	Q(B)	Q(B)	(Note 7)	---	See Page 2 of Appendix A.4
01U	01U072			---	---	---	---	---	---	---	
01U	01U085			---	---	---	---	---	---	---	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03M	03M848			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	2.a	
03L	03L673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L832			---	L(A)	---	L(A)	---	---	2.a	
03L	03L848			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L854			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L859			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L860			---	L(A)	---	L(A)	---	---	2.a	
03L	03L861			---	---	---	---	---	---	---	Abandoned FY06
03L	476837	MW15H		---	---	---	---	---	---	---	
PC	04U414	414U4		---	---	---	Q,L(A)	---	OR	2.a	
PC	04U673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U832			Q,L(A)	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U845			Q,L(A)	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U848			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U851			---	---	---	Q,L(A)	---	OR	2.a	
PC	04U852			---	---	---	---	---	---	---	Proposed Abandonment FY07
PC	04U854			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U859			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U860			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U861			Q,L(A)	---	---	---	---	---	---	Abandoned FY06
PC	04U863	323U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	2.a	
PC	04U864	324U4		--	--	--	--	--	--	--	Proposed Abandonment FY07
PC	04U865	325U4		--	---	--	---	--	---	---	Proposed Abandonment FY07
PC	04U866	326U4		--	Q,L(A)	--	Q,L(A)	--	OR	2.a	
PC	520931	NBM #13			--	--	--	--	--	--	City to Abandon FY07

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
J	04J864	324 J		--	--	--	--	--	--	--	Proposed Abandonment FY07
J	04J866	326 J		--	Q,L(A)	--	Q,L(A)	--	OR	2.a	

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FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments

Other Installation Restoration Activities

TCAAP Well Inventory

(Entries under "Notes" refer to the well inventory category)

Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
---	234356	Nordquist, Bob	1a	---	---	---	Q(B)	---	Well Inventory	---	1873 Old Hwy 8
---	249608	Rapit Printing, Inc	1a	---	---	---	Q(B)	---	Well Inventory	---	2520 Larpenteur Ave
---	433298	Town & Cntry Golf Crse	1a	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshall Ave
---	509052	Shriners Hospital	1a	---	---	---	Q(B)	---	Well Inventory	---	2025 E River Rd
---	S00311	Inglebrech, Brenda	1a	---	---	---	Q(B)	---	Well Inventory	---	1390 Silver Lake Rd
---	S00444	Mnpls Parks & Rec Dept	1a	---	---	---	Q(B)	---	Well Inventory	---	Ontario & E River Rd
---	200173	KSTP Radio TV	1b	---	---	---	Q(B)	---	Well Inventory	---	3415 University Ave
---	234355	Kingdom Hall	1b	---	---	---	Q(B)	---	Well Inventory	---	1987 Mound St
---	234421	BioChem	1b	---	---	---	Q(B)	---	Well Inventory	---	2151 Mustang Dr
---	234469	Palwski, T.	1b	---	---	---	Q(B)	---	Well Inventory	---	2816 Hwy 88
---	234544	R&D Systems	1b	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	249632	Montzka, Harold	1b	---	---	---	Q(B)	---	Well Inventory	---	2301 N Upland Crest NE
---	537801	Midwest Industrial	1b	---	---	---	Q(B)	---	Well Inventory	---	4759 Old Hwy 8
---	200180	Town & Cntry Golf Crse	1c	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshal Ave
---	200522	Pemtom	1c	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd
---	200523	Pemtom	1c	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd & Co Rd E
---	756236	Pechiney Plastic Pckging	1c	---	---	---	Q(B)	---	Well Inventory	---	150 26th Ave SE
---	S00437	Northern Star Co.	1c	---	---	---	Q(B)	---	Well Inventory	---	3171 5th St SE
---	107405	Anderson, Paul	2a	---	---	---	Q(B)	---	Well Inventory	---	4355 Hwy 10
---	249007	Walton, Reggie	2a	---	---	---	Q(B)	---	Well Inventory	---	4453 Hwy 10
---	249113	Wyttenbach, Daniel	2a	---	---	---	Q(B)	---	Well Inventory	---	990 11th Ave NW
---	127537	Midwest Asphalt	2b	---	---	---	Q(B)	---	Well Inventory	---	1400 Old Hwy 8
---	200176	Waldorf Paper Products	2b	---	---	---	Q(B)	---	Well Inventory	---	2236 Myrtle Ave
---	234571	Leiser, Mark	2b	---	---	---	Q(B)	---	Well Inventory	---	1901 17th St NW
---	S00002	Midland Hills Cntry Club	2b	---	---	---	Q(B)	---	Well Inventory	---	2001 N Fulham St
---	200076	Old Dutch Foods, Inc.	2c	---	---	---	Q(B)	---	Well Inventory	---	2375 Terminal Rd

APPENDIX A.1

FY 2006 - FY 2010 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 06	June 07	June 08	June 09	June 10	Water Quality	Water Level	Comments
---	236029	R&D Systems, S. Well	2c	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	236439	Waldorf Paper Products	2c	---	---	---	Q(B)	---	Well Inventory	---	2250 Wabash Ave
---	249150	Coldor, Lisa	4a	---	---	---	Q(B)	---	Well Inventory	---	3511 Stinson Blvd NE
---	249185	Novotny, Mark	4a	---	---	---	Q(B)	---	Well Inventory	---	1706 Malvern St
---	249191	Wells, Henry	4a	---	---	---	Q(B)	---	Well Inventory	---	1651 Millwood Ave
---	S00294	Western Remodelers	4a	---	---	---	Q(B)	---	Well Inventory	---	2520 W Larpenteur Ave
---	S00295	Alfson, Loren	4a	---	---	---	Q(B)	---	Well Inventory	---	2351 Summer St
---	S00409	Ohara, Rose	4a	---	---	---	Q(B)	---	Well Inventory	---	3553 Stinson Blvd NE
---	S00608	Grundtner, James	4a	---	---	---	Q(B)	---	Well Inventory	---	136 Oakwood Dr
---	---	Beach, Larry	4a	---	---	---	Q(B)	---	Well Inventory	---	1615 Silver Lake Rd
---	---	City of New Brighton	4a	---	---	---	Q(B)	---	Well Inventory	---	19 14th St NW
---	---	Burton, Jason	4a	---	---	---	Q(B)	---	Well Inventory	---	2073 Tenth St NW
---	---	Tabaika, Dorothy	4a	---	---	---	Q(B)	---	Well Inventory	---	2512 27th Ave NE
---	---	Willig, Allan	4a	---	---	---	Q(B)	---	Well Inventory	---	2600 Pahl Ave
---	---	Weisenberger, Heidi	4a	---	---	---	Q(B)	---	Well Inventory	---	2816 Silver Lake Rd
---	---	Hinton/Hermes	4a	---	---	---	Q(B)	---	Well Inventory	---	2935 Old Hwy 8

Grenade Range

---	653903	GR1-1		---	---	---	---	---	OR	---	
---	653904	GR1-2		---	---	---	---	---	OR	---	
---	653905	GR2-1		---	---	---	---	---	OR	---	
---	675976	GR-DF1		---	---	---	---	---	OR	---	

A.2 Remedial Treatment Systems

APPENDIX A.2
FY 2006 - FY 2010 MONITORING PLAN
FOR REMEDIAL TREATMENT SYSTEMS

OU1: DEEP GROUNDWATER [1]

Location	Sampling Frequency	Parameters
• Extraction Wells NBM#4, #14, and #15	- Monthly	- Pumping Volumes
(and also NBM#3, #5, and #6)	- Monthly	- Water Quality [2]
• PGAC Effluent	- Monthly	- Water Quality [2]

OU2: SITE A SHALLOW GROUNDWATER

Location	Sampling Frequency	Parameters
• Extraction Wells (EW1 through EW4)	- Monthly	- Pumping Volumes
	- Annual	- Water Levels
	- Annual	- Water Quality [2]
• Extraction/Discharge System Effluent	- Monthly	- Trichloroethene; 1,1,1-Trichloroethane; 1,2-Dichloroethene (cis and trans); and Mercury [3]

OU2: SITE K REMEDIAL ACTION

Location	Sampling Frequency	Parameters
• Extracted Groundwater	- Monthly	- Pumping Volume
• Treatment System Effluent [Outfall 391 (010)]	- See Appendix A.3	- See Appendix A.3

OU2: TCAAP GROUNDWATER RECOVERY SYSTEM (TGRS)

Location	Sampling Frequency	Parameters
• Extraction Wells	- Monthly	- Pumping Volumes
	- Semi-Annually	- Water Levels
	- Semi-Annually	- Water Quality [2]
• Treatment System Influent	- Monthly	- Pumping Volumes
	- Monthly	- Water Quality [2]
• Treatment System Effluent	- Monthly	- Water Quality [2]

Notes:
(1) Performed by the City of New Brighton using their Sampling and Analysis Plan.
(2) The required analyte list for each specific site is presented in Appendix A.4.
(3) Site A effluent sampling frequency and parameters are as required by the MCES Special Discharge Permit (#2194).

A.3 Surface Water

APPENDIX A.3
FY 2006 - FY 2010 MONITORING PLAN
FOR SURFACE WATER

Analysis	Analytical Method	Units	Site K Effluent (Outfall 010)
Flow Rate	- -	M gal/day	Continuous
Total Flow	- -	M gal	M
pH	(field)	(pH)	Q
Cyanide	9012A	µg/l	Q
Copper	6020	µg/l	Q
Lead	6020	µg/l	Q
Mercury	7470A	µg/l	Q
Phosphorus (Total)	365.4	µg/l	Q
Silver	6020	µg/l	Q
Silver	7761	µg/l	- -
Zinc	6020	µg/l	Q
Trichloroethene	8260B	µg/l	Q
1,1-Dichloroethene	8260B	µg/l	Q
1,1-Dichloroethane	8260B	µg/l	Q
Cis-1,2-Dichloroethene	8260B	µg/l	Q
Trans-1,2-Dichloroethene	8260B	µg/l	Q
Vinyl Chloride	8260B	µg/l	Q
1,2-Dichloroethane	8260B	µg/l	Q

Notes:

M = Measurement required once per month

Q = Analysis required once per quarter

A.4 Site Specific Lists of Required Analytes

APPENDIX A.4
SITE SPECIFIC LISTS OF REQUIRED ANALYTES

Note: Cleanup levels (in ug/l) from each Record of Decision are shown below for use in determining the required method detection limits. Also note that these lists represent the minimum list of analytes. A larger analyte list may be utilized by the monitoring organization, if so desired.

OU1 (DEEP GROUNDWATER) (1)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

SITE A (SHALLOW GROUNDWATER) (2)

Antimony*	6
1,1-Dichloroethene	6
1,2-Dichloroethane	4
Benzene	10
Chloroform	60
cis-1,2-Dichloroethene	70
Tetrachloroethene	7
Trichloroethene	30

*Antimony is only monitored at these wells: 01U103, 01U902 and 01U904.

SITE I (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30
Vinyl Chloride	0.2

SITE K (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30

OU2 (DEEP GROUNDWATER) (2)

1,1,1-Trichloroethane	200
1,1-Dichloroethane	70
1,1-Dichloroethene	6
1,2-Dichloroethane	4
cis-1,2-Dichloroethene	70
Tetrachloroethene	5
Trichloroethene	5

OU3 (DEEP GROUNDWATER) (3)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

Notes:

(1) From page 18 of the OU1 Record of Decision.
(2) From Table 1 of the OU2 Record of Decision.
(3) From Page 26 of the OU3 Record of Decision.

Analytical Methods:

VOCs: SW-846 Method 8260B
Antimony: SW-846 Method 6020

SITE SPECIFIC LISTS OF REQUIRED ANALYTES

OTHER INSTALLATION RESTORATION ACTIVITIES

WELL INVENTORY SAMPLING

VOCs (report full VOC list)

OU2 SHALLOW SOIL SITE 5-YEAR GROUNDWATER MONITORING

01U119 (Site A)	Metals (antimony, barium, copper, lead)
03U093 (Site D)	Metals (antimony, lead), Explosives (nitroglycerine)
03U089 (Site E)	Metals (antimony, barium, copper, lead, manganese)
01U060 (Site H)	Metals (antimony, arsenic, copper, lead, manganese)
03U087 (Site 129-3)	Metals (antimony, lead, manganese), Explosives (nitroglycerine), VOCs (report full VOC list)
03U097 (Site 129-5)	Metals (antimony, barium, lead)

Analytical Methods:

VOCs: SW-846 Method 8260B
Metals: SW-846 Method 6020
Explosives (nitroglycerine): SW-846 Method 8332
SVOCs (bis (2-ethylhexyl) phthalate): SW-846 Method 8270C
PCBs: SW-846 Method 8082
Radionuclides (gross alpha/gross beta): EPA Method 900.0
Radionuclides (radium 226/radium 228): EPA Method 9315/9320

A.5 Site C Monitoring Plan

Appendix A.5
Site C Monitoring Plan
Twin Cities Army Ammunition Plant

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Surface Water Sampling	*(Total numbers of samples are shown, excluding field duplicates.)*											
SW-1 through 8 (three consecutive days):												
Lead (dissolved) (2)				24	24	24	24	24	24	24		
Copper (dissolved) (2)				24								
Total Hardness				24								
EDTA				8(1)								
Groundwater Sampling												
MW-4, 6, 8, 9, 10, 11, 12, & 16:												
Lead (dissolved) (2)	8	8	8	8	8	8	8	8	8	8	8	8
Copper (dissolved) (2)				8								
EDTA				8								
EW-1, 2, 3:												
Lead (dissolved) (2)	3	3	3	3	3	3	3	3	3	3	3	3
Copper (dissolved) (2)				3								
EDTA				3								
MW-1, 2, 3, 5, 7, 13, 14 & 15:												
Lead (dissolved) (2)	8			8			8			8		
Copper (dissolved) (2)				8								
EDTA				8								
03U083						1(3)						

Notes:
1) A sample for EDTA analysis is collected at each of the 8 surface water locations on only 1 day of the 3-day surface water sampling event.
2) Analytical method 6020 for lead and copper
3) Well 03U083 will be sampled and analyzed for lead from FY2005 through FY2007.

Appendix B

Description of Hydrogeologic Units/Well Nomenclature and Trichloroethene Trends

(Trichloroethene Trend Graphs are located at the end of this Appendix)

APPENDIX B
DESCRIPTION OF HYDROGEOLOGIC UNITS/WELL NOMENCLATURE AND TRICHLOROETHENE TRENDS

On- and off-TCAAP wells have been installed in four hydrogeologic units beneath the site. These hydrogeologic units, as referred to in this report, are conceptually illustrated on Figure B-1 and are described below:

Unit 1: This unit, referred to as the Fridley Formation, consists of alluvium and lacustrine deposits above the Twin Cities Formation (Unit 2). The formation is made up of fine- to medium-grained sand and clayey silt, which acts as an unconfined aquifer with an estimated hydraulic conductivity of 8.3 x 10^{-3} cm/sec (International Technology Corp. 1992). The Unit 1 deposits are discontinuous at TCAAP and ranges in thickness from zero to 50 feet. They are predominantly limited to the north, east, and southwest portions of the site. Groundwater in Unit 1 is also discontinuous.

Unit 2: Known as the Twin Cities Formation, Unit 2 consists of Quaternary aged glacial till and, similar to Unit 1, is discontinuous at TCAAP. Unit 2 is generally regarded as an aquitard to vertical migration of groundwater; however, sand and gravel lenses may contain water.

Unit 3: This unit consists primarily of the Quaternary aged Hillside Sand Formation, which is continuous beneath TCAAP. Near the center of TCAAP, the Hillside Sand Formation is overlain by the Arsenal Sand, which forms a kame. There is no distinct lithologic contact between the Hillside Sand and the Arsenal Sand, and both are considered included in Unit 3. Unit 3 ranges in thickness from 25 to 450 feet. For monitoring purposes, the Unit 3 aquifer thickness has been arbitrarily subdivided into thirds designated as upper, middle, and lower.

Unit 4: This unit consists collectively of bedrock from the Prairie du Chien Group and Jordan Formation (Ordovician and Cambrian periods, respectively). For monitoring purposes, the Prairie du Chien Group is referred to as Upper Unit 4, while the Jordan Formation is Lower Unit 4. The Jordan Formation varies from fine- to coarse-grained quartz sandstone. The Prairie du Chien Group in the TCAAP area consists of a finely crystalline dolomite of the Oneota Formation, as well as quartz sandstone and dolomite members of the Shakopee Formation. A more detailed description of the bedrock geology can be found in the Remedial Investigation Report (Argonne National Laboratory, 1991).

In order to identify the hydrogeologic unit in which each well is completed, the United States Army Environmental Center (USAEC), formerly the United States Army Toxic and Hazardous Materials Agency (USATHAMA), developed a standardized identification system for wells at TCAAP (referred to as the IRDMIS number). Well designations consist of six characters, such as 03U093. The first two characters represent the hydrogeologic unit in which the well is completed, as follows:

01	-	Unit 1
03	-	Unit 3
04	-	Unit 4: Prairie du Chien Group <u>or</u> Jordan Formation
PJ	-	Unit 4: Prairie du Chien Group <u>and</u> Jordan Formation

The third character represents the relative position of the well screen or open hole within the specified hydrogeologic unit, as follows:

U	-	upper portion
M	-	middle portion
L	-	lower portion
J	-	Jordan Sandstone
F	-	fully penetrating Unit 3
#	-	open hole (total or partial thickness)

The remaining three characters represent the well number, as follows:

001 thru 500	USAEC wells and additional wells installed by others adjacent to an existing well with the 001-500 designation.
501 thru 600	TCAAP wells.
601 thru 800	On-post Alliant wells.
801 thru 999	Off-post Alliant wells.

Off-TCAAP wells installed by parties other than USAEC, TCAAP, or Alliant are designated by their Minnesota unique number. For reference, a well-designation cross-reference guide is included as Tables B-1 and B-2, which lists all wells of concern, the Minnesota unique number, the IRDMIS number, and any other name(s) the wells may have. Table B-1 is sorted by unique number and Table B-2 is sorted by IRDMIS number. The well type in these two tables is abbreviated as follows:

UN	-	Unknown
MUNI	-	Municipal
MON	-	Monitoring
DOM	-	Domestic
IND	-	Industrial
P.S.	-	Public Supply
COM	-	Commercial
IRR	-	Irrigation
ABAND	-	Abandoned
PIEZ.	-	Piezometer
REM	-	Remedial

Tables B-3 and B-4, which contain the same list of wells as Table B-2 (i.e., a listing that is sorted by IRDMIS number), can be used to view the boring log for a given well, if available. To view the well log, click on the desired well name in the table with the mouse. Table B-3 provides the boring logs for on-TCAAP wells and Table B-4 provides the boring logs for off-TCAAP wells.

Figures B-2 and B-3 show locations for off- and on-TCAAP wells, respectively. With a known well name, the location of that well can be determined using the "Edit, Find" or "Edit, Search" function and then typing in the desired well name, which will highlight this well name on the figure. Using either of the figures, the trichloroethene trend graph for a specific well can be viewed by clicking on the desired well name with the mouse. Some of the wells do not have trend graphs available (primarily sealed wells). Refer to the historical water quality database in Appendix D for this information.

TABLE B-1
TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
107405		ROEBKE	OFF	UN		
110485		NEW BRIGHTON #12	OFF	MUNI		
114410	03U521		OFF	MON		
122210		ST. PAUL PORT AUTH. #3	OFF	IND		
127537		MIDWEST ASPHALT	OFF	DOM		
134318		LORENZ W SEUTTER	OFF	DOM		
139035		WATERGATE MARINA	OFF	P.S.		
151568		ARDEN MANOR MOBILE HOME	OFF	P.S.		
161432		NEW BRIGHTON #10	OFF	MUN		
191942		118PDC/MODEL STONE	OFF	MON		
194701	01U620	OW120U1	ON	MON		
194702	01U621	PW121U1	ON	MON		
194703	01U622	OW122U1	ON	MON	✓	
194704	01U623	OW123U1	ON	MON	✓	
194716	01U634	OW504U1	ON	MON	✓	
194717	01U638	OW508U1		MON	✓	
194718	01U639	OW509U1	ON	MON		
194719	01U640	OW510U1	ON	MON		
194720	01U631	OW501U1	ON	MON		
194721	01U632	OW502U1		MON		
194722	01U635	OW505U1	ON	MON	✓	
194723	01U636	OW506U1	ON	MON.		
194724	01U642	OW512U1	ON	MON	✓	
194725	01U612	OW112U1	ON	MON		194758
194726	01U613		ON	MON		194759
194727	01U615	OW115U1	ON	MON		194760
194728	01U616	OW116U1	ON	MON		194761
194729	01U617	OW117U1	ON	MON		194770
194730	01U618	OW118U1	ON	MON		194771
194772	01U619	PW119U1	ON	MON		
200070		RUAN TRANSPORT	OFF	COM	✓	
200071		PRESTRESSED CONCRETE	OFF	IND	✓	
200072		WITTE TRANSPORTATION	OFF	IND	✓	
200073		WILSON TRANSFER & STORAGE	OFF	IND		
200074		ASBESTOS PROD	OFF	IND	✓	
200075		PHILLIPS PETROLEUM	OFF	IND	✓	
200076		OLD DUTCH FOODS INC	OFF	IND		
200077		JOHN CONLIN	OFF	DOM	✓	
200078		WILLIAM CLASS	OFF	DOM		
200079		LAWRENCE SCHOENING	OFF	DOM		
200080		CARL A OSTROM & SON	OFF	DOM		
200081		A. O. LIEBIG	OFF	DOM		
200082		2196 MARION ROAD	OFF	DOM		
200148		PAPER CALMERSON	OFF	IND	✓	
200154		U OF M GOLF COURSE	OFF	IRR		
200167		KOPPERS COKE #1	OFF	IND		
200171		PLATING INC	OFF	IND		
200197		SNOW FLAKE DAIRY	OFF	COM		
200264		1620 CENTRAL	OFF	IND		

TABLE B-1
TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
200384		METALLURGICAL INC. WELL #1	OFF	IND		
200524		ST. ANTHONY #5	OFF	MUNI		
200525		PLETSCHER	OFF	UN		
200531		NAZARETH	OFF	UN		
200599		CEDAR AVE. TRIANGLE	OFF	P.S.		
200602		ATKINSON MILL CO.	OFF	IND		
200629		GENERAL MILLS	OFF	IND		
200803		ST. ANTHONY #4	OFF	P.S.		
200804		ST. ANTHONY #3	OFF	MUNI		
200812		GROSS GOLF COURSE #1	OFF	COM		
200814		AMERICAN LINEN	OFF	IND		
201074		GLEASSON MORTUARY	OFF	COM		
201082		NORTHWESTERN HOSPITAL	OFF	P.S.		
206669		FRIDLEY #8	OFF	MUNI		
206672		FRIDLEY #9	OFF	MUNI		
206673		FRIDLEY #6	OFF	MUNI		
206688		CLOVERPOND WELL	OFF	DOM		
206689		JAMES K. O'NEIL	OFF	UN		
206693		FERNELIUS	OFF	UN		
206702		MINN E.S.	OFF	UN		
206720		MOUNDSVIEW	OFF	MUNI		
206722		M0UNDSVIEW #5	OFF	MUNI		
206724	PJ#504	TWIN CITIES ARSENAL	OFF	ABAND	✓	
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓	
206750		SHORE #4	OFF	MUNI		
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓	
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.	✓	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND	✓	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND	✓	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓	
206760	03M509		ON		✓	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM	✓	
206787		MOUNDSVIEW H.S.	OFF	P.S.		
206789		NEW BRIGHTON #1	OFF	MUNI	✓	
206791		NEW BRIGHTON #7	OFF	MUNI		
206792		NEW BRIGHTON #4				
206793		NEW BRIGHTON #3	OFF	MUNI		
206794		NEW BRIGHTON #9	OFF	MUNI		
206795		NEW BRIGHTON #8	OFF	MUNI		
206796		NEW BRIGHTON #5	OFF	MUNI		
206797		NEW BRIGHTON #6	OFF	MUNI		
206798		NEW BRIGHTON #2	OFF	MUNI	✓	
223844		KURTH MALTING CO EAST WL	OFF	IND		
223992		BOOM ISLAND	OFF	IND		
225886		FRANKLIN STEEL SQUARE	OFF	P.S.		
225905		ST PAUL TERM. WAREHOUSE	OFF	IND		
225906		ST PAUL TERM. WAREHOUSE	OFF	IND		
231741		LABELLE	OFF	UN		

TABLE B-1
TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND		
231845		MNDOT CIVIL DEFENSE TRAIN.	ON/OFF	P.S.		
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND 8/9	✓	
231857	03M505			ABAND	✓	
231878		MENGELKOCH #2	OFF	UN		
232067		NBR 135	OFF	UN		
232069		UHIL	OFF	UN		
233221		REUBEN MEAT	OFF	DOM		
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓	
233241		KOZAH'S MARKET	OFF	UN	✓	
233520		MCGILLIS	OFF	UN		
233533		ROSELAWN CEMETARY	OFF	IRR		
233763		P. L. MORGAN	OFF	DOM		
233806		2581 NORTH CLEVELAND	OFF	DOM		
234135	03U001	S1U3	ON	MON		
234136	03M001	S1M3	ON	MON		
234137	03L001	S1L3	ON	MON		
234138	04U001	S1U4	ON	MON		
234139	03U002	S2U3	ON	MON		
234140	03M002	S2M3	ON	MON		
234141	03L002	S2L3	ON	MON		
234142	03U003	S3U3	ON	MON		
234143	03M003	S3M3	ON	MON		
234144	03L003	S3L3	ON	MON		
234145	03U004	S4U3	ON	MON		
234146	03M004	S4M3	ON	MON		
234147	03L004	S4L3	ON	MON		
234148	03U005	S5U3	ON	MON		
234149	03U006	S6U3	ON	MON	✓	
234150	03U007	S7U3	ON	MON		
234151	03M007	S7M3	ON	MON		
234152	03L007	S7L3	ON	MON		
234153	03U008	S8U3	ON	MON		
234154	03U009	S9U3	ON	MON		
234155	03U010	S10U3	ON	MON		
234156	03M010	S10M3	ON	MON		
234157	03L010	S10L3	ON	MON		
234158	03U011	S11U3	ON	MON		
234159	03U012	S12U3	ON	MON		
234160	03M012	S12M3	ON	MON		
234161	03L012	S12L3	ON	MON		
234162	03U013	S13U3	ON	MON		
234163	03M013	S13M3	ON	MON		
234164	03L013	S13L3	ON	MON		
234165	03U014	S14U3	ON	MON		
234166	03U015	S15U3	ON	MON		
234167	03U016	S16U3	ON	MON		
234168	03U017	S17U3	ON	MON		
234169	03M017	S17M3	ON	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234170	03L017	S17L3	ON	MON		
234171	03U018	S18U3	ON	MON		
234172	03U019	S19U3	ON	MON		
234173	03U020	S20U3	ON	MON		
234174	03M020	S20M3	ON	MON		
234175	03L020	S20L3	ON	MON		
234176	03U021	S21U3	ON	MON		
234193	04U003	S3U4	ON	MON		
234194	04U002	S2U4	ON	MON		
234195	04U007	S7U4	ON	MON		
234196	04U012	S12U4	ON	MON		
234197	04U020	S20U4	ON	MON		
234198	01U004	S4U1	ON	MON	✓	
234199	01U011	S11U1	ON	MON	✓	
234200	01U012	S12U1	ON	MON	✓	
234201	01U022	S22U1	ON	MON	✓	
234202	01U033	S33U1	ON	MON	✓	
234204	01U034	S34U1	ON	MON	✓	
234205	01U035	S35U1	ON	TEST		
234206	01U036	S36U1	ON	MON	✓	
234207	01U037	S37U1		MON	✓	
234208	01U038	S38U1		MON		
234209	01U039	S39U1	ON	MON		
234210	01U040	S40U1	ON	MON		
234211	01U041	S41U1	ON	MON		
234212	01U044	S44U1	ON	MON		
234215	01U045	S45U1	ON	MON		
234216	01U046	S46U1	ON	MON		
234217	01U047	S47U1	ON	MON		
234218	01U048	S48U1		MON		
234221	01U050	S50AU1		MON	✓	
234222	01U051	S51U1	ON	MON	✓	
234223	01U052	S52U1	ON	MON		
234225	01U053	S53AU1	ON	MON	✓	
234227	01U054	S54AU1		MON	✓	
234235	01U060	S60U1	ON	MON		
234237	01U062	S62U1	ON	MON	✓	
234239	01U063	S63U1	ON	MON		
234240	01U064	S64U1	ON	MON		
234241	01U065	S65U1	ON	MON		
234243	01U067	S67U1	ON	MON		
234250	01U072	S72AU1	ON	MON		
234301		DEWITT	OFF	UN	✓	
234305		GLENN BEGGIN	OFF	UN		
234319		HIDE & TALLOW #1	OFF	UN		
234327		BRESKE	OFF	UN		
234335		MENGELKOCH #1	OFF	UN		
234337		MENGELKOCH #3	OFF	UN	✓	
234350		GORDON	OFF	UN		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234351		YEMPA	OFF	UN		
234352		1206 12TH AV NW	OFF	UN	✓	
234353		LENTSCH'S ICE WK.	OFF	UN		
234355		KINGDOM HALL	OFF	UN		
234356		NORDQUIST P43	OFF	UN		
234357		PHILLIPS PET P46	OFF	UN		
234386		ZELL OLS.	OFF	UN		
234391		SHERER L.	OFF	UN		
234396		DEWITT	OFF	UN	✓	
234406		KLAPP	OFF	UN	✓	
234409		HIDE & TALLOW	OFF	UN		
234425		KEN GEREBI	OFF	UN	✓	
234430		CMIEL	OFF	UN	✓	
234431		HARSTAD	OFF	UN		
234463		KEN SOLIE	OFF	UN		
234546		HONEYWELL RIDGEWAY	OFF	UN		
234547		HONEYWELL RIDGEWAY	OFF	UN		
234549		REINER	OFF	IRR		
235539		OLD HOTEL	OFF	UN		
235557		HIDDEN FALLS PARK W.WELL	OFF	P.S.		
235565	PJ#074	S74PJ		MON	✓	
235619		SHRINERS HOSPITAL	OFF	P.S.		
235735		FLOUR CITY ARCHITECTURAL	OFF	COM		
235748	03L014	S14L3	ON	MON		
235749	03L018	S18L3	ON	MON		
235750	03L021	S21L3	ON	MON		
235751	03L027	S27L3	ON	MON		
235752	03L028	S28L3		MON		
235753	03L029	S29L3		MON		236066
236066	03U094	S94U3	ON	MON		
236067	03L091	S91L3	ON	MON	✓	
236068	03L086	S86L3	ON	MON	✓	
236069	03U084	S84U3	ON	MON		
236070	03L081	S81L3	ON	MON		
236071	03L080	S80L3	ON	MON		
236072	03U079	S79U3	ON	MON		
236073	03U078	S78U3	ON	MON		
236074	03L078	S78L3	ON	MON		
236075	03U077	S77U3	ON	MON		
236076	03L077	S77L3	ON	MON		
236077	03U076	S76U3	ON	MON		
236078	03U075	S75U3	ON	MON		
236079	03L005	S5L3	ON	MON		
236080	03L113	WF1L3	ON	MON		
236122		NWR	OFF	ABAND		
236176	01U003	S3U1	ON	MON	✓	
236177	01U043	S43AU1		MON		
236178	03U022	S22U3		MON		
236179	03U023	S23U3		MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236180	03U024	S24U3		MON		
236181	03U025	S25U3		MON		
236182	03U026	S26U3	ON	MON		
236183	03U027	S27U3		MON		
236184	03U028	S28U3		MON		
236185	03U029	S29U3		MON		
236186	03U030	S30U3		MON		
236187	03U031	S31U3		MON		
236188	03U032	S32U3		MON		
236189	01U601	OW101U1	ON	MON		
236190	01U602	OW102U1	ON	MON		
236191	01U603	OW103U1	ON	MON		
236192	01U604	OW104U1	ON	MON		
236193	01U605	OW10571	ON	MON		
236194	01U524	FA4U1	ON	PIEZ.	✓	
236195	01U527	FV8U1	ON	PIEZ.	✓	
236196	01U525	FW5U1	ON	PIEZ.	✓	
236197	01U526	FV12U1	ON	PIEZ.	✓	
236437	PJ#802	T2PJ	OFF	MON		421437
236449	03U801	T1U3	OFF	MON		
236450	04U802	T2U4	OFF	MON		
236452	01U803	T3U1	OFF	TEST	✓	424053
236453	03U803	T3U3	OFF	MON		421434
236455	03U804	T4U3	OFF	MON		421433
236457	01U805	T5U1	OFF	MON	✓	424060
236458	03U805	T5U3	OFF	MON		421432
236460	01U806	T6U1	OFF	MON	✓	424058
236461	03U806	T6U3	OFF	MON		421431
236462	03M806	T6M3	OFF	MON		421430
236463	03L806	T6L3	OFF	MON		421429
236464	04U806	T6U4	OFF	MON		421428
236465	PJ#806	T6PJ	OFF	MON		421427
236468	PJ#003	S3PJ	ON	MON		
236469	PJ#027	S27PJ	ON	MON		
236471	01U807	T7U1	OFF	TEST	✓	424059
236476	03U082	S82U3	ON	MON		
236478	03U083	S83U3	ON	MON		
236479	01U085	S85U1	ON	MON		
236480	03U087	S87U3	ON	MON		
236482	03U088	S88U3	ON	MON		
236483	03U089	S89U3	ON	MON		
236485	03U090	S90U3	ON	MON		
236487	03U092	S92U3	ON	MON		
236489	03U093	S93U3	ON	MON		
236491	03U096	S96U3	ON	MON		
236493	03U097	S97U3	ON	MON		
236494	01U098	S98U1	ON	MON	✓	
236495	03U099	S99U3	ON	MON		
236497	01U100	S100U1	ON	MON	✓	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236498	01U101	S101U1	ON	MON	✓	
236499	01U102	S102U1	ON	MON		
236500	01U103	S103U1	ON	MON		
236501	01U104	S104U1	ON	MON		
236502	01U105	S105U1	ON	MON		
236503	01U106	S106U1	ON	MON		
236504	01U107	S107U1	ON	MON		
236505	01U108	S108U1	ON	MON		
236506	01U109	S109U1	ON	MON	✓	
236507	01U110	S11OU1	ON	MON		
236508	03U111	S111U3	ON	MON		
236510	03U112	S112U3	ON	MON		
242124	03U113	WF1U3	ON	MON		
242125	03U114	WF2U3	ON	MON		
242127	01U607	OW107U1	ON	MON		
242128	01U608	OW108U1	ON	MON		
242129	01U609	OW109U1	ON	MON		
242130	01U610	OW110U1	ON	MON		
242131	01U611	OW111U1	ON	MON		
242132	03U647	OW517U3	ON	MON		
242133	03U648	OW518U3	ON	MON		
242134	01U652	OW522U1	ON	MON	✓	
242135	01U666	OW536U1	ON	MON		
242136	01U667	OW537U1	ON	MON		
242137	01U668	OW538U1	ON	MON		
242138	04U027	S27U4		MON		
242153	01U813	H3U1	OFF	MON	✓	
242160	03L079	S79L3	ON	MON		
242162		301PB	OFF	UN		
242182	01U624A	BP185A	ON	PIEZ		
242183	01U624B	BP185B	ON	PIEZ		
242184	01U624C	BP185C	ON	PIEZ		
242185	01U624D	BP185D	ON	PIEZ		
242186	01U625A	BP285A	ON	PIEZ		
242187	01U625B	BP285B	ON	PIEZ		
242188	01U625C	BP285C	ON	PIEZ		
242189	01U625D	BP285D	ON	PIEZ		
242190	01U626A	BP385A	ON	PIEZ		
242191	01U626B	BP385B	ON	PIEZ		
242192	01U626C	BP385C	ON	PIEZ		
242193	01U626D	BP385D	ON	PIEZ		
242194	01U627A	BP485A	ON	PIEZ		
242195	01U627B	BP485B	ON	PIEZ		
242196	01U627C	BP485C	ON	PIEZ		
242197	01U627D	BP485D	ON	PIEZ		
242198	01U628A	BP585A	ON	PIEZ		
242199	01U628B	BP585B	ON	PIEZ		
242200	01U628C	BP585C	ON	PIEZ		
242201	01U628D	BP585D	ON	PIEZ		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
242207		SUNSET MEMORIAL CEMETARY	OFF	UN		
249152		BOYLE	OFF	DOM		
265735		FLOUR CITY ARCH	OFF	UN		
322664		ABBOTT NW HOSP	OFF	UN		
405651		METAL-MATIC INC.	OFF	IND		
406198	04U851	311U4	OFF	MON		
409546		PCA2L3	OFF	TEST	✓	
409547		PCA1U4	OFF	TEST		
409548		PCA2U4	OFF	TEST		
409549		PCA3U4	OFF	TEST		
409550		PCA6U3	OFF	TEST		
409555		PCA5U4	OFF	TEST		
409556		PCA4L3	OFF	TEST		
409557		PCA1L3	OFF	TEST		
409595		B109U3	OFF	ABAND		
409596		B118U3	OFF	MON		
409597		B118L3	OFF	IND		
409598		B117U3	OFF	ABAND		
416051	03M848	308M3	OFF	MON		
416078	04U848	308U4	OFF	TEST		
416080	04U852	312U4	OFF	MON		
416081	03L858	318L3	OFF	MON	✓	
416082	04U849	309U4	OFF	MON		
416143			OFF	ABAND		
416198		311U4	OFF	MON		
416199	03L848	308L3	OFF	MON		
416200	04U850	310U4	OFF	MON		
420713		HERBST LANDFILL	OFF	MON		
421425	03U659	OW529U3	ON	MON		
421426	03U658	OW528U3	ON	MON		
421438	03U671	PO-1	ON	MON		
421440	03U672	PD2U3	OFF	MON		
421441	03U673	PD3U3	OFF	MON		
424052	01L822	NW2L1	OFF	TEST	✓	
424054	01L821	NW1L1	OFF	TEST	✓	
424055	01L811	H1L1; MDNR Well	OFF	TEST		
424056	01L816	H6L1	OFF	ABAND	✓	
424057	01U808	T8U1	ON	MON	✓	
424061	01L823	NW3L1	OFF	TEST	✓	
424062	01L813	H3L1	OFF	TEST	✓	
426808	03U811	H1U3	OFF	TEST		
426809	03L811	H1L3	OFF	TEST		
426810	03U821	NW1U3	OFF	TEST		
426811	04U821	NW1U4	OFF	TEST		
426812	03U822	NW2U3	OFF	TEST		
426813	03L822	NW2L3	OFF	TEST		
426814	03U824	NW4U3	OFF	TEST	✓	
426815	03L673	PD3L3	OFF	TEST		
426816	03L813	H3L3	OFF	TEST	✓	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426817	03L802	T2L3	OFF	TEST		
426818	03M802	T2M3	OFF	TEST		
426842	03F302	B1	ON	REM		
426843	03F303	B2	ON	REM		
426844	03F304	B3	ON	REM		
426845	03F305	B4	ON	REM		
426846	03F306	B5	ON	REM		
426847	03F307	B6	ON	REM		
426848	03U701	701U3	ON	MON		
426849	04U701	701U4	ON	MON		
426850	03U702	702U3	ON	MON		
426851	04U841	301U4	OFF	TEST		
426852	03M843	303M3	OFF	TEST		
426853	04U843	303U4	OFF	TEST		
426854	04U844	304U4	OFF	TEST		
426855	04U845	305U4	OFF	MON		
426856	04U846	306U4	OFF	MON		
426857	04U847	307U4	OFF	MON		
426858	03L853	313L3	OFF	MON		
426859	03L854	314L3	OFF	MON		
426860	04U855	315U4	OFF	MON		
426861	03L856	316L3	OFF	MON	✓	
426862	03U815	H5U3	OFF	TEST	✓	
426863	03U831	OM1U3	OFF	TEST		
426864	03U832	OM2U3	OFF	TEST	✓	
426865	03L832	OM2L3	OFF	TEST		
426866	04U832	OM2U4	OFF	TEST		
426867	04U673	PD3U4	OFF	TEST		
426868	03L809	T9L3	OFF	MON		
426876	04U702	702U4	ON	MON		
426877	04U077	ST77U4	ON	MON		
426878	03U703	703U3		MON		
426879	03U708	708U3	ON	MON		
426880	04U708	708U4	ON	MON		
426881	03U709	709U3	ON	MON		
426882	04U709	709U4	ON	MON		
426883	03U704	704U3	ON	MON		
426884	03U705	705U3	ON	MON		
426885	03U706	706U3	ON	MON		
426886	03U707	707U3	ON	MON		
427410	01U120		ON	MON		
427411	01U115		ON	MON		
427412	01U116		ON	MON		
427413	01U117		ON	MON		
427414	01U118		ON	MON		
427415	01U119		ON	MON		
434031	04U711	711U4	OFF	MON		
434032	03U710	71OU3	ON	MON		
434033	03U711	711U3	OFF	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
434034	04U861	321U4	OFF	MON		
434035	04U860	320U4	OFF	MON		
434036	04U859	319U4	OFF	MON		
434037	03L841	301L3	OFF	MON		
434038	03L860	320L3	OFF	MON		
434039	03L861	321L3	OFF	MON		
434040	03L859	319L3	OFF	MON		
439701	04U854	314U4	OFF	MON		
440884	03U121		ON	MON		
440885	03M005	ST-5-M3	ON	MON		
440886	03U129		ON	MON		
440887	03L084	ST84L3	ON	MON		
440888	01U122		ON	MON	✓	
440889	01U125		ON	MON		
440890	01U126		ON	MON		
440891	01U127		ON	MON		
440892	01U128		ON	MON		
440893	01U133		ON	MON		
440894	01U134		OFF	MON		
440895	01U130		ON	MON	✓	
440896	03U124		ON	MON	✓	
447889	04U871	401U4	OFF	MON		
447890	04U882	412U4	OFF	MON		
447891	04U881	411U4	OFF	MON		
447892	04U883	413U4	OFF	MON		
447893	01U350		ON	MON		
447894	PJ#318	318U4	OFF	MON		
447895	04U880	410U4	OFF	MON		
447896	04U877	407U4	OFF	MON		
447898	04U875	405U4	OFF	MON		
447899	03L846	306L3	OFF	MON		
447900	04U879	409U4	OFF	MON		
447988	04U872	402U4	OFF	MON		
447998	01U135		ON	MON		
447999	01U136		ON	MON		
453821	03U317	SC-5	ON	REM		
453822	03U316	SC-4	ON	REM		
453823	03F308	B7	ON	REM		
453824	03F312	B11	ON	REM		
453825	PJ#309	B8	ON	REM		
453826	PJ#310	B9	ON	REM		
453827	PJ#311	B10	ON	REM		
453828	PJ#313	B12	ON	REM		
453829	04J708		ON	MON		
453830	04J713		ON	MON		
453831	03M713		ON	MON		
453832	04U714		ON	MON		
453833	03U715	SM1	ON	MON		
453834	03U716	SM2	ON	MON		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
471394	04U863	323U4	OFF	MON		
476387		MW15H	OFF	MON		
482083		K04-MW	ON	MON		
482084		K02-MW	ON	MON		
482085		K01-MW	ON	MON		
482086		I01-MW	ON	MON		
482087		I05-MW	ON	MON		
482088		I02-MW	ON	MON		
482089		I04-MW	ON	MON		
482090		I03-MW	ON	MON		
482707	04J882		OFF	MON		
482708	04J835		OFF	MON		
482709	04J834		OFF	MON		
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON		
500694	03L137		ON	MON	✓	
505189	01U137		ON	MON		
505190	01U138		ON	MON		
505191	01U139		ON	MON		
505192	01U140		ON	MON		
505193	01U141		ON	MON		
505209	01U902		OFF	MON		
505210	01U901	H3U1	OFF	MON		
505618	03L138		ON	MON	✓	
508115	04U322	322U4	OFF	MON		
508117	04J702		ON	MON		
508118	04J077		ON	MON		
508119	04U713		ON	MON		
508120	04J714		ON	MON		
508122	03U314	SC-2	ON	REM		
509083		NEW BRIGHTON #11	OFF	MUNI		
512761		GROSS GOLF #2	OFF	IRR		
519288		E101-MW	ON	MON		
519289		E102-MW	ON	MON		
519290		E103-MW	ON	MON		
519291		129-1501-MW	ON	MON	✓	
519836	04U834		OFF	MON		
519956	03L833		OFF	MON		
519957	04U833		OFF	MON		
520931		NEW BRIGHTON #13	OFF	MUNI		
524047	04U865	325U4	OFF	MON		
524048	04J866	326J	OFF	MON		
524049	04U866	326U4	OFF	MON		
524050	04U864	324U4	OFF	MON		
524051	04J864	324J	OFF	MON		
538039	01U145		ON	PIEZ.		
538040	01U146		ON	PIEZ.		
538041	01U147		ON	PIEZ.		
538042	01U148		ON	PIEZ.		
538043	01U149		ON	PIEZ.		

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
538044	01U150		ON	PIEZ.		
538045	01U151		ON	PIEZ.		
538046	01U152		ON	PIEZ.		
538047	01U153		ON	PIEZ.		
538048	01U154		ON	PIEZ.		
538049	01U155		ON	PIEZ.		
538050	01U156		ON	PIEZ.		
538051	01U351	EW1	ON	REM		
538052	01U352	EW2	ON	REM		
538053	01U353	EW3	ON	REM		
538054	01U354	EW4	ON	REM		
538055	01U355	EW5	ON	REM		
538056	01U356	EW6	ON	REM		
538057	01U357	EW7	ON	REM		
538058	01U358	EW8	ON	REM		
538059	01U904		OFF	MON		
538060	01U903		OFF	MON		
538062	01U157		ON	MON		
538063	01U158		ON	MON		
554216		NEW BRIGHTON #14	OFF	MUNI		
582628		NEW BRIGHTON #15	OFF	MUNI		
589650		CM1MW	ON	MON		
596628	04U836	MW-1	OFF	MON		
596629	04J836	MW-2	OFF	MON		
596630	04U837	MW-3	OFF	MON		
596631	04J837	MW-4	OFF	MON		
596632	04U838	MW-5	OFF	MON		
596633	04J838	MW-6	OFF	MON		
596634	04U839	MW-7	OFF	MON		
596635	04J839	MW-8	OFF	MON		
616601		CM2MW	ON	MON		
616602		CM3MW	ON	MON		
624019		CM5MW	ON	MON		
643379			ON	PIEZ.	✓	
643380			ON	PIEZ.	✓	
643381			ON	PIEZ.	✓	
643382			ON	PIEZ.	✓	
653903		GR1-1	ON	MON		
653904		GR1-2	ON	MON		
653905		GR2-1	ON	MON		
675976		GR-DF1	ON	MON		
687112	03F319	B13	ON	REM		
706043	04J822		OFF	MON		
706044	04J849		OFF	MON		
706045	04J947		OFF	MON		
	01U131				✓	
	01U132					
	01U142				✓	
	01U143				✓	

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TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
	01U144				✓	
	01U653			MON		
	01U675				✓	
	03L306		ON	MON		
	03L843	303L3	OFF	MON		
	03U301	SC-1	ON	REM		
	03U315	SC-3		REM		
	03U674	OW541U3	ON	MON		
	03U675					
	03U676	OW543U3	ON	MON		
	04U842			MON		
	PJ#006		ON	MON		
		MW15D	OFF	MON		
		MW15S	OFF	MON		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
424055	01L811	H1L1; MDNR Well	OFF	TEST		
424062	01L813	H3L1	OFF	TEST	✓	
424056	01L816	H6L1	OFF	ABAND	✓	
424054	01L821	NW1L1	OFF	TEST	✓	
424052	01L822	NW2L1	OFF	TEST	✓	
424061	01L823	NW3L1	OFF	TEST	✓	
236176	01U003	S3U1	ON	MON	✓	
234198	01U004	S4U1	ON	MON	✓	
234199	01U011	S11U1	ON	MON	✓	
234200	01U012	S12U1	ON	MON	✓	
234201	01U022	S22U1	ON	MON	✓	
234202	01U033	S33U1	ON	MON	✓	
234204	01U034	S34U1	ON	MON	✓	
234205	01U035	S35U1	ON	TEST		
234206	01U036	S36U1	ON	MON	✓	
234207	01U037	S37U1		MON	✓	
234208	01U038	S38U1		MON		
234209	01U039	S39U1	ON	MON		
234210	01U040	S40U1	ON	MON		
234211	01U041	S41U1	ON	MON		
236177	01U043	S43AU1		MON		
234212	01U044	S44U1	ON	MON		
234215	01U045	S45U1	ON	MON		
234216	01U046	S46U1	ON	MON		
234217	01U047	S47U1	ON	MON		
234218	01U048	S48U1		MON		
234221	01U050	S50AU1		MON	✓	
234222	01U051	S51U1	ON	MON	✓	
234223	01U052	S52U1	ON	MON		
234225	01U053	S53AU1	ON	MON	✓	
234227	01U054	S54AU1		MON	✓	
234235	01U060	S60U1	ON	MON		
234237	01U062	S62U1	ON	MON	✓	
234239	01U063	S63U1	ON	MON		
234240	01U064	S64U1	ON	MON		
234241	01U065	S65U1	ON	MON		
234243	01U067	S67U1	ON	MON		
234250	01U072	S72AU1	ON	MON		
236479	01U085	S85U1	ON	MON		
236494	01U098	S98U1	ON	MON	✓	
236497	01U100	S100U1	ON	MON	✓	
236498	01U101	S101U1	ON	MON	✓	
236499	01U102	S102U1	ON	MON		
236500	01U103	S103U1	ON	MON		
236501	01U104	S104U1	ON	MON		
236502	01U105	S105U1	ON	MON		
236503	01U106	S106U1	ON	MON		
236504	01U107	S107U1	ON	MON		
236505	01U108	S108U1	ON	MON		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236506	01U109	S109U1	ON	MON	✓	
236507	01U110	S11OU1	ON	MON		
427411	01U115		ON	MON		
427412	01U116		ON	MON		
427413	01U117		ON	MON		
427414	01U118		ON	MON		
427415	01U119		ON	MON		
427410	01U120		ON	MON		
440888	01U122		ON	MON	✓	
440889	01U125		ON	MON		
440890	01U126		ON	MON		
440891	01U127		ON	MON		
440892	01U128		ON	MON		
440895	01U130		ON	MON	✓	
	01U131				✓	
	01U132					
440893	01U133		ON	MON		
440894	01U134		OFF	MON		
447998	01U135		ON	MON		
447999	01U136		ON	MON		
505189	01U137		ON	MON		
505190	01U138		ON	MON		
505191	01U139		ON	MON		
505192	01U140		ON	MON		
505193	01U141		ON	MON		
	01U142				✓	
	01U143				✓	
	01U144				✓	
538039	01U145		ON	PIEZ.		
538040	01U146		ON	PIEZ.		
538041	01U147		ON	PIEZ.		
538042	01U148		ON	PIEZ.		
538043	01U149		ON	PIEZ.		
538044	01U150		ON	PIEZ.		
538045	01U151		ON	PIEZ.		
538046	01U152		ON	PIEZ.		
538047	01U153		ON	PIEZ.		
538048	01U154		ON	PIEZ.		
538049	01U155		ON	PIEZ.		
538050	01U156		ON	PIEZ.		
538062	01U157		ON	MON		
538063	01U158		ON	MON		
447893	01U350		ON	MON		
538051	01U351	EW1	ON	REM		
538052	01U352	EW2	ON	REM		
538053	01U353	EW3	ON	REM		
538054	01U354	EW4	ON	REM		
538055	01U355	EW5	ON	REM		
538056	01U356	EW6	ON	REM		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
538057	01U357	EW7	ON	REM		
538058	01U358	EW8	ON	REM		
236194	01U524	FA4U1	ON	PIEZ.	✓	
236196	01U525	FW5U1	ON	PIEZ.	✓	
236197	01U526	FV12U1	ON	PIEZ.	✓	
236195	01U527	FV8U1	ON	PIEZ.	✓	
236189	01U601	OW101U1	ON	MON		
236190	01U602	OW102U1	ON	MON		
236191	01U603	OW103U1	ON	MON		
236192	01U604	OW104U1	ON	MON		
236193	01U605	OW10571	ON	MON		
242127	01U607	OW107U1	ON	MON		
242128	01U608	OW108U1	ON	MON		
242129	01U609	OW109U1	ON	MON		
242130	01U610	OW110U1	ON	MON		
242131	01U611	OW111U1	ON	MON		
194725	01U612	OW112U1	ON	MON		194758
194726	01U613		ON	MON		194759
194727	01U615	OW115U1	ON	MON		194760
194728	01U616	OW116U1	ON	MON		194761
194729	01U617	OW117U1	ON	MON		194770
194730	01U618	OW118U1	ON	MON		194771
194772	01U619	PW119U1	ON	MON		
194701	01U620	OW120U1	ON	MON		
194702	01U621	PW121U1	ON	MON		
194703	01U622	OW122U1	ON	MON	✓	
194704	01U623	OW123U1	ON	MON	✓	
242182	01U624A	BP185A	ON	PIEZ		
242183	01U624B	BP185B	ON	PIEZ		
242184	01U624C	BP185C	ON	PIEZ		
242185	01U624D	BP185D	ON	PIEZ		
242186	01U625A	BP285A	ON	PIEZ		
242187	01U625B	BP285B	ON	PIEZ		
242188	01U625C	BP285C	ON	PIEZ		
242189	01U625D	BP285D	ON	PIEZ		
242190	01U626A	BP385A	ON	PIEZ		
242191	01U626B	BP385B	ON	PIEZ		
242192	01U626C	BP385C	ON	PIEZ		
242193	01U626D	BP385D	ON	PIEZ		
242194	01U627A	BP485A	ON	PIEZ		
242195	01U627B	BP485B	ON	PIEZ		
242196	01U627C	BP485C	ON	PIEZ		
242197	01U627D	BP485D	ON	PIEZ		
242198	01U628A	BP585A	ON	PIEZ		
242199	01U628B	BP585B	ON	PIEZ		
242200	01U628C	BP585C	ON	PIEZ		
242201	01U628D	BP585D	ON	PIEZ		
194720	01U631	OW501U1	ON	MON		
194721	01U632	OW502U1		MON		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
194716	01U634	OW504U1	ON	MON	✓	
194722	01U635	OW505U1	ON	MON	✓	
194723	01U636	OW506U1	ON	MON.		
194717	01U638	OW508U1		MON	✓	
194718	01U639	OW509U1	ON	MON		
194719	01U640	OW510U1	ON	MON		
194724	01U642	OW512U1	ON	MON	✓	
242134	01U652	OW522U1	ON	MON	✓	
	01U653			MON		
242135	01U666	OW536U1	ON	MON		
242136	01U667	OW537U1	ON	MON		
242137	01U668	OW538U1	ON	MON		
	01U675				✓	
236452	01U803	T3U1	OFF	TEST	✓	424053
236457	01U805	T5U1	OFF	MON	✓	424060
236460	01U806	T6U1	OFF	MON	✓	424058
236471	01U807	T7U1	OFF	TEST	✓	424059
424057	01U808	T8U1	ON	MON	✓	
242153	01U813	H3U1	OFF	MON	✓	
505210	01U901	H3U1	OFF	MON		
505209	01U902		OFF	MON		
538060	01U903		OFF	MON		
538059	01U904		OFF	MON		
426842	03F302	B1	ON	REM		
426843	03F303	B2	ON	REM		
426844	03F304	B3	ON	REM		
426845	03F305	B4	ON	REM		
426846	03F306	B5	ON	REM		
426847	03F307	B6	ON	REM		
453823	03F308	B7	ON	REM		
453824	03F312	B11	ON	REM		
687112	03F319	B13	ON	REM		
234137	03L001	S1L3	ON	MON		
234141	03L002	S2L3	ON	MON		
234144	03L003	S3L3	ON	MON		
234147	03L004	S4L3	ON	MON		
236079	03L005	S5L3	ON	MON		
234152	03L007	S7L3	ON	MON		
234157	03L010	S10L3	ON	MON		
234161	03L012	S12L3	ON	MON		
234164	03L013	S13L3	ON	MON		
235748	03L014	S14L3	ON	MON		
234170	03L017	S17L3	ON	MON		
235749	03L018	S18L3	ON	MON		
234175	03L020	S20L3	ON	MON		
235750	03L021	S21L3	ON	MON		
235751	03L027	S27L3	ON	MON		
235752	03L028	S28L3		MON		
235753	03L029	S29L3		MON		236066

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236076	03L077	S77L3	ON	MON		
236074	03L078	S78L3	ON	MON		
242160	03L079	S79L3	ON	MON		
236071	03L080	S80L3	ON	MON		
236070	03L081	S81L3	ON	MON		
440887	03L084	ST84L3	ON	MON		
236068	03L086	S86L3	ON	MON	✓	
236067	03L091	S91L3	ON	MON	✓	
236080	03L113	WF1L3	ON	MON		
500694	03L137		ON	MON	✓	
505618	03L138		ON	MON	✓	
	03L306		ON	MON		
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND	✓	
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓	
426815	03L673	PD3L3	OFF	TEST		
426817	03L802	T2L3	OFF	TEST		
236463	03L806	T6L3	OFF	MON		421429
426868	03L809	T9L3	OFF	MON		
426809	03L811	H1L3	OFF	TEST		
426816	03L813	H3L3	OFF	TEST	✓	
426813	03L822	NW2L3	OFF	TEST		
426865	03L832	OM2L3	OFF	TEST		
519956	03L833		OFF	MON		
434037	03L841	301L3	OFF	MON		
	03L843	303L3	OFF	MON		
447899	03L846	306L3	OFF	MON		
416199	03L848	308L3	OFF	MON		
426858	03L853	313L3	OFF	MON		
426859	03L854	314L3	OFF	MON		
426861	03L856	316L3	OFF	MON	✓	
416081	03L858	318L3	OFF	MON	✓	
434040	03L859	319L3	OFF	MON		
434038	03L860	320L3	OFF	MON		
434039	03L861	321L3	OFF	MON		
234136	03M001	S1M3	ON	MON		
234140	03M002	S2M3	ON	MON		
234143	03M003	S3M3	ON	MON		
234146	03M004	S4M3	ON	MON		
440885	03M005	ST-5-M3	ON	MON		
234151	03M007	S7M3	ON	MON		
234156	03M010	S10M3	ON	MON		
234160	03M012	S12M3	ON	MON		
234163	03M013	S13M3	ON	MON		
234169	03M017	S17M3	ON	MON		
234174	03M020	S20M3	ON	MON		
231857	03M505			ABAND	✓	
206760	03M509		ON		✓	
453831	03M713		ON	MON		
426818	03M802	T2M3	OFF	TEST		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236462	03M806	T6M3	OFF	MON		421430
426852	03M843	303M3	OFF	TEST		
416051	03M848	308M3	OFF	MON		
234135	03U001	S1U3	ON	MON		
234139	03U002	S2U3	ON	MON		
234142	03U003	S3U3	ON	MON		
234145	03U004	S4U3	ON	MON		
234148	03U005	S5U3	ON	MON		
234149	03U006	S6U3	ON	MON	✓	
234150	03U007	S7U3	ON	MON		
234153	03U008	S8U3	ON	MON		
234154	03U009	S9U3	ON	MON		
234155	03U010	S10U3	ON	MON		
234158	03U011	S11U3	ON	MON		
234159	03U012	S12U3	ON	MON		
234162	03U013	S13U3	ON	MON		
234165	03U014	S14U3	ON	MON		
234166	03U015	S15U3	ON	MON		
234167	03U016	S16U3	ON	MON		
234168	03U017	S17U3	ON	MON		
234171	03U018	S18U3	ON	MON		
234172	03U019	S19U3	ON	MON		
234173	03U020	S20U3	ON	MON		
234176	03U021	S21U3	ON	MON		
236178	03U022	S22U3		MON		
236179	03U023	S23U3		MON		
236180	03U024	S24U3		MON		
236181	03U025	S25U3		MON		
236182	03U026	S26U3	ON	MON		
236183	03U027	S27U3		MON		
236184	03U028	S28U3		MON		
236185	03U029	S29U3		MON		
236186	03U030	S30U3		MON		
236187	03U031	S31U3		MON		
236188	03U032	S32U3		MON		
236078	03U075	S75U3	ON	MON		
236077	03U076	S76U3	ON	MON		
236075	03U077	S77U3	ON	MON		
236073	03U078	S78U3	ON	MON		
236072	03U079	S79U3	ON	MON		
236476	03U082	S82U3	ON	MON		
236478	03U083	S83U3	ON	MON		
236069	03U084	S84U3	ON	MON		
236480	03U087	S87U3	ON	MON		
236482	03U088	S88U3	ON	MON		
236483	03U089	S89U3	ON	MON		
236485	03U090	S90U3	ON	MON		
236487	03U092	S92U3	ON	MON		
236489	03U093	S93U3	ON	MON		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
236066	03U094	S94U3	ON	MON		
236491	03U096	S96U3	ON	MON		
236493	03U097	S97U3	ON	MON		
236495	03U099	S99U3	ON	MON		
236508	03U111	S111U3	ON	MON		
236510	03U112	S112U3	ON	MON		
242124	03U113	WF1U3	ON	MON		
242125	03U114	WF2U3	ON	MON		
440884	03U121		ON	MON		
440896	03U124		ON	MON	✓	
440886	03U129		ON	MON		
	03U301	SC-1	ON	REM		
508122	03U314	SC-2	ON	REM		
	03U315	SC-3		REM		
453822	03U316	SC-4	ON	REM		
453821	03U317	SC-5	ON	REM		
114410	03U521		OFF	MON		
242132	03U647	OW517U3	ON	MON		
242133	03U648	OW518U3	ON	MON		
421426	03U658	OW528U3	ON	MON		
421425	03U659	OW529U3	ON	MON		
421438	03U671	PO-1	ON	MON		
421440	03U672	PD2U3	OFF	MON		
421441	03U673	PD3U3	OFF	MON		
	03U674	OW541U3	ON	MON		
	03U675					
	03U676	OW543U3	ON	MON		
426848	03U701	701U3	ON	MON		
426850	03U702	702U3	ON	MON		
426878	03U703	703U3		MON		
426883	03U704	704U3	ON	MON		
426884	03U705	705U3	ON	MON		
426885	03U706	706U3	ON	MON		
426886	03U707	707U3	ON	MON		
426879	03U708	708U3	ON	MON		
426881	03U709	709U3	ON	MON		
434032	03U710	71OU3	ON	MON		
434033	03U711	711U3	OFF	MON		
453833	03U715	SM1	ON	MON		
453834	03U716	SM2	ON	MON		
236449	03U801	T1U3	OFF	MON		
236453	03U803	T3U3	OFF	MON		421434
236455	03U804	T4U3	OFF	MON		421433
236458	03U805	T5U3	OFF	MON		421432
236461	03U806	T6U3	OFF	MON		421431
426808	03U811	H1U3	OFF	TEST		
426862	03U815	H5U3	OFF	TEST	✓	
426810	03U821	NW1U3	OFF	TEST		
426812	03U822	NW2U3	OFF	TEST		

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TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426814	03U824	NW4U3	OFF	TEST	✓	
426863	03U831	OM1U3	OFF	TEST		
426864	03U832	OM2U3	OFF	TEST	✓	
508118	04J077		ON	MON		
508117	04J702		ON	MON		
453829	04J708		ON	MON		
453830	04J713		ON	MON		
706043	04J822		OFF	MON		
508120	04J714		ON	MON		
482709	04J834		OFF	MON		
482708	04J835		OFF	MON		
596629	04J836	MW-2	OFF	MON		
596631	04J837	MW-4	OFF	MON		
596633	04J838	MW-6	OFF	MON		
596635	04J839	MW-8	OFF	MON		
706045	04J847		OFF	MON		
706044	04J840		OFF	MON		
524051	04J864	324J	OFF	MON		
524048	04J866	326J	OFF	MON		
482707	04J882		OFF	MON		
234138	04U001	S1U4	ON	MON		
234194	04U002	S2U4	ON	MON		
234193	04U003	S3U4	ON	MON		
234195	04U007	S7U4	ON	MON		
234196	04U012	S12U4	ON	MON		
234197	04U020	S20U4	ON	MON		
242138	04U027	S27U4		MON		
426877	04U077	ST77U4	ON	MON		
508115	04U322	322U4	OFF	MON		
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON		
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND		
426867	04U673	PD3U4	OFF	TEST		
426849	04U701	701U4	ON	MON		
426876	04U702	702U4	ON	MON		
426880	04U708	708U4	ON	MON		
426882	04U709	709U4	ON	MON		
434031	04U711	711U4	OFF	MON		
508119	04U713		ON	MON		
453832	04U714		ON	MON		
236450	04U802	T2U4	OFF	MON		
236464	04U806	T6U4	OFF	MON		421428
426811	04U821	NW1U4	OFF	TEST		
426866	04U832	OM2U4	OFF	TEST		
519957	04U833		OFF	MON		
519836	04U834		OFF	MON		
596628	04U836	MW-1	OFF	MON		
596630	04U837	MW-3	OFF	MON		
596632	04U838	MW-5	OFF	MON		
596634	04U839	MW-7	OFF	MON		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
426851	04U841	301U4	OFF	TEST		
	04U842			MON		
426853	04U843	303U4	OFF	TEST		
426854	04U844	304U4	OFF	TEST		
426855	04U845	305U4	OFF	MON		
426856	04U846	306U4	OFF	MON		
426857	04U847	307U4	OFF	MON		
416078	04U848	308U4	OFF	TEST		
416082	04U849	309U4	OFF	MON		
416200	04U850	310U4	OFF	MON		
406198	04U851	311U4	OFF	MON		
416080	04U852	312U4	OFF	MON		
439701	04U854	314U4	OFF	MON		
426860	04U855	315U4	OFF	MON		
434036	04U859	319U4	OFF	MON		
434035	04U860	320U4	OFF	MON		
434034	04U861	321U4	OFF	MON		
471394	04U863	323U4	OFF	MON		
524050	04U864	324U4	OFF	MON		
524047	04U865	325U4	OFF	MON		
524049	04U866	326U4	OFF	MON		
447889	04U871	401U4	OFF	MON		
447988	04U872	402U4	OFF	MON		
447898	04U875	405U4	OFF	MON		
447896	04U877	407U4	OFF	MON		
447900	04U879	409U4	OFF	MON		
447895	04U880	410U4	OFF	MON		
447891	04U881	411U4	OFF	MON		
447890	04U882	412U4	OFF	MON		
447892	04U883	413U4	OFF	MON		
236468	PJ#003	S3PJ	ON	MON		
	PJ#006		ON	MON		
236469	PJ#027	S27PJ	ON	MON		
235565	PJ#074	S74PJ		MON	✓	
453825	PJ#309	B8	ON	REM		
453826	PJ#310	B9	ON	REM		
453827	PJ#311	B10	ON	REM		
453828	PJ#313	B12	ON	REM		
447894	PJ#318	318U4	OFF	MON		
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.	✓	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND	✓	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND	✓	
206724	PJ#504	TWIN CITIES ARSENAL	OFF	ABAND	✓	
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM	✓	
236437	PJ#802	T2PJ	OFF	MON		421437
236465	PJ#806	T6PJ	OFF	MON		421427

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
107405		ROEBKE	OFF	UN		
110485		NEW BRIGHTON #12	OFF	MUNI		
122210		ST. PAUL PORT AUTH. #3	OFF	IND		
127537		MIDWEST ASPHALT	OFF	DOM		
134318		LORENZ W SEUTTER	OFF	DOM		
139035		WATERGATE MARINA	OFF	P.S.		
151568		ARDEN MANOR MOBILE HOME	OFF	P.S.		
161432		NEW BRIGHTON #10	OFF	MUNI		
191942		118PDC/MODEL STONE	OFF	MON		
200070		RUAN TRANSPORT	OFF	COM	✓	
200071		PRESTRESSED CONCRETE	OFF	IND	✓	
200072		WITTE TRANSPORTATION	OFF	IND	✓	
200073		WILSON TRANSFER & STORAGE	OFF	IND		
200074		ASBESTOS PROD	OFF	IND	✓	
200075		PHILLIPS PETROLEUM	OFF	IND	✓	
200076		OLD DUTCH FOODS INC	OFF	IND		
200077		JOHN CONLIN	OFF	DOM	✓	
200078		WILLIAM CLASS	OFF	DOM		
200079		LAWRENCE SCHOENING	OFF	DOM		
200080		CARL A OSTROM & SON	OFF	DOM		
200081		A. O. LIEBIG	OFF	DOM		
200082		2196 MARION ROAD	OFF	DOM		
200148		PAPER CALMERSON	OFF	IND	✓	
200154		U OF M GOLF COURSE	OFF	IRR		
200167		KOPPERS COKE #1	OFF	IND		
200171		PLATING INC	OFF	IND		
200197		SNOW FLAKE DAIRY	OFF	COM		
200264		1620 CENTRAL	OFF	IND		
200384		METALLURGICAL INC. WELL #1	OFF	IND		
200524		ST. ANTHONY #5	OFF	MUNI		
200525		PLETSCHER	OFF	UN		
200531		NAZARETH	OFF	UN		
200599		CEDAR AVE. TRIANGLE	OFF	P.S.		
200602		ATKINSON MILL CO.	OFF	IND		
200629		GENERAL MILLS	OFF	IND		
200803		ST. ANTHONY #4	OFF	P.S.		
200804		ST. ANTHONY #3	OFF	MUNI		
200812		GROSS GOLF COURSE #1	OFF	COM		
200814		AMERICAN LINEN	OFF	IND		
201074		GLEASSON MORTUARY	OFF	COM		
201082		NORTHWESTERN HOSPITAL	OFF	P.S.		
206669		FRIDLEY #8	OFF	MUNI		
206672		FRIDLEY #9	OFF	MUNI		
206673		FRIDLEY #6	OFF	MUNI		
206688		CLOVERPOND WELL	OFF	DOM		
206689		JAMES K. O'NEIL	OFF	UN		
206693		FERNELIUS	OFF	UN		
206702		MINN E.S.	OFF	UN		
206720		MOUNDSVIEW	OFF	MUNI		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
206722		M0UNDSVIEW #5	OFF	MUNI		
206750		SHORE #4	OFF	MUNI		
206787		MOUNDSVIEW H.S.	OFF	P.S.		
206789		NEW BRIGHTON #1	OFF	MUNI	✓	
206791		NEW BRIGHTON #7	OFF	MUNI		
206792		NEW BRIGHTON #4				
206793		NEW BRIGHTON #3	OFF	MUNI		
206794		NEW BRIGHTON #9	OFF	MUNI		
206795		NEW BRIGHTON #8	OFF	MUNI		
206796		NEW BRIGHTON #5	OFF	MUNI		
206797		NEW BRIGHTON #6	OFF	MUNI		
206798		NEW BRIGHTON #2	OFF	MUNI	✓	
223844		KURTH MALTING CO EAST WL	OFF	IND		
223992		BOOM ISLAND	OFF	IND		
225886		FRANKLIN STEEL SQUARE	OFF	P.S.		
225905		ST PAUL TERM. WAREHOUSE	OFF	IND		
225906		ST PAUL TERM. WAREHOUSE	OFF	IND		
231741		LABELLE	OFF	UN		
231845		MNDOT CIVIL DEFENSE TRAIN.	ON/OFF	P.S.		
231878		MENGELKOCH #2	OFF	UN		
232067		NBR 135	OFF	UN		
232069		UHIL	OFF	UN		
233221		REUBEN MEAT	OFF	DOM		
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓	
233241		KOZAH'S MARKET	OFF	UN	✓	
233520		MCGILLIS	OFF	UN		
233533		ROSELAWN CEMETARY	OFF	IRR		
233763		P. L. MORGAN	OFF	DOM		
233806		2581 NORTH CLEVELAND	OFF	DOM		
234301		DEWITT	OFF	UN	✓	
234305		GLENN BEGGIN	OFF	UN		
234319		HIDE & TALLOW #1	OFF	UN		
234327		BRESKE	OFF	UN		
234335		MENGELKOCH #1	OFF	UN		
234337		MENGELKOCH #3	OFF	UN	✓	
234350		GORDON	OFF	UN		
234351		YEMPA	OFF	UN		
234352		1206 12TH AV NW	OFF	UN	✓	
234353		LENTSCH'S ICE WK.	OFF	UN		
234355		KINGDOM HALL	OFF	UN		
234356		NORDQUIST P43	OFF	UN		
234357		PHILLIPS PET P46	OFF	UN		
234386		ZELL OLS.	OFF	UN		
234391		SHERER L.	OFF	UN		
234396		DEWITT	OFF	UN	✓	
234406		KLAPP	OFF	UN	✓	
234409		HIDE & TALLOW	OFF	UN		
234425		KEN GEREBI	OFF	UN	✓	
234430		CMIEL	OFF	UN	✓	

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
234431		HARSTAD	OFF	UN		
234463		KEN SOLIE	OFF	UN		
234546		HONEYWELL RIDGEWAY	OFF	UN		
234547		HONEYWELL RIDGEWAY	OFF	UN		
234549		REINER	OFF	IRR		
235539		OLD HOTEL	OFF	UN		
235557		HIDDEN FALLS PARK W.WELL	OFF	P.S.		
235619		SHRINERS HOSPITAL	OFF	P.S.		
235735		FLOUR CITY ARCHITECTURAL	OFF	COM		
236122		NWR	OFF	ABAND		
242162		301PB	OFF	UN		
242207		SUNSET MEMORIAL CEMETARY	OFF	UN		
249152		BOYLE	OFF	DOM		
265735		FLOUR CITY ARCH	OFF	UN		
322664		ABBOTT NW HOSP	OFF	UN		
405651		METAL-MATIC INC.	OFF	IND		
409546		PCA2L3	OFF	TEST	✓	
409547		PCA1U4	OFF	TEST		
409548		PCA2U4	OFF	TEST		
409549		PCA3U4	OFF	TEST		
409550		PCA6U3	OFF	TEST		
409555		PCA5U4	OFF	TEST		
409556		PCA4L3	OFF	TEST		
409557		PCA1L3	OFF	TEST		
409595		B109U3	OFF	ABAND		
409596		B118U3	OFF	MON		
409597		B118L3	OFF	IND		
409598		B117U3	OFF	ABAND		
416143			OFF	ABAND		
416198		311U4	OFF	MON		
420713		HERBST LANDFILL	OFF	MON		
476387		MW15H	OFF	MON		
482083		K04-MW	ON	MON		
482084		K02-MW	ON	MON		
482085		K01-MW	ON	MON		
482086		I01-MW	ON	MON		
482087		I05-MW	ON	MON		
482088		I02-MW	ON	MON		
482089		I04-MW	ON	MON		
482090		I03-MW	ON	MON		
509083		NEW BRIGHTON #11	OFF	MUNI		
512761		GROSS GOLF #2	OFF	IRR		
519288		E101-MW	ON	MON		
519289		E102-MW	ON	MON		
519290		E103-MW	ON	MON		
519291		129-1501-MW	ON	MON	✓	
520931		NEW BRIGHTON #13	OFF	MUNI		
554216		NEW BRIGHTON #14	OFF	MUNI		
582628		NEW BRIGHTON #15	OFF	MUNI		

TABLE B-2
TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #
589650		CM1MW	ON	MON		
616601		CM2MW	ON	MON		
616602		CM3MW	ON	MON		
624019		CM5MW	ON	MON		
643379			ON	PIEZ.	✓	
643380			ON	PIEZ.	✓	
643381			ON	PIEZ.	✓	
643382			ON	PIEZ.	✓	
653903		GR1-1	ON	MON		
653904		GR1-2	ON	MON		
653905		GR2-1	ON	MON		
675976		GR-DF1	ON	MON		
		MW15D	OFF	MON		
		MW15S	OFF	MON		

Appendix B: Table B-3

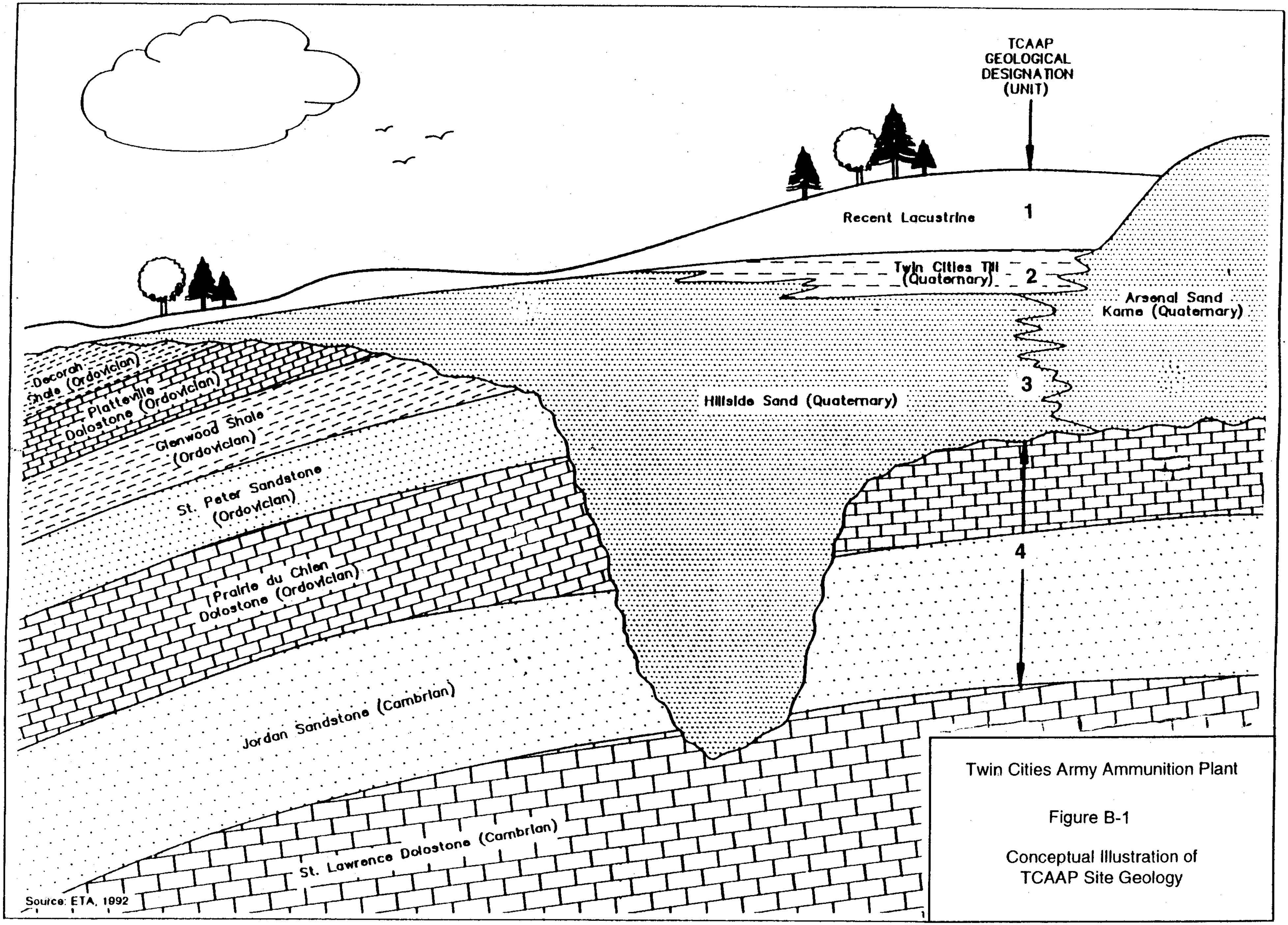
Boring Logs On-TCAAP Wells
Sorted by IRDMIS Number

TCAAP Well Boring Logs are included on this CDROM as Table B-3 and Table B-4

Appendix B: Table B-4

Boring Logs Off-TCAAP Wells
Sorted by IRDMIS Number

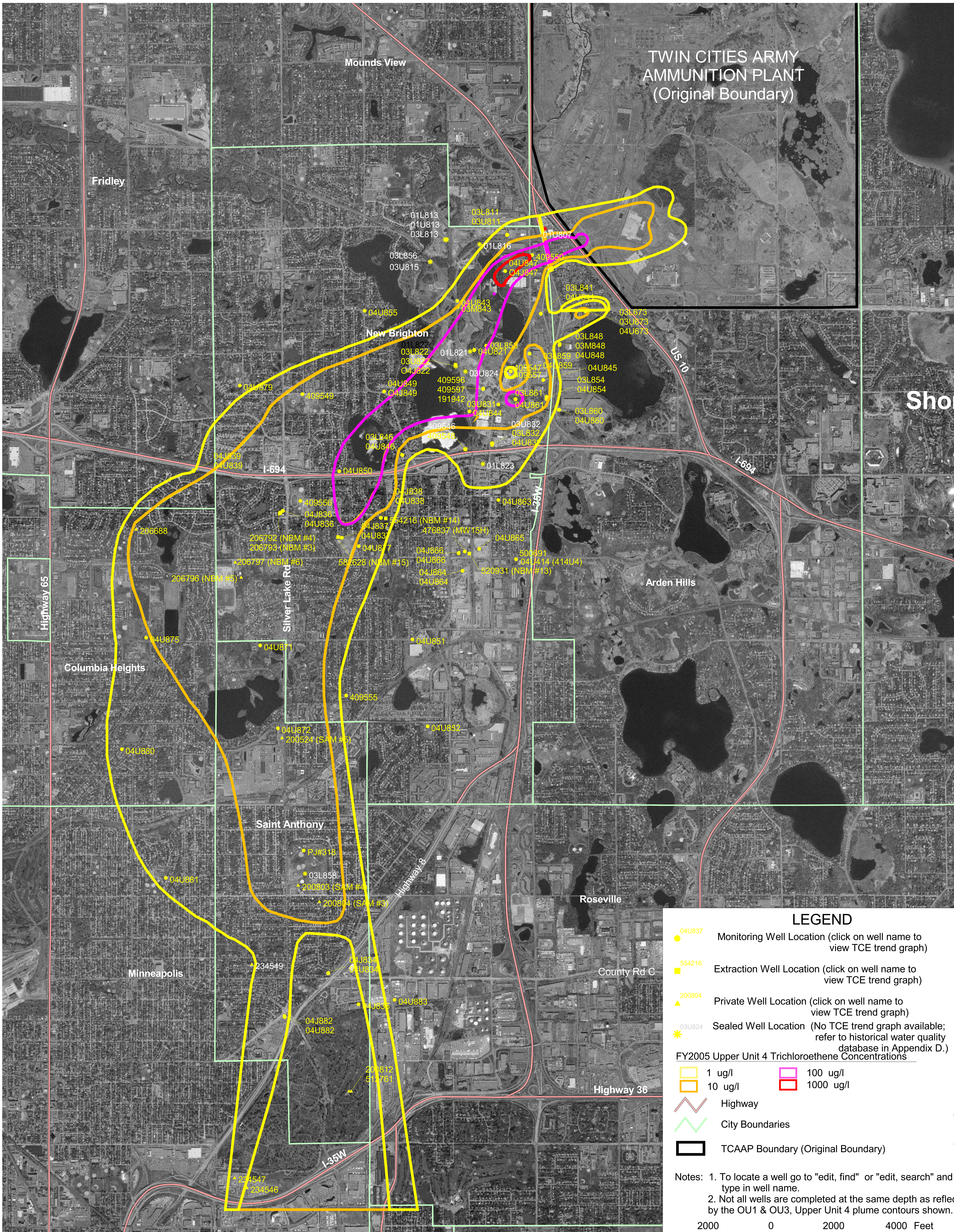
TCAAP Well Boring Logs are included on this CDROM as Table B-3 and Table B-4



Twin Cities Army Ammunition Plant

Figure B-1

Conceptual Illustration of
TCAAP Site Geology



LEGEND

- Monitoring Well Location (click on well name to view TCE trend graph)
- Extraction Well Location (click on well name to view TCE trend graph)
- Private Well Location (click on well name to view TCE trend graph)
- Sealed Well Location (No TCE trend graph available; refer to historical water quality database in Appendix D.)

FY2005 Upper Unit 4 Trichloroethene Concentrations

- 1 ug/l
- 10 ug/l
- 100 ug/l
- 1000 ug/l
- Highway
- City Boundaries
- TCAAP Boundary (Original Boundary)

N

Notes: 1. To locate a well go to "edit, find" or "edit, search" and type in well name.
2. Not all wells are completed at the same depth as reflected by the OU1 & OU3, Upper Unit 4 plume contours shown.

2000 0 2000 4000 Feet

L:\1561\01\Test\05report.apr\figure B-2
Updated: 5/30/07 18:12

TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3 Well Location and TCE History Map

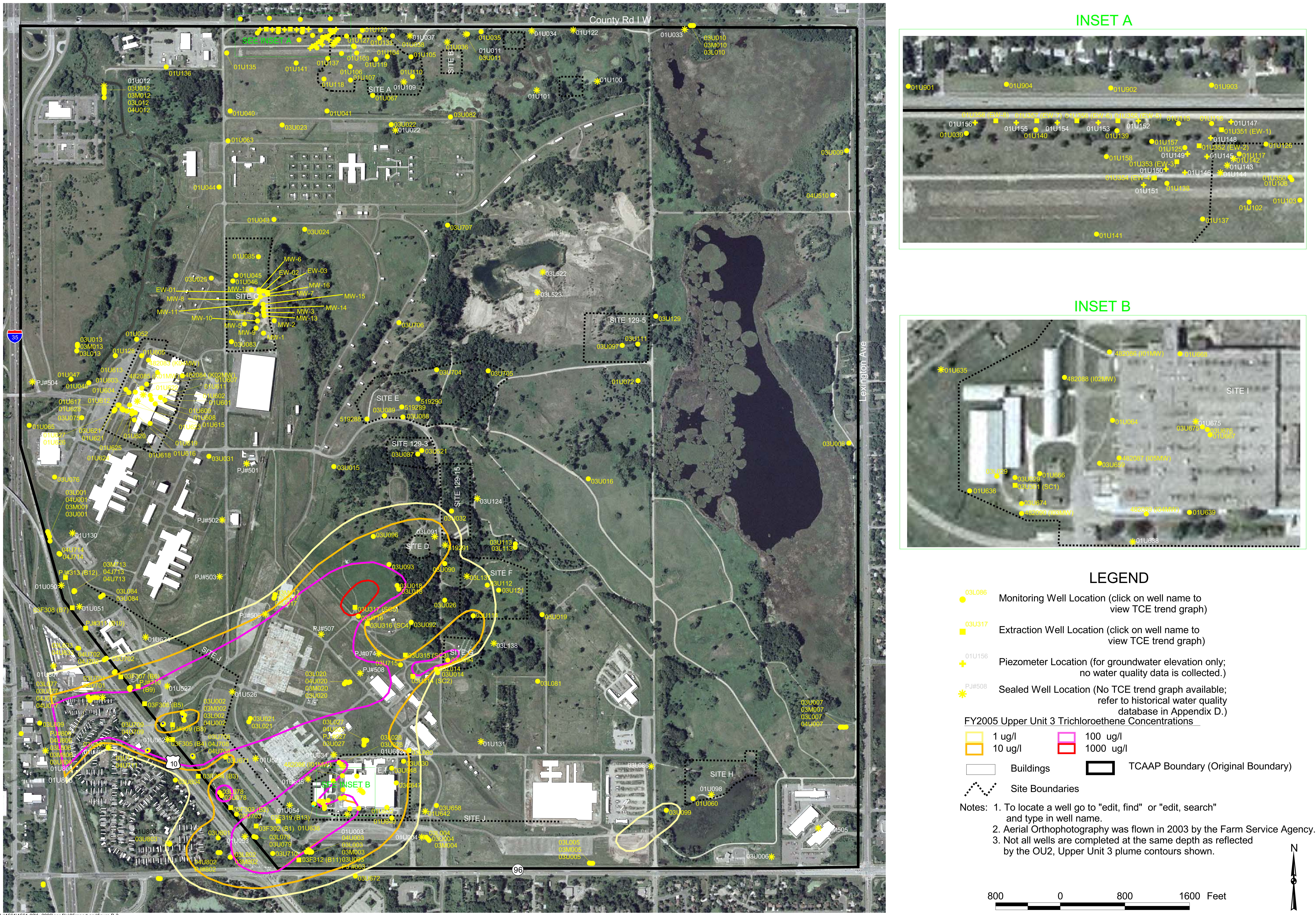
Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2006

Figure B-2



Notes:
1. To locate a well go to "edit, find" or "edit, search" and type in well name.
2. Aerial Orthophotography was flown in 2003 by the Farm Service Agency.
3. Not all wells are completed at the same depth as reflected by the OU2, Upper Unit 3 plume contours shown.

L:\1561\1561-02\fy 2006\apr file\05report.apr\figure B-3

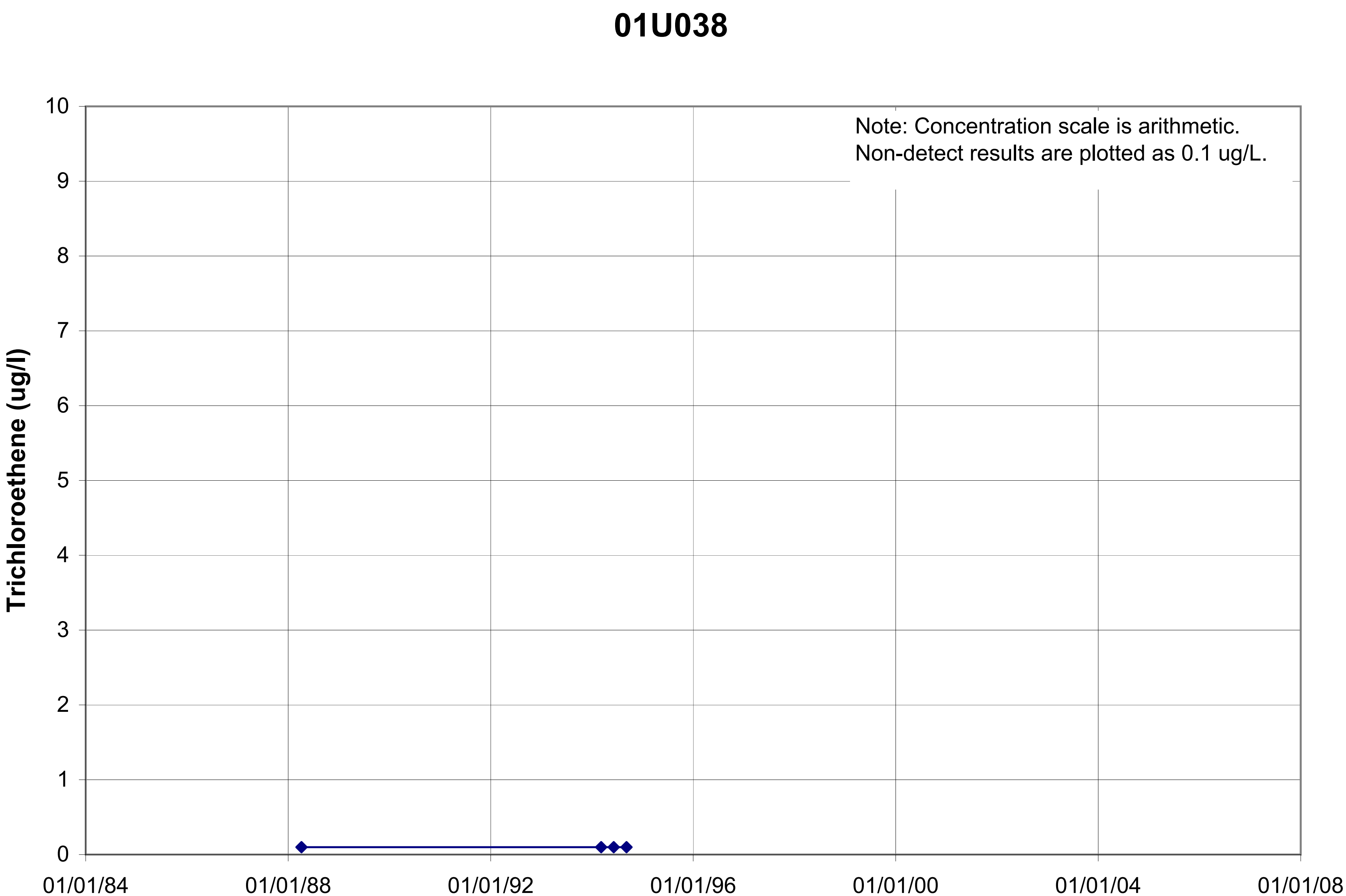
TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2006
OU2 Well Location and TCE History Map		Figure B-3

Trend Graph Not Available,
Well No Longer Routinely Sampled

TO RETURN TO MAP: Click on "Go to Previous View" Button in the Tool Bar

Monitoring Well Has Been Sealed

TO RETURN TO MAP: Click on "Go to Previous View" Button in the Tool Bar



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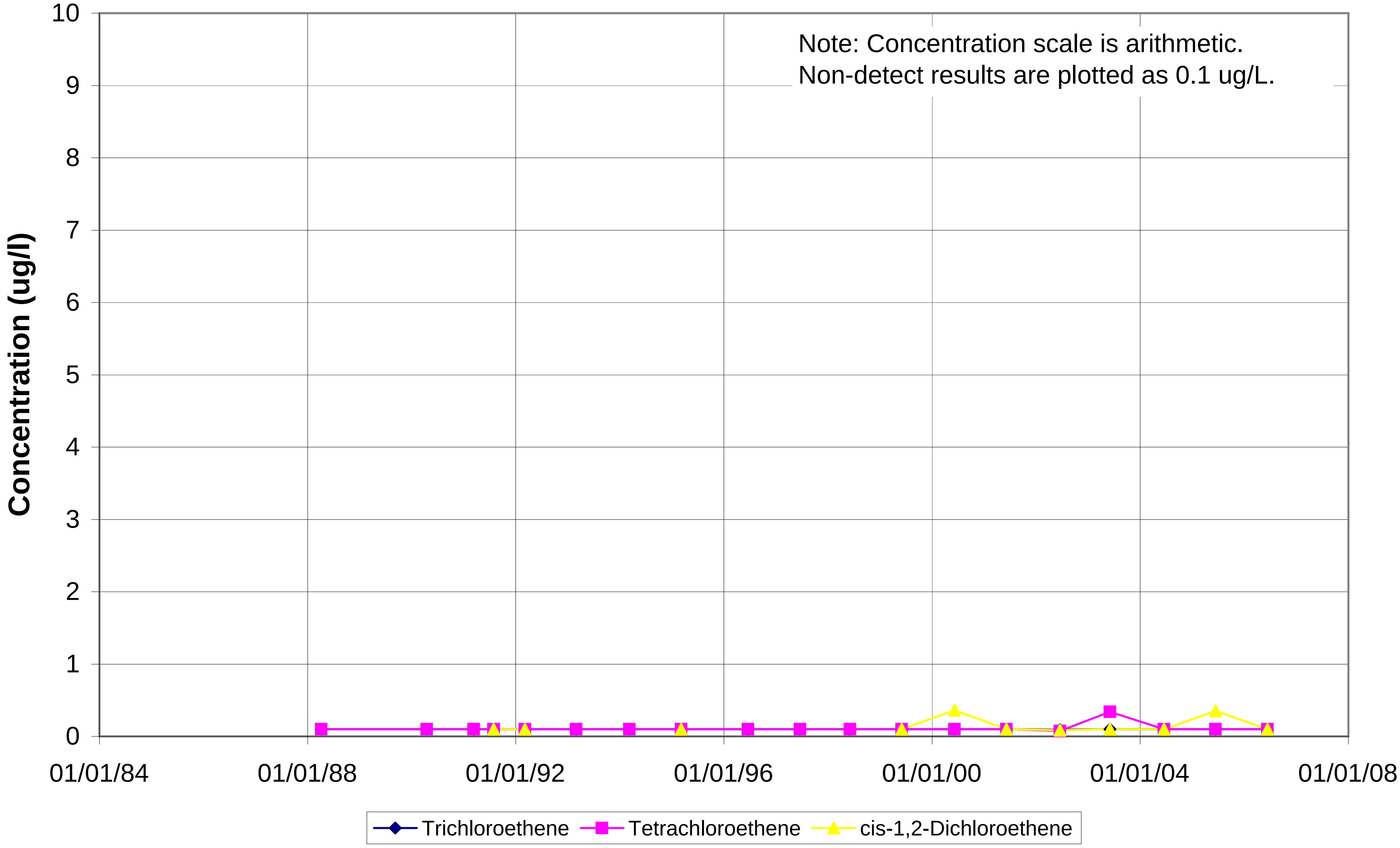
01U039



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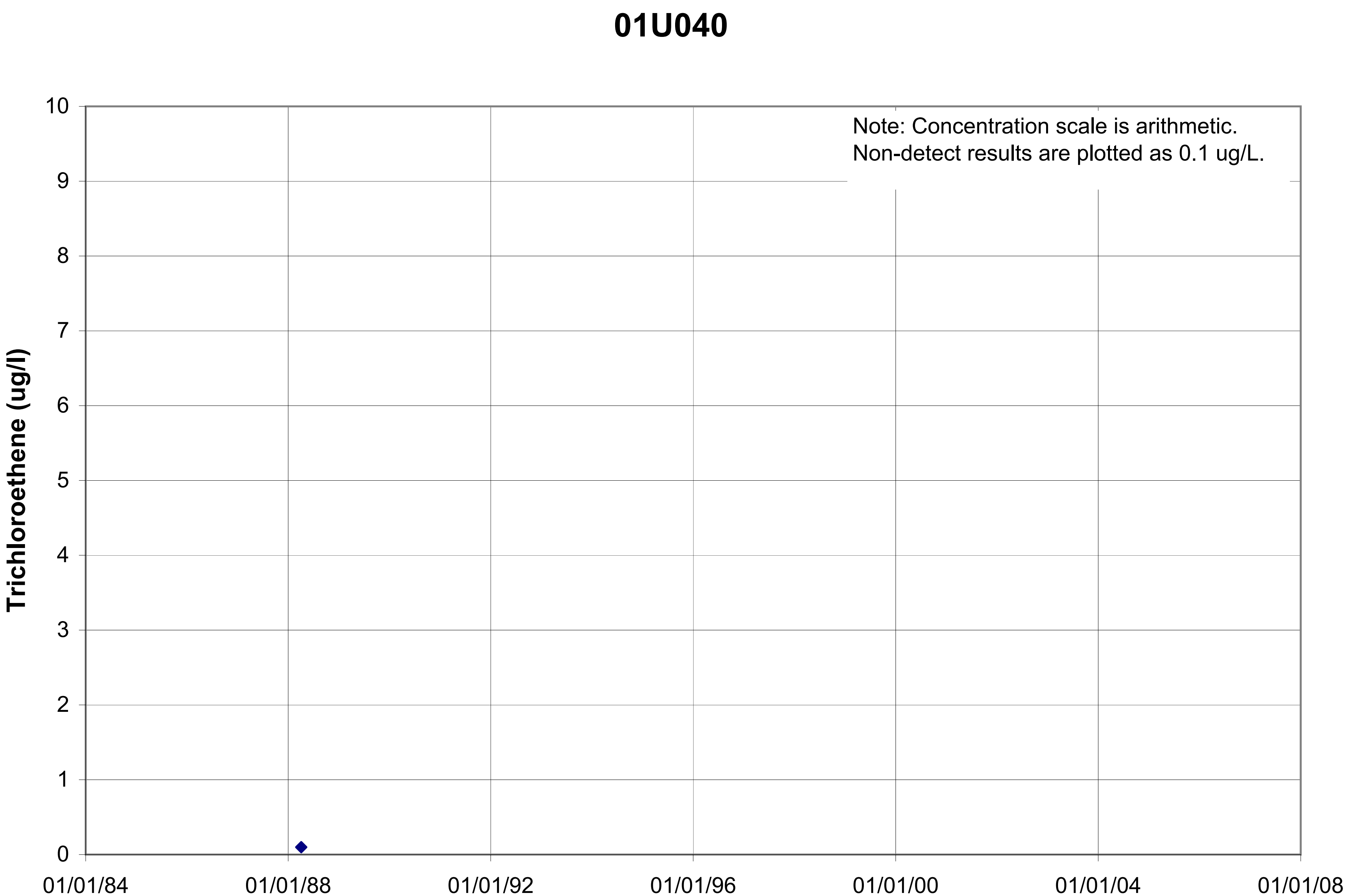

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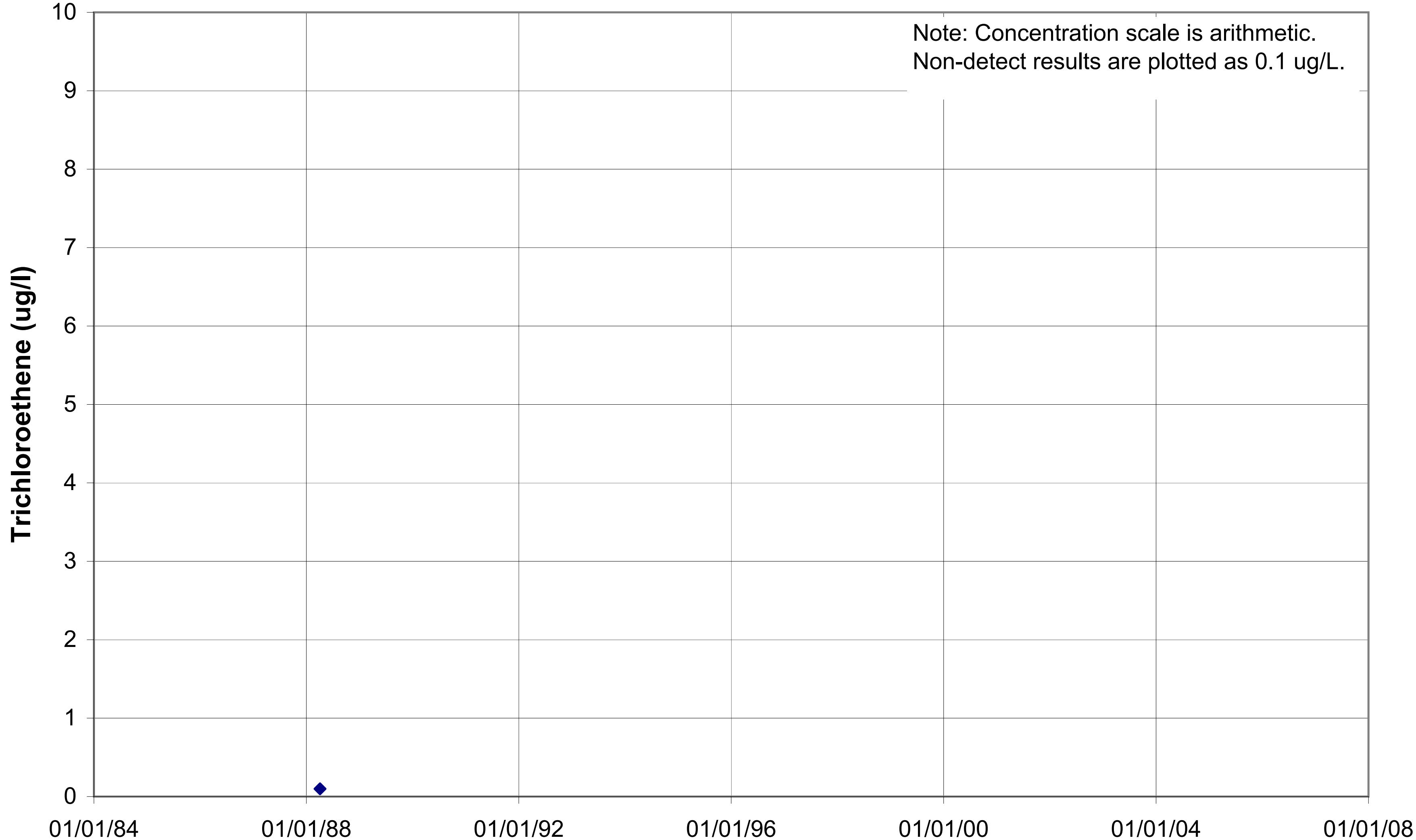

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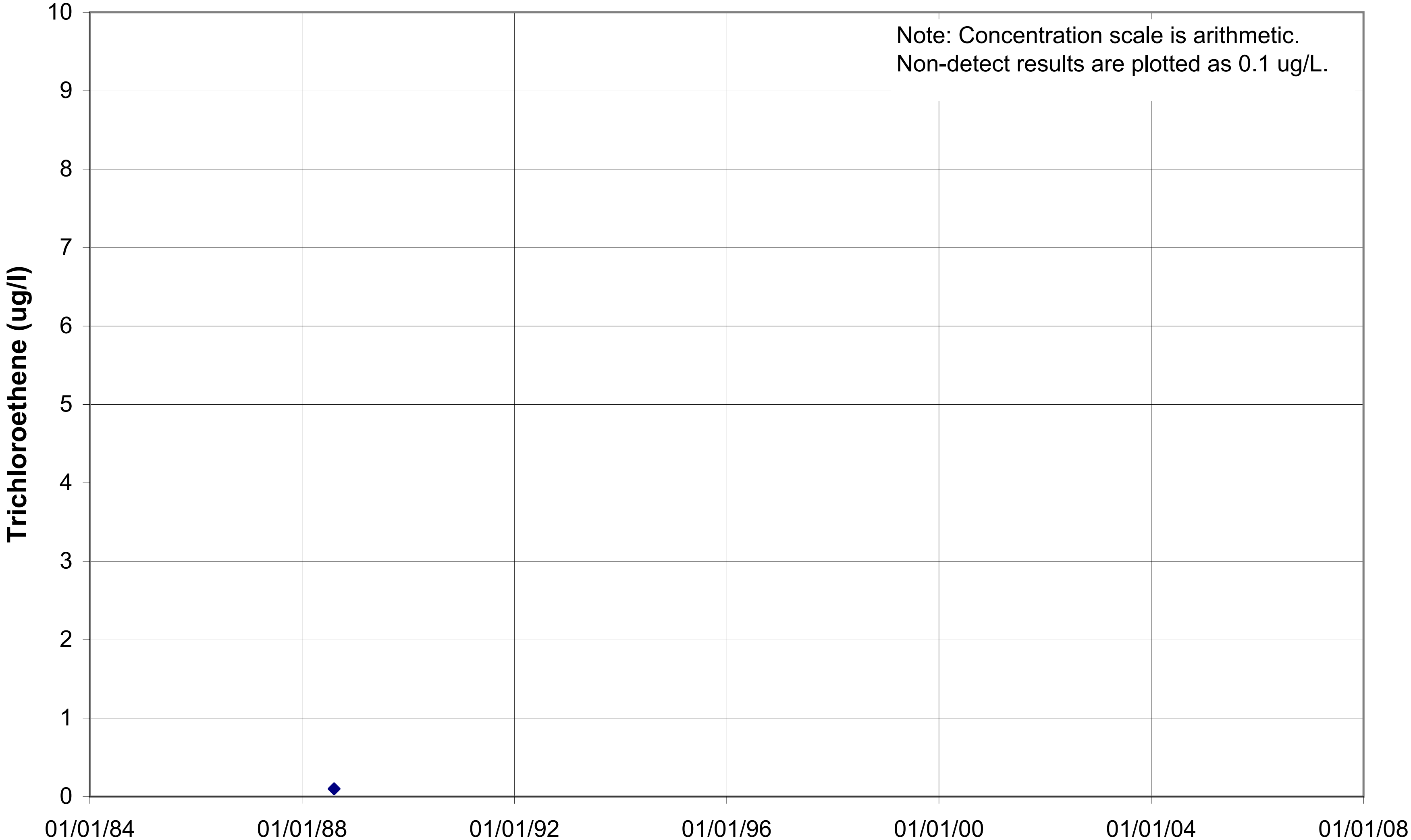

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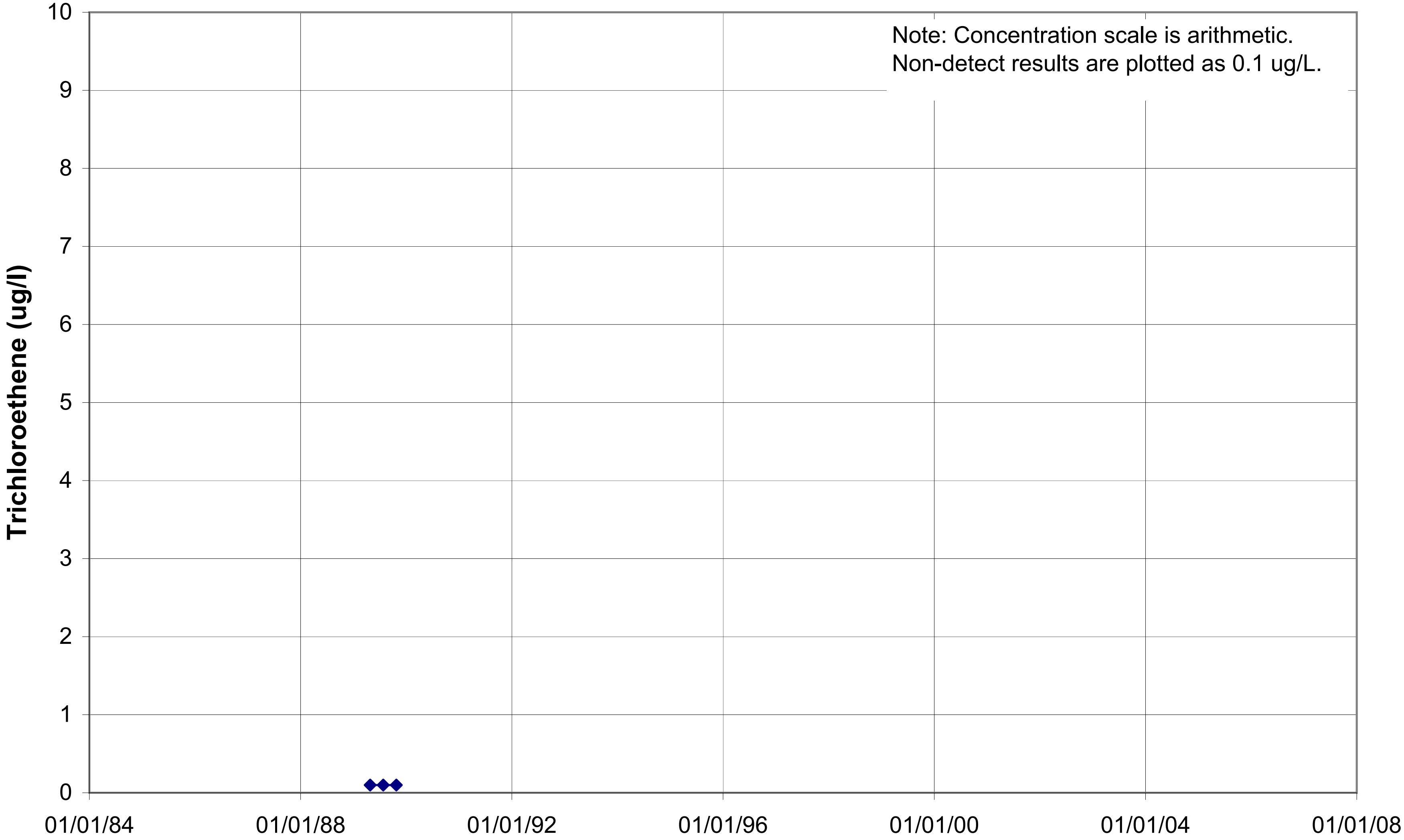

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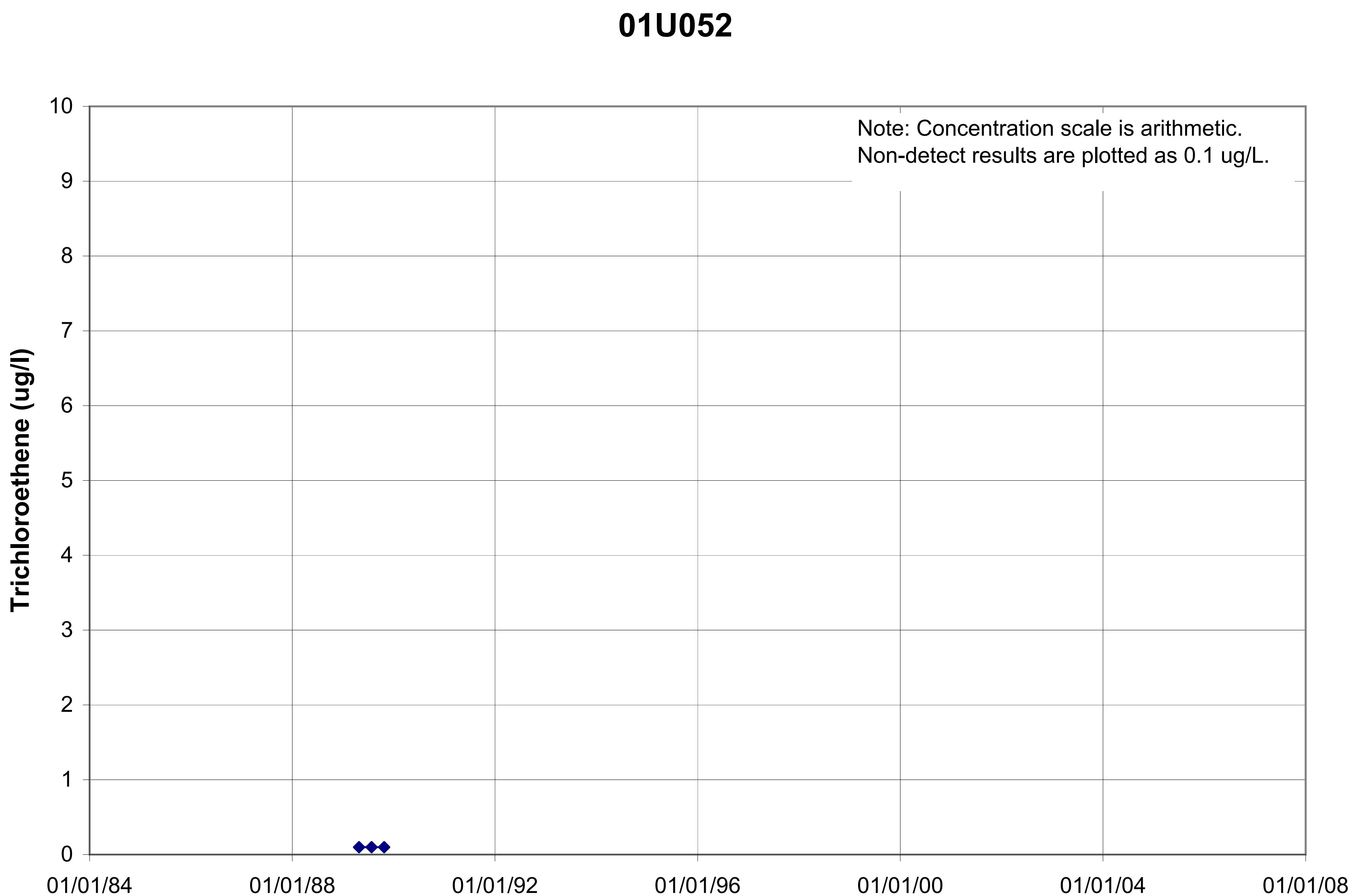

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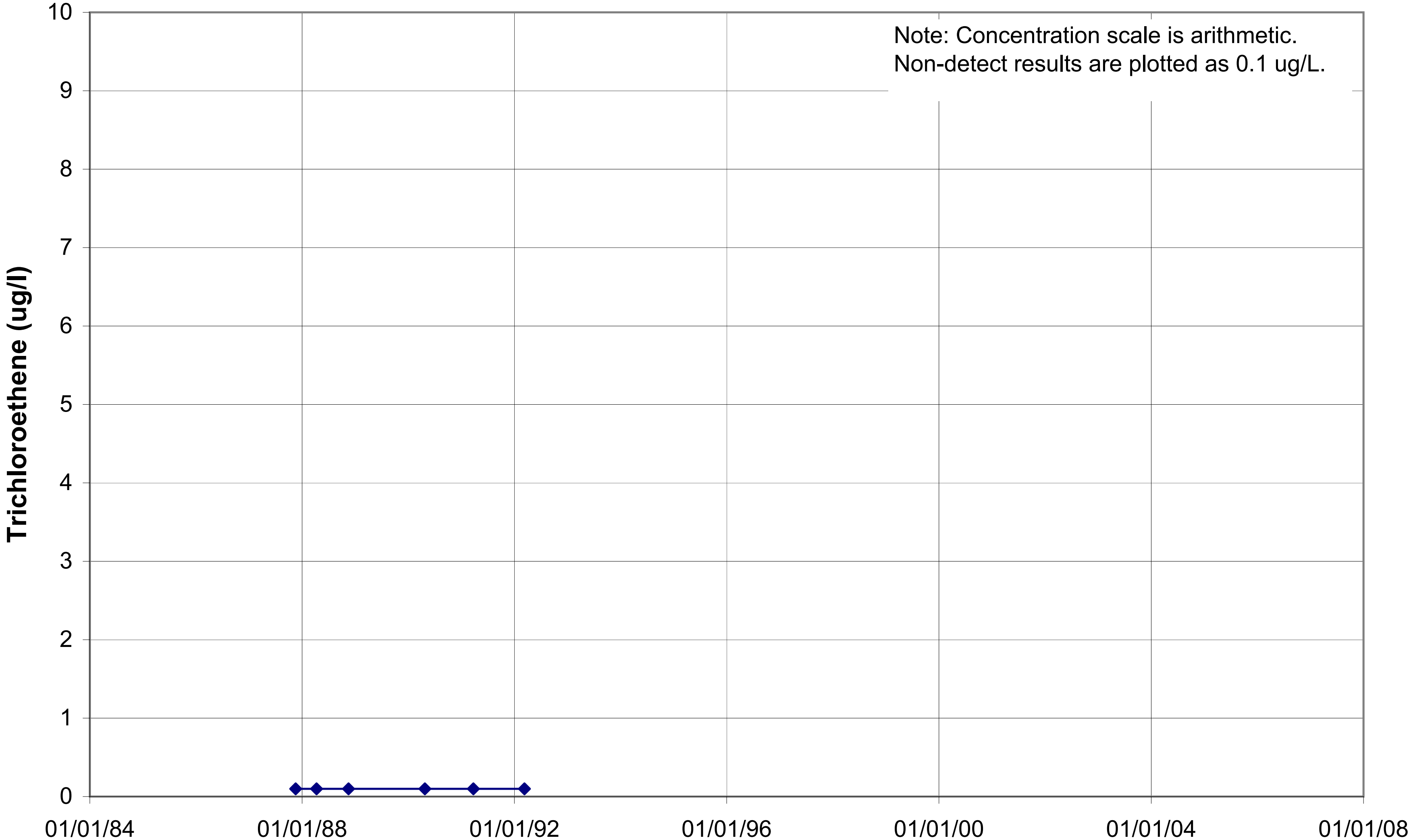

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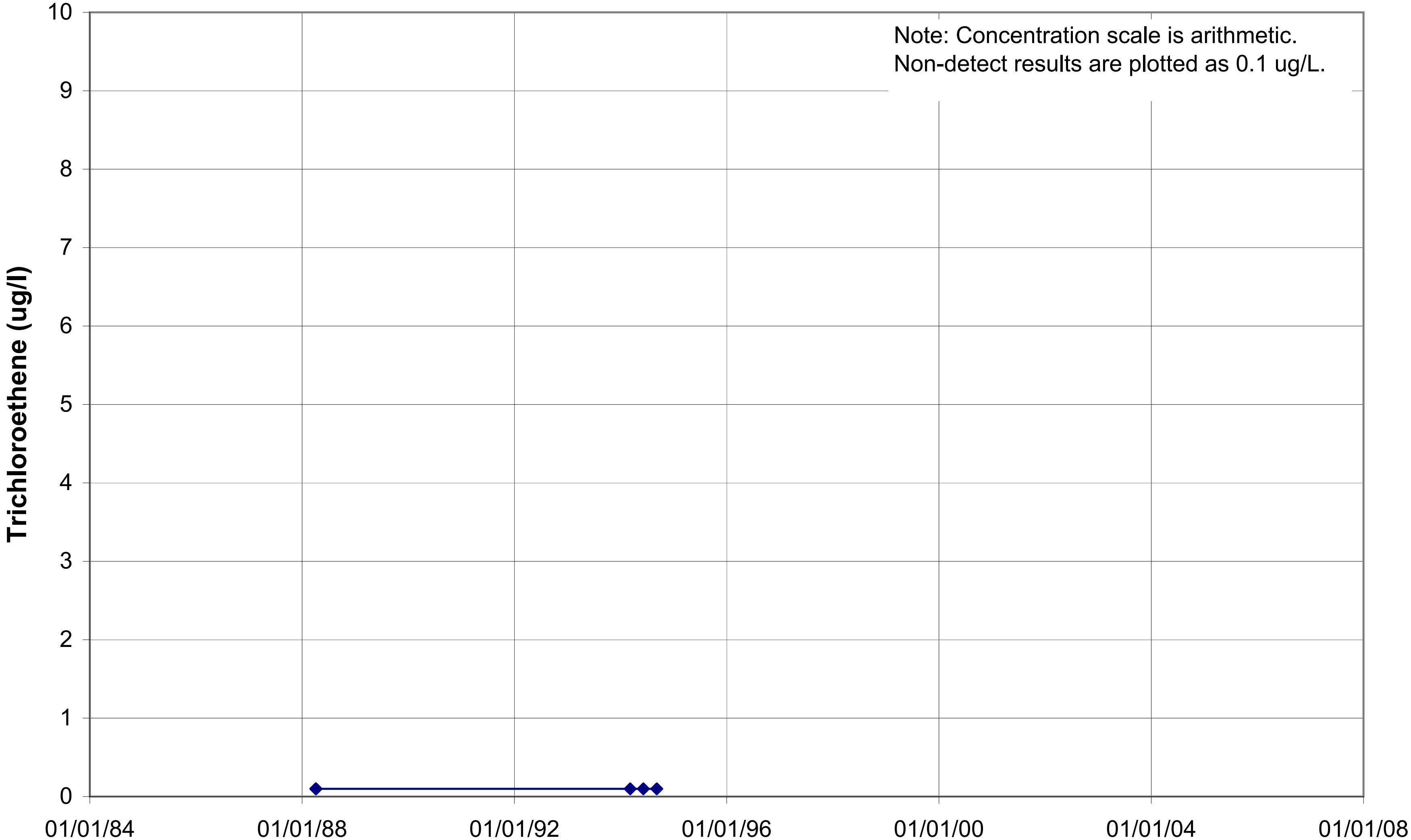

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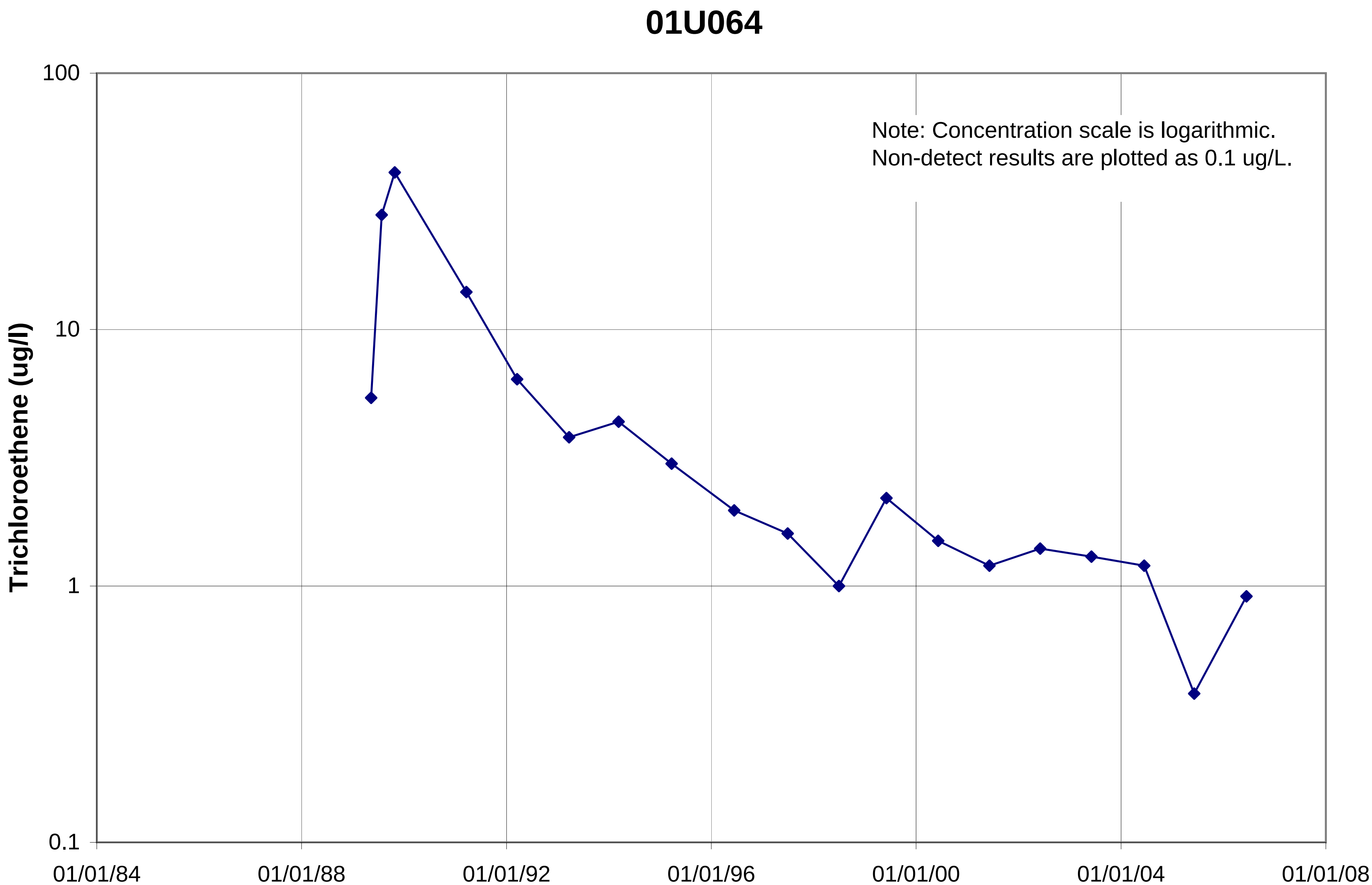

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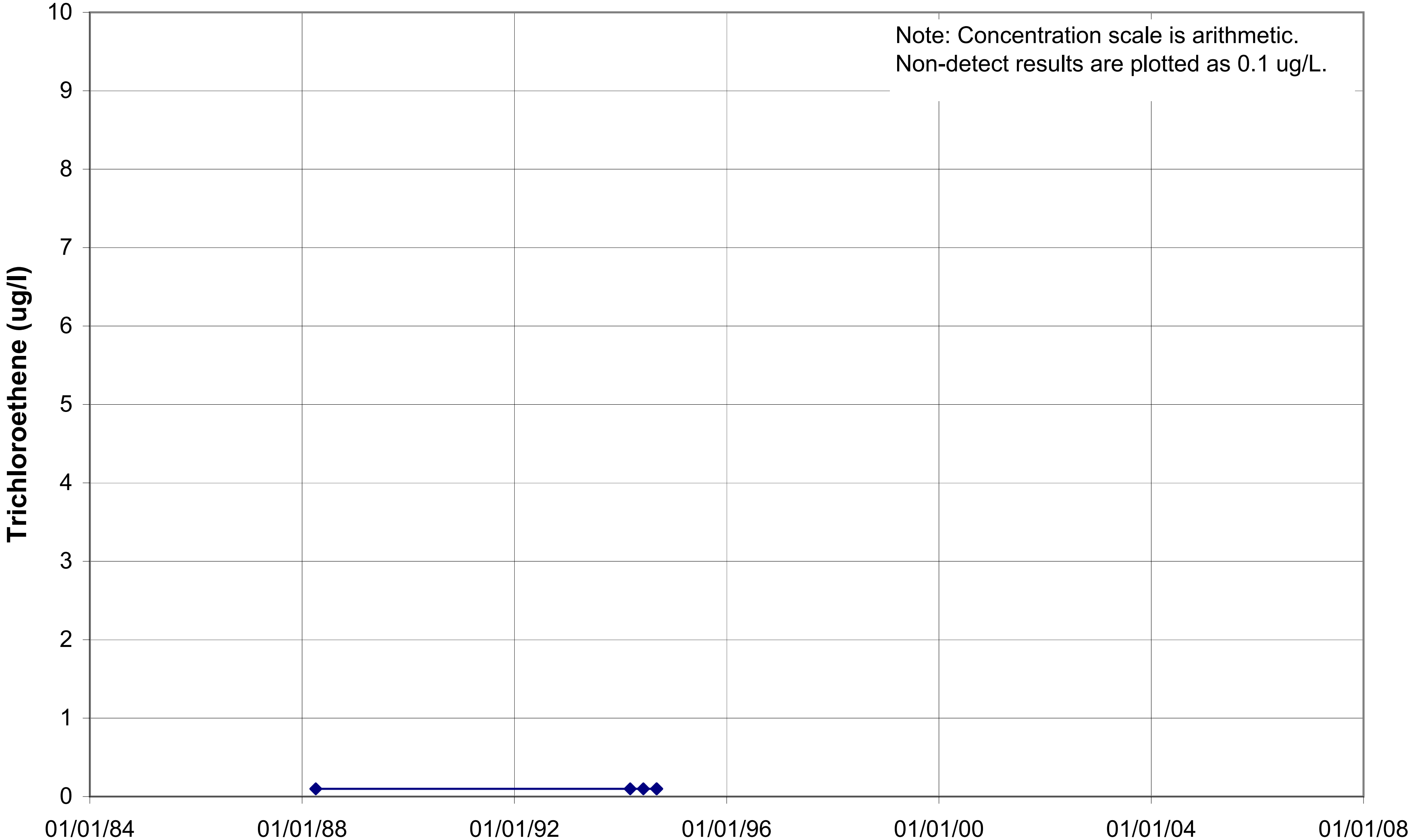

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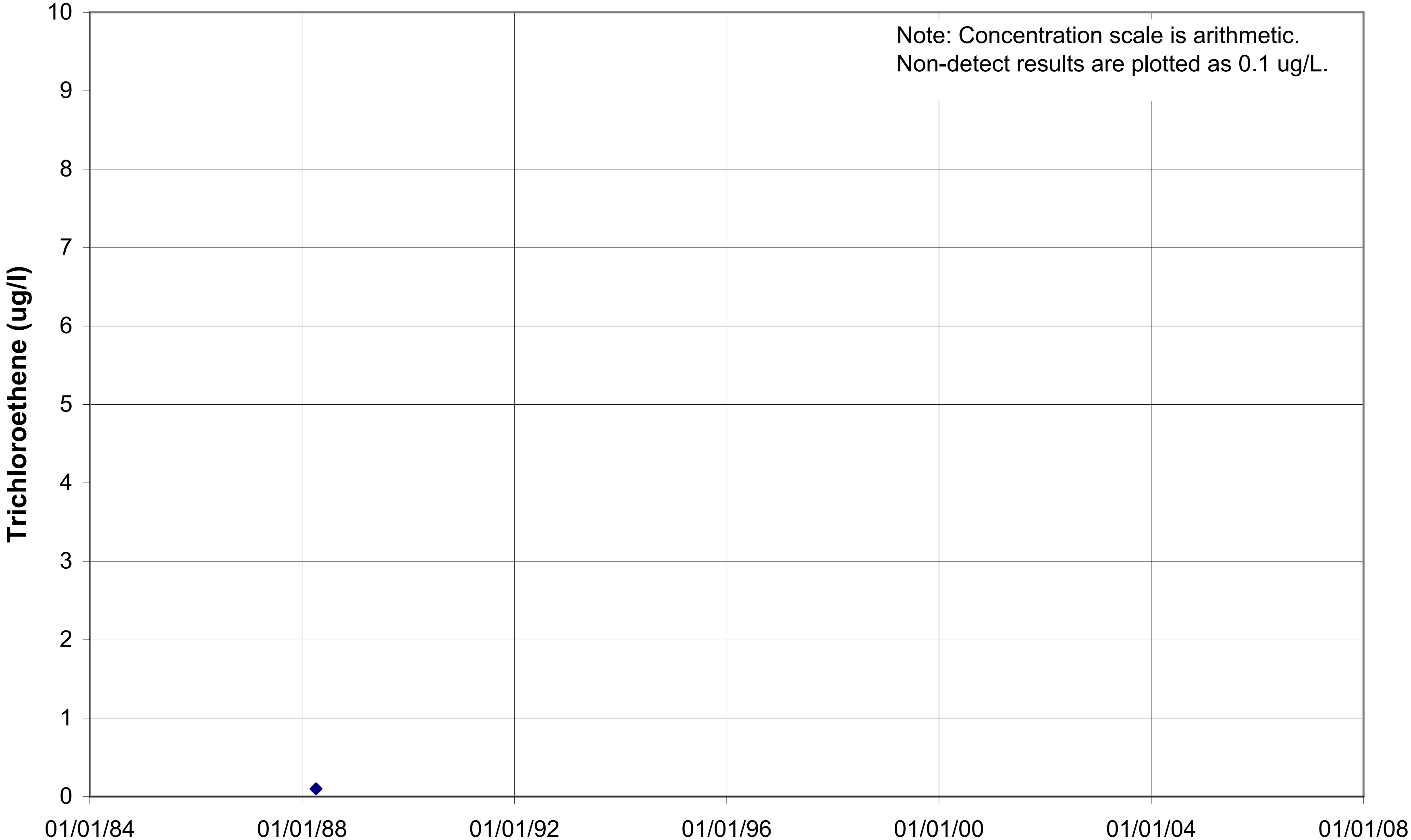

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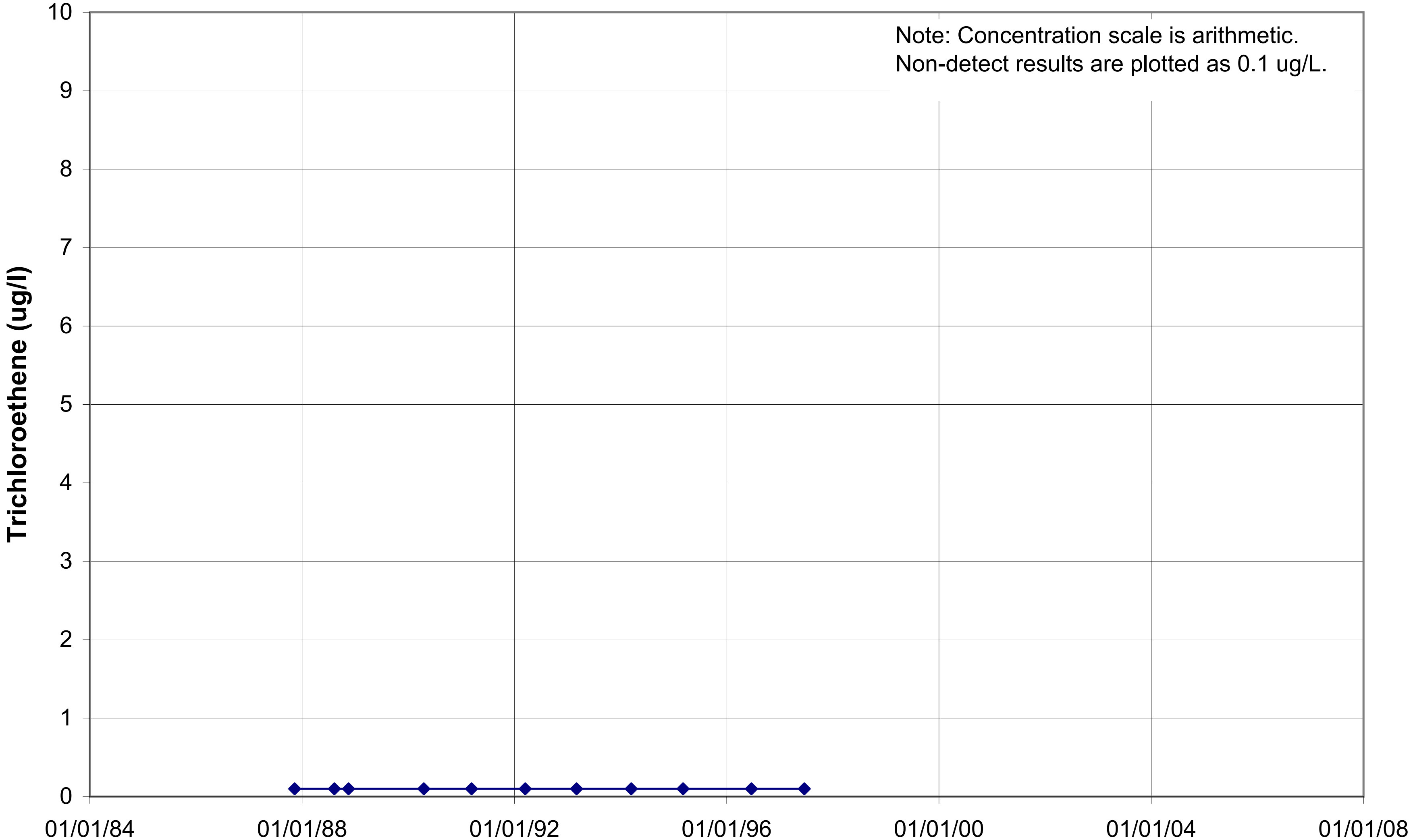

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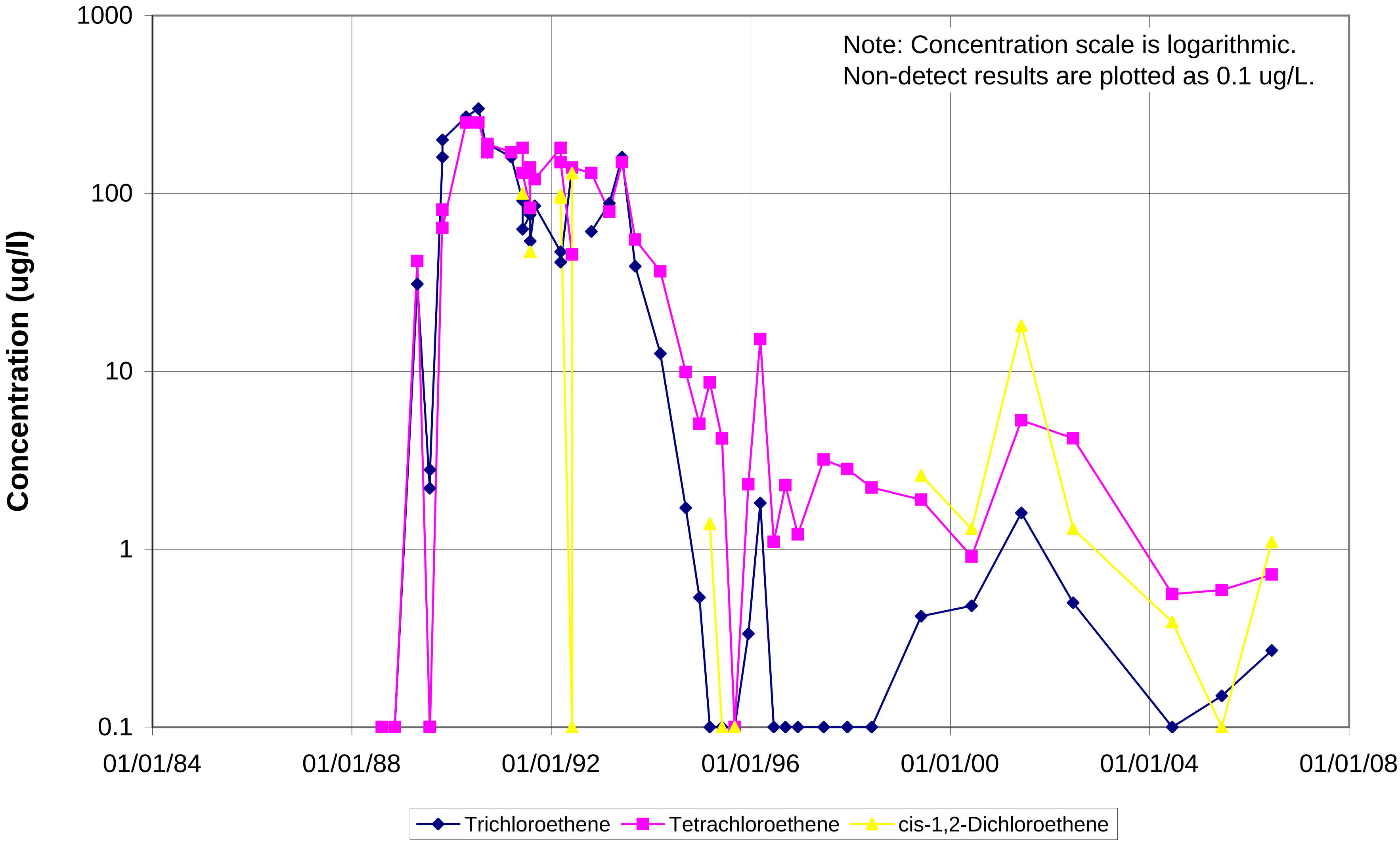

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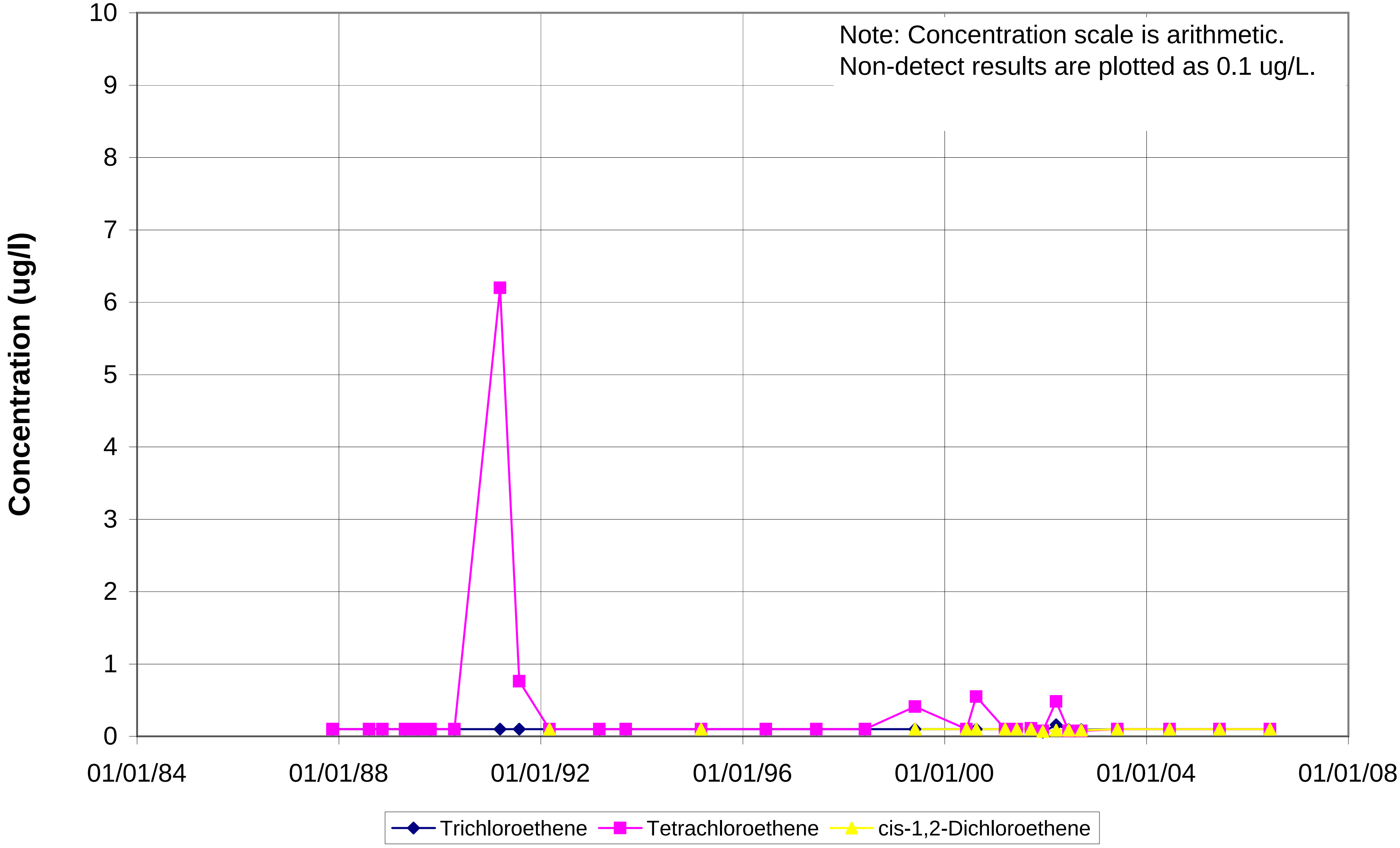

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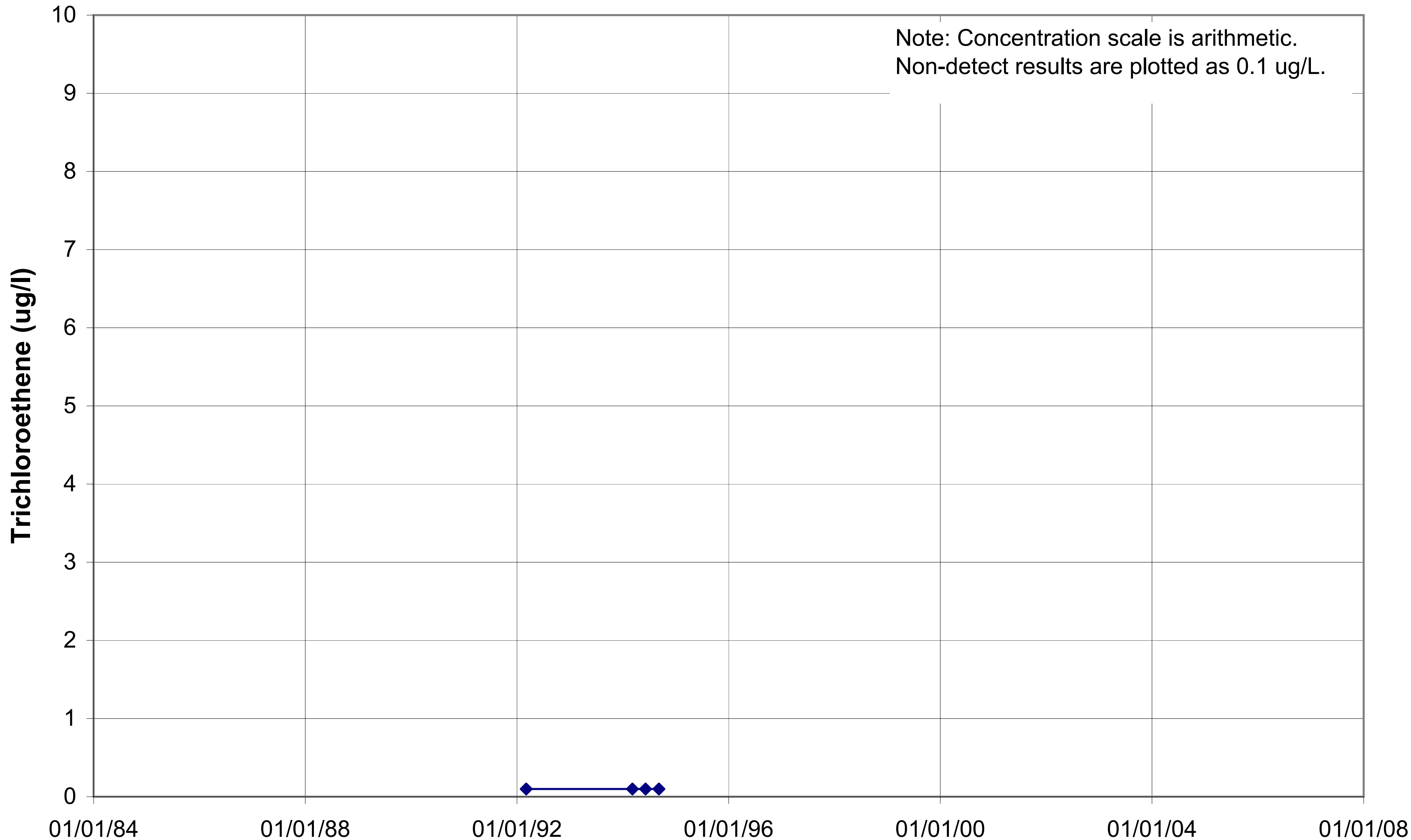

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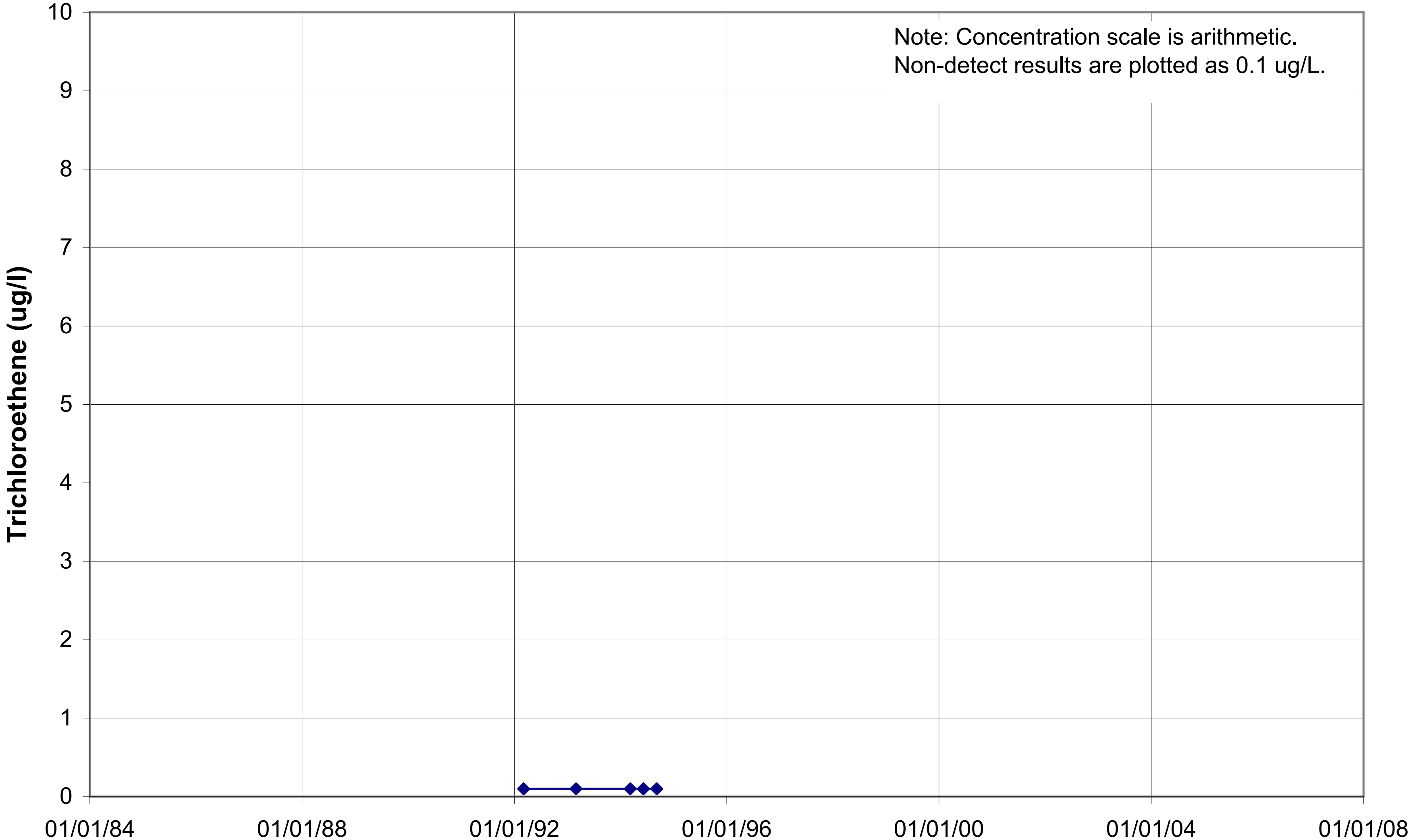

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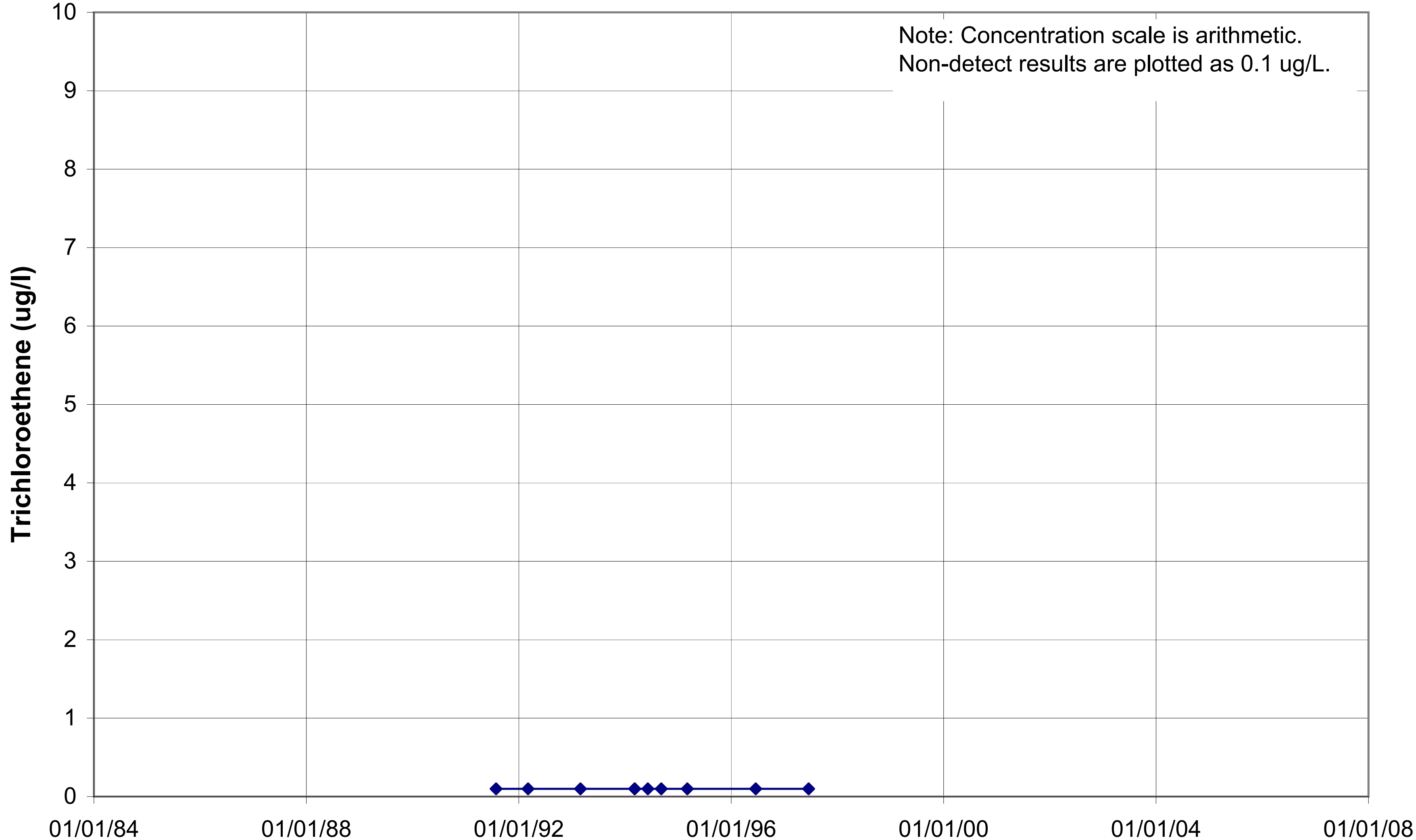

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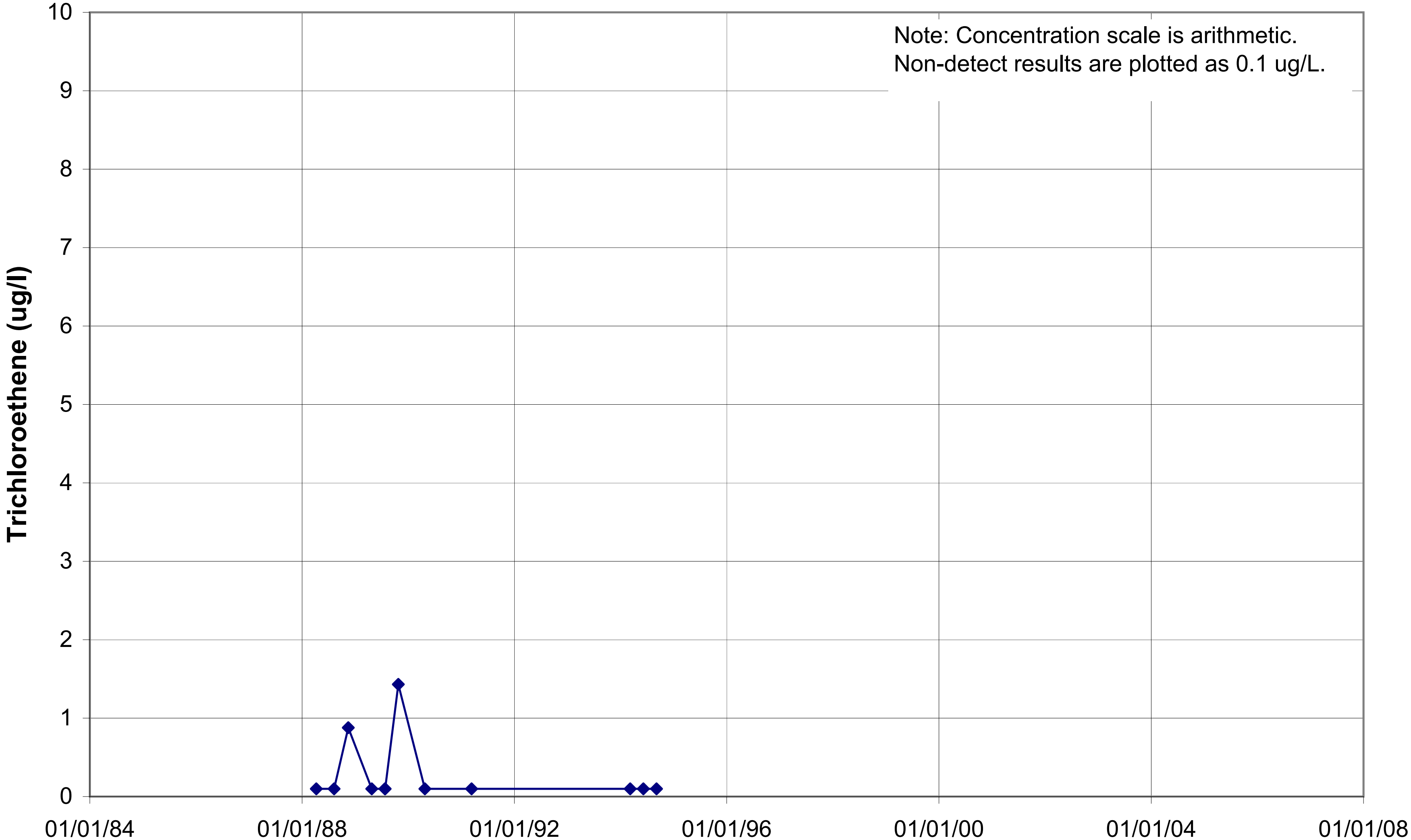

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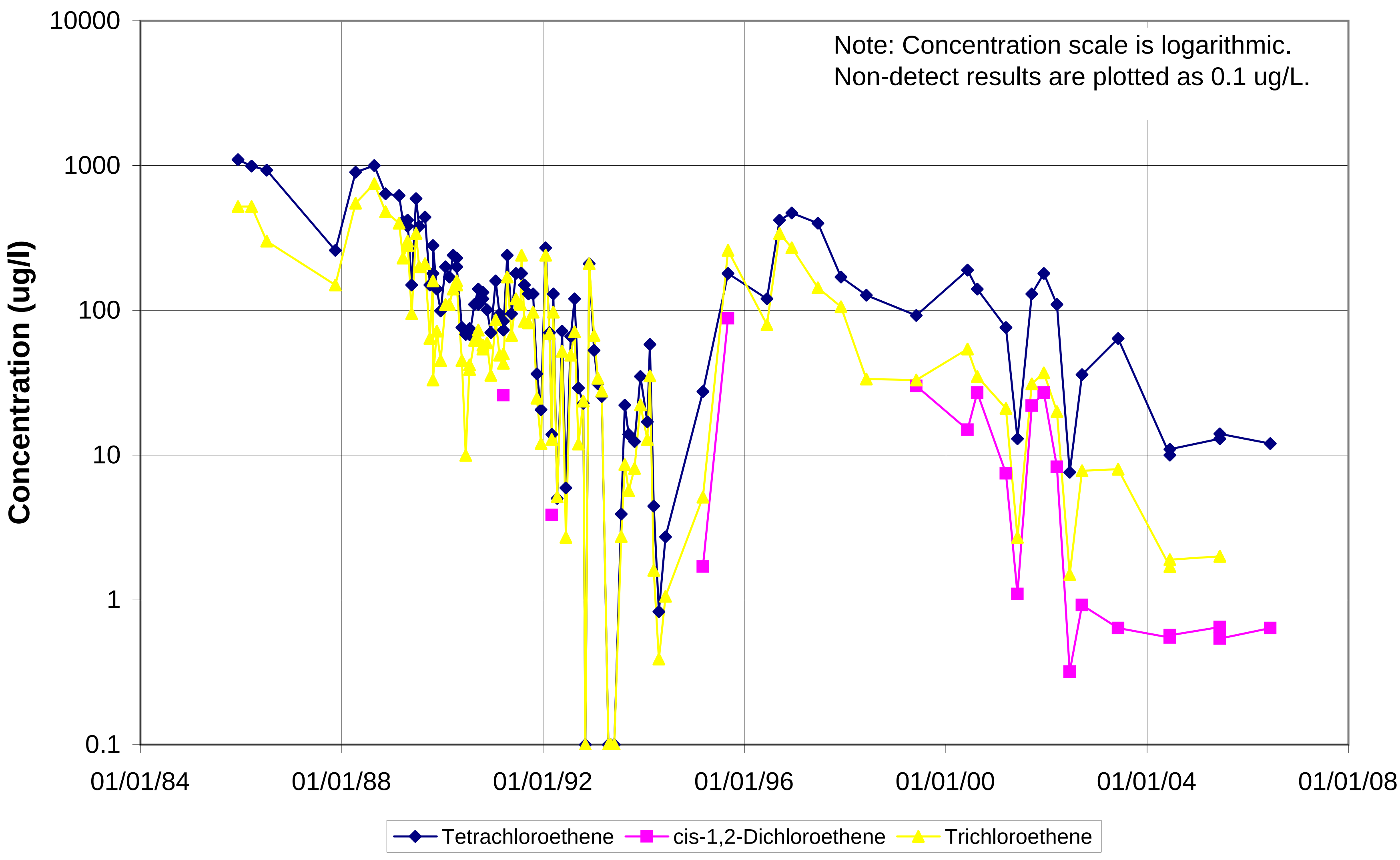

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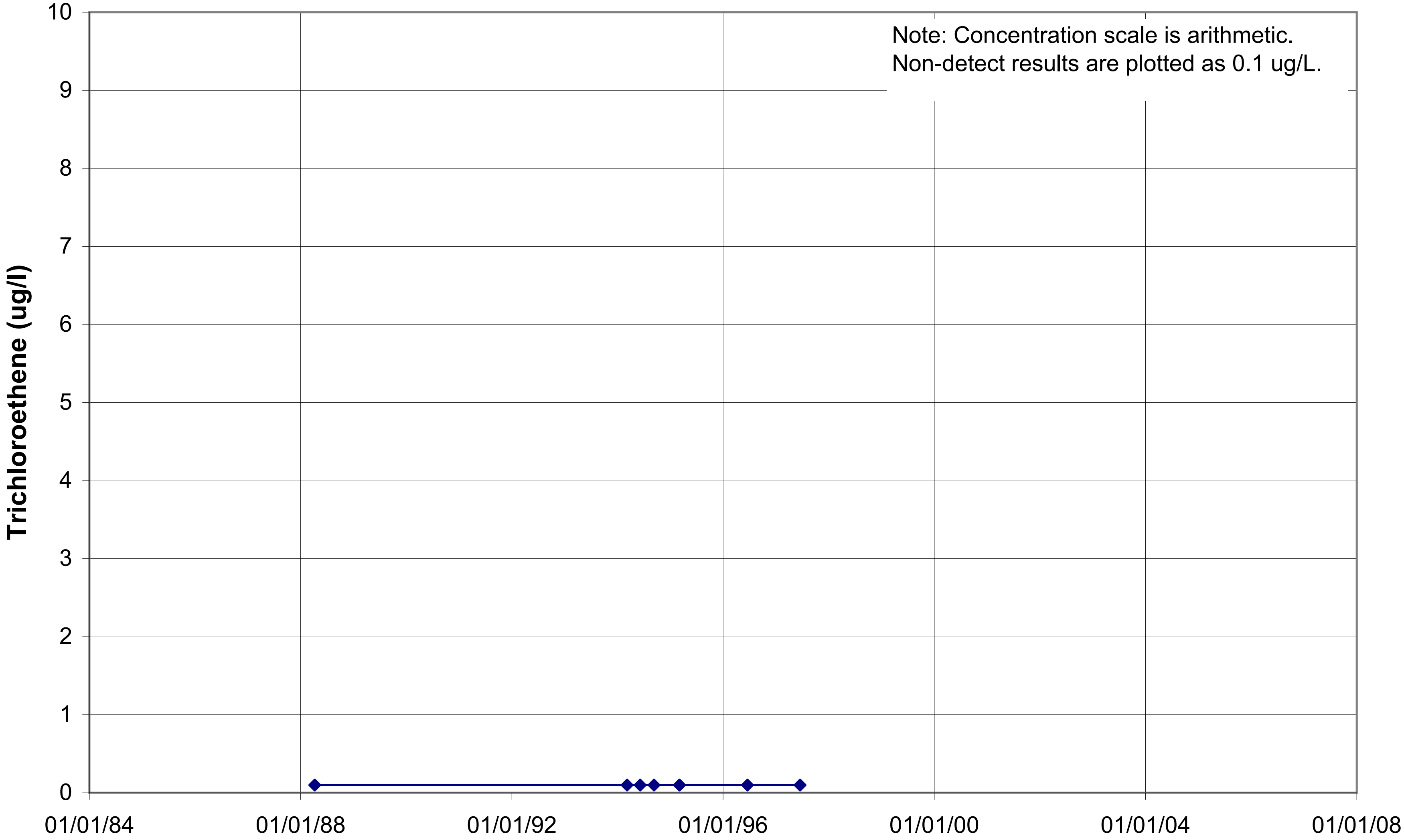
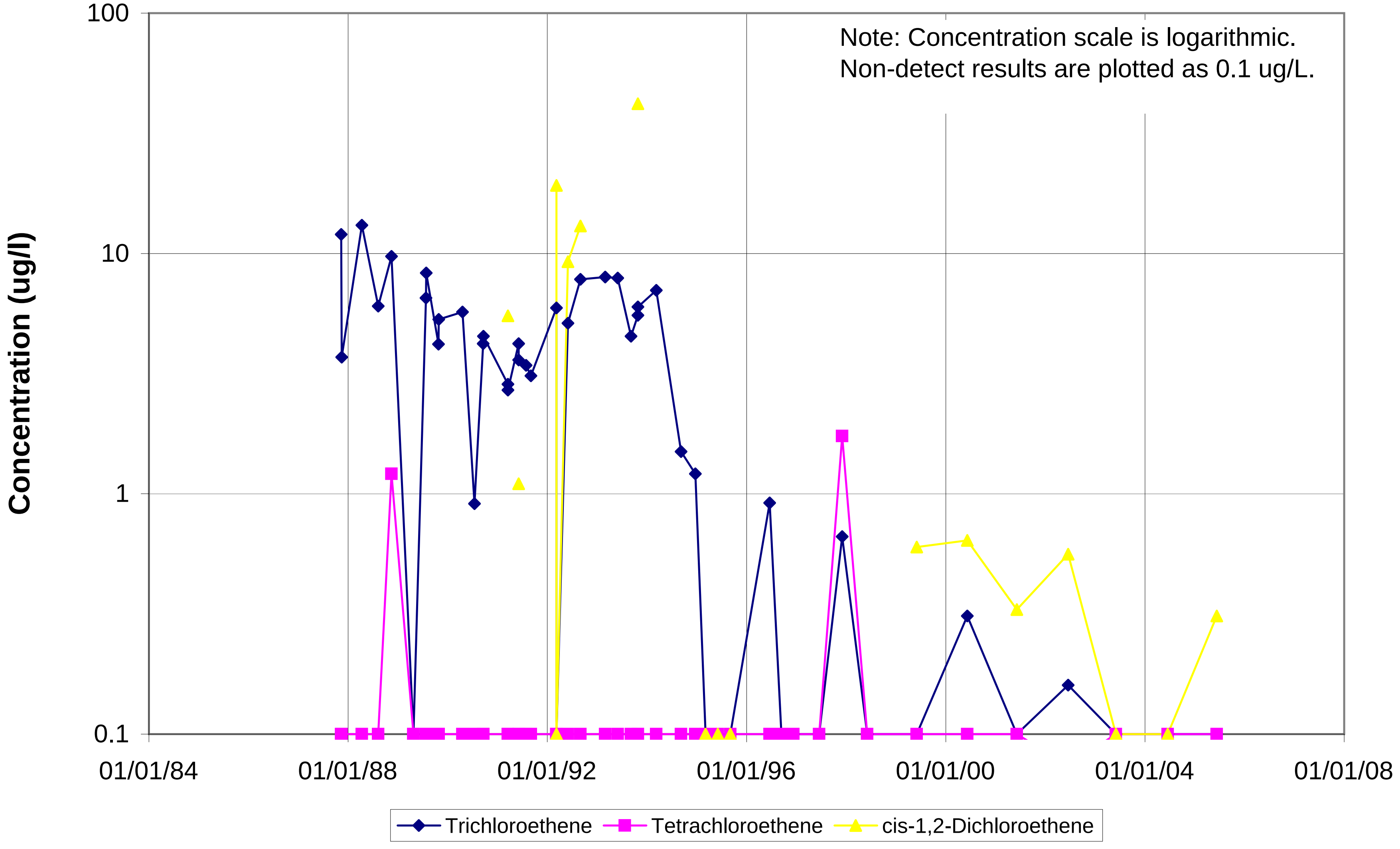
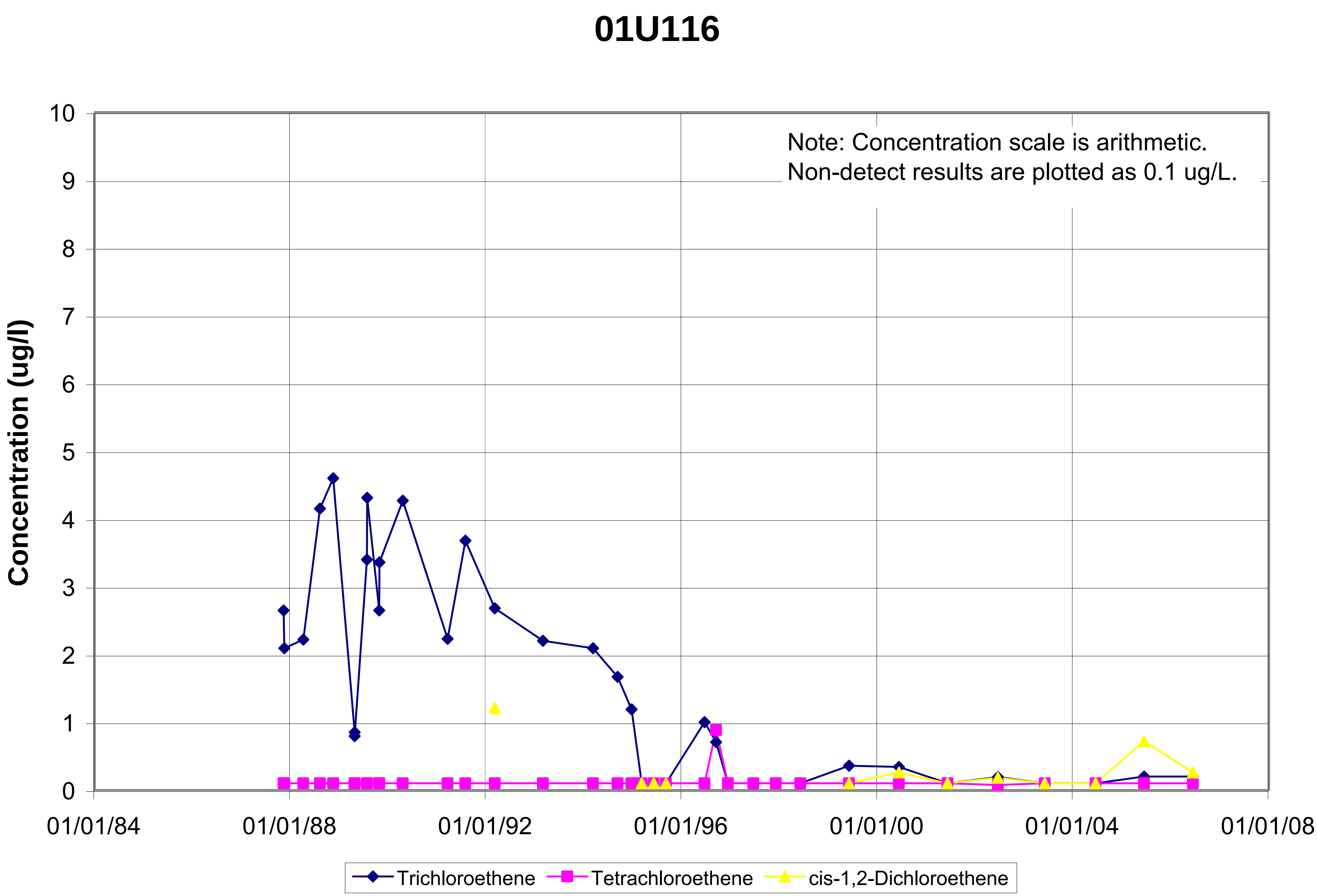


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U115

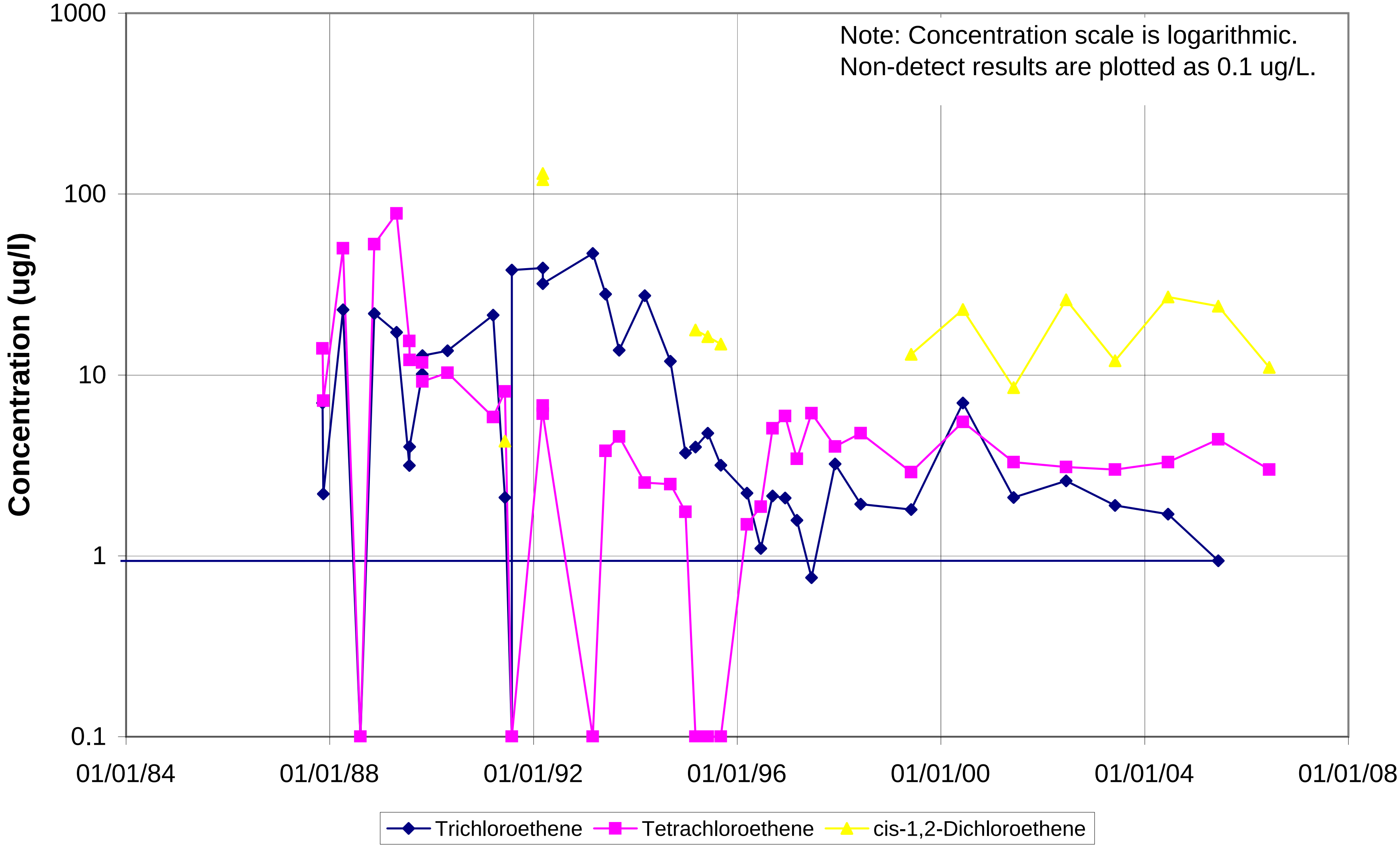


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



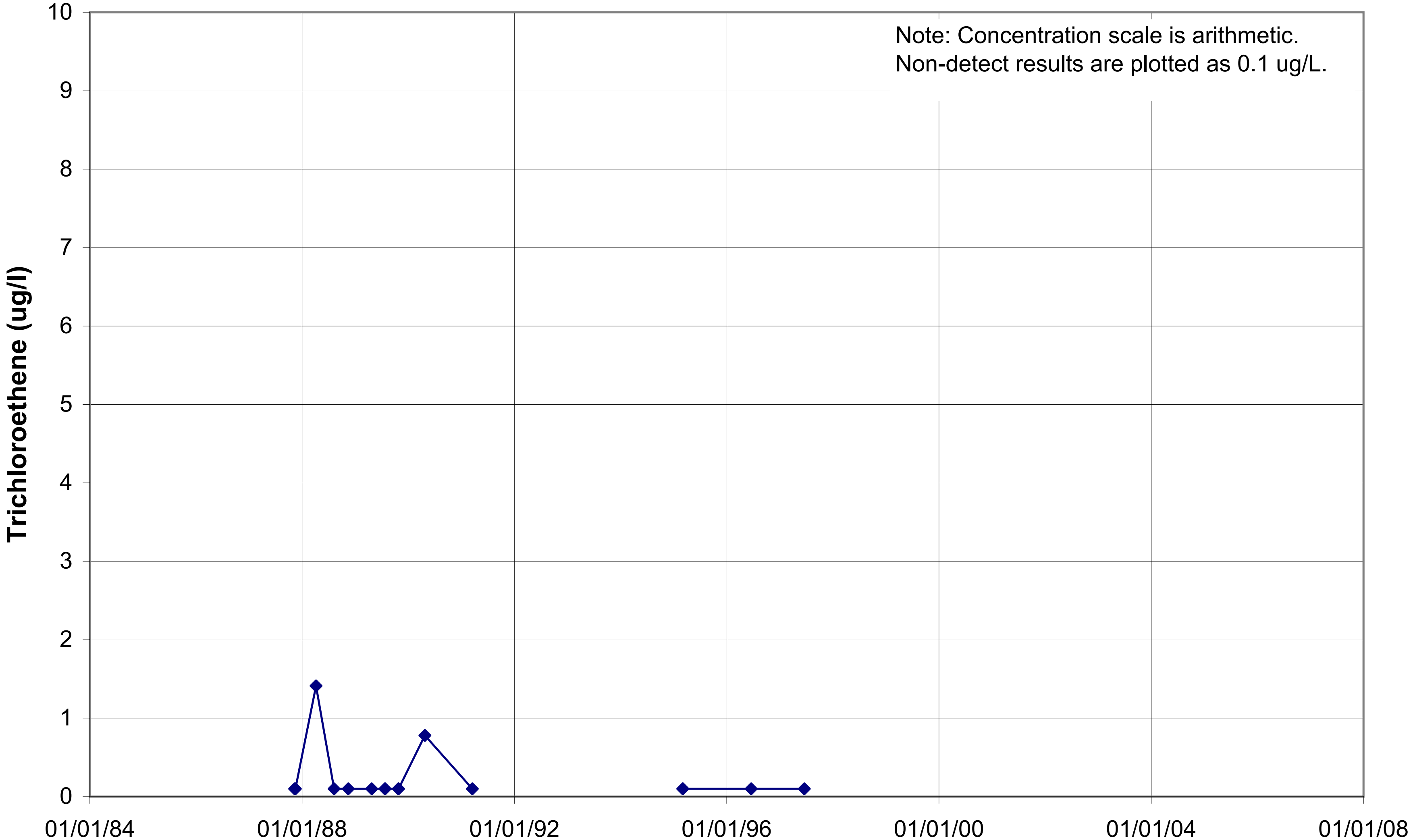
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U117



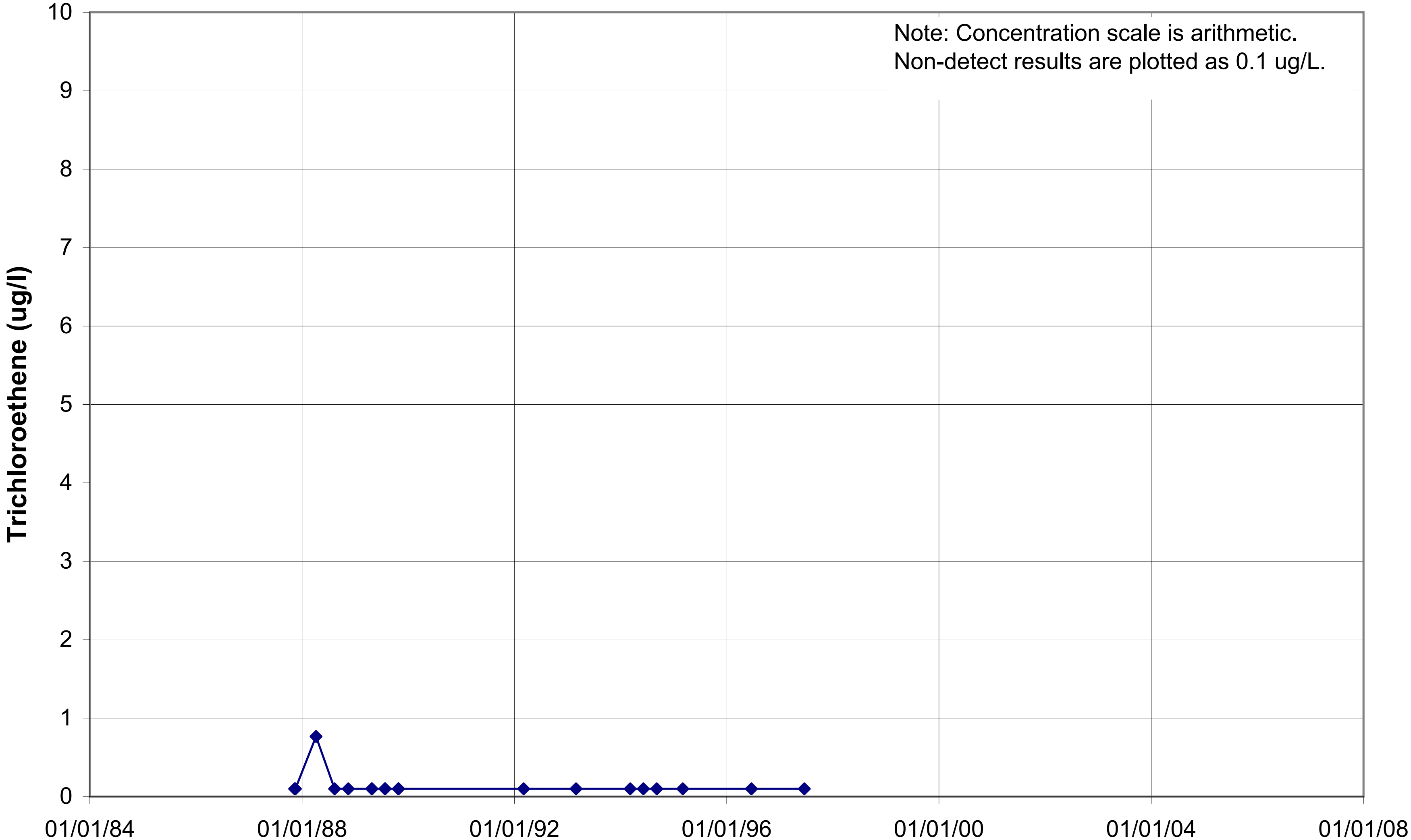
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U118



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U119



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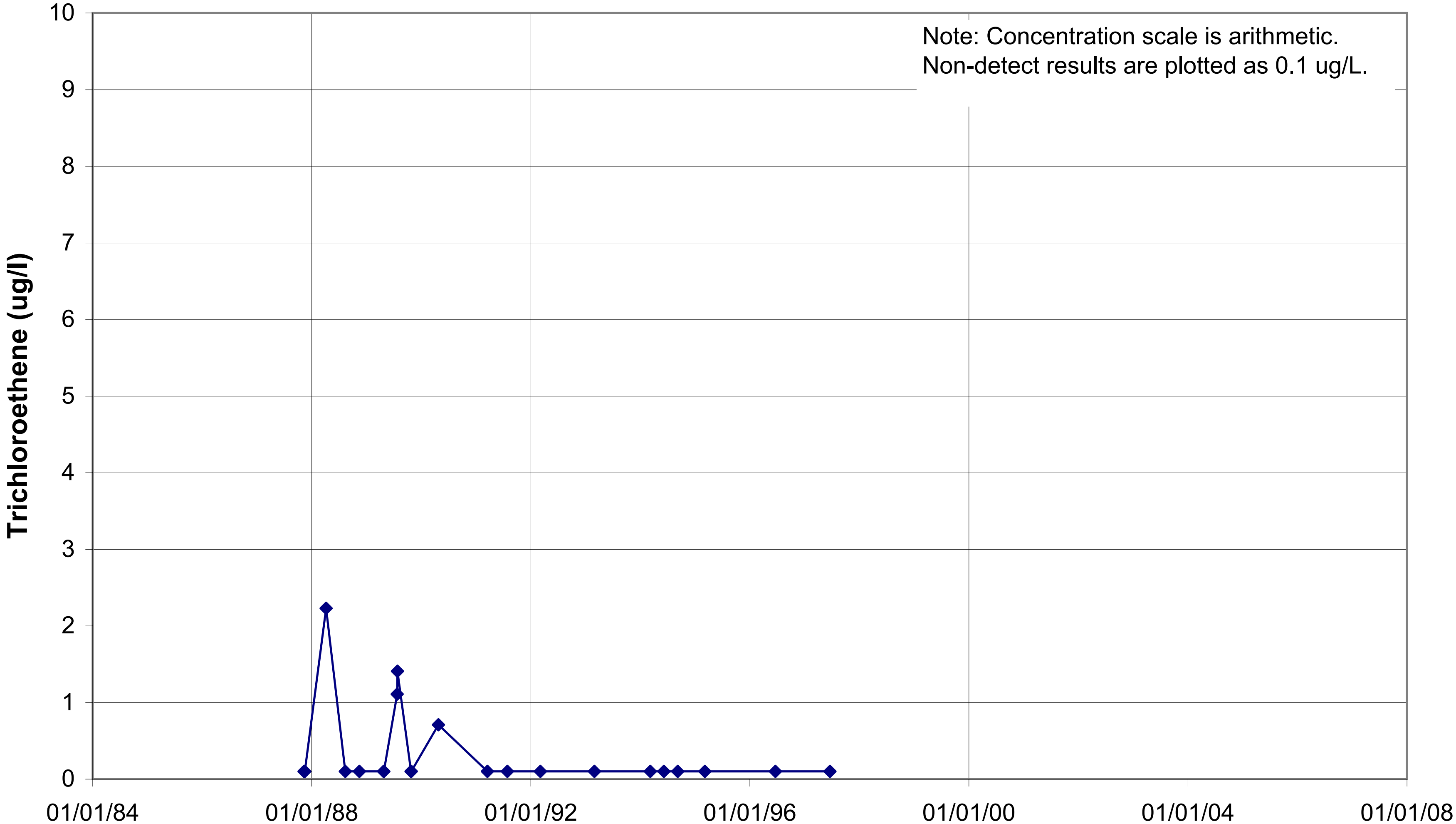
01U120



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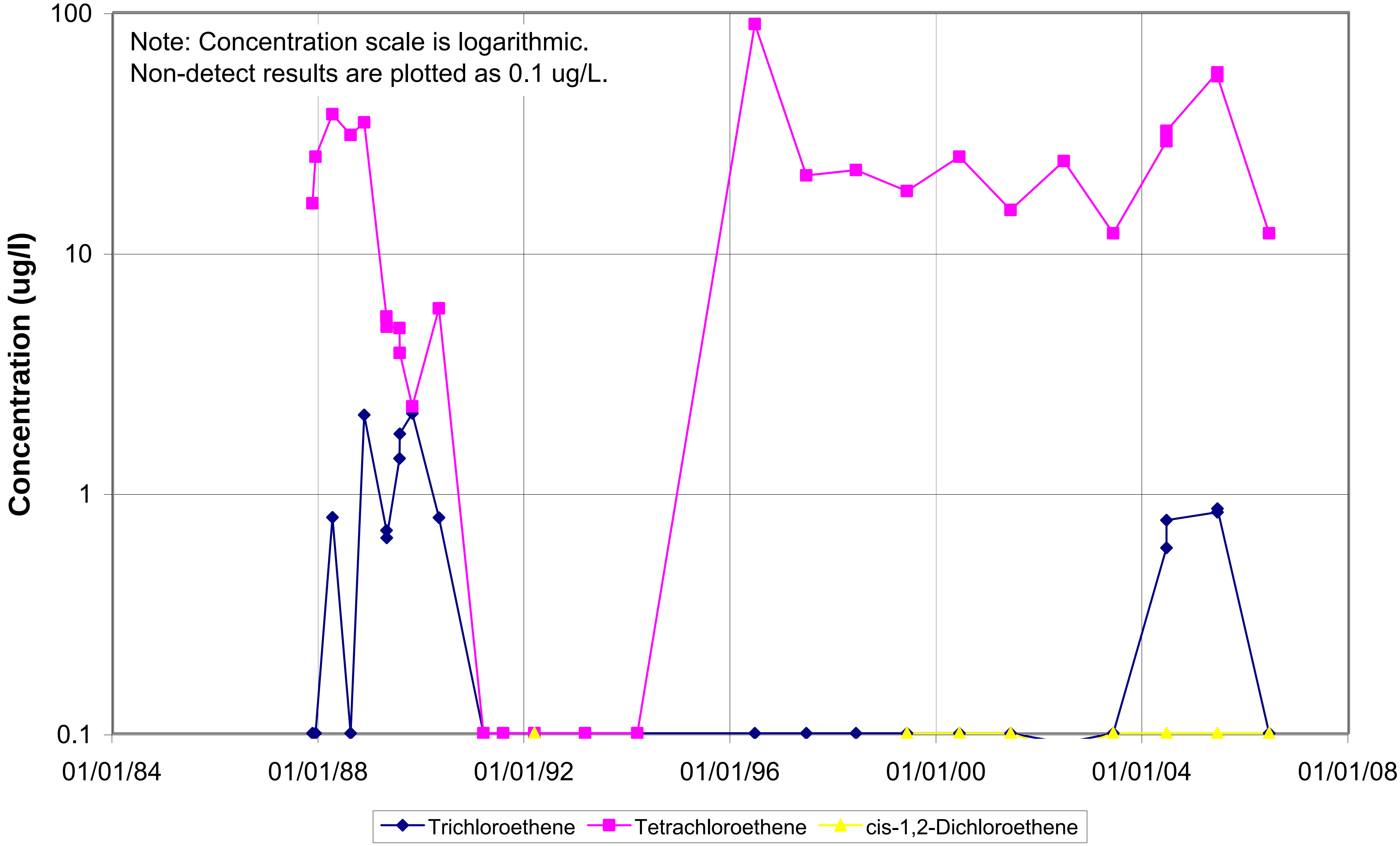
01U126



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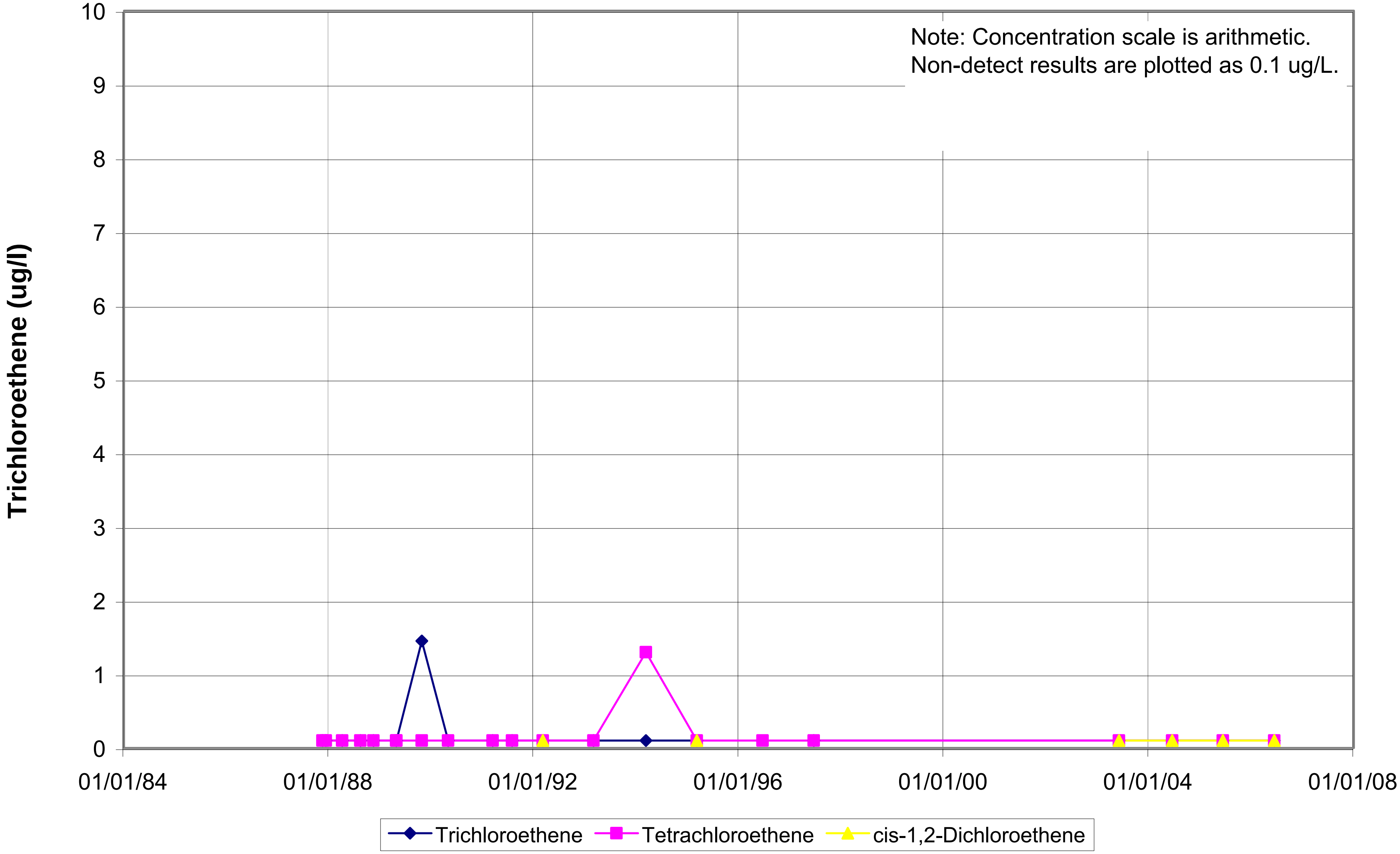
01U127



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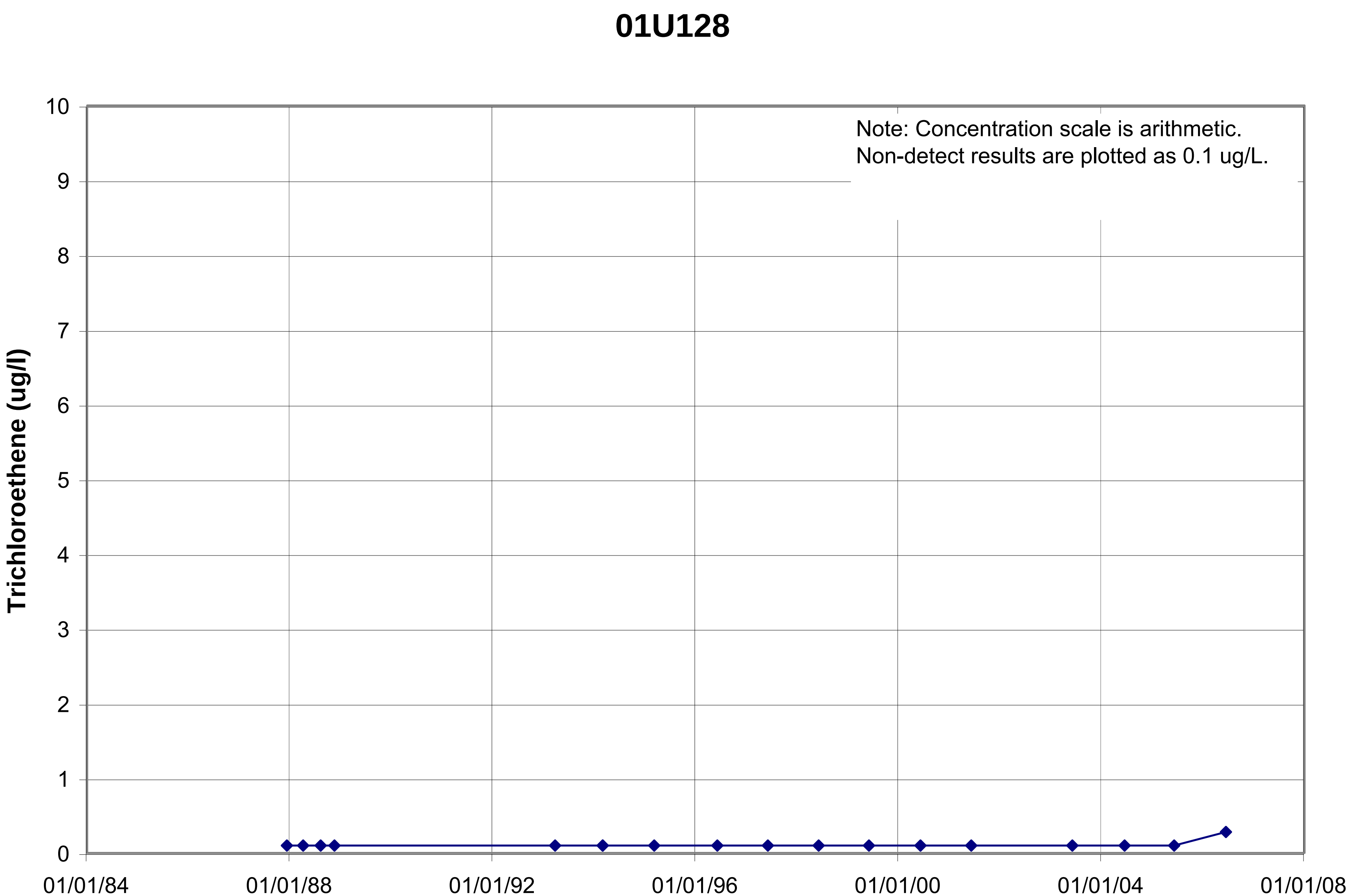

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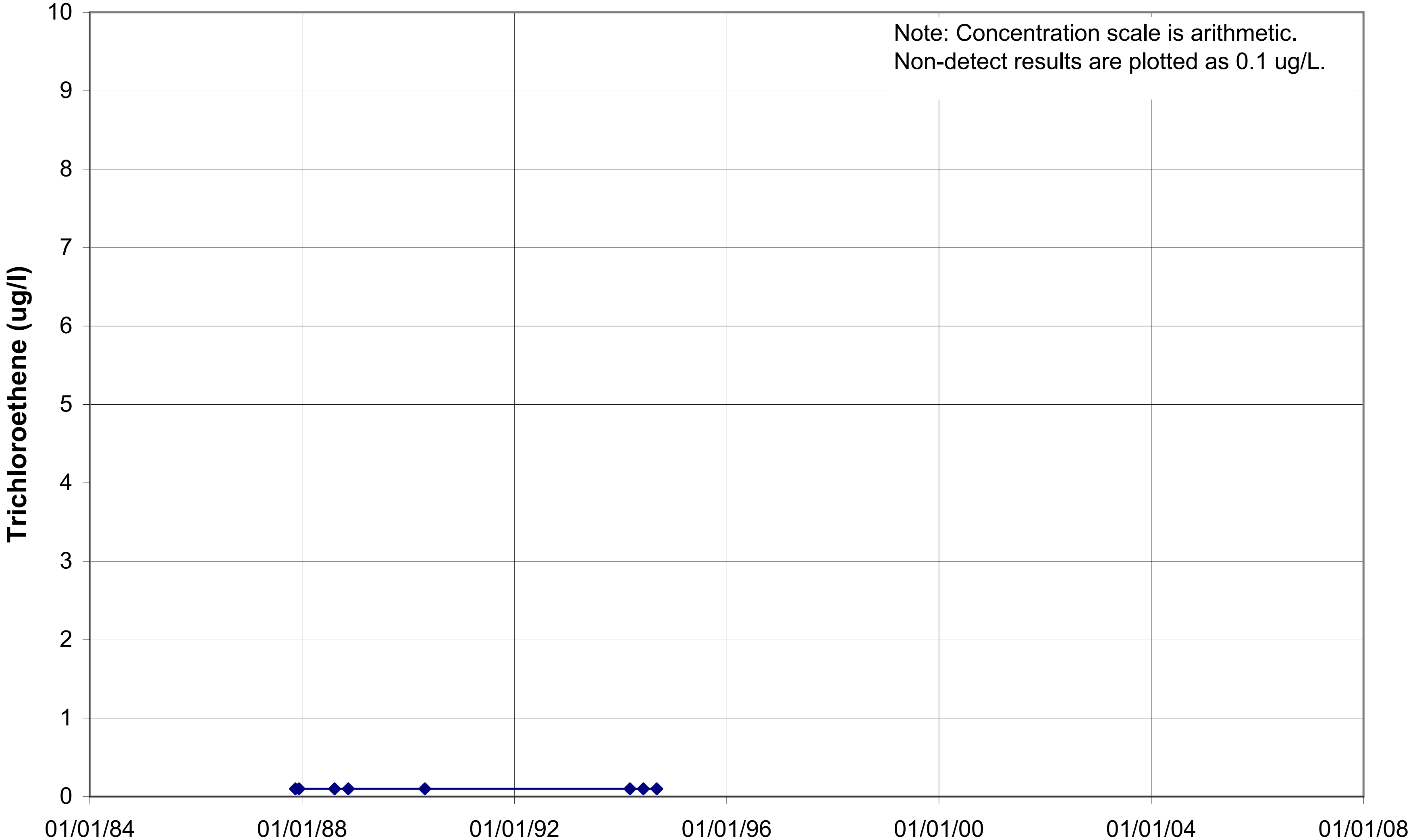
01U133



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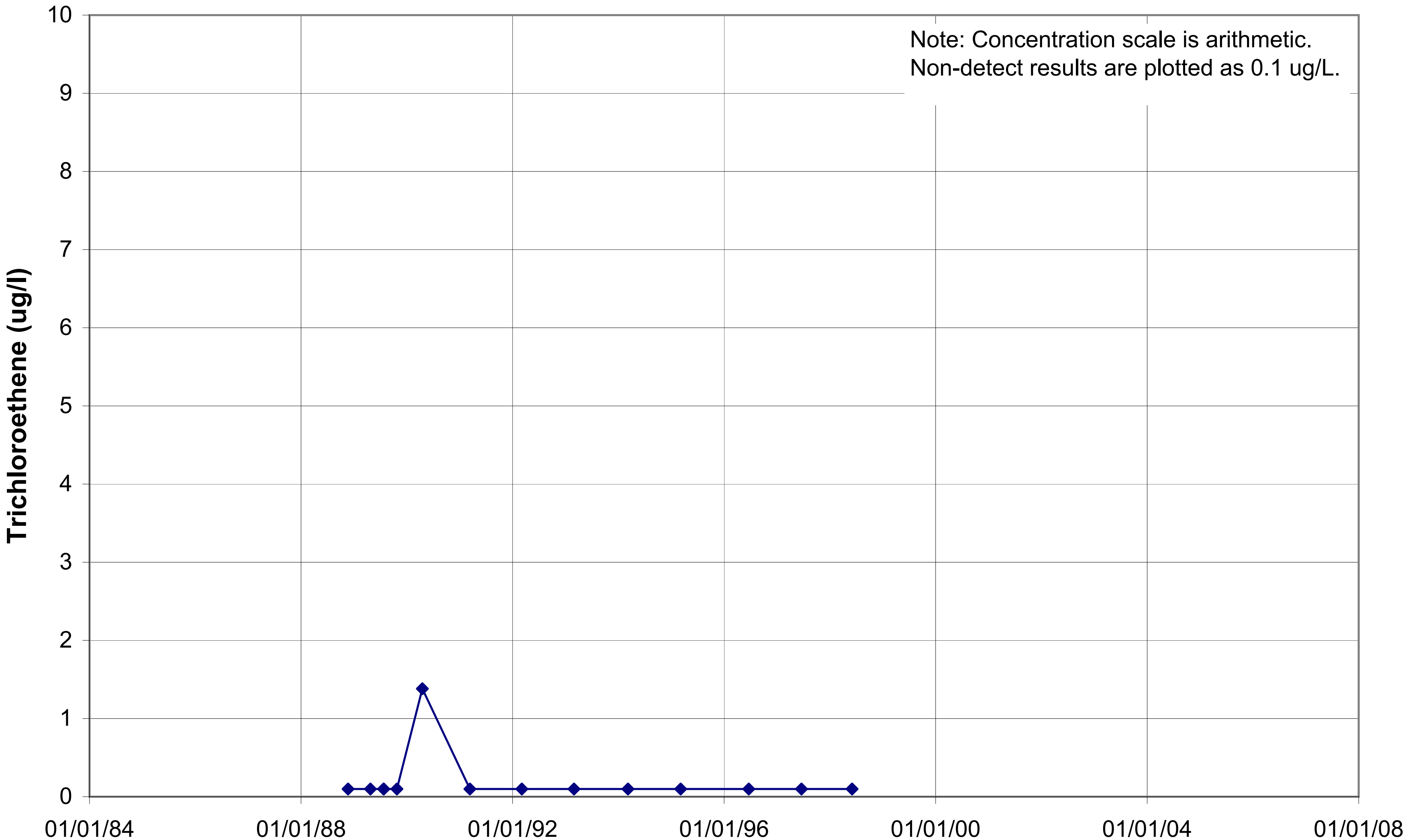
01U135



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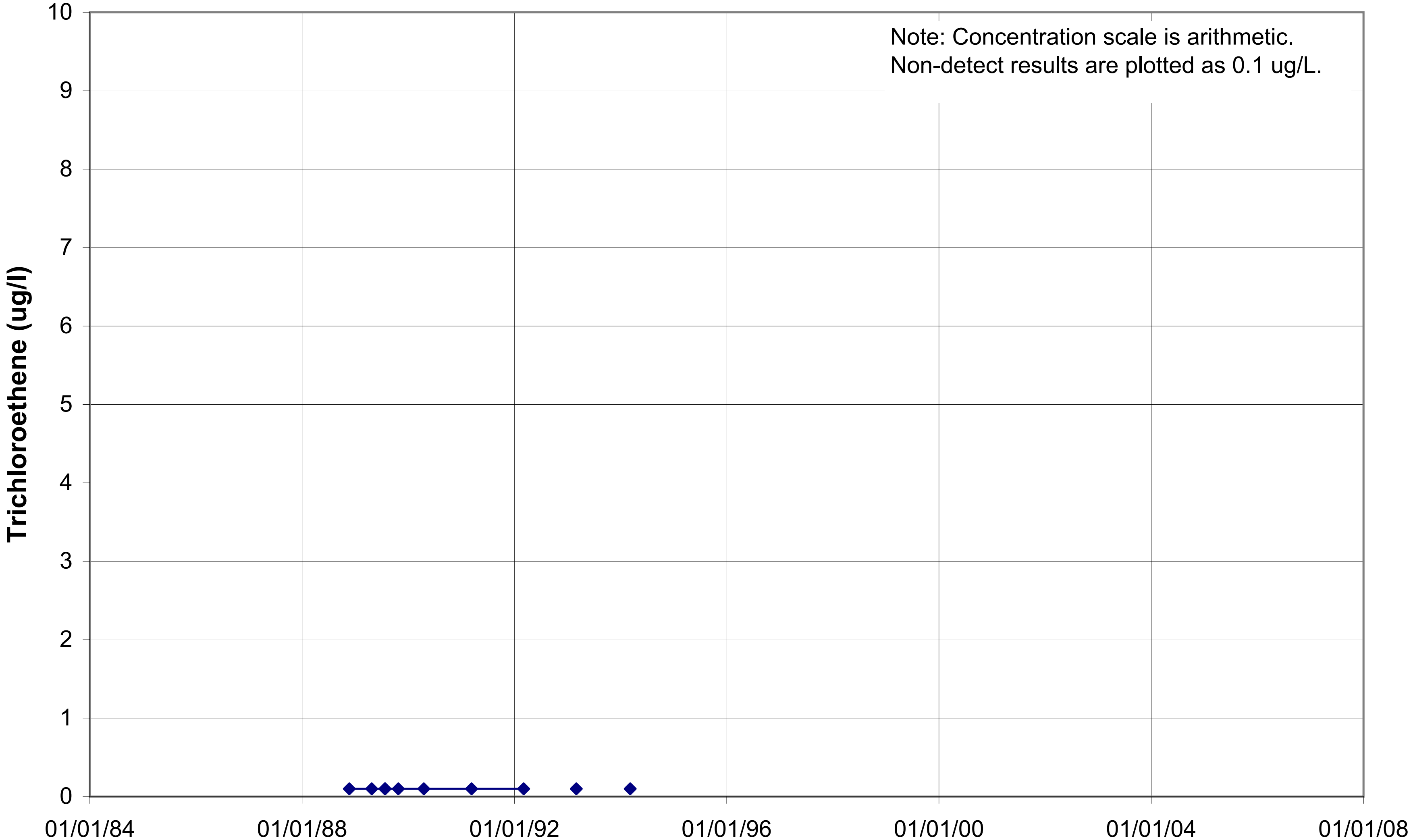
01U136



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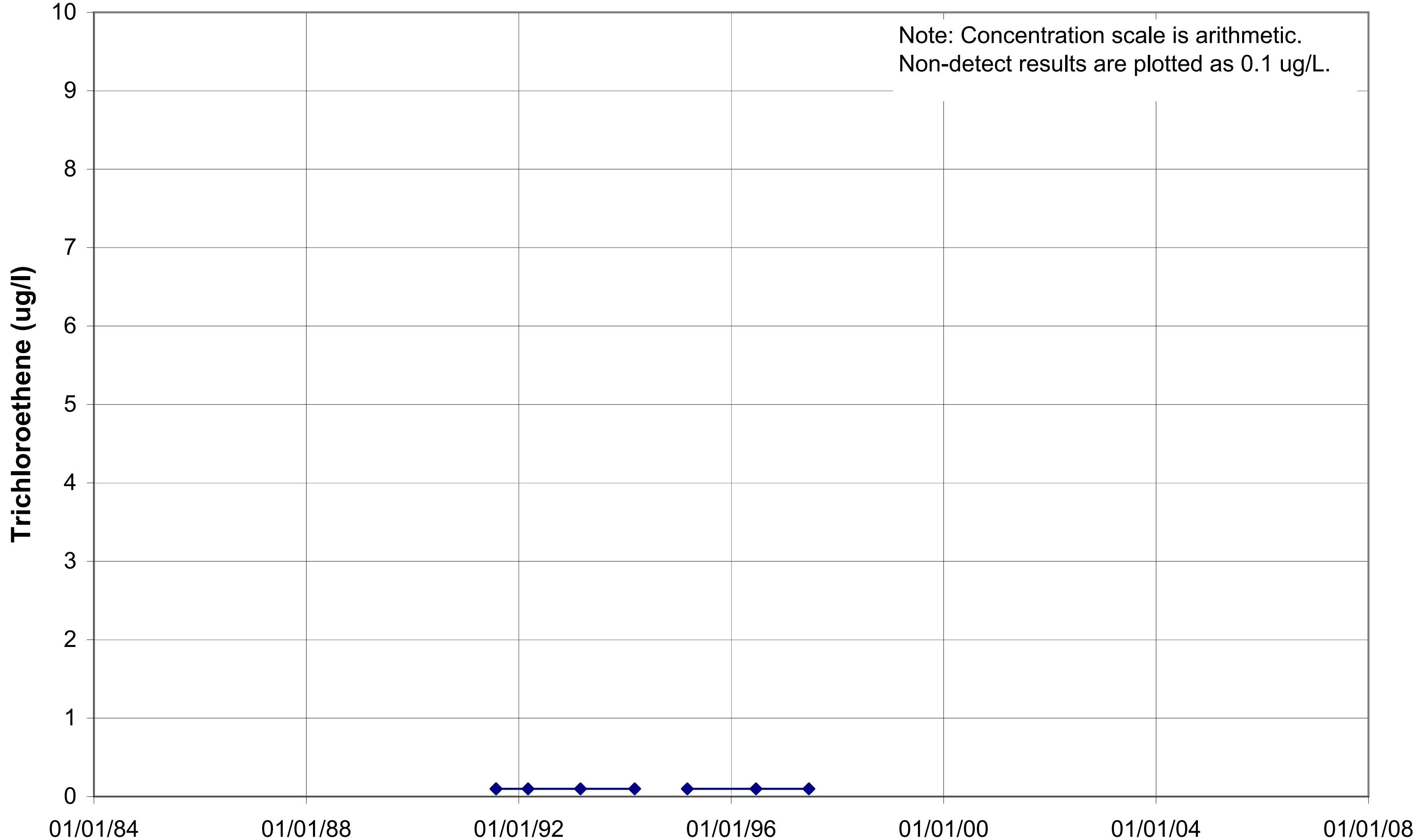
01U137



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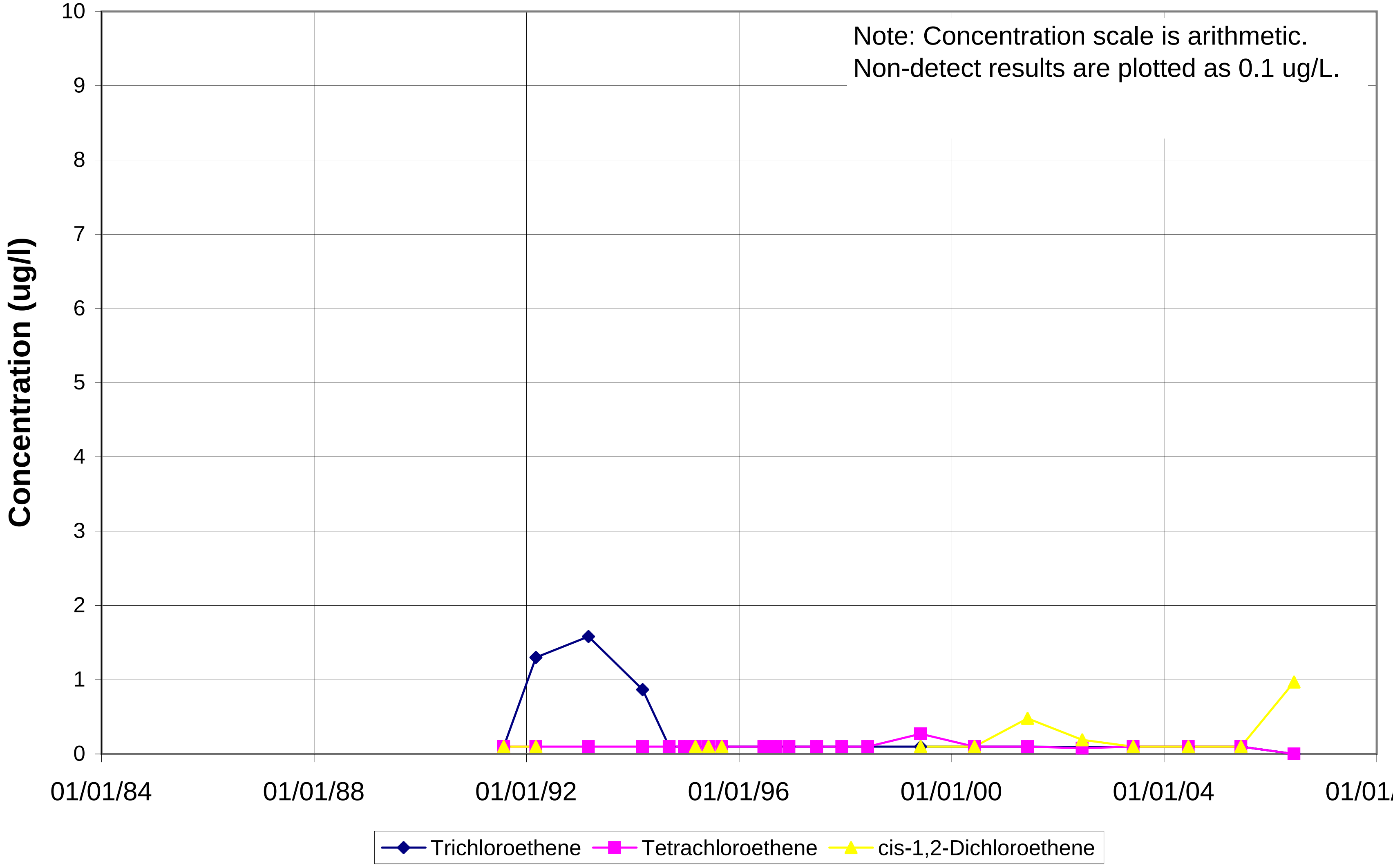

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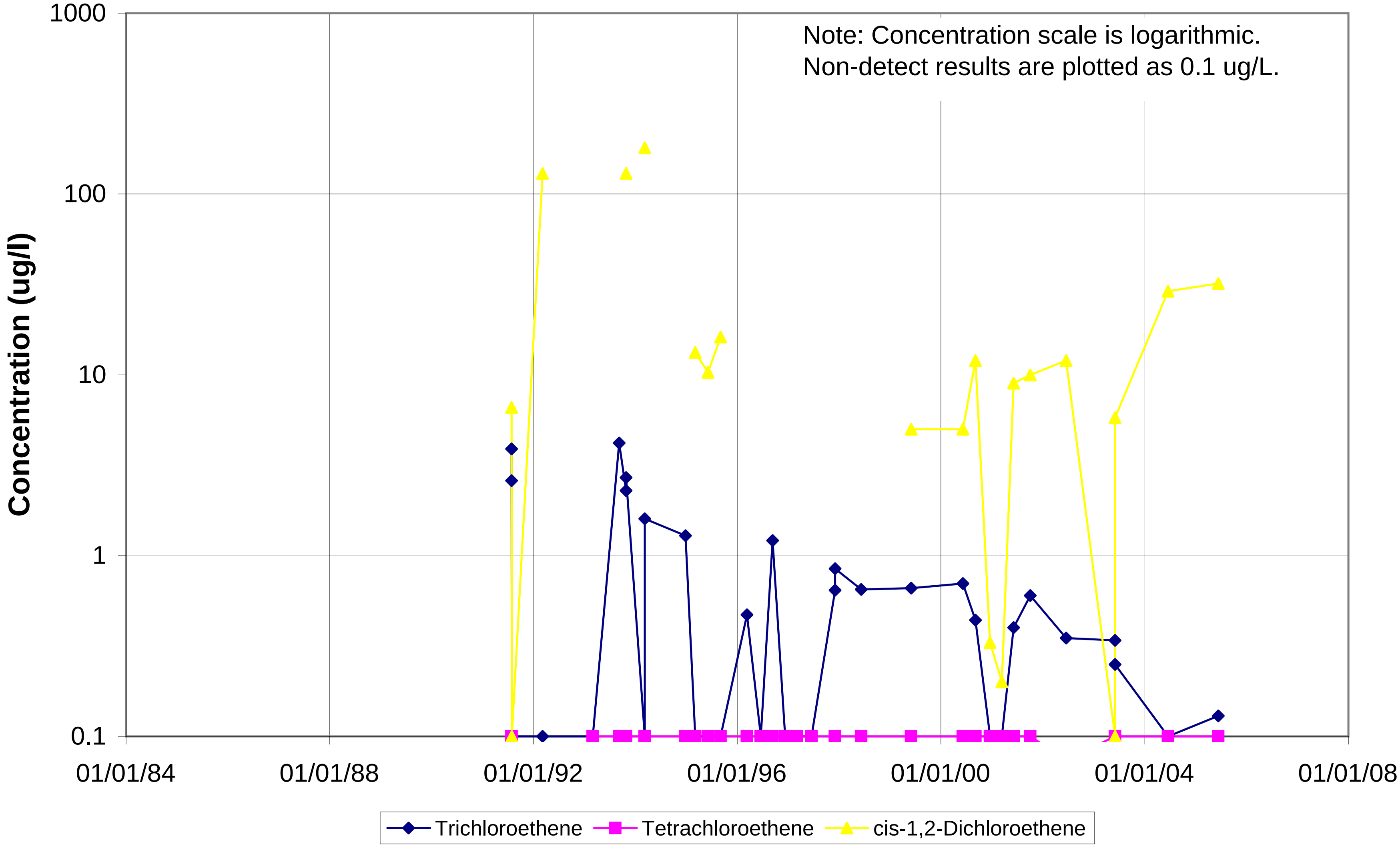
01U139



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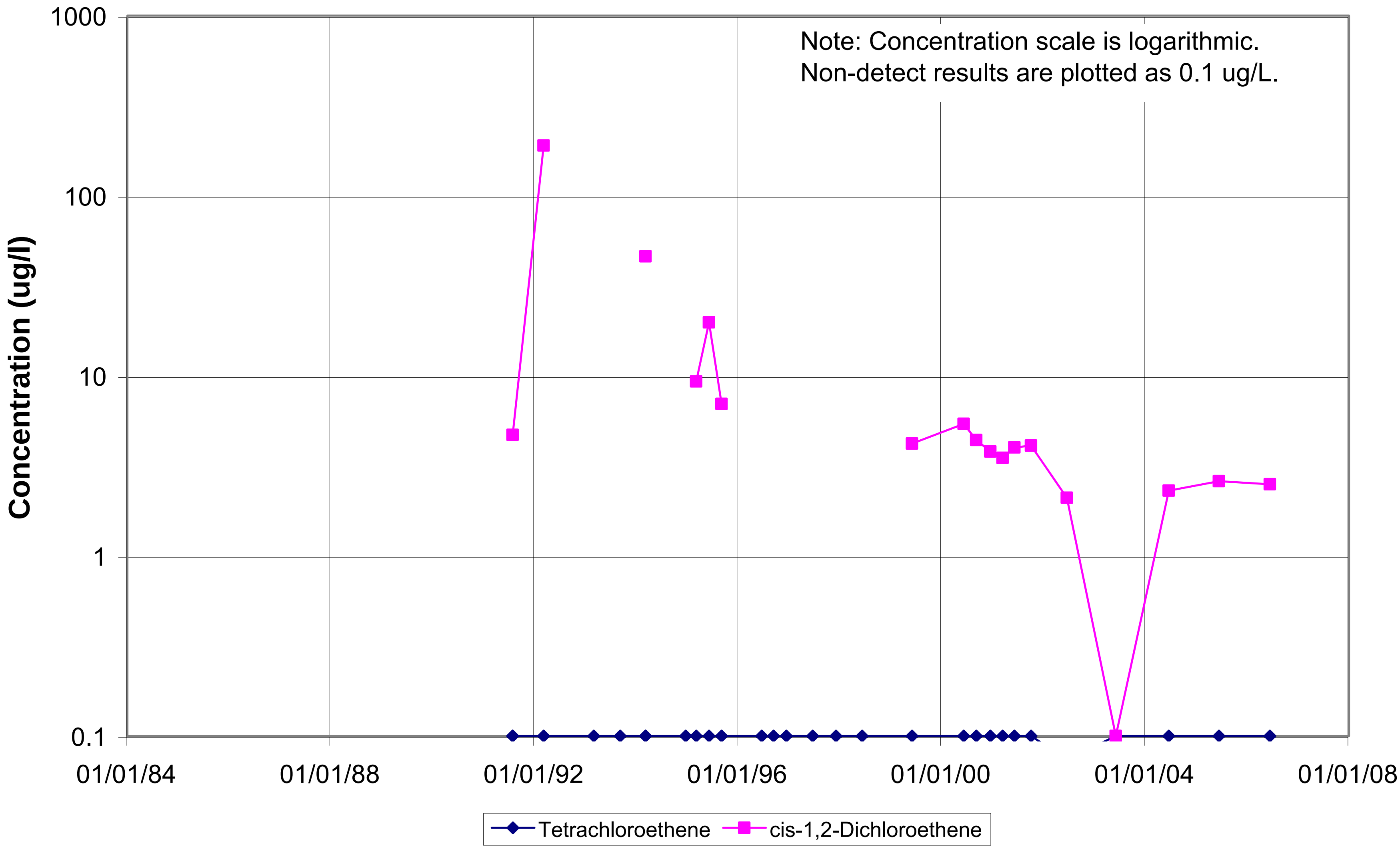

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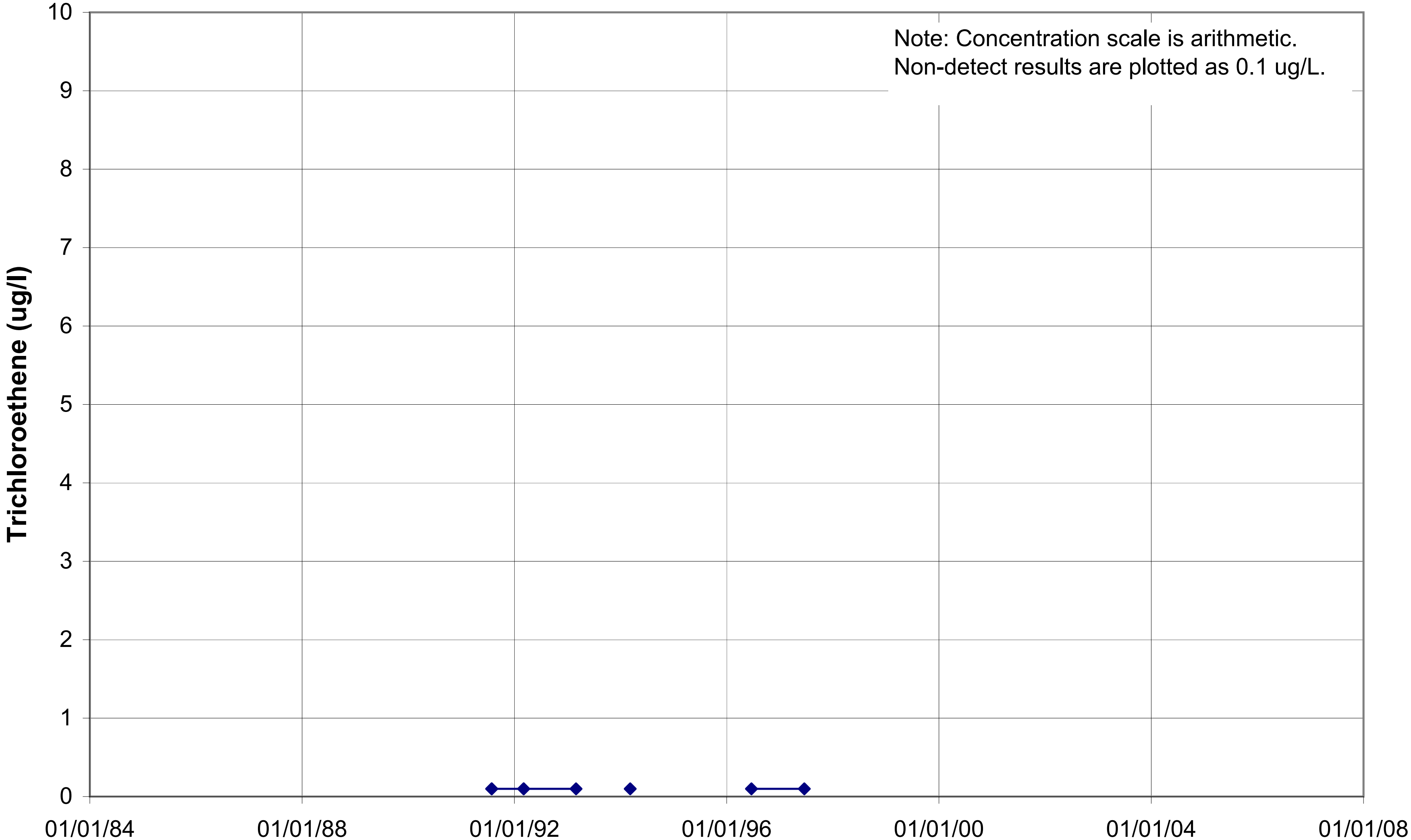

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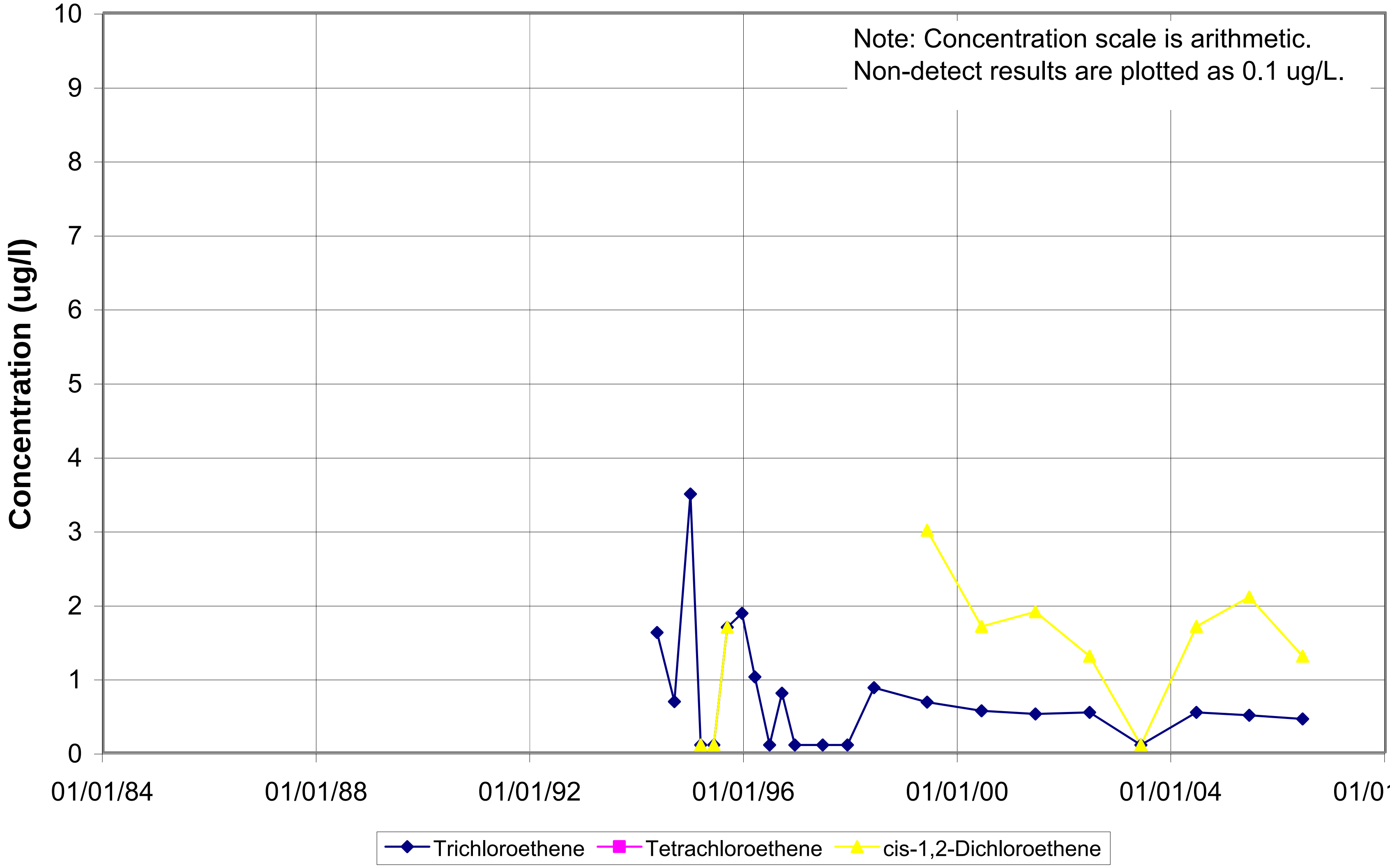
01U157



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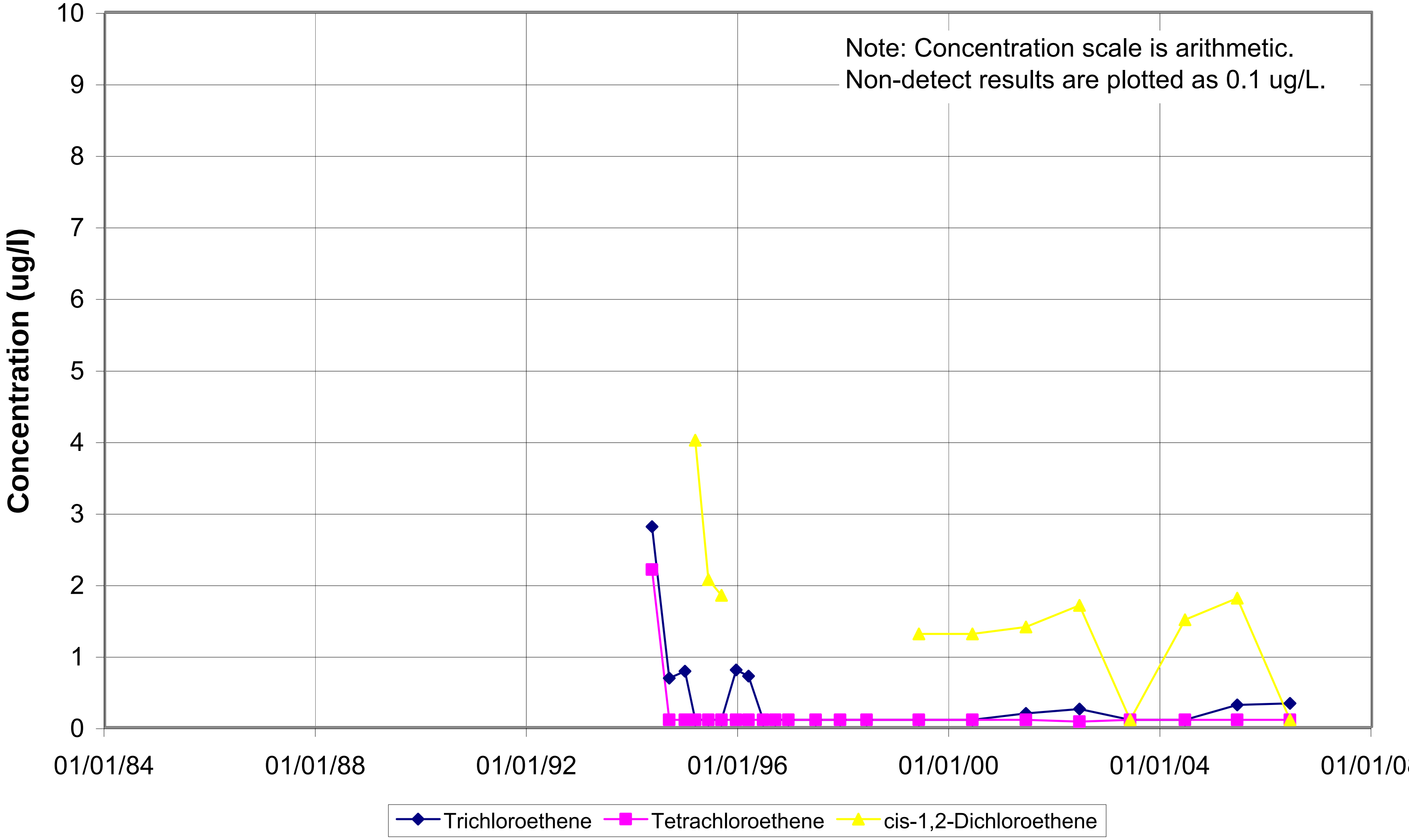
01U158



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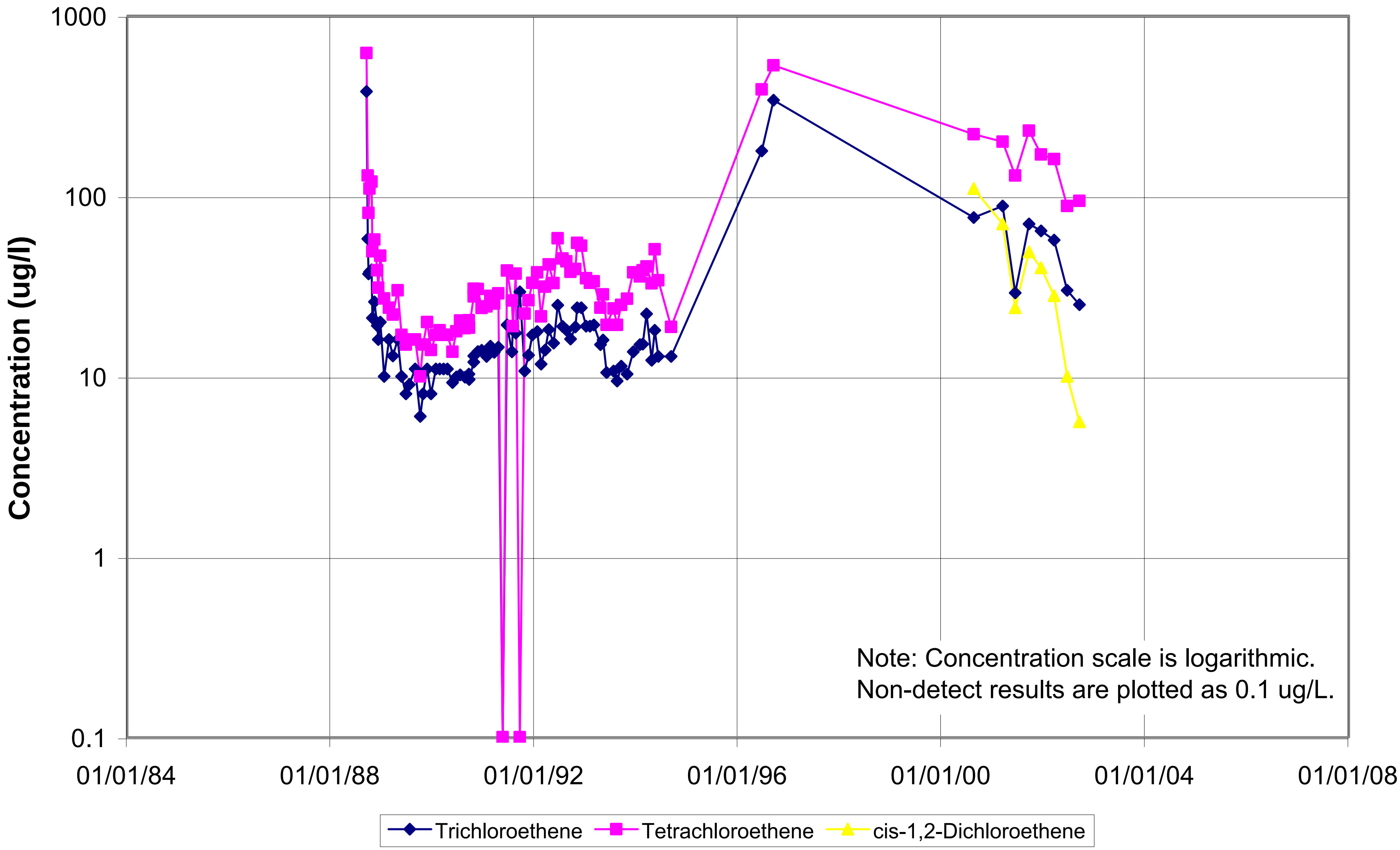
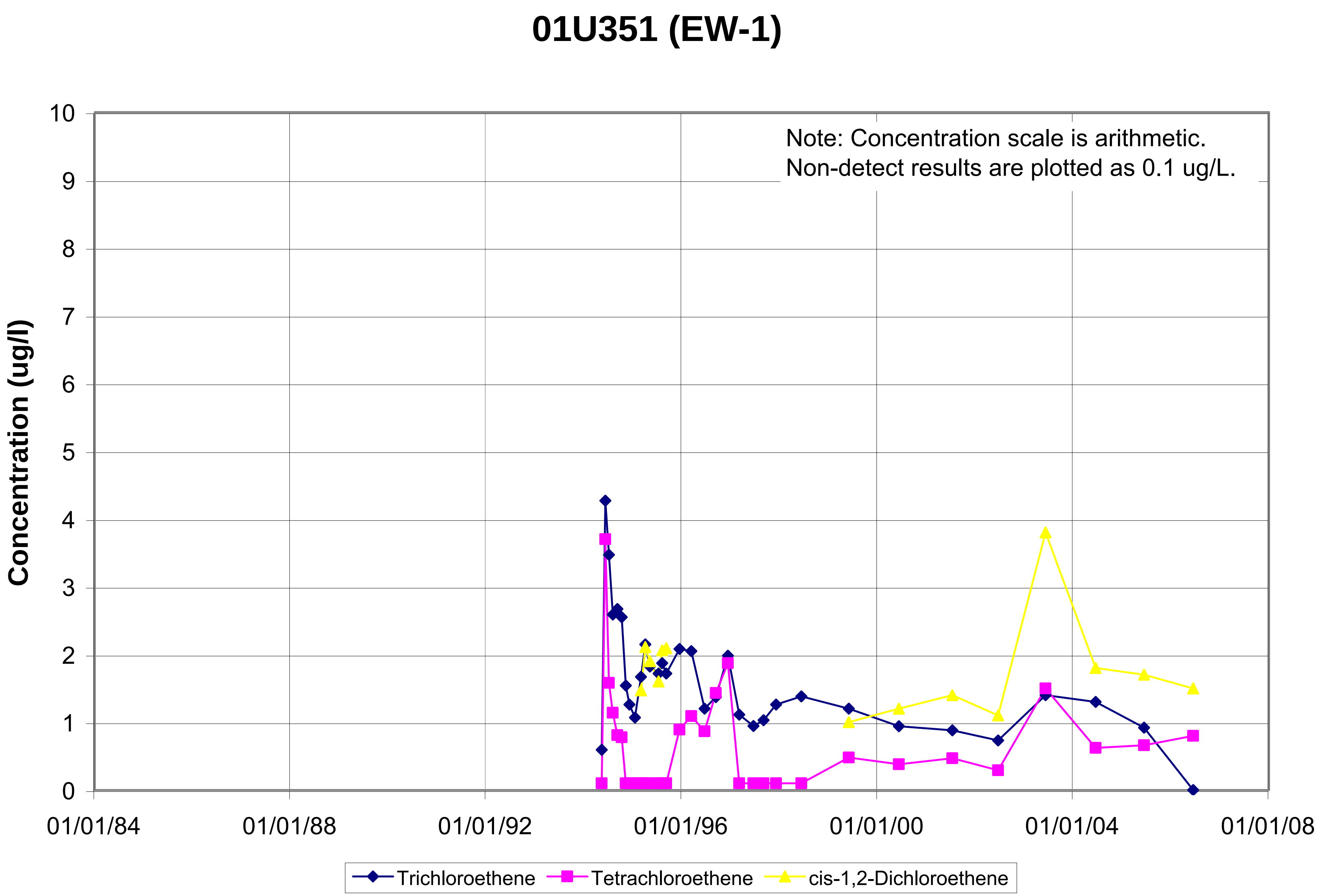
01U350

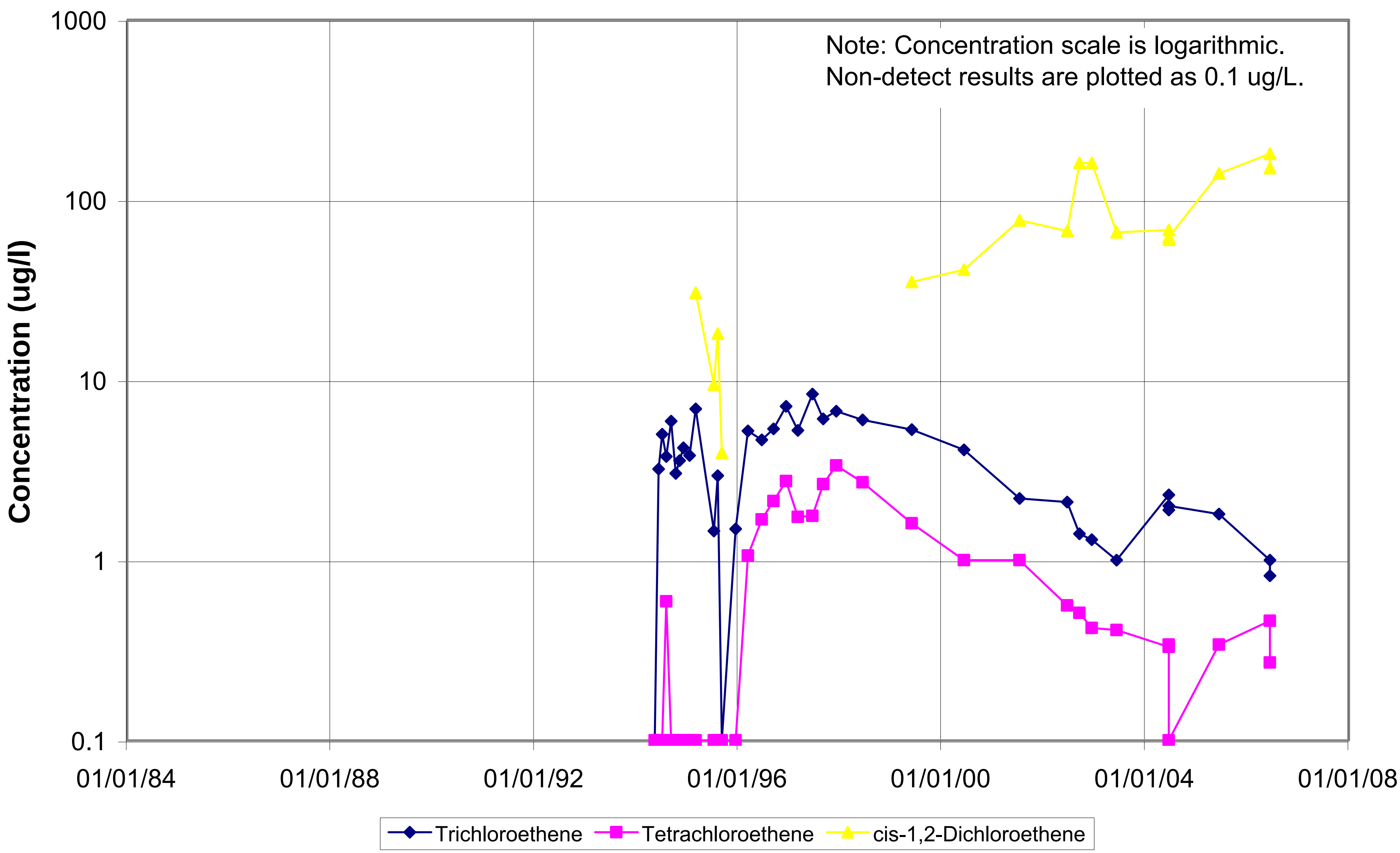


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



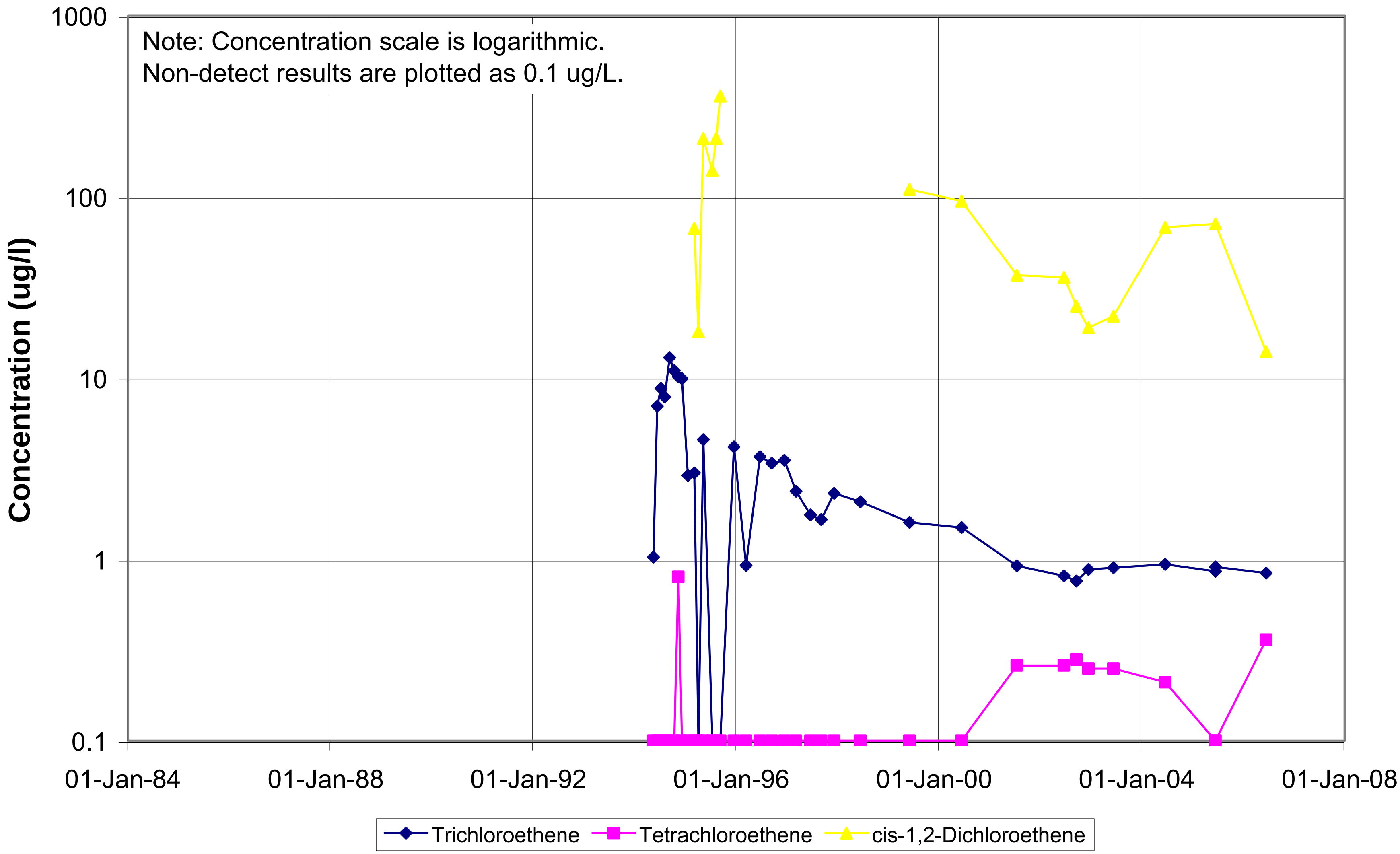
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U352 (EW-2)

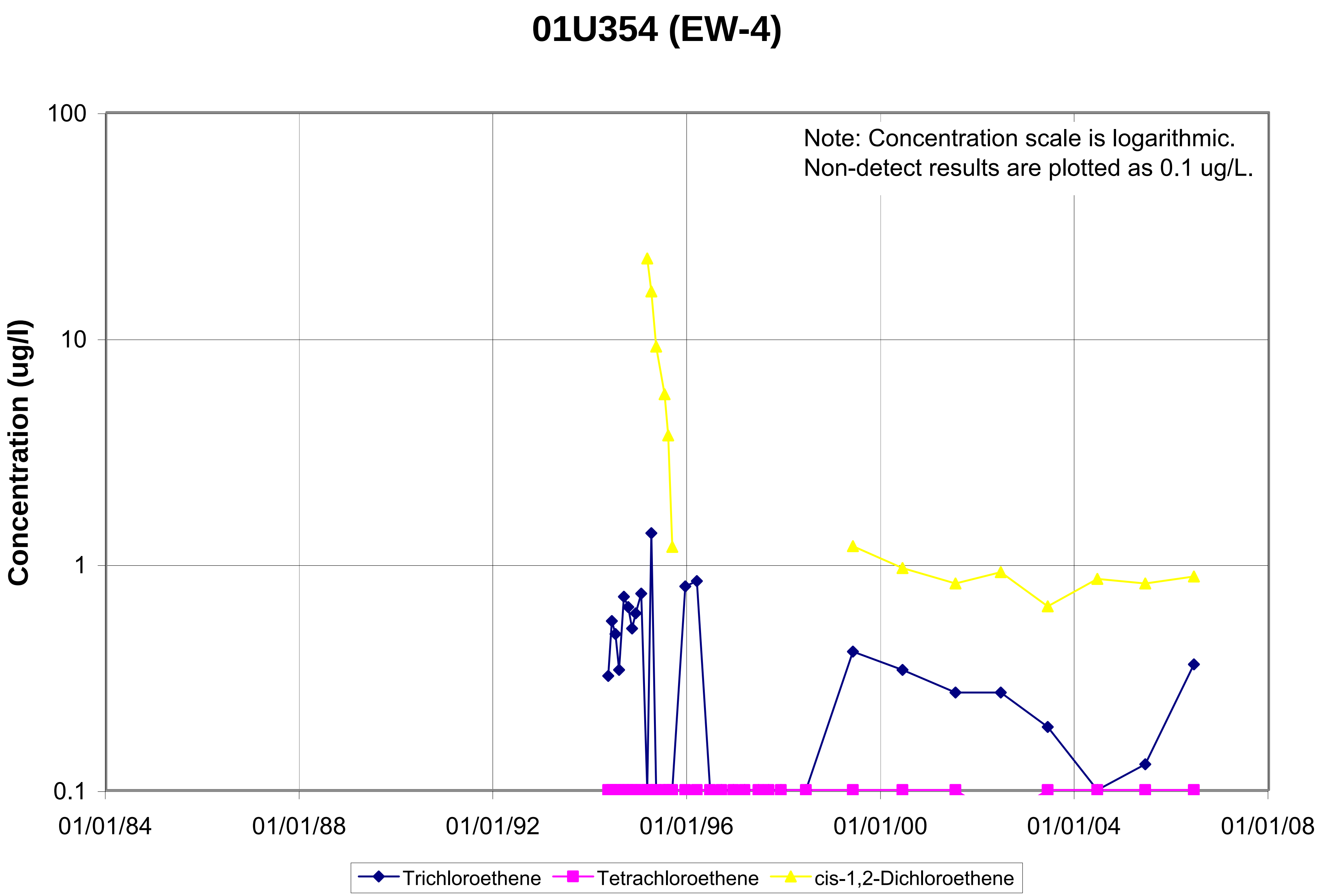


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

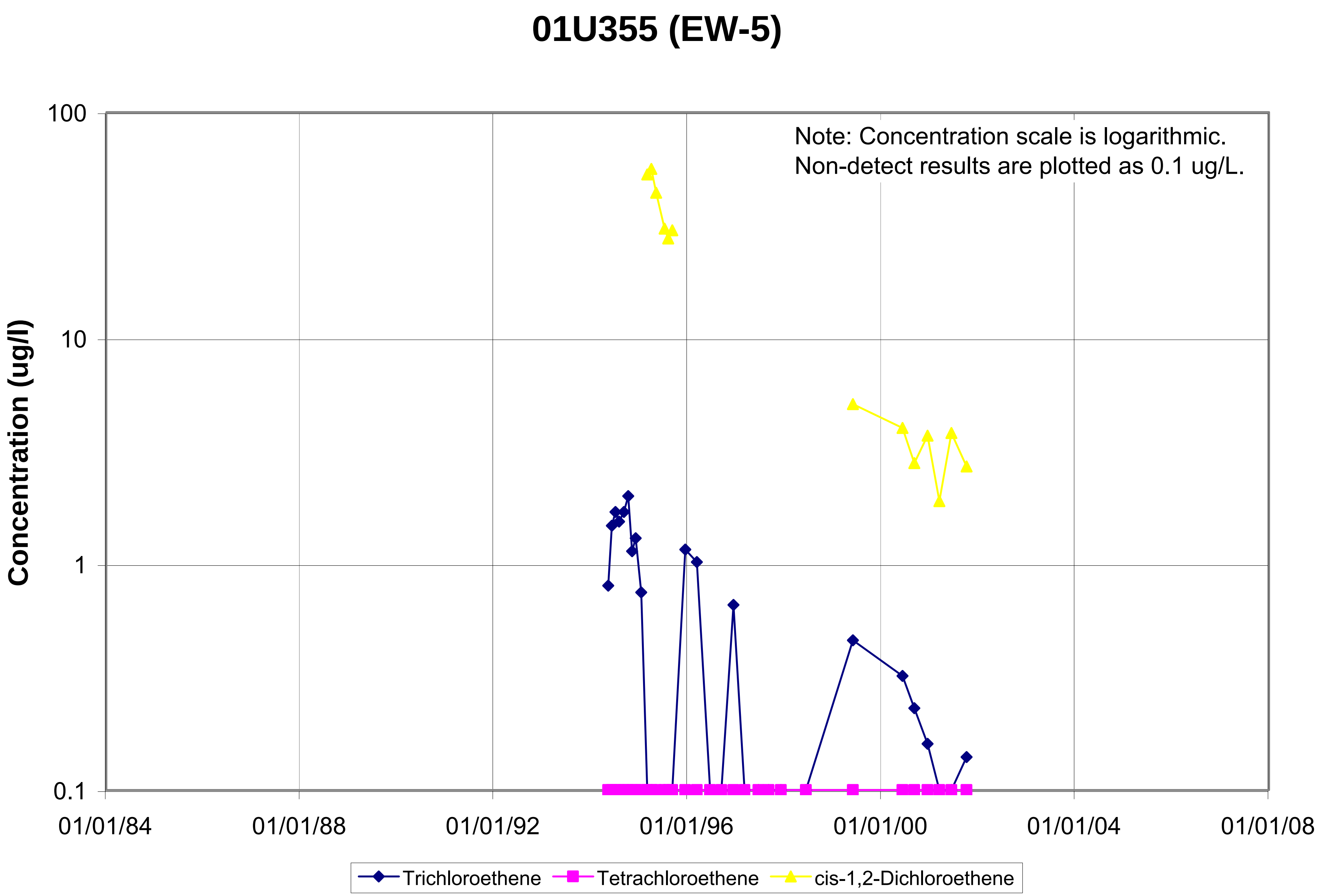
01U353 (EW-3)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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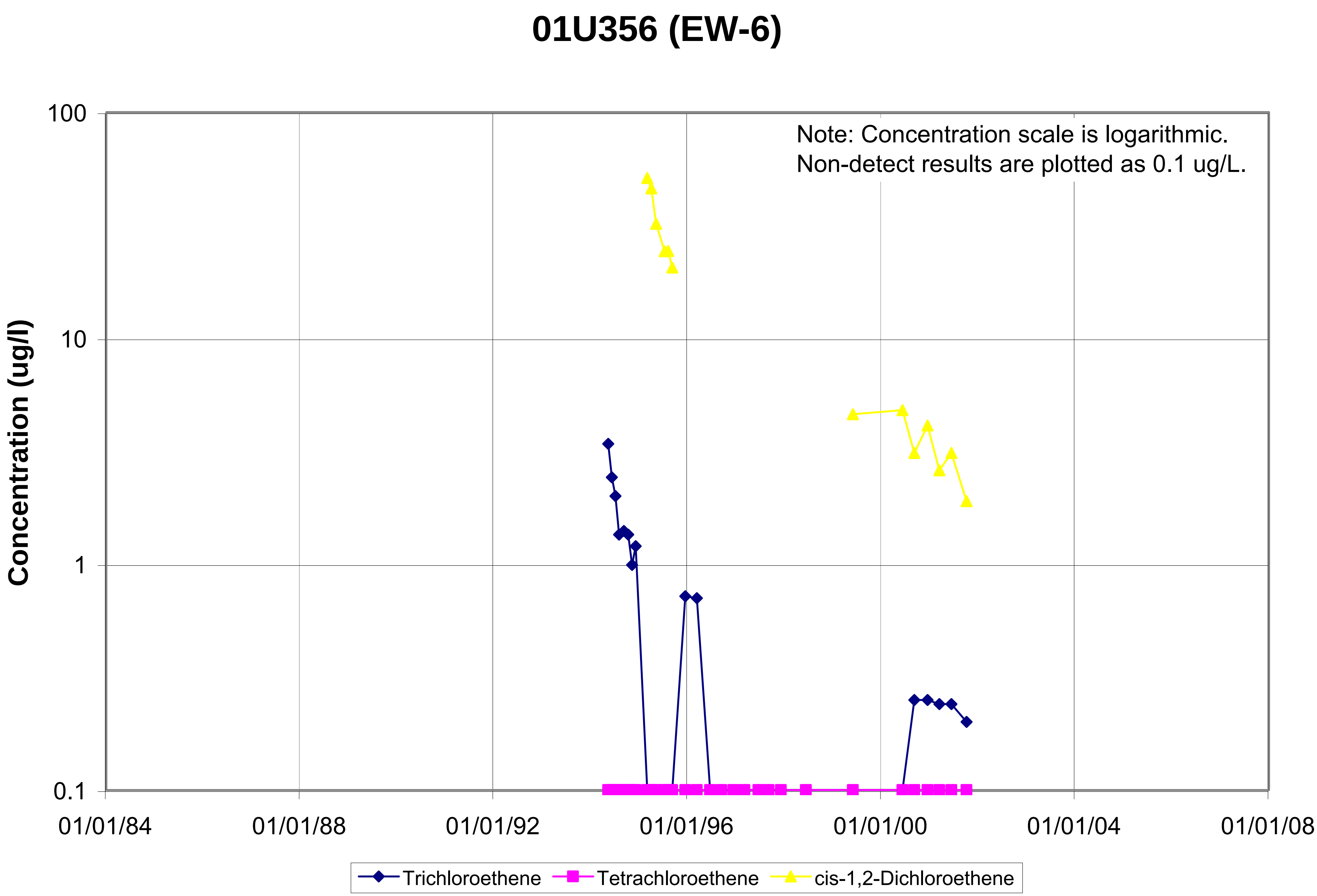

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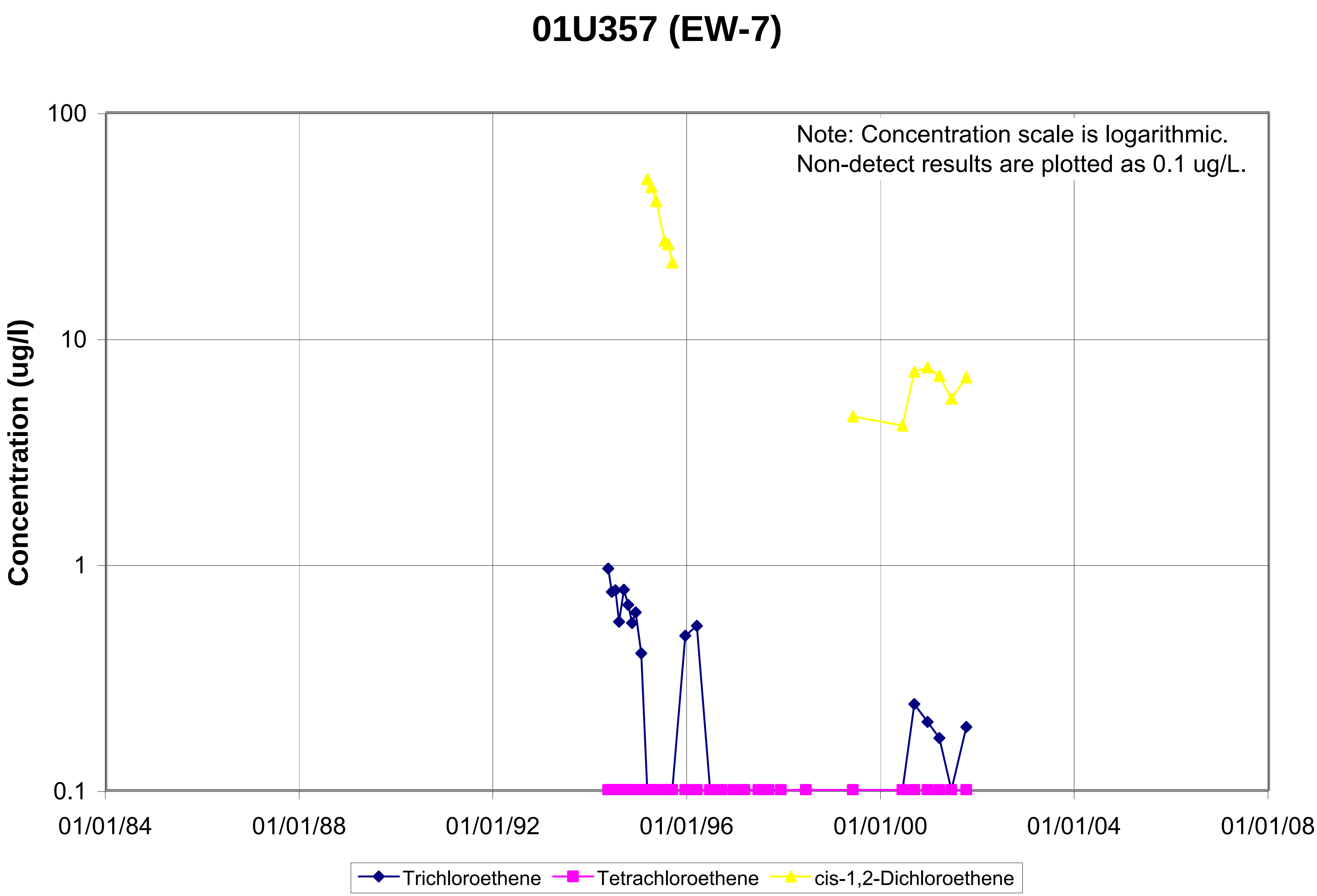

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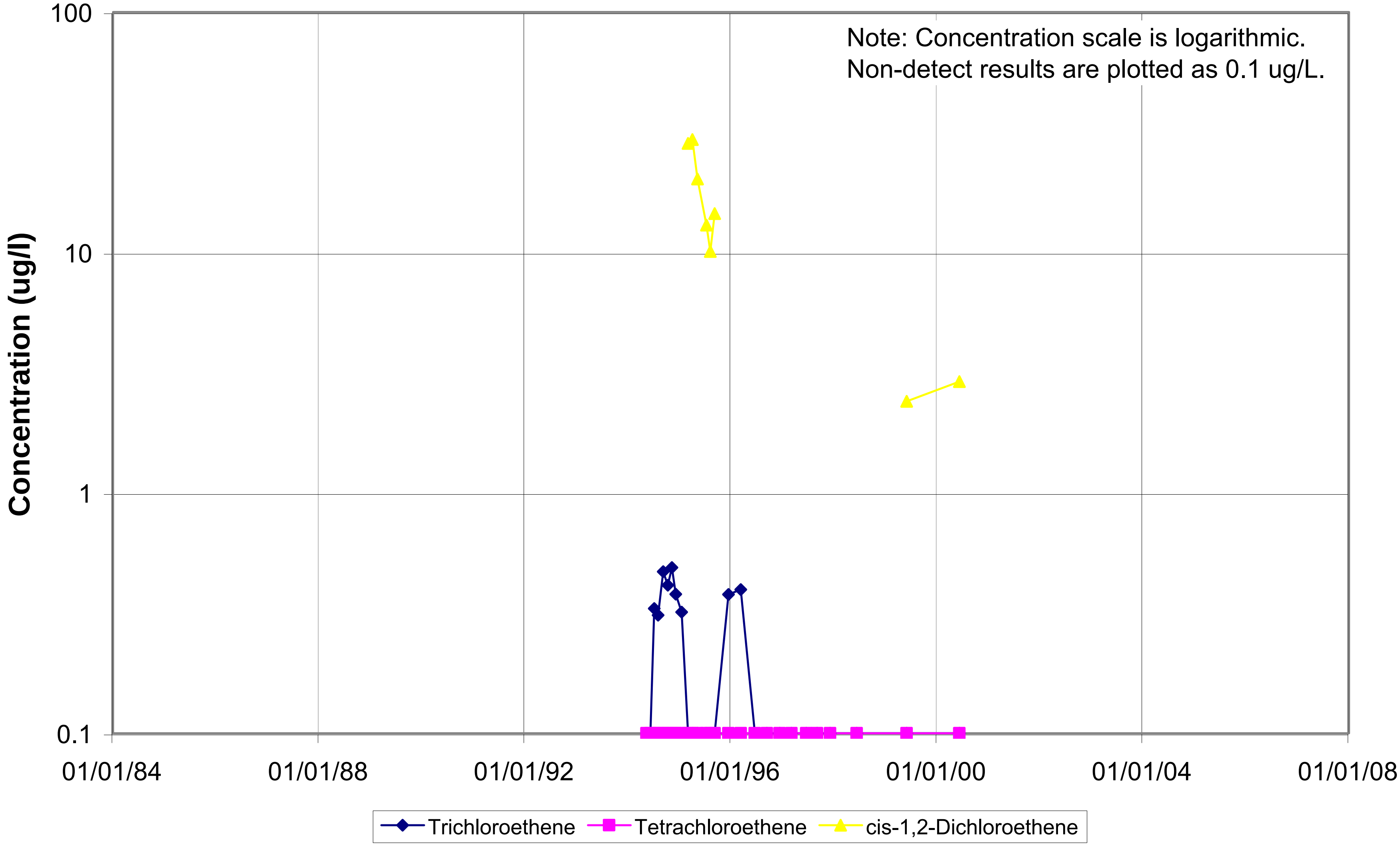
01U358 (EW-8)



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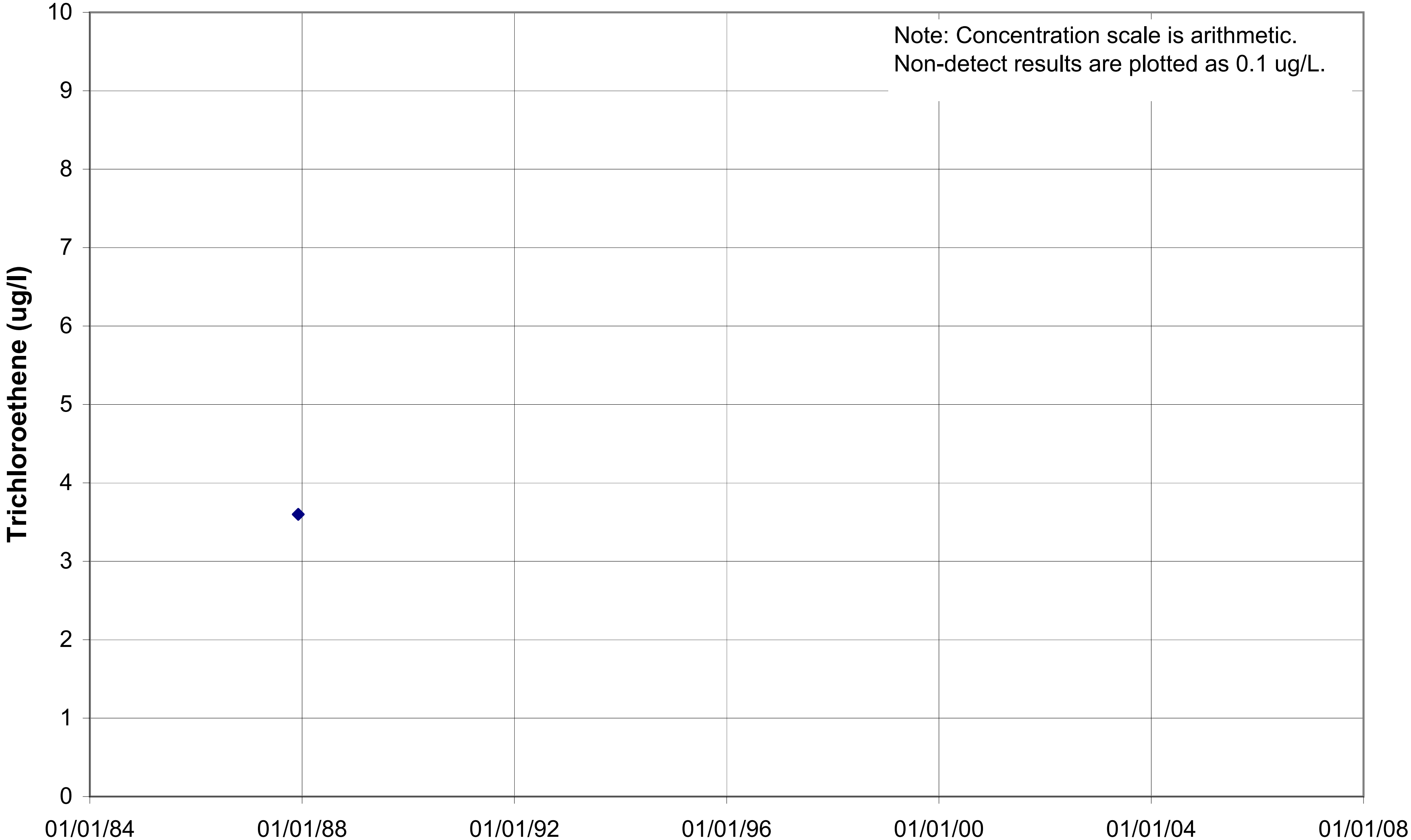

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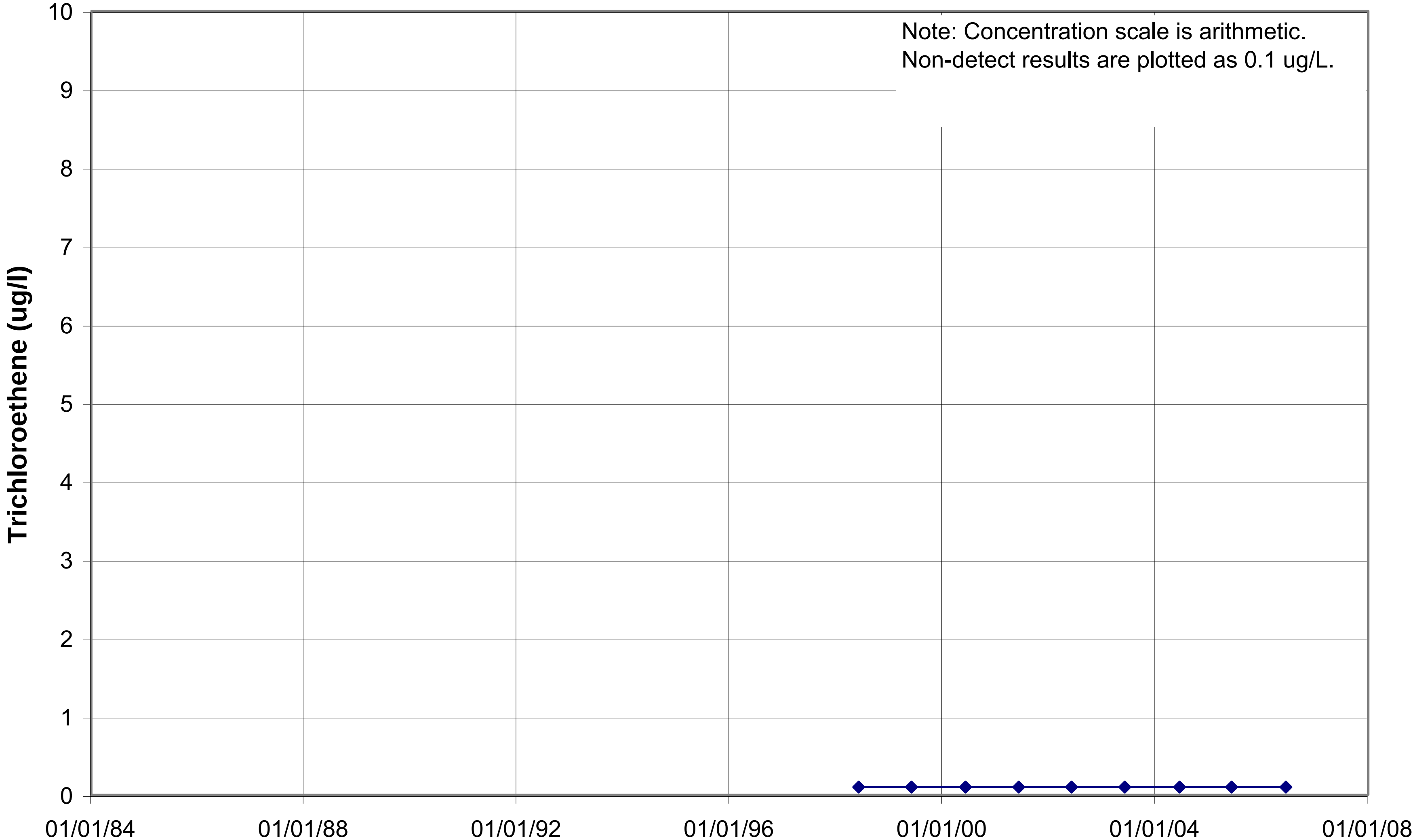

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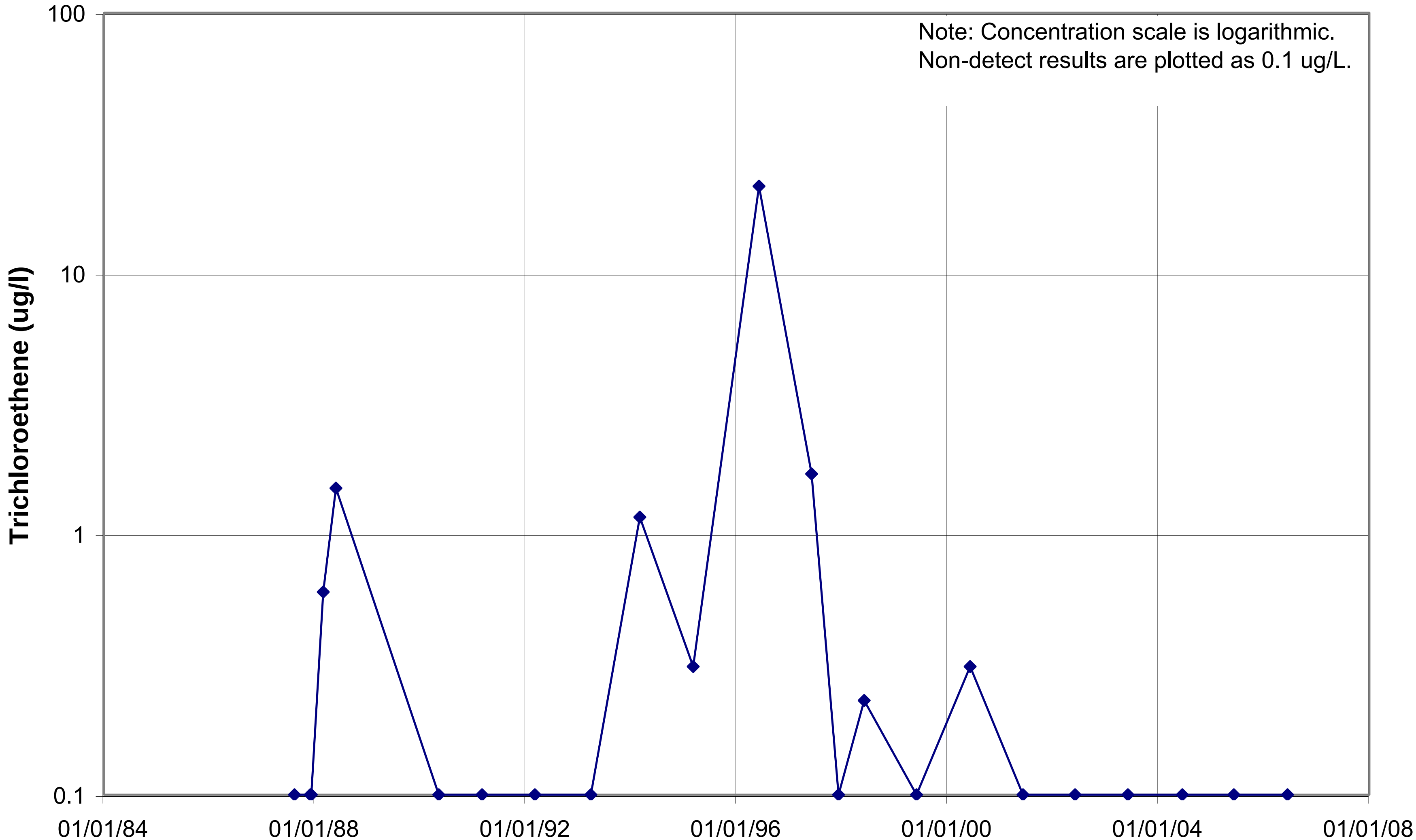

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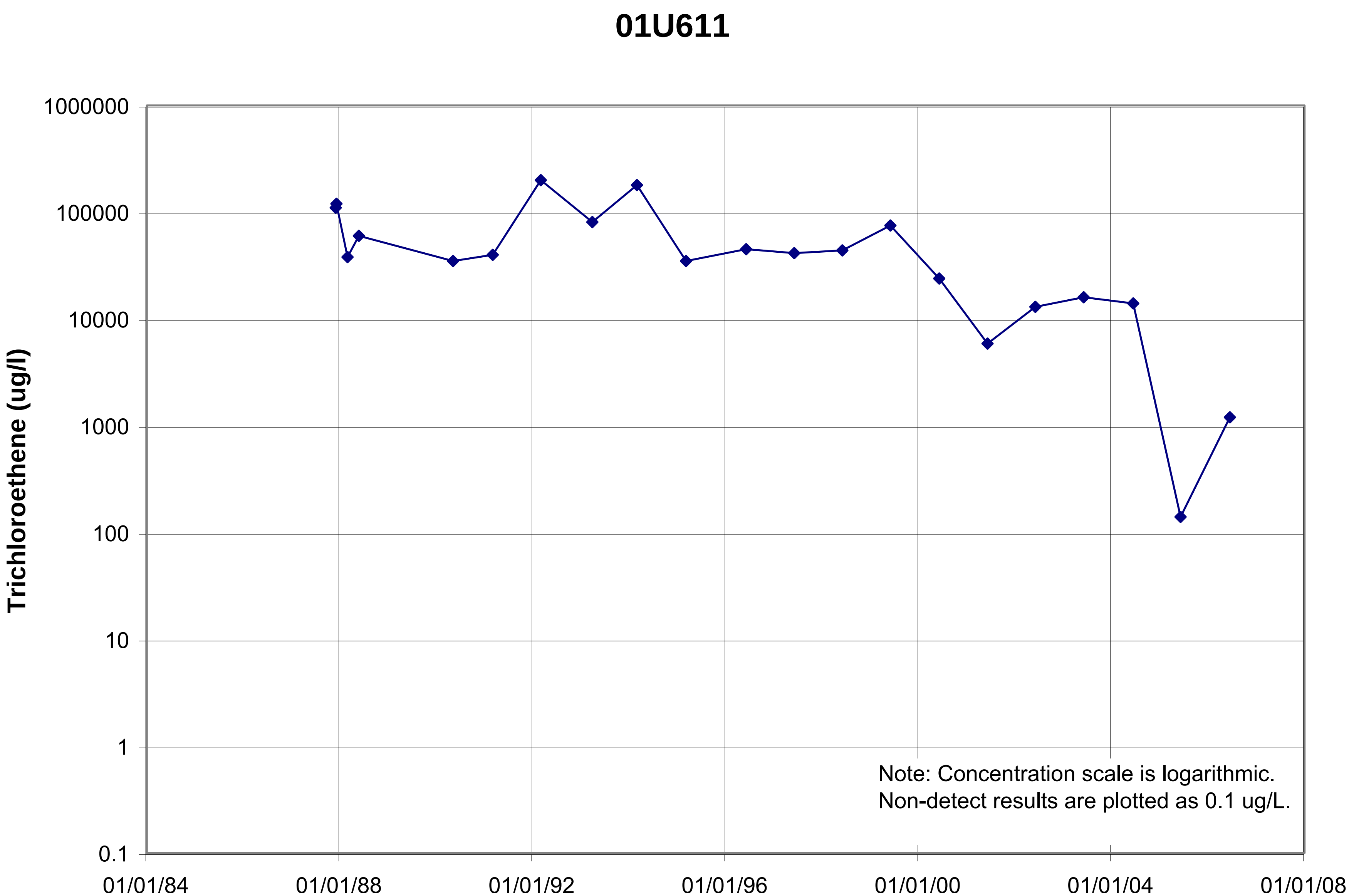

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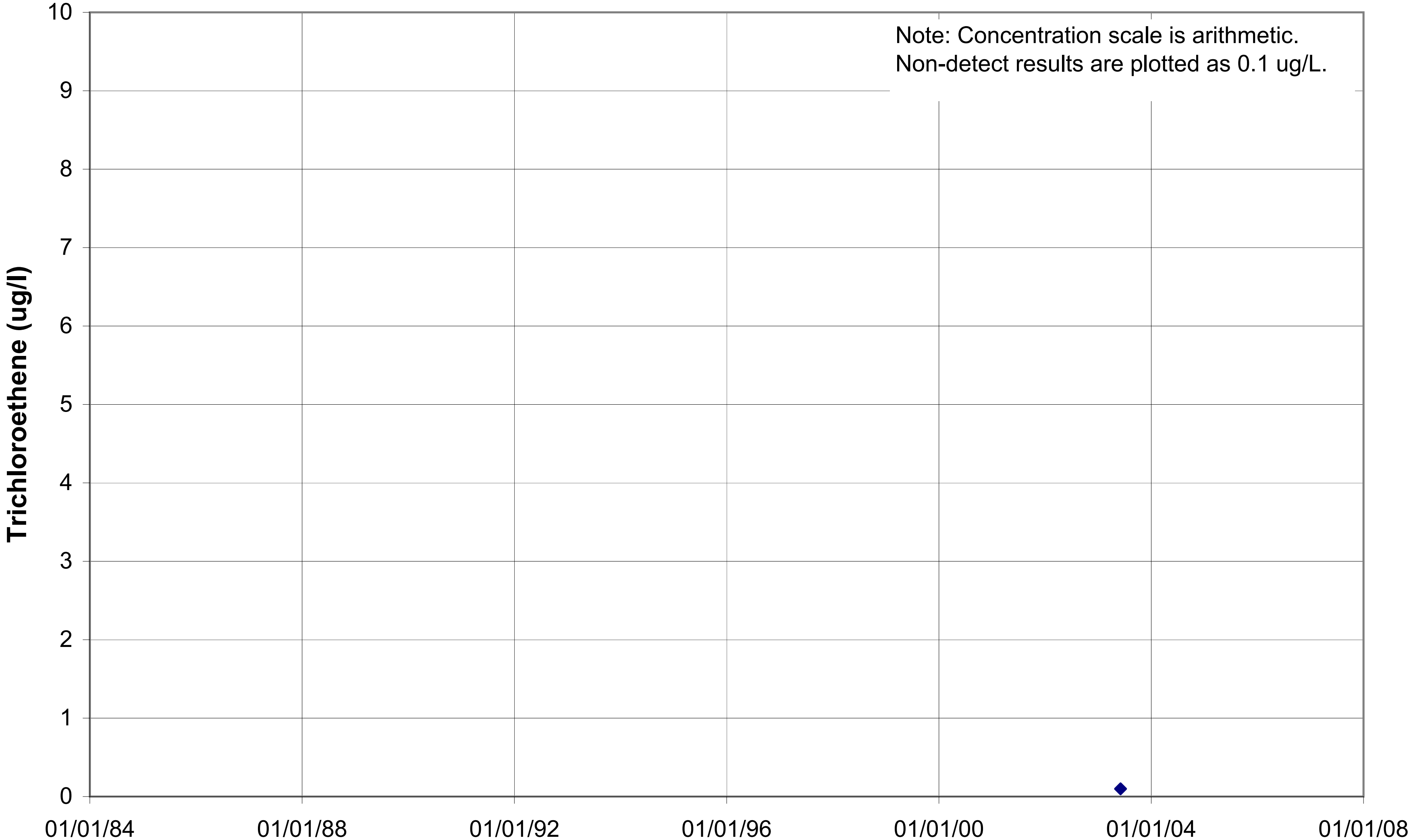

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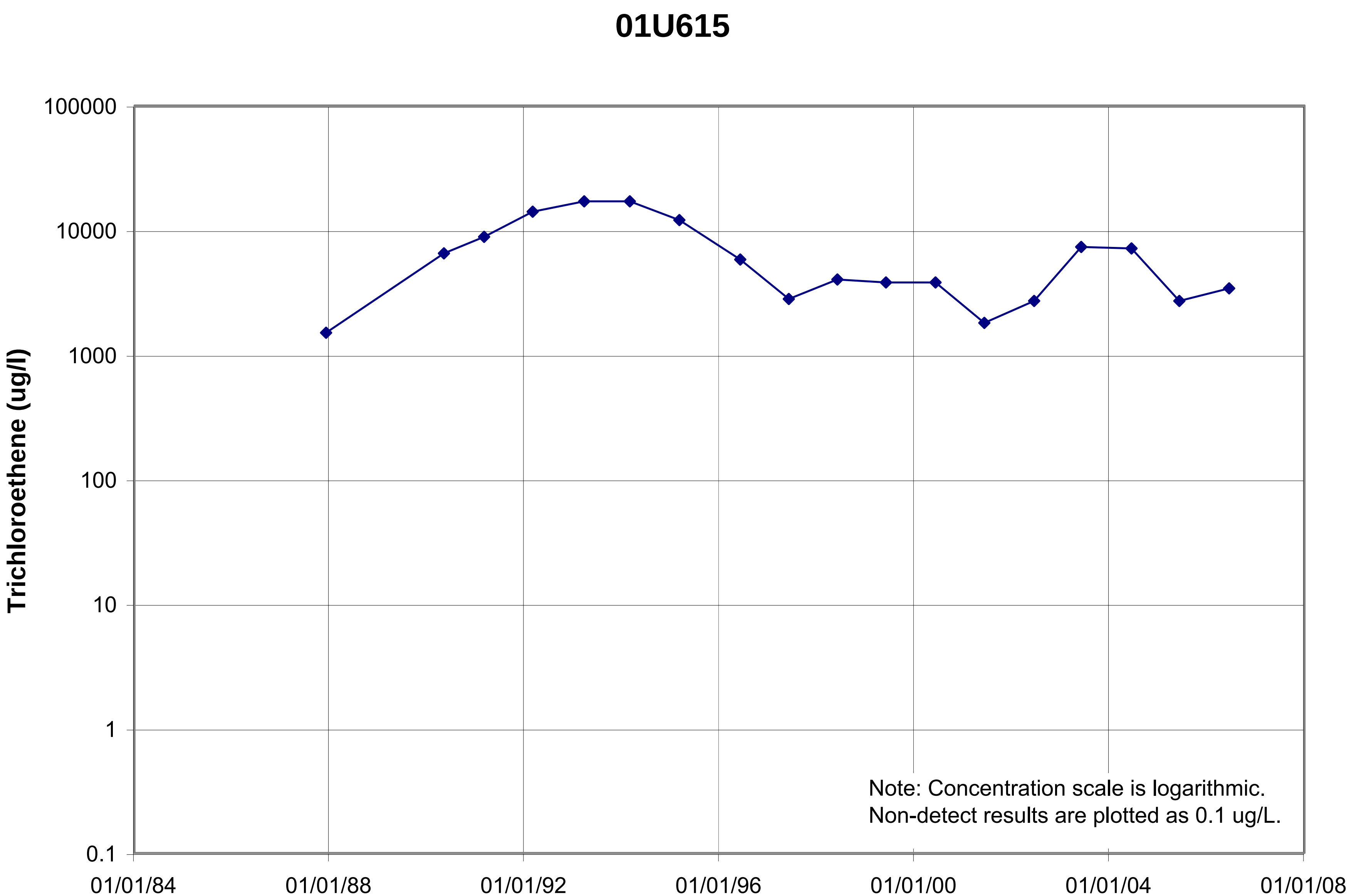

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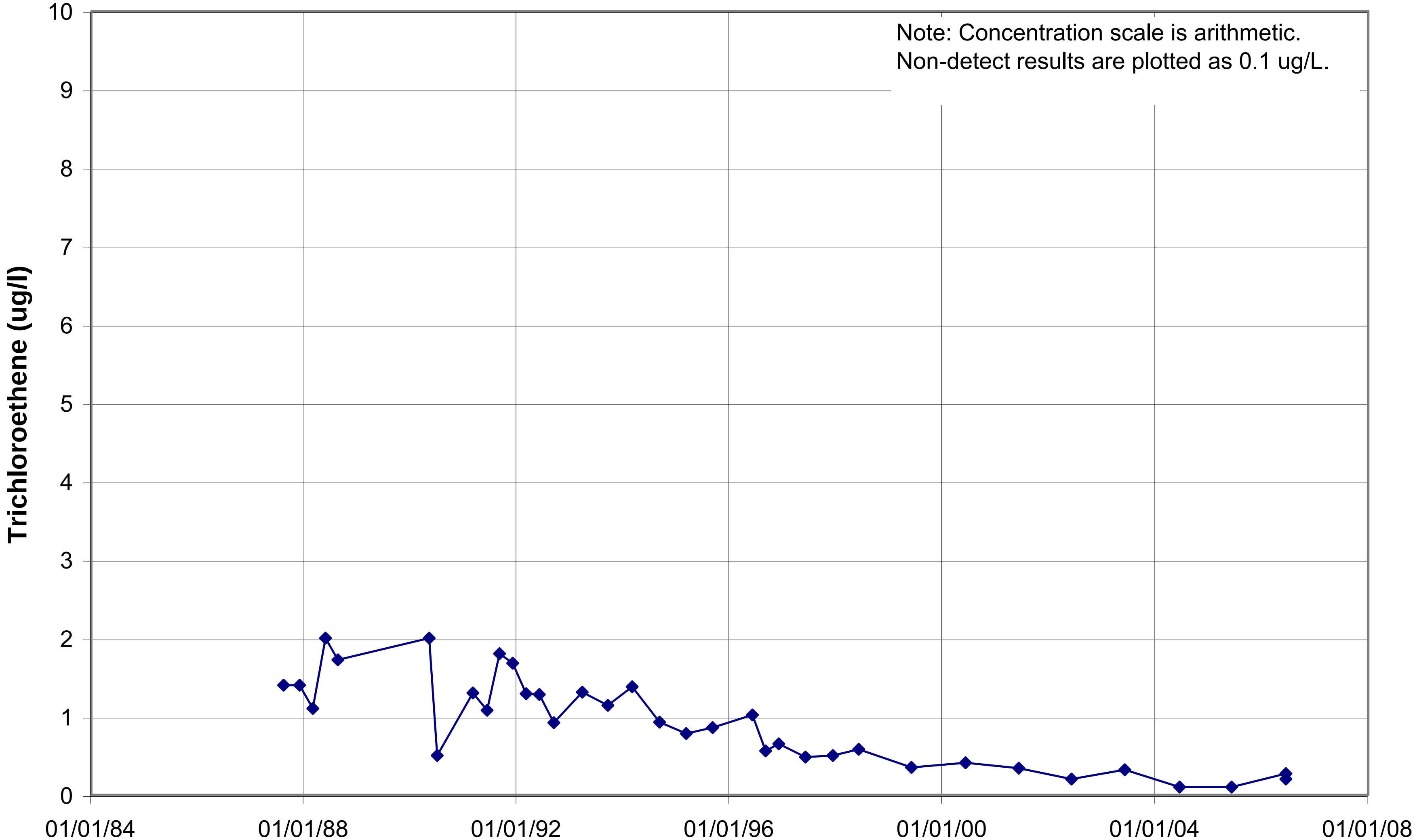

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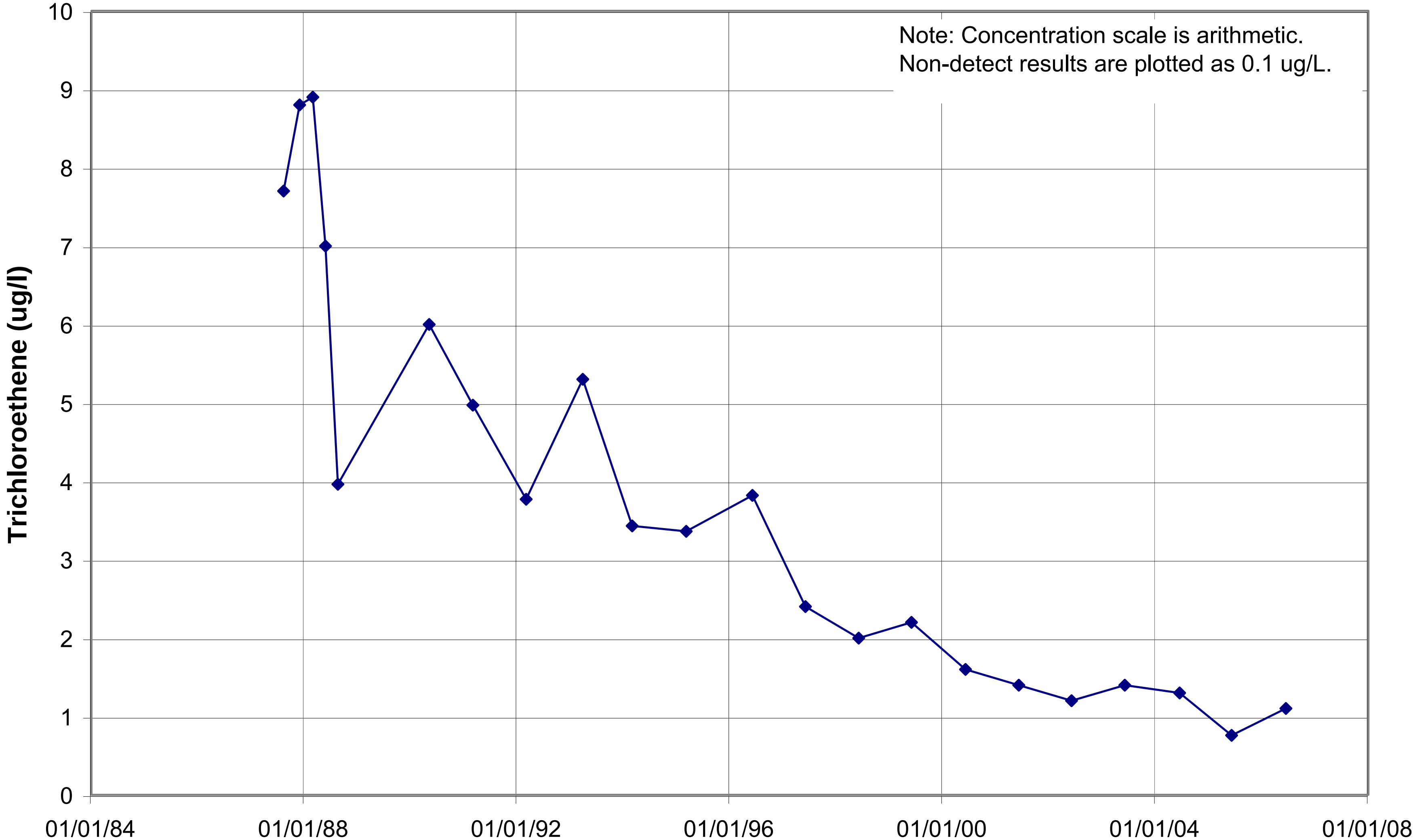

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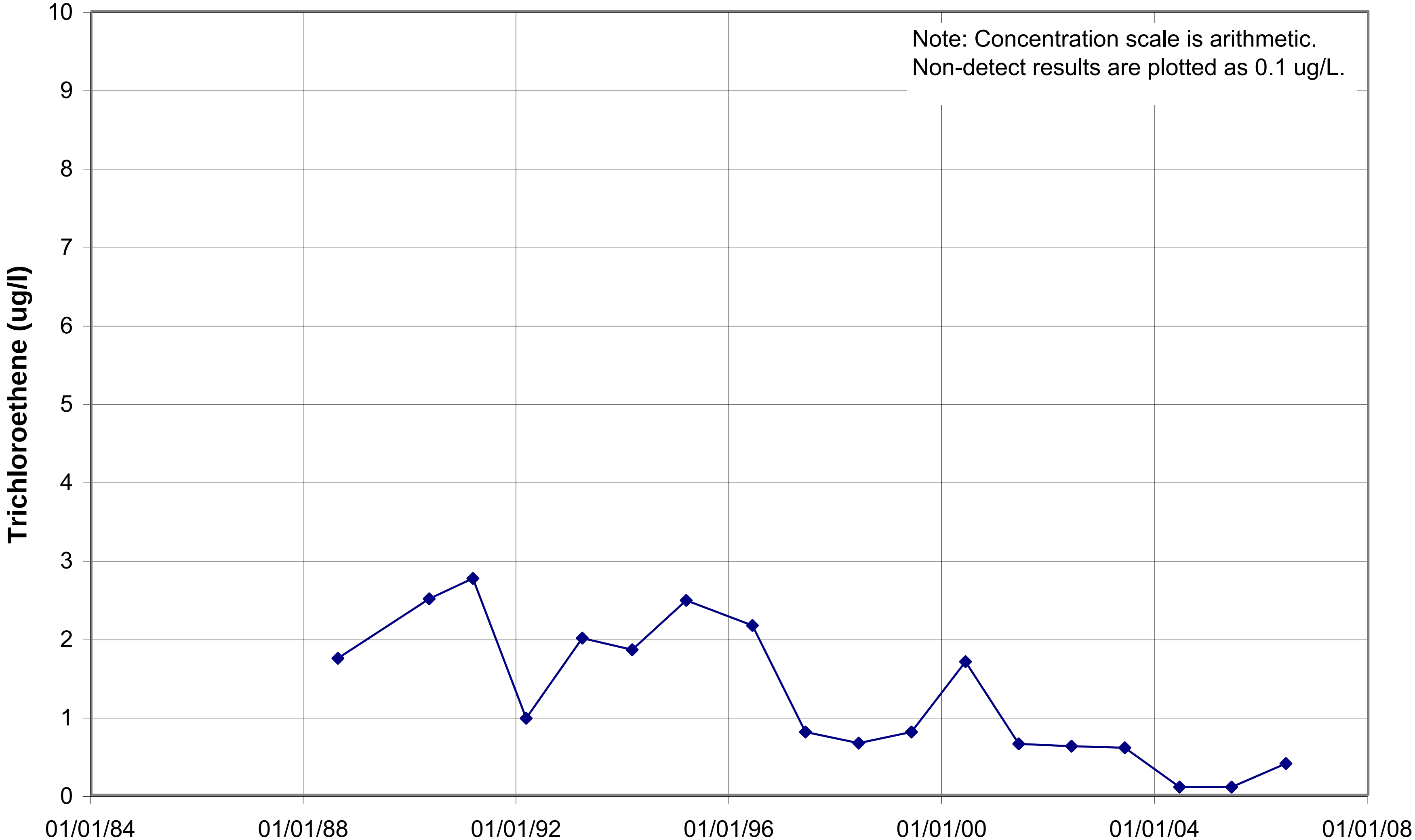

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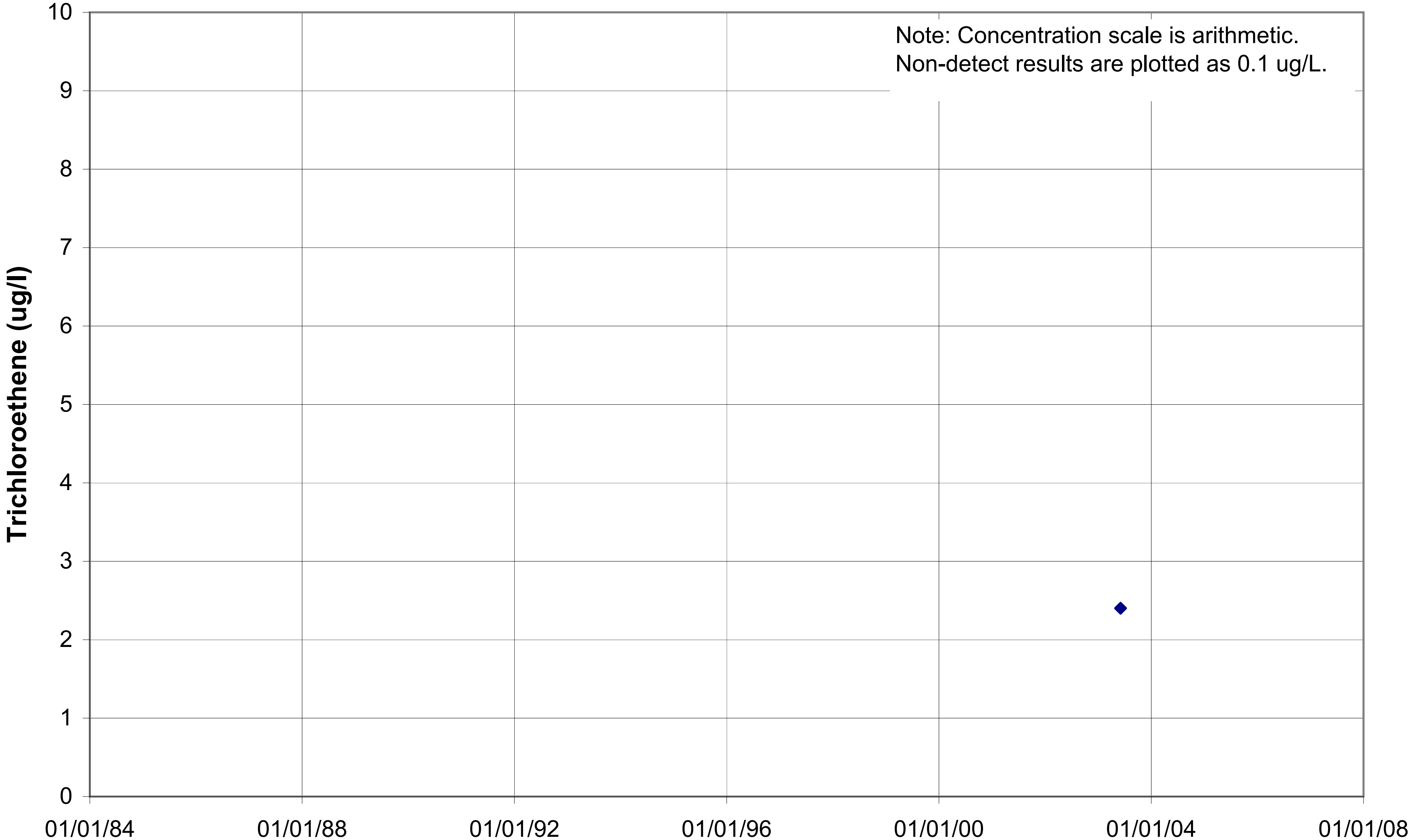

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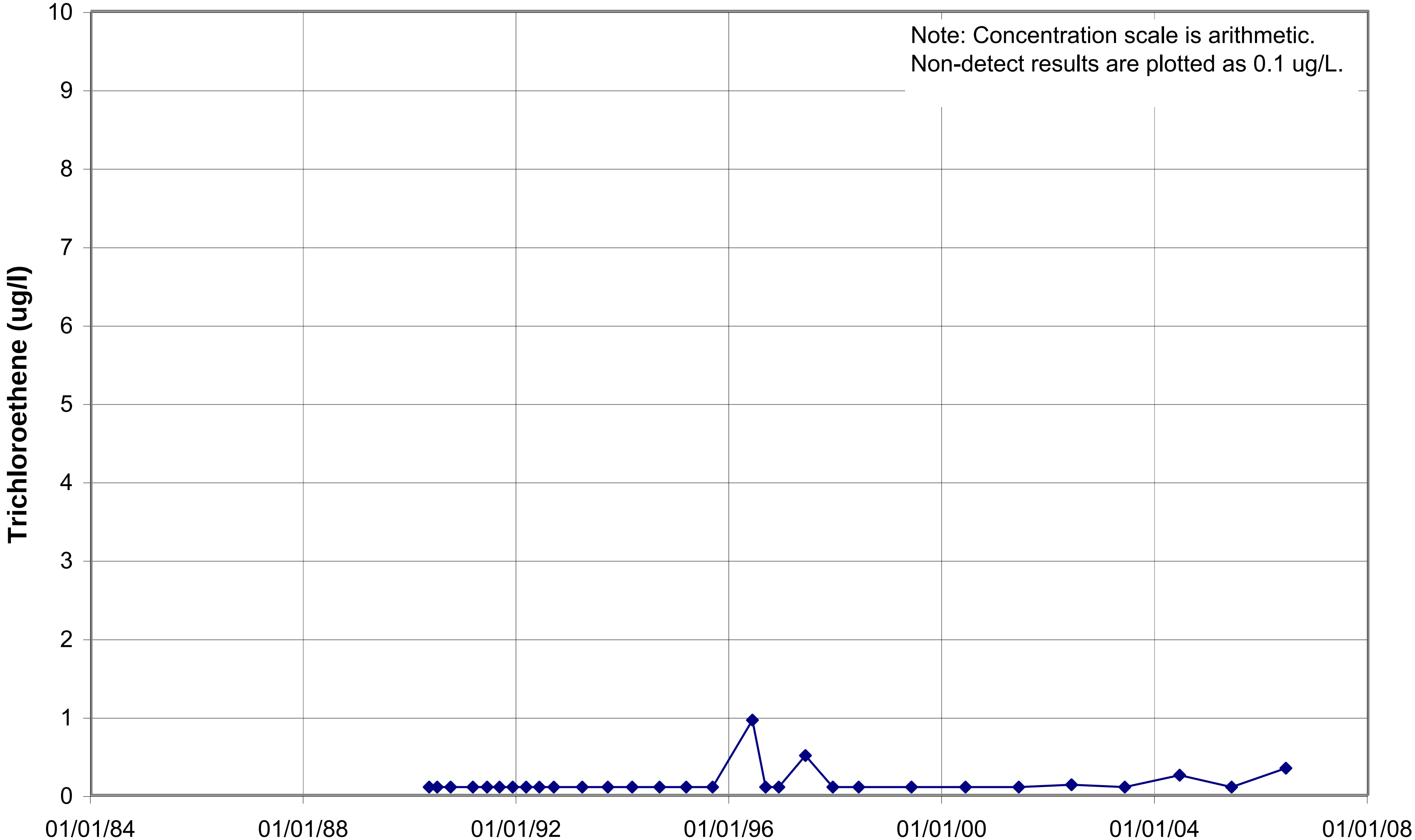

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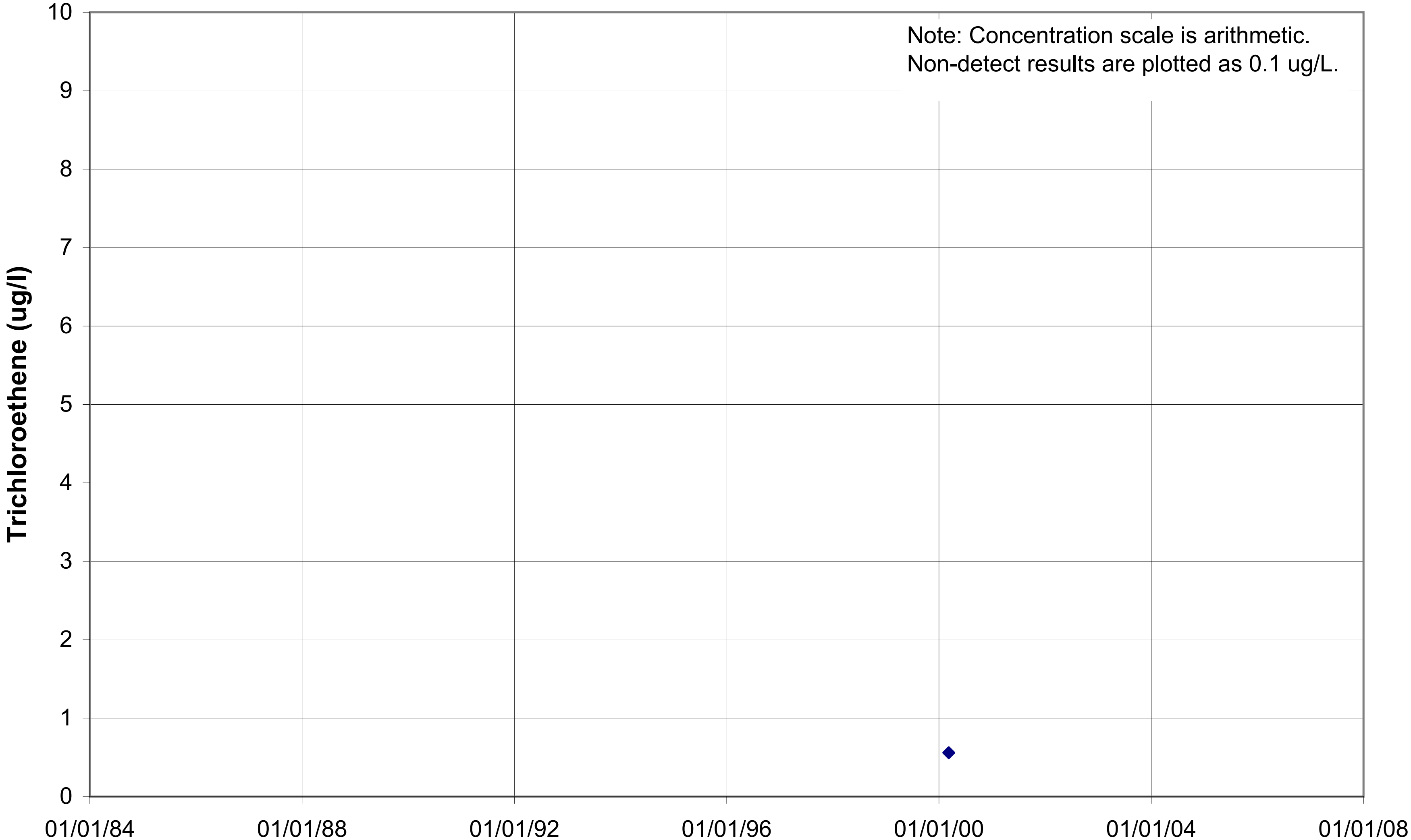

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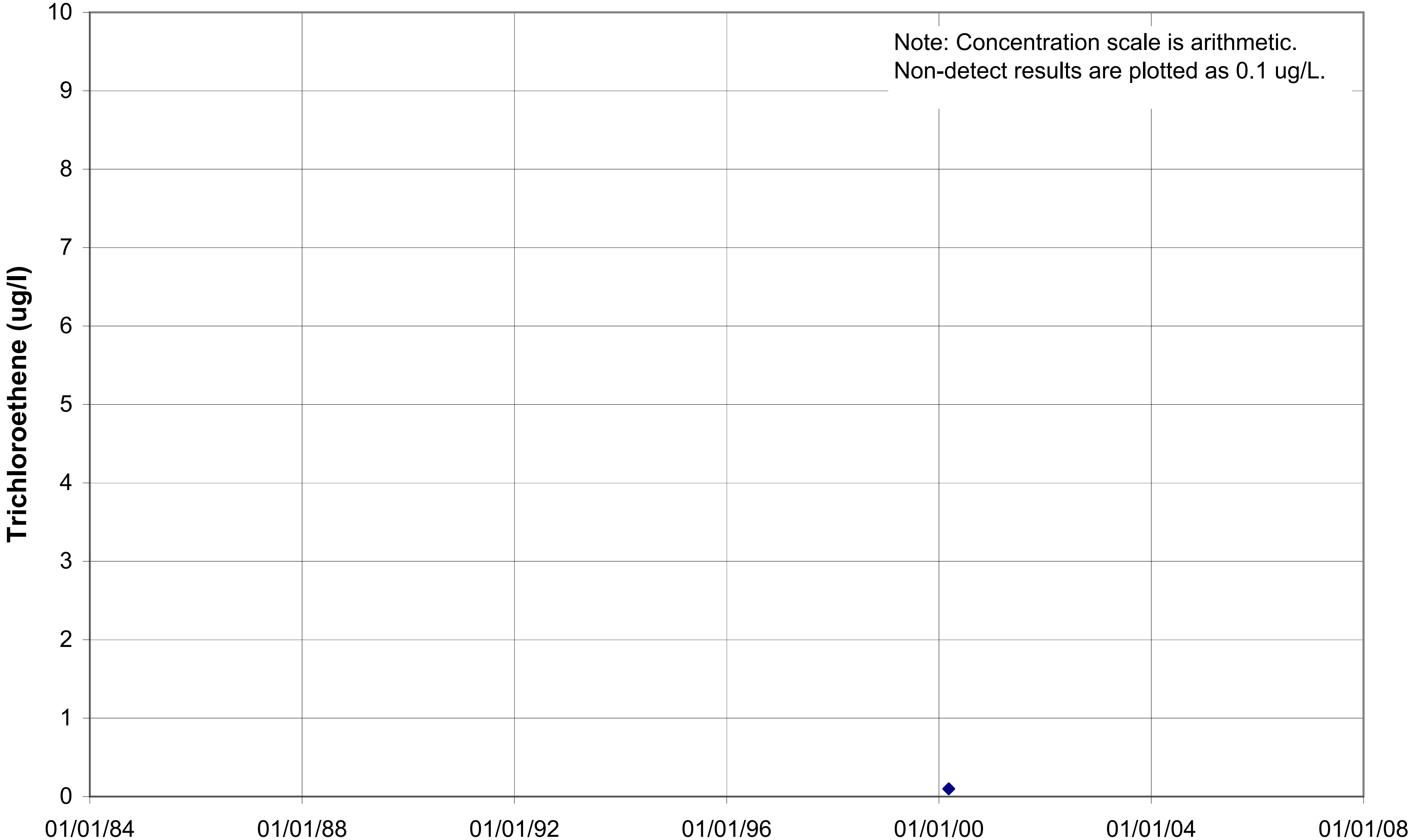

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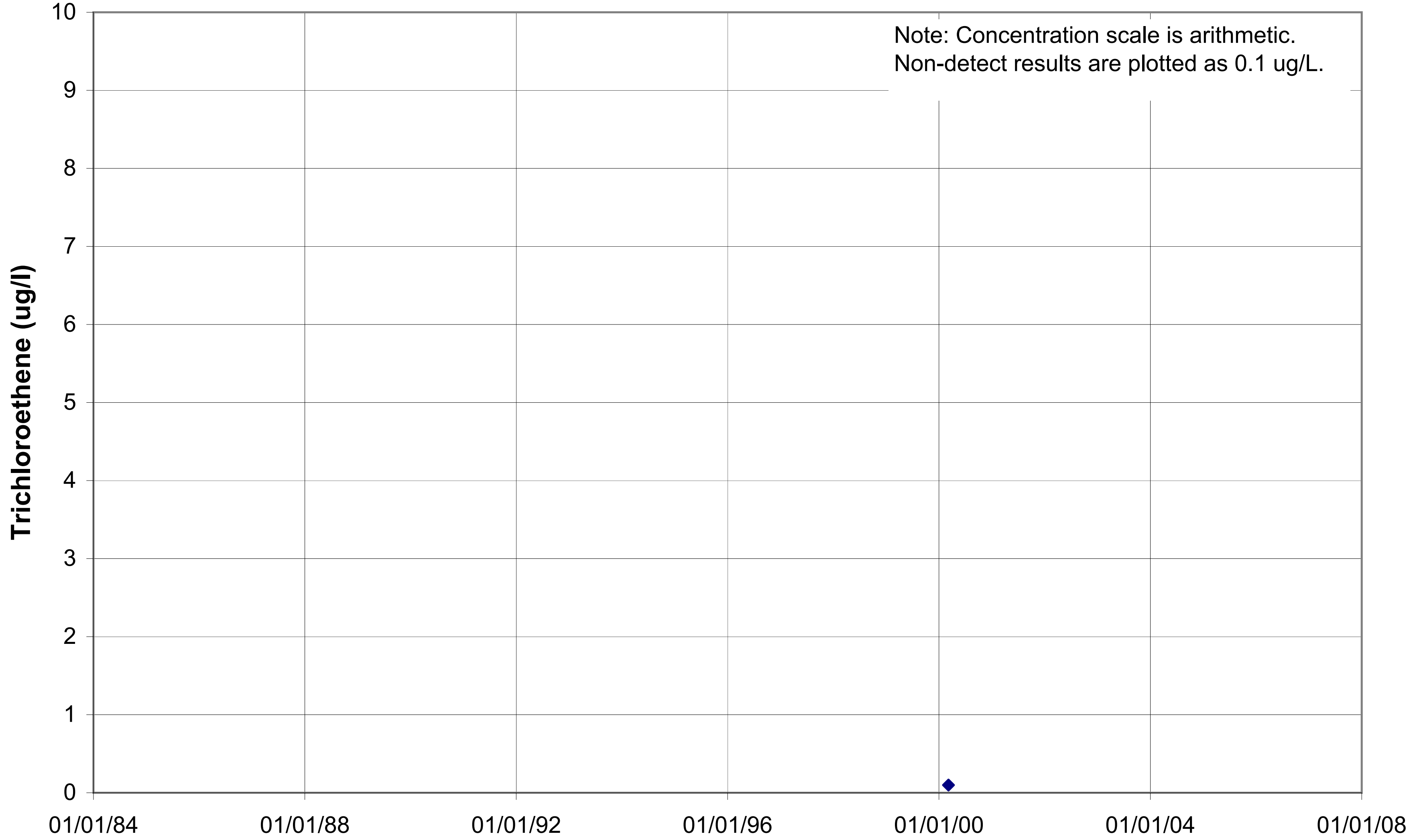

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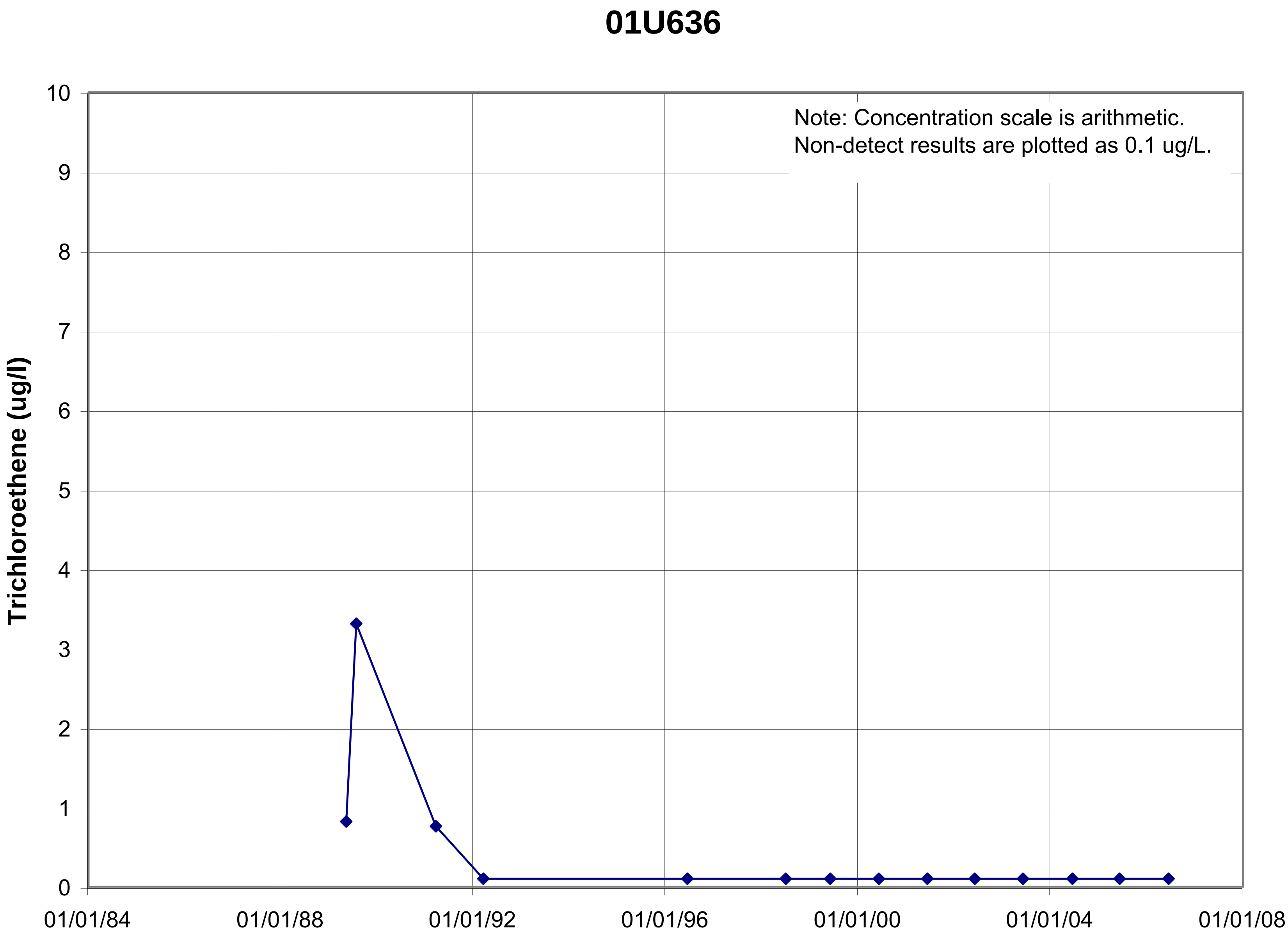

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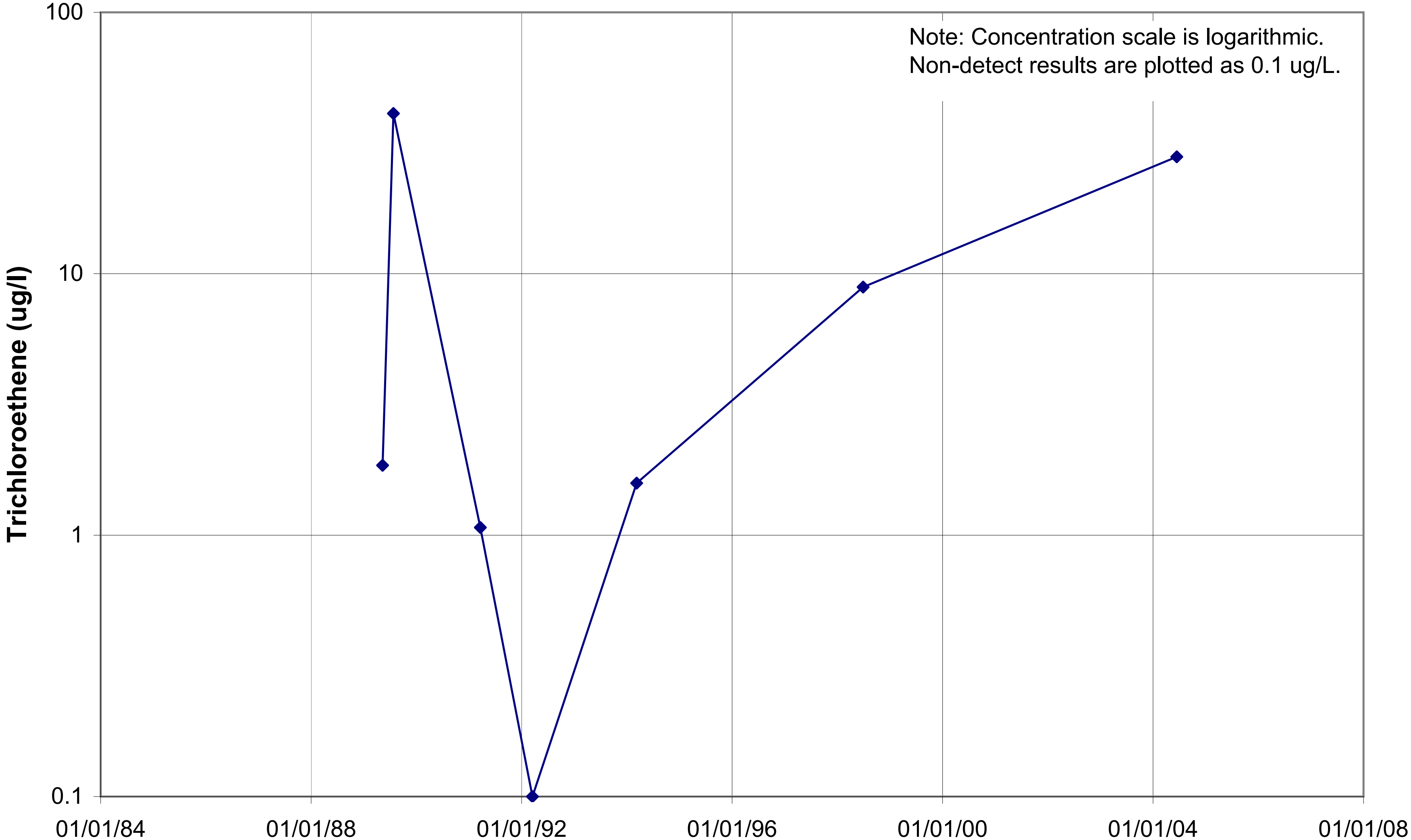

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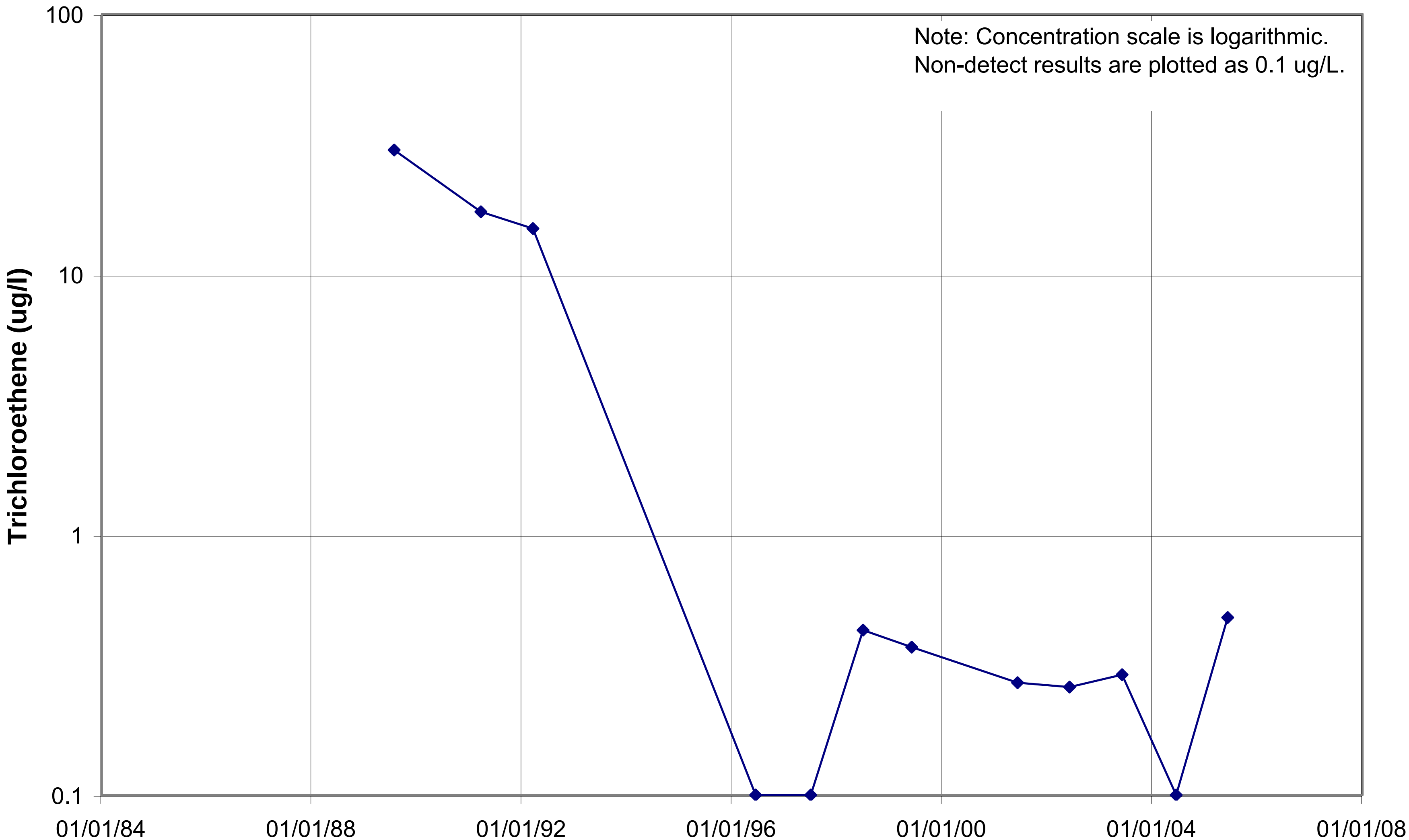

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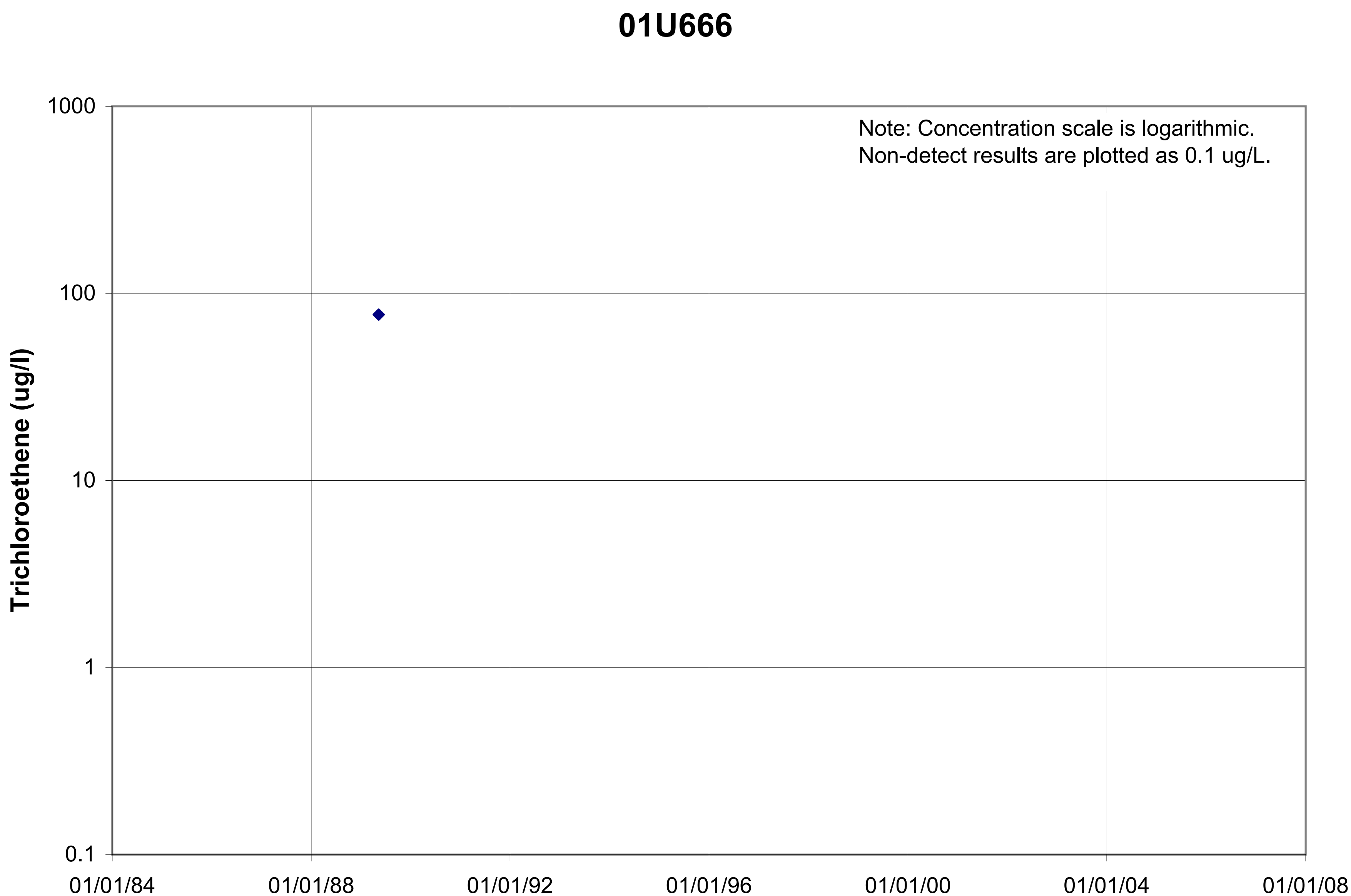

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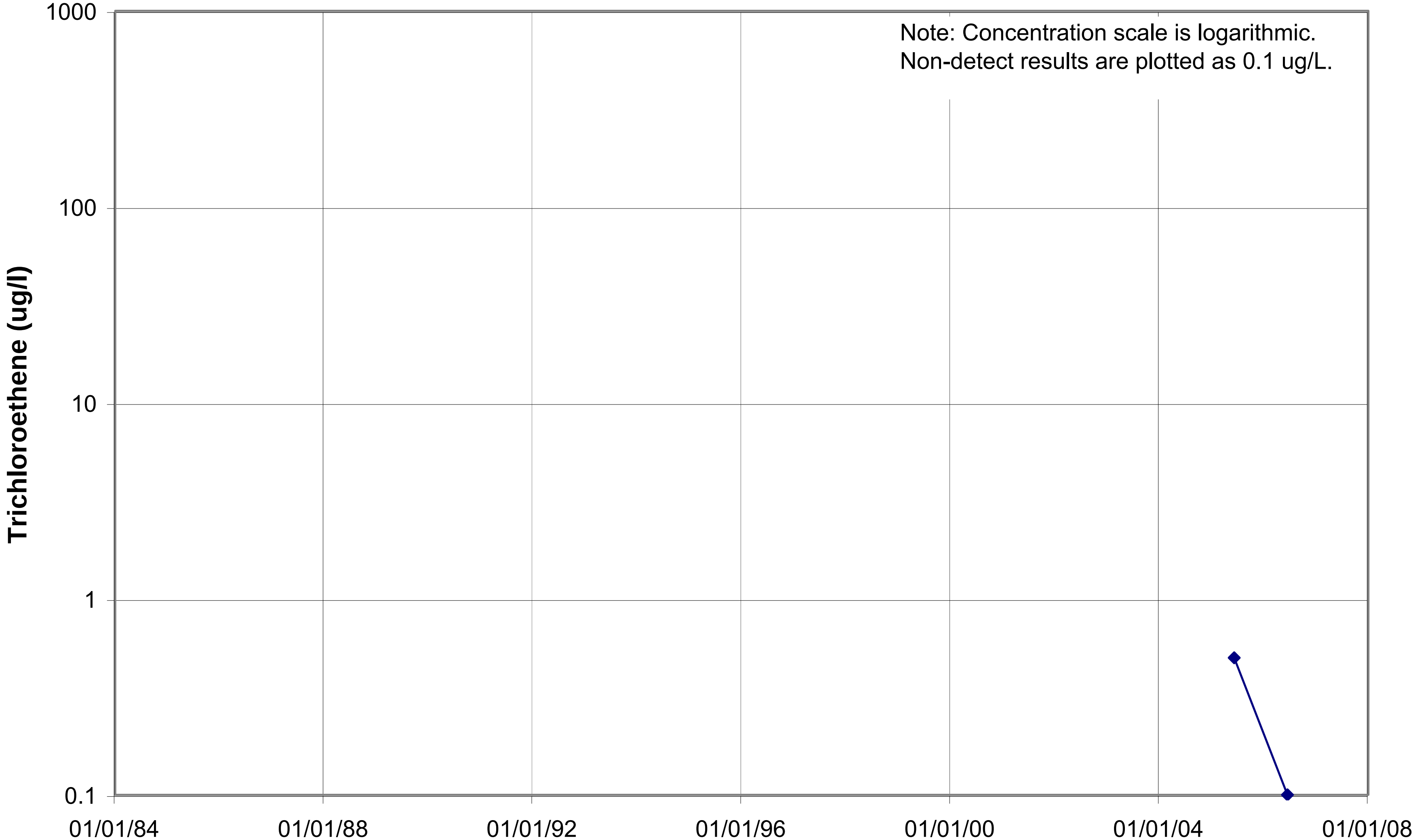

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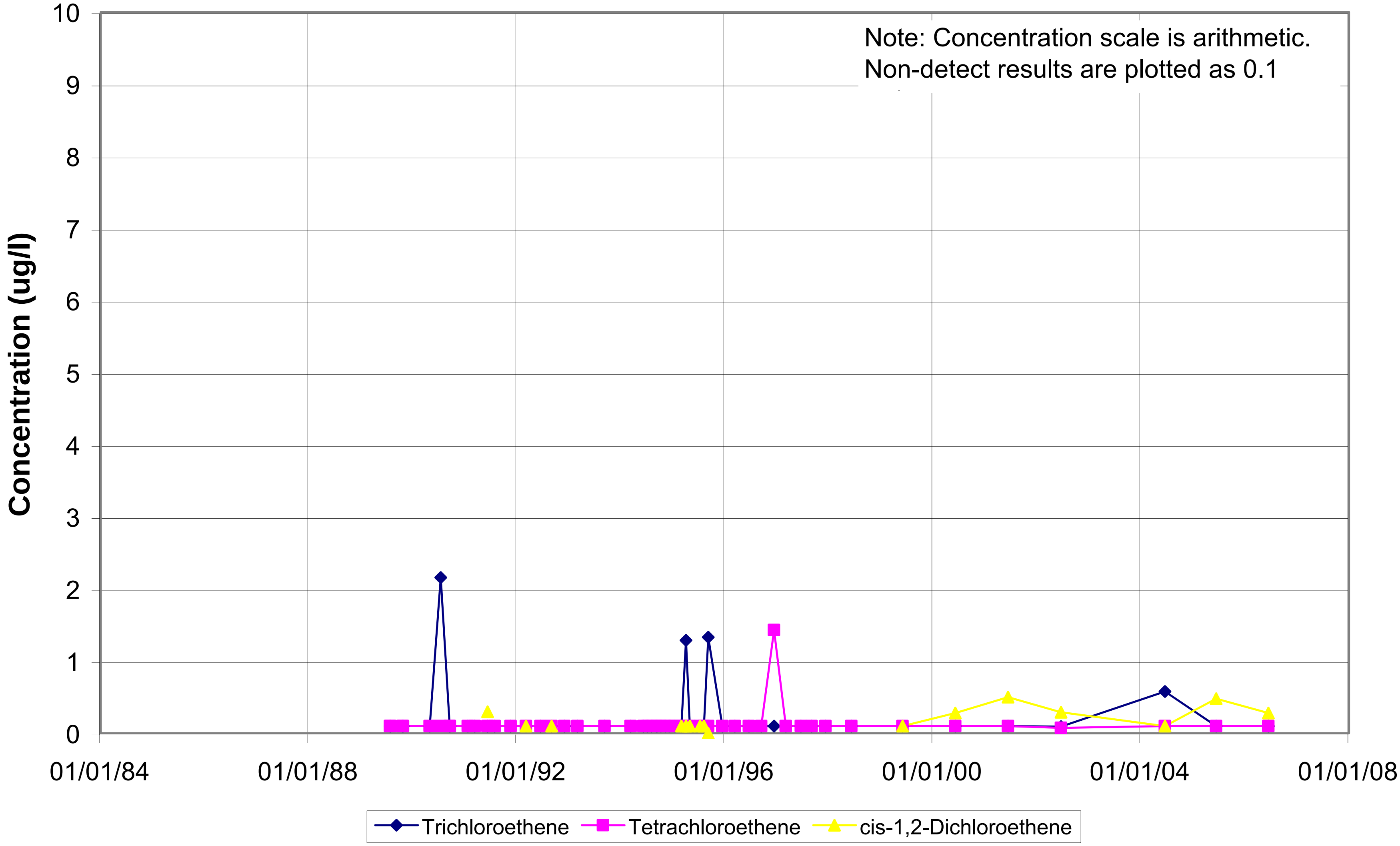

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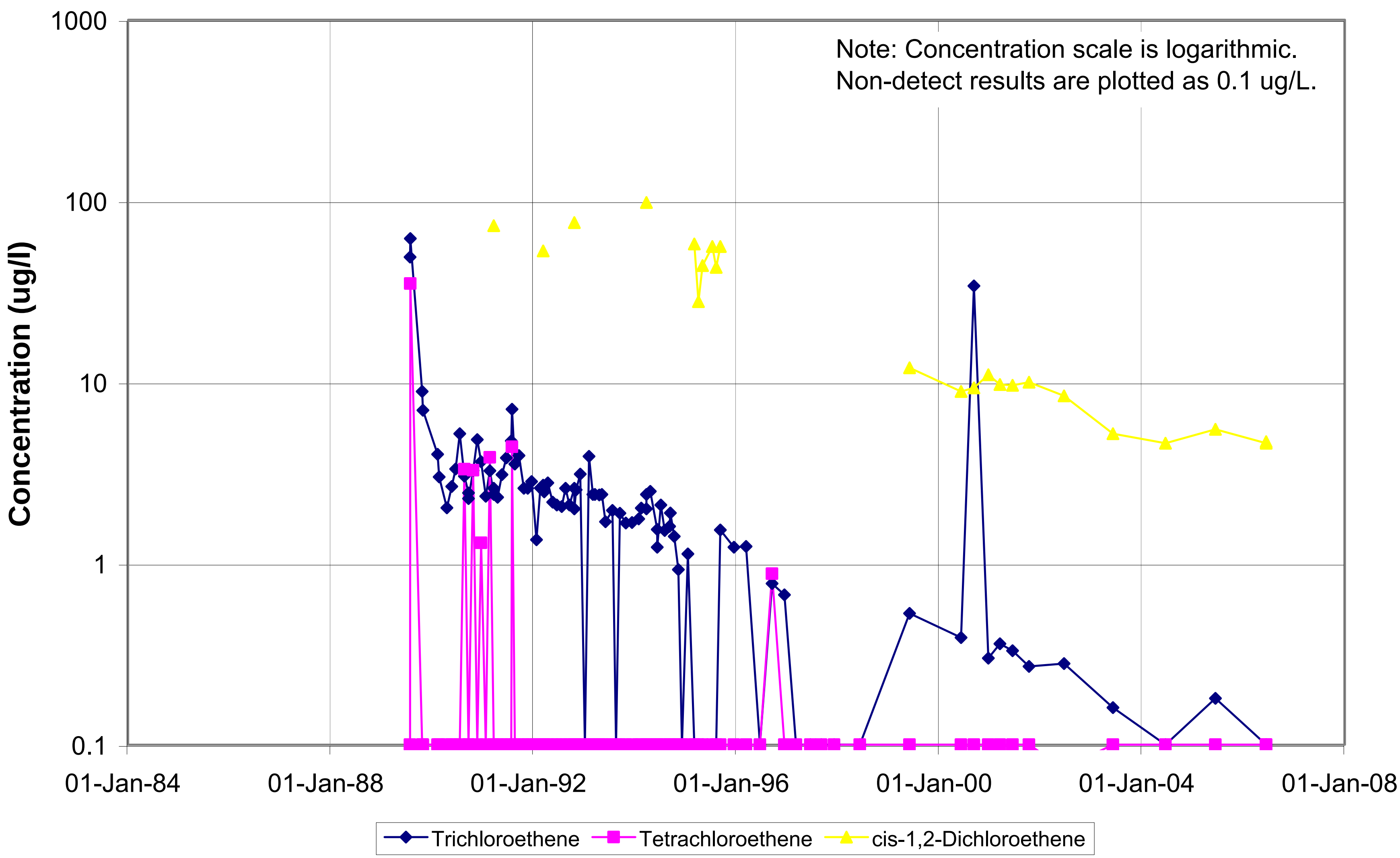

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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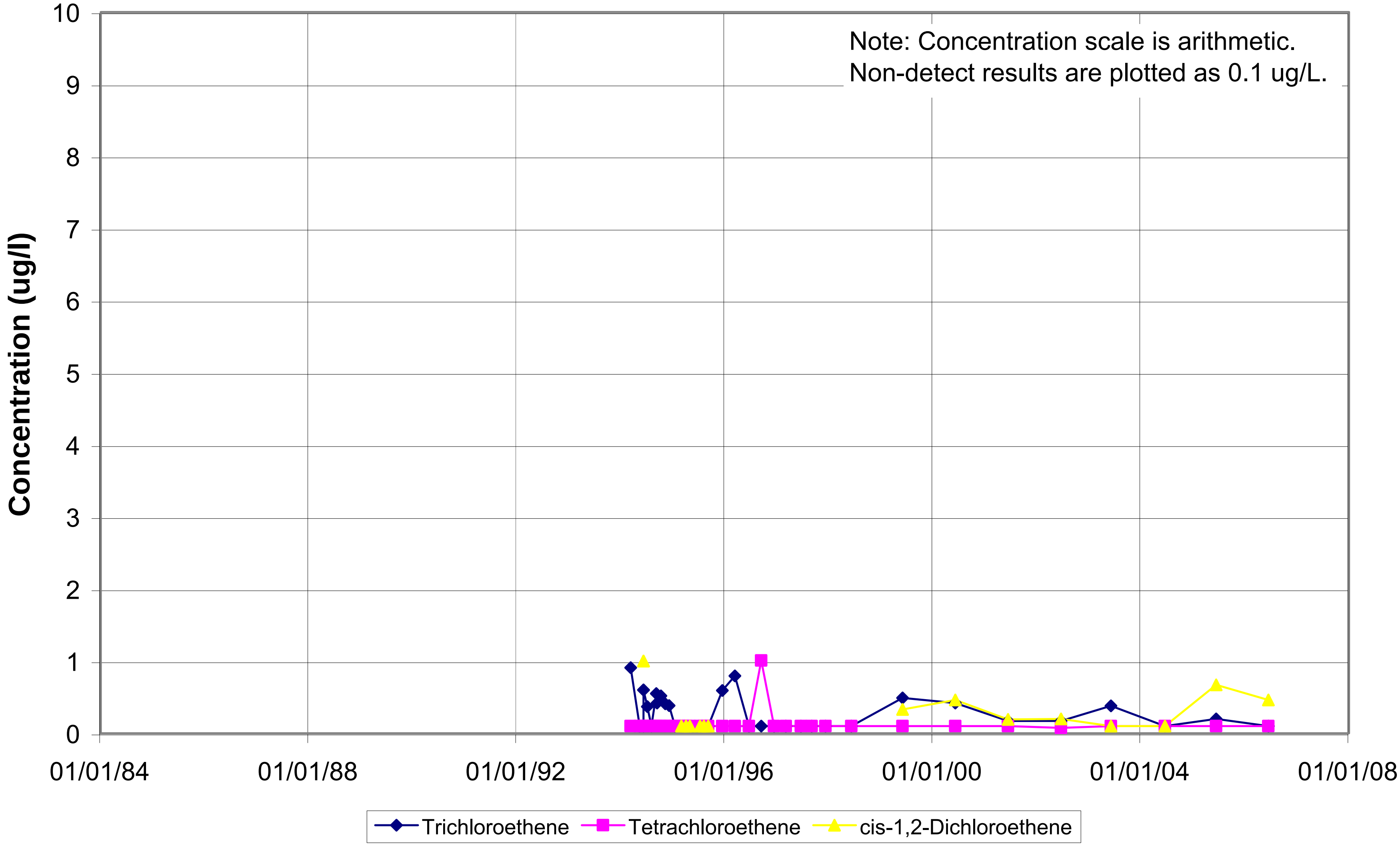

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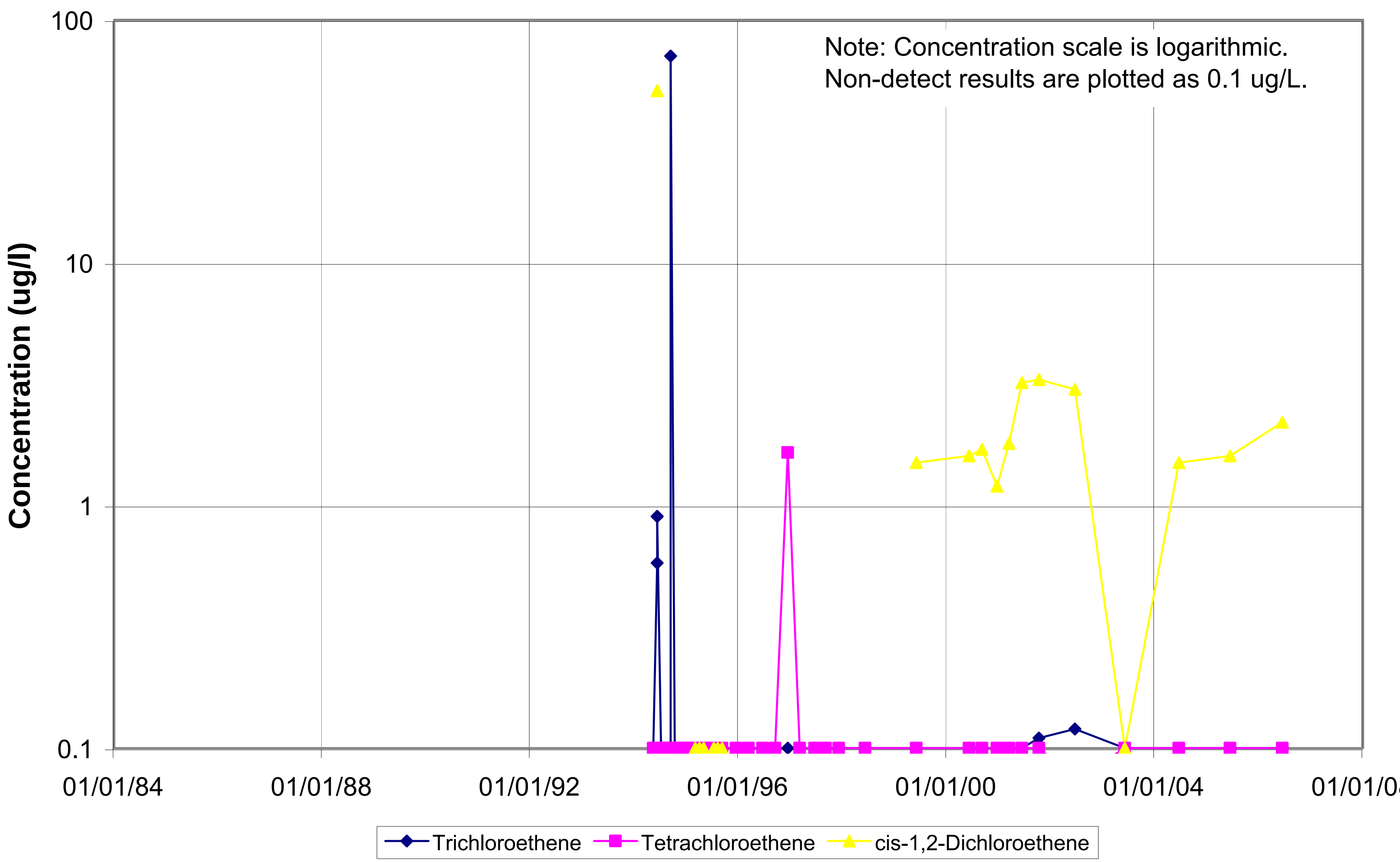
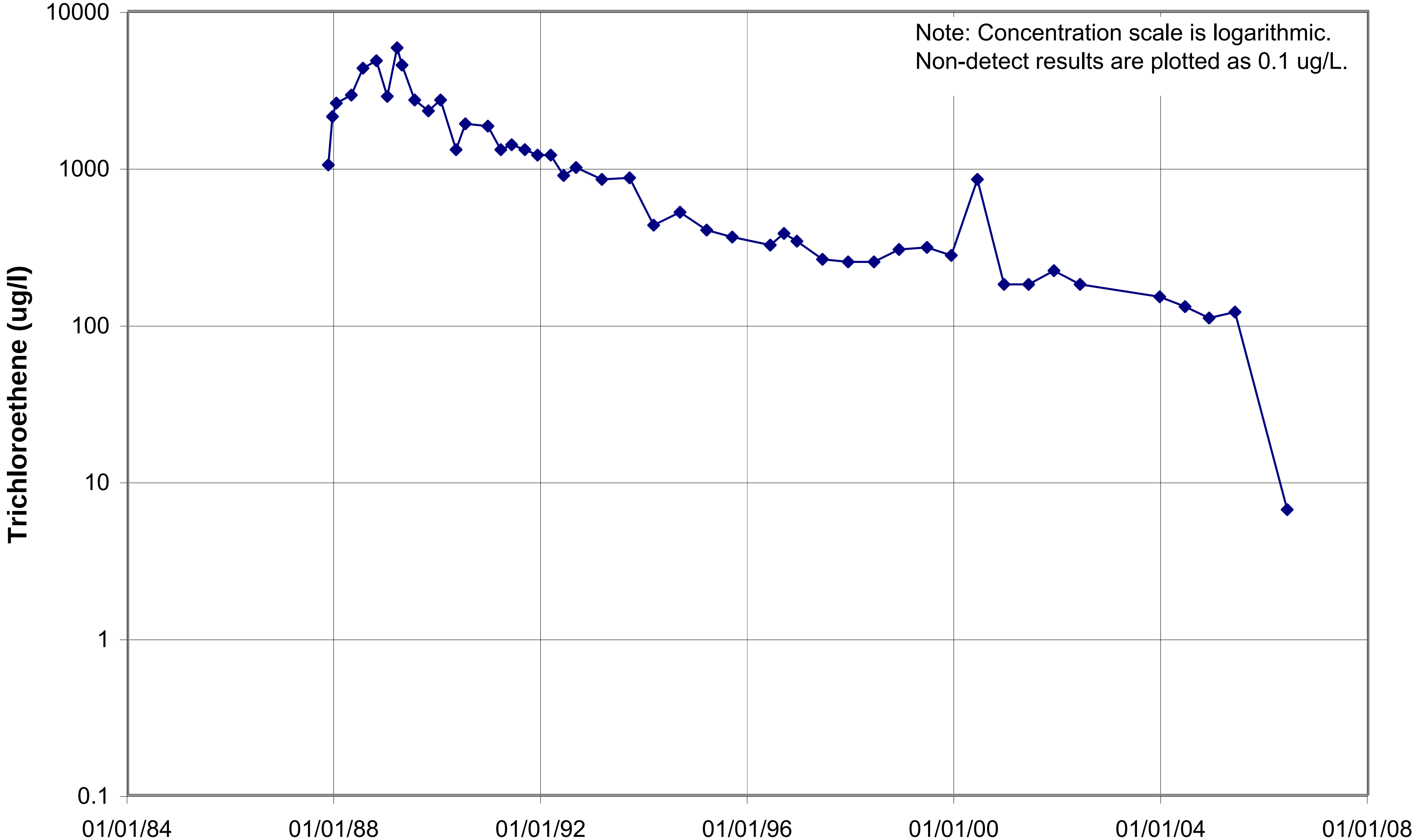
01U904

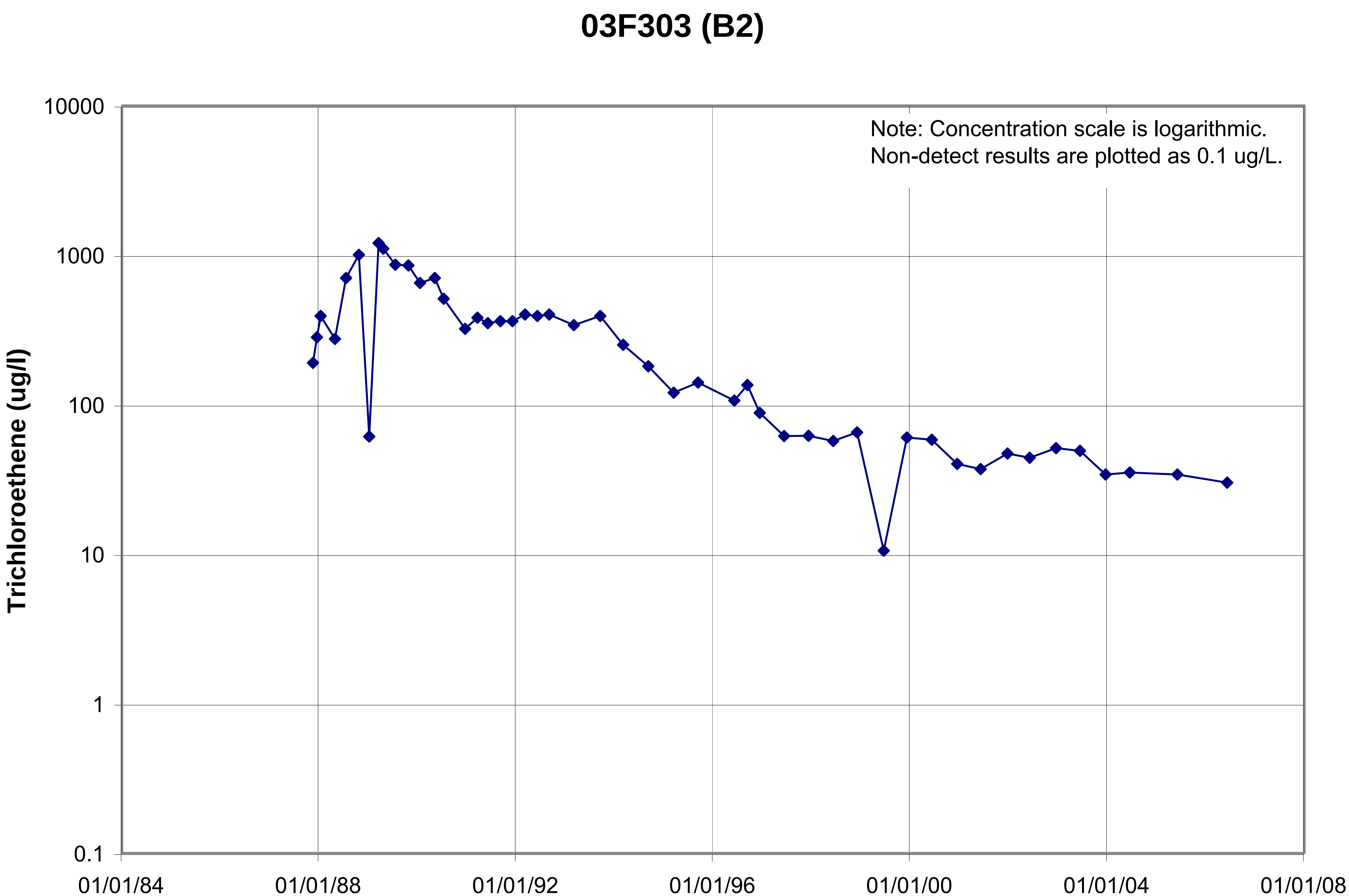


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03F302 (B1)

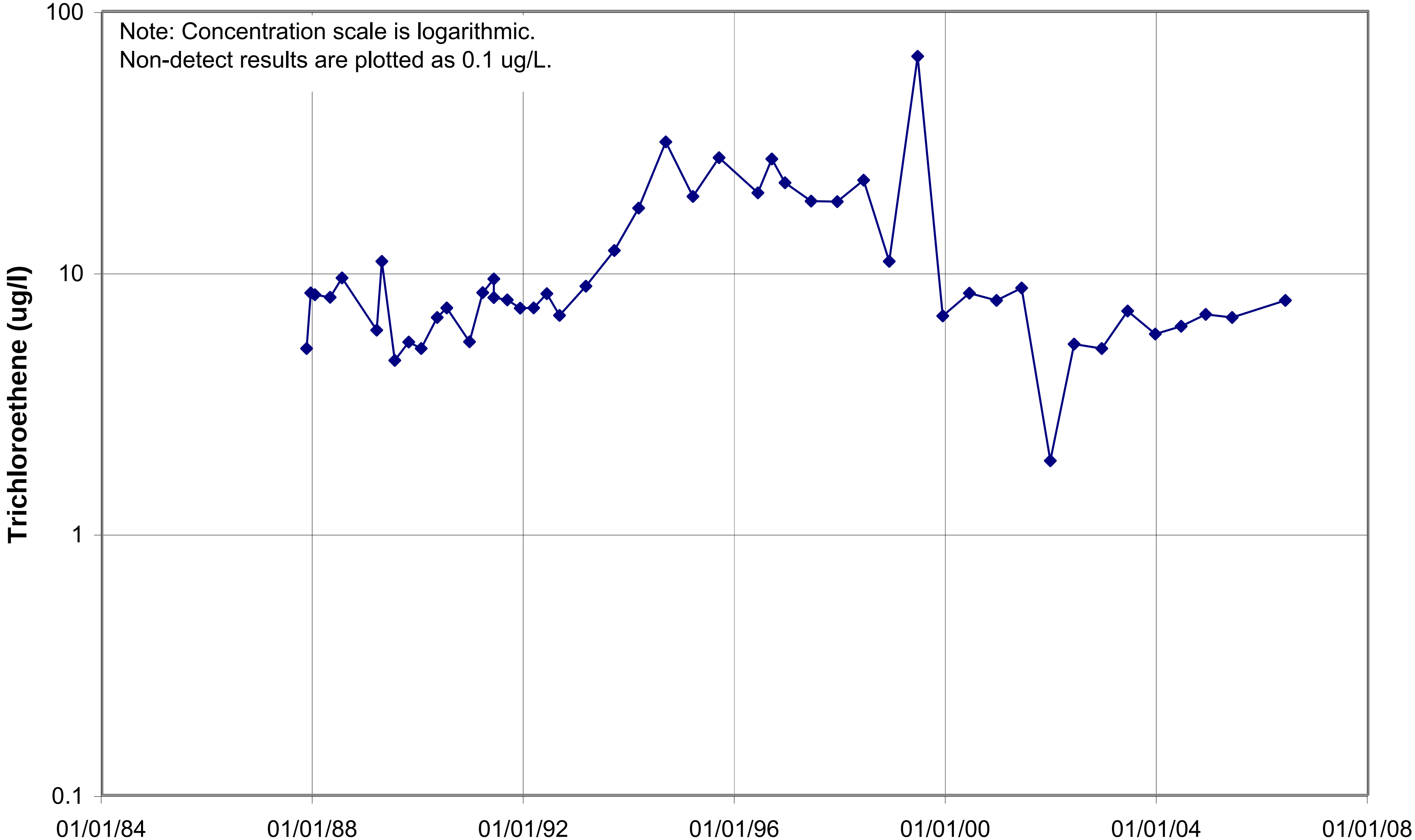


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



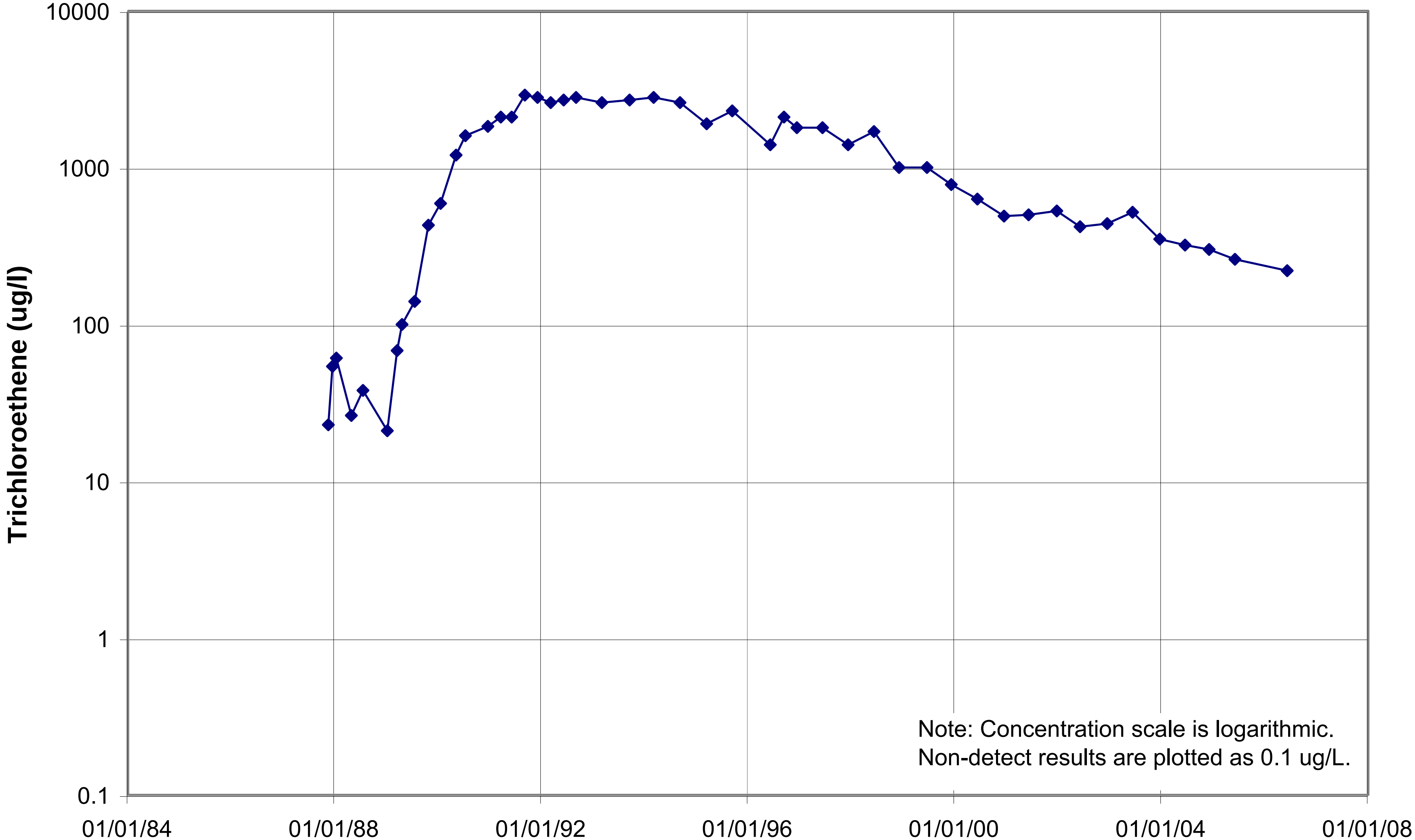
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03F304 (B3)

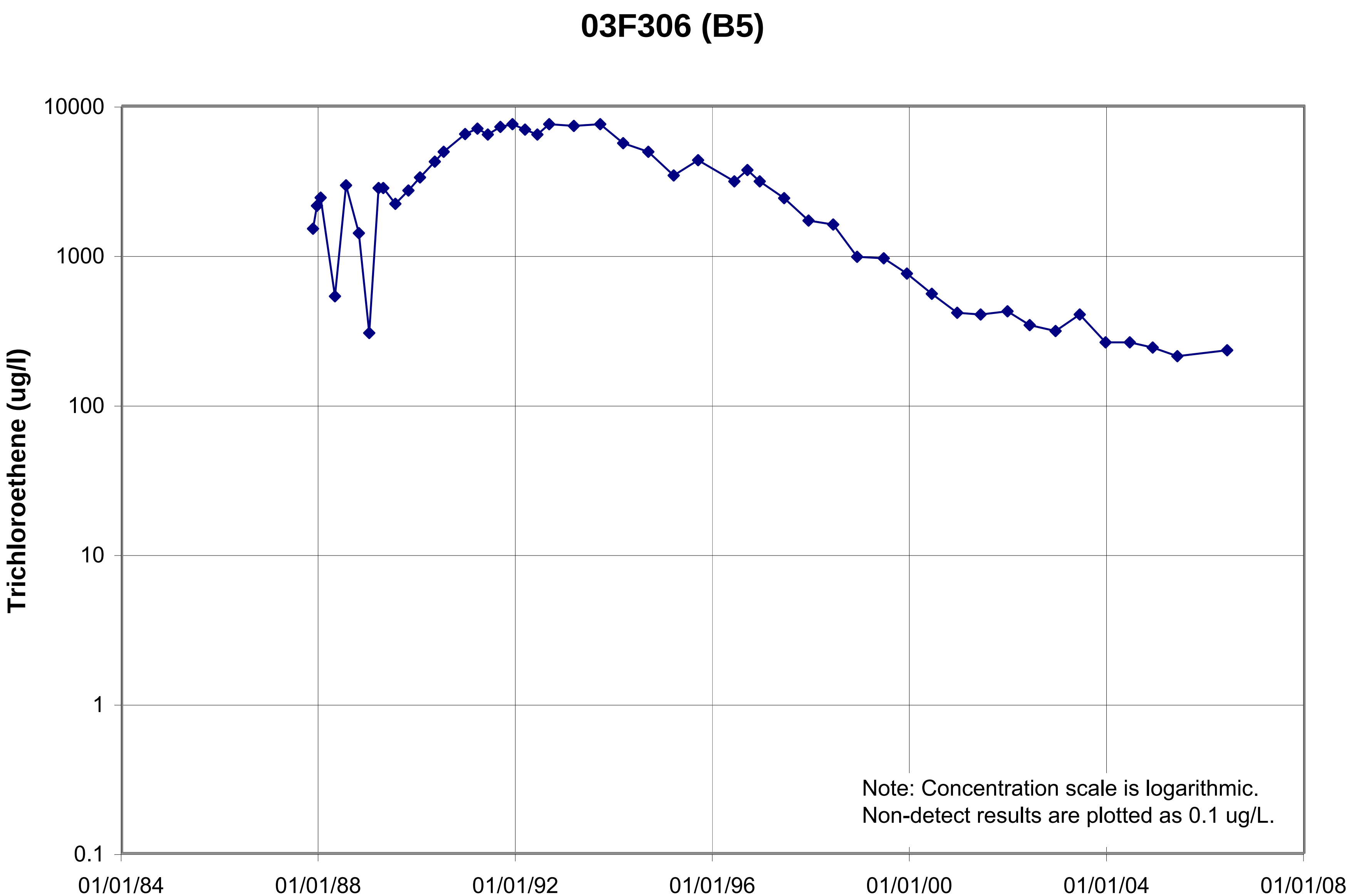


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03F305 (B4)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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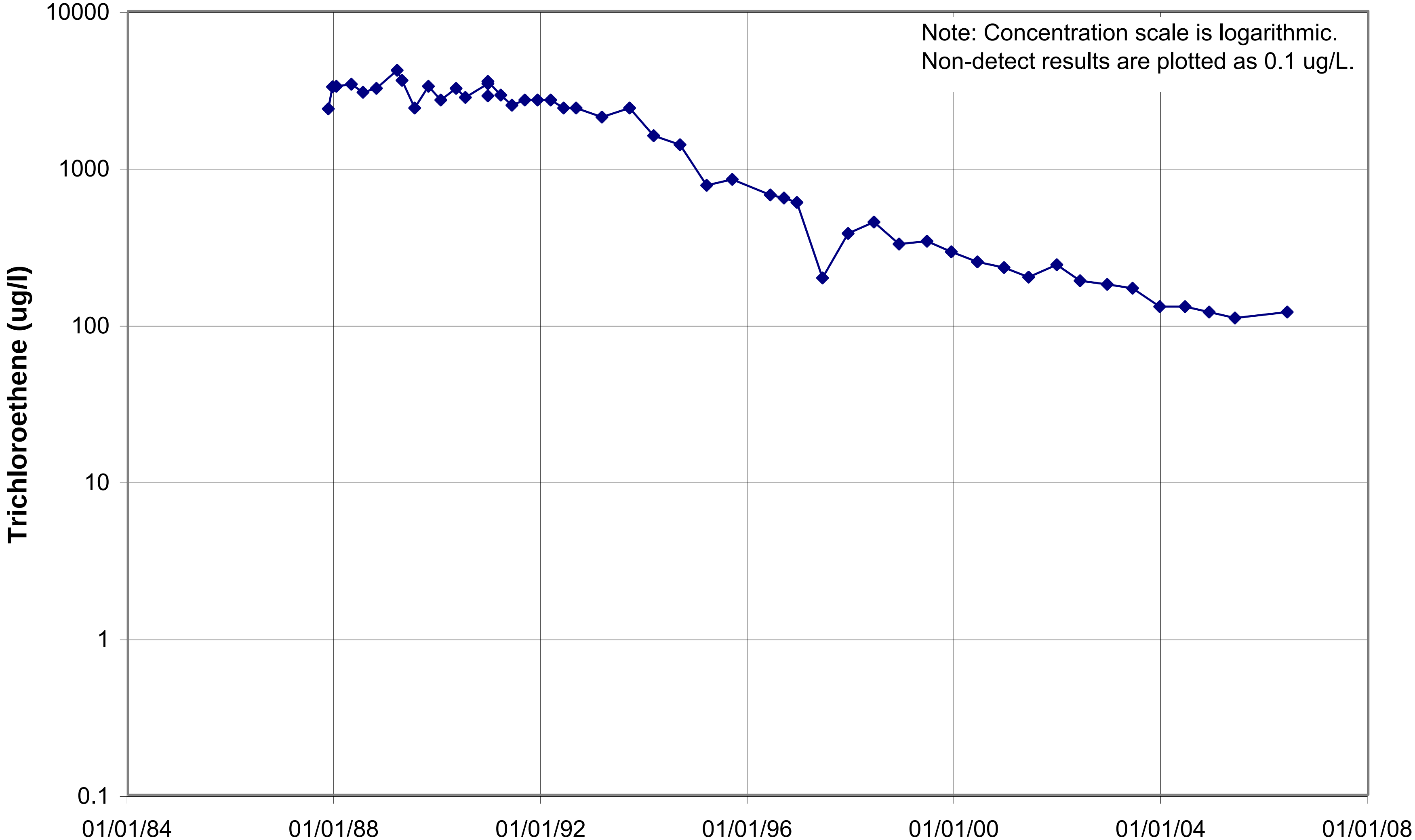

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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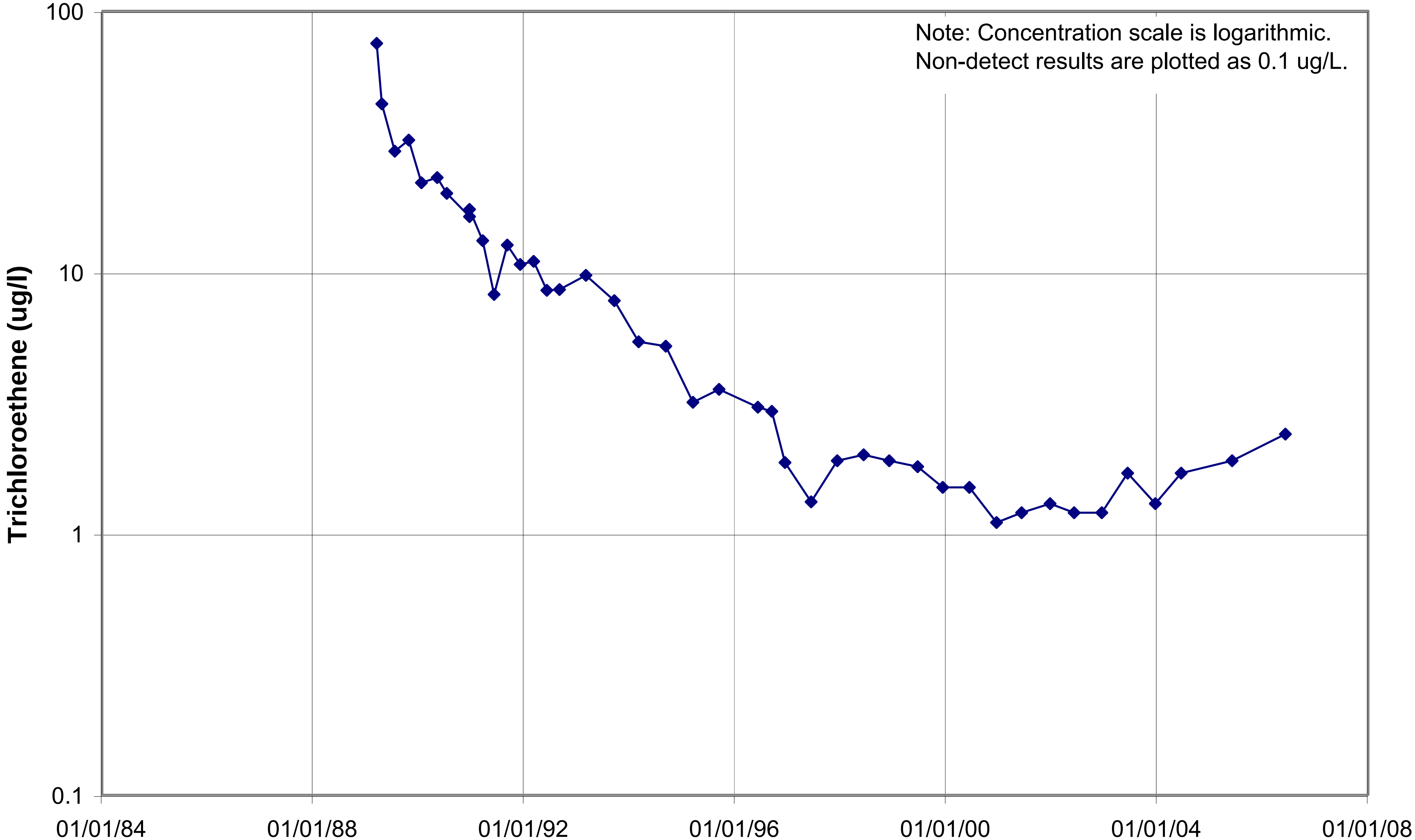

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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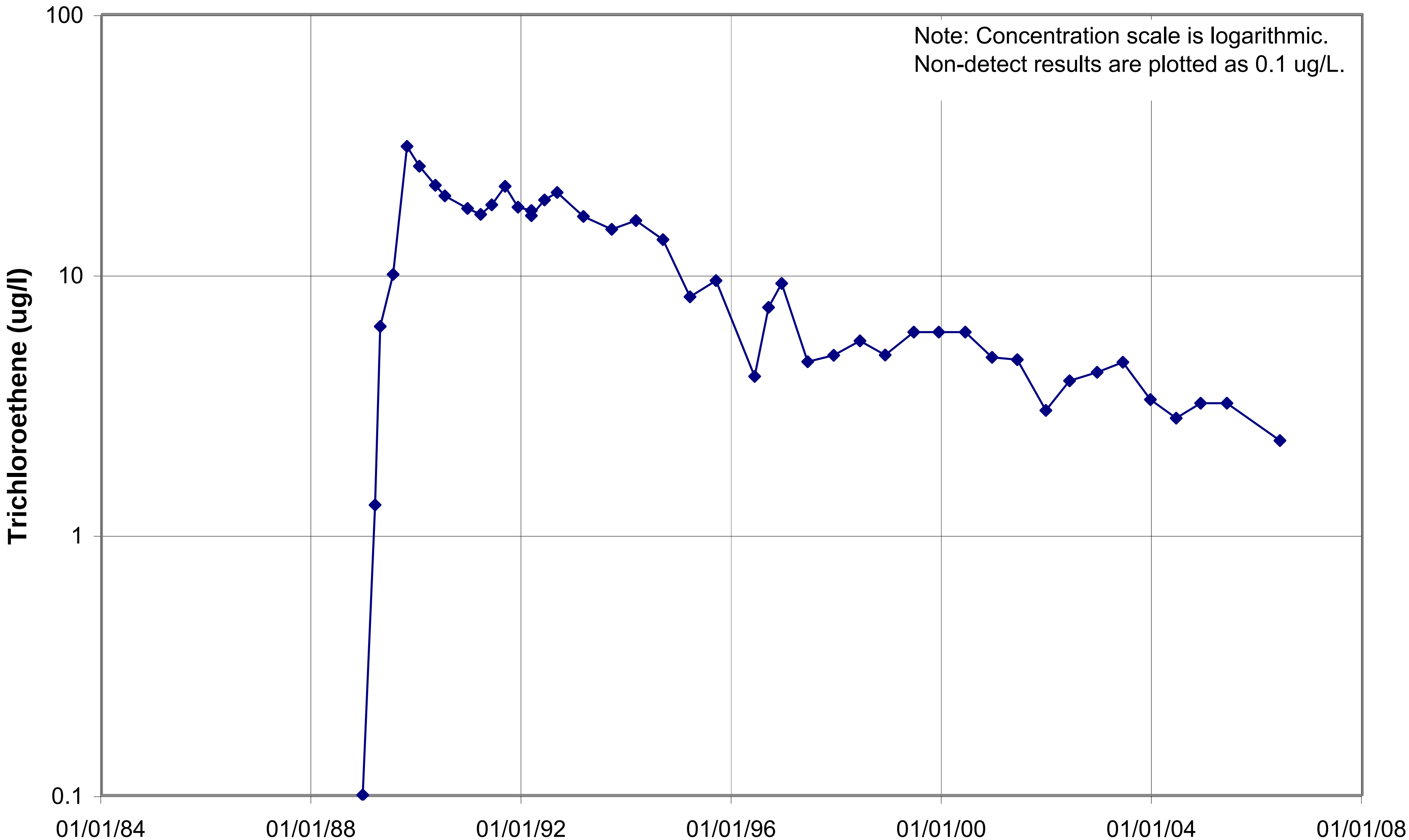

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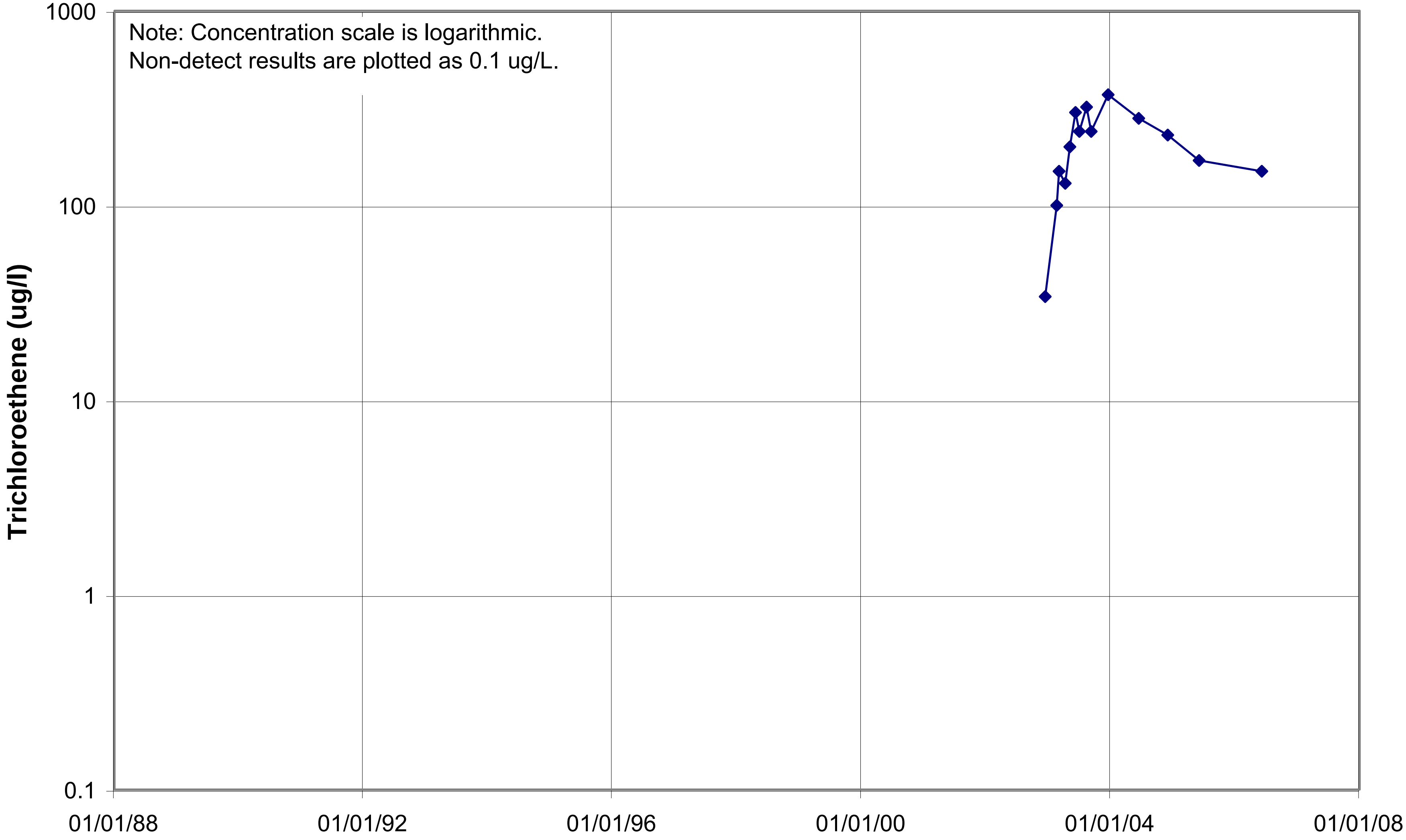
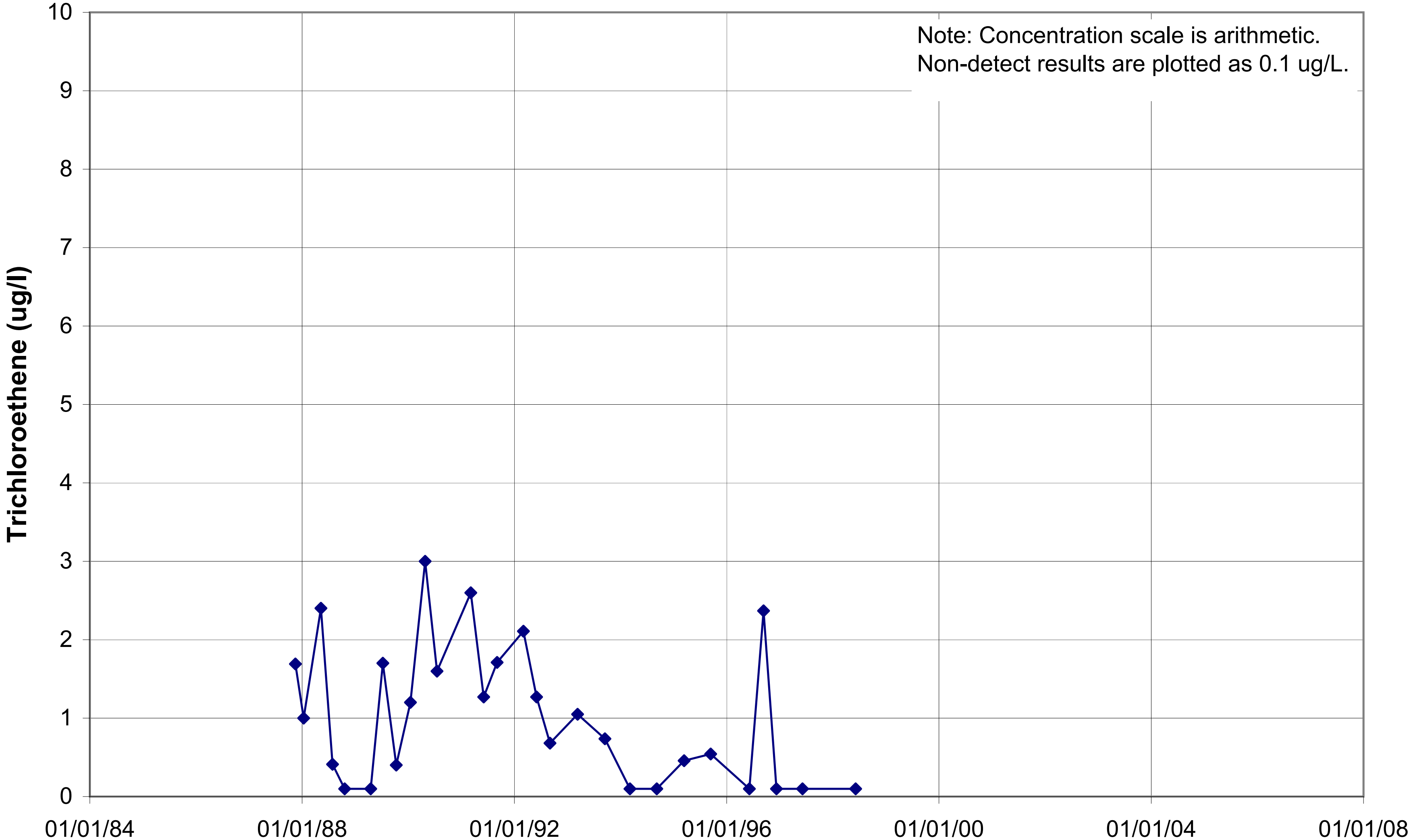
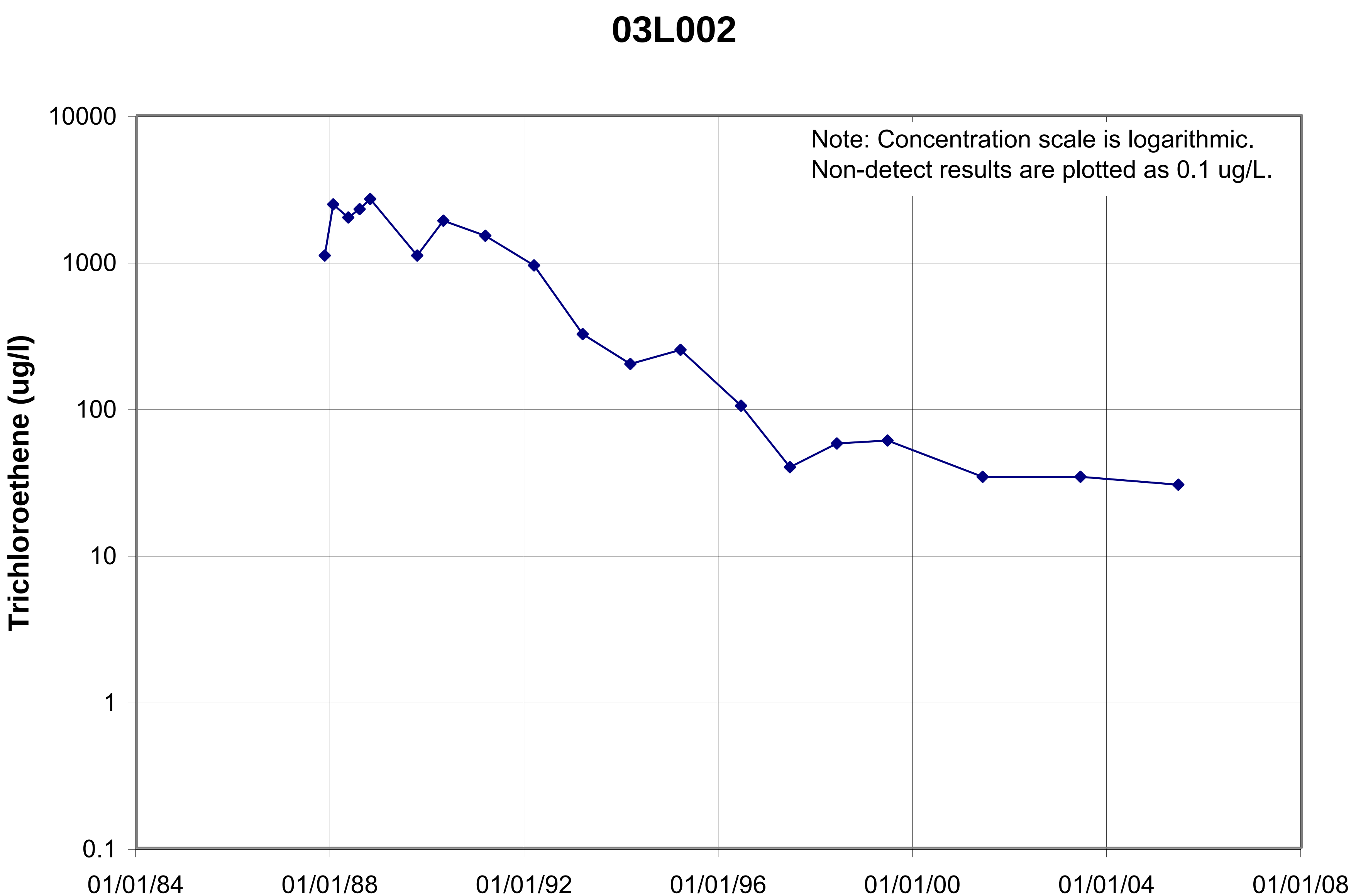


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L001

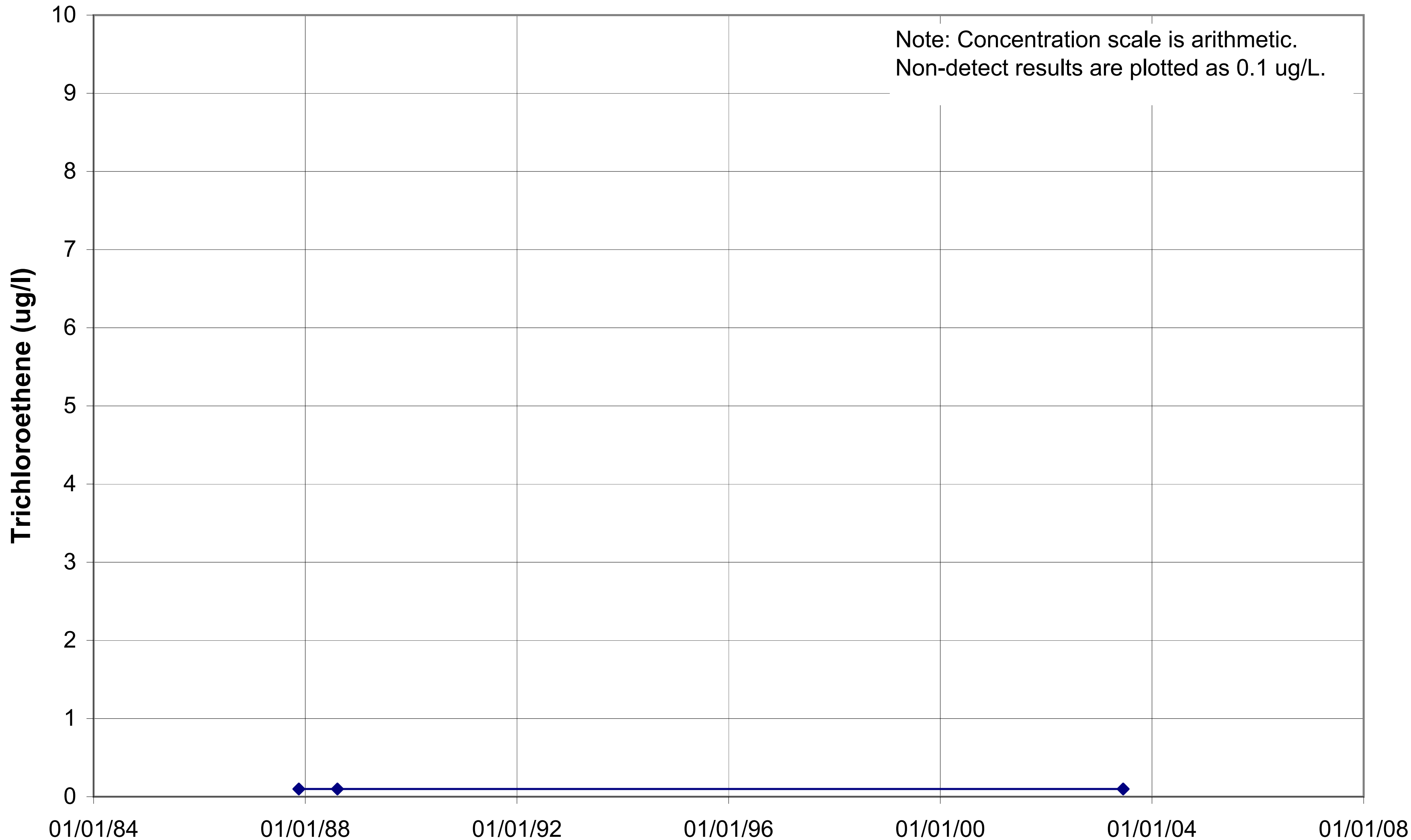


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

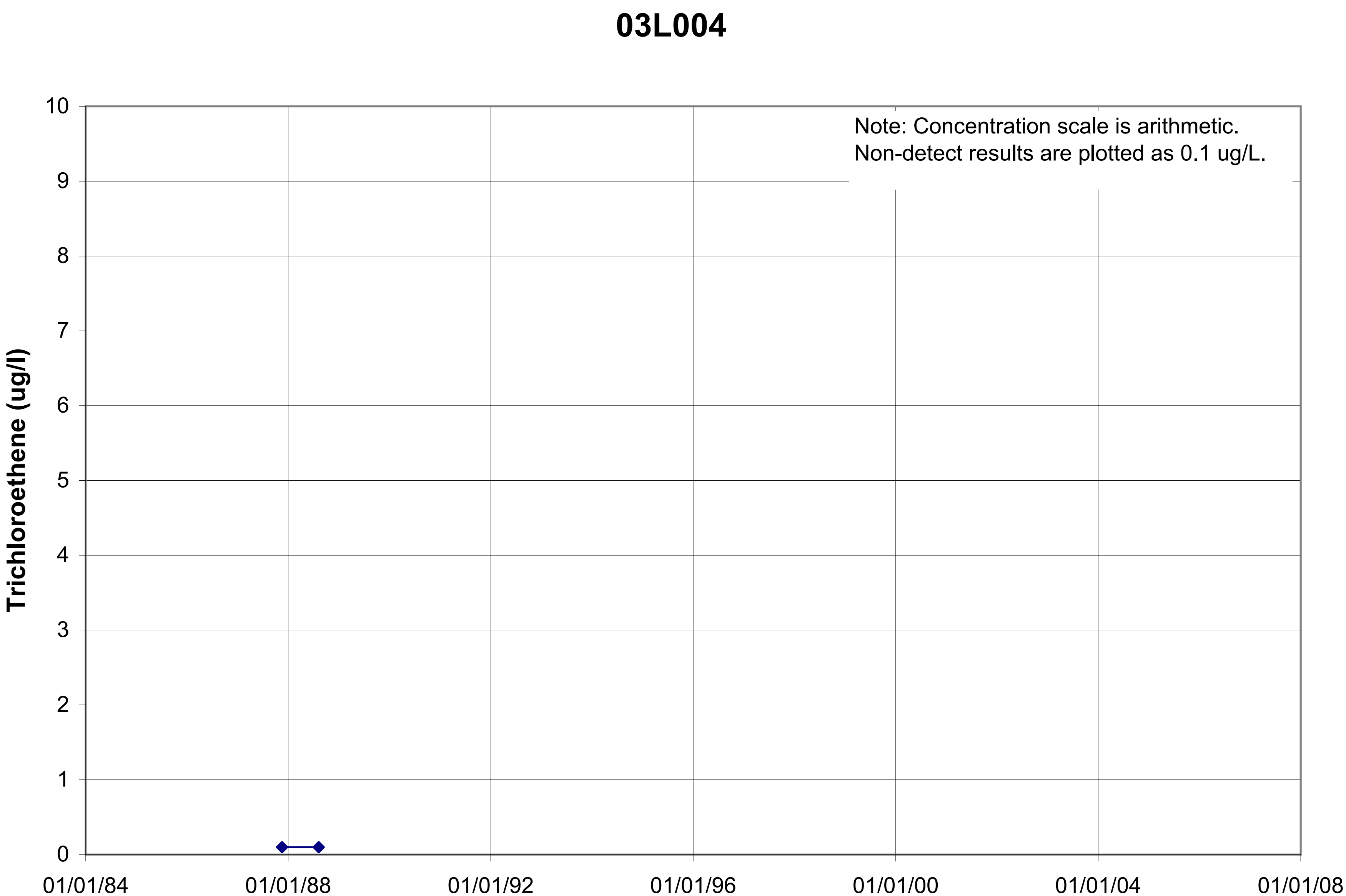


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L003



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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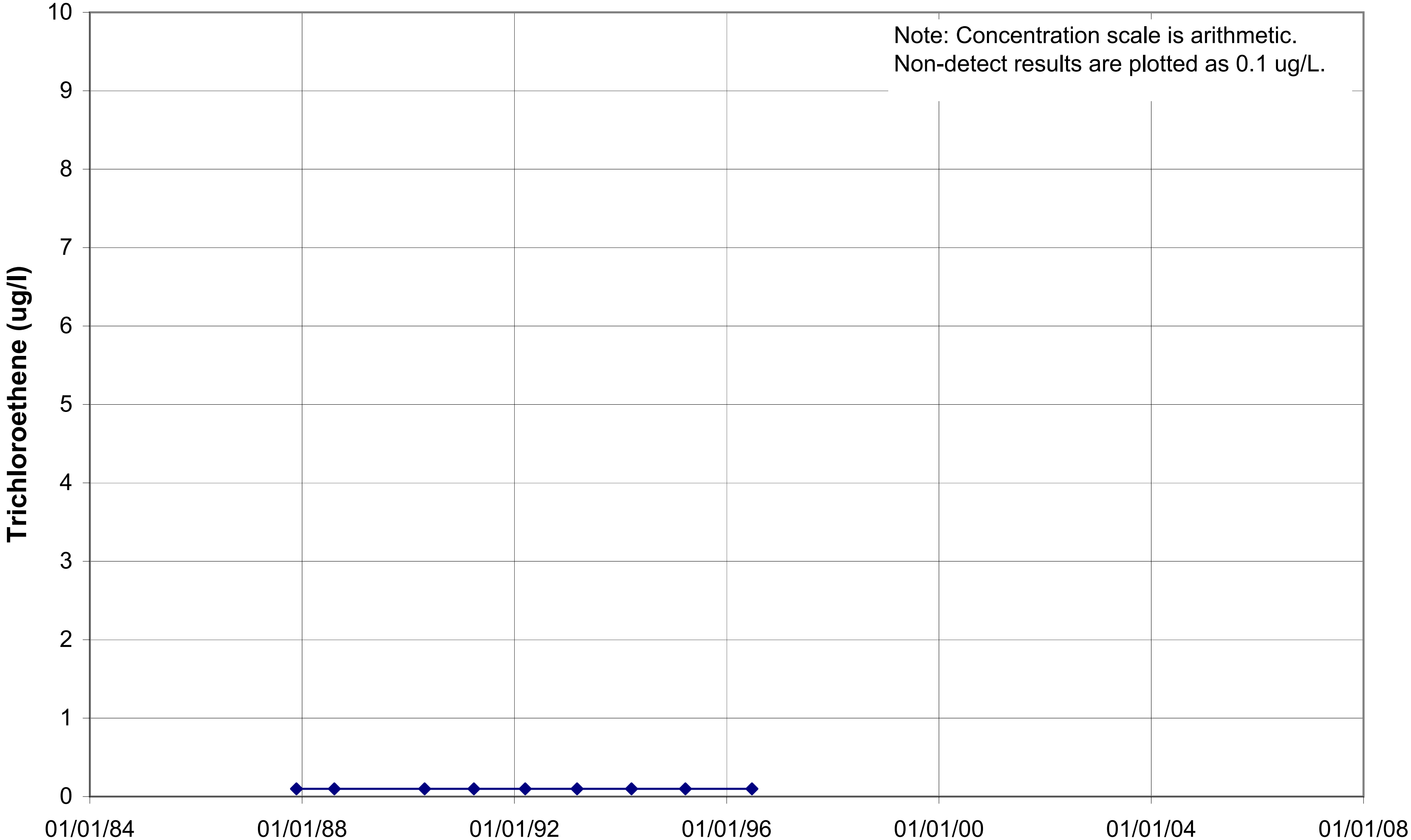

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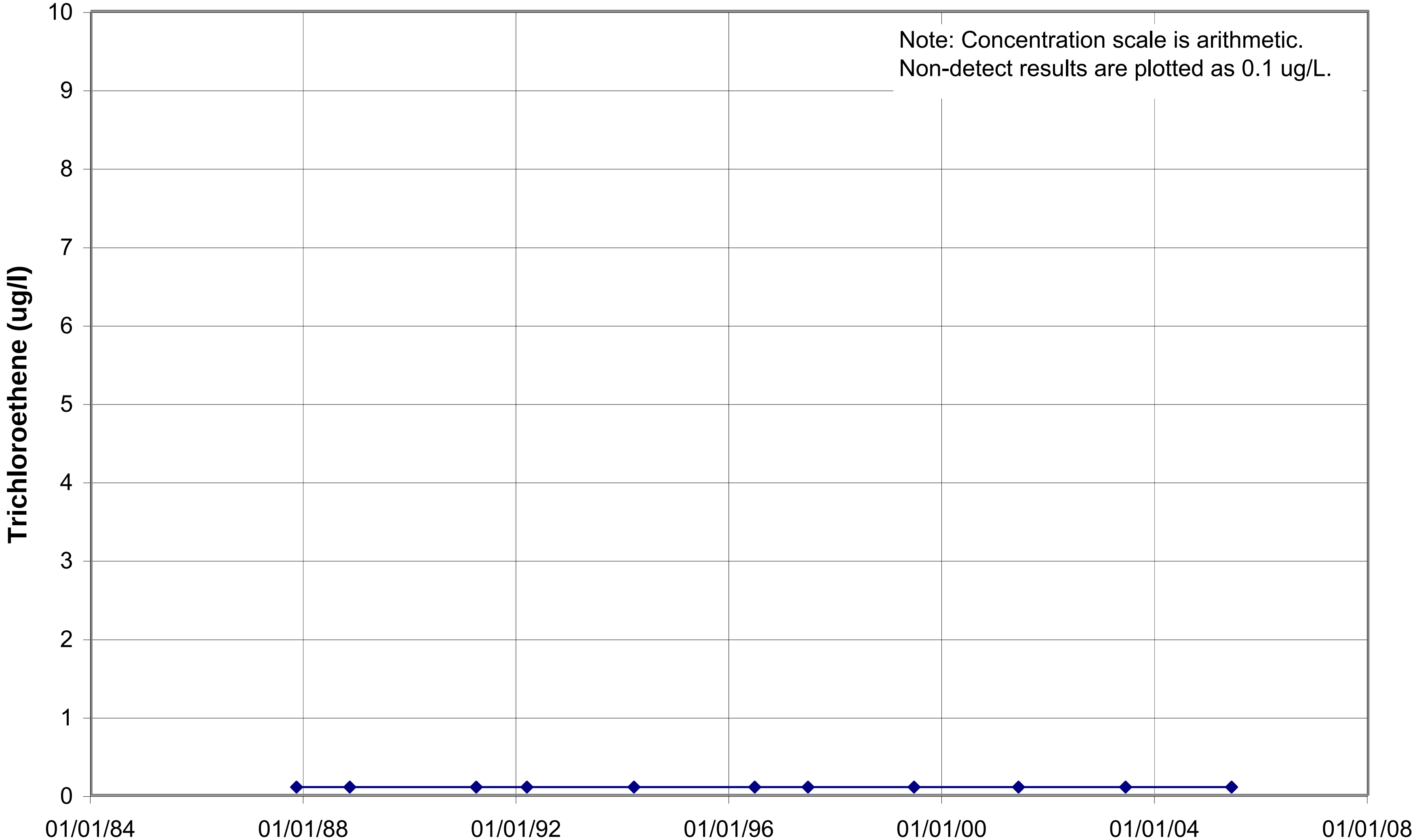

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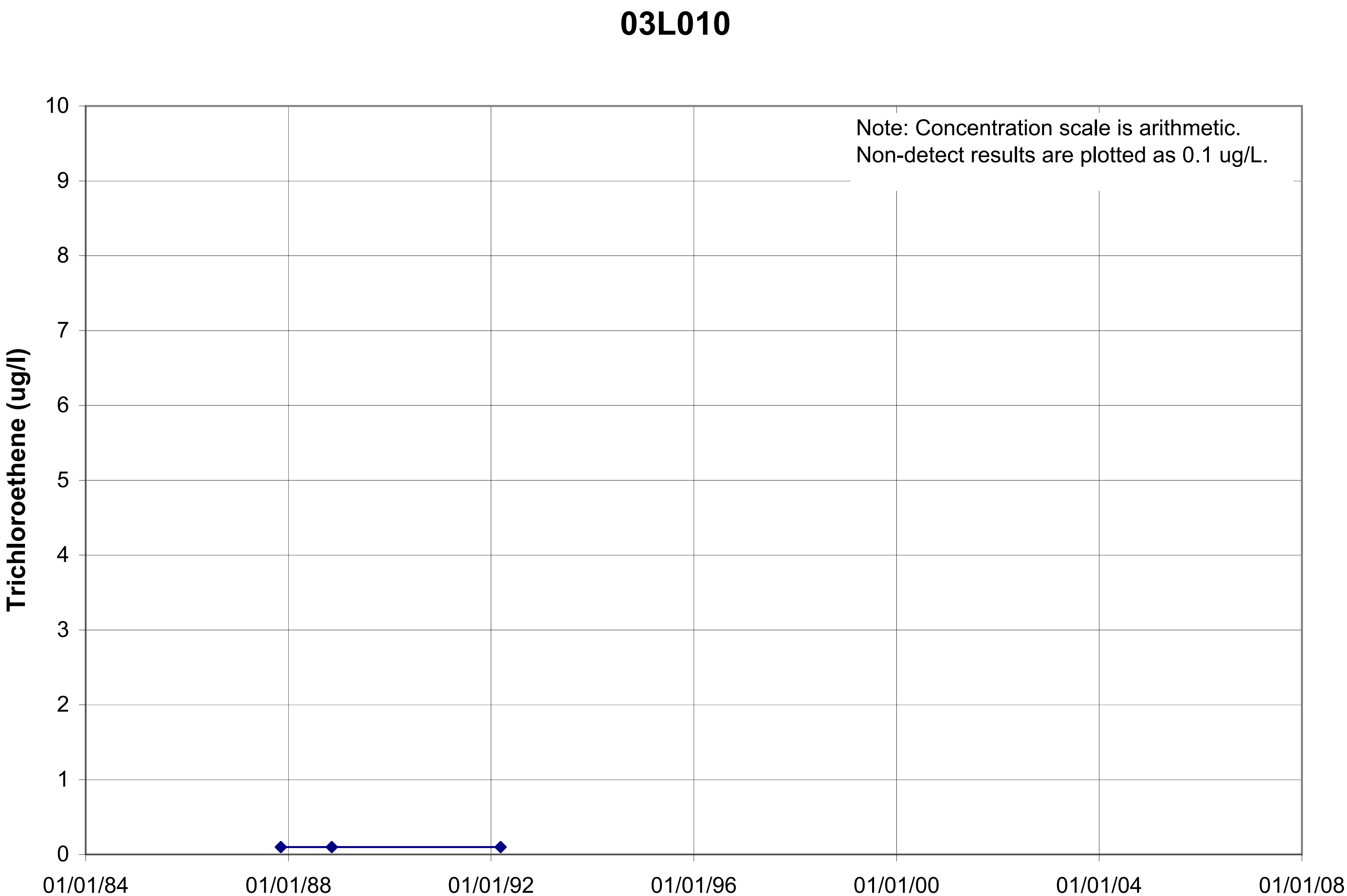

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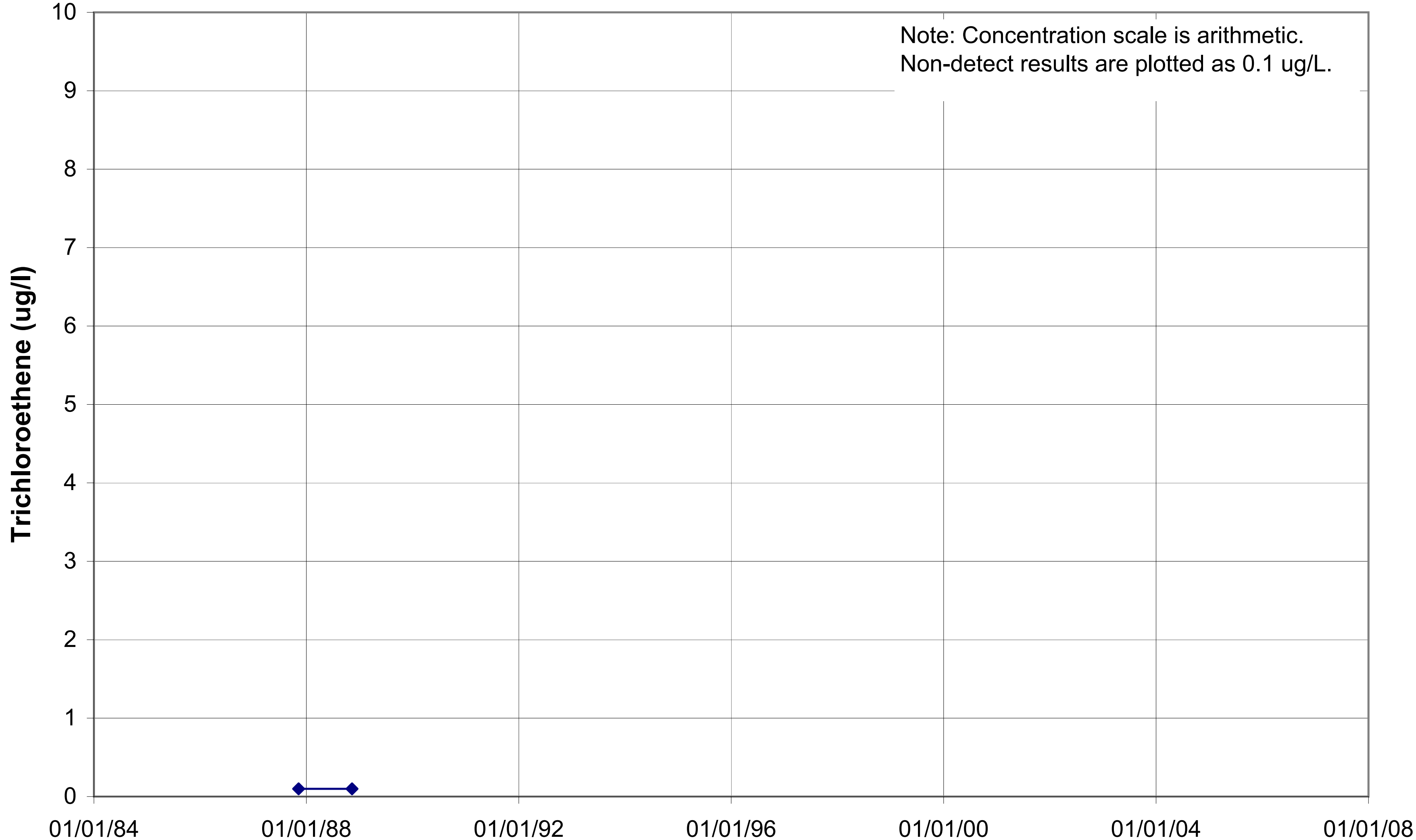

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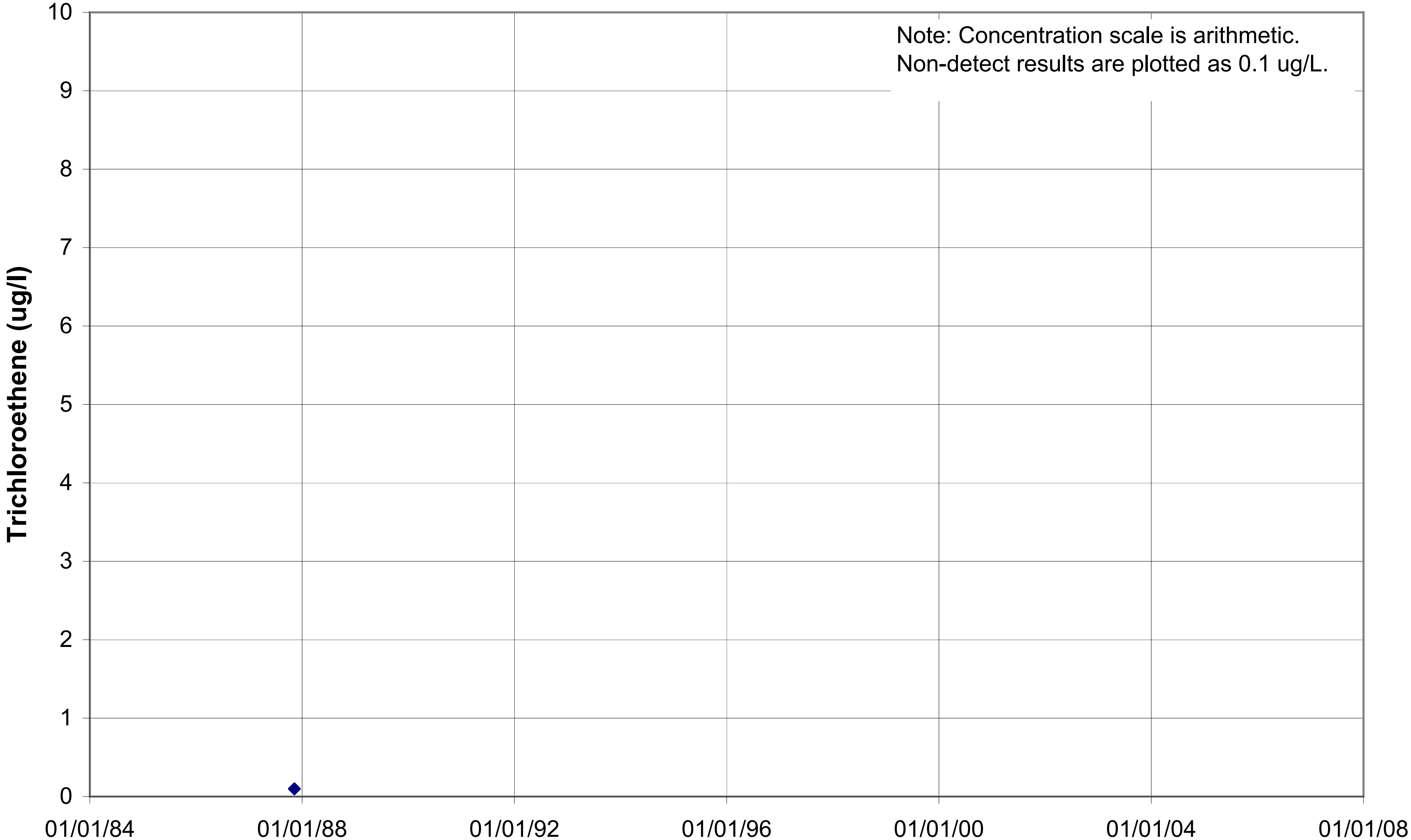

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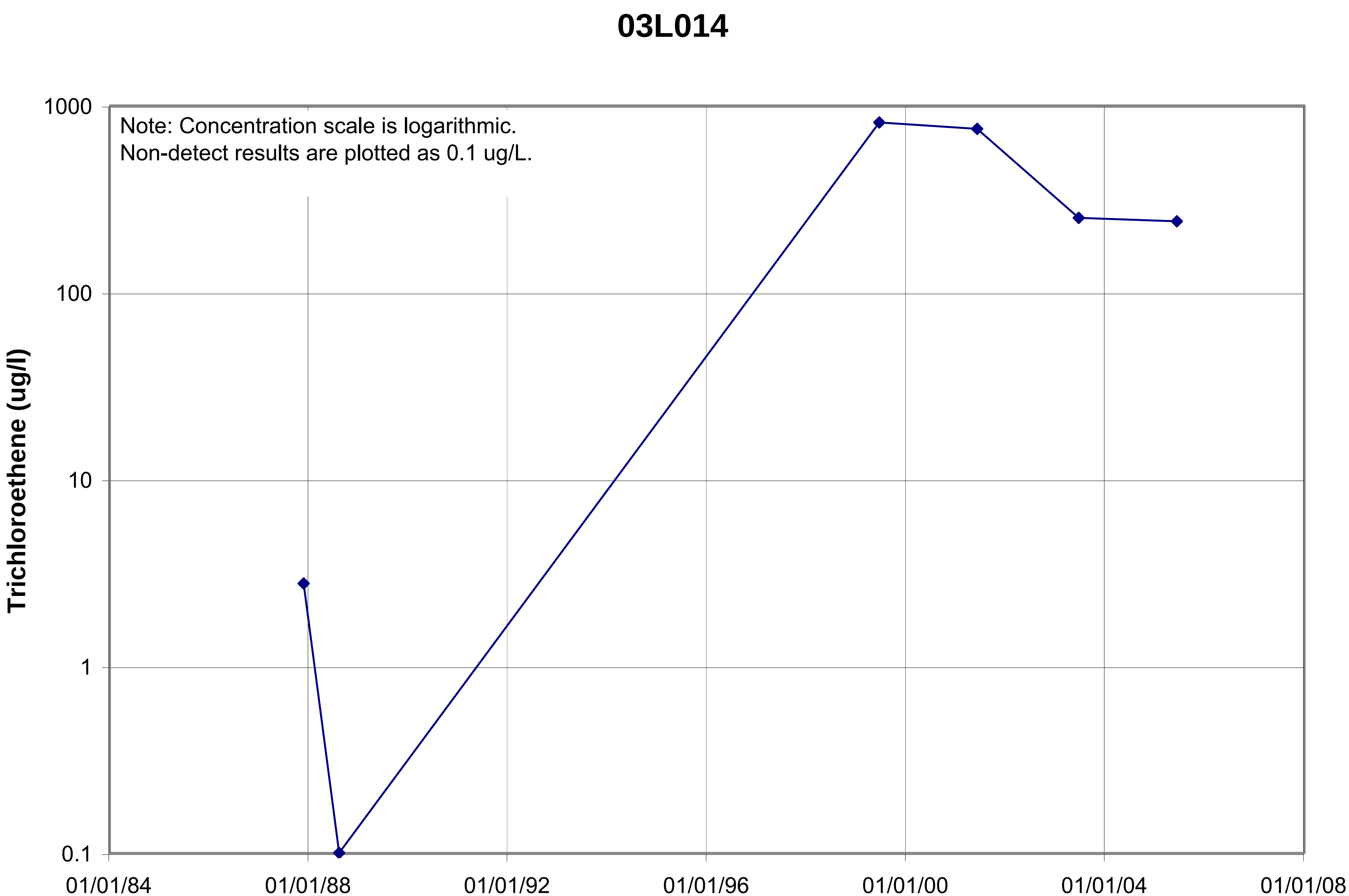

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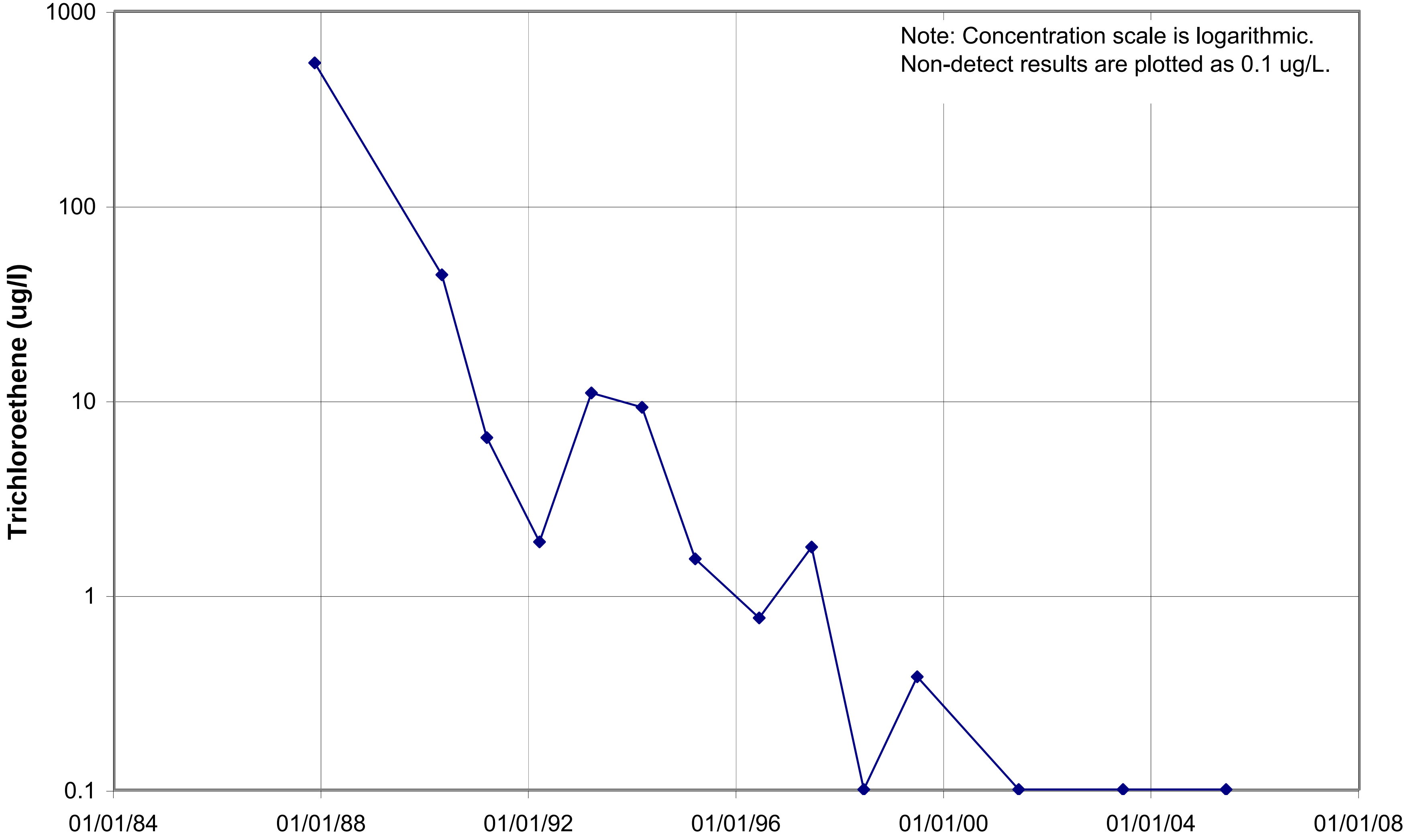

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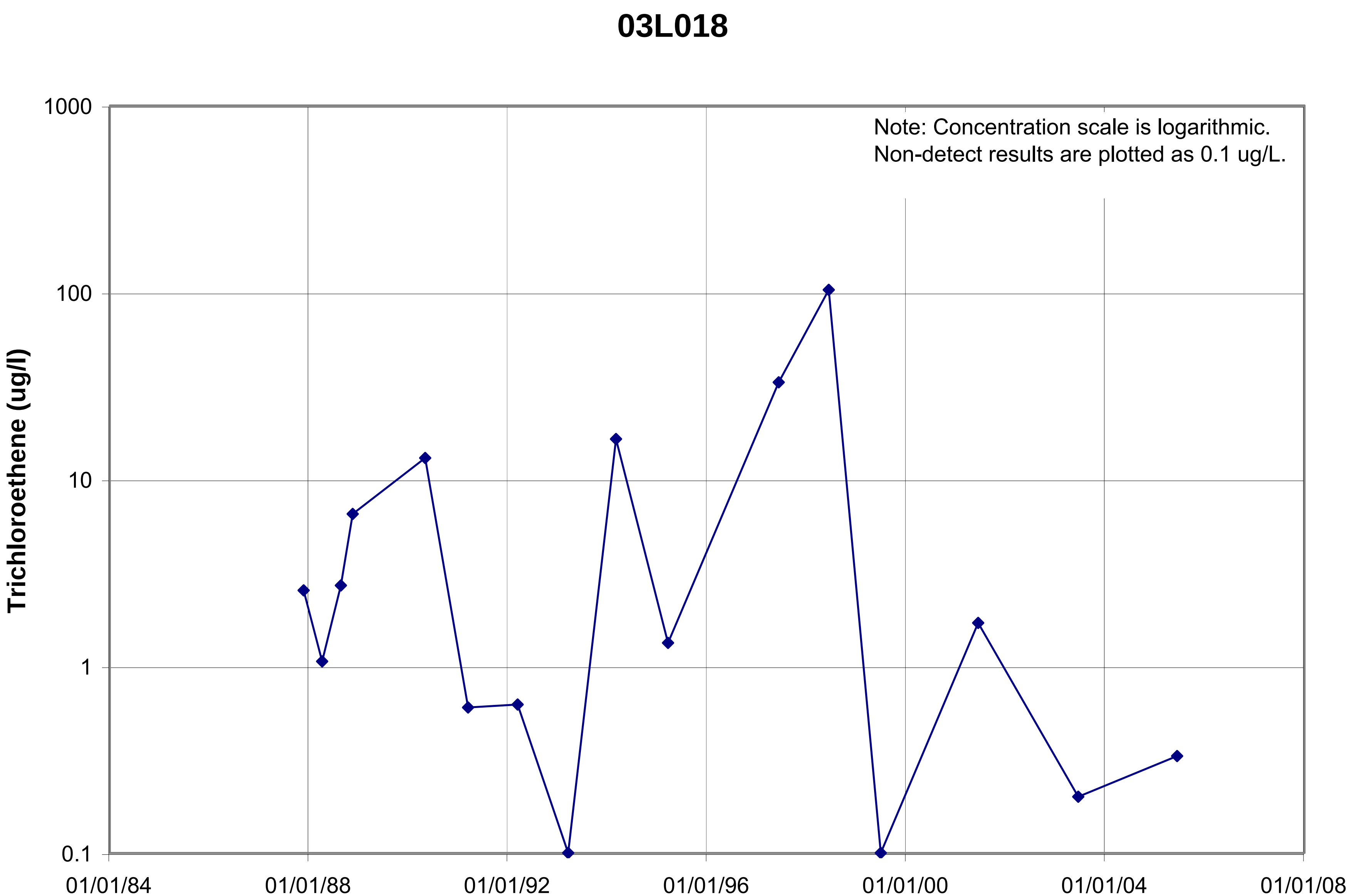

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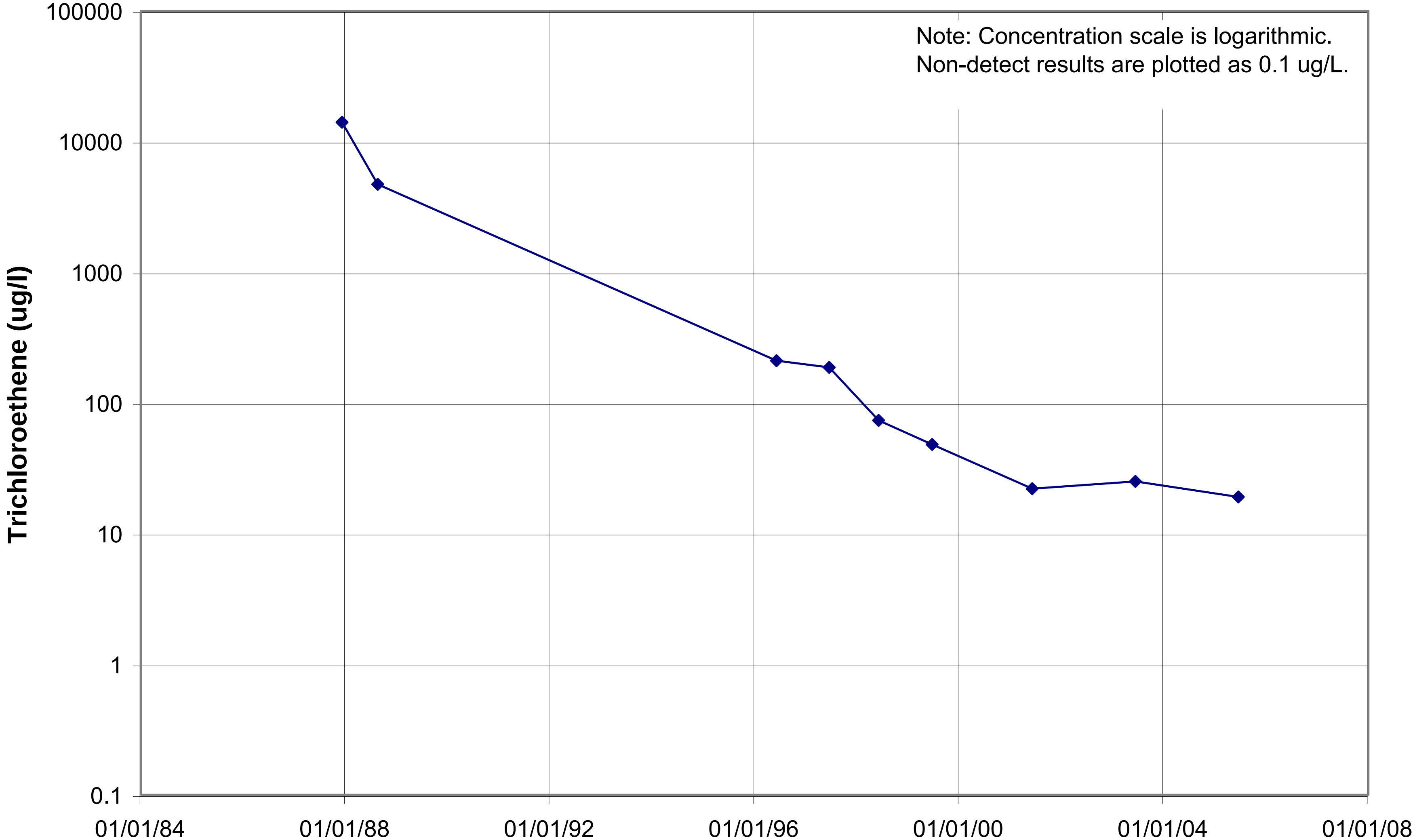

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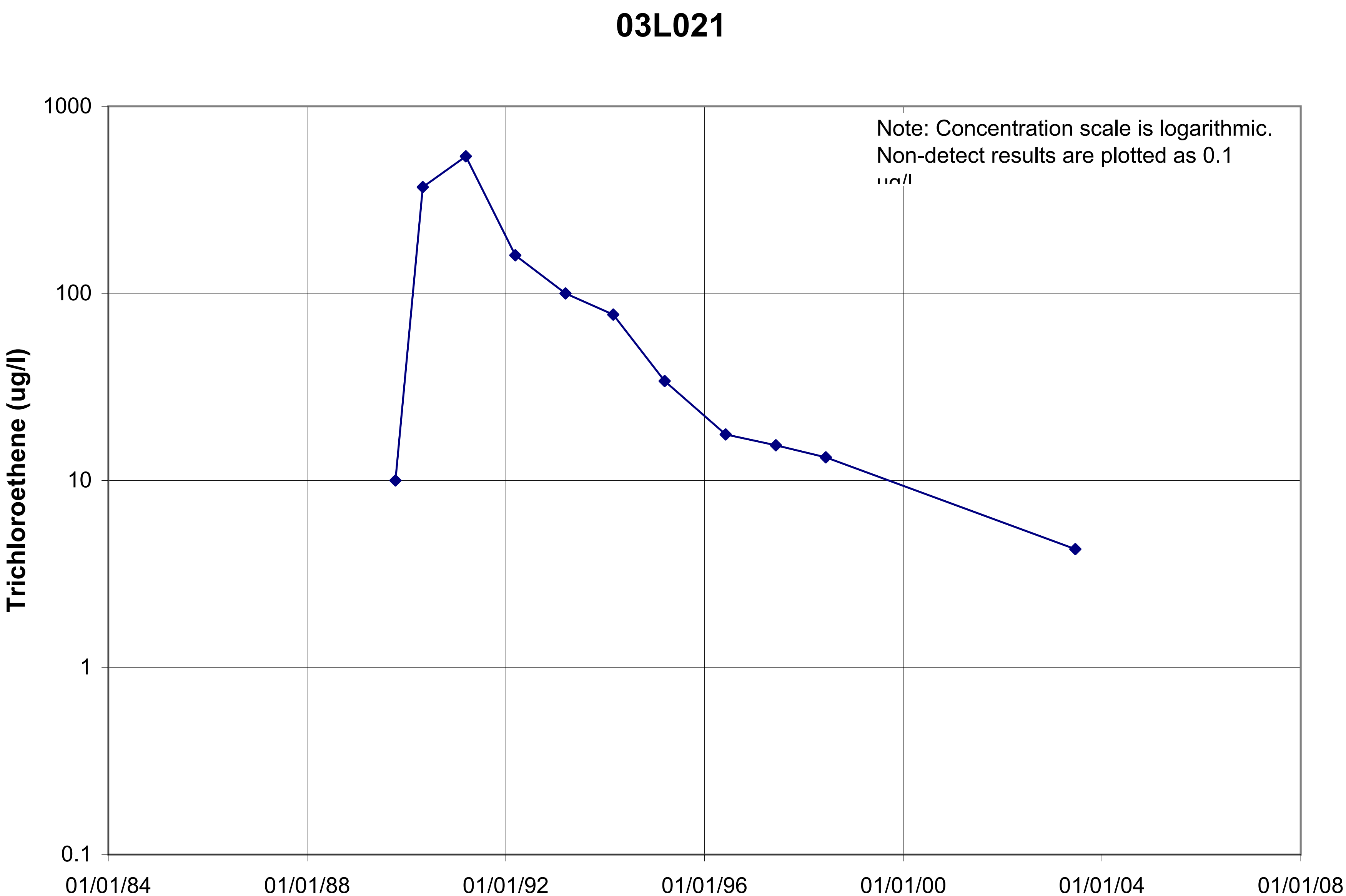

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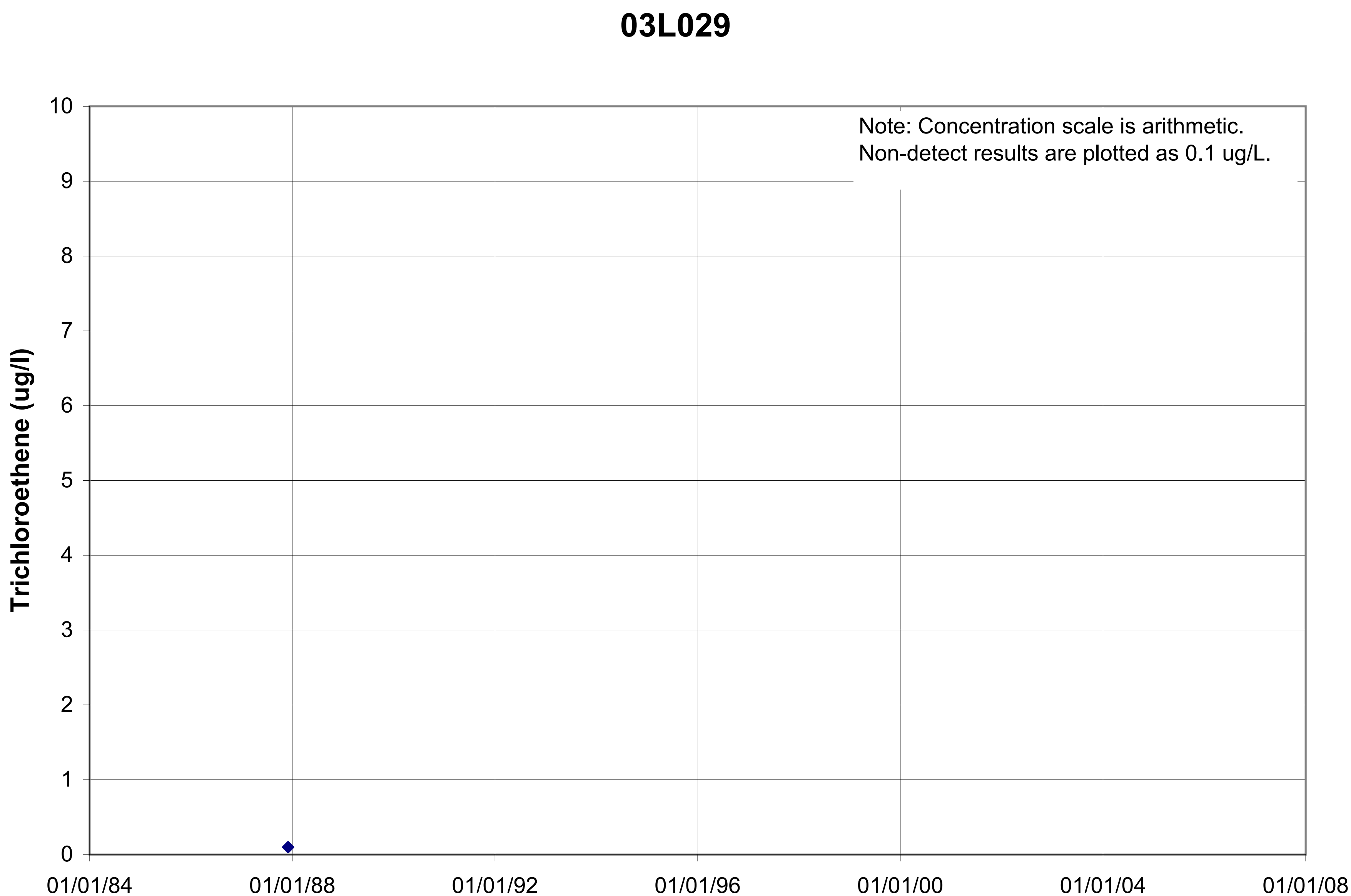

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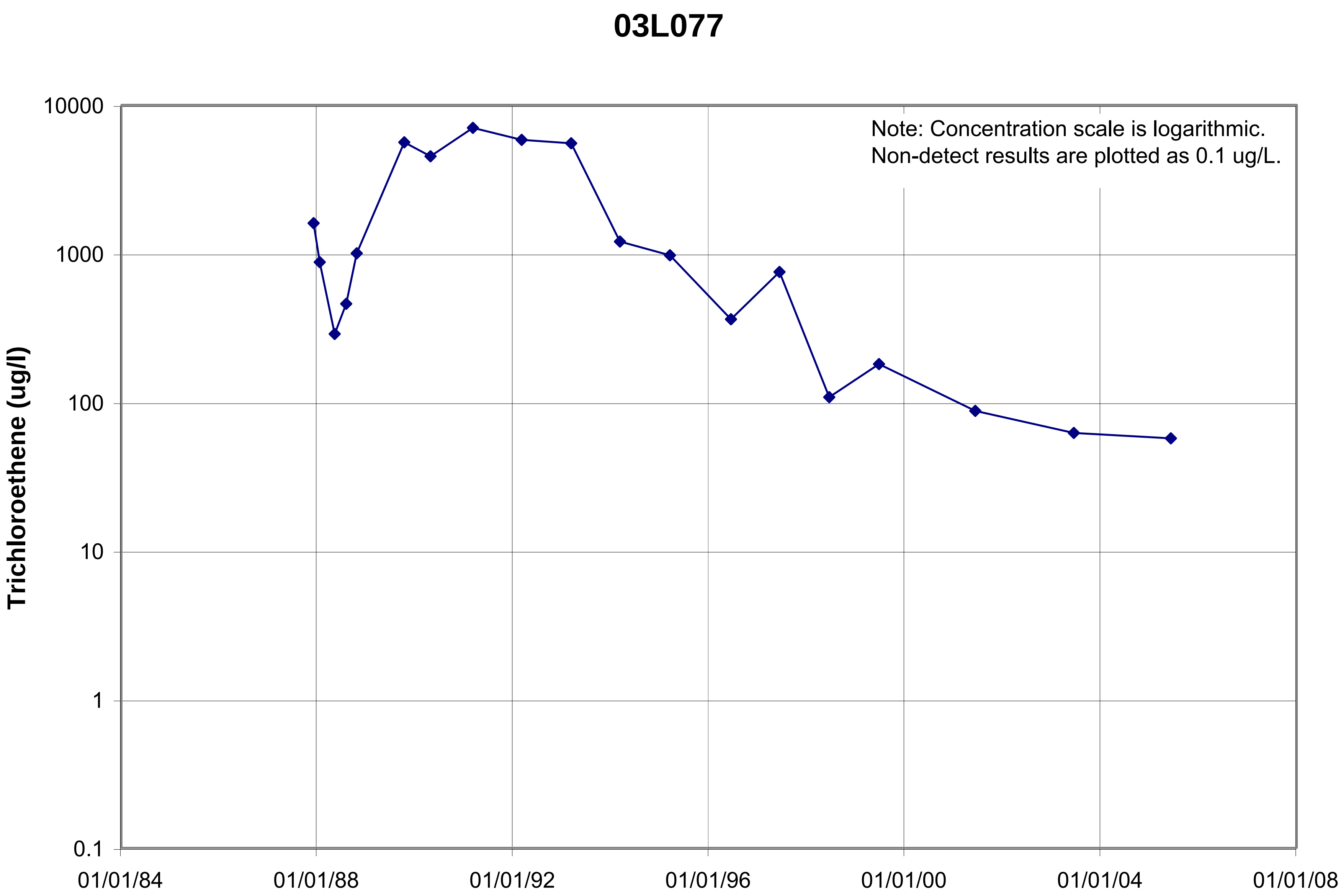

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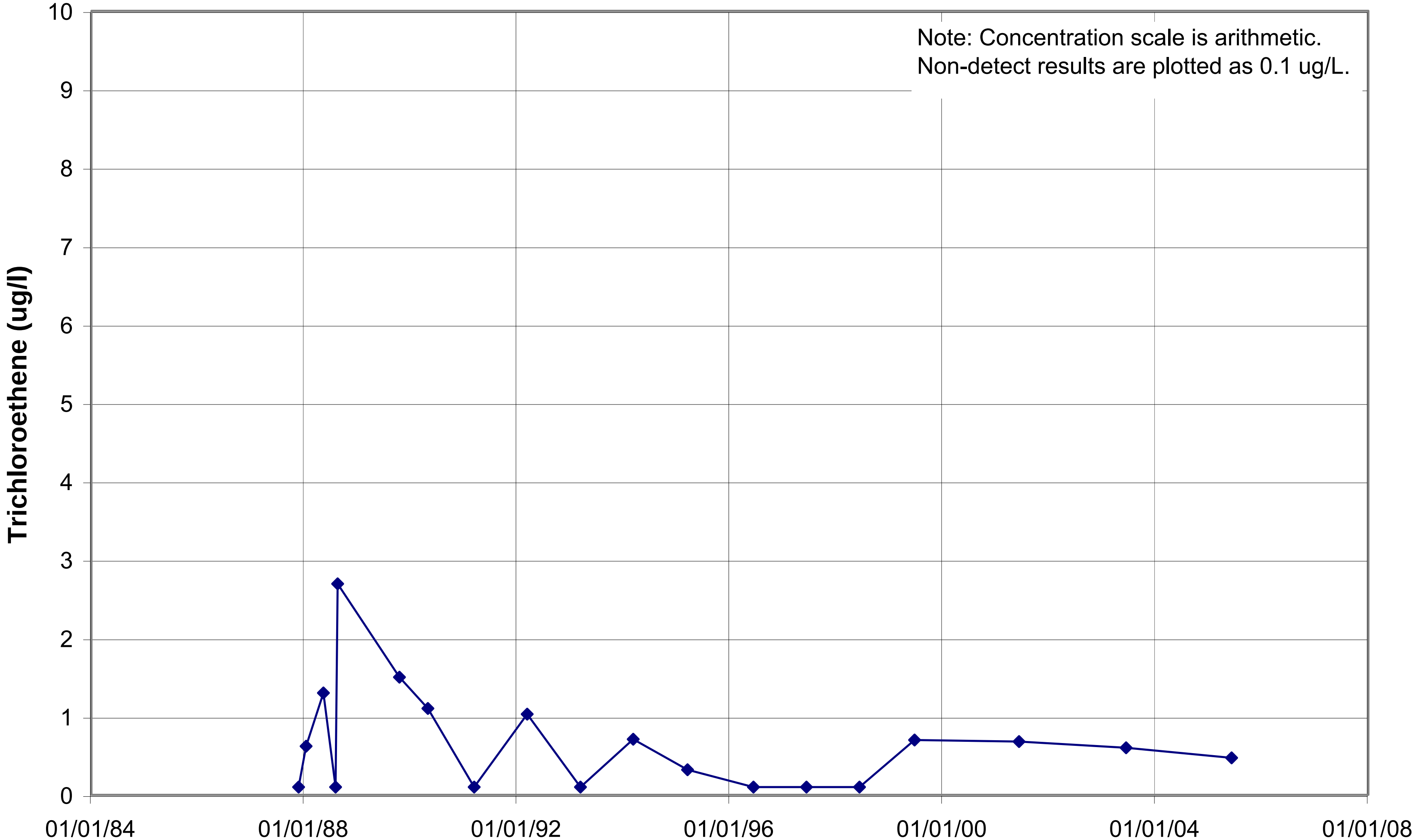

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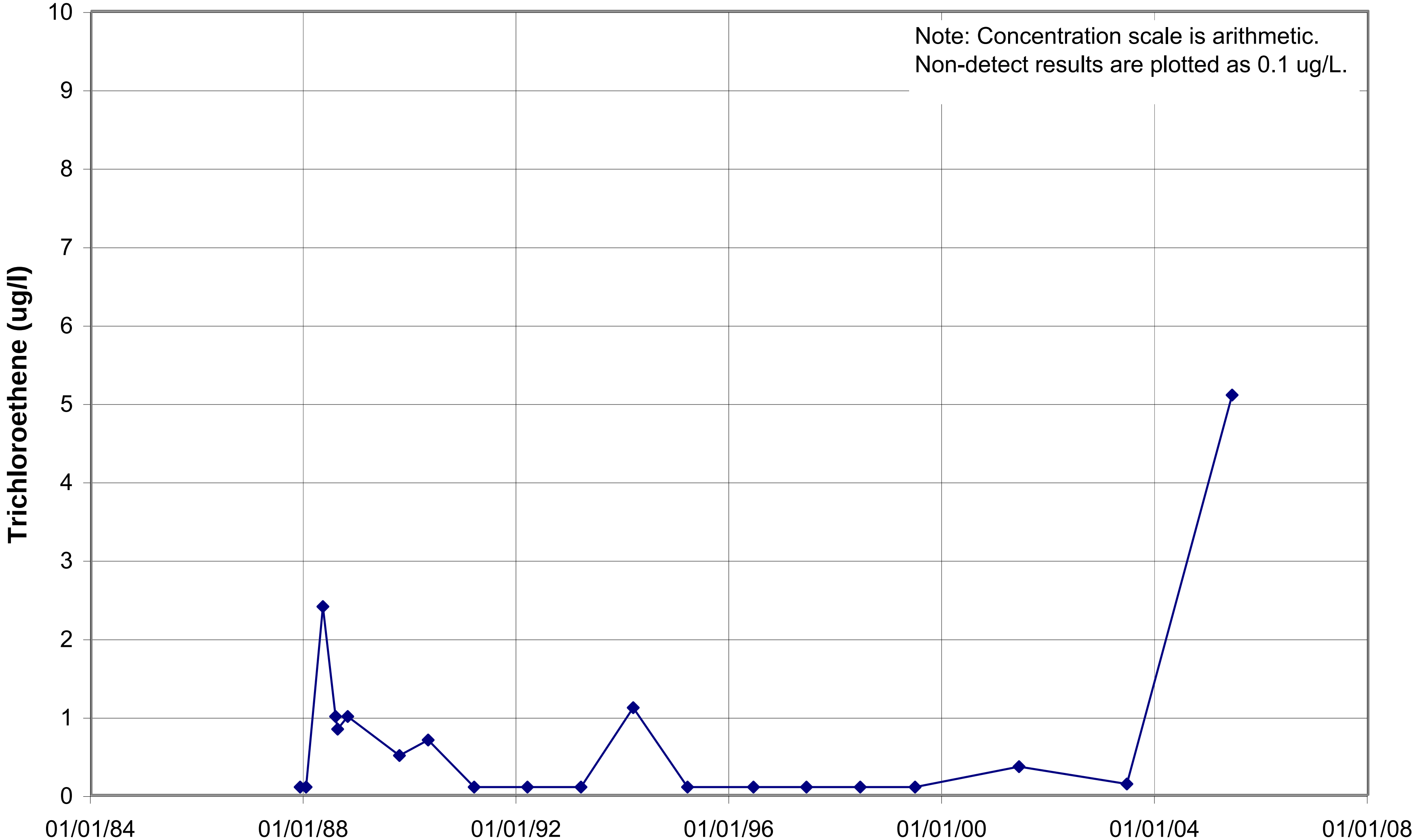

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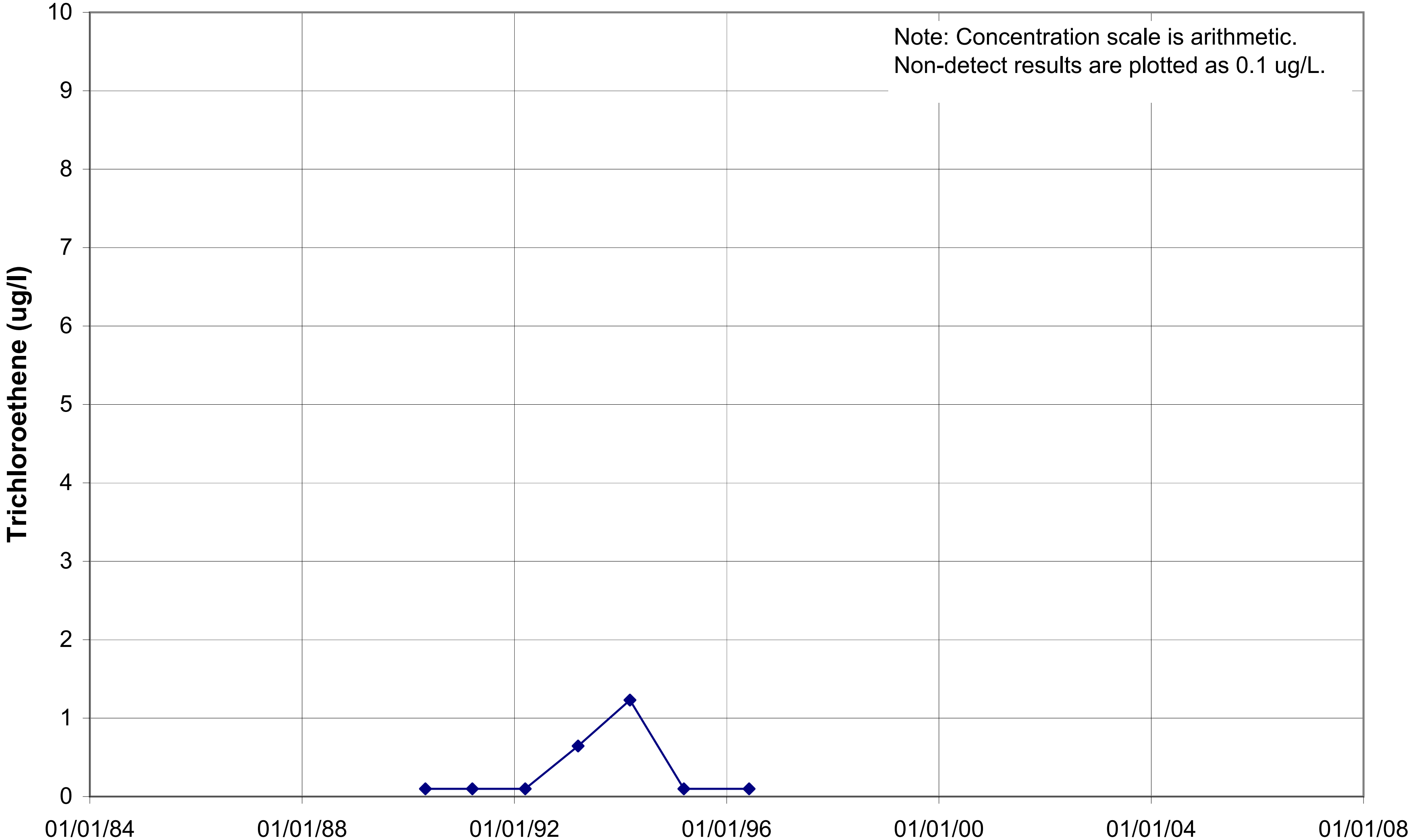

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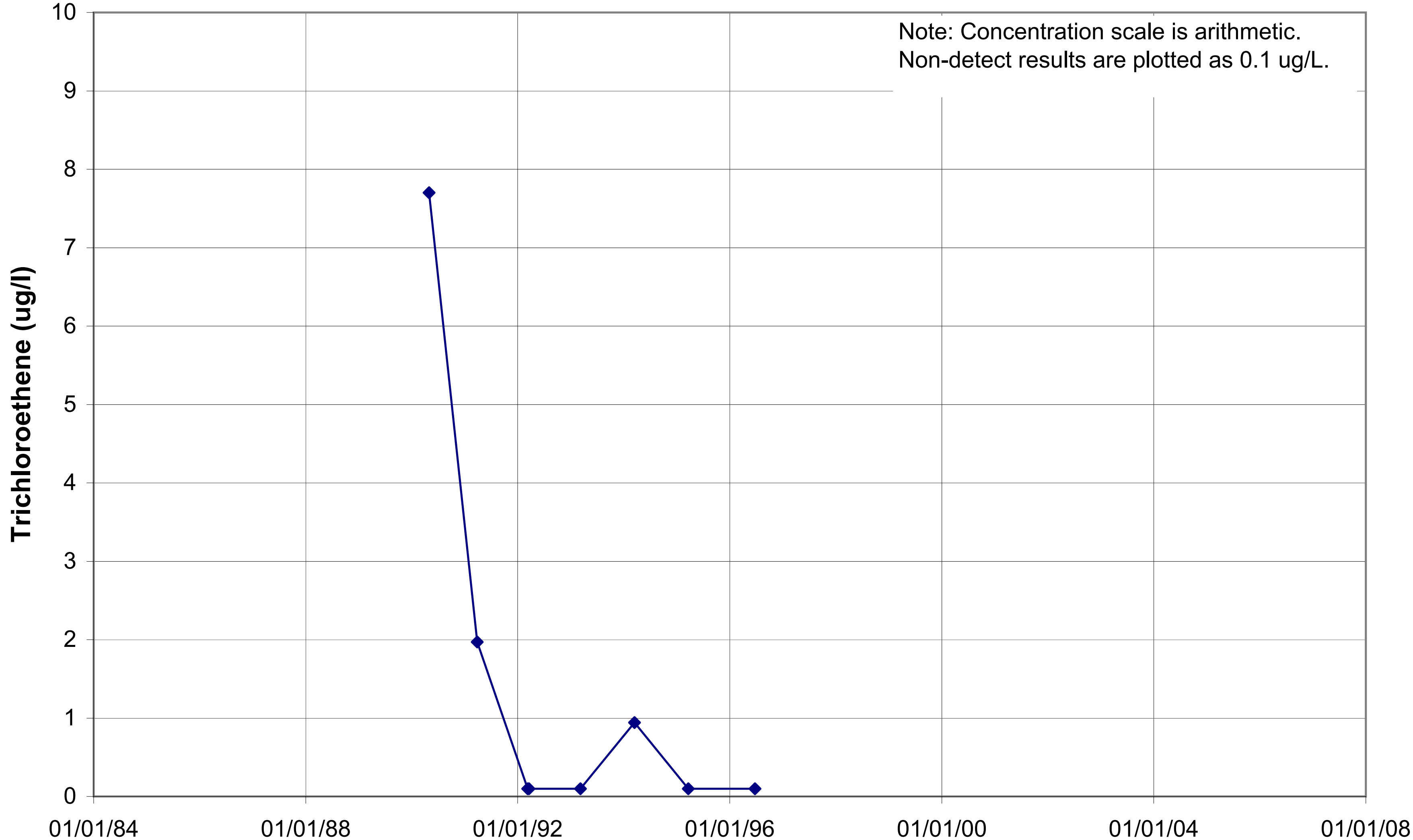

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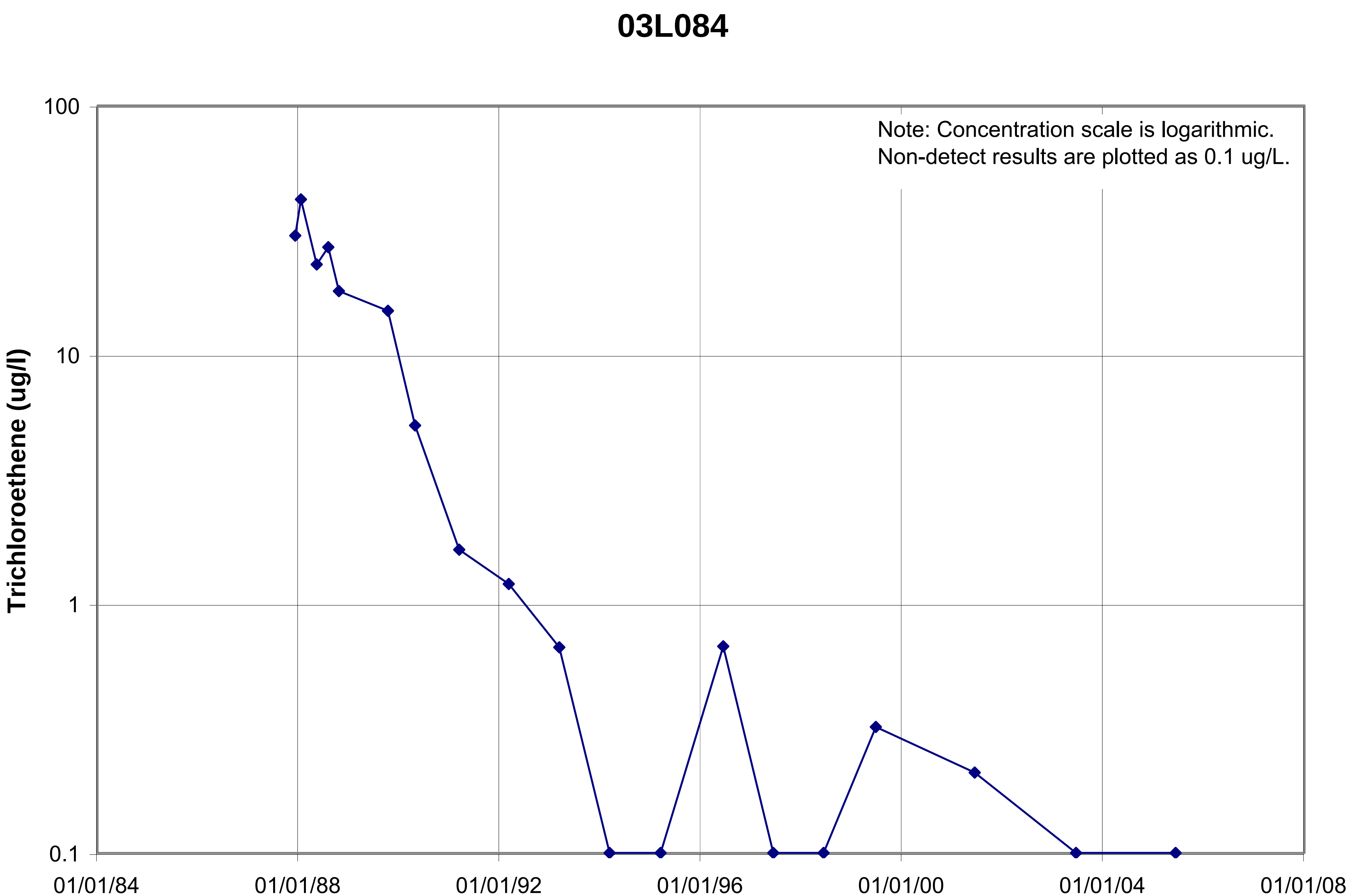

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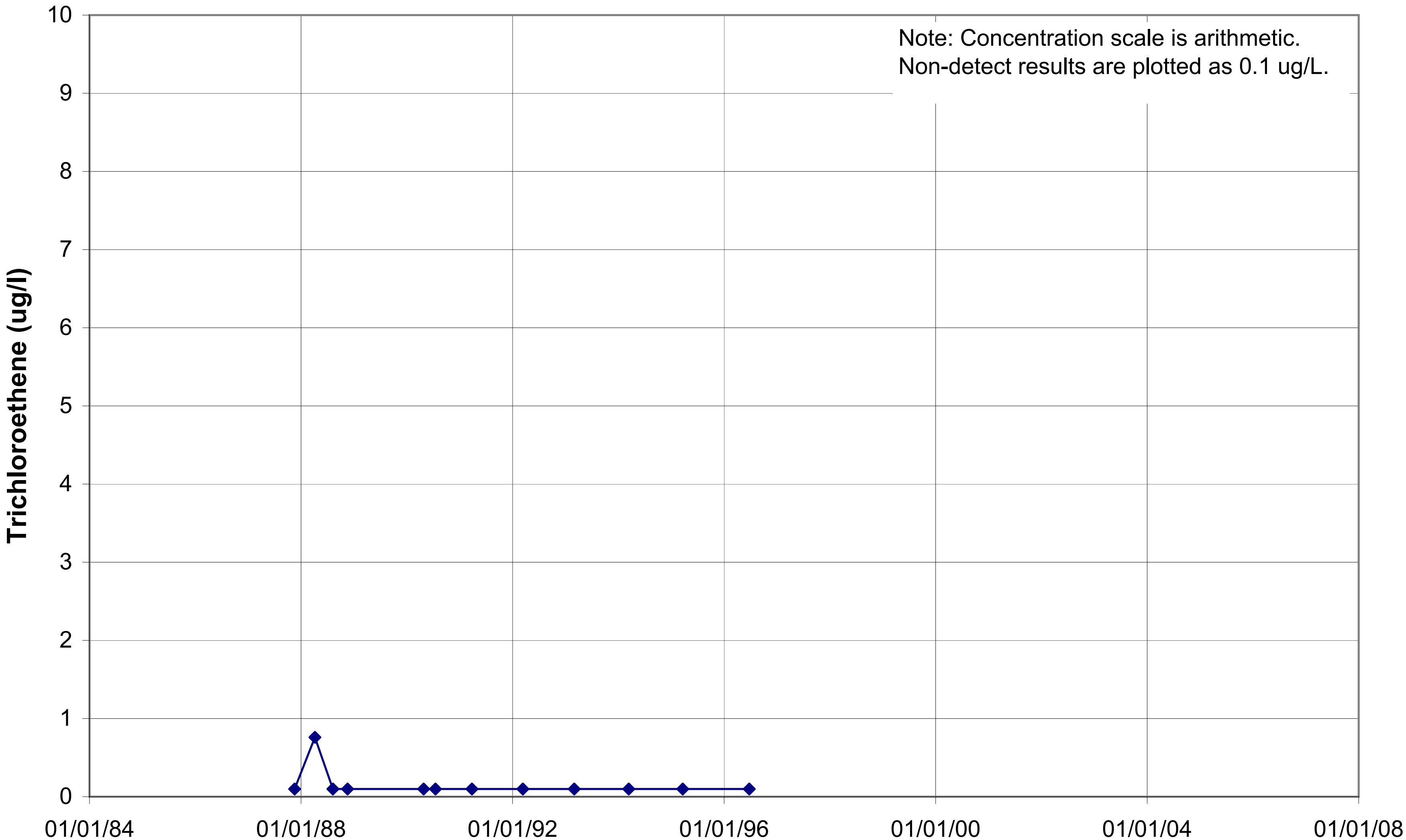

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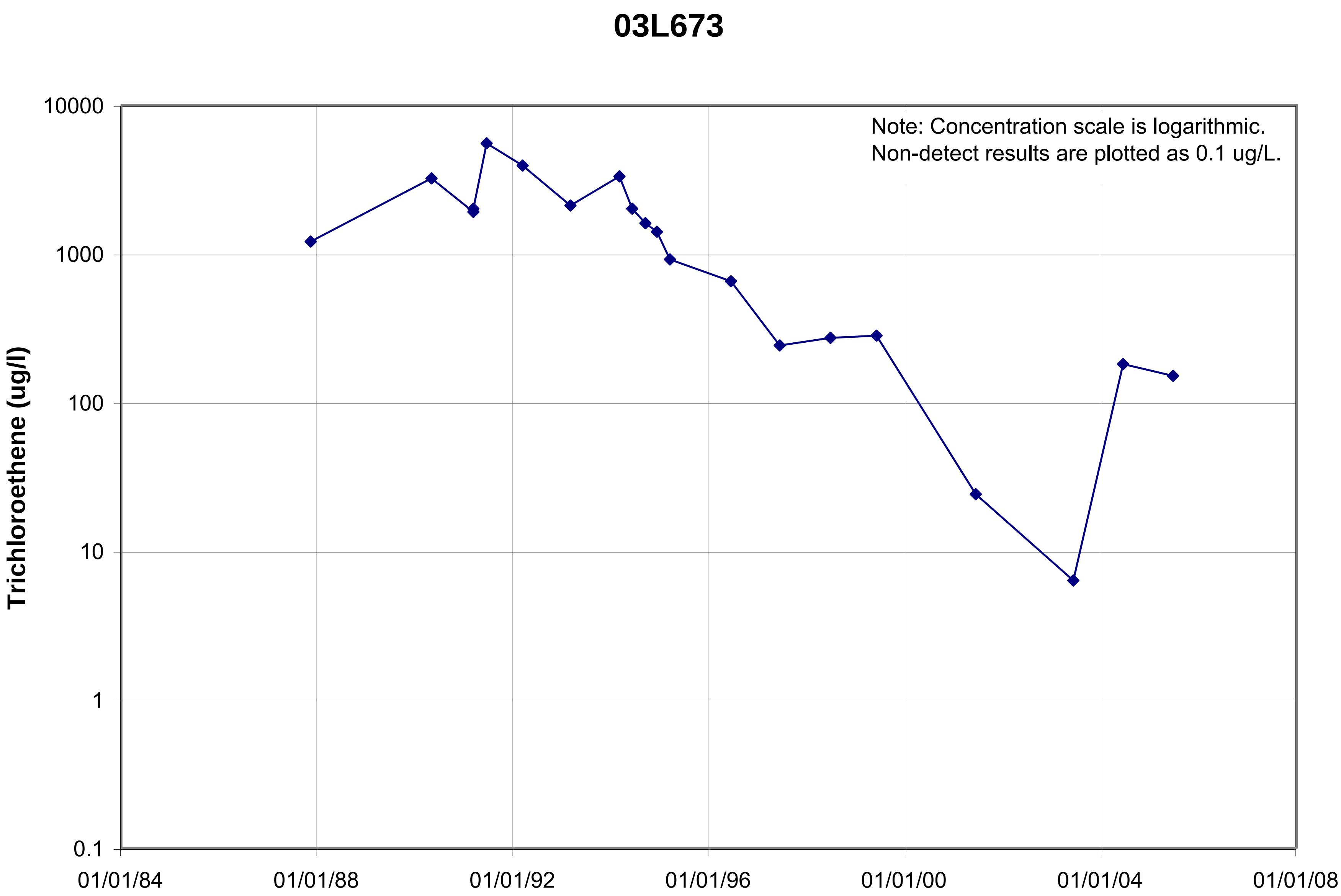

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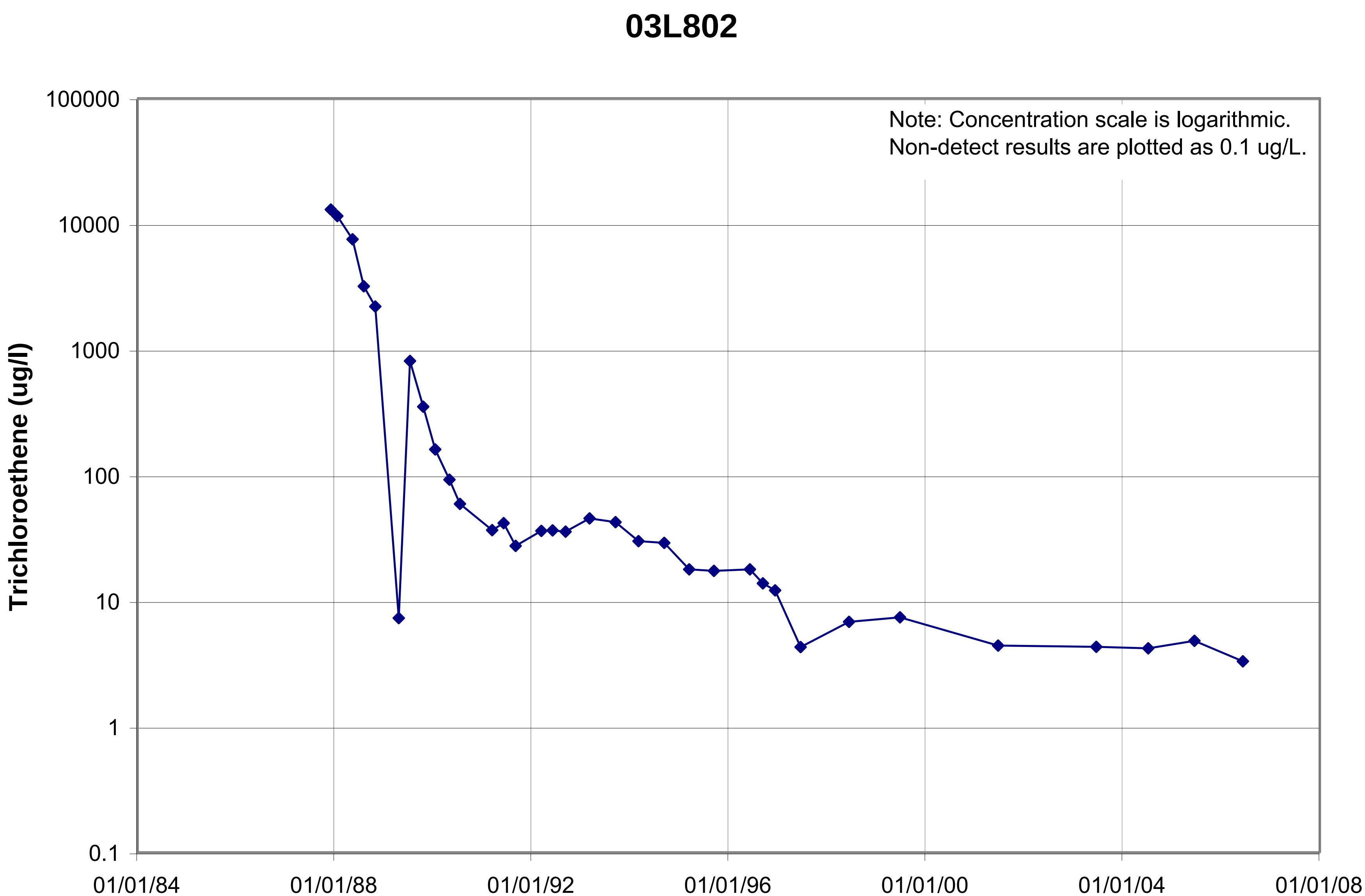

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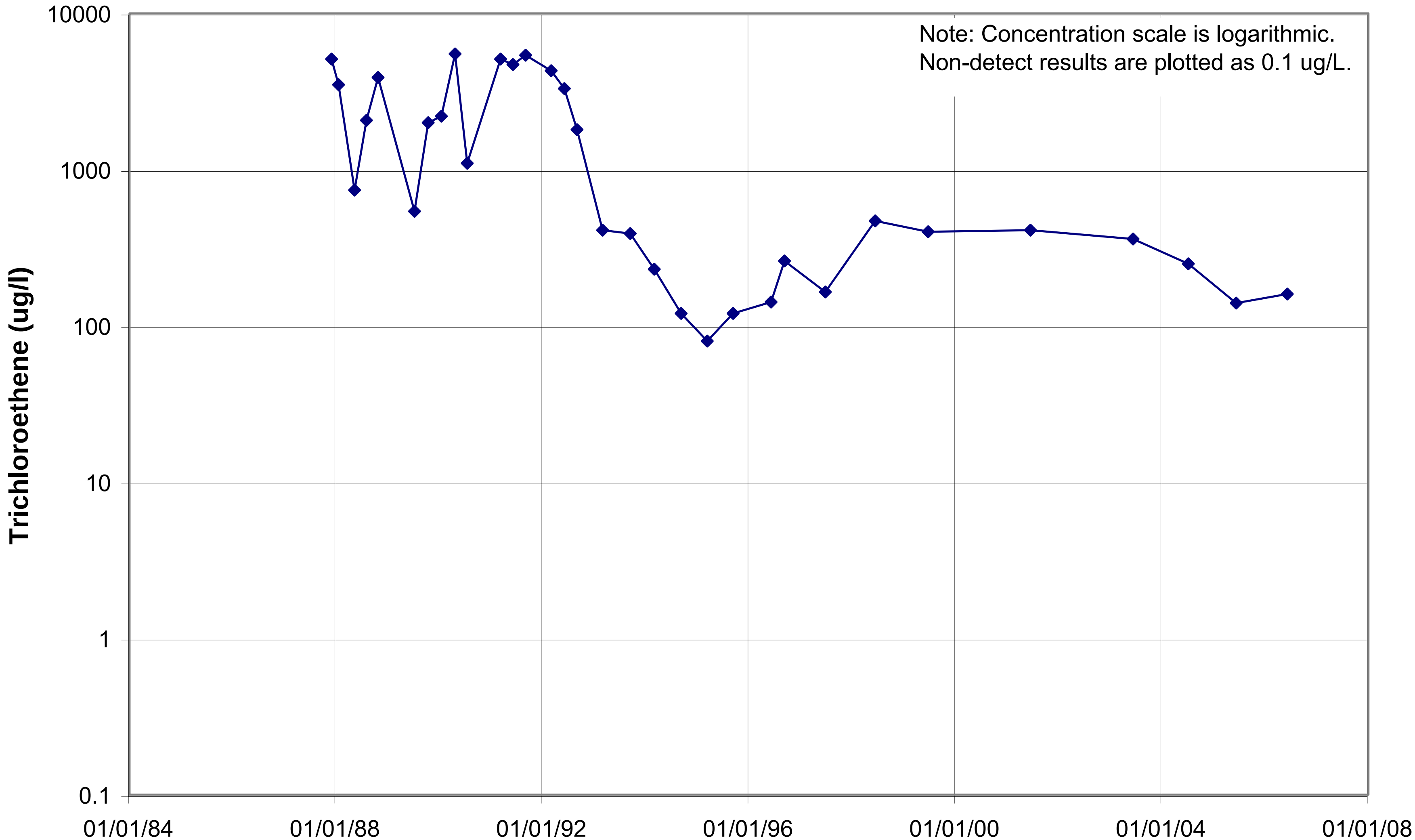

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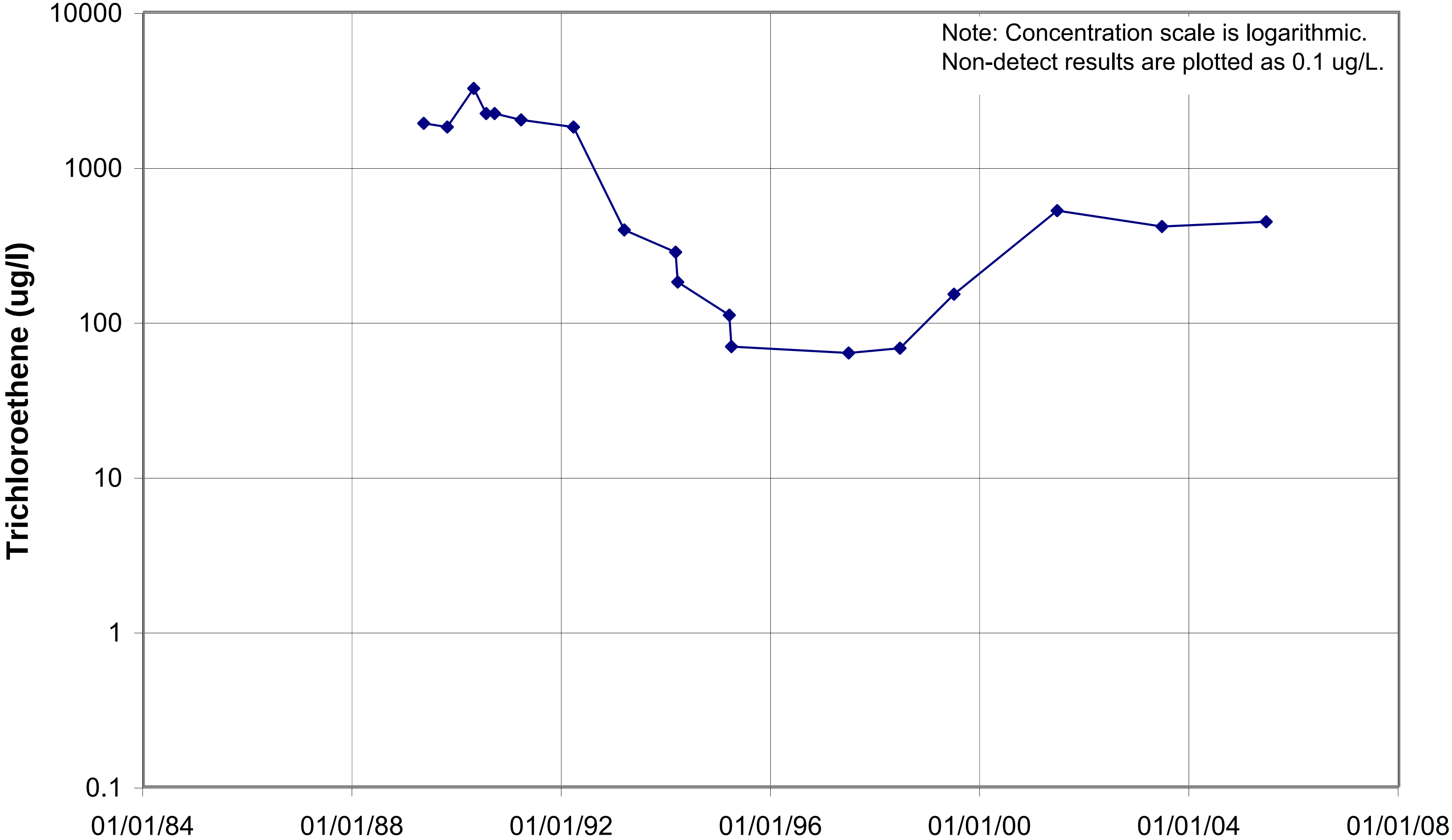

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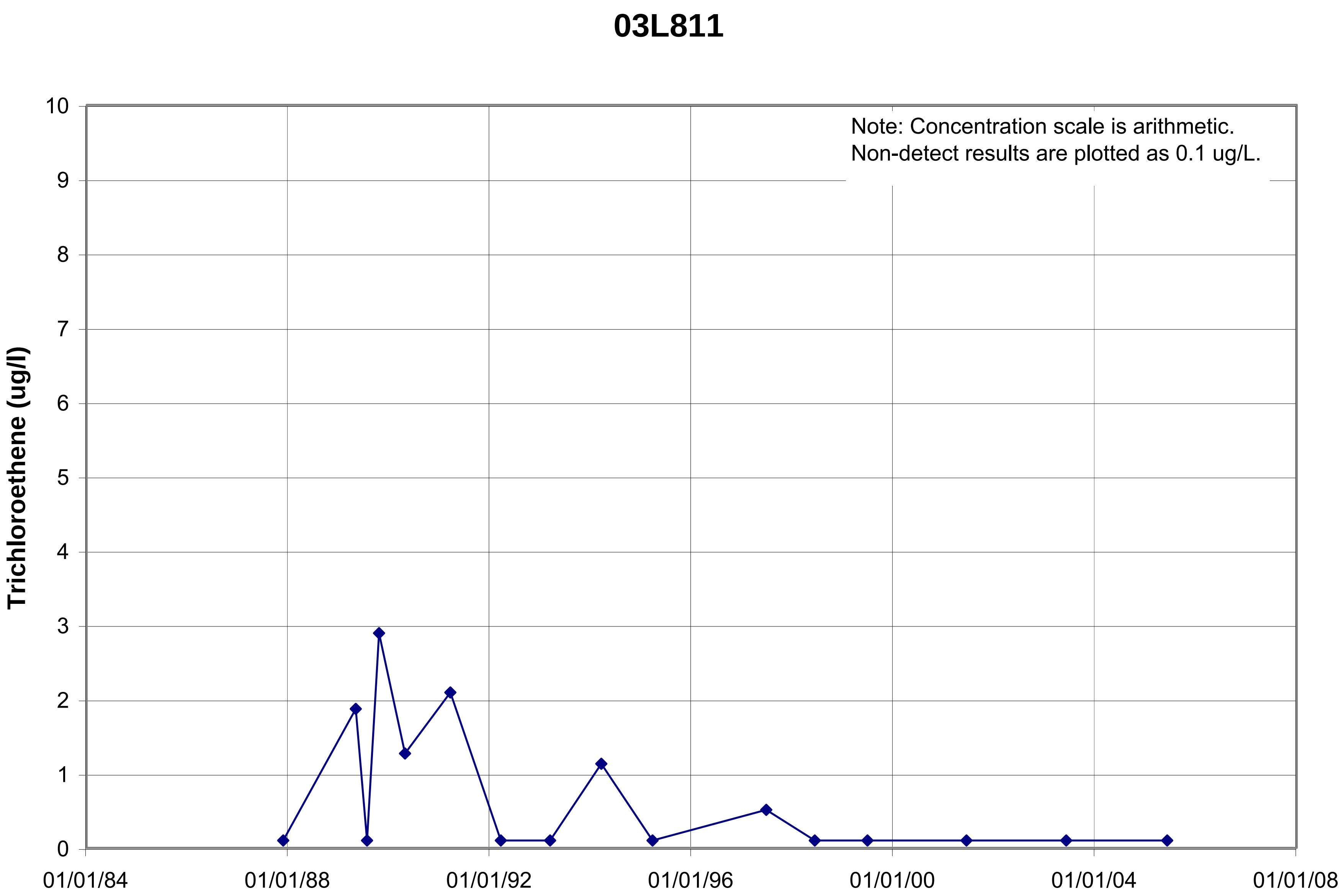

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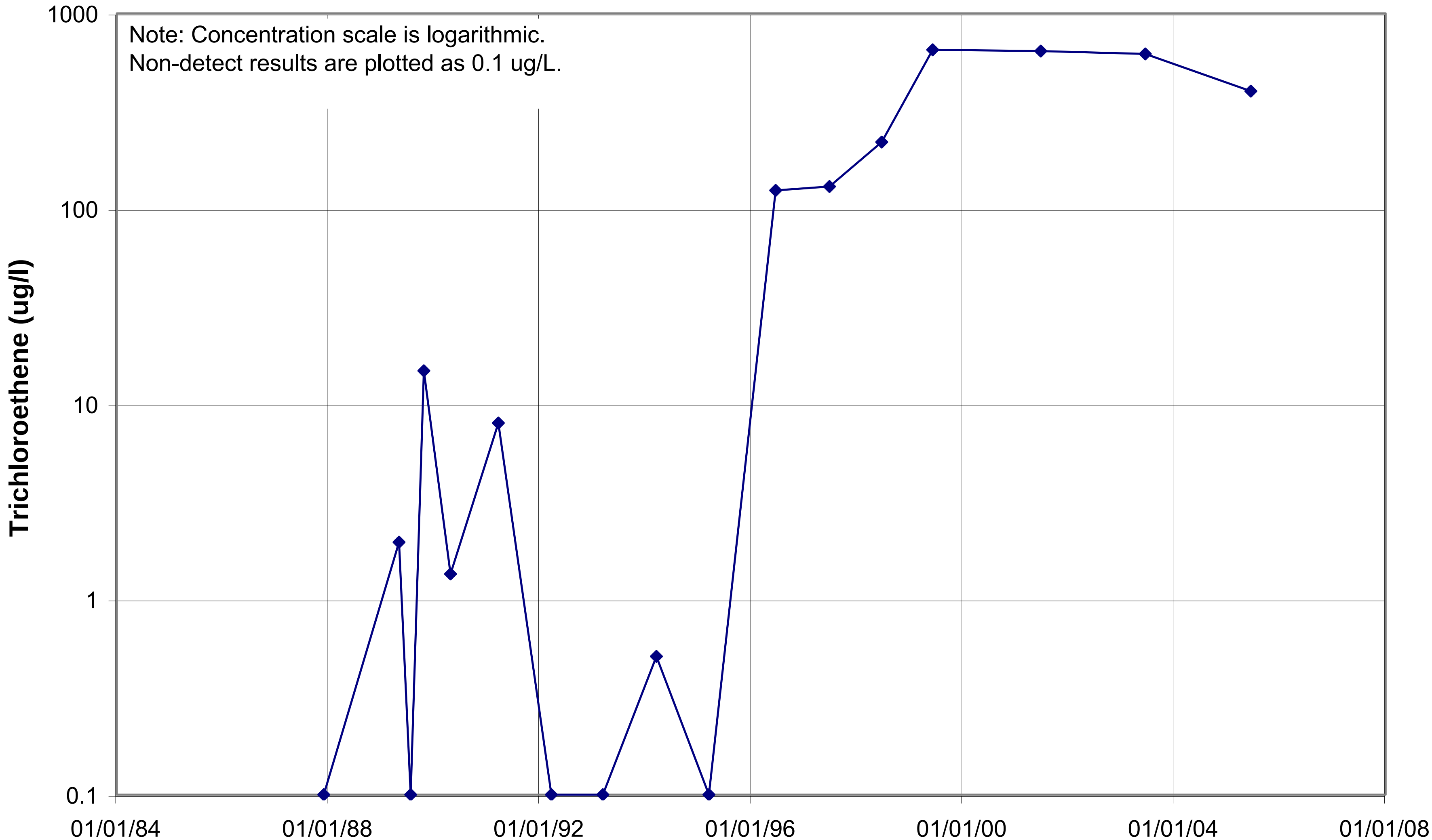

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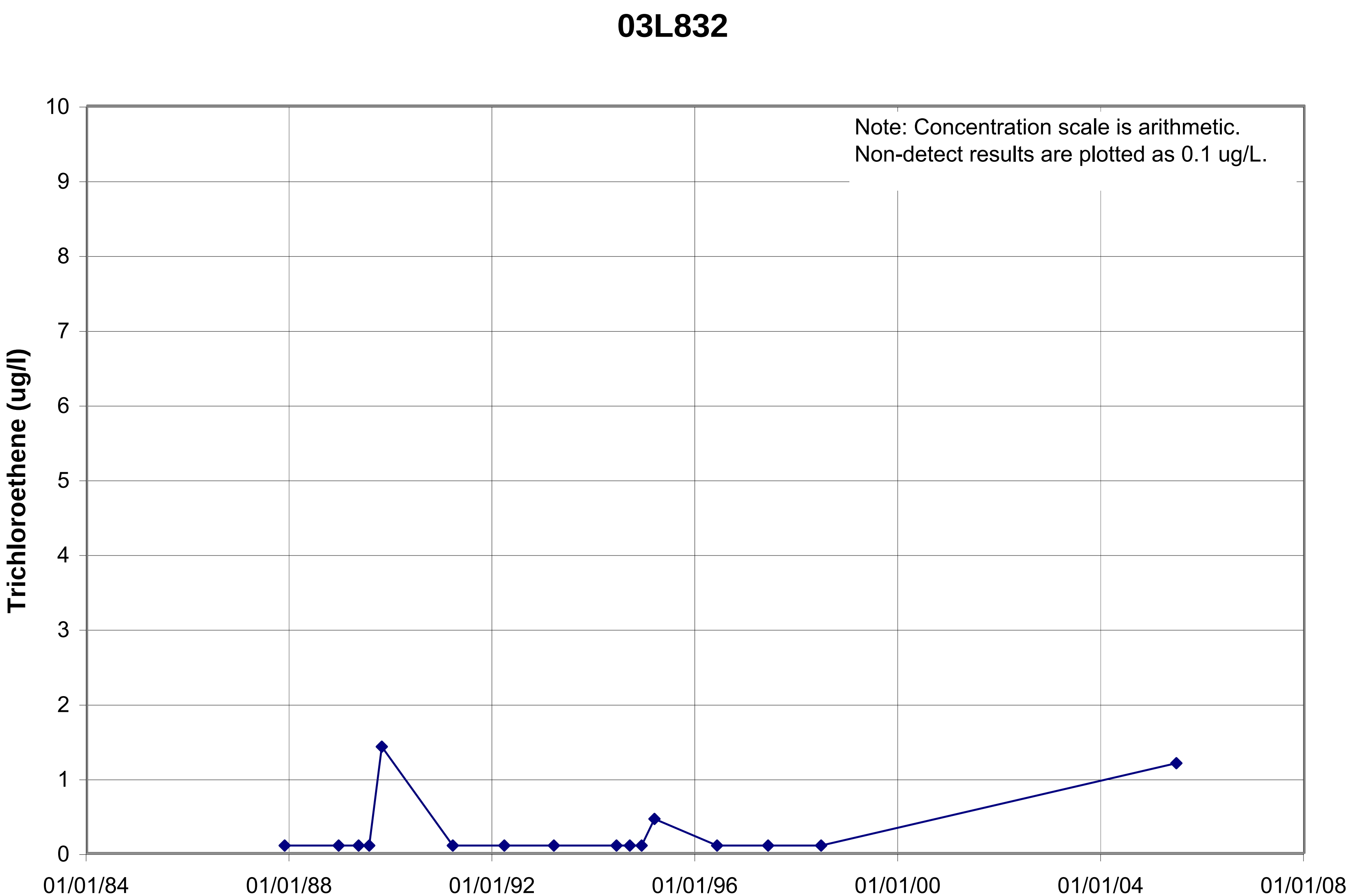

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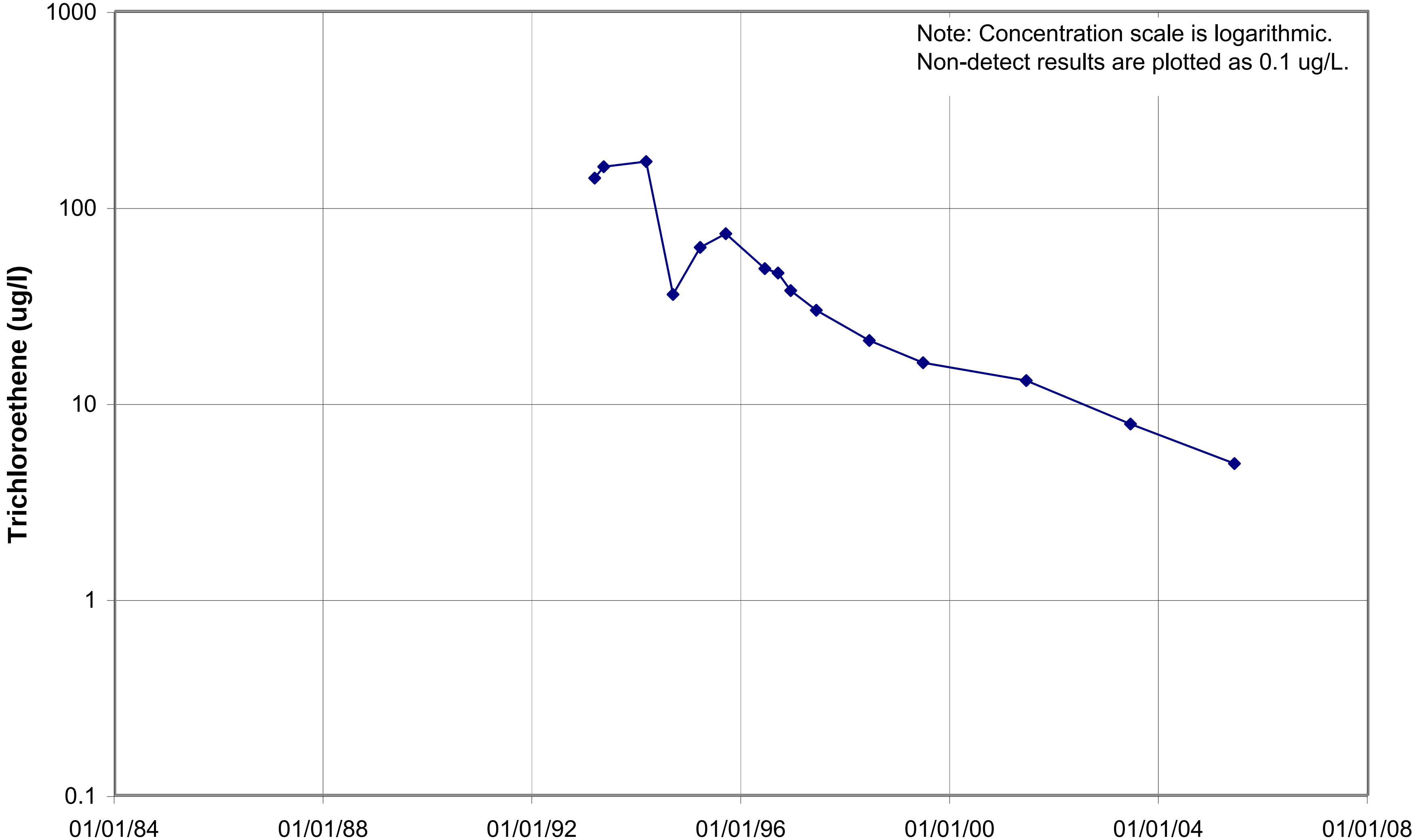

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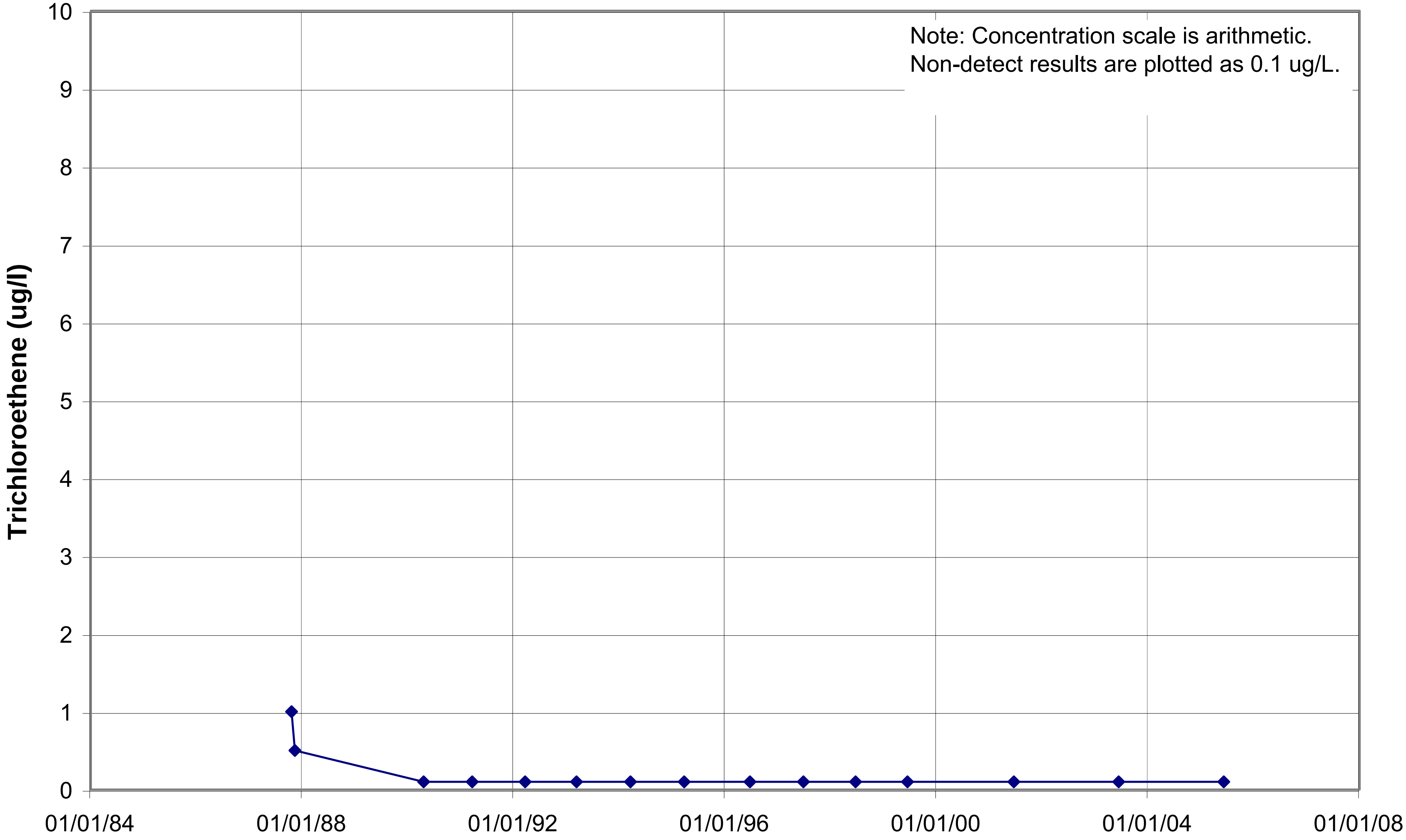

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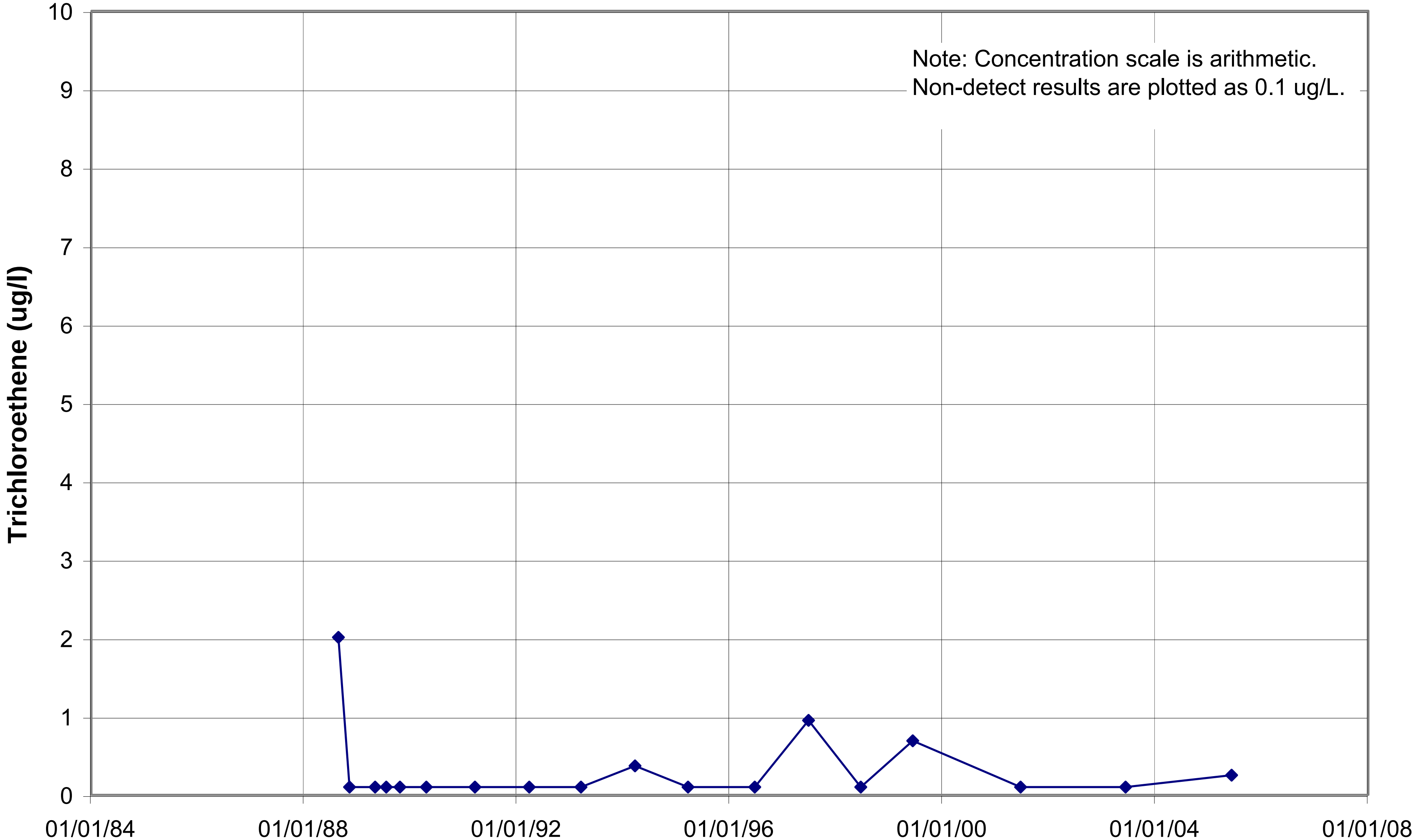

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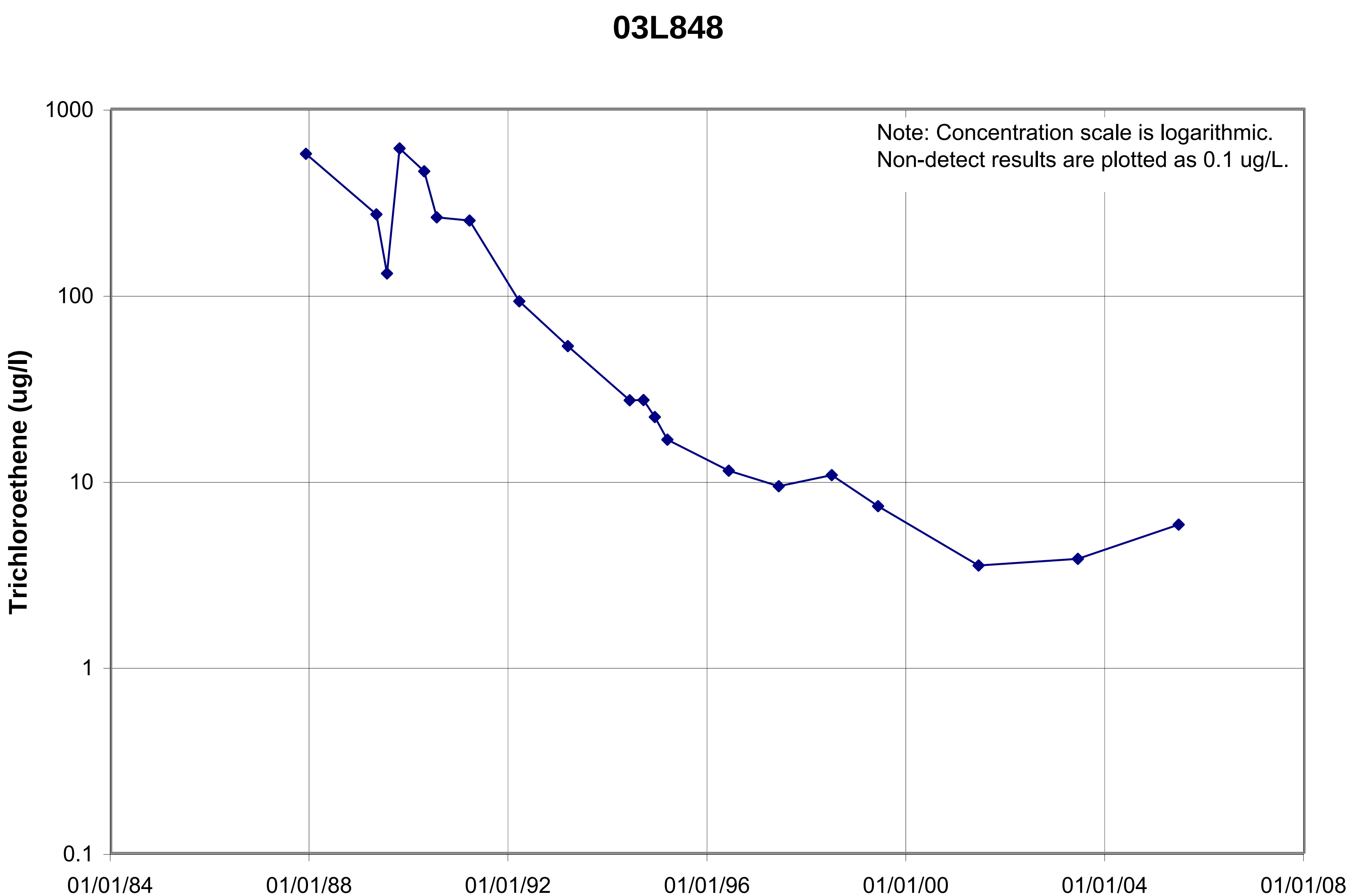

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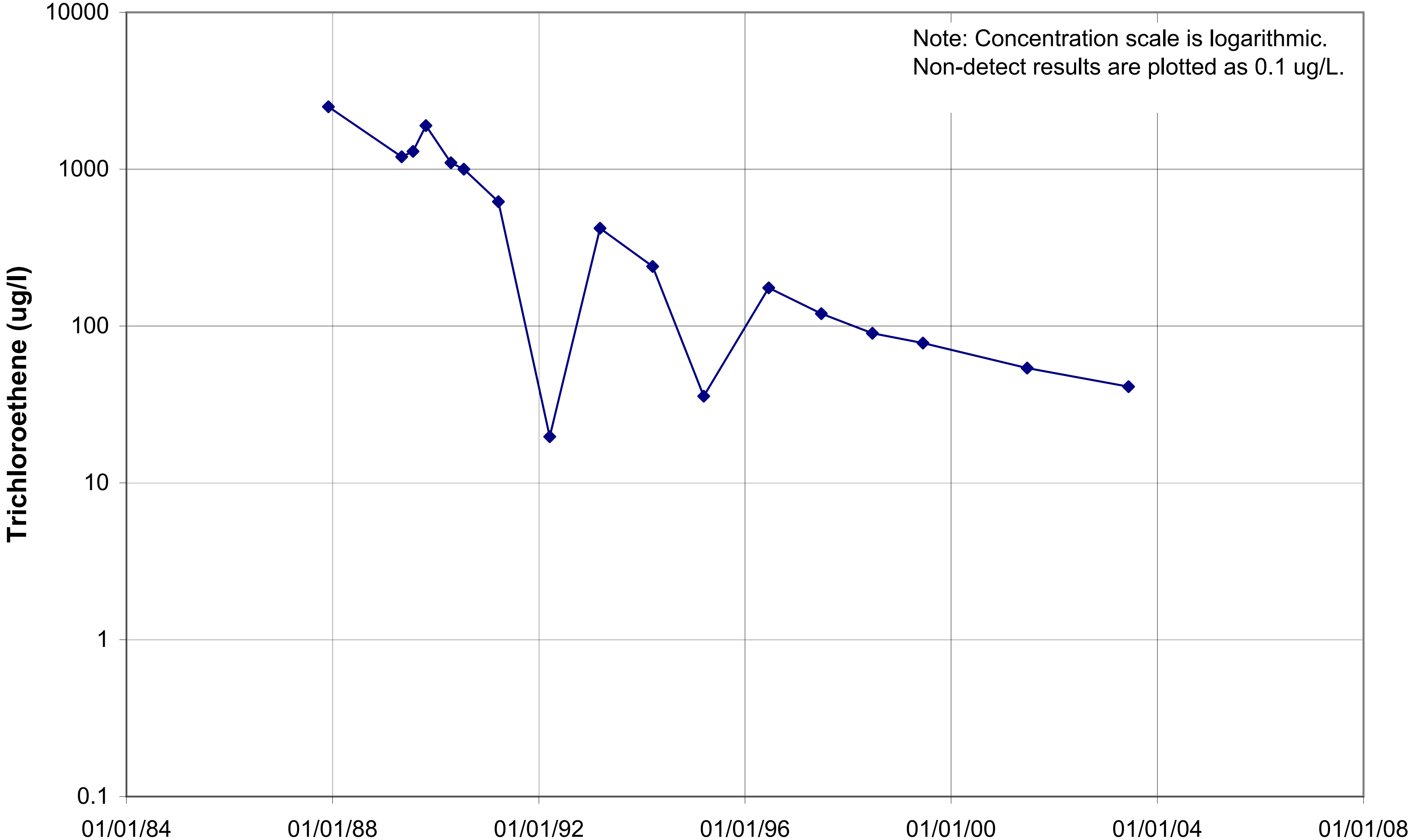

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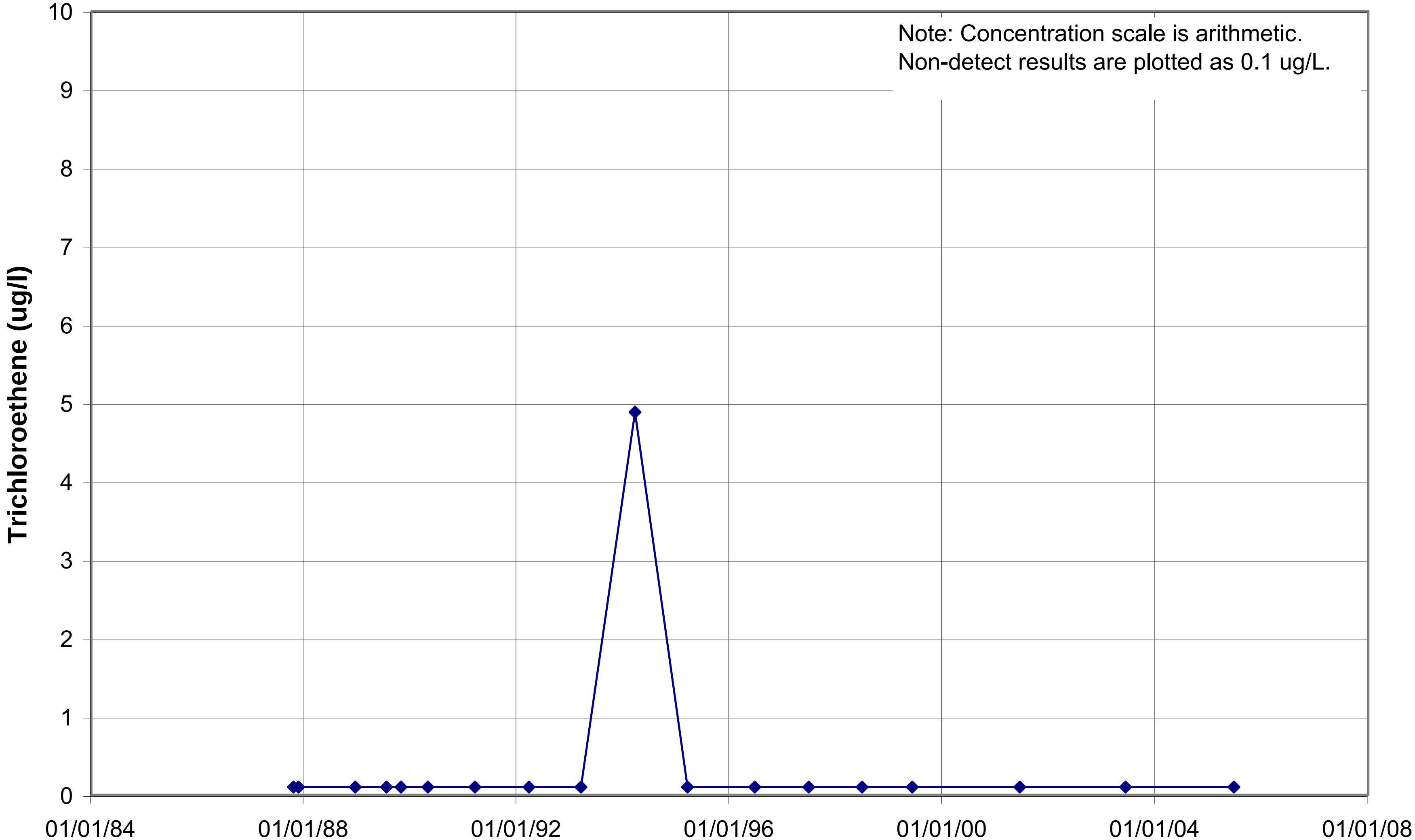

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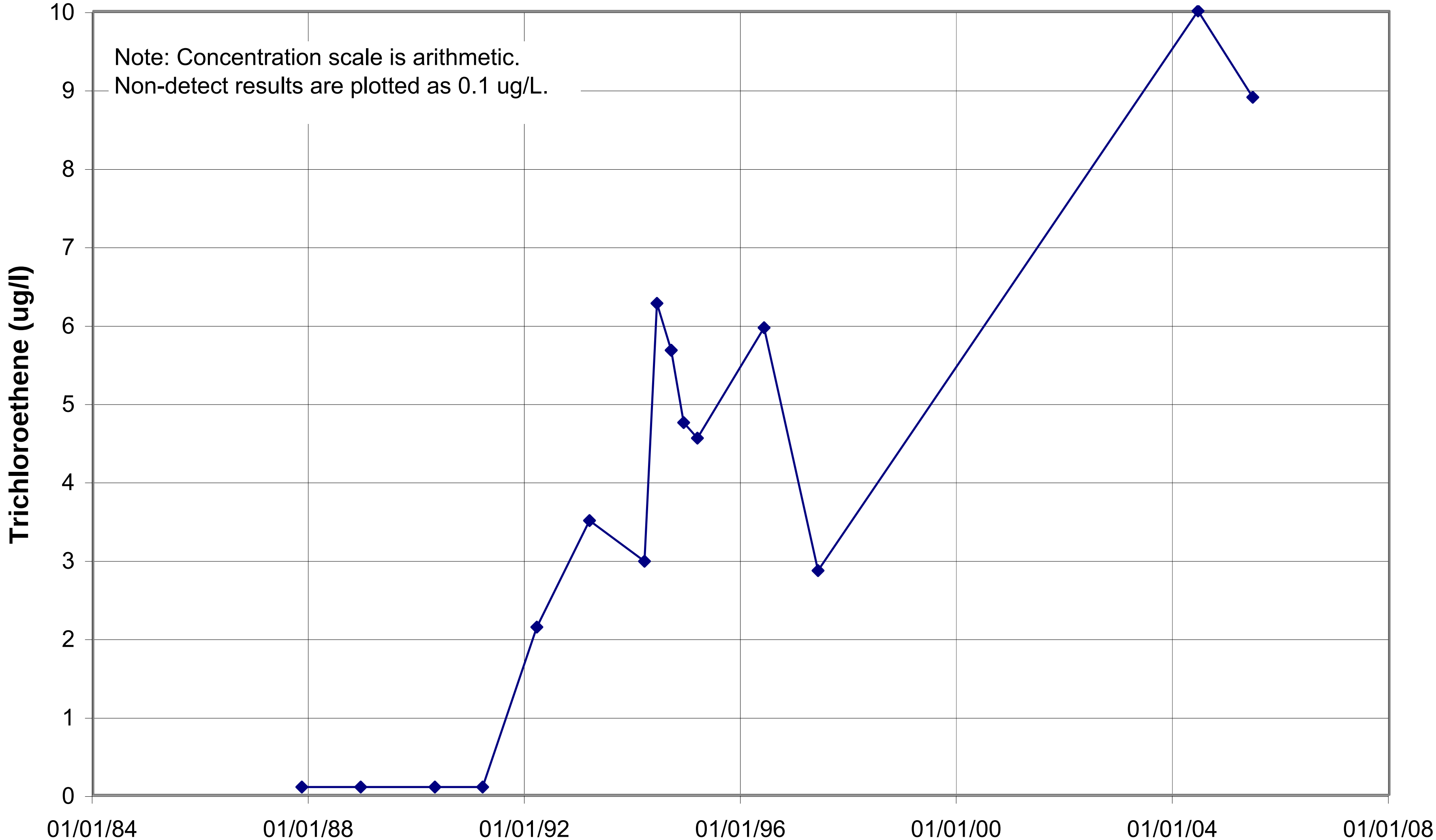

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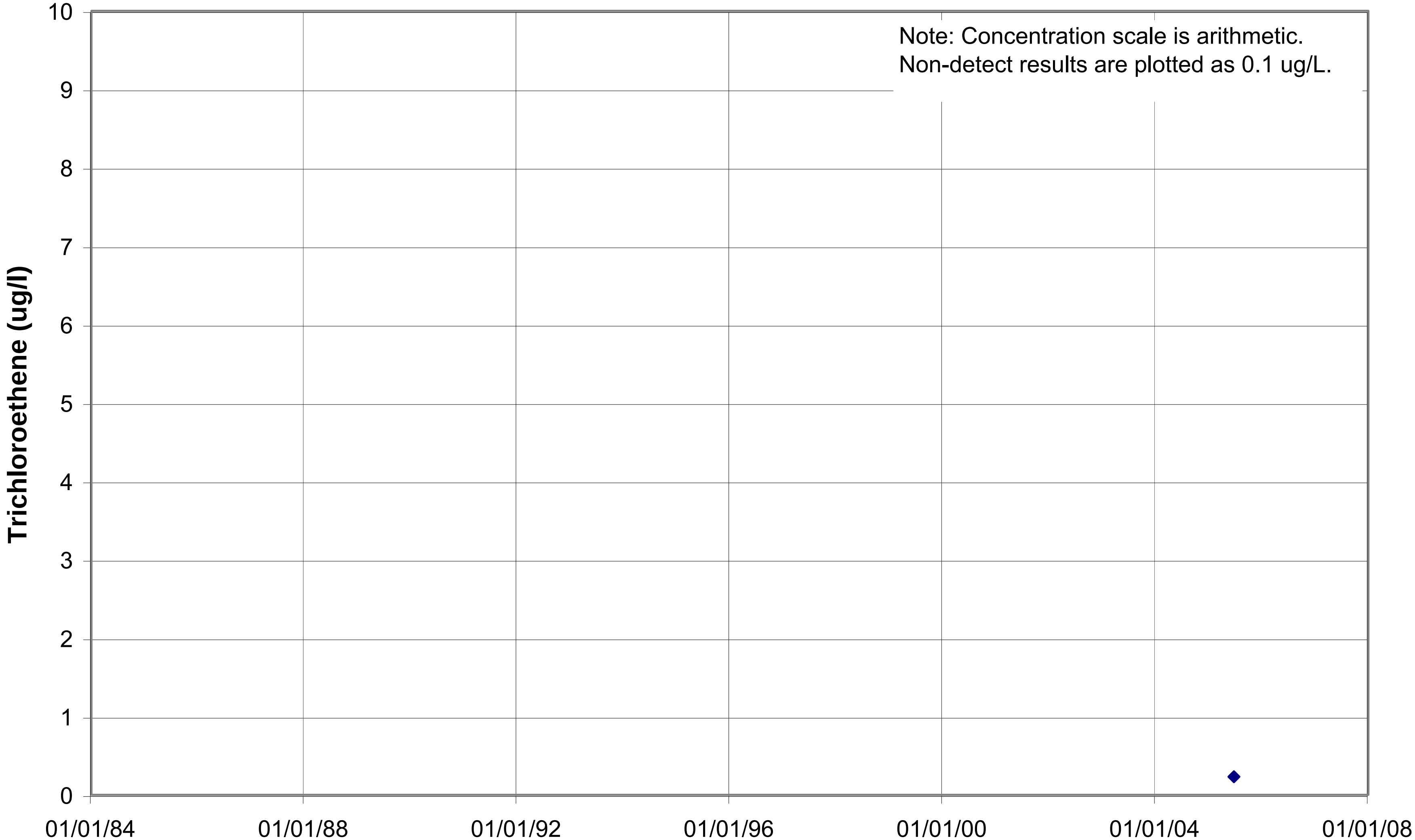

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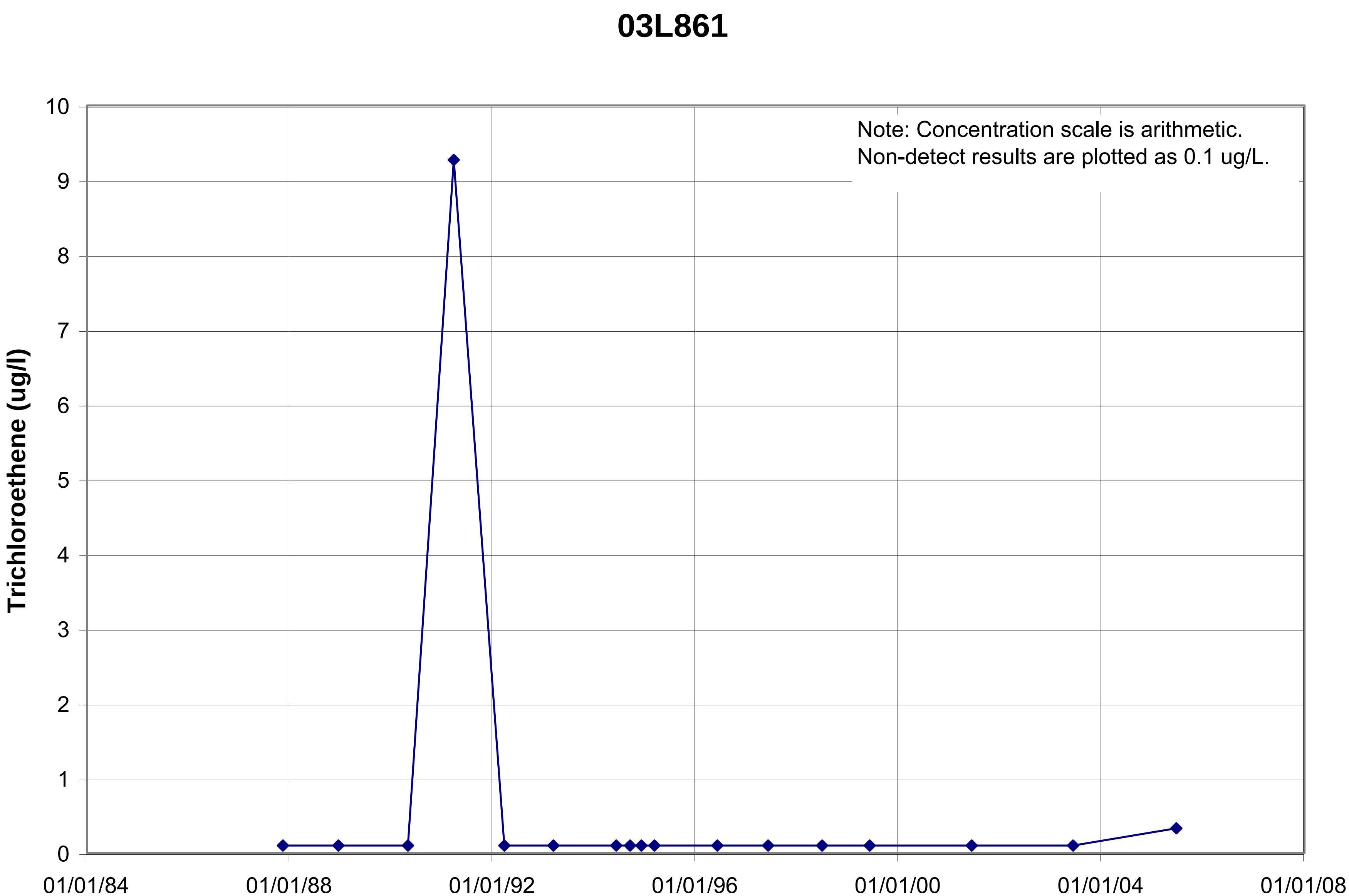

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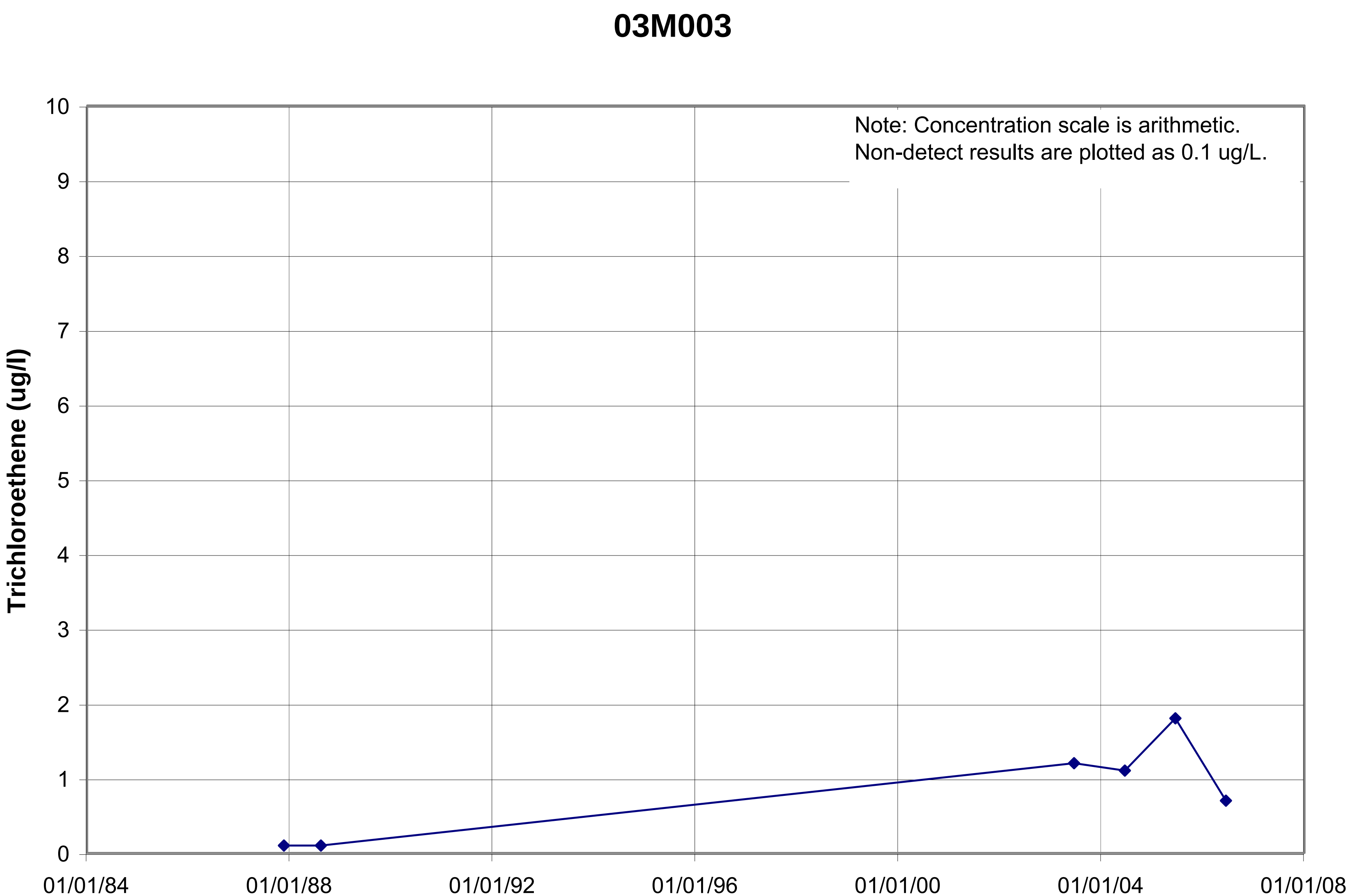

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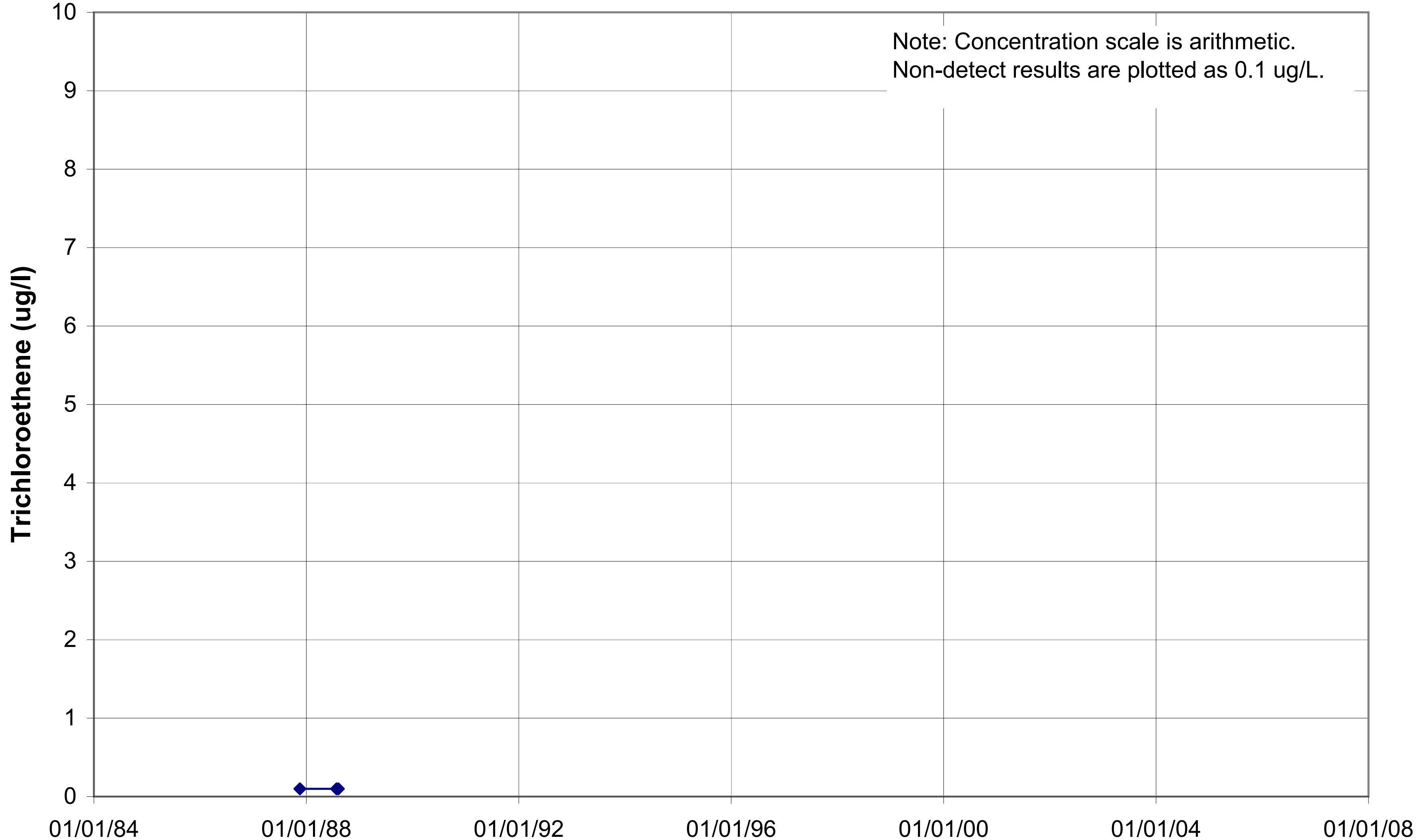

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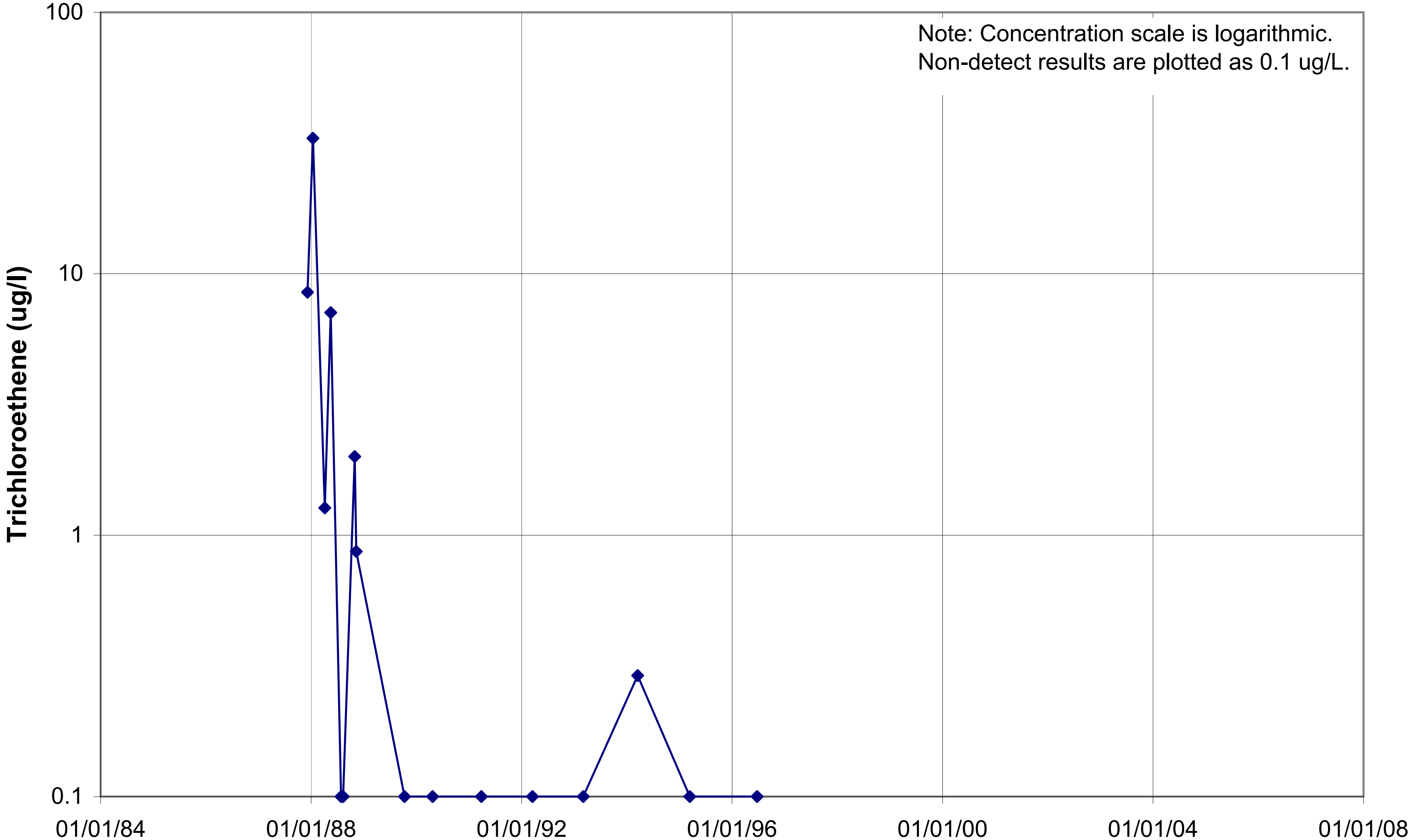

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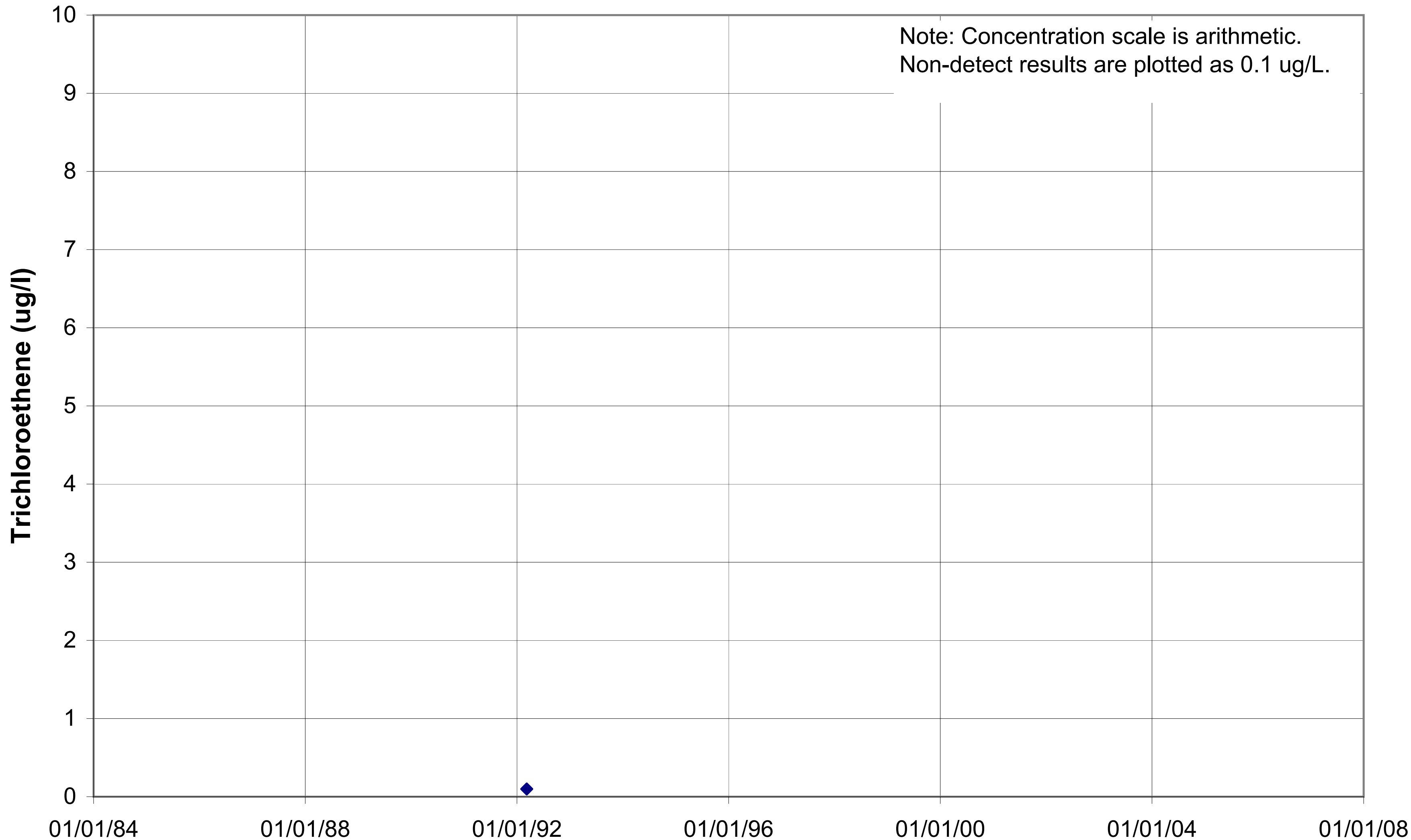

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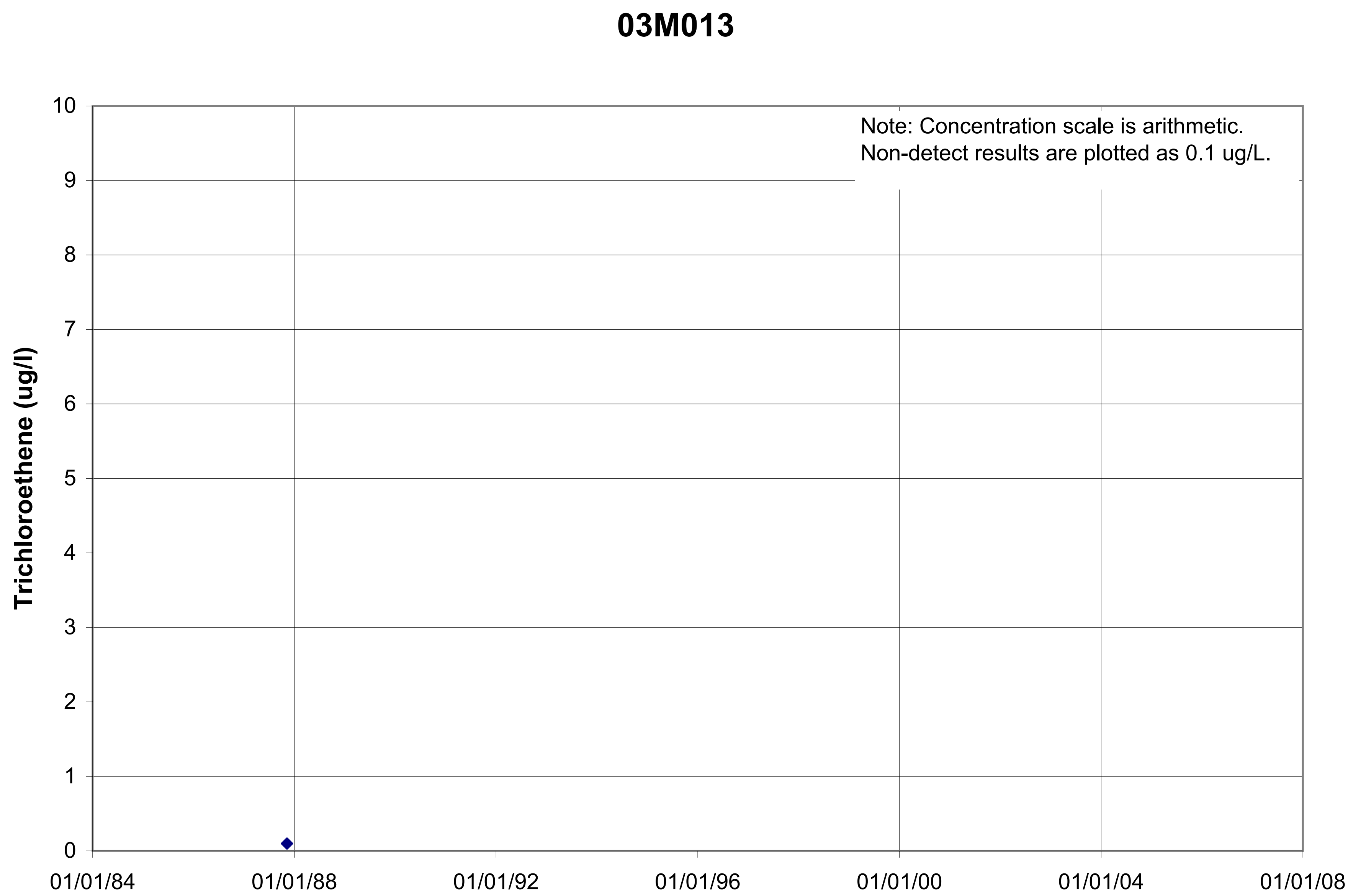

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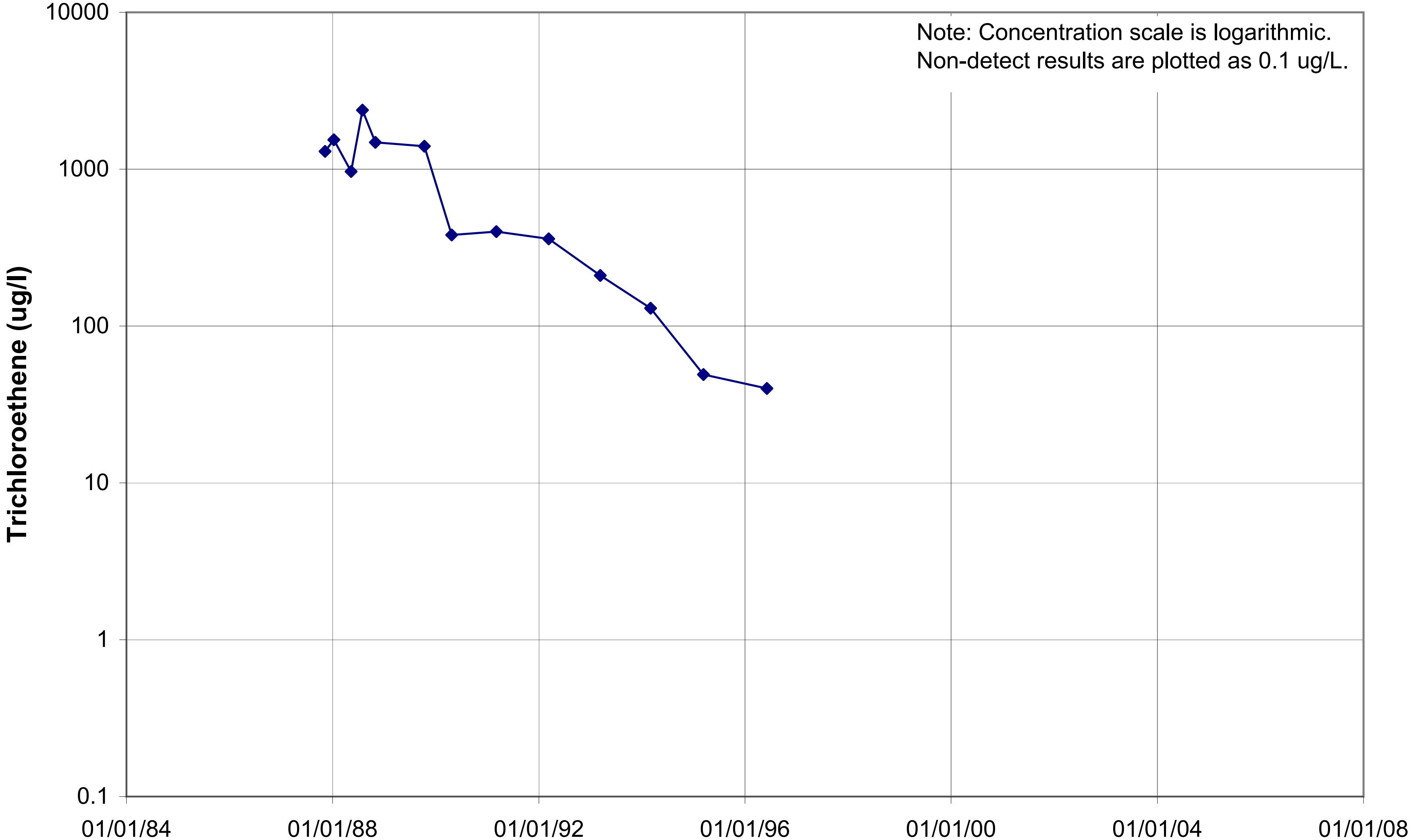

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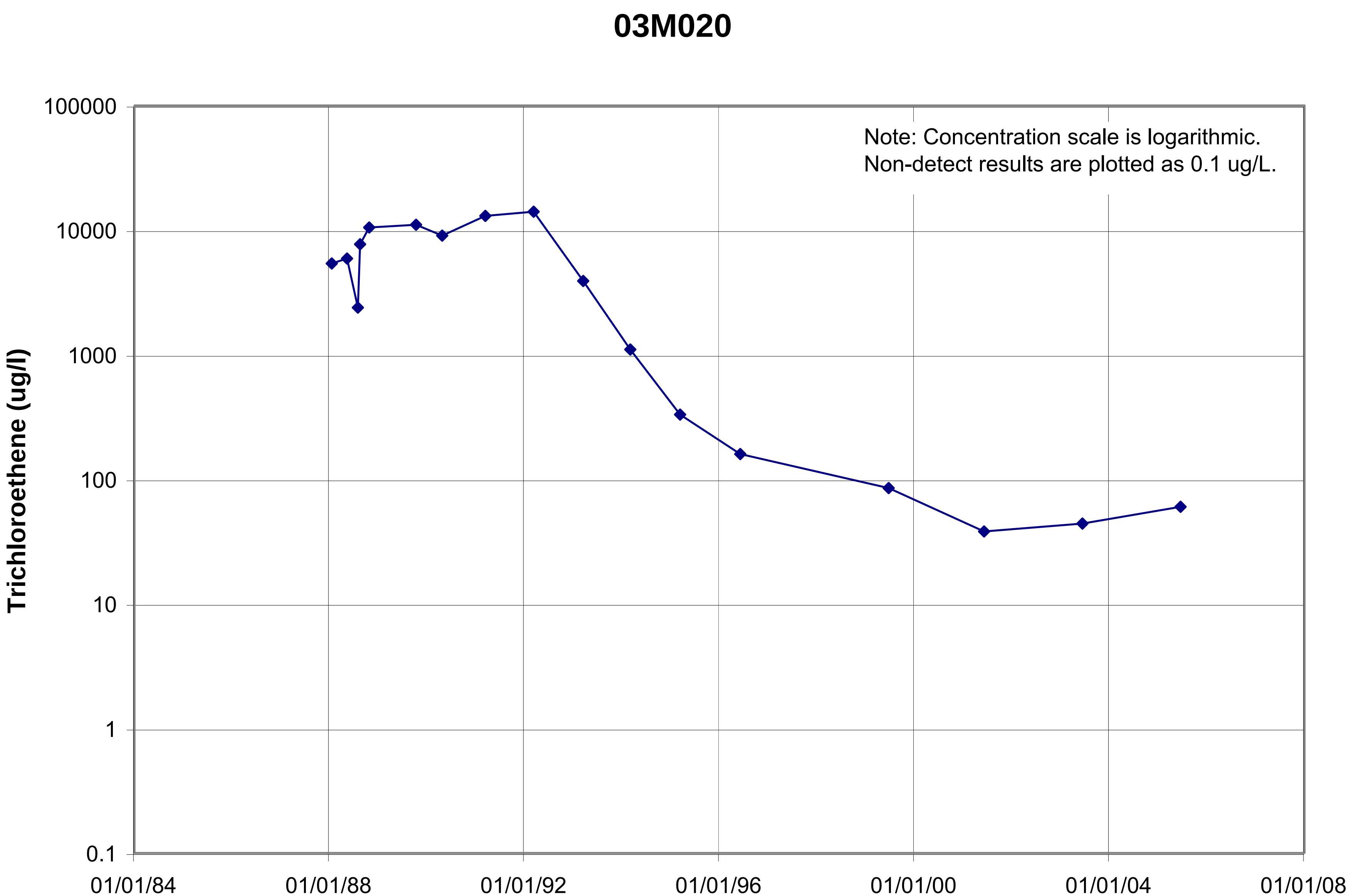

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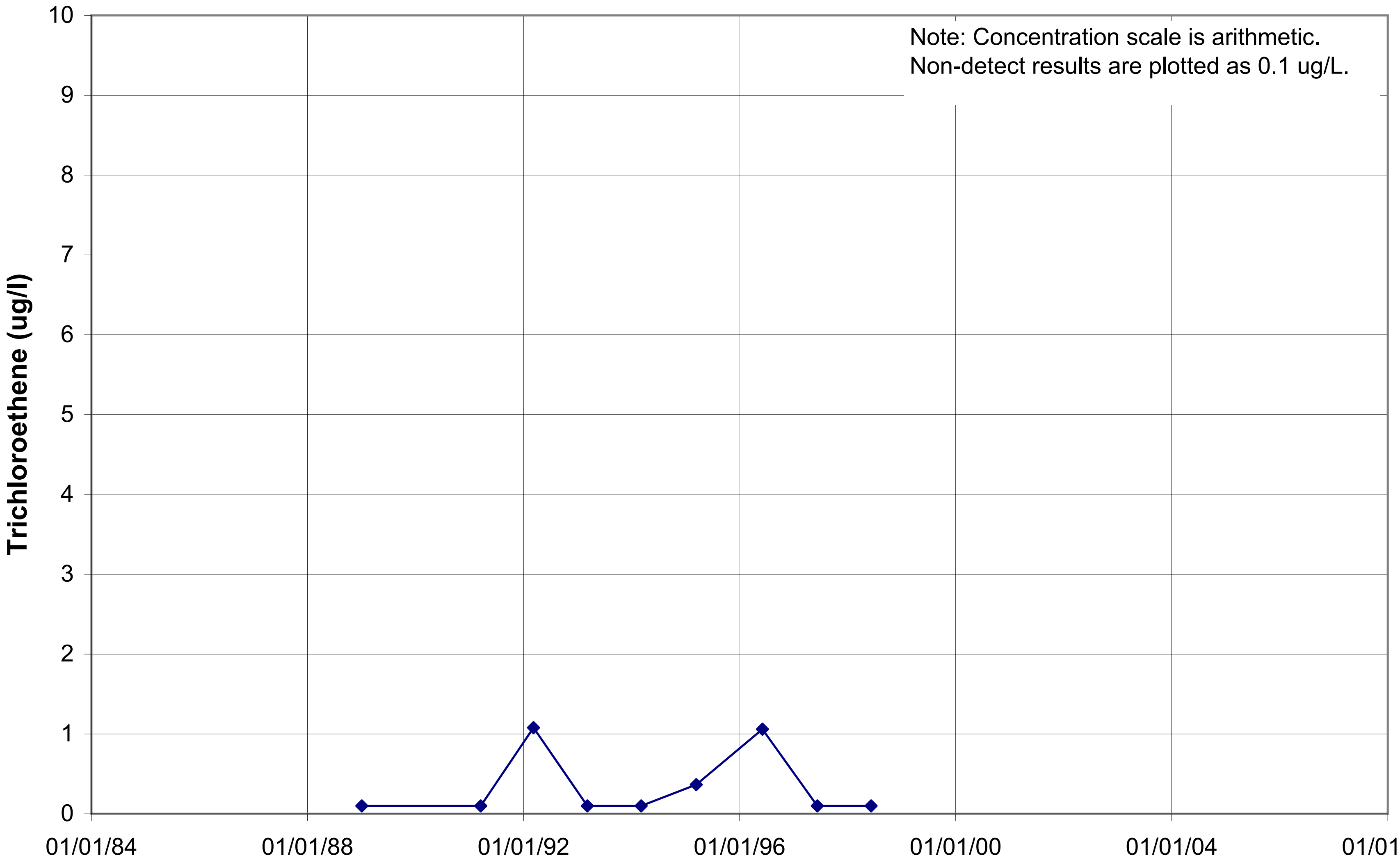

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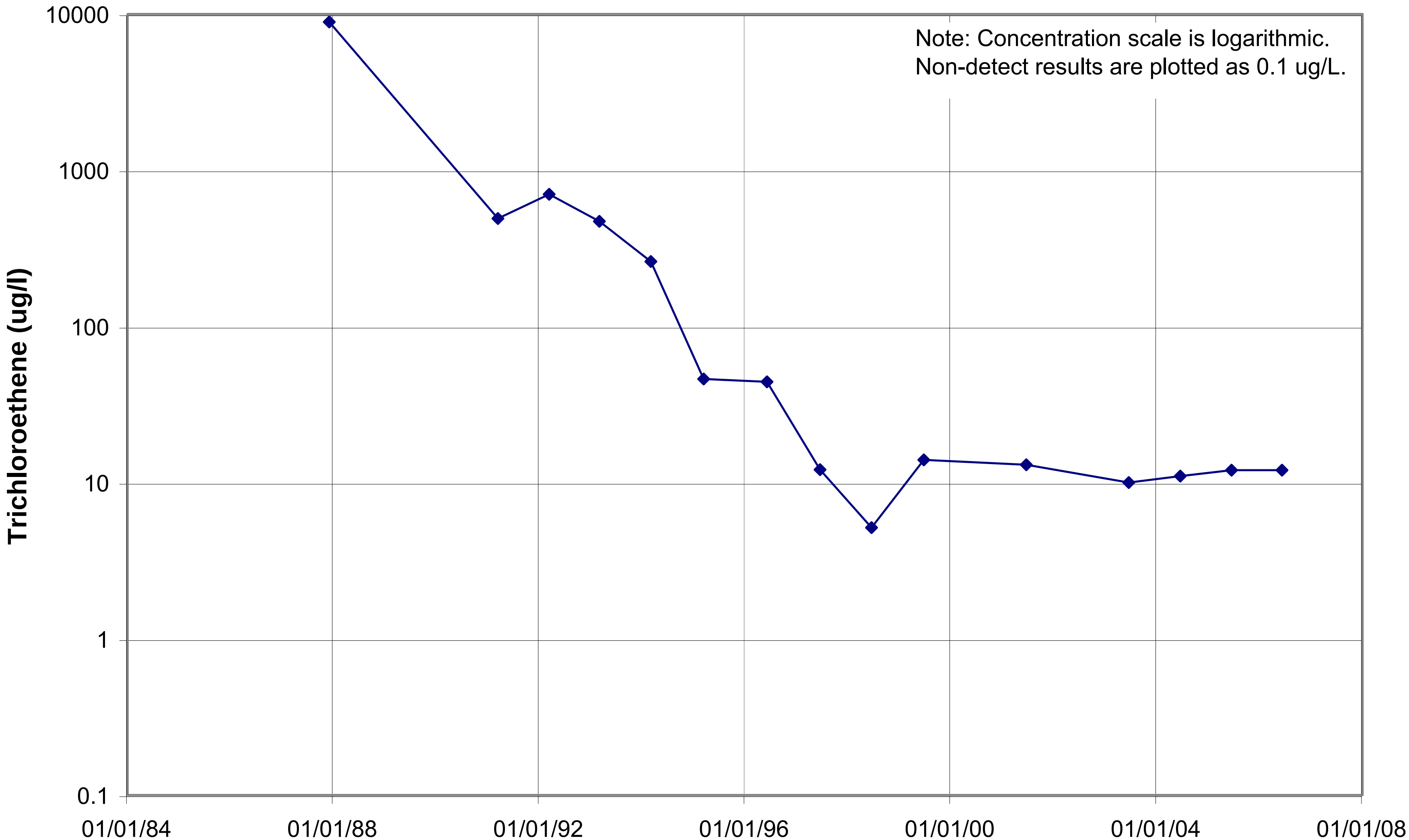

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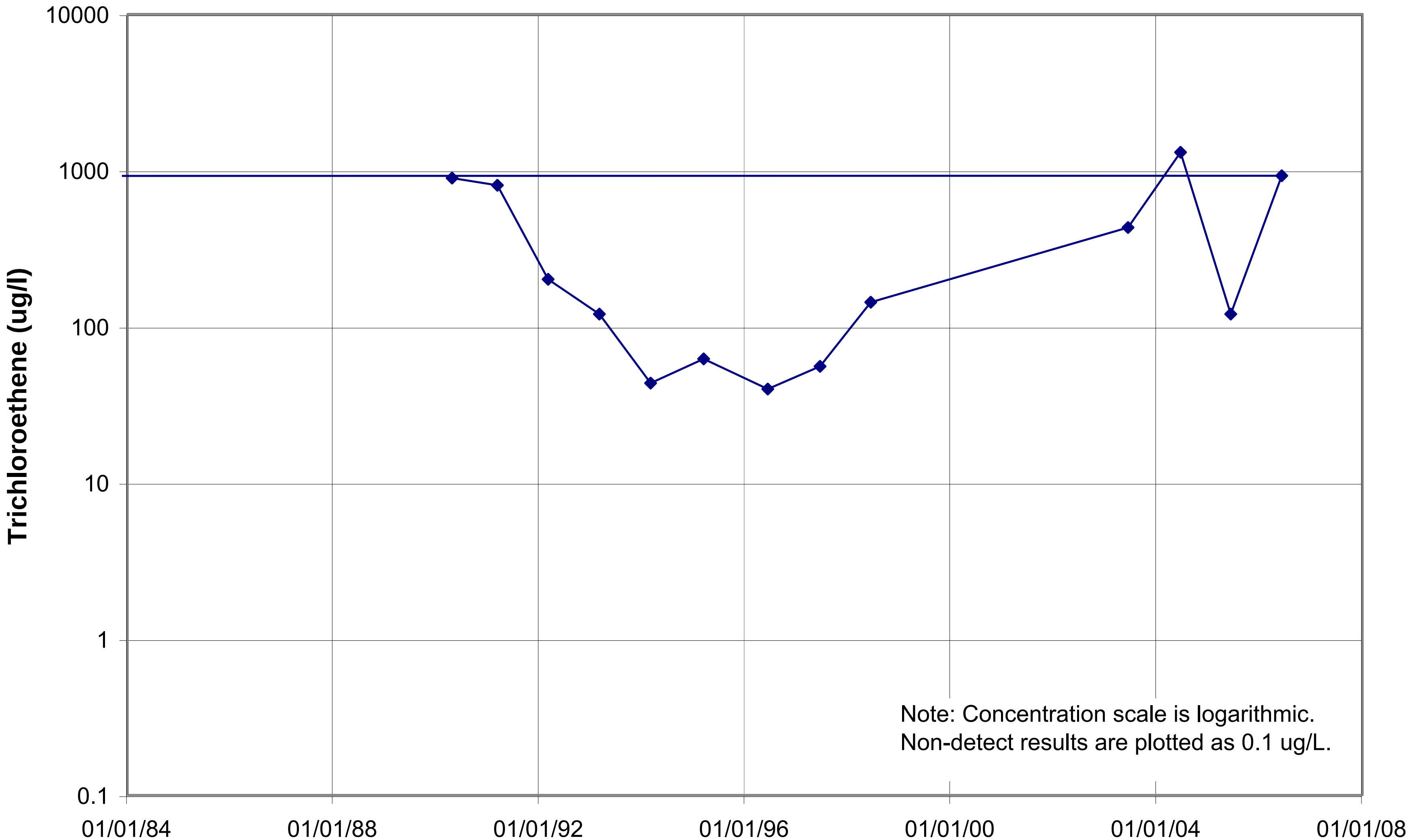

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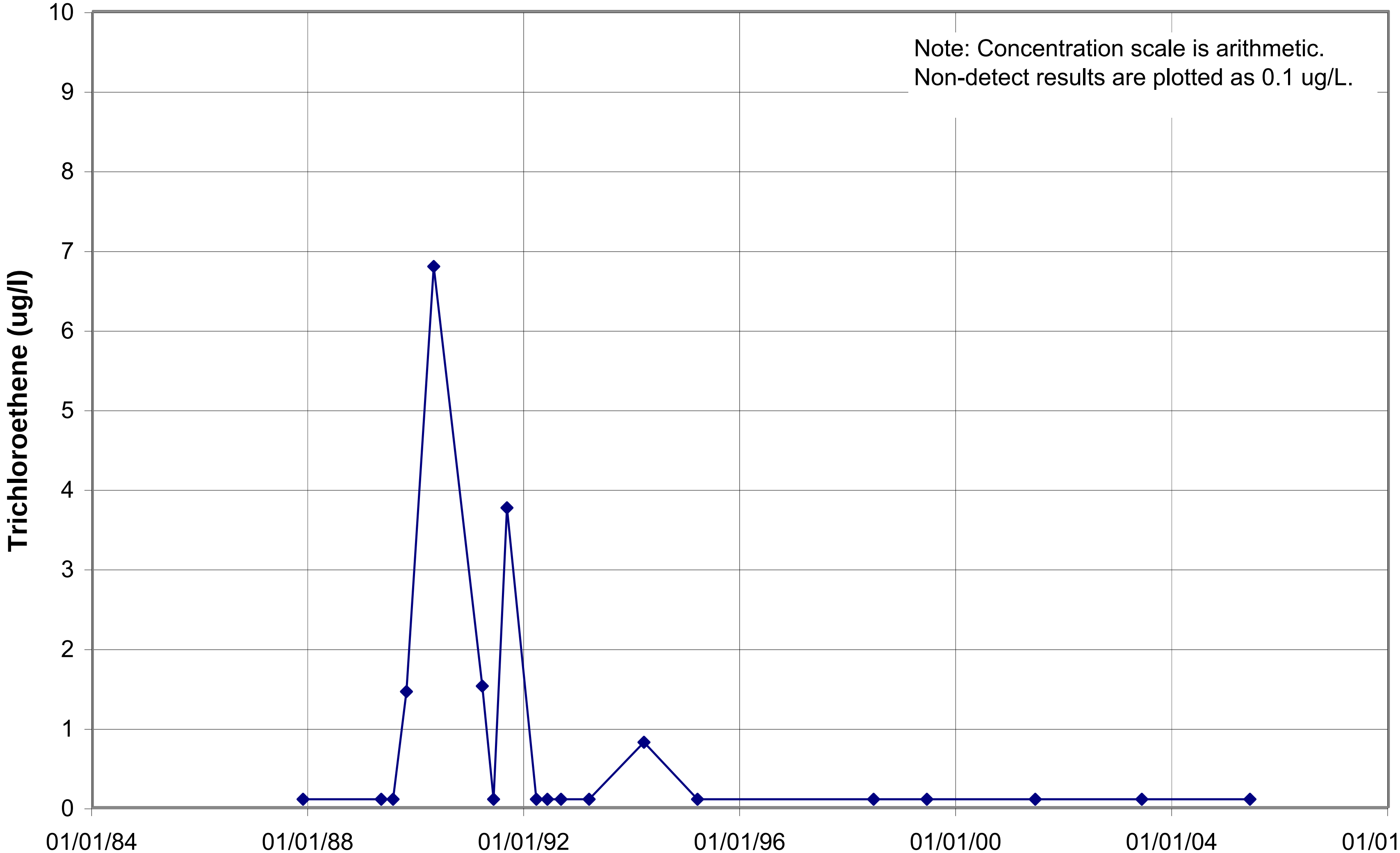

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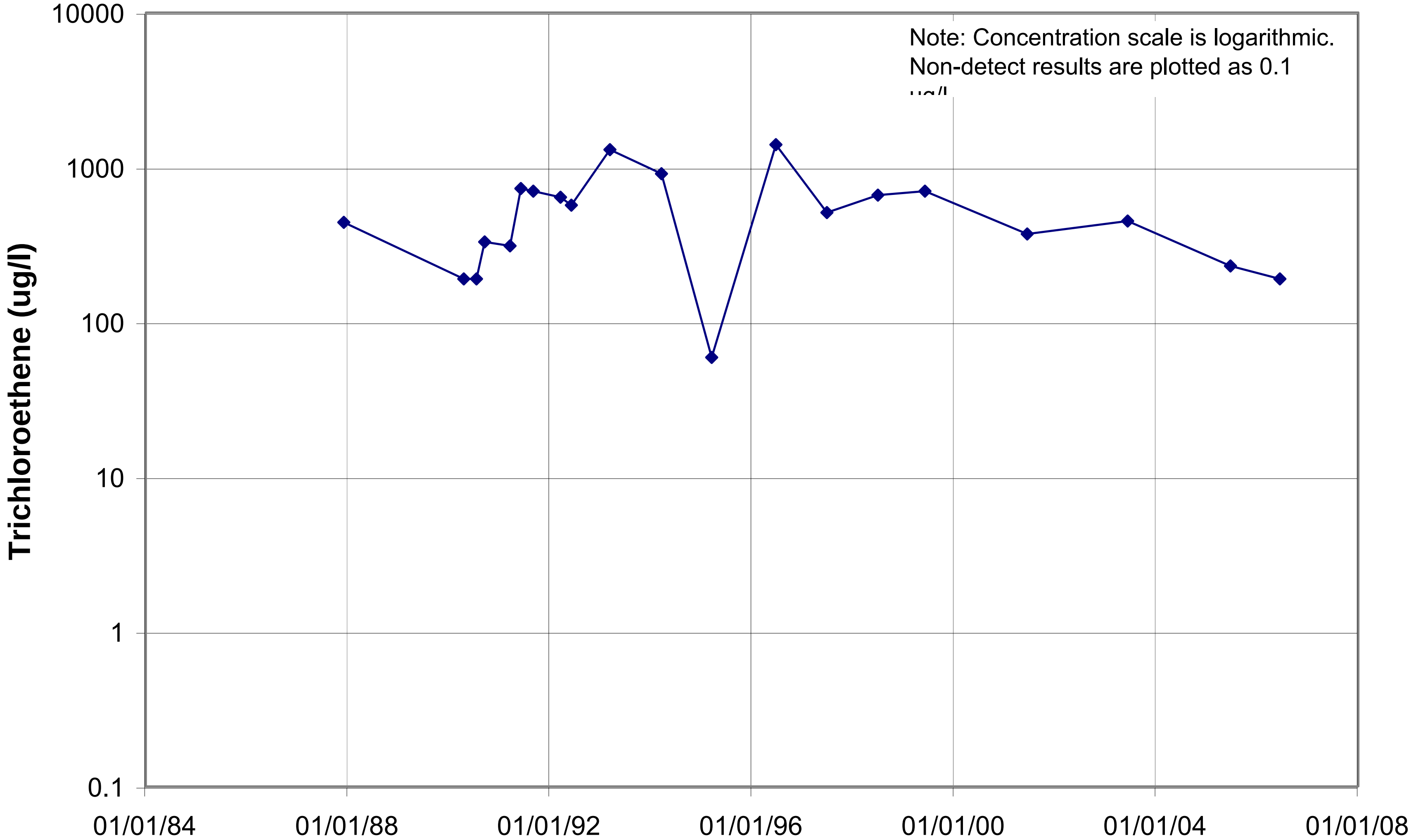

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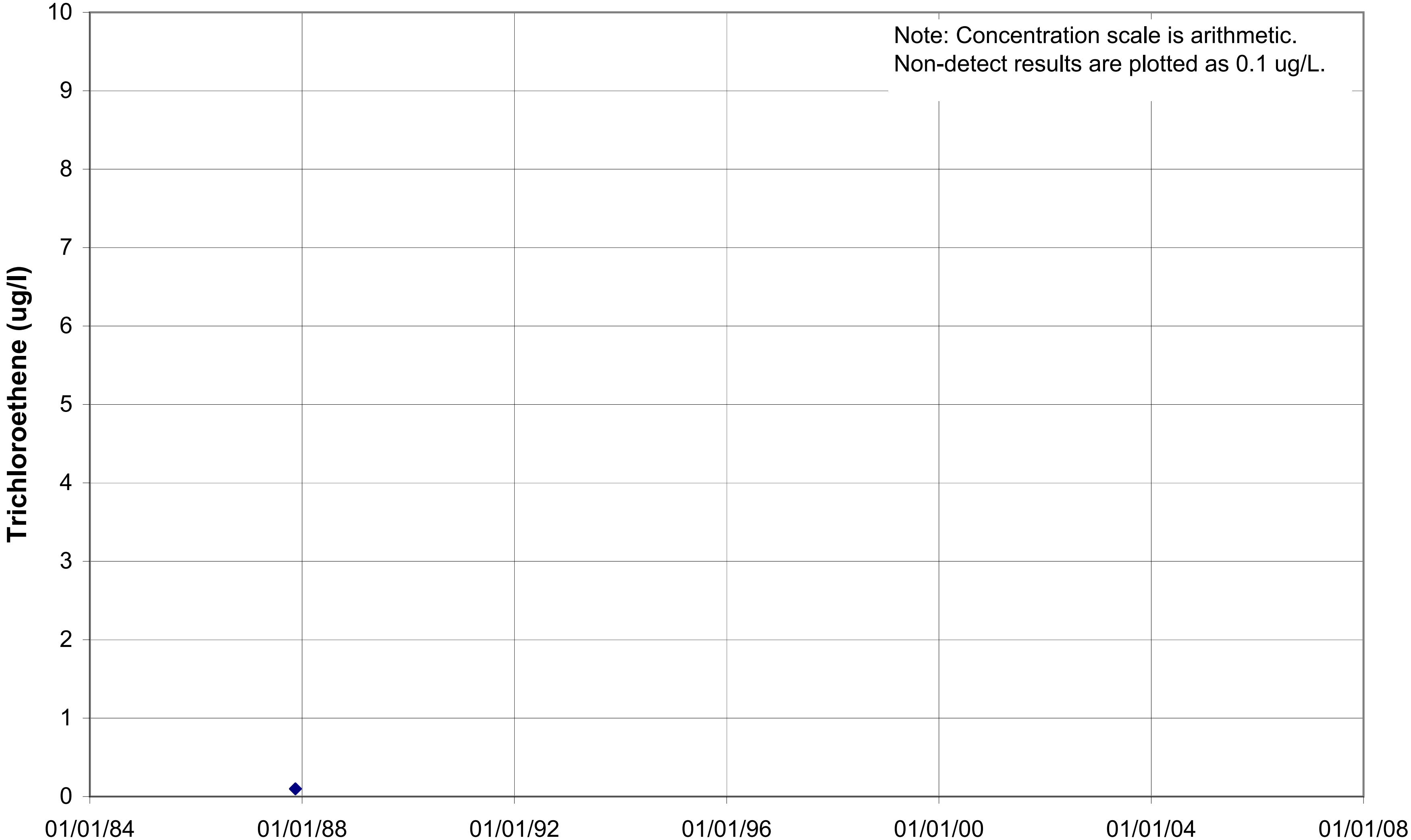

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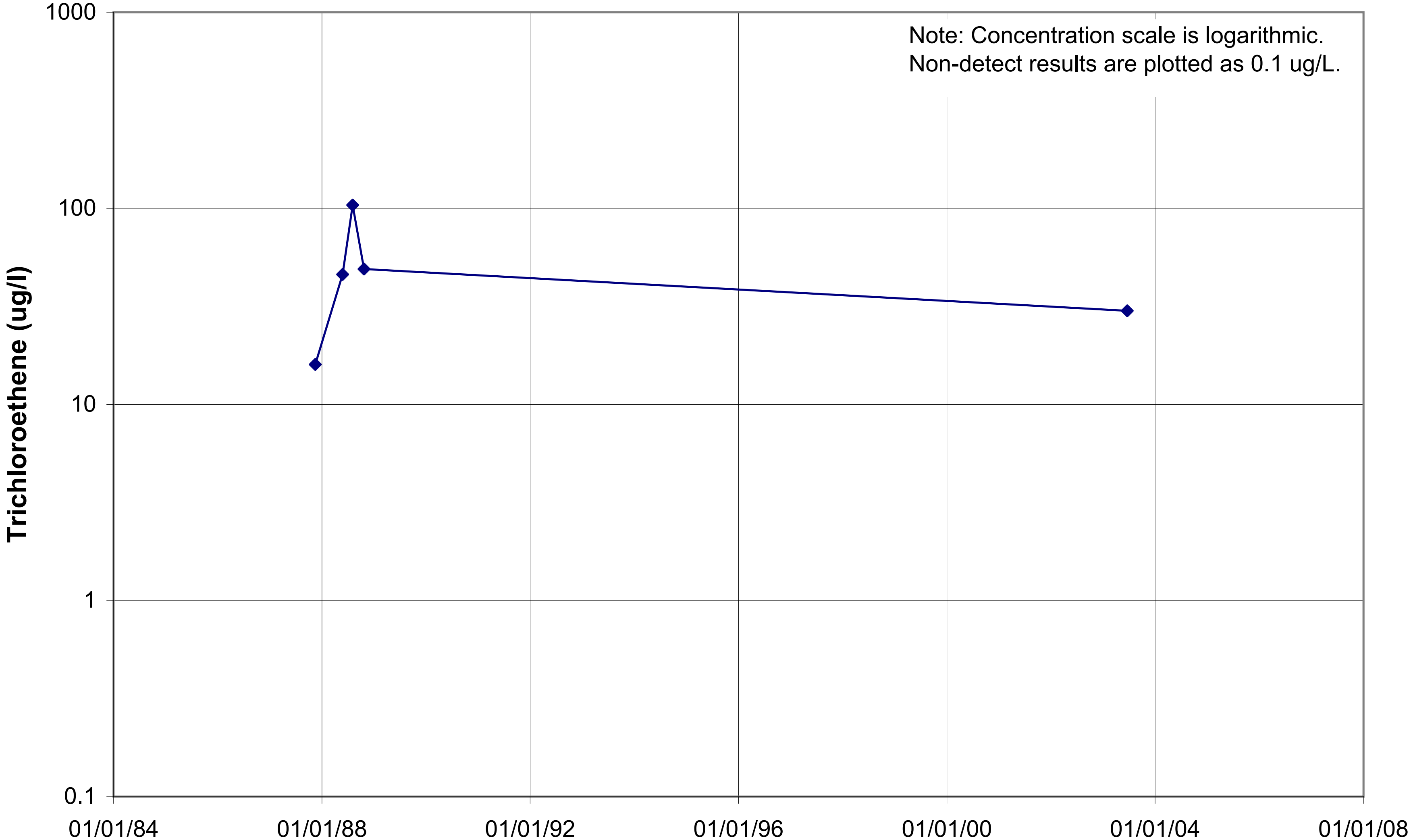

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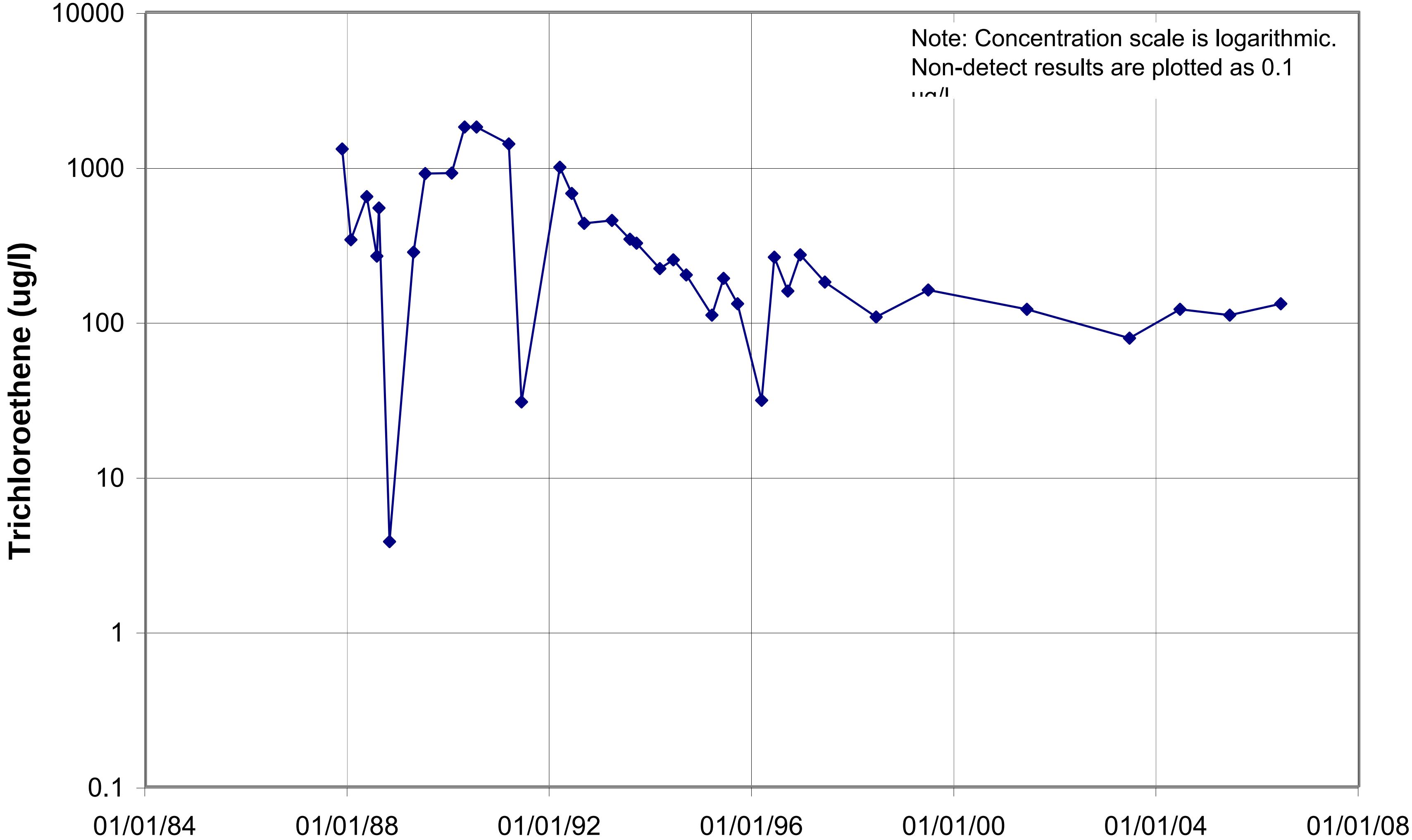

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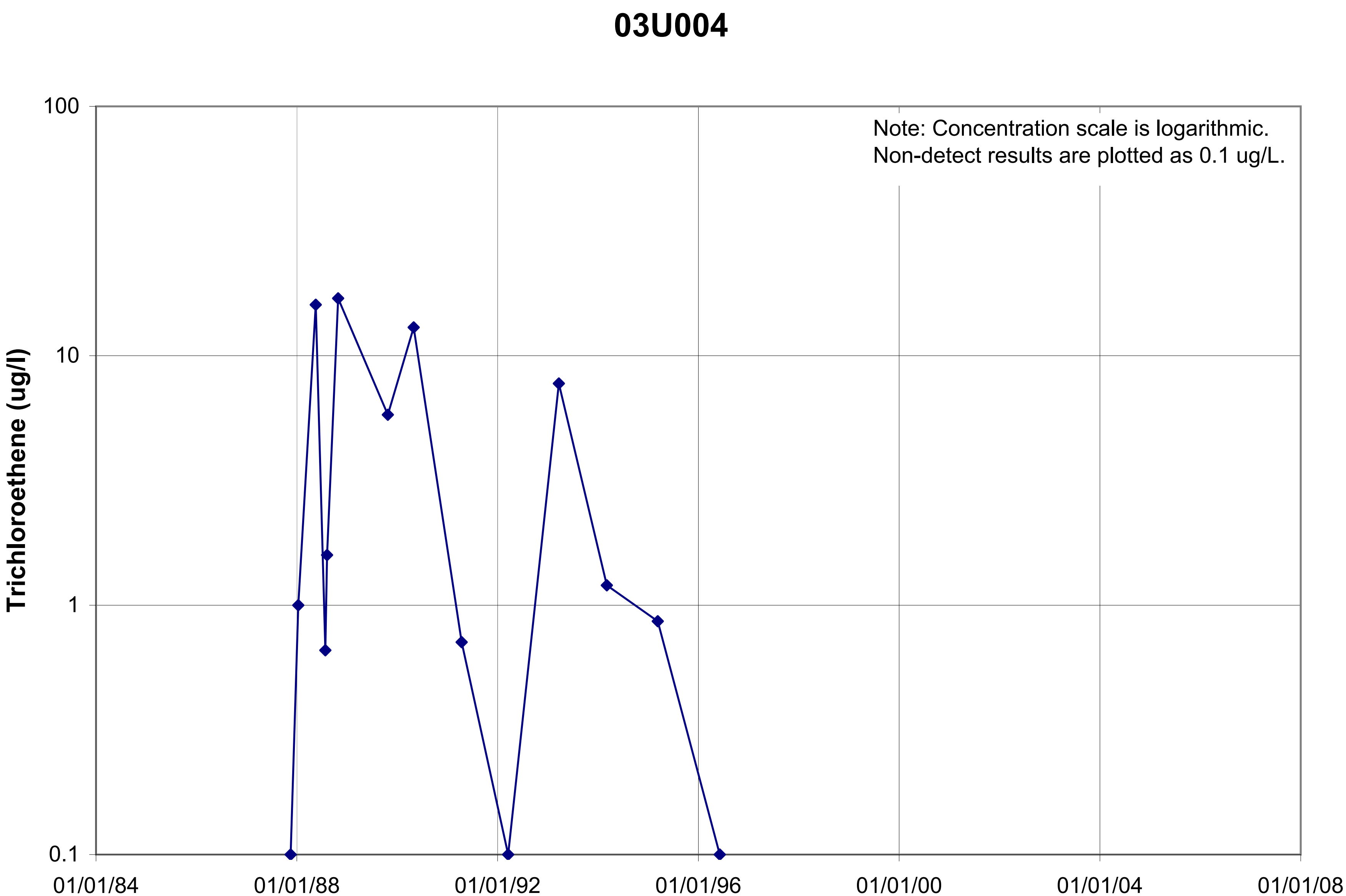

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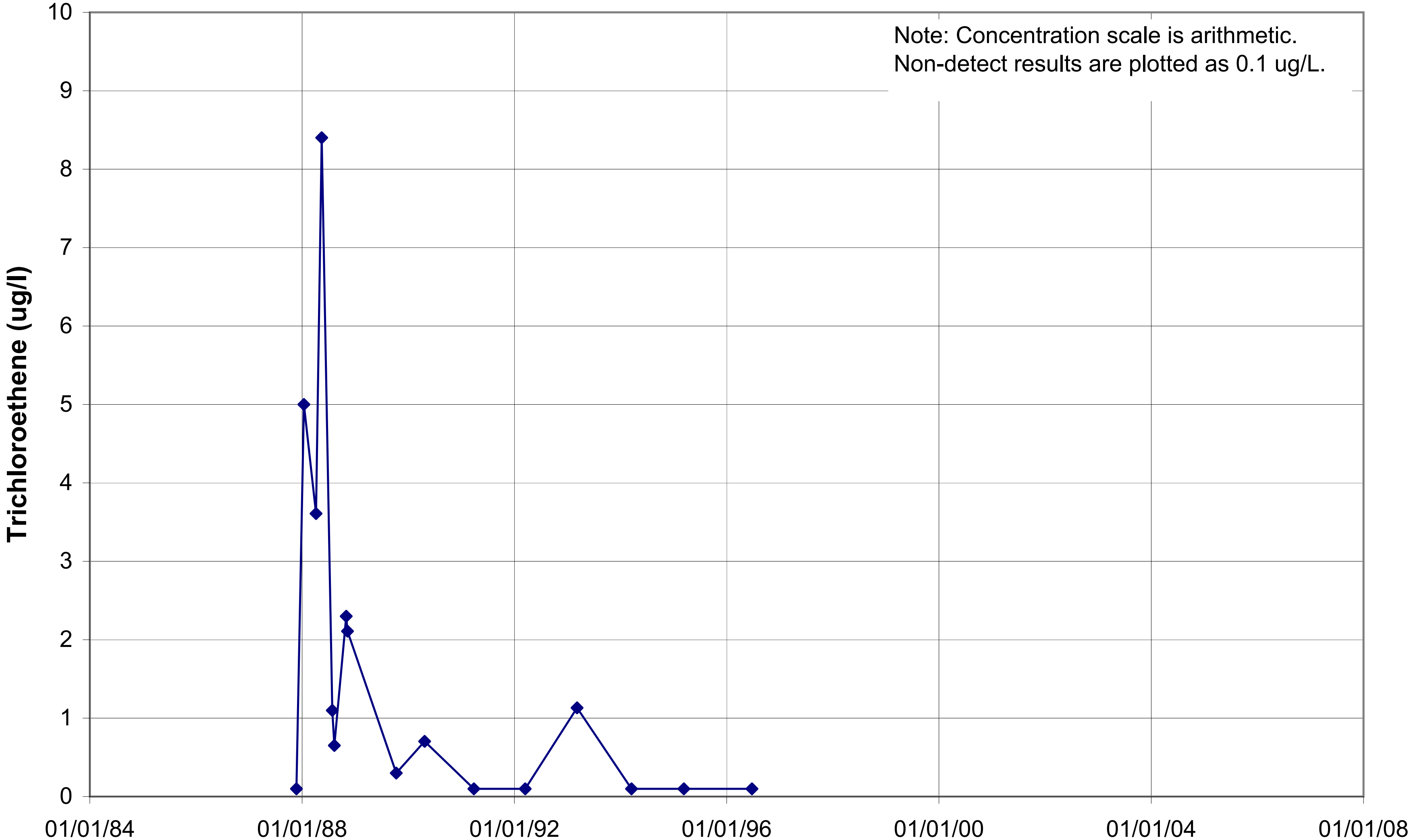

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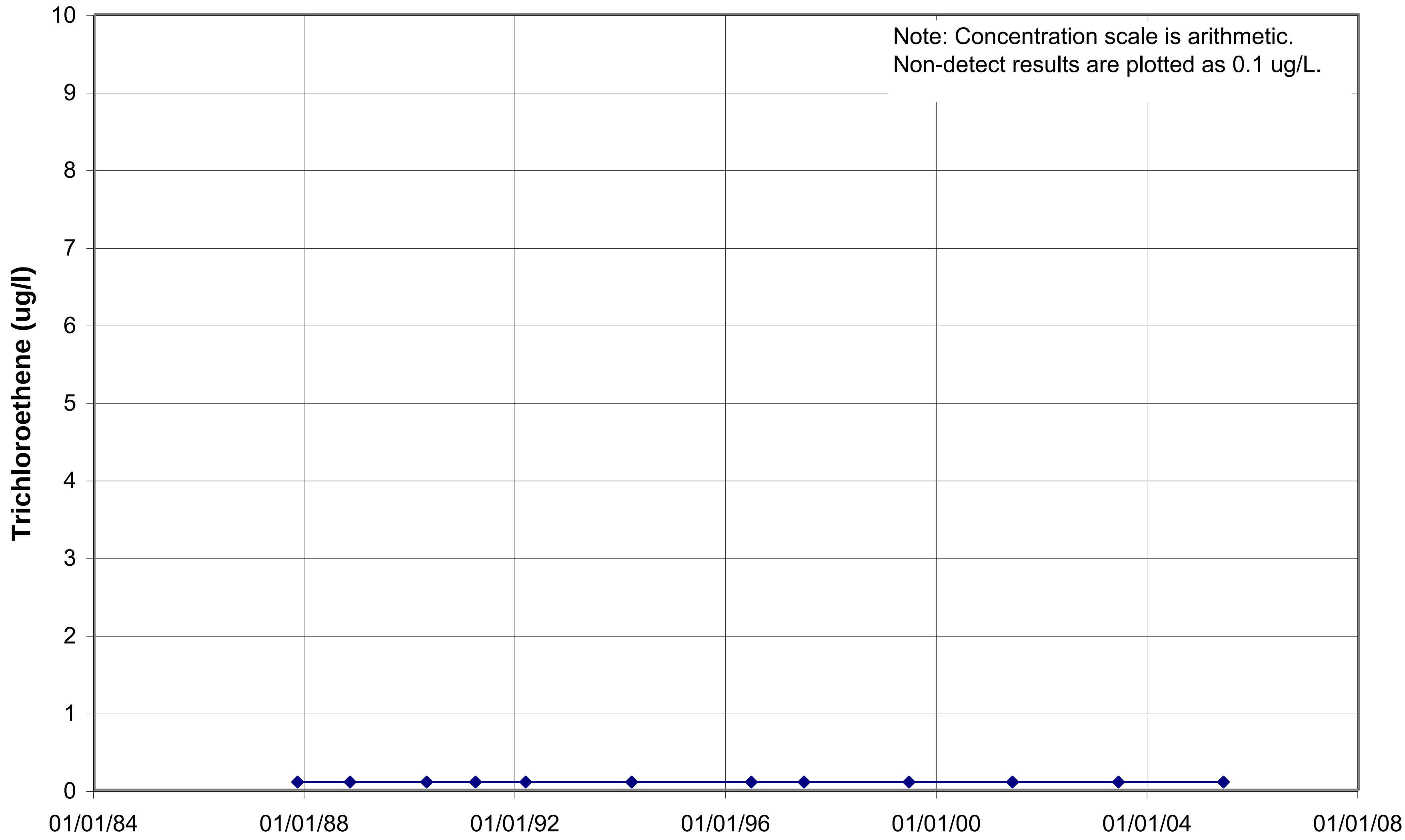

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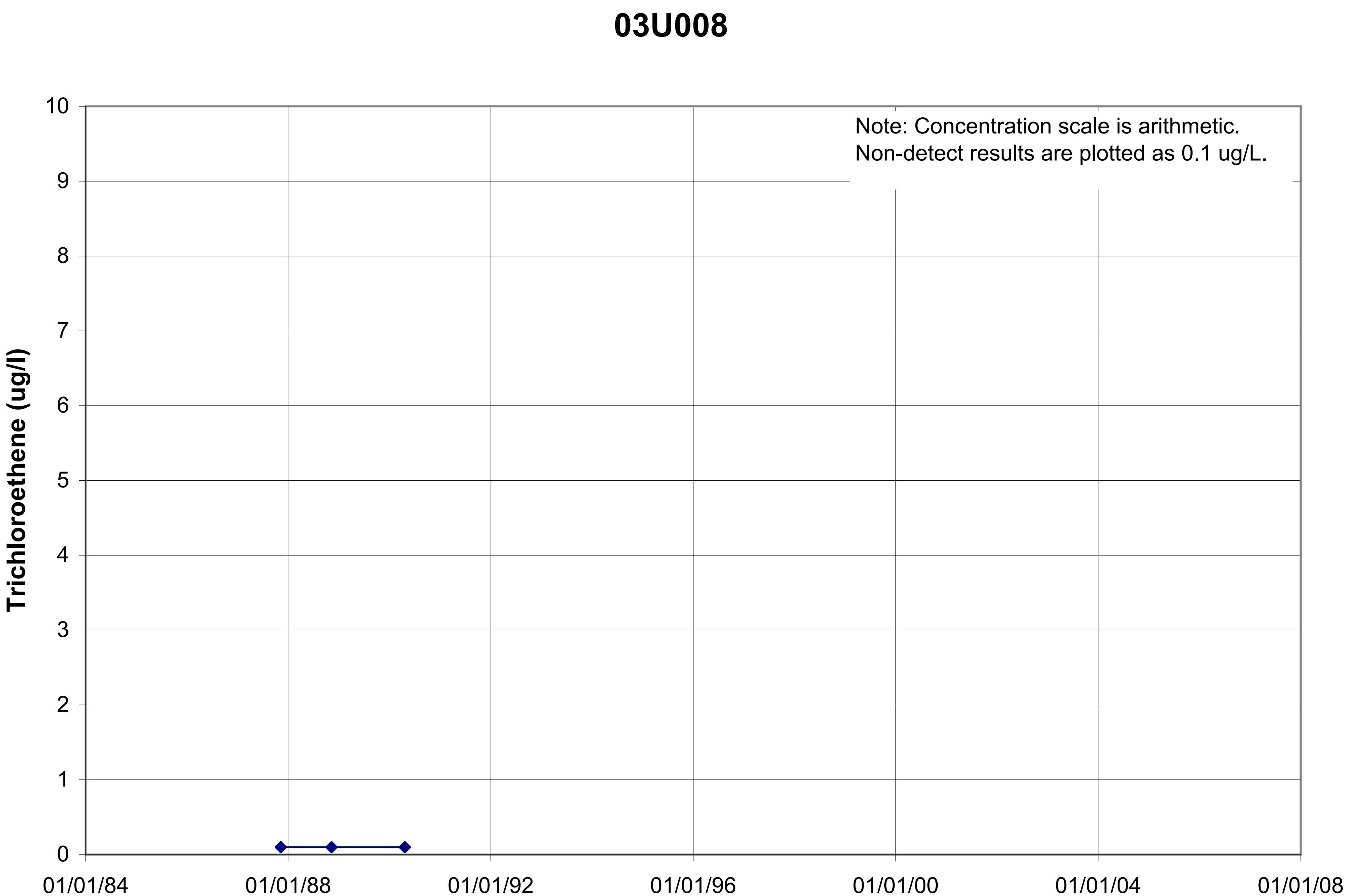

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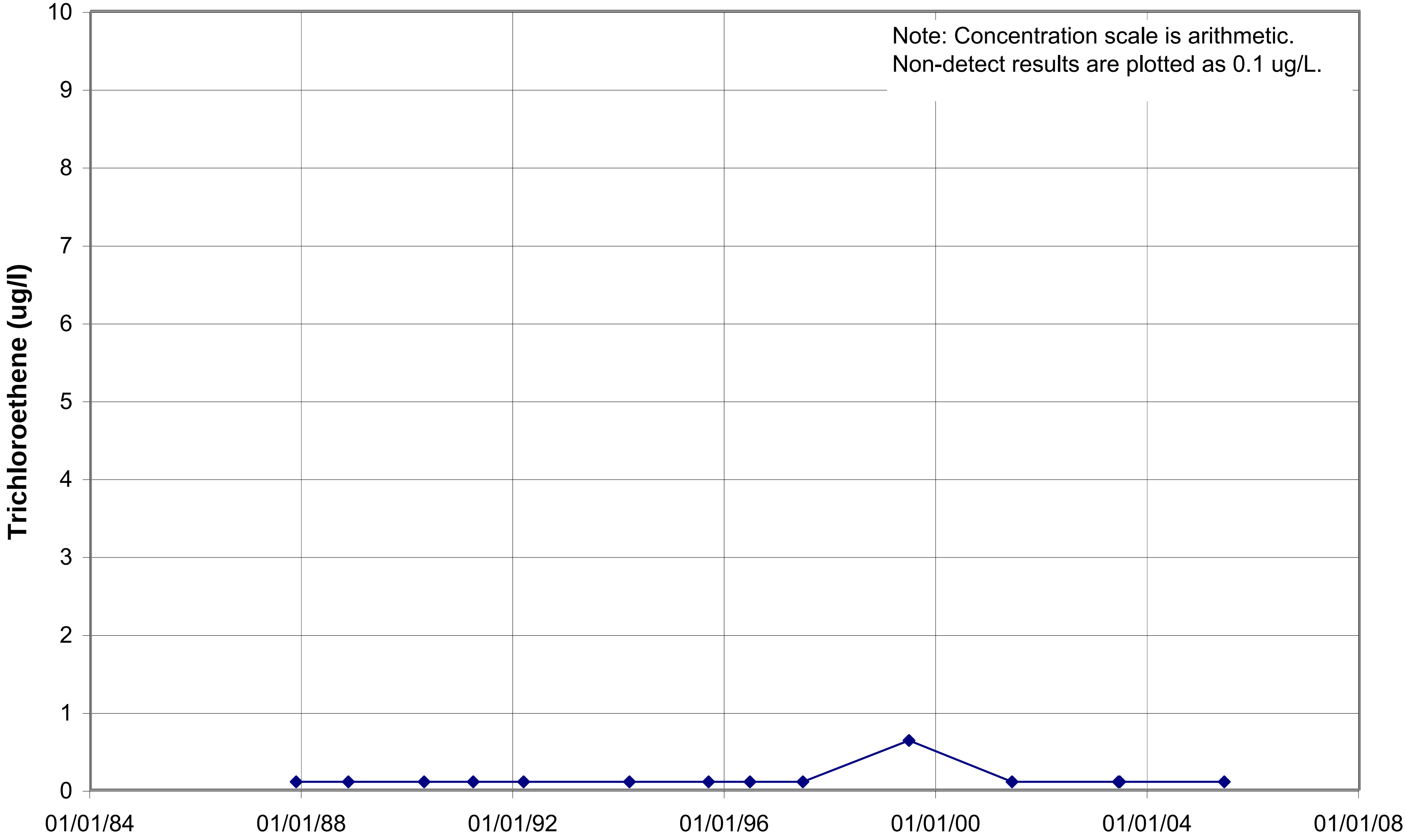

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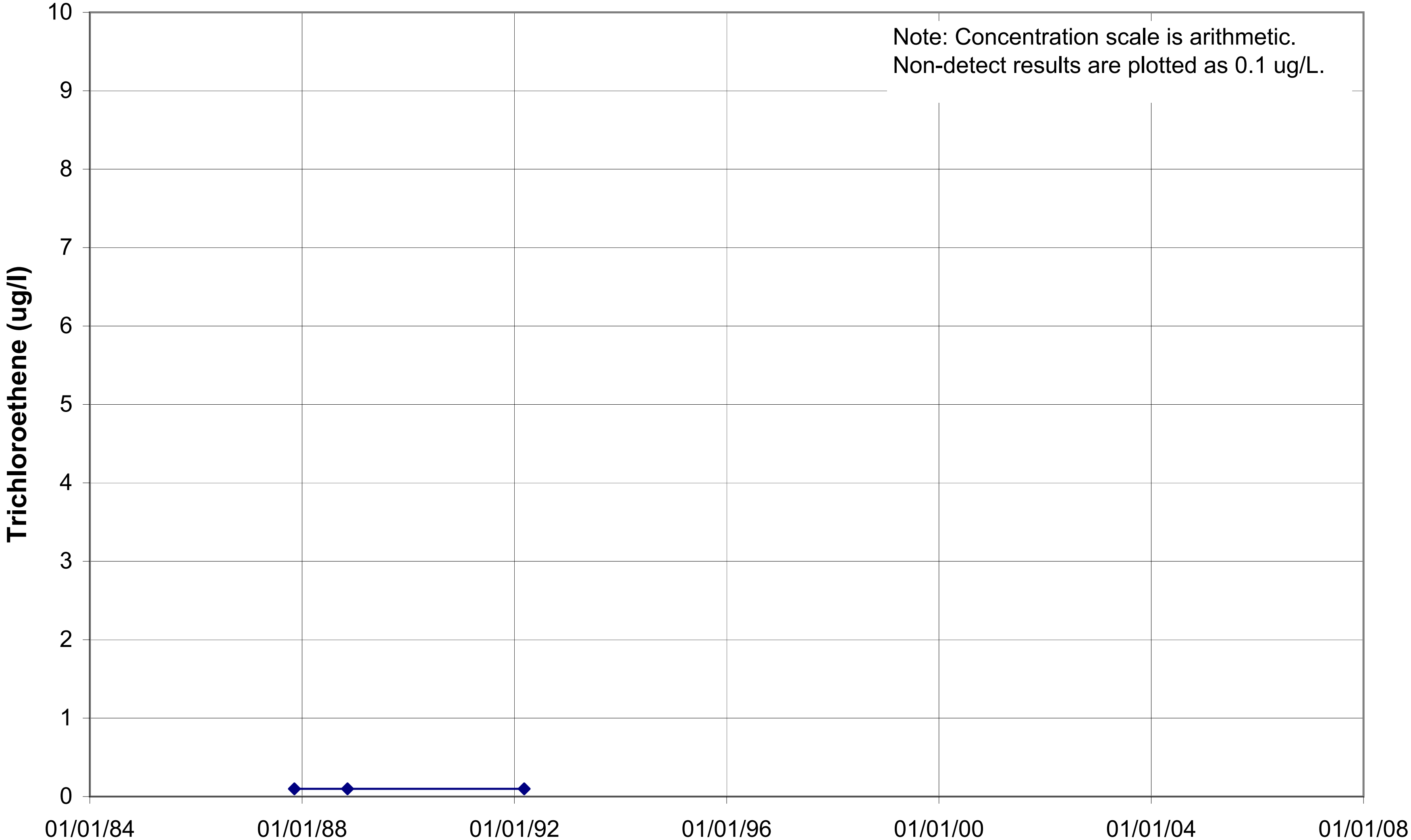

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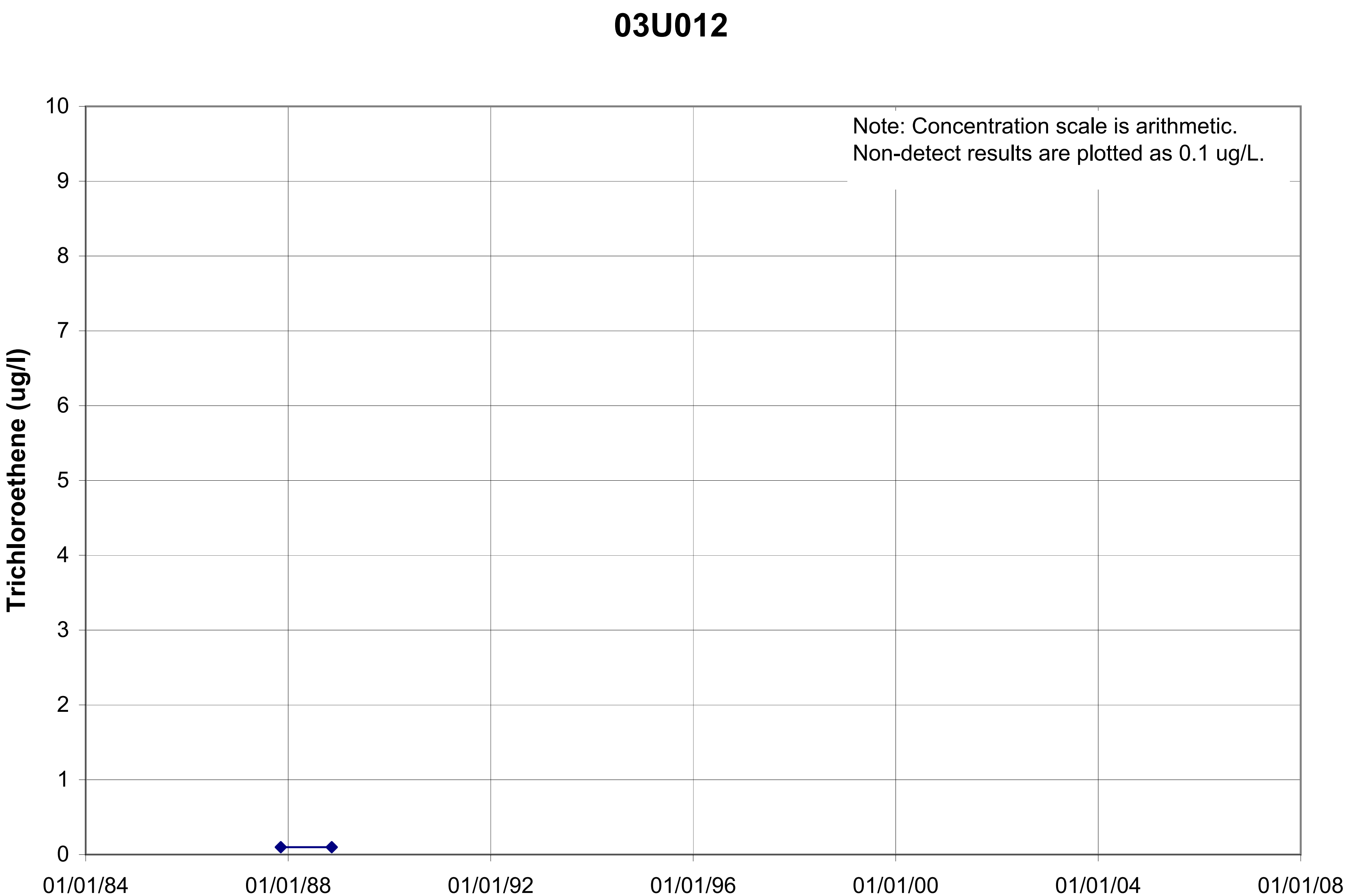

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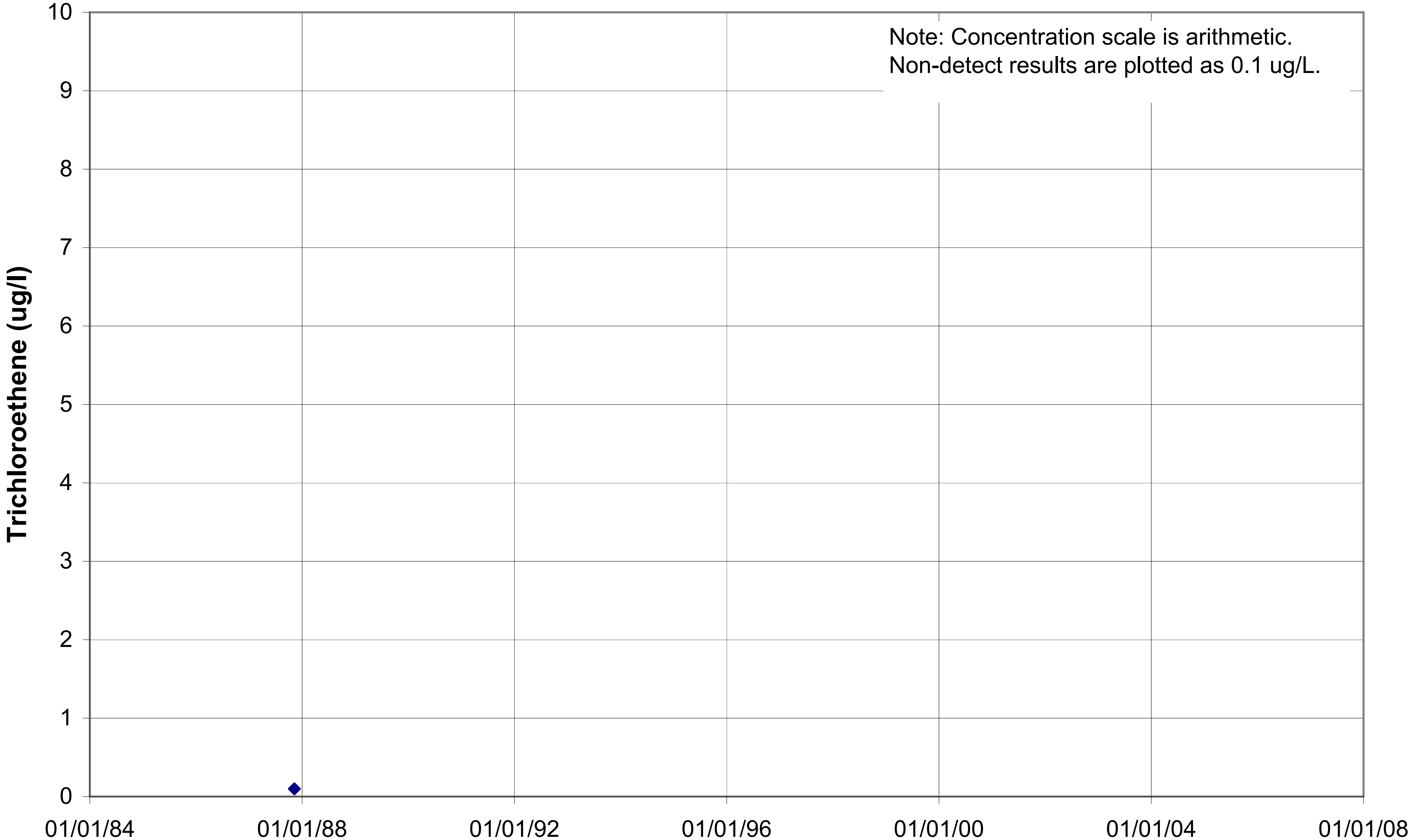

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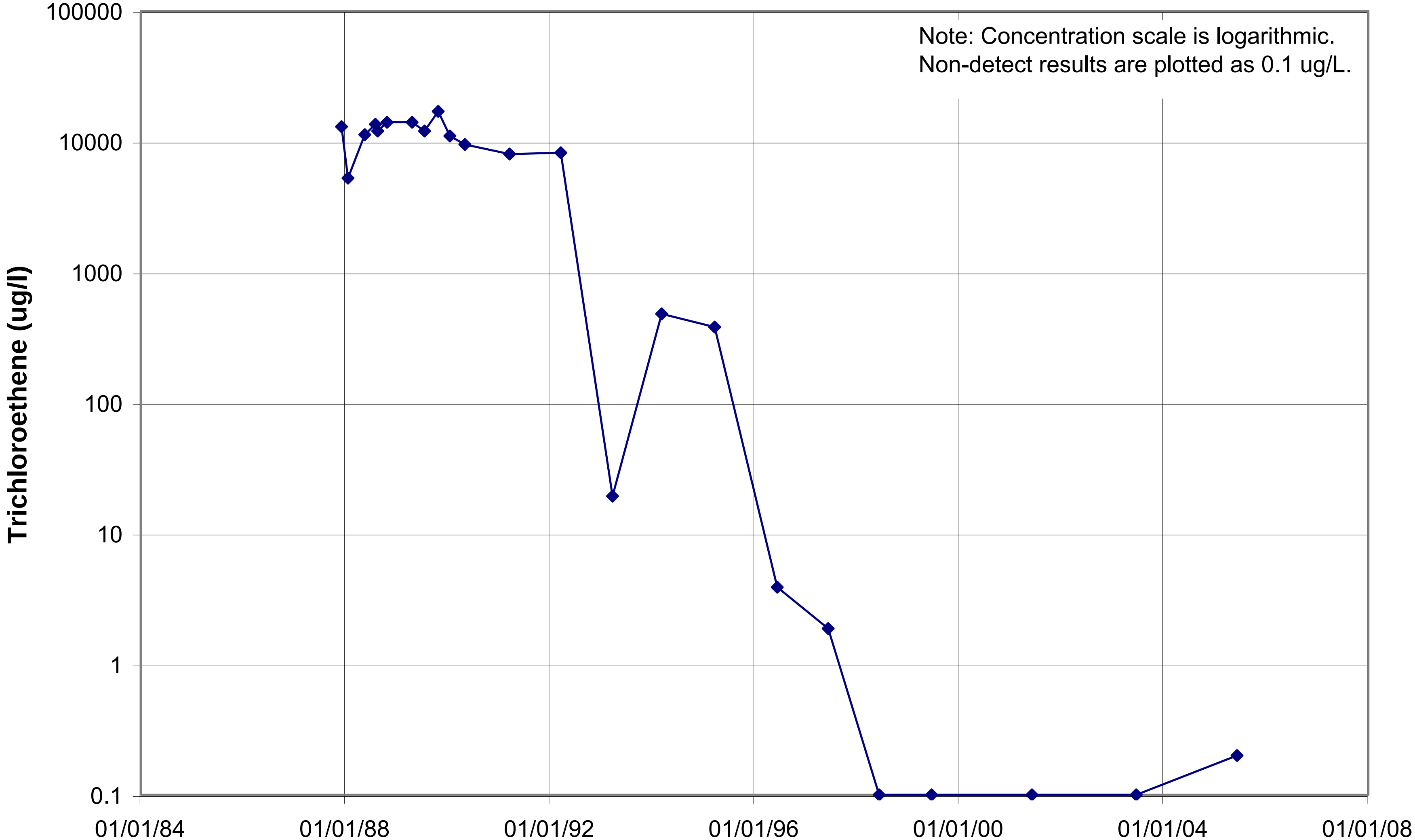

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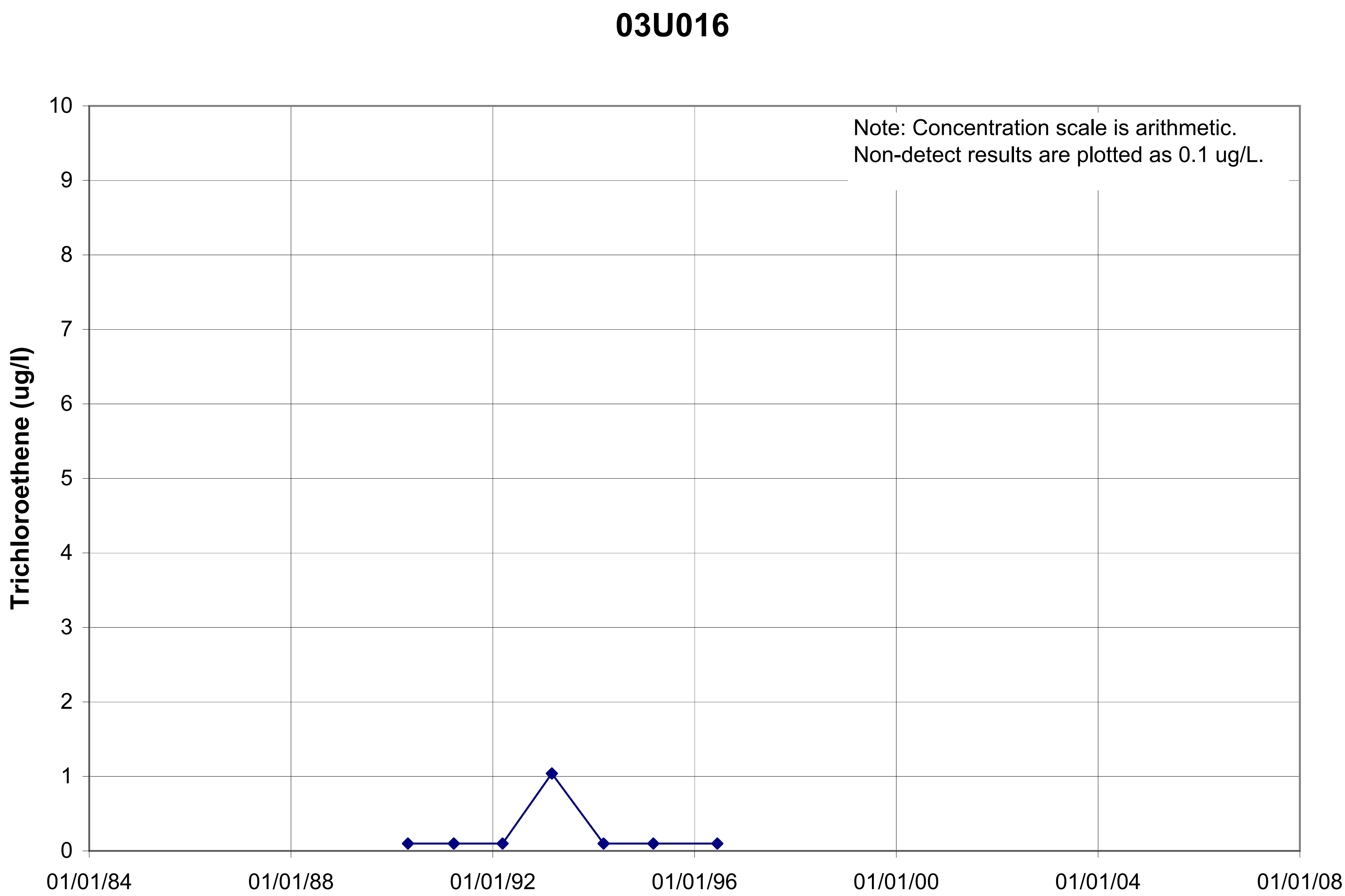

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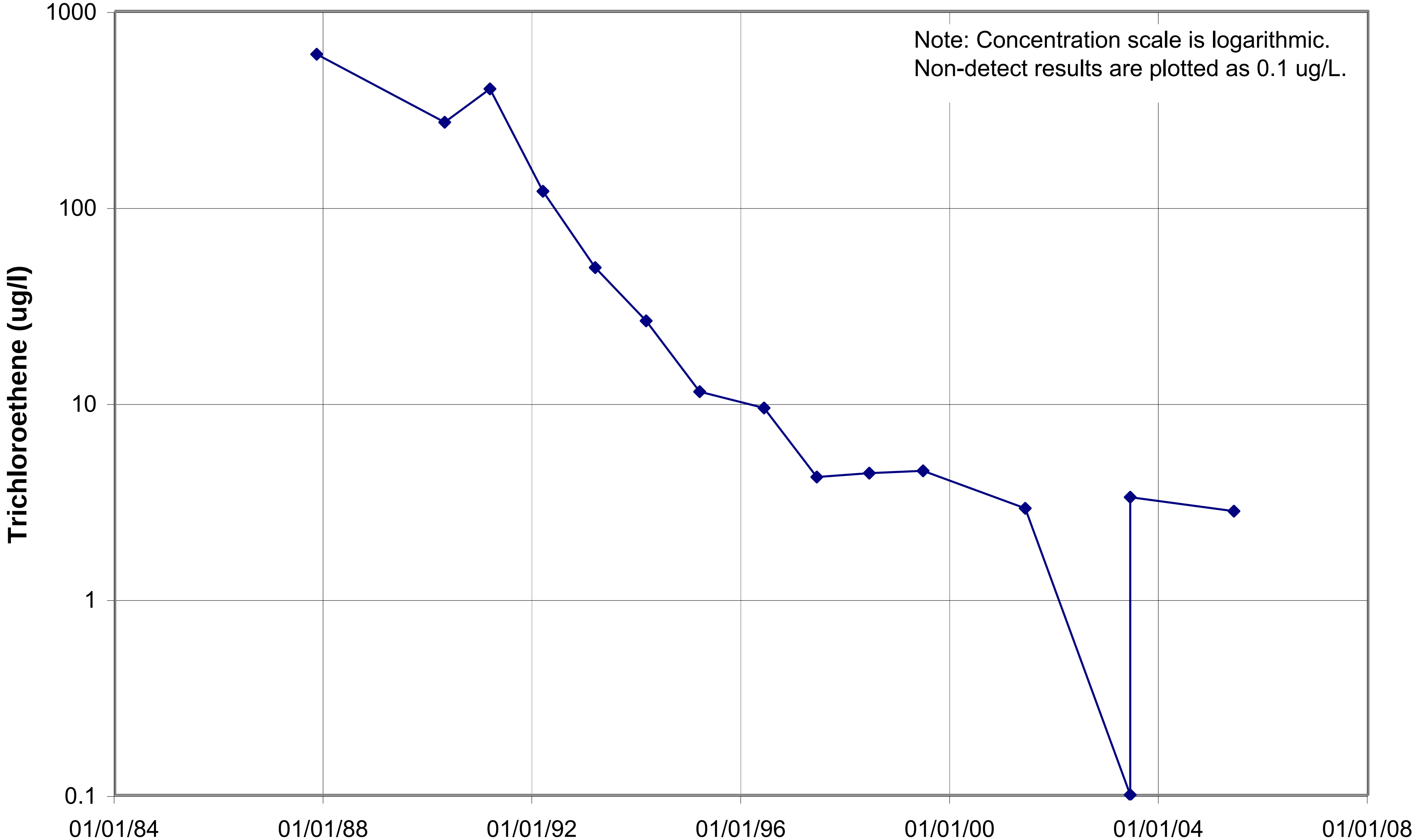

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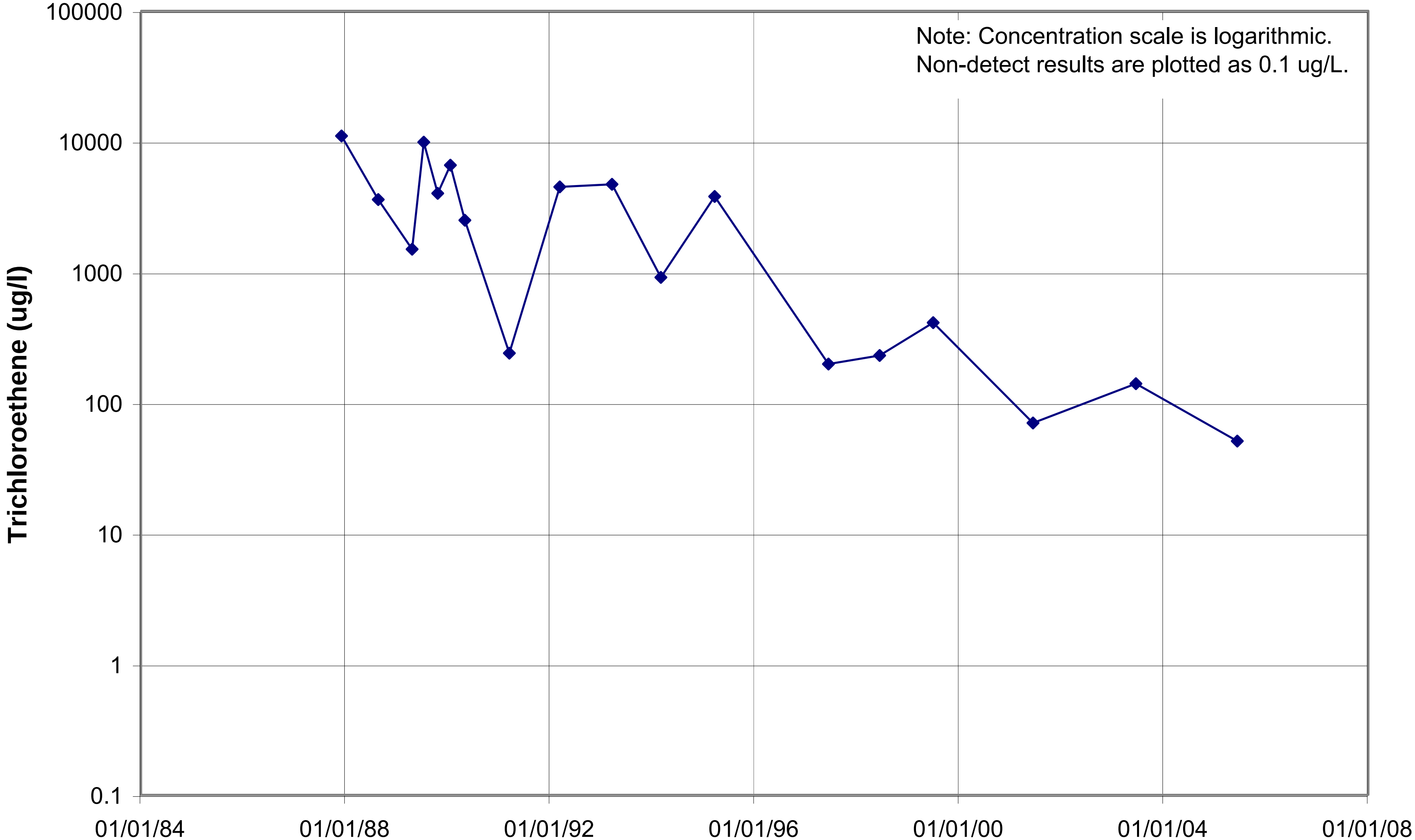

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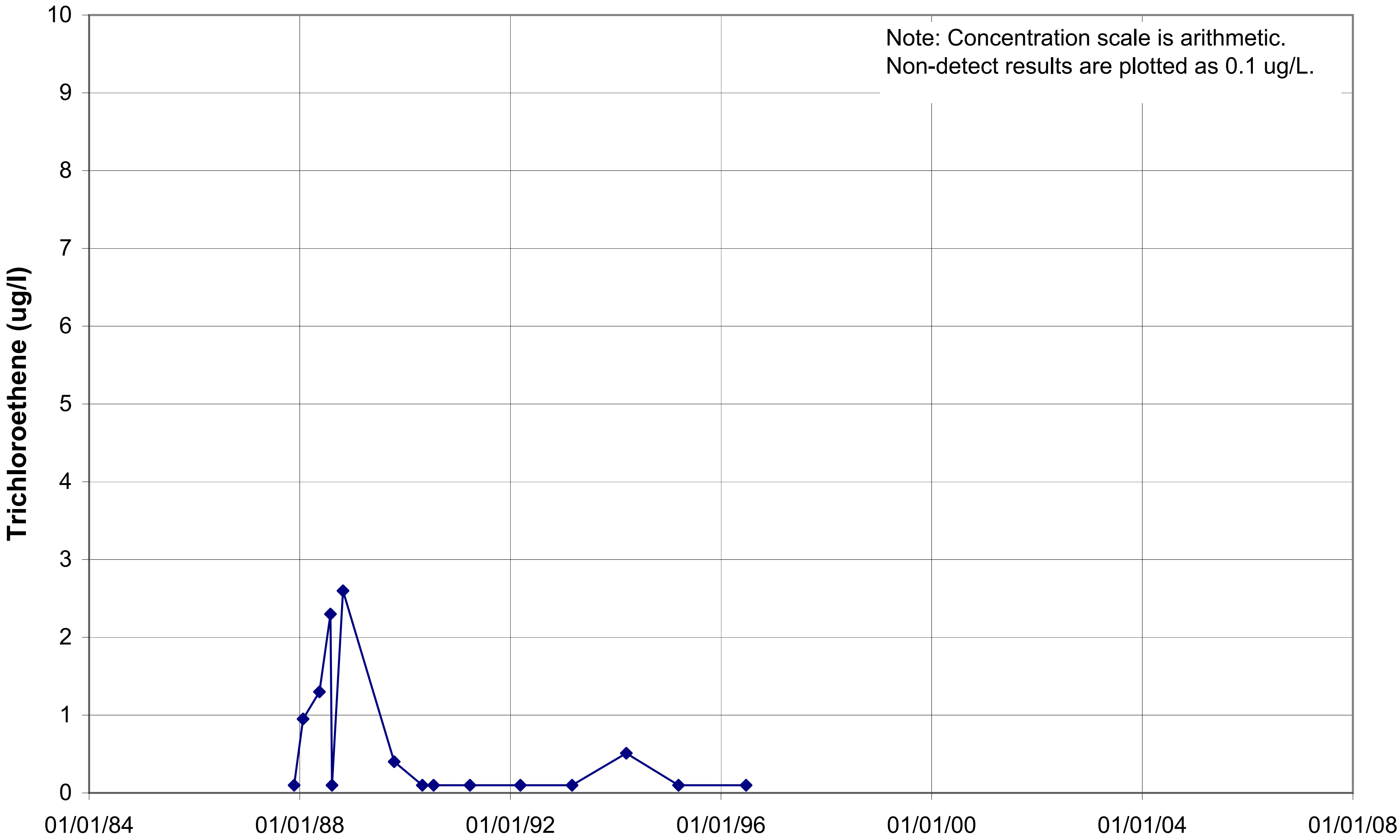
03U019



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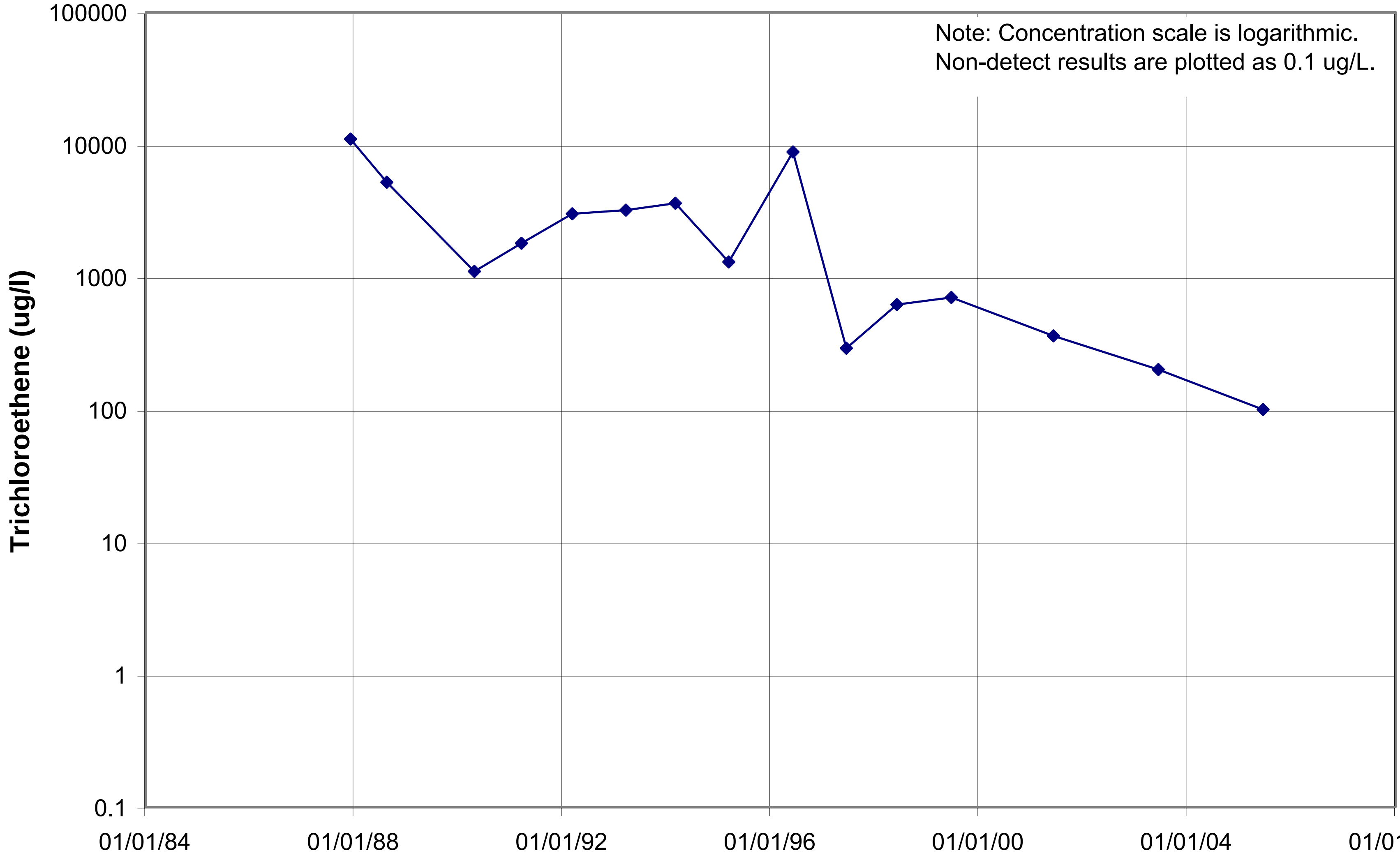
03U020



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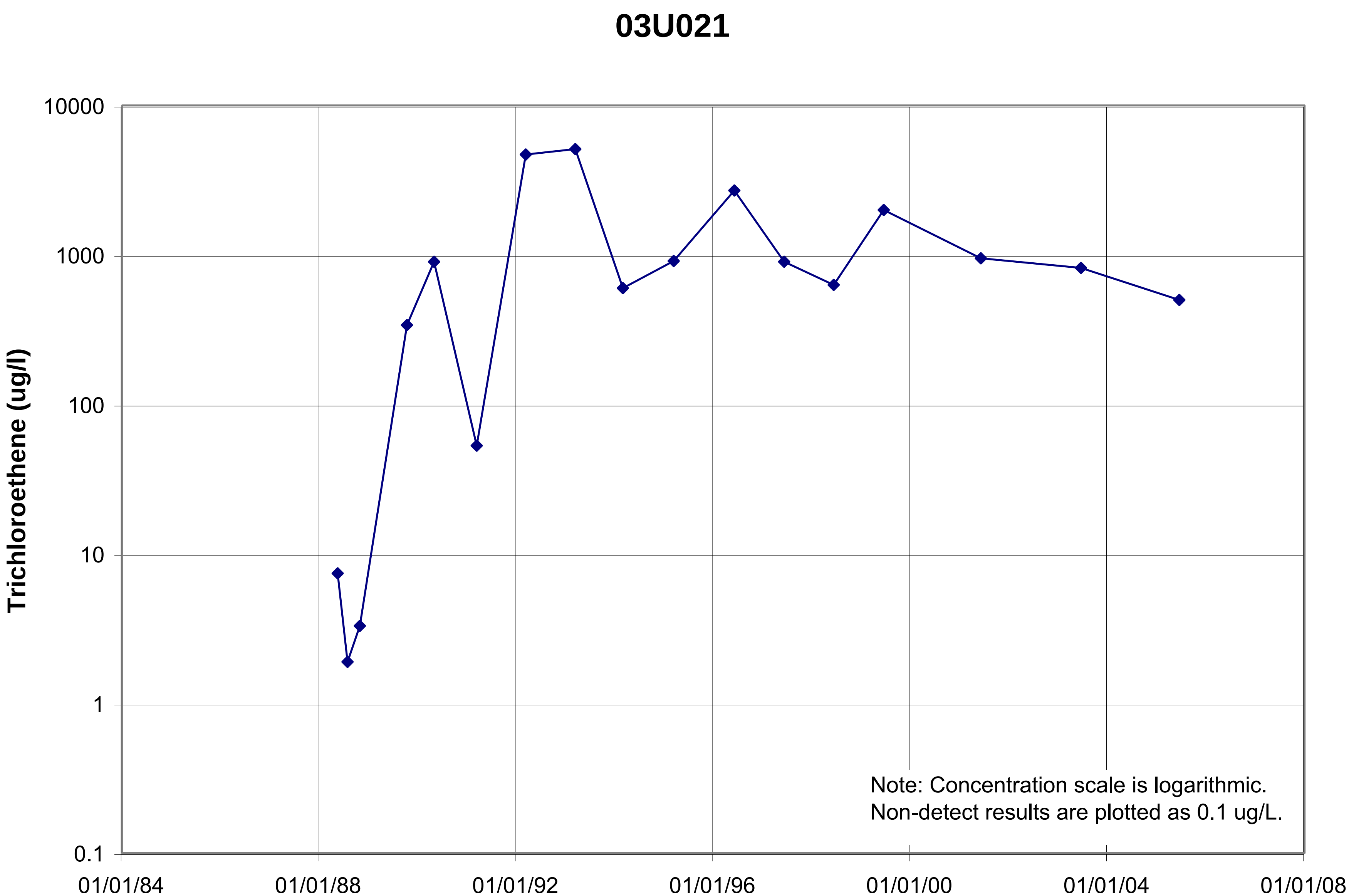

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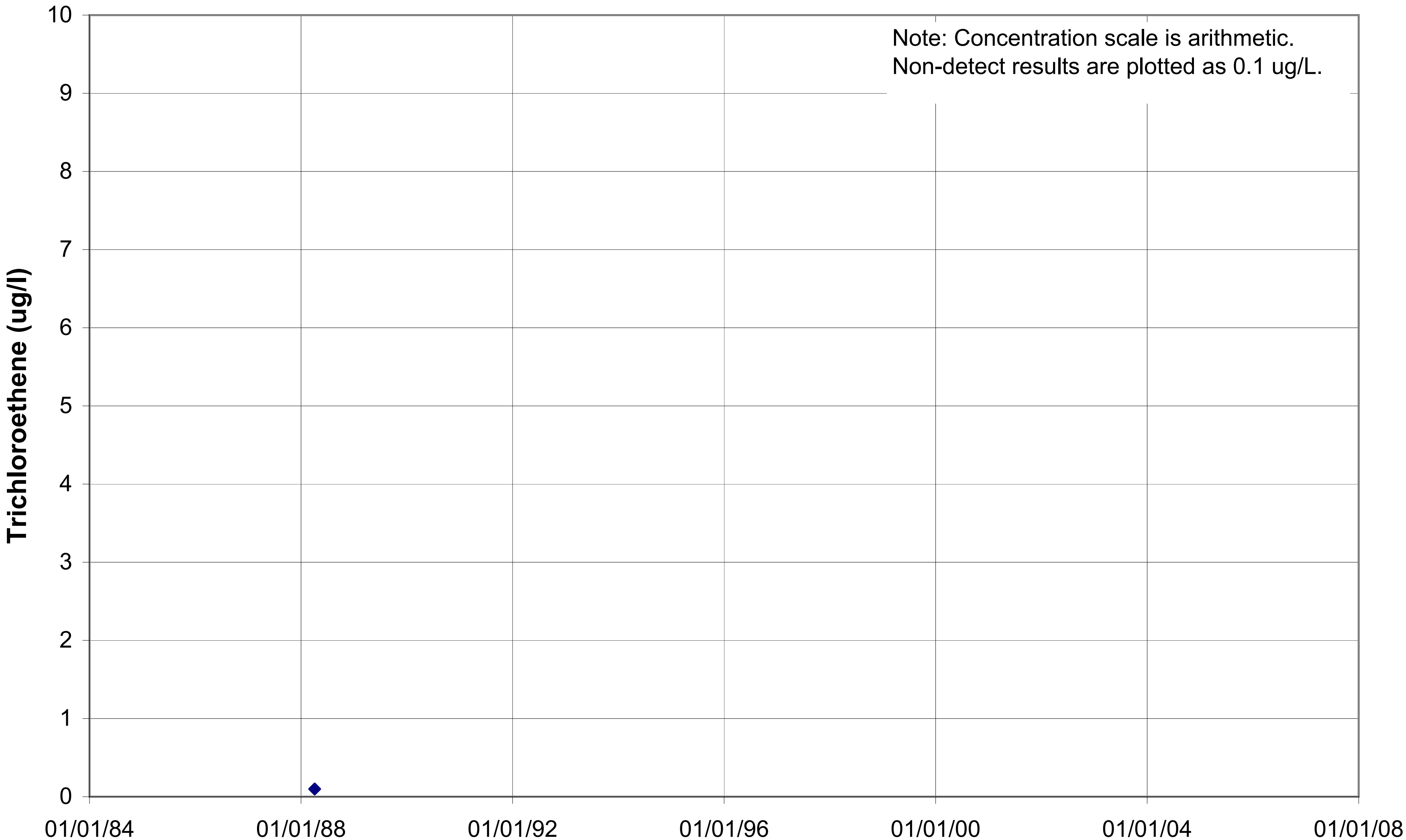

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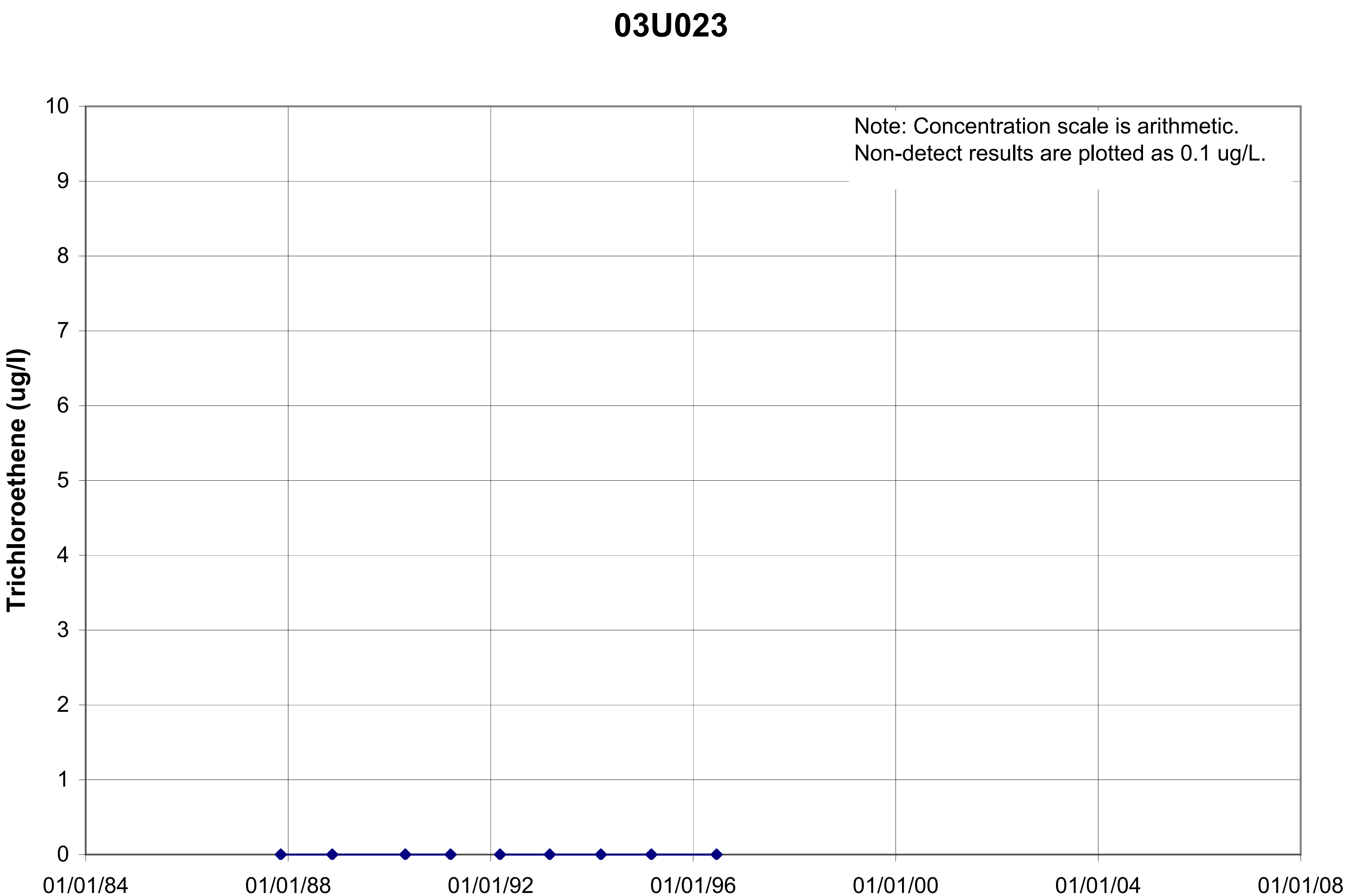

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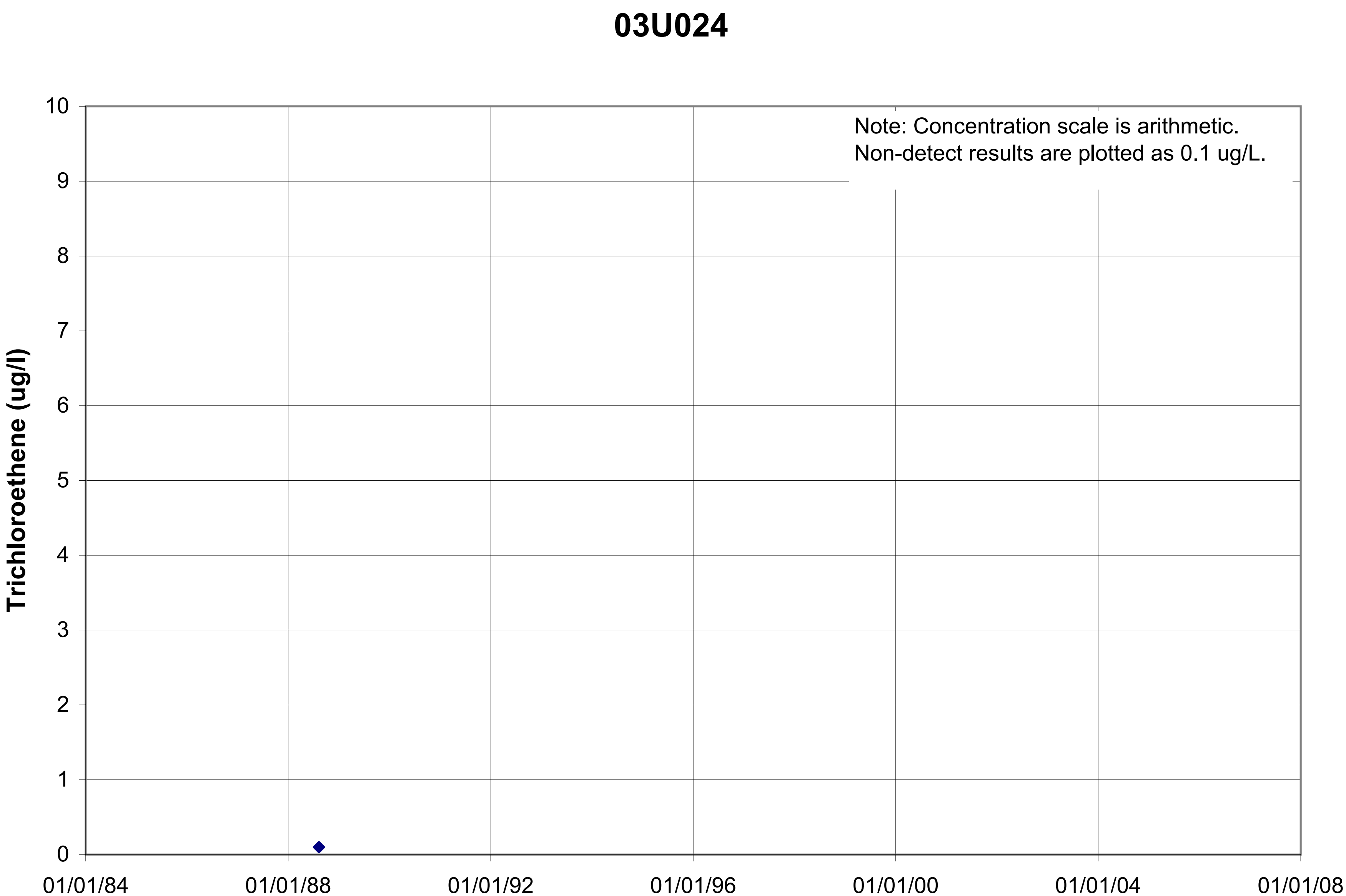

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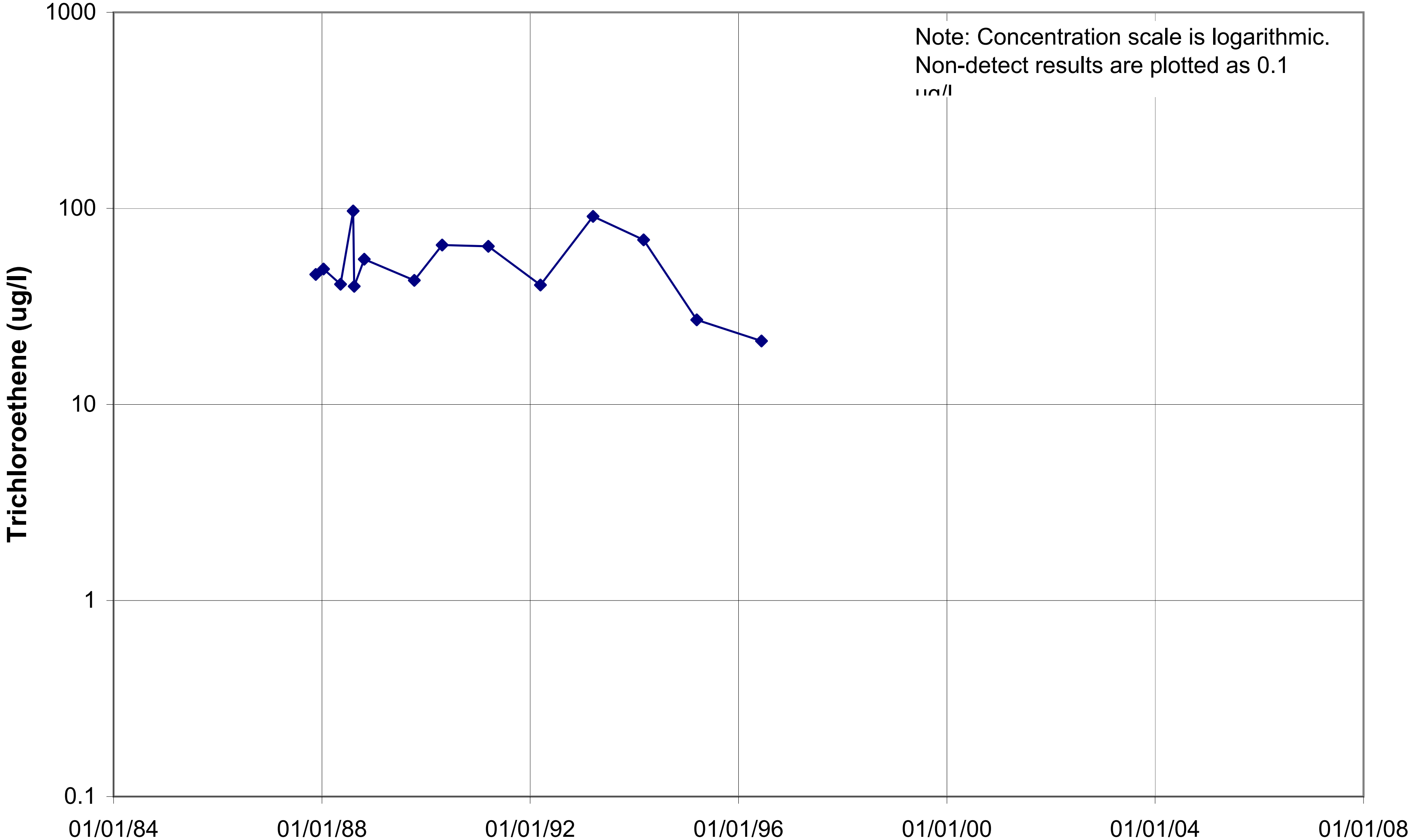

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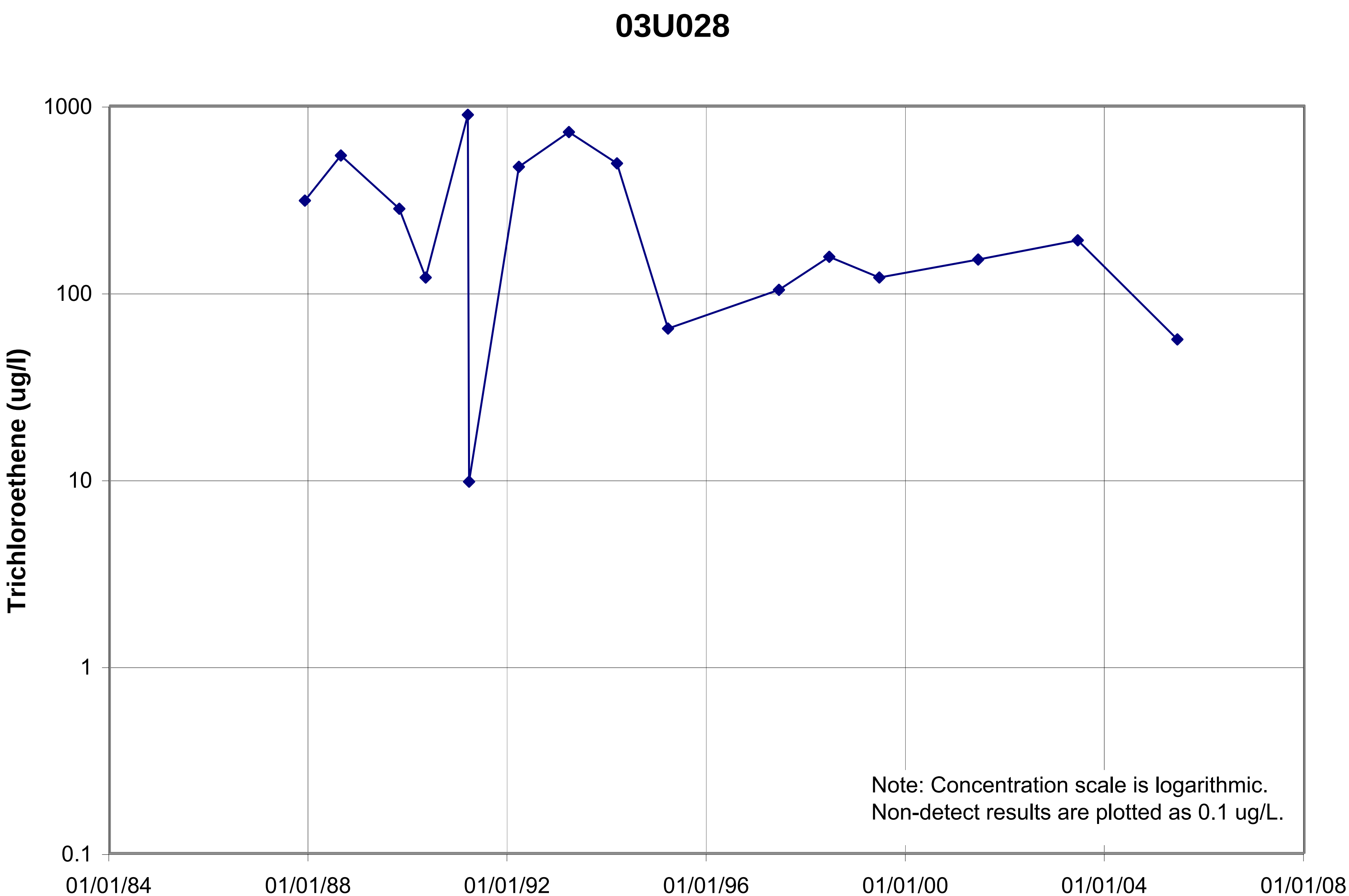

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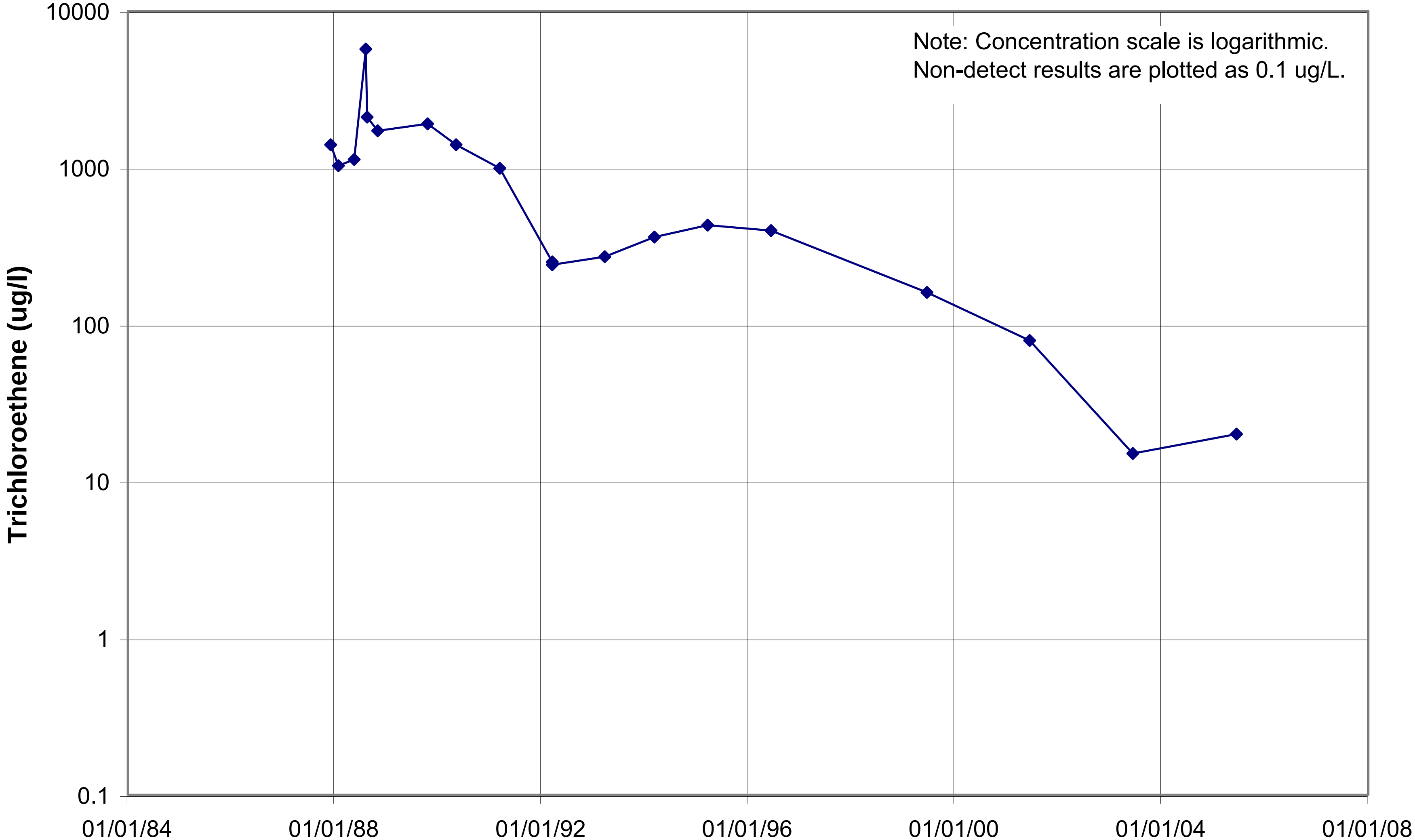

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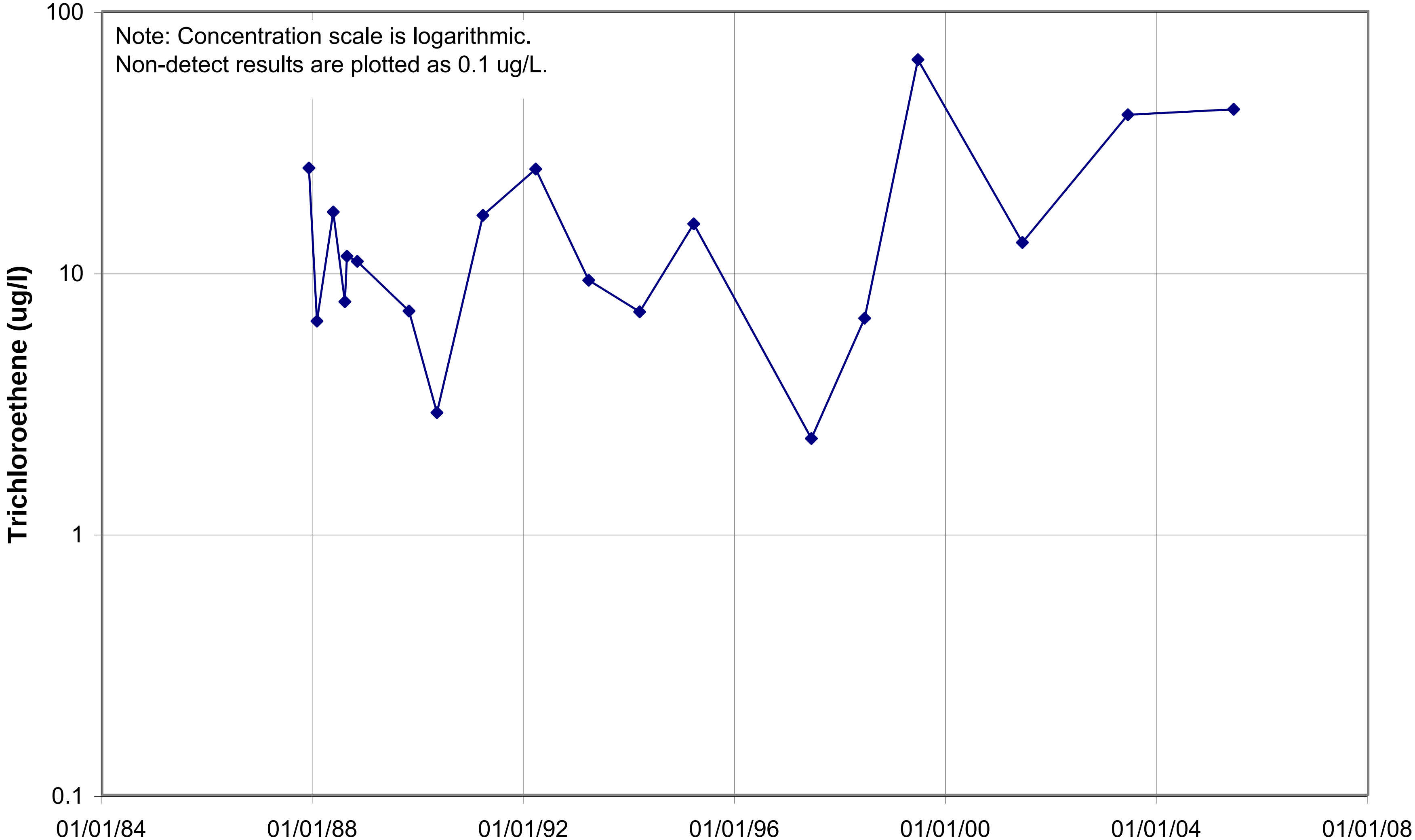

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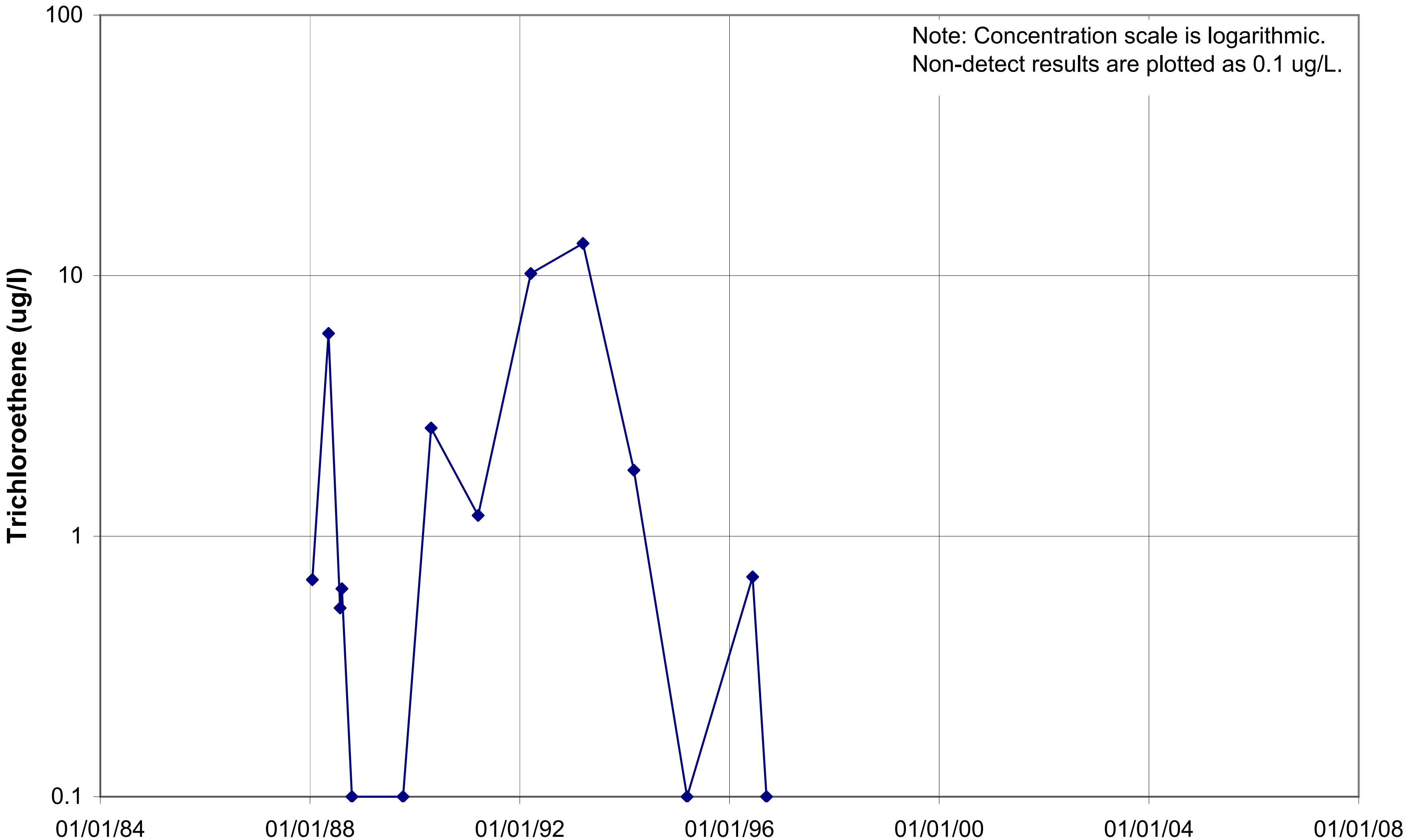

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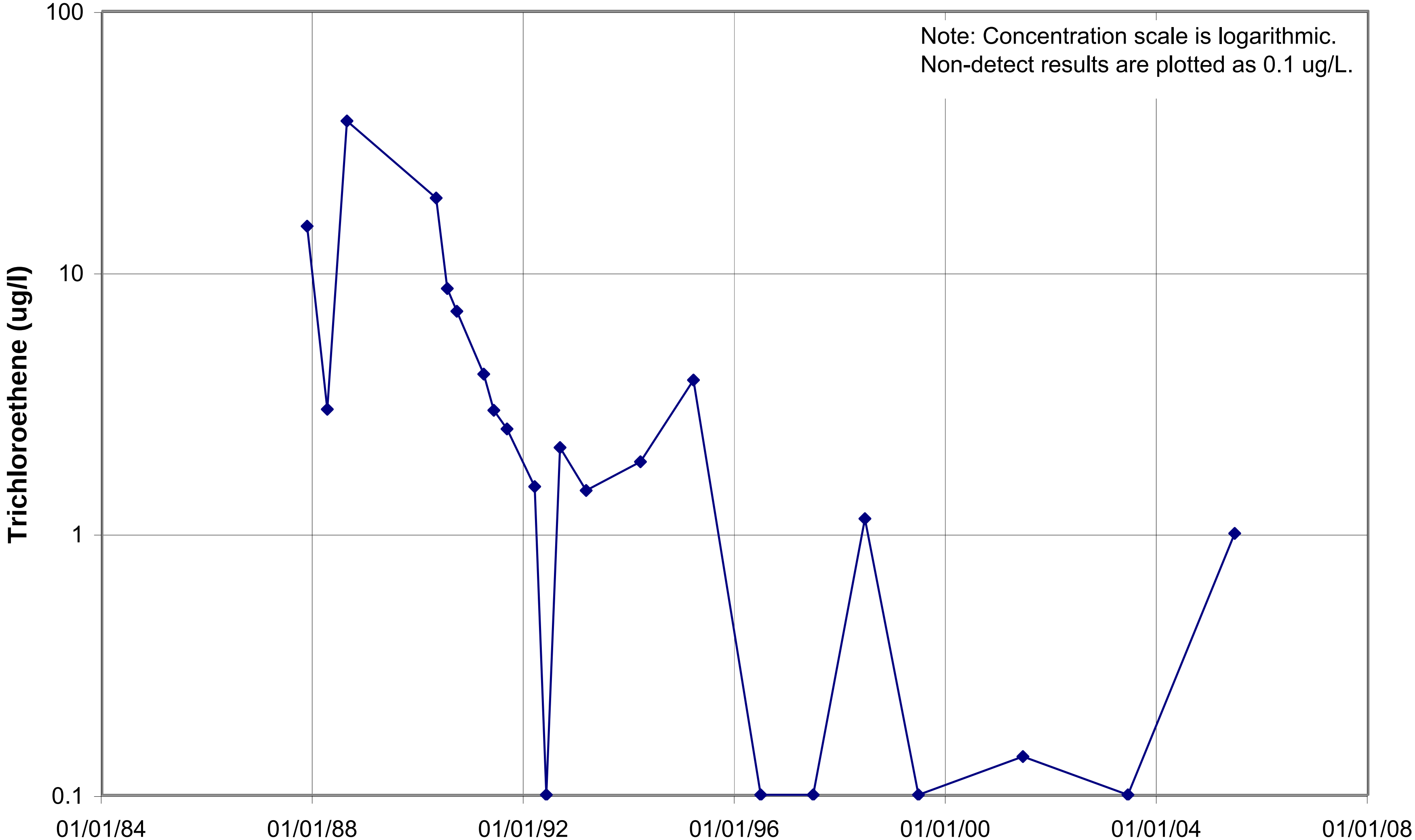

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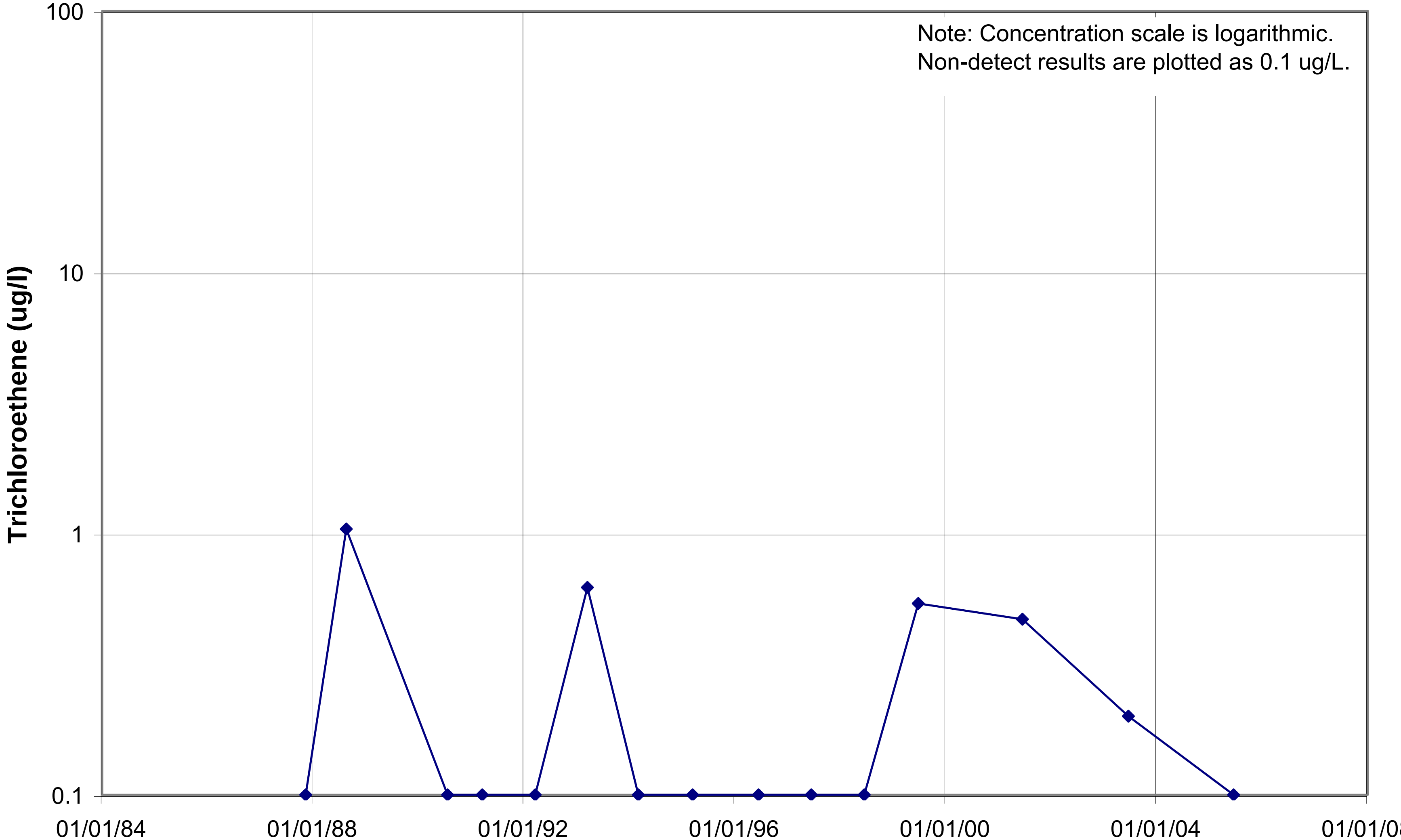

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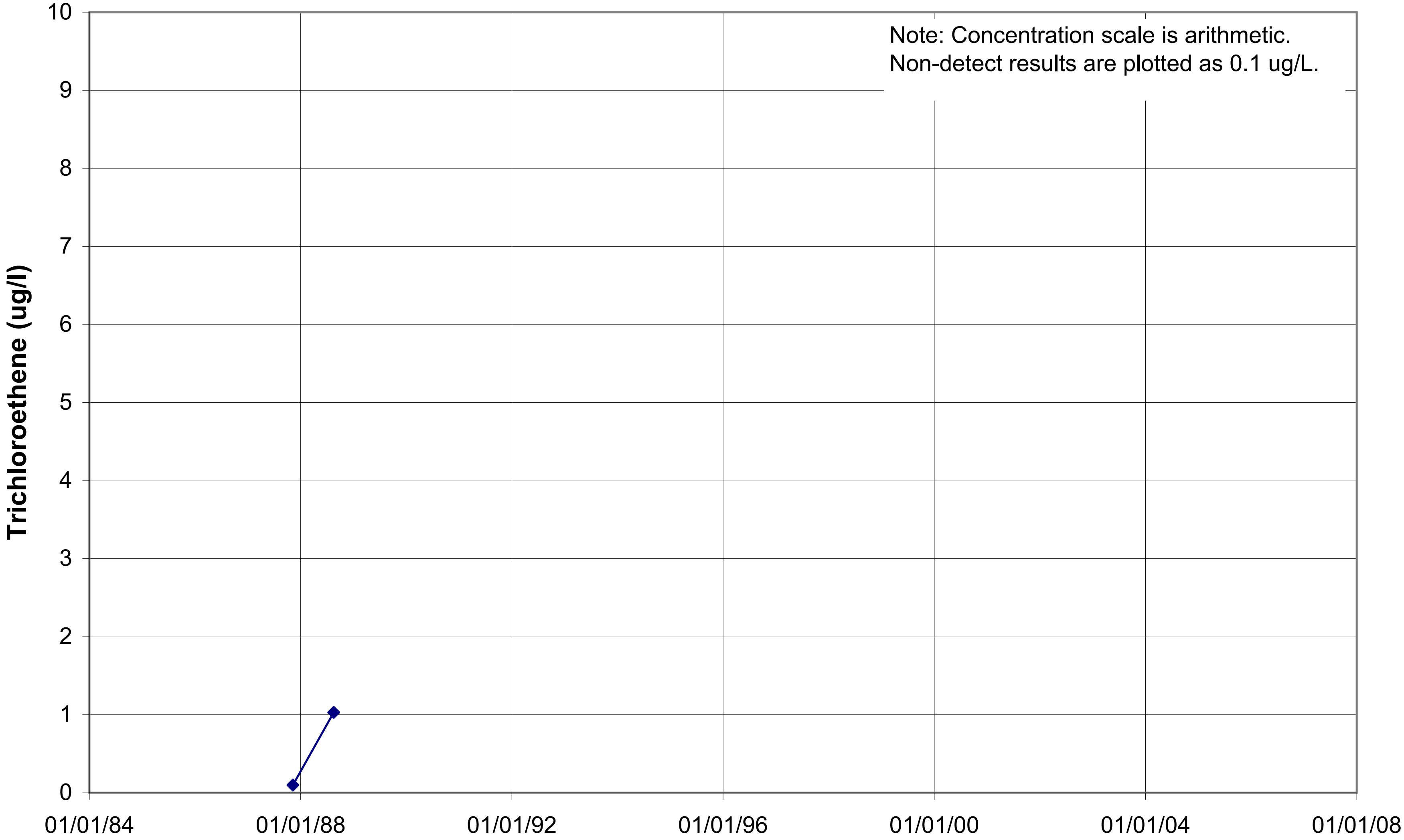

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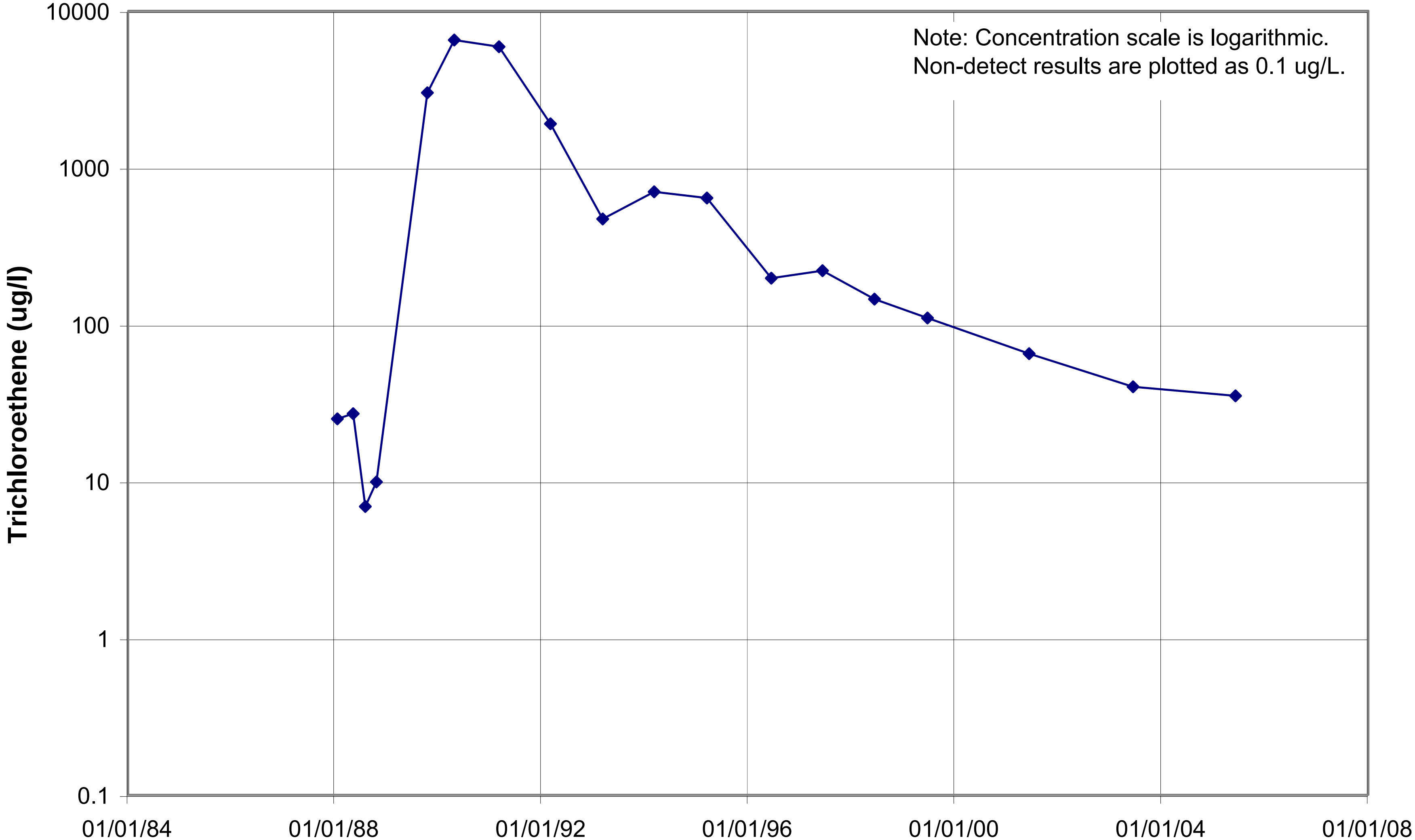

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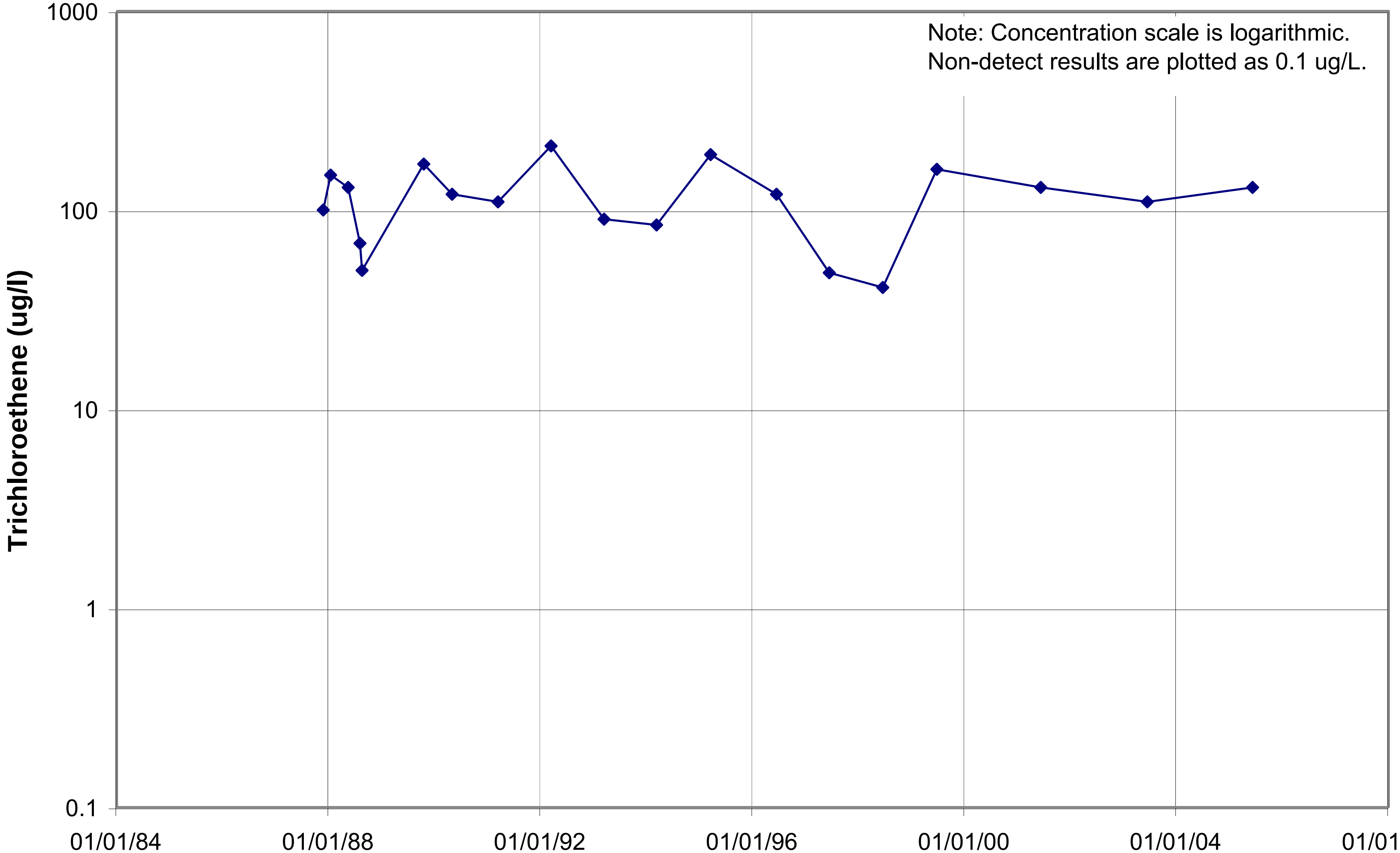

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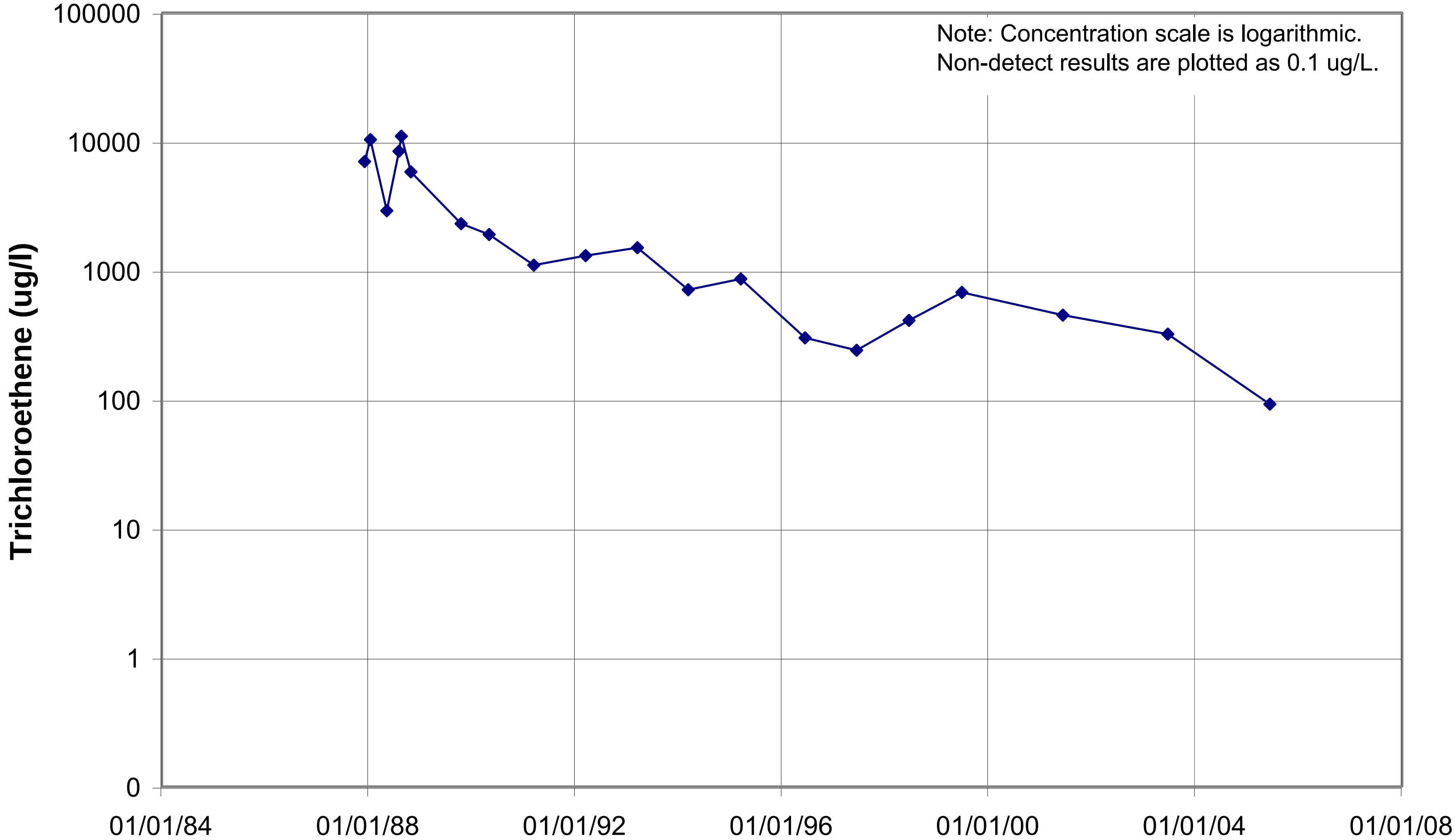

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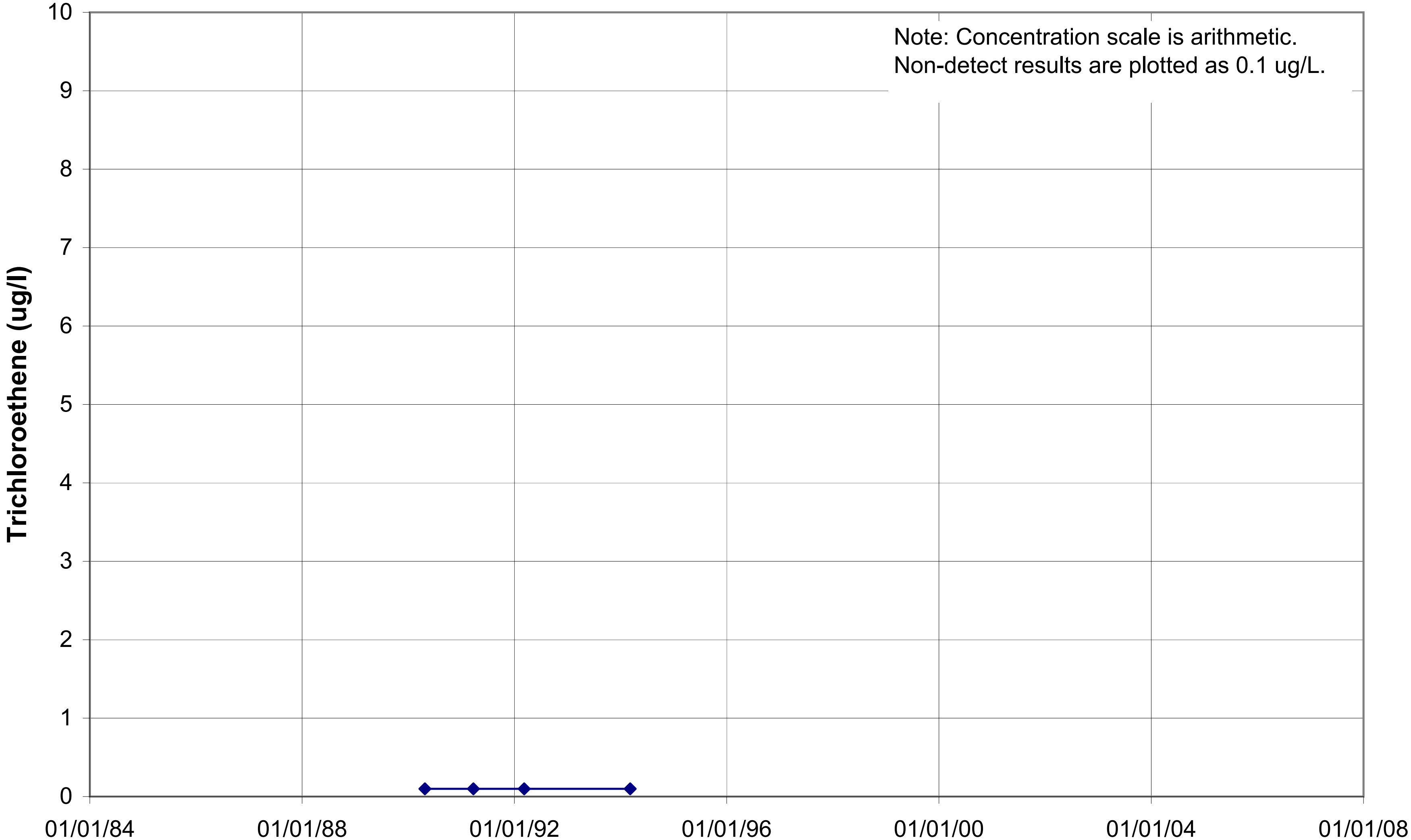

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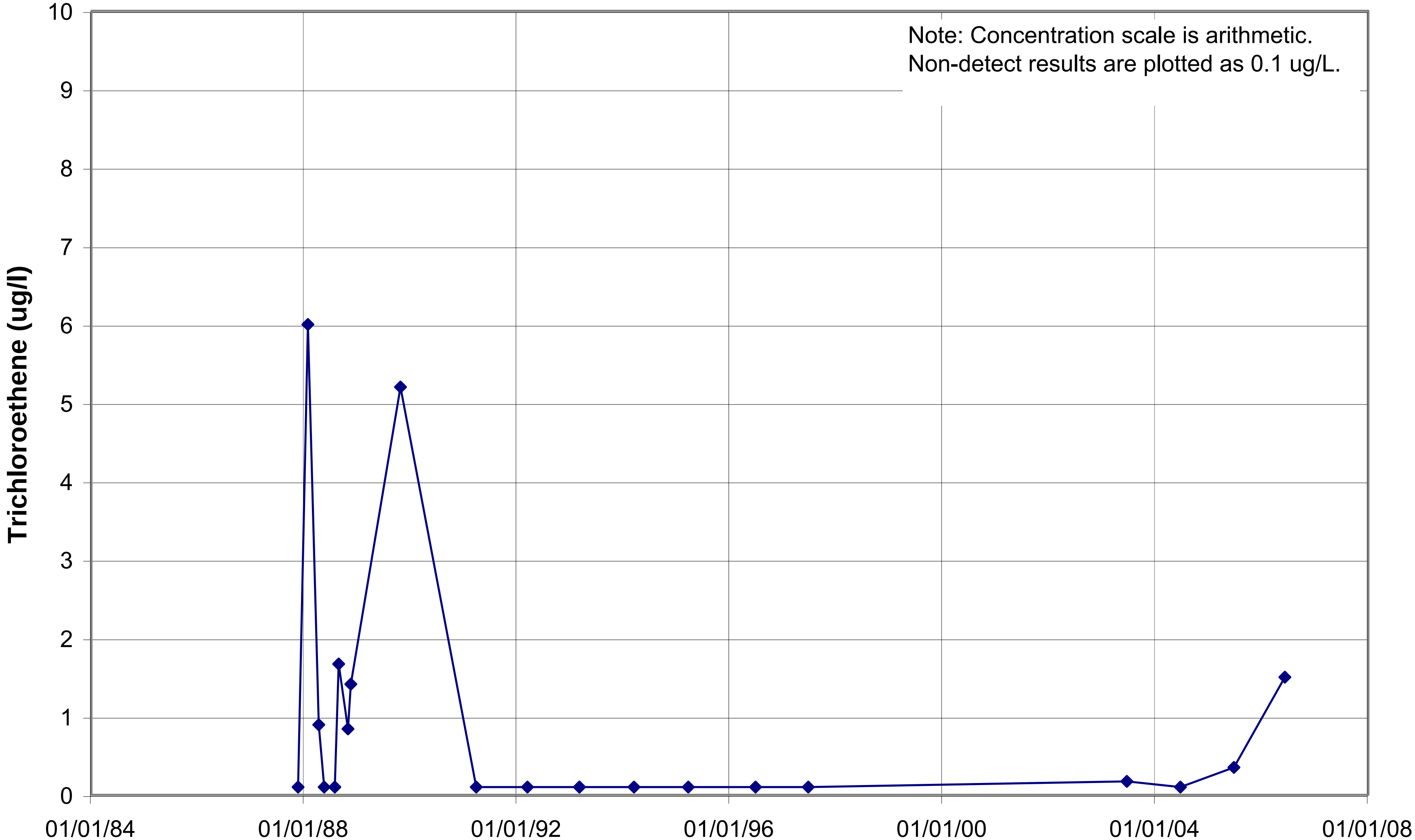

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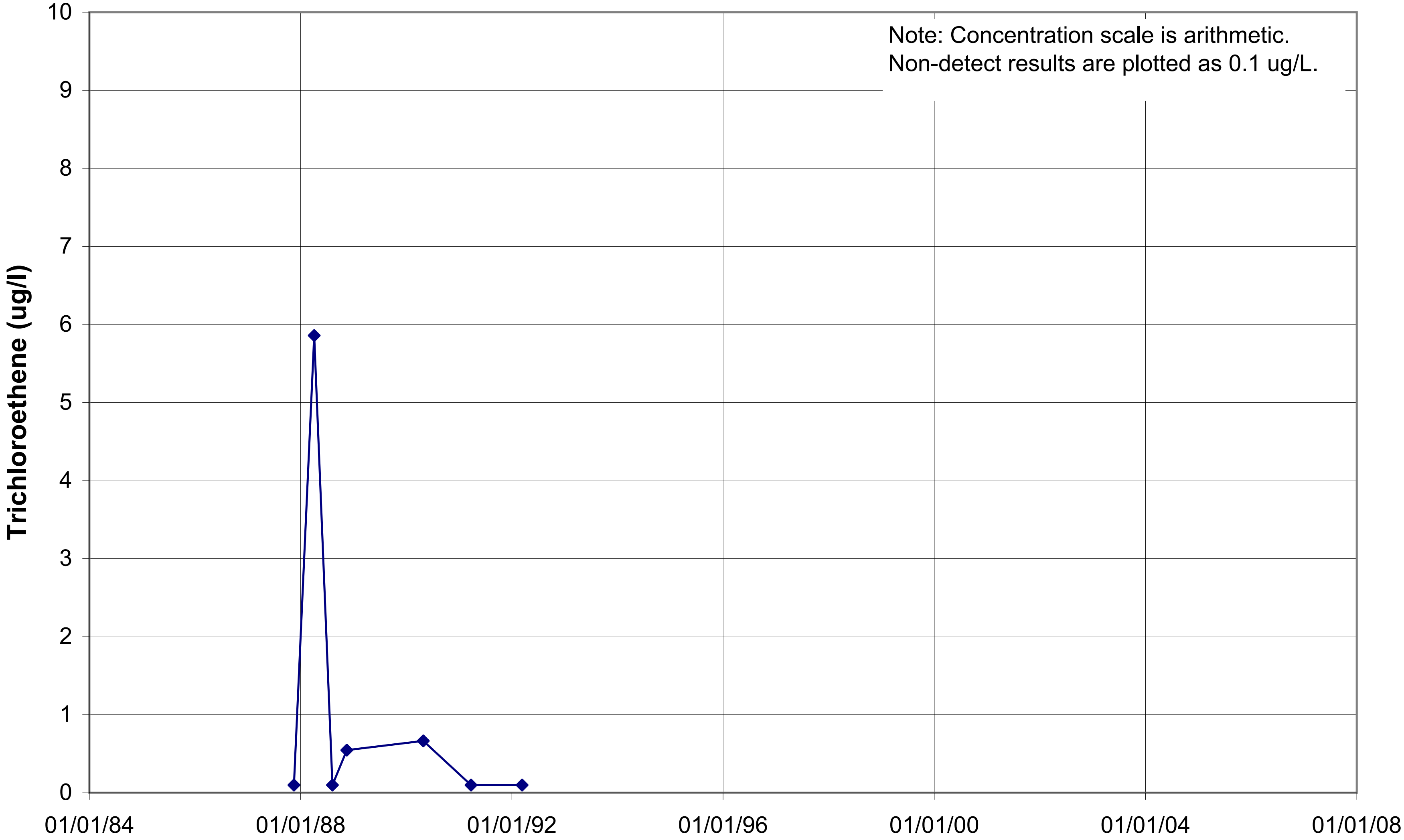

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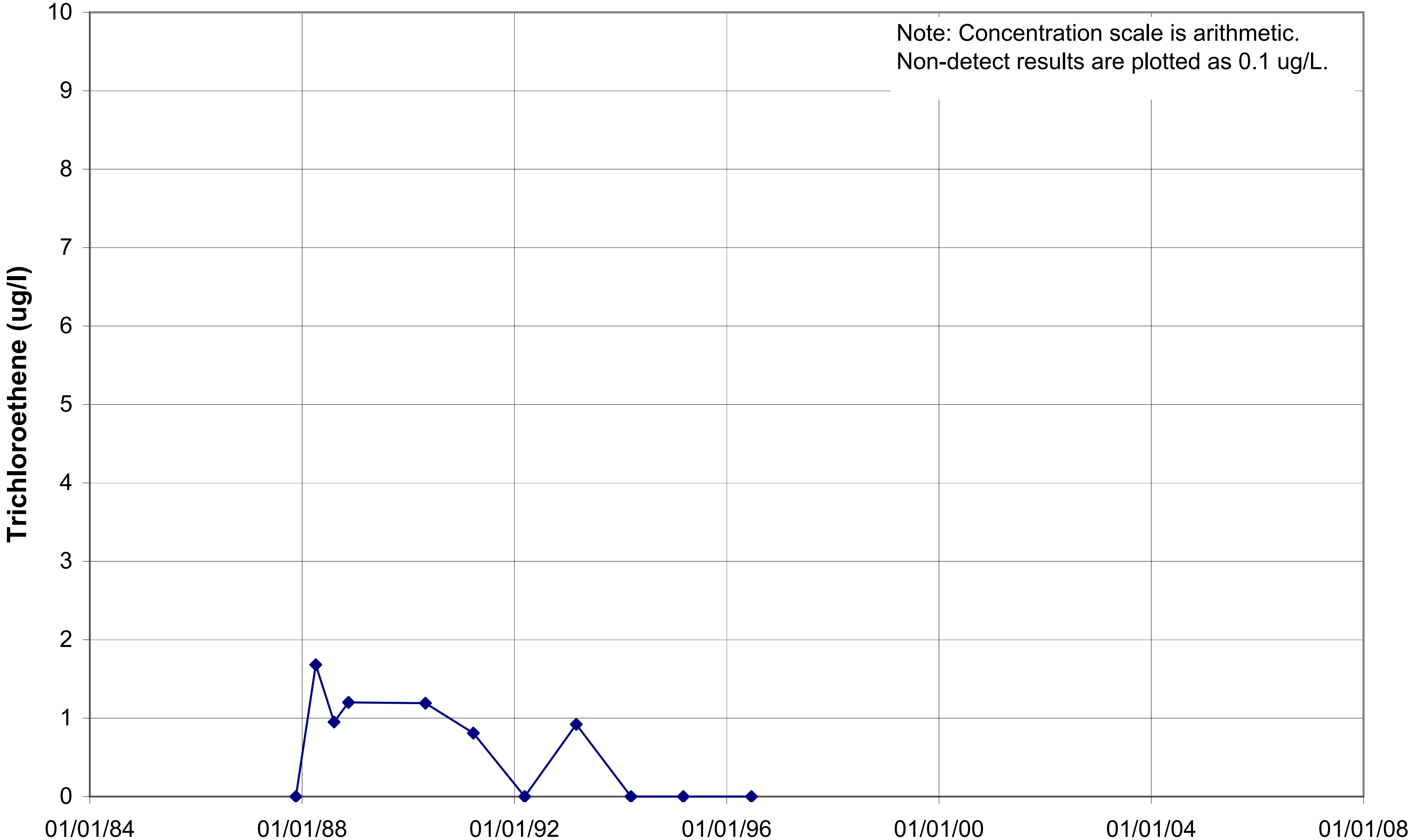

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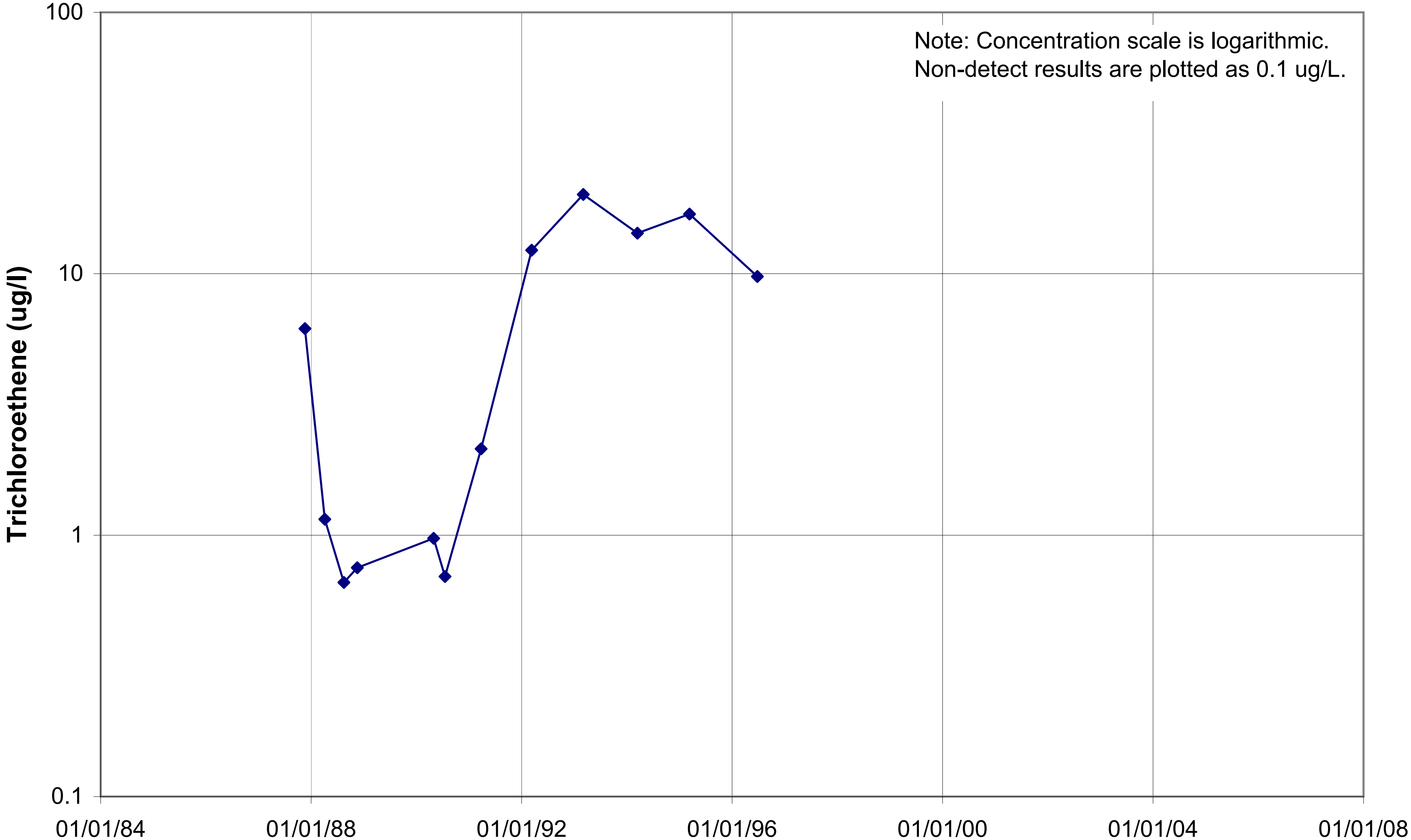

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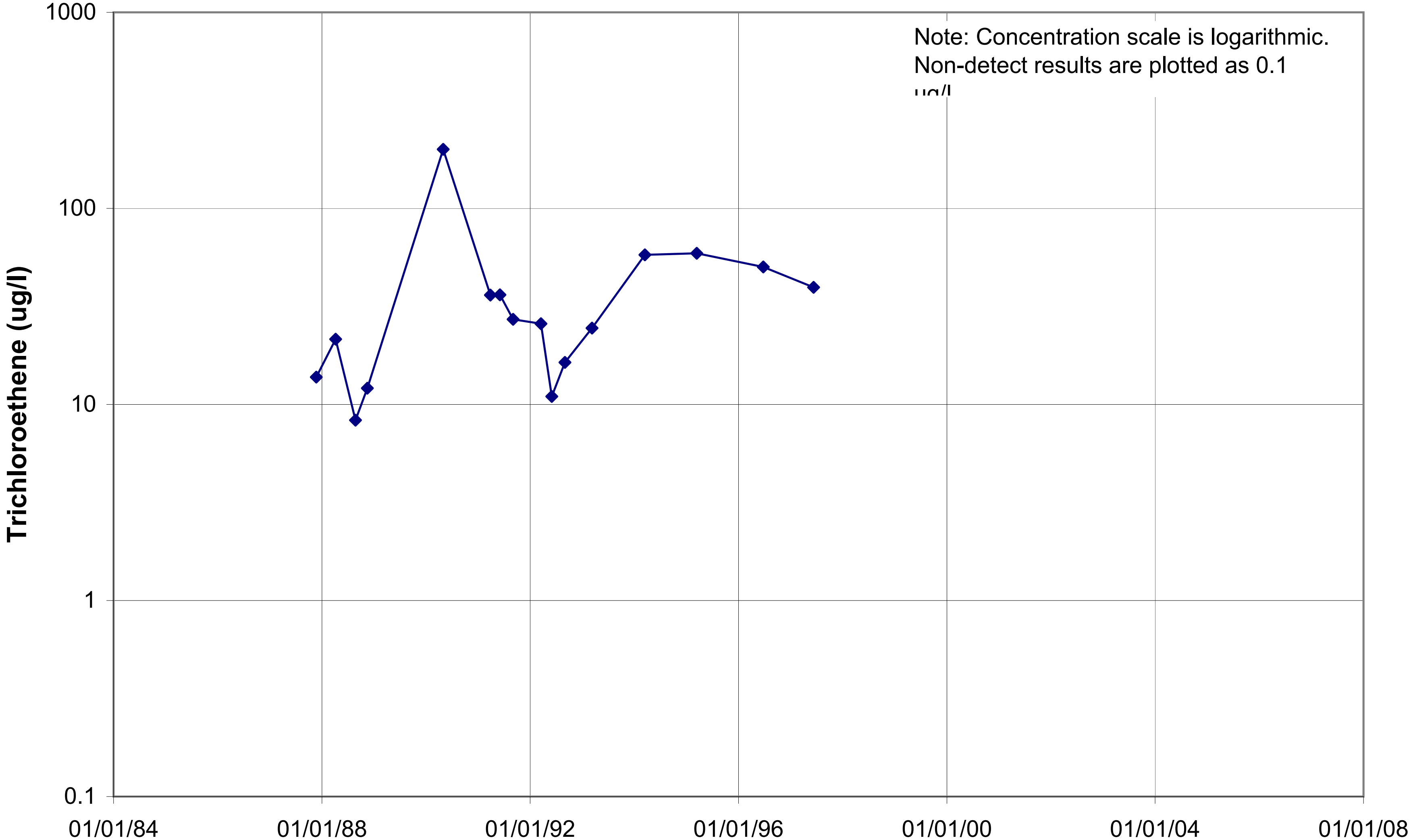

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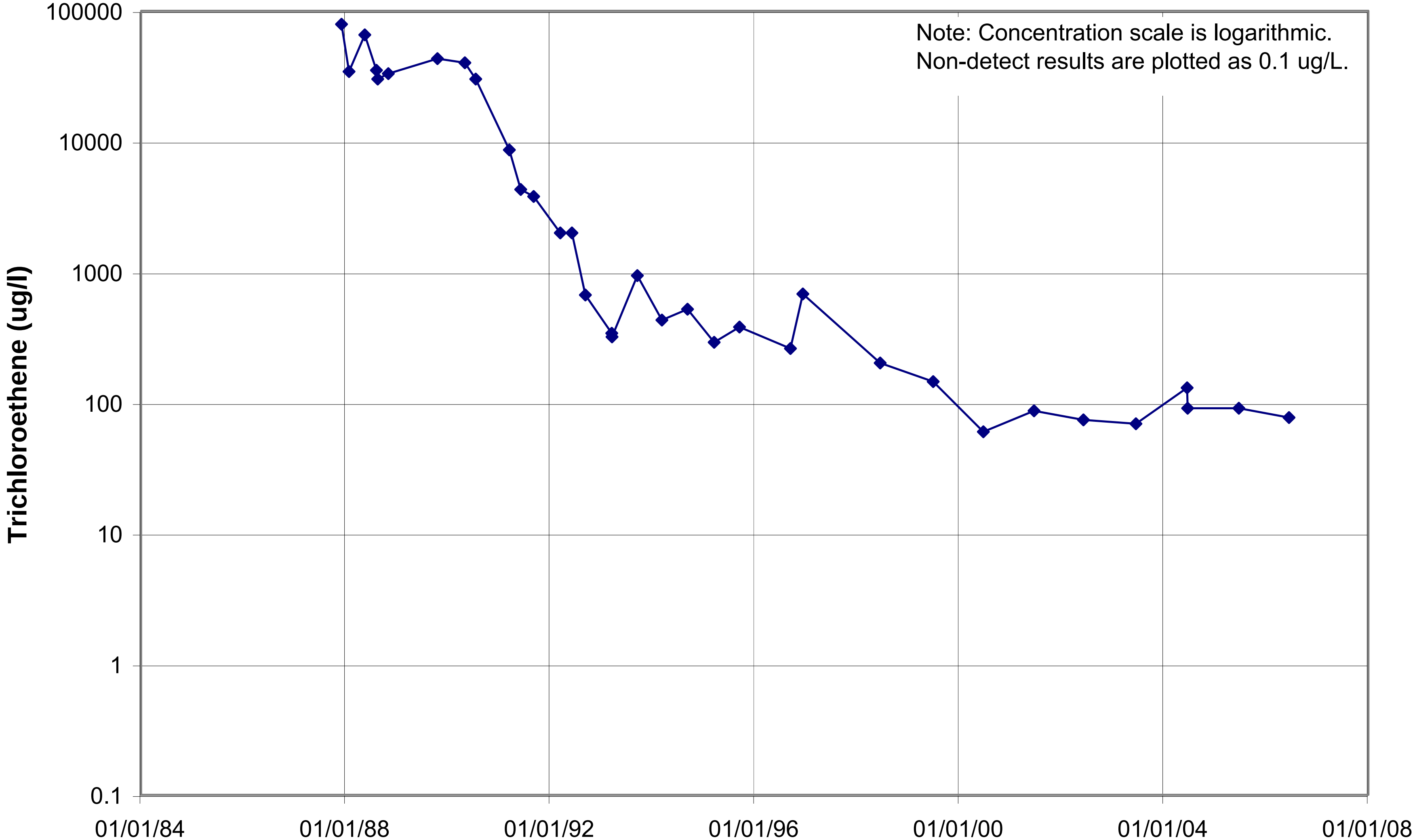

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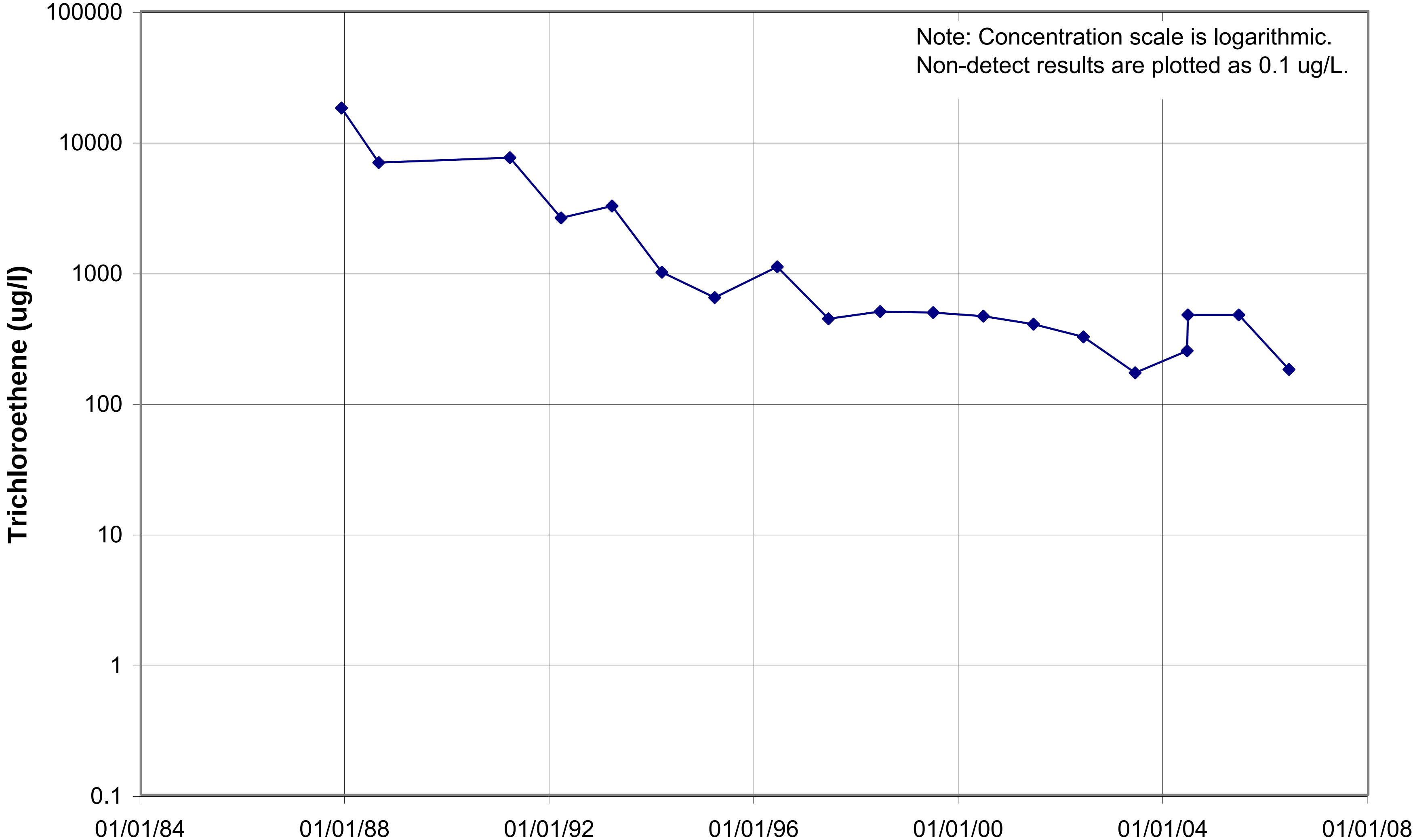

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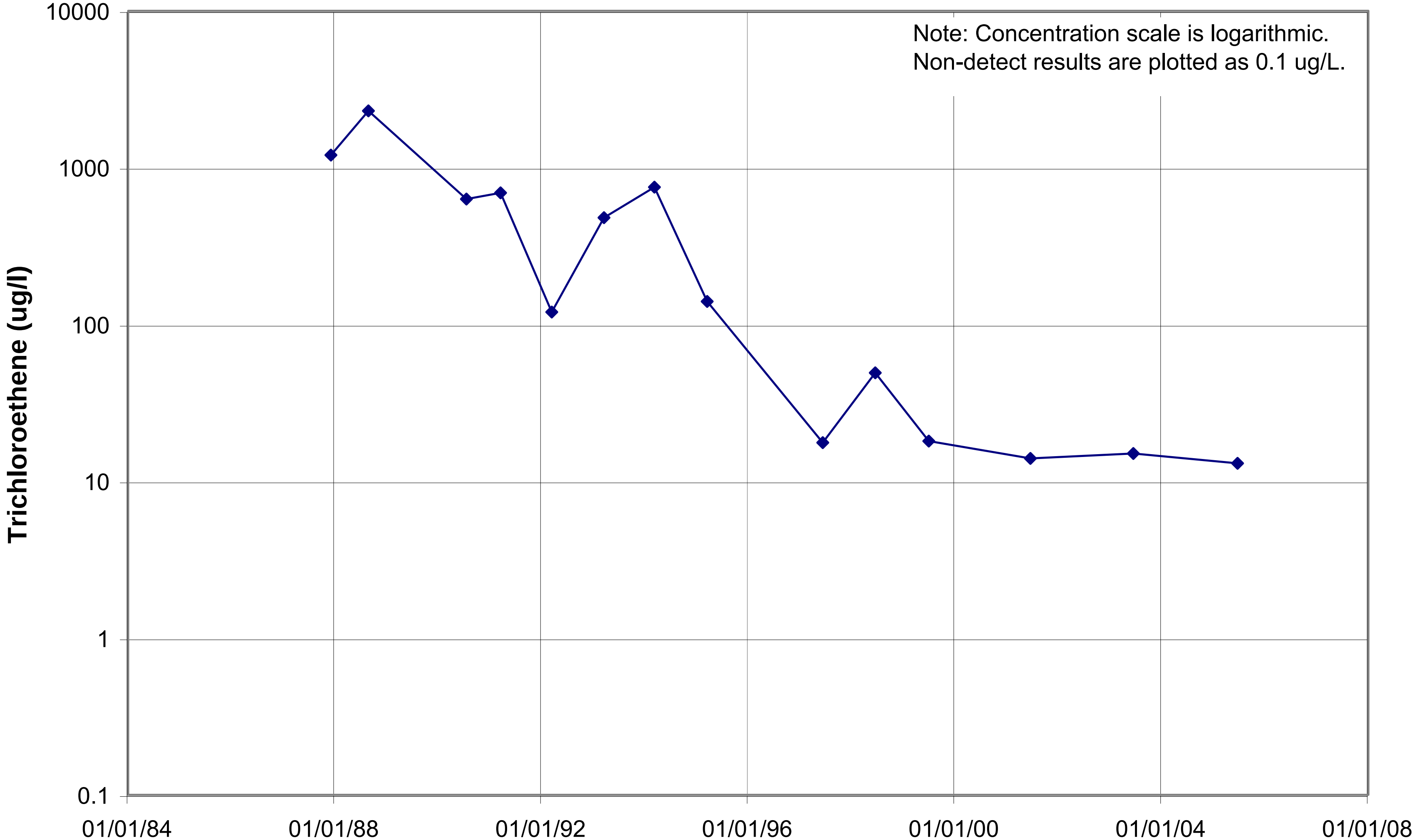

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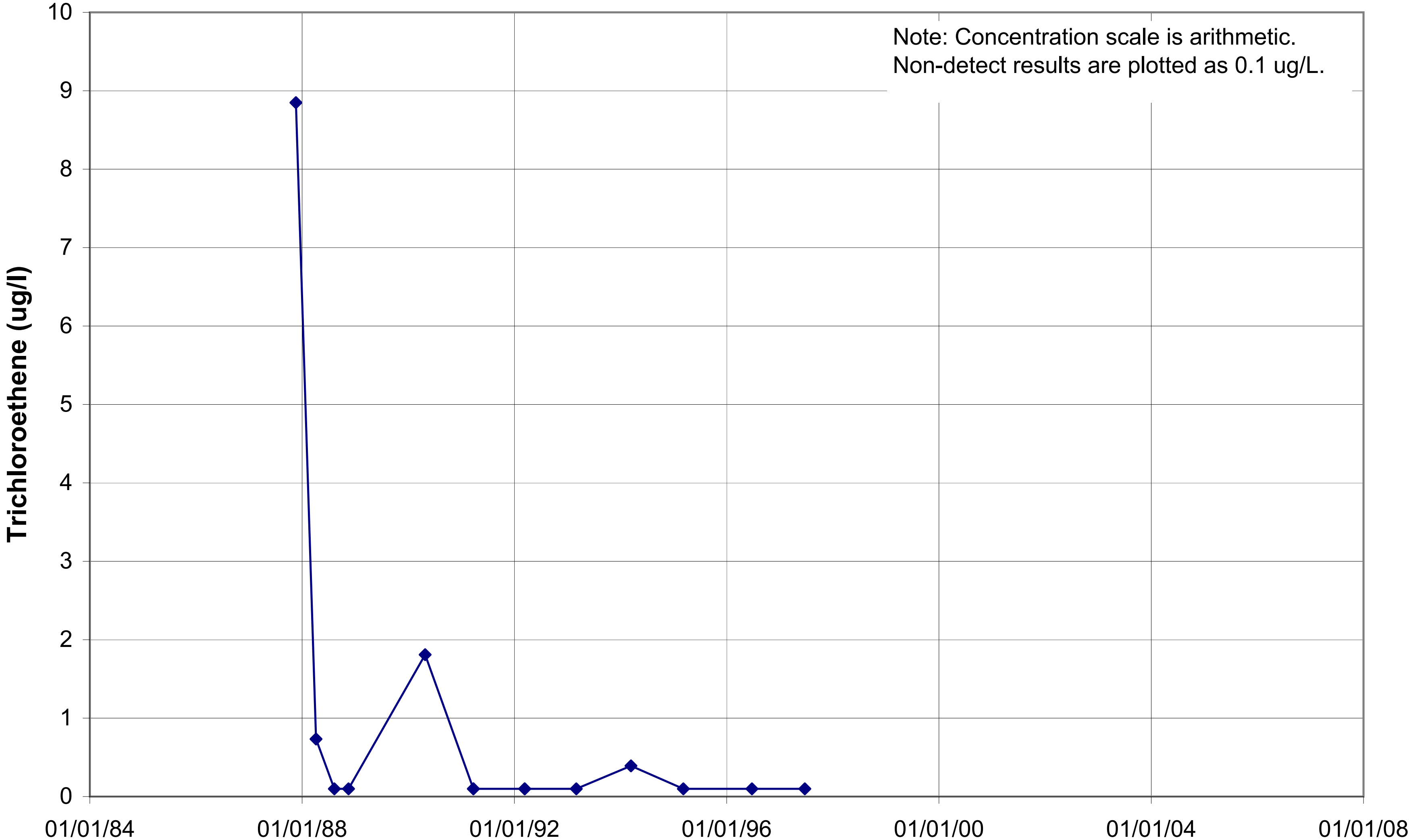

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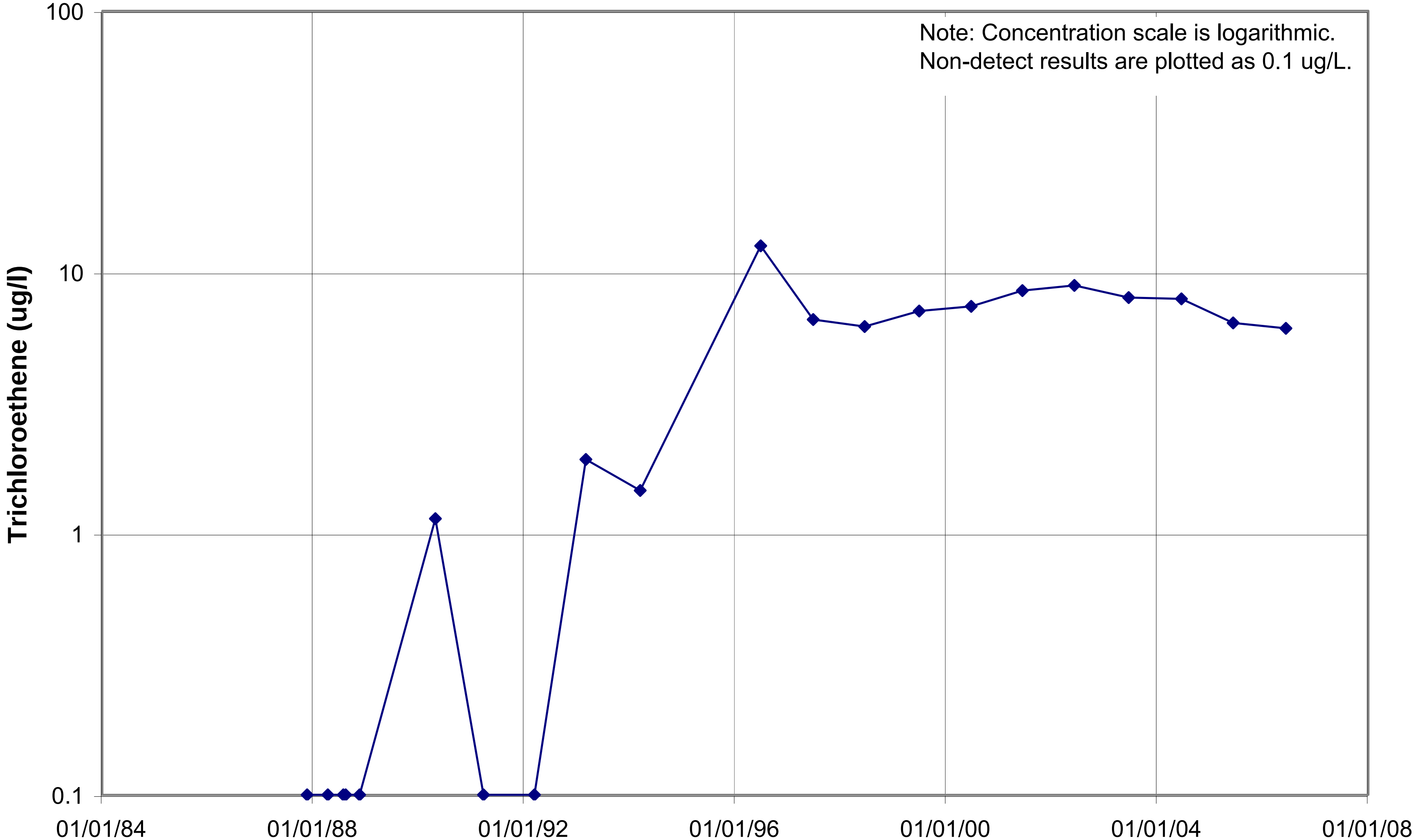

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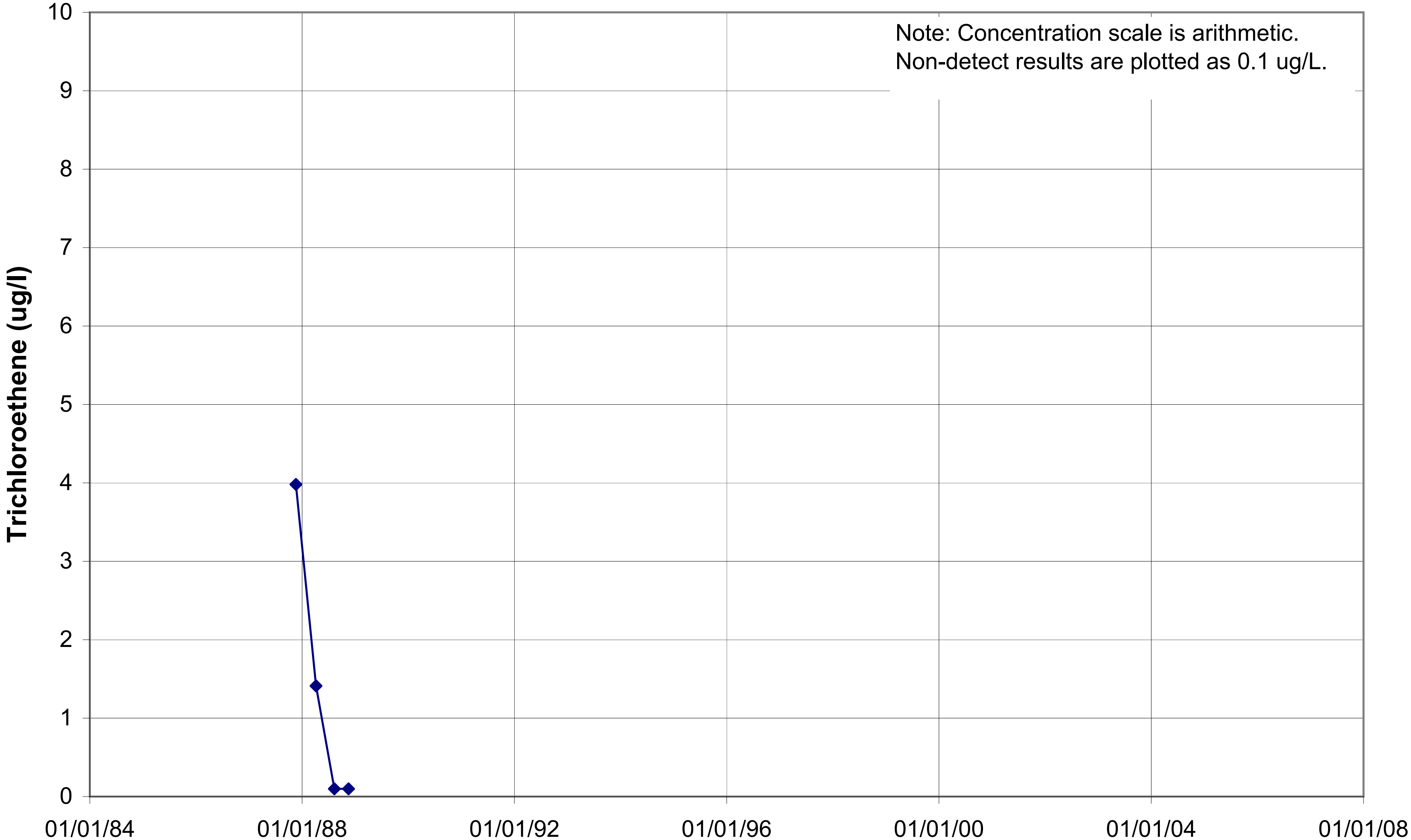

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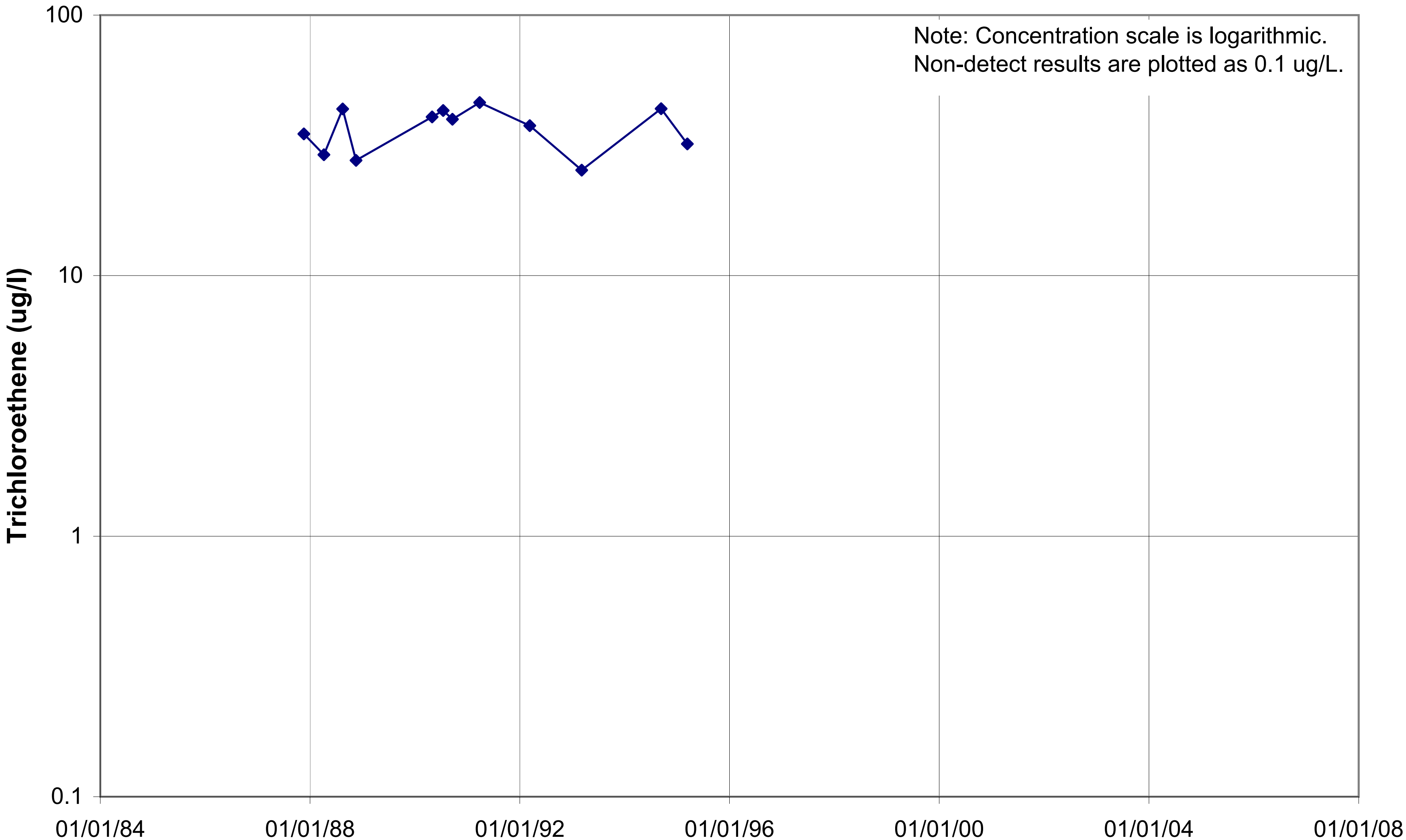

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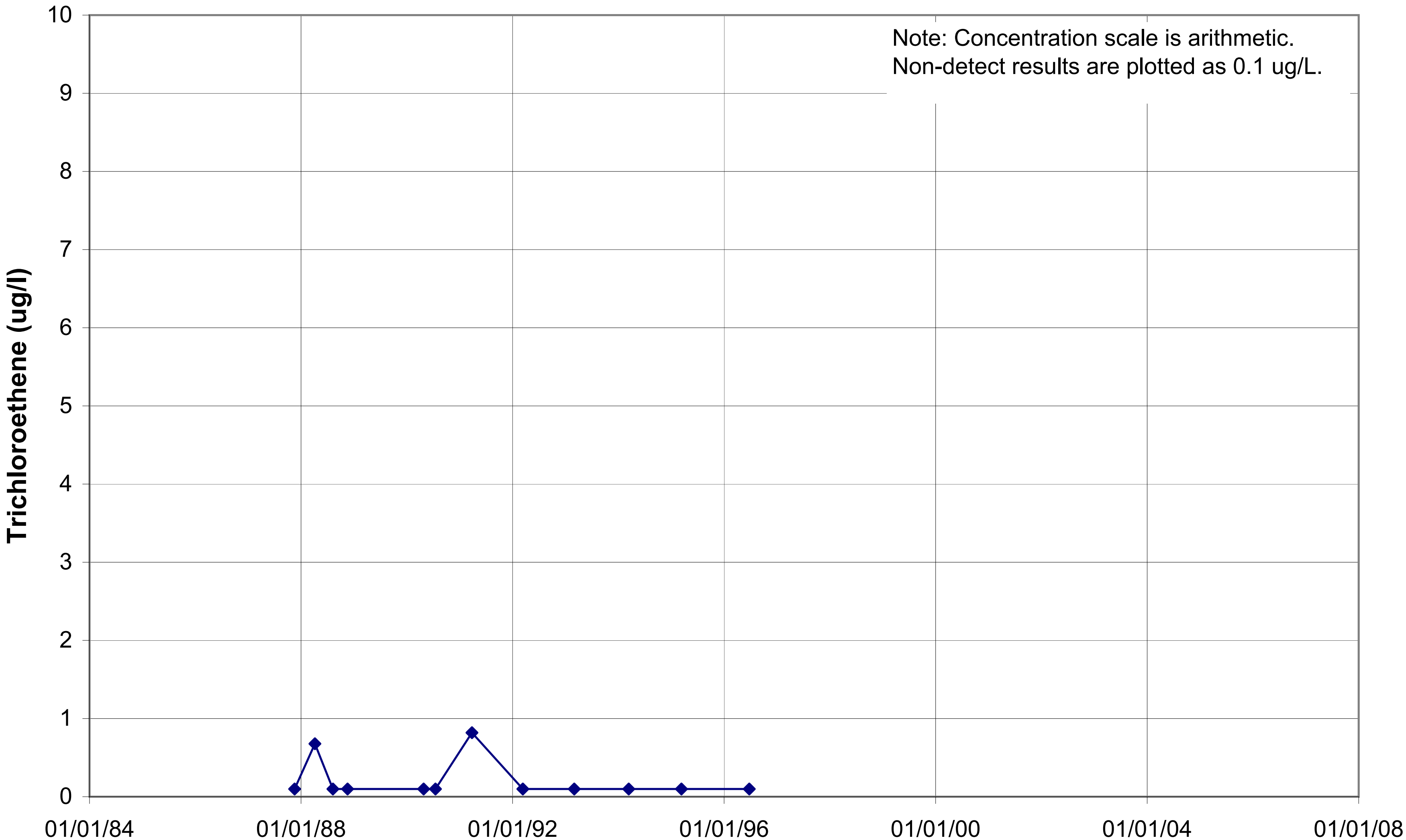

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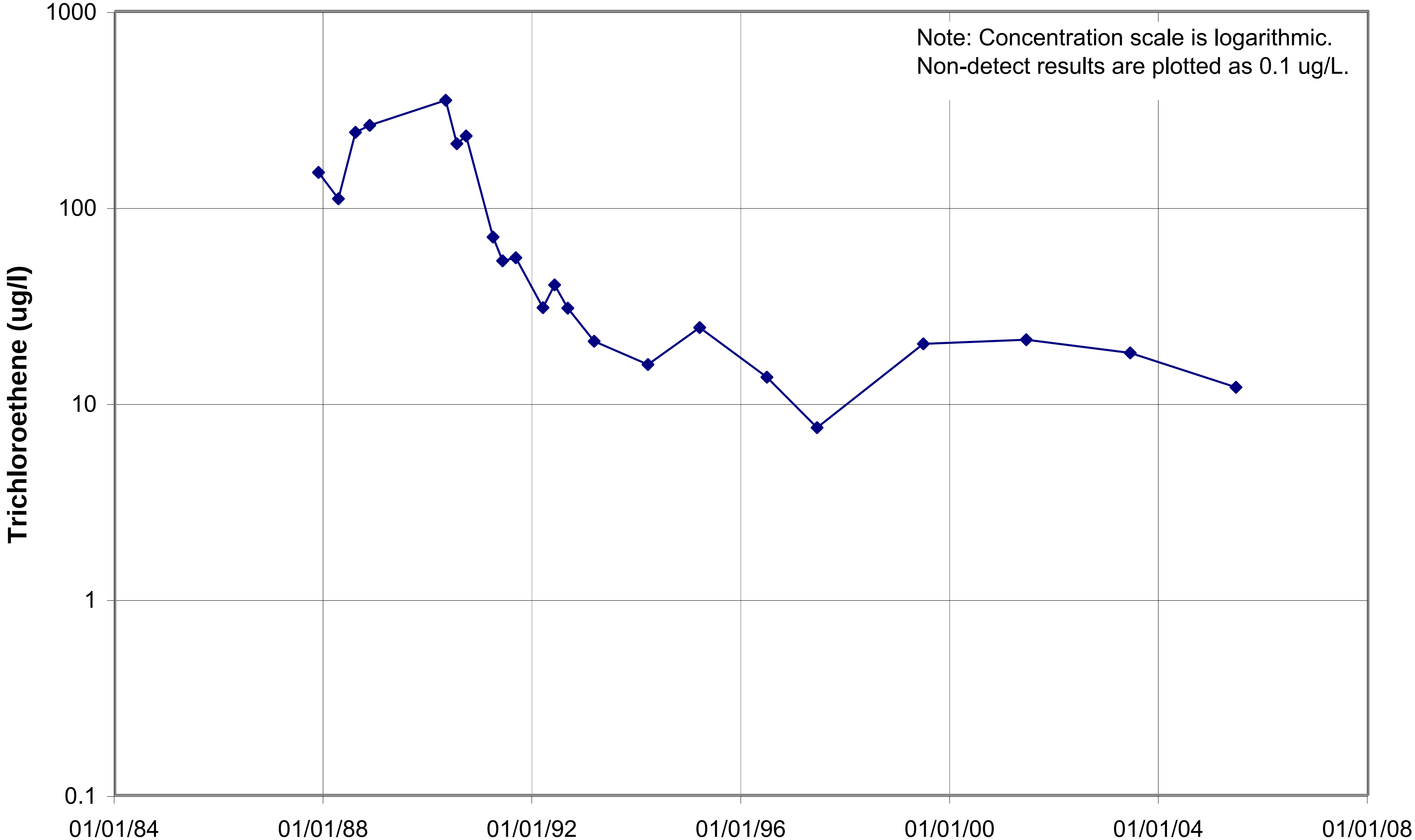

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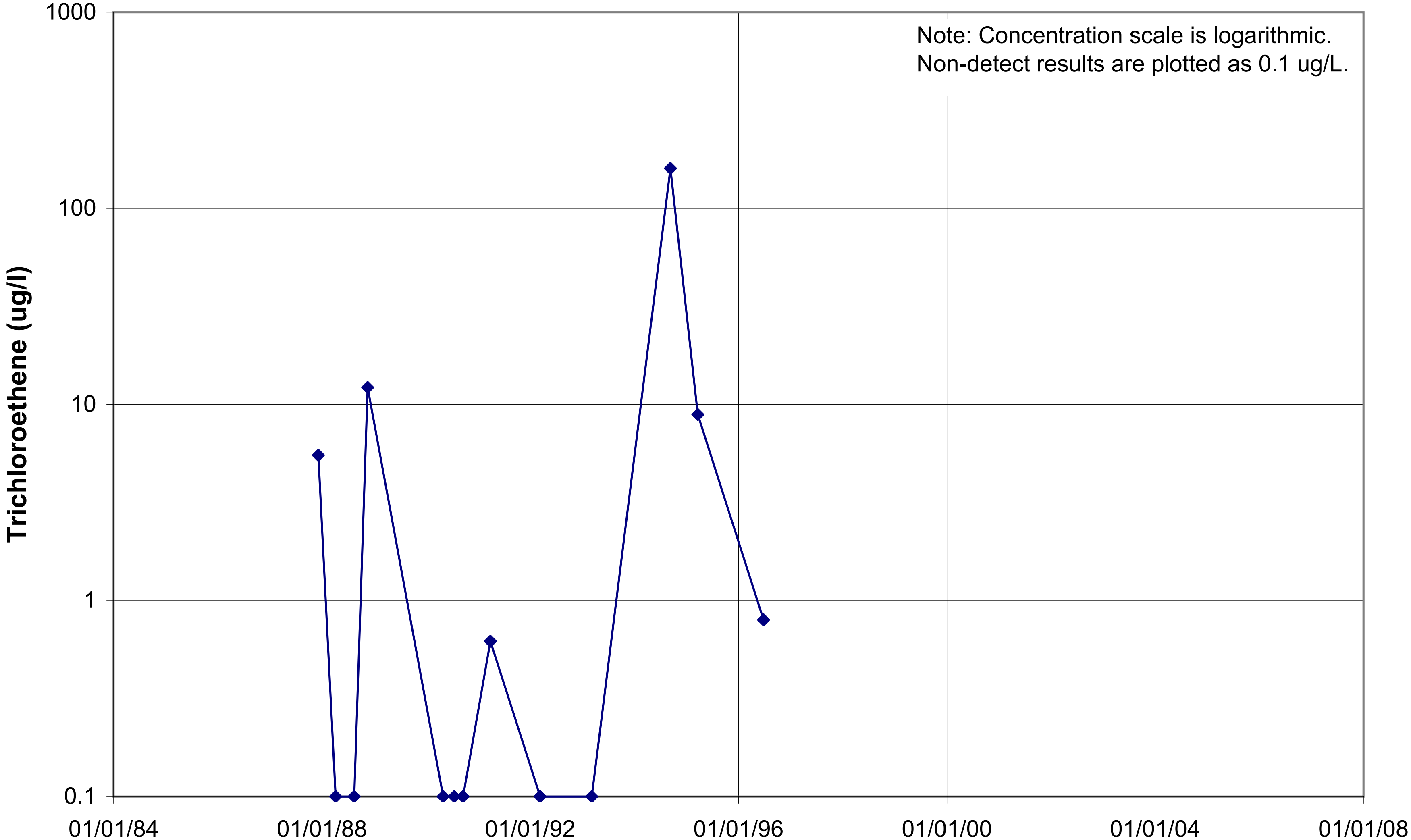

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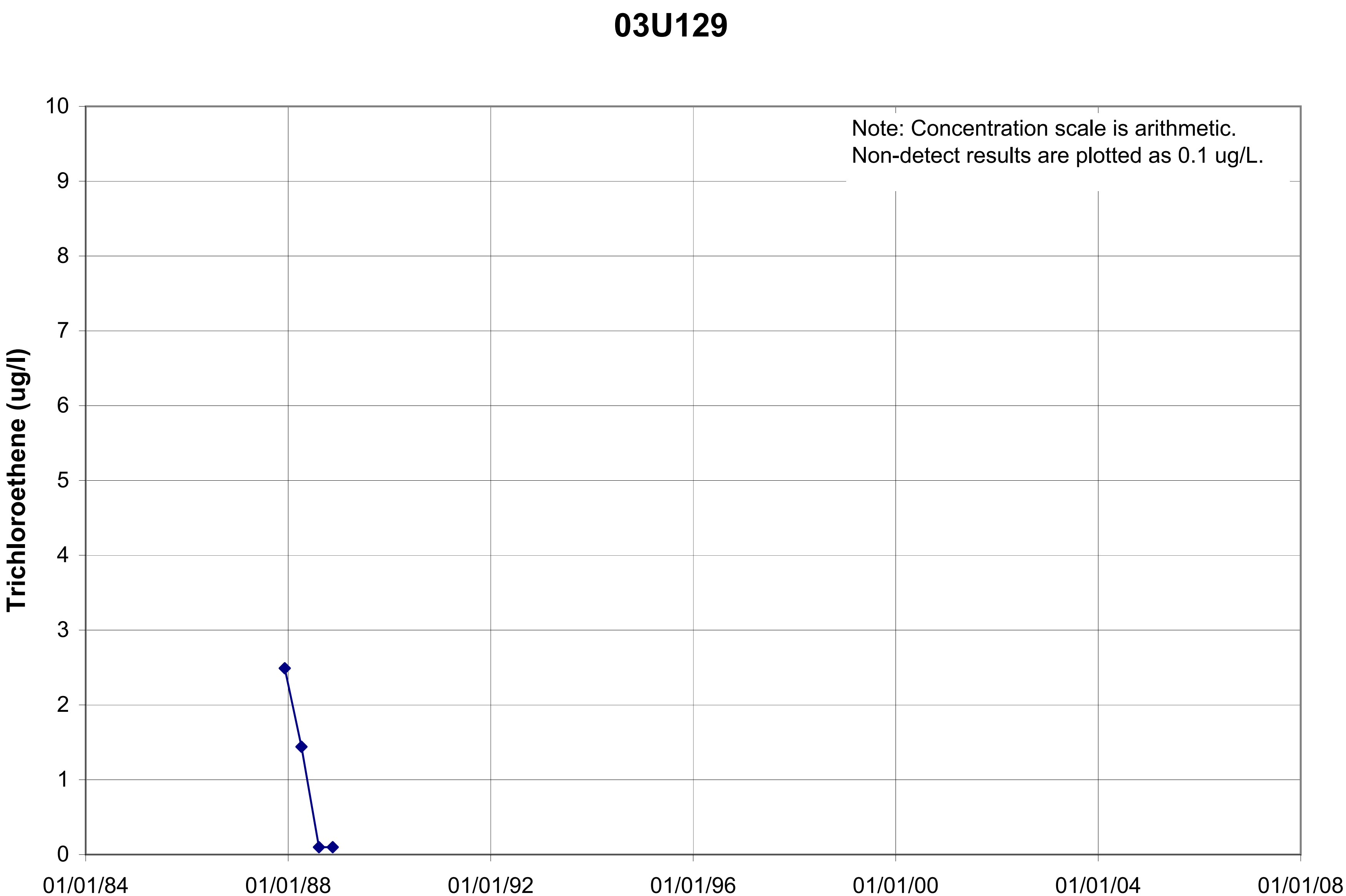

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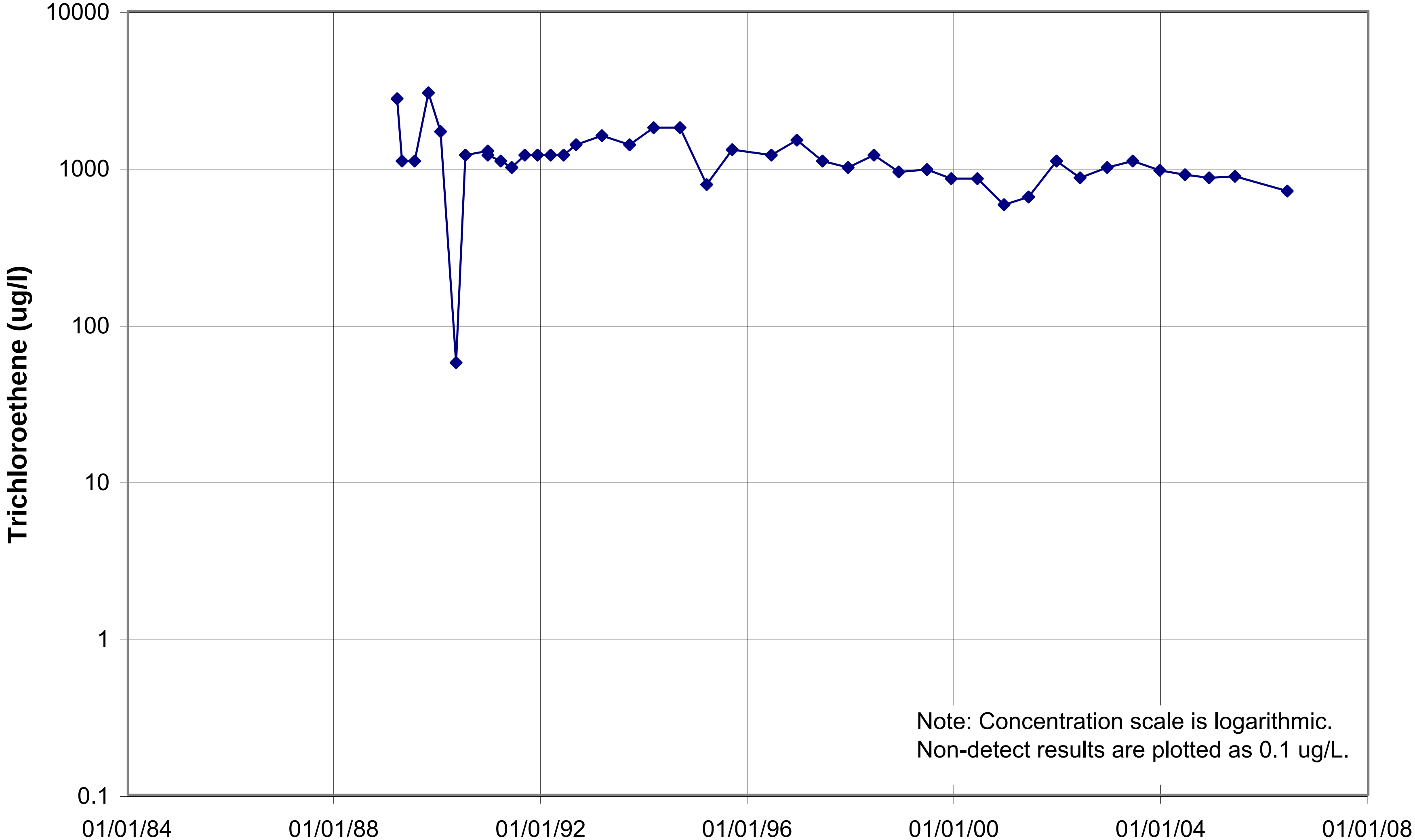
03U301 (SC1)



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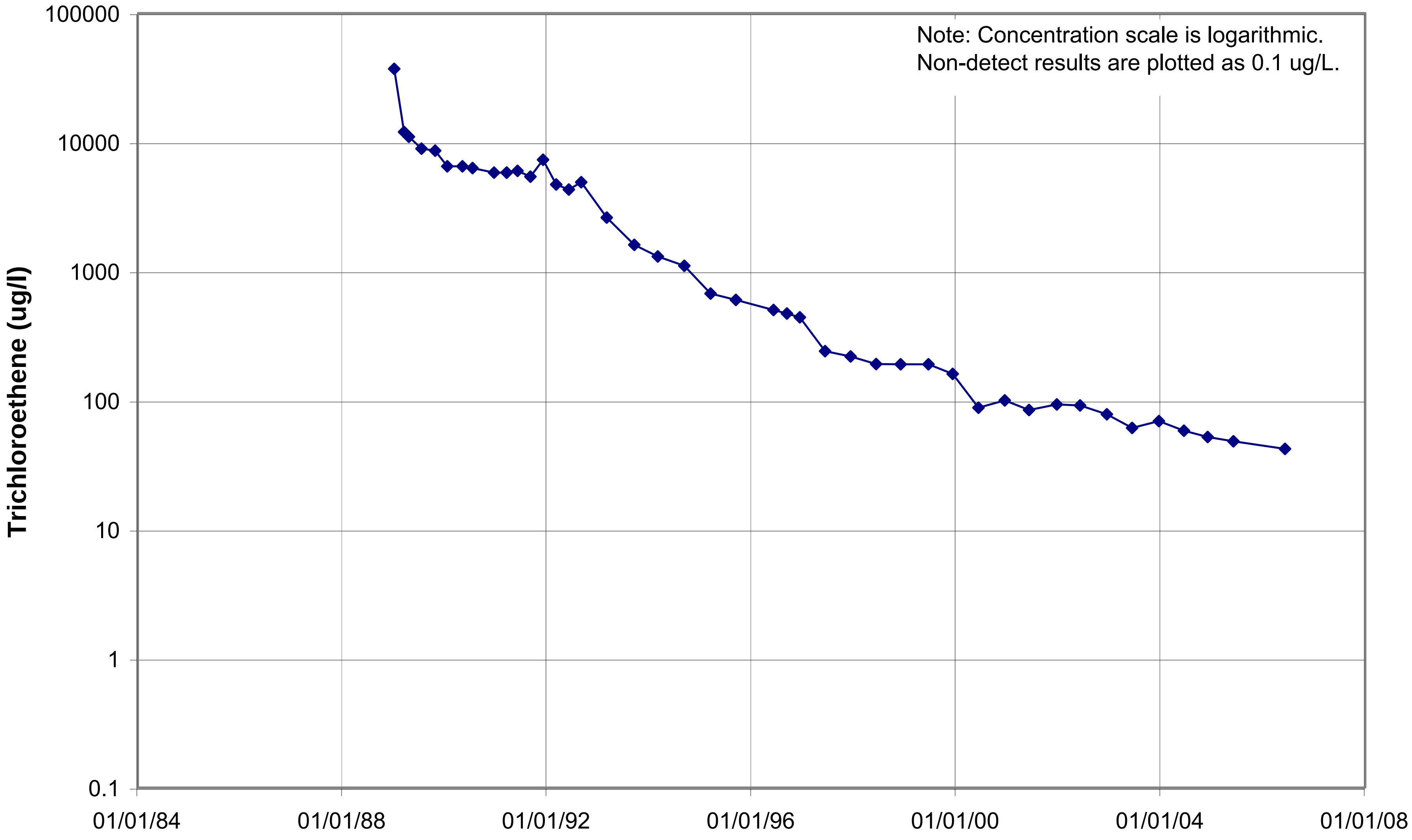

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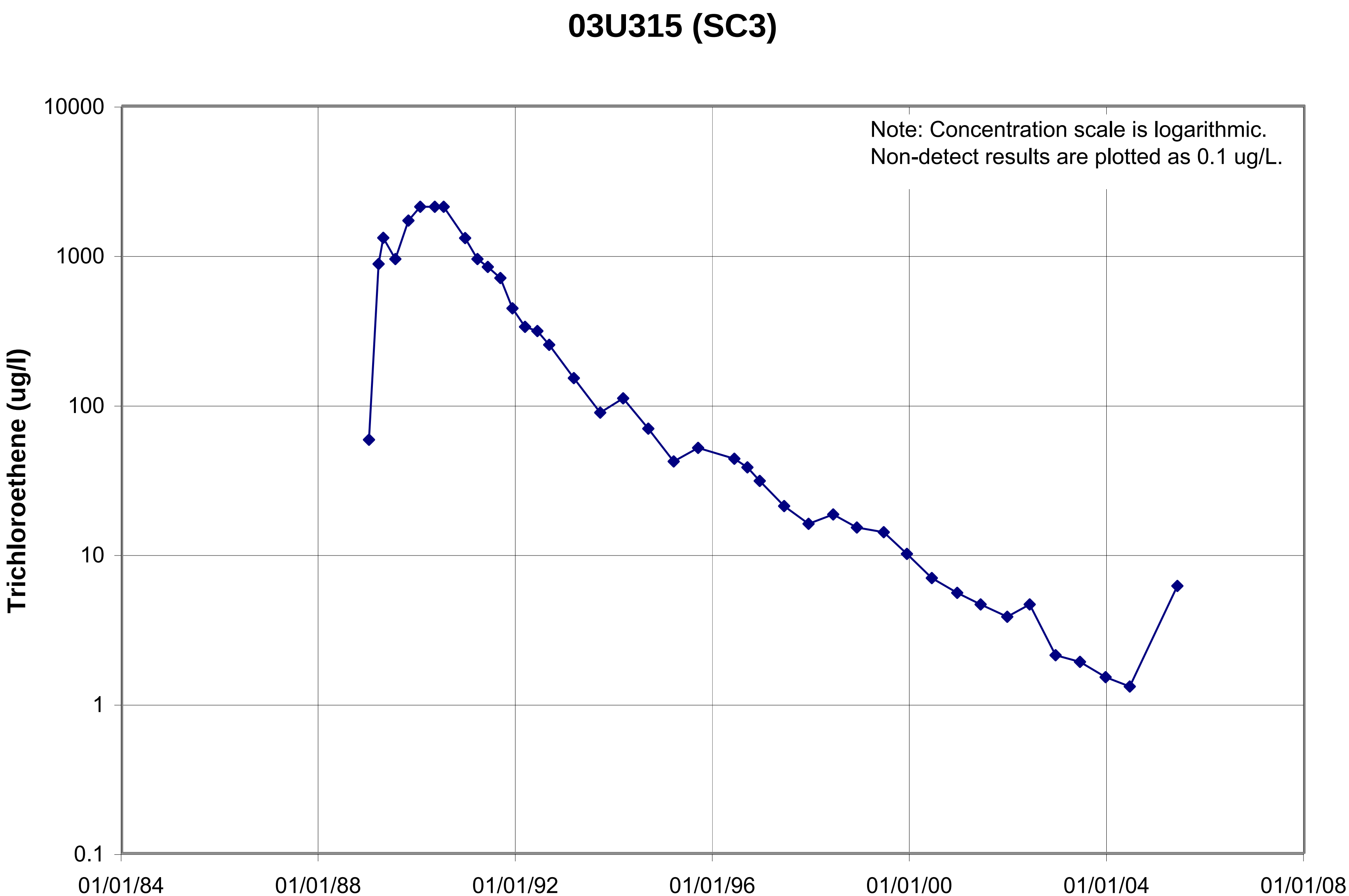

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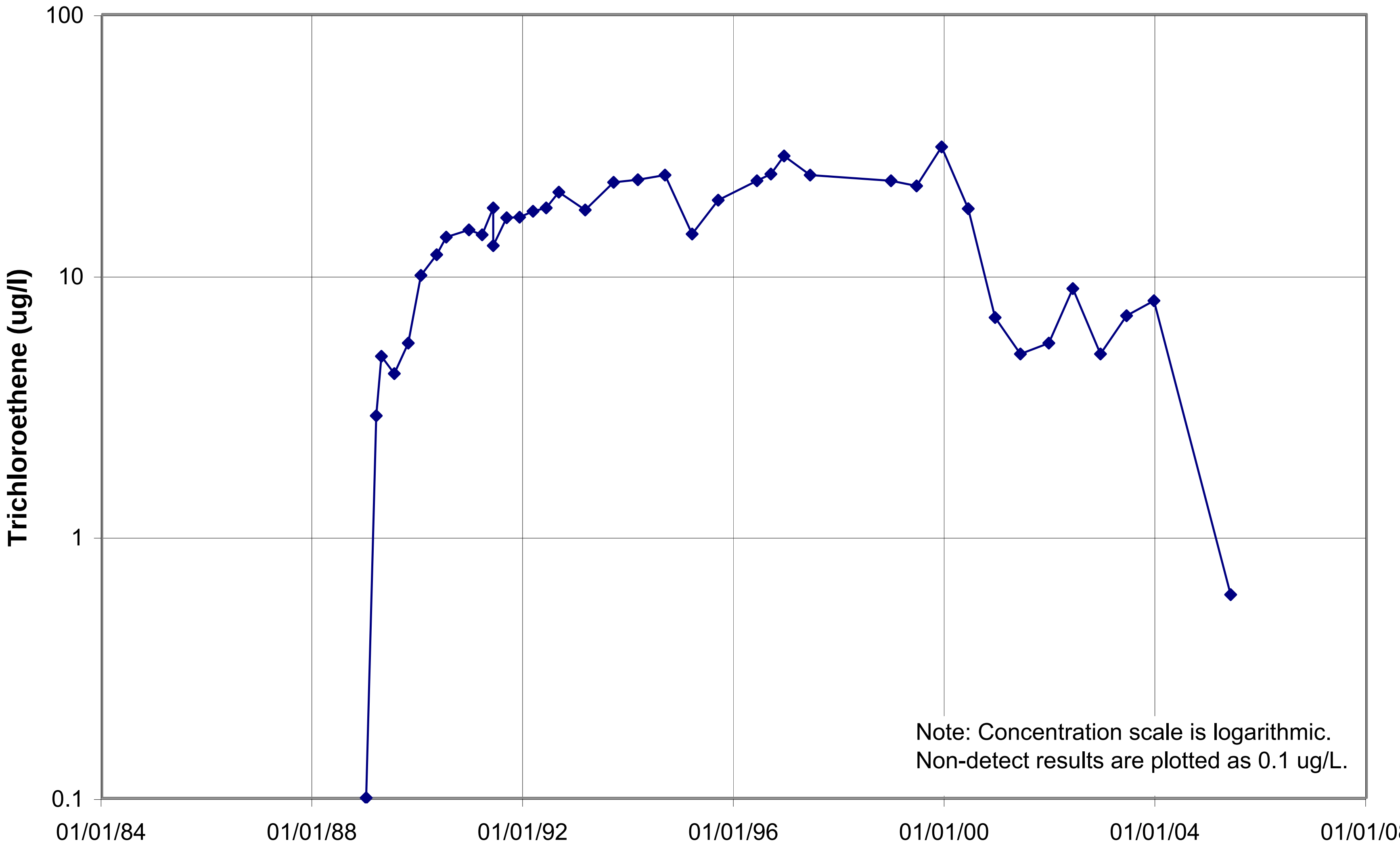

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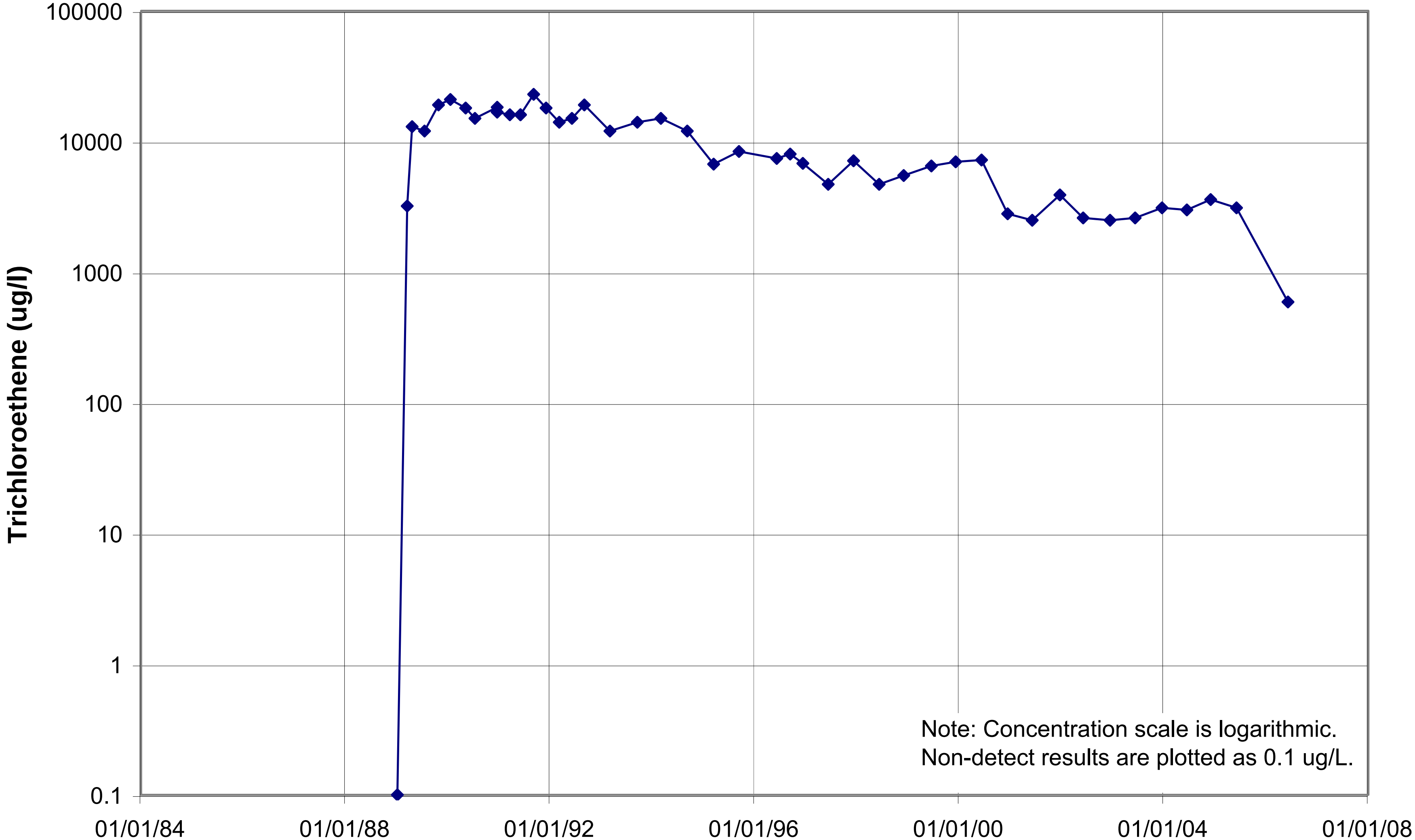

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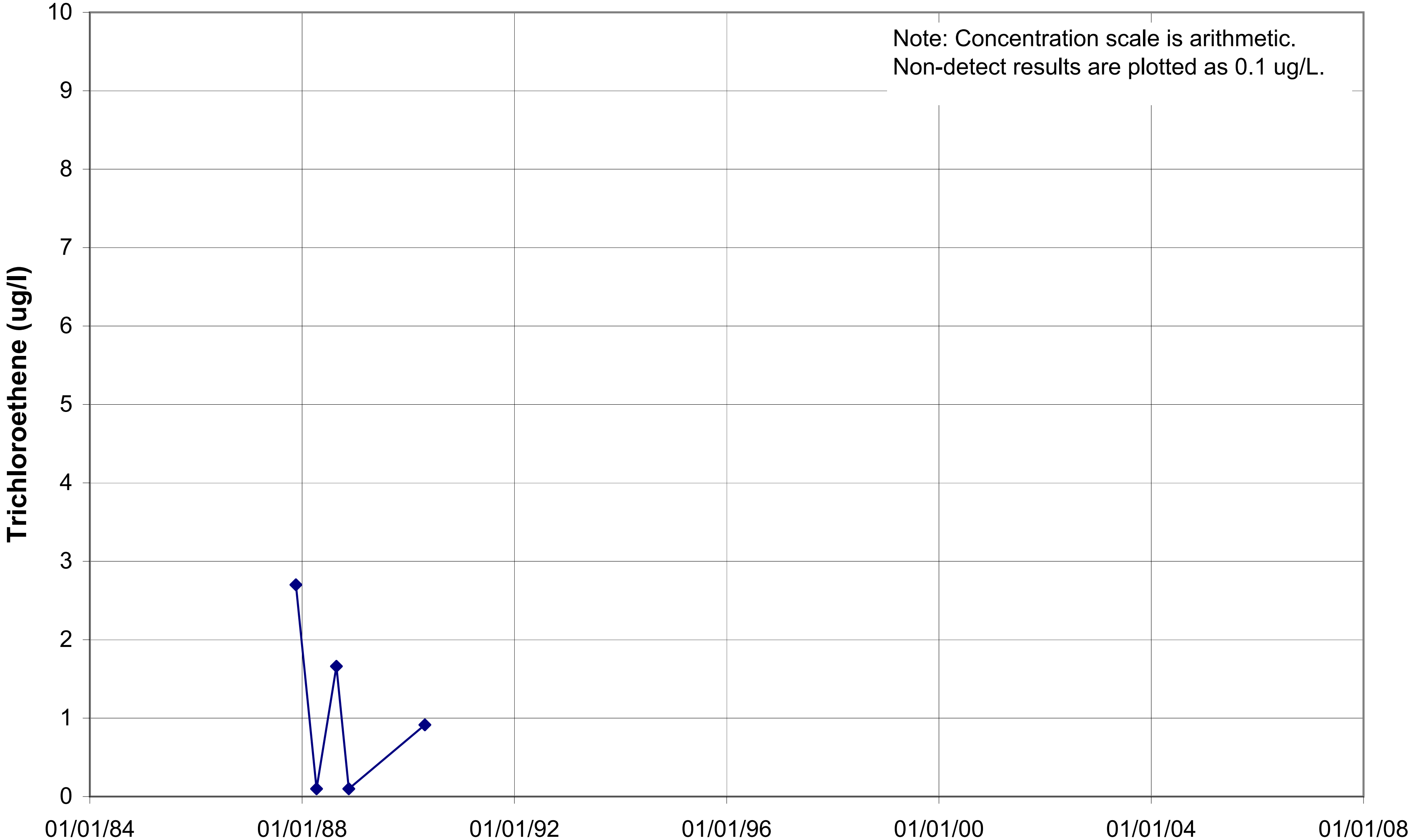

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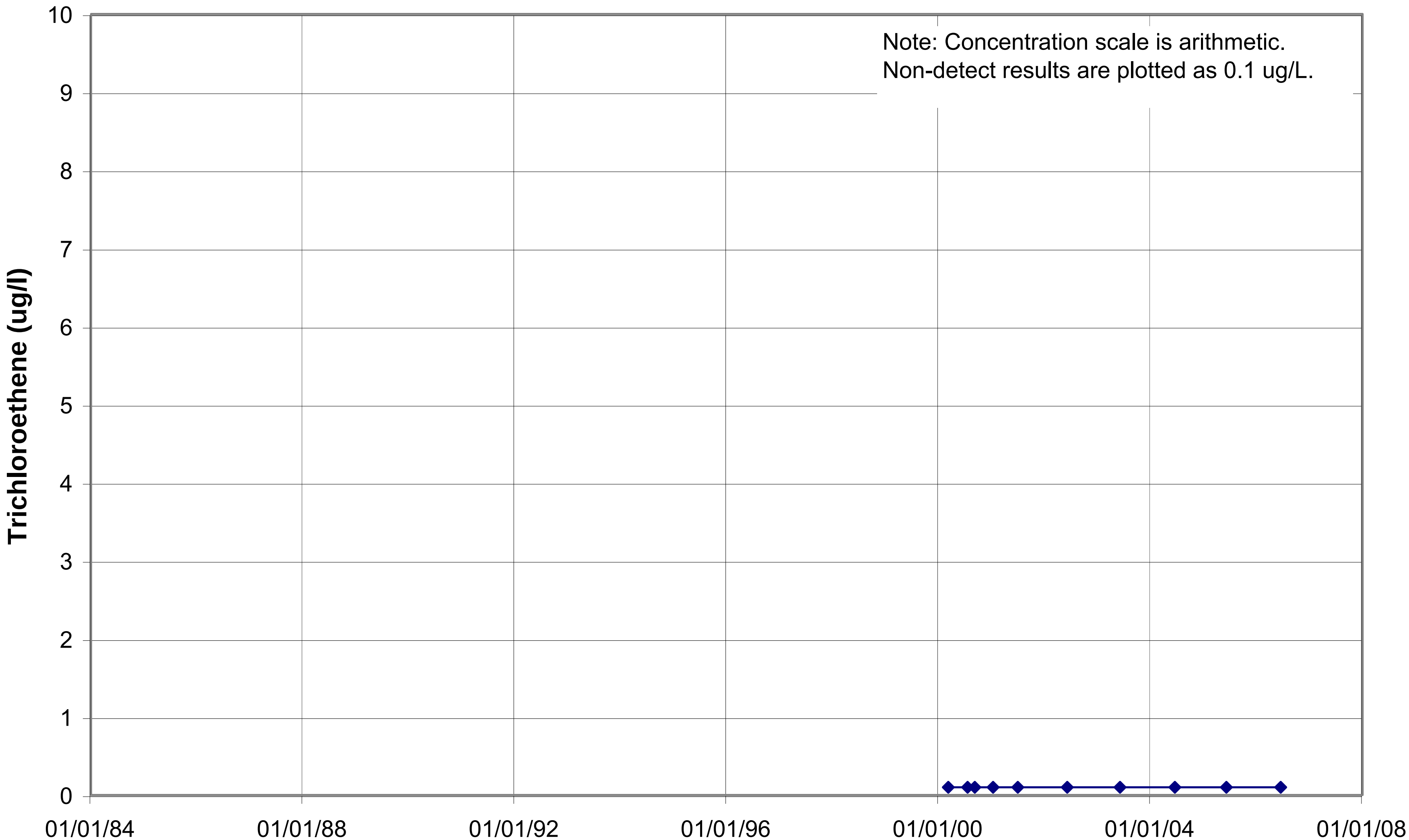

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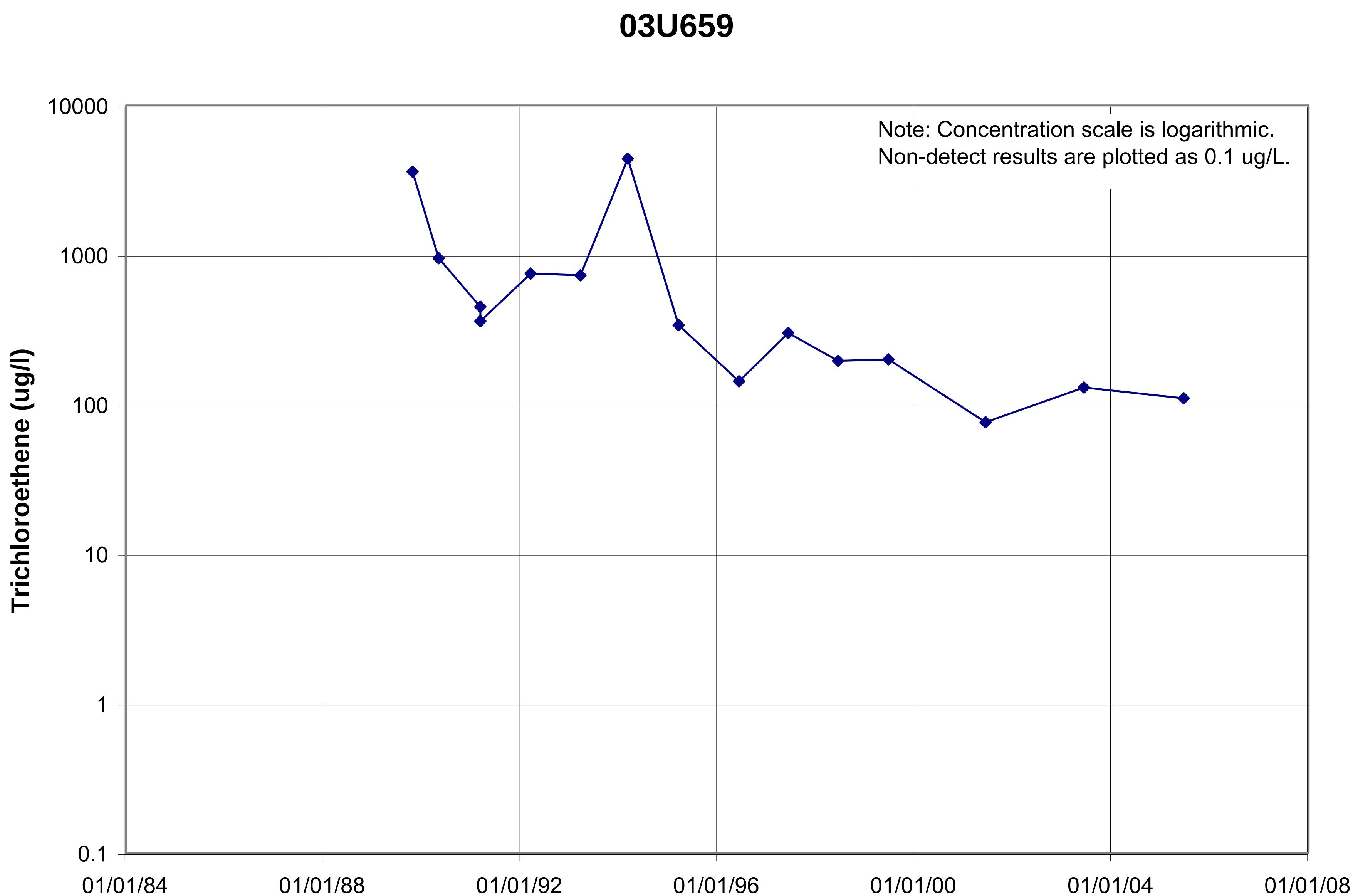

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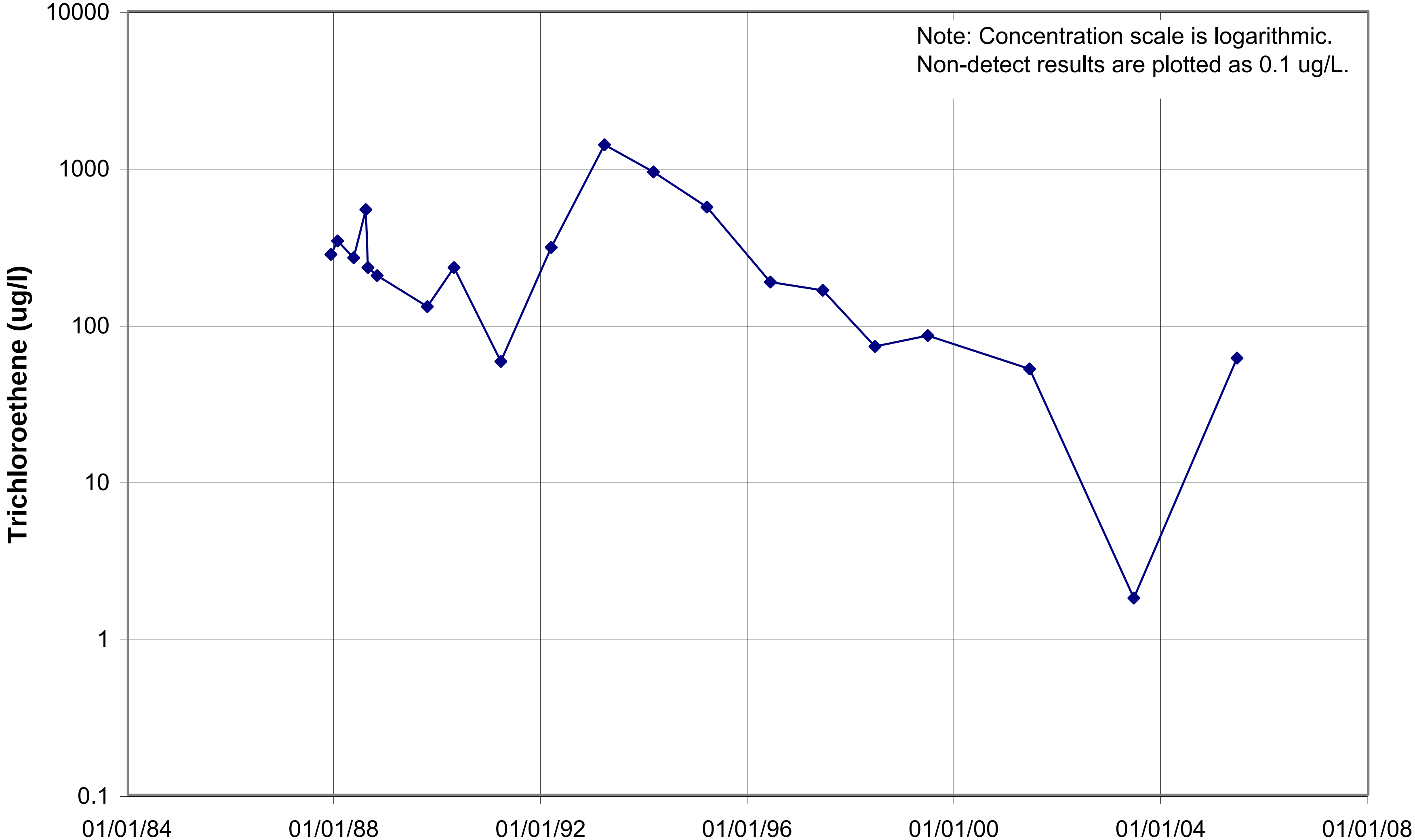

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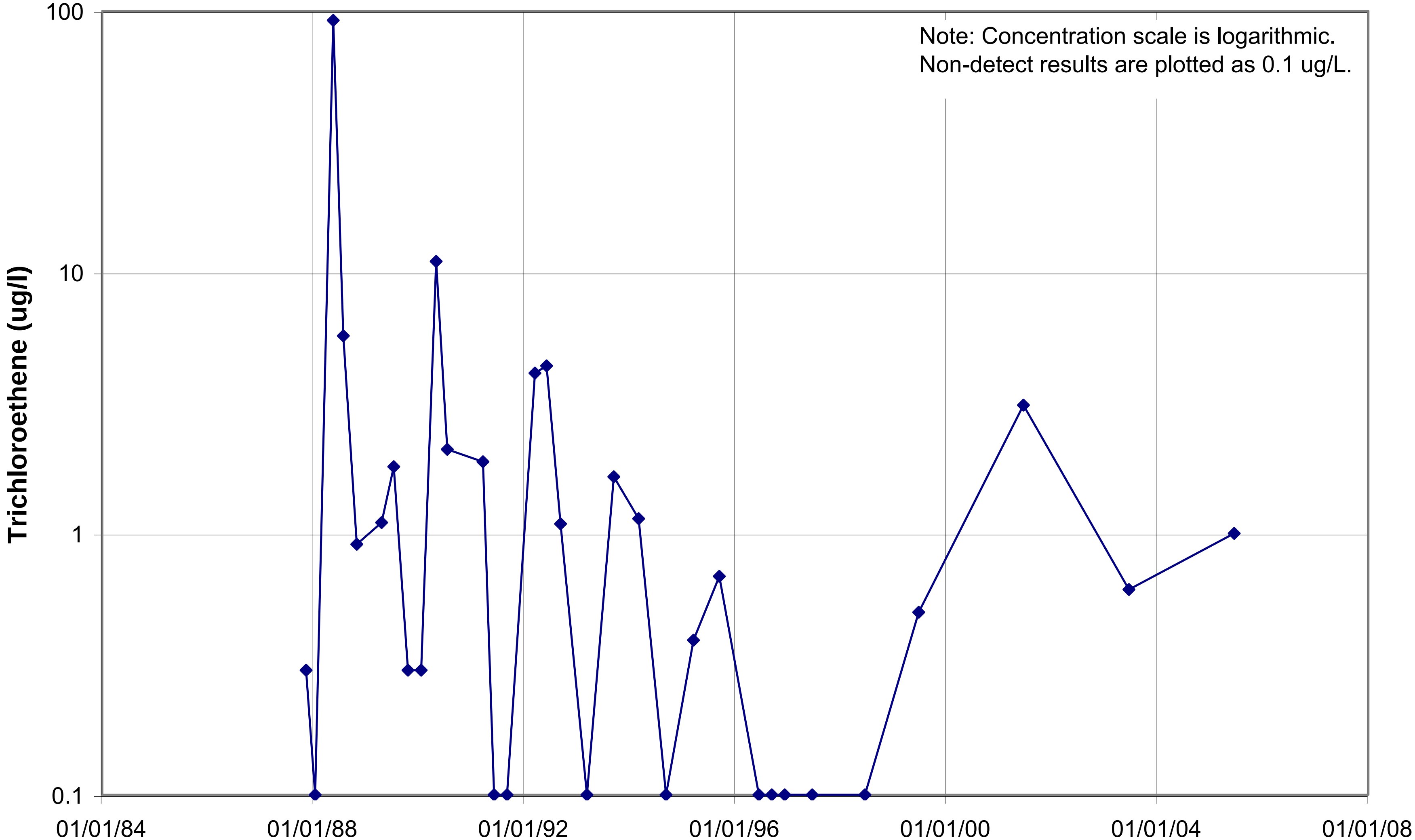

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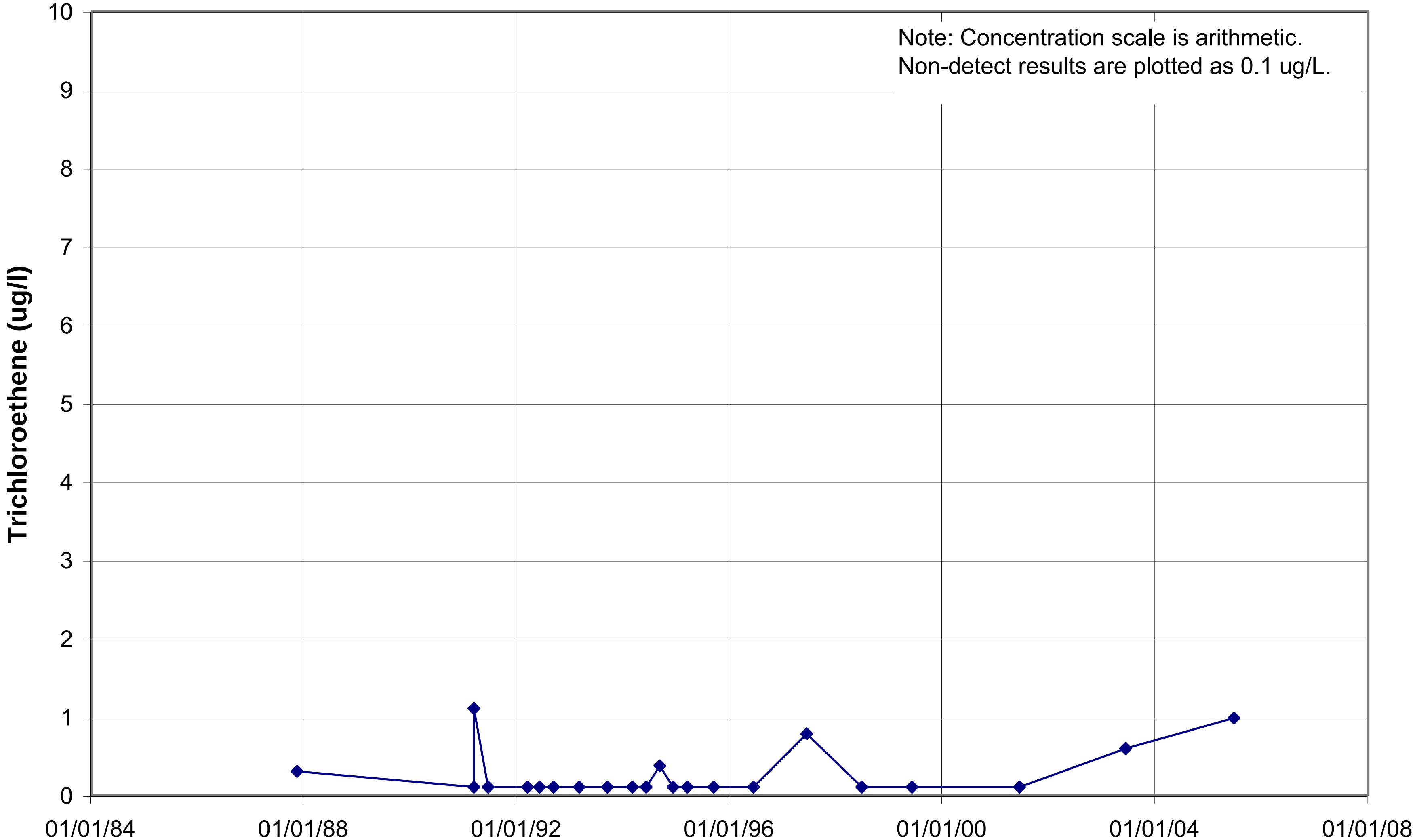

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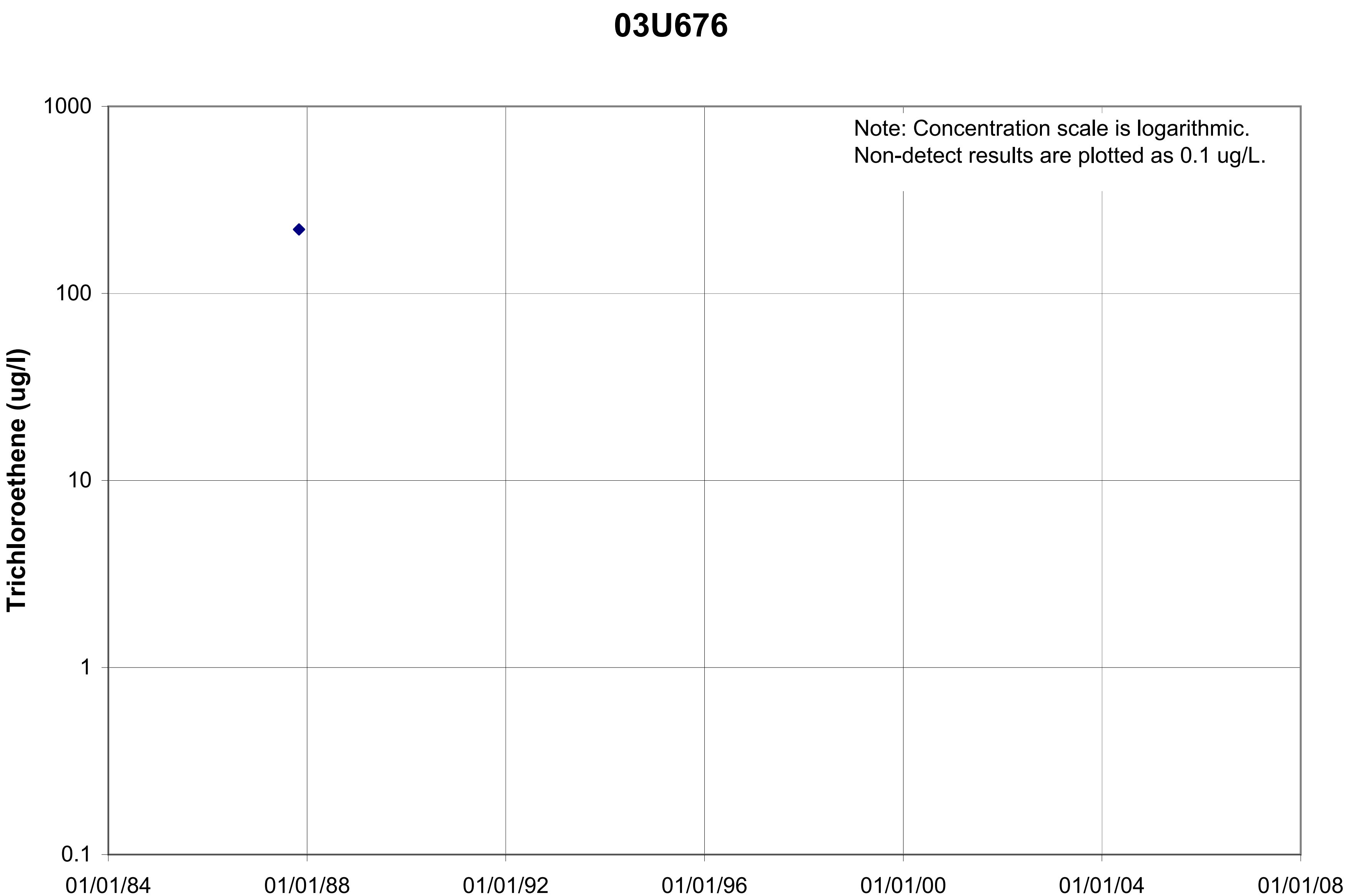

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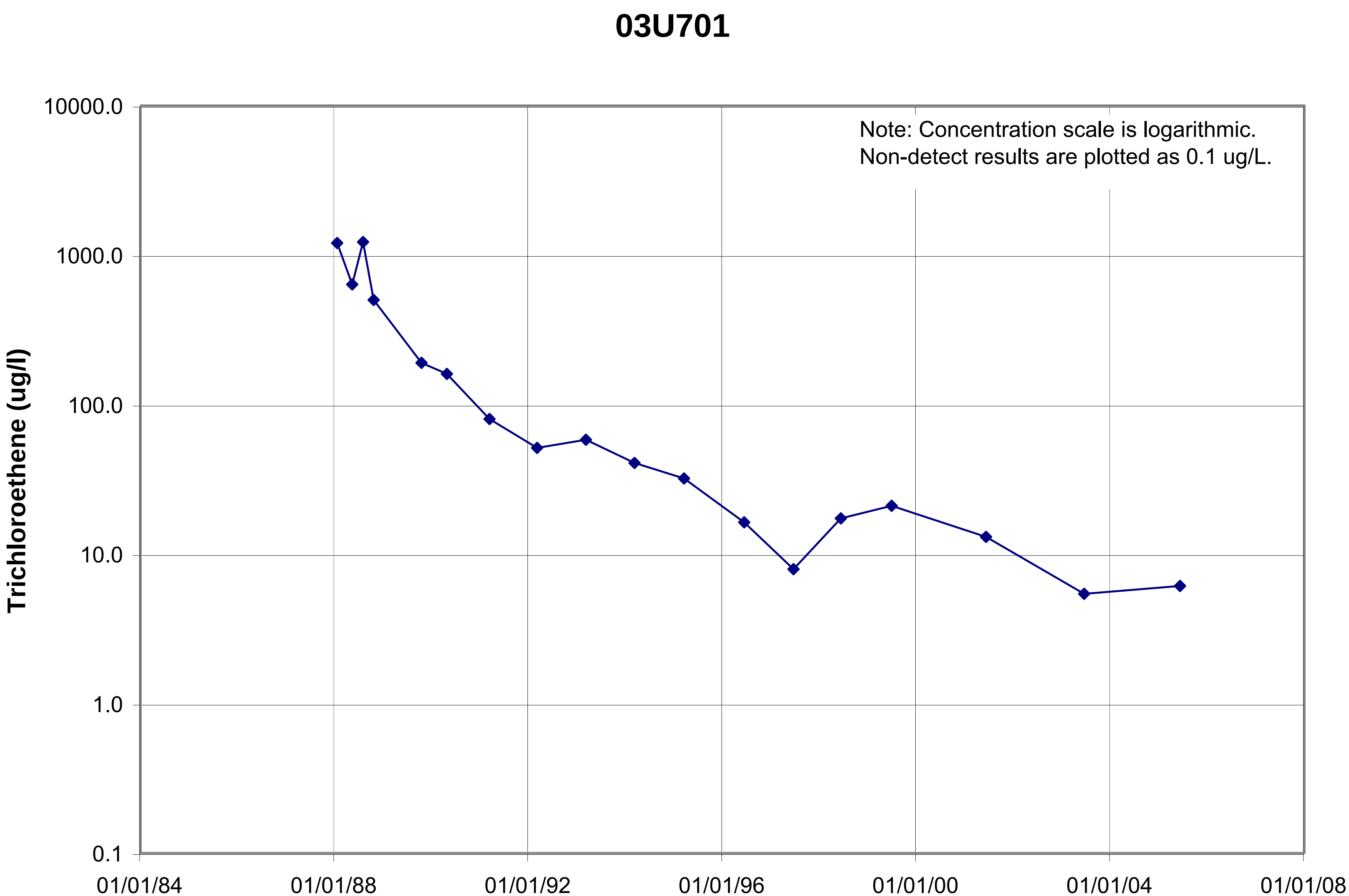

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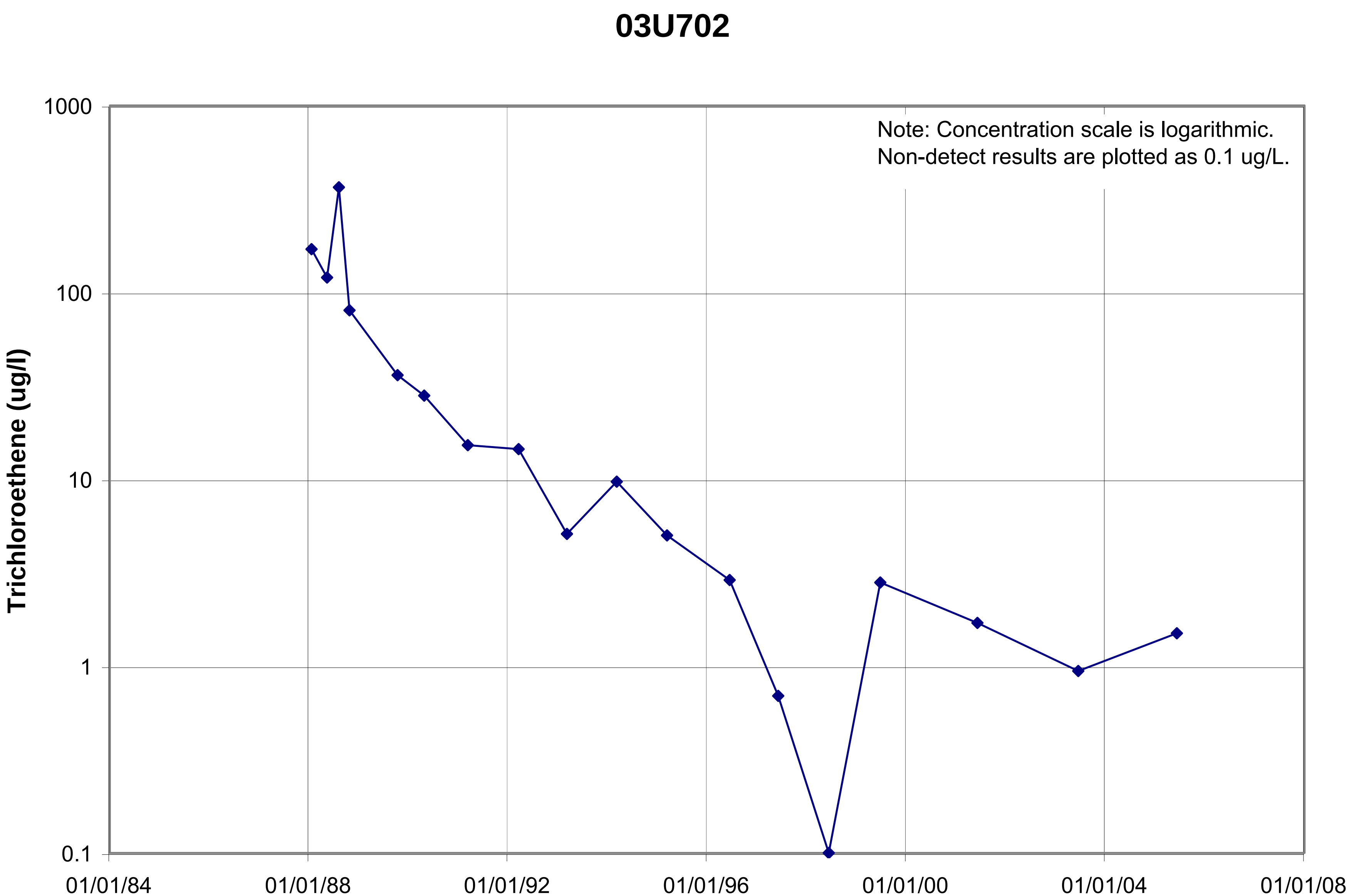

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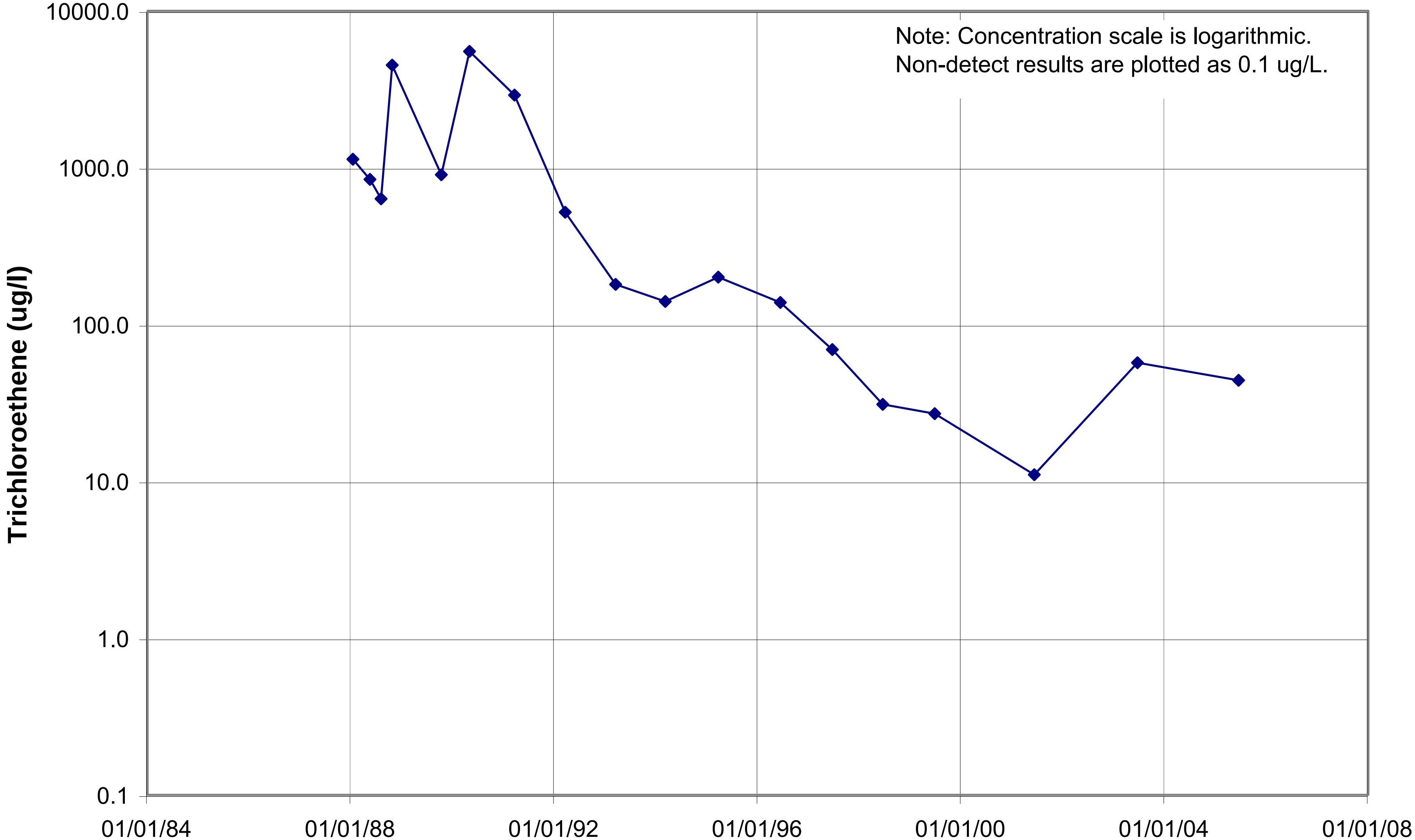

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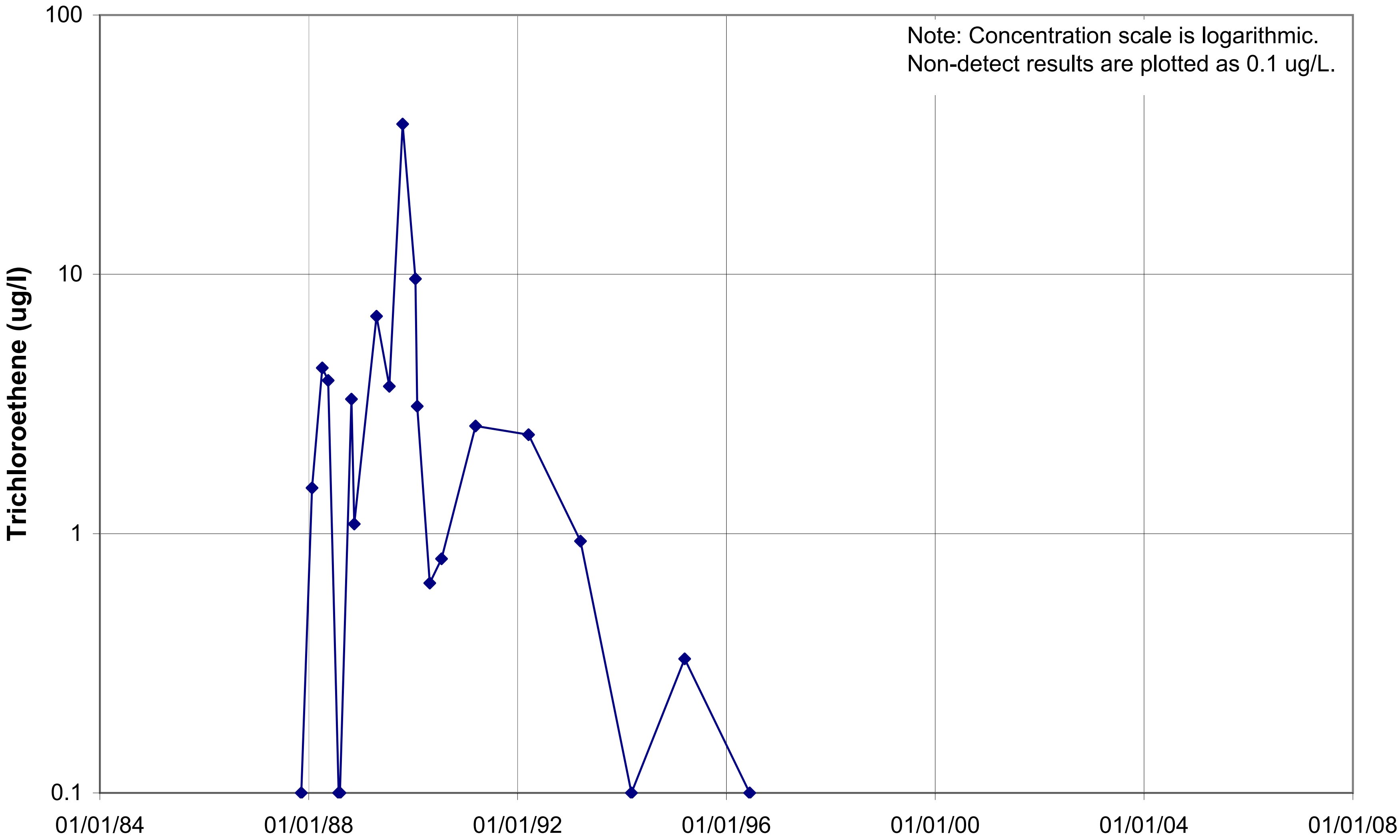

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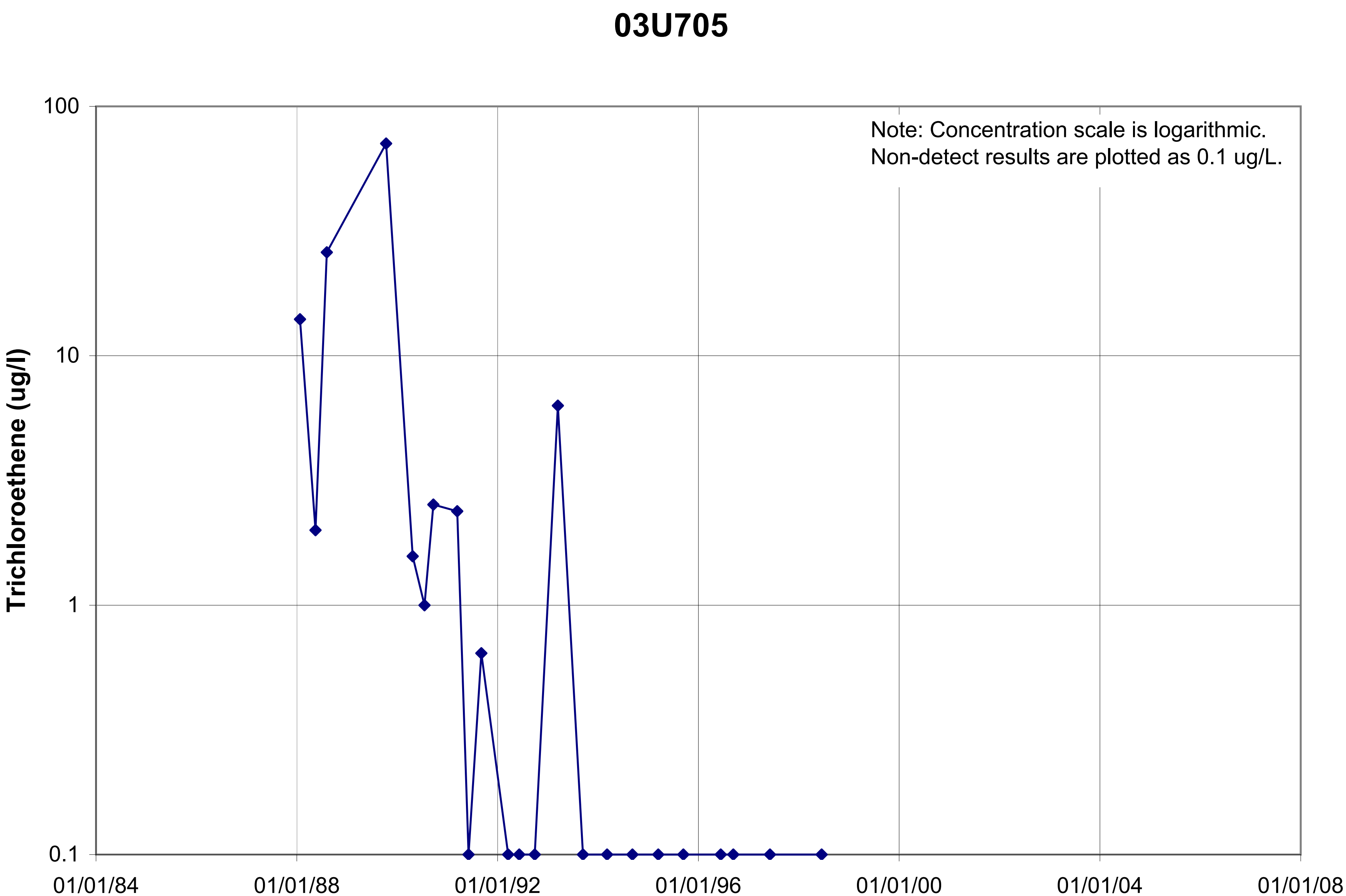

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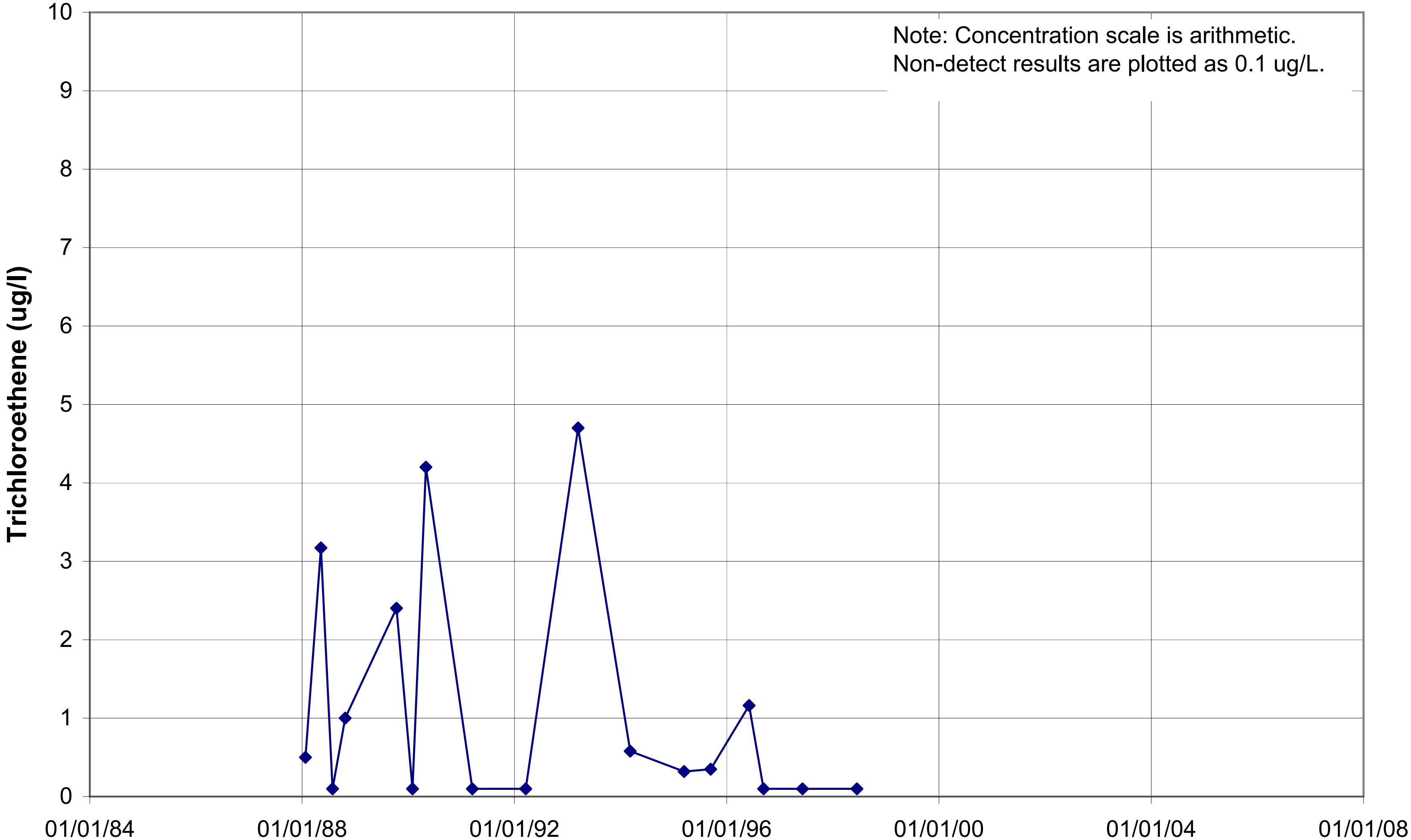

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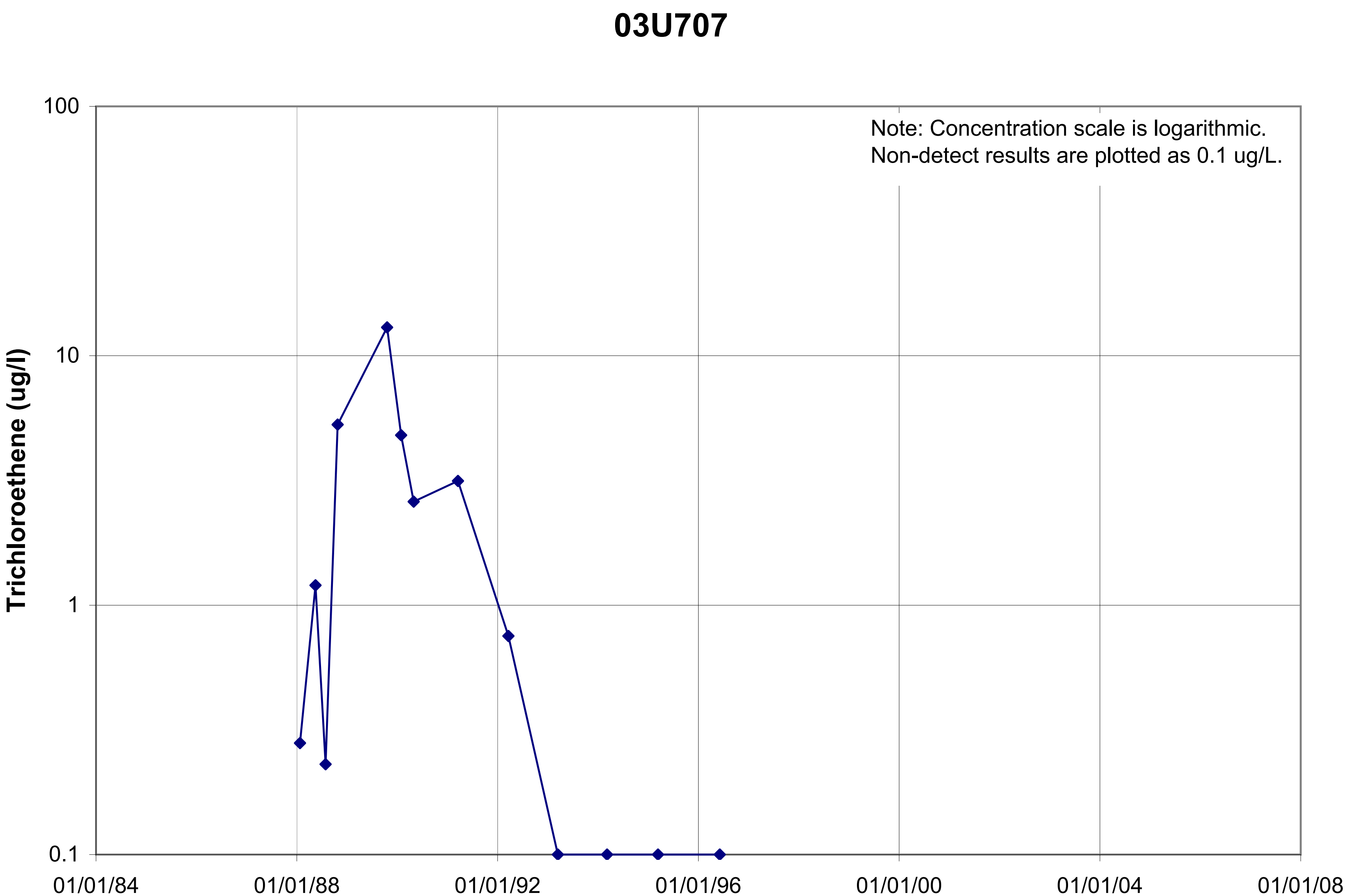

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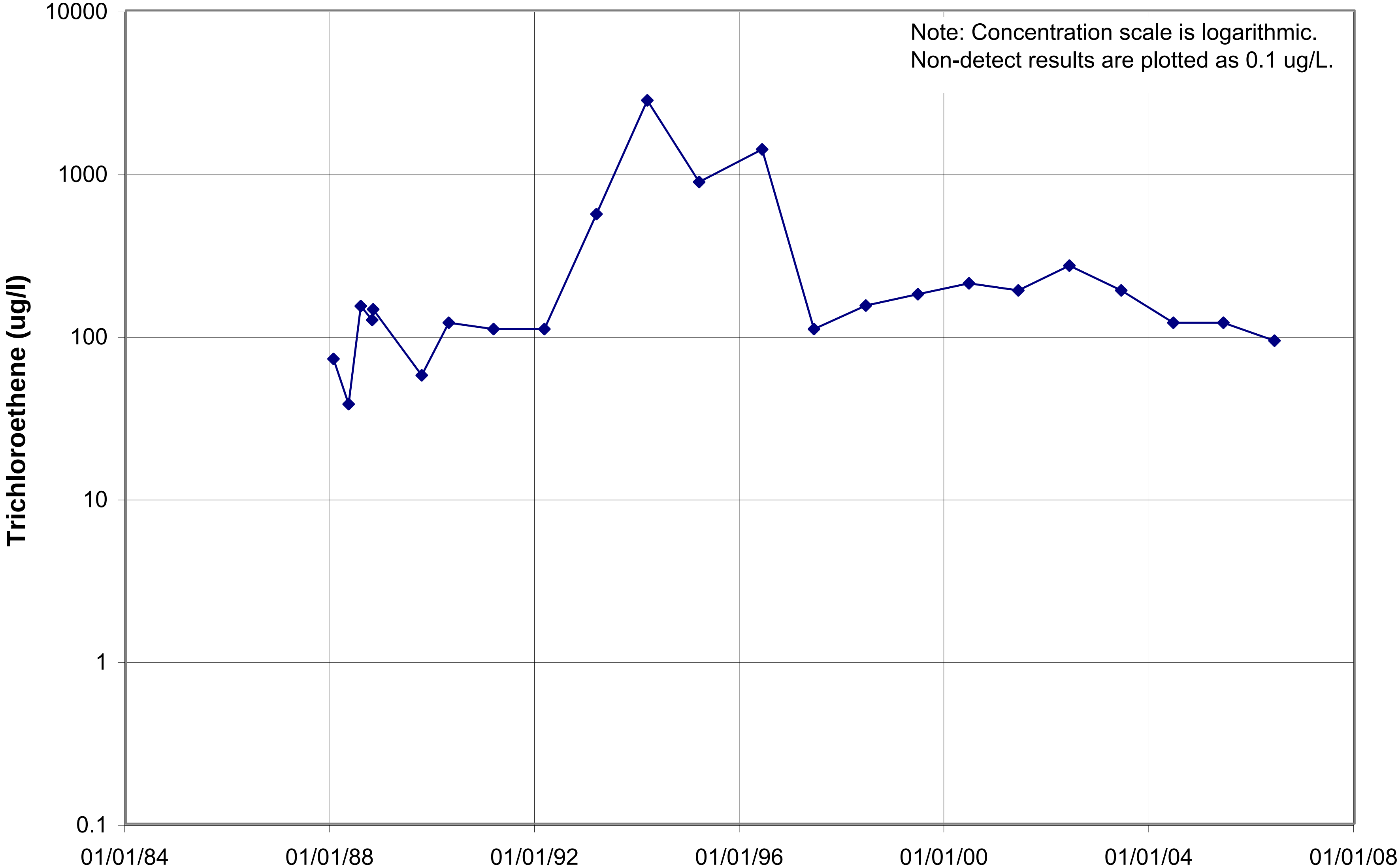

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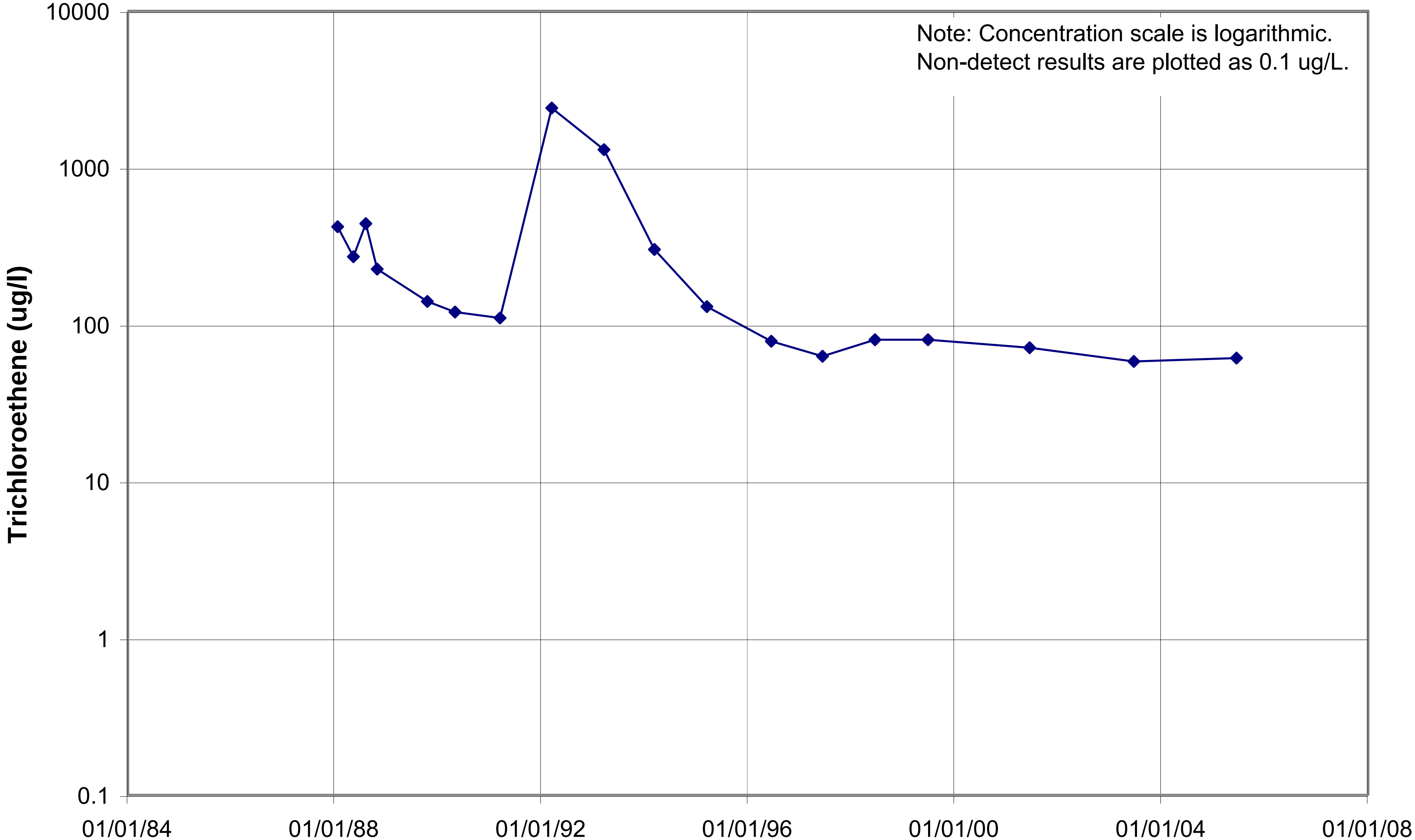

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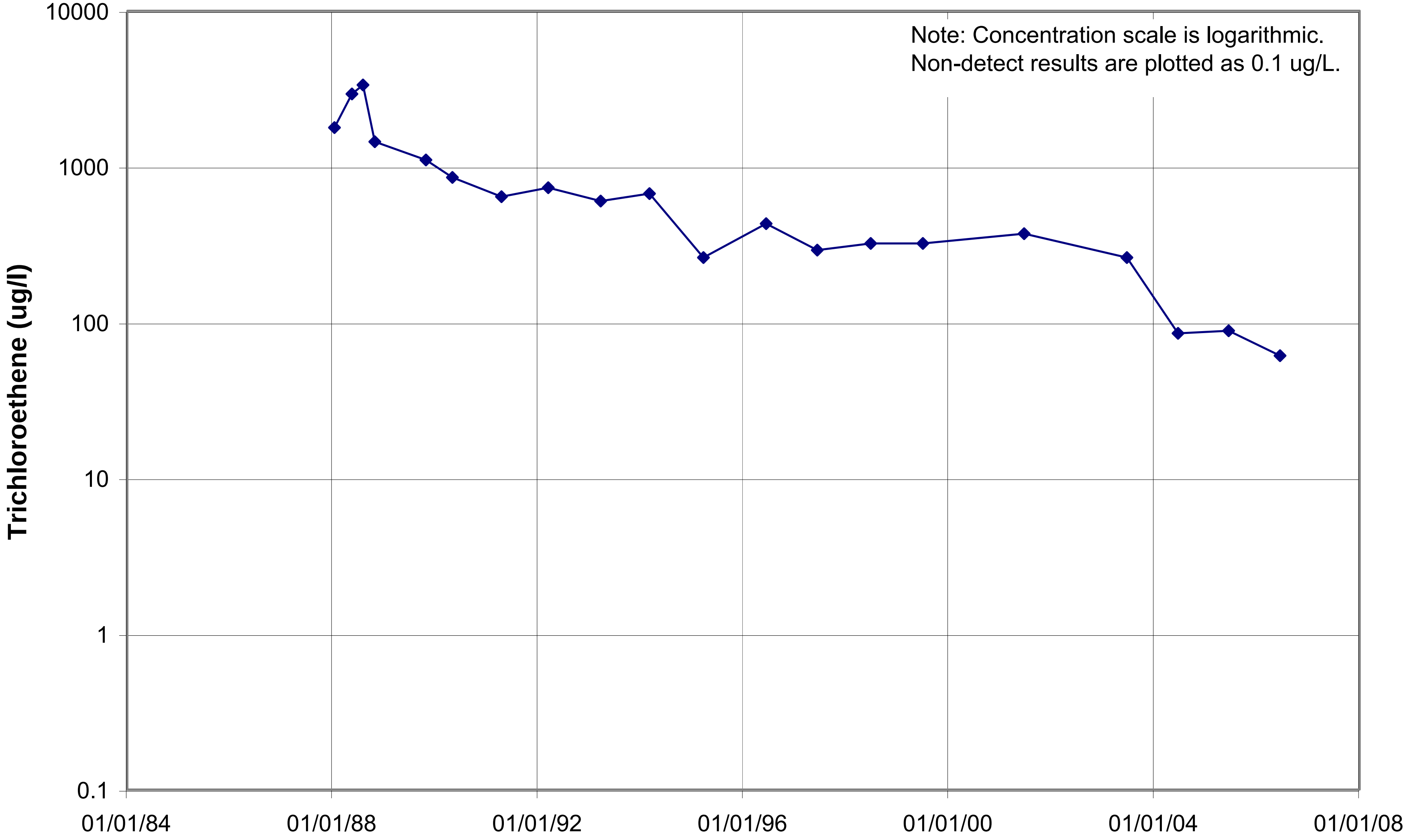

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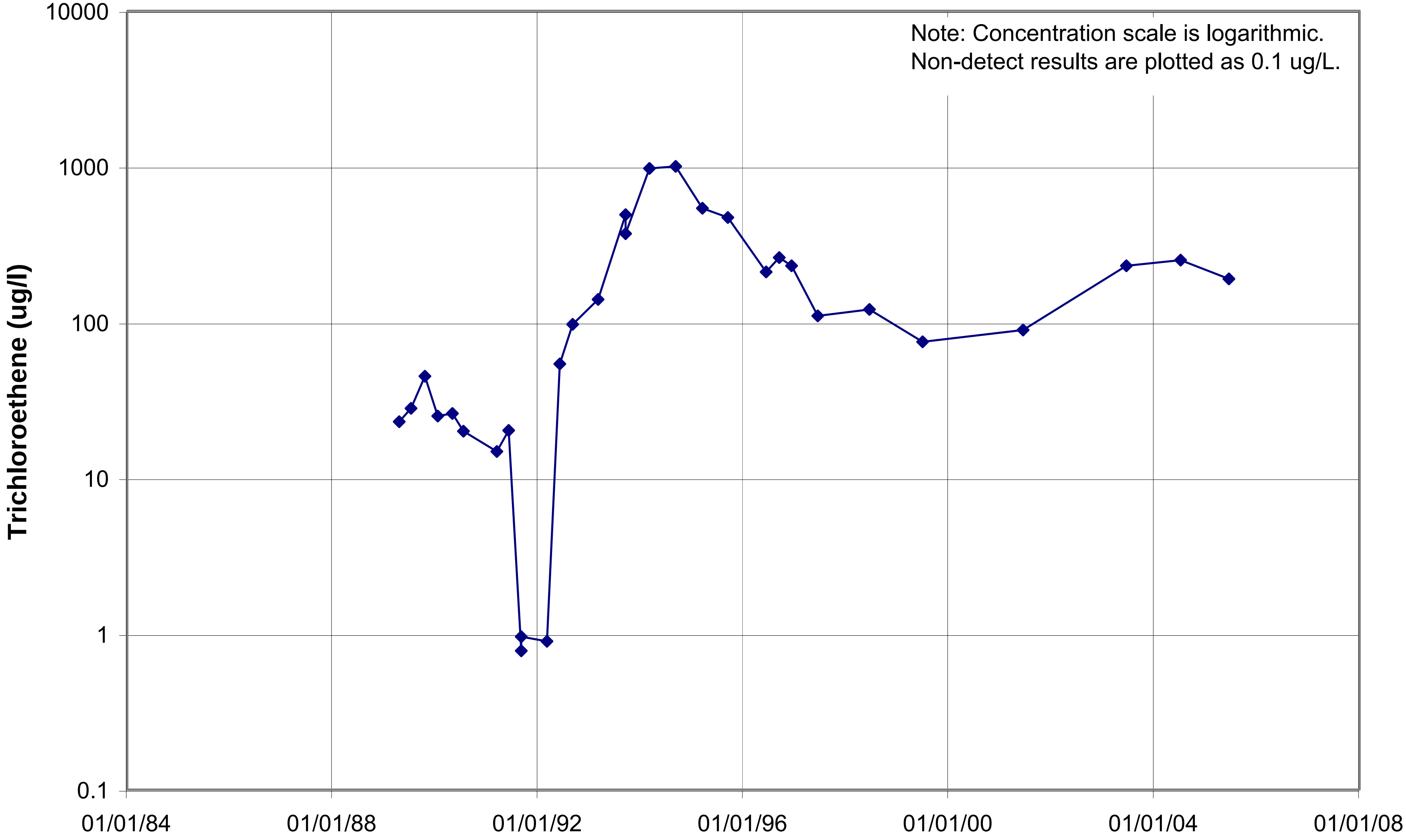

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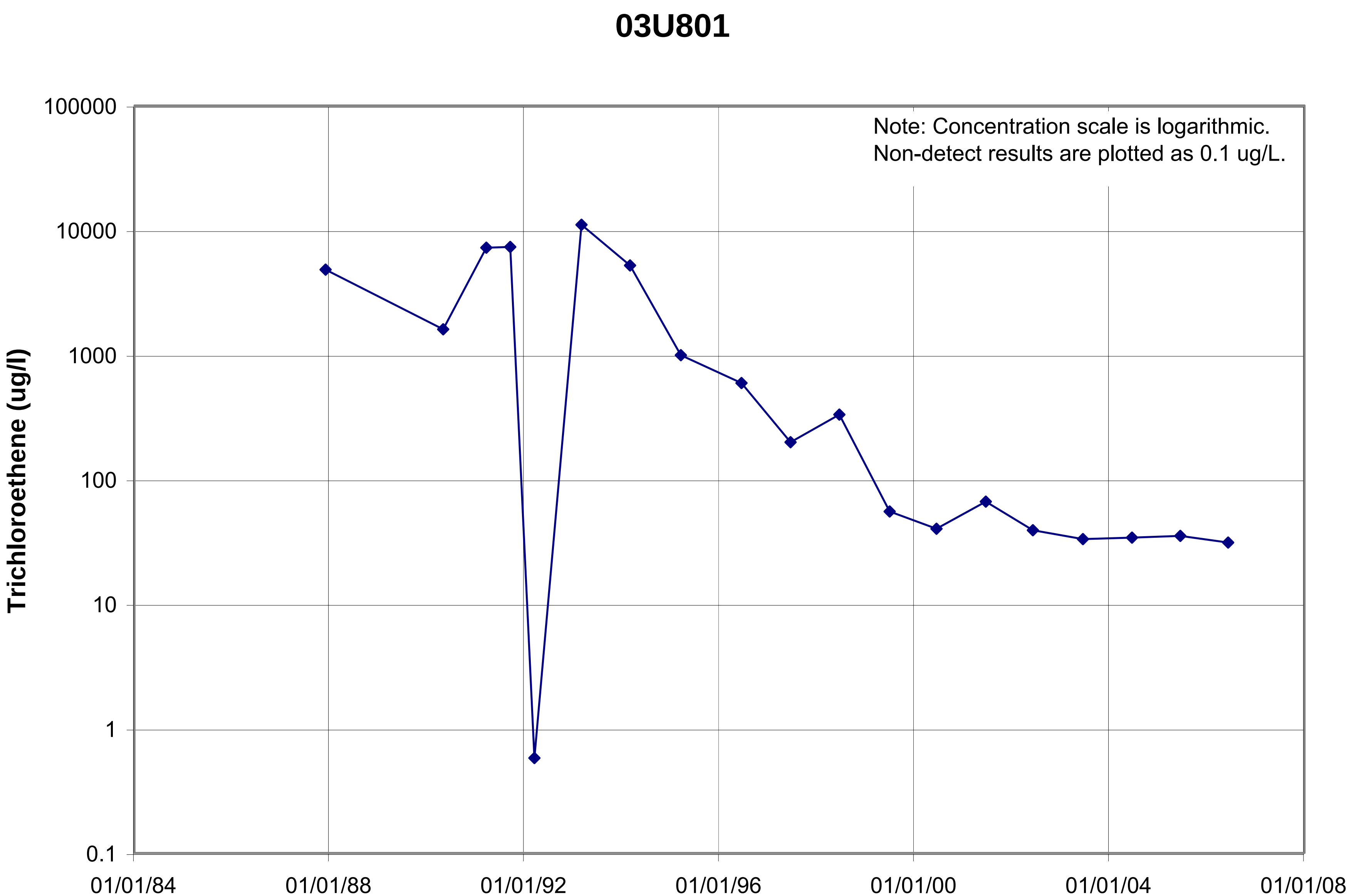

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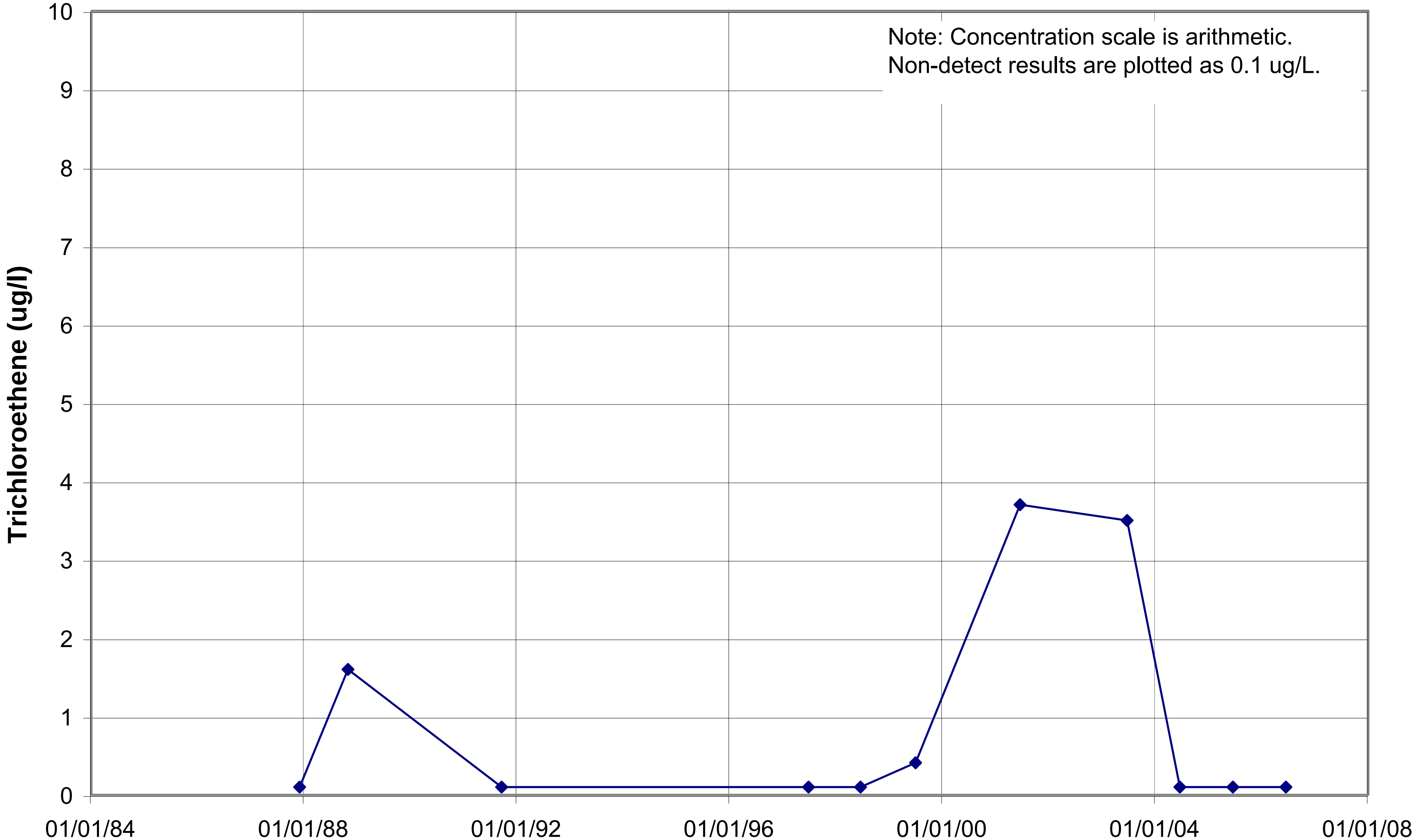

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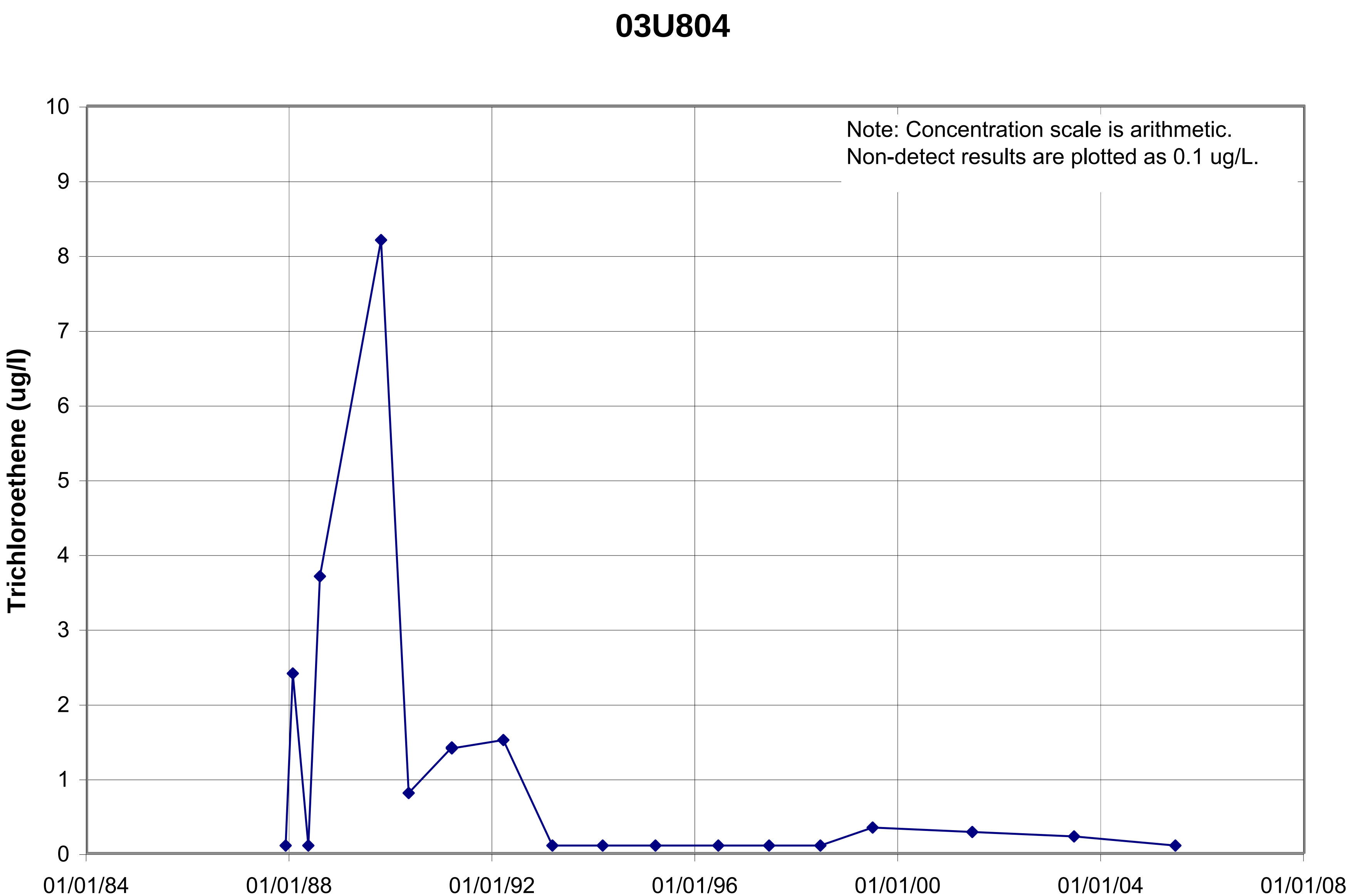

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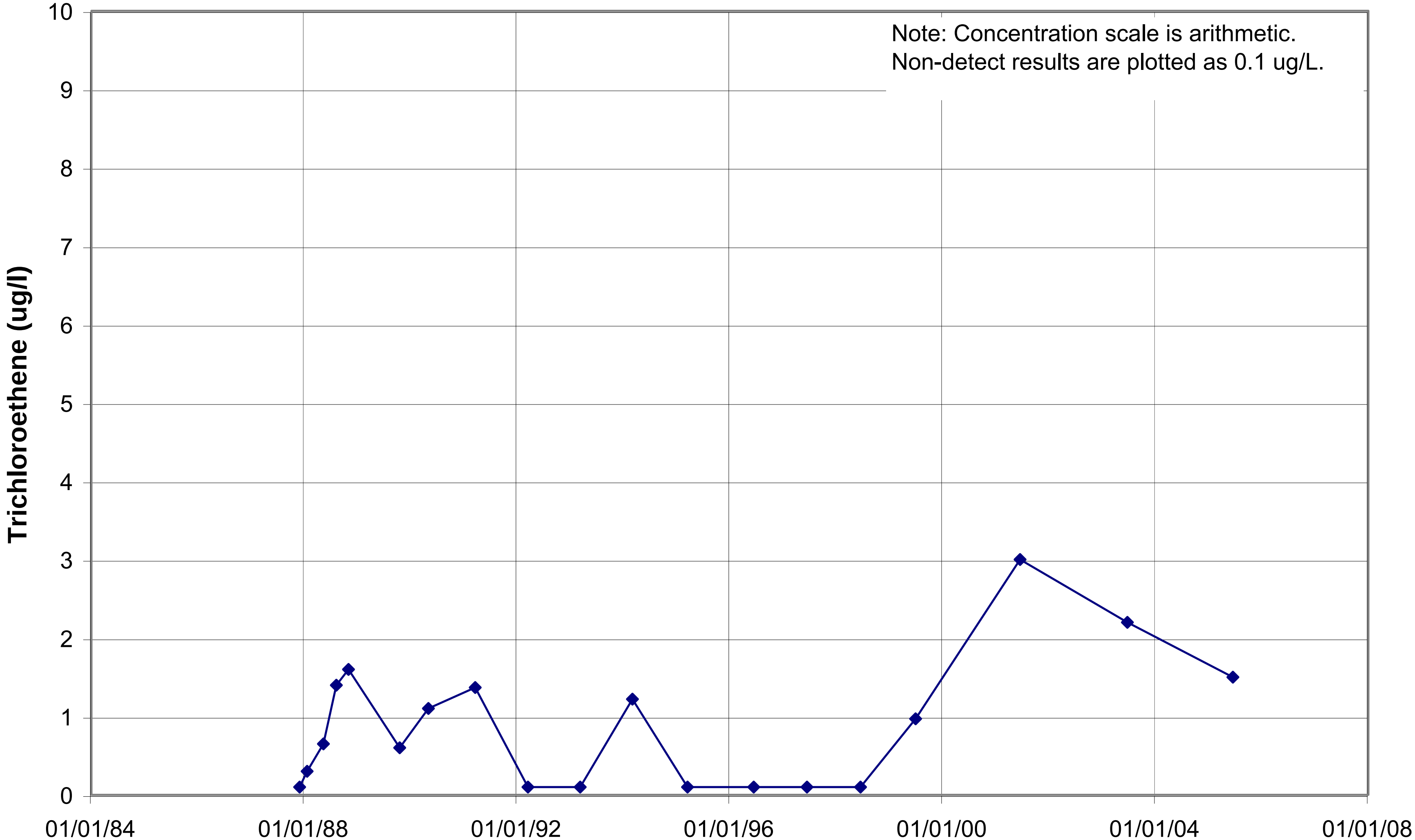

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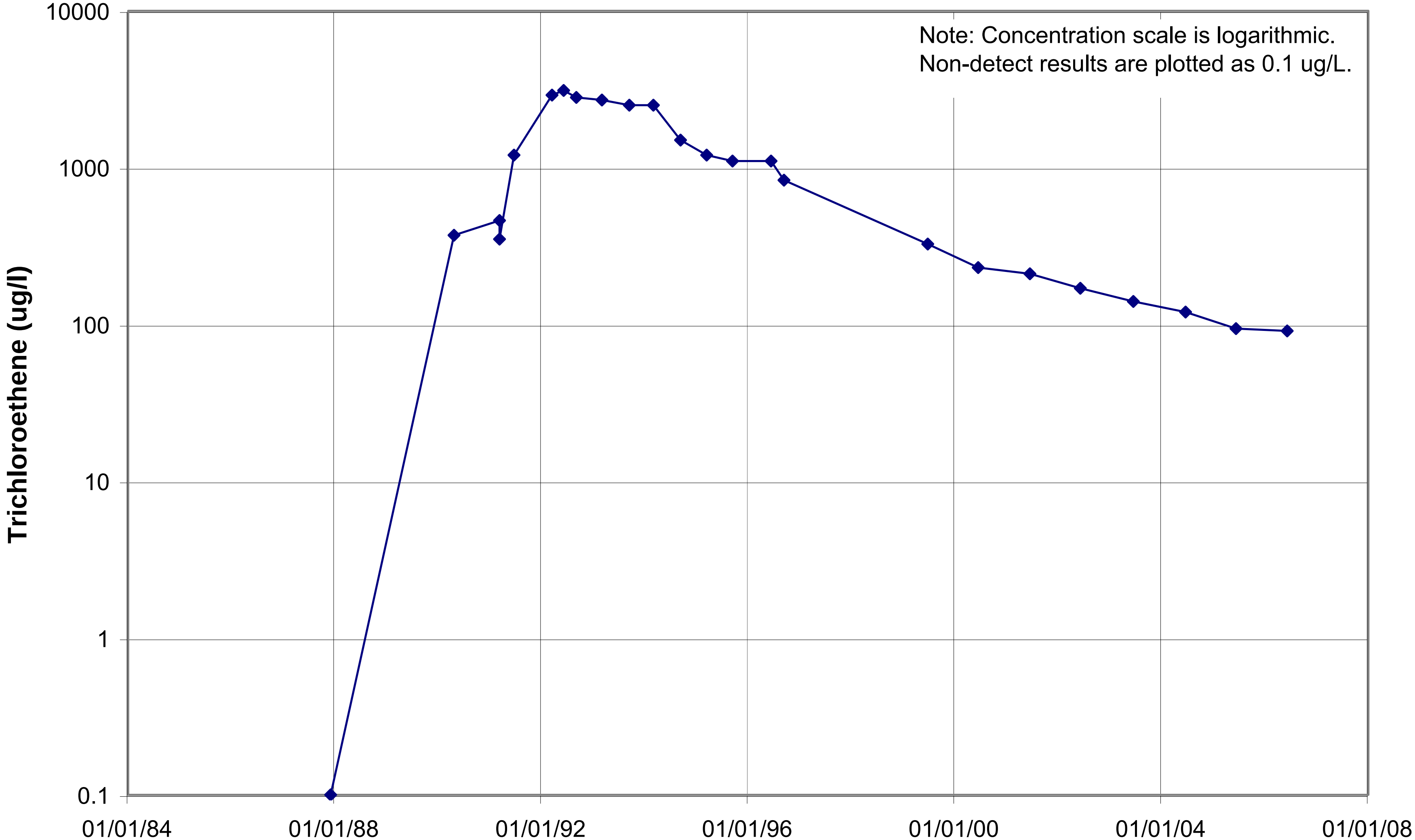

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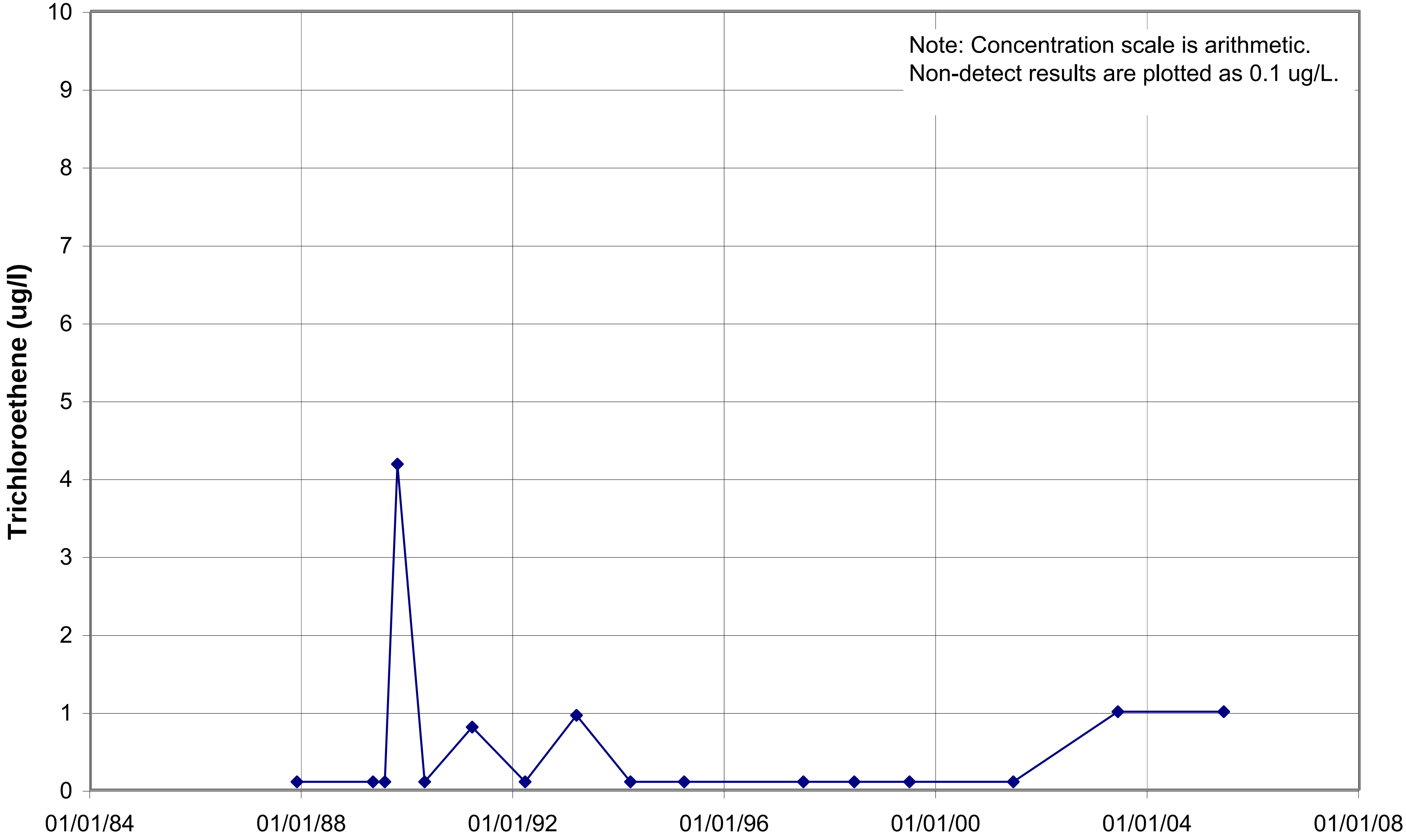

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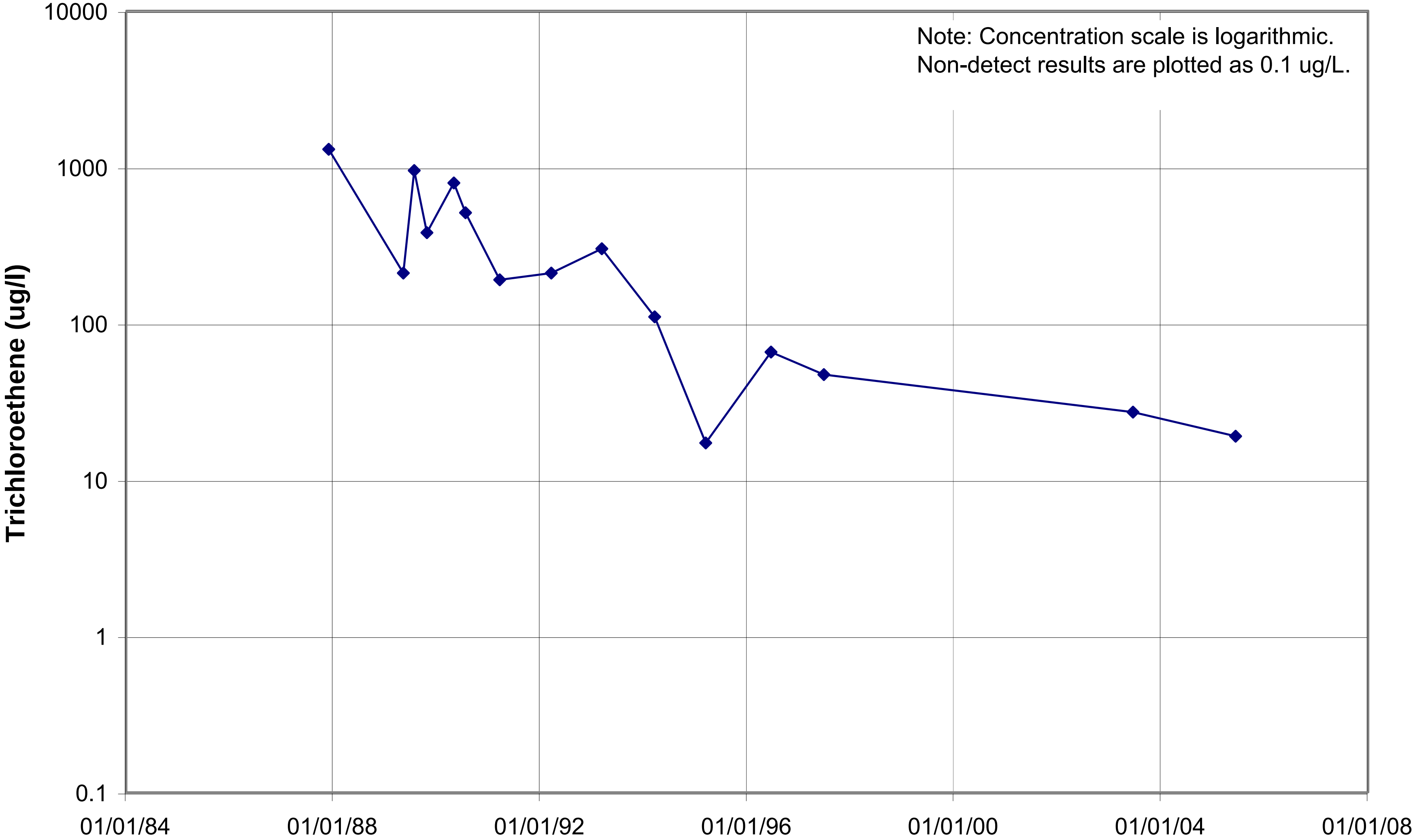
03U821



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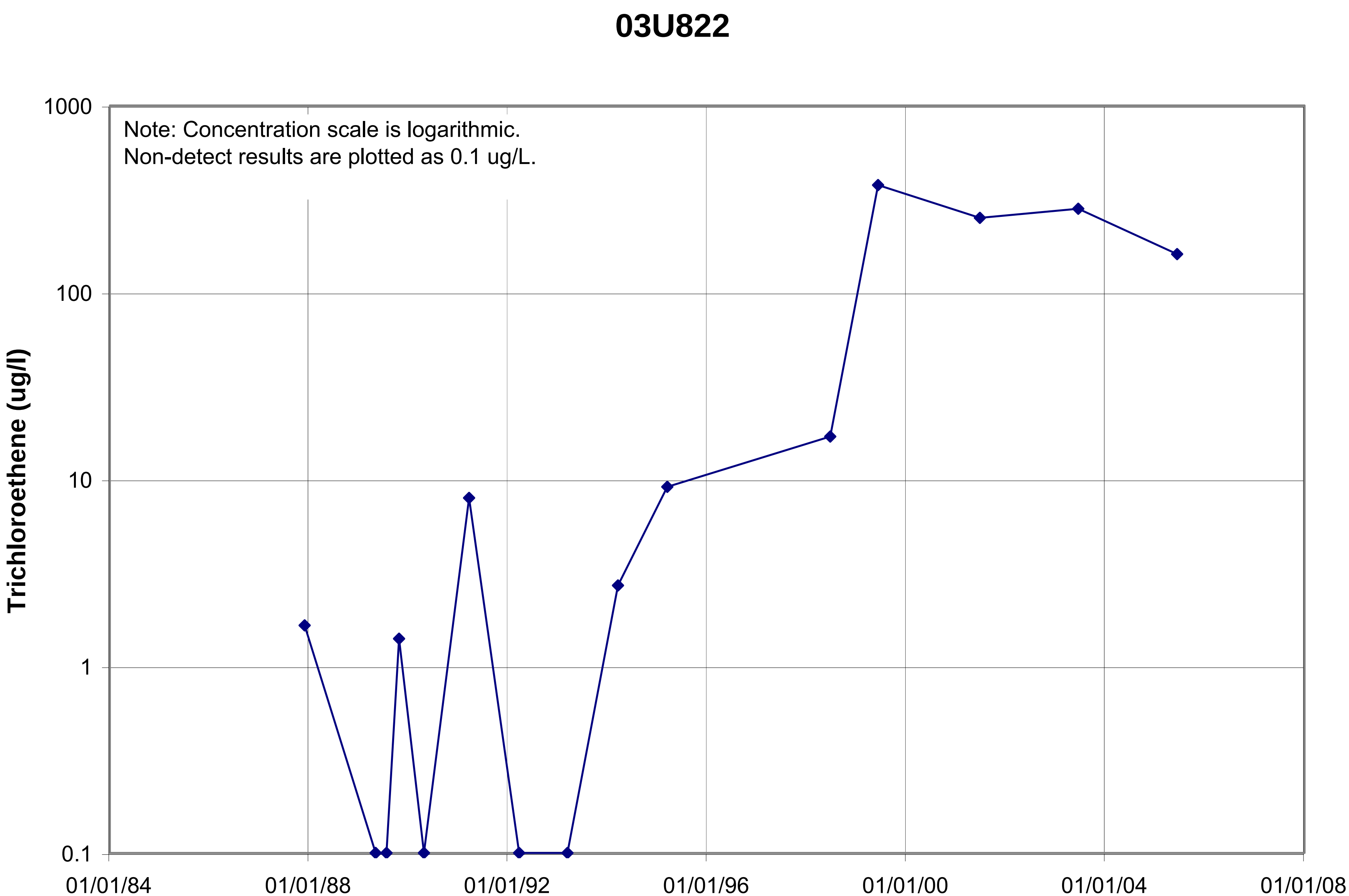

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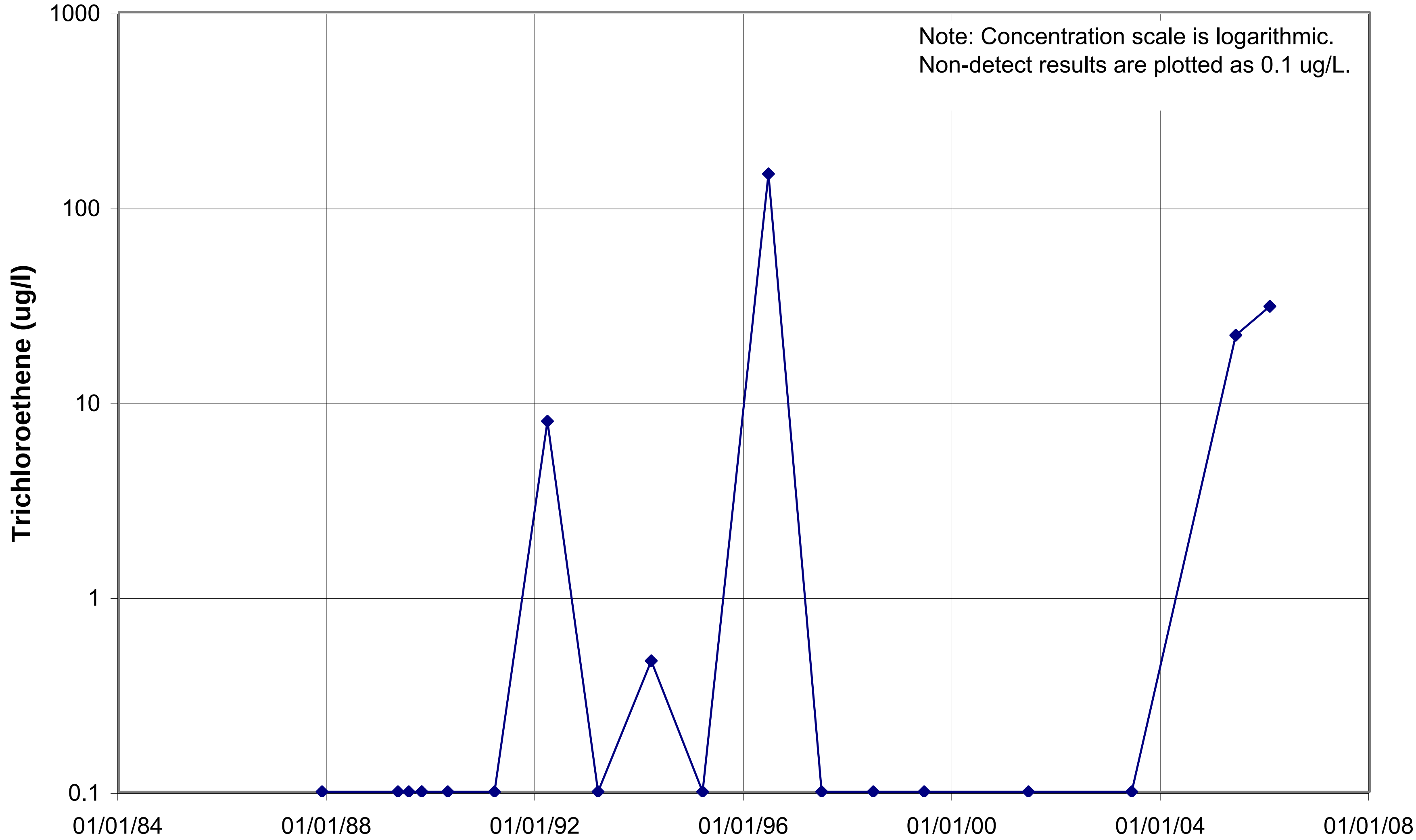

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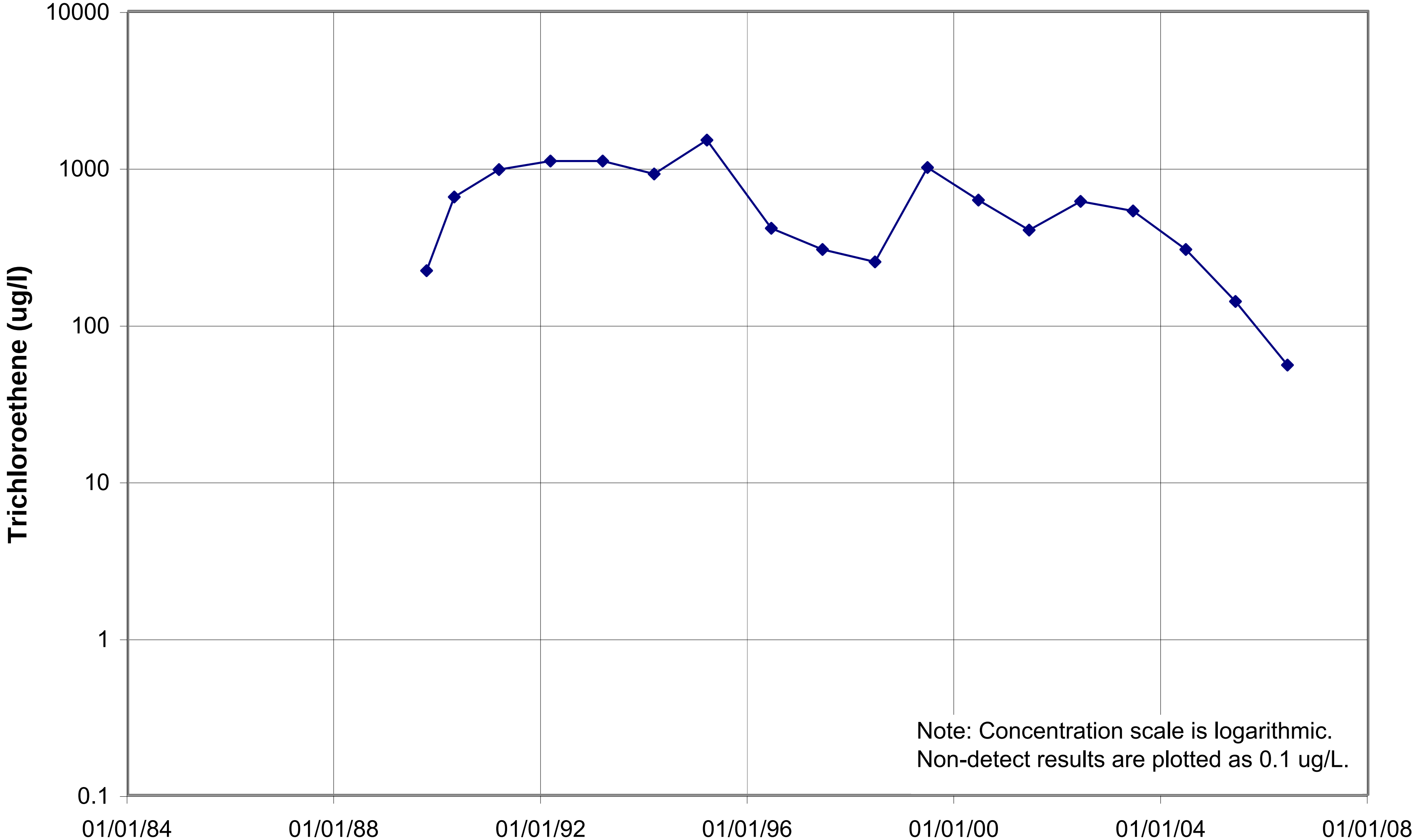
04J077



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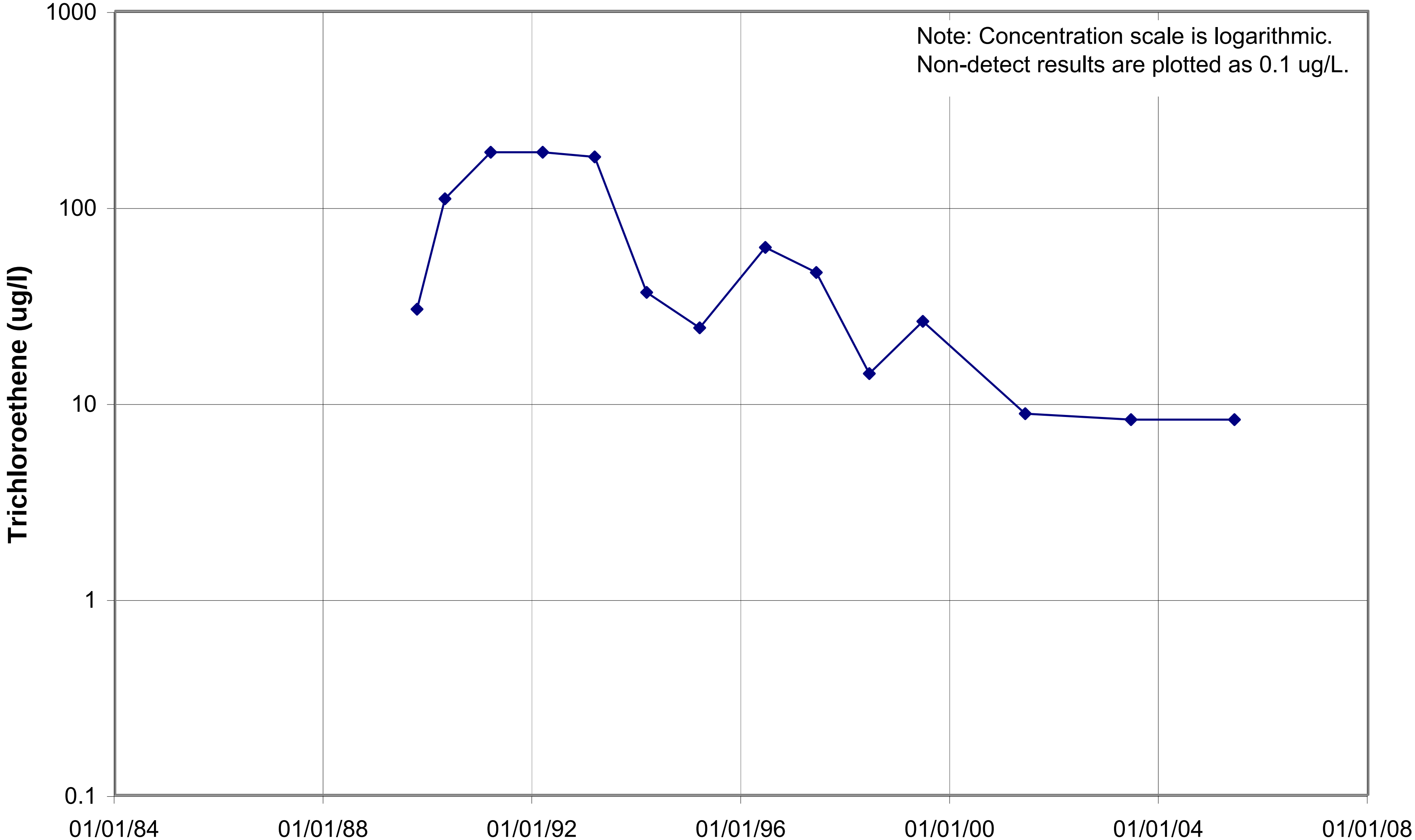

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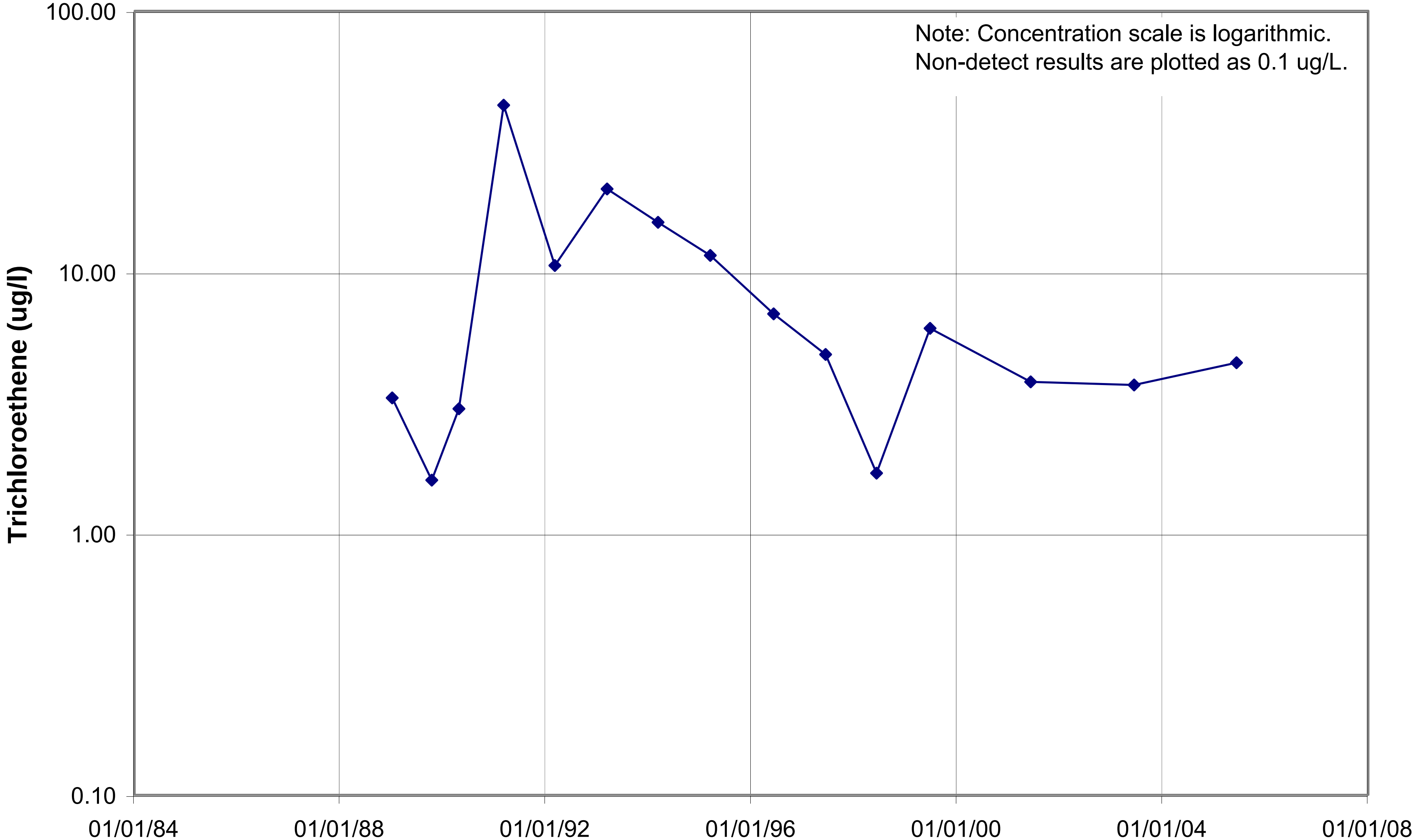

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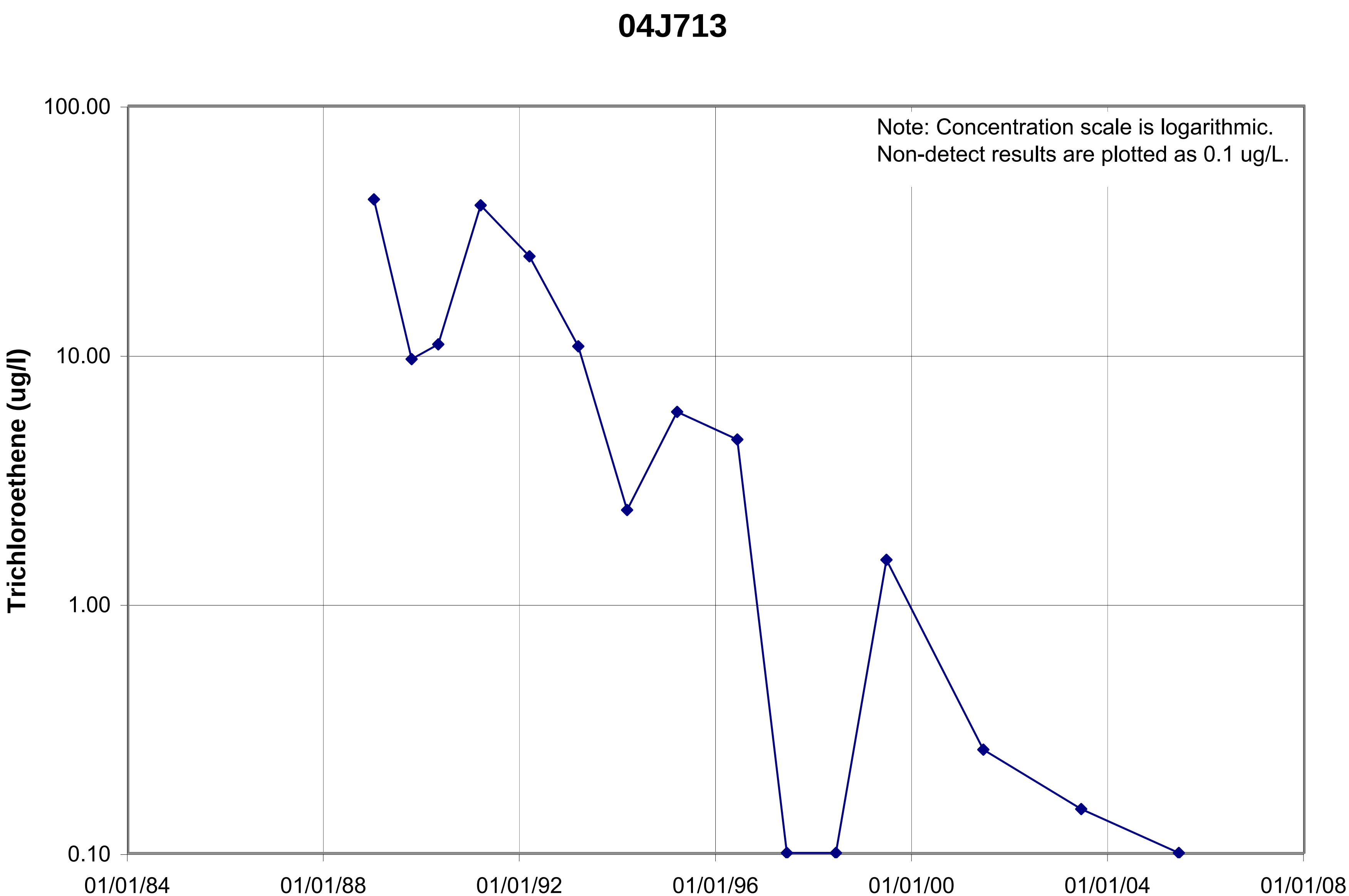

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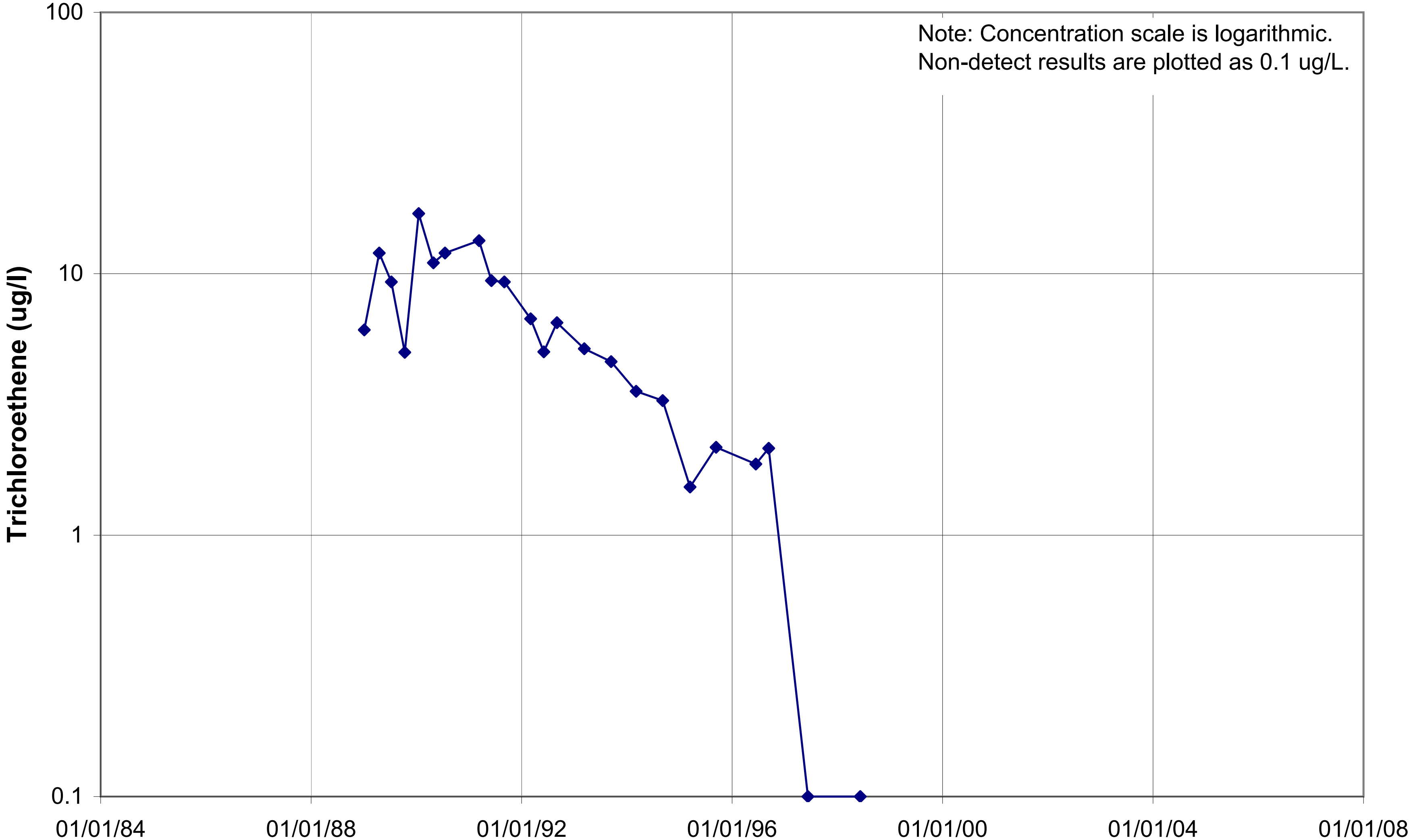

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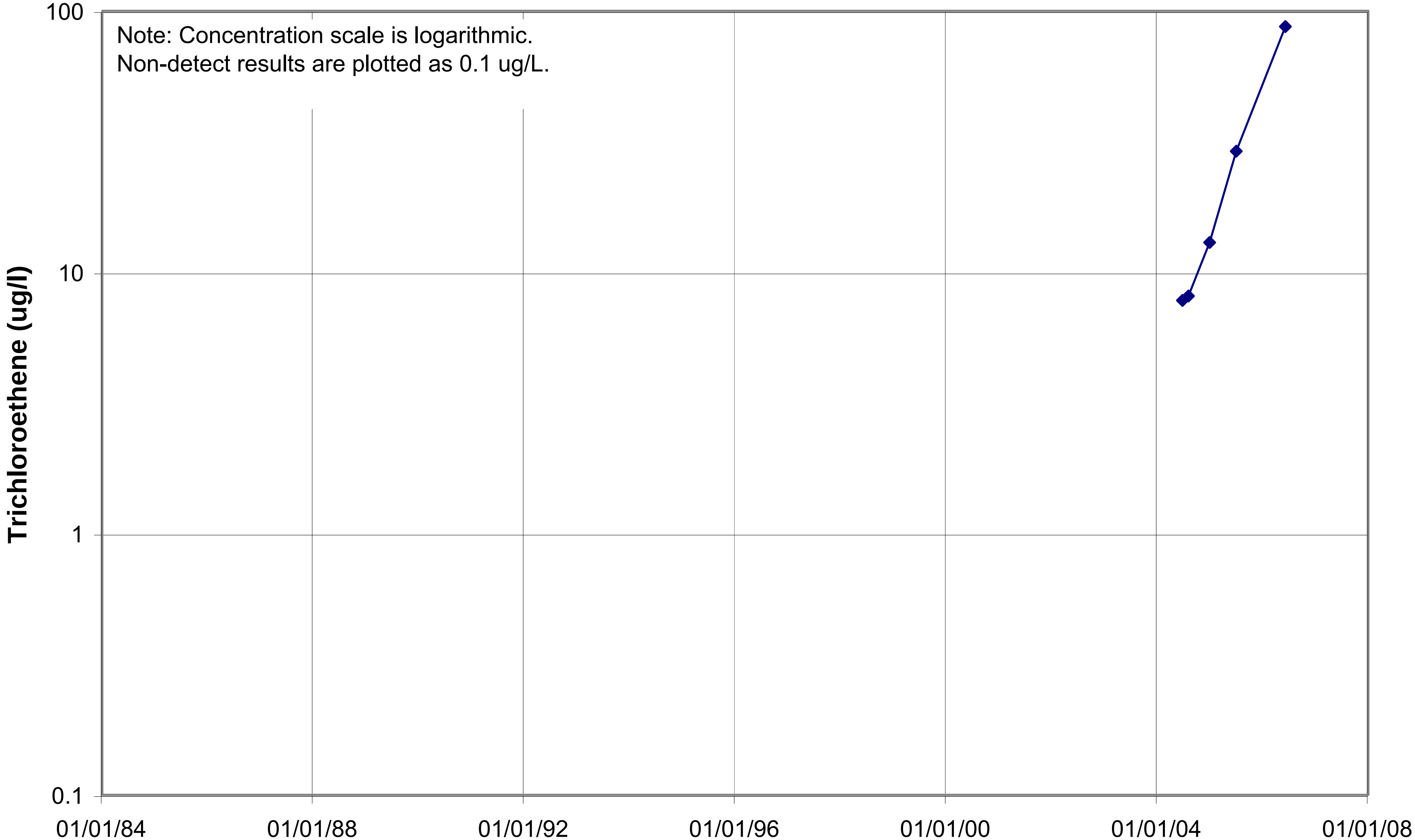

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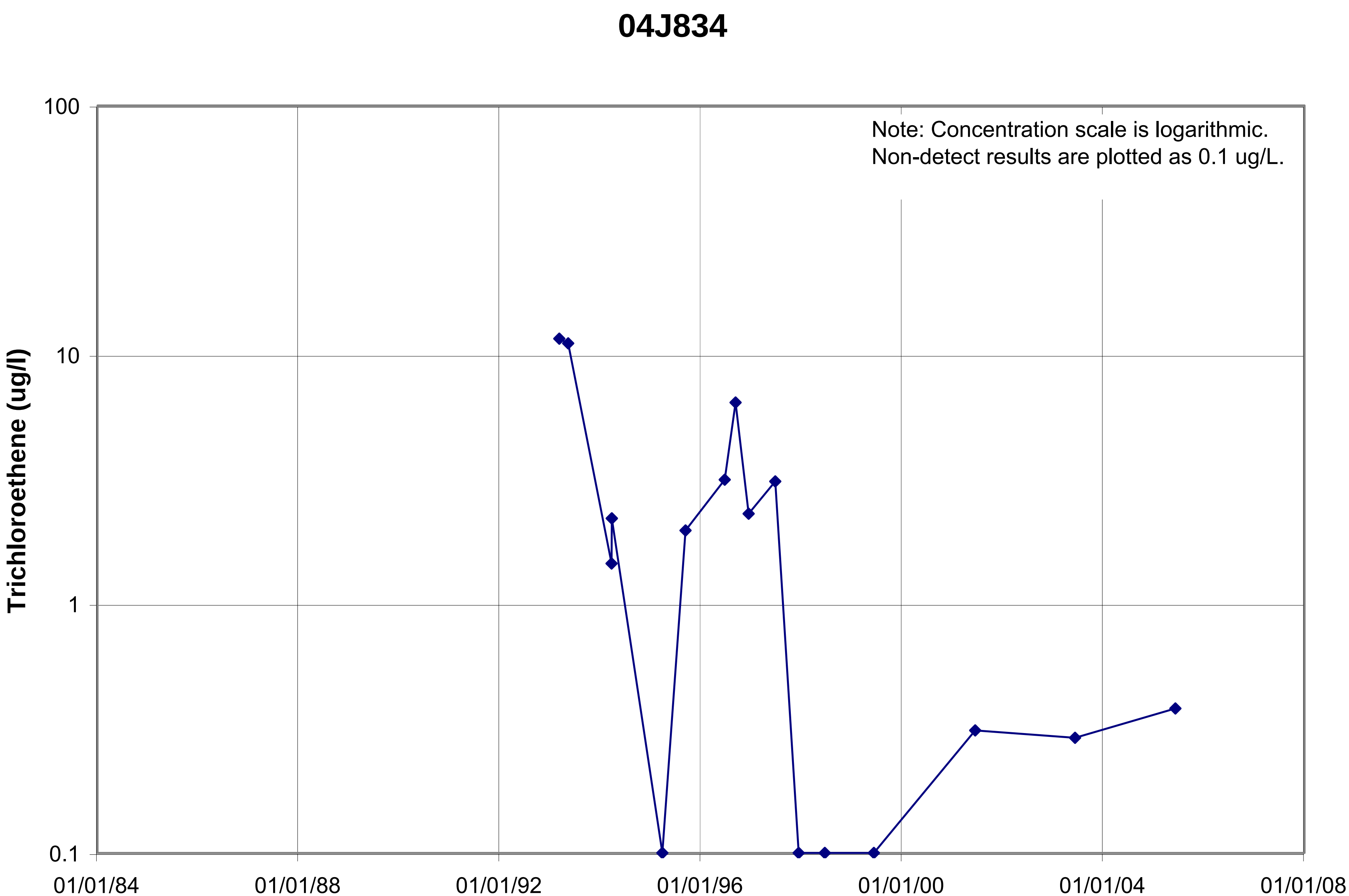

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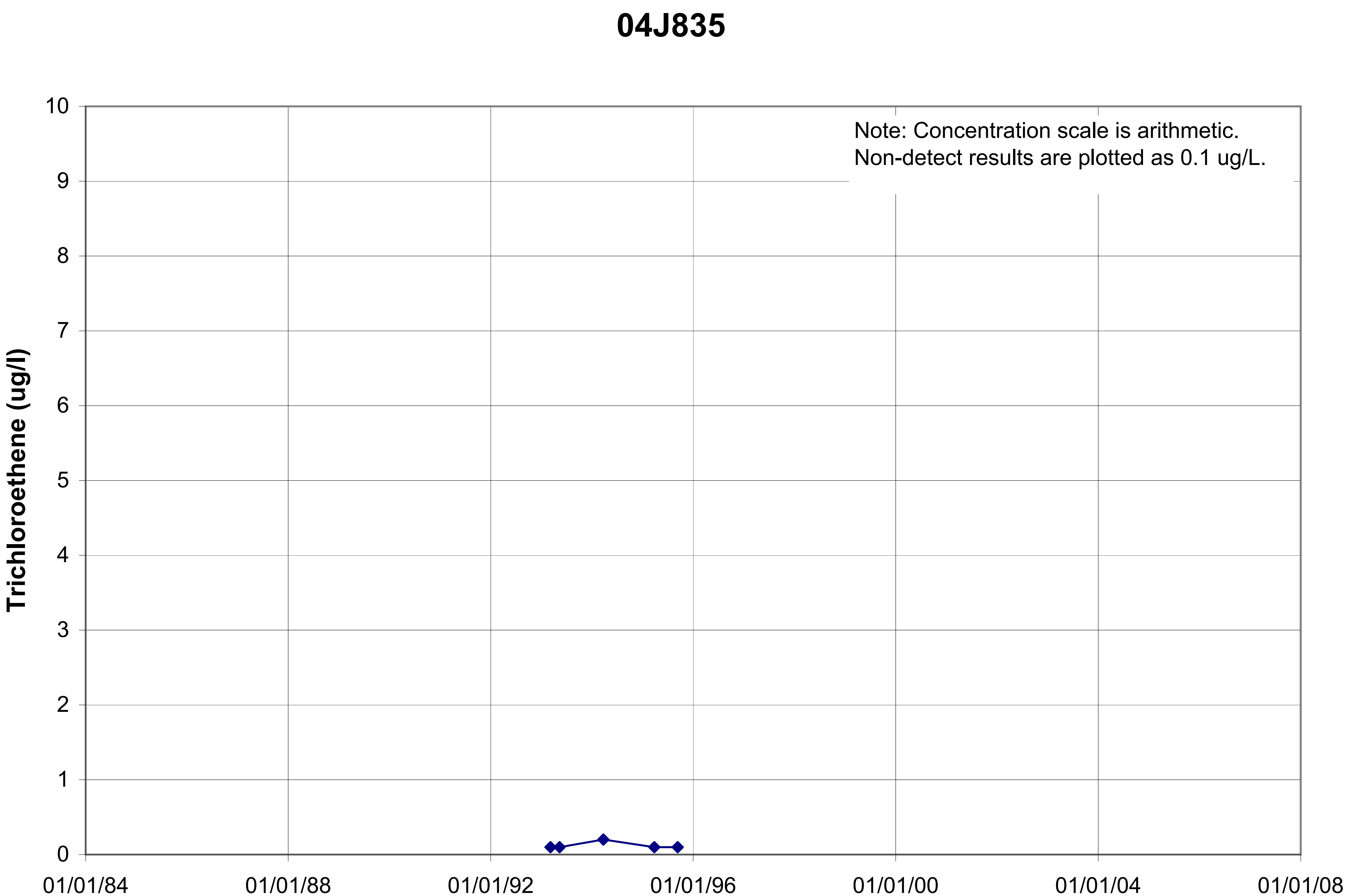

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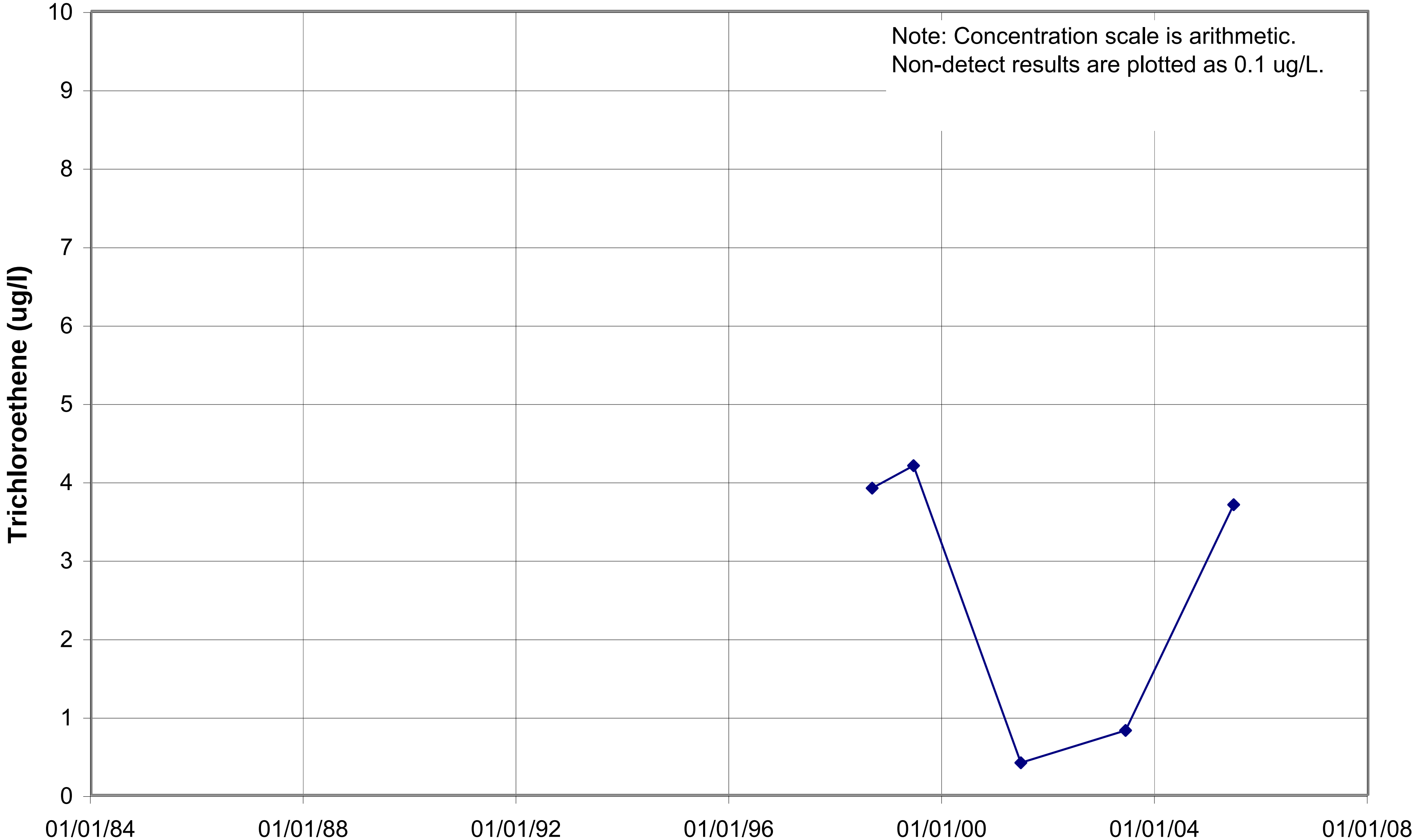

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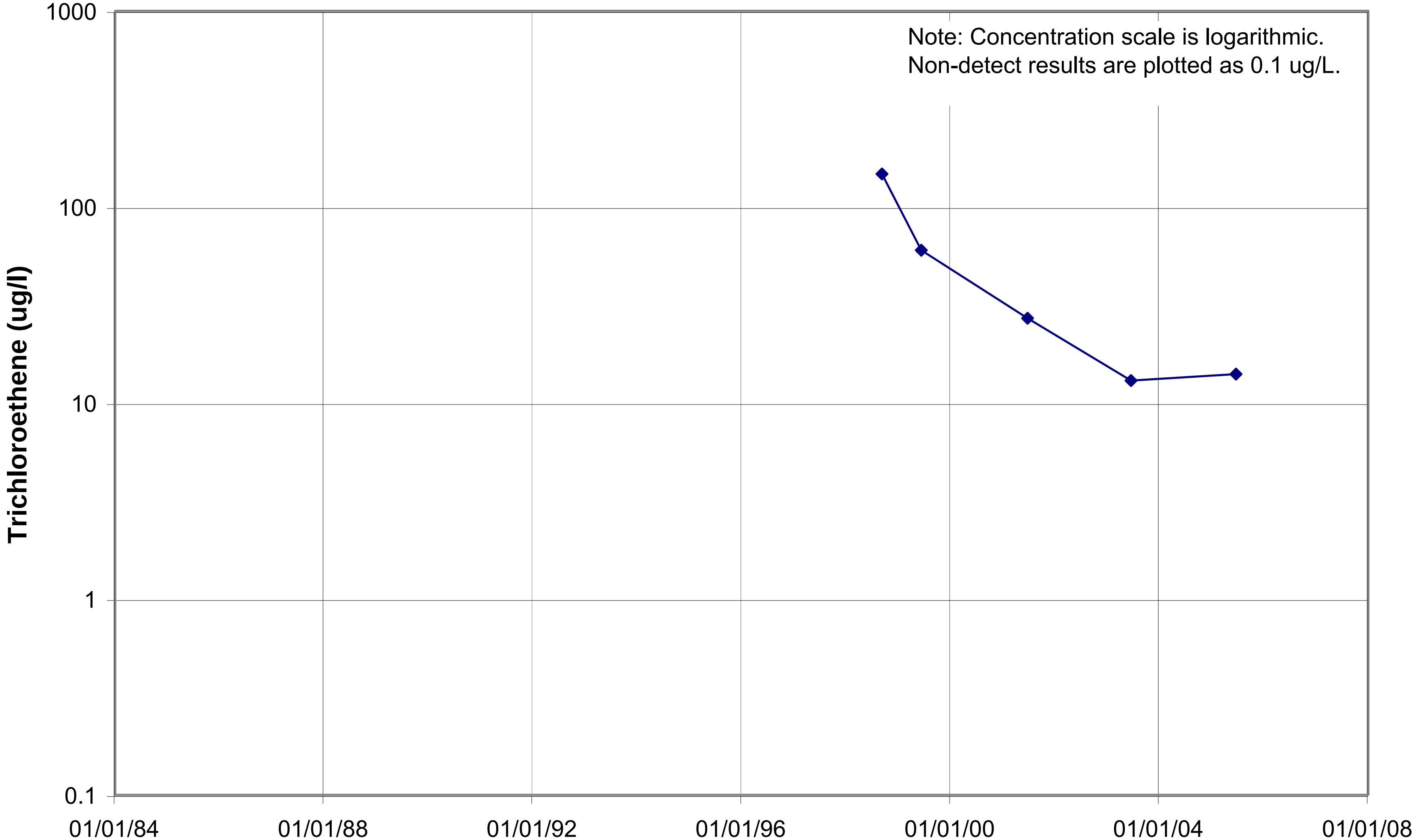

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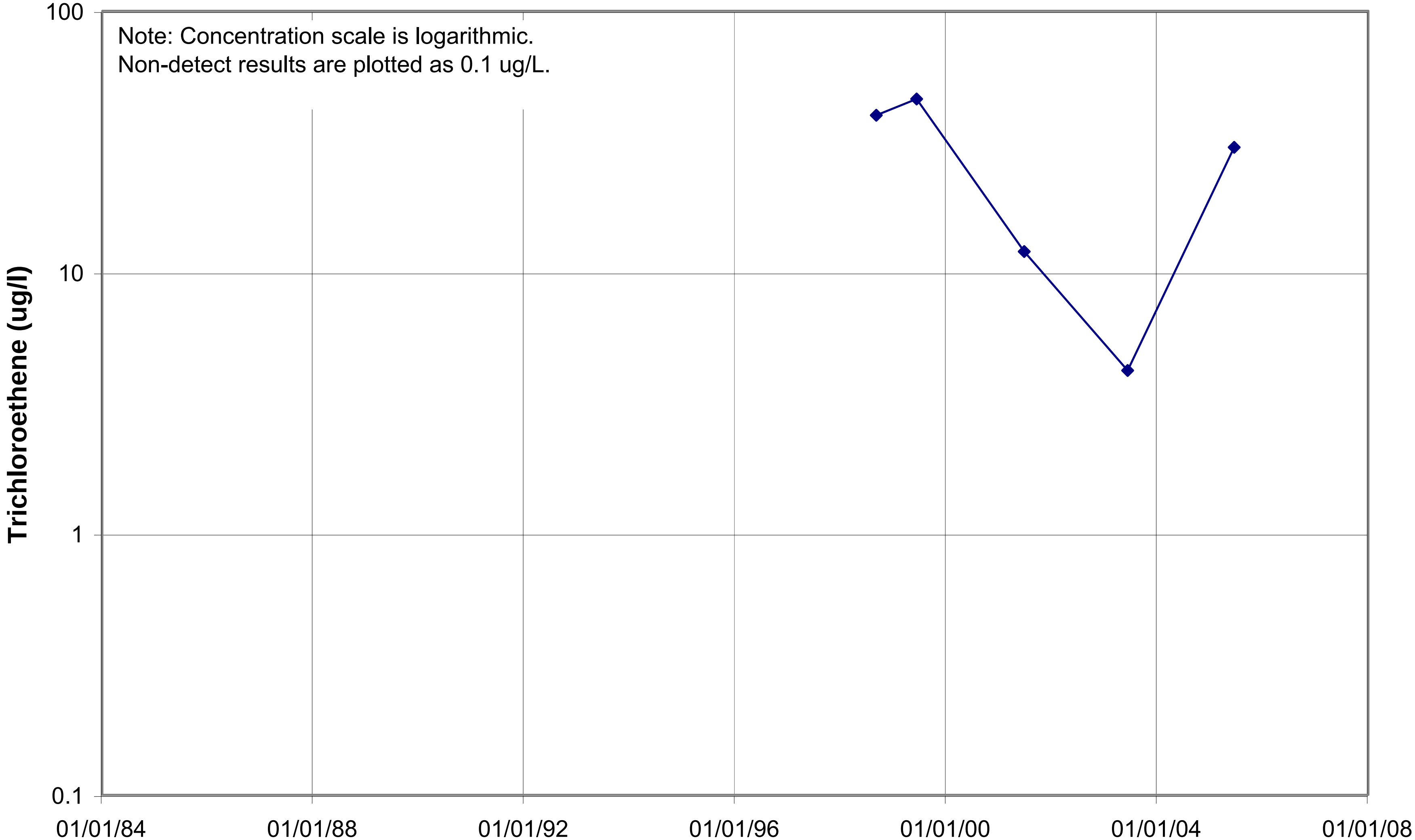

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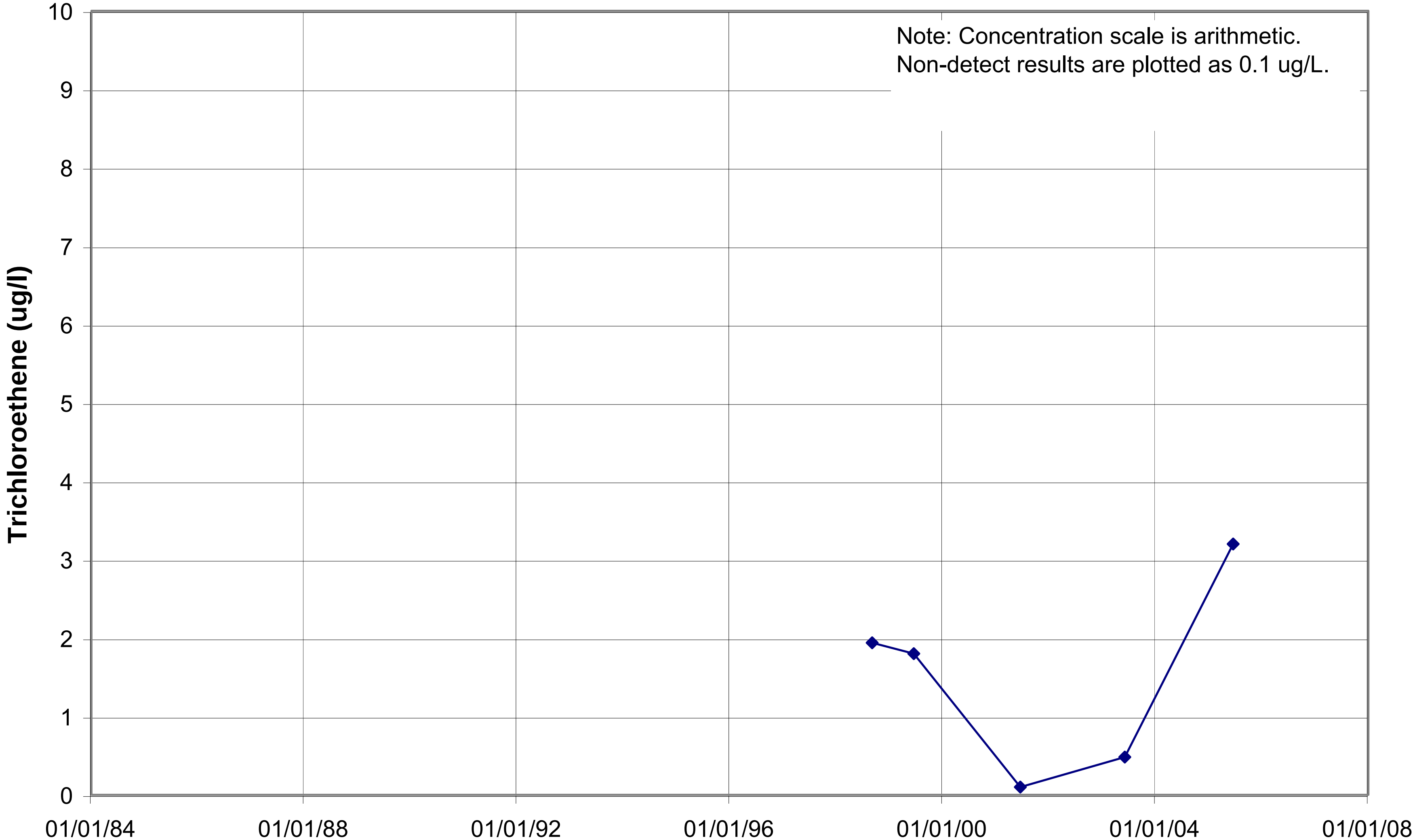

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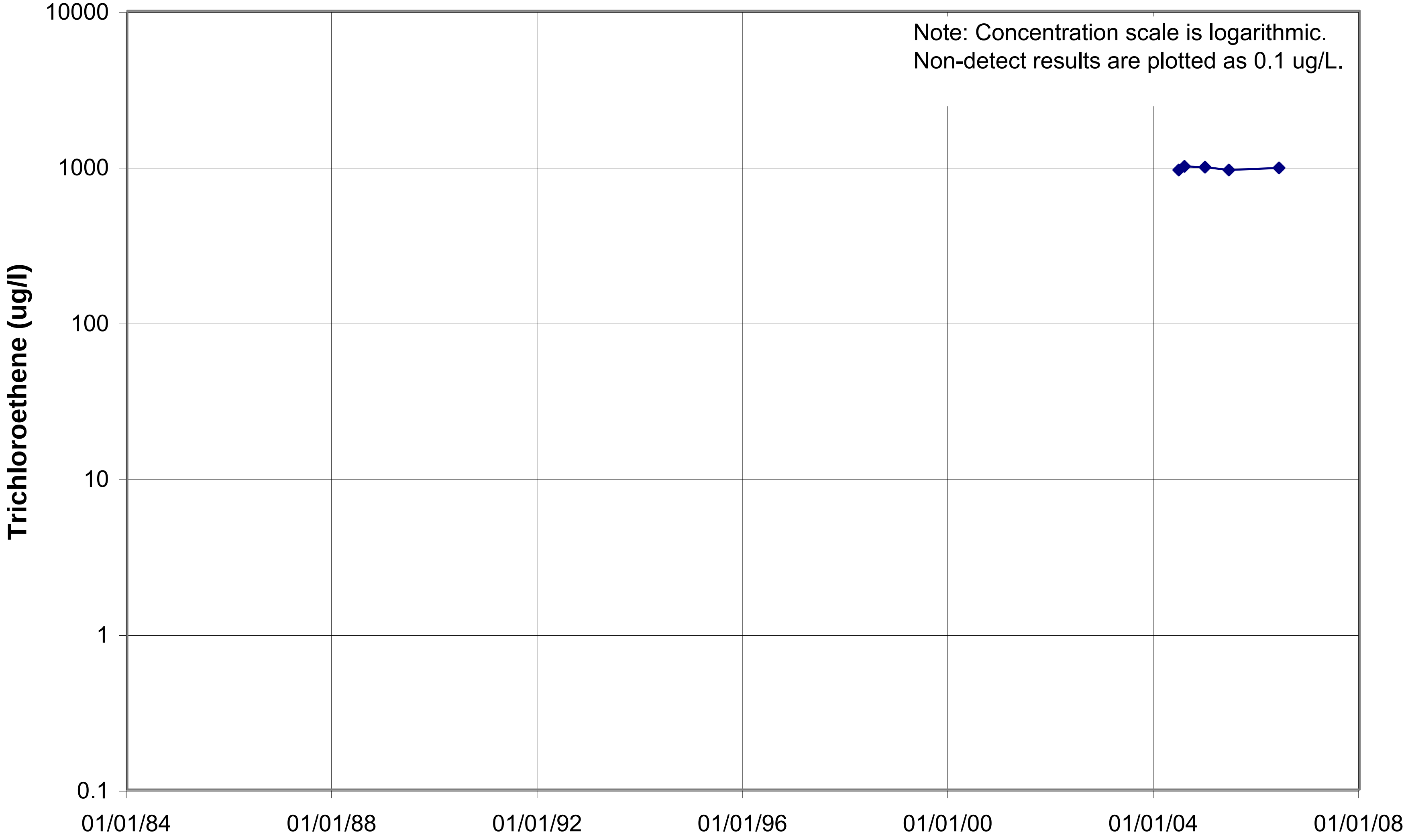

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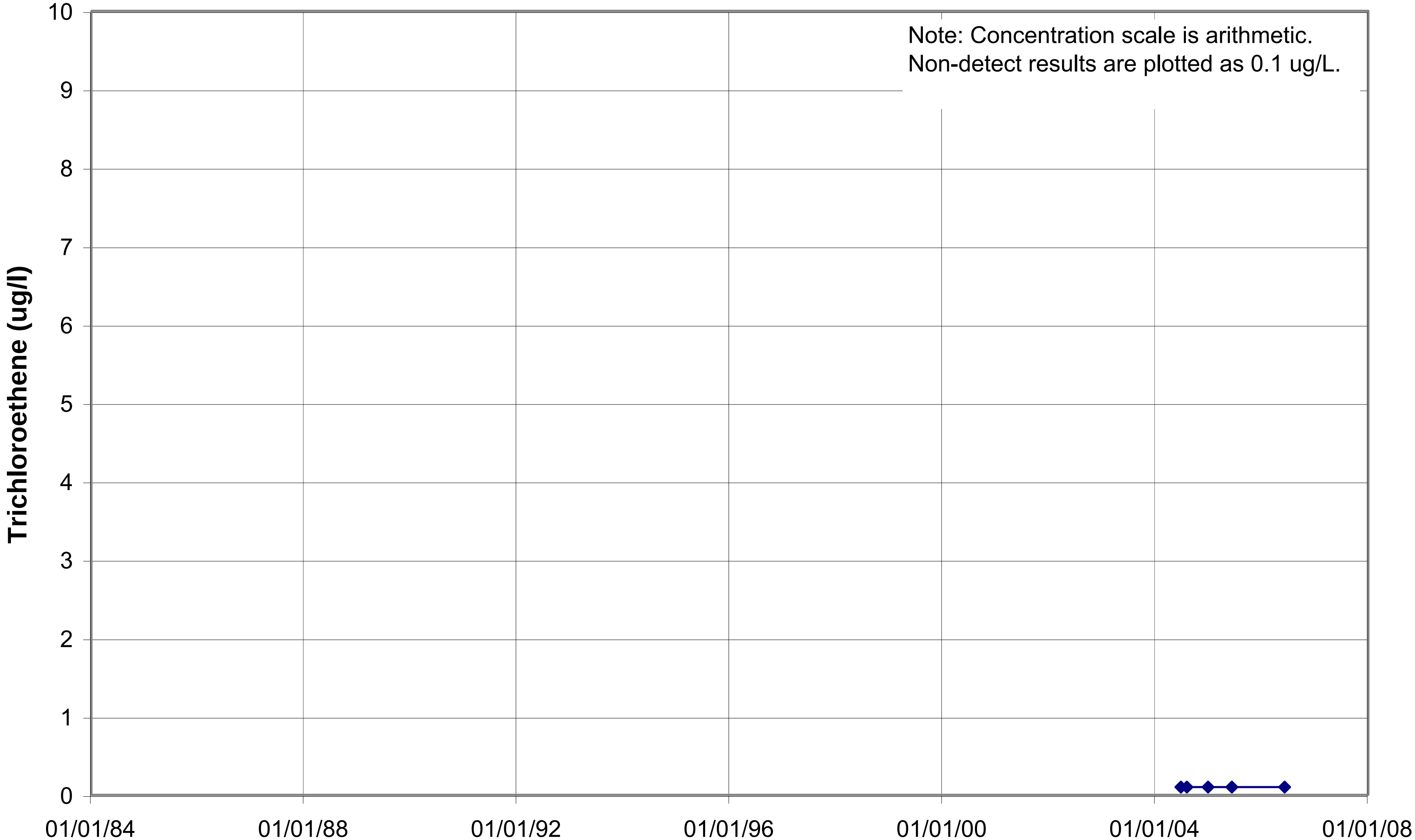

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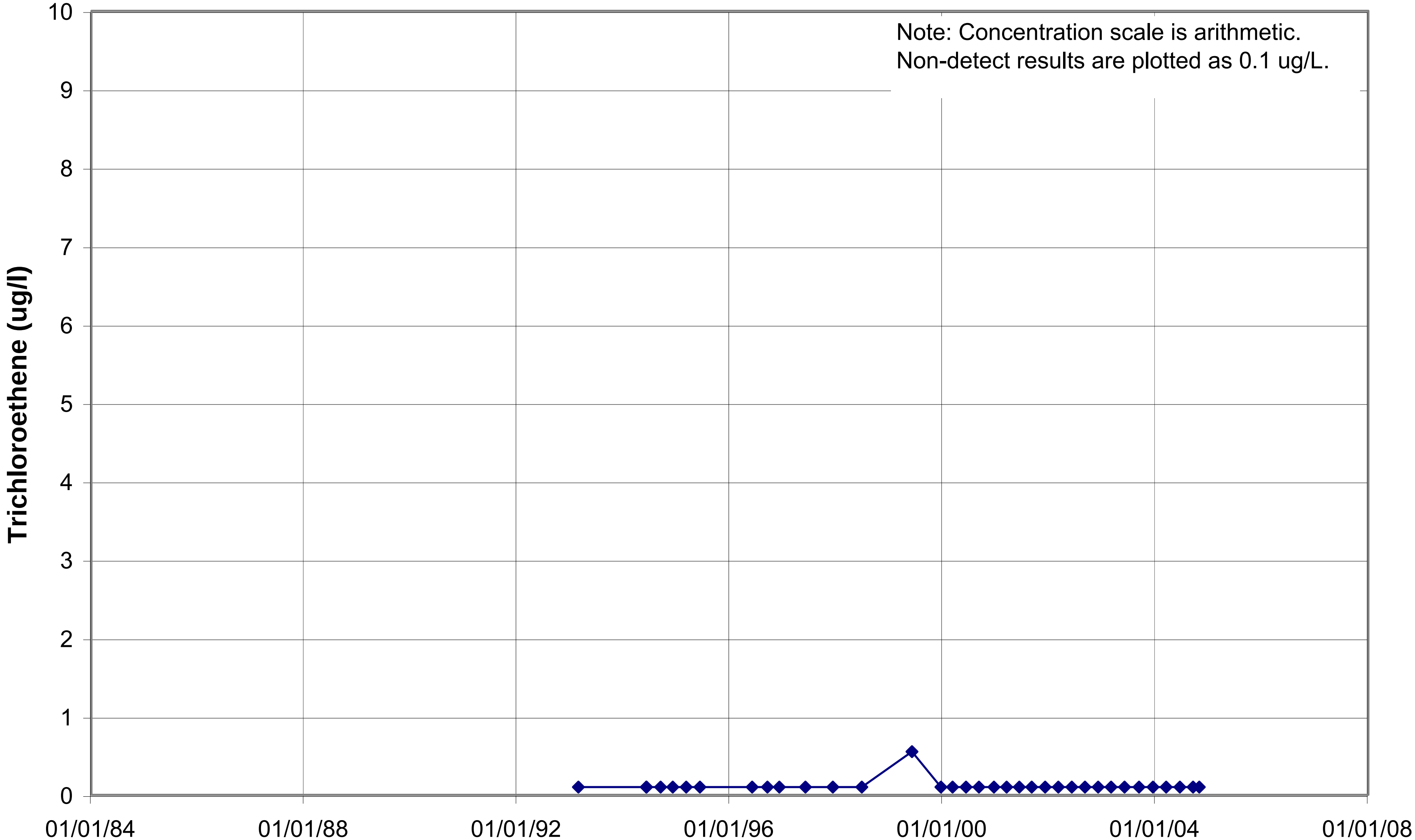

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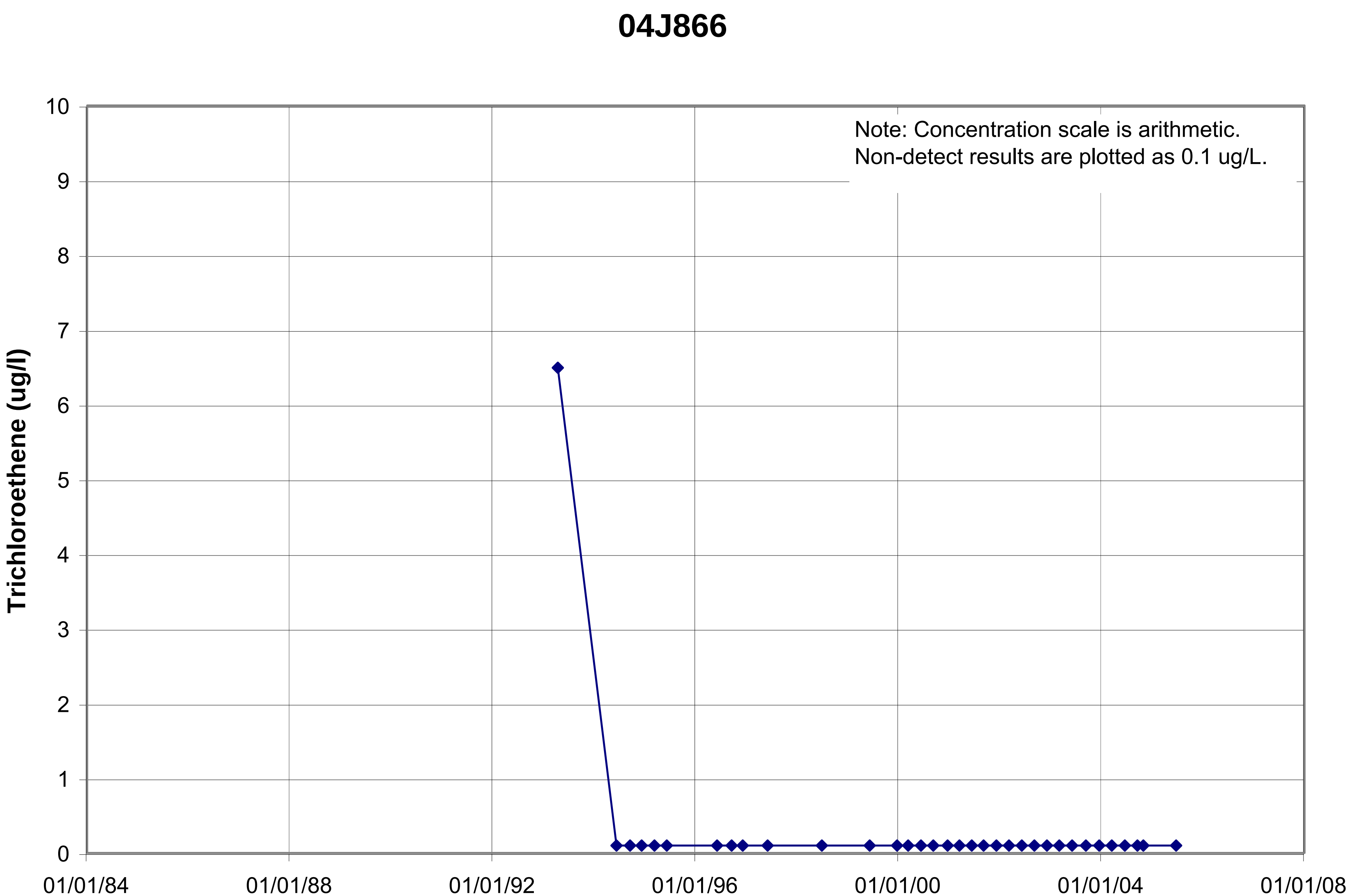

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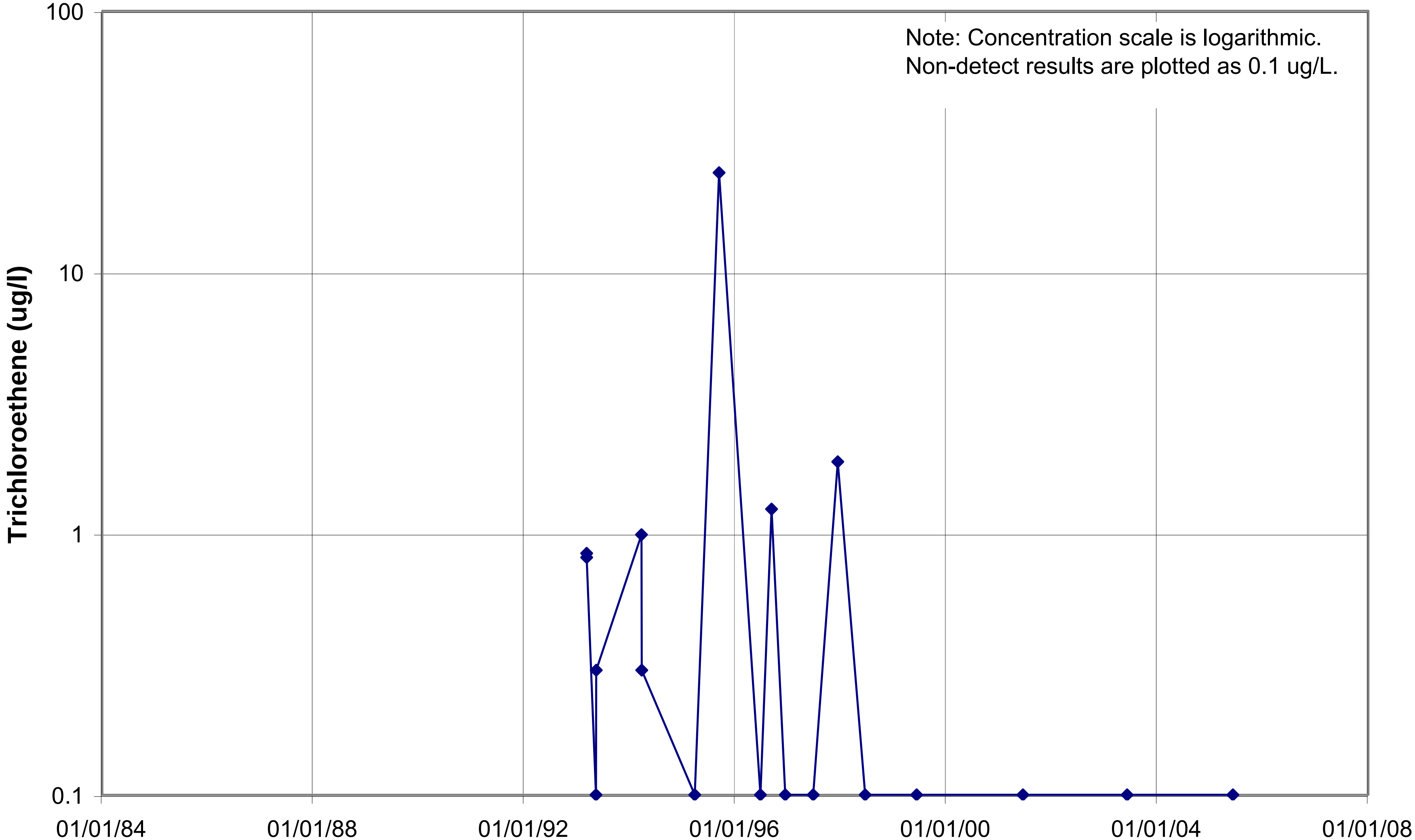

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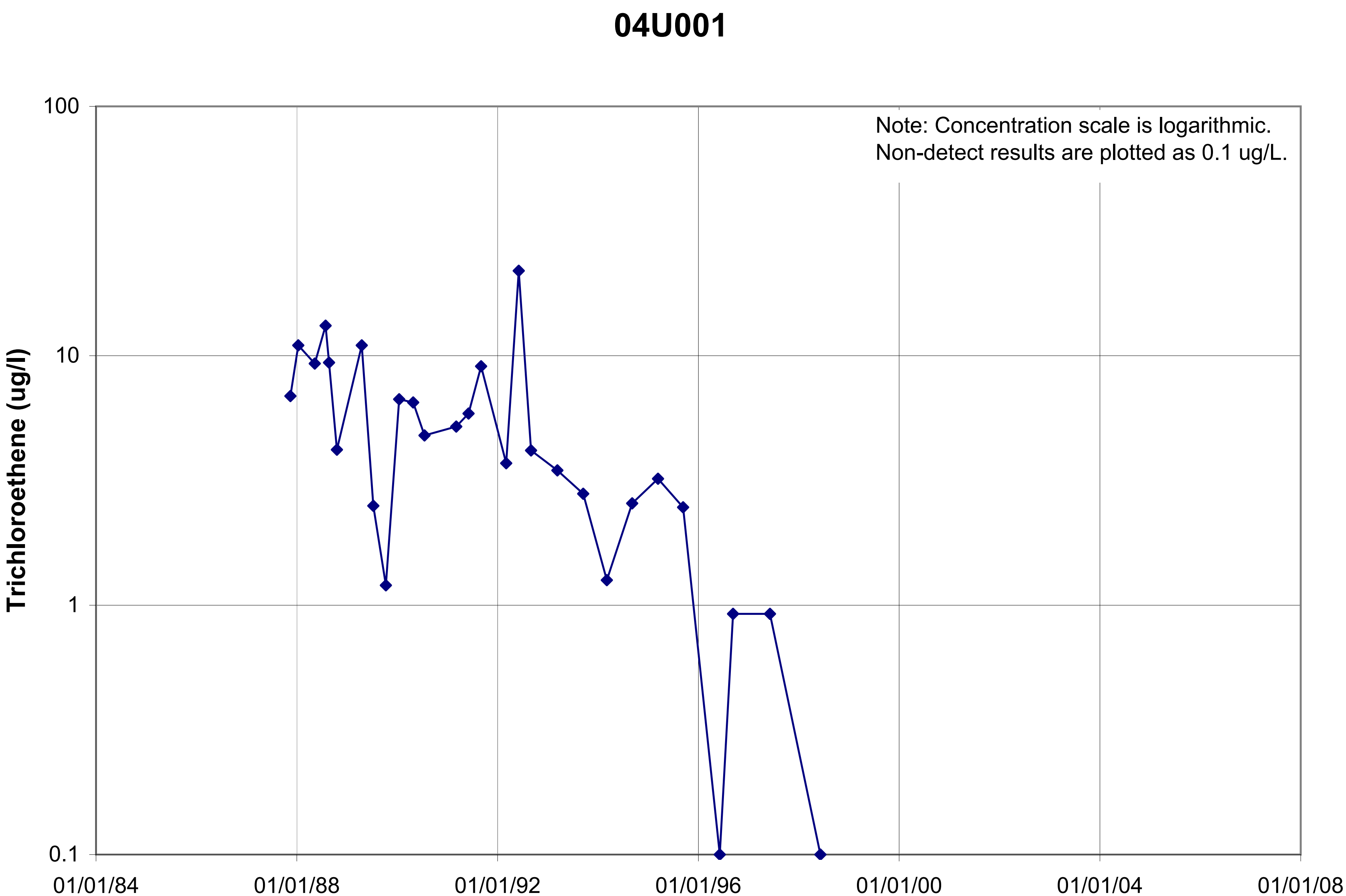

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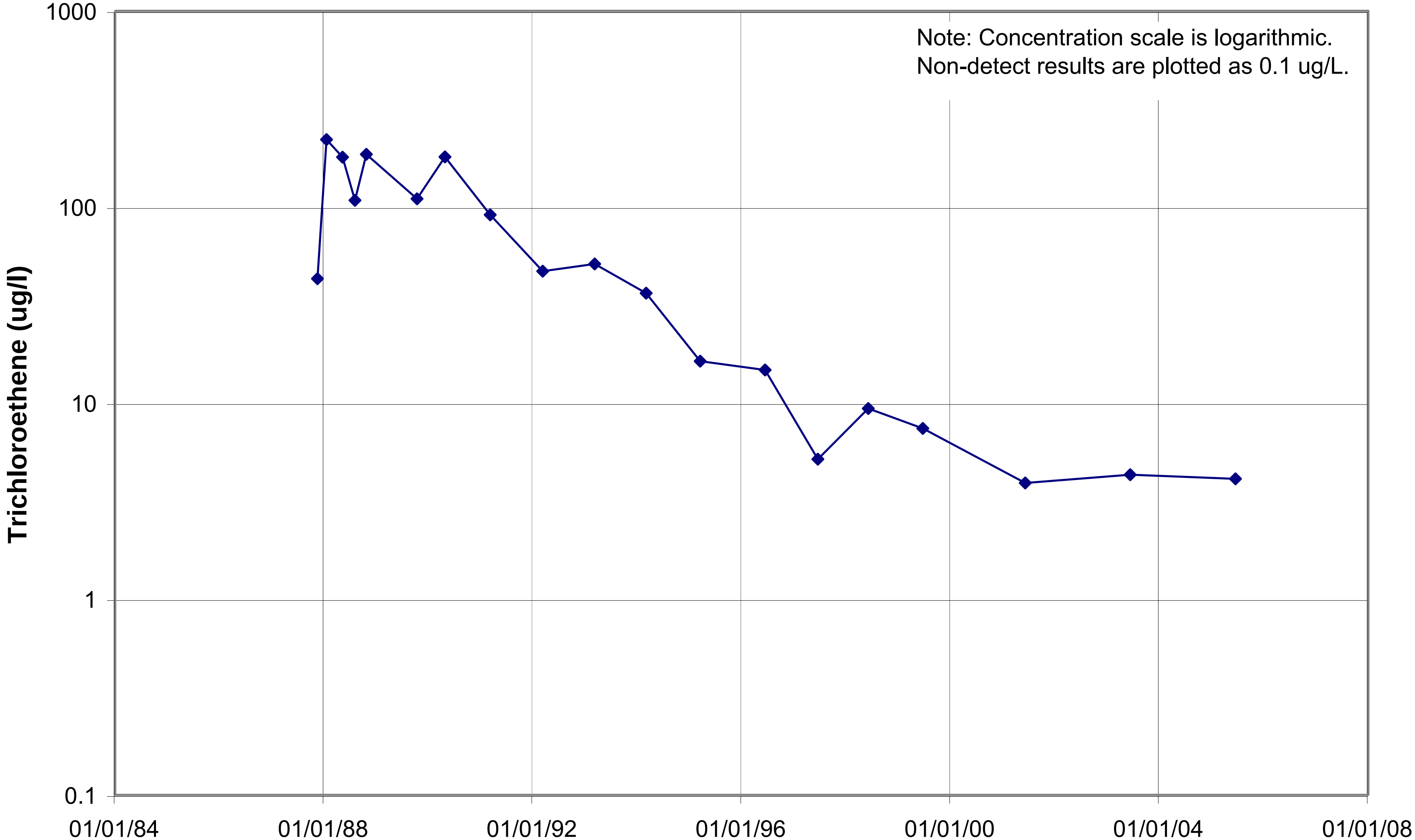
04U002



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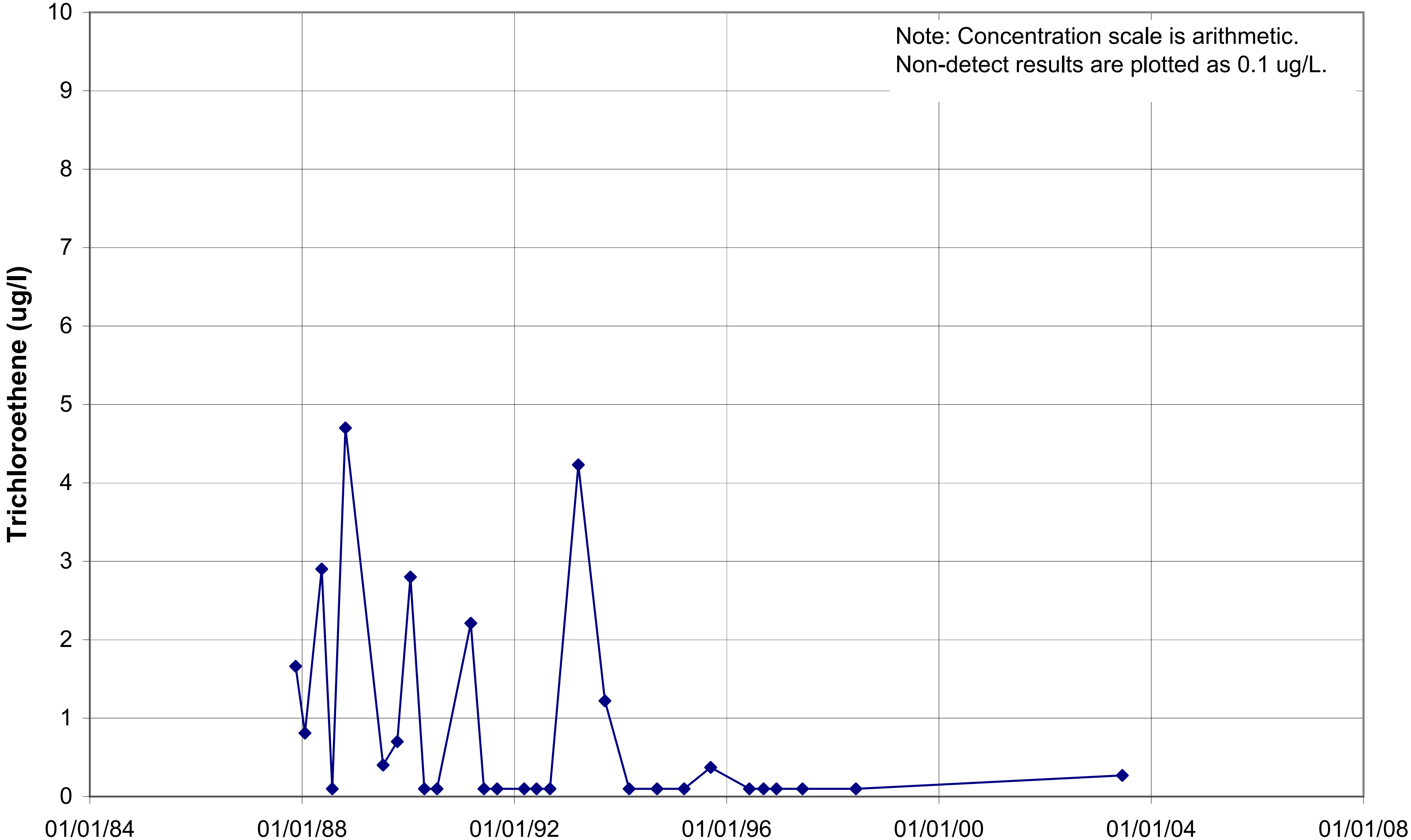

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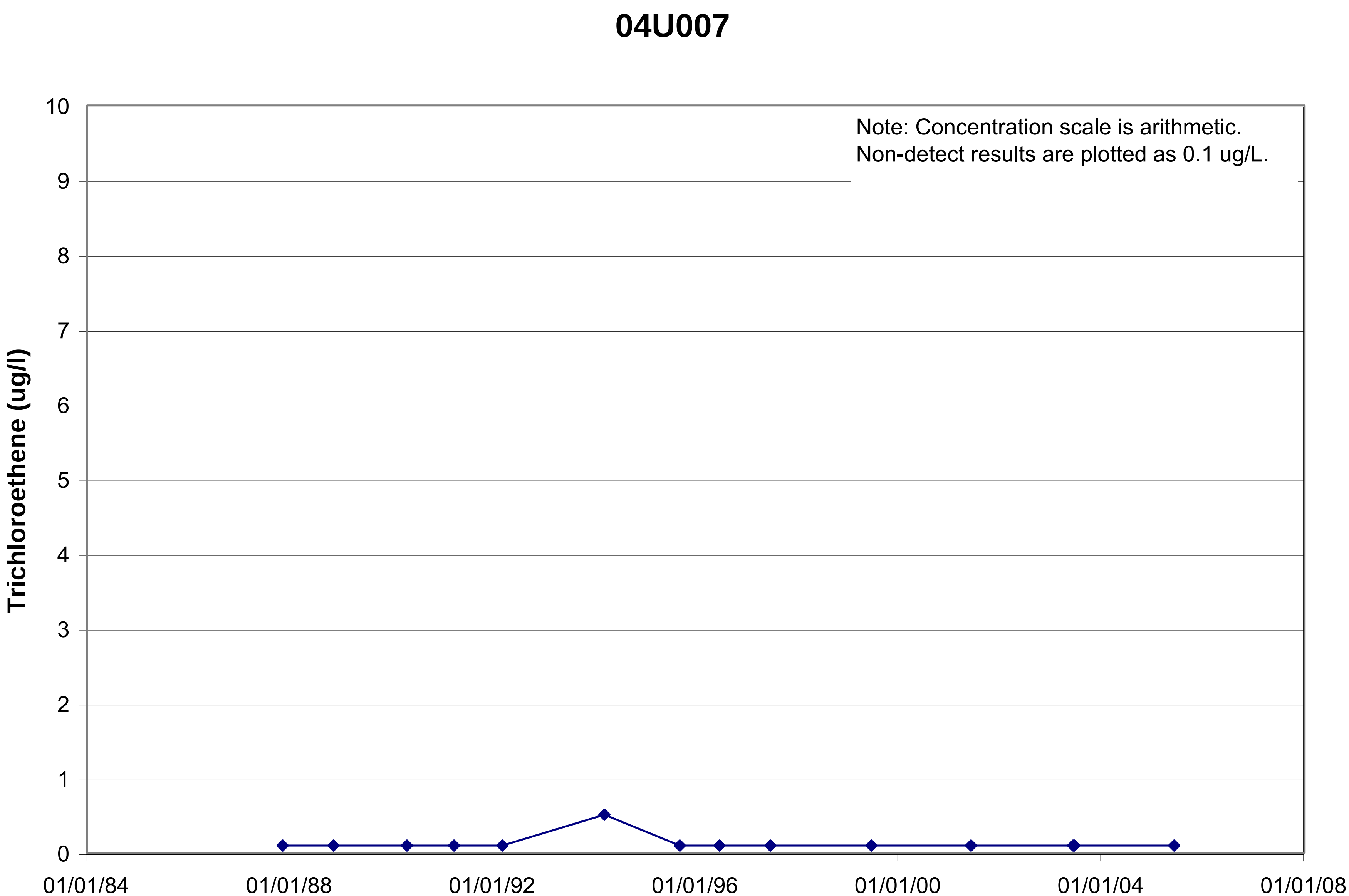

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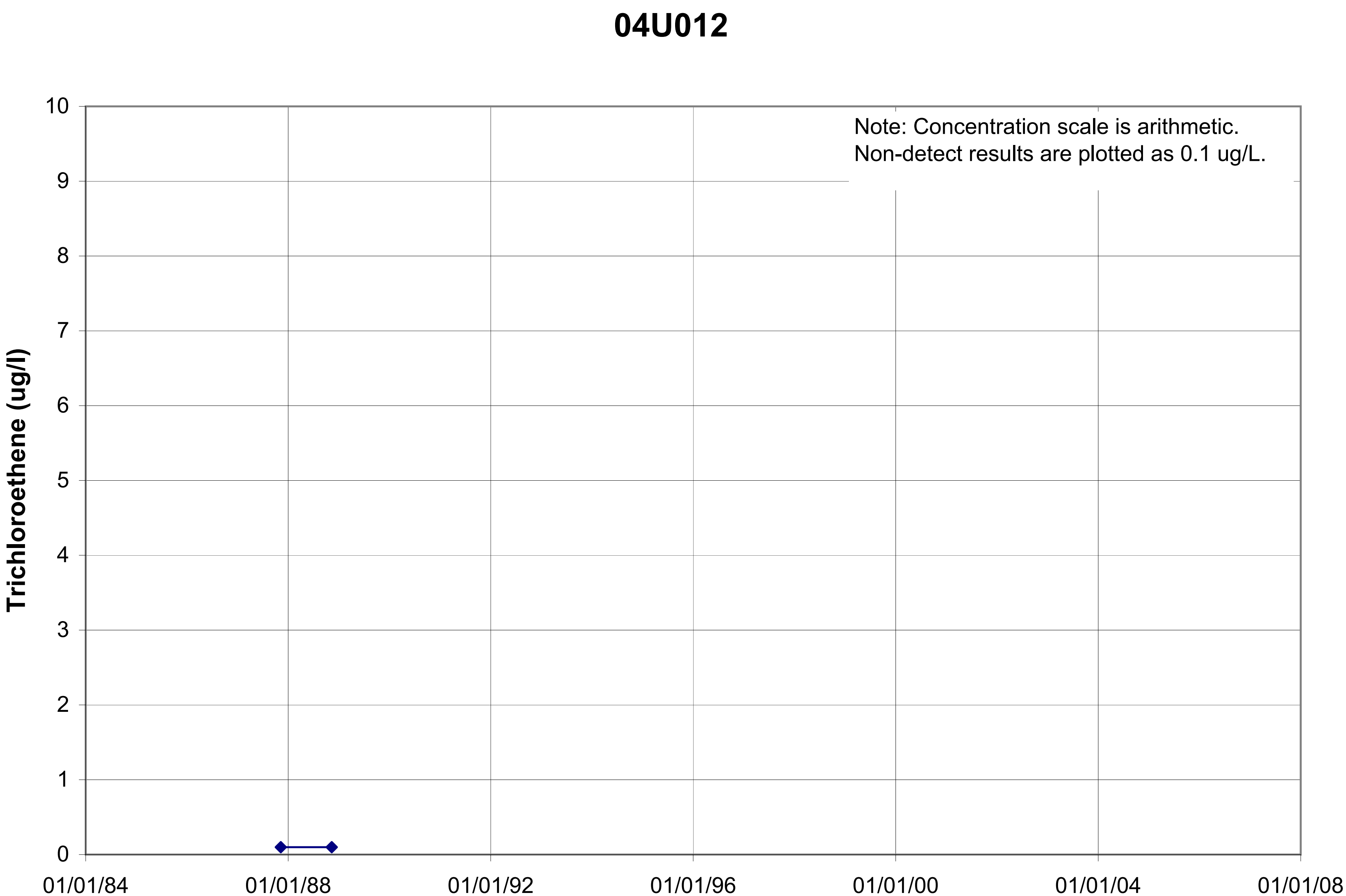

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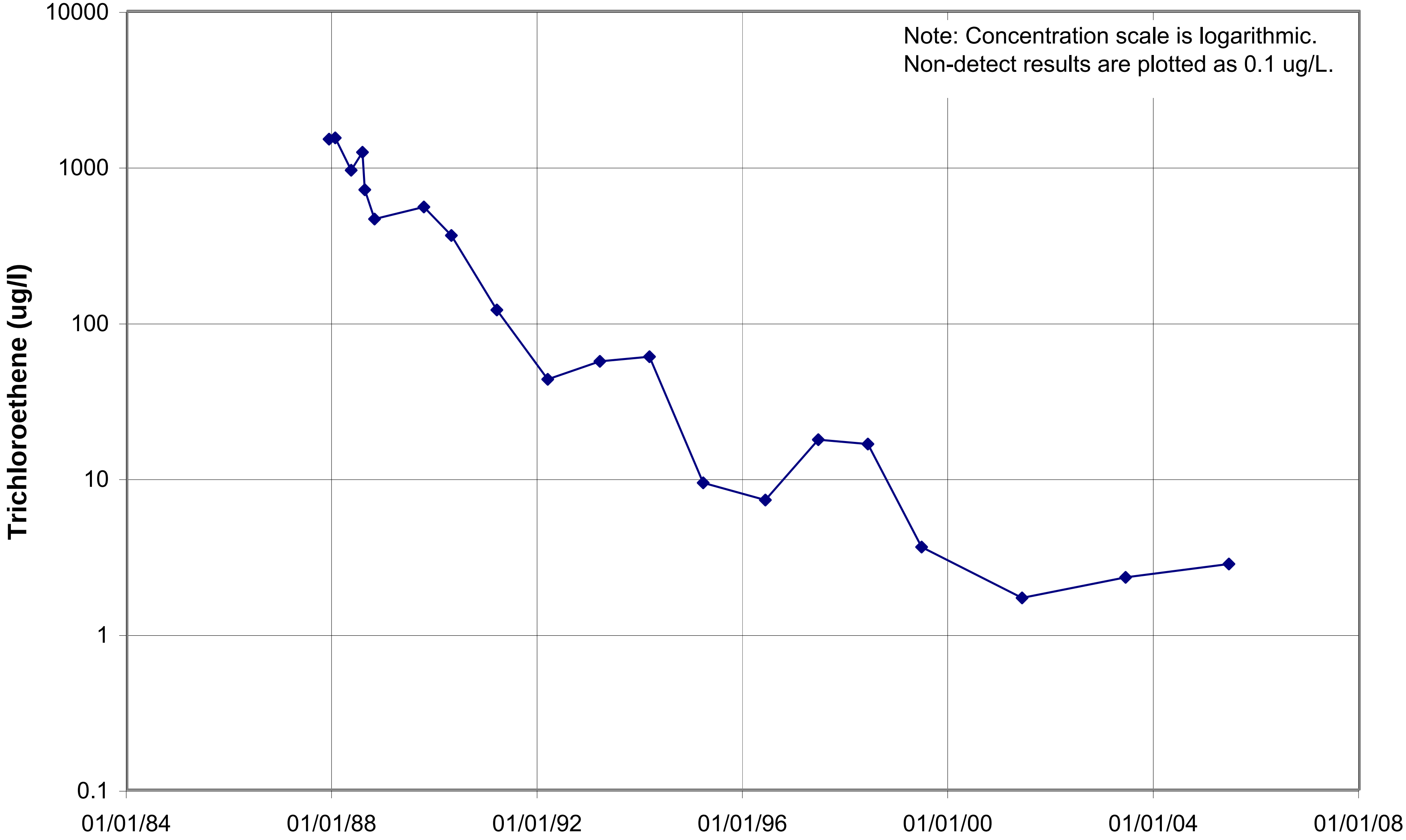

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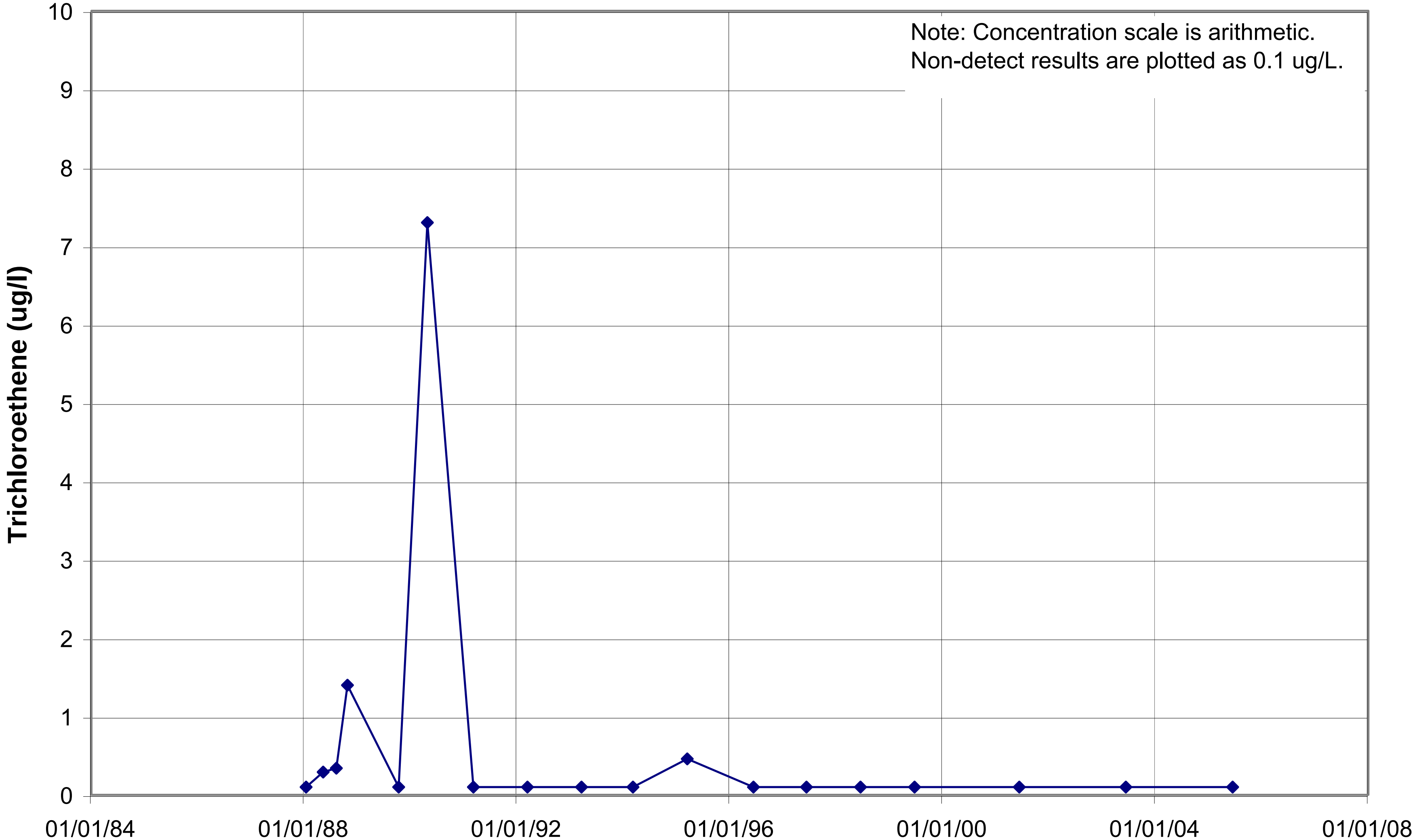

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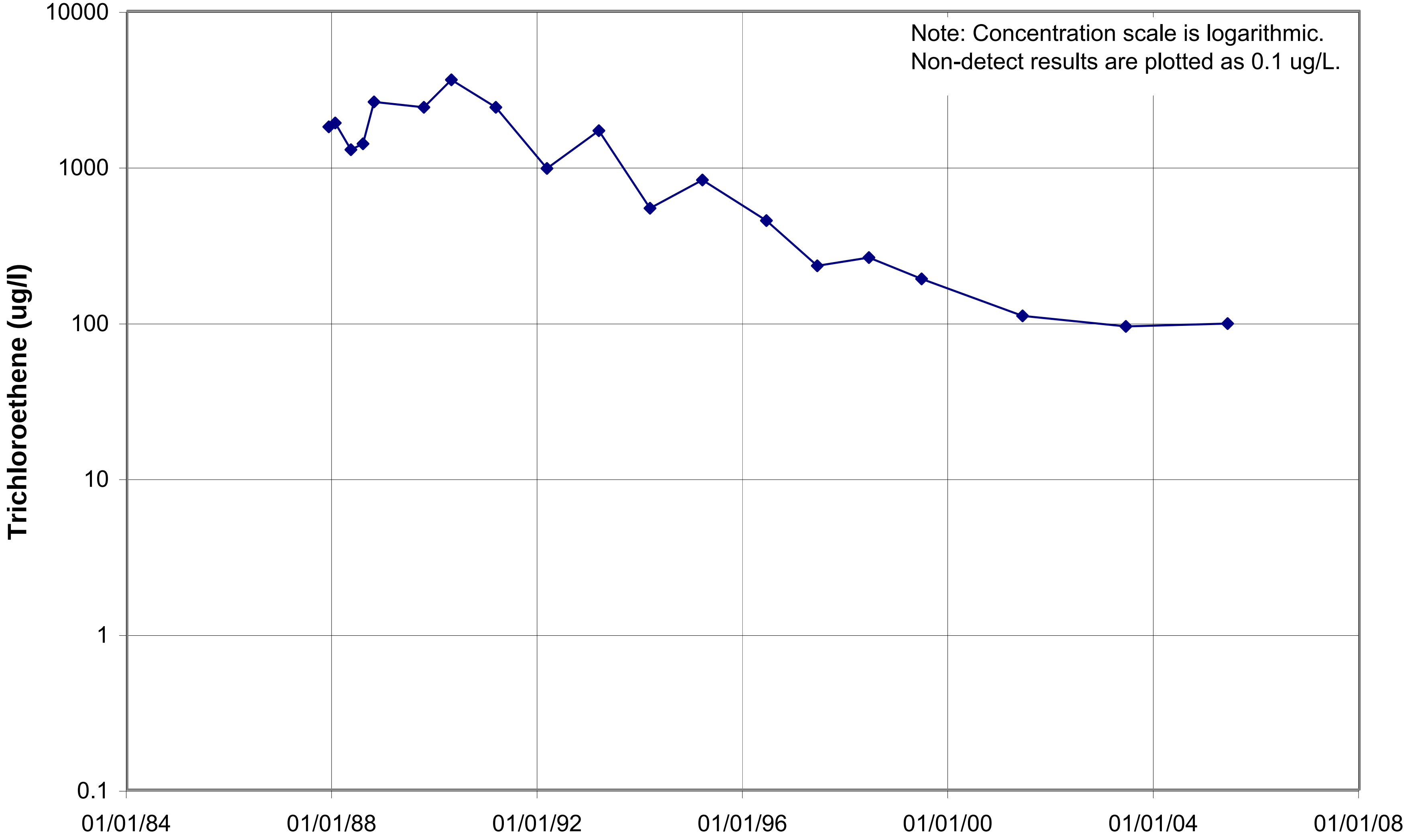

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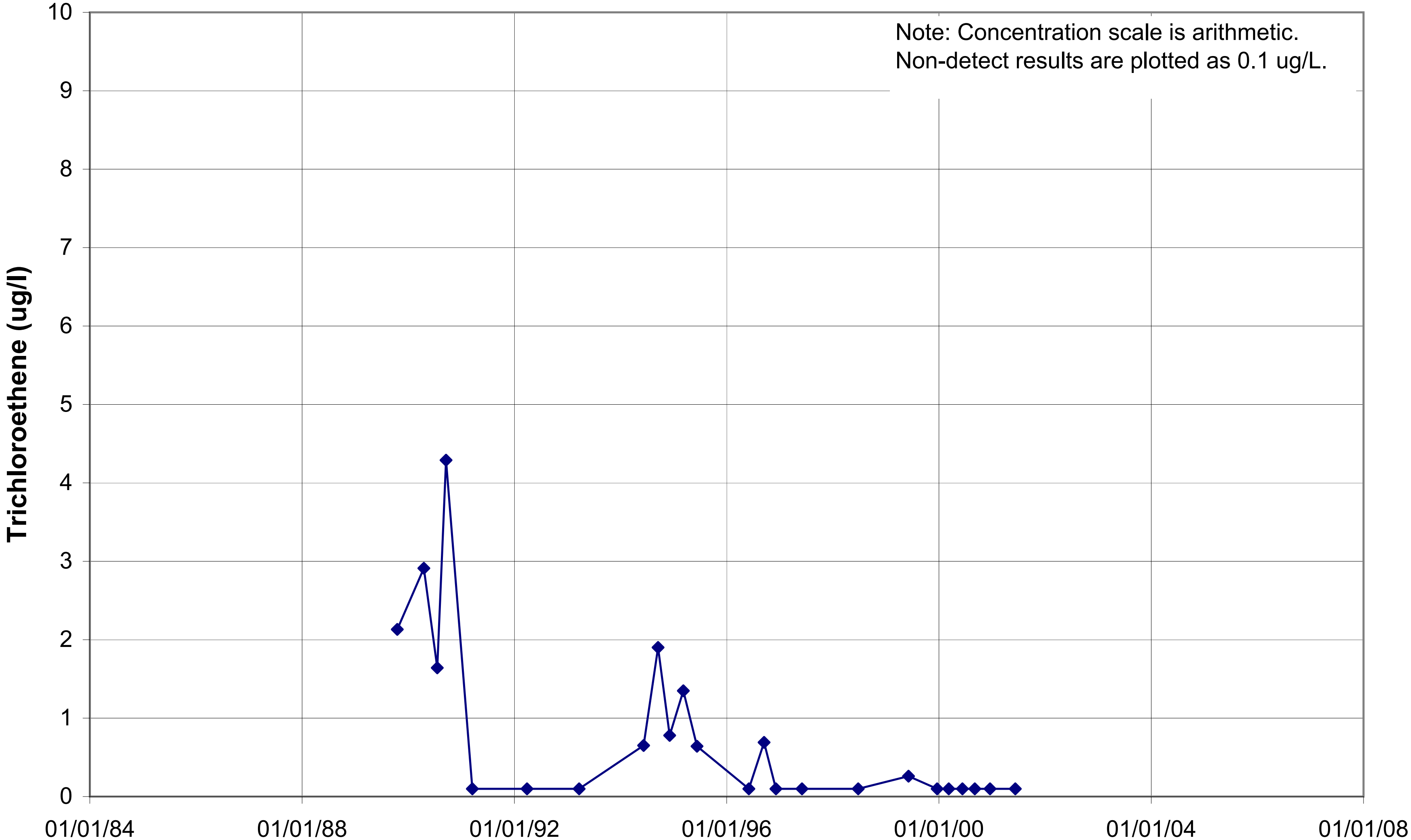
04U414 (414U4)



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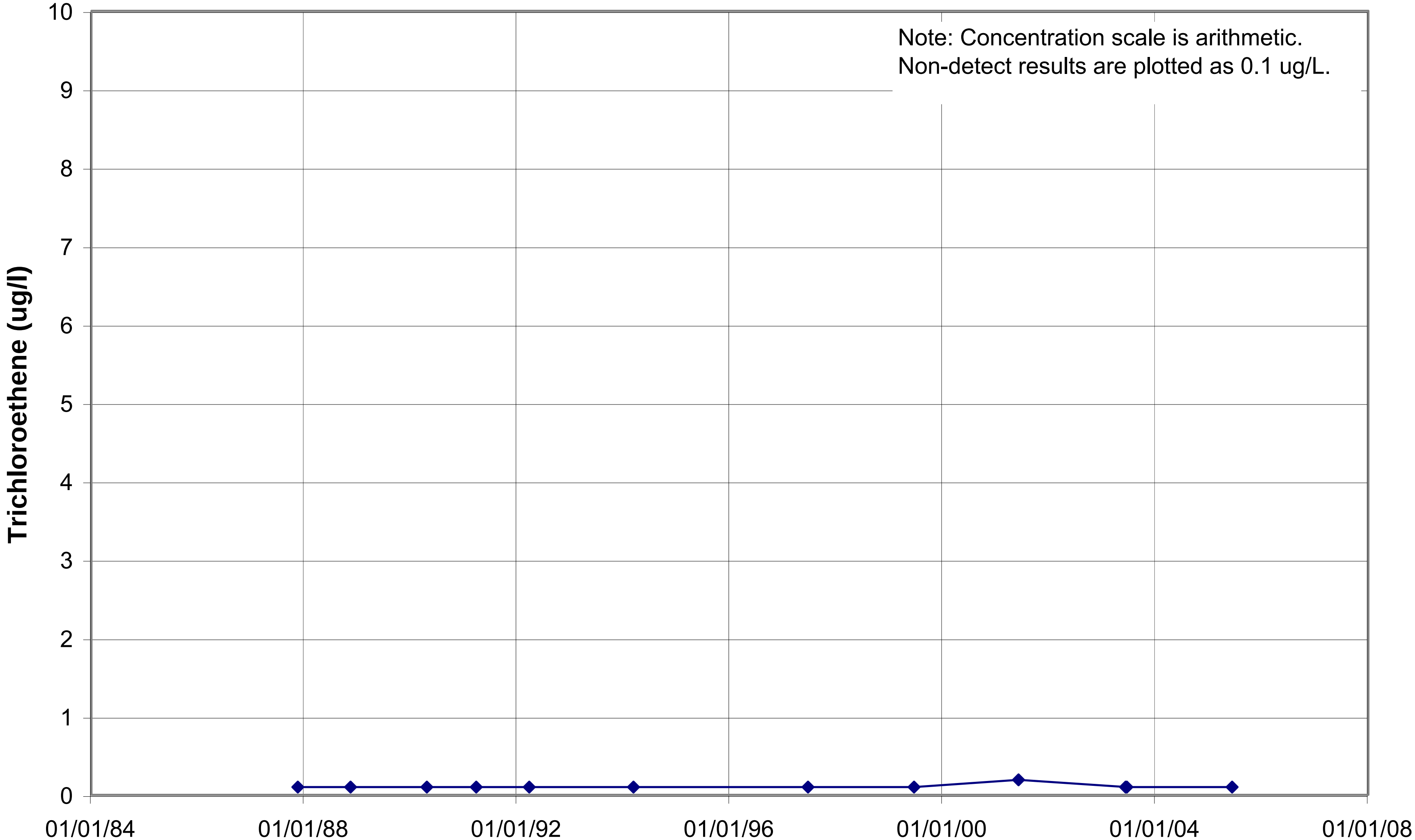

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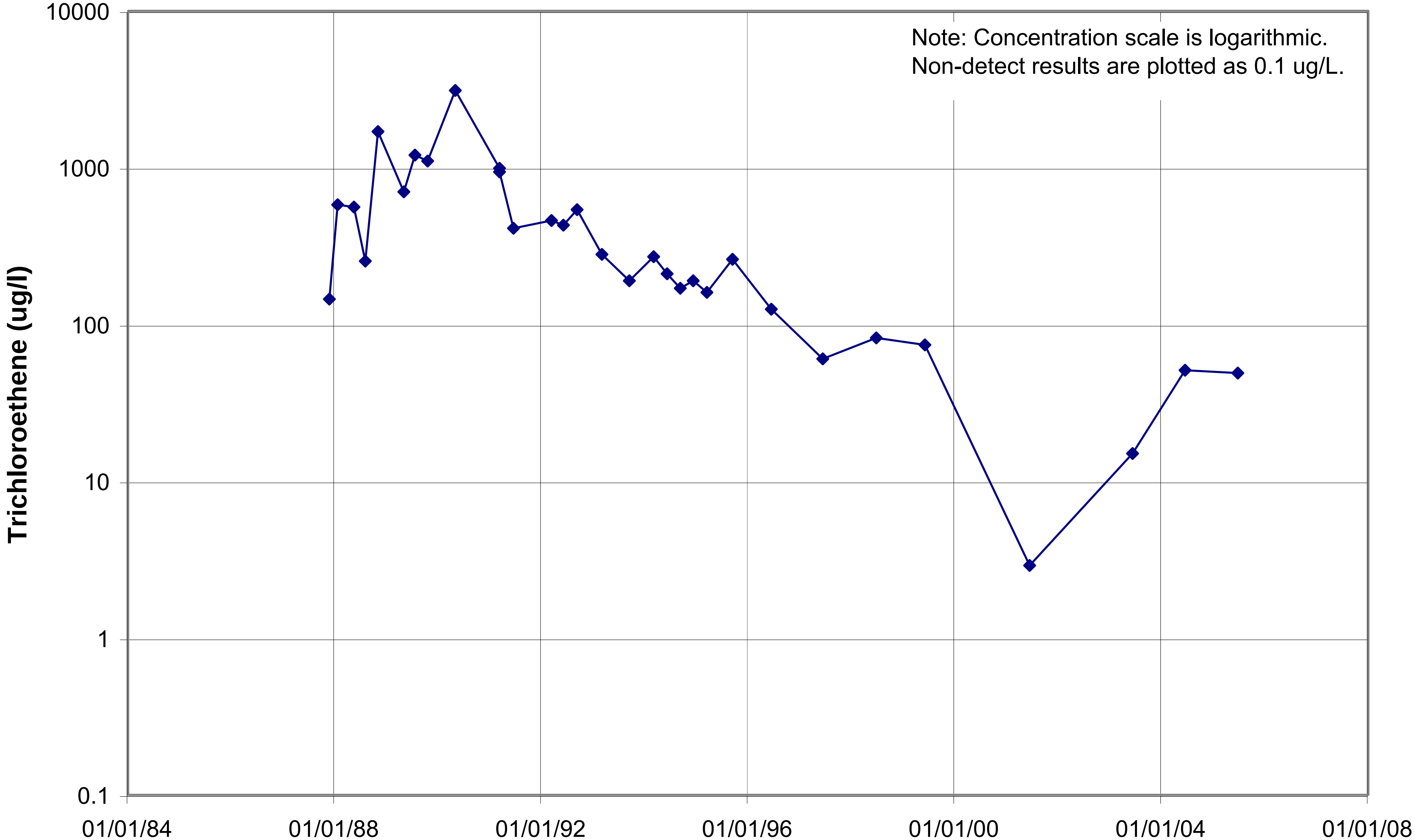

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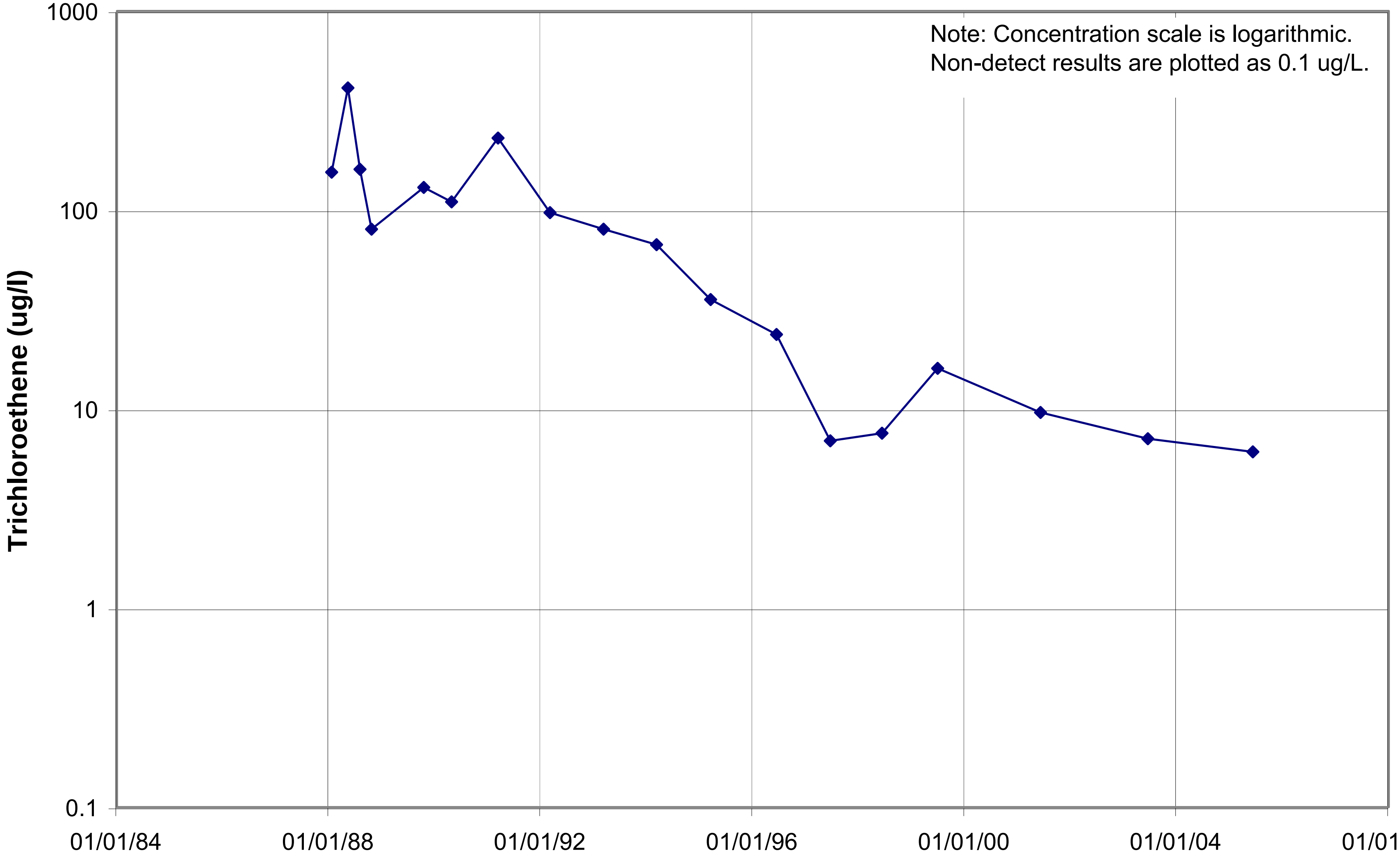

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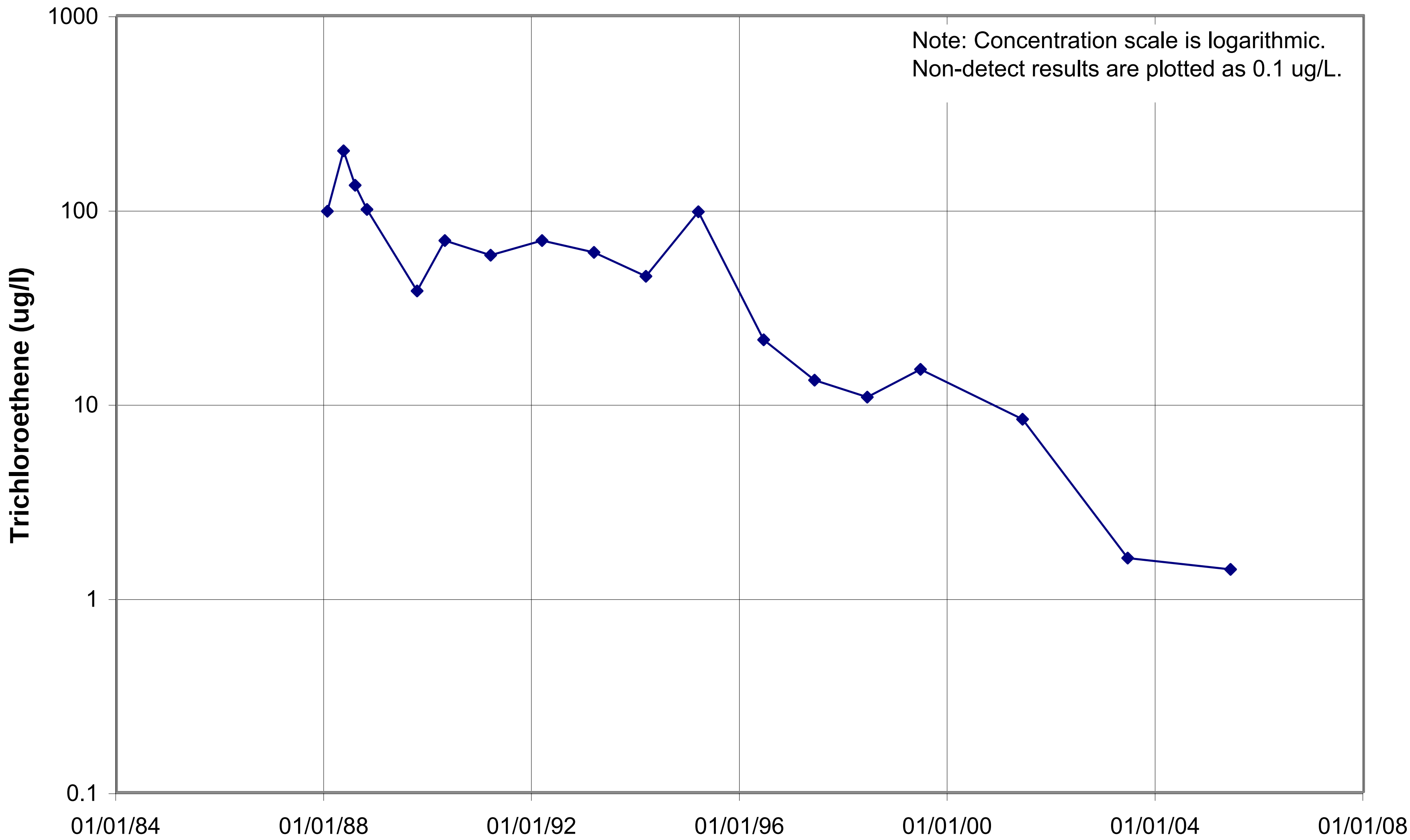

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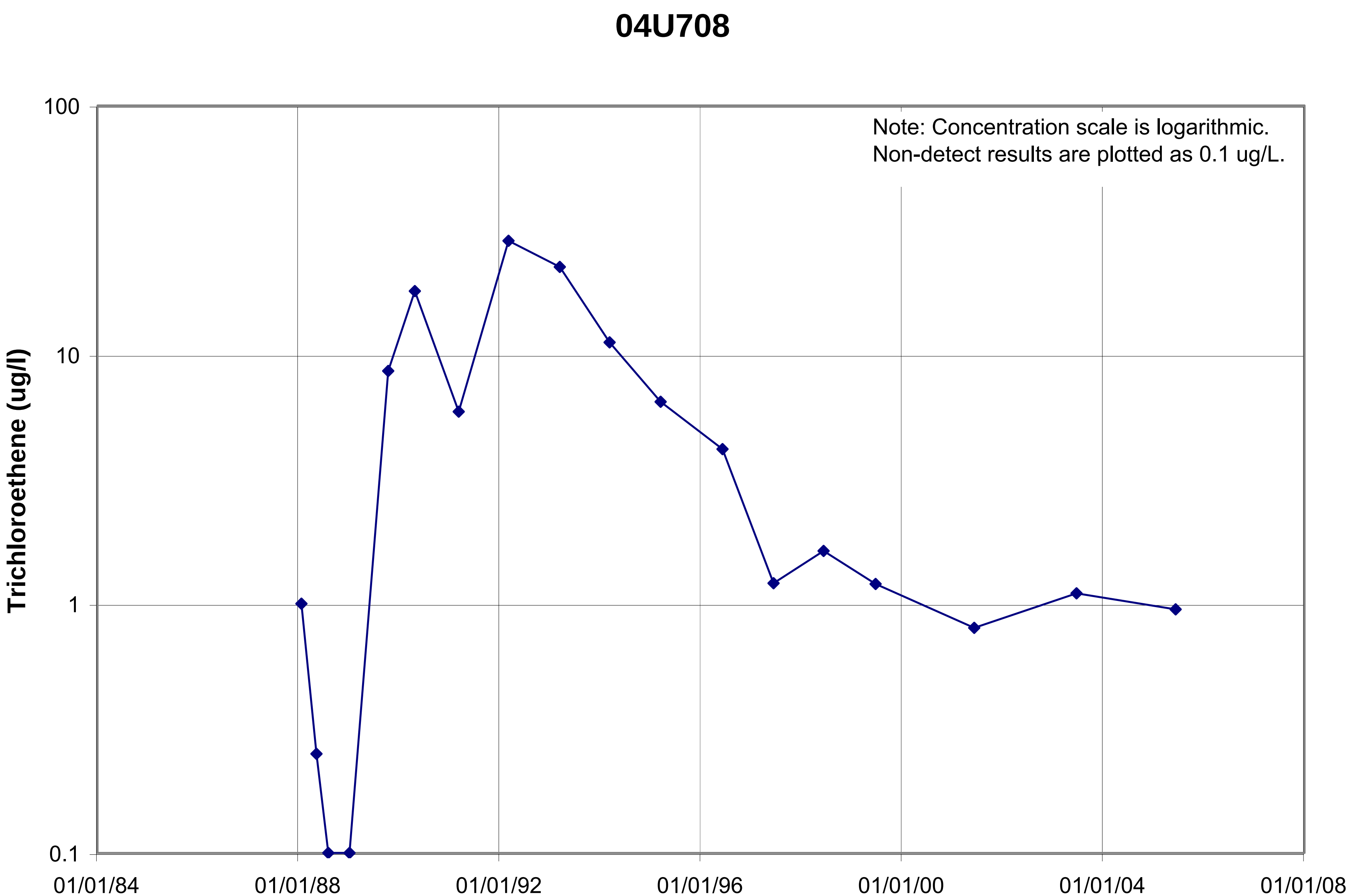

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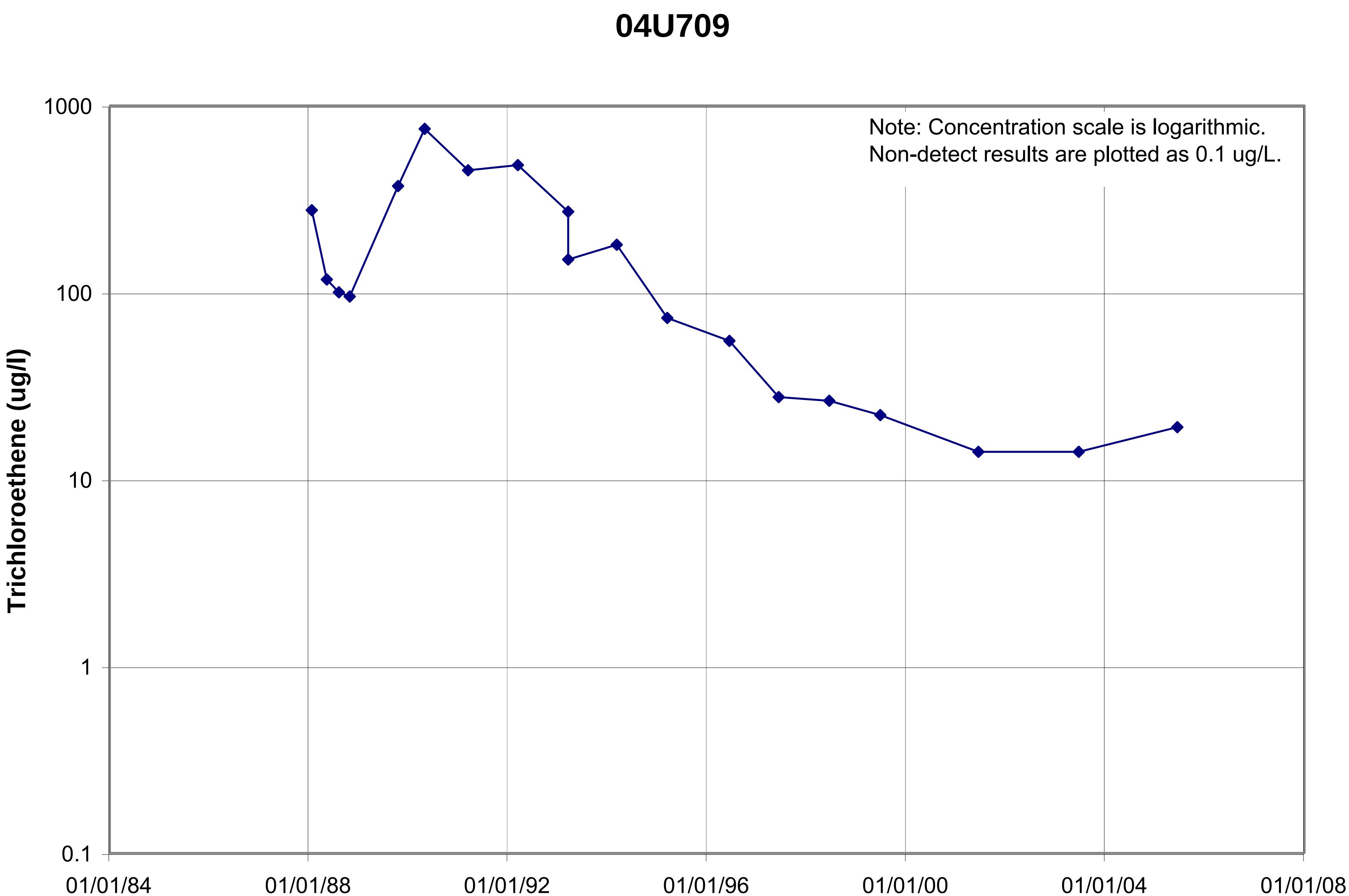

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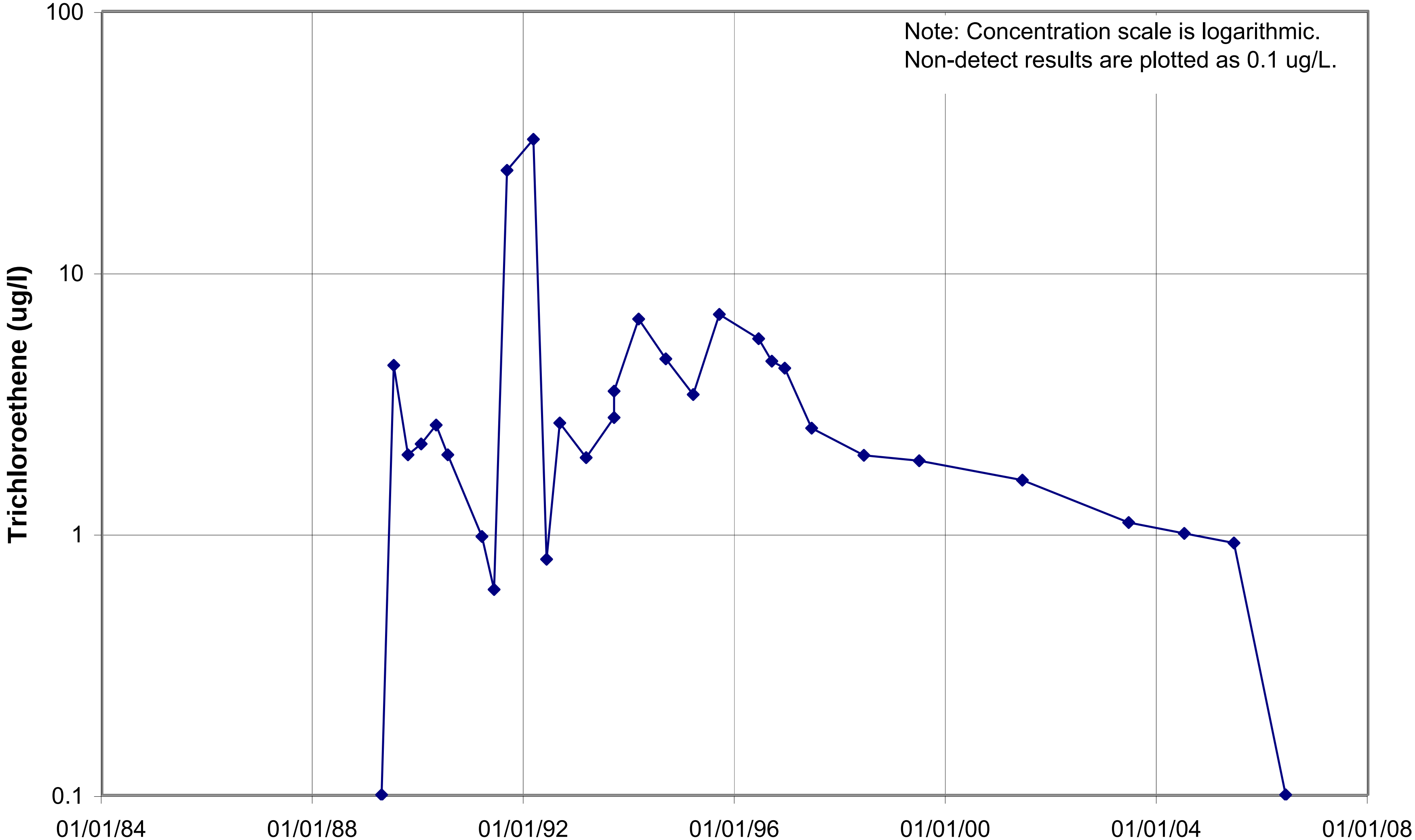

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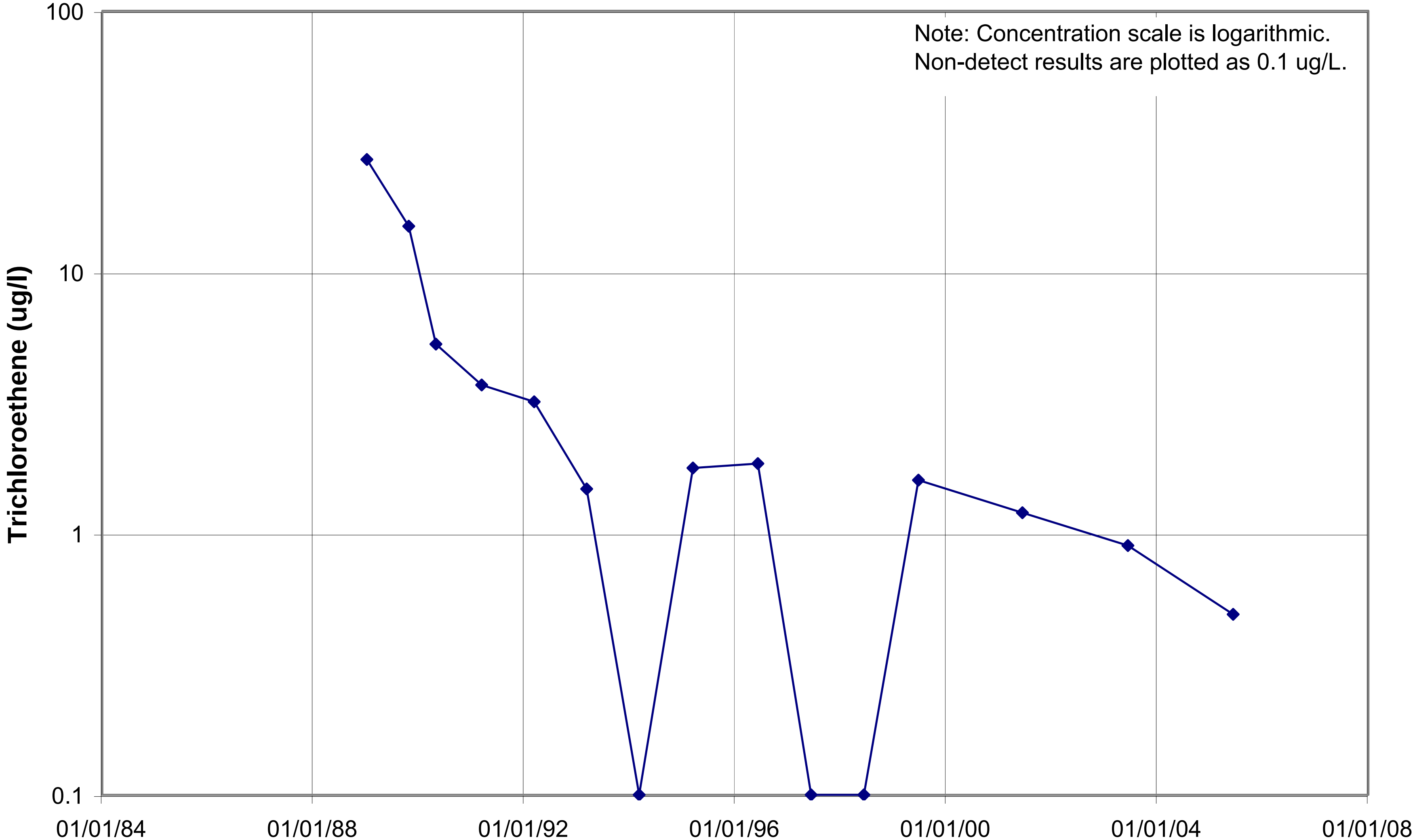

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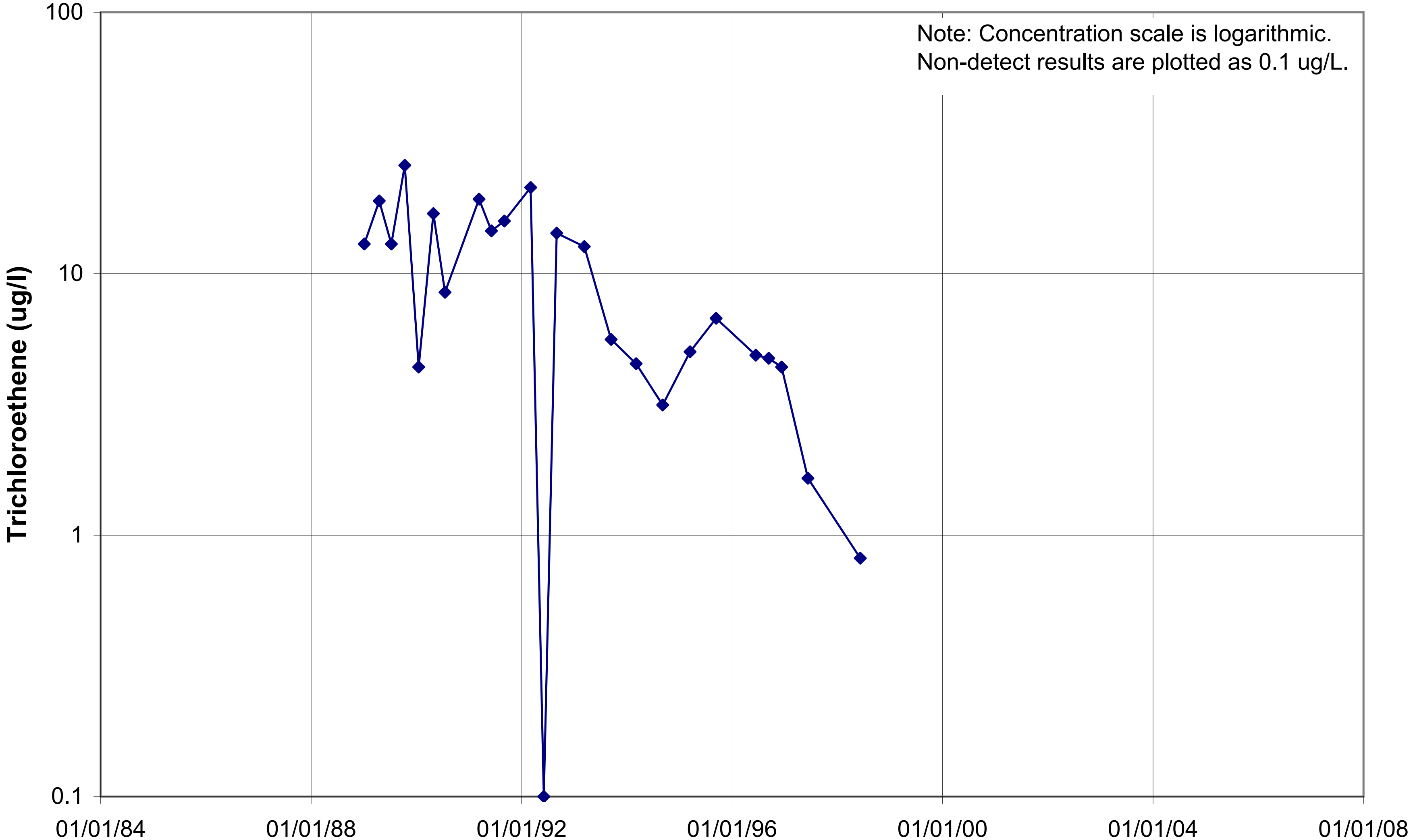

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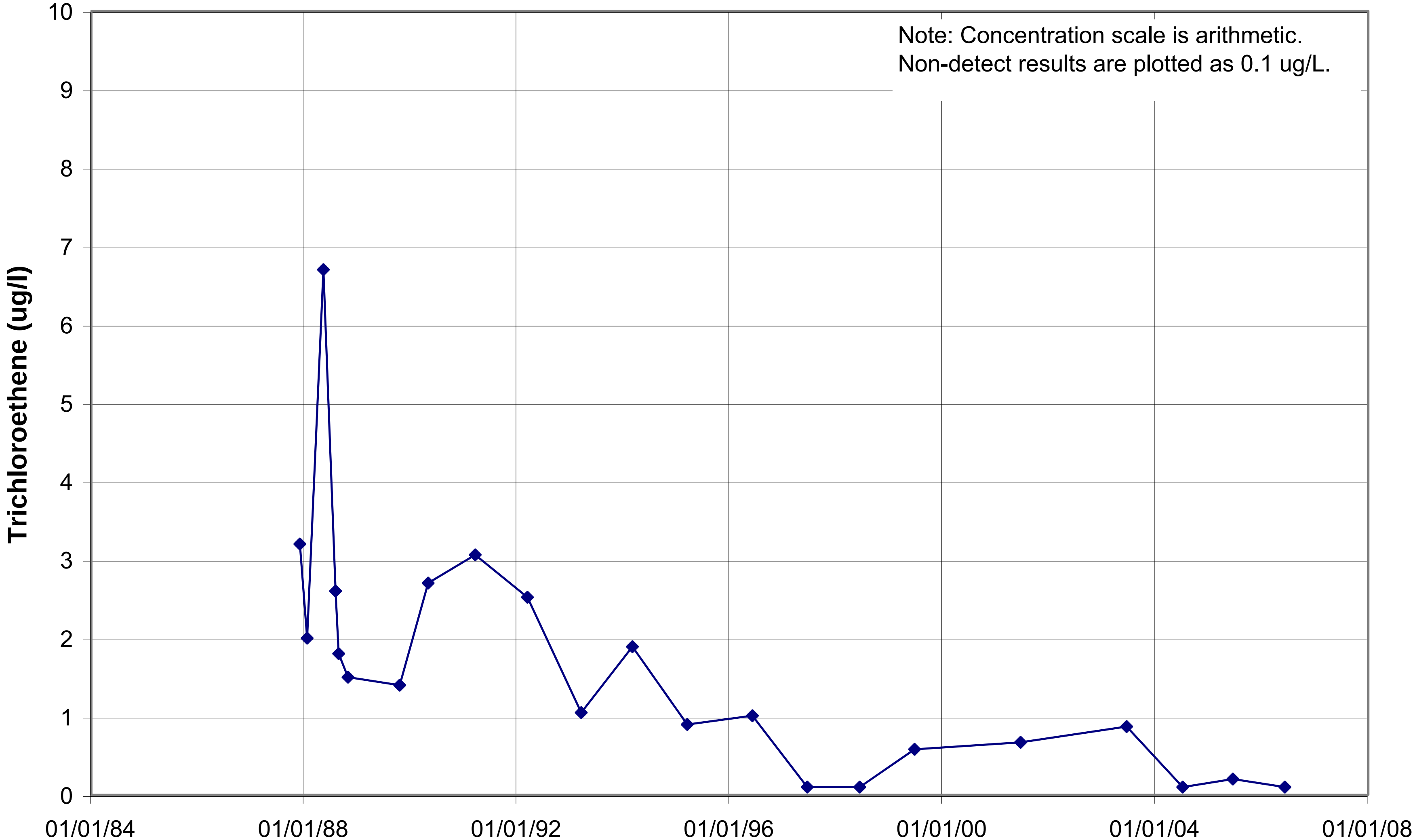

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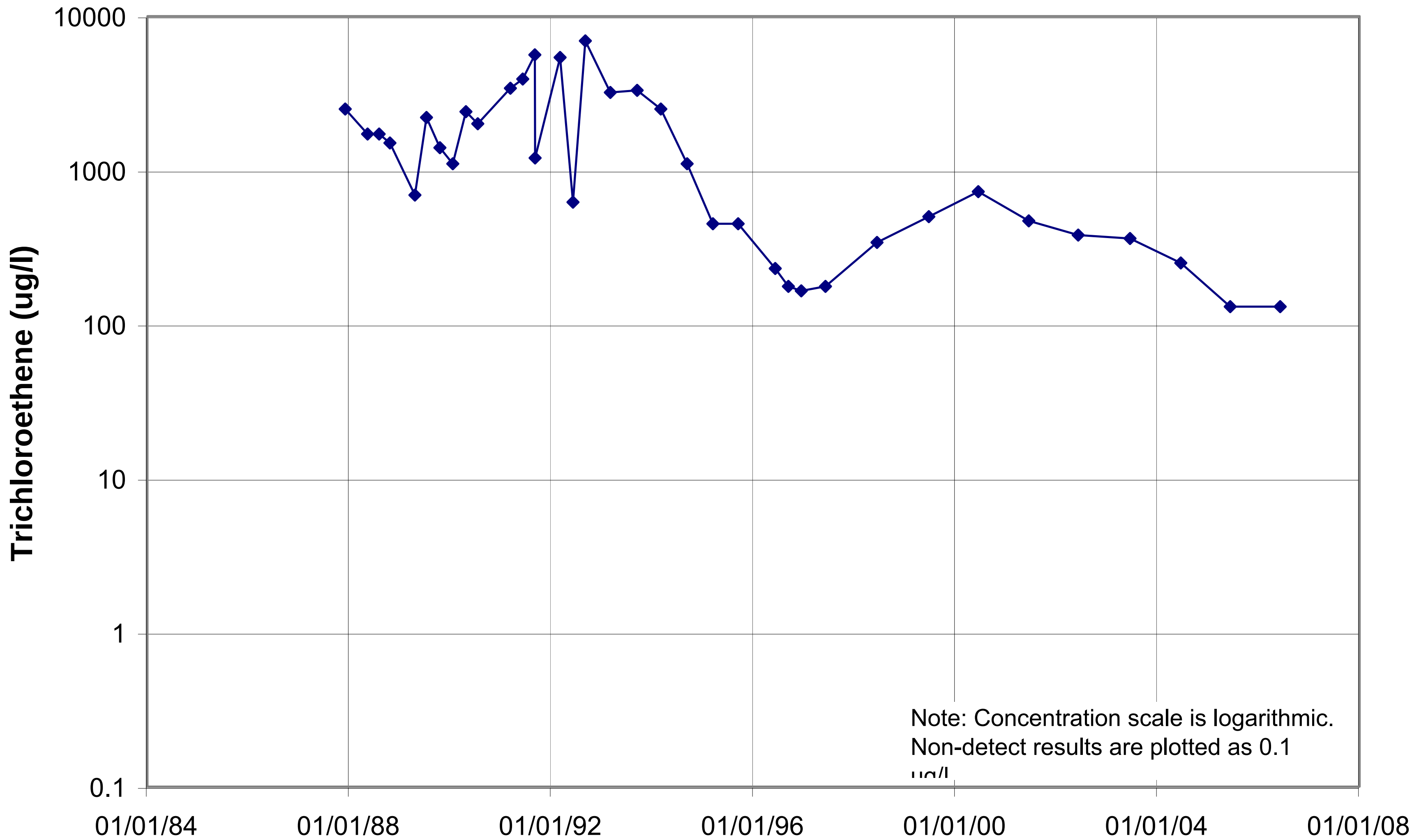

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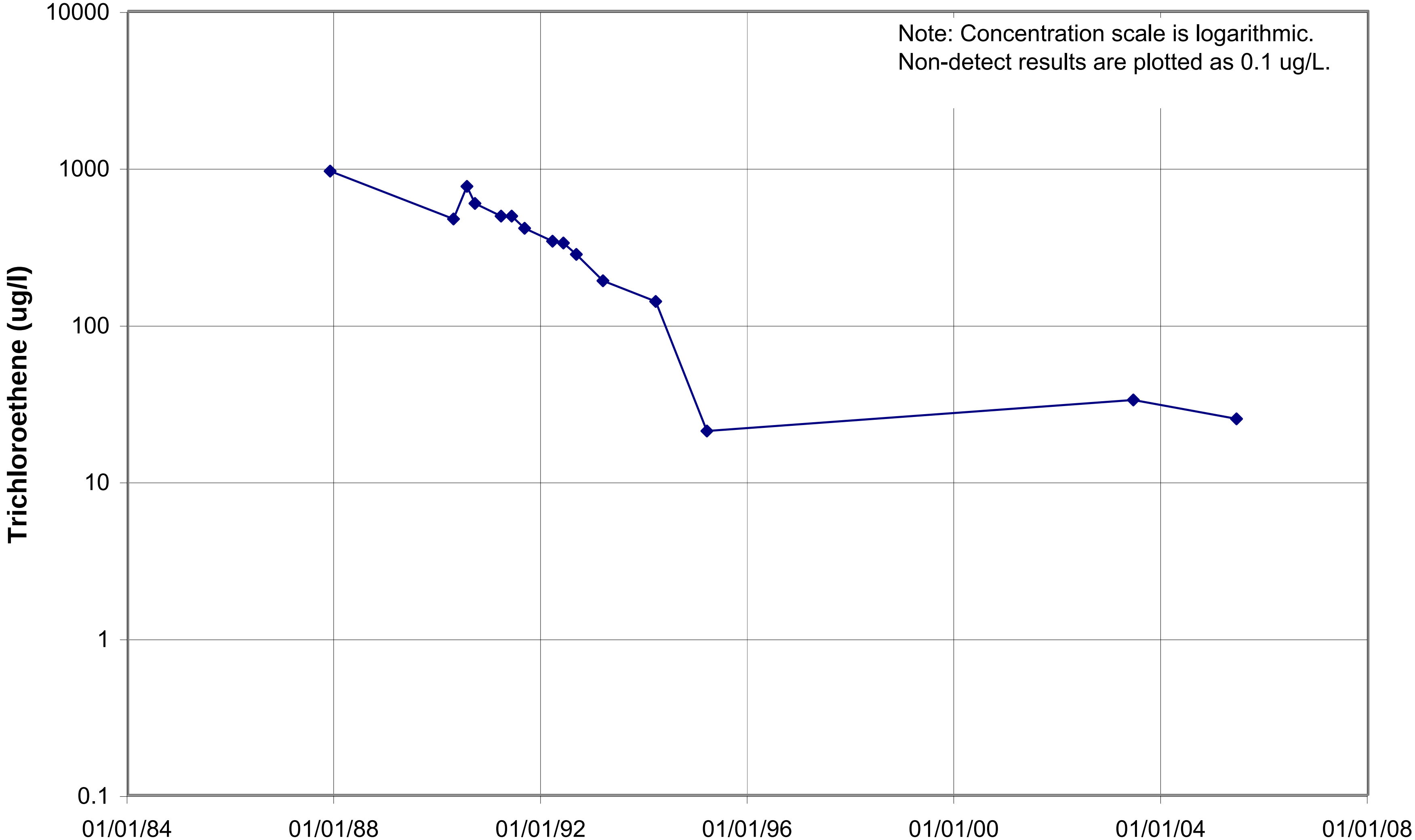

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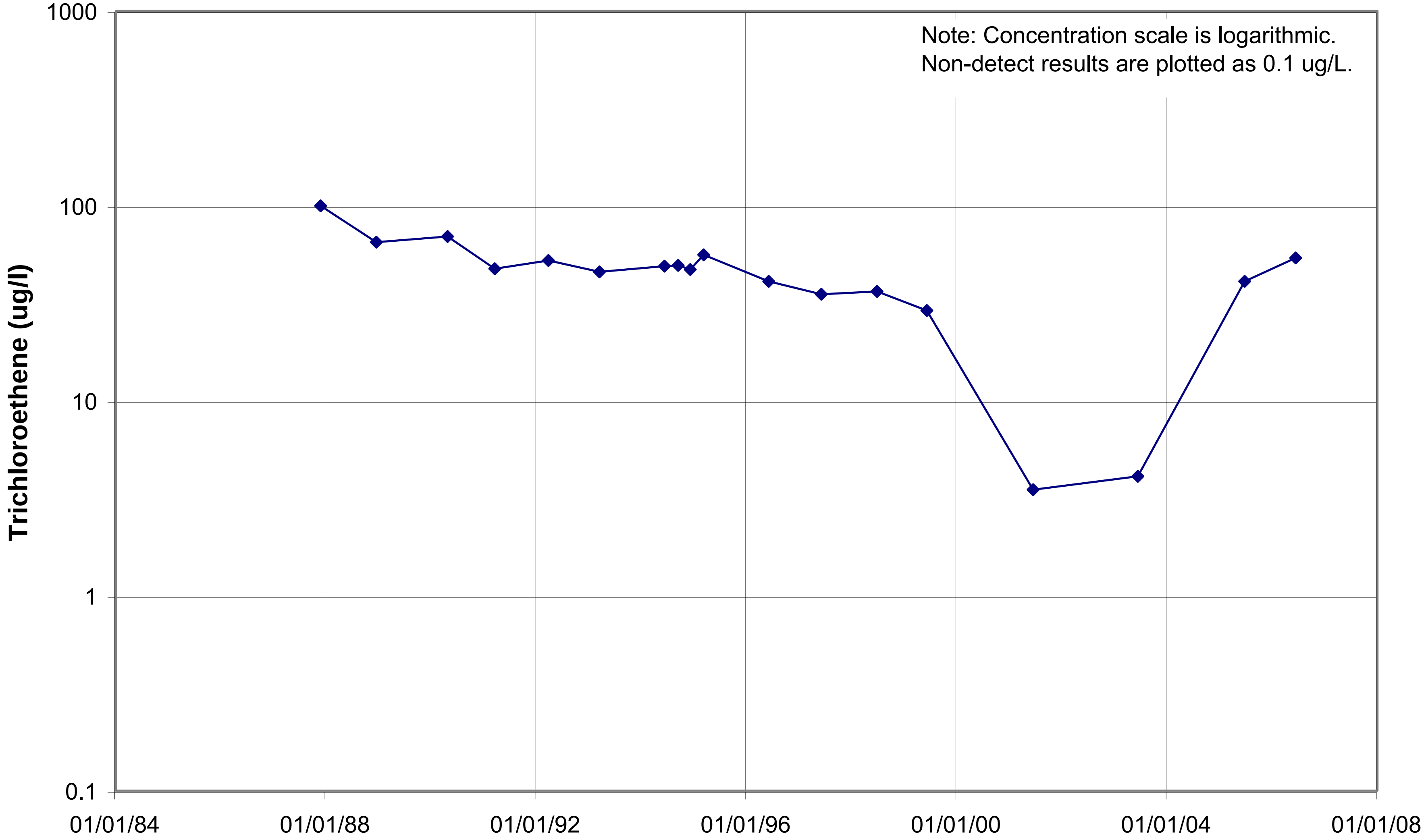

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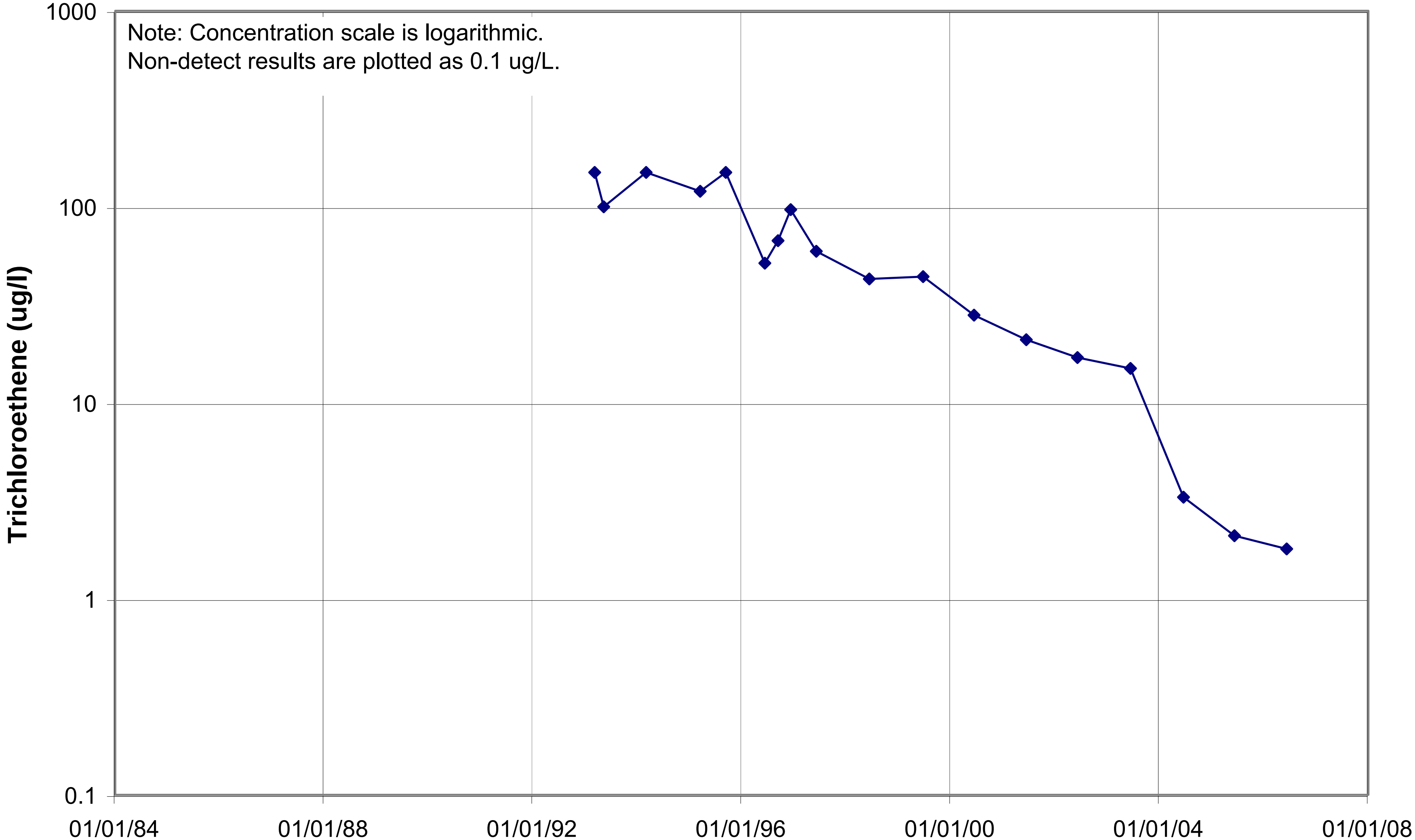

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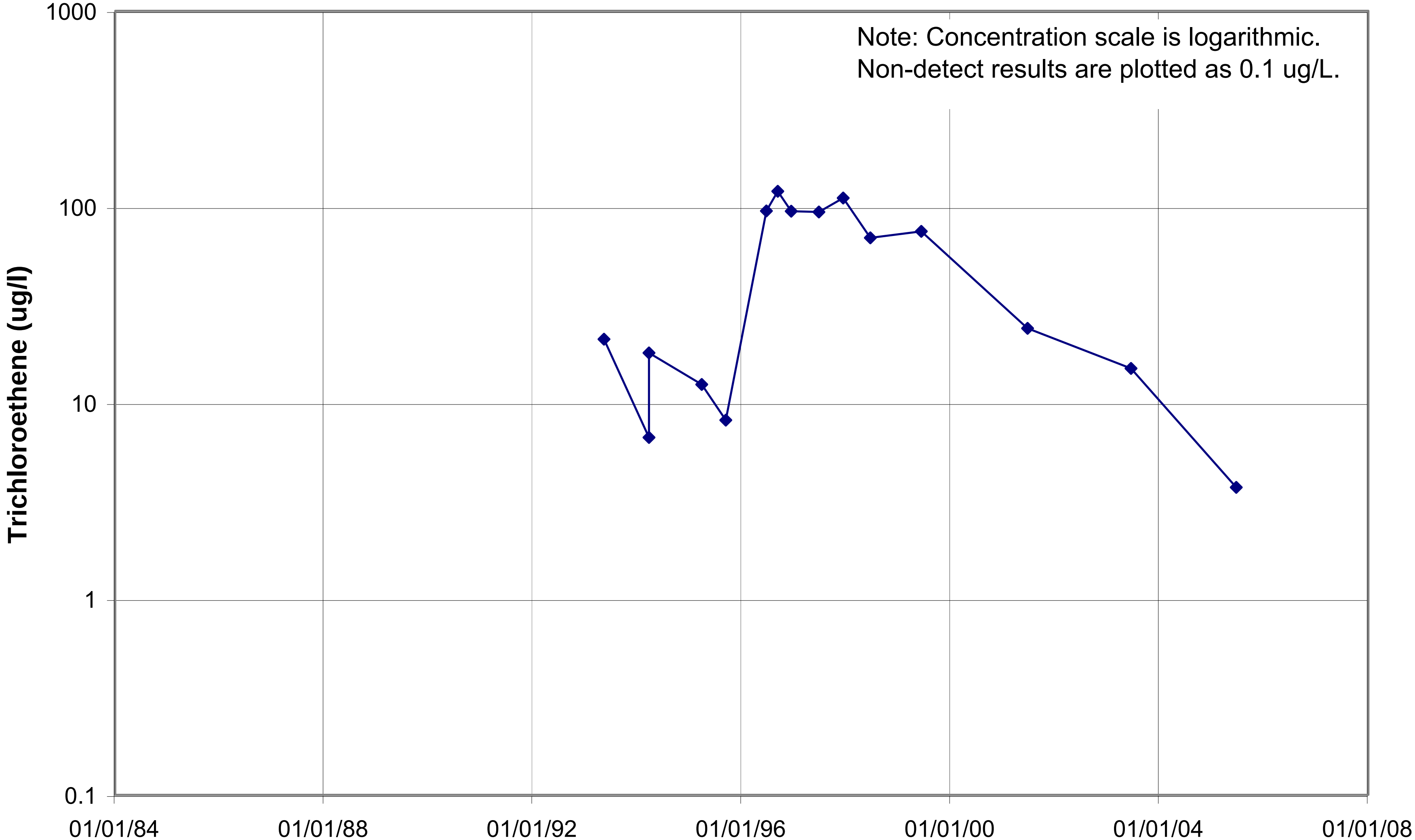

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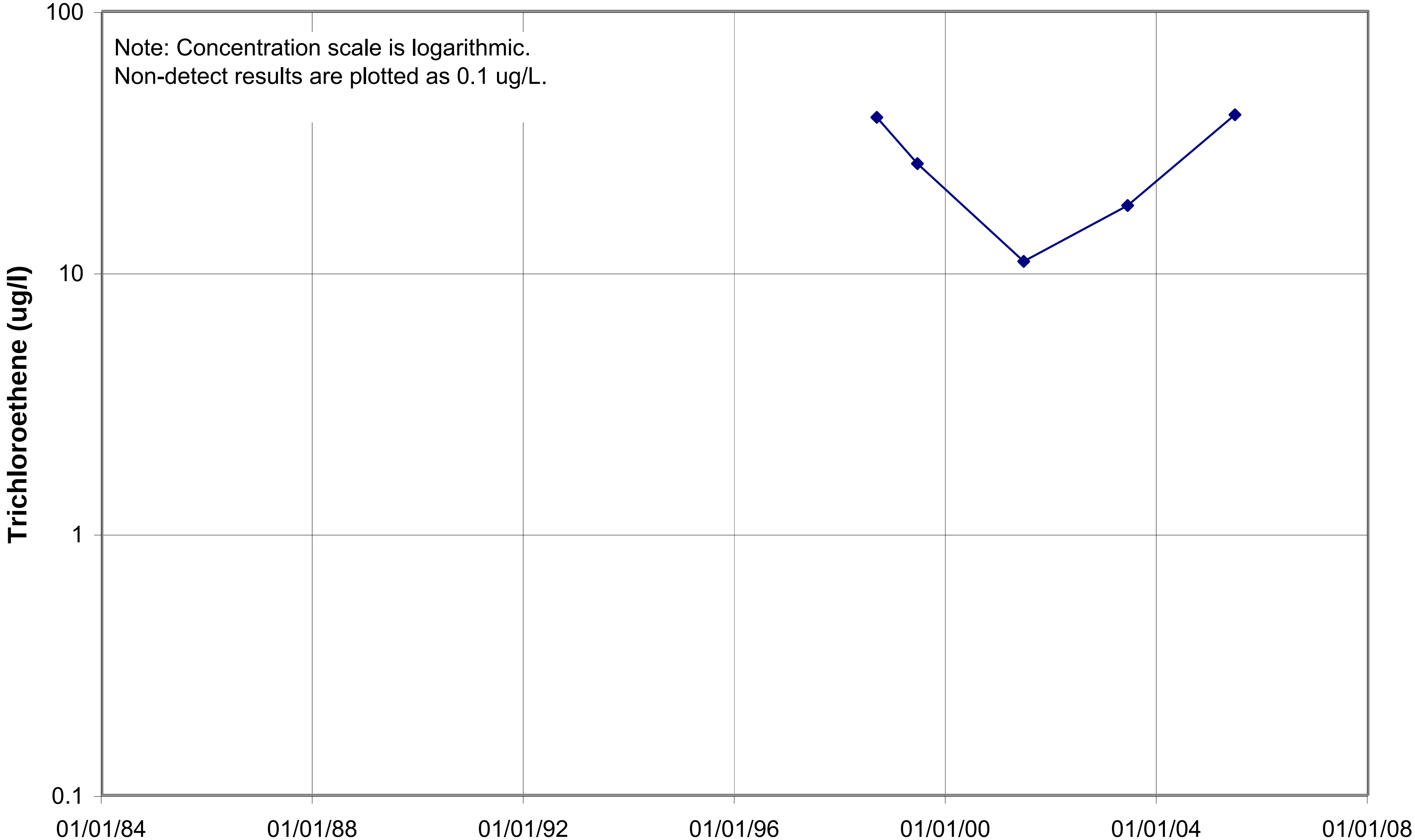

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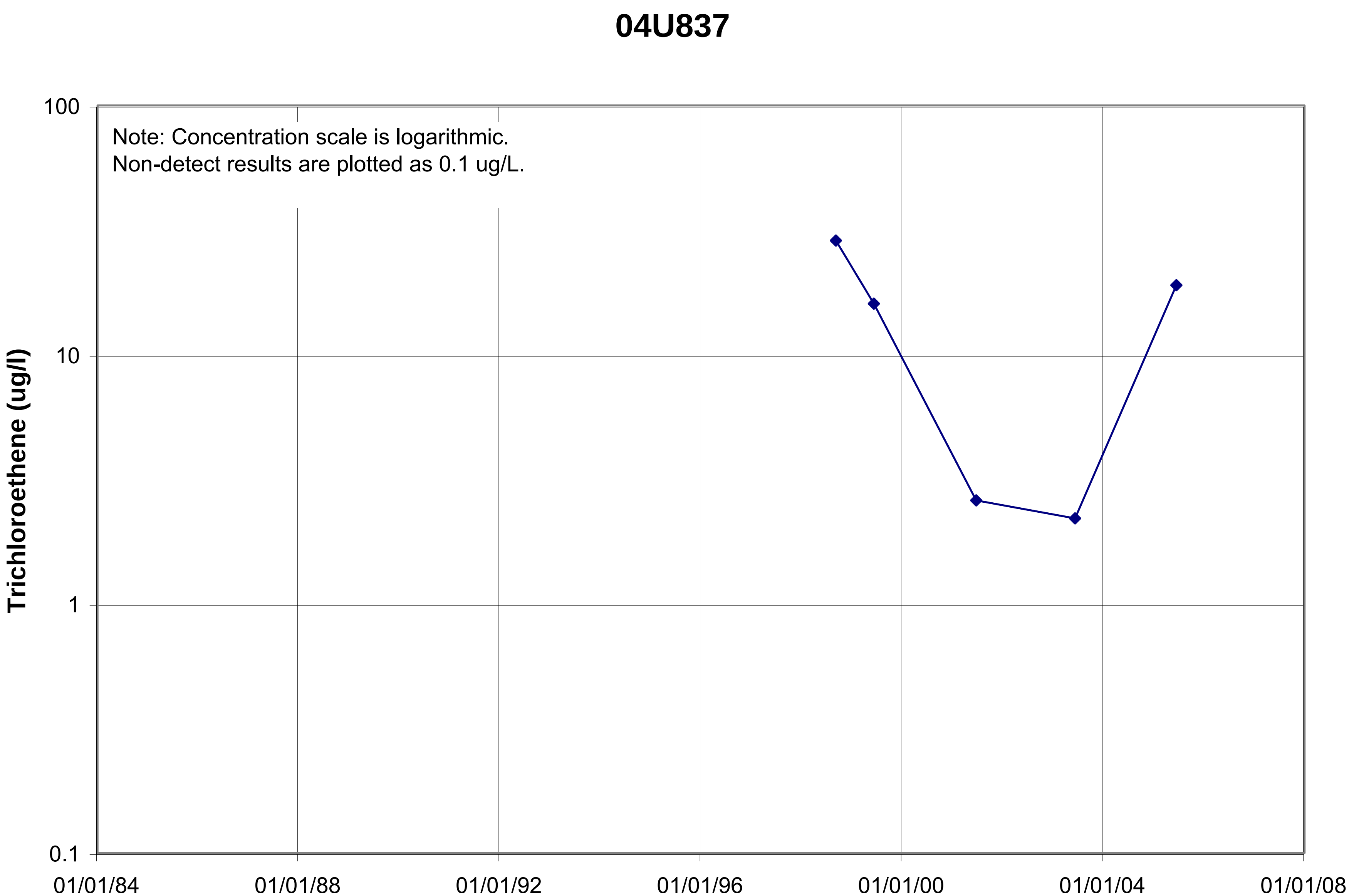

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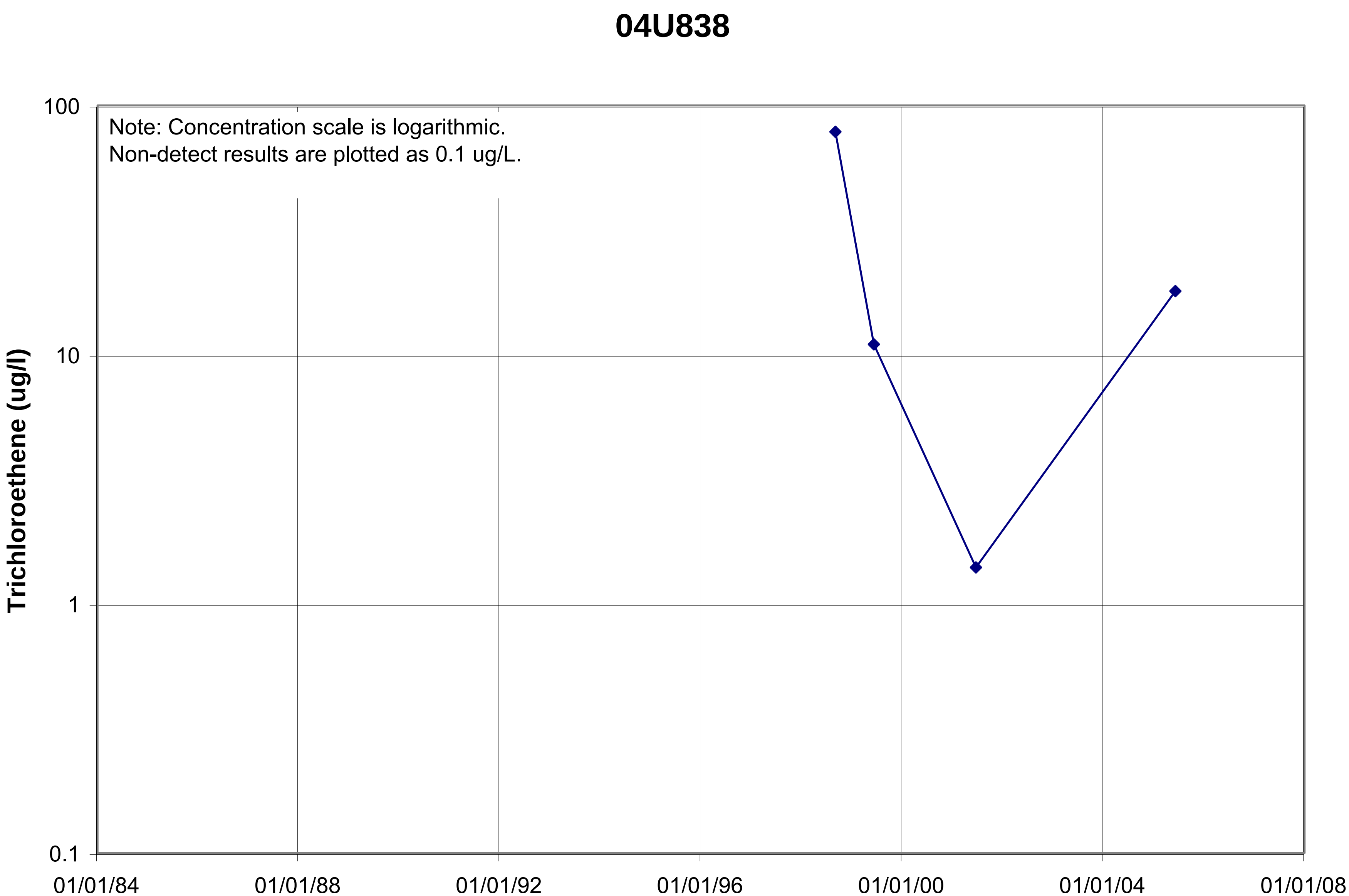

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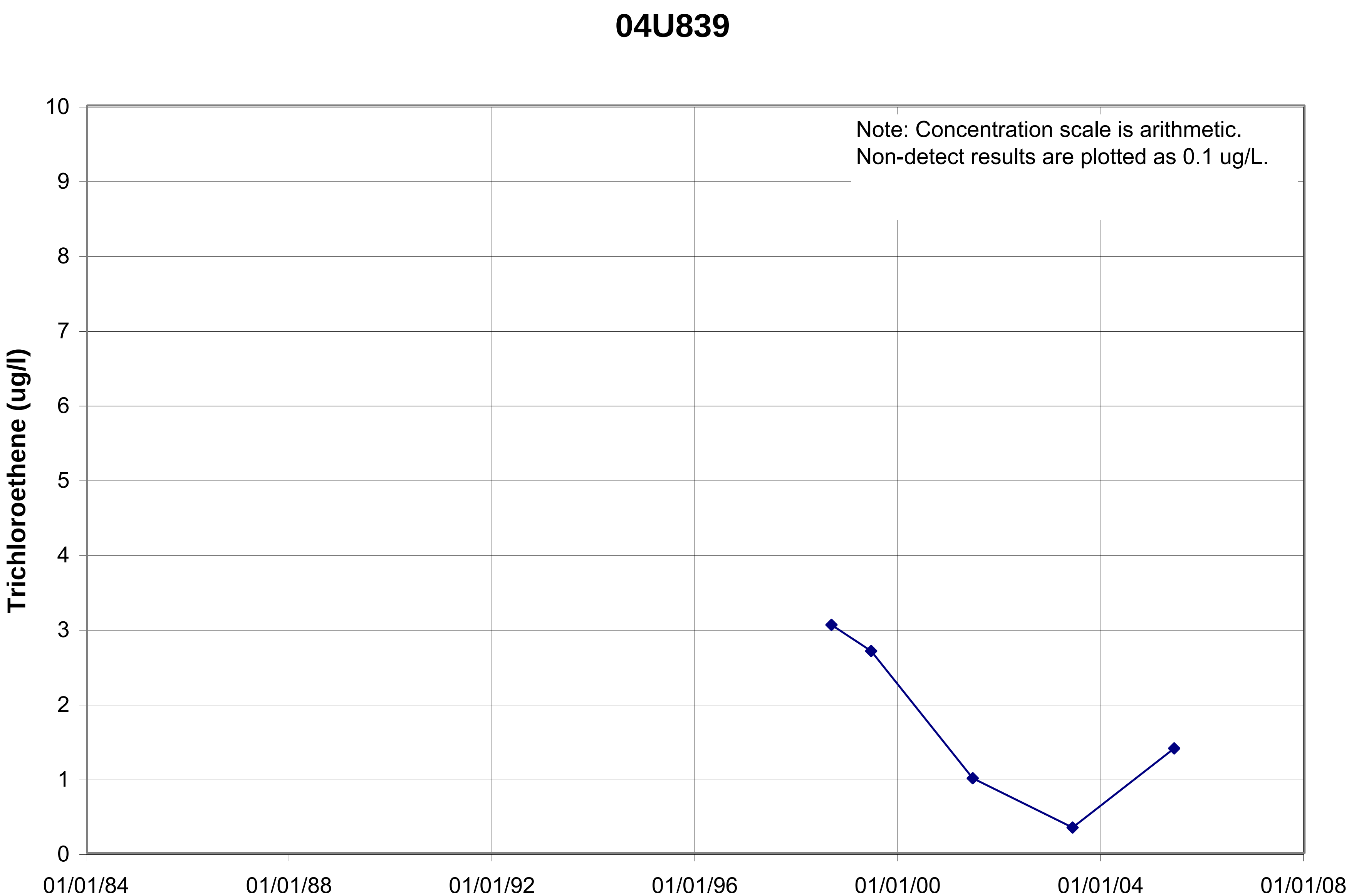

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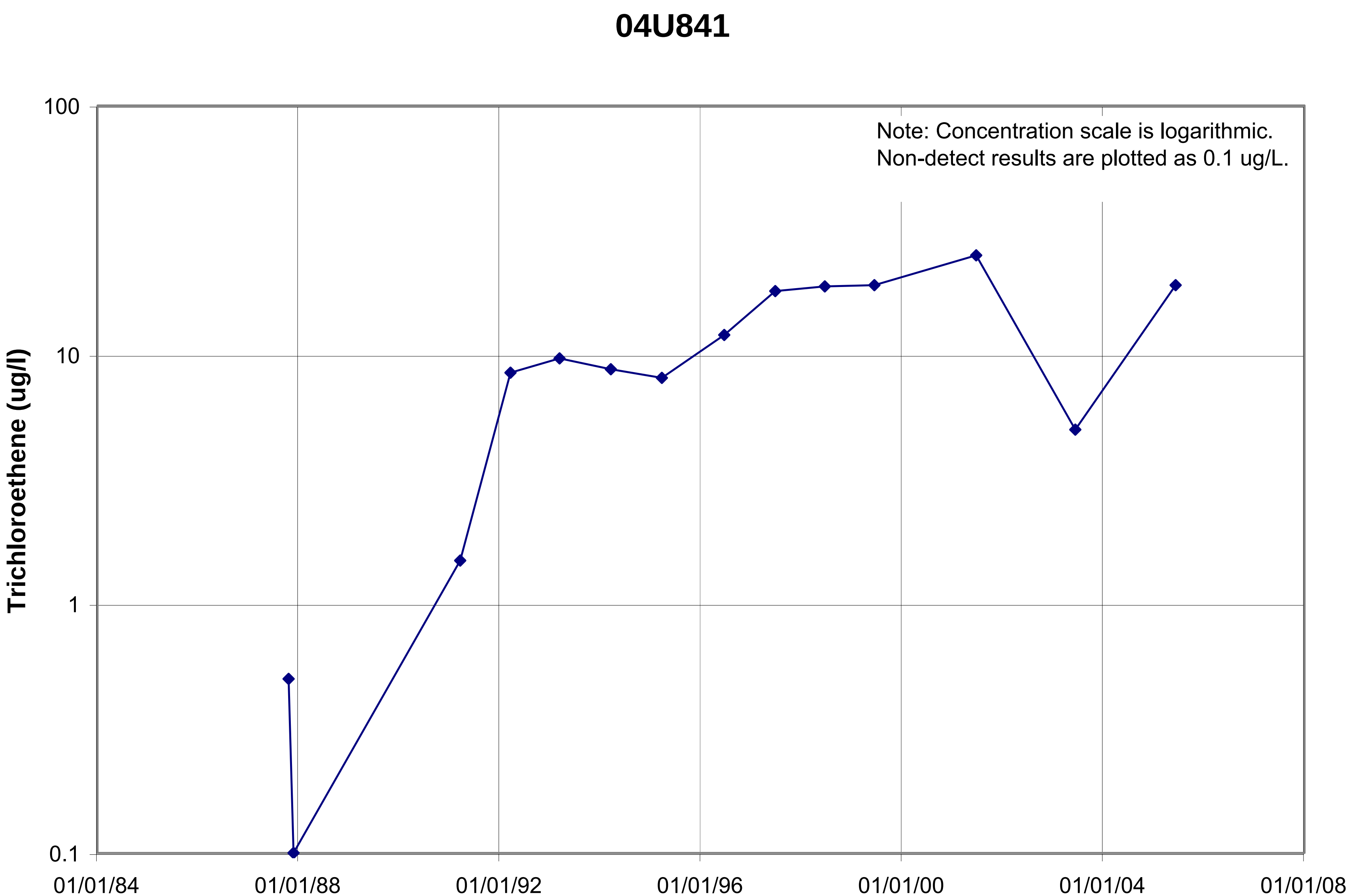

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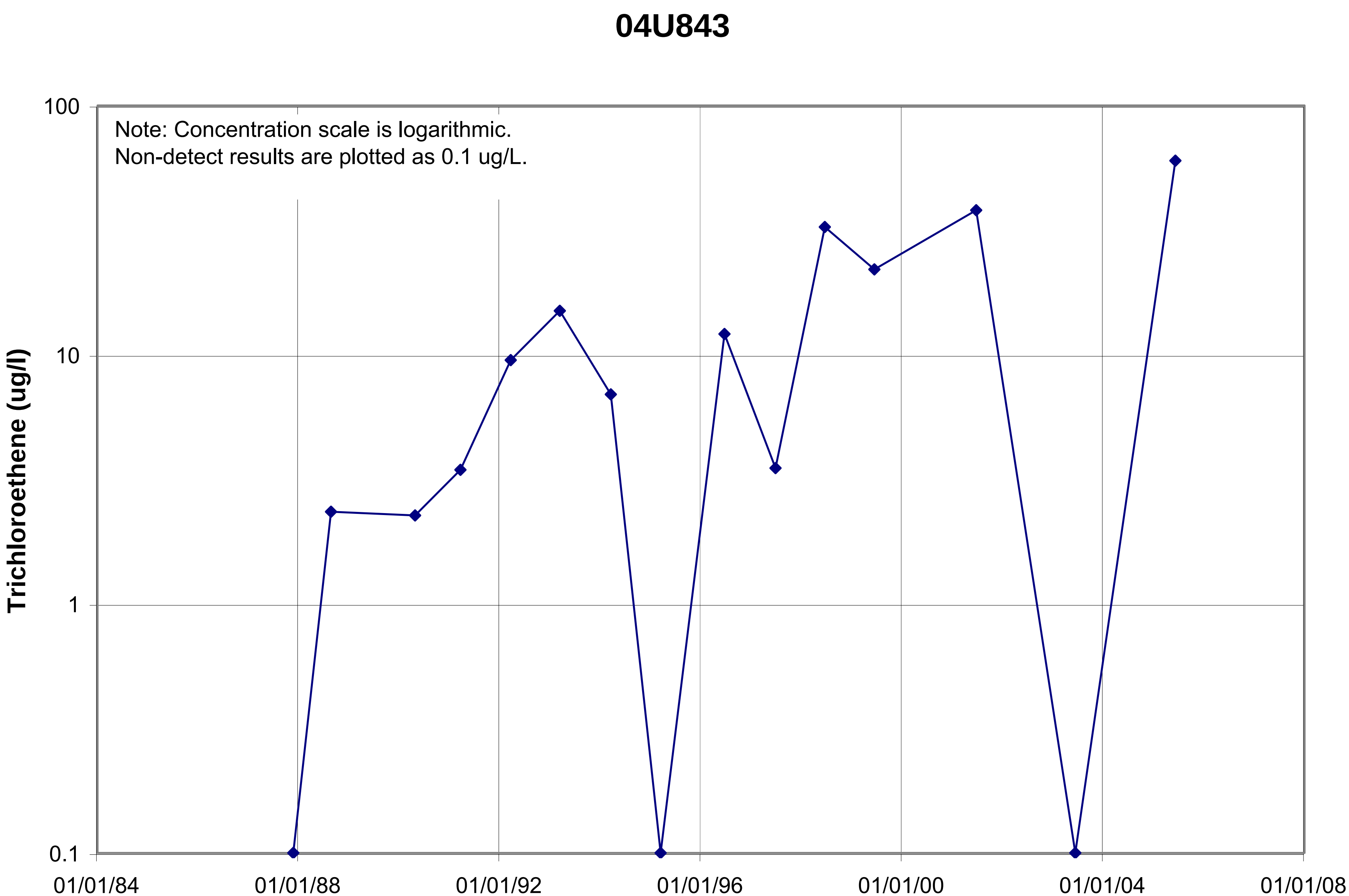

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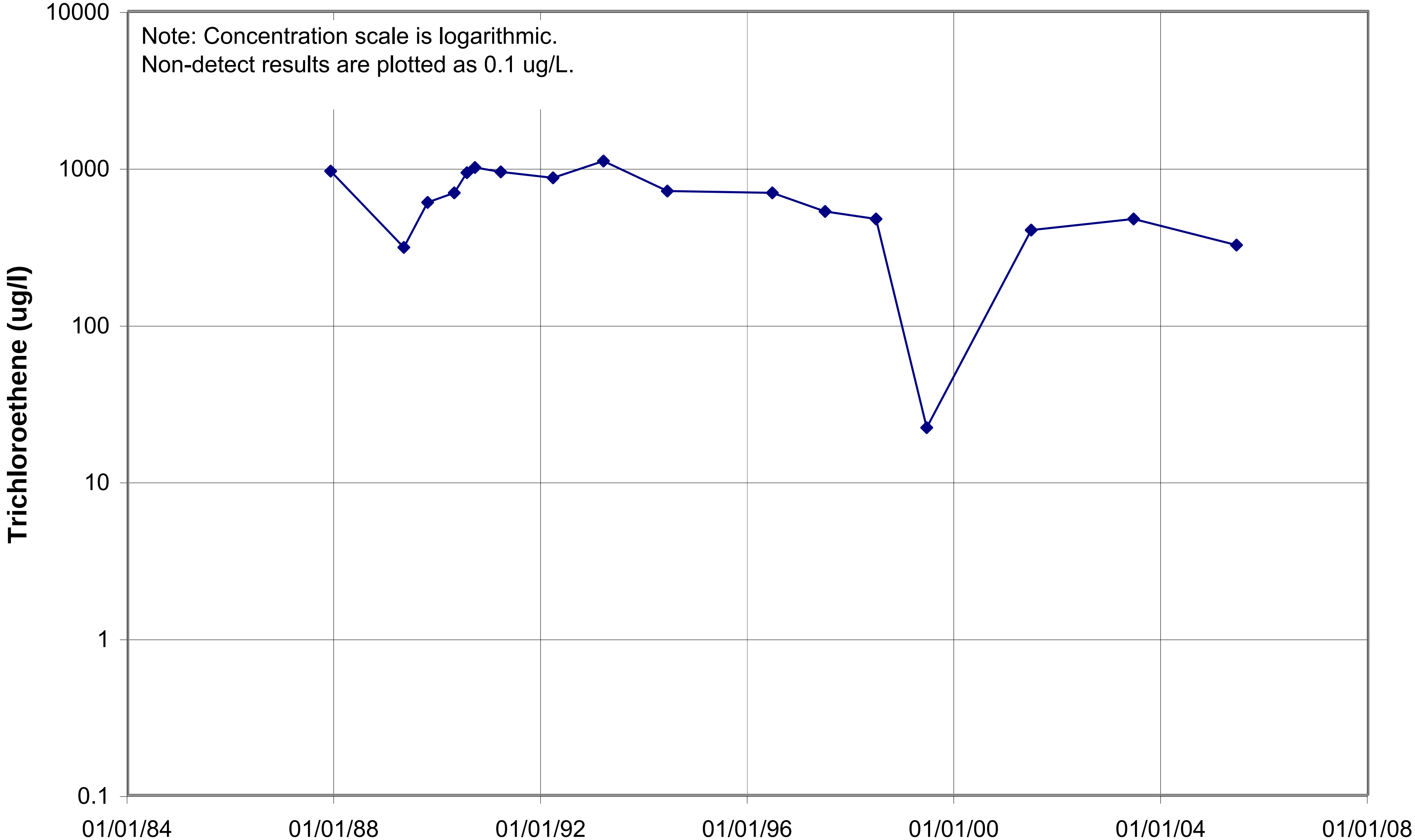

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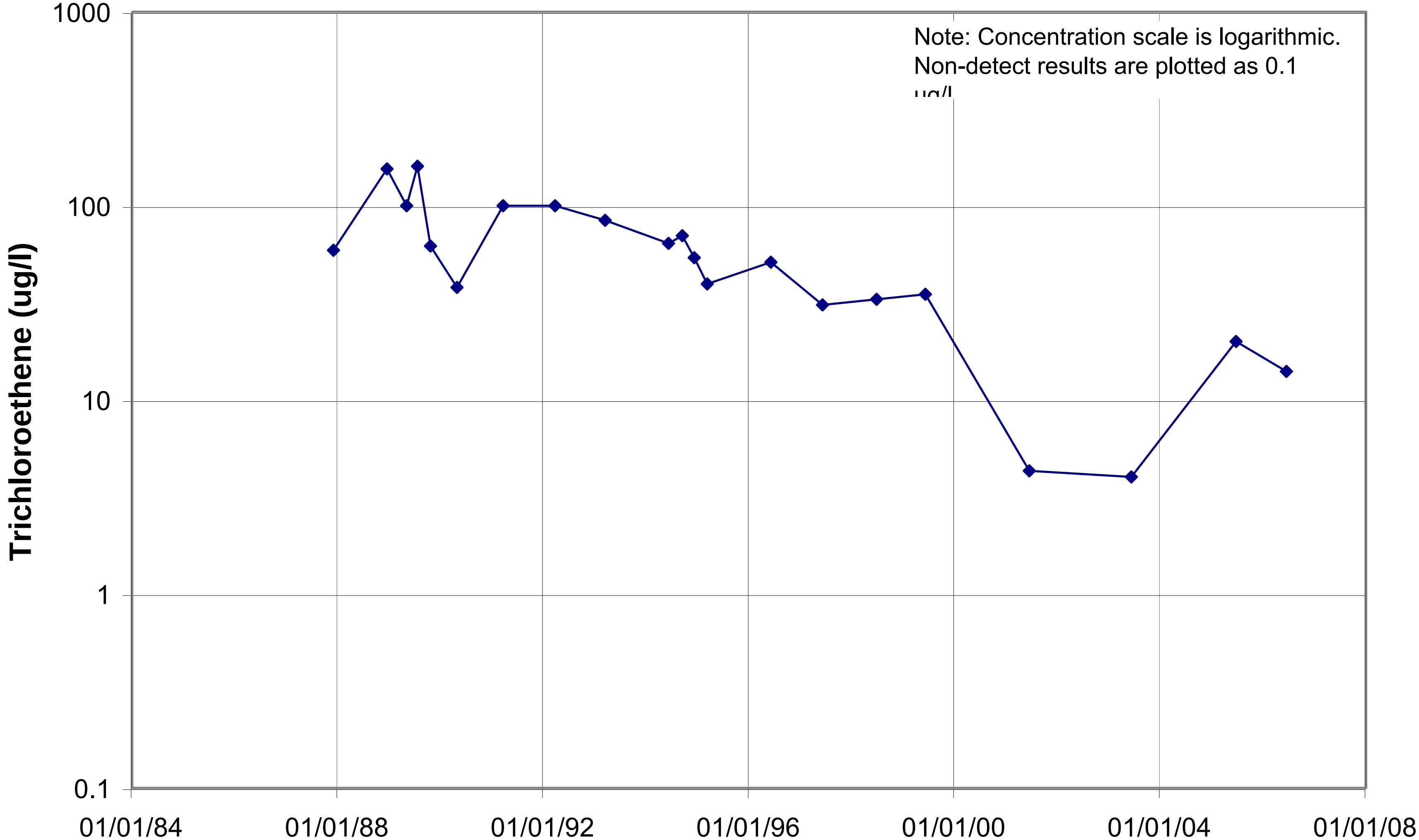

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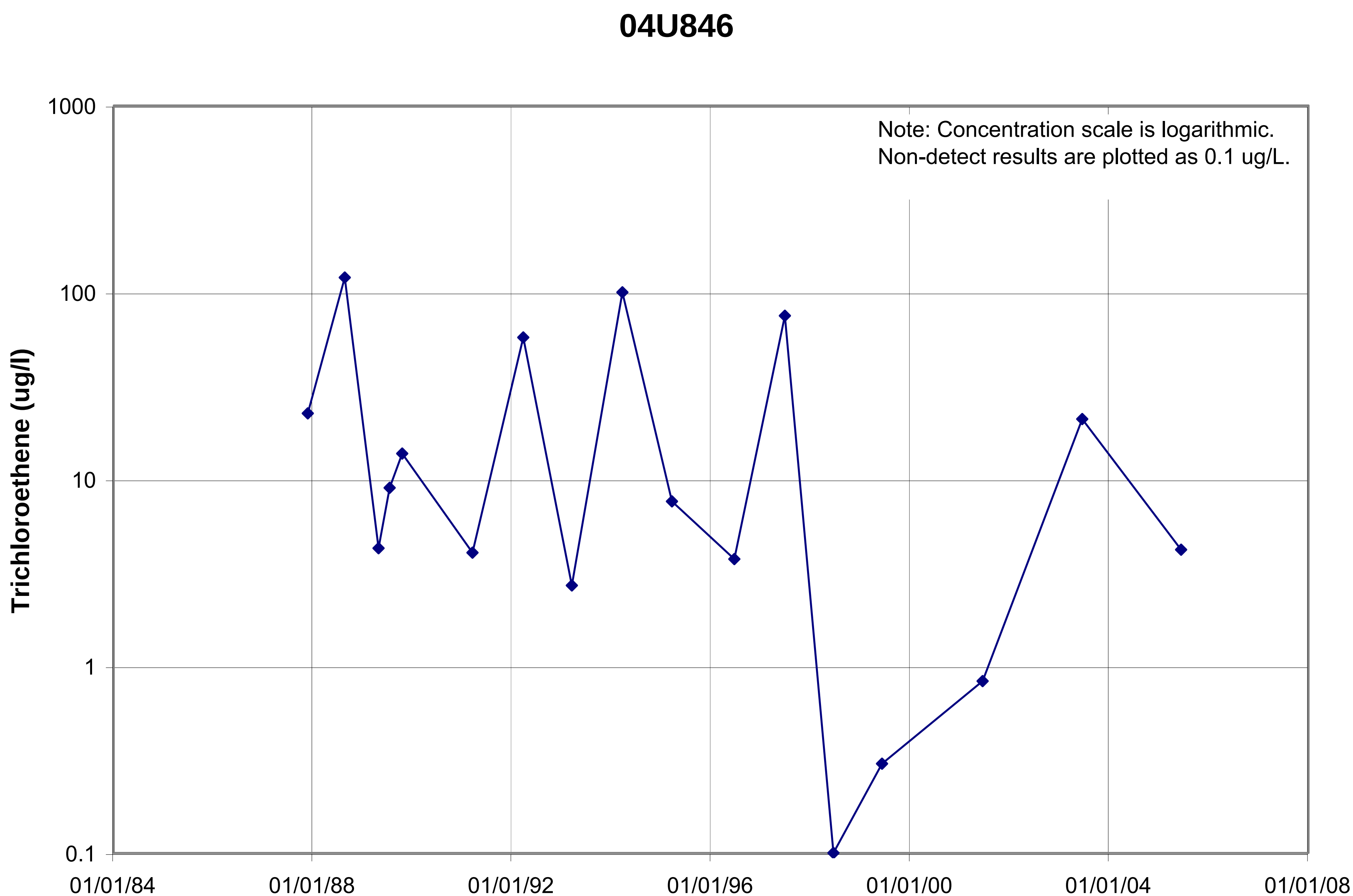

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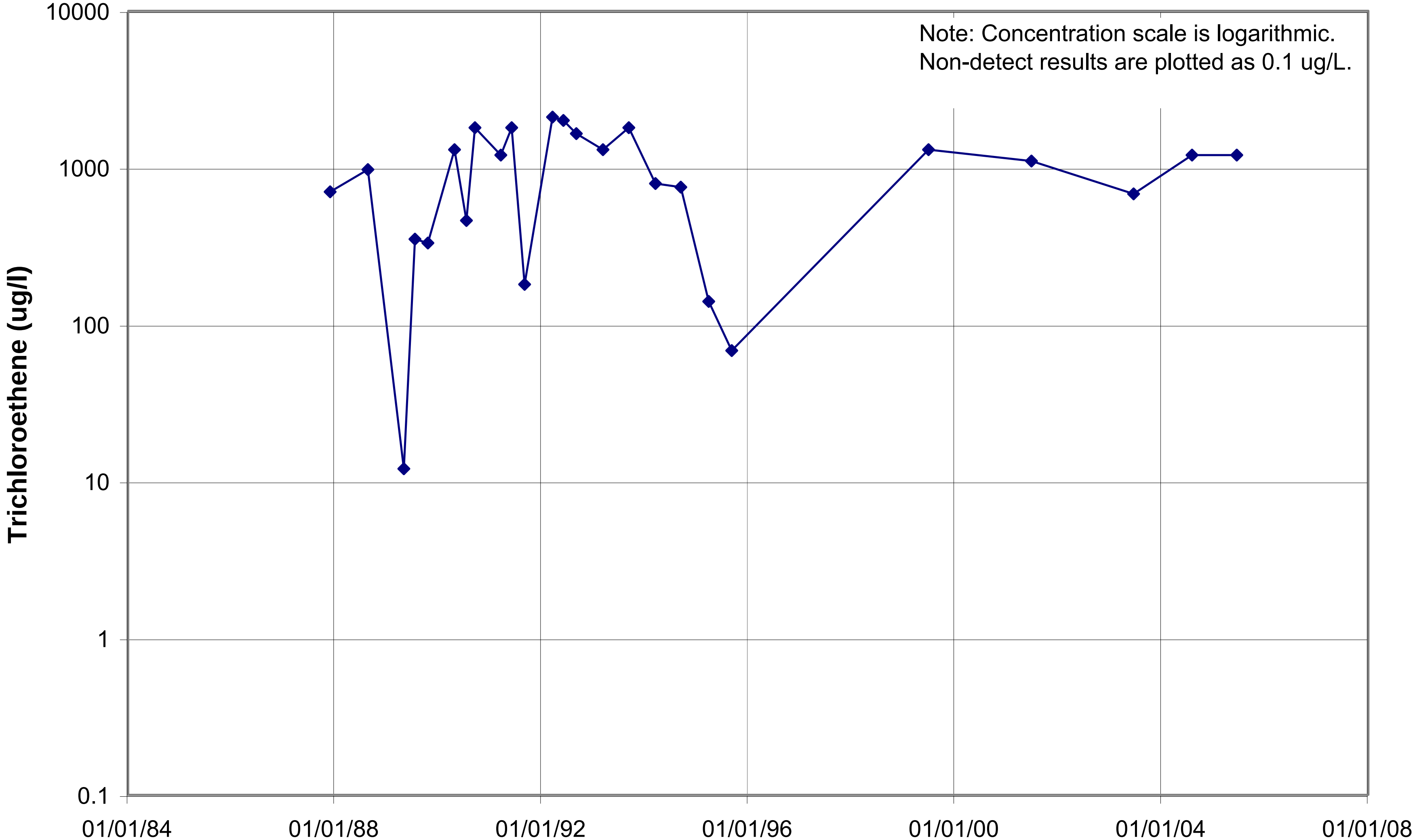

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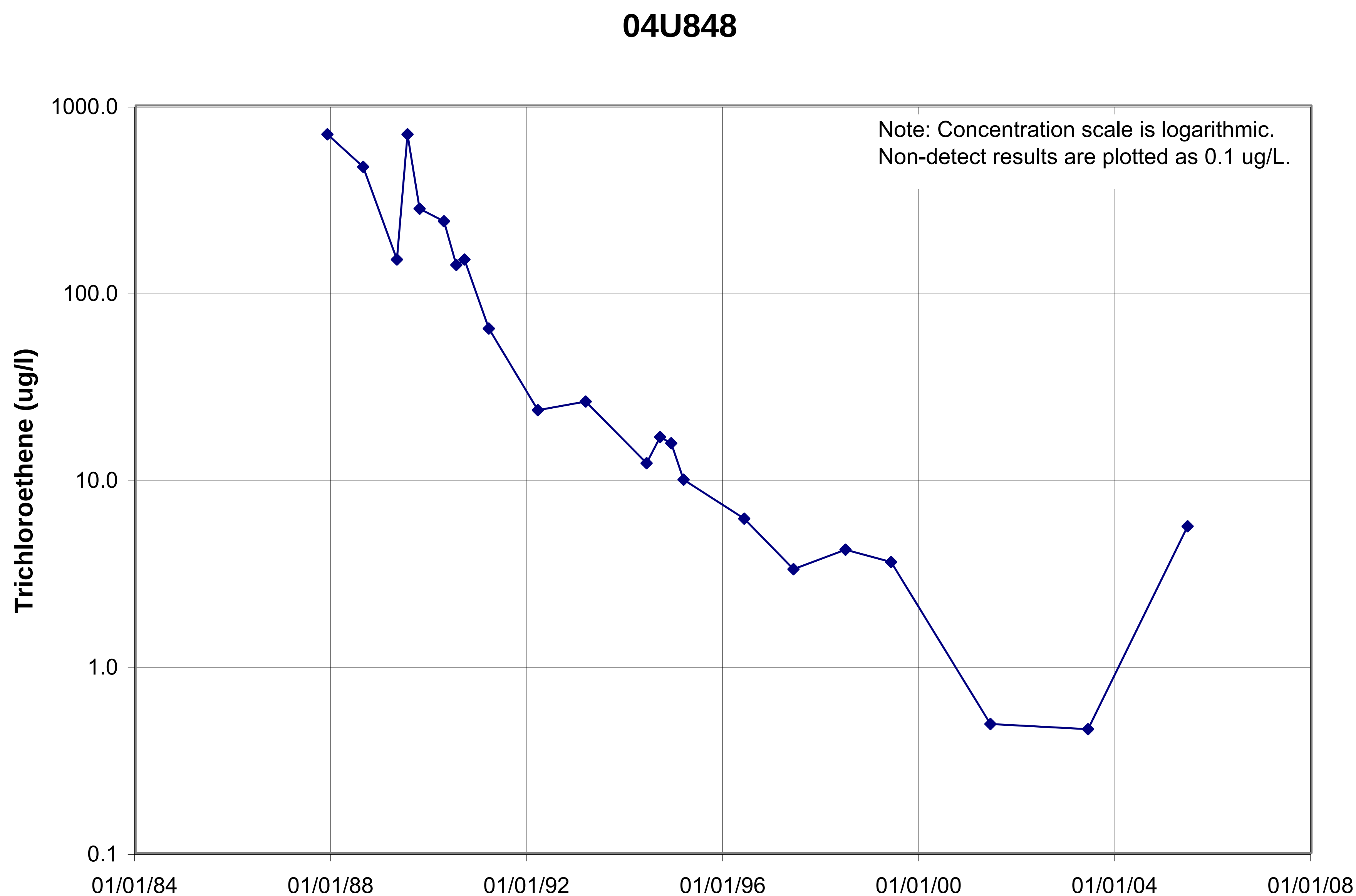

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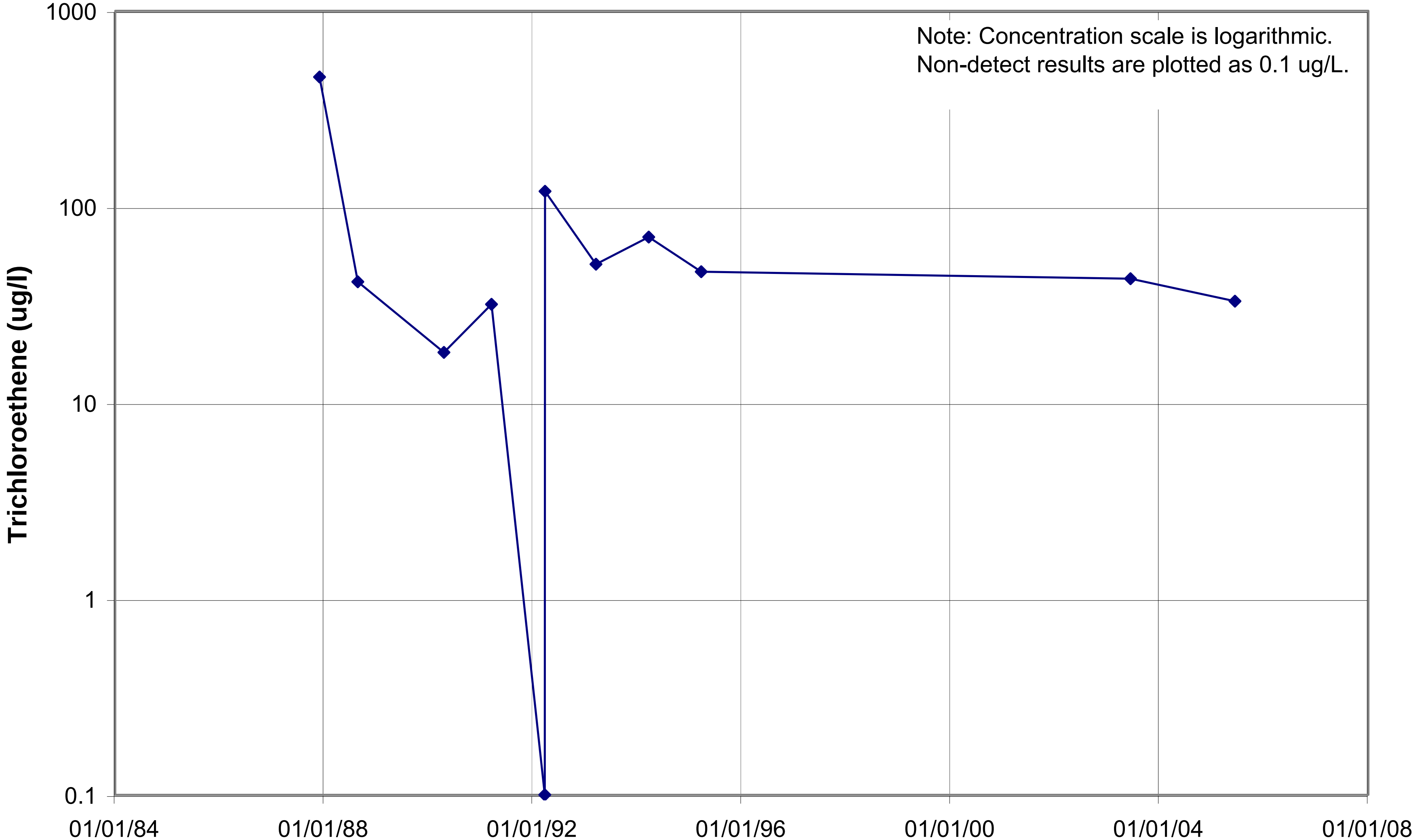

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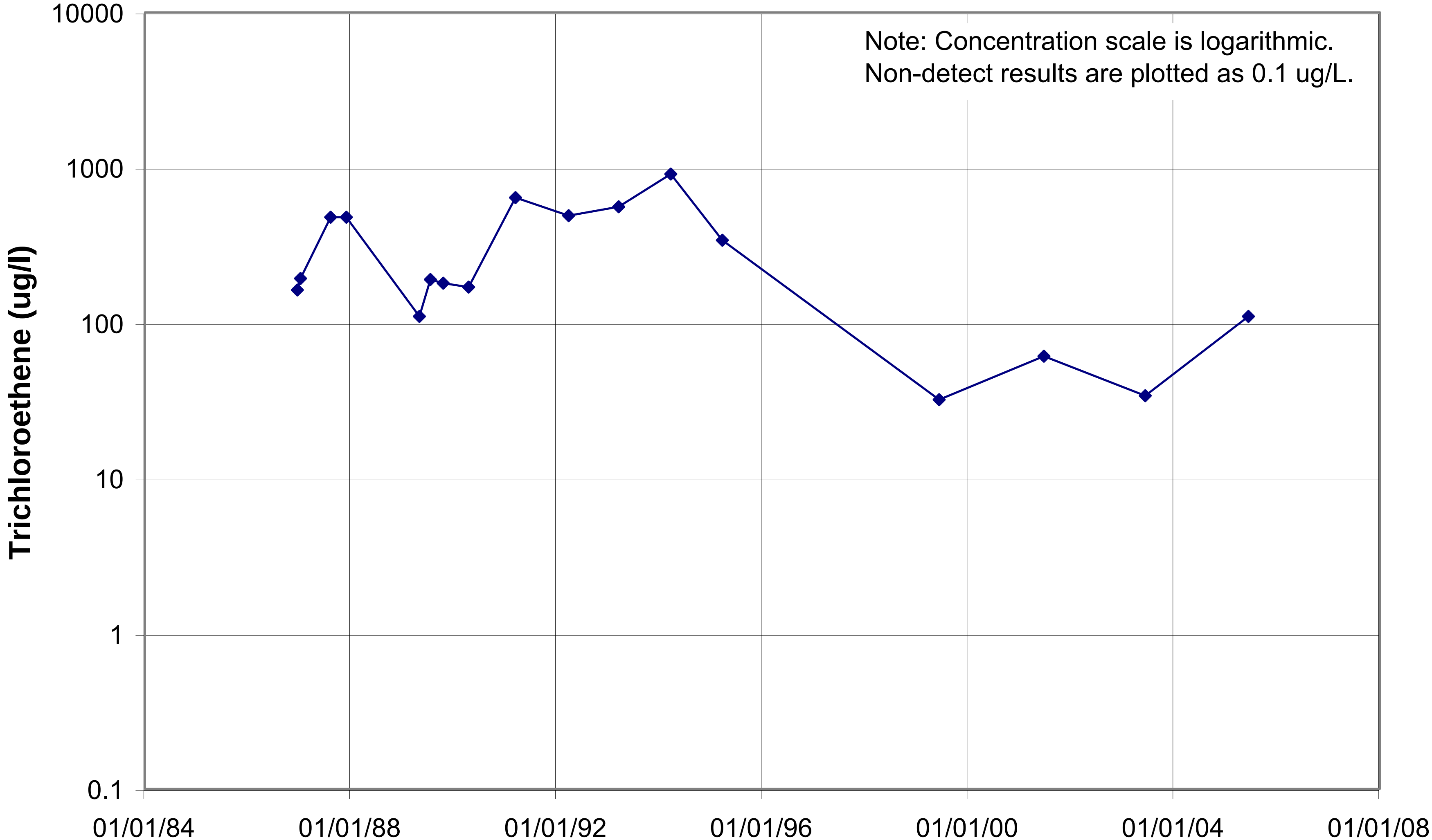

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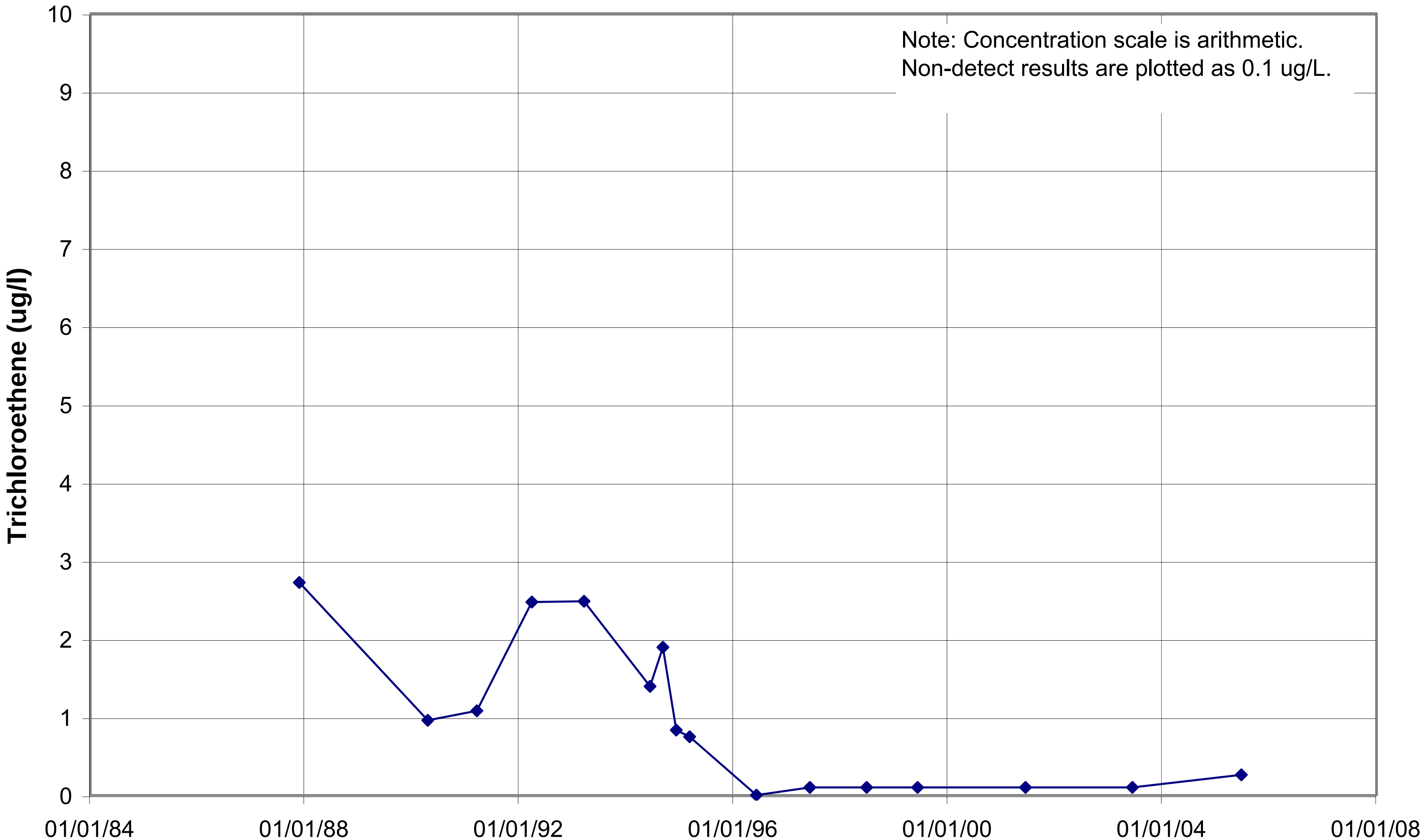

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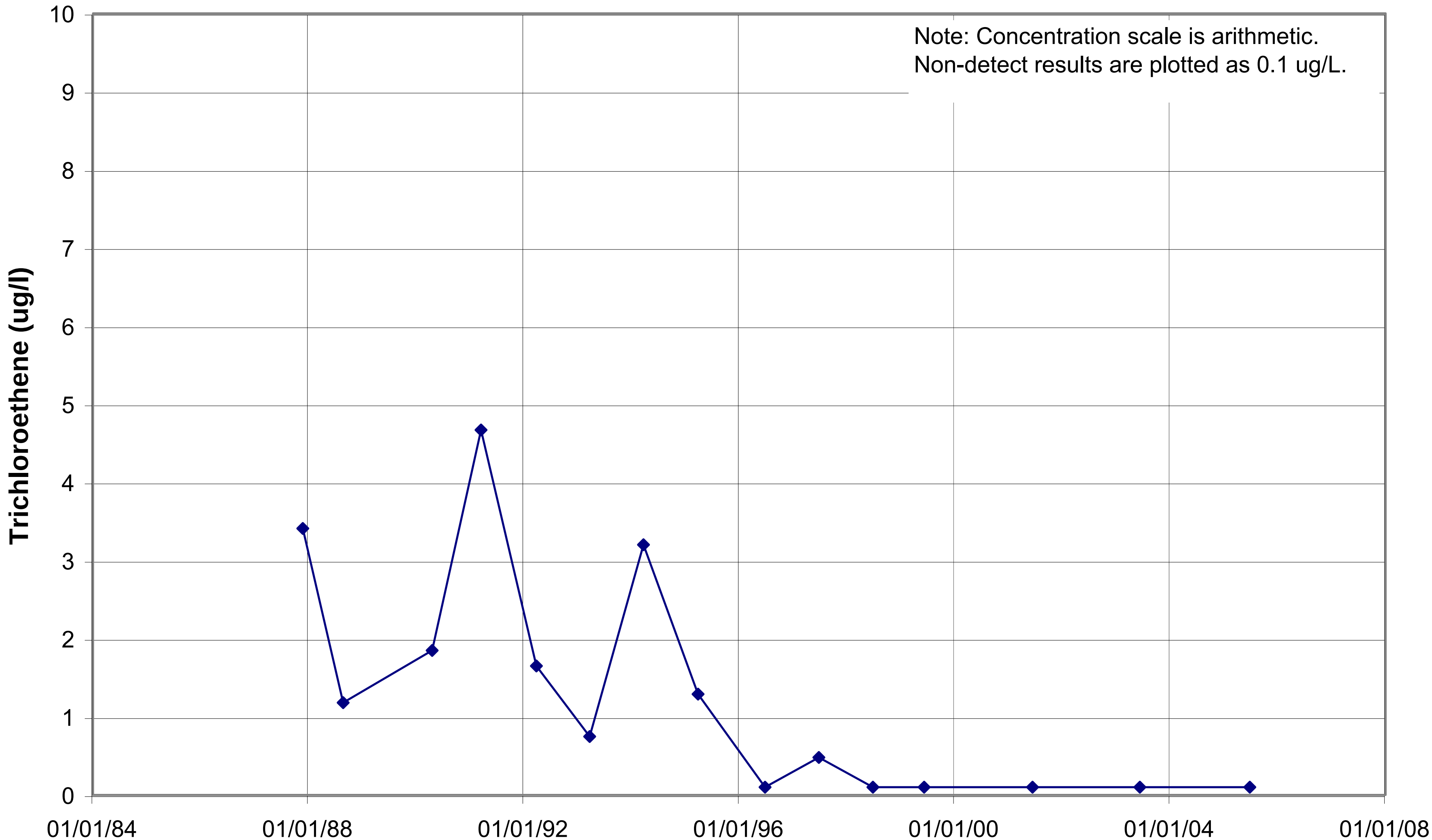

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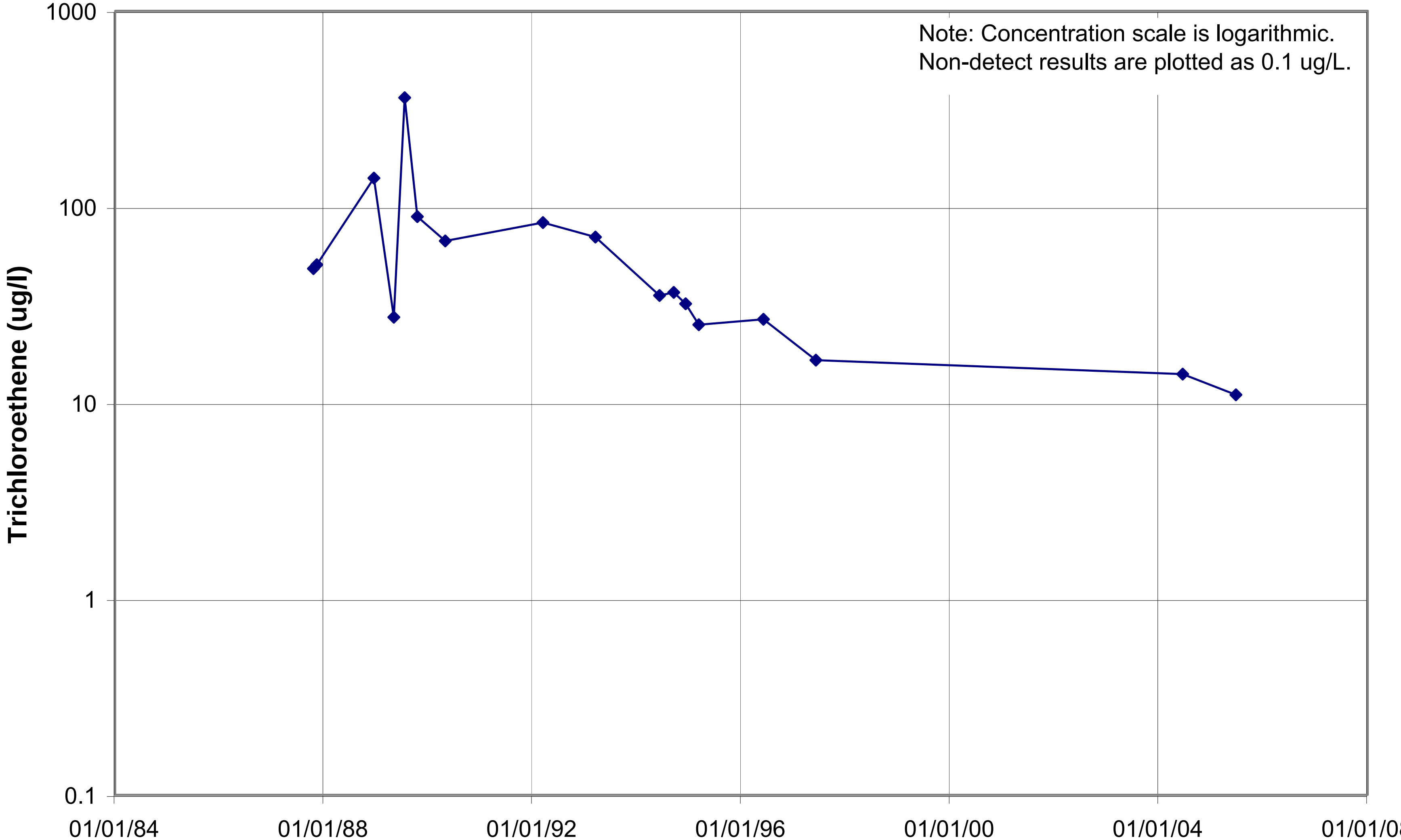

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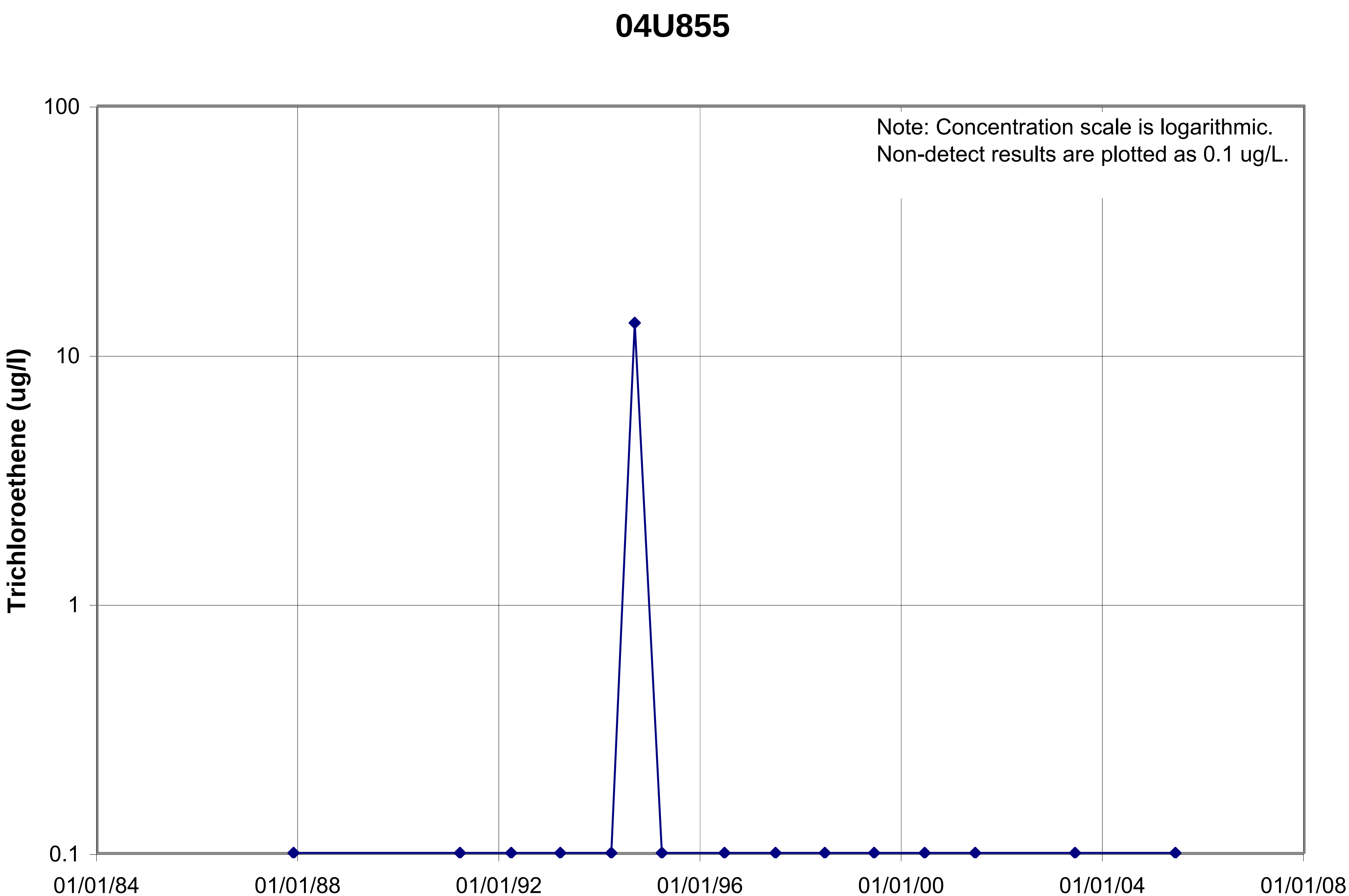

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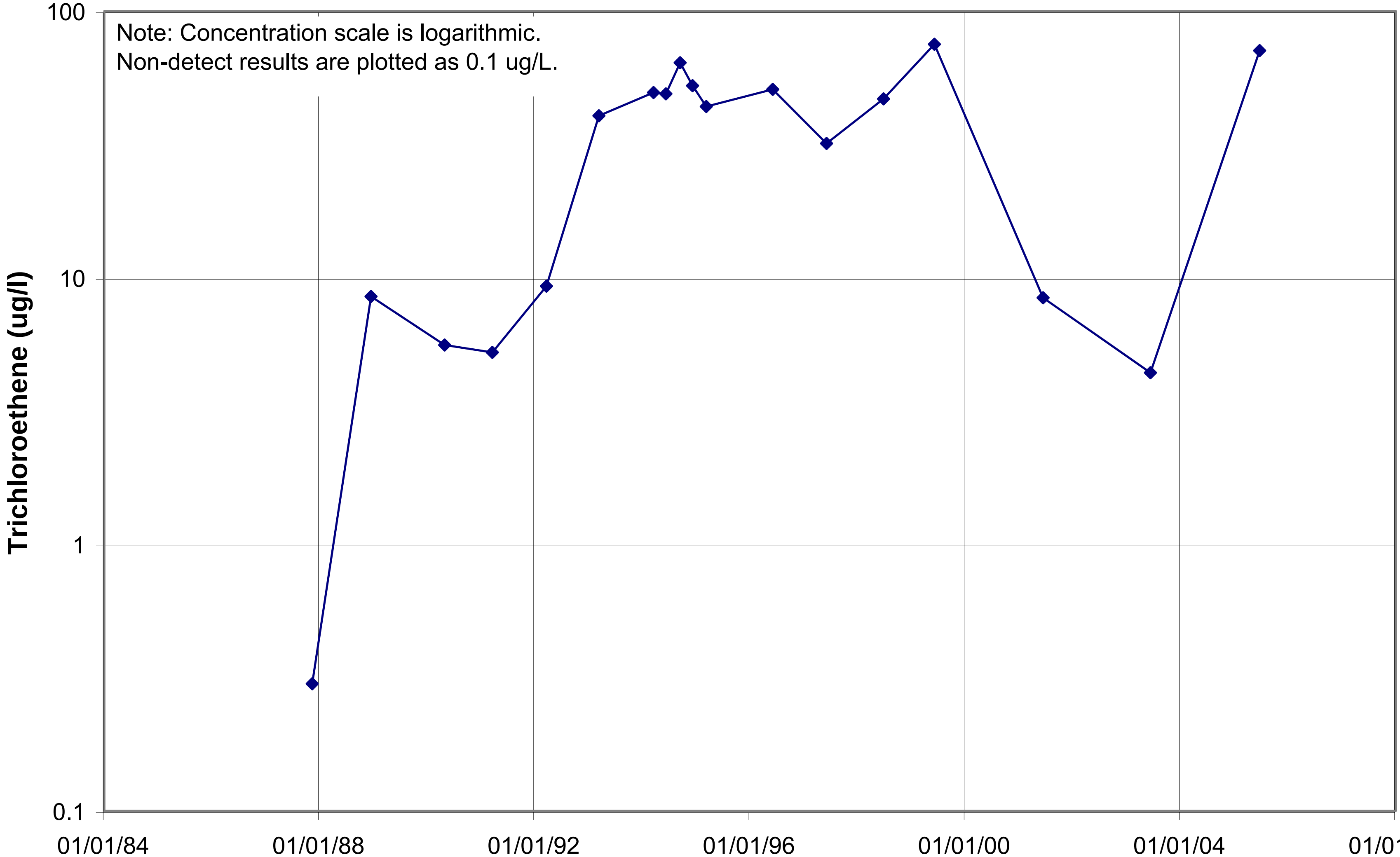

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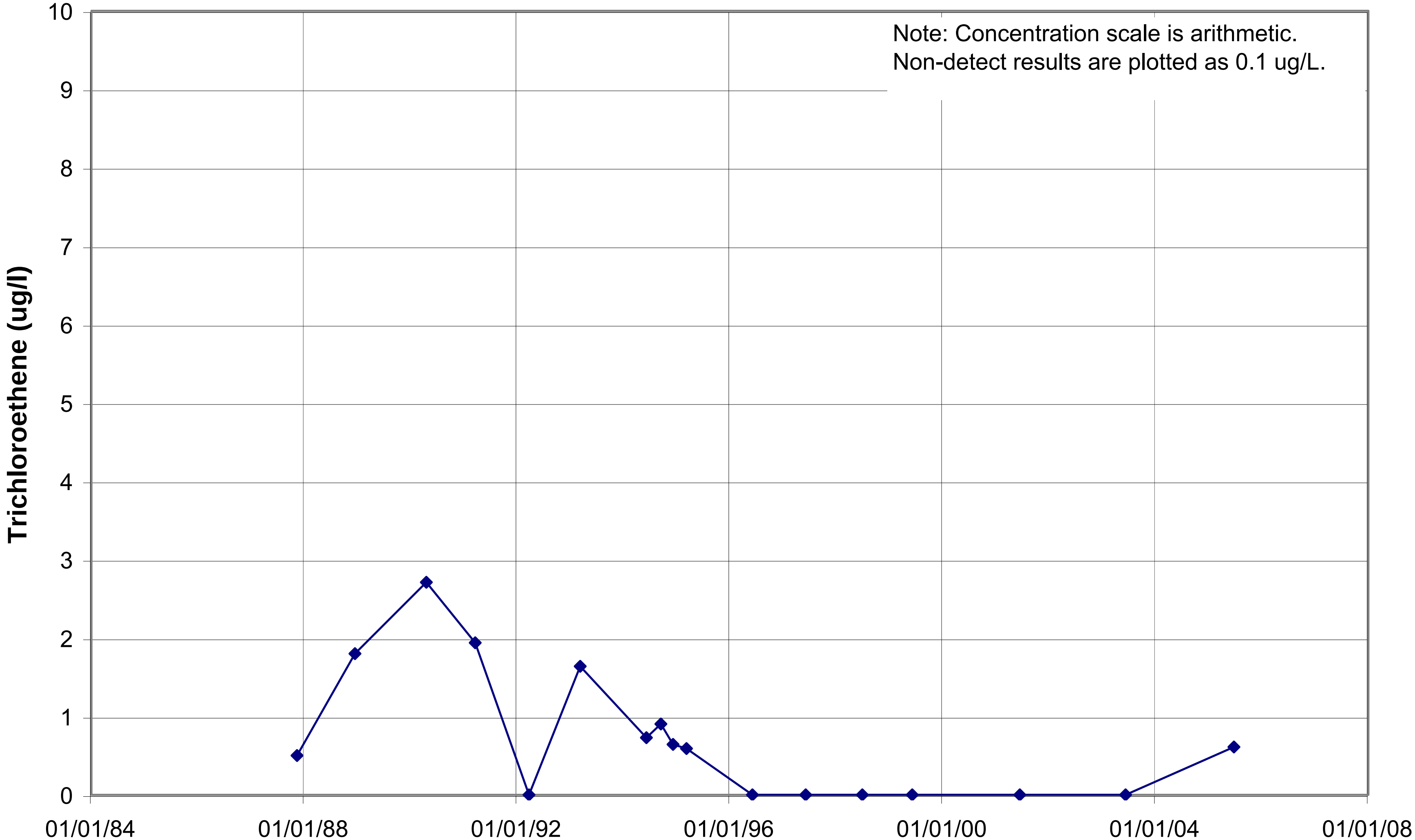

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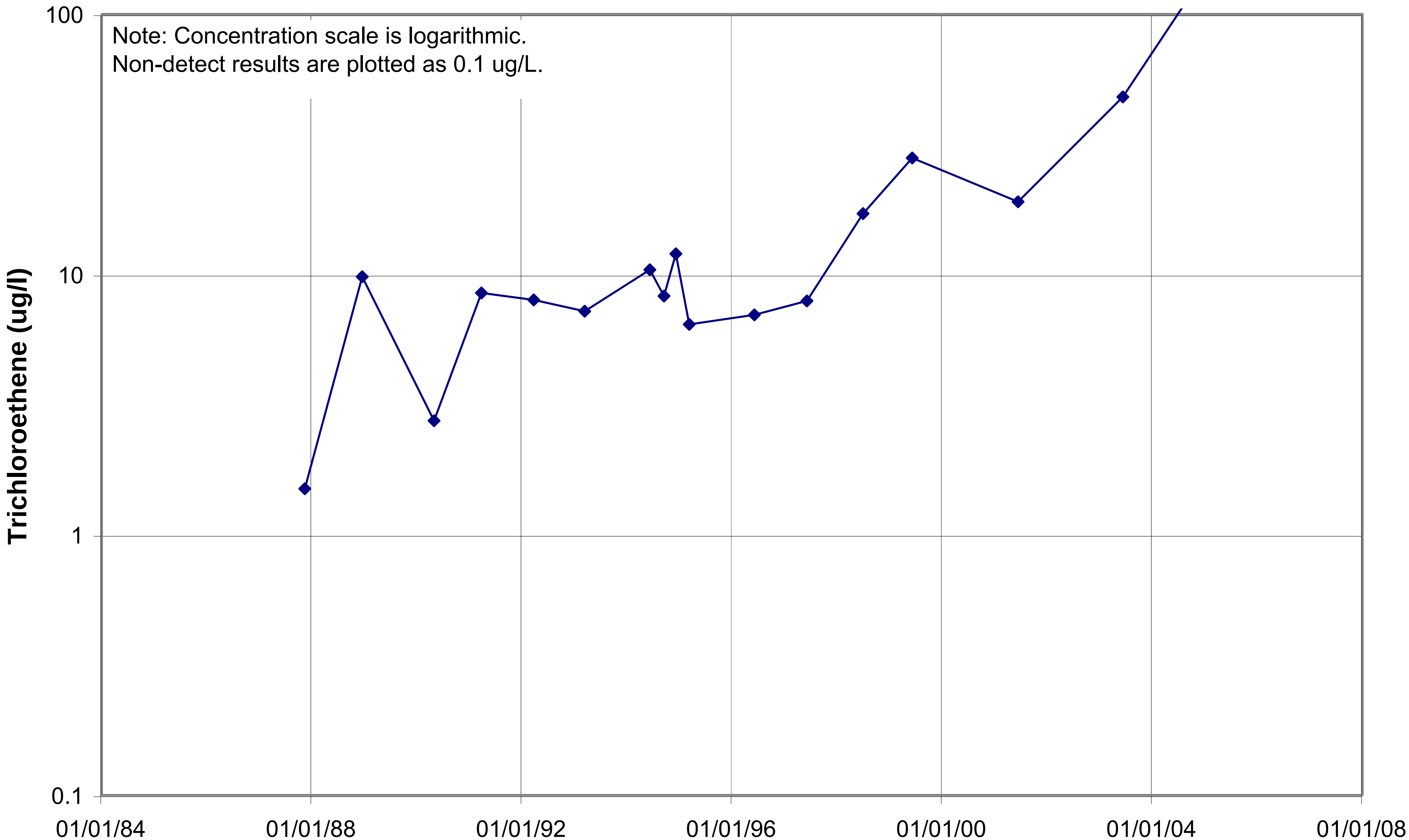
04U861



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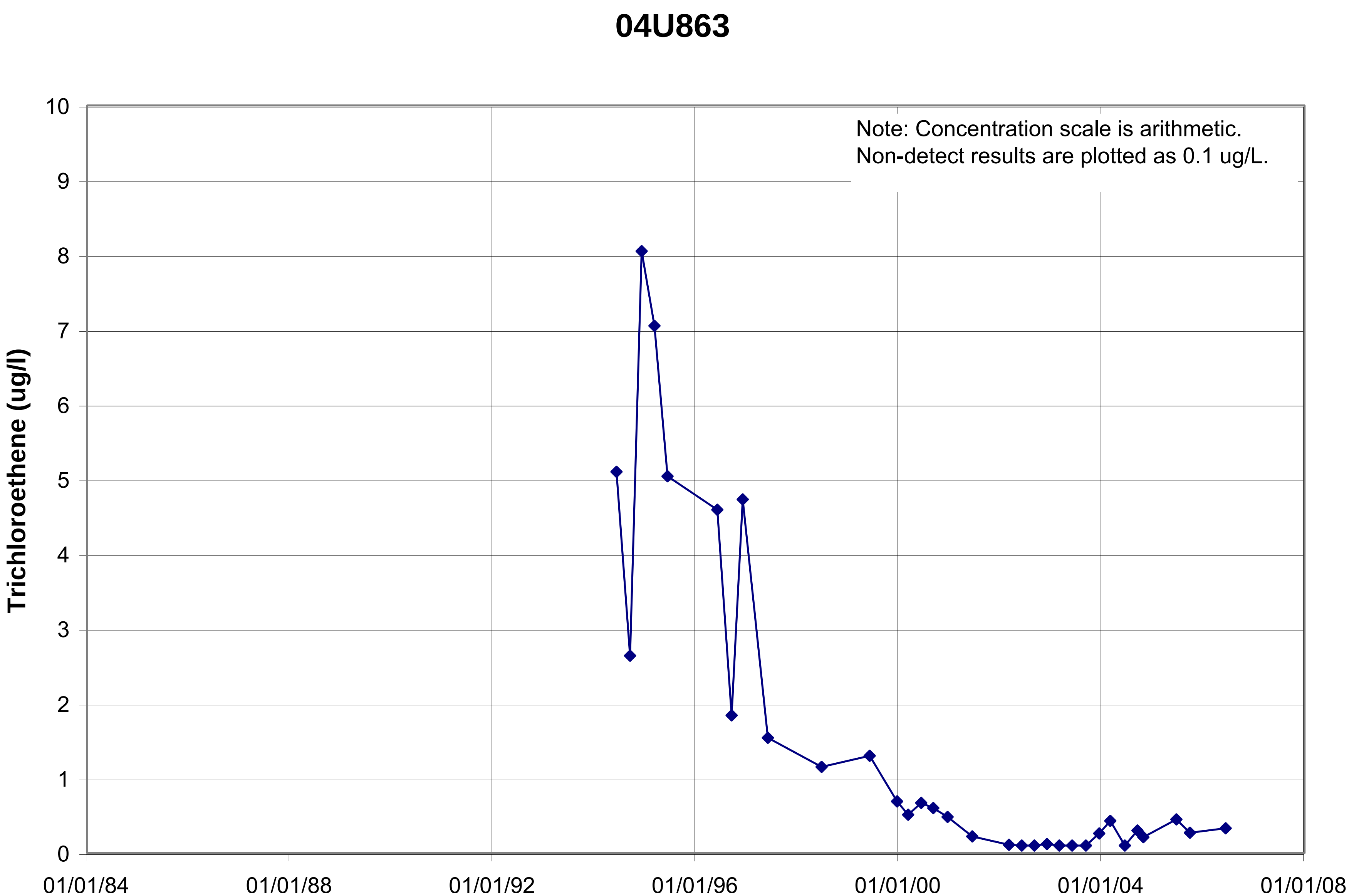

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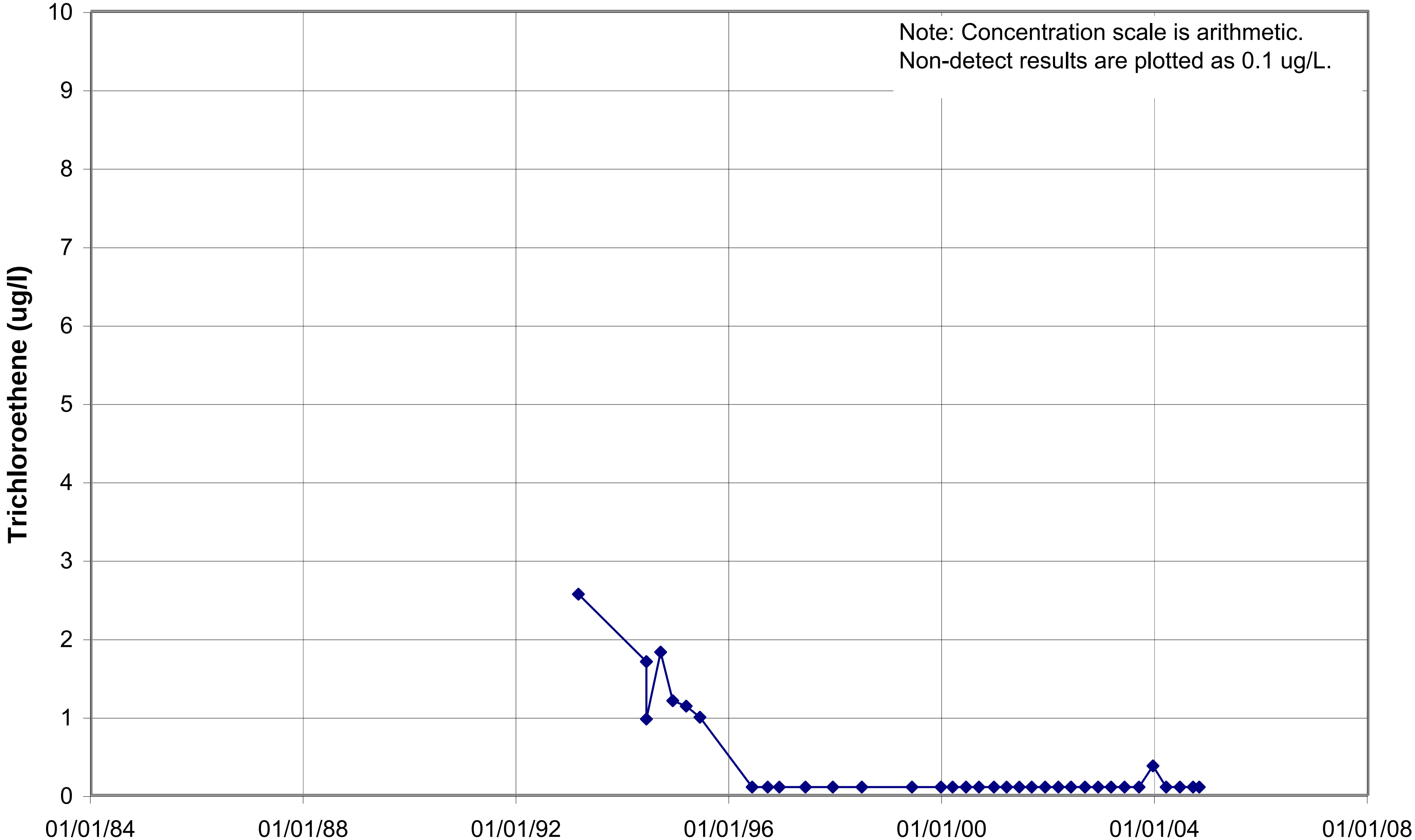
04U864



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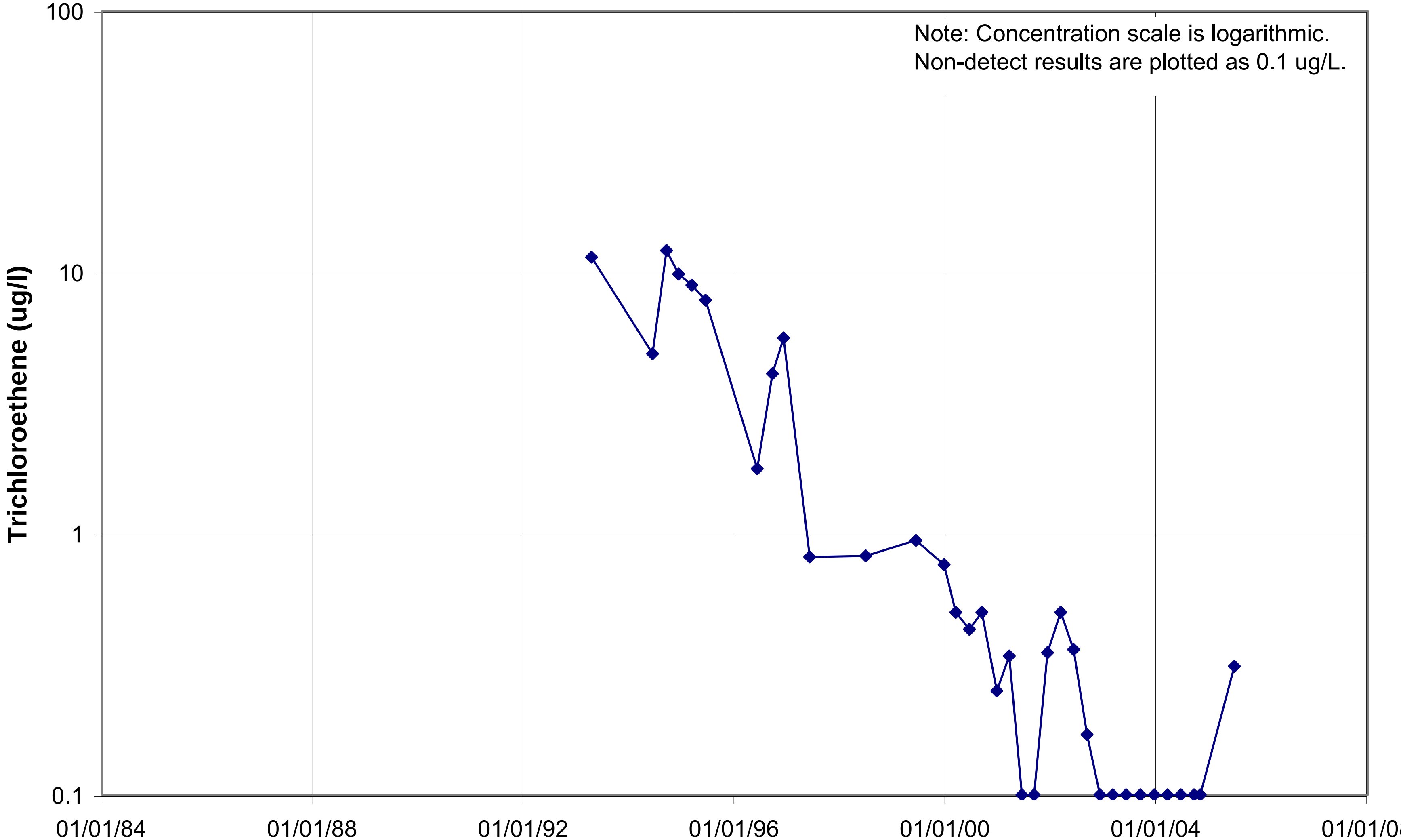

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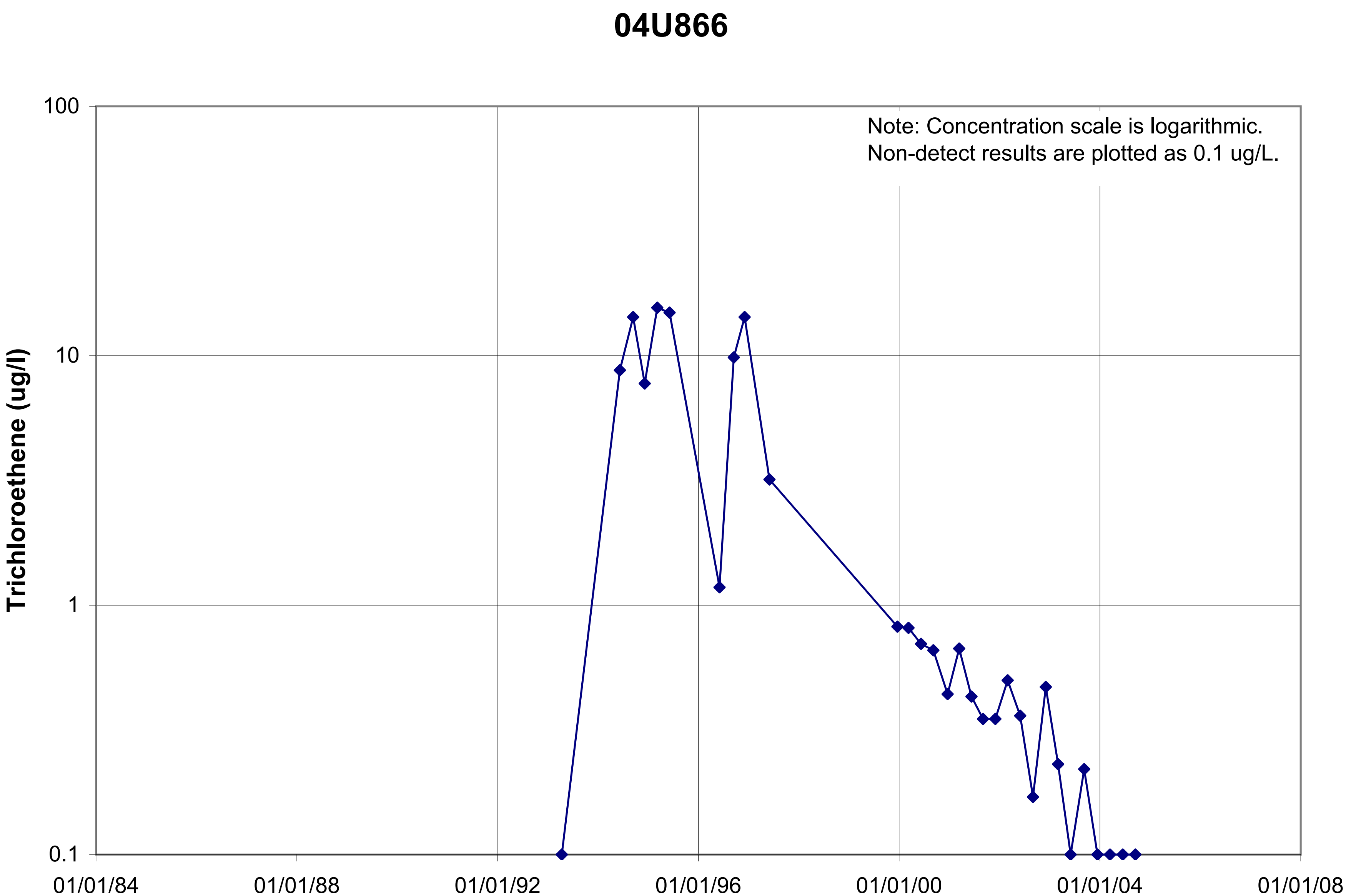

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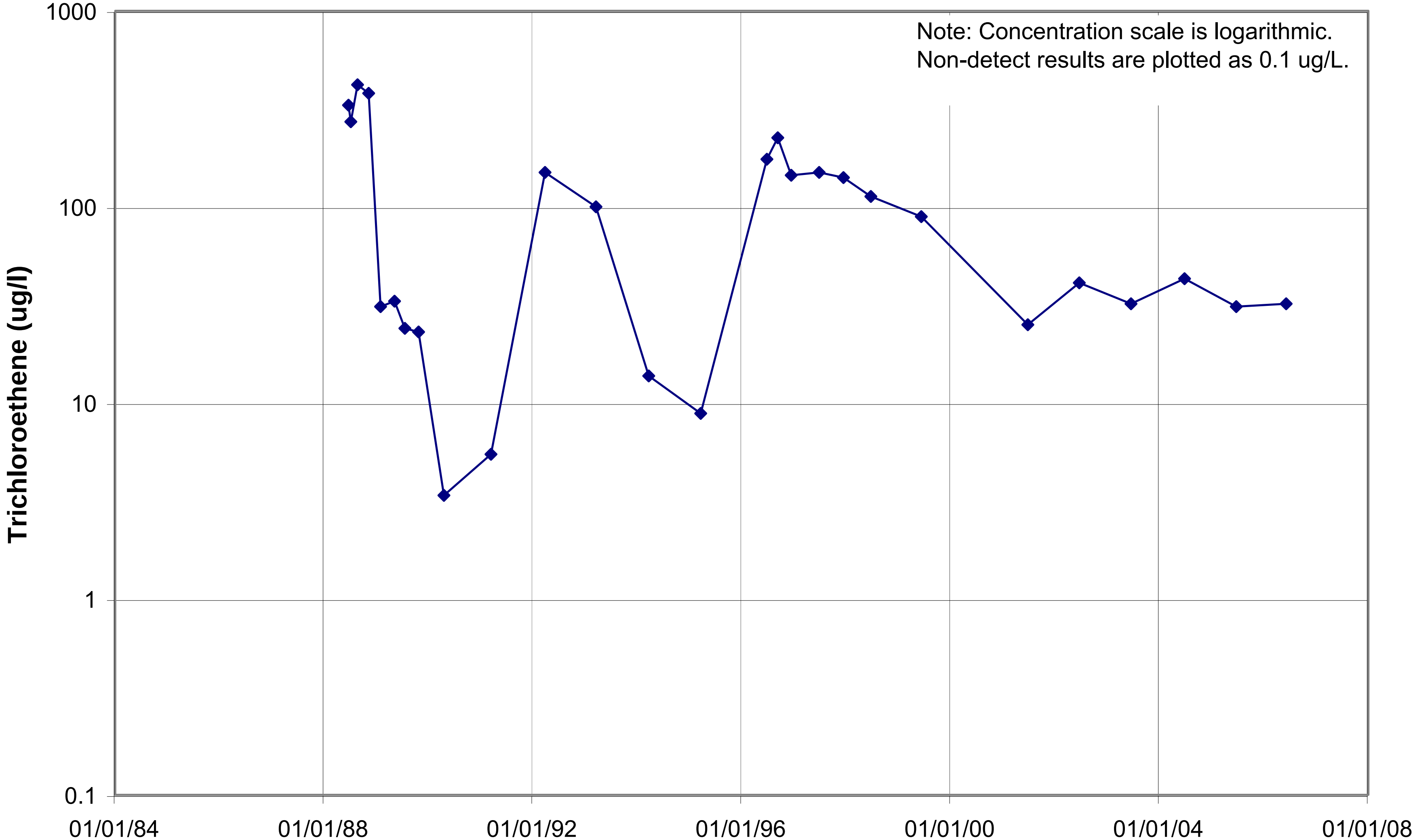

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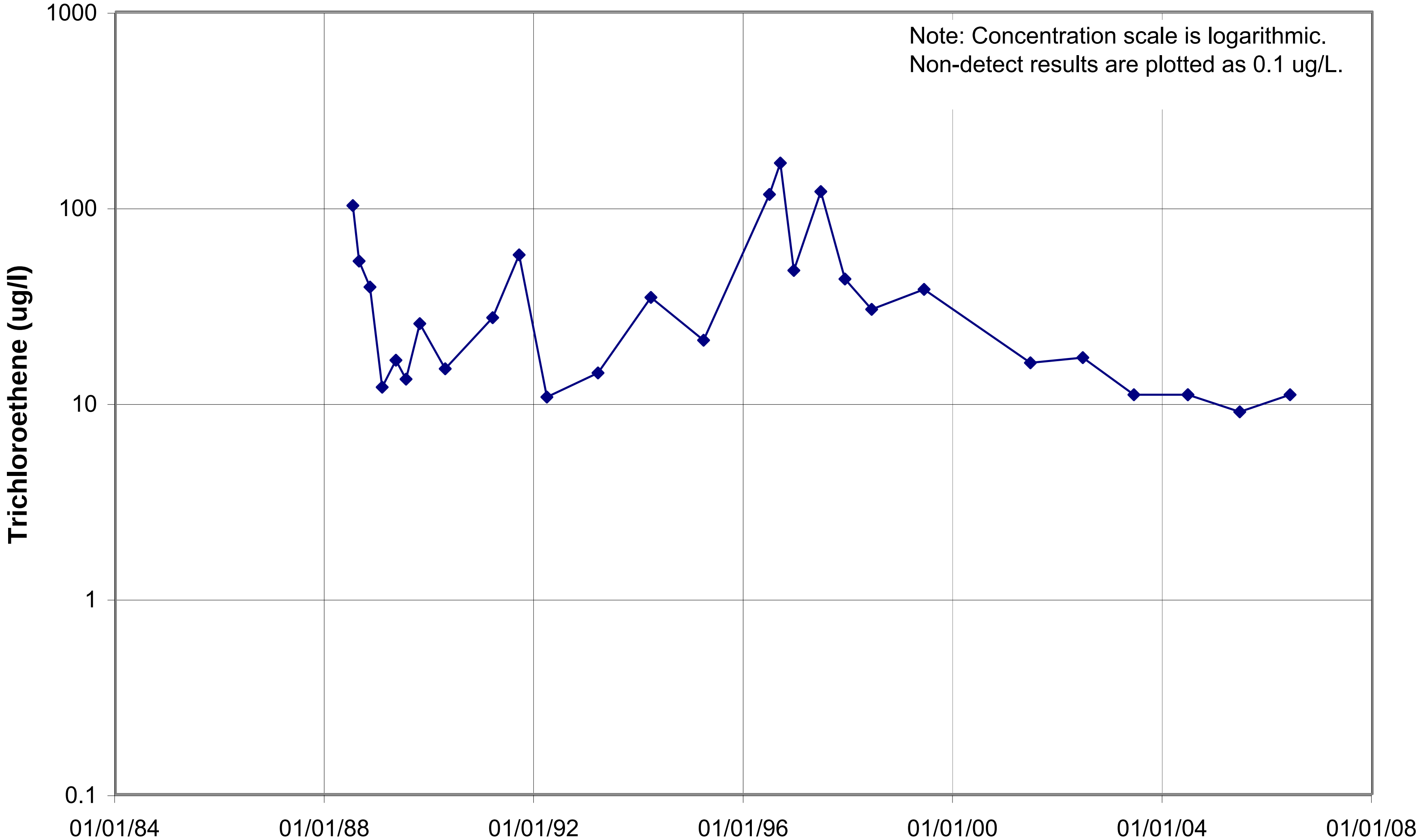

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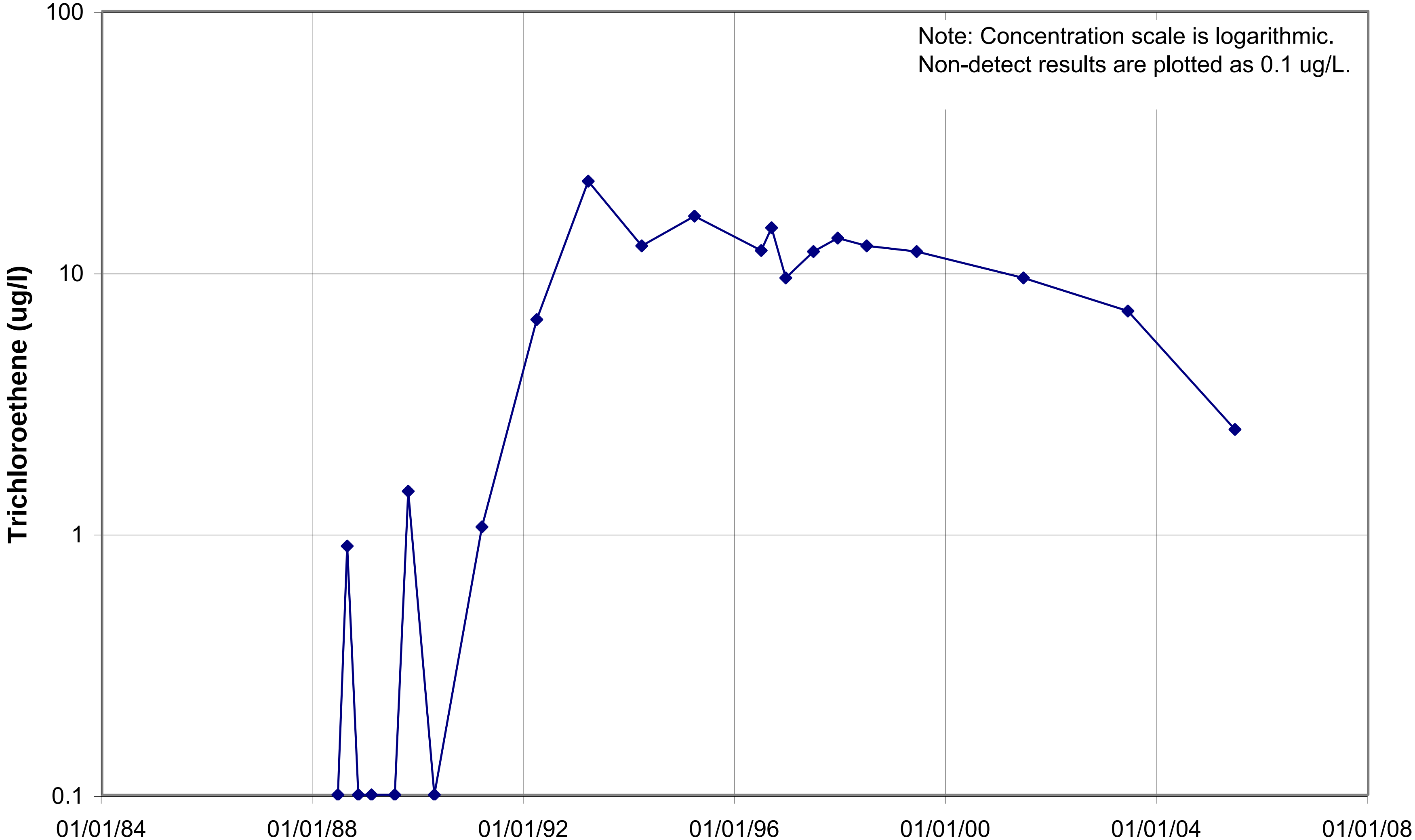

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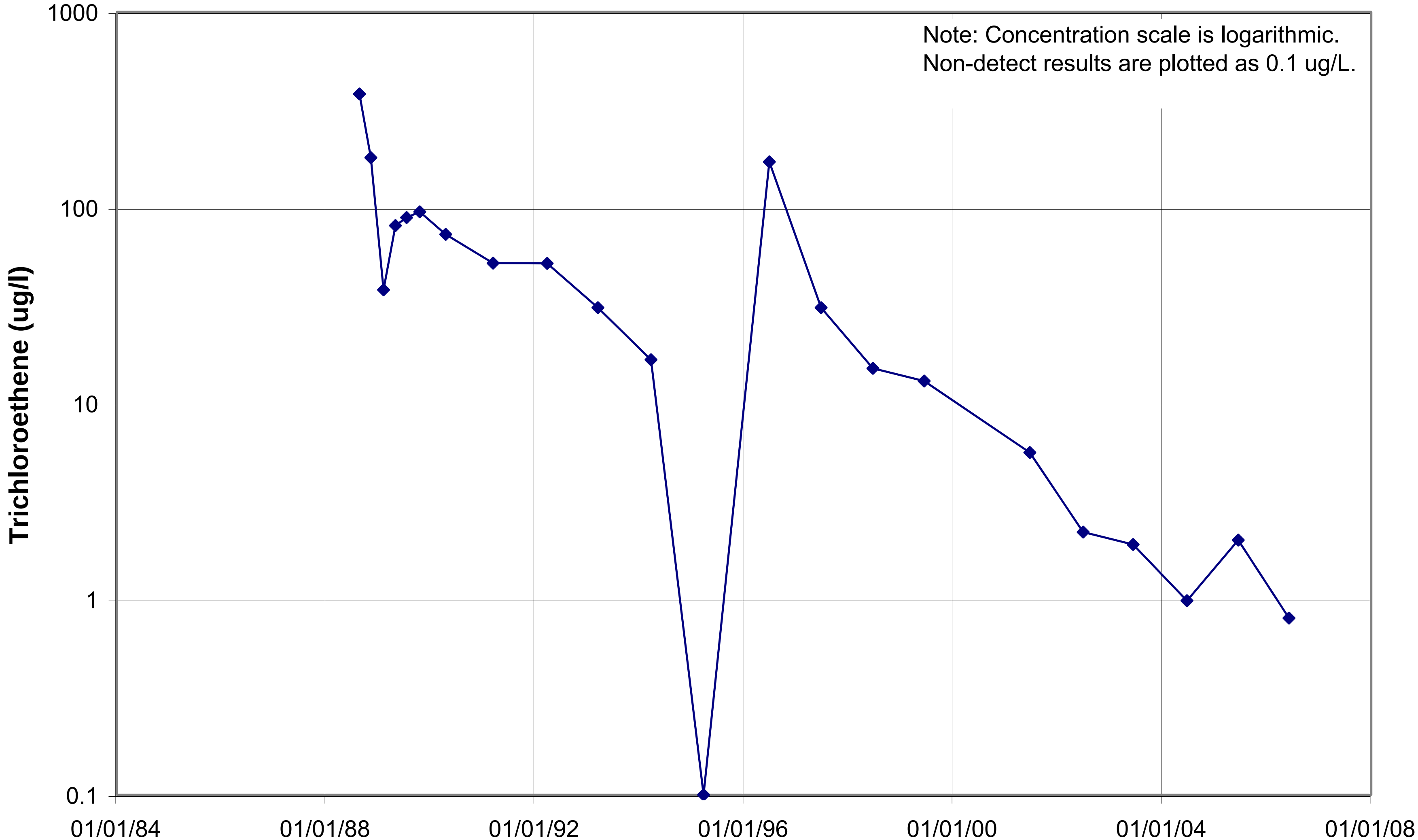

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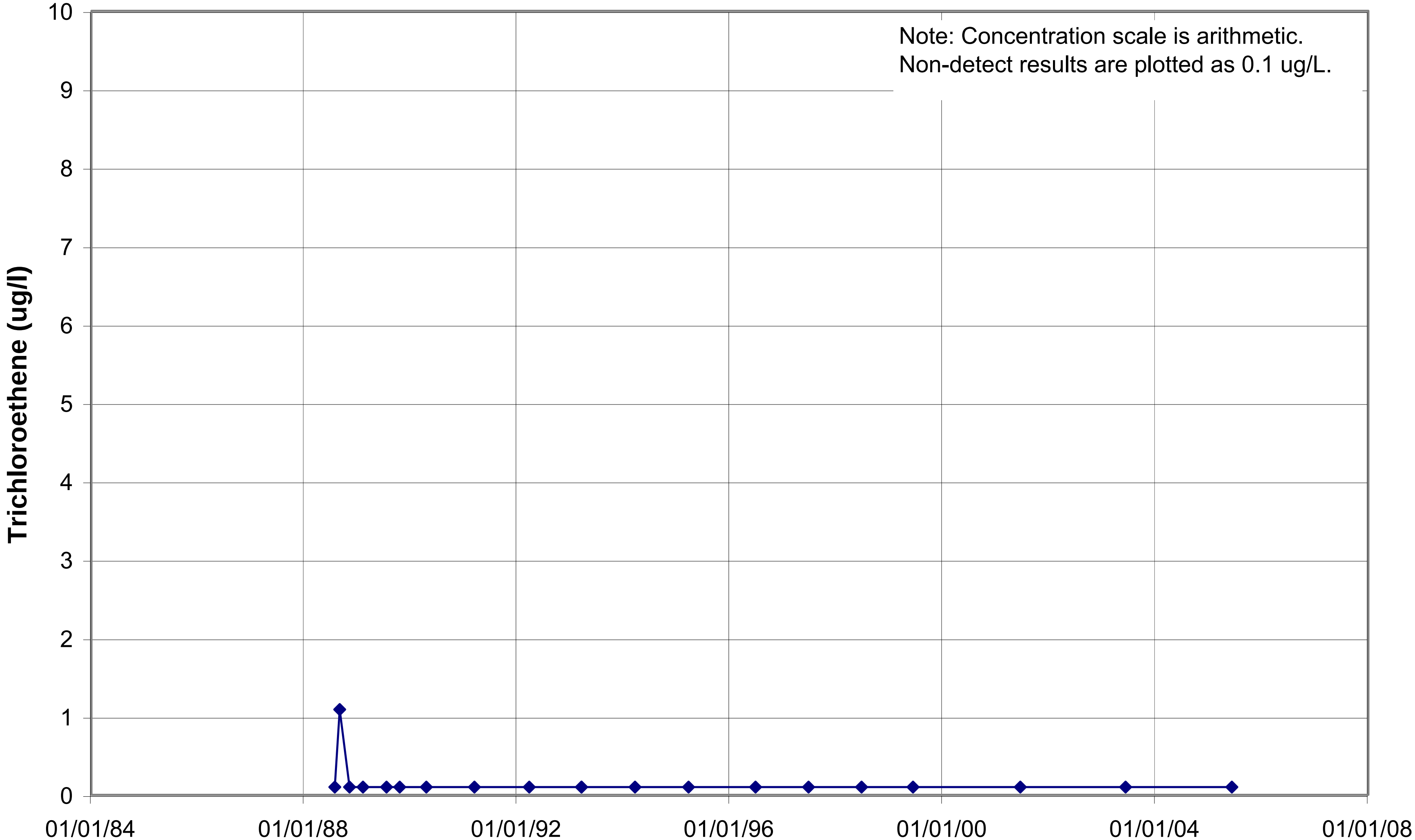

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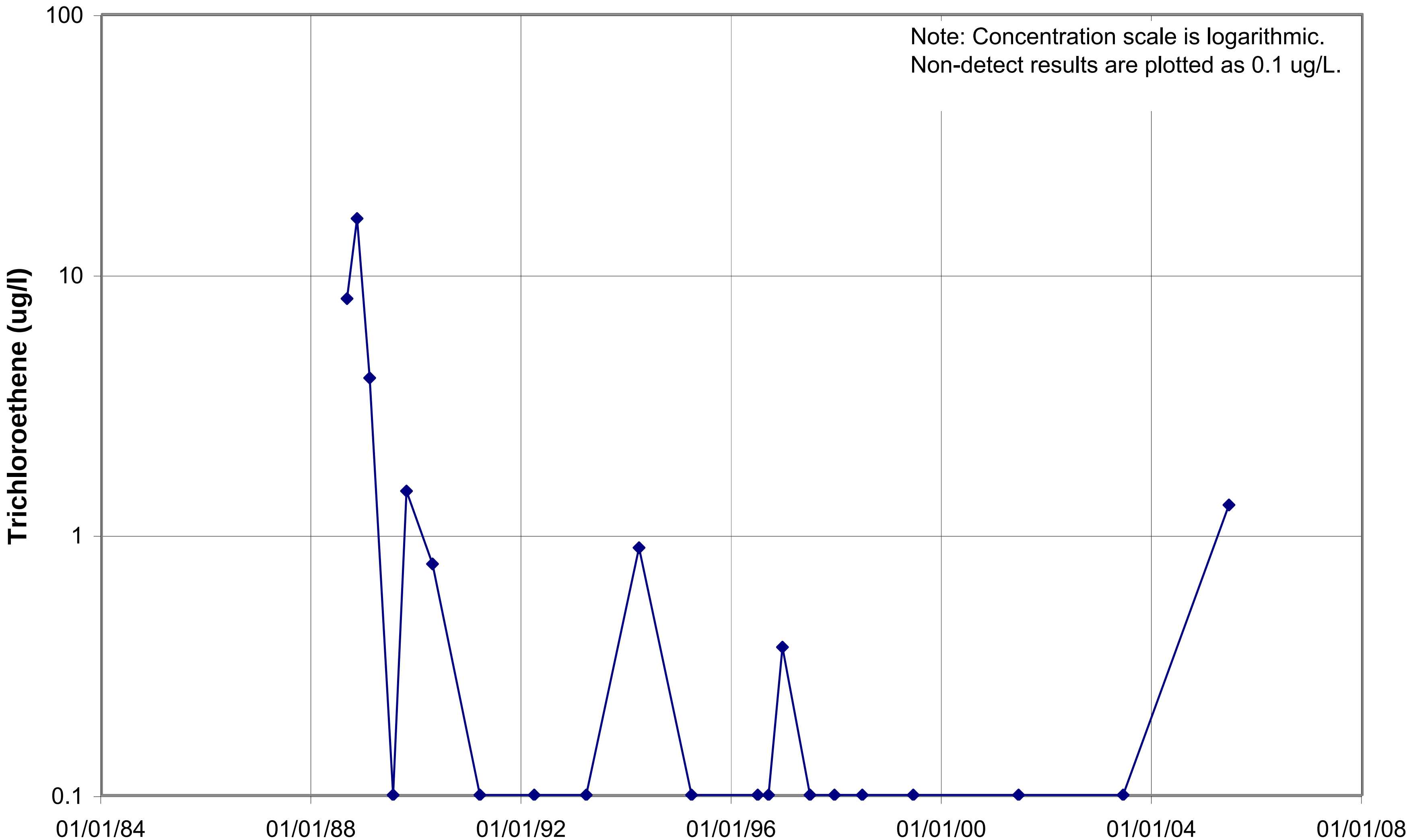

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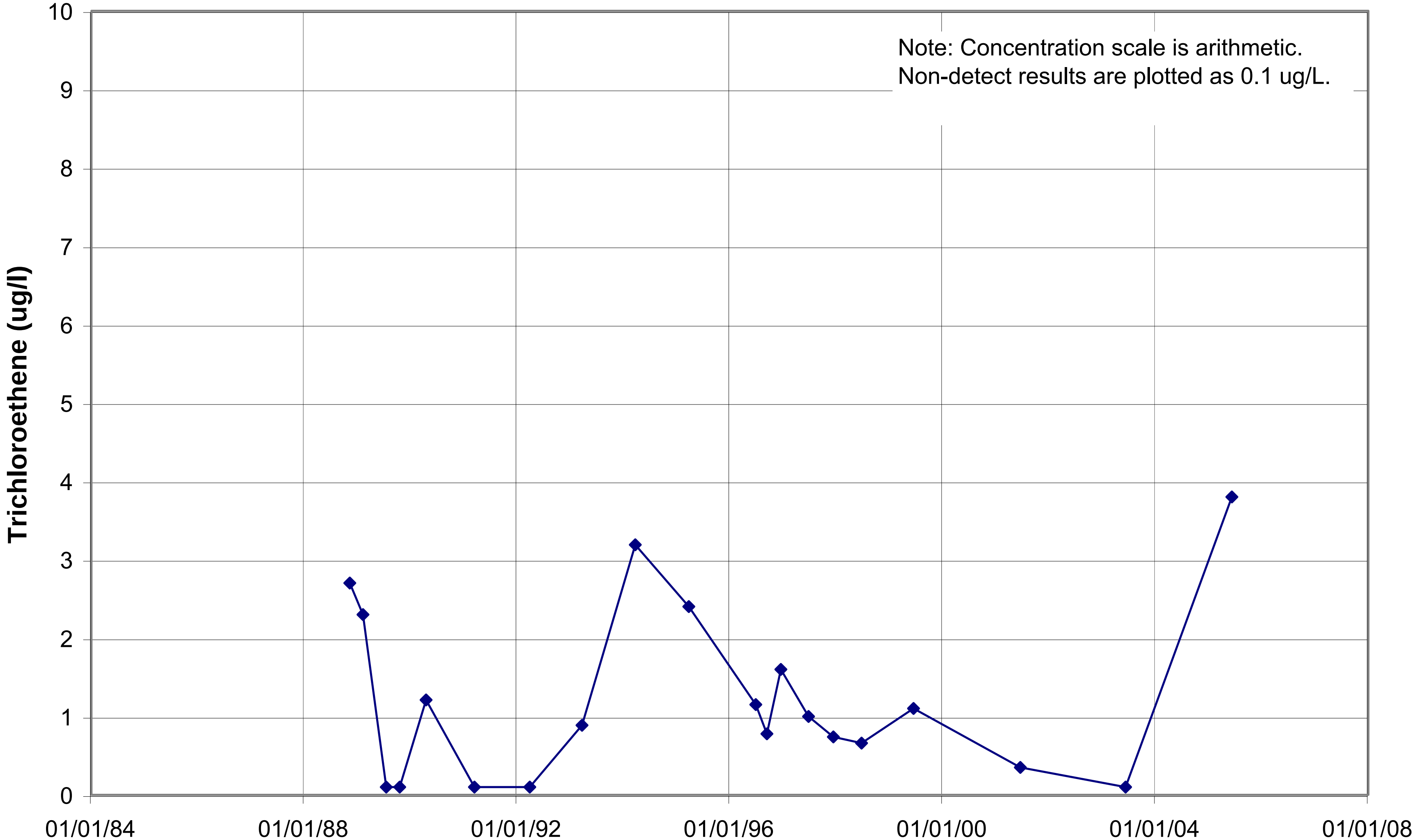

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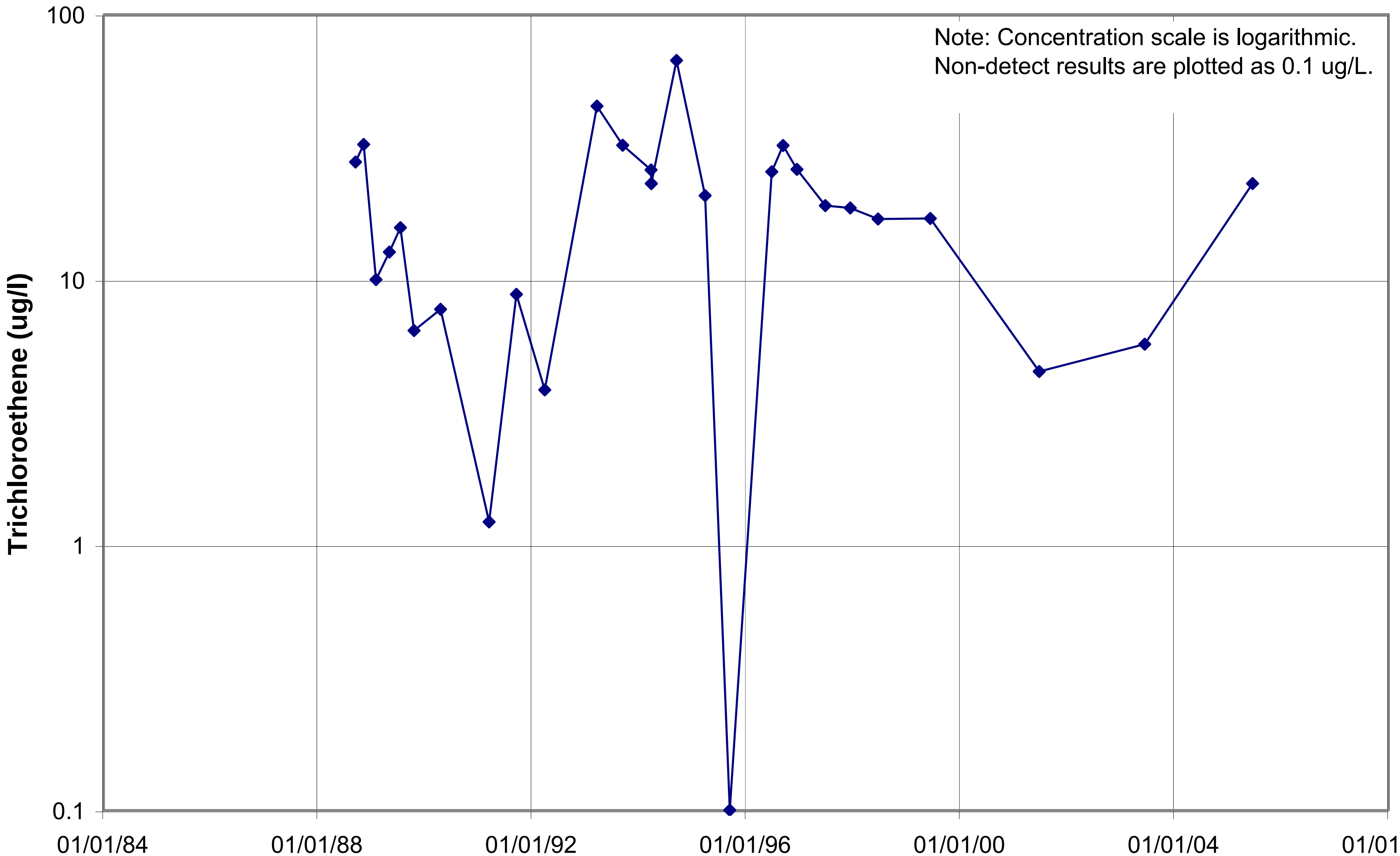

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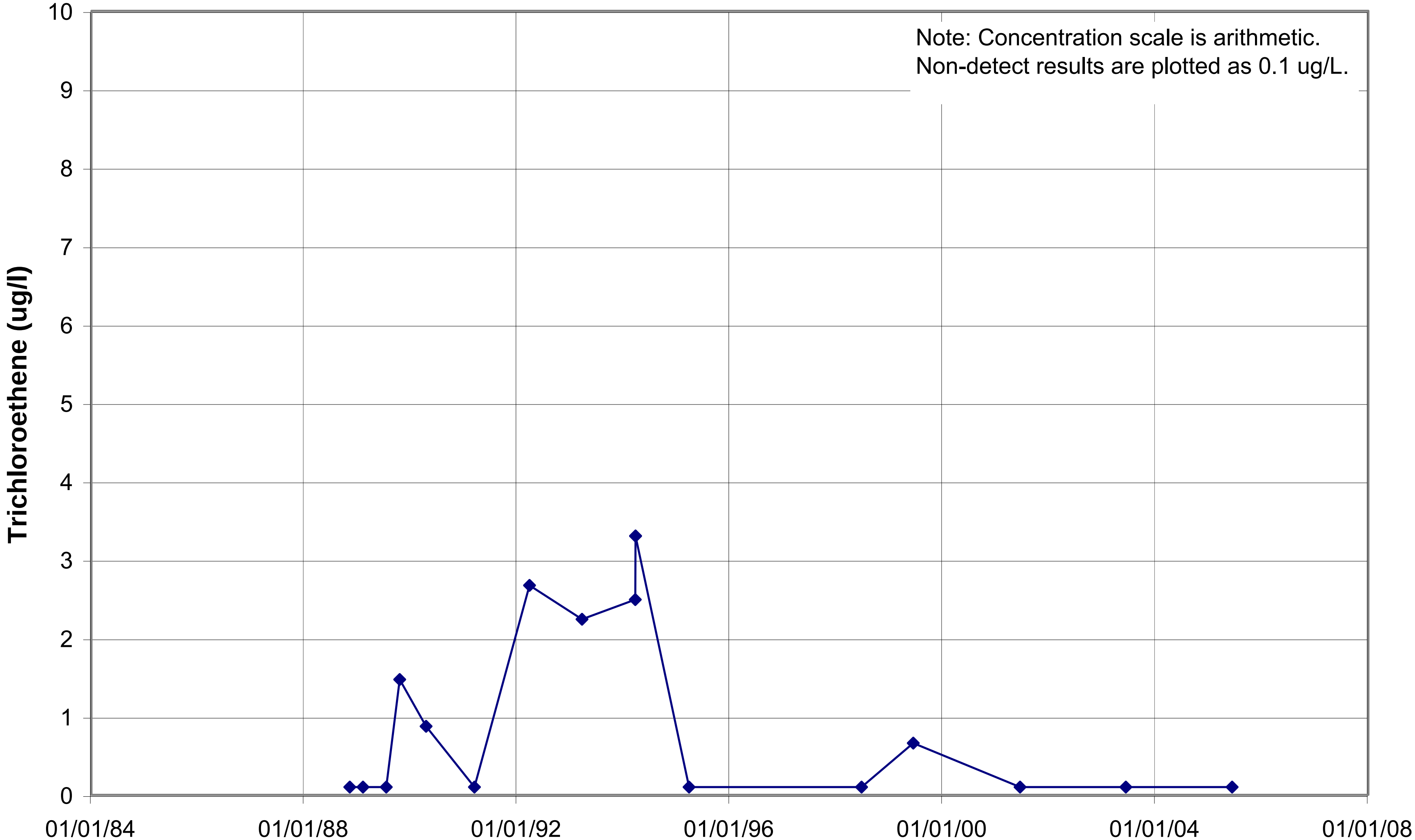

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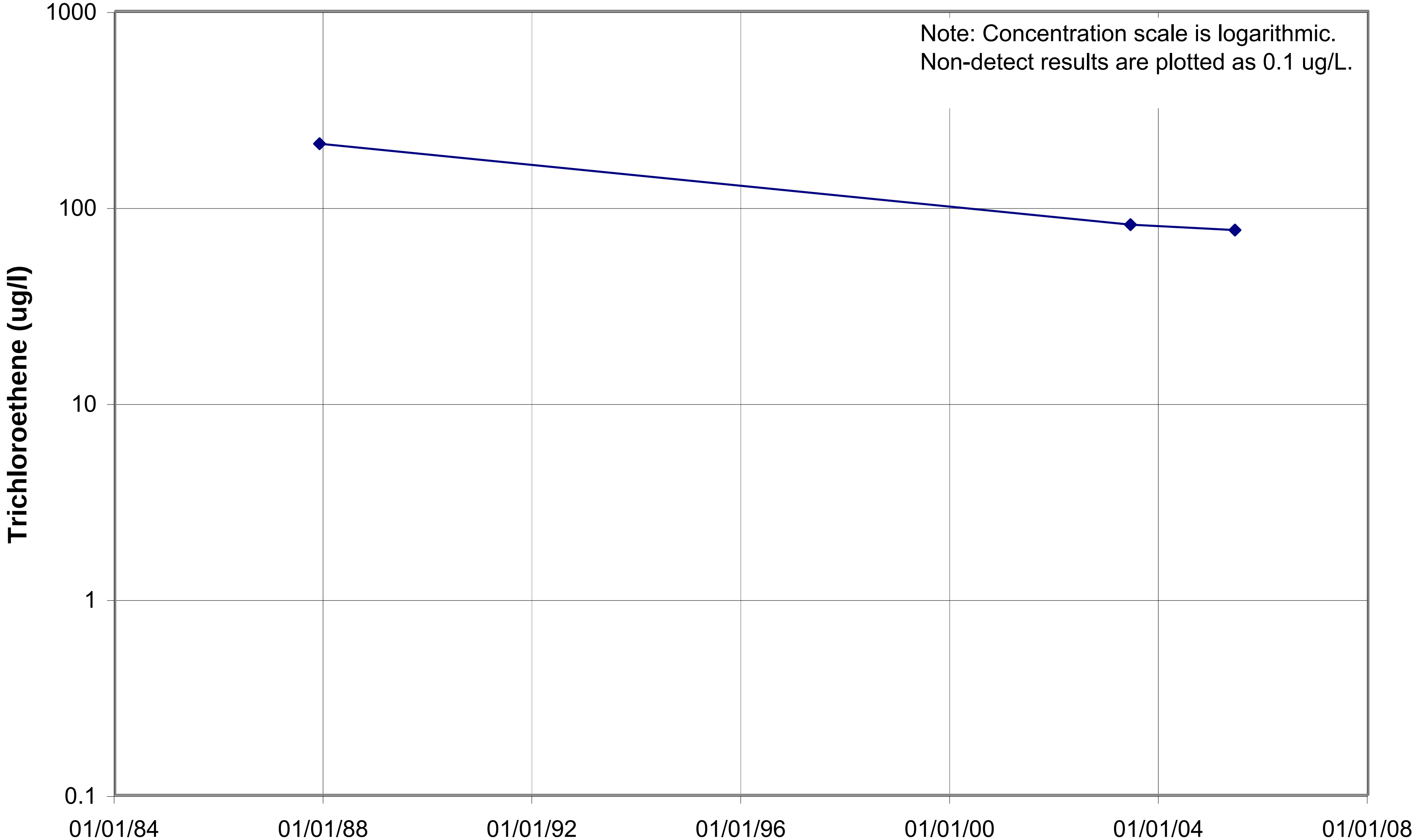

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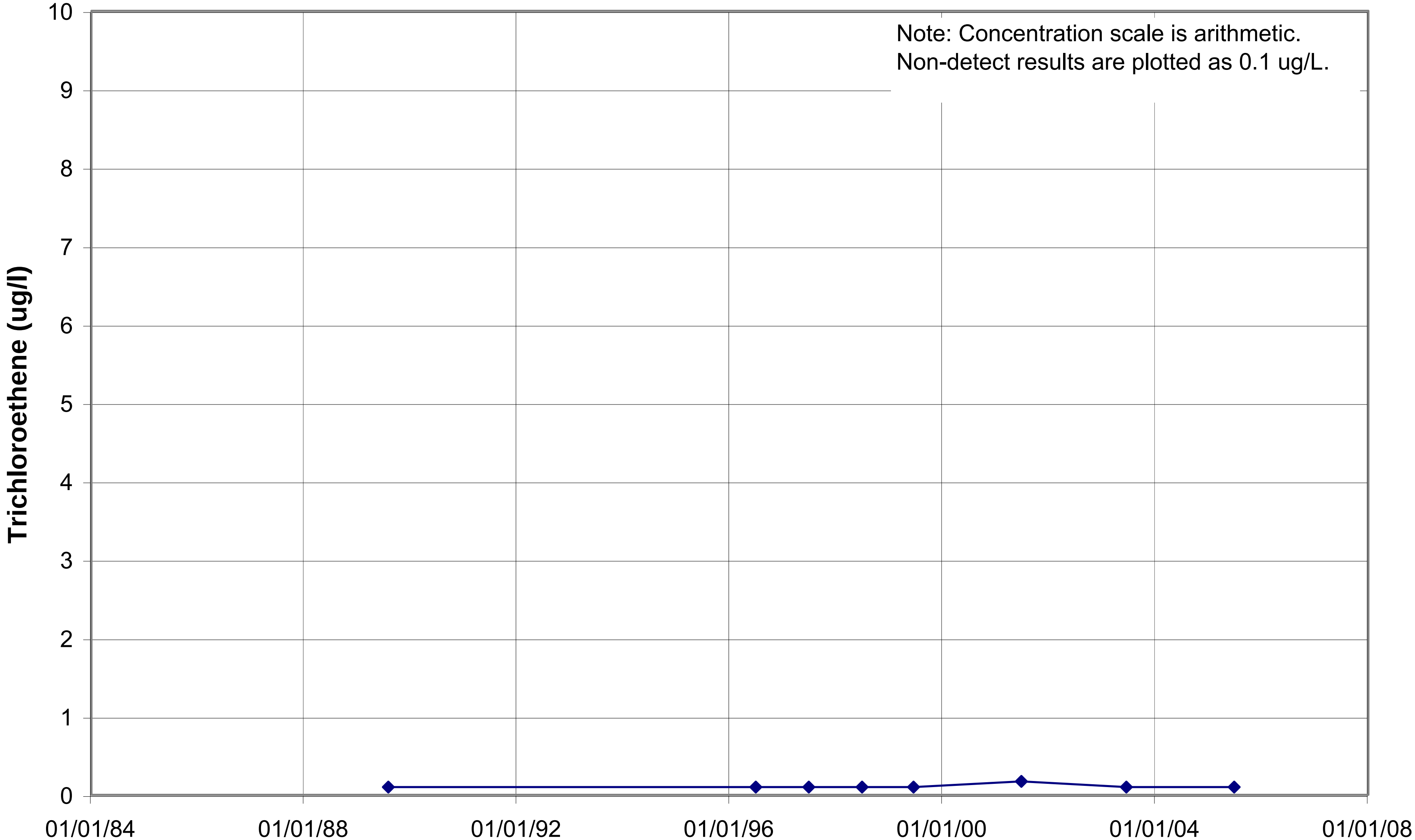
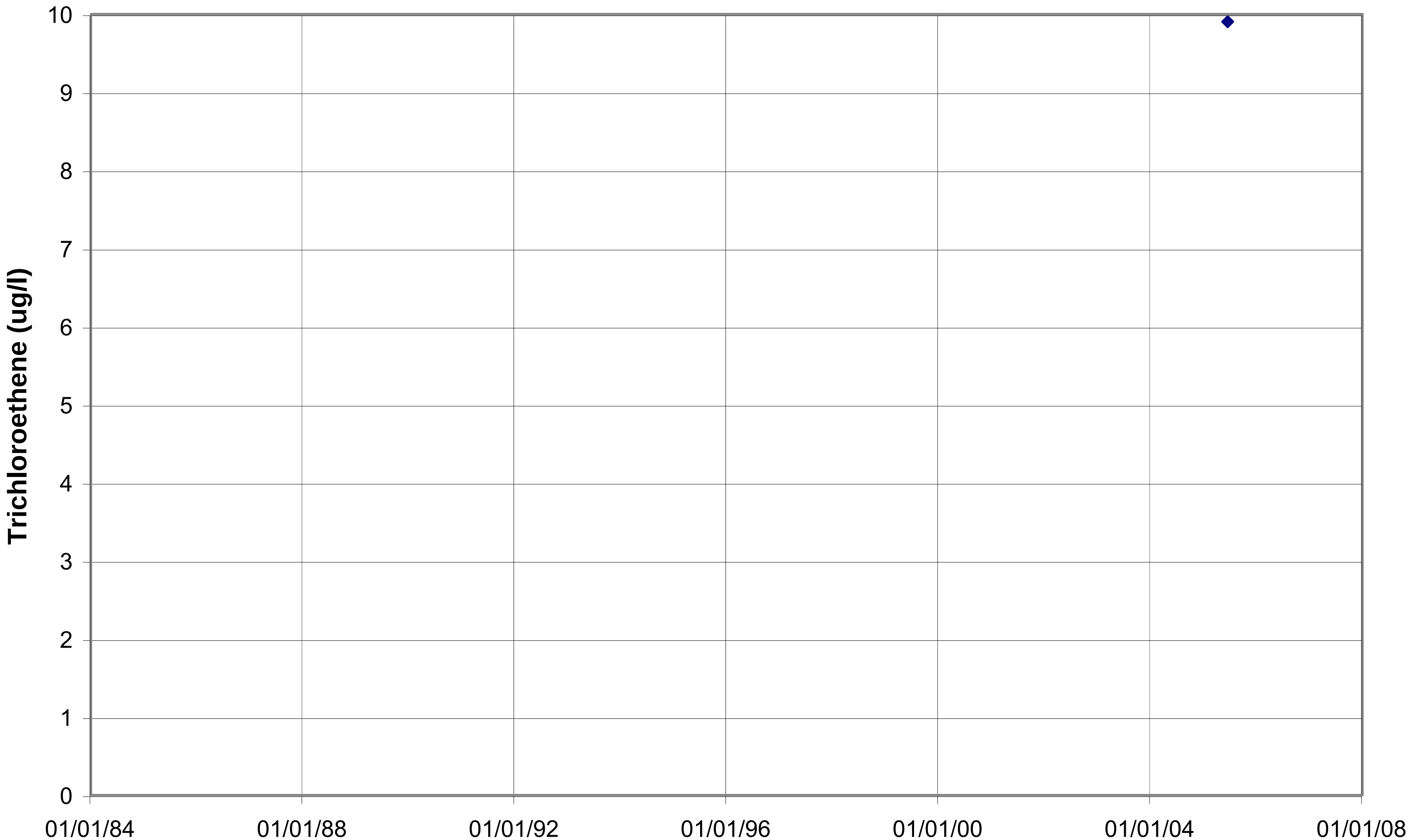


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

200524

Note: Concentration scale is arithmetic.
Non-detect results are plotted as 0.1 ug/L.



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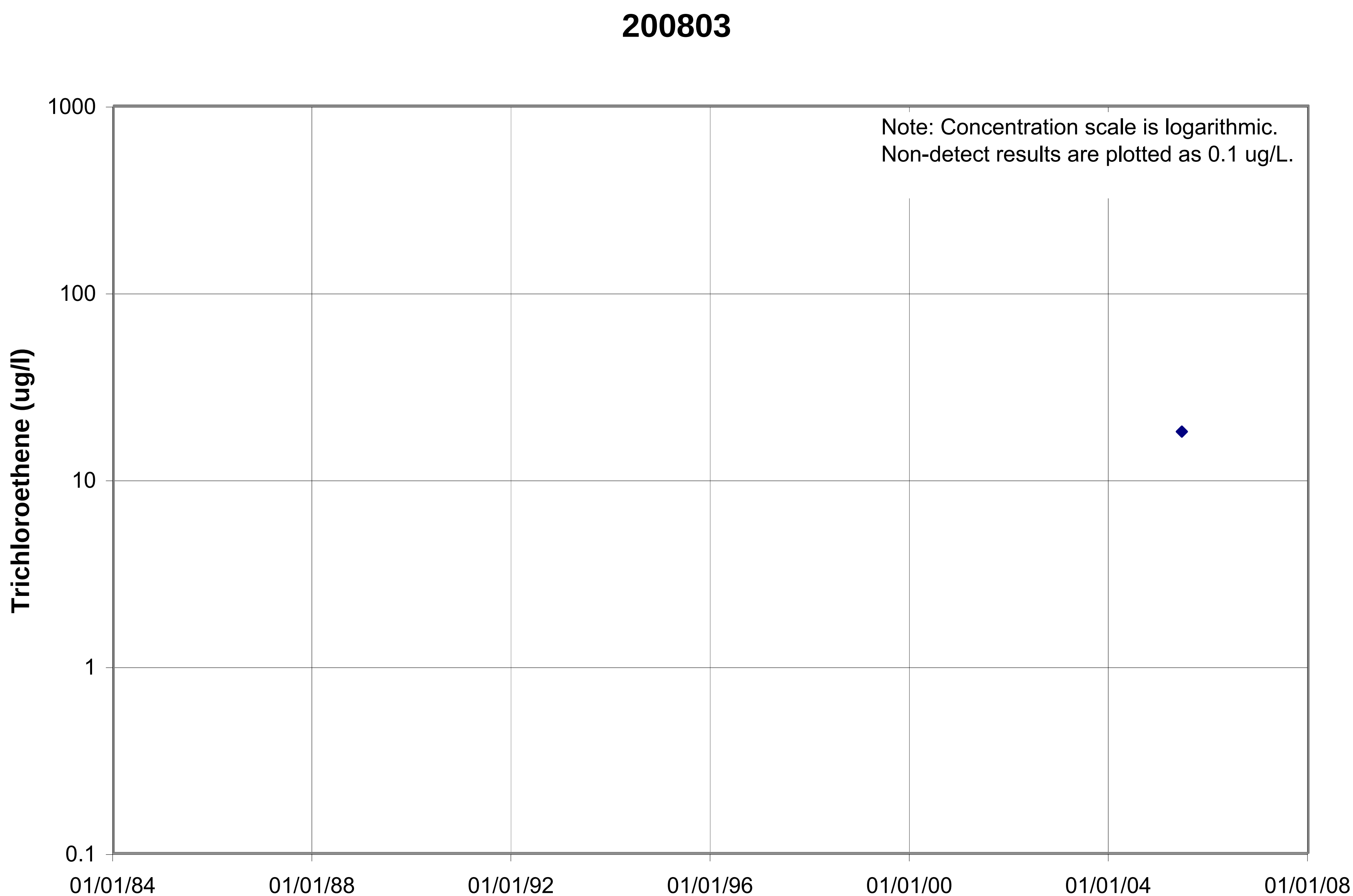

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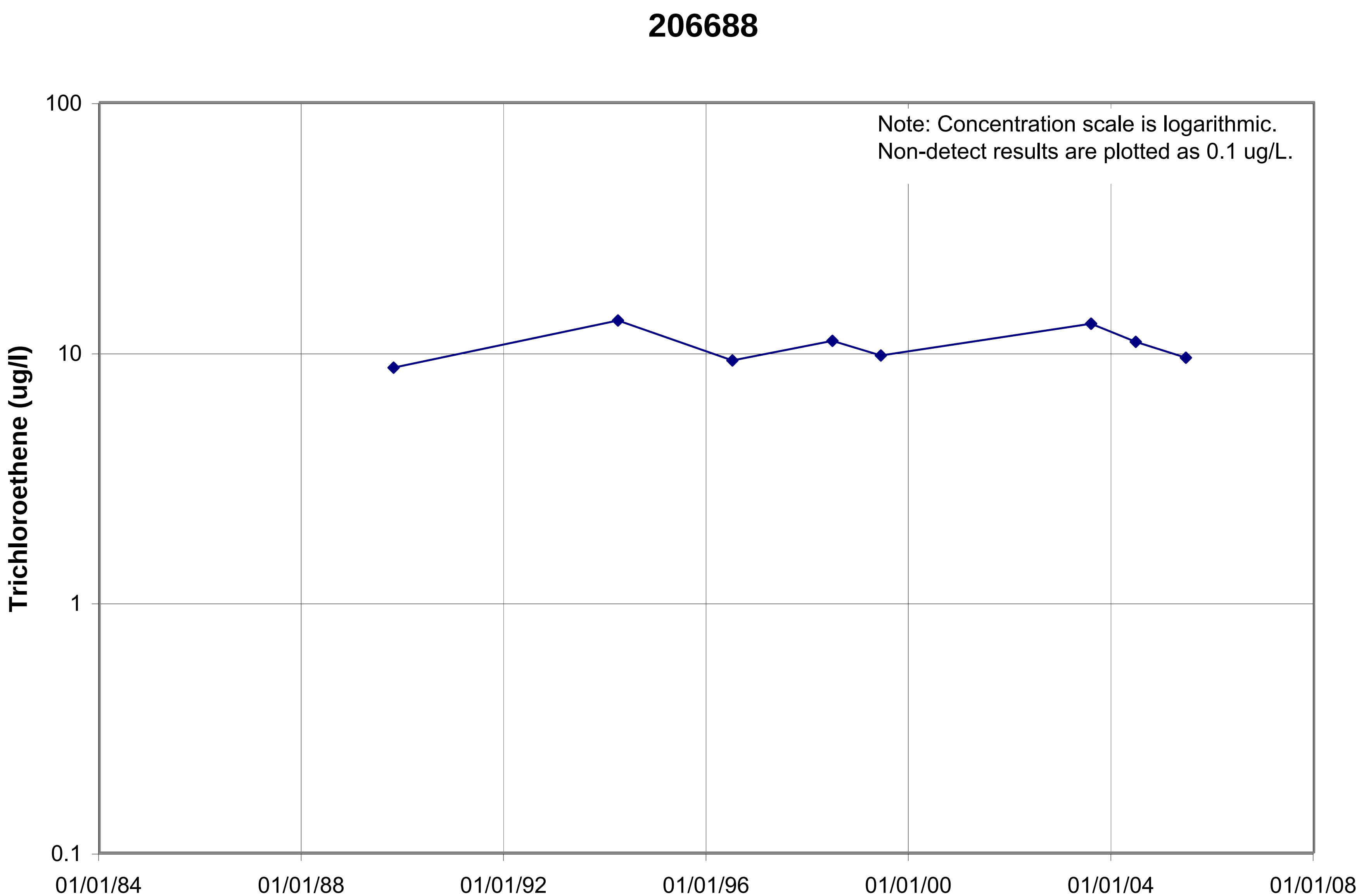

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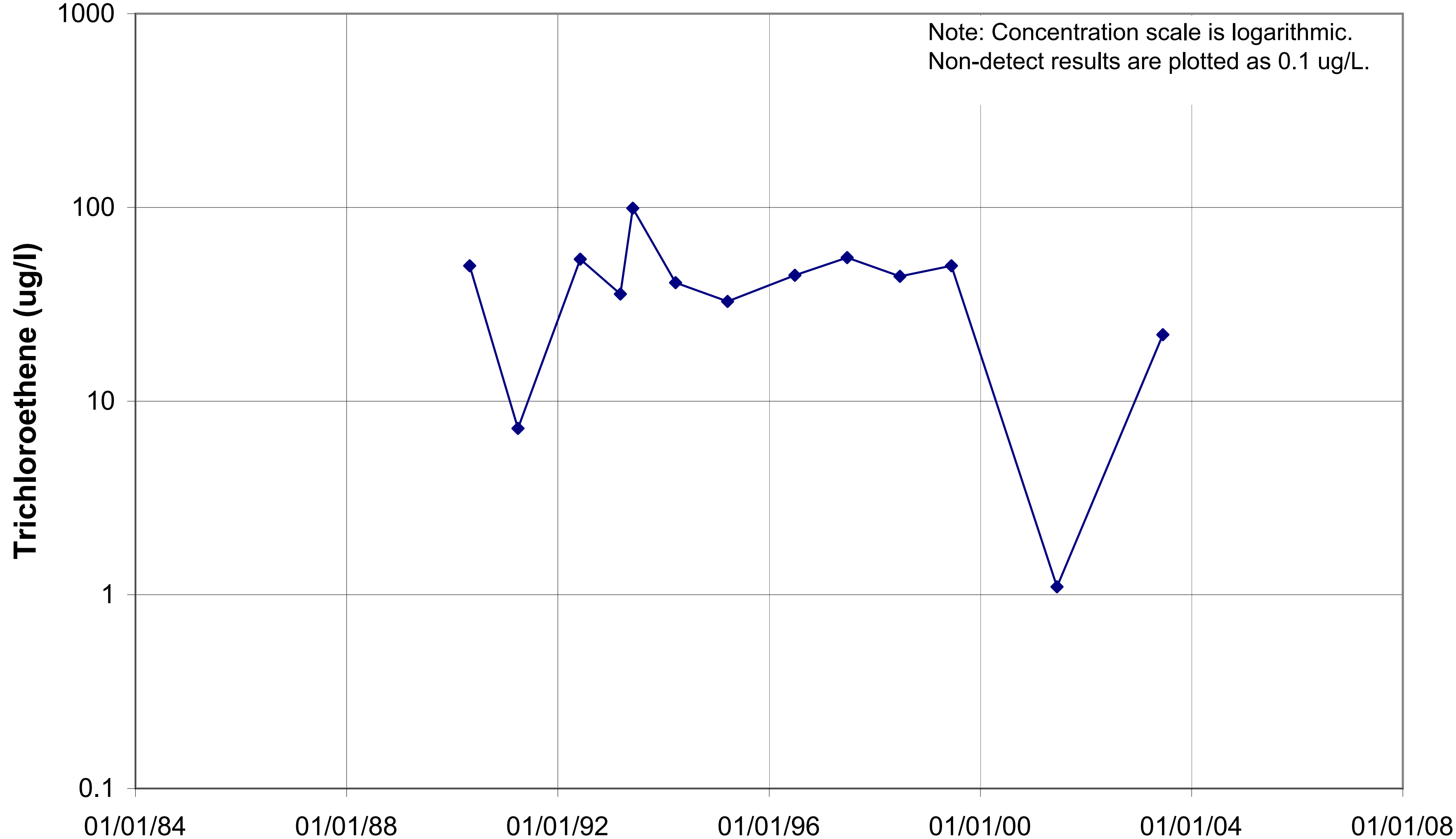
234546



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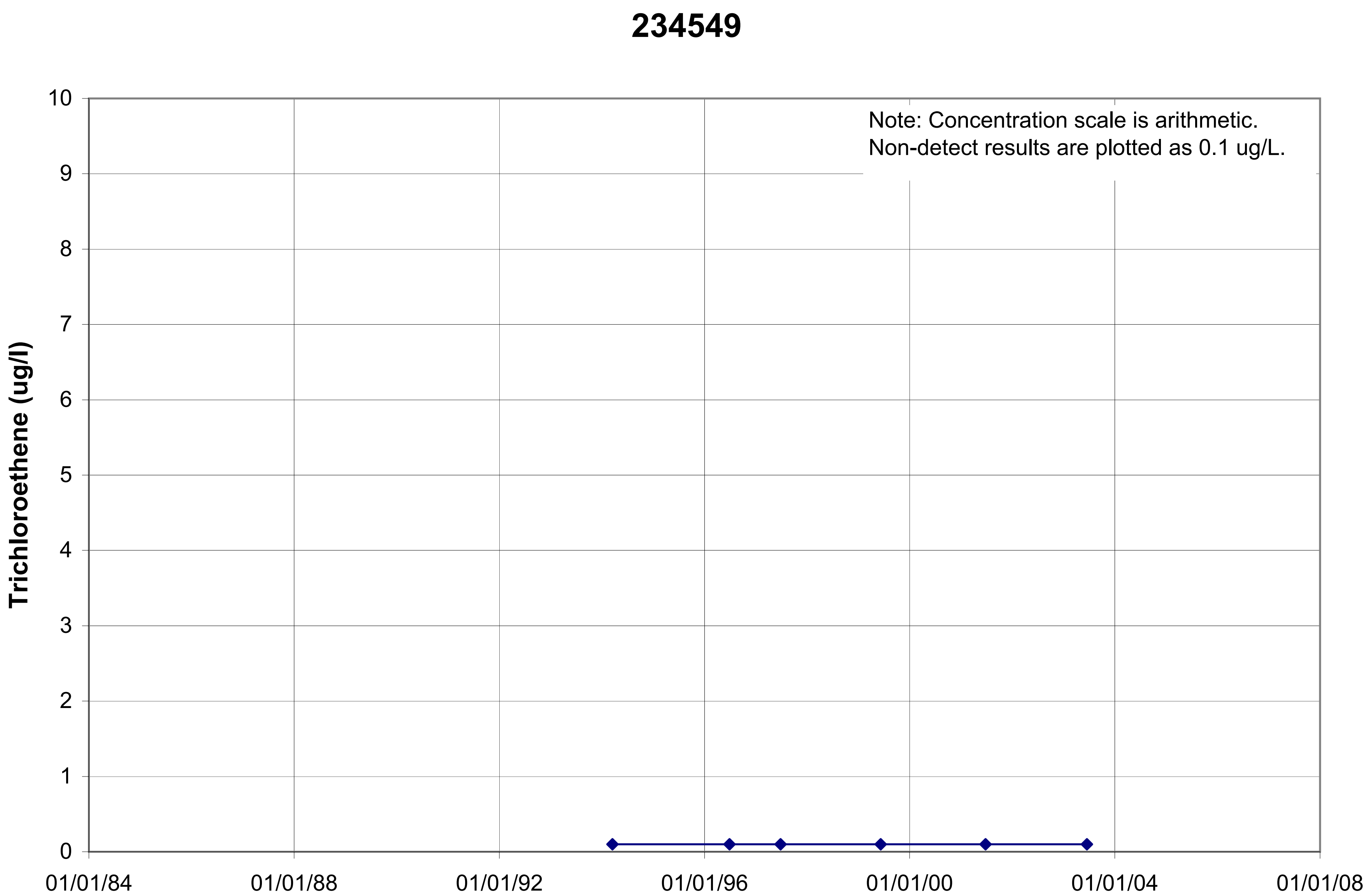

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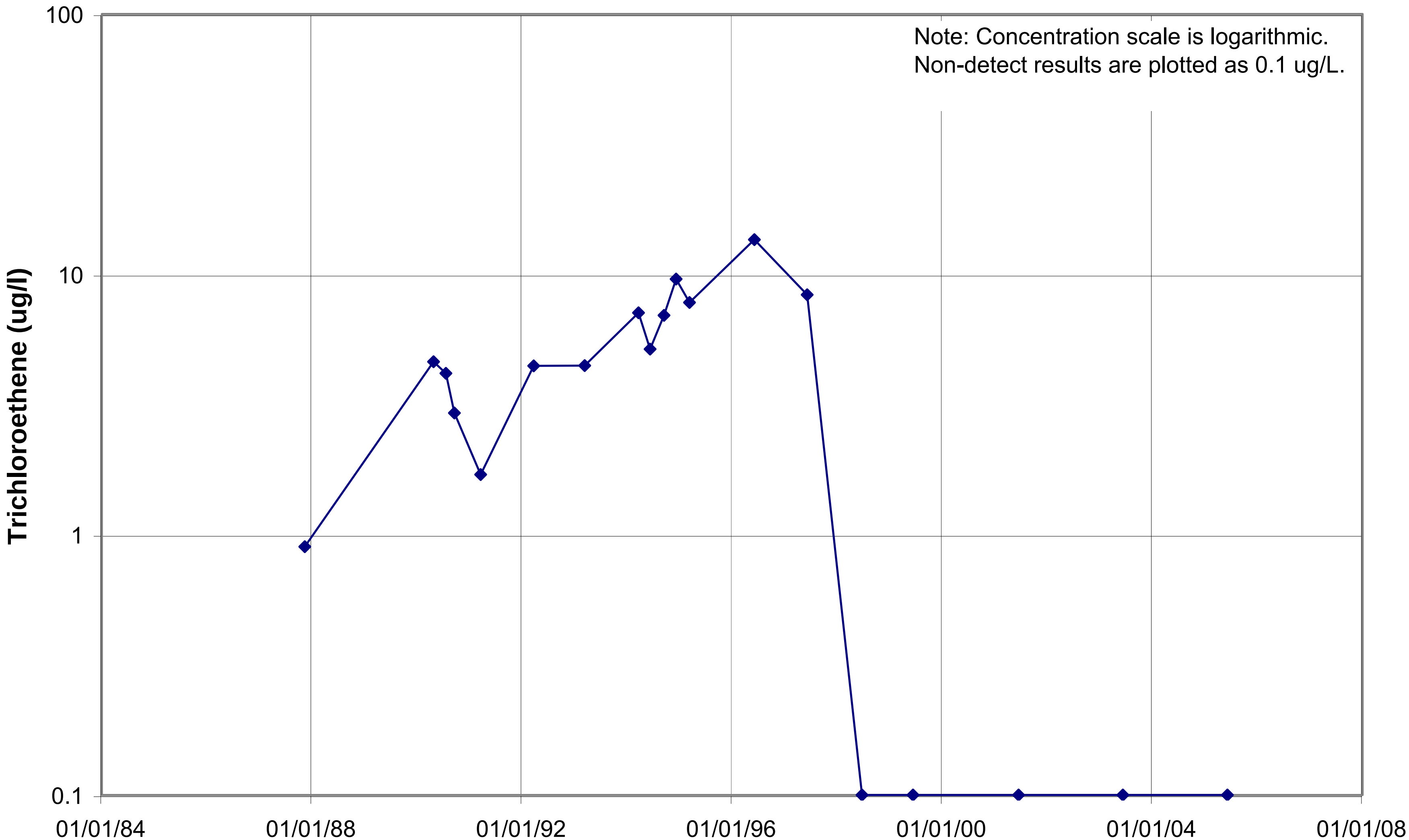

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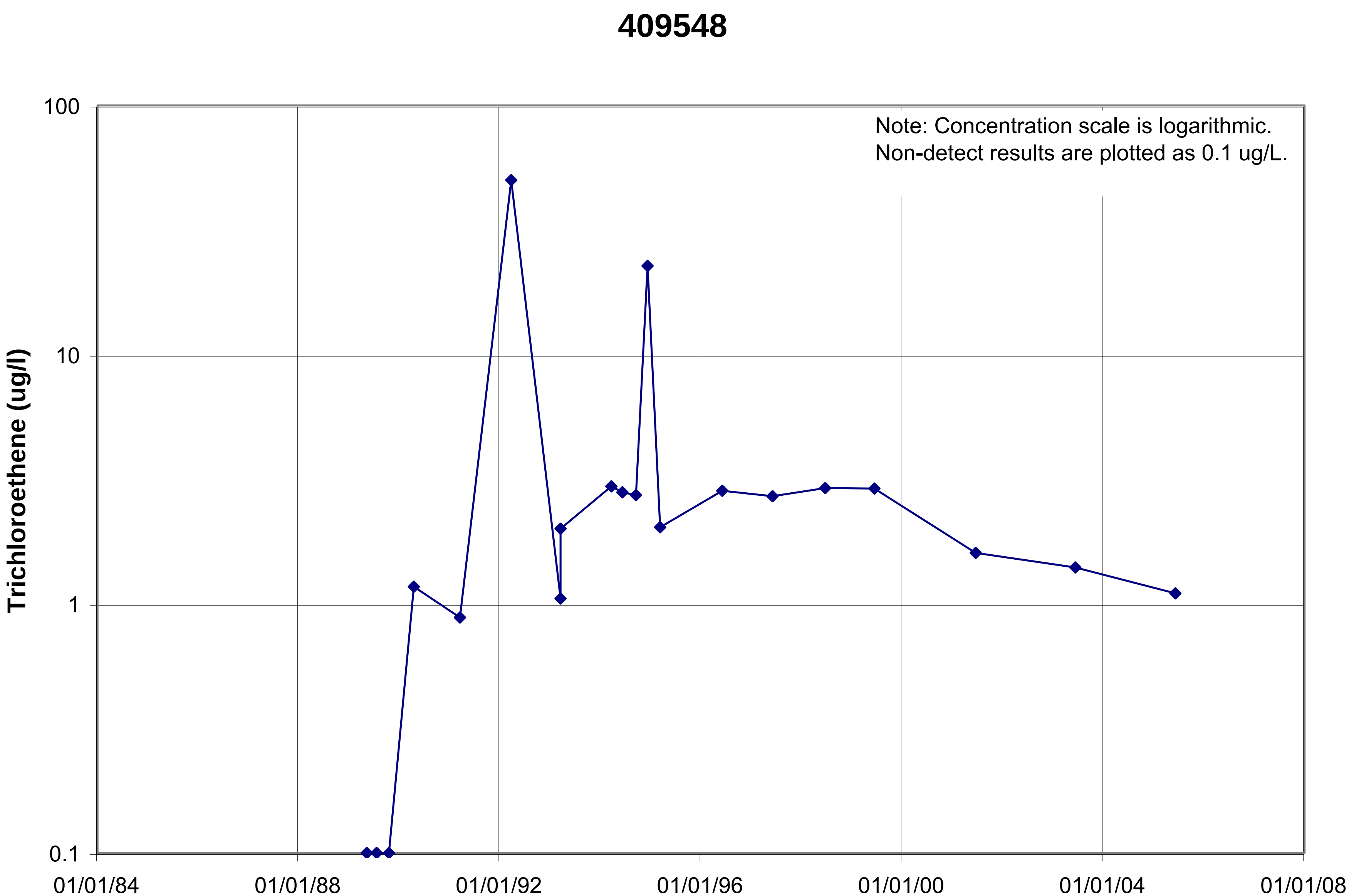

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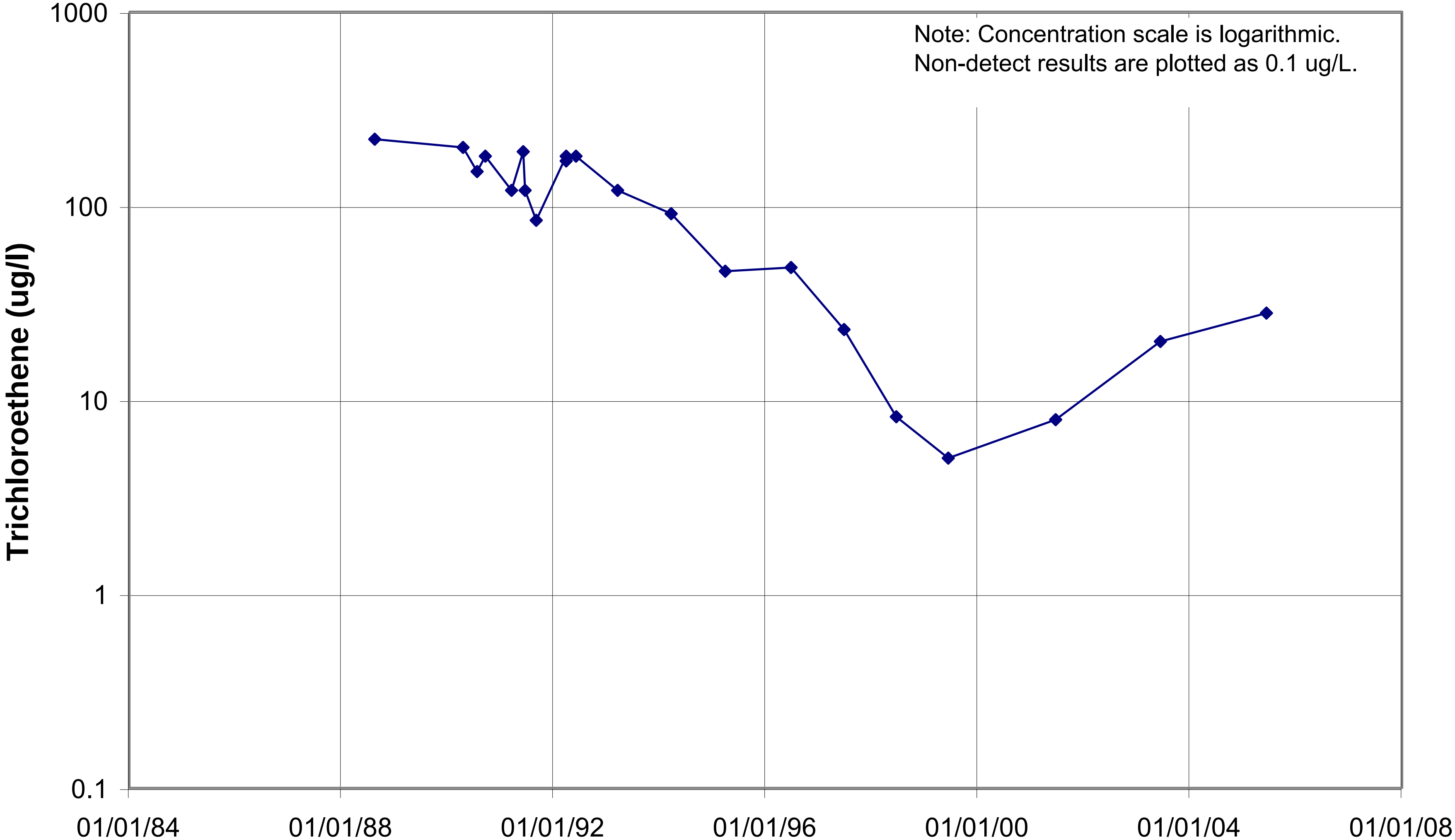

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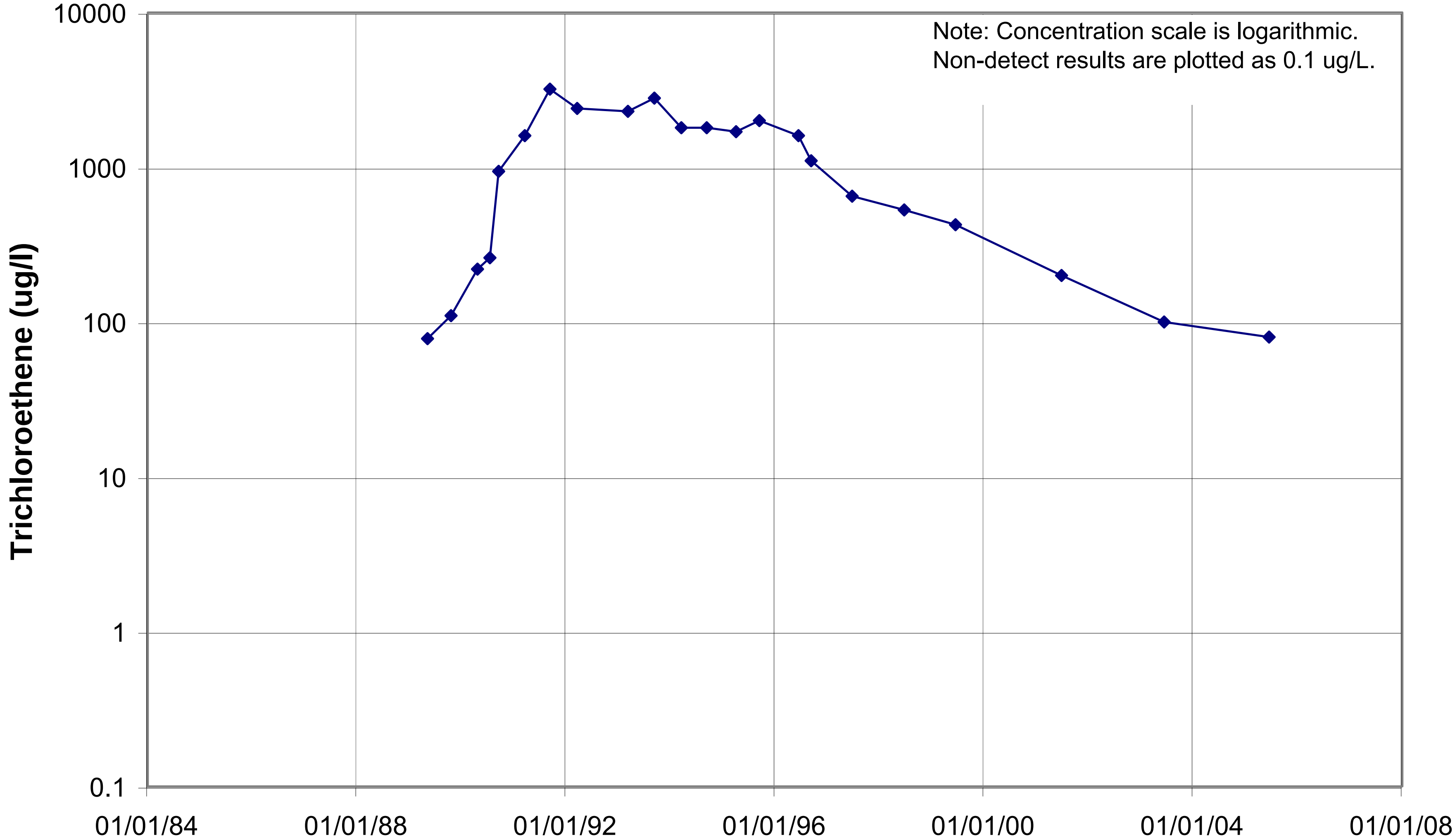
409550



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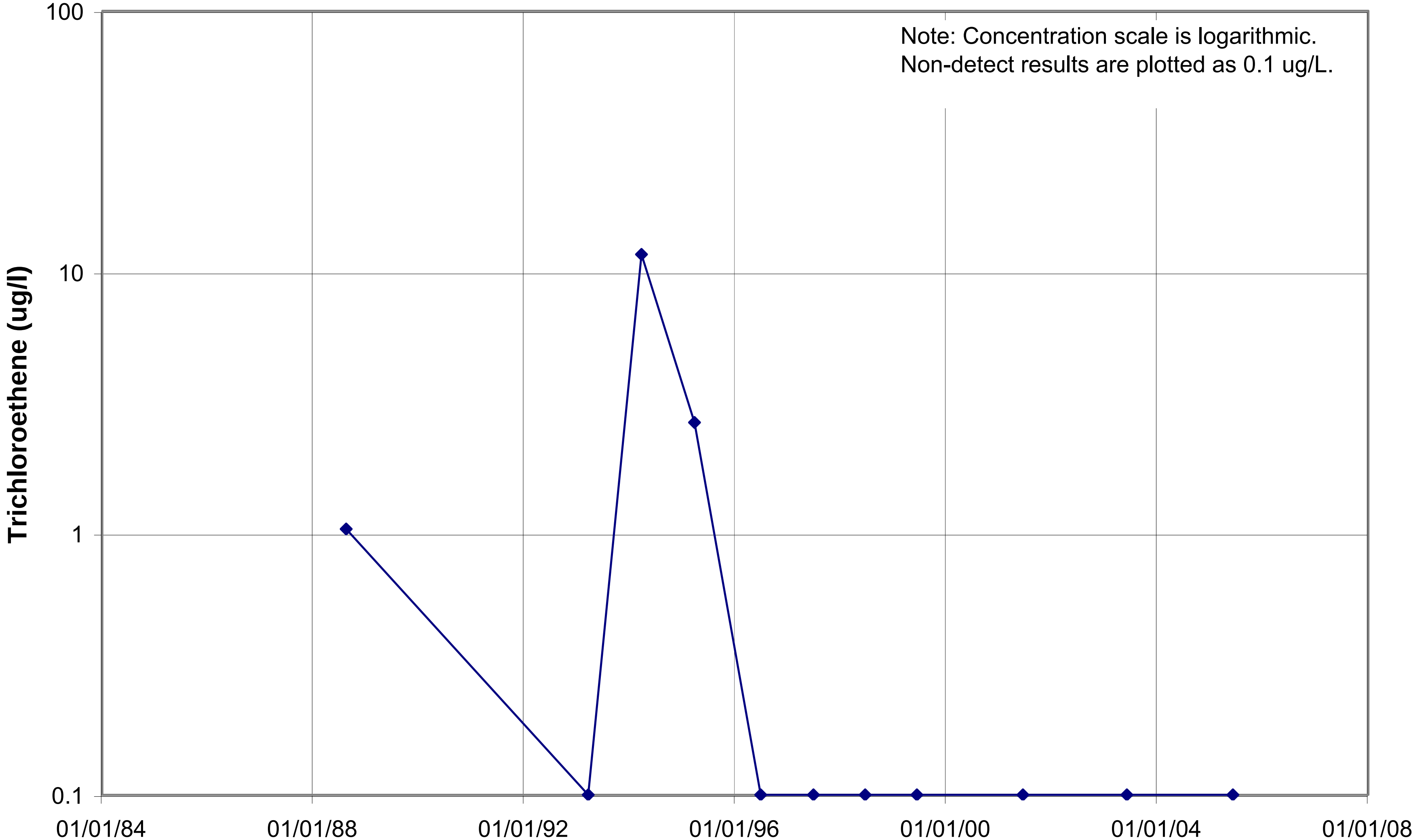

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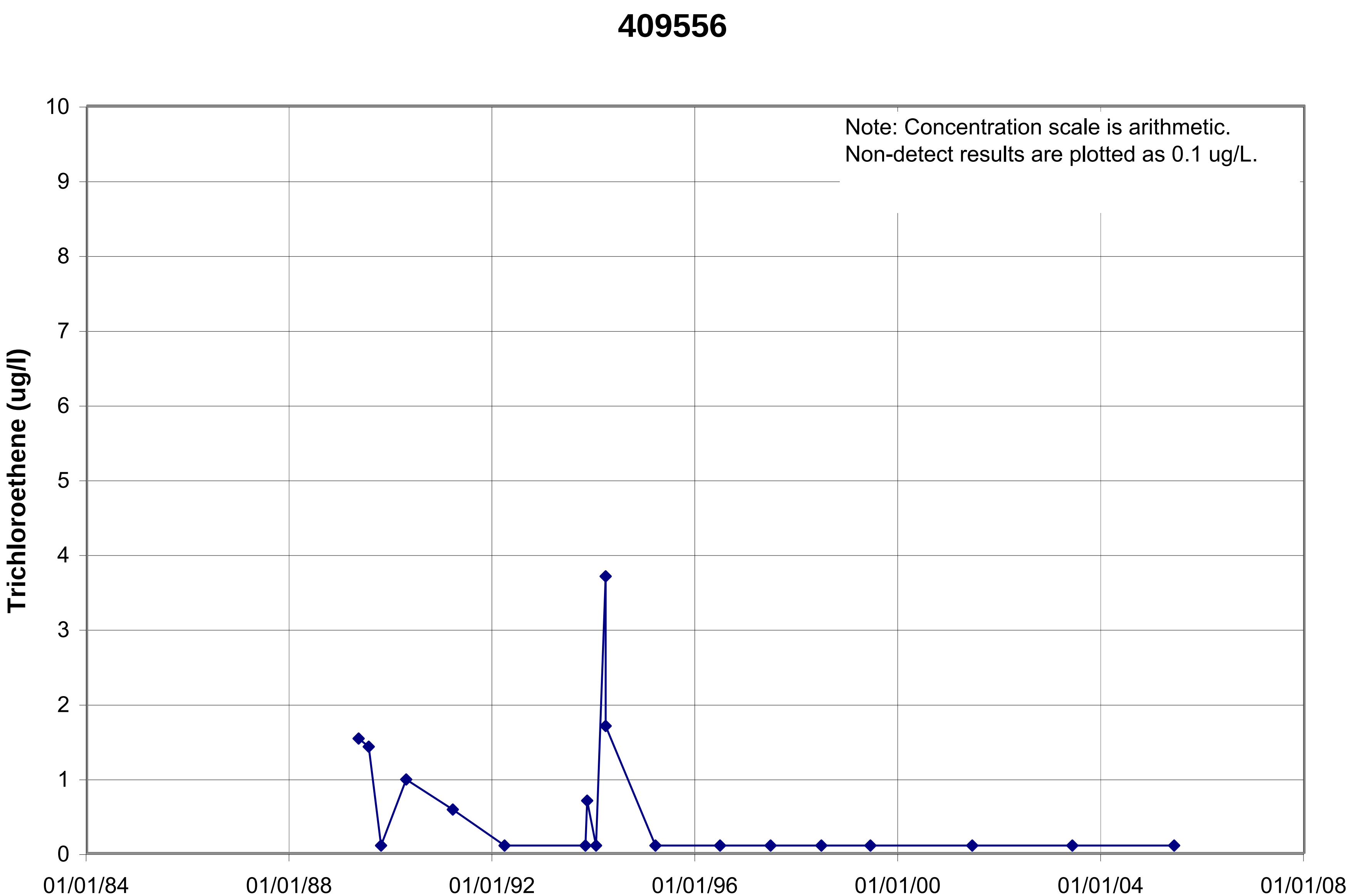

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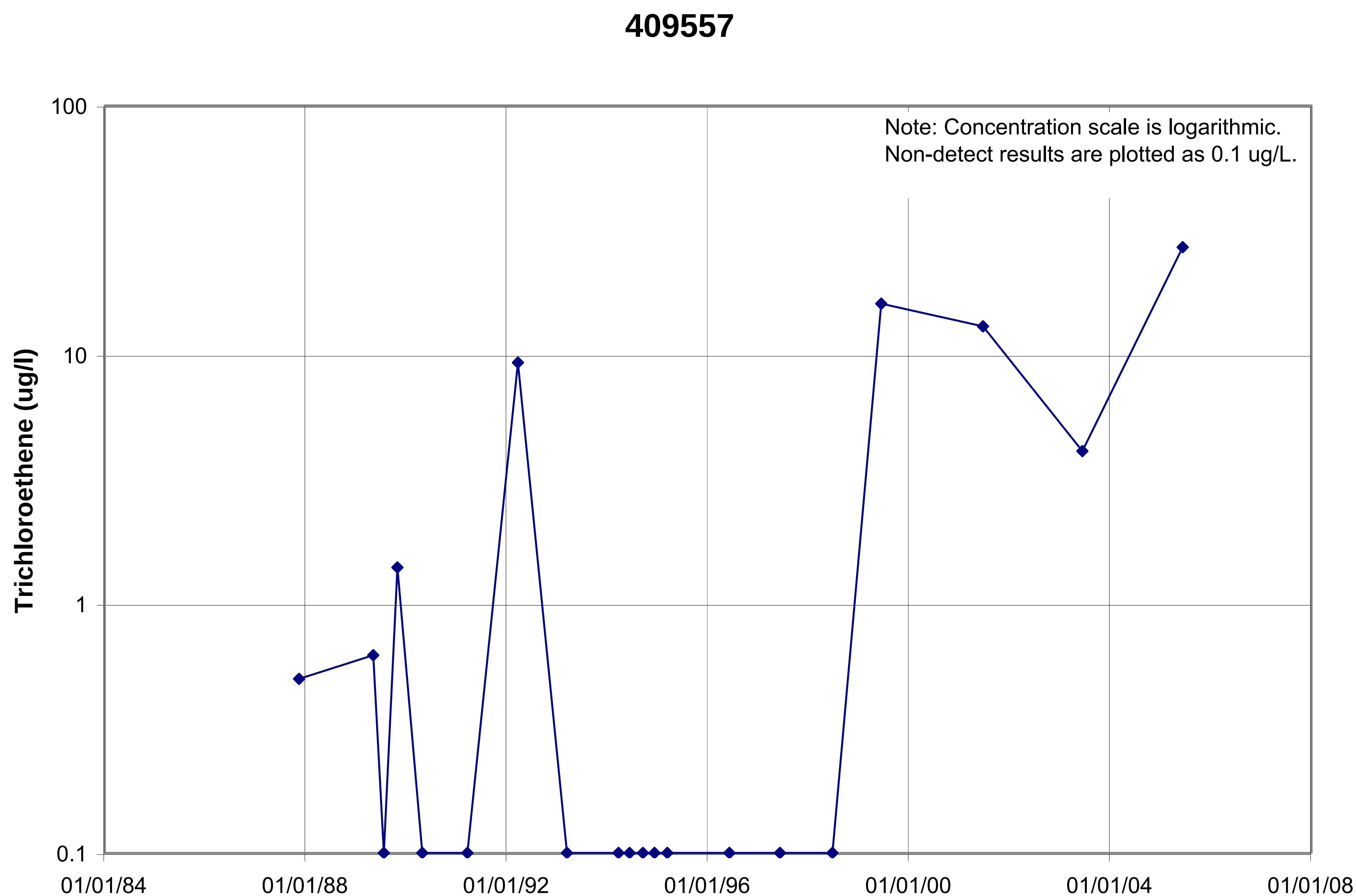

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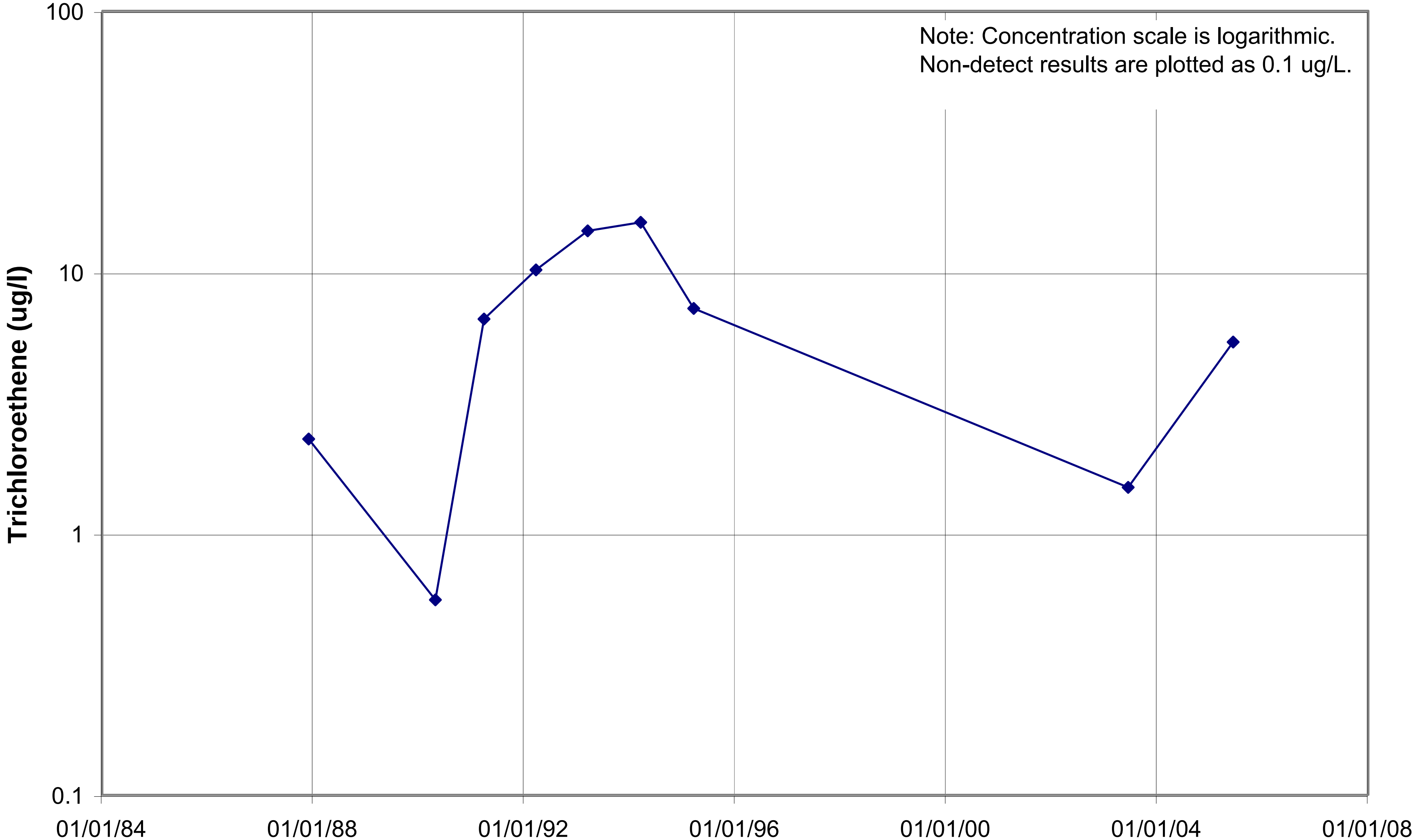

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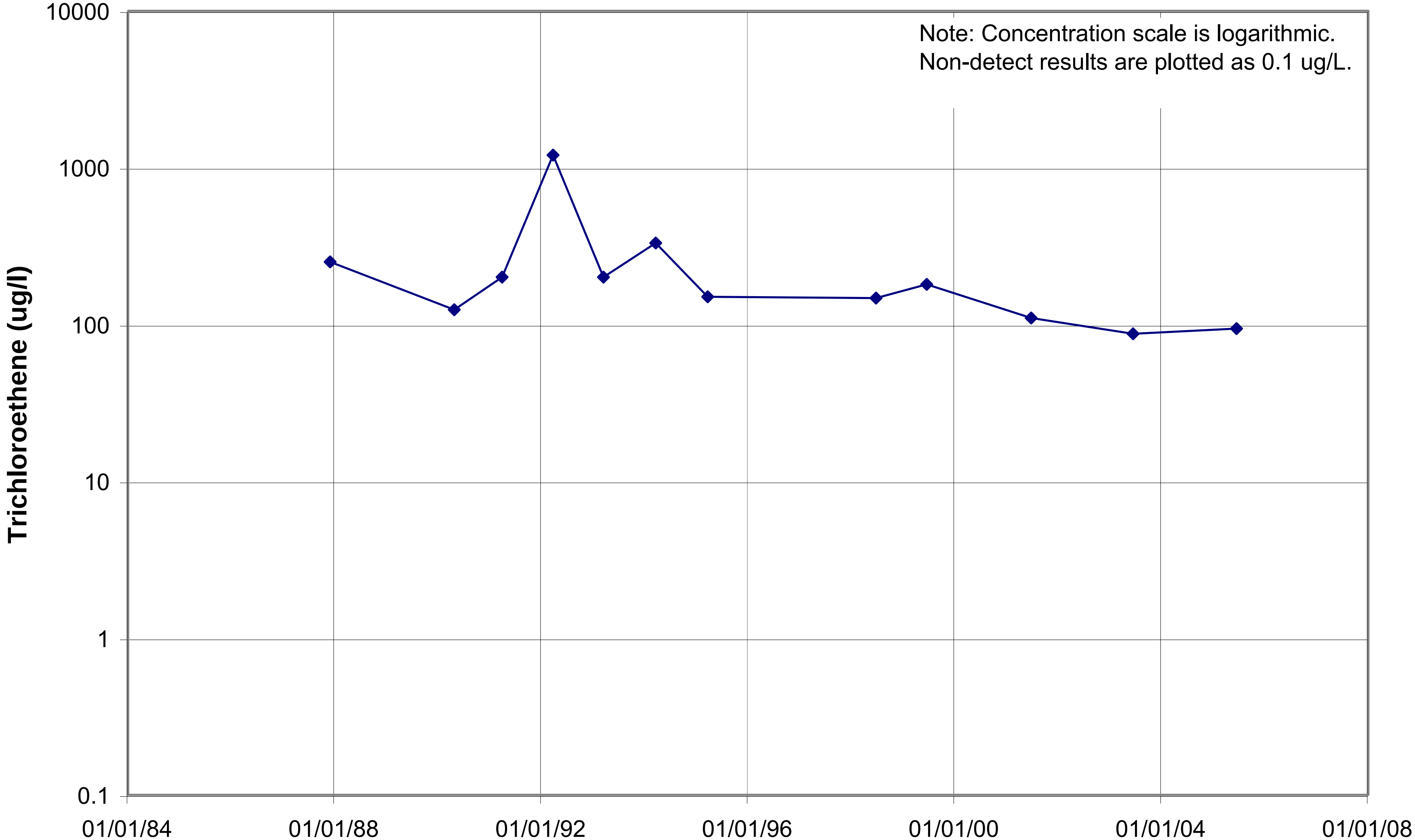

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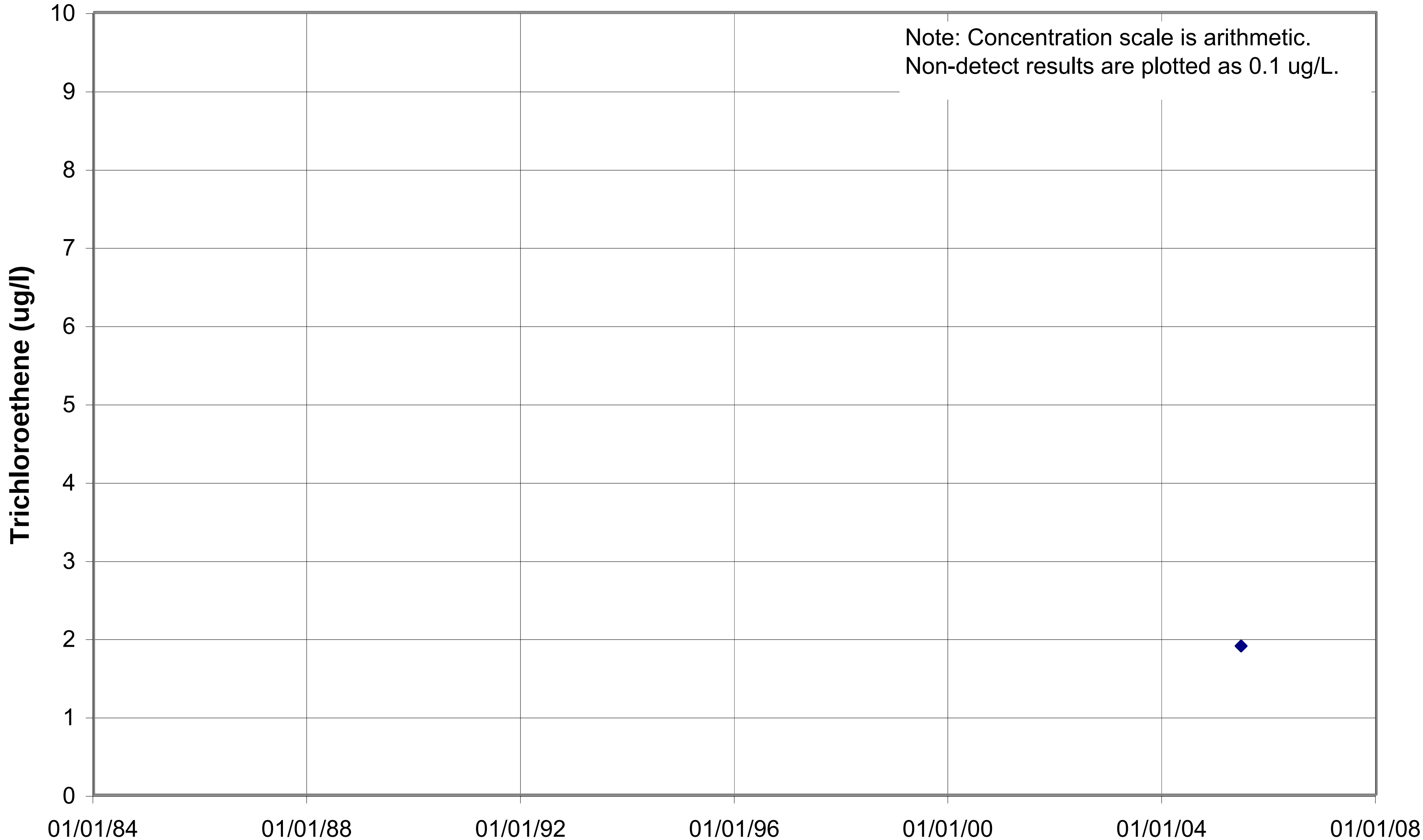

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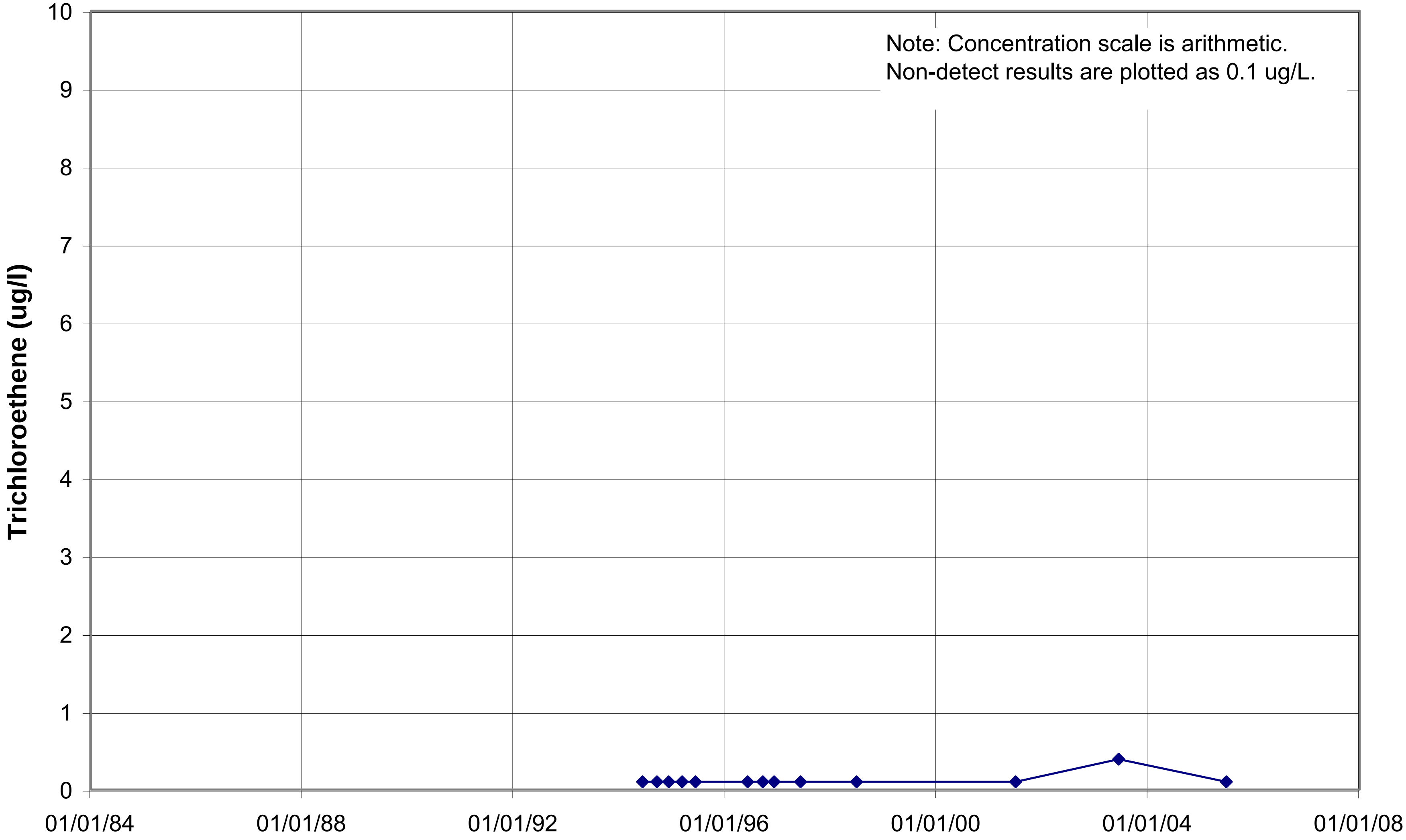
476837 (MW15H)



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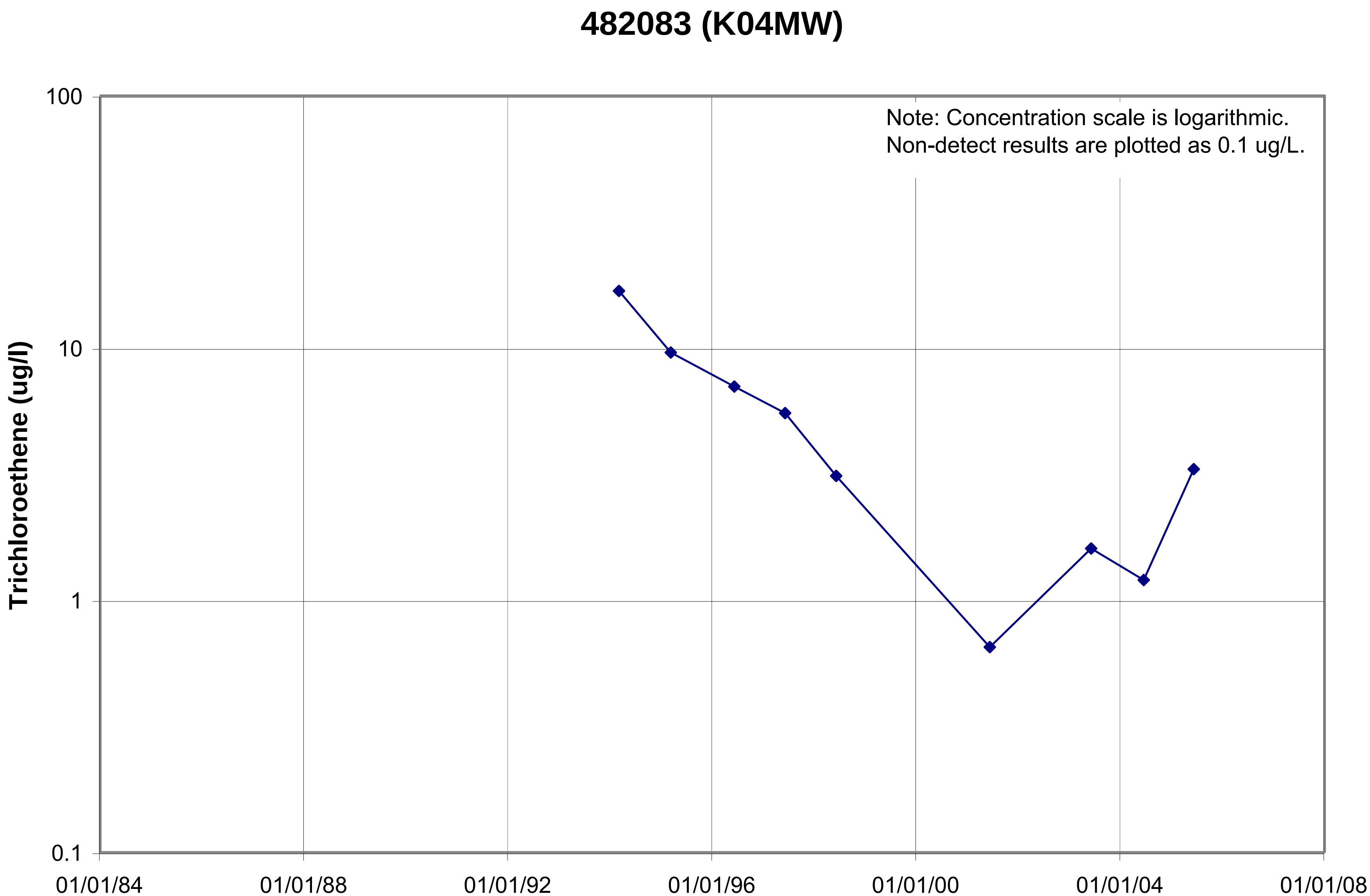

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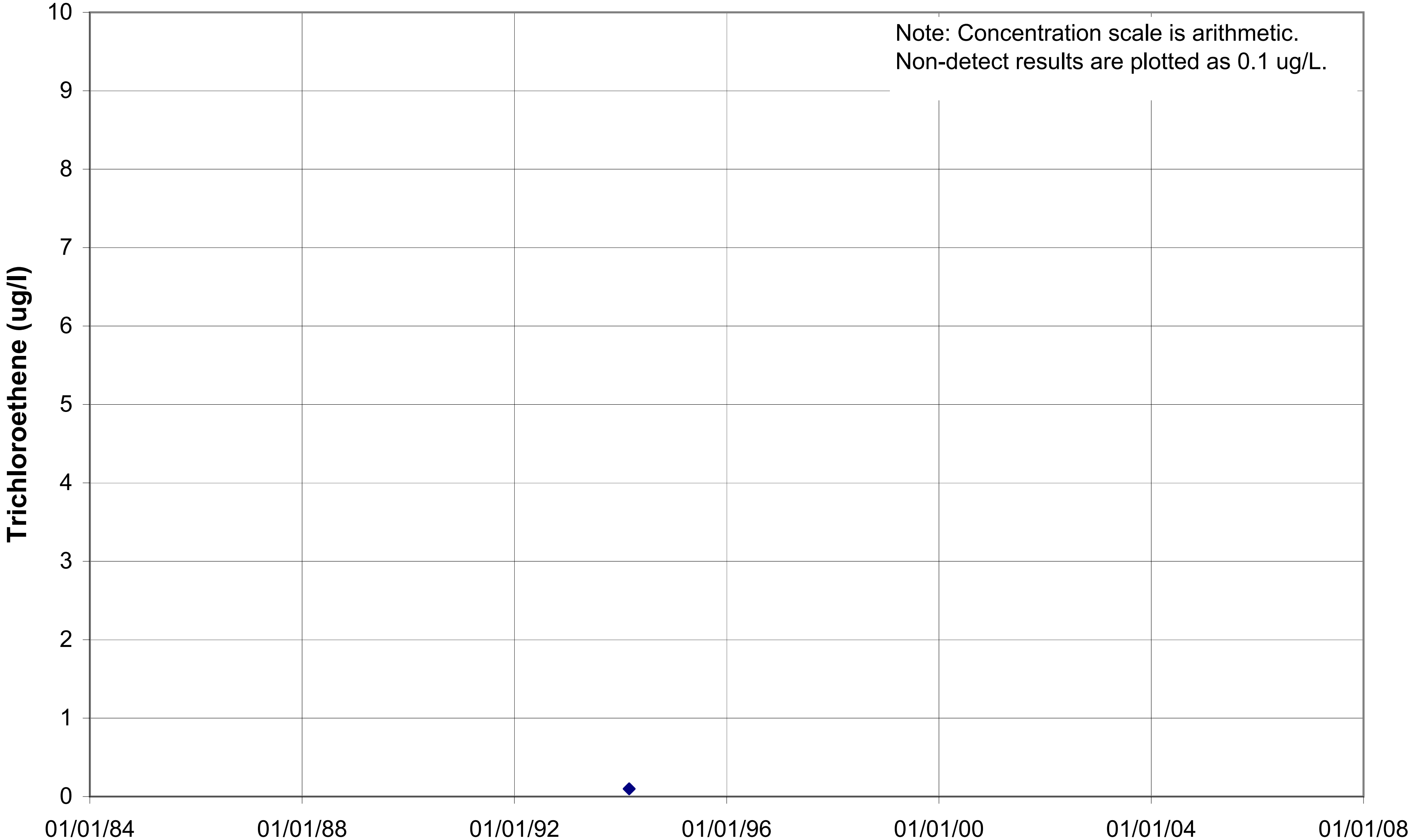
482084 (K02MW)



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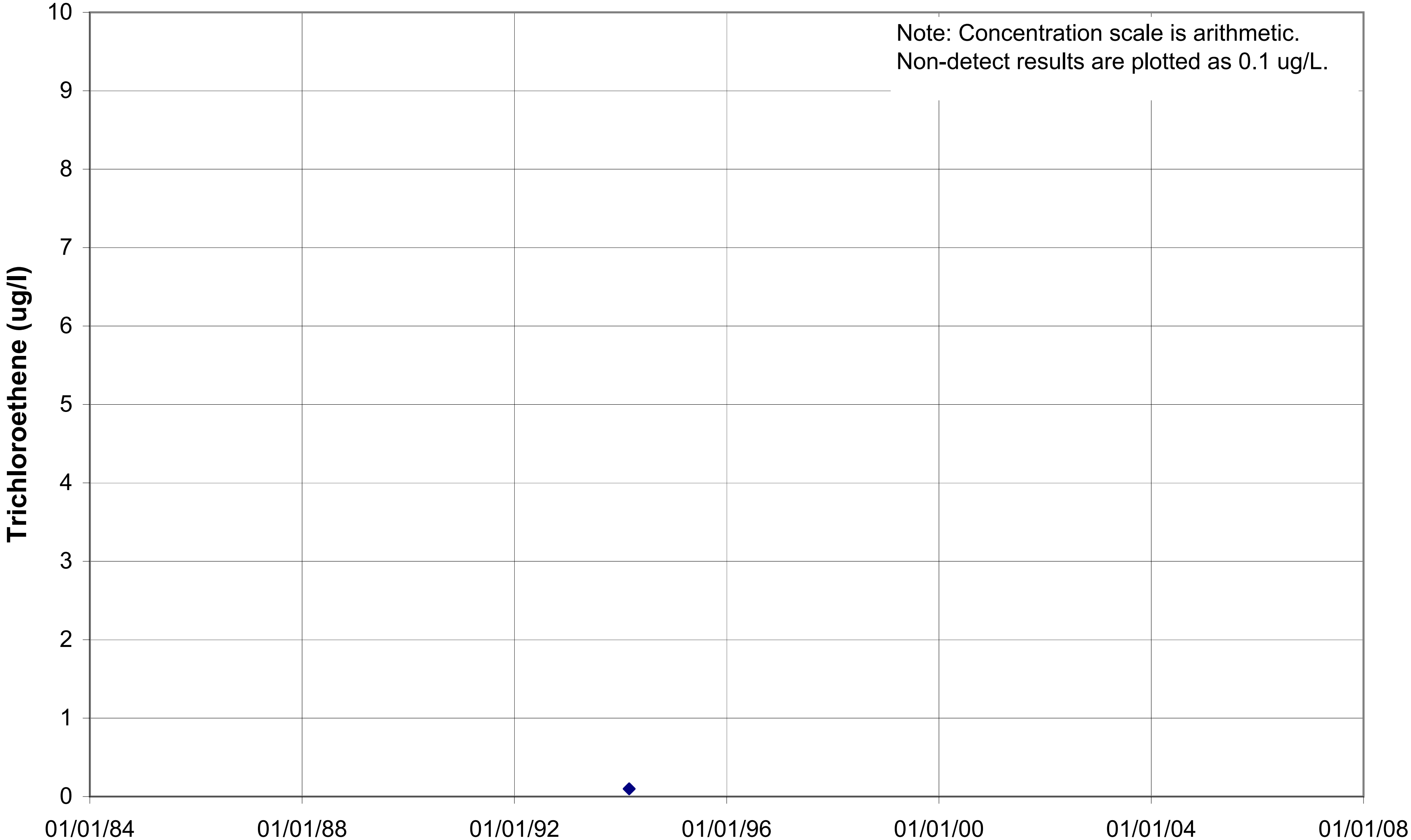

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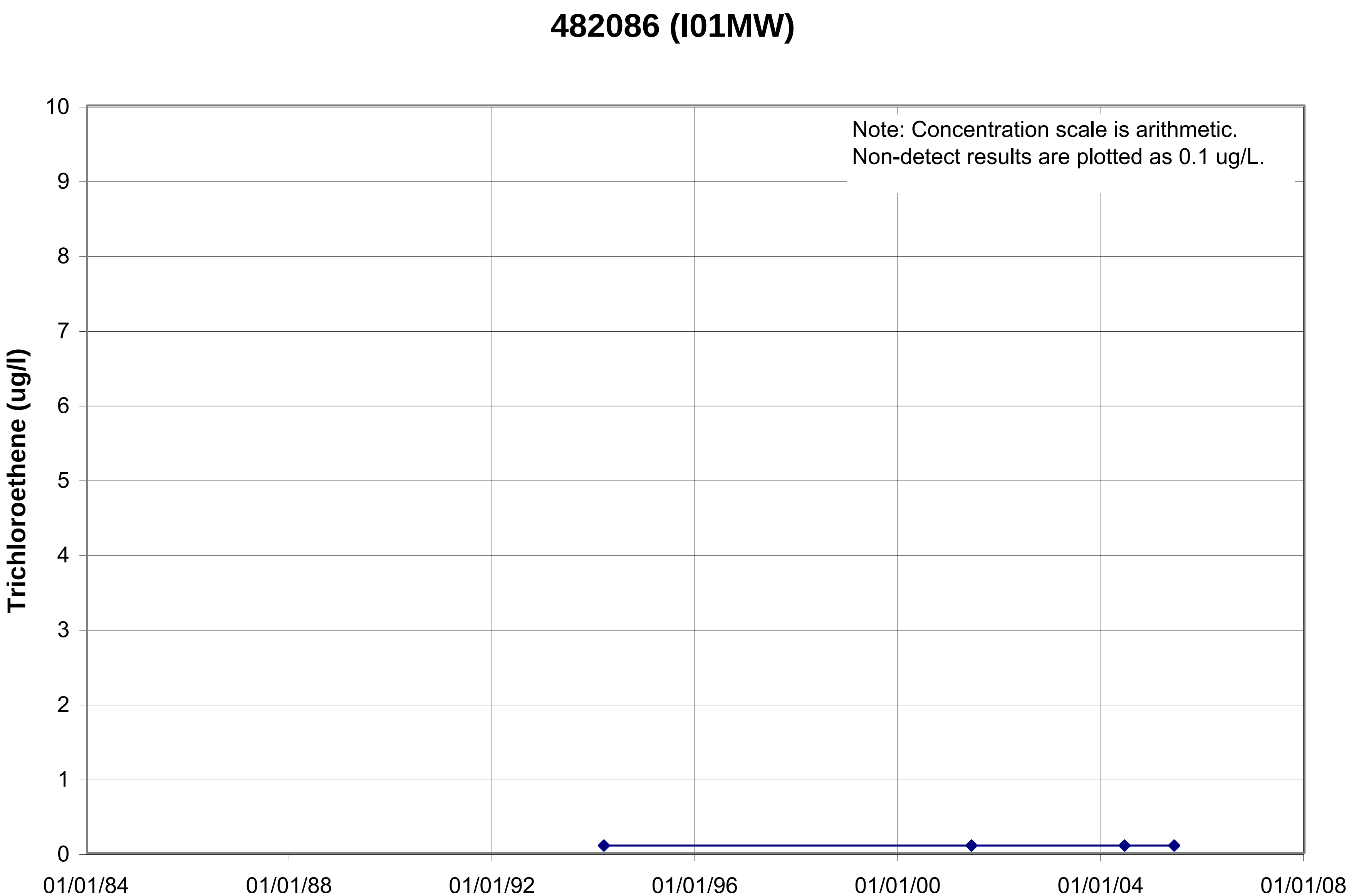

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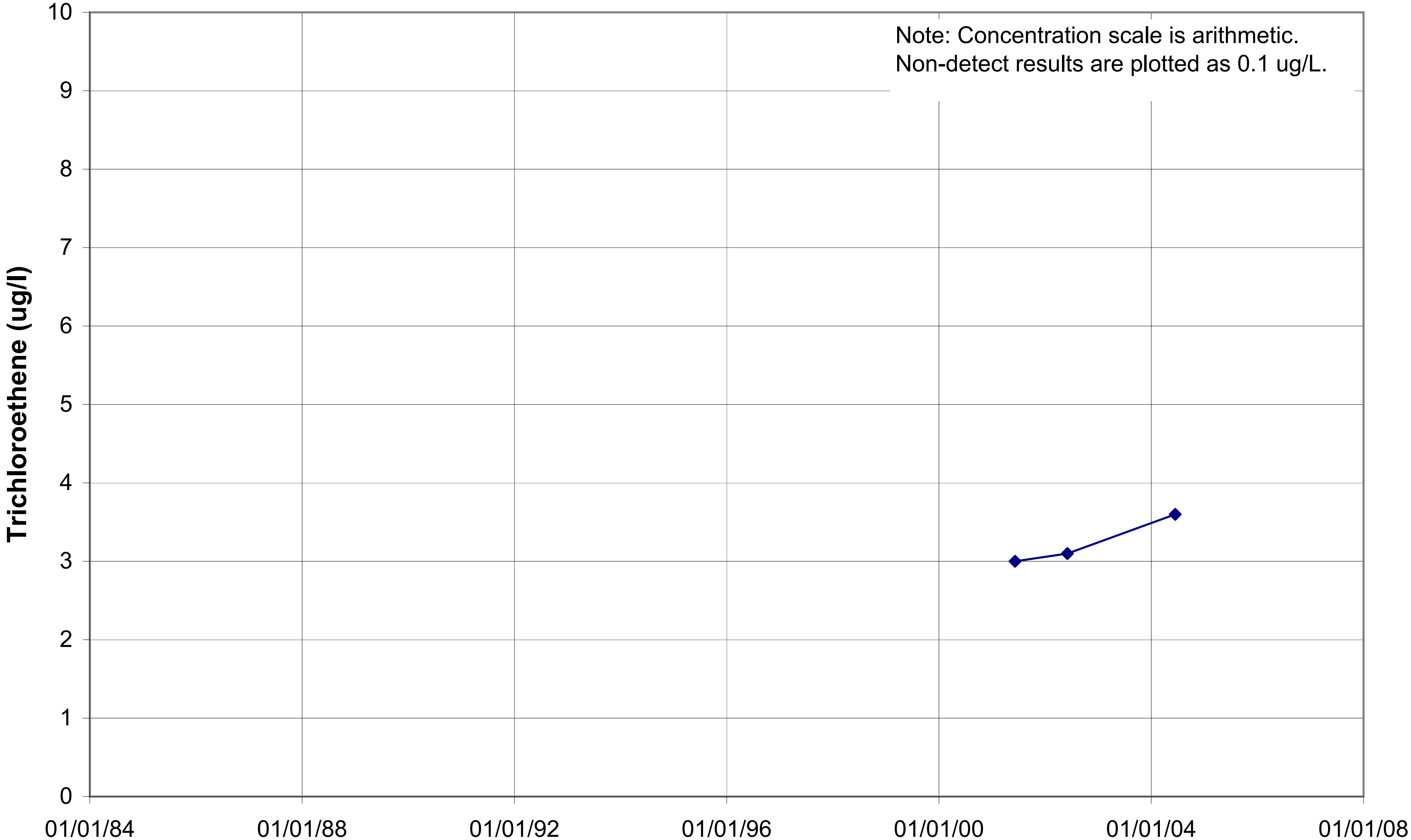
482087 (I05MW)



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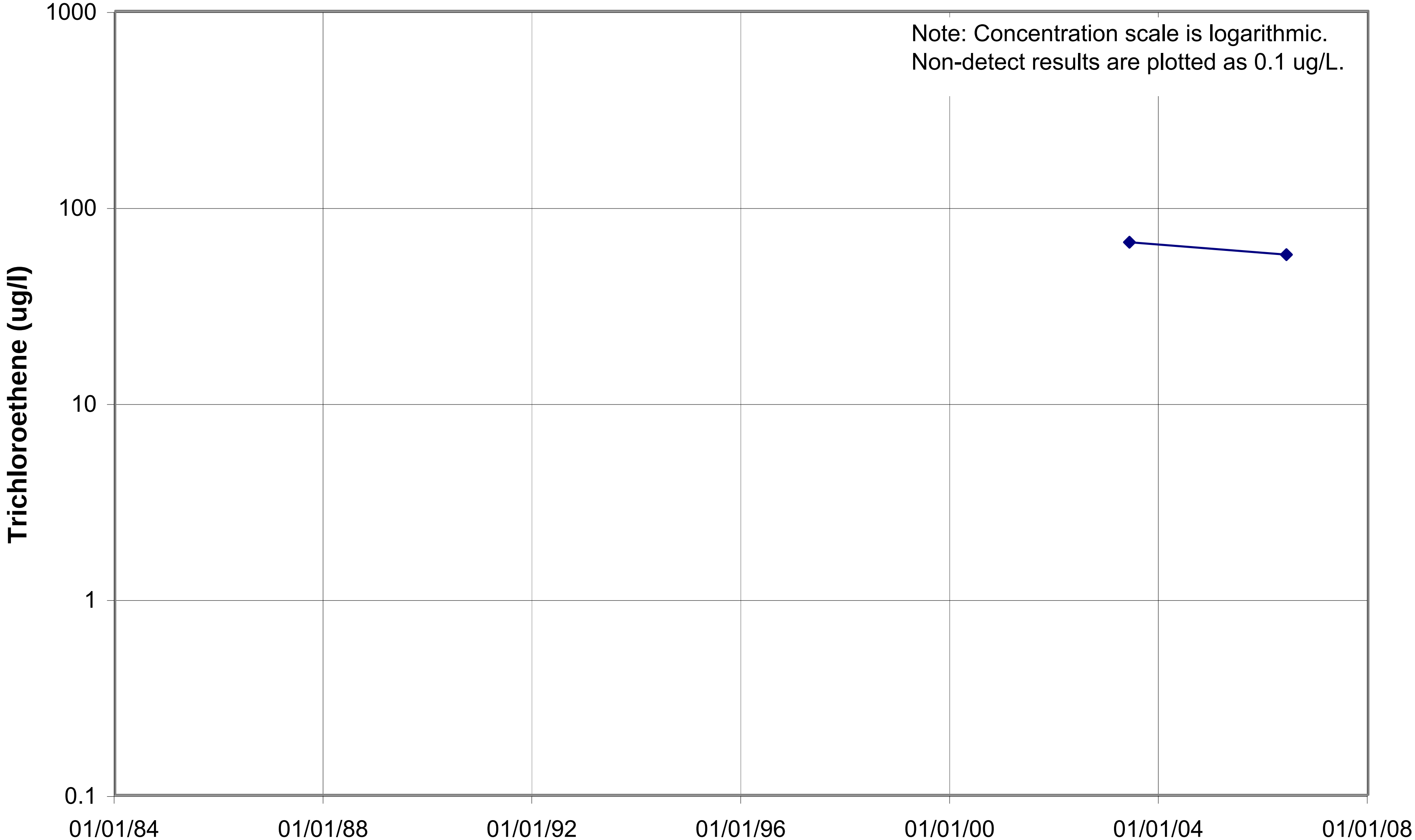

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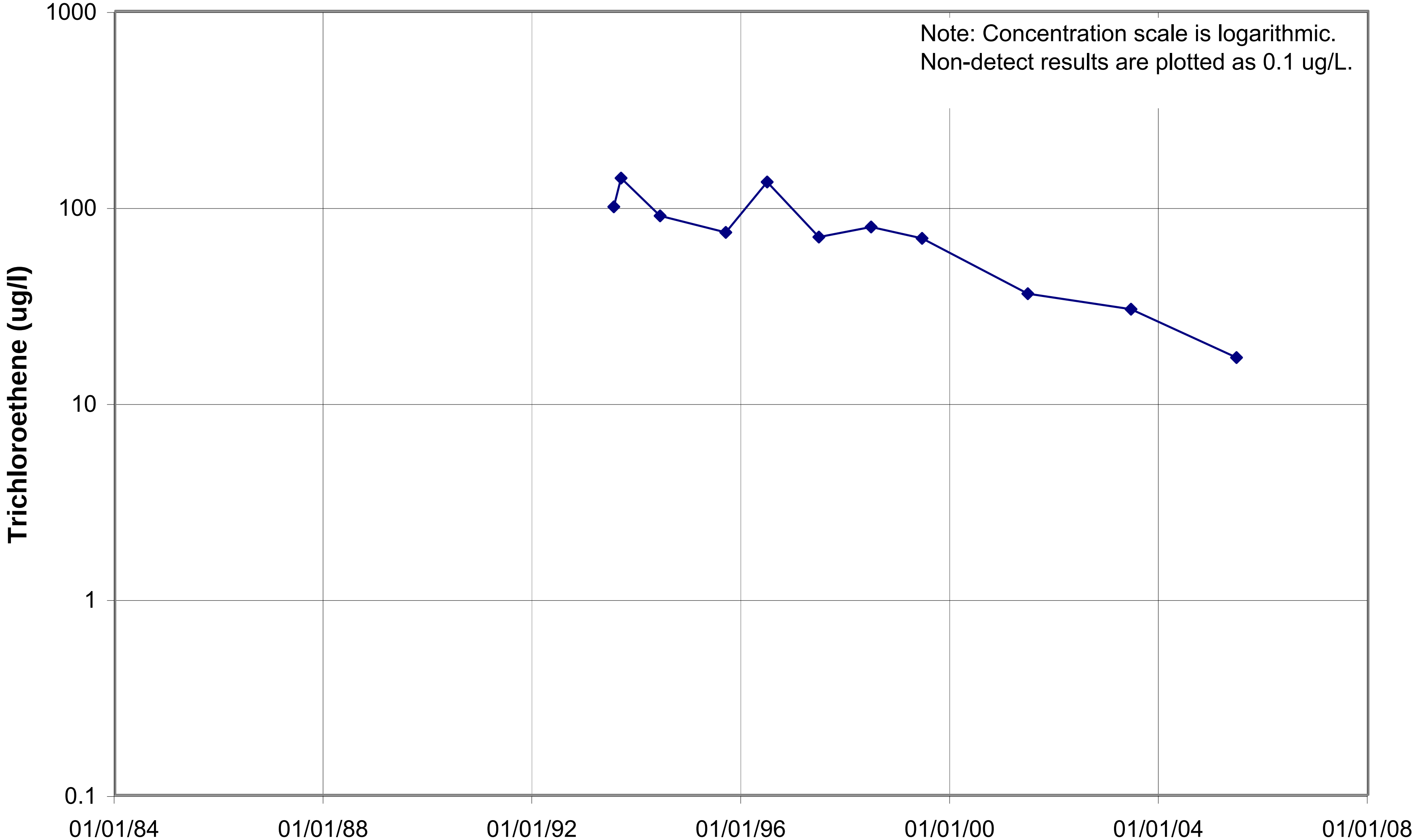

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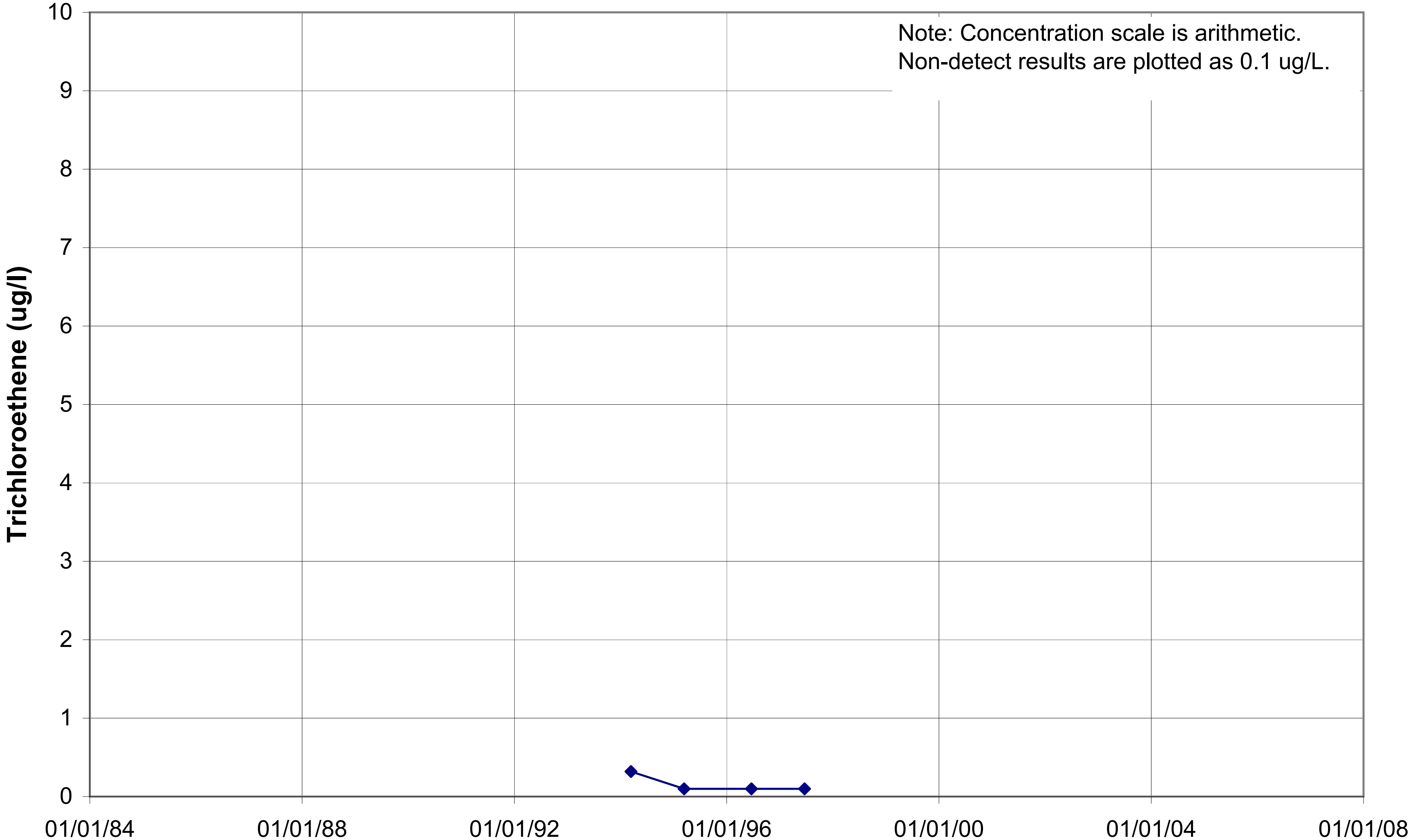

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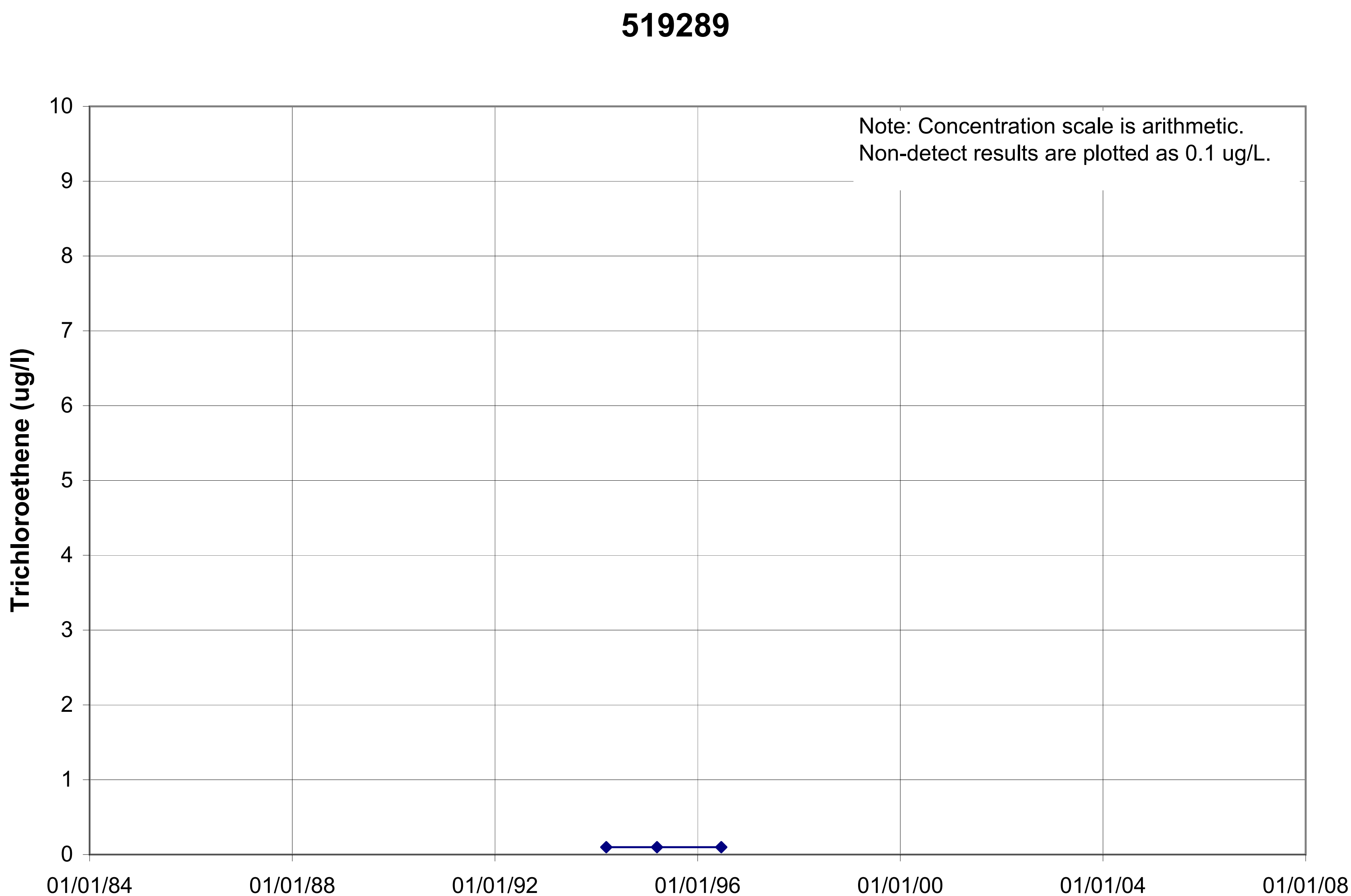

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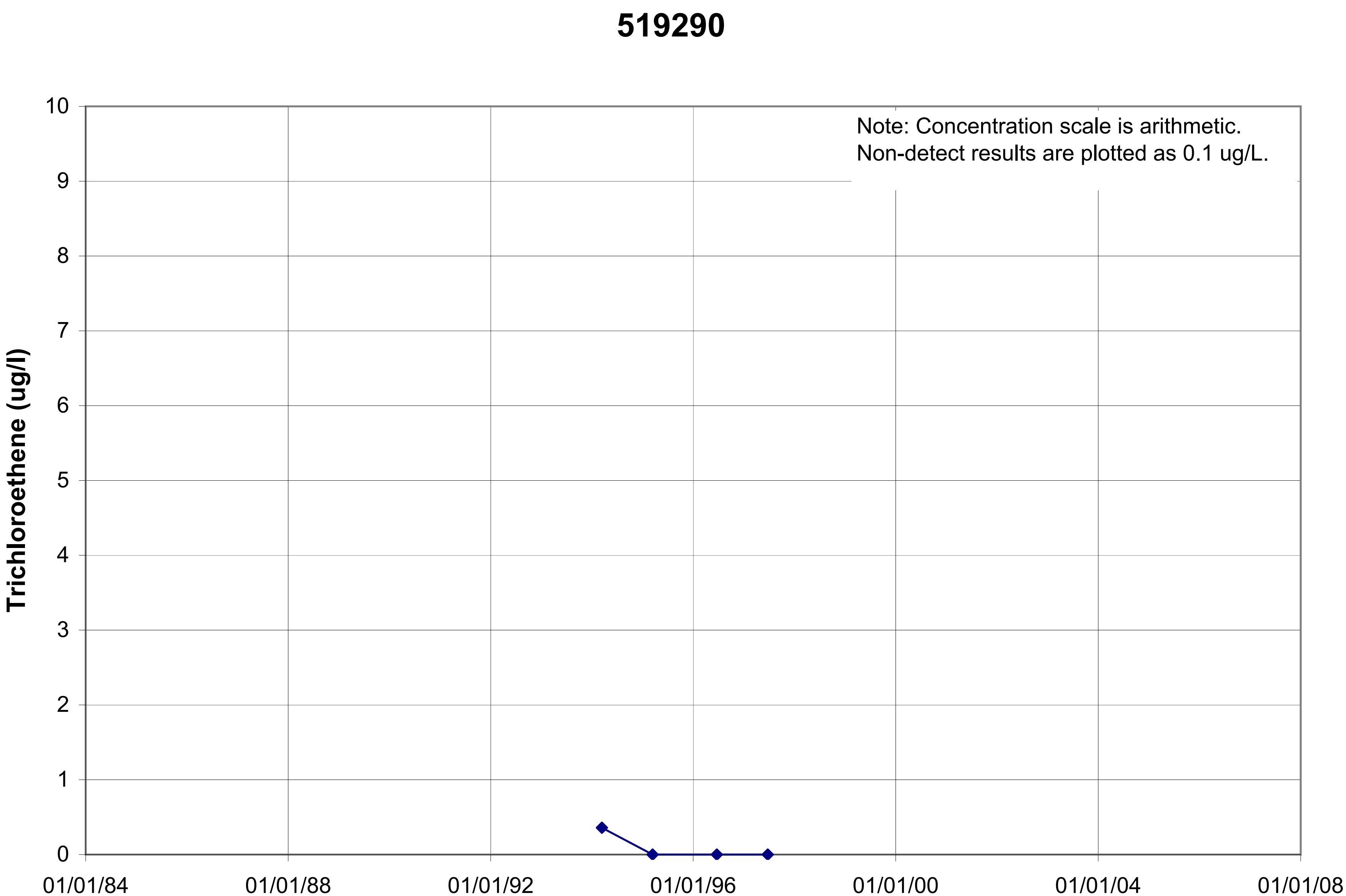

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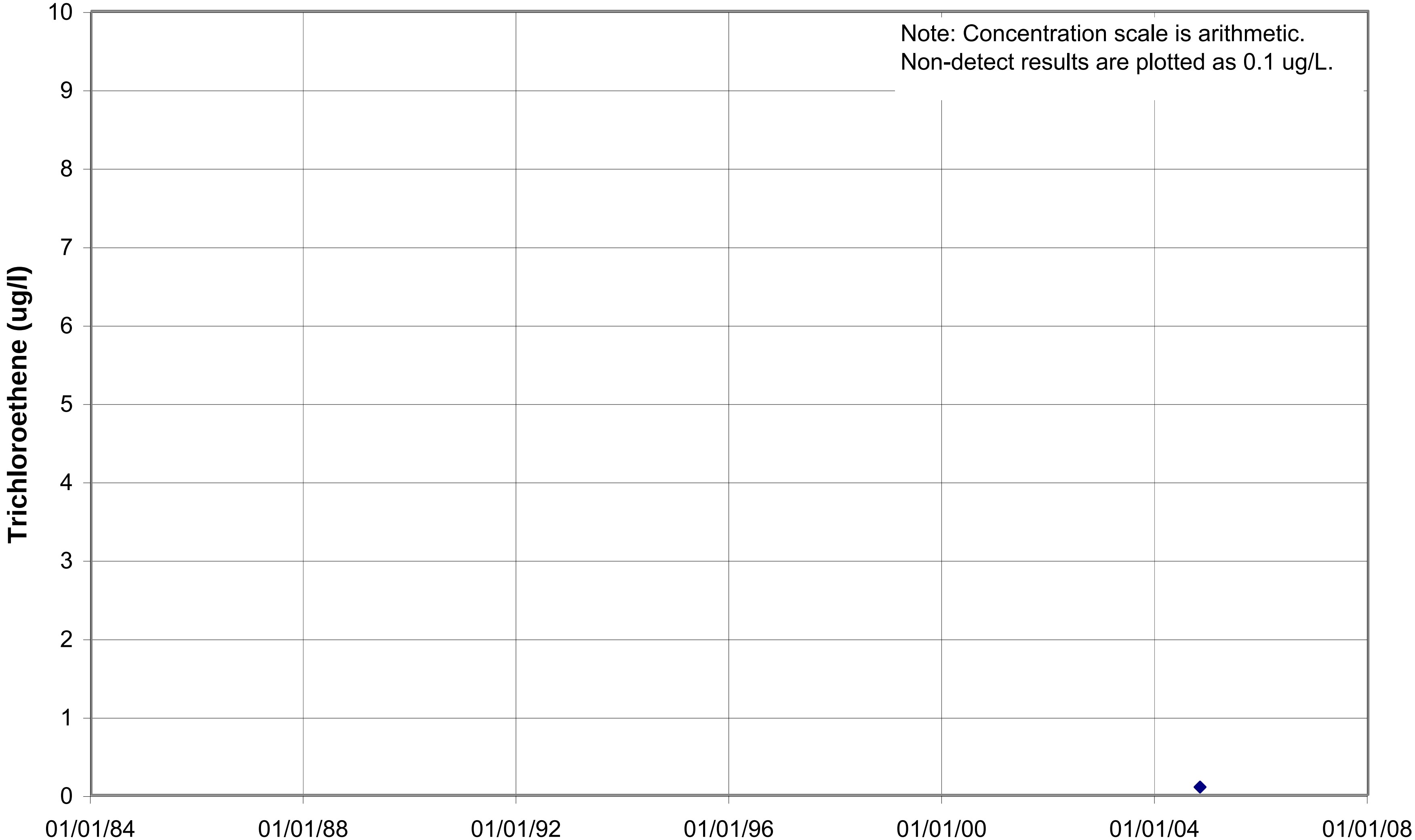
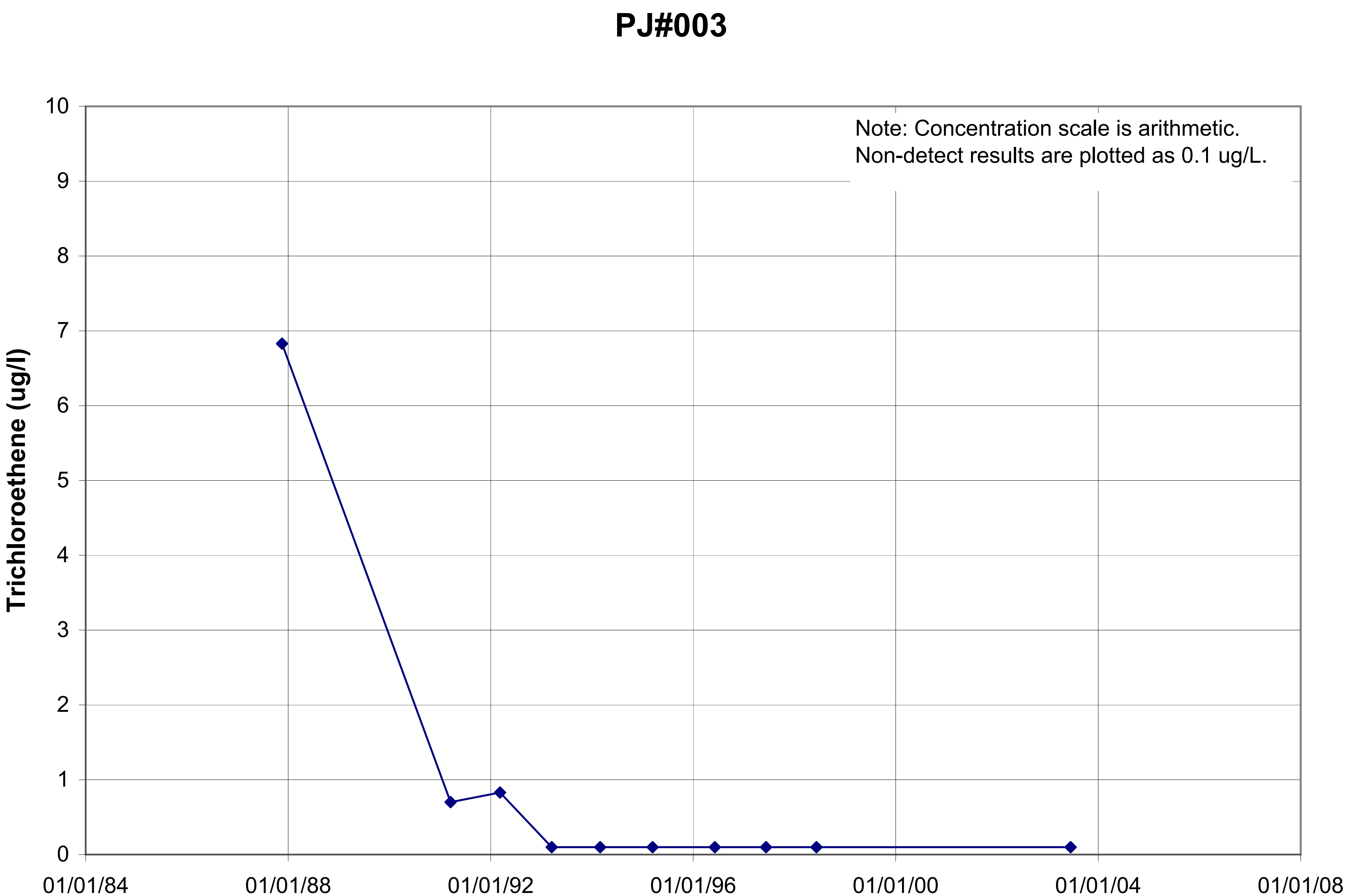


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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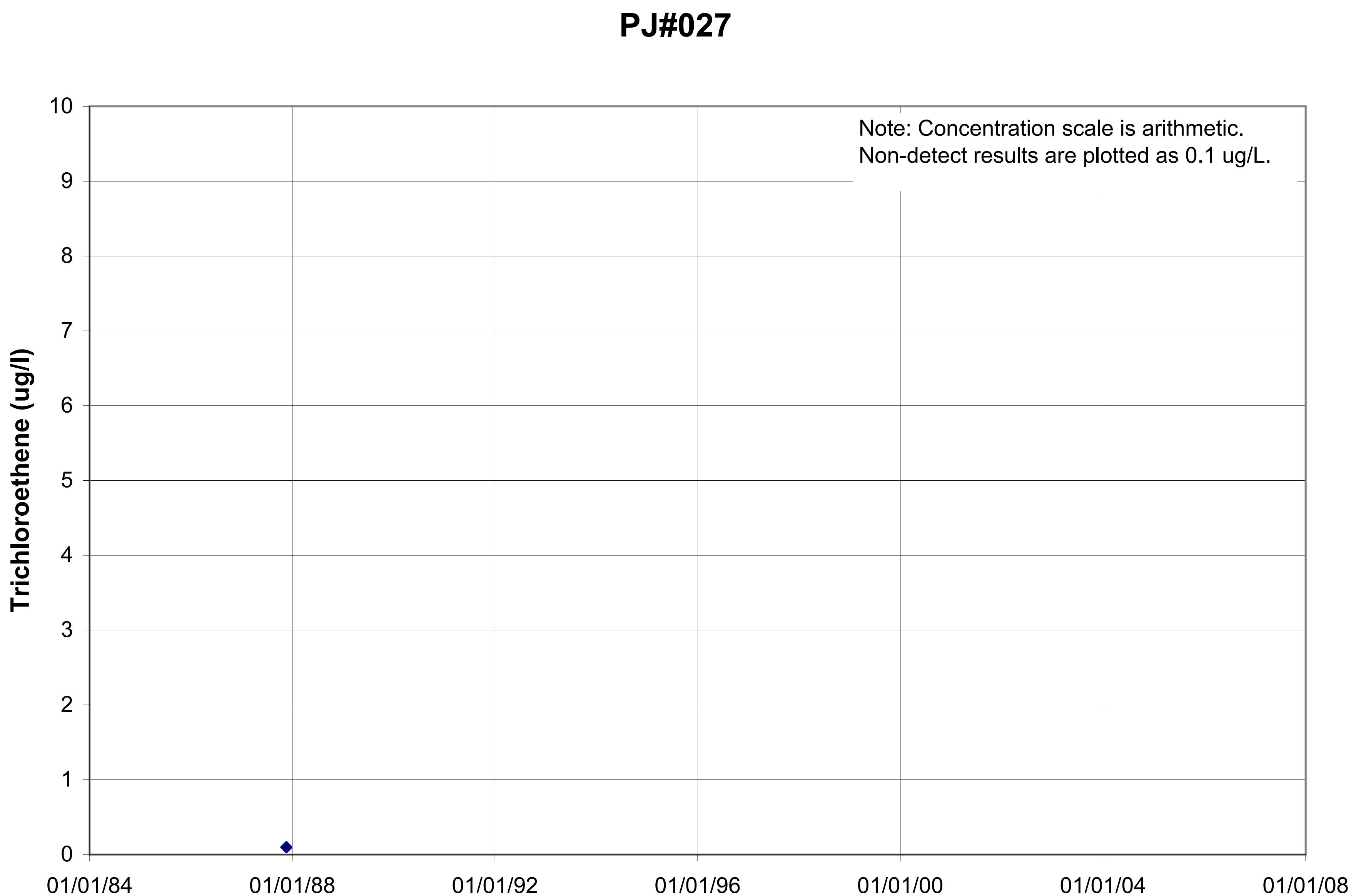

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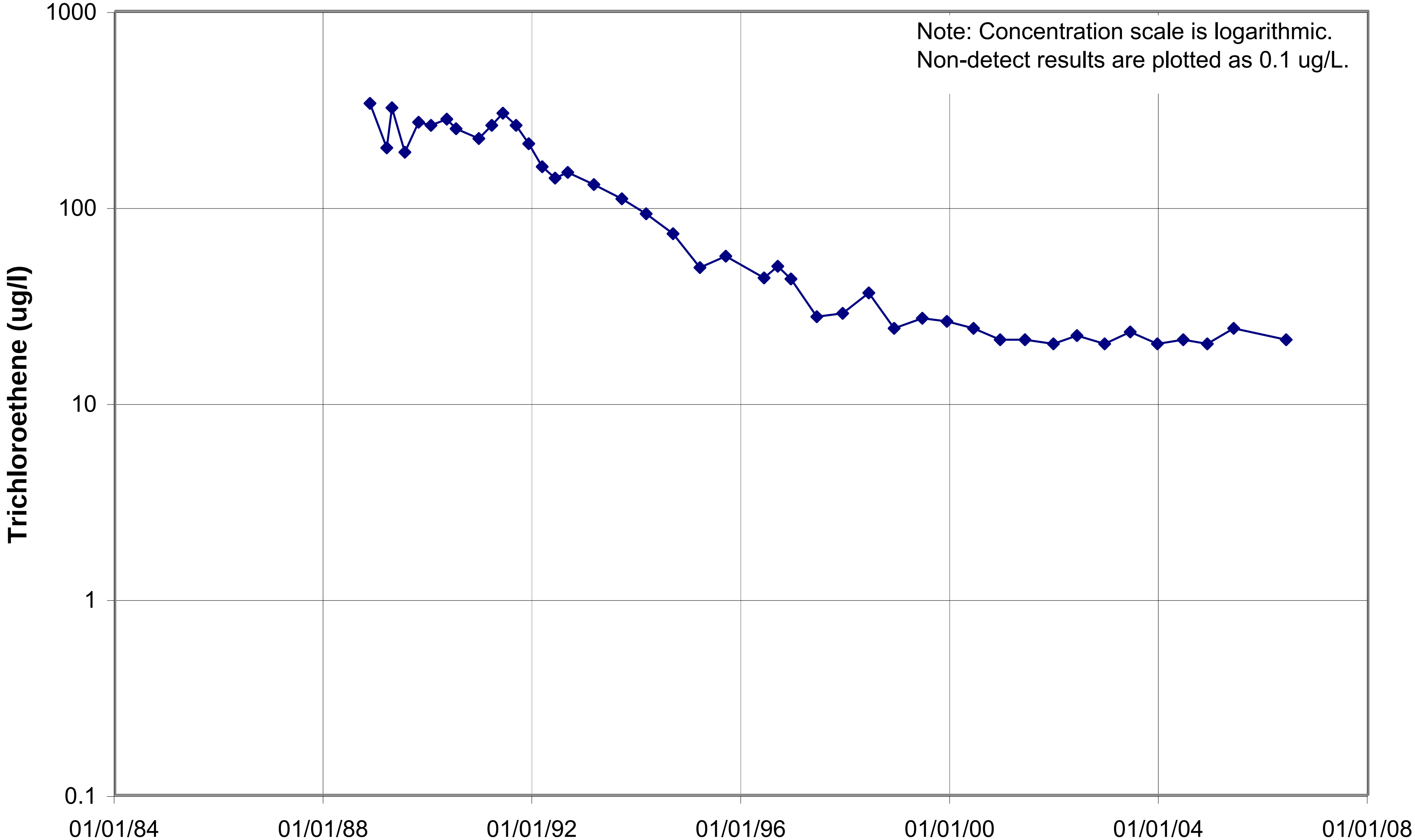
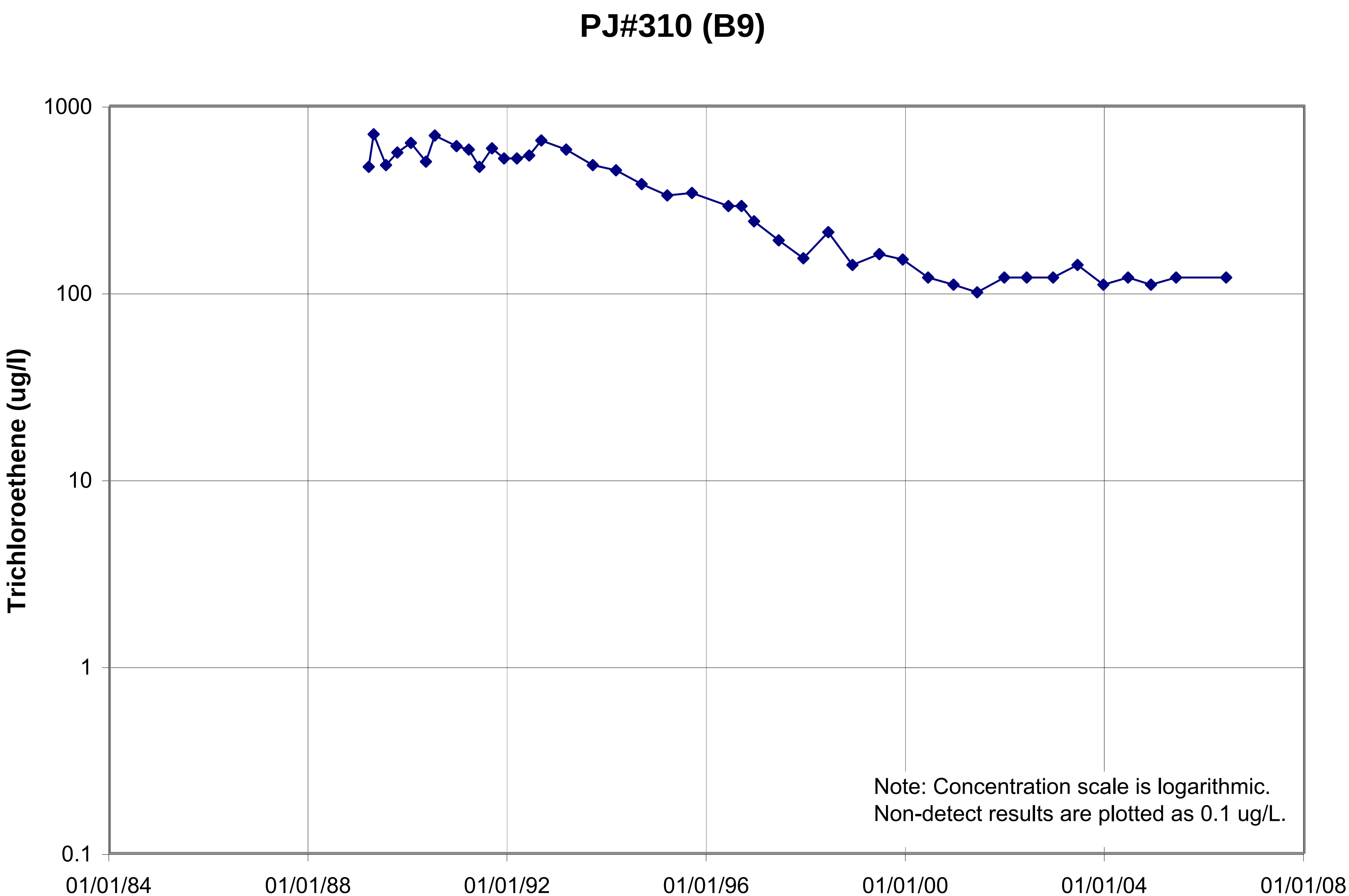
PJ#309 (B8)

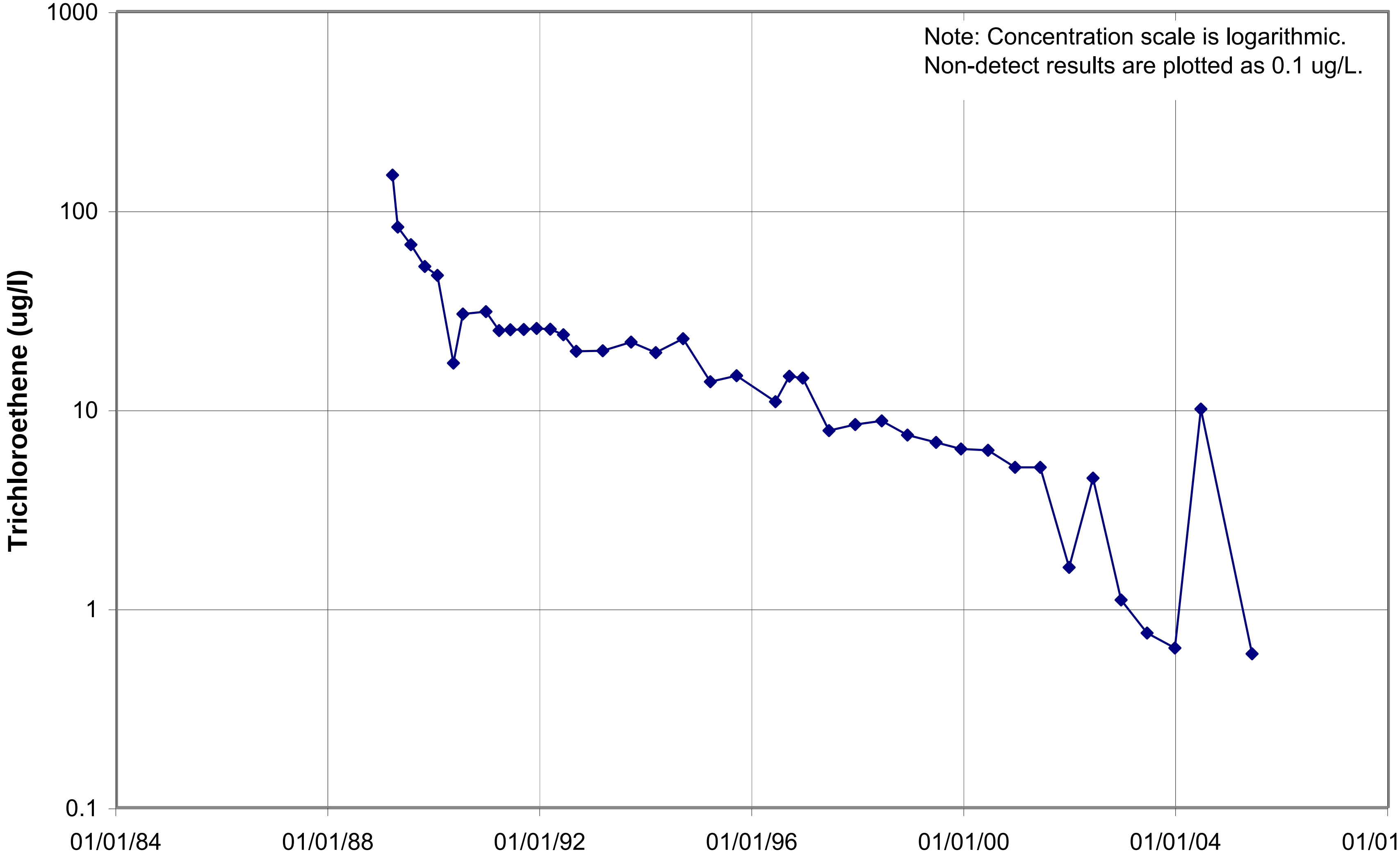


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

PJ#311 (B10)



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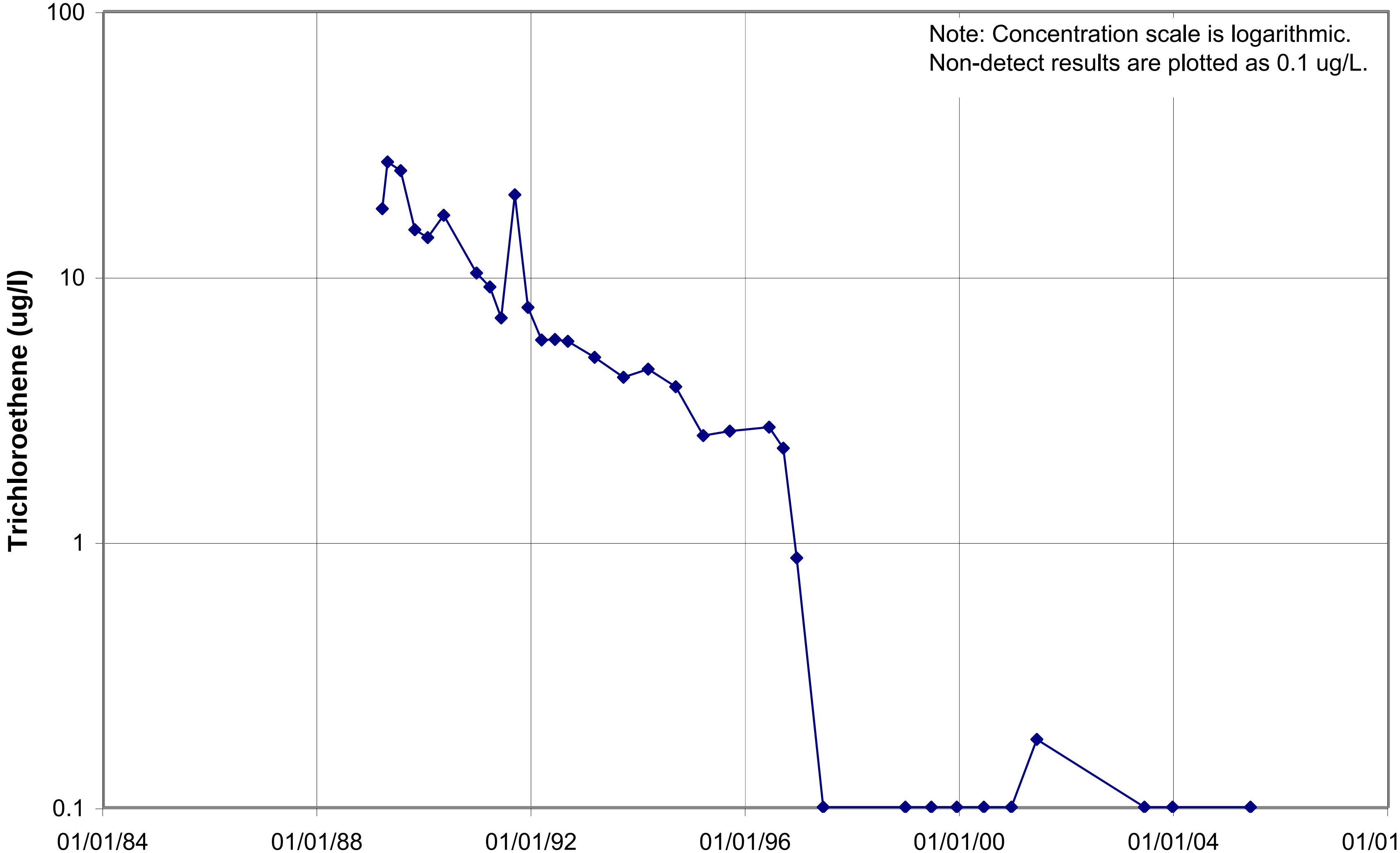
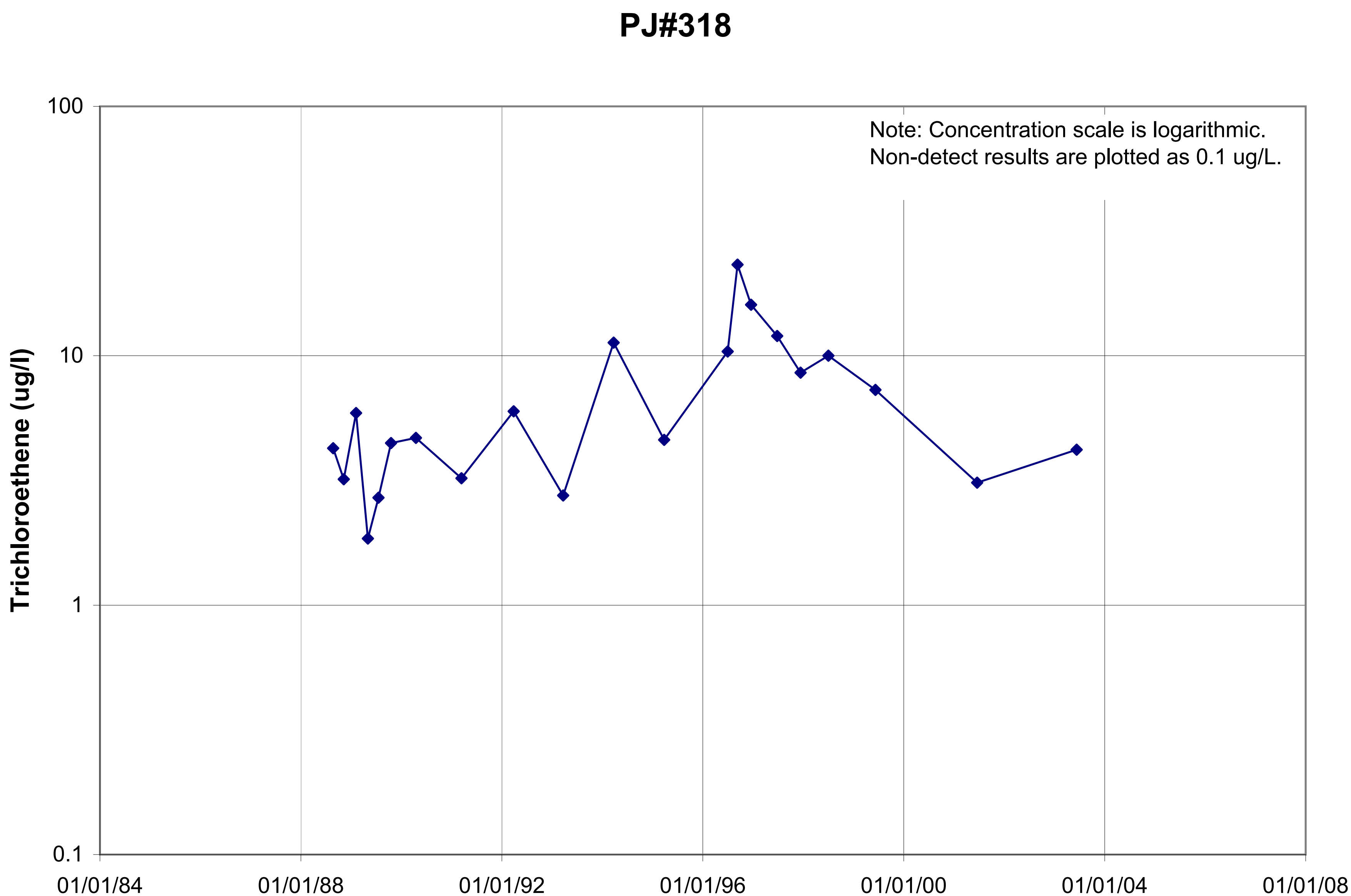
PJ#313 (B12)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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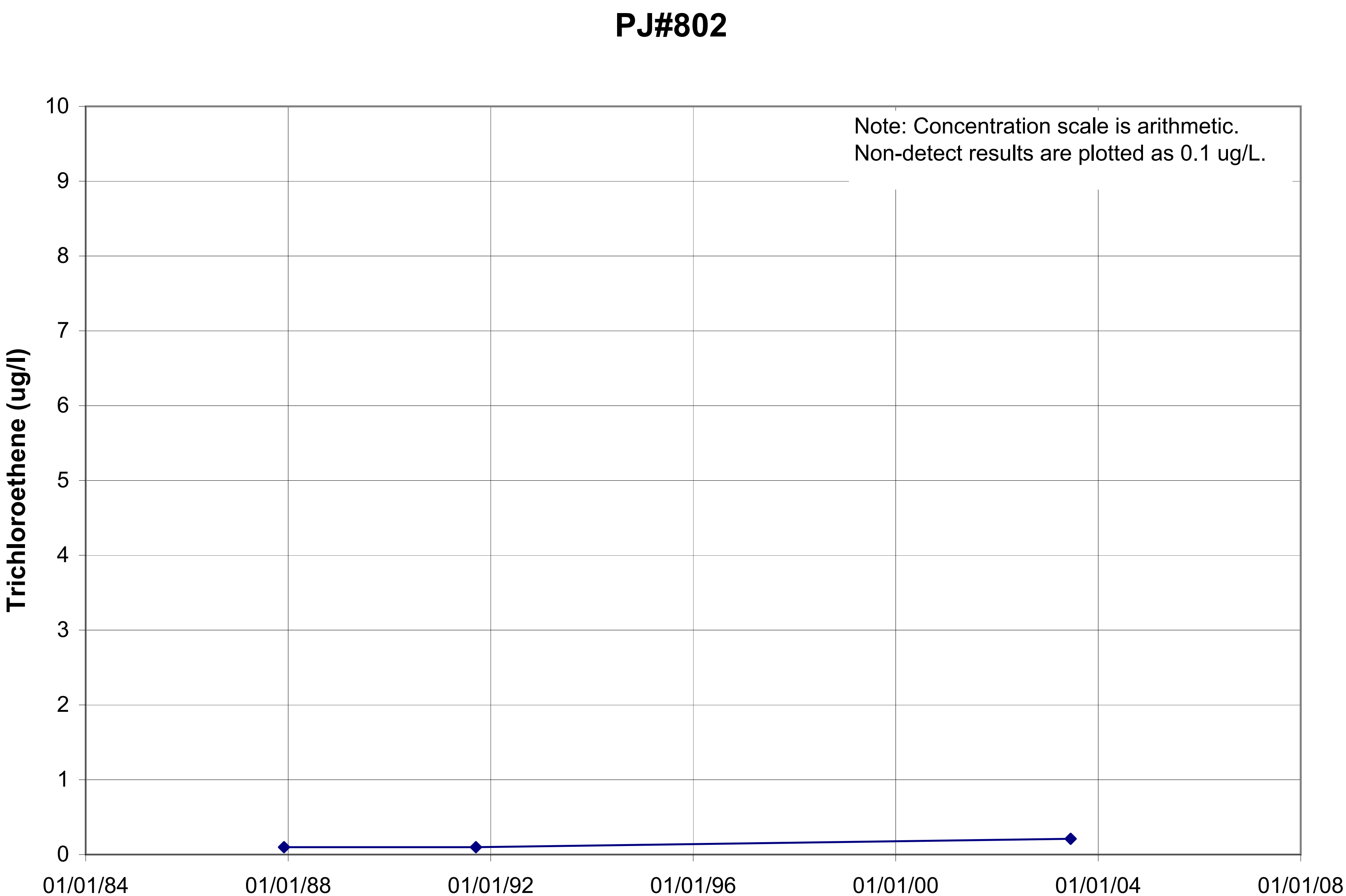

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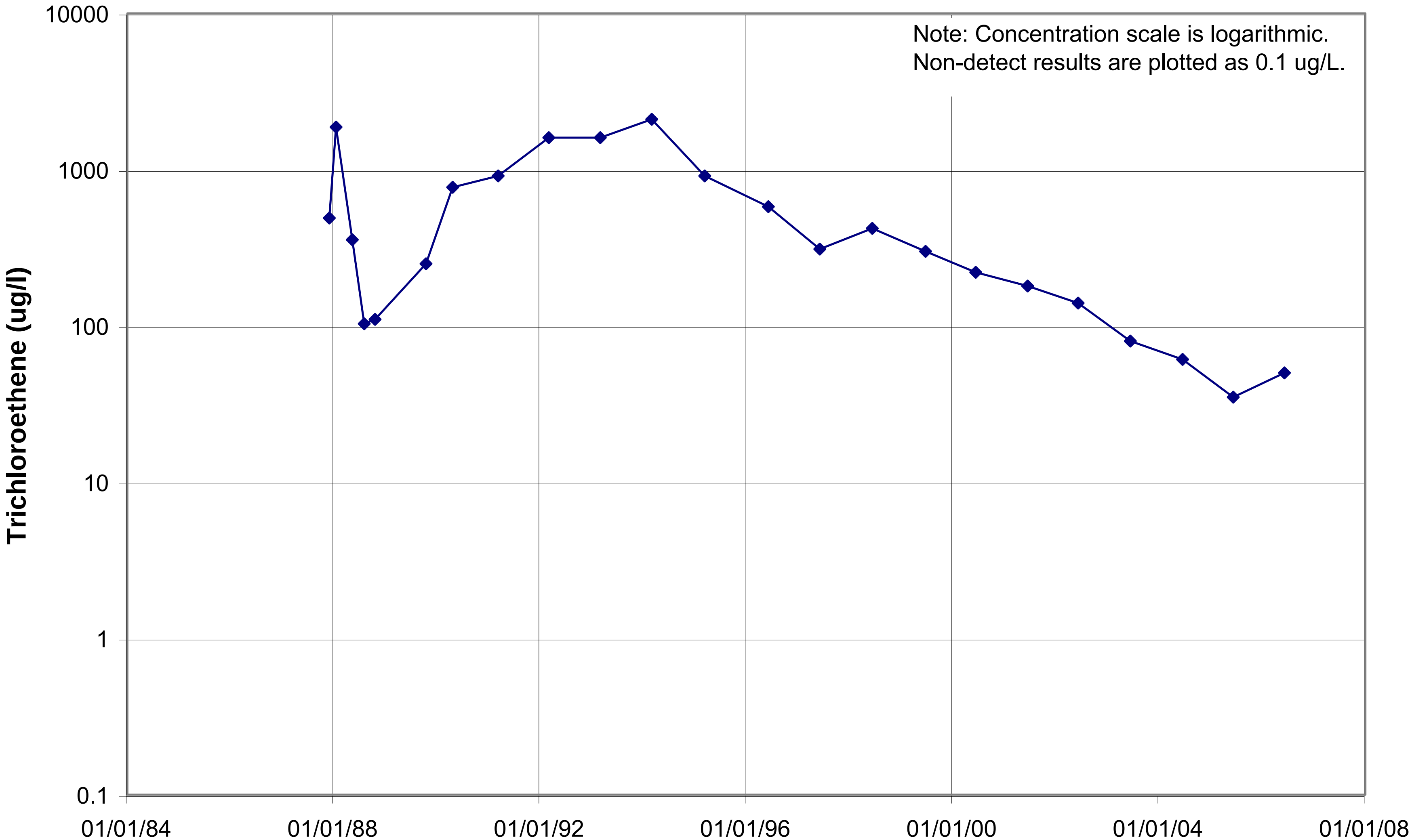
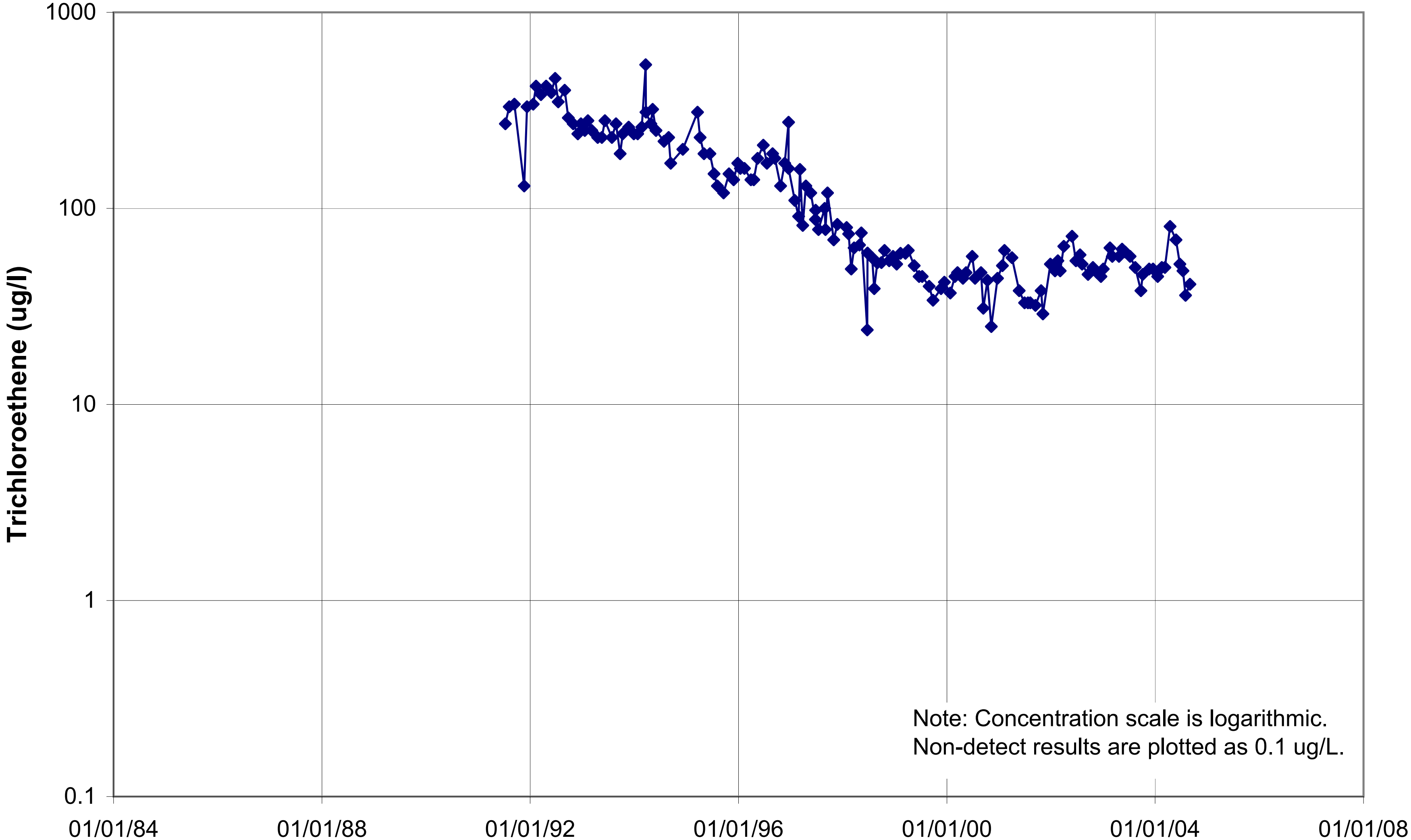
PJ#806



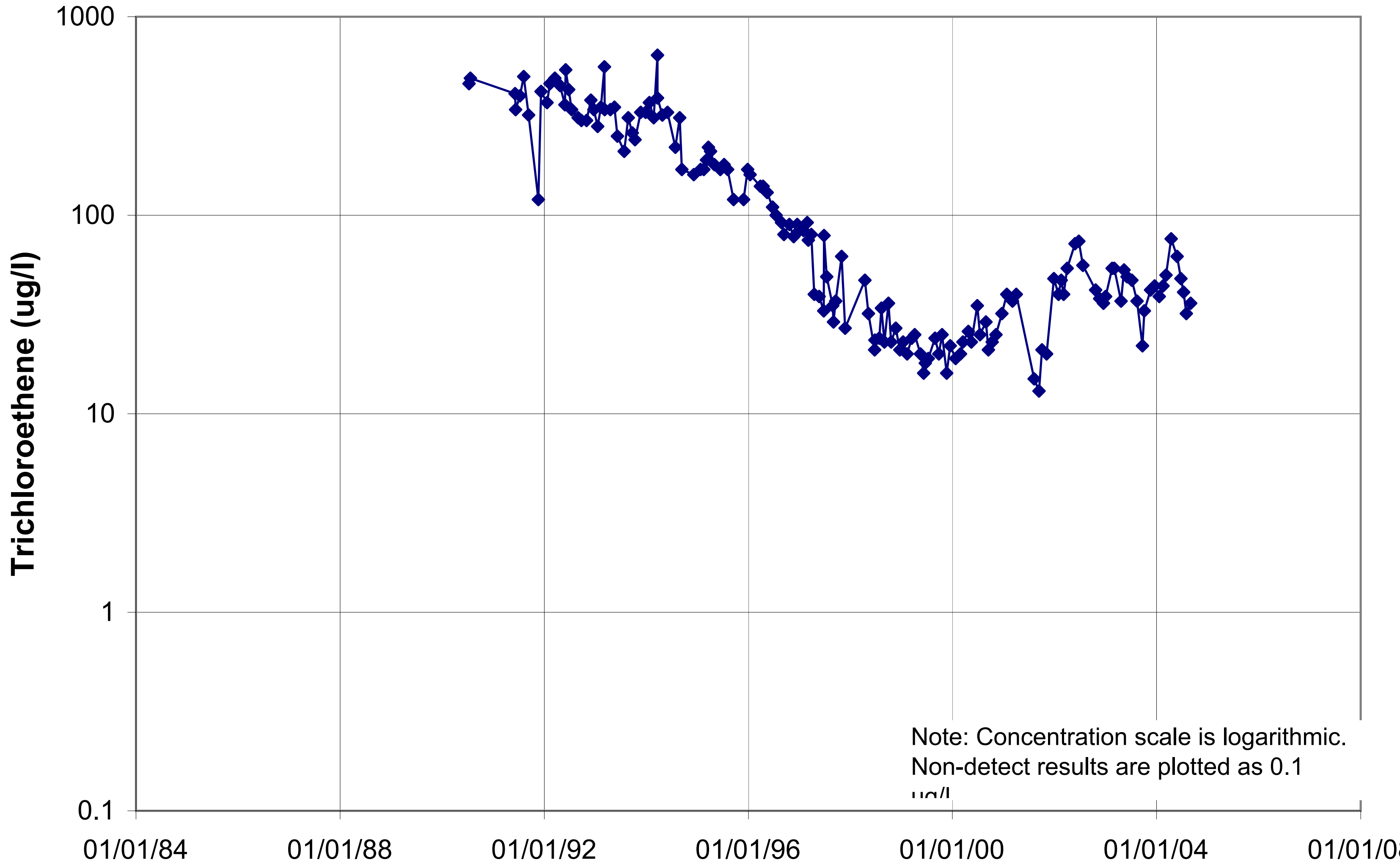
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

206792 (NBM#4)

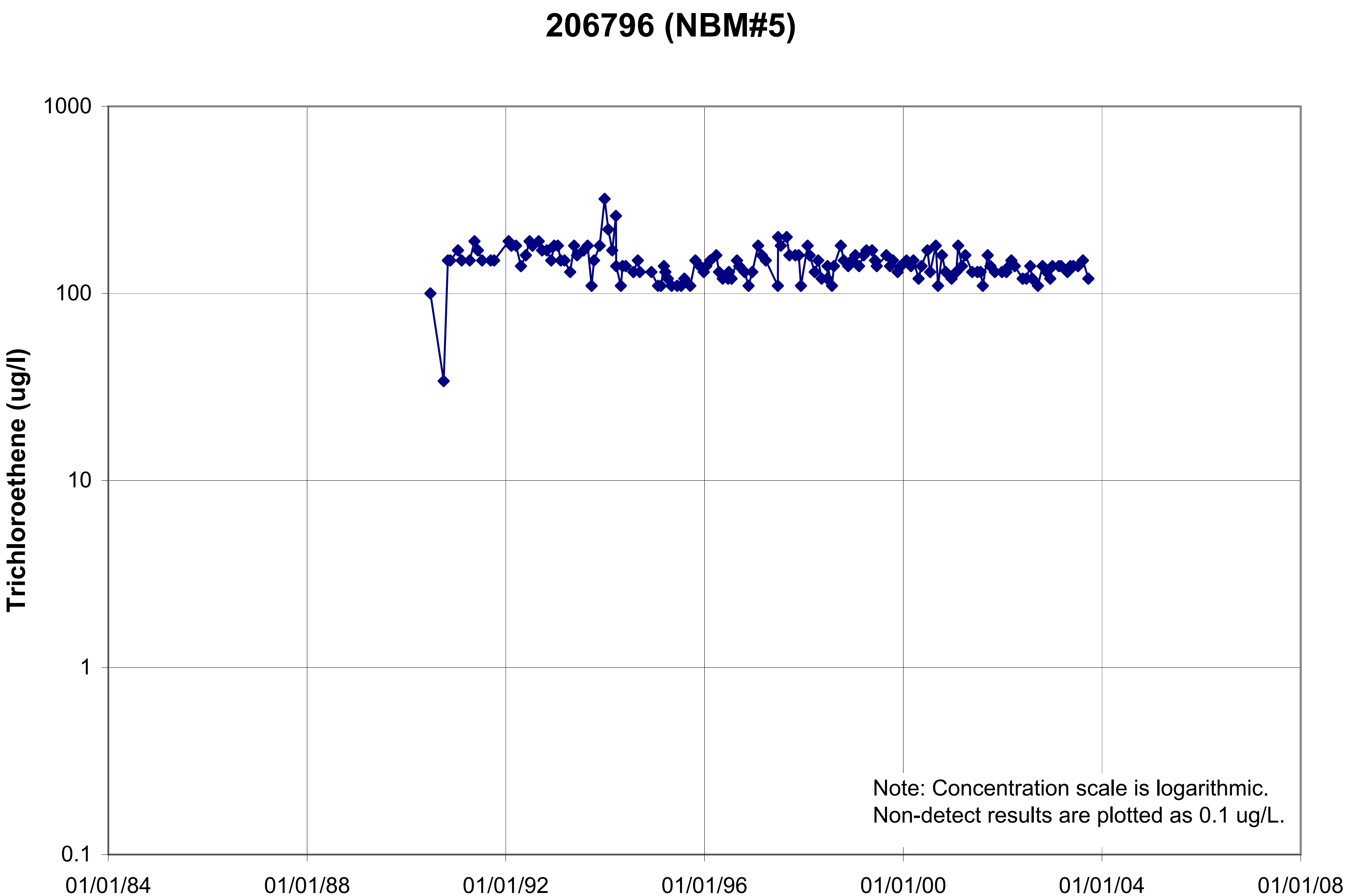


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

206793 (NBM#3)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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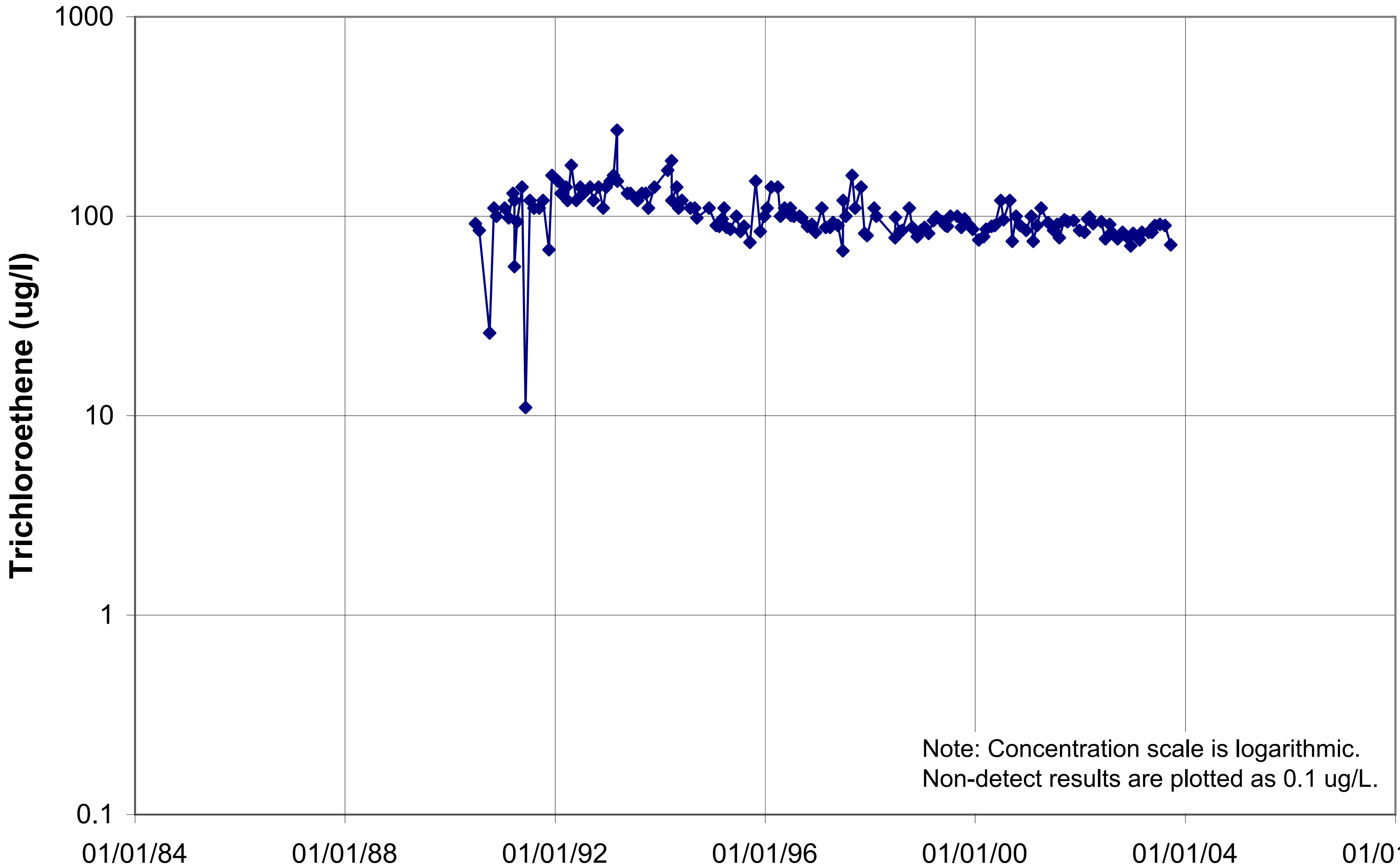
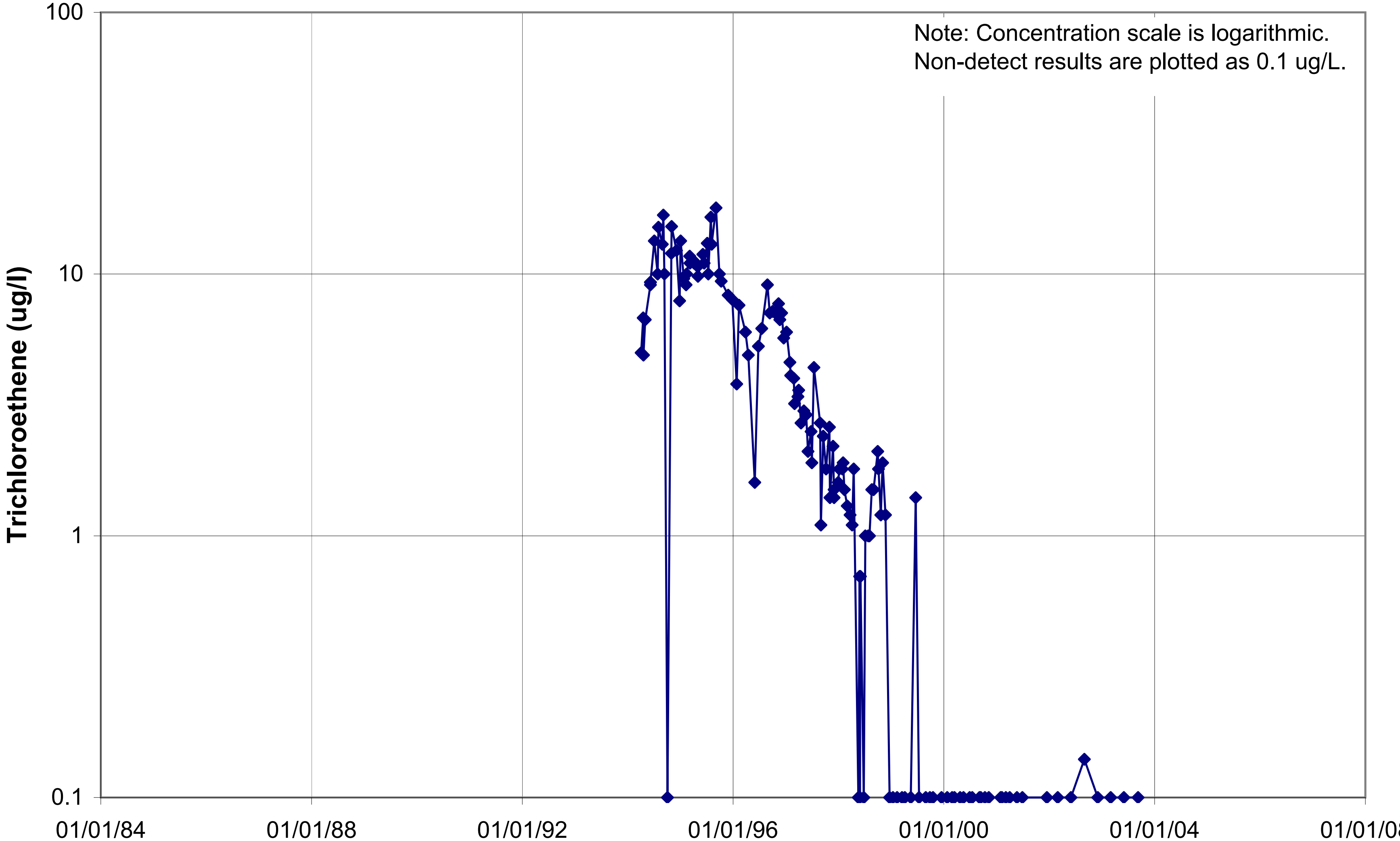


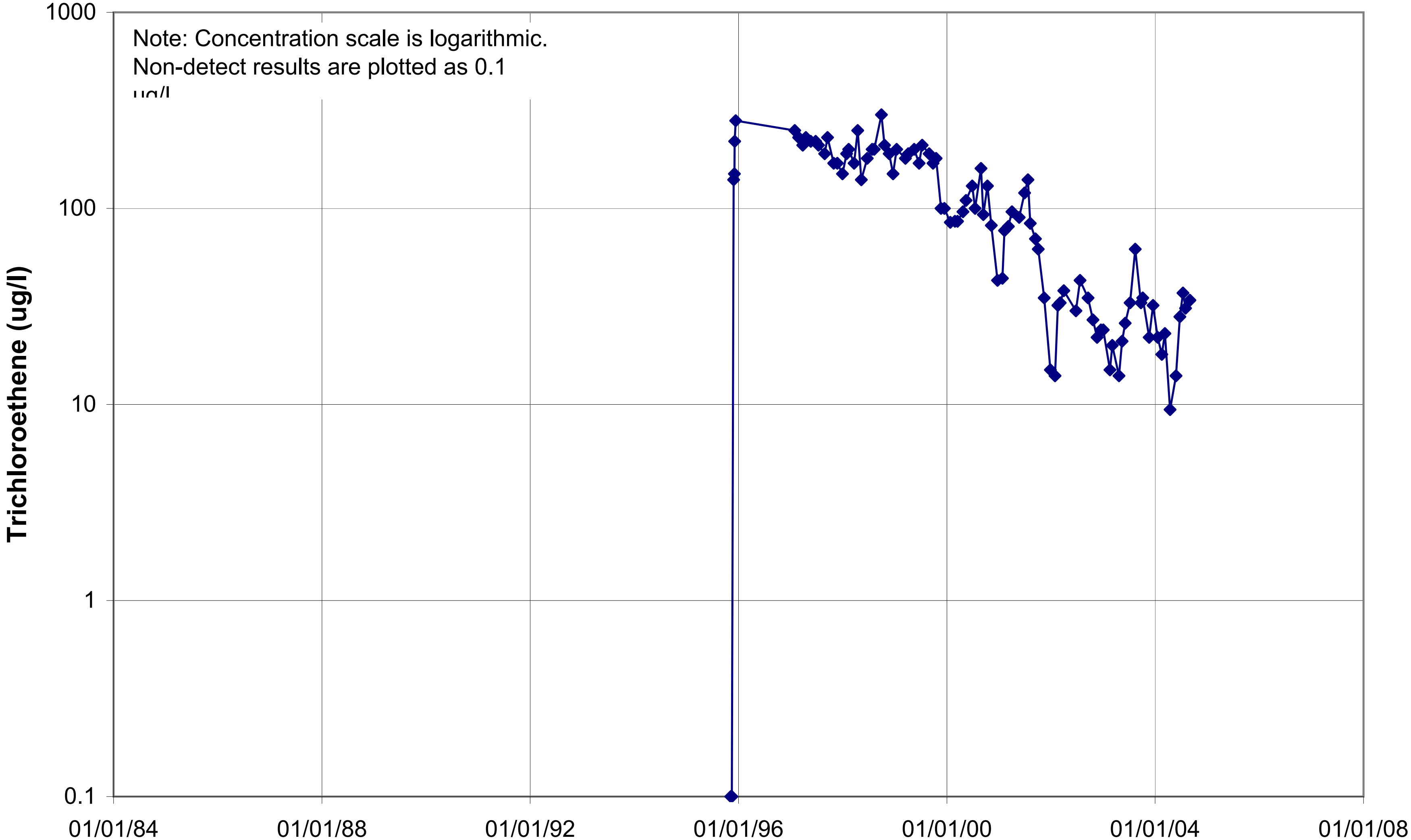
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

520931 (NBM#13)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

554216 (NBM#14)



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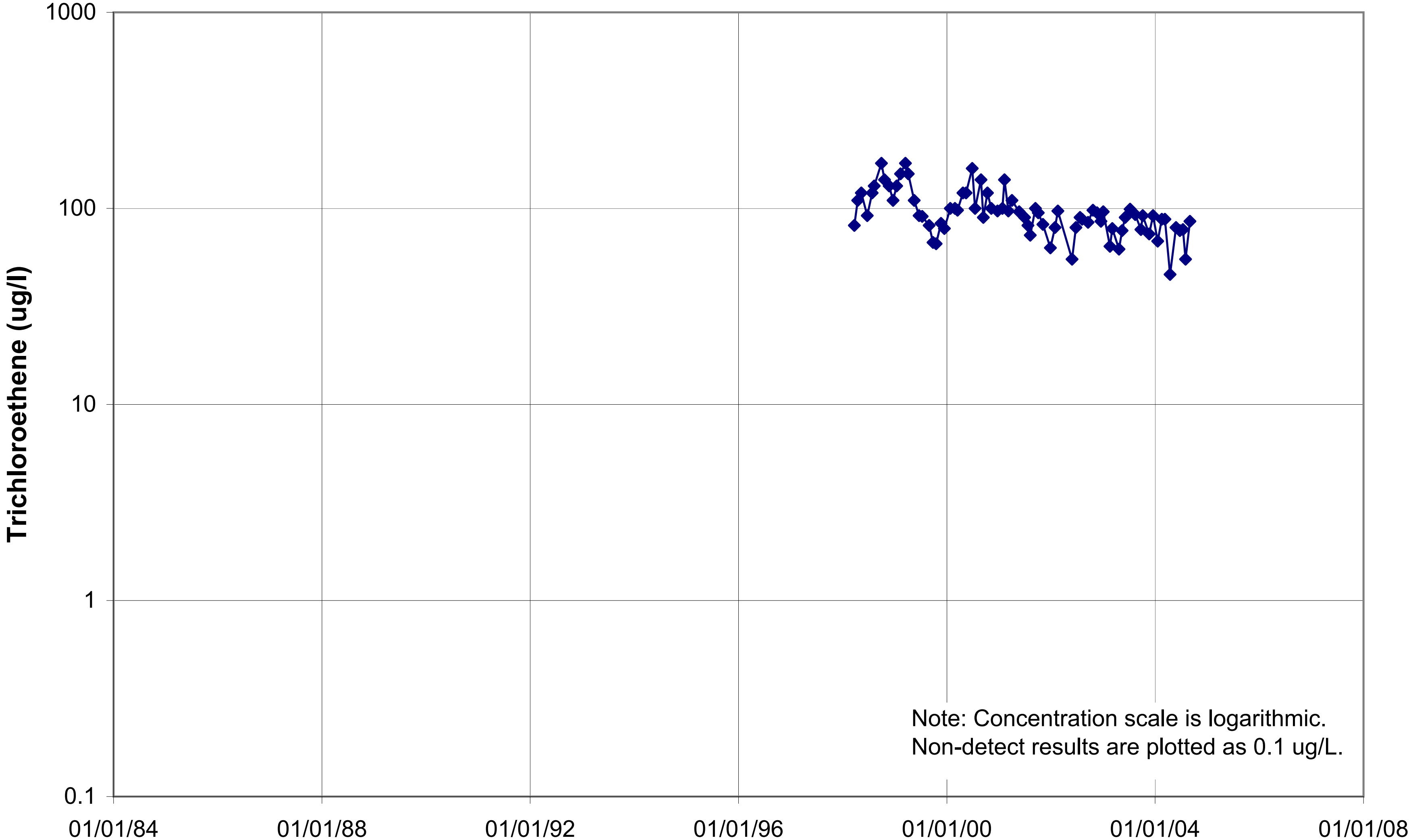
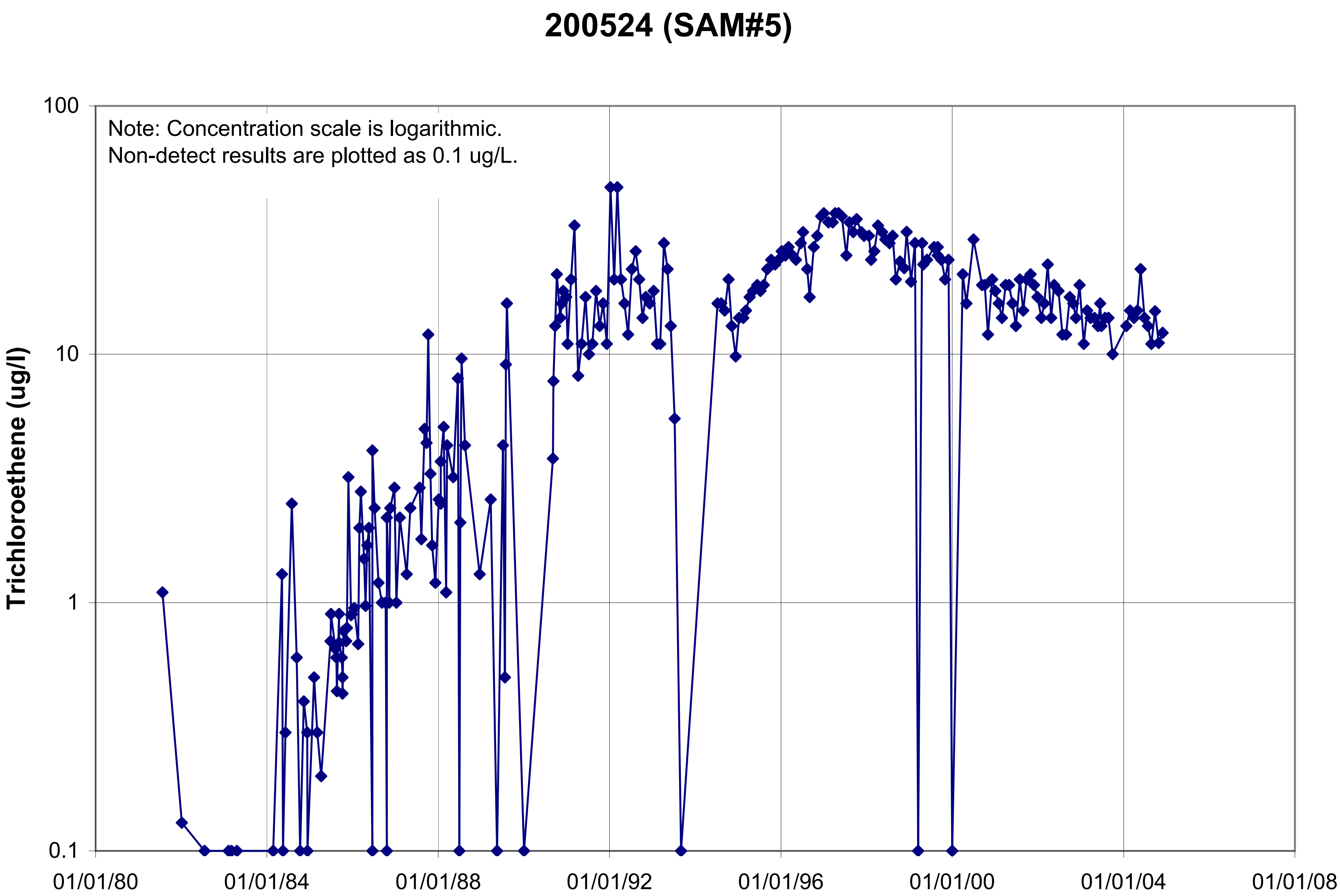
582628 (NBM#15)

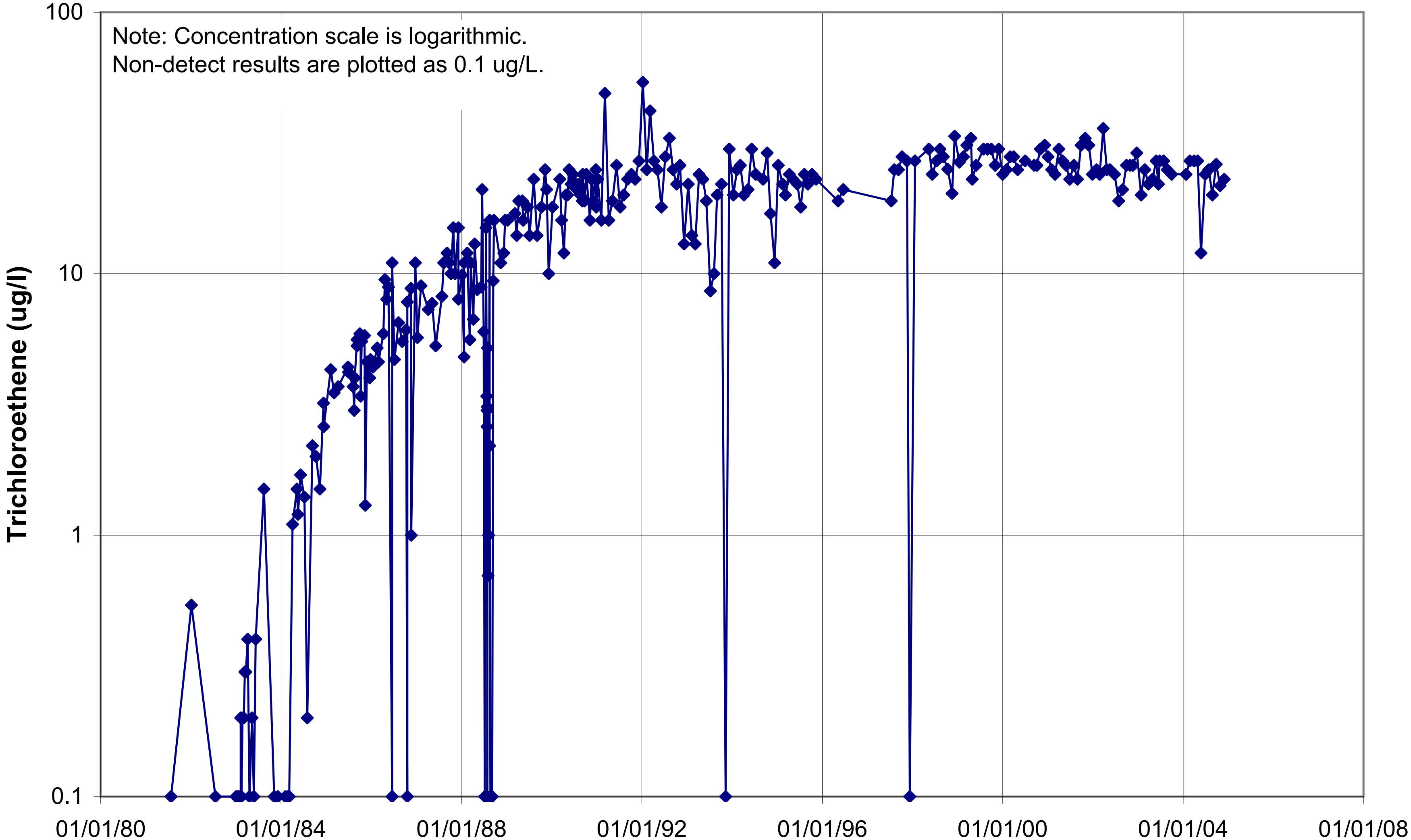


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



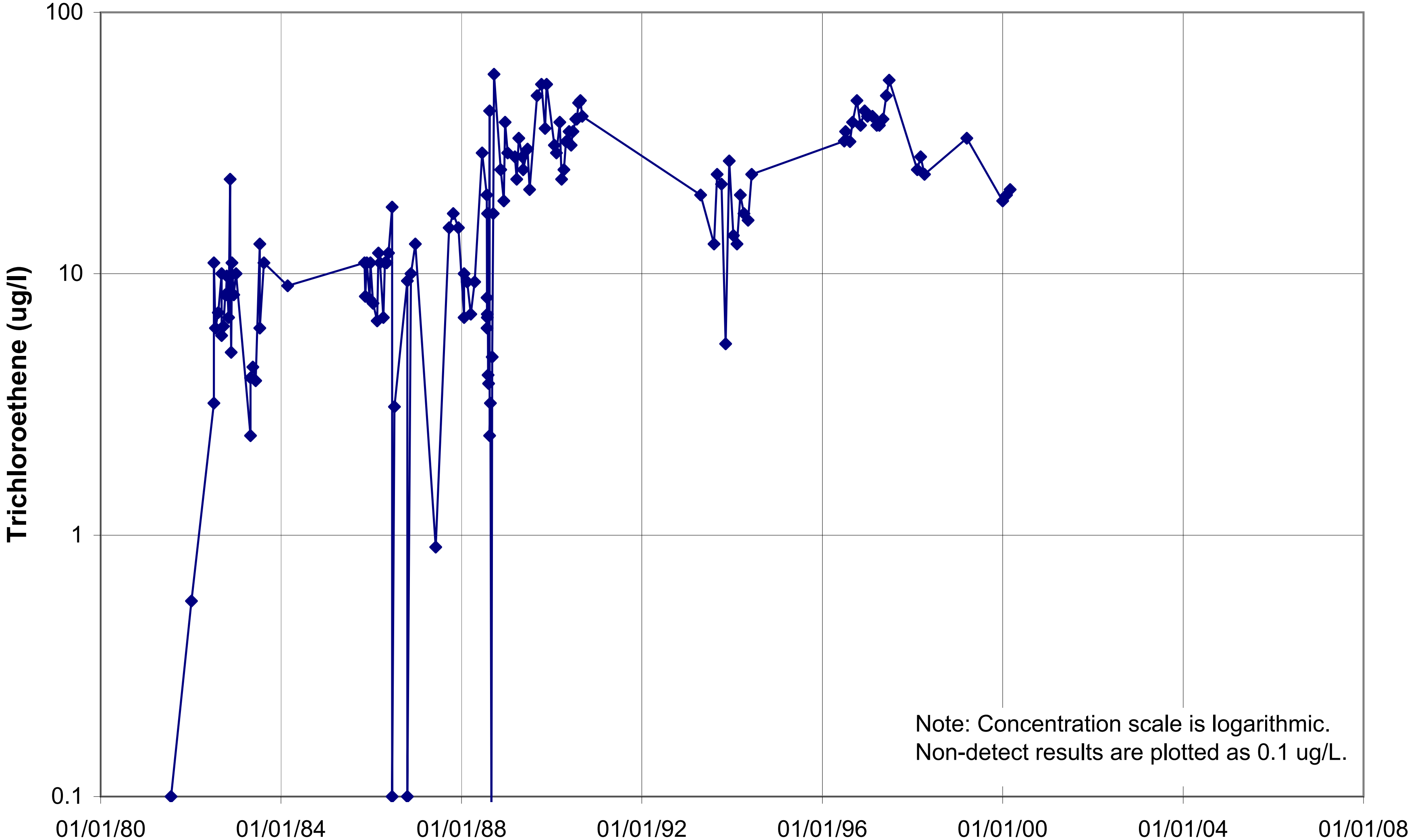
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

200803 (SAM#4)

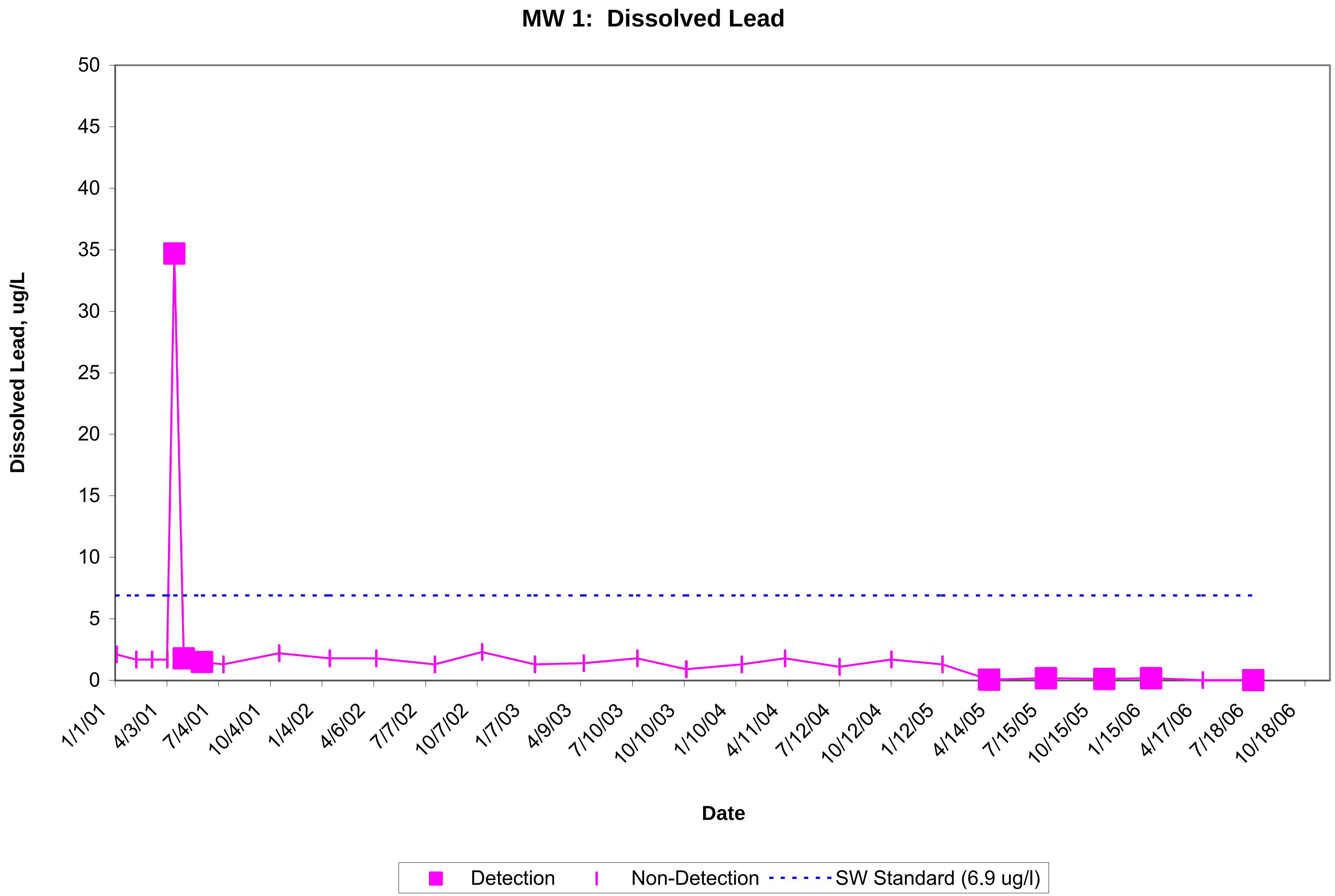


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

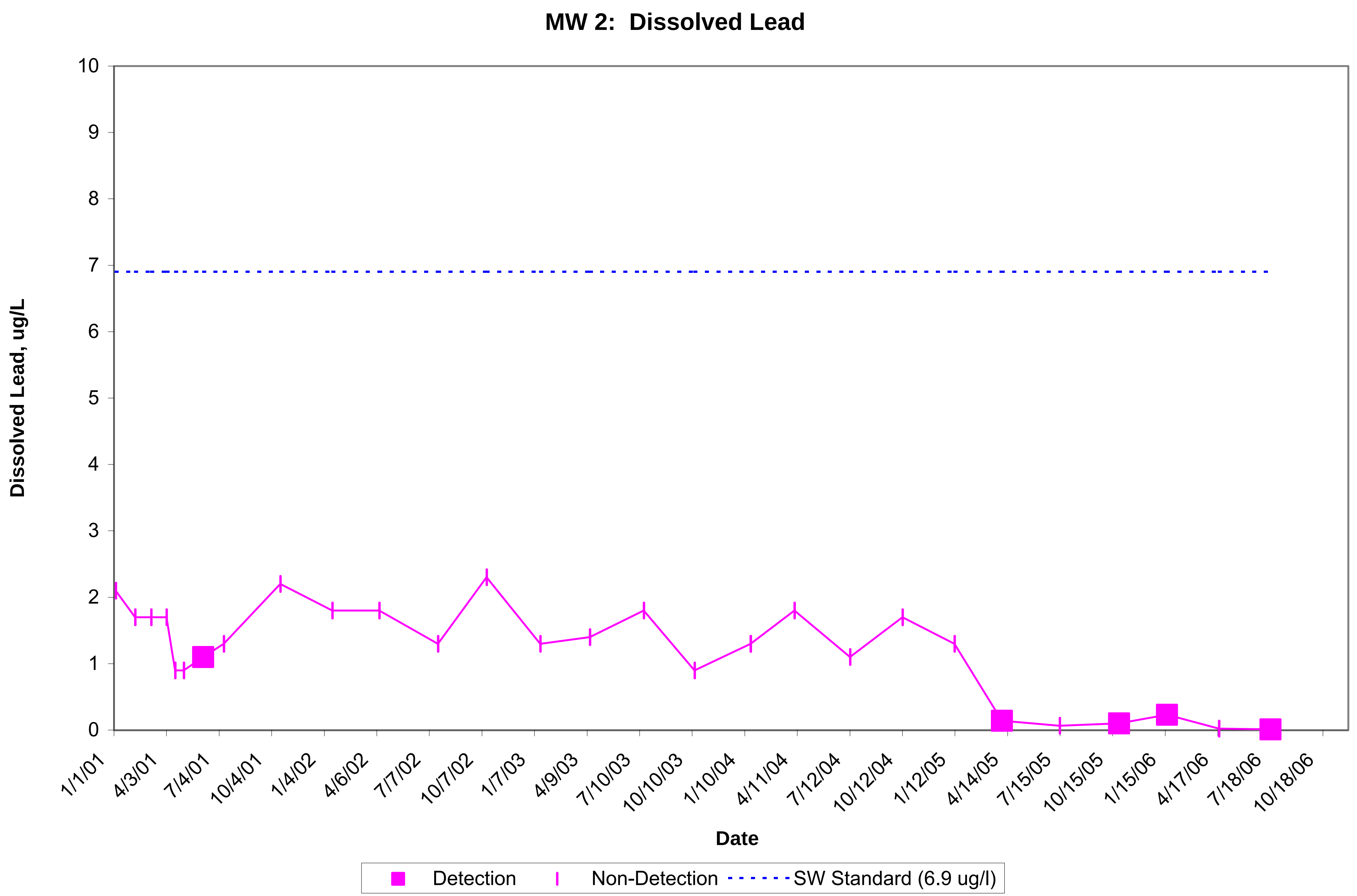
200804 (SAM#3)



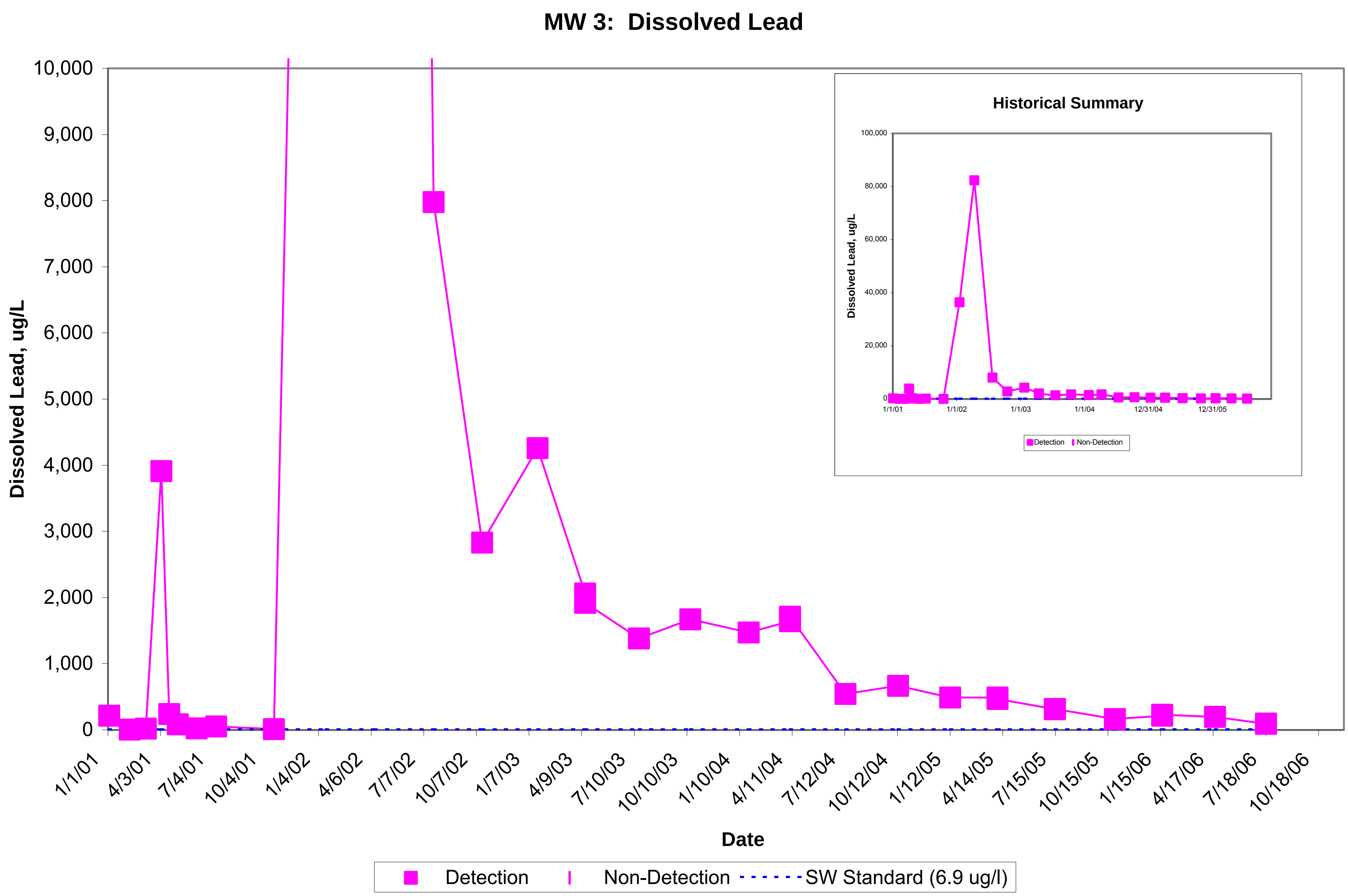
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

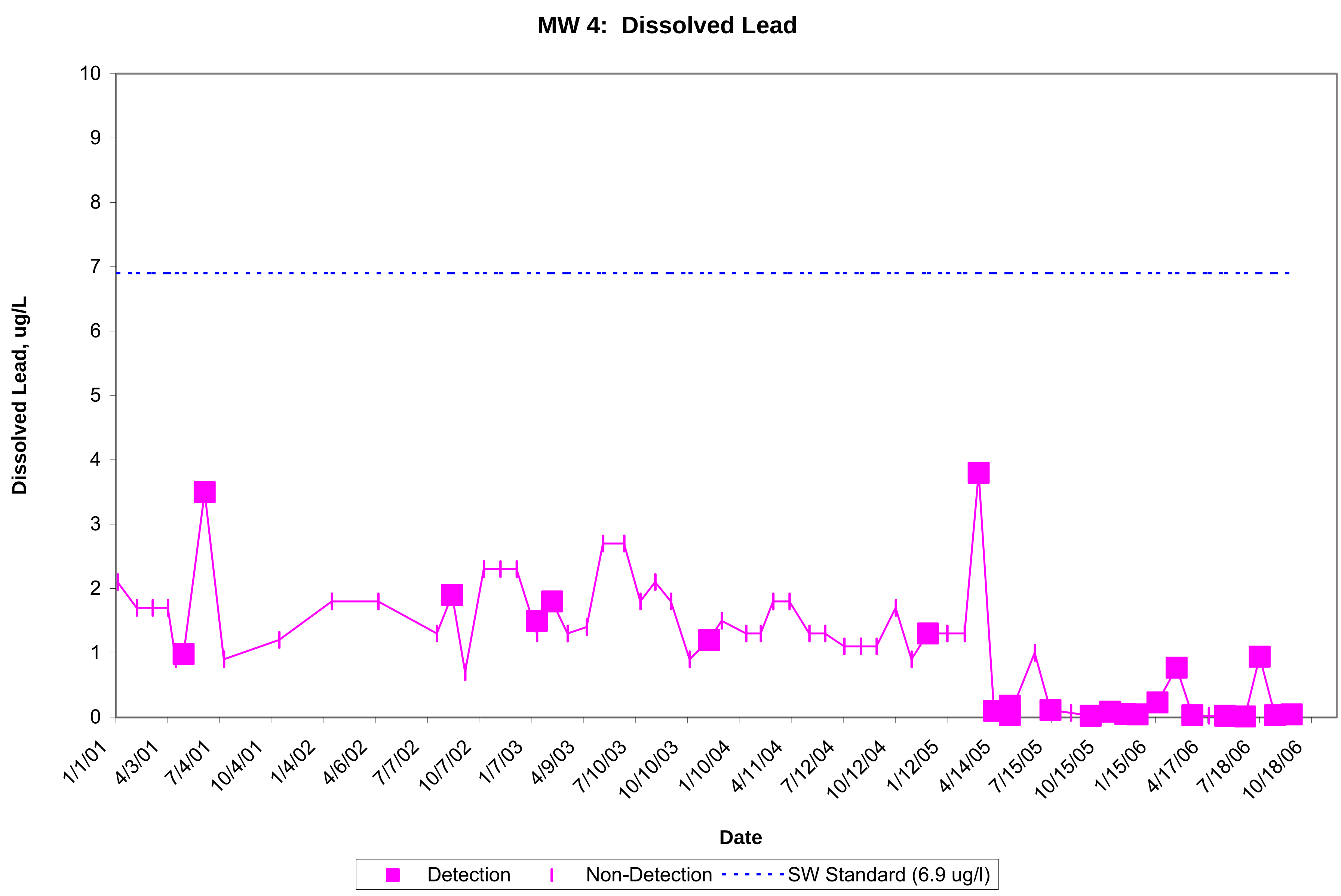


MW 1: Dissolved Lead
Dissolved Lead, ug/L
50
45
40
35
30
25
20
15
10
5
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

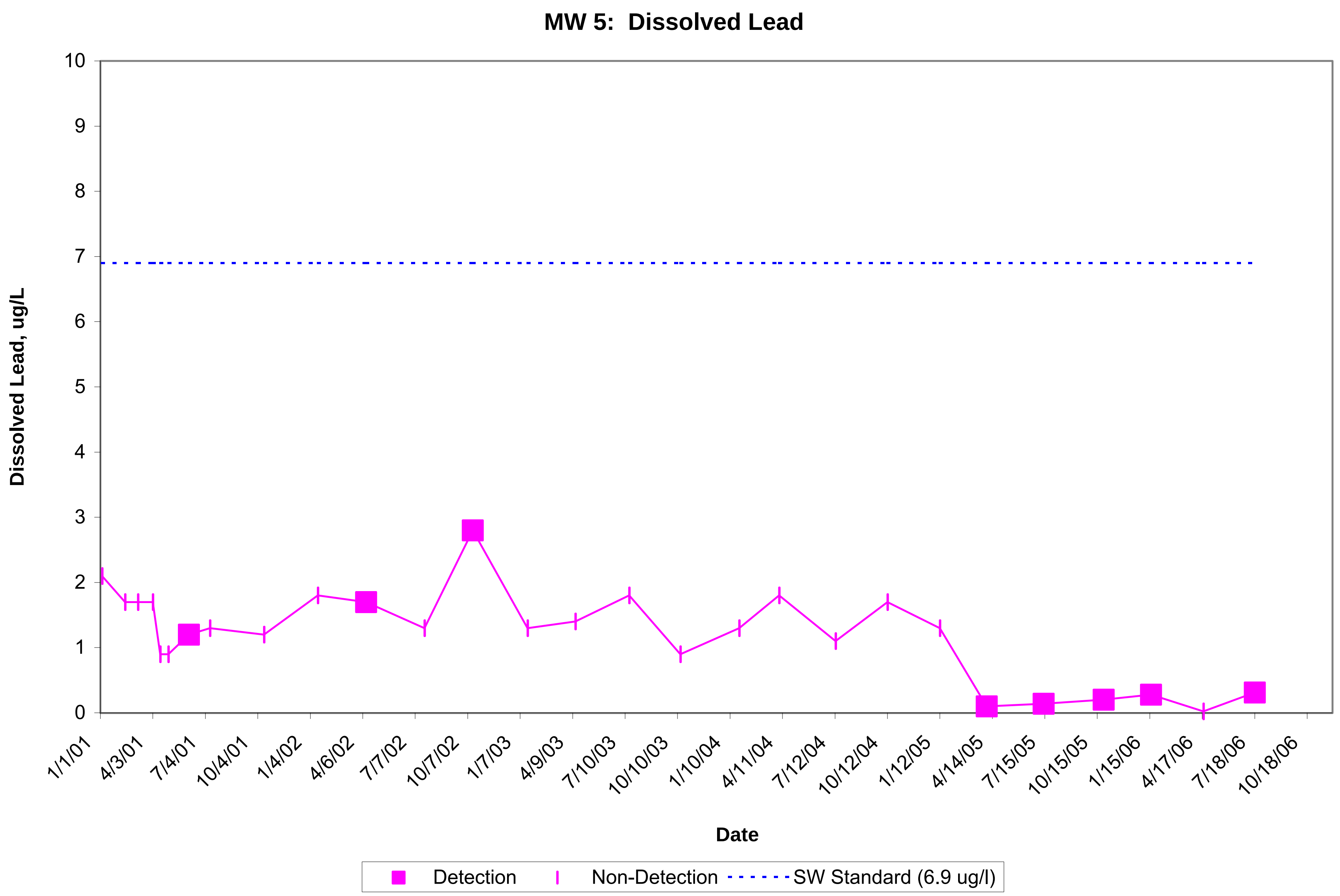


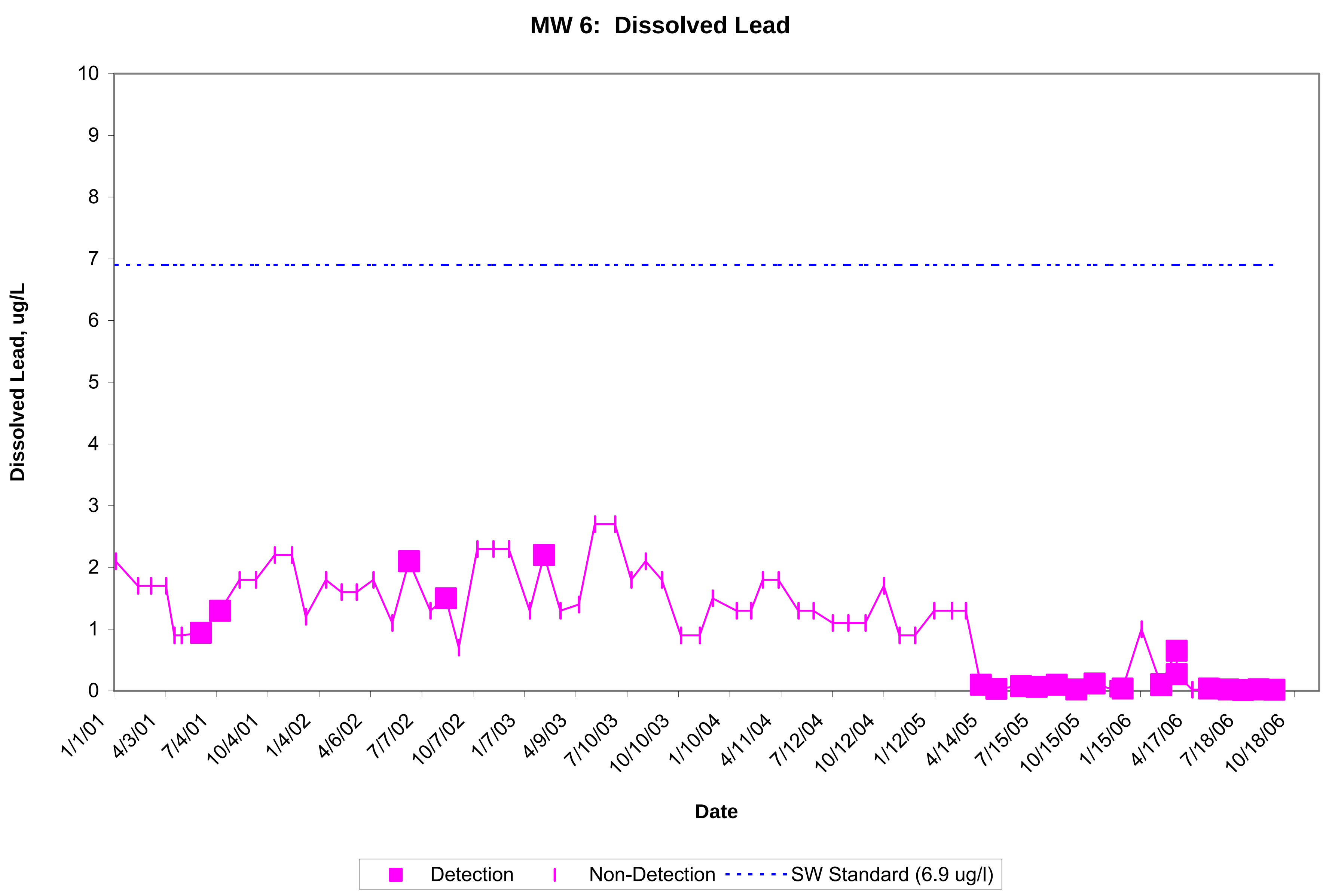
MW 2: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

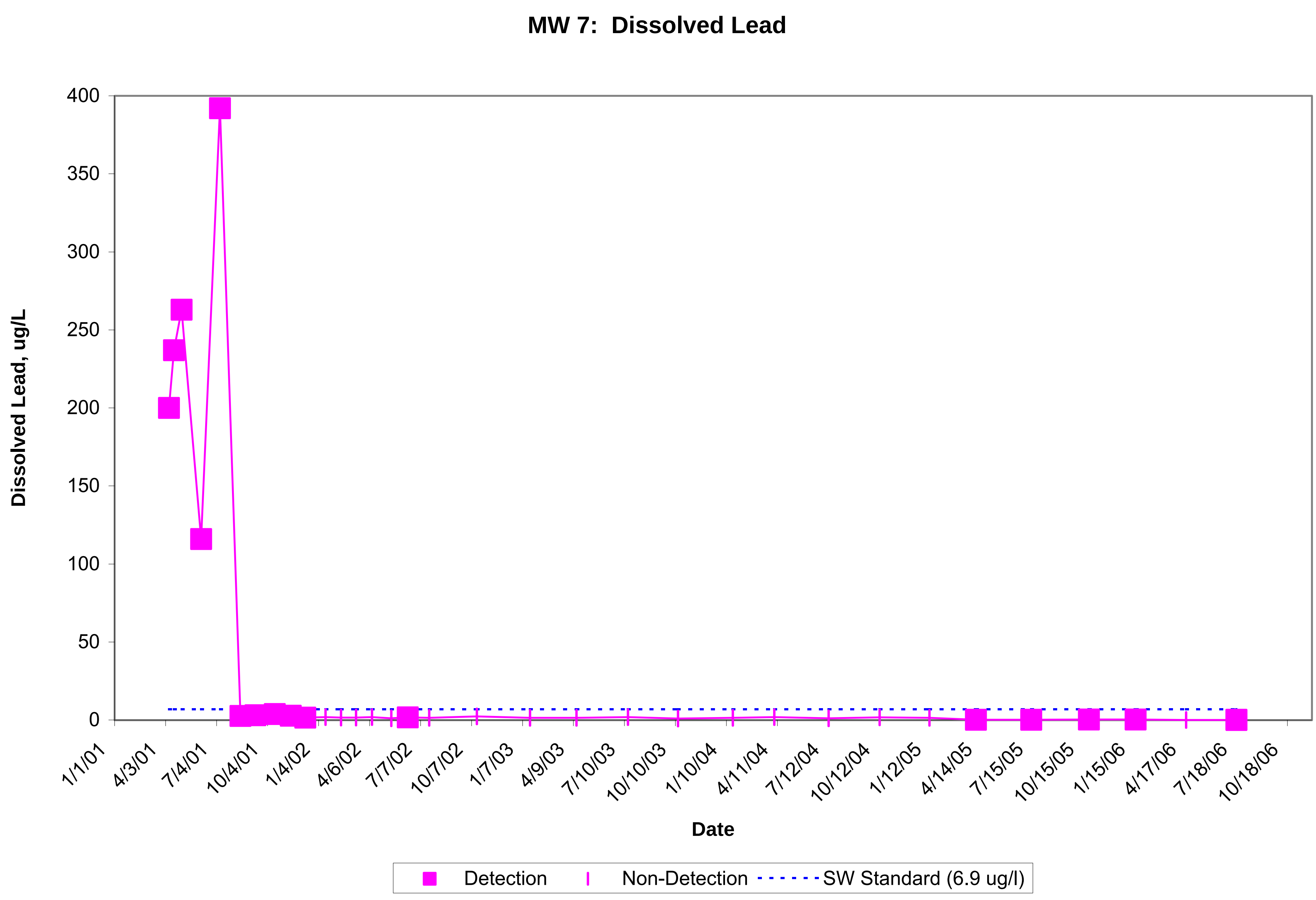

MW 3: Dissolved Lead
Dissolved Lead, ug/L
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)
Historical Summary
Dissolved Lead, ug/L
100,000
80,000
60,000
40,000
20,000
0
1/1/01
1/1/02
1/1/03
1/1/04
12/31/04
12/31/05
Detection
Non-Detection

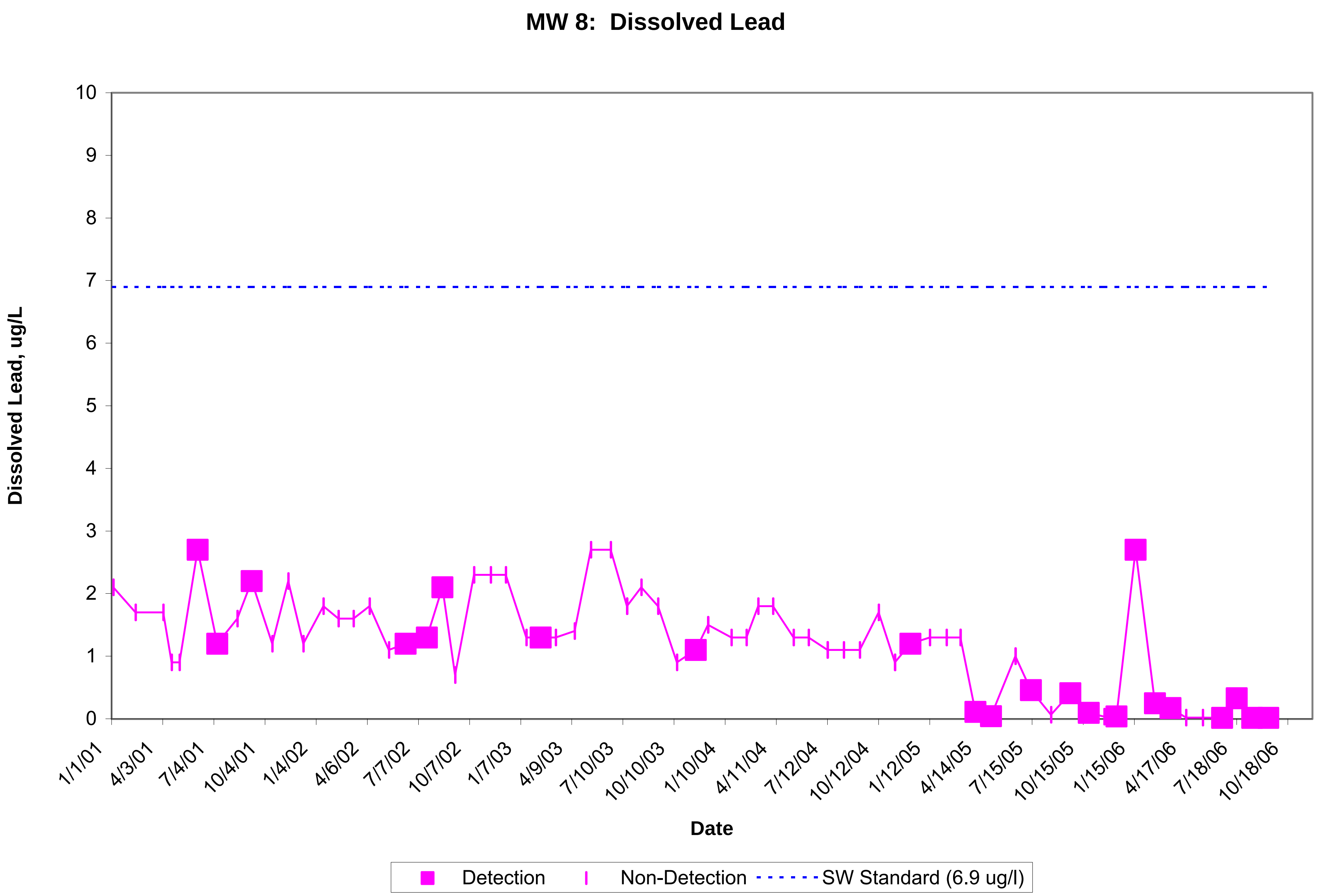


MW 4: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

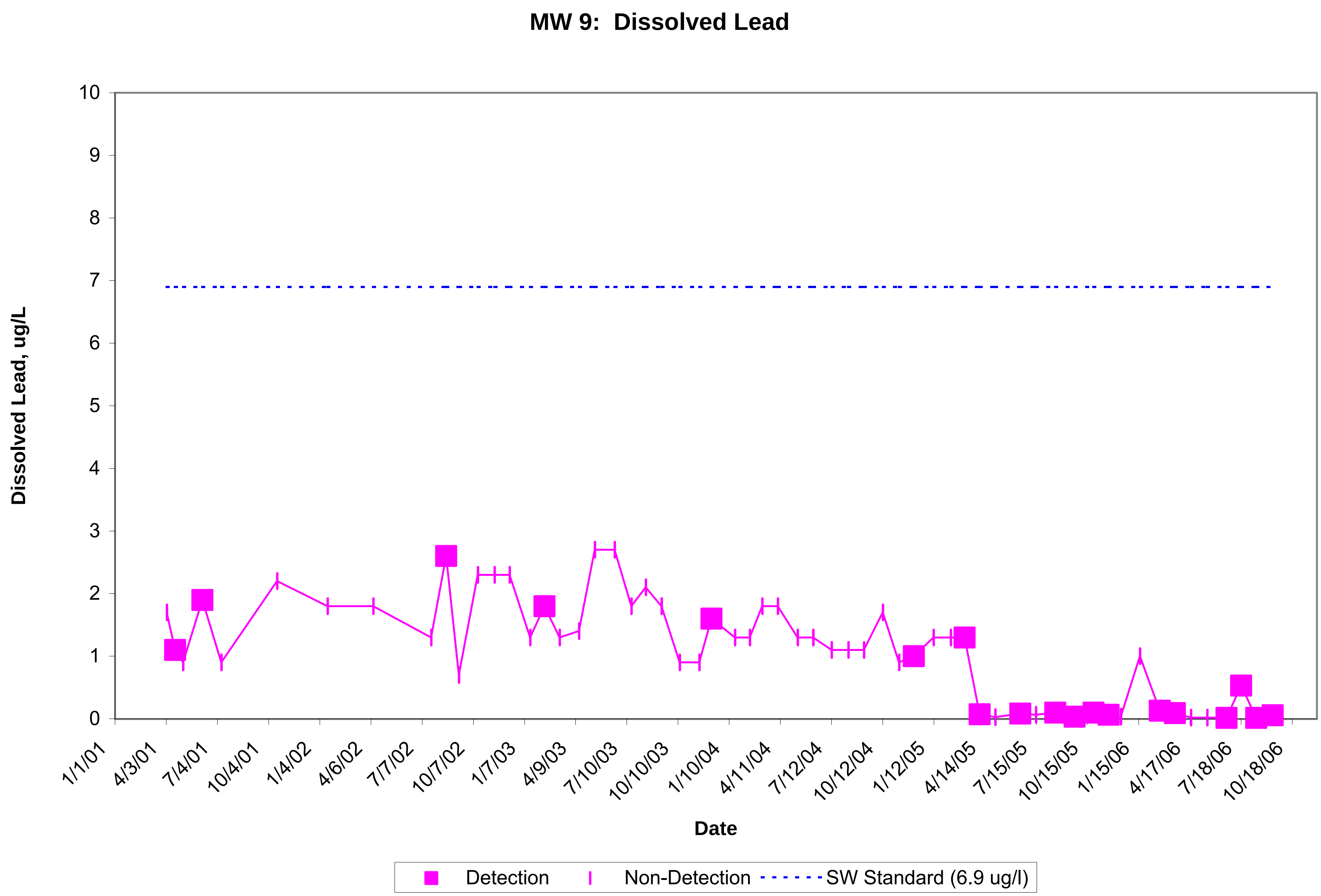

MW 5: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

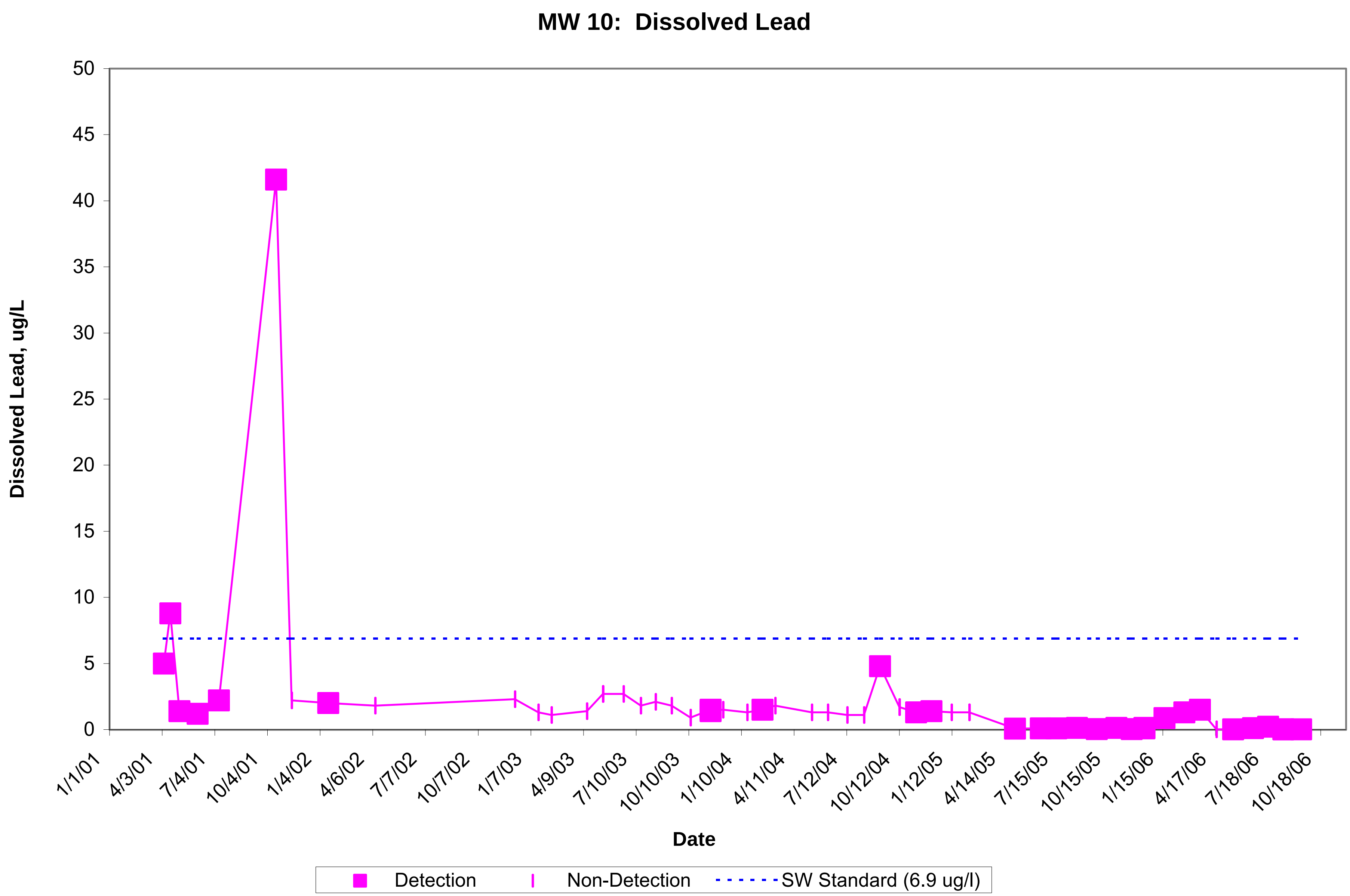

MW 6: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

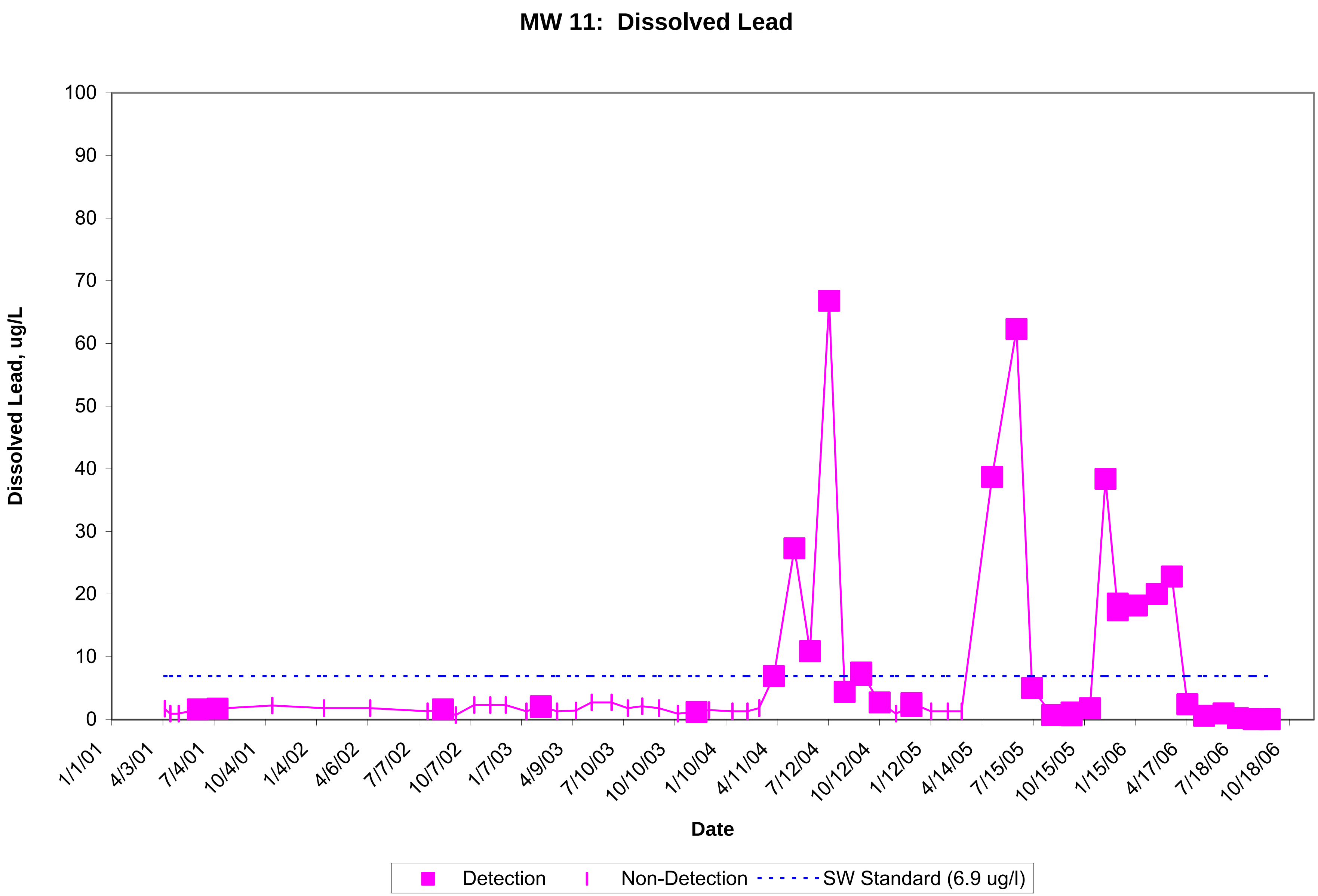

MW 7: Dissolved Lead
Dissolved Lead, ug/L
400
350
300
250
200
150
100
50
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

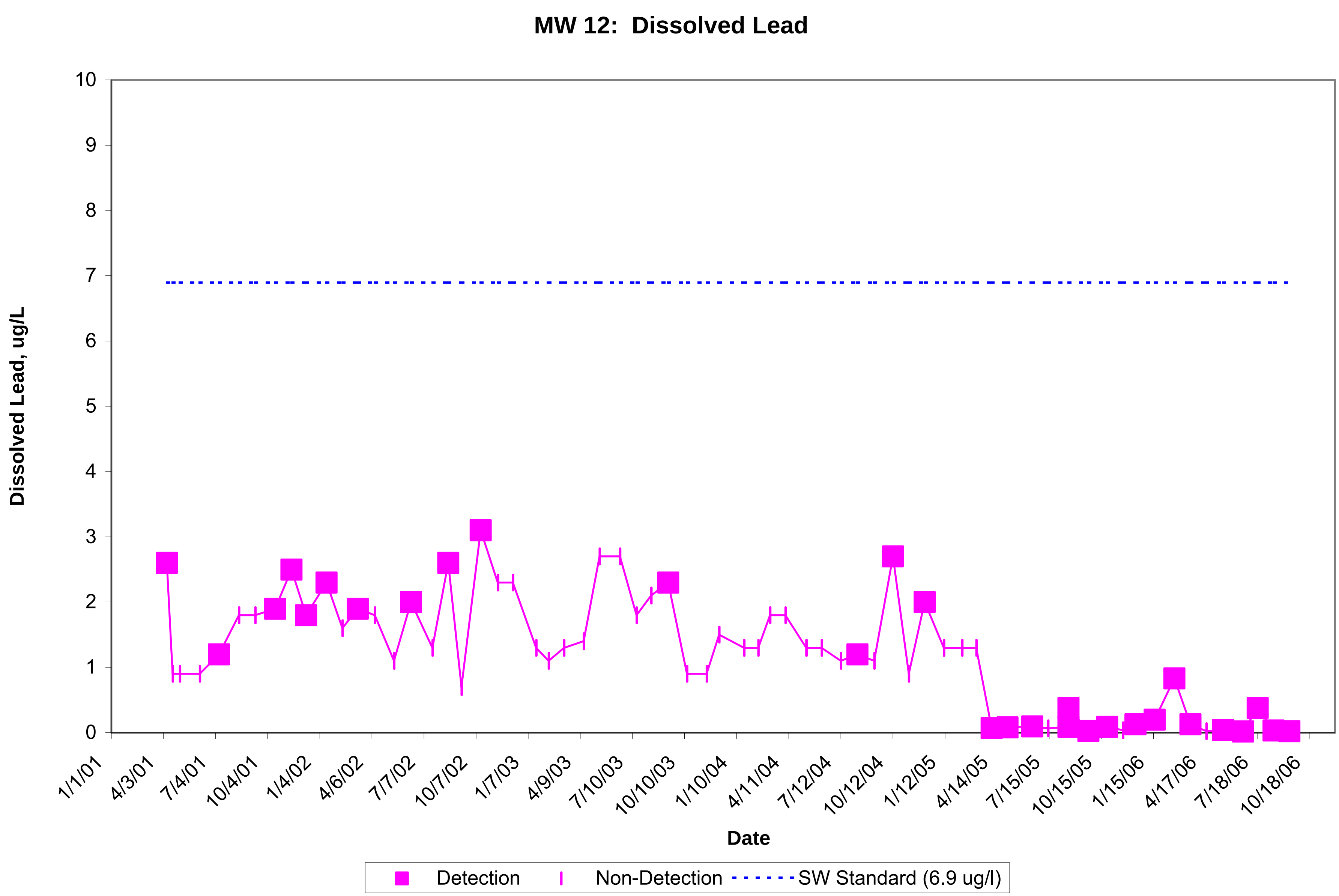


MW 8: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

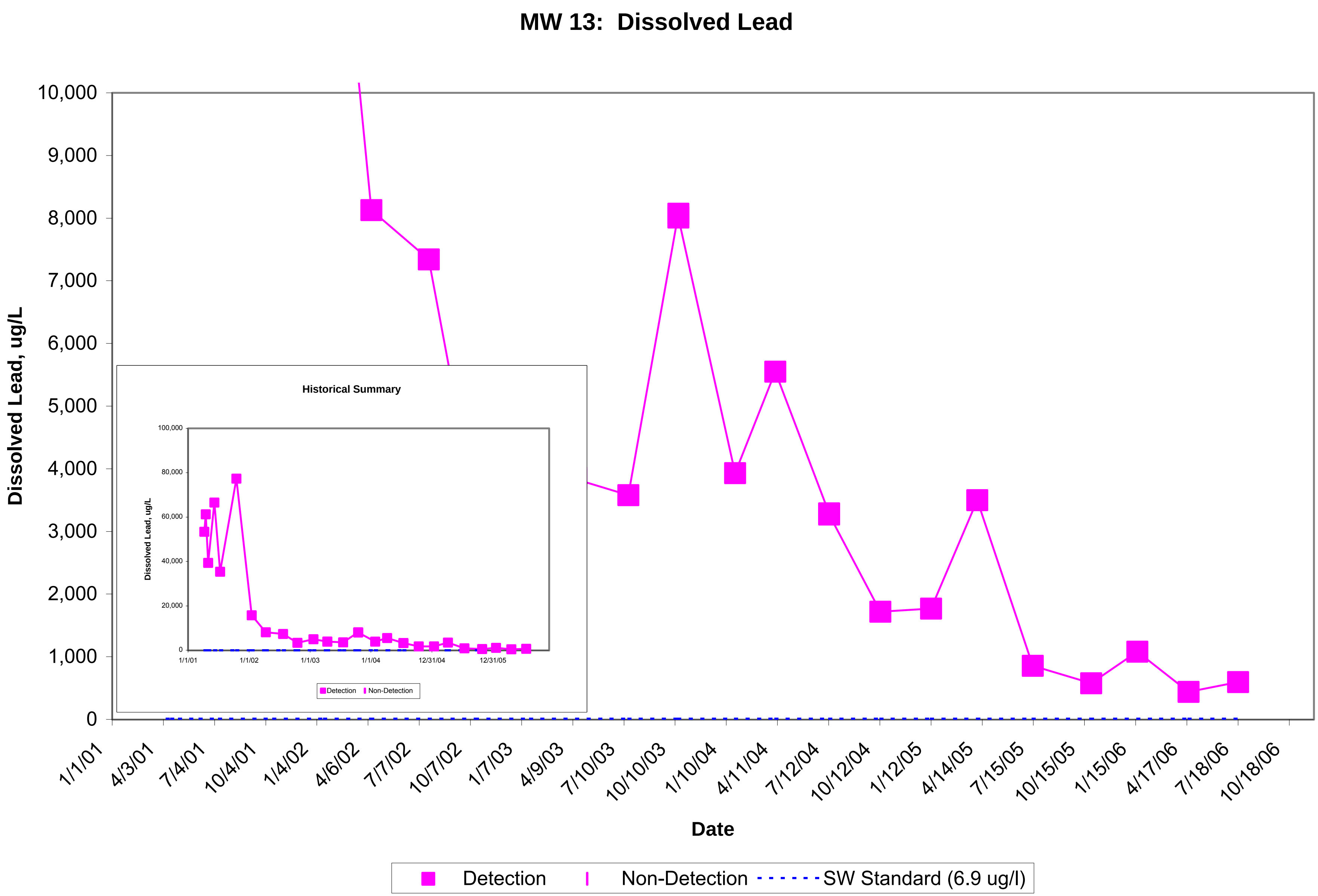

MW 9: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

MW 10: Dissolved Lead
Dissolved Lead, ug/L
50
45
40
35
30
25
20
15
10
5
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

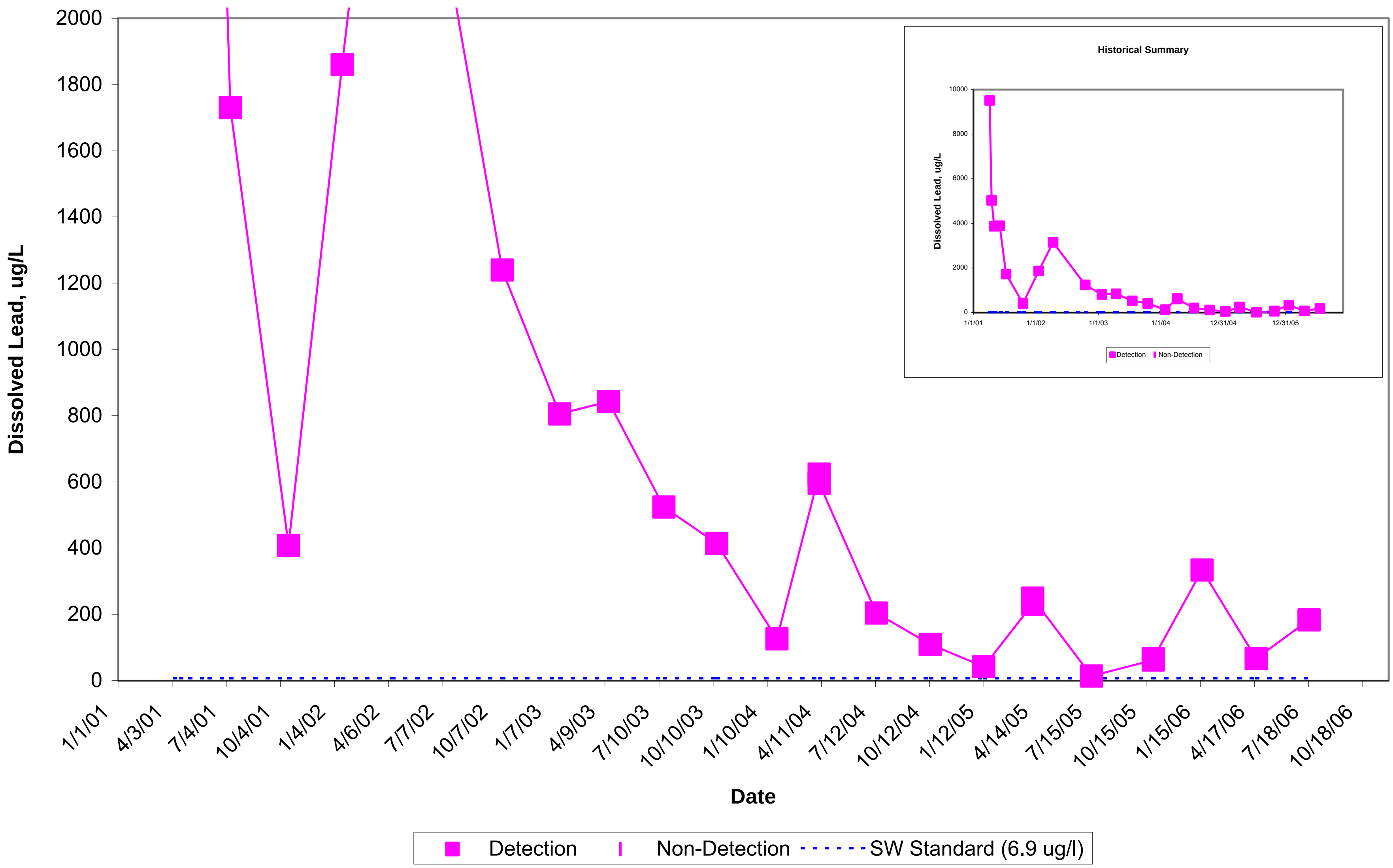

MW 11: Dissolved Lead
Dissolved Lead, ug/L
100
90
80
70
60
50
40
30
20
10
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

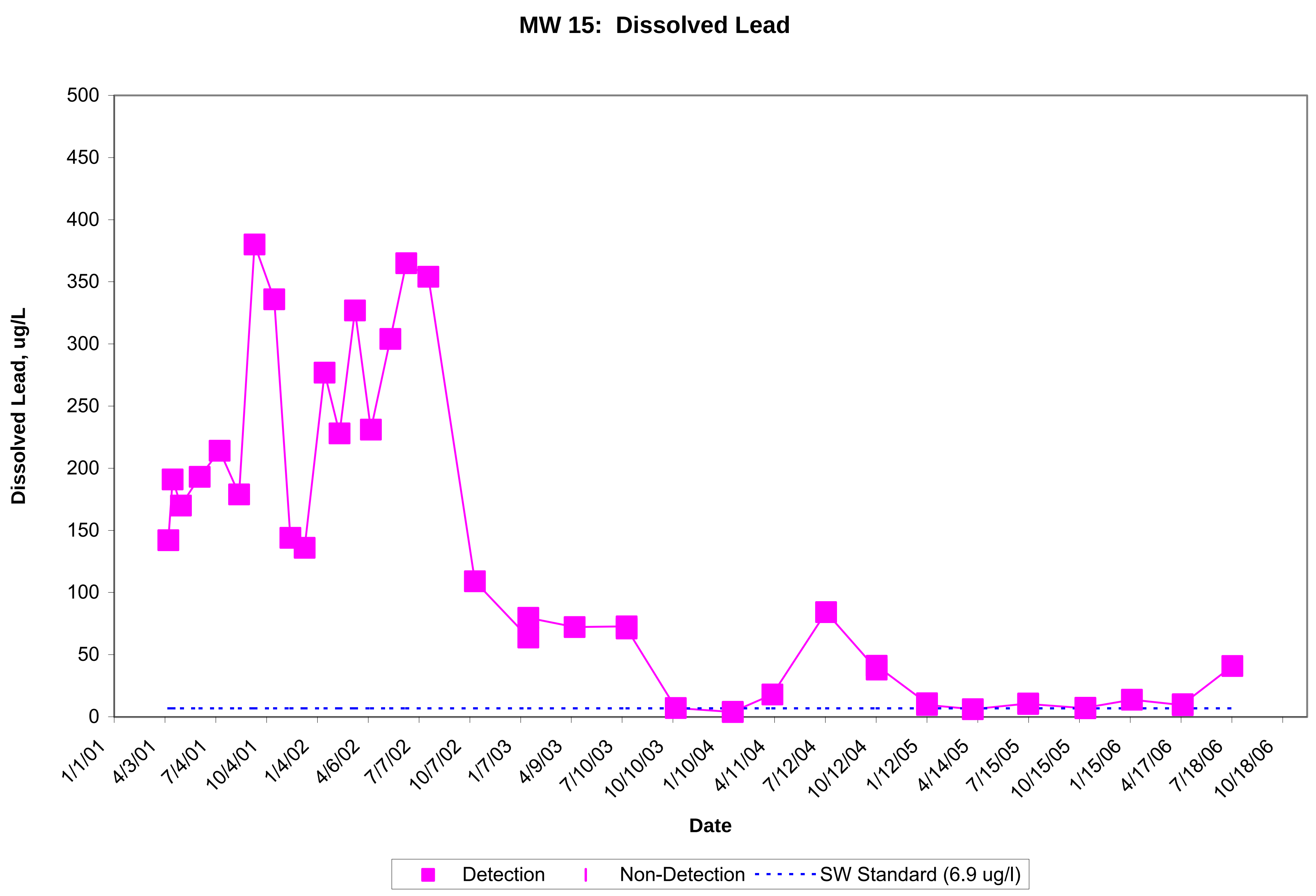


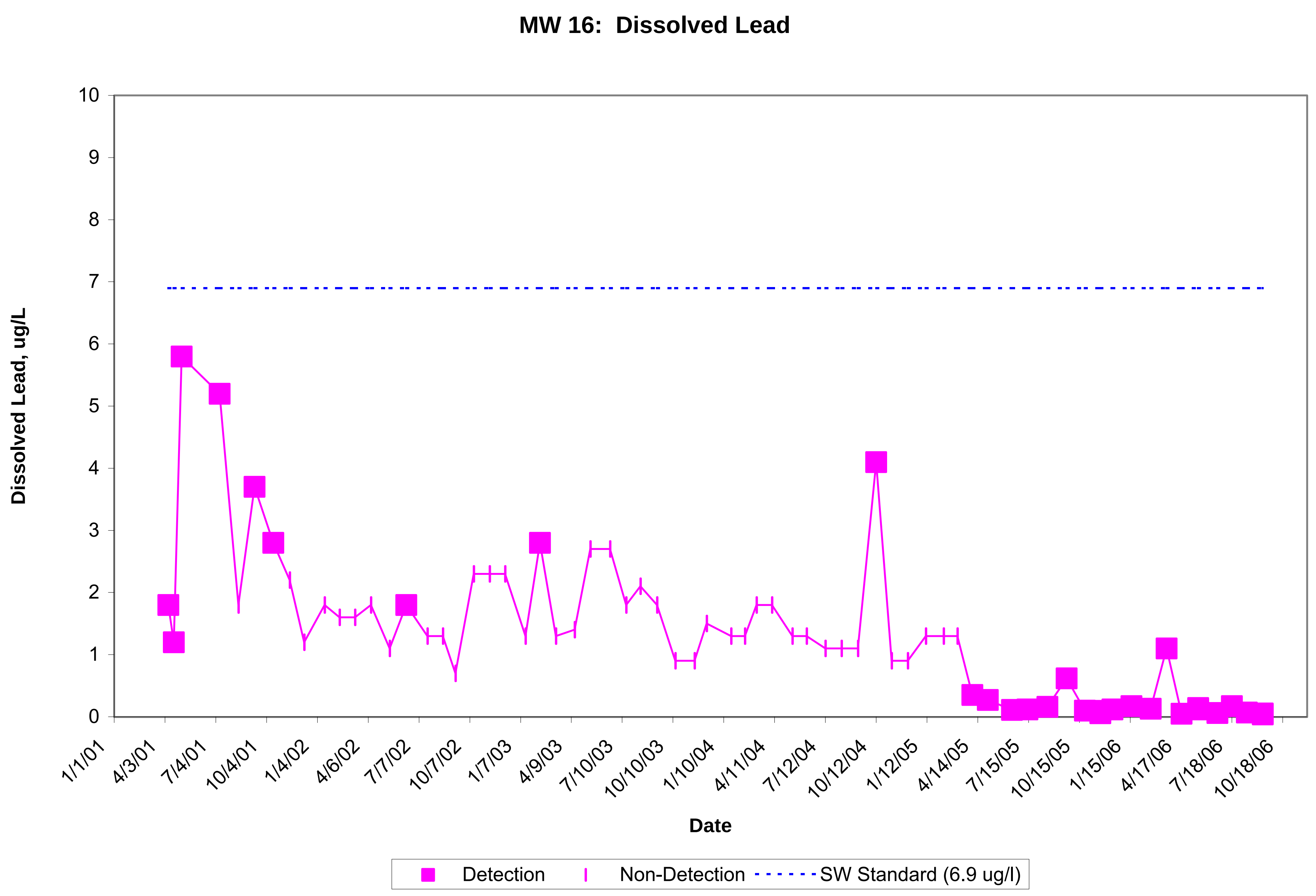
MW 12: Dissolved Lead
Dissolved Lead, ug/L
0
1
2
3
4
5
6
7
8
9
10
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)


MW 13: Dissolved Lead
Dissolved Lead, ug/L
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)
Historical Summary
Dissolved Lead, ug/L
100,000
80,000
60,000
40,000
20,000
0
1/1/01
1/1/02
1/1/03
1/1/04
12/31/04
12/31/05
Detection
Non-Detection

MW 14: Dissolved Lead




MW 15: Dissolved Lead
Dissolved Lead, ug/L
500
450
400
350
300
250
200
150
100
50
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)


MW 16: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/01
4/3/01
7/4/01
10/4/01
1/4/02
4/6/02
7/7/02
10/7/02
1/7/03
4/9/03
7/10/03
10/10/03
1/10/04
4/11/04
7/12/04
10/12/04
1/12/05
4/14/05
7/15/05
10/15/05
1/15/06
4/17/06
7/18/06
10/18/06
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

Appendix C

FY 2006 Data Collection and Management

C.1 Data Collection, Management, and Presentation

APPENDIX C.1

DATA COLLECTION, MANAGEMENT, AND PRESENTATION

1.0 INTRODUCTION

A groundwater monitoring program was initiated in January 1984 to obtain water level and water quality data at TCAAP. Each year has been divided into quarters with each quarter assigned a number. Accordingly, FY 2006 was comprised of Quarter 89 (October through December), Quarter 90 (January through March), Quarter 91 (April through June), and Quarter 92 (July through September). Water sampling, water level measurements, and laboratory analysis were conducted in accordance with the TCAAP "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996).

Prior to November 1, 2001, data collected at TCAAP was stored in the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS). The IRDMIS was managed by Potomac Research, Inc. (PRI) on behalf of the USAEC. USAEC replaced the IRDMIS System on November 1, 2001, with a new system, the Environmental Restoration Information System (ERIS), which incorporated all of the data that had previously been entered into IRDMIS.

2.0 GROUNDWATER LEVELS AND GROUNDWATER QUALITY

2.1 Data Collection and Management

Groundwater level and groundwater quality data were collected in accordance with the FY 2005 Annual Monitoring Plan (Appendix A), which established the monitoring responsibilities for both the Army and Alliant. Water level monitoring and water sampling were conducted by TWISS for the Army and by SECOR and CRA for Alliant. For all samples, laboratory analysis was performed by DataChem Laboratories, Salt Lake City, Utah.

Appendix A.4 contains lists of required analytes, as referenced by the monitoring plans in Appendix A. The lists are site-specific, based on the chemicals of concern. Halogenated volatile organic compounds were the parameters of primary interest, while select wells were sampled for aromatic volatile organic compounds, metals, and explosives. Appendix C.2 presents clarifications and deviations from the FY 2005 Annual Monitoring Plan.

Data assessment and validation was conducted in accordance with procedures and requirements outlined in the TCAAP QAPP. Flagging codes and data qualifiers assigned to data through data assessment/validation appear in the data tables included within the individual sections of this report (see table footnotes for definitions) and also in the historical databases (Appendix D). Data assessment and validation information was submitted to the MCPA and USEPA for review. Regulatory approvals for these submittals are included in Appendix C.3.

For water level measurements, the depth to water from the surveyed top of the well casing was measured. Groundwater elevations were calculated and data tables are included within the individual sections of this report and also in the historical database (Appendix D).

2.2 Groundwater Elevation Contour Maps

The most extensive water level monitoring event performed during FY 2006 was in June (Quarter 91). This data was used to prepare groundwater elevation contour maps for Sites A and K shallow groundwater. There was not a comprehensive water level event for deep groundwater. These maps are included within the individual sections of this report.

2.3 Groundwater Quality Contour Maps and Cross-Sections

The most extensive sampling event performed during FY 2006 was in June (Quarter 91). This data was used to prepare groundwater quality isoconcentration contour maps and/or cross-sections for Sites A and K shallow groundwater. Contour maps were generated by hand, based on the observed contaminant concentrations and the extent of past site contamination. These maps are included within the individual sections of this report.

For OU1/OU3 deep groundwater and OU2 deep groundwater, isoconcentration maps and cross-sections were not prepared since this was a minor sampling year.

For Site A, isoconcentration maps were developed for cis-1,2-dichloroethene, since this is the most widespread contaminant at Site A, and also for tetrachloroethene, which illustrates the source area. Site A cross-sections were also prepared which illustrate cis-1,2-dichloroethene. The isoconcentration maps for Site A were prepared only for Unit 1, since this is the only contaminated aquifer.

For Site K, an isoconcentration map was developed for trichloroethene (the primary contaminant). The map for Site K was prepared only for Unit 1, since this is the only contaminated aquifer.

Contaminant concentrations for recovery wells that are actively pumping are shown in parentheses on the isoconcentration maps. These values were considered, but were not used alone to prepare the isoconcentration contours. Concentrations of recovery wells generally represent an average contaminant value for all groundwater being drawn to the well; hence, the concentrations do not necessarily represent a discrete location or depth.

C.2 Deviations from Monitoring Program

APPENDIX C.2
DEVIATIONS FROM MONITORING PROGRAM

Fiscal Year 2006

OU2 Site I

June 2006:

Well I01MW:	No sample collected, well was dry.
Well 01U640:	Insufficient water to collect groundwater sample. Less than 1 inch water in well.
Well 01U667:	Bailed dry after 3.5 gallons removed (just over 1 well volume).
Well 01U639:	No sample collected, well was dry. A groundwater sample was collected from the alternate sampling location well I04MW.
Well I02MW:	No sample collected, well was dry.
Well 01U632:	Well bailed dry after 0.5 gallons removed (just over 2 well volumes).
Well 01U666:	No sample collected, well was dry.
Well 01U668:	No sample collected, well was dry.

OU2 Site K

June 2006:

Well 01U611:	Bailed dry after 1 gallon removed (1 well volume).
Well 01U617:	Bailed dry after 6 gallons removed (just over 1 well volume).
Well 01U618:	Bailed dry after 1.75 gallons removed (1 well volume).
Well 01U604:	Bailed dry after 1 gallon removed (1 well volume).
Well 01U603:	Bailed dry after 0.50 gallons removed (just over 1 well volume).
Well 01U615:	Bailed dry after 2.5 gallons removed (just over 1 well volume).
Well 03U621:	Pumped down after 14 gallons removed (just over 1 well volume).

C.3 Regulatory Approvals for Data Assessments and Validation

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

July 19, 2007

REPLY TO THE ATTENTION OF: SR-6J

Mr. Michael R. Fix
Commander's Representative
Twin Cities Army Ammunition Plant
4700 Highway 10 - Suite A
Arden Hills MN 55112-3928

Subject: **Approval of Data Usability Report Numbers 43, 44, 45, and 46**

Dear Mr. Fix:

This letter shall serve to document that the U.S. Environmental Protection Agency (USEPA) and the Minnesota Pollution Control Agency (MPCA) have completed their review of the U.S. Army's (Army) subject Data Usability Reports (DURs) Numbers 43, 44, 45 and 46. USEPA and MPCA review included review of:

- Final DUR No. 43 (1st Quarter FY 2006 Performance Monitoring), revised in accordance with the Army's May 17, 2006 responses to USEPA and MPCA comments;
- Final DUR No. 44 (2nd Quarter FY 2006 Performance Monitoring), revised in accordance with the Army's September 26, 2006 responses to USEPA and MPCA comments;
- Final DUR No. 45 (3rd Quarter FY 2006 Performance Monitoring), revised in accordance with the Army's April 13 and May 23, 2007 responses to USEPA and MPCA comments;
- Final DUR No. 46 (4th Quarter FY 2006 Performance Monitoring), revised in accordance with the Army's April 13, 2007 responses to USEPA and MPCA comments;

Based upon our review of the information provided by the Army and upon technical discussions held among USEPA, MPCA and Army staff to resolve the regulators' comments on the DURs, USEPA and MPCA agree that the subject DURs are acceptable. You are hereby advised that the USEPA and the MPCA approve Data Usability Report Numbers 43, 44, 45 and 46.

If you have any questions, please contact Tom Barounis of the EPA at (312) 353-5577 or Dagmar Romano of the MPCA at (651) 296-7776.

Sincerely,

Tom Barounis

Tom Barounis
Remedial Project Manager
U.S. Environmental Protection Agency
Region 5

Tom Barounis for

Dagmar Romano
Superfund Unit 2
Superfund Section
Majors and Remediation Division
Minnesota Pollution Control Agency

Appendix D

Comprehensive Groundwater Quality and Groundwater Level Databases

D.1 Comprehensive Groundwater Quality and Groundwater Level Databases

APPENDIX D.1
COMPREHENSIVE GROUNDWATER QUALITY AND GROUNDWATER LEVEL DATABASES

The historical groundwater tables are located on this CD-ROM in a directory named Appendix D. This directory contains three Microsoft Excel files:

File	Contents
Compelev.xls	Groundwater elevations
Comporwq.xls	Groundwater quality: organic data
Compinwq.xls	Groundwater quality: inorganic data

D.2 Operable Unit 1 Statistical Analysis

D.2.1 Well Groups and Statistical Evaluation Criteria Tables

Table D.2.1
Statistical Evaluation
Well Groups

Group 1 – Downgradient of TGRS

03U806	04U806	03L802	03U801
03M806	PJ#806	04U802	03U711
03L806	03M802	PJ#802*	04U711

Group 2 – Areal Extent of Plume

03U805	409557	04U841	04U875
03U672	04U673	04U843	04U877
03L848	04U832	04U833	206688
03L673	04U845	04U846	04U849
03L833	04U854	04U861	04U821
03L859	04U859	409549	191942

Group 3 ** – Downgradient Sentinel

04U871	04U875	04U851	

Group 4 – Lateral Sentinel

03U831	03L846	409556	409548
03U811	03L832	04U855	04U839
03U804	03L861	04U879	04U838
03U673	03L854	04U860	04U848
03U672	03L841	409547	04J839
03M843	03L811	04U863	

Group 5 – Global Plume

04J077	04U702	04U848	04U877
04J702	04U709	04U851	04U879
04J708	04U711	04U852	04U880
04J713	04U713	04U855	04U881
04J834	04U802	04U859	04U882
04J864	04U806	04U860	200154
04J866	04U832	04U861	234546
04J882	04U833	04U863	234549
04U002	04U834	04U864	409547
04U020	04U841	04U865	409548
04U027	04U843	04U866	409549
04U077	04U844	04U871	409555
04U673	04U845	04U872	512761
04U701	04U846	04U875	PJ#318

Group 6 – Jordan Aquifer

04J077	04J838	04U713	04U882
04J702	04J839	04U834	NBM#3
04J708	04J882	04U836	NBM#4
04J713	04J847	04U837	NBM#5
04J822	04J849	04U838	NBM#6
04J834	04U077	04U839	
04J836	04U702	04U847	
04J837	04U708	04U849	

* PJ#802 will not be monitored or used for evaluation unless 04U802 shows TCE concentrations greater than 1 ppb.

** Group 3 is analyzed as a rectangular area taken from the Group 5 contouring.

TABLE D.2.2

MAROS Decision Matrix

Mann-Kendall S	Confidence	Coefficient of Variance	Trend Conclusion
S > 0	> 95%	NA	Increasing
S > 0	90-95%	NA	Probably Increasing
S > 0	< 90%	NA	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	NA	Probably Decreasing
S < 0	>95%	NA	Decreasing

Table D.2.3
Summary of Groups, Purpose, and Statistical Tests

Well Group	**Purpose**	**Measure**	**Time Window/ Monitoring Frequency**	**Test**	**Response Threshold**
Group 1	AWC Immediately Downgradient of TGRS	AWC Trend	6 years/annual	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 2	Defining Plume Size (Low Concentration Edges)	Individual Well Trend for TCE	12 years/biennial	Mann-Kendall and MAROS	Increasing or No Trend
Group 3	AWC Immediately Downgradient of NBCGRS	AWC Trend	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 4	Lateral (Clean) Sentinel Wells	Individual Well Concentration	12 years/biennial	Individual Concentrations	Greater than ROD goals
Group 5	Global Plume Mass Reduction	AWC Trend	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 6	Evaluating and comparing trends in Jordan Aquifer	Individual Well Trend for TCE	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing or No Trend

Note: A Response Threshold is the test result(s) that triggers further response. See text for additional explanation of response process.

AWC = Area-Weighted Concentration.

Table D.2.4
Group 1 – Downgradient of TGRS, Evaluation Process

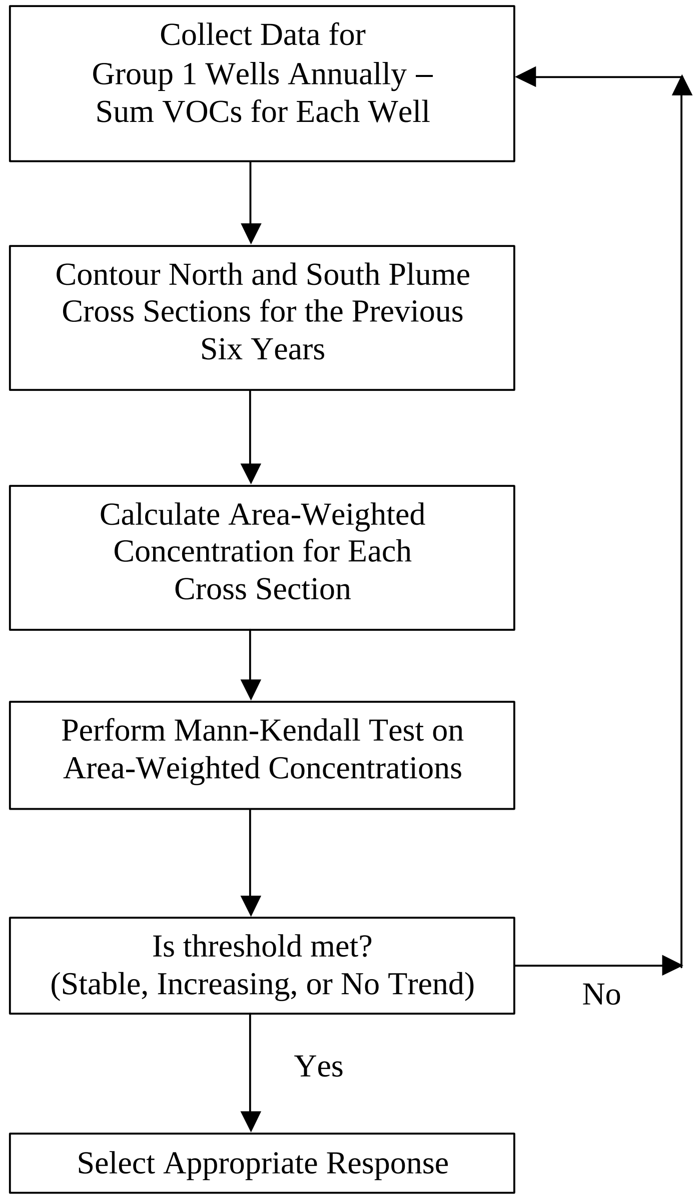


Table D.2.5

Group 2 – Areal Extent of Plume, Evaluation Process

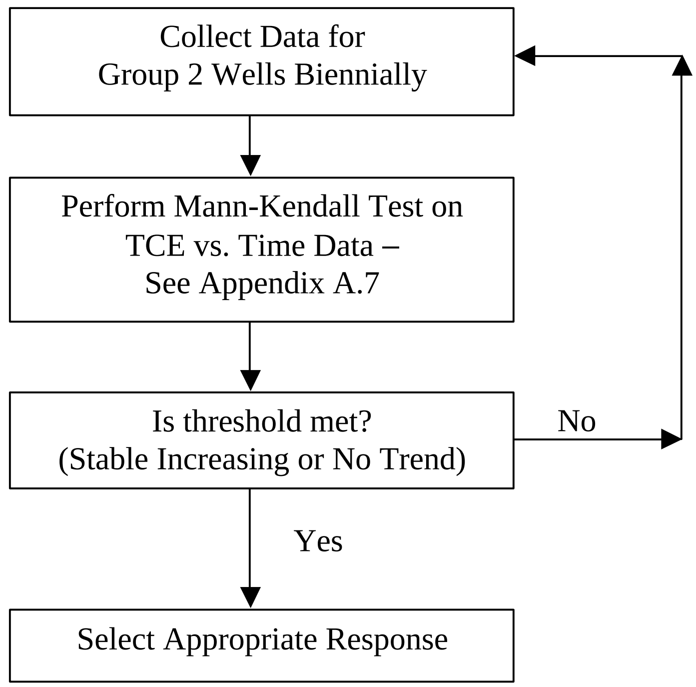


Table D.2.6

Group 3 and Group 5 – Downgradient Sentinel and Global Plume, Evaluation Processes

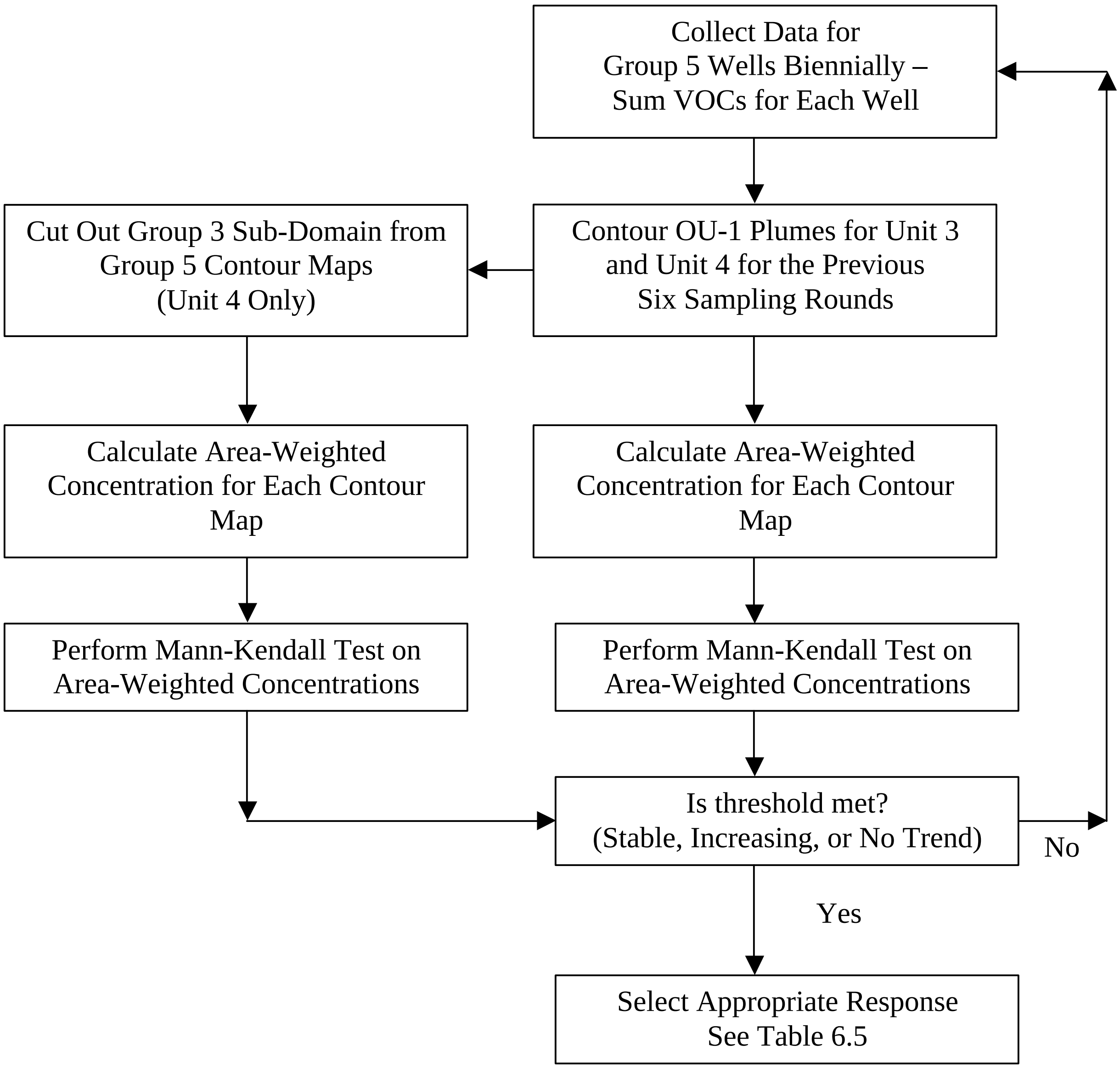


Table D.2.7
Group 4 – Lateral Sentinel Wells, Evaluation Process

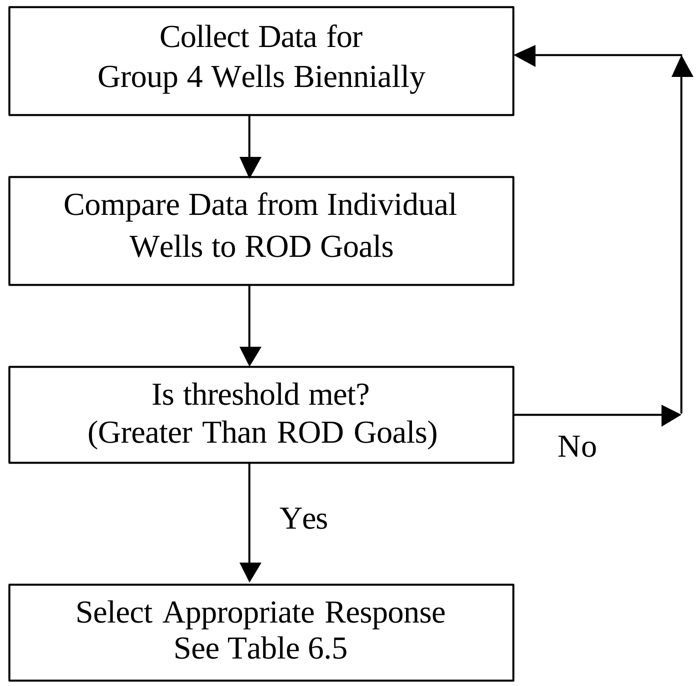


Table D.2.8

Responses to Threshold Indicators

Factors to Consider

- Contaminant concentrations
- Location (vertical and horizontal)
- Surrounding data
- Risks to human health or the environment
- Need for urgency in response

Possible Evaluation Responses

- Perform additional or confirmation sampling
- Write up in the Annual Performance Report
- Perform separate evaluation and write-up (Tech Memo)

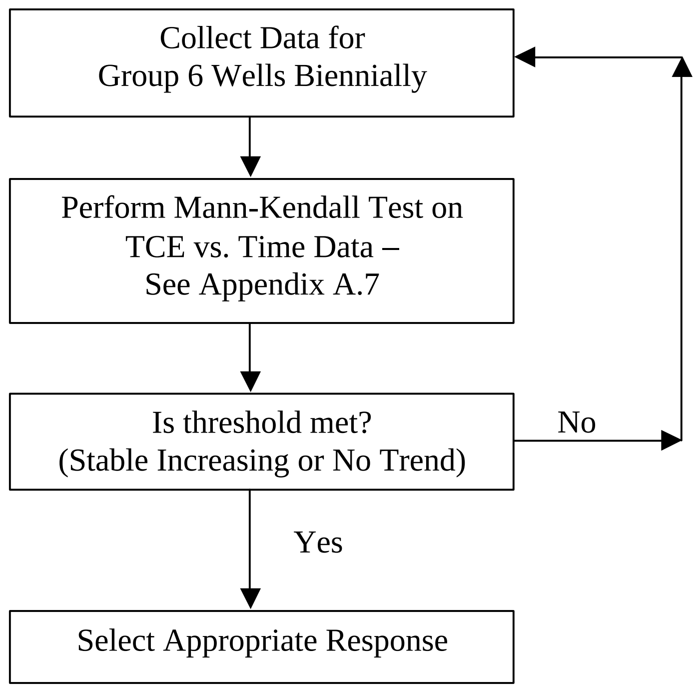
Possible Long-Term Responses

- Increase sampling frequency
- Modify operation of remedial system(s)
- Perform new remedy evaluation
- Install additional monitoring well(s)
- Modify the Special Well Construction Area
- Control risk at the receptors

Note: Threshold responses to be described and evaluated in the Annual Performance Reports.

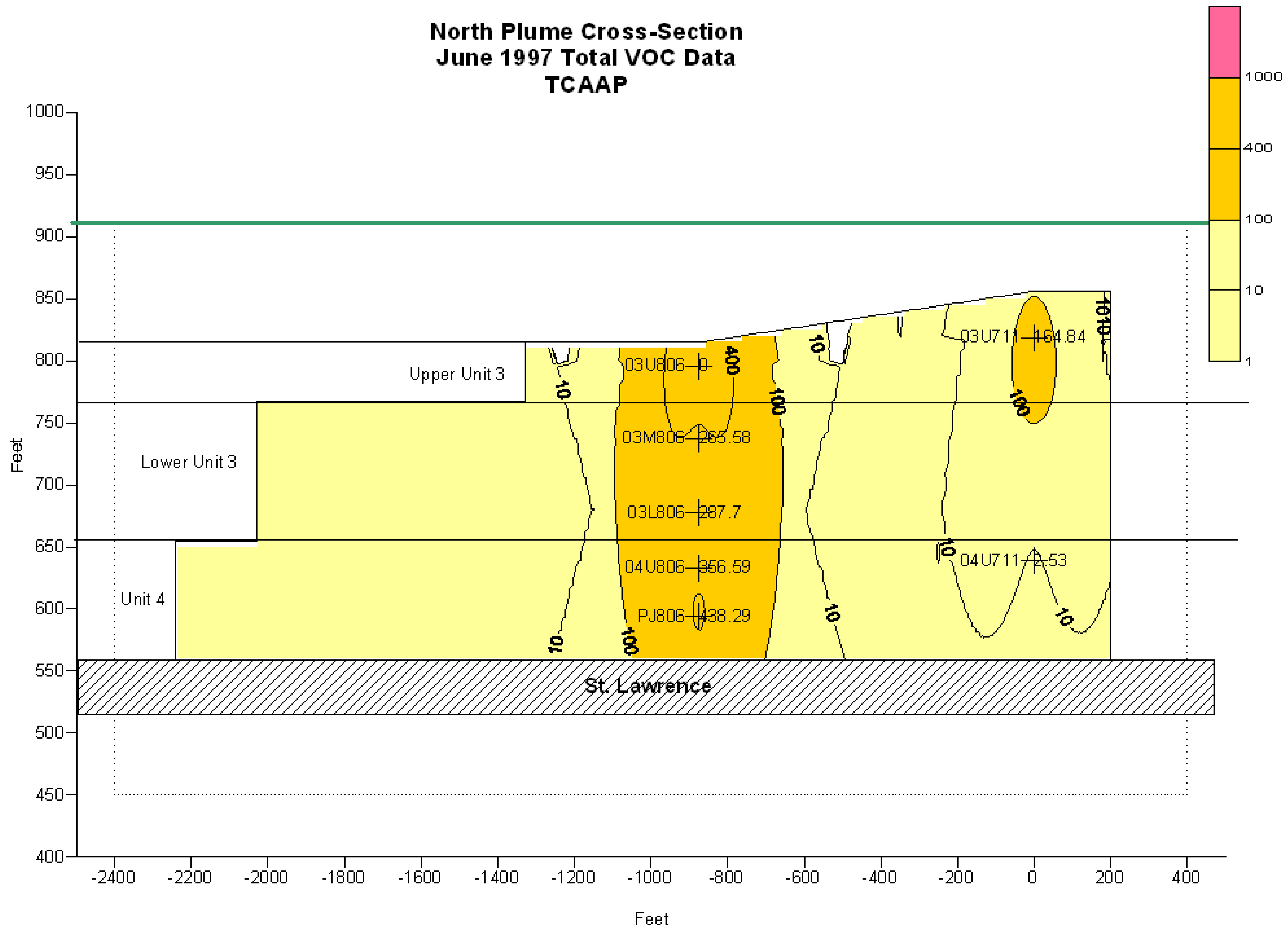
Table D.2.9

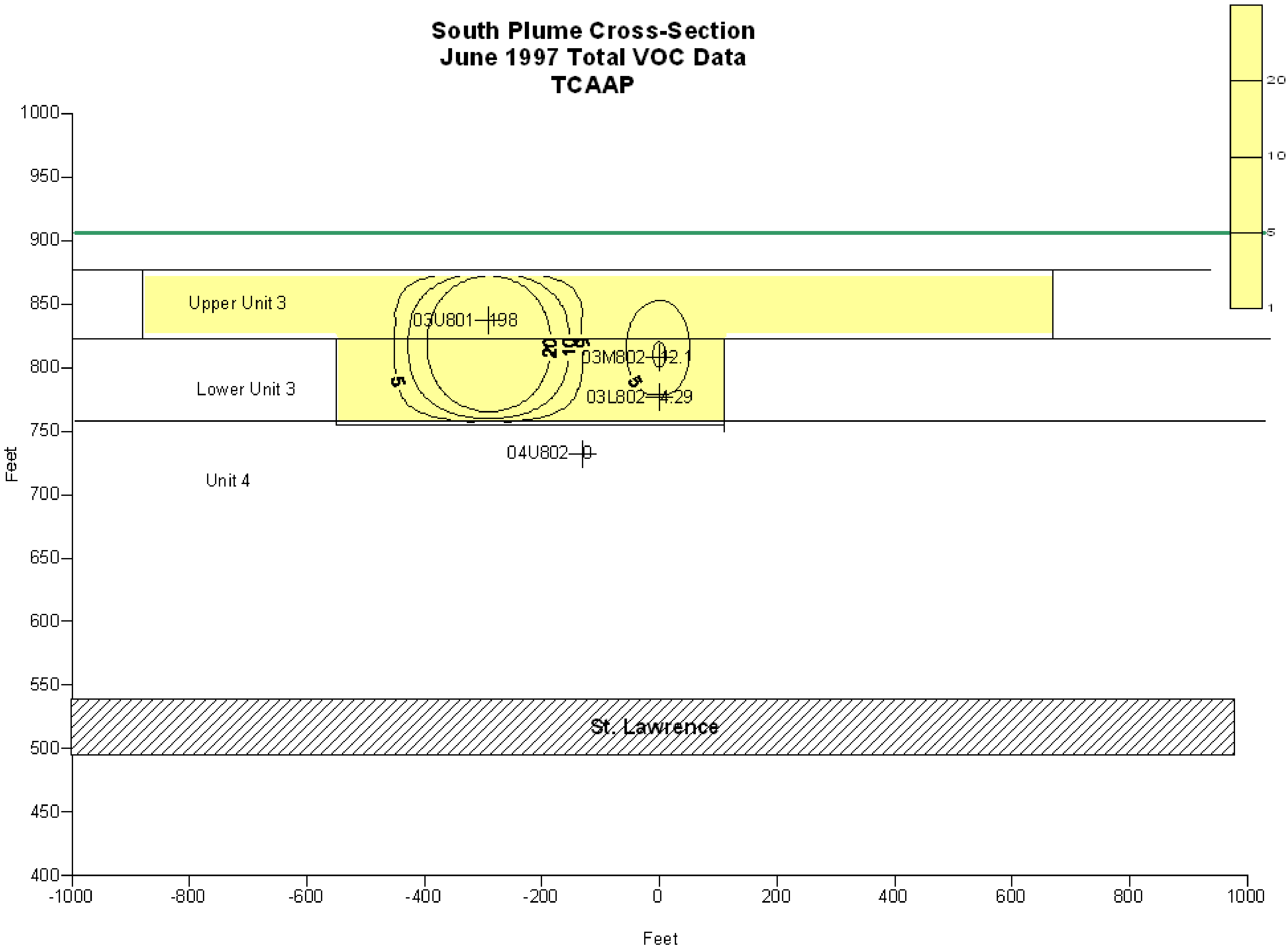
Group 6 – Jordan Aquifer, Evaluation Process



D.2.2 Group 1 Kriging Evaluation

1997


North Plume Cross-Section
June 1997 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806
03M806
265.58
03L806
287.7
04U806
356.59
PJ806
438.29
03U711
164.84
04U711
Feet
Feet
1000
400
100
10
1


South Plume Cross-Section
June 1997 Total VOC Data
TCAAP
1000
950
900
850
800
750
700
650
600
550
500
450
400
Feet
Upper Unit 3
Lower Unit 3
Unit 4
03U801
198
03M802
12.1
03L802
4.29
04U802
0
20
10
5
5
5
St. Lawrence
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
Feet
20
10
5
1

Groundwater Quality Data (Organics) - 1997		
Well	**Date**	**TOTAL VOCs (ug/l)**
03L806	6/25/1997	287.70
03M806	6/17/1997	265.58
03U711	6/13/1997	164.84
03U806*		986.00
04U711	6/13/1997	2.53
04U806	6/5/1997	356.59
PJ#806	6/5/1997	438.29
03L802	6/16/1997	4.29
03M802	6/16/1997	12.10
03U801	6/17/1997	201.66
04U802	6/16/1997	0.00

* Interpolated
South Plume
North plume

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 1997

Concentration	Positive Planar Area (ft2)
Plume to 1	570490
Plume to 5	288525
Plume to 10	269887
Plume to 50	165775
Plume to 100	113709
Plume to 200	74691
Plume to 300	43287
Plume to 400	12634
Plume to 500	6612
Plume to 600	3768
Plume to 700	2021
Plume to 800	917
Plume to 900	191
Plume to 1000	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	281964	845893
5 to 10	7.5	18638	139786
10 to 50	30	104112	3123373
50 to 100	75	52065	3904904
100 to 200	150	39018	5852772
200 to 300	250	31404	7850995
300 to 400	350	30653	10728491
400 to 500	450	6022	2709721
500 to 600	550	2845	1564609
600 to 700	650	1746	1135058
700 to 800	750	1105	828667
800 to 900	850	725	616459
900 to 1000	950	191	181775
	Sum	570490	39482503

Area Wtd Conc	69	ug/L

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South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 1997

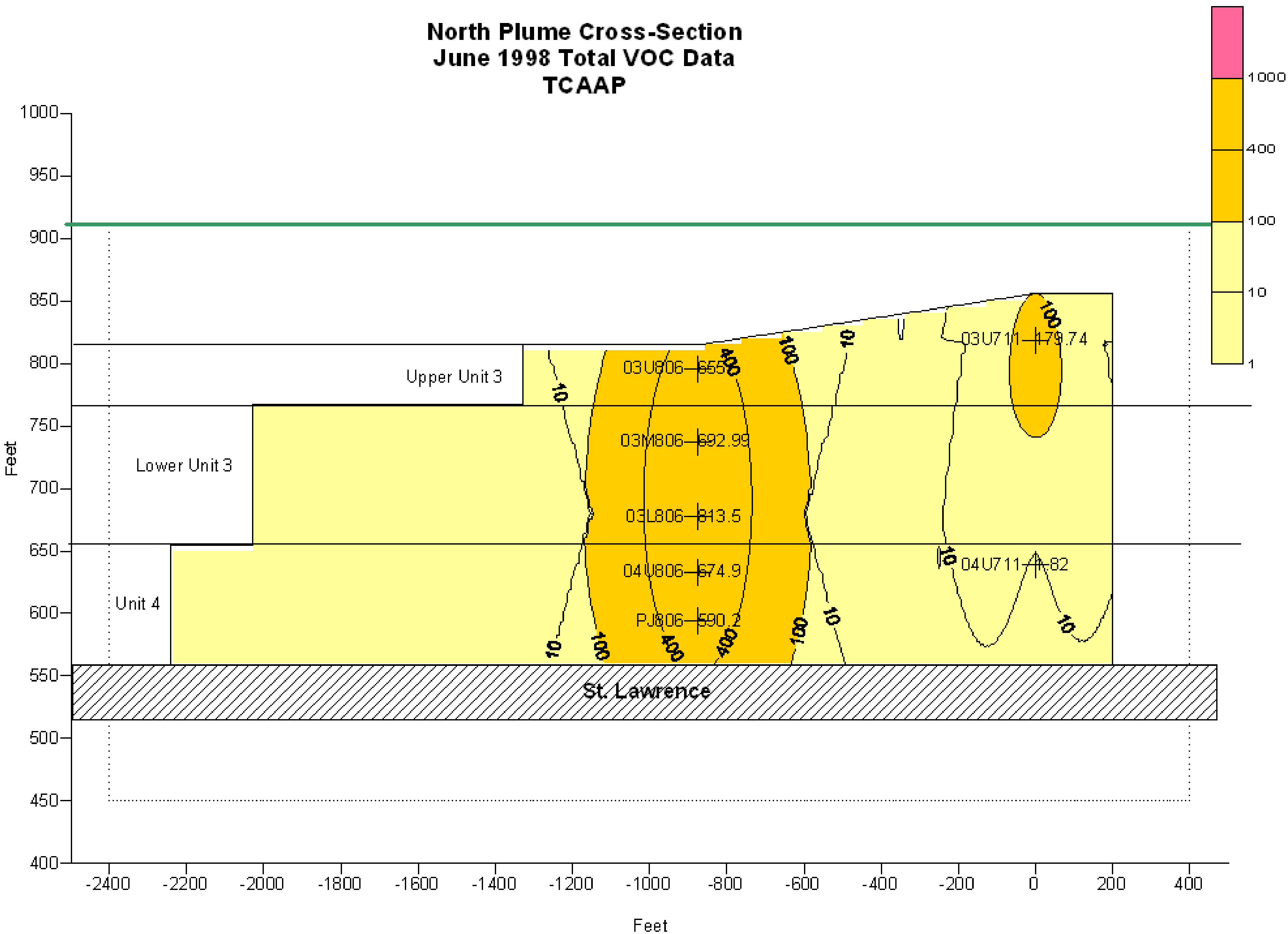
Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	40363
Plume to 10	26616
Plume to 25	15757
Plume to 50	8734
Plume to 100	2906
Plume to 200	0

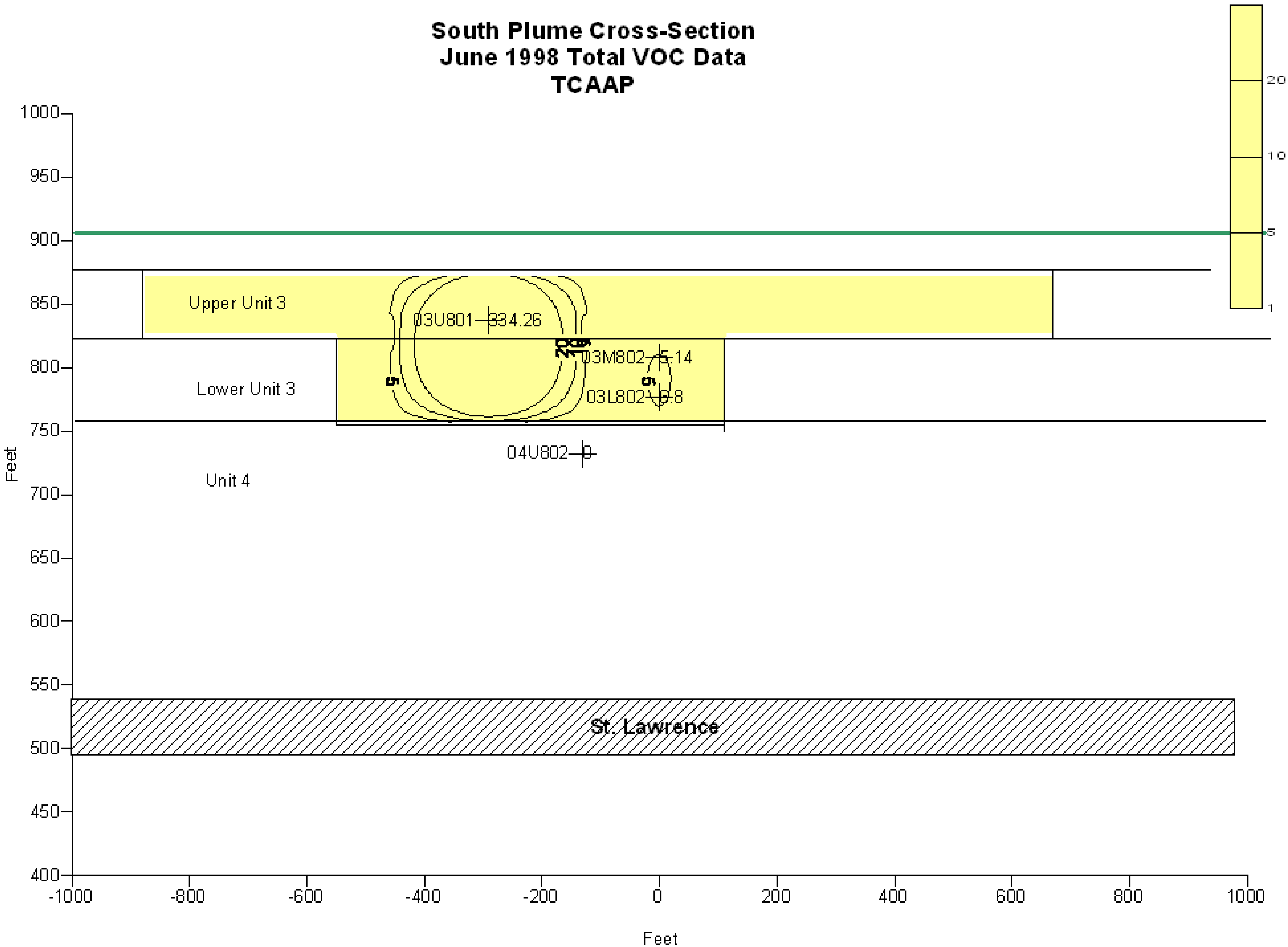
Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	74873	224619
5 to 10	7.5	13748	103107
10 to 25	17.5	10858	190020
25 to 50	37.5	7023	263376
50 to 100	75	5828	437100
100 to 200	150	2906	435878
	Sum	115236	1654100

Area Wtd Conc	14	ug/L

1998

North Plume Cross-Section
June 1998 Total VOC Data
TCAAP




South Plume Cross-Section
June 1998 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
03U801
334.26
03M802
5.14
03L802
6.8
04U802
0
St. Lawrence
Feet
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
20
10
5
1

Groundwater Quality Data (Organics) - 1998

Well	Date	TOTAL VOCs (ug/l)
03L806	6/12/1998	813.50
03M806	6/12/1998	692.99
03U711	6/16/1998	179.74
03U806*		655.00
04U711	6/9/1998	1.82
04U806	6/12/1998	674.90
PJ#806	6/12/1998	590.20
03L802	6/11/1998	6.80
03M802	6/17/1998	5.14
03U801	6/17/1998	334.26
04U802	6/11/1998	0.00

* Interpolated

South Plume

North plume

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 1998

Concentration	Positive Planar Area (ft2)
Plume to 1	572327
Plume to 5	291283
Plume to 10	275277
Plume to 50	200943
Plume to 100	151271
Plume to 200	102729
Plume to 300	78851
Plume to 400	58828
Plume to 500	39484
Plume to 600	22174
Plume to 700	6155
Plume to 800	71
Plume to 900	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	281044	843132
5 to 10	7.5	16006	120046
10 to 50	30	74334	2230032
50 to 100	75	49671	3725356
100 to 200	150	48542	7281374
200 to 300	250	23877	5969303
300 to 400	350	20024	7008373
400 to 500	450	19344	8704734
500 to 600	550	17310	9520603
600 to 700	650	16018	10411811
700 to 800	750	6084	4563319
800 to 900	850	71	60279
	Sum	572327	60438362

Area Wtd Conc	106	ug/L

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South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 1998

Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	37221
Plume to 10	30498
Plume to 25	20858
Plume to 50	13520
Plume to 100	6920
Plume to 200	1673
Plume to 300	75
Plume to 400	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	78015	234045
5 to 10	7.5	6723	50426
10 to 25	17.5	9640	168693
25 to 50	37.5	7339	275194
50 to 100	75	6599	494951
100 to 200	150	5248	787167
200 to 300	250	1597	399360
300 to 400	350	75	26341
	Sum	115236	2436177

Area Wtd Conc	21	ug/L

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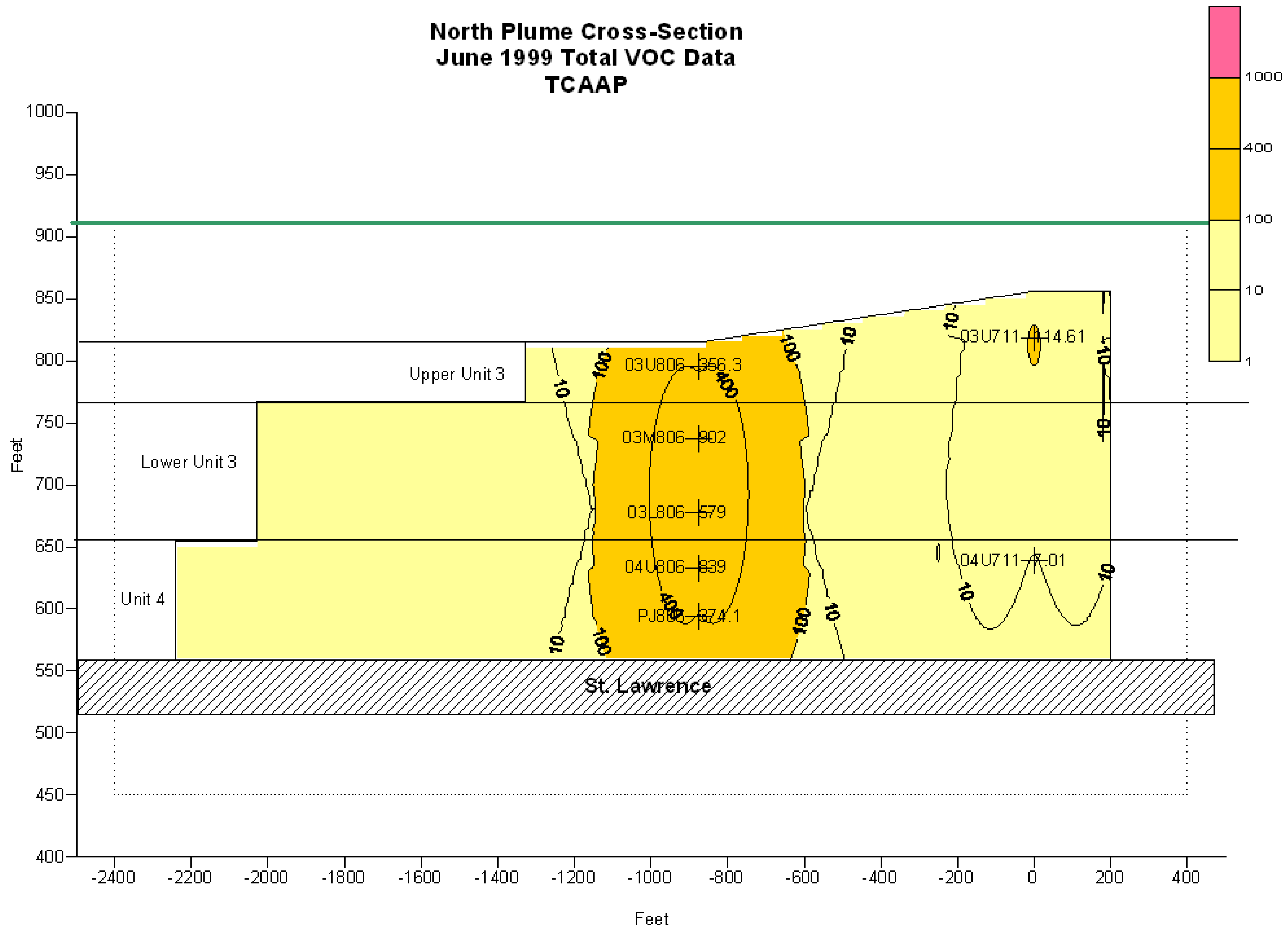
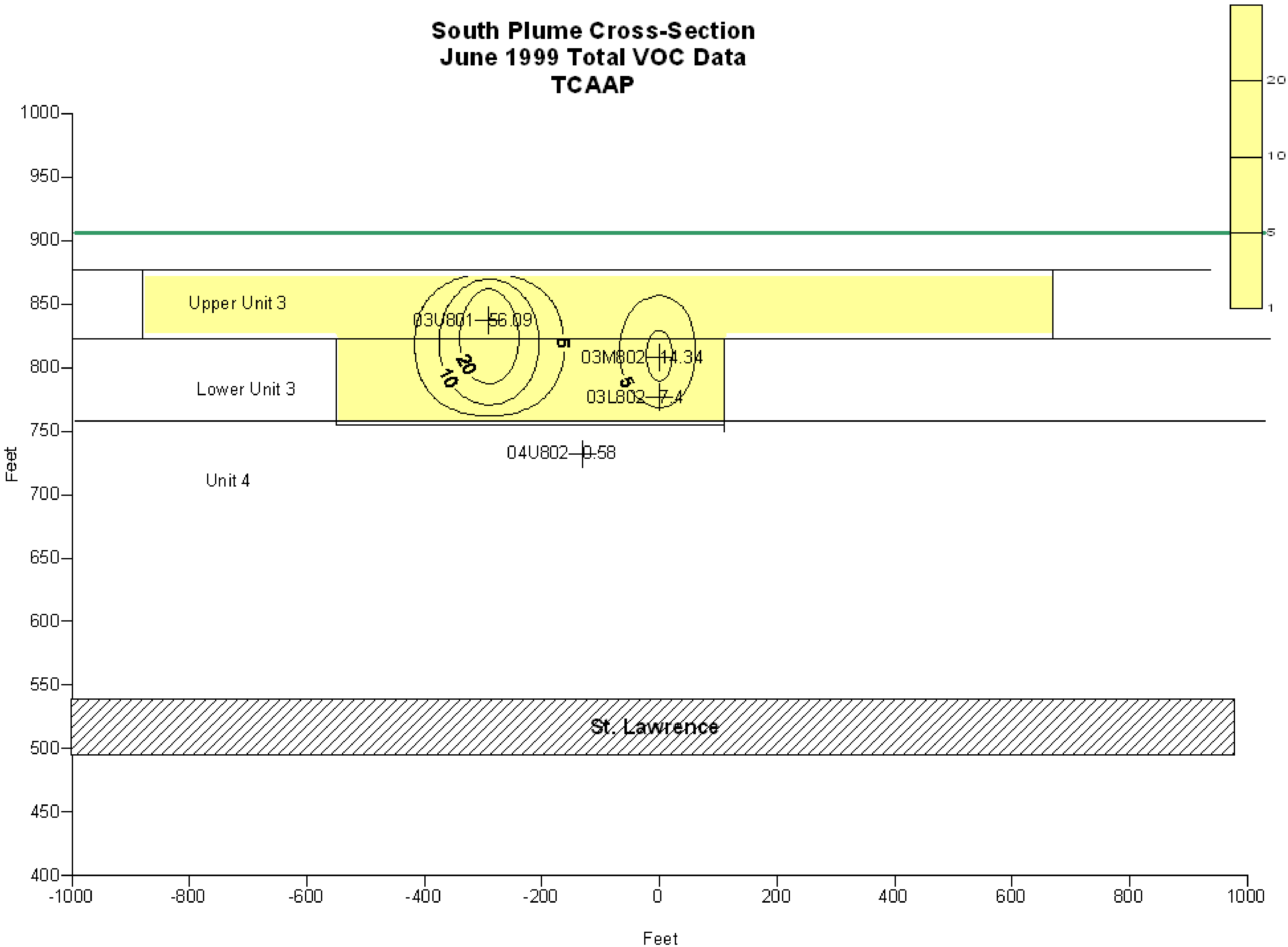
1999



North Plume Cross-Section
June 1999 Total VOC Data
TCAAP
1000
950
900
850
800
750
700
650
600
550
500
450
400
Feet
-2400
-2200
-2000
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
Feet
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806 356.3
03M806 902
03L806 579
04U806 839
PJ806 874.1
03U711 14.61
04U711 7.01
1000
400
100
10
1


South Plume Cross-Section
June 1999 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U801
56.09
03M802
14.34
03L802
7.4
04U802
0.58
20
10
5
1
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
Feet

Groundwater Quality Data (Organics) - 1999

Well	Date	TOTAL VOCs (ug/l)
03L802	6/23/1999	7.40
03M802	6/23/1999	14.34
03U801	6/29/1999	56.09
04U802	6/23/1999	0.58
03L806	6/23/1999	579.00
03M806*		902.00
03U711	6/28/1999	114.61
03U806	6/23/1999	356.30
04U711	6/28/1999	7.01
04U806	6/23/1999	839.00
PJ#806	6/23/1999	374.10

* Interpolated

South Plume

North plume

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 1999

Concentration	Positive Planar Area (ft2)
Plume to 1	572514
Plume to 5	294922
Plume to 10	270495
Plume to 50	183129
Plume to 100	138286
Plume to 200	99392
Plume to 300	70102
Plume to 400	44570
Plume to 500	27825
Plume to 600	15887
Plume to 700	4664
Plume to 800	783
Plume to 900	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	277592	832777
5 to 10	7.5	24427	183204
10 to 50	30	87366	2620971
50 to 100	75	44843	3363213
100 to 200	150	38894	5834158
200 to 300	250	29290	7322437
300 to 400	350	25532	8936067
400 to 500	450	16746	7535697
500 to 600	550	11937	6565574
600 to 700	650	11223	7294904
700 to 800	750	3881	2910574
800 to 900	850	783	665891
	Sum	572514	54065467

Area Wtd Conc	94	ug/L

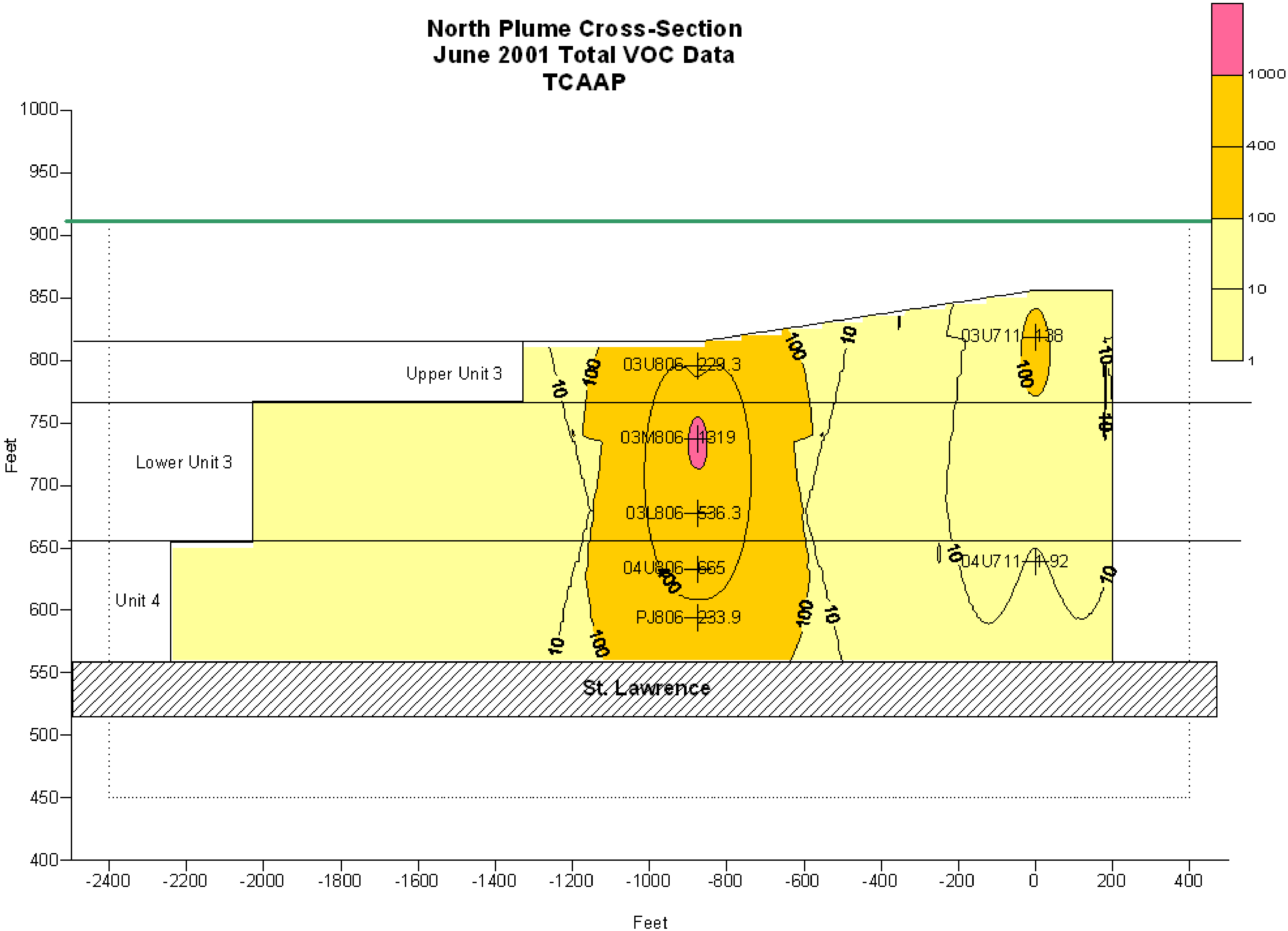
South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 1999

Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	32196
Plume to 10	14726
Plume to 25	3947
Plume to 50	94
Plume to 100	0

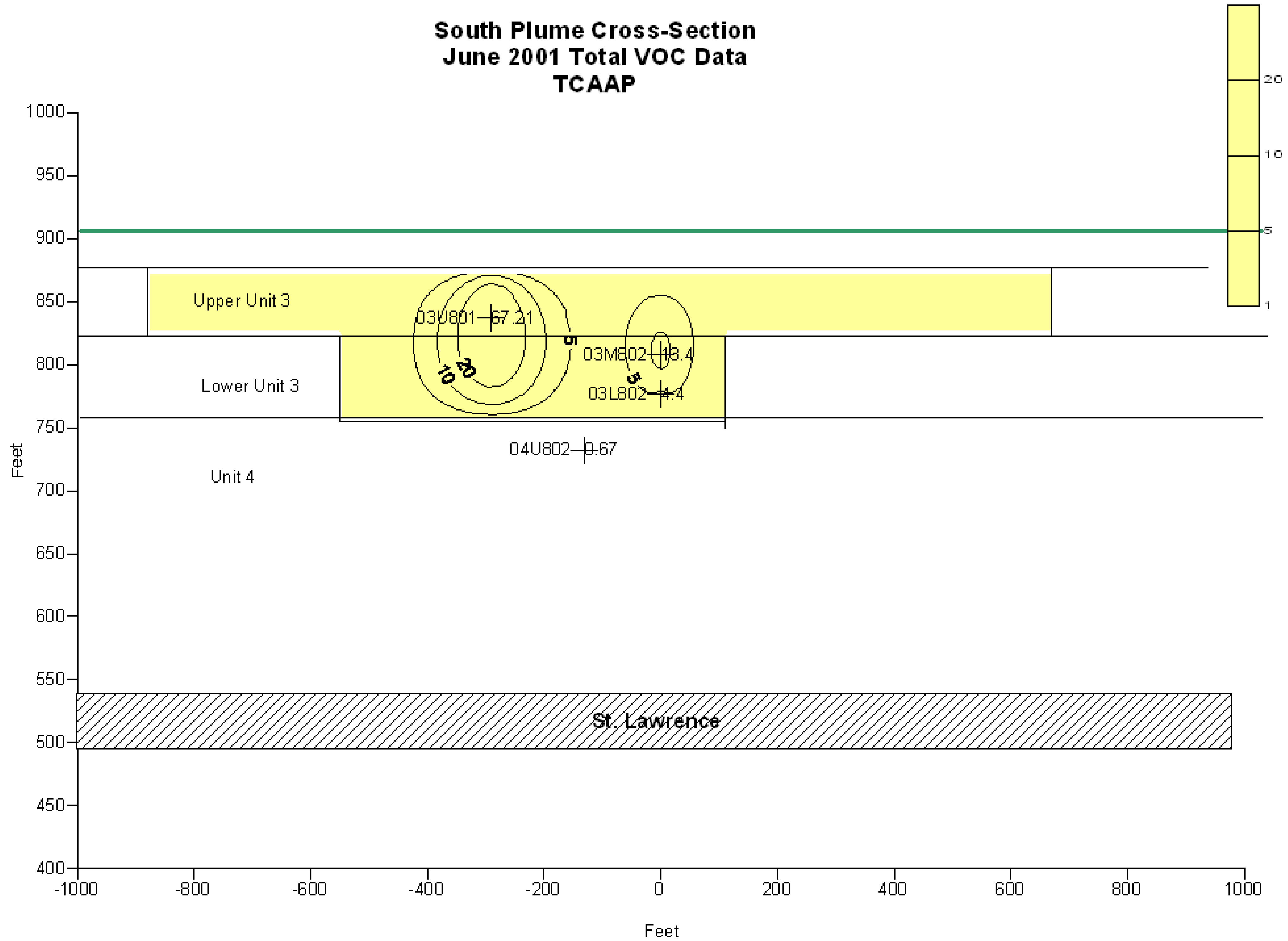
TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	83040	249120
5 to 10	7.5	17470	131025
10 to 25	17.5	10779	188629
25 to 50	37.5	3854	144519
50 to 100	75	94	7016
	Sum	115236	720309

Area Wtd Conc	6	ug/L

2001



North Plume Cross-Section
June 2001 Total VOC Data
TCAAP
1000
950
900
850
800
750
700
650
600
550
500
450
400
Feet
-2400
-2200
-2000
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
Feet
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806 229.3
03M806 1319
03L806 536.3
04U806 665
PJ806 233.9
03U711 138
04U711 92
10
100
1000
400
100
10
1


South Plume Cross-Section
June 2001 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U801 67.21
03M802 18.4
03L802 4.4
04U802 0.67
20
10
5
1
Feet
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
1000

Groundwater Quality Data (Organics) - 2001		
Well	**Date**	**TOTAL VOCs (ug/l)**
03L806	6/15/2001	536.30
03M806*		1319.00
03U711	6/12/2001	138.00
03U806	6/15/2001	229.30
04U711	6/12/2001	1.92
04U806	6/15/2001	665.00
PJ#806	6/15/2001	233.90
03L802	6/19/2001	4.40
03M802	6/19/2001	13.40
03U801	6/18/2001	67.21
04U802	6/19/2001	0.67

* Interpolated
South Plume
North plume

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 2001

Concentration	Positive Planar Area (ft2)
Plume to 1	572398
Plume to 5	288569
Plume to 10	267944
Plume to 50	191092
Plume to 100	143221
Plume to 200	103426
Plume to 300	65435
Plume to 400	42734
Plume to 500	28083
Plume to 600	16350
Plume to 700	9048
Plume to 800	5367
Plume to 900	3079
Plume to 1000	1615
Plume to 1100	697
Plume to 1200	184
Plume to 1300	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	283829	851488
5 to 10	7.5	20624	154683
10 to 50	30	76853	2305575
50 to 100	75	47871	3590299
100 to 200	150	39795	5969323
200 to 300	250	37991	9497682
300 to 400	350	22701	7945227
400 to 500	450	14651	6593110
500 to 600	550	11733	6453374
600 to 700	650	7302	4746206
700 to 800	750	3680	2760309
800 to 900	850	2288	1944735
900 to 1000	950	1465	1391325
1000 to 1100	1050	918	963849
1100 to 1200	1150	513	589863
1200 to 1300	1250	184	229853
	Sum	572398	55986901

Area Wtd Conc	98	ug/L

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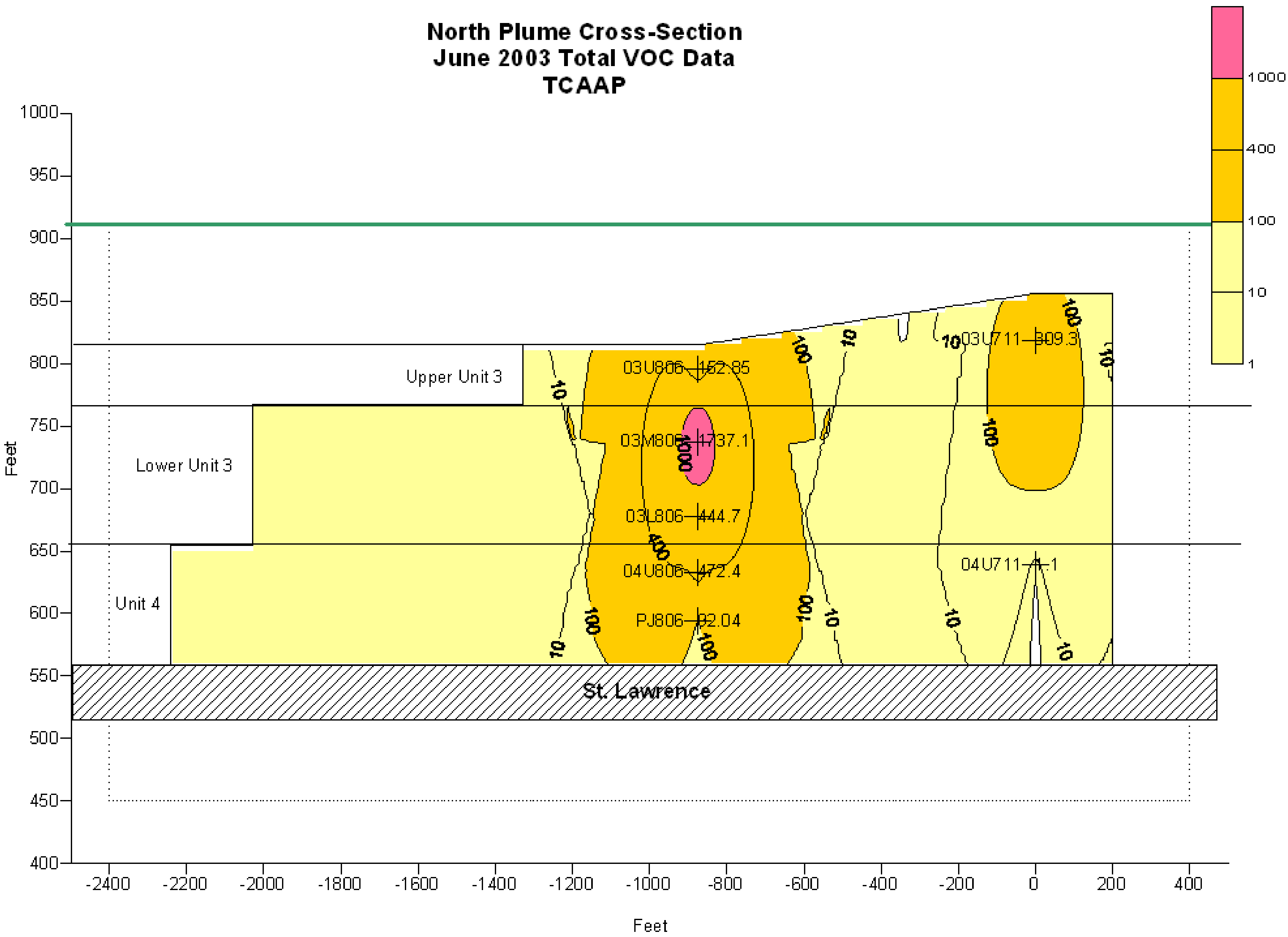
South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 2001

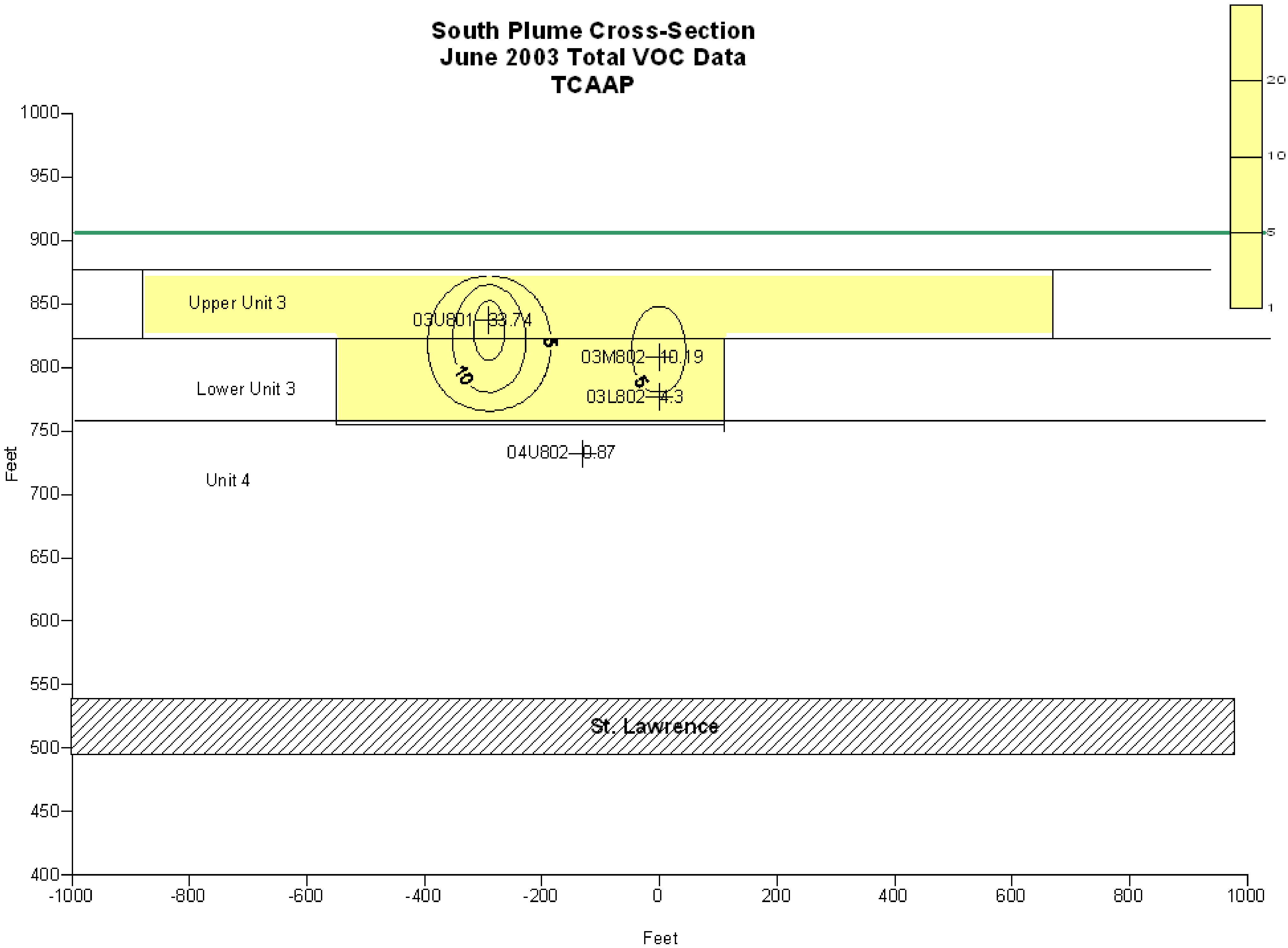
Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	32494
Plume to 10	15927
Plume to 25	5422
Plume to 50	638
Plume to 100	0

TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	82743	248228
5 to 10	7.5	16567	124253
10 to 25	17.5	10505	183839
25 to 50	37.5	4783	179368
50 to 100	75	638	47878
	Sum	115236	783566

Area Wtd Conc	7	ug/L

2003


North Plume Cross-Section
June 2003 Total VOC Data
TCAAP
Feet
Feet
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806 152.85
03M806 1737.1
03L806 444.7
04U806 472.4
PJ806 92.04
03U711 309.3
04U711 1
1000
400
100
10
1


South Plume Cross-Section
June 2003 Total VOC Data
TCAAP
Upper Unit 3
03U801
33.74
03M802
10.19
03L802
4.3
Lower Unit 3
04U802
0.87
Unit 4
St. Lawrence
10
5
5
20
10
5
1
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
Feet
Feet

Groundwater Quality Data (Organics) - 2003		
Well	Date	TOTAL VOCs (ug/l)
03L806	6/12/2003	444.70
03M806	6/12/2003	1737.10
03U711	6/17/2003	309.30
03U806	6/16/2003	152.85
04U711	6/17/2003	1.10
04U806	6/16/2003	472.40
PJ#806	6/12/2003	92.04
03L802	6/17/2003	4.30
03M802	6/17/2003	10.19
03U801	6/17/2003	33.74
04U802	6/17/2003	0.87

South Plume
North plume

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 2003

Concentration	Positive Planar Area (ft2)
Plume to 1	570970
Plume to 5	293399
Plume to 10	285615
Plume to 50	226380
Plume to 100	172784
Plume to 200	104726
Plume to 300	62076
Plume to 400	41078
Plume to 500	26311
Plume to 600	17751
Plume to 700	12321
Plume to 800	8684
Plume to 900	6147
Plume to 1000	4318
Plume to 1100	2971
Plume to 1200	1969
Plume to 1300	1227
Plume to 1400	687
Plume to 1500	318
Plume to 1600	93
Plume to 1700	0

TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	277571	832713
5 to 10	7.5	7784	58377
10 to 50	30	59235	1777060
50 to 100	75	53596	4019665
100 to 200	150	68058	10208666
200 to 300	250	42650	10662576
300 to 400	350	20998	7349150
400 to 500	450	14767	6645320
500 to 600	550	8560	4708004
600 to 700	650	5430	3529256
700 to 800	750	3638	2728383
800 to 900	850	2537	2156220
900 to 1000	950	1829	1737148
1000 to 1100	1050	1348	1414965
1100 to 1200	1150	1002	1151948
1200 to 1300	1250	742	927859
1300 to 1400	1350	539	728236
1400 to 1500	1450	369	534776
1500 to 1600	1550	226	349576
1600 to 1700	1650	93	153324
	Sum	570970	61673222

Area Wtd Conc	108	ug/L

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South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 2003

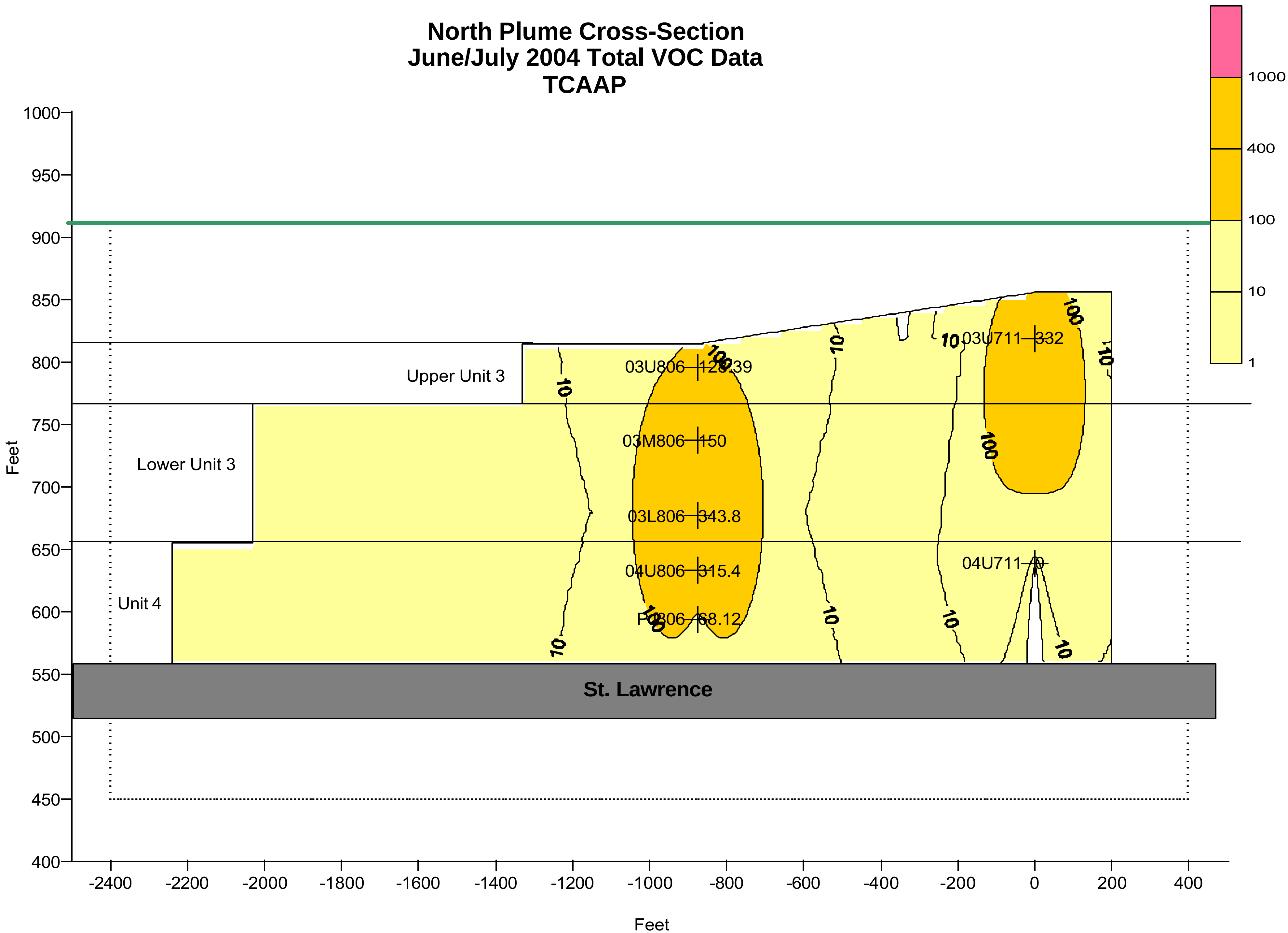
Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	22810
Plume to 10	8328
Plume to 25	701
Plume to 50	0

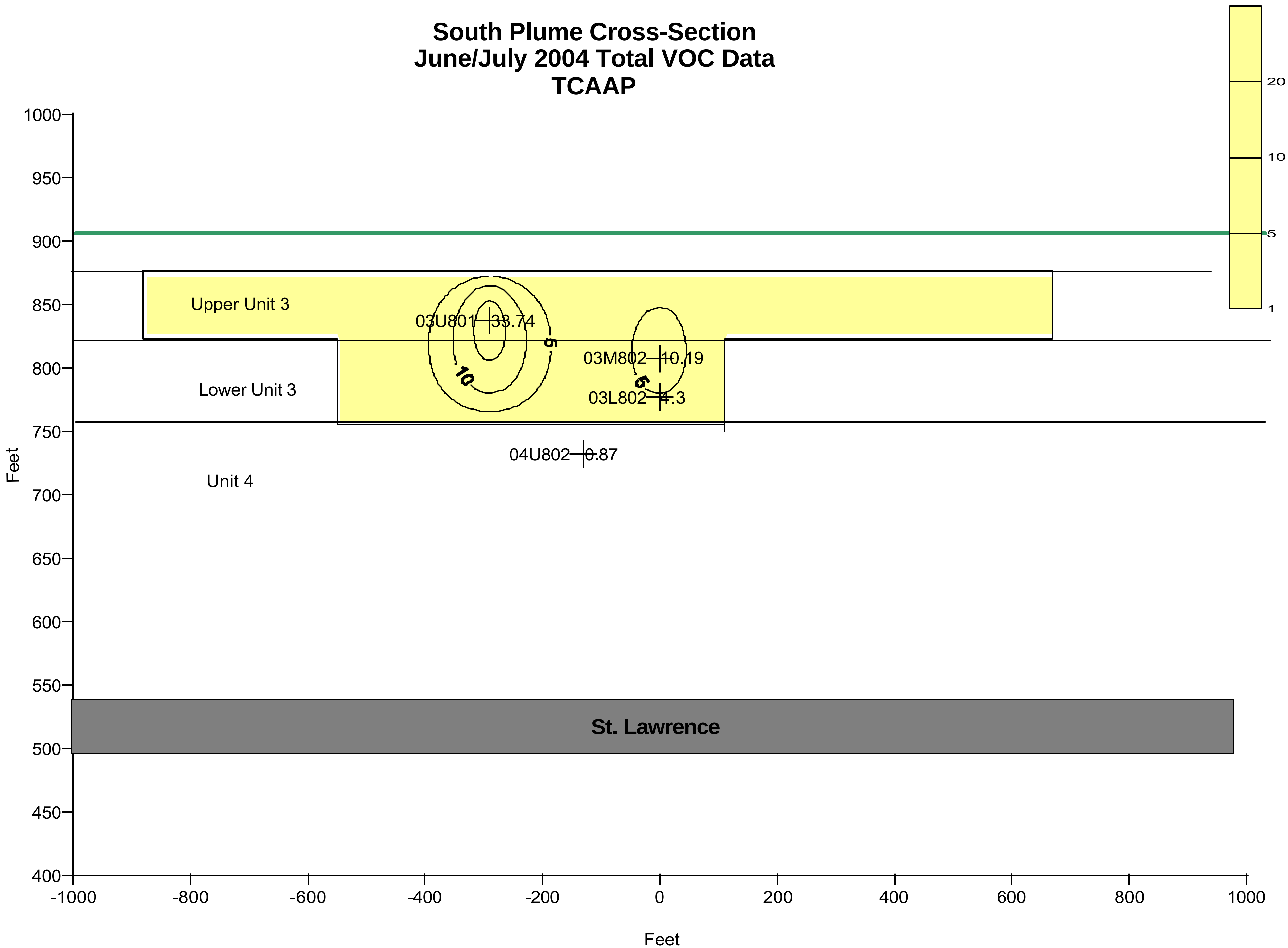
Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	92426	277278
5 to 10	7.5	14482	108617
10 to 25	17.5	7627	133469
25 to 50	37.5	701	26296
	Sum	115236	545660

Area Wtd Conc	5	ug/L

2004

North Plume Cross-Section
June/July 2004 Total VOC Data
TCAAP





South Plume Cross-Section
June/July 2004 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
03U801
33.74
03M802
10.19
03L802
4.3
04U802
0.87
5
10
St. Lawrence
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
20
1

Groundwater Quality Data
Fiscal Year 2004
TGRS, TCAAP
Arden Hills, Minnesota

		1,1,1-Trichloroethane	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*	***Total VOCs***
TGRS Cleanup Level[(1)]		200 µg/L	70 µg/L	6 µg/L	4 µg/L	70 µg/L	5 µg/L	5 µg/L	µg/L
Location	***Date***								
03L802	7/7/04	<1	<1	<1	<1	<1	<1	4.2	4.2
03M802	6/17/04	<1	<1	<1	<1	<1	<1	11	11
03U801	6/17/04	<1	<1	<1	<1	0.6P	<1	34	34.61
04U802	7/7/04	<1	<1	<1	<1	<1	<1	<1	0
03L806	7/7/04	37	29	25	<1	2.8	<1	250	343.8
03M806	6/18/04	<1	19	9.9	<1	1.1	<1	120	150
03U711	7/6/04	51	10	14	<1	4.6	2.4	250	332
03U806	6/18/04	<1	3.6	2.9	<1	0.6P	1.3	120	128.39
04U711	7/6/04	<1	<1	<1	<1	<1	<1	<1	0
04U806	6/17/04	18	24	20	<1	3.4	<1	250	315.4
PJ#806	6/17/04	1.4	2.9	2.4	<1	0.4P	<1	61	68.12

Notes:
(1) Cleanup levels for TGRS are from the OU2 ROD. Shading indicates exceedence of the cleanup level.
D - Duplicate Analysis
J - Value is estimated
P - Results less than reporting level but greater than instrument detection limit.
South Plume
North Plume
Assumptions:
(<) values were treated as 0
any value with a text before or after number was treated as the detection.

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June/July 2004

Concentration	Positive Planar Area (ft2)
Plume to 1	570022
Plume to 5	292356
Plume to 10	283133
Plume to 50	191824
Plume to 100	100970
Plume to 200	23072
Plume to 300	2543
Plume to 400	0
Plume to 500	0

TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	277666	832998
5 to 10	7.5	9223	69173
10 to 50	30	91309	2739270
50 to 100	75	90854	6814050
100 to 200	150	77898	11684700
200 to 300	250	20529	5132250
300 to 400	350	2543	890050
400 to 500	450	0	0
	Sum	570022	28162491

Area Wtd Conc	49	ug/L

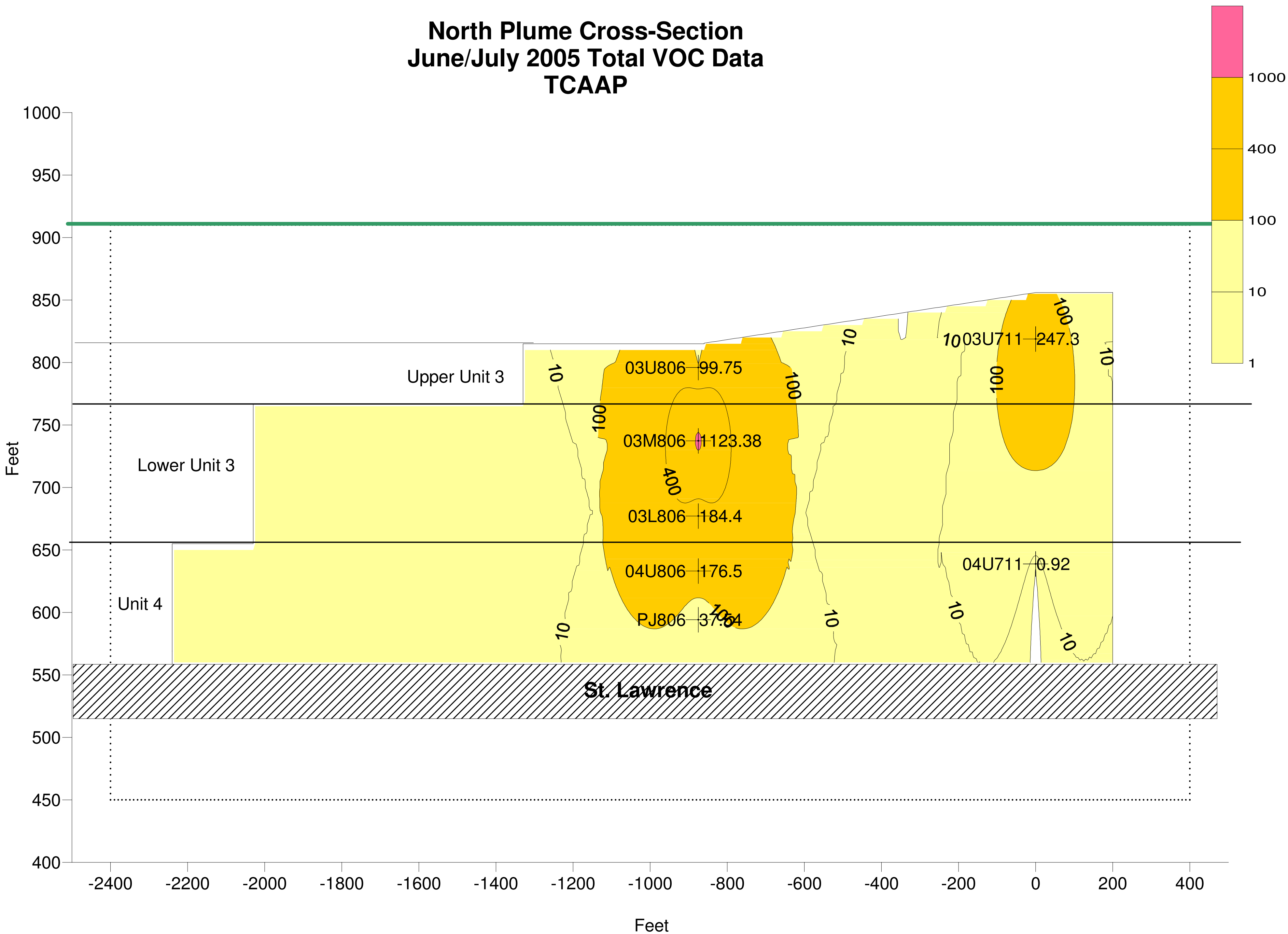
South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June/July 2004

Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	23878
Plume to 10	8680
Plume to 25	817
Plume to 50	0

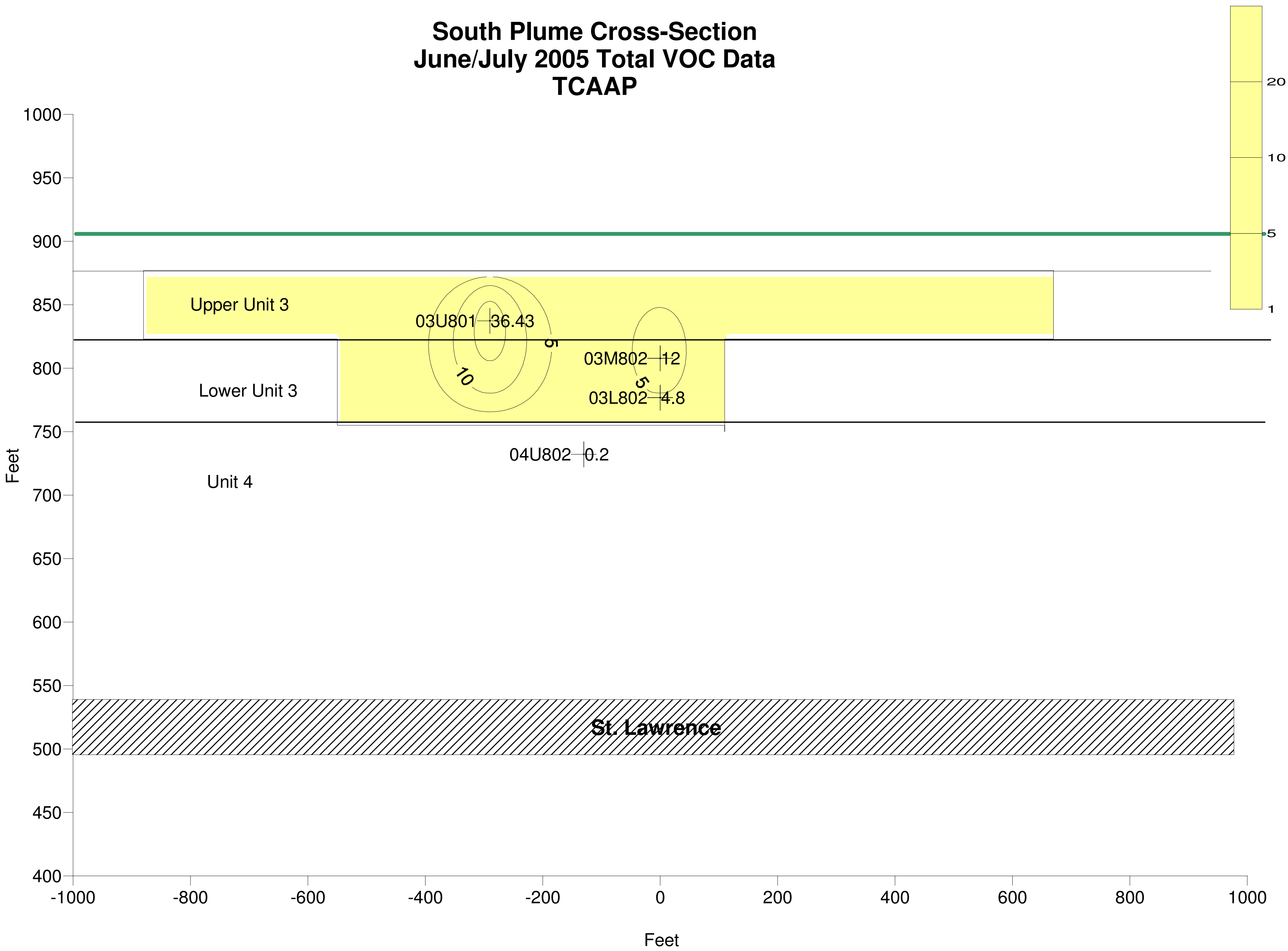
Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	91358	274074
5 to 10	7.5	15198	113985
10 to 25	17.5	7863	137603
25 to 50	37.5	817	30638
	Sum	115236	556299

Area Wtd Conc	5	ug/L

2005



North Plume Cross-Section
June/July 2005 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806 99.75
03M806 1123.38
03L806 184.4
04U806 176.5
PJ806 37.64
03U711 247.3
04U711 0.92
Feet
1000
400
100
10
1



South Plume Cross-Section
June/July 2005 Total VOC Data
TCAAP
Upper Unit 3
Lower Unit 3
Unit 4
03U801
36.43
03M802
12
03L802
4.8
04U802
0.2
10
5
5
St. Lawrence
Feet
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
20
10
5
1

North Plume Cross Section Data

well	June 2005 - Total VOC Conc (ug/L)
03L806	184.4
03M806	1123.4
03U711	247.3
03U806	99.8
04U711	0.9
04U806	176.5
PJ806	37.5

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 2005

Concentration	Positive Planar Area (ft2)
Plume to 1	570939
Plume to 5	291677
Plume to 10	280513
Plume to 50	197699
Plume to 100	127405
Plume to 200	49292
Plume to 300	24075
Plume to 400	13538
Plume to 500	8008
Plume to 600	4780
Plume to 700	2761
Plume to 800	1459
Plume to 900	638
Plume to 1000	174
Plume to 1100	0

TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	279263	837788
5 to 10	7.5	11164	83727
10 to 50	30	82814	2484409
50 to 100	75	70294	5272047
100 to 200	150	78113	11716958
200 to 300	250	25217	6304365
300 to 400	350	10537	3687899
400 to 500	450	5530	2488435
500 to 600	550	3228	1775257
600 to 700	650	2020	1312854
700 to 800	750	1302	976374
800 to 900	850	821	697839
900 to 1000	950	464	440980
1000 to1100	1050	174	182396
	Sum	570939	38261328

Area Wtd Conc	67	ug/L

South Plume Cross Section Data

well	June 2005 - Total VOC Conc (ug/L)
03L802	4.8
03M802	12
03U801	36.43
04U802	0.2

South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June/July 2005

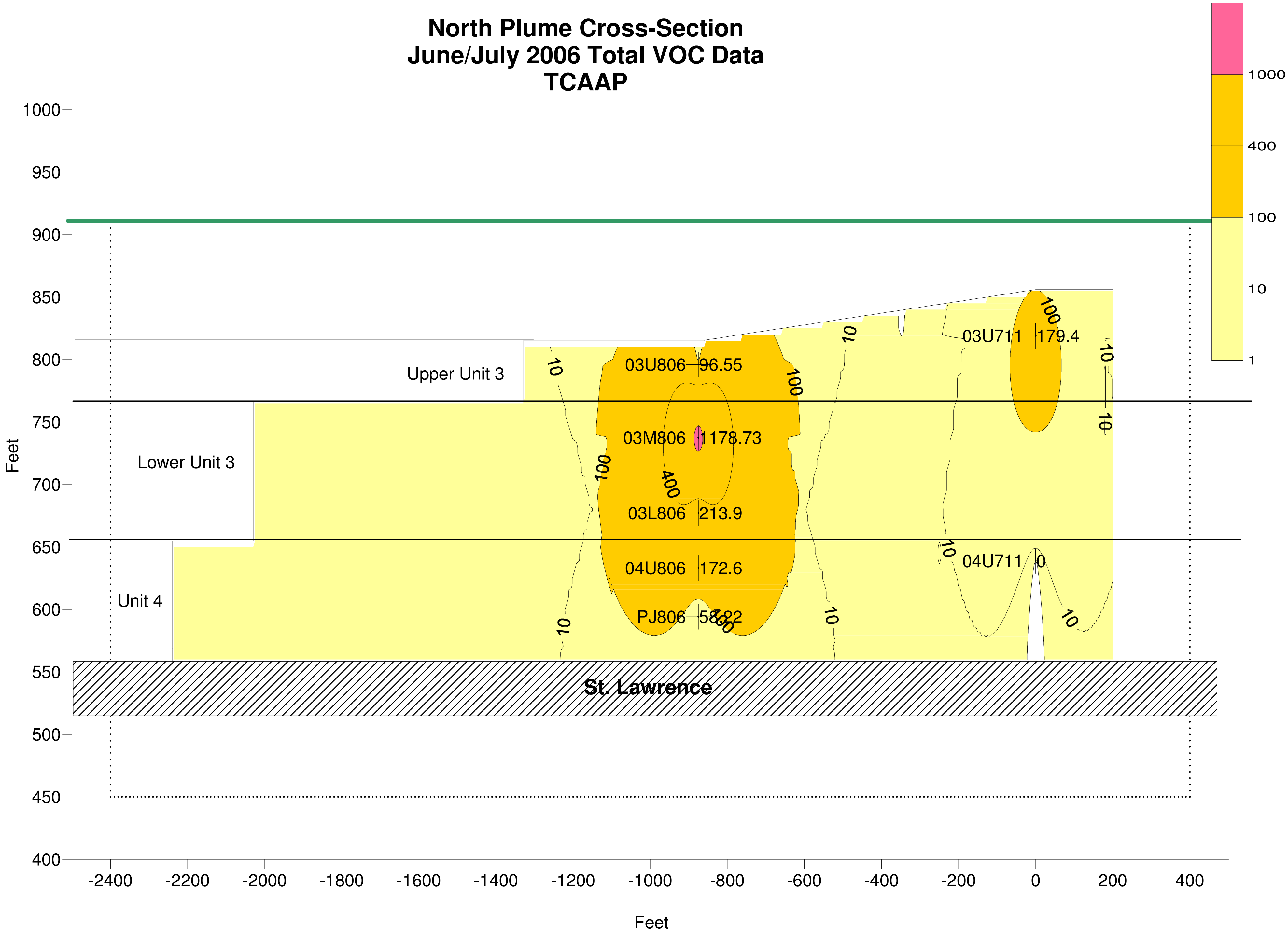
Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	25368
Plume to 10	9422
Plume to 25	1068
Plume to 50	0

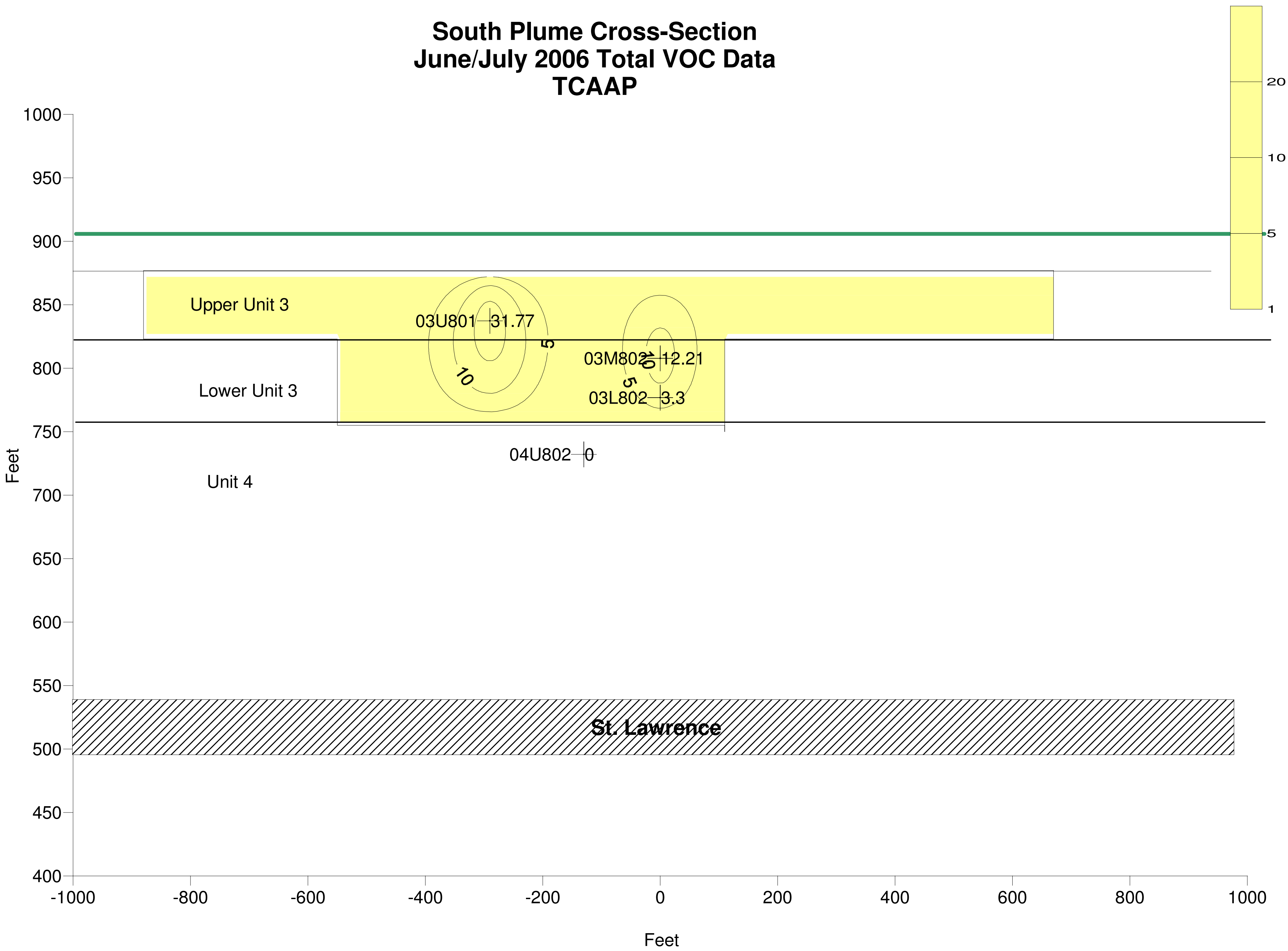
Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	89869	269606
5 to 10	7.5	15946	119592
10 to 25	17.5	8354	146200
25 to 50	37.5	1068	40035
	Sum	115236	575434

Area Wtd Conc	5	ug/L

2006

North Plume Cross-Section
June/July 2006 Total VOC Data
TCAAP




South Plume Cross-Section
June/July 2006 Total VOC Data
TCAAP
1000
950
900
850
800
750
700
650
600
550
500
450
400
Feet
-1000
-800
-600
-400
-200
0
200
400
600
800
1000
Feet
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U801 31.77
03M802 12.21
03L802 3.3
04U802 0
10
5
20
10
5
1

North Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June/July 2006

Concentration	Positive Planar Area (ft2)
Plume to 1	569991
Plume to 5	288686
Plume to 10	271528
Plume to 50	186104
Plume to 100	120640
Plume to 200	51763
Plume to 300	26657
Plume to 400	15227
Plume to 500	9171
Plume to 600	5618
Plume to 700	3378
Plume to 800	1909
Plume to 900	950
Plume to 1000	358
Plume to 1100	52
Plume to 1200	0

TCE (ug/L)	Avg TCE (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	281305	843916
5 to 10	7.5	17158	128682
10 to 50	30	85425	2562744
50 to 100	75	65463	4909742
100 to 200	150	68878	10331672
200 to 300	250	25105	6276324
300 to 400	350	11430	4000556
400 to 500	450	6056	2725346
500 to 600	550	3553	1954040
600 to 700	650	2240	1455778
700 to 800	750	1469	1101604
800 to 900	850	960	815703
900 to 1000	950	591	561797
1000 to1100	1050	306	321663
1100 to1200	1150	52	59923
	Sum	569991	38049490

Area Wtd Conc	67	ug/L

South Plume
Average Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June/July 2006

Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	26387
Plume to 10	9922
Plume to 25	705
Plume to 50	0

Total VOCs (ug/L)	Avg Total VOCs (ug/L)	Area (ft2)	Areal Conc (ug*ft2/L)
1 to 5	3	88849	266548
5 to 10	7.5	16465	123487
10 to 25	17.5	9217	161298
25 to 50	37.5	705	26443
	Sum	115236	577775

Area Wtd Conc	5	ug/L

D.2.3 Group 1, 2, 3, 5, and 6 Mann-Kendall Evaluations

Summary Table

Group 1, 2, 3, and 5 Mann-Kendall Summary and MAROS Conlusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 1 NP	-4	6	Decreasing	76.50%	0.2834	S or NT	**Stable**	yes	Likely decreasing, confidence low
Group 1 SP	-7	6	Decreasing	86.40%	0.1521	S or NT	**Stable**	yes	Likely decreasing, confidence low
Group 2	--	--	--	--	--	--	--	--	Not Sampled in FY 2006
Group 3	--	--	--	--	--	--	--	--	Not Sampled in FY 2006
Group 5	--	--	--	--	--	--	--	--	Not Sampled in FY 2006

Notes:
S or NT = Stable or No Trend
N = number of data points
COV = Coefficient of Variance

MAROS Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Group 6 Mann-Kendall Summary and MAROS Conclusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 6 OU1 Jordan Wells:									
04J822	12	6	Increasing	98.00%	0.9544	Definite	**Increasing**	Yes	Based on 2 years of data
04J847	-5	6	Decreasing	76.50%	0.0832	S or NT	**Stable**	Yes	Based on 2 years of data
04J849	0	6	Zero	50.00%	#DIV/0!	S or NT	**#DIV/0!**	No	All conc. ND

Notes:
S or NT = Stable or No Trend
N = number of data points
COV = Coefficient of Variance

MAROS Decsion Matrix

M-K S	Confidence	Trend
S > 0	> 95%	Increasing
S > 0	90-95%	Pr. Incr.
S > 0	< 90%	No Trend
S</= 0	< 90%	No Trend
S </= 0	< 90%	Stable
S < 0	90-95%	Pr. Decr.
S < 0	>95%	Decreasing

Mann-Kendall Plots

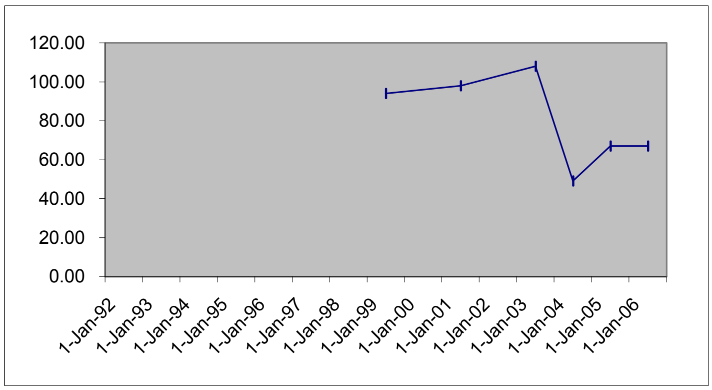
Well: Group 1 NP

Date	TCE (ug/l)	Mann-Kendall Calculation:						
6/18/1999	94.00	1						
6/18/2001	98.00	1	1					
6/18/2003	108.00	1	1	1				
6/18/2004	49.00	1	-1	-1	-1			
6/18/2005	67.00	1	-1	-1	-1	1		
6/8/2006	67.00	1	-1	-1	-1	1	0	
N		6	5	4	3	2	1	15
	sum		-1	-2	-3	2	0	-4
Possibles		15						

Mean 80.50
STNDEV 22.81009
COV 0.283355

Trend: Negative

Confidence (lookup) 76.50%



S -4

tau -0.266667

Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: Group 1 SP

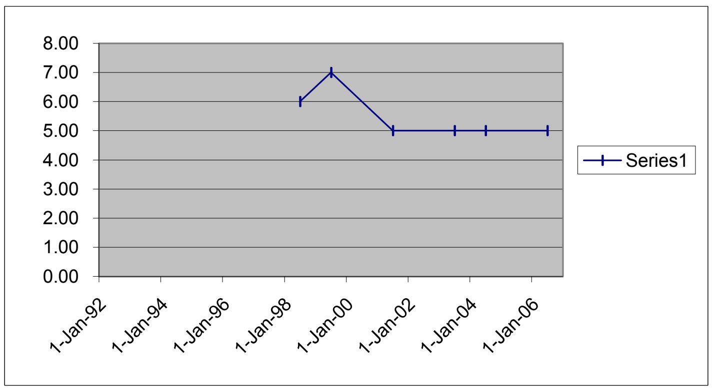
Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/18/1998	6.00	1					
6/18/1999	7.00	1	1				
6/18/2001	5.00	1	-1	-1			
6/18/2003	5.00	1	-1	-1	0		
6/18/2004	5.00	1	-1	-1	0	0	
6/8/2006	5.00	1	-1	-1	0	0	0

N		6	5	4	3	2	1	15
	sum		-3	-4	0	0	0	-7
Possibles		15						

Mean 5.50
STNDEV 0.83666
COV 0.15212

Trend: Negative

Confidence (lookup) 86.40%



S -7

tau -0.466667

Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 03U831

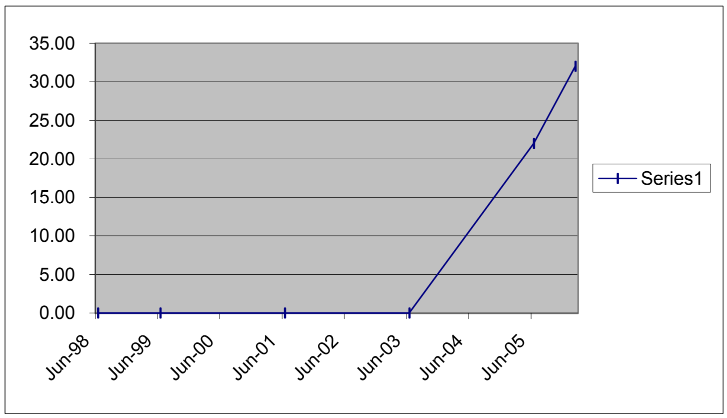
Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/23/1998	0.00	1					
6/15/1999	0.00	1	0				
6/15/2001	0.00	1	0	0			
6/9/2003	0.00	1	0	0	0		
6/7/2005	22.00	1	1	1	1	1	
2/1/2006	32.00	1	1	1	1	1	1

N		6	5	4	3	2	1	15
	sum		2	2	2	2	1	9
Possibles		15						

Mean 9.00
STNDEV 14.29685
COV 1.588539

Trend: Positive

Confidence (lookup) 93.20%



S 9

tau 0.6

Decsion Matrix

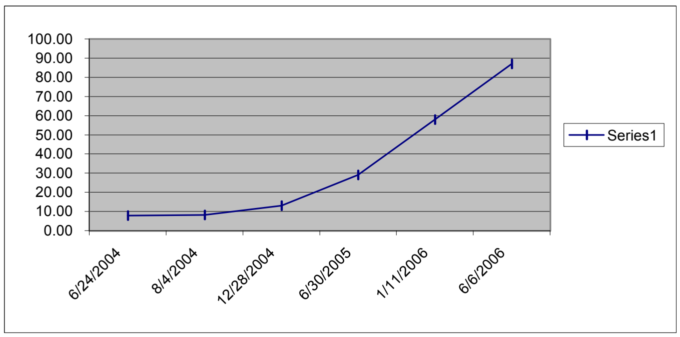
M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 04J822

Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/24/2004	7.80	1					
8/4/2004	8.10	1	1				
12/28/2004	13.00	1	1	1			
6/30/2005	29.0	1	1	1	1		
1/11/2006	58.00	1	1	1	1	1	
6/6/2006	87.00	1	1	1	1	1	1

N		6	5	4	3	12
	sum		5	4	3	12
Possibles		15				

Mean	33.82
STNDEV	32.2739782
COV	0.95438082
Trend:	Positive
Confidence (lookup)	98.00%



S	12
tau	0.8

Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 04J847

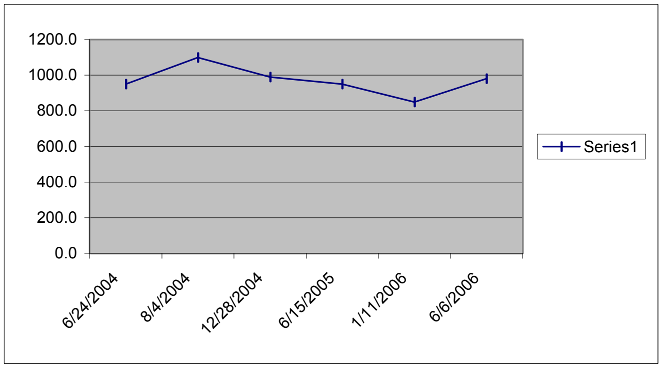
Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/24/2004	950.0	1					
8/4/2004	1100.0	1	1				
12/28/2004	990.0	1	1	-1			
6/15/2005	950.0	1	0	-1	-1		
1/11/2006	850.00	1	-1	-1	-1	-1	
6/6/2006	980.00	1	1	-1	-1	1	1

N		6	5	4	3	12
	sum		2	-4	-3	-5
Possibles		15				

Mean 970.00
STNDEV 80.74652
COV 0.083244

Trend: Negative

Confidence (lookup) 76.50%



S -5

tau -0.333333

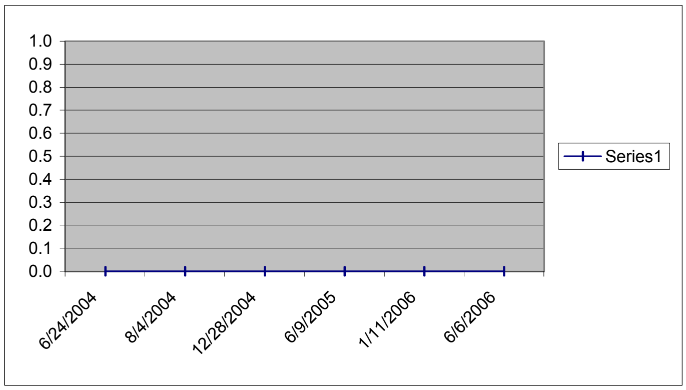
Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: **04J849**

Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/24/2004	0.0	1					
8/4/2004	0.0	1	0				
12/28/2004	0.0	1	0	0			
6/9/2005	0.0	1	0	0	0		
1/11/2006	0.00	1	0	0	0	0	
6/6/2006	0.00	1	0	0	0	0	0

N		6	5	4	3	12
	sum		0	0	0	0
Possibles		15				



S 0

tau 0

Mean 0.00
STNDEV 0
COV #DIV/0!

Trend: Zero

Confidence (lookup) 50.00%

Decsion Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

D.3 Site C Analytical and Water Level Database

Appendix E

TCAAP Well Inventory Update, FY 2006

APPENDIX E
TCAAP WELL INVENTORY UPDATE

FISCAL YEAR 2006

Purpose

The purpose of well inventory is to identify wells that have been impacted by contaminants from TCAAP or that could potentially be impacted by TCAAP contaminants.

Background

Developing and maintaining the well inventory is a process that was initiated in 1991, with the work efforts documented in several update reports since that time. Beginning in FY 1999, the update reporting was incorporated into the Annual Performance Reports.

The well inventory "study area," as defined by the Minnesota Pollution Control Agency, is shown on Figure E-1, and coincides with the Minnesota Department of Health (MDH) Special Well Construction Area.

The aquifers of concern are defined by the 1 μg/l trichloroethene contour for the Unit 3 and Unit 4 aquifers, and the 1 μg/l cis-1,2-dichloroethene contour for the Unit 1 aquifer north of TCAAP.

The "area of concern" for the Unit 3 and Unit 4 aquifers is created by adding a quarter mile buffer area outside the 1 μg/l trichloroethene contour. The area of concern for the Unit 3 and Unit 4 aquifers is shown on Figure E-2.

The area of concern for the Unit 1 aquifer north of TCAAP is delineated by city streets. The area of concern for the Unit 1 aquifer is shown on Figure E-3.

Wells within the study area are categorized based on location, depth/aquifer, and use. Well categories for the well inventory are described in Table E-1.

Program Requirements

The well inventory program requirements have evolved over time, with changes documented through the update reports. A flowchart that describes the annual requirements for maintaining the TCAAP well inventory database is shown on Figure E-4. Requirements are summarized below.

Approximately in March of each year, a database of study area wells is acquired from the MDH. This MDH database query is limited to study area wells that were constructed, sealed, or disclosed in the previous fiscal year. The MDH database consists of three lists:

1. Constructed Wells (generated through drillers submitting Water Well Records);
2. Sealed Wells (generated through drillers submitting Well Sealing Records); and
3. Disclosed Wells (made known through property transfer).

With the new MDH information, the TCAAP well inventory database is updated by recategorizing wells, as necessary, and by adding any new wells that are within the study area. Any new wells found in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a are targeted for sampling in that fiscal year; however, an attempt to reclassify any new category 4a wells will be made prior to sampling. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

Category 4 wells are those with an unknown depth or unknown location, or both. Ideally, there should be no wells in Category 4. Each year, an attempt is made to reclassify Category 4 wells into one of the other categories. This is accomplished through phone calls, letters, and/or site visits in an attempt to obtain additional information. Any wells which are re-classified as Category 1a, 1b, 1c, 2a, 2b, or 2c are targeted for sampling in that fiscal year.

"Major" well inventory sampling events occur every four years and are shown in Appendix A.1. The major sampling events are scheduled to coincide with the biennial sampling events for performance purposes as delineated in the APR. For each major event, all wells in Categories 1a, 1b, 1c, 2a, 2b, 2c, and 4a are targeted for sampling. After every sampling event, each well owner is mailed a copy of their testing results. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

For each sampling event, if any well has a detection which exceeds the applicable TCAAP groundwater cleanup level for that contaminant (or an additivity of 1.0, similar to the MDH Hazard Index calculation), the well is evaluated using the flow chart presented in Figure E-4 to determine the timing of additional sampling. Wells that are used for drinking water are sampled again within one month of data validation. Wells that are not used for drinking water, but have possible contact exposure risks, are sampled the next fiscal year. If a cleanup level exceedance is confirmed (two consecutive events), and the contaminant concentrations in the well are proportional to contaminant concentrations of the TCAAP OU1 plume, the Army offers to abandon the well and/or provide an alternate water supply.

The annual reporting requirements for the TCAAP well inventory will include:

- A list of any wells found or reclassified.
- Analytical results and a summary of sampling efforts from that fiscal year.
- Recommendations for participation in the Well Abandonment/Alternate Water Supply Program.
- An updated well inventory database that lists wells by well category.
- An updated database listing water quality of wells.

FY 2006 Update

In FY06 there was no sampling conducted. Table E-2 is included here as a placeholder only.

The updated MDH database was provided to TWISS on May 8, 2006. MDH generates the database from specific Township, Range, and Section data. This comprehensive database was screened to extract the lists of wells that were constructed, disclosed, or sealed between October 1, 2004 and September 30, 2005. Further investigative efforts were primarily focused on determining each well's location (inside or outside the study area and/or area of concern), status (active, inactive, or sealed), and water use (supply/non-supply).

Newly constructed active and inactive wells, and wells of unknown status that were determined to be located within the study area, are presented in Table E-3. With the exception one well, all newly constructed wells were monitoring wells and were classified into Category 6. The remaining well was located outside of the area of concern and was classified into Category 3.

Disclosed wells that were identified as being in use, inactive, or of unknown status (but not sealed) and that were determined to be located within the study area are identified in Table E-4. Six of these wells were Category 3 wells that required no further investigation. Four of these wells were further investigated and determined to be monitoring wells.

Sealed wells were found by reviewing the MDH sealed well list, by screening the MDH disclosed and new construction lists (which also contain sealed wells), and by talking with well owners. Wells identified as sealed are shown in Table E-5. Disclosed wells that were located within the area of concern and that the MDH identified as having a change in status from active or inactive to sealed were further investigated for confirmation of their sealed status. Any wells that were already in the TCAAP well inventory database that the MDH identified as having a change in status from active or inactive to sealed are shown in Table E-5 with strikeouts through the old well category entry. Wells identified as sealed in the MDH database updates were assigned to Category 7a (documented as sealed/abandoned). Wells that were determined to be sealed through conversations with well owners were assigned to Category 7b (undocumented as sealed, or improperly abandoned).

Thirty-nine Category 4 wells were field studied in FY 2006. This field study was accomplished through telephone calls, letters, and/or site visits in an attempt to reclassify Category 4 wells that were in the existing TCAAP well inventory database into one of the other categories. Contact information was updated, three wells were re-categorized, and three wells were deleted from the list as they were found to be located outside of the study area. A field investigation and sampling summary is included in Table E-6.

Through the FY 2006 well inventory update effort, no wells were sampled.

Information contained in Tables E-3 through E-6 has been updated in the well inventory database (Filename "Well_Inv", an Excel file included on this CD-ROM).

Recommendations

- At this time no wells are recommended for the Army to offer alternate water supply or well abandonment.
- Wells to be sampled during the next sampling event in FY 2007 are:
    - Any previously undiscovered wells determined to be in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a based on the FY 2007 review of the MDH database.
    - Any Category 4 wells that are determined, from further investigation, to be in Category 1a, 1b, 1c, 2a, 2b, or 2c.
- The next "major" well inventory sampling event will occur in FY 2009.

TABLE E-1
WELL INVENTORY CATEGORY DESCRIPTIONS

Category	*Subcategory*	*Explanation*
1		Water supply wells screened in an aquifer of concern, inside the 1 µg/l contour. Wells are divided into the following subcategories:
	1a	• Drinking water well
	1b	• Nondrinking but possible contact water
	1c	• Nondrinking, noncontact water
	1d	• Well is inoperable or has not been used for several years
	1e	• Well for which the owner has refused (or has been unresponsive to) an Army offer for abandonment, or for which the water use has been deemed acceptable
2		Water supply wells in an area of concern, inside the buffer lines, but outside the 1 µg/l contour, screened in an aquifer of concern. Wells are divided into the following subcategories:
	2a	• Drinking water well
	2b	• Nondrinking but possible contact water
	2c	• Nondrinking, noncontact water
	2d	• Well is inoperable or has not been used for several years
3		Water supply wells within the Study Area that are either outside the area of concern, or are within the area of concern but are not screened in an aquifer of concern.
4		Water supply wells with missing information, divided into the following subcategories:
	4a	• Unknown depth or aquifer, but located in the area of concern.
	4b	• Unknown location, but potentially located within the Study Area. Wells with both an unknown depth and an unknown location are included in 4b.
5		Wells that are in the study area, but that have been field checked and not located. No further action is recommended for these wells.
6		Nonsupply wells (primarily monitoring wells).
7		Sealed or abandoned wells. Wells are divided into the following subcategories:
	7a	• Documented as sealed/abandoned
	7b	• Undocumented as sealed, or improperly abandoned

TABLE E-2

WELL INVENTORY SAMPLING RESULTS
Fiscal Year 2006

No sampling conducted in FY06.

TABLE E-3
CONSTRUCTED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Use	Depth	Date Drilled
715626	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	12	09/2005
715627	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	12	09/2005
715628	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	11	09/2005
715634	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	10	09/2005
715635	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	28	09/2005
715636	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	10	09/2005
715637	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	10	09/2005
715638	6	US Army TCAAP	4700 Highway 10	Arden Hills	Monitoring	11	09/2005
719143	6	Holiday Stationstores	5695 Hackman Avenue	Fridley	Monitoring	70	01/2005
719144	6	Holiday Stationstores	5695 Hackman Avenue	Fridley	Monitoring	15	01/2005
721844	6	Canadian Pacific Railway	2729 Central Avenue Ne	Minneapolis	Monitoring	239	04/2005
721845	6	Canadian Pacific Railway	2729 Central Avenue Ne	Minneapolis	Monitoring	136	04/2005
721846	6	Canadian Pacific Railway	2729 Central Avenue Ne	Minneapolis	Monitoring	43	04/2005
726801	6	Body Cote Thermal Processing	900 E Hennepin	Minneapolis	Monitoring	40	04/2005
726802	6	Body Cote Thermal Processing	940 E Hennepin Avenue	Minneapolis	Monitoring	30	04/2005
726803	6	Body Cote Thermal Processing	940 E Hennepin Avenue	Minneapolis	Monitoring	35	04/2005
726804	6	Body Cote Thermal Processing	940 E Hennepin	Minneapolis	Monitoring	31	04/2005
726805	6	Body Cote Thermal Processing	940 E Hennepin	Minneapolis	Monitoring	29	04/2005
727216	6	Mn PCA	580 Kasota Avenue	Minneapolis	Monitoring	19	04/2005
729330	6	U of M	Sixth Street Se		Monitoring	64	07/2005
729332	6	U of M	Huron Boulevard		Monitoring	20	07/2005
729333	6	U of M	Sixth Street Se		Monitoring	62	08/2005
729334	6	U of M			Monitoring	19	07/2005
729335	6	U of M			Monitoring	60	08/2005
729336	6	U of M	Oak Street Se		Monitoring	20	07/2005
729340	6	U of M			Monitoring	20	07/2005
729341	6	U of M			Monitoring	61	08/2005
717916	3	Bell Lumber And Pole Company	778 First Street Nw	New Brighton	Remedial Well	41	12/2004

TABLE E-4
WELLS DISCLOSED THROUGH PROPERTY TRANSFER

Unique Number	Category	Last Name or Business Name	Street	City	Use	Status	Date Sealed	Depth	Aquifer	Date Drilled
	3		1755 Tatum Street	St. Paul		In Use				
	3		3170 New Brighton Road	Arden Hills		No Status Reported				
145752	3	~~Vossen~~, Edgetown Acres	1768 Terrace Drive	Shoreview		In Use				
	3	~~Engstrom~~, Edgetown Acres	1705 Terrace Drive	Shoreview		In Use				
	3	Shorewood Hills	4050 Fairview Avenue N	Arden Hills		In Use				
	3	Sunnyside Heights	2506 Sunbow Lane	New Brighton		In Use				
	6		520 Malcolm Avenue	Minneapolis	Monitoring	Not In Use				
	6	Kasota Industrial Park	550 Kasota Avenue SE	Minneapolis	Monitoring	In Use				
	6	Kasota Industrial Park	550 Kasota Avenue SE	Minneapolis	Monitoring	In Use				
	6	Kasota Industrial Park	550 Kasota Avenue SE	Minneapolis	Monitoring	In Use				

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
223105	7a	Moore Lake Highlands First	6437 Dellwood Drive Ne	Fridley	Sealed	14-Sep-2005
235539	7a	Jackson		New Brighton	Sealed	15-Oct-2004
255908	7a		2035 University Avenue Se	Minneapolis	Sealed	5-Aug-2005
255996	7a		2035 University Avenue Se	Minneapolis	Sealed	5-Aug-2005
443255	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
443256	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
471129	7a	Magellan Pipeline Company	2451 W County Road C	Roseville	Sealed	25-Aug-2005
497385	7a	Mabel & Louise Garments	14 27th Avenue	Minneapolis	Sealed	29-Oct-2004
527360	7a	Magellan Pipeline Company	2755 Long Lake Road	Roseville	Sealed	25-Aug-2005
599546	7a	Glidden Company	1901 Hennepin Avenue E	Minneapolis	Sealed	11-May-2005
599547	7a	Glidden Company	1901 Hennepin Avenue E	Minneapolis	Sealed	11-May-2005
612712	7a	Williams Pipe Line Company	2950 Long Lake Road	Roseville	Sealed	25-Aug-2005
624047	7a	Dresser/Rand Company	347 Harrison Street	Minneapolis	Sealed	26-Sep-2005
H0028378	7a	Auditors Subdivision No. 92	1535 Gardena Avenue Ne	Fridley	Sealed	7-Mar-2005
H0043345	7a	Falcon Woods	1966 Roselawn Avenue	Falcon Heights	Sealed	6-Jan-2005
H0054402	7a	Pinewood Terrace No. 4	5337 Clifton Drive	Mounds View	Sealed	5-Jan-2005
H0091872	7a	Brookview	6810 Channel Road	Fridley	Sealed	9-Feb-2005
H0200575	7a		1225 Winter Street	Minneapolis	Sealed	17-Nov-2004
H0204735	7a		2929 University Avenue Se	Minneapolis	Sealed	11-Mar-2005
H0204740	7a		2929 University Avenue Se	Minneapolis	Sealed	11-Apr-2005
H0205086	7a		3232 New Brighton Road	Arden Hills	Sealed	17-Nov-2004
H0217072	7a	Auditors Subdivision No. 94	1385 Skywood Lane Ne	Fridley	Sealed	19-Nov-2004
H0217098	7a		2442 W County Road D	Roseville	Sealed	22-Oct-2004
H0217101	7a	Pinewood Terrace No. 2	5298 Pinewood Court	Mounds View	Sealed	28-Oct-2004
H0217127	7a		5085 Rainbow Lane	Mounds View	Sealed	18-Jan-2005
H0217137	7a		1828 Draper Drive	Roseville	Sealed	10-Mar-2005
H0221128	7a	Brookview	2215 Rainbow Avenue	New Brighton	Sealed	7-Mar-2005
H0222049	7a		1962 Stowe Avenue	St. Paul	Sealed	5-Apr-2005
H0222056	7a		2195 Marion Street	Roseville	Sealed	28-Apr-2005
H0222921	7a	Brookeview (Also Lot 12)	6887 Channel Road Ne	Fridley	Sealed	10-Dec-2004
H0223106	7a	Moore Lake Highlands First	6437 Dellwood Drive Ne	Fridley	Sealed	23-Jun-2005
H0224409	7a	Rohleders Home And Garden Acres	3695 New Brighton Road	Arden Hills	Sealed	16-Dec-2004
H0224410	7a	Rohleders Home And Garden Acres	3695 New Brighton Road	Arden Hills	Sealed	16-Dec-2004
H0225677	7a		2202 Oriole Avenue	New Brighton	Sealed	13-Apr-2005
H0225908	7a		0 Essex (& Ontario) Street	Minneapolis	Sealed	9-Dec-2004
H0226032	7a		1736 Snelling Avenue N	Falcon Heights	Sealed	13-Oct-2004
H0226540	7a		1851 Central Avenue Ne	Minneapolis	Sealed	14-Nov-2004
H0226623	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226624	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226625	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226626	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
H0226628	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226629	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226630	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226632	7a		2451 W County Road C	Roseville	Sealed	25-Aug-2005
H0226929	7a		1427 Highway 8, Old	New Brighton	Sealed	3-Dec-2004
H0227424	7a			Shoreview	Sealed	7-Oct-2004
H0227537	7a		0 Lexington Avenue		Sealed	15-Feb-2005
H0228586	7a	Menges Supplement To East Side Addition To Minneapolis	2622 Taylor Street Ne	Minneapolis	Sealed	13-Oct-2004
H0228884	7a		1901 13th Street Ne	Arden Hills	Sealed	10-Dec-2004
H0228987	7a		2174 Rosewood Lane S	Roseville	Sealed	12-Apr-2005
H0229393	7a		1989 Longview Drive	New Brighton	Sealed	30-Apr-2005
H0229619	7a		3059 16th Street Nw	New Brighton	Sealed	4-Jan-2005
H0230405	7a		557 Fifth Avenue Nw	New Brighton	Sealed	1-Apr-2005
H0230447	7a	Vermont Park (Also Lot 5)	322 Second Avenue Se	New Brighton	Sealed	30-Nov-2004
H0230486	7a	Auditors Subdivision No. 10	1340 66th Avenue Ne	Fridley	Sealed	19-Nov-2004
H0230489	7a		1865 Stowe Avenue	Arden Hills	Sealed	3-May-2005
H0230592	7a		2470 Highcrest Road	Roseville	Sealed	6-Dec-2004
H0230795	7a		1001 Westgage Drive	St. Paul	Sealed	28-Feb-2005
H0230957	7a		2529 Maple Lane	Roseville	Sealed	1-Mar-2005
H0231303	7a		1987 Highway 8, Old Nw	New Brighton	Sealed	14-Dec-2004
H0231765	7a	Knollwood Park	7069 Pleasant View Drive	Mounds View	Sealed	4-Feb-2005
H0231767	7a		5155 Bona Road	Mounds View	Sealed	7-Feb-2005
H0231774	7a		119 14th Street Nw	New Brighton	Sealed	11-Apr-2005
H0232098	7a		2929 University Avenue Se	Minneapolis	Sealed	27-Jan-2005
H0232143	7a		2446 University Avenue W	St. Paul	Sealed	26-May-2005
H0232359	7a			Minneapolis	Sealed	6-Apr-2005
H0232446	7a		2814 Cleveland Avenue N	Roseville	Sealed	12-Aug-2005
H0232447	7a		2690 Cleveland Avenue N	Roseville	Sealed	9-Aug-2005
H0232448	7a		1947 County Road C	Roseville	Sealed	15-Aug-2005
H0232449	7a		2680 Prior (2680-2690) Avenue N	Roseville	Sealed	15-Aug-2005
H0232467	7a		2378 Long Lake Road	New Brighton	Sealed	24-May-2005
H0232726	7a		1901 NE 13th Street	Arden Hills	Sealed	3-Feb-2005
H0232761	7a		2550 14th Street Nw	New Brighton	Sealed	17-Feb-2005
H0233116	7a		451 Stinson Boulevard	Minneapolis	Sealed	23-May-2005
H0234457	7a		5695 Hackmann Avenue Ne	Fridley	Sealed	8-Jun-2005
H0234491	7a		2303 Palmer Drive	New Brighton	Sealed	22-Jul-2005
H0234559	7a		7373 Knollwood Drive	Mounds View	Sealed	27-Apr-2005
H0234564	7a		2629 Valleyview Lane	New Brighton	Sealed	10-May-2005
H0234579	7a		1842 Draper Drive	Roseville	Sealed	5-Jun-2005
H0234582	7a		5454 Jackson Drive	Mounds View	Sealed	21-Jun-2005
H0234600	7a		1629 Glenview Court	Arden Hills	Sealed	18-Jul-2005

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
H0234603	7a		2901 County Road H2	Mounds View	Sealed	20-Jul-2005
H0234618	7a		1351 Hillcrest Drive	Fridley	Sealed	23-Aug-2005
H0234623	7a		6805 Channel Road Ne	Fridley	Sealed	2-Sep-2005
H0235054	7a		0		Sealed	2-Jun-2005
H0235085	7a		2335 Highway 36 W	St. Paul	Sealed	9-Sep-2005
H0235105	7a		2650 Cleveland Avenue N	Roseville	Sealed	19-Jul-2005
H0235106	7a		1947 County Road C	Roseville	Sealed	15-Jul-2005
H0235107	7a		2680 Prior (2680-2690) Avenue	Roseville	Sealed	3-Aug-2005
H0235108	7a		2814 Cleveland Avenue N	Roseville	Sealed	10-Aug-2005
H0235109	7a			Shoreview	Sealed	9-Aug-2005
H0235201	7a		0 County Road E	New Brighton	Sealed	4-Aug-2005
H0235202	7a		15 Highway 8, Old Sw	New Brighton	Sealed	28-Jul-2005
H0235203	7a		0 County Road E	New Brighton	Sealed	27-Jul-2005
H0235204	7a		1001 County Road E	New Brighton	Sealed	25-Jul-2005
H0235205	7a		10 Highway 8, Old Sw	New Brighton	Sealed	26-Jul-2005
H0235206	7a		1008 First Street Nw	New Brighton	Sealed	29-Jul-2005
H0235207	7a		105 Highway 8, Old Nw	New Brighton	Sealed	4-Aug-2005
H0235208	7a		150 Highway 8, Old Nw	New Brighton	Sealed	4-Aug-2005
H0235535	7a		2100 Larpenteur Avenue W	St. Paul	Sealed	27-Jul-2005
H0235706	7a		2161 W County Road B	Roseville	Sealed	23-May-2005
H0236642	7a			Roseville	Sealed	28-Jul-2005
H0236688	7a		2940 Spring View Lane	Mounds View	Sealed	28-Jul-2005
H0236784	7a		1715 Fifth Street Se	Minneapolis	Sealed	23-Aug-2005
H0236796	7a		0 Fulham (& Roselawn Av) Street	Roseville	Sealed	16-Sep-2005
H0237291	7a		0 Sixth Street Se	Minneapolis	Sealed	28-Jul-2005
H0237292	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237293	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237294	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237295	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237296	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237297	7a		0 Sixth Street Se	Minneapolis	Sealed	6-Jul-2005
H0237298	7a		0 Sixth Street Se	Minneapolis	Sealed	7-Jul-2005
H0237299	7a		0 Sixth Street Se	Minneapolis	Sealed	7-Jul-2005
H0237300	7a		0 Sixth Street Se	Minneapolis	Sealed	7-Jul-2005
H0237301	7a		0 Sixth Street Se	Minneapolis	Sealed	8-Jul-2005
H0237302	7a		0 Huron Boulevard	Minneapolis	Sealed	11-Jul-2005
H0237303	7a		0 Oak Street Se	Minneapolis	Sealed	11-Jul-2005
H0237304	7a		0 Oak Street Se	Minneapolis	Sealed	12-Jul-2005
H0237305	7a		0 Huron Boulevard	Minneapolis	Sealed	12-Jul-2005
H0237812	7a		1330 Amble Road	Arden Hills	Sealed	30-Sep-2005
H0237887	7a		501 30th Avenue S	Minneapolis	Sealed	20-Jul-2005

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
H0237888	7a		501 29th Avenue Se	Minneapolis	Sealed	21-Jul-2005
H0238234	7a		2425 Kennedy Terrace Ne	Minneapolis	Sealed	12-Sep-2005
H0238602	7a		3377 Lake Johanna Boulevard	Arden Hills	Sealed	28-Jul-2005
H0239159	7a		7299 Highway 65 Ne	Fridley	Sealed	18-Aug-2005
H0239192	7a		737 Pelham Boulevard	St. Paul	Sealed	8-Sep-2005
H0245082	7a			Arden Hills	Sealed	25-Apr-2005
	7a	Moore Lake Hills	1354 Hillcrest Drive Ne	Fridley	Sealed	29-Dec-2004
	7a	Shorewood Hills No. 2	1767 Venus Avenue	Arden Hills	Sealed	22-Aug-2005
	7a	Beisswenger Hardware	1873 Highway 8, Old Nw	New Brighton	Sealed	17-Aug-2005
	7a	Beisswenger Hardware	1873 Highway 8, Old Nw	New Brighton	Sealed	17-Aug-2005
	7a	Beisswenger Hardware	1873 Highway 8, Old Nw	New Brighton	Sealed	17-Aug-2005
	7a	Lake Johanna Park	1912 Edgewater Avenue	Arden Hills	Sealed	17-Aug-2005
	7a	Sunset View	1995 Skillman Avenue W	Roseville	Sealed	6-Jan-2005
	7a	Sunset View	1995 Skillman Avenue W	Roseville	Sealed	6-Jan-2005
	7a	Vermont Park	204 Third Avenue Se	New Brighton	Sealed	9-Nov-2004
	7a	Sunnyside Heights	2156 Cedar Drive	New Brighton	Sealed	6-Jan-2005
	7a	Boarmaris Five Acre Lots	2191 Roselawn Avenue W	Roseville	Sealed	6-Jan-2005
	7a	Boarmaris Five Acre Lots	2191 Roselawn Avenue W	Roseville	Sealed	6-Jan-2005
	7a	Lamberts	2222 Bronson Drive	Mounds View	Sealed	4-Jan-2005
	7a	Fairways Subdivision	2370 County Road B	Roseville	Sealed	18-Aug-2005
	7a	Sunnyside Heights	2395 Brighton Lane	New Brighton	Sealed	9-Feb-2005
	7a	Sunnyside Heights	2503 Silver Lake Road	New Brighton	Sealed	9-Feb-2005
	7a	Sunnyside Heights	2530 Sunbow Lane	New Brighton	Sealed	9-Feb-2005
	7a	Knollwood Park No. 2	2578 Eastman Drive Ne	New Brighton	Sealed	5-Jan-2005
	7a		2597 Cleveland Avenue N	Roseville	Sealed	6-Jan-2005
	7a	Fourth	2598 Charlotte Street	Roseville	Sealed	9-Feb-2005
	7a	Knollwood Park Ramsey County	2908 County Road H2	Mounds View	Sealed	5-Jan-2005
	7a	Knollwood Park Ramsey County	2908 County Road H2	Mounds View	Sealed	5-Jan-2005
	7a	Hall Edgewater Estates	3066 Arthur Street	Roseville	Sealed	9-Feb-2005
	7a	Hedlunds	3085 Mildred Drive	Roseville	Sealed	7-Mar-2005
	7a		560 Highway 8, Old Sw	New Brighton	Sealed	22-Aug-2005
	7a		560 Highway 8, Old Sw	New Brighton	Sealed	22-Aug-2005
	7a	Dennis (Also Lot 10)	6633 Central Avenue Ne	Fridley	Sealed	17-Feb-2005
	7a	Greenfield Plat 2	7630 Greenfield Avenue	Mounds View	Sealed	18-Aug-2005
231878	~~1e~~, 7a	Mengelkoch Co.	119 14th Street Nw	New Brighton	~~Active~~, Sealed	18-Mar-2005
463059	~~6~~, 7a	H.B. Fuller Company	520 Malcolm Avenue	Minneapolis	~~Active~~, Sealed	12-Jan-2005
468587	~~6~~, 7a	~~Northern States Power Co,~~ Union Pacific Railroad Company	1701 Sixth Street Se	Minneapolis	~~Active~~, Sealed	21-Mar-2005
471128	~~6~~, 7a	~~MW-27D,~~ Magellan Pipeline Company	2451 W County Road C	Roseville	~~Active~~, Sealed	25-Aug-2005
472961	~~6~~, 7a	Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	6-May-2005
472962	~~6~~, 7a	Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	6-May-2005
472964	~~6~~, 7a	Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	6-May-2005

TABLE E-5
SEALED WELLS

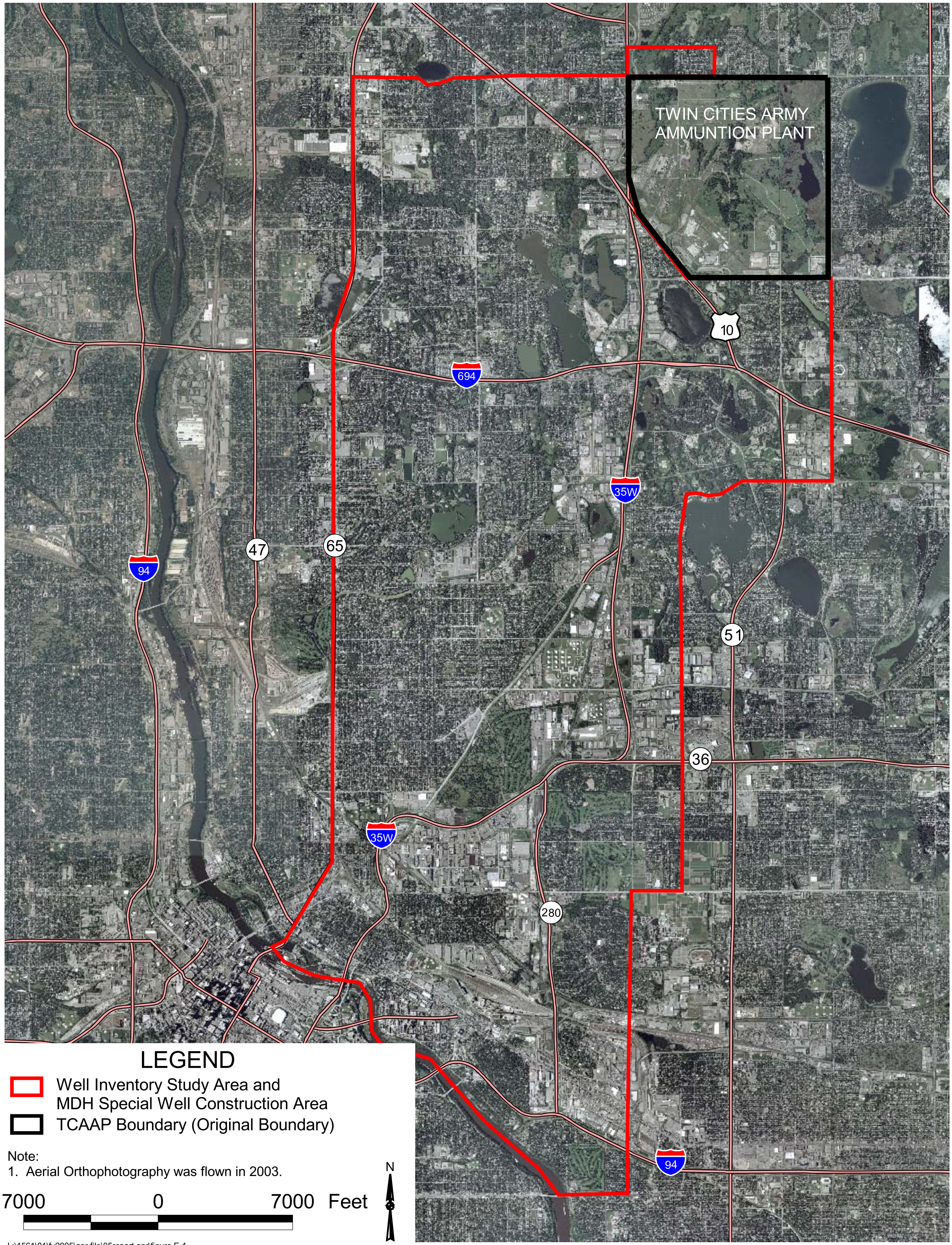
Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
478929	~~6~~, 7a	Garmers	14 27th Avenue Se	Minneapolis	~~Active~~, Sealed	29-Oct-2004
478930	~~6~~, 7a	Bame	838 Thornton Street	Minneapolis	Sealed	29-Oct-2004
478931	~~6~~, 7a	~~U of MN,~~ University Health Care Center	22 27th Avenue Se	Minneapolis	Sealed	29-Oct-2004
484959	~~6~~, 7a	~~Williams Bros Pipeline~~, Magellan Pipeline Company	2451 W County Road C	Roseville	~~Active~~, Sealed	25-Aug-2005
490051	~~6~~, 7a	Gopher Oil Company	825 Thornton Street Se	Minneapolis	~~Active~~, Sealed	29-Oct-2004
491933	~~6~~, 7a	~~Gopher Oil Co~~, Unocal Corporation	825 Thornton Street Se	Minneapolis	~~Active~~, Sealed	29-Oct-2004
507385	~~6~~, 7a	H.B. Fuller Company	520 Malcolm Avenue	Minneapolis	~~Active~~, Sealed	12-Jan-2005
519480	~~6~~, 7a	~~Williams Bros Pipeline~~, Magellan Pipeline Company	2451 W County Road C	Roseville	Sealed	25-Aug-2005
527359	~~6~~, 7a	~~MW-32~~, Magellan Pipeline Company	2845 Long Lake Road	Roseville	~~Active~~, Sealed	25-Aug-2005
527361	~~6~~, 7a	~~MW-31~~, Magellan Pipeline Company	2480 Long Lake Road	Roseville	~~Active~~, Sealed	25-Aug-2005
533624	~~6~~, 7a	~~MW-4~~, Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	6-May-2005
533625	~~6~~, 7a	~~MW-5~~, Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	16-May-2005
533626	~~6~~, 7a	~~MW-6~~, Pennzoil Quaker State Co. Sopus Products	7000 Highway 65 Ne	Fridley	~~Active~~, Sealed	6-May-2005
564028	~~6~~, 7a	Glidden Paint Company	1901 Hennepin Avenue E	Minneapolis	~~Active~~, Sealed	11-May-2005
564029	~~6~~, 7a	Glidden Paint Company	1901 Hennepin Avenue E	Minneapolis	~~Active~~, Sealed	11-May-2005
564030	~~6~~, 7a	Glidden Paint Company	1901 Hennepin Avenue E	Minneapolis	~~Active~~, Sealed	11-May-2005
576183	~~6~~, 7a	~~Allen~~, Bradford Industrial Properties	2327 Wycliff Street	St. Paul	~~Active~~, Sealed	16-Feb-2005
576184	~~6~~, 7a	~~Allen~~, Bradford Industrial Properties	2327 Wycliff Street	St. Paul	~~Active~~, Sealed	16-Feb-2005
576185	~~6~~, 7a	~~Allen~~, Bradford Industrial Properties	2327 Wycliff Street	St. Paul	~~Active~~, Sealed	16-Feb-2005
594615	~~6~~, 7a	Hillcrest Development	3311 Broadway Street Ne	Minneapolis	~~Active~~, Sealed	15-Mar-2005
599698	~~6~~, 7a	Hillcrest Development	3311 Broadway Street Ne	Minneapolis	~~Active~~, Sealed	15-Mar-2005
624046	~~6~~, 7a	Dresser/Rand Company	347 Harrison Street	Minneapolis	~~Active~~, Sealed	26-Sep-2005
624048	~~6~~, 7a	Dresser/Rand Company	347 Harrison Street	Minneapolis	~~Active~~, Sealed	26-Sep-2005
658163	~~6~~, 7a	Union Pacific Railroad Co	2000 Elm Street	Minneapolis	~~Active~~, Sealed	21-Mar-2005
658164	~~6~~, 7a	Union Pacific Railroad Co.	2000 Elm Street	Minneapolis	~~Active~~, Sealed	21-Mar-2005
658165	~~6~~, 7a	Union Pacific Railroad	2000 Elm Street	Minneapolis	~~Active~~, Sealed	21-Mar-2005
658166	~~6~~, 7a	Union Pacific Railroad Co.	2000 Elm Street	Minneapolis	~~Active~~, Sealed	21-Mar-2005
658167	~~6~~, 7a	Union Pacific Railroad Co.	2000 Elm Street	Minneapolis	~~Active~~, Sealed	21-Mar-2005
658192	~~6~~, 7a	Wiswell	1851 Central Avenue Ne	Minneapolis	~~Active~~, Sealed	4-Nov-2004
658193	~~6~~, 7a	Wiswell	1851 Central Avenue Ne	Minneapolis	~~Active~~, Sealed	4-Nov-2004
659857	~~6~~, 7a	Union Pacific Railroad Company	2200 8th St SE (1701 Sixth Street Se)	Minneapolis	~~Active~~, Sealed	21-Mar-2005
659859	~~6~~, 7a	Union Pacific Railroad Company	2200 8th St SE (1701 Sixth Street Se)	Minneapolis	~~Active~~, Sealed	21-Mar-2005
674795	~~6~~, 7a	~~MN, State Of, Bldg. Construction Div.~~, State Architects Office	5420 Highway 8	Arden Hills	~~Active~~, Sealed	20-Apr-2005
674796	~~6~~, 7a	~~MN, State Of, Bldg. Construction Div.~~, State Architects Office	5420 Highway 8	Arden Hills	~~Active~~, Sealed	20-Apr-2005
674797	~~6~~, 7a	~~MN, State Of, Bldg. Construction Div.~~, State Architects Office	5420 Highway 8	Arden Hills	~~Active~~, Sealed	20-Apr-2005
678201	~~6~~, 7a	Ingersoll Rand Company	347 Harrison Street	Minneapolis	~~Active~~, Sealed	26-Sep-2005
678202	~~6~~, 7a	Ingersoll Rand Company	347 Harrison Street	Minneapolis	~~Active~~, Sealed	26-Sep-2005
678203	~~6~~, 7a	Ingersoll Rand Company	347 Harrison Street	Minneapolis	~~Active~~, Sealed	26-Sep-2005
682738	~~6~~, 7a	U of M	1715 Fifth Street Se	Minneapolis	~~Active~~, Sealed	12-Sep-2005
688419	~~6~~, 7a	~~Samina - Sci~~, Secure Mini Storage	2516 Wabash Avenue	St. Paul	~~Active~~, Sealed	8-Apr-2005
688420	~~6~~, 7a	~~Samina - Sci~~, Secure Mini Storage	2516 Wabash Avenue	St. Paul	~~Active~~, Sealed	8-Apr-2005

TABLE E-5
SEALED WELLS

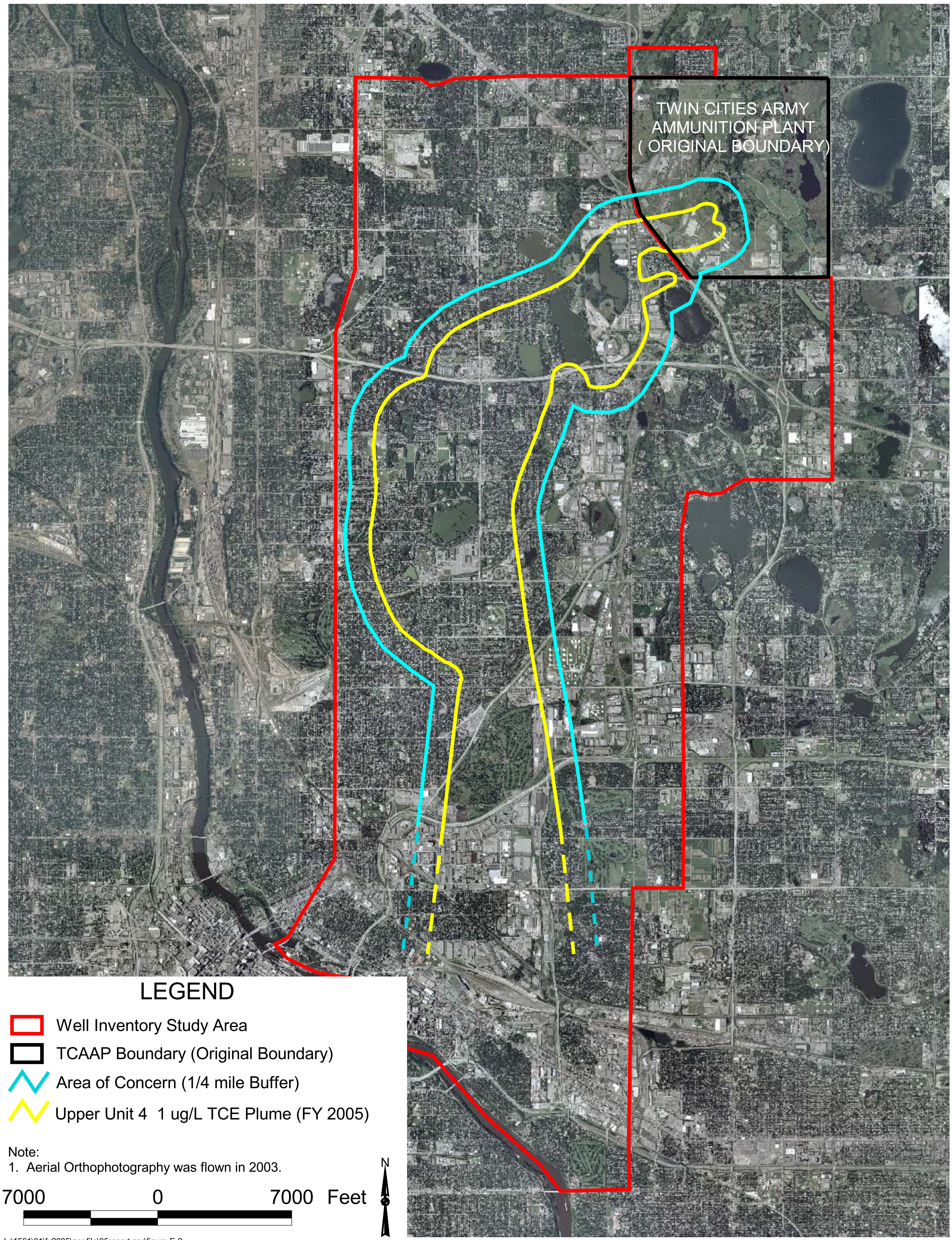
Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
691868	~~6~~, 7a	Wiswell	1851 Central Avenue Ne	Minneapolis	~~Active~~, Sealed	4-Nov-2004
691869	~~6~~, 7a	Wiswell	1851 Central Avenue Ne	Minneapolis	~~Active~~, Sealed	4-Nov-2004
694199	~~6~~, 7a	Hillcrest Development	3311 Broadway Street Ne	Minneapolis	~~Active~~, Sealed	15-Mar-2005
694200	~~6~~, 7a	Hillcrest Development	3311 Broadway Street Ne	Minneapolis	~~Active~~, Sealed	15-Mar-2005
H0230435	~~7b~~, 7a	Anderson	1758 Venus Avenue	Arden Hills	Sealed	5-Nov-2004
	4~~b~~, 7b	Brighton Land Development, LLC	1001 County Rd E West	New Brighton	~~Active~~, Sealed	
	4~~b~~, 7b	Nottestad	1001 County Rd E West	New Brighton	~~Active~~, Sealed	

TABLE E-6
FY 2006 FIELD INVESTIGATION AND SAMPLING SUMMARY

Unique Number	*Category*	*Last Name or Business Name*	*Street*	*City*	*Date Last Sampled*	*Status*	*Depth*	*Comments*
	4a	City of New Brighton	19 14th St NW	New Brighton		Active		Could not locate.
	4a	Burton	2073 10th St NW	New Brighton		Inactive		Well inoperable per owner.
	4a	Tabaika	2512 27th Ave NE	St. Anthony		Inactive		No response.
	4a	Willig	2600 Pahl Ave	St. Anthony		Inactive		No response.
	4a	Weisenberger	2816 Silver Lake Rd	St. Anthony		Inactive		No response.
	4a	Amundsen	2816 St. Anthony Blvd	St. Anthony		Not in Use		Well inoperable per owner.
	4a	Cuddihy	2933 Troseth Road	Roseville		Not in Use		Well inoperable per owner.
	4a	Hermes	2935 Old Hwy 8	Roseville	6/22/2005	Active		Scheduled to sample in 2009
	4a	Olson	4439 Old Hwy 10	Arden Hills		In Use		No response.
	4a	Bryant, Jr.	615 12th Ave NW	New Brighton		Not in Use		Well inoperable per owner.
249185	4a	Novotny	1706 Malvern St	Lauderdale		Unknown		No response.
S00295	4a	Alfson	2351 Summer St	Lauderdale		Unknown		No response.
	4b	New Brighton Alano Society, Inc.		Mounds View		Active		Could not locate.
	4b	New Brighton Alano Society, Inc.		Mounds View		Active		Could not locate.
	4b	Meridian Properties Real Estate Dev., LLC.	3700 Silver Lake Rd	St. Anthony		Active		Could not locate.
105242	4b	Weber, Nordeen Jr.				Active	214	Could not locate.
105271	4b	Nelson				Active	137	Could not locate.
126463	4b	B & M Construction	Nordeen Estates			Active	216	Could not locate.
130000	4b	550 Associates		Arden Hills		Inactive		Could not locate.
130000	4b	550 Associates		Arden Hills		Inactive		Could not locate.
180922	4b					Active		Could not locate.
192091	4b			Elmwood		Active		Could not locate.
201192	4b					Active		Could not locate.
234434	4b	Marquart		Arden Hills		Unknown		Could not locate.
234532	4b							Could not locate.
234537	4b							Could not locate.
234545	4b				PHASE I			Could not locate.
234568	4b	Thomsen	4 88th NE	Minneapolis			200	No response.
234658	4b				6/7/1982			Could not locate.
239465	4b	Lennox				Active	256	Could not locate.
S00471	4b	R Komarek/Nelson-Miller Cons				Inactive		Could not locate.
S00551	4b	Tamarack Care Temp			2/17/1982	Unknown		Could not locate.
S00650	4b	CME		New Brighton	6/24/1984			Could not locate.
249150	4~~a~~, 5	Coldor	3511 Stinson Blvd NE	St. Anthony		Unknown		Site visit, owner bought home in 1999 and reports no well.
	4~~b~~, 7b	Brighton Land Development, LLC	1001 County Rd E West	New Brighton		~~Active~~, Sealed		Owner had wells sealed prior to purchasing property ~2003. No water supply wells on property.
	4~~b~~, 7b	Nottestad	1001 County Rd E West	New Brighton		~~Active~~, Sealed		Owner had wells sealed prior to purchasing property ~2003. No water supply wells on property.
148132	4~~b~~, delete	Vince Velie, H & H Construction		Maple Plain		Active	190	Well located outside of study area - delete from list
239468	4~~b~~, delete	Burlington Northern Railroad		Minneapolis		Active	253	Well located outside of study area - delete from list
239469	4~~b~~, delete	Great Northern Railway				Active	200	Well located outside of study area - delete from list

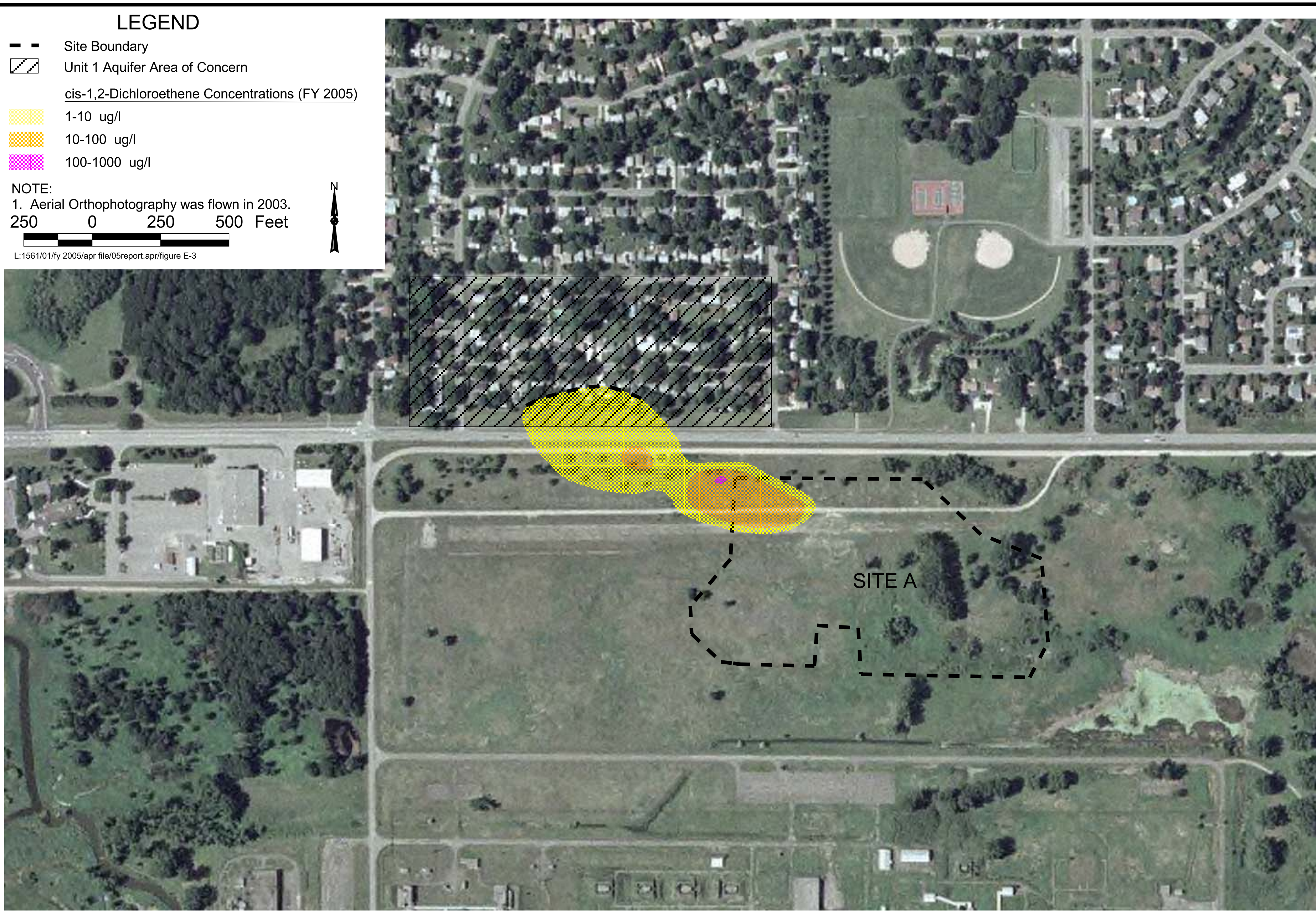


TWIN CITIES ARMY AMMUNITION PLANT	COPYRIGHT Wenck	FY 2006
Well Inventory Study Area	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	Figure E-1



L:\1561\01\fy2005\apr file\05report.apr\figure E-2

TWIN CITIES ARMY AMMUNITION PLANT	COPYRIGHT Wenck	FY 2006
Areas of Concern (Unit 3 and Unit 4)	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	Figure E-2



TWIN CITIES ARMY AMMUNITION PLANT

Area of Concern (Unit 1)

COPYRIGHT Wenck

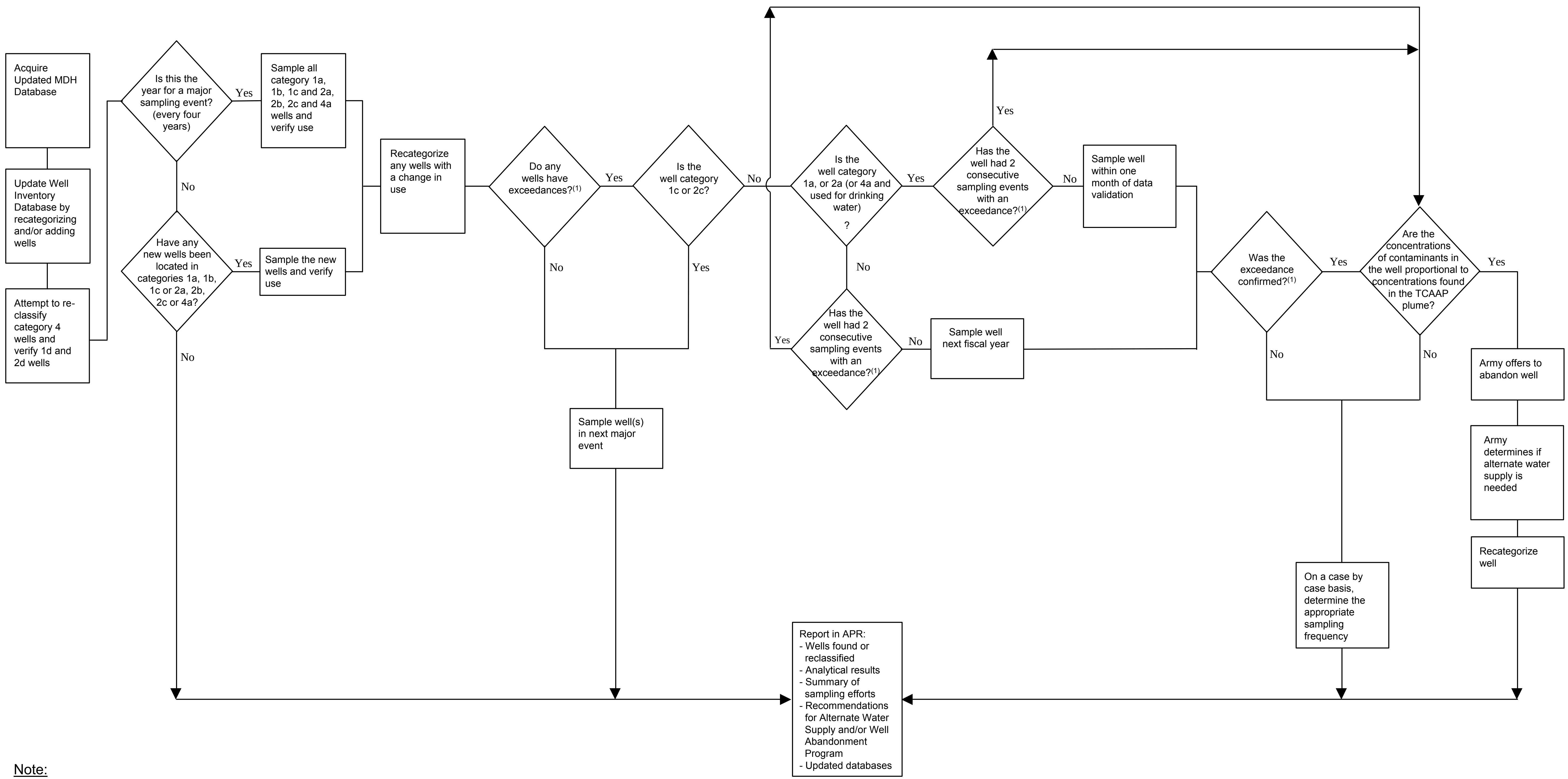
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0249

FY 2006

Figure E-3

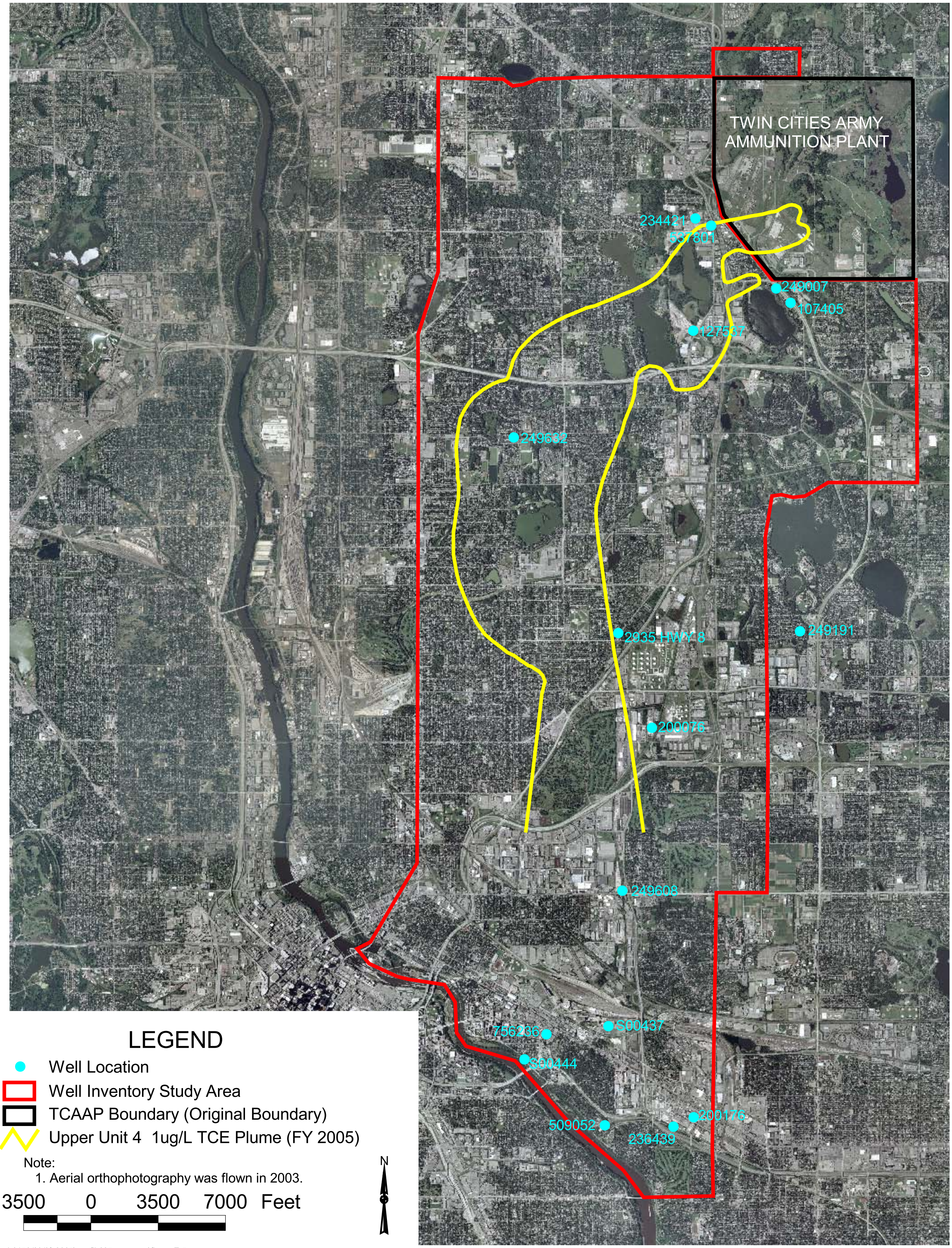
Figure E-4

Annual Requirements for Maintaining TCAAP Well Inventory Database



Note:

(1) = Exceedance of a TCAAP Groundwater Cleanup Level



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TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers	1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2006
FY2005 Well Inventory Sampling Locations			Figure E-5

TCAAP WELL INVENTORY DATABASE

The TCAAP Well Inventory Database is located on this CD-ROM in the following Microsoft Excel file:

Well_Inv.xls

Appendix F

Site K, TGRS, and PGRS Operational Data

F.1 Inspection and Maintenance Activities, Fiscal Year 2006, Site K, TCAAP

APPENDIX F.1

INSEPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

October 2005

1) 10/21/2005, Performed monthly O&M, increased flow rate to 14.5 gpm

2) 10/25/2005, Removed obstruction from nozzle, reset flow to 18 gpm.

November 2005

1) 11/2/05, Monthly O&M performed. System downtime: None.

2) 11/10/05, System in suspense. System downtime: None.

3) 11/11/05, System in suspense. System downtime: None.

4) 11/21/05, System in suspense. System downtime: None.

5) 11/30/05, System in suspense. System downtime: None.

December 2005

1) 12/6/05, System in suspense. System downtime: None.

2) 12/13/05, System in suspense. System downtime: None.

3) 12/20/05,System in suspense. System downtime: None.

4) 12/21/05, Monthly O&M performed. System downtime: None.

January 2006

1) 1/5/06, System in suspense. System downtime: None.

2) 1/13/06, System in suspense. System downtime: None.

3) 1/25/06, Monthly O&M performed. System downtime: None.

4) 1/31/06, System in suspense. System downtime: None.

February 2006

1) 2/13/06, System in suspense. System downtime: None. Performed Monthly O&M.

2) 2/27/06, System in suspense. System downtime: None.

APPENDIX F.1

INSEPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

March 2006

1) 3/15/06, System down, low building temperature fault. System downtime approx. 35 hours.

2) 3/16/06, System in suspense. System downtime: None.

3) 3/21/06, System in suspense. System downtime: None.

4) 3/22/06, System in suspense. System downtime: None.

5) 3/23/06, System in suspense. System downtime: None.

6) 3/28/06, Performed system monthly O&M.

7) 3/29/06, System in suspense. System downtime: None.

April 2006

1) 4/6/06, System in suspense. System downtime: None

2) 4/11/06, System down due to high water level alarm. System downtime approx. 48 hours.

3) 4/20/06, System in suspense. System downtime: None.

4) 4/26/06, Performed system monthly O&M. System downtime: None.

5) 4/29/06, Power failure. Power outage occurred approx. 1200 on 4/28/06. Power restored to system by Excel Energy on 5/1/06 at approx. 1700. System downtime approx. 79 hours.

May 2006

1) 5/1/06, Power failure. Power restored at approximately 1700. System downtime approximately 17 hours.

2) 5/31/06, Performed system monthly O&M. System downtime: None

June 2006

1) 6/16/06, Performed system monthly O&M. System downtime: None

APPENDIX F.1

INSEPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

July 2006

1) 7/28/06, Performed system monthly O&M. System downtime: None

August 2006

1) 8/31/06, Performed system monthly O&M. Also performed annual system cleaning. System shut down due to low flow fault and would not restart. System downtime. Approximately 15 h

September 2006

1) 9/1/06, System shut down for repairs. Blower motor replaced, submersible pump repaired System downtime: approximately 19 days, 13 hours.

2) 9/27/06, Performed monthly O&M. System downtime: None.

F.2 Maintenance Activities, Fiscal Year 2006, TGRS, TCAAP

APPENDIX F.2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

October 2005

10/3/2005	Treatment System; Shut down well field and treatment system to facilitate cleaning of the wet wells. Down time: 6 hours at each pumphouse.
10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
10/6-8/2005	Pumphouse B4; ECV will not stay open; Replaced solenoid valve and observed normal operation. Down time: 14 hours.
10/8-15/2005	Treatment System; Call out from autodialer, CRA responds; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted opening and closing speed valves but to no avail; Likely a bad seal; Well field is cycling; Shut off part of the well field to negate cycling of wells; All Enviro called to install a valve seal repair kit on 10/14/2005. Treatment System Lock out/Tagout and health and safety meeting performed; The valve seal kit was installed and the ECV 3 operated normally. Down time: B1, B13, B5, B6, SC1 and SC5 for 39 hours each; B3, B8, B11 and SC2 for 117 hours each; B9 for 87 hours.
10/15/2005	Treatment System; ECV 3 required additional adjustment after the new valve seal was installed; The well field cycled overnight. Down time: 4 hours at B1, B5, B6 and SC5; 8 hours at B13, B8, B9 and B11.
10/13-14/2005	Treatment System; Qwest on site to repair autodialer phone line. Down time: None.
10/22/2005	Pumphouse B3; In-ground concrete enclosure for the communication cables has a broken cover possibly from the lawn mower or the track mounted tree grinder. Down time: None.
10/24/2005	Pumphouse SC1; Power line across road to pumphouse is not repaired yet; Tied blaze orange tape on wires to warn potential pedestrians/motorists. Down time: None.
10/26-31/2005	Pumphouse SC5; Light flashing on PLC; Reset well field and light came on steady. Down time: 50 hours.

APPENDIX F.2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

November 2005

11/2/2005	Treatment System; Call out from Autodialer; TGRS fail; ECV 3 will not open on command; Change filter, flush control piping, adjust speed control valves and cycle valve several times to observe normal operation. Down time: None.
11/3/2005	Pumphouse B3; Changed out failed pilot with new and adjusted flow rate to 130 gpm. Down time: None.
11/3/2005	Pumphouse SC5; Changed out old pilot, old solenoid valve and one way check valves to attempt to control flow rate; All work failed; Likely will require a new 3" CLA-VAL check valve. Down time: 2 hours.
11/4-8/2005	Treatment System; Call out from Autodialer; TGRS fail; ECV 3 will not open on command; Changed filter, flushed control piping, adjusted speed control valves, changed out pilot with new; changed out solenoid valve with new but all to no avail; Turned off extraction wells B3, B5, B8, B9, SC2 and B11 to negate well field cycling. All Enviro on site on 11/8/2005; Changed out solenoid valve body and valve began working normally. Down time: 12 hours at B1 and B6; 47 hours at B13, B5 and SC1; 78 hours at SC2 and 94 hours at B3, B8, B9 and B11.
11/17-28/2005	Pumphouse SC5 shut down for well re-development. Down time: 257 hours.
11/17/2005	Pumphouse SC3 heater not operating. Laughlin Electric replaced thermostat with new. Down time: None.
11/25/2005	Treatment System; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: None.
11/25/2005	Treatment System; ECV 4 will not open on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: None.

APPENDIX F.2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

11/28-30/2005	Treatment System; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: 52 hours at B13, B3, B6, B8, B9 and B11 and 28 hours at SC1.

December 2005

12/1 and 12/8/2005	Pumphouse SC2; Forcemain pressure was too high; Adjusted gate valve to 82 psi and measured normal flow rate. Down time: 9.8 hours.
12/13/2005	Pumphouse B6; Changed out flow meter and totalizer with new. Down time: None.
12/13/2005	Pumphouse B13; Changed out flow meter and totalizer with new. Down time: None.
12/13/2005	Pumphouse SC2; Changed out flow meter and totalizer with new. Down time: None.
12/15-17/2005	Altitude Valve; Received a call from the answering service; Altitude valve not closing; Opened the closing speed ball valve slightly. This allowed more water to the top of the valve allowing it to close. Manually drained the tower down to 33 feet. Observed normal chart cycle operation when on site on Sunday. Down time: None.
12/24/2005	Pumphouse SC5; opened gate valve to decrease pressure from 92 psi to 82 psi to increase flow to 100 gpm. Down time: 1.5 hours.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.

January 2006

1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/3/2006	Pumphouse SC1; Gate to the Building 502 area was locked with a lock that was owned by others; Unable to access the 502 area. Down time: None, calculated the flow rate for 1/3/2006 using the meter reading from 1/4/2006.

APPENDIX F.2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/6/2006	Treatment System; ECV 3 would not close on command; Changed filter, flushed control piping, adjusted speed control valve and cycled valve several times. Observed normal operation. Down time: None.
1/8/2006	Treatment System; ECV 3 not closing, flushed operating solenoid valve and ECV 3 closed normally. Down time: None.
1/10/2006	Treatment System; ECV 4 not closing, flushed operating solenoid valve, valve closed and ECV 4 closed normally. Down time: None.
1/11/2006	Pumphouses B3, B8 and B11; Increased each flow rate to 180 gpm, 140 gpm and 100 gpm, respectively. Down time: None.
1/23/2006	Pumphouse B11; The ball valve on the control valve has a pinhole leak; Replaced the ball valve and observed normal operation. Down time: None.
1/24/2006	Treatment System; Measured difference in flow rate between a calibrated meter and the meters currently measuring flow from pumps 1 and 2; The Pump 1 existing flow rate was 21 gpm slower than the calibrated meter. The Pump 2 existing flow rate was 18 gpm slower than the calibrated meter. The flow meter installed at pump 2 was removed and sent in for cleaning and calibration and the calibrated flow meter was installed in its place. Down time: None.
1/31/2006	Treatment System; Greased and tightened the gland bushing at pump 2 to stop the leaking. Down time: None.
1/31/2006	Pumphouse SC5; Measured the difference in flow rate between the meter currently installed at SC5 and a calibrated meter. The meter installed in SC5 is measuring the flow rate accurately. Down time: None.

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MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

February 2006

2/3/2006	Pumphouse B4; Pump is off on arrival; Reset motor starter and observe normal operation. Down time: 22 hours.
2/6/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close; Cycled valve open in 21 seconds and closed in 52 seconds; observed normal operation. Opened the altitude valve to drain the tower from 33 feet down to 30 feet. Down time: None.
2/7/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close again; Closed the valve by hand; Opened the altitude valve to drain the tower from 33 feet down to 29.3 feet; Flushed control piping and changed the filter. Down time: None.
2/8/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close again; Changed the solenoid valve and cycled the valve several times and observed normal operation. Reset the system to the Auto position. Down time: None.
2/8/2006	Pumphouse SC5; Turned off the pump and locked out the control panel; Changed out the 3" globe valve and control piping; Reset the pilot and restarted the pumphouse. Down time: 4.5 hours.
2/19/2006	Treatment System; Replaced the blower belt for the blower fan for tower number 1. Down time: None.
2/20/2006	Treatment System; ECV 4 will not close on command; Changed filter, flushed control piping, adjusted speed control valves and cycled valve several times; Observed normal operation. Down time: None.

March 2006

3/4/2006	Pumphouse SC5; The pressure dropped from 81 psi to 55 psi overnight. Increased the pressure to 80 psi. Down time: None.
3/5/2006	Pumphouse SC5; Increased the pressure from 55 psi to 80 psi. Down time: None.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/5/2006 Groundwater Storage Reservoir (GSR); Audible alarm is on "GSR LOW"; Acknowledged alarm and notified Rick Boyer that the GSR level was at 3.4'.
Down time: None.

3/5/2006 Altitude Valve; Call from Rick Boyer that the water tower has no water in it, the altitude valve will not open on command and the recycle valve will not close on command; He switched the system to summer operation and set the altitude valve to hand open. The recycle valve and altitude valve responded in 15 minutes.
Down time: None.

3/5-7/2006 Pumphouse B11 ; B11 light flashing on PLC; Reset PLC; At pumphouse, piece of gunk released from solenoid valve, replaced solenoid valve.
Down time: 32 hours.

3/10/2006 Pumphouse SC2; The temperature inside the pumphouse was above 90^{o} F because the vent fan would not turn off and the insulation was in the fan housing; Switched the breaker switch for the vent fan to off.
Down time: None.

3/13/2006 Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105.
Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.

3/18/2006 Pumphouse B5; Light off on PLC in Building 116; Attempted to reset at PLC but light did not illuminate; At pumphouse, pump will not start in HAND or AUTO; Checked continuity and likely a failed motor; Scheduled well for re-development during motor replacement.
March down time: 299 hours.

3/28/2006 A pipe burst in front of Building 105 draining the water tower and elevated storage tank.

Down time: None.

April 2006

4/1-4/2006 Pumphouse B5; Pump shut off to re-develop the well.
April down time: 90 hours.

4/5/2006 Pumphouse B5; Valve will not open properly; Changed out solenoid valve with new and observed normal operation.
Down time: 30 hours.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/7/2006	Pumphouse B3; Flow meter stopped totaling; Changed out flow meter with rebuilt flow meter. Down time: None, adjusted flow rate as if meter continued totalling as usual.
4/7/2006	Snelling Avenue Valve; Effluent flow pressure at the treatment center was elevated above 80 psi; Cleaned the strainer screen, flushed control piping and reset the pressure at the Snelling Avenue valve; Pumped run-off (snow melt) water from the valve vault as well. Down time: None.
4/12-14/2006	Snelling Avenue Valve; Well field is cycling; Effluent flow pressure at the treatment center was elevated above 80 psi; Reduced the pressure at the Snelling Avenue Valve to 32 psi and observed normal operation of the well field. Down time: Pumphouse B13 and B8 for 9.5 hours each; Pumphouse B3 for 8 hours; Pumphouse B6 for 6.5 hours and pumphouse B5, SC1, SC2 and SC5 for 2 hours each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
4/17-19/2006	Pumphouse B4; Pump not pumping; Performed troubleshooting; Starter coil tripped for unknown reason; Reset and observed normal operation. Down time: 32 hours.
4/29-30/2006	Pumphouse B3; The pump is turning off for approximately 1 minute every hour; Failed lower level water level probe; Replaced with new. Down time: None.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.

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MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

May 2006

5/1/2006	Pumphouse B3; Turn pump back on and increase pressure to lower the flow rate to 160 gpm. Down time: 25 hours.
5/1-2/2006	Pumphouse B13; Flow meter is no longer totaling; Replace with new; Adjusted the flow rate for 5/1 and 5/2 accordingly. Down time: 3 hours.
5/2/2006	Pumphouse B5; Measured the pumping water level at 84.8 ft btoc. Down time: None.
5/4/2006	Pumphouse B3; Pumping water level is at 72.0 feet btoc; Lower level probe is not working and will be replaced. Down time: None.
5/4/2006	Pumphouse B1; Humidistat does not turn on the vent fan; Troubleshooting required. Down time: None.
5/9-18/2006	Pumphouse B8; Light out on PLC in Building 116; Reset PLC but the light did not illuminate; Pump runs in HAND but not AUTO; Problem with communication between B8 and Building 116. Down time: 184 hours.
5/9/2006	Pumphouse B6; Light flashing on PLC in Building 116; Reset PLC and light relit normally. Down time: 11.5 hours.
5/9/2006	Pumphouse SC5; Light flashing on PLC in Building 116; Reset PLC and light relit normally. Down time: 14 hours.
5/18/2006	Pumphouse B4; Pump is not pumping in "Auto" but works in "Hand". Troubleshooting indicates a failed limit switch. Replace with new. Down time: 32 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.

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MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

June 2006

6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/5/2006	Treatment System; Blower 1 flow rate sensing line blocked; Removed blockage and observed normal operation. Down time: None.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/13/2006	Treatment System; ECV 4 and ECV 3 will not close on command; Changed filters, flushed control piping and reset opening and closing speed valves. Observed normal valve opening and closing operation. Down time: None.
6/17/2006	Pumphouse SC5; On arrival to Building 116, SC5 was blinking on well field panel; Reset PLC and observed normal operation. Down time: 12.5 hours.
6/17/2006	Treatment System; Call from Time Communications, TGRS fail; Upon arrival, PDU #3 failed to open; Reset and cycled the valve and observed normal operation. Down time: None.
6/18/2006	Treatment System; Upon arrival, PDU #3 failed to open again; Replaced operating solenoid valve and observed normal operation. Down time: None.
6/22/2006	Treatment System; Replace auto dialer backup battery. Down time: None.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
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6/27/2006	Pumphouse SC2; Replaced flow meter with new; New meter reading was 78587400 at 13:45. Down time: None.
6/27/2006	Pumphouse SC5; Replaced flow meter with new; New meter reading was 36263000 at 13:10. Down time: None.
6/27/2006	Pumphouses B3; Decreased the pressure from 138 psi to 100 psi to increase the flow rate. Down time: None.
6/27/2006	Pumphouses B5; Decreased the pressure from 84 psi to 77 psi to increase the flow rate. Down time: None.

July 2006

7/1-10/2006	Treatment System and Pumphouses B3, B6 and SC5; Pumphouses are cycling due to restriction at water distribution manifold at top of Tower 3. Down time: Pumphouse B3 for 2.5 hours, B6 for 3 hours and SC5 for 5 hours.
7/4/2006	Treatment System and Well Field; Daily inspection was not performed due to the Independence Day holiday. Down time: None.
7/7/2006	Treatment System; ECV 4 did not close on command; Changed filter, flushed control piping and adjusted opening and closing speed control valves. Down time: None.
7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
7/11/2006	Pumphouses B8 and B11; Increased pressures to decrease their flow rates to target flow. Down time: None.
7/16/2006	Pumphouse B3; Pump is off due to the low level switch; Adjusted the by-pass clip and the pump resumed operation. Down time: 9 hours.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/17/2006	Pumphouse SC5; ECV closed slightly overnight; Adjusted speed control needle valve and observed normal operation. Down time: 3 hours.
7/18/2006	Treatment System; Labeled ECV control piping valves and posted filter change procedure. Down time: None.
7/18/2006	Pumphouse B3; Low level light is on; Performed troubleshooting work and replaced water level control board; Problem persists. Down time: None.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.
7/21/2006	Treatment System; Call from Time Communications-TGRS fail; Upon arrival ECV 2 would not open on command and ECV 3 would not close on command; Changed filters, flushed control piping and adjusted speed control valves. Down time: None.
7/26-31/2006	Pumphouse SC5; Pump will not start in "HAND" or "AUTO"; Laughlin Electric on Site to troubleshoot; Troubleshooting indicates a failed motor; T.L. Stevens on site to replace motor and wire with new. Following restart of the pump, the pump ran for approximately 0.5 hours and then quit pumping. Laughlin on site again on 7/31/2006 to perform electrical troubleshooting. Troubleshooting indicates electrical system is in check. Change out communication I/O cards and pumphouse restarted normally. Down time: 140 hours.

August 2006

8/15/2006	Treatment System; ECV 3 will not close on command; Replaced failed operating solenoid valve; Changed filter, flushed control piping and adjusted speed control valves; Cycled valve and observed normal operation. Down time: None.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/16/2006	Pumphouse B4; Changed out cold water flow meter with new; New meter installed at 14:00 at reading 59576500. Down time: None.
8/16/2006	Pumphouse B13; Changed out cold water flow meter with new; New meter installed at 15:00 at reading 72243200. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
8/25-29/2006	Pumphouse SC5; Pump will only operate in the "HAND" position; Likely a communication problem due to a thunderstorm on 8/24/2006; Troubleshooting indicates a failed I/O adapter, a failed input card and a failed output card; Replaced with new and observed normal operation. Down time: 105 hours.
8/27/2006	Pumphouse SC1; No power to pumphouse; Xcel Energy responds and repairs outage at power station. Down time: 16 hours.
8/28/2006	Treatment System; Turned off power to pump 3 in the treatment center to work on ECV 3 causing some of the well field to cycle. Down time: B13, B3 and B4 for 1.5 hours each.
8/30-31/2006	Treatment System; ECV 3 will not close on command; Changed out the pressure relief pilot but problem persists; Changed out the solenoid valve body and problem persists; Troubleshooting, however, indicates a faulty solenoid valve body; Change out with another solenoid valve body and observe normal operation. Down time: None.

September 2006

9/11/2006	Pumphouse SC1; Changed out flow meter with new; Old meter out at 13:30 at 32740900; New meter in at 14:10 at 00000900. Down time: None.
9/21/2006	Treatment System and Well Field; Power outage; Xcel Energy responds. Down time: None.

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MAINTENANCE ACTIVITIES
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/26/2006	Treatment System; Installed a new filter prior to operating solenoid and changed out the back pressure sustaining pilot at ECV 3. Down time: None.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.
9/27-28/2006	Pumphouse SC5; Pump turned off to install a new ECV. Down time: 28 hours.
9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.
9/29-10/3/2006	Pumphouse SC5; ECV will not open without emergency shut down solenoid energized; Wire emergency shut down solenoid and observe normal operation. September Down time: 23.5 hours.

F.3 Maintenance Activities by Location, Fiscal Year 2006, TGRS, TCAAP

APPENDIX F.3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse B1

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/4/2006	Pumphouse B1; Humidistat does not turn on the vent fan; Troubleshooting required. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.

APPENDIX F.3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.
9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.

Pumphouse B3

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
10/22/2005	Pumphouse B3; In-ground concrete enclosure for the communication cables has a broken cover possibly from the lawn mower or the track mounted tree grinder. Down time: None.
11/3/2005	Pumphouse B3; Changed out failed pilot with new and adjusted flow rate to 130 gpm. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/11/2006	Pumphouses B3, B8 and B11; Increased each flow rate to 180 gpm, 140 gpm and 100 gpm, respectively. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.

APPENDIX F.3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/7/2006	Pumphouse B3; Flow meter stopped totaling; Changed out flow meter with rebuilt flow meter. Down time: None, adjusted flow rate as if meter continued totalling as usual.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
4/29-30/2006	Pumphouse B3; The pump is turning off for approximately 1 minute every hour; Failed lower level water level probe; Replaced with new. Down time: None.
5/1/2006	Pumphouse B3; Turn pump back on and increase pressure to lower the flow rate to 160 gpm. Down time: 25 hours.
5/4/2006	Pumphouse B3; Pumping water level is at 72.0 feet btoc; Lower level probe is not working and will be replaced. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/27/2006	Pumphouses B3; Decreased the pressure from 138 psi to 100 psi to increase the flow rate. Down time: None.
7/1-10/2006	Treatment System and Pumphouses B3, B6 and SC5; Pumphouses are cycling due to restriction at water distribution manifold at top of Tower 3. Down time: Pumphouse B3 for 2.5 hours, B6 for 3 hours and SC5 for 5 hours.

APPENDIX F.3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
7/16/2006	Pumphouse B3; Pump is off due to the low level switch; Adjusted the by-pass clip and the pump resumed operation. Down time: 9 hours.
7/18/2006	Pumphouse B3; Low level light is on; Performed troubleshooting work and replaced water level control board; Problem persists. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
8/28/2006	Treatment System; Turned off power to pump 3 in the treatment center to work on ECV 3 causing some of the well field to cycle. Down time: B13, B3 and B4 for 1.5 hours each.
9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.
9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.

Pumphouse B4

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.

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10/6-8/2005	Pumphouse B4; ECV will not stay open; Replaced solenoid valve and observed normal operation. Down time: 14 hours.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
2/3/2006	Pumphouse B4; Pump is off on arrival; Reset motor starter and observe normal operation. Down time: 22 hours.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
4/17-19/2006	Pumphouse B4; Pump not pumping; Performed troubleshooting; Starter coil tripped for unknown reason; Reset and observed normal operation. Down time: 32 hours.
5/18/2006	Pumphouse B4; Pump is not pumping in "Auto" but works in "Hand". Troubleshooting indicates a failed limit switch. Replace with new. Down time: 32 hours.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.

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6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
8/16/2006	Pumphouse B4; Changed out cold water flow meter with new; New meter installed at 14:00 at reading 59576500. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
8/28/2006	Treatment System; Turned off power to pump 3 in the treatment center to work on ECV 3 causing some of the well field to cycle. Down time: B13, B3 and B4 for 1.5 hours each.
9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.
9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.

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Pumphouse B5

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
3/18/2006	Pumphouse B5; Light off on PLC in Building 116; Attempted to reset at PLC but light did not illuminate; At pumphouse, pump will not start in HAND or AUTO; Checked continuity and likely a failed motor; Scheduled well for re-development during motor replacement. March down time: 299 hours.
4/1-4/2006	Pumphouse B5; Pump shut off to re-develop the well. April down time: 90 hours.
4/5/2006	Pumphouse B5; Valve will not open properly; Changed out solenoid valve with new and observed normal operation. Down time: 30 hours.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/2/2006	Pumphouse B5; Measured the pumping water level at 84.8 ft btoc. Down time: None.

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4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/27/2006	Pumphouses B5; Decreased the pressure from 84 psi to 77 psi to increase the flow rate. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.

Pumphouse B6

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/13/2005	Pumphouse B6; Changed out flow meter and totalizer with new. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.

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1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/9/2006	Pumphouse B6; Light flashing on PLC in Building 116; Reset PLC and light relit normally. Down time: 11.5 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
7/1-10/2006	Treatment System and Pumphouses B3, B6 and SC5; Pumphouses are cycling due to restriction at water distribution manifold at top of Tower 3. Down time: Pumphouse B3 for 2.5 hours, B6 for 3 hours and SC5 for 5 hours.
7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.

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9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.

Pumphouse B8

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/11/2006	Pumphouses B3, B8 and B11; Increased each flow rate to 180 gpm, 140 gpm and 100 gpm, respectively. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.
5/9-18/2006	Pumphouse B8; Light out on PLC in Building 116; Reset PLC but the light did not illuminate; Pump runs in HAND but not AUTO; Problem with communication between B8 and Building 116. Down time: 184 hours.

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5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
7/11/2006	Pumphouses B8 and B11; Increased pressures to decrease their flow rates to target flow. Down time: None.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.

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Pumphouse B9

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.

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8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.

Pumphouse B11

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/11/2006	Pumphouses B3, B8 and B11; Increased each flow rate to 180 gpm, 140 gpm and 100 gpm, respectively. Down time: None.
1/23/2006	Pumphouse B11; The ball valve on the control valve has a pinhole leak; Replaced the ball valve and observed normal operation. Down time: None.
3/5-7/2006	Pumphouse B11; B11 light flashing on PLC; Reset PLC; At pumphouse, piece of gunk released from solenoid valve, replaced solenoid valve. Down time: 32 hours.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.

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6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
7/11/2006	Pumphouses B8 and B11; Increased pressures to decrease their flow rates to target flow. Down time: None.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.

Pumphouse B13

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/13/2005	Pumphouse B13; Changed out flow meter and totalizer with new. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.

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4/6/2006	Pumphouse B1, B13, B3, B4, B5, B8, B9 and Treatment System; System shutdown for annual electrical inspection. Down time: Pumphouse B1 for 3.5 hours; Pumphouses B13, B3, B4 and B8 for 2.5 hours each and pumphouses B5 and B9 for 1 hour each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/1-2/2006	Pumphouse B13; Flow meter is no longer totaling; Replace with new; Adjusted the flow rate for 5/1 and 5/2 accordingly. Down time: 3 hours.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.

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8/16/2006	Pumphouse B13; Changed out cold water flow meter with new; New meter installed at 15:00 at reading 72243200. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/22/2006	Cleaned pumphouses B1; B13; B3, B4, B5, B6, B8, B9 and B11. Down time: None.
8/28/2006	Treatment System; Turned off power to pump 3 in the treatment center to work on ECV 3 causing some of the well field to cycle. Down time: B13, B3 and B4 for 1.5 hours each.
9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.
9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.

Pumphouse SC1

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
10/24/2005	Pumphouse SC1; Power line across road to pumphouse is not repaired yet; Tied blaze orange tape on wires to warn potential pedestrians/motorists. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.

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1/3/2006	Pumphouse SC1; Gate to the Building 502 area was locked with a lock that was owned by others; Unable to access the 502 area.
3/13/2006	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, and SC1; Power outage due to downed power line near Building 105. Down time: 16 hours each at B1, B13, B3, B4, B5, B6, B8 and B9; 10 hours at B11 and SC1.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/27/2006	Pumphouse SC1; No power to pumphouse; Xcel Energy responds and repairs outage at power station. Down time: 16 hours.

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9/11/2006	Pumphouse SC1; Changed out flow meter with new; Old meter out at 13:30 at 32740900; New meter in at 14:10 at 00000900. Down time: None.

Pumphouse SC2

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.
12/1 and 12/8/2005	Pumphouse SC2; Forcemain pressure was too high; Adjusted gate valve to 82 psi and measured normal flow rate. Down time: 9.8 hours.
12/13/2005	Pumphouse SC2; Changed out flow meter and totalizer with new. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
3/10/2006	Pumphouse SC2; The temperature inside the pumphouse was above 90^{o} F because the vent fan would not turn off and the insulation was in the fan housing; Switched the breaker switch for the vent fan to off. Down time: None.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.

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6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/27/2006	Pumphouse SC2; Replaced flow meter with new; New meter reading was 78587400 at 13:45. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.

Pumphouse SC3

11/17/2005	Pumphouse SC3 heater not operating. Laughlin Electric replaced thermostat with new. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.

Pumphouse SC5

10/4-6/2005	Pumphouses B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5; Power outage at power pole near B5. Power was restored but failed again later in the day on the 4th; A new transformer was installed and power was restored. Down time: 48 hours at B4, B5, B6, B8 and B9; 30 hours at SC5; 16 hours at B1, B13, B11 and SC2; 9 hours at B3 and SC1.

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10/26-31/2005	Pumphouse SC5; Light flashing on PLC; Reset well field and light came on steady. Down time: 50 hours.
11/3/2005	Pumphouse SC5; Changed out old pilot, old solenoid valve and one way check valves to attempt to control flow rate; All work failed; Likely will require a new 3" CLA-VAL check valve. Down time: 2 hours.
11/17-28/2005	Pumphouse SC5 shut down for well re-development. Down time: 257 hours.
12/24/2005	Pumphouse SC5; opened gate valve to decrease pressure from 92 psi to 82 psi to increase flow to 100 gpm. Down time: 1.5 hours.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/31/2006	Pumphouse SC5; Measured the difference in flow rate between the meter currently installed at SC5 and a calibrated meter. The meter installed in SC5 is measuring the flow rate accurately. Down time: None.
2/8/2006	Pumphouse SC5; Turned off the pump and locked out the control panel; Changed out the 3" globe valve and control piping; Reset the pilot and restarted the pumphouse. Down time: 4.5 hours.
3/4/2006	Pumphouse SC5; The pressure dropped from 81 psi to 55 psi overnight. Increased the pressure to 80 psi. Down time: None.
3/5/2006	Pumphouse SC5; Increased the pressure from 55 psi to 80 psi. Down time: None.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
5/9/2006	Pumphouse SC5; Light flashing on PLC in Building 116; Reset PLC and light relit normally. Down time: 14 hours.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.

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5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.
6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/17/2006	Pumphouse SC5; On arrival to Building 116, SC5 was blinking on well field panel; Reset PLC and observed normal operation. Down time: 12.5 hours.
6/27/2006	Pumphouse SC5; Replaced flow meter with new; New meter reading was 36263000 at 13:10. Down time: None.
7/1-10/2006	Treatment System and Pumphouses B3, B6 and SC5; Pumphouses are cycling due to restriction at water distribution manifold at top of Tower 3. Down time: Pumphouse B3 for 2.5 hours, B6 for 3 hours and SC5 for 5 hours.
7/17/2006	Pumphouse SC5; ECV closed slightly overnight; Adjusted speed control needle valve and observed normal operation. Down time: 3 hours.
7/20-25/2006	Pumphouses B8, B11, B13, SC1 and SC5; Communication problems between pumphouses and PLC in Building 116; Active light on I/O cards are not lit; Switched the control switch on the control panels to "HAND" during the day and to the "OFF" position at night; Anik responds and finds a faulty SN card and a faulty I/O adapter card in B8. Down time: B13 for 13 hours; B8 for 120 hours; B11 for 104 hours; SC1 for 89.5 hours and SC5 for 106 hours.

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7/26-31/2006	Pumphouse SC5; Pump will not start in "HAND" or "AUTO"; Laughlin Electric on Site to troubleshoot; Troubleshooting indicates a failed motor; T.L. Stevens on site to replace motor and wire with new. Following restart of the pump, the pump ran for approximately 0.5 hours and then quit pumping. Laughlin on site again on 7/31/2006 to perform electrical troubleshooting. Troubleshooting indicates electrical system is in check. Change out communication I/O cards and pumphouse restarted normally. Down time: 140 hours.
8/16/2006	Applied pest control products for rodents and insects to each pumphouse. Down time: None.
8/25-29/2006	Pumphouse SC5; Pump will only operate in the "HAND" position; Likely a communication problem due to a thunderstorm on 8/24/2006; Troubleshooting indicates a failed I/O adapter, a failed input card and a failed output card; Replaced with new and observed normal operation. Down time: 105 hours.
9/27-28/2006	Pumphouse SC5; Pump turned off to install a new ECV. Down time: 28 hours.
9/29-10/3/2006	Pumphouse SC5; ECV will not open without emergency shut down solenoid energized; Wire emergency shut down solenoid and observe normal operation. September Down time: 23.5 hours.

TREATMENT SYSTEM

10/3/2005	Treatment System; Shut down well field and treatment system to facilitate cleaning of the wet wells. Down time: 6 hours at each pumphouse.
10/8-15/2005	Treatment System; Call out from autodialer, CRA responds; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted opening and closing speed valves but to no avail; Likely a bad seal; Well field is cycling; Shut off part of the well field to negate cycling of wells; All Enviro called to install a valve seal repair kit on 10/14/2005. Treatment System Lock out/Tagout and health and safety meeting performed; The valve seal kit was installed and the ECV 3 operated normally. Down time: B1, B13, B5, B6, SC1 and SC5 for 39 hours each; B3, B8, B11 and SC2 for 117 hours each; B9 for 87 hours.
10/15/2005	Treatment System; ECV 3 required additional adjustment after the new valve seal was installed; The well field cycled overnight. Down time: 4 hours at B1, B5, B6 and SC5; 8 hours at B13, B8, B9 and B11.
10/13-14/2005	Treatment System; Qwest on site to repair autodialer phone line. Down time: None.

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11/2/2005	Treatment System; Call out from Autodialer; TGRS fail; ECV 3 will not open on command; Change filter, flush control piping, adjust speed control valves and cycle valve several times to observe normal operation. Down time: None.
11/4-8/2005	Treatment System; Call out from Autodialer; TGRS fail; ECV 3 will not open on command; Changed filter, flushed control piping, adjusted speed control valves, changed out pilot with new; changed out solenoid valve with new but all to no avail; Turned off extraction wells B3, B5, B8, B9, SC2 and B11 to negate well field cycling. All Enviro on site on 11/8/2005; Changed out solenoid valve body and valve began working normally. Down time: 12 hours at B1 and B6; 47 hours at B13, B5 and SC1; 78 hours at SC2 and 94 hours at B3, B8, B9 and B11.
11/25/2005	Treatment System; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: None.
11/25/2005	Treatment System; ECV 4 will not open on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: None.
11/28-30/2005	Treatment System; ECV 3 will not close on command; Changed filter, flushed control piping, adjusted speed control valves, cycled valve 3 times and observed normal operation. Down time: 52 hours at B13, B3, B6, B8, B9 and B11 and 28 hours at SC1.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
1/6/2006	Treatment System; ECV 3 would not close on command; Changed filter, flushed control piping, adjusted speed control valve and cycled valve several times. Observed normal operation. Down time: None.
1/8/2006	Treatment System; ECV 3 not closing, flushed operating solenoid valve and ECV 3 closed normally. Down time: None.
1/10/2006	Treatment System; ECV 4 not closing, flushed operating solenoid valve, valve closed and ECV 4 closed normally. Down time: None.

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1/24/2006	Treatment System; Measured difference in flow rate between a calibrated meter and the meters currently measuring flow from pumps 1 and 2; The Pump 1 existing flow rate was 21 gpm slower than the calibrated meter. The Pump 2 existing flow rate was 18 gpm slower than the calibrated meter. The flow meter installed at pump 2 was removed and sent in for cleaning and calibration and the calibrated flow meter was installed in its place. Down time: None.
1/31/2006	Treatment System; Greased and tightened the gland bushing at pump 2 to stop the leaking. Down time: None.
2/19/2006	Treatment System; Replaced the blower belt for the blower fan for tower number 1. Down time: None.
2/20/2006	Treatment System; ECV 4 will not close on command; Changed filter, flushed control piping, adjusted speed control valves and cycled valve several times; Observed normal operation. Down time: None.
3/28/2006	A pipe burst in front of Building 105 draining the water tower and elevated storage tank. Down time: None.
4/7/2006	Snelling Avenue Valve; Effluent flow pressure at the treatment center was elevated above 80 psi; Cleaned the strainer screen, flushed control piping and reset the pressure at the snelling avenue valve; Pumped run-off (snow melt) water from the valve vault as well. Down time: None.
4/12-14/2006	Snelling Avenue Valve; Well field is cycling; Effluent flow pressure at the treatment center was elevated above 80 psi; Reduced the pressure at the Snelling Avenue Valve to 32 psi and observed normal operation of the well field. Down time: Pumphouse B13 and B8 for 9.5 hours each; Pumphouse B3 for 8 hours; Pumphouse B6 for 6.5 hours and pumphouse B5, SC1, SC2 and SC5 for 2 hours each.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.
4/28/2006	Power is turning off and on at Building 116 causing the well field to cycle; Osprey are building a nest on a power pole adjacent to former Building 103 and are arcing wires. Xcel Energy responds and reroutes power away from the nest. Down time: Pumphouse B13, B4, B8 and SC5 for 1.5 hours each; Pumphouse B5 for 4 hours.
5/30/2006	Treatment System; Power outage; Xcel Energy responds and repairs problem. Down time: B1, B13, B3, B4, B5, B6, B9, SC2 and SC5 for 44 hours each; B11 and SC1 for 38 hours each and B8 for 25 hours.

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6/1-2/2006	Treatment System; Power outage at Building 116; Blown fuse and shorted wire on power pole at substation outside Building 116; Xcel Energy responds and replaces wire and fuse; Restarted treatment system and well field and observed normal operation. Down time: B11, SC1 and SC5 for 6 hours each; B1, B3, B5, B6, B8 and B9 for 16 hours each and B13, B4 and SC2 for 18.5 hours each.
6/5/2006	Treatment System; Blower 1 flow rate sensing line blocked; Removed blockage and observed normal operation. Down time: None.
6/6-13/2006	Treatment System; Wet well pump 4 is rattling loudly and the motor is shaking on its base; Turned off power to the motor and contracted a pump company for repair work; Replaced the pump and motor and ordered and inserted a 1" spacer to line up the old discharge pipe with the new; Turned off some extraction wells to minimize well field cycling. Down time: B1, B4, B5 and SC5 for 5 hours each; B6 for 19 hours; SC1 for 26 hours; B13 for 46 hours; B11 for 114 hours; B8, B9 and SC2 for 127 hours each and B3 for 140 hours.
6/13/2006	Treatment System; ECV 4 and ECV 3 will not close on command; Changed filters, flushed control piping and reset opening and closing speed valves. Observed normal valve opening and closing operation. Down time: None.
6/17/2006	Treatment System; Call from Time Communications, TGRS fail; Upon arrival, PDU #3 failed to open; Reset and cycled the valve and observed normal operation. Down time: None.
6/18/2006	Treatment System; Upon arrival, PDU #3 failed to open again; Replaced operating solenoid valve and observed normal operation. Down time: None.
6/22/2006	Treatment System; Replace auto dialer backup battery. Down time: None.
7/1-10/2006	Treatment System and Pumphouses B3, B6 and SC5; Pumphouses are cycling due to restriction at water distribution manifold at top of Tower 3. Down time: Pumphouse B3 for 2.5 hours, B6 for 3 hours and SC5 for 5 hours.
7/4/2006	Treatment System and Well Field; Daily inspection was not performed due to the Independence Day holiday. Down time: None.
7/7/2006	Treatment System; ECV 4 did not close on command; Changed filter, flushed control piping and adjusted opening and closing speed control valves. Down time: None.

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7/11/2006	Treatment System and Pumphouses B13, B3, B6 and SC1; ECV 2 did not open all the way on command; Well field cycled overnight; Changed filter, flushed control piping and adjusted speed control valves. Down time: B3 for 15 hours; B13 and B6 for 8 hours each and SC1 for 5 hours.
7/18/2006	Treatment System; Labeled ECV control piping valves and posted filter change procedure. Down time: None.
7/21/2006	Treatment System; Call from Time Communications-TGRS fail; Upon arrival ECV 2 would not open on command and ECV 3 would not close on command; Changed filters, flushed control piping and adjusted speed control valves. Down time: None.
8/15/2006	Treatment System; ECV 3 will not close on command; Replaced failed operating solenoid valve; Changed filter, flushed control piping and adjusted speed control valves; Cycled valve and observed normal operation. Down time: None.
8/28/2006	Treatment System; Turned off power to pump 3 in the treatment center to work on ECV 3 causing some of the well field to cycle. Down time: B13, B3 and B4 for 1.5 hours each.
8/30-31/2006	Treatment System; ECV 3 will not close on command; Changed out the pressure relief pilot but problem persists; Changed out the solenoid valve body and problem persists; Troubleshooting, however, indicates a faulty solenoid valve body; Change out with another solenoid valve body and observe normal operation. Down time: None.
9/21/2006	Treatment System and Well Field; Power outage; Xcel Energy responds. Down time: None.
9/26/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 3 in the treatment center; Pump 3 turned off to install a leak containment shroud around the gland bushings. Down time: B13 for 3 hours; B3 for 1 hour; B4 and B8 for 2 hours each.
9/26/2006	Treatment System; Installed a new filter prior to operating solenoid and changed out the back pressure sustaining pilot at ECV 3. Down time: None.
9/27/2006	Treatment System and Well Field; Well field cycling due to shutdown of Pump 2 in the treatment center; Pump 2 turned off to install a leak containment shroud around the gland bushing. Down time: B1, B6, B8 and SC2 for 1 hour each; B13, B3 and B4 for 2.5 hours each.

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ARDEN HILLS, MINNESOTA

9/29/2006	Treatment System and Well Field; Well field cycling due to shut down of pump 1 in the treatment center; Pump 1 turned off to install a leak containment shroud around the gland bushings. Down time: B1, B13, B3 and B4 for 2 hours each.

FORCEMAIN

12/15-17/2005	Altitude Valve; Received a call from the answering service; Atitude valve not closing; Opened the closing speed ball valve slightly. This allowed more water to the top of the valve allowing it to close. Manually drained the tower down to 33 feet. Observed normal chart cycle operation when on site on Sunday. Down time: None.
12/25/2005	Daily Inspection was not performed due to Christmas Day holiday. Down time: None.
1/1/2006	Daily Inspection not performed due to New Year's Holiday. Down time: None.
2/6/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close; Cycled valve open in 21 seconds and closed in 52 seconds; observed normal operation. Opened the altitude valve to drain the tower from 33 feet down to 30 feet. Down time: None.
2/7/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close again; Closed the valve by hand; Opened the altitude valve to drain the tower from 33 feet down to 29.3 feet; Flushed control piping and changed the filter. Down time: None.
2/8/2006	Altitude Valve; Call from Time Communication; Altitude valve failed to close again; Changed the solenoid valve and cycled the valve several times and observed normal operation. Reset the system to the Auto position. Down time: None.
3/5/2006	Groundwater Storage Reservoir (GSR); Audible alarm is on "GSR LOW"; Acknowledged alarm and notified Rick Boyer that the GSR level was at 3.4'. Down time: None.
3/5/2006	Altitude Valve; Call from Rick Boyer that the water tower has no water in it, the altitude valve will not open on command and the recycle valve will not close on command; He switched the system to summer operation and set the altitude valve to hand open. The recycle valve and altitude valve responded in 15 minutes. Down time: None.
4/16/2006	TGRS; The daily inspection was not performed today due to the Easter holiday. Down time: None.

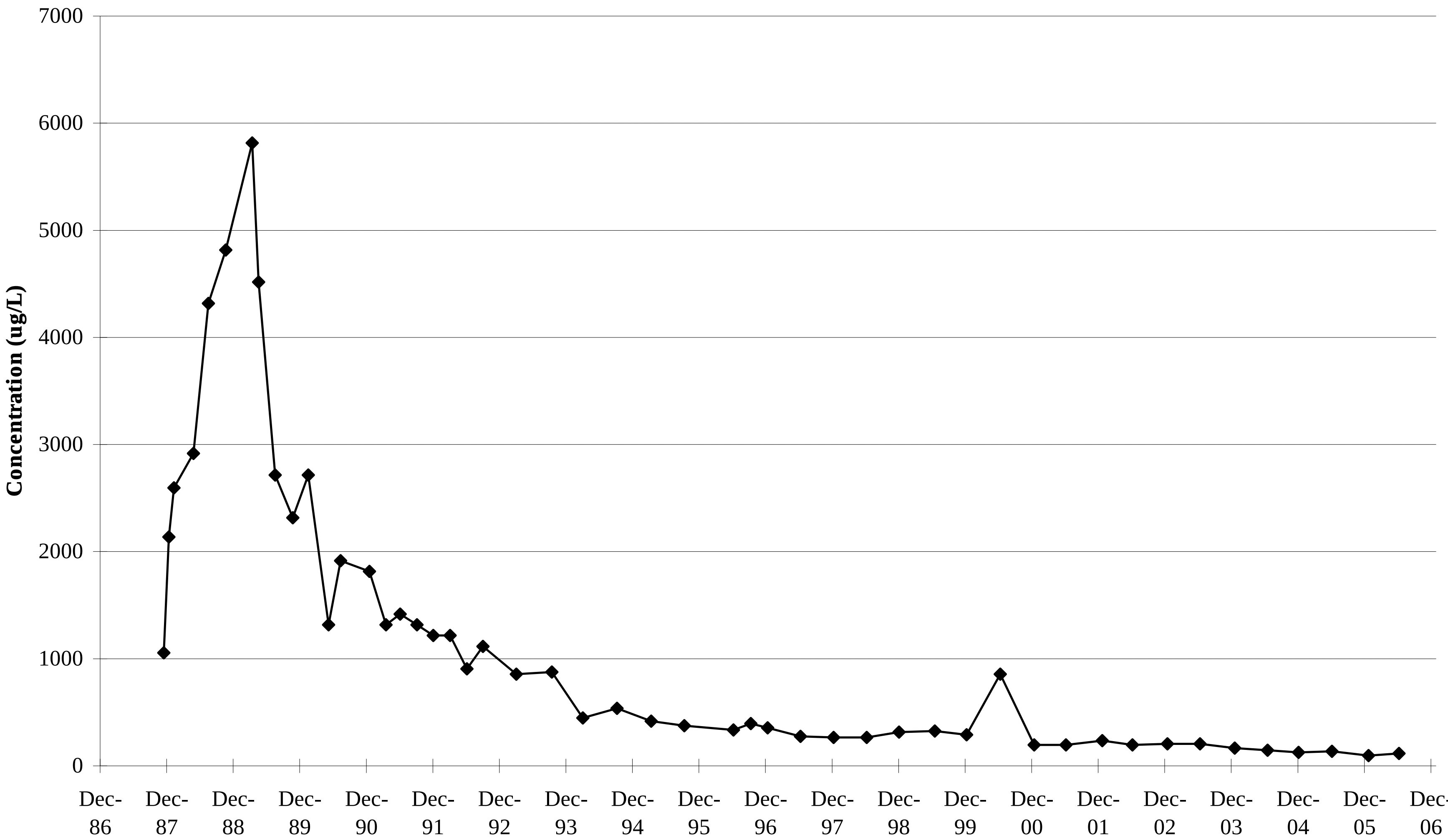
Appendix G

TGRS Chemical Data

G.1 TGRS Extraction Wells – TRCLE Versus Time

APPENDIX G.1

EXTRACTION WELL B1 - TRCLE VS.TIME

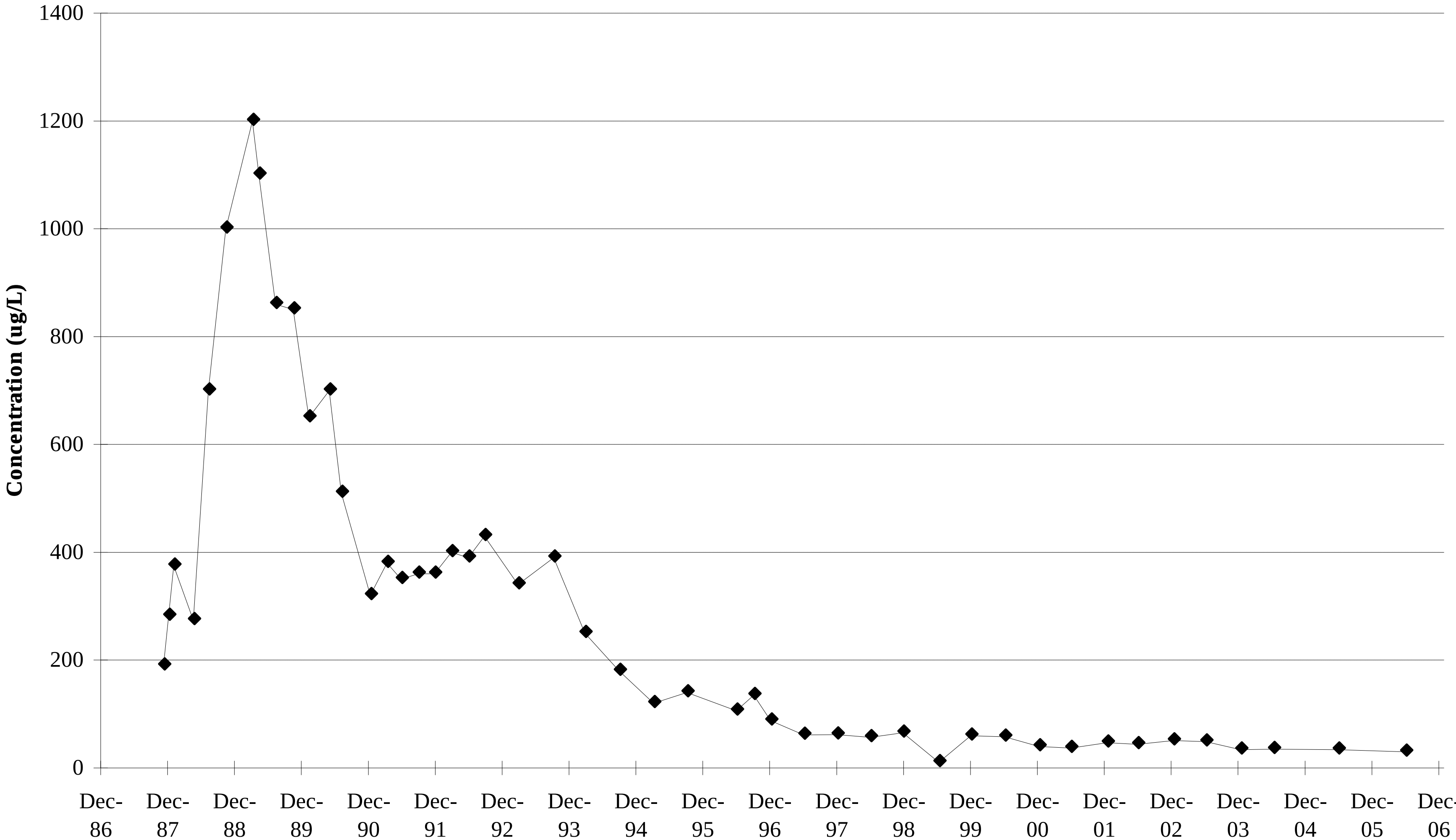


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B2 - TRCLE VS. TIME

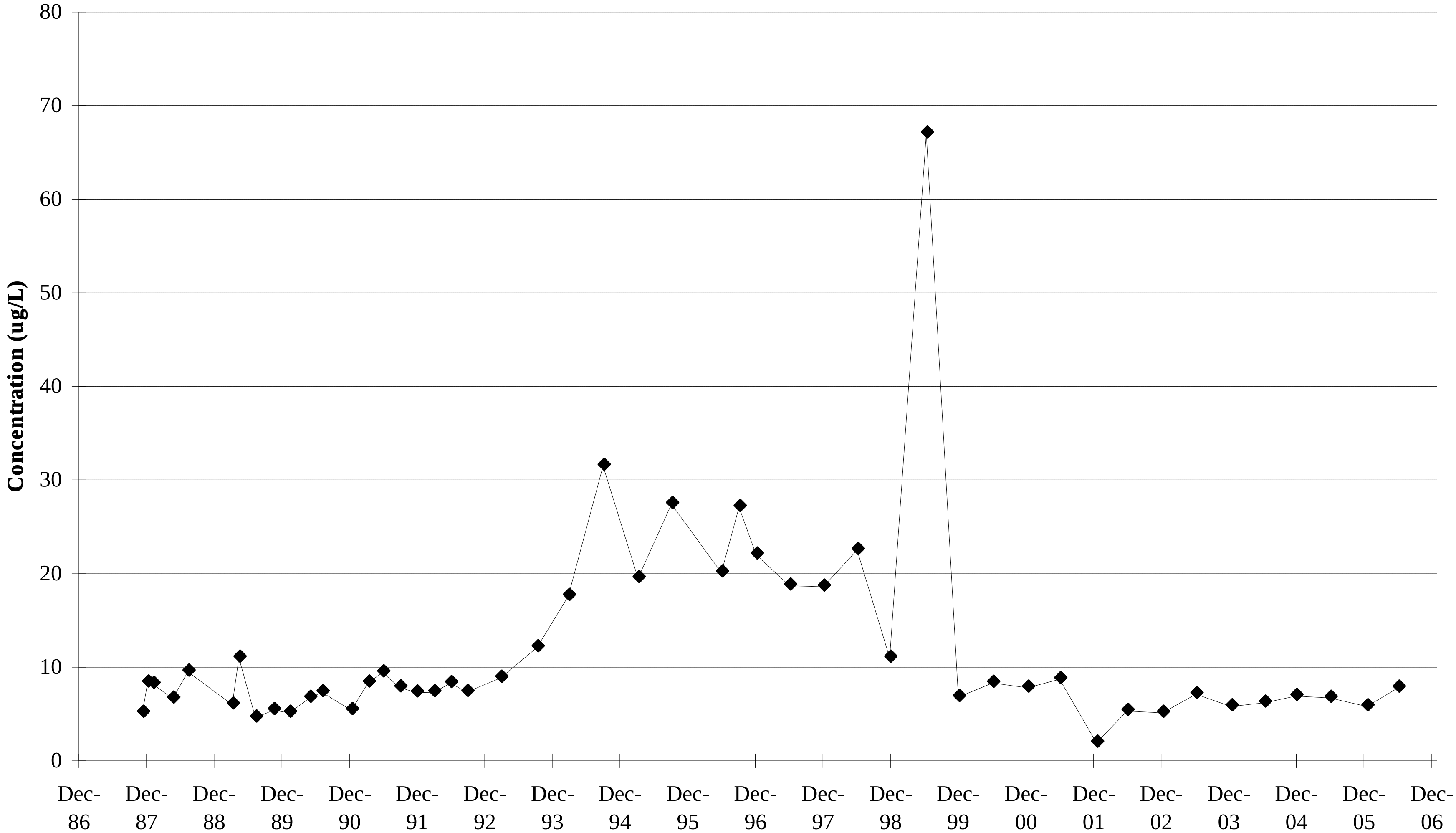


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B3 - TRCLE VS. TIME

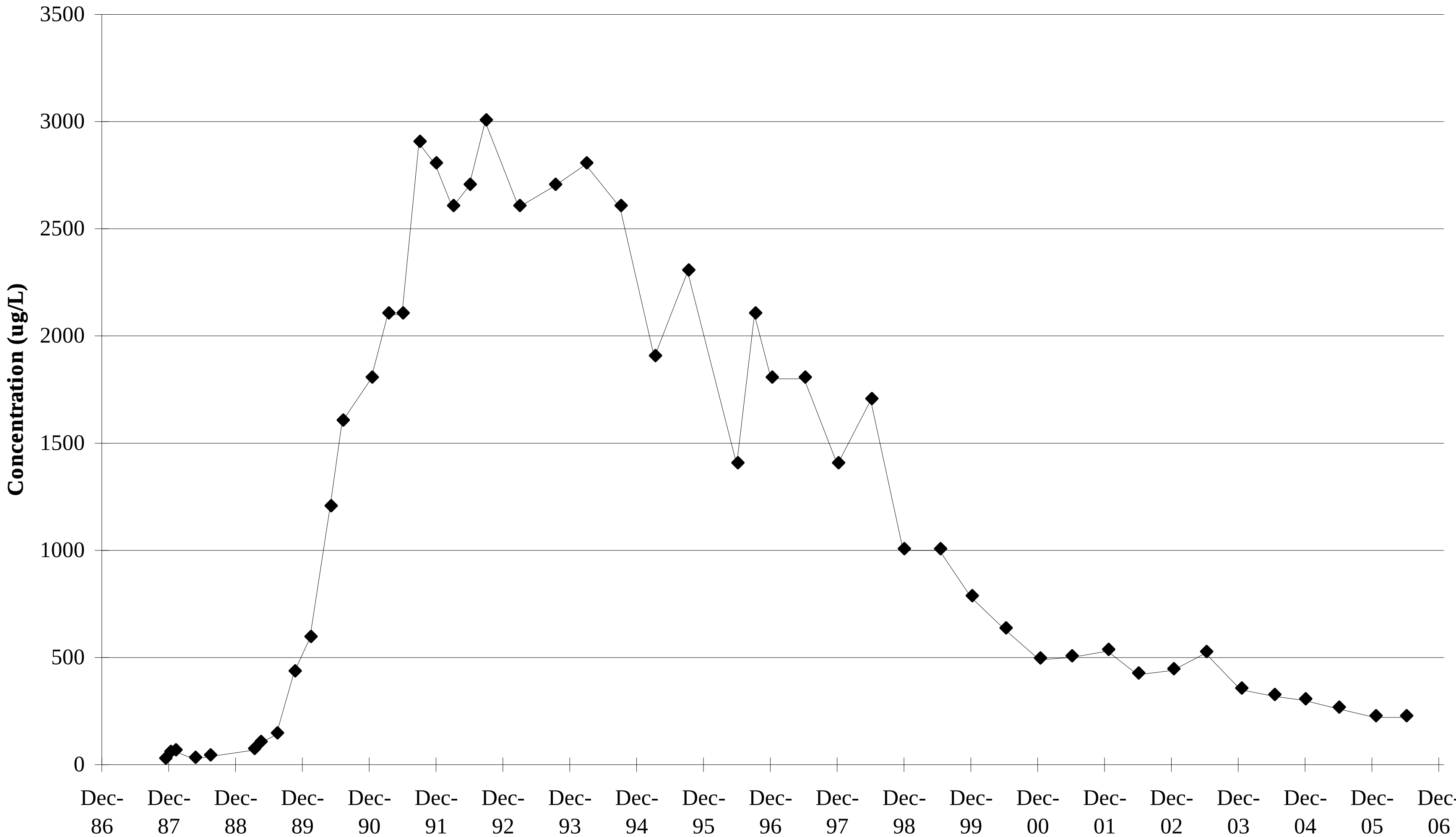


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B4 - TRCLE VS. TIME

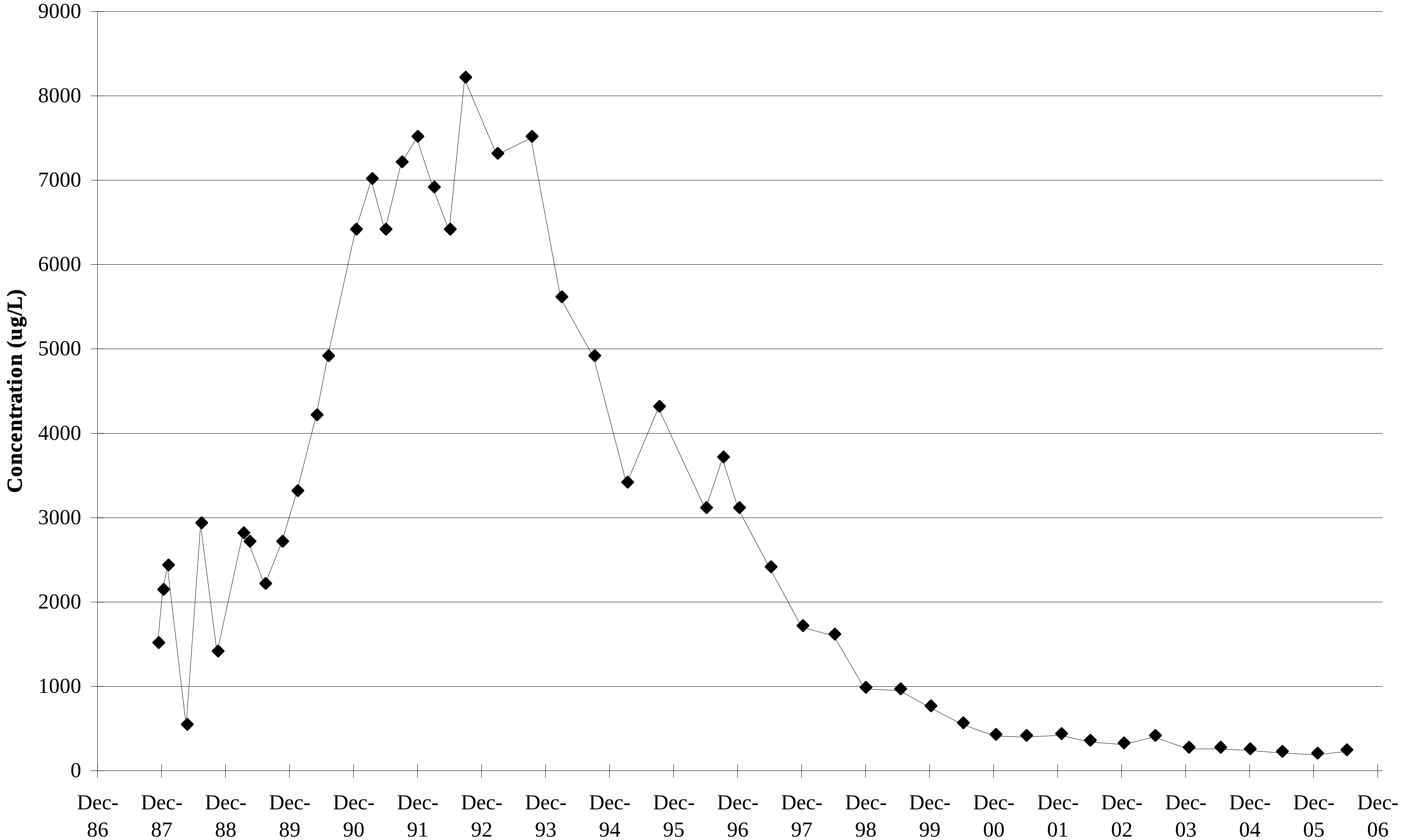


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B5 - TRCLE VS. TIME

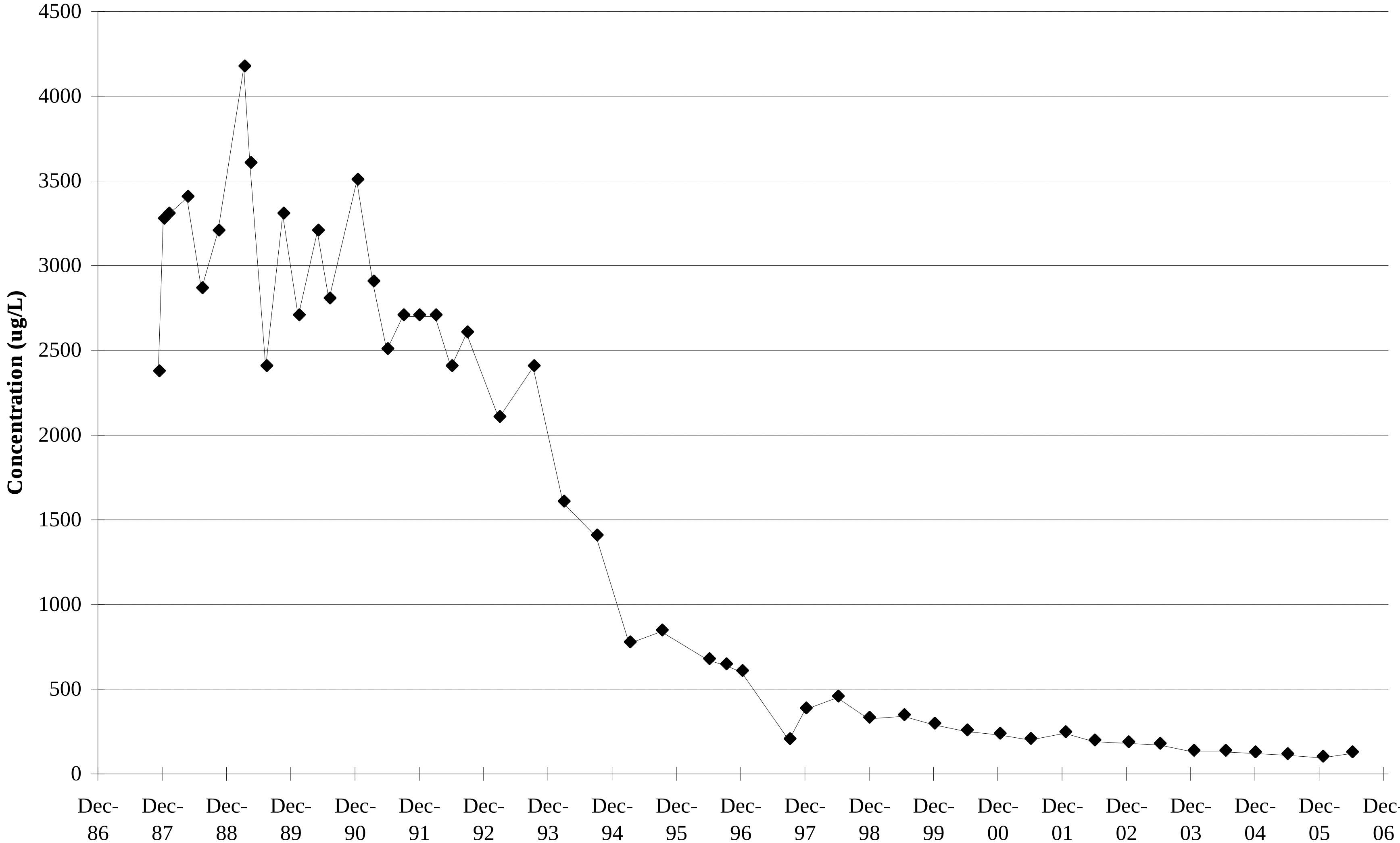


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B6 - TRCLE VS. TIME

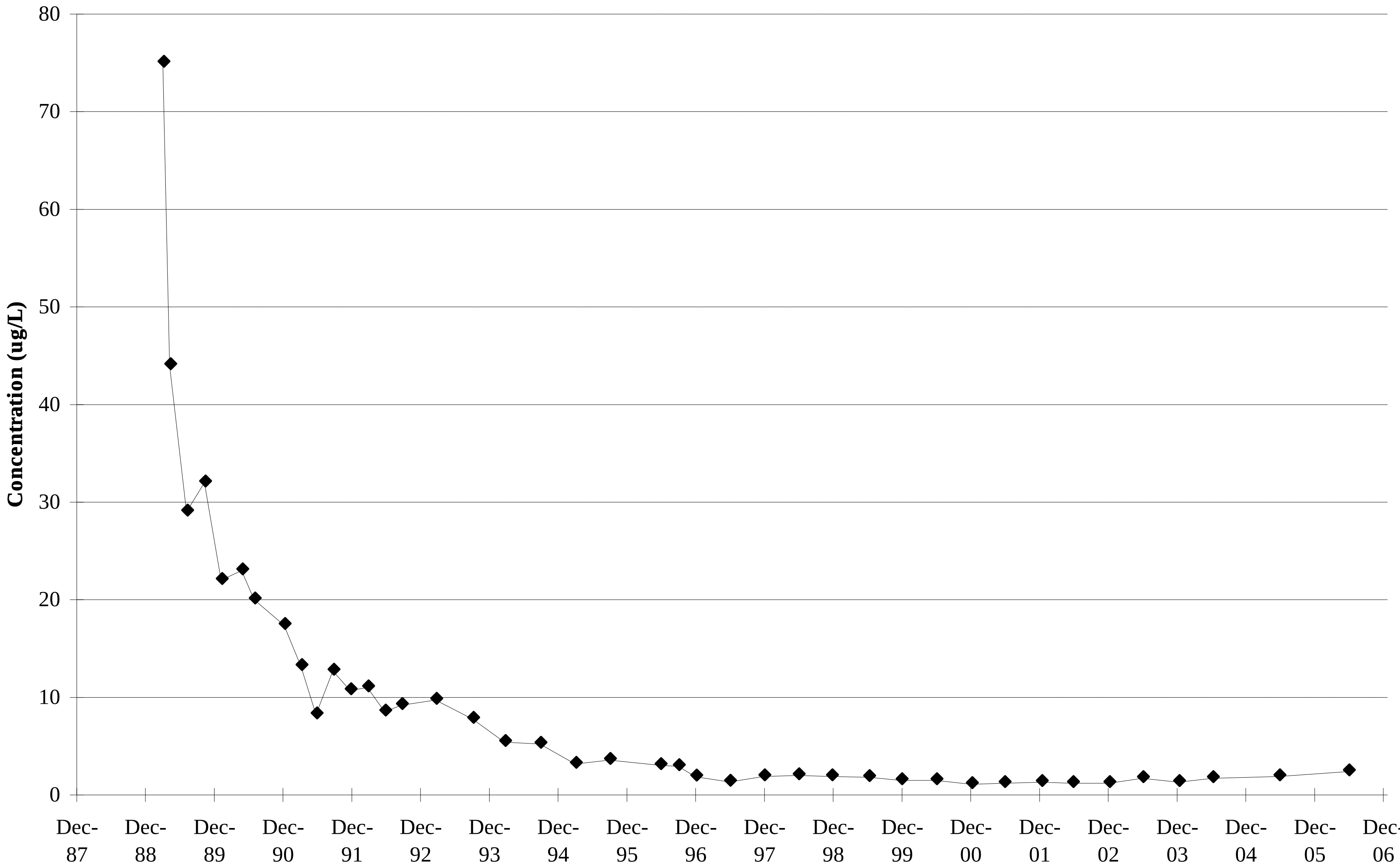


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B7 - TRCLE VS. TIME

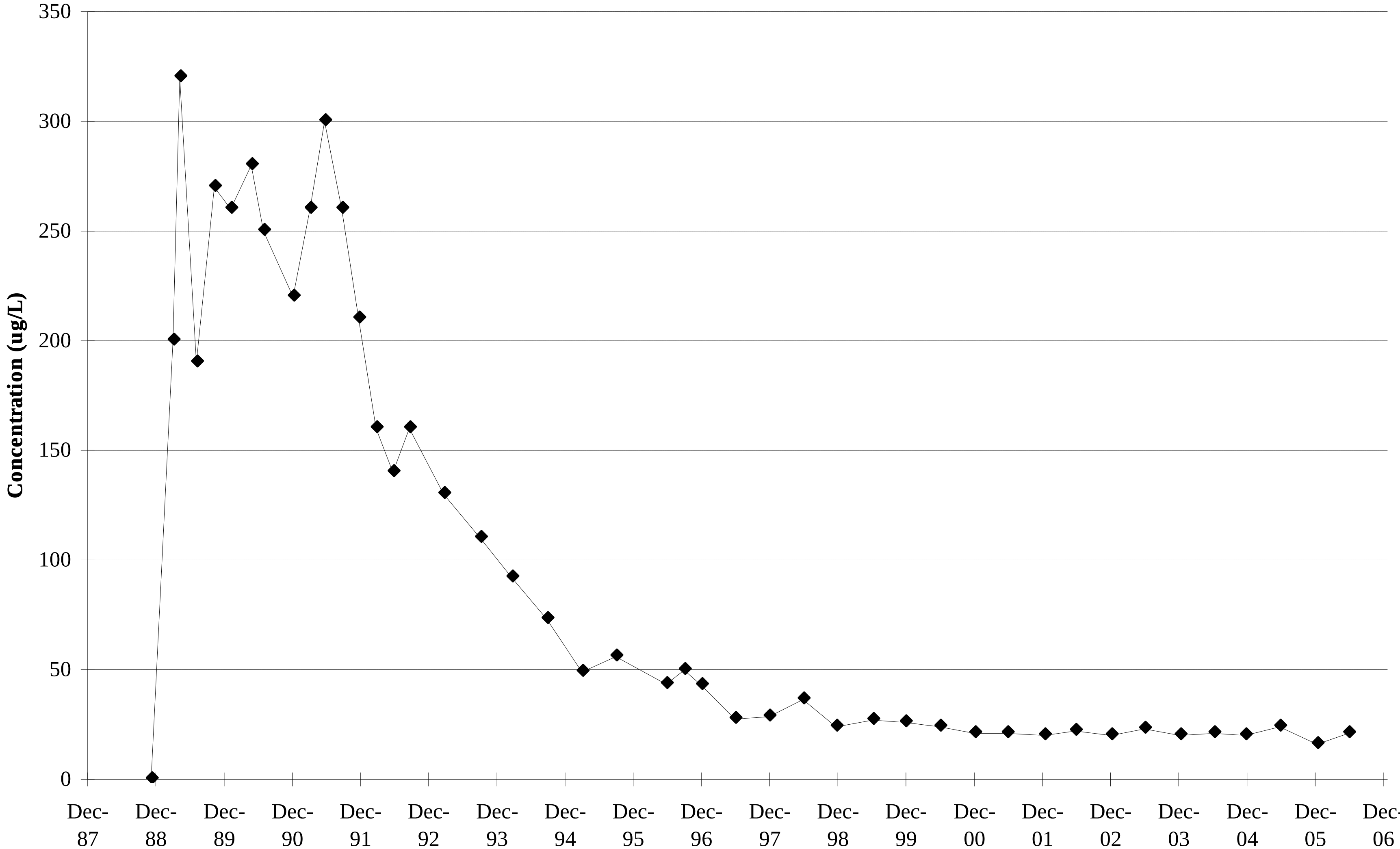


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B8 - TRCLE VS. TIME

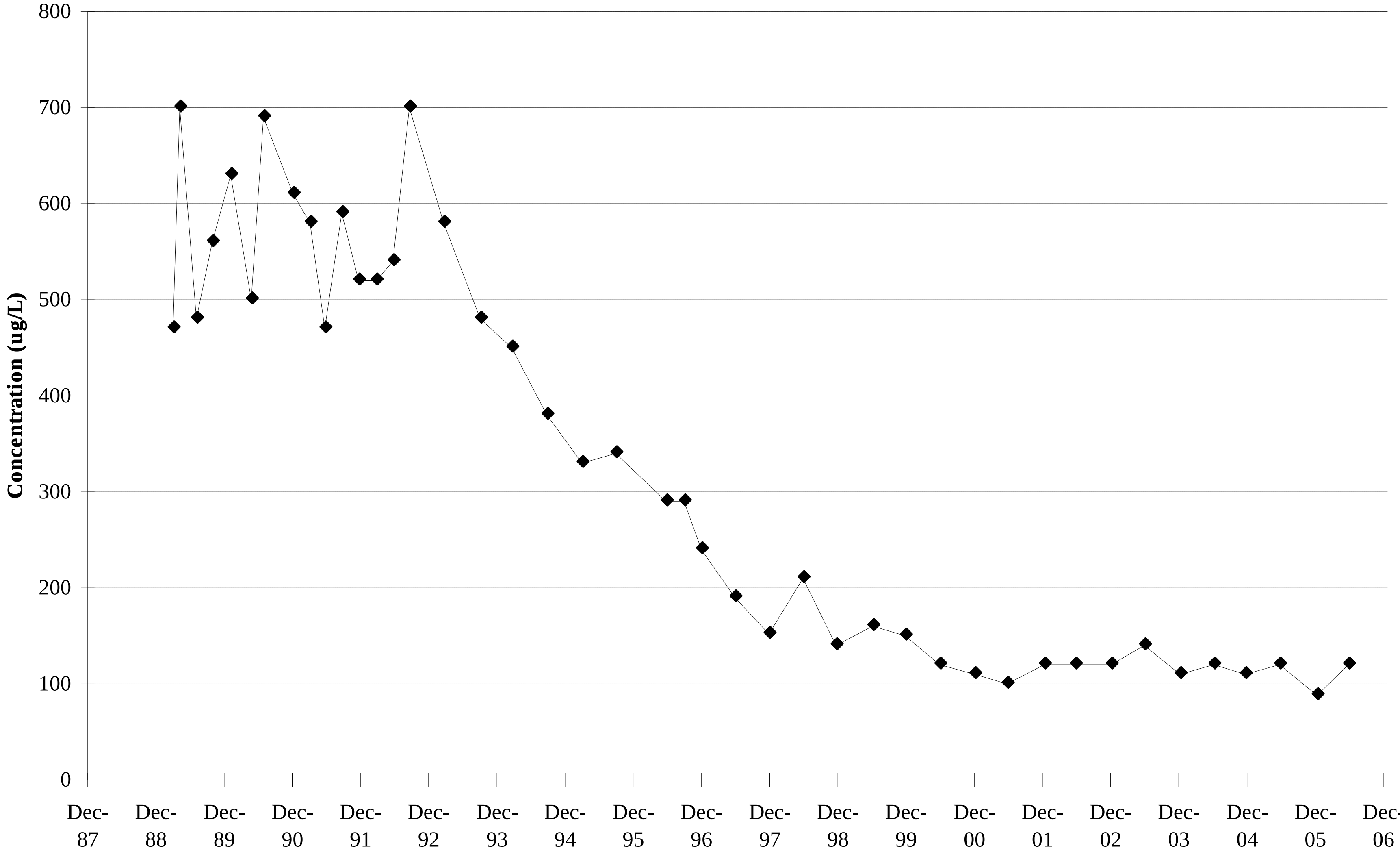


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B9 - TRCLE VS. TIME

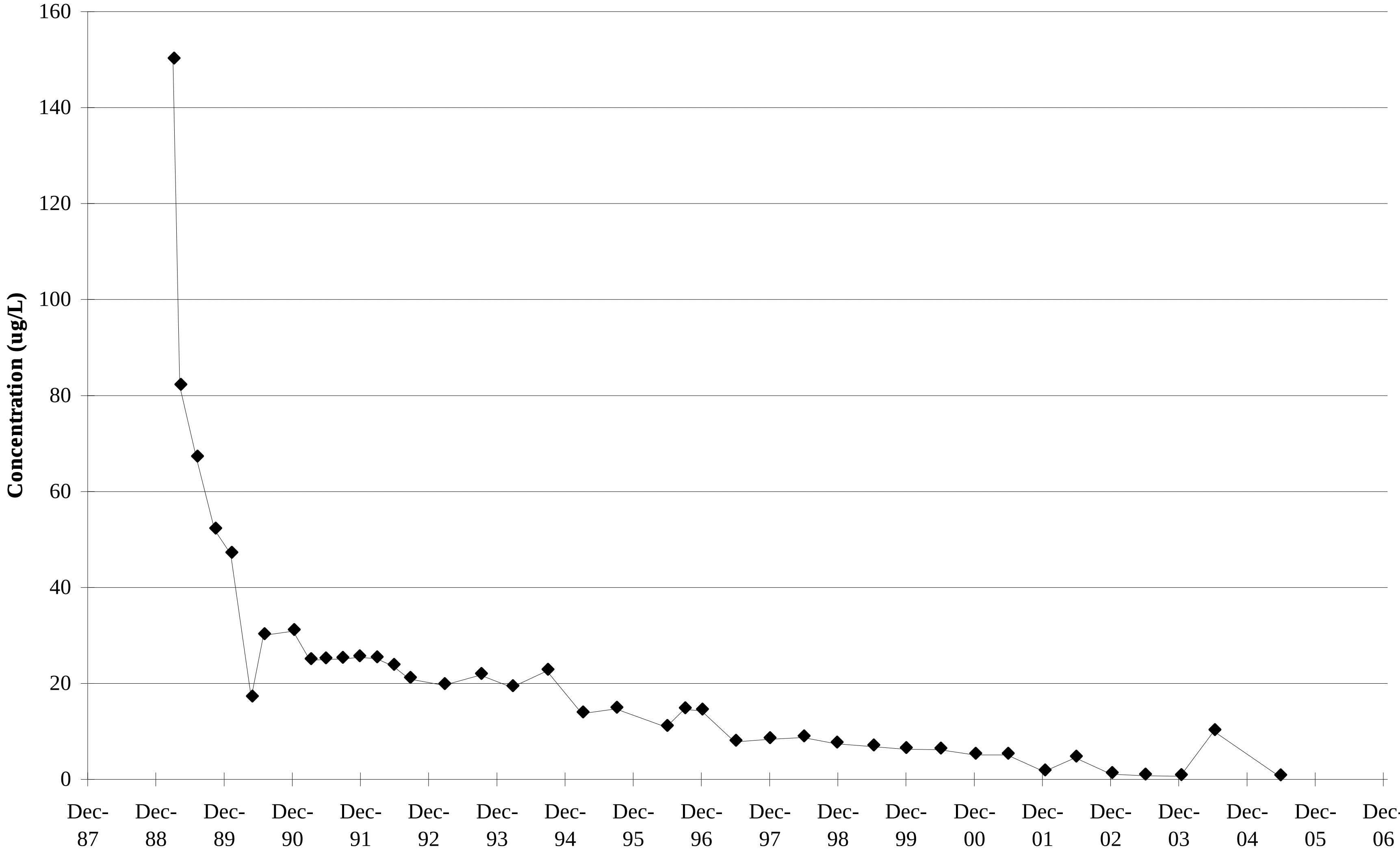


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B10 - TRCLE VS. TIME

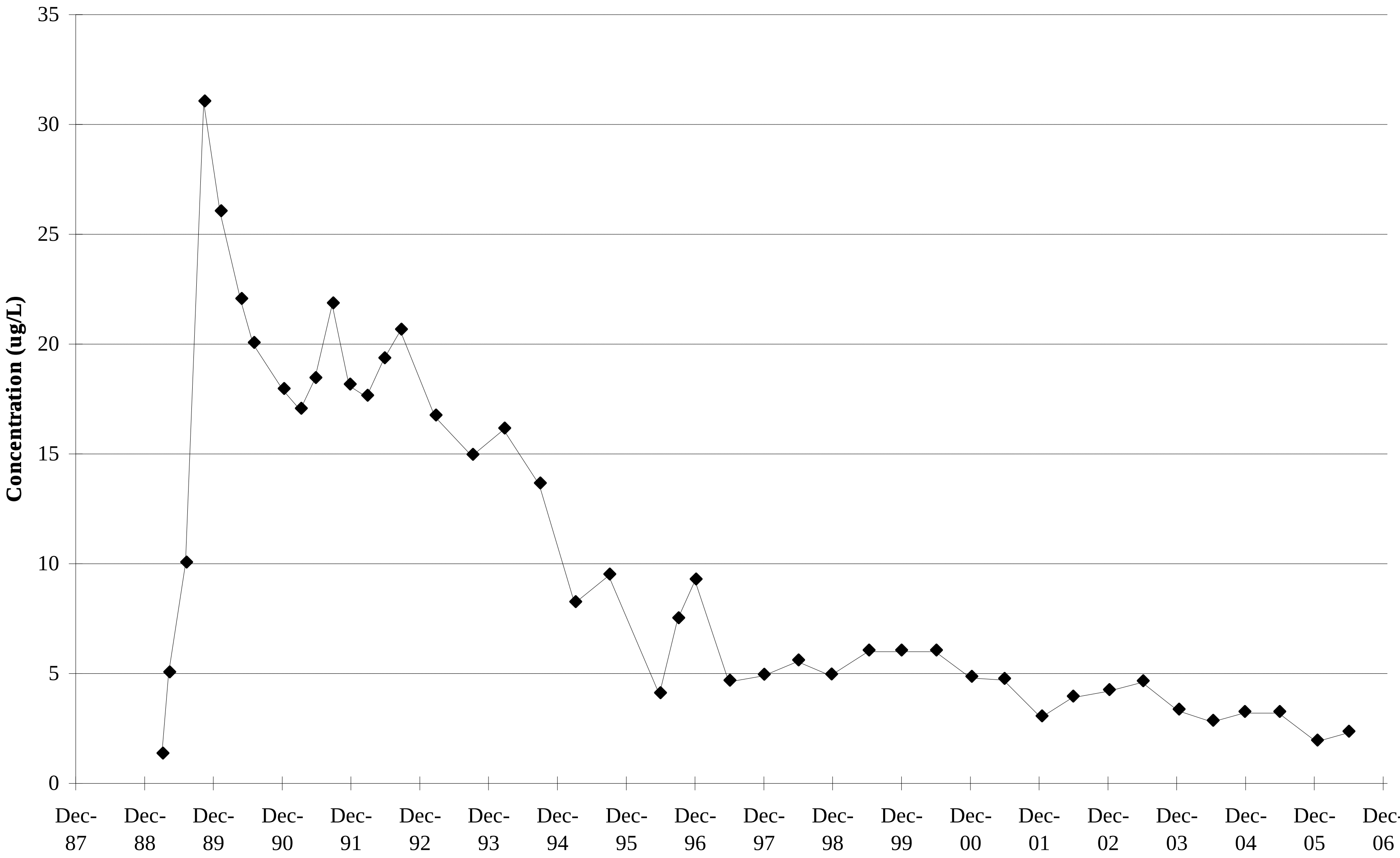


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B11 - TRCLE VS. TIME

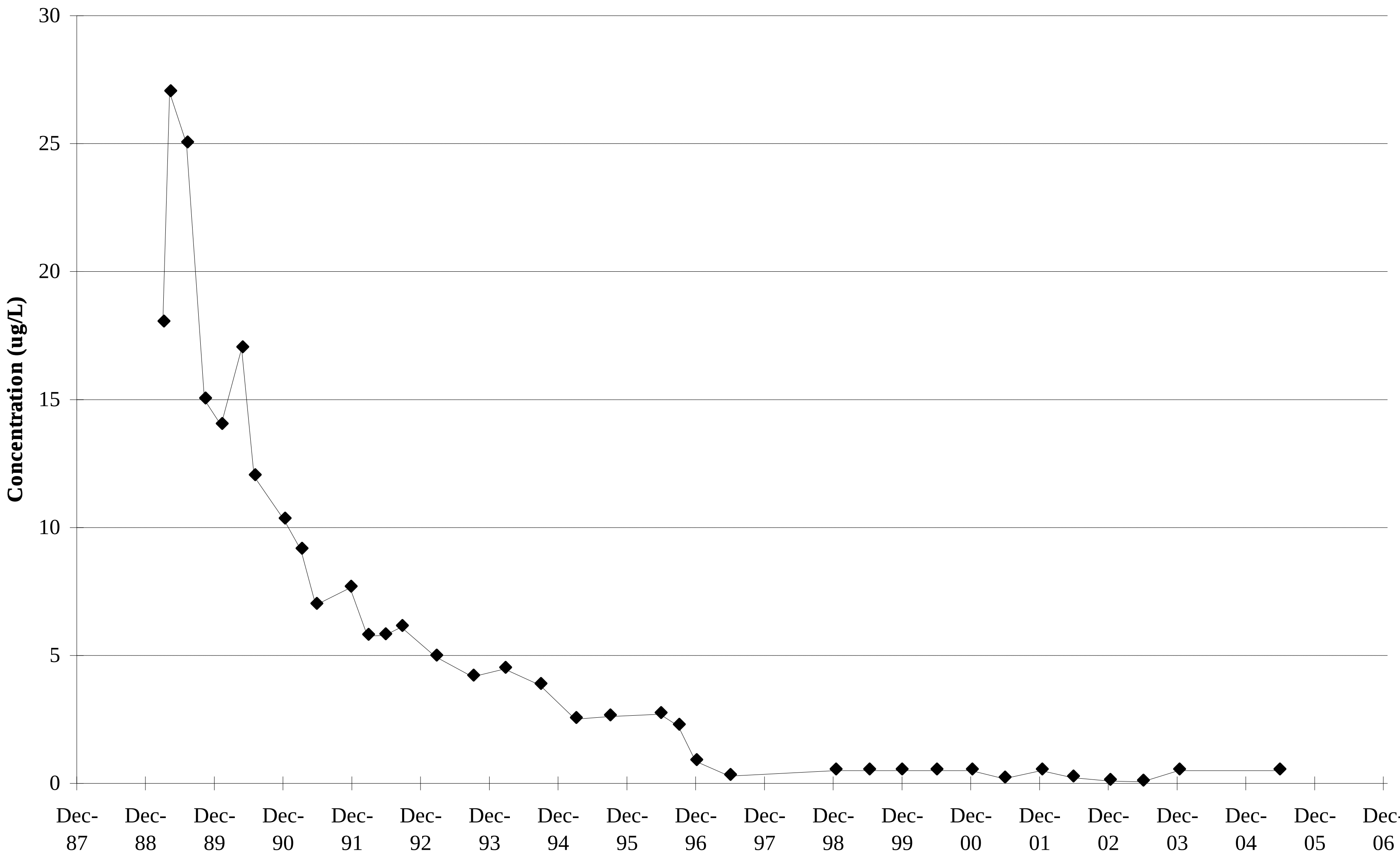


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B12 - TRCLE VS. TIME

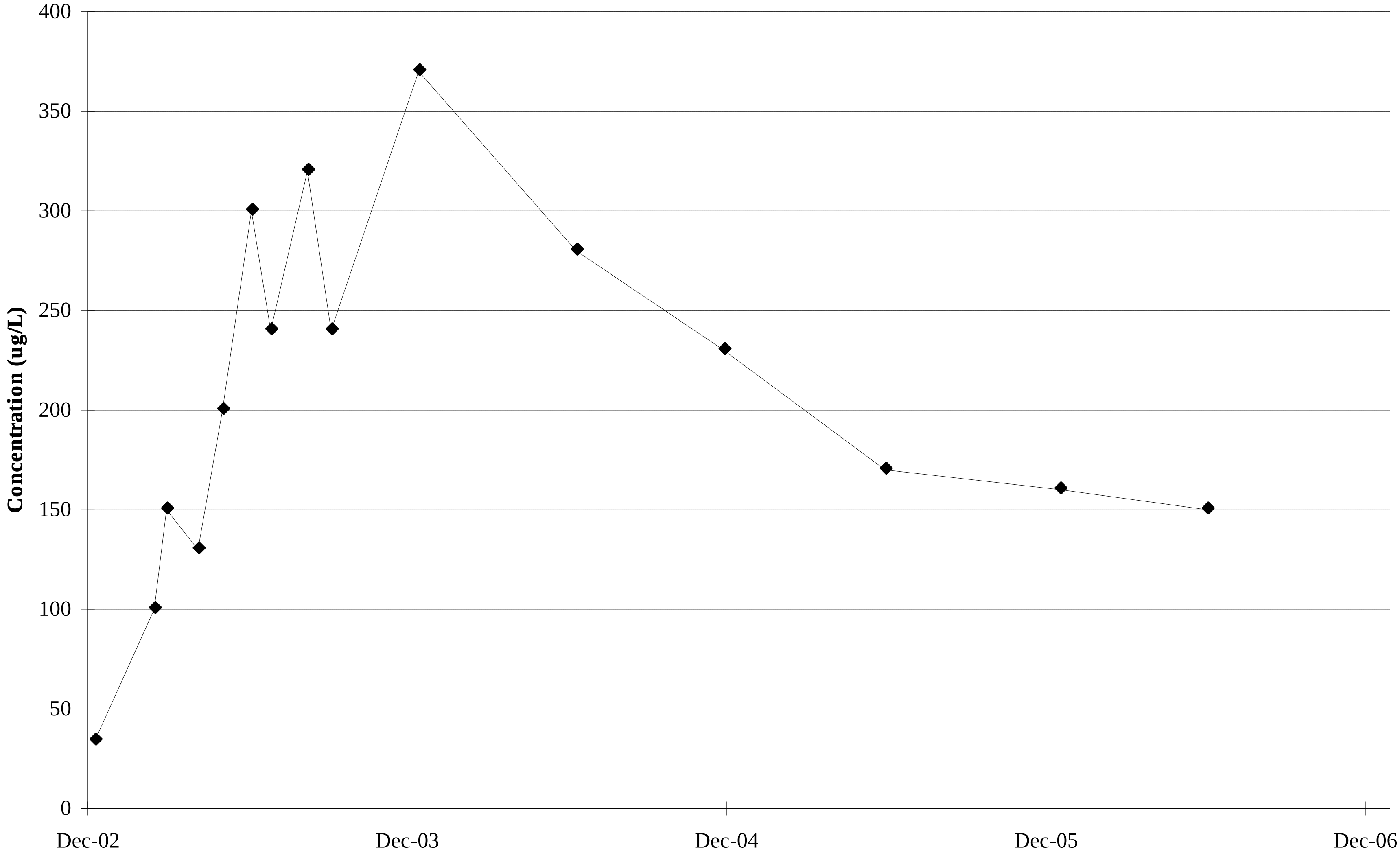


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL B13 - TRCLE VS. TIME

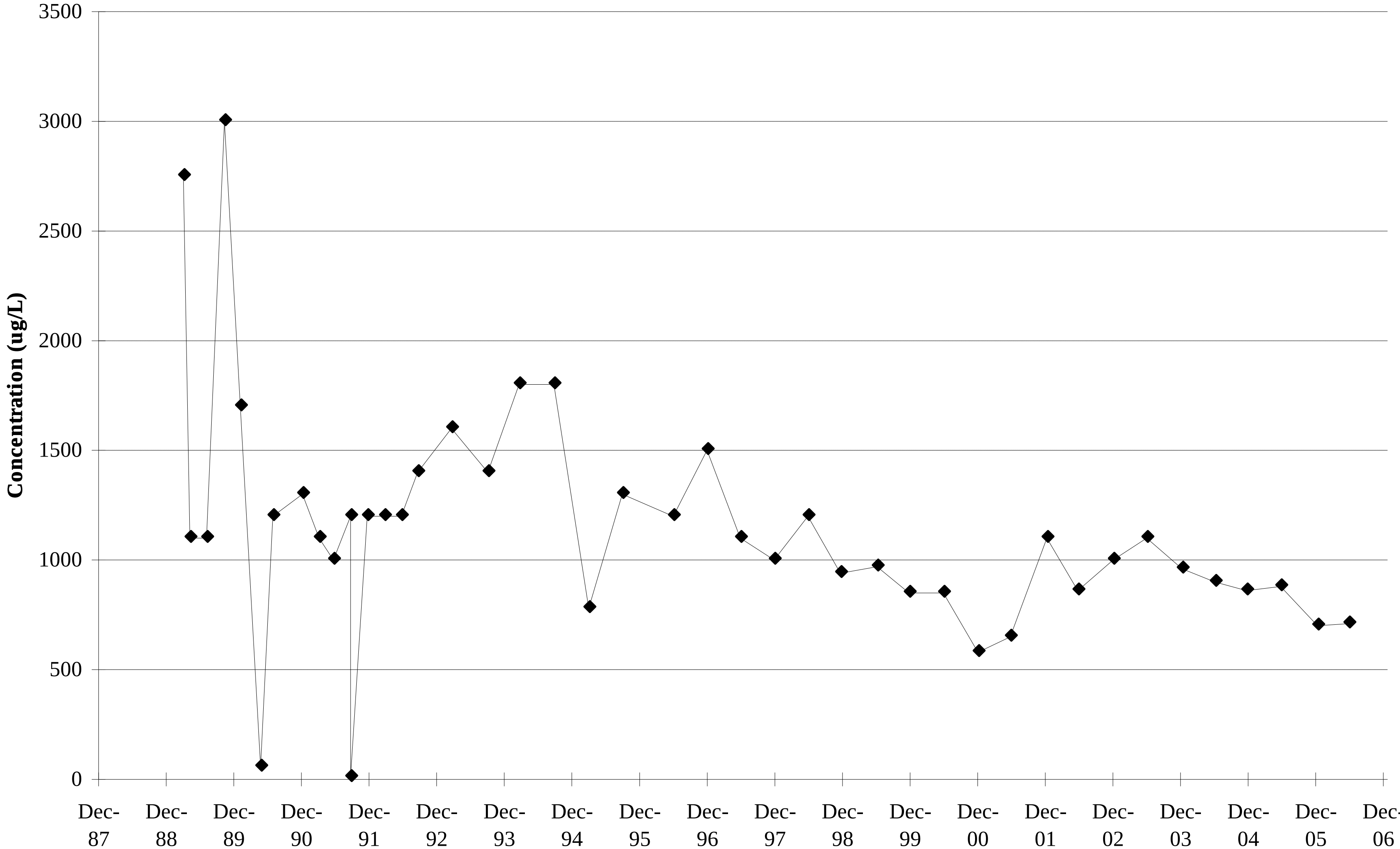


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL SC1 - TRCLE VS. TIME

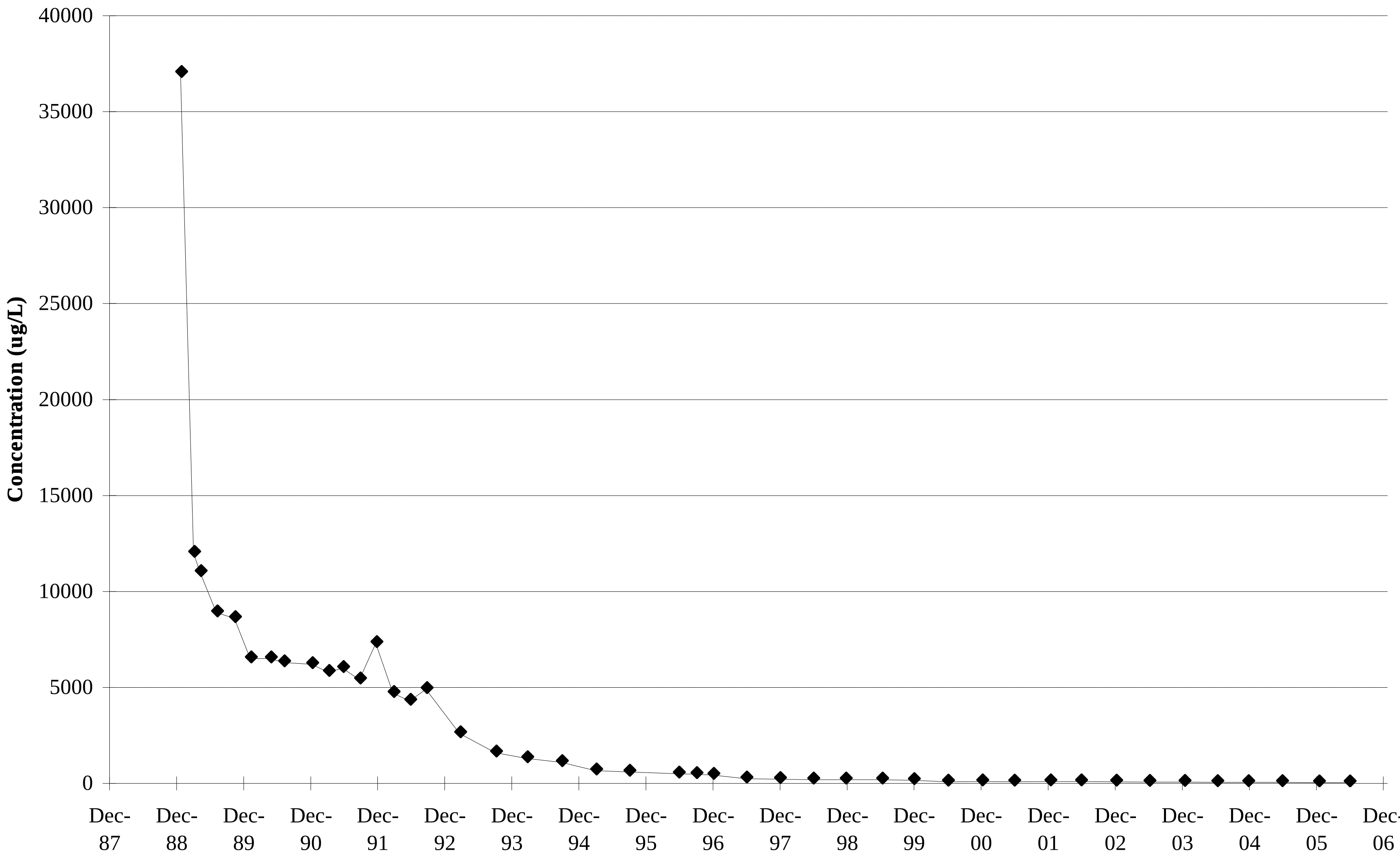


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL SC2 - TRCLE VS. TIME

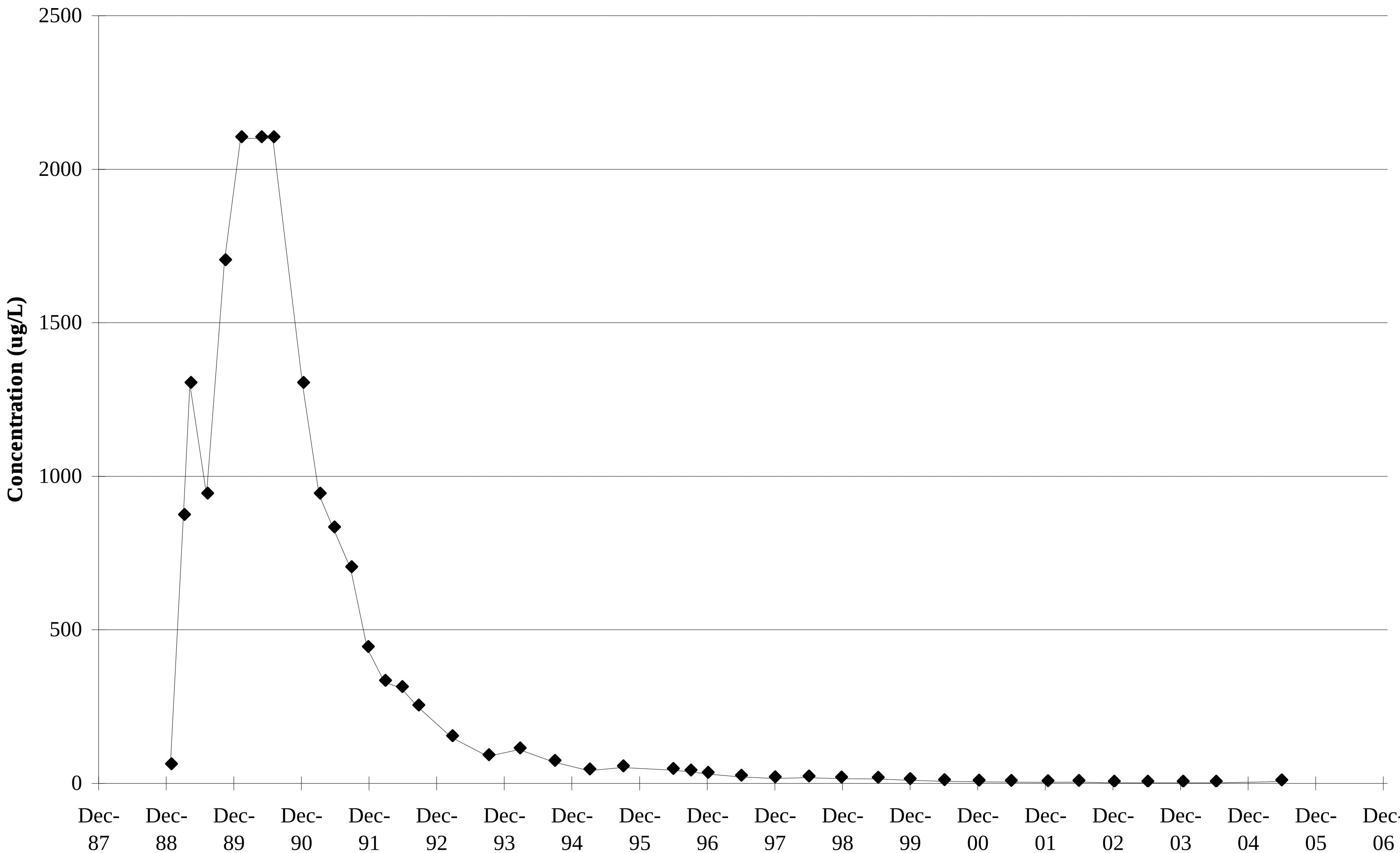


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL SC3 - TRCLE VS. TIME

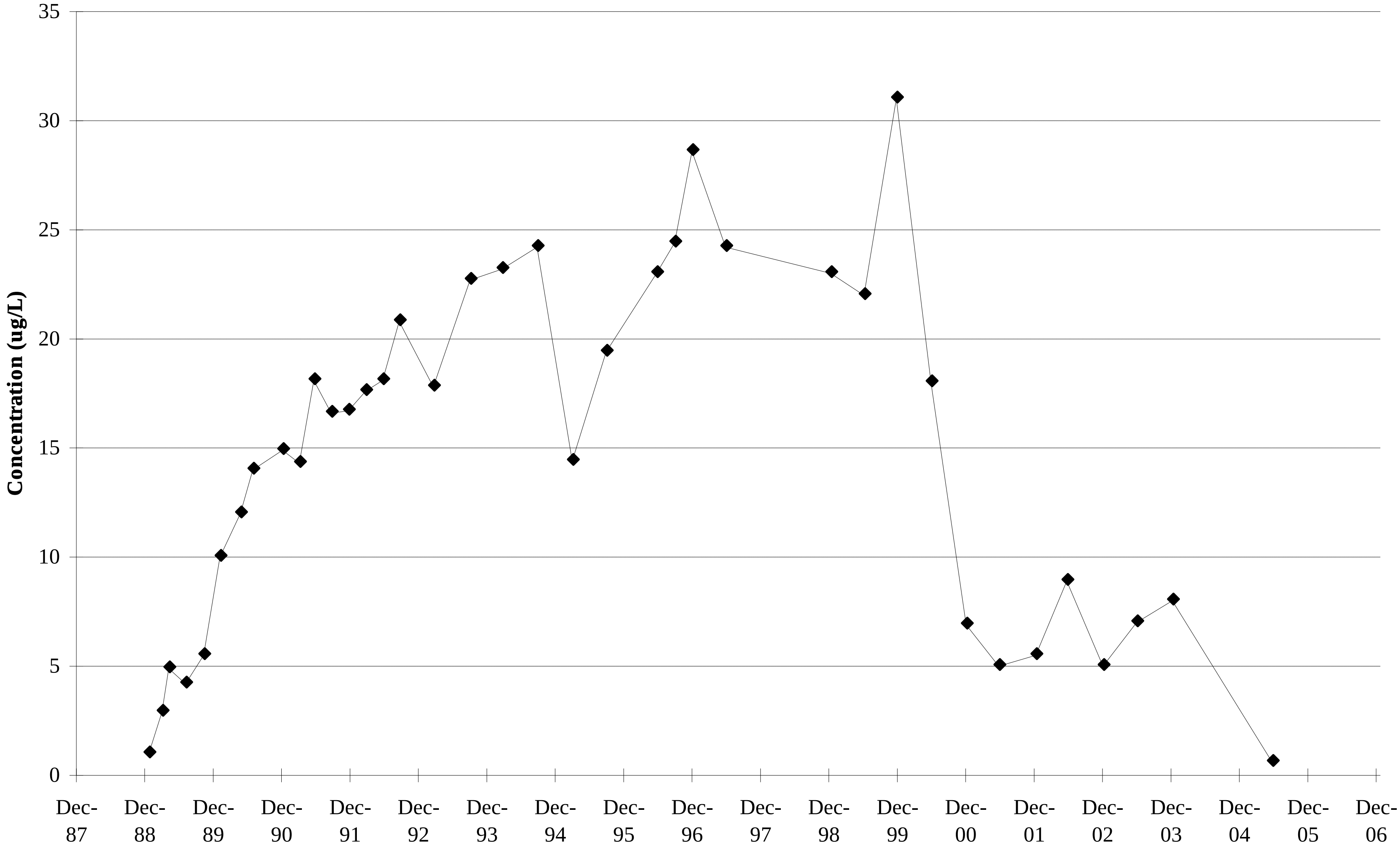


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL SC4 - TRCLE VS. TIME

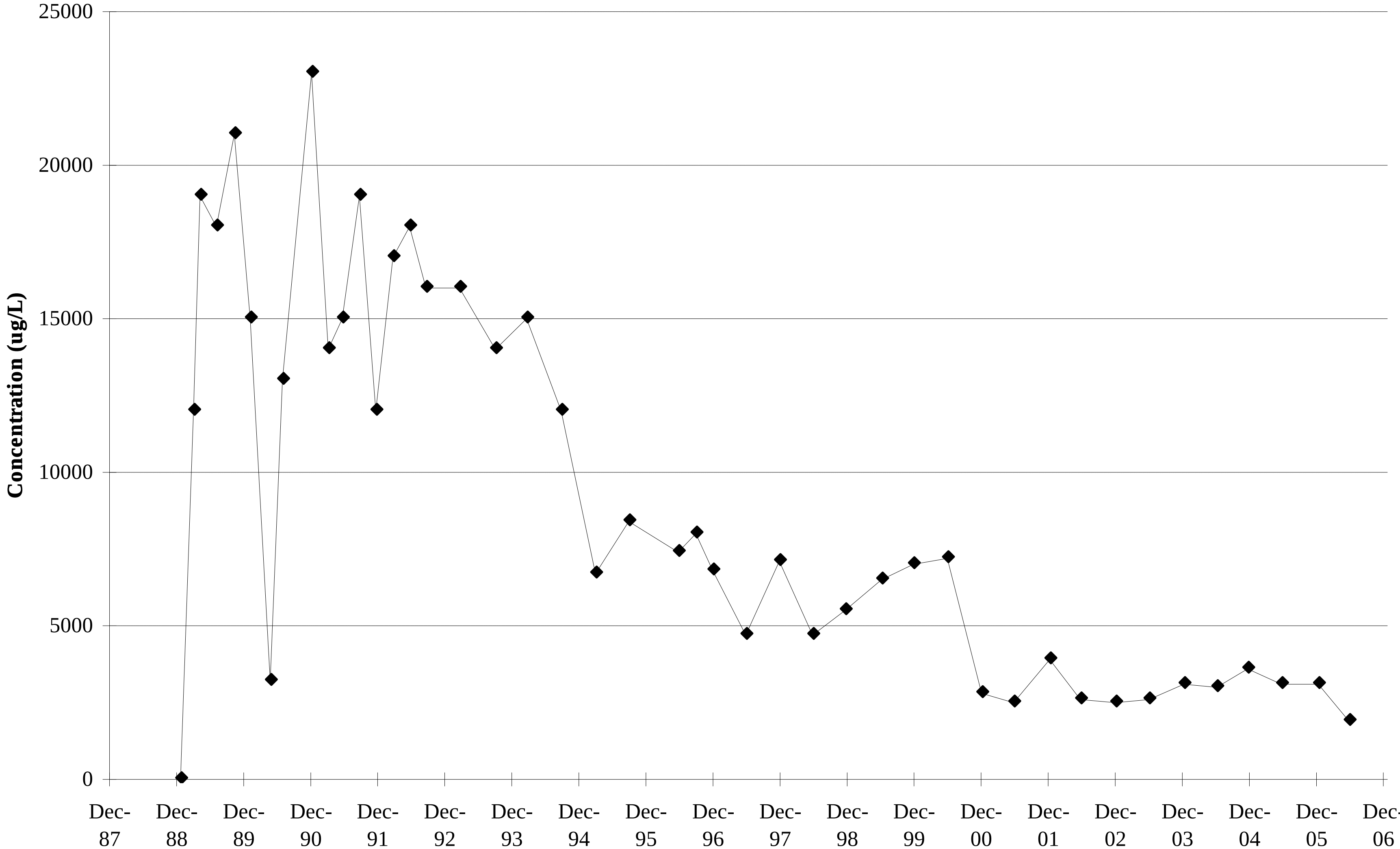


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

APPENDIX G.1

EXTRACTION WELL SC5 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

043774 (2)
C:\Files\Lisa\FY 2006 APR\043774-2-APP-G1

G.2 Influent/Effluent Database, Fiscal Year 2006, TGRS, TCAAP

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*		*1,1,1-Trichloroethane* µg/L	*1,1,2-Trichloroethane* µg/L	*1,1-Dichloroethane* µg/L	*1,1-Dichloroethene* µg/L	*1,2-Dichloroethane* µg/L	*Carbon Tetrachloride* µg/L	*Chloroform* µg/L	*cis-1,2-Dichloroethene* µg/L	*Freon 113* µg/L	*Methylene Chloride* µg/L	*Tetrachloroethene* µg/L	*trans-1,2-Dichloroethene* µg/L	*Trichloroethene* µg/L	*Vinyl Chloride* µg/L
TGRSE	10/10/05		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.22 JP	< 1
TGRSE	10/10/05	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.27 JP	< 1
TGRSE	11/3/05		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 UB (0.37),JP	< 1	0.34 JP	< 1
TGRSE	11/3/05	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 UB (0.37),JP	< 1	0.37 JP	< 1
TGRSE	12/12/05		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.4 JP	< 1
TGRSE	12/12/05	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.46 JP	< 1
TGRSE	1/3/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP	< 1
TGRSE	2/6/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP	< 1
TGRSE	2/6/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.36 JP	< 1
TGRSE	3/1/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.32 JP	< 1
TGRSE	3/1/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.29 JP	< 1
TGRSE	4/11/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.4 JP	< 1
TGRSE	4/11/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.35 JP	< 1
TGRSE	5/4/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.33 JP	< 1
TGRSE	6/6/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 UB 1.0,JP	< 1	< 1	< 1 UB 0.32,JP	< 1
TGRSE	6/6/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1 UB 1.0,JP	< 1	< 1	< 1 UB 0.32,JP	< 1
TGRSE	7/10/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.39 JP	< 1
TGRSE	7/10/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP	< 1
TGRSE	8/7/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.46 JP	< 1
TGRSE	8/7/06	D	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.49 JP	< 1
TGRSE	9/11/06		< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.4 JP	< 1

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2006
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date		1,1,1-Trichloroethane µg/L	1,1,2-Trichloroethane µg/L	1,1-Dichloroethane µg/L	1,1-Dichloroethene µg/L	1,2-Dichloroethane µg/L	Carbon Tetrachloride µg/L	Chloroform µg/L	cis-1,2-Dichloroethene µg/L	Freon 113 µg/L	Methylene Chloride µg/L	Tetrachloroethene µg/L	trans-1,2-Dichloroethene µg/L	Trichloroethene µg/L	Vinyl Chloride µg/L
TGRSI	10/10/05		59	< 1	7.2	7.8	0.38 JP	< 1	< 1	4.6	0.76 JP	< 1	0.92 JP	< 1	290	< 1
TGRSI	11/3/05		49	< 1	5.9	6.8	< 1	< 1	< 1	4	0.62 JP	< 1	< 1 UB (0.37),JP	< 1	270	< 1
TGRSI	12/12/05		76	< 1	6.5	7.2	0.45 JP	< 1	< 1	4	1.1	< 1	0.88 JP	< 1	320	< 1
TGRSI	1/3/06		66	0.37 JP	6.2	7	0.38 JP	< 1	< 1	3.6	0.99 JP	< 1	0.87 JP	< 1	290	< 1
TGRSI	1/3/06	D	65	< 1	6	7	0.31 JP	< 1	< 1	3.7	1	< 1	0.86 JP	< 1	300	< 1
TGRSI	2/6/06		58	0.32 JP	5.6	6.1	0.34 JP	< 1	< 1	3.3	0.75 JP	< 1	0.75 JP	< 1	270	< 1
TGRSI	3/1/06		66	< 1	6.1	6.4	0.41 JP	< 1	< 1	3.8	0.91 JP	< 1	0.67 JP	< 1	260	< 1
TGRSI	4/11/06		70	< 1	6.4	8	0.46 JP	< 1	< 1	3.7	0.75 JP	< 1	2.1	< 1	250	< 1
TGRSI	5/4/06		57	< 1	6.5	7.5	< 1	< 1	< 1	4	0.98 JP	< 1	1.6	< 1	210	< 1
TGRSI	5/4/06	D	56	< 1	6.4	7.6	< 1	< 1	< 1	4	1.1	< 1	1.5	< 1	220	< 1
TGRSI	6/6/06		55	< 1	5.4	6.9	< 1	< 1	< 1	3.4	0.78 JP	< 1 UB 1.0,JP	1.7	< 1	210	< 1
TGRSI	7/10/06		46	< 1	5.2	5.3	< 1	< 1	< 1	3.2	0.49 JP	< 1	1	< 1	190	< 1
TGRSI	8/7/06		69	< 1	5.7	7.4	< 1	< 1	< 1	3.4	0.89 JP	< 1	1.8	< 1	260	< 1
TGRSI	9/11/06		63	0.29 JP	5.6	6.4	< 1	< 1	< 1	3.1	1	< 1	1.4	< 1	270	< 1
TGRSI	9/11/06	D	61	0.42 JP	5.5	6.6	< 1	< 1	< 1	3.4	1	< 1	1.5	< 1	270	< 1

Notes:
D - Duplicate analysis
JP - Results less than reporting level but greater than instrument detection limit.
UB# - Blank Contamination, # = highest concentration of blank affecting data.

Appendix H

Operable Unit 3 Statistical Analysis

MAROS DECISION MATRIX

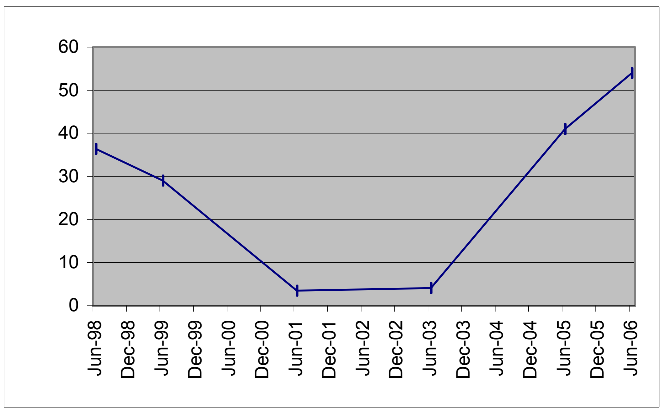
Kendall S	***Confidence***	***Coefficient of Varience***	***Trend***
S > 0	> 95%	NA	Definitely Increasing
S > 0	90-95%	NA	Probably Increasing
S > 0	< 90%	NA	No Trend
S< / = 0	< 90%	> / = 1	No Trend
S < / = 0	< 90%	< 1	Stable
S < 0	90-95%	NA	Probably Decreasing
S < 0	>95%	NA	Definitely Decreasing

Well: **04U832**

Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/25/1998	**36.40**	1					
6/7/1999	**29.00**	1	-1				
6/14/2001	**3.50**	1	-1	-1			
Jun-03	**4.10**	1	-1	-1	1		
6/23/2005	**41**	1	1	1	1	1	
6/13/2006	**54**	1	1	1	1	1	1

N		6	5	4	3	2	1	0		15
	sum		-1	0	3	2	1	0	Kendall S	5
Possibles		15								
									Kendall tau	0.33333333

Mean	28.00	
STNDEV	20.43536151	
COV	0.72983434	
Trend:		Positive
Confidence (lookup)		76.50%



Raw Data	Date	TCE
04U832		
	11/24/1987	**100.00**
	12/16/1988	**65.00**
	4/25/1990	**69.53**
	3/19/1991	**47.60**
	3/25/1992	**52.50**
	3/16/1993	42.00
	3/16/1993	**45.90**
	6/10/1994	49.00
	9/13/1994	**49.50**
	12/7/1994	43.30
	12/7/1994	47.10
	3/10/1995	**56.00**
	6/3/1996	**41.00**
	6/4/1997	**35.20**
	6/25/1998	**36.40**
	6/7/1999	**29.00**
	6/14/2001	**3.50**
	Jun-03	**4.10**
	6/23/2005	**41**
	6/13/2006	**54**

Well: **04U845**

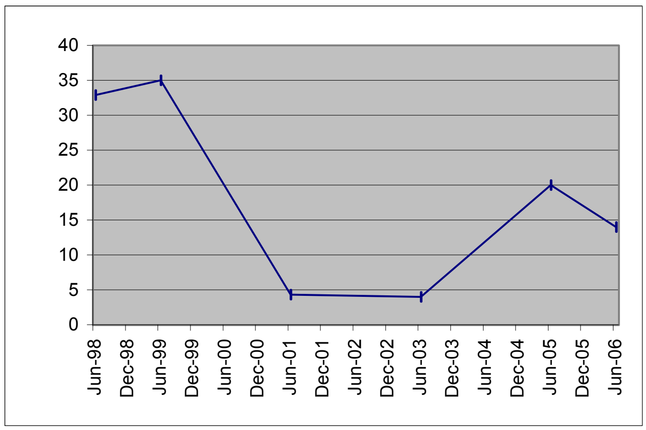
Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/25/1998	**32.90**	1					
6/7/1999	**35.00**	1	1				
6/13/2001	**4.30**	1	-1	-1			
6/1/2003	**4.00**	1	-1	-1	-1		
6/22/2005	**20**	1	-1	-1	1	1	
6/13/2006	**14**	1	-1	-1	1	1	-1

N		6	5	4	3	2	1		15
	sum		-3	-4	1	2	-1	Kendall S	-5
Possibles		15							
								Kendall tau	-0.3333333

Mean	18.37
STNDEV	13.51956607
COV	0.736092526

Trend: Negative

Confidence (lookup) 76.50%



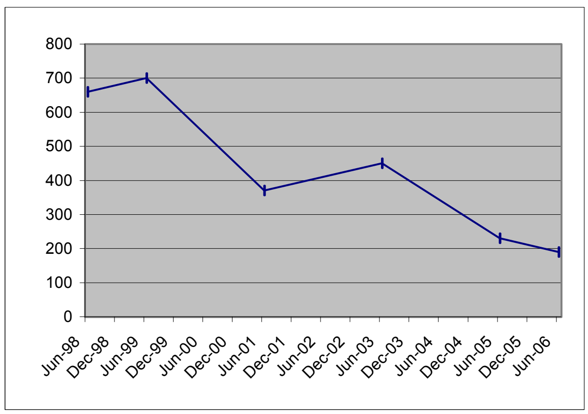
Raw Data	Date	TCE
04U845		
	12/1/1987	**59.00**
	12/16/1988	**155.00**
	5/4/1989	100.00
	7/20/1989	**160.00**
	10/20/1989	62.00
	4/26/1990	**38.00**
	3/20/1991	**100.00**
	3/23/1992	>50.10
	3/23/1992	**100.00**
	3/15/1993	**84.00**
	6/8/1994	64.00
	9/13/1994	**70.00**
	12/7/1994	54.00
	3/10/1995	**39.50**
	6/4/1996	**51.20**
	6/5/1997	**30.80**
	6/25/1998	**32.90**
	6/7/1999	**35.00**
	6/13/2001	**4.30**
	6/1/2003	**4.00**
	6/22/2005	**20**
	6/13/2006	**14**
	6/13/2006	14

Well: **03M848**

Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/29/1998	**660**	1					
6/4/1999	**700**	1	1				
6/12/2001	**370**	1	-1	-1			
6/1/2003	**450**	1	-1	-1	1		
6/21/2005	**230**	1	-1	-1	-1	-1	
6/13/2006	**190**	1	-1	-1	-1	-1	-1

N		6	5	4	3	2	1	0		15
	sum		-3	-4	-1	-2	-1	0	Kendall S	-11
Possibles		15								
									Kendall tau	-0.73333333

Mean	433.33
STNDEV	213.2291412
COV	0.492067249
Trend:	Negative
Confidence (lookup)	97.20%



Raw Data	Date	TCE
03M848		
	12/2/1987	**440.00**
	4/19/1990	190.00
	7/19/1990	190.00
	9/17/1990	**330.00**
	3/18/1991	310.00
	6/4/1991	**730.00**
	9/3/1991	700.00
	3/18/1992	**640.00**
	6/3/1992	>50.10
	6/3/1992	570.00
	9/3/1992	>50.10
	3/9/1993	**1300**
	3/9/1993	970
	3/17/1994	**910**
	3/16/1995	**59**
	6/21/1996	**1400**
	6/26/1997	**510**
	6/29/1998	**660**
	6/4/1999	**700**
	6/4/1999	650
	6/12/2001	**370**
	6/1/2003	**450**
	6/21/2005	**230**
	6/13/2006	**190**

Well: **04U861**

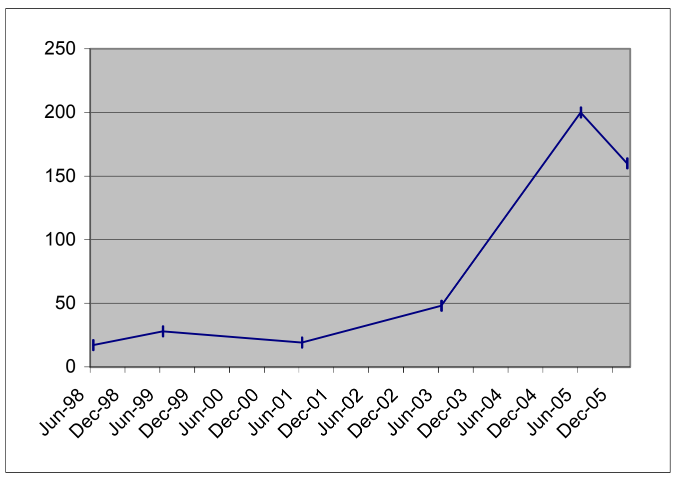
Date	TCE (ug/l)	Mann-Kendall Calculation:					
6/29/1998	**17.10**	1					
6/7/1999	**28**	1	1				
6/11/2001	**19**	1	1	-1			
Jun-03	**48**	1	1	1	1		
6/23/2005	**200**	1	1	1	1	1	
2/8/2006	**160**	1	1	1	1	1	-1

N		6	5	4	3	2	1		15
	sum		5	2	3	2	-1	Kendall S	11
Possibles		15							
								Kendall tau	0.73333333

Mean	78.68
STNDEV	80.24339017
COV	1.01982703

Trend: Positive

Confidence (lookup) 97.20%



Raw Data	Date	TCE
04U861		
	11/12/1987	**1.50**
	12/16/1988	**9.80**
	4/30/1990	**2.74**
	3/25/1991	**8.49**
	3/23/1992	**7.97**
	3/12/1993	**7.22**
	6/8/1994	9.69
	6/8/1994	10.40
	9/14/1994	8.26
	12/6/1994	**12.00**
	3/9/1995	**6.42**
	6/4/1996	**6.99**
	6/4/1997	**7.91**
	6/29/1998	**17.10**
	6/7/1999	**28**
	6/11/2001	**19**
	Jun-03	**48**
	6/23/2005	**200**
	2/8/2006	**160**
	2/8/2006	150

Appendix I

Other Installation Restoration Activities During FY 2006

APPENDIX I

OTHER INSTALLATION RESTORATION ACTIVITIES DURING FY 2006

This appendix is intended to give the reader a brief overview of other activities at TCAAP that are related to the Installation Restoration Program, but are not required by the RODs for OU1 through OU3.

A. BACKGROUND MONITORING

1. Deep Groundwater

In order to assess the quality of deep groundwater flowing from off-site to beneath TCAAP, monitoring is performed at locations near the upgradient side of TCAAP (the northeast corner and east side). Locations of these wells are shown on Figure B-3 in Appendix B. These wells were not scheduled for sampling in FY 2006. For reference, the FY 2005 results were:

Well	Trichloroethene
03U007	<1.0
03U009	<1.0
03L007	<1.0
04U007	<1.0
04U510	<1.0

These locations will be sampled again in FY 2007 as shown in Appendix A.1 (the wells are listed under TCAAP Groundwater Recovery System in the appendix).

2. Surface Water

The FY 2006 – FY 2010 Surface Water Monitoring Plan is presented in Appendix A.3. Although an NPDES permit is no longer in effect, monitoring for the Building 103 (Site K) treatment system effluent (Outfall 010) is being done to comply with the Final Modified Substantive Requirements Document (MN U000579), dated November 19, 1997. The data for Outfall 010 is presented in Tables 9-3 and 9-4, where it is listed as "effluent."

In addition, the Army has chosen to monitor Rice Creek as it enters and exits TCAAP (monitoring points 20700 and 20800, respectively, as shown on Figure I-1). This voluntary monitoring (not a regulatory requirement) is conducted to establish baseline characteristics for Rice Creek. Monitoring has been conducted annually beginning with FY 2001 (previous years had been quarterly). The FY 2006 data is presented in Table I-1. VOCs, mercury, lead, copper and cyanide were all non-detectable in the water entering and leaving TCAAP. There were low concentrations of zinc leaving the site.

Based on the lack of significant results in these data, the Army will discontinue the voluntary Rice Creek monitoring in FY 2007.

B. AQUATIC STUDIES

The Tier II Ecological Risk Assessment Report for aquatic sites, prepared by the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM), was approved by the MPCA and USEPA in December 2004. In June 2005, the Army submitted a draft feasibility study to support the Risk Manager's decision with respect to "No Further Action" or "Implement a Remedy" for each aquatic site. There was no action on this item in FY 2006. At the end of FY 2006, there were efforts underway to conduct additional sampling of Marsden Lake and Pond G.

C. GRENADE RANGE

The removal action to address contaminated soils was completed in early FY 2000. The Grenade Range Closeout Report received partial regulatory approval in FY 2002, with land use control issues still needing resolution. There was no activity related to this site in FY 2006.

D. OUTDOOR FIRING RANGE

The removal action to address metals-contaminated soils was completed in early FY 2000 and the Outdoor Firing Range Closeout Report received partial regulatory approval in FY 2002, with land use control issues still needing resolution. Construction was completed in October 2004 of a soil cover over a portion of the 1900-yard range that is contaminated with polynuclear aromatic hydrocarbons (PAHs). In FY 2006, the prepared an addendum (subsequently approved) to the above-referenced closeout report to document the work at the 1900-yard range.

E. 135 AND 535 PRIMER/TRACER AREAS

Preliminary assessment reports for both of these sites received regulatory approval in FY 2002. It was recommended that a Site Inspection be conducted for both areas. The Site Inspection investigation report for each of these sites received MPCA and USEPA approval in FY 2005. It is recommended that an Engineering Evaluation/Cost Analysis be conducted for both areas to determine what, if any, remediation is required to address contamination observed in the soils.

F. PROPERTY TRANSFER-RELATED ENVIRONMENTAL ACTIVITIES

In 2002, the remaining 774 acres that were still under the control of TCAAP, were declared excess to the needs of the Department of Defense. The Army Base Realignment and Closure Office funded environmental site assessment (ESA) work to collect reliable information regarding the environmental condition of the property in order to facilitate property transfer. The work included document reviews and field sampling of various media. The findings were published in “Environmental Site Assessment for 774-Acre Excess Parcel, Phase I and Phase II

Report, Twin Cities Army Ammunition Plant” (Plexus Scientific Corporation, February 20, 2004, final report). Based on comments from the MPCA and USEPA, additional samples were collected and analyzed in FY 2005. The Army submitted a draft “ESA Addendum Report” in May 2005, documenting the additional field work, and addressing other concerns raised by the regulators. The ESA addendum was approved in FY 2006.

G. RICE CREEK AREA

In FY 2005, 112 acres along Rice Creek were transferred from the federal government to Ramsey County as a public benefit conveyance for recreational use. During the transfer process, it came to light that a sample showed sediment in a drainage ditch was contaminated with polynuclear aromatic hydrocarbons (PAHs). The sample was collected at the outfall of a storm sewer that conveys water from the 135 Primer/Tracer Area. While the 135 Primer/Tracer Area is not on the 112-acre parcel, the outfall and ditch were on the transferring property. In FY 2005, the Army collected additional samples to delineate the extent of contamination. Field work to excavate and remove the PAH contamination was completed in October 2005. A closeout report was approved FY 2006.

TABLE I-1
WATER QUALITY DATA FOR SURFACE WATER

Fiscal Year 2006

	20700 (Entering TCAAP)	20800 (Leaving TCAAP)
	6/15/06	6/15/06
VOCs (ug/l)		
1,1-Dichloroethane	<1.0	<1.0
1,1-Dichloroethene	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
cis-1,2-Dichloroethene	<1.0	<1.0
trans-1,2-Dichloroethene	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Vinyl Chloride	<1.0	<1.0
Metals (ug/l)		
Copper	B 0.996	B 1.31
Lead	B 0.178	B 0.297
Mercury	B 0.0628	< 0.100
Silver	---	---
Zinc	B 0.642	2.39
Inorganics (ug/l)		
Cyanide	B 5.6	B 4.5
Total Phosphorus	< 400	< 400

Notes:

B = The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2006
Surface Water Monitoring Locations		Figure I-1

Appendix J

Annual Site Inspection Checklist for Land Use Controls

ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

Twin Cities Army Ammunition Plant

Date: July 20, 2006

Inspected By: Mike Fix (TCAAP), Dave Fuller (TCAAP), Dave Hamernick (Nat'l Guard), Keith Benker (Wenck)

Sites:	A	C	D	E	G	H	I	K
Site is located on property held by:	N.G.	BRAC	N.G.	N.G.	N.G.	N.G.	BRAC	BRAC
Is the fence surrounding federally-controlled property intact?	Yes							
Is access to the federally-controlled property still controlled by BRAC & the National Guard?	Yes							
Is the current land use consistent with the land use scenario upon which the cleanup levels were based?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Has there been any excavation or other man-made soil disturbance at the site?	No	No	No	No	No	No	Yes (1)	No (2)
If excavation or soil disturbance has occurred, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A
Have any new structures or facilities (including new wells) been constructed on the site?	No	No	No	No	No	No	No	No
If new facilities or structures were constructed, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If new facilities or structures were authorized, was constuction in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Has there been any damage to or removal/modification of groundwater remediation systems?	No	No	N/A	N/A	N/A	N/A	N/A	No
If such systems were removed or modified, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If system removal/modification was authorized, was removal/modification in accordance with approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If a protective soil cover is present, is adequate vegetation present throughout the soil cover area?	N/A	N/A	Yes	Yes	Yes	Yes	N/A	N/A
If a protective soil cover is present, is there any woody vegetation > 2" diameter present on the soil cover area?	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
If a protective soil cover is present, are run-on/runoff controls in good condition (swales, berms, riprap, etc.)?	N/A	N/A	Yes	Yes	Yes	Yes	N/A	N/A
If a protective soil cover is present, are signs marking the edge of the soil cover present and in good condition?	N/A	N/A	Yes	Yes	Yes	Yes	N/A	N/A

Comments (Attach additional pages as necessary):

(1) During 2006, there was repair of the water line outside of Bldg 502.

(2) Building 103 has been demolished, but the slab was left in-place, and there was no disturbance of the soil.

ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

Twin Cities Army Ammunition Plant

Sites:	129-3	129-5	129-15	Grenade Range	Outdoor Firing Range	Bldg 135 P/T Area	Bldg 535 P/T Area	Unchar. Land
Site is located on property held by:	N.G.	N.G.	N.G.	N.G.	N.G.	BRAC	N.G.	BRAC/N.G.
Is the fence surrounding federally-controlled property intact?	Yes							
Is access to the federally-controlled property still controlled by BRAC & the National Guard?	Yes							
Is the current land use consistent with the land use scenario upon which the cleanup levels were based?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Has there been any excavation or other man-made soil disturbance at the site?	No	No	No	No	No	No	No	N/A
If excavation or soil disturbance has occurred, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Have any new structures or facilities (including new wells) been constructed on the site?	No	No	No	No (3)	No	No	No	N/A
If new facilities or structures were constructed, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If new facilities or structures were authorized, was constuction in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Has there been any damage to or removal/modification of groundwater remediation/monitoring systems?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If such systems were removed or modified, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If system removal/modification was authorized, was removal/modification in accordance with approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If a protective soil cover is present, is adequate vegetation present throughout the soil cover area?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A
If a protective soil cover is present, is there any woody vegetation > 2" diameter present on the soil cover area?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If a protective soil cover is present, are run-on/runoff controls in good condition (swales, berms, riprap, etc.)?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A
If a protective soil cover is present, are signs marking the edge of the soil cover present and in good condition?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A

Comments (Attach additional pages as necessary):

(3) Four Monitoring wells were sealed in Spring 2006.