INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

FISCAL YEAR 2004 ANNUAL PERFORMANCE REPORT

Prepared for:

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

TECUMSEH/WENCK
INSTALLATION SUPPORT SERVICES

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

SEPTEMBER 2005
FINAL REPORT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

September 22, 2005

SR-6J

Mr. Michael R. Fix
Remedial Project Manager
Twin Cities Army Ammunition Plant
4700 Highway 10 – Suite A
Arden Hills, MN 55112- 3928

RE: Consistency Test for the Fiscal Year 2004 Annual Performance Report, Twin Cities Army Ammunition Plant, Arden Hills, Minnesota

Dear Mr. Fix:

Staff at the U.S. Environmental Protection Agency (U.S. EPA) and the Minnesota Pollution Control Agency (MPCA) have completed review of the Fiscal Year 2004 Annual Performance Report (Report). Our review included the draft version of the Report dated February 2005; U.S. EPA comments dated March 31, 2005; MPCA comments dated March 24, 2005 and Army's responses to our comments dated June 23, 2005.

You are hereby advised that, in accordance with Chapter XIV of the Federal Facility Agreement, the Twin Cities Army Ammunition Plant Fiscal Year 2004 Annual Performance Report passes the Consistency Test.

If you have any questions, please contact Dagmar Romano at (651) 296-7776 or Tom Barounis at (312) 353-5577.

Sincerely

Tom Barounis
for
Dagmar M. Romano
Project Manager
Superfund Section
Majors and Remediation Division

Tom Barounis
Tom Barounis
Remedial Project Manager
U.S. EPA, Region 5

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APPENDICES

List of Acronyms

Alliant	-	Alliant Techsystems Inc.
Army	-	U.S. Army
AS/SVE	-	Air Sparging/Soil Vapor Extraction
BGRS	-	Boundary Groundwater Recovery System
CAMU	-	Corrective Action Management Unit
CRA	-	Conestoga-Rovers & Associates, Inc.
CRDL	-	Contract Required Detection Limit
DNAPL	-	Dense Non-Aqueous Phase Liquid
EE/CA	-	Engineering Evaluation/Cost Analysis
ERIS	-	Environmental Restoration Information System
FFA	-	Federal Facilities Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
GOS	-	TGRS Global Operating Strategy
gpm	-	Gallons per Minute
HBV	-	Health Based Value
HRC	-	Hydrogen Release Compound
IRA	-	Interim Remedial Action
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
MOS	-	TGRS Micro Operation Strategy

List of Acronyms (Cont.)

MPCA	-	Minnesota Pollution Control Agency
NBM	-	New Brighton Municipal
NPL	-	National Priorities List
O&M	-	Operation and Maintenance
OU	-	Operable Unit
OU1TG	-	OU1 Technical Group
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
QAPP	-	Quality Assurance Project Plan
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
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

List of Acronyms (Cont.)

USAEC	-	United States Army Environmental Center
USEPA	-	United States Environmental Protection Agency
VOC	-	Volatile Organic Compound
Wenck	-	Wenck Associates, Inc.

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

List of Acronyms (Cont.)

CH3CL	-	Chloromethane
CHBR3	-	Bromoform
CHCL3	-	Chloroform
CLC6H5	-	Chlorobenzene
CU	-	Copper
CYN	-	Cyanide
DBRCLM	-	Dibromochloromethane
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 2004 (FY 2004) 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 2004 is defined as the period from October 1, 2003, through September 30, 2004.

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

- OU1 ROD signed September 1993
- OU2 ROD signed December 1997
- OU3 ROD signed September 1992

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)*
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 2004. 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 2004 are:

- One private well was sampled in FY 2004 (Unique No. 234474). Results for this well showed that no VOCs were detectable, indicating that the well does not require an offer for well abandonment and/or alternate water supply.
- 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. There were several minor updates to the well inventory in FY 2004 with no new recommendations for abandonment or alternate water supply needed.
- Evaluation of pumping rates and water quality trends support the interpretation that the extraction system is effectively containing contamination in the Prairie du Chien aquifer. The degree of containment remains under discussion between the Army, United States Environmental Protection Agency (USEPA), Minnesota Pollution Control Agency (MPCA), City of New Brighton, and Restoration Advisory Board. The Army, USEPA, MPCA, Restoration Advisory Board, and City of New Brighton continued discussions regarding amending the OU1 ROD to modify the requirement for containment, and replacing it with a requirement to demonstrate that the plume is not spreading and that aquifer restoration is occurring. These parties formed the OU1 Technical Group (OU1TG), which met throughout FY 2004 to address the technical aspects of a ROD amendment. At

the end of FY 2004, a report was being completed documenting statistical methods to be used to help assess remedial progress in OU1 under the anticipated ROD amendment. It is expected that the ROD amendment will require demonstration of decreasing contaminant trends using the statistical analysis developed by the OU1TG.

- Three Jordan aquifer monitoring wells were installed and sampled off-TCAAP in FY 2004, according to an agreement with the MPCA and USEPA. These wells provide additional monitoring points between TCAAP and the New Brighton municipal well field. These wells will be incorporated into the statistical analysis when there are sufficient data points to meet the statistical significance required for evaluation.
- The PGAC treated 1.4 billion gallons of water and removed 733 pounds of VOCs during FY 2004. Approximately 17,547 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. Only limited sampling was conducted in FY 2004 (in accordance with the monitoring plan), so the statistical analysis is based primarily on data through FY 2003. Both the extent and magnitude of contamination in the Prairie du Chien aquifer appear to be stable or improving.

Operable Unit 2 (OU2)

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.

Highlights for activities within OU2 during FY 2004 are:

- Shallow Soil Sites
  - The Closeout Report for VOC-contaminated soils at Site A received final regulatory consistency.
  - Closeout Reports for Sites A (excluding VOC-contaminated soils), E, H, 129-3, 129-5, and 129-15 (which received regulatory approval prior to FY 2004) continued to await final consistency based on resolution of land use controls.
  - At Site C, soil remediation work temporarily resumed during October-November 2003. Approximately 3,176 tons of contaminated soil were excavated, stabilized, and landfilled off-TCAAP. Sediment samples were also collected from engineered drainage ditches near the north and west sides of Site C. Options for completing remediation of soils and ditch sediments at this site were under discussion at the end of FY 2004.
  - In FY 2004, the MPCA, USEPA and Army agreed to incorporate the shallow groundwater response action at Site C into the TCAAP FFA. The groundwater contamination was an inadvertent result from a demonstration project for phytoremediation of soils. In FY 2004 the groundwater extraction system extracted 2.9 million gallons of groundwater and removed 23.4 pounds of lead. The total lead mass removed is 90.8 pounds. The monitoring requirements for demonstrating containment were met.
  - The Closeout Report for the Corrective Action Management Unit (CAMU) received final regulatory consistency. The CAMU was used intermittently as a staging and treatment area during remediation of some of the shallow soil sites.

- Deep Soil Sites
  - The Site D 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 D shallow soils was being prepared at the end of FY 2004.
  - Cover construction was completed over the Site G dump in early FY 2004. 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 2004.

- Site A Shallow Groundwater
  - Four extraction wells continued to provide containment and mass removal.
  - The system pumped at an average rate of 15.9 gallons per minute (gpm), exceeding the 15 gpm target rate.
  - The system removed approximately 2.4 pounds of VOCs during FY 2004, with a cumulative mass removal of 42 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.
  - Monitoring well 01U108 was sampled and analyzed for 1,4-dioxane. The laboratory result was 15 µg/l, below the MDH HBV of 30 µg/l. No additional sampling is proposed.

- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 2004. USEPA requested monitoring of four additional wells during FY 2004. These wells were 01U632, 01U666, 01U667, and 01U668. Four of the eleven wells scheduled for sampling were dry.
  - Eight monitoring wells (01U004, 01U054, 01U634, 01U635, 01U638, 01U642, 01U652, 01U675) were abandoned in FY 2004.

- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 4,583,336 gallons of water and maintained a continuous zone of capture downgradient of Building 103. A total of 11.9 pounds of VOCs were removed in FY 2004.
  - The extracted water was discharged to Rice Creek in compliance with all discharge criteria with the exception of a February 2004 sample. The February 2004 sample had an estimated zinc concentration of 367 µg/l. An effluent sample was collected in March 2004. The March 2004 sample had a zinc concentration of 55 µg/l. The discharge criteria for zinc is 134 µg/l.
  - Two monitoring wells (01U622 and 01U623) were abandoned in FY 2004.
  - Monitoring well 01U615 was sampled and analyzed for 1,4-dioxane. The laboratory result was estimated at 0.64 µg/l, which is below the MDH HBV of 30 µg/l. No additional sampling is proposed.

- Deep Groundwater
  - The TCAAP Groundwater Recovery System (TGRS) operated in accordance with the OU2 ROD.
  - The TGRS very likely operated at a rate sufficient to support the conclusion that the 5-µg/l TRCLE contour is hydraulically contained.

- In FY 2004, the TGRS extracted and treated 895,281,560 gallons of water. The mass of VOCs removed was 3,291 pounds, which is greater than that achieved in FY 2003. The total VOC mass removed by the TGRS through FY 2004 is 189,268 pounds.
- The TGRS Operating Strategy (OS) was approved by the regulatory agencies and finalized in FY 2003. The OS presents a Global Operation Strategy (GOS) for the entire TGRS extraction system and a Micro Operation Strategy (MOS) for well groups.
- The TGRS Operating Strategy (OS) was modified (Modification #3) in FY 2004 such that pumping rates at the South Plume wells with higher trichloroethene concentrations (B1 and B13) were increased, while the pumping at wells with lower trichloroethene concentrations was decreased. In allowing for lower pumping rates, the modification was expected to increase the mass removal for contaminants, which occurred as noted in a bullet above. The USEPA and MPCA approved the modified OS in May 2004 and the modification was implemented in July 2004.
- Analytical results for a select group of wells sampled in 2004 showed detections of 1,4-dioxane ranging from less than 1 µg/l to 15 µg/l. These results are below the MDH HBV for 1,4-dioxane of 30 µg/l. Field blank contamination for 1,4-dioxane was also identified. No additional sampling is proposed.

Operable Unit 3 (OU3): Deep Groundwater

- The PGRS extraction well (NB13) and the associated treatment plant were not used for remediation (groundwater capture or containment) purposes or to satisfy peak water supply needs during FY 2004. At the end of FY 2003 the PGRS was returned to standby status. The PGRS was operated in support of standby status and for collection of groundwater samples in FY 2004. All water pumped was sewered. Monitoring continued to show that the OU3 plume no longer extends to the extraction well.

- A technical memorandum in support of a future OU3 ROD amendment was submitted to the USEPA and MPCA on August 26, 2004. This document provides a statistical evaluation of VOC concentrations in OU3 wells to demonstrate the OU3 plume is either stable or decreasing in concentration. The document was still under review at the end of FY 2004.

<u>All Three Operable Units (OU1, OU2, OU3)</u>

- A Five-Year Review of the remedies for all three operable units was performed during FY 2004. Since contamination is still present above levels that allow for "unlimited use and unrestricted exposure," it is a requirement to conduct a review every five years. The first Five-Year Review was signed in September 1999. The 2004 review concluded that the remedies are functioning as intended and remain protective of human health and the environment under the current land use. The Army, USEPA, and MPCA signed the document in September 2004.

Table 1-1
Status of Remedial Actions

Fiscal Year 2004

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: Groundwater Containment	Yes	Yes	No	The containment requirement is under review. The OU1 Technical Group developed a statistical approach in support of a proposed ROD amendment modifying the containment requirement.
#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	

Table 1-1 (continued)
Status of Remedial Actions

Fiscal Year 2004

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				
#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	Site was partially excavated FY 2000-2004. Additional characterization was done in FY2004. An alternatives analysis for this site was under review at the end of FY2004. The groundwater response action is included in the APR for FY2004.
Site E	Yes	Yes	Partially	Closeout Report was partially approved; however, see Note 1 at the end of the OU2 section of this table.
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 FY2003, 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 FY2003; however, see Note 1 at the end of the OU2 section of this table.
Overall Remedy	Yes	Yes	Partially	

Table 1-1 (continued)
Status of Remedial Actions

Fiscal Year 2004

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	Partially	Site D and Site G Closeout Reports were partially approved; however, see Note 1 at the end of the OU2 Section of this table.
#3: SVE Systems (Deep)	Yes	Yes	Yes	
#4: Enhancements to SVE Systems	Yes	Yes	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	Partially	Site D and Site G Closeout Reports were partially approved; however, see Note 1 at the end of the OU2 Section of this table.
#6: Maintain Surface Drainage Controls	Yes	Yes	Partially	Site D and Site G Closeout Reports were partially approved; however, see Note 1 at the end of the OU2 Section of this table.
#7: Characterize Shallow Soils and Dump	Yes	Yes	Partially	Site D and Site G Closeout Reports were partially approved; however, see Note 1 at the end of the OU2 Section of this table.
Overall Remedy	Yes	Yes	Partially	

Table 1-1 (continued)
Status of Remedial Actions

Fiscal Year 2004

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	Yes	A Closeout Report for the Former 1945 Trench soils received regulatory consistency in FY 2004.
Overall Remedy	Yes	Yes	No	
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	Yes	Yes	No	See above.
Overall Remedy	Yes	Yes	No	See above.

Table 1-1 (continued)
Status of Remedial Actions

Fiscal Year 2004

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 K Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Sentinel Wells	Yes	Yes	Yes	
#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

Fiscal Year 2004

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	Modification #3 to the TGRS Operating Strategy received consistency in FY2004.
#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	

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.

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 3: Deep Groundwater				
#1: Groundwater Extraction	Yes	Yes	No	Operation during FY 2004 was in support of maintaining system in stand-by status and for collecting samples. All water was sewered.
#2: Groundwater Treatment	Yes	Yes	No	See above comment under Remedy Component #1.
#3: Use of Water for Municipal Supply	Yes	Yes	No	See above comment under Remedy Component #1.
#4: Groundwater Monitoring	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	A ROD Amendment was in Progress at the end of FY2004

2.0 Introduction

2.1 PURPOSE

This Fiscal Year 2004 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 2004 (FY 2004) extended from October 1, 2003, through September 30, 2004.

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, 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 beginning in this 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, and sediment at Site C.

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 really answering two questions:

1. *Are all of the remedies being implemented? (Compliance check with the RODs)*
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 one more level 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 2004, 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 2004 through FY 2008. The FY 2004 monitoring plan indicates the work that generated the results presented in this report. The FY 2005 monitoring plan is in progress. The monitoring plan is a moving 5-year time span (i.e., next year FY 2004 will drop off and FY 2009 will be added).

This report represents the collaboration of work performed by the Army and Alliant Techsystems Inc. (Alliant). On behalf of the Army, Tecumseh/Wenck Installation Support Services (TWISS) 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. TWISS, 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. TWISS is the current contracted operator.

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. The remaining 774 acres of TCAAP were declared excess to the needs of the Department of Defense in 2002, and the Army is working towards the transfer of this property from 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 and 129-15 (see Figure 2-2 for locations). Sites F and J were remediated 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 2004 Monitoring Plan for Groundwater Monitoring Wells
- FY 2004 Monitoring Plan for Remedial Treatment Systems
- FY 2004 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

Data was collected principally by four parties: TWISS 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 2004 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)?

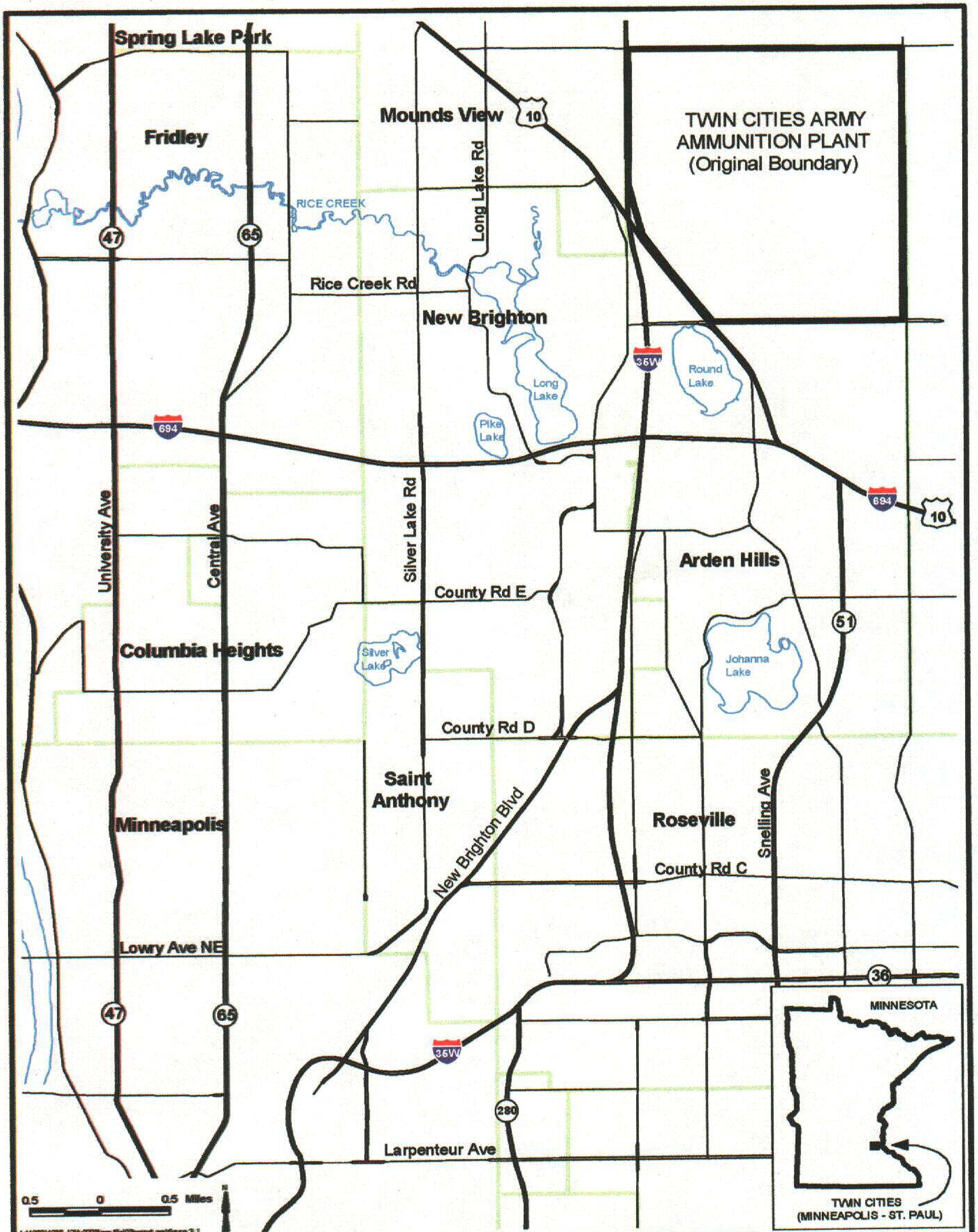
Yes. The data was collected in accordance with the FY 2004 Monitoring Plan. FY 2004 was a transition year for the quality assurance plan. Data collected through April 1, 2004 was collected, assessed, and validated in accordance with the "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996). Data collected after April 1, 2004 was collected, assessed, and validated in accordance with the "Quality Assurance Project Plan for Performance Monitoring, Revision 3, December 10, 2003, (TWISS, 2003).

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 2004 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 dated March 25, June 8, October 7, and November 29, 2004. 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 2004 Monitoring Plan. The completeness goals are the same in both the 1996 and 2003 QAPPs. Field completeness for FY 2004 was 100% and laboratory completeness was 100% (wells that were dry 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 11%, also meeting the QAPP-specified frequency. Data validation was performed on 27% 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 100% complete in FY 2004.

The data for FY 2004 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	COPYRIGHT Wenck	FY 2004
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

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2004

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

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

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 2004, as defined by the 1 μg/l contour line?

No. There was not a comprehensive sampling round conducted in FY 2004. Therefore, it is assumed that the 1 μg/l contour line remained essentially the same as in FY 2003 (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?
Yes (see Appendix E for additional information).

Were any water supply wells within the area of concern for OU1 sampled during FY 2004 (outside of those included in the OU1 performance monitoring plan)? If yes, what were the findings?
Yes. One well was sampled in FY 2004, as discussed in Appendix E. Analytical results are summarized in Table E-2 and the well location is illustrated on Figure E-5. Results for the well showed that no VOCs were detected.

Were any well owners offered an alternate water supply and/or well abandonment during FY 2004? 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?
Yes. FY 2005 is a major sampling event for well inventory wells as shown in Appendix A.1. Wells to be sampled during the "major" sampling event in FY 2005 are:

- Any previously undiscovered wells determined to be in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a based on the FY 2005 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.
- Any operational wells in the existing database that have been determined to be Categories 1a, 1b, 1c, 2a, 2b, 2c.

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: GROUNDWATER CONTAINMENT

Description: "Extracting groundwater at the containment boundary in the North Plume near County Road E." (ROD, page 2)

- 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 (Note that Figure 3-1 shows the FY 2003 plume outline since FY 2004 was a minor sampling year).

- 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 containment boundary created by the extraction system is providing capture of groundwater with contaminant concentrations exceeding the cleanup standards specified on page 18 of the OU1 ROD.

During FY 2004, did the OU1 extraction system provide capture (at the containment boundary) of groundwater exceeding the cleanup standards specified on page 18 of the OU1 ROD?
The degree of containment remains under discussion between the Army, USEPA, MPCA, City of New Brighton, and Restoration Advisory Board. In FY 2002, the Army prepared a technical memorandum (TWISS, December 2001) regarding the feasibility of a modification to the ROD. The contemplated change would be to switch from a requirement for demonstrating complete hydraulic containment, to a requirement for maintaining a specified pumping rate while demonstrating that the plume is not spreading and that aquifer restoration is occurring.

To address the technical issues surrounding the contemplated ROD amendment, representatives from the Army, USEPA, MPCA, Restoration Advisory Board, and City of New Brighton formed the Operable Unit 1 Technical Group (OU1TG). The OU1TG comprises technical representatives who met throughout 2004 under a cooperative and non-binding effort to develop a set of statistical tools for evaluating the progress of aquifer restoration in OU1. In September 2004, the OU1TG completed a draft report titled "Technical Memorandum, Statistical Evaluation Method for Operable Unit 1 Water Quality Data" (OU1 Technical Memorandum) and presented it to the TCAAP project managers for review. The report was being finalized in December of 2004. The statistical evaluation is presented here (see Section 3.7) in anticipation that these methods will become part of the annual performance evaluation of the remedial progress in OU1.

In the meantime, the extraction system has continued to operate. Following is a discussion of the performance of the system with respect to containment.

<u>Pumping Rates</u>

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 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 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 2004, the NBCGRS was in the normal operating condition (Condition A) approximately 62 percent of the time. The system was in Condition G (primarily for carbon change-outs) for 21 percent of the time, with other operating conditions comprising the remaining 17 percent of the time.

Figure 3-2 indicates that the NBCGRS, as a whole, exceeded the monthly targets in all months except March during FY 2004. The graph shows much lower targets in October 2003 and April 2004. Also, the monthly pumping volumes in October 2003 and April 2004, were lower than the typical pumping volume in the other months. 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/May. Although 3 months had noticeably lower pumping volumes, the pumping volumes for the other 9 months typically exceeded pumping targets by 20 to 40 percent. Looking at the total NBCGRS pumping volume for FY 2004 of 1,405 million gallons, the average monthly pumping volume (if pumping was at a uniform rate) would be about 117 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 and NBM #4 were slightly below the target in April, related to the Condition G due to carbon change-outs. Pumping targets for the extraction wells were met in all other months.

The overall adherence to the pumping targets supports the interpretation that the extraction system is providing substantial containment in the Prairie du Chien.

Water Level Contour Analysis

Since FY 2004 was a minor sampling year, there was not a comprehensive water level collection round. Therefore, groundwater elevation contour maps were not prepared for OU1. Table 3-2 presents the groundwater elevations measured during FY 2004.

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. The range in FY 2004 at NBM #3 was 32 µg/l to 76 µg/l, with an average of 46 µg/l. The range in FY 2004 at NBM #4 was 36 µg/l to 81 µg/l, with an average of 51 µg/l. NBM #14 has generally shown a decreasing trend since its startup in December 1996, though there seems to have been a leveling off in FY 2004. The range in FY 2004 was 9 µg/l to 37 µg/l, with an average of 25 µg/l. NBM #15 fluctuated between its startup in March 1998 and 2000, decreased slightly during 2001, and has been relatively stable since then. The range in FY 2004 was 46 µg/l to 92 µg/l, with an average of 77 µg/l.

While not conclusive in and of itself, the 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.

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 2004 monitoring well data.

Are any changes or additional actions required for this remedy component?

Potential changes and/or additional actions will be addressed through the ROD modification process discussed previously.

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 MCLs and non-zero 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 3-3 shows that the PGAC effluent met the performance standard during FY 2004.

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 3-3 shows that two carbon change-outs occurred in FY 2004: one in October/November 2003 that was triggered by breakthrough detection, and one in April/May 2004, which was electively done to avoid having to conduct a change-out during the peak demand months of the summer (breakthrough had not yet been detected). The sampling results that represent PGAC effluent water quality are highlighted in Table 3-3 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 3-4 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, with one exception. Saint Anthony Municipal #3 was not sampled, since it was not in service at the time of the June sampling event. The monitoring plan does not require this well to be sampled unless it is in service.

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

- Groundwater sampling of water supply wells related to alternate supply and abandonment will be in accordance with recommendations in Appendix E. The next "major" event will be in FY 2005.
- 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 2005.

Are any changes or additional actions required for this remedy component?

As part of the OU1 ROD Modification discussions, the USEPA and MPCA requested that the Army install three additional monitoring wells completed in the Jordan aquifer. The Army agreed and funding was secured in September 2003. The wells were installed in June 2004 and sampled in June and August 2004. A report documenting the installation and sampling of these wells was prepared and submitted in September 2004. The report recommends sampling these wells again in December 2004, and annually in June thereafter. As part of ongoing discussions, the Army agreed to sample the new Jordan wells semi-annually through FY 2006 to establish a statistical database for these wells. The proposed monitoring requirements are shown in Appendix A.1.

Also related to the OU1 ROD Modification, additional sampling has been added to support future statistical analysis as described in the OU1TG Tech Memo. Wells 03U711/04U711, 03M802/03L802/04U802, and 03L806 were changed from a biennial frequency to annual. Well 03M806 was changed from no sampling to annual. Wells 04U821, 04U849, and 191942 were changed from no sampling to biennially, and added to the statistical analysis under Group2 "Areal Extent of Plume". Wells 03L859, 04U854, and 206688 were added for sampling in June 2004, and thereafter biennially. These changes are shown in Appendix A.1. While the changes are the result of OU1 discussions, note that some of the wells are listed in Appendix A.1 under the heading of TGRS or OU3.

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 Technical Memorandum was prepared to develop statistical methods specifically selected to answer this question. 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.

Additional detail on the well groups and analysis is presented in the OU1 Technical Memorandum and Appendix D.2.

FY 2004 was a minor sampling year, so new comprehensive plume mapping was not completed. Table 3-5 presents the FY 2004 groundwater quality data for OU1. These data were collected to support the statistical analysis developed by the OU1TG. 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 OU1 Technical Memorandum presented an analysis of the water quality data through FY 2003. Since FY 2004 was a minor sampling event, that analysis represents the most current application of the statistical methods for Groups 3 and 5 and the majority of Group 2. For Group 1, representing the area immediately downgradient of the TGRS, a round of samples was collected in FY 2004. This group is now sampled annually. Group 2 wells 206688 and 04U833 were also sampled in FY 2004 to help improve the statistical significance at these wells.

The analysis in Appendix D.2 is the same as presented in the OU1 Technical Memorandum with the addition of FY 2004 data for Group 1 and Group 2 and edited for the Annual Report. The inclusion of hydrogeologic Unit 3 as an addition to the Group 5 evaluation will be completed in FY 2005 when a comprehensive round of water quality data are collected.

Table 3-6 presents a summary of the statistical results for all groups, from Appendix D.2, reflecting the data collected through FY 2004. The response threshold was triggered for two of the 25 data sets. Table 3-6 includes brief comments addressing these threshold triggers, and these are discussed further below.

The Group 1 (downgradient of the TGRS) response thresholds were not triggered for the north and south plume. In the FY 2003 analysis these were triggered due to an increasing trend in the north plume and a stable trend in the south plume, since 1996. The FY 2004 data improved the trend statistics and the thresholds are no longer triggered based on data from FY 1997 through 2004. It should be noted however, that the data set for Group 1 was incomplete (due to different monitoring frequencies in the past) as discussed in Appendix D.2, Section 5.1, so some data points were interpolated. The Group 1 trends, therefore, need to be confirmed through future monitoring and evaluation. The monitoring plan has been adjusted to eliminate this problem over time.

In Group 2 (areal extent of plume wells), 19 of 21 wells showed stable, decreasing or downward trends. The individual trend for well 03U805 was upward, however all concentrations were below 5 µg/l and the well is not in a location that suggests an increase in plume size. Since this well remains below the cleanup criteria, continued monitoring is sufficient response. Group 2 well 04U861 showed an upward trend. This well is located between the north and south plumes so represents a mingling of the plumes and does not represent a widening of the plume(s). Therefore, ongoing monitoring and continued evaluation of the trend is a sufficient response. The trend at this well will become more crucial as the South Plume continues to shrink. At this time, there are no "remedial" decisions that hinge on this trend. The trend for Group 2 well 206688 was rejected due to insufficient number of data points. This will be resolved as future monitoring continues.

The trends in the Area Weighted Concentration (AWC) for the Group 3 (downgradient sentinel wells) and the Group 5 (global plume mass wells) were both downward, showing improvement in the plume overall and downgradient of the NBCGRS. For further explanation of how the AWC is calculated see Appendix D.2.

Overall, with the monitoring changes discussed above, the data meet the statistical criteria developed in this document for assessing the remedial progress in the off-TCAAP aquifers. The data show continuing improvement in the OU1 plume over the timeframe of 1996 through 2004.

Overall, the monitoring data indicates that aquifer restoration is occurring in the Prairie du Chien. Both the extent and magnitude appear to be stable or improving.

With respect to the Jordan, the three new wells installed and sampled in FY 2004 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. As adequate data is collected to establish a trend, these wells will be incorporated into the statistical analysis. Table 3-5 includes the initial sampling results from the new Jordan wells. The initial data from these wells suggests that the concentrations in the Jordan are similar to or lower than in the overlying Prairie du Chien.

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

Table 3-1 shows that the NBCGRS removed 733 pounds of VOCs during FY 2004. The relative contribution from each extraction well was 38% from NBM #3/4, 14% from NBM #14, and 47% from NBM #15. The total cumulative VOCs removed by the NBCGRS is 17,547 pounds.

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 2004 was slightly decreased compared to FY 2003 (733 versus 835 pounds), which is due to both a decrease in pumping and a decrease in the annual mass removal per unit volume pumped. The trend in annual mass removal per unit volume pumped continued to decrease from FY 2003 to FY 2004 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. The Army, USEPA, MPCA, City of New Brighton, and Restoration Advisory Board are continuing to discuss the contemplated change from a requirement for containment, to a requirement for demonstrating that the plume is not spreading and that aquifer restoration is occurring. The OU1 Technical Memorandum will be finalized in early FY 2004 and will form the technical basis for the change in requirements.

TABLE 3-1
OU1 Pumping/VOC Mass Removal Data

Fiscal Year 2004

	WELL #3		WELL #4		WELL #5		WELL #6		WELL #14		WELL #15				
MONTH	VOC (ug/l)	WATER TREATED (mgallons)	VOC (ug/l)	WATER TREATED (mgallons)	VOC (ug/l)	WATER TREATED (mgallons)	VOC (ug/l)	WATER TREATED (mgallons)	VOC (ug/l)	WATER TREATED (mgallons)	VOC (ug/l)	WATER TREATED (mgallons)	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, 2004														13,070.511	16,814
OCTOBER	38	6.098	52	29.348	160	0.184	97	0.141	40	27.532	100	37.790	0	101.093	55.77
NOVEMBER	53	8.188	60	35.273	170	0.158	95	0.134	26	34.650	89	36.125	0	114.528	55.97
DECEMBER	55	16.460	60	30.233	180	0.207	110	0.161	39	43.218	110	42.741	0	133.020	76.47
JANUARY	47	15.905	53	40.290	155	0.115	94	0.100	25	22.846	82	40.245	0	119.501	56.60
FEBRUARY	57	6.567	62	34.993	170	1.226	99	1.010	21	29.162	110	39.433	0	112.391	65.12
MARCH	66	18.125	64	46.753	172	0.210	108	0.170	29	44.121	110	4.243	0	113.622	49.99
APRIL	96	5.208	100	1.241	170	3.246	110	0.602	9	21.747	58	27.091	0	59.135	25.19
MAY	79	3.782	87	24.023	170	2.174	100	0.133	15	26.372	99	43.474	0	99.958	62.36
JUNE	61	6.856	65	41.083	170	0.156	100	0.112	34	36.226	93	42.119	0	126.552	69.07
JULY	53	13.110	60	44.629	160	0.188	99	0.159	46	43.815	97	42.591	0	144.492	79.84
AUGUST	42	15.417	45	44.505	130	0.124	84	0.104	39	42.000	68	42.601	0	144.751	60.18
SEPTEMBER	48	8.268	52	42.933	170	0.108	120	0.091	43	41.936	110	42.989	0	136.325	76.71
TOTAL GALLONS TREATED AND VOC'S REMOVED FOR FISCAL YEAR 2004														1,405.368	733.26
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP														14,475.879	17,547

Note: The mass of VOCs removed from Well No. 4 in December 2003 was calculated using analytical results from the previous month (November).

Note: The mass of VOCs removed from Well No. 15 in March 2004 was calculated using analytical results from the previous month (February).

Table 3-2

TCAAP - OU1 Groundwater Elevations

Fiscal Year 2004

WELL NUMBER				TOC	GW
(IRDMIS)	*MN unique*	**Date**	**WL (ft.)**	**(ft.)**	**Elev (ft.)**
04J822	706044	6/24/2004	43.57	880.15	836.58
04J822	706044	8/4/2004	44.26	880.15	835.89
04J822	706044	12/28/2004	43.57	880.15	836.58
04J847	706045	6/24/2004	74.18	918.38	844.20
04J847	706045	8/4/2004	75.08	918.38	843.30
04J847	706045	12/28/2004	74.18	918.38	844.20
04J849	706043	6/24/2004	45.27	876.58	831.31
04J849	706043	8/4/2004	45.97	876.58	830.61
04J849	706043	12/28/2004	45.27	876.58	831.31
04U847	426857	8/4/2004	71.77	916.10	844.33
04U871	447889	6/23/2004	137.77	959.11	821.34
04U872	447988	6/23/2004	134.31	954.87	820.56
04U877	447896	6/23/2004	93.95	923.08	829.13

Notes:

All groundwater elevations are in feet above mean sea level.
All TOC numbers are from a 1999 CRA-maintained file except as noted.

Table 3-3
OU1, PGAC Effluent Water Quality

Fiscal Year 2004

	Influent Well Monitoring						Operational Performance Monitoring															
Sampling	Well	Well	Well	Well	Well	Well	Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
Date	#3	#4	#5	#6	#14	#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-03	38	52	160	97	40	100	0	NS	1.2	NS	2	NS	1.4	NS	0	NS	1.1	NS	0	NS	0	NS
GAC replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between October 11, 2003 and November 10, 2003. "B" Vessels become the Lead Vessels.																						
30-Nov-03	53	60	170	95	26	89	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Dec-03	55	60	180	110	39	110	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Jan-03	47	53	155	94	25	82	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
28-Feb-04	57	62	170	99	21	110	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
31-Mar-04	66	64	172	108	29	110	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
30-Apr-04	96	100	170	110	9	58	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 20, 2004 and May 5, 2004. "A" Vessels become the Lead Vessels.																						
31-May-04	79	87	170	100	15	99	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Jun-04	61	65	170	100	34	93	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Jul-04	53	60	160	99	46	97	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
31-Aug-04	42	45	130	84	39	68	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
30-Sep-04	48	52	170	120	43	110	0	NS	0	NS	0	NS	0	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 3-4
Summary of OU1 Monitoring Requirements

Fiscal Year 2004

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: Groundwater Containment	a. Pumping volume and rates for each extraction well for comparison to design flowrates for containment	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, especially downgradient of the extraction system, to assist in evaluation of containment.	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 attainment	Army	OU1 Groundwater Monitoring Plan in the Annual Report

Table 3-5
OU1 Groundwater Quality Data

Fiscal Year 2004

			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
04J822		6/24/04	**7.8**	1.5	<1	2.0	<1	JP 0.97
04J822		8/4/04	**8.1**	1.7	<1	2.3	<1	JP 0.94
04J847		6/24/04	**950**	**75**	10	68	JP 0.65	51
04J847		8/4/04	**1000**	**75**	10	74	JP 0.73	53
04J847	D	8/4/04	**1100**	**77**	11	67	JP 0.54	54
04J849		6/24/04	<1	<1	<1	<1	<1	<1
04J849		8/4/04	<1	<1	<1	<1	<1	<1
04U847		8/4/04	**1200**	**85**	12	64	JP 0.77	62
04U871		6/24/04	**43**	2.8	JP 0.31 (JQ)	3.1	<1	2.3
04U872		6/23/04	**11**	JP 0.43	<1	JP 0.54	<1	JP 0.64
04U872	D	6/23/04	**11**	JP 0.62	<1	JP 0.59	<1	JP 0.64
04U877		6/23/04	JP 0.98	<1	<1	<1	<1	<1
206688		6/23/04	**11**	JP 0.69	<1	1.2	<1	JP 0.69

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.

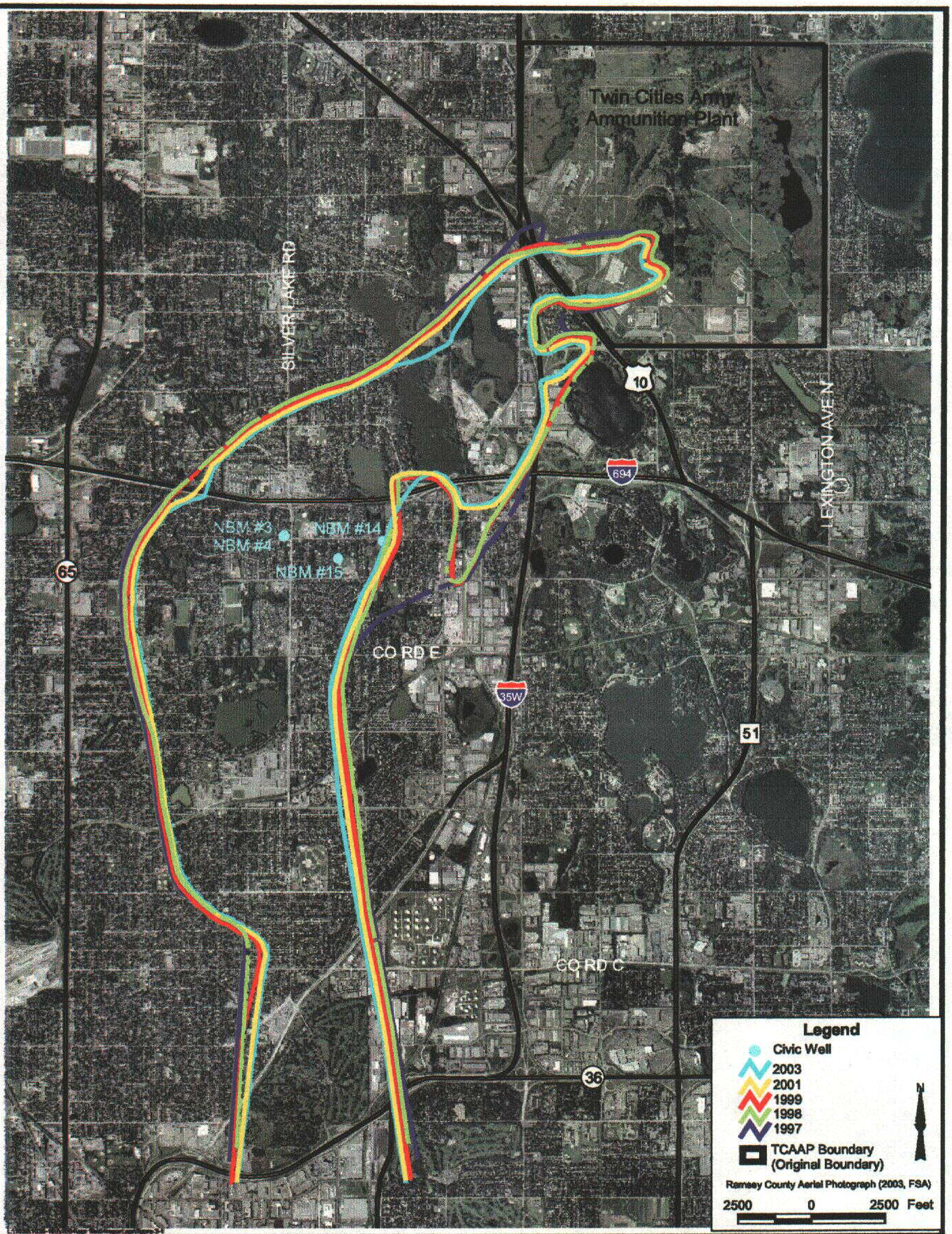
JQ The reported result may be a false positive.

Table 3-6
Group 1, 2, 3 and 5 Mann-Kendall Summary and MAROS Conclusion

Fiscal Year 2004 OU1

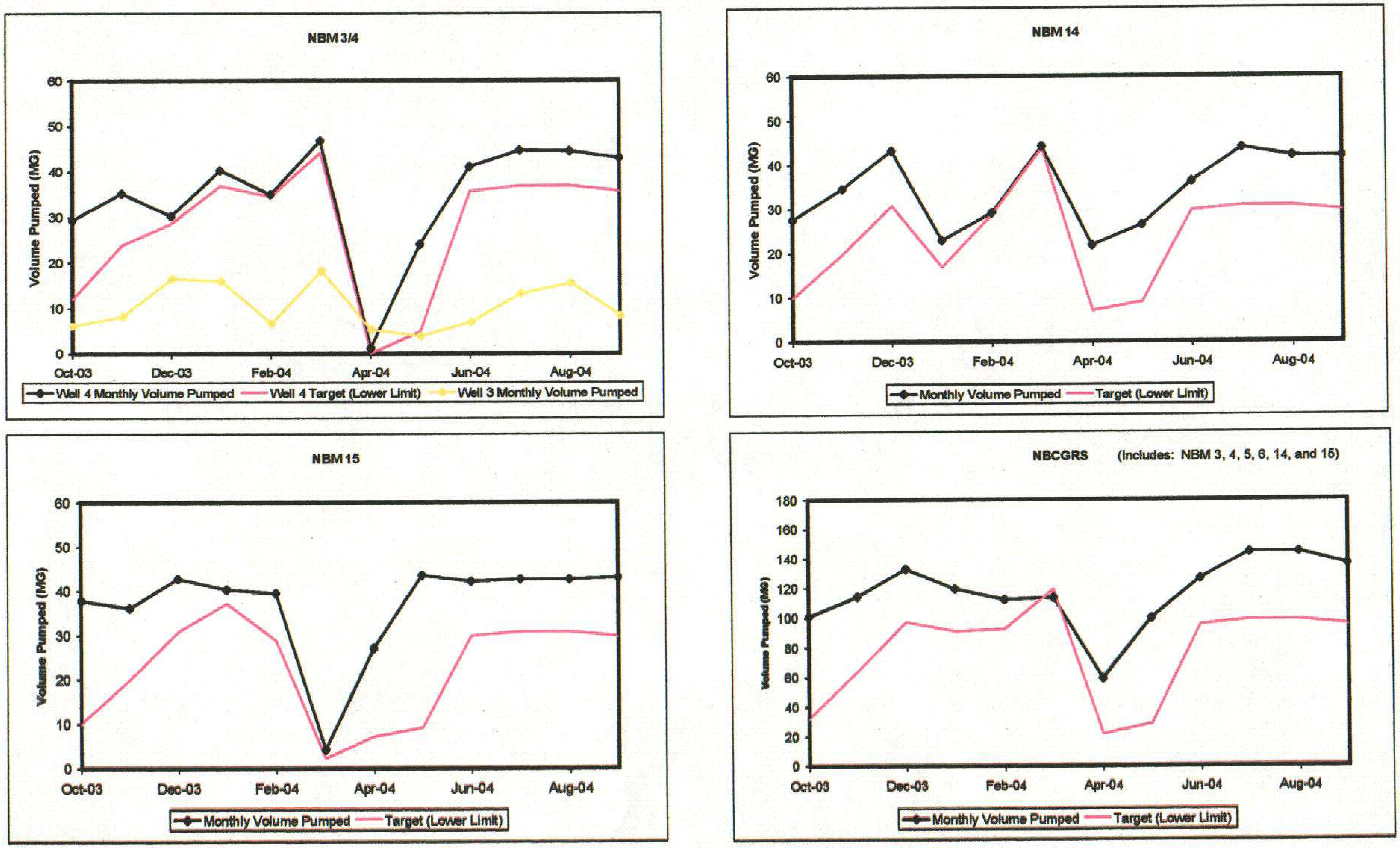
Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 2 Wells:									
409549	-7	6	Decreasing	0.864	0.8622748	S or NT	Stable	No	
409557	6	6	Increasing	0.81	1.305156932	S or NT	No Trend	No	
03L673	-9	6	Decreasing	0.932	0.95130556	Probable	Decreasing	No	
03L833	-15	6	Decreasing	0.999	0.648034777	Definite	Decreasing	No	
03L848	-11	6	Decreasing	0.972	0.443474482	Definite	Decreasing	No	
03L859	3	6	Increasing	0.64	0.397618428	S or NT	No Trend	No	
03U672	3	6	Increasing	0.64	2.449489743	S or NT	No Trend	No	
03U805	10	6	Increasing	0.904	1.263140077	Probable	Increasing	Yes	All concentrations below 5 ug/L
04U673	-9	6	Decreasing	0.93	0.753933983	Probable	Decreasing	No	
04U832	-11	6	Decreasing	0.972	0.674106282	Definite	Decreasing	No	
04U833	-13	6	Decreasing	0.9917	0.685834743	Definite	Decreasing	No	
04U841	5	6	Increasing	0.765	0.499713489	S or NT	No Trend	No	
04U843	1	6	Increasing	0.5	0.858184227	S or NT	No Trend	No	
04U845	-9	6	Decreasing	0.93	0.707670157	Probable	Decreasing	No	
04U846	1	6	Increasing	0.5	1.761520586	S or NT	No Trend	No	
04U854	-13	6	Decreasing	0.992	0.622253367	Definite	Decreasing	No	
04U859	-7	6	Decreasing	0.854	0.744339039	S or NT	Stable	No	
04U861	13	6	Increasing	0.9917	0.699111896	Definite	Increasing	Yes	located between N. and S. Plume
04U875	-15	6	Decreasing	0.999	0.243166319	Definite	Decreasing	No	
04U877	-15	6	Decreasing	0.999	0.959019721	Definite	Decreasing	No	
206688	2	6	Increasing	0.625	0.089734908	S or NT	No Trend	No	Trend rejected, insufficient data
Group5	-13	6	Decreasing	0.992	0.234998914	Definite	Decreasing	No	
Group3	-14	6	Decreasing	0.995	0.685814633	Definite	Decreasing	No	
Group1NP	1	6	Increasing	0.5	0.268013952	S or NT	No Trend	No	
Group1SP	-10	6	Decreasing	0.952	0.672546406	Definite	Decreasing	No	

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



TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2004
Upper Unit 4, 1 ug/l Trichloroethene Isoconcentration Map	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 3-1

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



T:\1036\12\FY03 APR\APR Figures\Fig 3-2_04

Wenck Associates, Inc.

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

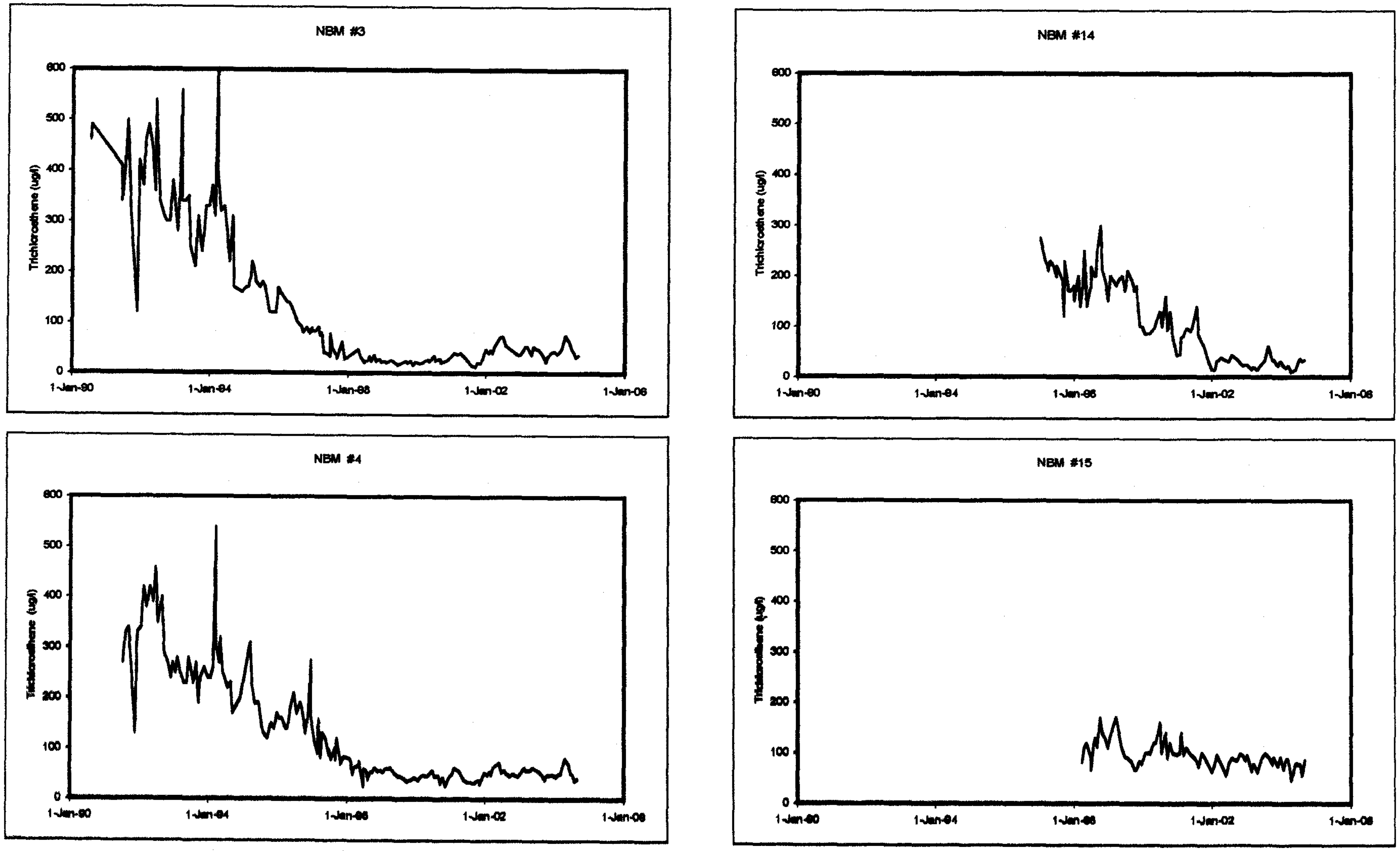
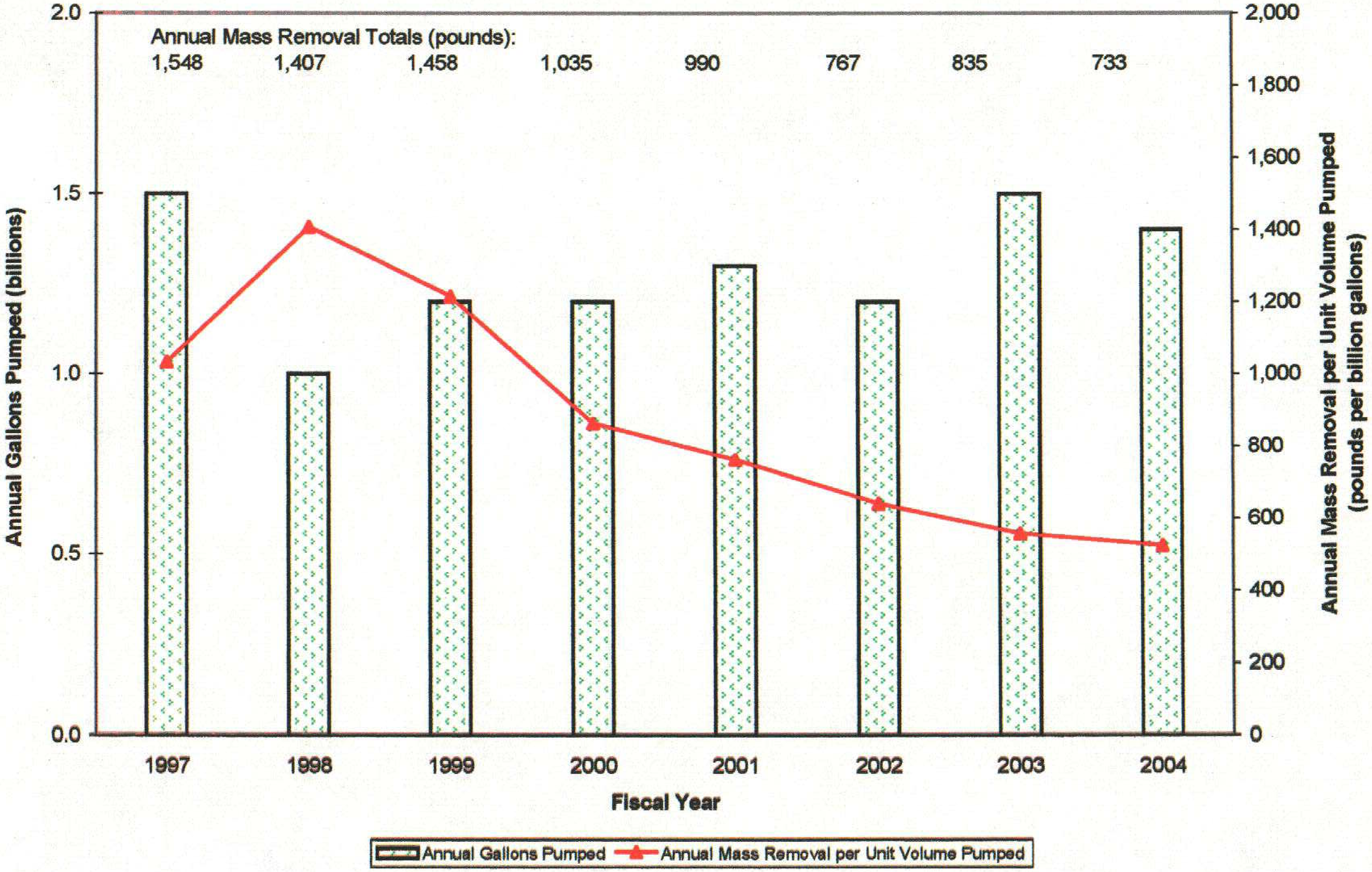


FIGURE 3-4
OU1, NBCGRS MASS REMOVAL HISTORY
Twin Cities Army Ammunition Plant



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 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.

New for FY 2004 is the addition of the Site C groundwater response presented in Section 4.4. In FY 2004 the response action in progress at Site C was incorporated into the FFA.

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, C, 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 2004. 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 11.0 for information on land use controls). Work at Site C remains to be completed. Activities during FY 2004 were:

- The Closeout Report for VOC-contaminated soils at Site A received final regulatory consistency.
- At Site C, soil remediation work temporarily resumed during October-November 2003. Approximately 3,176 tons of contaminated soil were excavated, stabilized, and landfilled off-TCAAP. Sediment samples were also collected from engineered drainage ditches near the north and west sides of Site C. Options for completing remediation of soils and ditch sediments at this site were under discussion at the end of FY 2004.
- The Closeout Report for the Corrective Action Management Unit (CAMU) received final regulatory consistency. The CAMU was used intermittently as a staging and treatment area during remediation of some of the shallow soil sites. The monitoring wells at the CAMU were sealed in FY 2004.

Are any changes or additional actions required for this remedy component?

Yes. Technical issues need to get resolved in order to complete the remedy for soils and ditch sediments at Site C. Also, 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:

<u>Site A</u>

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

<u>Site C</u>

Shallow groundwater at Site C is known to be impacted and there is an ongoing Corrective Action for Site C groundwater. See Section 4.4 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 2004:

Results for the June 2004 sampling event are summarized in Table 4-1 (see Section 4.4 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, only copper exceeded the background value (12.1 µg/l versus background of 4 µg/l). This well showed similar results (9.6 µg/l) in FY 2003. The only other time this same well was sampled for copper (1987), the result was 1.44 µg/l. The HRL for copper is 1,000 µg/l so no remedial action is needed at this time. At Site 129-5, barium exceeded the background value in FY 2003, but was below the background value in FY 2004 (106 µg/l versus background of 206 µg/l). Both copper and barium warrant attention during monitoring in the next few years. Overall, the results suggest that there were no impacts to groundwater due to soil remediation activities.

Per a request from USEPA, water levels were measured at all Site E wells during the October 2004 monitoring event (adding water levels at 519288, 519289, and 519290). These wells were intended to be measured in June 2004, but were missed due to an oversight. The purpose was to verify that well 03U089 is the most appropriate well to monitor. Table 4-2 and Figure 4-1 present the water levels and contour map. Overall, the contours, and the historical water levels in this area, indicate that well 03U089 is the most downgradient well from the areas where remediation work occurred.

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 11.0 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 2004.

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

4.4 SITE C GROUNDWATER RESPONSE ACTION

4.4.1 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 4-2, 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 4-3. The ditches ultimately discharge into Rice Creek, which is also monitored.

Figures 4-4 and 4-5 present cross-sections showing the geological features of the shallow soil and aquifer (the cross-section alignments are shown on Figure 4-2). 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 4-2, and 8 surface water sampling locations, as shown on Figure 4-3.

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.

4.4.2 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 to the monitoring program for FY 2005 through FY 2007. This well will be sampled and analyzed for lead.

4.4.3 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. See Section 4.4.6 for details of the monitoring data.

4.4.4 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 contingency plan and the concentrations at specified monitoring points are within the requirements of the contingency plan. See Section 4.4.6 for details of the monitoring data.

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 4-6 presents the groundwater contours from June 2004. 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. As a result of the complex hydrogeology and the low flow rates a clear zone of capture is not evident in the contours.

Figure 4-7 presents the lead data from June 2004. The areas of exceedances are upgradient of the extraction wells and within the likely area of capture shown on Figure 4-6. The lack of lead exceedances (see discussions in Sections 4.4.6 and 4.4.7, below) indicates that the system is capturing groundwater effectively.

4.4.5 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 4-3 presents the effluent analytical results for FY 2004 and the MCES discharge limits. The combined effluent is labeled "Effluent-C" on Table 4-3. The MCES requirements for lead, mercury, and COD were all met. The other compounds listed are not regulated in the MCES permit.

4.4.6 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-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 4-4 presents the FY 2004 analytical results for groundwater. In FY 2004, the lead chronic standard for the ditch was 6.9 µg/l. There were no exceedances of the triggers in FY 2004. 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 with the highest detection at 66.8 µg/l. The other wells in the contingency group remained below the trigger. These results suggest, especially 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.

4.4.7 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 4-5 presents the FY 2004 analytical results for surface water. The surface water chronic standard for the ditch (SW-6) was 6.9 µg/l and the chronic standard for Rice Creek is 4 µg/l. No surface water triggers were exceeded in FY 2004. Appendix D.3 presents the historical database for surface water samples.

4.4.8 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. Table 4-6 presents a summary of the lead mass removal and pumped volumes through FY 2004. In FY 2004, the system treated 2.9 million gallons of water and removed 23.4 pounds of lead. Overall, the system has treated 7.5 million gallons of water and removed 90.8 pounds of lead.

Are any changes proposed for the remedy? No.

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

Fiscal Year 2004

	Unit 1 Wells		Unit 3 Wells					TCAAP	TCAAP	
	01U119	01U060	03U089	03U087	03U087D	03U093	03U097	Unit 1 GW	Units 3/4 GW	
	(Site A)	(Site H)	(Site E)	(Site 129-3)		(Site D)	(Site 129-5)	Background (1)	Background (1)	MDH HRL
VOCs (ug/L)	6/22/04	6/22/04	6/22/04	6/21/04	6/21/04	6/22/04	6/22/04			
1,1,1-Trichloroethane				<1				None	None	600
1,1,2,2-Tetrachloroethane				<1				None	None	2
1,1,2-Trichloroethane				<1				None	None	3
1,1-Dichloroethane				<1				None	None	70
1,1-Dichloroethene				<1				None	None	6
1,2-Dichloroethane				<1				None	None	4
1,2-Dichloropropane				<1				None	None	5
2-Butanone				<5 (R)				None	None	4000
2-Hexanone				<5				None	None	(Note 2)
4-Methyl-2-Pentanone				<5				None	None	300
Acetone				<5 (JSB2)				None	None	700
Benzene				<1				None	None	10
Bromodichloromethane				<1				None	None	6
Bromoform				<1				None	None	40
Bromomethane				<1				None	None	10
Carbon Disulfide				<1				None	None	700
Carbon Tetrachloride				<1				None	None	3
Chlorobenzene				<1				None	None	100
Chloroethane				<1				None	None	280
Chloroform				<1				None	None	60
Chloromethane				<1				None	None	80
cis-1,2-Dichloroethene				<1				None	None	70
cis-1,3-Dichloropropene				<1				None	None	2
Dibromochloromethane				<1				None	None	80
Ethylbenzene				<1				None	None	700
m&p-Xylene				<2				None	None	10,000
Methylene Chloride				<1				None	None	50
o-Xylene				<1				None	None	10,000
Styrene				<1				None	None	(Note 2)
Tetrachloroethene				<1				None	None	7
Toluene				<1				None	None	1000
trans-1,2-Dichloroethene				<1				None	None	100
trans-1,3-Dichloropropene				<1				None	None	2
Trichloroethene				<1				None	None	30
Vinyl Chloride				<1				None	None	0.2

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

Fiscal Year 2004

	Unit 1 Wells		Unit 3 Wells					TCAAP	TCAAP	
	01U119 (Site A)	01U060 (Site H)	03U089 (Site E)	03U087 (Site 129-3)	03U087D	03U093 (Site D)	03U097 (Site 129-5)	Unit 1 GW Background (1)	Units 3/4 GW Background (1)	MDH HRL
	6/22/04	6/22/04	6/22/04	6/21/04	6/21/04	6/22/04	6/22/04			
Metals (ug/L)										
Antimony	<5	B 3.83	<5	B 0.907 (UB1.7)	B 1.08 (UB1.7)	B 0.521	<5	<10	<10	6 (3)
Arsenic		B 3.56						6.80	14	(Note 2)
Barium	57.8		29.4				106	240	206	2000
Copper	B 1.21 (UB0.7)	**12.1**	B 1.55 (UB0.7)					4	27	1000
Lead	<5	B 0.326	B 0.217	B 0.336	B 0.124	B 0.225	B 0.190	4.2	3.8	15 (4)
Manganese		265	B 0.970	5.37	5.38			7,500	760	1000
Explosives (ug/L)										
Nitroglycerine				<0.970	<0.970	<0.970		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.
JS The percent recovery for the matrix spike/matrix spike duplicate was below the lower QC limit (the percent recovery is listed after "JS").
The sample result could be biased low.
R Rejected Data
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 4-2
Site E Supplemental Water Levels
October 2004

Fiscal Year 2004

WELL NUMBER	LOCATION	DATE	WATER LEVEL (ft.)	Top of Casing Elevation	Groundwater Elevation
519288	Site E	22-Oct-04	111.17	966.80	855.63
519289	Site E	22-Oct-04	122.97	978.70	855.73
519290	Site E	22-Oct-04	112.51	969.30	856.79
03U088	Site E	22-Oct-04	128.09	983.73	855.64
03U089	Site E	22-Oct-04	117.07	972.99	855.92
03U704	Site E	22-Oct-04	119.15	976.38	857.23

Table 4-3
Site C FY 2004 Extraction Well/Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Mercury (MCES Discharge Limit: 0.002) mg/L	pH	COD (MCES Discharge Limit: 250) mg/L	TSS mg/L	EDTA as EDTA mg/L
EW1	10/2/2003	9:30	Legend	<0.0030					
EW2	10/2/2003	9:30	Legend	<0.0030					
EW3	10/2/2003	9:30	Legend	3.9					
EW3	10/9/2003	10:00	Legend	2.8					
EW1	10/16/2003	9:30	Legend	<0.0030					
EW2	10/16/2003	9:30	Legend	<0.0030					
EW3	10/16/2003	9:30	Legend	3.0					
EFFLUENT-C	10/16/2003	9:30	Legend	0.035	<0.00020	6.7	22	21	
EW3	10/23/2003	10:00	Legend	5.6					
EW1	10/30/2003	9:30	Legend	<0.0030					
EW2	10/30/2003	9:30	Legend	<0.0030					
EW3	10/30/2003	9:30	Legend	3.2					
EW3	11/6/2003	10:00	Legend	3.4					
EW1	11/13/2003	9:30	Legend	<0.0030					
EW2	11/13/2003	9:30	Legend	<0.0030					
EW3	11/13/2003	9:30	Legend	3.2					
EW1	11/20/2003	9:00	Legend	<0.0030					
EW2	11/20/2003	9:00	Legend	<0.0030					
EW3	11/20/2003	9:00	Legend	3.2					
EFFLUENT-C	11/20/2003	9:00	Legend	0.052	<0.00020	6.7			
EW1	12/4/2003	10:30	Legend	0.0043					
EW2	12/4/2003	10:30	Legend	<0.0030					
EW3	12/4/2003	10:30	Legend	3.0					
EW3	12/11/2003	9:00	Legend	2.9					
EW3	12/18/2003	10:30	Legend	3.0					
EFFLUENT-C	12/18/2003	10:30	Legend	0.086	<0.00020	6.8			
EW1	12/22/2003	9:00	Legend	<0.0030					
EW2	12/22/2003	9:00	Legend	<0.0030					
EW3	12/22/2003	9:00	Legend	3.2					
EW3	12/29/2003	9:00	Legend	3.0					
EW1	1/8/2004	10:30	Legend	0.016					

Table 4-3
Site C FY 2004 Extraction Well/Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Mercury (MCES Discharge Limit: 0.002) mg/L	pH	COD (MCES Discharge Limit: 250) mg/L	TSS mg/L	EDTA as EDTA mg/L
EW2	1/8/2004	10:30	Legend	0.028					
EW3	1/8/2004	10:30	Legend	3.0					
EW3	1/15/2004	10:30	Legend	2.9					
EW1	1/22/2004	10:00	Legend	0.031					
EW2	1/22/2004	10:00	Legend	<0.0030					
EW3	1/22/2004	10:00	Legend	3.0					
EFFLUENT-C	1/22/2004	10:00	Legend	0.039	<0.00020	6.7	<50	11	
EW3	1/29/2004	10:00	Legend	2.9					
EW1	2/4/2004	10:00	Legend	0.0089					
EW2	2/4/2004	10:00	Legend	<0.0030					
EW3	2/4/2004	10:00	Legend	3.0					
EW3	2/12/2004	10:00	Legend	2.8					
EW1	2/19/2004	9:30	Legend	<0.0030					
EW2	2/19/2004	9:30	Legend	<0.0030					
EW3	2/19/2004	9:30	Legend	2.8					
EFFLUENT-C	2/19/2004	9:30	Legend	0.029	0.00067	6.7			
EW3	2/26/2004	10:00	Legend	3.2					
EW1	3/4/2004	10:00	Legend	<0.0030					
EW2	3/4/2004	10:00	Legend	<0.0030					
EW3	3/4/2004	10:00	Legend	3.1					
EW3	3/11/2004	10:00	Legend	4.0					
EFFLUENT-C	3/11/2004	10:00	Legend	0.082	<0.00020	6.7			
EW3	3/18/2004	10:00	Legend	3.1					
EW1	3/25/2004	10:00	Legend	<0.0030					
EW2	3/25/2004	10:00	Legend	<0.0030					
EW3	3/25/2004	10:00	Legend	1.8					
EW3	4/1/2004	10:30	Legend	2.7					
EW1	4/6/2004	11:45	ChemServe						20
EW2	4/6/2004	11:40	ChemServe						11
EW3	4/6/2004	11:37	ChemServe						200
EW3D	4/6/2004	11:37	ChemServe						210

Table 4-3
Site C FY 2004 Extraction Well/Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Mercury (MCES Discharge Limit: 0.002) mg/L	pH	COD (MCES Discharge Limit: 250) mg/L	TSS mg/L	EDTA as EDTA mg/L
EFFLUENT-C	4/6/2004	11:50	ChemServe						13
EW1	4/8/2004	10:00	Legend	<0.0030					
EW2	4/8/2004	10:00	Legend	<0.0030					
EW3	4/8/2004	10:00	Legend	2.8					
EW3	4/15/2004	10:00	Legend	2.8					
EW1	4/22/2004	10:15	Legend	<0.0030					
EW2	4/22/2004	10:15	Legend	<0.0030					
EW3	4/22/2004	10:15	Legend	3.1					
EFFLUENT-C	4/22/2004	10:15	Legend	<0.0030	<0.00020	6.7	<50	8.0	
EW3	4/29/2004	9:30	Legend	2.6					
EW1	5/6/2004	10:00	Legend	<0.0030					
EW2	5/6/2004	10:00	Legend	<0.0030					
EW3	5/6/2004	10:00	Legend	2.8					
EW3	5/13/2004	10:00	Legend	2.4					
EW1	5/20/2004	2:00	Legend	<0.0030					
EW2	5/20/2004	2:00	Legend	<0.0030					
EW3	5/20/2004	2:00	Legend	2.7					
EFFLUENT-C	5/20/2004	2:00	Legend	<0.0030	<0.00020	6.7	<50	16	
EW3	5/27/2004	10:00	Legend	2.8					
EW1	6/3/2004	8:30	Legend	<0.0030					
EW2	6/3/2004	8:30	Legend	<0.0030					
EW3	6/3/2004	8:30	Legend	3.0					
EW3	6/10/2004	9:00	Legend	1.9					
EW1	6/17/2004	9:00	Legend	<0.0030					
EW2	6/17/2004	9:00	Legend	<0.0030					
EW3	6/17/2004	9:00	Legend	2.5					
EW3	6/24/2004	10:30	Legend	1.9					
EFFLUENT-C	6/28/2004	10:30	Legend	0.012	<0.00020	6.7			
EW1	7/1/2004	9:05	Legend	<0.0030					
EW2	7/1/2004	9:05	Legend	0.0054					
EW3	7/1/2004	9:05	Legend	4.5					

Table 4-3
Site C FY 2004 Extraction Well/Effluent Data

Sample Location	Collection Date	Collection Time	Lab	Total Lead (MCES Discharge Limit: 1) mg/L	Mercury (MCES Discharge Limit: 0.002) mg/L	pH	COD (MCES Discharge Limit: 250) mg/L	TSS mg/L	EDTA as EDTA mg/L
EW3	7/8/2004	10:00	Legend	4.7					
EW1	7/15/2004	10:00	Legend	<0.0030					
EW2	7/15/2004	10:00	Legend	<0.0030					
EW3	7/15/2004	10:00	Legend	4.6					
EW3	7/22/2004	10:30	Legend	3.4					
EFFLUENT-C	7/26/2004	10:00	Legend	0.0041	<0.00020	6.7	<50	21.0	
EW1	7/29/2004	10:00	Legend	<0.0030					
EW2	7/29/2004	10:00	Legend	<0.0030					
EW3	7/29/2004	10:00	Legend	2.4					
EW3	8/5/2004	10:30	Legend	1.9					
EW1	8/12/2004	10:00	Legend	<0.0030					
EW2	8/12/2004	10:00	Legend	<0.0030					
EW3	8/12/2004	10:00	Legend	2.1					
EW3	8/19/2004	10:00	Legend	1.9					
EFFLUENT-C	8/23/2004	9:30	Legend	0.015	<0.00020	6.7			
EW2	8/26/2004	9:00	Legend	0.0030					
EW3	8/26/2004	9:00	Legend	2.3					
EW3	9/2/2004	10:30	Legend	2.0					
EW1	9/9/2004	10:00	Legend	<0.0030					
EW2	9/9/2004	10:00	Legend	<0.0030					
EW3	9/9/2004	10:00	Legend	2.1					
EW3	9/16/2004	9:30	Legend	2.0					
EW1	9/23/2004	10:00	Legend	<0.0030					
EW2	9/23/2004	10:00	Legend	0.0054					
EW3	9/23/2004	10:00	Legend	1.8					
EFFLUENT-C	9/27/2004	10:00	Legend	<0.0030	<0.00020	6.7			
EW3	9/30/2004	10:00	Legend	1.8					

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
MW 1	10/13/2003		NS		0.90	U			NS			NS			NS			NS	
MW 1D	10/13/2003		NS		0.90	U			NS			NS			NS			NS	
MW 1	1/20/2004		NS		1.3	U			NS			NS			NS			NS	
MW 1	4/6/2004		NS		1.8	U			NS		1.8	U			NS		1.4		
MW 1	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
MW 2	10/14/2003		NS		0.90	U			NS			NS			NS			NS	
MW 2	1/20/2004		NS		1.3	U			NS			NS			NS			NS	
MW 2D	1/20/2004		NS		1.3	U			NS			NS			NS			NS	
MW 2	4/6/2004		NS		1.8	U			NS		1.8	U			NS		<0.5		
MW 2	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
MW 3	10/16/2003		NS		1670				NS			NS			NS			NS	
MW 3	1/26/2004		NS		1470				NS			NS			NS			NS	
MW 3	4/7/2004		NS		1640				NS		1.8	U			NS		90		
MW 3D	4/7/2004		NS		1710				NS		1.8	U			NS		91		
MW 3	7/13/2004		NS		544				NS			NS			NS			NS	
MW 4	10/13/2003		NS		0.90	U			NS			NS			NS			NS	
MW 4	11/17/2003		NS		1.2	B			NS			NS			NS			NS	
MW 4	12/9/2003		NS		1.5	U			NS			NS			NS			NS	
MW 4	1/21/2004		NS		1.3	U			NS			NS			NS			NS	
MW 4	2/16/2004		NS		1.3	U			NS			NS			NS			NS	
MW 4	3/9/2004		NS		1.8	U	JK-1.8		NS			NS			NS			NS	
MW 4	4/7/2004		NS		1.8	U			NS		1.8	U			NS		<0.5		
MW 4	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
MW 4	6/9/2004		NS		1.3	U			NS			NS			NS			NS	

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
MW 4	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
MW 4	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
MW 4D	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
MW 4	9/8/2004	NS			1.1	U		NS			NS			NS			NS		
MW 5	10/15/2003	NS			0.90	U		NS			NS			NS			NS		
MW 5	1/26/2004	NS			1.3	U		NS			NS			NS			NS		
MW 5	4/5/2004	NS			1.8	U		NS			1.8	U		NS			0.7		
MW 5	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
MW 6	10/14/2003	NS			0.90	U		NS			NS			NS			NS		
MW 6	11/17/2003	NS			0.90	U		NS			NS			NS			NS		
MW 6	12/10/2003	NS			1.5	U		NS			NS			NS			NS		
MW 6	1/22/2004	NS			1.3	U		NS			NS			NS			NS		
MW 6	2/17/2004	NS			1.3	U		NS			NS			NS			NS		
MW 6D	2/17/2004	NS			1.3	U		NS			NS			NS			NS		
MW 6	3/9/2004	NS			1.8	U	JK-1.8	NS			NS			NS			NS		
MW 6	4/6/2004	NS			1.8	U		NS			1.8	U		NS			20		
MW 6	5/12/2004	NS			1.3	U		NS			NS			NS			NS		
MW 6	6/8/2004	NS			1.3	U		NS			NS			NS			NS		
MW 6	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
MW 6	8/9/2004	NS			1.1	U		NS			NS			NS			NS		
MW 6	9/9/2004	NS			1.1	U		NS			NS			NS			NS		
MW 7	10/14/2003	NS			0.90	U		NS			NS			NS			NS		
MW 7	1/21/2004	NS			1.3	U		NS			NS			NS			NS		
MW 7	4/5/2004	NS			1.8	U		NS			1.8	U		NS			14		

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
MW 7	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
MW 8	10/15/2003		NS		0.90	U			NS			NS			NS			NS	
MW 8	11/18/2003		NS		1.1	B			NS			NS			NS			NS	
MW 8	12/10/2003		NS		1.5	U			NS			NS			NS			NS	
MW 8D	12/10/2003		NS		1.5	U			NS			NS			NS			NS	
MW 8	1/21/2004		NS		1.3	U			NS			NS			NS			NS	
MW 8	2/17/2004		NS		1.3	U			NS			NS			NS			NS	
MW 8	3/9/2004		NS		1.8	U	JK-1.8		NS			NS			NS			NS	
MW 8	4/5/2004		NS		1.8	U			NS		1.8	U			NS		15		
MW 8	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
MW 8	6/8/2004		NS		1.3	U			NS			NS			NS			NS	
MW 8	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
MW 8D	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
MW 8	8/10/2004		NS		1.1	U			NS			NS			NS			NS	
MW 8	9/8/2004		NS		1.1	U			NS			NS			NS			NS	
MW 9	10/13/2003		NS		0.90	U			NS			NS			NS			NS	
MW 9	11/17/2003		NS		0.90	U			NS			NS			NS			NS	
MW 9	12/9/2003		NS		1.6	B			NS			NS			NS			NS	
MW 9	1/20/2004		NS		1.3	U			NS			NS			NS			NS	
MW 9	2/16/2004		NS		1.3	U			NS			NS			NS			NS	
MW 9	3/9/2004		NS		1.8	U	JK-1.8		NS			NS			NS			NS	
MW 9	4/6/2004		NS		1.8	U			NS		1.8	U			NS		1.2		
MW 9	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
MW 9	6/9/2004		NS		1.3	U			NS			NS			NS			NS	

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
MW 9D	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
MW 9	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
MW 9	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
MW 9	9/8/2004	NS			1.1	U		NS			NS			NS			NS		
MW 10	10/13/2003	NS			0.90	U		NS			NS			NS			NS		
MW 10	11/17/2003	NS			1.5	B		NS			NS			NS			NS		
MW 10D	11/17/2003	NS			1.4	B		NS			NS			NS			NS		
MW 10	12/9/2003	NS			1.5	U		NS			NS			NS			NS		
MW 10	1/20/2004	NS			1.3	U		NS			NS			NS			NS		
MW 10	2/16/2004	NS			1.5	B		NS			NS			NS			NS		
MW 10	3/9/2004	NS			1.8	U	JK-1.8	NS			NS			NS			NS		
MW 10	5/12/2004	NS			1.3	U		NS			NS			NS			NS		
MW 10	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
MW 10	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
MW 10	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
MW 10	9/8/2004	NS			4.8			NS			NS			NS			NS		
MW 11	10/15/2003	NS			0.90	U		NS			NS			NS			NS		
MW 11	11/18/2003	NS			1.2	B		NS			NS			NS			NS		
MW 11	12/10/2003	NS			1.5	U		NS			NS			NS			NS		
MW 11	1/21/2004	NS			1.3	U		NS			NS			NS			NS		
MW 11	2/17/2004	NS			1.3	U		NS			NS			NS			NS		
MW 11	3/9/2004	NS			1.8	U	JK-1.8	NS			NS			NS			NS		
MW 11D	3/9/2004	NS			1.8	U	JK-1.8	NS			NS			NS			NS		
MW 11	4/5/2004	NS			6.9			NS			6.1			NS			5.3		

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	EDTA as EDTA (mg/L)
MW 11	5/12/2004	NS	27.3			NS	NS			NS	NS
MW 11	6/9/2004	NS	10.9			NS	NS			NS	NS
MW 11	7/13/2004	NS	66.8			NS	NS			NS	NS
MW 11	8/10/2004	NS	4.4			NS	NS			NS	NS
MW 11	9/9/2004	NS	7.1			NS	NS			NS	NS
MW 11D	9/9/2004	NS	7.5			NS	NS			NS	NS
MW 12	10/14/2003	NS	0.90	U		NS	NS			NS	NS
MW 12	11/18/2003	NS	0.90	U		NS	NS			NS	NS
MW 12	12/10/2003	NS	1.5	U		NS	NS			NS	NS
MW 12	1/23/2004	NS	1.3	U		NS	NS			NS	NS
MW 12	2/17/2004	NS	1.3	U		NS	NS			NS	NS
MW 12	3/9/2004	NS	1.8	U	JK-1.8	NS	NS			NS	NS
MW 12	4/5/2004	NS	1.8	U		NS	1.8	U		NS	16
MW 12	5/12/2004	NS	1.3	U		NS	NS			NS	NS
MW 12D	5/12/2004	NS	1.3	U		NS	NS			NS	NS
MW 12	6/8/2004	NS	1.3	U		NS	NS			NS	NS
MW 12	7/12/2004	NS	1.1	U		NS	NS			NS	NS
MW 12	8/10/2004	NS	1.2	B		NS	NS			NS	NS
MW 12	9/9/2004	NS	1.1	U		NS	NS			NS	NS
MW 13	10/16/2003	NS	8070			NS	NS			NS	NS
MW 13D	10/16/2003	NS	8010			NS	NS			NS	NS
MW 13	1/26/2004	NS	3930			NS	NS			NS	NS
MW 13	4/7/2004	NS	5550			NS	16.3			NS	390
MW 13	7/13/2004	NS	3290			NS	NS			NS	NS

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)	Lead Diss. (ug/L)			Copper Total (ug/L)	Copper Diss. (ug/L)		Hardness (mg/L)	EDTA as EDTA (mg/L)	
MW 13D	7/13/2004	NS	3270			NS	NS		NS	NS	
MW 14	10/16/2003	NS	414			NS	NS		NS	NS	
MW 14	1/26/2004	NS	126			NS	NS		NS	NS	
MW 14	4/7/2004	NS	623			NS	4.1	B	NS	34	
MW 14D	4/7/2004	NS	596			NS	4.1	B	NS	NS	
MW 14	7/13/2004	NS	204			NS	NS		NS	NS	
MW 15	10/15/2003	NS	7.1			NS	NS		NS	NS	
MW 15	1/26/2004	NS	3.8			NS	NS		NS	NS	
MW 15D	1/26/2004	NS	4.0			NS	NS		NS	NS	
MW 15	4/7/2004	NS	17.9			NS	1.8	U	NS	7.7	
MW 15	7/13/2004	NS	84.2			NS	NS		NS	NS	
MW 16	10/14/2003	NS	0.90	U		NS	NS		NS	NS	
MW 16	11/18/2003	NS	0.90	U		NS	NS		NS	NS	
MW 16	12/10/2003	NS	1.5	U		NS	NS		NS	NS	
MW 16	1/23/2004	NS	1.3	U		NS	NS		NS	NS	
MW 16	2/17/2004	NS	1.3	U		NS	NS		NS	NS	
MW 16	3/9/2004	NS	1.8	U	JK-1.8	NS	NS		NS	NS	
MW 16	4/6/2004	NS	1.8	U		NS	1.8	U	NS	19	
MW 16	5/13/2004	NS	1.3	U		NS	NS		NS	NS	
MW 16	6/8/2004	NS	1.3	U		NS	NS		NS	NS	
MW 16	7/12/2004	NS	1.1	U		NS	NS		NS	NS	
MW 16	8/10/2004	NS	1.1	U		NS	NS		NS	NS	
MW 16	9/9/2004	NS	1.1	U		NS	NS		NS	NS	

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L) L	Lead Total (ug/L) D	Lead Diss. (ug/L) L	Lead Diss. (ug/L) D	Copper Total (ug/L) L	Copper Total (ug/L) D	Copper Diss. (ug/L) L	Copper Diss. (ug/L) D	Hardness (mg/L) L	Hardness (mg/L) D	EDTA as EDTA (mg/L) L	EDTA as EDTA (mg/L) D

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)
N	the sample spike recovery is out of control limits
E	indicated an estimated value

Data Validation Qualifiers (D):

J	estimated
JC#	calibaration accuracy, # = percent recovery of the standard analyte
JD#	duplicate precision, # = value of the Relative Percent Difference (RPD)
JE#	serial dilution interference, # = percent difference from undiluted value
JG#	graphite furnance interference, # = linearlty coefficient
JH#	holding time exceeded, # = number of days exceeding holding time
JI#	ICP interference check sample, # = percent recovery
JK#	negative blank results, # = value of negative blank
JL#	laboratory control sample recovery, # = percent recovery of the LCS
JM#	graphite furnance interference, # = linearlty coefficient
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
UJ	compound was not detected in the analysis; however, the associated detection limit may not be accurate or precise.

Table 4-4
Site C FY 2004 Groundwater Data

Sample Location	Date Collected	Lead Total (ug/L)		Lead Diss. (ug/L)		Copper Total (ug/L)		Copper Diss. (ug/L)		Hardness (mg/L)		EDTA as EDTA (mg/L)	
		L	D	L	D	L	D	L	D	L	D	L	D

<u>Other Notes:</u>

NS not sampled
EDTA ethylenediaminetetraacetic acid

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)		Lead Diss. (ug/L)			Copper Total (ug/L)		Copper Diss. (ug/L)			Hardness (mg/L)			EDTA as EDTA (mg/L)		
		L	D		L	D	L	D		L	D		L	D		L	D
SW 1	7/12/2004	NS		1.1	U		NS			NS			NS			NS	
SW 2	4/5/2004	NS		2.8	B		NS		17.4			512		JD58		NS	
SW 2	4/6/2004	NS		1.7	B		NS		16.0			241		JD58	<0.5		
SW 2	4/7/2004	NS		2.9	B		NS		15.1			207				NS	
SW 2	5/11/2004	NS		1.8	B		NS			NS			NS			NS	
SW 2	5/12/2004	NS		3.2			NS			NS			NS			NS	
SW 2	5/13/2004	NS		1.3	U		NS			NS			NS			NS	
SW 2	6/7/2004	NS		1.3	U		NS			NS			NS			NS	
SW 2	6/8/2004	NS		1.3	U		NS			NS			NS			NS	
SW 2	6/9/2004	NS		1.3	U		NS			NS			NS			NS	
SW 2	7/12/2004	NS		1.1	U		NS			NS			NS			NS	
SW 2	7/13/2004	NS		3.7			NS			NS			NS			NS	
SW 2	7/14/2004	NS		4.3			NS			NS			NS			NS	
SW 3	4/5/2004	NS		1.3	U		NS		2.6	B	JK-1.0	461		JD58		NS	
SW 3D	4/5/2004	NS		1.3	U		NS		1.9	B	JK-1.0	477		JD58		NS	
SW 3	4/6/2004	NS		1.3	U		NS		2.2	B	JK-1.0	539		JD58	<0.5		
SW 3	4/7/2004	NS		1.3	U		NS		2.5	B		381				NS	
SW 3	5/11/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3D	5/11/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3	5/12/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3	5/13/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3	6/7/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3D	6/7/2004	NS		1.3	U		NS			NS			NS			NS	
SW 3	6/8/2004	NS		1.3	U		NS			NS			NS			NS	

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 3	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
SW 3	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3D	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	7/14/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	8/9/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	8/10/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3D	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
SW 3	9/7/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 3	9/8/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 3	9/9/2004	NS			1.1	U	JK-1.5	NS			NS			NS			NS		
SW 3D	9/9/2004	NS			1.1	U	JK-1.5	NS			NS			NS			NS		
SW 4	4/5/2004	NS			1.3	U		NS			10.2			511		JD58	NS		
SW 4	4/6/2004	NS			1.5	B		NS			10.6			532		JD58	<0.5		
SW 4	4/7/2004	NS			1.6	B		NS			9.6			493			NS		
SW 4	5/11/2004	NS			1.5	B		NS			NS			NS			NS		
SW 4	5/12/2004	NS			1.3	U		NS			NS			NS			NS		
SW 4	5/13/2004	NS			1.3	U		NS			NS			NS			NS		
SW 4	6/7/2004	NS			1.3	U		NS			NS			NS			NS		
SW 4	6/8/2004	NS			1.4	B		NS			NS			NS			NS		
SW 4	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
SW 4D	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
SW 4	7/12/2004	NS			1.1	U		NS			NS			NS			NS		

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 4	7/13/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4D	7/13/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4	7/14/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4	8/9/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4	8/10/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4	8/11/2004		NS		1.1	U			NS			NS			NS			NS	
SW 4	9/7/2004		NS		4.2		JK-1.1		NS			NS			NS			NS	
SW 4	9/8/2004		NS		4.7		JK-1.1		NS			NS			NS			NS	
SW 4	9/9/2004		NS		4.0		JK-1.5		NS			NS			NS			NS	
SW 5	10/14/2003		NS		2.3	B			NS			NS			NS			NS	
SW 5	10/15/2003		NS		1.5	B			NS			NS			NS			NS	
SW 5	10/16/2003		NS		1.7	B			NS			NS			NS			NS	
SW 5	4/5/2004		NS		1.7	B			NS		4.1	B	JK-1.0	606		JD58		NS	
SW 5	4/6/2004		NS		1.4	B			NS		3.9	B	JK-1.0	466		JD58	2.6		
SW 5	4/7/2004		NS		1.5	B			NS		3.6	B		547				NS	
SW 5	5/11/2004		NS		3.0	B			NS			NS			NS			NS	
SW 5	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
SW 5D	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
SW 5	5/13/2004		NS		1.3	U			NS			NS			NS			NS	
SW 5	6/7/2004		NS		4.5				NS			NS			NS			NS	
SW 5	6/8/2004		NS		2.8	B			NS			NS			NS			NS	
SW 5	6/9/2004		NS		1.3	U			NS			NS			NS			NS	
SW 5	7/12/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5	7/13/2004		NS		1.3	B			NS			NS			NS			NS	

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 5	7/14/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5D	7/14/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5	8/9/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5D	8/9/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5	8/10/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5	8/11/2004		NS		1.1	U			NS			NS			NS			NS	
SW 5	9/7/2004		NS		1.1	U	JK-1.1		NS			NS			NS			NS	
SW 5D	9/7/2004		NS		1.1	U	JK-1.1		NS			NS			NS			NS	
SW 5	9/8/2004		NS		1.1	U	JK-1.1		NS			NS			NS			NS	
SW 5	9/9/2004		NS		1.1	U	JK-1.5		NS			NS			NS			NS	
SW 6	10/14/2003		NS		0.90	U			NS			NS			NS			NS	
SW 6	10/15/2003		NS		0.90	U			NS			NS			NS			NS	
SW 6D	10/15/2003		NS		0.90	U			NS			NS			NS			NS	
SW 6	10/16/2003		NS		0.90	U			NS			NS			NS			NS	
SW 6	4/5/2004		NS		1.9	B			NS		4.0	B	JK-1.0	329		JD58		NS	
SW 6	4/6/2004		NS		2.6	B			NS		3.9	B	JK-1.0	208		JD58	3.5		
SW 6D	4/6/2004		NS			NS			NS			NS		379		JD58	3.3		
SW 6	4/7/2004		NS		1.6	B			NS		4.4	B		472				NS	
SW 6	5/11/2004		NS		3.4				NS			NS			NS			NS	
SW 6	5/12/2004		NS		1.3	U			NS			NS			NS			NS	
SW 6	5/13/2004		NS		3.1				NS			NS			NS			NS	
SW 6D	5/13/2004		NS		2.9	B			NS			NS			NS			NS	
SW 6	6/7/2004		NS		5.2				NS			NS			NS			NS	
SW 6	6/8/2004		NS		3.0	B			NS			NS			NS			NS	

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 6D	6/8/2004	NS			3.3			NS			NS			NS			NS		
SW 6	6/9/2004	NS			6.3			NS			NS			NS			NS		
SW 6	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6	7/14/2004	NS			1.3	B		NS			NS			NS			NS		
SW 6	8/9/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6	8/10/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6D	8/10/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
SW 6	9/7/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 6	9/8/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 6	9/9/2004	NS			1.1	U	JK-1.5	NS			NS			NS			NS		
SW 7	10/14/2003	NS			0.90	U		NS			NS			NS			NS		
SW 7	10/15/2003	NS			0.90	U		NS			NS			NS			NS		
SW 7	10/16/2003	NS			0.90	U		NS			NS			NS			NS		
SW 7	4/5/2004	NS			1.3	U		NS			0.80	U	JK-1.0	141		JD58	NS		
SW 7	4/6/2004	NS			1.3	U		NS			1.0	B	JK-1.0	154		JD58	<0.5		
SW 7	4/7/2004	NS			1.3	U		NS			1.0	B		248			NS		
SW 7	5/11/2004	NS			1.3	U		NS			NS			NS			NS		
SW 7	5/12/2004	NS			1.3	U		NS			NS			NS			NS		
SW 7	5/13/2004	NS			1.3	U		NS			NS			NS			NS		
SW 7	6/7/2004	NS			1.3	U		NS			NS			NS			NS		
SW 7	6/8/2004	NS			1.3	U		NS			NS			NS			NS		
SW 7	6/9/2004	NS			1.3	U		NS			NS			NS			NS		

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 7	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	7/13/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	7/14/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	8/9/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	8/10/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
SW 7	9/7/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 7	9/8/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 7	9/9/2004	NS			1.1	U	JK-1.5	NS			NS			NS			NS		
SW 8	10/14/2003	NS			0.90	U		NS			NS			NS			NS		
SW 8	10/15/2003	NS			0.90	U		NS			NS			NS			NS		
SW 8	10/16/2003	NS			0.90	U		NS			NS			NS			NS		
SW 8	4/5/2004	NS			1.3	U		NS			0.87	B	JK-1.0	187		JD58	NS		
SW 8	4/6/2004	NS			1.3	U		NS			0.80	U	JK-1.0	162		JD58	<0.5		
SW 8	4/7/2004	NS			1.3	U		NS			0.80	U		182			NS		
SW 8D	4/7/2004	NS			1.3	U		NS			1.1	B		230			NS		
SW 8	5/11/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	5/12/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	5/13/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	6/7/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	6/8/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	6/9/2004	NS			1.3	U		NS			NS			NS			NS		
SW 8	7/12/2004	NS			1.1	U		NS			NS			NS			NS		
SW 8	7/13/2004	NS			1.1	U		NS			NS			NS			NS		

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D
SW 8	7/14/2004	NS			1.2	B		NS			NS			NS			NS		
SW 8	8/9/2004	NS			1.1	U		NS			NS			NS			NS		
SW 8	8/10/2004	NS			1.1	U		NS			NS			NS			NS		
SW 8	8/11/2004	NS			1.1	U		NS			NS			NS			NS		
SW 8	9/7/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 8	9/8/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 8D	9/8/2004	NS			1.1	U	JK-1.1	NS			NS			NS			NS		
SW 8	9/9/2004	NS			1.1	U	JK-1.5	NS			NS			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)
N	the sample spike recovery is out of control limits
E	indicated an estimated value

Data Validation Qualifiers (D):

J	estimated
JC#	calibaration accuracy, # = percent recovery of the standard analyte
JD#	duplicate precision, # = value of the Relative Percent Difference (RPD)
JE#	serial dilution interference, # = percent difference from undiluted value

Table 4-5
Site C FY 2004 Surface Water Data

Sample Location	Date Collected	Lead Total (ug/L)	L	D	Lead Diss. (ug/L)	L	D	Copper Total (ug/L)	L	D	Copper Diss. (ug/L)	L	D	Hardness (mg/L)	L	D	EDTA as EDTA (mg/L)	L	D

JG# graphite furnance interference, # = linearlty coefficient
JH# holding time exceeded, # = number of days exceeding holding time
JI# ICP interference check sample, # = percent recovery
JK# negative blank results, # = value of negative blank
JL# laboratory control sample recovery, # = percent recovery of the LCS
JM# graphite furnance interference, # = linearlty coefficient
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
UJ compound was not detected in the analysis; however, the associated detection limit may not be accurate or precise.

Other Notes:

NS not sampled
EDTA ethylenediaminetetraacetic acid

TABLE 4-6
SITE C Removal Action Monthly Lead Removal

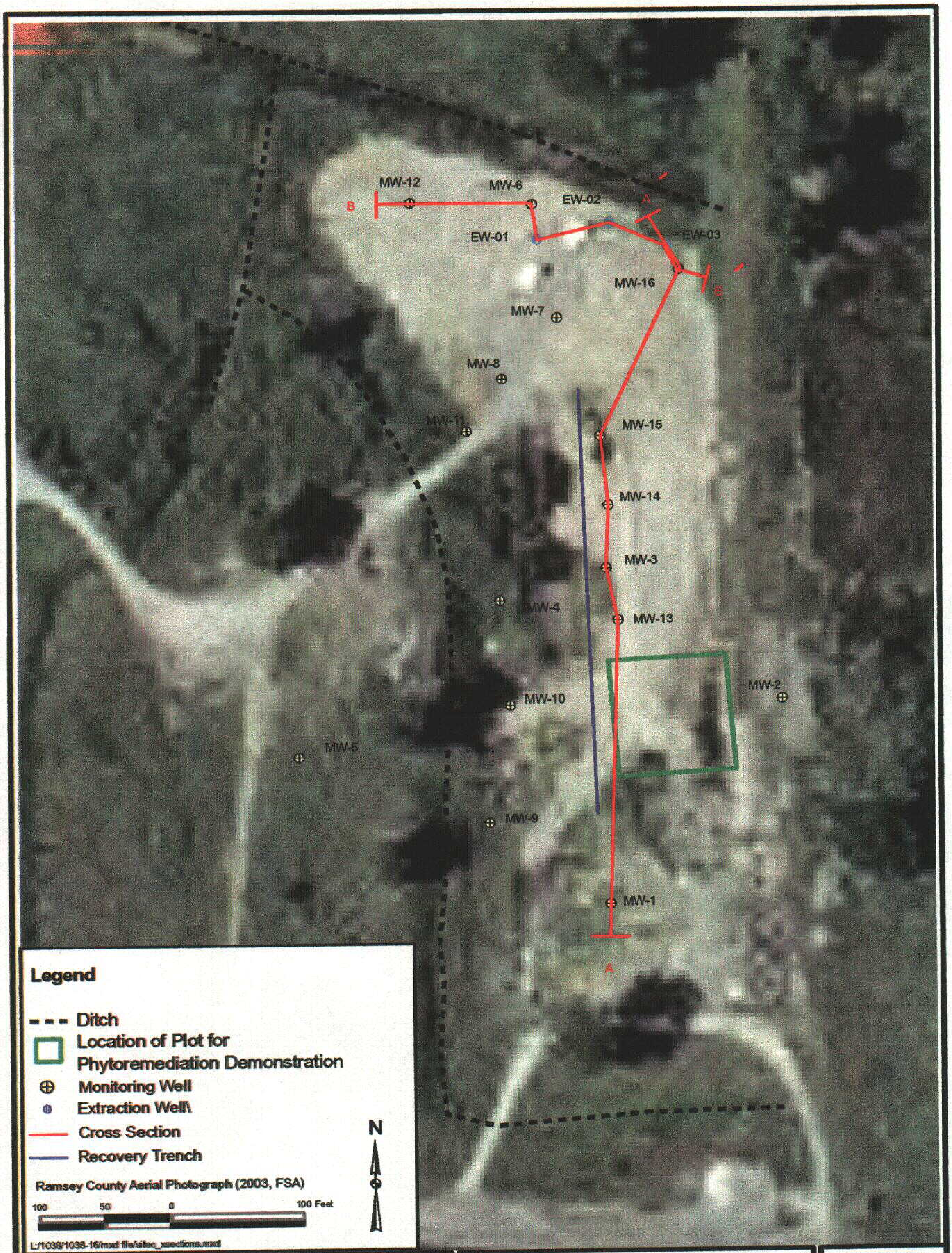
Fiscal Year 2004

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 9/30/03)		1,555,776		67.42	4,636,915
OCTOBER	3.70	83,401	8.35E-06	2.58	207,781
NOVEMBER	3.27	85,080	8.35E-06	2.32	203,620
DECEMBER	3.02	95,336	8.35E-06	2.40	244,052
JANUARY	2.95	87,933	8.35E-06	2.17	263,146
FEBRUARY	2.95	66,903	8.35E-06	1.65	202,081
MARCH	3.00	70,190	8.35E-06	1.76	247,021
APRIL	2.80	70,702	8.35E-06	1.65	228,792
MAY	2.68	80,168	8.35E-06	1.79	242,061
JUNE	2.33	110,714	8.35E-06	2.15	334,946
JULY	3.92	84,760	8.35E-06	2.77	279,808
AUGUST	2.05	71,439	8.35E-06	1.22	333,664
SEPTEMBER	1.94	55,006	8.35E-06	0.89	103,613
WATER AND LEAD REMOVED (FY 2004)		961,632		23.36	2,890,585
WATER AND LEAD REMOVED (TOTAL)		2,517,408		90.78	7,527,500

Notes:

1) EW-1 and EW-2 remain at or near non-detect lead levels and do not provide a significant source of removed lead.
2) Mass calculations began in June 2002 when significant lead was detected in EW-3
3) In September 2004, the flow meters for EW-2, EW-3, and for the Total Effluent were replaced and the piping inside of the building was re-plumbed to allow for better access and more accurate flow metering.

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2004
October 2004 Site E Supplemental Groundwater Elevation Contours		Figure 4-1



TWIN CITIES ARMY AMMUNITION PLANT

Site C: Site Plan and Cross Section Locations

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Wenck Associates, Inc. Environmental Engineers

1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2004

Figure 4-2

TWIN CITIES ARMY AMMUNITION PLANT

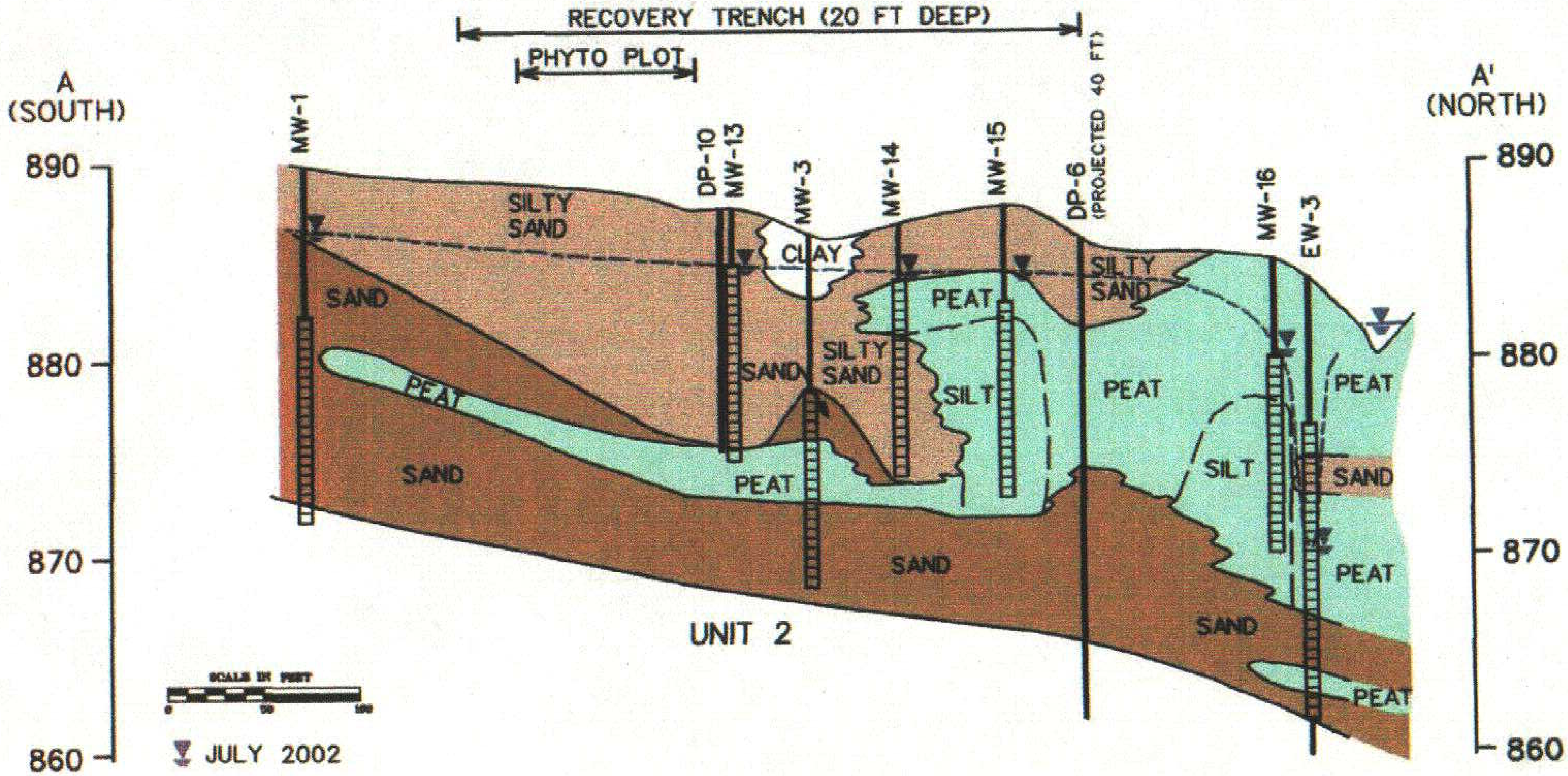
Surface Water Monitoring Locations Related to Site C

Wenck

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

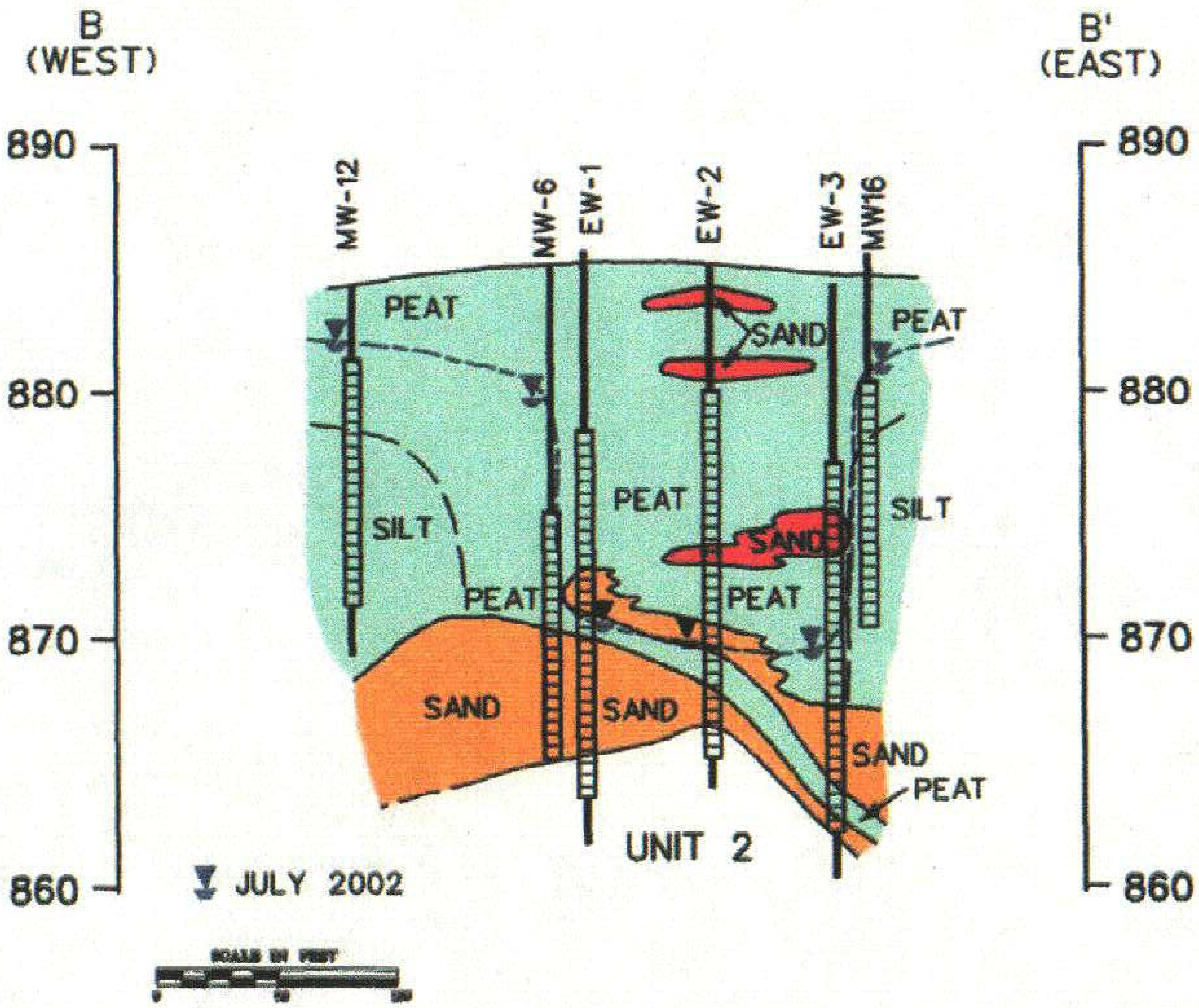
FY 2004

Figure 4-3



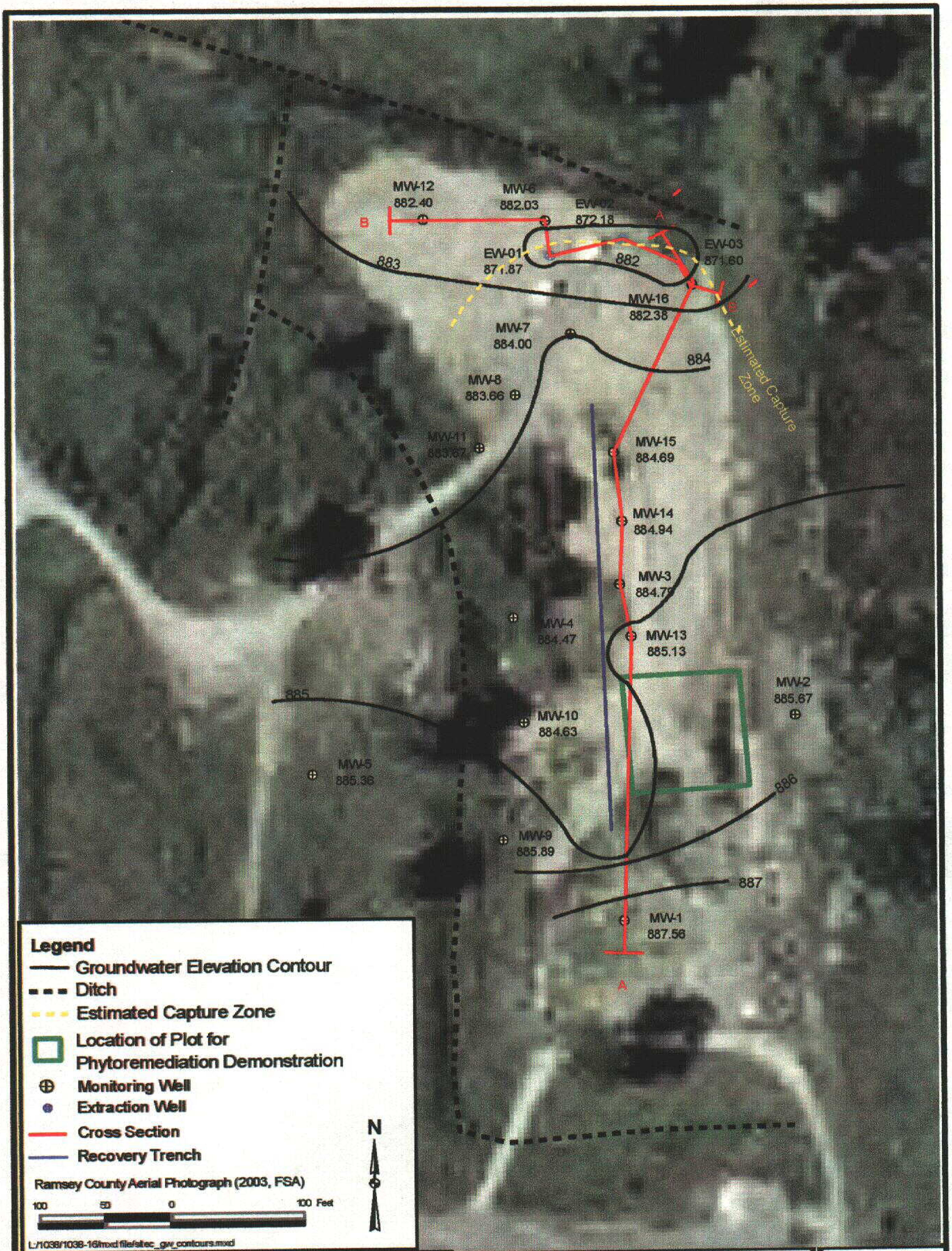
M:/1038/12/NO-SO-XSEC.DGN

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359	FY 2004
Site C: Cross-Section A-A'		Fig. 4-4



M:/1038/12/E-W XSEC.DGN

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359	FY 2004
Site C: Cross-Section B-B'		Fig. 4-5



TWIN CITIES ARMY AMMUNITION PLANT

Site C: June 2004

Groundwater Elevation Contours

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1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2004

Figure 4-6

TWIN CITIES ARMY AMMUNITION PLANT

Site C Lead in Groundwater July 2004

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

FY 2004

Figure 4-7

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 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 2004 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. FY 2004 was a minor sampling year so only two wells downgradient of Sites D and G were sampled. 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.

Downgradient of Site G, at 03U094 (Figure 5-3), the concentrations over the past five years show a decreasing trend.

Table 5-1 presents the FY 2004 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. In FY 2003, the concentration of 1,1-dichloroethene exceeded the cleanup level in 03U094 (18 µg/l versus cleanup level of 6 µg/l).

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 up to 50 times 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 (finalized in FY 2000).

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 2005 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 11.0 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?

Yes. The intent of this remedy component was to add additional deep vents at both sites, as needed, to address the presumed existence of contaminated soils below the existing SVE systems. Also, the existing systems were to be modified, as needed, to improve VOC mass removal. The site investigation conducted in FY 2000 showed that all Site D soils (shallow and deep) were below the Site D VOC cleanup levels, and that all Site G soils (shallow and deep) were below the subsequently-developed, higher cleanup goals, as documented in "Technical Memorandum, Soil Leaching Values, Site G," dated July 31, 2002. Therefore, neither deep SVE systems nor modifications to the shallow SVE systems will be required at either site. 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 2004.

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?

Yes. 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 11.0 for information on land use controls and long-term O&M).

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

5.6 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 11.0 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 2004.

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 2004. 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 2004.

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

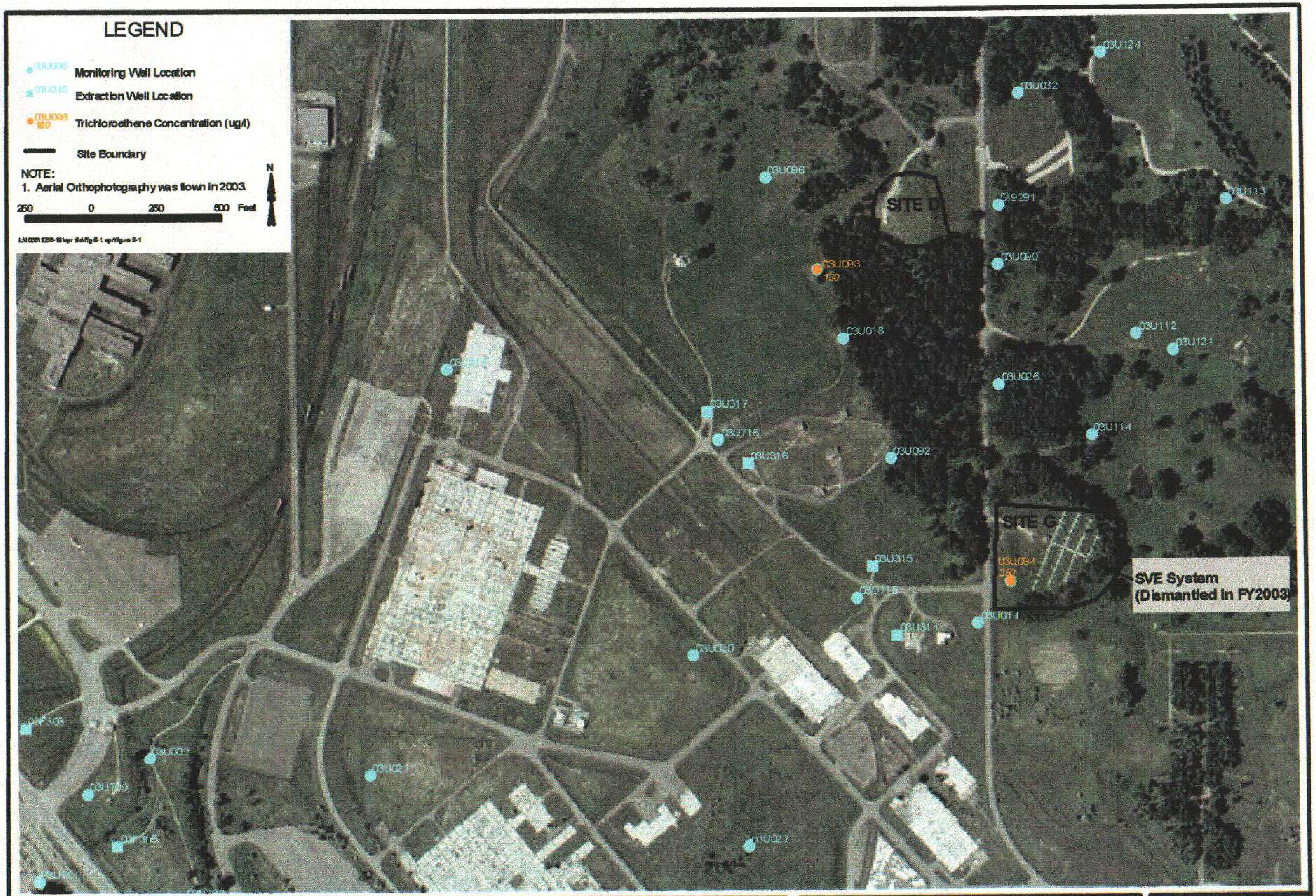
Fiscal Year 2004

		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	6/16/04	<1	**130**	2.4	JP 0.96	3.0	18	<1
Site G								
03U094	6/16/04	<1	**250**	5.3	1.0	1.0	140	<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



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2004
Location of Wells Nearest to Sites D and G		Figure 5-1

FIGURE 5-2
SITE D, WELL 03U093, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT

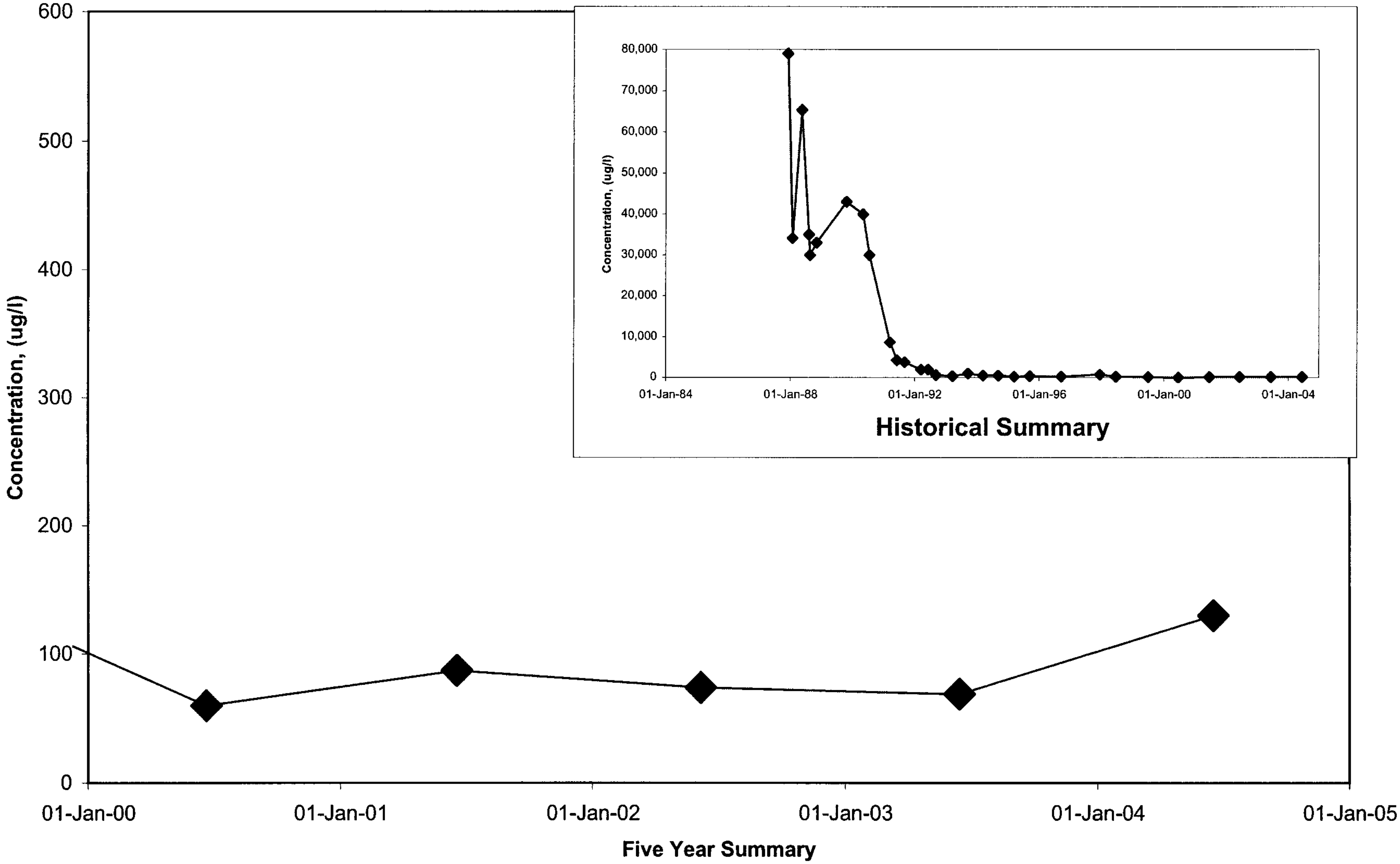
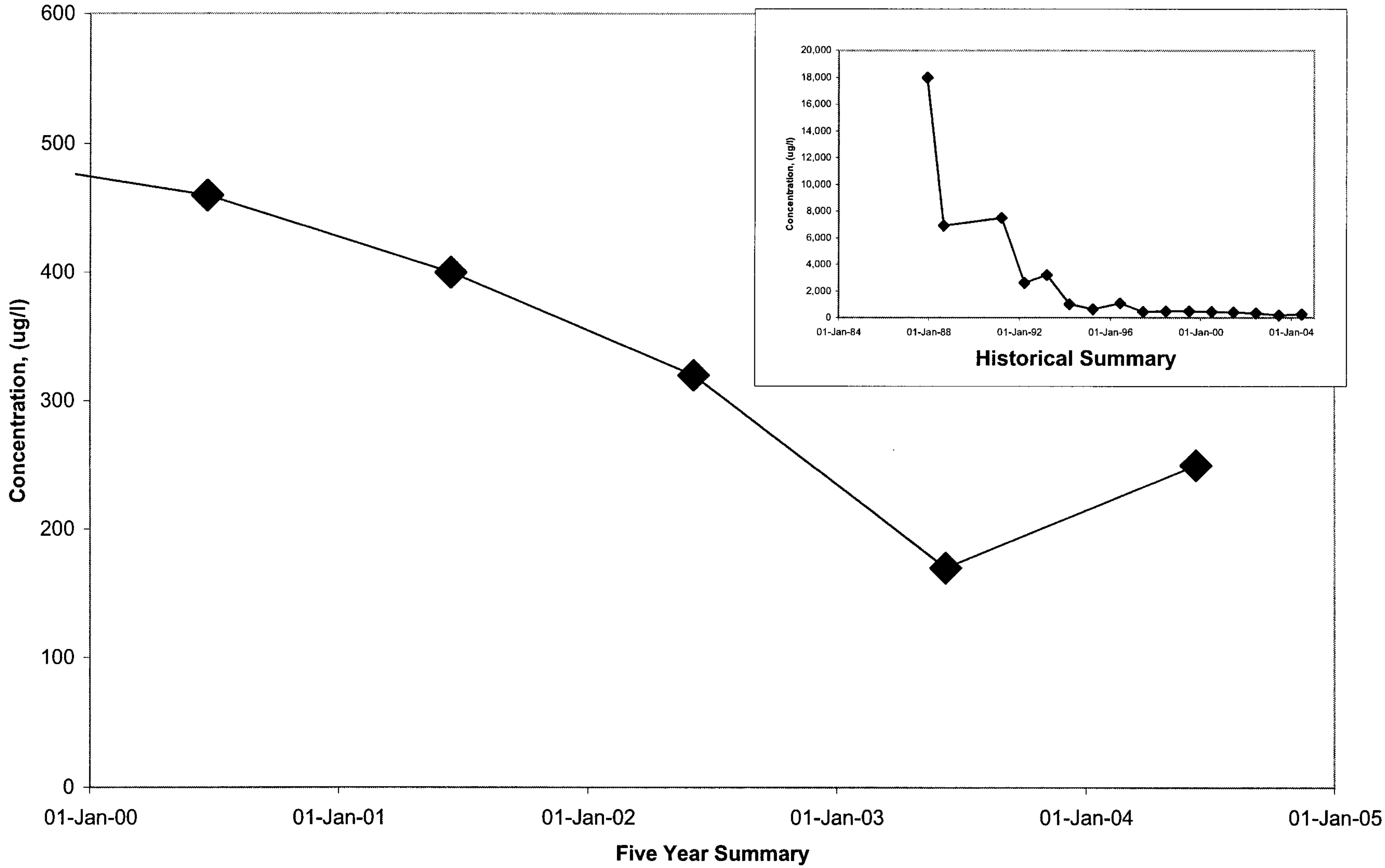


FIGURE 5-3
SITE G, WELL 03U094, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT



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 2004 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 2004.

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 2004. The next "major" event will be in FY 2005.
- 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, 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 - 5) was 15 gpm. Even with 01U355 (EW-5) off, the system has been operated to maintain a target pumping rate of 15 gpm. Table 6-3 shows that monthly total flow rates exceeded the target of 15 gpm during eleven months and was slightly below (14.5 gpm) in April 2004. This corresponds to a shut down due to a pipeline repair (see Table 6-5). The average pumping rate for FY 2004 was 15.9 gpm.

Water level data collected at Site A on June 2, 2003, 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 locations and in the system effluent.

The decreasing concentration of cis-1,2-dichloroethene in 01U902 (downgradient of the extraction system) is also evidence of the extraction system's capture zone (Figure 6-6). The cis-1,2-dichloroethene concentration in this well has dropped from a historical high around 100 µg/l to 4.6 µg/l in FY 2004.

Were there any significant operation and maintenance problems (greater than 24-hour shutdown)?
Yes. Table 6-5 summarizes O&M notes for FY 2004.

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 2004, as defined by the 1 μg/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 2004? If yes, what were the findings? No.

Were any well owners offered an alternate supply and/or well abandonment in FY 2004? 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 2004, 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 2004.

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. Shaw 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 Shaw 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 2003. 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) in the June 2004 event (Figure 6-4). However, Table 6-2 shows that extraction wells 01U352 (EW-2) and 01U353 (EW-3) are just below the cleanup standard (>60 μg/l and <70 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) may still persist in the vicinity of EW-2 and EW-3, though it does not extend back to the source area. Similarly, the benzene concentration in EW-2 was below the cleanup level of 10 μg/l in the June 2003 event, but was above the cleanup level in the December 2002 event (detected at 21 μg/l). 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 plume extent decreasing slightly and the tetrachloroethene plume extent remaining about the same. Some minor changes in plume contours in Figure 6-4 (cis-1,2-dichloroethene) and Figure 6-5 (tetrachloroethene) from the FY 2002 plume contours are noted as follows:

- Figure 6-4: 1) 01U904 increased from <1.0 μg/l to 1.5 μg/l, moving the 1 μg/l contour outward.
  2) 01U139 increased from 5.8 to 29 μg/l, reestablishing the 10 μg/l contour in this area.
  3) 01U158 increased from 0.67 to 1.5 μg/l, moving the 1 μg/l contour outward.
  4) 01U157 increased from <0.1 to 1.7 μg/l. As shown on Figure 6-3, 01U157 is located at the approximate limit of the downgradient edge of the capture zone for the operating extraction wells.

- Figure 6-5: 1) 01U108 decreased from 65 to 11 μg/l, moving the 10 μg/l contour inward.

Wells at, and downgradient, of the first line of extraction wells generally showed slightly decreasing concentrations. 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, although based on only one round of data, may indicate 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 may be just beginning to influence the FY 2004 monitoring data. At 01U108, the closest monitoring well downgradient of the source area, the concentration of tetrachloroethene decreased from FY 2003. Additional monitoring will be required to verify the trend at 01U108. The groundwater travel time from the source area to the first line of recovery wells is approximately 2 years, and therefore, the potential effects of source removal will be even more delayed at the recovery wells.

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 2.4 pounds of VOCs in FY 2004, with a cumulative VOC mass removal of approximately 42 pounds since system startup on May 31, 1994 (Table 6-7).

Has 10 years elapsed since signing of the OU2 ROD? No. The June 2004 sampling event marked seven 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 2004 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.

Do additional remedial measures need to be addressed? No.

6.7 OTHER ACTIVITIES IN FY 2004

During the June 2004 monitoring, a groundwater sample was collected from well 01U108 and analyzed for 1,4-dioxane using EPA method 8270c. The work was conducted by CRA as part of a larger 1,4-dioxane sampling round (see Section 9.0). The laboratory analytical result for 1,4-dioxane was 15 µg/l, which is below the MDH Health Based Value (HBV) of 30 µg/l.

Well 01U108 represents the most contaminated portion of the aquifer. In light of this, and the results being below the HBV, no further 1,4-dioxane sampling will be conducted.

Table 6-1
Summary of Site A Shallow Groundwater Monitoring Requirements

Fiscal Year 2004

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 2004

			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		6/16/04	<1	<1	<1	<1	<1	<1	<1	
01U102		6/15/04	JP 0.56 (JS128)	<1	<1	<1	JP 0.39	<1	<1	
01U103		6/16/04	<1	<1	<1	<1	<1	<1	<1	B 2.34 (UB1.7)
01U108		6/15/04	10 (JS128)	1.7	<1	<1	JP 0.55	<1	<1	
01U108	D	6/15/04	11 (JS128)	1.9	<1	<1	JP 0.57	<1	<1	
01U115		6/17/04	<1	<1	<1	<1	<1	<1	<1	
01U116		6/17/04	<1	<1	<1	<1	JP 0.82	<1	<1	
01U117		6/17/04	3.3 (JS128)	1.7	<1	<1	27	<1	<1	
01U126		6/17/04	29	JP 0.59	<1	<1	<1	<1	<1	
01U126	D	6/17/04	32	JP 0.77	<1	<1	<1	<1	<1	
01U127		6/16/04	<1	<1	<1	<1	<1	<1	<1	
01U138		6/16/04	<1	<1	<1	<1	<1	<1	<1	
01U139		6/17/04	<1	<1	<1	<1	29	<1	1.7	
01U140		6/17/04	<1	JP 0.47	<1	<1	2.3	<1	JP 0.50	
01U157		6/17/04	<1	JP 0.54	<1	<1	1.7	<1	<1	
01U158		6/17/04	<1	<1	<1	<1	1.5	<1	<1	
01U901		6/18/04	<1	JP 0.58	<1	<1	<1	<1	<1	
01U902		6/18/04	<1	<1	<1	<1	4.6	<1	<1	<5
01U903		6/18/04	<1	<1	<1	<1	<1	<1	<1	
01U904		6/18/04	<1	<1	<1	<1	1.5	<1	<1	<5

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2004

			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)		6/16/04	JP 0.62 (JS128)	1.3	<1	<1	1.8	<1	<1	
01U352 (EW2)		6/17/04	JP 0.33 (JS128)	2.3	<1	<1	68	<1	4.5	
01U352 (EW2)	D	6/17/04	JP 0.34 (JS128)	1.9	<1	<1	60	<1	3.9	
01U352 (EW2)	D	6/17/04	<1	2.0	<1	<1	62	<1	3.8	
01U353 (EW3)		6/16/04	JP 0.21 (JS128)	JP 0.94	<1	<1	68	<1	5.1	
01U354 (EW4)		6/16/04	<1	<1	<1	<1	JP 0.86	<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.

B 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.

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.

Table 6-3
Site A Removal Action Pumping Data

Fiscal Year 2004

Month	01U351	01U352	01U353	01U354	01U351-354 Subtotal
				Target Flowrate (gpm):	**15.0**
	Average Flowrate (gpm)				
Oct-03	4.8	2.8	4.5	5.1	17.1
Nov-03	4.4	4.3	4.3	3.9	16.8
Dec-03	4.3	2.8	4.5	4.1	15.7
Jan-04	4.5	2.9	4.1	3.9	15.4
Feb-04	4.7	2.7	3.9	3.8	15.1
Mar-04	5.9	2.2	3.8	3.9	15.7
Apr-04	3.3	2.5	3.6	5.2	14.5
May-04	4.9	2.7	3.7	5.1	16.4
Jun-04	5.4	2.7	3.7	4.9	16.7
Jul-04	4.7	2.7	3.1	4.7	15.1
Aug-03	4.9	3.6	3.1	4.5	16.0
Sep-03	5.8	2.3	2.8	4.8	15.7
FY04 Average	**4.8**	**2.9**	**3.7**	**4.5**	**15.9**

Table 6-4
Site A Groundwater Level Data

Fiscal Year 2004

Well ID	TOS (ft)	Groundwater Elevation (ft)	Well ID	TOS (ft)	Groundwater Elevation (ft)
01U038	900.30	893.76	01U140	898.83	884.60
01U039	897.50	883.55	01U141	897.74	886.20
01U040	892.54	885.37	01U145	902.56	887.47
01U041	898.33	893.98	01U146	902.89	885.21
01U063	892.61	885.26	01U147	902.80	886.85
01U067	897.40	894.11	01U148	902.60	886.45
01U102	905.20	889.76	01U149	901.30	886.05
01U103	904.14	891.63	01U150	901.30	885.54
01U104	899.12	894.23	01U151	904.70	---
01U105	901.39	895.43	01U152	901.00	885.62
01U106	896.80	891.44	01U153	899.90	885.25
01U107	899.16	893.69	01U154	898.90	884.94
01U108	904.30	890.97	01U155	897.90	884.12
01U110	897.22	895.20	01U156	897.80	883.57
01U115	900.33	885.85	01U157	901.90	885.62
01U116	902.71	886.09	01U158	901.10	885.25
01U117	902.69	887.28	01U901	901.48	882.53
01U118	901.79	890.49	01U902	901.29	884.88
01U119	898.08	893.75	01U903	903.70	886.43
01U120	902.15	890.48	01U904	899.40	883.60
01U126	903.34	888.89			
01U127	902.93	891.07			
01U133	900.73	893.35	*Extraction Wells:*		
01U135	899.94	883.39	*(Elevations measured while pumping.)*		
01U136	898.84	879.74	01U351 (EW1)	904.00	883.66
01U137	900.51	888.37	01U352 (EW2)	901.00	884.81
01U138	904.38	885.52	01U353 (EW3)	902.00	877.57
01U139	901.15	885.42	01U354 (EW4)	903.80	884.20

Notes:

TOS = Top of Surface which represents the ground surface elevation in feet above mean sea level (MSL).

Groundwater elevations were measured on June 21, 2004.

Table 6-5
Site A Removal Action Monthly Operation and Maintenance Notes

Fiscal Year 2004

October
During October, the system continued to operate as designed. Operational parameters were recorded daily on business days
10/21-22/03; System shut down for scheduled acid washing. Total down time: 35.25 hours

November
During November, the system continued to operate as designed. Operational parameters were recorded daily on business days

December
During December, the system continued to operate as designed. Operational parameters were recorded daily on business days.
12/15-17/03; System shut down for scheduled acid washing. Total down time: 49.5 hours.

January
During January, the system continued to operate as designed. Operational parameters were recorded daily on business days.

February
During the month of February, the system continued to operate as designed. Operational parameters were recorded daily on business days
2/9-10/04; The system was shutdown for scheduled cleaning by acid treatment. Total down time: 38 hours

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

April
4/5-6/04 The system was shut-down for acid cleaning of the wells. System down time: 32 hours
4/7/04 Well 01U351 was shut-down to repair leaking pipes inside of control building. 01U351 down time: 5 hours.
4/8/04 Water was found to be ponding on the ground surface just to the south of the control building. Well 01U352 was shut-down and the surface flow stopped. The remaining three extraction wells were adjusted to compensate for the temporary shutdown of 01U352. 01U352 down time:
4/13/04 Roso Excavating out to dig on leaking 01U352 pipe. Several small holes were found about 14 inches below the ground surface on the 01U352 vertical pipe leading into the control building. As preventative maintenance, all four vertical pipes and elbows leading into the control building were replaced. System down time: 5.25 hours.
4/23/04 Glacier out to replace bad O-ring in pitless adapter for 01U351. 01U351 down time: 5 hours
4/26/04 Glacier out to replace pitless adapter for 01U351. 01U351 down time: 2 hours

May
During the month of May, the system continued to operate as designed. Operational parameters were recorded daily on business days.
5/18-19/04 The system was shut-down for scheduled acid cleaning of the wells. System down time: 32 hours

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

July
During the month of July, the system continued to operate as designed. Operational parameters were recorded daily on business days
7/6-7/04 System was shut down for scheduled acid washing treatment. Down time: 33.5 hours
7/8-9/04 System was shut down for scheduled welgicide treatment. Down time: 24 hours
7/26-29/04 The pump for 01U352 failed on 7/26/04 and was replaced on 7/29/04. Down time for 01U352: 72 hours.

August
During the month of August, the system continued to operate as designed. Operational parameters were recorded daily on business days
8/18-19/04 System was shut down for scheduled acid washing treatment. Down time: 32 hours

September
During the month of September, the system continued to operate as designed. Operational parameters were recorded daily on business days.

Table 6-6
Site A Effluent Water Quality

Fiscal Year 2004

	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
27-Oct-03	51	JP 0.92	1.2	<1	<0.100
20-Nov-03	29	JP 0.64	1.1	<1	<0.100
29-Dec-03	35	JP 0.75	1.2	<1	<0.100
22-Jan-04	22	JP 0.60	JP 0.96	<1	<0.100
25-Feb-04	25	JP 0.69	1.1	<1	<0.100
25-Mar-04	19	JP 0.62	1.1	<1	<0.100
20-Apr-04	33	2.1	1.1	<1	<0.100
18-May-04	21	JP 0.60	JP 0.79	<1	B 0.06782
28-Jun-04	24	JP 0.58	JP 0.91	<1	<0.100
29-Jul-04	24	JP 0.69	JP 0.69	<1	<0.100
24-Aug-04	59	JP 0.59	1.0	<1	<0.100
20-Sep-04	52	JP 0.66	JP 1.0	<1	0.112

Notes:

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

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

Table 6-7
SITE A Monthly VOC Removal

Fiscal Year 2004

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, 2003					130,289,441	39.10
OCTOBER	51.92	1.20	53.12	8.35E-09	730,911	0.32
NOVEMBER	29.64	1.10	30.74	8.35E-09	666,126	0.17
DECEMBER	35.75	1.20	36.95	8.35E-09	795,955	0.25
JANUARY	22.60	0.96	23.56	8.35E-09	665,449	0.13
FEBRUARY	25.69	1.10	26.79	8.35E-09	603,141	0.13
MARCH	19.62	1.10	20.72	8.35E-09	755,721	0.13
APRIL	35.10	1.10	36.20	8.35E-09	606,807	0.18
MAY	21.60	0.79	22.39	8.35E-09	659,366	0.12
JUNE	24.58	0.91	25.49	8.35E-09	795,430	0.17
JULY	24.69	0.69	25.38	8.35E-09	646,199	0.14
AUGUST	59.59	1.00	60.59	8.35E-09	736,235	0.37
SEPTEMBER	52.66	1.00	53.66	8.35E-09	675,281	0.30
TOTAL GALLONS PUMPED AND VOC'S REMOVED FOR FISCAL YEAR 2004					8,336,621	2.42
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP					138,626,062	41.53

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

TWIN CITIES ARMY AMMUNITION PLANT

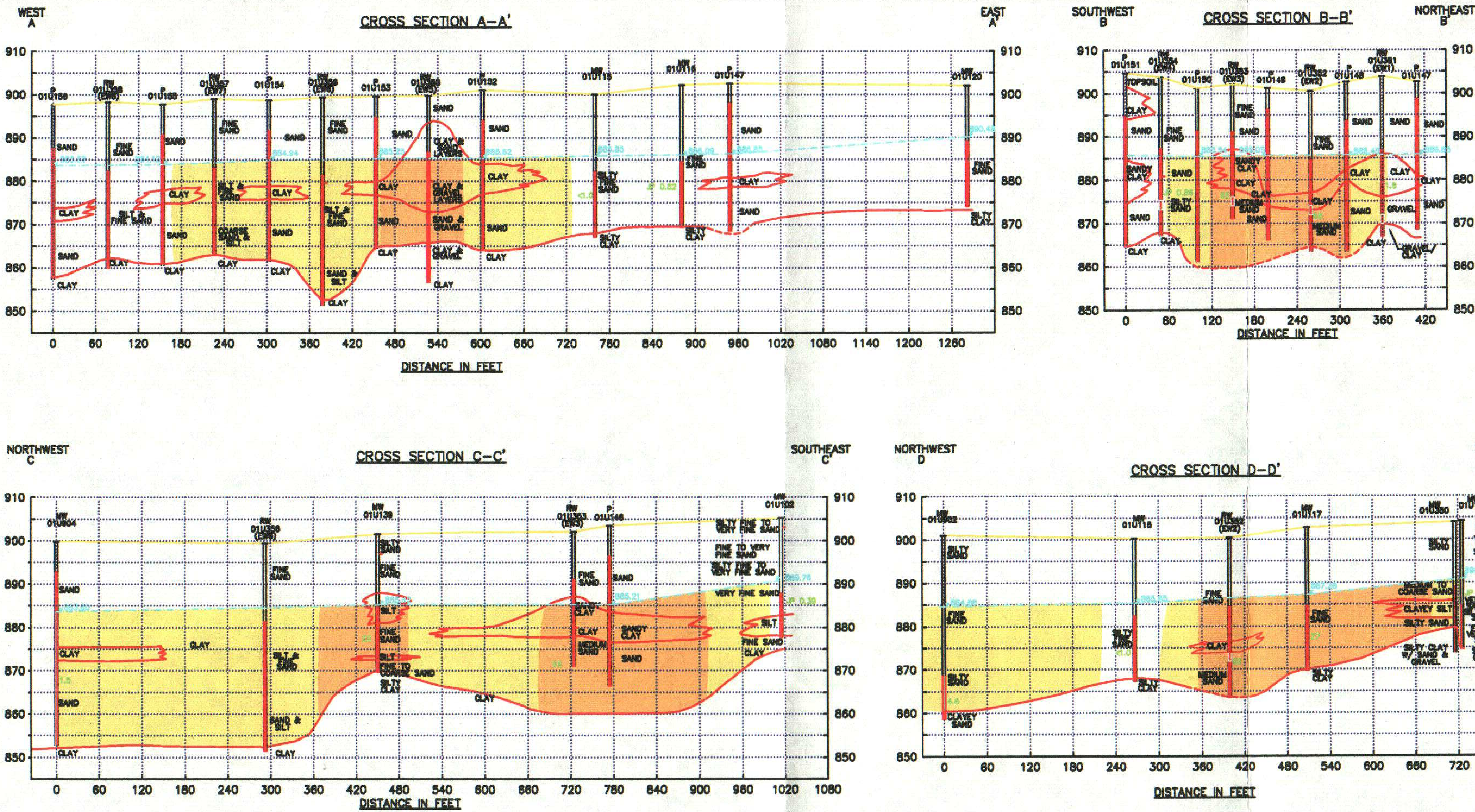
Site A, Well Location Map

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2004

Figure 6-1



NOTES:

1. RESULTS ARE FROM GROUNDWATER SAMPLES COLLECTED BETWEEN JUNE 3-9, 2004.

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
- 888.0 WATER LEVEL SURFACE
- SLIGHT CHANGE IN GEOLOGIC UNIT (MARK LOCATED ALONG WELL STAFF)
- MW MONITORING WELL
- RW RECOVERY WELL
- P PIEZOMETER
- MW 01U117 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

1036\ARDENHILLS\TCAX0256.DWG

TWIN CITIES ARMY AMMUNITION PLANT

Site A, cis-1,2-Dichloroethene Cross Sections A-A', B-B', C-C' and D-D' Summer 2004

Wenck

Wenck Associates, Inc. Environmental Engineers

24 Weston Southwest Grand Rapids, MI 49503

FY 2004

Figure 6-2

TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2004
Site A, Unit 1, Potentiometric Map -- Summer 2004	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359-0249	Figure 6-3

TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2004
Site A, Unit 1, cis-1,2-Dichloroethene Isoconcentration Map, Summer 2004	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	Figure 6-4

TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 Tetrachloroethene Isoconcentration Map, Summer 2004

Wenck

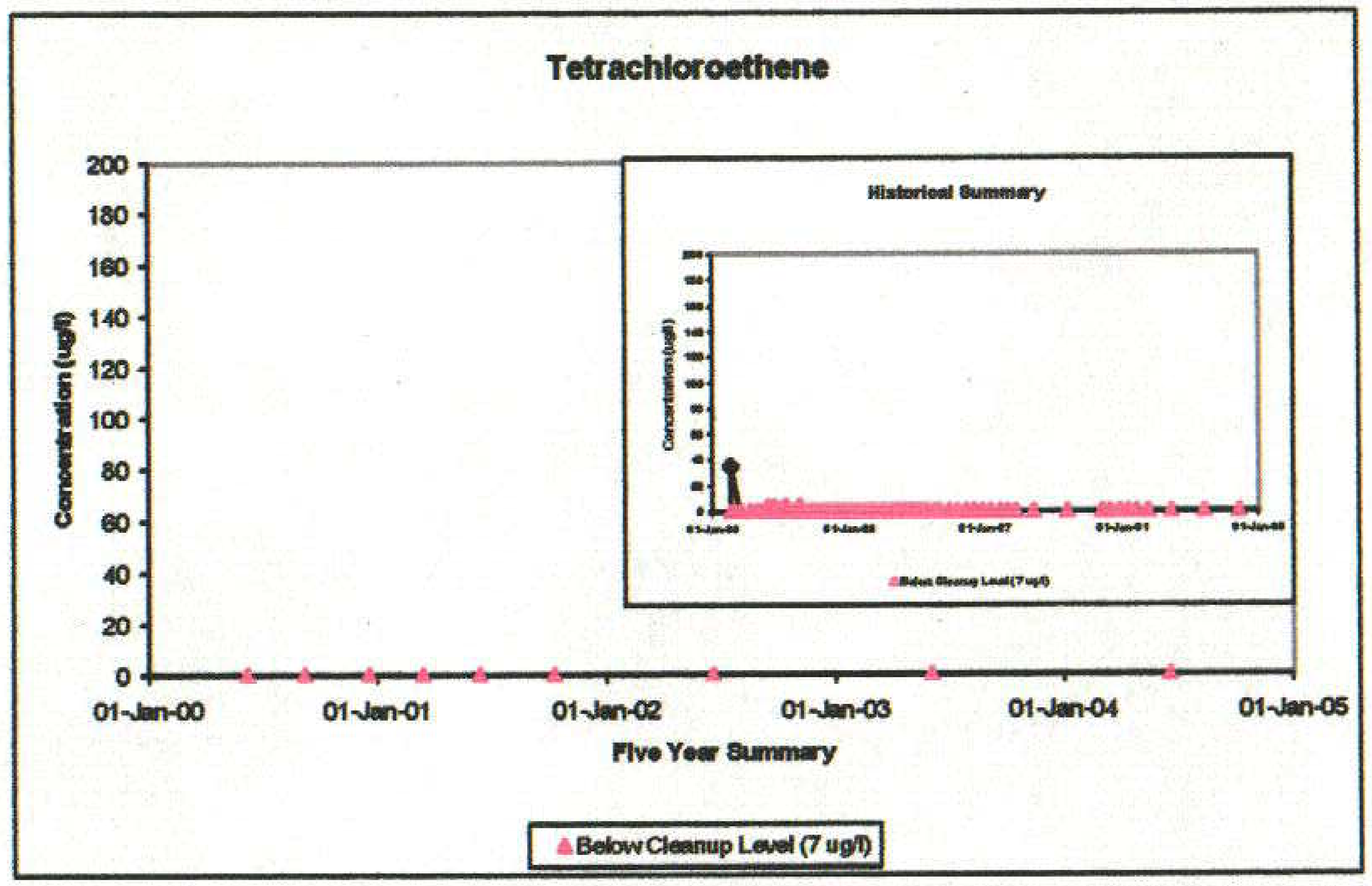
Wenck Associates, Inc.
Environmental Engineers

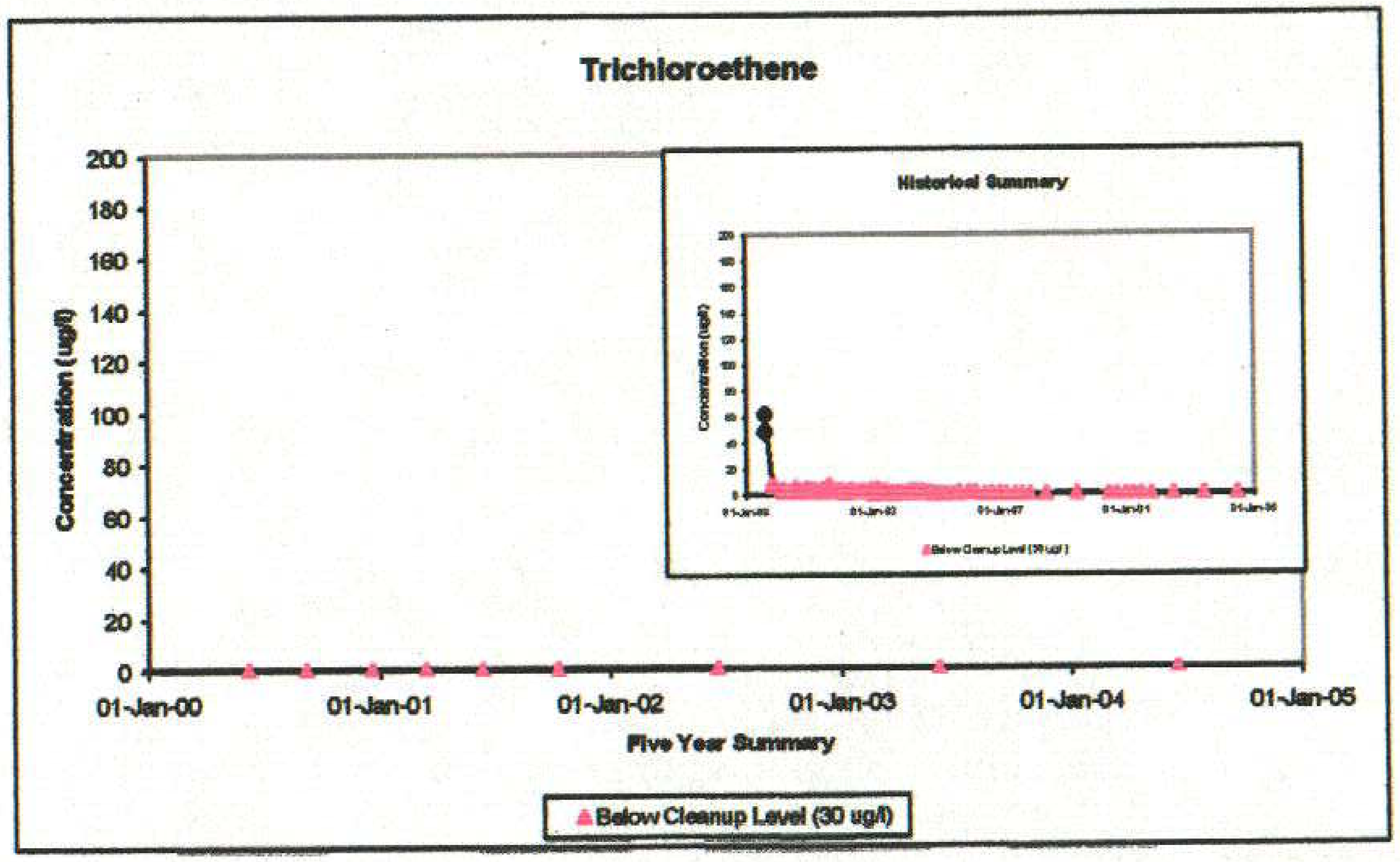
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

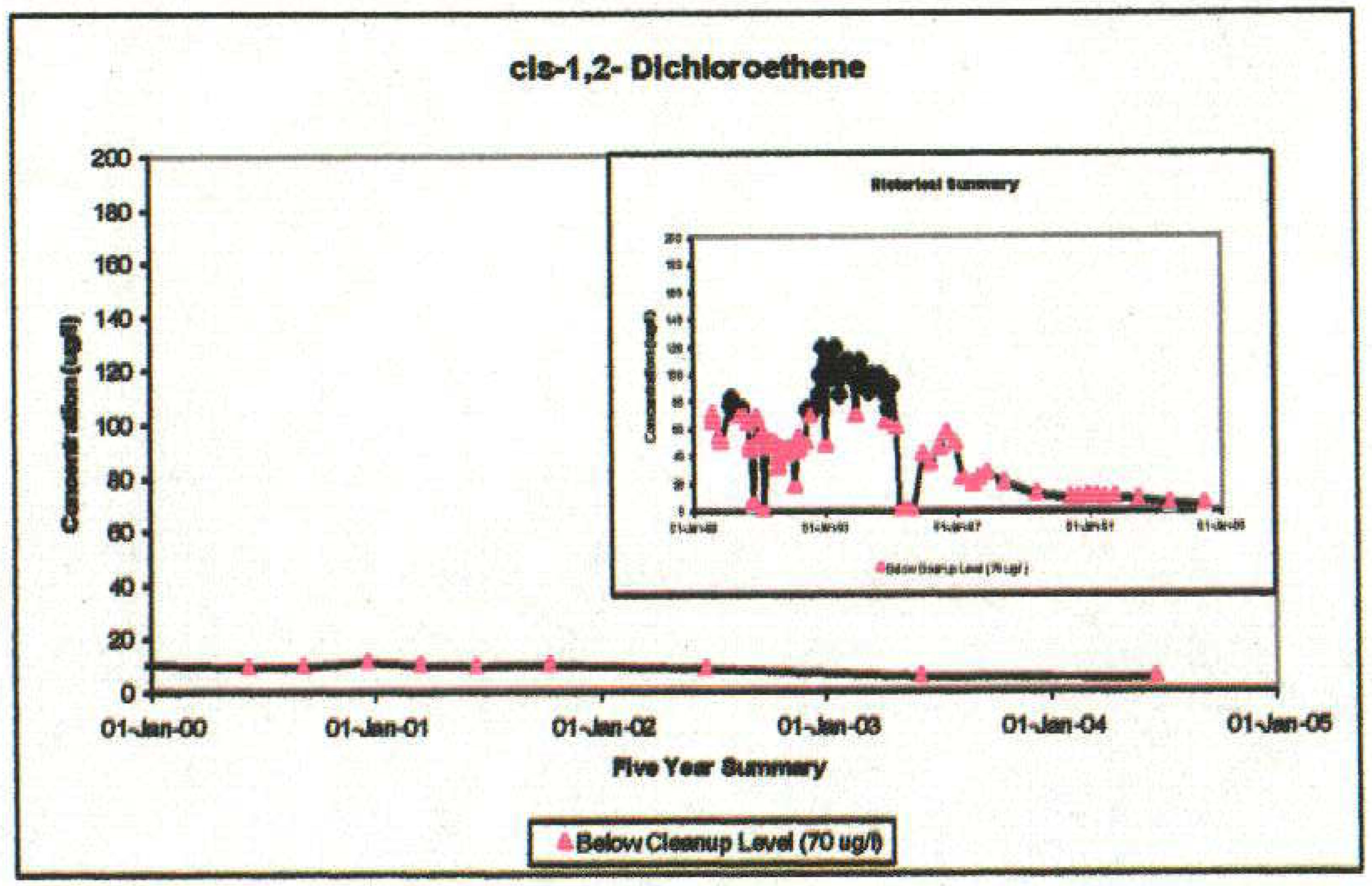
FY 2004

Figure 6-5

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



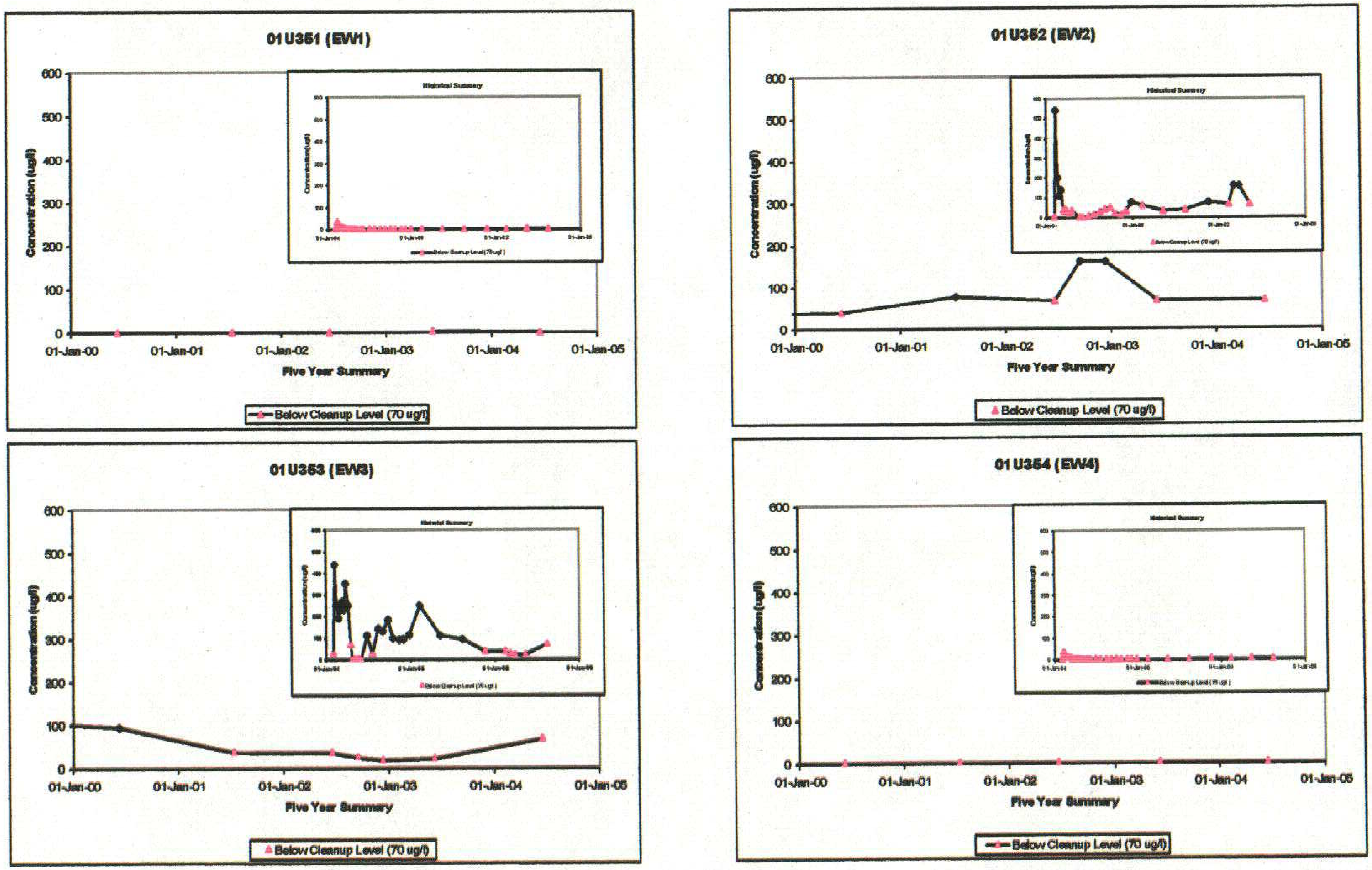




T:\1088\16\FY04 APR\APR Figures\Fig 6-6

Wenck Associates, Inc.

FIGURE 6-7
SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: RECOVERY WELLS
TWIN CITIES ARMY AMMUNITION PLANT



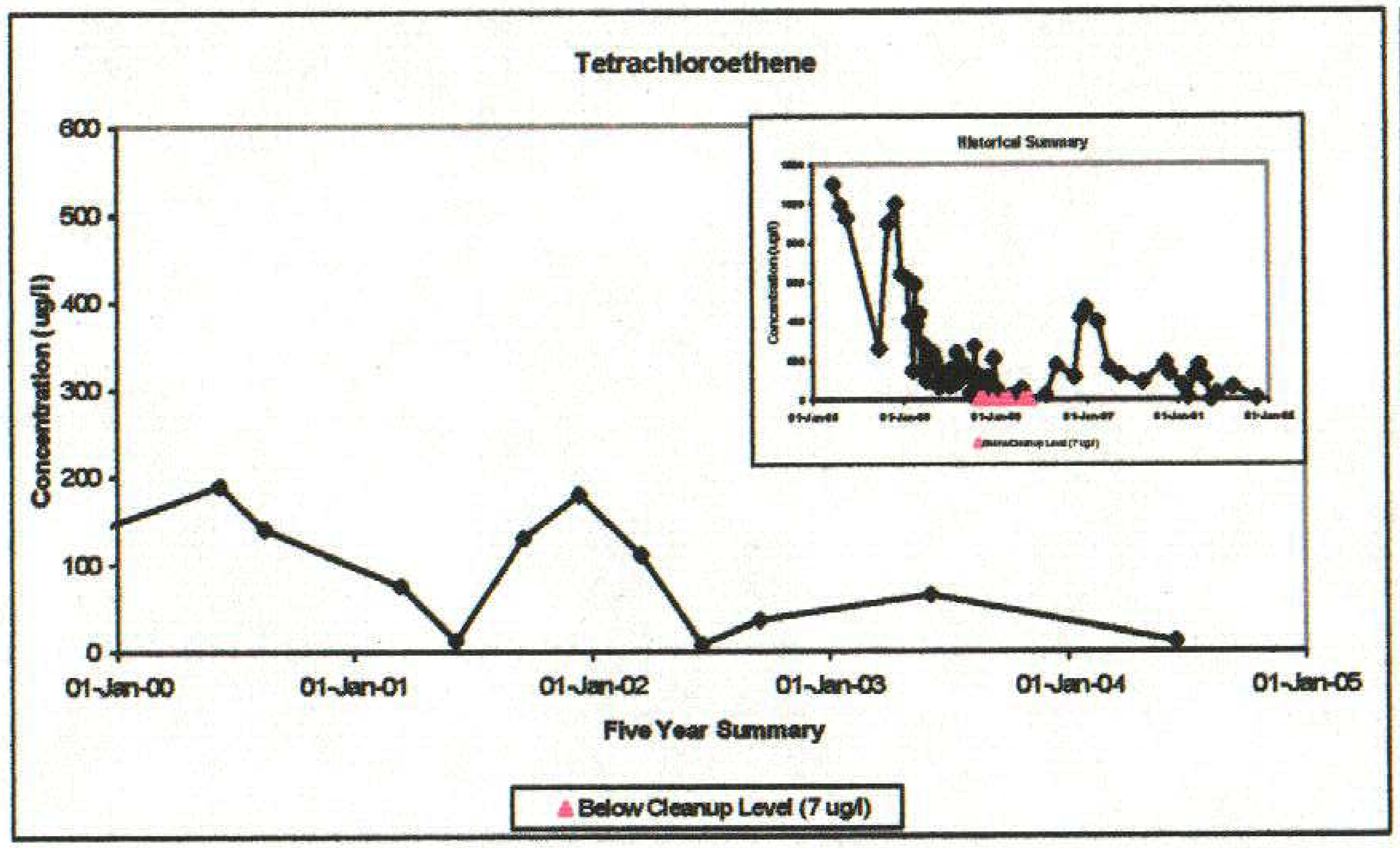
T:\1035\16\FY04 APR\APR Figures\Fig 6-7

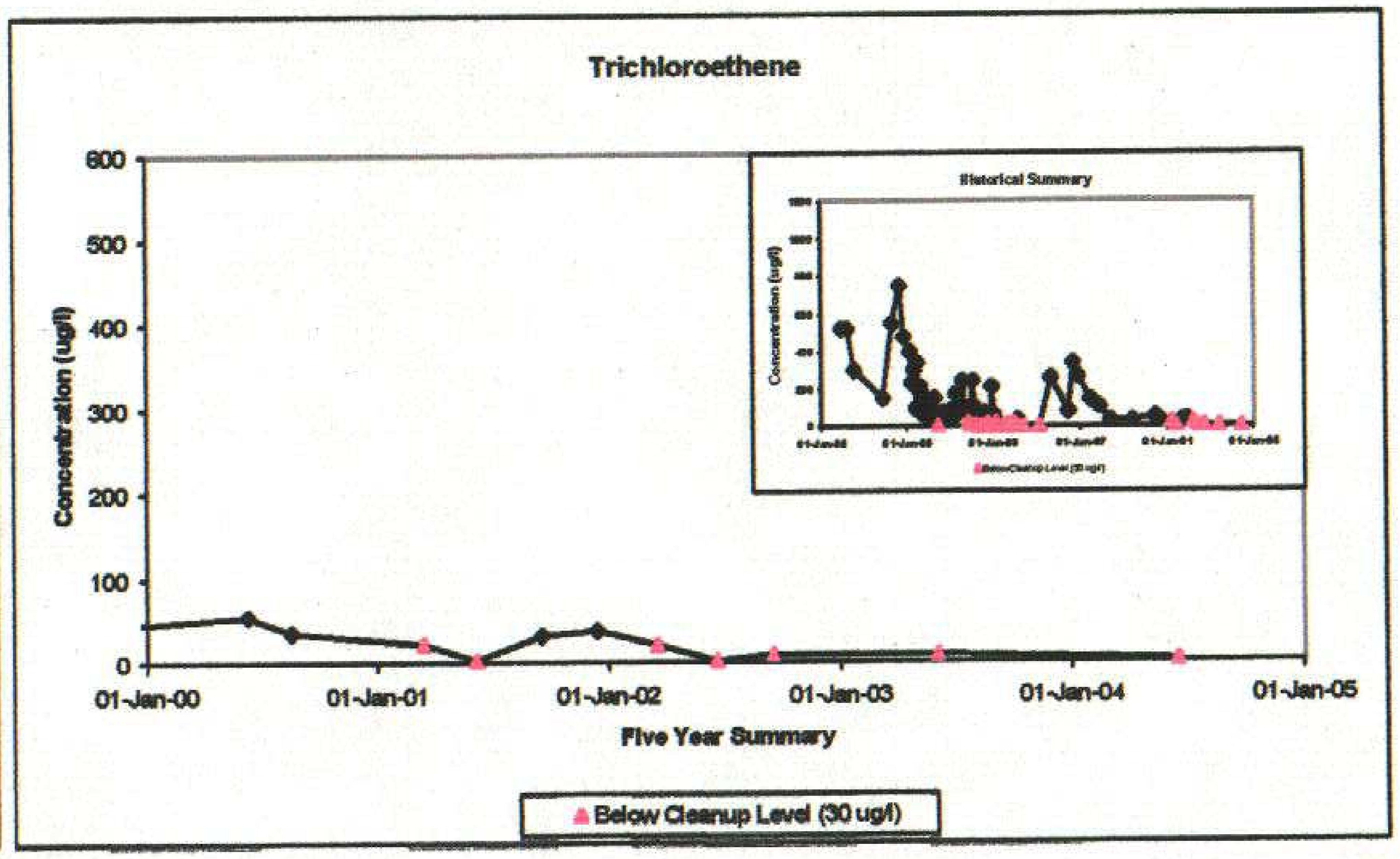
Wenck Associates, Inc.

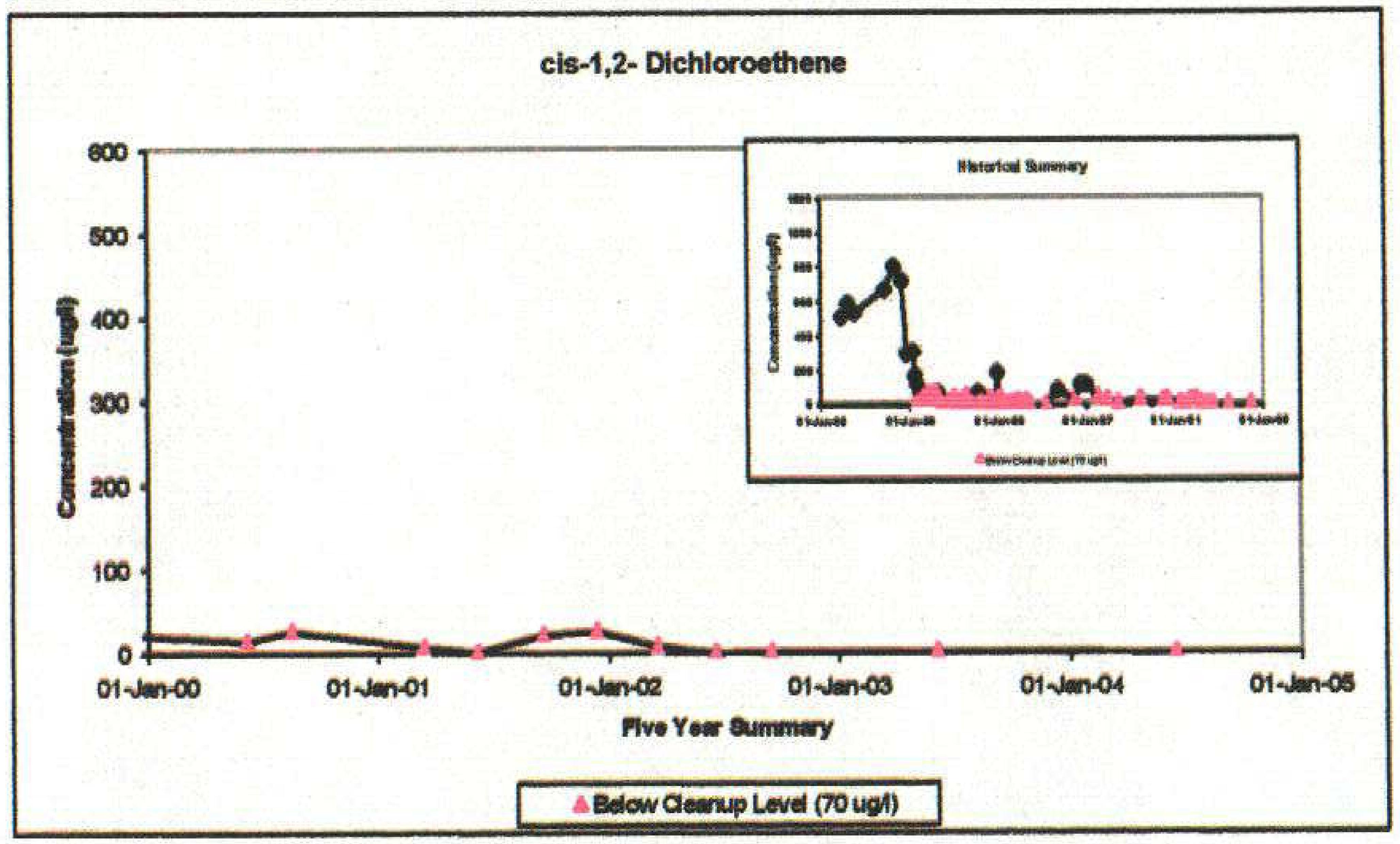
FIGURE 6-8

SITE A, WELL 01U108, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS

TWIN CITIES ARMY AMMUNITION PLANT







7.0 Operable Unit 2: Site I Shallow Groundwater

VOCs were identified in the Unit 1 groundwater at Site I. PCBs were 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 2004 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. An amendment to the OU2 ROD will be pursued in FY 2005 to change the preferred remedy from groundwater pump and treat to a groundwater monitoring based remedy.

7.1 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 2004 was conducted according to the monitoring plan for FY 2004. Appendix A summarizes the FY 2004 monitoring plan and any deviations are explained in Appendix C.2.

A new QAPP was implemented in FY 2004. The *IRP-QAPP for Performance Monitoring*, TWISS, dated December 10, 2003, was accepted by the USEPA and MPCA as passing the Consistency Test on December 22, 2003. The new QAPP was implemented on April 1, 2004, the beginning of the 3rd quarter FY 2004.

Eleven Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during FY 2004. These wells were 01U064, 01U632, 01U636, 01U639, 01U640, 01U666, 01U667, 01U668, I01MW, I02MW, I04MW, and I05MW. Figure 7-1 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. For FY 2004, 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 historical analytical data associated with this location.

Wells 01U632, 01U666, and 01U668 were dry at the time of sampling (June, 2004). Well I02MW had only 4 inches of water in it and it was not possible to collect a sample. Well I05MW had an insufficient volume of water to collect field monitoring data; however, there was sufficient groundwater to collect a sample for analysis. Wells I02MW and I05MW have yielded water or had measurable water levels since original installation. Wells 01U667 and 01U639 bailed dry after collecting one and three well volumes respectively; however, there was sufficient groundwater to collect samples for analysis. Groundwater samples were analyzed using EPA Method 8260 for VOCs. Attempts to sample wells 01U632, 01U666, and 01U668 will be made for at least the next two years sampling rounds until sampling is achieved.

What were the monitoring results for FY 2004?

Table 7-1 presents the results of the FY 2004 analyses. Monitoring wells 01U064 and 01U640, have both shown overall declines in concentration of trichloroethene and 1,2-dichloroethene since the early 1990's. Well 01U640 remains below the cleanup standards for Site I. Well 01U064 remains slightly above the Site I cleanup standards for vinyl chloride in FY 2004. The results for wells 01U636, 01U639, and I01MW are non-detect for site-specific required analytes. Well 482087 (I05MW) analytical results for trichloroethene and 1,2-dichloroethene are below cleanup standards for Site I and vinyl chloride is non-detect. Well 01U667 had concentrations of 1,2-dichloroethene and vinyl chloride above cleanup standards for Site I. Figure 7-2 presents the groundwater elevations.

7.2 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.

7.3 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.

7.4 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 2004 was consistent with the FY 2004 monitoring plan. The following conclusions are made for FY 2004:

- 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 2004 - FY 2008 Monitoring Plan. Table 7-2 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 for Site I.

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.

7.5 OTHER ACTIVITY

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

Table 7-1

Groundwater Quality Data
Site I, TCAAP

Fiscal Year 2004

Location	Date	*1,1,1-Trichloroethane* 111TCE	*1,1,2-Trichloroethane* 112TCE	*1,1-Dichloroethene* 11DCE	*1,1-Dichloroethane* 11DCLE	*cis-1,2-Dichloroethene* C12DCE	*Vinyl chloride* C2H3CL	*Chloroform* CHCL3	*trans-1,2-Dichloroethene* T12DCE	*Tetrachloroethene* TCLEE	*Trichloroethene* TRCLE	*1,2-Dichloroethane* 12DCLE
01U064	6/15/2004	<1	<1	<1	<1	20	1.2	<1	2.6	<1	1.2	<1
01U064 dup	6/15/2004	<1	<1	<1	<1	21	1.4	<1	2.6	<1	1.1	<1
01U632	6/14/2004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U636	6/14/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
01U639	6/15/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	28	<1
01U640	6/14/2004	<1	<1	<1	<1	<1	<1	<1	<1	0.26JP	<1	<1
01U666	6/14/2004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U667	6/15/2004	<1	<1	56	100	19,000	45,000	<1	130	<1	16	<1
01U668	6/14/2004	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
482086 (I01MW)	6/15/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 7-1

Groundwater Quality Data
Site I, TCAAP

Fiscal Year 2004

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
482087 (I05MW)	6/14/2004	<1	<1	<1	<1	1.4	<1	<1	<1	<1	3.6	<1

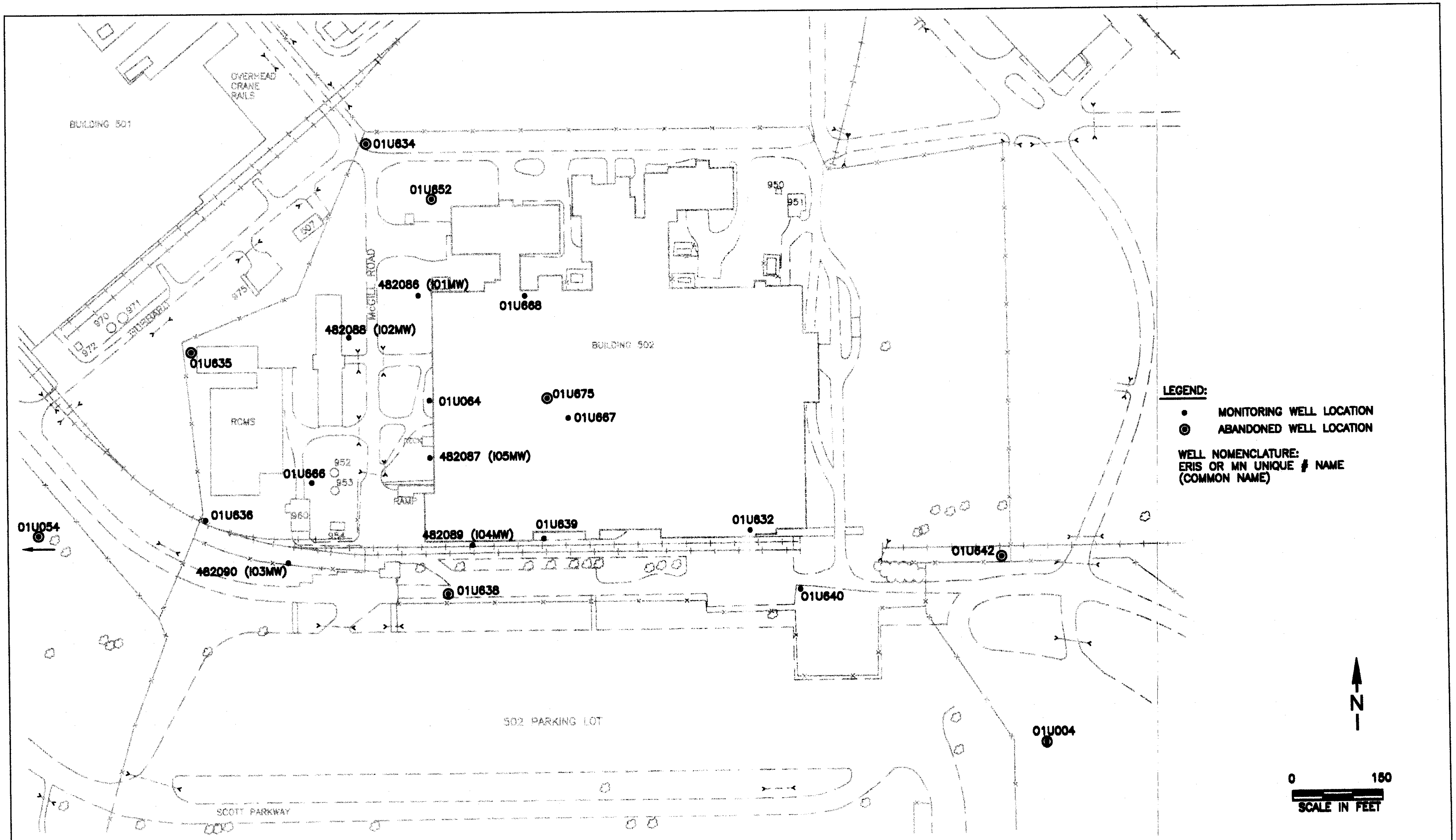
Notes:
Concentrations in ug/L.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

Table 7-2
Summary of Groundwater Monitoring Requirements
Site I, TCAAP

Fiscal Year 2004

	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.



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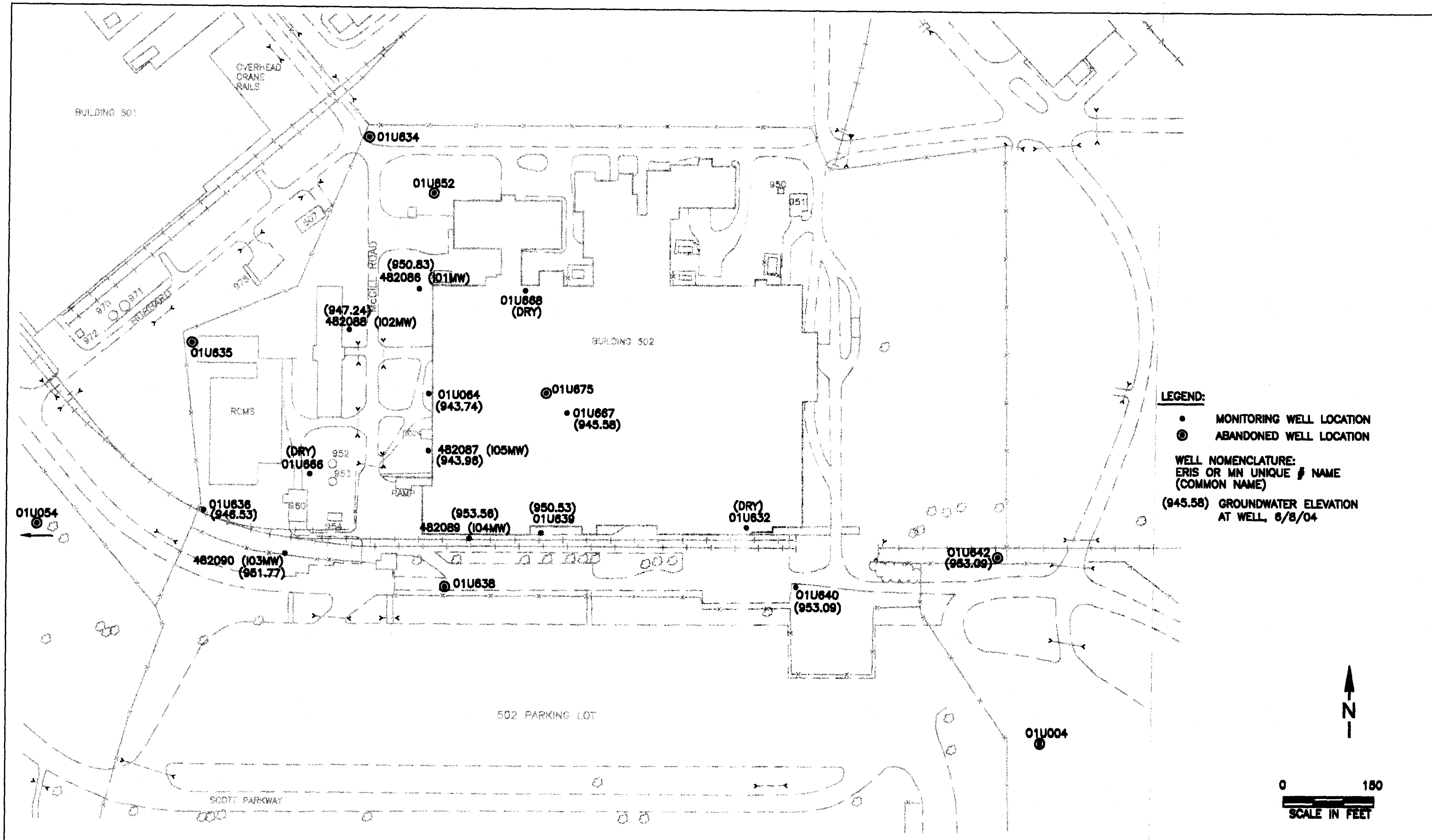
WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA
SITE I, UNIT 1
GROUNDWATER QUALITY MONITORING LOCATIONS

030T.18508.00.0362
SITE-I-04-A
11/20/04

FIGURE 7-1



SECOR INTERNATIONAL INCORPORATED 4463 WHITE BEAR PARKWAY, SUITE 105 WHITE BEAR LAKE, MINNESOTA 55110	TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA SITE I, UNIT 1 GROUNDWATER ELEVATIONS, 6/8/04	030T.18608.00.0362 SITE-I-04-A 12/03/04	FIGURE 7-2

8.0 Operable Unit 2: Site K Shallow Groundwater

VOC contamination was 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.

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 is established and monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2004 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 December 10, 2003, was accepted by the USEPA and MPCA as passing the Consistency Test on December 22, 2003. The new QAPP was implemented on April 1, 2004, the beginning of the 3rd quarter FY 2004.

Water levels are collected annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. FY 2004 monitoring was performed in accordance with the Monitoring Plan included as Appendix A. The comprehensive monitoring well sampling round was conducted in June 2004. Figure 8-1 presents the sampling and water level monitoring locations. Figure 8-1 also shows the cross-section alignment.

8.2 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 DNAPLs to migrate beneath the trench along the Unit 1/Unit 2 interface. These four piezometers are screened at that interface.

Figure 8-1 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 2004 for FY 2004. The results of the sample collected during FY 2004 are presented in Table 8-1. VOCs were not detected in the Unit 3 sentinel well.

8.3 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 8-2. Figure 8-2 presents a plan view of the groundwater contours from the June 2004 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 8-3. 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 piezometer demonstrates complete vertical and horizontal hydraulic capture.

Figure 8-4 presents the trichloroethene concentrations from the June 2004 annual sampling event. Trichloroethene concentrations range from non-detect to 14,000 μg/l. The FY 2004 concentrations at wells 01U615 and 01U611, which monitor the core of the plume, were comparable to the concentrations measured in FY 2003. Water levels measured during the FY 2004 monitoring were approximately 0.8 feet higher than FY 2003. These wells have historically exhibited fluctuating concentrations.

Comparison of Figure 8-4 to the groundwater contour maps indicates that the VOC plume is hydraulically contained by the treatment system. Table 8-1 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 8-4 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 2003 and previous years.

8.4 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 2004, the treatment system functioned properly. The new air stripper is less prone to fouling and requires less maintenance. The treatment system was operational over 97% of the time in FY 2004. During FY 2004, a regular maintenance schedule was maintained. Appendix F.1 summarizes operational data and events at the groundwater extraction and treatment system.

8.5 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 8.6.

8.6 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 8-3 and Table 8-4. The discharge met all the treatment requirements, with exception of the February 3, 2004 sample, which had an estimated zinc concentration of 367 µg/l. The discharge requirement for zinc is 134 µg/l. The effluent was resampled on March 8, 2004, and the zinc concentration was 55 µg/l.

Table 8-5 presents the VOC mass removal and monthly flow rates. A total of 4,583,336 gallons of water and 11.9 pounds of VOCs were removed from the aquifer in FY 2004. The cumulative mass removal is 149.5 pounds of VOCs.

See discussion regarding new QAPP in Section 8.1.

8.7 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.

8.8 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?

Yes. Appendix A presents the FY 2004 - 2008 Monitoring Plan. Table 8-6 presents the Site K monitoring requirements. The monitoring plan is subject to review based on the results of on-going performance monitoring.

8.9 OTHER ACTIVITY

During the June 2004 monitoring, a groundwater sample was collected from well 01U615 and analyzed for 1,4-dioxane using EPA method 8270c. The sampling was part of a larger 1,4-dioxane sampling event conducted by CRA. 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 MDL was 0.11 μg/l and the CRDL was 1.0 μg/l.

Well 01U615 represents the most contaminated portion of the aquifer. In light of this, and the concentration of 1,4-dioxane found to be below the HBV, no further sampling will be conducted.

Two monitoring wells (01U622 and 01U623) were abandoned in FY 2004, after obtaining regulatory approval. 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 2004
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	6/14/2004	<1	<1	<1	<1	<1	4.6	<1	<1	1.8	<1	<1
01U128 D	6/14/2004	<1	<1	<1	<1	<1	4.7	<1	<1	1.8	<1	<1
OW103 (01U603)	6/14/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
01U604	6/14/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
OW111 (01U611) (1)	6/14/2004	14000	<2.9	<3.7	<2.0	<1.6	870	<1.6	<3.0	230	<4.1	<1.9
OW115 (01U615) (2)	6/15/2004	7100	<1.4	<1.9	<1	<0.79	1500	9.8	<1.5	540	<2.1	<0.96
OW117 (01U617)	6/14/2004	<1	<1	<1	<1	<1	2.5	<1	<1	1.6	<1	<1
OW118 (01U618)	6/14/2004	1.3	<1	<1	<1	<1	0.56 JP	<1	<1	<1	<1	<1
OW119 (01U619)	6/14/2004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
OW121 (01U621)	6/14/2004	0.25 JP	<1	<1	<1	<1	3.5	<1	<1	1.4	<1	<1
03U621	6/17/2007	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

TABLE 8-1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2004
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
482083 (K04MW)	6/14/2004	1.2	<1	<1	<1	0.58 JP	<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 = 20.
(2) Trichloroethene Sample Dilution = 100, Other VOC's Sample dilution = 10.

Table 8-2
Groundwater Elevations (FT. AMSL)
Site K, TCAAP

Fiscal Year 2004

Well ID	TOC Elevation	Groundwater Elevation 6/8/2004
01U047	880.31	875.48
01U048	885.32	875.91
01U052	886.51	876.11
01U065	883.90	874.77
01U128	883.69	876.83
01U601	892.68	885.07
01U602	889.35	883.65
01U603	887.31	879.83
01U604	888.98	878.73
01U605	887.76	879.27
01U607	891.01	886.48
01U608	889.30	884.17
01U609	889.33	883.54
01U611	889.29	884.36
01U612	886.91	879.00
01U613	892.07	884.79
01U615	888.66	877.88
01U616	890.37	880.16
01U617	887.72	878.63
01U618	891.52	881.01
01U619	891.75	885.14
01U620	888.65	879.91
01U621	886.57	879.56
01U622	889.43	ABD
01U623	889.44	ABD
01U624A	889.88	879.42
01U624B	889.88	879.39
01U624C	889.91	879.40
01U624D	889.89	879.40
01U625A	886.92	878.62
01U625B	886.91	878.57
01U625C	886.91	878.58
01U625D	886.92	878.57
01U626A	886.87	878.74
01U626B	886.88	878.23
01U626C	886.88	878.27
01U626D	886.88	878.32
01U627A	886.46	879.85
01U627B	886.47	878.56
01U627C	886.47	878.46
01U627D	886.48	878.47
01U628A	887.82	879.27
01U628B	887.83	879.07

Table 8-2
Groundwater Elevations (FT. AMSL)
Site K, TCAAP

Fiscal Year 2004

Well ID	TOC Elevation	Groundwater Elevation 6/8/2004
01U628C	887.82	878.74
01U628D	887.84	878.83
482085 (K01MW)	891.24	886.60
482084 (K02MW)	891.35	887.29
482083 (K04MW)	887.66	881.68
03U621	887.01	852.98

Notes:
ABD - abandoned wellPage 2 of

Table 8-3
Treatment System Concentrations (Organics)
Site K, TCAAP

Fiscal Year 2004

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	12/4/2003	ND		ND		ND		ND		ND		ND		ND	
Effluent	12/4/2003	ND	D	ND	D	ND	D	0.21	JPD	ND	D	ND	D	ND	D
Effluent	2/3/2004	ND		ND		ND		ND		ND		ND		ND	
Effluent	2/3/2004	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D
Effluent	6/14/2004	ND		ND		ND		1.1		ND		2.9		ND	
Effluent	6/14/2004	ND	D	ND	D	ND	D	1.2	D	ND	D	3.0	D	ND	D
Effluent	9/14/2004	ND		ND		ND		ND		ND		0.22	JP	ND	
Effluent	9/14/2004	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D
Influent	12/4/2003	ND		0.39	JP	ND		84		11		160		1.0	
Influent	2/3/2004	ND		ND		ND		25		4.7		53		ND	
Influent	6/14/2004	ND		ND		ND		89		10		340		0.65	JP
Influent	9/14/2004	ND		ND		ND		120		15		210		1.5	
MDL	2/03, 2/04, 6/04, 9/04	0.355		0.199		0.297		0.171		0.168		0.195	(1)	0.456	
CRDL		1		1		1		1		1		1	(1)	1	
REQ.		--		7.0		3.8		70		100		10		0.18	

Table 8-3
Treatment System Concentrations (Organics)
Site K, TCAAP

Fiscal Year 2004

Notes:

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

"--" - means no maximum daily concentration limit assigned for this parameter in the substantive requirements document.
(1) For the 6/14/2004 influent sample, the serial dilution was 5:1, the MDL 0.98 ug/l and the CRDL 5 ug/l. For the 9/14/2004 influent sample, the serial dilution was 10:1, the MDL was 0.195 ug/L and CRDL was 1 ug/L.

Table 8-4
Treatment System Concentrations (Inorganics)
Site K, TCAAP

Fiscal Year 2004

Location	Sample Date	Phosphorus Total		Copper		Cyanide		Lead		Mercury	Silver	Zinc	
Effluent	12/4/2003	433		ND		ND	JQ	ND		ND	ND	41.2	
Effluent	2/3/2004	261		11.0	B	ND		11.7		ND	ND	367.	JE16
Effluent	3/8/2004			4.5	B							55.	
Effluent	6/14/2004	210	B	3.71	B	ND		0.0798	UB.048	ND	ND	18.7	
Effluent	9/14/2004	345	UB160	5.01		ND		2.18		ND	ND	42.2	
MDL	12/03	18.1		5.00		5.95		0.416		0.0221	0.410	10.0	
MDL	2/04, 3/04	18.1		4.49		5.89		0.416		0.0234	0.410	2.33	
MDL	6/14/04	84.7		0.341		5.89		0.0789		0.0234	0.221	0.580	
MDL	9/14/04	84.7		0.341		2.32		0.0798		0.0234	0.221	0.580	
CRDL	12/03	50		20		10		3		0.100	1	30	
CRDL	2/04, 3/04	20		20		10		3		0.100	1	20	
CRDL	6/14/04, 9/14/04	300		5		10		2		0.100	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 at or above the MDL.

REQ - Substantive Requirement Document Concentration Limit, Maximum Daily Conc.
U - Not detected at or above the MDL or IDL.
B - Estimated value, concentration is between the MDL and the CRDL.
JE16 - Based on analysis of serial dilution, estimated value due to possible presence of interferring partculate or trace compound.
JQ - method detection limit was estimated at the time of analysis.
UB# - blank contamination, # = highest concentration of blank affecting data.

Table 8-5
Summary of Monthly VOC Removal
Site K, TCAAP

Fiscal Year 2004

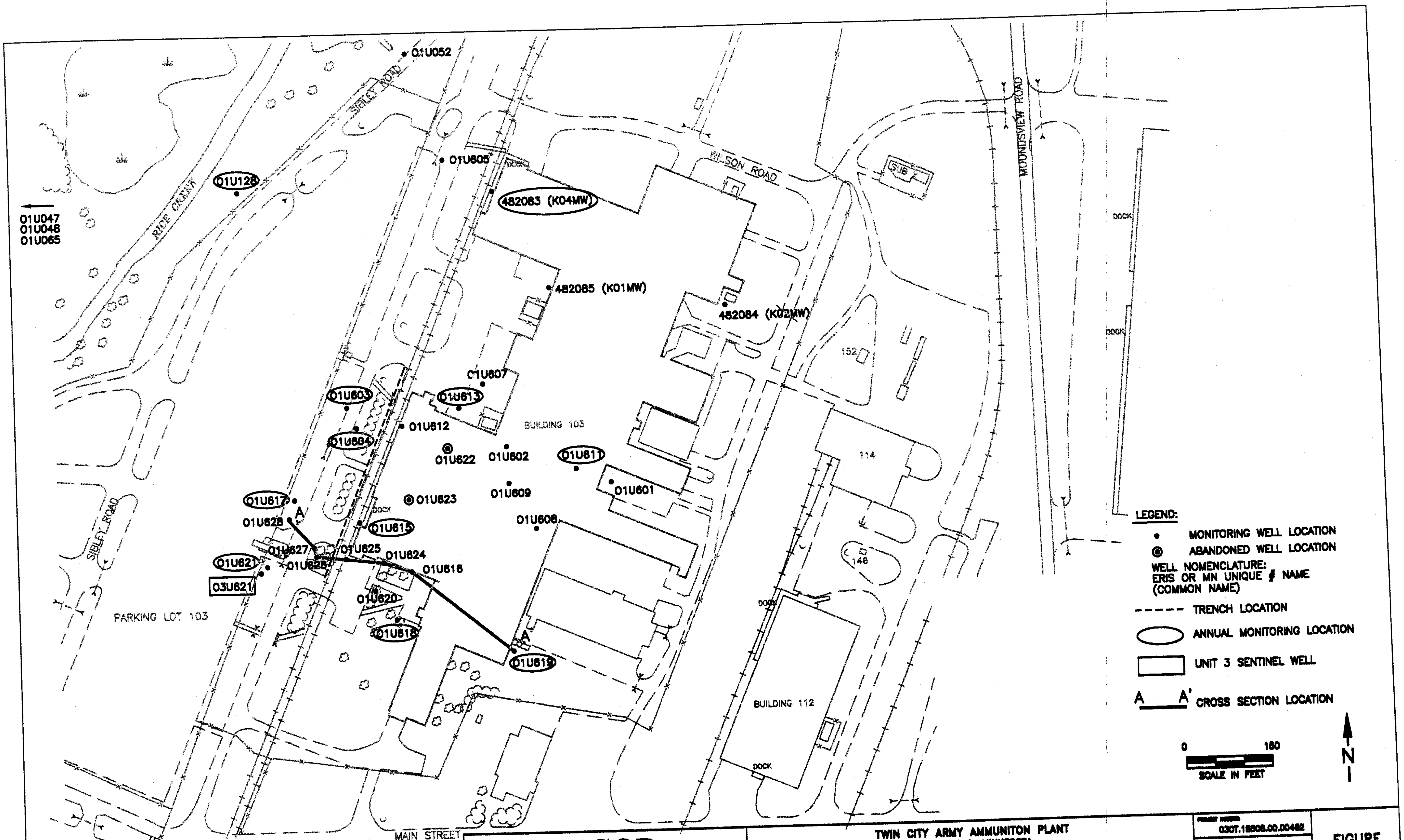
Month	Total Monthly Flow (million gallons)	Total VOC Influent Concentration	Total VOC Effluent Concentration	Total VOCs in Treatment Center Discharge (g)	Total VOC Mass Removed (g)	Total VOC Mass Removed (lb)
Cumulative As Of September 2003 (FY04)						137.6
October[1]	0.34606	256.0	0	0.00	334.87	0.74
November[1]	0.29420	256.0	0	0.00	284.69	0.63
December	0.28475	256.0	0	0.00	275.54	0.61
January[1]	0.23719	82.7	0	0.00	74.15	0.16
February	0.25479	82.7	0	0.00	79.65	0.18
March[1]	0.29652	82.7	0	0.00	92.69	0.20
April[1]	0.35832	439.0	4.2	5.69	588.91	1.30
May[1]	0.47705	439.0	4.2	7.57	784.05	1.73
June	0.62505	439.0	4.2	9.92	1027.29	2.26
July[1]	0.54263	346.5	0	0.00	710.73	1.57
August[1]	0.46908	346.5	0	0.00	614.39	1.35
September	0.39770	346.5	0	0.00	520.90	1.15
Totals - FY04	4.58334			23.2	5387.9	11.9
Cumulative To Date						149.5

Notes:
[1] Influent and Effluent VOC concentrations from 12/4/03, 2/03/04, 6/14/04 and 9/14/04 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 8-6
Summary of Groundwater Monitoring Requirements
Site K, TCAAP

Fiscal Year 2004

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



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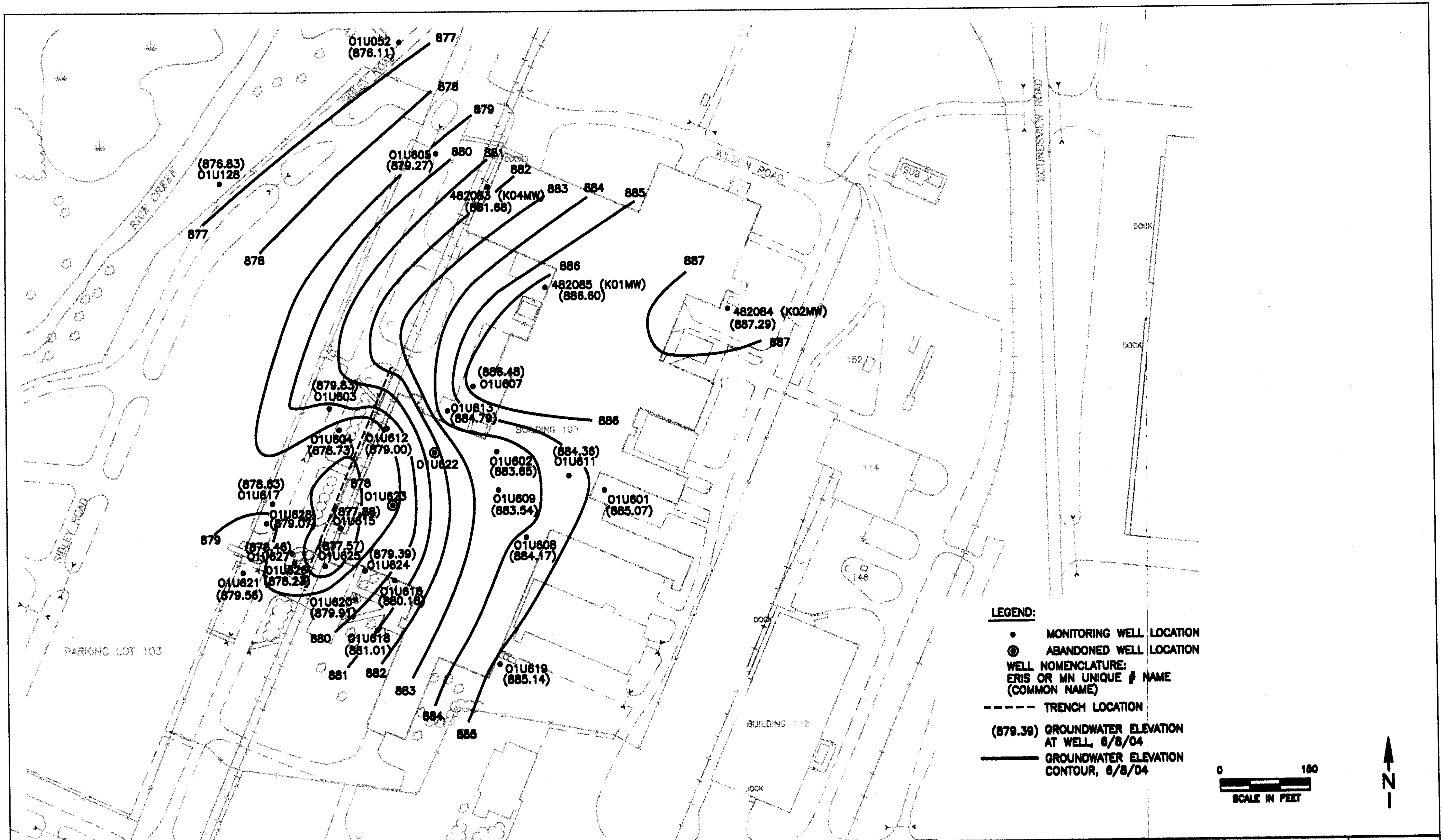
TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA

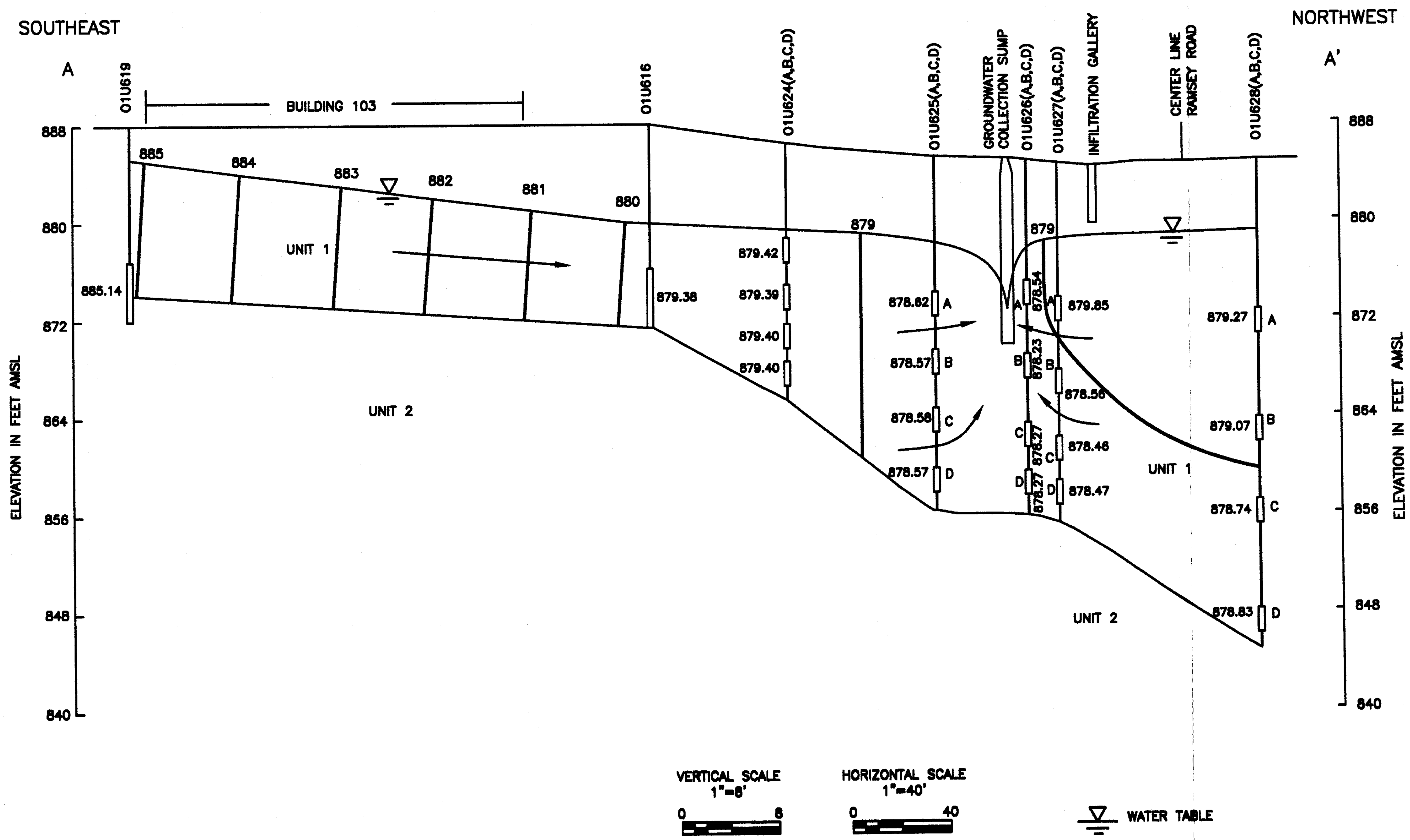
SITE K, UNIT 1 AND UNIT 3
GROUNDWATER MONITORING LOCATIONS

PROJECT NUMBER: 030T.18508.00.00462
FILE NAME: SITE-K-04-A
DATE: 11/20/04

FIGURE 8-1



SECOR INTERNATIONAL INCORPORATED 4463 WHITE BEAR PARKWAY, SUITE 105 WHITE BEAR LAKE, MINNESOTA 55110	TWIN CITY ARMY AMMUNITON PLANT ARDEN HILLS, MINNESOTA SITE K, UNIT 1 POTENTIOMETRIC MAP, 6/8/04	03ot.18508.00.00462 SITE-K-GW-04 11/20/04	FIGURE 8–2



SECOR

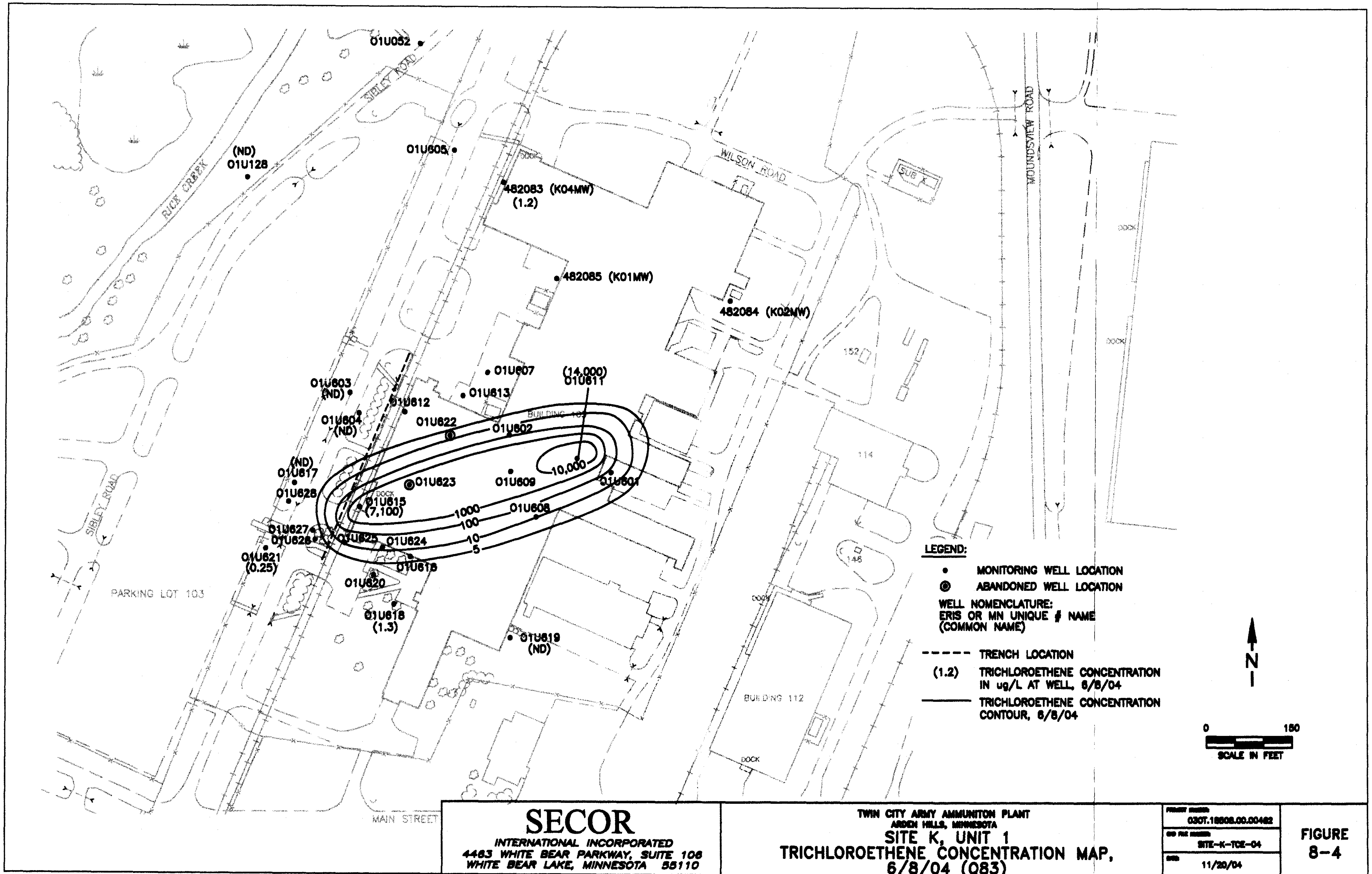
INTERNATIONAL INCORPORATED
4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE K
HYDROGEOLGIC CROSS SECTION A-A', 6/8/04 (Q83)

030T.18508.00.0462
CROSS-04-A
12/02/04

FIGURE
8-3


01U052
SIBLEY ROAD
RICE CREEK
(ND)
01U128
01U605
482083 (K04MW)
(1.2)
WILSON ROAD
SUB X
MOUNDSVIEW ROAD
482085 (K01MW)
482084 (K02MW)
01U607
(14,000)
01U611
01U603
(ND)
01U612
01U613
01U604
(ND)
01U622
01U602
BUILDING 103
10,000
1000
100
10
5
(ND)
01U617
01U623
01U609
01U601
01U628
01U615
(7,100)
01U608
01U627
01U626
01U625
01U624
01U621
(0.25)
01U616
01U620
PARKING LOT 103
01U618
(1.3)
01U619
(ND)
114
152
146
BUILDING 112
DOCK
MAIN STREET
LEGEND:
MONITORING WELL LOCATION
ABANDONED WELL LOCATION
WELL NOMENCLATURE:
ERIS OR MN UNIQUE # NAME
(COMMON NAME)
TRENCH LOCATION
(1.2) TRICHLOROETHENE CONCENTRATION IN ug/L AT WELL, 6/8/04
TRICHLOROETHENE CONCENTRATION CONTOUR, 6/8/04
N
0
150
SCALE IN FEET
SECOR
INTERNATIONAL INCORPORATED
4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55110
TWIN CITY ARMY AMMUNITON PLANT
ARDEN HILLS, MINNESOTA
SITE K, UNIT 1
TRICHLOROETHENE CONCENTRATION MAP,
6/8/04 (Q83)
030T.18608.00.00462
SITE-K-TCE-04
11/20/04
FIGURE
8-4

9.0 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 2003 through September 2004.

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 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 EPA.

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 this or future 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.

9.1 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 2004 consistent with the requirements of the OU2 ROD. Table 9-1 presents the cleanup requirements for the TGRS from the OU2 ROD. The Final TGRS Operating Strategy (as per Modification #3) provided the following base pumping rates to ensure acceptable hydraulic containment:

GOS Total System Operational Minimum:	1,745 gpm
GOS Total System Operational Target:	1,845 gpm

MOS Operational Minimums:

B1, B2, B11, and B13	415 gpm
B4, B5, and B6	600 gpm
B4, B5, B6, B8, and B9	1,010 gpm

During FY 2004, the total extraction well water pumped was approximately 1,729 gpm. The total extraction well water pumped was below the GOS Total System Operational Minimum (1,745 gpm); however, the modification was not implemented until July 2004. Also, the individual well groupings were above the MOS minimums for August and September 2004.

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

Summary of Operations

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 9-1.

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 approximately 55,000 gallons per workday, depending on the time of year.

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;
- 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 2004 Maintenance and Inspection Activity

During FY 2004, 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 downtime 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.

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 the 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?

Probably, although total extraction rates were slightly lower than the operational minimum rate presented in the OS. The total extraction well water pumped was below the GOS Total System Operational Minimum (1,745 gpm); however, the modification was not implemented until July 2004. The August and September 2004 extraction rates were above the GOS Total System Operational Minimum. The monthly and annual volume of water pumped is presented in Table 9-2 and 9-3. Table 9-2 presents the pumphouse metered monthly flow volumes of each extraction well and historical flow data.

Table 9-3 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. As shown on Table 9-3, the TGRS successfully captured and treated 895,281,560 gallons of contaminated water from October 2003 through September 2004. This volume reflects an increase of approximately 4.4 million gallons over FY 2003 rates.

The above extraction volume is corrected to reflect the total from treatment center meters #1 and #2, which historically have been the most accurate for overall flow measurement. Review of Table 9-3 shows that the sum of the individual pumphouse extraction volumes was larger (908,718,760 gallons in FY 2004 that converts to an average flow rate of 1,729 gpm). While this is only a 1.5 percent difference from the sum of treatment center meters #1 and #2, it correlates to an average difference of 26 gpm over the year.

The TGRS as a whole was operational 99 percent of the time.

Monthly Flow Reports

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 2004 operational notes is presented in Appendix F.2. During FY 2004, treatment center flow meters #1 and #2 were used to measure total flow volumes used in monthly reports, and in this report, because they have historically been the most accurate and representative of actual flow. 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 9-4. A summary of average down time for the pumphouses and the treatment center by the category of failure is presented in Table 9-5. 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 less in FY 2004 then they were in FY 2003.

Description of Down Time Categories

Pumphouse component failures accounted for an average of 3.8 days down time per pumphouse. Compared to FY 2003, down times due to pumphouse maintenance were minimal in FY 2004. The major pumphouse repairs causing down time were:

- Pump replacement and/or well redevelopment at Pumphouses B1, B4, B6, B13, B11, and SC5.
- PLC software malfunction at Pumphouses B1, B3, and B4.

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 3.3 days down time per pumphouse.

Electrical service system failures accounted for an average of 0.8 days down time per pumphouse. Electrical storm damage was the primary cause of down time.

Preventative maintenance procedures accounted for an average of 0.2 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 2.6 days down time per pumphouse. The replacement of the Pump director units (PDU) for the Wet Well pumps was the primary cause of down time in FY 2004 for this item.

Forcemain issues accounted for an average of 1.7 days down time per pumphouse. Diagnosis and repair of a forcemain failure on the raw water loop and the repair of the water tower altitude valve were another primary cause of downtime in FY 2004.

Were there any major operational changes during the year?

Yes. The TGRS Operating Strategy was implemented in FY 2003, which resulted in installing one extraction well (B13), shutting down 4 extraction wells (B2, B7, B10, and SC3) and adjusting flow rates to conform with the operational extraction rates contained in the OS. These changes resulted in focused groundwater extraction within the centers of the VOC plumes, which, in turn should accelerate shrinking the width of the plumes and provide more efficient VOC removal.

Due to the lower than expected pumping rate capacity of B13, the regulatory agencies requested an evaluation of potential response actions for the TGRS. Eleven different alternatives were evaluated in an evaluation memorandum (EM) dated February 9, 2004. The EM recommended that the TGRS be modified by increasing pumping rates in the South Plume wells with higher TRCLE concentrations (B1 and B13) and decreasing the pumping rates in wells with lower TRCLE concentrations (B11 and B3). While allowing for lower pumping rates, the modification was expected to increase the mass removal for contaminants. The EM was incorporated into a TGRS Operating Strategy Modification (Modification #3). The Agencies stated in the USEPA letter dated May 13, 2004 that Modification #3 passed the Consistency Test per the Federal Facilities Agreement.

TGRS OS Modification #3 was implemented in July 2004. Pumps in wells B1 and B13 were replaced and the pump elevation in B13 was lowered to allow pumping below the well screen. The GOS operating minimum was reduced to 1,745 gpm (down from 1,800 gpm) and the MOS operating minimum for the southern well grouping (Wells B1, B11, and B13) was lowered to 415 gpm.

Did the system achieve hydraulic capture?

Probably. The total extraction well water pumped was below the GOS Operational Minimum (1,745 gpm); however, the modification was not implemented until July 2004. The average extraction rates for August and September 2004 were above the GOS Operational Minimum.

Additional groundwater elevation sampling was performed in FY 2004 to evaluate the modifications to wells B1 and B13. Groundwater elevation measurements were collected two weeks prior to and one month after the modifications were implemented to monitor the effectiveness of the modifications. Appendix D.1 contains the water level database for the monitoring wells. Figures 9-2 through 9-7 present the groundwater elevations for Upper Unit 3, Lower Unit 3, and Unit 4 during these time periods.

The groundwater elevations on August 10, 2004, collected one month after the modifications were implemented, appear to indicate that increasing the pumping rates at wells B1 and B13 caused a lowering of the potentiometric surface in the Unit 3. The pumping rates at wells B1 and B13 increased from 209 gpm to 237 gpm, and 87 gpm to 104 gpm, respectively, following modifications. Groundwater elevations decreased between 0.40 foot and 0.82 foot in Upper Unit 3 wells and between 0.68 foot and 0.85 foot in Lower Unit 3 wells. Substantial groundwater elevation decreases were identified in wells closest to the B1/B13 pumping center, including 0.82 foot at 03U079 (Upper Unit 3), 0.75 foot at 03L079 (Lower Unit 3), and 0.71 foot at 04U003 (Unit 4).

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

As discussed above, the TGRS extracted and treated 895,281,560 gallons of water from October 2003 through September 2004. 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 3,291 pounds of VOCs from October 2003 through September 2004. The VOC mass removal is over 7 percent higher than the FY 2003 VOC mass removal of 3,041 pounds. The most significant increases in VOC mass removal rate were noted at B4 and SC5. Table 9-7 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed 189,268 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 17 extraction wells that comprise the TGRS. Wells B2, B7, B10, and SC3 are shut down, but were temporarily operated for sampling. Wells B12 and SC4 are shut down, and were not sampled, as they are now sampled biennially (next event in 2005). Table 9-8 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 9-1.

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 (the December 2003 sample reported a TRCLE concentration below 1 μg/l). TRCLE concentrations have been gradually declining at SC1 since 1993. TRCLE concentrations peaked at SC4 in 1999, then leveled off. Since its installation in November 2002, TRCLE concentrations at B13 have been increasing. Overall, the trends indicate a long-term decrease in VOC concentrations.

Extraction well B6 exhibited a slight concentration increase in FY 1998 and was stable or slightly declining through FY 2004. 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 2004.

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 9-7 illustrates, seven 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 seven wells together accounted for over 98 percent of the VOC mass removed.

The source control wells, SC1 through SC5, together accounted for 60 percent of the VOC mass removed while accounting for only 5 percent of the water pumped by the system. SC5, in particular, removed 55 percent of the total VOC mass at a rate of only approximately 90 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 are not expected to reflect a uniform or easily predictable pattern.

Several wells were identified in previous APRs or when reviewing the FY 2004 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 µg/l in early 1990's recently stable in 100's of µg/l; however, increased from 78 µg/l in 2003 to 120 µg/l in 2004. Maintain annual sampling frequency through 2006.
03U030	Trend identified during FY 2003 data review. Under 30 µg/l through 1998, peaked over 60 µg/l in 1999, recently at 40 µg/l. Maintain biennial sampling frequency (next event 2005).
03U806, 03L806, and 04U806	Trend identified in FY 2001 APR. Dropped from 1000's of µg/l in mid 1990's, recently stable in 100's of µg/l. Maintain sampling frequency.
03U094	Trend identified during FY 2004 data review. Dropped from 1,000's of µg/l in late 1980's and early 1990's, recently stable in 100's of µg/l; however, increased from 170 µg/l in 2003 to 250 µg/l in 2004. Maintain annual sampling frequency.
03M806	Trend identified during FY 2003 data review. Dropped from near 900 µg/l in 1987, to below 100 µg/l from 1993 through 1996. Increased to 1,300 µg/l, a historical high concentration, in 2003. Recently decreased to 120 µg/l. Maintain annual sampling frequency.
03U708	No clear trend in TRCLE concentration is evident at this time. TRCLE concentrations have fluctuated between 120 µg/l and 270 µg/l over the last 6 sampling events, with the 2004 sample having a TRCLE concentration of 120 µg/l.

Well	Trend Observation
03U711	Trend identified in FY 2001 APR. Dropped from near 1,000 μg/l in 1994, to 89 μg/l in 1999, recently increased to 250 μg/l. Maintain biennial sampling frequency.
03U710	Trend identified during FY 2004 data review. Dropped from over 3,000 μg/l in late 1980's, to 100's during the 1990's, recently decreased to 85 μg/l, a historical low concentration. Maintain biennial sampling frequency.
03L014	Trend identified during FY 2003 data review. Increased from near non-detect in late 1980s to over 800 μg/l in 1999, recently decreased to below 1 μg/l. Maintain biennial sampling frequency (next event 2005).
03L809	Trend identified in FY 2001 APR. Dropped from over 3,000 μg/l to 67 μg/l through 1998, recently at 410 μg/l. Maintain biennial sampling frequency (next event 2005).
04U861	Trend identified in FY 2001 APR. Below 10 μg/l during late 1980s through 1993, increased to high 20's during 1999, recently increased to 48 μg/l. Maintain biennial sampling frequency.
04U843	Trend identified in FY 2001 APR. Below 15 μg/l from late 1980s through 1997, increased to above 30 μg/l in 1998, peaked at 38 μg/l, recently dropped to below 1 μg/l. Maintain biennial sampling frequency.
04U841	Trend identified in FY 2001 APR. Below 10 μg/l through 1995, increased to 25 μg/l, recently decreased to 5 μg/l. Maintain biennial sampling frequency.

Well	Trend Observation
03U822	Trend identified during FY 2003 data review. Below 25 µg/l through 1998, peaked over 350 µg/l in 1999, recently at 280 µg/l. Maintain biennial sampling frequency.
03L822	Trend identified in FY 2001 APR. Increased from below 5 µg/l during early 1990s to over 600 µg/l in 1999 and 2003. Approximately 1 mile from TGRS. Well historically showed 1,1,1-trichloroethane as major contaminant. Maintain biennial sampling frequency.

9.2 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 cleanup 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 2004. The influent/effluent database for FY 2004 is contained in Appendix G.2. Figure 9-8 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 2004 influent TRCLE concentration was 335 µg/l, up from 330 µg/l in FY 2003. This was expected since greater pumping is now occurring in the centers of the

VOC plumes and less pumping is occurring on the edges of the plumes where VOC concentrations are much lower.

Figure 9-8 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 2004. A review of the FY 2004 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 99.7 percent.

What was the mass of VOCs emitted into the air?

The air stripping towers remove VOCs with an efficiency of approximately 99.7 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 9-7. Air emissions therefore averaged 9.0 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 2003 through September 2004 were 3,291 pounds.

9.3 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 2004, there were no noticeable changes in Gravel Pit performance. The Gravel Pit is accommodating the TGRS discharge as designed.

9.4 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.

9.5 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,
- 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 are expected to be published in FY 2005.
- "New technologies" is an ongoing agenda item for the monthly Technical Review Committee meetings between the Army, USEPA, and MPCA. No emerging technologies were identified through the process during FY 2004.
- The MPCA identified a study involving the addition of vegetable oil to groundwater that is being monitored at the Navy site as a potential technology of interest.

Were any new technologies identified and considered to have merit during FY 2004?

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 U.S. Environmental Protection Agency 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 2005.

9.6 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 2004 was consistent with the OU2 ROD. Water level measurements and water quality samples were collected as stated in Appendix A.1 of the Annual Performance Report (APR), Final TGRS Operating Strategy (TGRS OS) Modification #3, and the Recommended Changes to the TCAAP Groundwater Monitoring Plan Proposed by the TCAAP OU1 Technical Workgroup dated March 25, 2004. Appendix A summarizes the FY 2004 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 2003 and June/July 2004 according to the FY 2004 APR. Groundwater levels were also measured in July and August 2004 at wells stated in Appendix A.1 of the APR and in TGRS OS Modification #3. Appendix D.1 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 FY 2004 APR. Groundwater samples were collected at wells stated in Appendix A.1 of the APR and TGRS OS Modification #3. All wells were sampled for volatile organic compound (VOC) (8260B) analysis. FY 2004 was an "off year" in the biennial sample program, so only a few wells were sampled.

At the request of the Agencies, groundwater samples were also collected for 1,4-dioxane at wells B1, B4, B5, B6, SC1, SC5, 01U615 (Site K), and 01U108 (Site A). These data are included in Appendix D.1.

Results from the 2004 groundwater sampling showed similar or decreasing TRCLE concentrations at most wells sampled. The decrease was most notable at 03M806 where TRCLE decreased from 1,300 μg/l to 120 μg/l. The notable exceptions to the decreasing trend were at B10 (PJ#311, increased from 0.75 J to 10 μg/l), 03U003 (increased from 78 to 120 μg/l) and 03U094 (increased from 170 to 250 μg/l).

1,4-dioxane was added to the analyte list for the following TGRS extraction well locations during the June 2004 sampling event: B1, B4, B5, B6, SC1, and SC5. These are the extraction wells with the highest VOC concentrations in both the north and south plumes, and therefore, the most likely locations for detecting 1,4-dioxane, if present. The results of the testing were validated and submitted in a memo independent of the FY 2004 APR (Data Usability Report No. 37 dated September 3, 2004). Although, the Quality Assurance Project Plan (QAPP) does not currently address 1,4-dioxane, the samples were collected and analyzed in a manner consistent with the intent of the QAPP.

Analytical results showed detections of 1,4-dioxane ranging from less than 1 µg/l to 15 µg/l. These results are below the MDH HBV for 1,4-dioxane of 30 µg/l. Field blank contamination for 1,4-dioxane was also identified. In light of these results no further sampling will be conducted.

<u>Treatment System</u>
The TGRS treatment system influent and effluent was sampled monthly during FY 2004 in accordance with the FY 2004 monitoring plan. Groundwater samples from the extraction wells were collected in December 2003 and June 2003 in accordance with the FY 2004 monitoring plan.

Is additional monitoring proposed prior to the next report?
Yes. Per TGRS OS Modification #3, the following wells have been added for additional VOC sampling in 2004, 2005, and 2006, to evaluate the effect of 2004 modifications on the capture of the TRCLE plume: Wells 03M802, 03U803, 03U003, 03M003, and 03U710. Appendix A presents the FY 2004 to FY 2008 monitoring plan.

9.7 OVERALL REMEDY FOR DEEP GROUNDWATER

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

- Hydraulic capture in Unit 3 very likely extends beyond the 5-µg/l TRCLE contour. This meets the VOC capture criterion in the OU2 ROD. Hydraulic capture in Unit 4 very likely 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 below the Total System Operational Minimum (1,745 gpm); however, the modification was not implemented until August 2004. The September 2004 extraction well water pumped was approximately 1,790 gpm.
- The TGRS extracted and treated 895,281,560 gallons of water and removed 3,291 pounds of VOCs from October 2003 to September 2004.
- 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 9-1
Groundwater Cleanup Levels
TGRS, TCAAP

Fiscal Year 2004

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	--	4
Trichloroethene	<5	5
1,1-Dichloroethane	--	70
Tetrachloroethene	--	5

Table 9-2
Extraction Well Water Pumped
TGRS, TCAAP

Fiscal Year 2004

	Volume of Water Pumped (gallons)												
	B1	*B3*	*B4*	*B5*	*B6*	*B8*	*B9*	*B11*	*B13*	*SC1*	*SC2*	*SC5*	*TOTAL*
October 2003	8,310,100	7,885,500	7,970,400	9,409,000	9,374,400	5,770,500	12,011,800	3,380,100	4,134,900	1,268,200	2,730,800	3,976,500	76,222,200
(gpm)	186	177	179	211	210	129	269	76	93	28	61	89	1,707
November 2003	8,415,700	7,959,600	8,063,900	9,752,800	9,756,700	5,890,800	11,811,100	3,402,400	4,526,500	1,303,300	2,935,400	4,016,100	77,834,300
(gpm)	195	184	187	226	226	136	273	79	105	30	68	93	1,802
December 2003	8,602,100	8,235,900	8,185,300	9,629,100	9,751,500	6,019,300	12,885,700	3,430,000	4,450,400	1,348,200	2,781,000	3,750,900	79,069,400
(gpm)	193	184	183	216	218	135	289	77	100	30	62	84	1,771
January 2004	8,558,300	8,154,200	8,070,300	9,072,200	8,982,400	6,101,900	12,895,600	3,442,500	4,367,000	1,376,700	3,393,700	3,846,200	78,261,000
(gpm)	192	183	181	203	201	137	289	77	98	31	76	86	1,753
February 2004	8,906,300	6,718,900	7,735,400	8,546,600	8,000,800	5,237,800	11,167,800	2,502,400	3,521,400	1,053,700	2,365,800	3,271,600	69,028,500
(gpm)	213	161	185	205	192	125	267	60	84	25	57	78	1,653
March 2004	9,297,700	7,577,000	8,125,200	9,444,000	8,428,900	6,196,000	13,196,700	3,447,500	3,783,300	1,166,900	3,180,100	2,467,400	76,310,700
(gpm)	208	170	182	212	189	139	296	77	85	26	71	55	1,709
April 2004	8,701,400	7,803,600	8,757,200	8,312,100	8,456,100	5,904,500	12,553,200	3,334,264	3,661,700	1,326,500	1,892,300	4,223,700	74,926,560
(gpm)	201	181	203	192	196	137	291	77	85	31	44	98	1,734
May 2004	9,190,312	8,069,523	9,079,494	8,893,729	8,380,076	6,189,458	13,118,599	3,464,629	3,796,881	1,305,226	1,744,074	4,371,471	77,603,471
(gpm)	206	181	203	199	188	139	294	78	85	29	39	98	1,738
June 2004	8,564,788	7,419,377	8,331,906	7,879,871	6,518,024	5,757,542	12,133,301	3,181,671	3,593,819	1,209,374	1,898,026	3,911,329	70,399,029
(gpm)	198	172	193	182	151	133	281	74	83	28	44	91	1,630
July 2004	9,573,900	7,709,000	7,692,800	7,453,800	9,128,400	5,571,000	12,049,800	3,241,900	3,616,900	1,150,800	1,470,900	4,290,900	72,950,100
(gpm)	214	173	172	167	204	125	270	73	81	26	33	96	1,634
August 2004	10,344,000	7,509,100	8,069,200	8,579,000	10,078,500	5,716,600	12,521,000	4,350,200	4,511,100	1,097,100	1,518,400	4,500,700	78,794,900
(gpm)	232	168	181	192	226	128	280	97	101	25	34	101	1,765
September 2004	10,141,800	7,610,200	7,614,900	8,953,200	9,871,800	5,394,400	12,093,900	4,161,100	4,524,300	1,057,000	1,369,000	4,527,000	77,318,600
(gpm)	235	176	176	207	229	125	280	96	105	24	32	105	1,790
TOTAL FY 2004	**108,606,400**	**92,651,900**	**97,696,000**	**105,925,400**	**106,727,600**	**69,749,800**	**148,438,500**	**41,338,664**	**48,488,200**	**14,663,000**	**27,279,500**	**47,153,800**	**908,718,760**
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
FY04 Average Flow Rate (gpm)	378	590	1006	1,729
September 2004 Average Flow Rate (gpm)	436	612	1017	1,790
MOS Operational Minimum (gpm)	415	600	1,010	1,745

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Table 9-3
Treatment Center Water Meter Totals
TGRS, TCAAP

Fiscal Year 2004

	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 2003	76,222,200	45,913,000	30,549,000	76,462,000	10,342,000	65,093,000	75,435,000	0	0	0
November 2003	77,834,300	44,673,000	32,897,000	77,570,000	10,662,000	69,639,000	80,301,000	0	0	0
December 2003	79,069,400	42,789,000	34,841,000	77,630,000	13,969,000	66,880,000	80,849,000	0	0	0
January 2004	78,261,000	50,228,900	26,764,700	76,993,600	15,581,000	64,420,000	80,001,000	0	0	0
February 2004	69,028,500	39,445,000	28,332,960	67,777,960	15,259,000	56,210,000	71,469,000	0	0	0
March 2004	76,310,700	44,200,000	29,971,000	74,171,000	28,670,000	47,215,000	75,885,000	0	0	0
April 2004	74,926,560	41,791,000	31,520,000	73,311,000	21,756,000	50,111,000	71,867,000	0	0	0
May 2004	77,603,471	42,045,987	34,242,716	76,288,703	17,525,077	56,963,016	74,488,093	0	0	0
June 2004	70,399,029	39,012,013	29,962,284	68,974,297	18,933,923	47,994,984	66,928,907	0	0	0
July 2004	72,950,100	40,987,000	31,395,000	72,382,000	23,619,000	46,575,000	70,194,000	0	0	0
August 2004	78,794,900	44,184,000	33,511,000	77,695,000	18,816,000	56,718,000	75,534,000	0	0	0
September 2004	77,318,600	43,123,000	32,903,000	76,026,000	21,044,000	52,814,000	73,858,000	0	0	0
TOTAL 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

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

Table 9-4
Pumphouse Down Time (Days)
TGRS, TCAAP

Fiscal Year 2004

Well Name	*FY04 Down Time (Days)*	*FY03 Down Time (Days)*	*FY02 Down Time (Days)*	*FY01 Down Time (Days)*	*FY00 Down Time (Days)*
B1	7.1	46	22.4	3.4	7.5
B2	(1)	1	63.2	3.9	18.7
B3	11.3	26	117.9	1.8	8.8
B4	7.6	21	11.8	1.7	5.7
B5	7.6	29	9.4	3.3	6.0
B6	15.4	19	10.8	1.6	32.3
B7	(1)	(1)	109.4	2.9	11.8
B8	10.0	18	107.6	1.3	9.0
B9	8.4	15	51.3	1.3	4.8
B10	(1)	(1)	109.9	2.4	8.0
B11	15.5	23	90.8	1.5	12.0
B12	(1)	(1)	(1)	(1)	(1)
B13	12.8	19	(1)	(1)	(1)
SC1	17.8	29	35.9	2.9	18.7
SC2	11.4	27	107.7	3.0	6.8
SC3	(1)	(1)	108.1	1.5	7.2
SC4	(1)	(1)	(1)	(1)	(1)
SC5	24.8	18	5.9	2.0	12.1

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

Table 9-5
Down Time (Days) by Category
TGRS, TCAAP

Fiscal Year 2004

Category	Down Time (Days)
Pumphouse Component	3.8
Treatment Center Component	3.3
Electrical Service	0.8
Miscellaneous	0.0
Preventive Maintenance	0.2
System Modification	2.6
Forcemain	1.7
Total System Equivalent	12.5

nticipated Down Time for Fiscal Year 200	
Pumphouse Component	3.5
Treatment Center Component	3
Electrical Service	1
Miscellaneous	0.1
Preventive Maintenance	3.5
System Modification	1
Forcemain	2

TABLE 9-6

GROUNDWATER QUALITY DATA (μg/L)
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*
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
Location	***Date***							
03L802	7/7/04	< 1	< 1	< 1	< 1	< 1	< 1	4.2
03L806	7/7/04	37	29	25	< 1	2.8	< 1	250
03L806	7/7/04	38 D	30 D	26 D	< 1 D	2.9 D	< 1 D	270 D
03M003	6/16/04	< 1	0.9 JP	0.66 JP	< 1	1	< 1	1.1
03M802	6/17/04	< 1	< 1	< 1	< 1	< 1	< 1	11
03M806	6/18/04	< 1	19	9.9	< 1	1.1	< 1	120
03U003	6/16/04	54	3.2	6.9	< 1	14	< 1	120
03U093	6/16/04	18	3	2.4	< 1	0.96 JP	< 1	130
03U094	6/16/04	140	1	5.3	< 1	1	< 1	250
03U099	6/16/04	2.2	< 1	< 1	< 1	< 1	< 1	7.9
03U099	6/16/04	2.2 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	7.8 D
03U708	6/17/04	32	5.4	8.5	< 1	3	2.2	120
03U708	6/17/04	32 D	5.3 D	8.5 D	< 1 D	2.6 D	2.1 D	110 D
03U710	6/18/04	9	0.7 JP	1.5	< 1	2.3	< 1	85
03U711	7/6/04	51	10	14	< 1	4.6	2.4	250
03U801	6/17/04	< 1	< 1	< 1	< 1	0.61 JP	< 1	34
03U803	6/17/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03U806	6/18/04	< 1	3.6	2.9	< 1	0.59 JP	1.3	120

TABLE 9-6

GROUNDWATER QUALITY DATA (µg/L)
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*
TGRS Cleanup Level[(1)]		200	70	6	4	70	5	5
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Location	***Date***							
04J077	6/21/04	30	36	32	< 1	11	< 1	300
04U711	7/6/04	< 1	< 1	< 1	< 1	< 1	< 1	1
04U802	7/7/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U806	6/17/04	18	24	20	< 1	3.4	< 1	250
04U833	6/18/04	< 1	< 1	< 1	< 1	< 1	< 1	3.3
PJ#806	6/17/04	1.4	2.9	2.4	< 1	0.42 JP	< 1	61

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.

Table 9-7
VOC Mass Loading Summary
TGRS, TCAAP

Fiscal Year 2004

Well	Percent Contribution to VOC Mass Removal	FY 2004 Total Pounds VOCs Mass Removed
B1	5.1%	166.8
B2	0.0%	0.0
B3	0.3%	8.6
B4	9.1%	299.2
B5	8.9%	292.8
B6	4.3%	141.2
B7	0.0%	0.0
B8	0.5%	16.9
B9	6.5%	214.3
B10	0.0%	0.0
B11	0.0%	1.3
B13	4.9%	161.6
SC1	4.3%	140.8
SC2	0.7%	23.6
SC3	0.0%	0.0
SC4	0.0%	0.0
SC5	55.4%	1,824
Fiscal Year 2004 Total (lbs)		*3,291*
Daily Average (lbs/day)		*9.0*

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
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		*189,268*

TABLE 9-8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Alias	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	1,4-Dioxane µg/L	Carbon Tetrachloride µg/L
03F302	B1	12/18/03	11	0.8 JP	2.5	2.7	< 1		< 1
03F302	B1	6/15/04	9.3	0.8 JP	2	2.4	< 1	< 8.5 UB 2.5	< 1
03F302	B1	6/15/04	9 D	0.56 JPD	2 D	2.2 D	< 1 D	< 1 UBD 2.5	< 1 D
03F303	B2	12/19/03	0.66 JP	2	0.81 JP	1.9	< 1		< 1
03F303	B2	6/15/04	0.41 JP	2.1	0.7 JP	1.9	< 1		< 1
03F303	B2	6/15/04	0.41 JPD	2.2 D	0.66 JPD	1.7 D	< 1 D		< 1 D
03F304	B3	12/18/03	1	< 1	1.3	1.4	< 1		< 1
03F304	B3	6/15/04	0.88 JP	< 1	1.2	1.3	< 1		< 1
03F305	B4	12/18/03	45	< 1	24	21	< 1		< 1
03F305	B4	6/15/04	34	< 1	20	19	< 1	< 2.5 UB 2.5	< 1
03F306	B5	12/18/03	13	< 1	9.9	8.9	< 1		< 1
03F306	B5	6/15/04	14	< 1	9	8.3	< 1	< 2.6 UB 2.5	< 1
03F307	B6	12/18/03	3	< 1	3.9	3.8	< 1		< 1
03F307	B6	6/15/04	2.5	< 1	3.5	3.4	< 1	< 2.3 UB 2.5	< 1
03F308	B7	12/19/03	< 1	< 1	< 1	< 1	< 1		< 1
03F308	B7	6/15/04	< 1	< 1	< 1	< 1	< 1		< 1
03F312	B11	12/18/03	< 1	< 1	< 1	< 1	< 1		< 1
03F312	B11	12/18/03	< 1 D	< 1 D	0.38 JPD	0.27 JPD	< 1 D		< 1 D
03F312	B11	6/15/04	< 1	< 1	< 1	< 1	< 1		< 1
03F319	B13	12/18/03	12	0.51 JP	2.9	2.8	< 1		< 1
03F319	B13	6/15/04	7.4	< 1	2.6	2	< 1		< 1
03U301	SC1	12/19/03	18	< 2	1.6 JP	3.1	< 2		< 2
03U301	SC1	6/15/04	15	< 1	< 1	< 1	< 1	< 9.2 UB 2.5	< 1
03U314	SC2	12/19/03	27	< 1	1.5	3	< 1		< 1
03U314	SC2	6/15/04	14	< 1	1.2	1.9	< 1		< 1
03U315	SC3	12/19/03	0.28 JP	< 1	< 1	< 1	< 1		< 1
03U315	SC3	6/15/04	< 1	< 1	< 1	< 1	< 1		< 1

TABLE 9-8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	Alias	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		1,4-Dioxane µg/L		Carbon Tetrachloride µg/L	
03U316	SC4	12/19/03	1.2		< 1		< 1		0.25	JP	< 1				< 1	
03U317	SC5	12/19/03	1100		< 5		22		35		2.3	JP			< 5	
03U317	SC5	6/15/04	920		< 1		18	JP	29		< 1		< 1.8	UB 2.5	< 1	
PJ#309	B8	12/18/03	2.5		< 1		1.2		1.3		< 1				< 1	
PJ#309	B8	12/18/03	2.4	D	< 1	D	1.2	D	1.4	D	< 1	D			< 1	D
PJ#309	B8	6/15/04	2.4		< 1		1.2		1.4		< 1				< 1	
PJ#310	B9	12/18/03	16		< 1		9.7		9.7		< 1				< 1	
PJ#310	B9	6/15/04	14		< 1		10		11		< 1				< 1	
PJ#311	B10	12/19/03	< 1		< 1		< 1		< 1		< 1				< 1	
PJ#311	B10	6/15/04	< 1		< 1		< 1		< 1		< 1				< 1	
PJ#313	B12	12/19/03	< 1		< 1		< 1		< 1		< 1				< 1	

TABLE 9-8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Alias*	*Date*	*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
03F302	B1	12/18/03	0.38 JP	10	< 1	< 1	2.1	< 1	150	< 1
03F302	B1	6/15/04	< 1	7.7	< 1	< 1	2.3	< 1	130	< 1
03F302	B1	6/15/04	< 1 D	7.6 D	< 1 D	< 1 D	2.2 D	< 1 D	120 D	< 1 D
03F303	B2	12/19/03	< 1	1.8	< 1	< 1	1.3	< 1	34	< 1
03F303	B2	6/15/04	< 1	1.7	< 1	< 1	1.2	< 1	35	< 1
03F303	B2	6/15/04	< 1 D	1.6 D	< 1 D	< 1 D	1.2 D	< 1 D	33 D	< 1 D
03F304	B3	12/18/03	< 1	0.43 JP	< 1	< 1	< 1	< 1	5.8	< 1
03F304	B3	6/15/04	< 1	0.34 JP	< 1	< 1	< 1	< 1	6.2	< 1
03F305	B4	12/18/03	0.27 JP	12	< 1	< 1	< 1	0.32 JP	350	< 1
03F305	B4	6/15/04	< 1	11	< 1	< 1	< 1	0.46 JP	320	< 1
03F306	B5	12/18/03	< 1	1.7	0.32 JP	< 1	1.1	< 1	260	< 1
03F306	B5	6/15/04	< 1	1.4 JP	< 1	< 1	1.2 JP	< 1	260	< 1
03F307	B6	12/18/03	< 1	0.92 JP	< 1	< 1	< 1	< 1	130	< 1
03F307	B6	6/15/04	< 1	0.72 JP	< 1	< 1	< 1	< 1	130	< 1
03F308	B7	12/19/03	< 1	< 1	< 1	< 1	< 1	< 1	1.3	< 1
03F308	B7	6/15/04	< 1	< 1	< 1	< 1	< 1	< 1	1.7	< 1
03F312	B11	12/18/03	< 1	0.36 JP	< 1	< 1	< 1	< 1	3.3	< 1
03F312	B11	12/18/03	< 1 D	0.31 JPD	< 1 D	< 1 D	< 1 D	< 1 D	3.1 D	< 1 D
03F312	B11	6/15/04	< 1	< 1	< 1	< 1	< 1	< 1	2.8	< 1
03F319	B13	12/18/03	0.34 JP	15	< 1	< 1	0.8 JP	0.26 JP	370	< 1
03F319	B13	6/15/04	< 1	11	< 1	< 1	< 1	< 1	280	< 1
03U301	SC1	12/19/03	0.79 JP	74	< 2	< 2	< 2	0.95 JP	960	< 2
03U301	SC1	6/15/04	< 1	70	< 1	< 1	< 1	< 1	900	< 1
03U314	SC2	12/19/03	0.29 JP	0.64 JP	< 1	< 1	< 1	< 1	69	< 1
03U314	SC2	6/15/04	< 1	0.39 JP	< 1	< 1	< 1	< 1	58	< 1
03U315	SC3	12/19/03	< 1	< 1	< 1	< 1	< 1	< 1	1.5	< 1
03U315	SC3	6/15/04	< 1	< 1	< 1	< 1	< 1	< 1	1.3	< 1

TABLE 9-8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

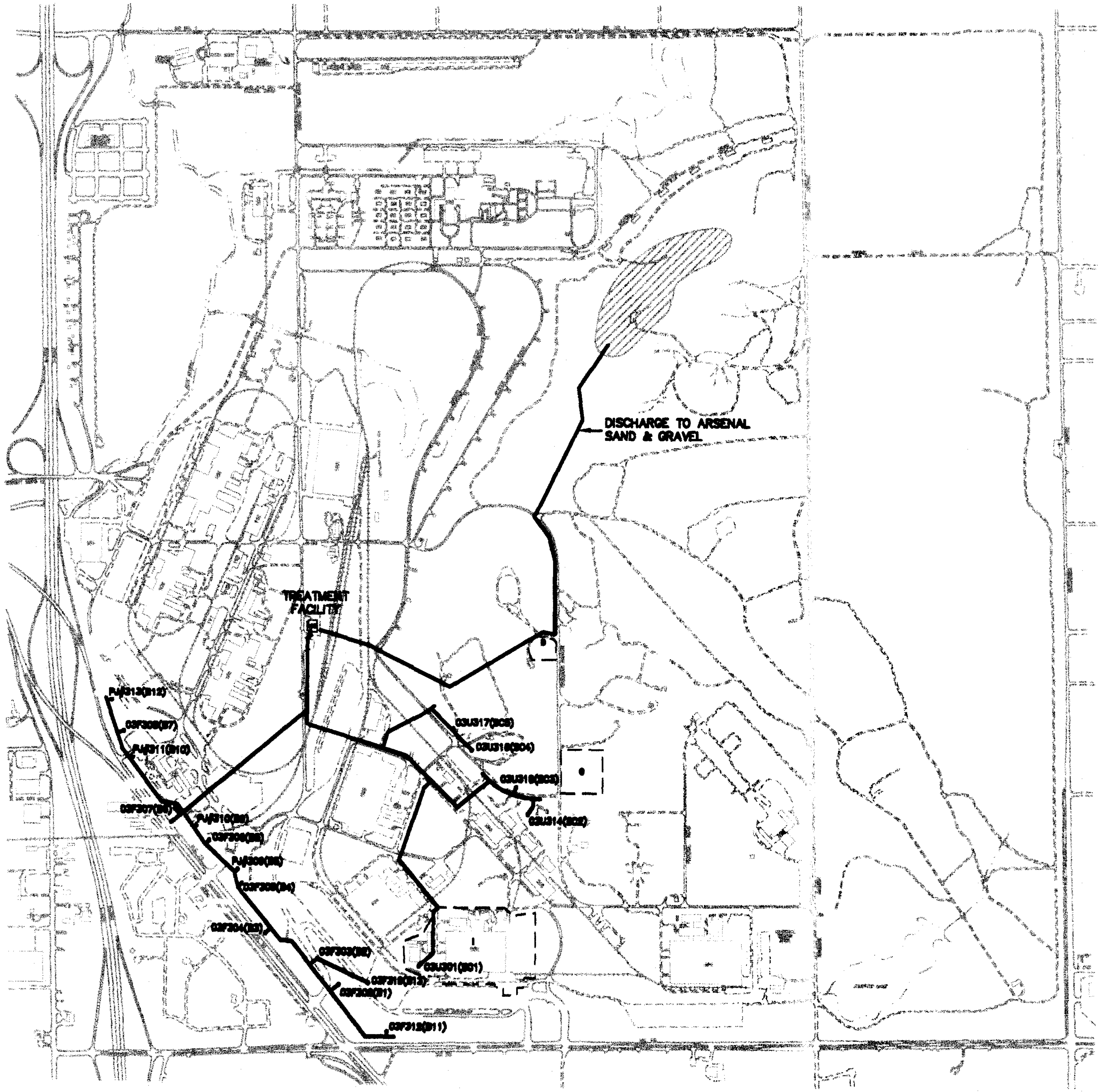
Location	Alias	Date	Chloroform µg/L		cis-1,2-Dichloroethene µg/L		Freon 113 µg/L		Methylene Chloride µg/L		Tetrachloroethene µg/L		trans-1,2-Dichloroethene µg/L		Trichloroethene µg/L		Vinyl Chloride µg/L	
03U316	SC4	12/19/03	1.2		0.23	JP	< 1		< 1	U	< 1		< 1		8		< 1	
03U317	SC5	12/19/03	1.1	JP	2.6	JP	17		1.1	JP	7.3		< 5		3100		< 5	
03U317	SC5	6/15/04	< 1		< 1		13	JP	< 1		< 1		< 1		3000		< 1	
PJ#309	B8	12/18/03	< 1		0.62	JP	< 1		< 1		< 1		< 1		20		< 1	
PJ#309	B8	12/18/03	< 1	D	0.54	JPD	< 1	D	< 1	D	< 1	D	< 1	D	19	D	< 1	D
PJ#309	B8	6/15/04	< 1		0.44	JP	< 1		< 1		< 1		< 1		21		< 1	
PJ#310	B9	12/18/03	< 1		3.6		< 1		< 1		< 1		< 1		110		< 1	
PJ#310	B9	6/15/04	< 1		3.5		< 1		< 1		< 1		< 1		120		< 1	
PJ#311	B10	12/19/03	< 1		< 1		< 1		< 1		< 1		< 1		0.63	JP	< 1	
PJ#311	B10	6/15/04	< 1		< 1		< 1		< 1		< 1		< 1		10		< 1	
PJ#313	B12	12/19/03	< 1		< 1		< 1		< 1		< 1		< 1		< 1		< 1	

Notes:
D - Duplicate analysis
J - Value is estimated
JP - Results less than reporting level but greater than instrument detection limit.
U - The analyte is non-detect with the associated value being the quantitation limit.
UB - The associated field blank yielded a detection of the analyte; therefore, analyte is non-detect with the associated detection being the quantitation limit.

Table 9-9
Summary of OU2 Deep Groundwater Monitoring Requirements
TGRS, TCAAP

Fiscal Year 2004

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



0 400 1200ft

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 9-1

TGRS LAYOUT
Twin Cities Army Ammunition Plant

CRA

34878-43(005)GN-SP001 OCT 26/2004

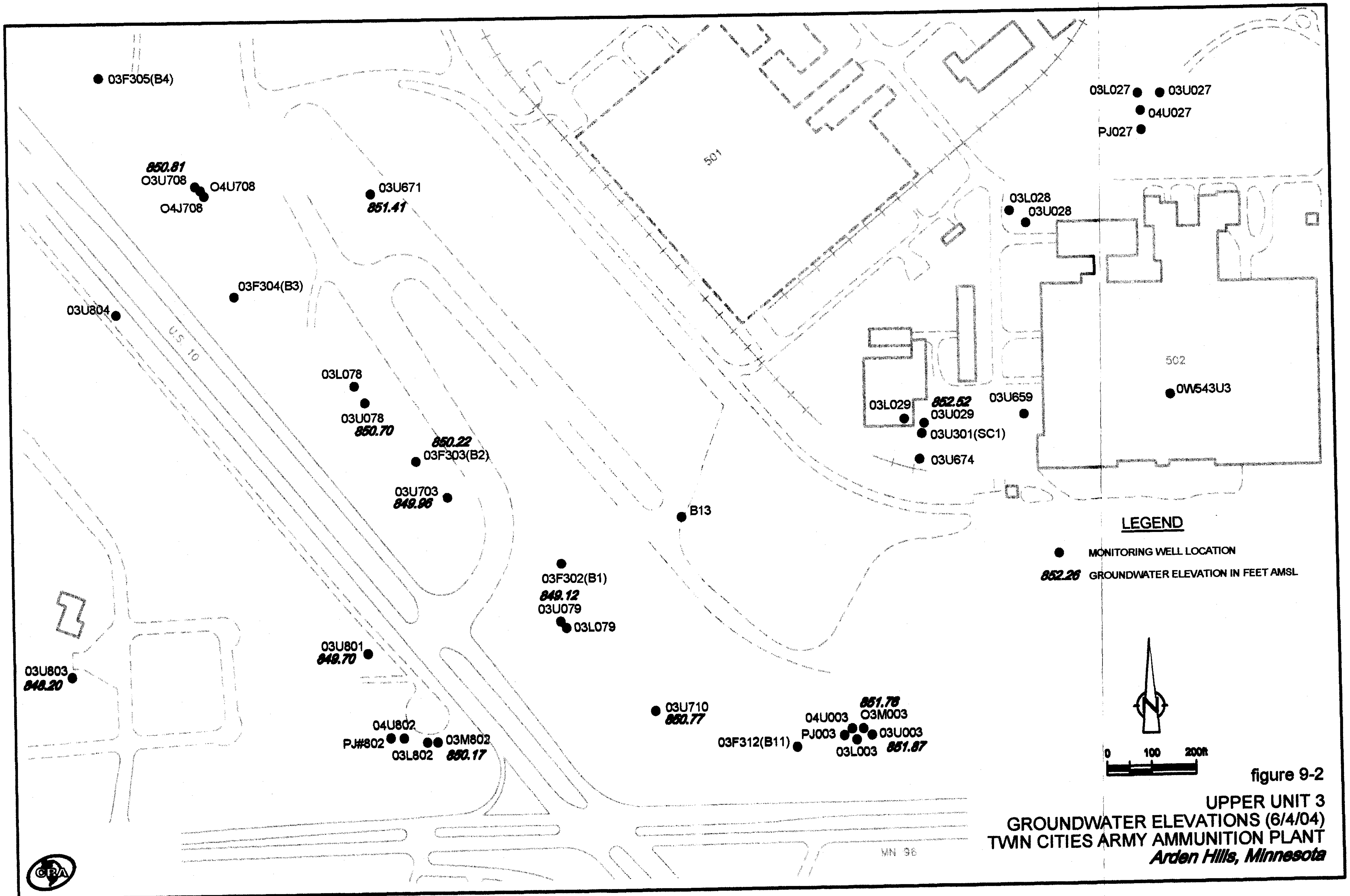


figure 9-2

UPPER UNIT 3
GROUNDWATER ELEVATIONS (6/4/04)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

34878-43(005)GN-SP003 OCT 27/2004

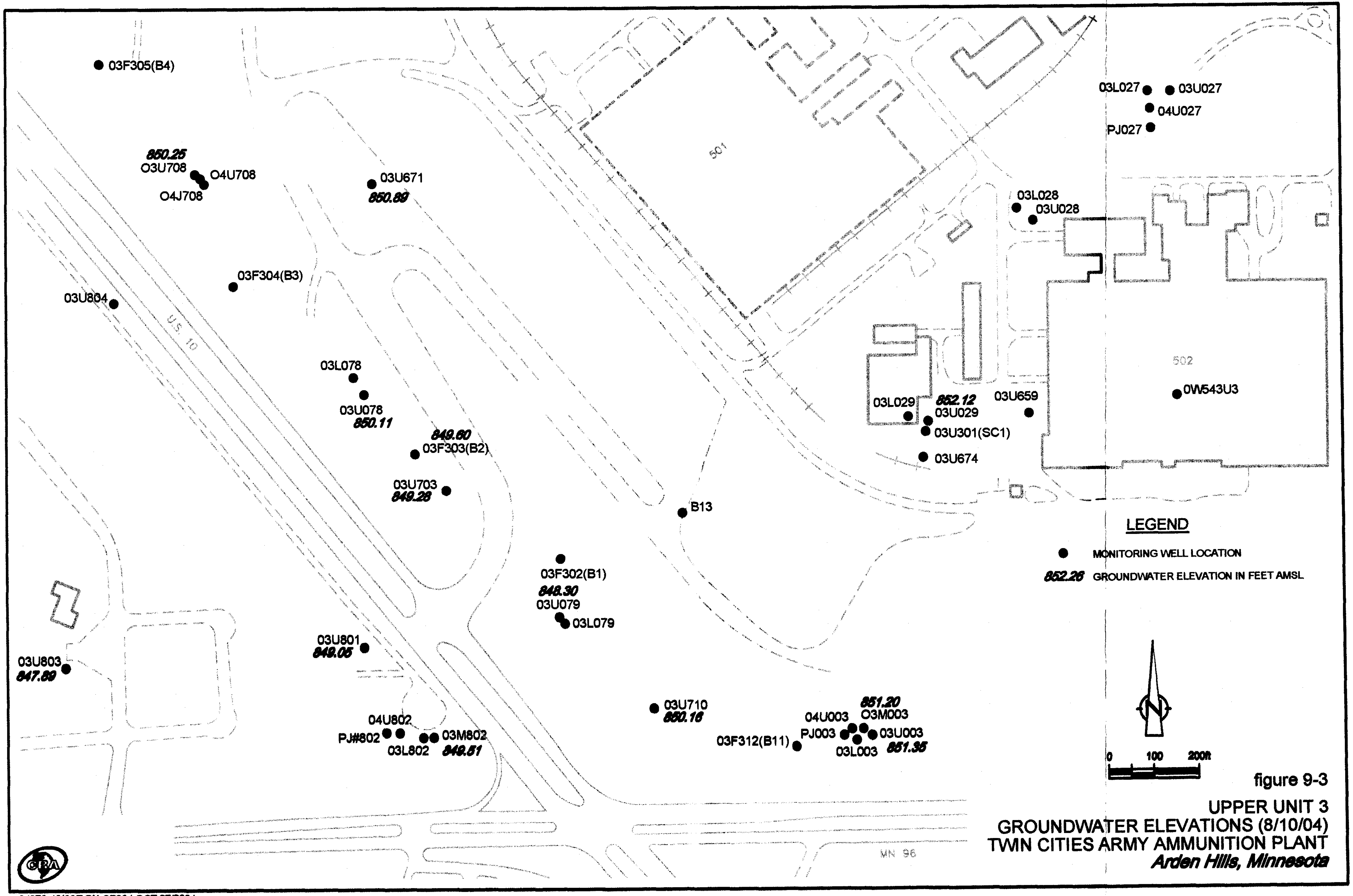


figure 9-3

UPPER UNIT 3
GROUNDWATER ELEVATIONS (8/10/04)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

34878-43(005)GN-SP004 OCT 27/2004

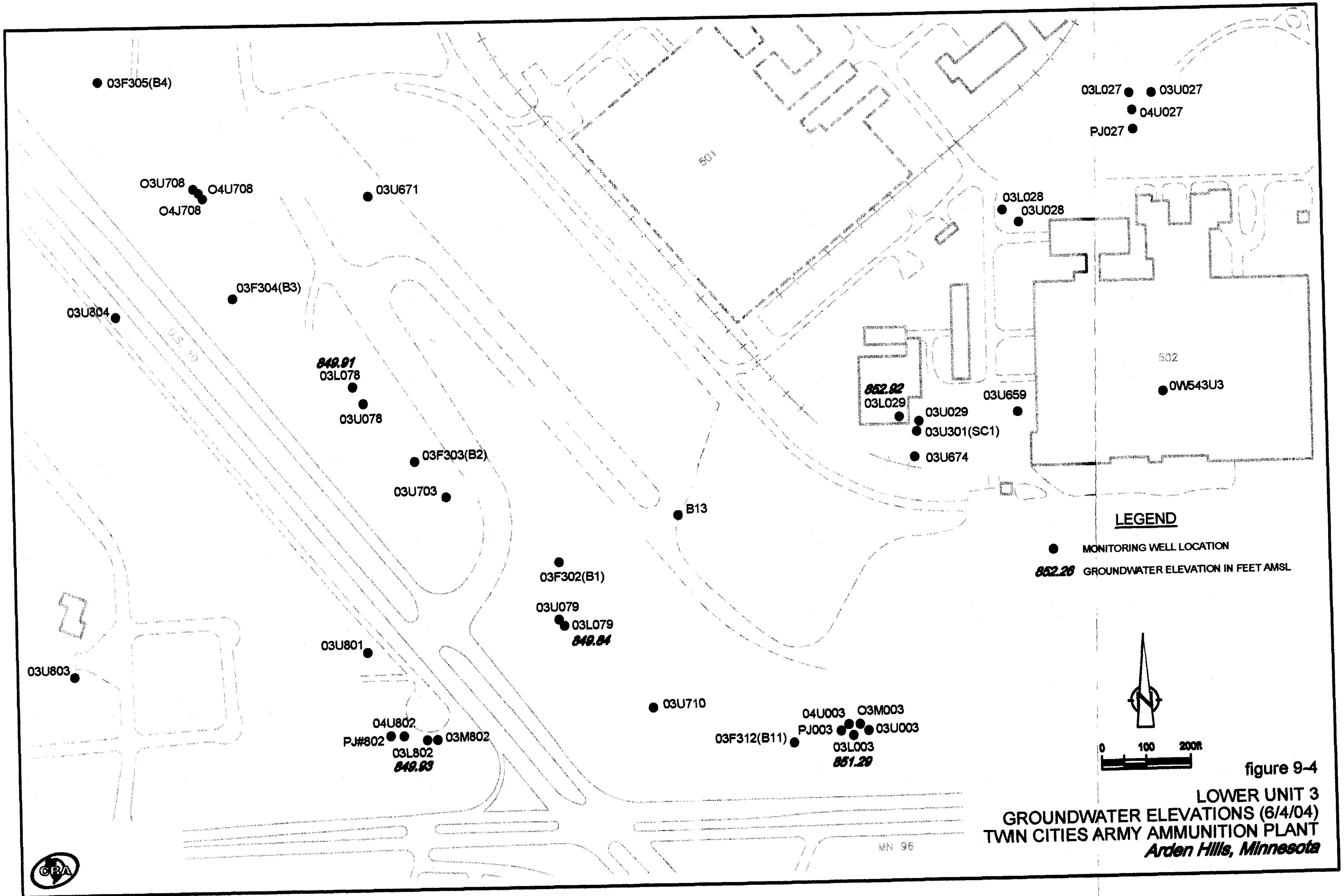


figure 9-4

LOWER UNIT 3
GROUNDWATER ELEVATIONS (6/4/04)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

34878-43(005)GN-SP005 OCT 27/2004

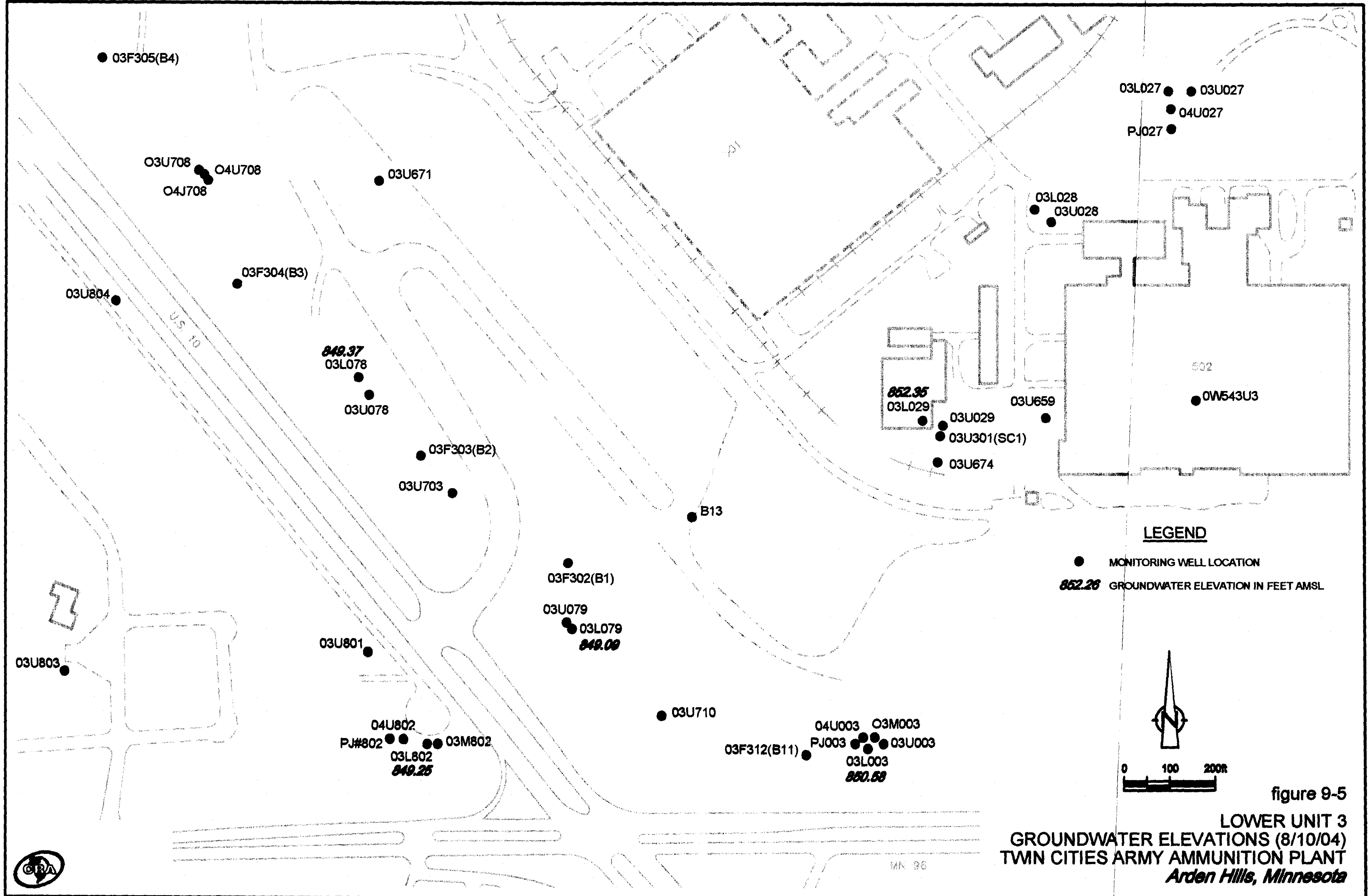


figure 9-5

LOWER UNIT 3
GROUNDWATER ELEVATIONS (8/10/04)
TWIN CITIES ARMY AMMUNITION PLANT
Arden Hills, Minnesota

34878-43(005)GN-SP006 OCT 27/2004

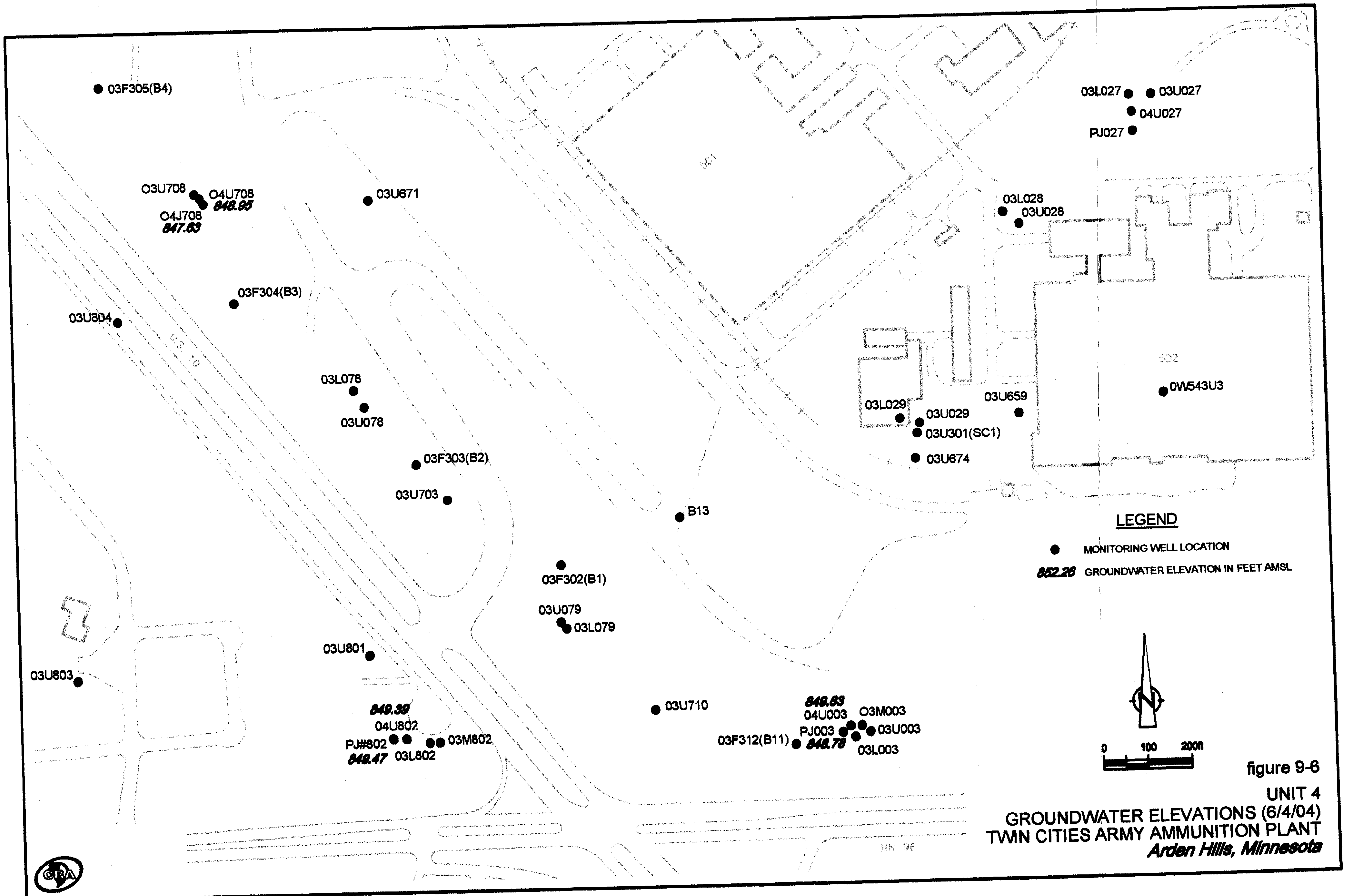


figure 9-6

UNIT 4

GROUNDWATER ELEVATIONS (6/4/04)

TWIN CITIES ARMY AMMUNITION PLANT

Arden Hills, Minnesota

34878-43(005)GN-SP007 OCT 27/2004

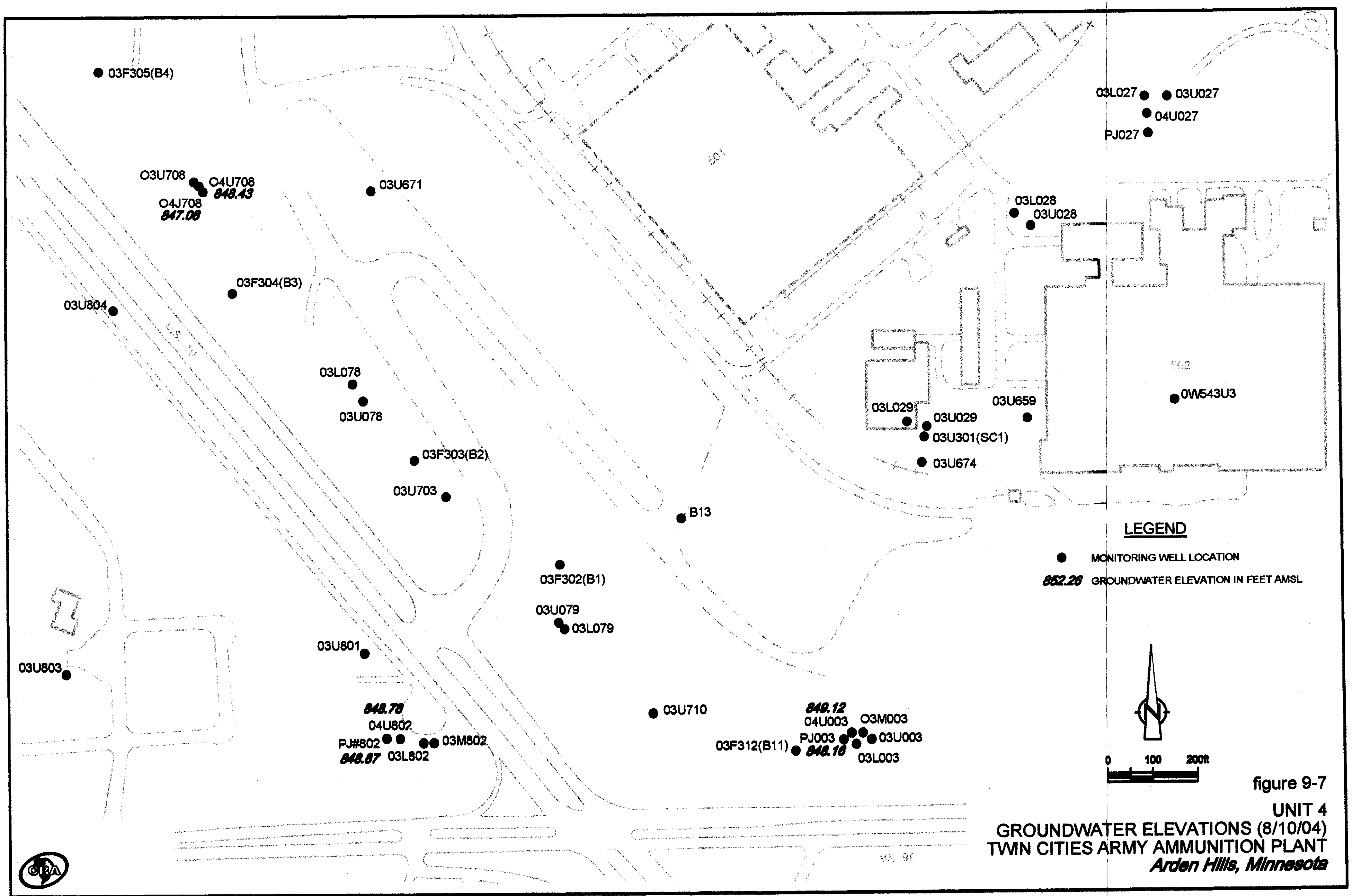


figure 9-7

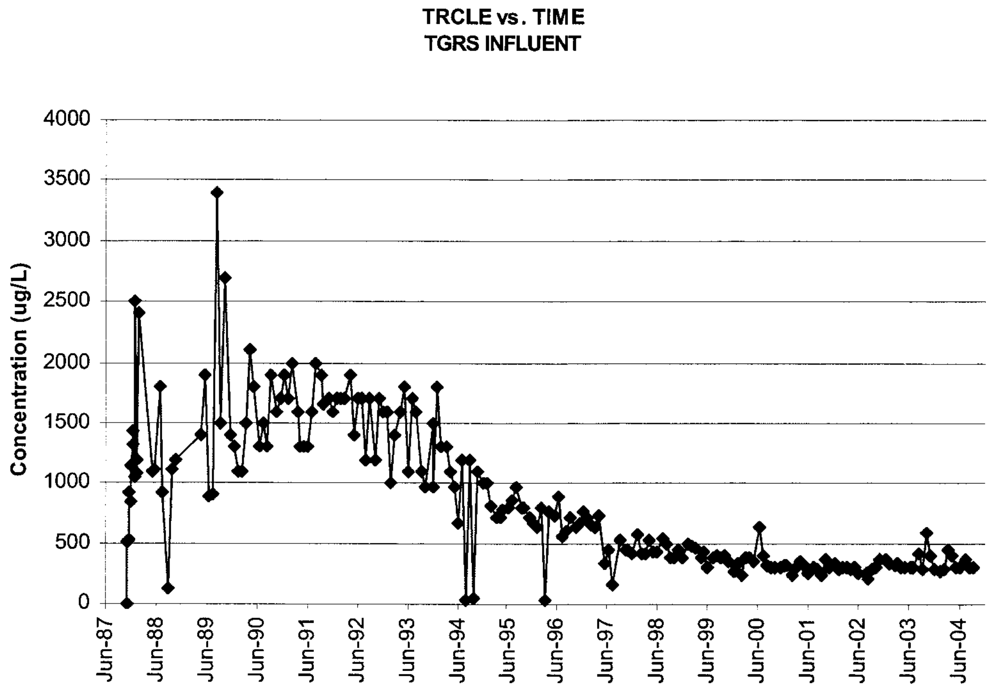
UNIT 4

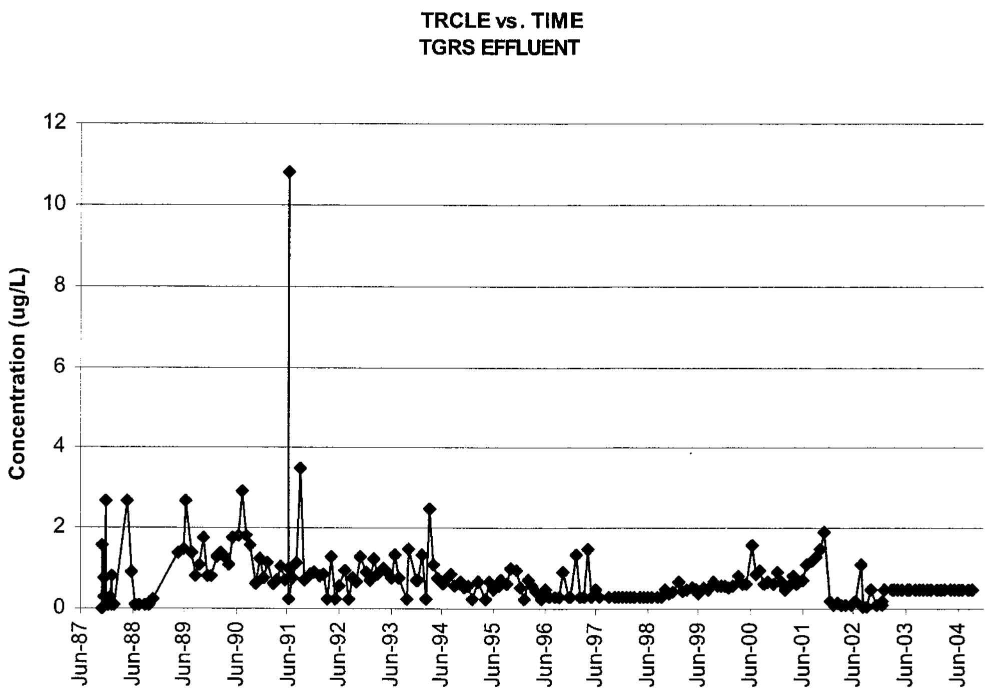
GROUNDWATER ELEVATIONS (8/10/04)

TWIN CITIES ARMY AMMUNITION PLANT

Arden Hills, Minnesota

34878-43(005)GN-SP008 OCT 27/2004





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 9–8

TGRS TREATMENT SYSTEM PERFORMANCE
Twin Cities Army Ammunition Plant

CRA

34878–43(005)GN–SP002 OCT 27/2004

10.0 Operable Unit 3: Deep Groundwater

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

There have been no subsequent ROD Amendments or Explanations of Significant Differences during FY 2004.

A draft "Groundwater Statistical Evaluation, OU3" technical memorandum was issued to the MPCA and USEPA on August 26, 2004. This document is intended to show that the OU3 plume is stable and or decreasing in concentration based on historic trends in COC concentrations in OU3 monitoring wells. This document, when approved, will form the basis for an OU3 ROD Amendment in FY 2005 for OU3 that will effectively remove the need for implementing a pump and treat remedy using the PGRS well and treatment train for OU3 remediation purposes.

The PGRS (Plume Groundwater Recovery System) of Operable Unit 3 (OU3) is an off-post groundwater extraction and treatment system and municipal potable water supply. The PGRS consists of New Brighton Municipal Well #13 (NBM #13) and a GAC treatment plant. The water is used by New Brighton for municipal supply. The PGRS is designed to contain the south plume of VOC contamination emanating from TCAAP and to prevent further downgradient migration. Recovered groundwater is treated and used by the City of New Brighton to fulfill its municipal water supply demand. Figure 10-1 presents a site plan for OU3.

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. The City has 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.

10.1 REMEDY COMPONENT #1: GROUNDWATER EXTRACTION

Description: "Extraction of groundwater at the leading edge of the South Plume." (OU3 ROD, page 2)

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

When the PGRS is operating at the designed flow rates and the zone of capture is achieving containment of the leading edge of the south plume.

Is the remedy component being implemented?

Yes. The PGRS began full-scale operation in May 1994. The flow rate was reduced to zero in August 2001 due to the reduction in plume size and concentration. The PGRS was operated from May 2003 through September 2003, solely to satisfy municipal peak water supply demand requirements, and then placed back in "standby" mode. The system remained in standby mode during FY 2004. PGRS operations during FY 2004 were in support of maintaining the system in "standby" condition in the event groundwater must be treated for contamination and for collection of groundwater samples. All water pumped was sewered.

Is the PGRS containing the south plume?

The intent of this ROD requirement is being met. The monitoring data indicates that the south plume no longer extends as far as the PGRS at concentrations above the ROD requirements. Samples collected in FY 2004 from the extraction well and monitoring wells in the vicinity of the extraction well were below 1 µg/l, indicating that the southern edge of the South Plume was north of monitoring well 04U863. Table 10-1 presents a summary of the monitoring well sample analyses.

10.2 REMEDY COMPONENT #2: GROUNDWATER TREATMENT

Description: "Treatment of extracted groundwater for the removal of volatile organic compounds (VOCs) by a pressurized granular activated carbon (GAC) system." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):
When the effluent from the treatment system meets the standards in the OU3 ROD.

Is the remedy component being implemented?
Yes. The City of New Brighton maintained the PGRS in "standby" mode during FY 2004. PGRS operations during FY 2004 were in support of maintaining the system in "standby" condition in the event groundwater must be treated for contamination and for collection of groundwater samples. All water pumped was sewered.

Is treatment meeting the requirements of the OU3 ROD?
Yes. The influent and effluent water was sampled in FY 2003 by the City of New Brighton after returning the system to operational status and on a monthly basis during the months the system was in operation. The City did not monitor the PGRS during FY 2004 because the PGRS did not provide potable water to the City. Historical monitoring data is provided in Appendix H.1.

The FY 2003 influent and effluent trichloroethene and FY 2004 NB well #13 concentrations were <1.0 μg/l (below detection limits for all sampling events). Figure 10-2 presents a summary of the influent and effluent trichloroethene concentrations versus time.

How much VOC mass did the system remove?
The PGRS extracted 577,000 gallons of water during FY 2004 in support of "standby" status operations and monitoring. All water was sewered.

The PGRS did not remove any measurable VOC mass during FY 2004 as NB well #13 concentrations were non-detect. A summary of the monthly pumping volumes and VOC removal is shown in Table 10-2. The total mass removed by the PGRS since startup is 132.0 pounds.

10.3 REMEDY COMPONENT #3: USE OF WATER FOR MUNICIPAL SUPPLY

Description: "Discharge of treated groundwater to the potable supply of the City of New Brighton." (OU3 ROD, page 2)

Performance Standard (how do you know when you're done):
When the City of New Brighton is able to accept the entire discharge from the PGRS, and is doing so on a full-time basis.

Is the remedy component being implemented?
Yes. The City of New Brighton maintained the PGRS in "standby" mode during FY 2004. PGRS operations during FY 2004 were in support of maintaining the system in "standby" condition in the event groundwater must be treated for contamination and for collection of groundwater samples. All water pumped was sewered.

10.4 REMEDY COMPONENT #4: GROUNDWATER MONITORING

Description: "Monitoring of the groundwater to verify the effectiveness of the remedy." (OU3 ROD, page 2)

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 2004 monitoring plan and any deviations are explained in Appendix C.2. Monitoring was as follows:

<u>Groundwater</u>

Groundwater samples were collected from seven wells, including the extraction well, in the vicinity of the PGRS (south of Interstate 694) during the months of December 2003, March 2004, June 2004, and September 2004. The seven sentinel wells are: 04U863, 04U864, 04U865, 04U866, 04J864, 04J866, and 520931 (NBM #13). Monitoring well 04U863 was not part of the monitoring network but was voluntarily added to the quarterly monitoring program beginning in March 2002. These wells provide a sentry-monitoring network near the extraction well to monitor for any potential rebound in concentrations.

As requested by USEPA, wells 04U854, 04U673, 03L673, and 03L859 were also sampled in June 2004 and groundwater levels were measured. Wells 03L673 and 04U673 are already included in the larger biennial list of monitoring wells for groundwater sampling and were sampled in June 2004, an "off-year", on a "one-time" basis. Wells 03L859 and 04U854 were added to the larger biennial list of monitoring wells for groundwater sampling and were sampled in June 2004, an "off-year", on a "one-time" basis. Monitoring wells used for sampling the PGRS are shown on Figure 10-1. The specific role of each well is provided in Appendix A. Water elevations were gathered during monitoring events and Appendix H.2 presents the water level database.

Table 10-1 presents a summary of the analytical results. Trichloroethene was detected below the contract detection limit of 1 µg/l in three of the seven sentinel wells, which is down from FY 2002, in which four sentinel wells had detections below the contract detection limit of 1 µg/l. These concentrations are consistent with expected residual levels in this area.

Monitoring was performed in accordance with TCAAP RD/RA QAPP (1996) and a new QAPP. The *IRP-QAPP for Performance Monitoring*, TWISS, dated December 10, 2003 was accepted by the USEPA and MPCA as passing the Consistency Test on December 22, 2003. The new QAPP was implemented on April 1, 2004, the beginning of the 3rd quarter FY 2004.

Treatment System

Samples were collected in FY 2003 by the City of New Brighton from the treatment system after returning the system to operational status and on a monthly basis during the months the system was in operation. The City did not perform sampling during the FY 2004 period. Historical data is provided in Appendix H.1.

Is additional monitoring proposed prior to the next report?

Yes. The existing OU3 monitoring requirements are presented in Table 10-3. Appendix A presents the FY 2004 - FY 2008 monitoring plan. Appendix A states that quarterly monitoring well sampling and water level measurements are planned for sentinel wells and a larger list of wells will be monitored on a biennial basis. This monitoring plan may change pending resolution of comments to the technical memorandum in support of the proposed ROD amendment, and completion of the ROD amendment that would remove groundwater extraction as a component of the OU3 remedy.

These activities are anticipated to be completed in FY 2005. Monitoring plan revisions will include changes to the list of locations monitored and the frequency of monitoring. The OU3 section of Appendix A.1 and A.2 will be updated to reflect these revisions upon completion of the ROD amendment.

10.5 OVERALL REMEDY FOR OU3

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

The PGRS extraction well was shut down in FY 2001. In FY 2004 there were no wells exhibiting VOC concentrations above the ROD requirements in the vicinity of the PGRS. All detection limits were below the requirements of the ROD.

Are any changes or additional actions required for OU3?

Yes. A technical memorandum in support of the ROD amendment was submitted to the USEPA and MPCA on August 26, 2004. These documents propose permanent shutdown of NBM #13 for remediation purposes. Monitoring will continue to confirm that the plume remains below applicable standards.

10.6 OTHER ACTIVITIES

There were no other activities in FY 2004.

Table 10-1
Groundwater Quality Data
PGRS, TCAAP

Fiscal Year 2004

Well	Date	Trichloroethene TRCLE	1,1,1-Trichloroethane 111TCE	1,1,2-Trichloroethane 112TCE	1,1-Dichloroethene 11DCE	1,1-Dichloroethane 11DCLE	cis-1,2-Dichloroethene C12DCE	Vinyl chloride C2H3CL	Chloroform CHCL3	trans-1,2-Dichloroethene T12DCE	Tetrachloroethene TCLEE	1,2-Dichloroethane 12DCLE
PGRS Cleanup Level (1)		5	200	3	6	70	70	--	--	--	--	--
03L673	June-04	180	<1	<1	0.61 JP	0.66 JP	7.7	<1	<1	<1	<1	<1
04U673	June-04	51	<1	<1	<1	<1	1.8	<1	<1	<1	<1	<1
04U854	June-04	14	<1	<1	<1	<1	0.55 JP	<1	<1	<1	<1	<1
04U854 D	June-04	<1	<1	<1	<1	<1	0.60 JP	<1	<1	<1	<1	<1
03L859	June-04	10	<1	<1	1.1	1.8	0.81 JP	<1	<1	<1	<1	<1
04J864	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J864	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J864	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J864	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J864 D	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J864 D	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866 D	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04J866 D	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U863	Dec-03	0.26 JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 10-1
Groundwater Quality Data
PGRS, TCAAP

Fiscal Year 2004

Well	Date	Trichloroethene TRCLE	1,1,1-Trichloroethane 111TCE	1,1,2-Trichloroethane 112TCE	1,1-Dichloroethene 11DCE	1,1-Dichloroethane 11DCLE	cis-1,2-Dichloroethene C12DCE	Vinyl chloride C2H3CL	Chloroform CHCL3	trans-1,2-Dichloroethene T12DCE	Tetrachloroethene TCLEE	1,2-Dichloroethane 12DCLE
PGRS Cleanup Level (1)		5	200	3	6	70	70	--	--	--	--	--
04U863	Mar-04	0.43 JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U863	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U863	Sep-04	0.30 JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U864	Dec-03	0.37JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U864	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U864	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U864	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U865	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U865	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U865	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U865	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U866	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U866	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U866 D	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table 10-1
Groundwater Quality Data
PGRS, TCAAP

Fiscal Year 2004

Well	Date	Trichloroethene TRCLE	1,1,1-Trichloroethane 111TCE	1,1,2-Trichloroethane 112TCE	1,1-Dichloroethene 11DCE	1,1-Dichloroethane 11DCLE	cis-1,2-Dichloroethene C12DCE	Vinyl chloride C2H3CL	Chloroform CHCL3	trans-1,2-Dichloroethene T12DCE	Tetrachloroethene TCLEE	1,2-Dichloroethane 12DCLE
PGRS Cleanup Level (1)		5	200	3	6	70	70	--	--	--	--	--
04U866	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
04U866	Sep-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
NBWELL13	Dec-03	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
NBWELL13	Mar-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
NBWELL13	Jun-04	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
NBWELL13	Sep-04	0.28 JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Notes:
- Indicates a detection.
D - Duplicate analysis.
J - Value Estimated.
P - Result is less than reporting level but greater than instrument detection limit.
(1) Clean up level from OU3 ROD.

Table 10-2
Summary of Monthly VOC Removal
PGRS, TCAAP

Fiscal Year 2004

Month	Total Monthly Flow[1] (million gallons)	Total VOC Influent[2] Concentration	Total VOC Effluent [2] Concentration	Total VOCs in Treatment Center Discharge (gm)	Total VOC Mass Removed (gm)	Total VOC Mass Removed (lb)
Cumulative As Of September 2003 (FY033)						132.0
October	0.23300					
November	0.15300					
December	0.07400					
January	0.00000					
February	0.00000					
March	0.02900					
April	0.00000					
May	0.00000					
June	0.06800					
July	0.00000					
August	0.00000					
September	0.02000					
Totals - FY04	0.57700					
Cumulative To Date						132.0

Notes:
(1)Data collected by City of New Brighton.
(2) The plant was not operated as a water supply system during FY04 and no monitoring was performed by the City of New Brighton.

Table 10-3
Summary of Groundwater Monitoring Requirements
PGRS, TCAAP

Fiscal Year 2004

	Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1	Groundwater Extraction	a. Water levels for use in drawing contour maps demonstrating capture (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
		b. Pumping rates and volumes for reporting (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
#2	Groundwater Treatment	a. Influent/effluent monitoring to verify compliance and calculate mass removal (currently not applicable).	Alliant	OU3 Monitoring Plan in Annual Report
#3	Use of Water for Municipal Supply	a. Effluent monitoring for verifying compliance with public water supply requirements (currently not applicable).	New Brighton	New Brighton's Monitoring Plan
#4	Groundwater Monitoring	a. Groundwater sampling to track progress of clean-up.	Alliant	OU3 Monitoring Plan in Annual Report
	Overall Remedy	a. Water quality monitoring to verify attainment of clean-up goals.	Alliant	OU3 Monitoring Plan in Annual Report

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INTERNATIONAL INCORPORATED

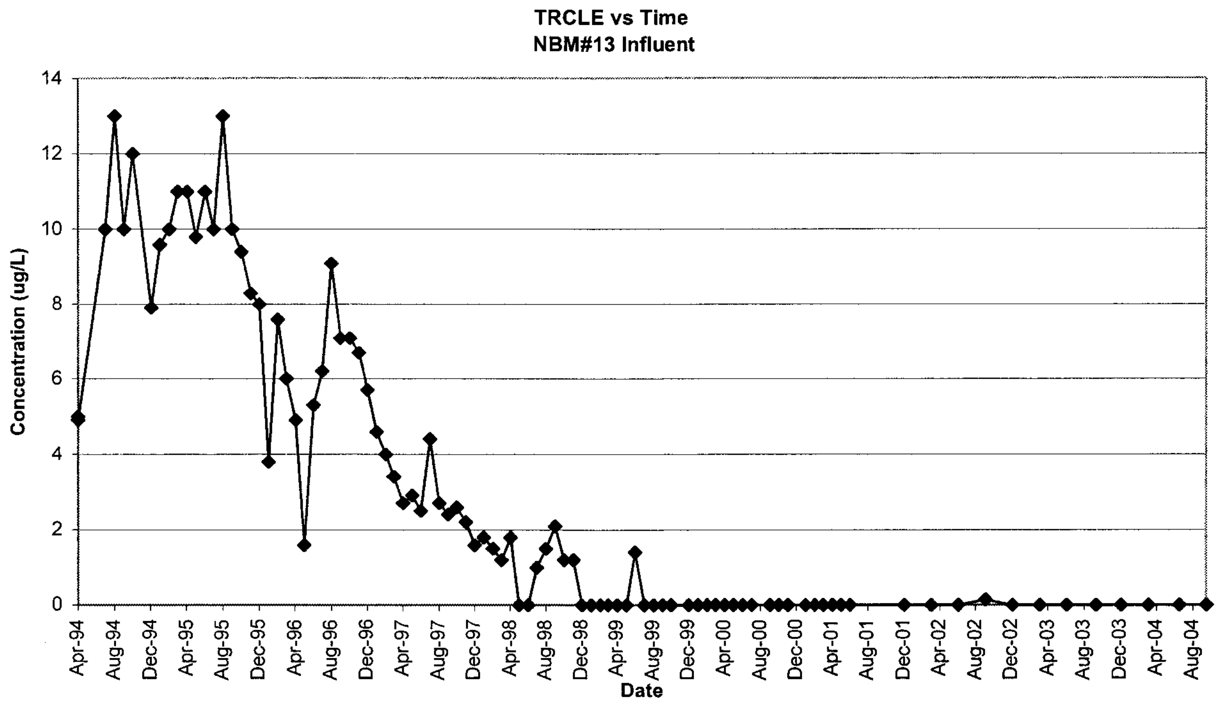
4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55110

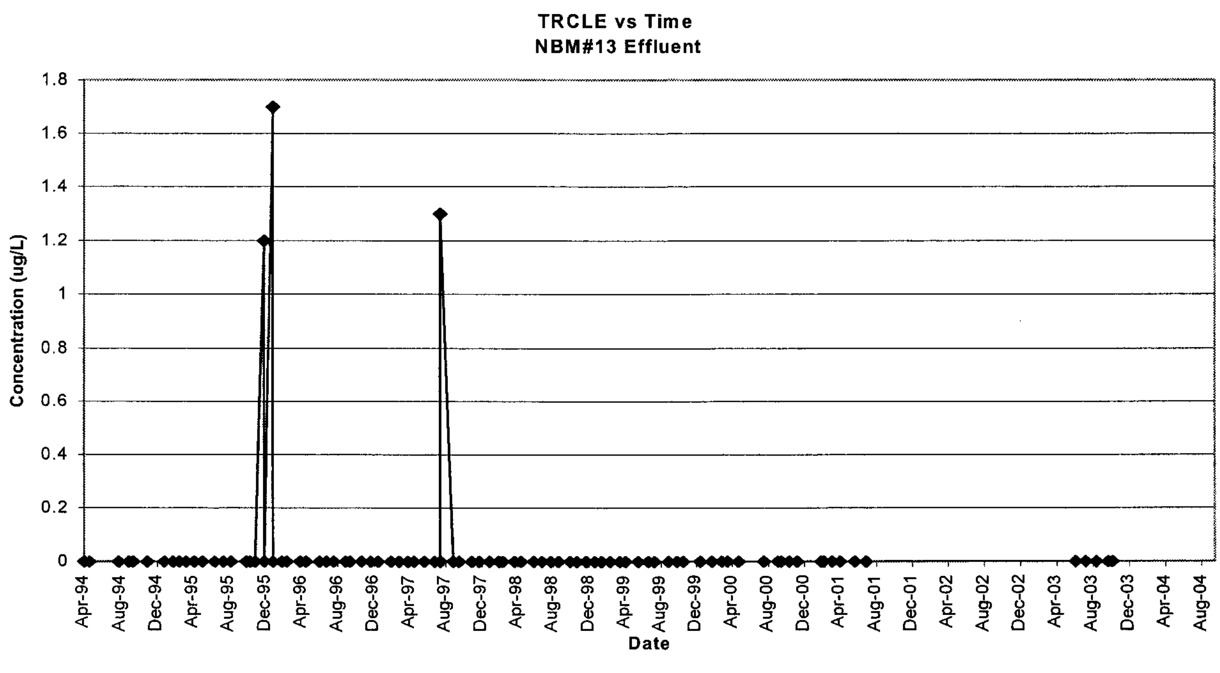
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

OU3 (PGRS) SITE PLAN

FIGURE 10-1

SECOR PROJECT #: 0307.18608.00.0262 | FILENAME: SITE-03 | DATE: 11/22/04





SECOR
INTERNATIONAL INCORPORATED
4463 WHITE BEAR PARKWAY, SUITE 106
WHITE BEAR LAKE, MINNESOTA 55110

TWIN CITIES ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

OU3 (PGRS)
TRCLE VS. TIME

SECOR PROJECT #: 003.18508.00.0262 | FILENAME: SITE-13-04 | DATE: 11/29/04

FIGURE
10-2

11.0 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 2004, the Army, the National Guard, and Alliant 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 2004 of a national-level debate between the USEPA and 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 2005.

Was the annual site inspection for land use controls conducted in FY 2004, as specified in the LUCIP?

On July 28, 2004, the Army, National Guard, and TWISS 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, than signs need to be installed around the cover area. At Site G, some erosion was observed at two locations just outside the fill area. Repairs were completed to these areas in September 2004. At the 1900-yard range, some erosion was observed along the east side of the site. Repairs were made in October 2004.

12.0 Other Installation Restoration Activities During FY 2004

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.

13.0 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 Technical Memorandum, Statistical Evaluation Method for Operable Unit 1 Water Quality Data. Final Report, December 2004.

"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.

"Record of Decision, Groundwater Remediation Operable Unit 1 at New Brighton/Arden Hills Superfund Site." September 1993.

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 2004 – FY 2008 Monitoring Plans

A.1 Groundwater Monitoring Wells

APPENDIX A.1
FY 2004 – FY 2008 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
  - 1.a = To contour water levels for evaluation of containment

(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 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
Operable Unit 1			Note: Changes from the monitoring plan presented in the previous Annual Performance Report are shown in bold (red color) 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	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			---	---	---	---	---	---	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	
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	

APPENDIX A.1

FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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)	---	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	Sample in June & Dec through 2006
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	Sample in June & Dec through 2006
J	04J849			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	Sample in June & Dec through 2006
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
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

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
Operable Unit 2											
Site A Removal Action											
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)	Q,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	
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	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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	
Site C Response Action											
01U	01U551	EW-1									See Appendix A.5
01U	01U552	EW-2									See Appendix A.5

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
01U	01U553	EW-3									See Appendix A.5
01U	01U561	MW-1									See Appendix A.5
01U	01U562	MW-2									See Appendix A.5
01U	01U563	MW-3									See Appendix A.5
01U	01U564	MW-4									See Appendix A.5
01U	01U565	MW-5									See Appendix A.5
01U	01U566	MW-6									See Appendix A.5
01U	01U567	MW-7									See Appendix A.5
01U	01U568	MW-8									See Appendix A.5
01U	01U569	MW-9									See Appendix A.5
01U	01U570	MW-10									See Appendix A.5
01U	01U571	MW-11									See Appendix A.5
01U	01U572	MW-12									See Appendix A.5
01U	01U573	MW-13									See Appendix A.5
01U	01U574	MW-14									See Appendix A.5
01U	01U575	MW-15									See Appendix A.5
01U	01U576	MW-16									See Appendix A.5

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	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			Q,L(A)	L(A)	L(A)	L(A)	L(A)	—	1a, OR	One-time WQ event in 2004
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			Q,L(A)	L(A)	L(A)	L(A)	L(A)	—	1a, OR	One-time WQ event in 2004
01U	01U667			Q,L(A)	L(A)	L(A)	L(A)	L(A)	—	1a, OR	One-time WQ event in 2004
01U	01U668			Q,L(A)	L(A)	L(A)	L(A)	L(A)	—	1a, OR	One-time WQ event in 2004
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	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	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	
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	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
03U	03U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	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)	---	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			---	L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U003			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U004			---	L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U005			---	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	
03U	03U021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U022			---	L(A)	---	L(A)	---	---	1.a	

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Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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			---	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			---	Q,L(A)	Q,L	Q,L(A)	---	---	1.a	Lead Only, See Appendix A.5
03U	03U084			---	L(A)	---	L(A)	---	---	1.a	
03U	03U087		(7)	Q(B)	Q(B),L(A)	Q(B)	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)	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			---	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(B)	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)	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	
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			---	---	---	---	---	---	---	

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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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)	---	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	
03U	03U715			---	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	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
03U	03U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	519288	E101-MW		L(A)	---	---	---	---	---	---	One-time event in 2004
03U	519289	E102-MW		L(A)	---	---	---	---	---	---	One-time event in 2004
03U	519290	E103-MW		L(A)	---	---	---	---	---	---	One-time event in 2004
03M	03M001			---	L(A)	---	L(A)	---	---	1.a	
03M	03M002			---	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	
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	

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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
03L	03L021			---	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	
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	

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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
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)	---	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 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	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)	---	(Note 7)	---	See Page 2 of Appendix A.4
01U	01U072			---	---	---	---	---	---	---	
01U	01U085			---	---	---	---	---	---	---	

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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03M	03M848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L832			—	—	—	—	—	—	—	
03L	03L848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L854			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L859			Q,L(A)	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L860			—	L(A)	—	L(A)	—	—	1.a	
03L	03L861			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	476837	MW15H		—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U414	414U4		—	—	—	—	—	—	—	
PC	04U673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U832			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U845			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U851			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U852			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U854			Q,L(A)	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U859			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U860			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U861			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U863	323U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U864	324U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U865	325U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U866	326U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	520931	NBM #13			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J864	324 J		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	

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FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
J	04J866	326 J		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	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 04	June 05	June 06	June 07	June 08	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
---	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

APPENDIX A.1

FY 2004 - FY 2008 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
---	234474	Hodson, Randy	4a	Q(B)	Q(B)	---	---	---	Well Inventory	---	2601 Silver Lane NE
---	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
---	---	Lube-Tech	4a	---	Q(B)	---	---	---	Well Inventory	---	2420 Co Rd C West
---	---	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
		Cuddihy	4a	---	Q(B)	---	---	---	Well Inventory	---	2933 Troseth Rd.
		Bryant, Jr.	4a	---	Q(B)	---	---	---	Well Inventory	---	612 12th Ave NW

Grenade Range

Unit	Well I.D.	Common Name	Notes	June 04	June 05	June 06	June 07	June 08	Water Quality	Water Level	Comments
OU1	653903	GR1-1		Q(B)	---	---	---	---	OR	---	
OU1	653904	GR1-2		Q(B)	---	---	---	---	OR	---	
OU1	653905	GR2-1		Q(B)	---	---	---	---	OR	---	
OU1	675976	GR-DF1		Q(B)	---	---	---	---	OR	---	

A.2 Remedial Treatment Systems

APPENDIX A.2
FY 2004 - FY 2008 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 C RESPONSE ACTION

See Appendix A.5

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]

OU3: PLUME GROUNDWATER RECOVERY SYSTEM (PGRS) [Not Operating]

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 2004 - FY 2008 MONITORING PLAN
FOR SURFACE WATER

Analysis	Analytical Method	Units	Site K Effluent (Outfall 010)	Rice Creek (Entering TCAAP) (20700)	Rice Creek (Leaving TCAAP) (20800)	Site C
Flow Rate	- -	M gal/day	Continuous	- -	- -	see App. A.5
Total Flow	- -	M gal	M	- -	- -	
pH	(field)	(pH)	Q	A	A	
Cyanide	9012A	ug/l	Q	A	A	
Copper	6020	ug/l	Q	A	A	
Lead	6020	ug/l	Q	A	A	
Mercury	7470A	ug/l	Q	A	A	
Phosphorus (Total)	365.4	mg/l	Q	A	A	
Silver	6020	ug/l	Q	- -	- -	
Zinc	6020	ug/l	Q	A	A	
Trichloroethene	8260B	ug/l	Q	A	A	
1,1-Dichloroethene	8260B	ug/l	Q	A	A	
1,1-Dichloroethane	8260B	ug/l	Q	A	A	
Cis-1,2-Dichloroethene	8260B	ug/l	Q	A	A	
Trans-1,2-Dichloroethene	8260B	ug/l	Q	A	A	
Vinyl Chloride	8260B	ug/l	Q	A	A	
1,2-Dichloroethane	8260B	ug/l	Q	A	A	

Notes:
M = Measurement required once per month
Q = Analysis required once per quarter
A = Analysis required once per year

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 C (SHALLOW GROUNDWATER) (4)

EDTA	none
Lead (dissolved)	(note 4)
Copper (dissolved)	(note 4)

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.

(4) From Contingency Plan, surface water standards are calculated

Analytical Methods:

VOCs: SW-846 Method 8260B

Antimony: SW-846 Method 6020

APPENDIX A.4 (cont'd)
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)

GRENADE RANGE

SVOCs (bis (2-ethylhexyl) phthalate)
PCBs (PCB-1016, 1221, 1232, 1242, 1248, 1254, 1260)
Metals (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, nickel, silver, thallium, vanadium, zinc)
Radionuclides (gross alpha, gross beta, radium 226, radium 228)

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

(Total numbers of samples are shown, excluding field duplicates.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Surface Water Sampling												
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

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 8.3×10^{-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 or Jordan Formation
PJ	-	Unit 4: Prairie du Chien Group and 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				✓	

TABLE B-1
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

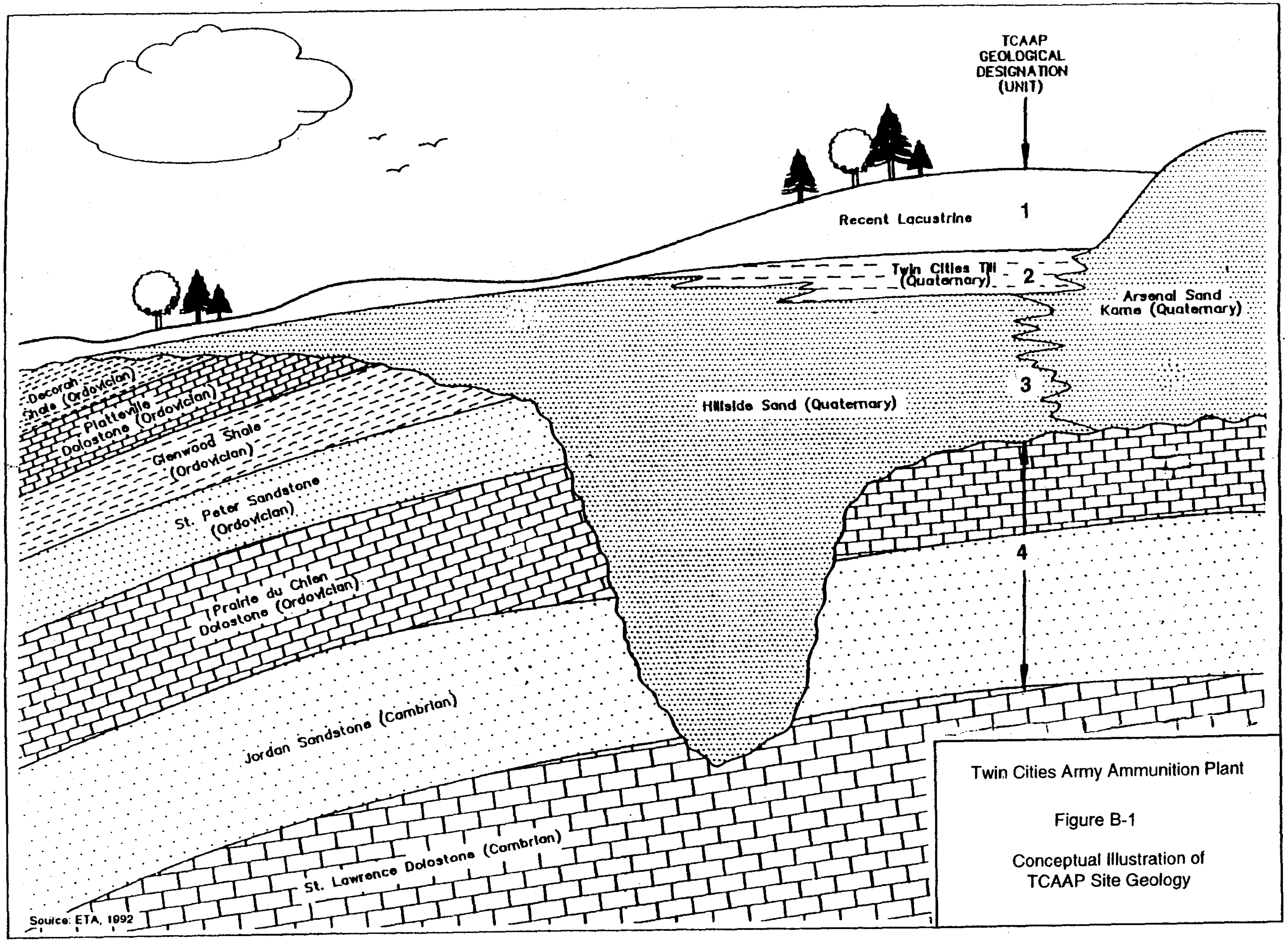
Boring Logs On-TCAAP Wells
Sorted By IRDMIS Number

TCAAP Well Boring logs are include on this CD ROM as Table B-3 and Table B-4

Appendix B: Table B-4

Boring Logs Off-TCAAP Wells
Sorted By IRDMIS Number

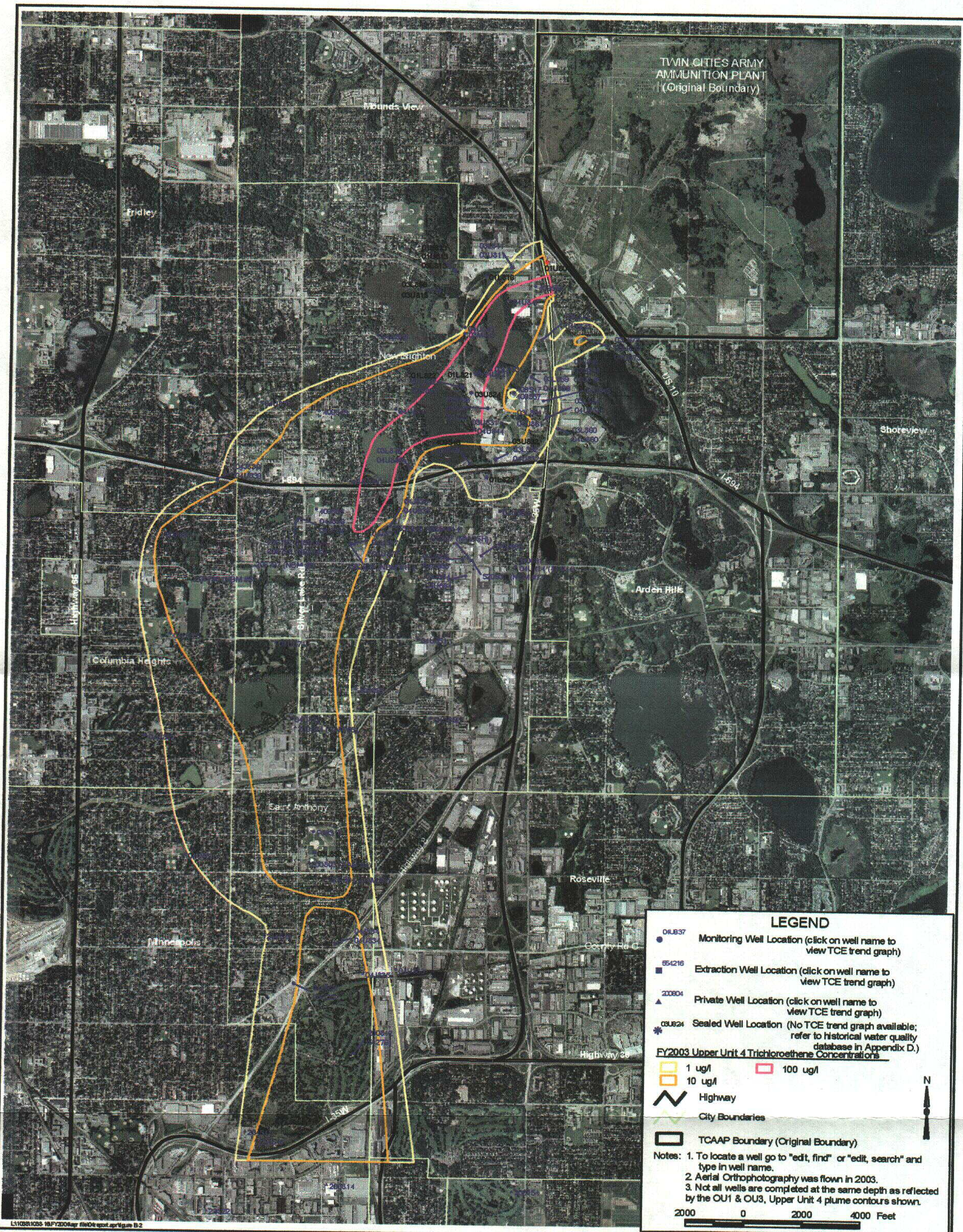
TCAAP Well Boring logs are include on this CD ROM as Table B-3 and Table B-4



Twin Cities Army Ammunition Plant

Figure B-1

Conceptual Illustration of
TCAAP Site Geology



TWIN CITIES ARMY AMMUNITION PLANT

OU1 & OU3 Well Location and TCE History Map

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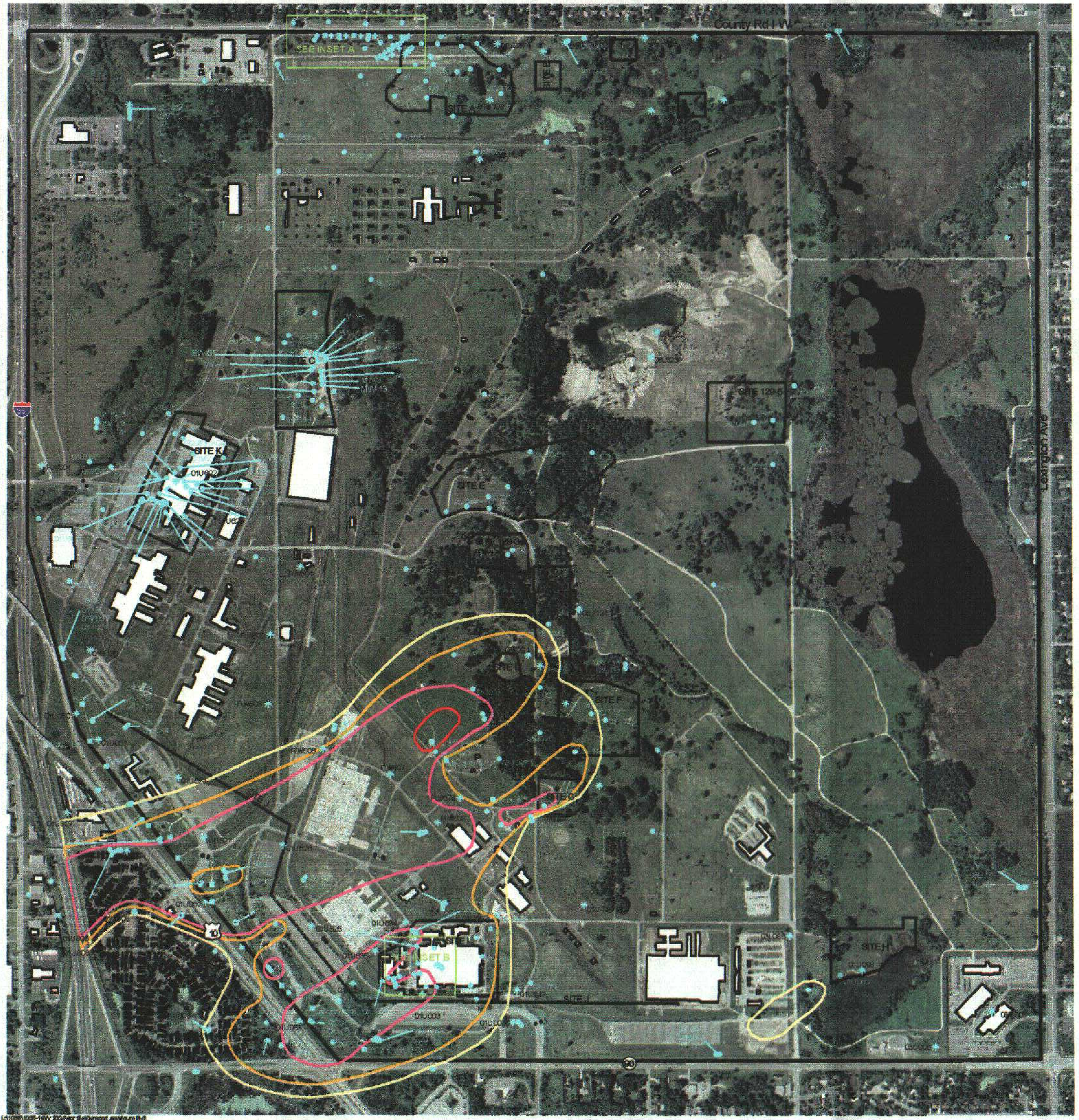
Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

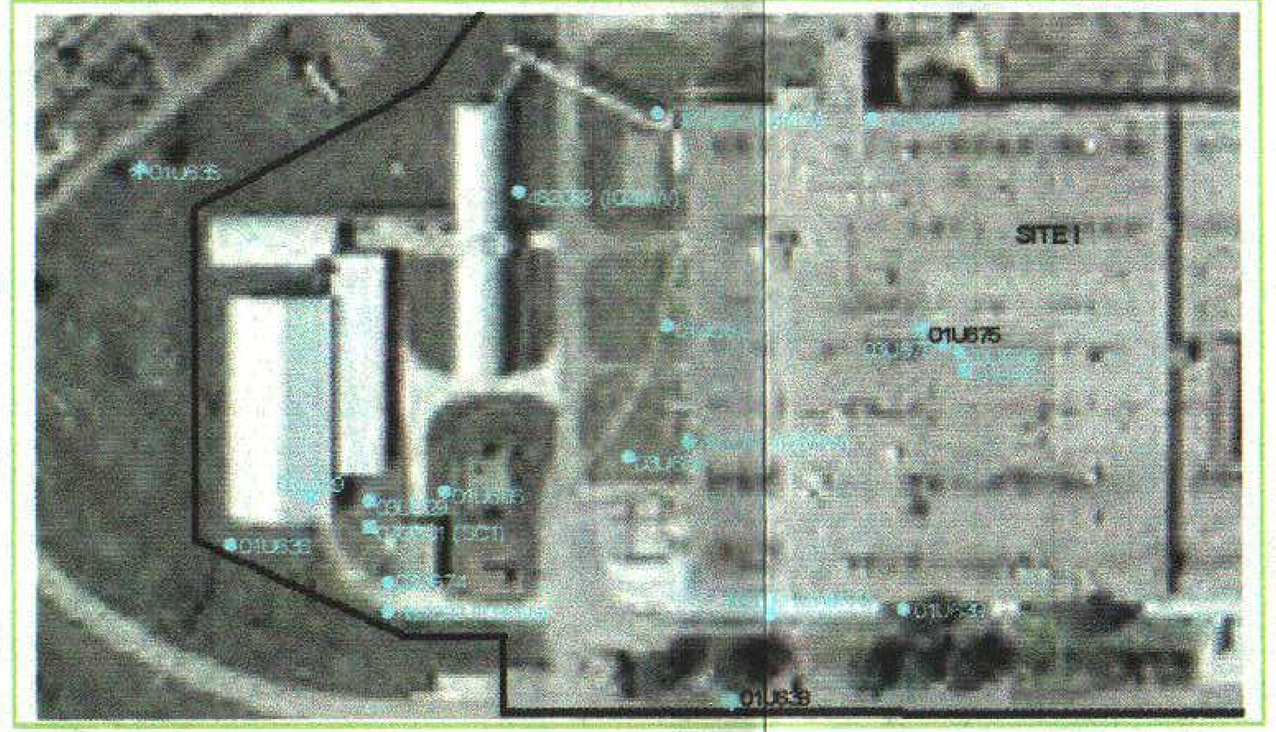
FY 2004

Figure B-2



INSET A

INSET B



LEGEND

- 03L086 — Monitoring Well Location (click on well name to view TCE trend graph)
- 03U317 — Extraction Well Location (click on well name to view TCE trend graph)
- 01U156 — Piezometer Location (for groundwater elevation only; no water quality data is collected.)
- PJ#508 — Sealed Well Location (No TCE trend graph available; refer to historical water quality database in Appendix D.)

FY2003 Upper Unit 3 Trichloroethene Concentrations

- 1 ug/l
- 10 ug/l
- 100 ug/l
- 1000 ug/l

- Buildings
- TCAAP Boundary (Original Boundary)
- Site Boundaries

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.

N

800 0 800 1600 Feet

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2004
OU2 Well Location and TCE History Map		Figure B-3

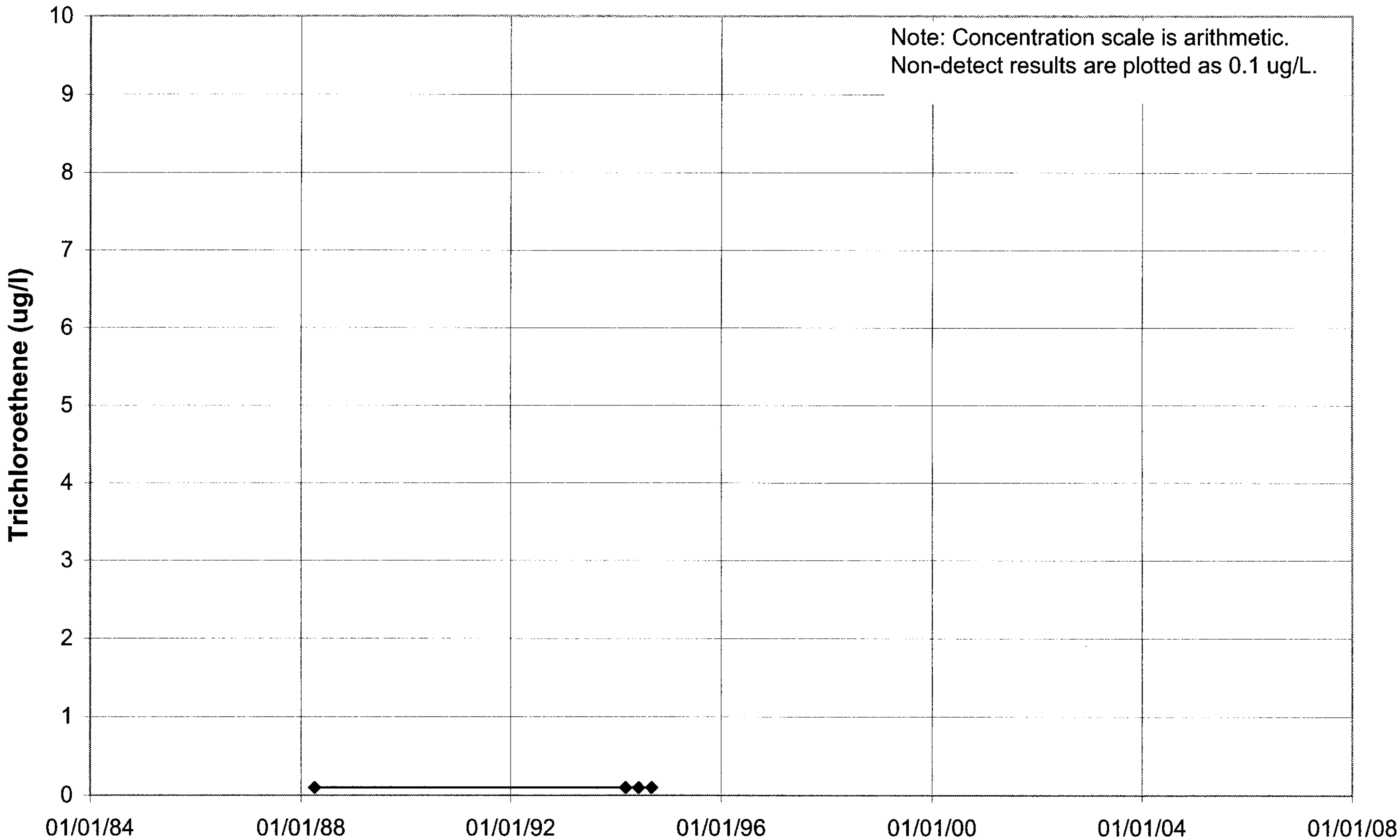
Trend Graph Not Available,
Well No Longer Routinely Sampled

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

01U038



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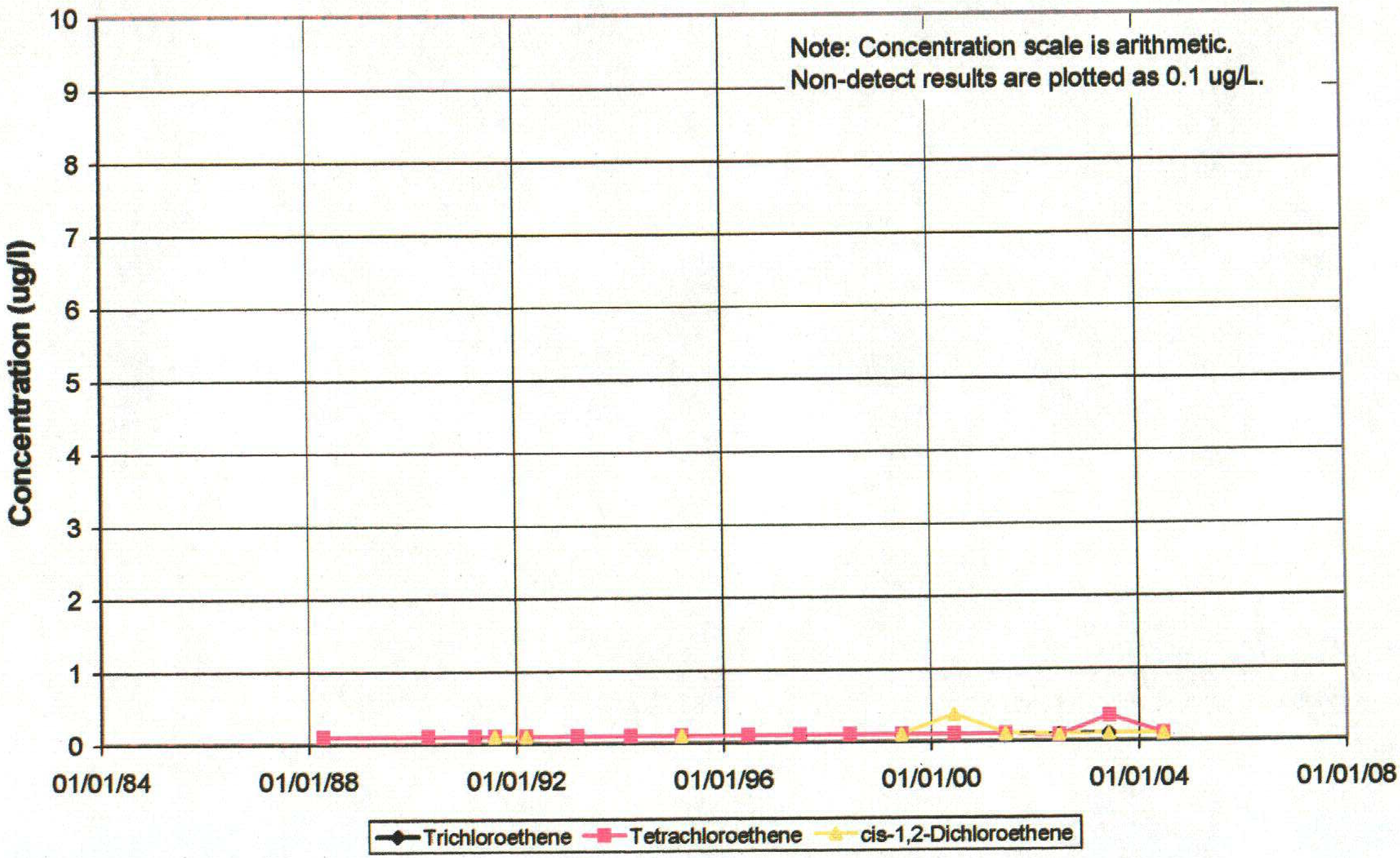
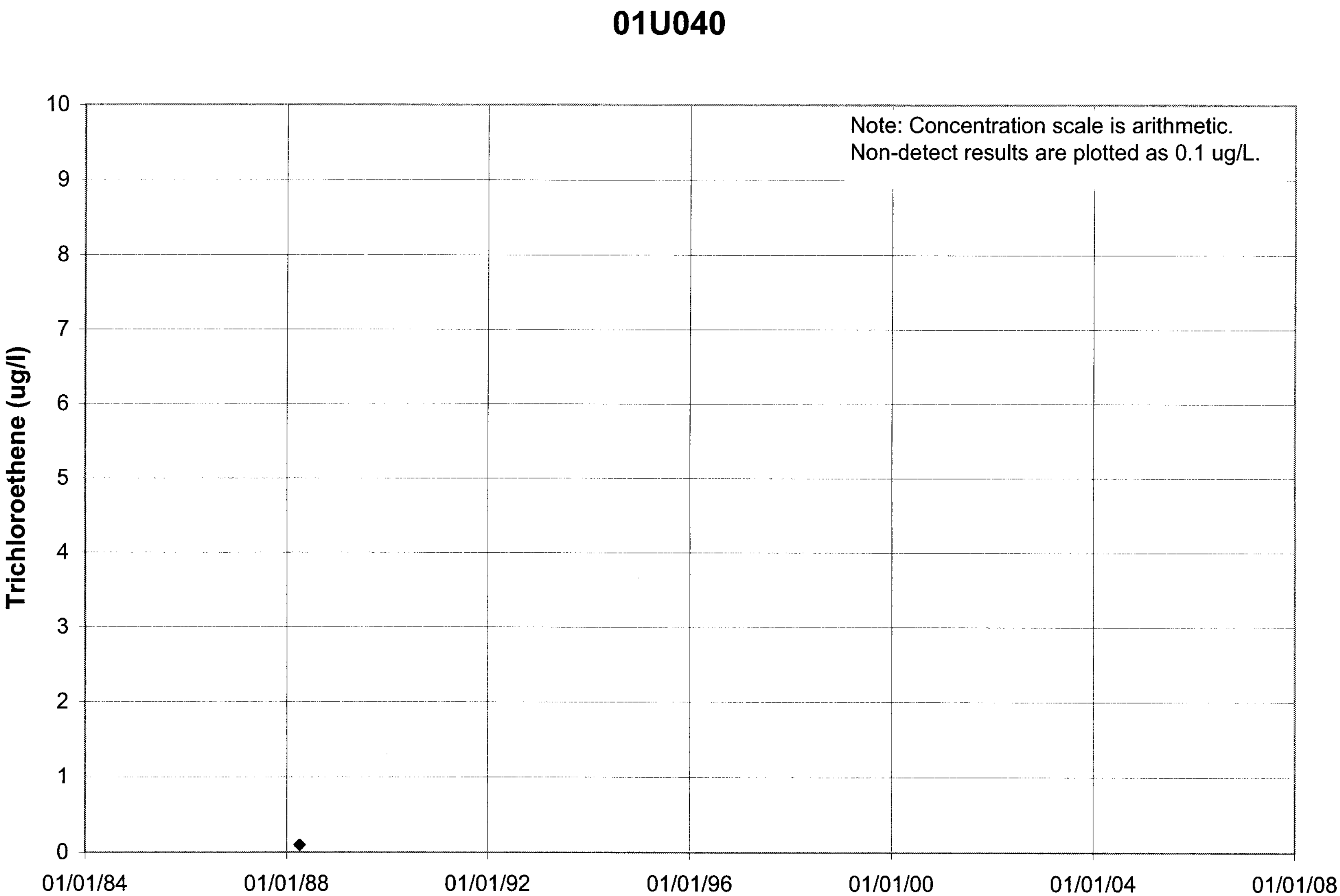
01U039



TO RETURN TO MAP: Click on "Go to Previous View" Button in the Tool Bar



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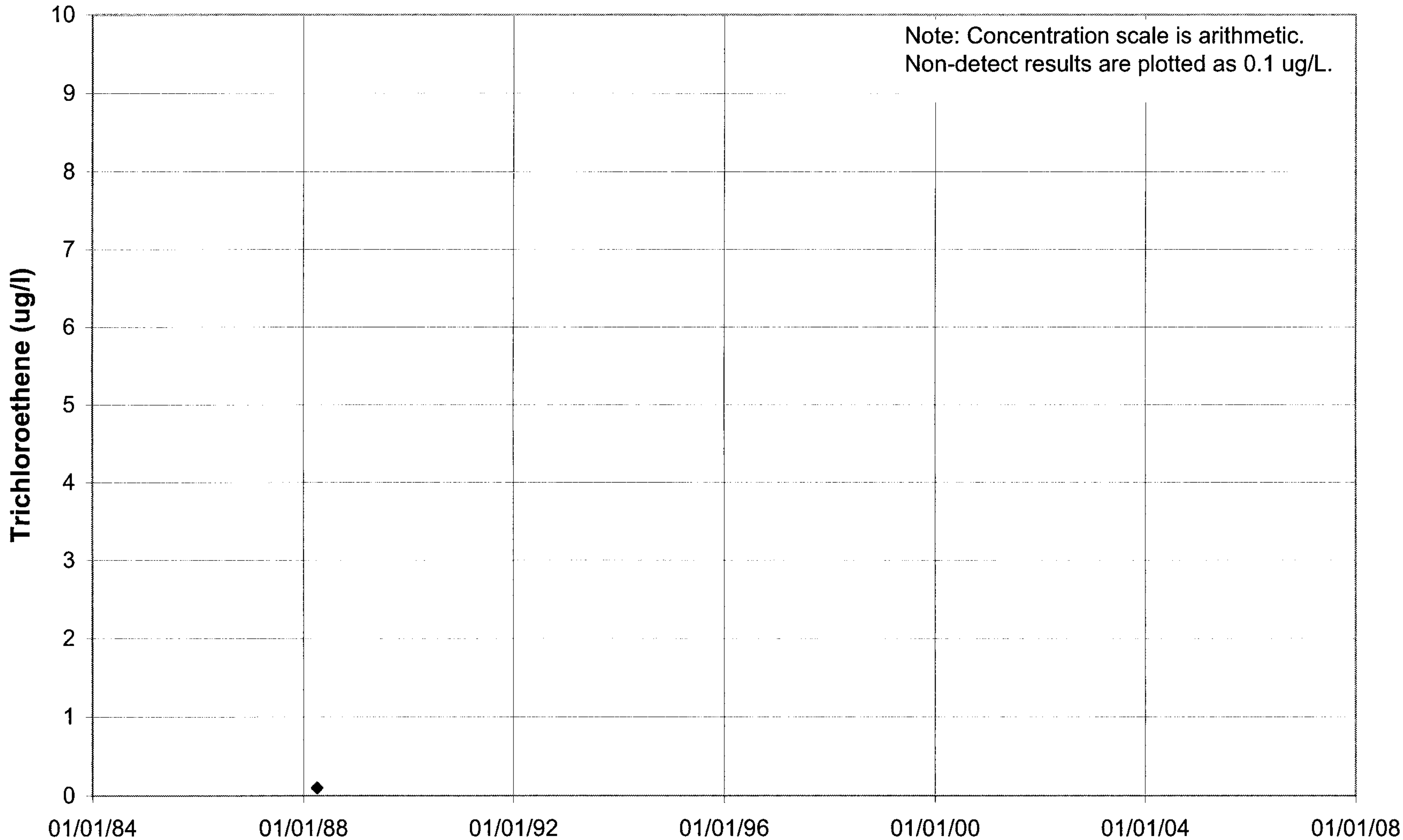

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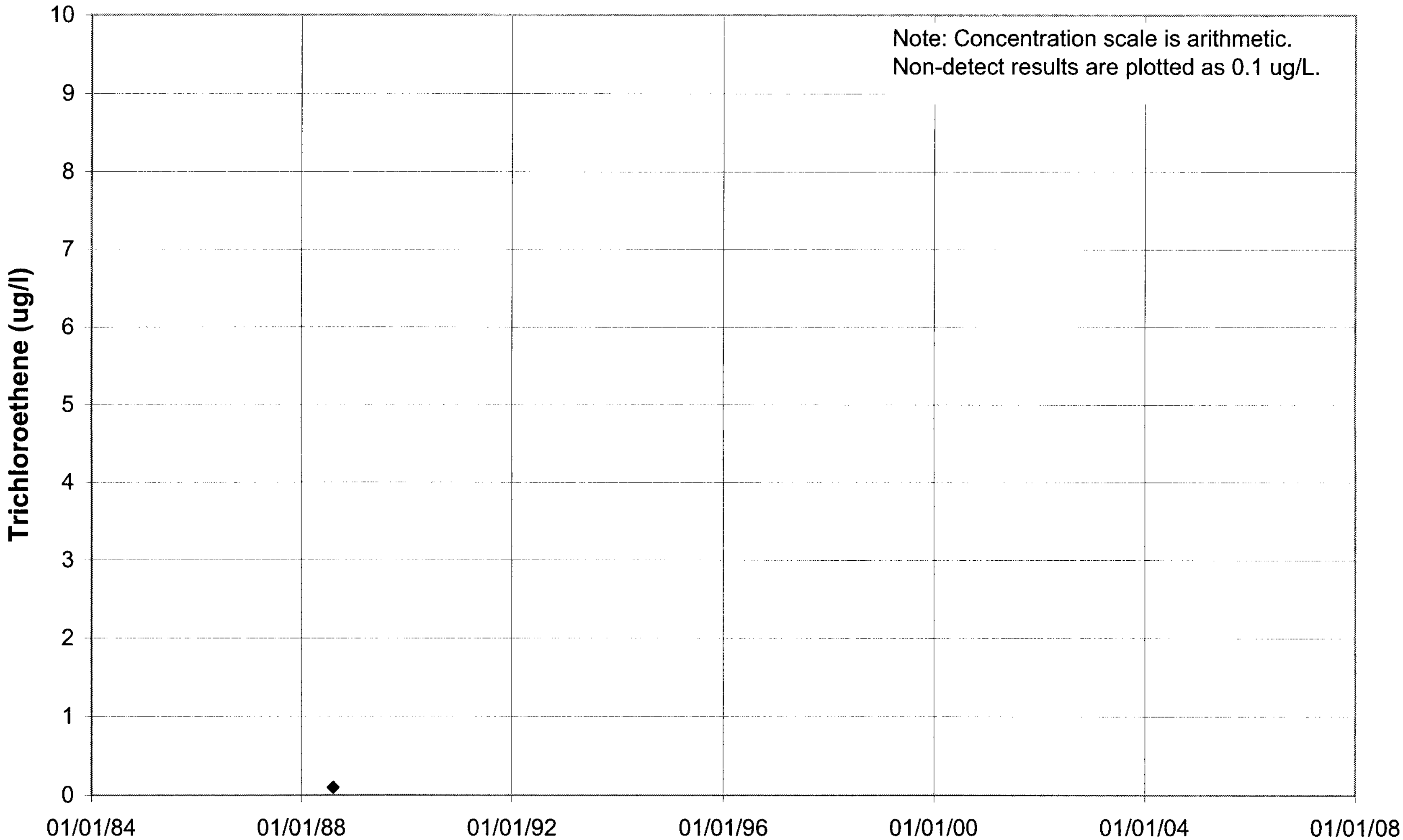

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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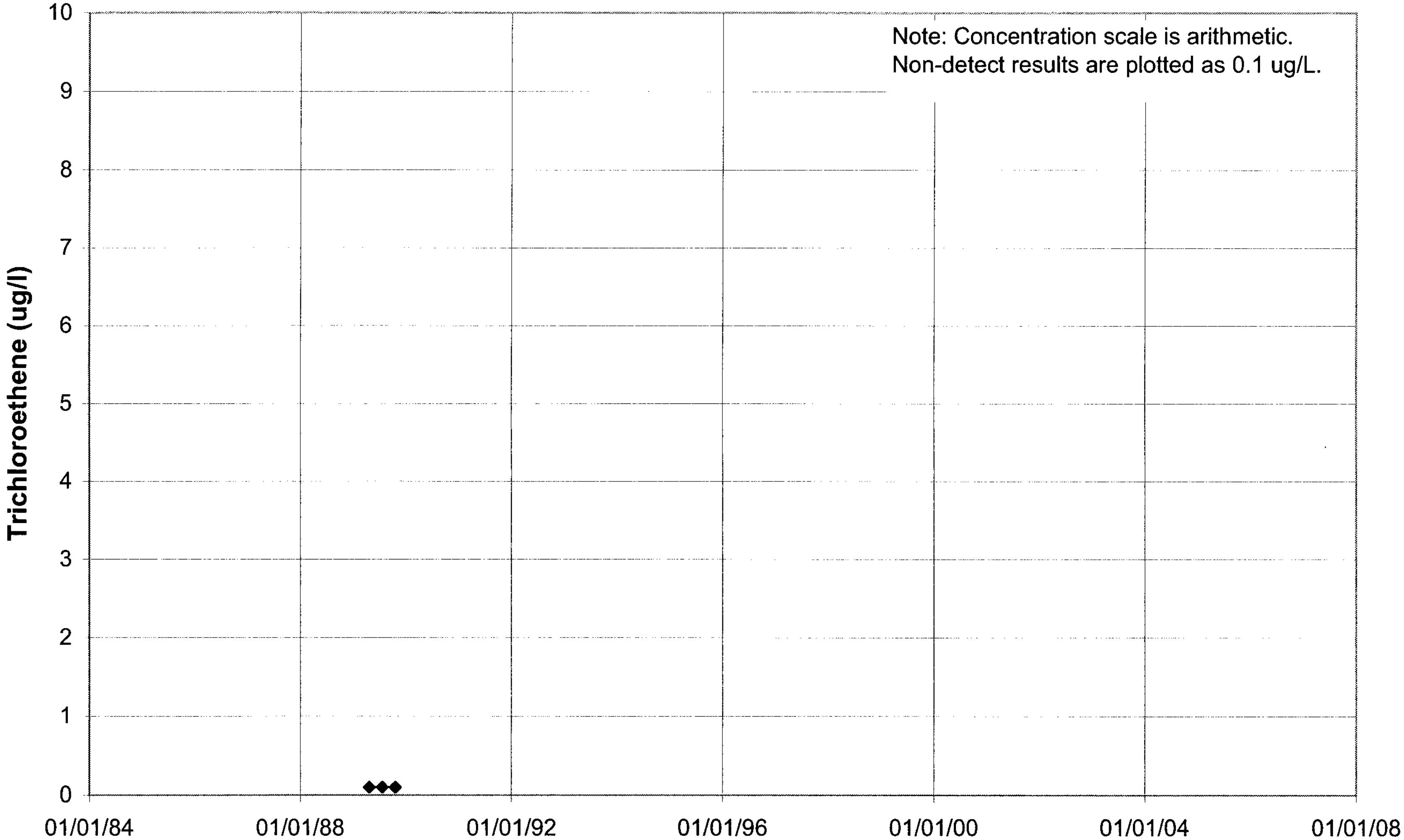

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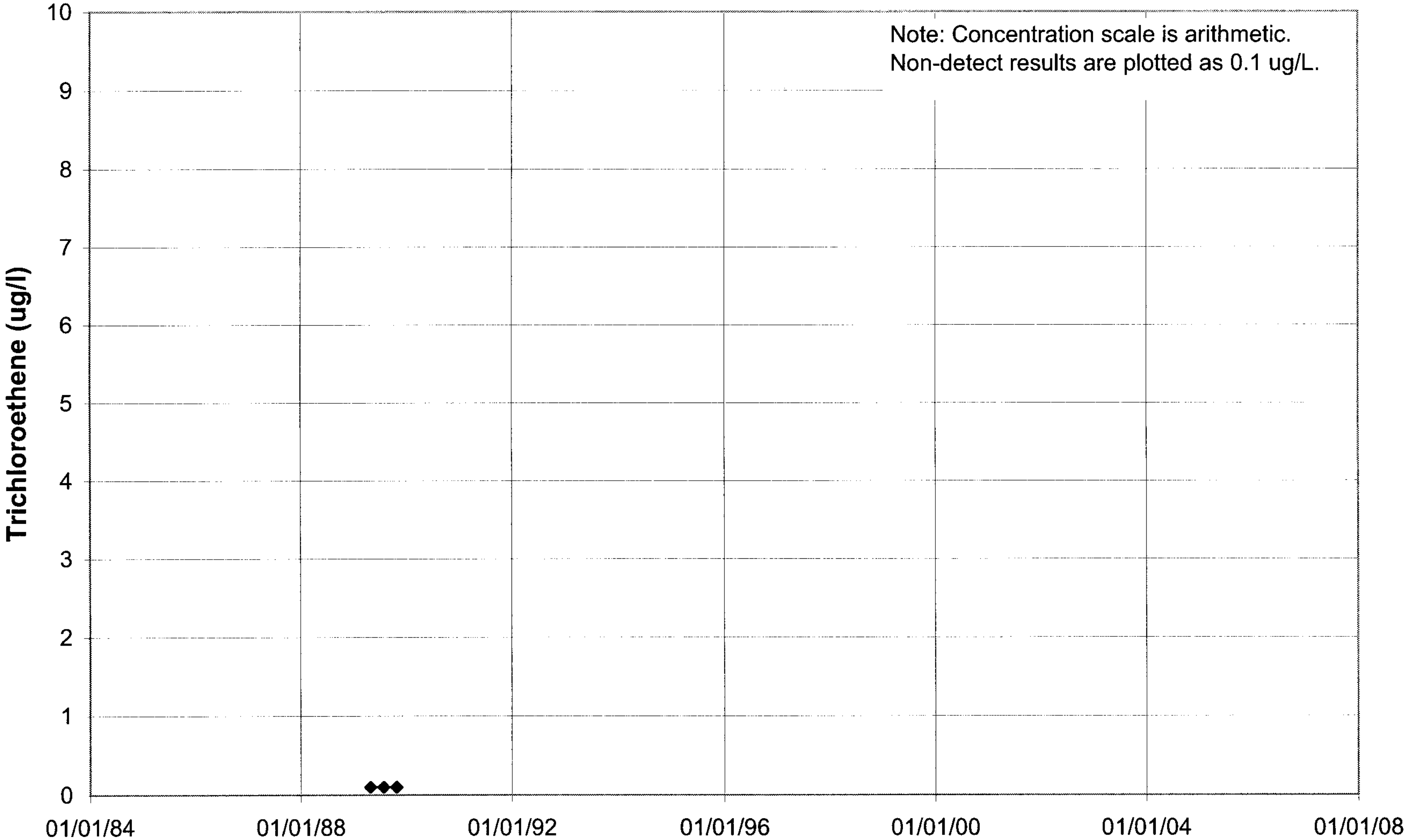
01U052



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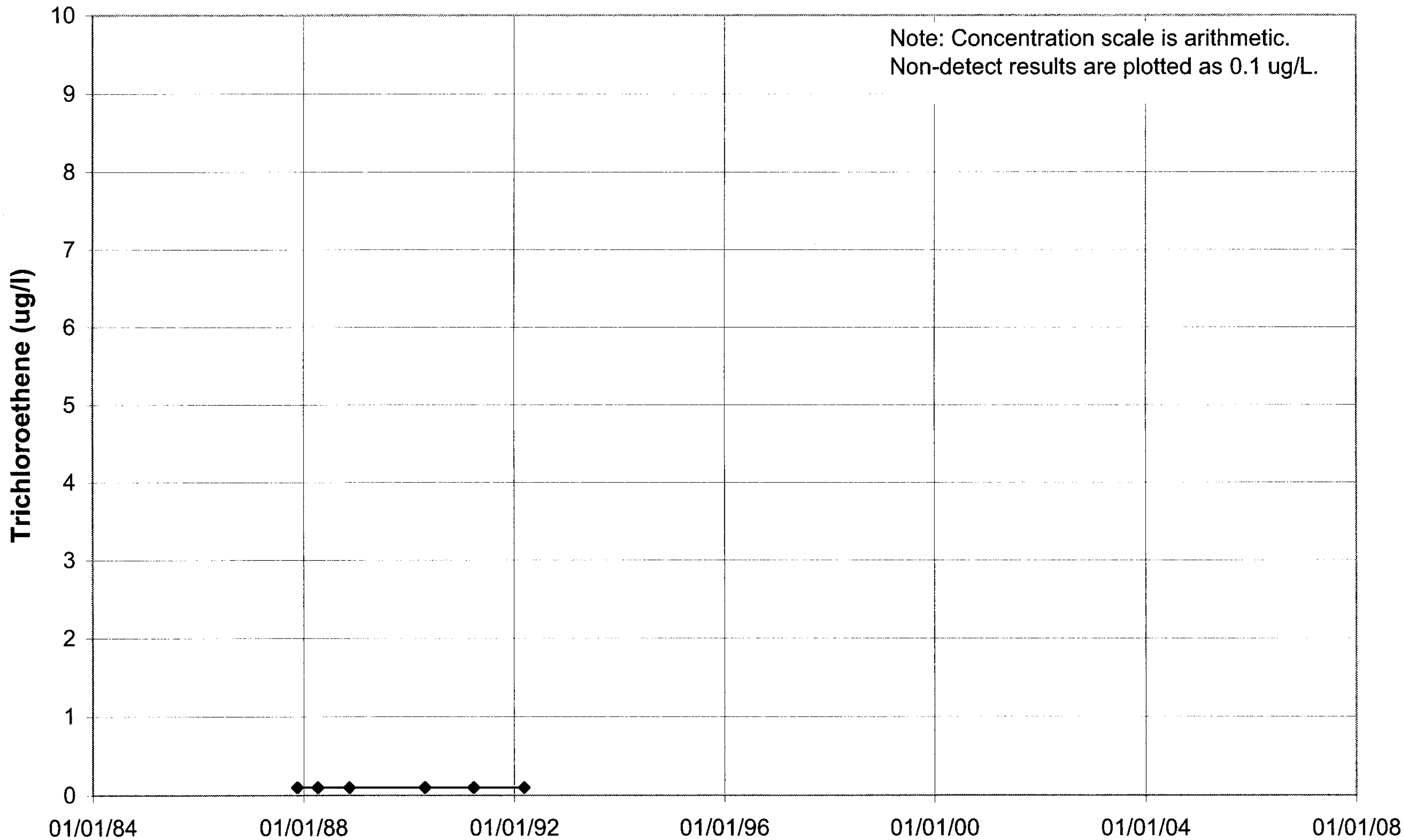

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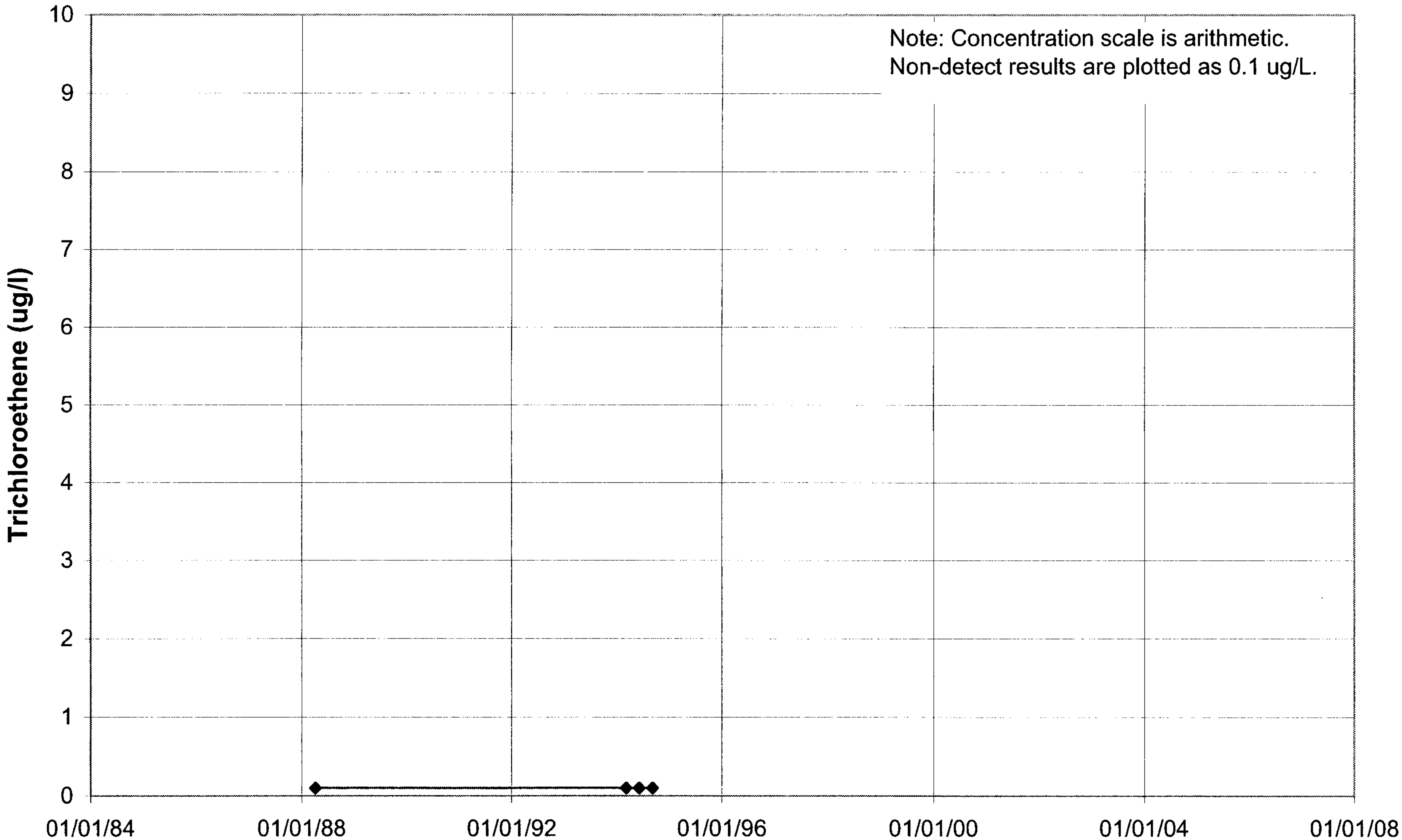
01U063



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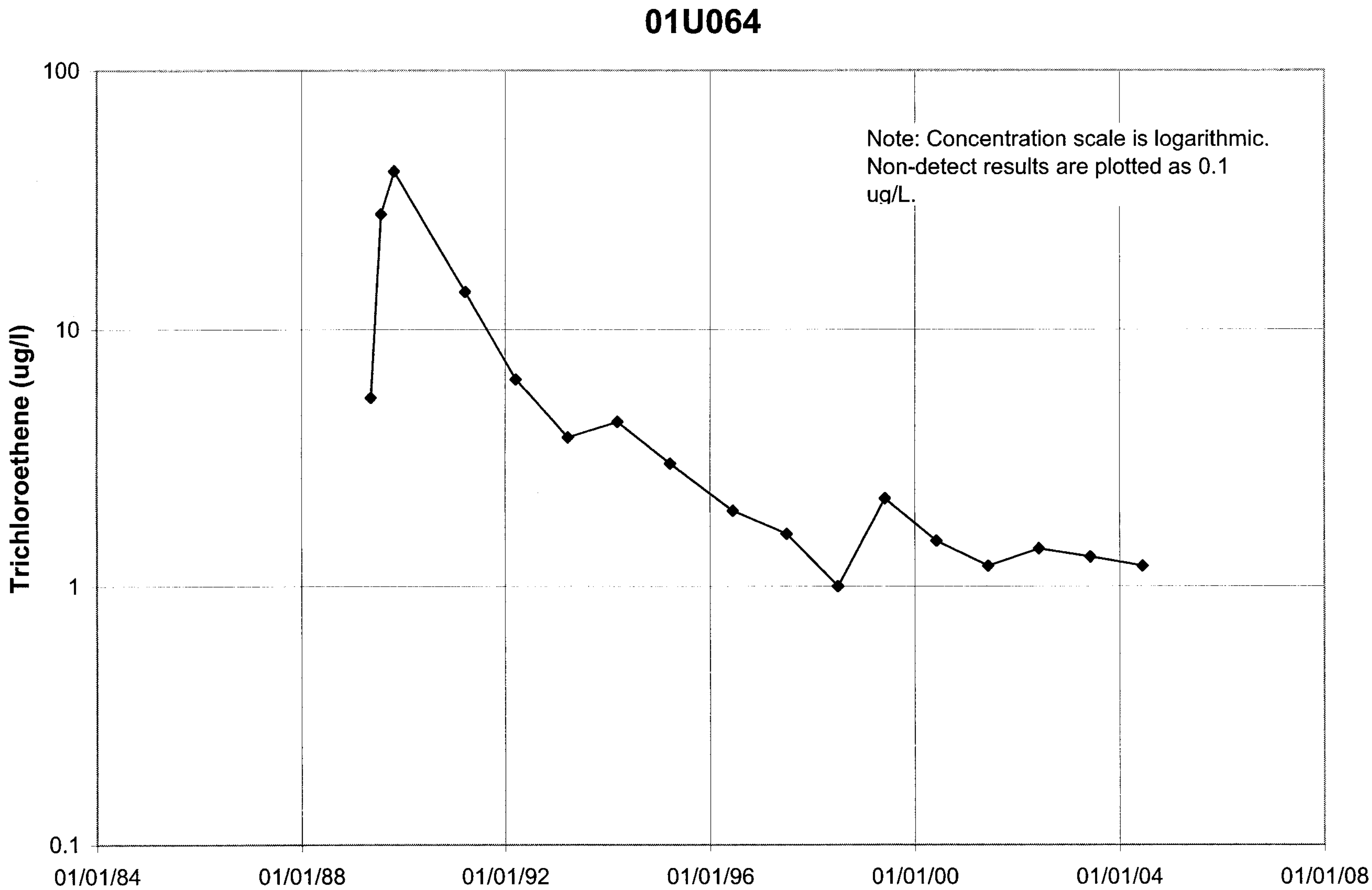

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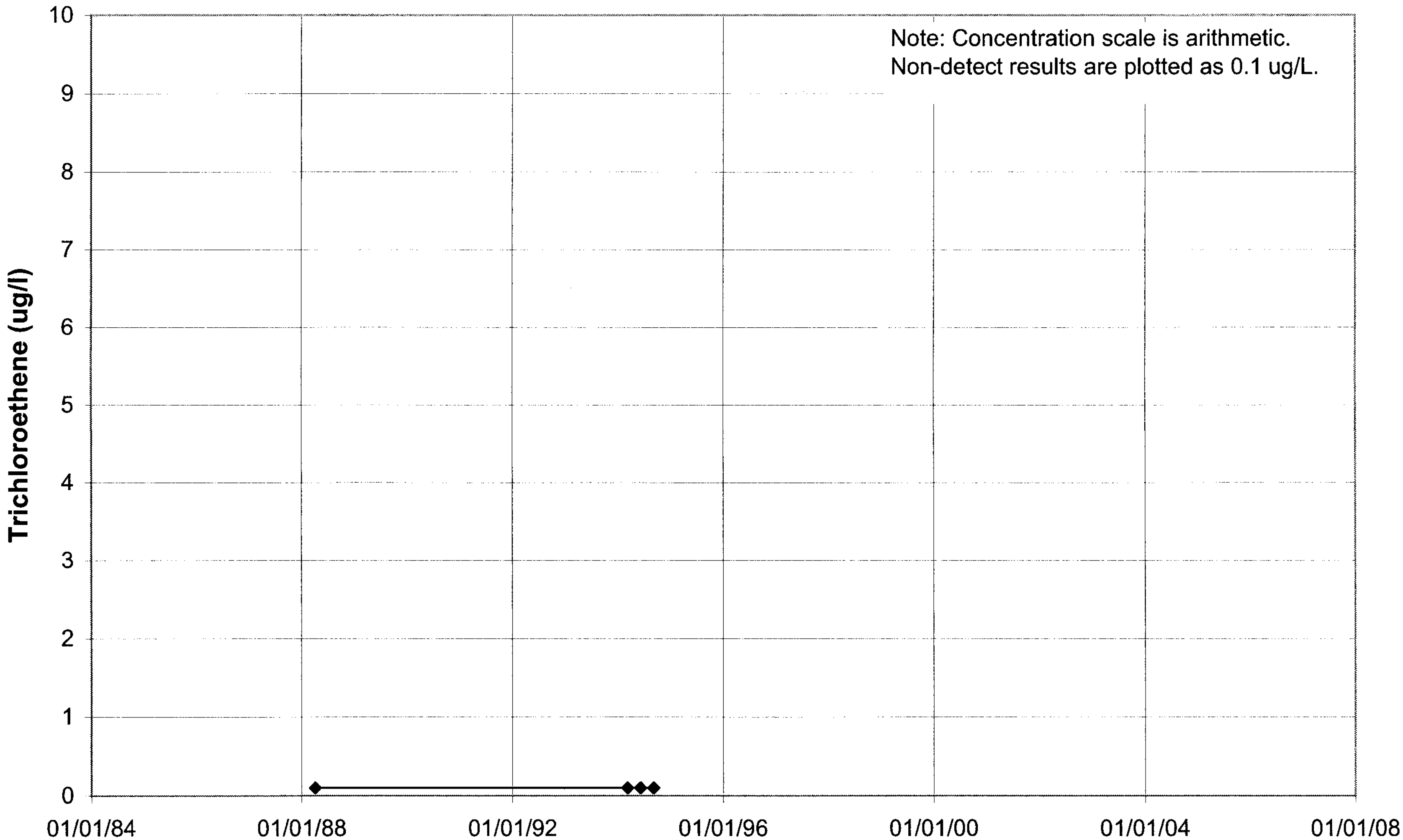
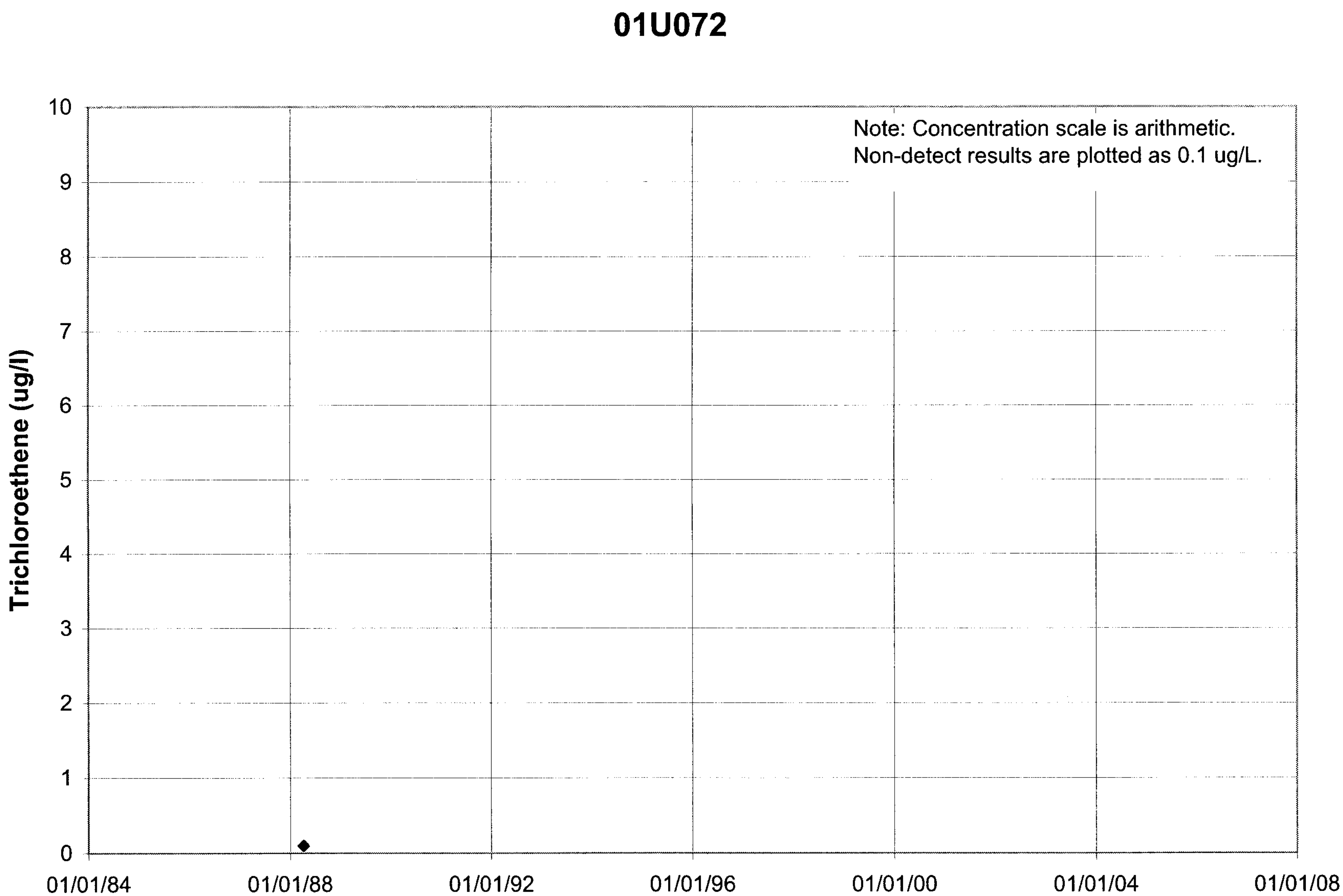
01U067



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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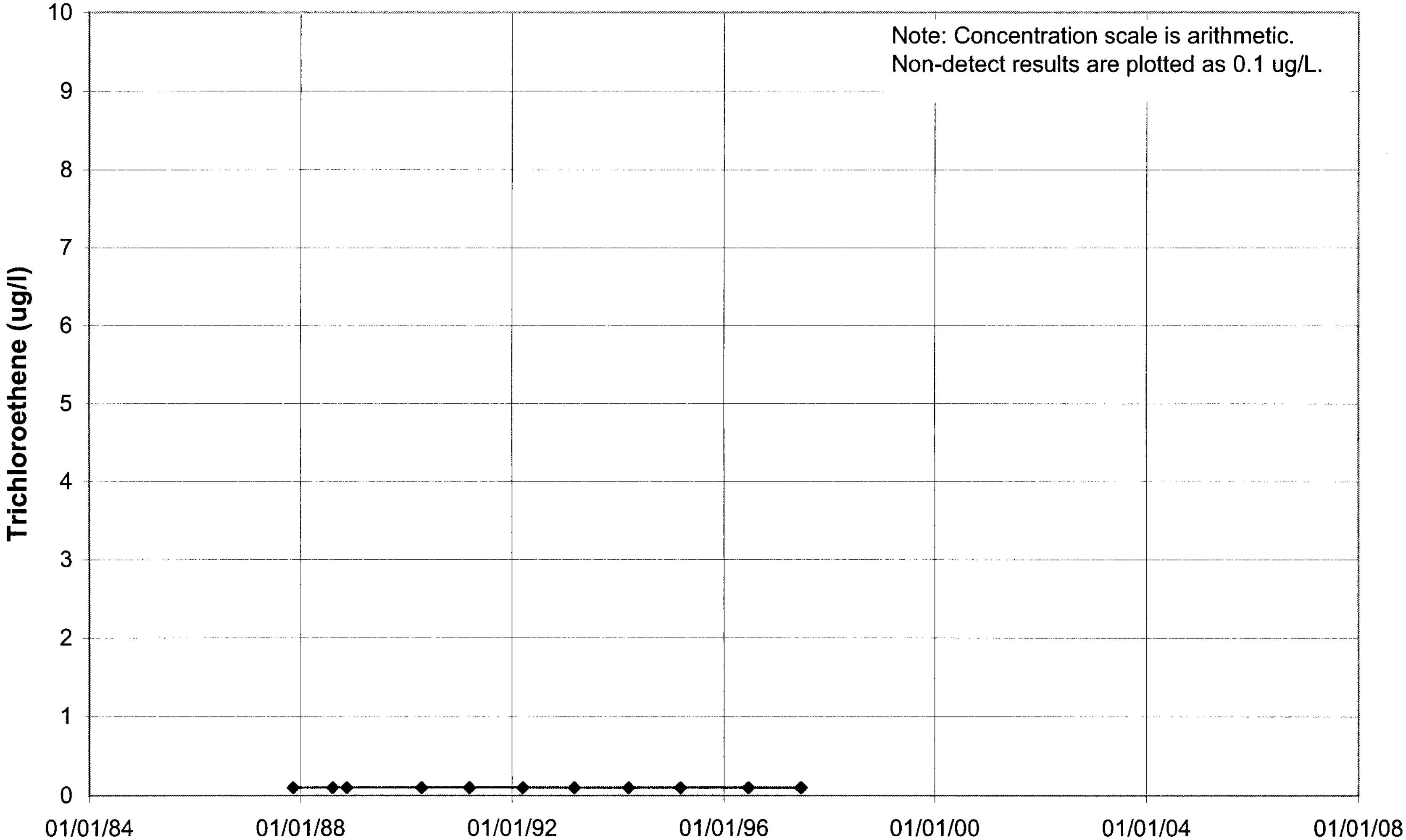
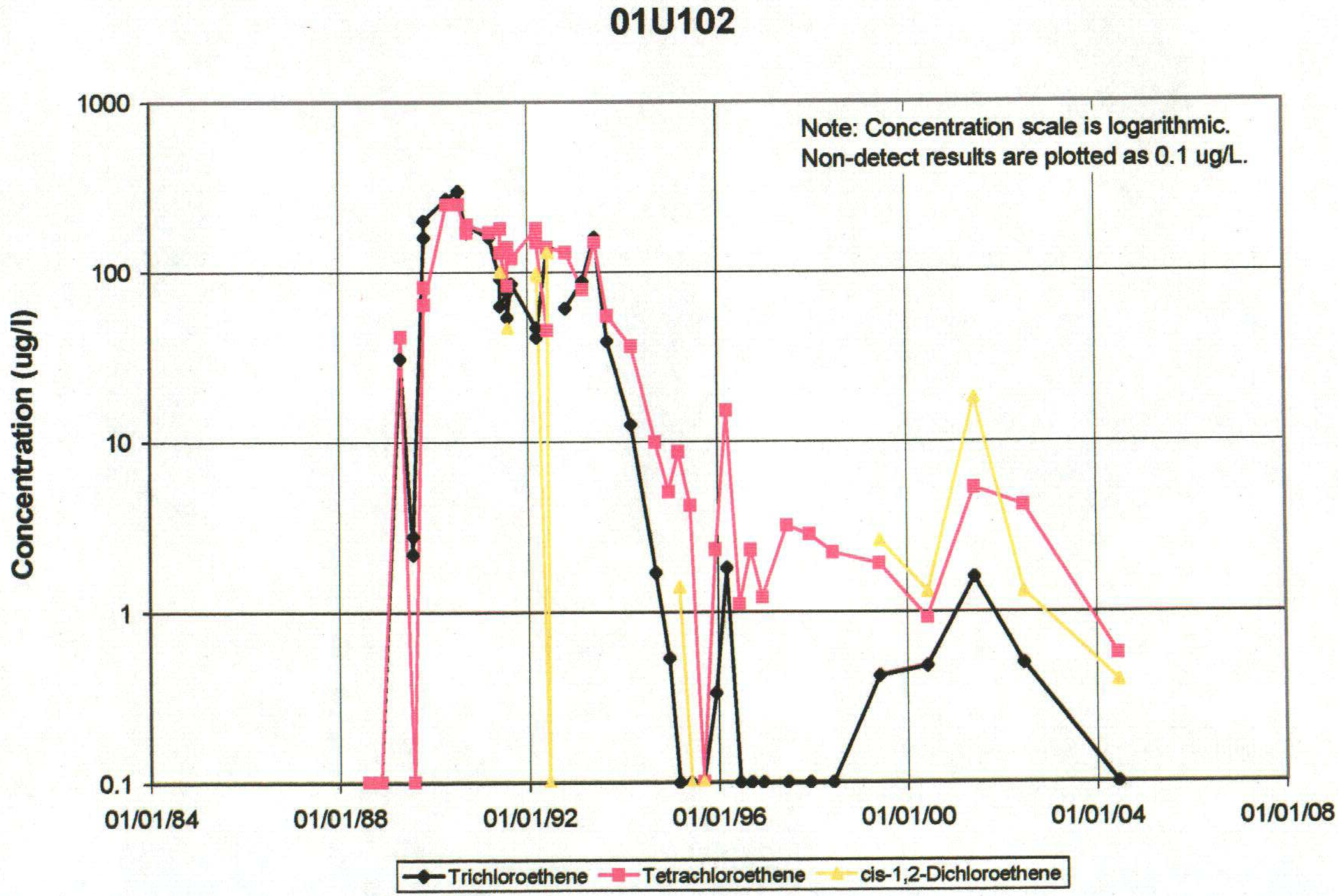
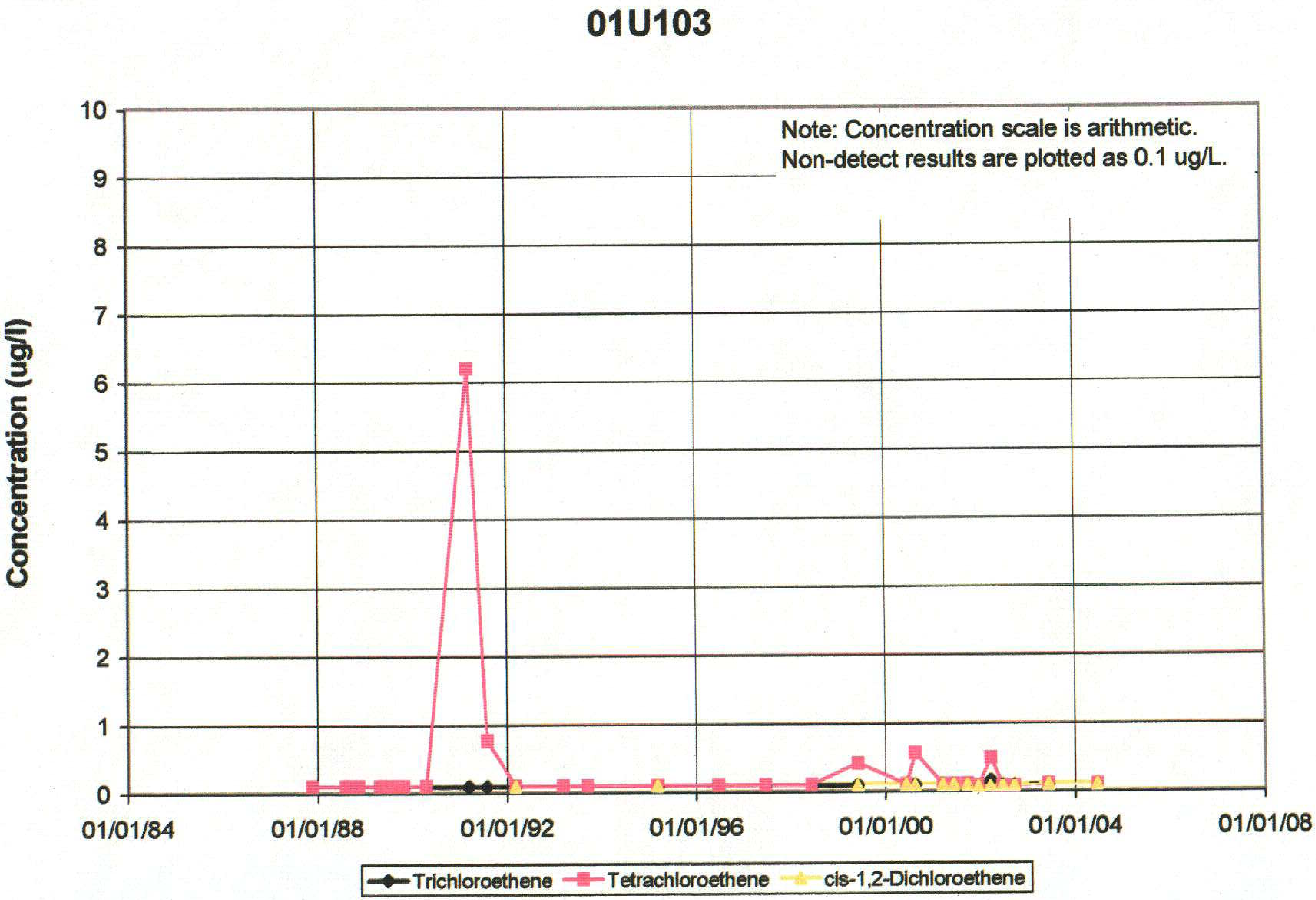
01U085



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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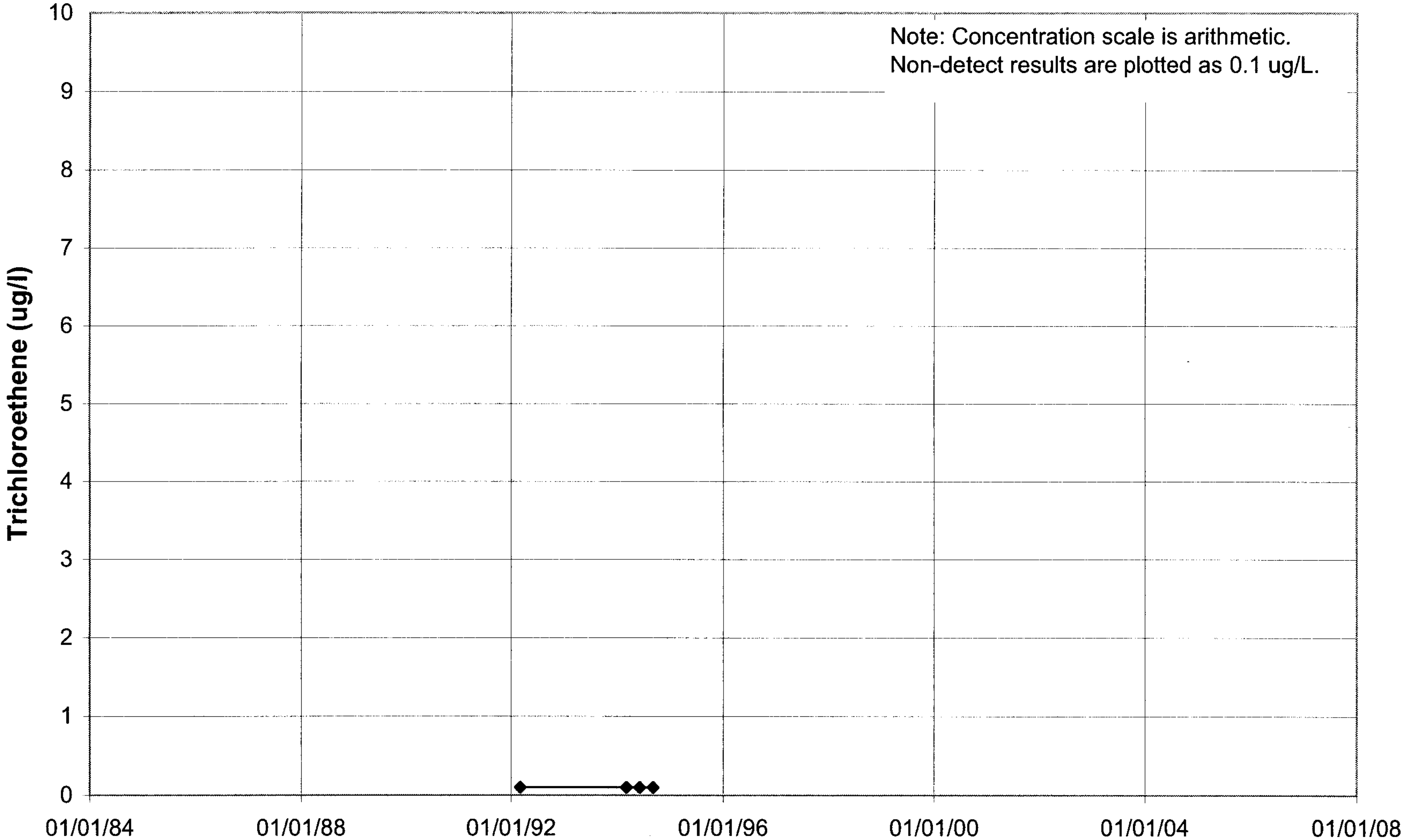
01U104



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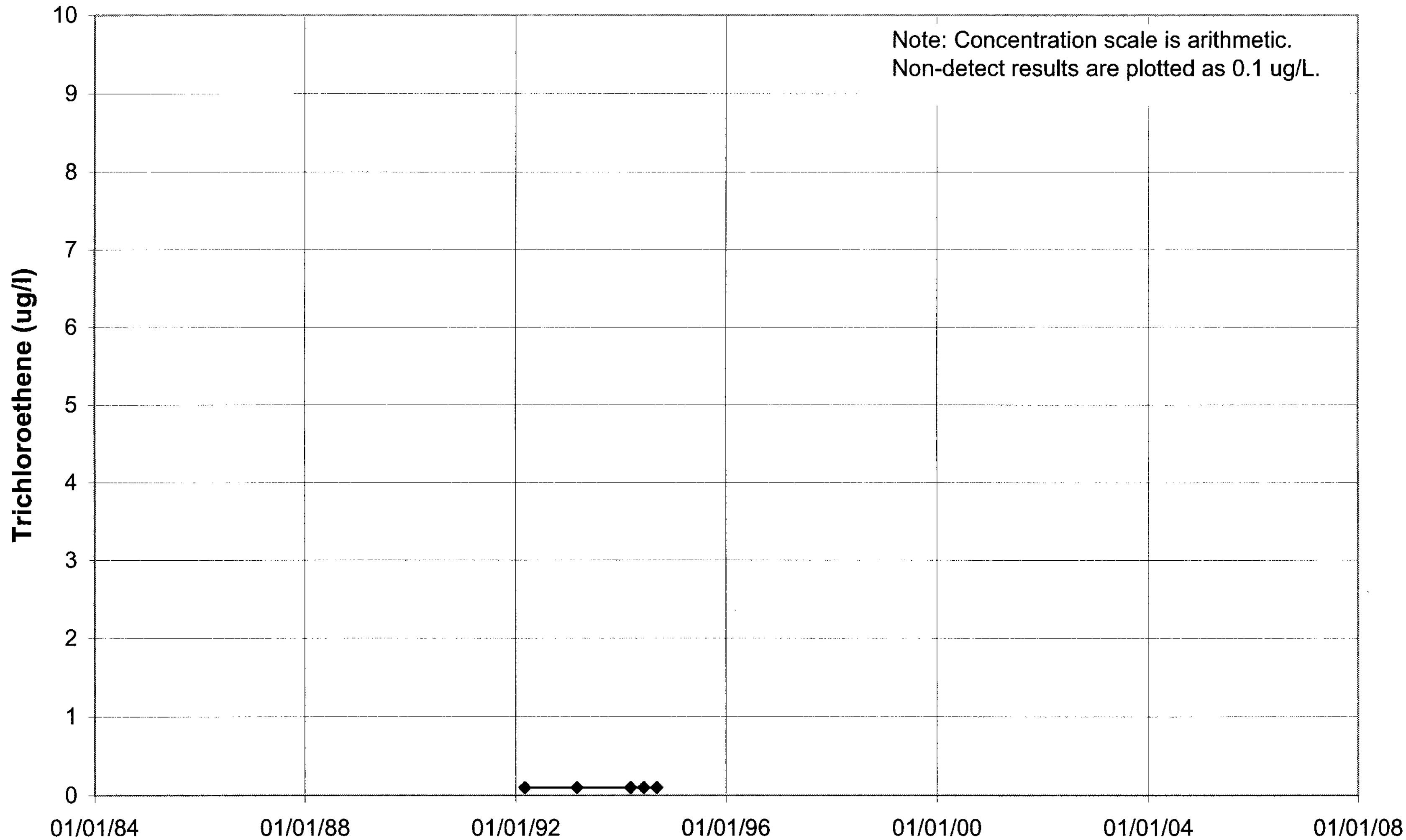
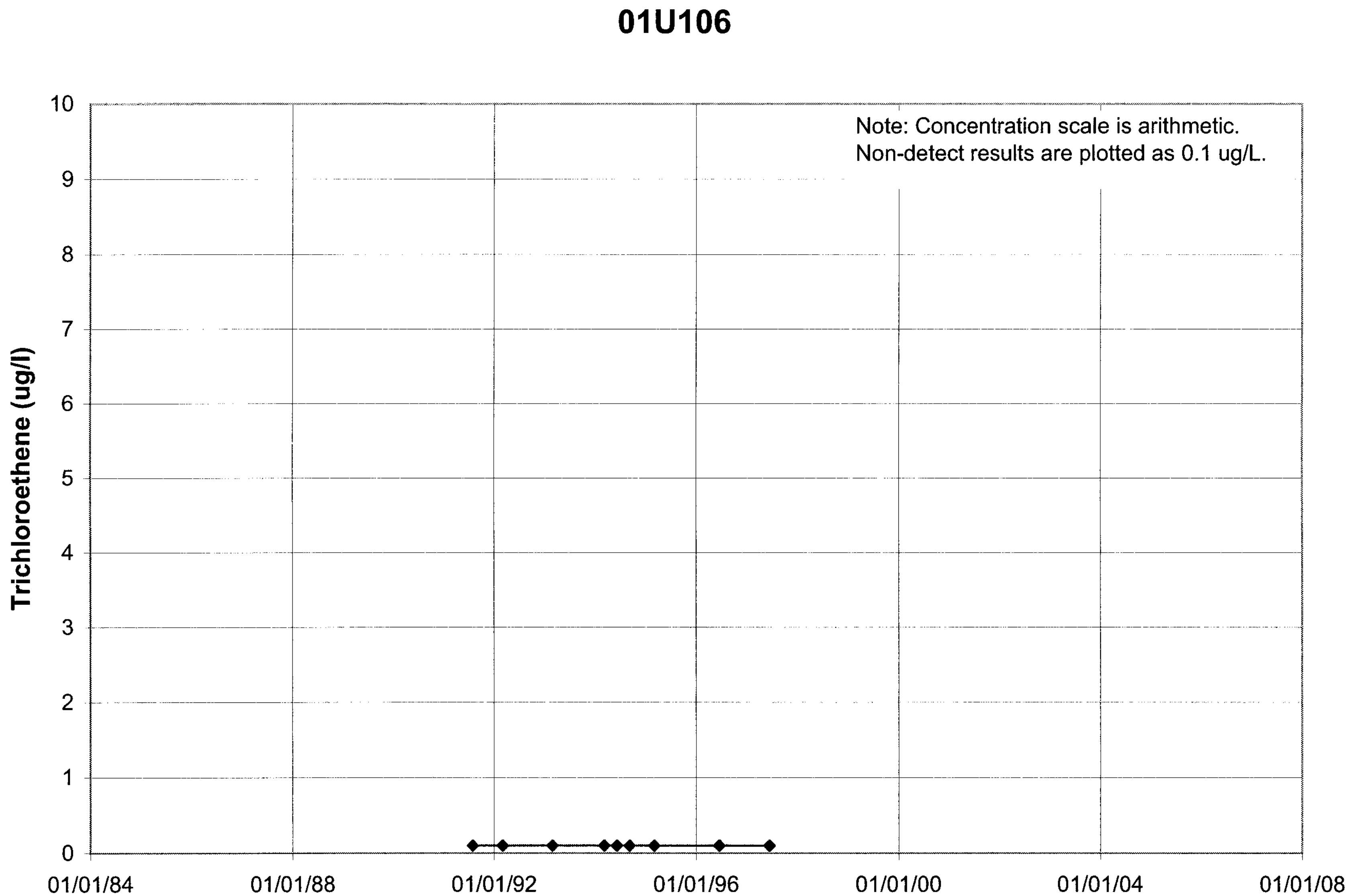
01U105

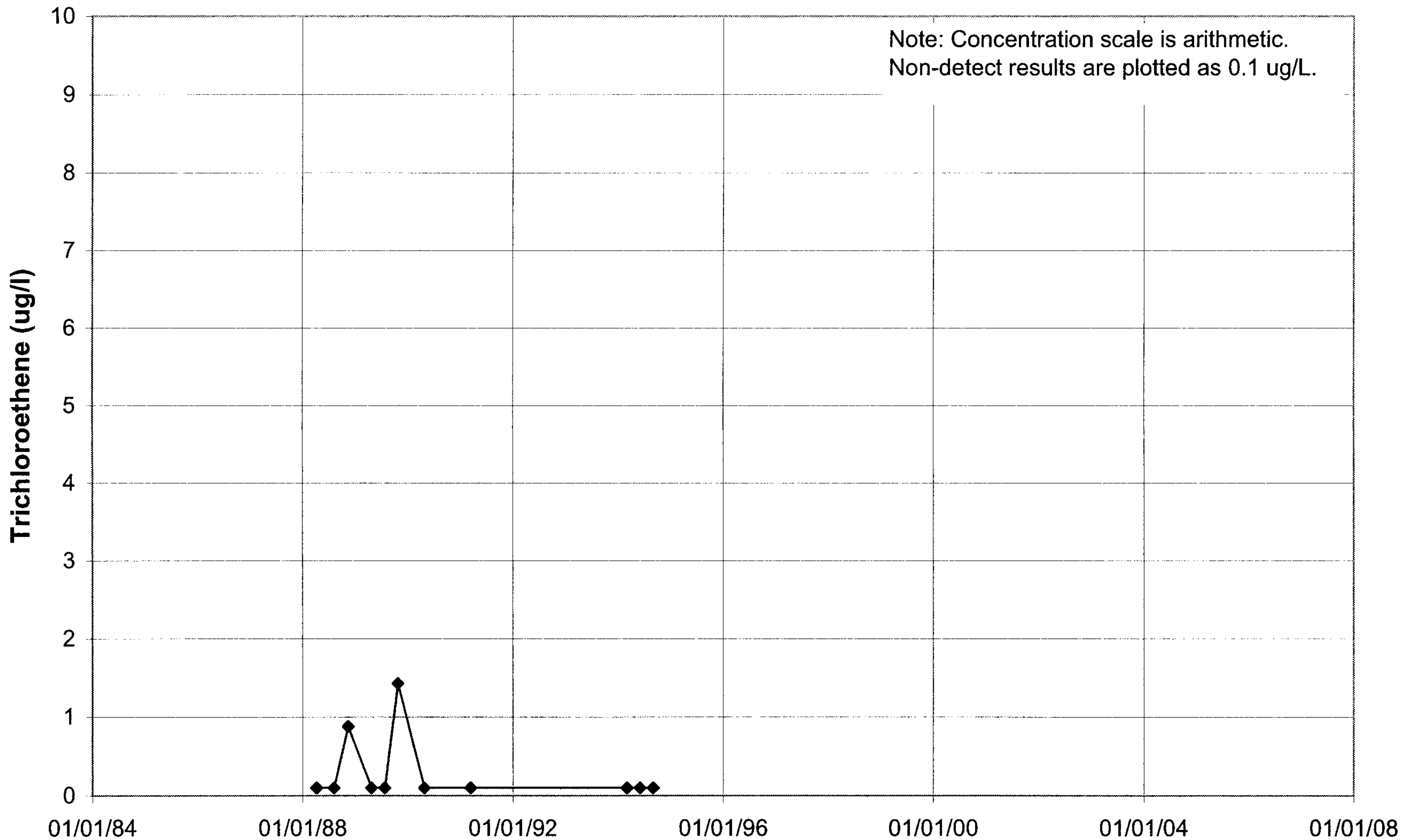


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U107



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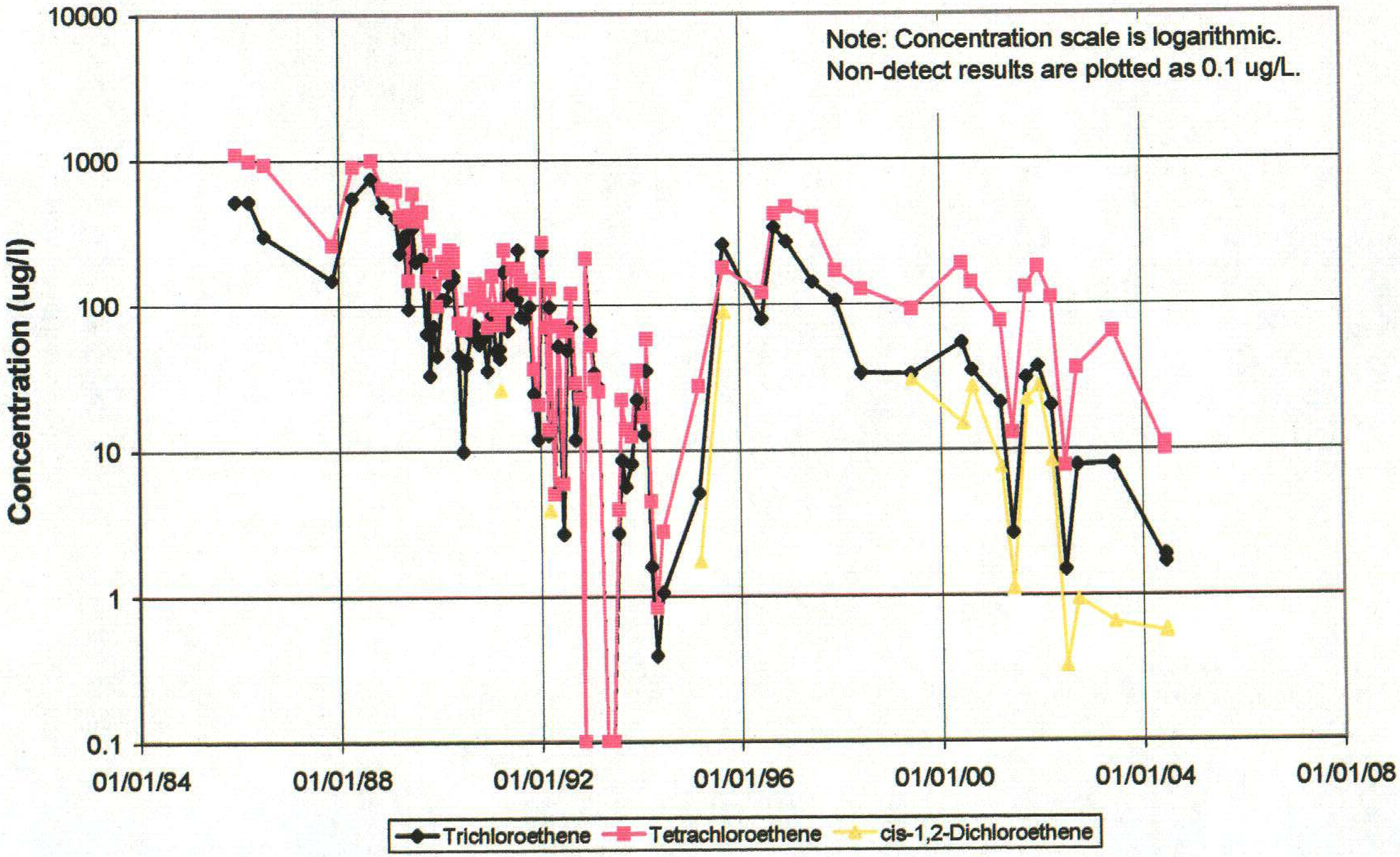
01U108



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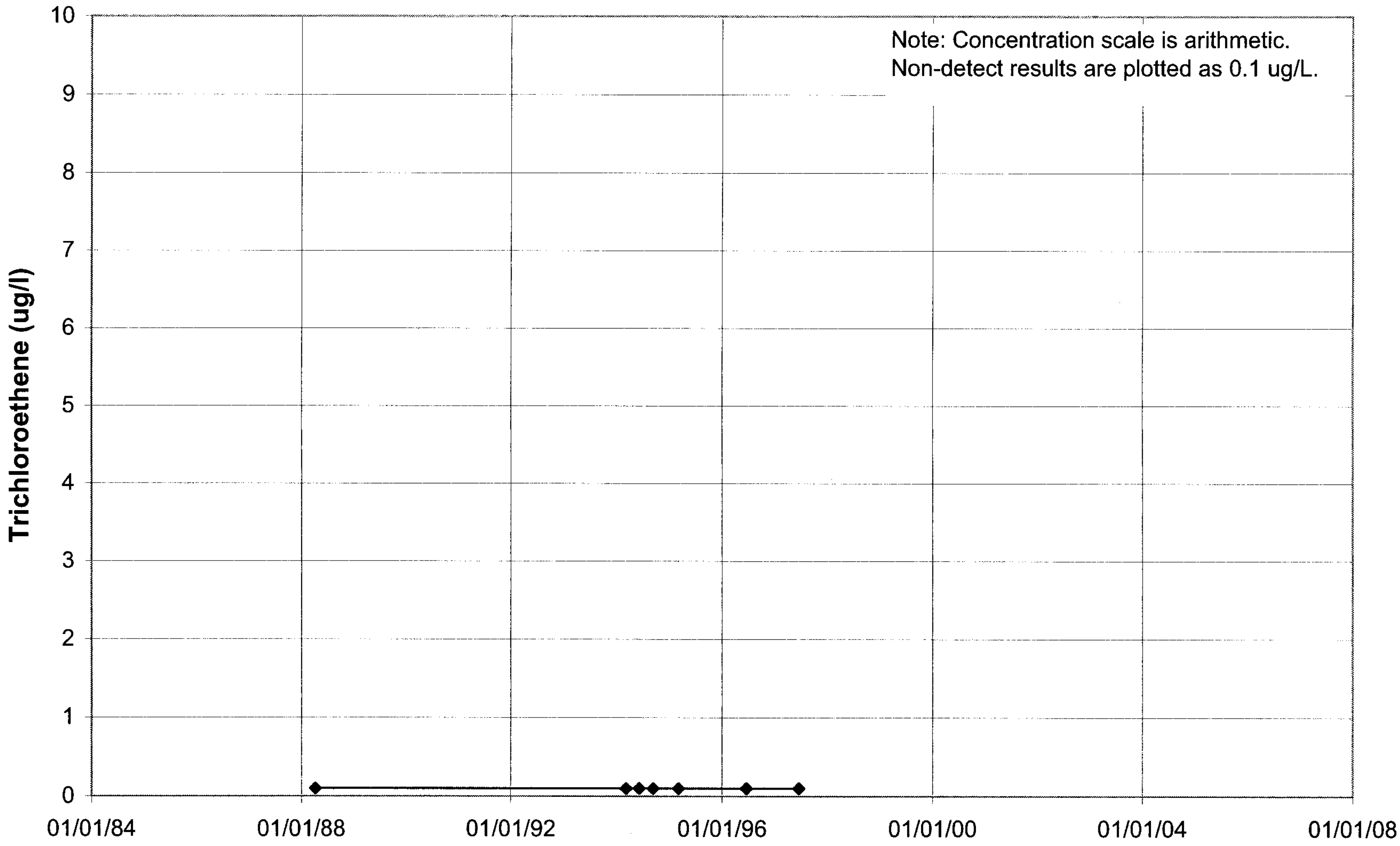
01U110



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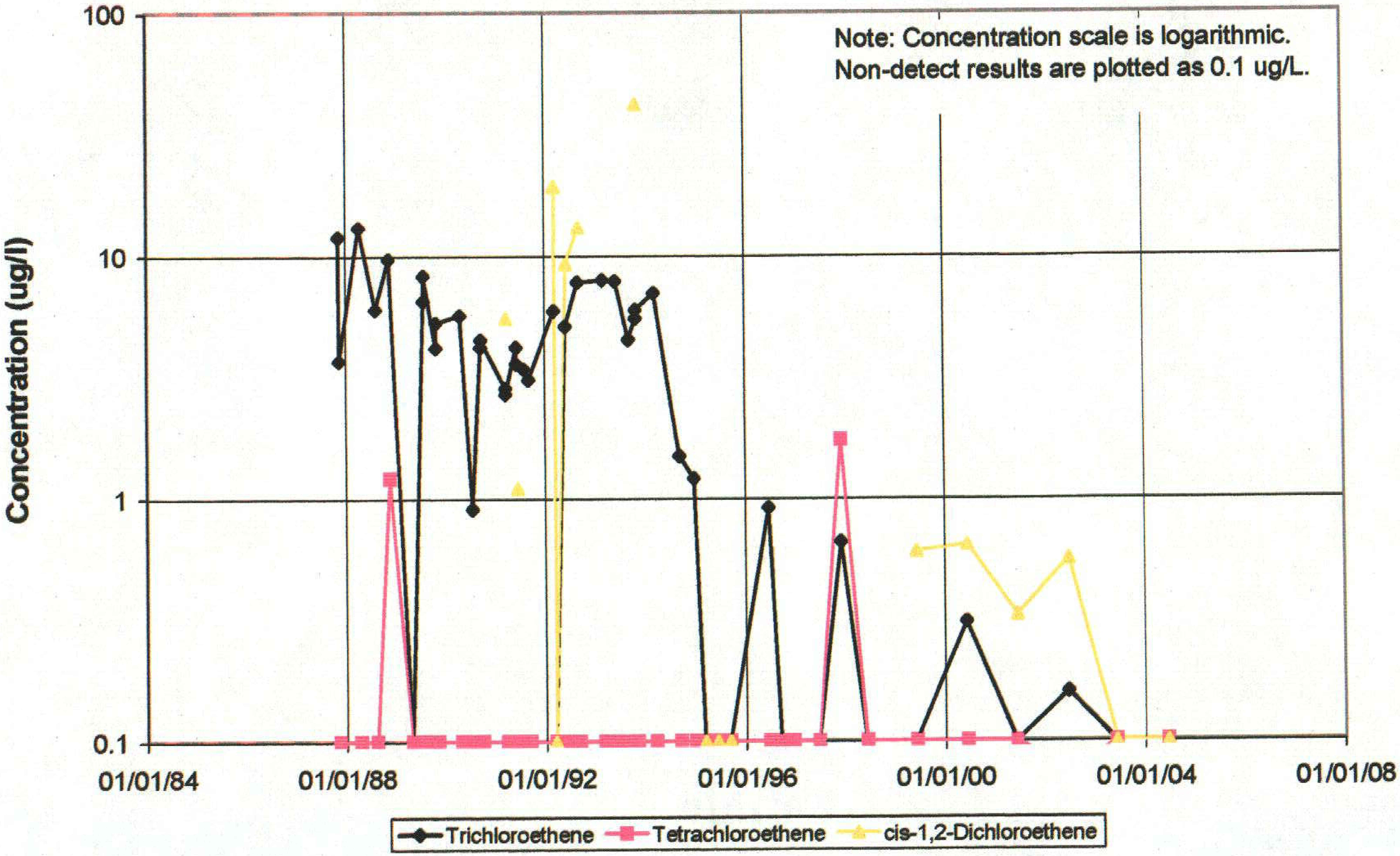
01U115



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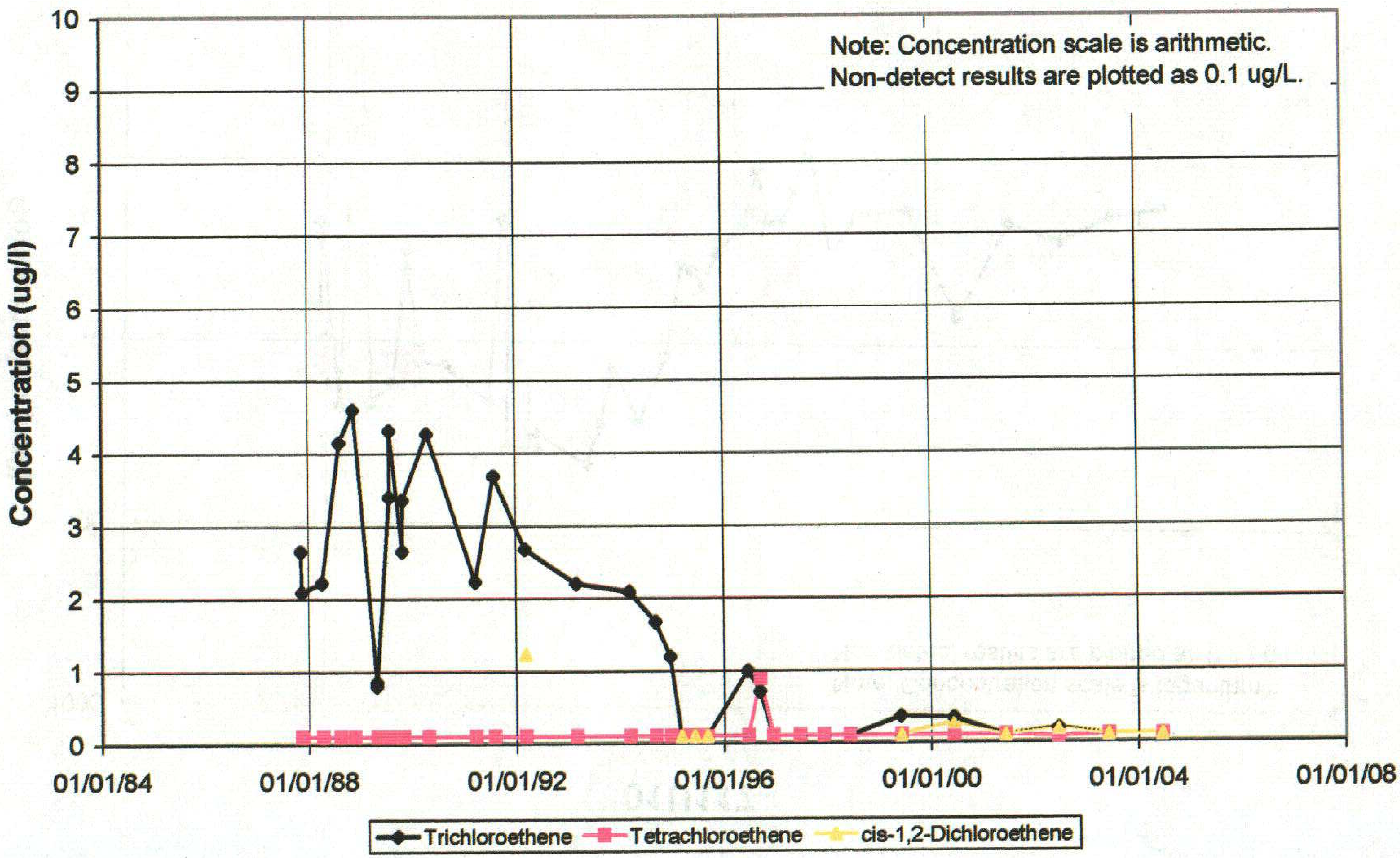
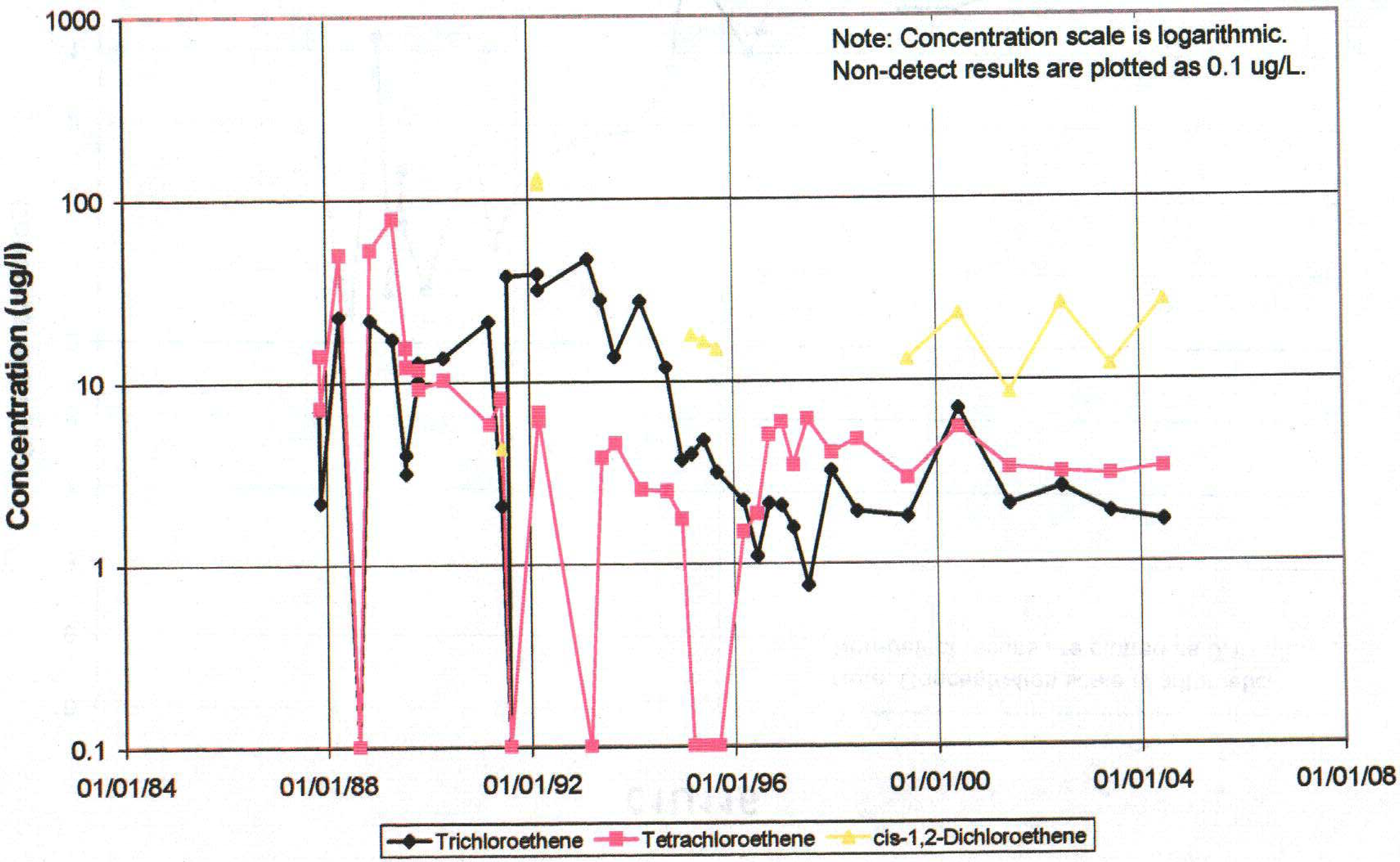


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

01U117



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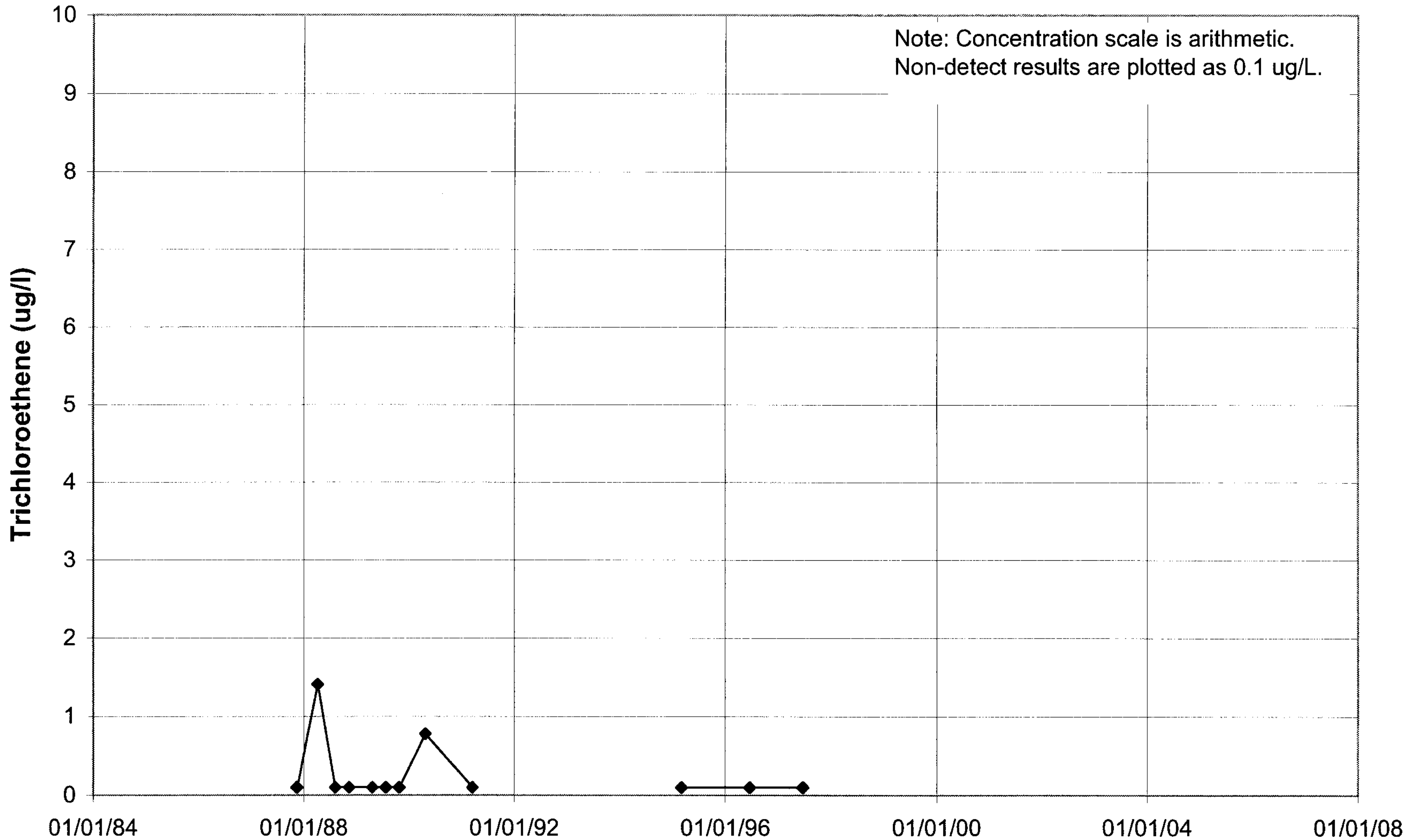
01U118



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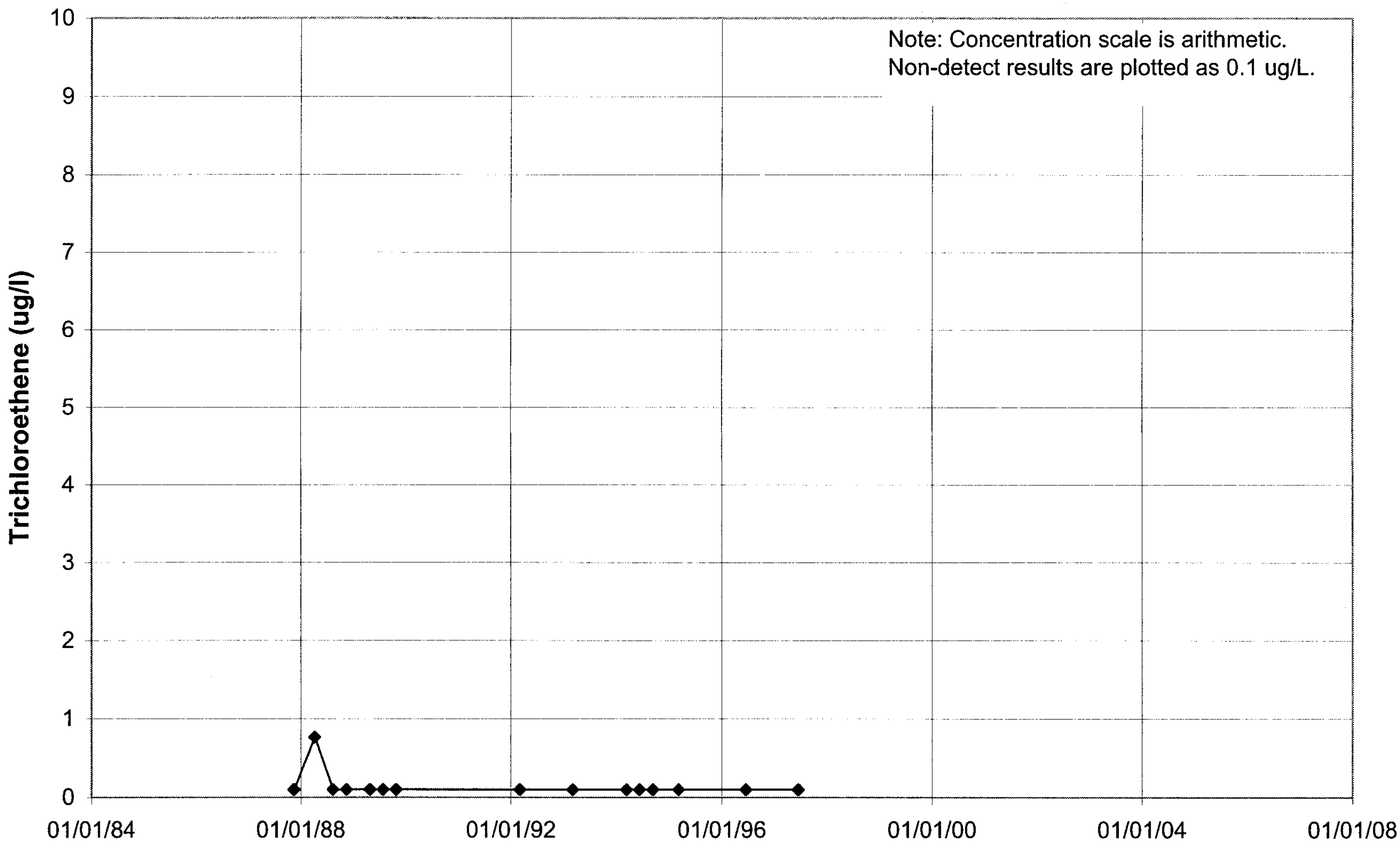

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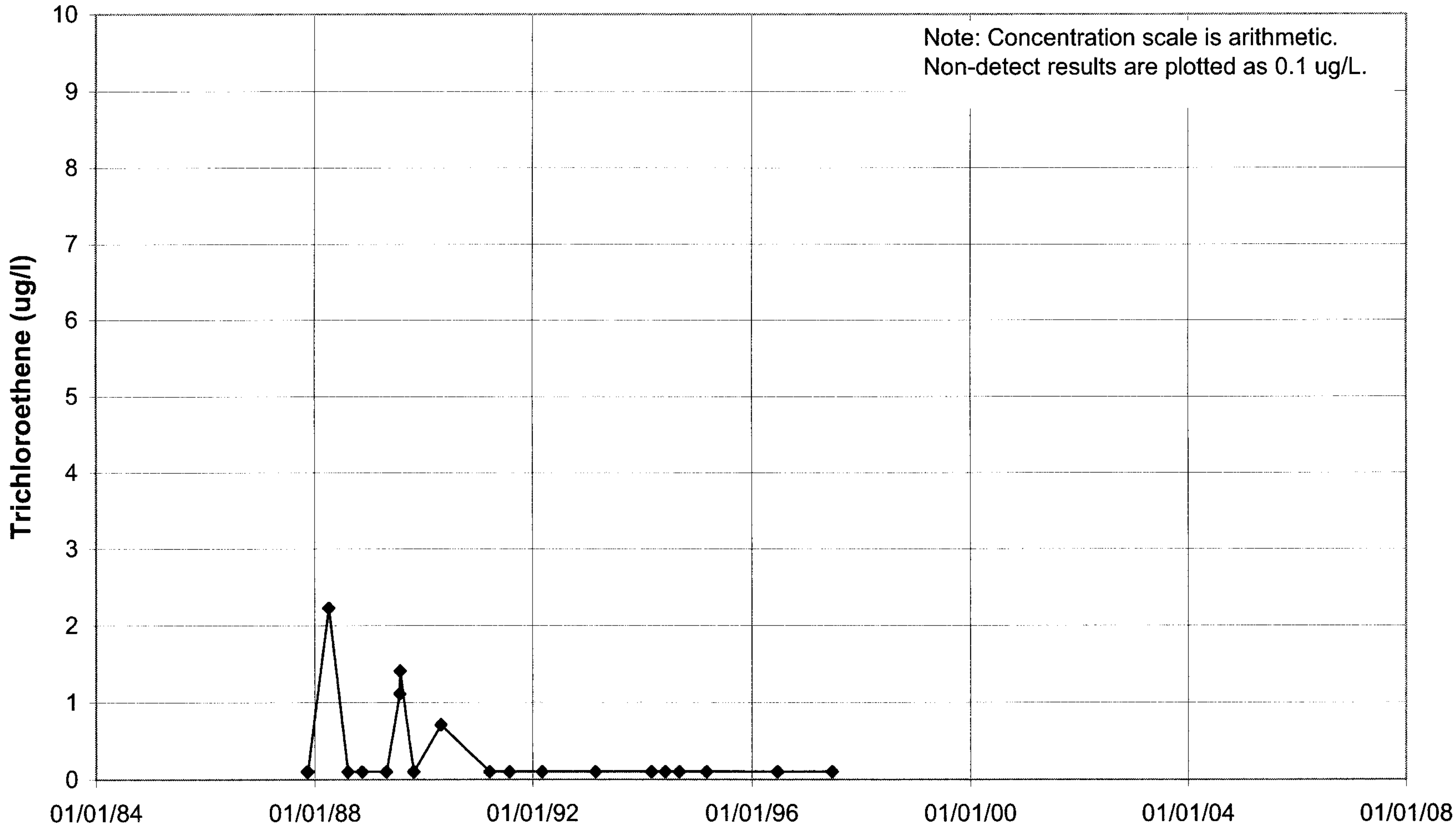

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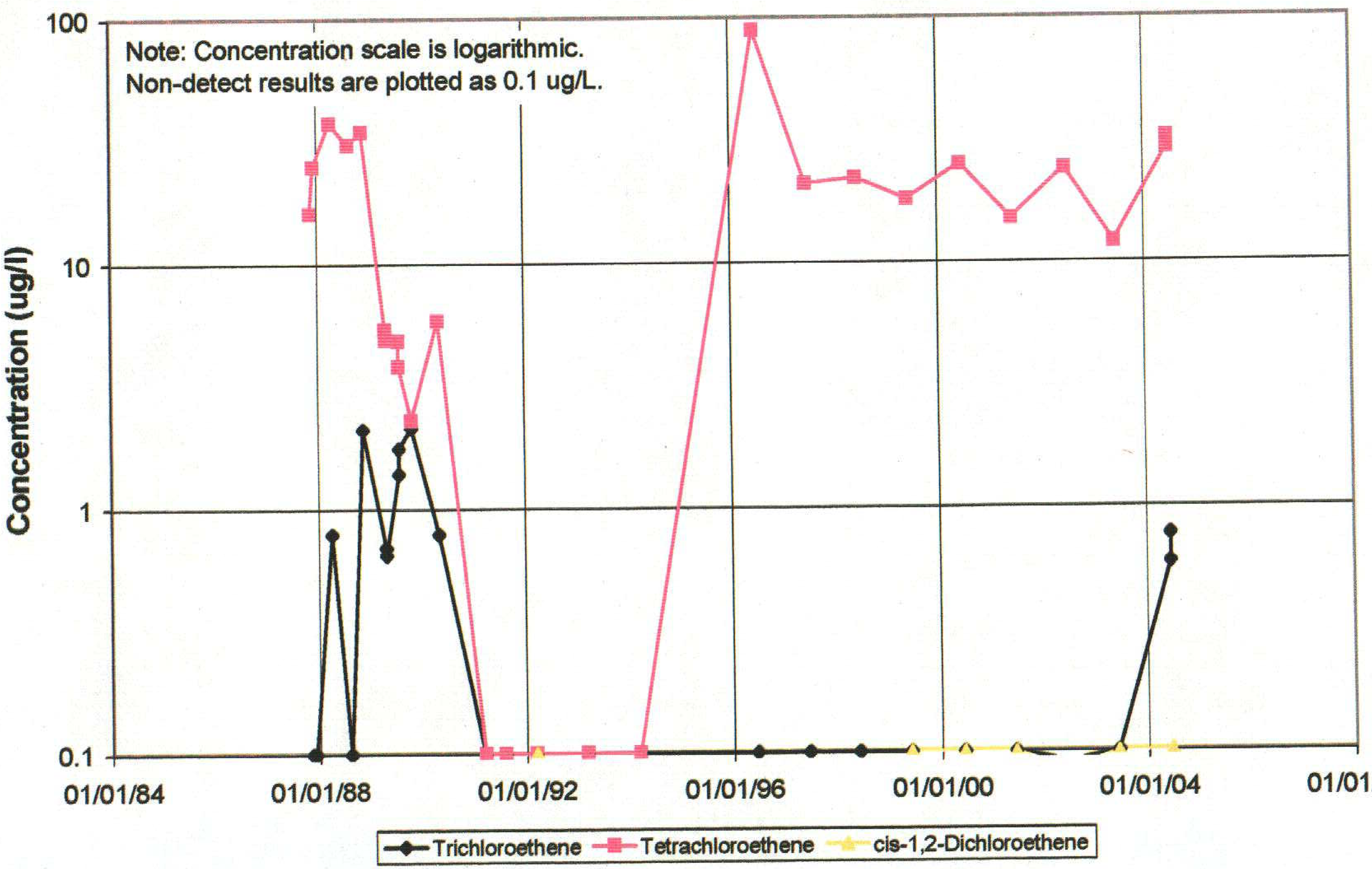

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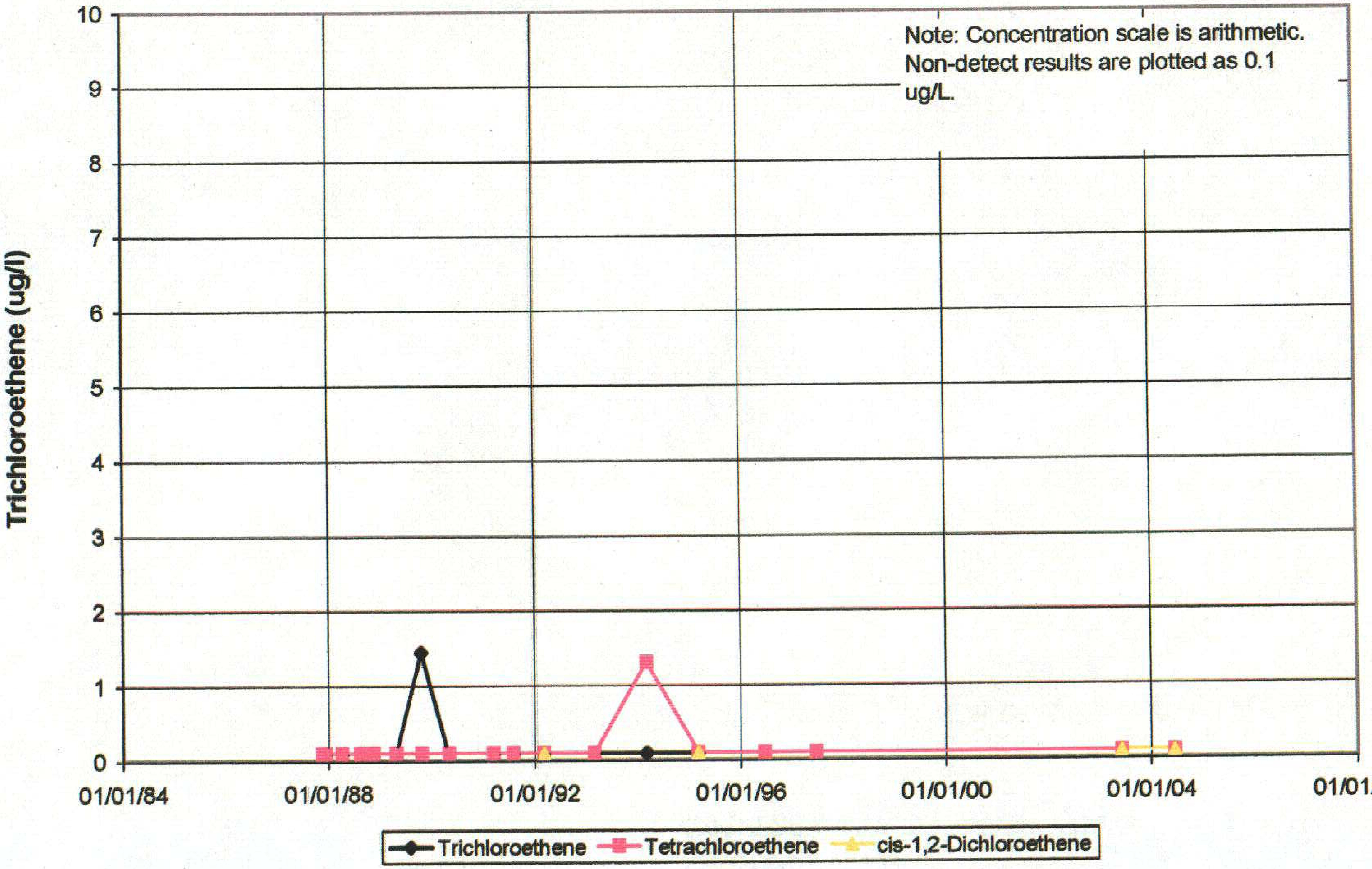
01U127



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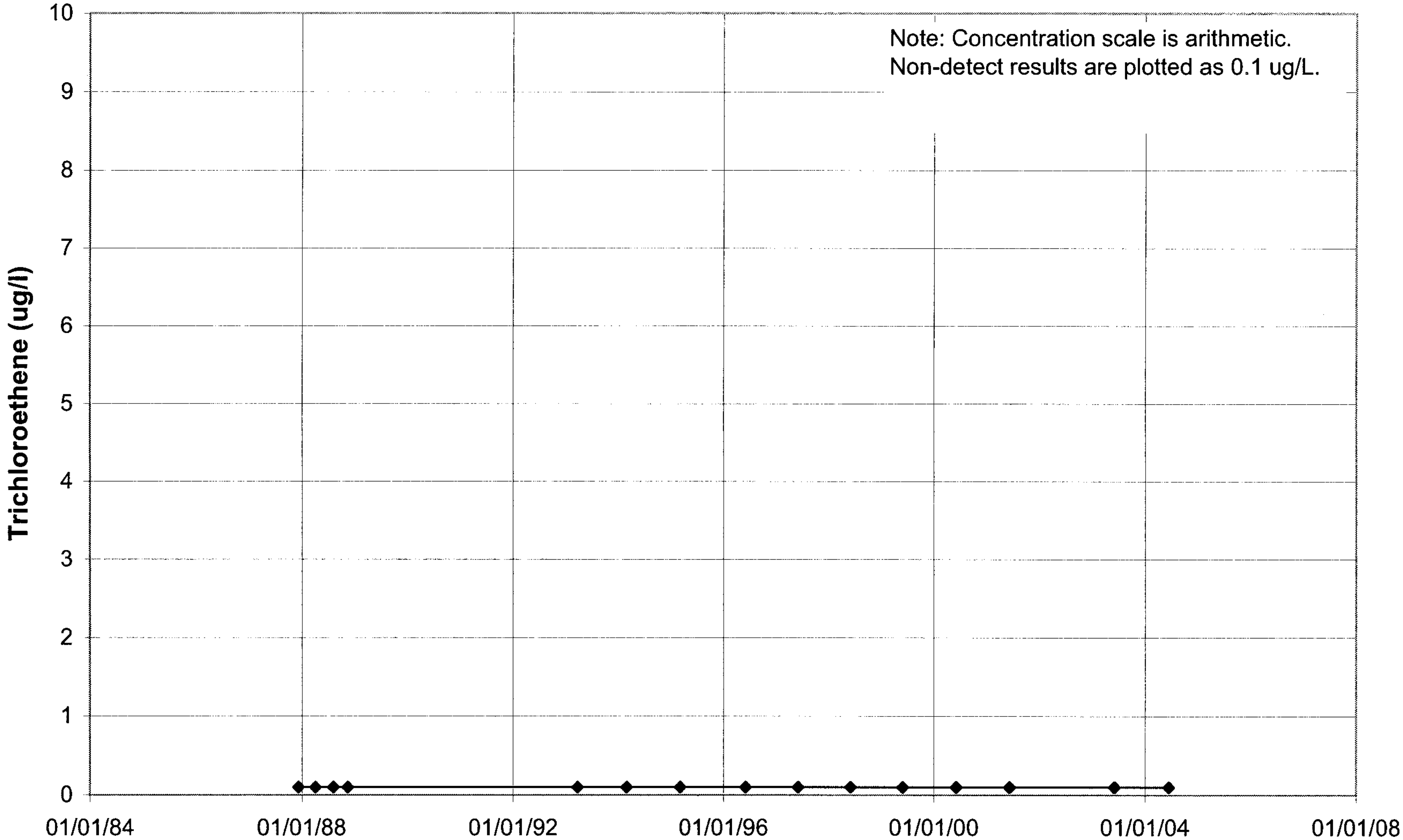

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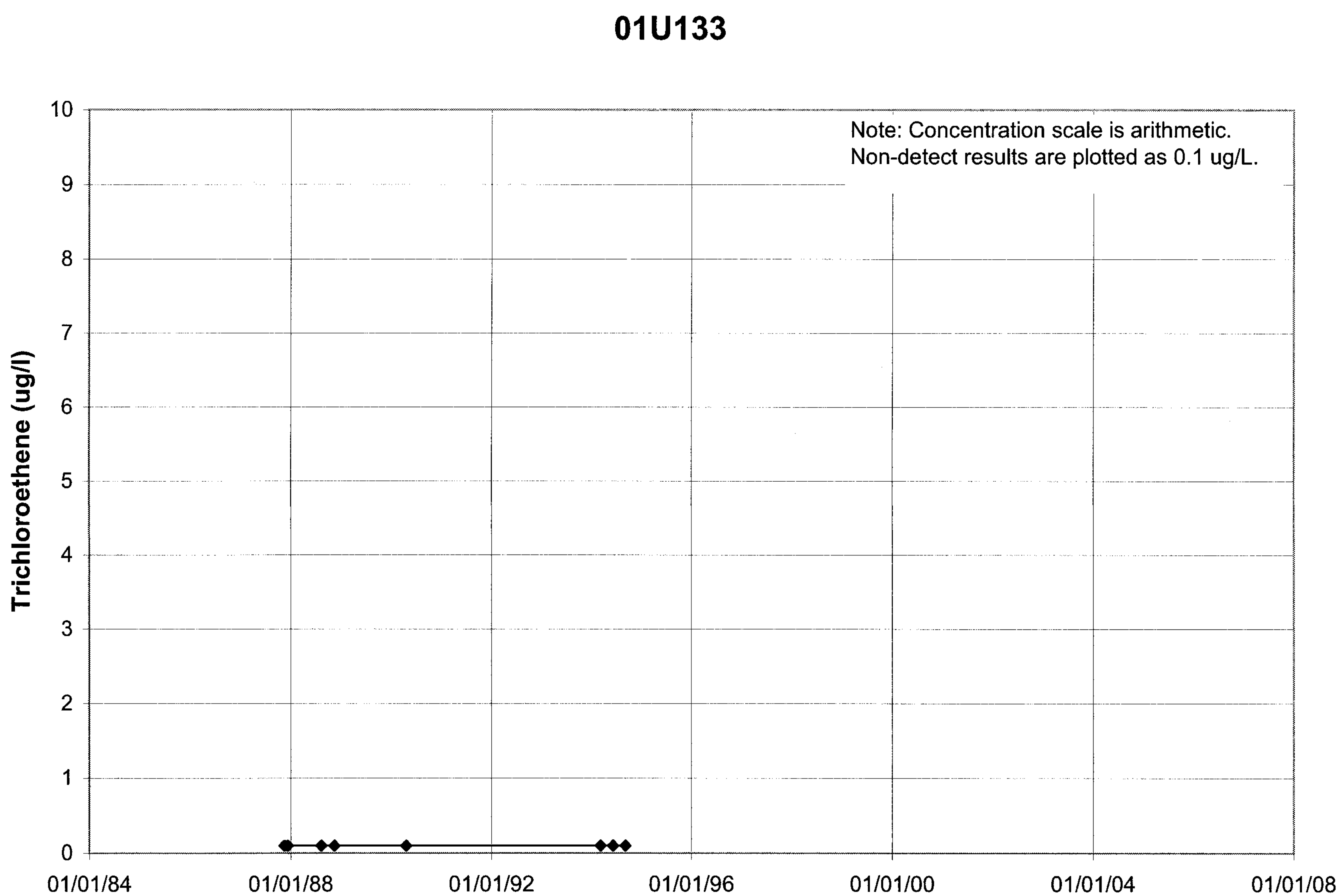

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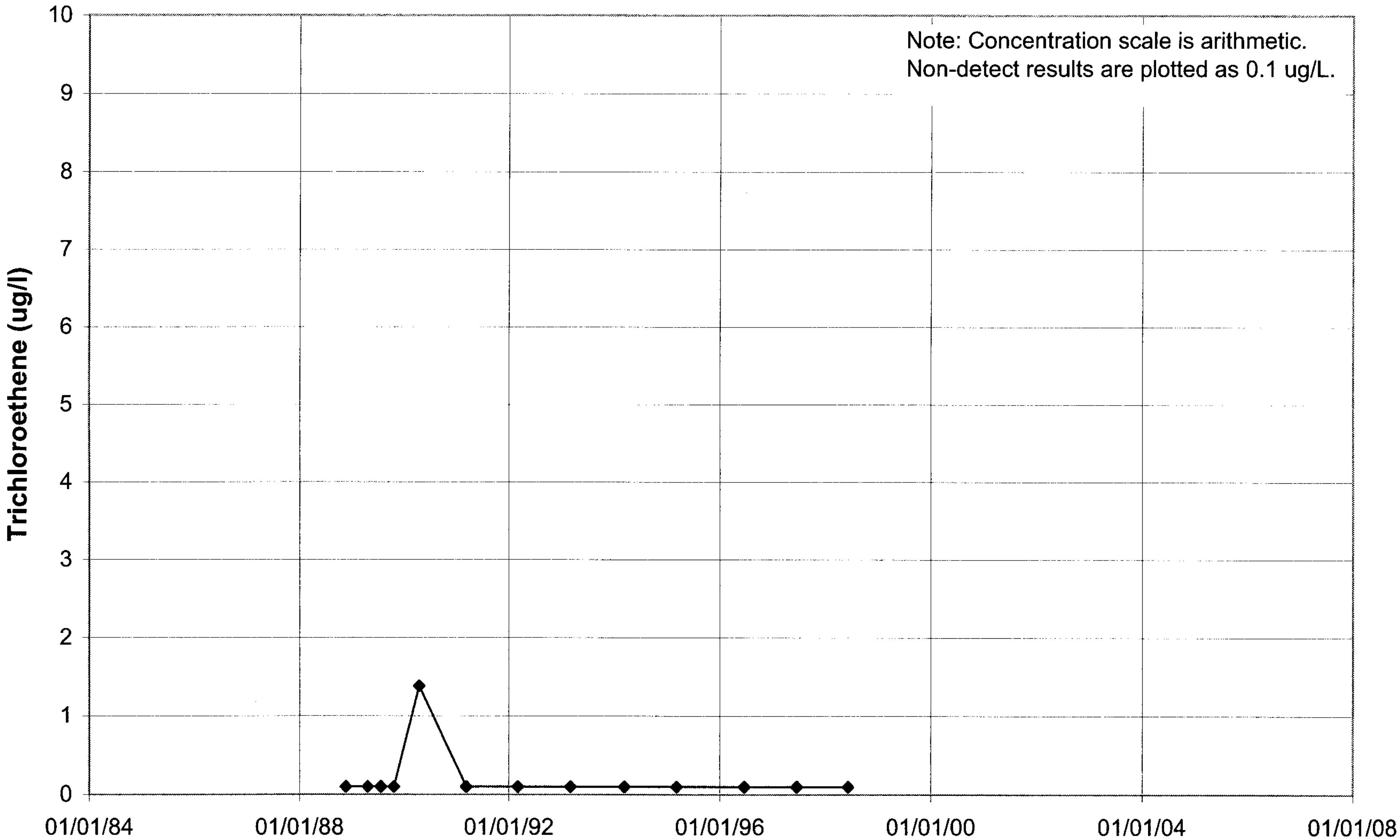

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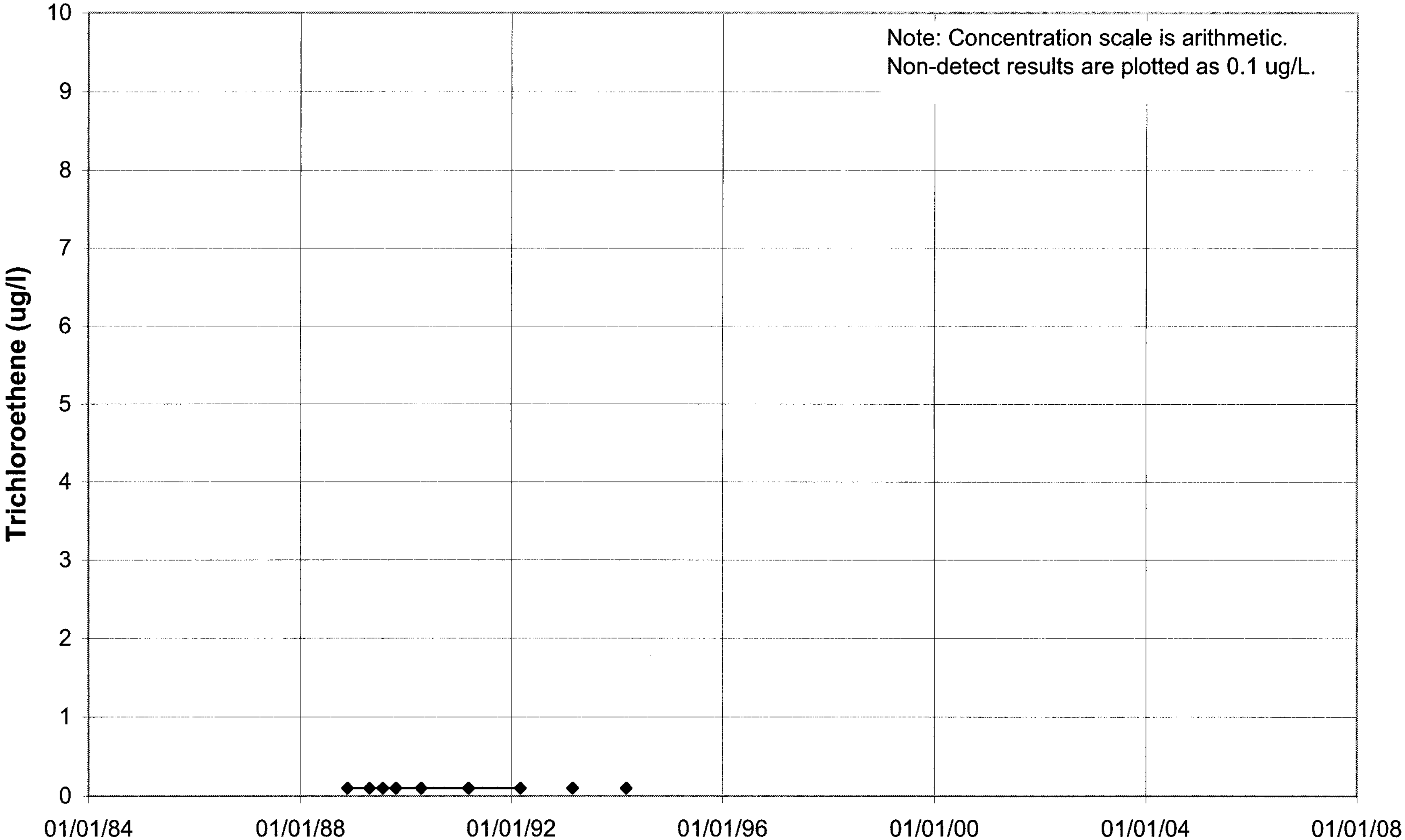
01U136



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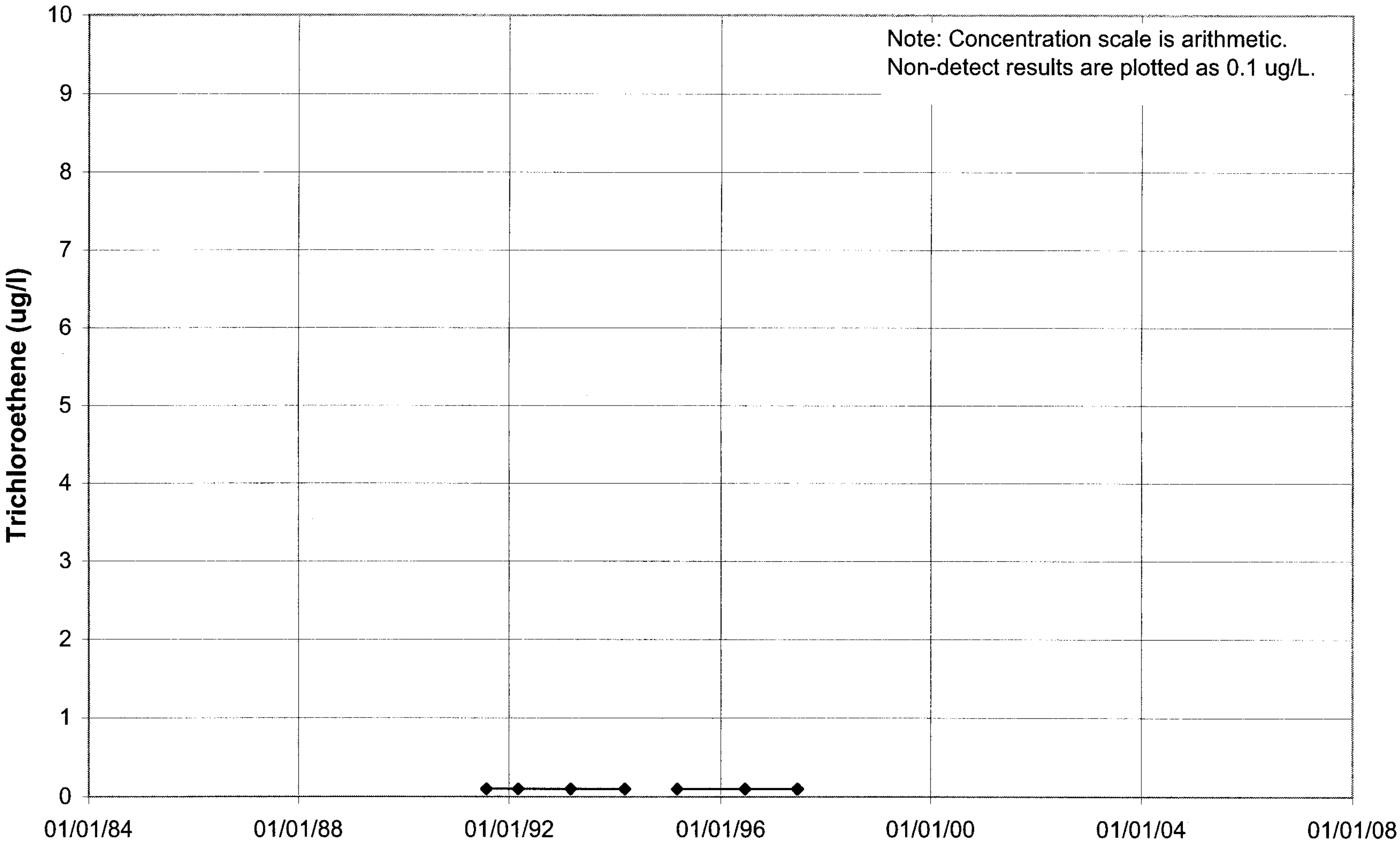

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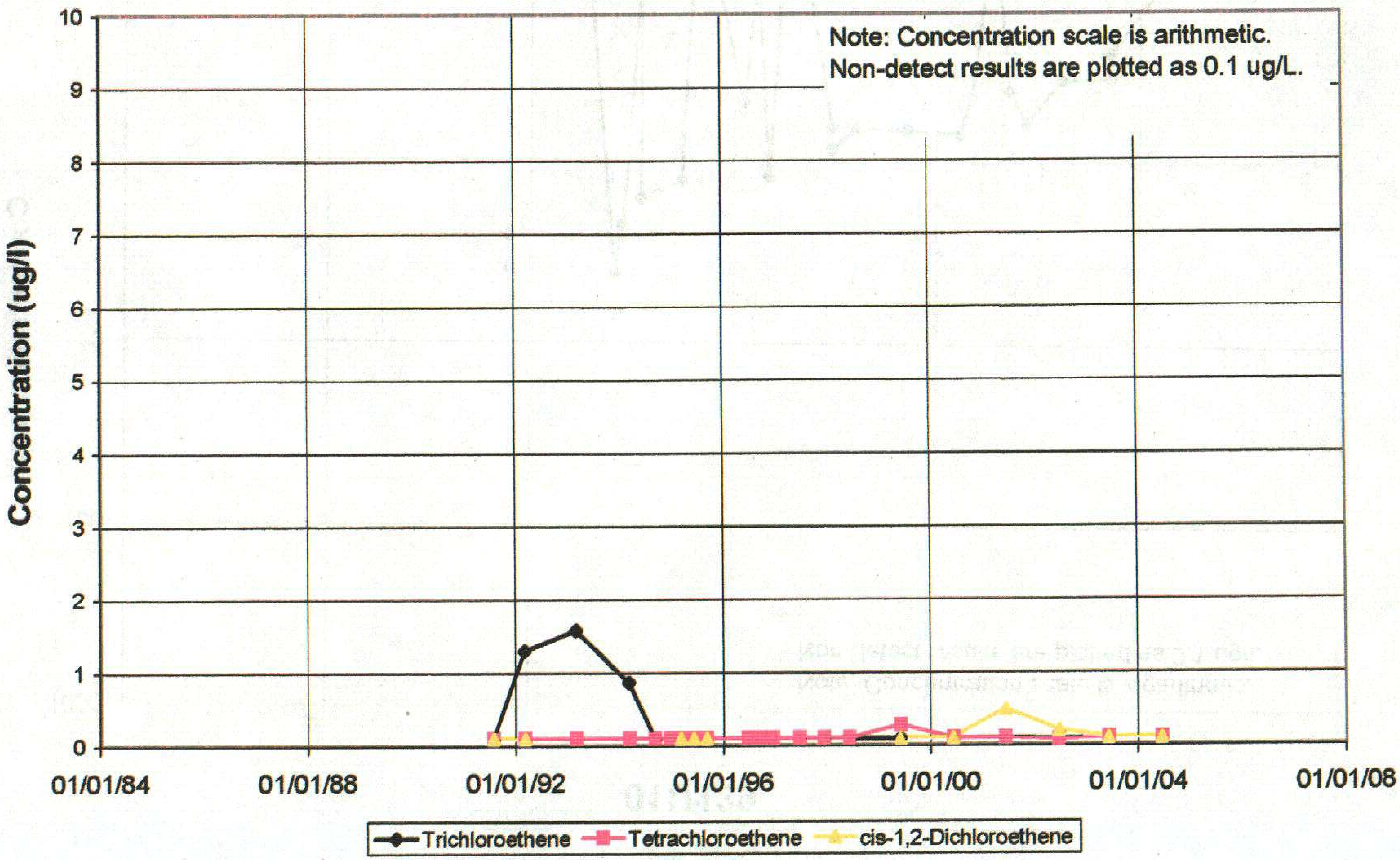

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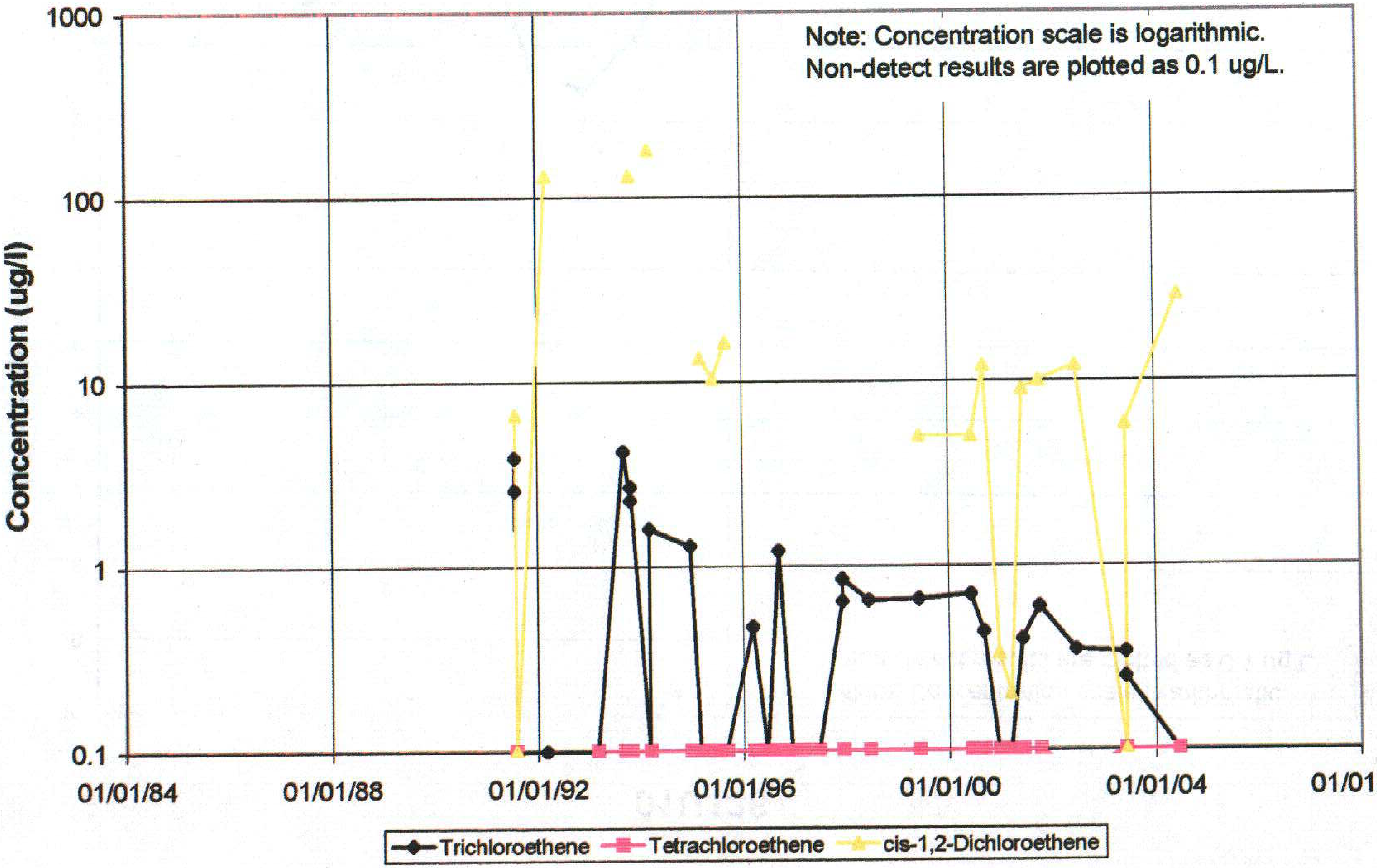

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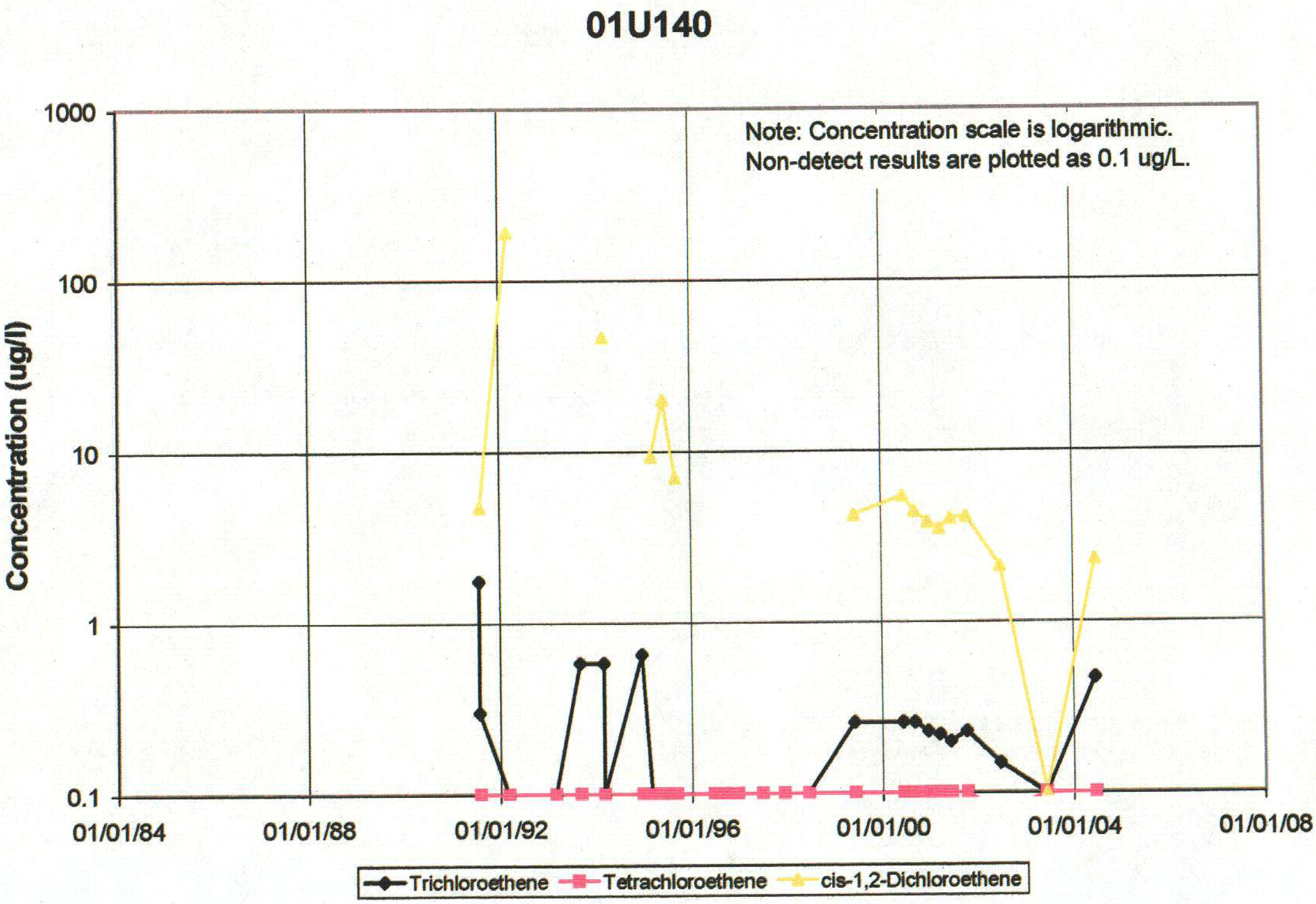

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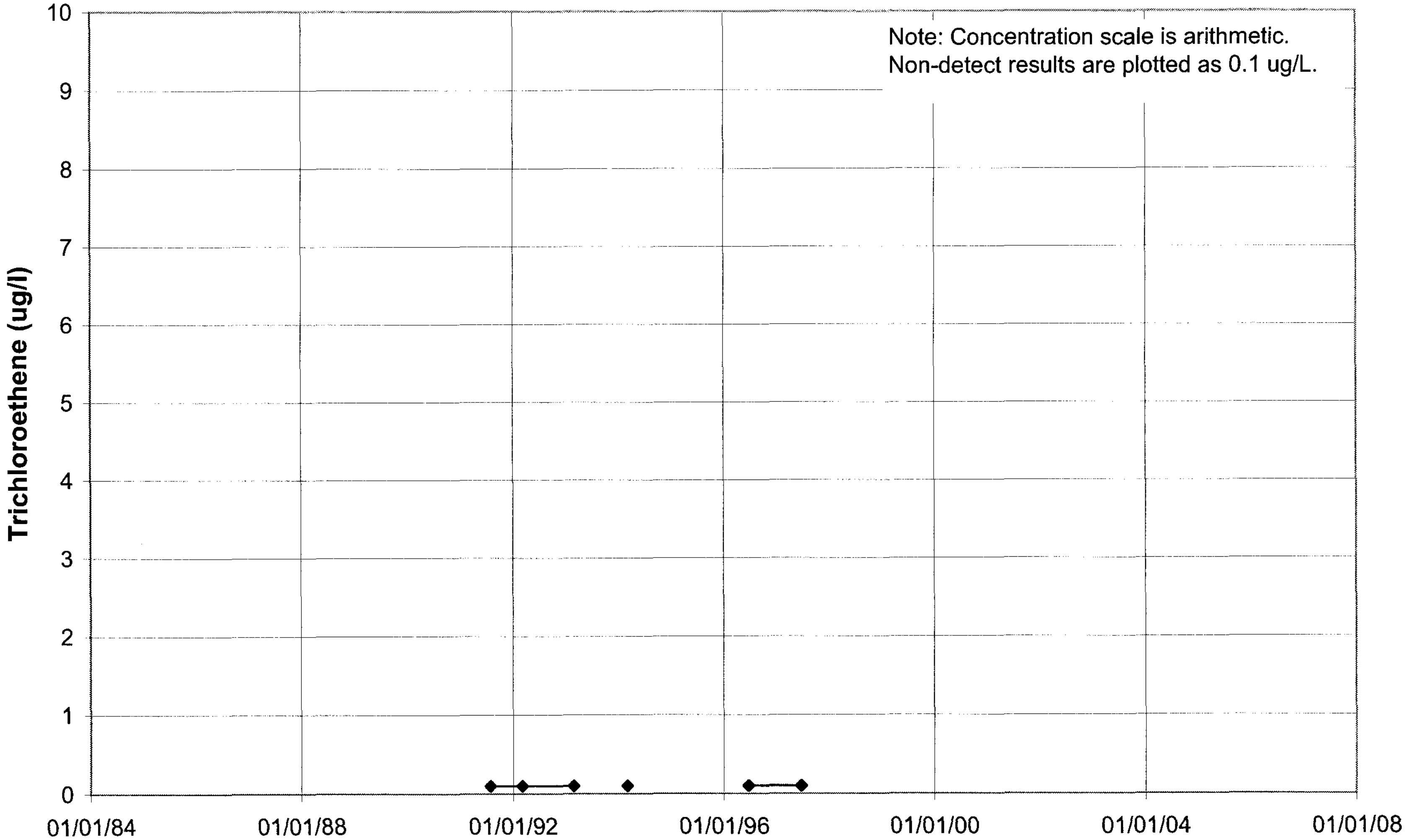

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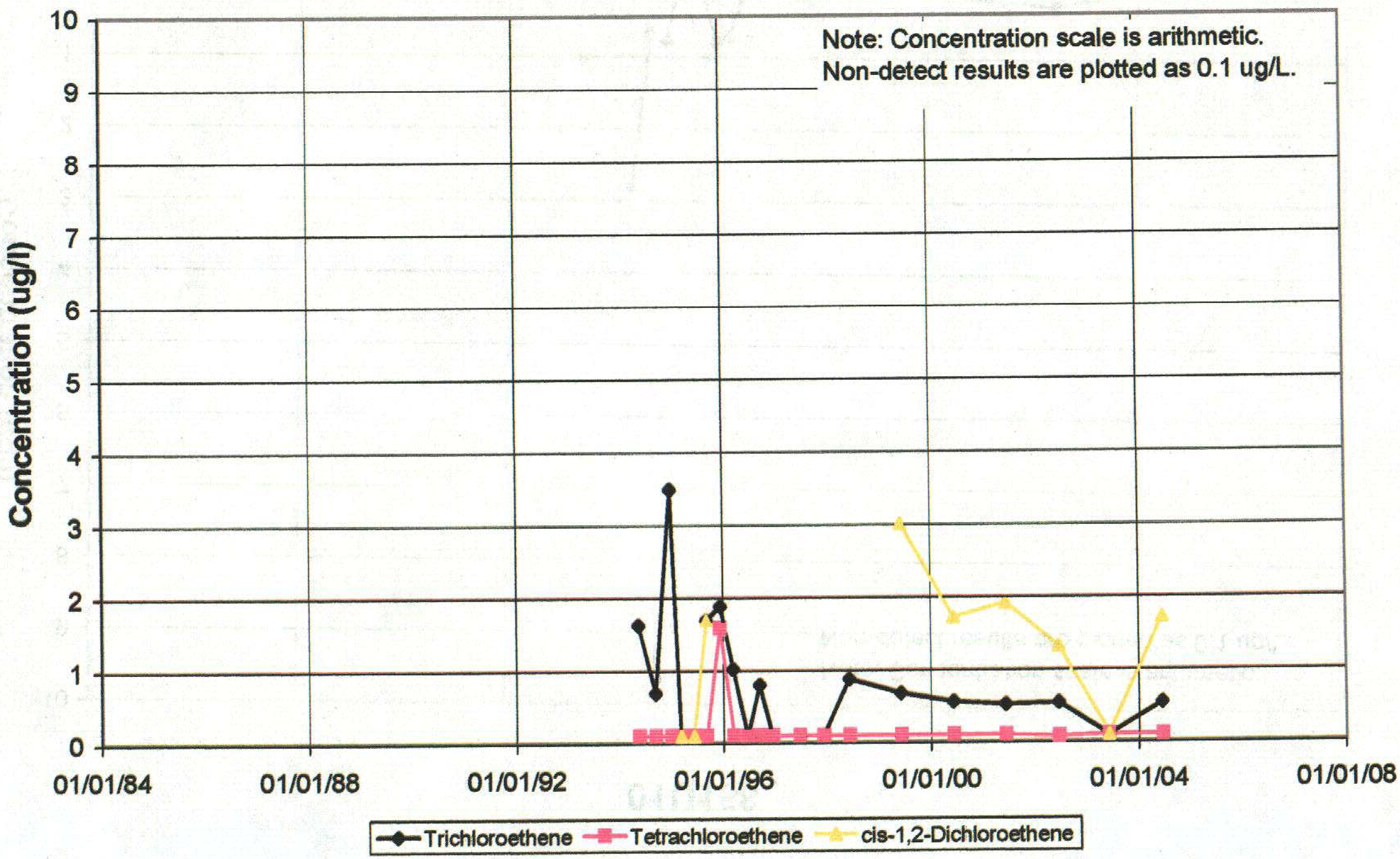

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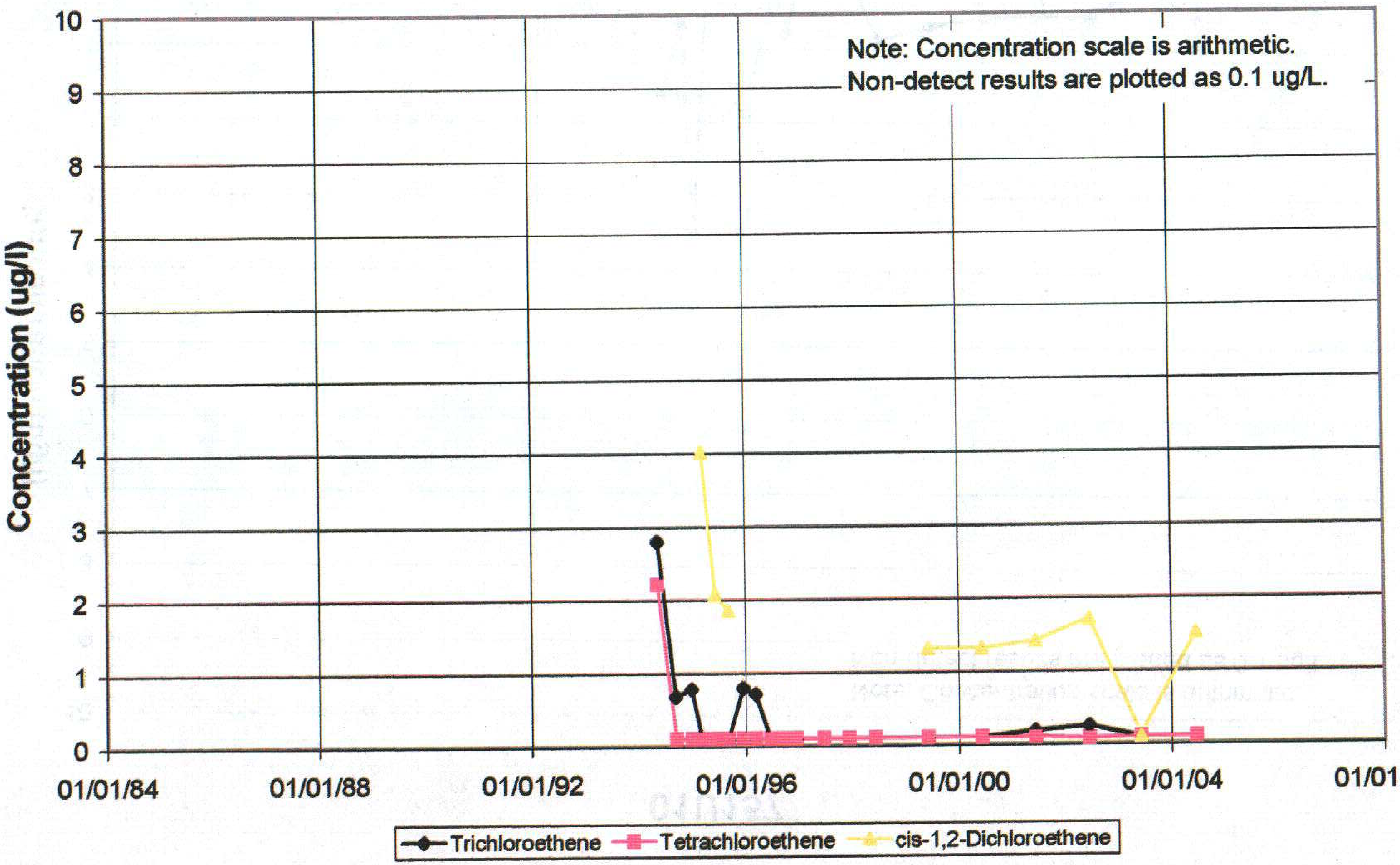
01U158



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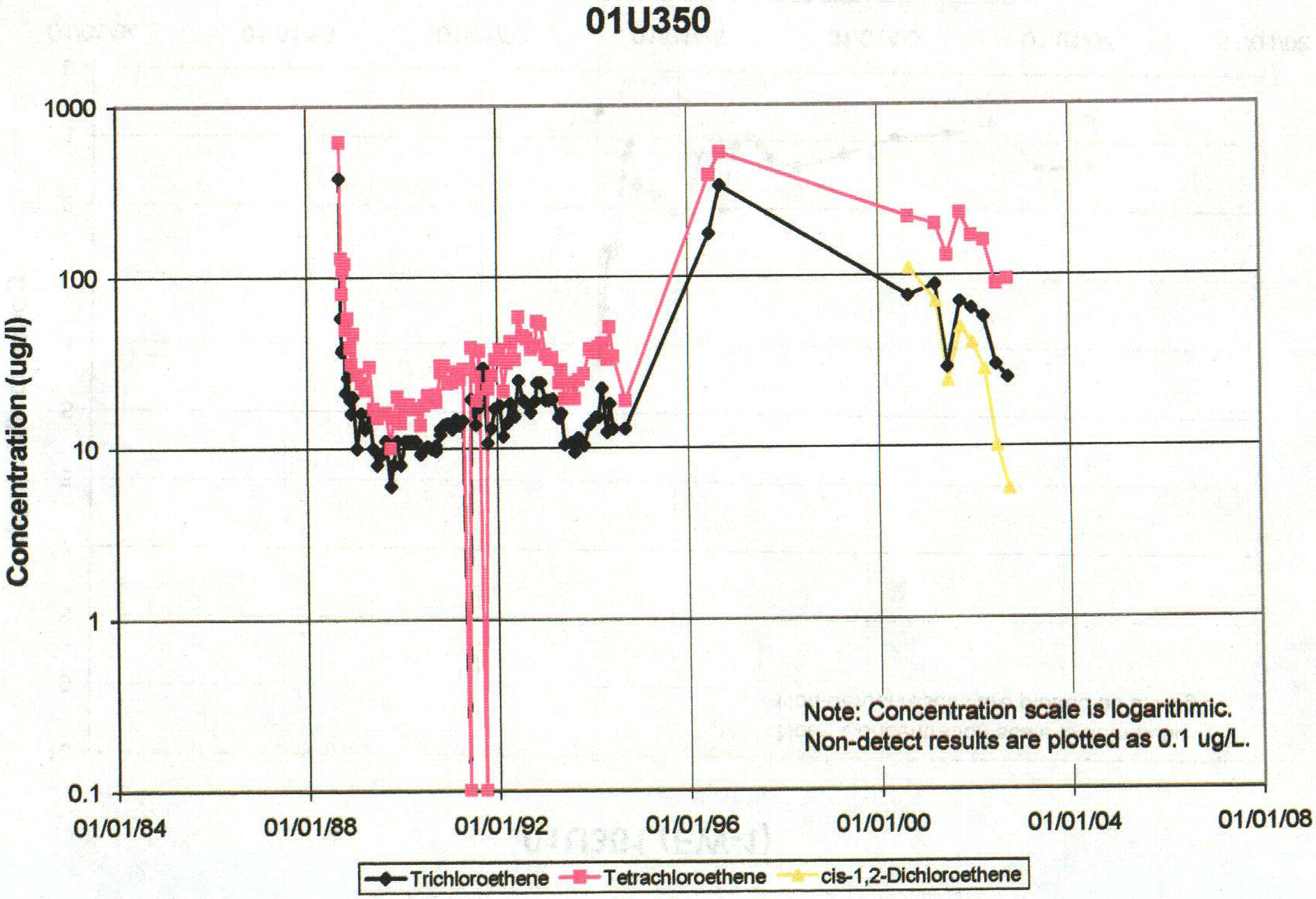

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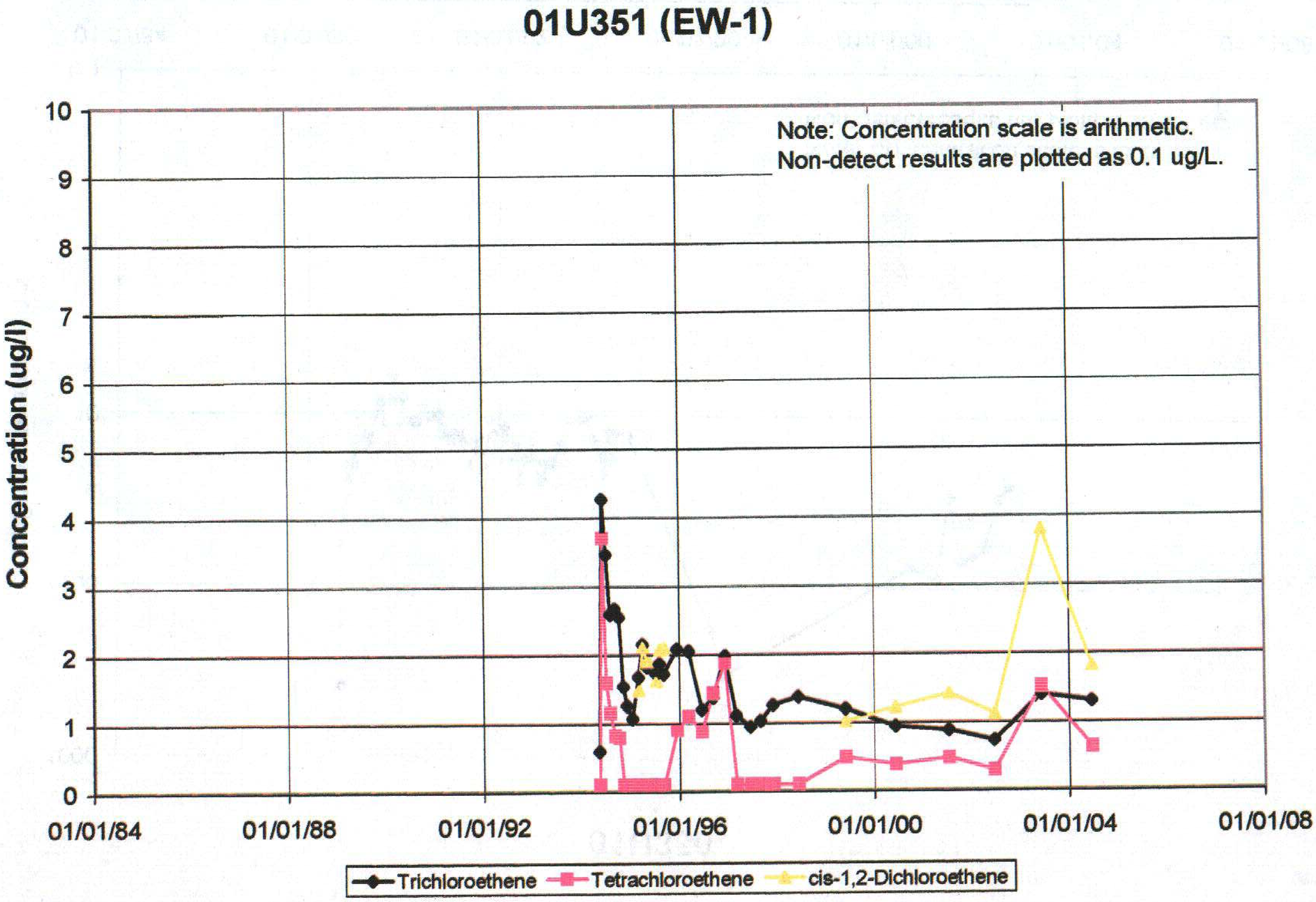

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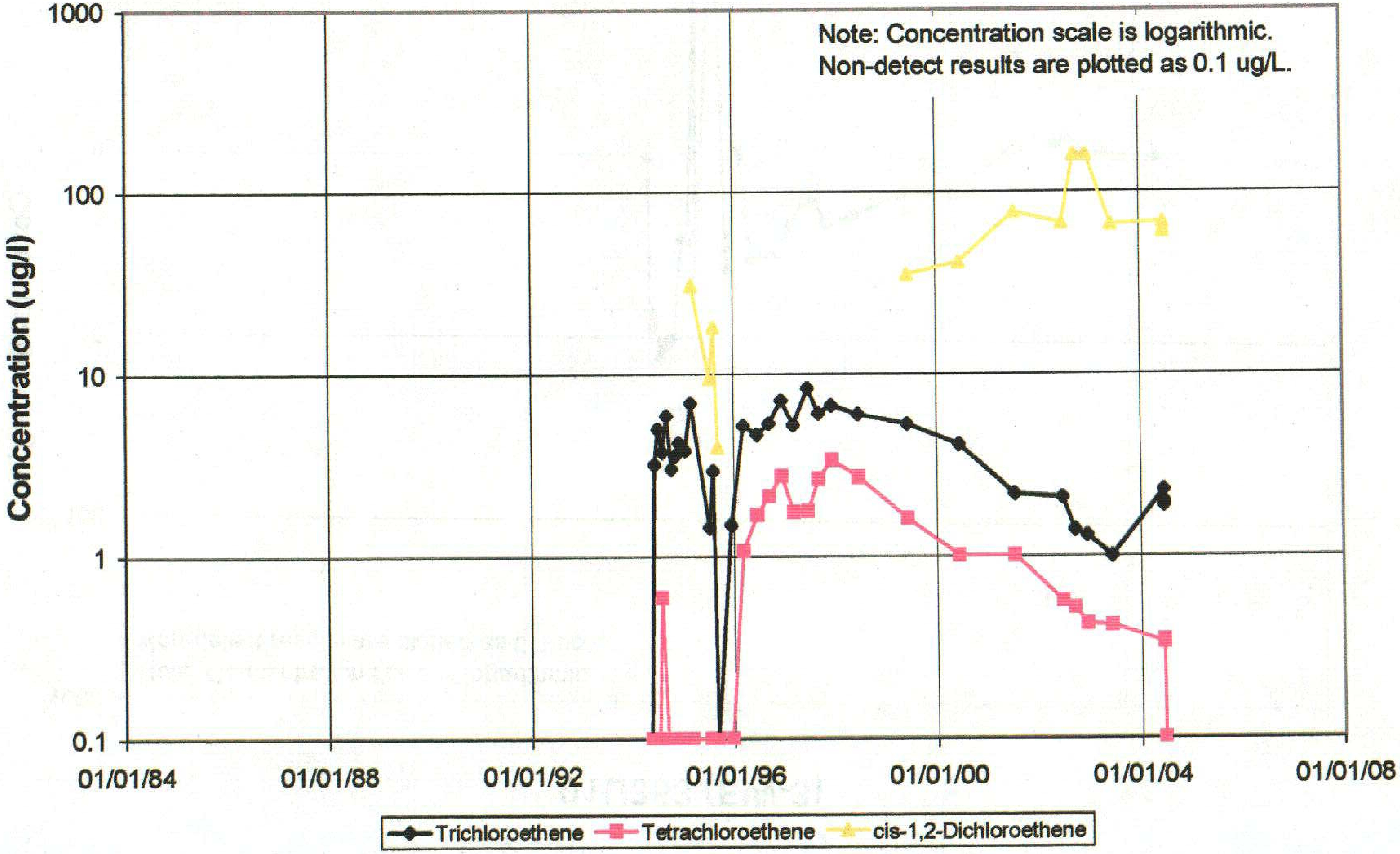
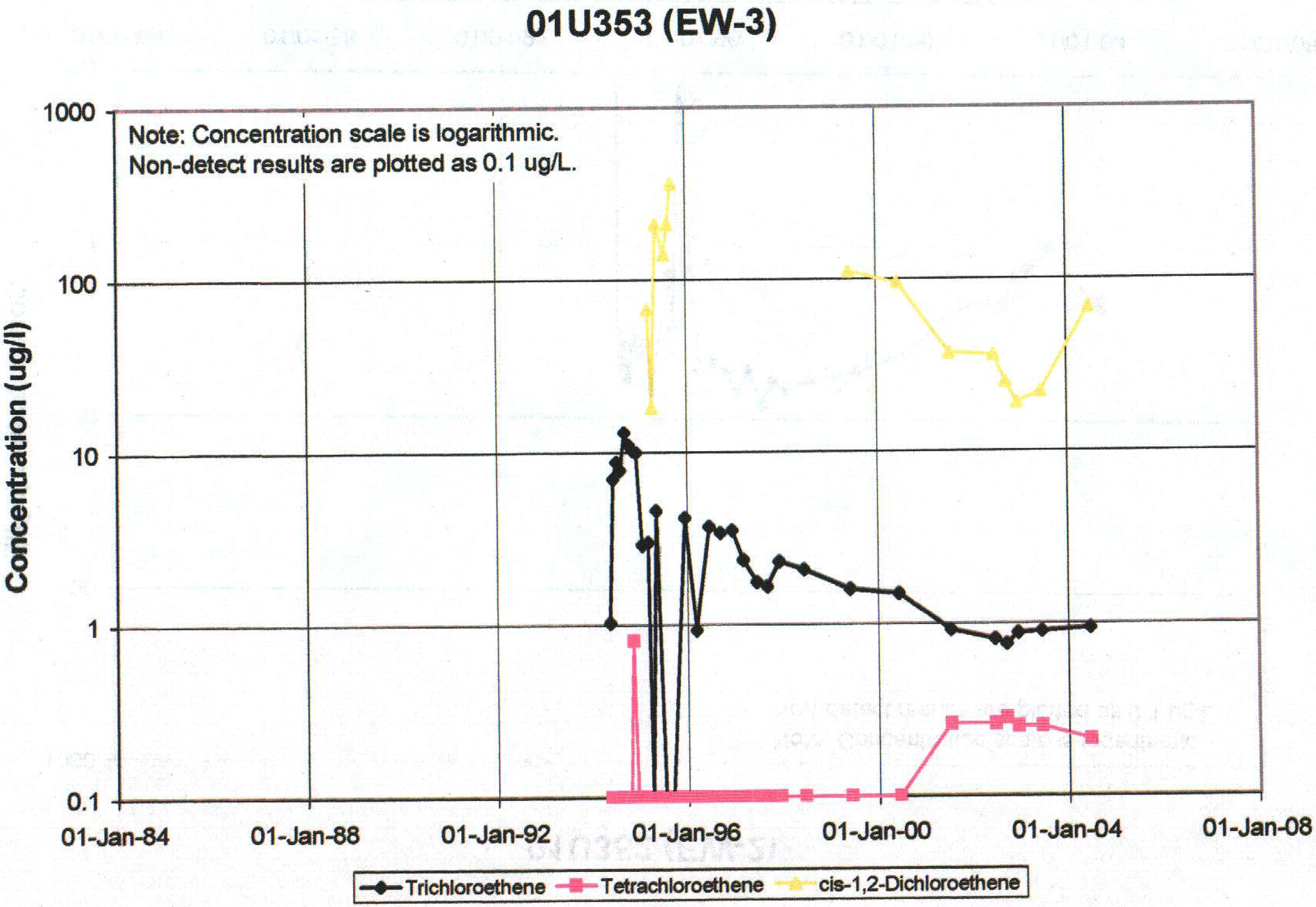
01U352 (EW-2)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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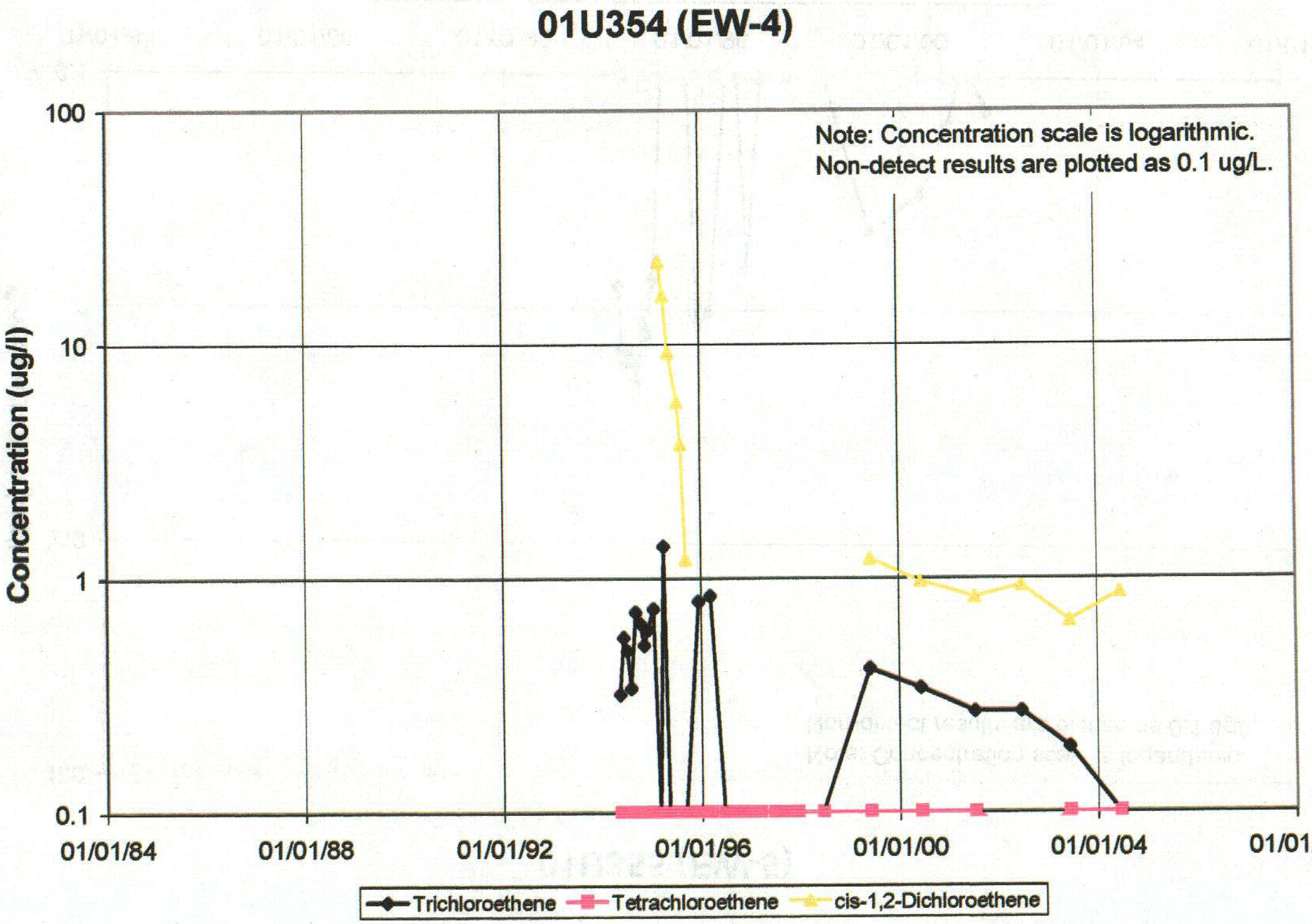

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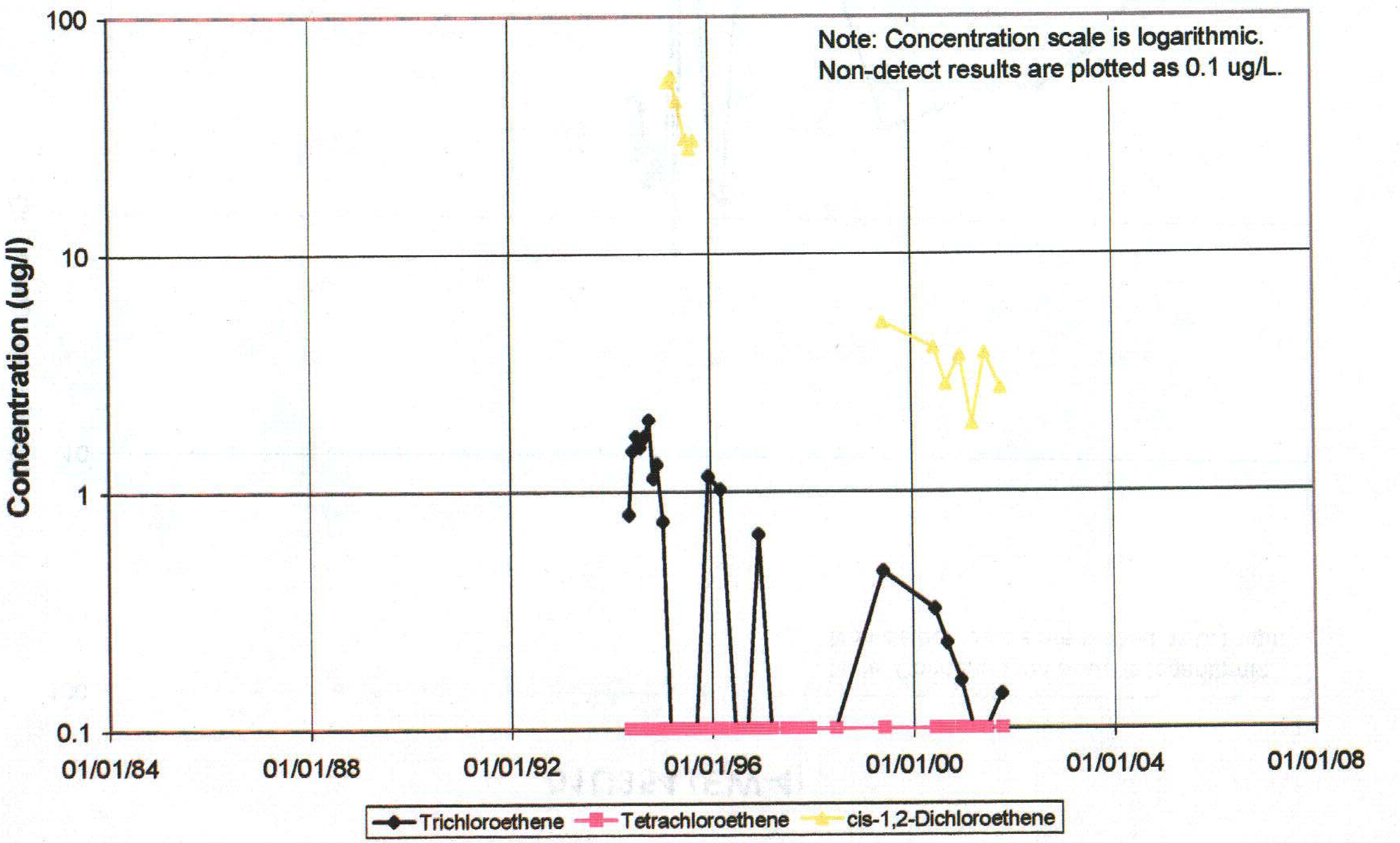
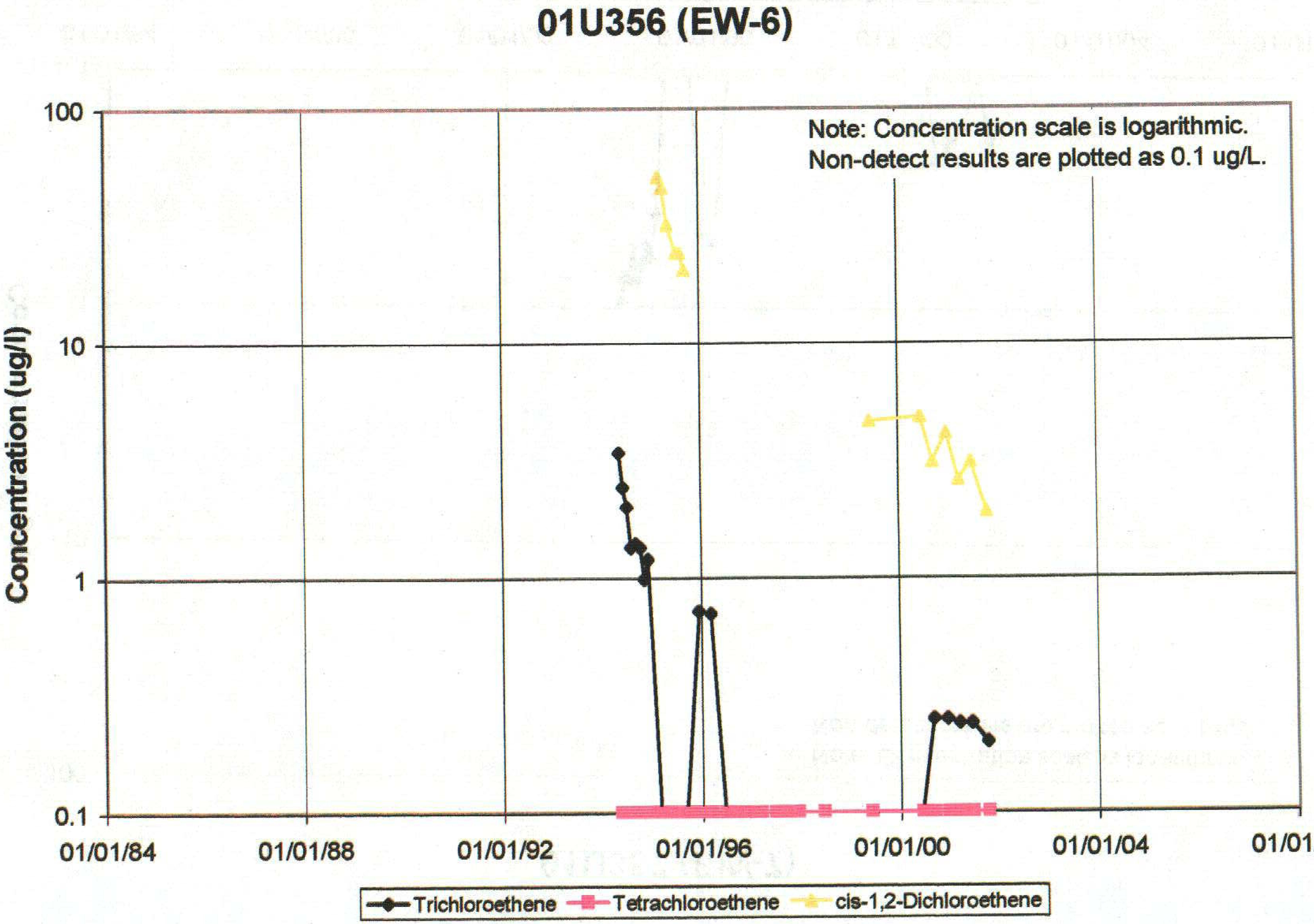
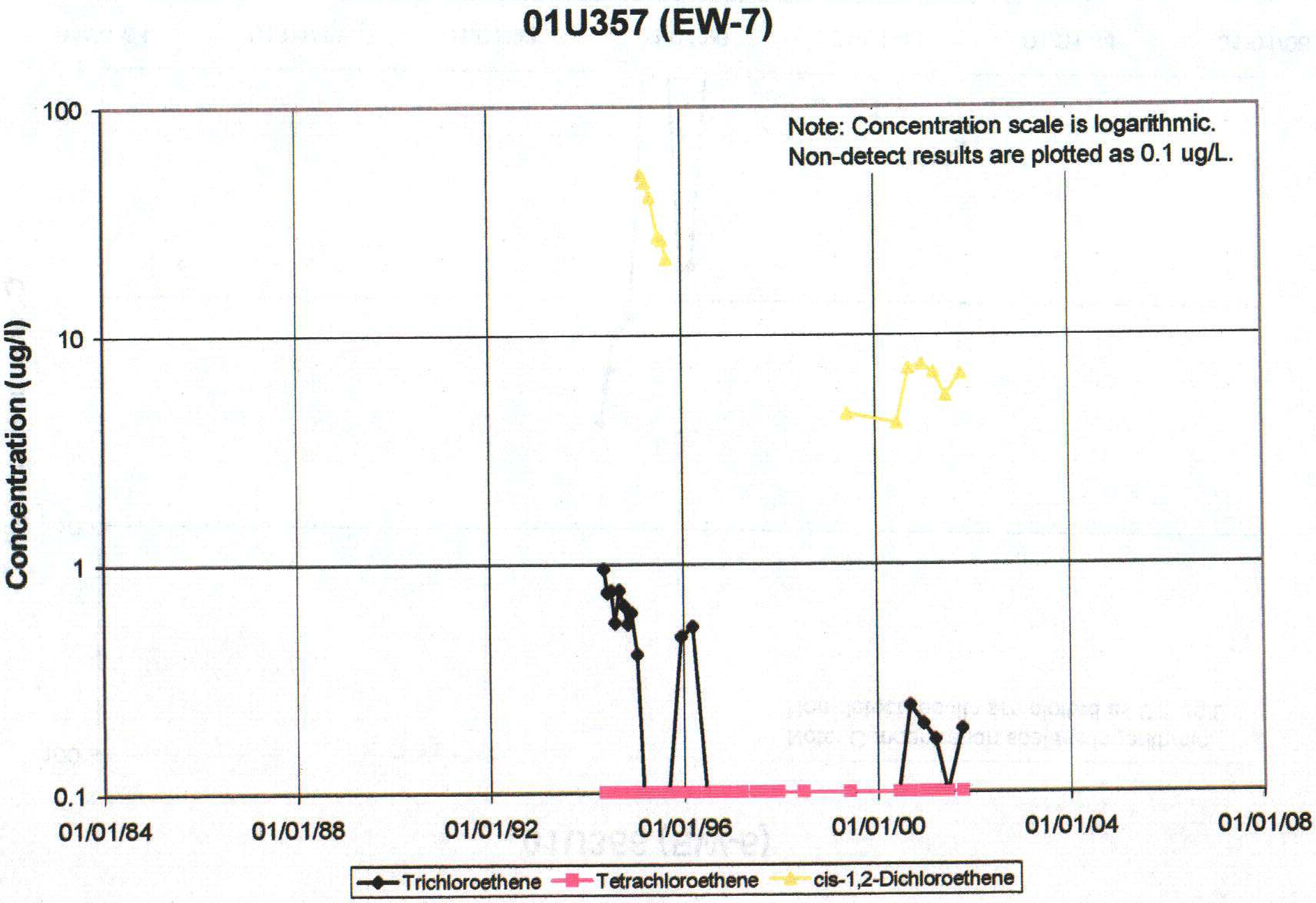
01U355 (EW-5)



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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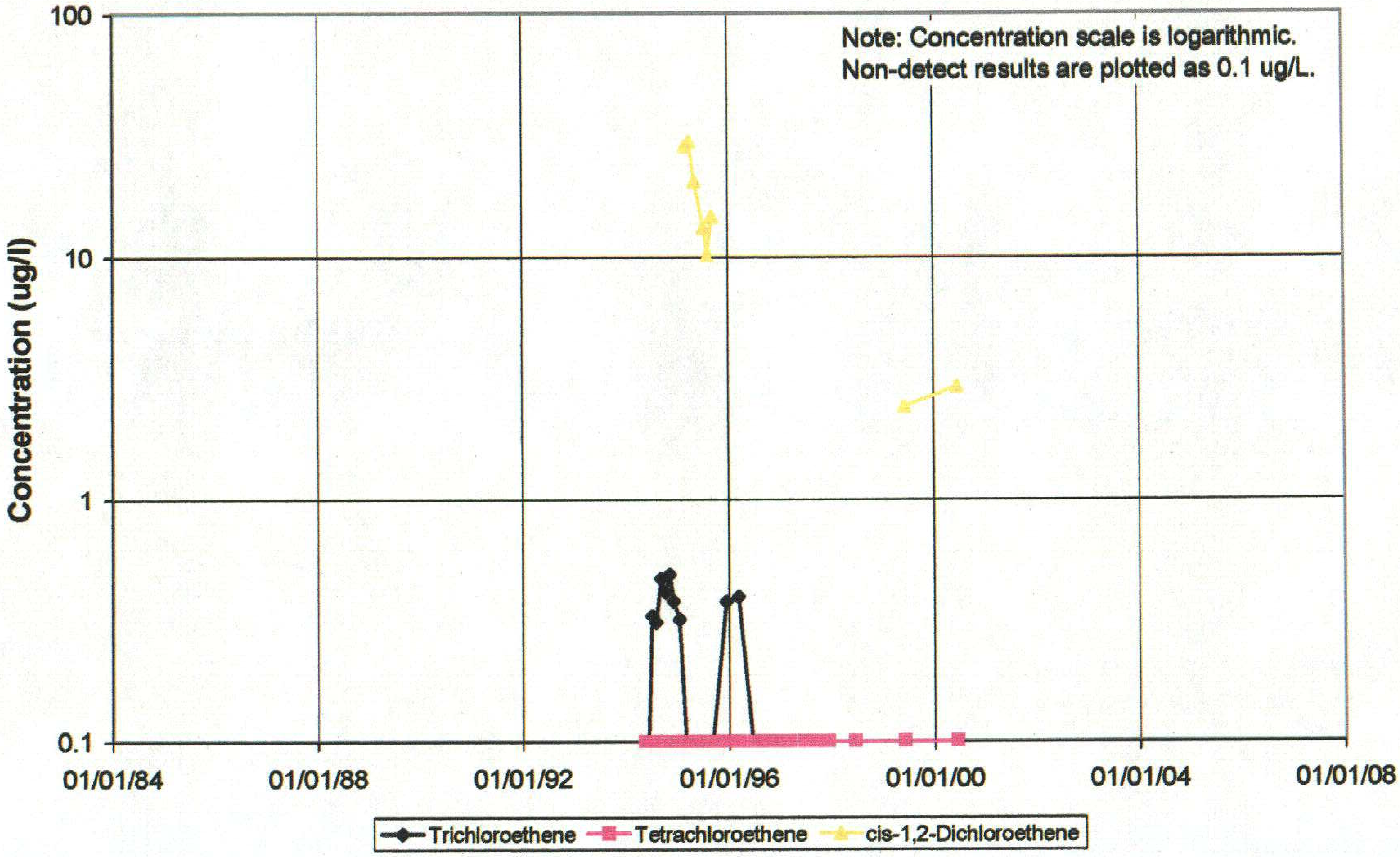
01U358 (EW-8)



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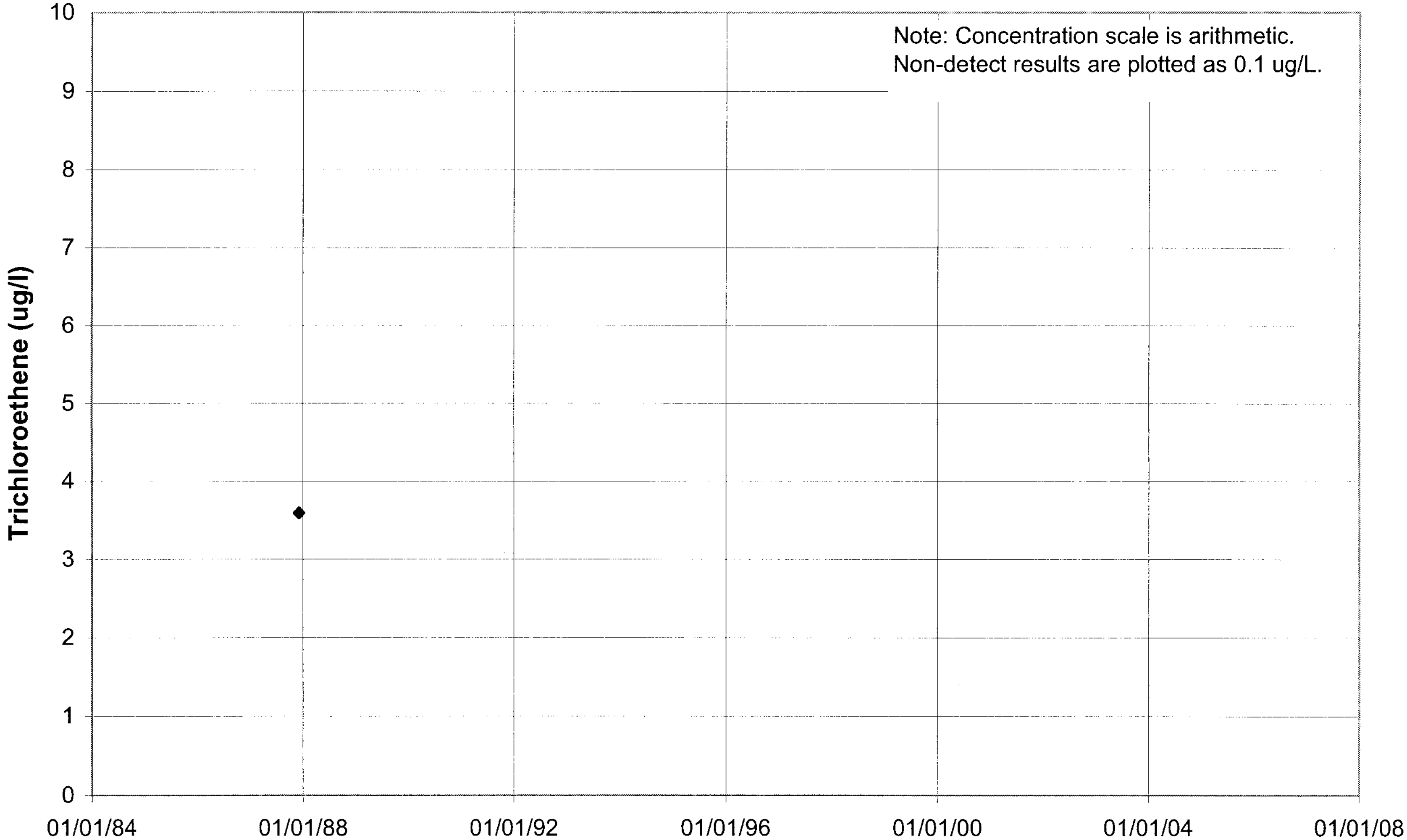
01U601



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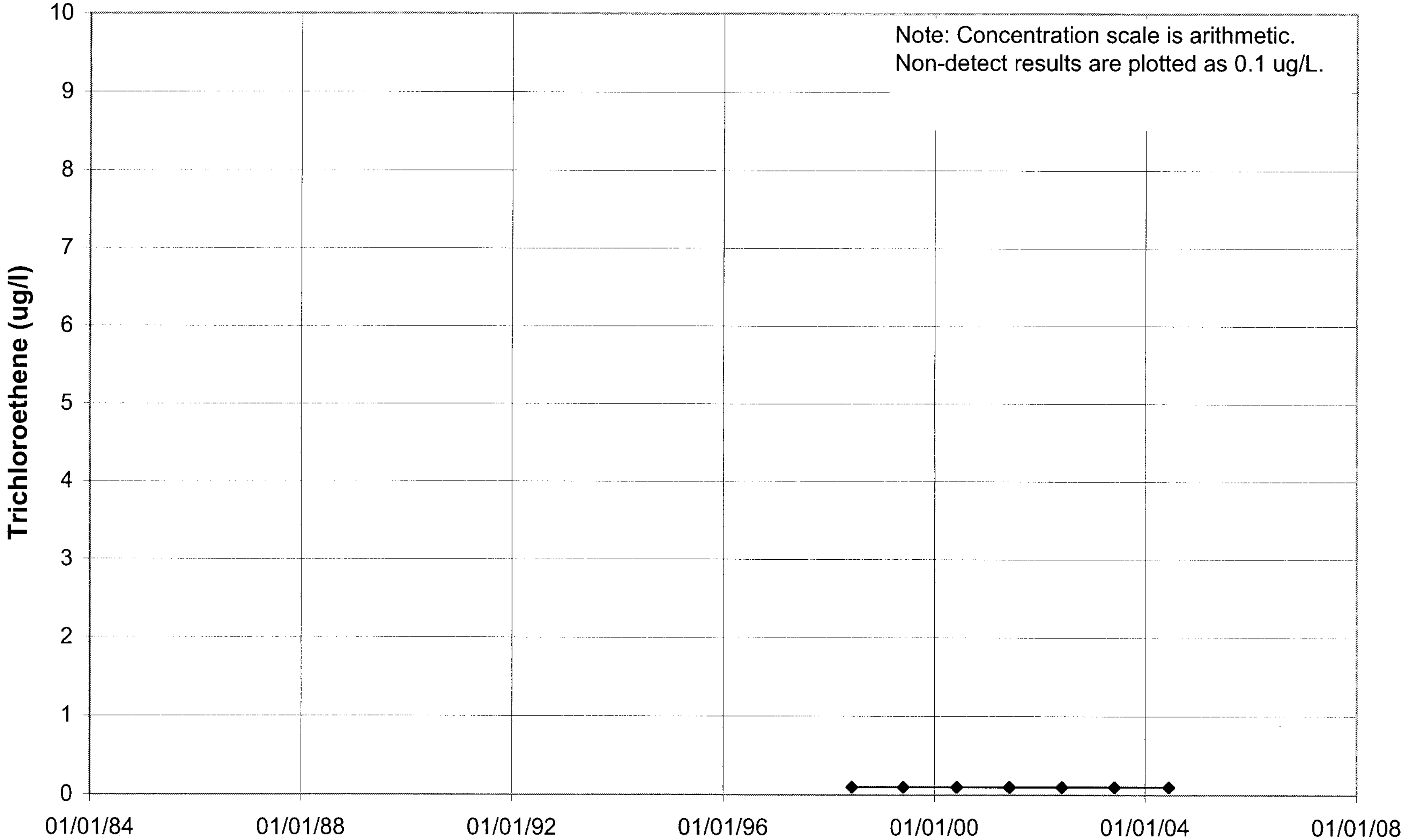

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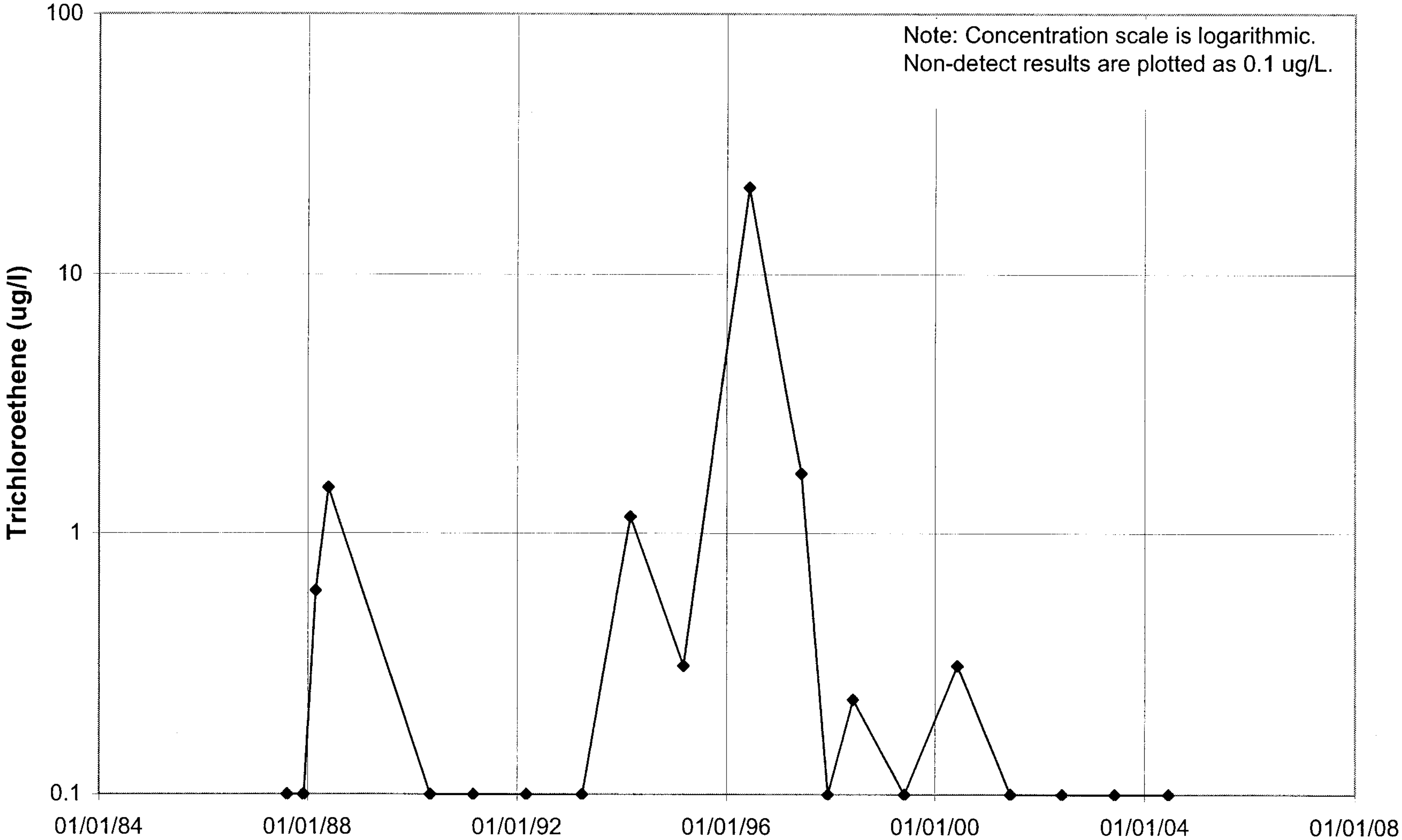

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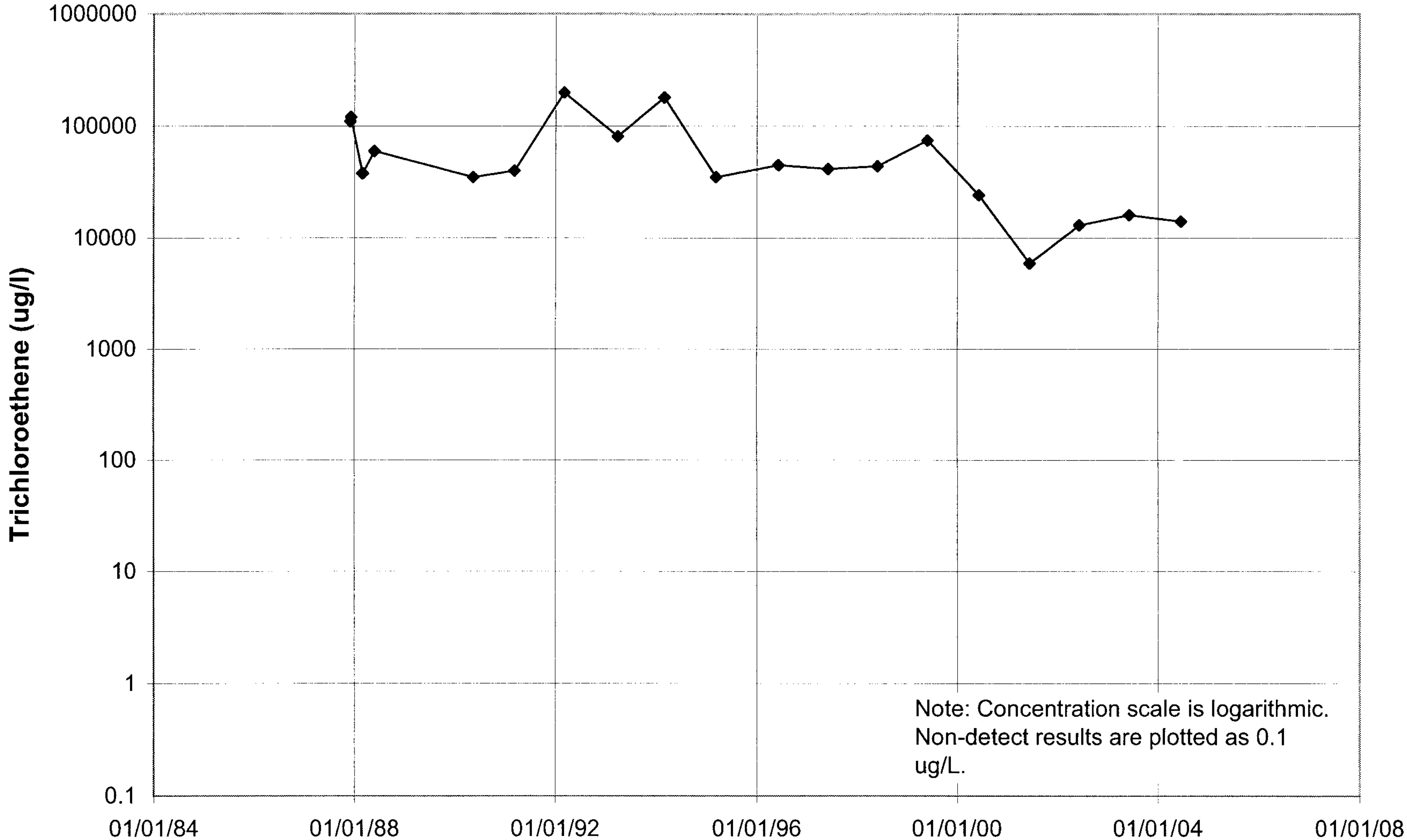

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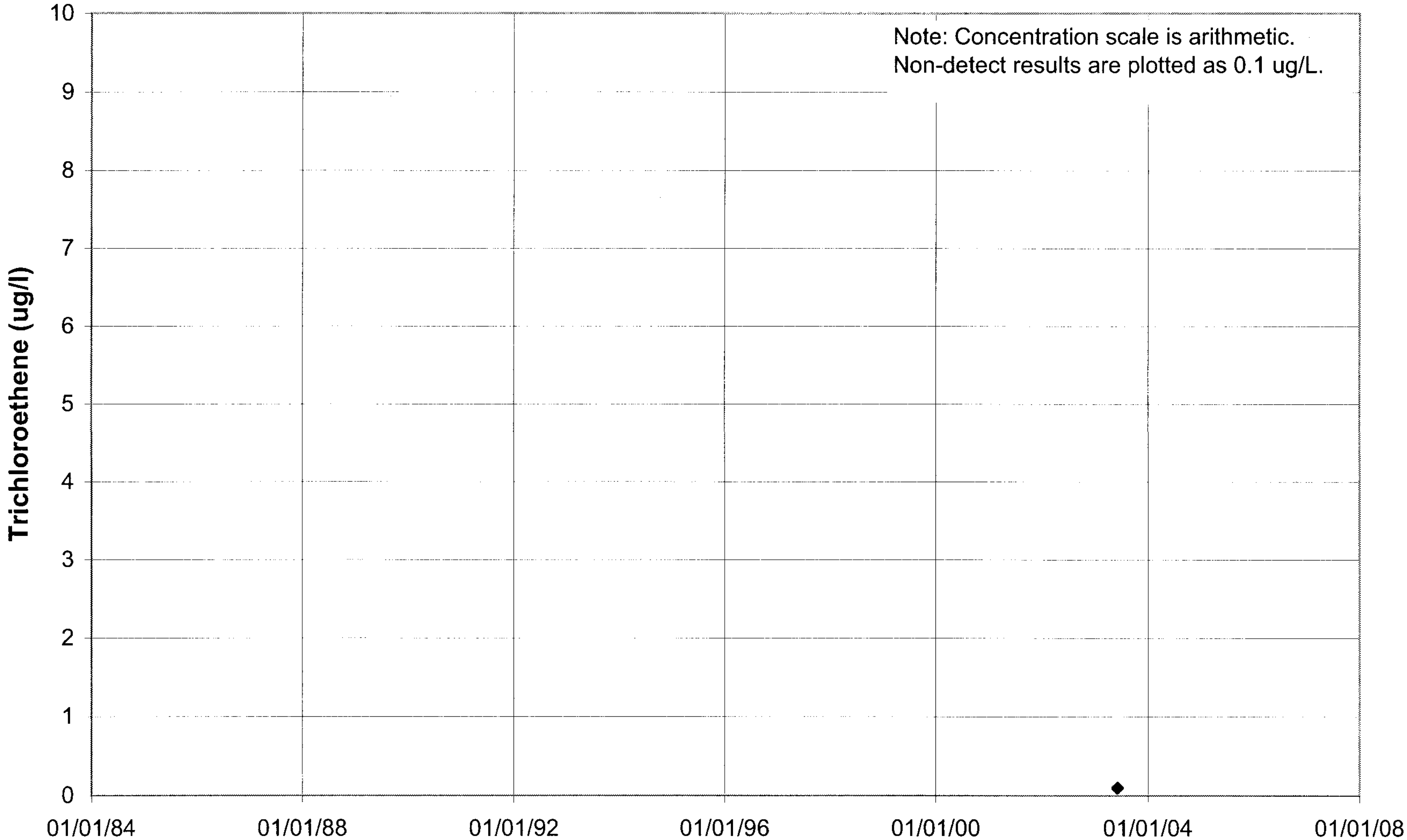

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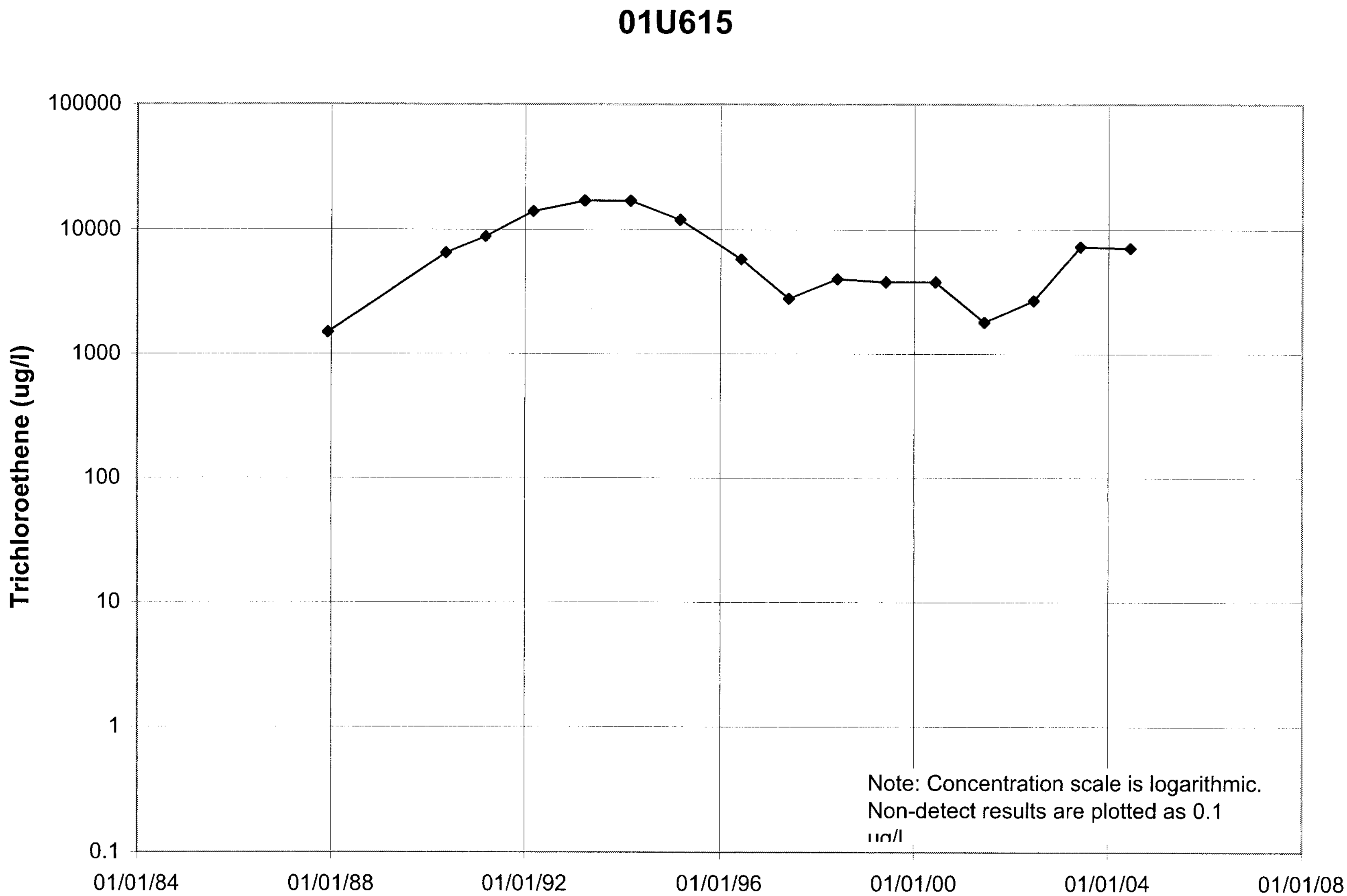

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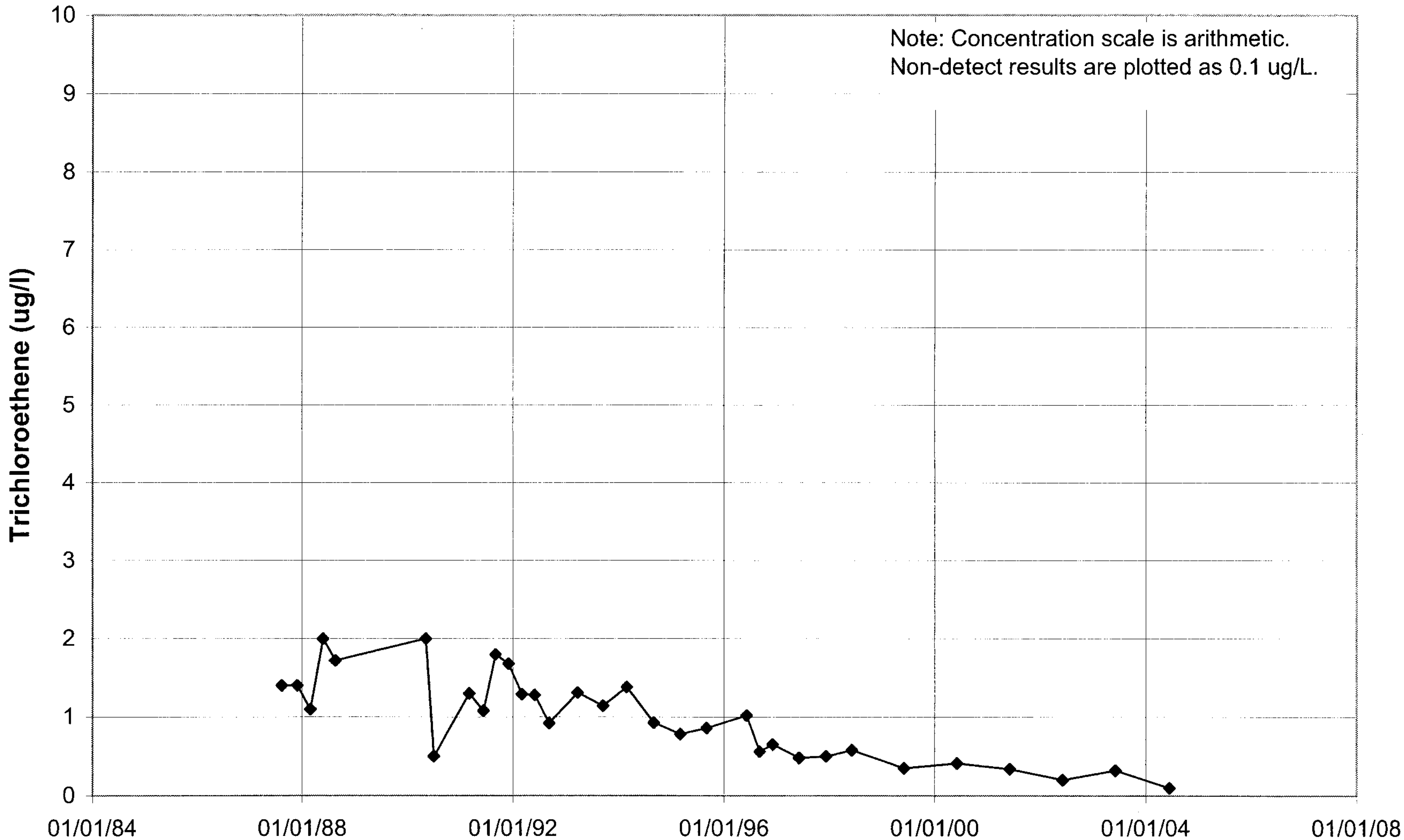

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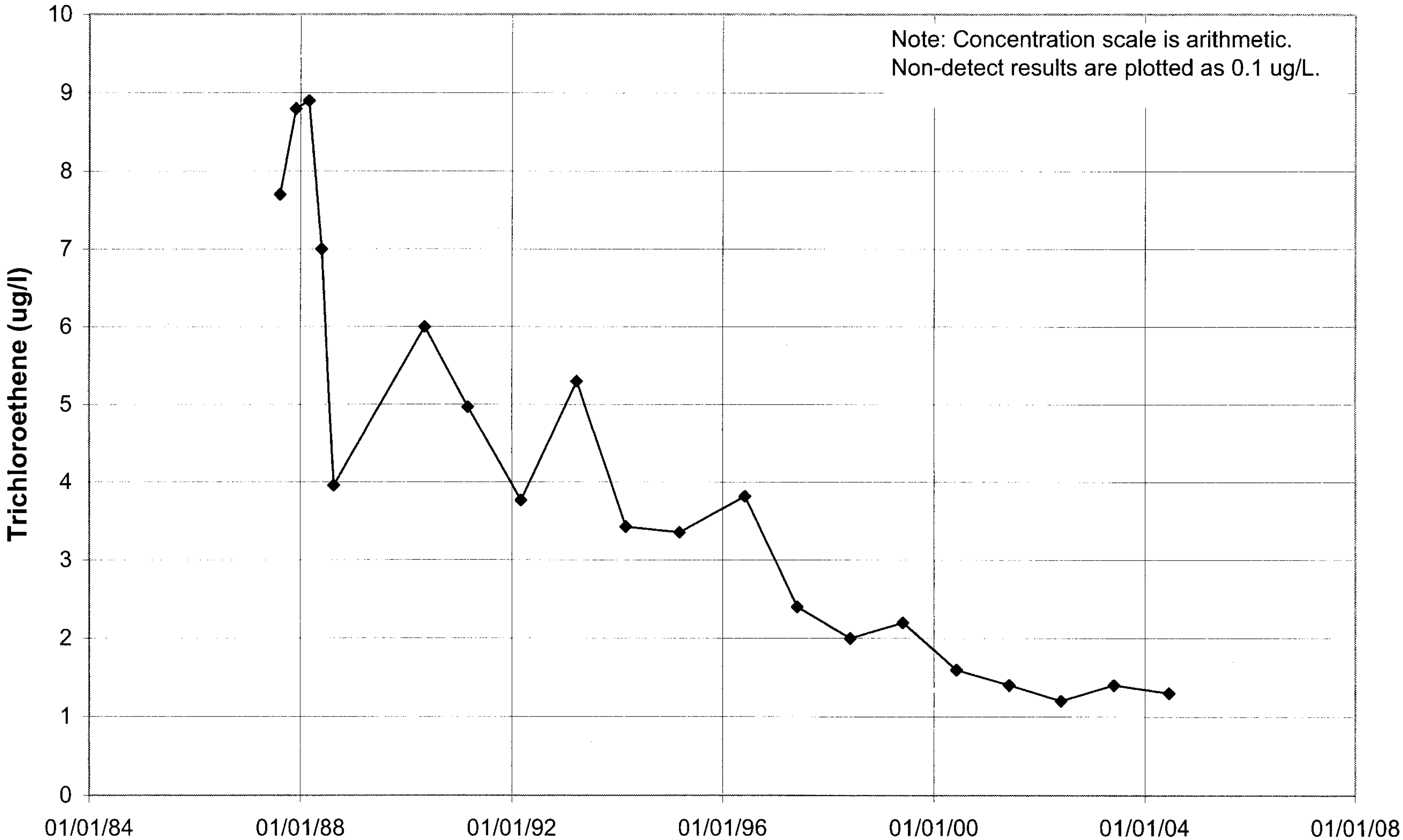

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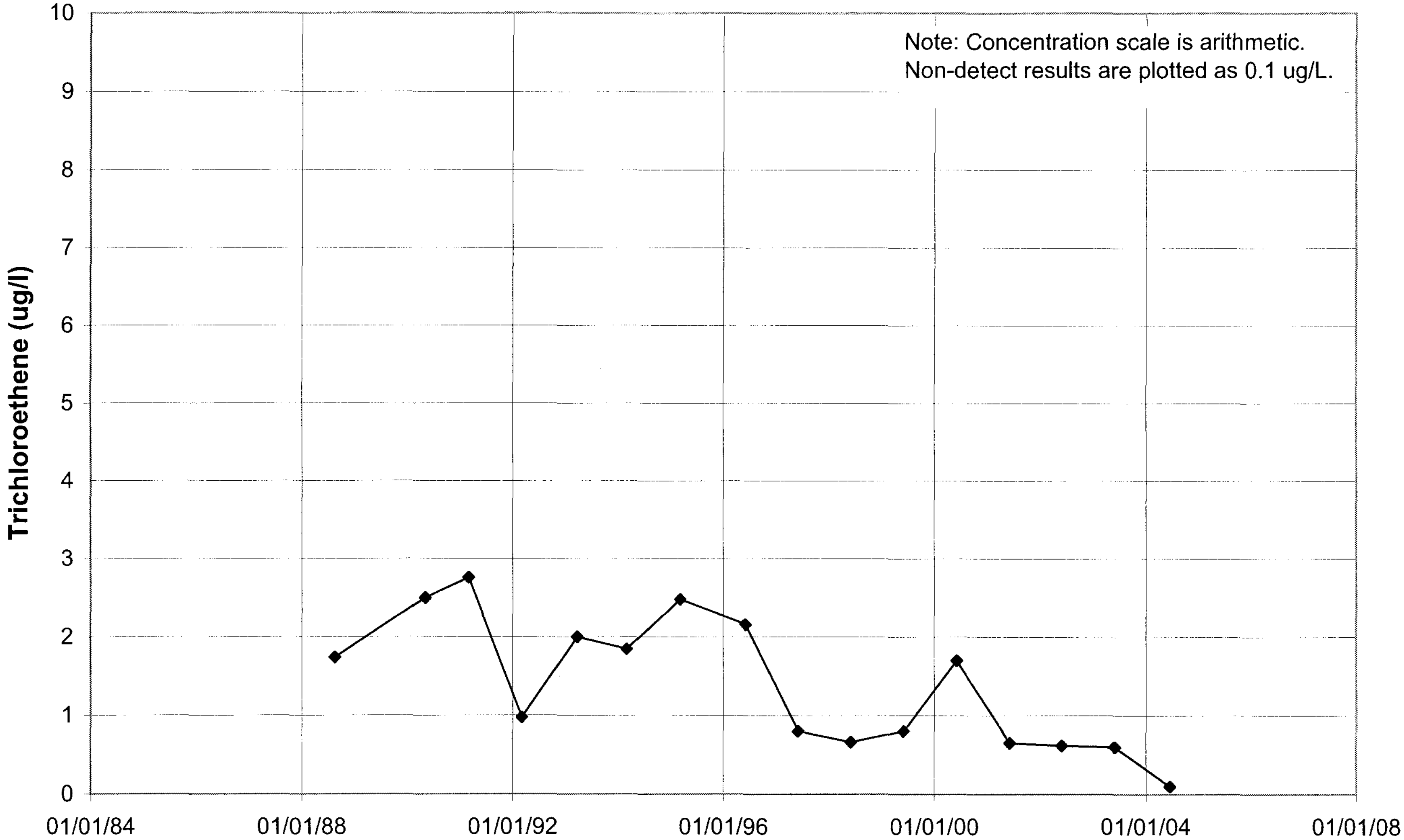

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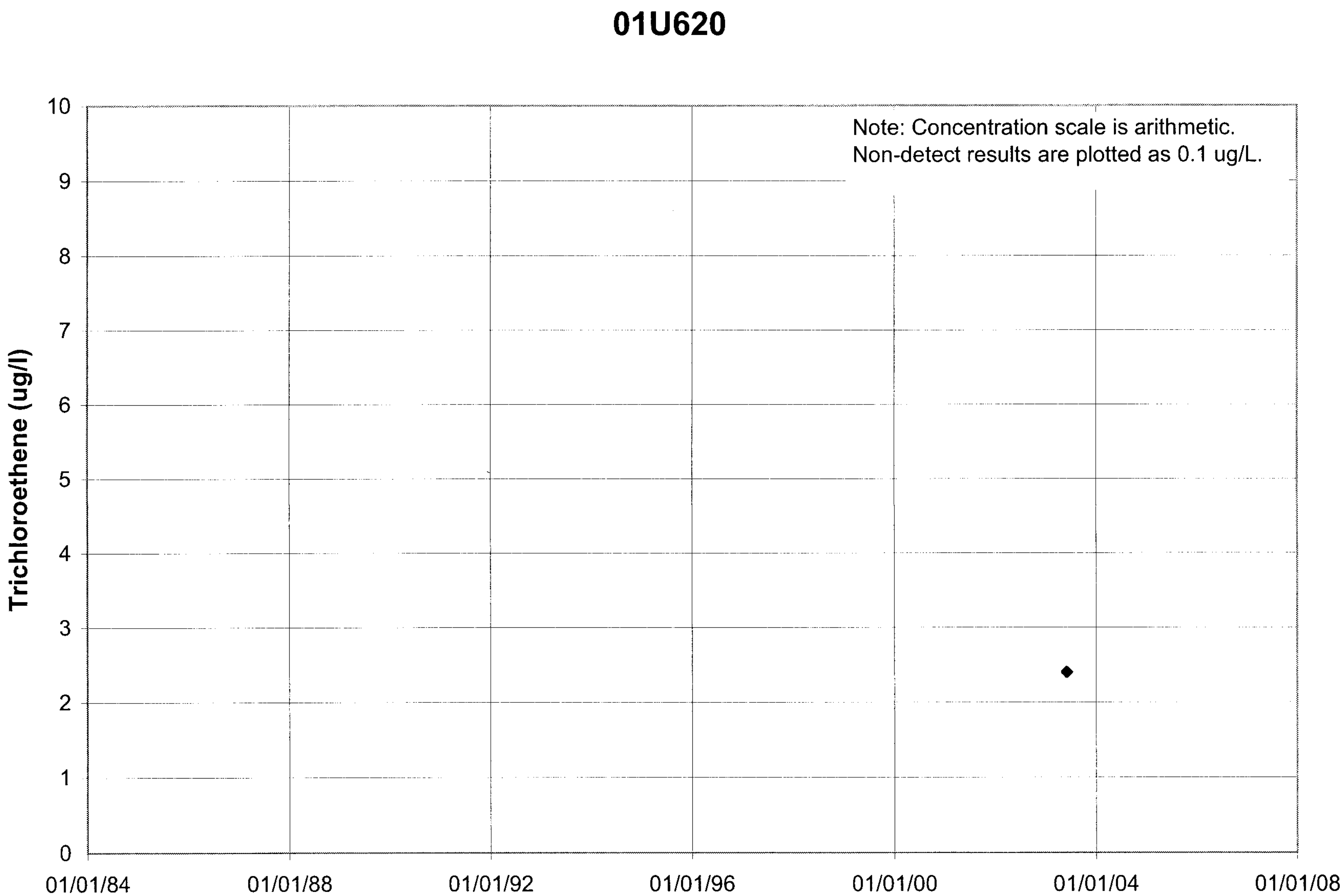

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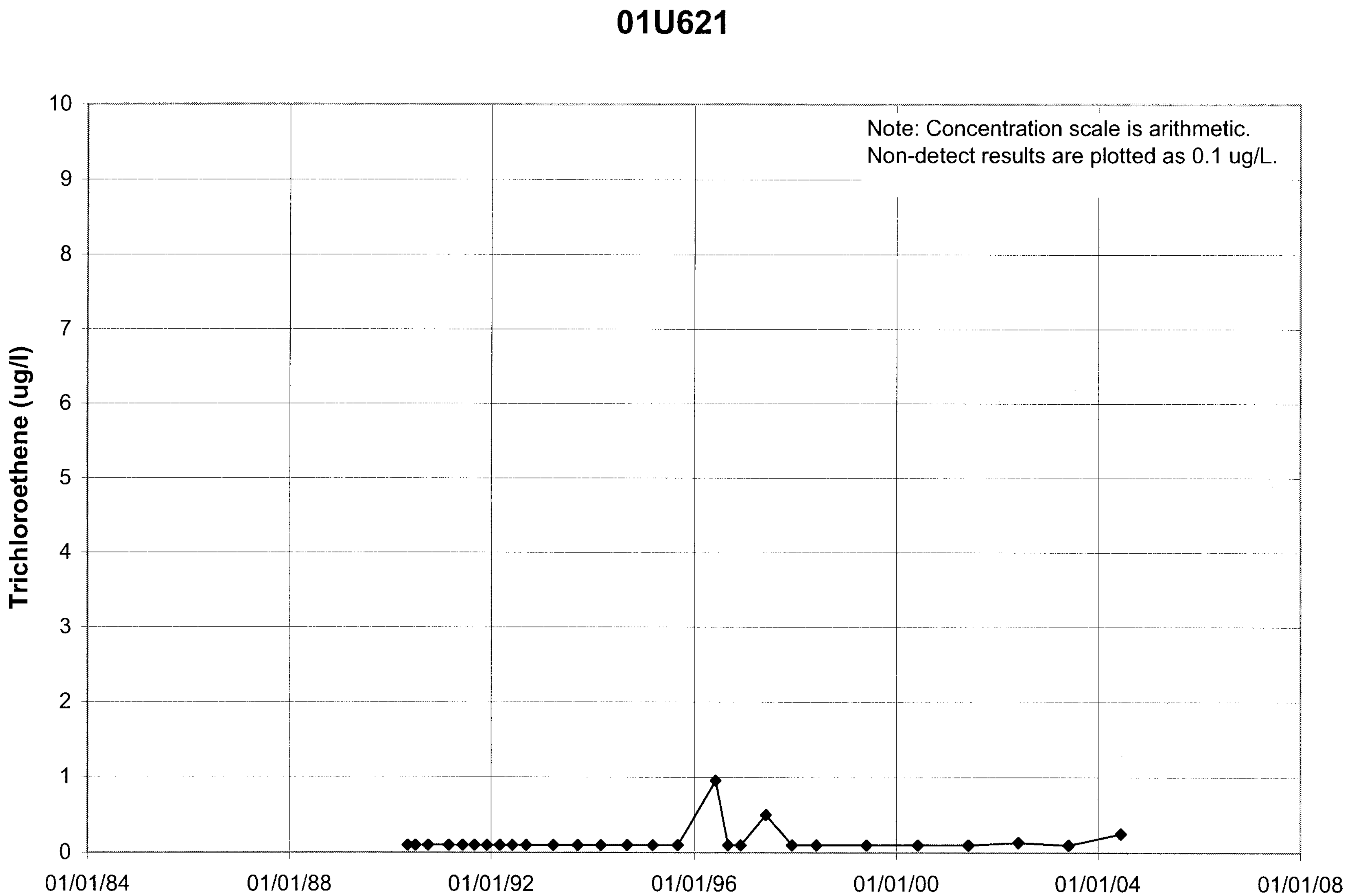

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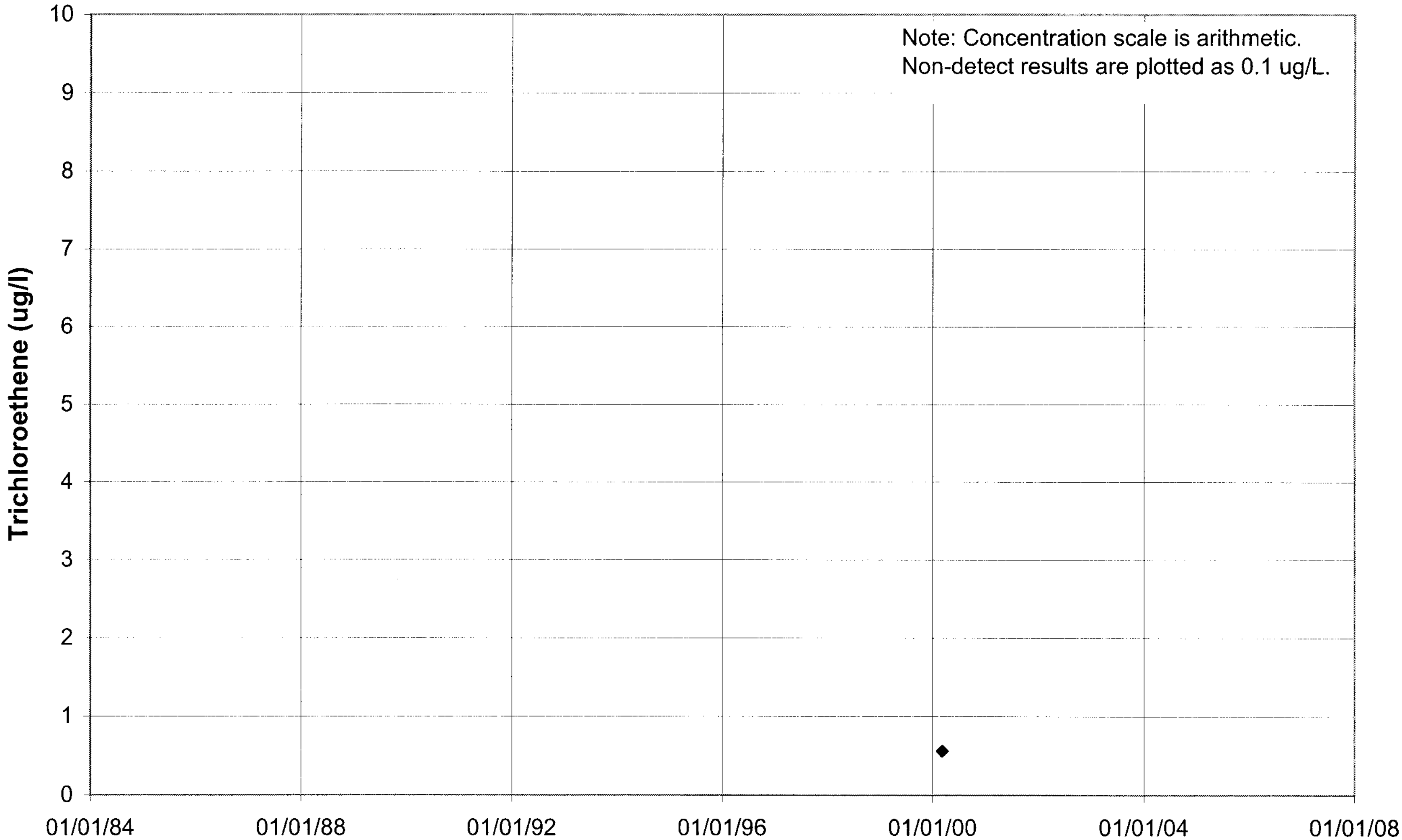

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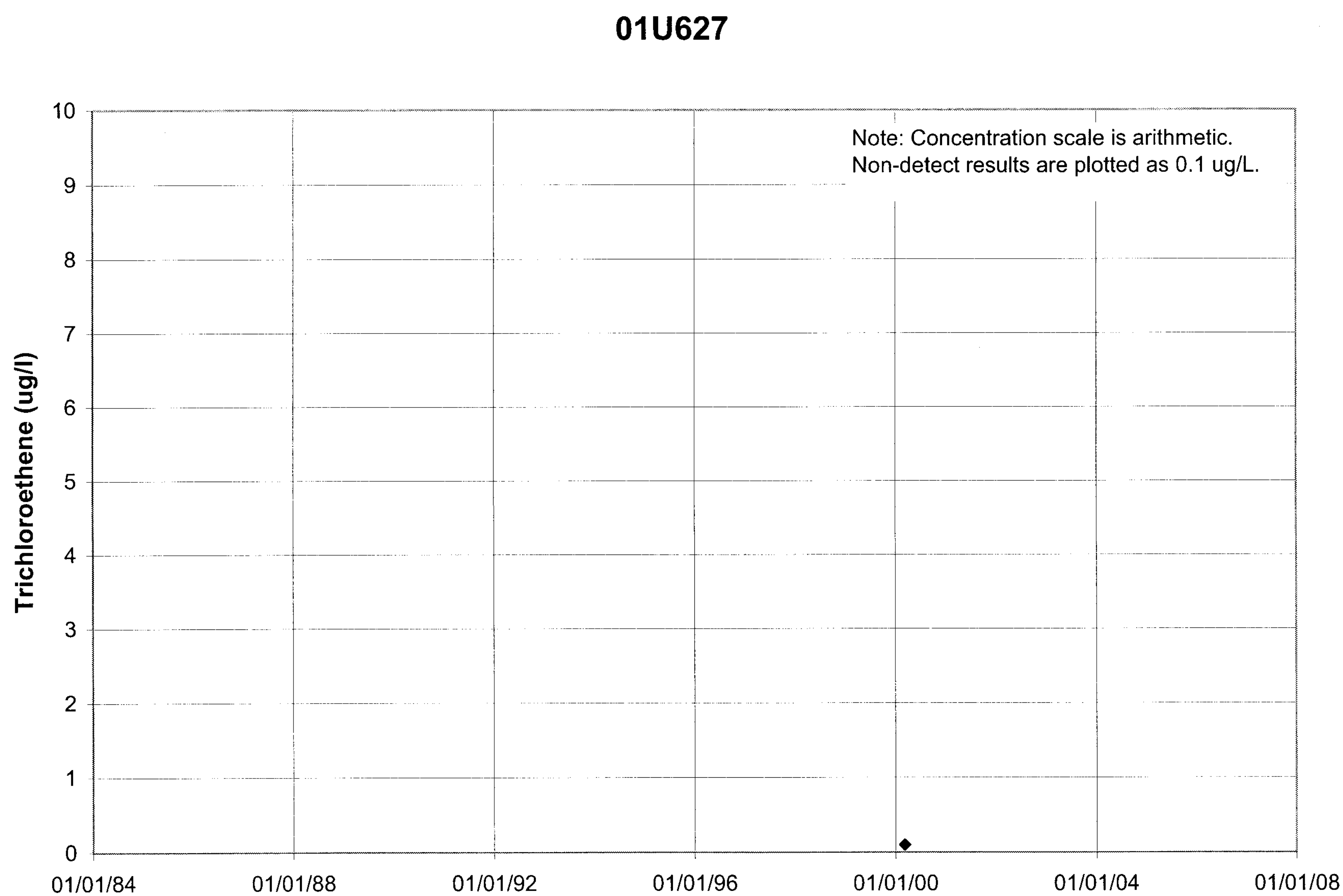

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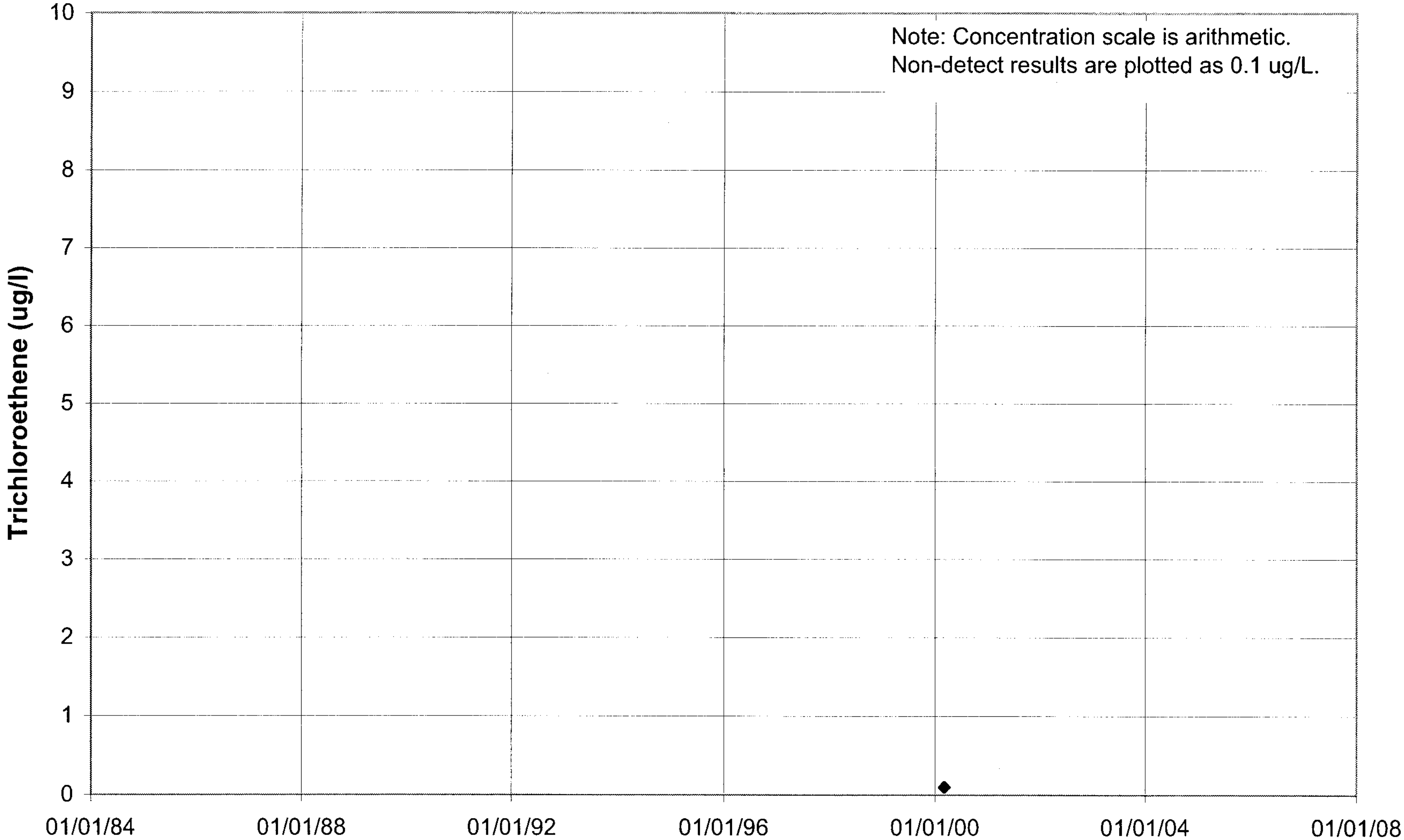

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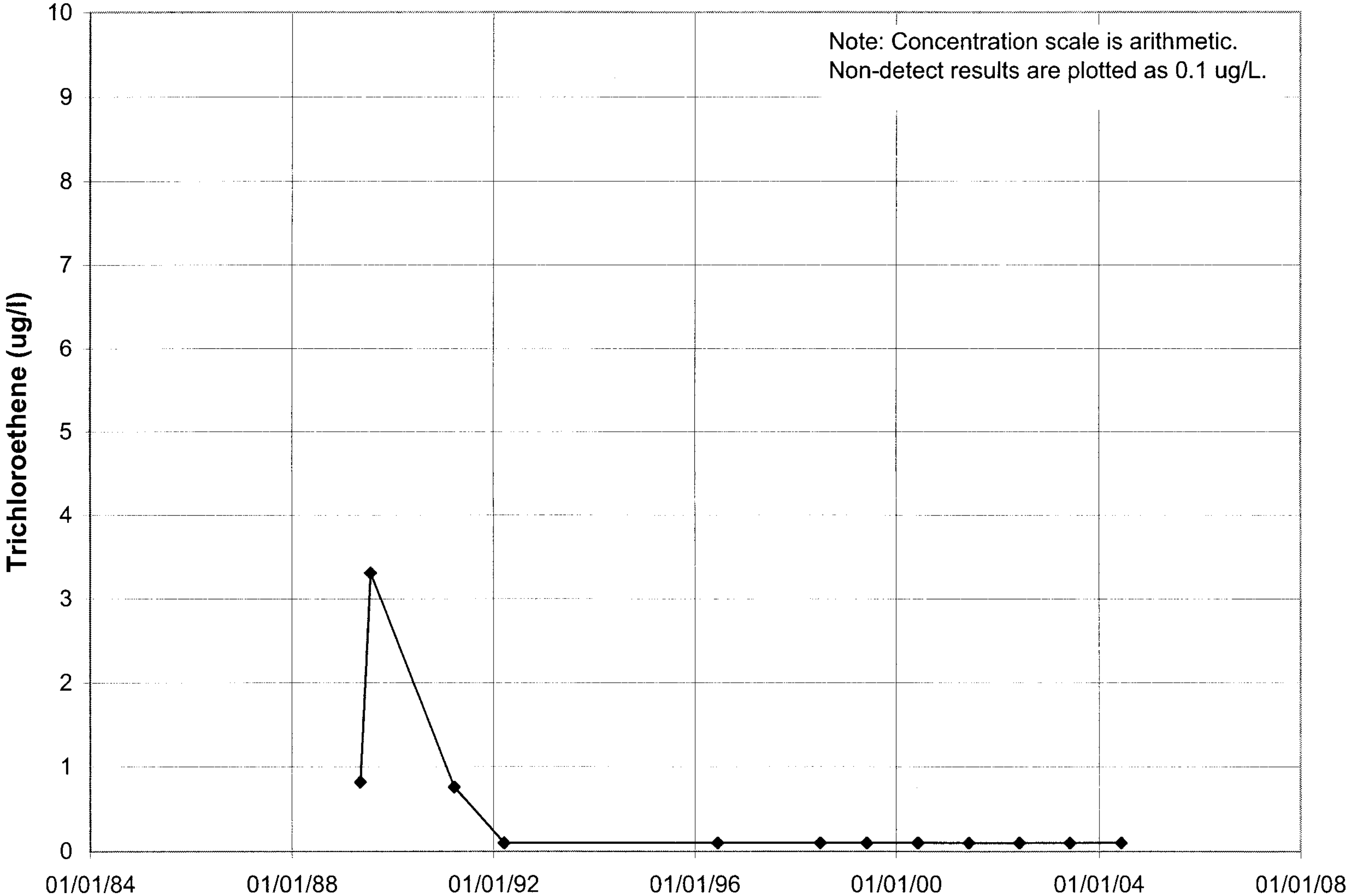

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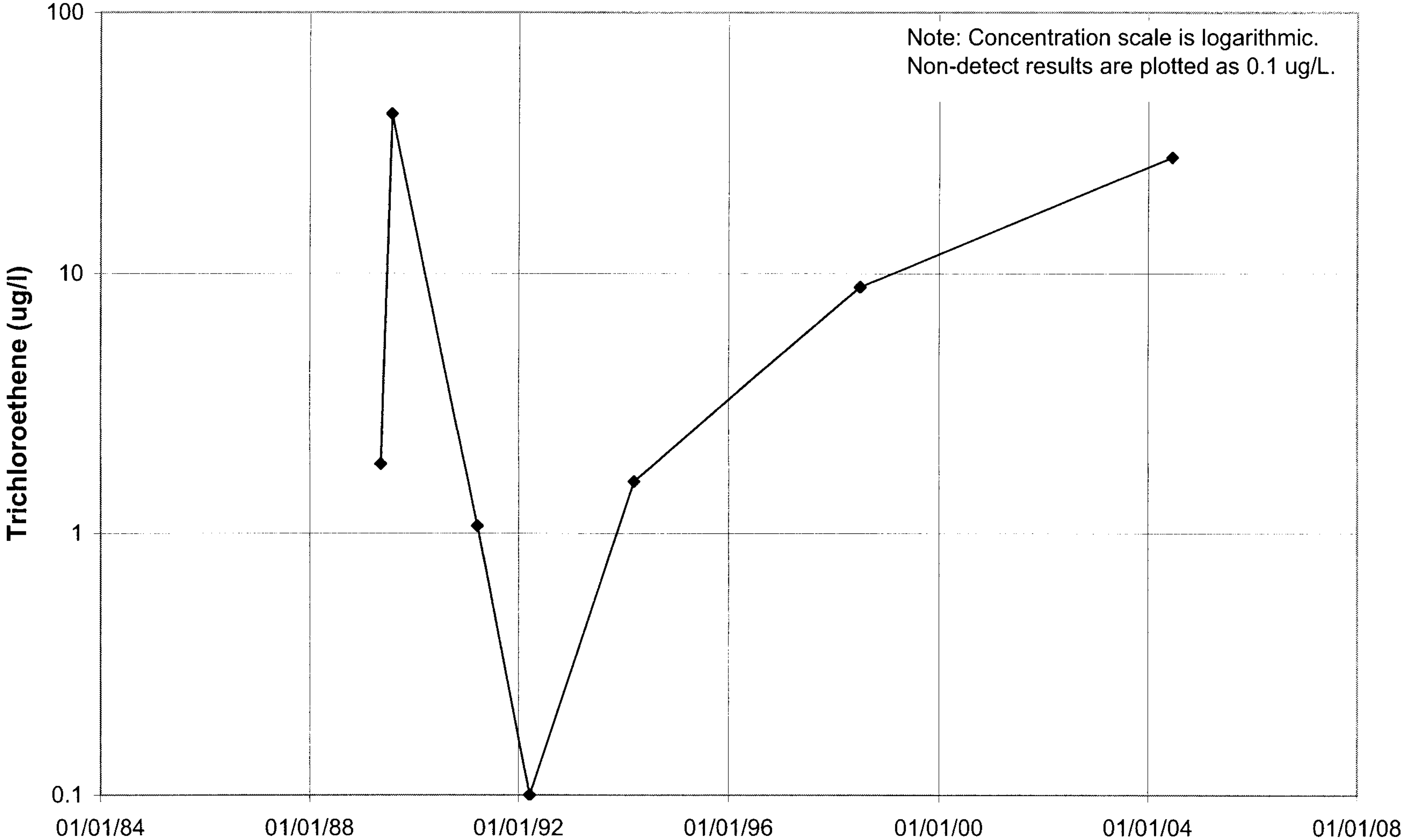

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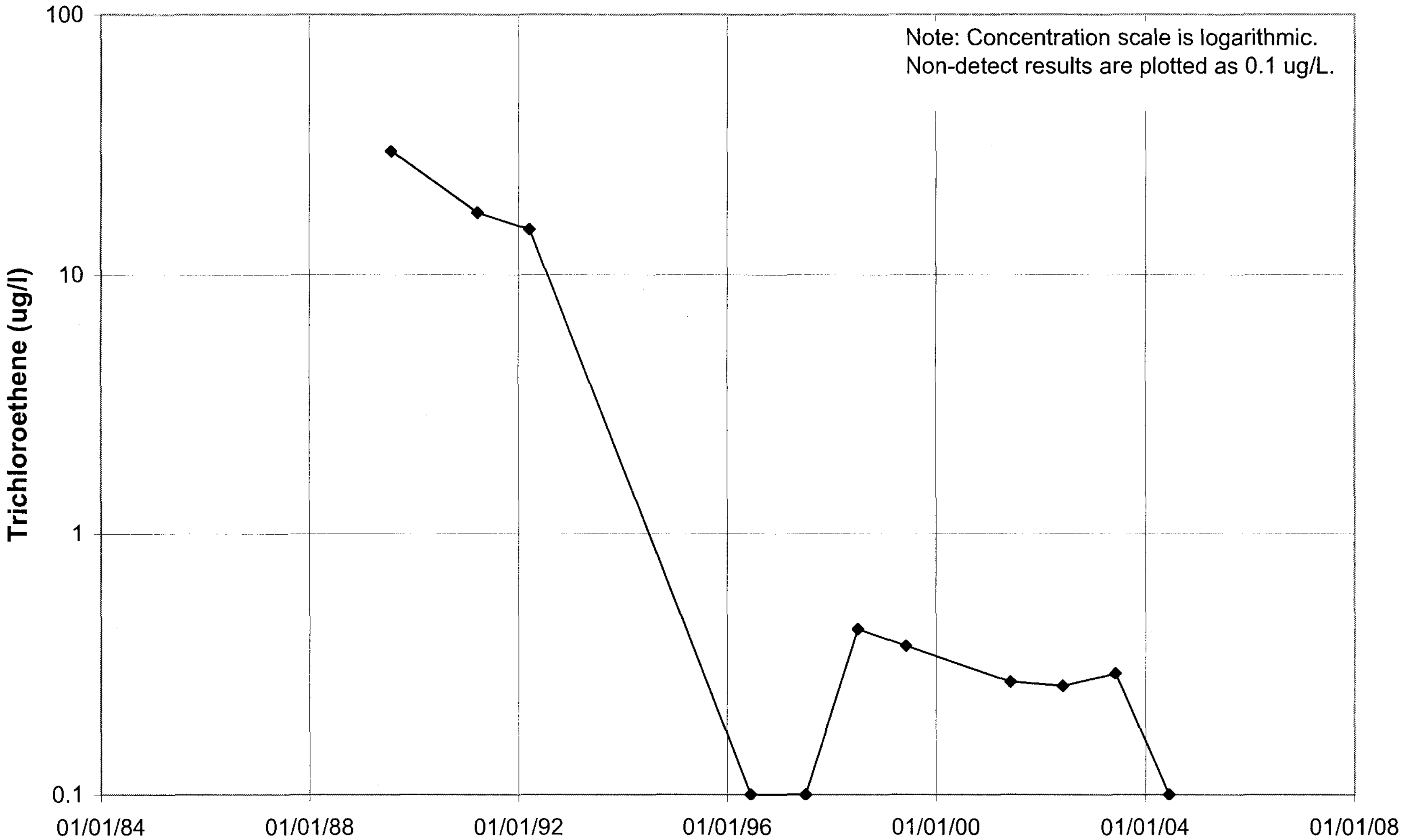

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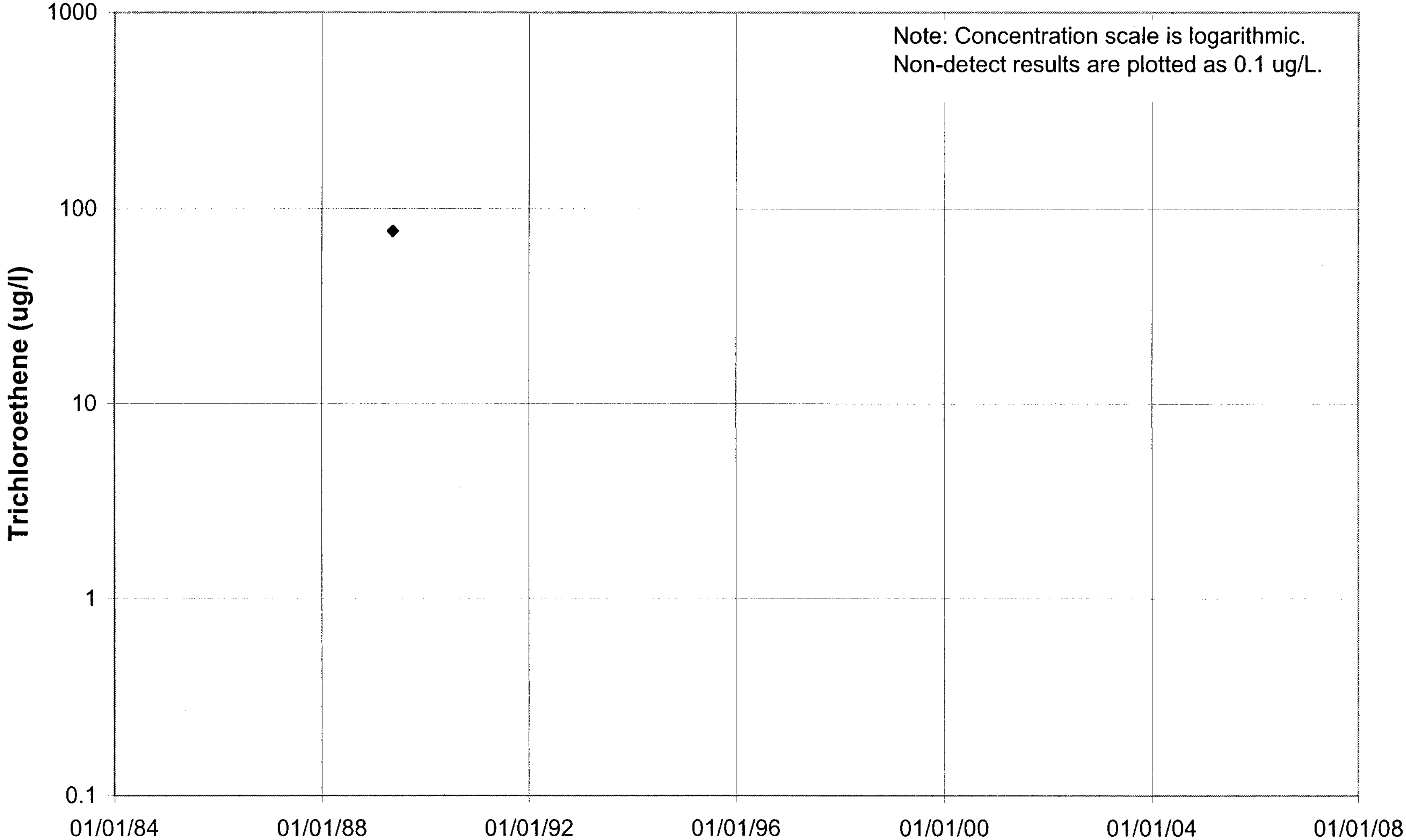

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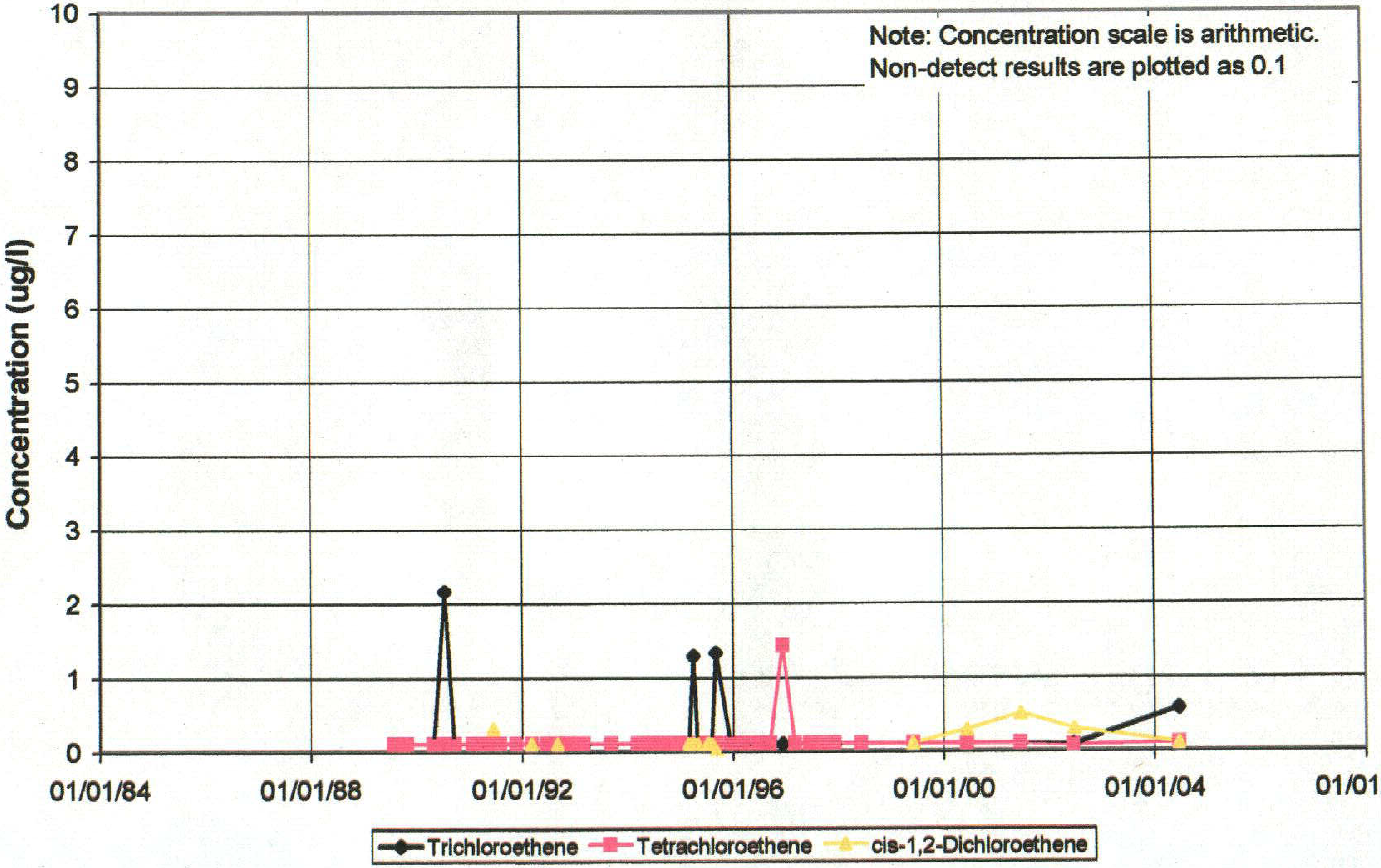

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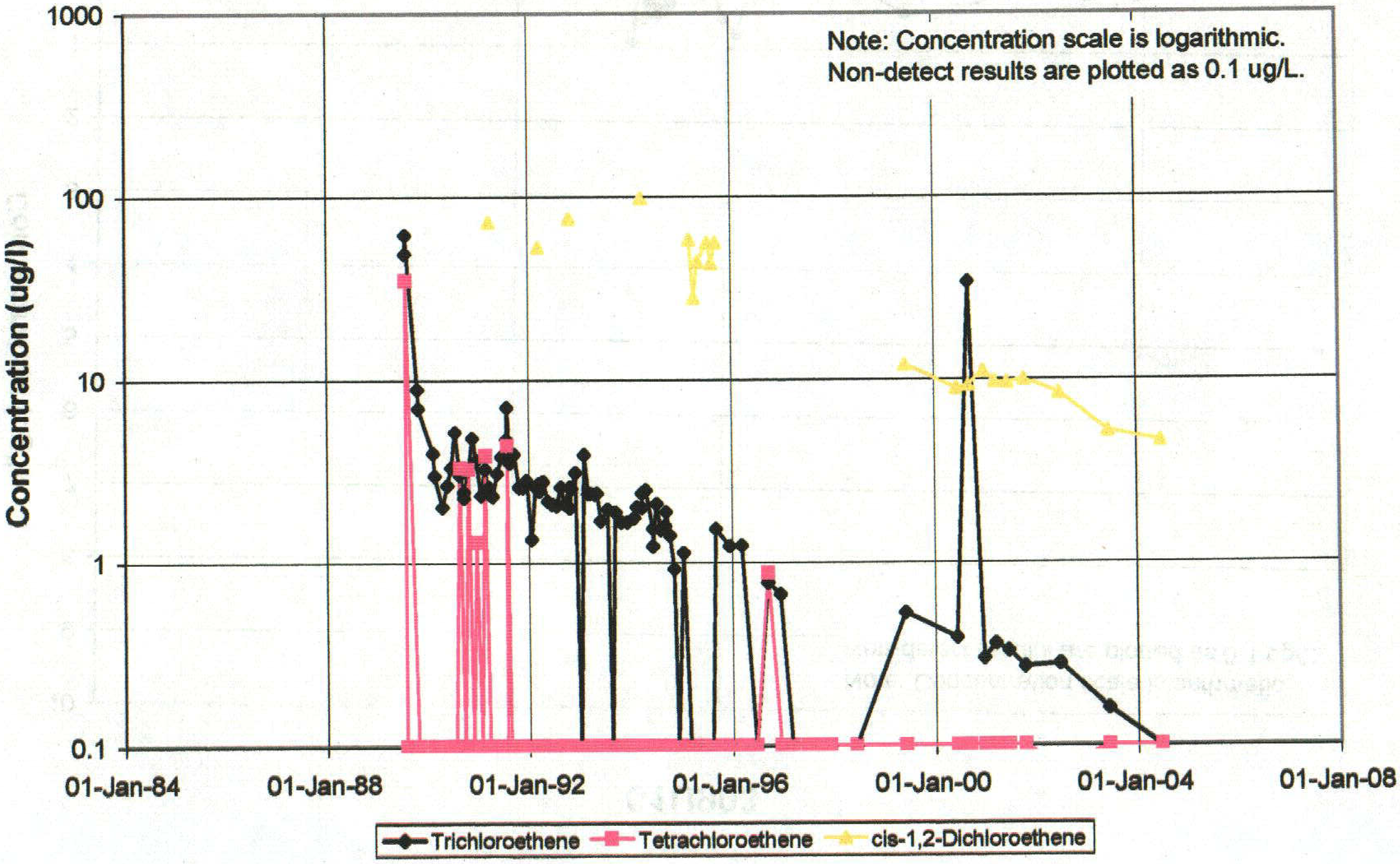

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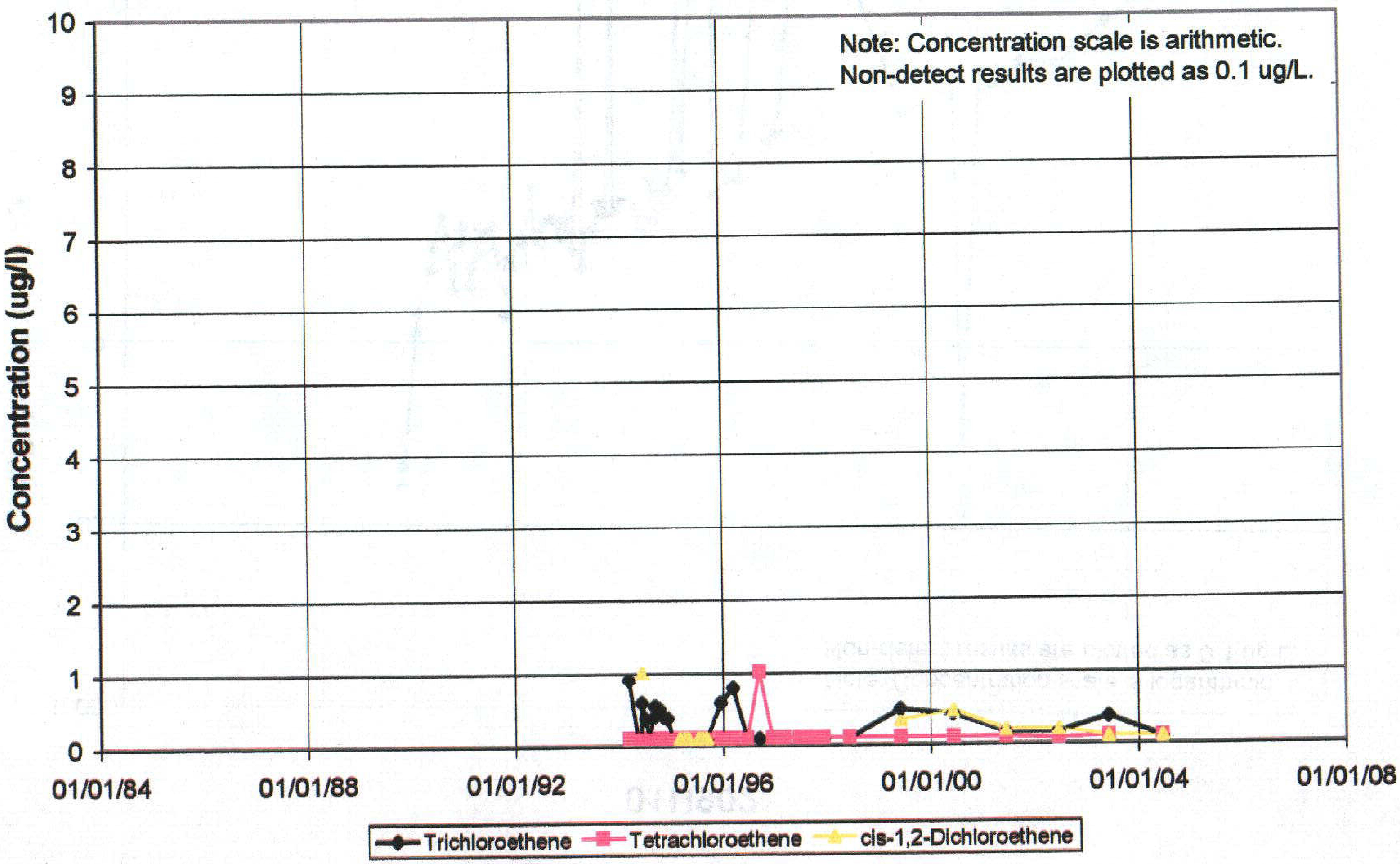

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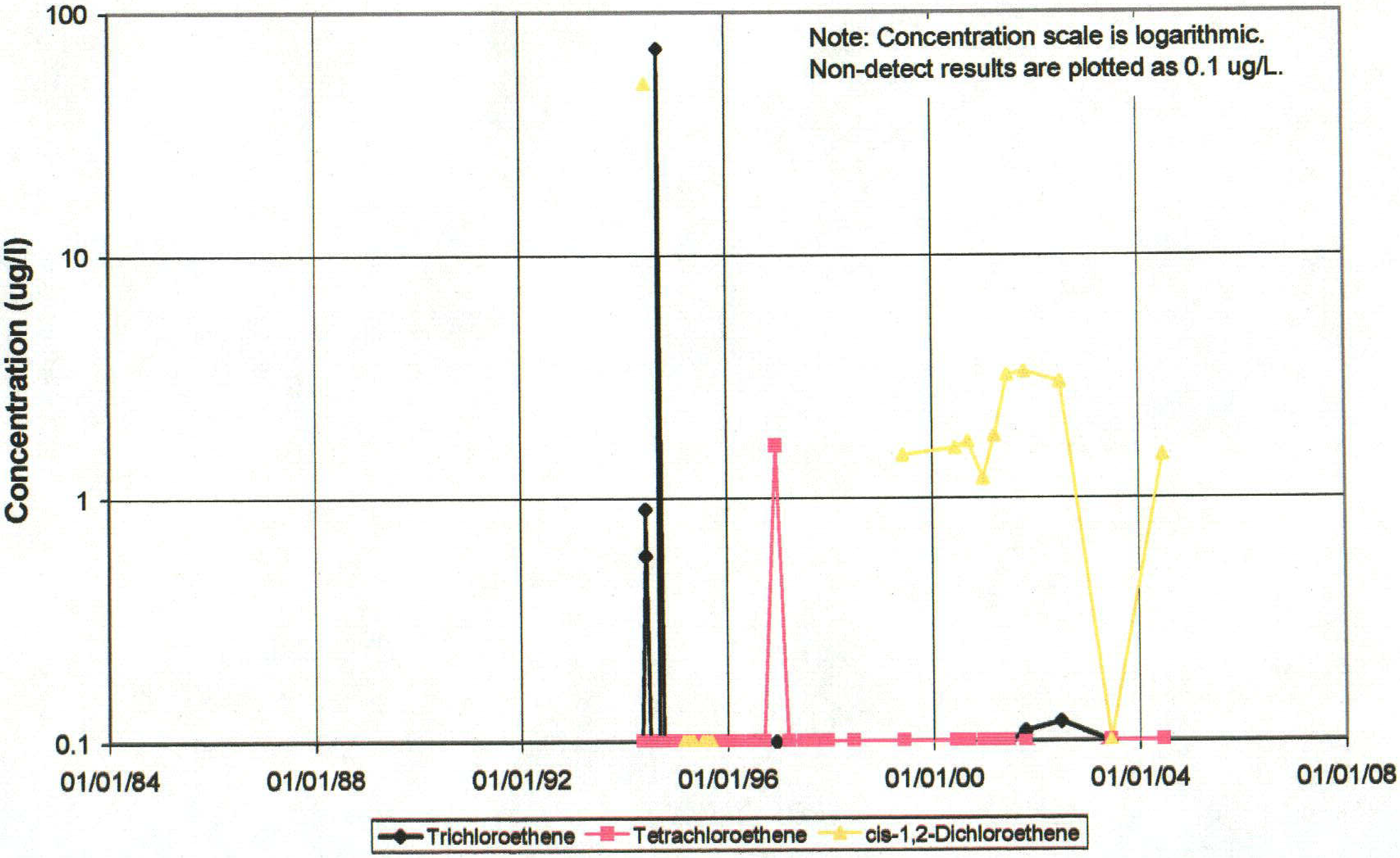
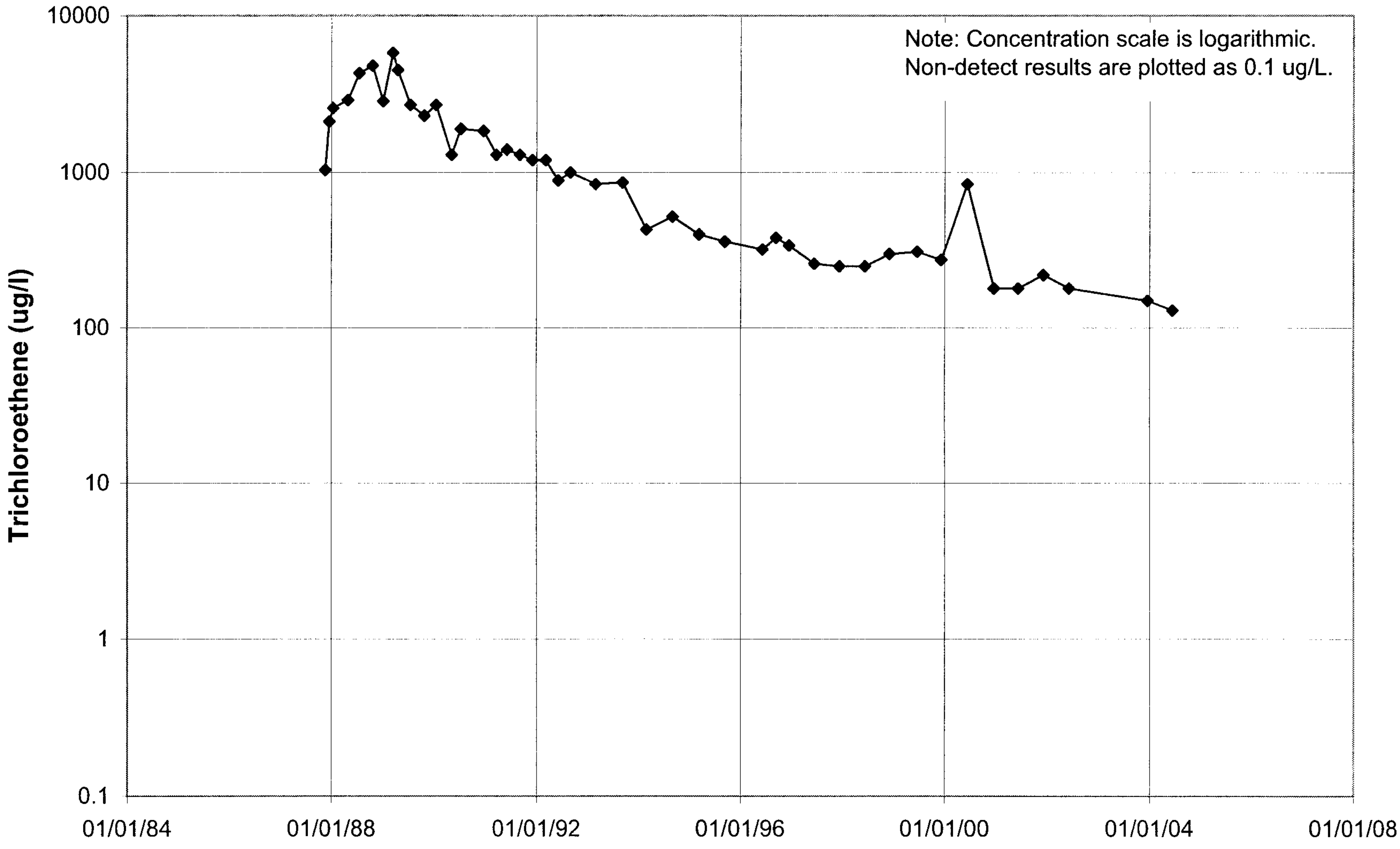


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03F302 (B1)



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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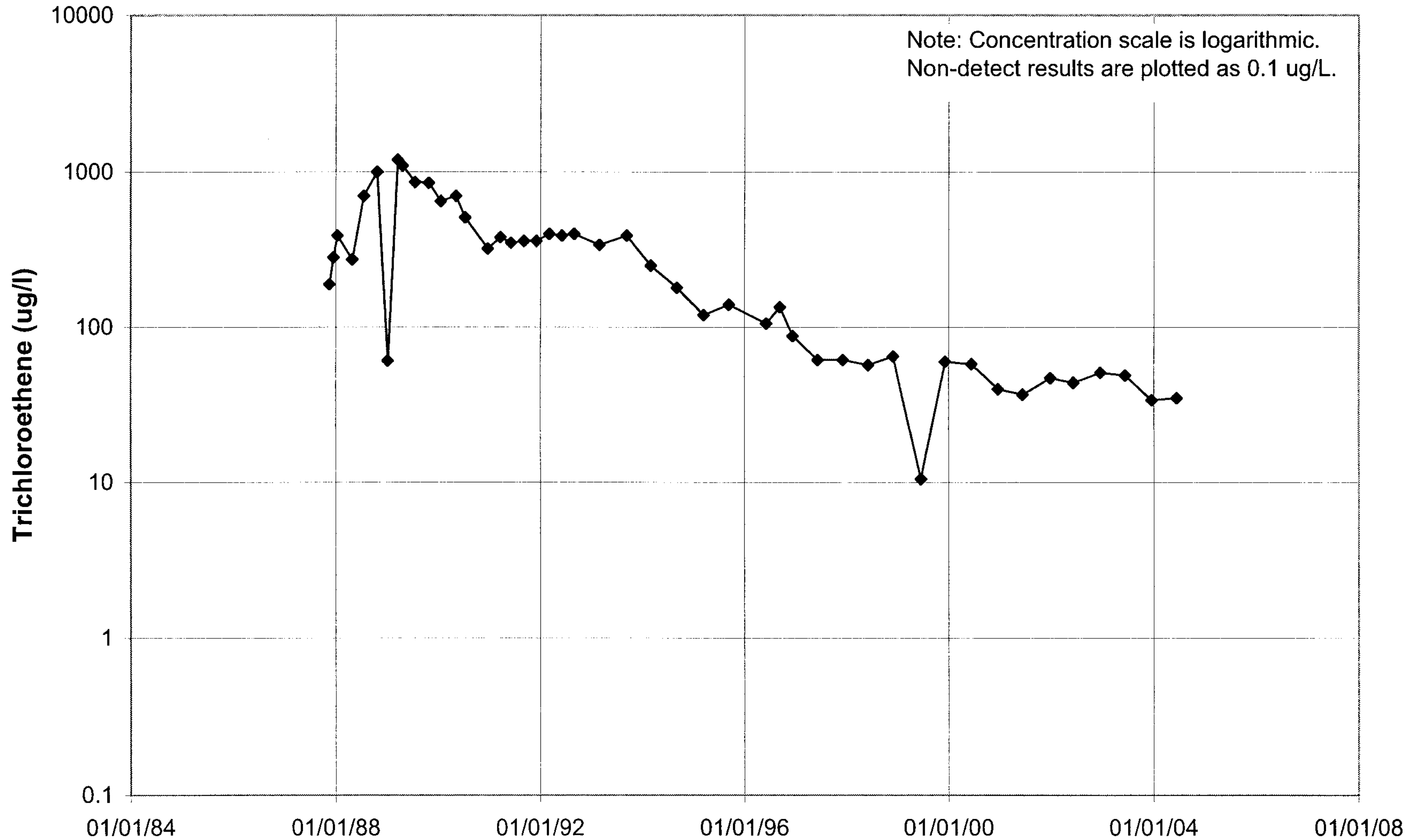

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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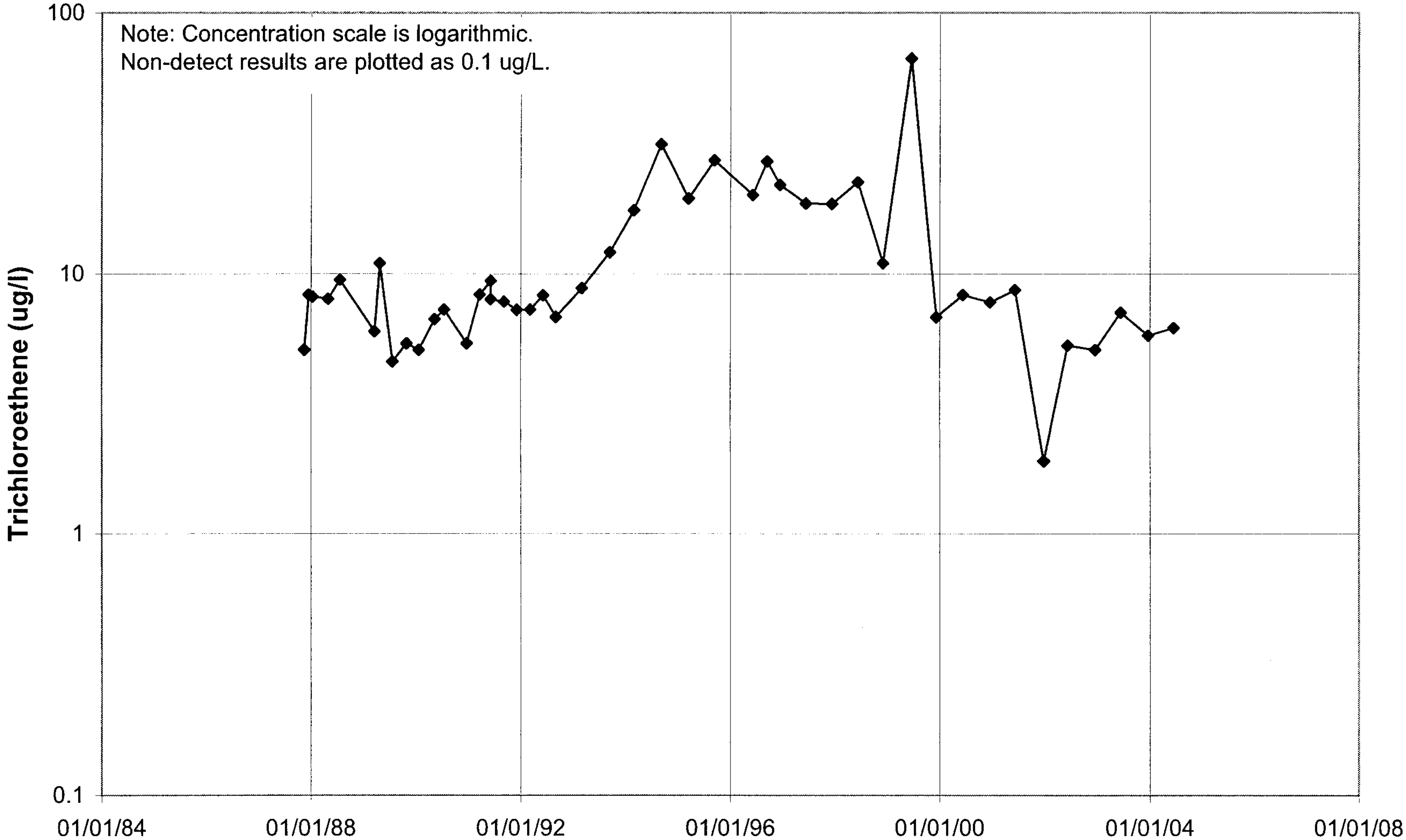

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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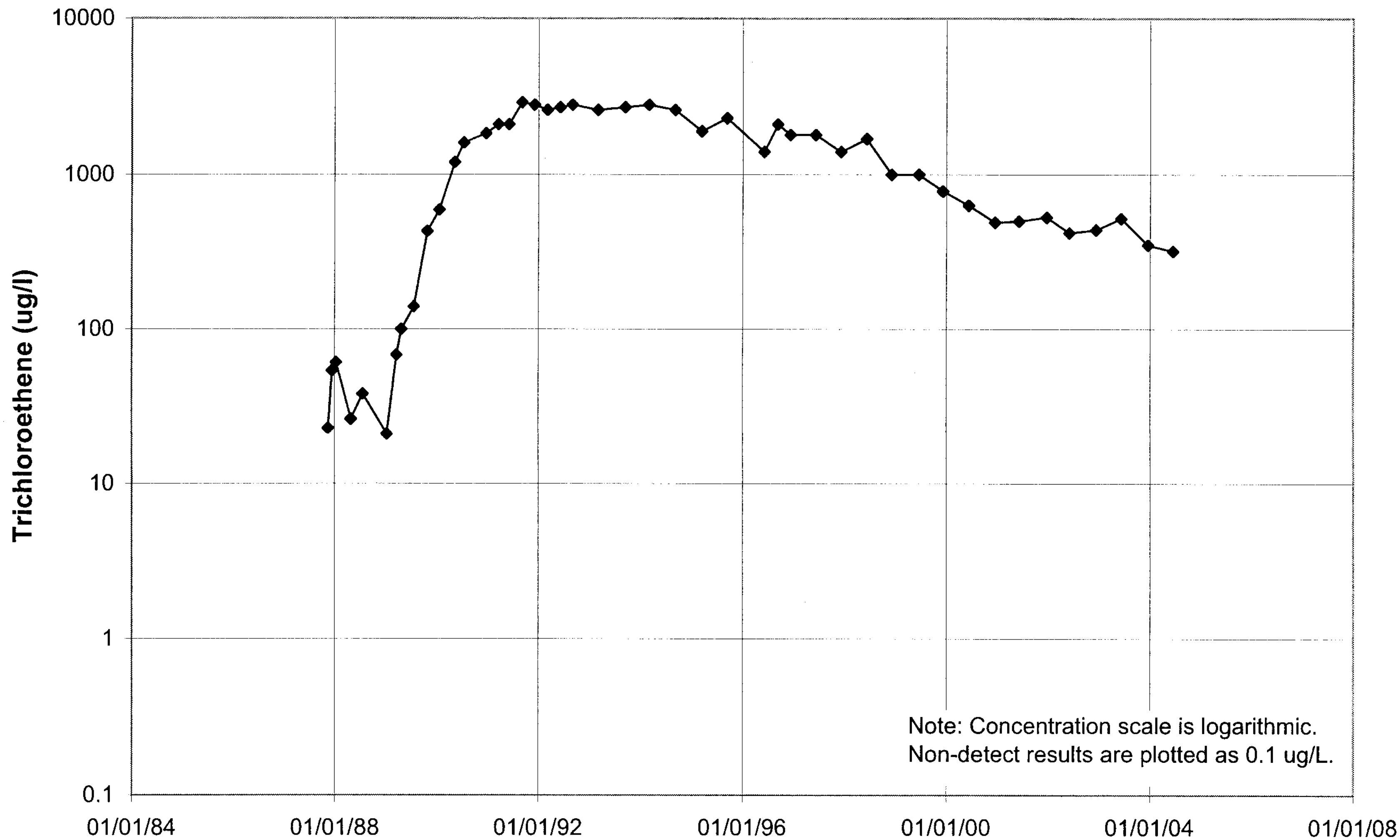
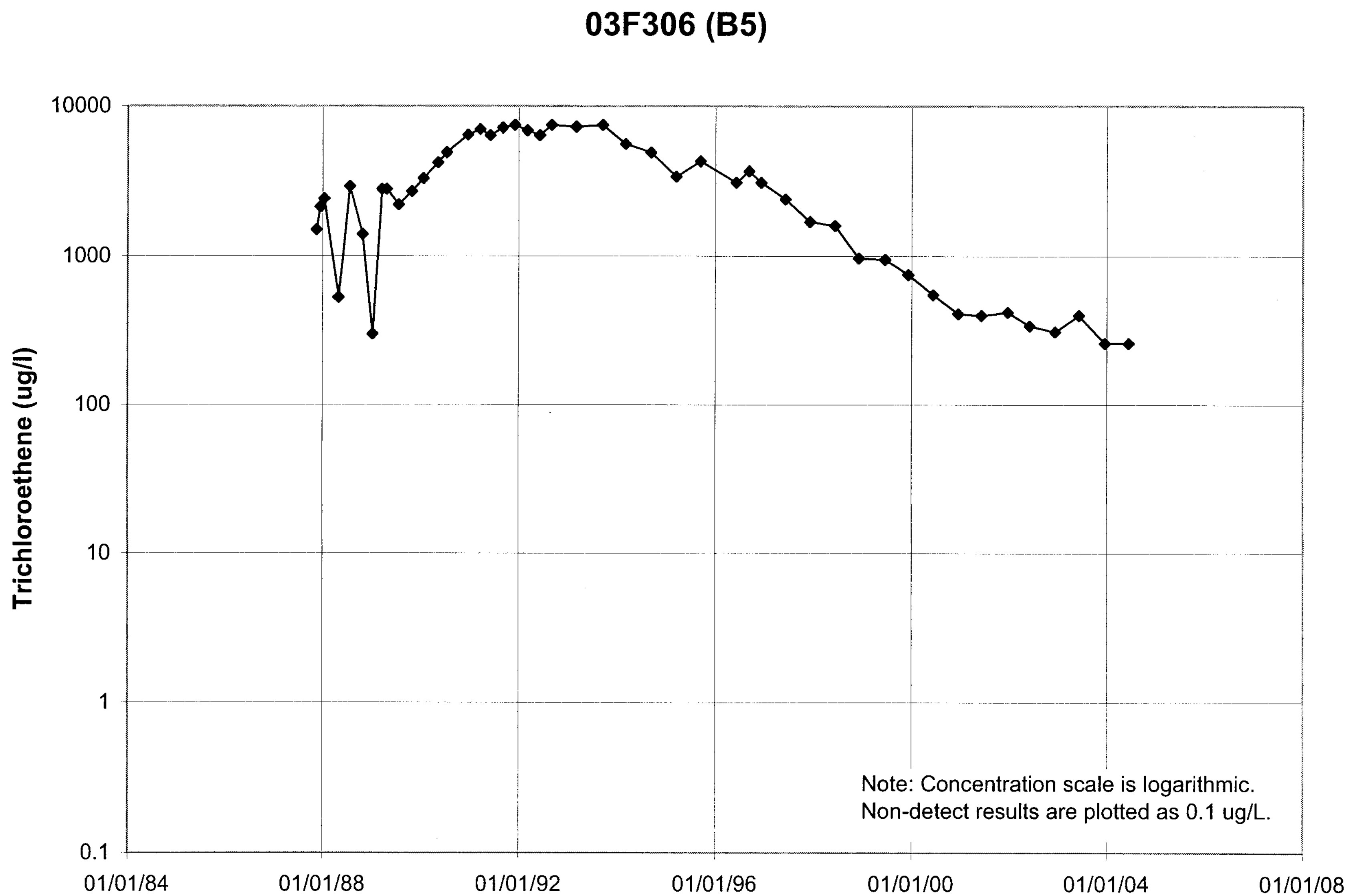


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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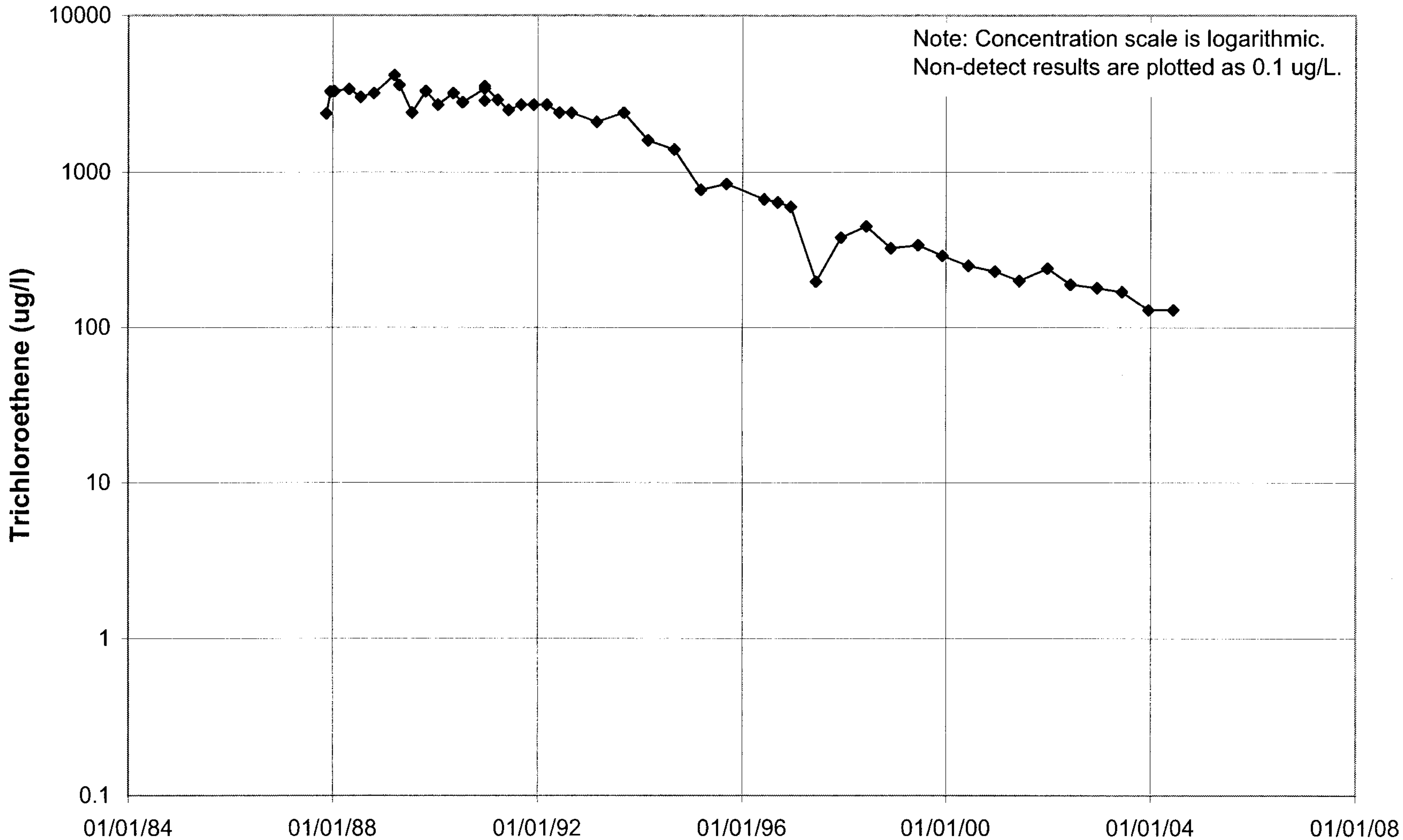

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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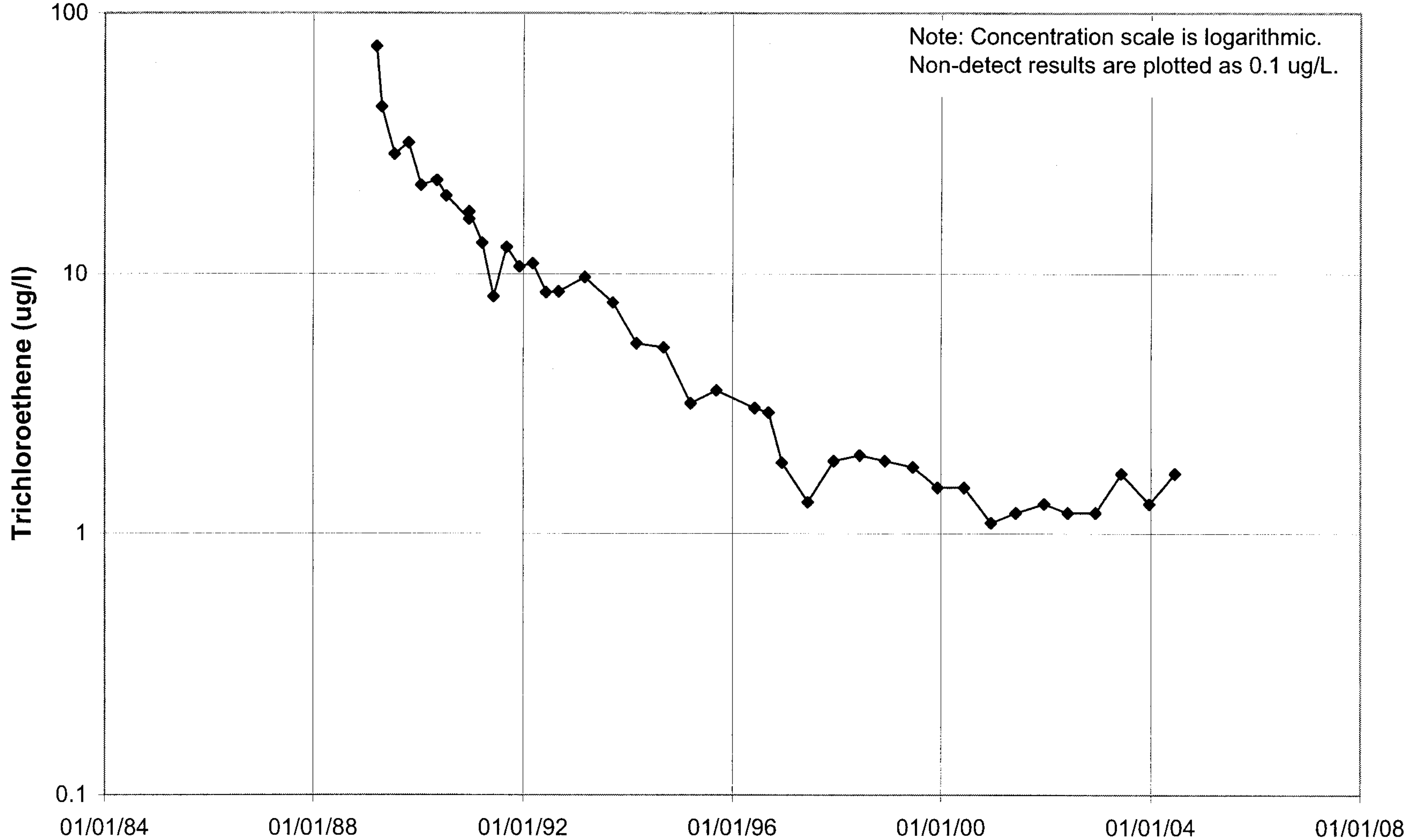

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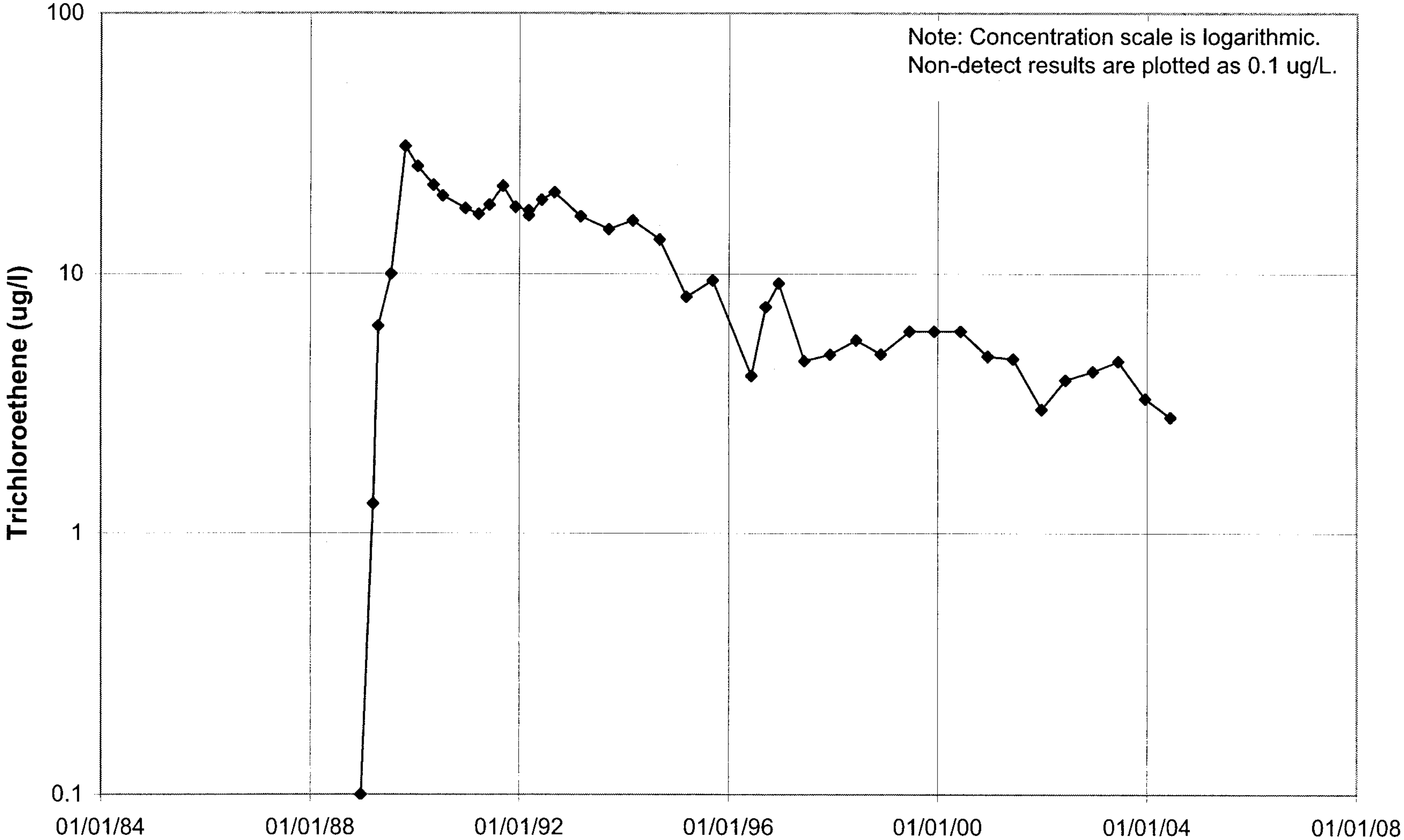

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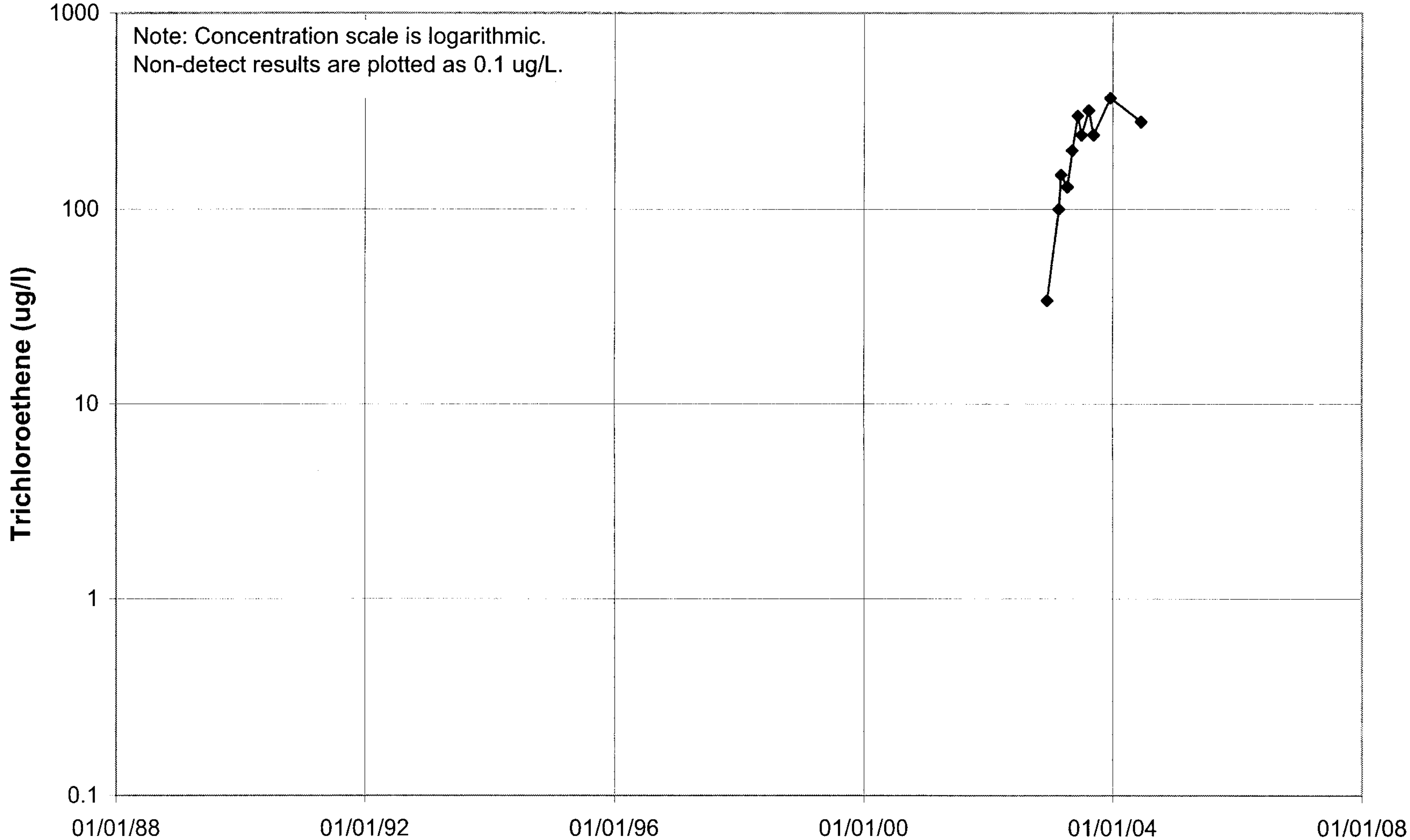
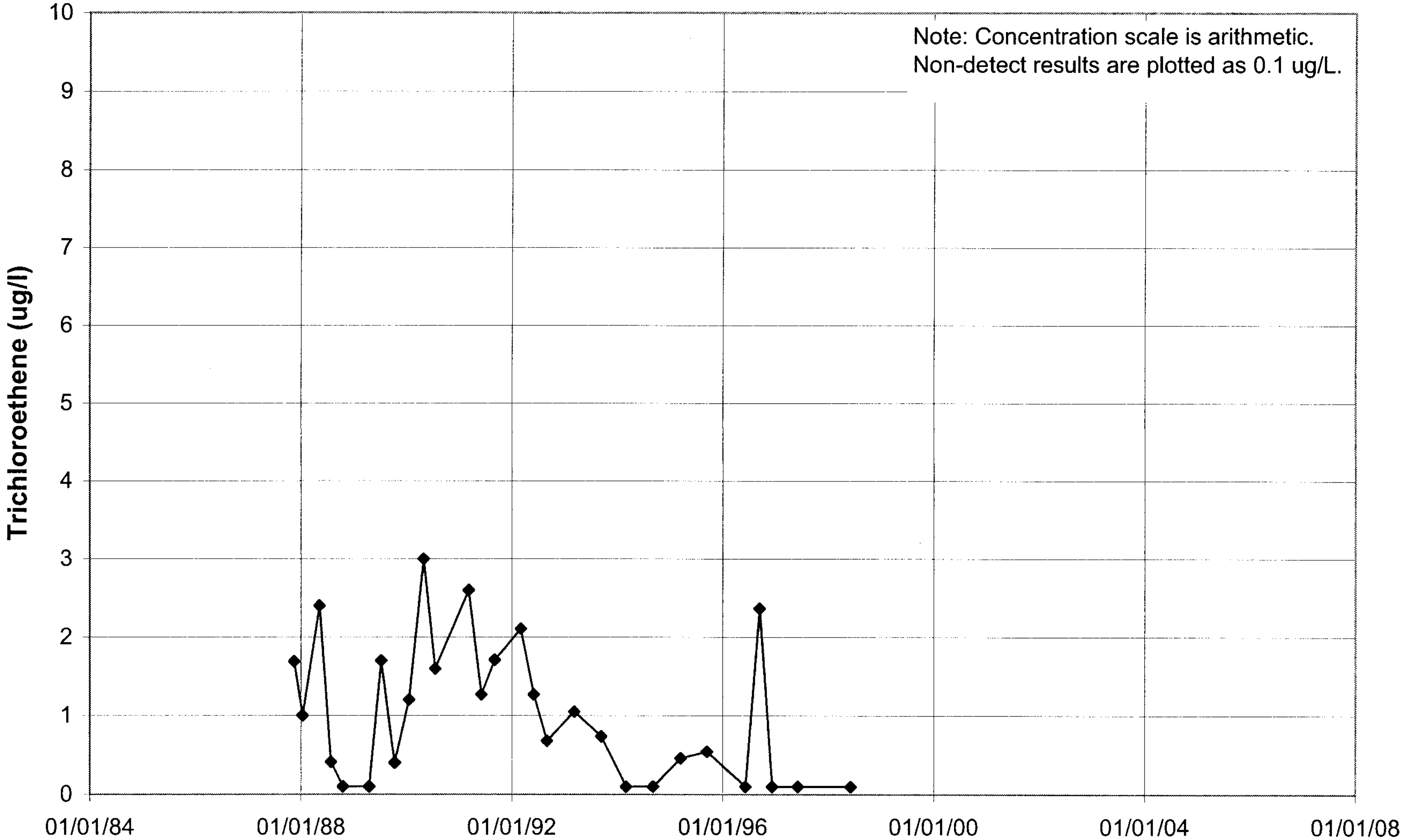
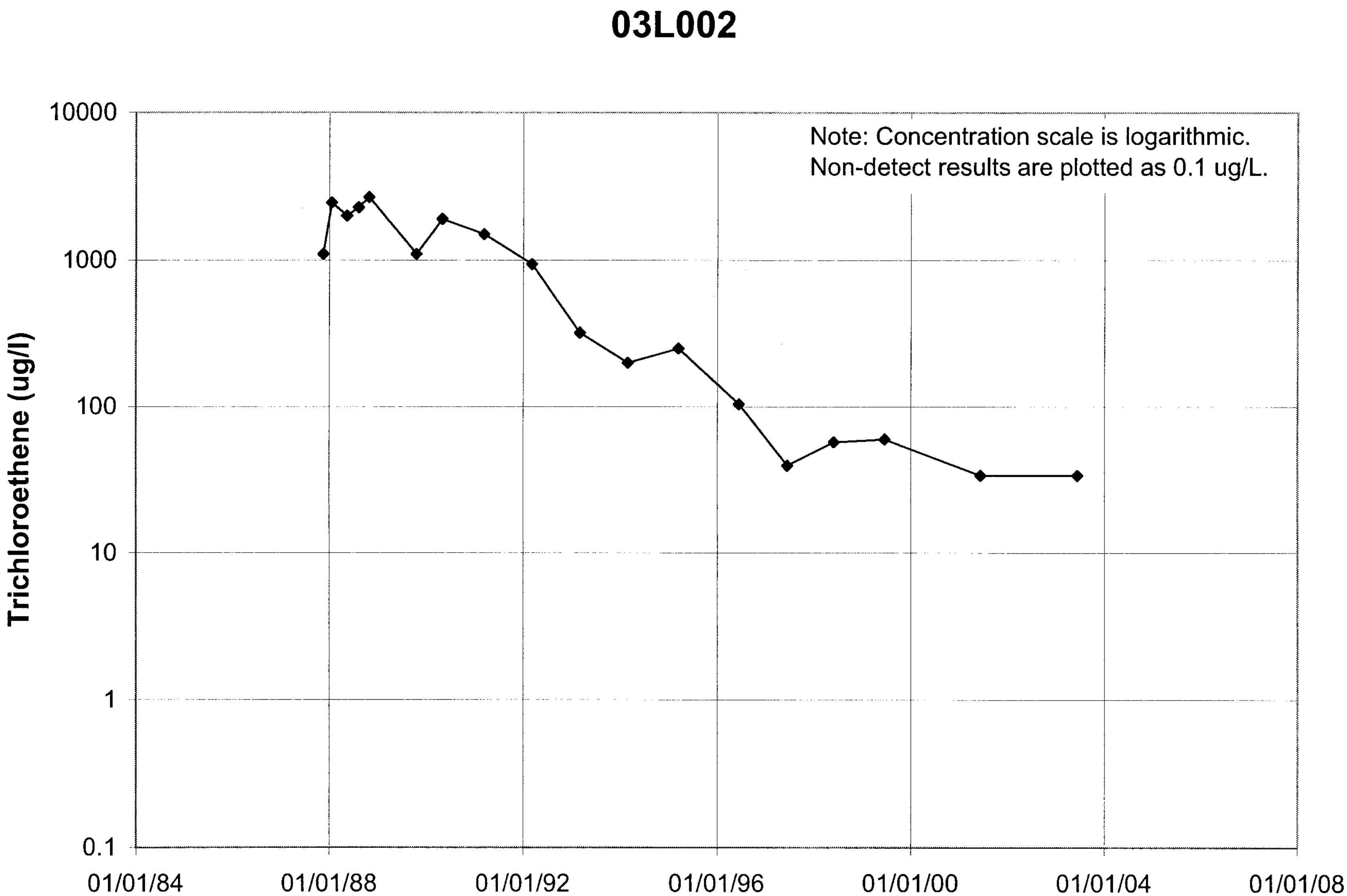


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

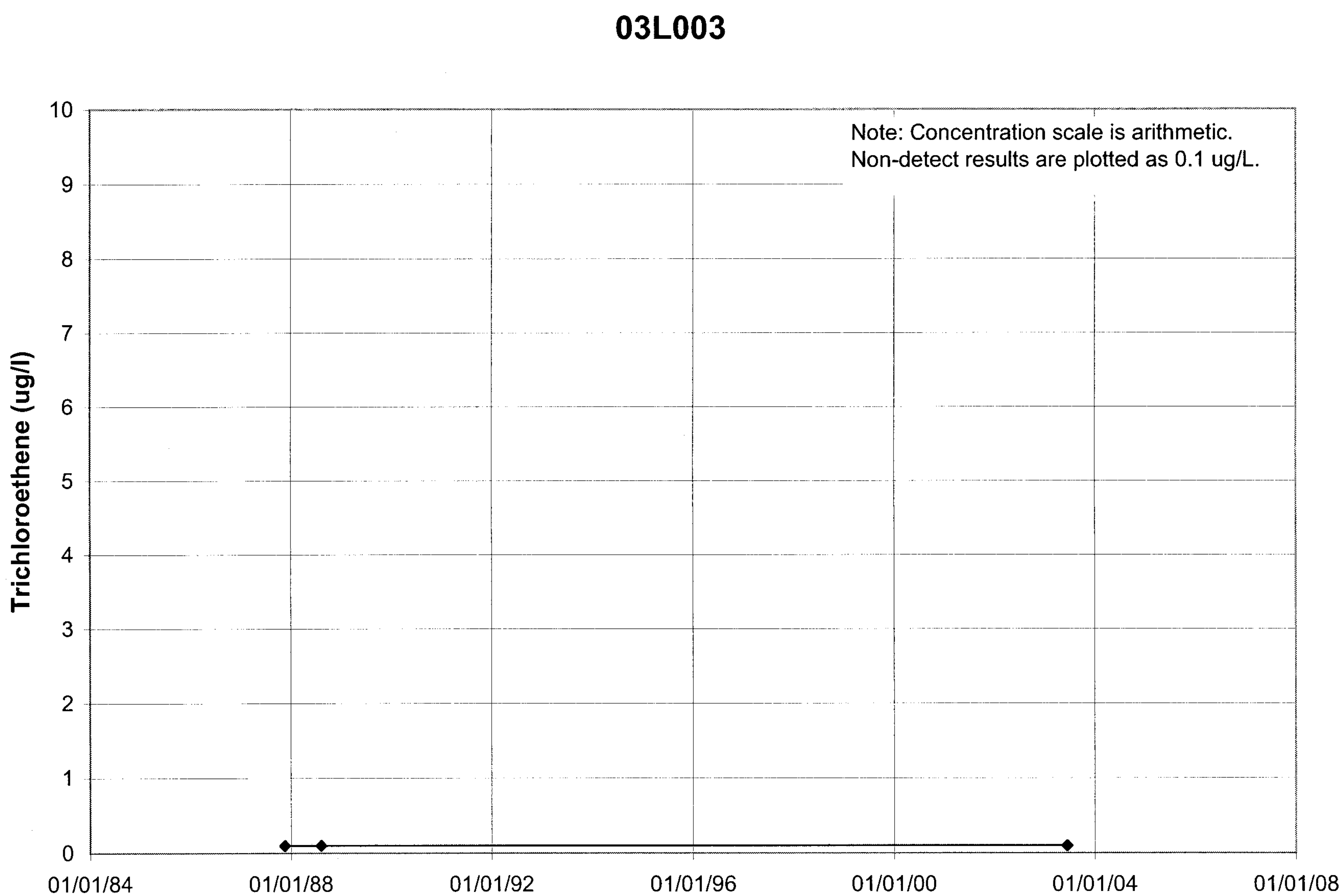
03L001



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

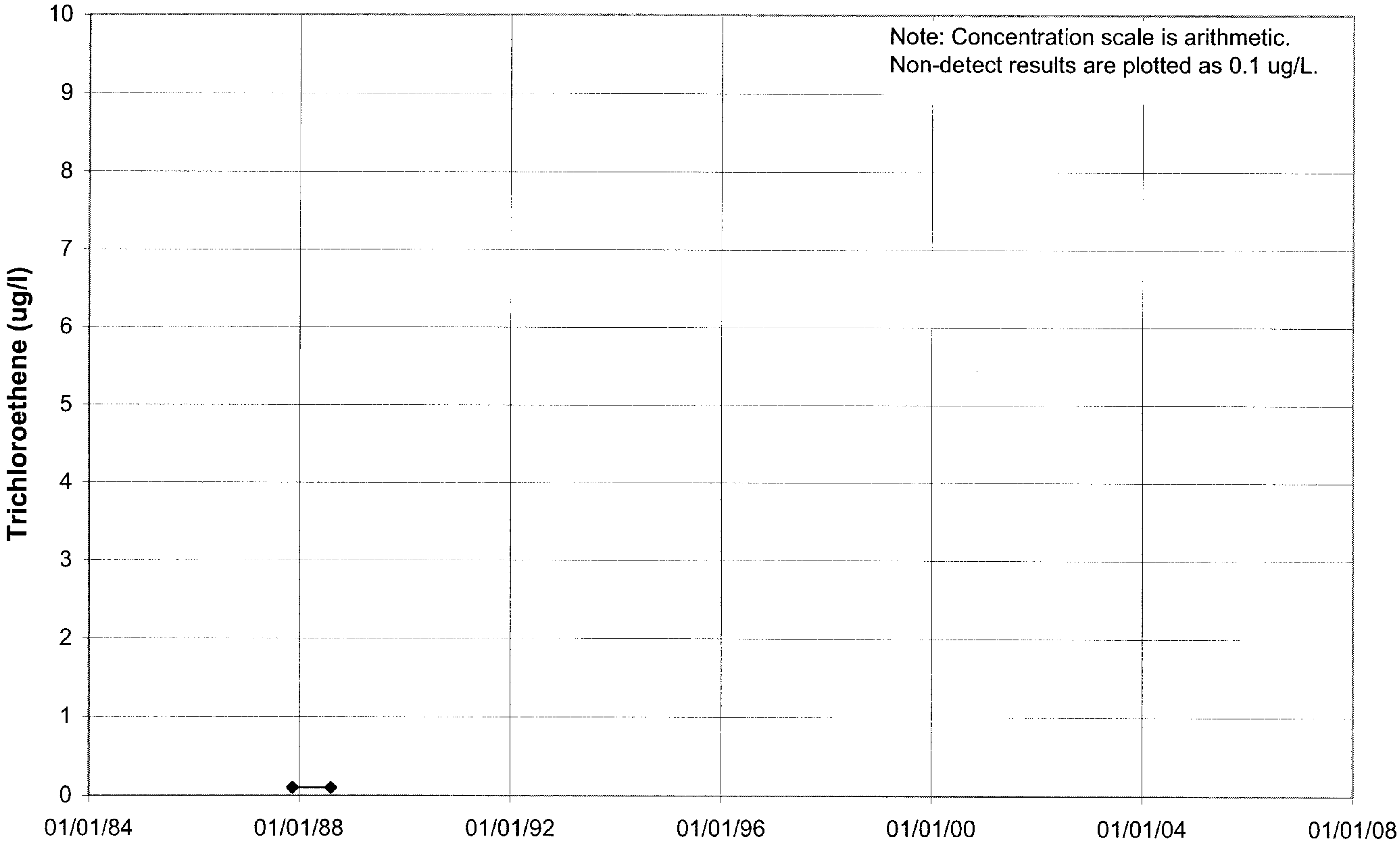


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



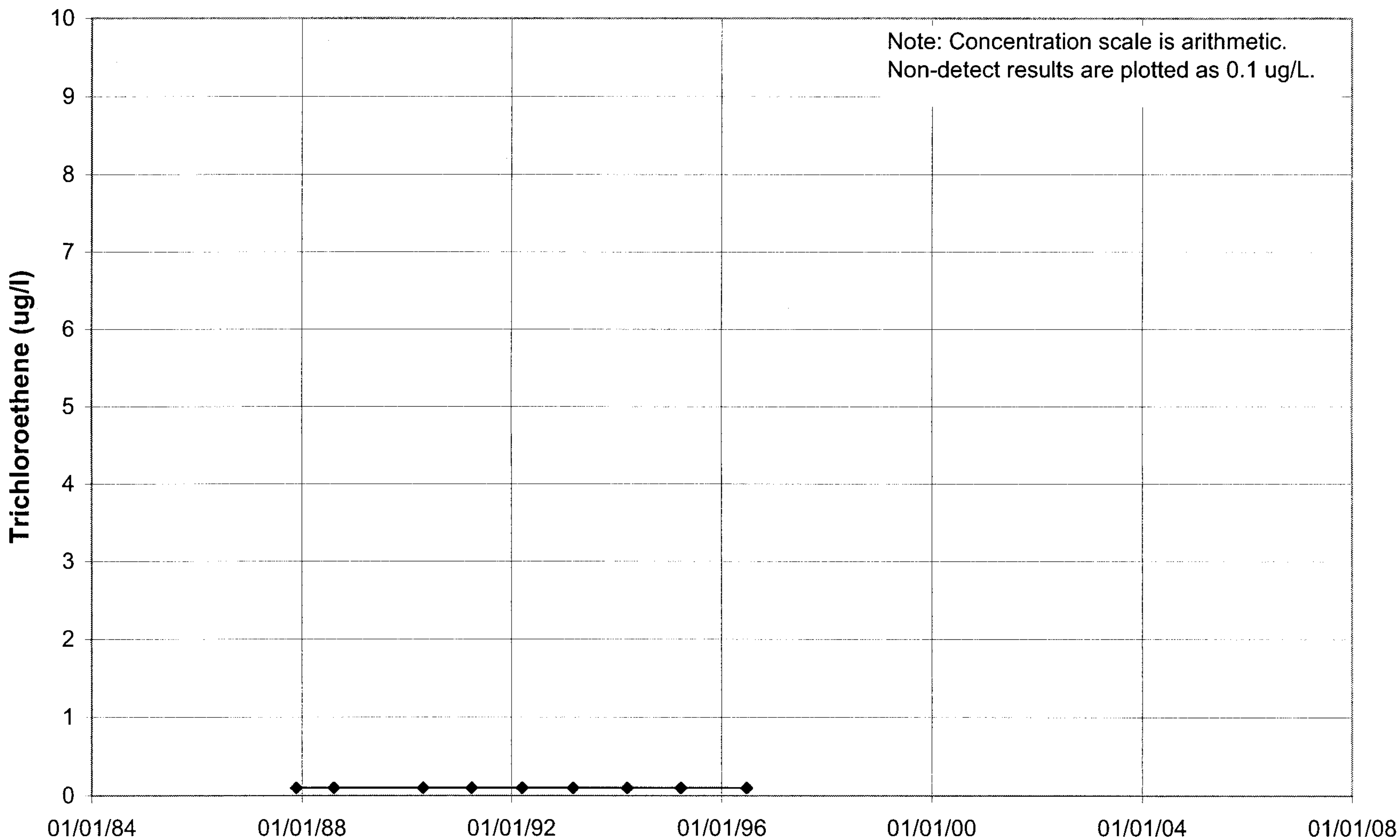
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L004



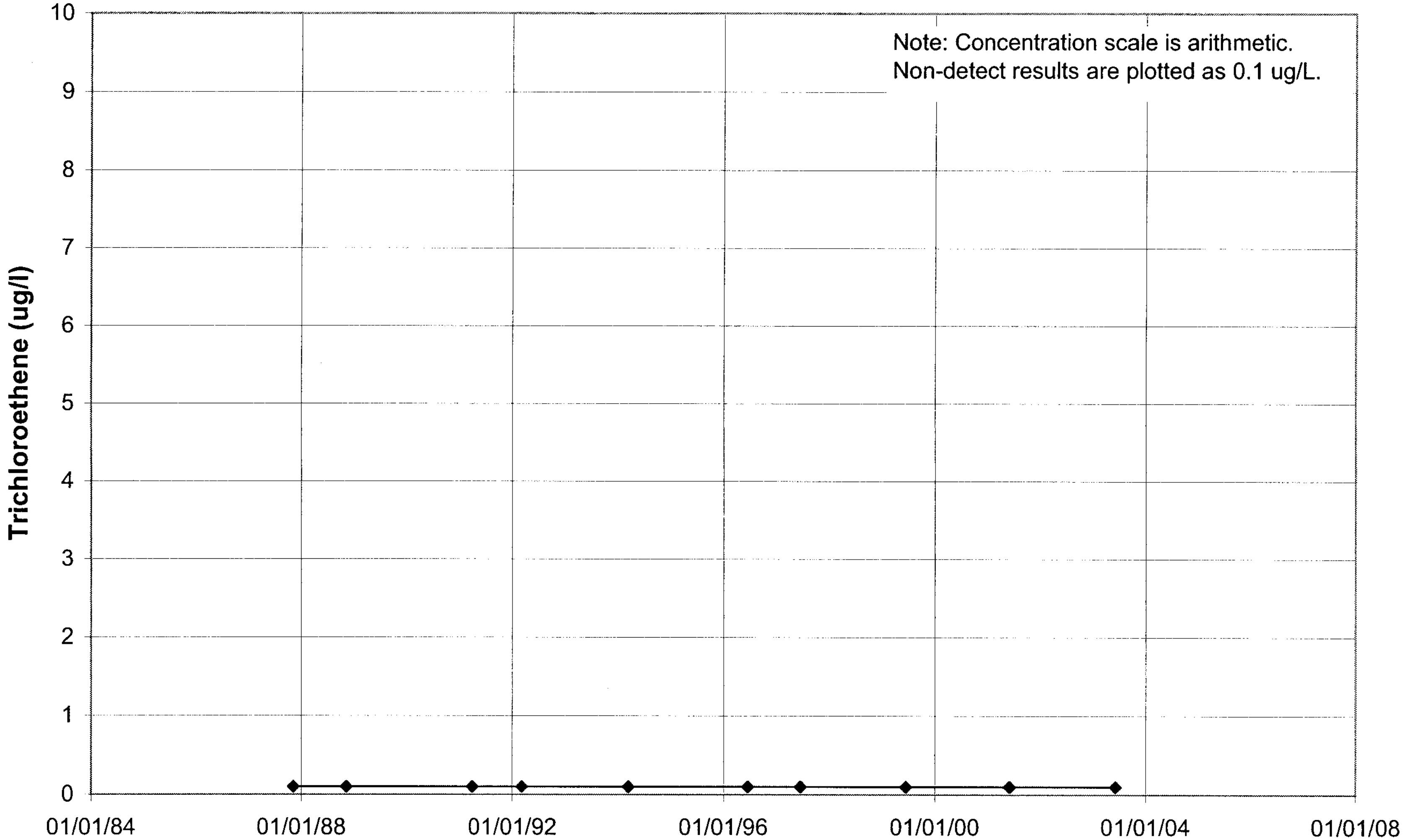
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L005



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

03L007



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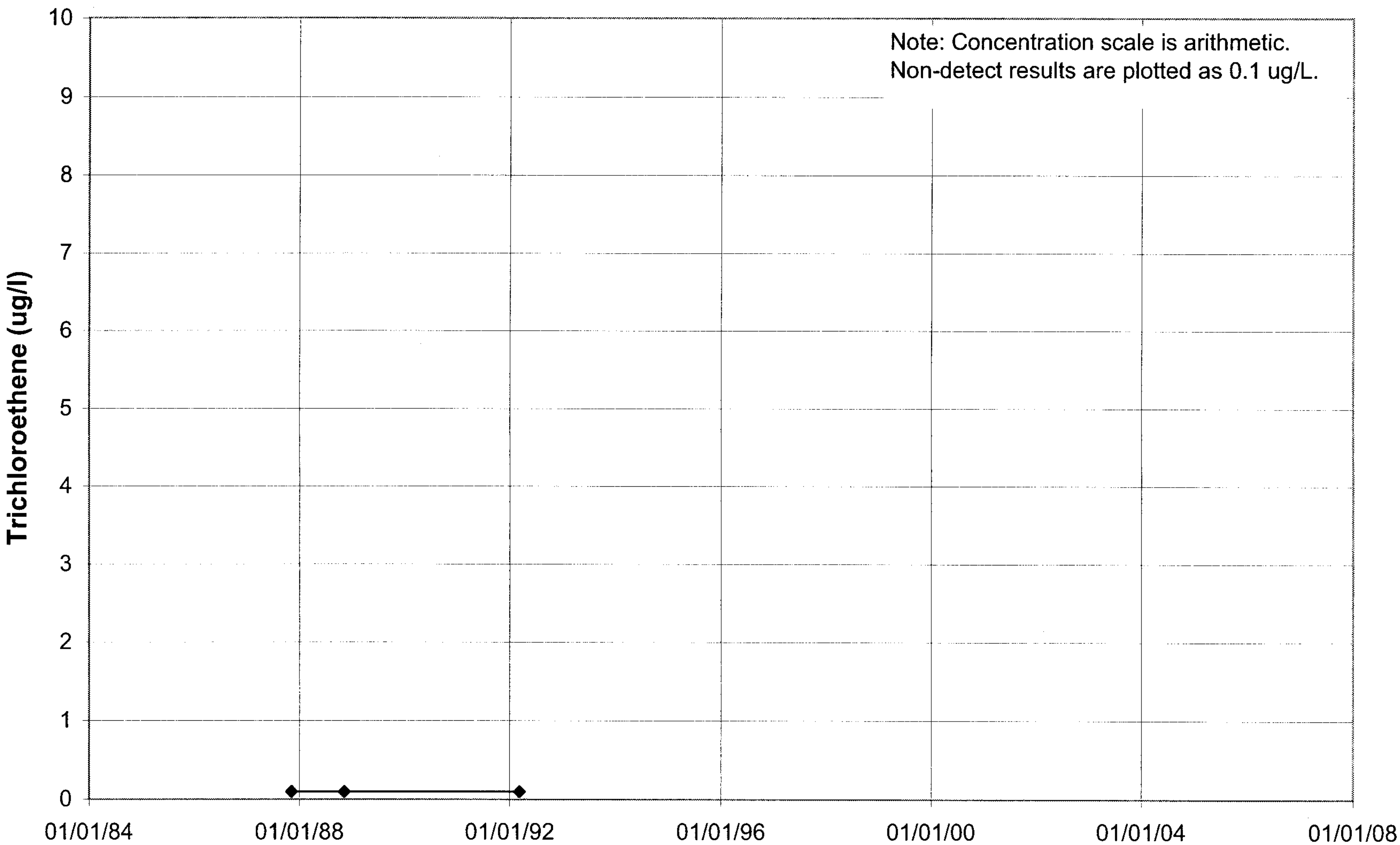
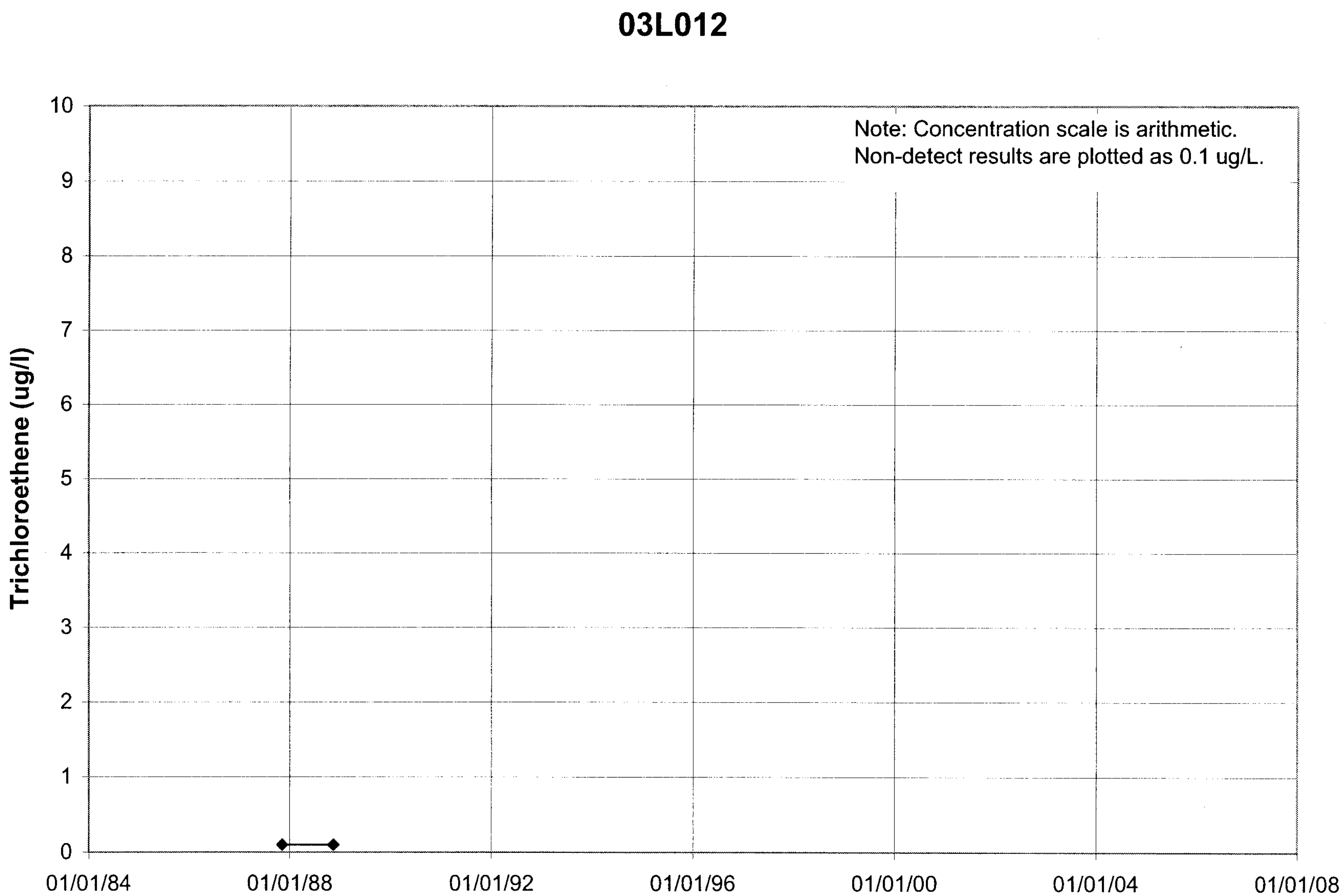
03L010



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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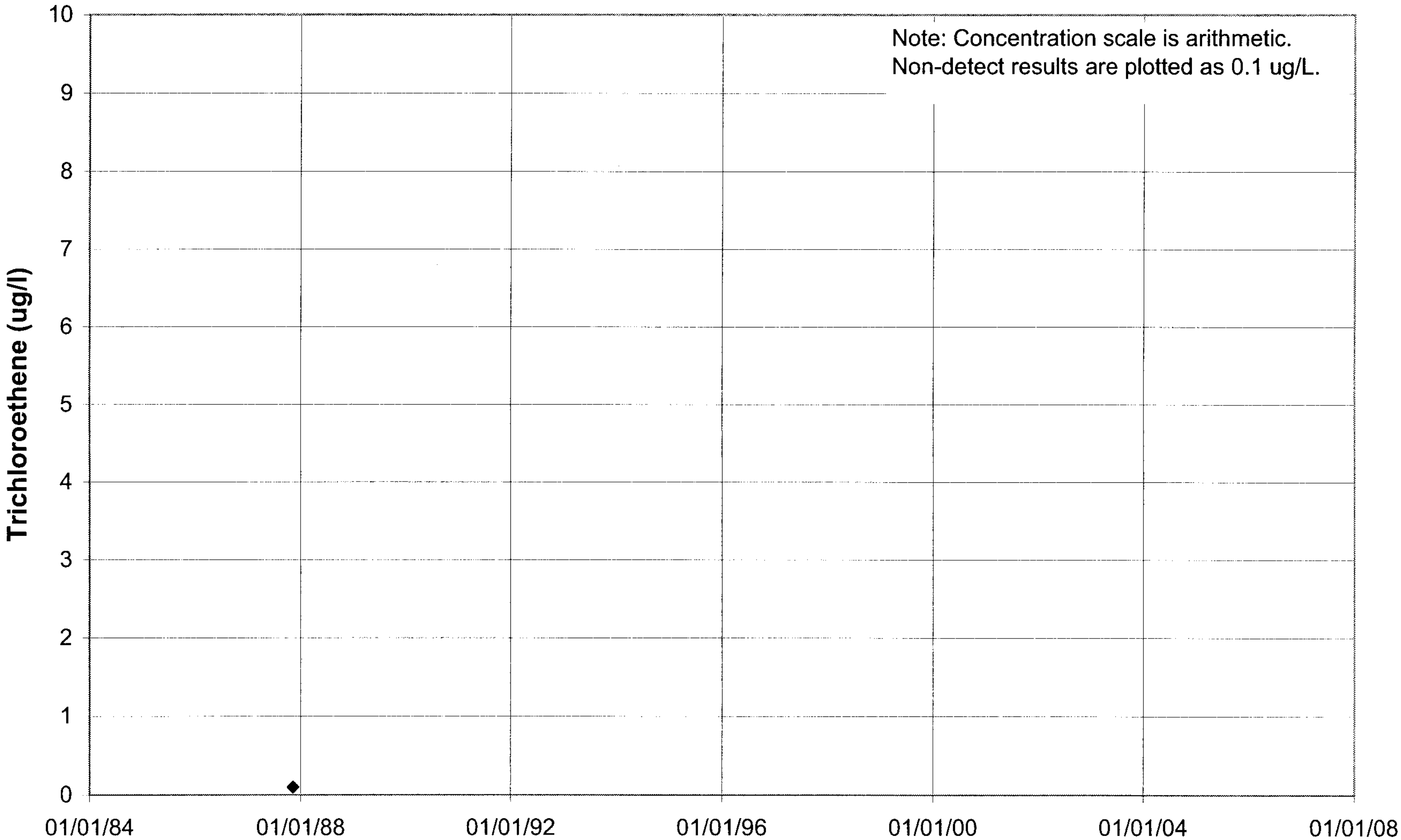

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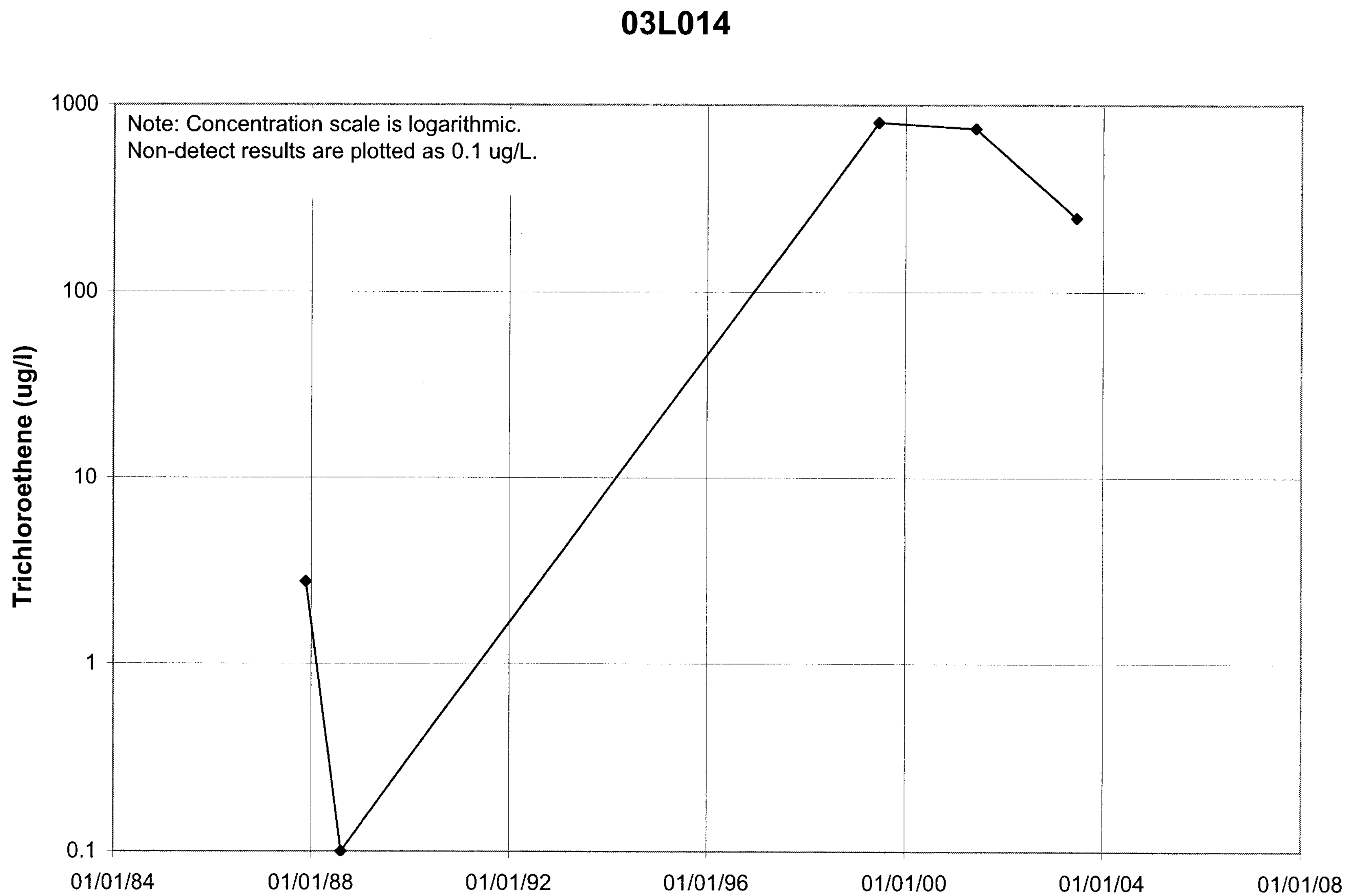

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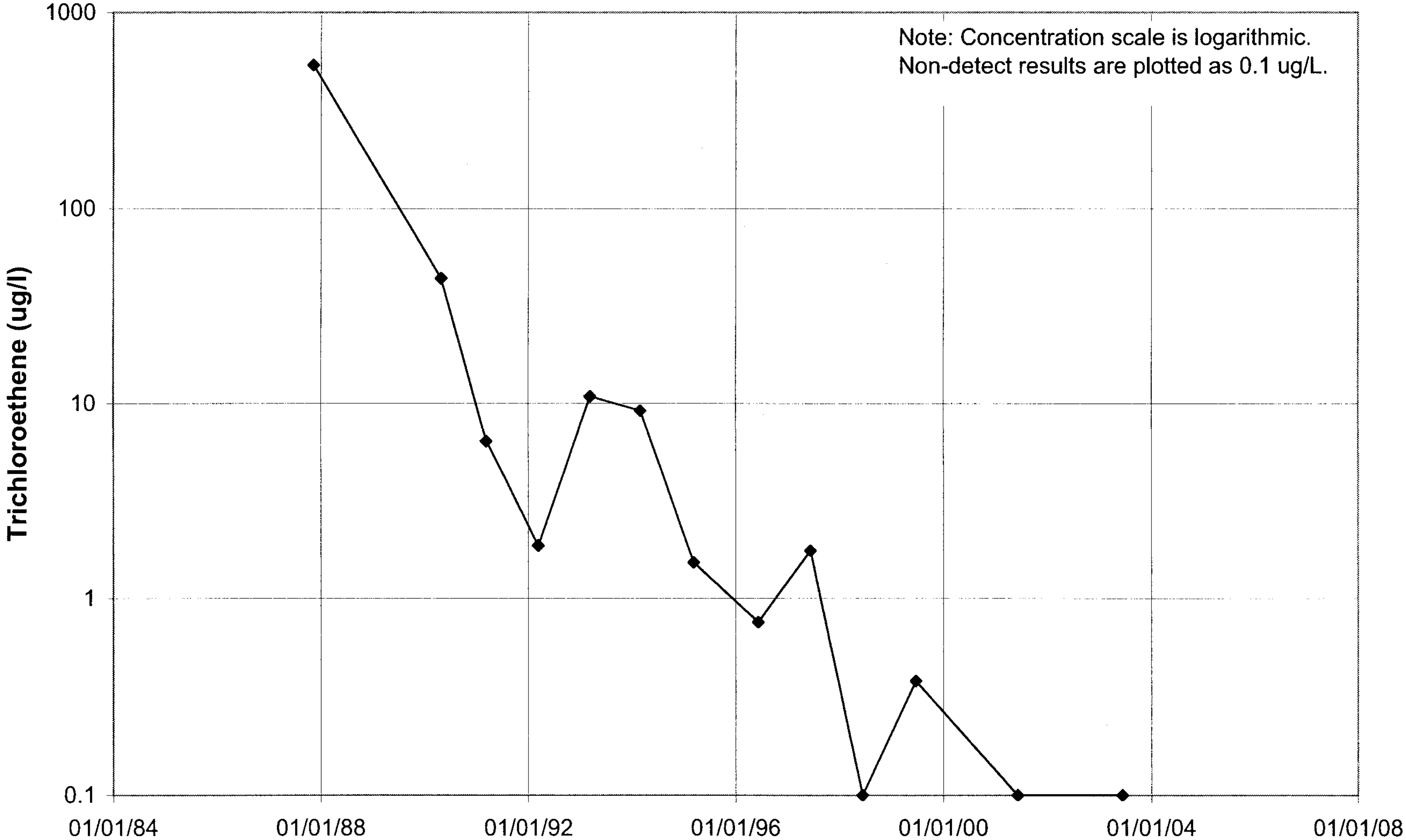

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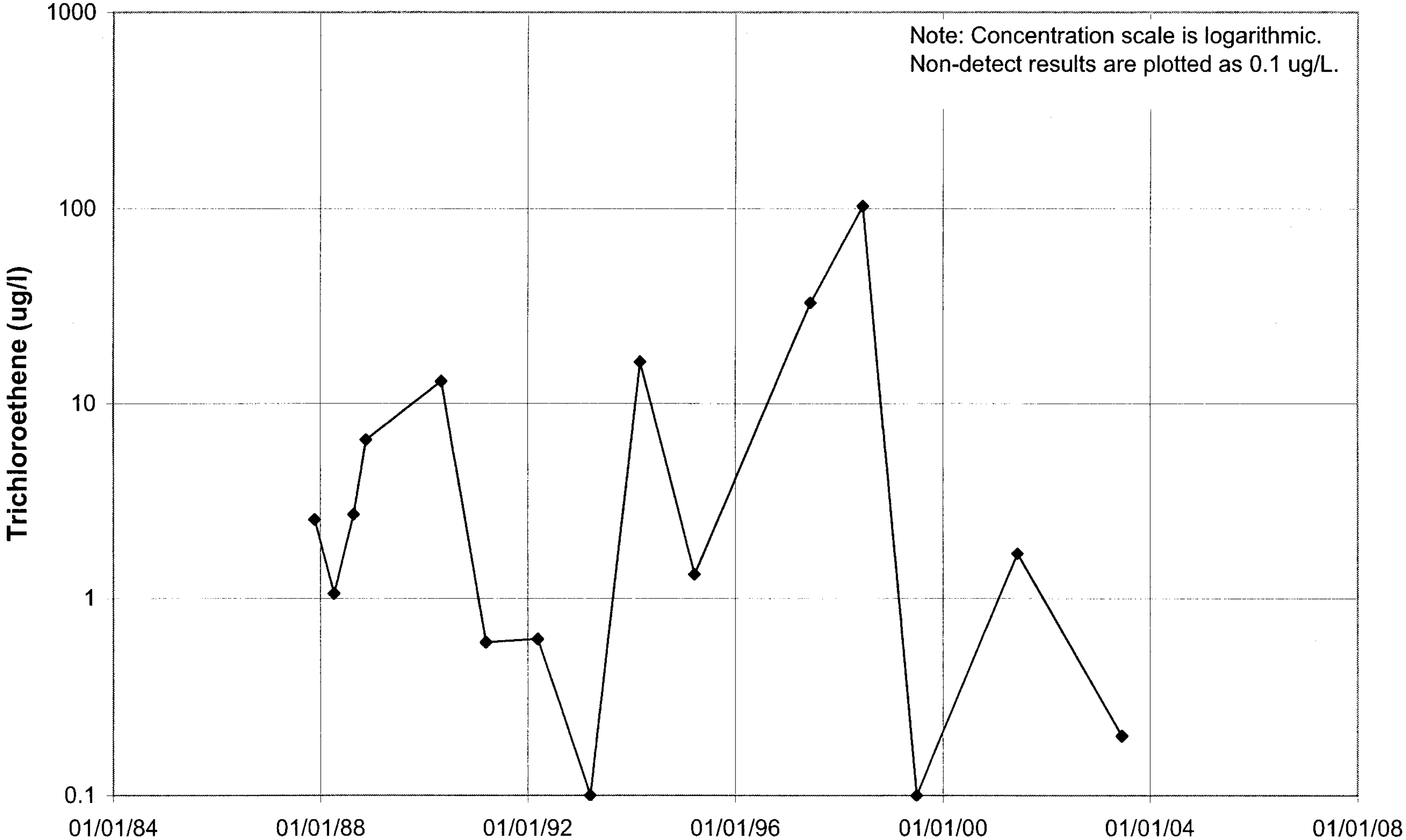

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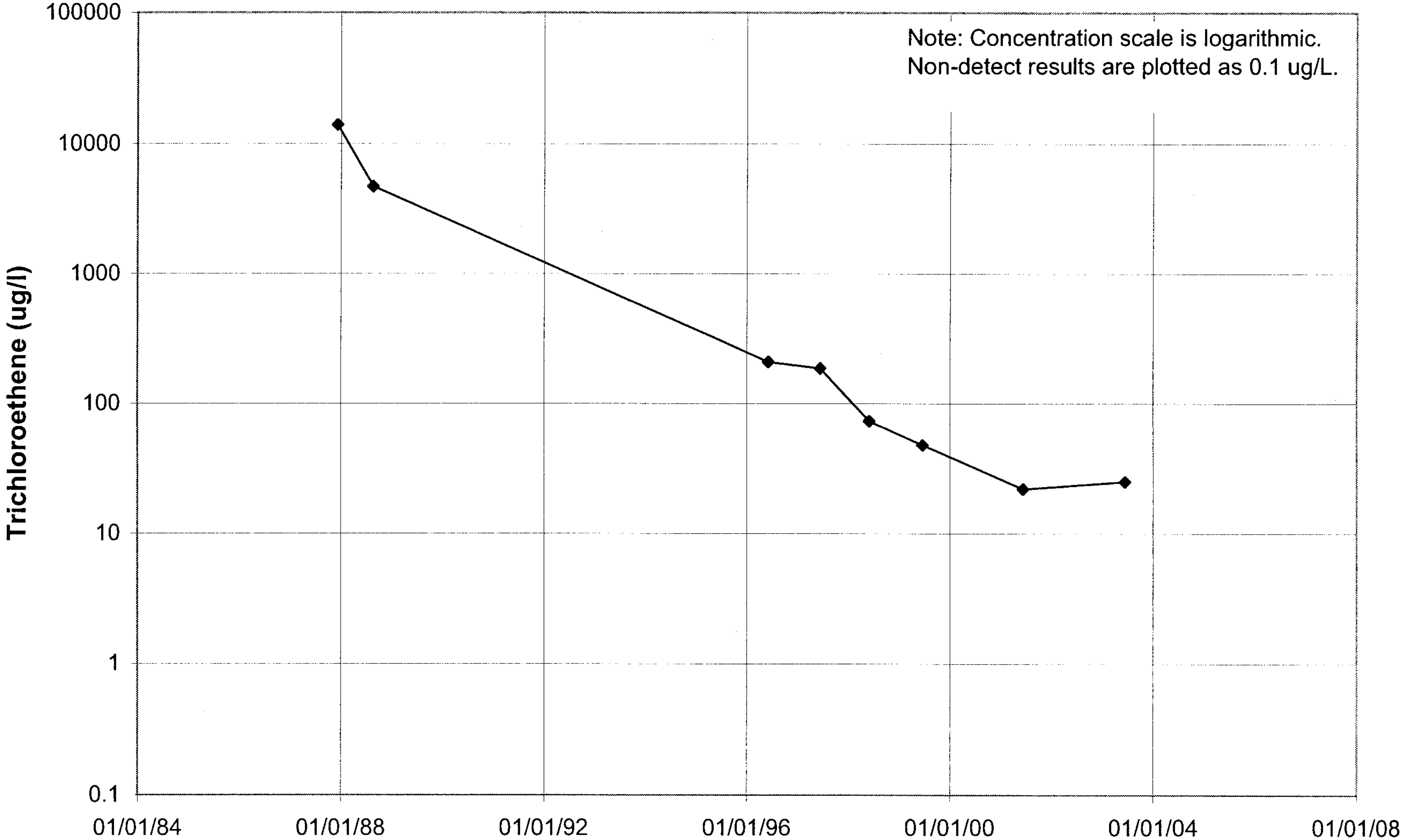

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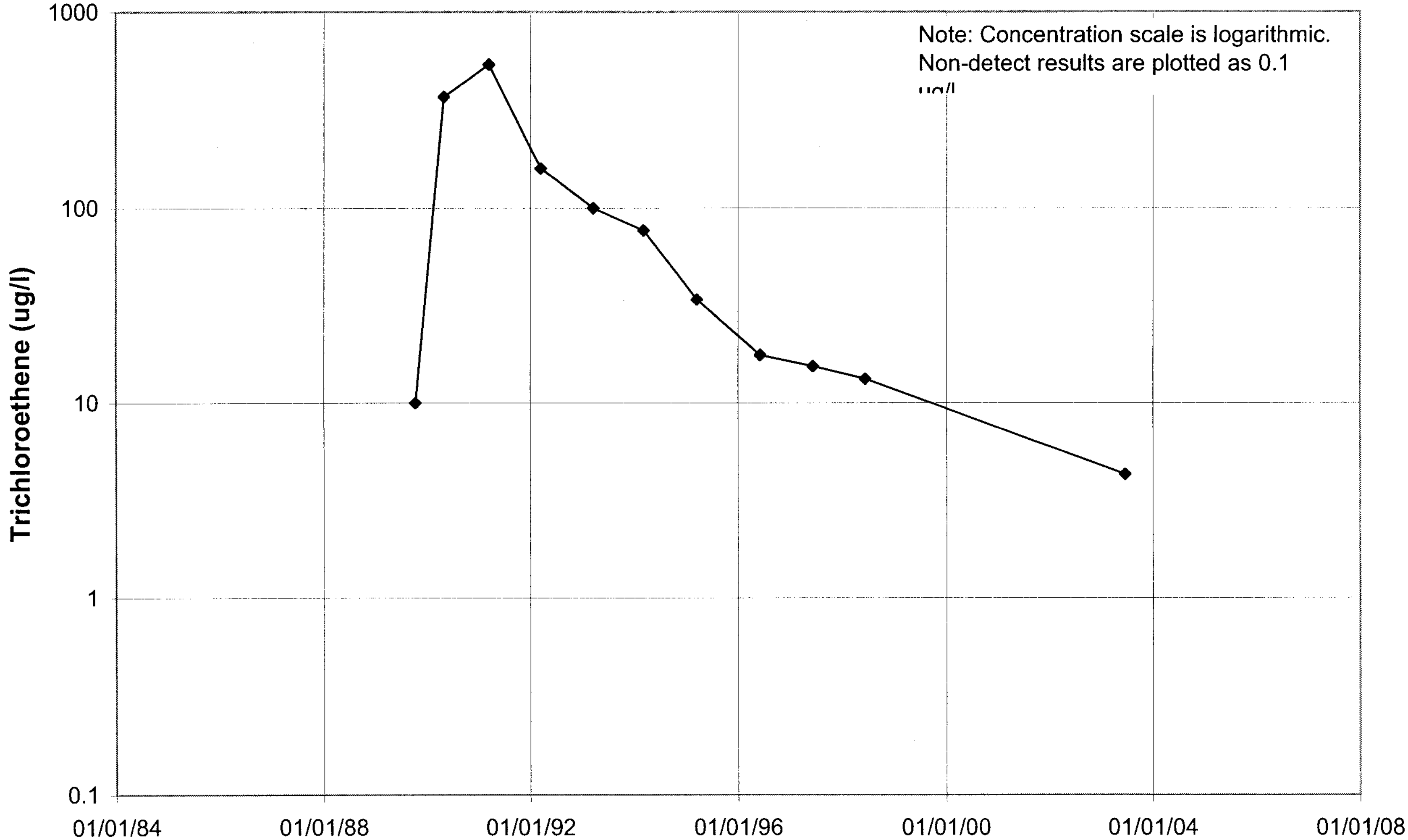

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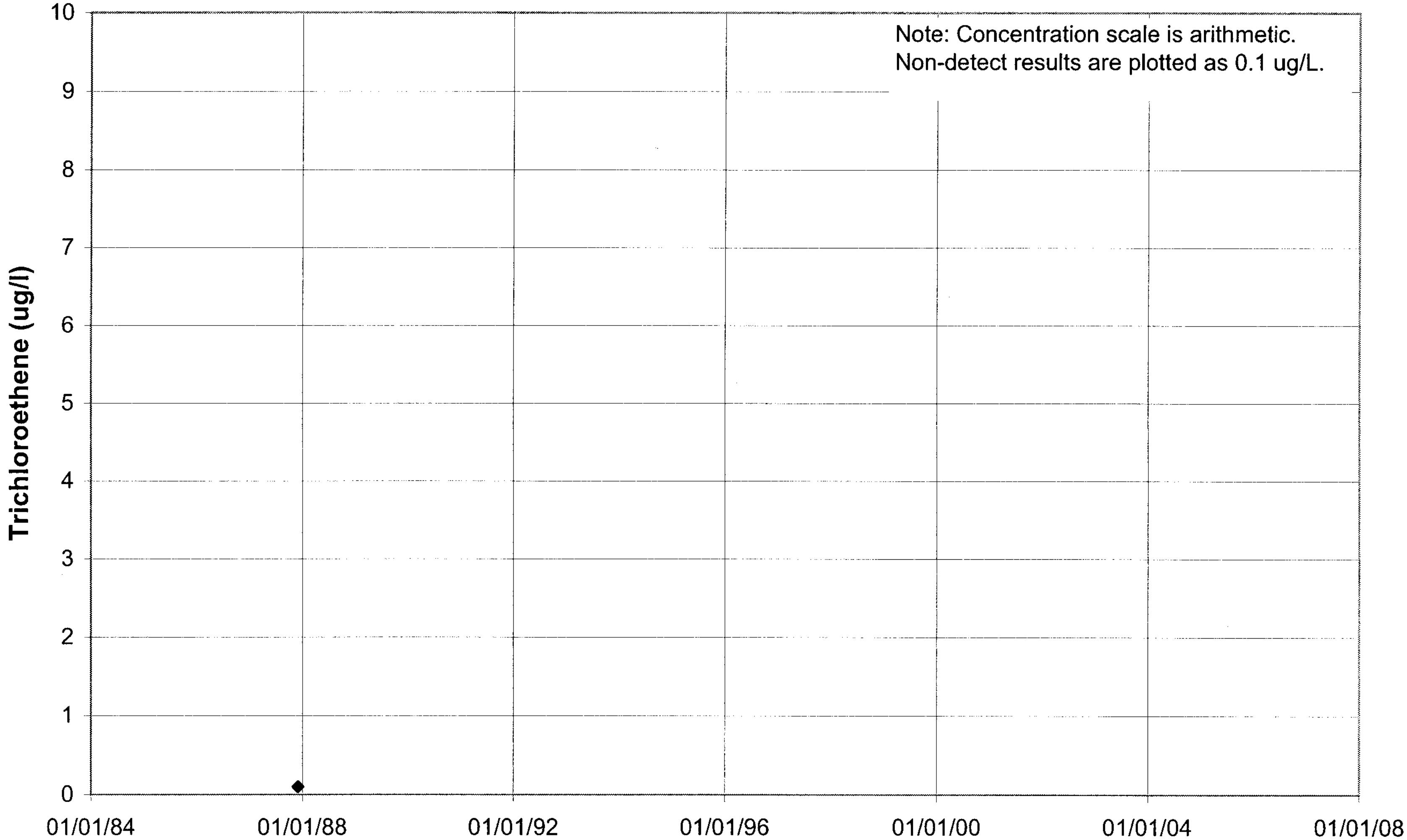

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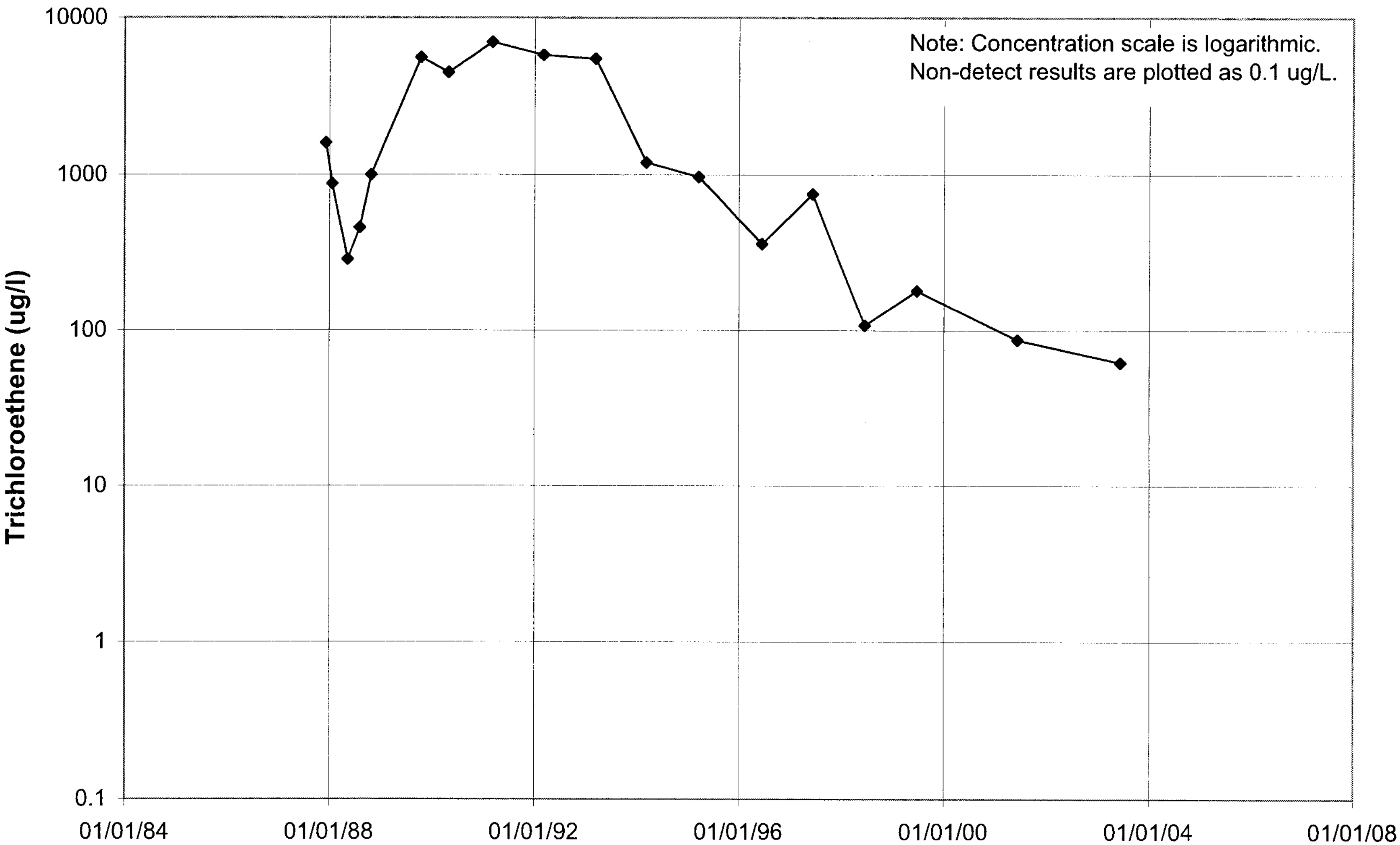

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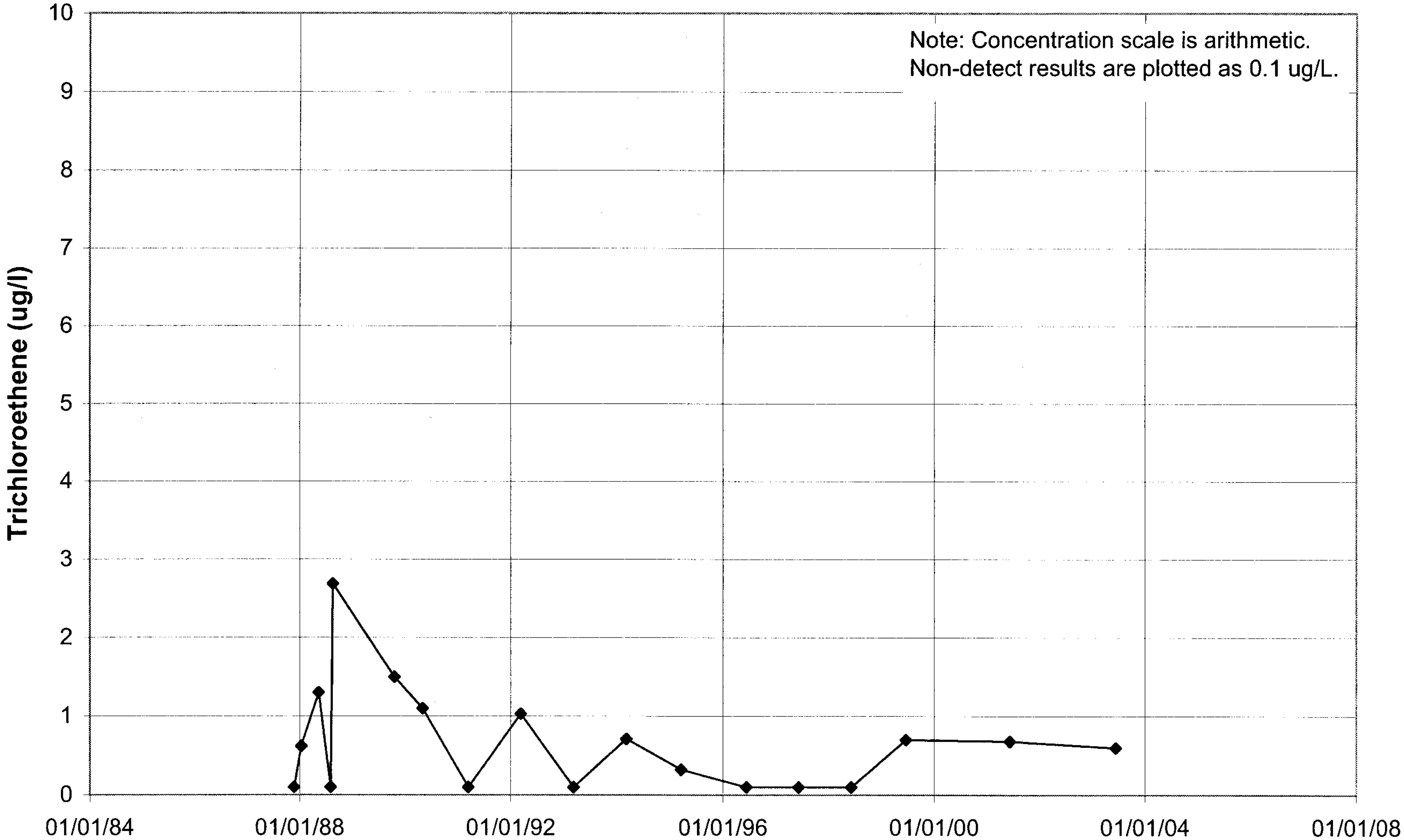

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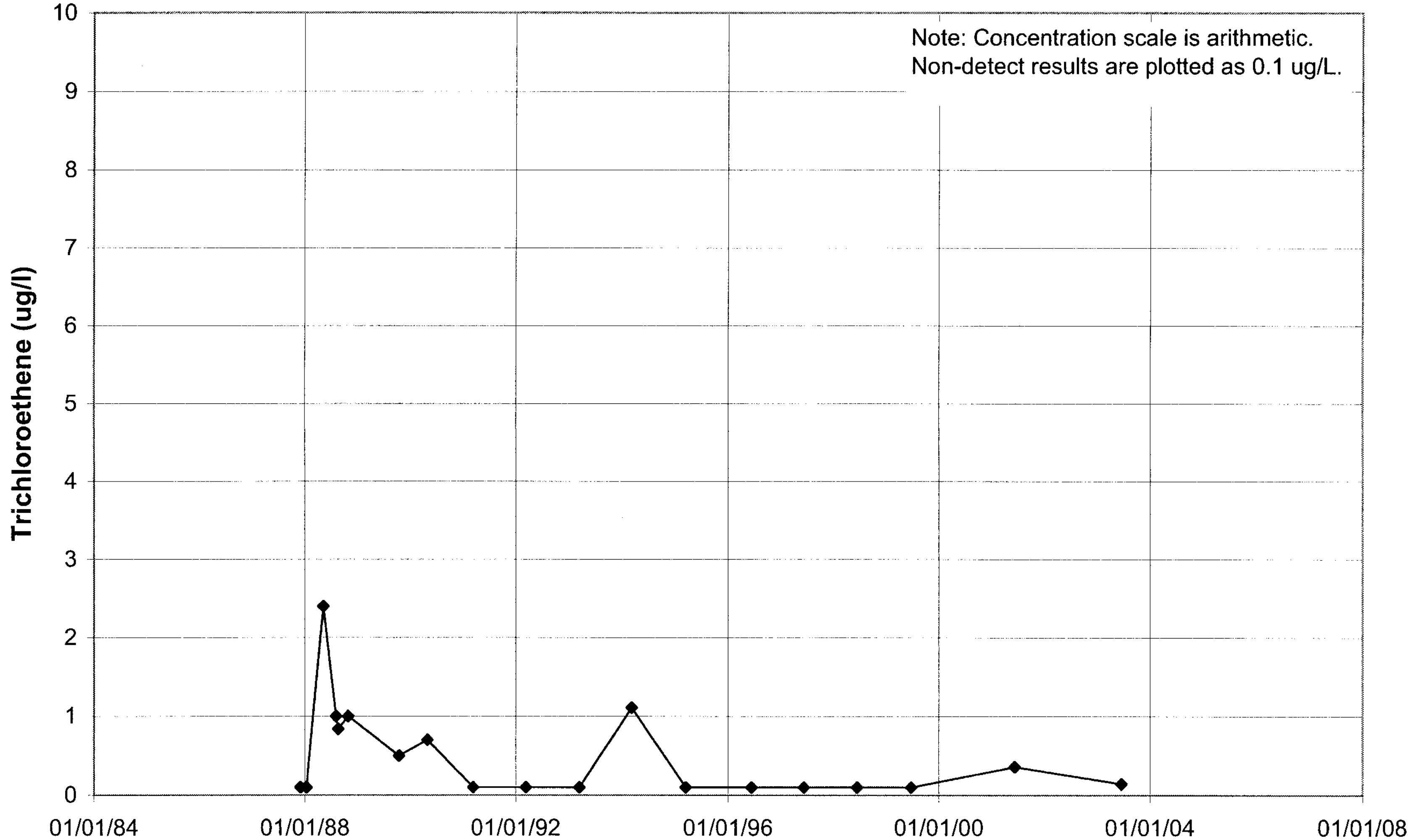

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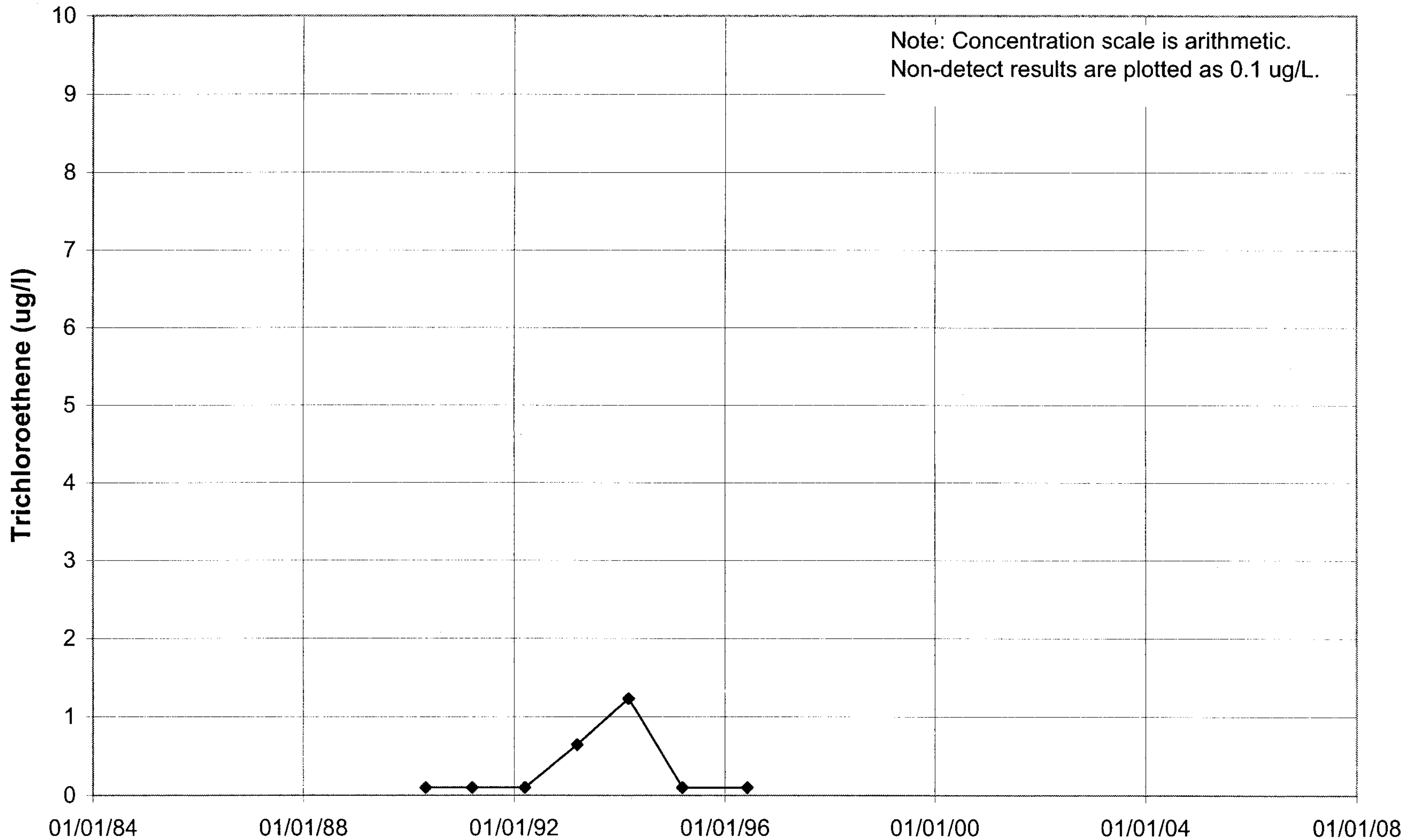

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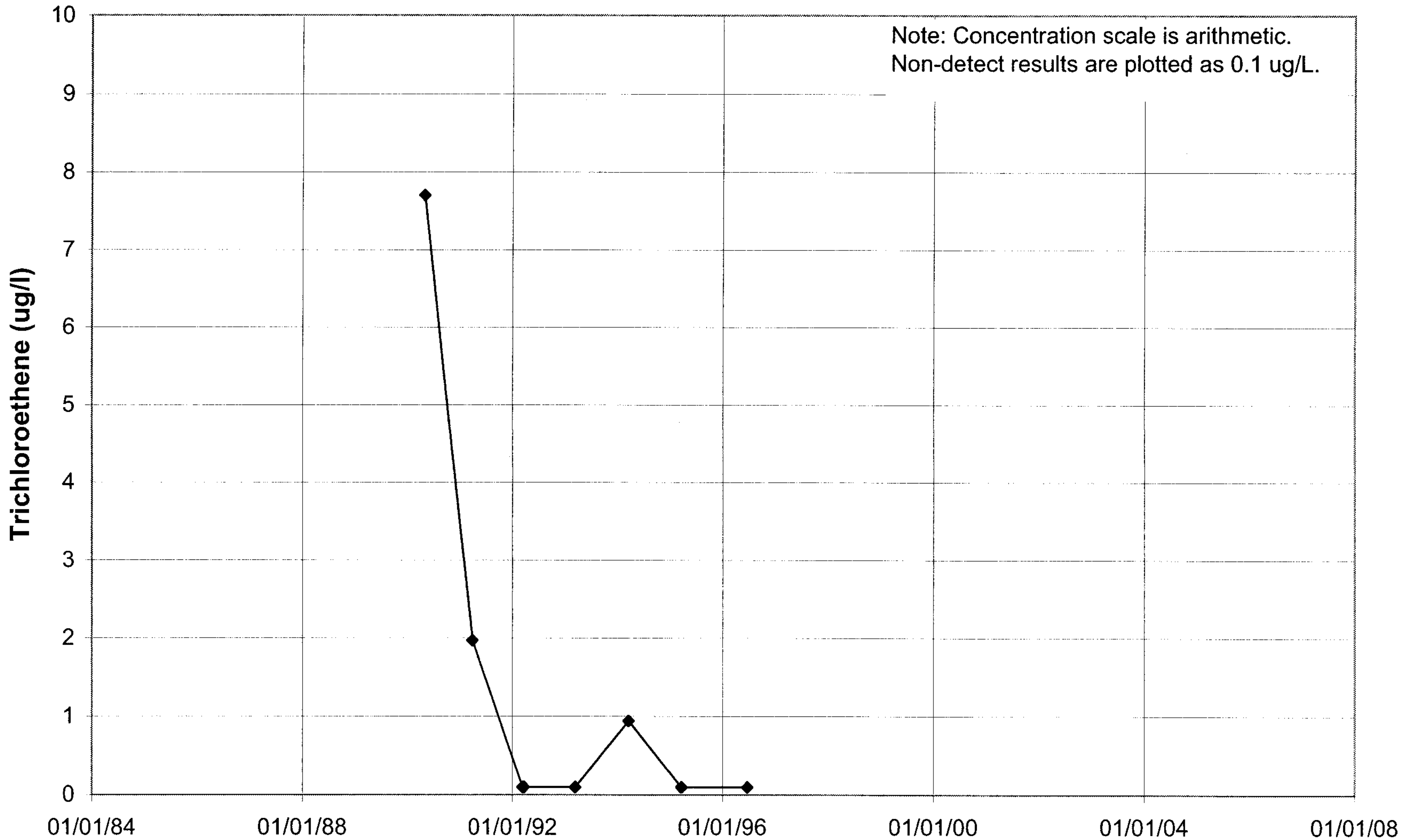

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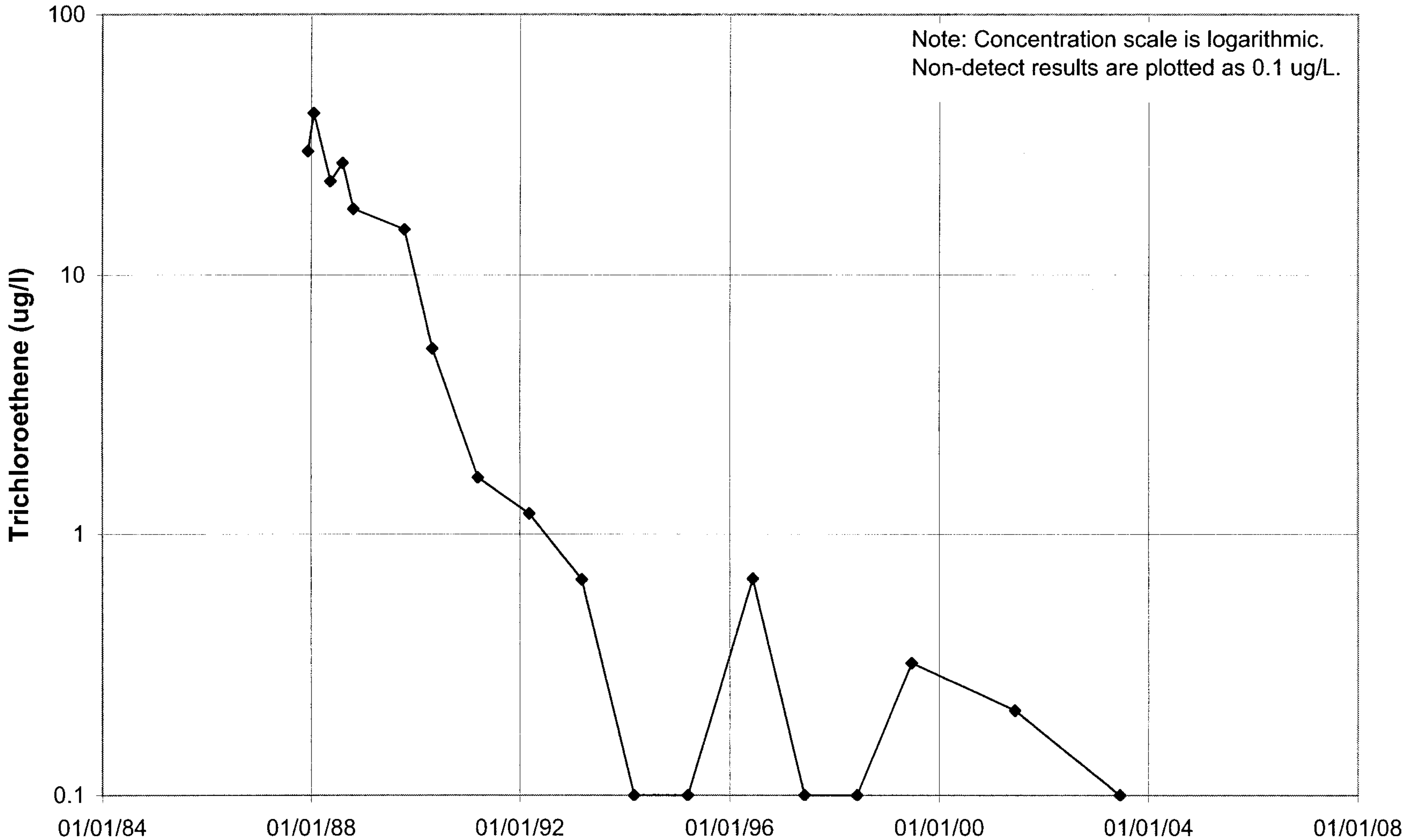

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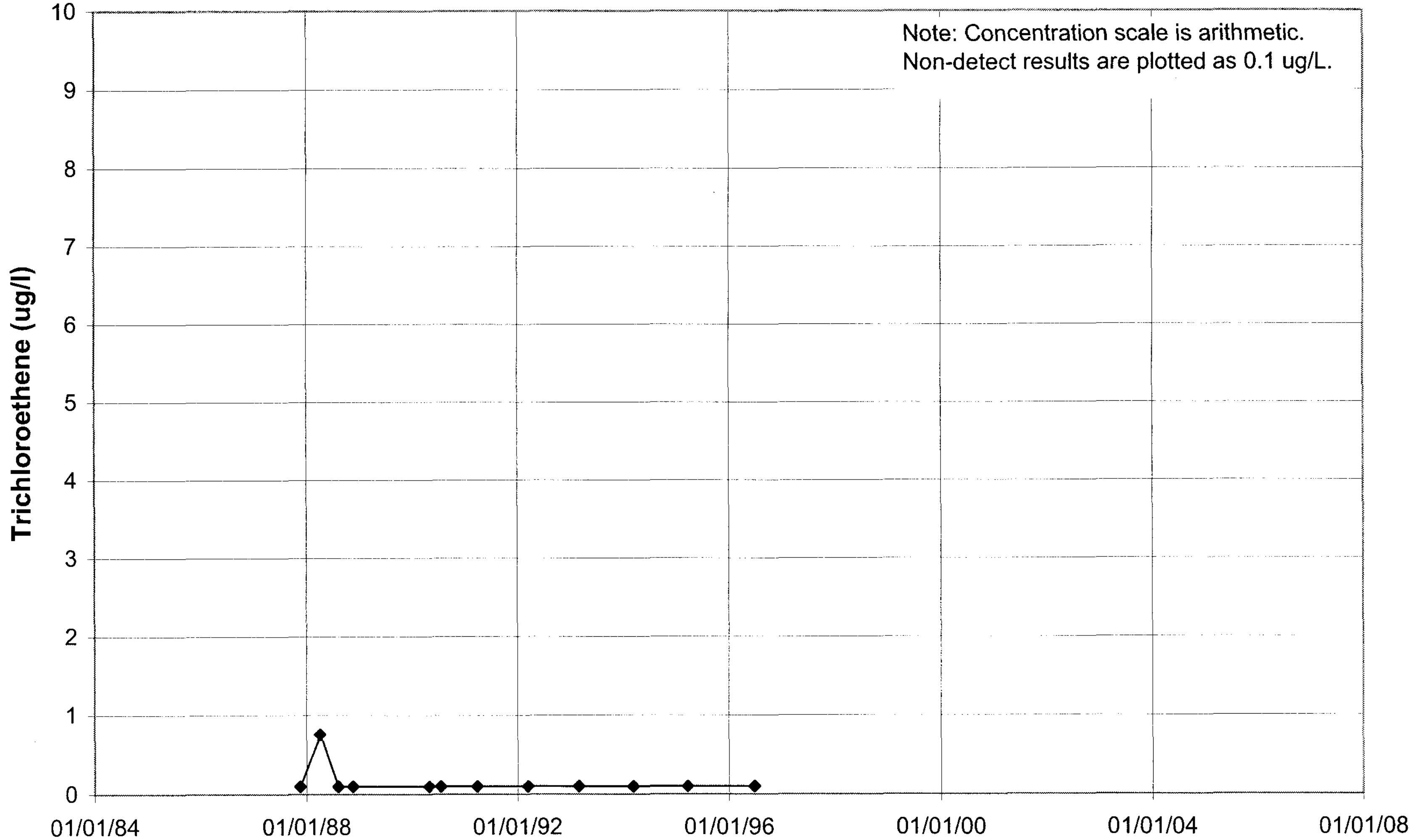

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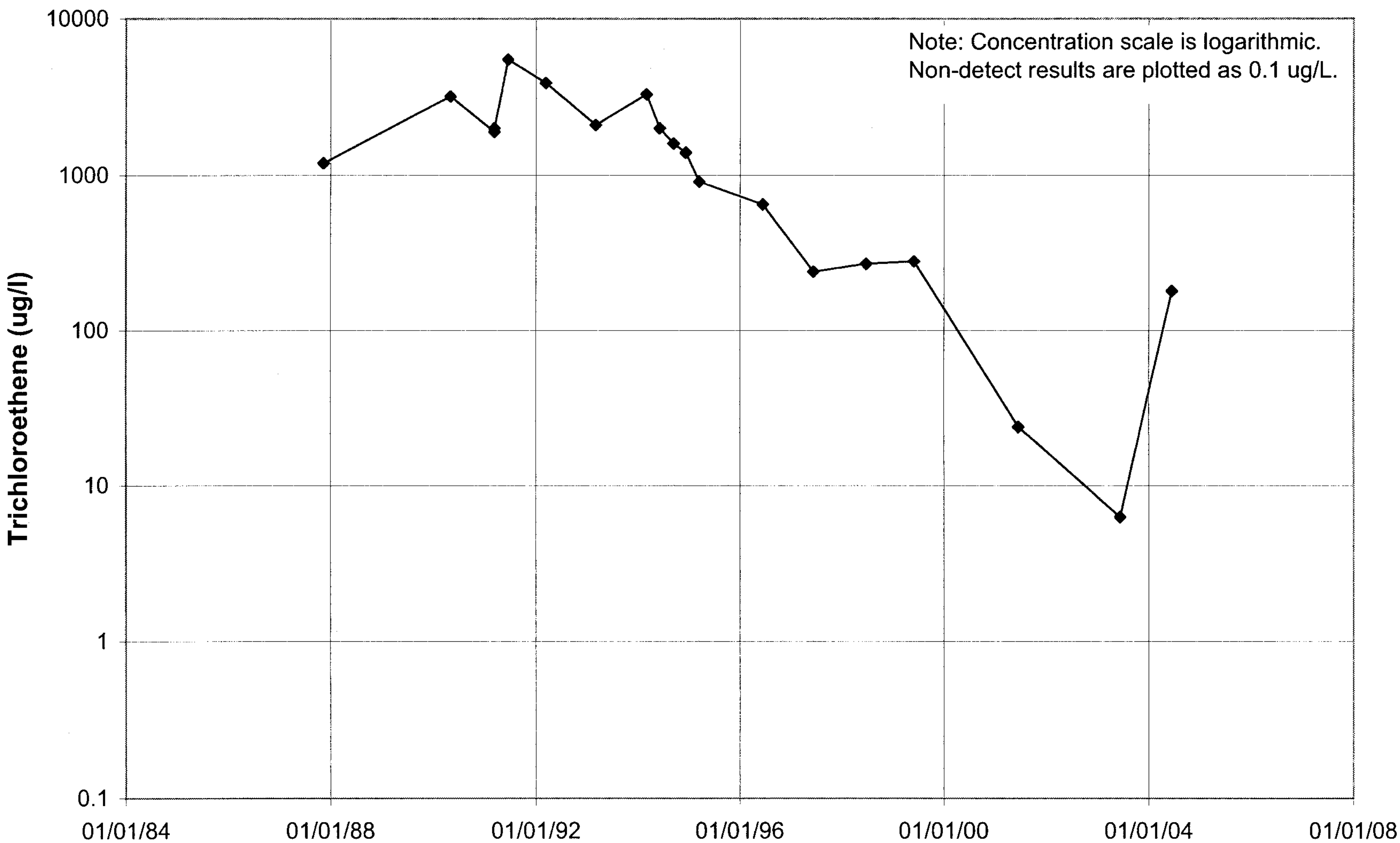

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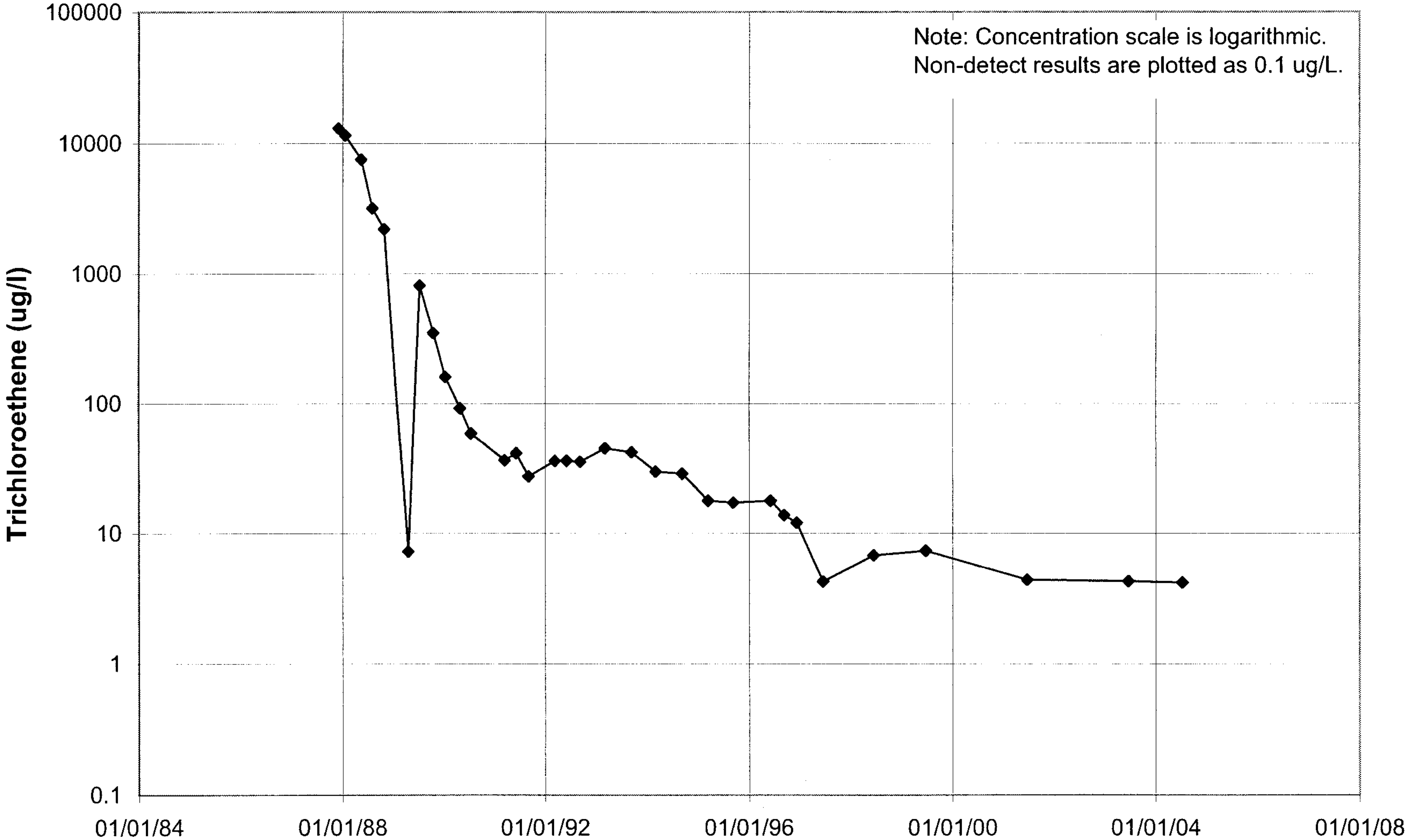

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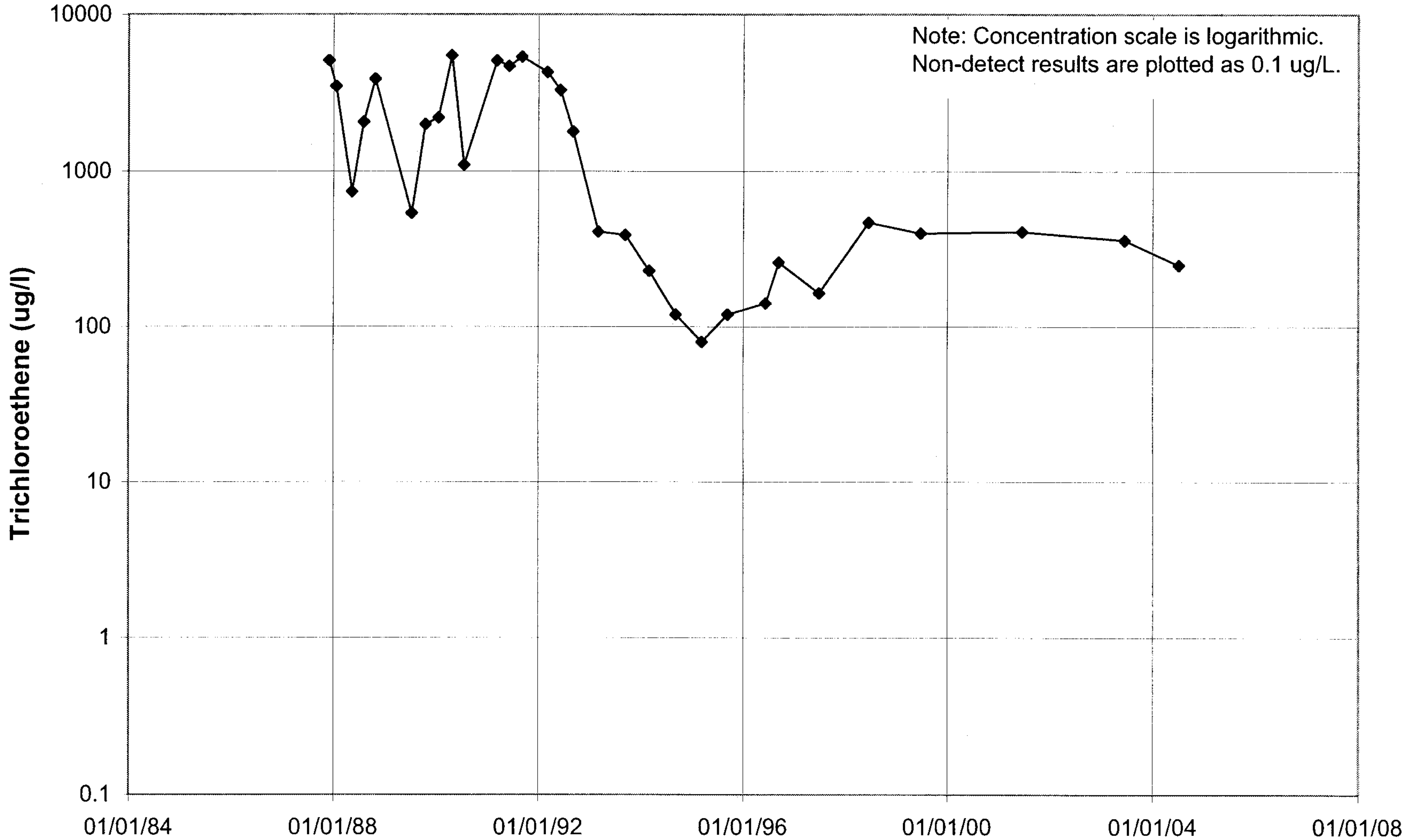

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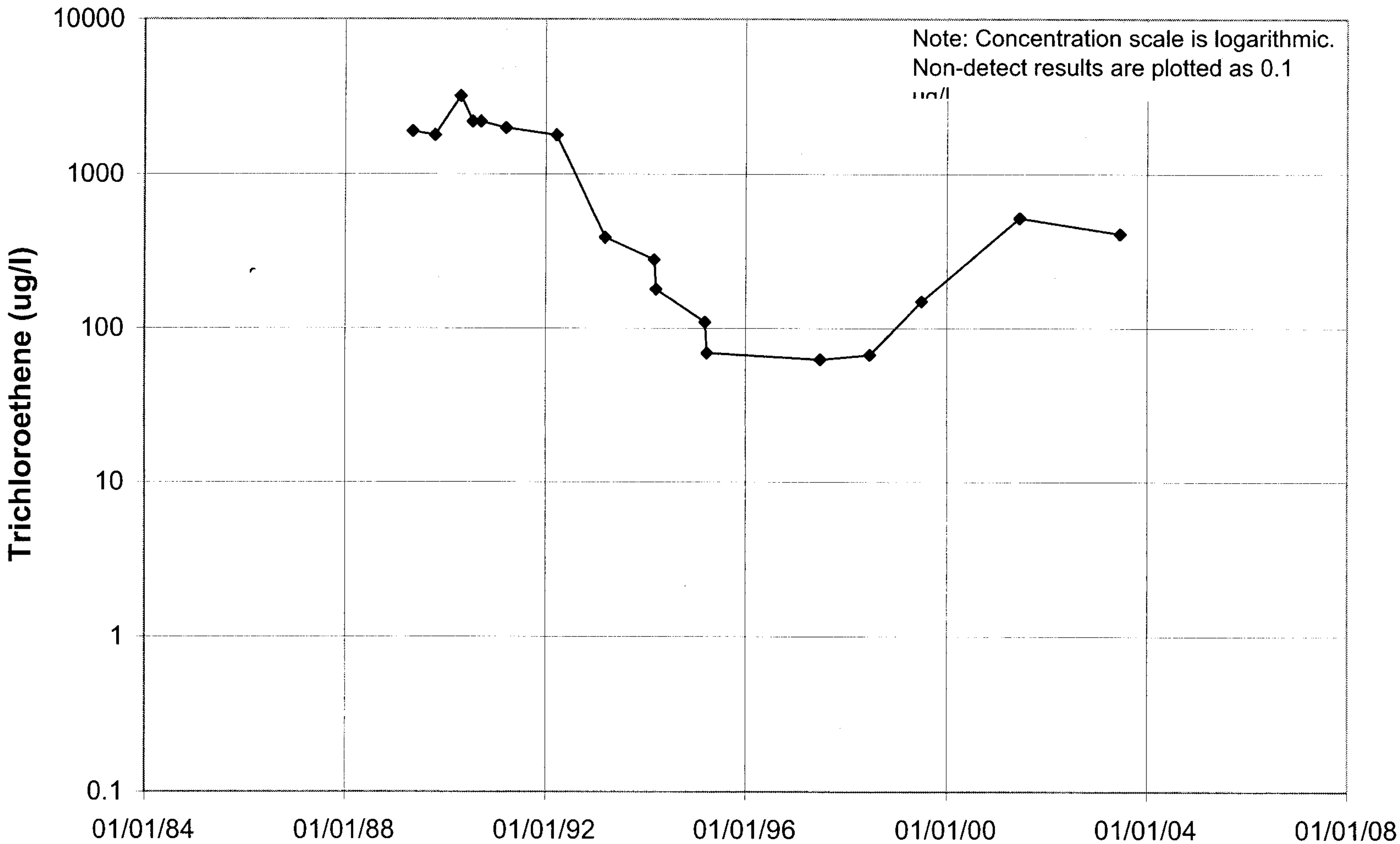

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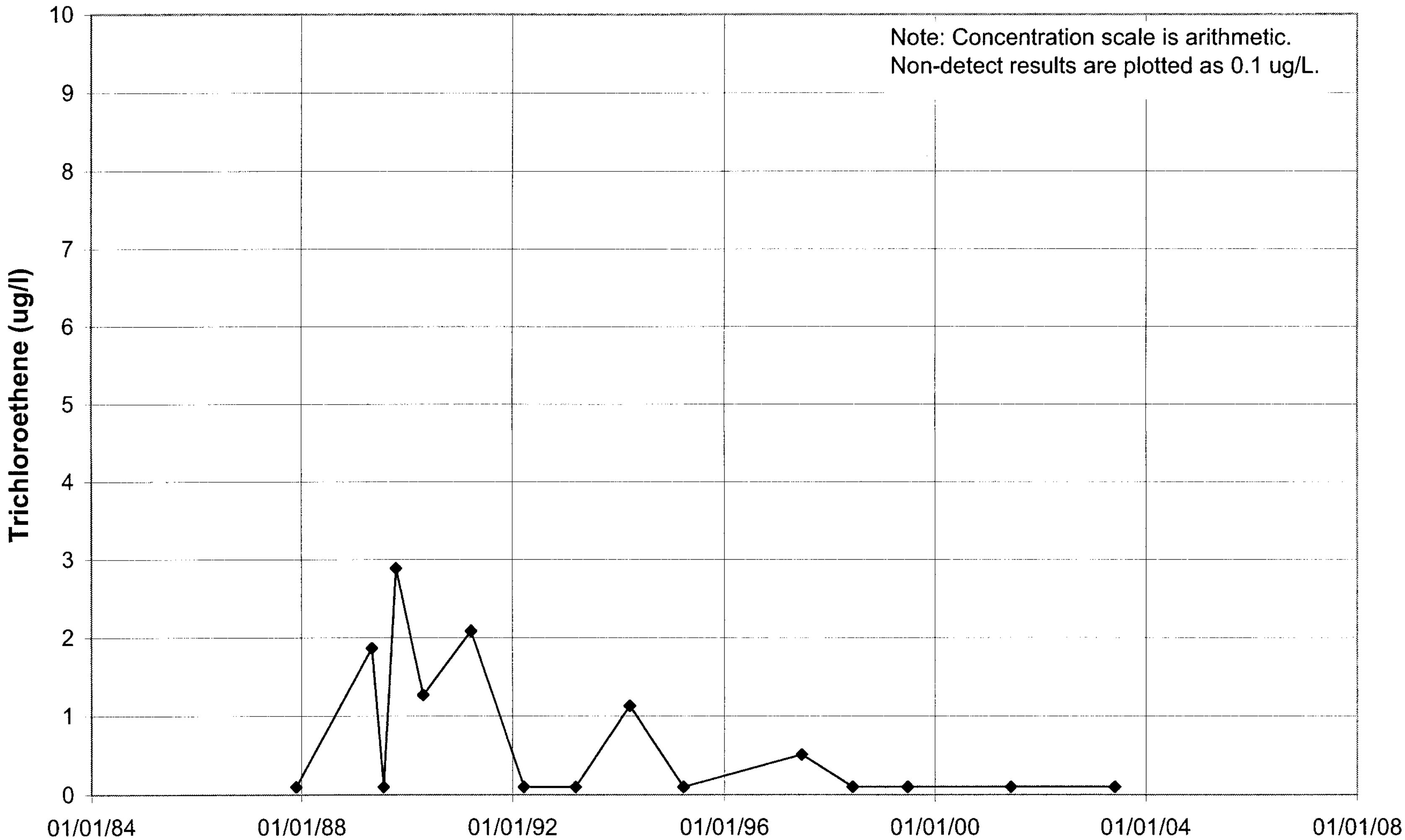

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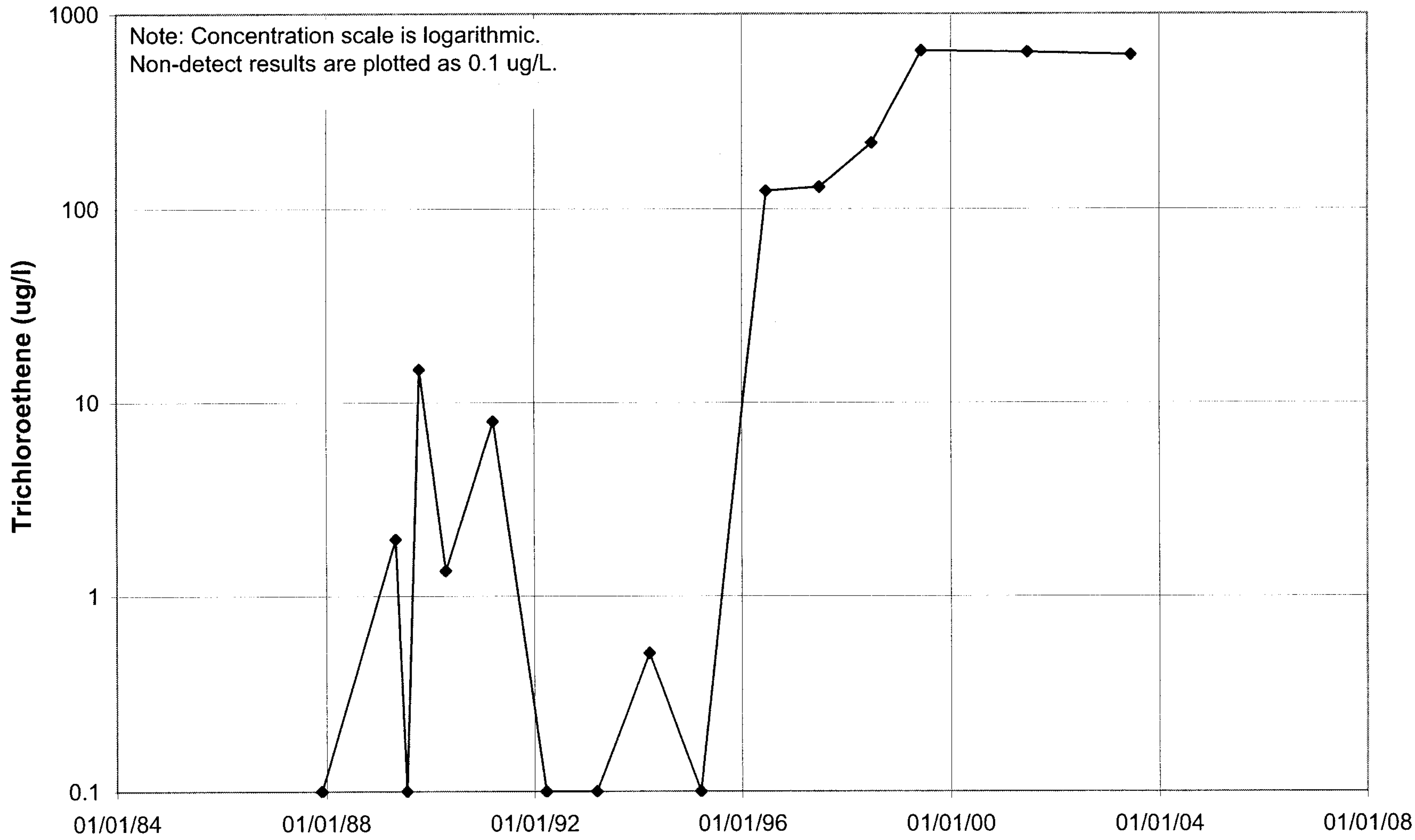

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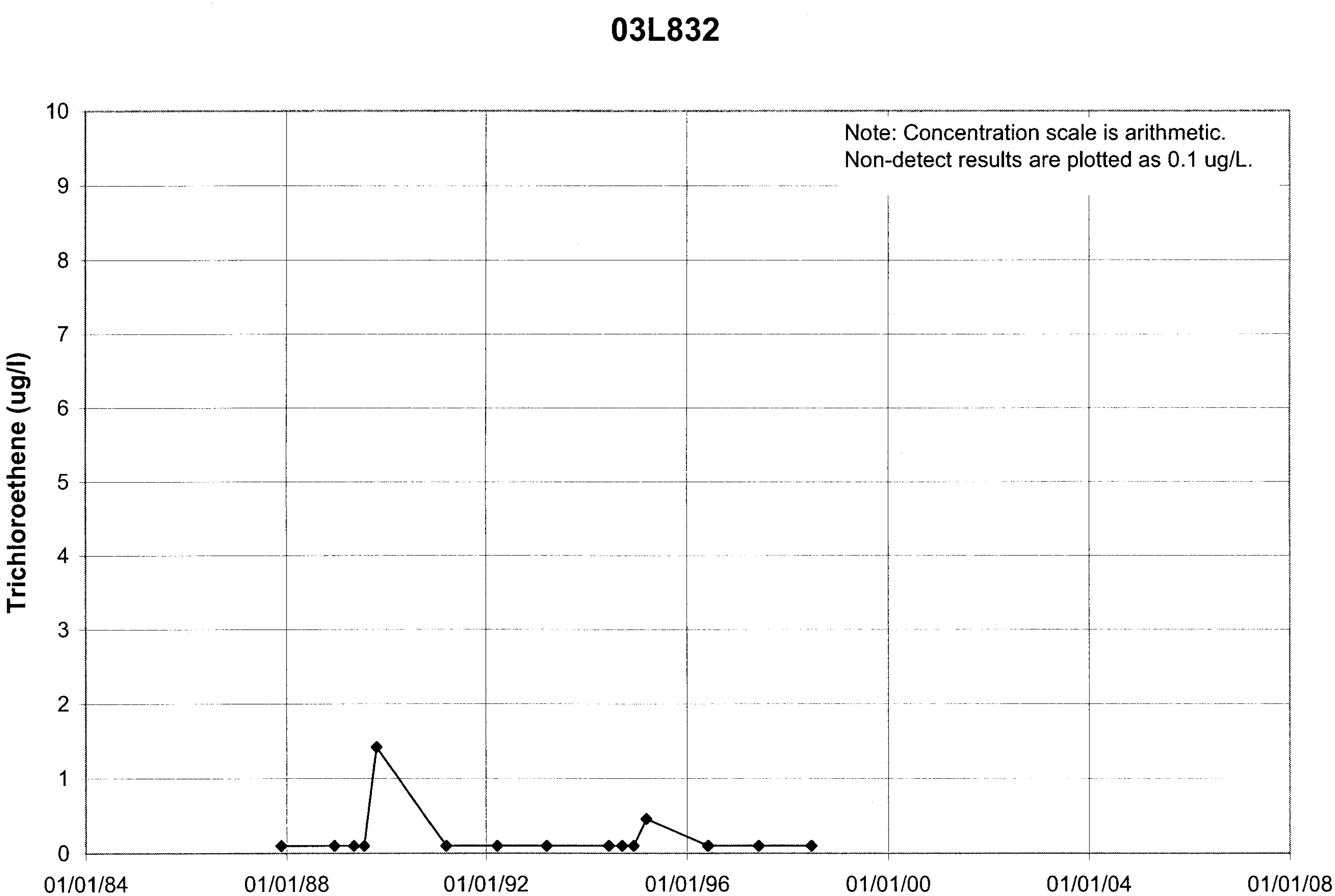

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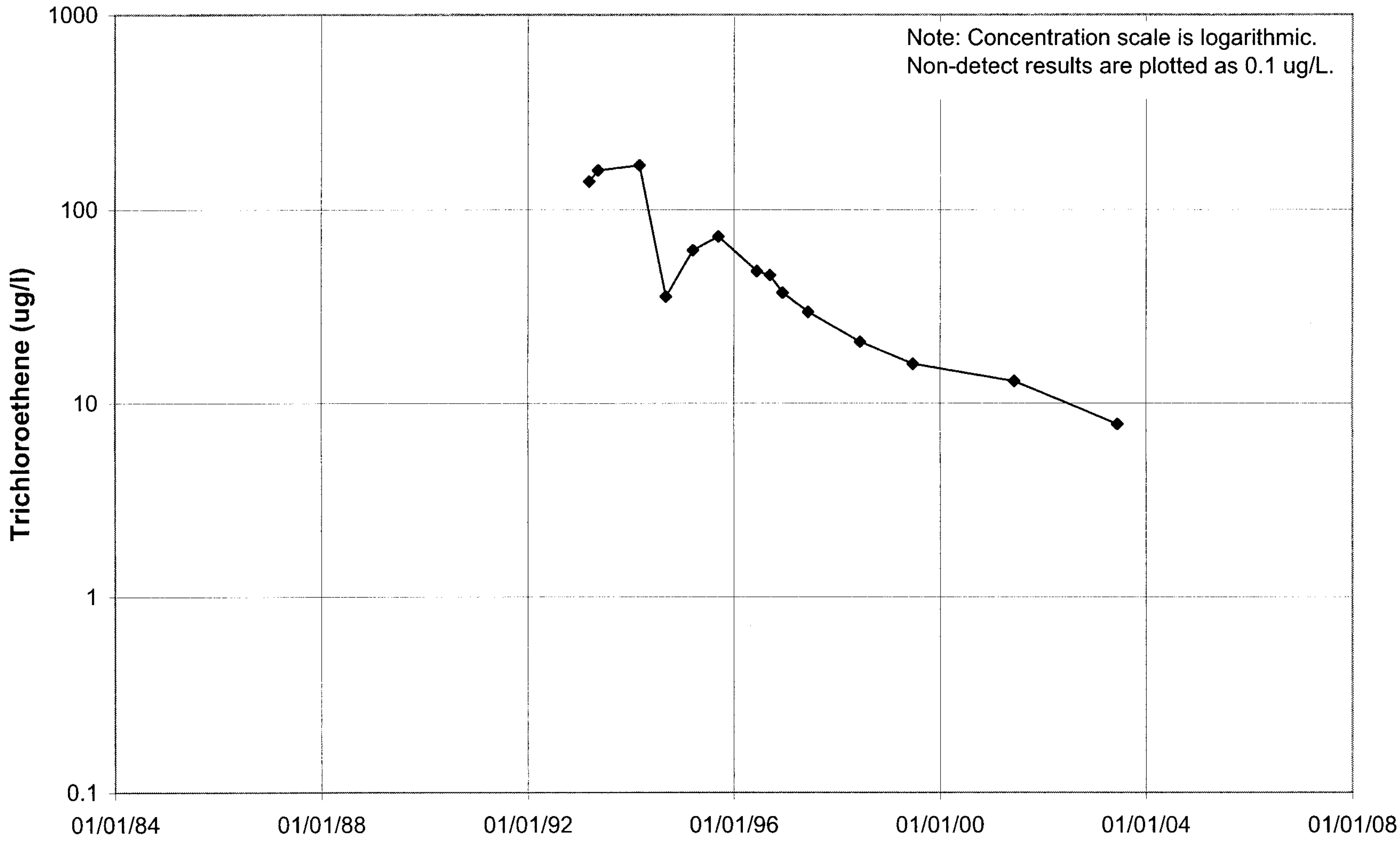

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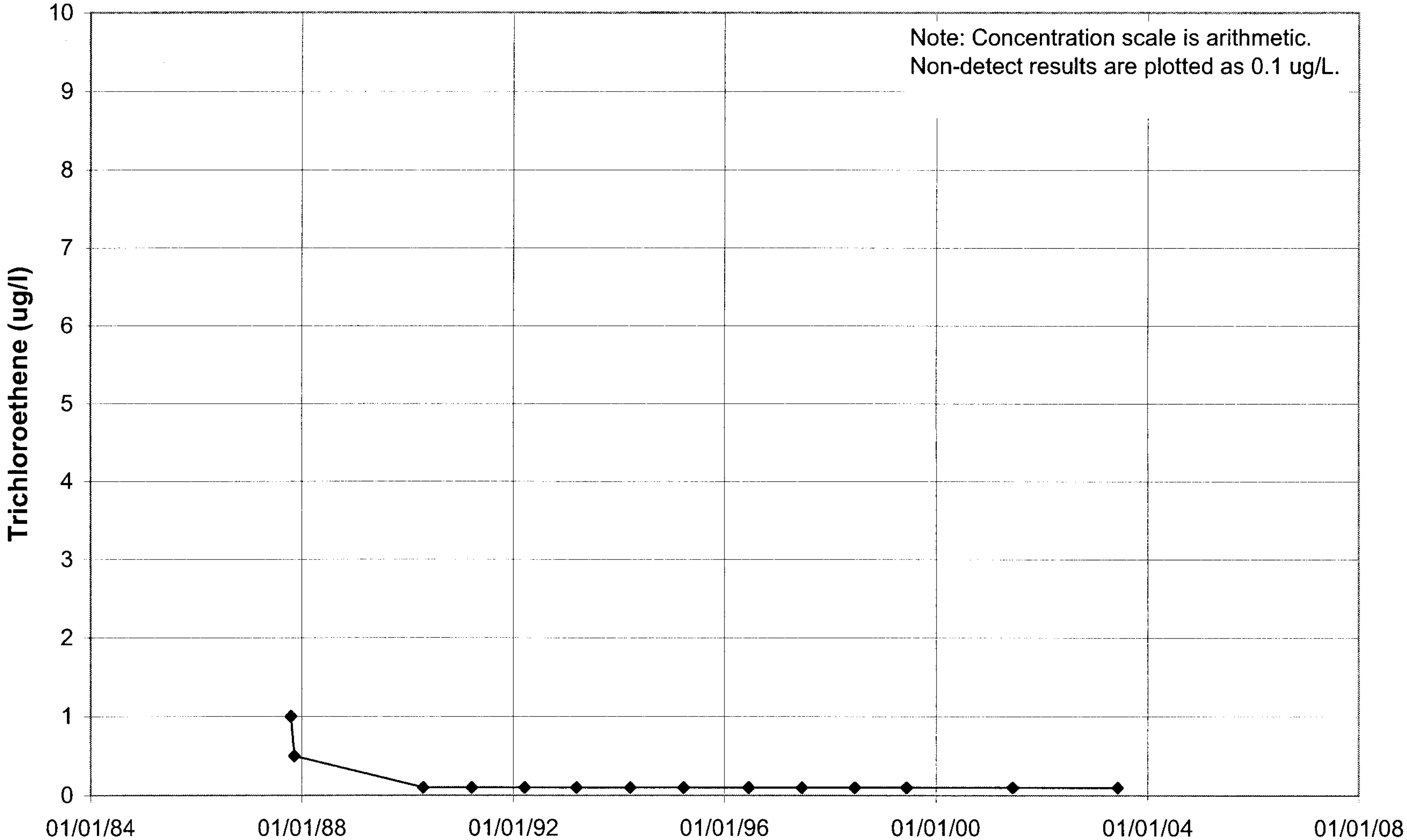

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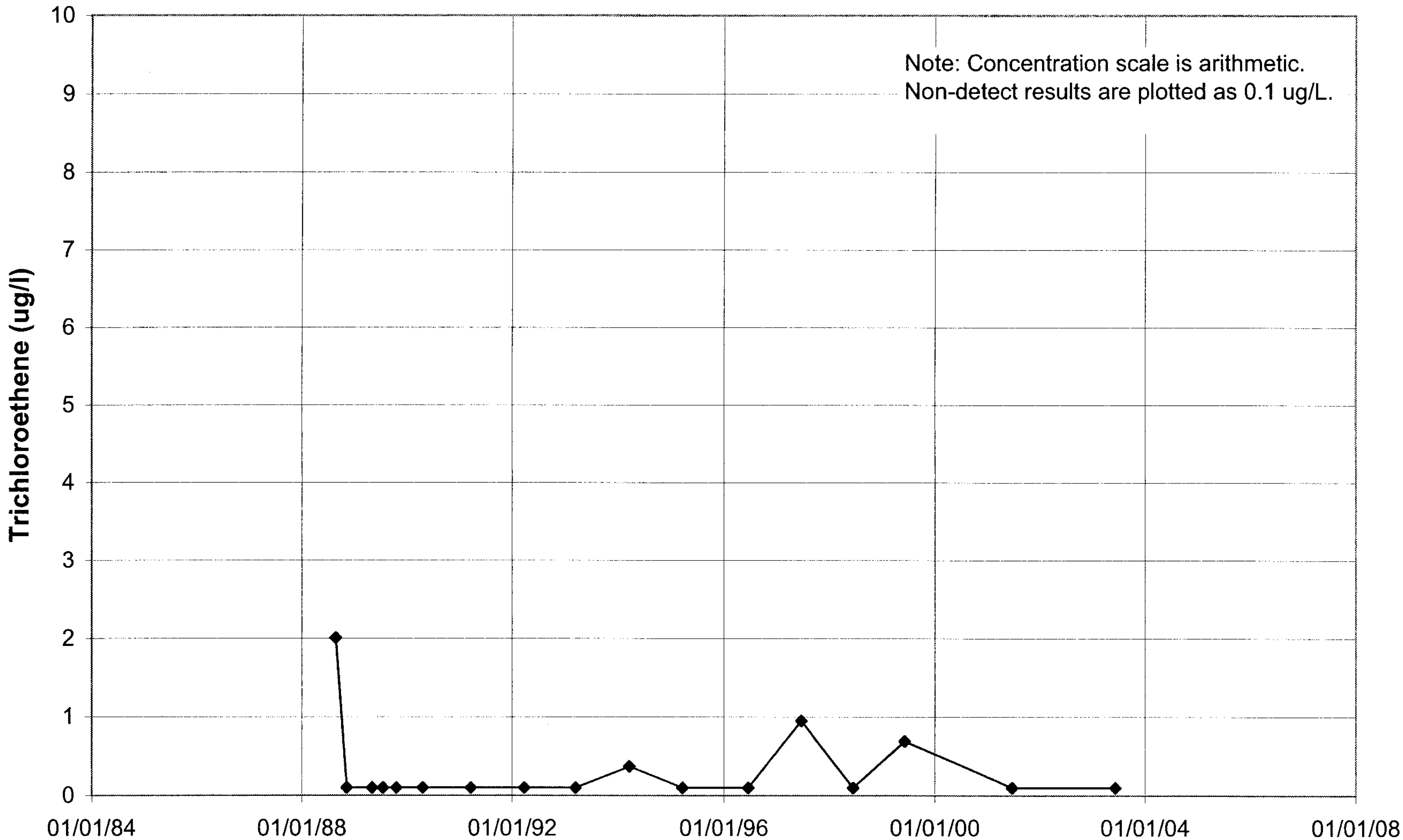

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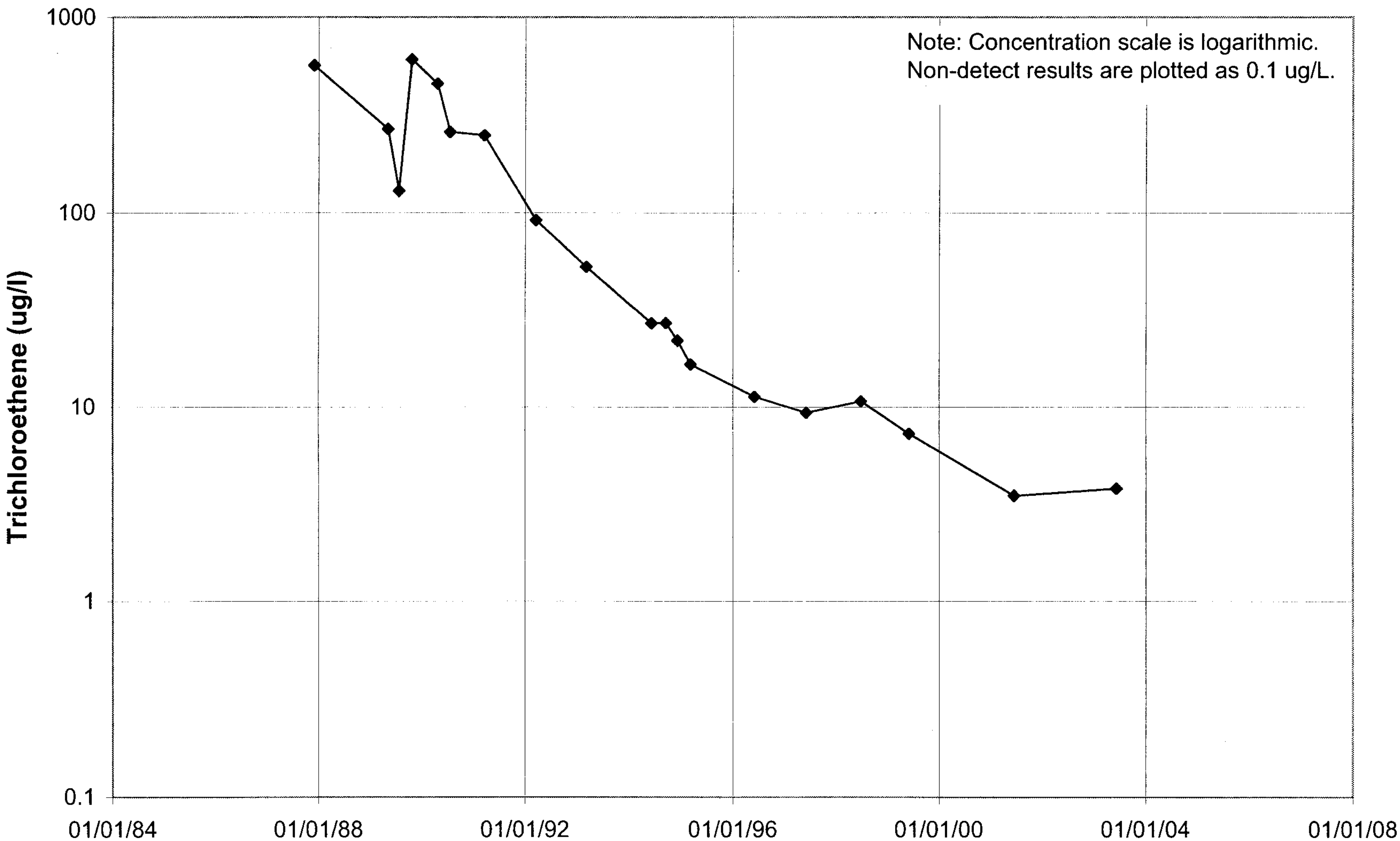

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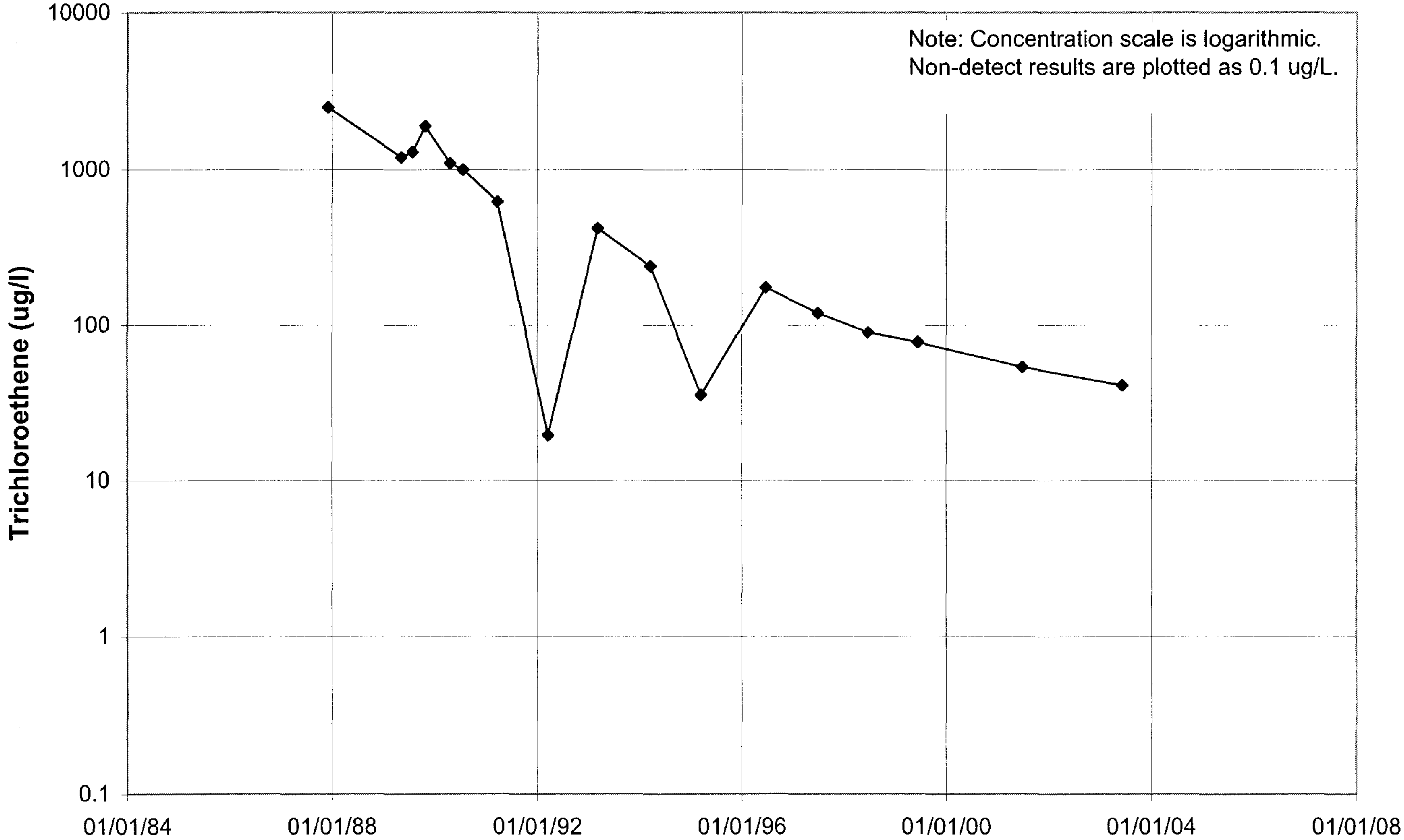

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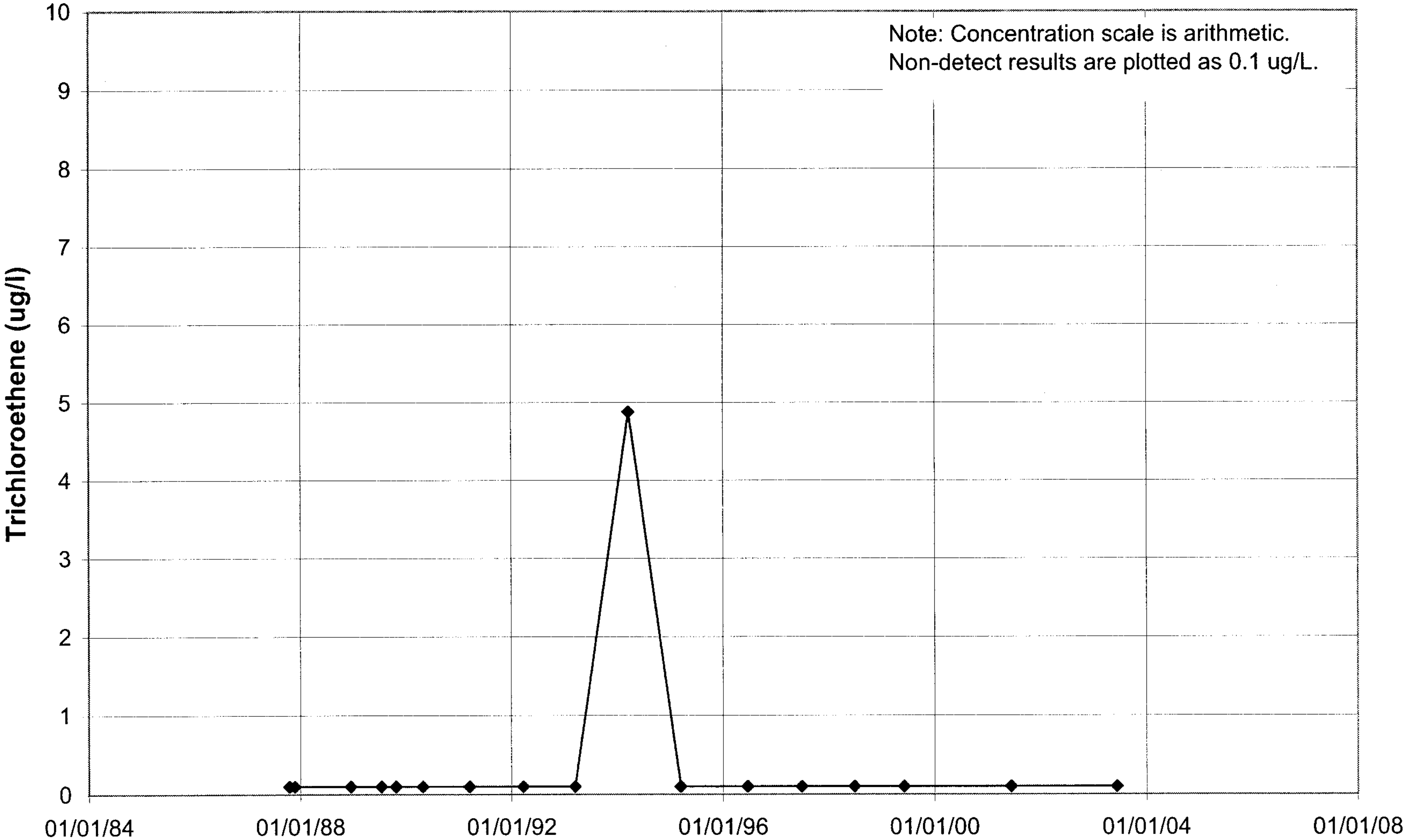

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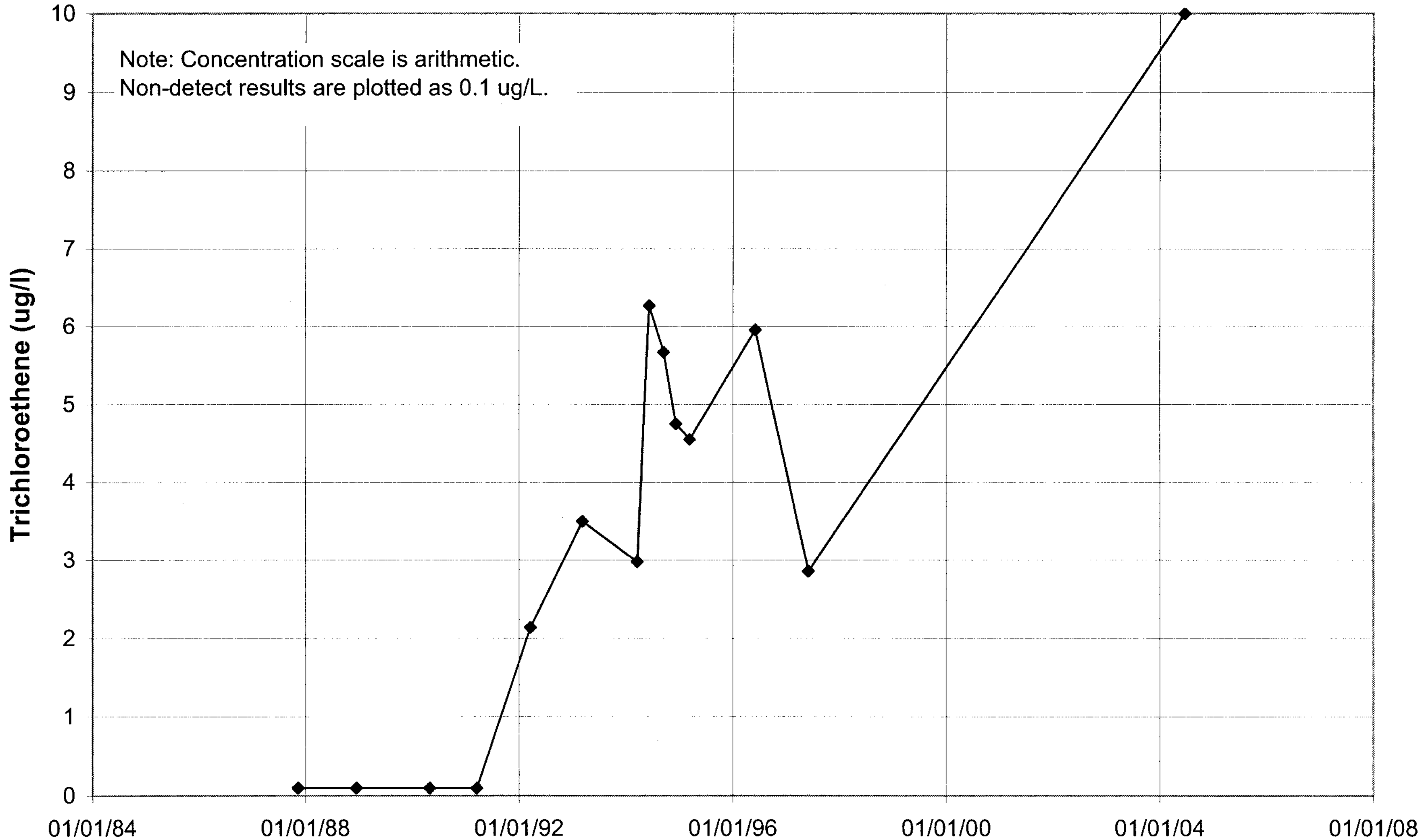

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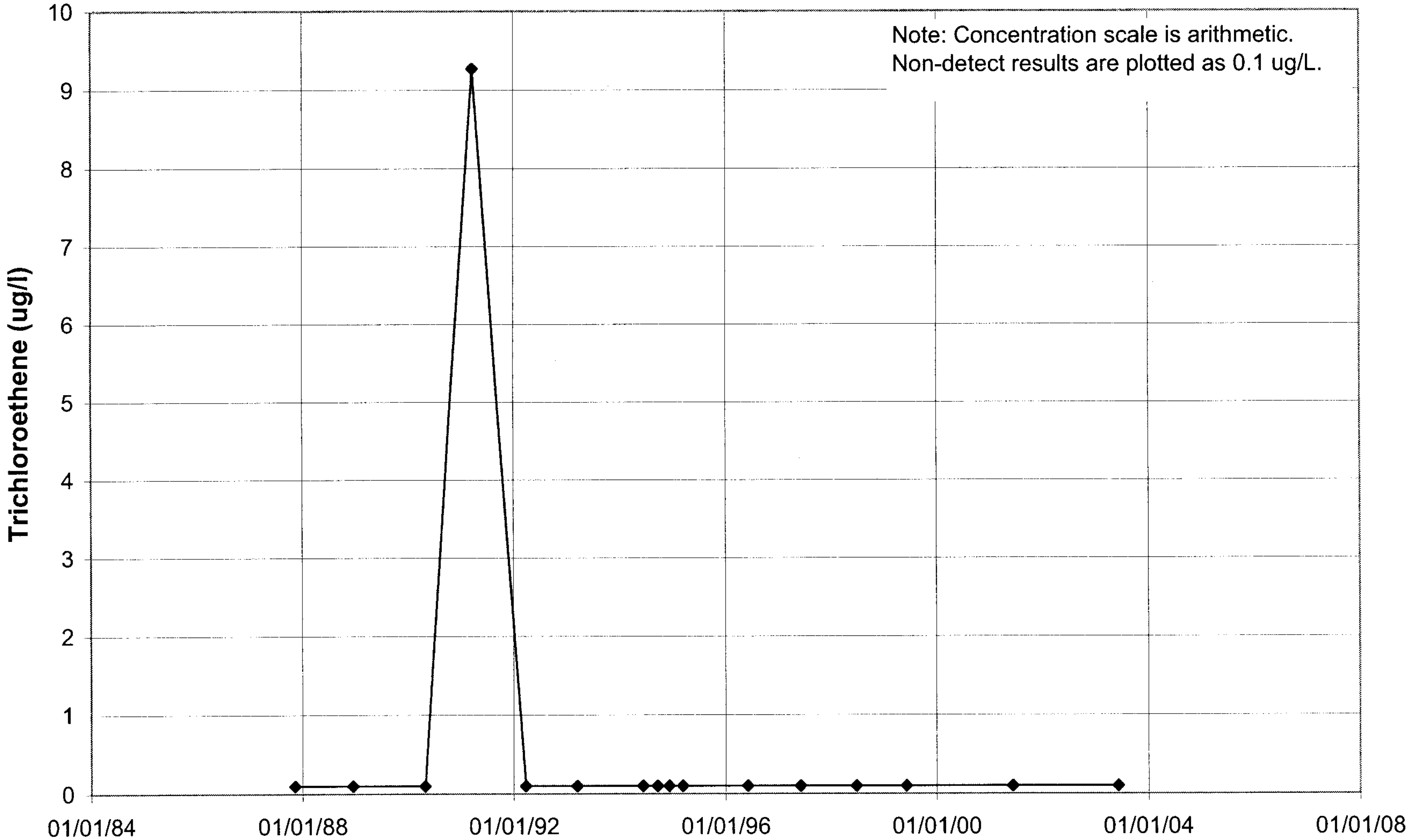

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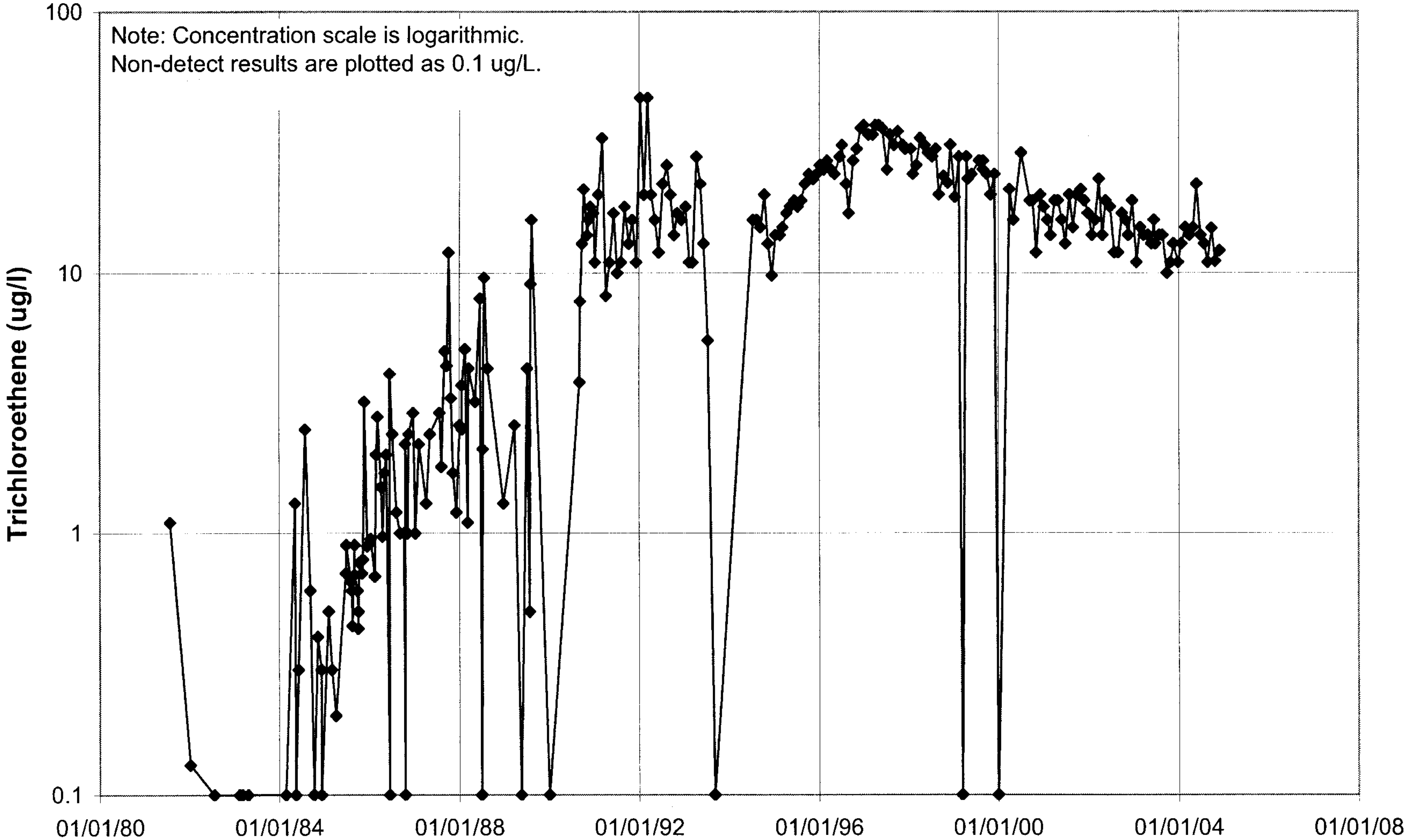
200524 (SAM#5)



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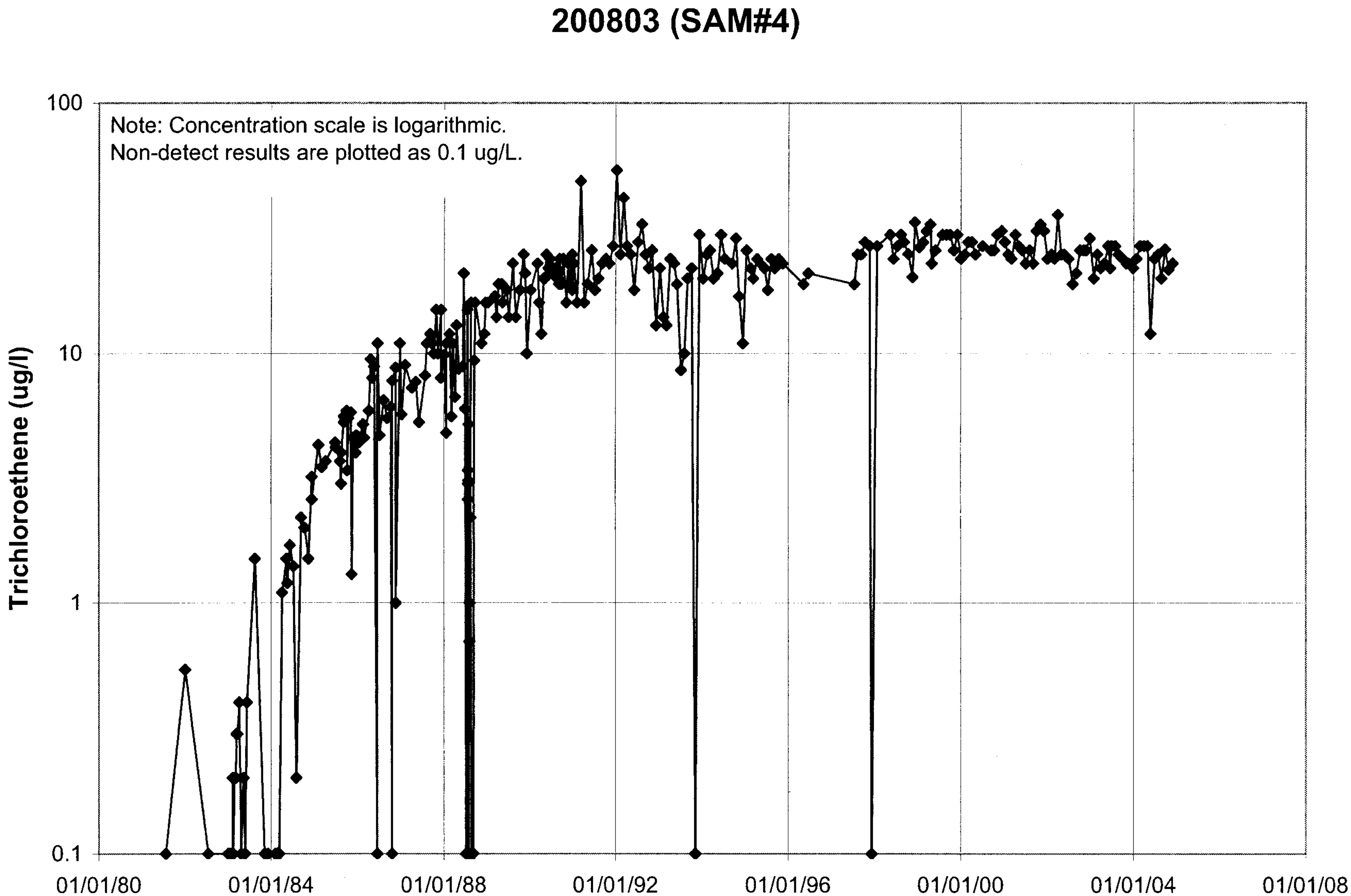

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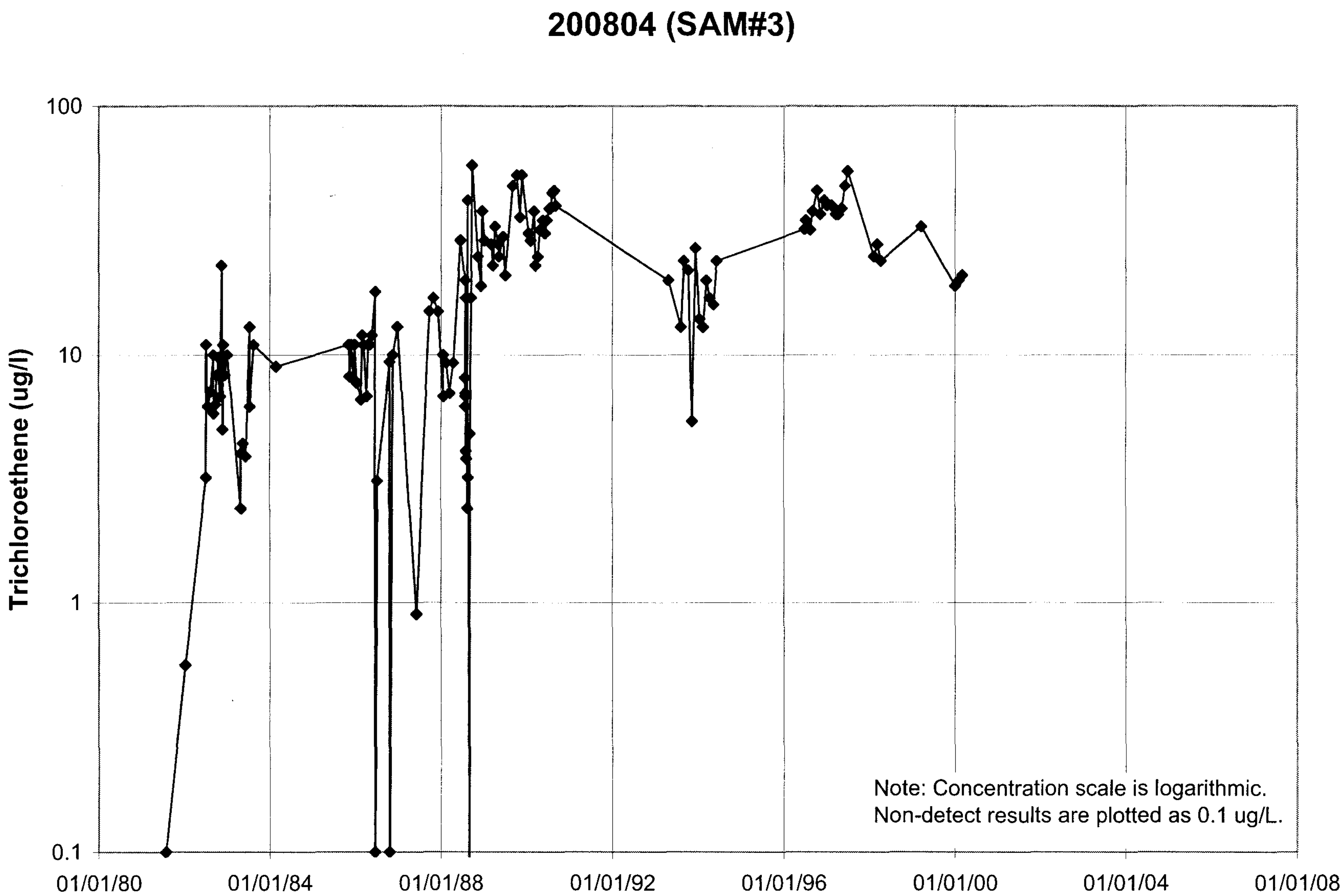

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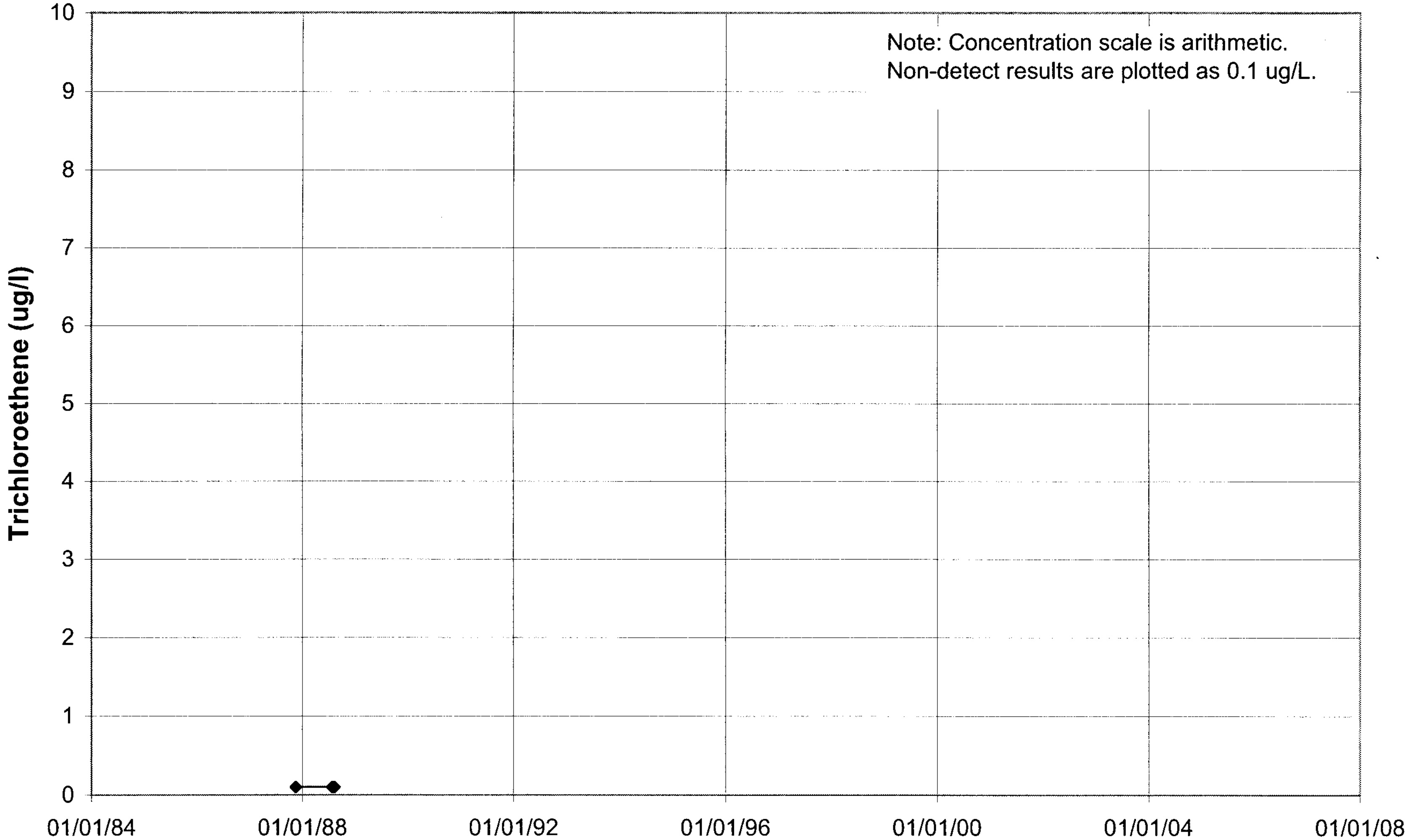

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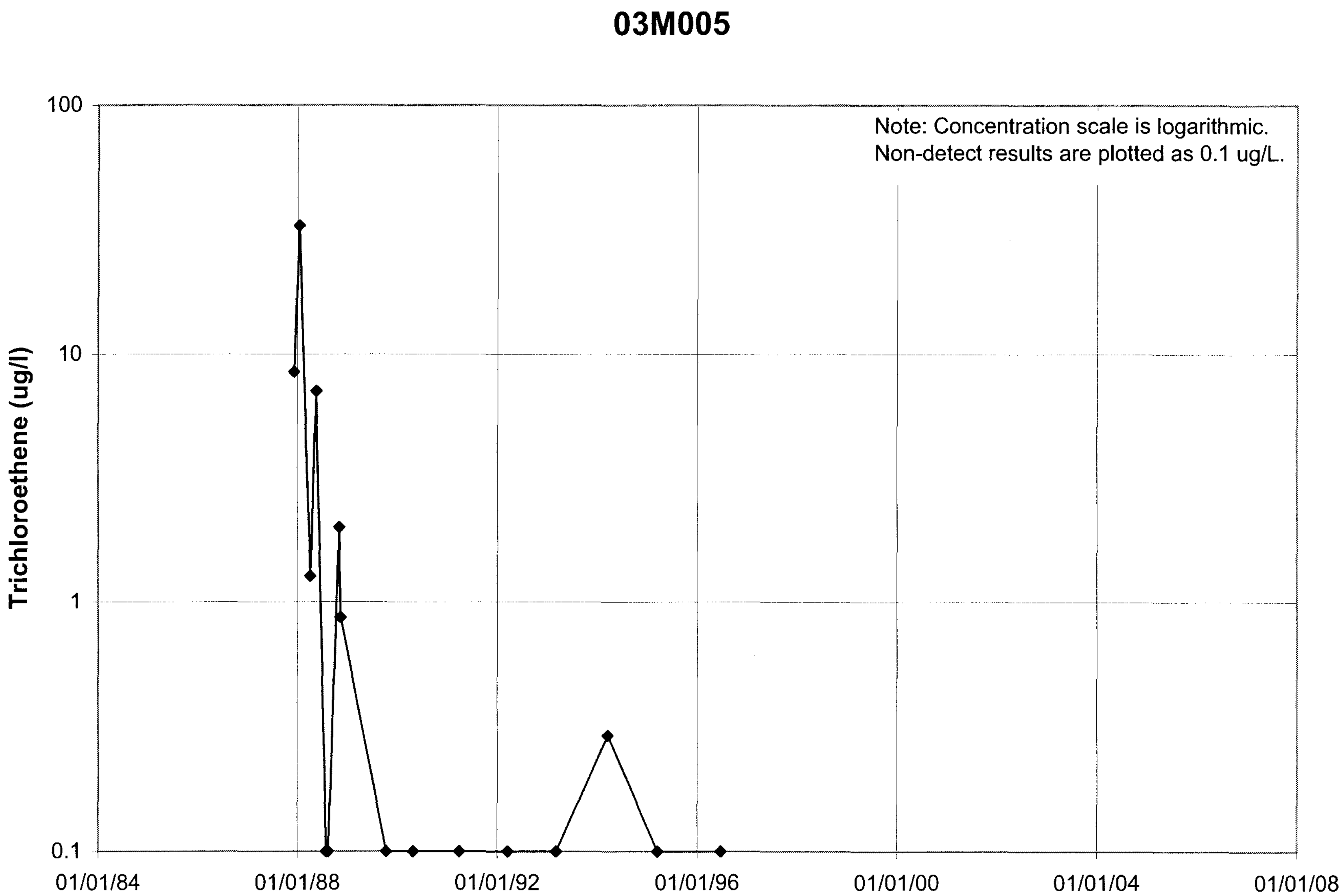

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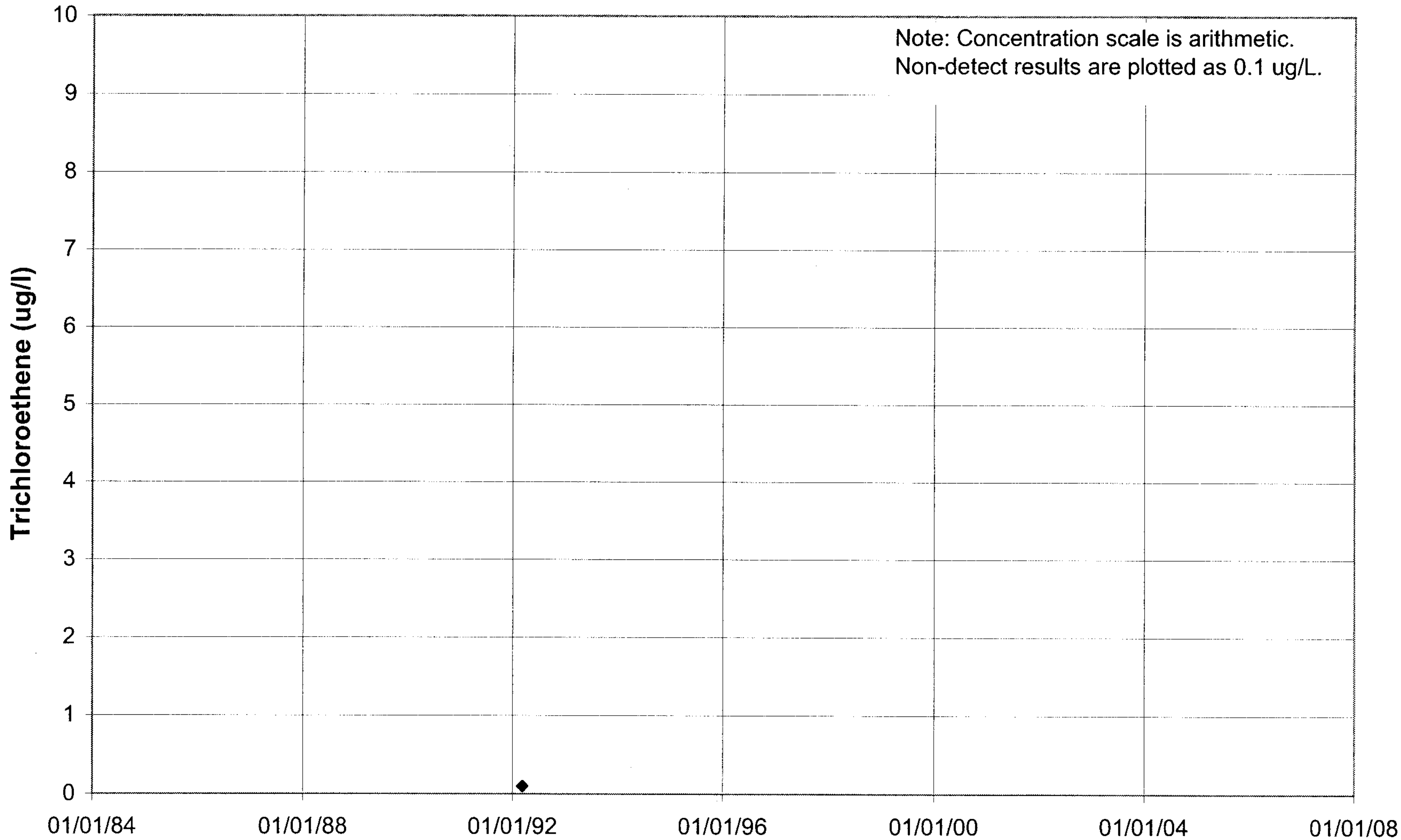

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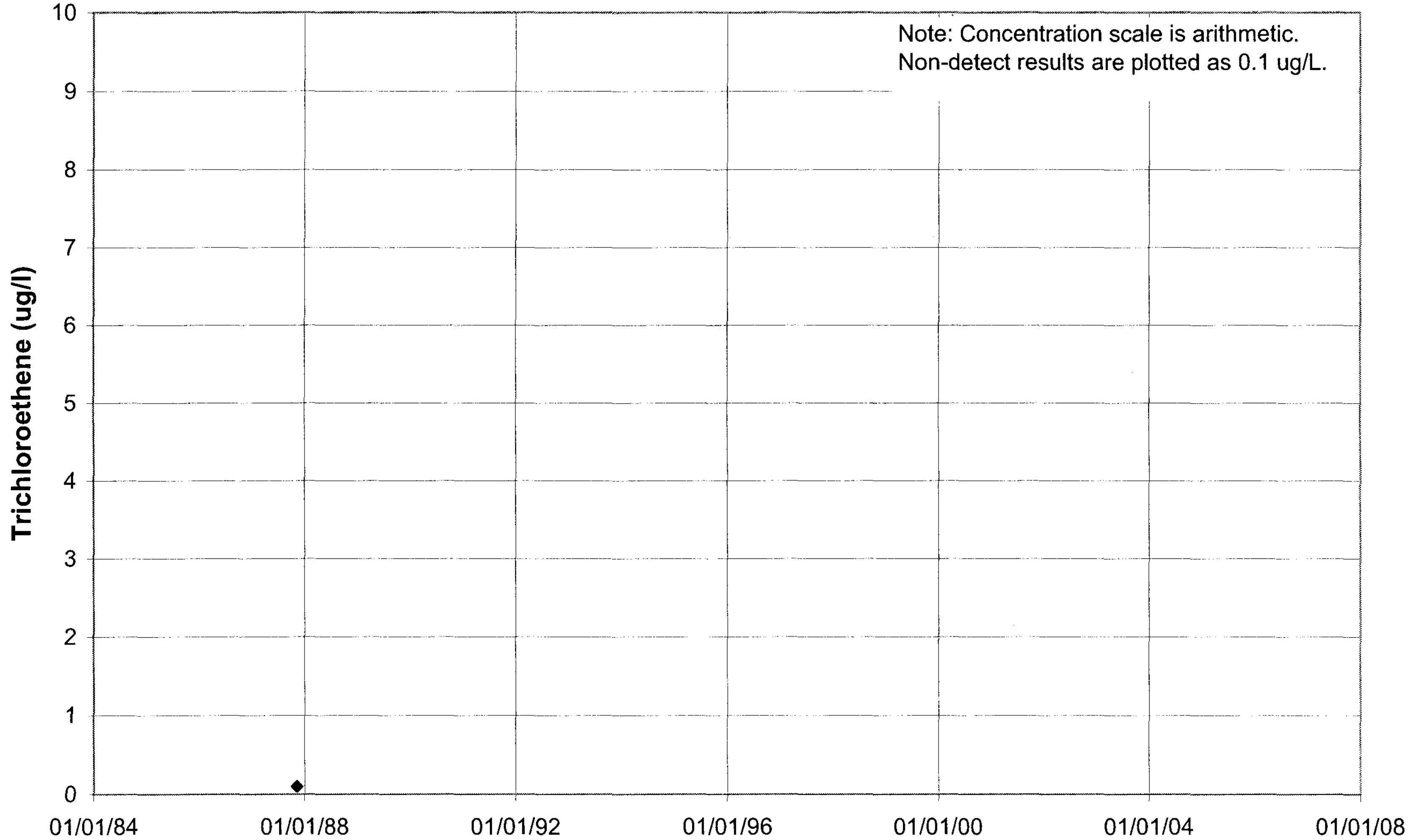

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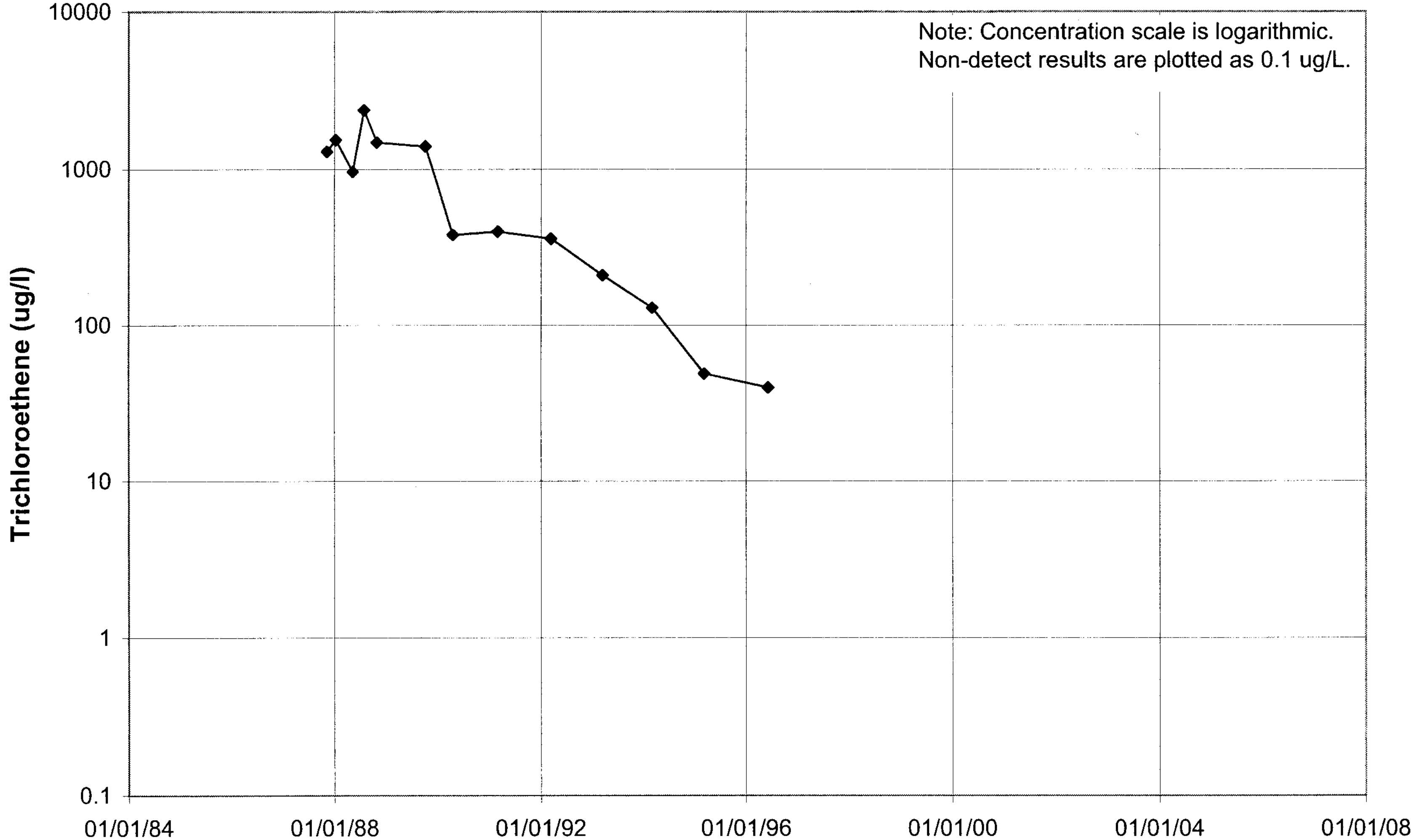

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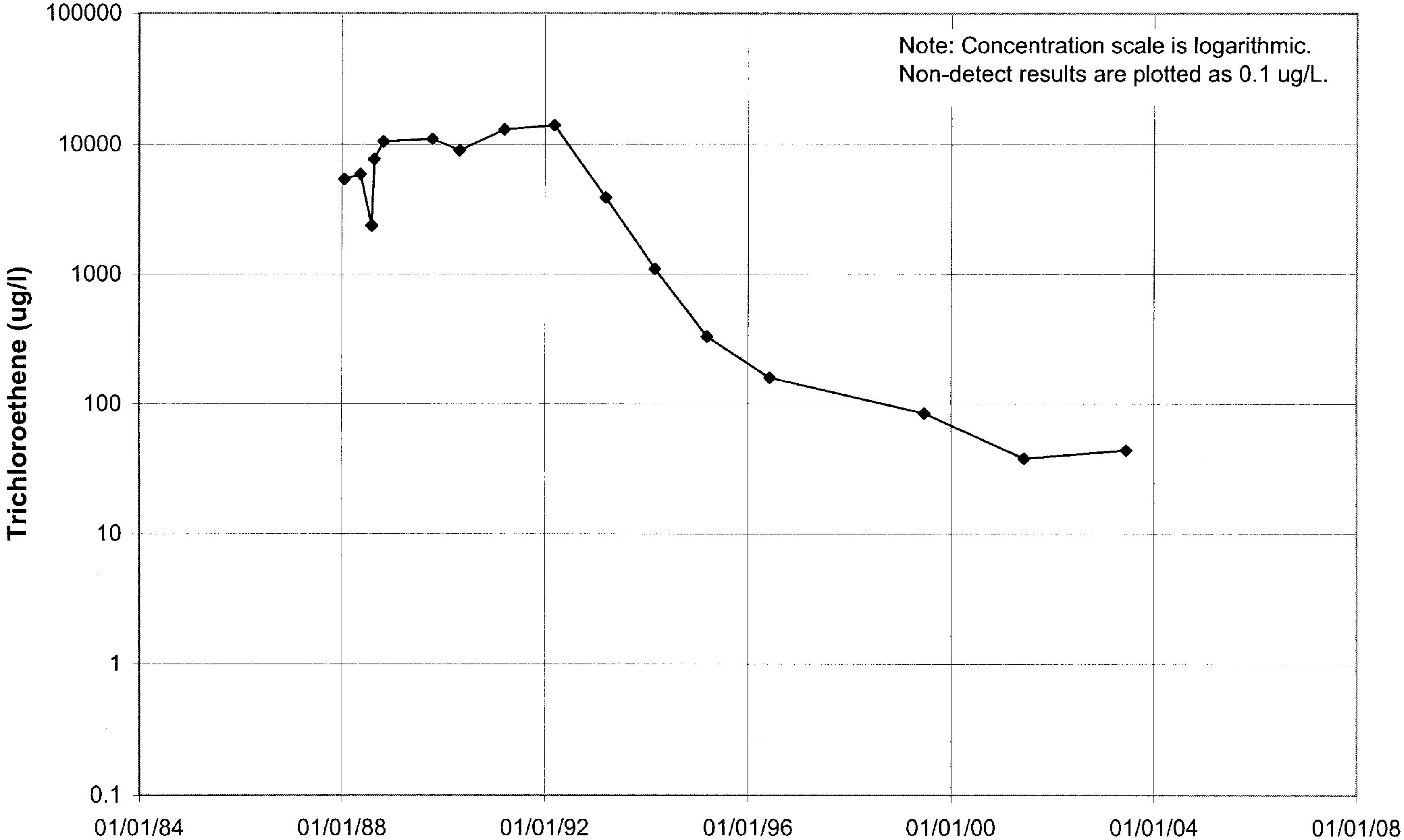

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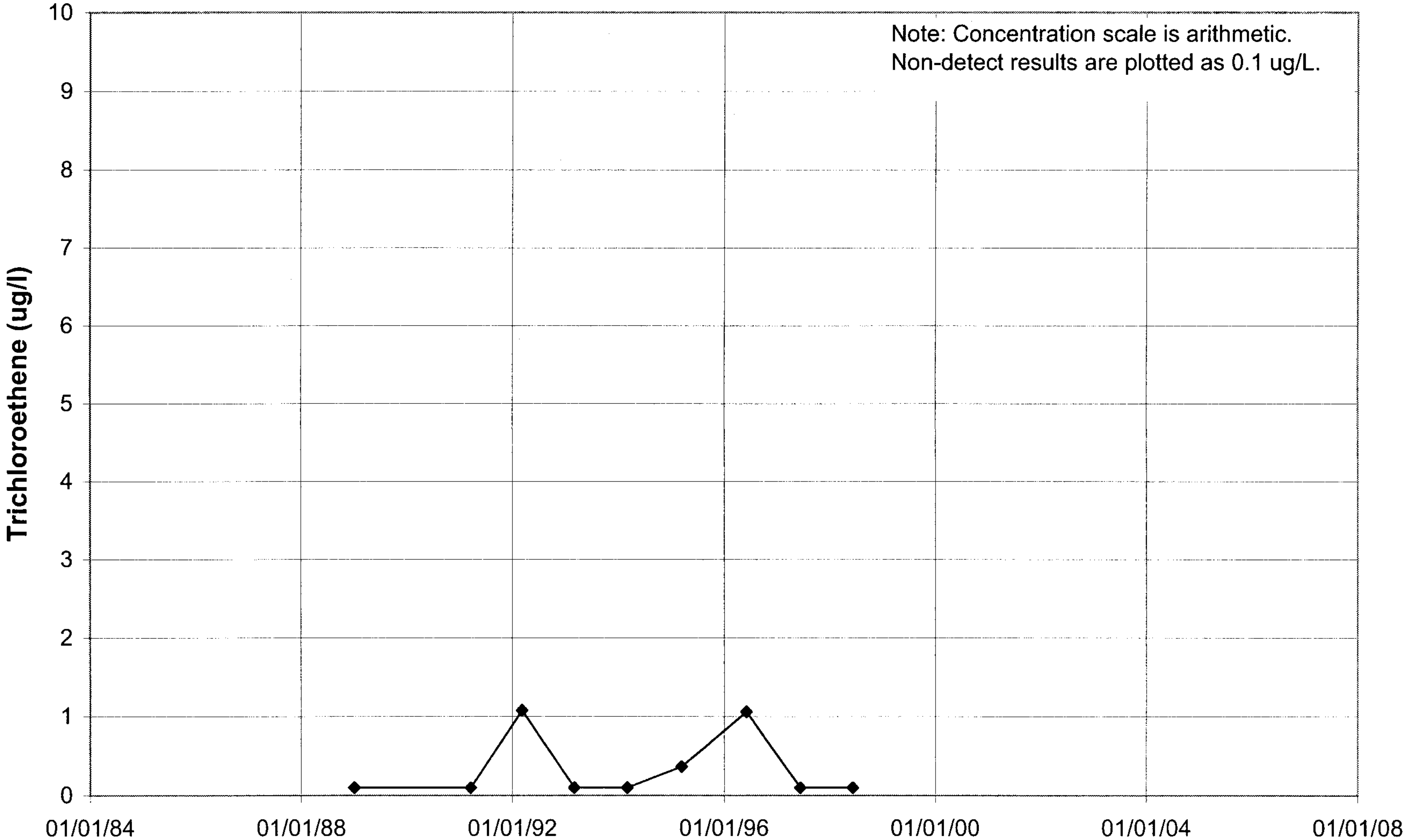

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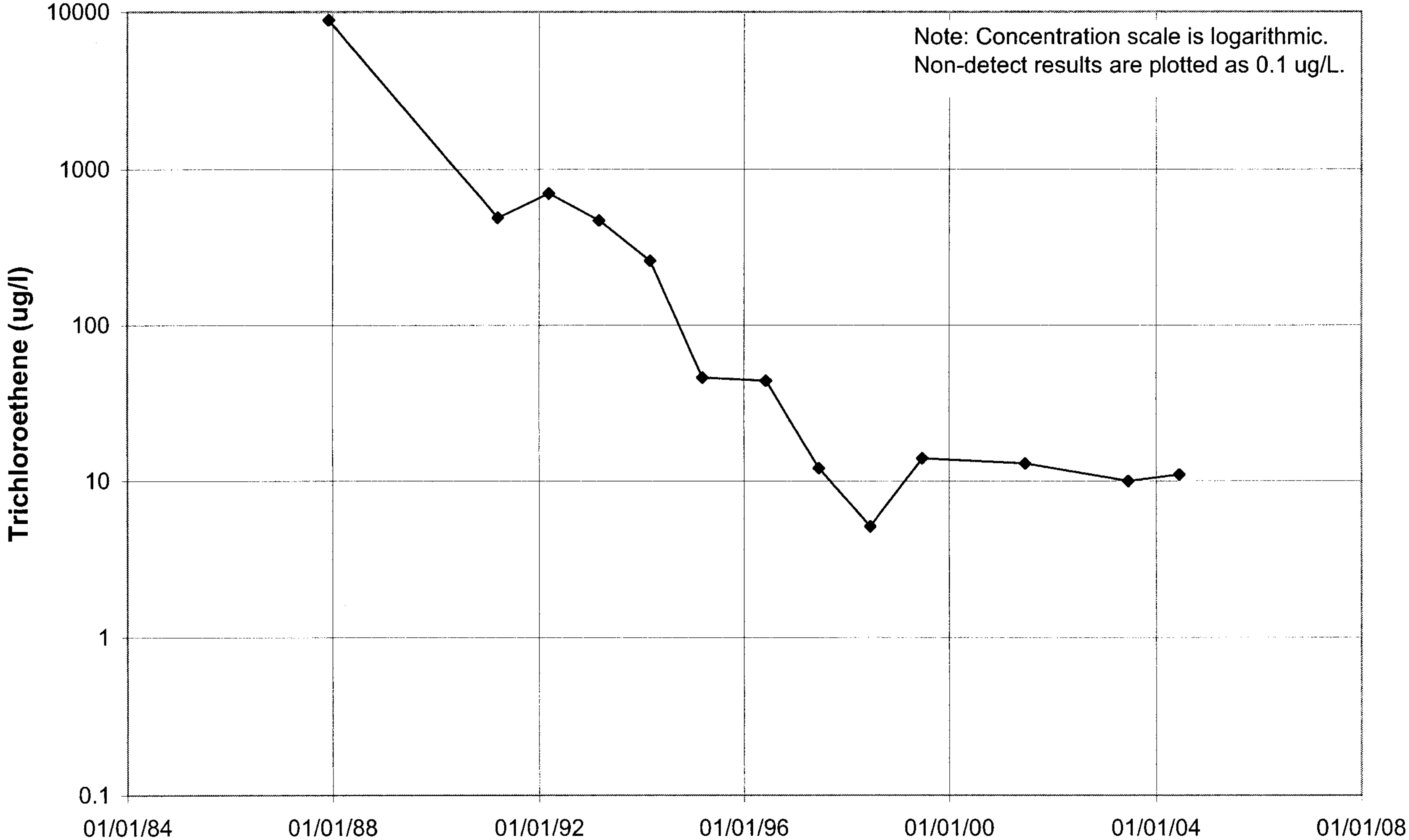

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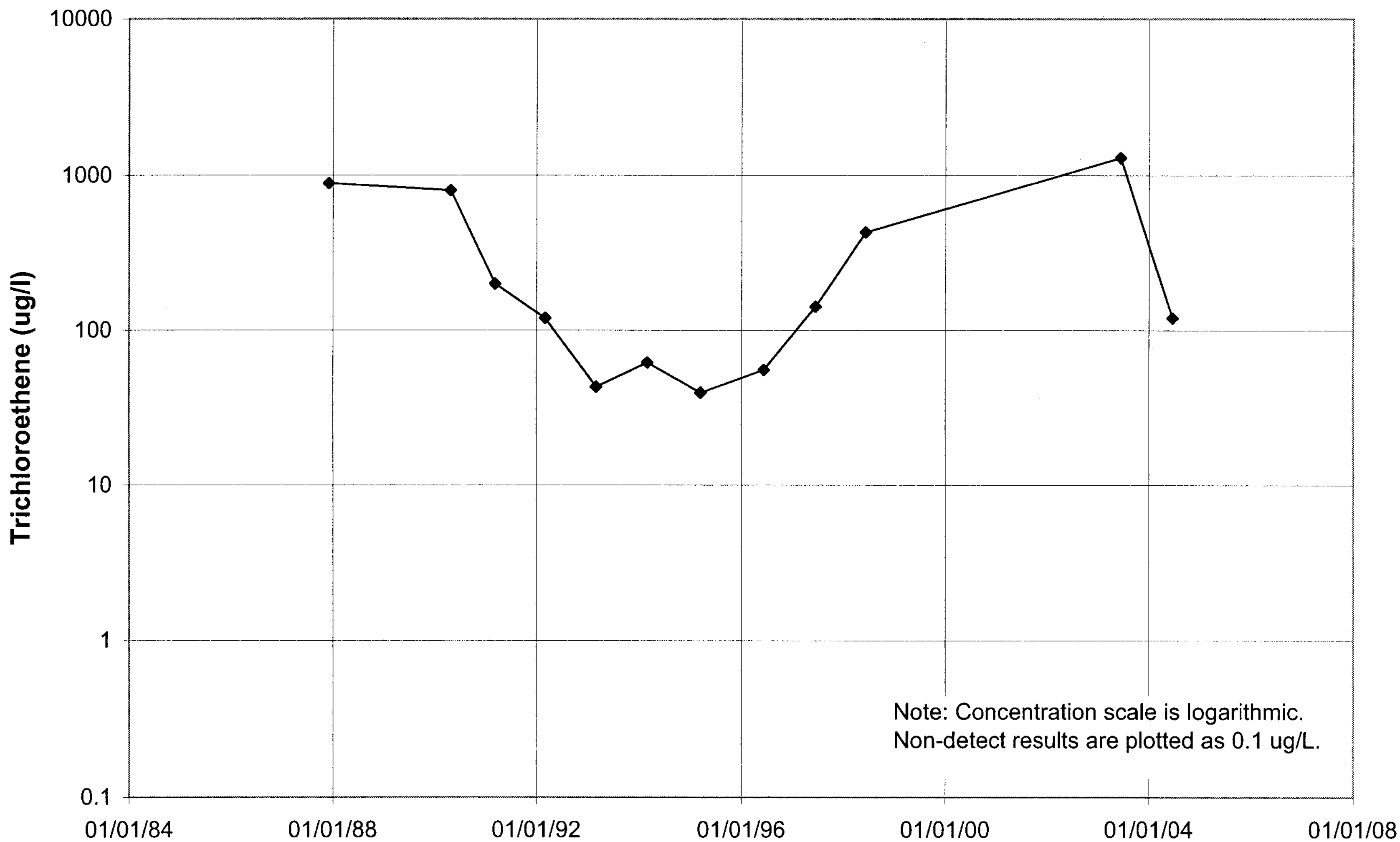

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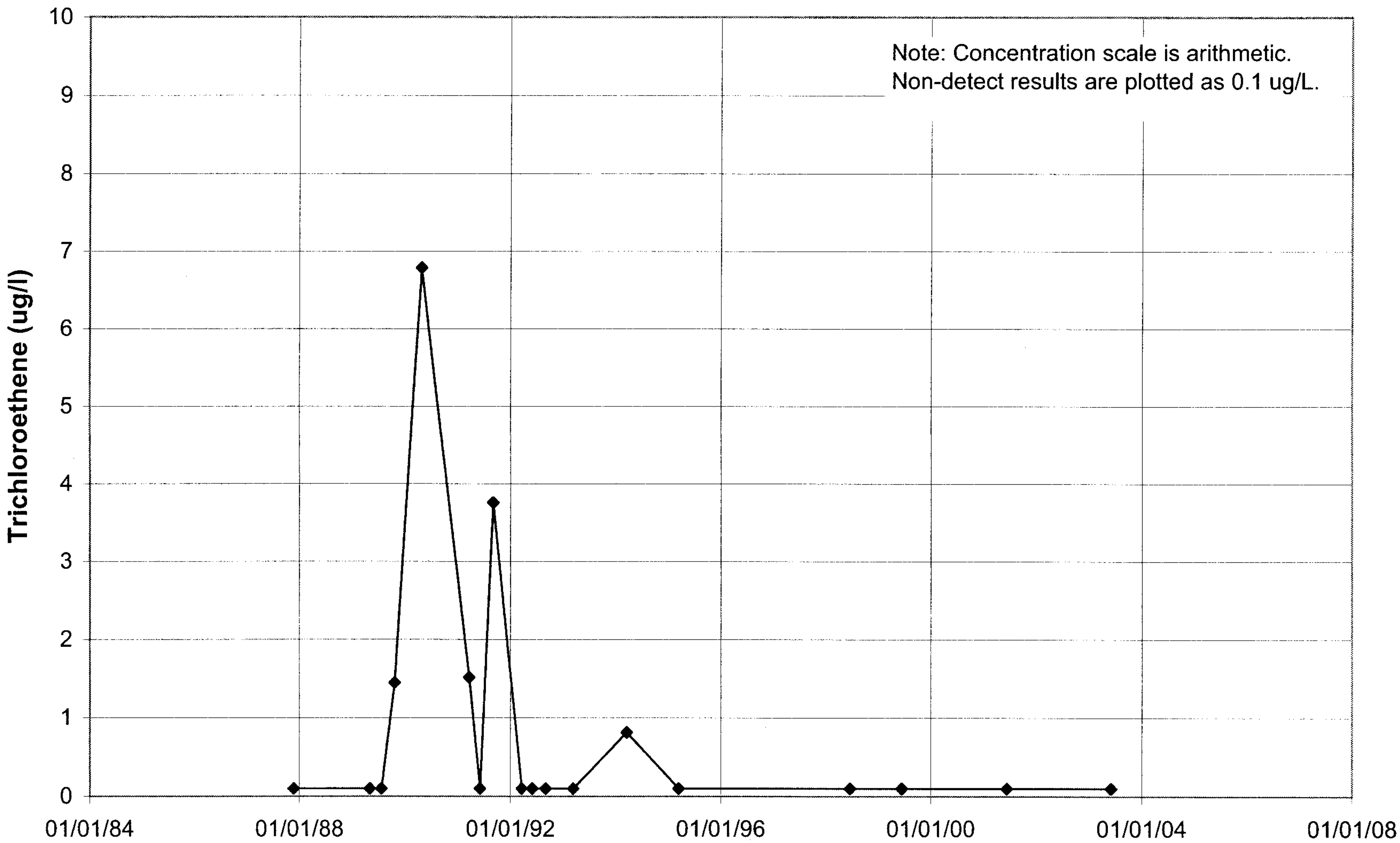

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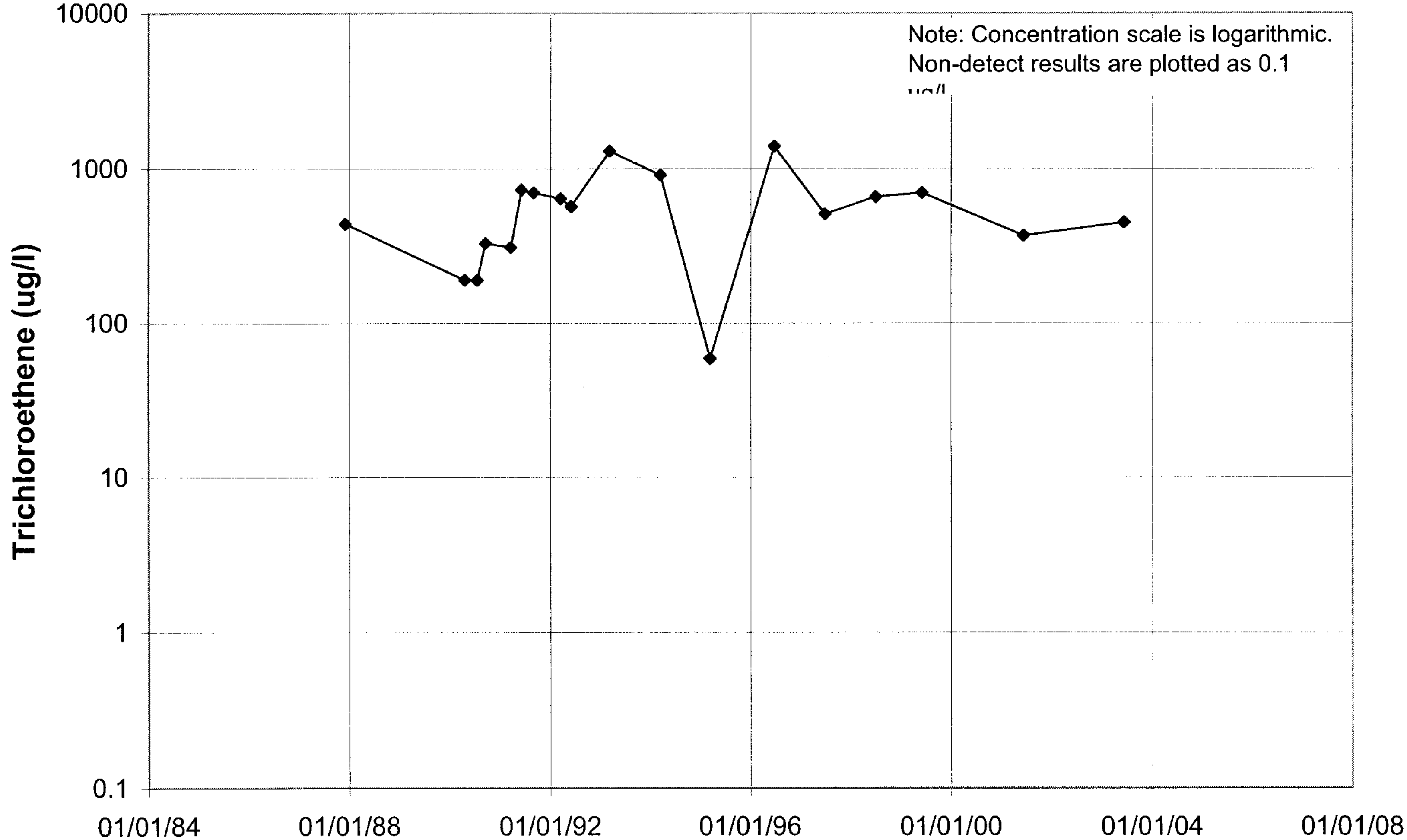

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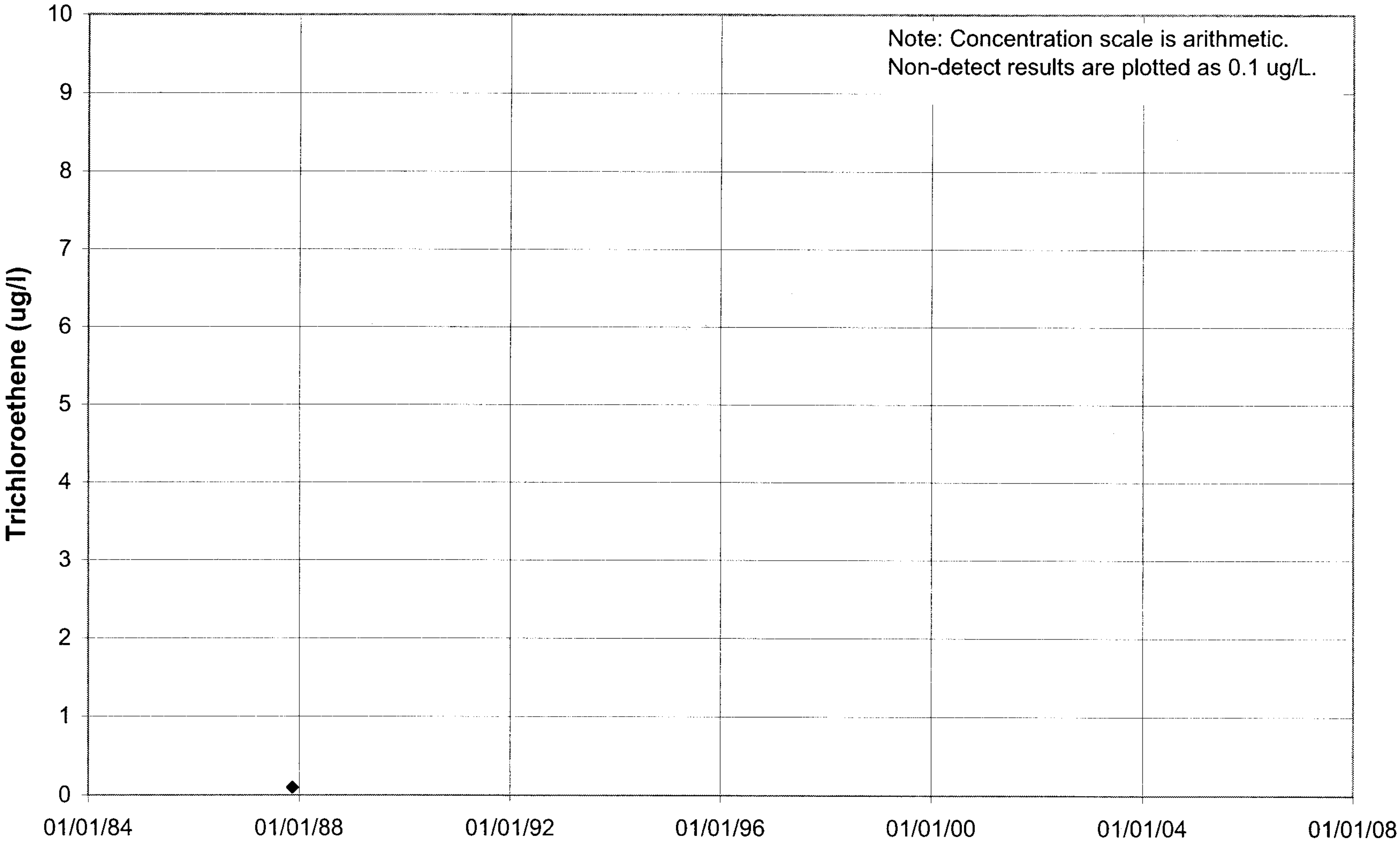

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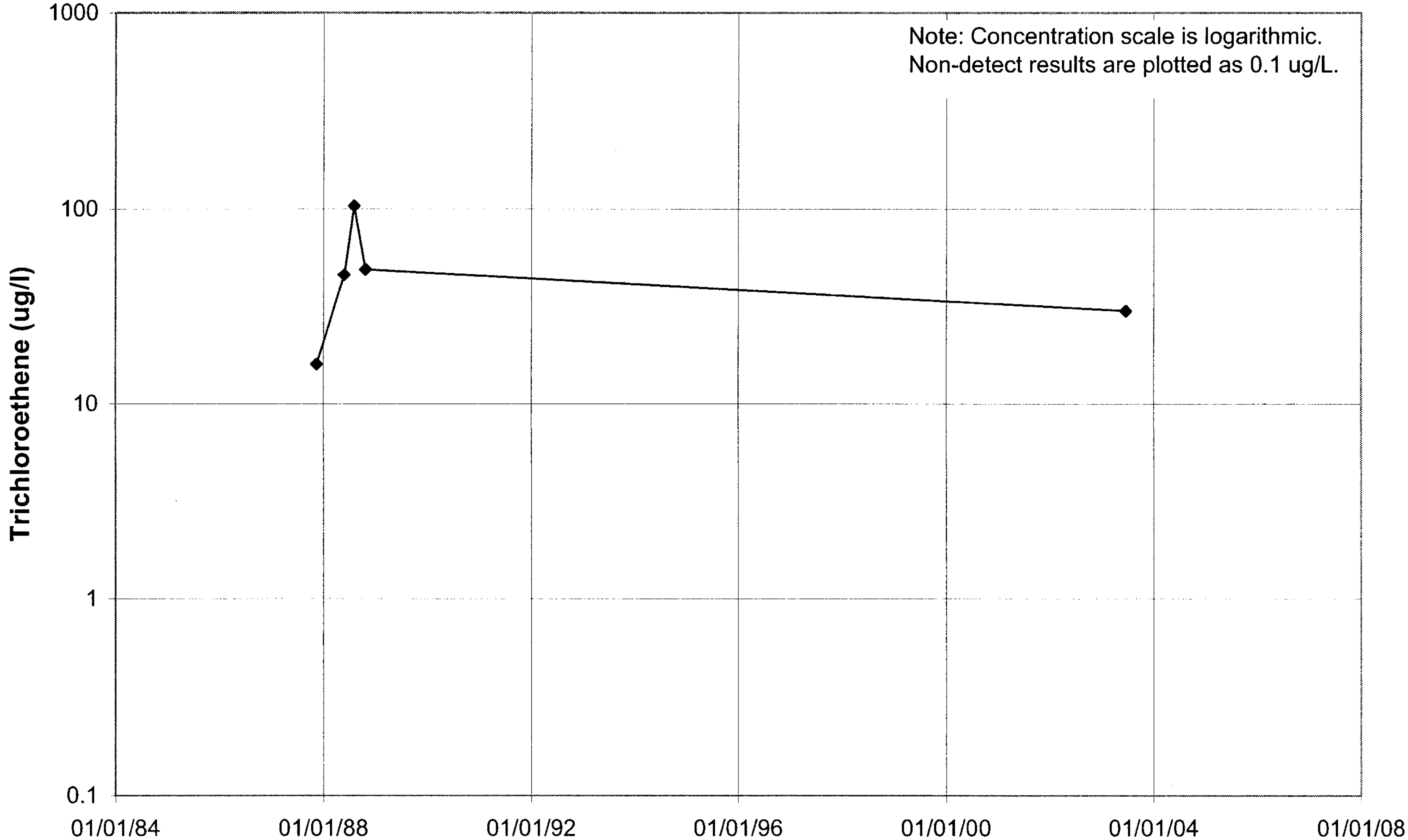

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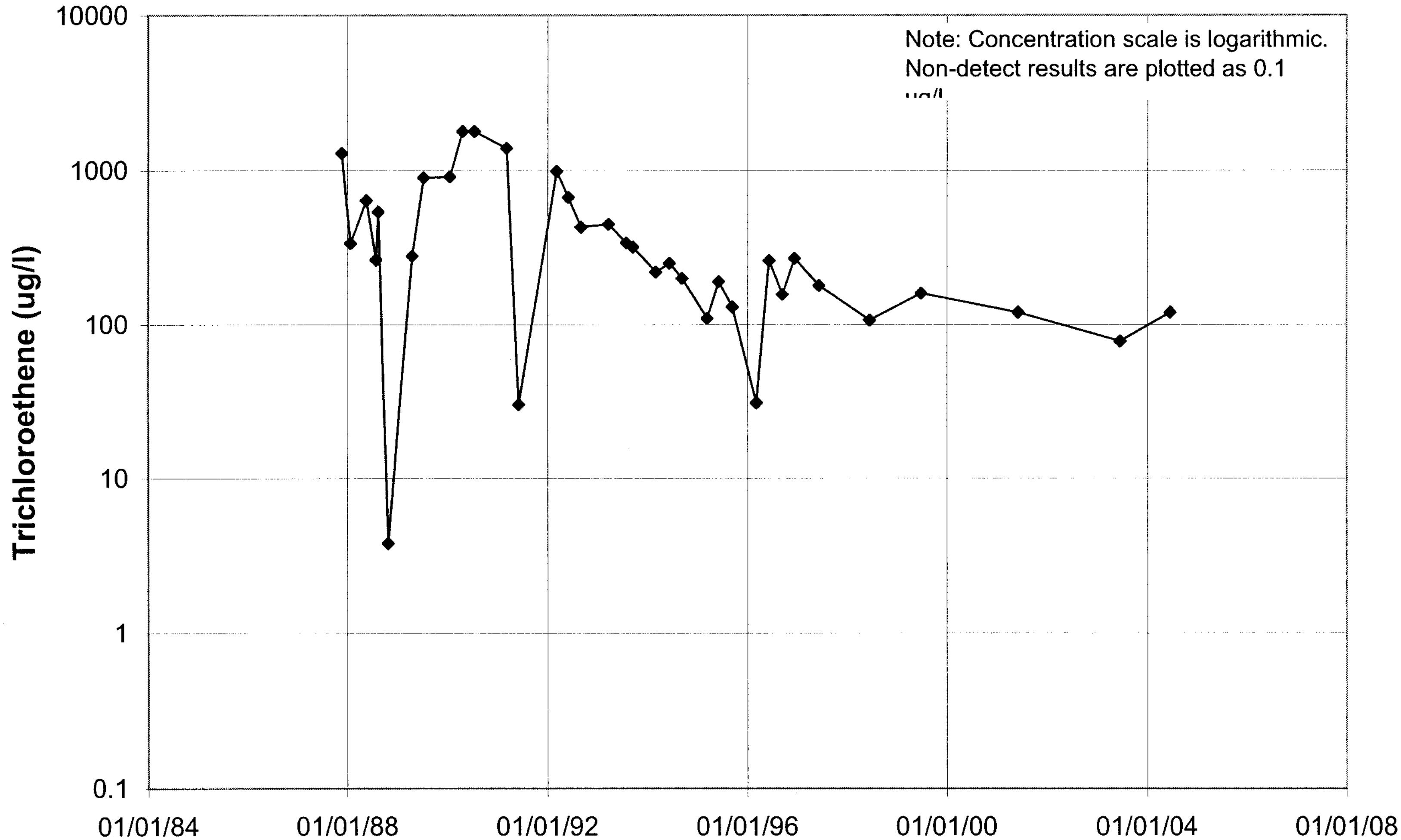

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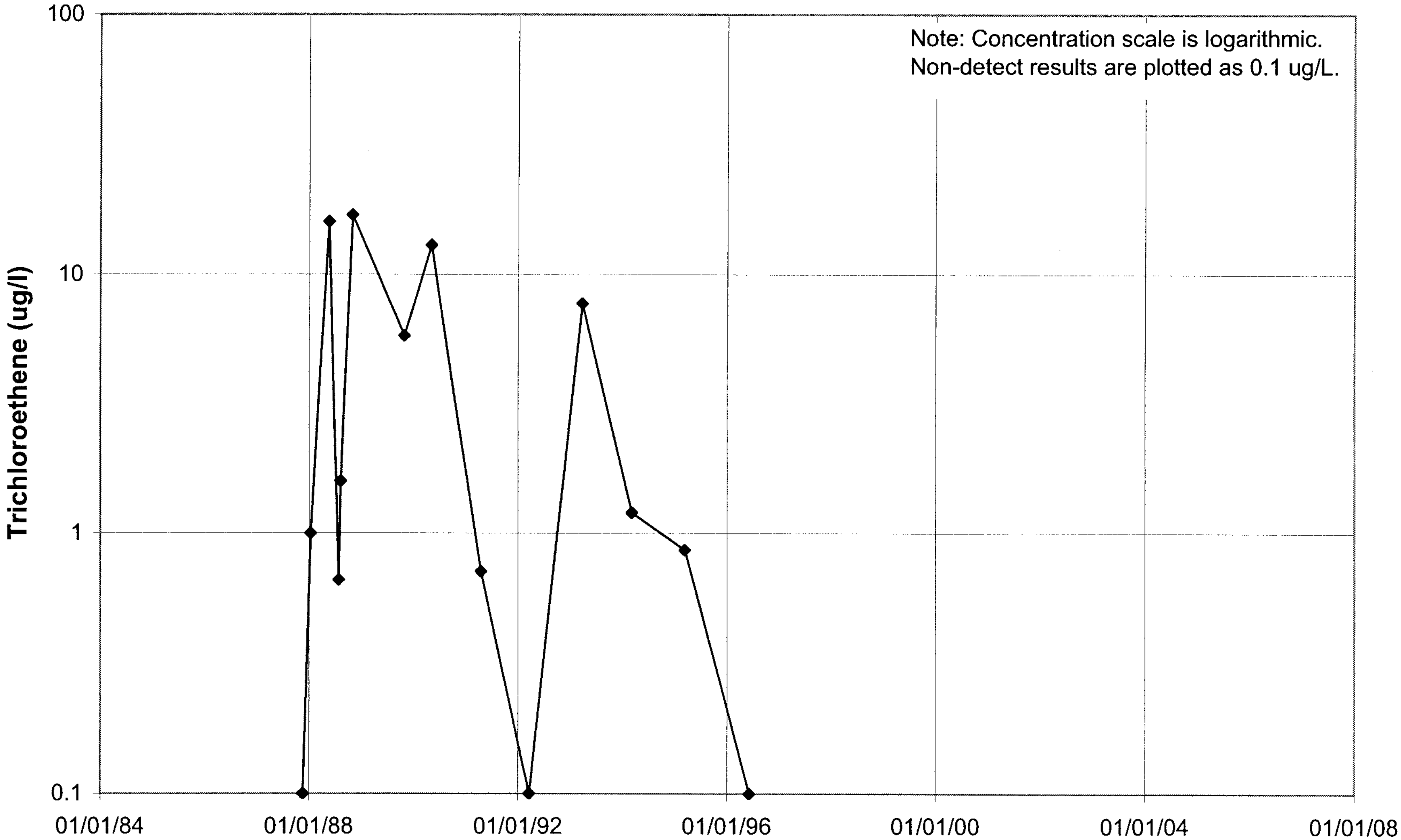

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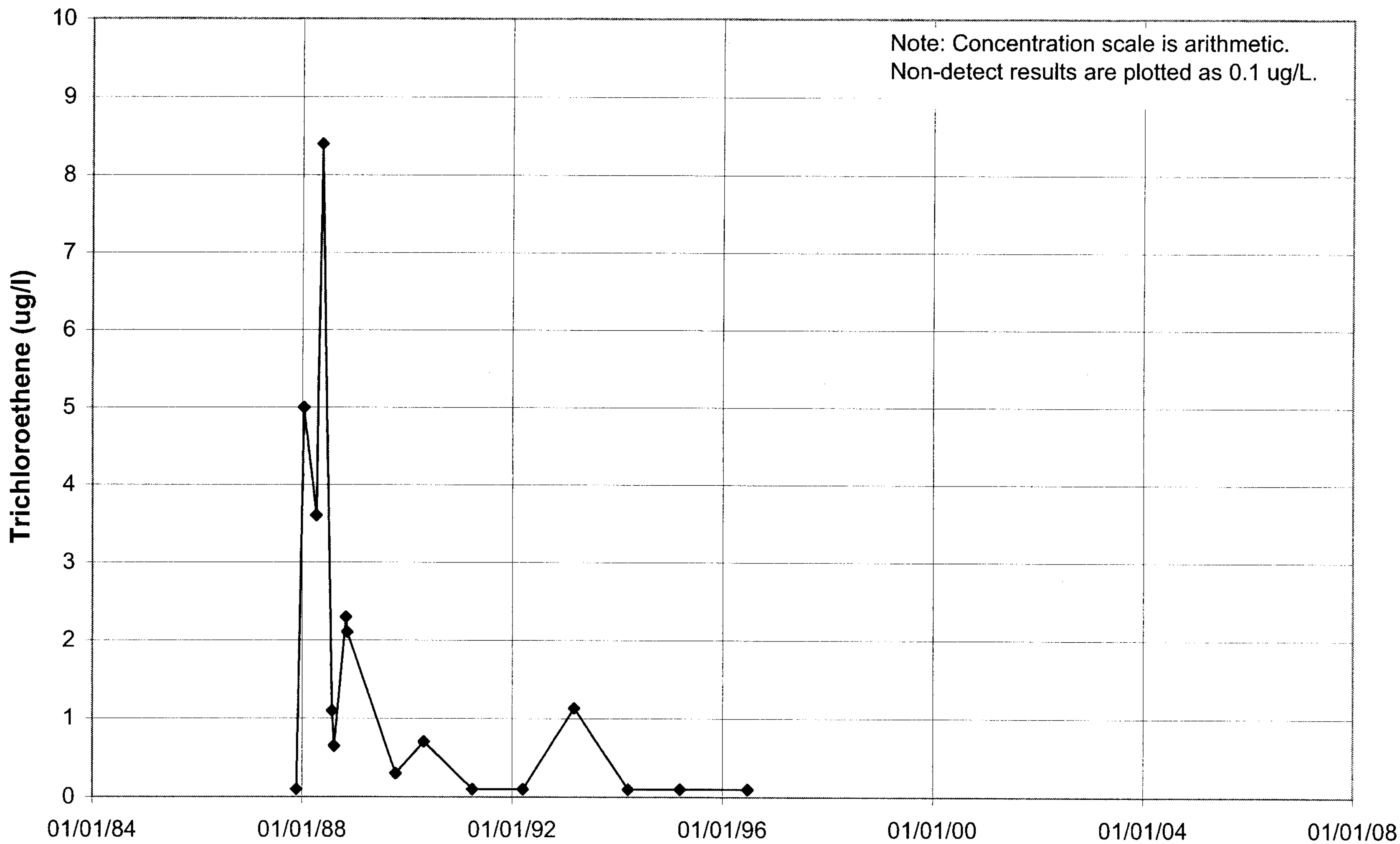

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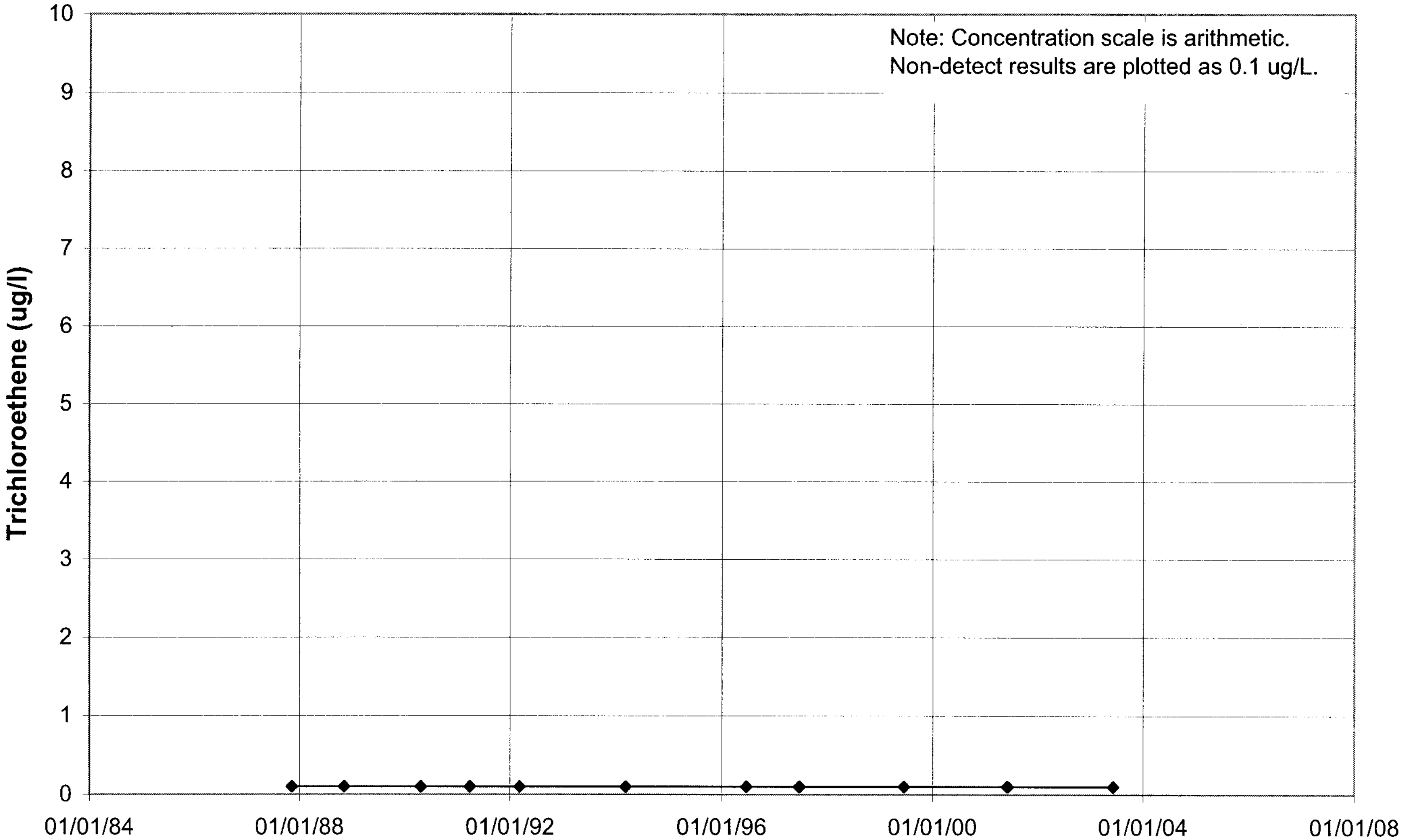

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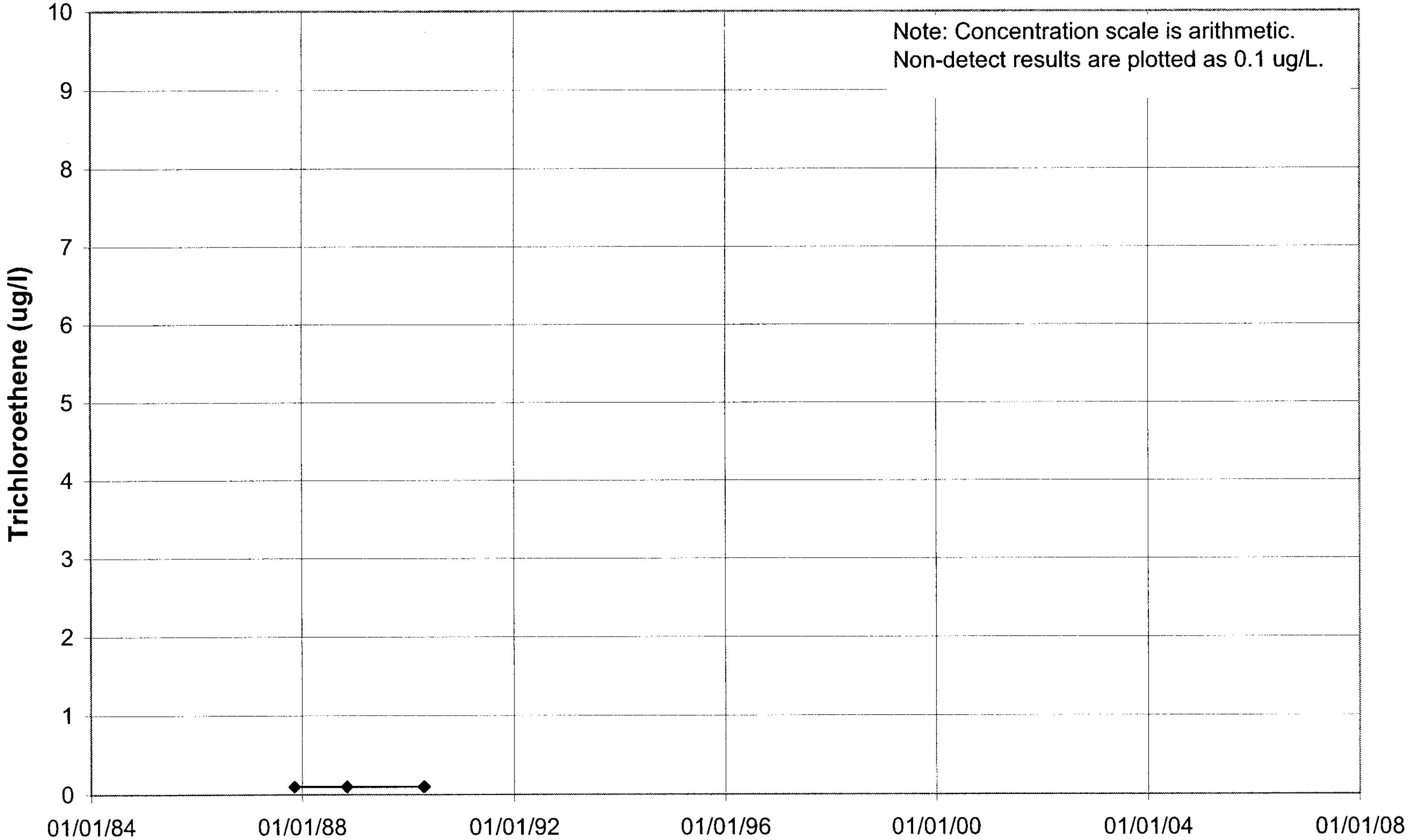

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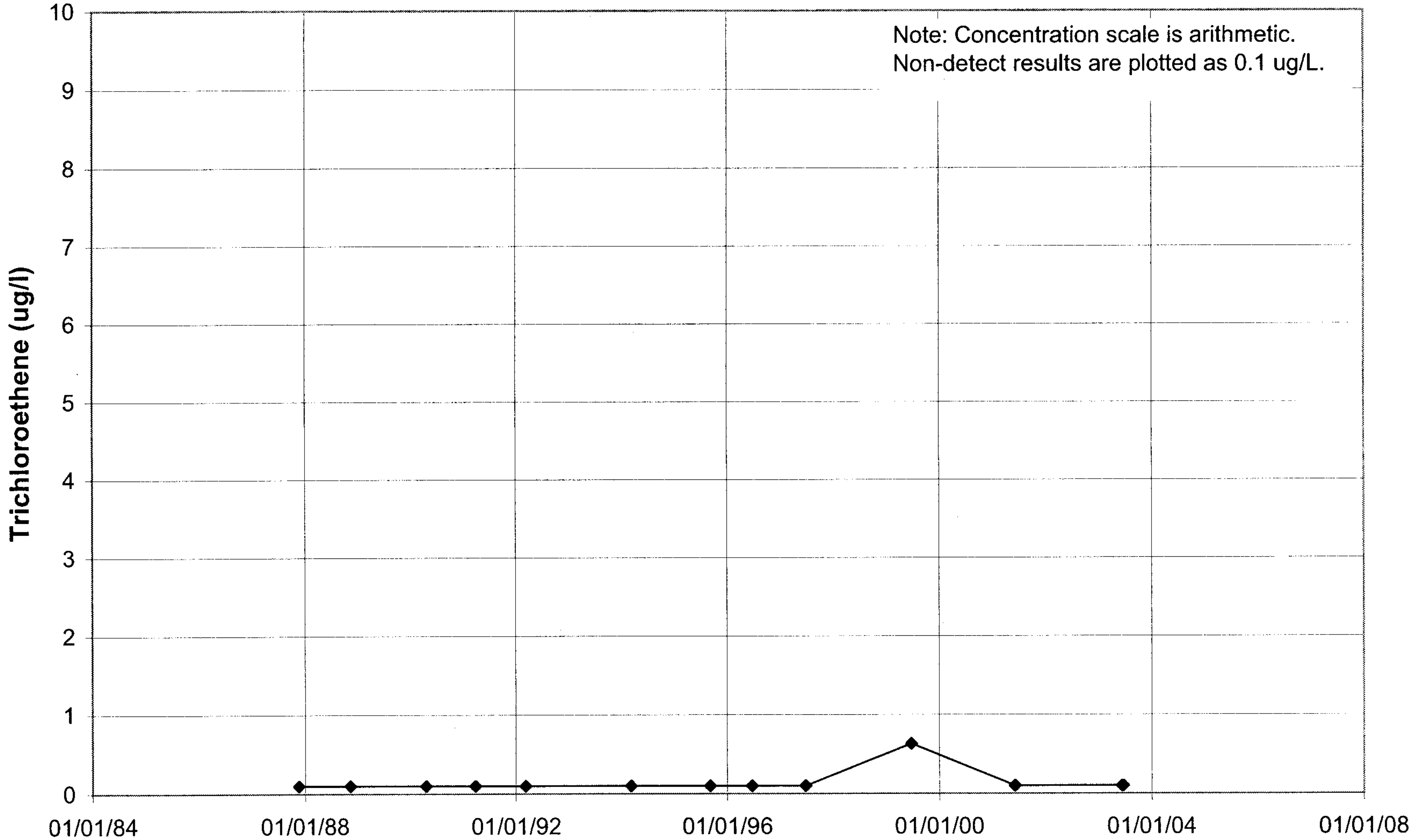

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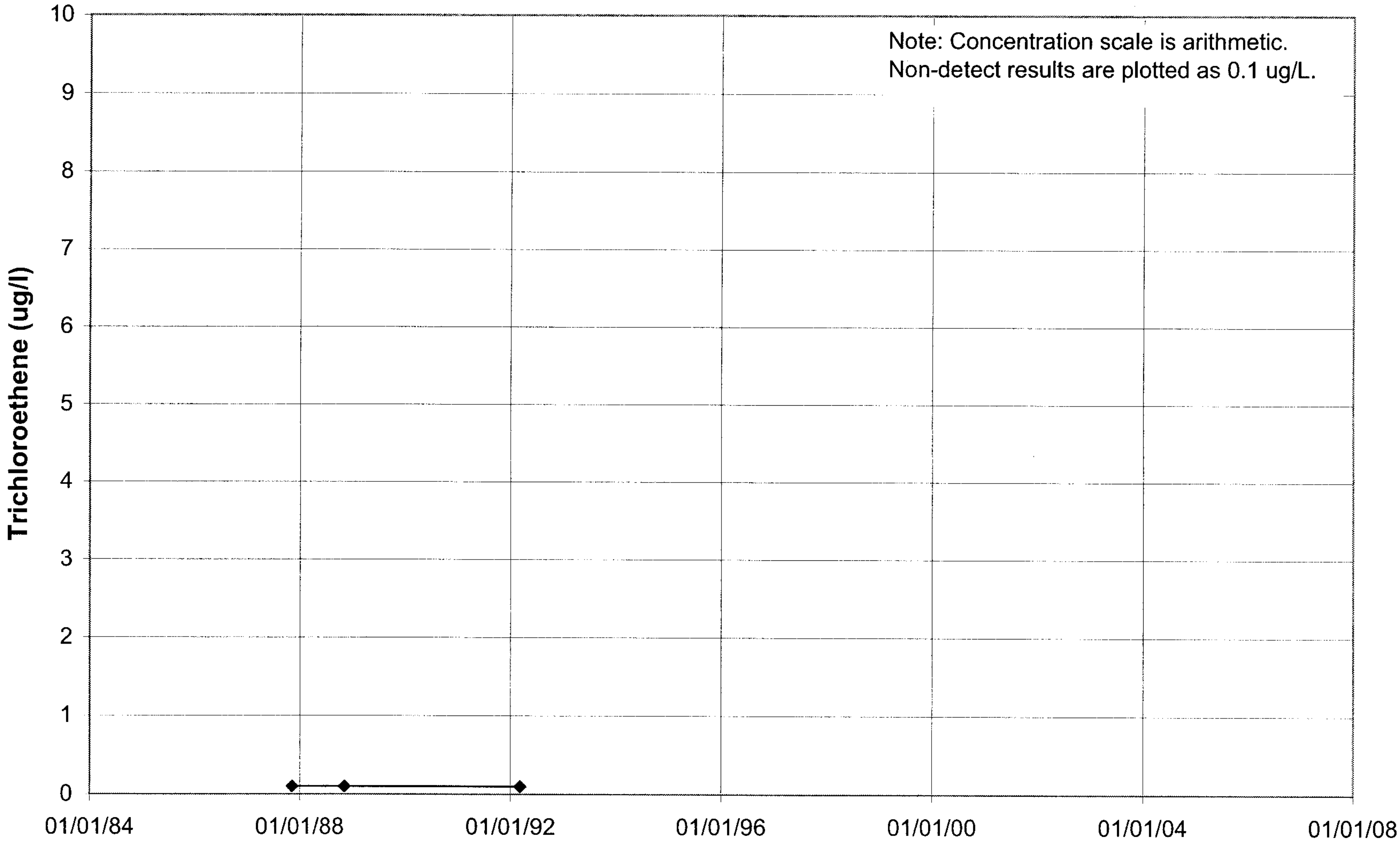

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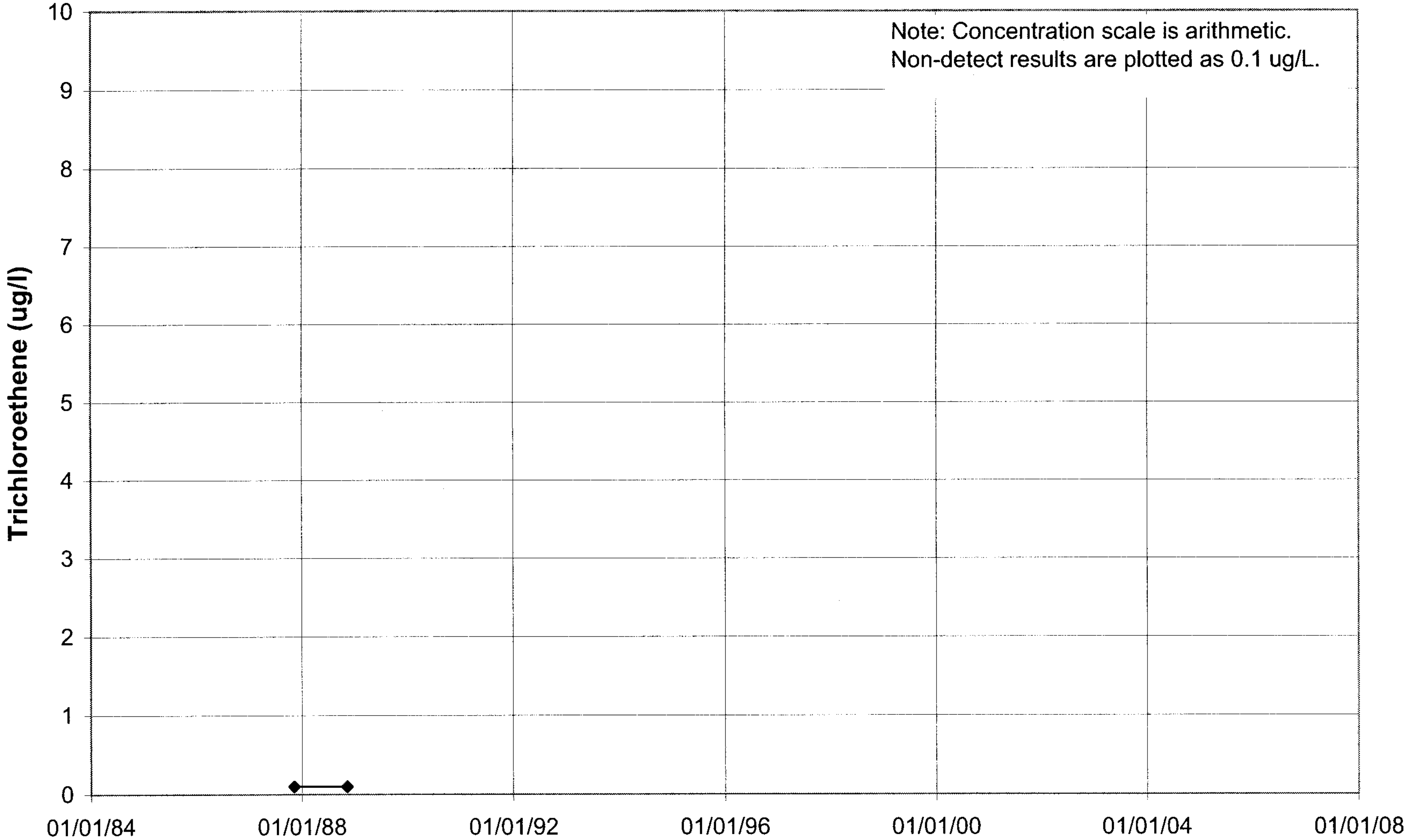

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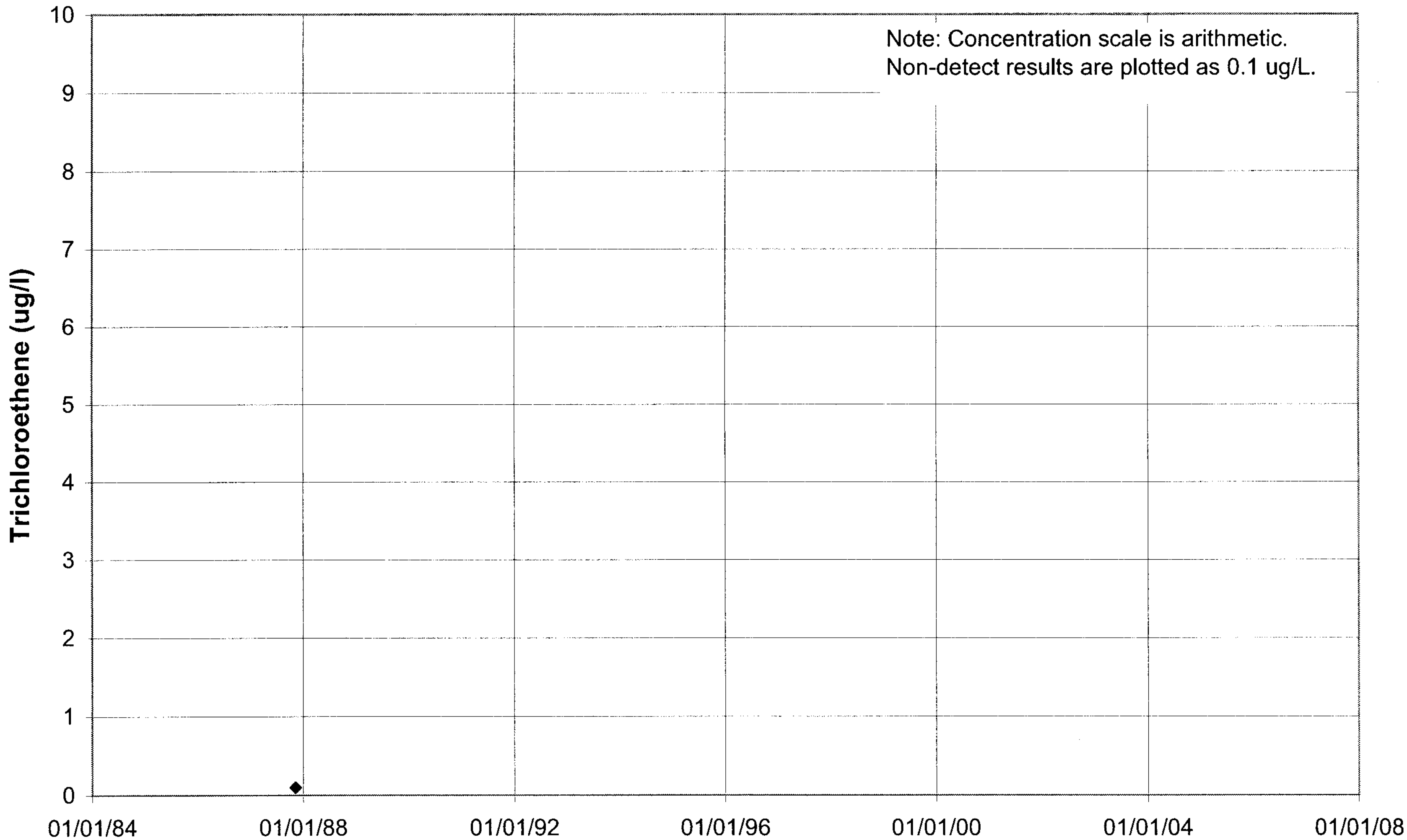

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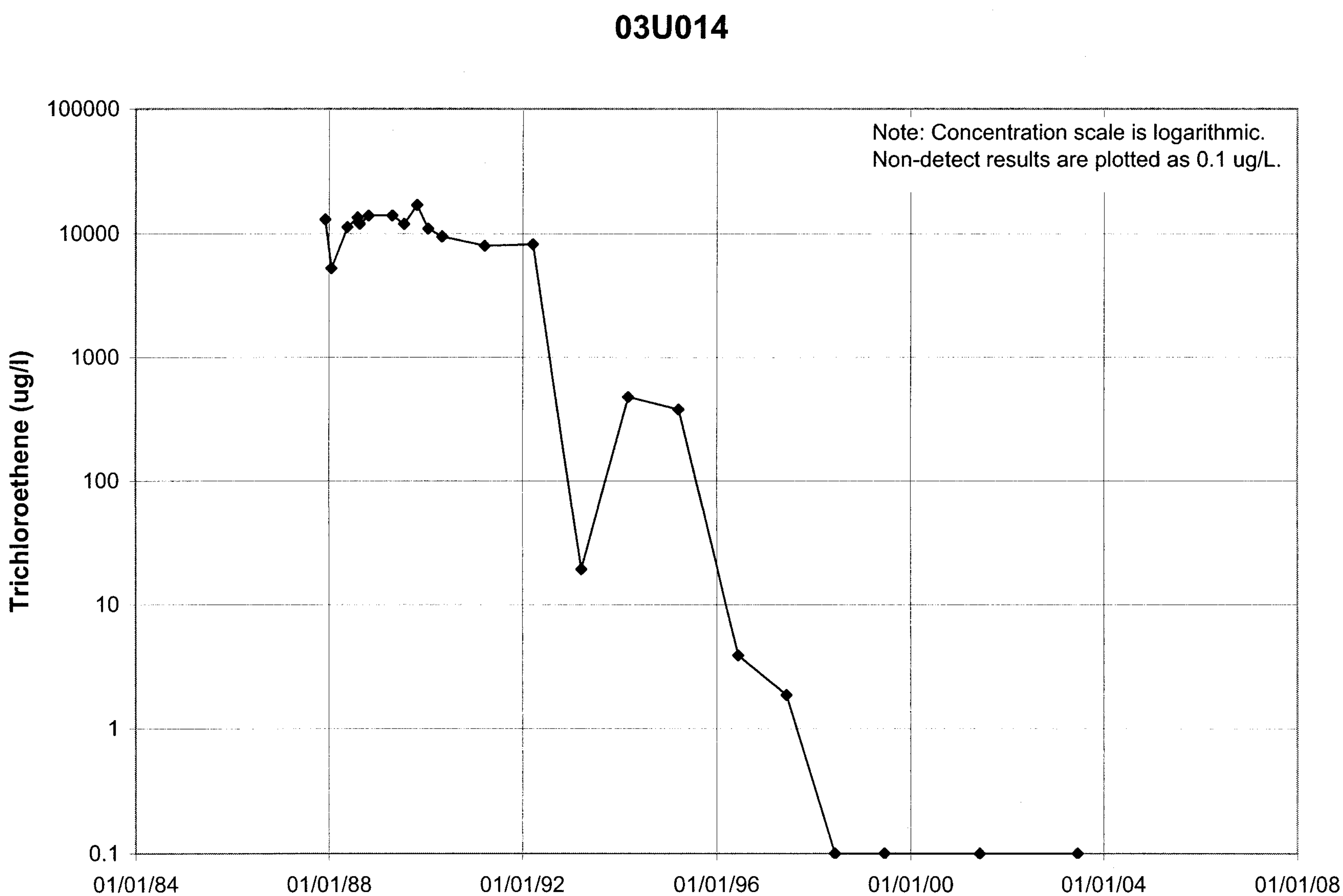

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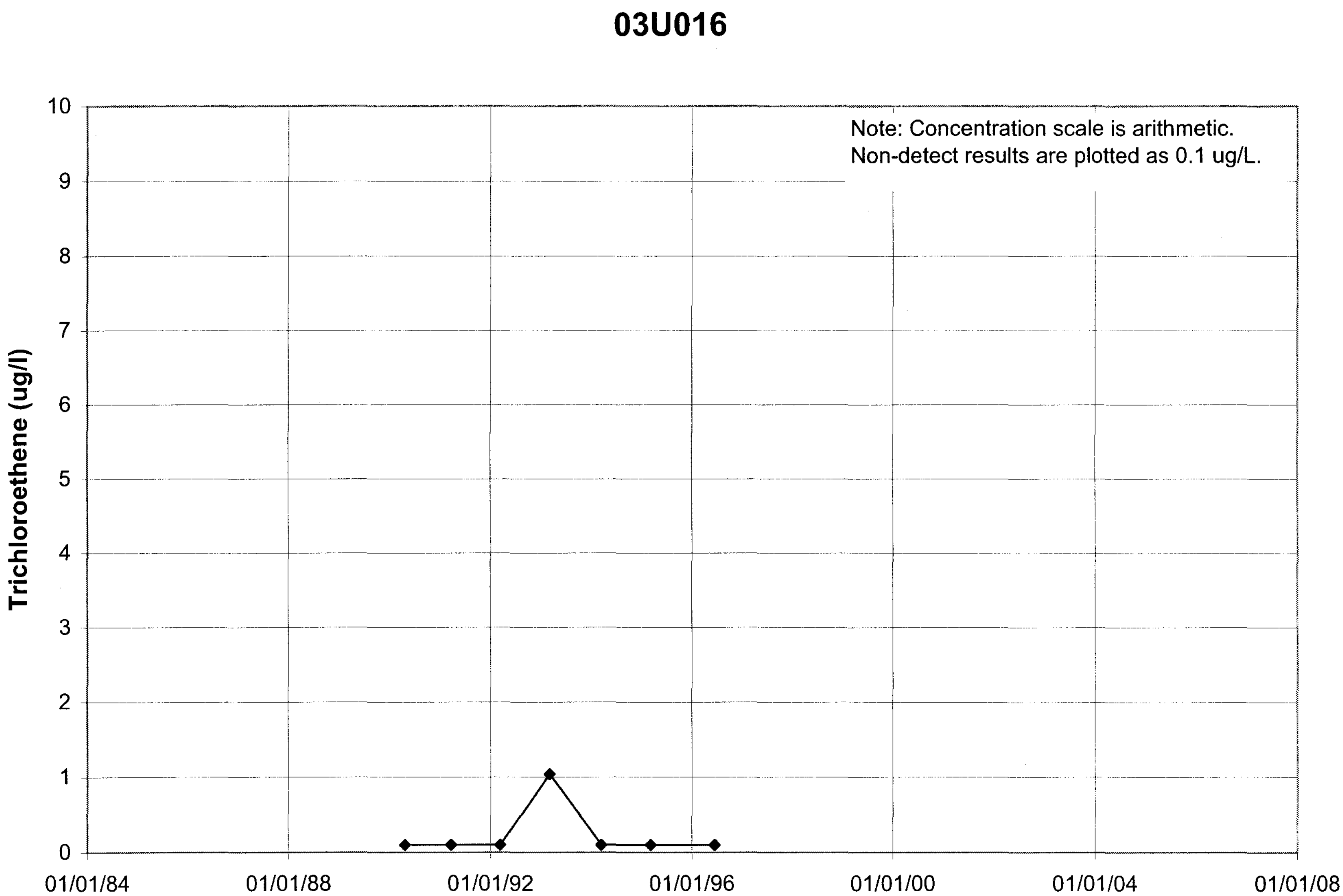

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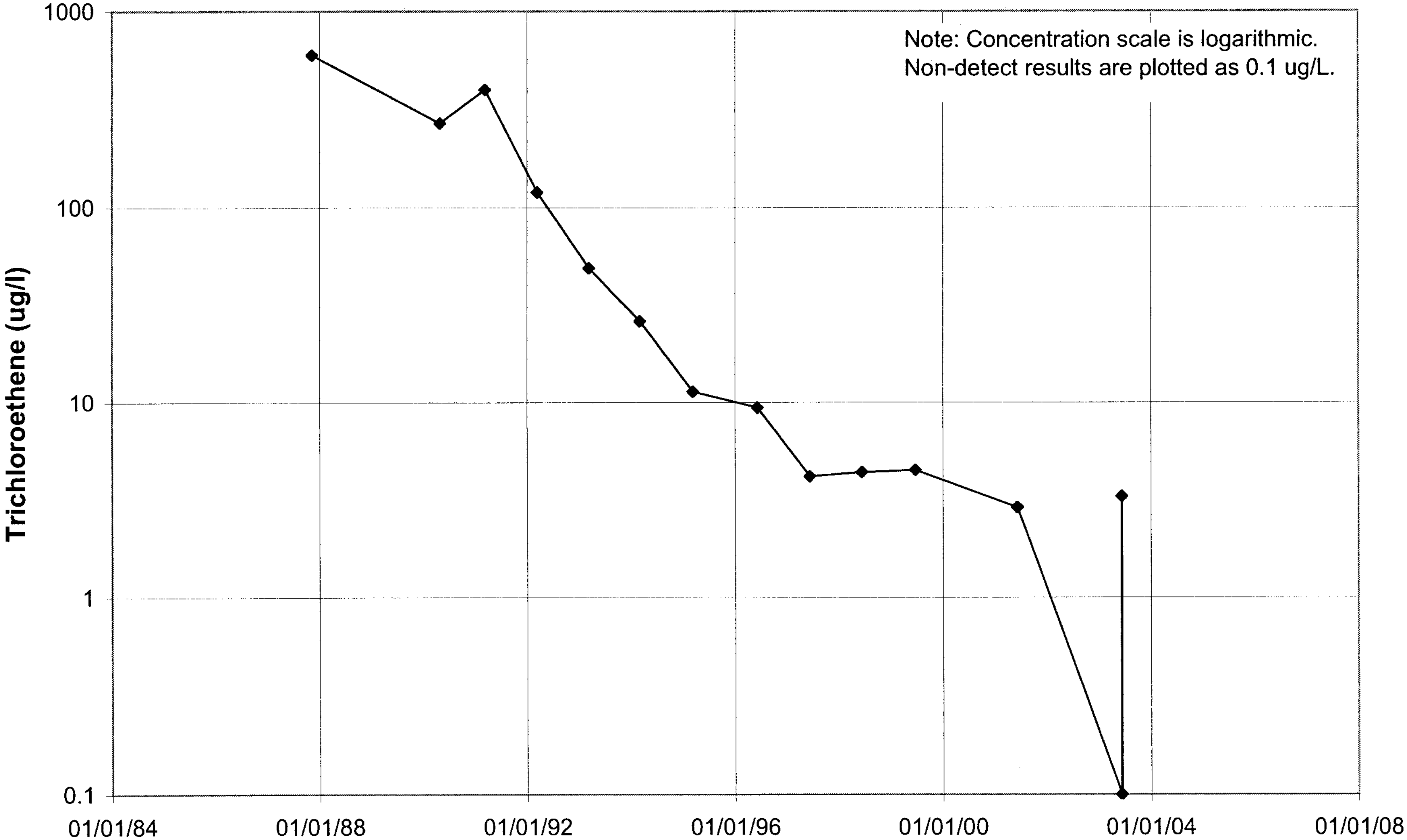

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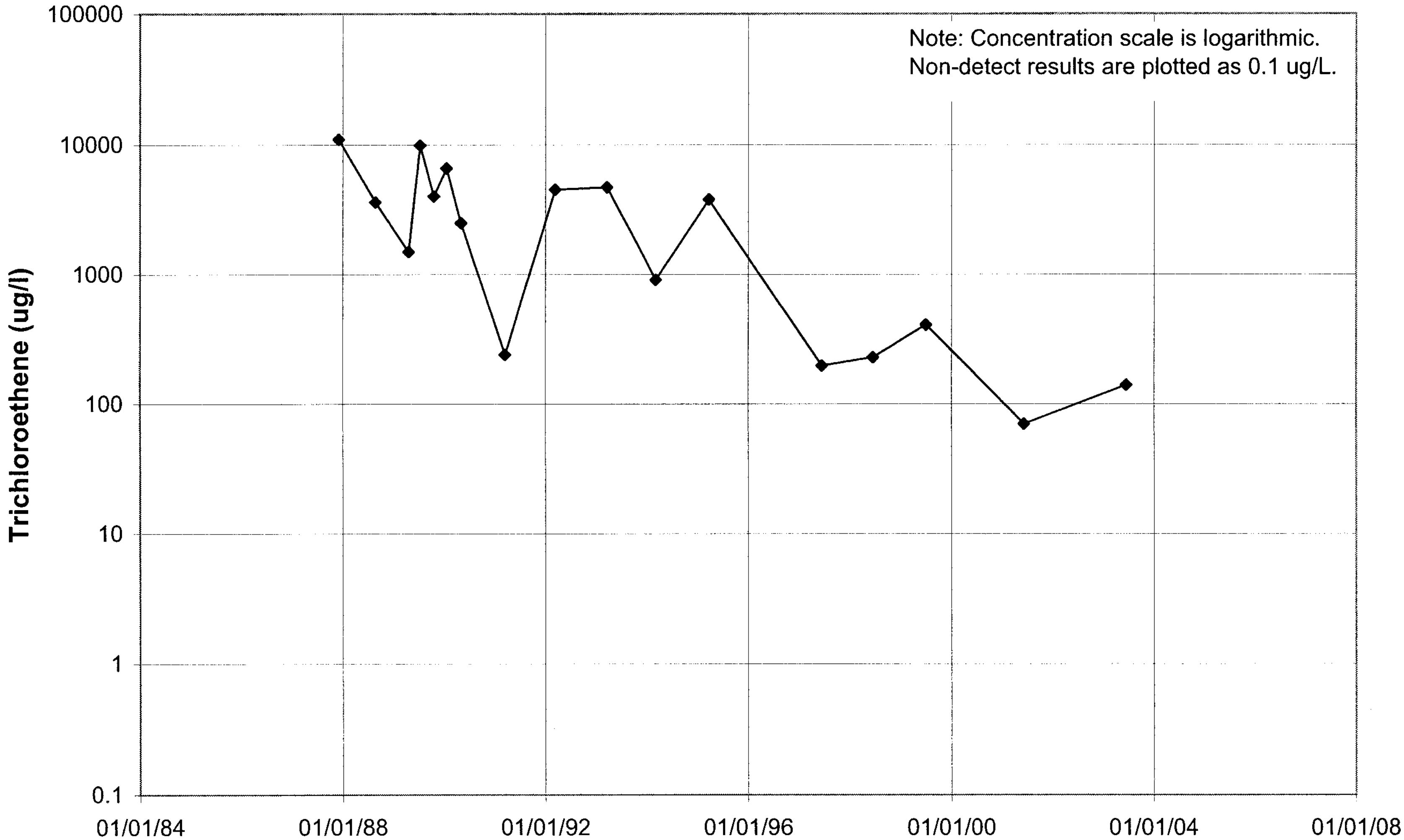

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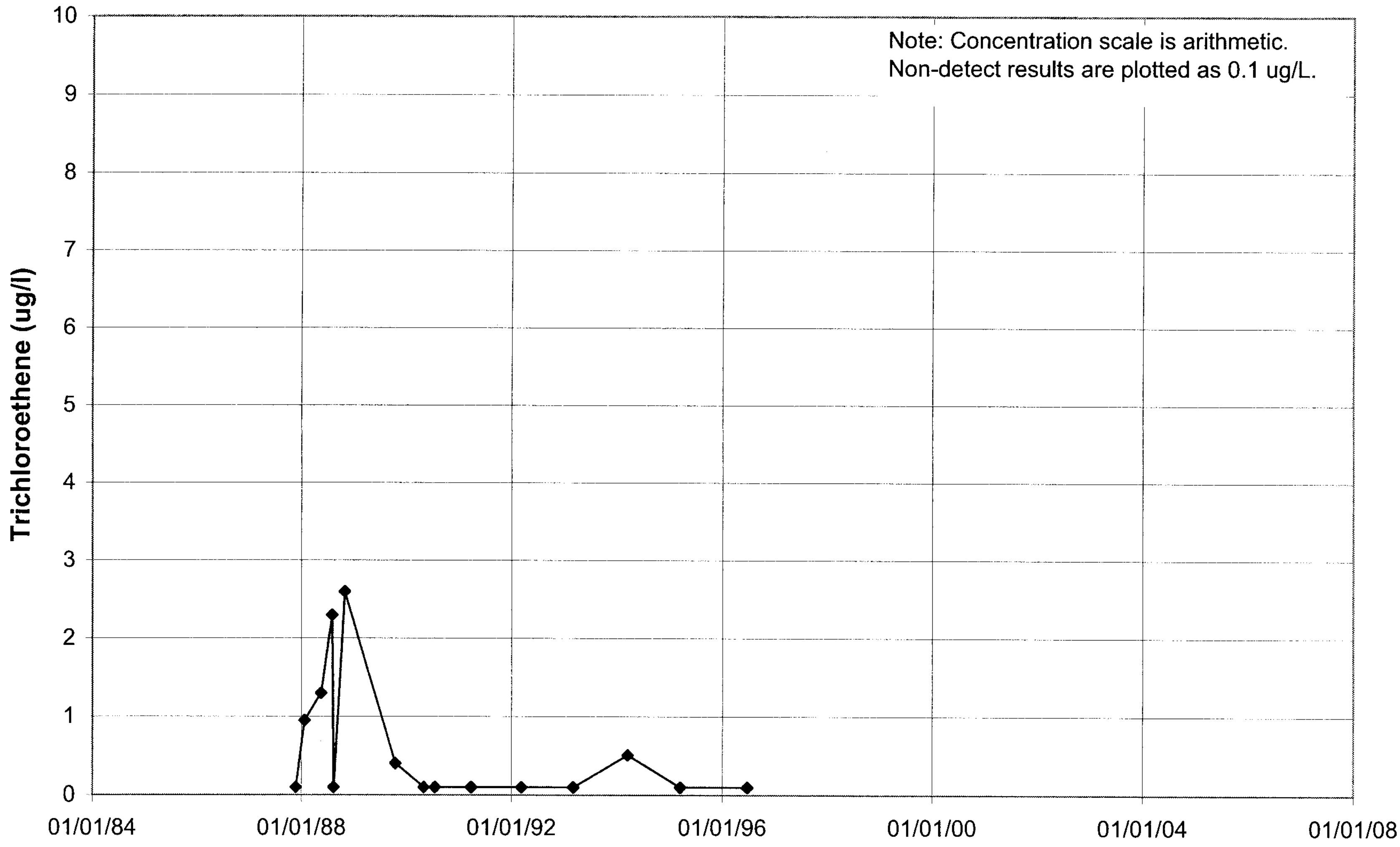

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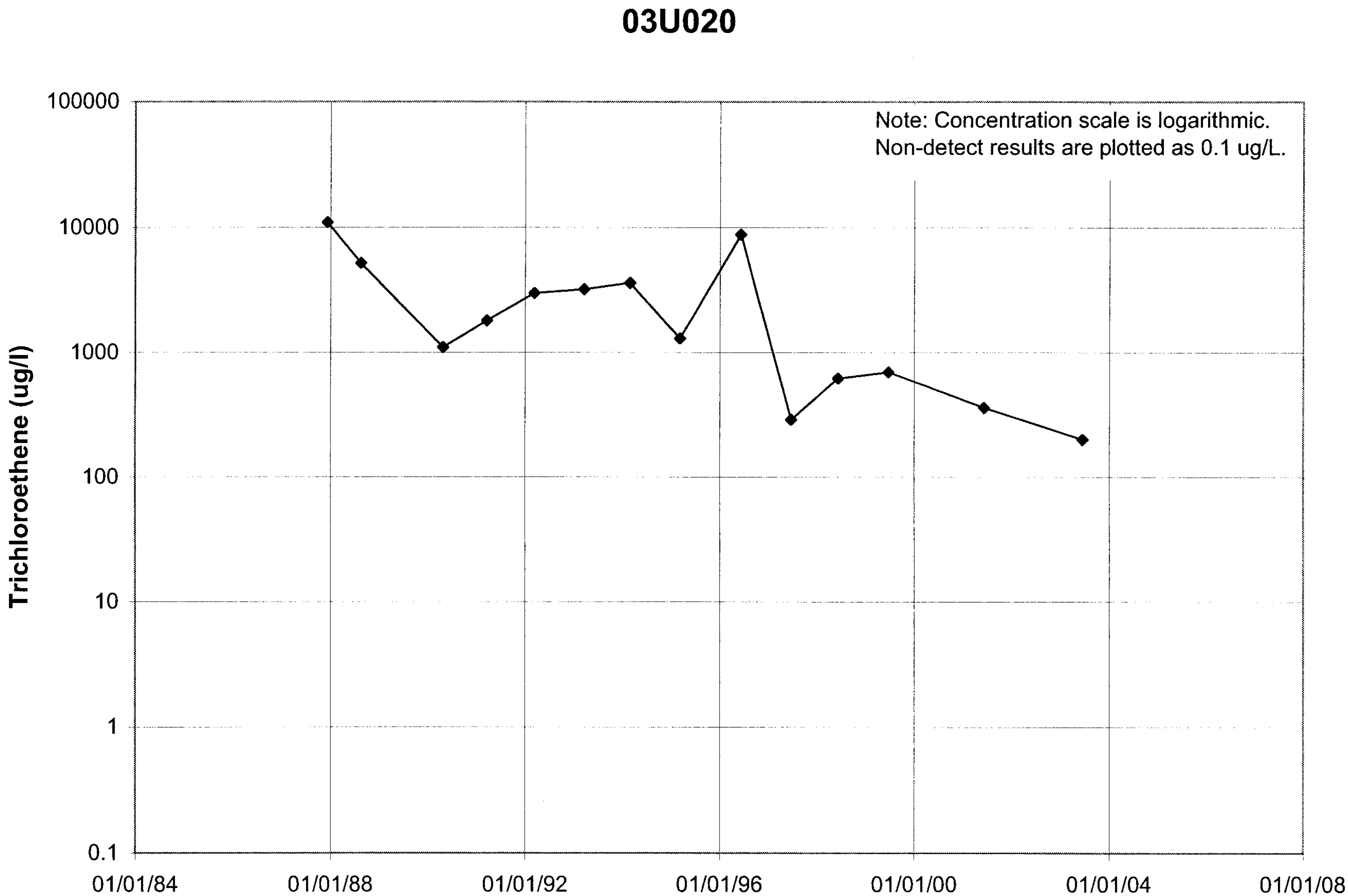

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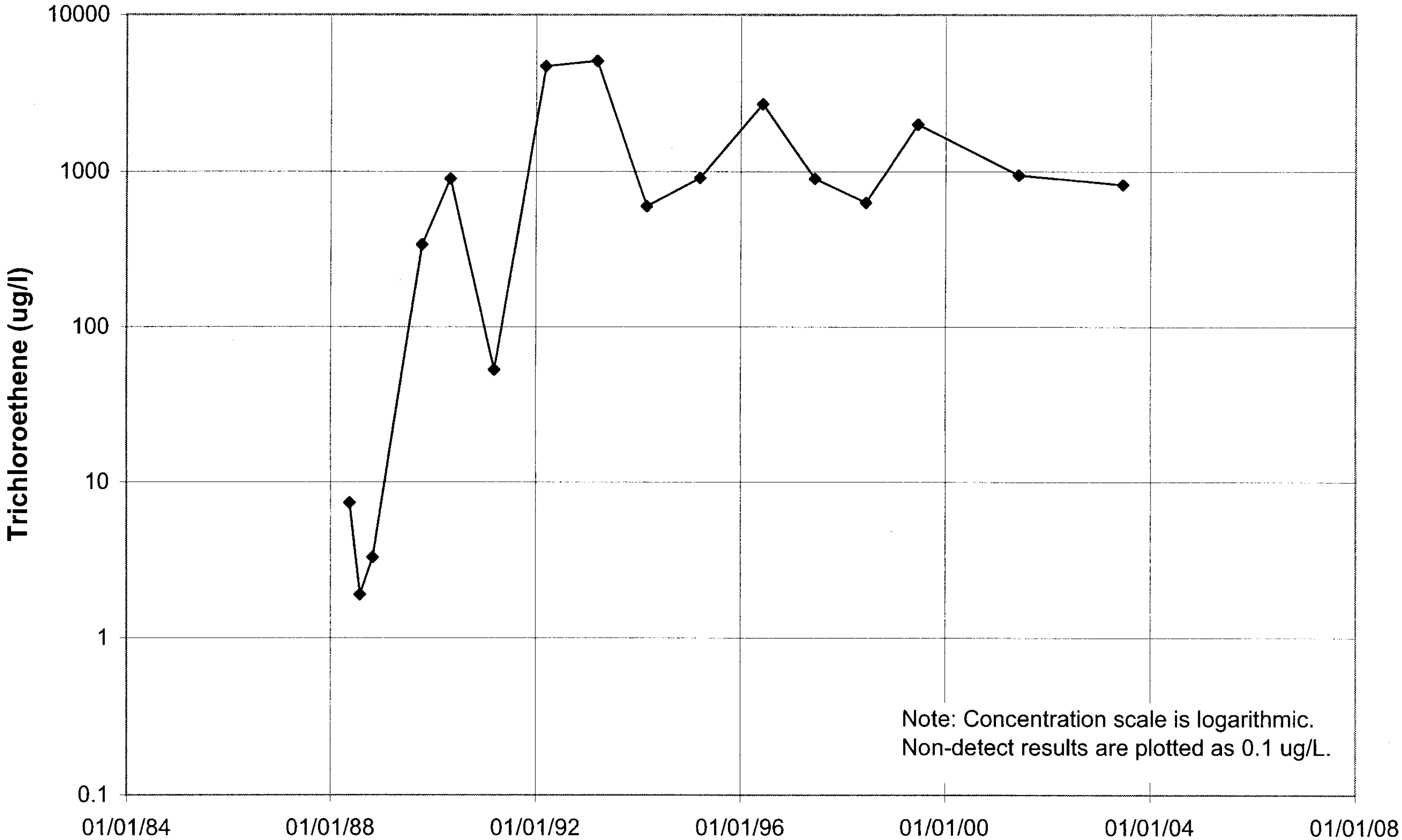
03U021



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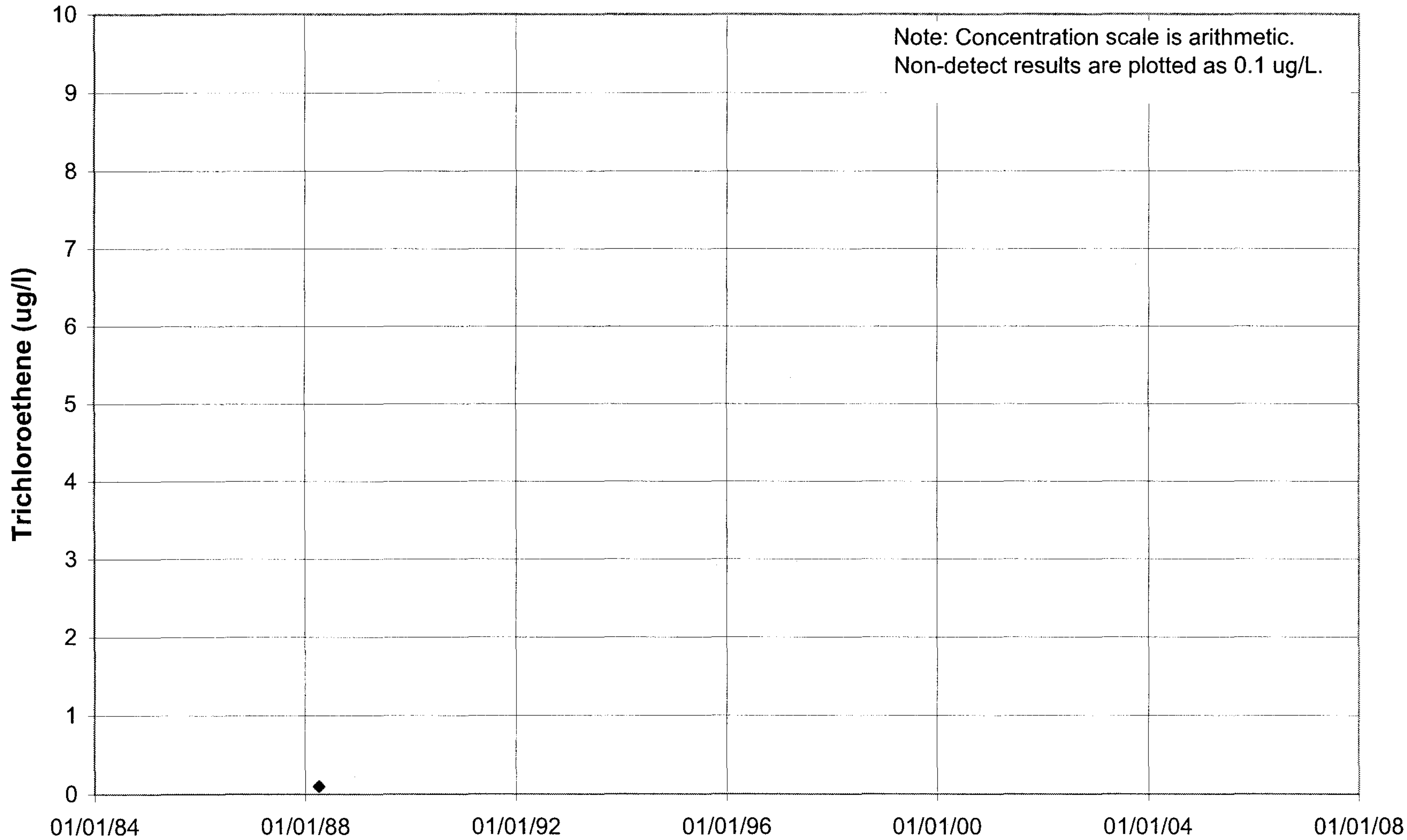
03U022



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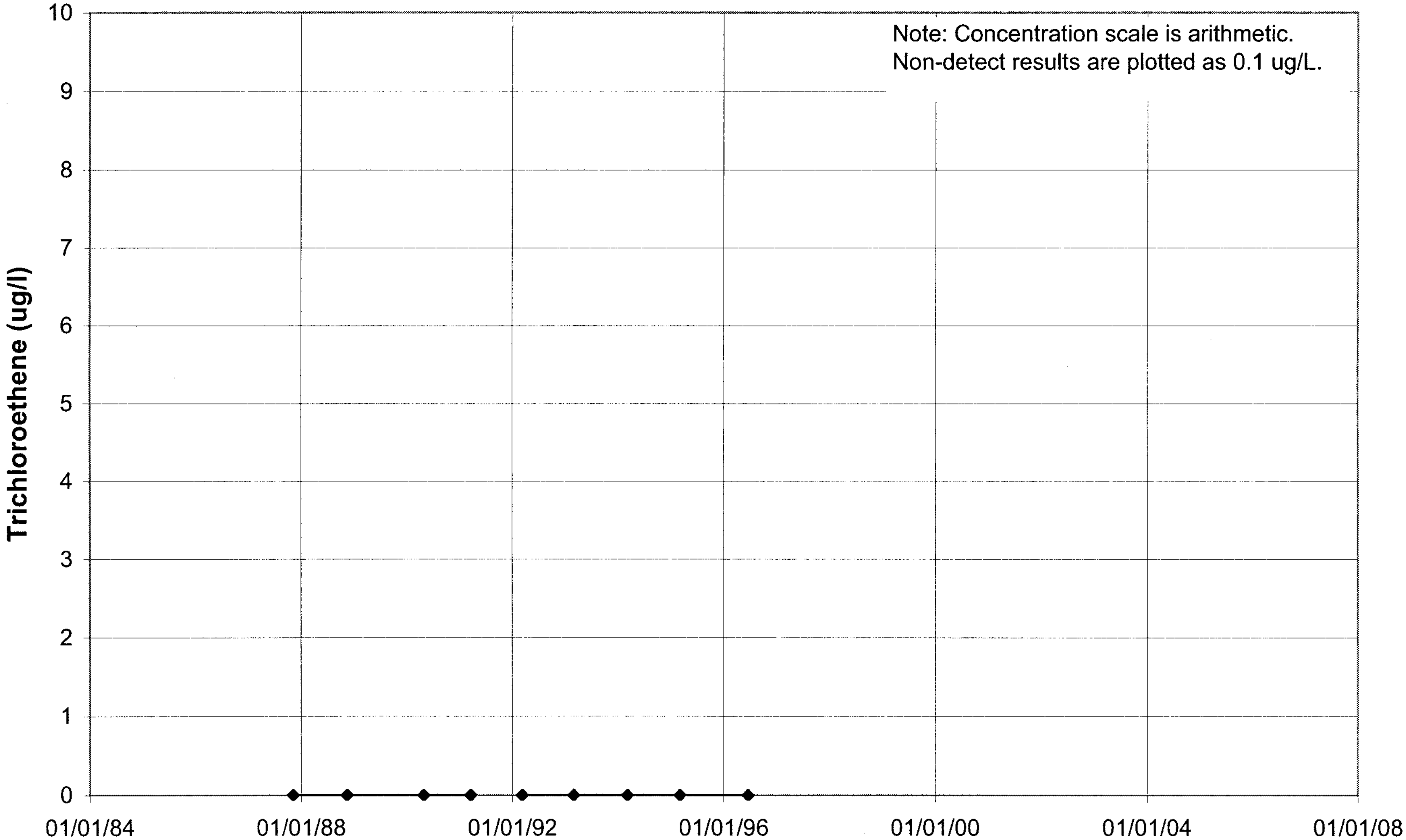
03U023



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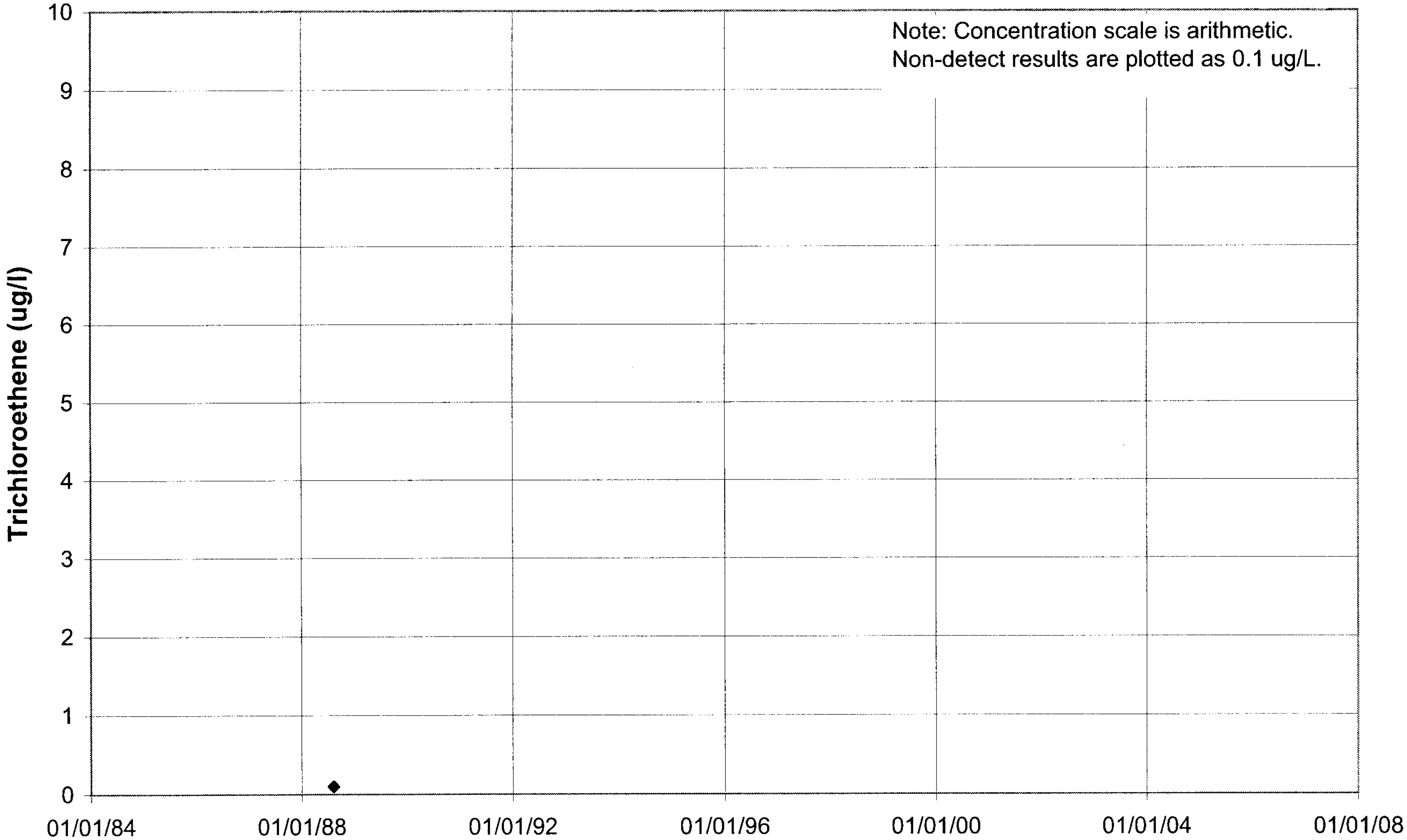

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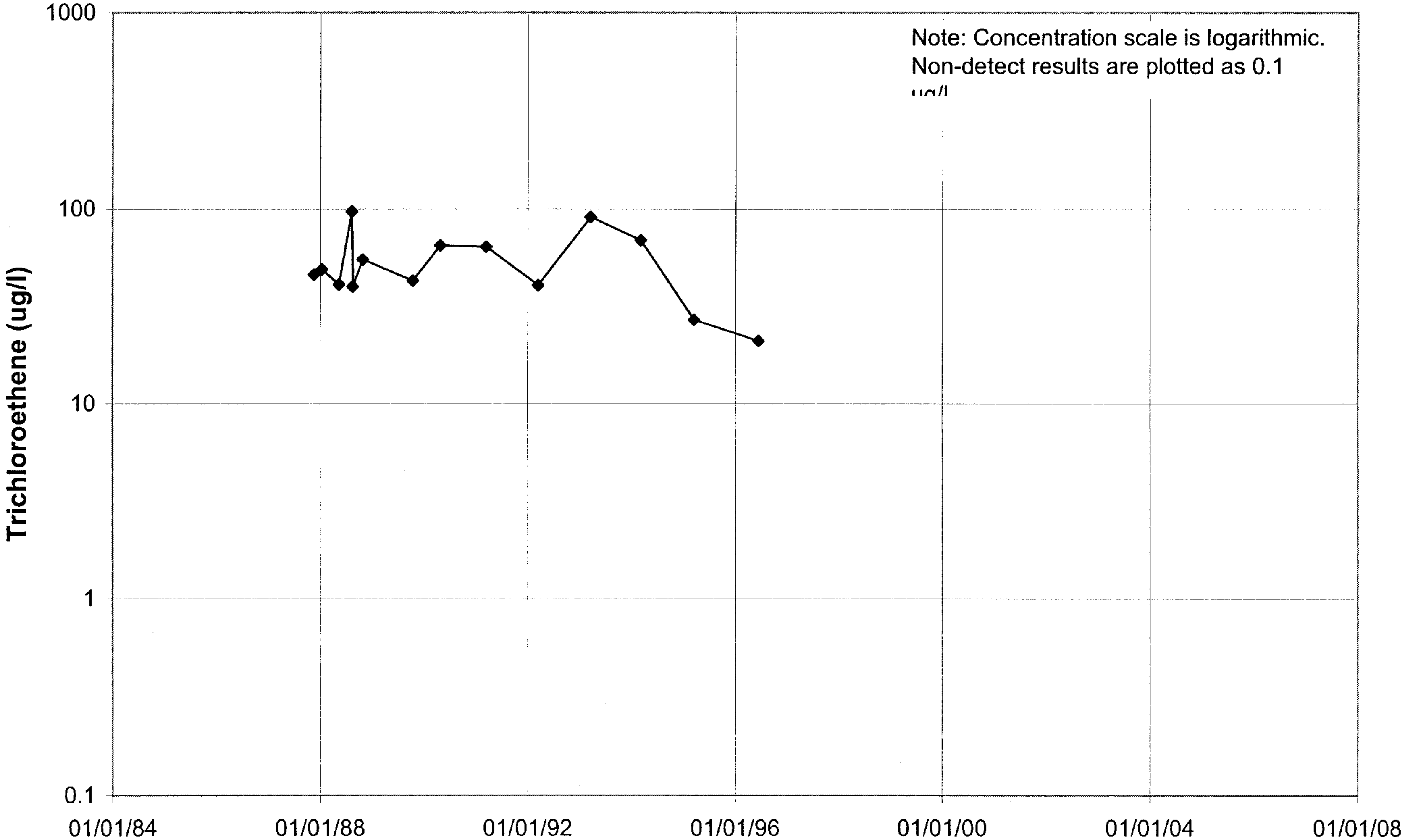

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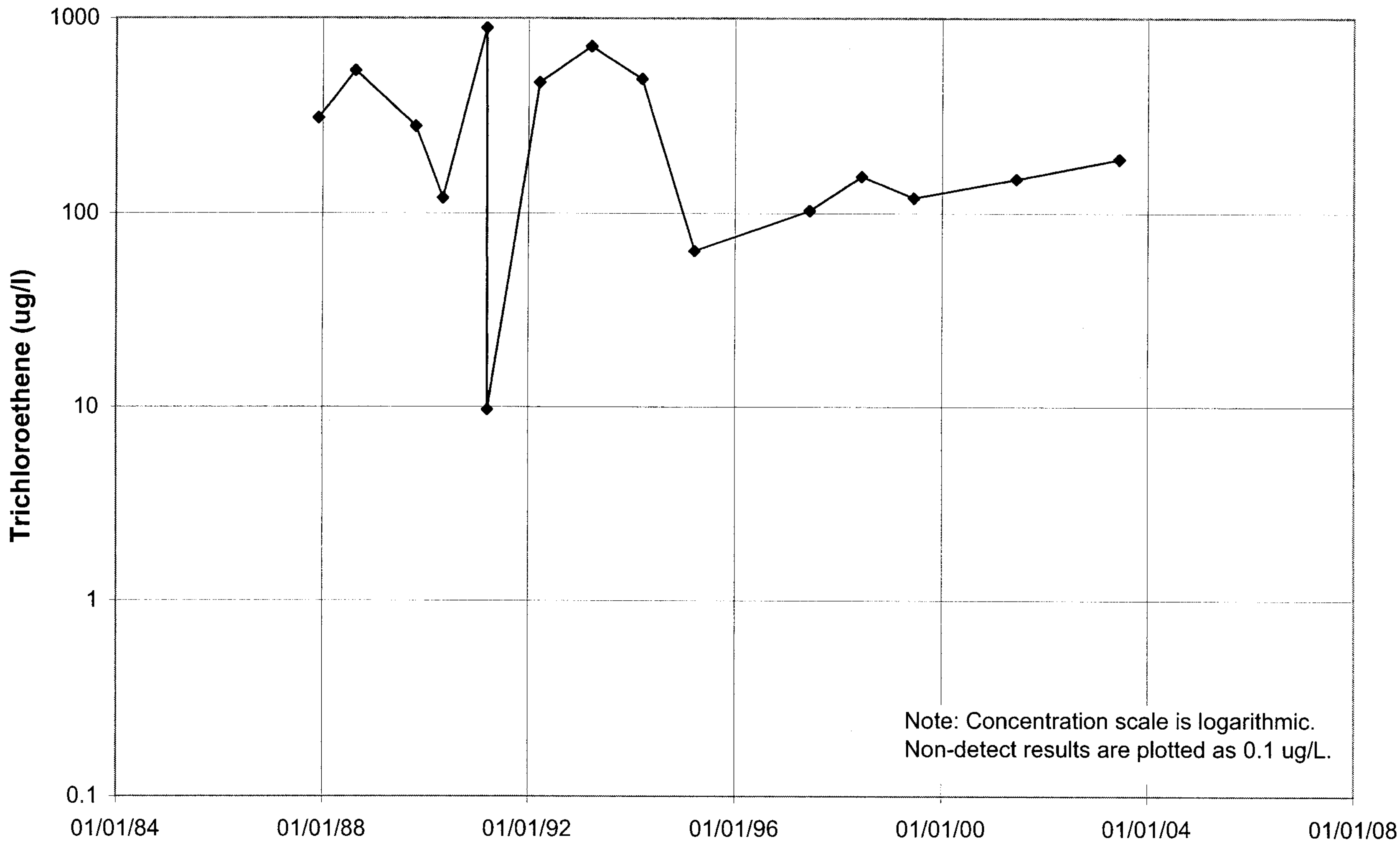

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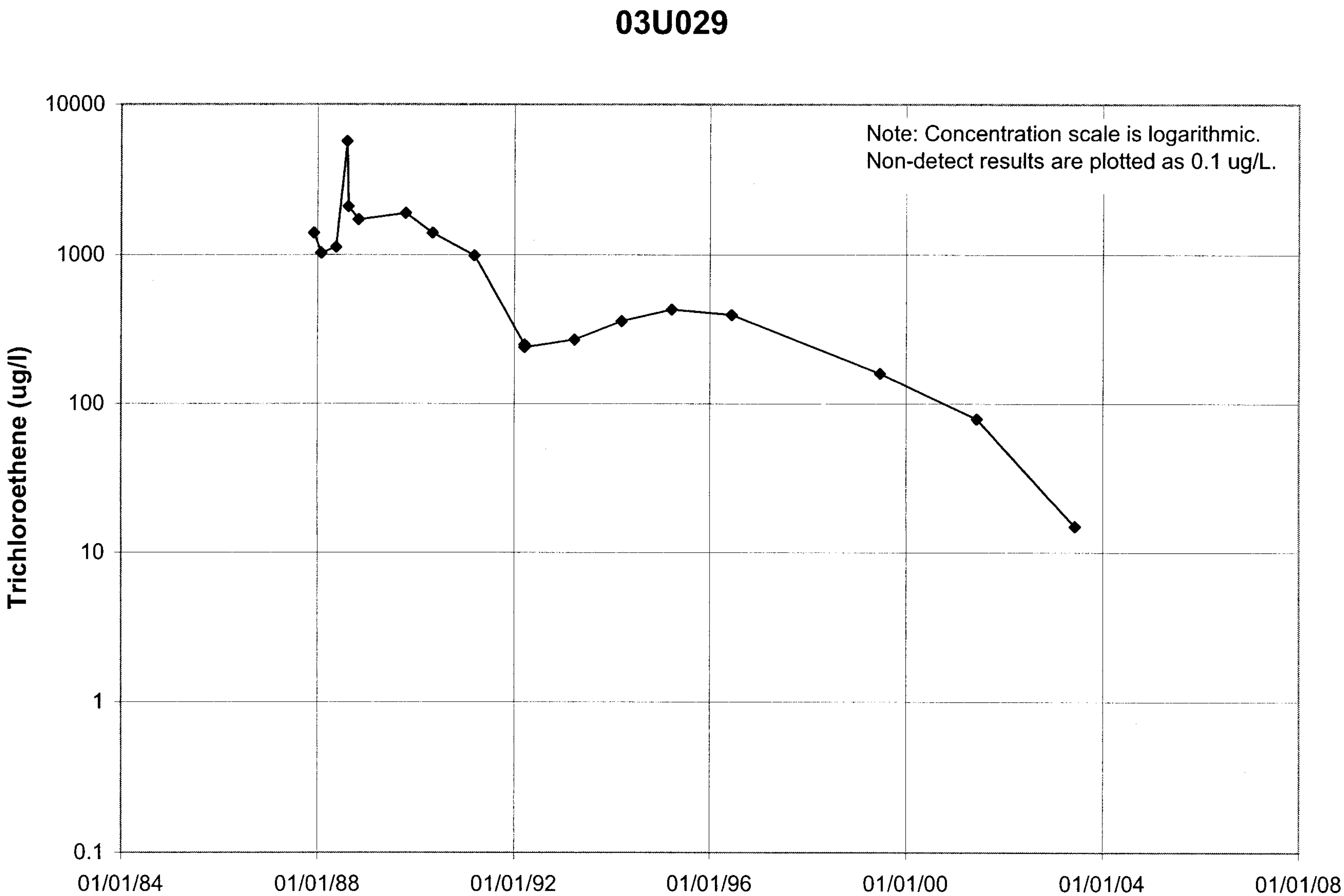

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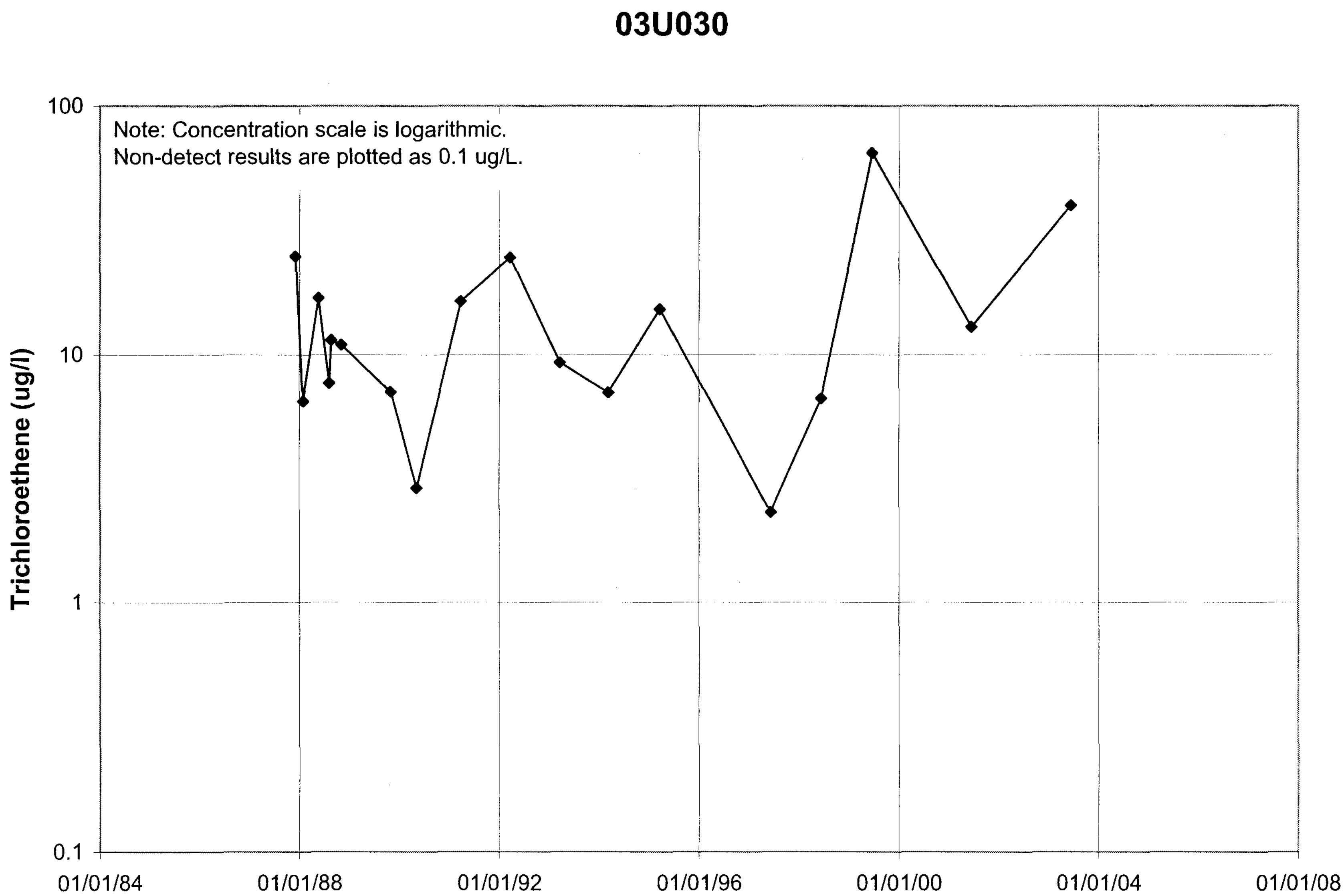

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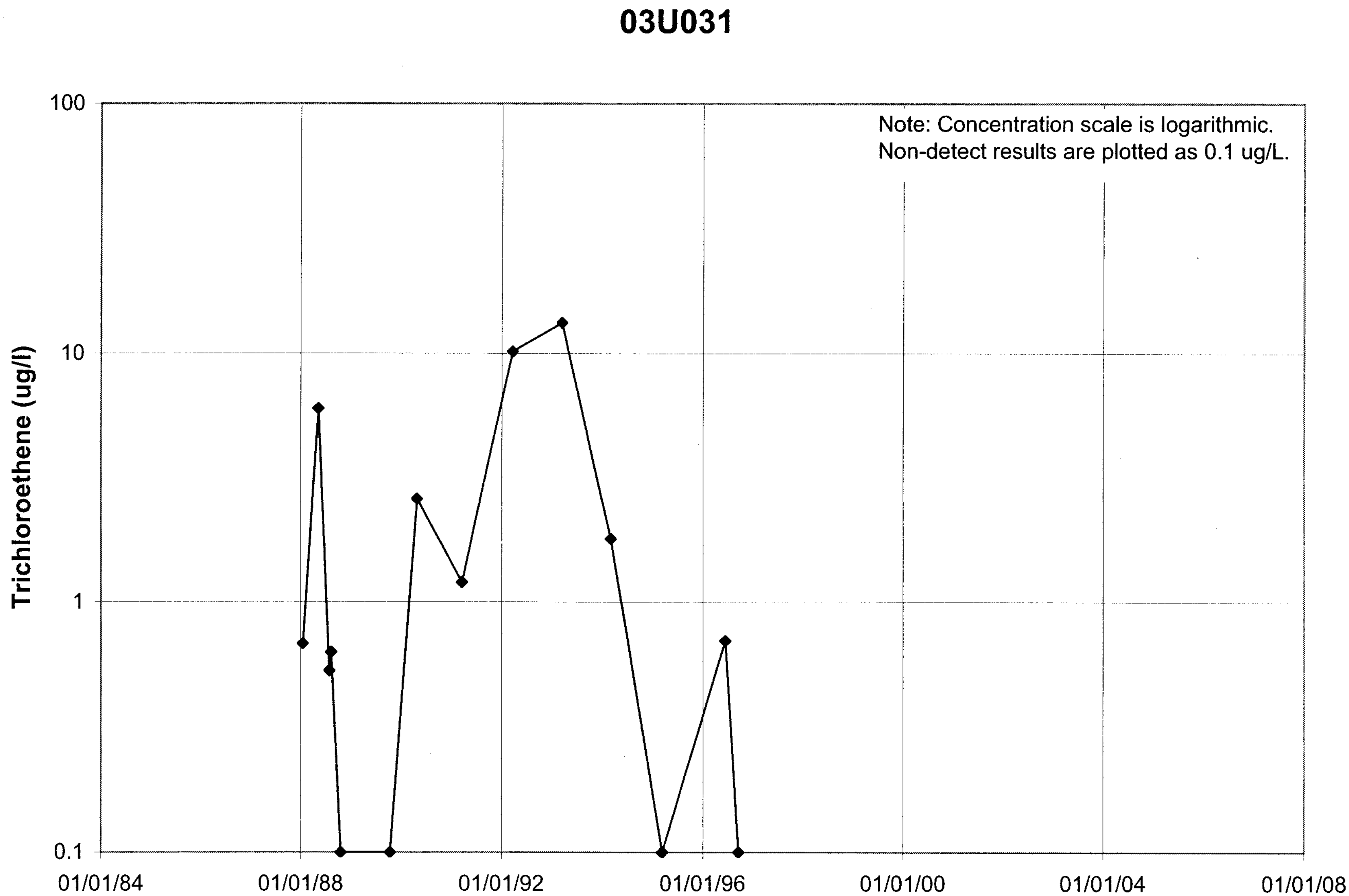

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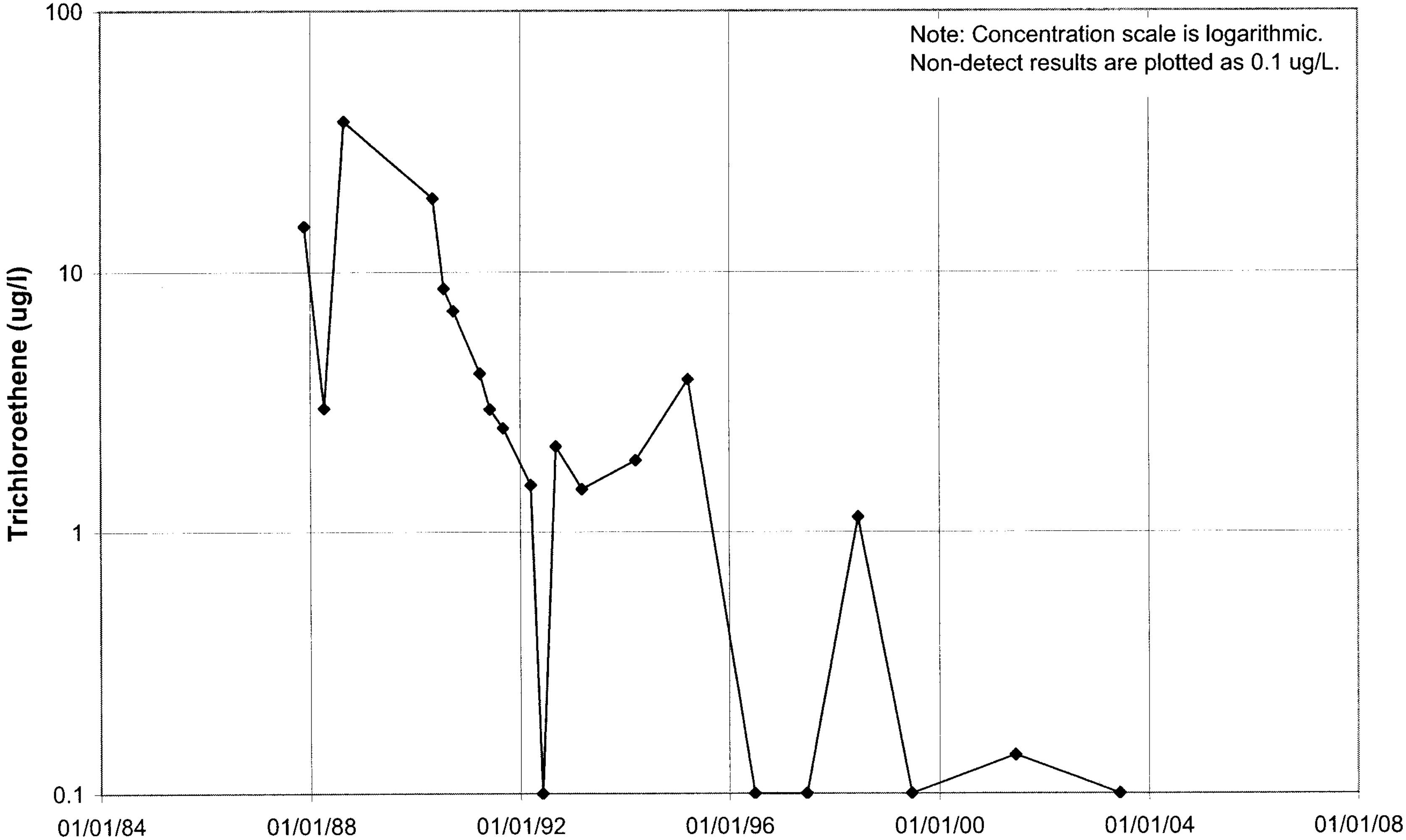

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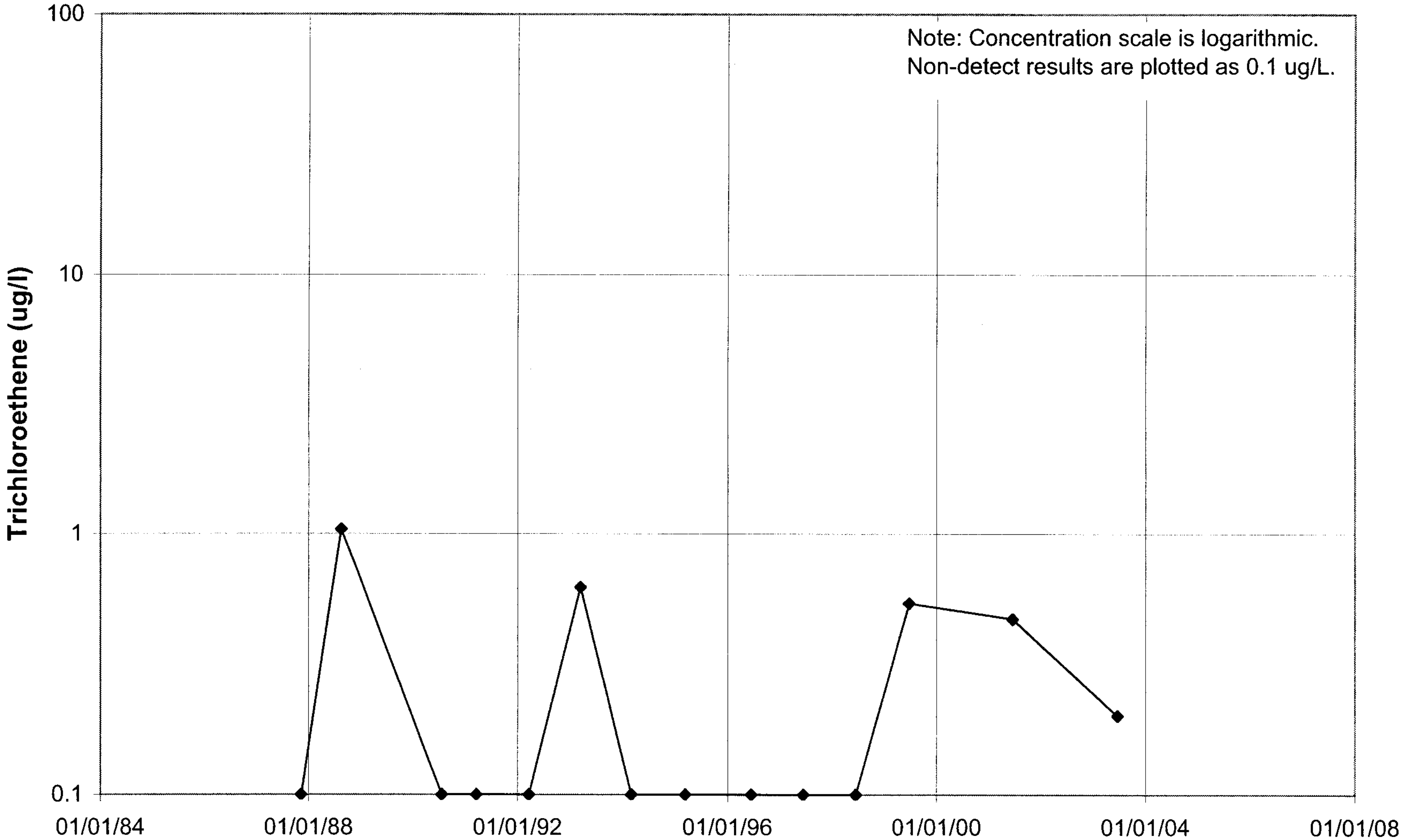

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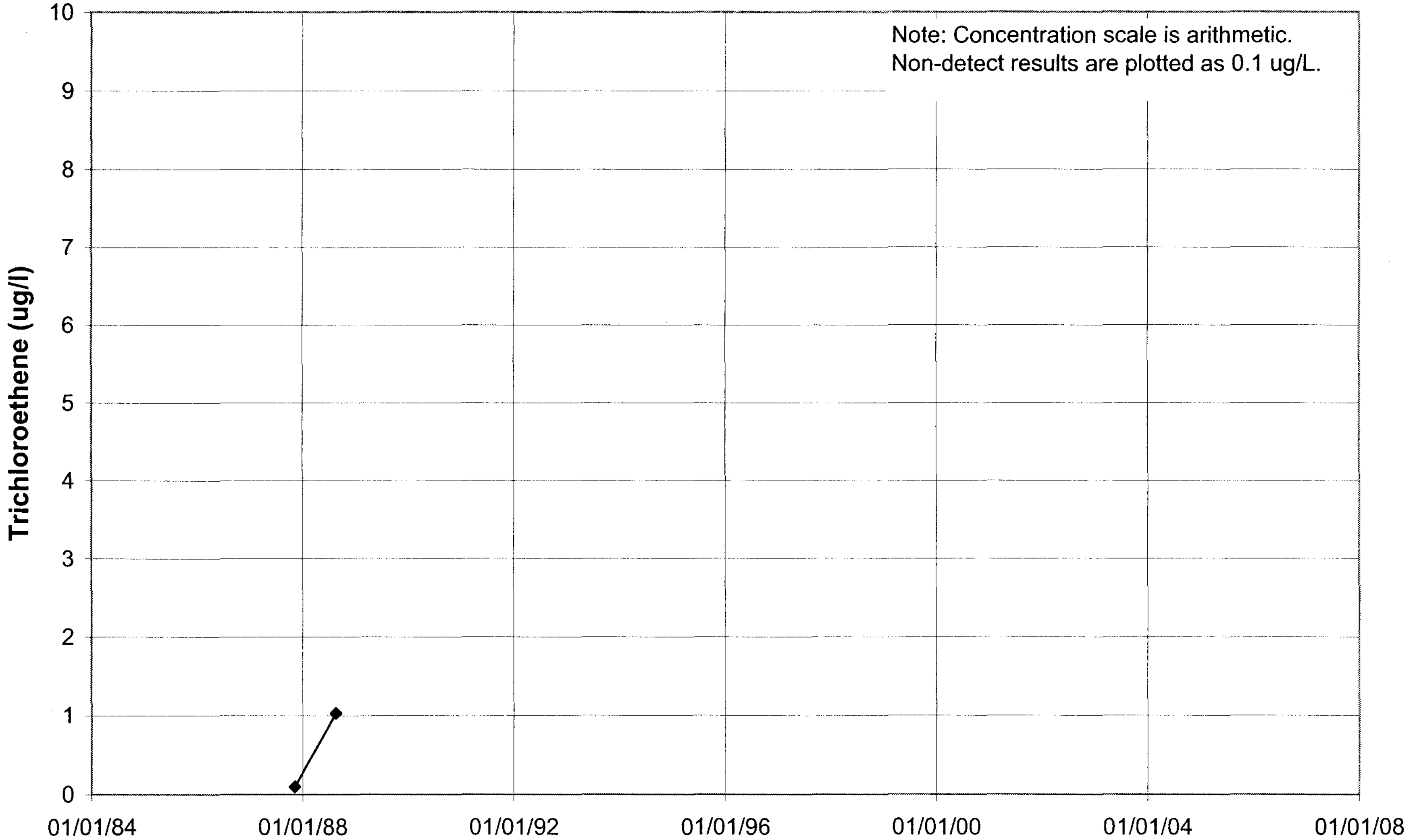

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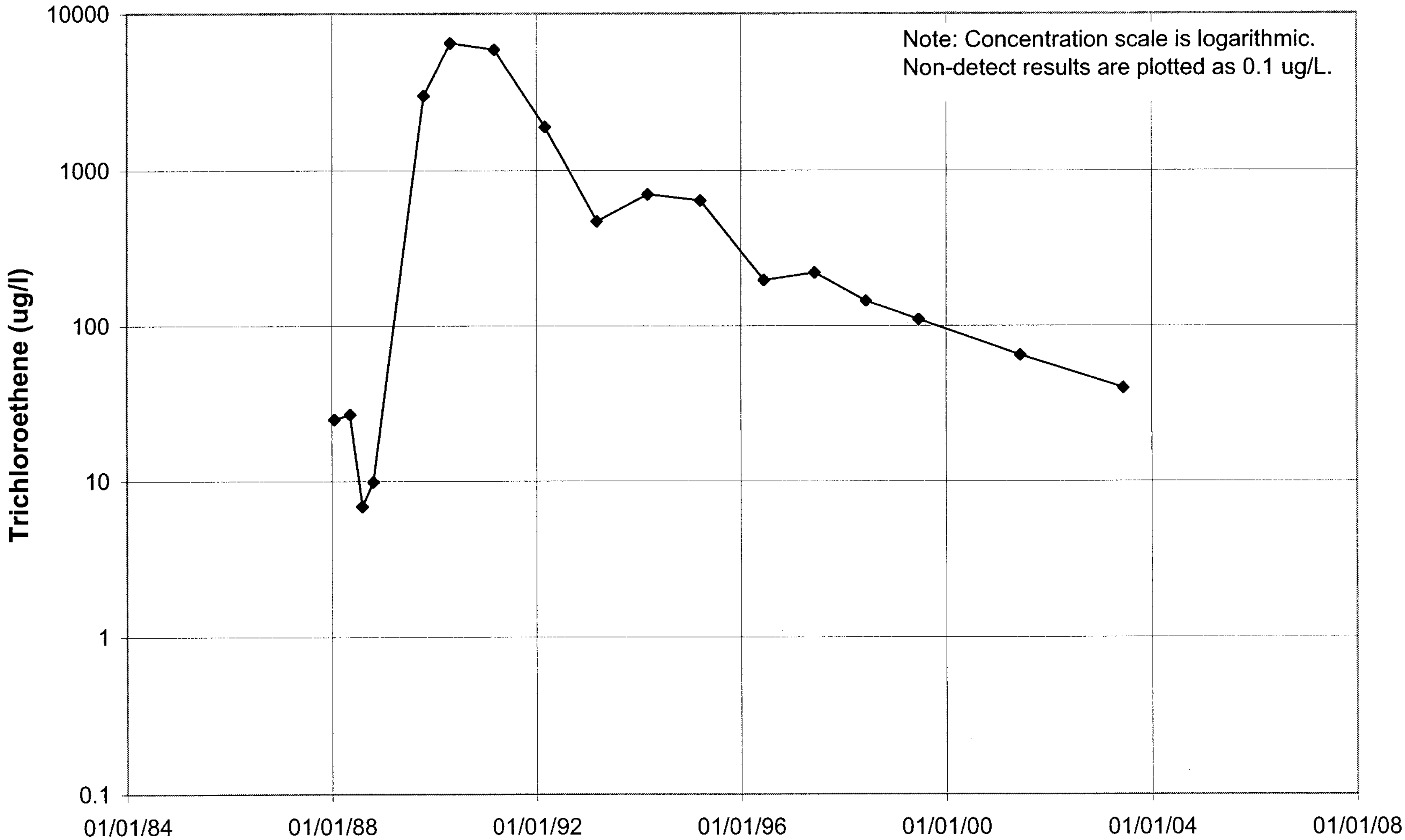

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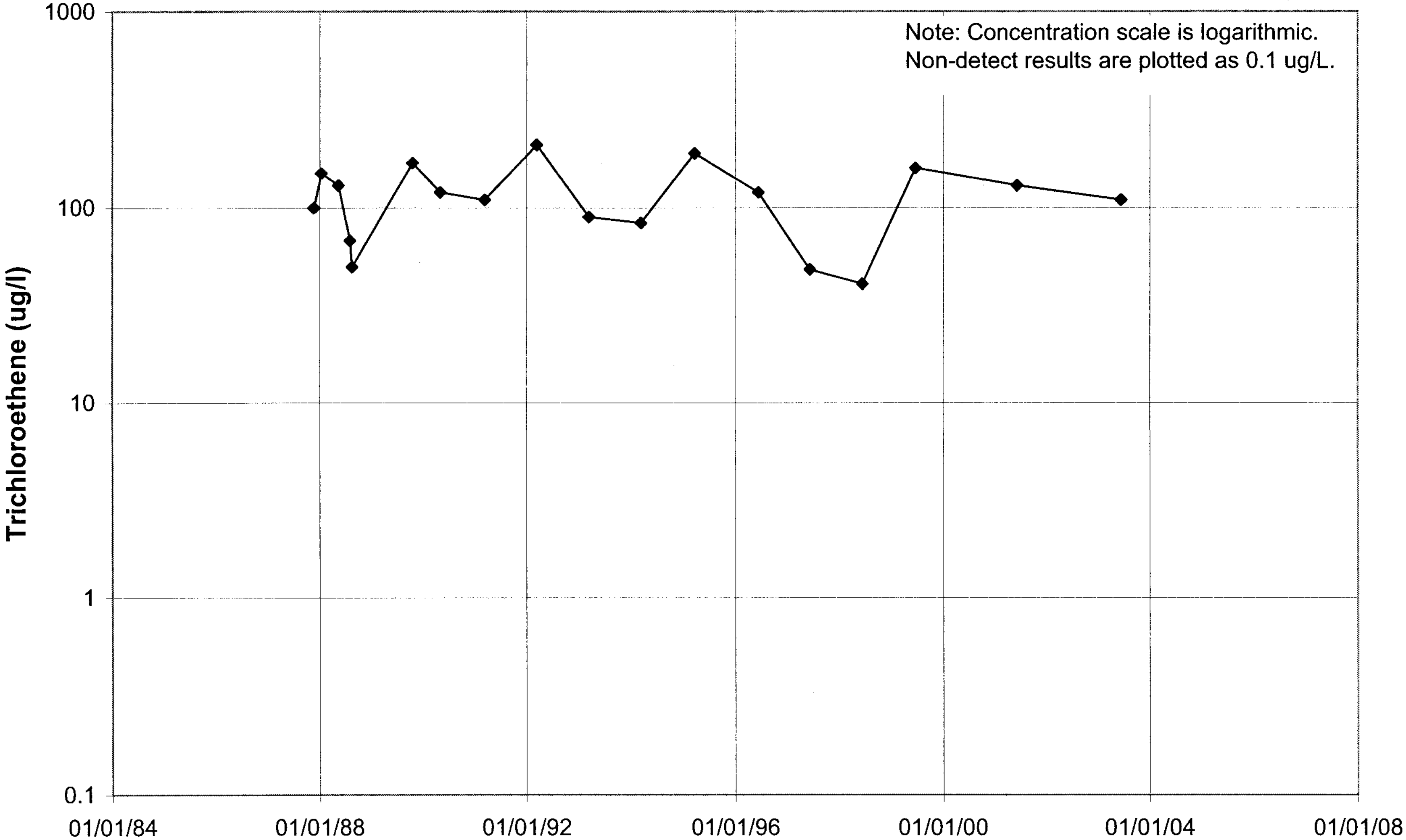

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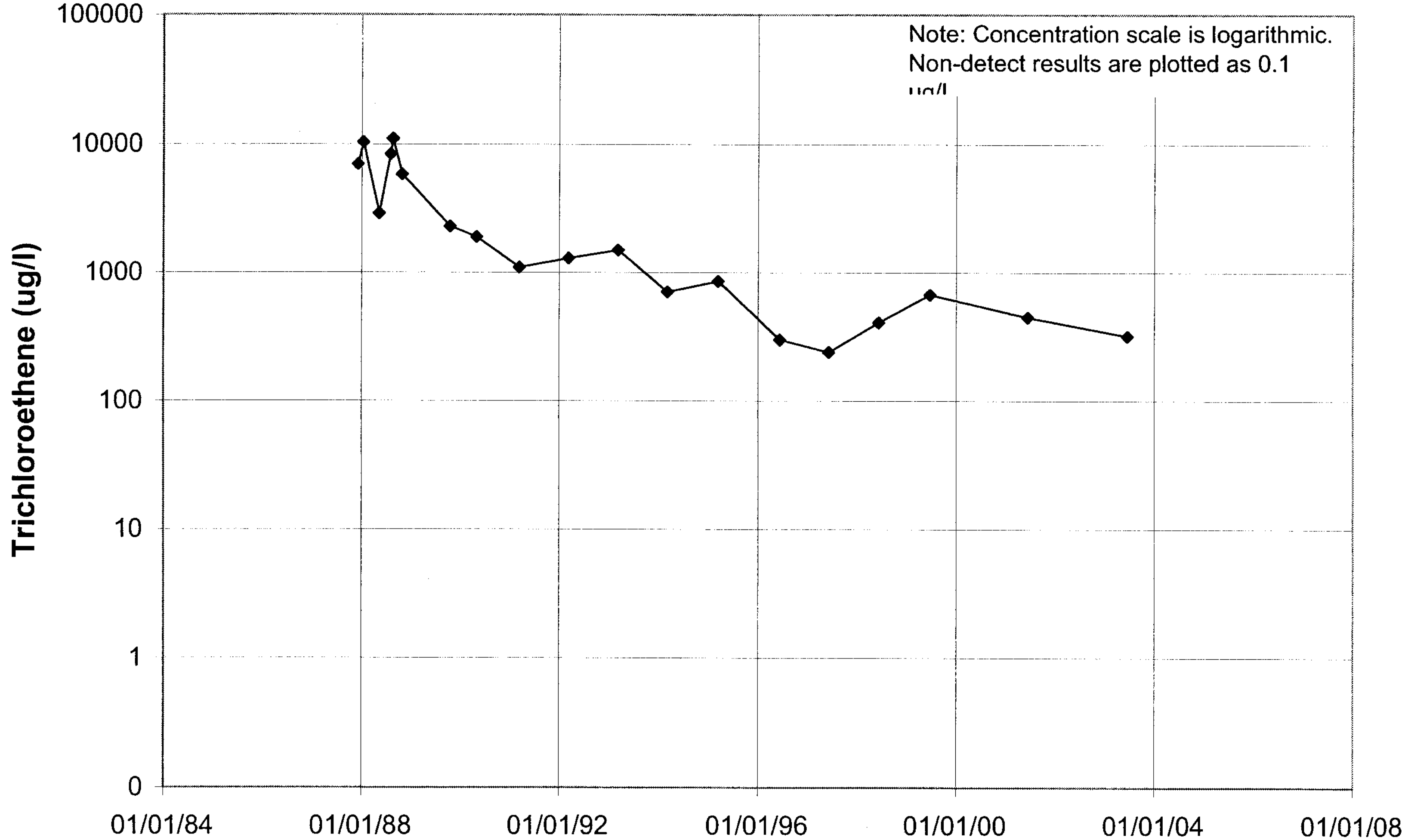

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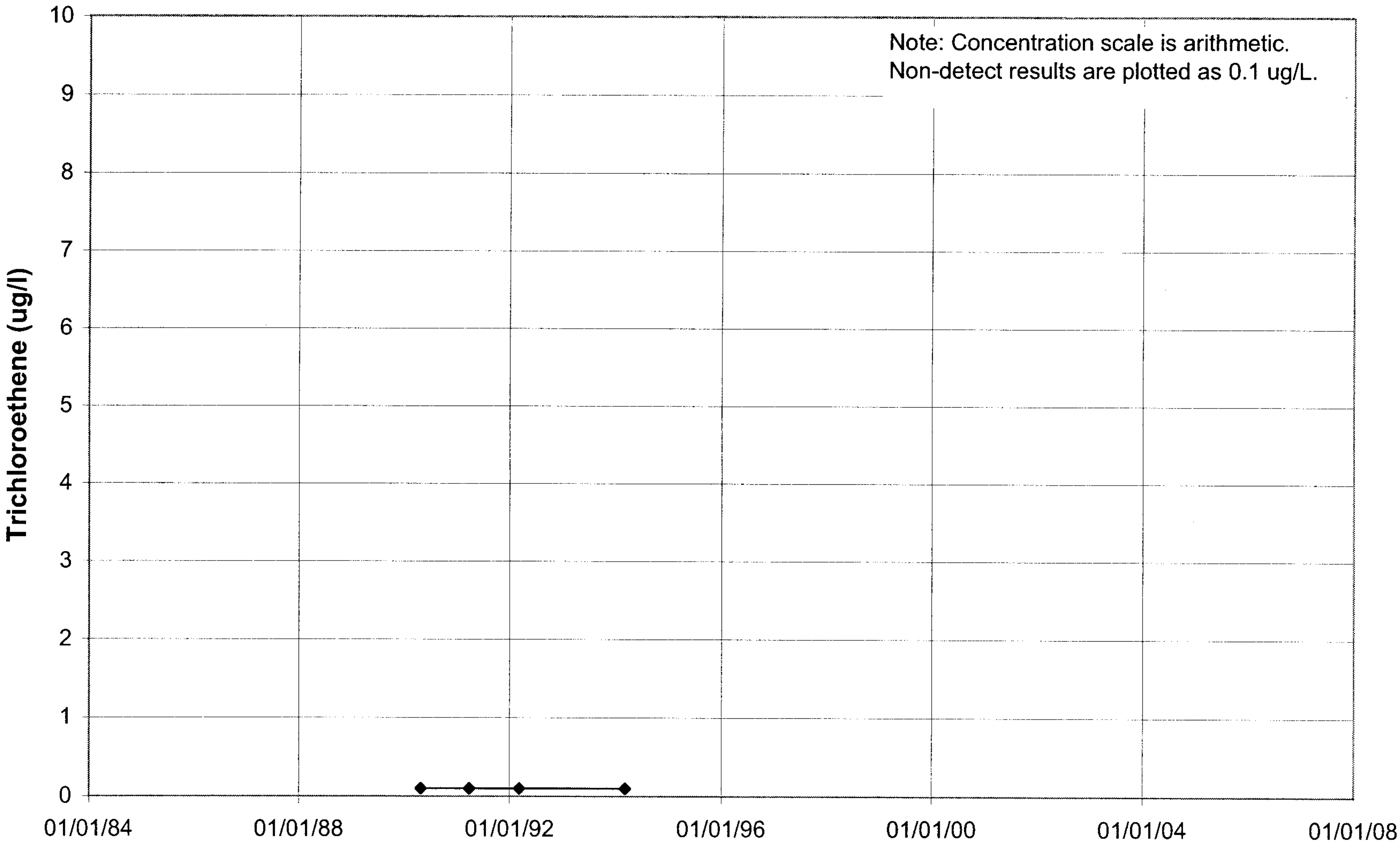

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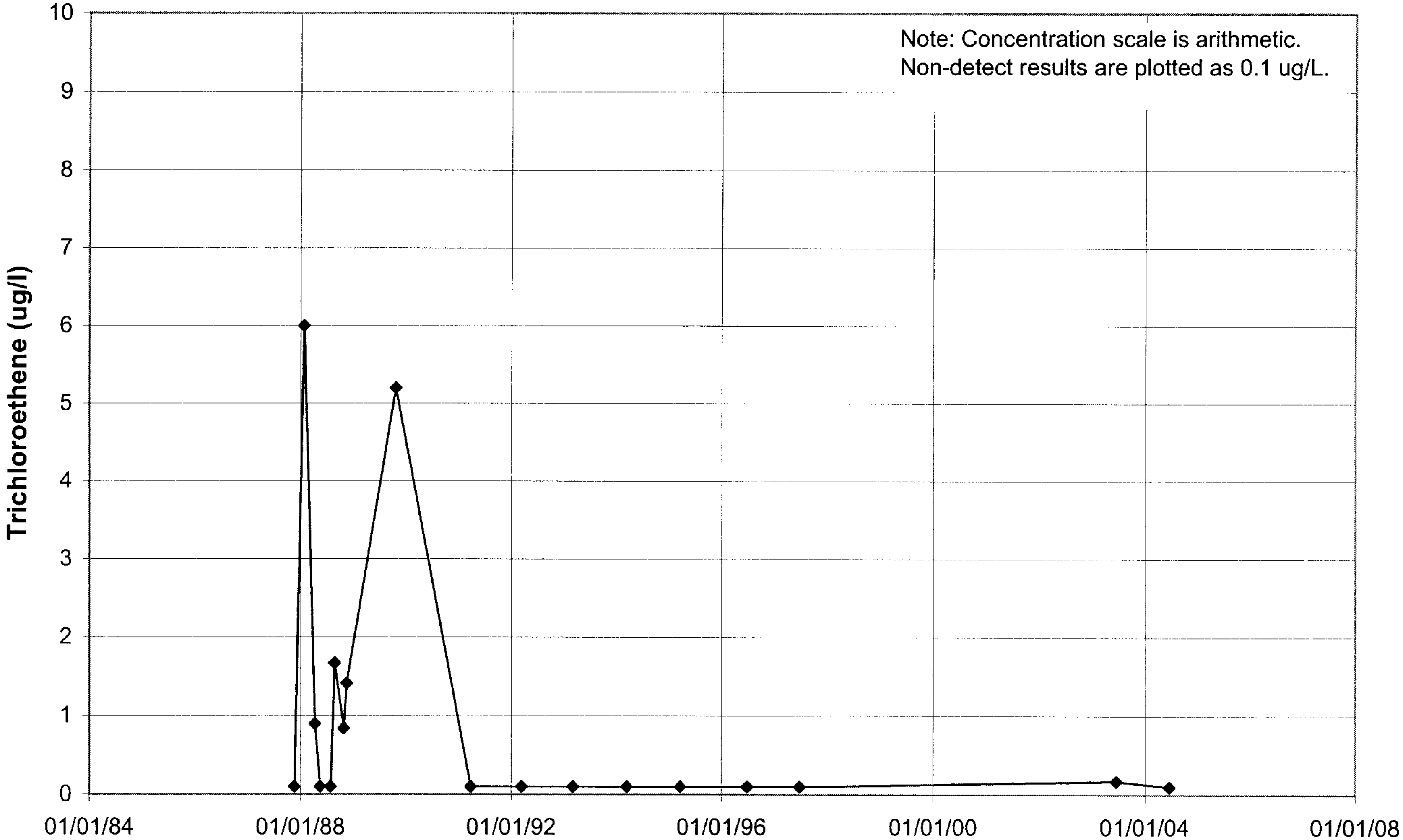

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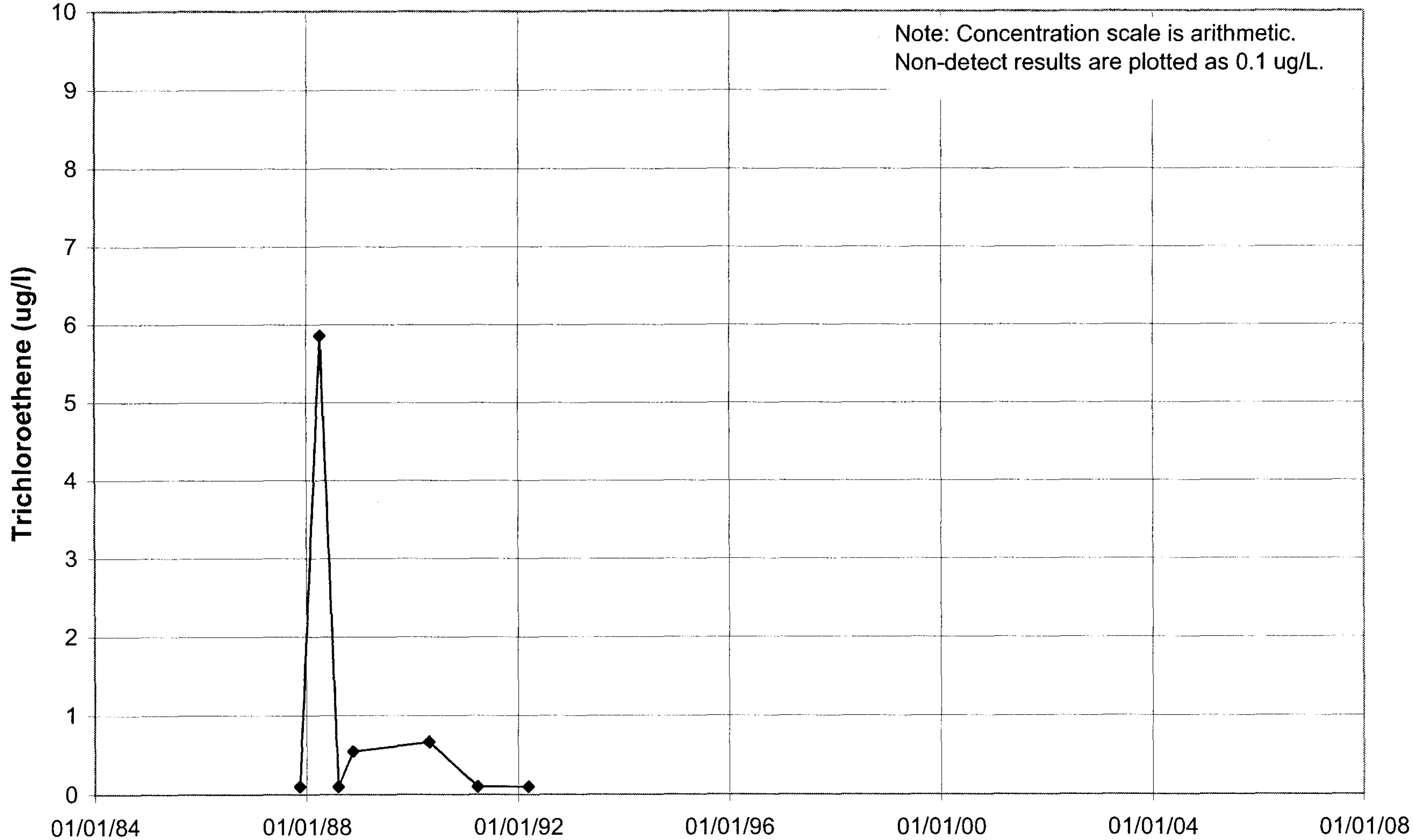

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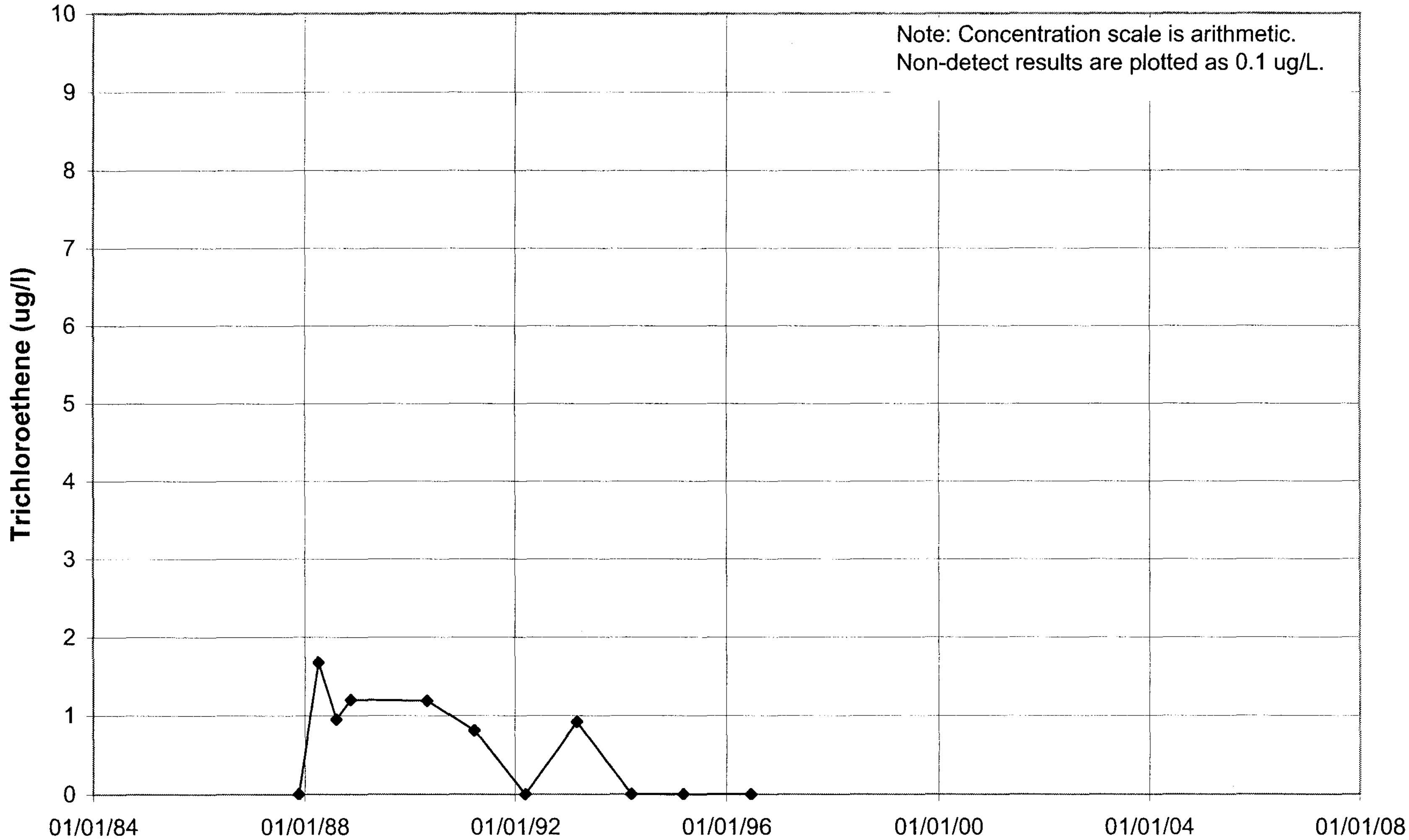

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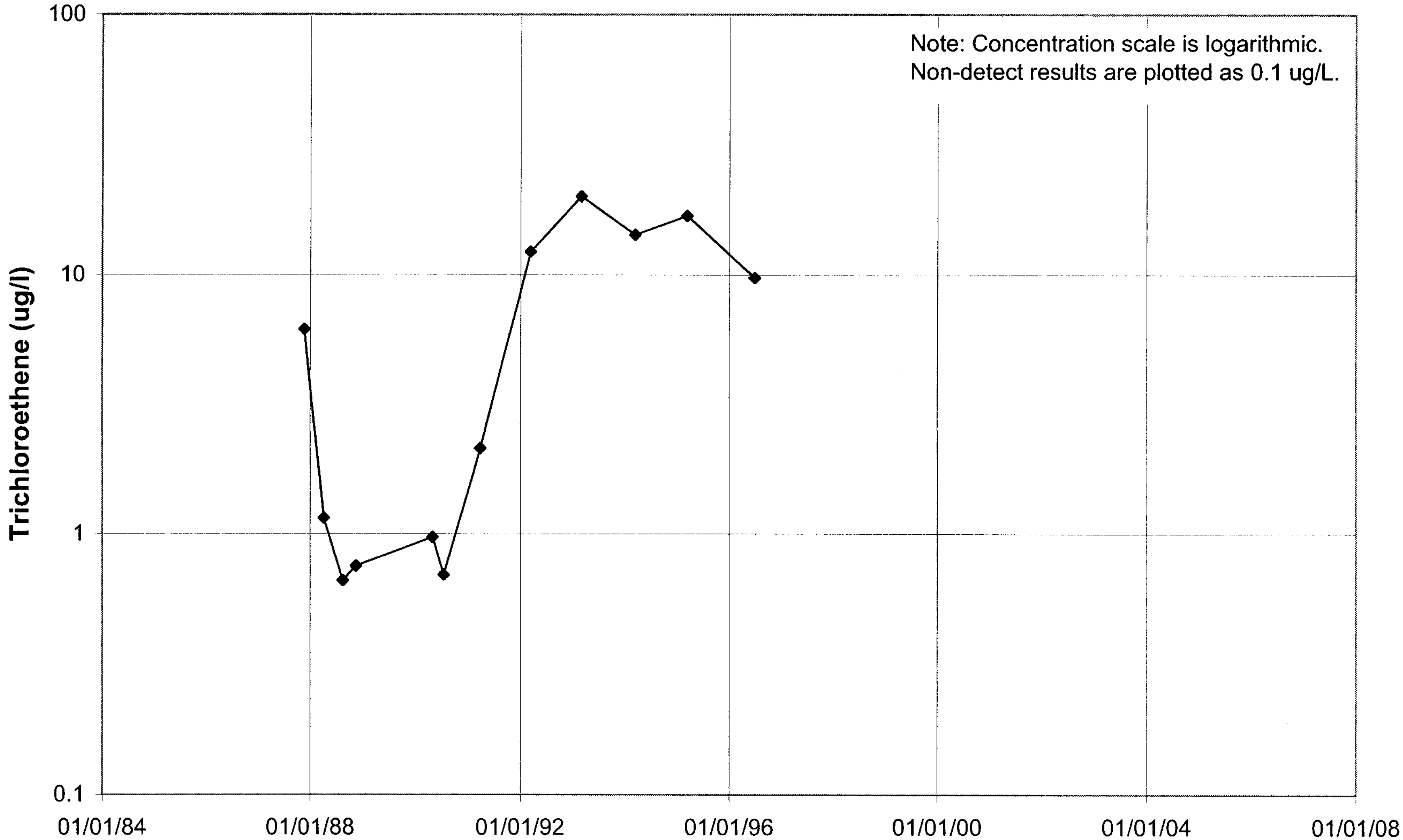

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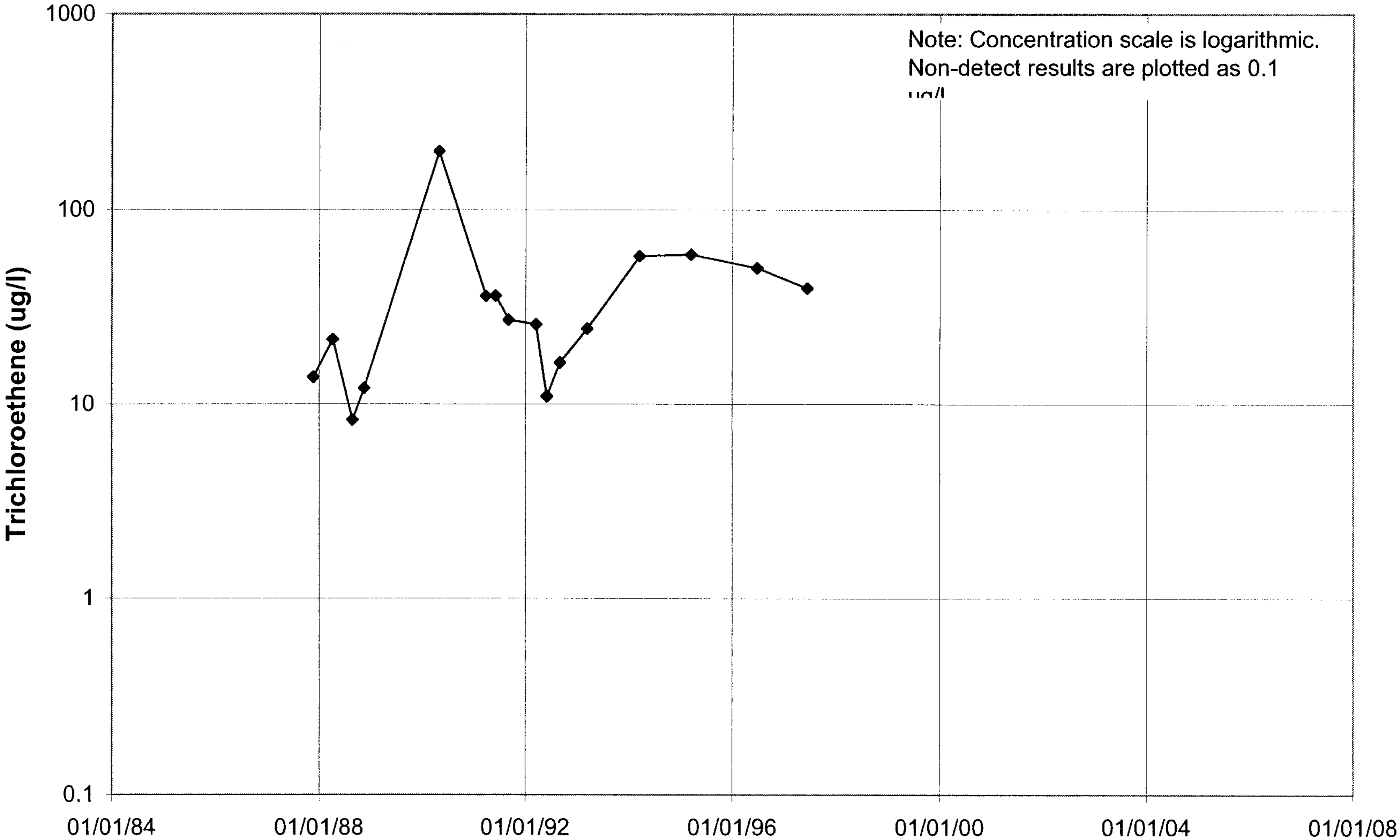

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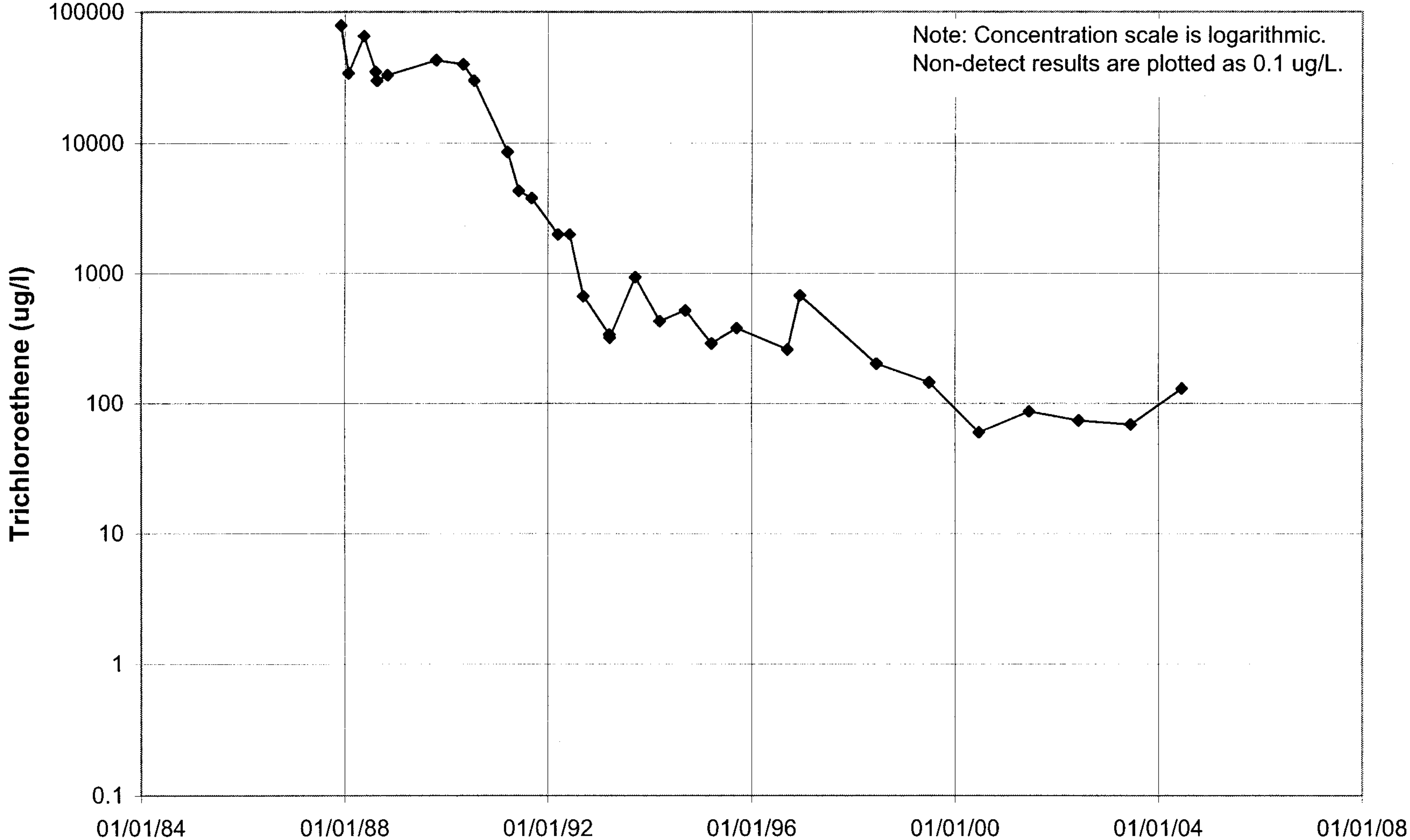

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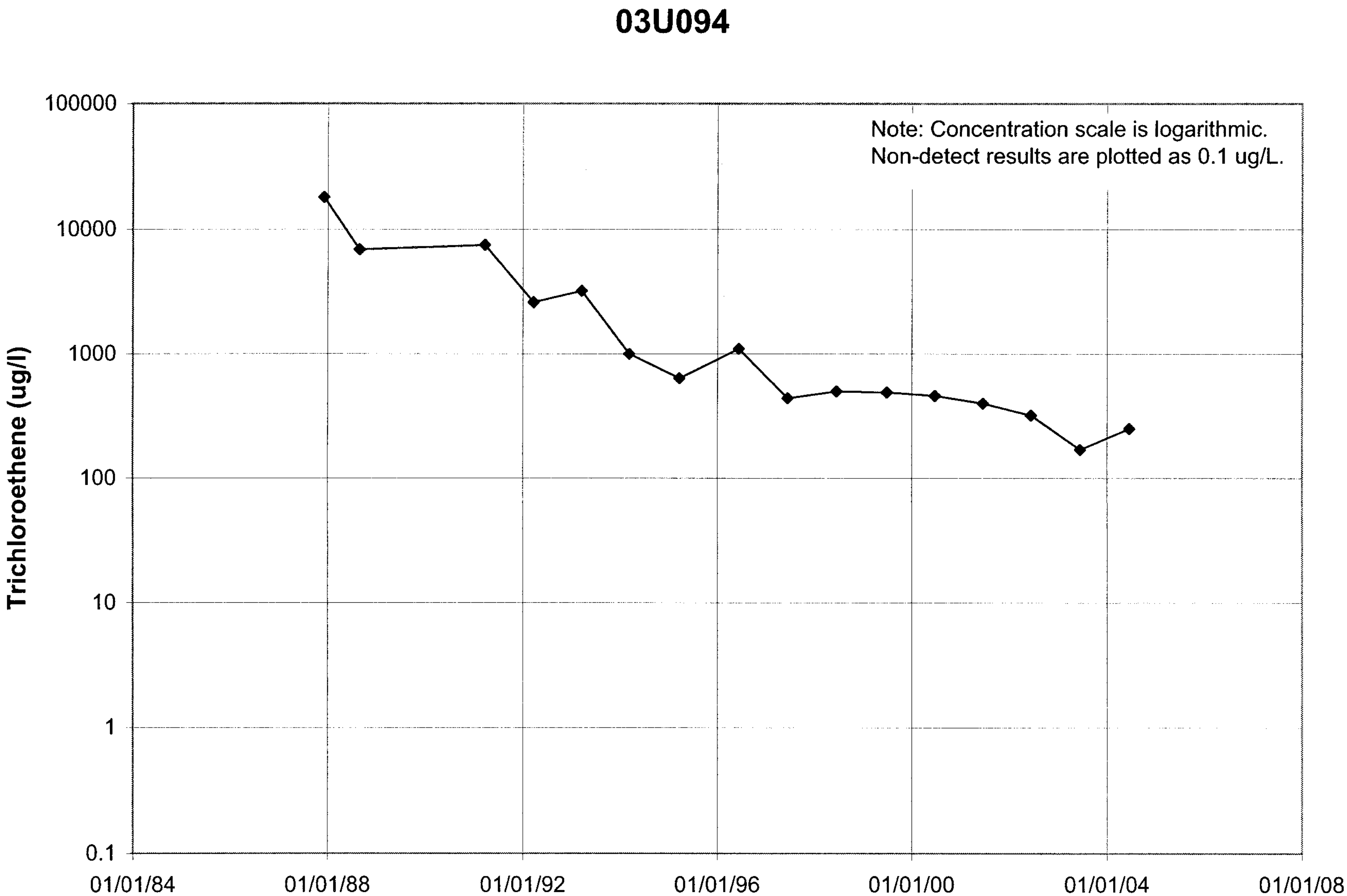

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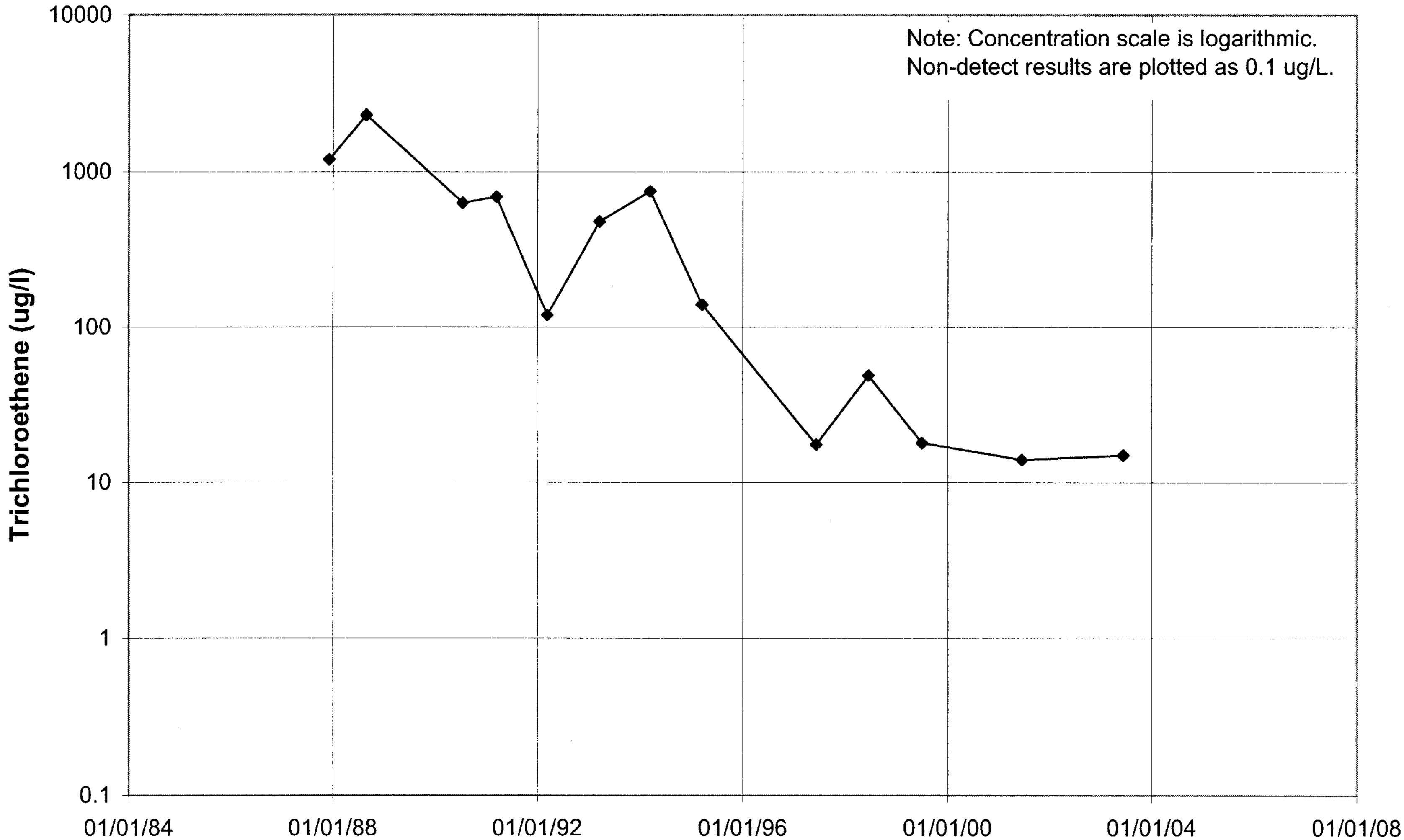

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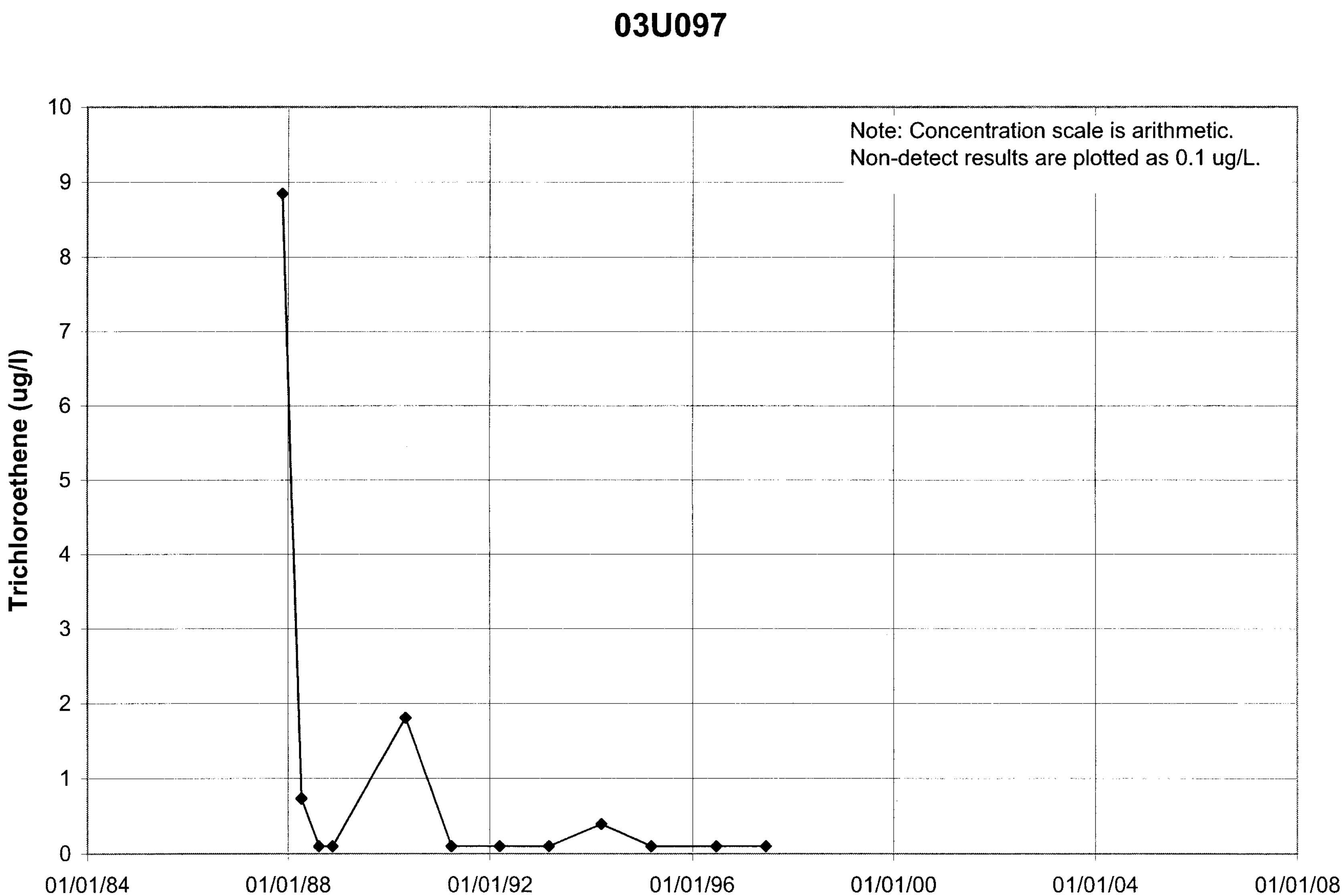

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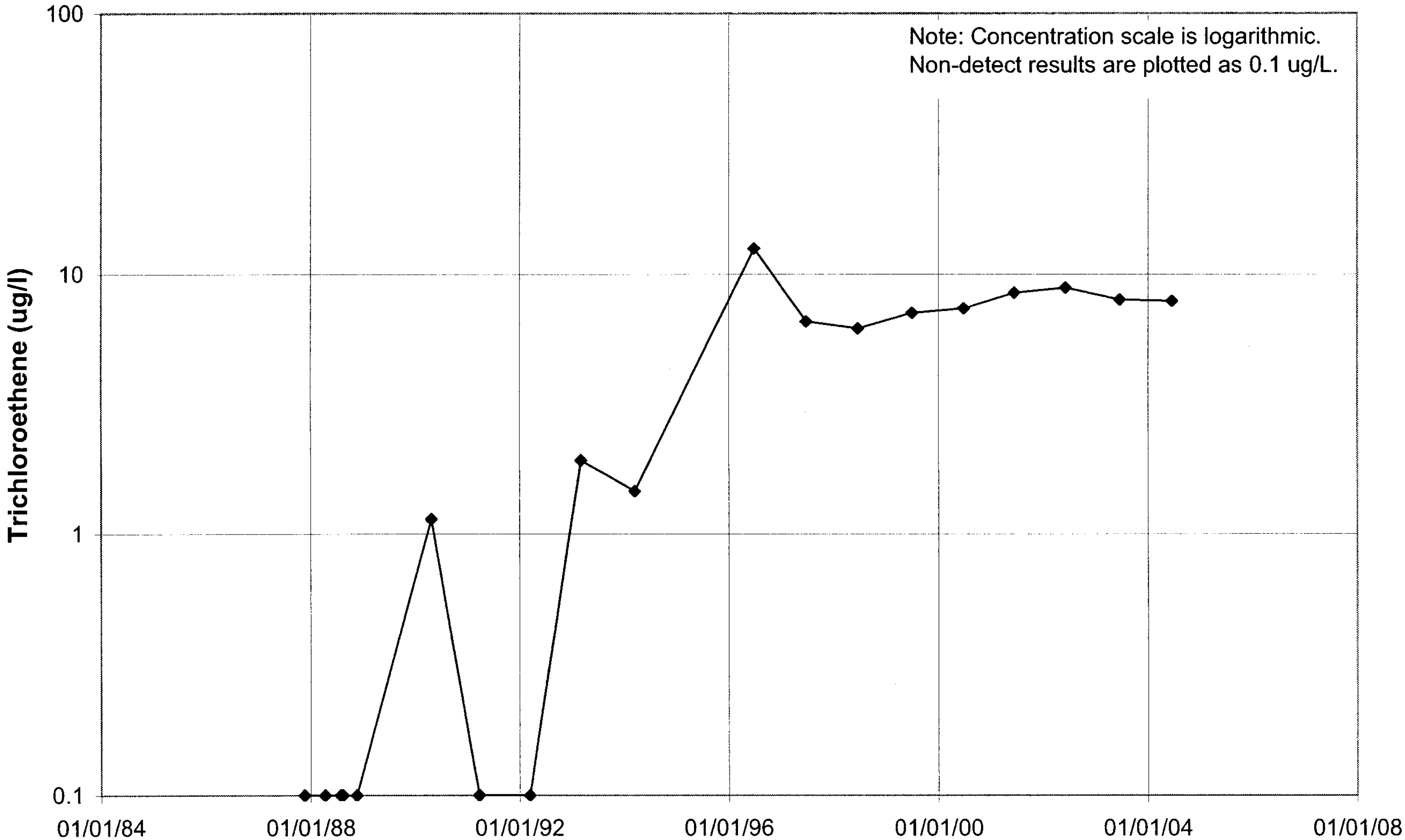

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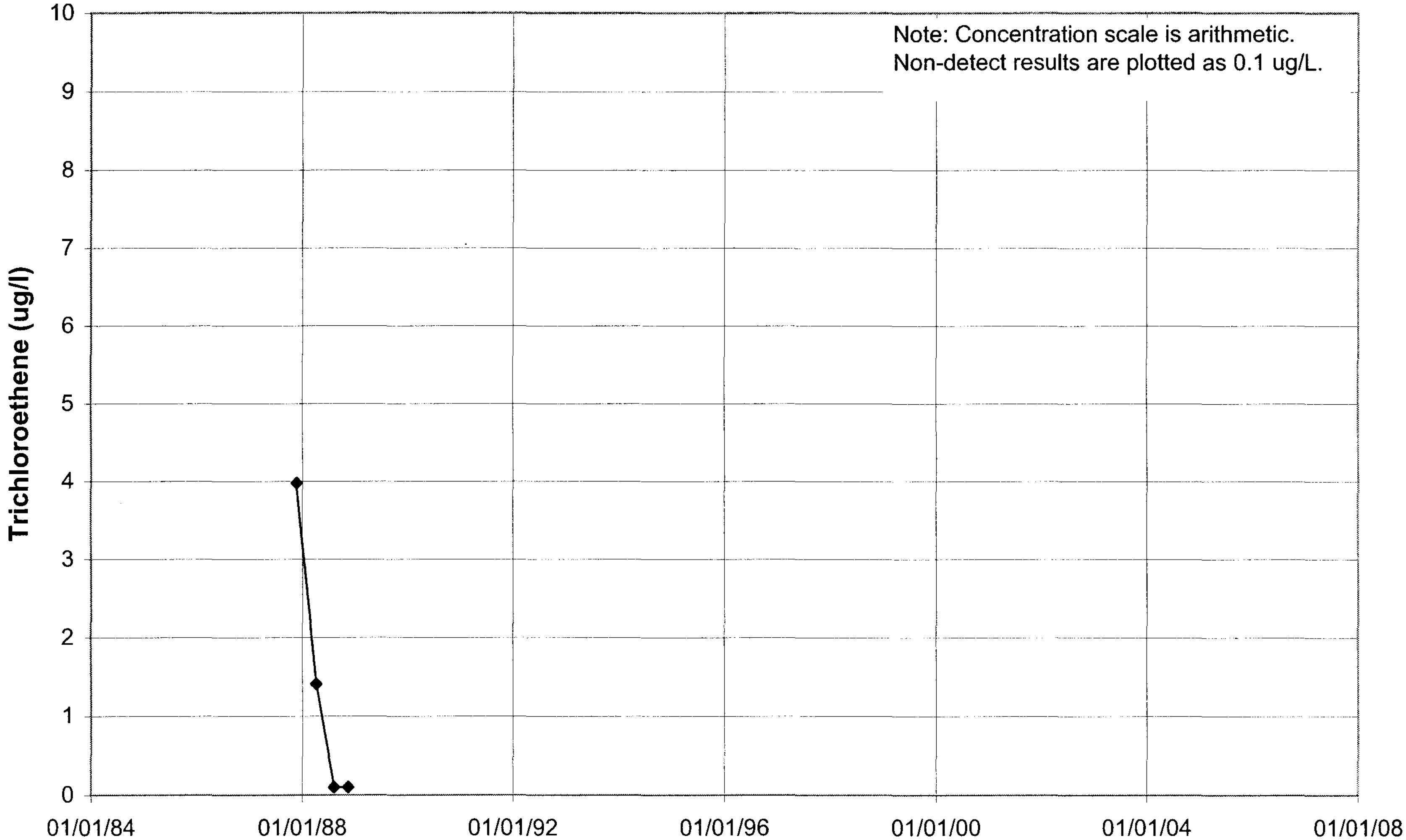

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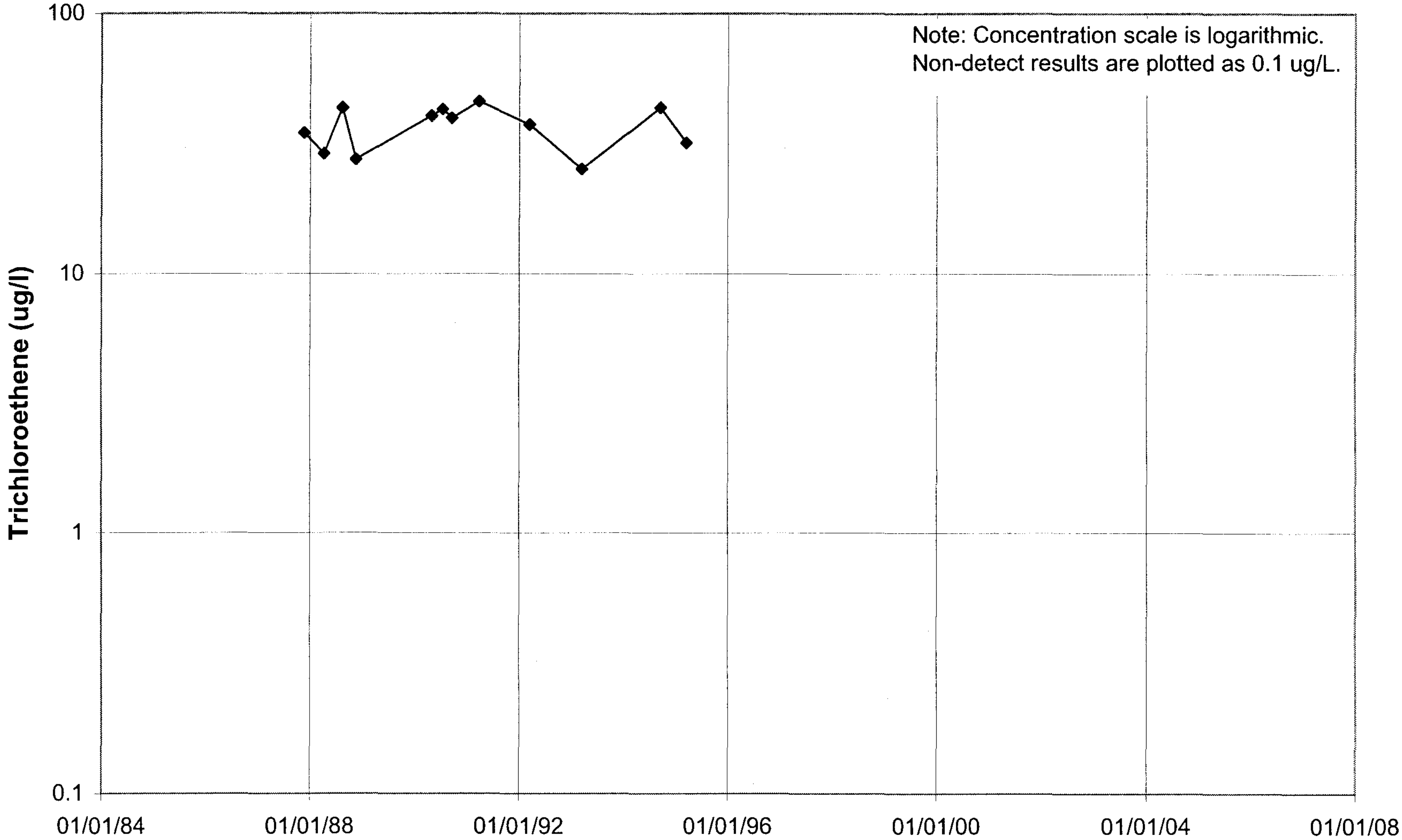

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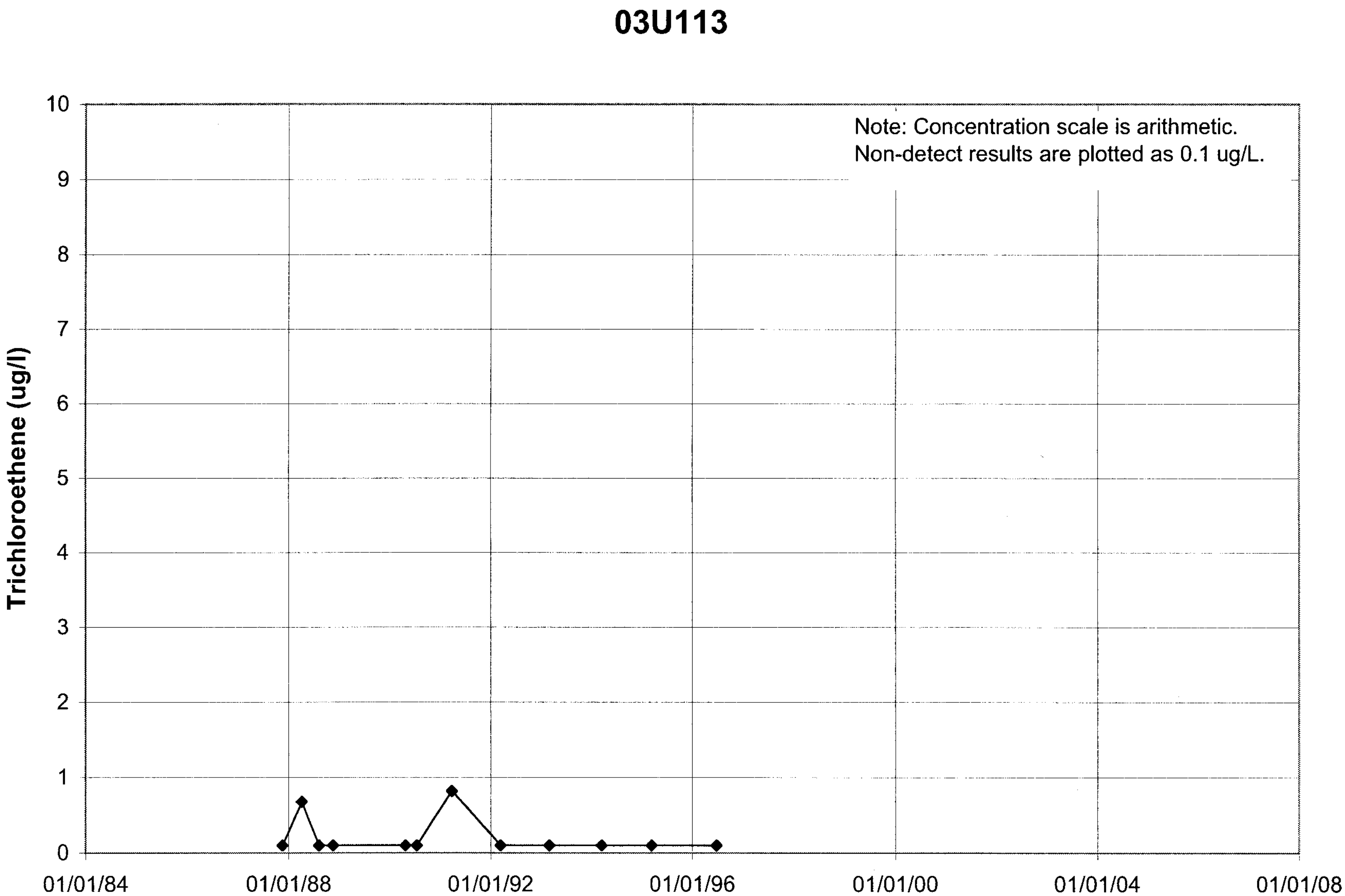

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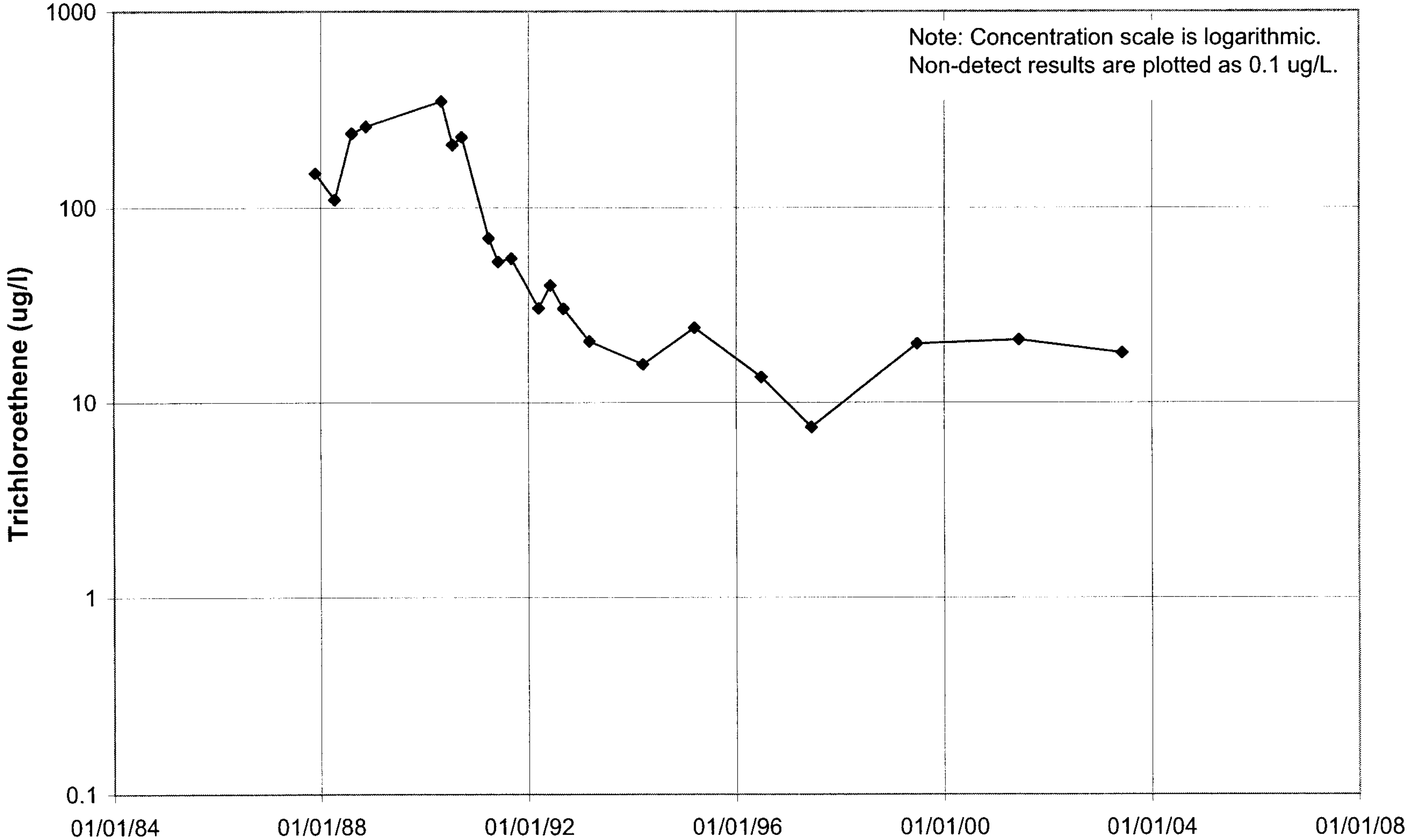

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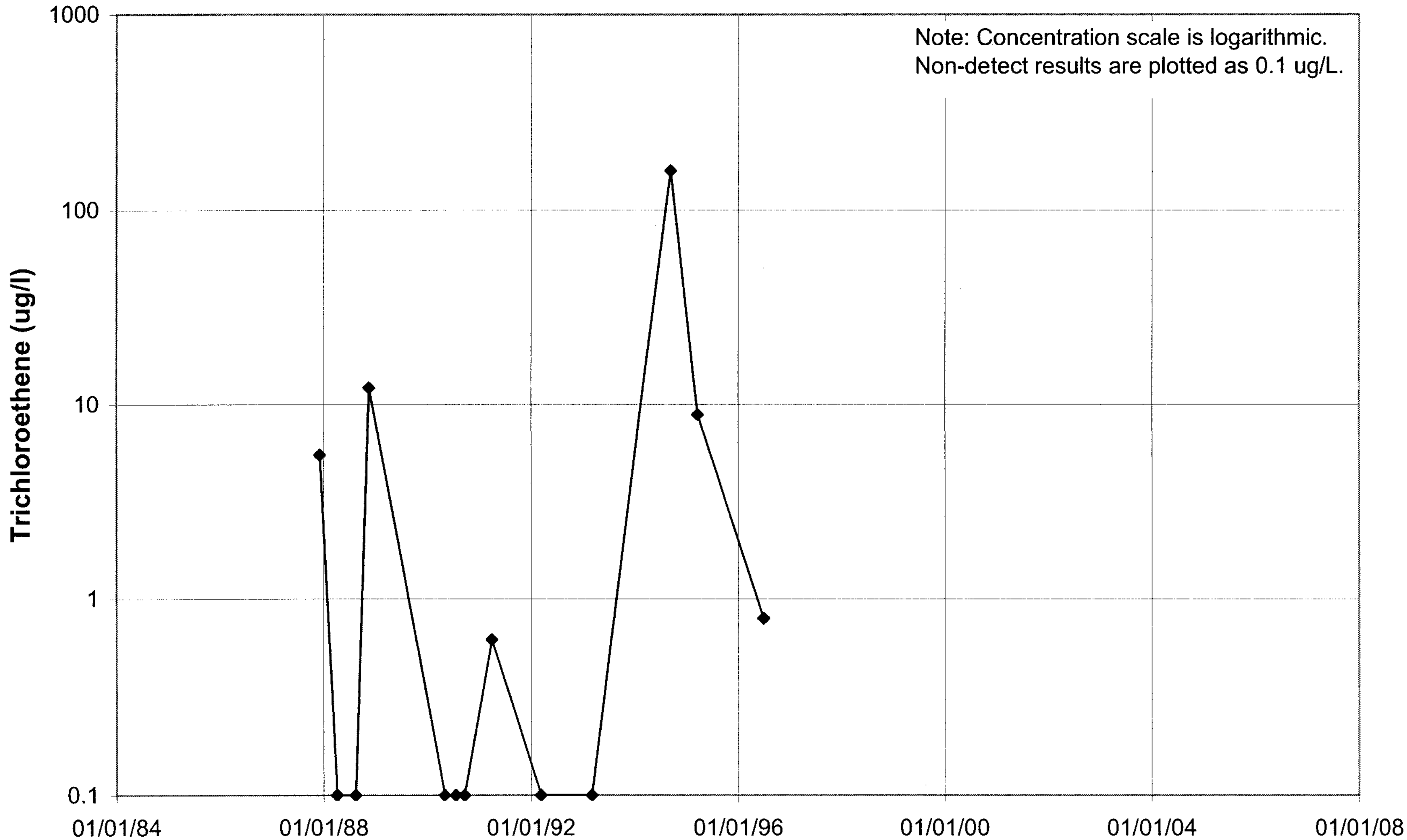

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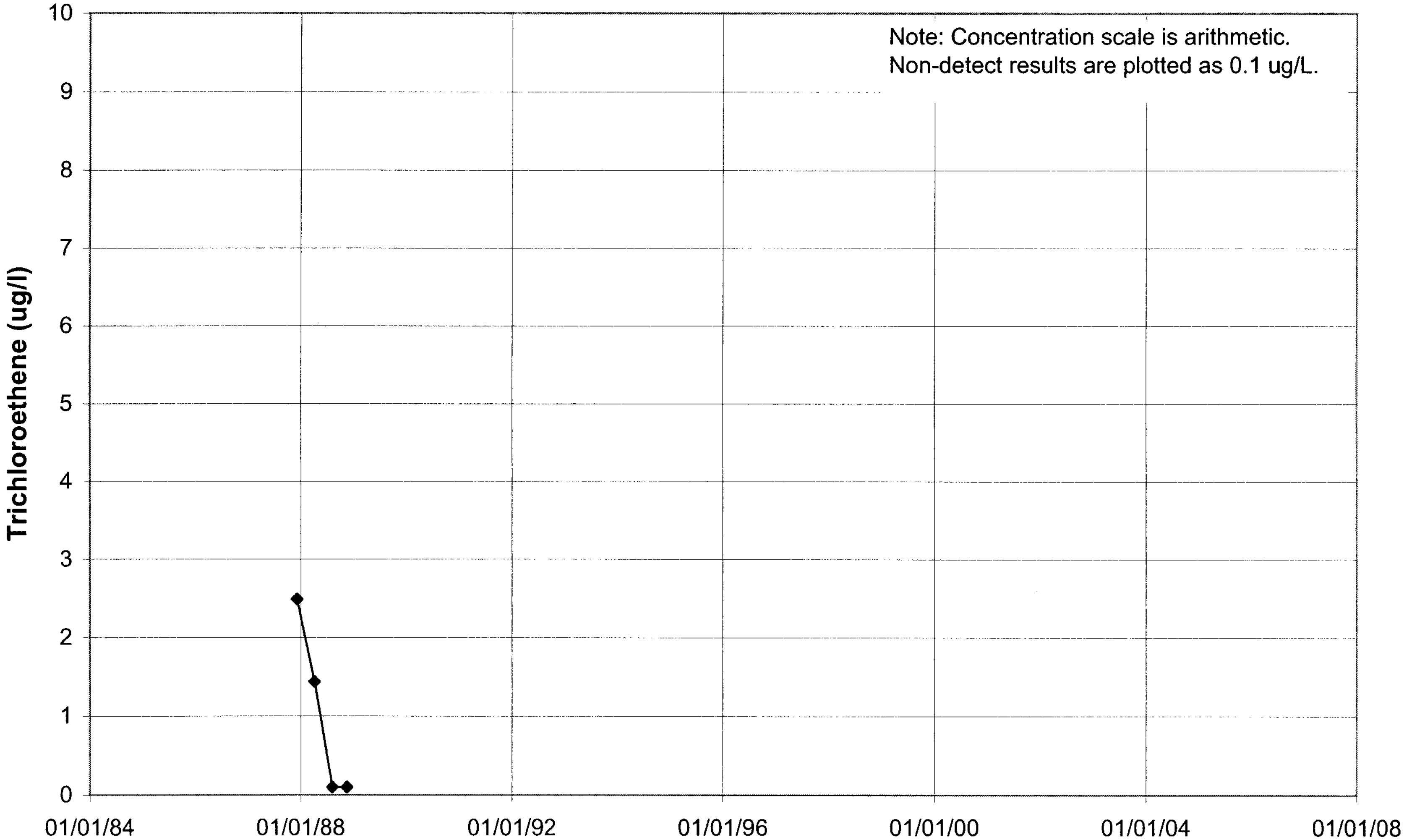

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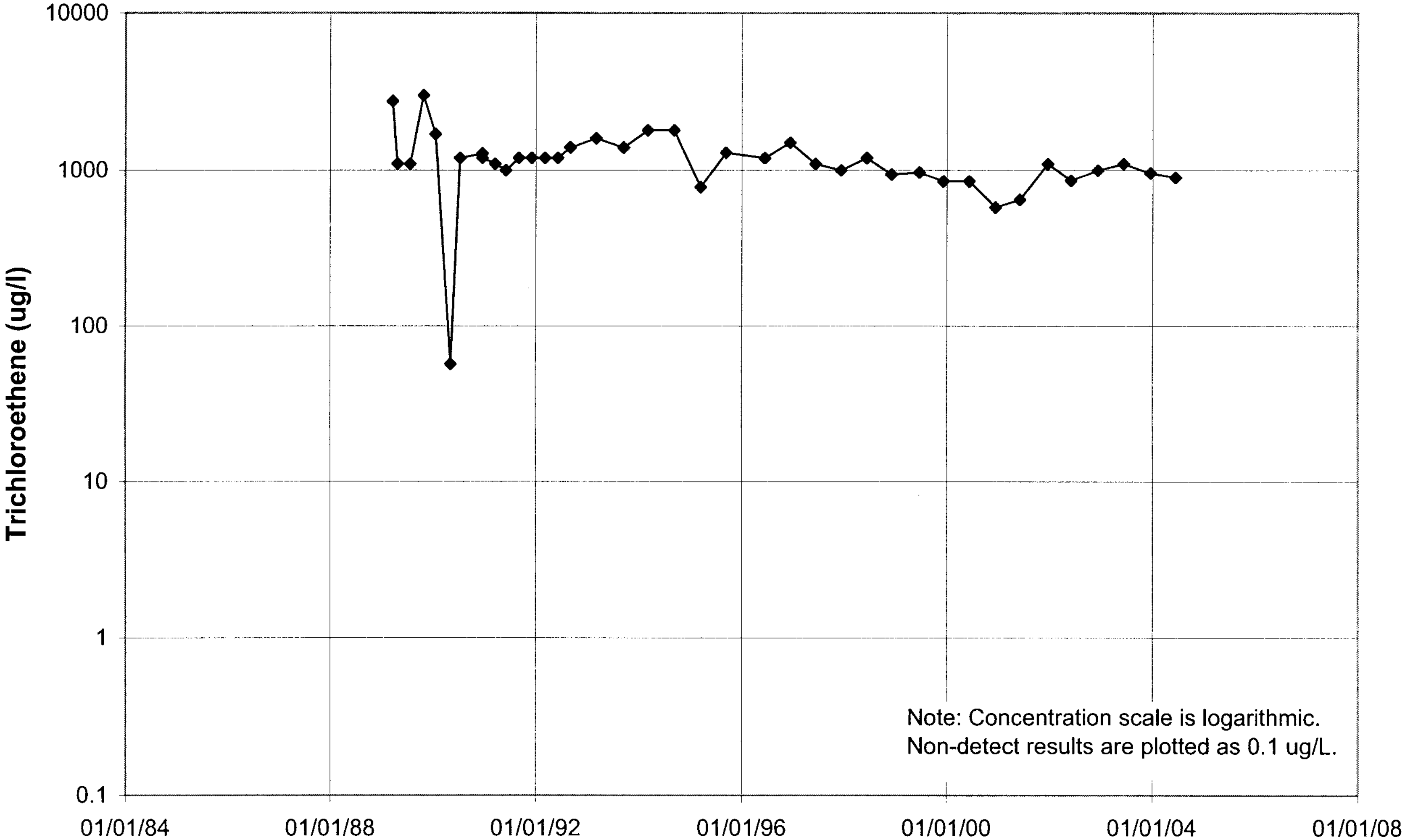

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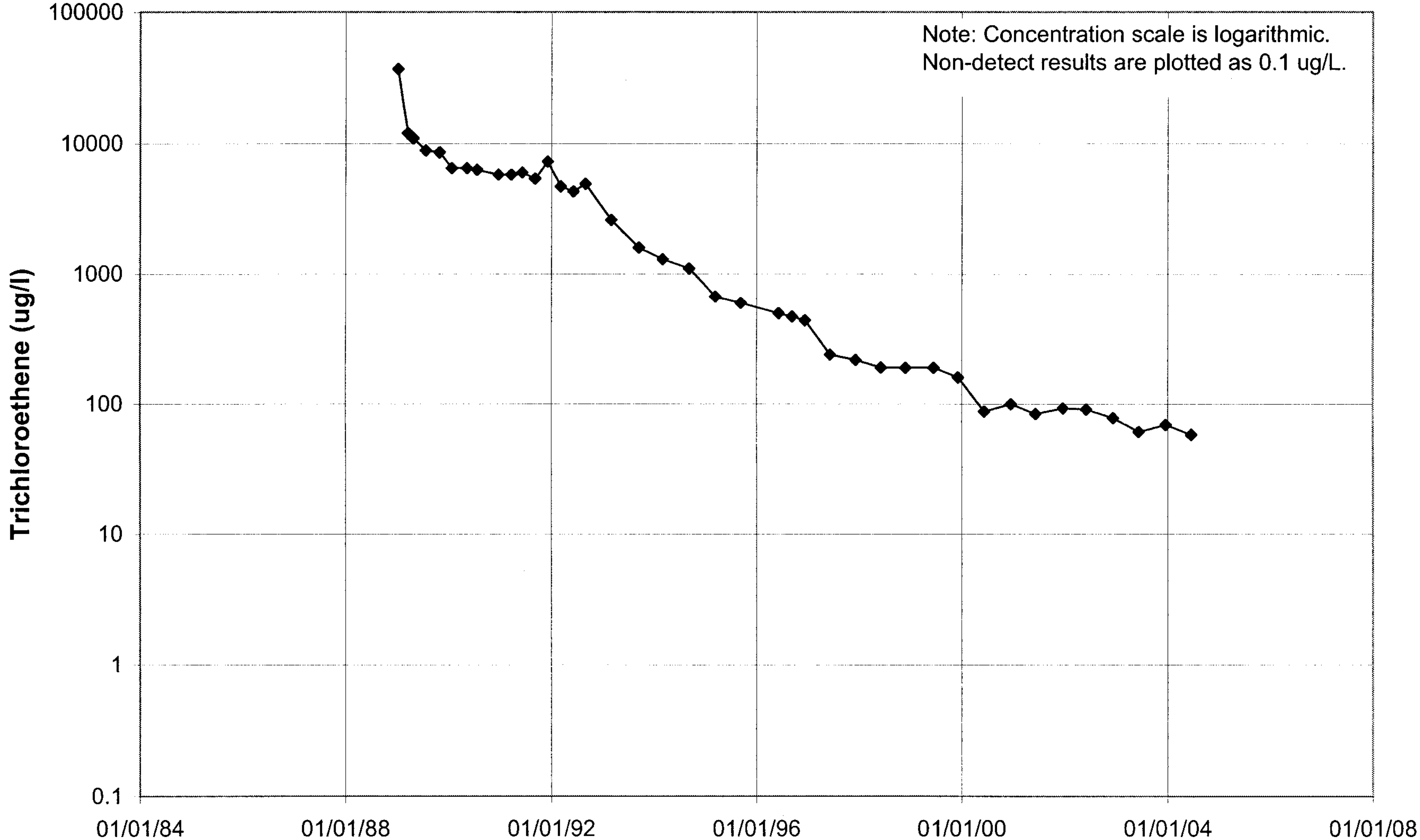

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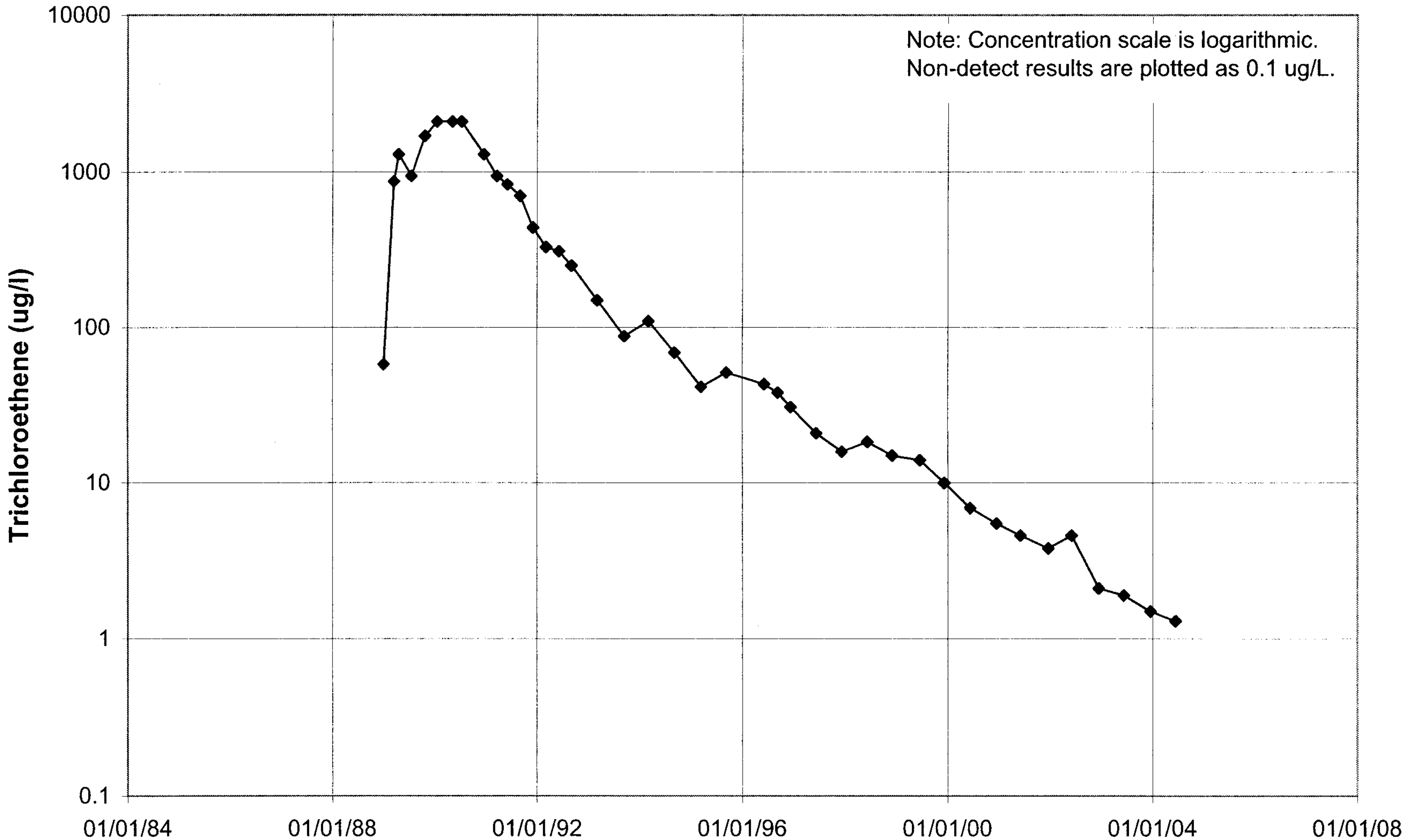

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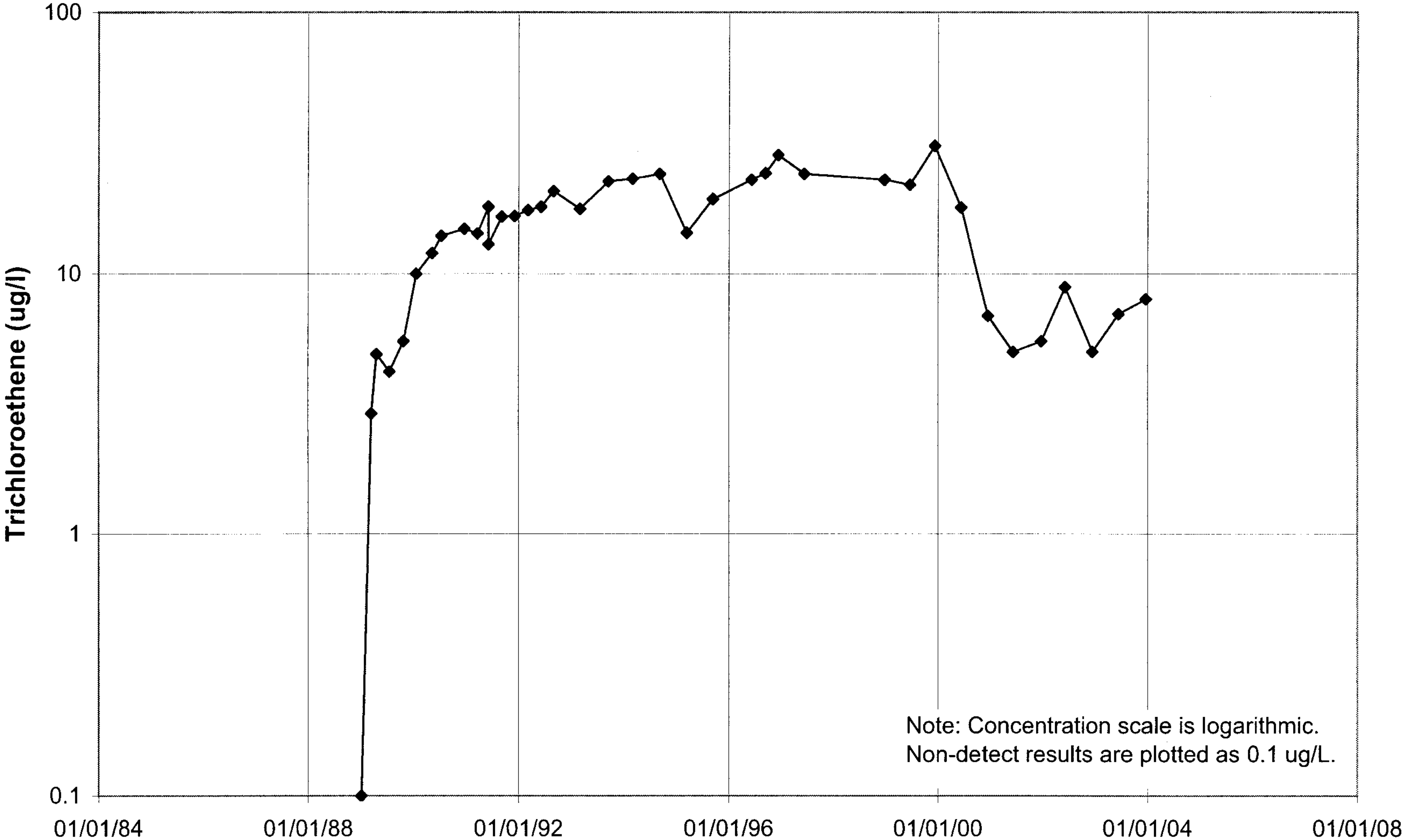

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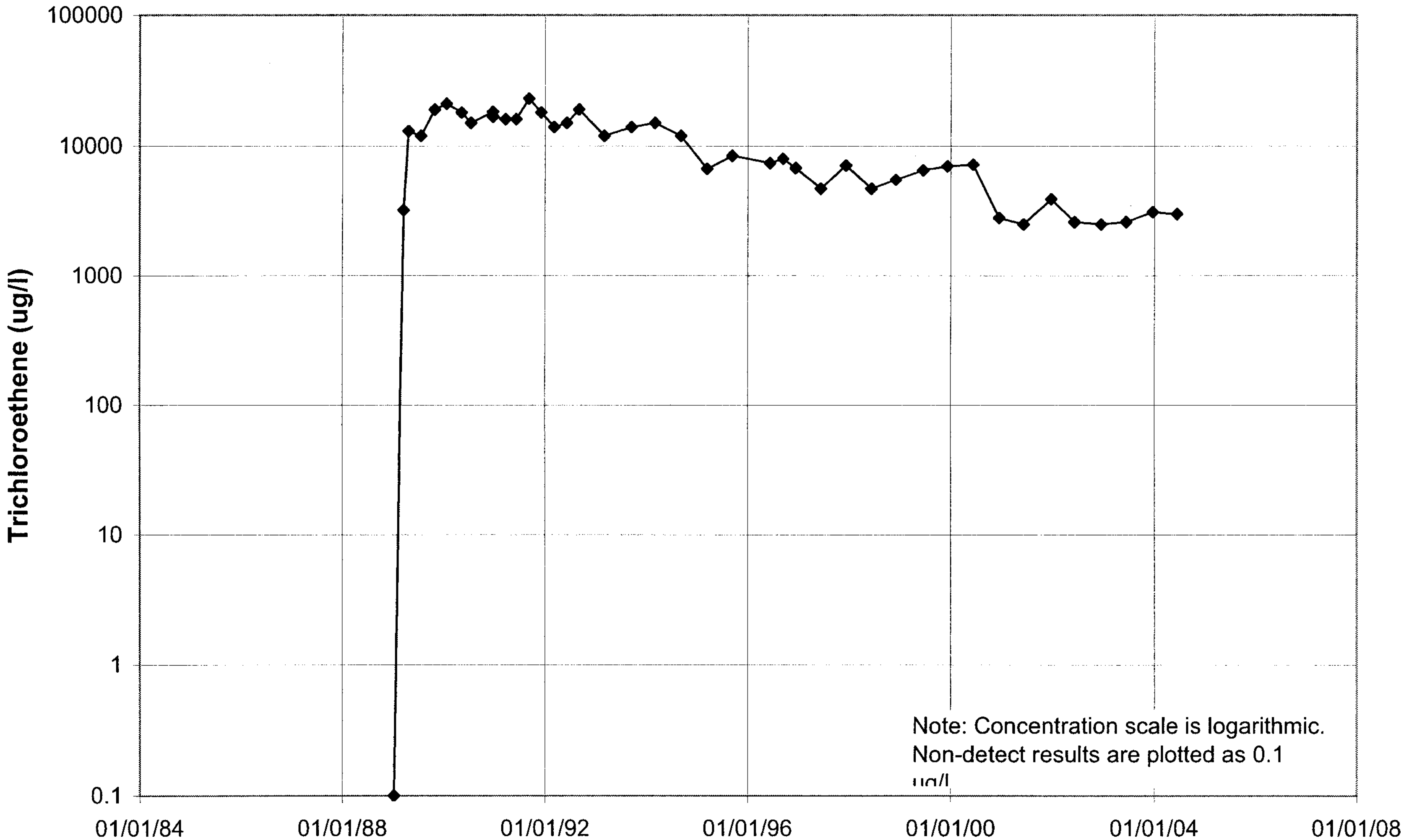

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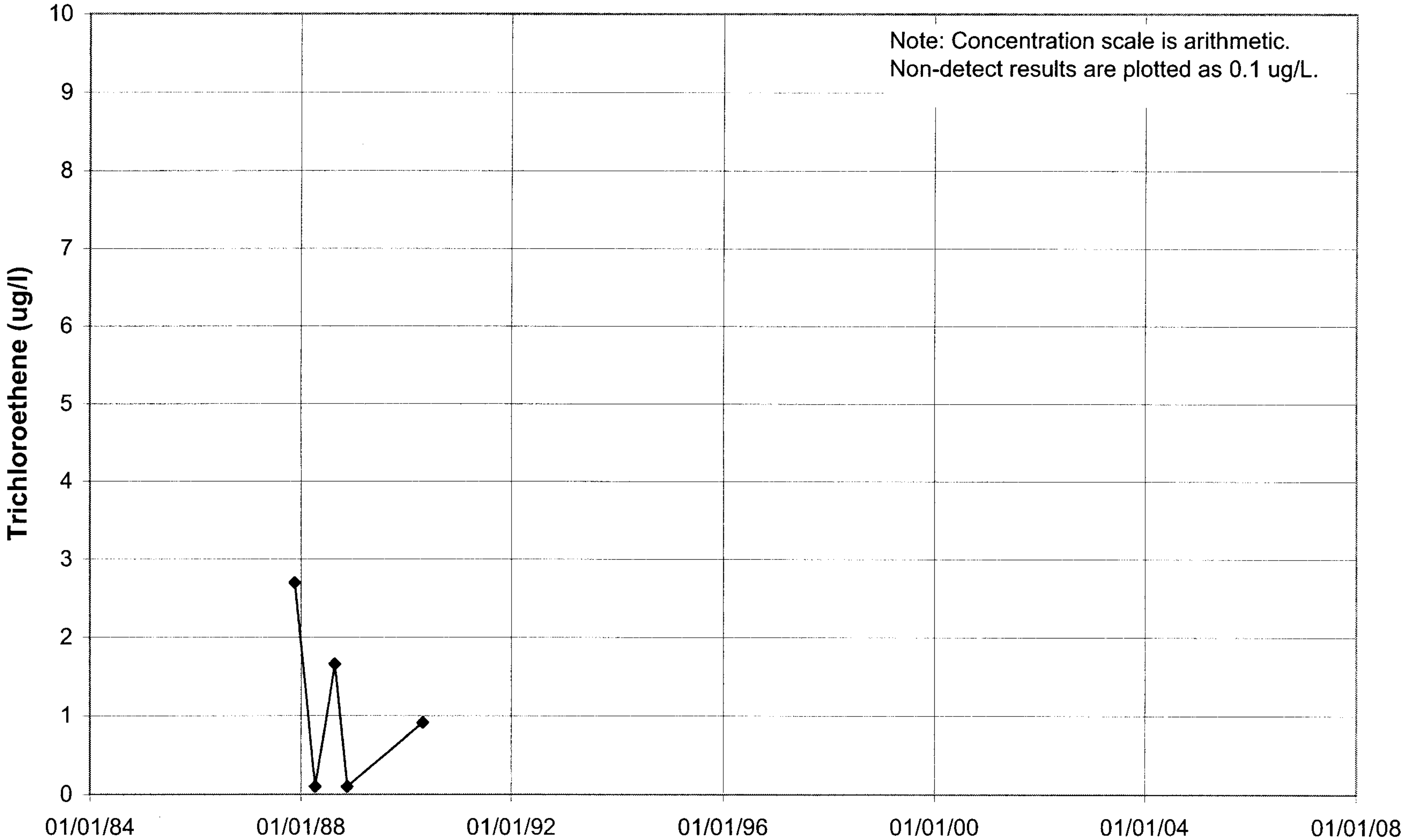

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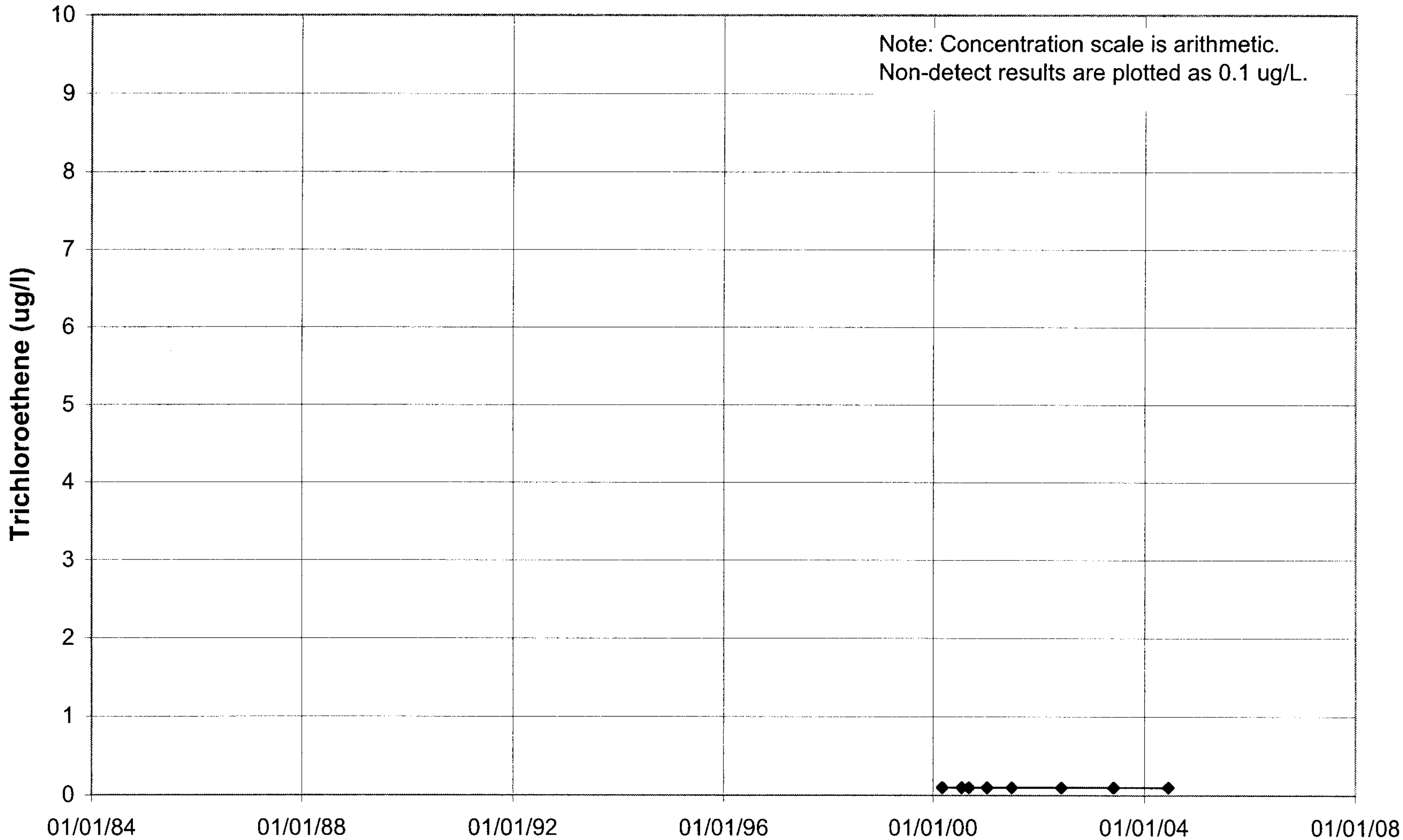

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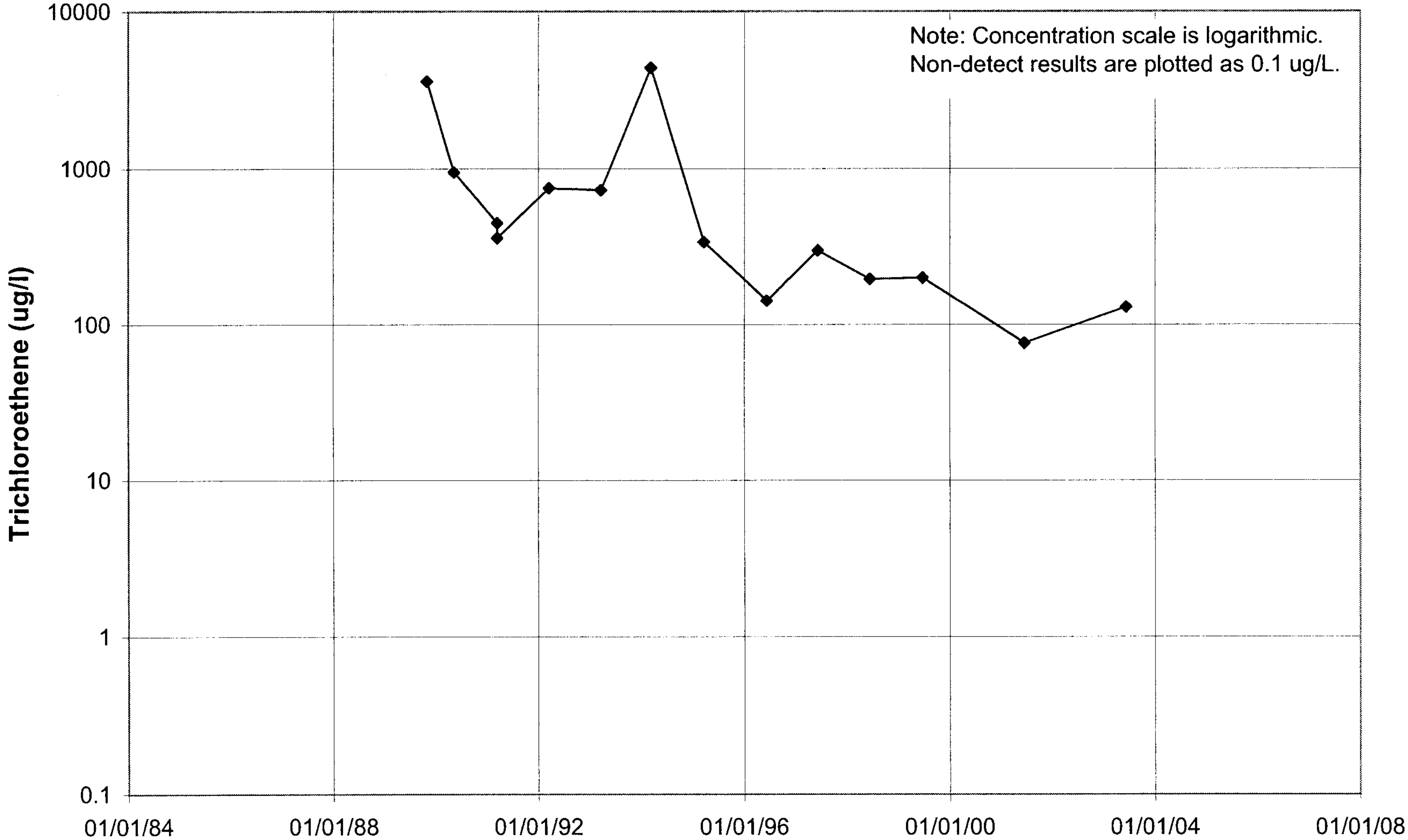

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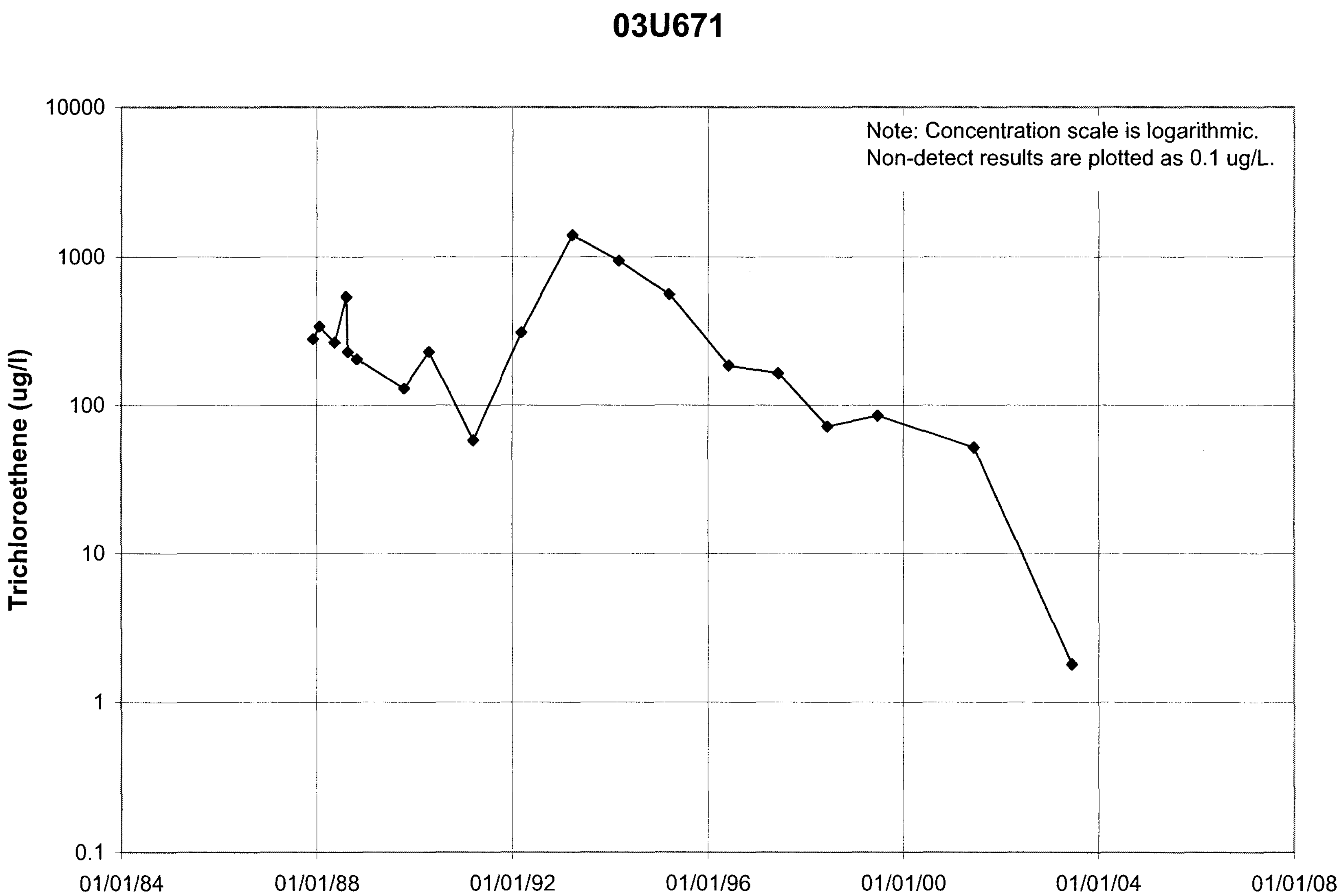

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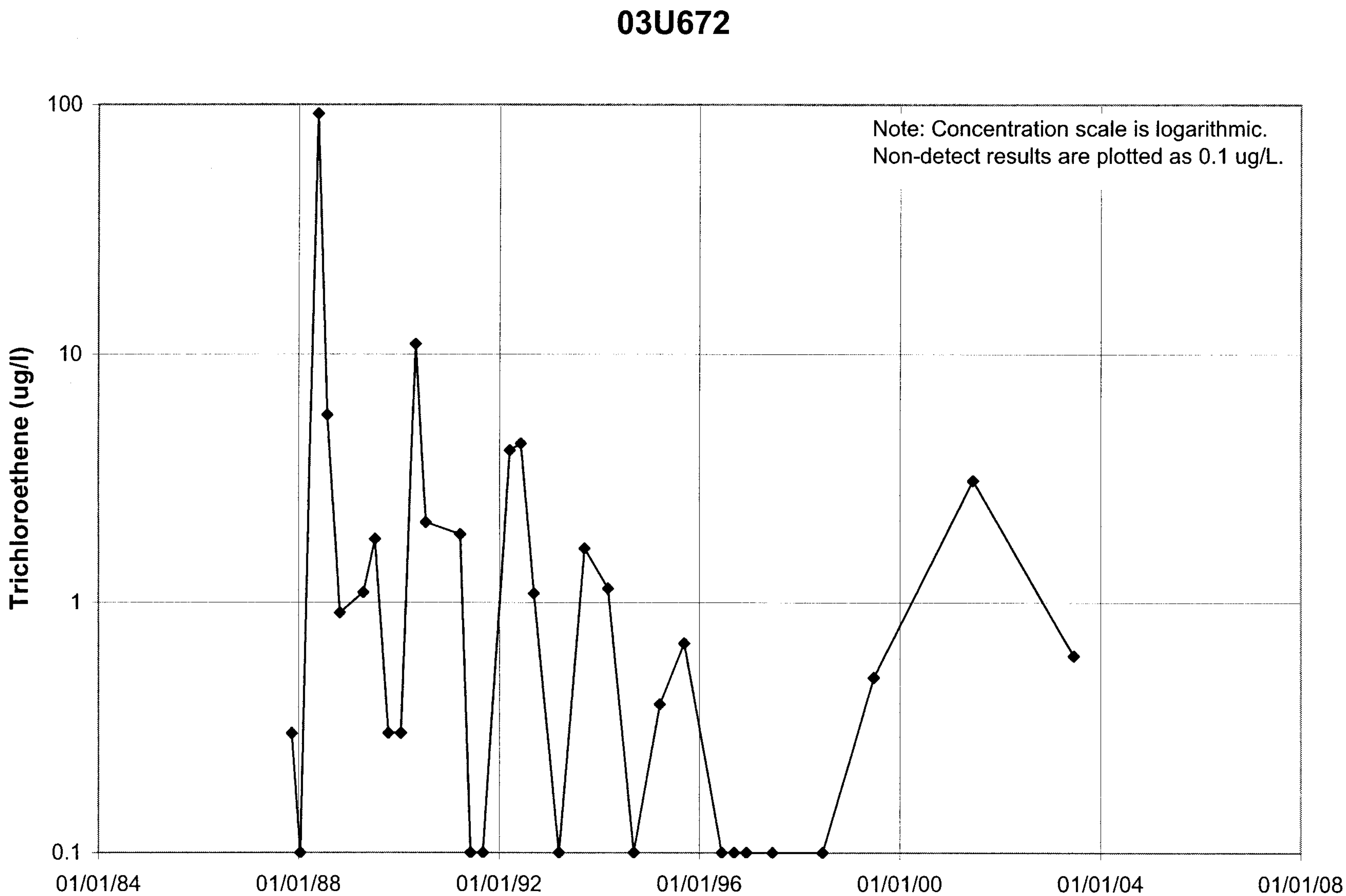

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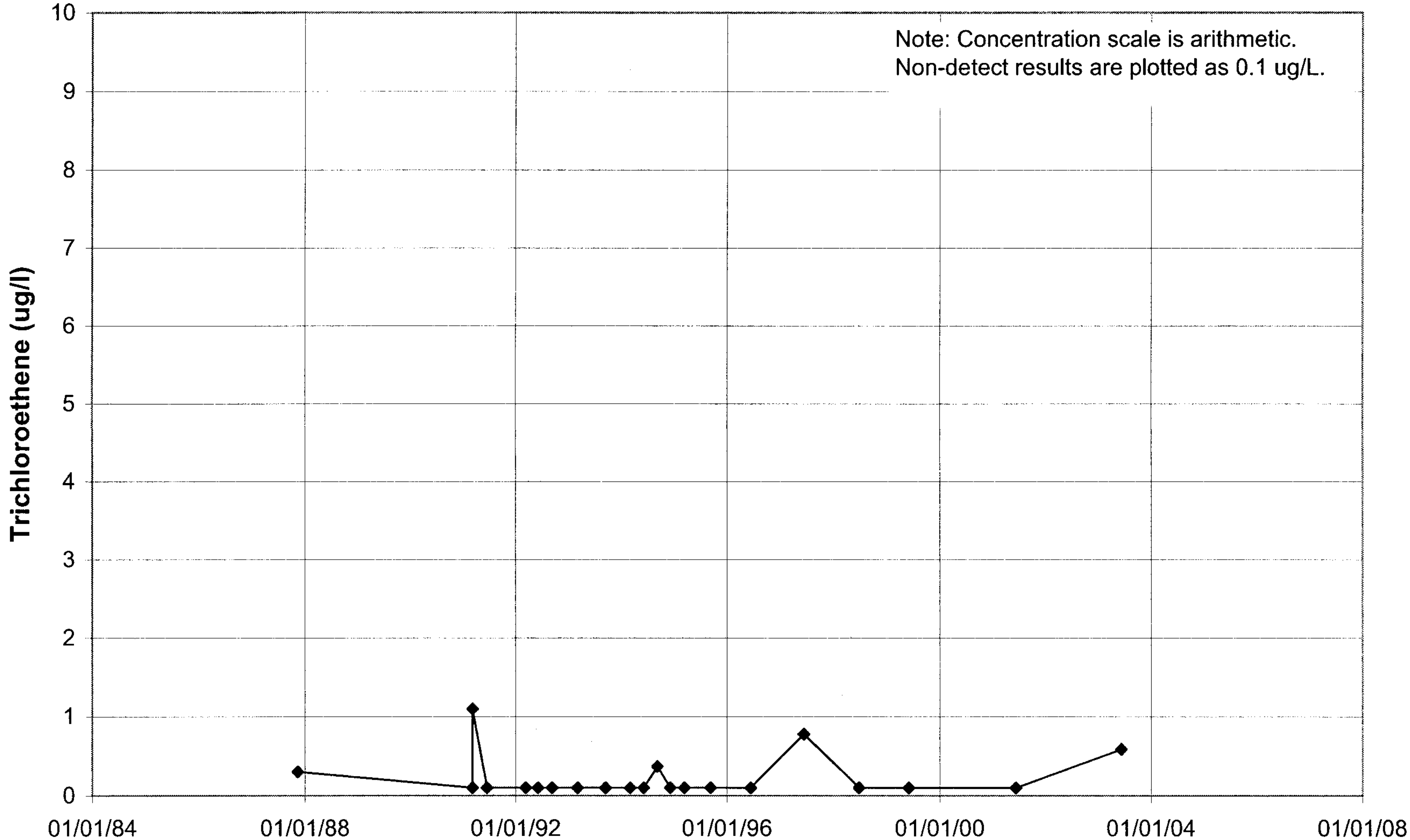

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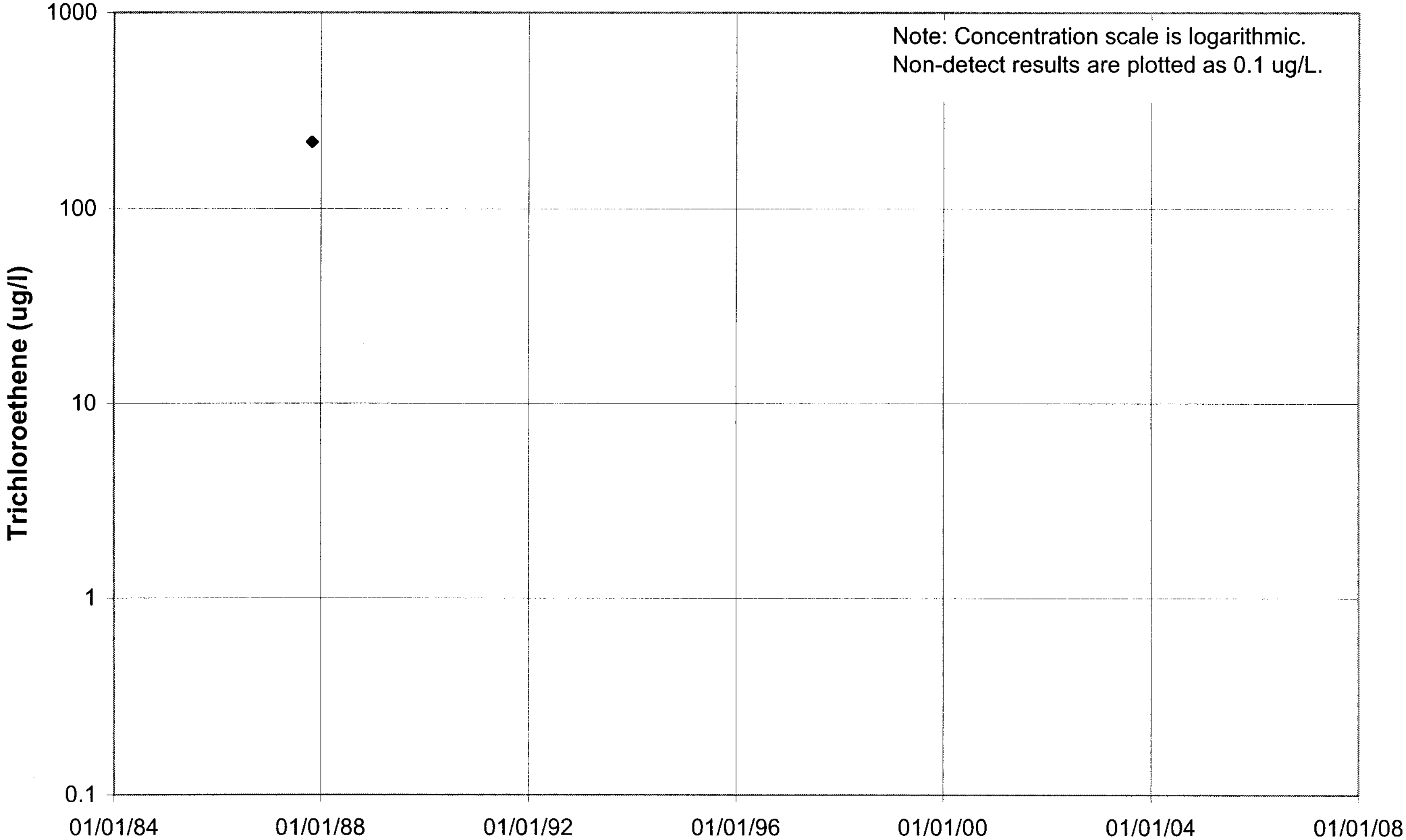

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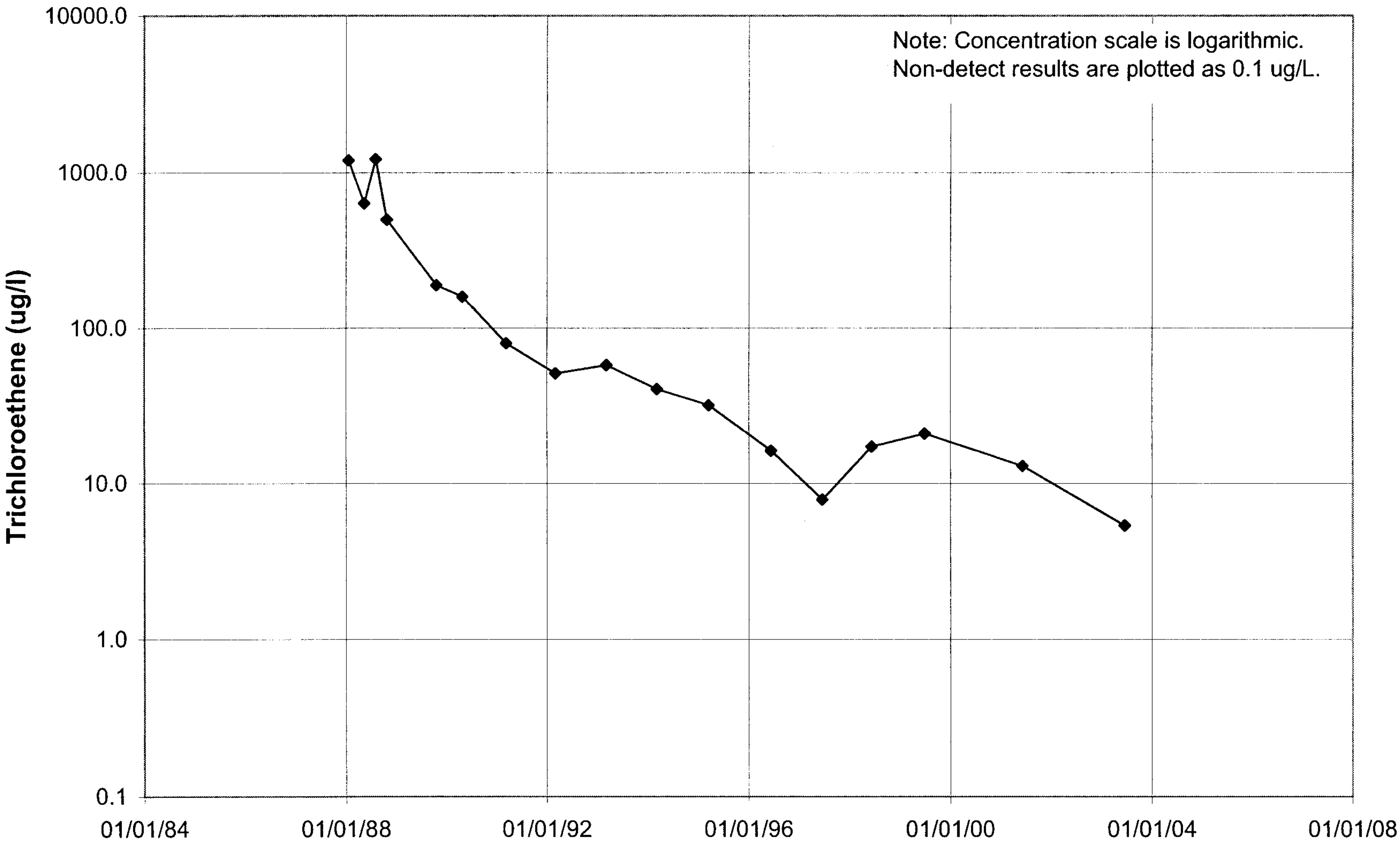

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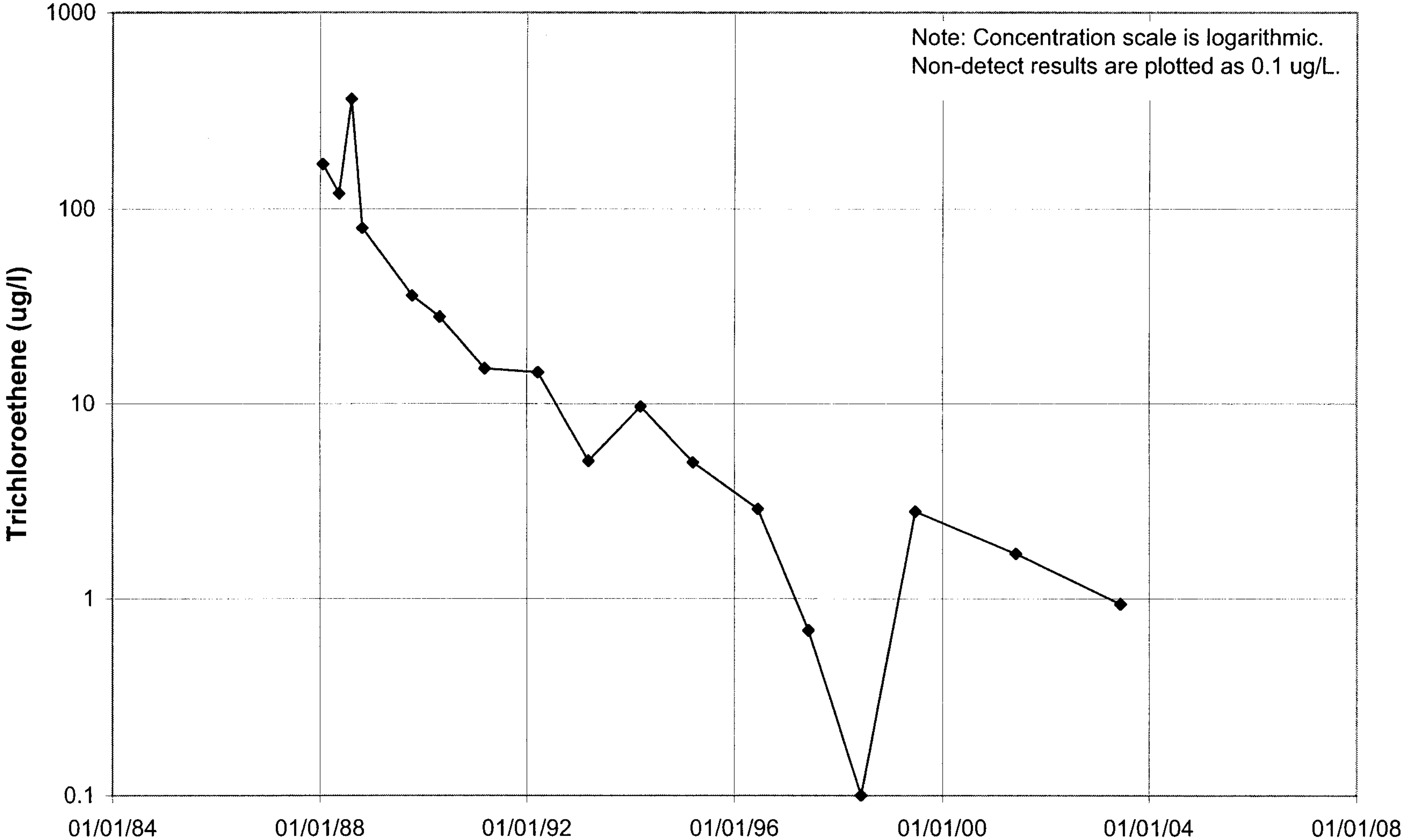

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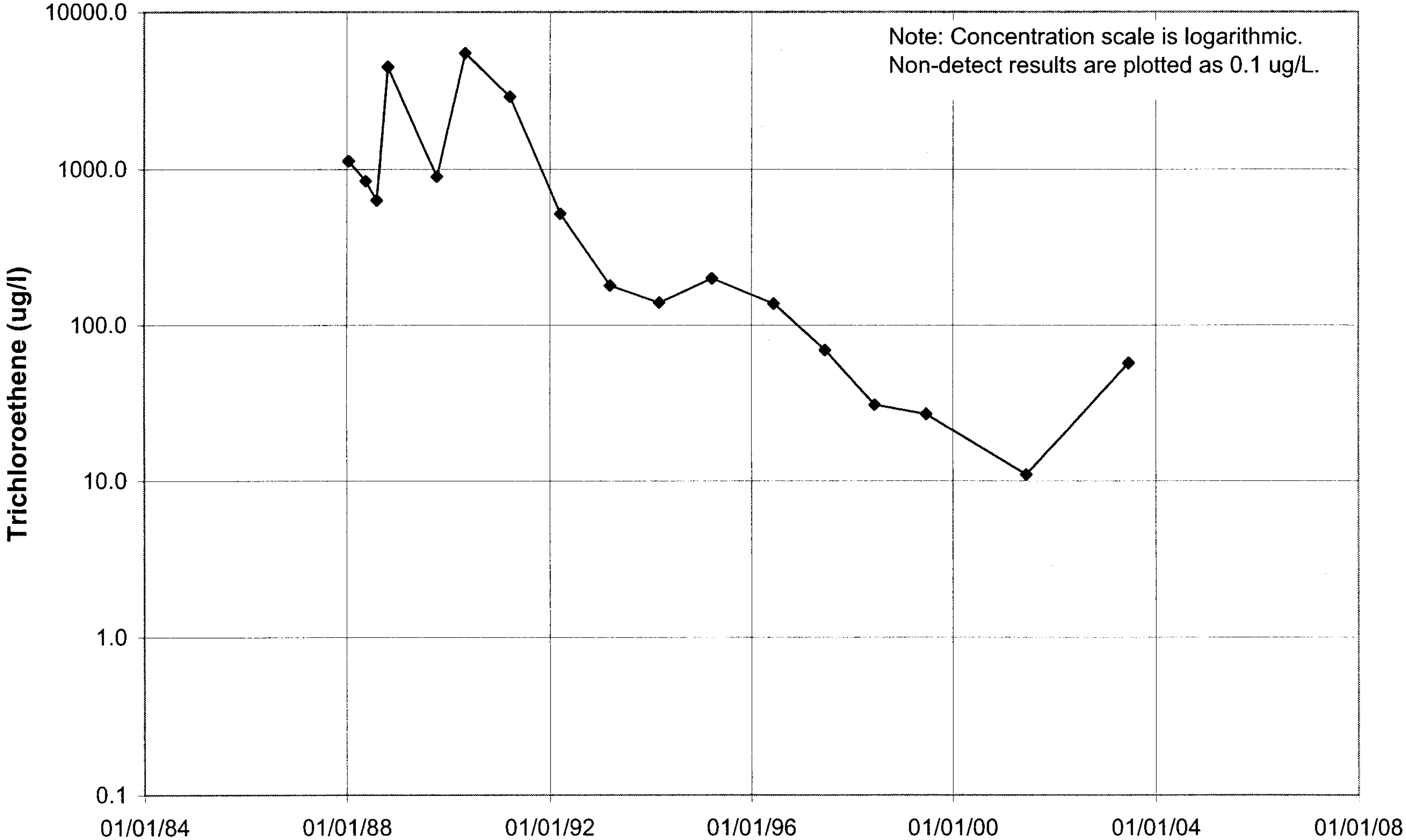

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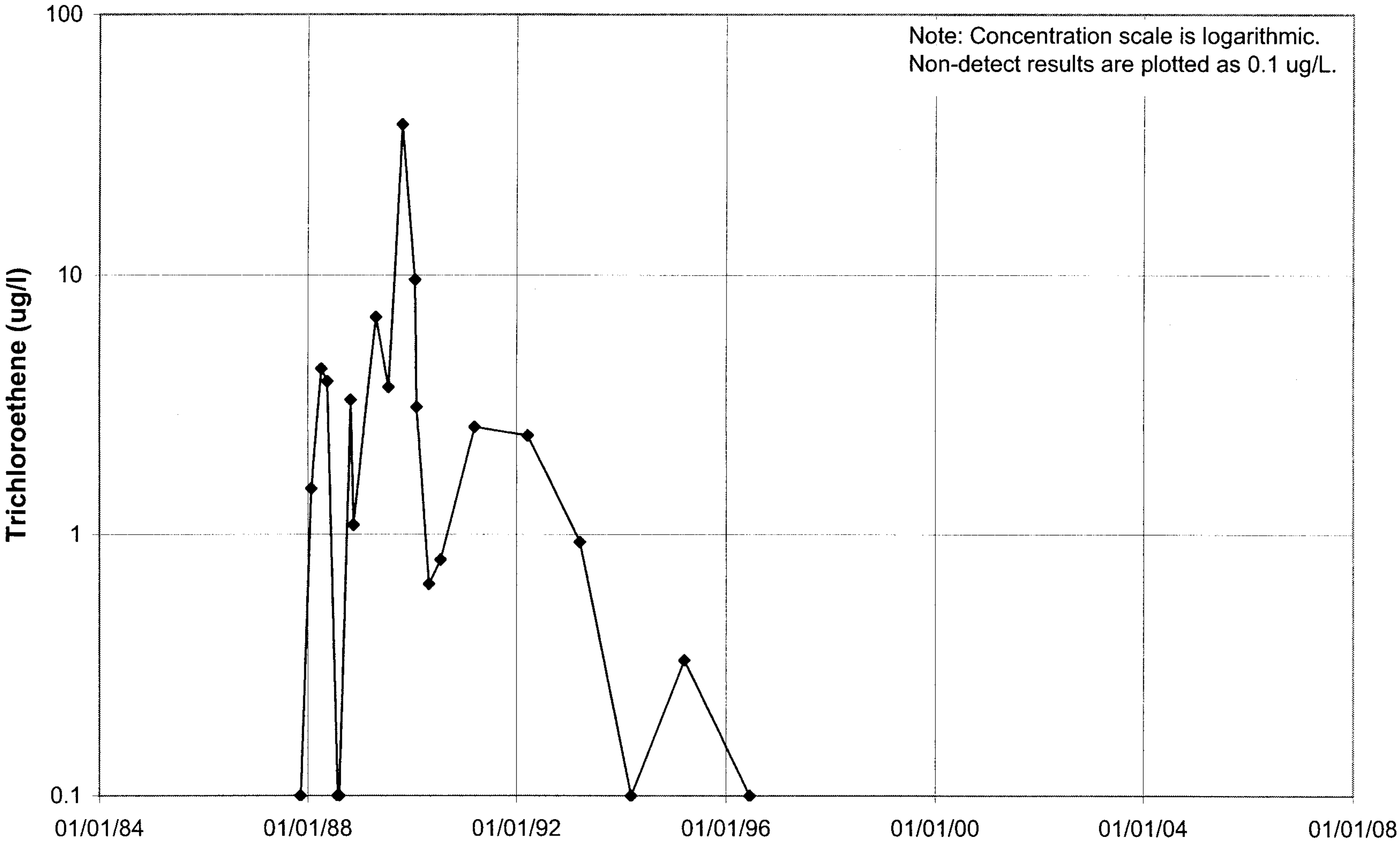

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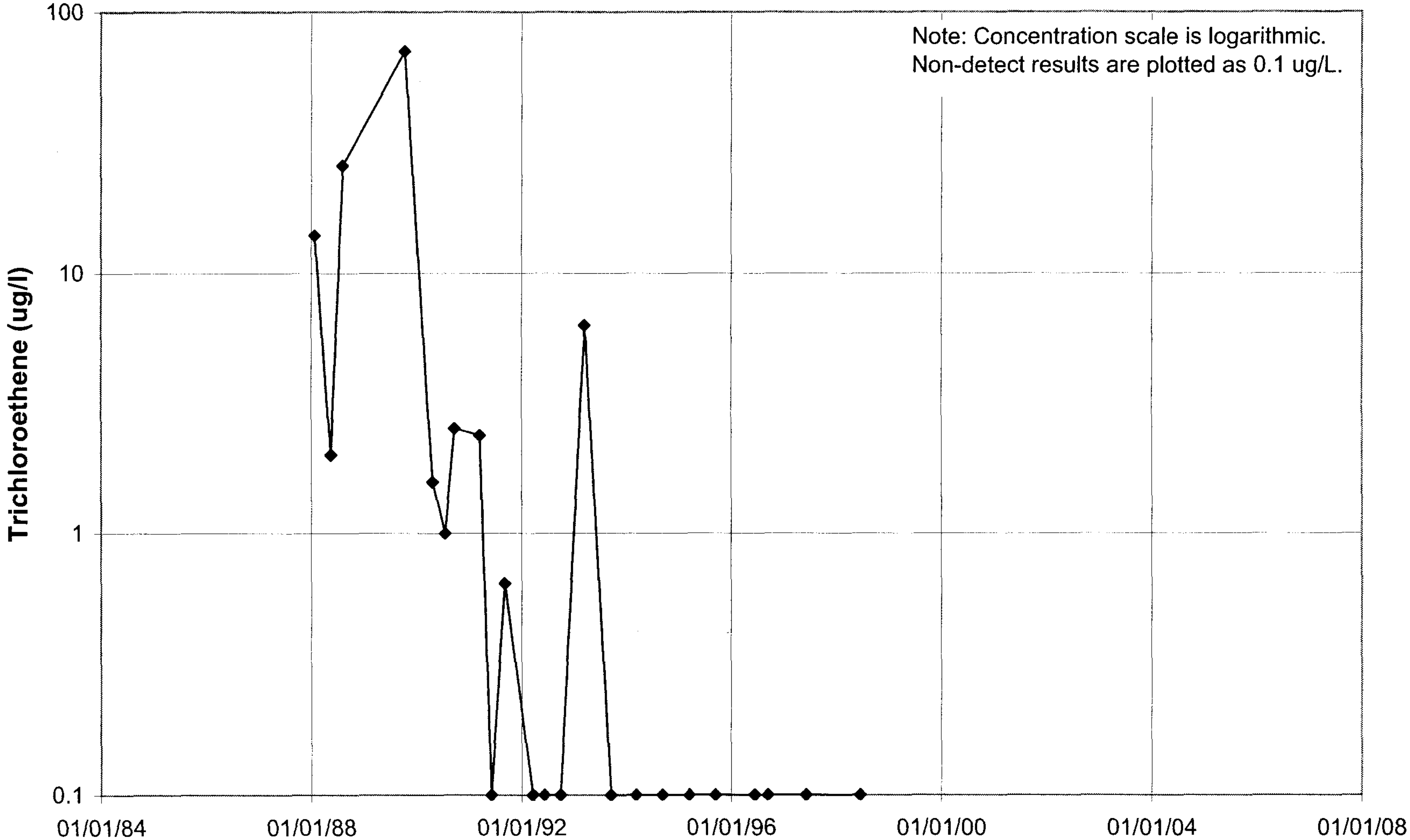

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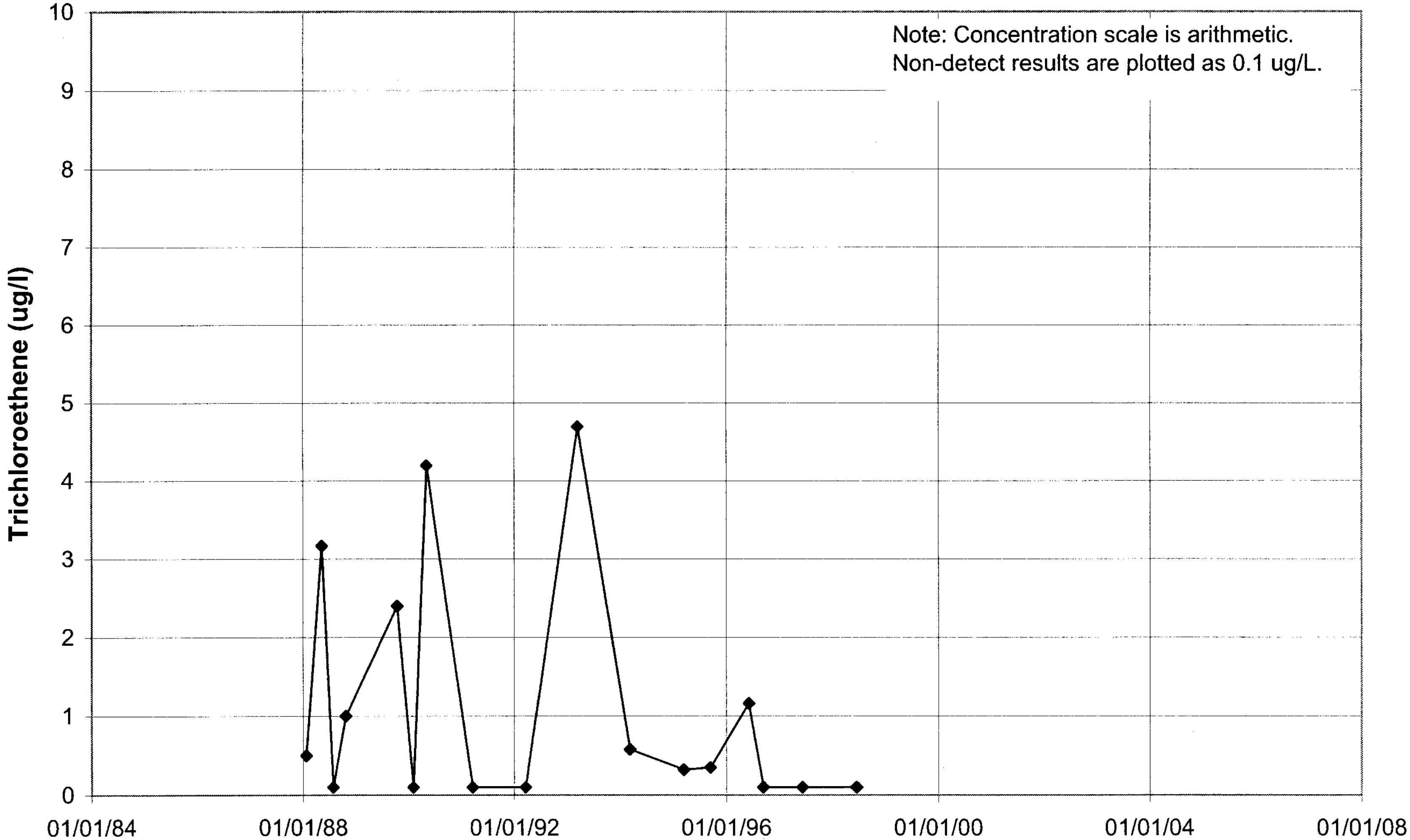

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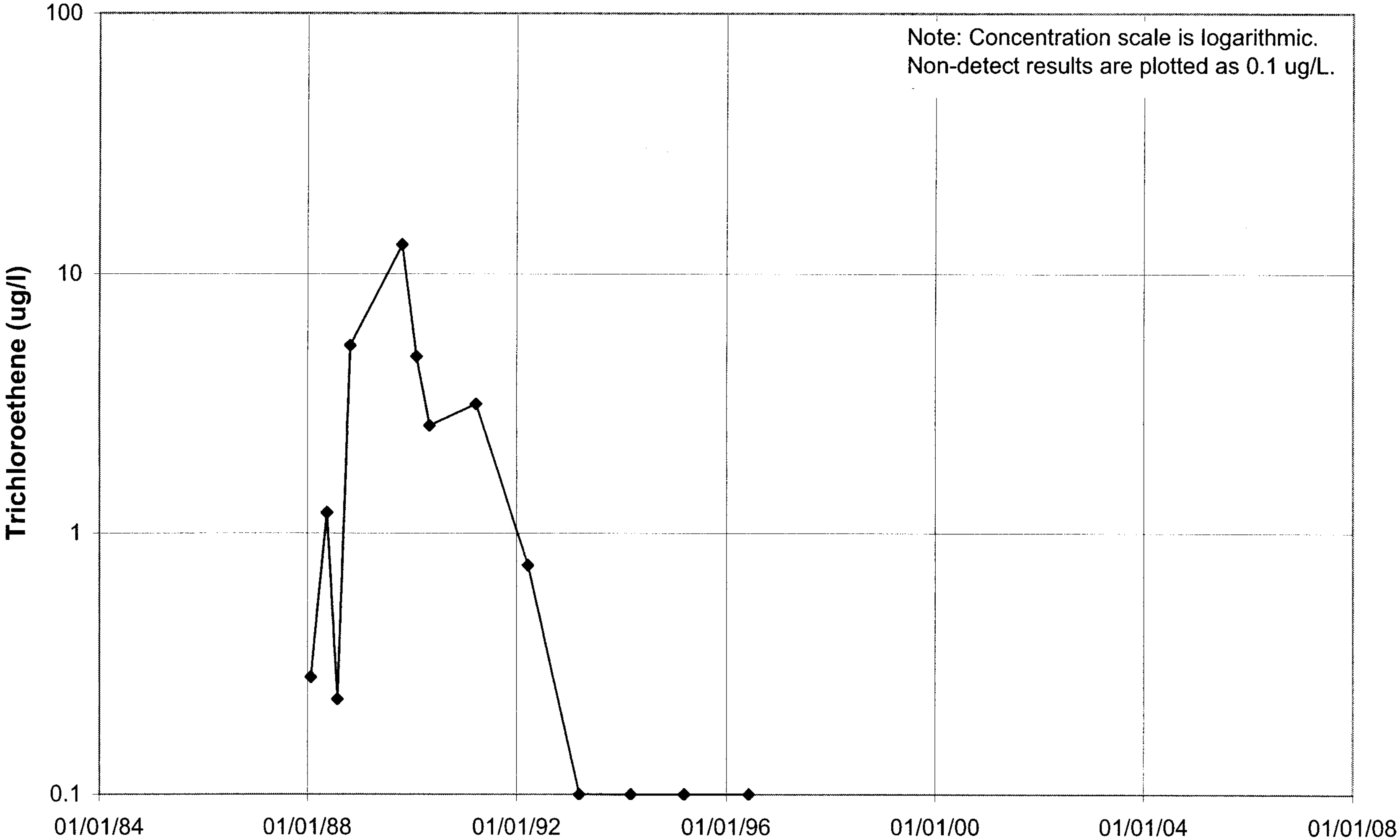

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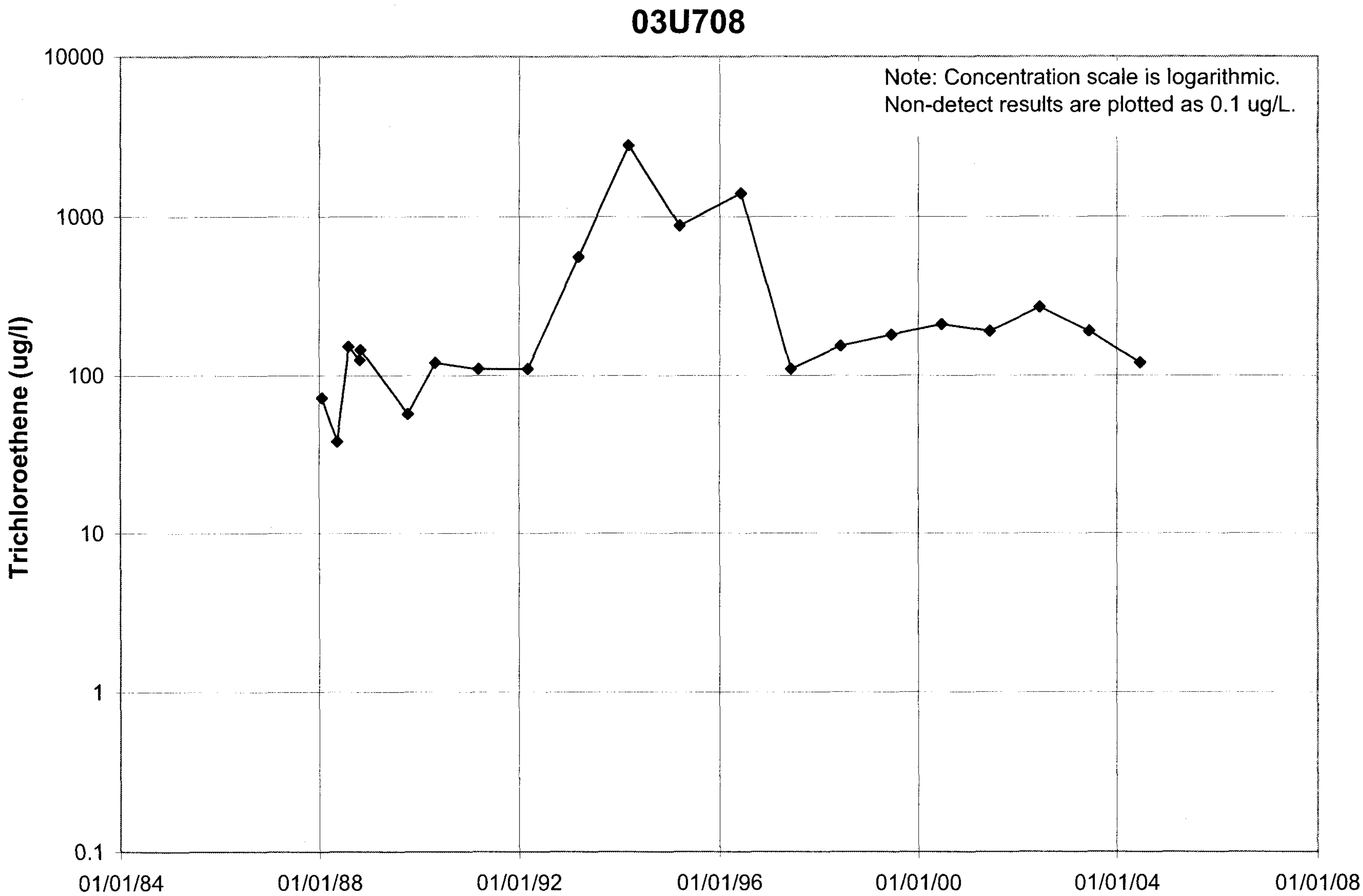

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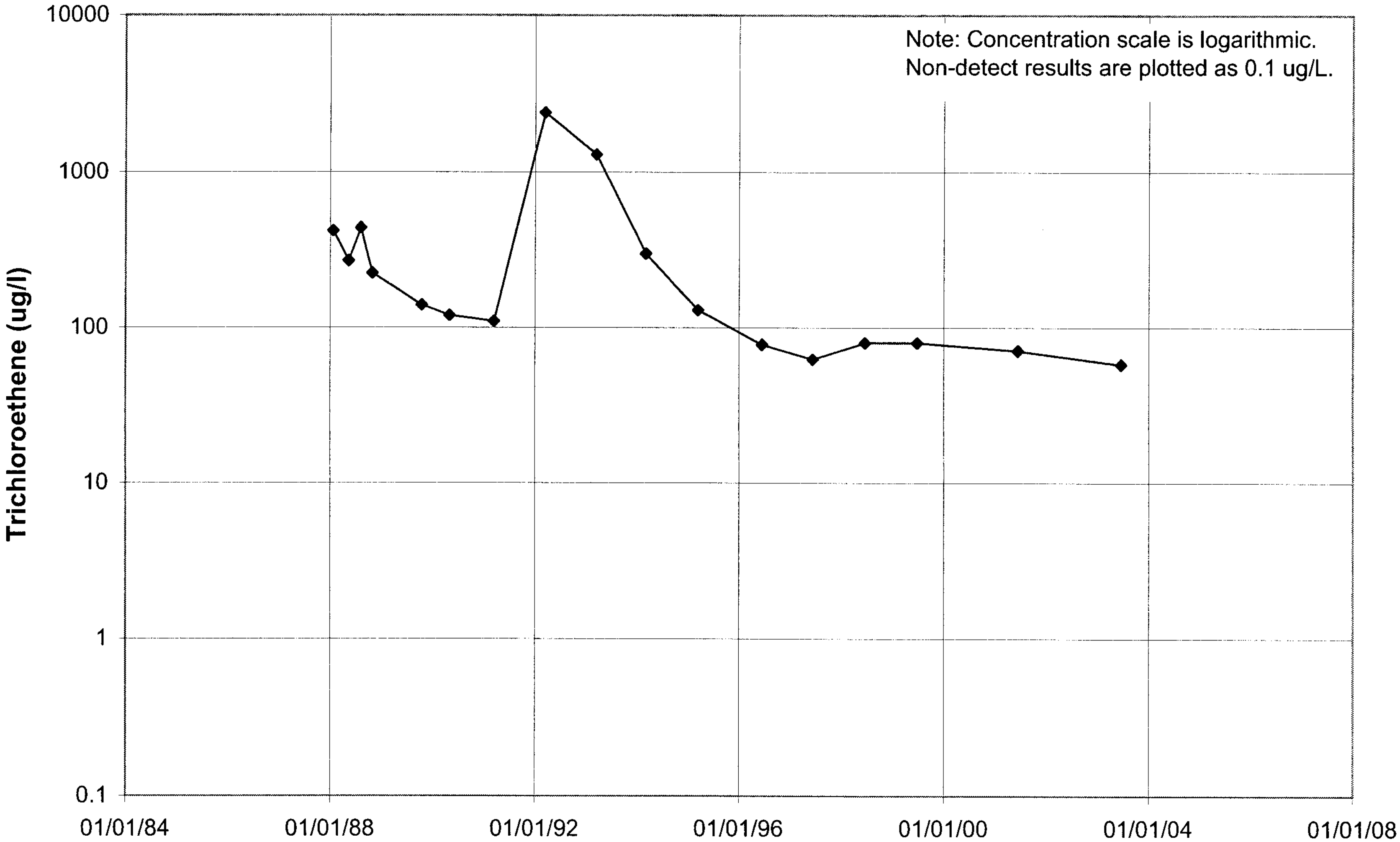

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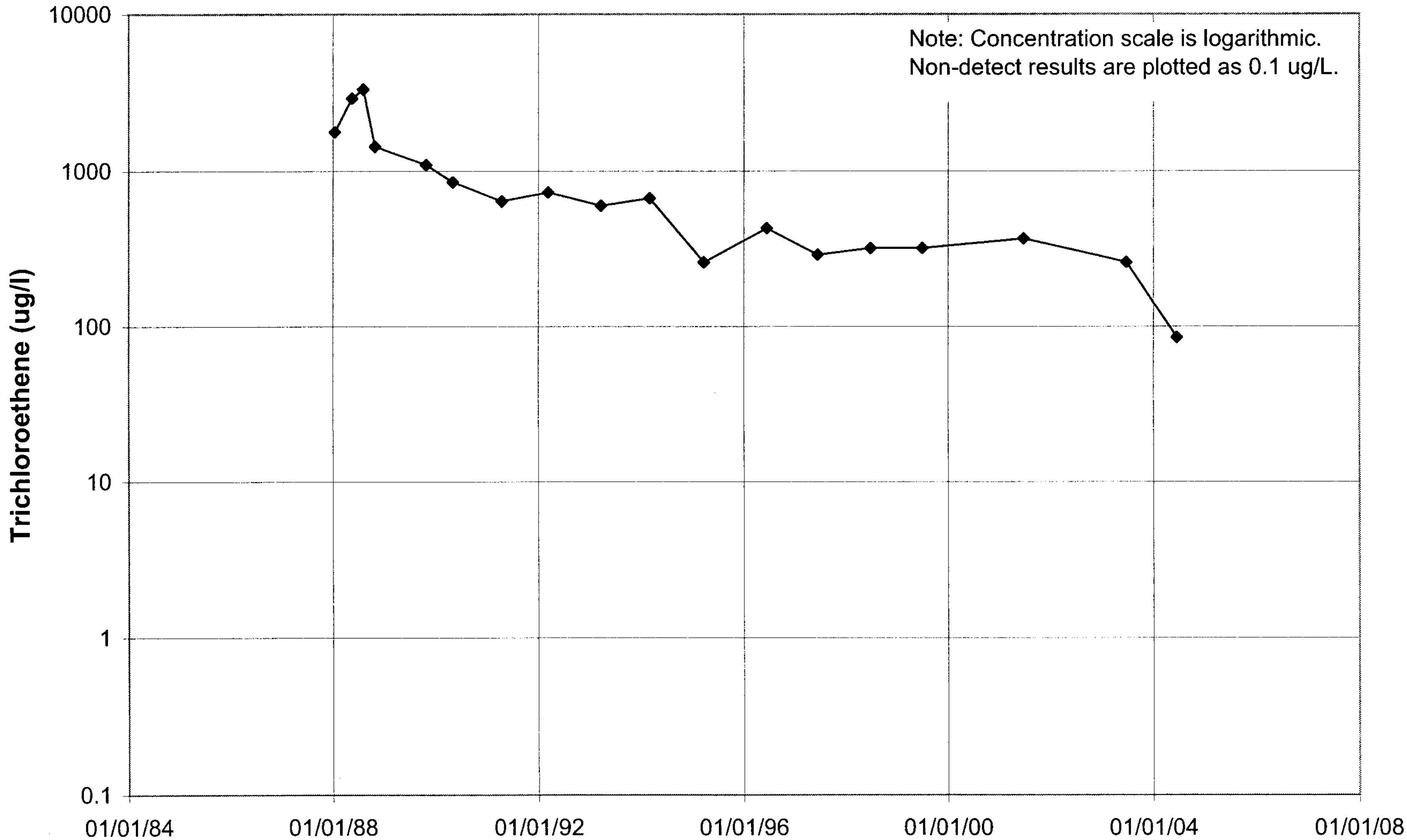

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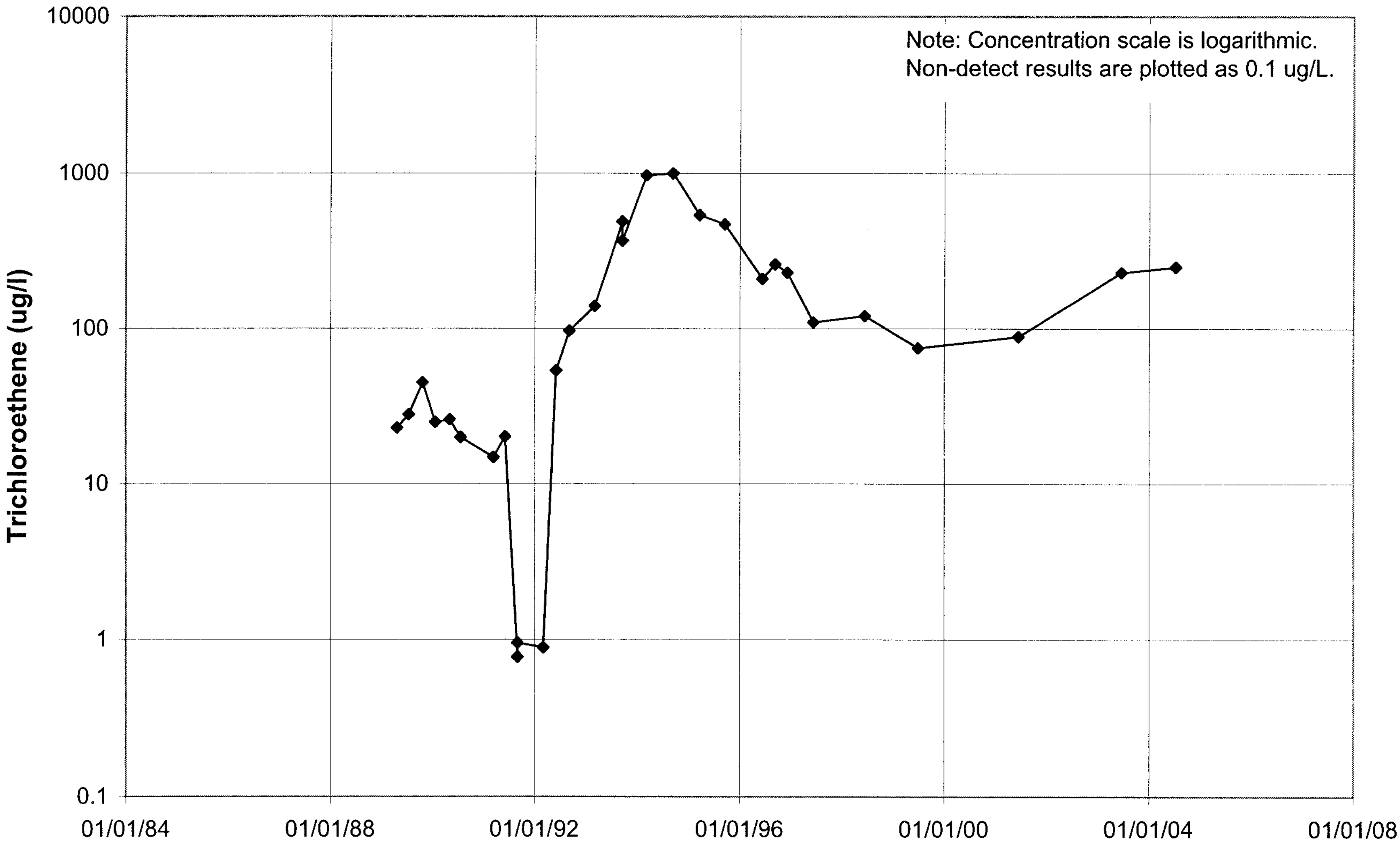

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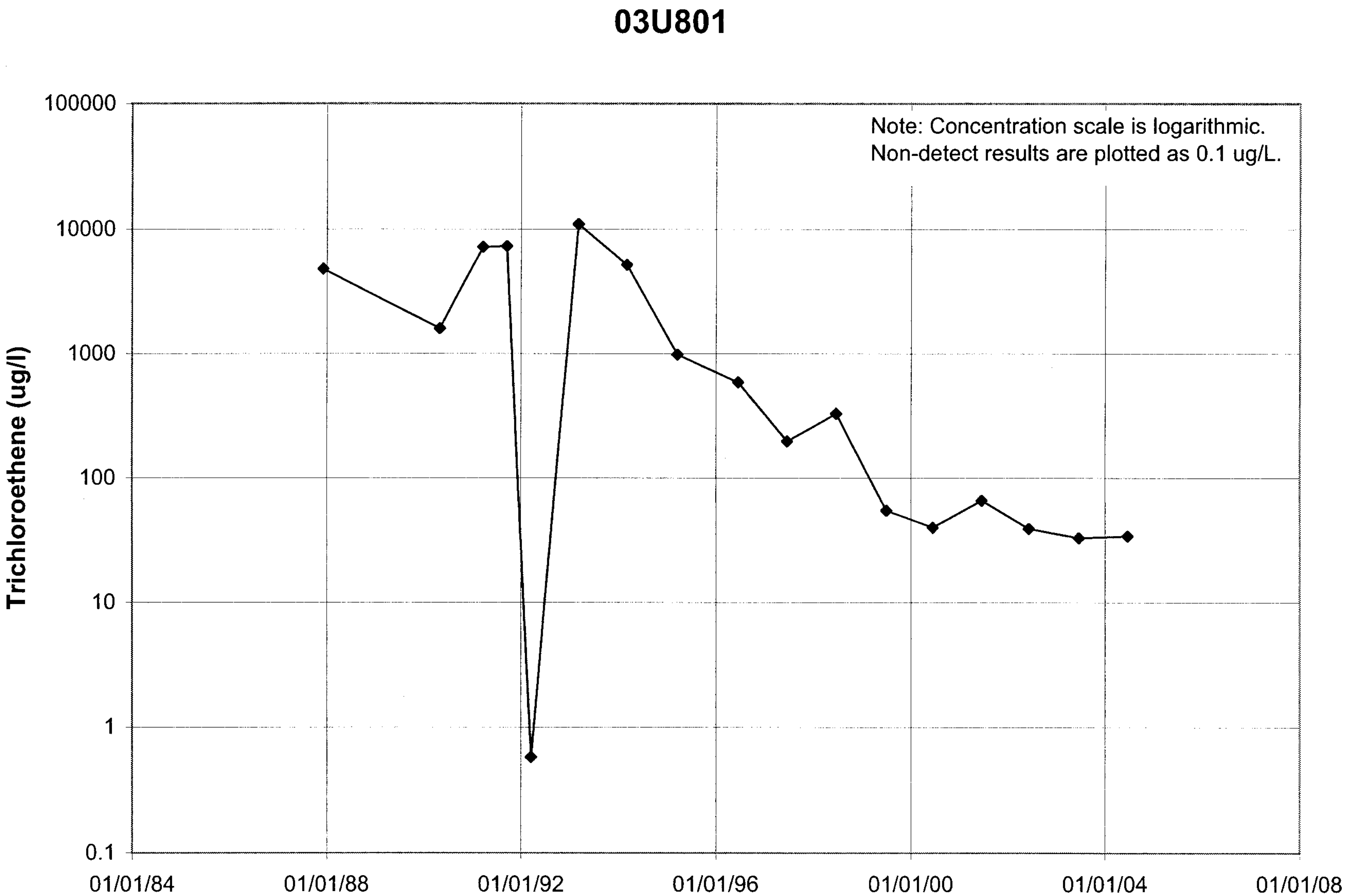

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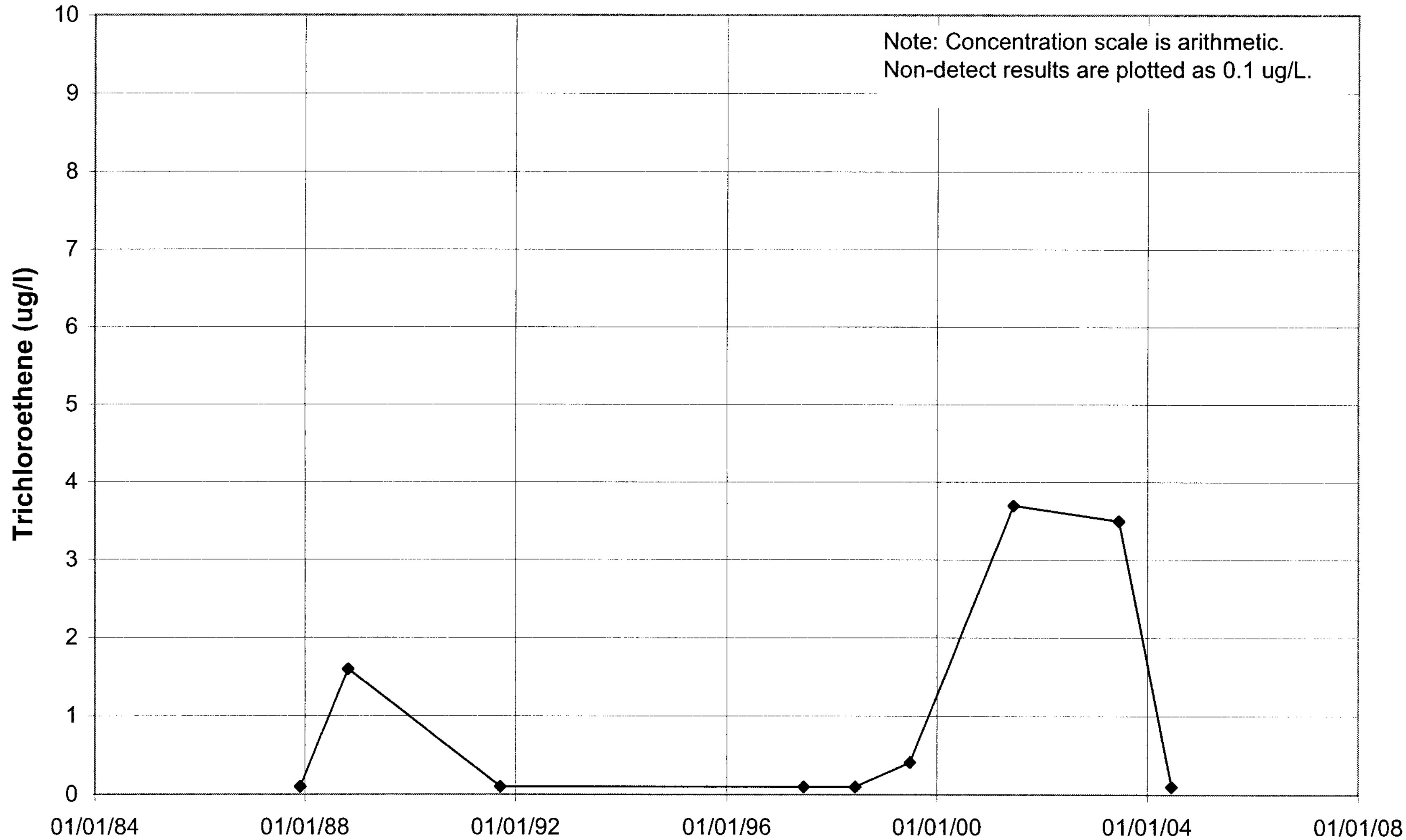

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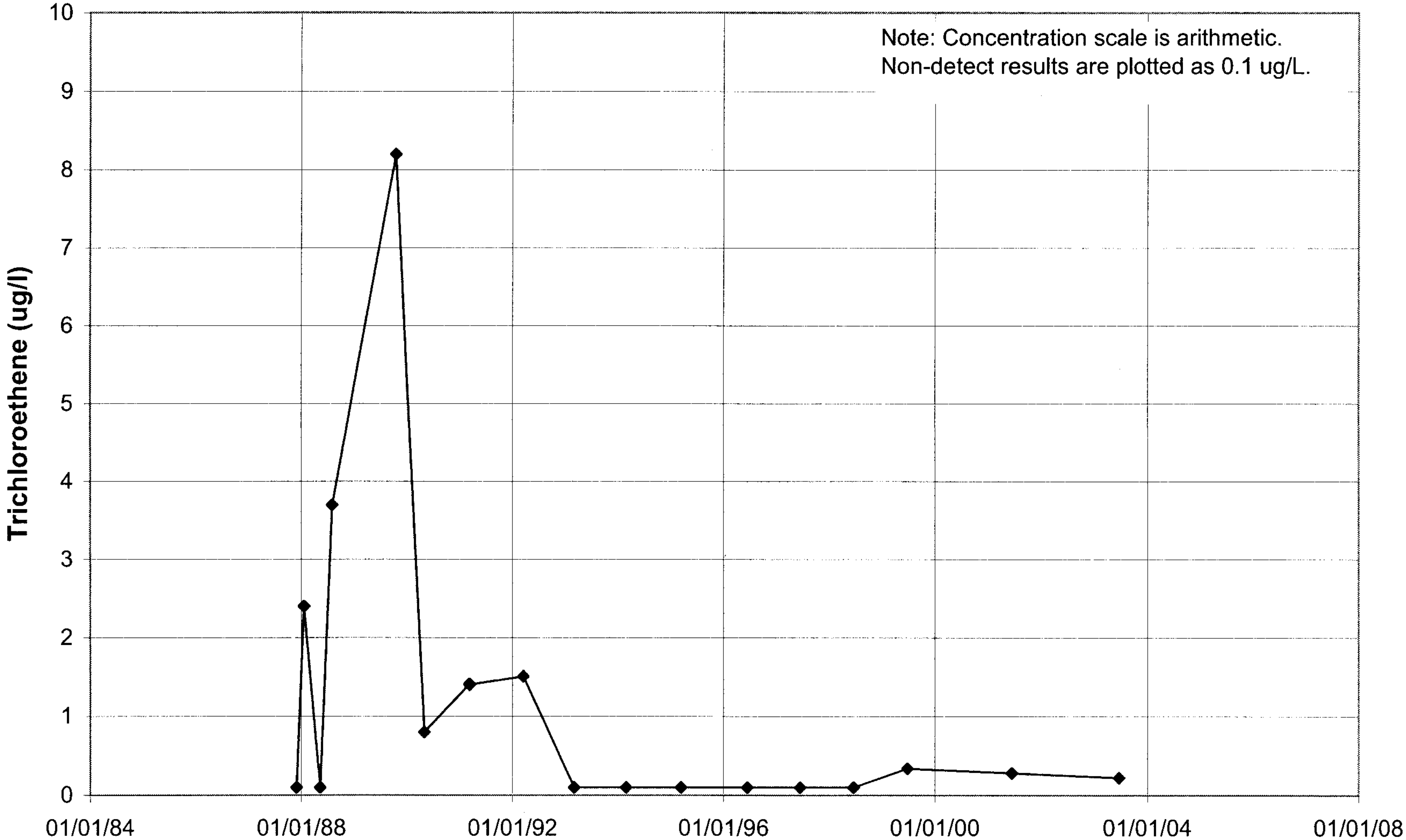

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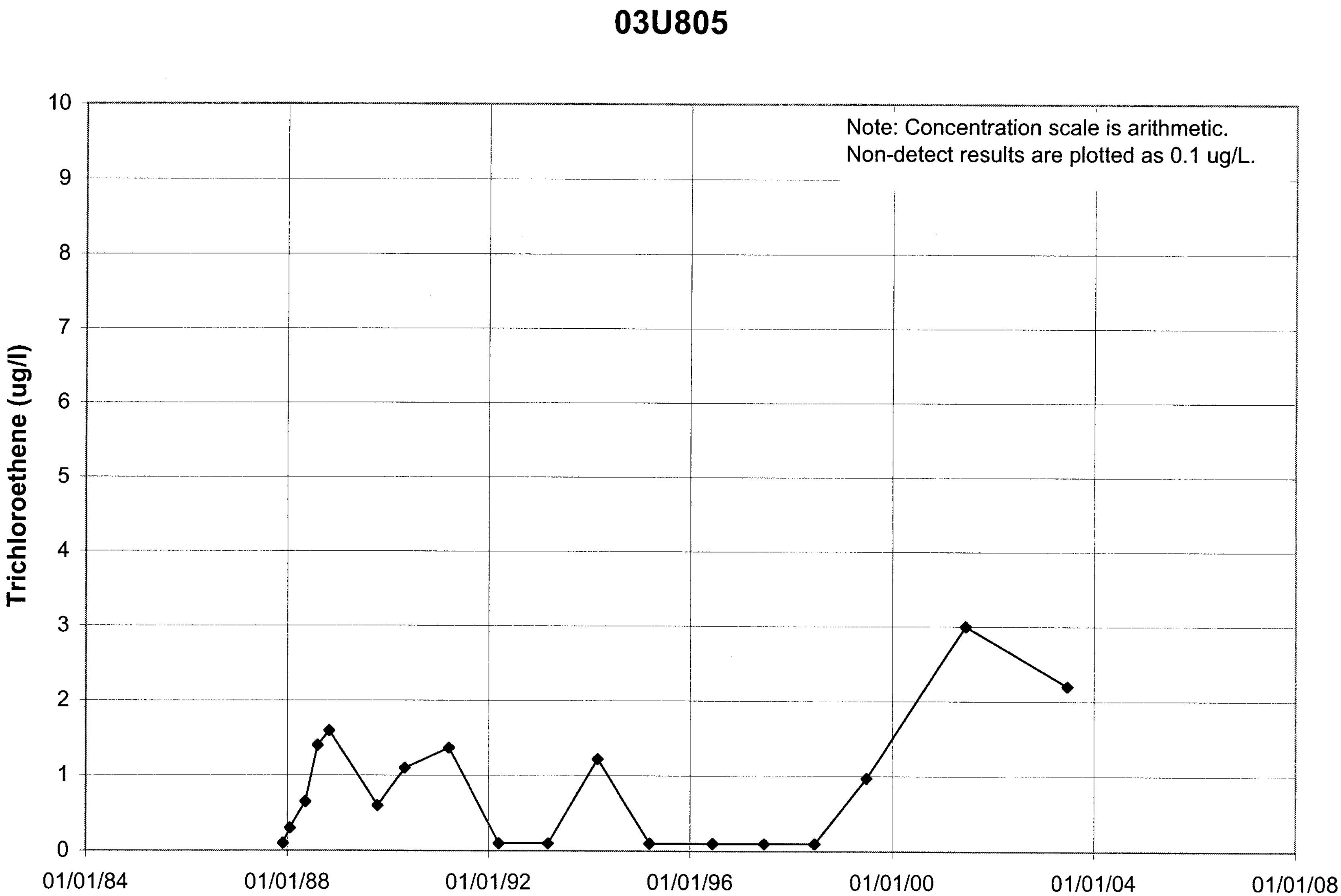

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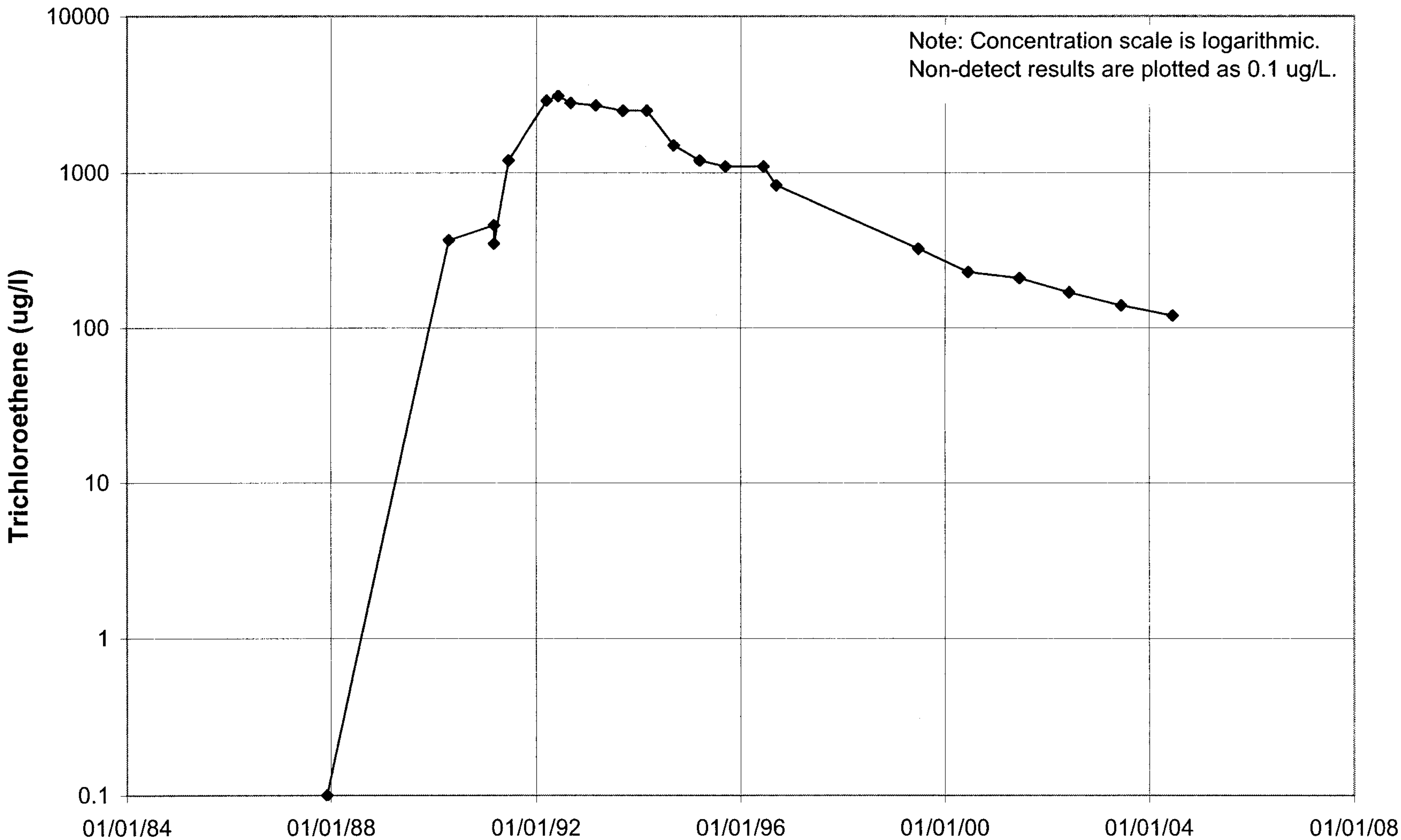

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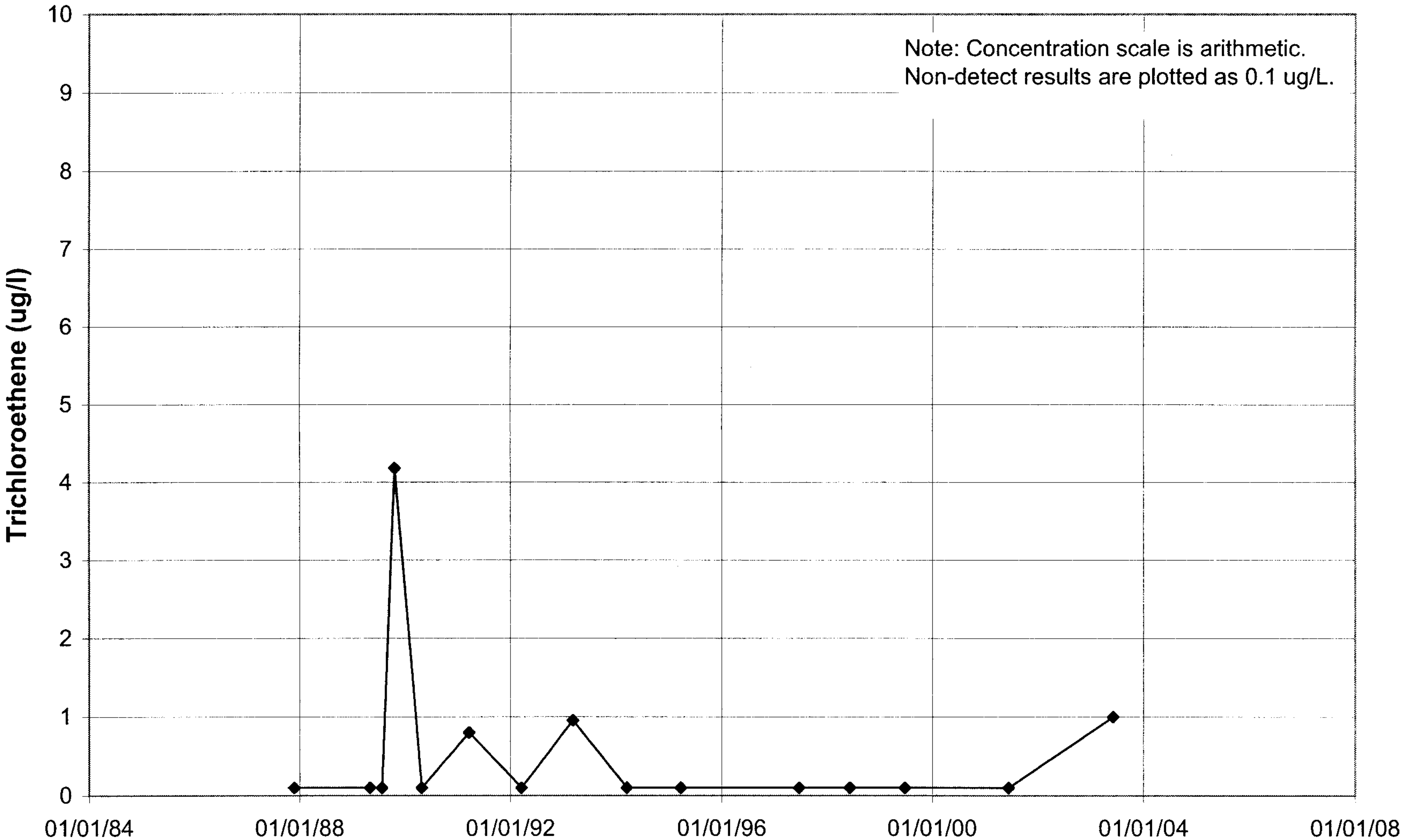

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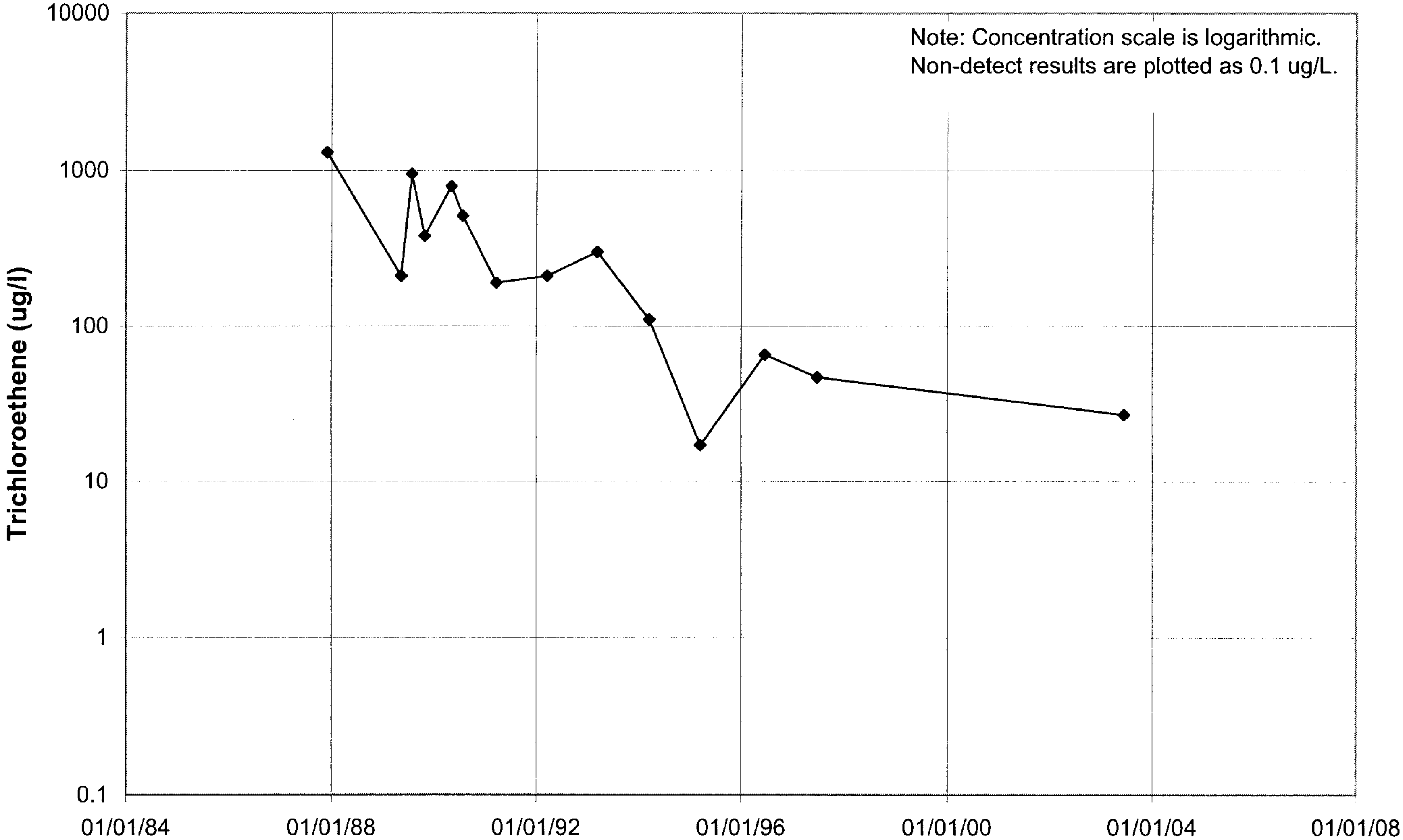

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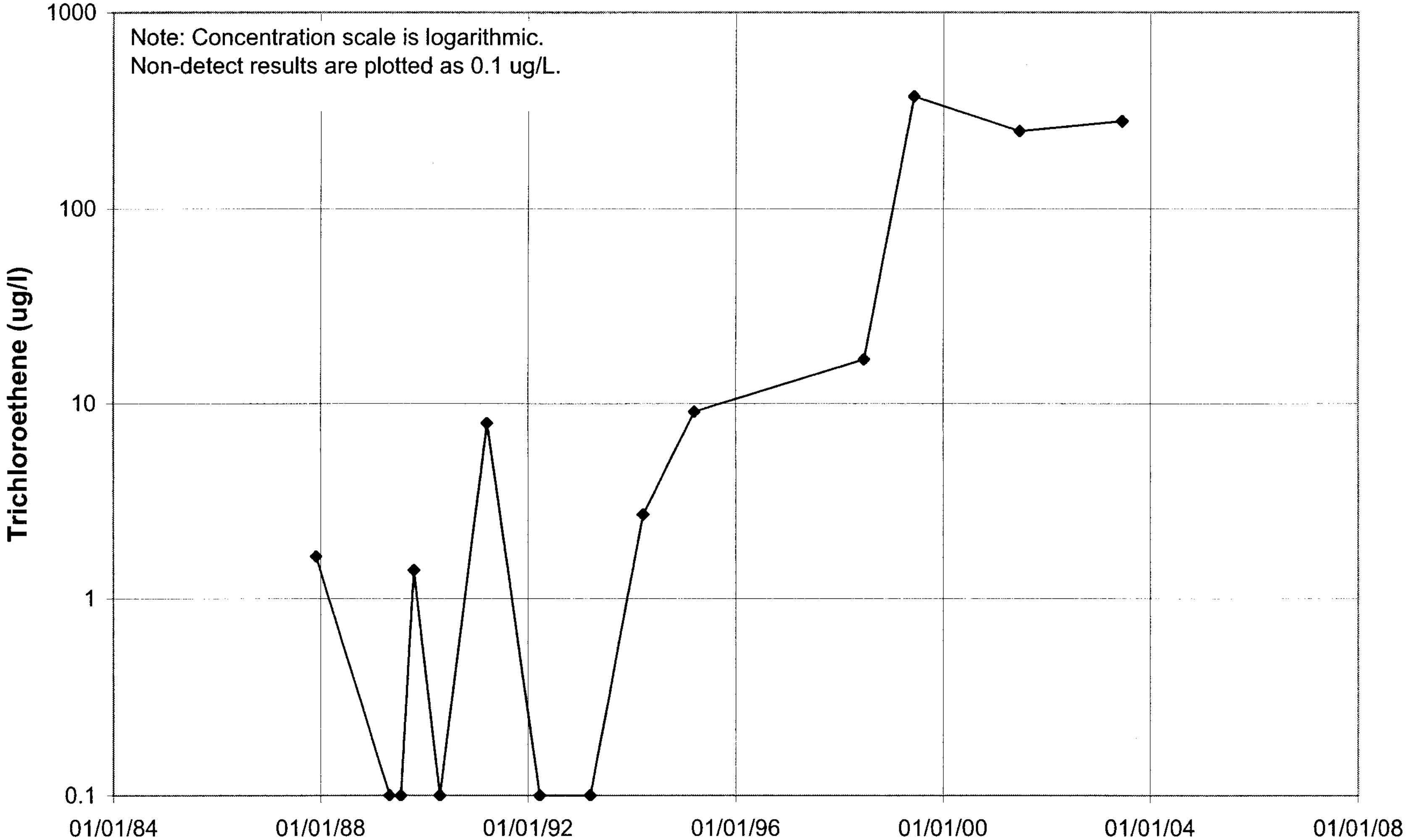

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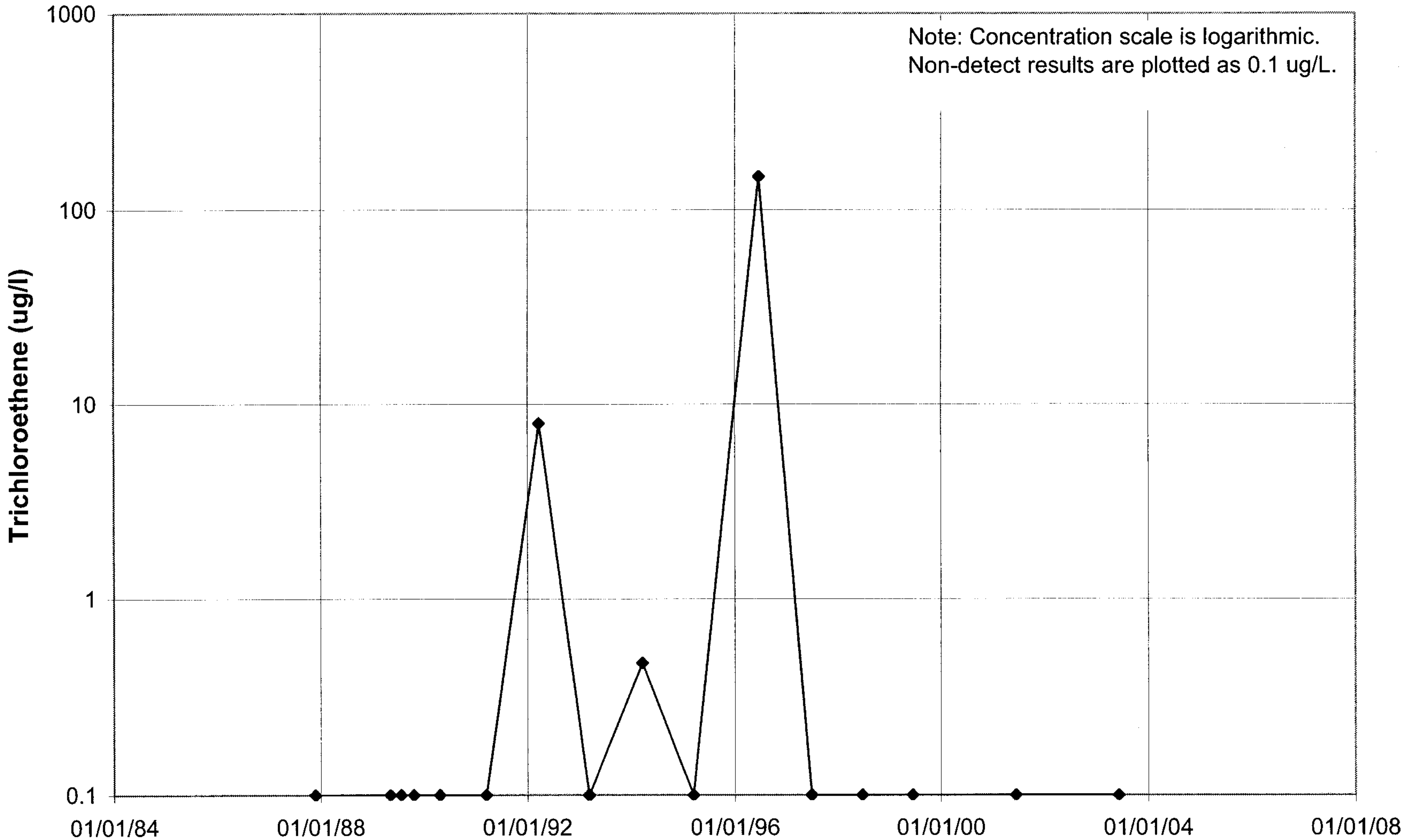
03U831



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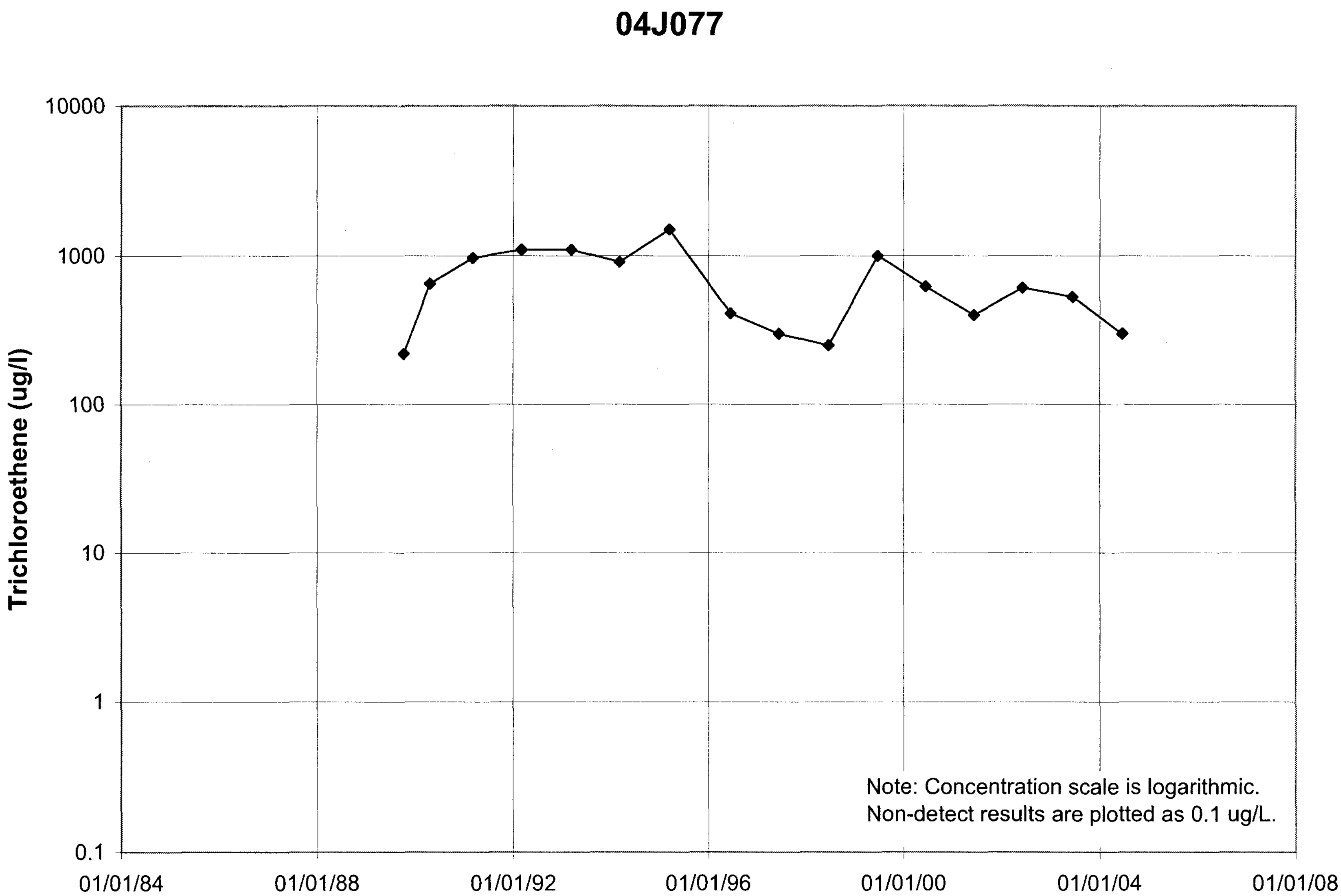

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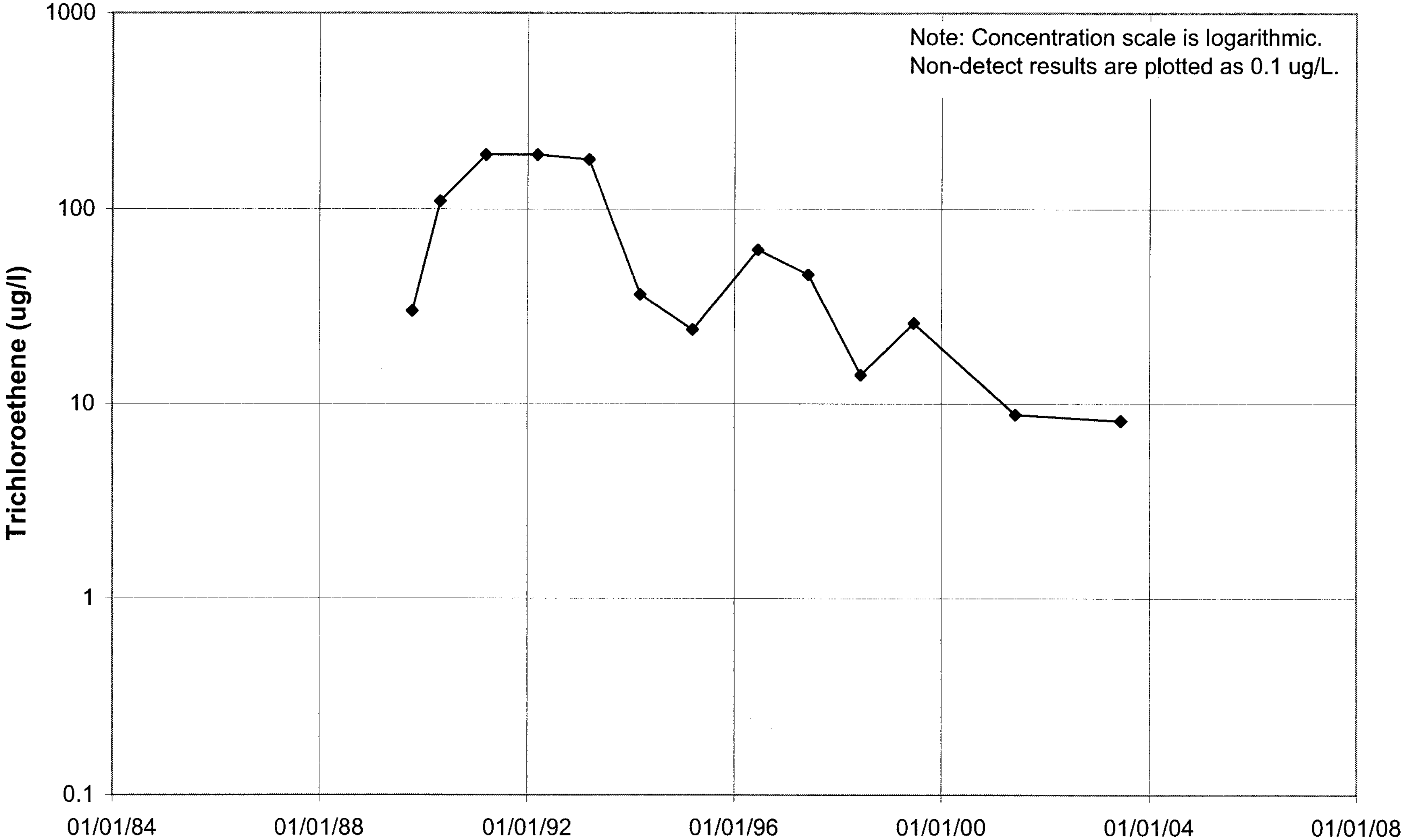

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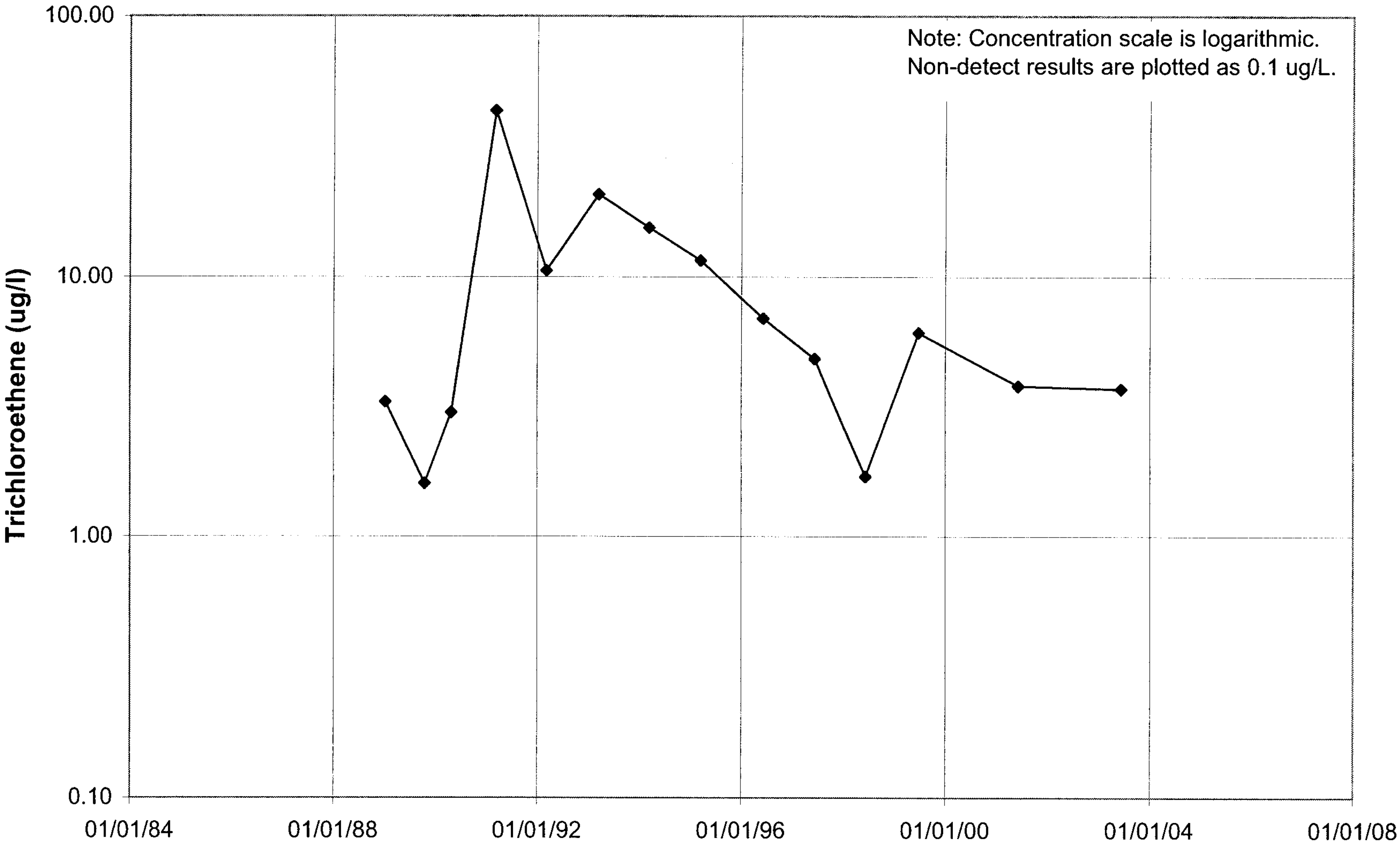

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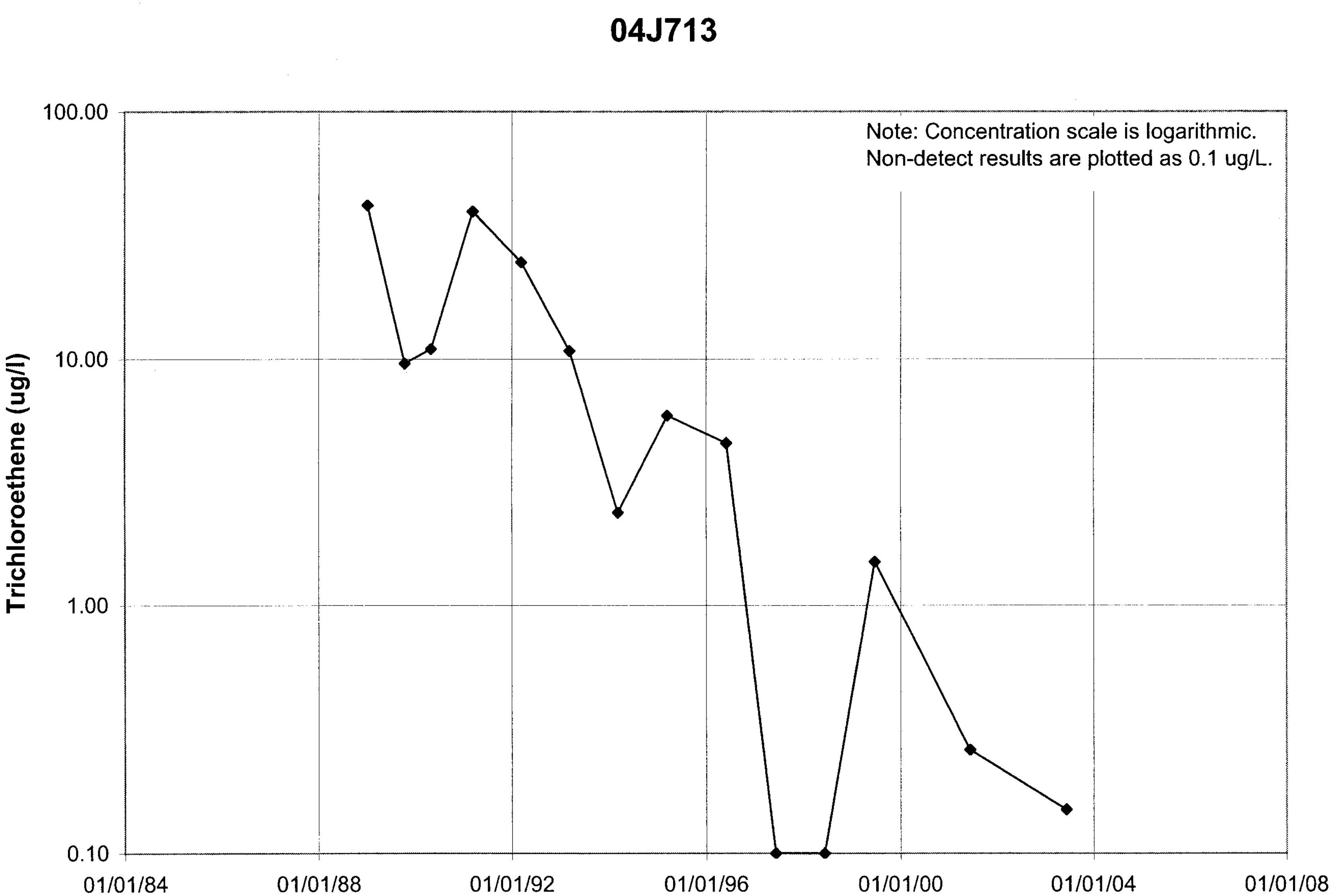

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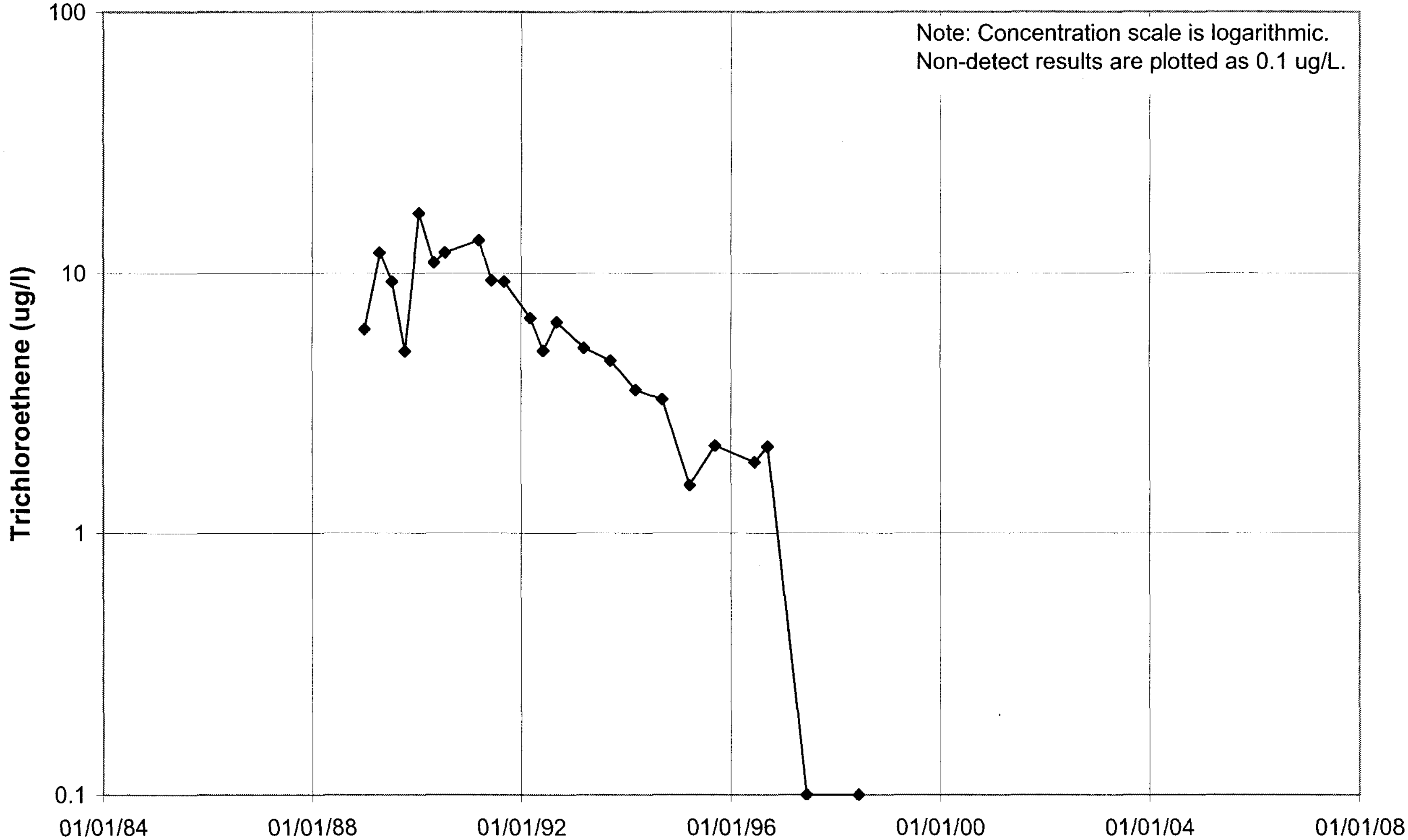

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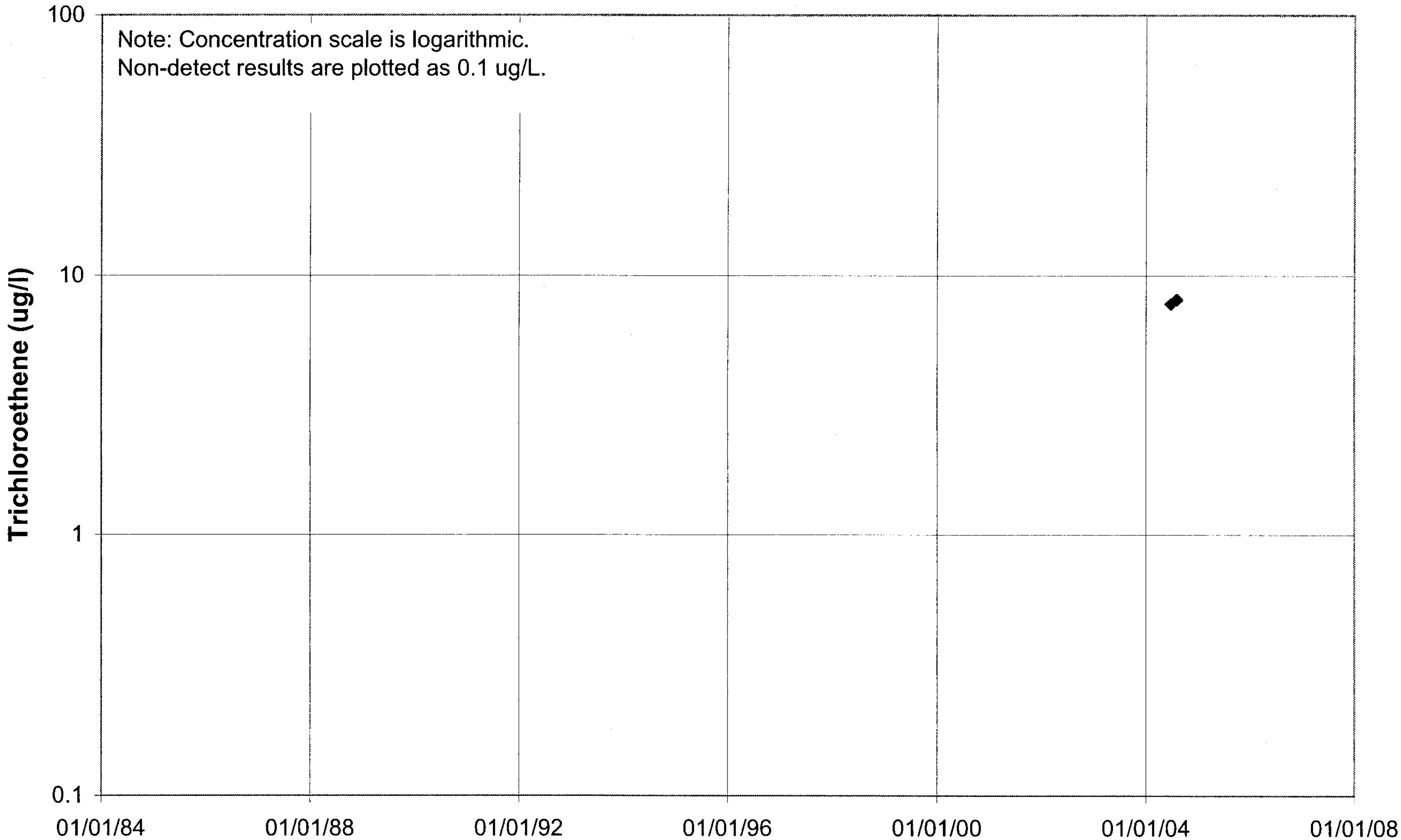

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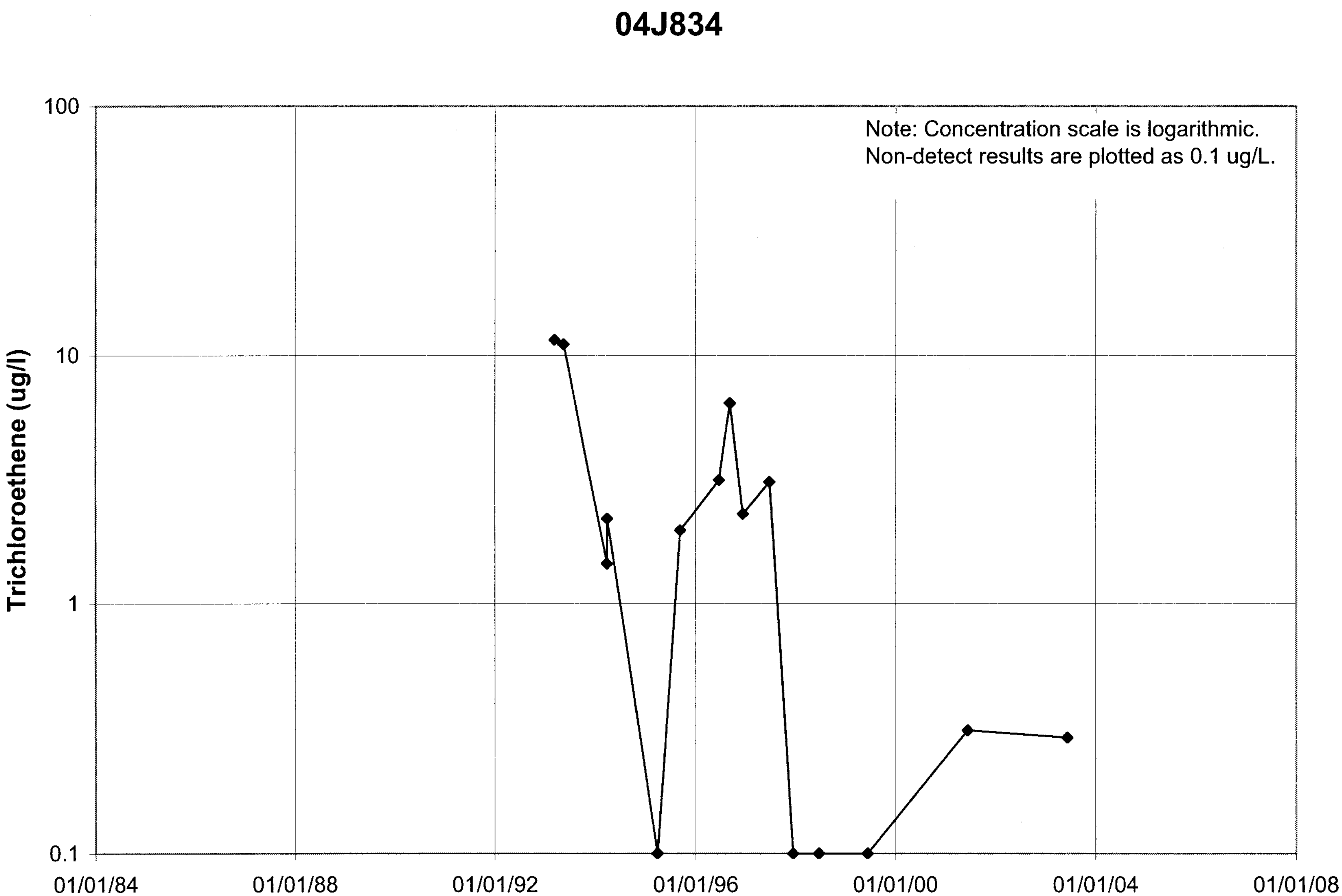

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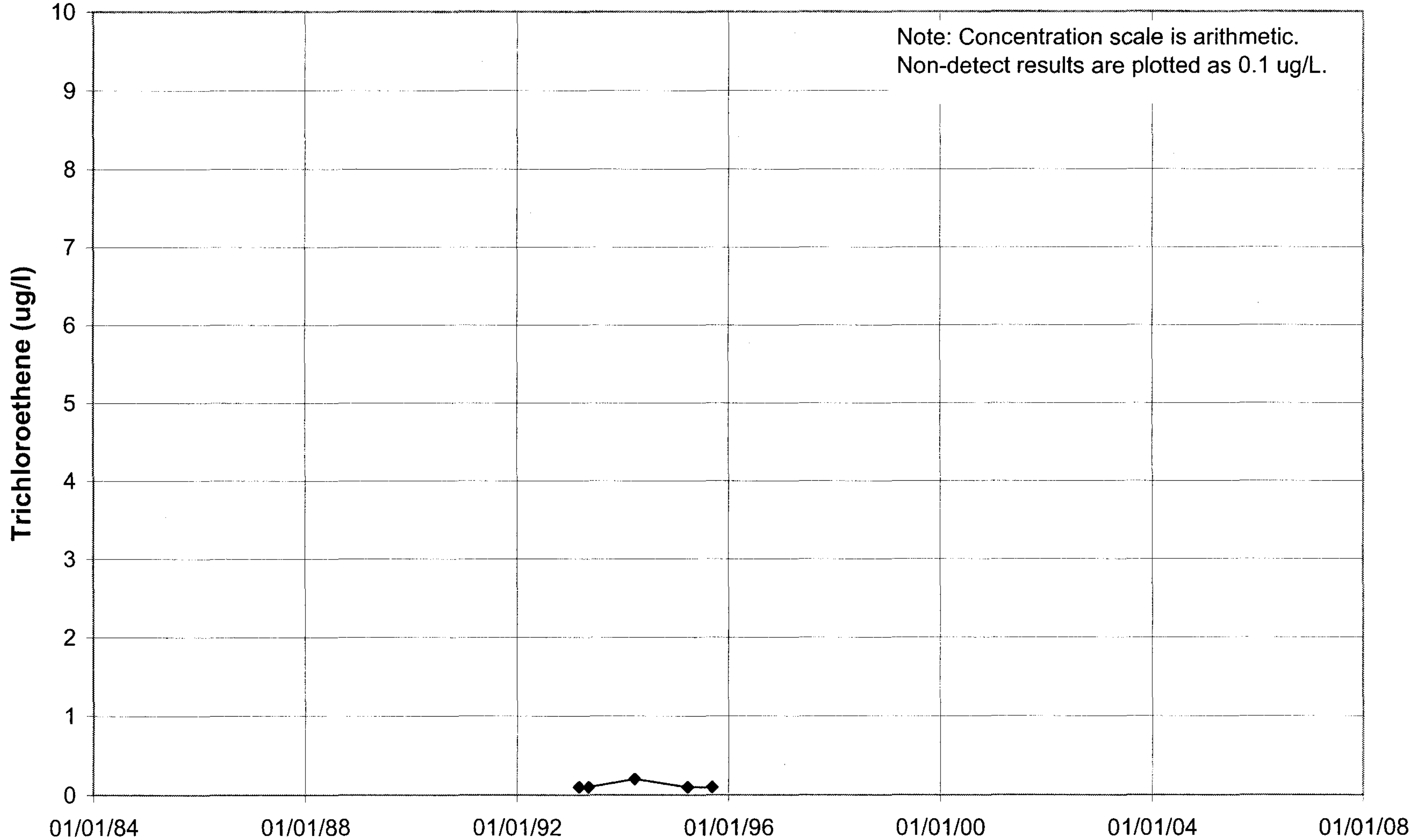

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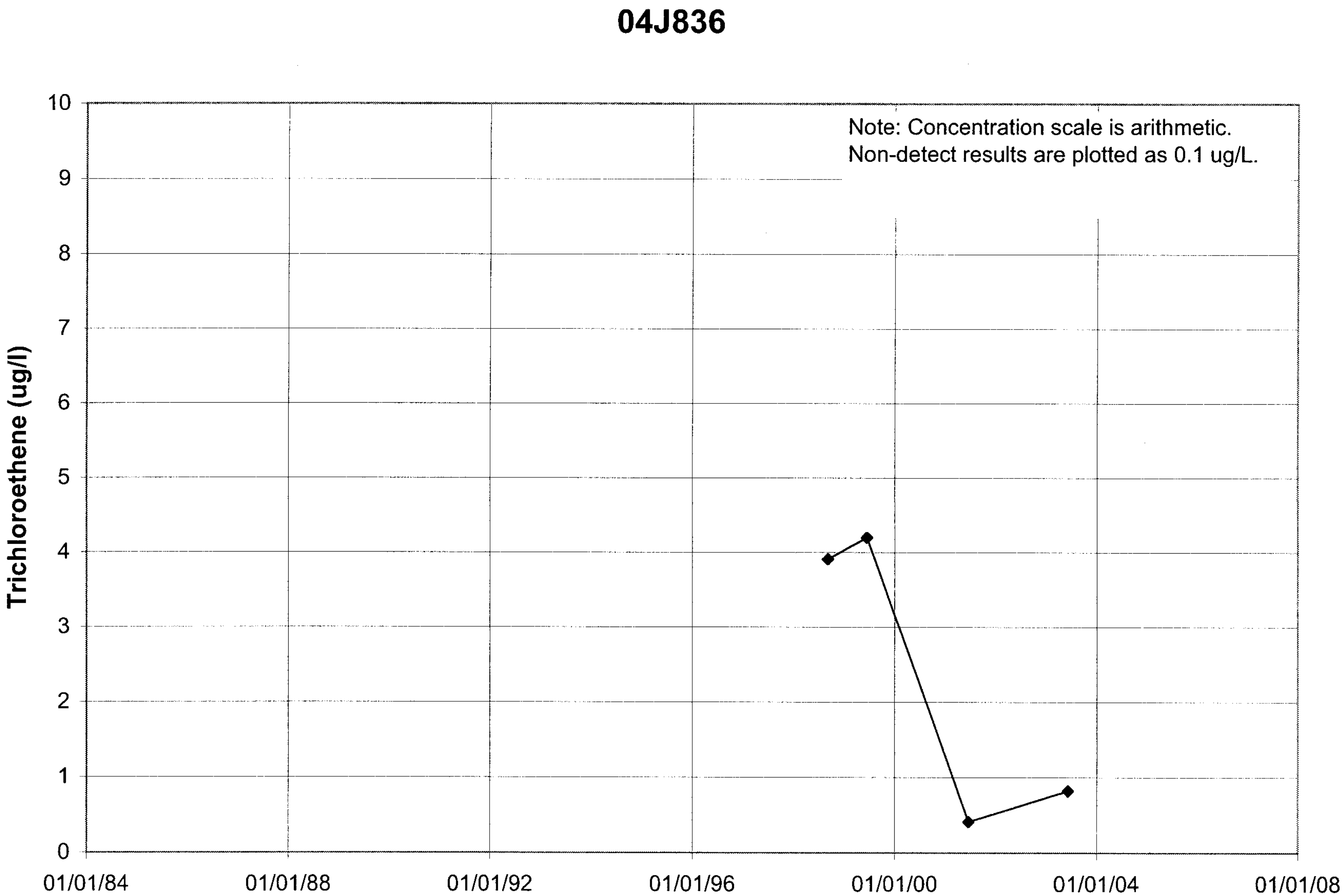

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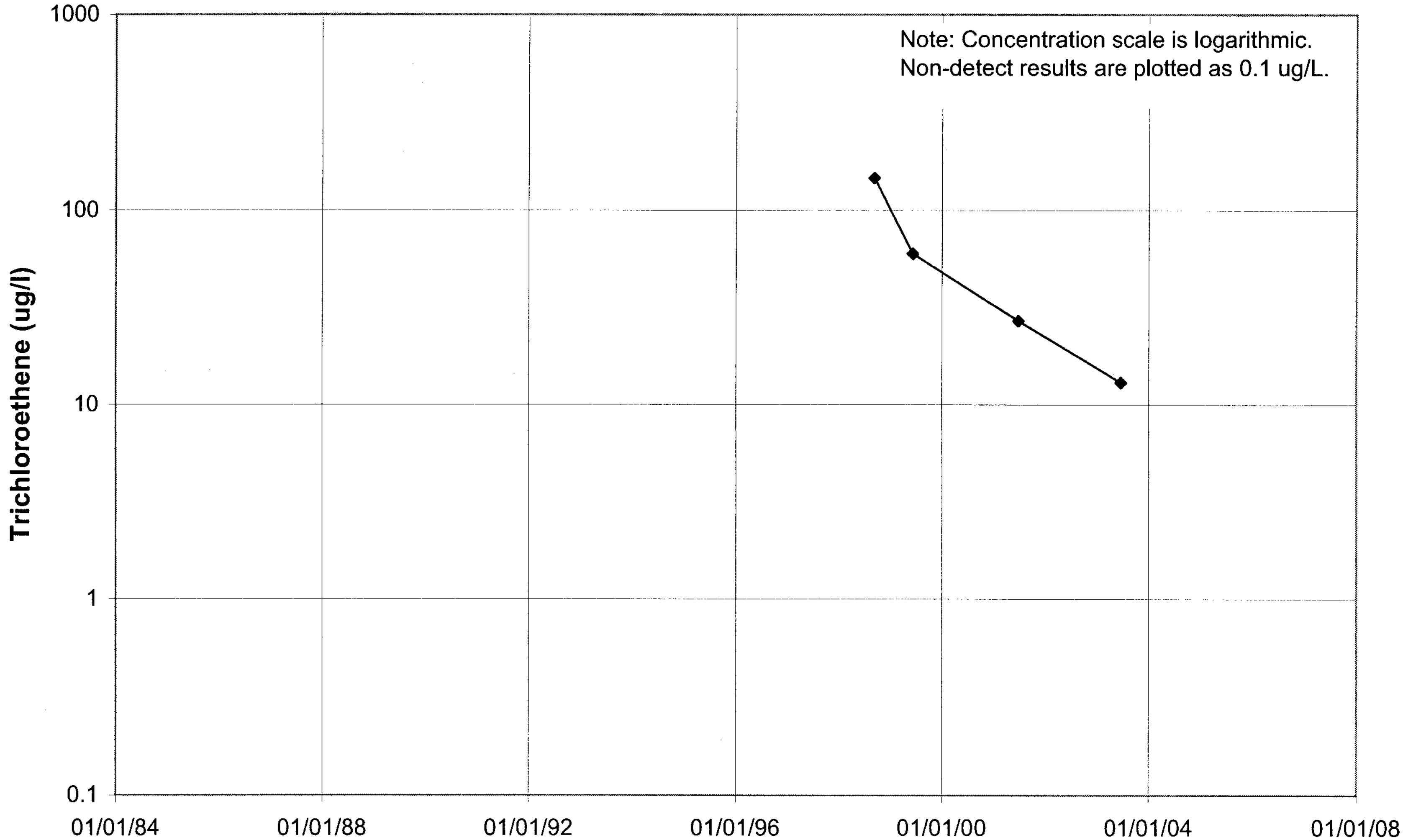

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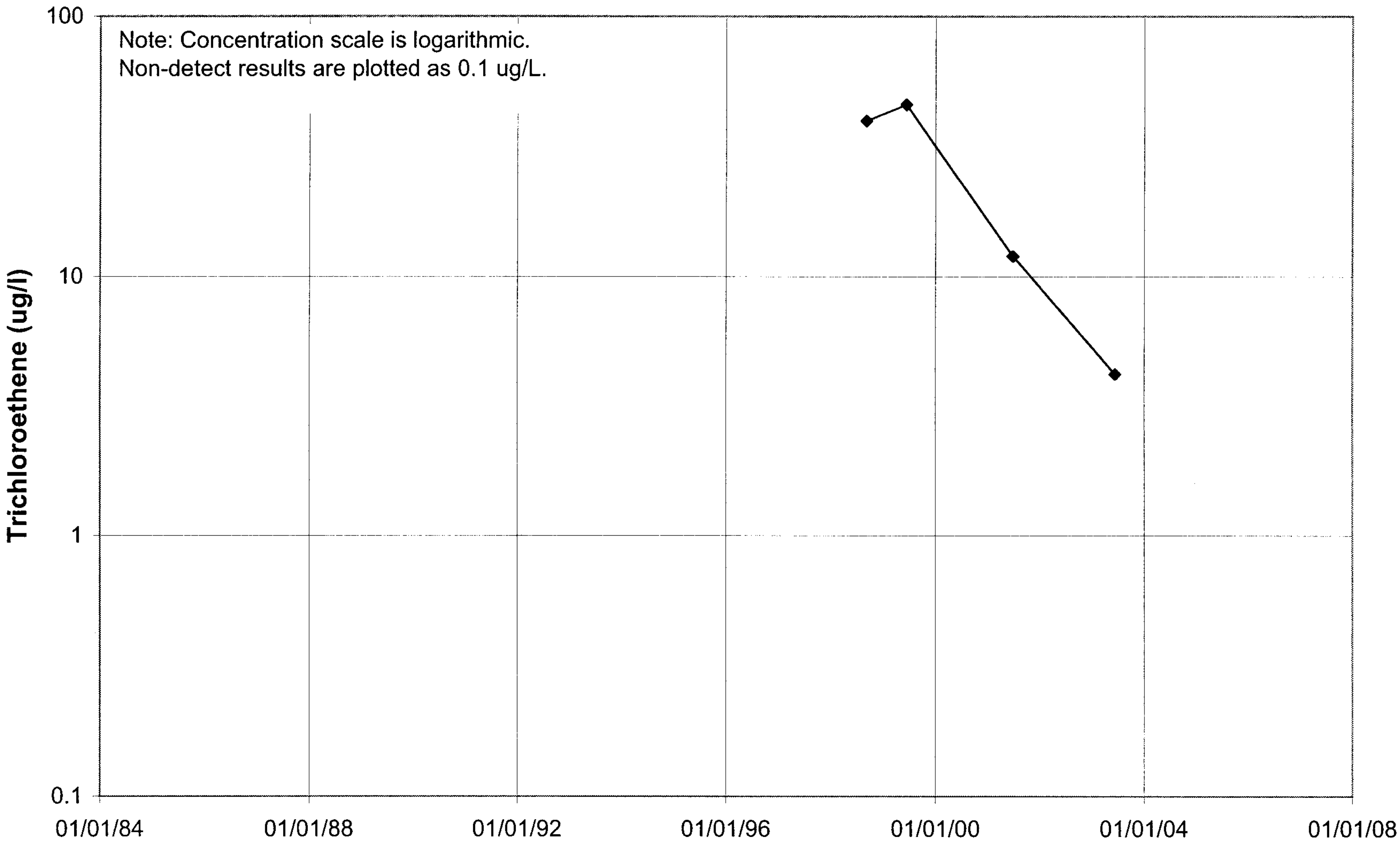

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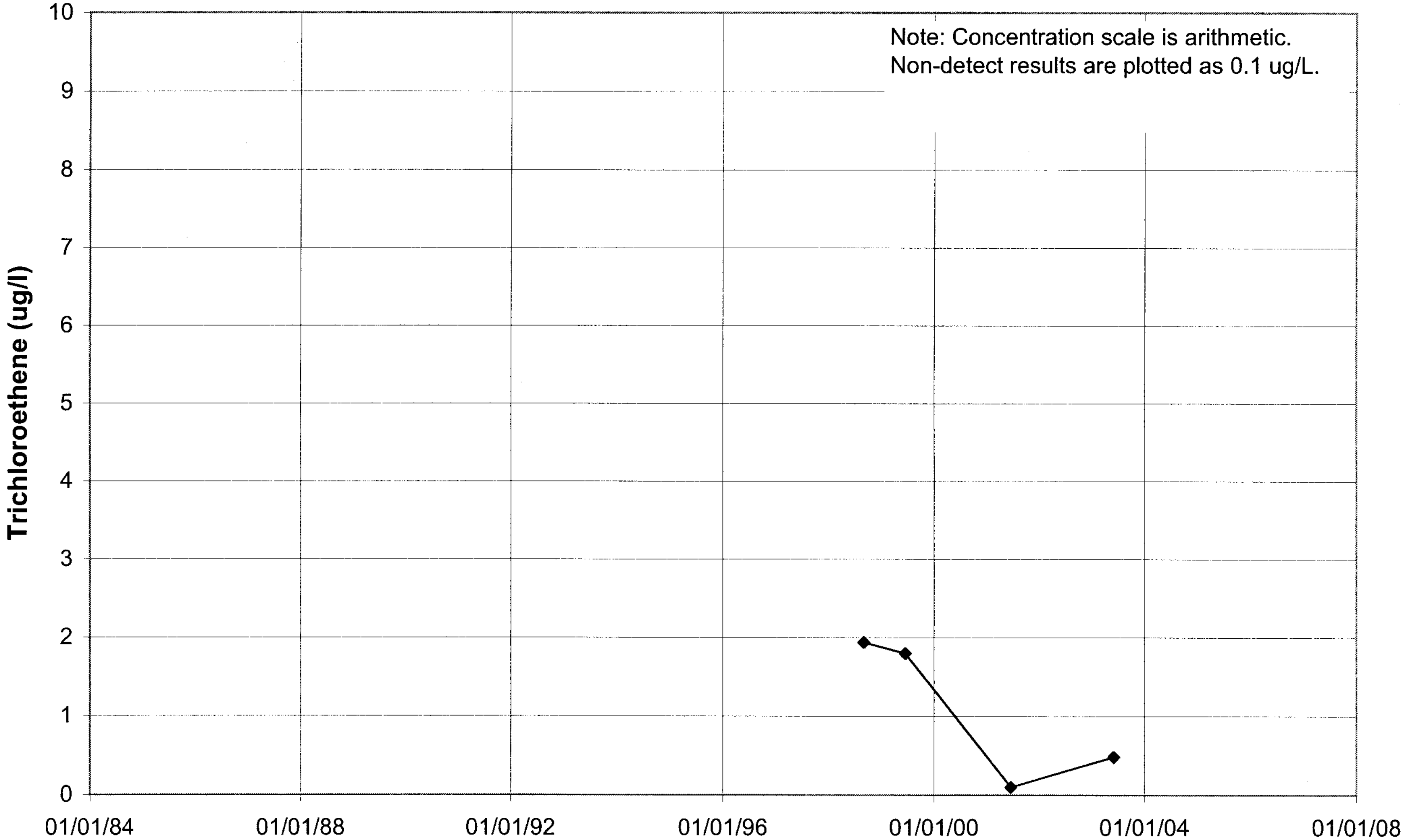

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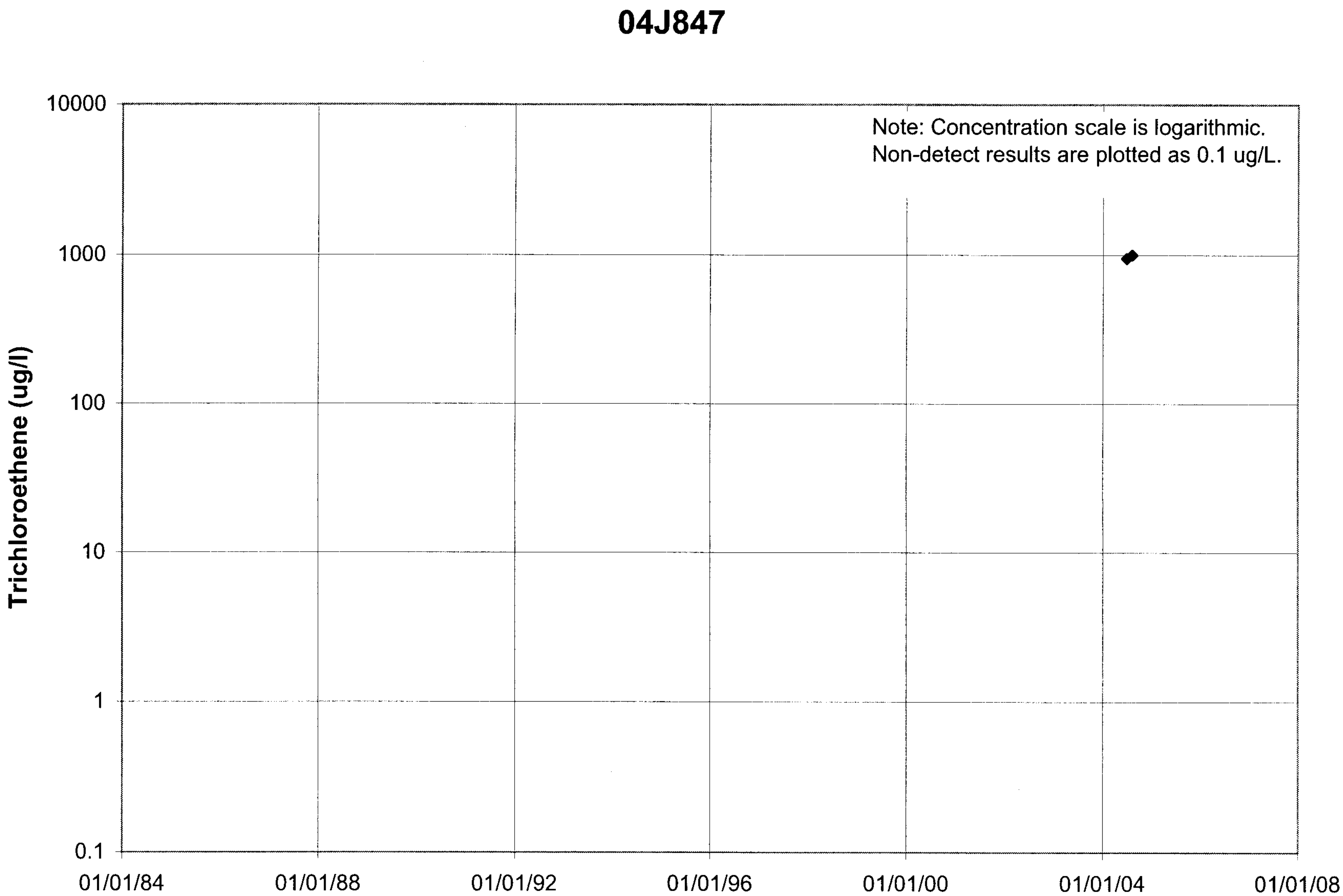

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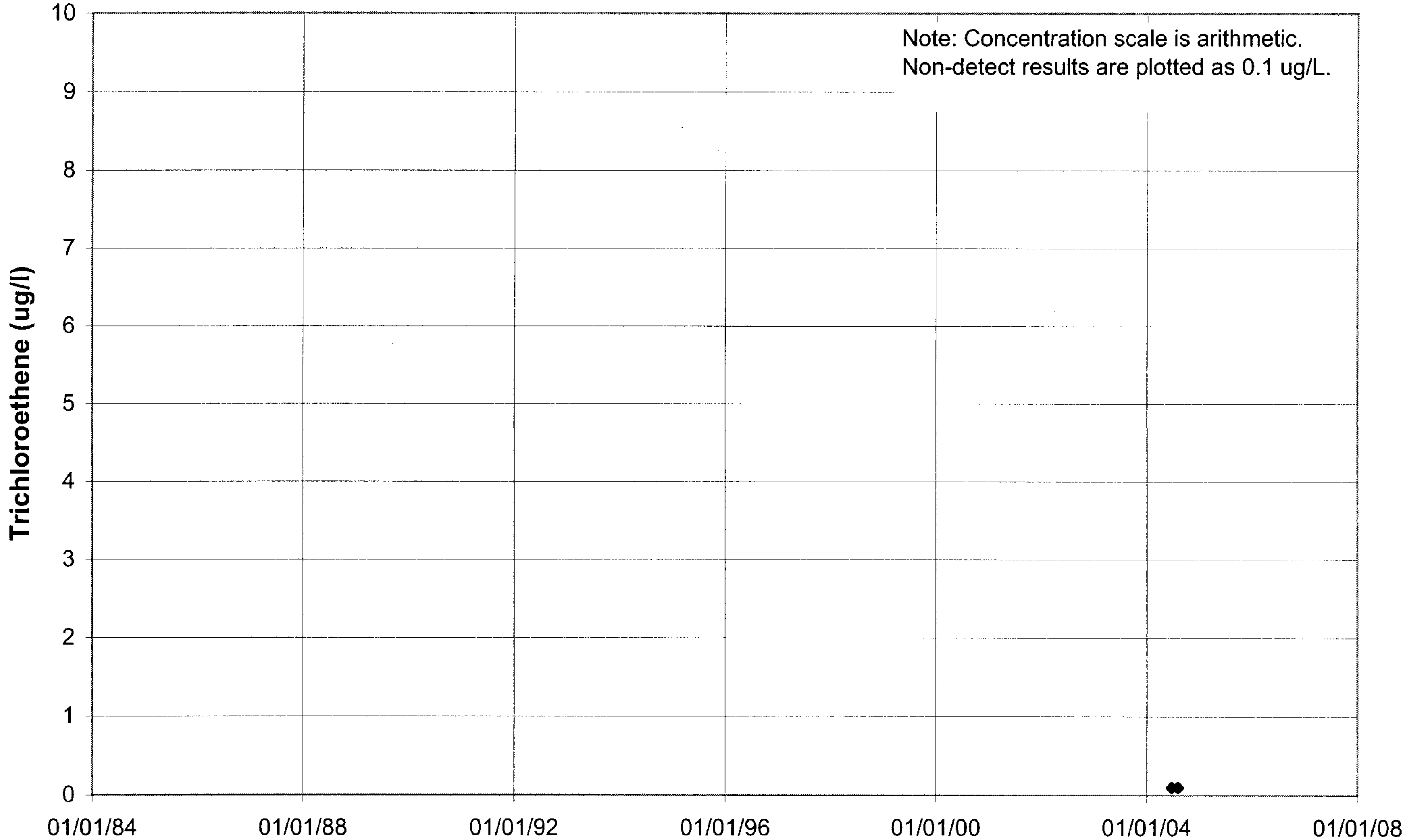

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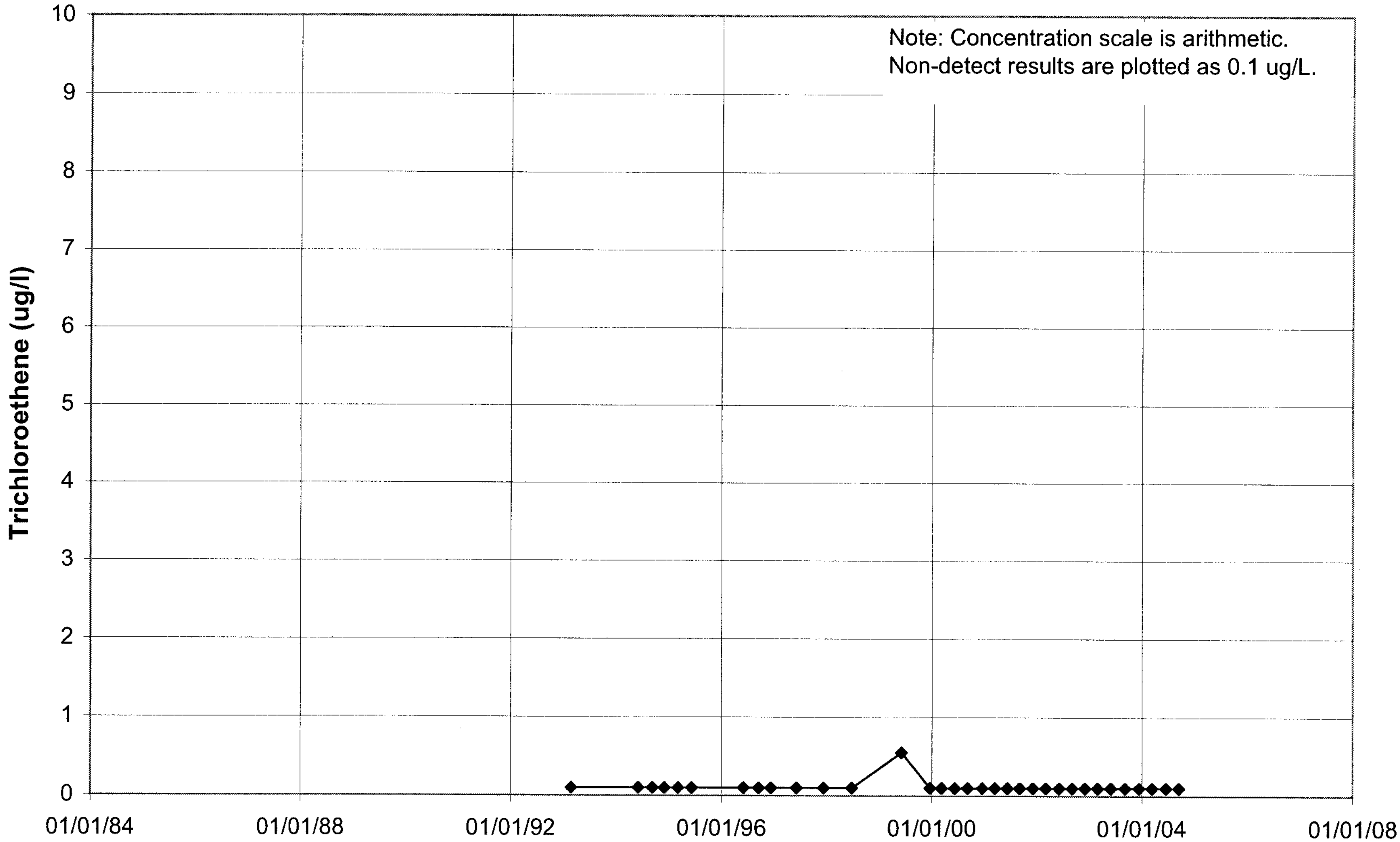

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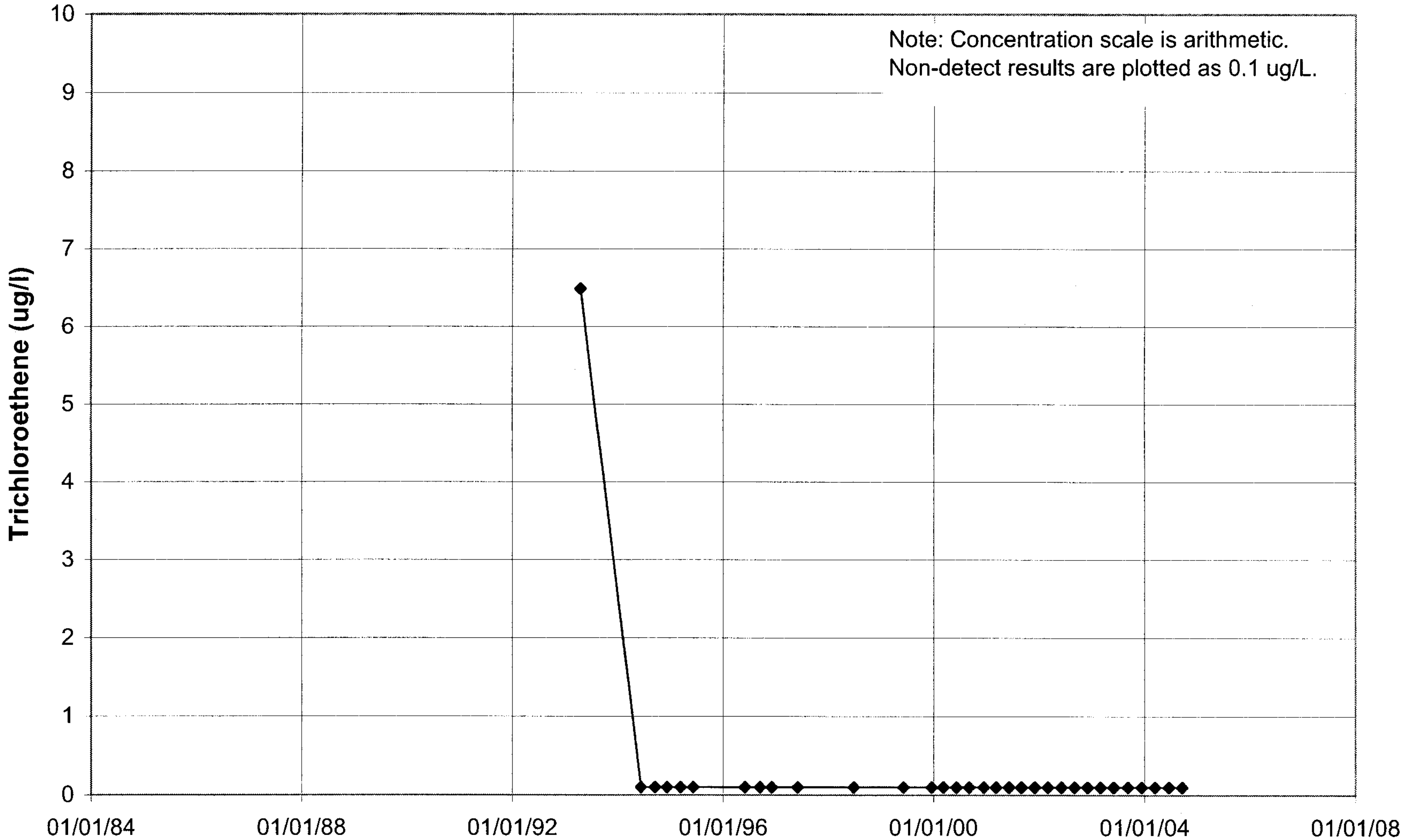

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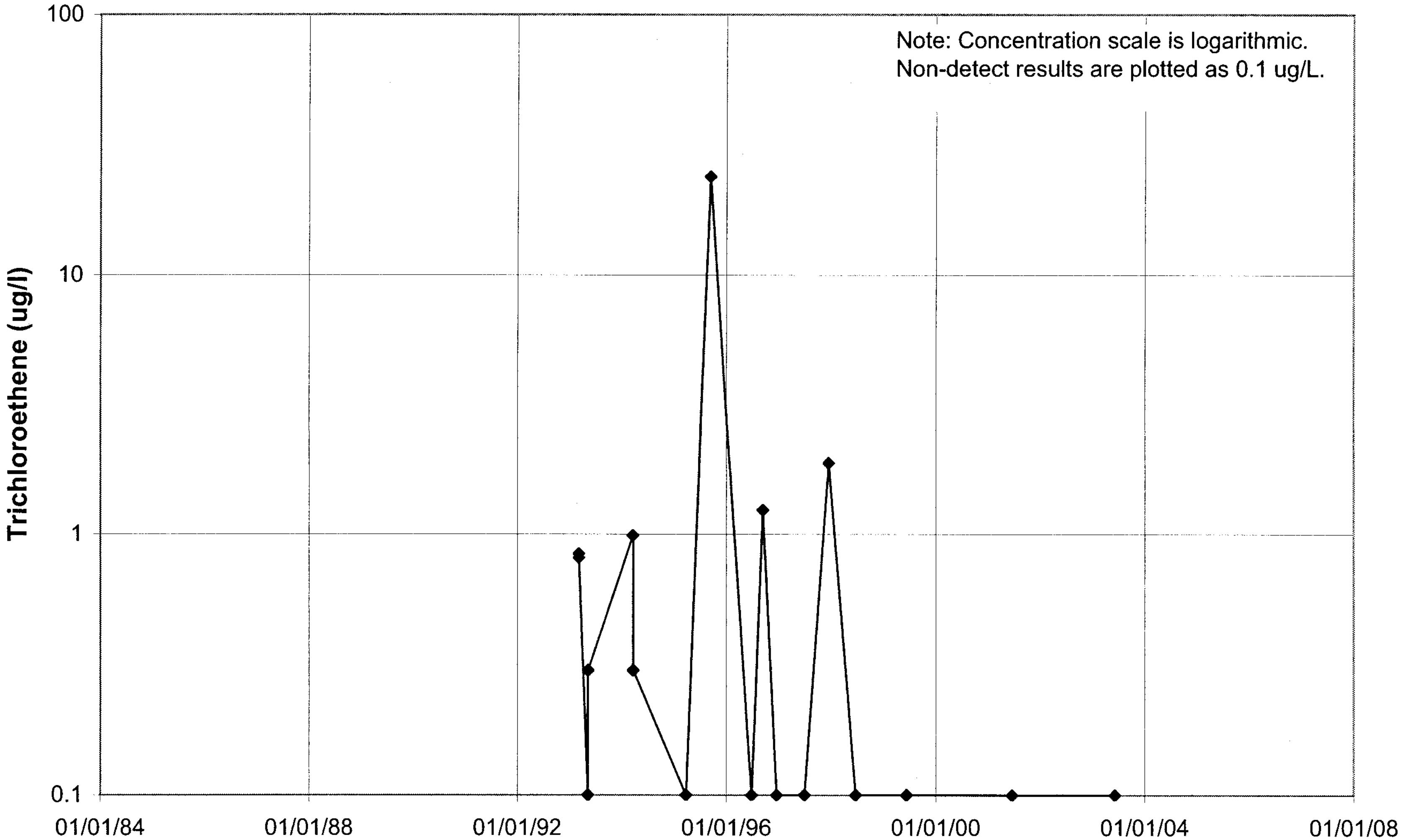

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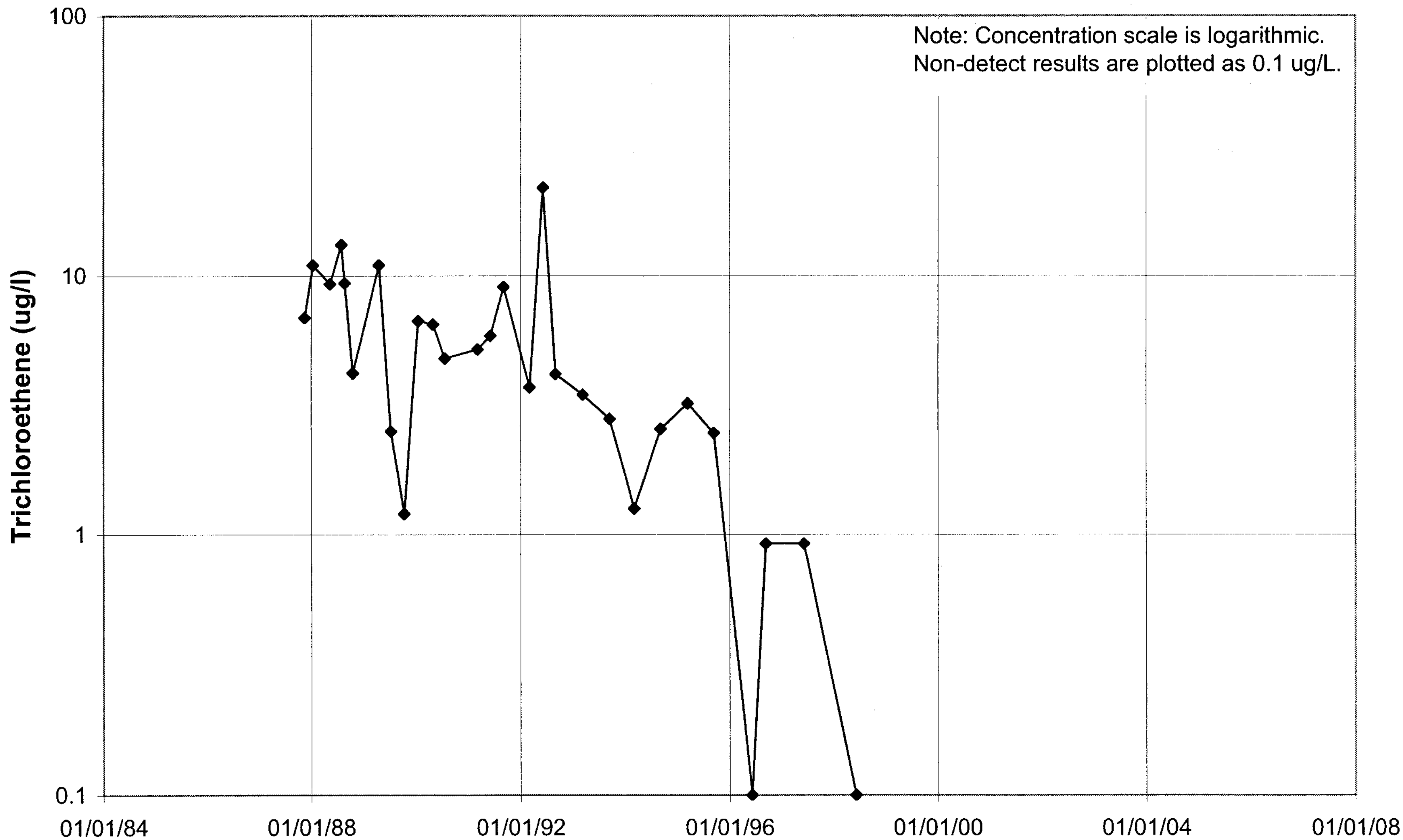
04U001



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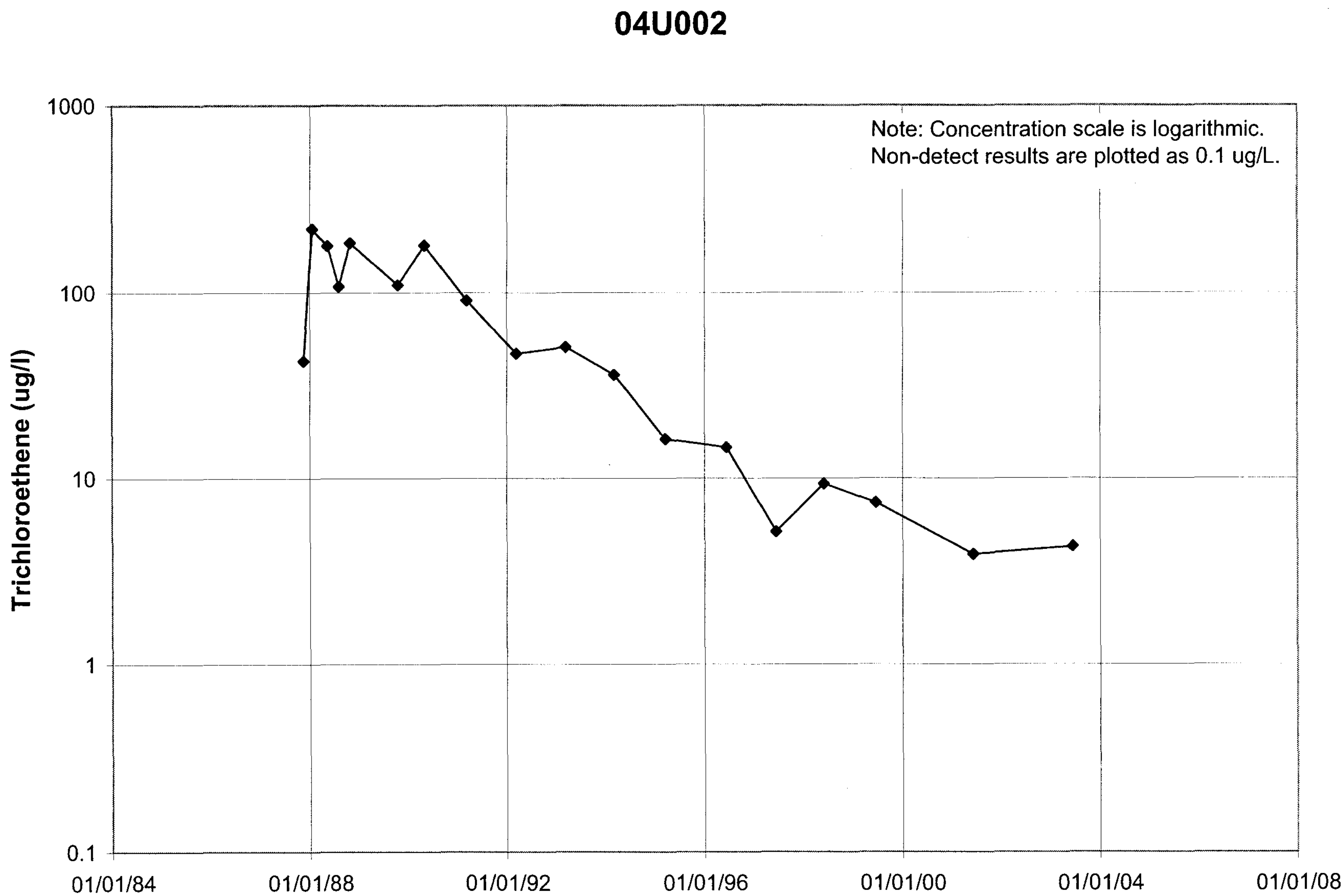

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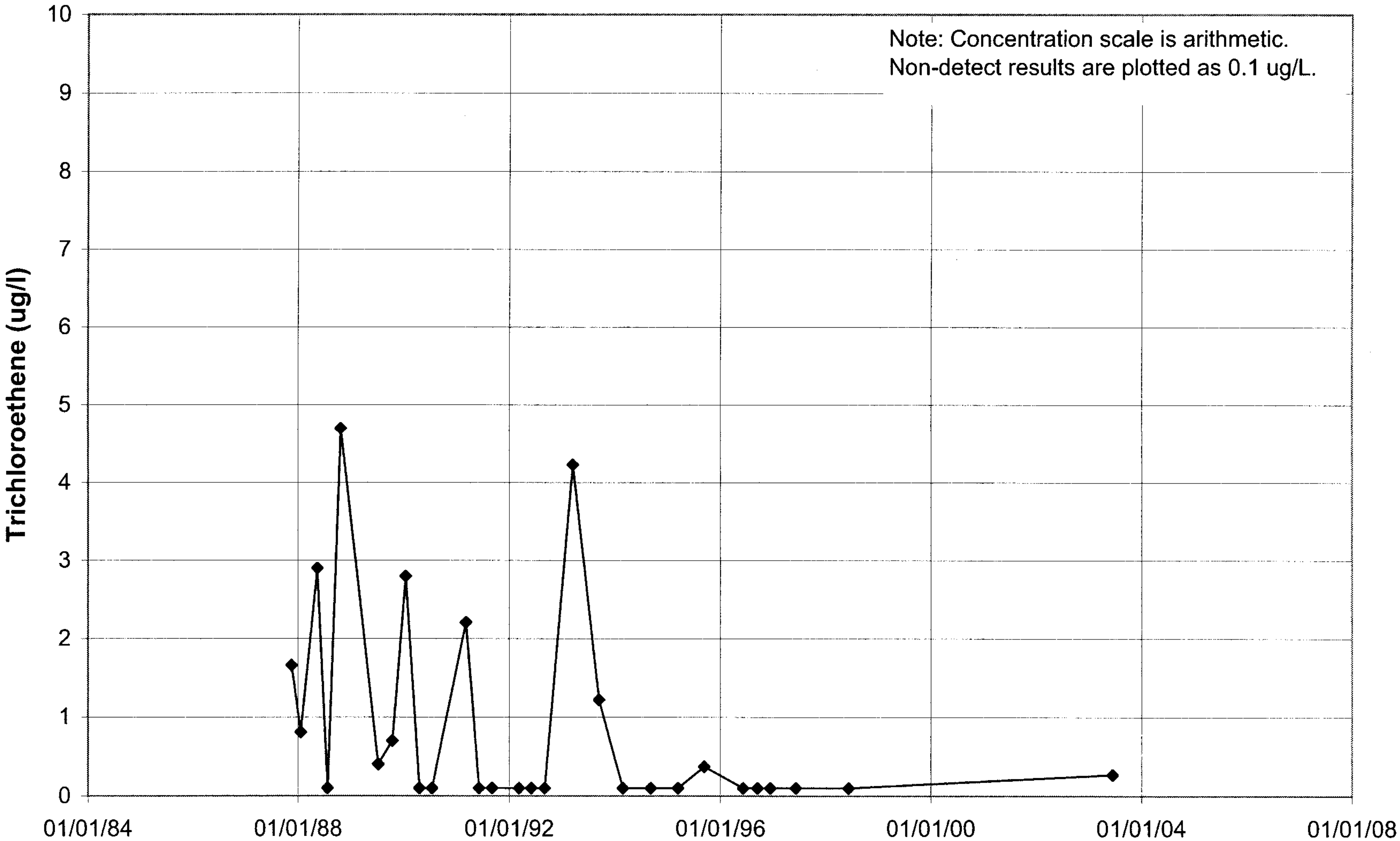

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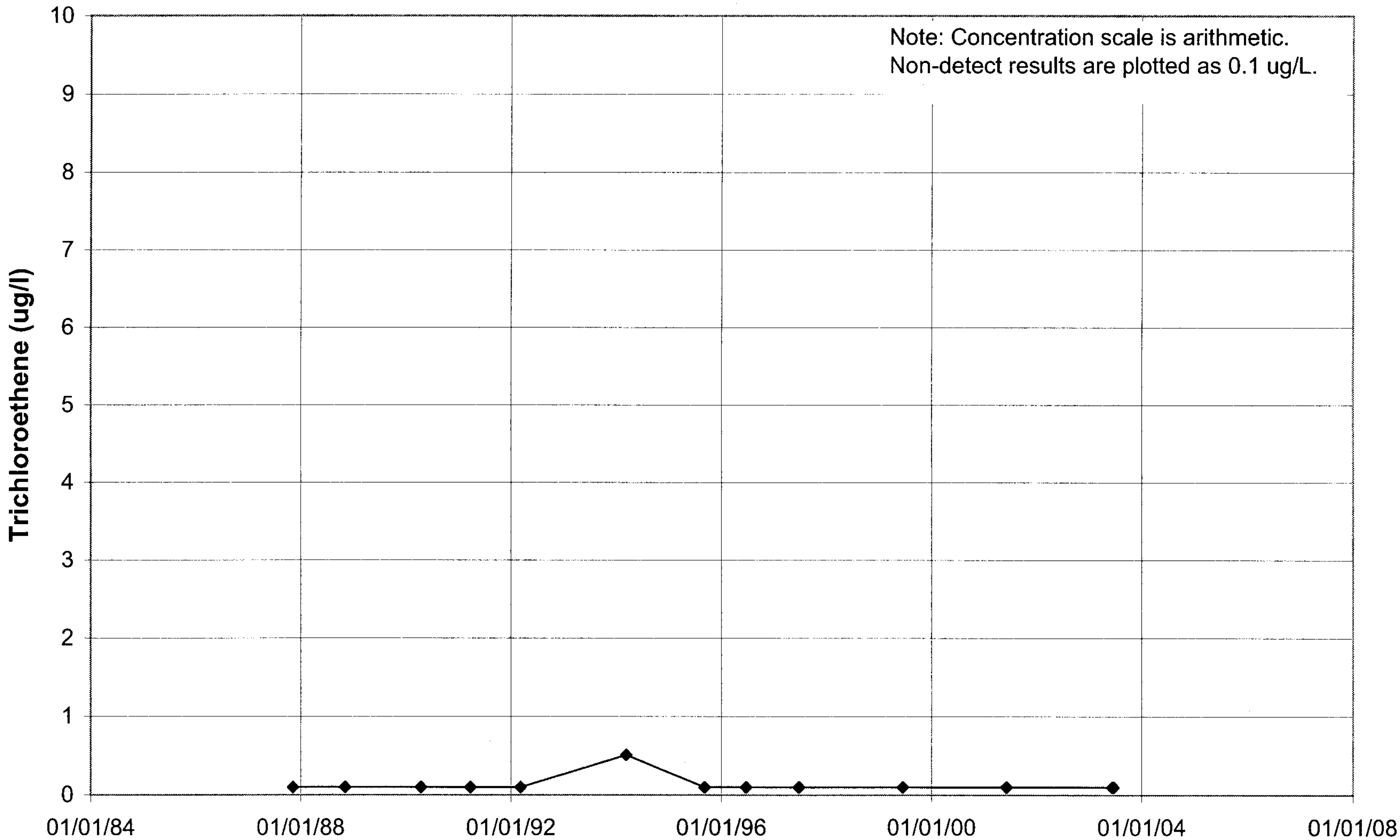

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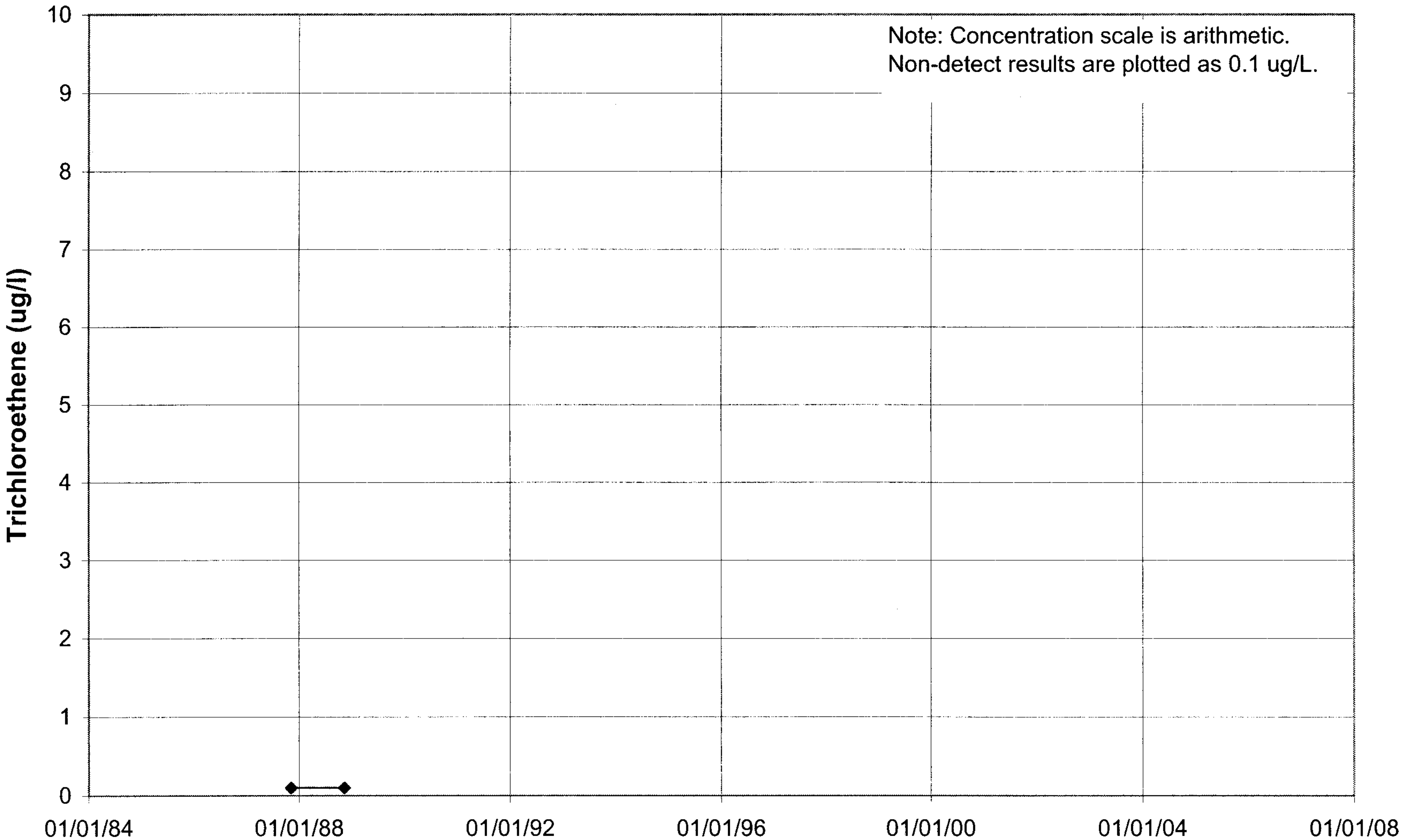

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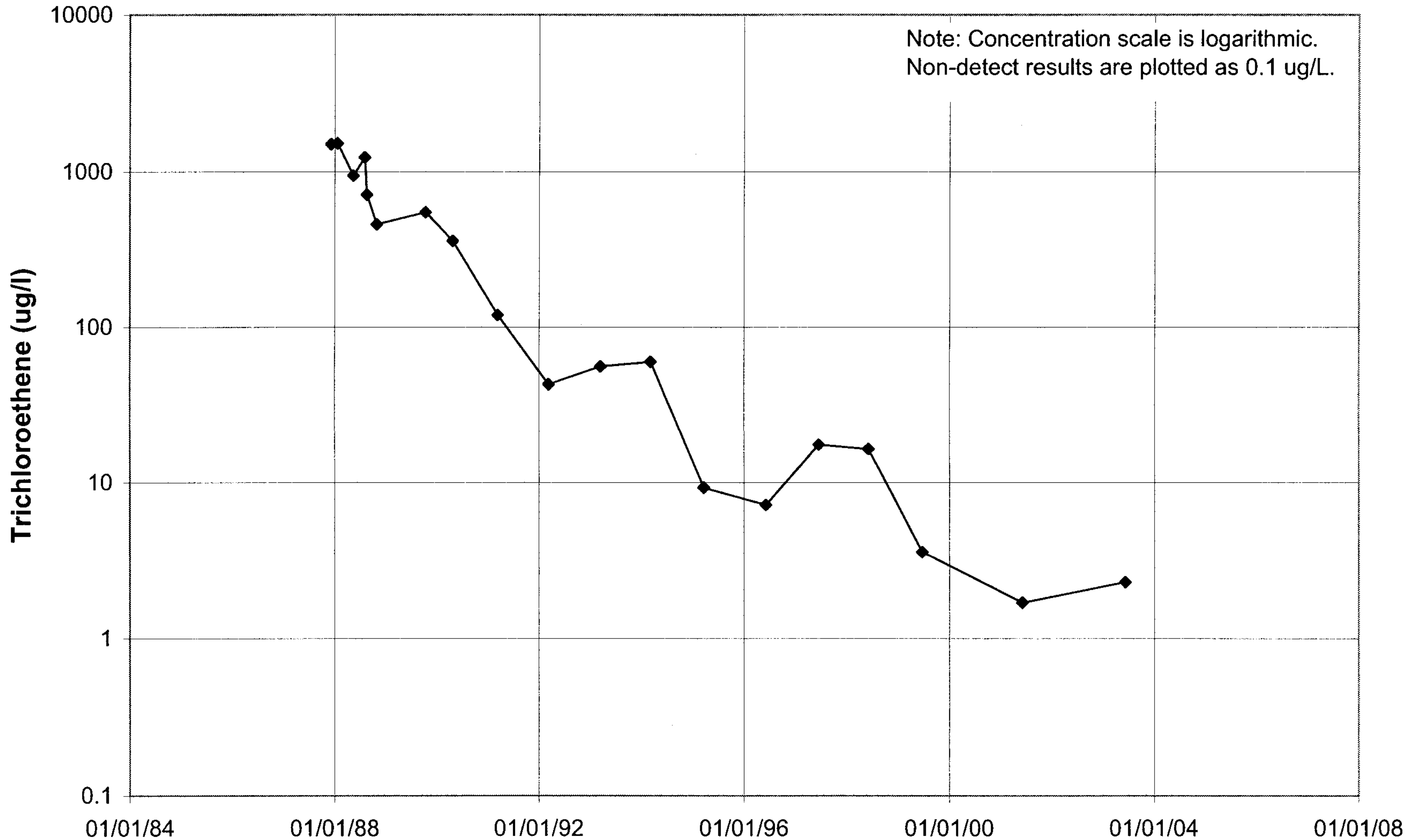

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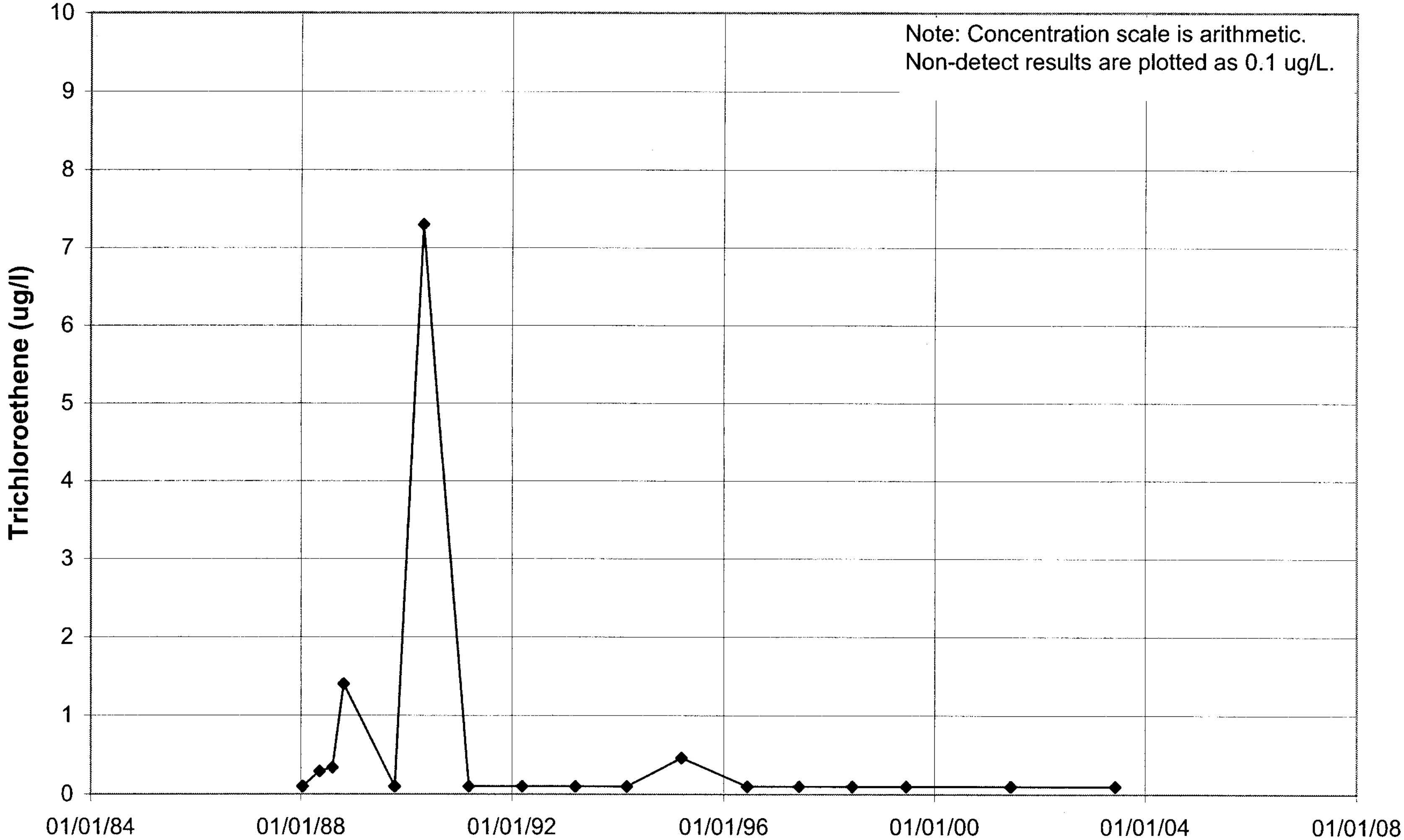

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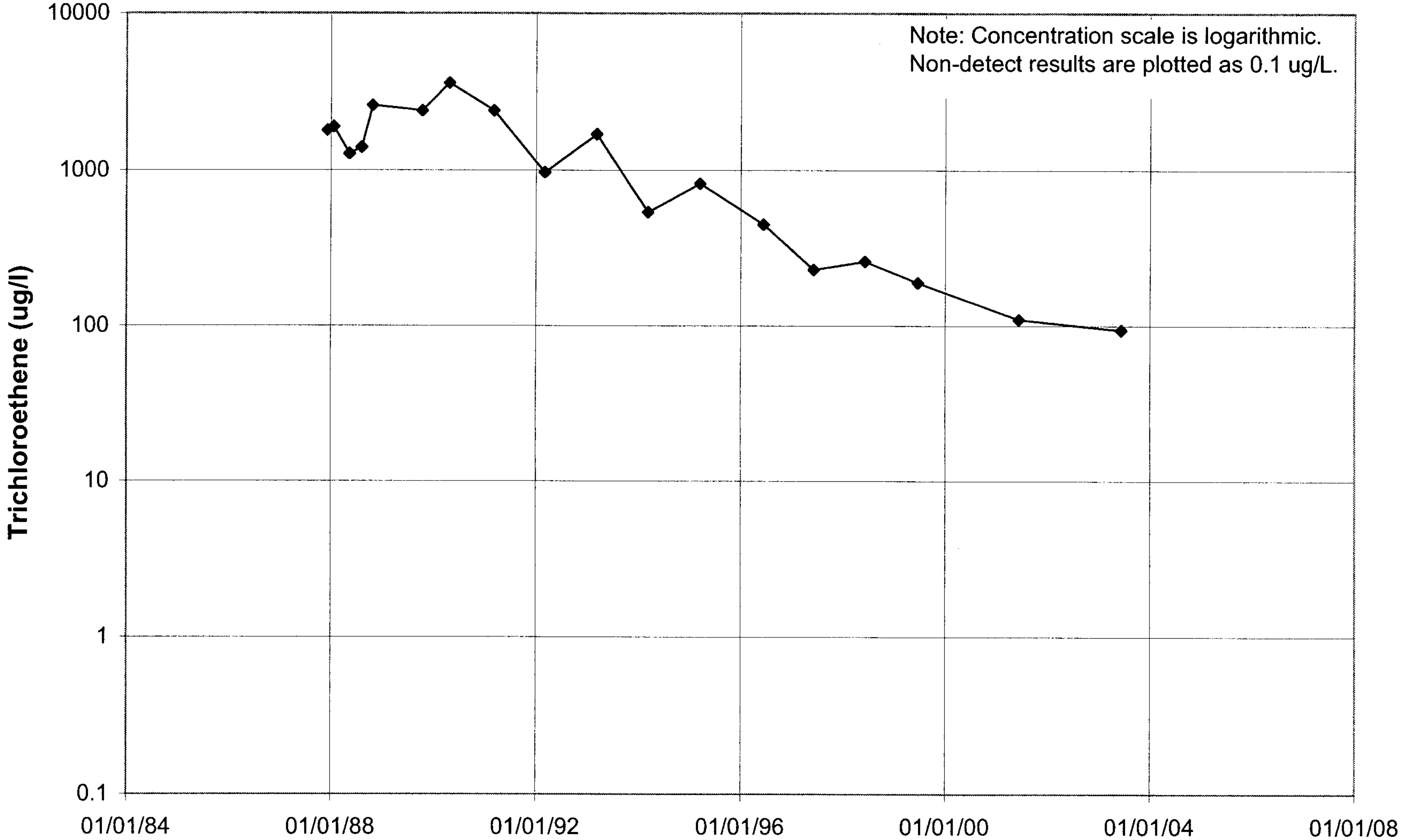

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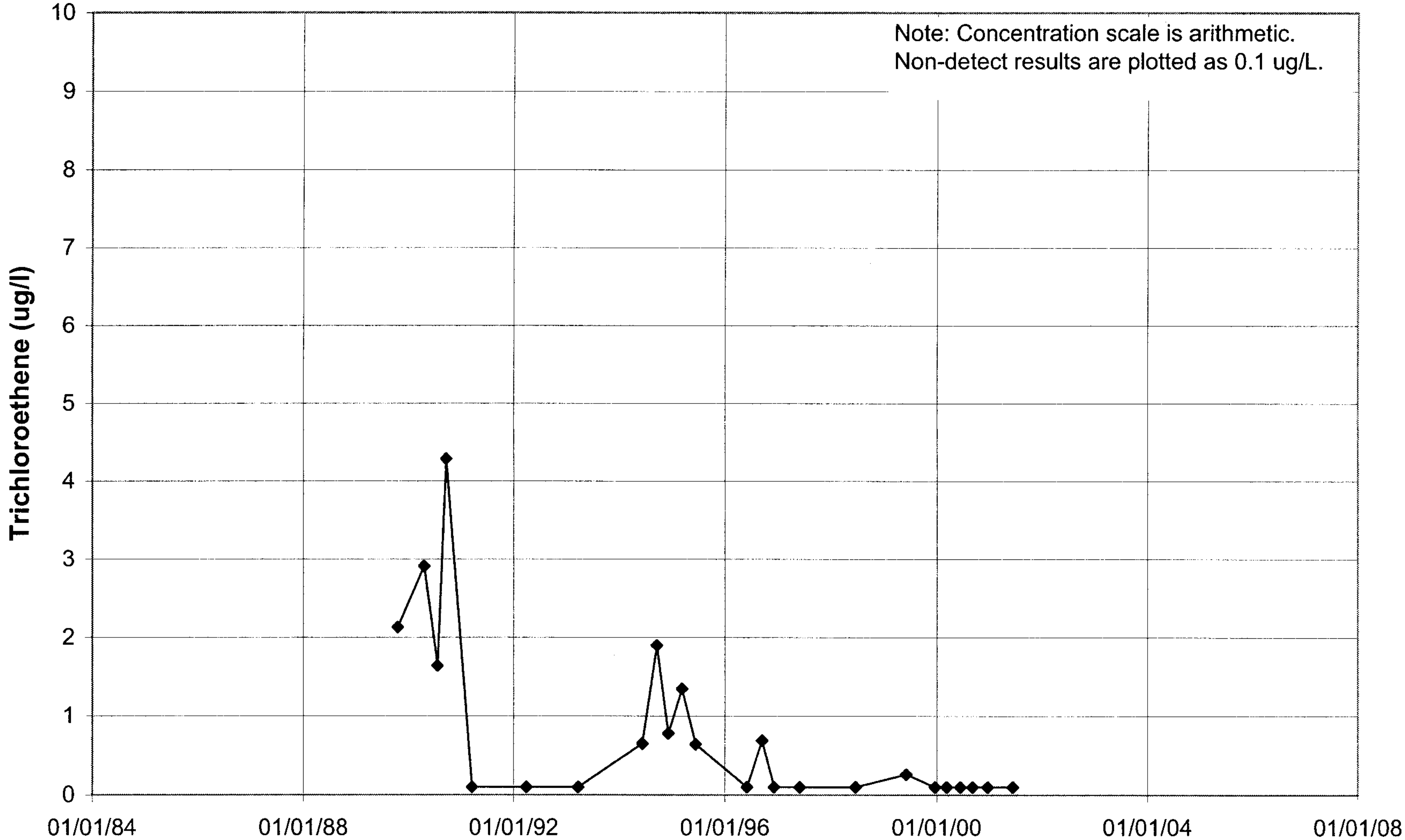
04U414 (414U4)



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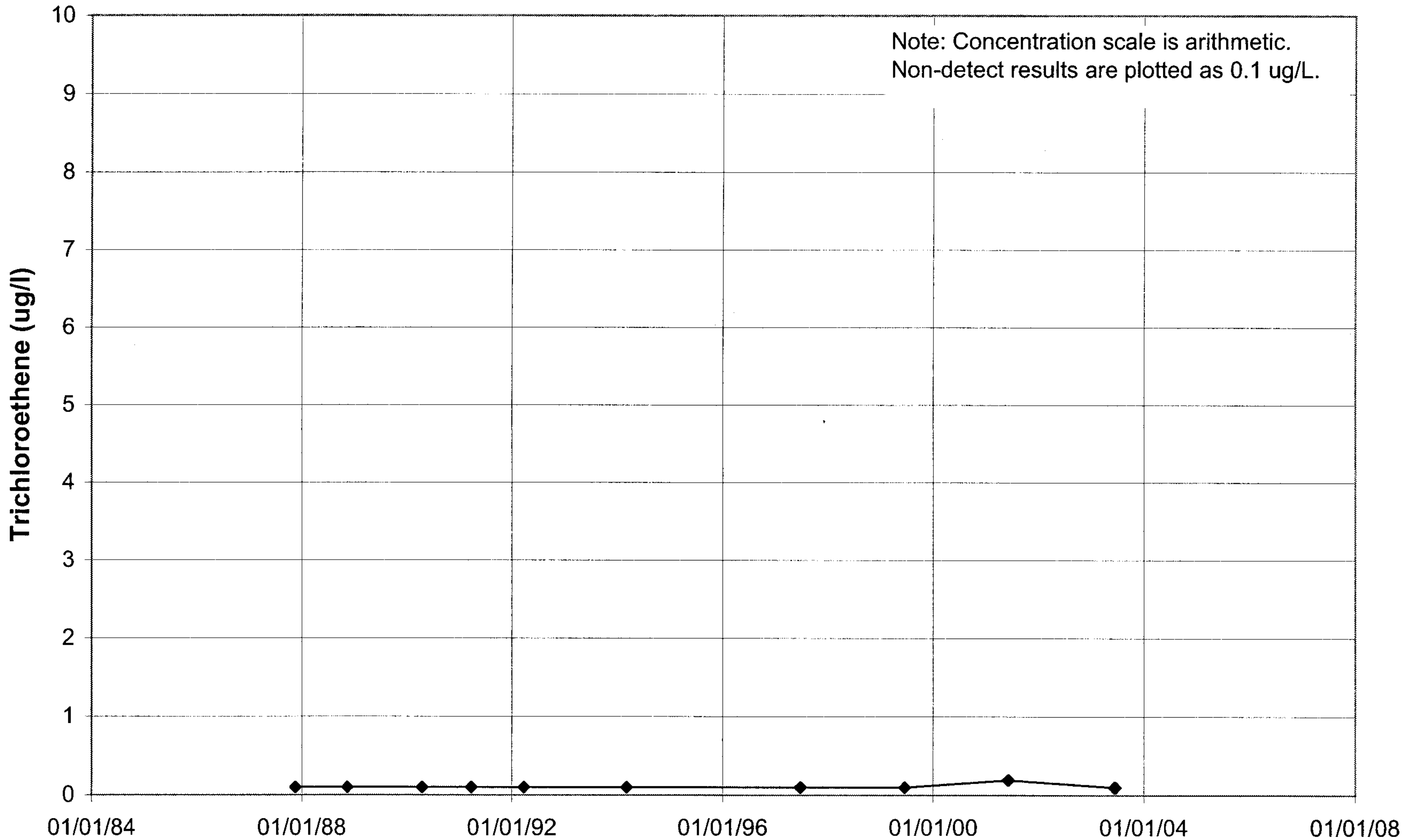

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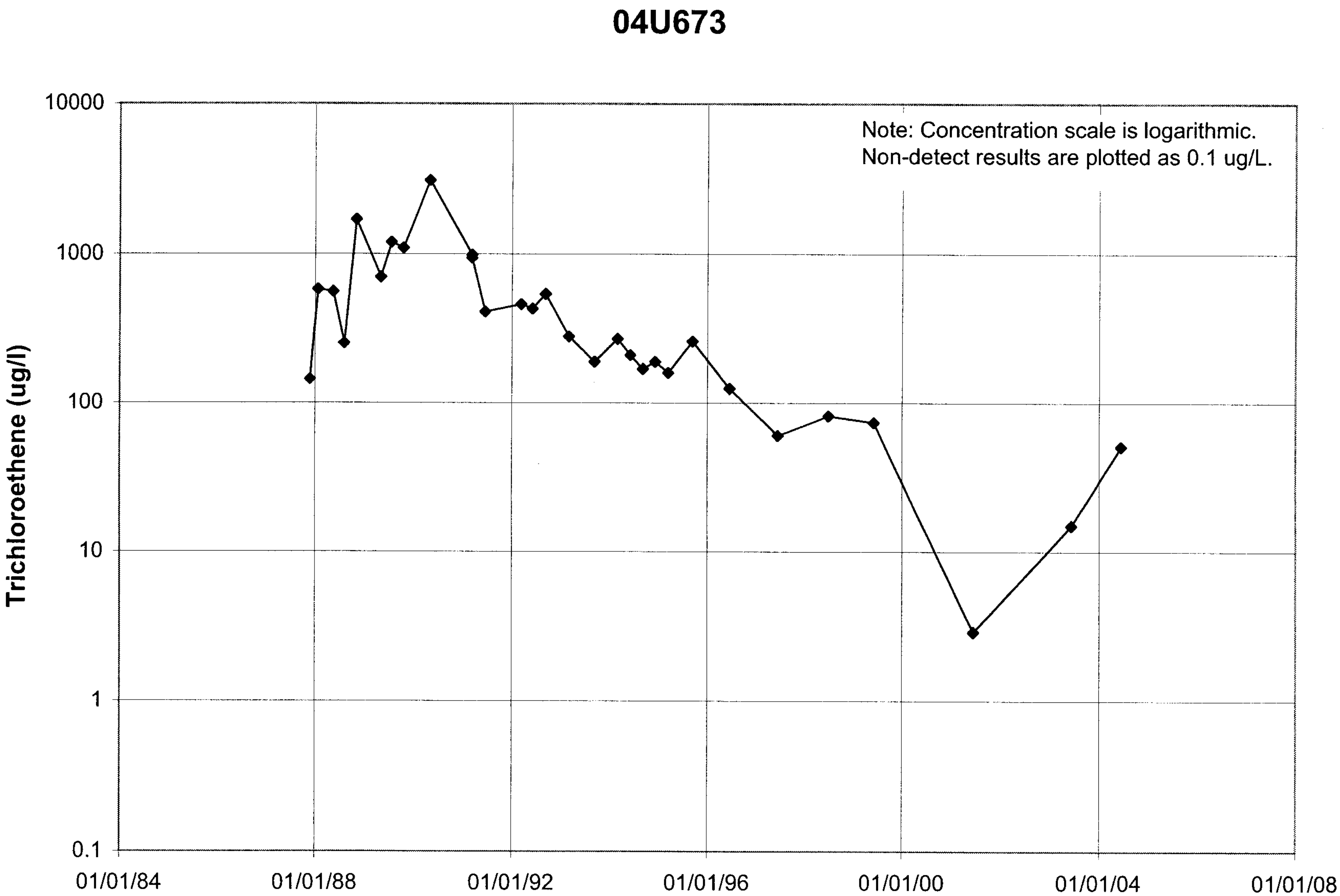

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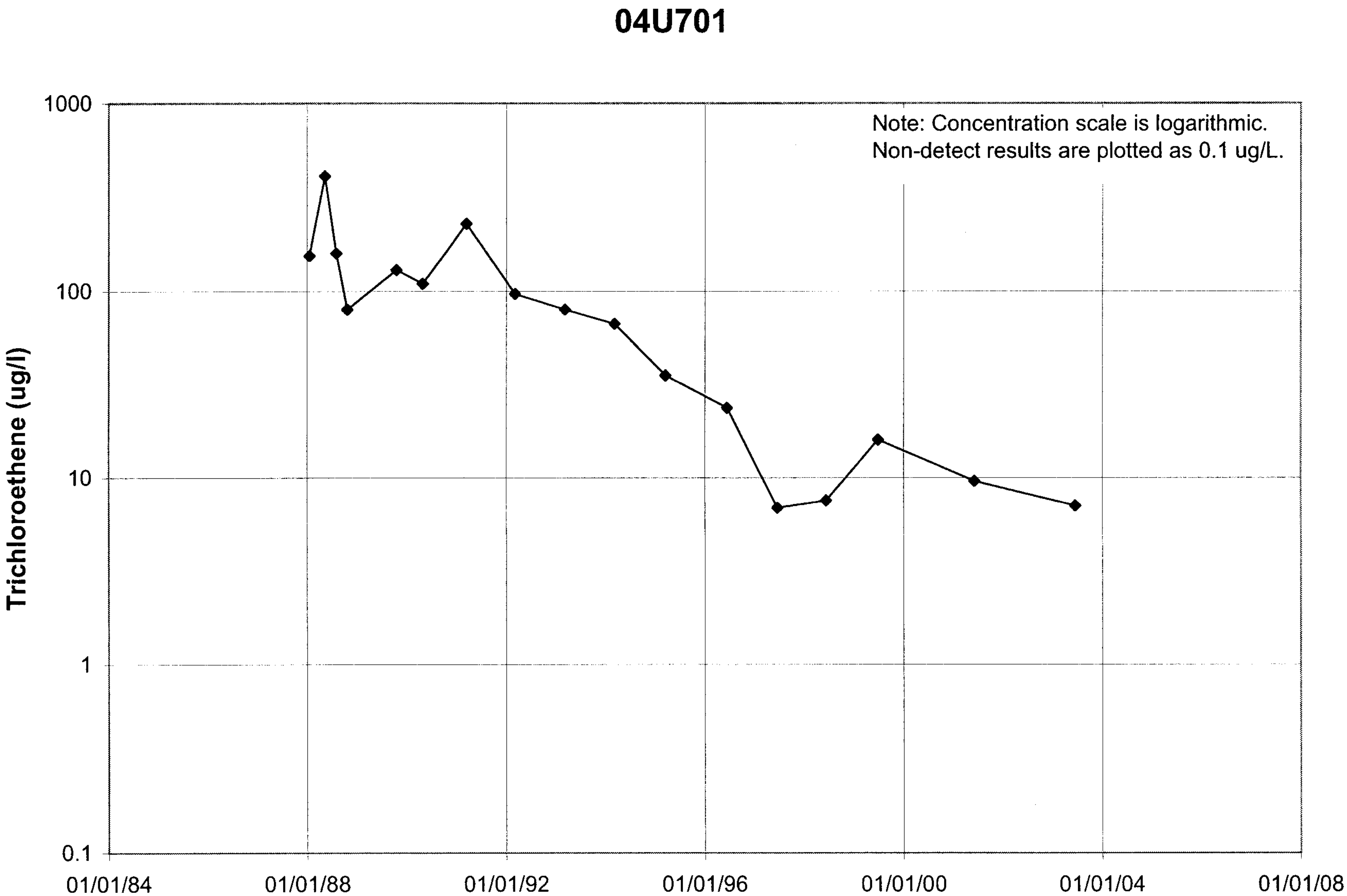

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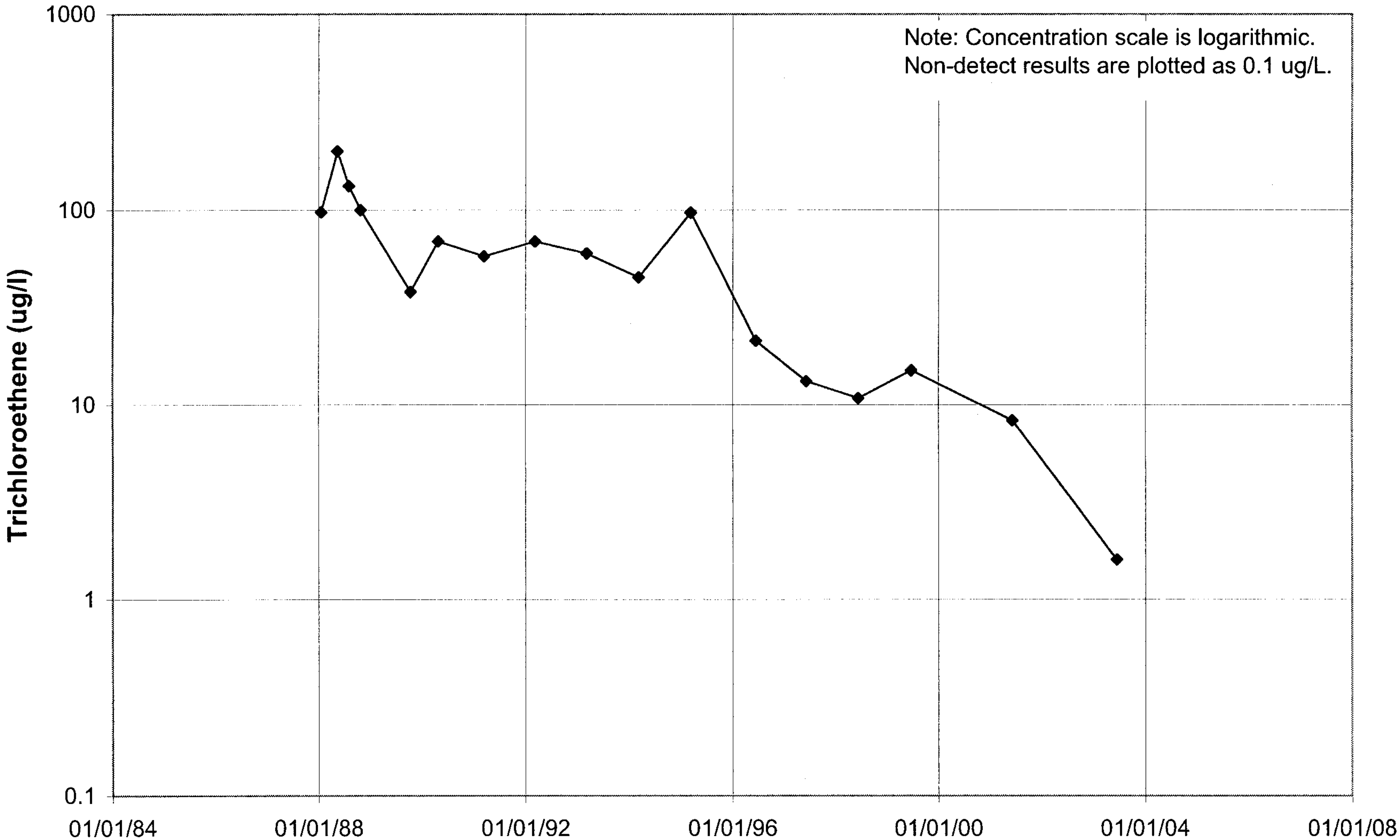

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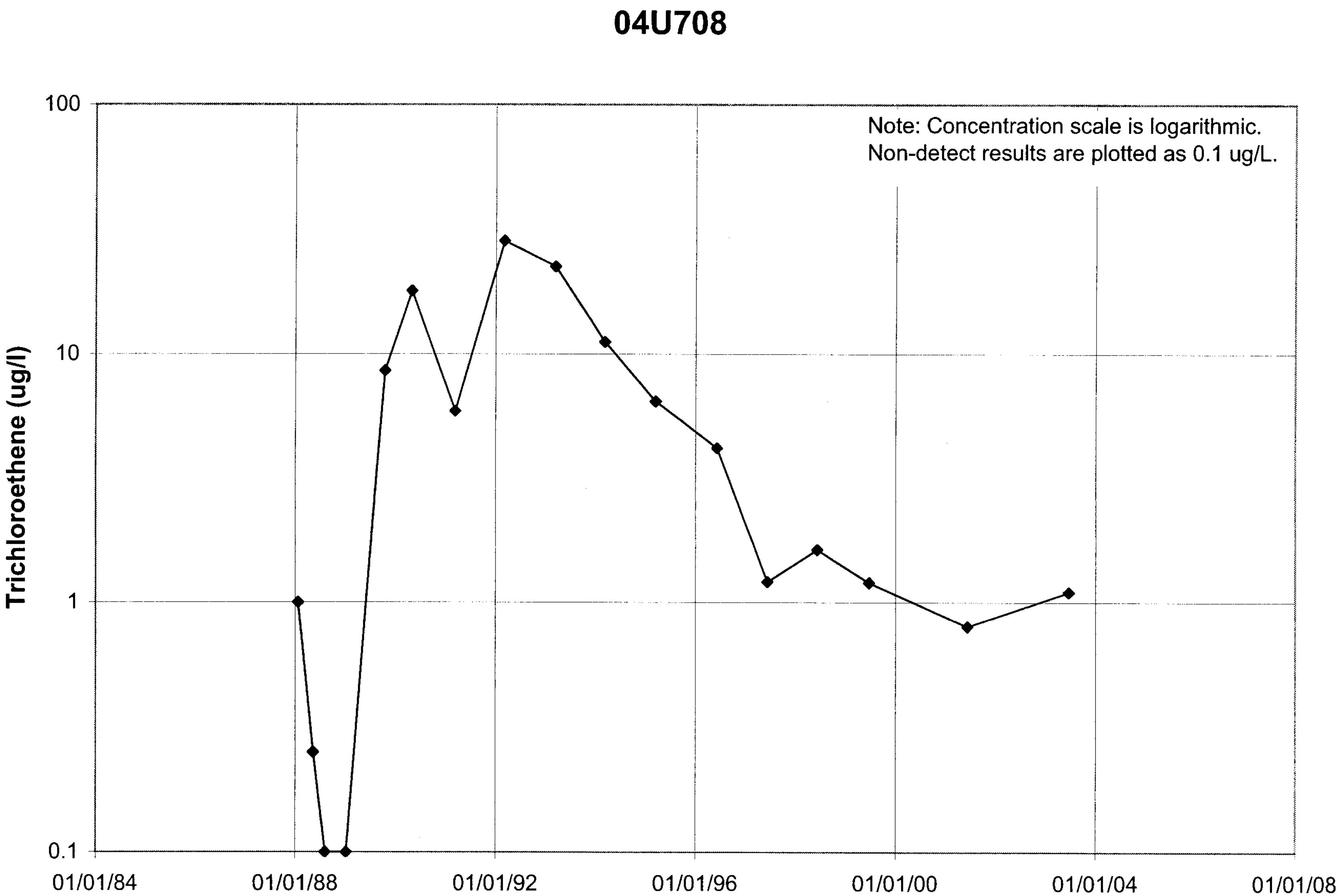

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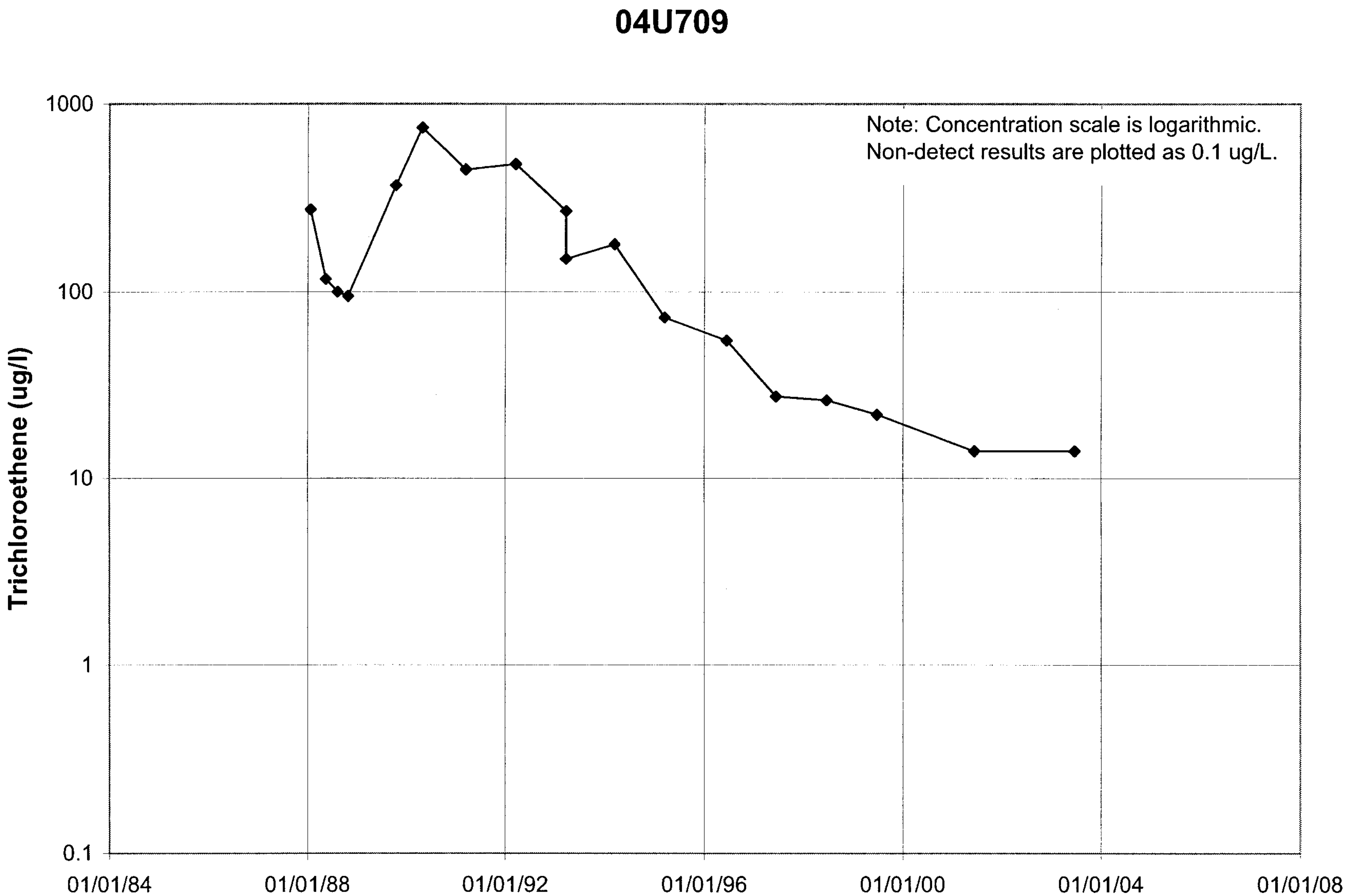

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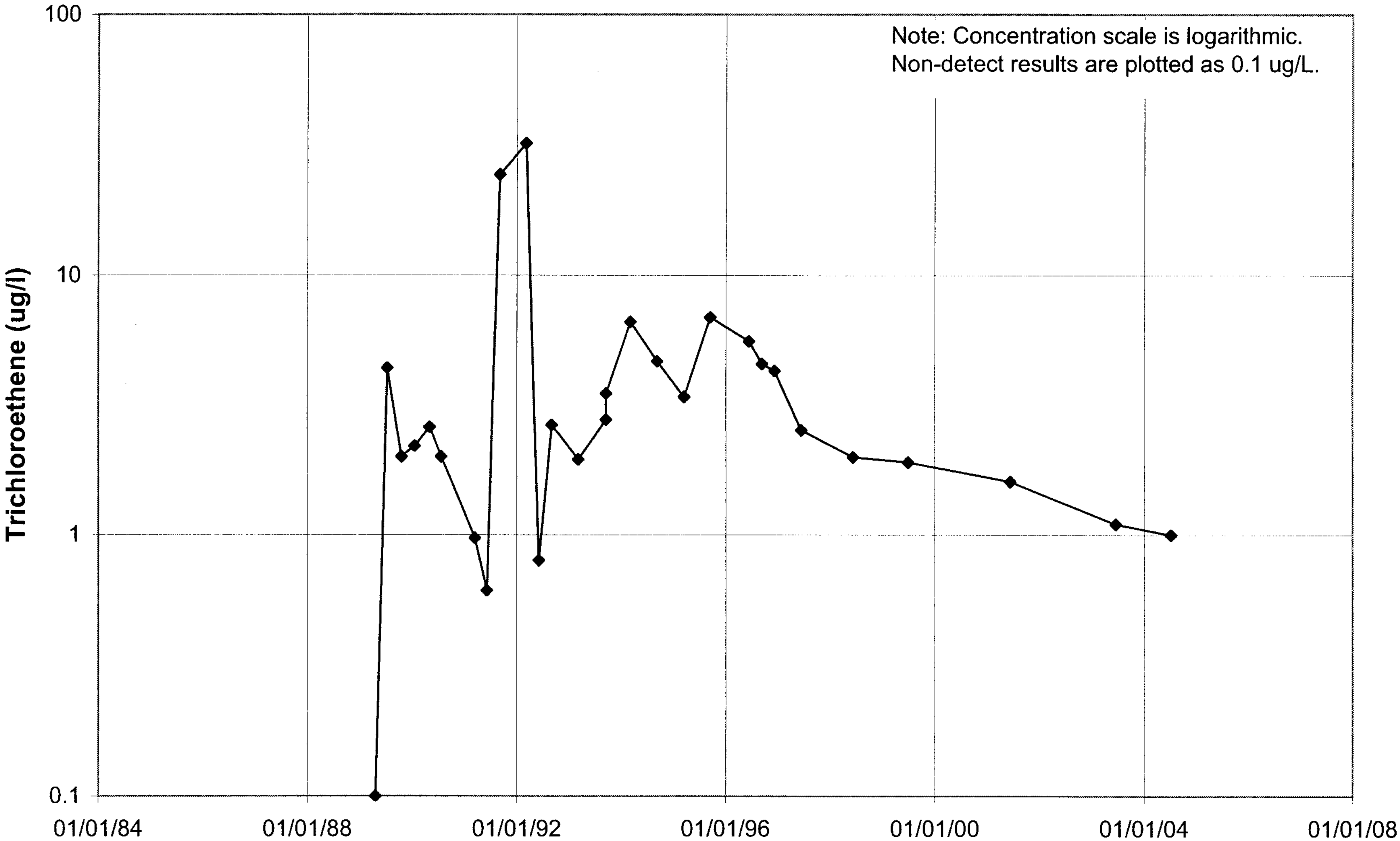

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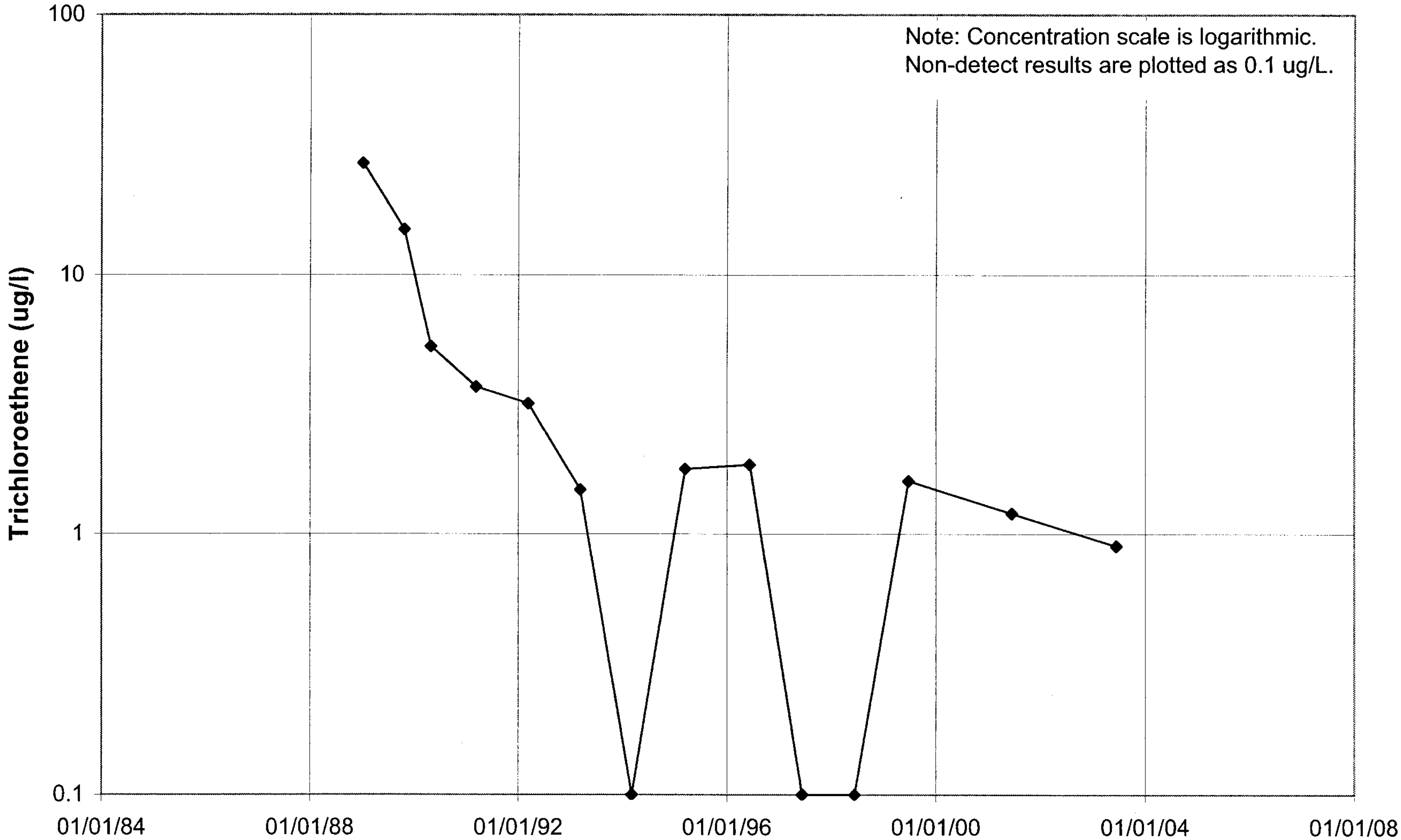

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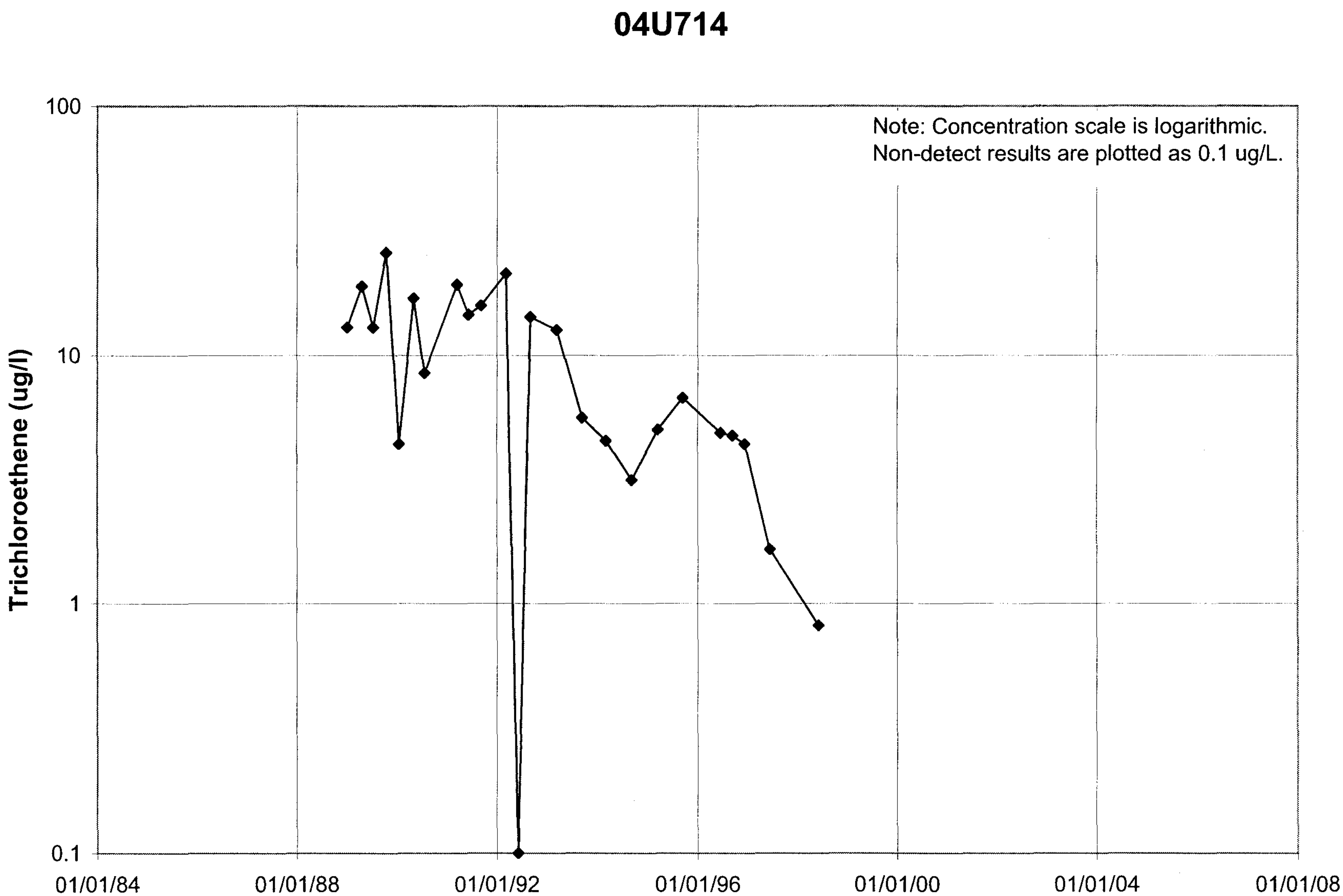

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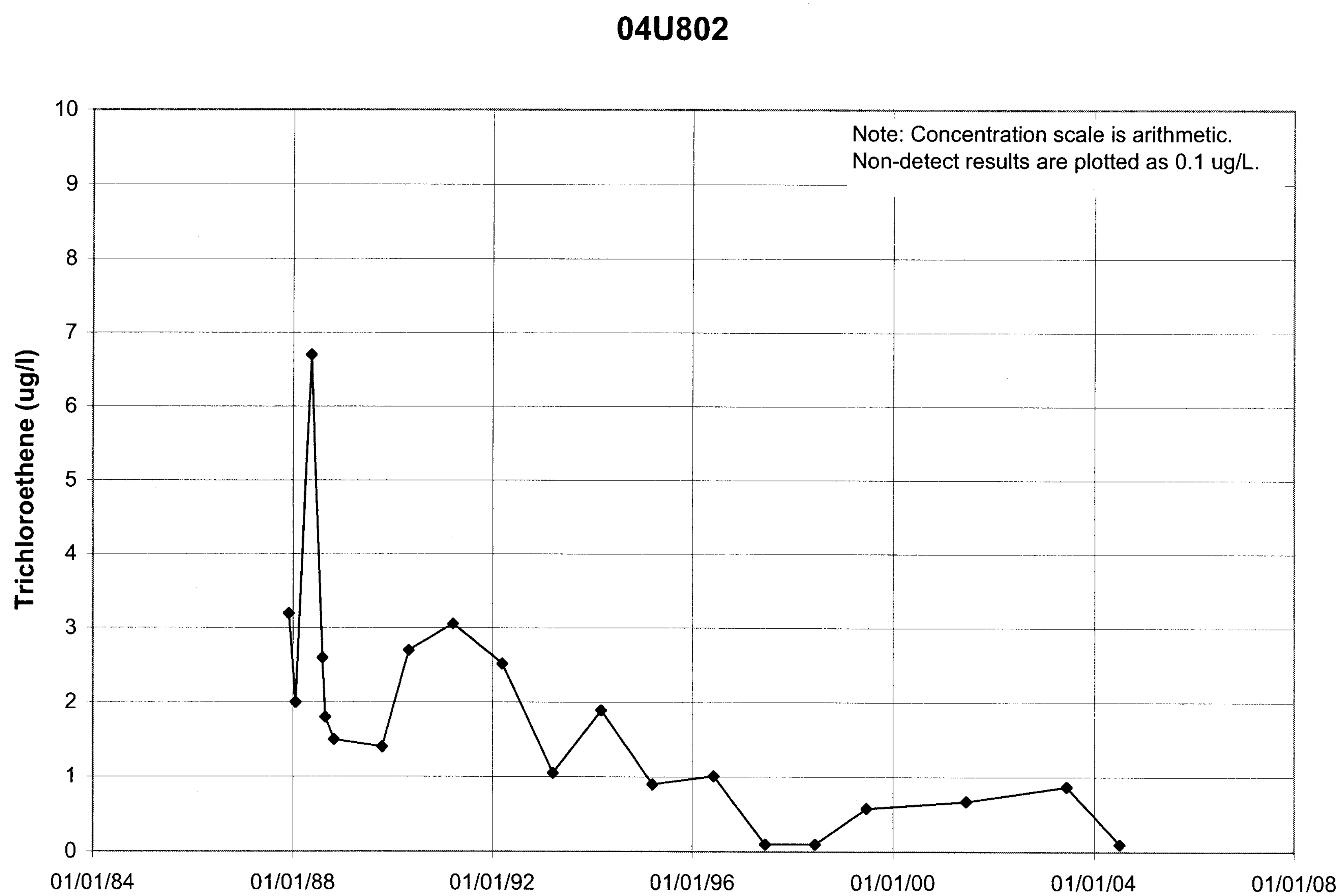

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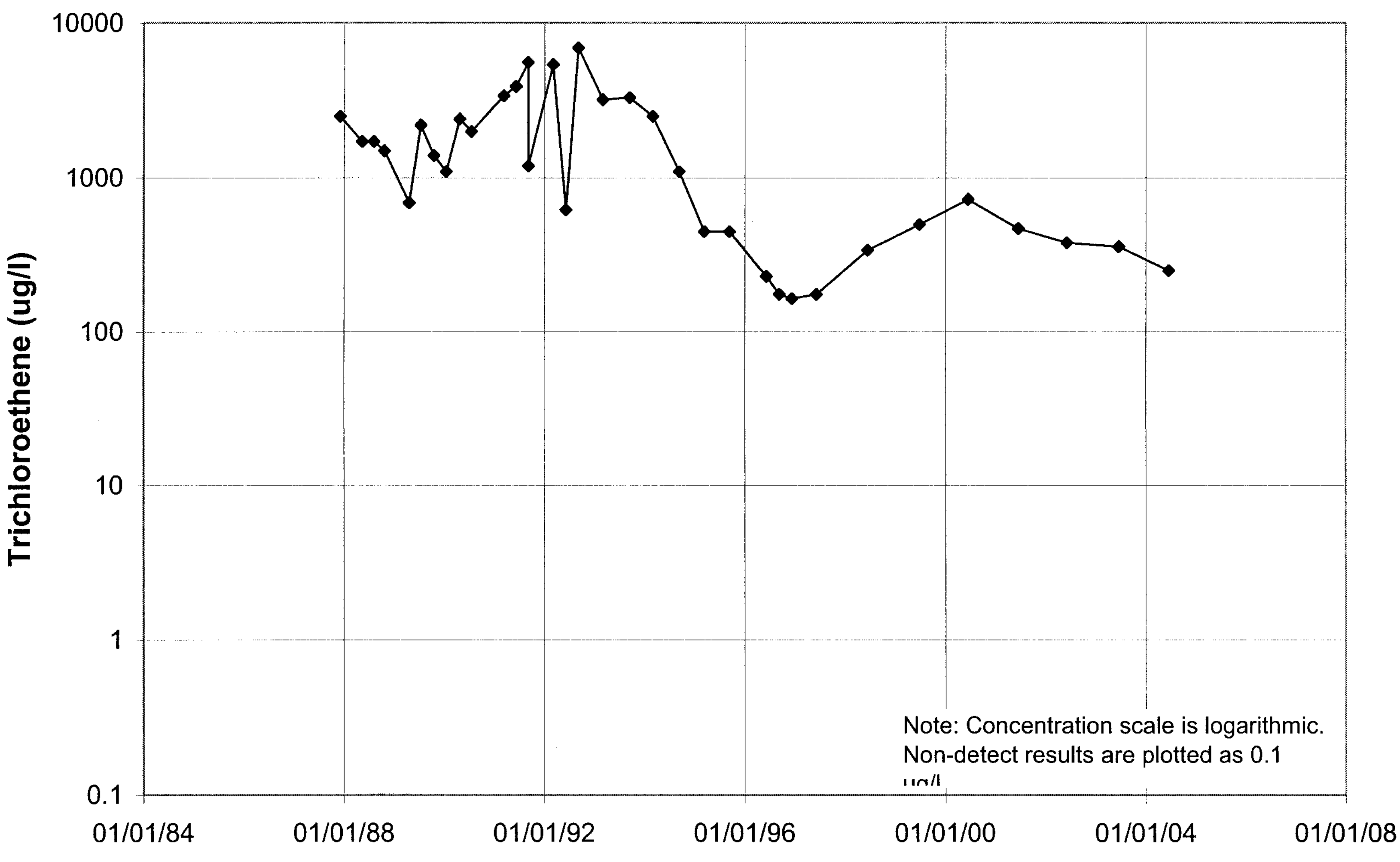

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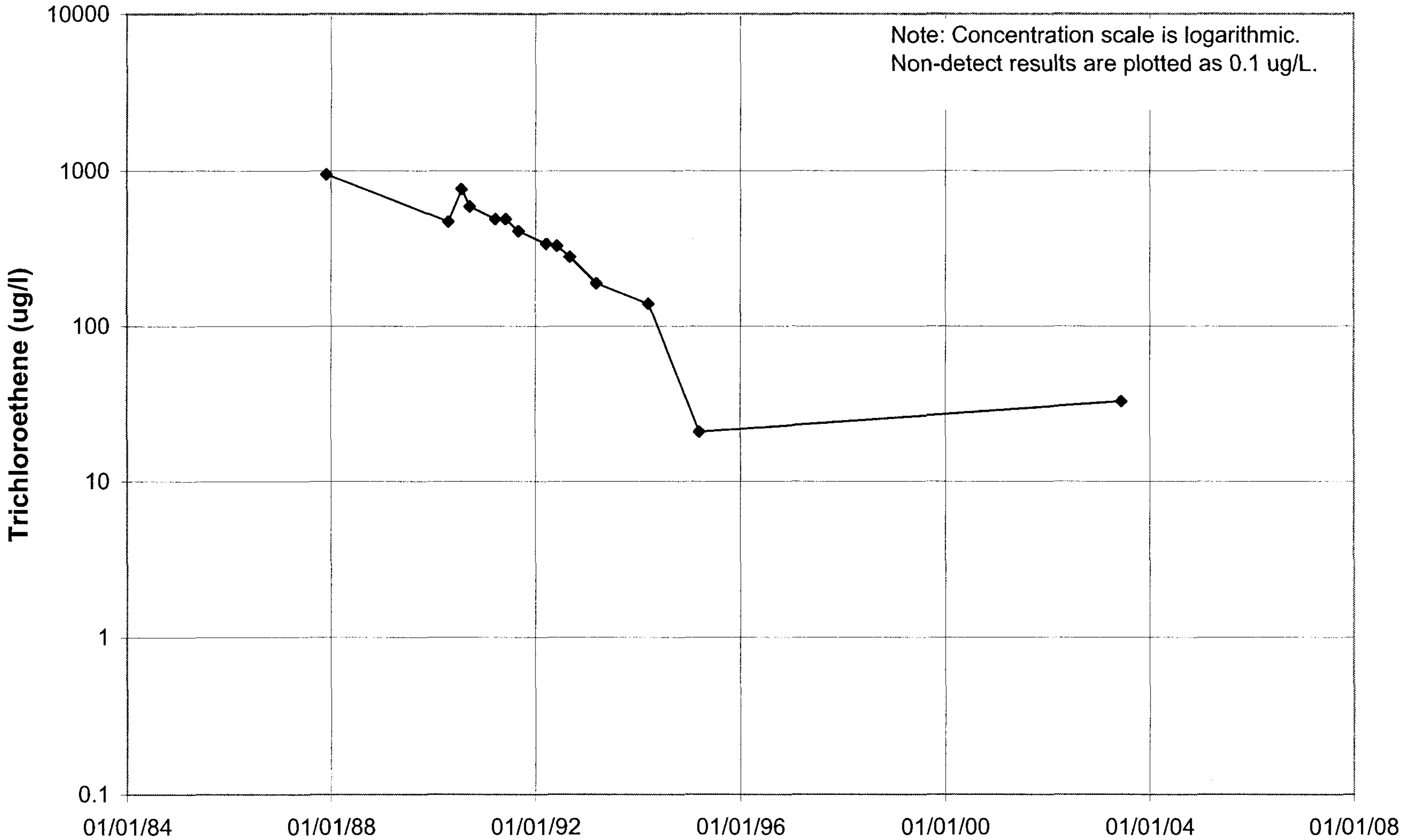

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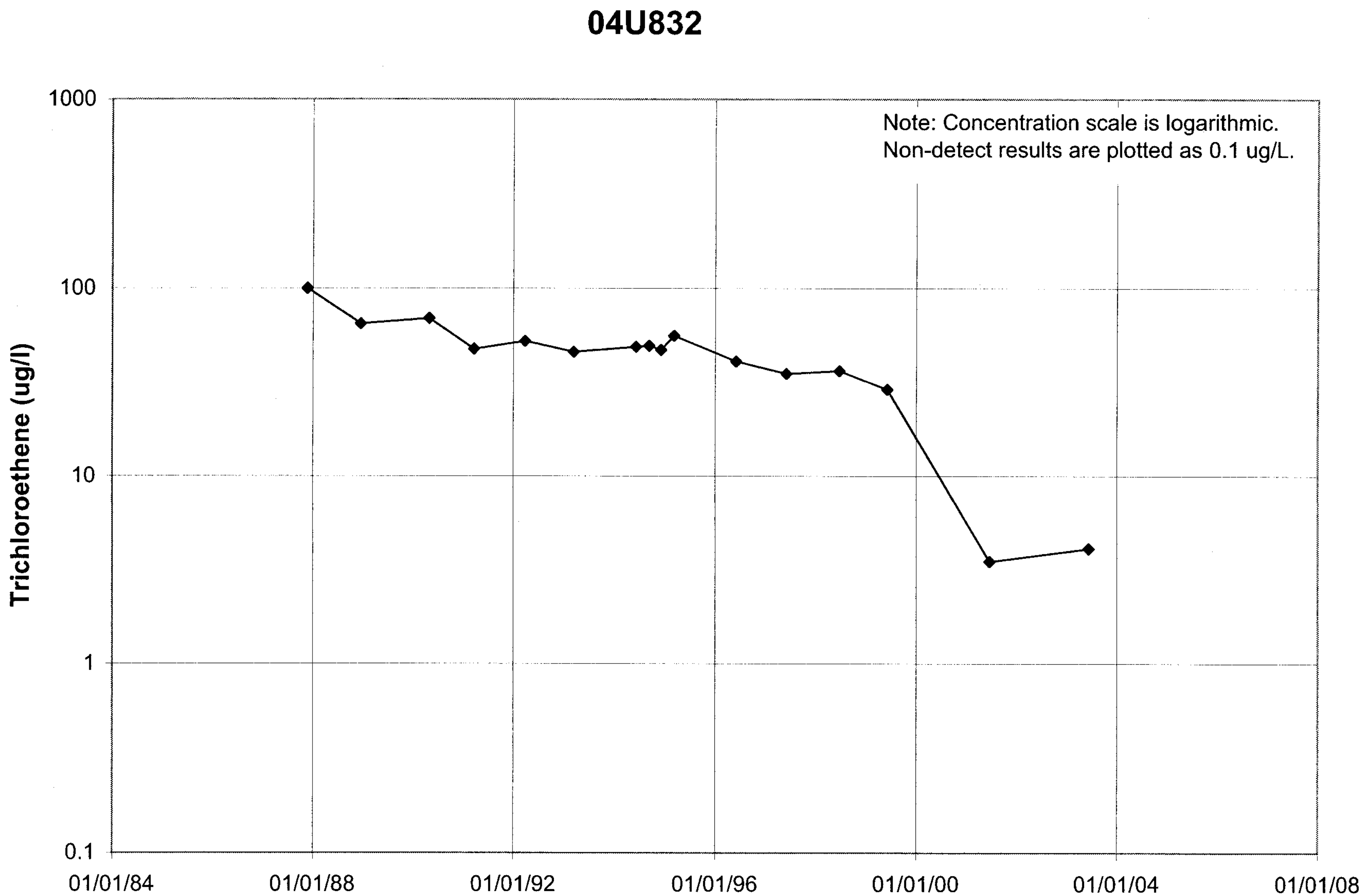

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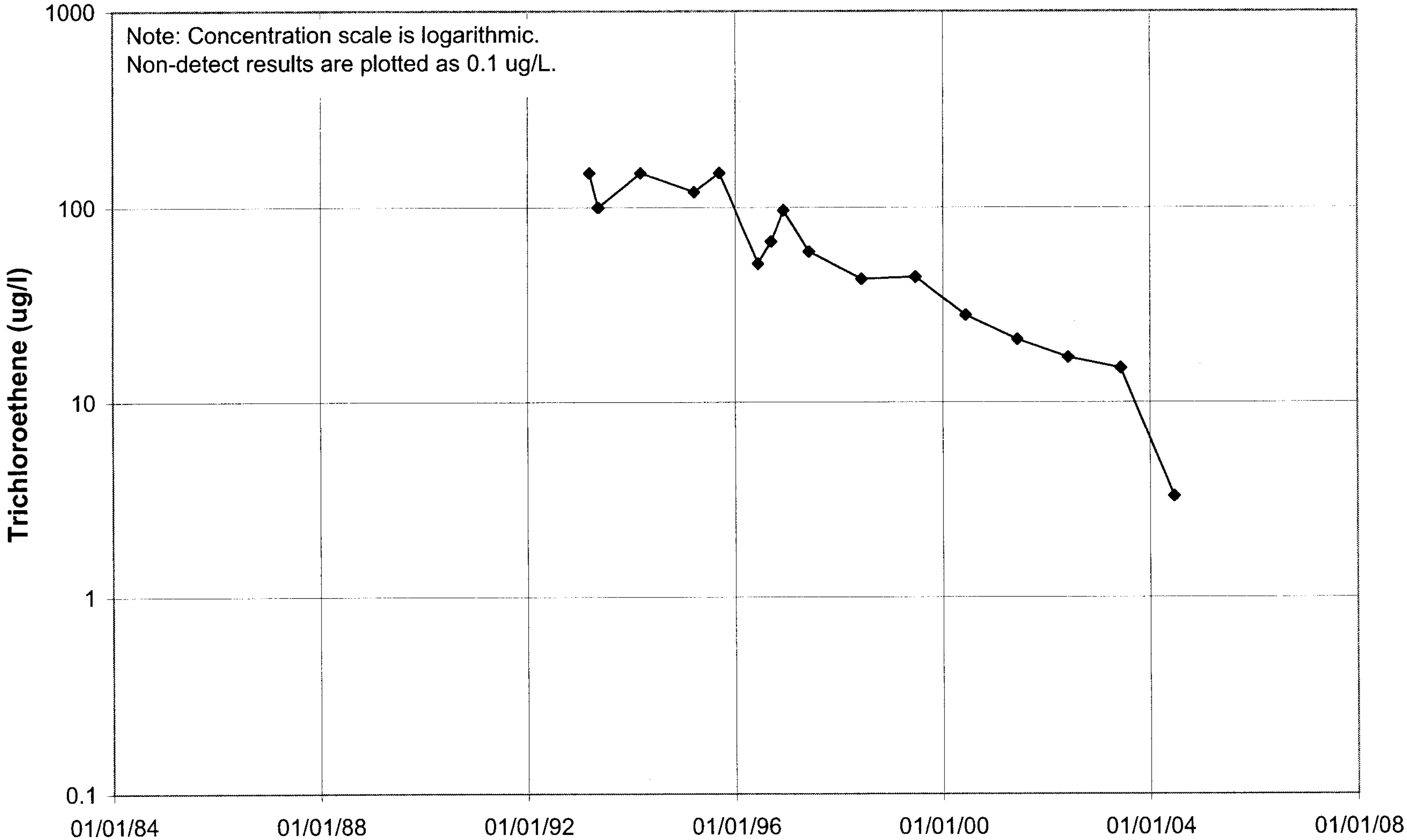

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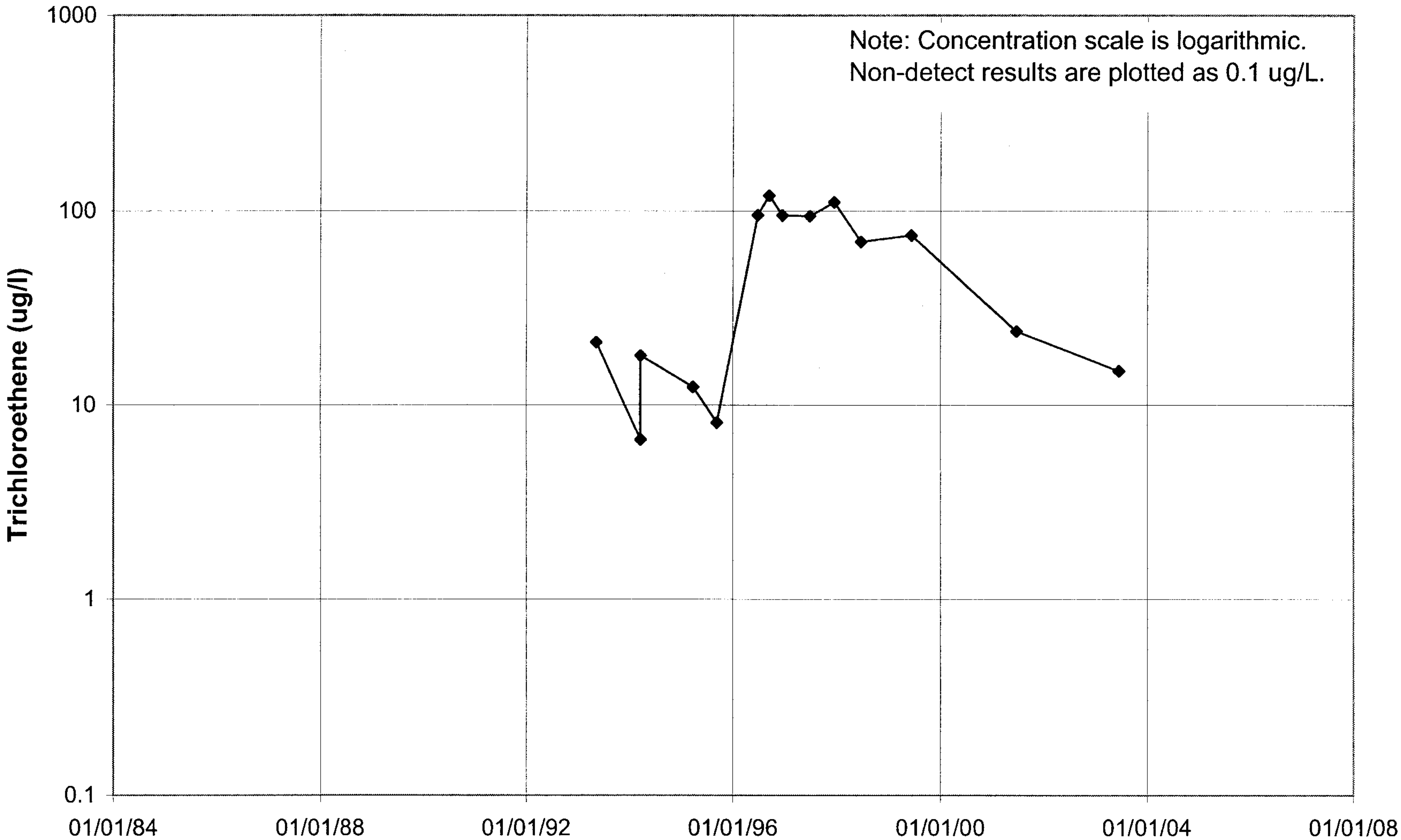

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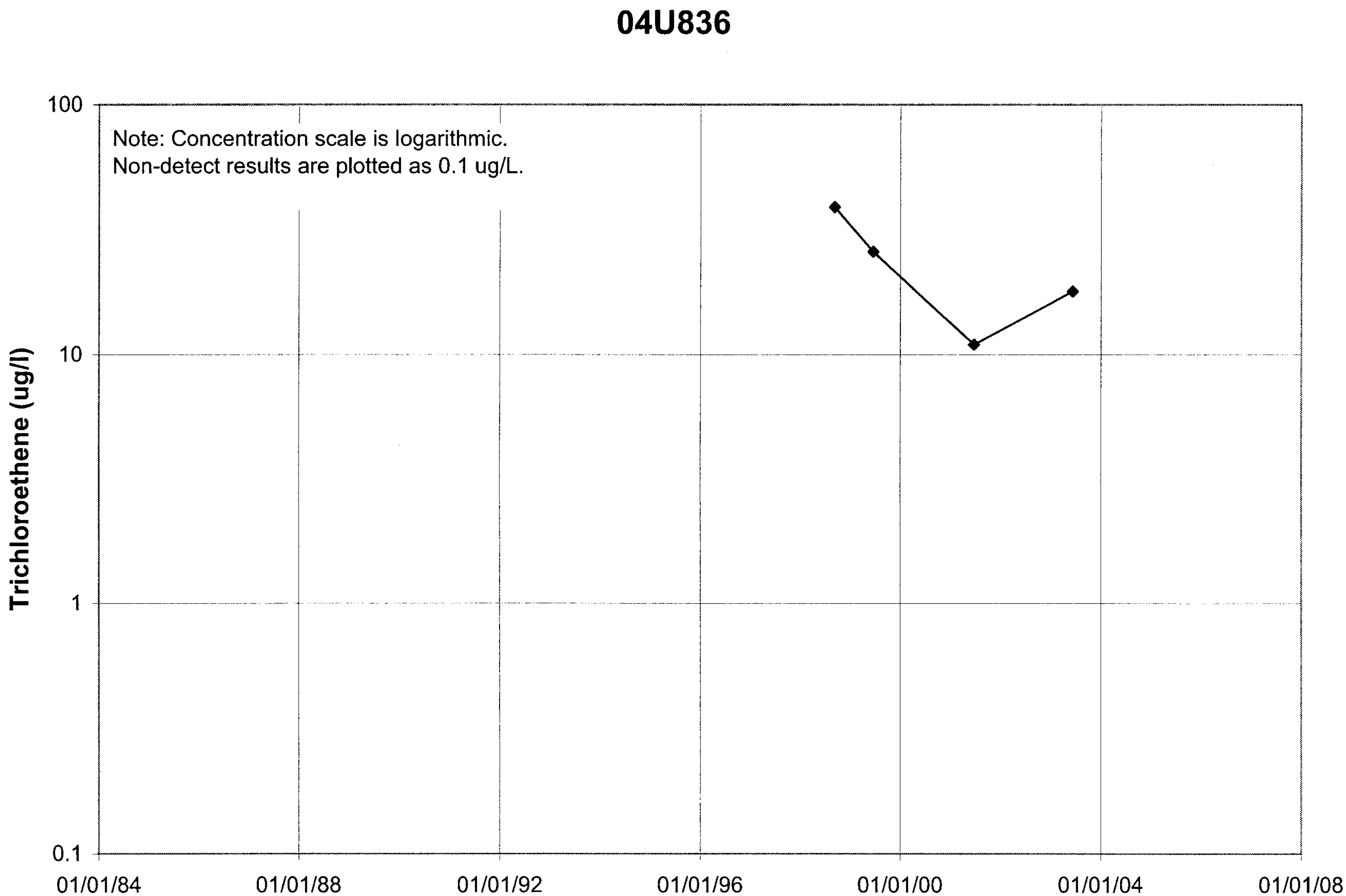

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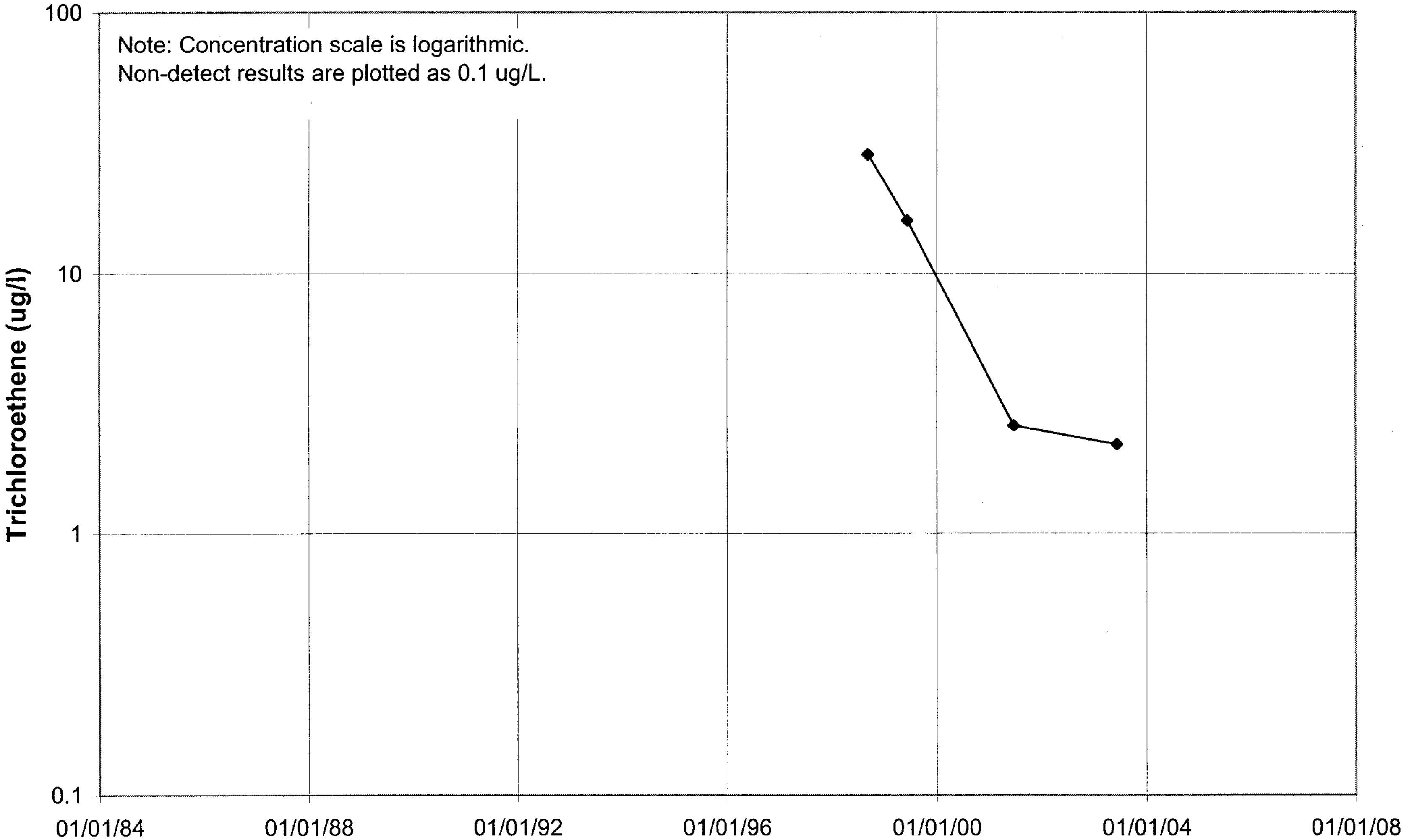

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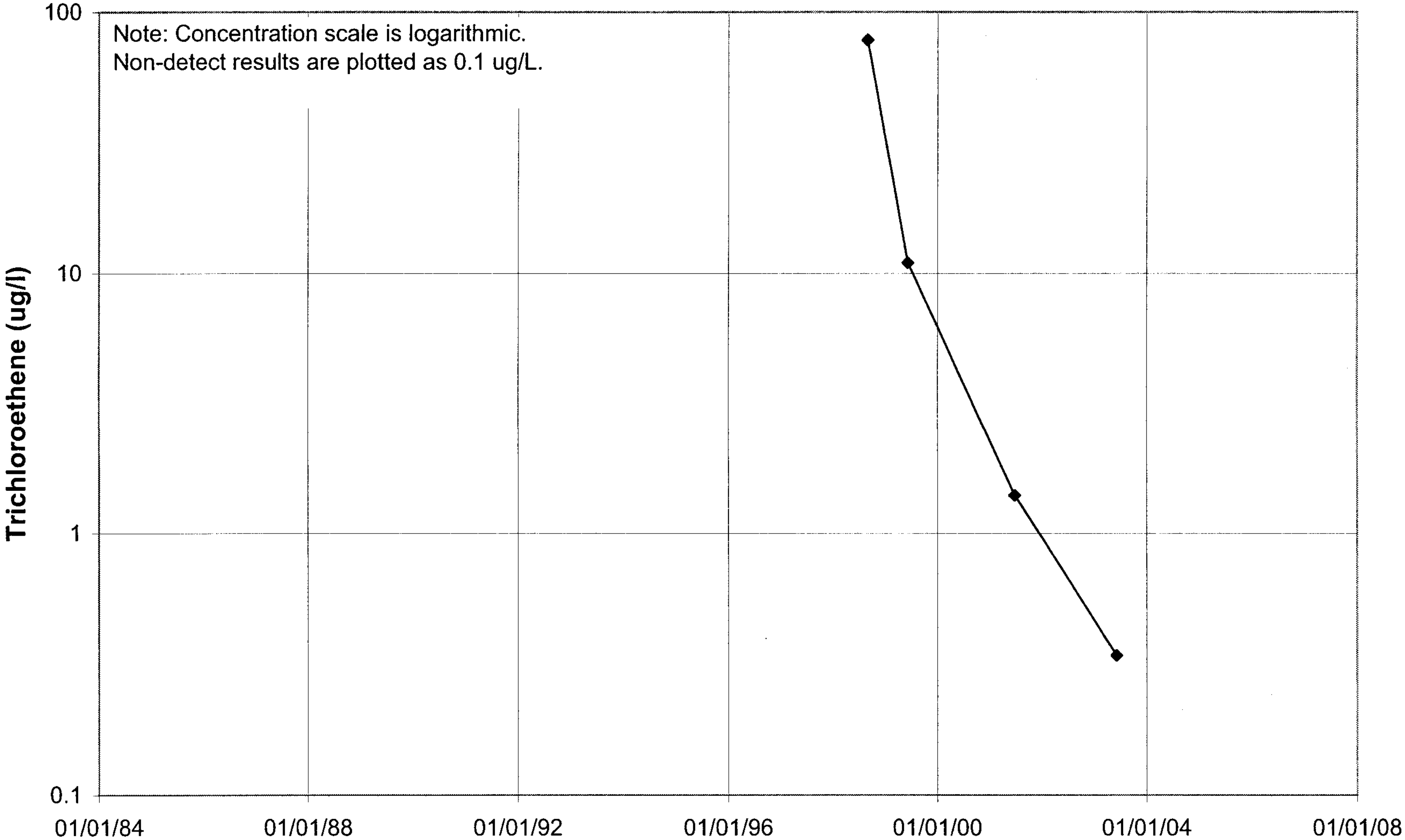

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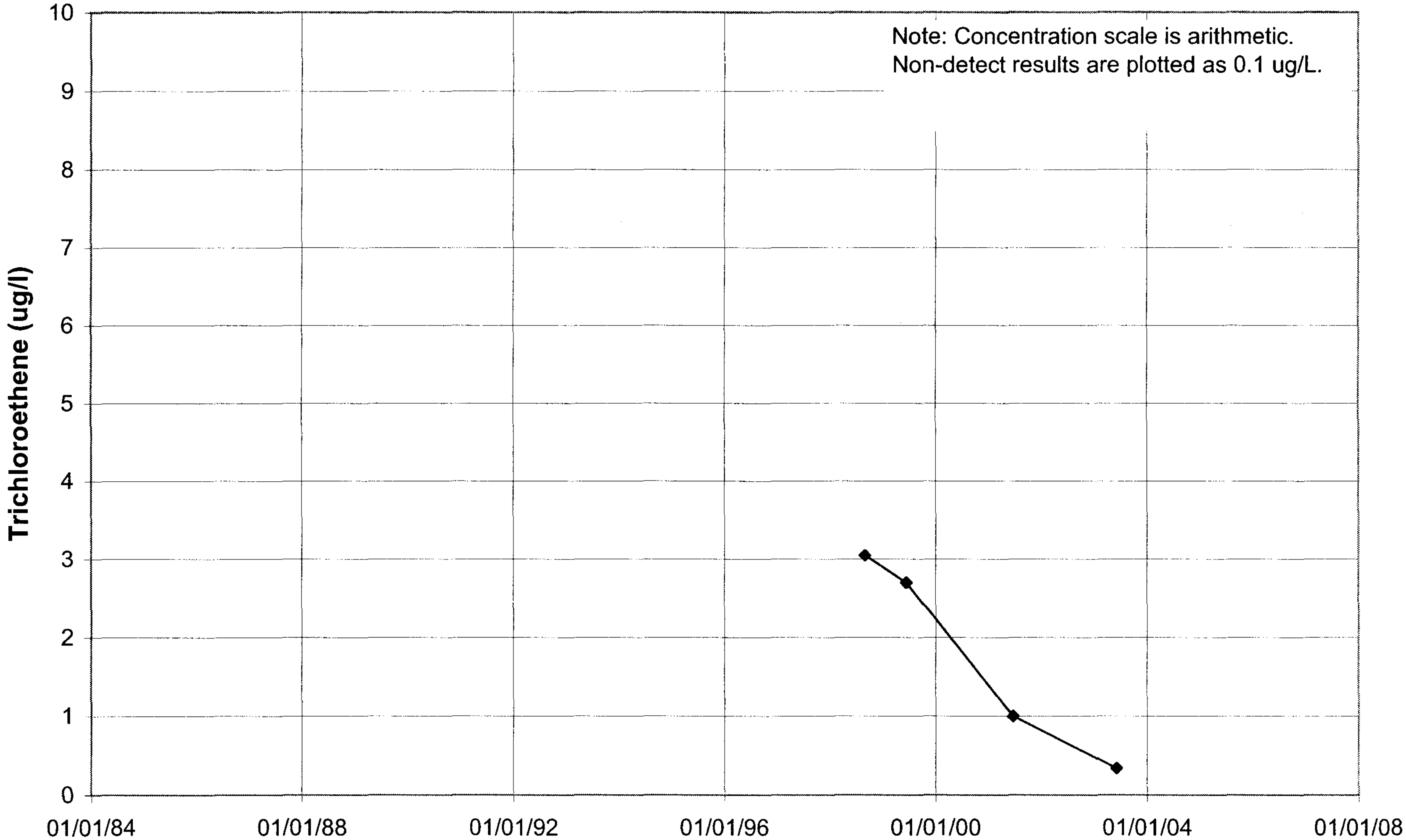

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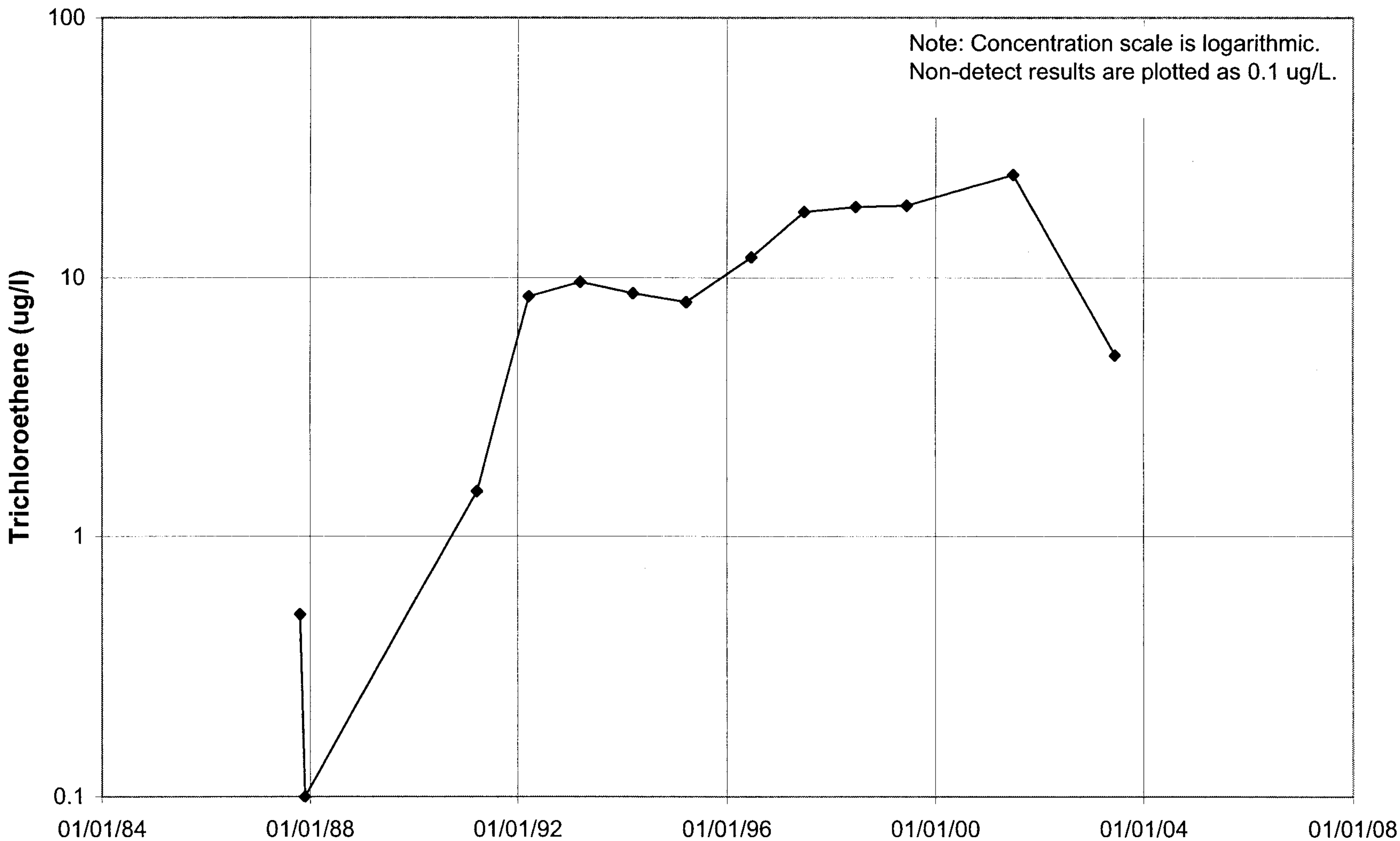

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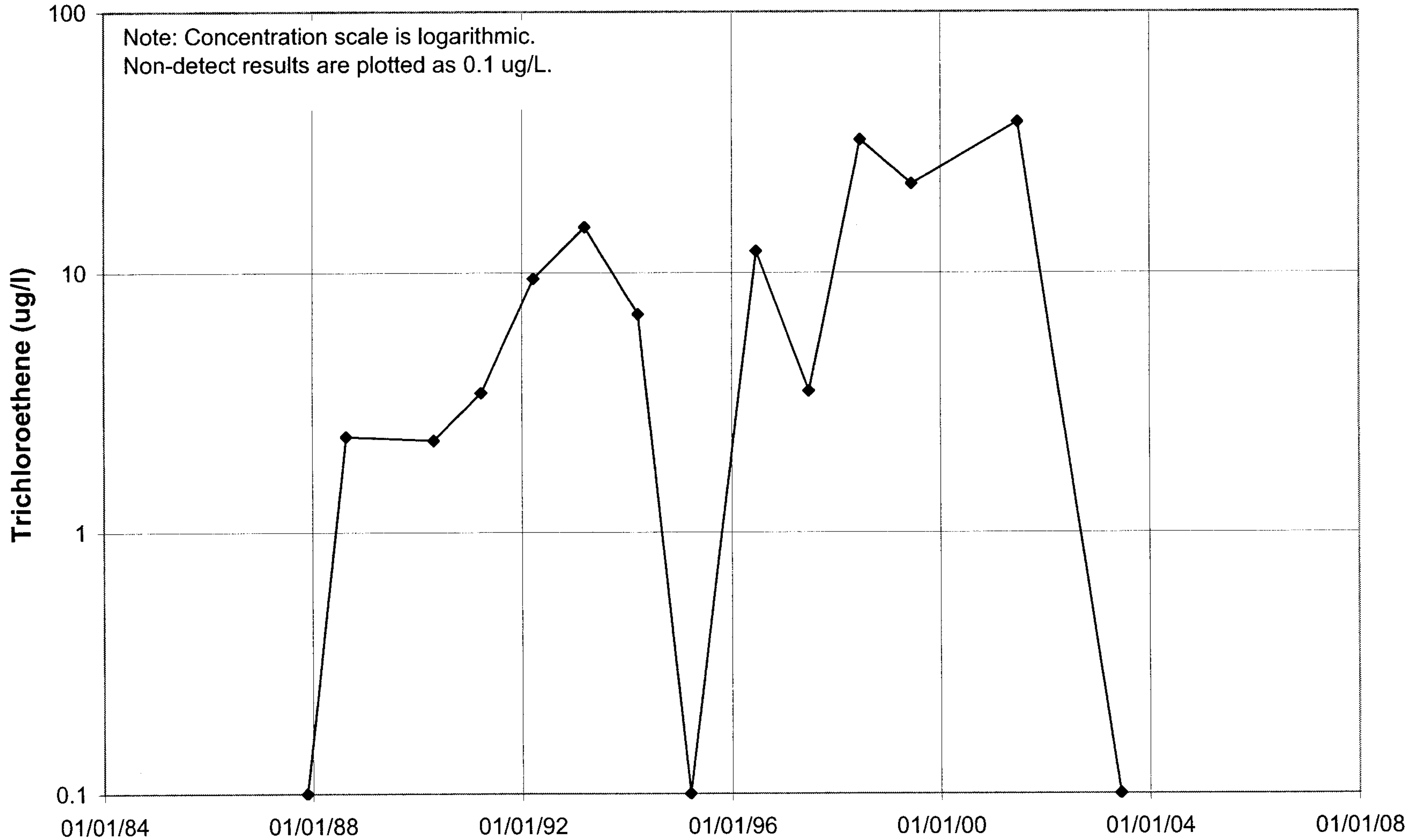

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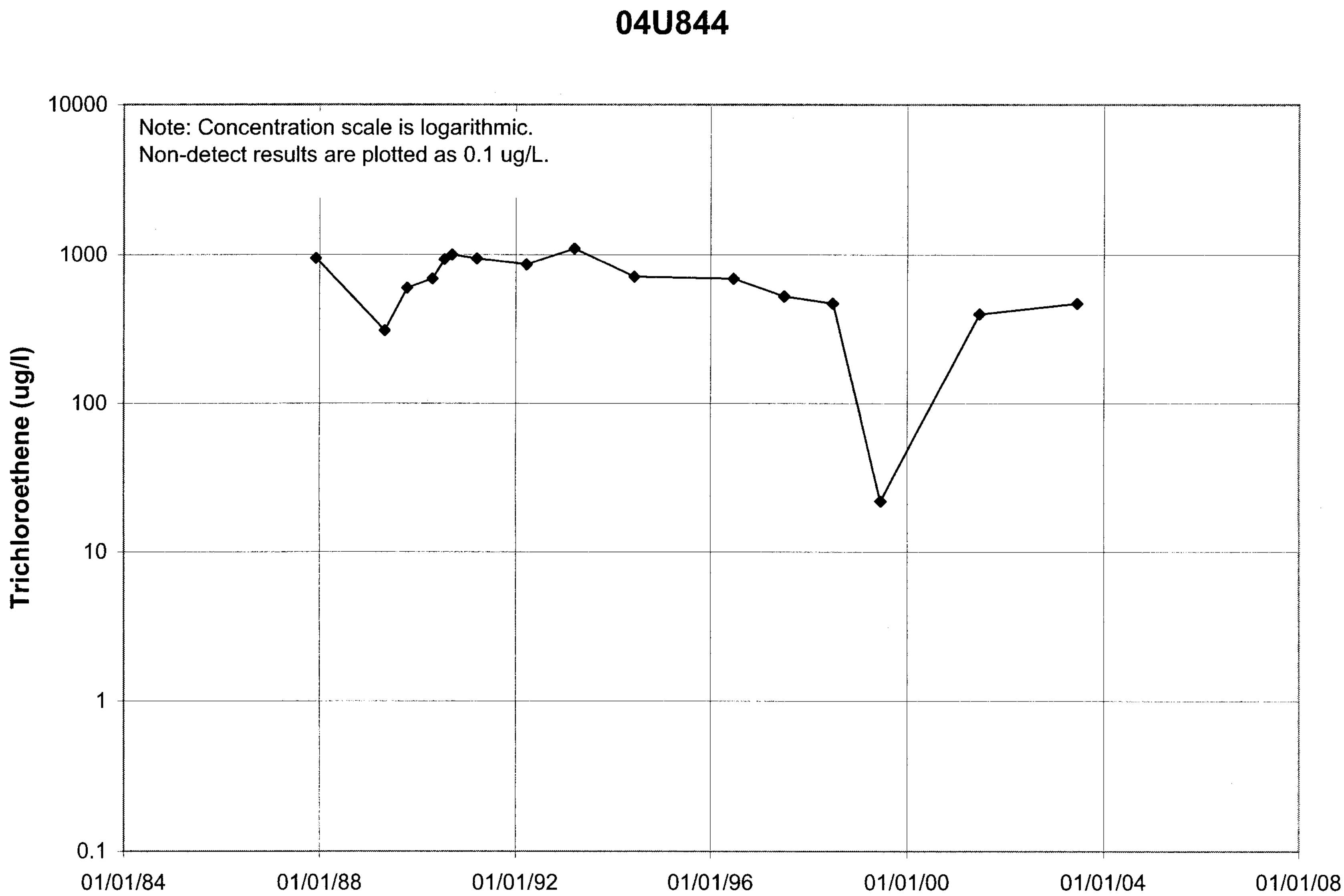

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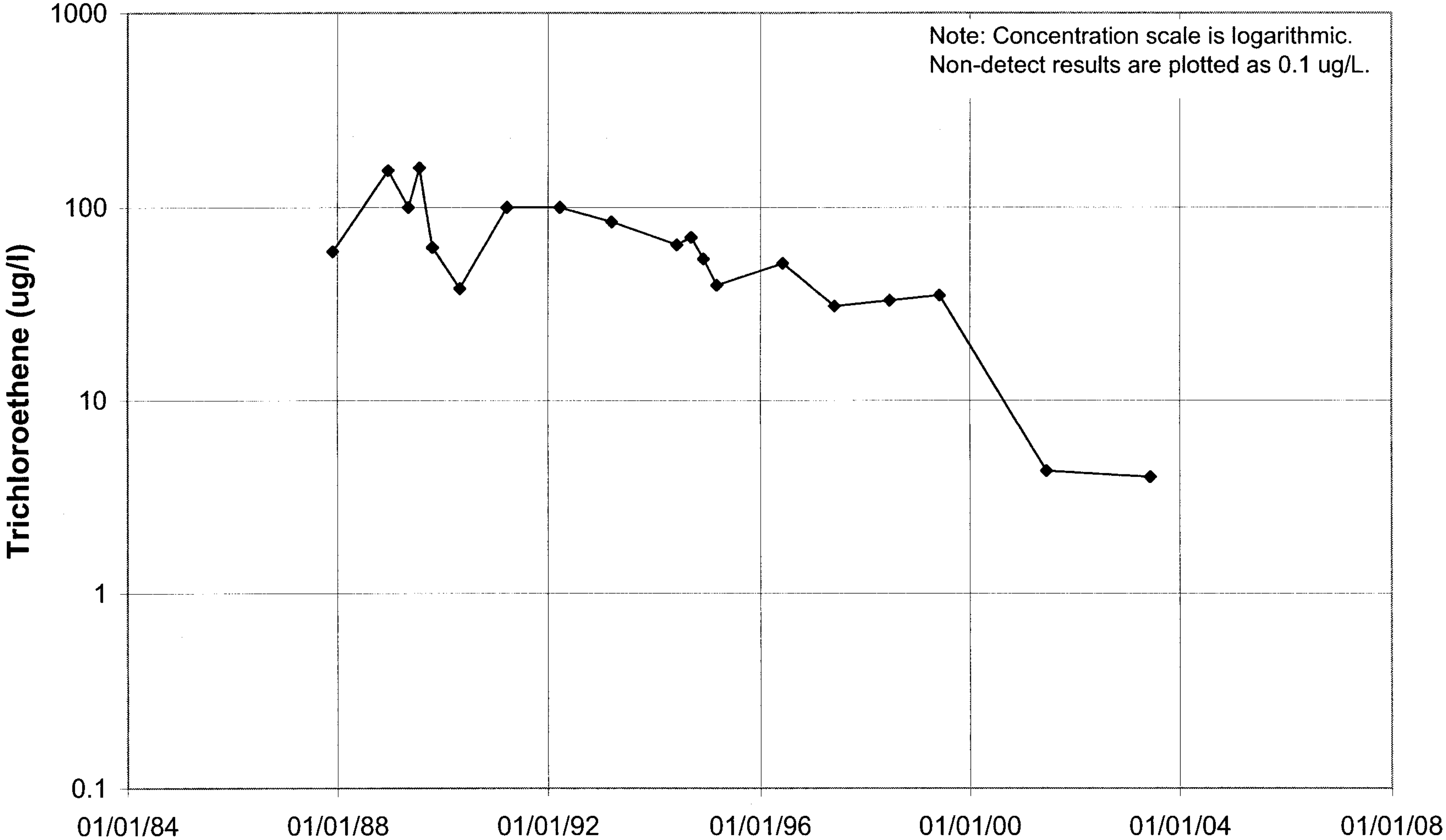

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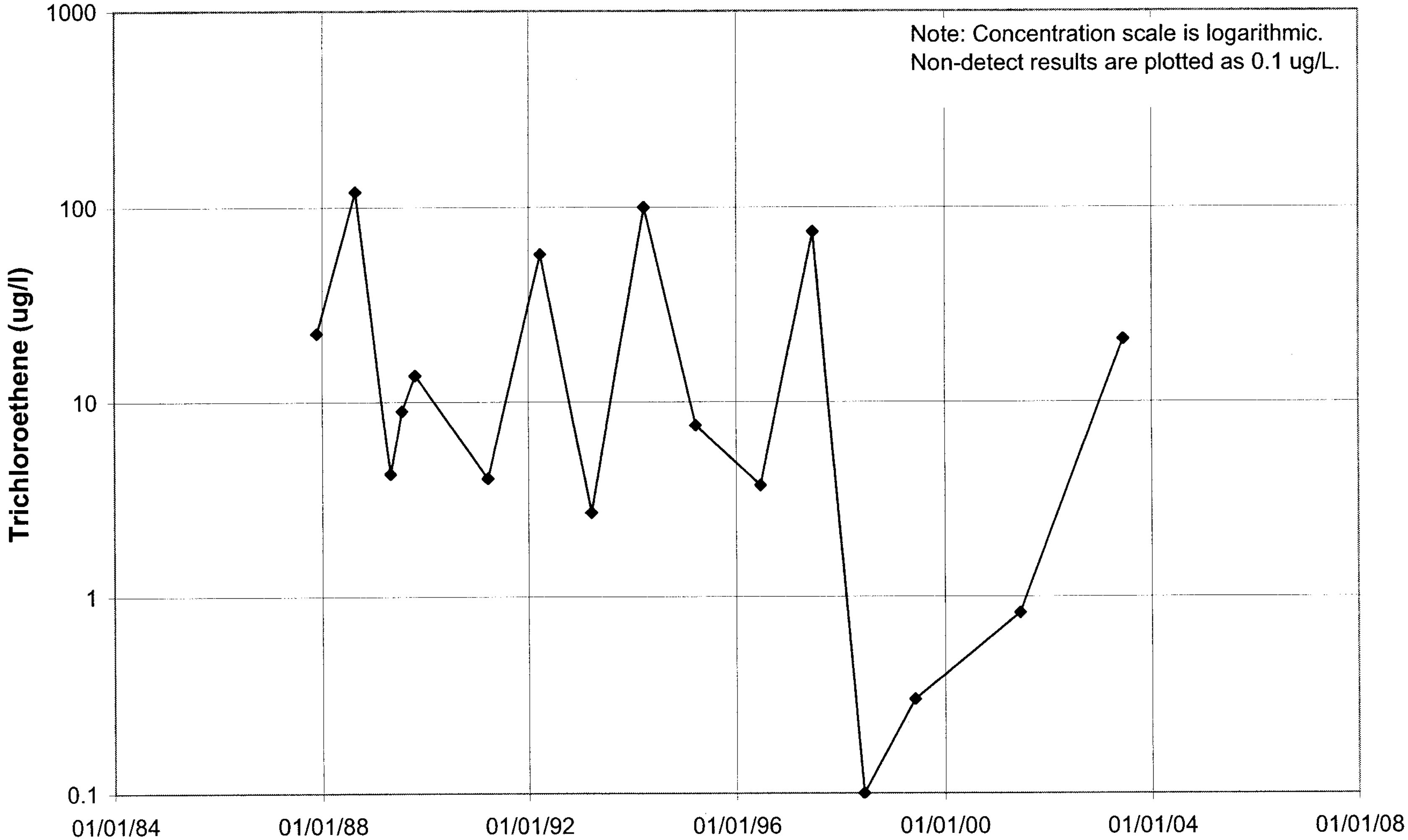

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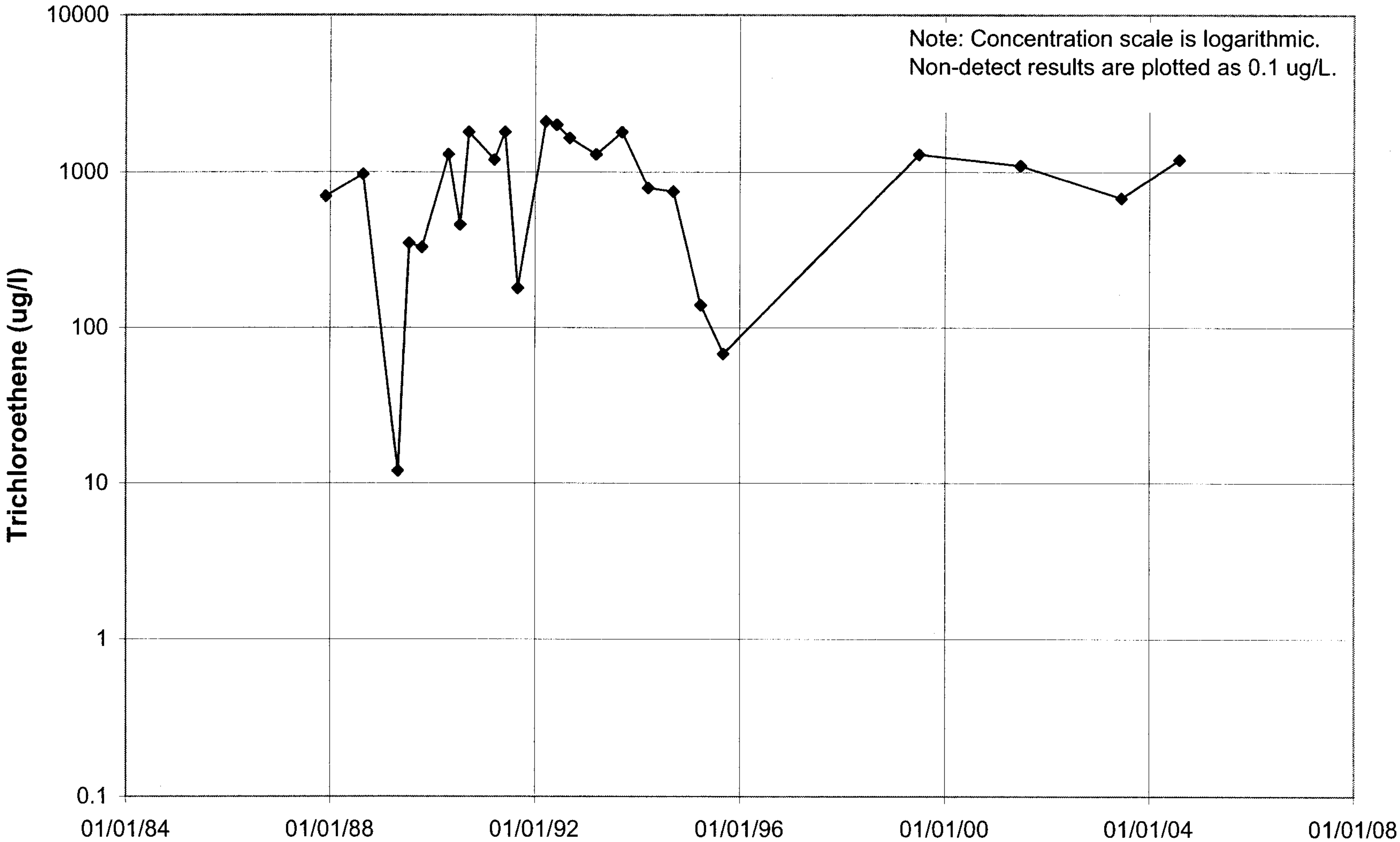

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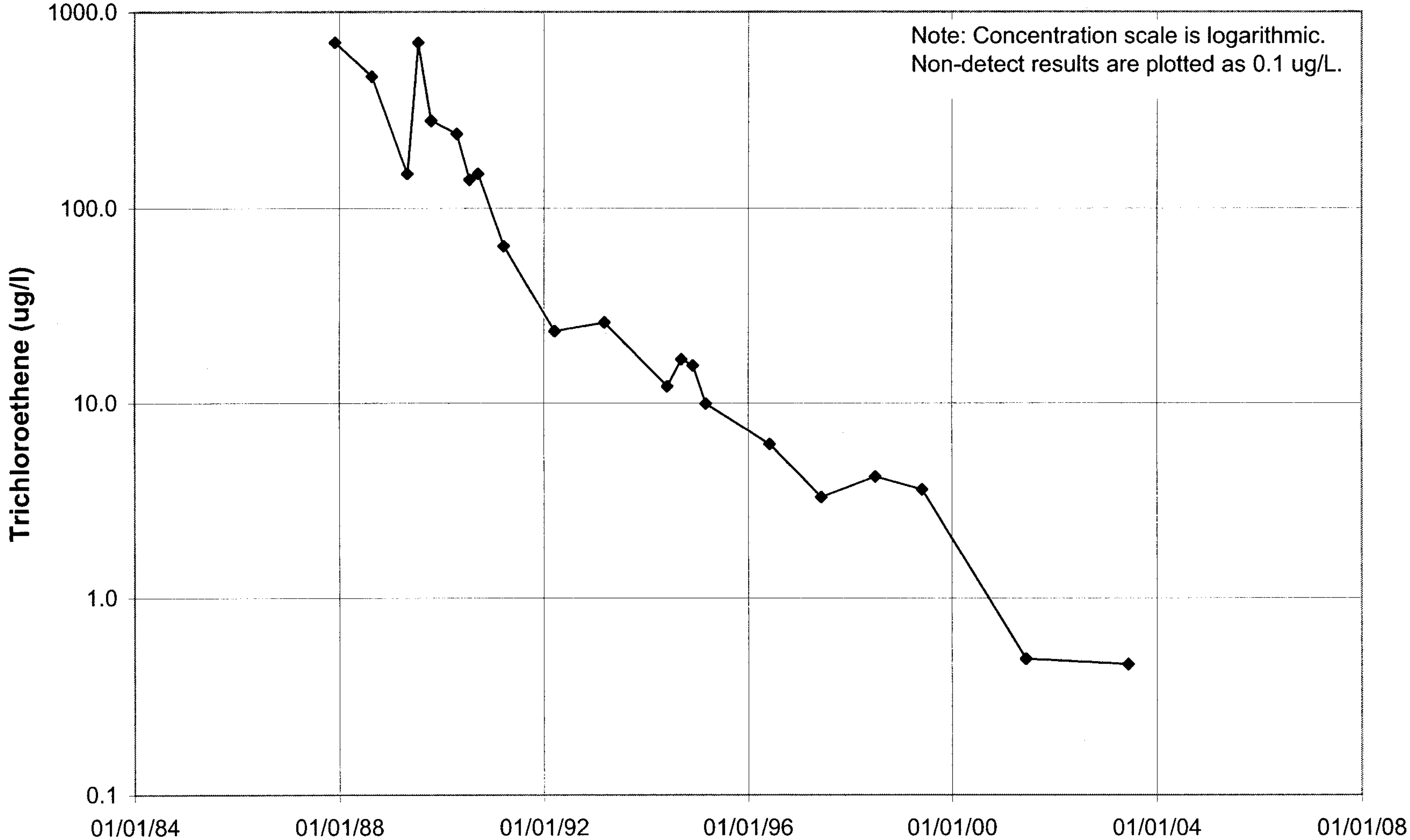

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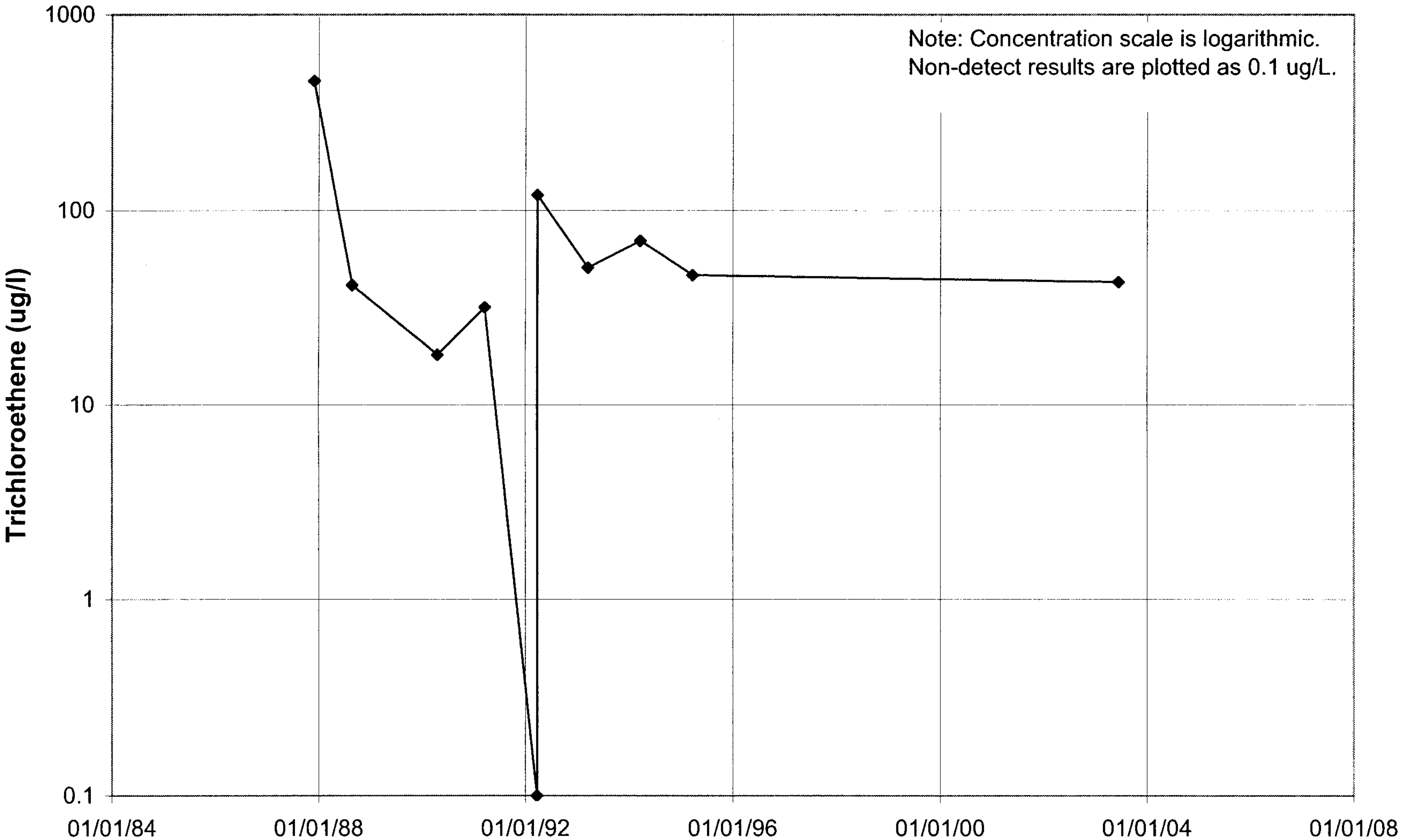

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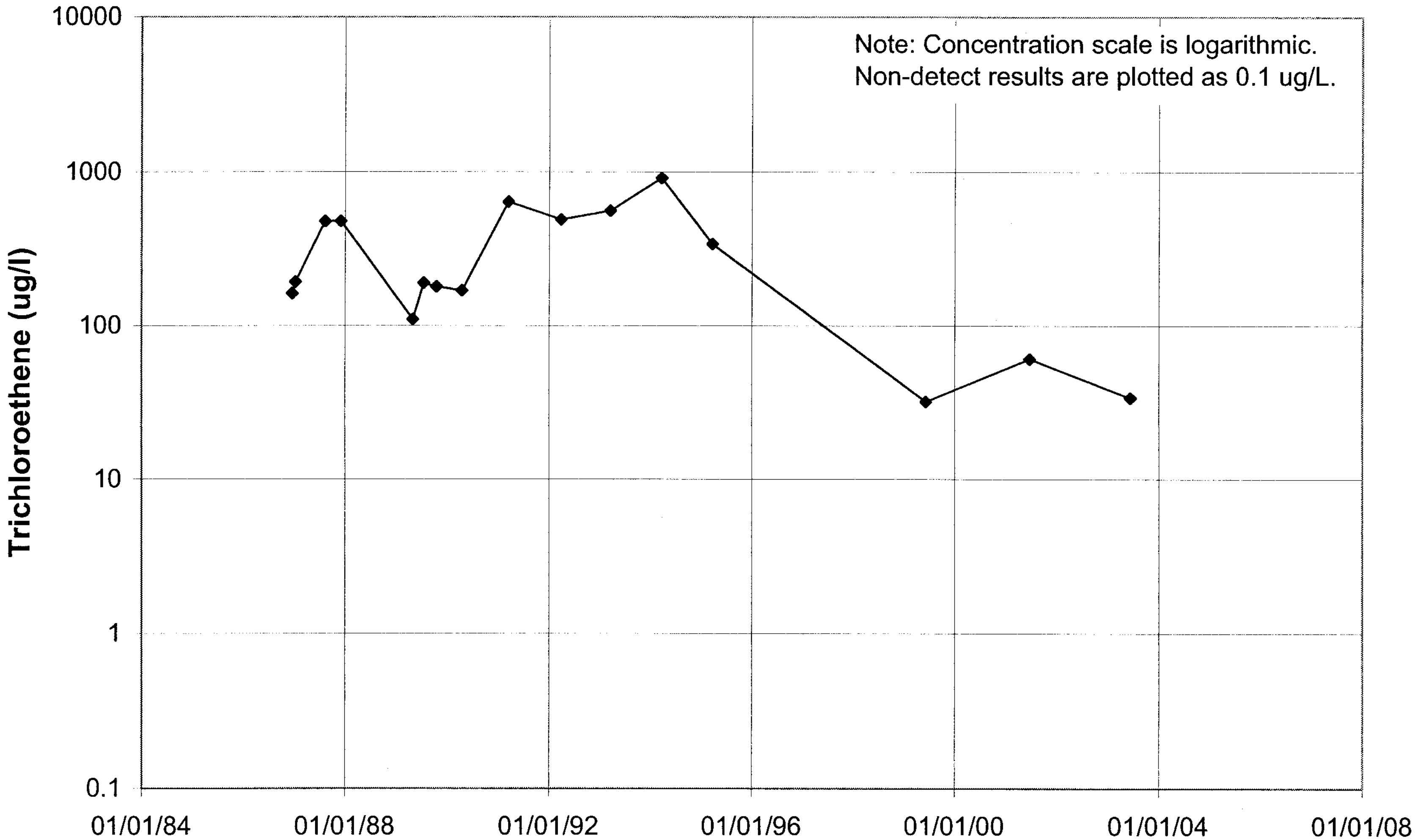

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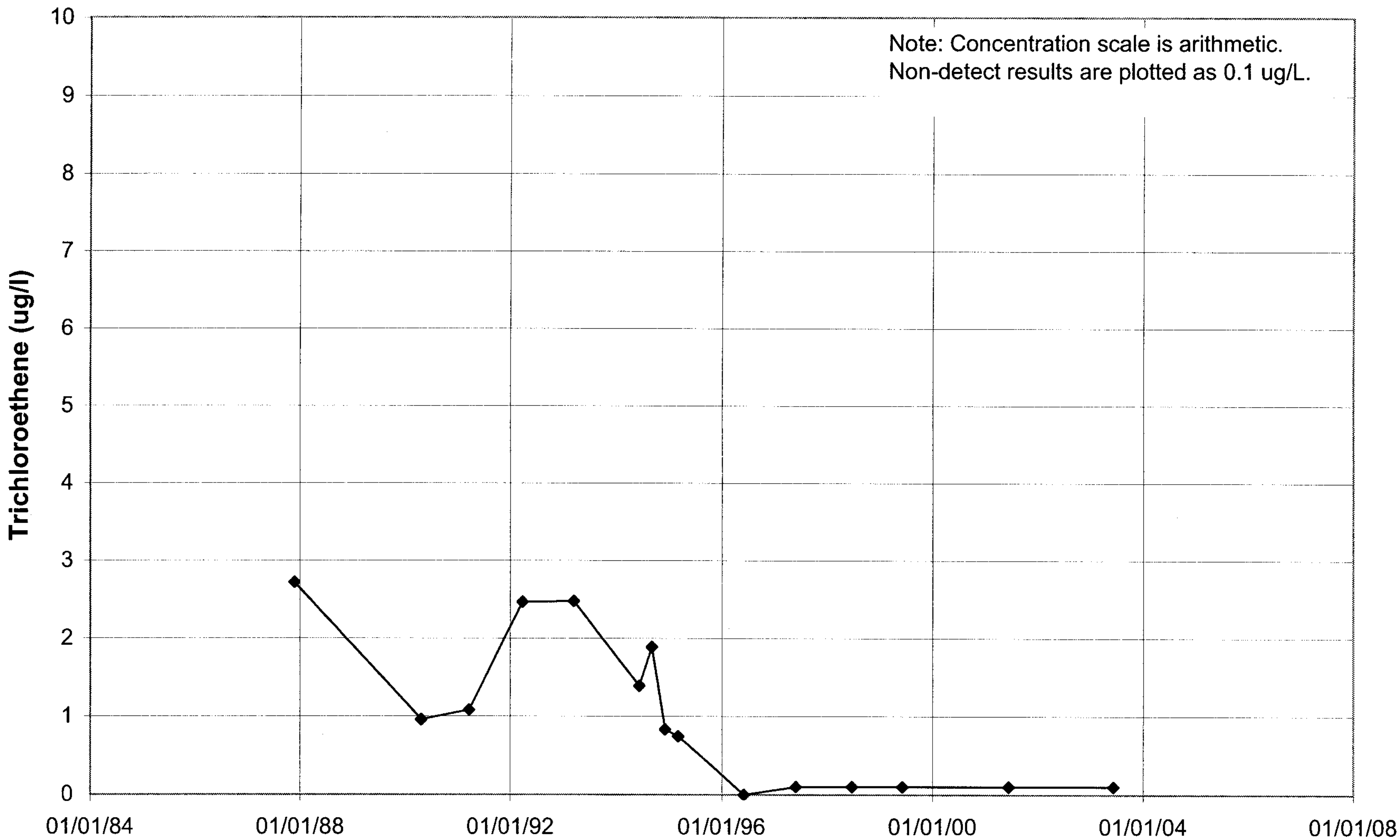

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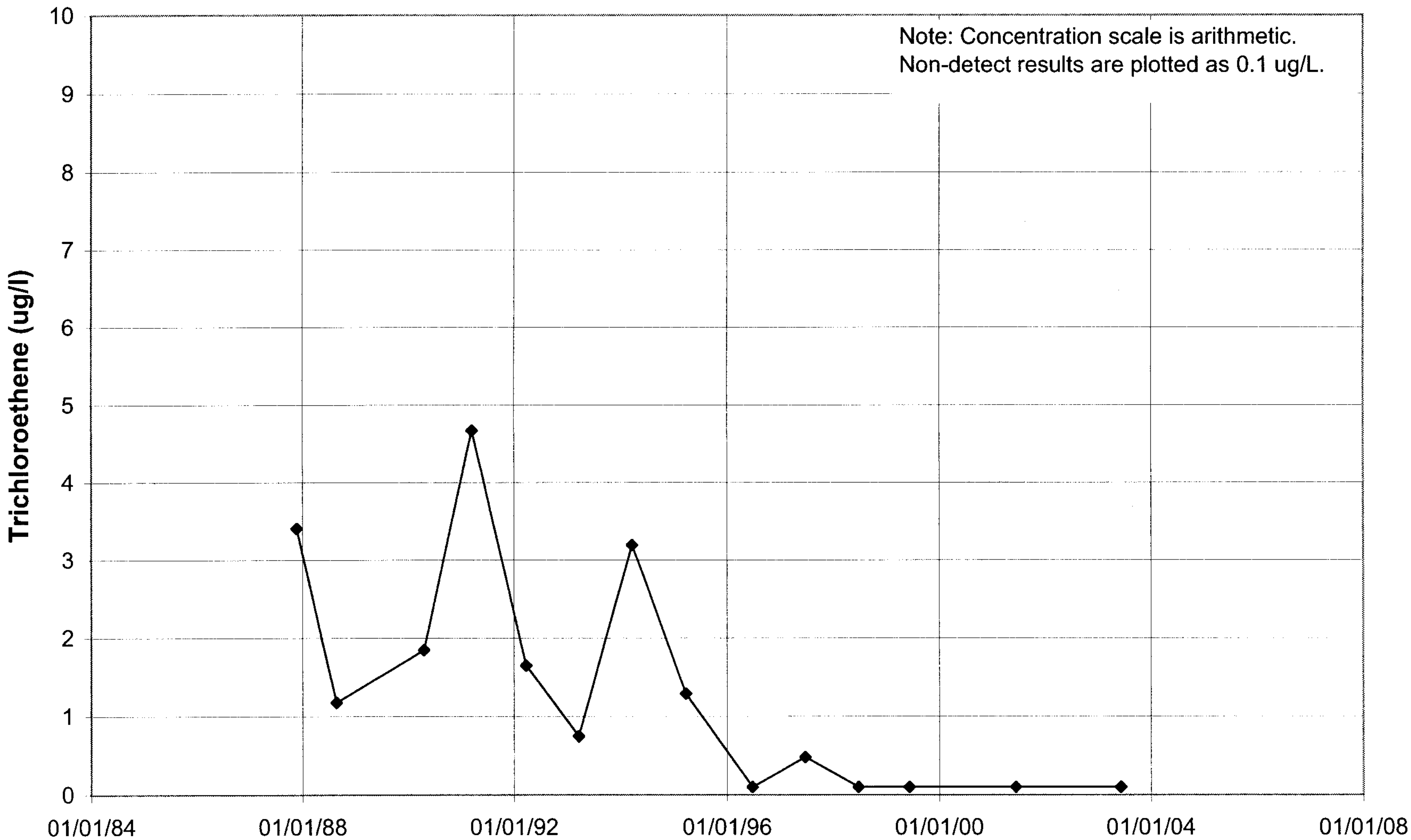

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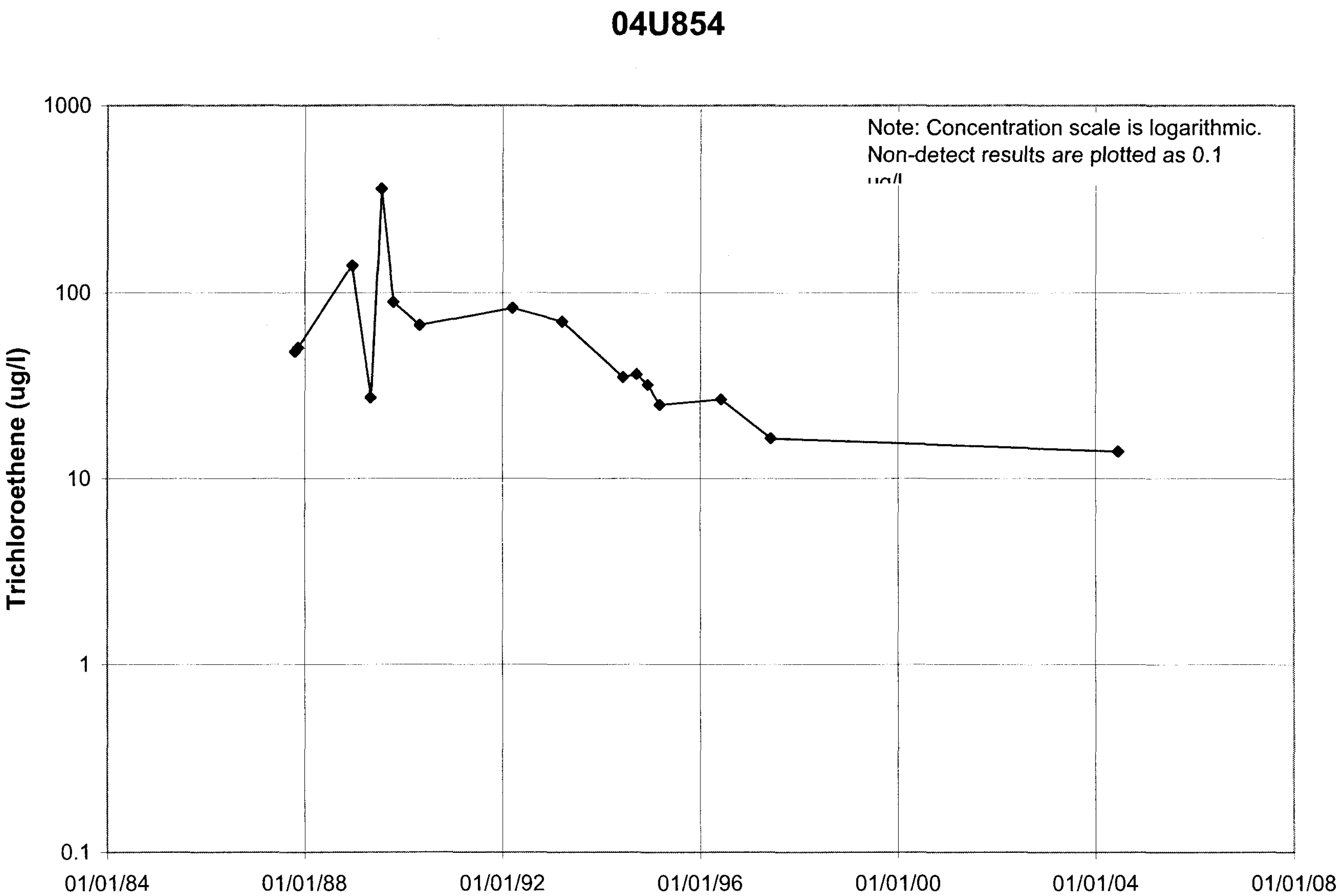

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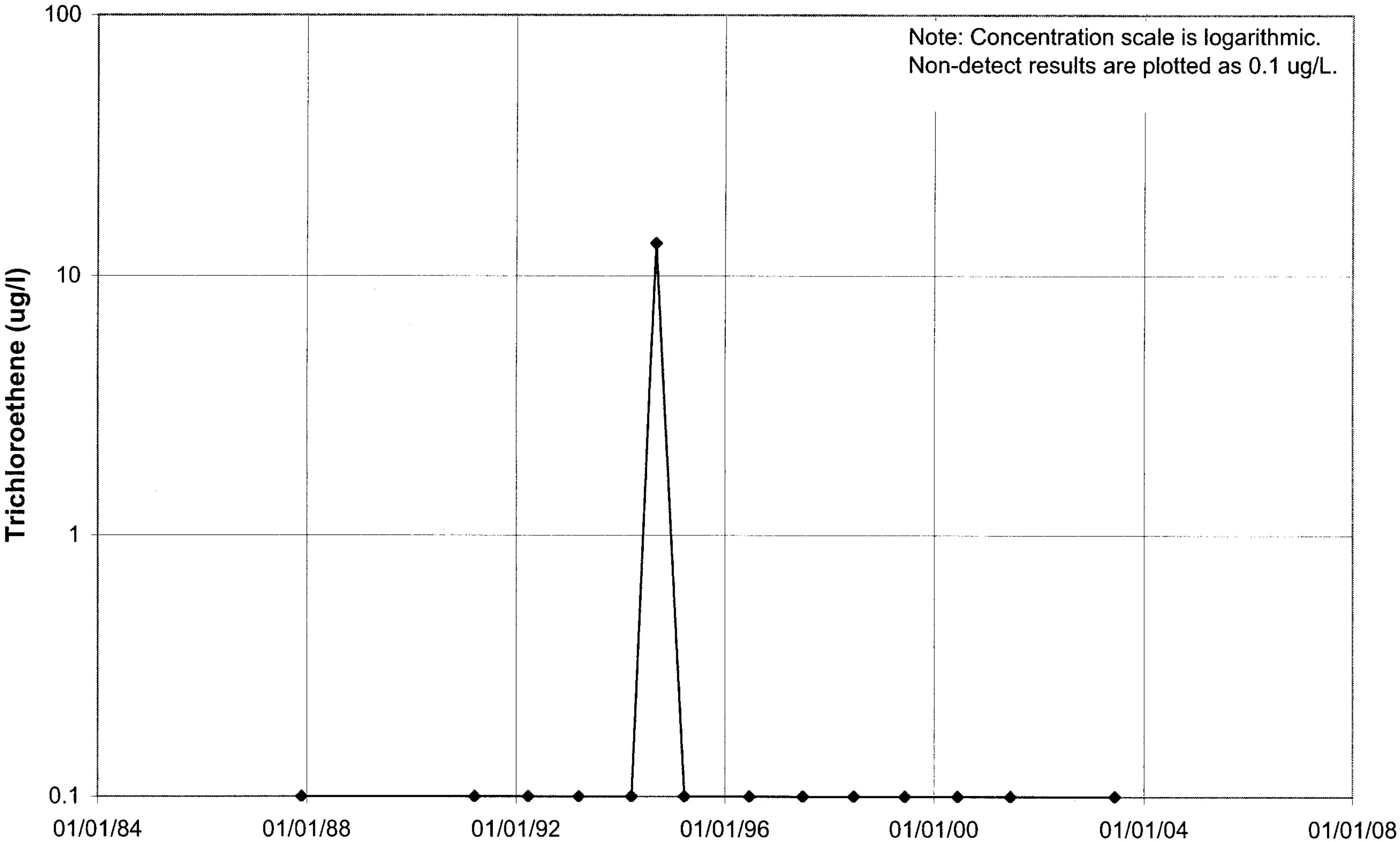

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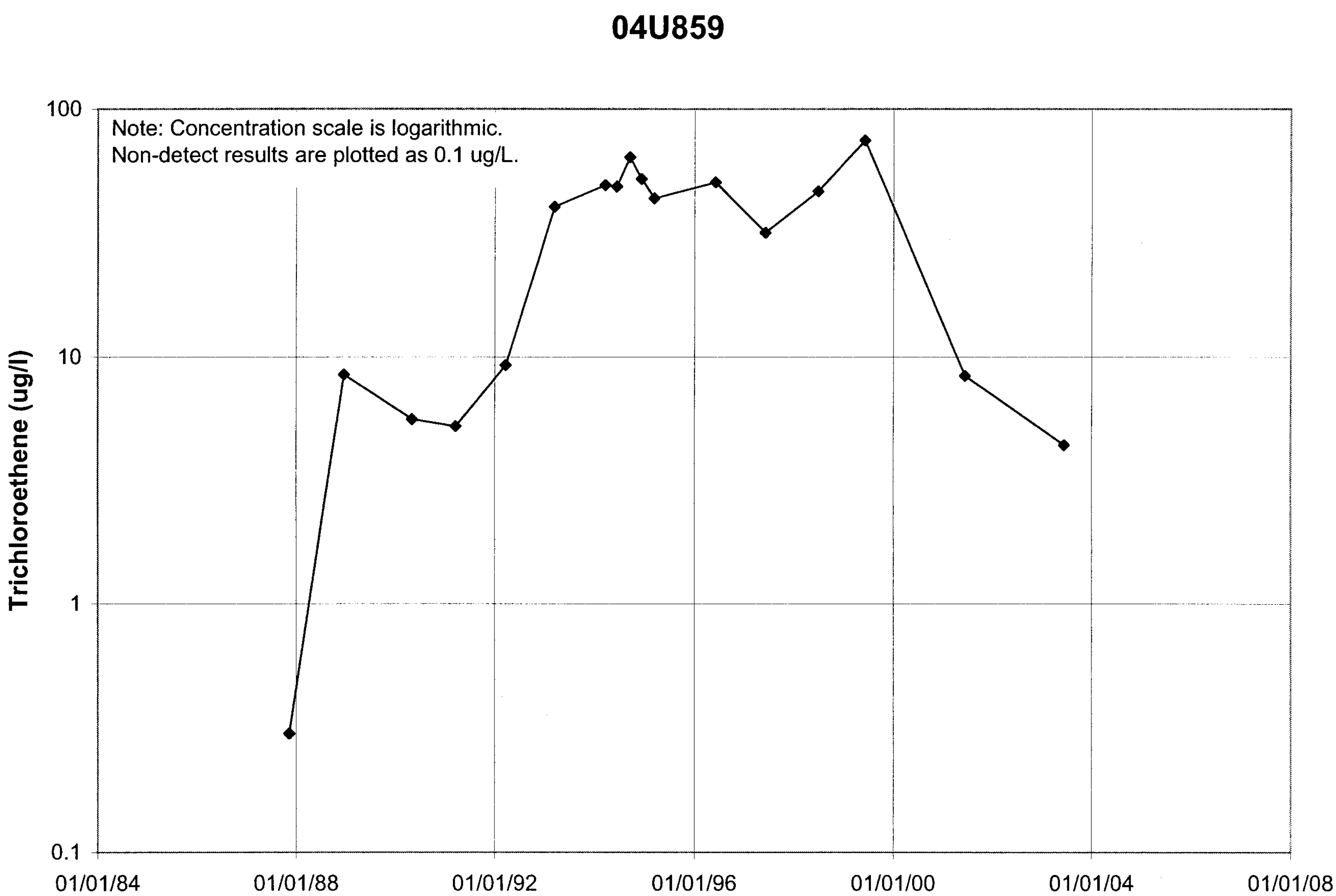

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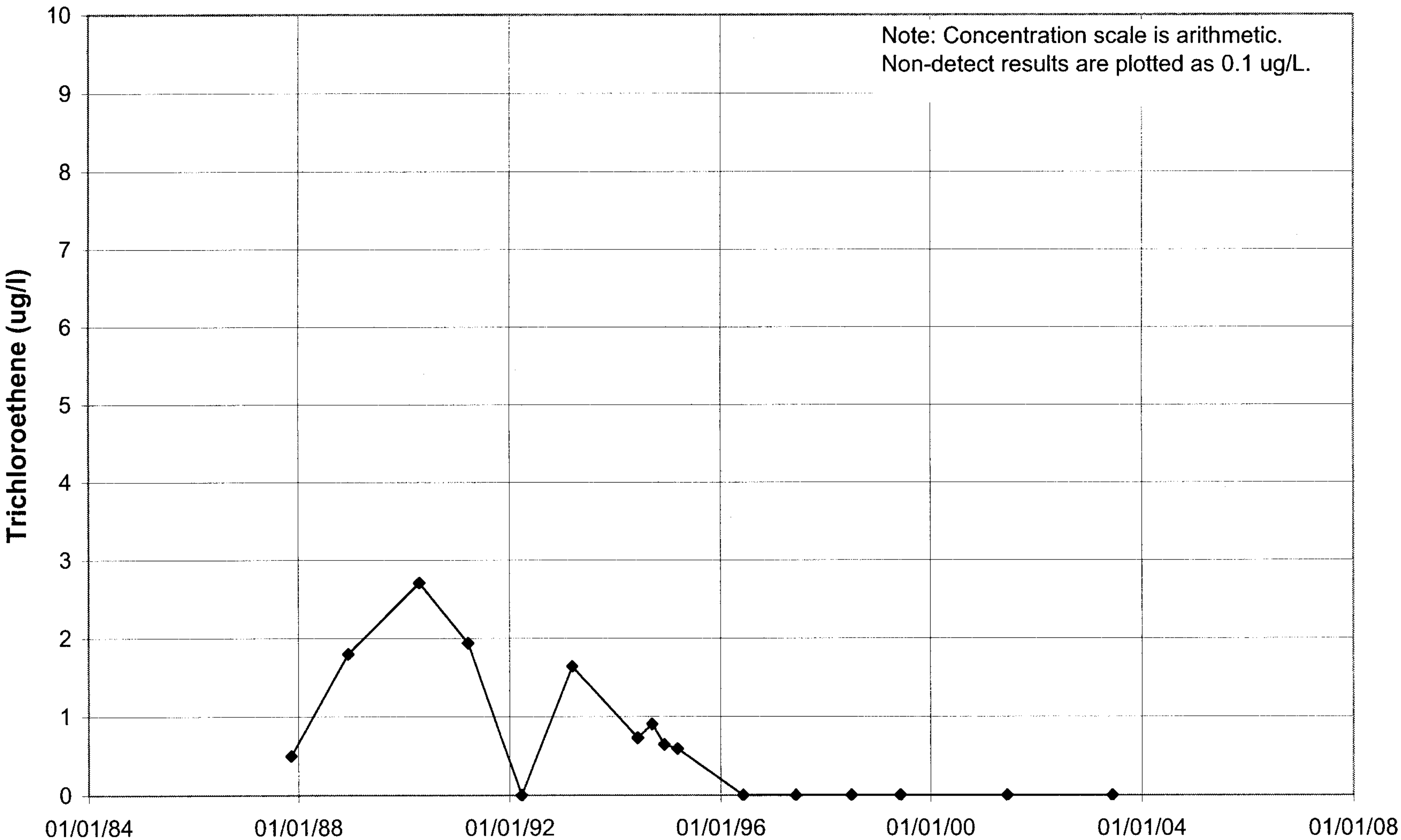

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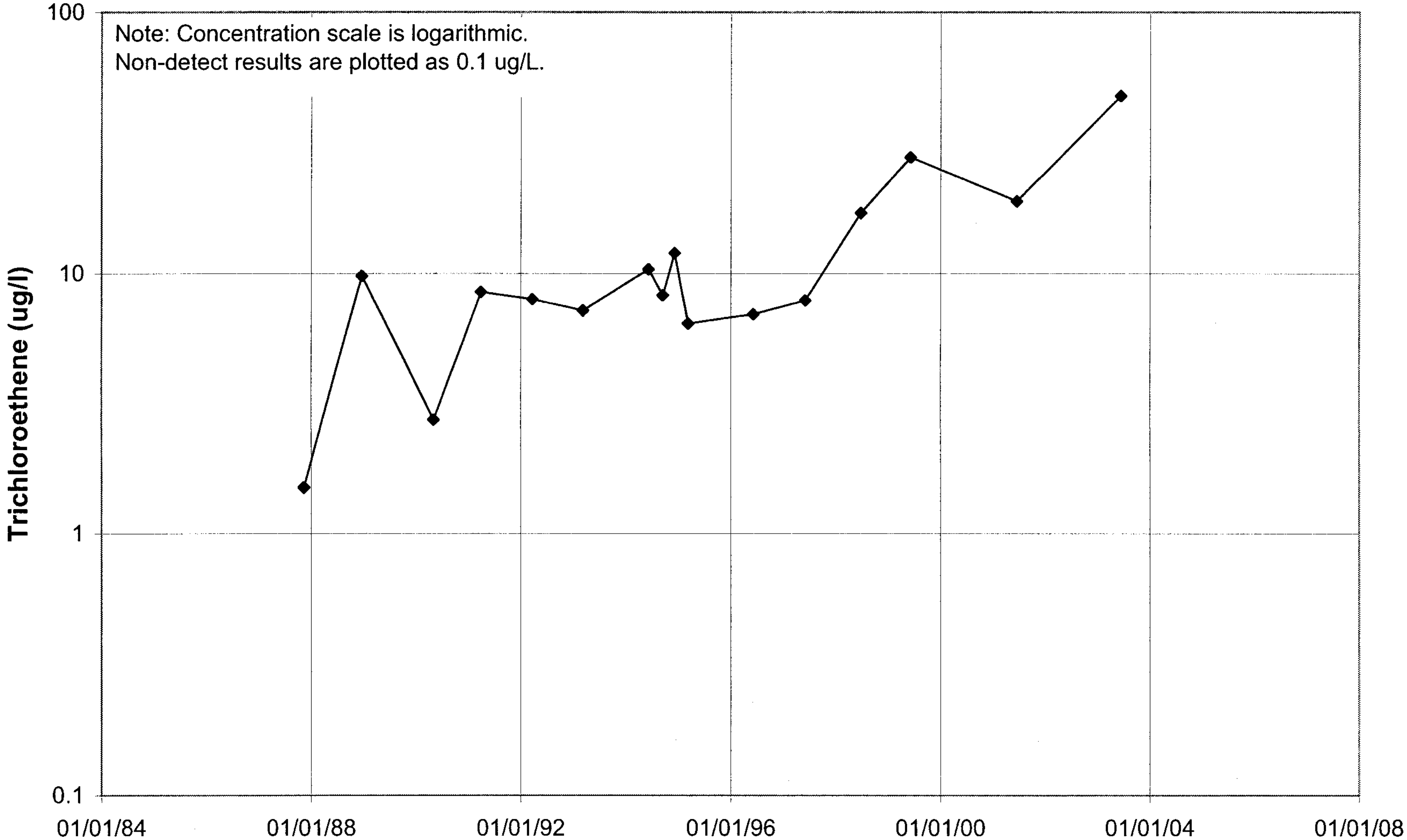

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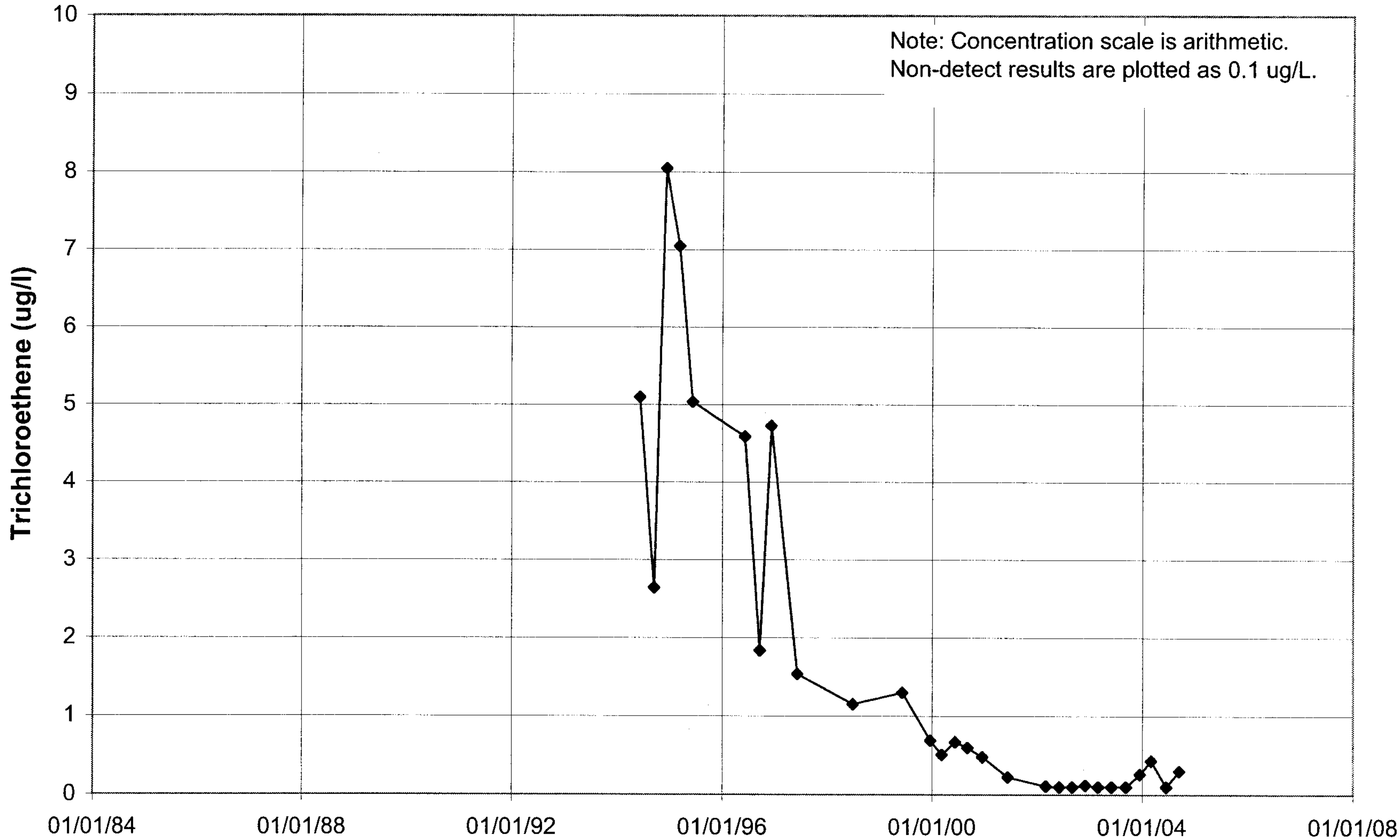
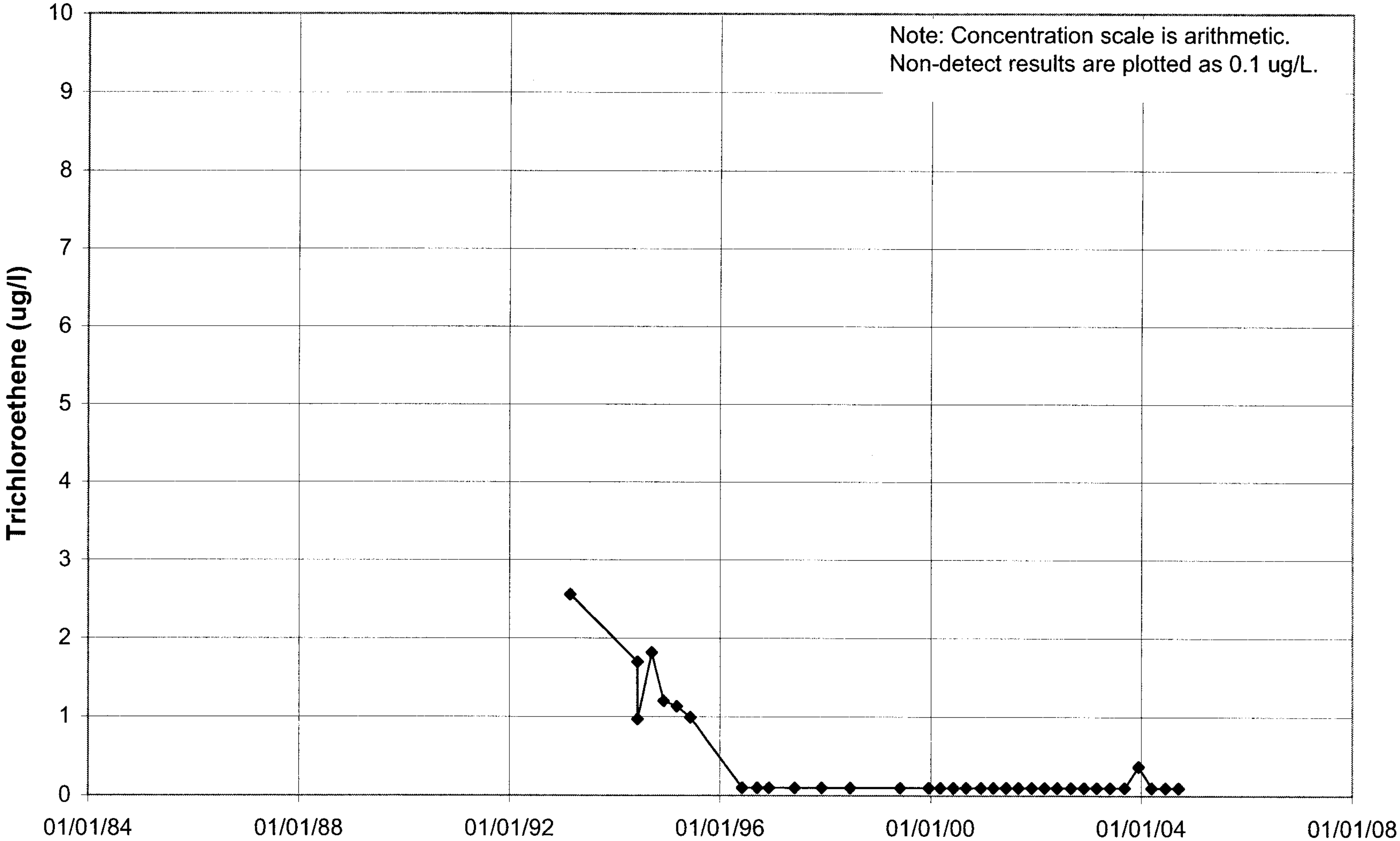
04U863



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

04U864



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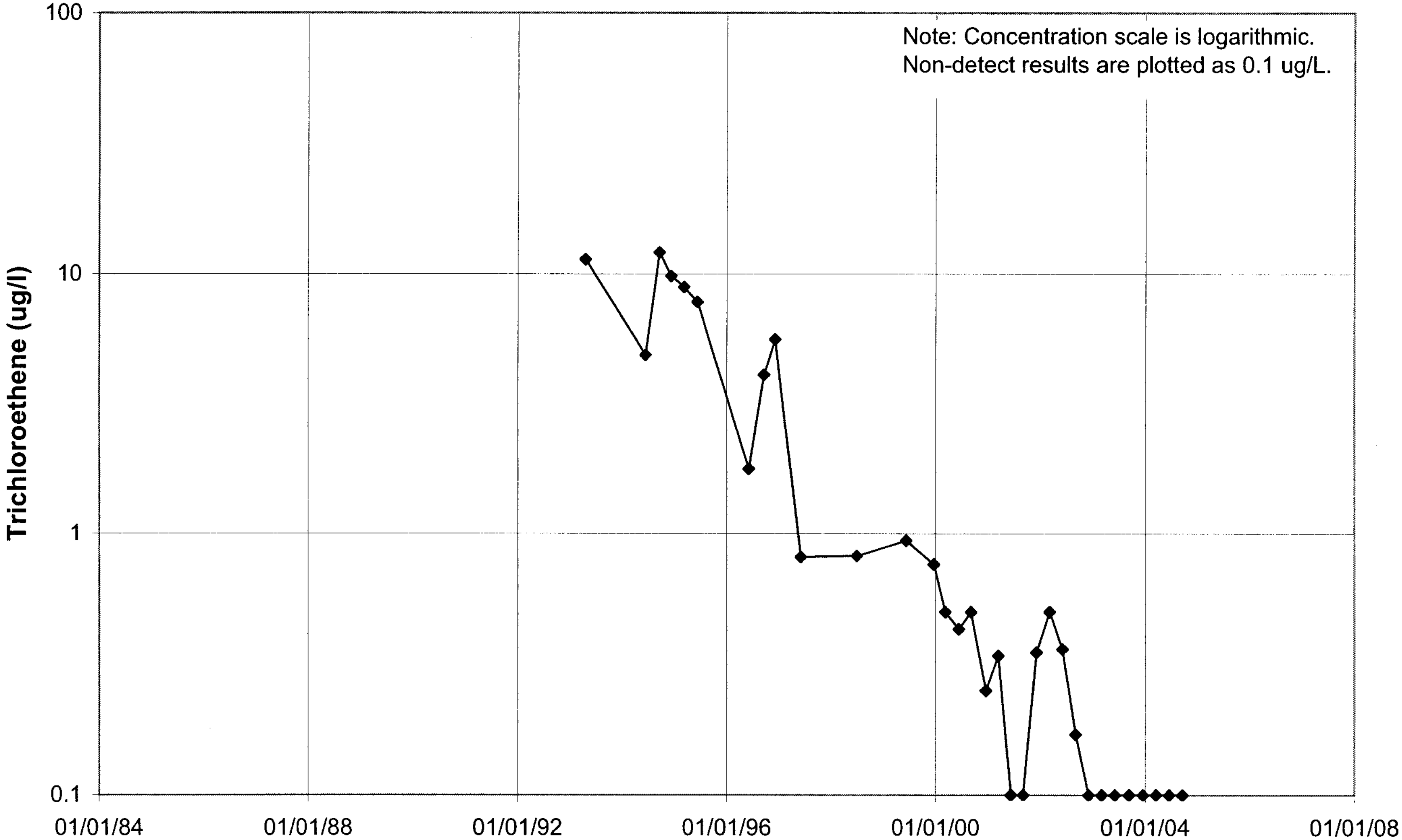
04U865



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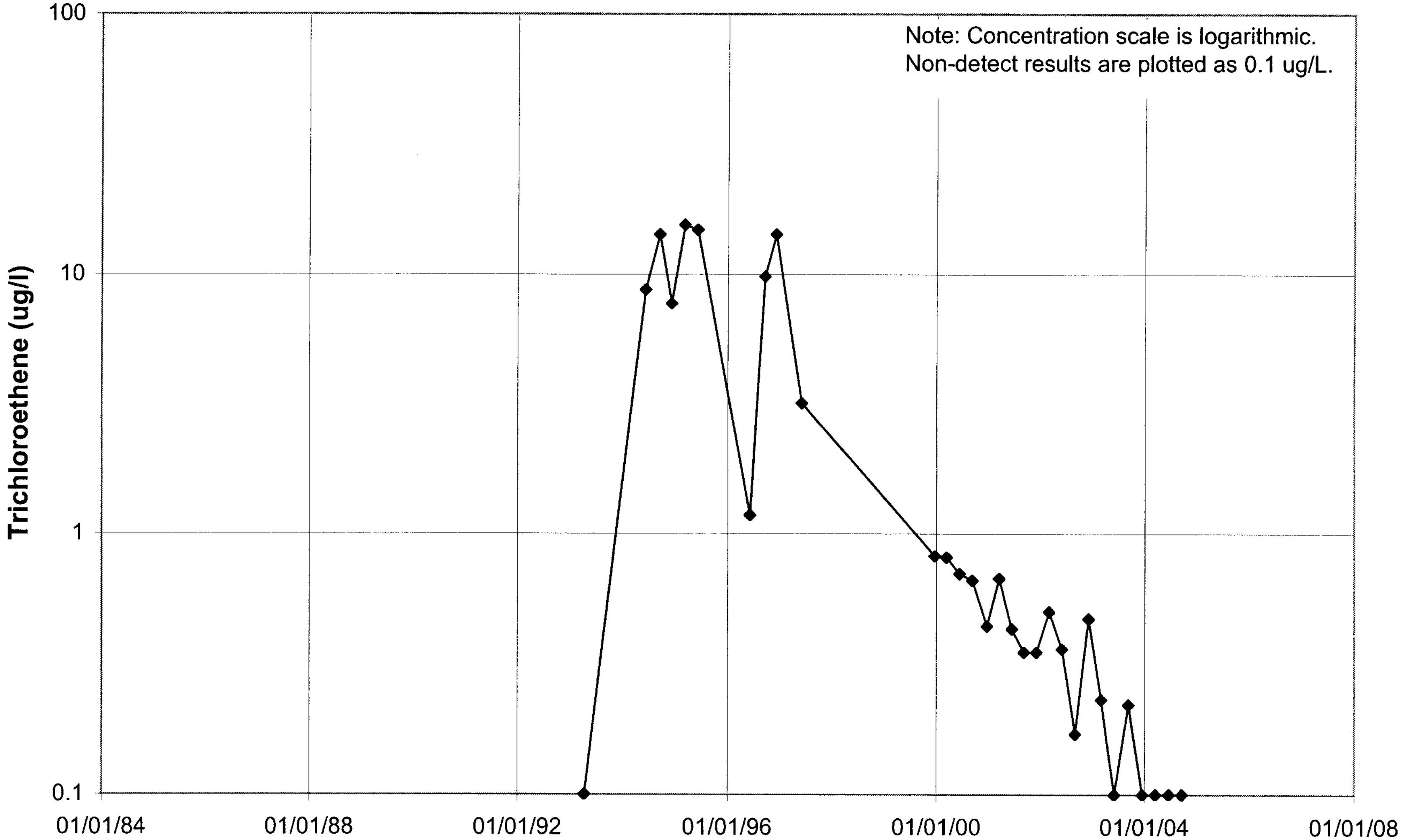

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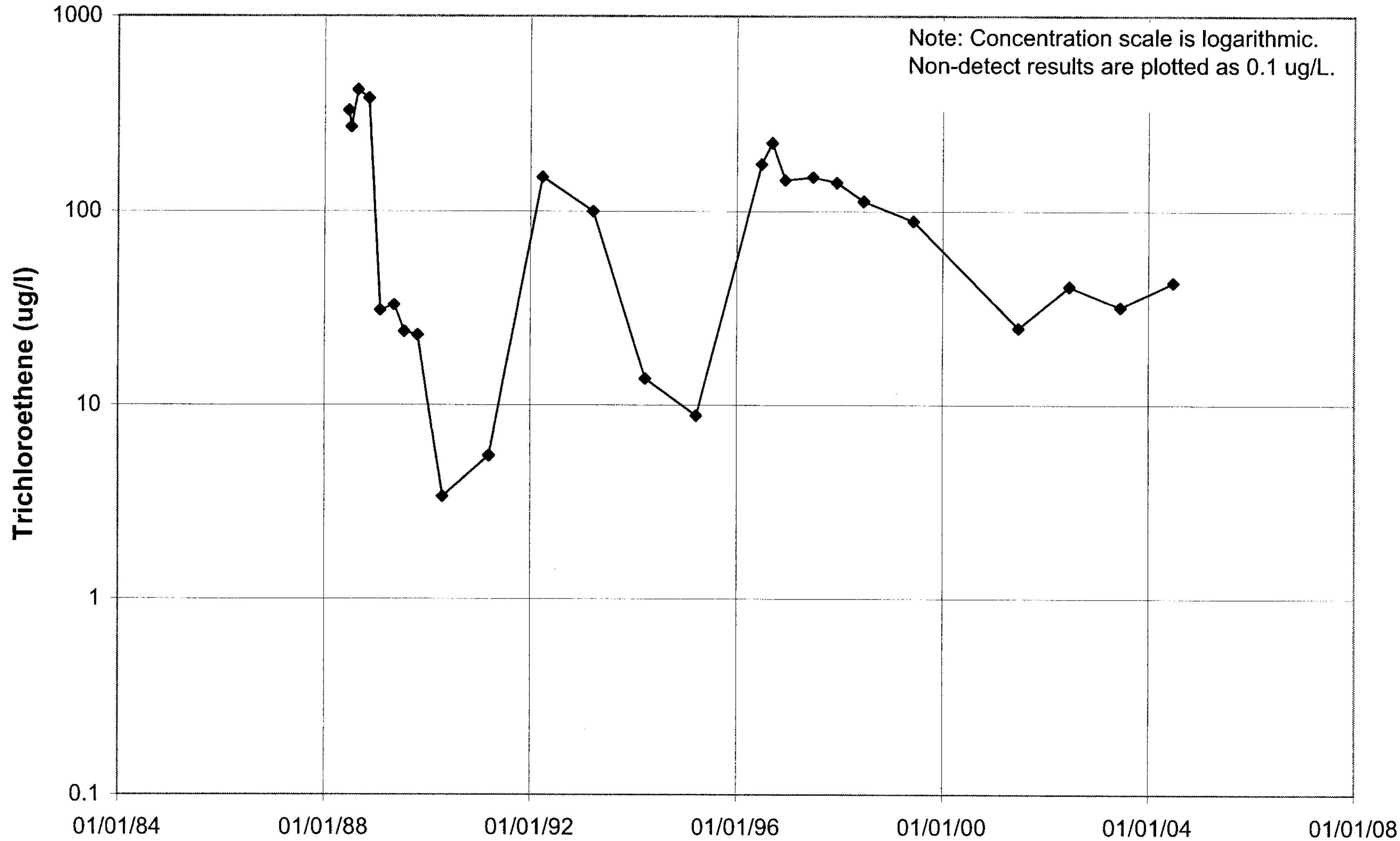

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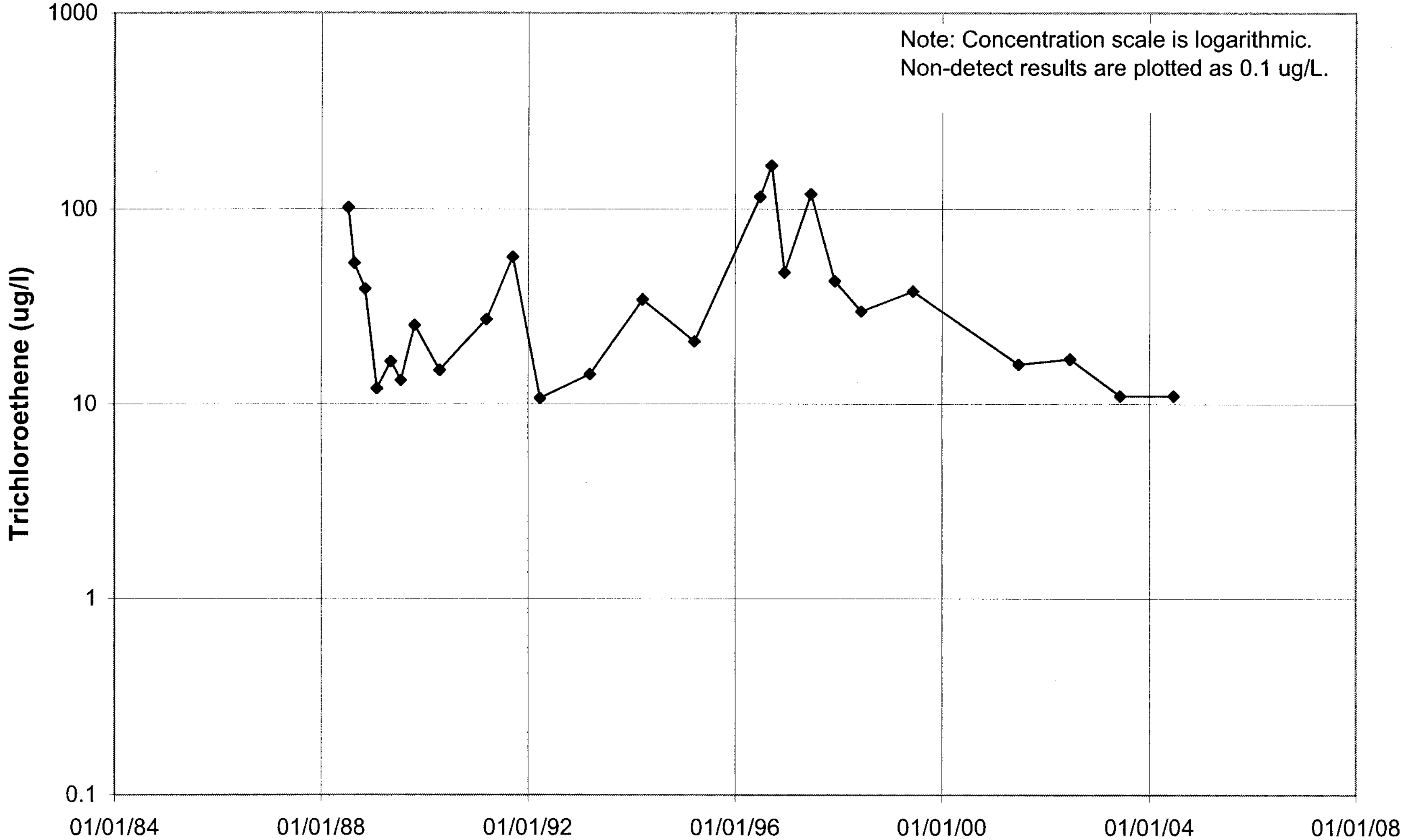

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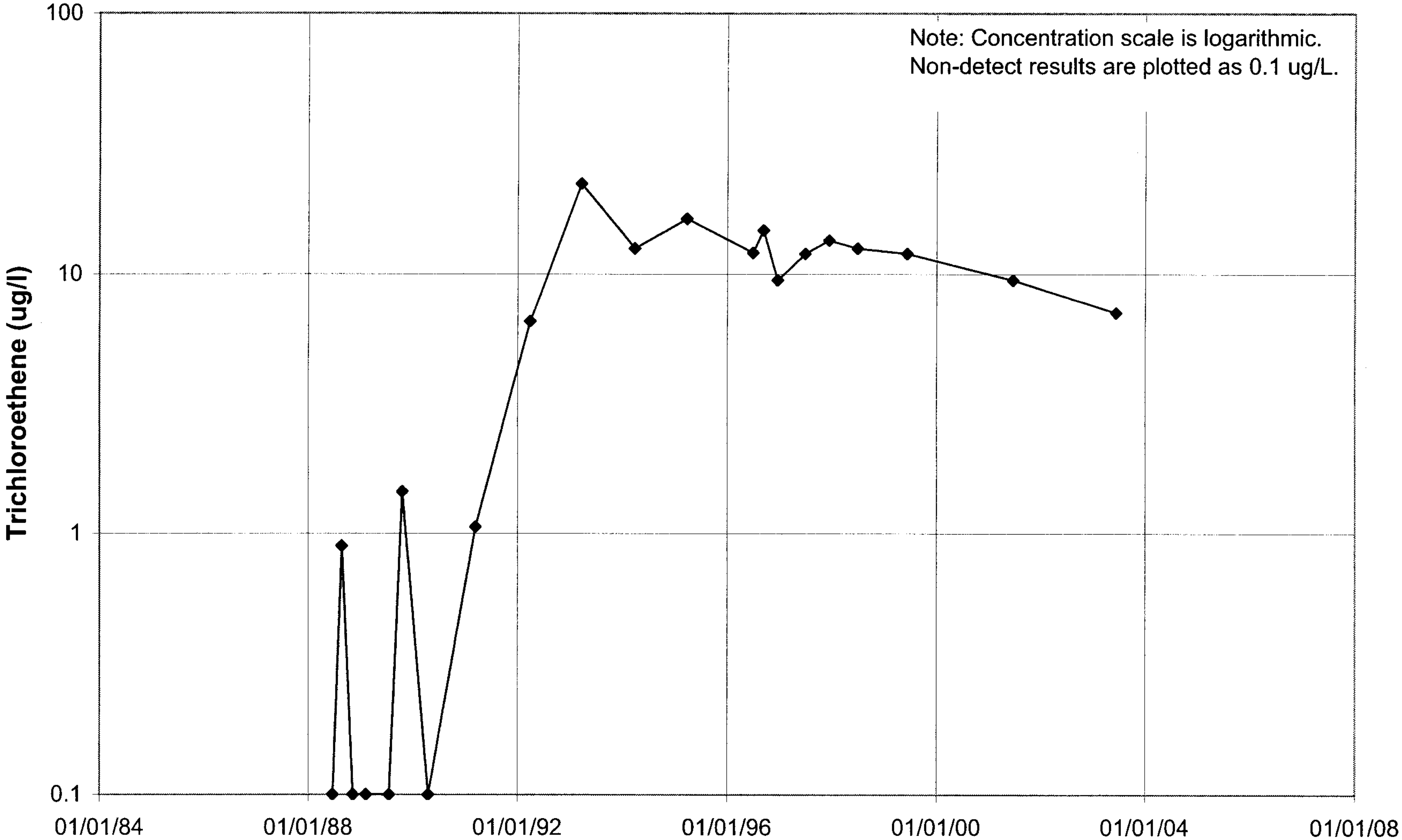

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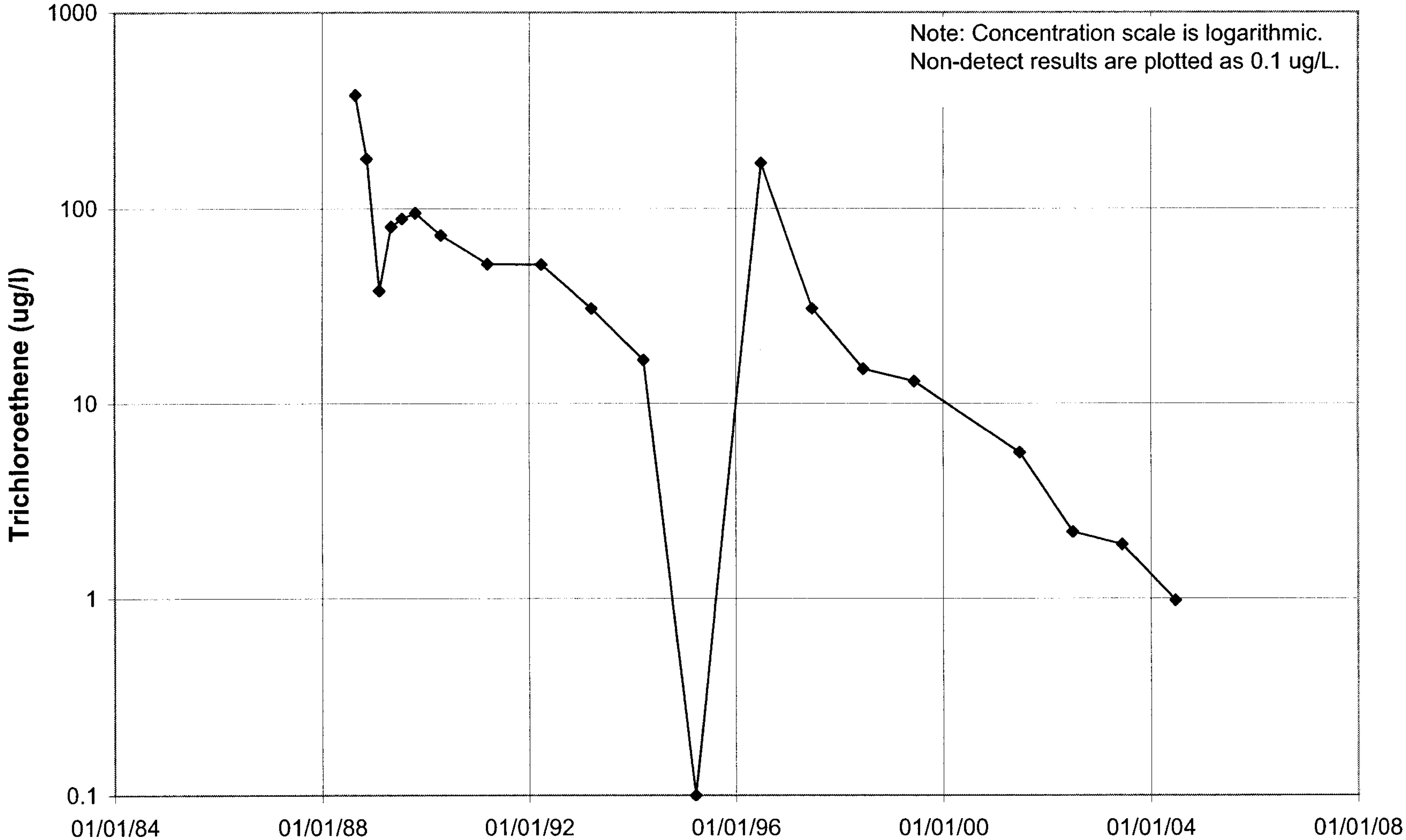

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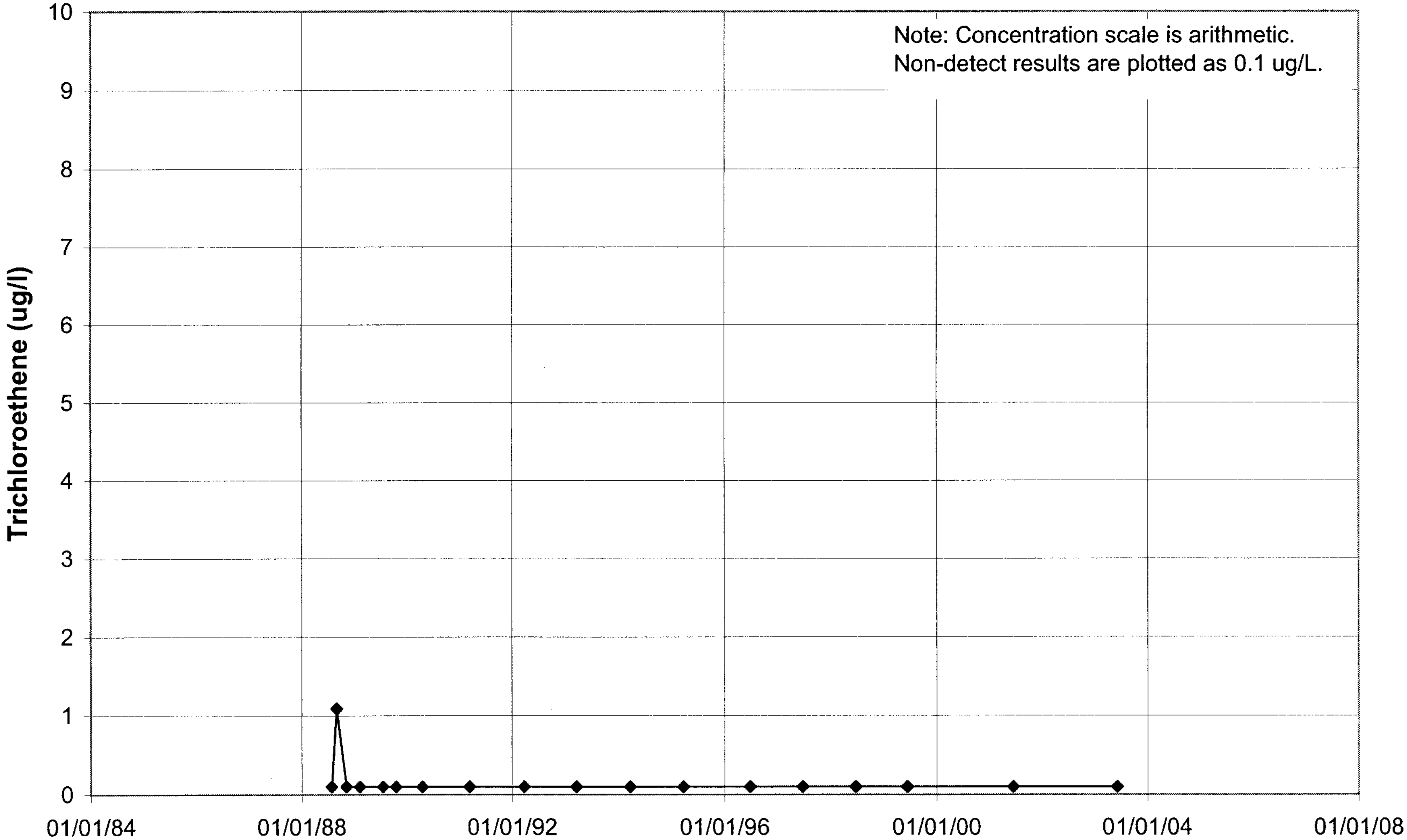

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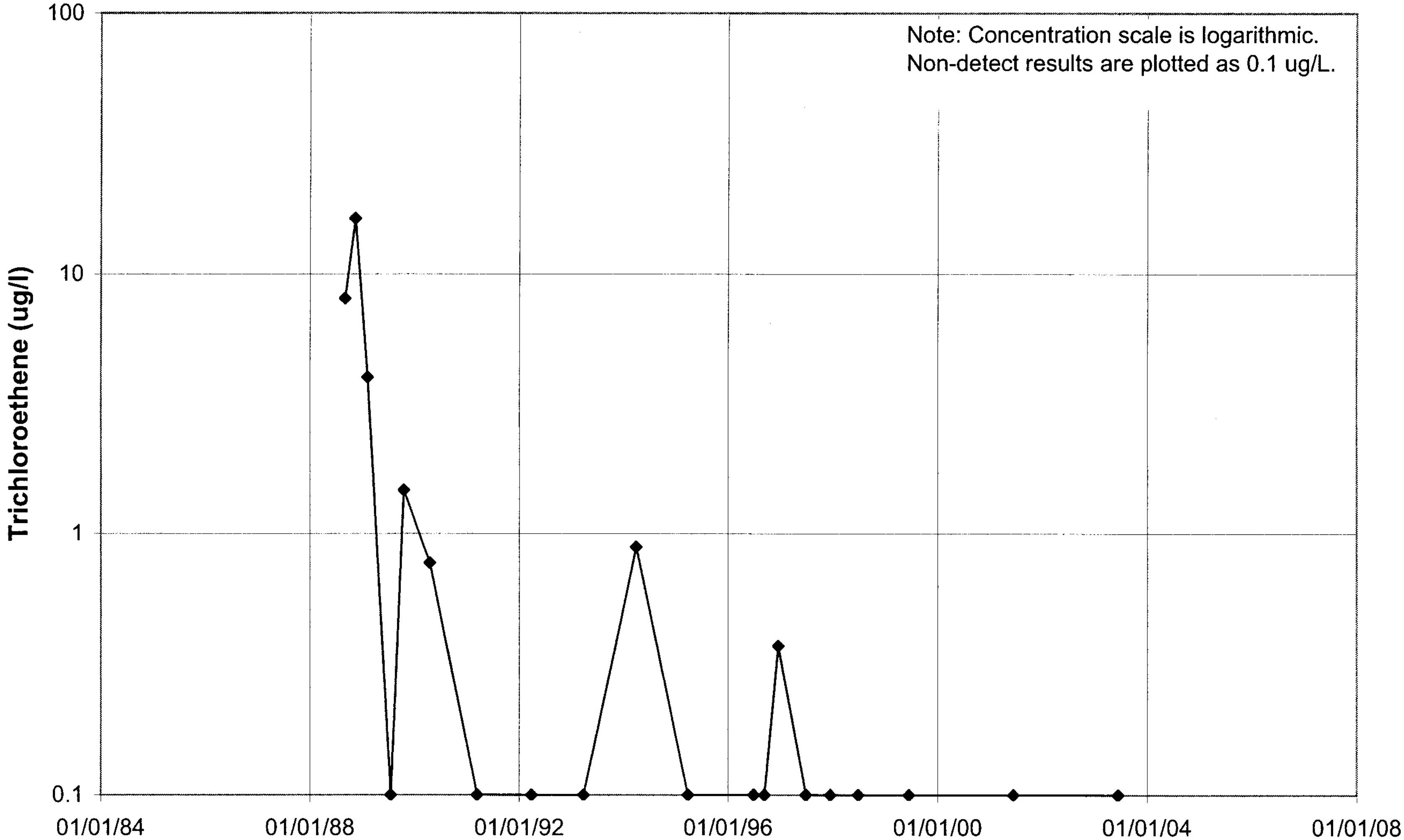

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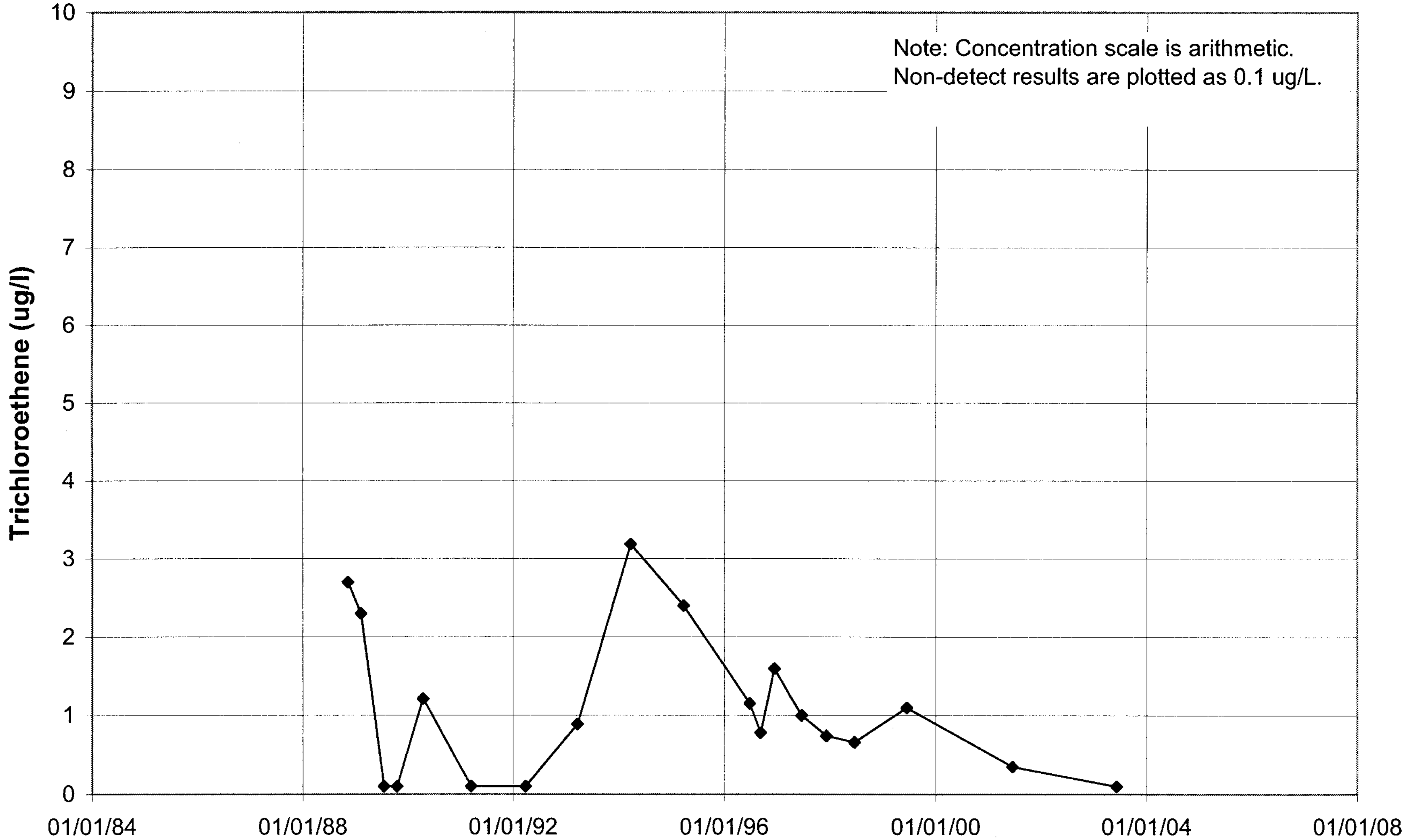

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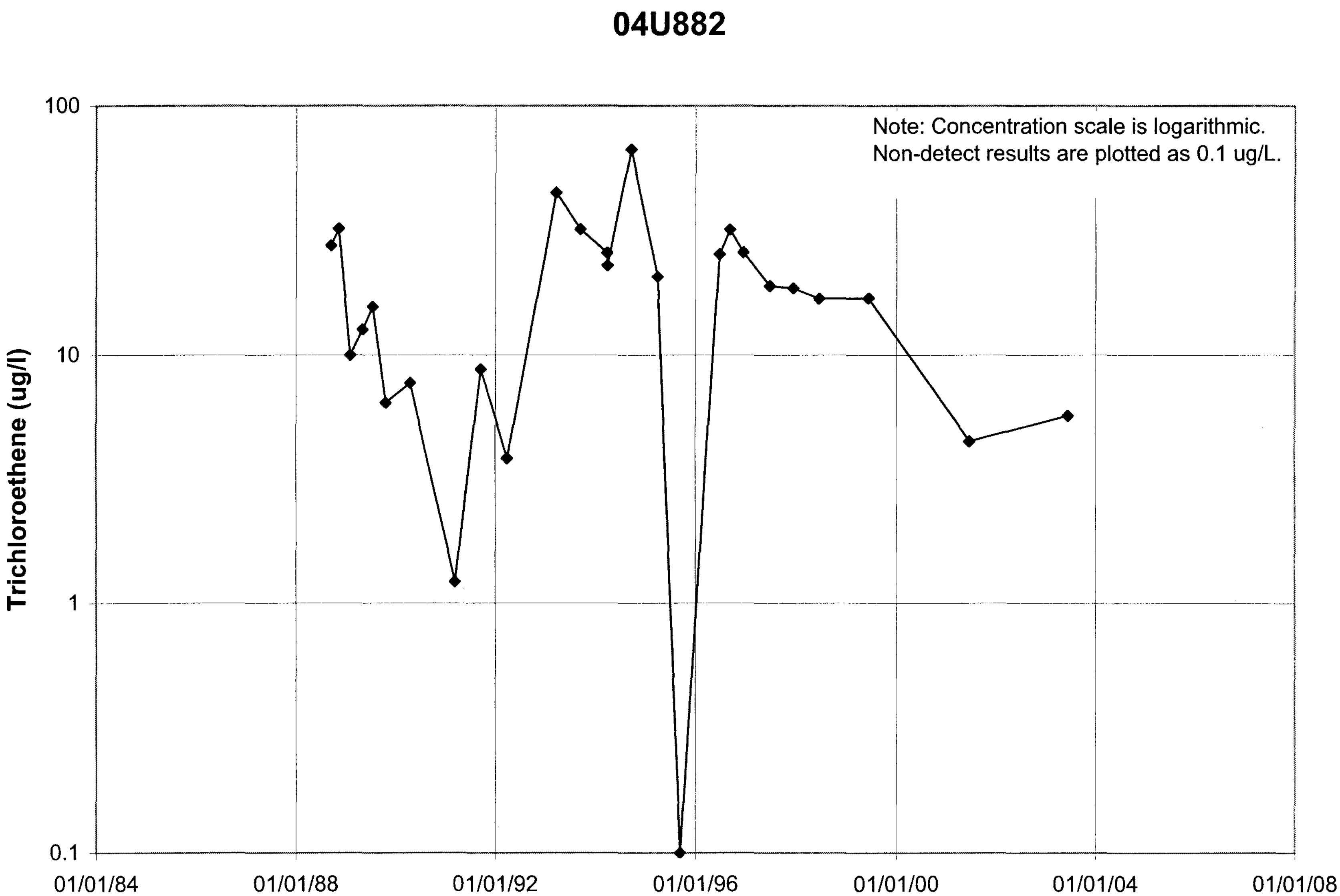

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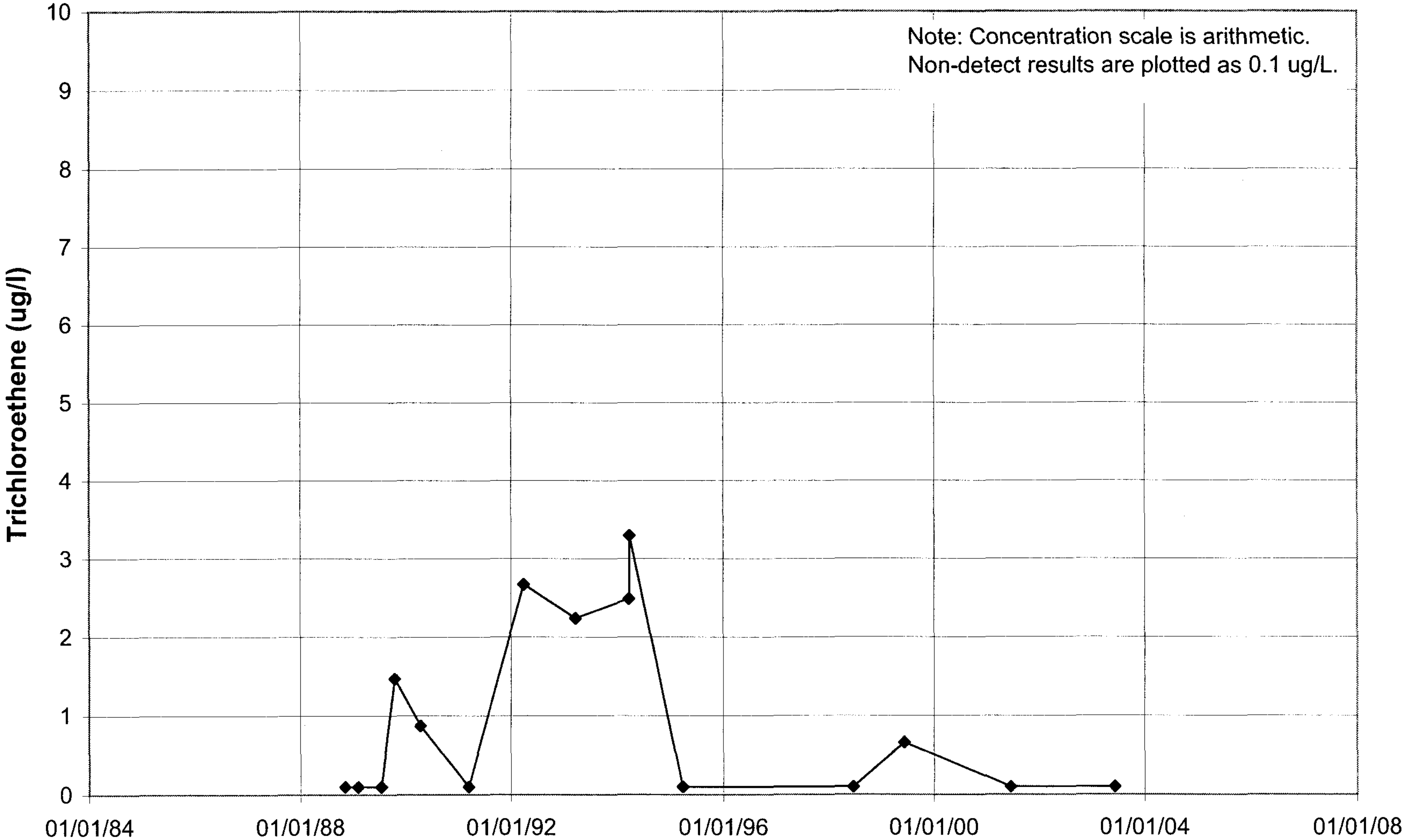

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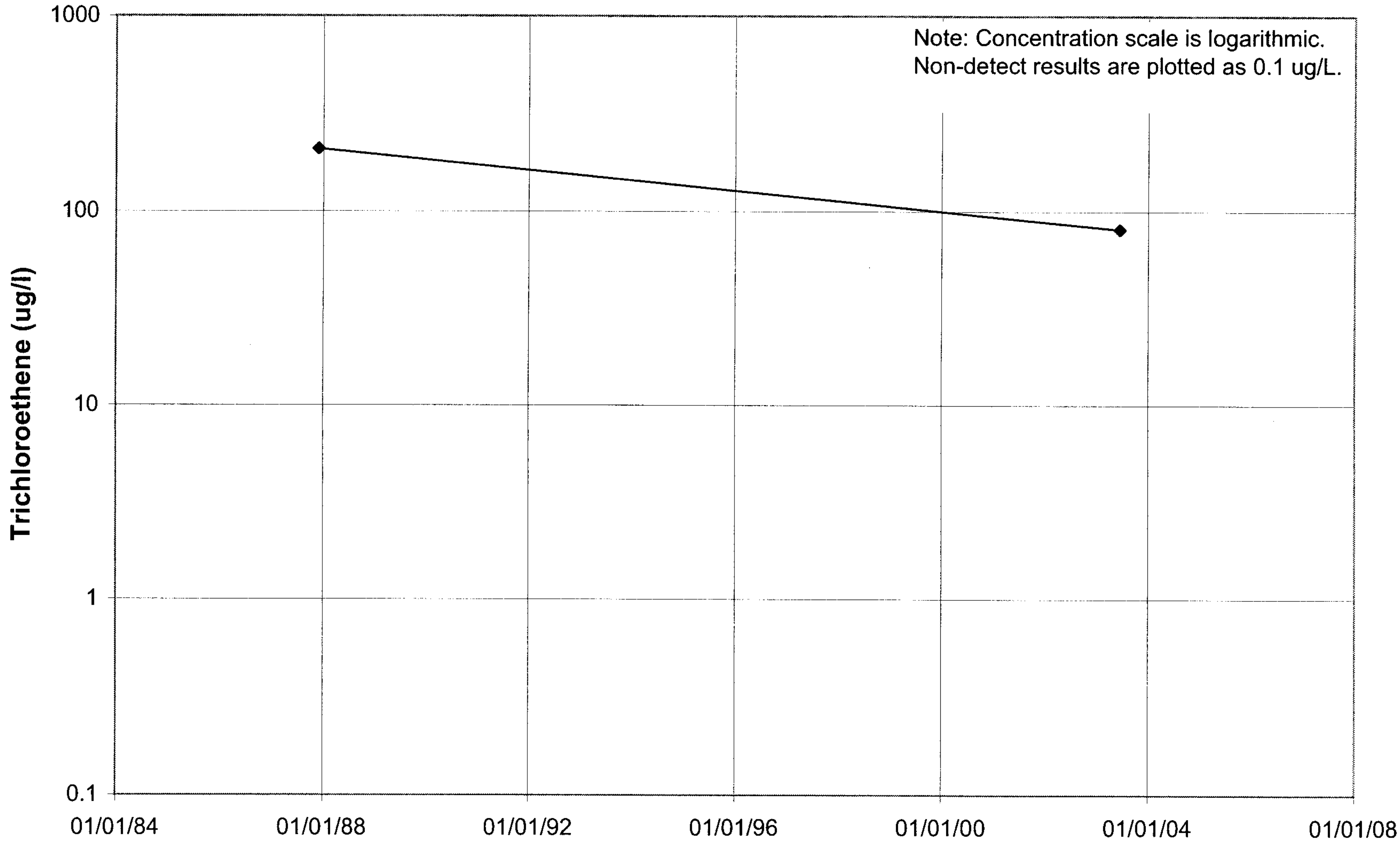

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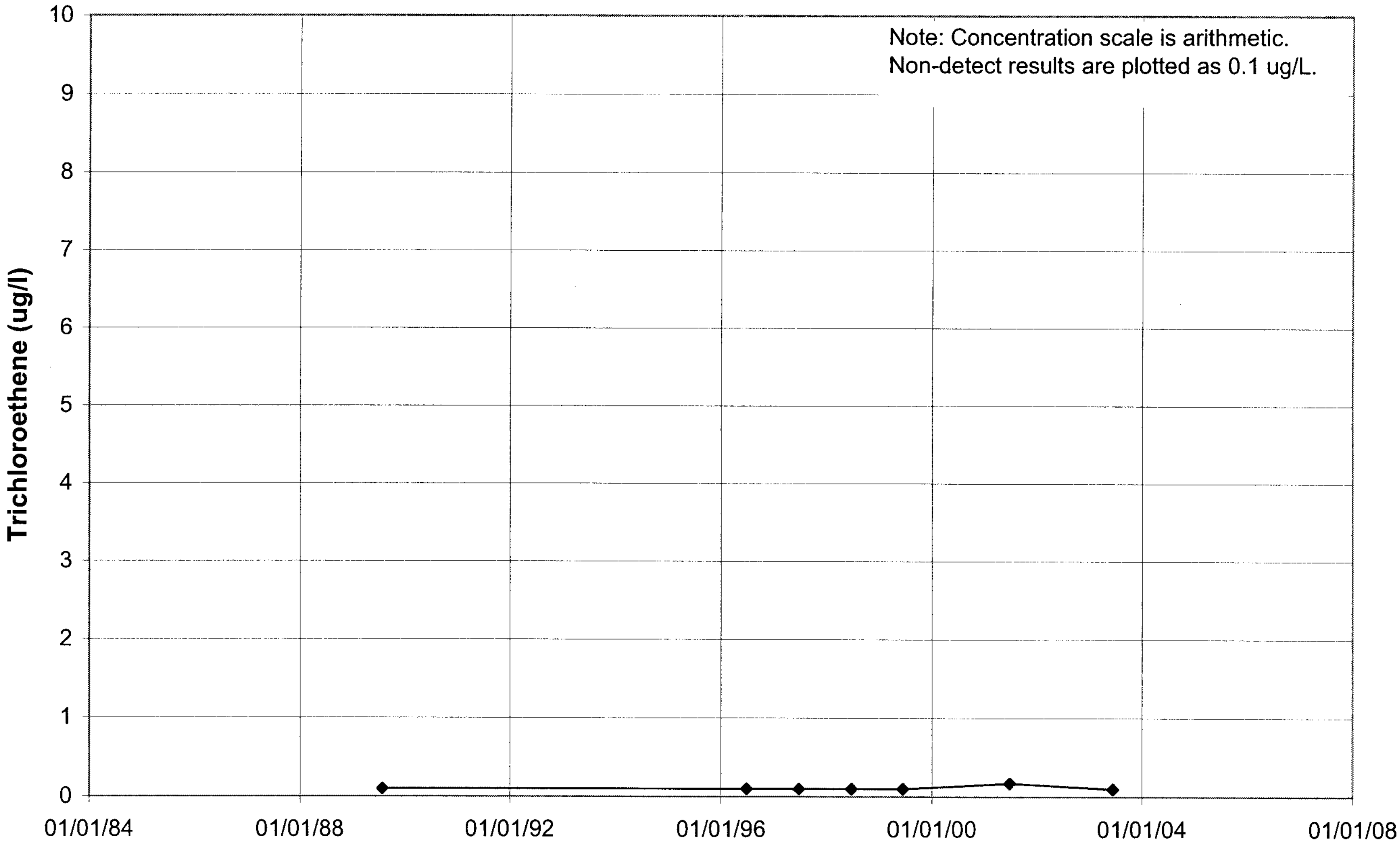

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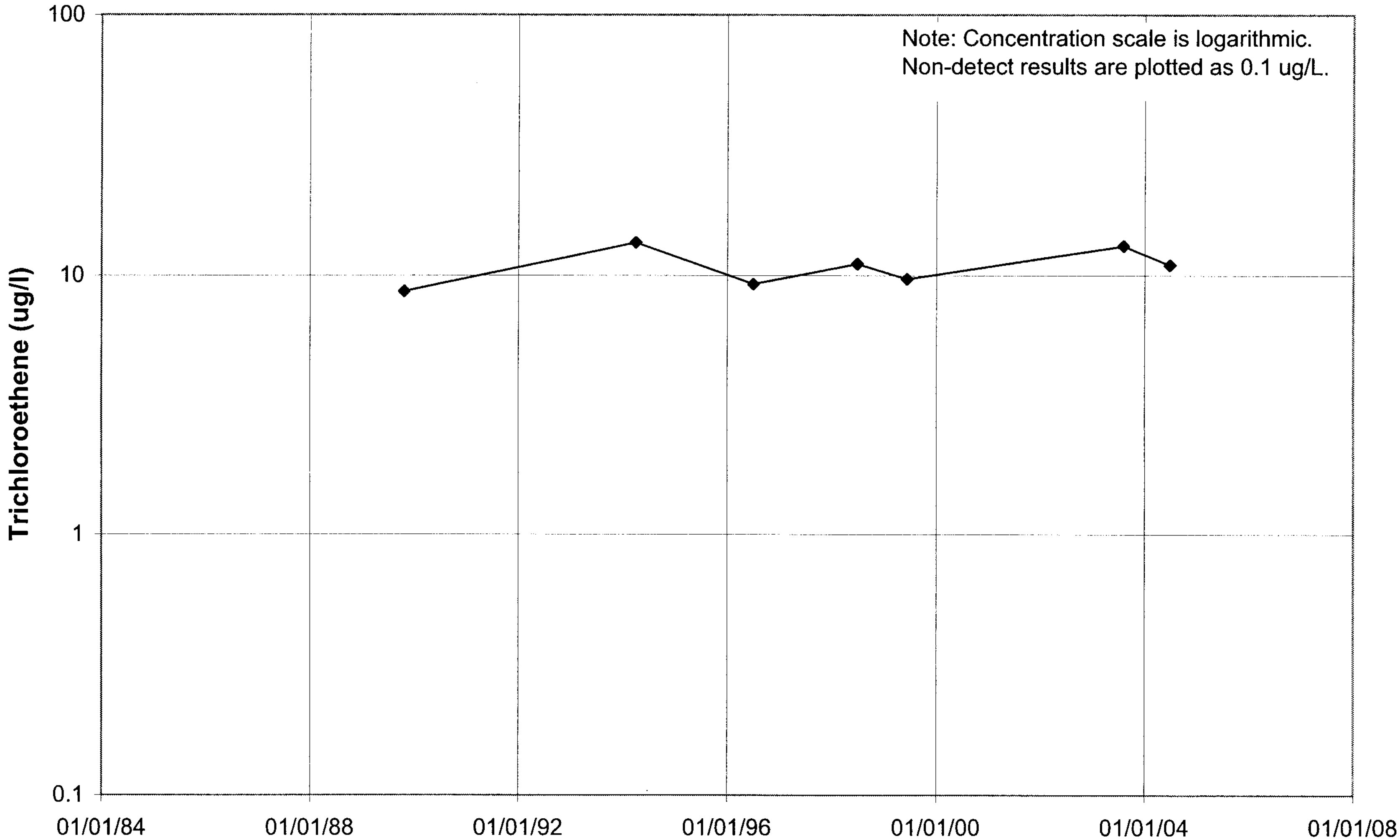

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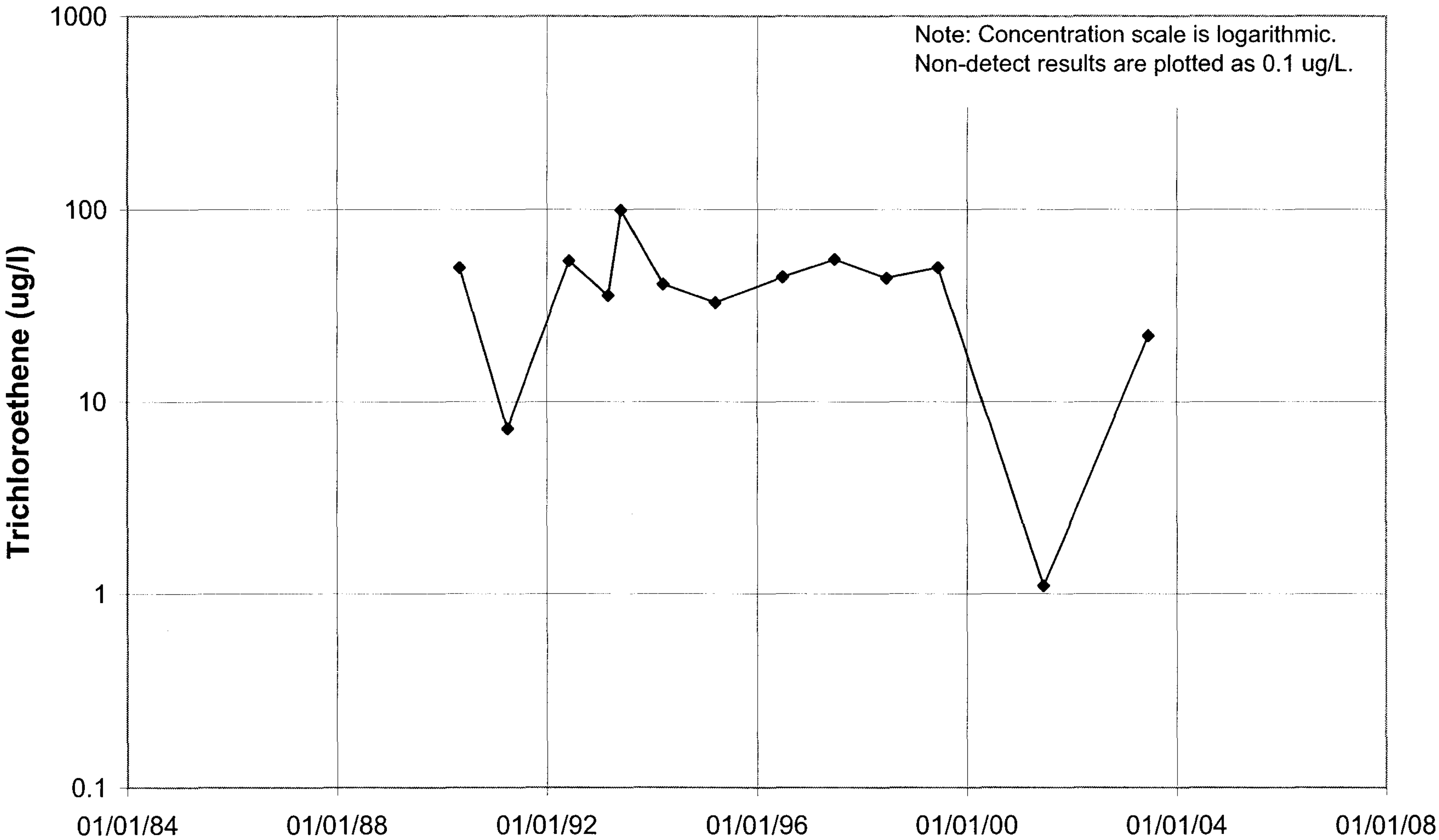

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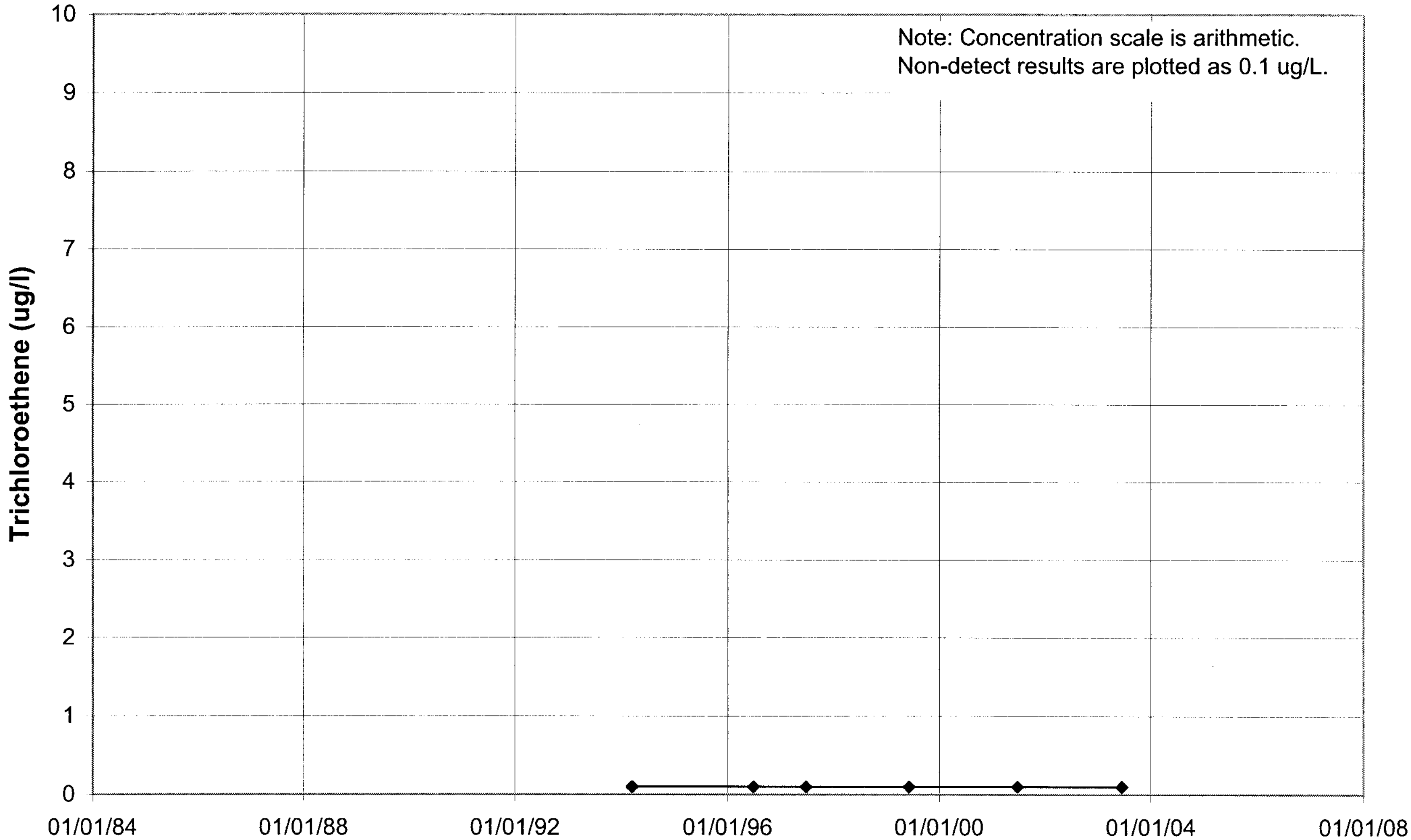

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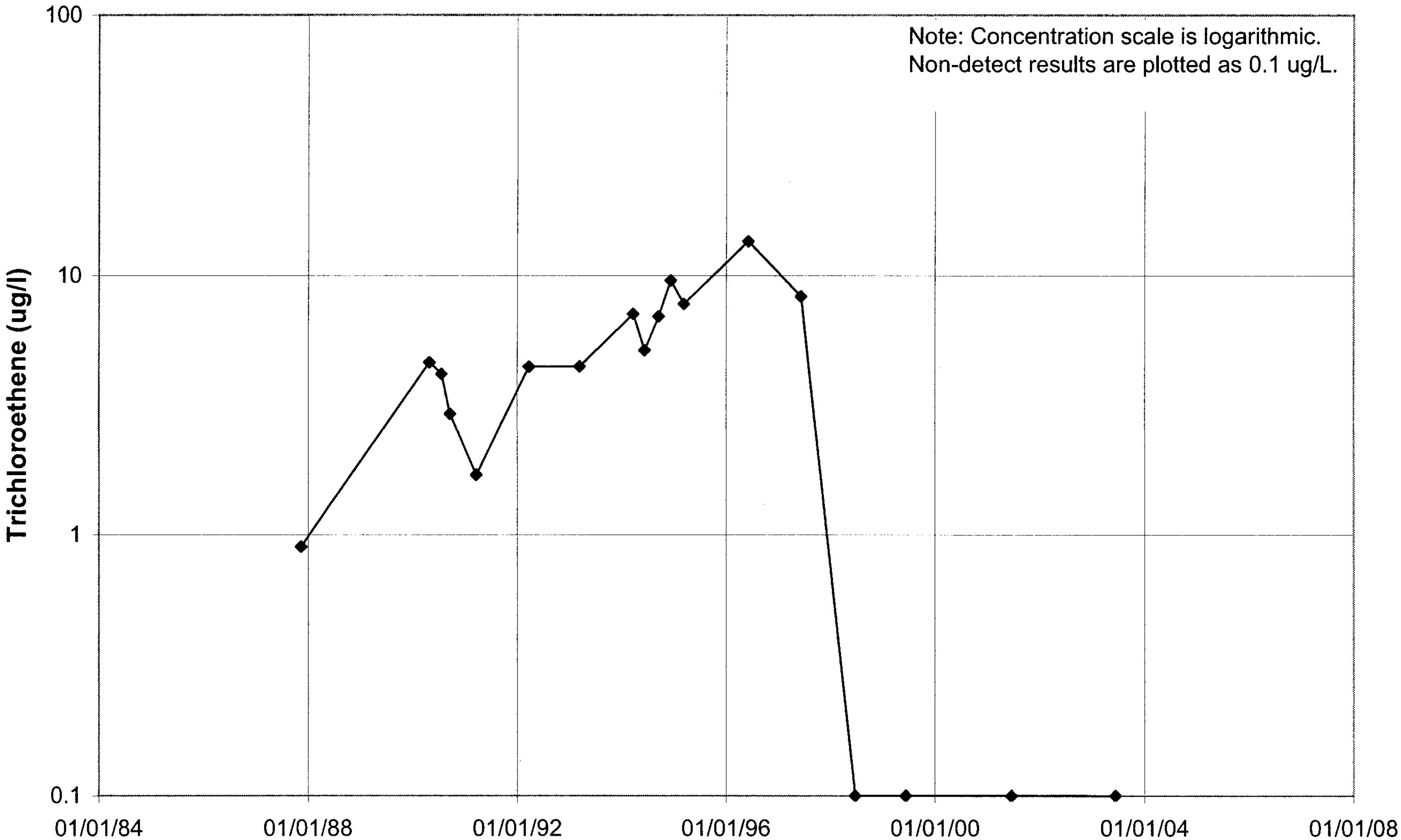

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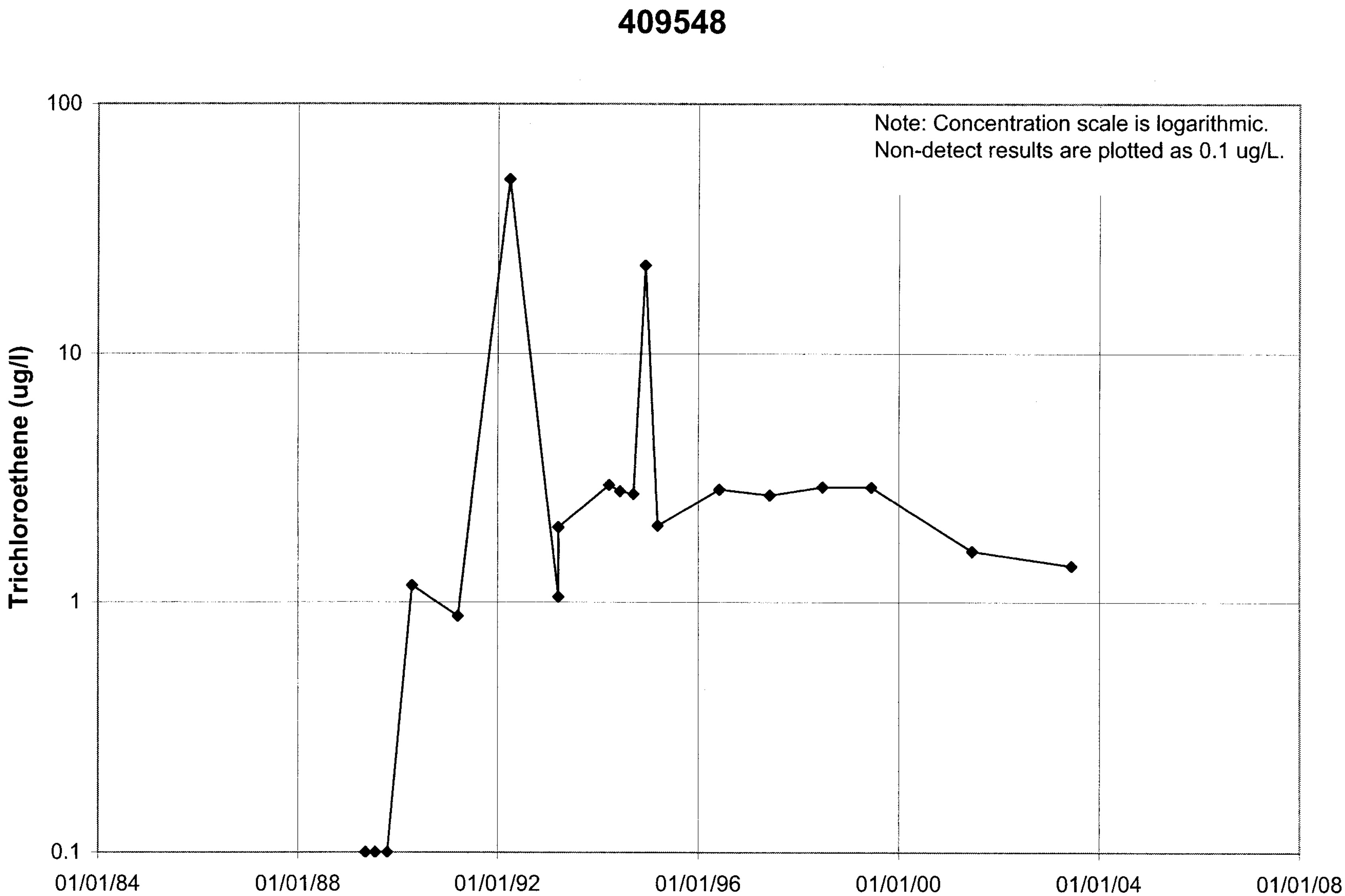

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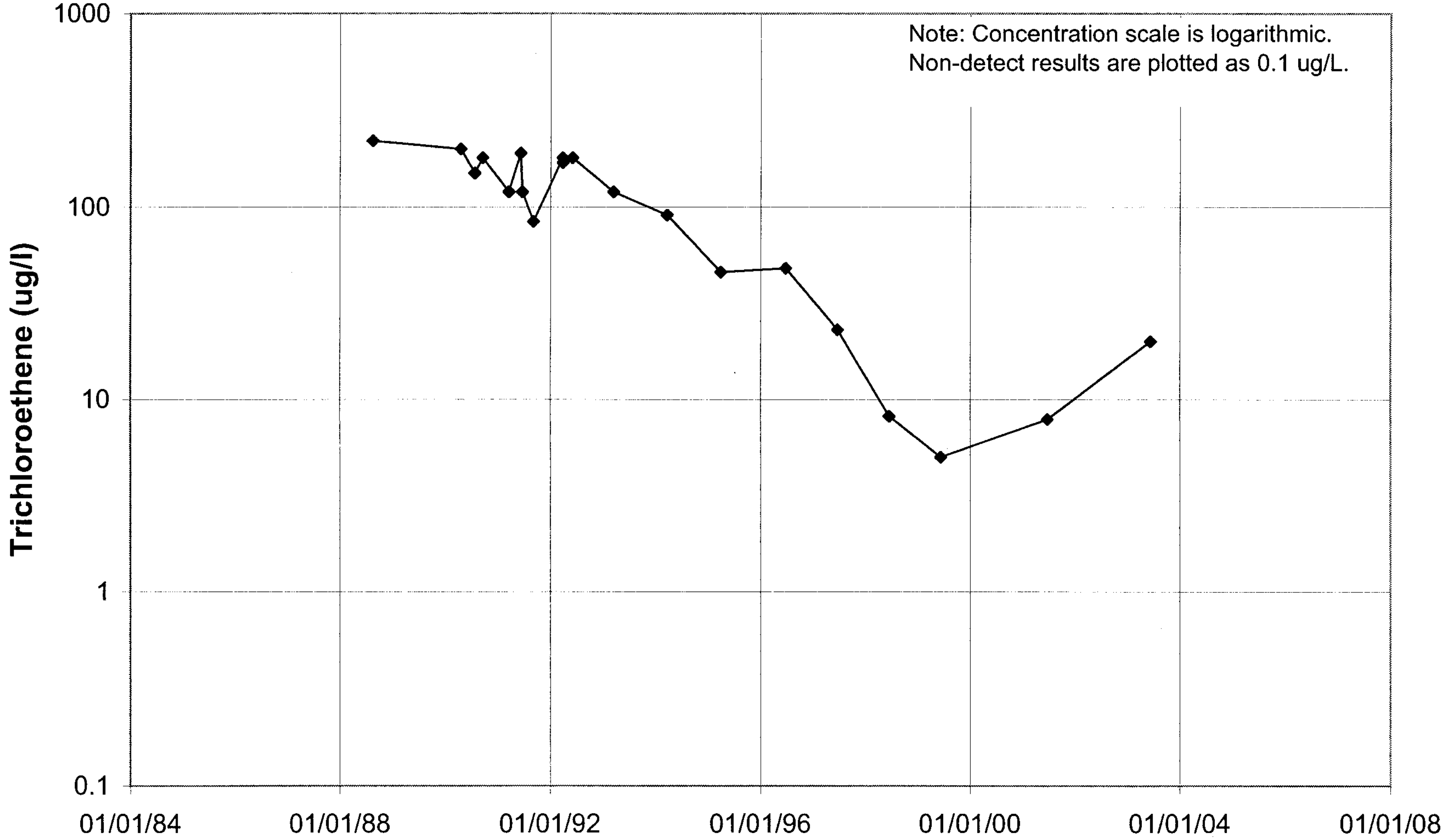

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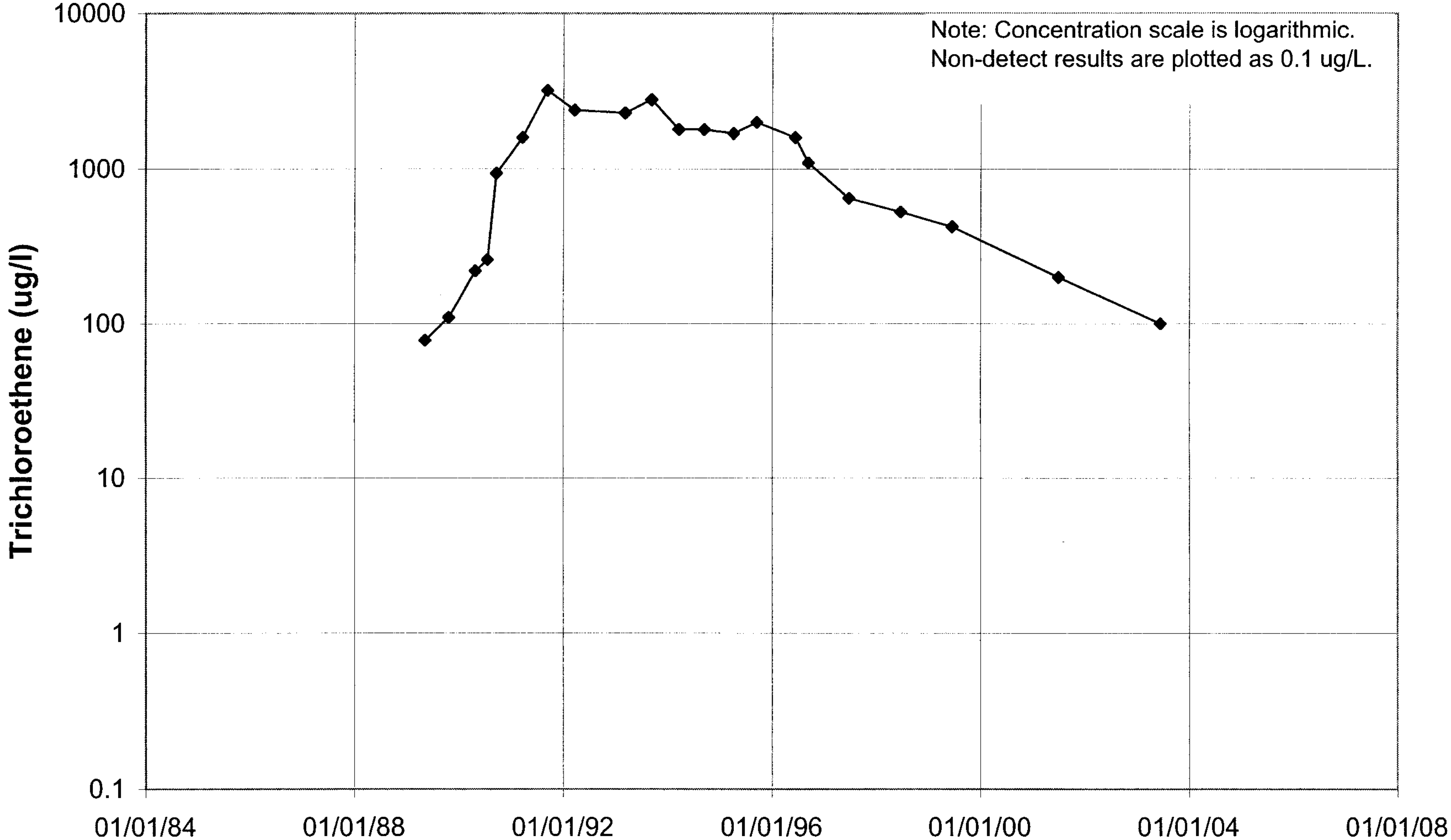

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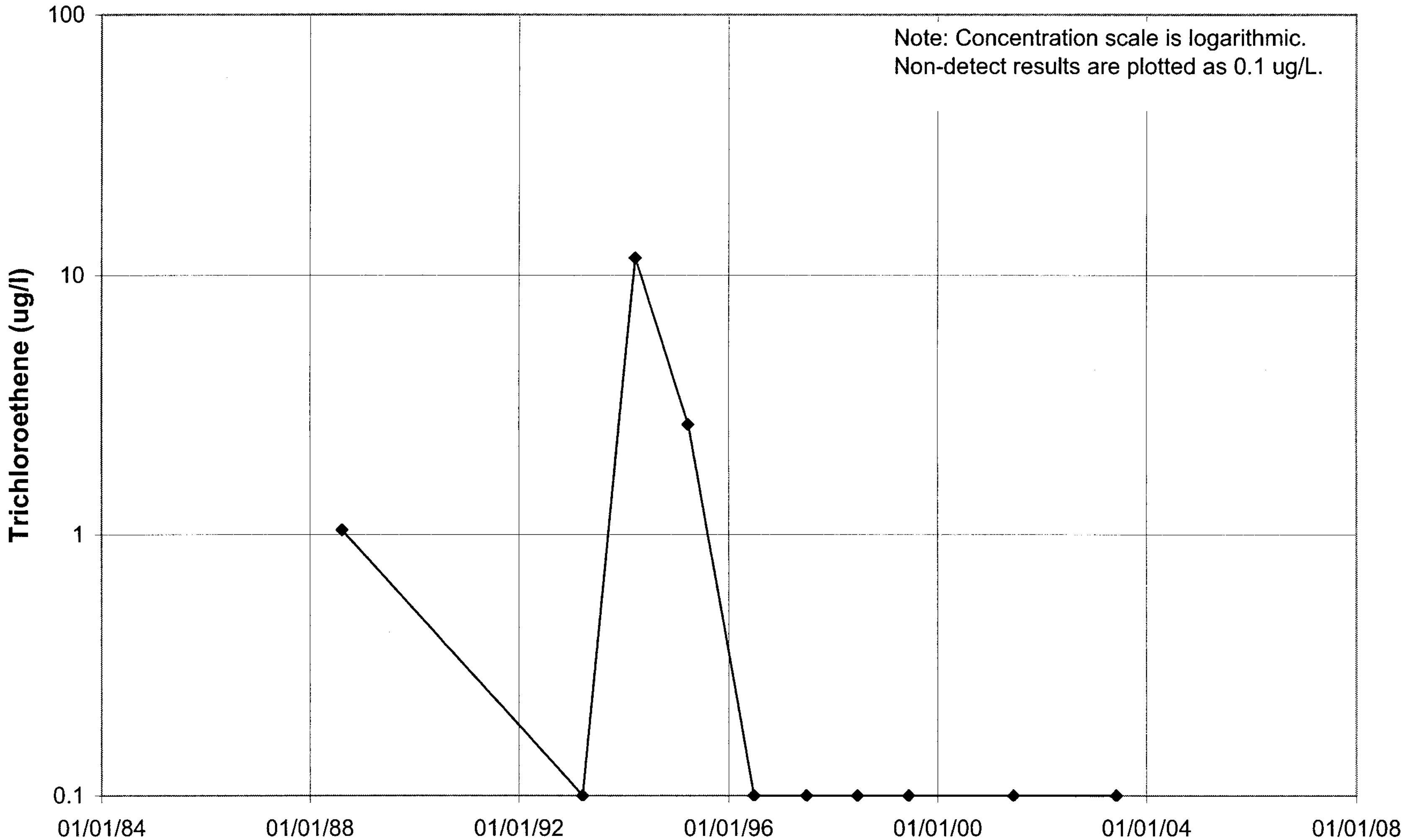

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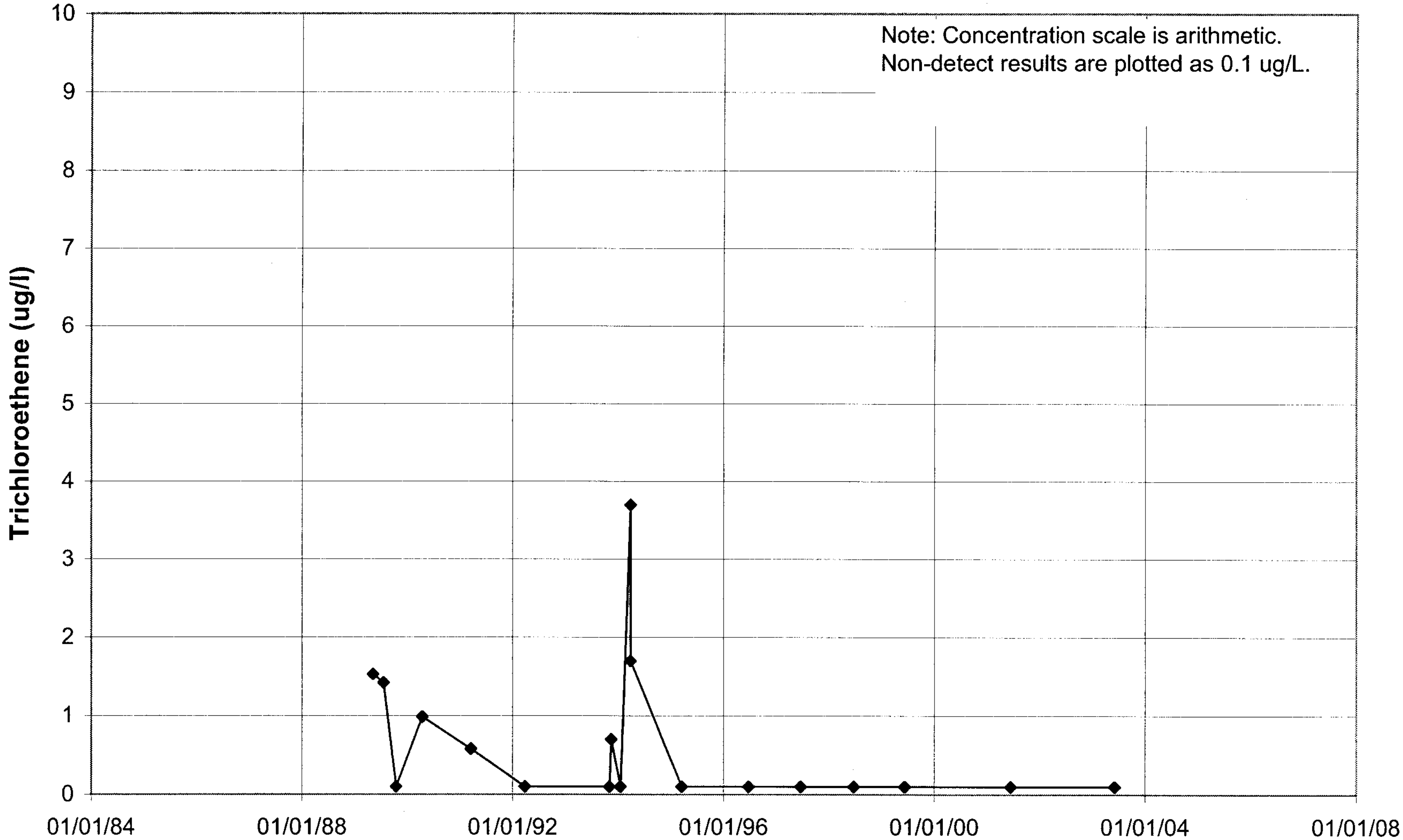

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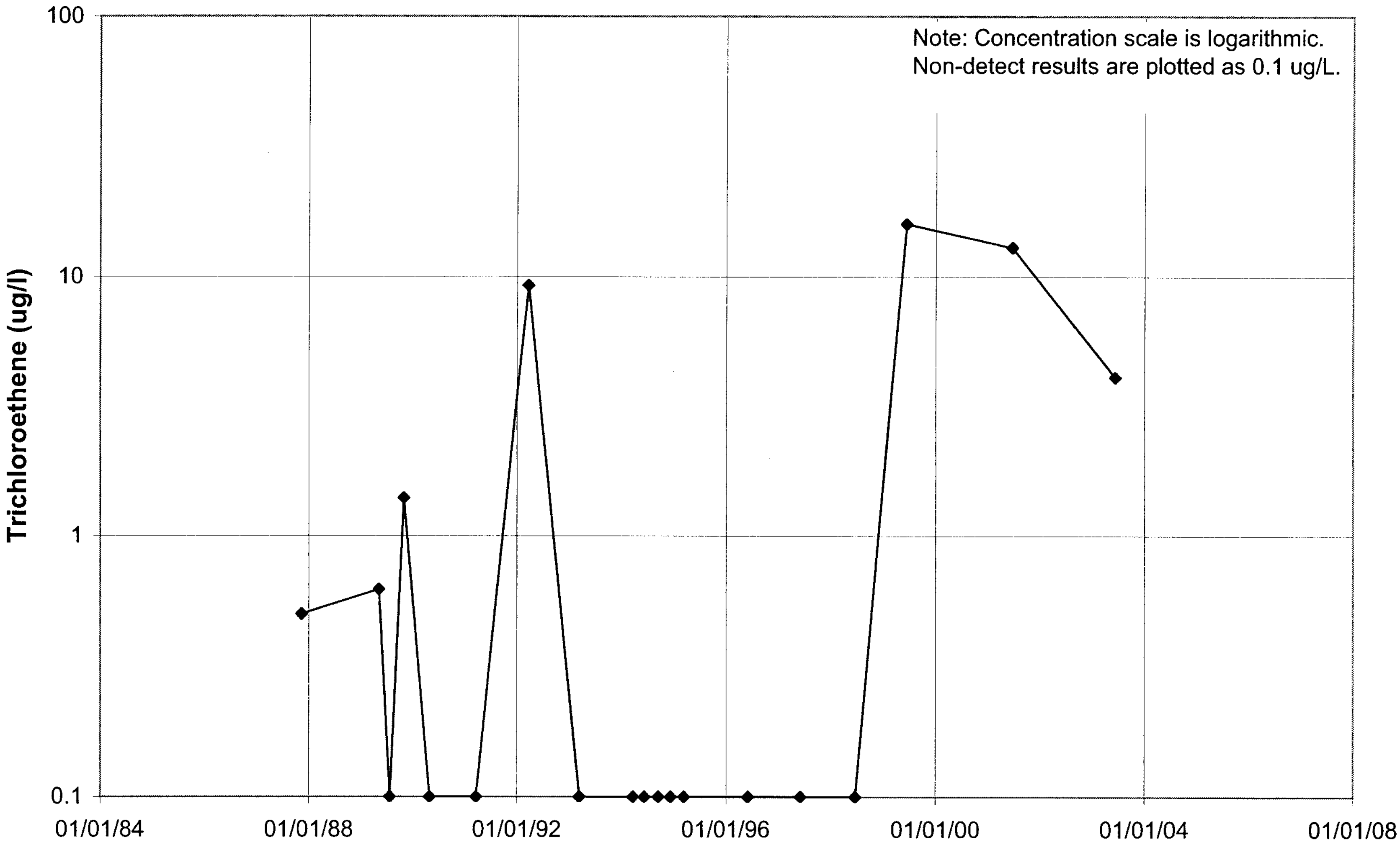

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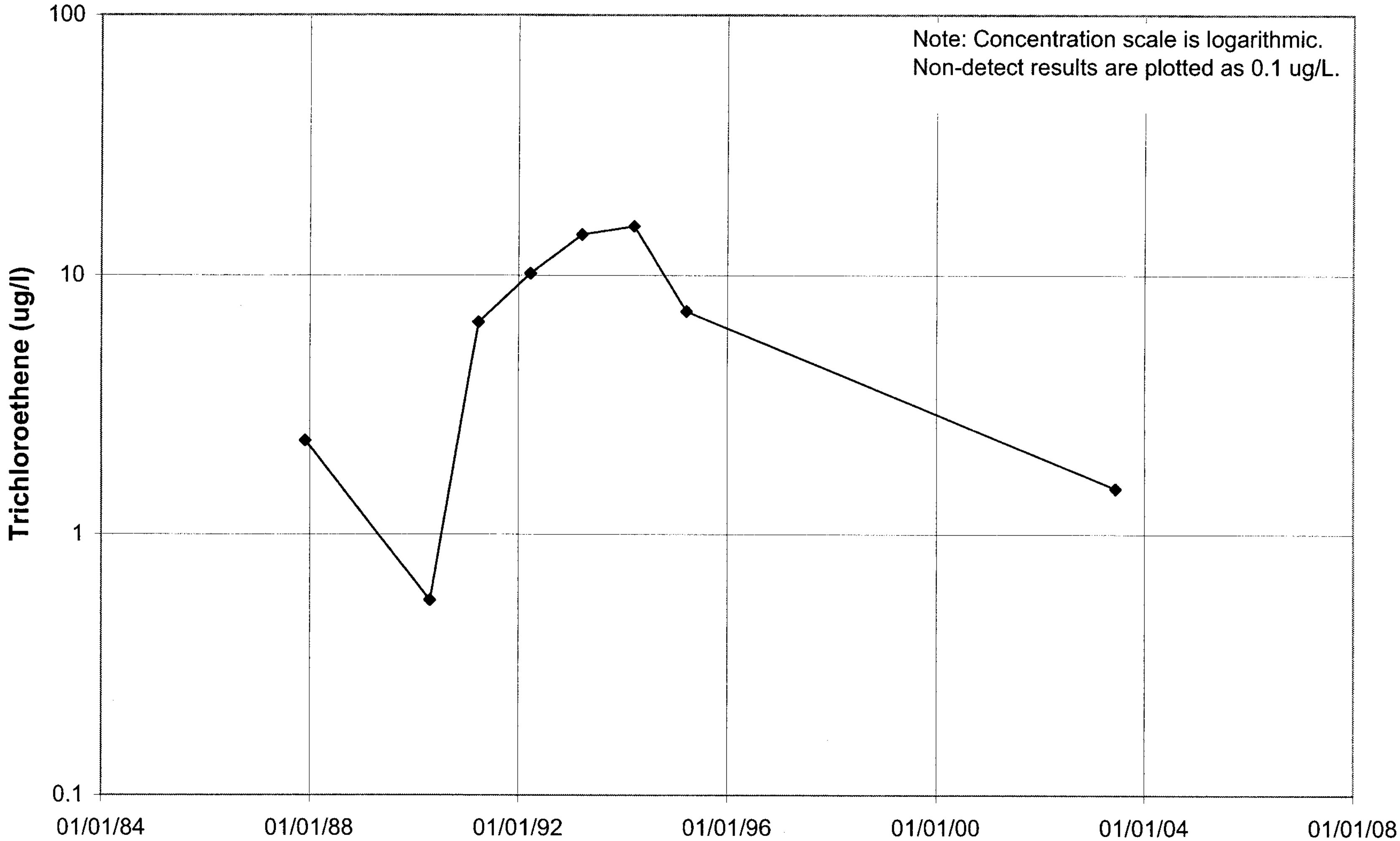

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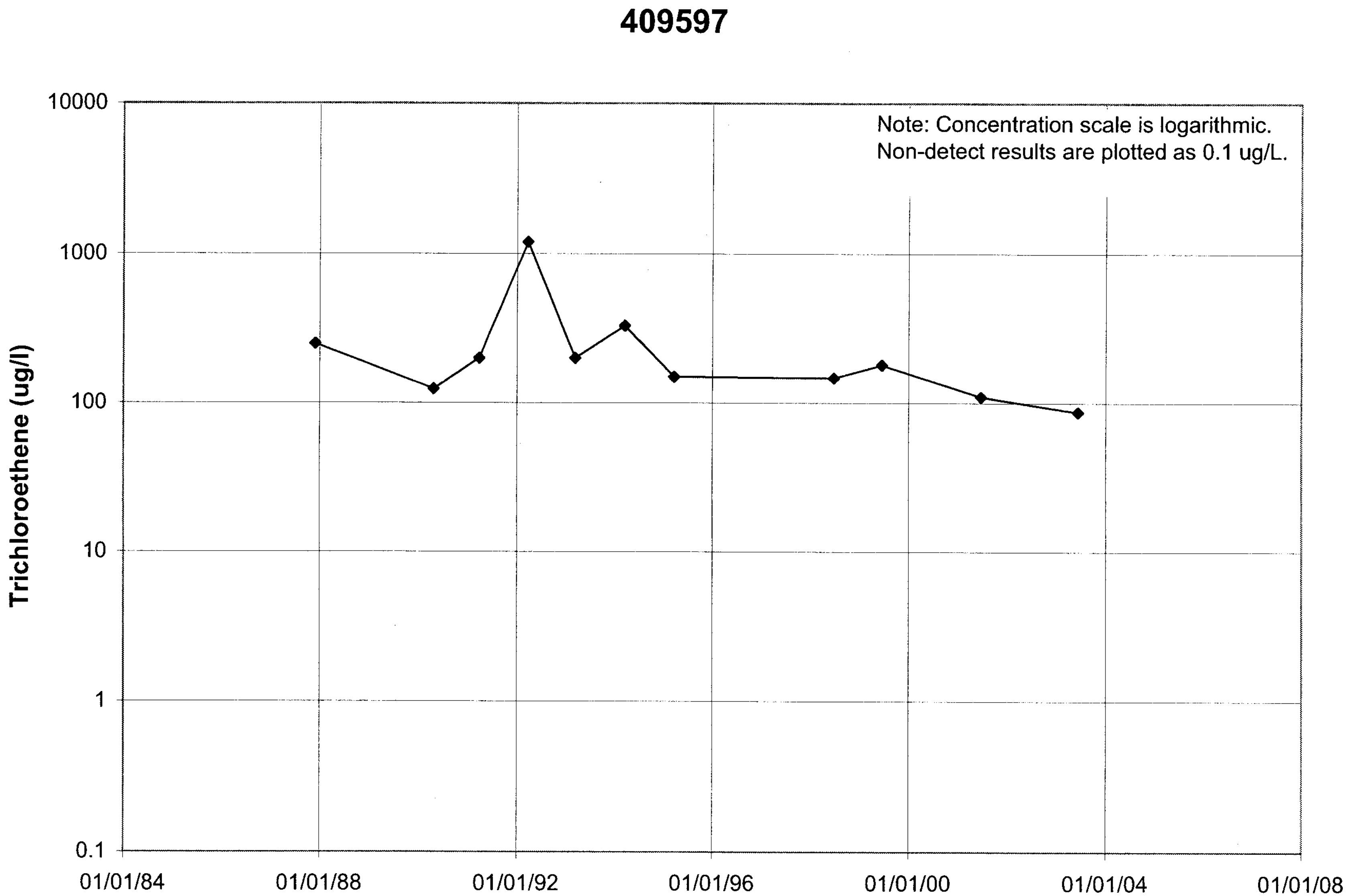

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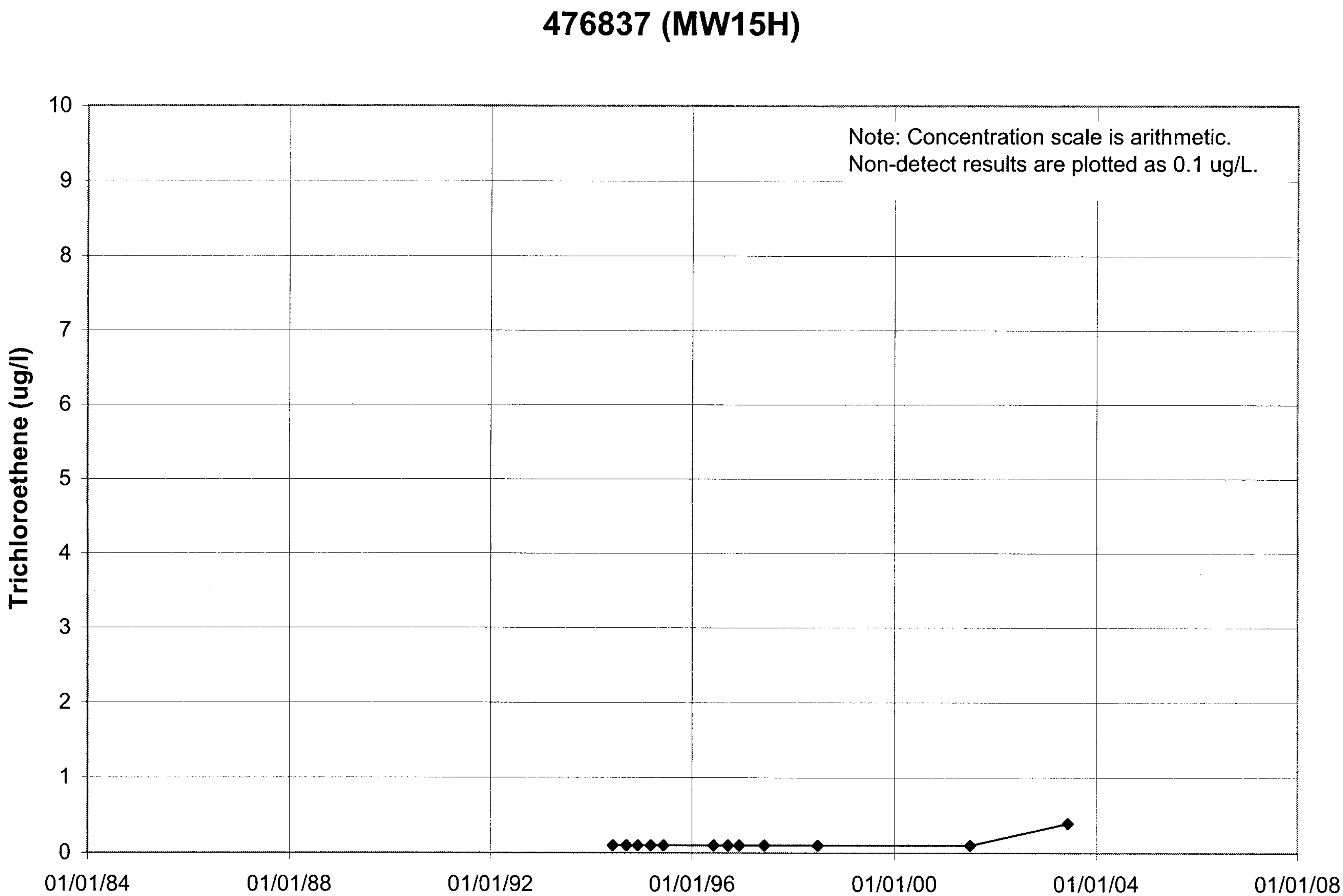

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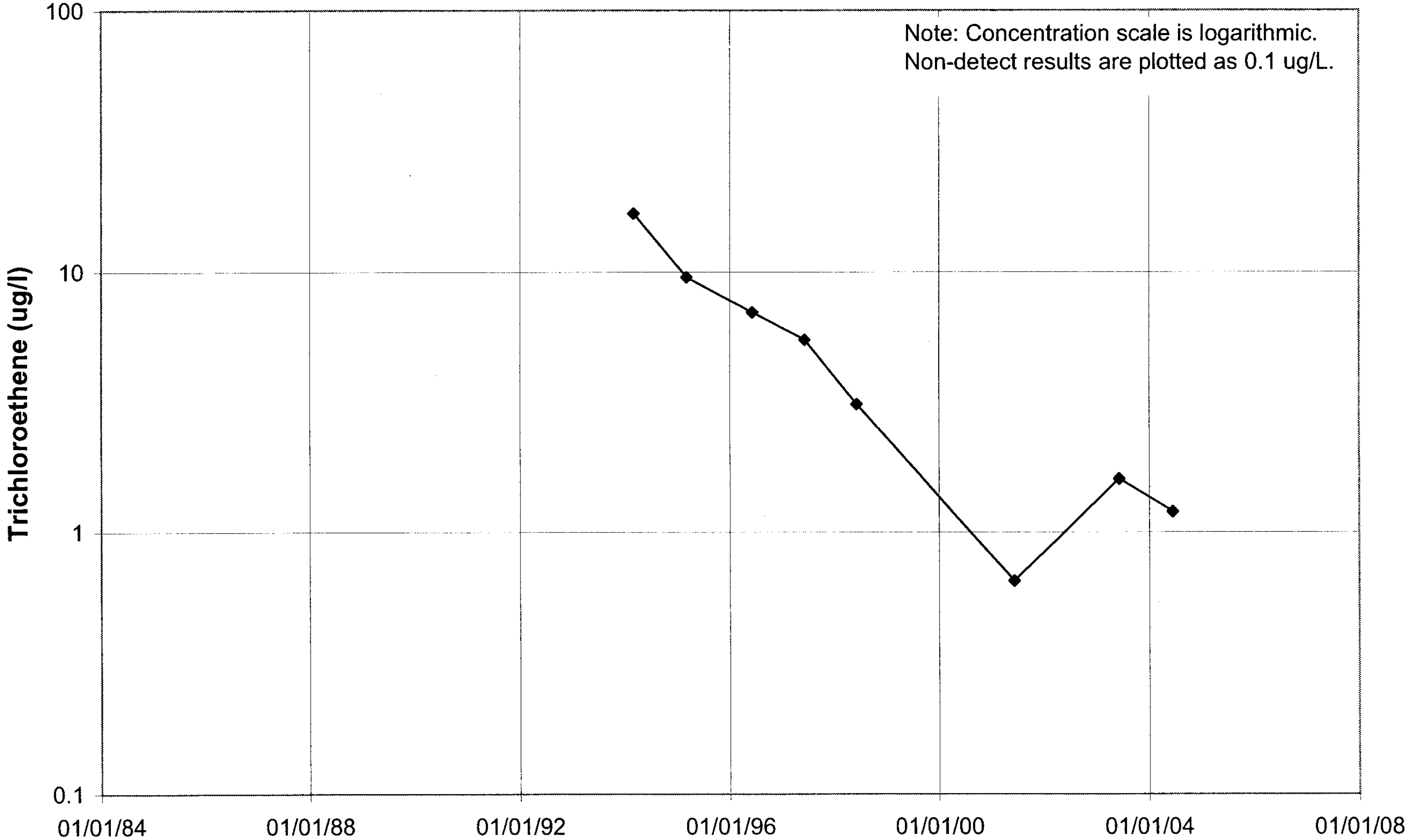
482083 (K04MW)



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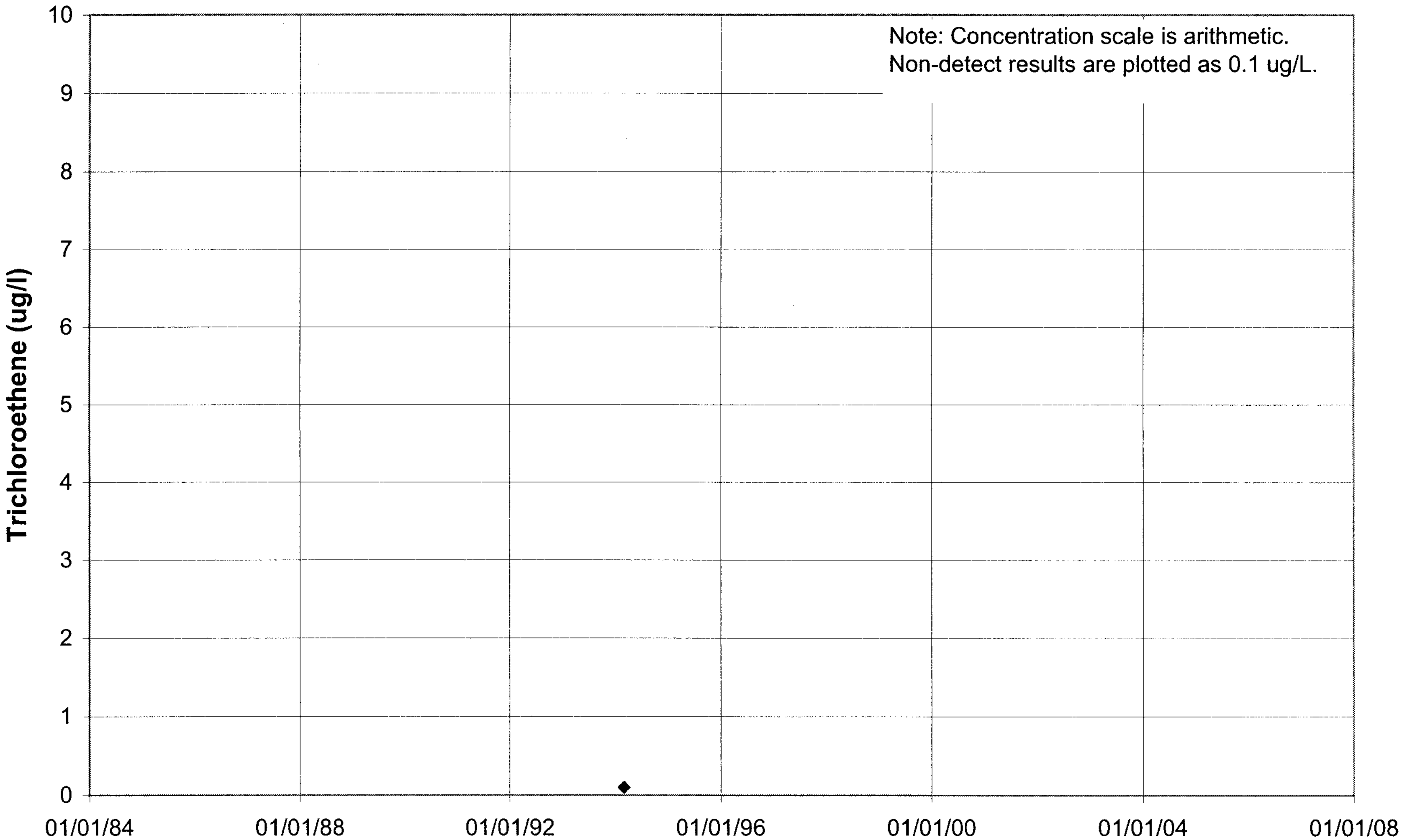
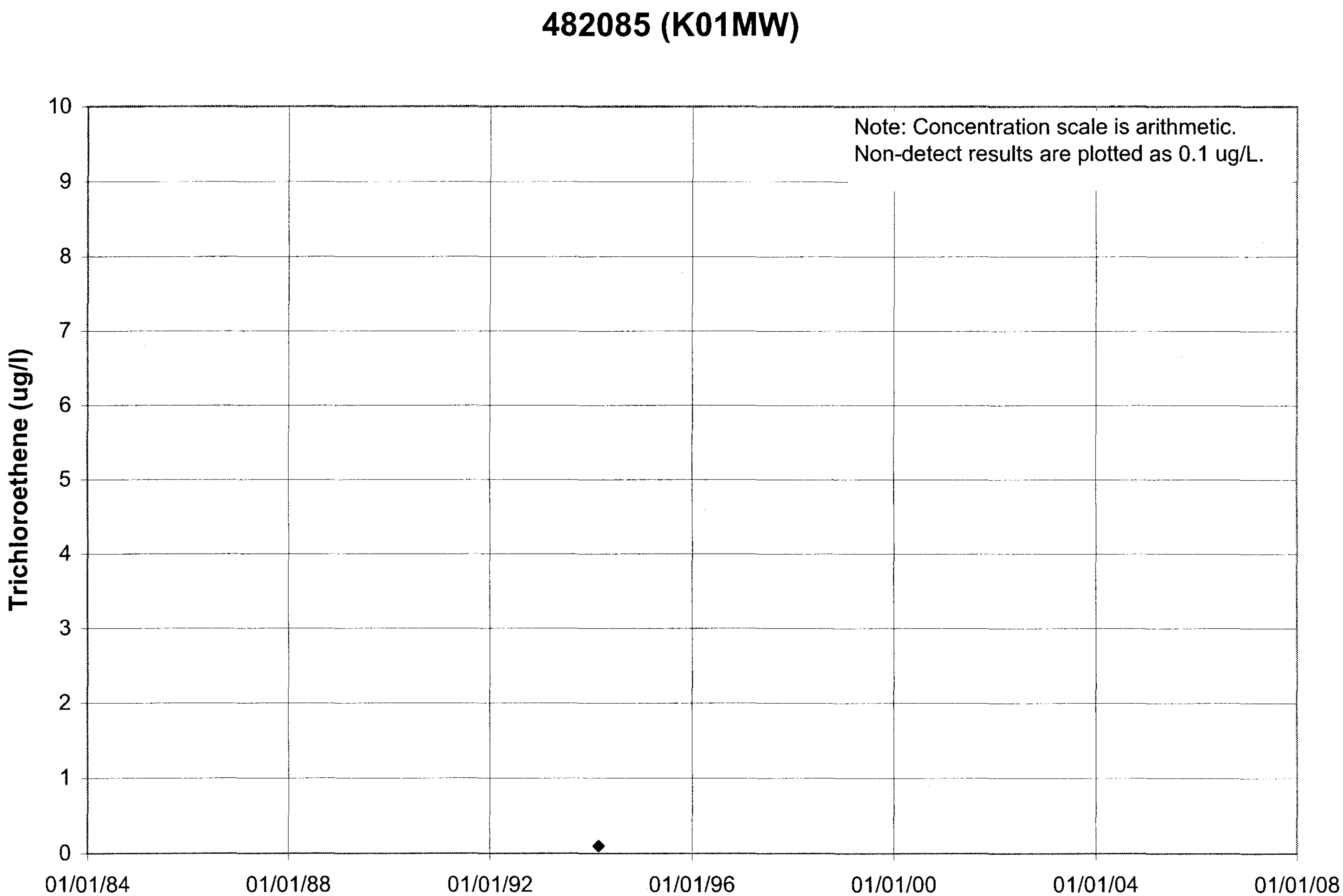


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar



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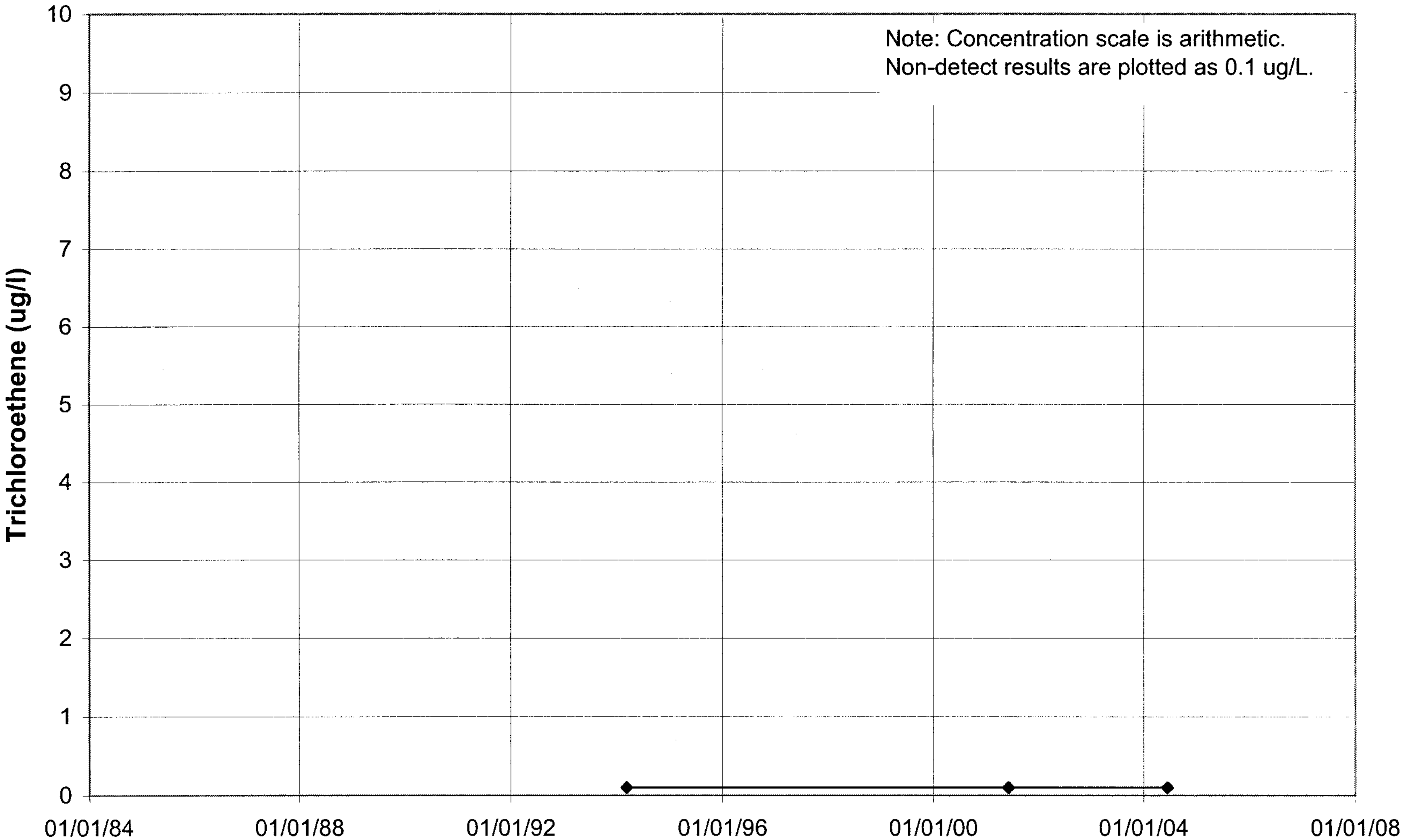
482086 (I01MW)



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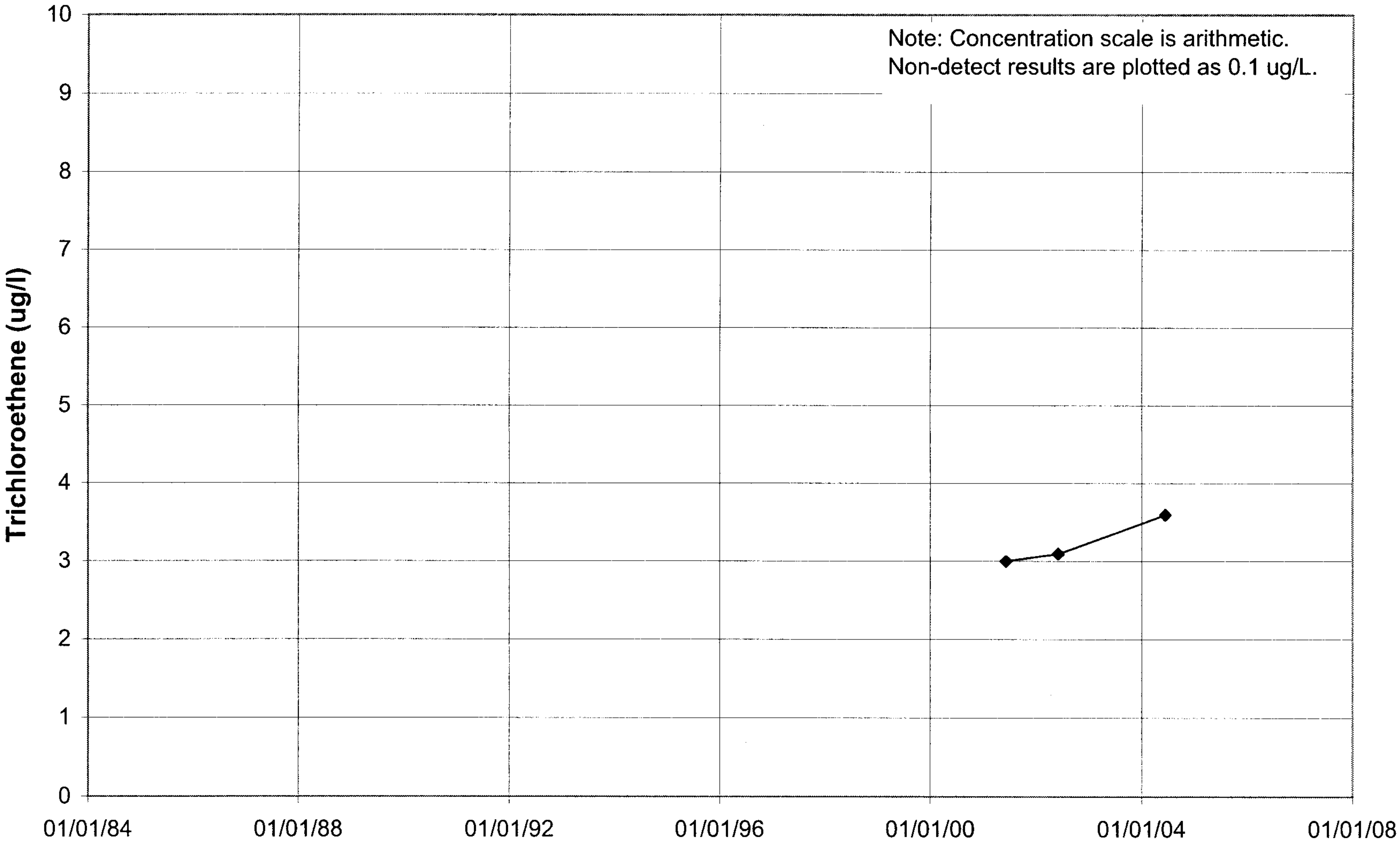

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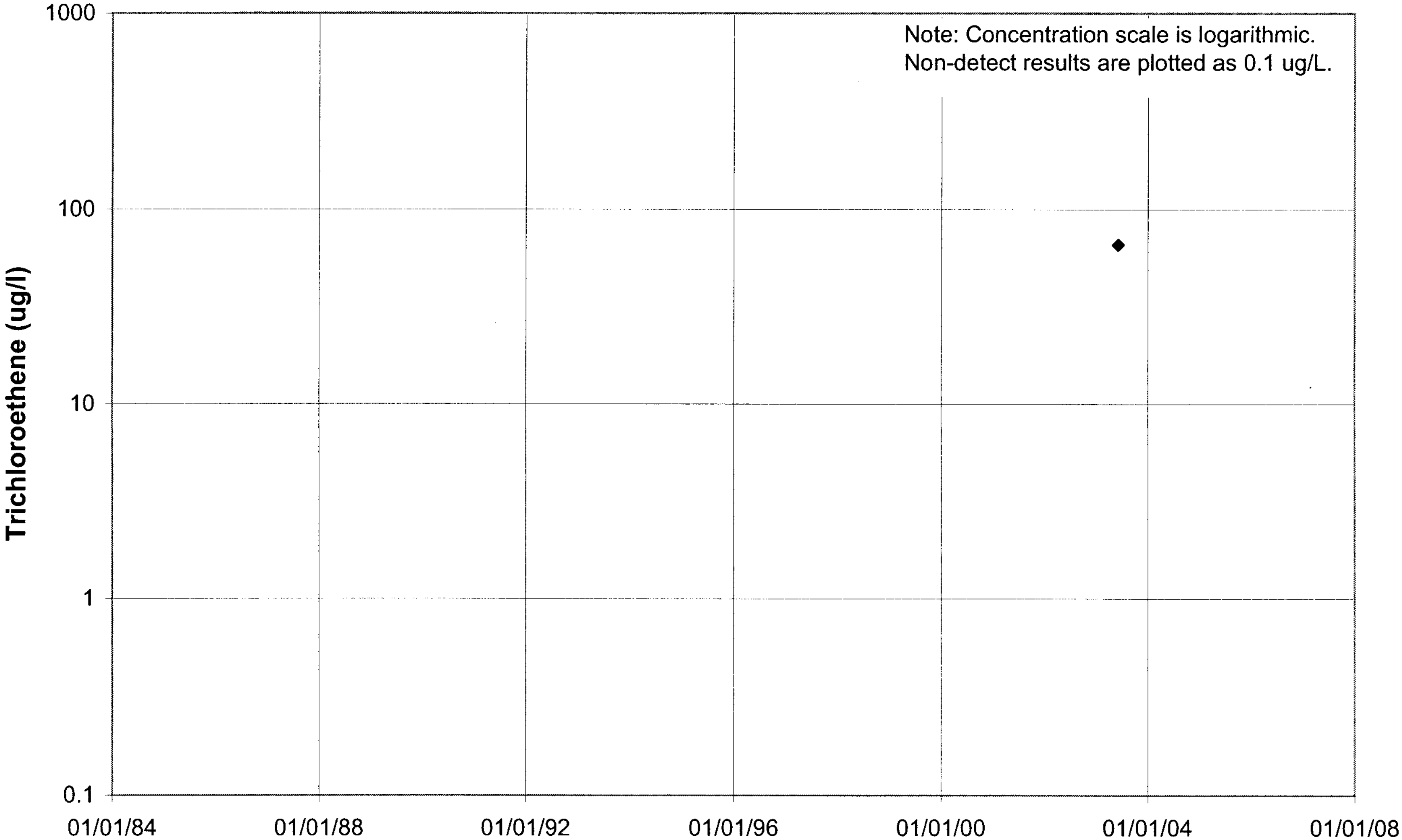

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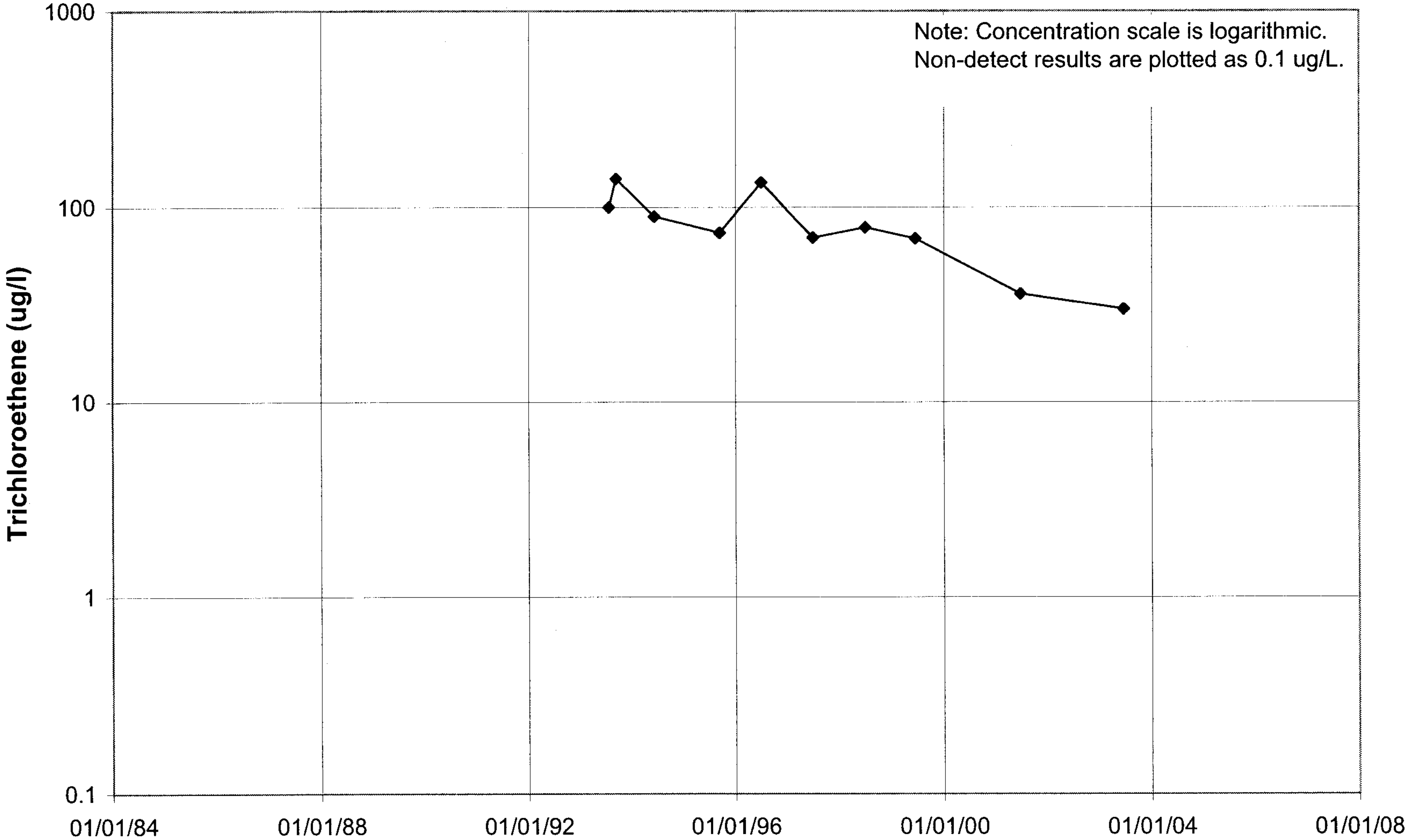

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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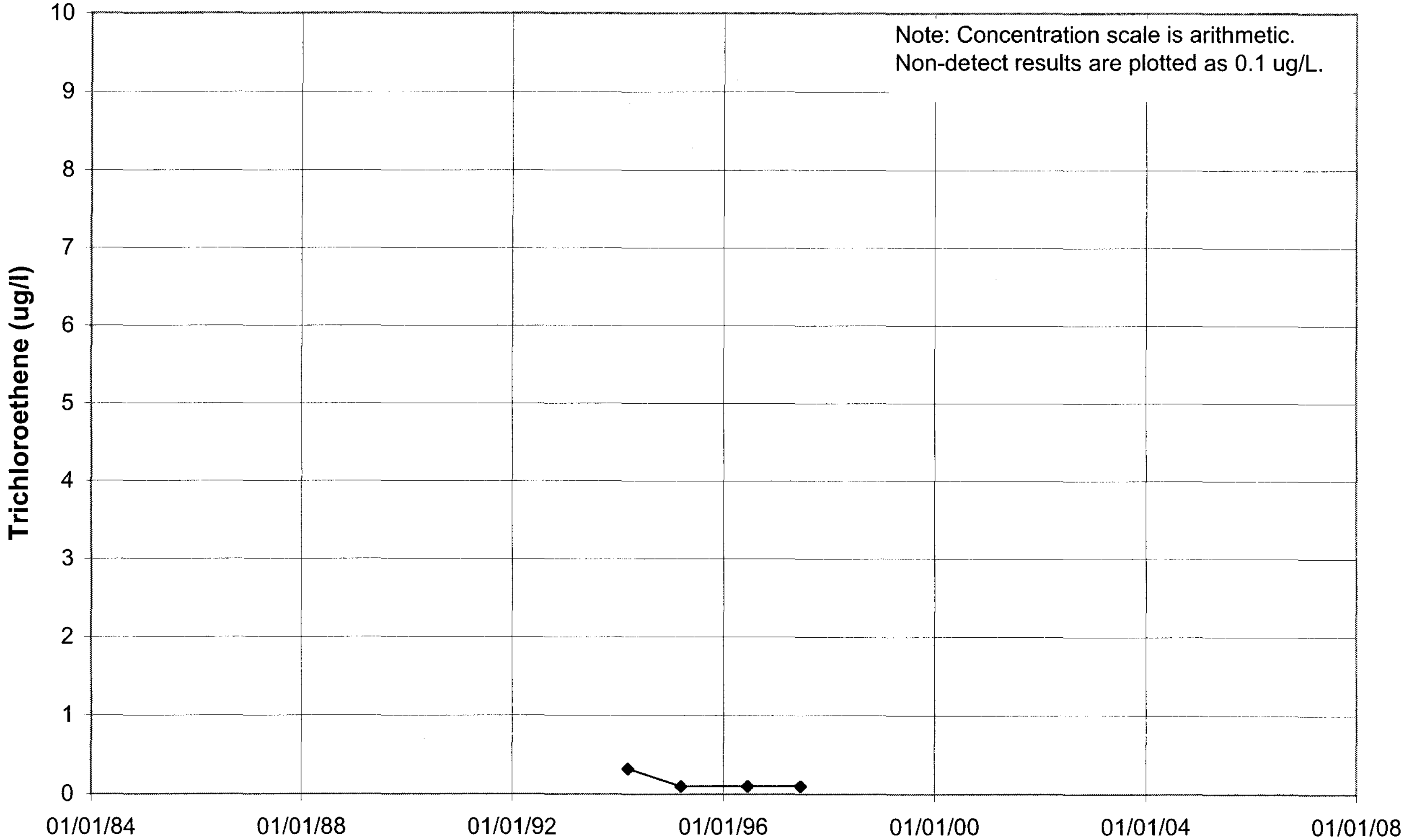

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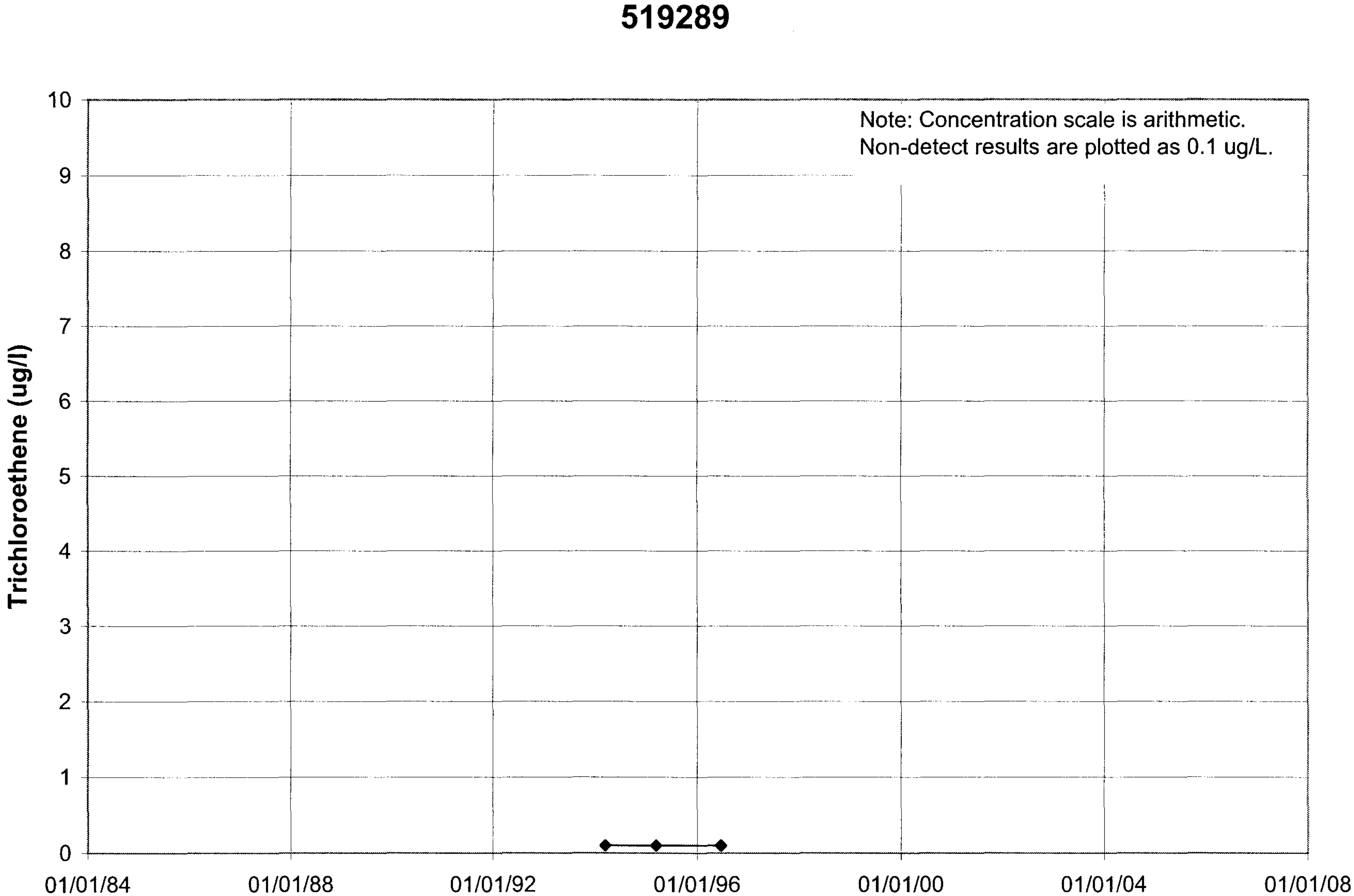

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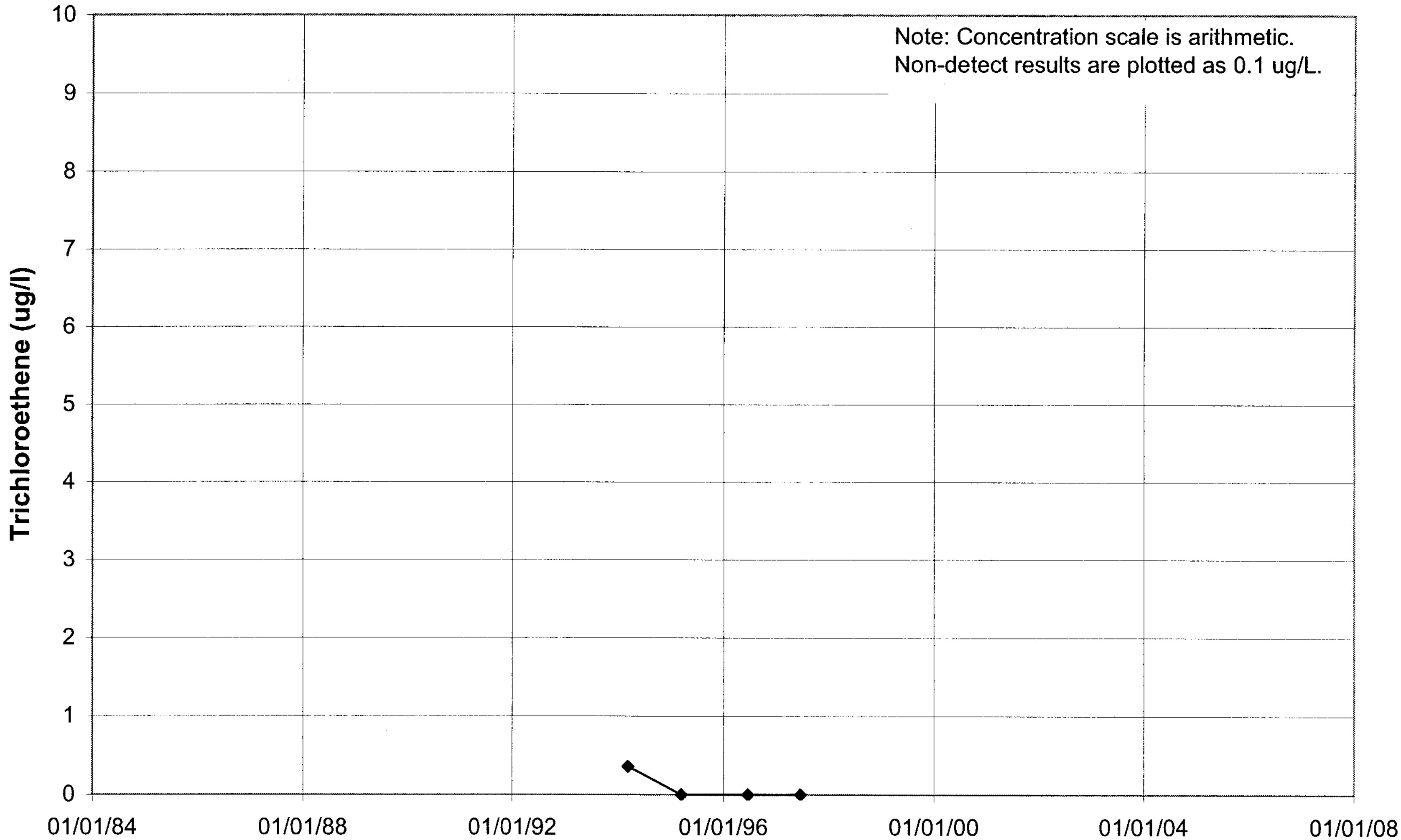

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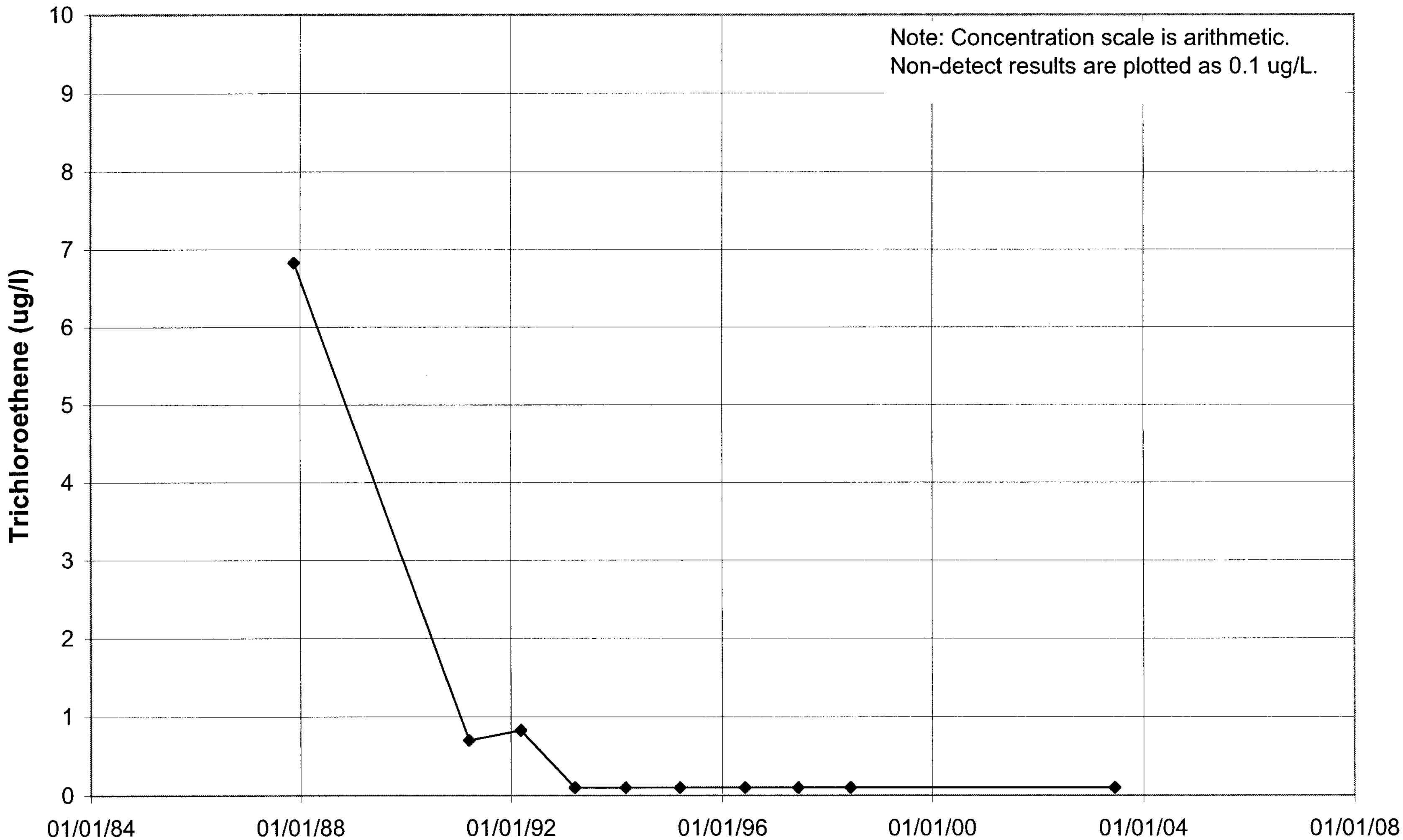
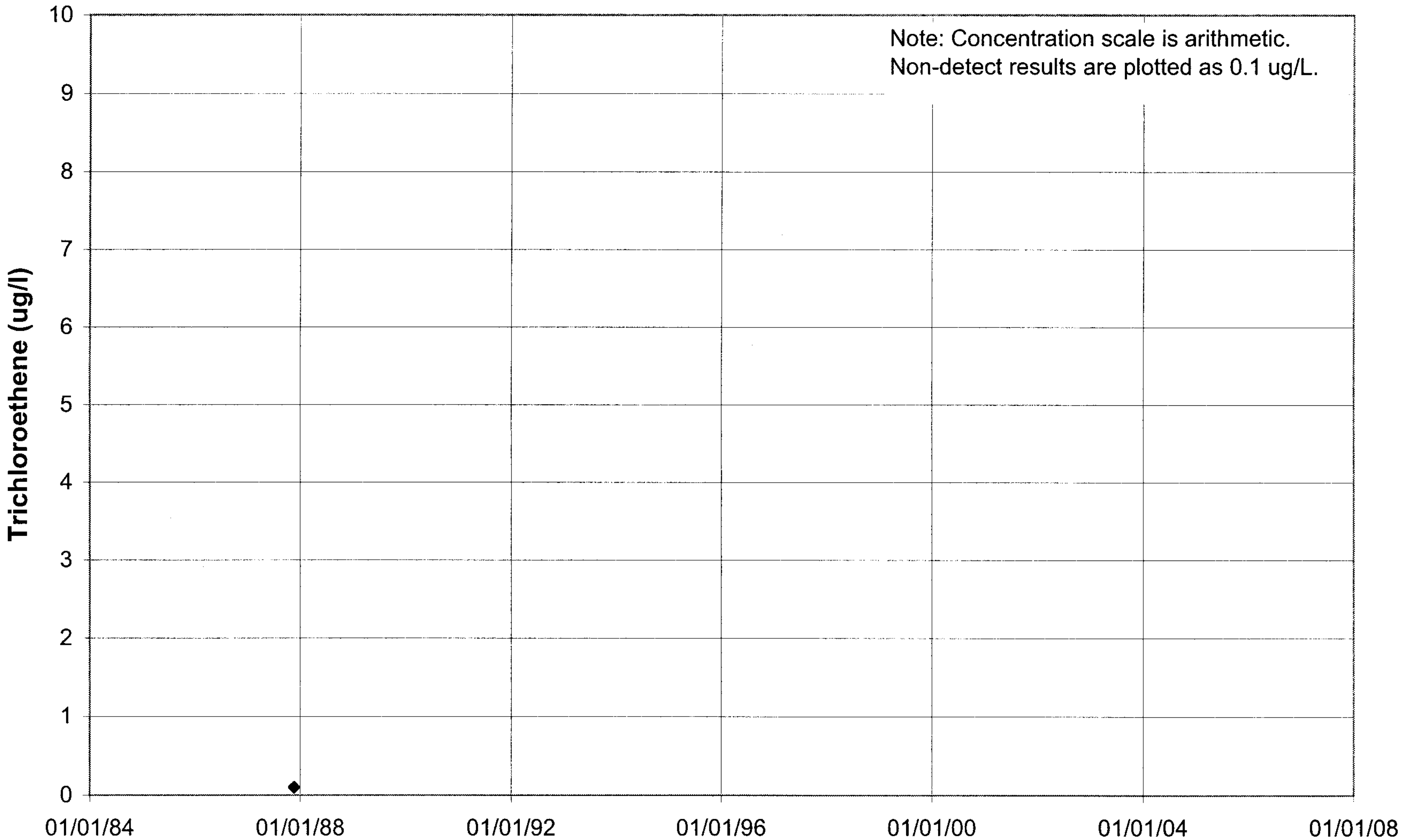
PJ#003



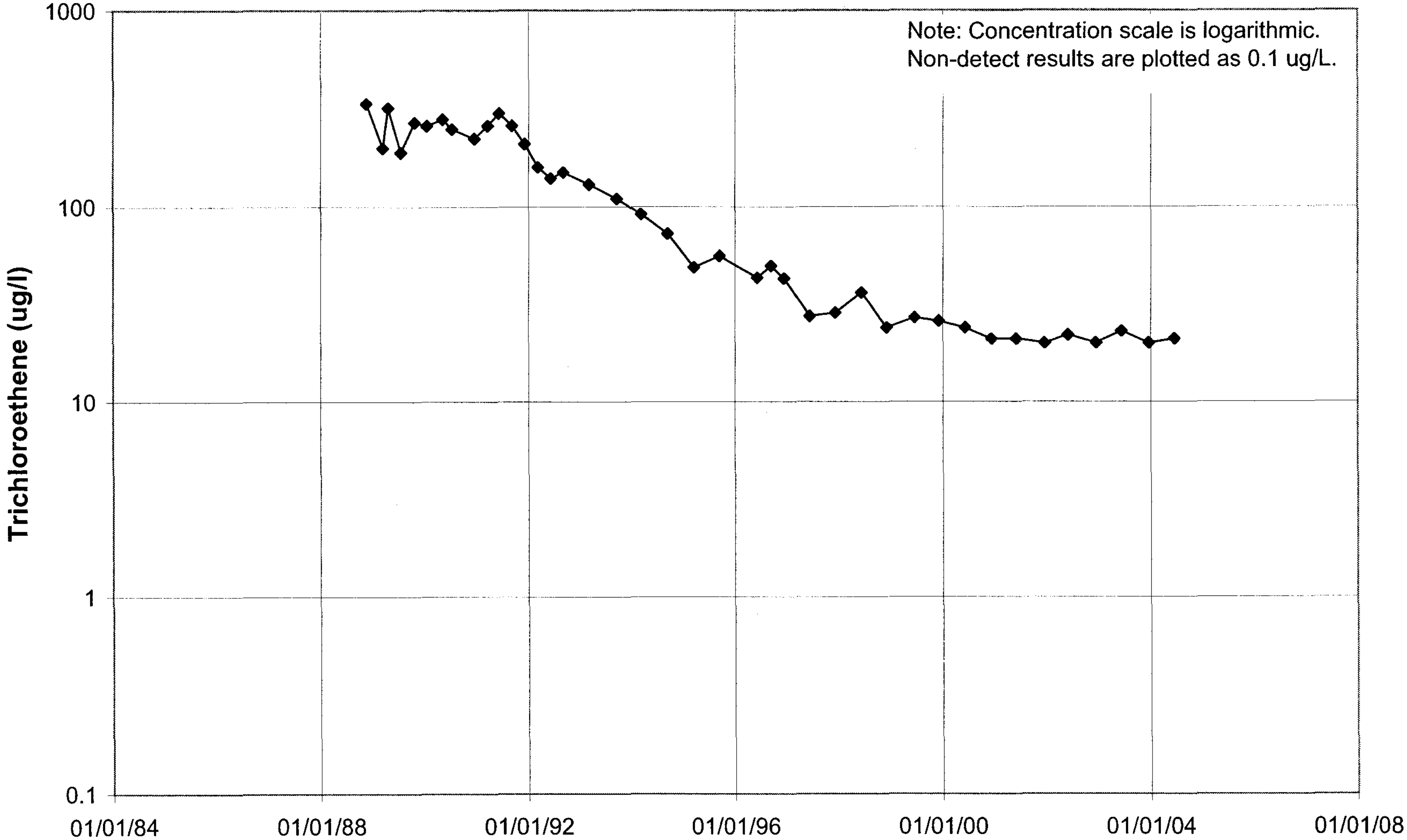
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

PJ#027



TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

PJ#309 (B8)



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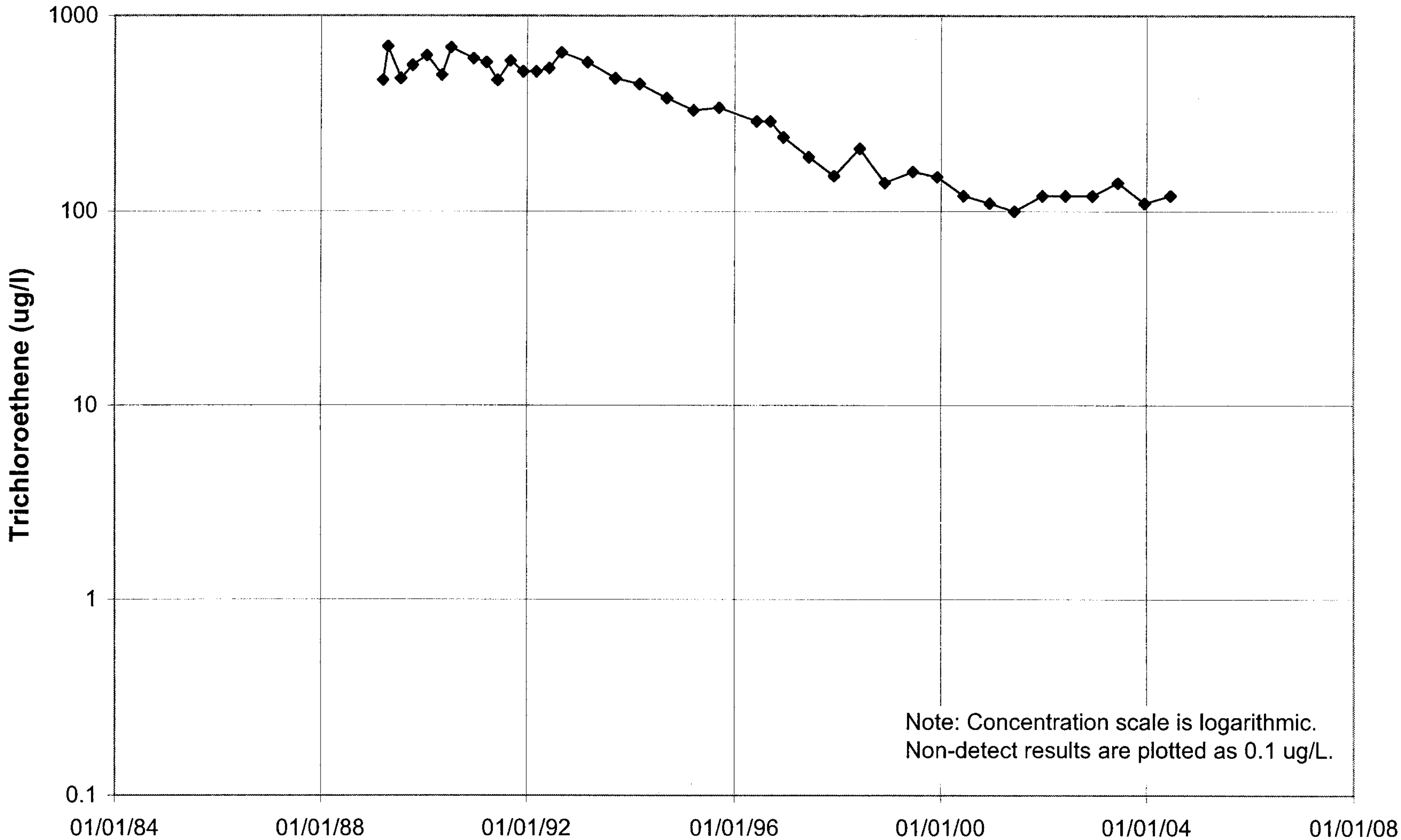

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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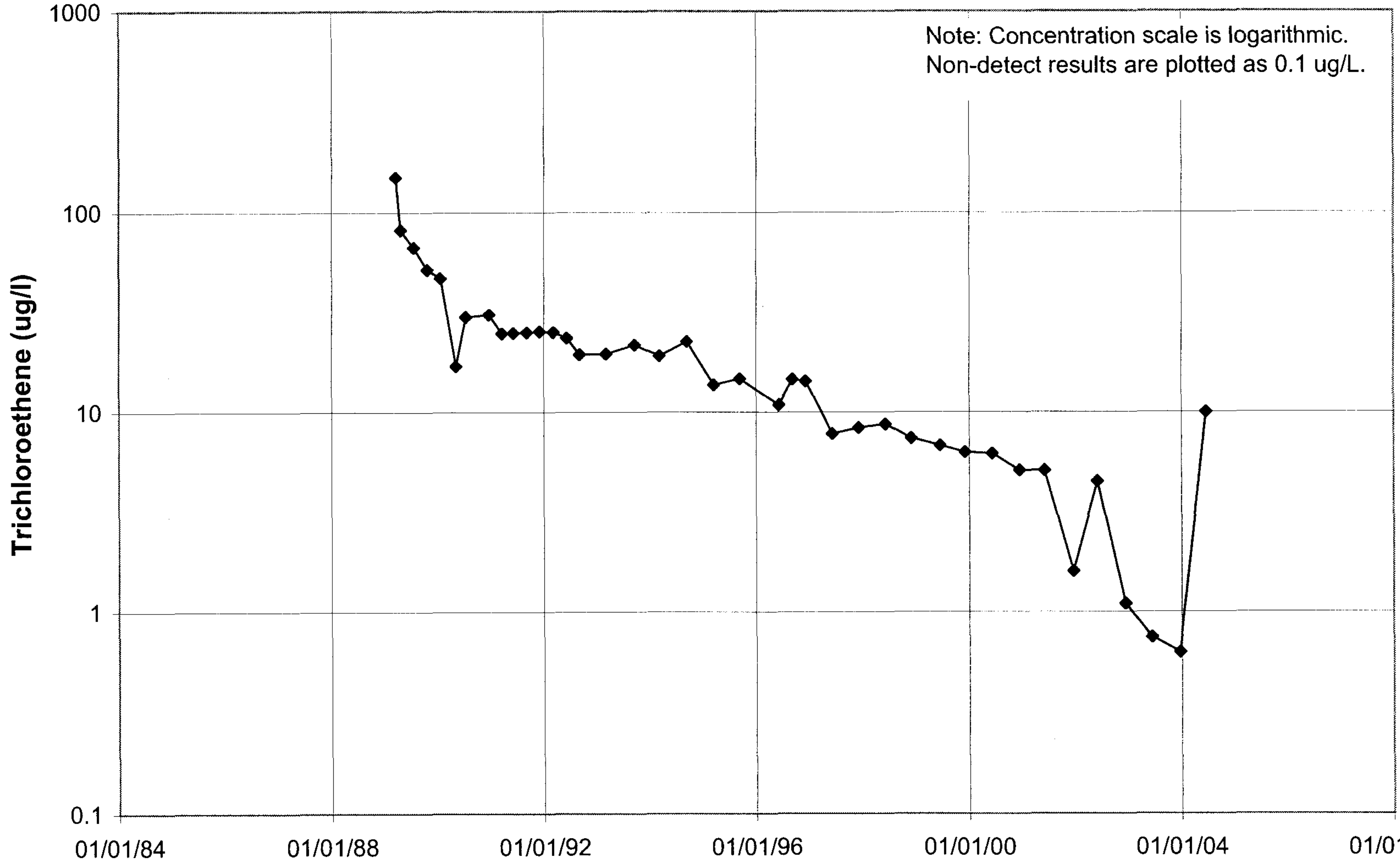

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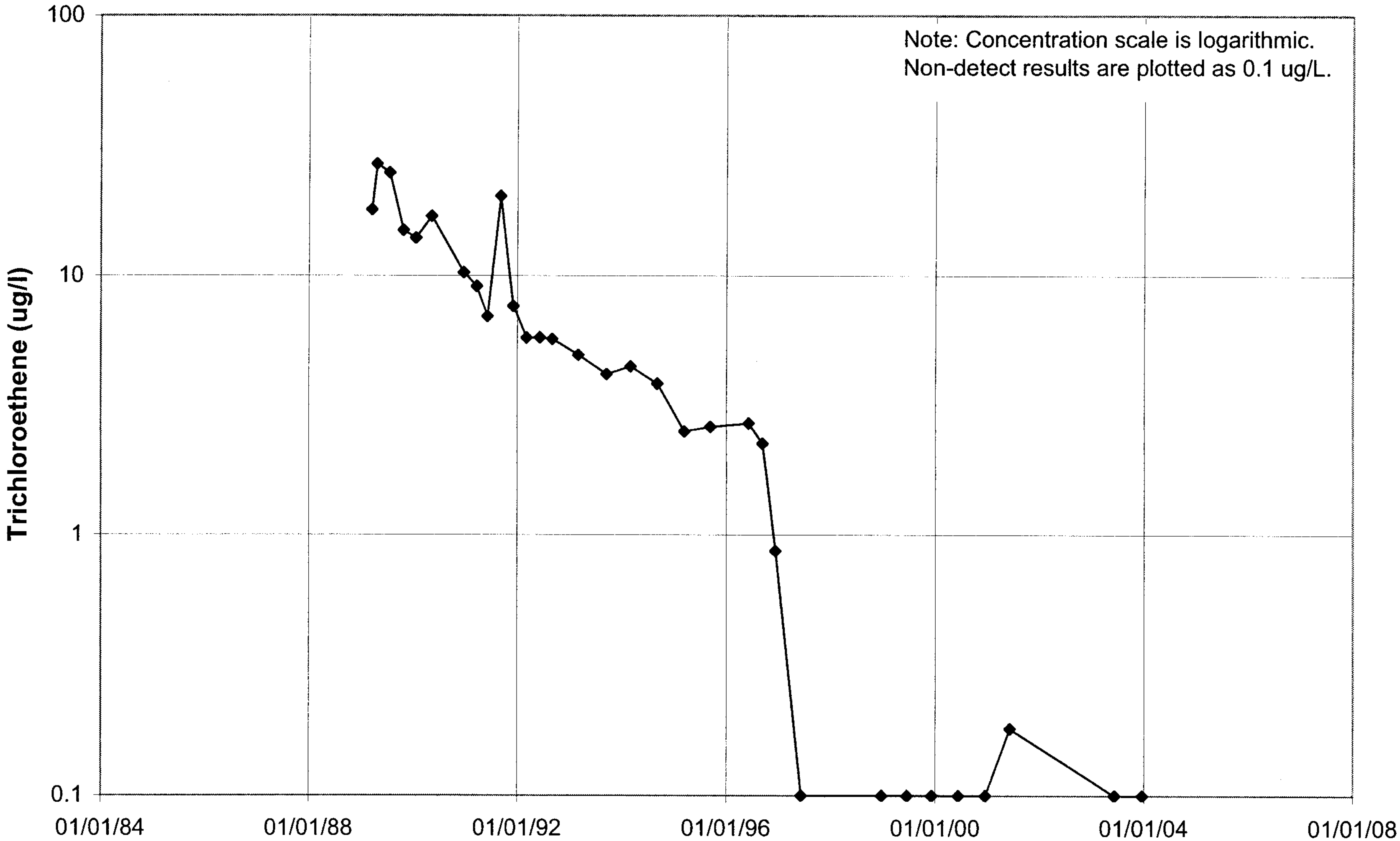

TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

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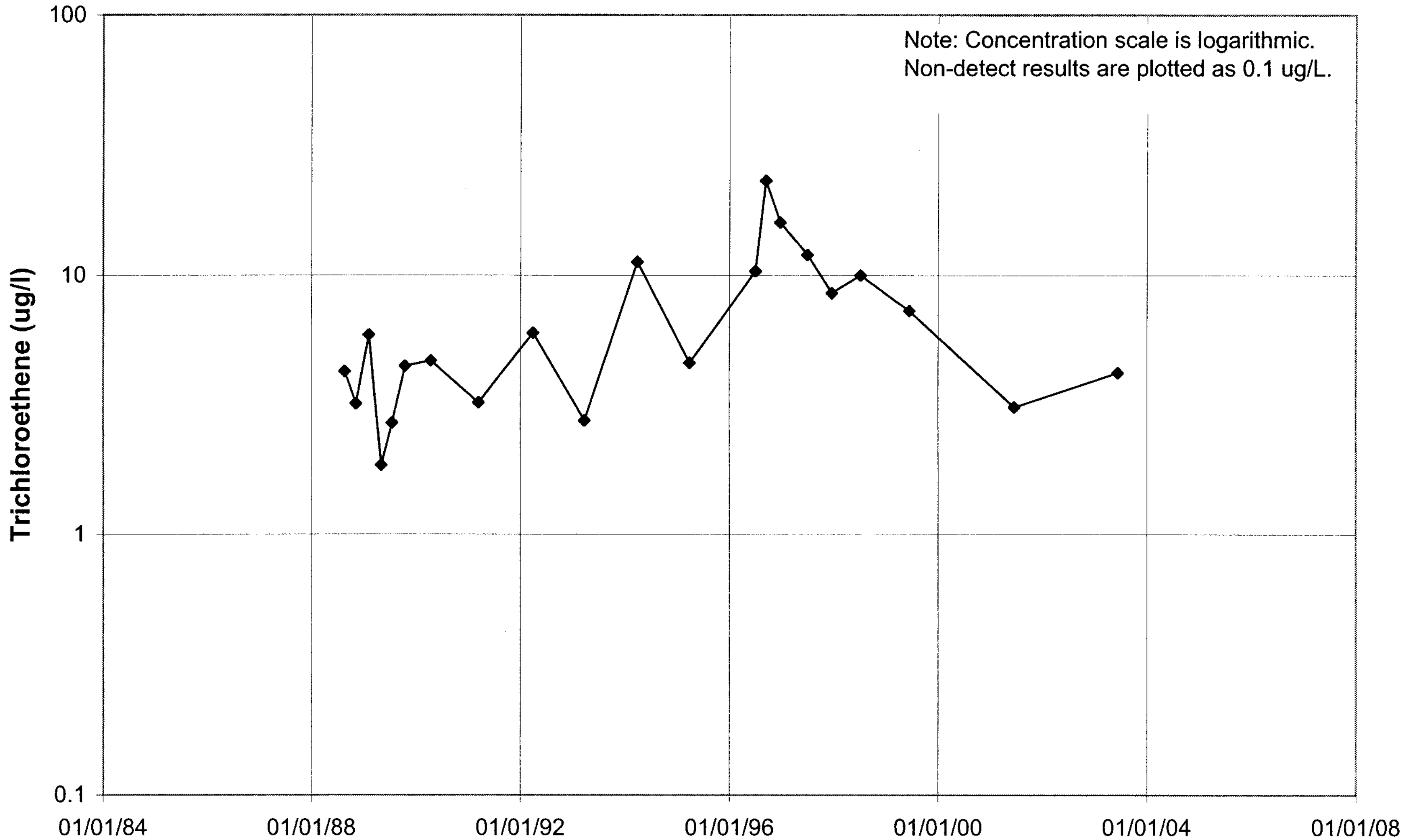

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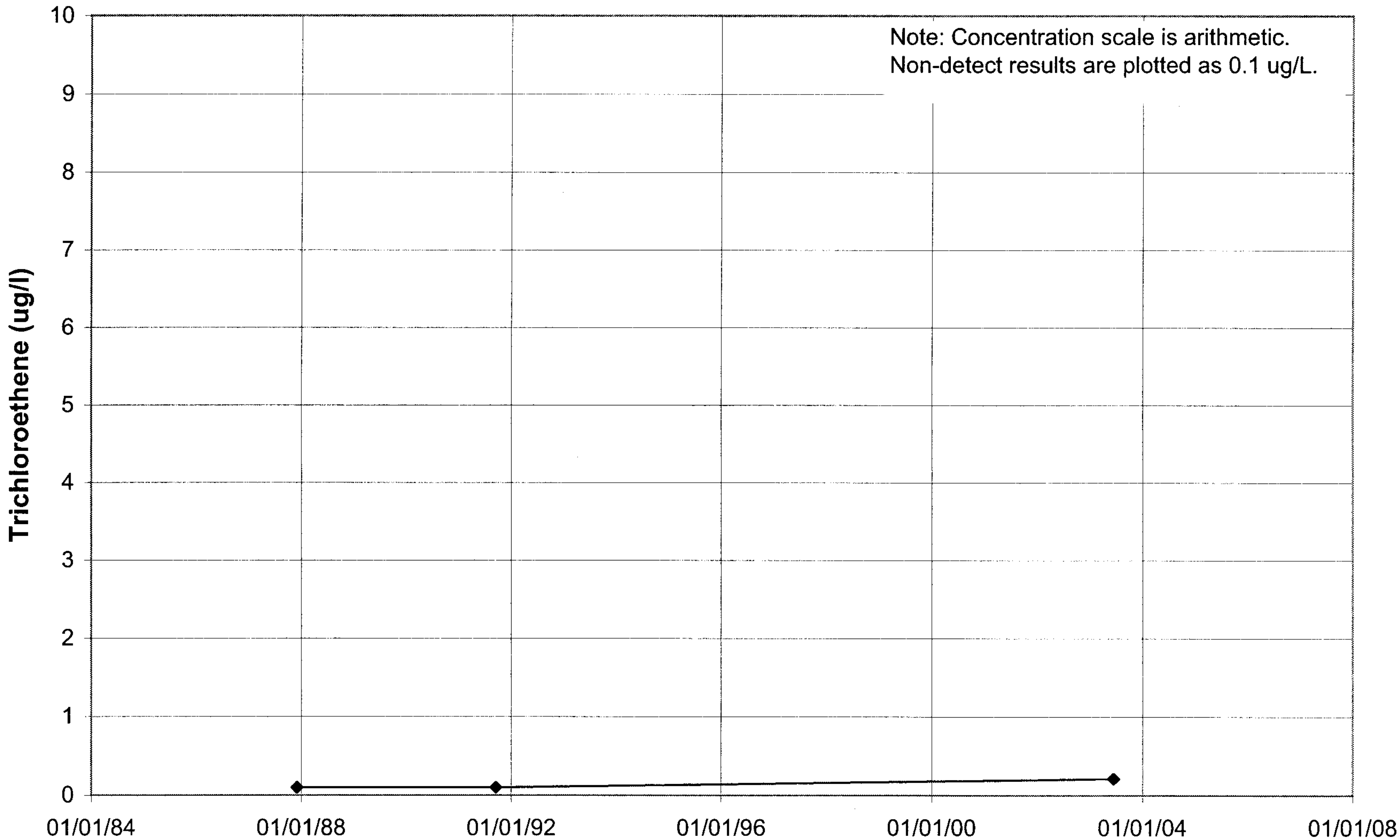

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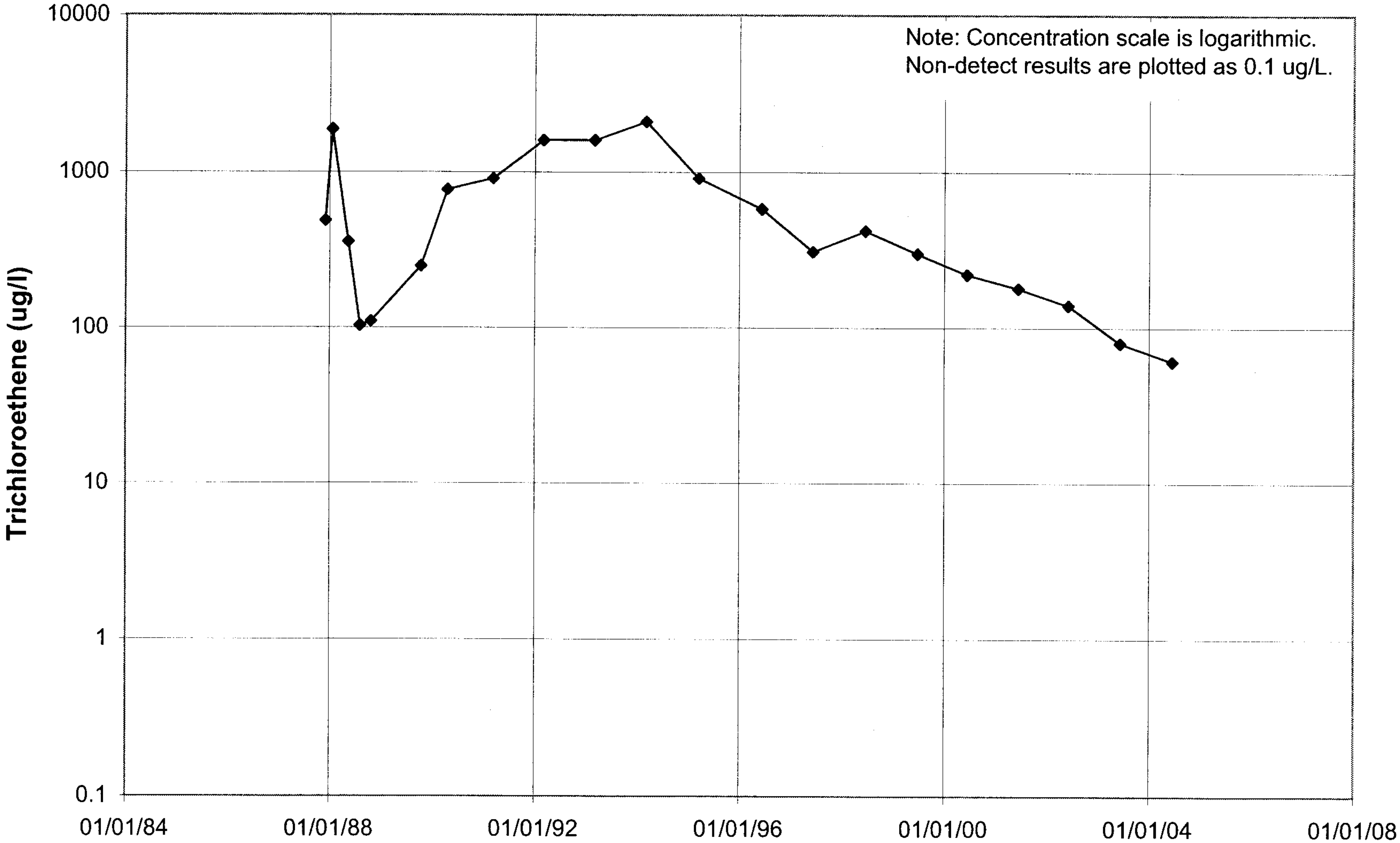
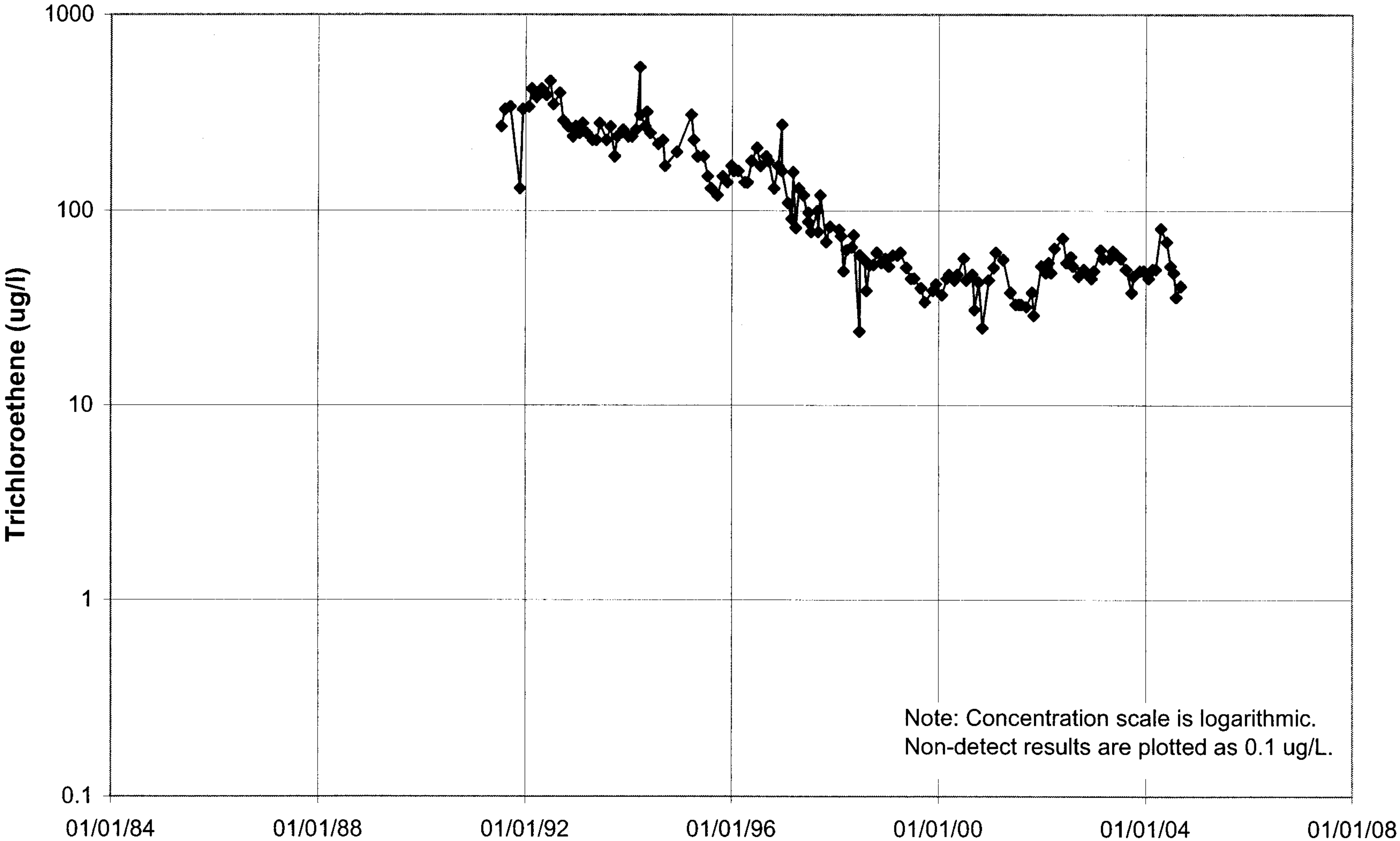
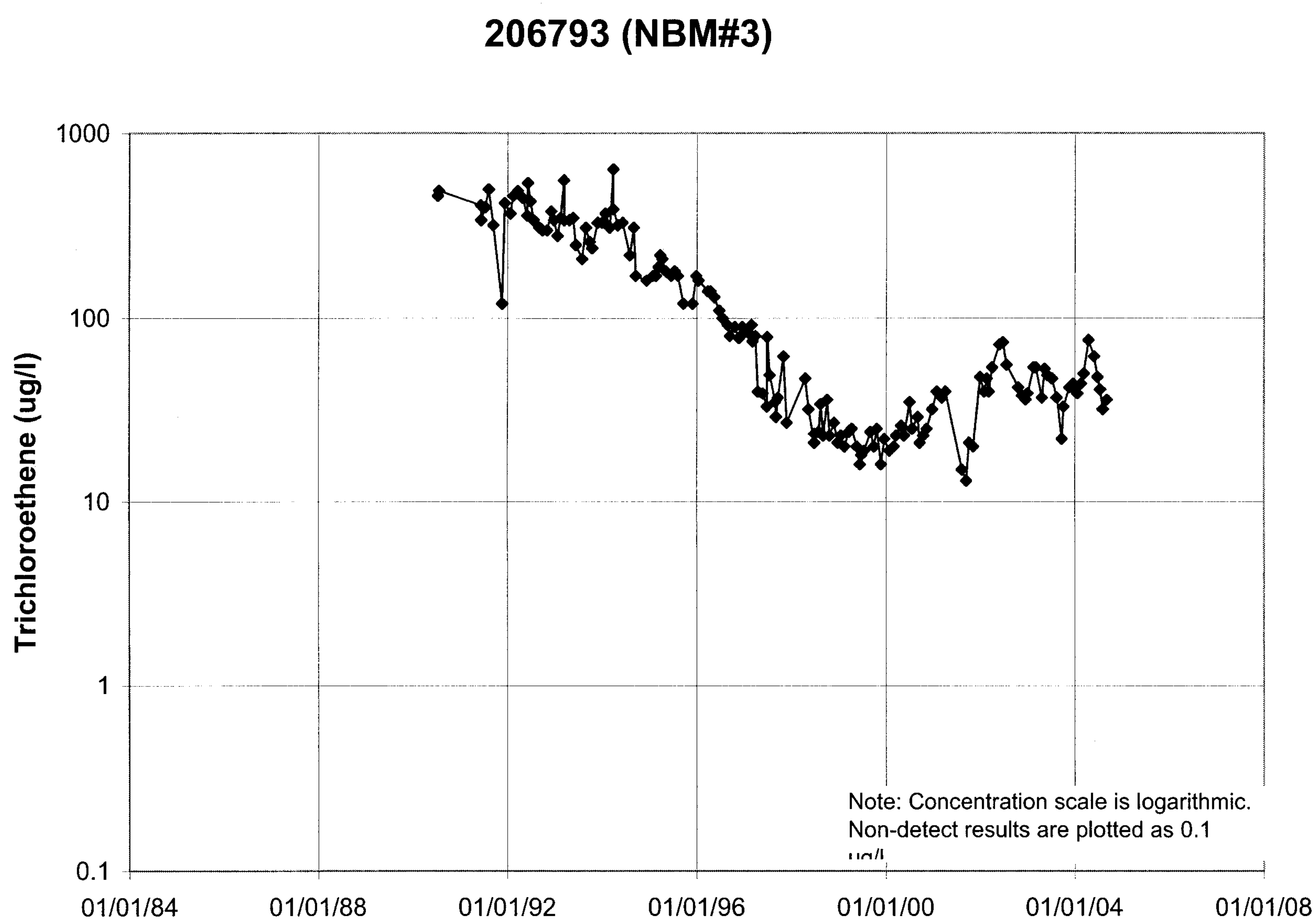


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

206792 (NBM#4)



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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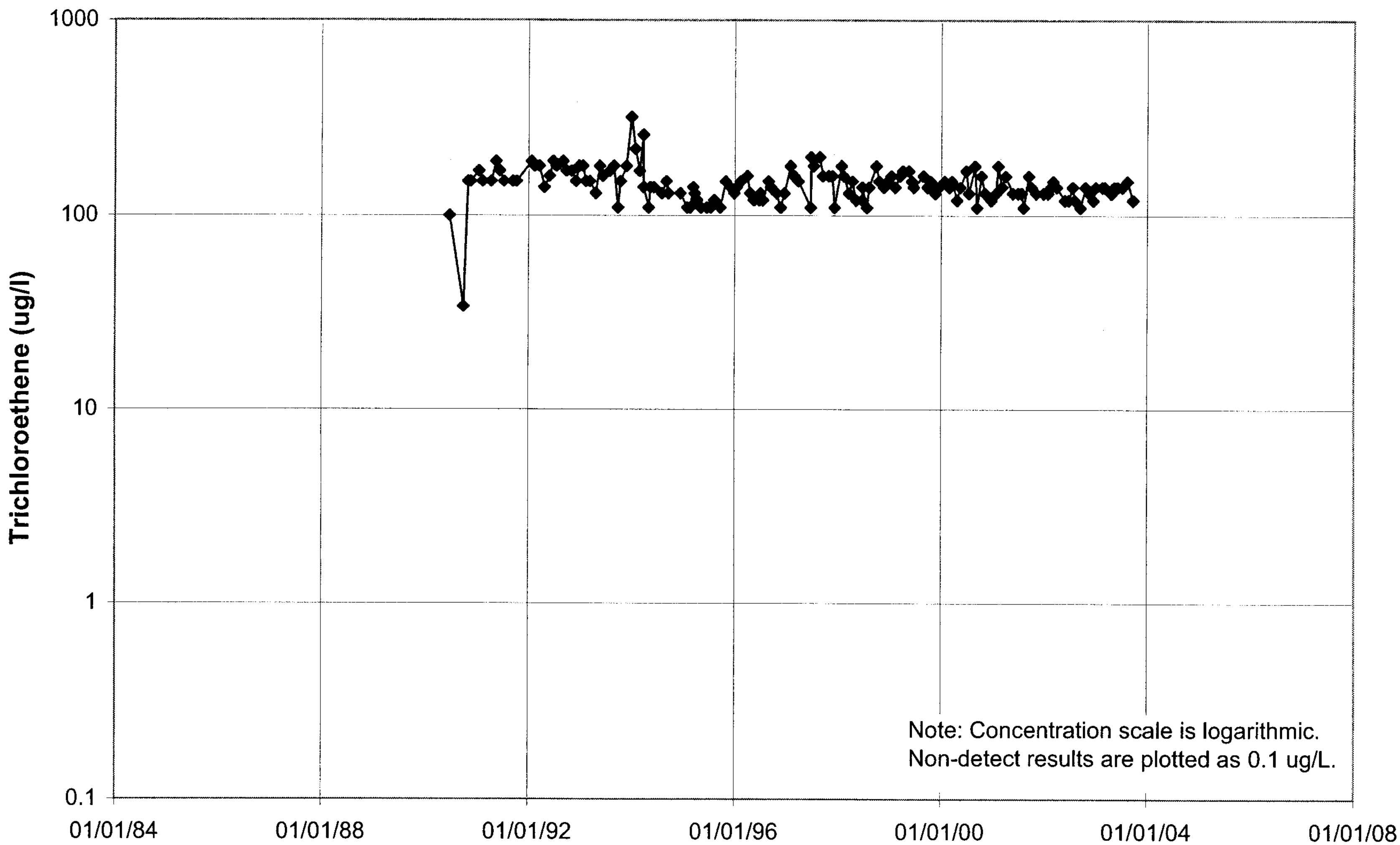
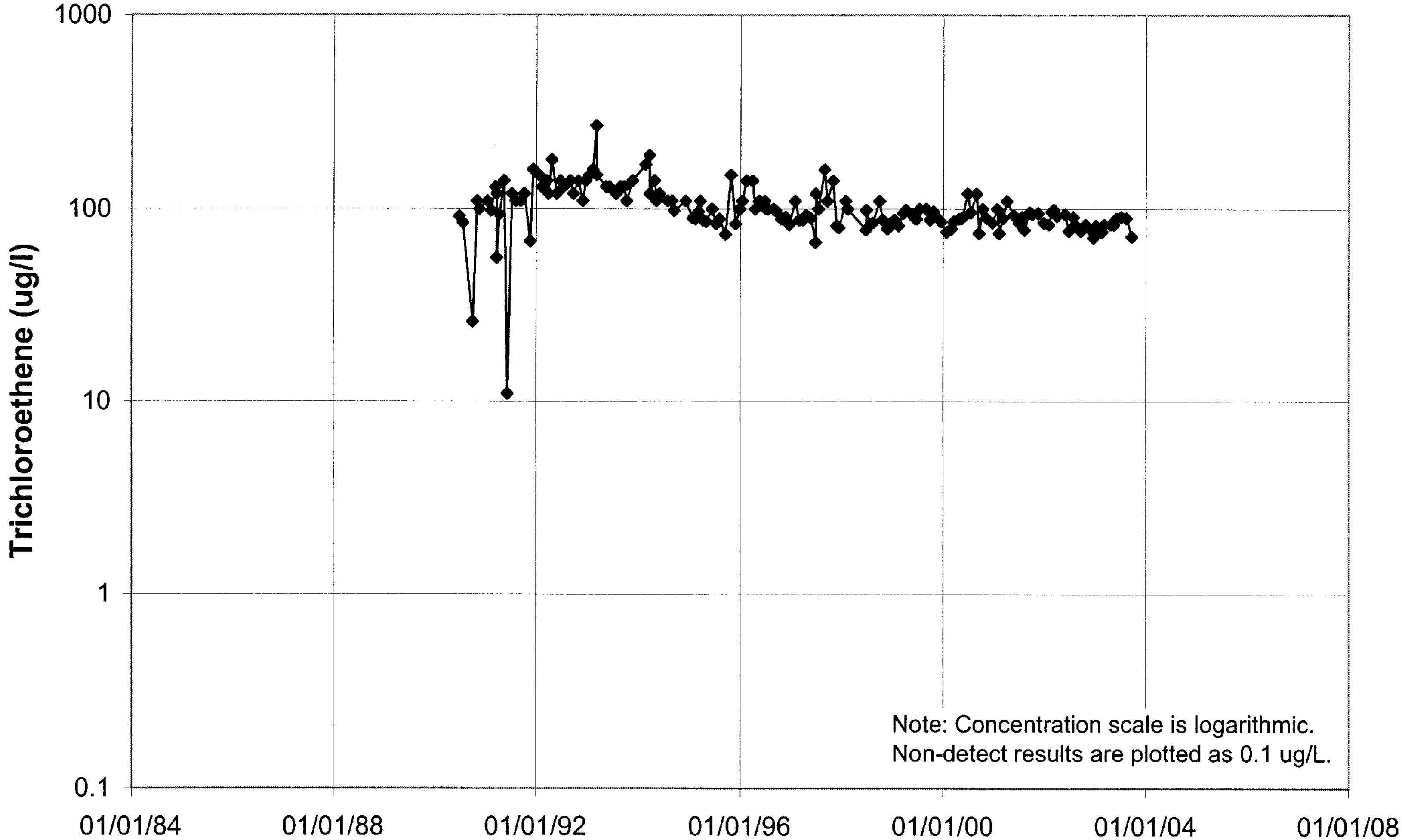
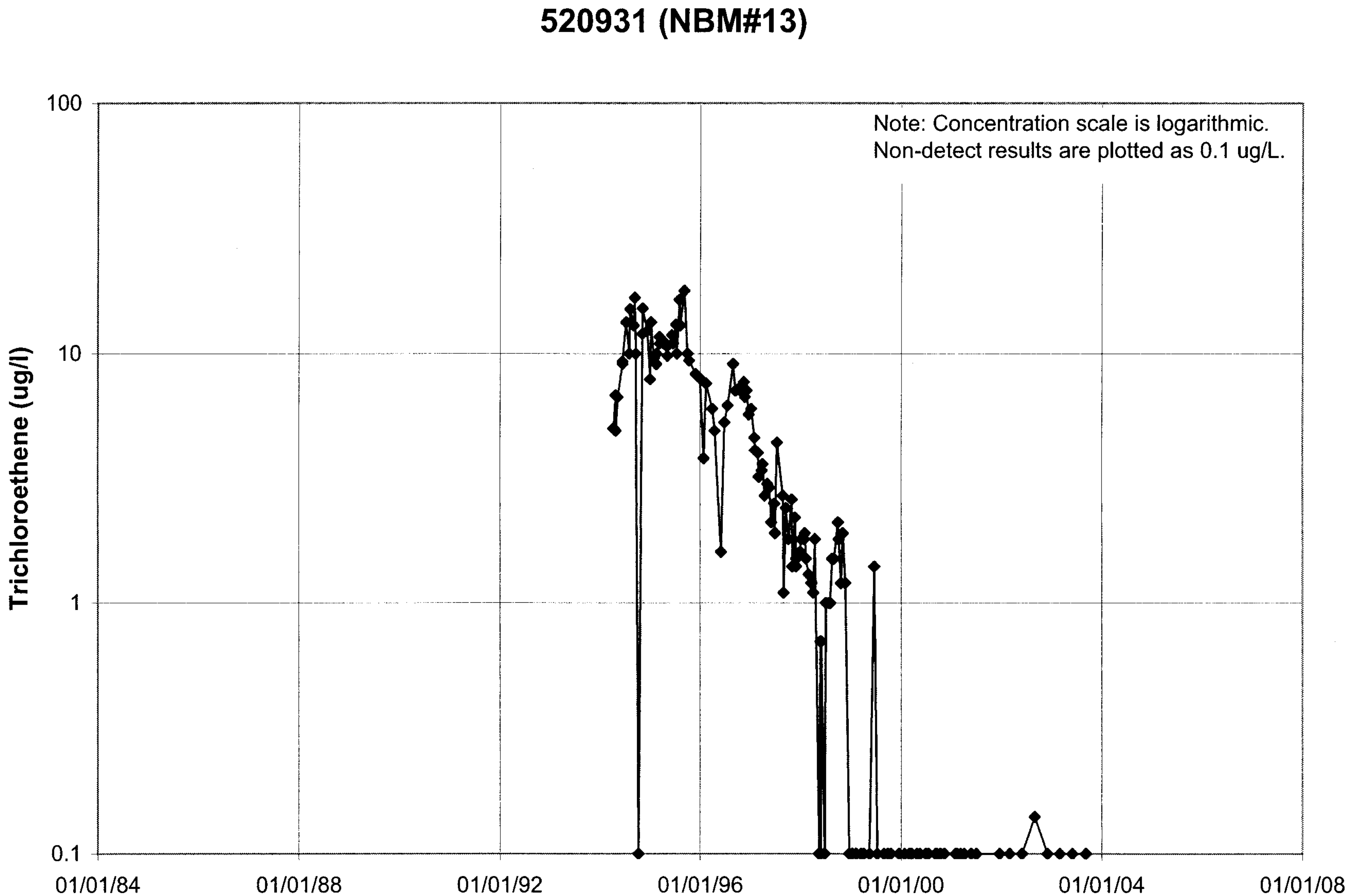


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

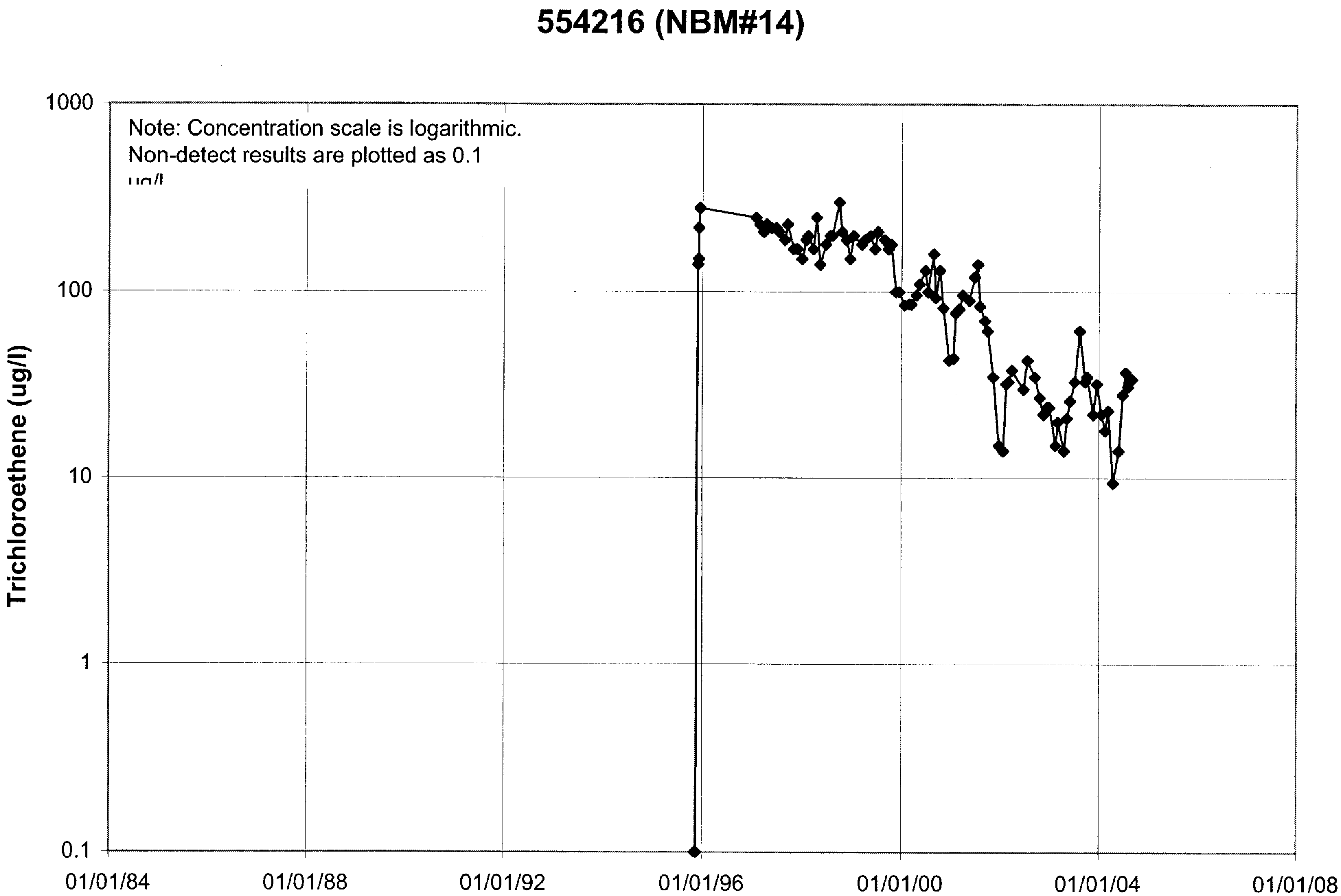
206797 (NBM#6)



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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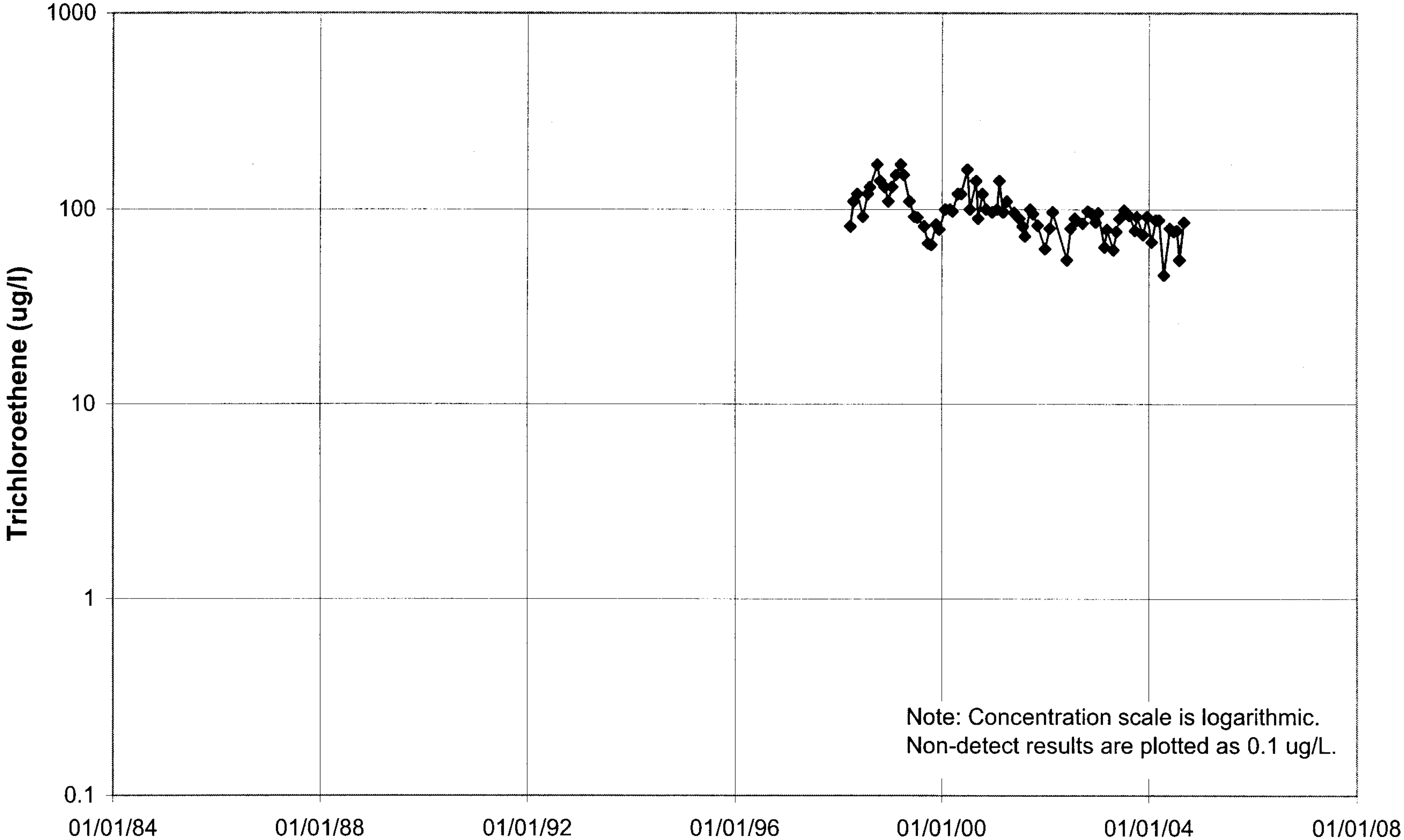
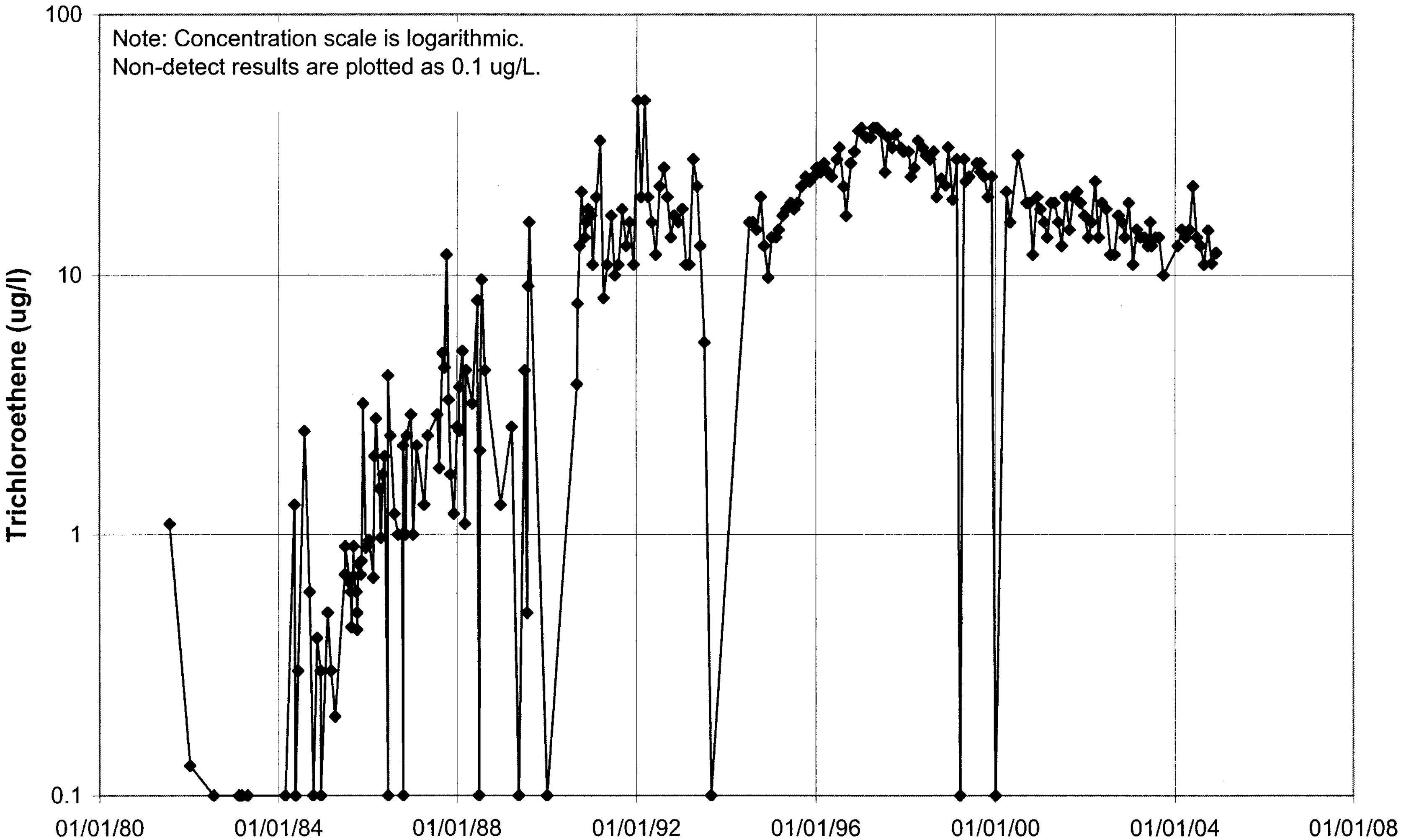
582628 (NBM#15)



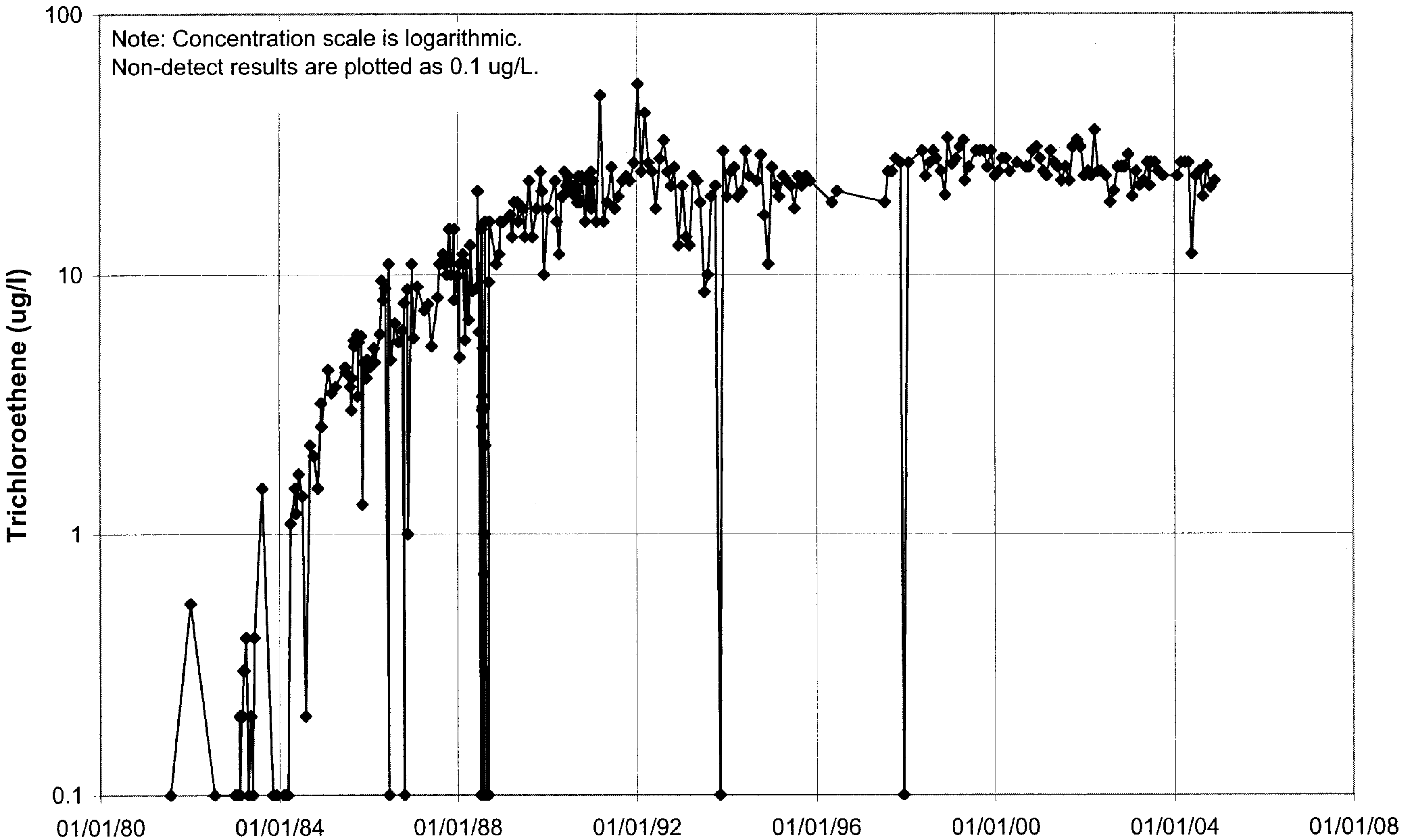
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

200524 (SAM#5)



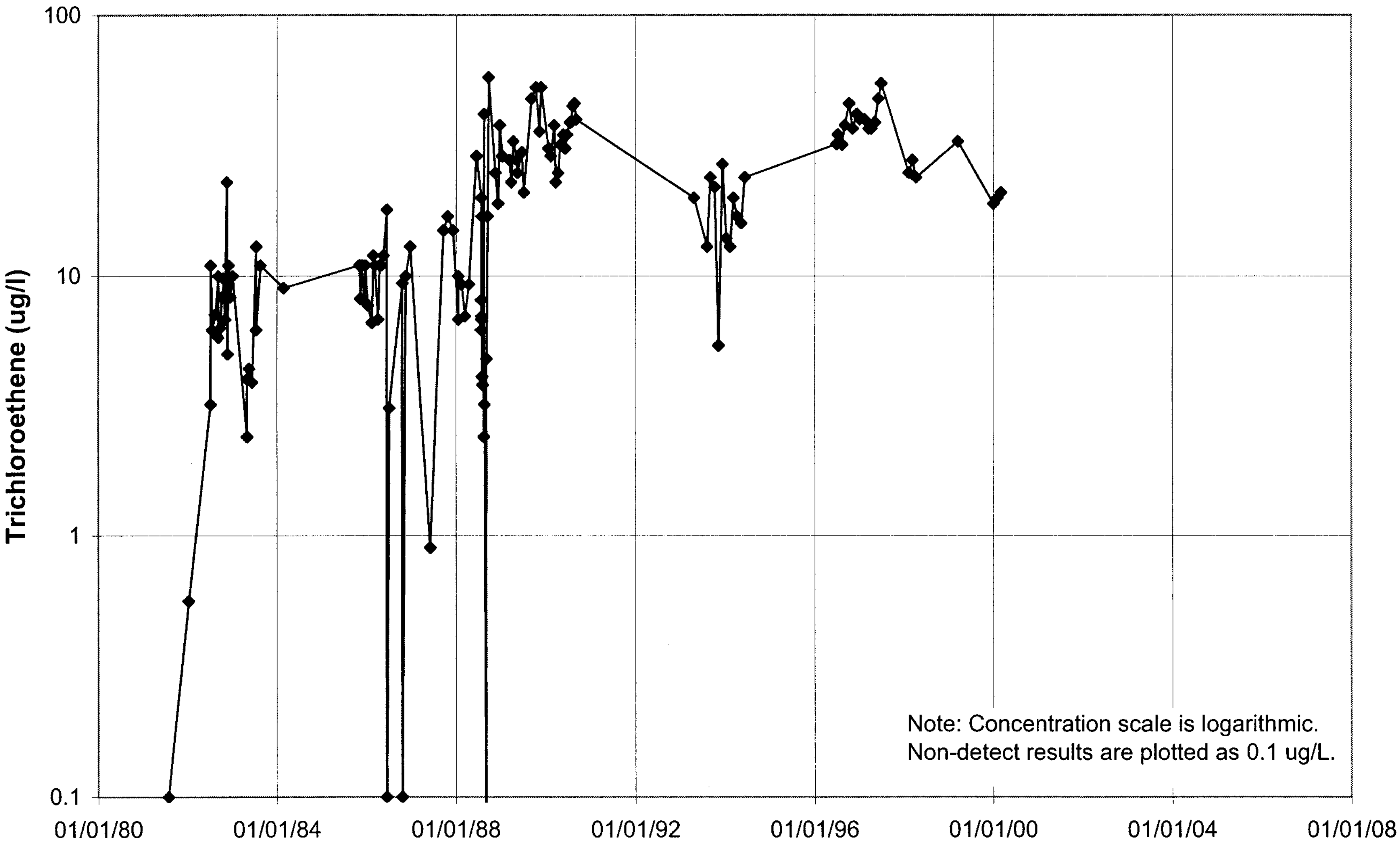
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

200803 (SAM#4)

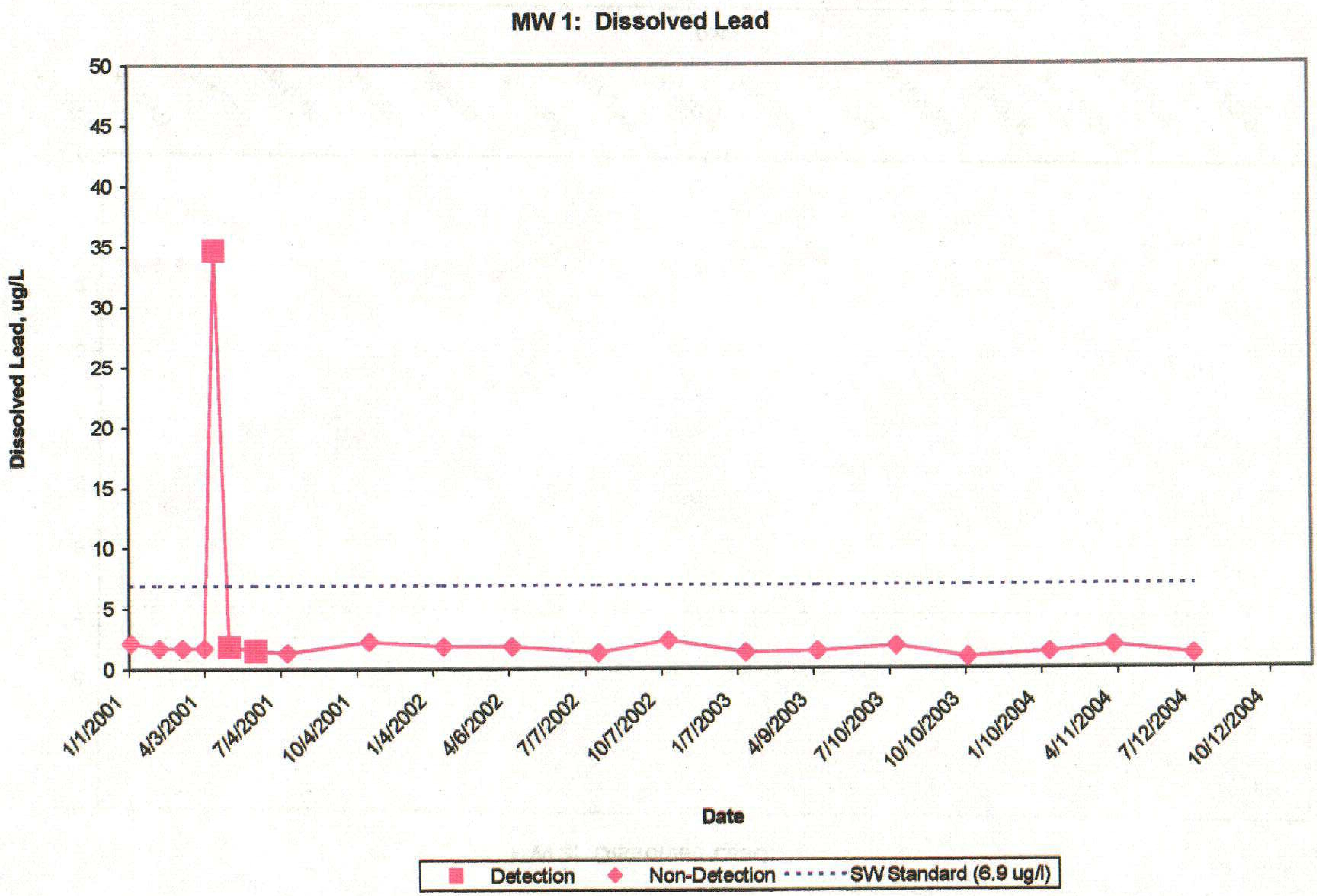


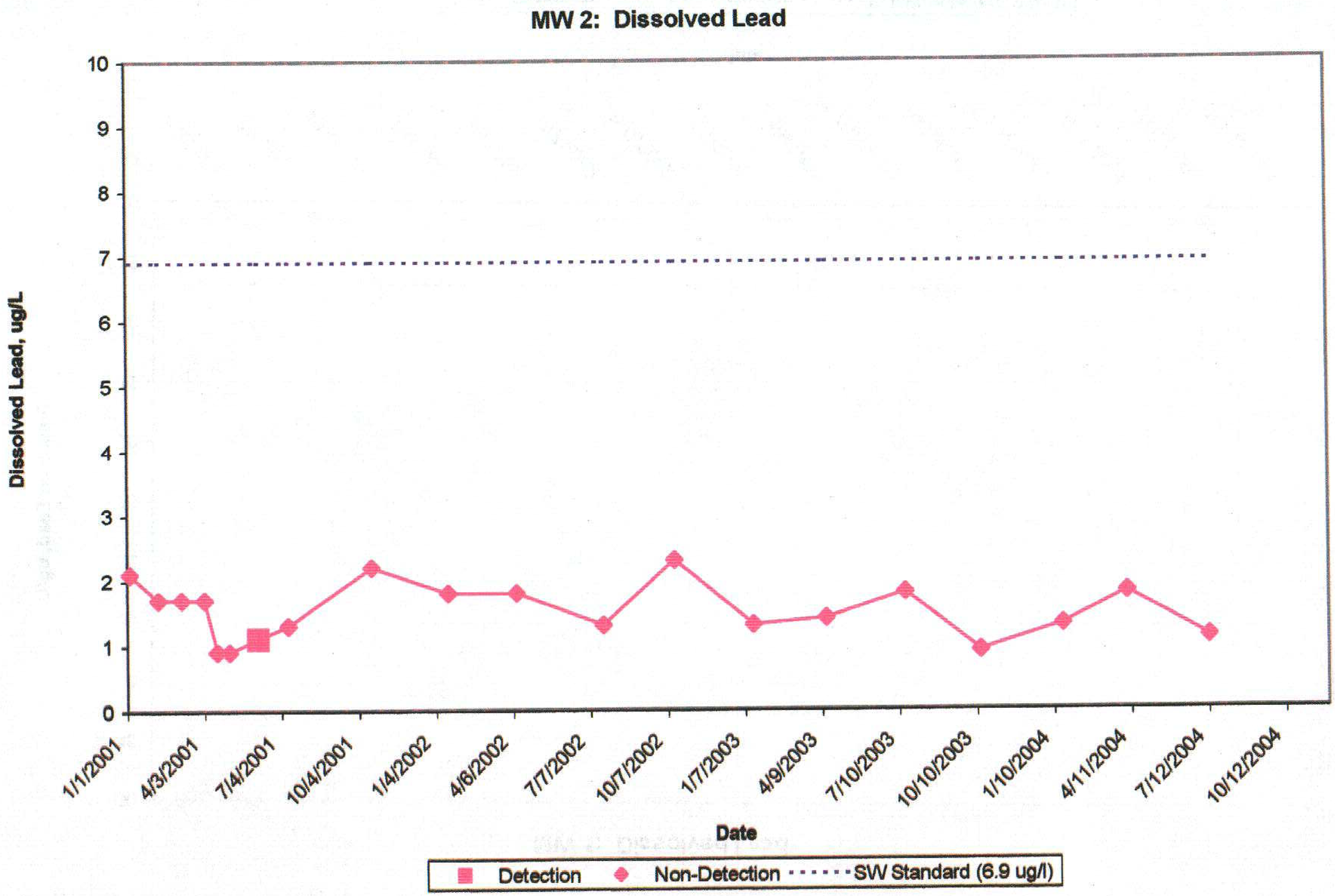
TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

200804 (SAM#3)

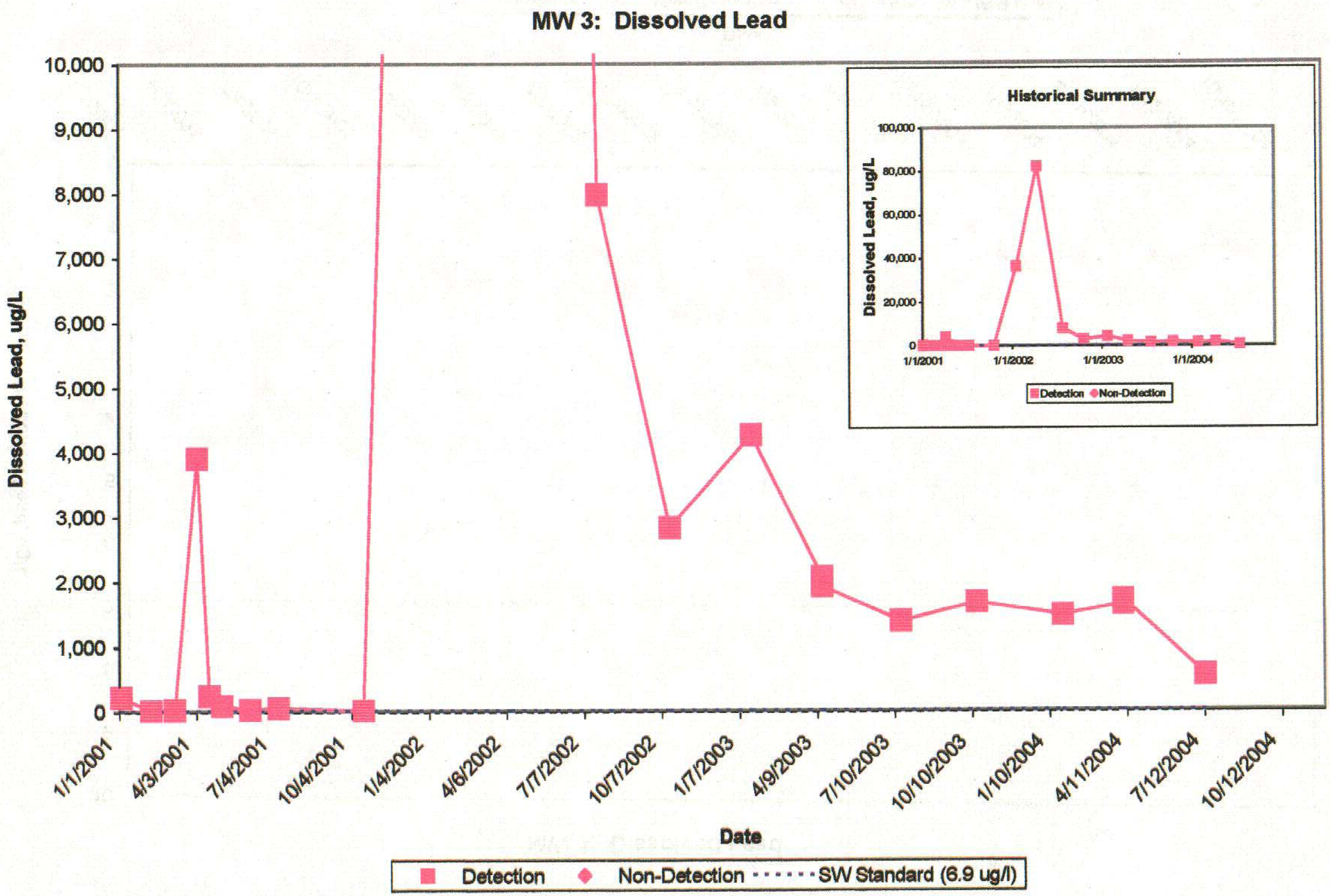


TO RETURN TO MAP: Click on "Go To Previous View" Button in the Tool Bar

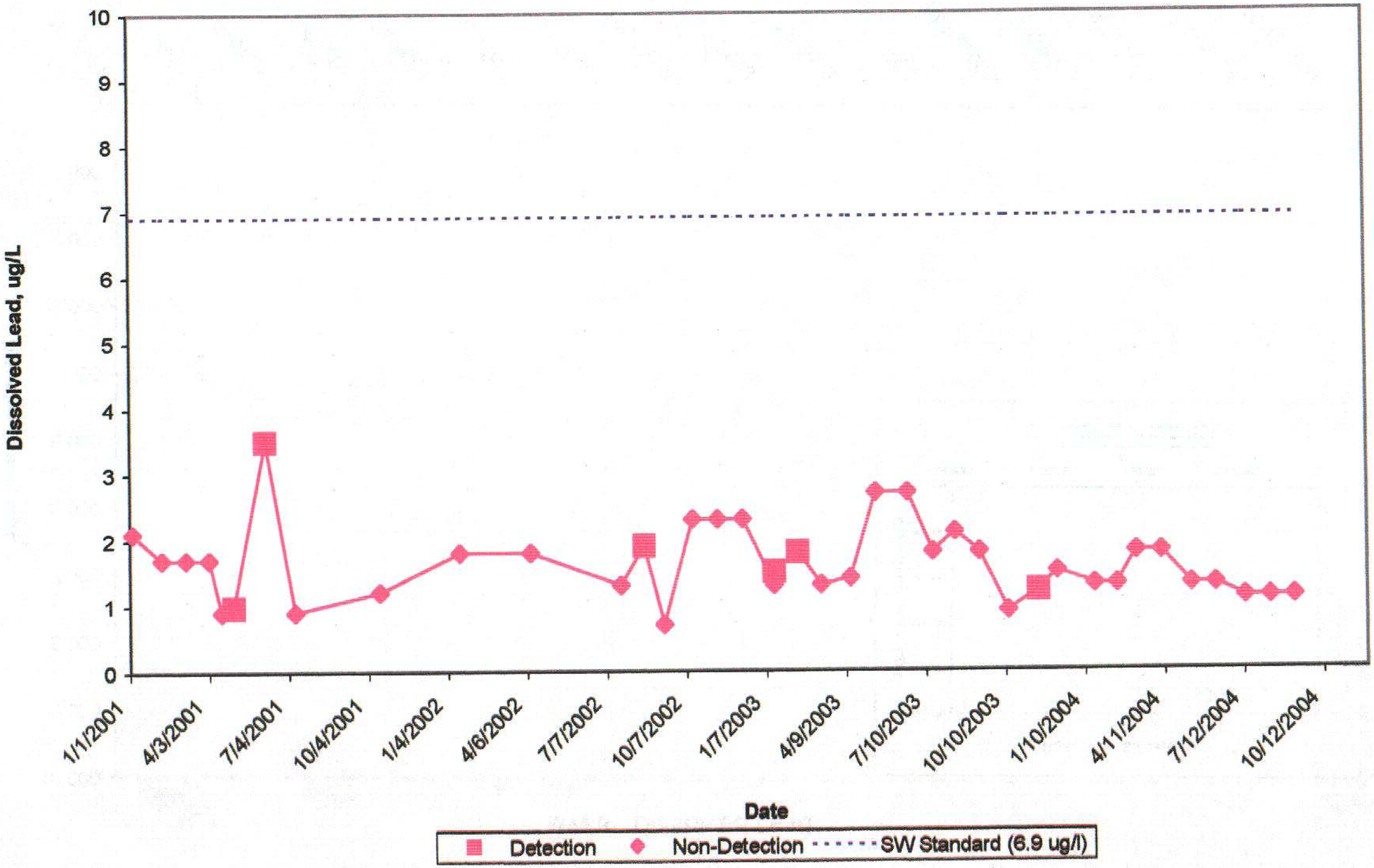

MW 1: Dissolved Lead
Dissolved Lead, ug/L
50
45
40
35
30
25
20
15
10
5
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

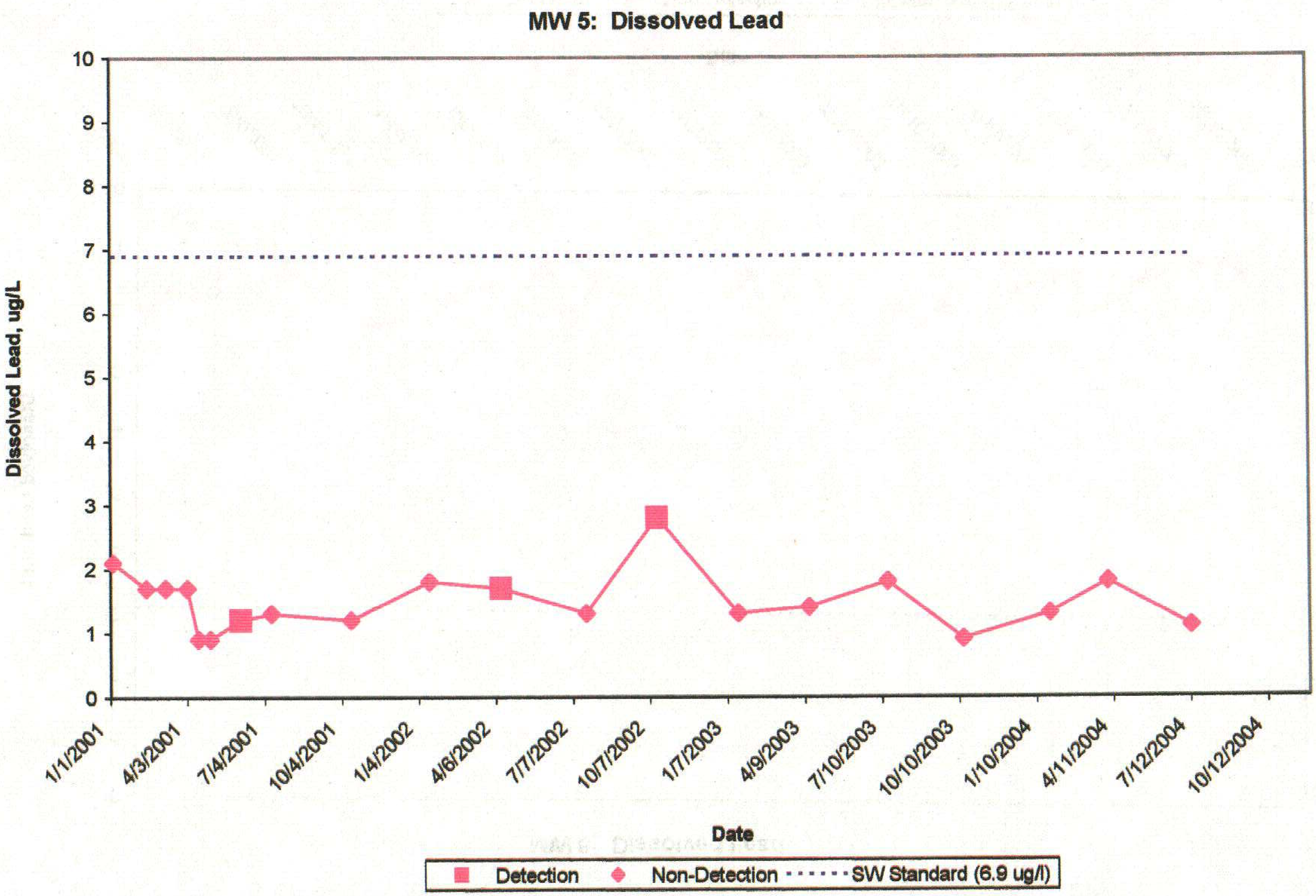


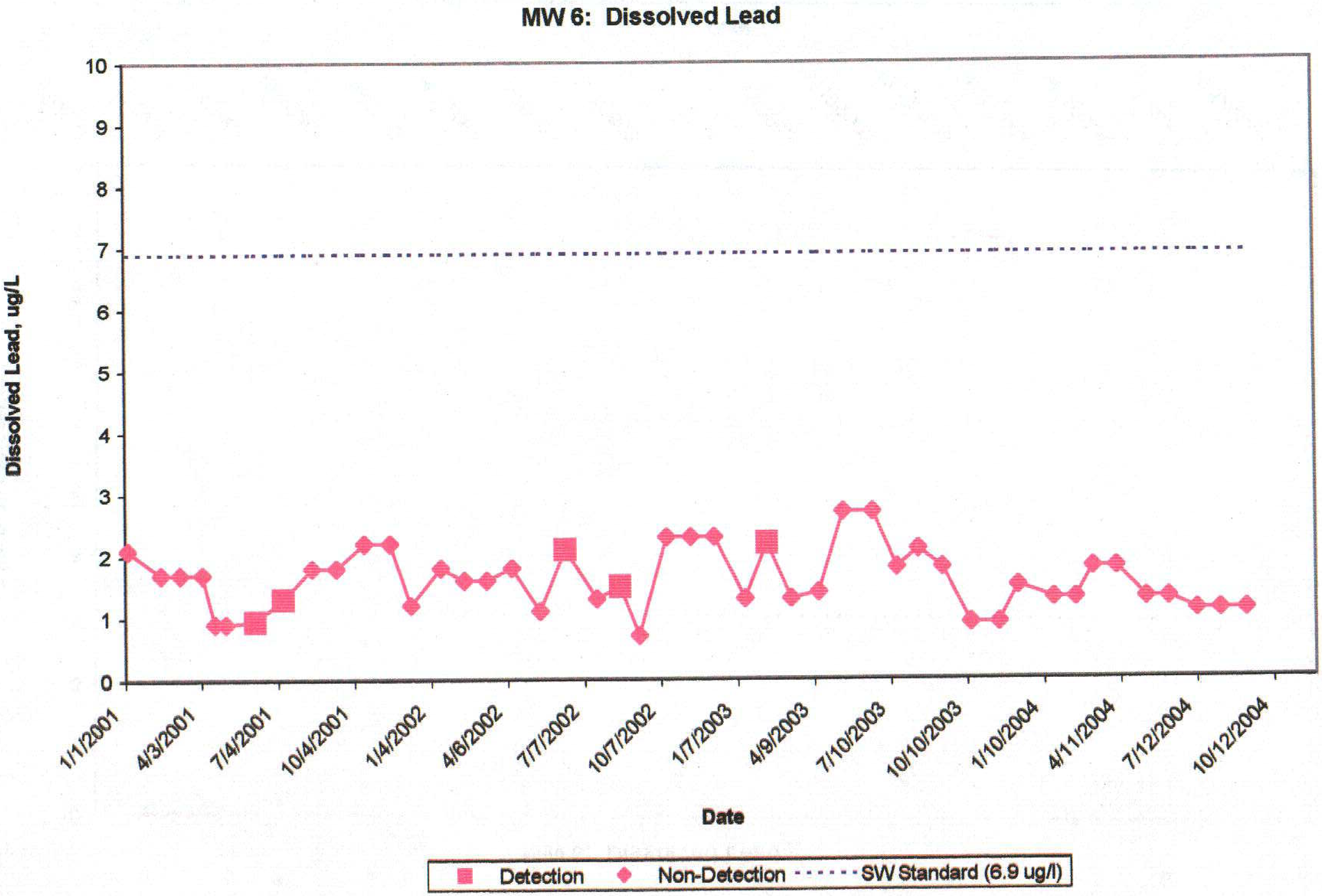
MW 2: Dissolved Lead
Dissolved Lead, ug/L
0
1
2
3
4
5
6
7
8
9
10
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

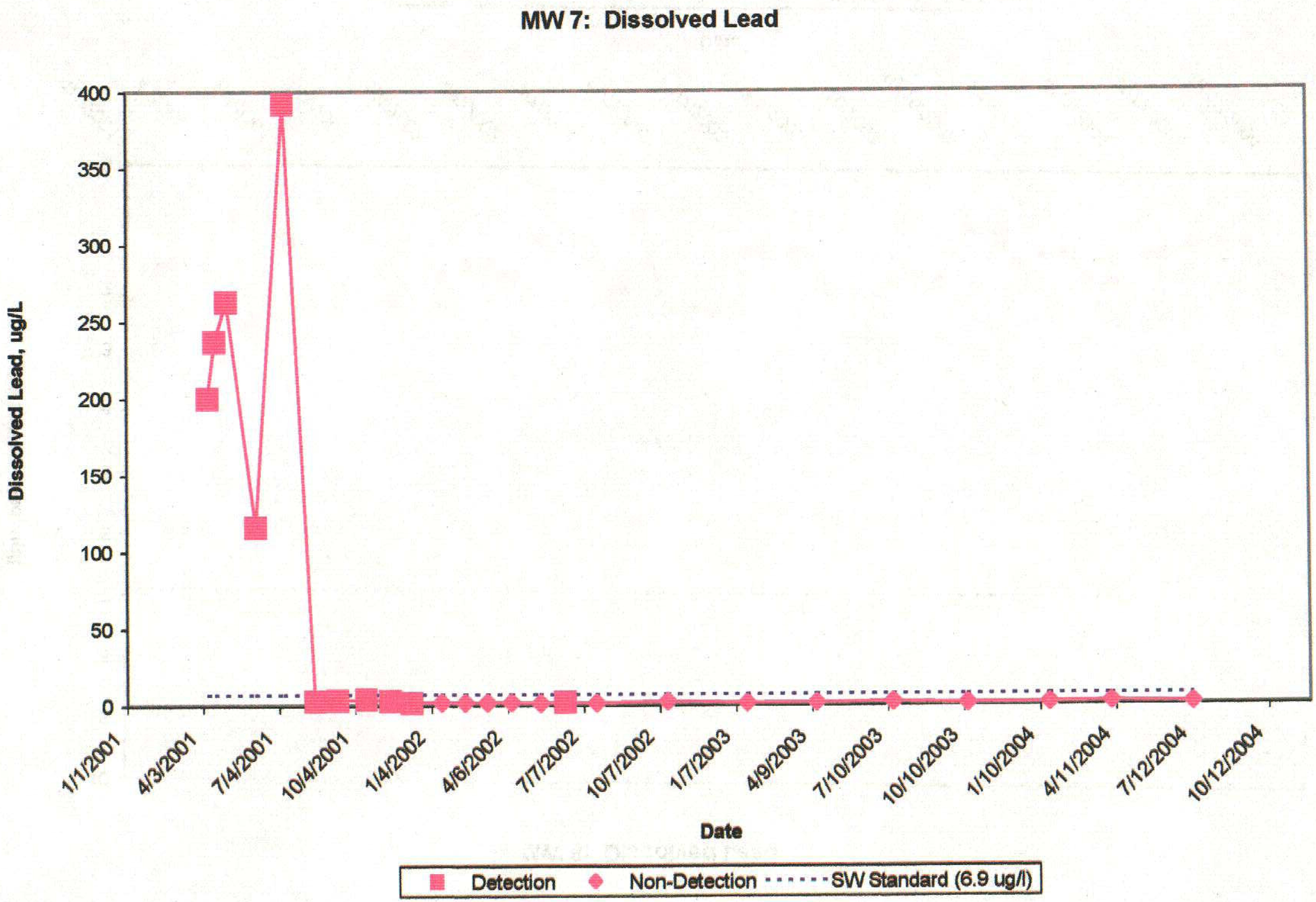

MW 3: Dissolved Lead
Dissolved Lead, ug/L
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)
Historical Summary
Dissolved Lead, ug/L
100,000
80,000
60,000
40,000
20,000
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
Detection
Non-Detection

MW 4: Dissolved Lead

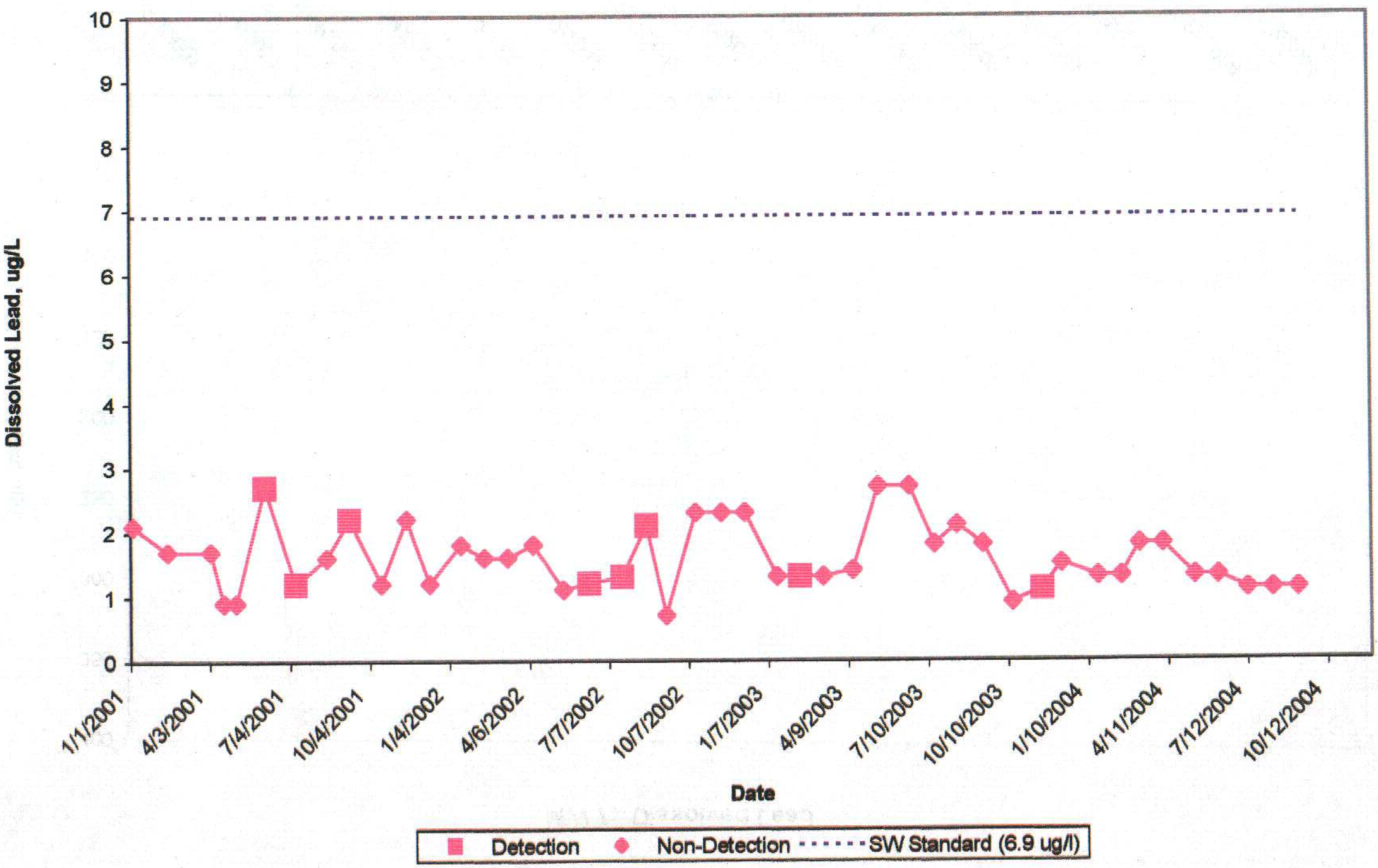



MW 5: Dissolved Lead
Dissolved Lead, ug/L
0
1
2
3
4
5
6
7
8
9
10
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

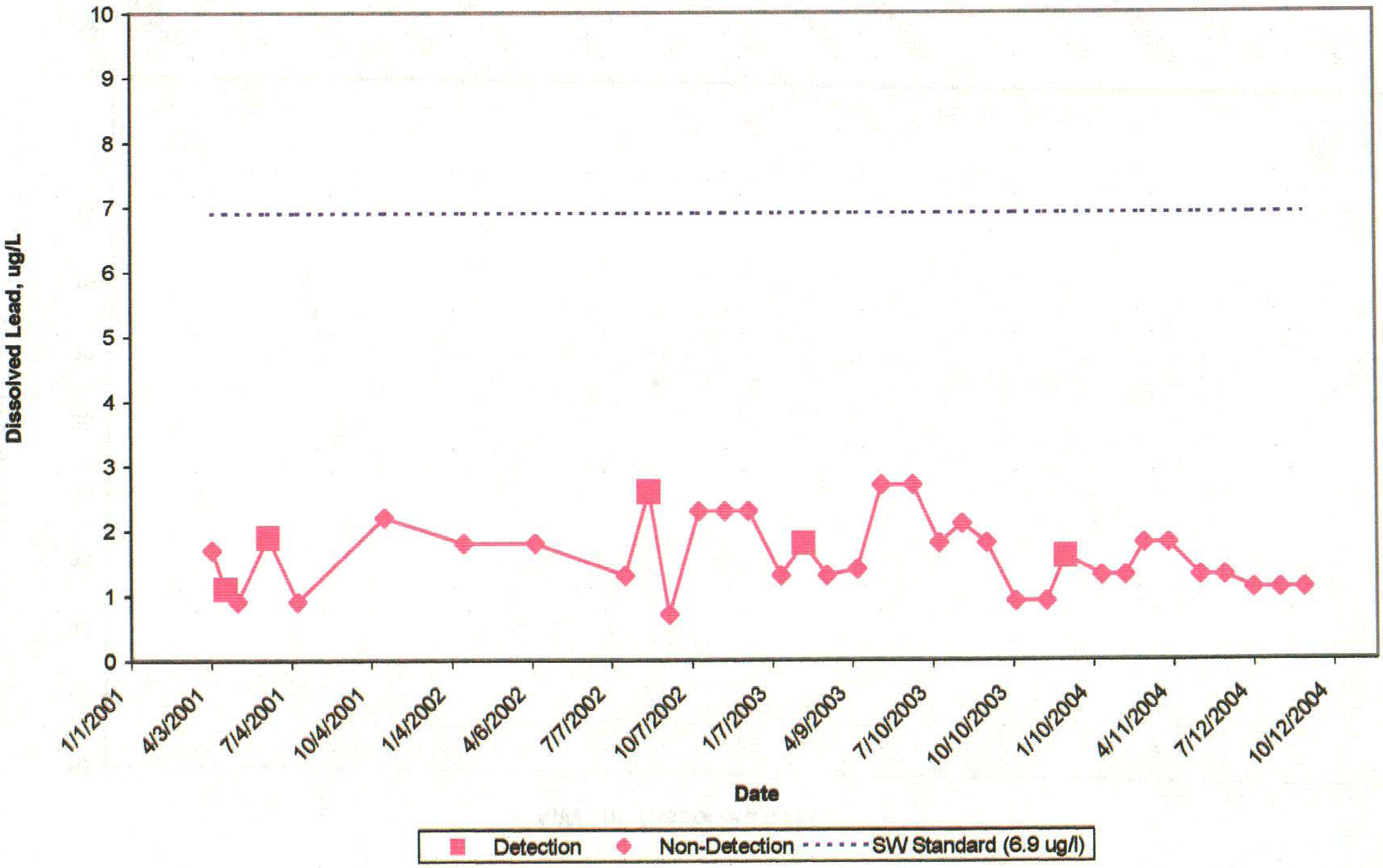

MW 6: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

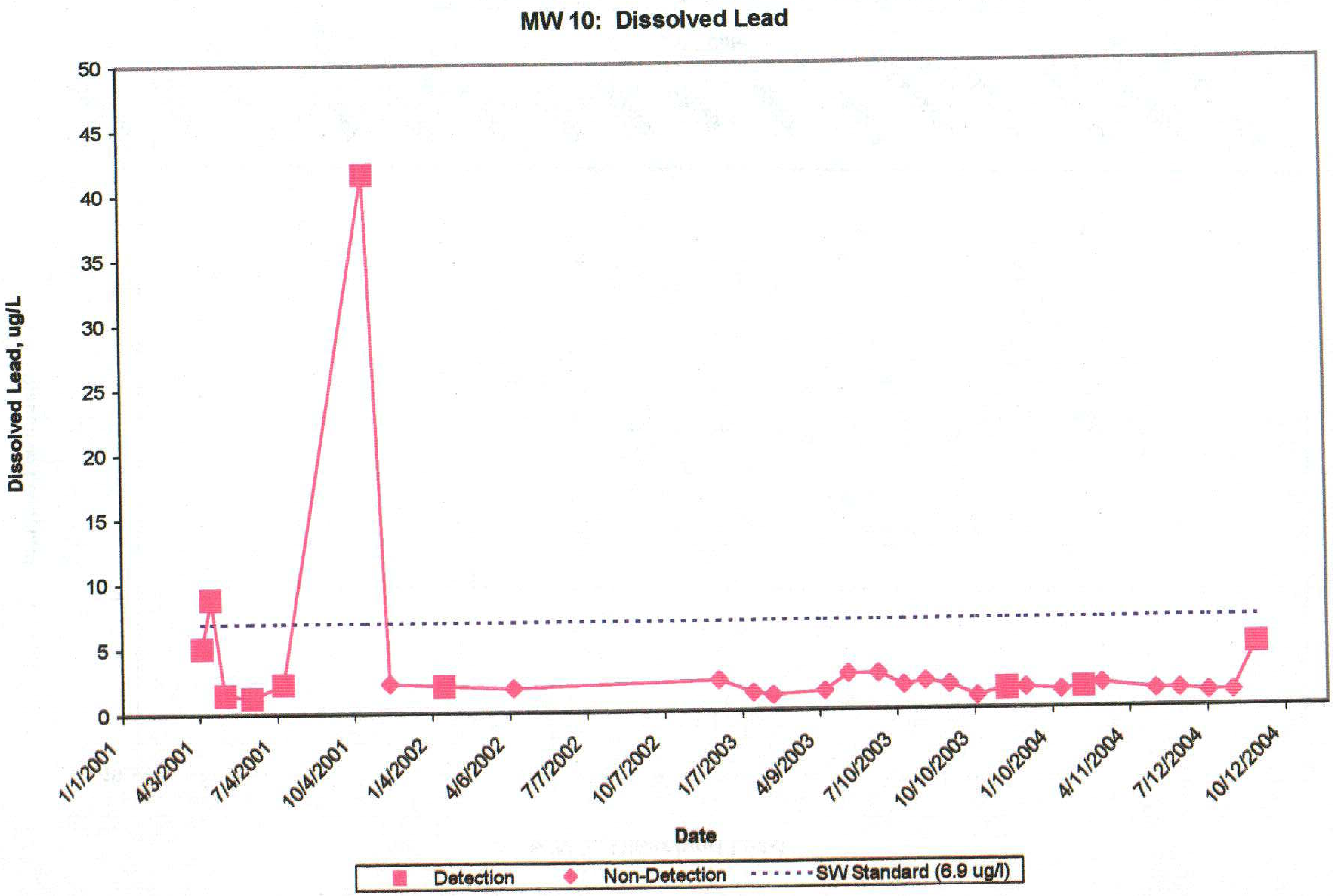

MW 7: Dissolved Lead
Dissolved Lead, ug/L
400
350
300
250
200
150
100
50
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

MW 8: Dissolved Lead



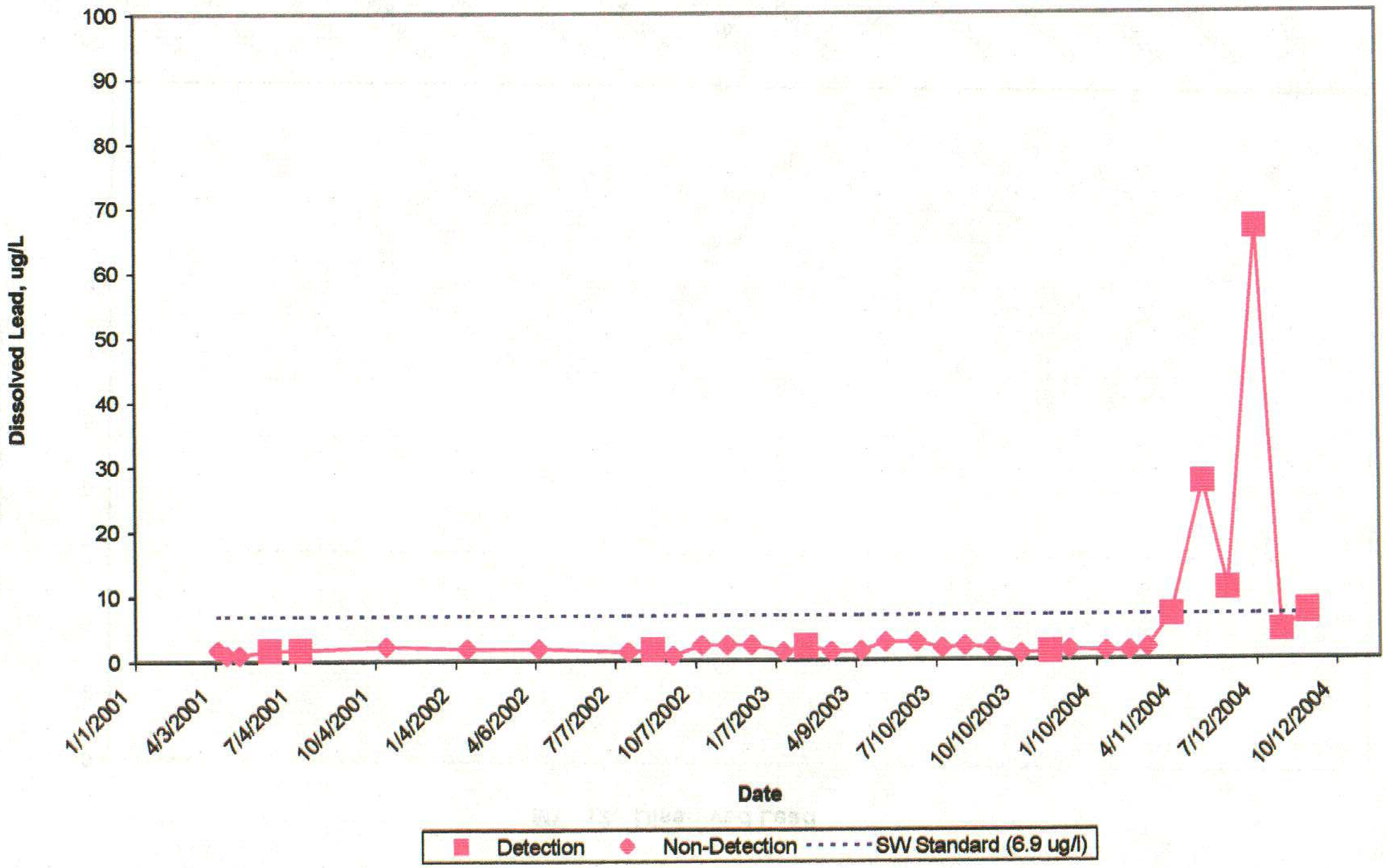
MW 9: Dissolved Lead

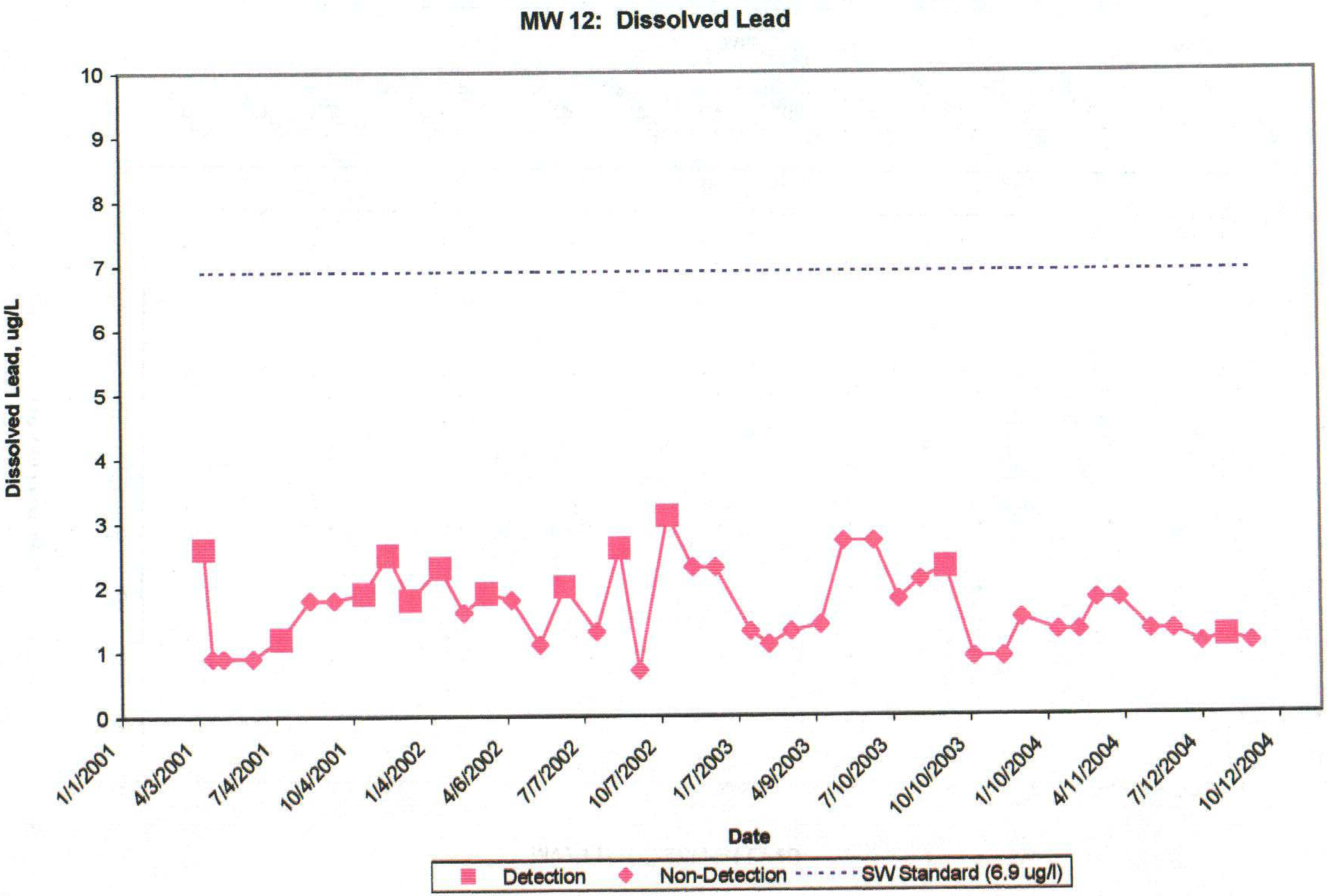




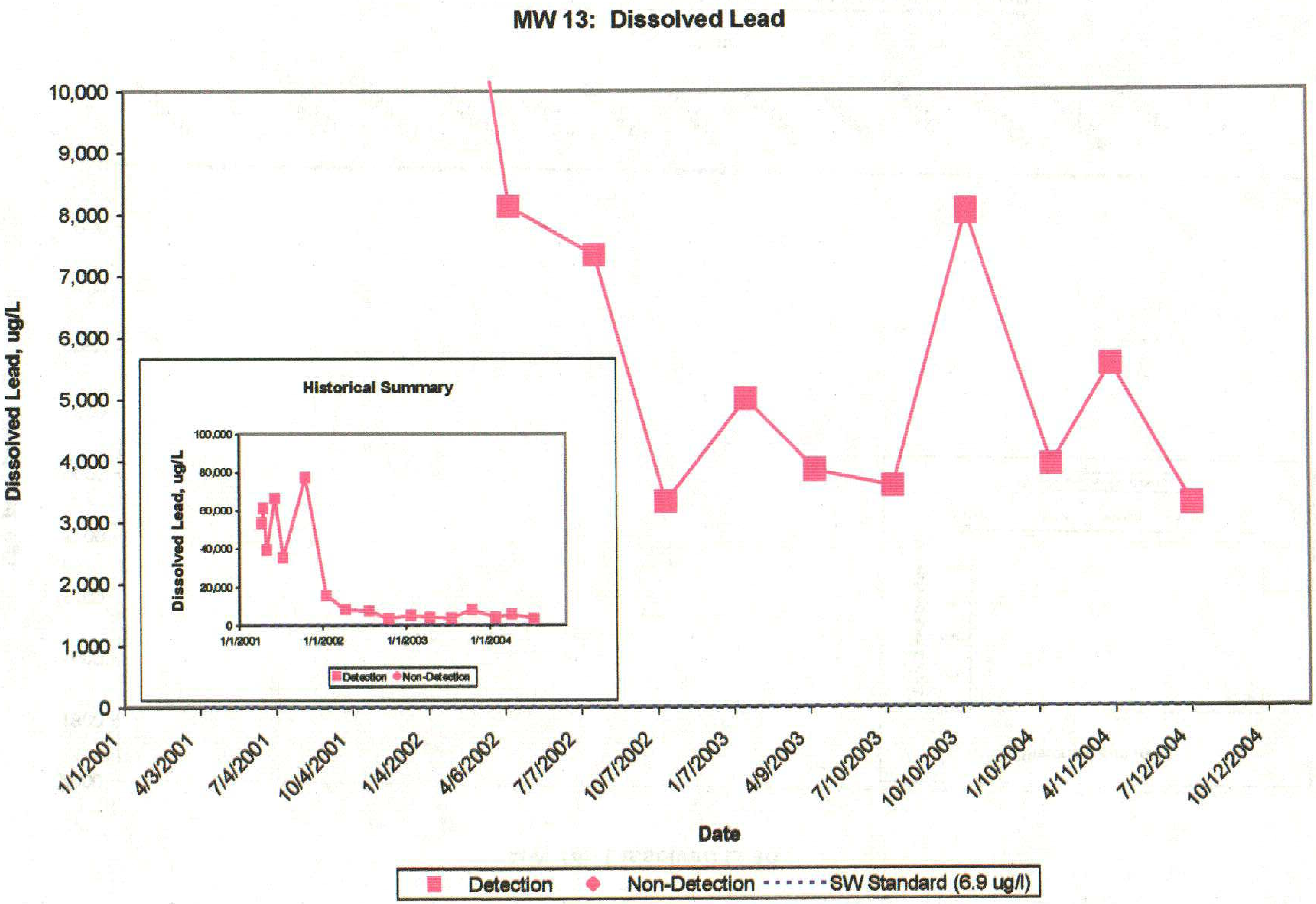
MW 10: Dissolved Lead
Dissolved Lead, ug/L
50
45
40
35
30
25
20
15
10
5
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

MW 11: Dissolved Lead

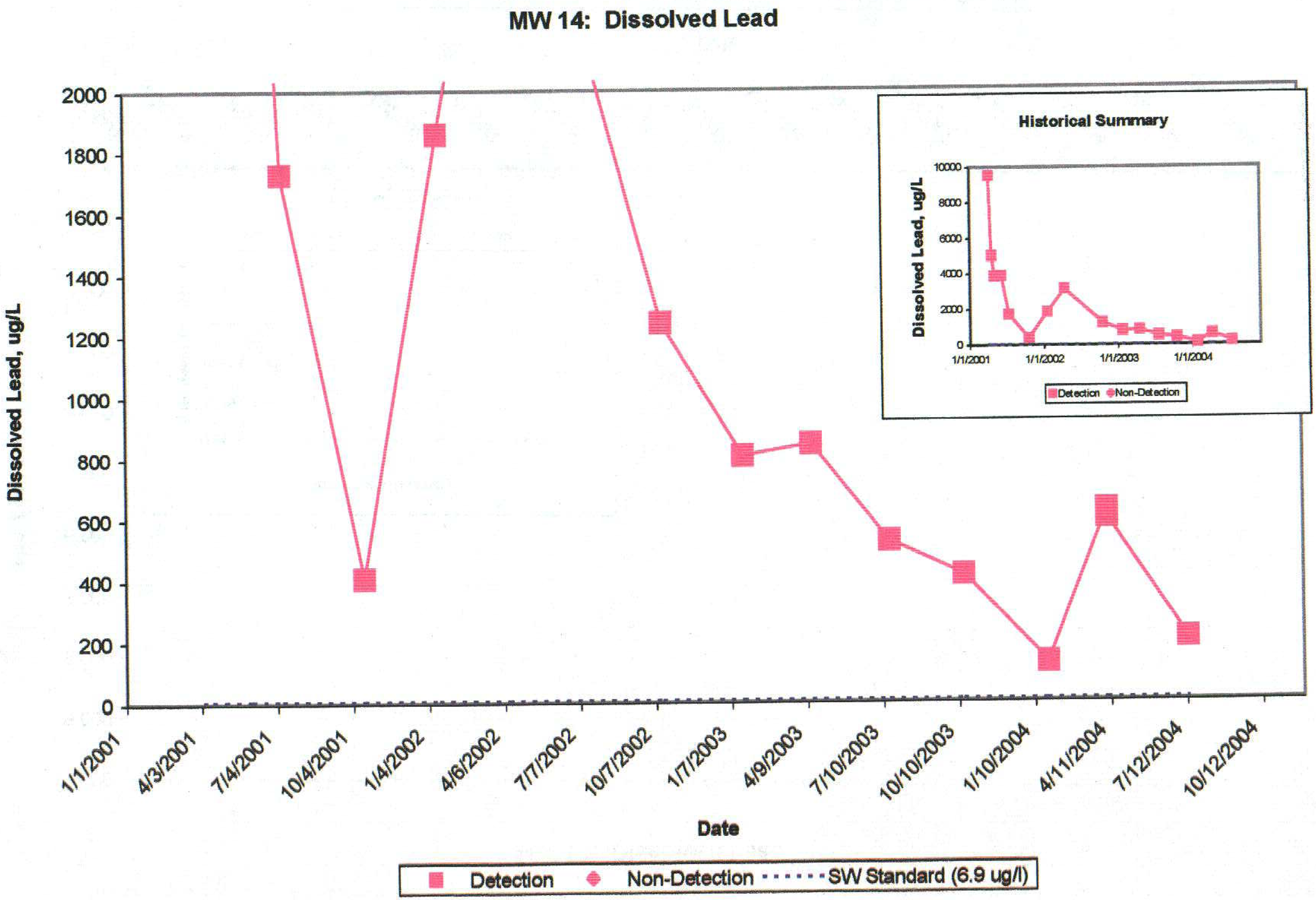




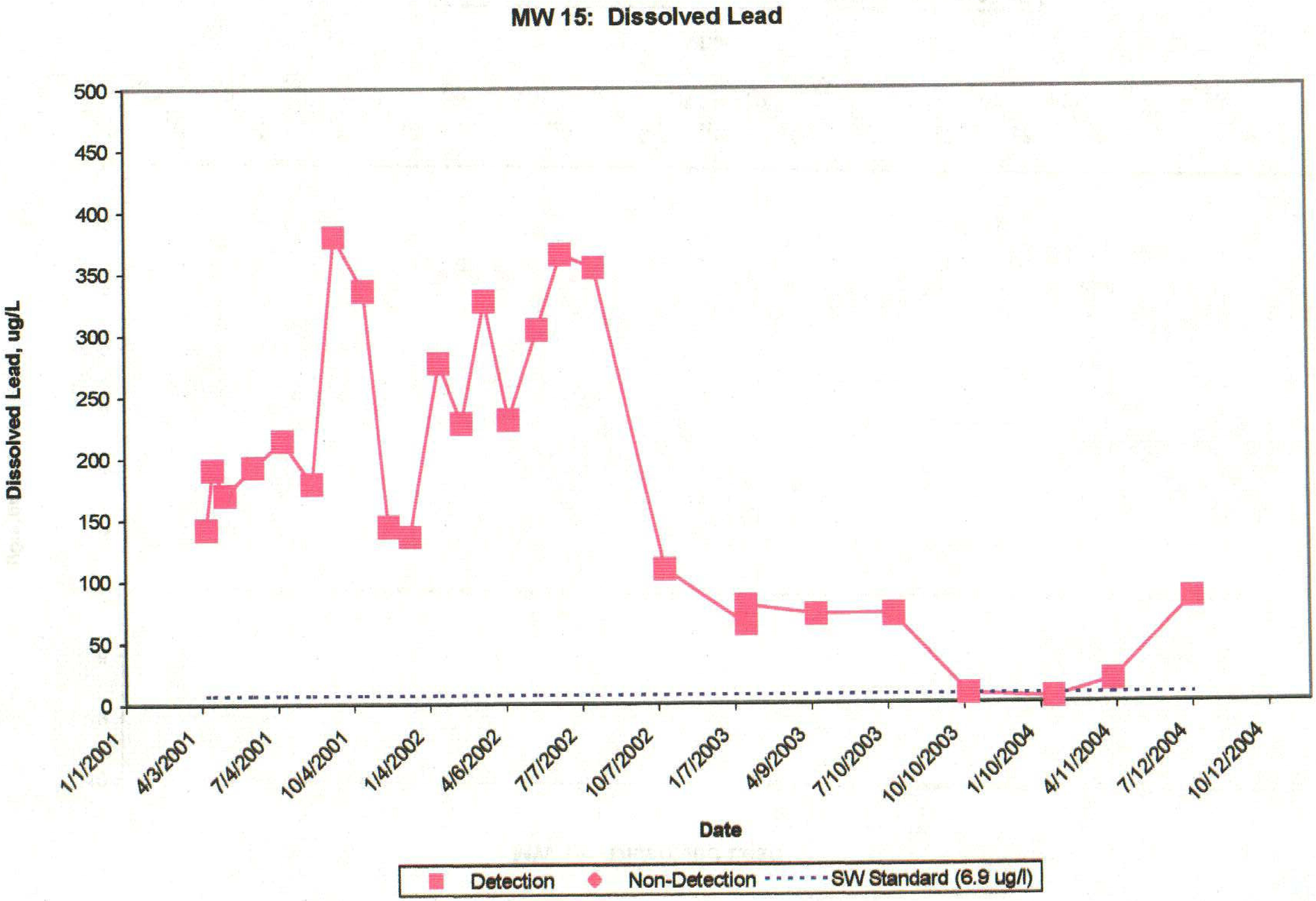
MW 12: Dissolved Lead
Dissolved Lead, ug/L
10
9
8
7
6
5
4
3
2
1
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

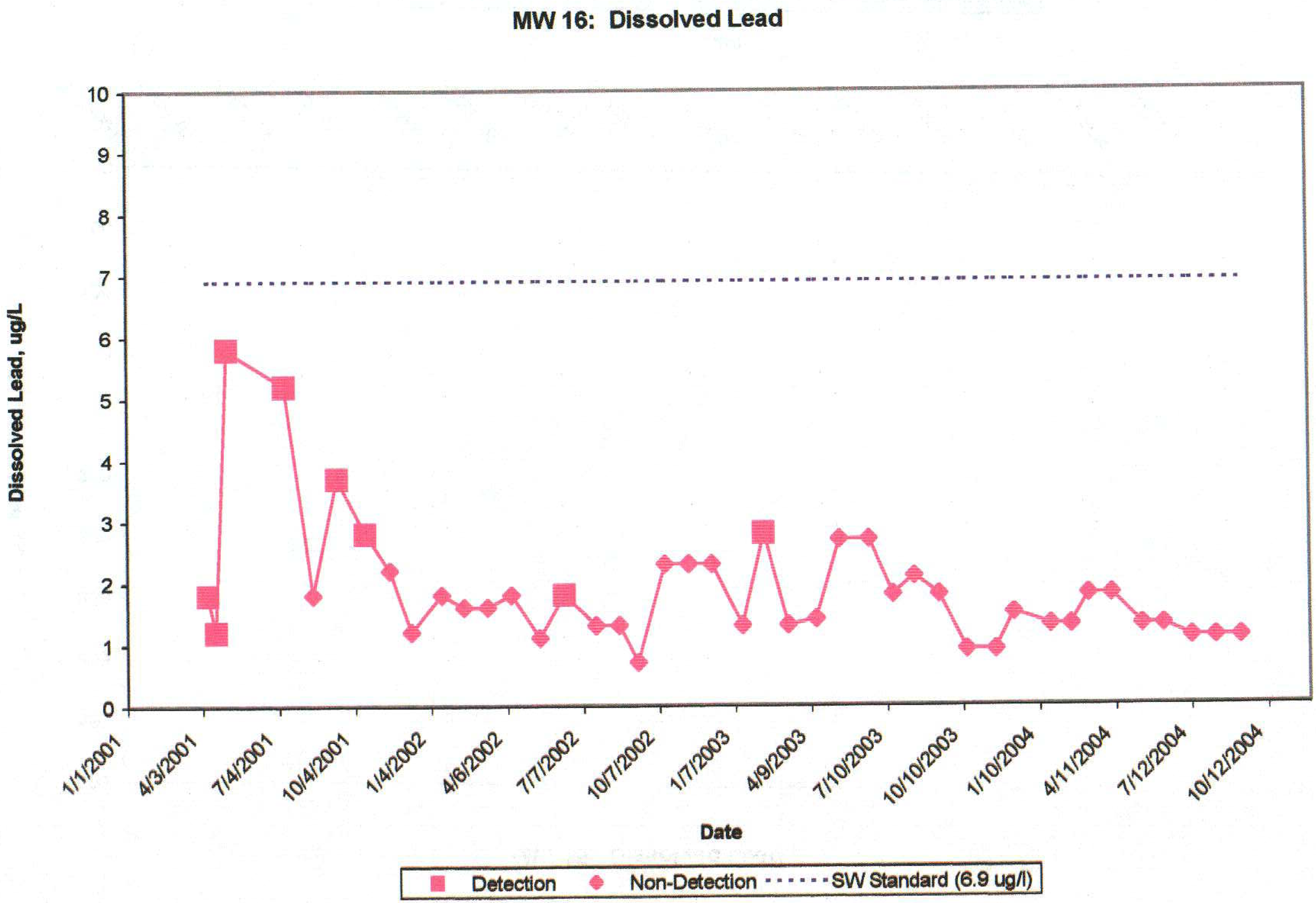


MW 13: Dissolved Lead
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Dissolved Lead, ug/L
Historical Summary
100,000
80,000
60,000
40,000
20,000
0
Dissolved Lead, ug/L
1/1/2001
1/1/2002
1/1/2003
1/1/2004
Detection
Non-Detection
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)



MW 14: Dissolved Lead
Dissolved Lead, ug/L
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)
Historical Summary
Dissolved Lead, ug/L
10000
8000
6000
4000
2000
0
1/1/2001
1/1/2002
1/1/2003
1/1/2004
Detection
Non-Detection


MW 15: Dissolved Lead
Dissolved Lead, ug/L
500
450
400
350
300
250
200
150
100
50
0
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)


MW 16: Dissolved Lead
Dissolved Lead, ug/L
0
1
2
3
4
5
6
7
8
9
10
1/1/2001
4/3/2001
7/4/2001
10/4/2001
1/4/2002
4/6/2002
7/7/2002
10/7/2002
1/7/2003
4/9/2003
7/10/2003
10/10/2003
1/10/2004
4/11/2004
7/12/2004
10/12/2004
Date
Detection
Non-Detection
SW Standard (6.9 ug/l)

Appendix C

FY 2004 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 2004 was comprised of Quarter 81 (October through December), Quarter 82 (January through March), Quarter 83 (April through June), and Quarter 84 (July through September). The data was collected in accordance with the FY 2004 Monitoring Plan. FY 2004 was a transition year for the Quality Assurance Project Plan (QAPP). Data colleted through April 1, 2004 was collected, assessed, and validated in accordance with the "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996). Data collected after April 1, 2004 was collected, assessed, and validated in accordance with the "Quality Assurance Project Plan for Performance Monitoring, Revision 3, December 10, 2003, (TWISS, 2003).

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 2004 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 2004 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

There was not a comprehensive water level round conducted in FY2004 for OU1/OU3 deep groundwater (off-TCAAP), and OU2 deep groundwater (on-TCAAP). Water level rounds were collected in June 2004 (Quarter 83) for Sites A and K shallow groundwater. The Site C response action is being reported in the APR for the first time in FY2004. Monthly water level rounds were collected at Site C. Groundwater elevation contour maps for Sites A, K and C were prepared for the June 2004 water level rounds and are included within the individual sections of this report.

2.3 Groundwater Quality Contour Maps and Cross-Sections

FY 2004 was not a comprehensive sampling year for OU1/OU2/OU3 deep groundwater; therefore, isoconcentration maps were not prepared.

Groundwater quality isoconcentration contour maps and/or cross-sections for Sites A, C and K shallow groundwater were prepared. 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 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.

For Site C a map of lead concentrations from June 2004 was prepared. The map for Site C 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 2004

OU1 Deep Groundwater

Well 04U847 was sampled during August 2004, although not scheduled, as part of the sampling of the new Jordan wells.

The supplemental water levels required at Site E, as per the FY2003 APR, were collected in October 2004 rather than June 2004.

OU2 Site I

June 2004:
Well I05MW yielded insufficient water for stabilization readings. A groundwater sample was taken immediately.

Well 01U667 bailed dry after 3 gallons (just over 1 well volume) of groundwater were removed. When the well recovered a groundwater sample was collected.

Well 01U639 bailed dry after 1 gallon (2 well volumes) of groundwater were removed. When the well recovered a groundwater sample was collected.

Well I02MW had only 4 inches of water in well. The well did not yield a sufficient volume of groundwater to collect a sample.

Well 01U632 was dry and no sample was collected.

Well 01U666 was dry and no sample was collected.

Well 01U668 was dry and no sample was collected.

OU2 Site K

February 2004:
Analysis of a treatment system effluent sample collected on February 3, 2004 indicated that the estimated zinc concentration was 367 ug/L, which was thought to be an anomalously high concentration. In accordance with substantive requirements document, a second treatment system effluent sample was collected on March 8, 2004 and, on an expedited basis, analyzed for zinc. The March sample had a zinc concentration of 55. ug/L, which is representative of previous zinc effluent concentrations at the Site. The maximum daily allowable concentration for zinc is 134 ug/L.

June 2004:
Well 01U611 bailed dry after 1.25 gallons (1.5 well volumes) of groundwater were removed. When the well recovered, a groundwater sample was collected.

Well 01U617 bailed dry after 8 gallons (1.5 well volumes) of groundwater was removed. When the well recovered a groundwater sample was collected.

Well 01U618 bailed dry after 3 gallons (1.5 well volumes) of groundwater were removed. When the well recovered a groundwater sample was collected.

Well 01U604 bailed dry after 2.25 gallons (1.75 well volumes) of groundwater were removed. When the well recovered a groundwater sample was collected.

Well 01U603 bailed dry after 1.25 gallons (1.5 well volumes) of groundwater were removed. When the well recovered a groundwater sample was collected.

OU2 Deep Groundwater

The June sampling event extended into early July for several samples. These were samples added to the monitoring plan for FY2004 that had not been listed in draft versions of the Monitoring Plan.

OU3 Deep Groundwater

December 2003:
Well 04U865 was sampled on December 4, 2003. The sample was inadvertently omitted from the shipping cooler. The well was re-sampled on December 9, 2003.

C.3 Regulatory Approvals for Data Assessments and Validation

APPENDIX C.3
REGULATORY APPROVALS FOR DATA ASSESSMENTS AND VALIDATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

May 17, 2005

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 35, 36, 37, and 38**

Dear Mr. Fix:

This letter documents that the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) have completed their review of the subject Data Usability Reports (DURs) 35, 36, 37 and 38. Based upon our review of the information provided by the U.S. Army (Army) and upon technical discussions held among EPA, MPCA and Army staff to resolve the regulators' comments on the DURs, EPA and MPCA agree that the subject DURs are acceptable. You are hereby advised that the EPA and the MPCA approve Data Usability Report Numbers 35, 36, 37 and 38.

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

Refs.: **Data Usability Report Number 35, TCAAP FY 2004 Performance Monitoring Program, 1st Quarter Monitoring (October - December 2003), March 25, 2004;**

EPA comments on DUR Number 35, dated April 27, 2004;

MPCA comments on DUR Number 35, dated April 28, 2004;

U.S. Army responses to EPA and MPCA comments on DUR 35, dated May 21, 2004;

TCAAP Data Usability Report Number 35, Final Report, June 14, 2004;

Data Usability Report Number 36, Data Usability Report Number 36, TCAAP FY 2004 Performance Monitoring Program, 2nd Quarter Monitoring (January - March 2004), June 8, 2004;

MPCA comments on DUR Number 36, dated June 9, 2004;

EPA comments on DUR Number 36, dated July 8, 2004;

Army responses to EPA and MPCA comments on DUR 36, dated August 13, 2004;

Data Usability Report Number 37, TCAAP FY 2004 Performance Monitoring Program, 3rd Quarter Monitoring (April - June 2004), October 7, 2004;

EPA comments on DUR Number 37, dated November 15, 2004;

MPCA comments on DUR Number 37, dated November 17, 2004;

Army responses to EPA and MPCA comments on DUR Number 37, dated December 10, 2004;

Additional MPCA Comments on DUR 37 (e-mail from Dagmar Romano to Mike Fix dated 2/14/2004);

Data Usability Report Number 38, TCAAP FY 2004 Performance Monitoring Program, 4th Quarter Monitoring (July - September 2004), November 29, 2004;

MPCA comments on DUR Number 38, dated December 22, 2004 and February 2, 2005 (e-mail from Dagmar Romano to Mike Fix);

EPA comments on DUR Number 38, dated January 5, 2005;

Army responses to EPA and MPCA comments on DUR Number 38, dated April 6, 2004 (*sic*);

MPCA e-mail from Dagmar Romano to Mike Fix, dated 04/07/2005;

EPA review of Army responses to EPA comments on DUR Number 38, May 10, 2005.

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

APPENDIX D.2
Operable Unit 1 Statistical Analysis

D.3 Site C Analytical and Water Level Database

APPENDIX D.3
Site C Analytical and Water Level Database

Appendix E

TCAAP Well Inventory Update, FY 2004

APPENDIX E
TCAAP WELL INVENTORY UPDATE

FISCAL YEAR 2004

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.

At the beginning of each federal fiscal year, an updated version of the MDH database of wells in the study area is acquired. The MDH database consists of three lists:

1. Wells constructed since 1990 (generated through drillers submitting Water Well Records);
2. Sealed wells (generated through drillers submitting Well Sealing Records); and
3. Wells disclosed through property transfer.

Since the MDH database is comprehensive for all time, the database is screened to extract the new information that was added since the previous update.

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 (FY 2005 will be the next major well inventory sampling event). 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.

<u>FY 2004 Update</u>

The updated MDH database was provided to TWISS on February 24, 2004. 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 as of September 30, 2003. 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).

To ensure the T,R,S data query completely overlapped the Study Area, Sections along the western edge of the Study Area were added separately to the data request. All wells from this separate data request were plotted to check for inclusion in the Study Area. A total of 42 wells were added to the database from this separate search, including 28 sealed wells, 13 monitoring wells, and one well of unknown status. Most of these wells were located along on the east side of Central Avenue, which defines the western boundary of the Study Area.

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 of two wells, all newly constructed wells were monitoring wells and were classified into Category 6. The remaining two wells were listed as dewatering wells, with Well 689609 already existing in the database being updated to reflect its depth of 170 feet below ground surface. These two supply wells were classified into Category 3, since they are not screened in an aquifer of concern.

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. Most of these wells were Category 3 wells that required no further investigation. Four of these wells were further investigated, with the following results:

- The well located at 2933 Troseth Rd. and the well located at 615 12th Ave. NW are both inactive supply wells located inside the buffer lines but outside the 1 ug/L contour. The wells are either inoperable or have not been used in several years and are classified as Category 4a due to the lack of information on their depth.

- The well located at 2420 W. County Rd. C and the well located at 359 Hoover St. were found to be monitoring wells, Category 6.

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).

As required each fiscal year, an attempt was made to reclassify Category 4 wells that were in the existing TCAAP well inventory database into one of the other categories. This was accomplished through telephone calls, letters, and/or site visits in an attempt to obtain additional information. Forty-six Category 4 wells were field studied during FY 2004 and an investigative summary is included in Table E-6. Contact information was updated and two wells were re-categorized out of Category 4.

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).

Through the FY 2004 well inventory update effort, one well was sampled. The wells of concern that were not sampled were either found to be abandoned, non-existent, or inoperable, or the well owners were not responsive to requests for access to sample. The analytical data from the FY 2004 sampling effort are summarized in Table E-2. The location of the well sampled in FY 2004 is shown on Figure E-5. The well had no detections of TCAAP contaminants, nor any other reported VOCs.

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 "major" sampling event in FY 2005 are:
    - Any previously undiscovered wells determined to be in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a based on the FY 2005 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.
    - Any operational wells in the existing database that have been determined to be Categories 1a, 1b, 1c, 2a, 2b, 2c

TABLE E-1
WELL INVENTORY CATEGORY DESCRIPTIONS

Category	*Subcategory*	*Explanation*
1		Water supply wells screened in an aquifer of concern, inside the 1 ug/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 ug/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 2004

VOCs (ug/L)	Unique Number: 234474 Address: 2601 Silver Lane NE 24-Jun-04	OU1 Cleanup Level(1)	MDH HRL(2)
OU1 Chemicals of Concern:			
Trichloroethene	<1.0	5	
1,1-Dichloroethene	<1.0	6	
cis-1,2-Dichloroethene	<1.0	70	
1,1,1-Trichloroethane	<1.0	200	
1,1,2-Trichloroethane	<1.0	3	
1,1-Dichloroethane	<1.0	70	
Other Analytes:			
1,1,2,2-Tetrachloroethane	<1.0		2
1,2-Dichloroethane	<1.0		4
1,2-Dichloropropane	<1.0		5
2-Butanone	<5.0		4000
2-Hexanone	<5.0		(Note 3)
4-Methyl-2-Pentanone	<5.0		300
Acetone	<5.0		700
Benzene	<1.0		10
Bromodichloromethane	<1.0		6
Bromoform	<1.0		40
Bromomethane	<1.0		10
Carbon Disulfide	<1.0		700
Carbon Tetrachloride	<1.0		3
Chlorobenzene	<1.0		100
Chloroethane	<1.0		280
Chloroform	<1.0		60
Chloromethane	<1.0		80
cis-1,3-Dichloropropene	<1.0		2
Dibromochloromethane	<1.0		80
Ethylbenzene	<1.0		700
m&p-Xylene	<2.0		10,000
Methylene Chloride	<1.0		50
o-Xylene	<1.0		10,000
Styrene	<1.0		(Note 3)
Tetrachloroethene	<1.0		7
Toluene	<1.0		1000
trans-1,2-Dichloroethene	<1.0		100
trans-1,3-Dichloropropene	<1.0		2
Vinyl Chloride	<1.0		0.2

<u>Notes:</u>

(1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD.
(2) Minnesota Department of Health's Health Risk Limits (HRLs), for reference.
(3) No HRL has been established for this analyte.

TABLE E-3
CONSTRUCTED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Use	Depth	Date Drilled
696921	3	U of M	500 Pillsbury Drive SE	Minneapolis	Dewatering	170	9/2003
689609	3	U of M	500 Pillsbury Drive SE	Minneapolis	Dewatering	~~68~~ 168	4/1/2003
473279	6	Soo Line Railroad Company	0 28th & Central Av	Minneapolis	Monitoring	57	10/1990
481675	6	Burlington Northern Railroad/David Seep	0 18th and Central	Minneapolis	Monitoring	67	6/1992
481677	6	Burlington Northern Railroad/David Seep	0 18th and Central	Minneapolis	Monitoring	61	6/1991
481678	6	Minar	0 18th and Central	Minneapolis	Monitoring	66	6/1992
495203	6	Soo Line Railroad Company	0 Central Av	Minneapolis	Monitoring	55	9/1991
582965	6	Cp Rail Systems	2827 Central Av NE	Minneapolis	Monitoring	53	10/1996
582966	6	Cp Rail System	2827 Central Av NE	Minneapolis	Monitoring	72	10/1996
582967	6	Cp Rail System	2827 Central Av NE	Minneapolis	Monitoring	53	10/1996
582968	6	Cp Rail System	2827 Central Av NE	Minneapolis	Monitoring	73	10/1996
582969	6	Cp Rail System	2827 Central Av NE	Minneapolis	Monitoring	47	11/1996
582972	6	Cp Rail System	2827 Central Av NE	Minneapolis	Monitoring	59	12/1996
594615	6	Hillcrest Development	3311 Broadway Street NE	Minneapolis	Monitoring	90	8/2003
599698	6	Hillcrest Development	3311 Broadway Street NE	Minneapolis	Monitoring	85	8/2003
616474	6	Soo Line Railroad Company	0 28th Street Ne & Central	Minneapolis	Monitoring	118	7/1998
616475	6	Soo Line Railroad Company	0 28th Street Ne & Central	Minneapolis	Monitoring	42	7/1998
644723	6	Holiday Stationstores, Inc.	5695 Hackmann Avenue NE	Fridley	Monitoring	72	8/2003
674795	6	MN, State Of, Bldg. Construction Div.	5420 Old Highway 8	Arden Hills	Monitoring	15	4/2003
674796	6	MN, State Of, Bldg. Construction Div.	5420 Old Highway 8	Arden Hills	Monitoring	15	4/2003
674797	6	MN, State Of, Bldg. Construction Div.	5420 Old Highway 8	Arden Hills	Monitoring	14	4/2003
682723	6	Stewart Lumber/Shaw Acquistions	421 Johnson Street NE	Minneapolis	Monitoring	26	4/2003
682732	6	U of M	545 Oak Street SE	Minneapolis	Monitoring	16	7/2003
682733	6	U of M	1715 Fifth Street SE	Minneapolis	Monitoring	16	8/2003
682734	6	U of M	705 Oak Street SE	Minneapolis	Monitoring	16	7/2003
682735	6	U of M	1715 Fifth Street SE	Minneapolis	Monitoring	51	8/2003
682736	6	U of M	1715 Fifth Street SE	Minneapolis	Monitoring	56	8/2003
682737	6	U of M	1715 Fifth Street SE	Minneapolis	Monitoring	16	8/2003
682738	6	U of M	1715 Fifth Street SE	Minneapolis	Monitoring	18	8/2003
691868	6	Wiswell	1851 Central Avenue NE	Minneapolis	Monitoring	16	6/2003
691869	6	Wiswell	1851 Central Avenue NE	Minneapolis	Monitoring	16	6/2003
691874	6	Tom Thumb Food Markets, Inc.	2951 Central Avenue NE	Minneapolis	Monitoring	45	6/2003
691875	6	Tom Thumb Food Markets, Inc.	2951 Central Avenue NE	Minneapolis	Monitoring	45	6/2003
691876	6	Tom Thumb Food Markets, Inc.	2951 Central Avenue NE	Minneapolis	Monitoring	45	6/2003
692839	6	Northeast Towing	6519 Central Avenue	Fridley	Monitoring	78	8/2003
694184	6	Holiday Stationstores, Inc.	5695 Hackmann Avenue NE	Fridley	Monitoring	20	7/2003
694198	6	Holiday Stationstores, Inc.	5695 Hackmann Avenue NE	Fridley	Monitoring	68	8/2003
694199	6	Hillcrest Development	3311 Broadway Street NE	Minneapolis	Monitoring	85	8/2003
694200	6	Hillcrest Development	3311 Broadway Street NE	Minneapolis	Monitoring	86	8/2003
694741	6	Lubrication Technologies	2420 County Road C West	Roseville	Monitoring	90	9/2003
694742	6	Lubrication Technologies	2420 County Road C West	Roseville	Monitoring	95	9/2003

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	Rosenthal Real Estate Holdings, LLC	1203 W County Rd E	Arden Hills		In Use				
	3	Determan	1241 72nd Ave Ne	Fridley		In Use				
249145	3	~~Aulich,~~ Phillippi	1774 Terrace Dr	Shoreview	Domestic	Unknown		135/111?	QBAA	1977
	3	Ryals	1910 Grant Road	Arden Hills		In Use				
	3	Commers (Roseville Acquisitions, LLC)	1947 W County Road C	Roseville		In Use				
	6	Lamn, Llc	2420 W County Rd C	Roseville		In Use				
	4a	Cuddihy	2933 Troseth Road	Roseville		Not in Use				
	6	Fulford Hoover Investments, LLC	359 Hoover Street	Minneapolis		In Use				
233824	3	~~Bishop,~~ Westby	3947 Glenview Ave	Arden Hills	Irrigation	Active		167	OSTP	1957
249162	3	~~Racine,~~ Wraneschetz	3947 Rolling Hills Rd	Arden Hills	Irrigation	Active		150		1959
234374	3	~~Moren,~~ Cushing	4401 Hwy 10	Arden Hills	Domestic	Active		150	QBAA	
S00405	3	~~Sale,~~ Nygren, Jr.	5779 Fairview Ave N	Shoreview	Domestic	Active		100	QBAA	
	4a	Bryant, Jr.	615 12th Ave Nw	New Brighton		Not in Use				
	3	Wager	7584 Groveland Road	Mounds View		In Use				
	3	Nelson	7601 Groveland Road	Mounds View		In Use				
	3	ECOLAB, INC.		Columbia Heights		Active				

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
194716	7a	Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	Sealed	9/11/03
194717	7a	Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	Sealed	9/11/03
194722	7a	Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Araden Hills	Sealed	9/11/03
194724	7a	Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	Sealed	9/11/03
234364	7a	~~Sorenson,~~ Shoop	1875 Long Lake Rd	New Brighton	Sealed	5/29/1990
242134	7a	Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	Sealed	9/11/03
457412	7a	Amoco Oil	0	Fridley	Sealed	11/10/1994
501660	7a	Soo Line Bldg	0	Minneapolis	Sealed	10/18/1990
525827	7a	Minneapolis Community Development Agency	0		Sealed	7/1/1994
525828	7a	Minneapolis Community Development Agency	0		Sealed	7/1/1994
525829	7a	Minneapolis Community Development Agency	0		Sealed	7/1/1994
533290	7a	Csm Investors Ii, Inc.	3171 Fifth St SE	Minneapolis	Sealed	5/8/03
533291	7a	Csm Investors Ii, Inc.	3171 Fifth St SE	Minneapolis	Sealed	5/8/03
533292	7a	Csm Investors Ii Inc.	3171 Fifth St SE	Minneapolis	Sealed	5/8/03
533293	7a	Csm Investors Ii Inc.	3171 Fifth St SE	St. Paul	Sealed	5/8/03
536848	7a	Csm Investors Ii, Inc.	3171 Fifth St SE	St. Paul	Sealed	5/8/03
536849	7a	Csm Investors Ii, Inc.	3171 Fifth St SE	St. Paul	Sealed	5/8/03
536850	7a	Csm Investors Inc.	3171 Fifth St SE	St. Paul	Sealed	5/8/03
536851	7a	Csm Investors Inc.	3171 Fifth St SE	St. Paul	Sealed	5/8/03
536852	7a	Csm Investors Inc.	3171 Fifth St SE	St. Paul	Sealed	5/7/03
536853	7a	Csm Investors Inc.	3171 Fifth St SE	St. Paul	Sealed	5/7/03
545244	7a	Stewart Lumber	401 Johnson St NE	Minneapolis	Sealed	4/14/03
549769	7a	Property Manaagemtnt & Investments	1021 First St Nw	New Brighton	Sealed	6/2/03
549770	7a	Property Management && Investments	1021 First St Nw	New Brighton	Sealed	6/1/03
549771	7a	Property Management & Investments	1021 First St Nw	New Brighton	Sealed	6/2/03
594030	7a	Inland Ryan LLC	1520 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594031	7a	Inland Ryan LLC	1520 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594032	7a	Inland Ryan LLC	1600 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594033	7a	Inland Ryan LLC	1600 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594034	7a	Inland Ryan LLC	1540 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594035	7a	Inland Ryan LLC	1540 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594036	7a	Inland Ryan LLC	1650 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
594037	7a	Inland Ryan LLC	1650 New Brighton Blvd.	Minneapolis	Sealed	9/4/03
623370	7a	Sunset Acquisition Corporation	2250 St. Anthony Blvd.	St. Anthony	Sealed	5/16/03
624407	7a	Sunset Acquisition Corporation	2250 St. Anthony Blvd.	St. Anthony	Sealed	5/16/03
624408	7a	Sunset Acquisition Corporation	2250 St. Anthony Blvd.	St. Anthony	Sealed	5/16/03
624409	7a	Sunset Acquisition Corporation	2250 St. Anthony Blvd.	St. Anthony	Sealed	5/16/03
	7a	Garg	1748 Glenview Ave	Arden Hills	Sealed	08/18/03
	7a	Kattaria	1781 Tatum Ave	Falcon Heights	Sealed	05/13/03
	7a	Russoro	1927 Roselawn Ave W	Roseville	Sealed	06/20/03
	7a	Quanbeck, Ii	2200 Rosewood Lane	Roseville	Sealed	05/01/03
	7a	Corbett	2203 Rosewood Lane	Roseville	Sealed	05/13/03
	7a	Walker	2217 Draper Ave	Roseville	Sealed	04/08/03
	7a	Masterpiece Homes, Inc.	2263 County Rd B W	Roseville	Sealed	08/18/03
	7a	Padovan	366 New Brighton Road	New Brighton	Sealed	06/16/03
	7a	Cardenas	5045 Longview Drive	Mounds View	Sealed	05/16/03
	7a	Meysembourg	5072 Longview Drive	Mounds View	Sealed	04/17/03
	7a	Strom	5302 St. Stephen Street	Mounds View	Sealed	05/16/03
	7a	Hanson	5421 Adams Street	Mounds View	Sealed	05/16/03
	7a	Fox	7226 Knollwood Drive	Mounds View	Sealed	09/10/03
H0011292	7a	~~Homauer,~~ Ernst	5071 Red Oak Dr	Mounds View	Sealed	6/14/1991
H0036993	7a	Cypress Development Company	0	Fridley	Sealed	3/8/1994
H0040928	7a	Minneapolis Community Development Agency	0		Sealed	5/16/1994
H0041125	7a	~~Hallanger,~~ Timming	1875 Tatum St	Falcon Heights	Sealed	11/13/1993
H0047869	7a	Johnston	2808 Pahl Ave	St. Anthony	Sealed	04/15/03
H0070502	7a	~~UTKE,~~ Villela	2095 Longview Dr	New Brighton	Sealed	
H0079221	7a	Soo Line Railroad	0 Central (28Xx Block) Av	Minneapolis	Sealed	7/23/1992
H0093639	7a	Cargill Inc.	3799 Fifth Av Ne	Columbia Heights	Sealed	3/16/1988
H0111185	7a	Iacono	2847 Central Av Ne	Minneapolis	Sealed	10/7/1996
H0114671	7a	Carlson	1505 Central Av Ne	Minneapolis	Sealed	6/16/1997
H0114780	7a	Hennepin, County Of	2747 Central Av Ne	Minneapolis	Sealed	10/1/1998
H0128653	7a	~~ASPROTH,~~ Brown	3025 COUNTY ROAD H	Mounds View	Sealed	
H0136068	7a	Brinks. Inc.	950 13Th Av Ne	Minneapolis	Sealed	4/21/1998
H0139227	7a	CAVANAUGH	2909 ST. ANTHONY BL	St. Anthony	Sealed	- -
H0150185	7a	Jarvi	3275 Lake Johanna Blvd	Arden Hills	Sealed	09/12/03
H0150768	7a	Alemu	2801 Pahl Ave Ne	St. Anthony	Sealed	06/03/03
H0152768	7a	Heartland Automotive Service	4955 Central Av Ne	Columbia Heights	Sealed	5/20/1999
H0163816	7a	University Station	0	Fridley	Sealed	1/26/2000
H0164897	7a	~~SNYDER,~~ Hensley	1642 HILLVIEW RD	Shoreview	Sealed	4/24/2000
H0176662	7a	Van Waters And Rogers	0	Minneapolis	Sealed	12/21/2000
H0182413	7a	Gentling	2362 Brighton Lane	New Brighton	Sealed	05/01/03
H0182430	7a	Wingspan Life Resources	2939 Troseth Road	Roseville	Sealed	04/08/03
H0182499	7a	Schutta	176 Cleveland Ave Sw	New Brighton	Sealed	09/12/03
H0185347	7a	~~NICHOLS,~~ Savage	2275 LEONA DR	New Brighton	Sealed	3/15/2002
H0189986	7a	~~SULLIVAN,~~ Breid	1802 OAKCREST AV	Roseville	Sealed	4/23/2002
H0190485	7a	~~LARSON,~~ Pariseau	2813 PAHL AV	St. Anthony	Sealed	- -

TABLE E-5
SEALED WELLS

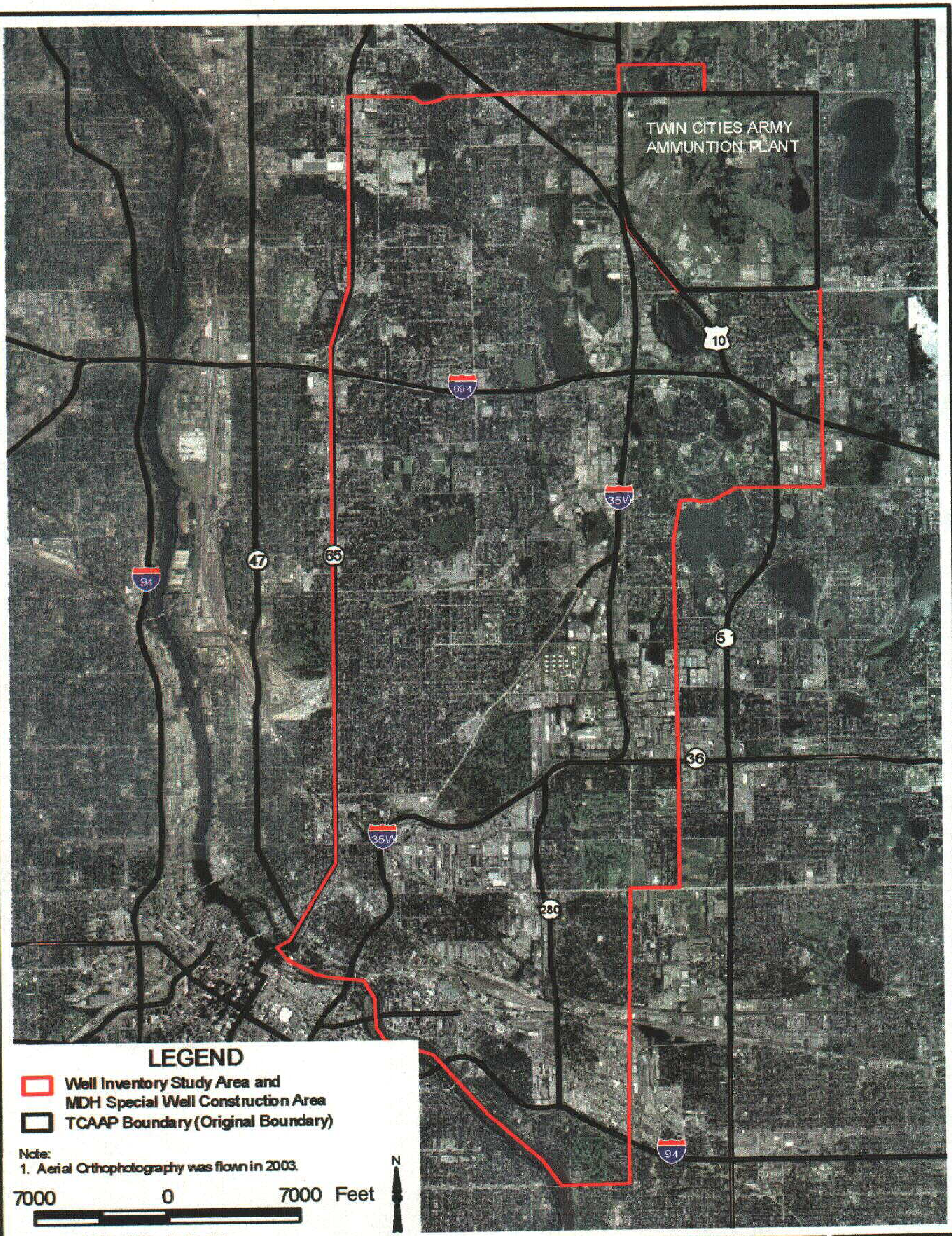
H0190646	7a	~~PETERSON,~~ Lundy	4086 VALENTINE CREST RD	ARDEN HILLS	Sealed	4/24/2002
H0191077	7a	Standfield	5335 St. Stephens	Mounds View	Sealed	06/20/03
H0192846	7a	~~HEDLUND,~~ Betz	1865 FAIRVIEW AV N	Falcon Heights	Sealed	4/10/2002
H0193291	7a	Bear Creek Capital LLC	215 Tenth Ave. SE	Minneapolis	Sealed	7/24/03
H0193292	7a	Bear Creek Capital LLC	928 University Ave. SE	Minneapolis	Sealed	7/24/03
H0193293	7a	Bear Creek Capital LLC	928 University Ave. SE	Minneapolis	Sealed	7/24/03
H0193680	7a	Slomski	2906 16th Street	New Brighton	Sealed	06/16/03
H0194528	7a	Canadian Pacific Railway	0	Minneapolis	Sealed	7/19/2002
H0194529	7a	C.P. Railway	0	Minneapolis	Sealed	7/23/2002
H0196750	7a	Stariha	1835 Grant Road	Arden Hills	Sealed	09/12/03
H0200400	7a	England	2285 Oriole Ave.	New Brighton	Sealed	4/22/03
H0201075	7a	Canadian Pacific Railway	0		Sealed	12/16/2002
H0203068	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	1/6/2003
H0203069	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	12/20/2002
H0203070	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	12/23/2002
H0203072	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	1/3/2003
H0203073	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	1/17/2003
H0203074	7a	Canadian Pacific Railroad	0 Central Av	Minneapolis	Sealed	1/19/2003
H0203075	7a	Canadian Pacific Railrod	0		Sealed	1/19/2003
H0203775	7a	Masterpiece Homes	2275 County Road B West	Roseville	Sealed	4/25/03
H0203779	7a	Masterpiece Homes	2245 County Road B West	Roseville	Sealed	5/26/03
H0205071	7a	Jaster	3453 Lake Johanna Blvd.	Arden Hills	Sealed	7/8/03
H0205447	7a	Tanurb Of Canada	0 County Road B2 & Fairview Circle	Roseville	Sealed	4/17/03
H0205949	7a	Janisch	1896 Edgewater Ave.	Arden Hills	Sealed	5/21/03
H0206267	7a	MN PCA	2500 S Delaware St	Minneapolis	Sealed	5/19/03
H0206268	7a	Metro Transit	515 Cleveland Ave. N	St. Paul	Sealed	6/9/03
H0206270	7a	New Brighton, City Of	1427 Old Highway 8	New Brighton	Sealed	6/13/03
H0206296	7a	New Brighton, City Of	1275 Old Highway 8	New Brighton	Sealed	7/29/03
H0206417	7a	Reha	3898 Dellview Ave.	Arden Hills	Sealed	5/22/03
H0206452	7a	Bayer	1170 Norton Ave Ne	Fridley	Sealed	07/15/03
H0206454	7a	Mygaard	183 Third Ave. SE	New Brighton	Sealed	4/21/03
H0206497	7a	Sladek	4420 Hamline Ave. N	Arden Hills	Sealed	9/17/03
H0206507	7a	Engelhart	1927 Autumn St	Falcon Heights	Sealed	4/17/03
H0207231	7a	Fairview/Roseville LLC	1821 County Road C	Roseville	Sealed	7/11/03
H0208301	7a	Tom Thumb Food Markets, Inc.	2951 Central Ave. NE	Minneapolis	Sealed	5/1/03
H0208730	7a	Beisswenger'S Hardware	1823 Old Highway 8 NW	New Brighton	Sealed	8/28/03
H0208733	7a	Prospect Auto Parts	2555 Franklin Ave.	St. Paul	Sealed	9/9/03
H0209498	7a	Canadian Pacific Railway	0	Minneapolis	Sealed	6/9/03
H0209594	7a	Kavanaugh	2909 St. Anthony Blvd.	St. Anthony Village	Sealed	6/5/03
H0210816	7a	Leffingwell	1314 Missisippi St NE	Fridley	Sealed	6/25/03
H0211029	7a	Elias Nordgren, Estate Of	3032 Bronson Dr	Mounds View	Sealed	7/23/03
H0211371	7a	U.S. Army	4700 Highway 10	Arden Hills	Sealed	8/20/03
H0212289	7a	Canadian Pacific Railway	0	Minneapolis	Sealed	9/2/2003
H0212293	7a	Canadian Pacific Railway	0 Central Av	Minneapolis	Sealed	6/12/2003
H0212641	7a	Schweppe	1215 12th Avenue	New Brighton	Sealed	9/30/03
H0212955	7a	Stinson Automotive	3300 Stinson Blvd.	Minneapolis	Sealed	9/11/03
H0213102	7a	Hjort	1434 Onandaga St NE	Fridley	Sealed	8/1/03
H0213104	7a	Wahl	2300 Thorndale	New Brighton	Sealed	7/31/03
H0213127	7a	Amirfazli	1842 Ryan Ave. W	Roseville	Sealed	9/2/03
H0213143	7a	Towberman	7444 Silver Lake Rd	Mounds View	Sealed	9/12/03
H0213718	7a	Kraft	5323 Clifton Ave.	Mounds View	Sealed	8/26/03
H0213726	7a	Erickson Oil Products	3810 Silver Lake Rd	St. Anthony	Sealed	9/25/03
H0215636	7a	Twin Cities Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	Sealed	9/11/03
	7a	Er	1890 W County Rd D	Roseville	Sealed	09/11/03
	7a	Grace	1939 Midland Hills Road	Roseville	Sealed	09/23/03
	7a	Cmiel	2023 Thom Drive	New Brighton	Sealed	06/20/03
	7a	Clifford	2516 St. Anthony Blvd Ne	St. Anthony	Sealed	08/11/03
	7a	Kittelson	3420 Fairview Ave N	Arden Hills	Sealed	09/10/03
	7a	Midwest Associates I, LLC	670 Pelham Blvd	St. Paul	Sealed	06/20/03
200387	~~7b,~~ 7a	Varsity Theater	1308 SE 4th St	Minneapolis	Sealed	06/24/03
H0200377	~~3,~~ 7a	Noren	5615 Fairview Ave.	Shoreview	~~Active,~~ Sealed	4/8/03
	~~3,~~ 7a	~~Bernt,~~ Grape	1593 Lois Dr	Shoreview	~~Active,~~ Sealed	05/14/03
H0210820	~~3,~~ 7a	Springer	1967 Glenpaul Ave	Arden Hills	~~Inactive,~~ Sealed	7/3/03
194703	~~6,~~ 7a	01U622, Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	~~Active,~~ Sealed	9/11/03
194704	~~6,~~ 7a	01U623, Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	~~Active,~~ Sealed	9/11/03
234198	~~6,~~ 7a	O1U004; ST-4-U1, Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	~~Active,~~ Sealed	9/11/03
234227	~~6,~~ 7a	PSB-54A, Twin Cities Army Ammunition Plant	4700 Highway 10, Suite F	Arden Hills	~~Active,~~ Sealed	9/11/03
557665	~~6,~~ 7a	~~Northern States Power Co,~~ Csm Investors Ii, Inc	3171 5th St SE	Minneapolis	~~Active,~~ Sealed	5/8/03
	7b	Lindsey Court, LLC	2700 27th Ave	New Brighton	Sealed	
437758	~~3,~~ 7b	~~Raddatz,~~ Wachter	4337 Hwy 10	Arden Hills	~~Active,~~ Sealed	

TABLE E-6
FY 2004 EFFORT TO RECLASSIFY CATEGORY 4 WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Depth	Comments
249150	4a	Coldor, Lisa	3511 Stinson Blvd NE	St Anthony	Unknown		No response
249185	4a	Novotny, Mark L	1706 Malvern St	Lauderdale	Unknown		No response
249191	4a	Wells, Henry A, Jr	1651 Millwood Ave	Roseville	Active		No response
S00294	4a	Western Remodelers, Rapit Printing owns bldg	2520 W Larpenteur Ave	St Paul	Unknown		No response
S00295	4a	Alfson, Loren	2351 Summer St	Lauderdale	Unknown		No response
S00409	4a	Ohara, Rose L	3553 Stinson Blvd NE	St Anthony			No response
S00608	4a	Grundtner, James	136 Oakwood Dr	New Brighton	Active		No response
	4a	Beach, Larry K.	1615 Silver Lake Rd	New Brighton	Active		Could not locate
	4a	Burton , Jason P.	2073 10th St NW	New Brighton	Inactive		Inactive well
	4a	Hinton, E and T Hermes, Daniel	2935 Old Hwy 8	Roseville	Active		No response
	4a	New Brighton, City of	19 14th St NW	New Brighton	Active		Could not locate
	4a	Tabaika, Dorothy	2512 27th Ave NE	St. Anthony	Inactive		Inactive well
	4a	Weisenberger, Heidi B.	2816 Silver Lake Rd	St. Anthony	Inactive		Inactive well
	4a	WILLIG , Allan A.	2600 Pahl Ave	St. Anthony	Active		No response
105242	4b	Weber, Nordeen Jr., Nordeen Estates			Active	214	Could not locate
105271	4b	Nelson, Roger			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
148132	4b	Vince Velie, H & H Construction			Active	190	Could not locate

TABLE E-6
FY 2004 EFFORT TO RECLASSIFY CATEGORY 4 WELLS

180922	4b				Active		Could not locate
192091	4b			Elmwood	Active		Could not locate
201192	4b				Active		Could not locate
234434	4b	Marquart, Vina L		Arden Hills	Unknown		Could not locate
234532	4b						Could not locate
234537	4b						Could not locate
234545	4b						Could not locate
234568	4b	Thomsen	4 88th NE			200	Could not locate
234658	4b						Could not locate
239465	4b	Lennox, Dan			Active	256	Could not locate
239468	4b	Burlington Northern Railroad			Active	253	Could not locate
239469	4b	Great Northern Railway			Active	200	Could not locate
688419	4b	SANMINA-SCI , Attn: Kimberly McMorrow	2516 Wabash Ave	St. Paul	Active		No response
688420	4b	SANMINA-SCI , Attn: Kimberly McMorrow	2516 Wabash Ave	St. Paul	Active		No response
688421	4b	SANMINA-SCI , Attn: Kimberly McMorrow	2516 Wabash Ave	St. Paul	Active		No response
S00413	4b	Norquist Campground			Unknown		Could not locate
S00471	4b	R Komarek/Nelson-Miller Cons			Inactive		Could not locate
S00551	4b	Tamarack Care Temp			Unknown		Could not locate
S00650	4b	CME		New Brighton			Could not locate
	4b	Brighton Land Development, LLC	1001 County Rd E West	New Brighton	Active		No response
	4b	DONATELLE ASSOCIATES, LLC		New Brighton	Active		Could not locate
	4b	Hogan, Bridget T.	1700 County Road F West	Arden Hills	Active		No response
	4b	Meridian Properties Real Estate Dev., LLC.	3700 Silver Lake Rd	St. Anthony	Active		Could not locate
	4b	NEW BRIGHTON ALANO SOCIETY, INC.		Mounds View	Active		Could not locate
	4b	Nottestad, James R.	1001 County Rd E West	New Brighton	Active		No response
234474	~~4a,~~ 3	Hodson, ~~Randy~~ Jolene	2601 Silver Ln NE	Minneapolis	Active	214	Sampled, Re-categorized to 3
00LUBETE	~~4a,~~ 6	Lube-Tech, Attn: Greg Revering	2420 County Road C West	Roseville	Active		Re-categorized to 6



TWIN CITIES ARMY AMMUNITION PLANT

Well Inventory Study Area

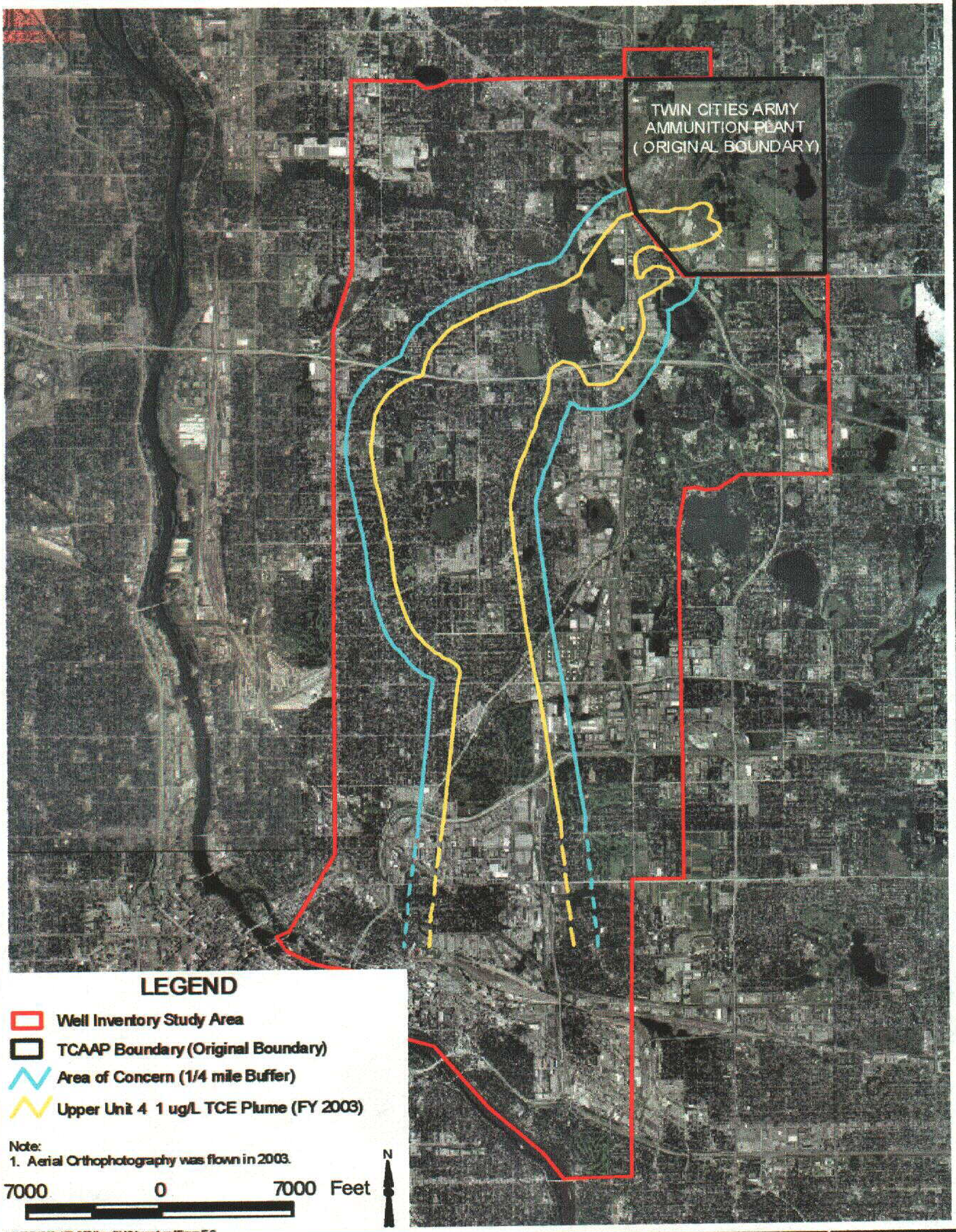
Wenck

Wenck Associates, Inc.
Environmental Engineers

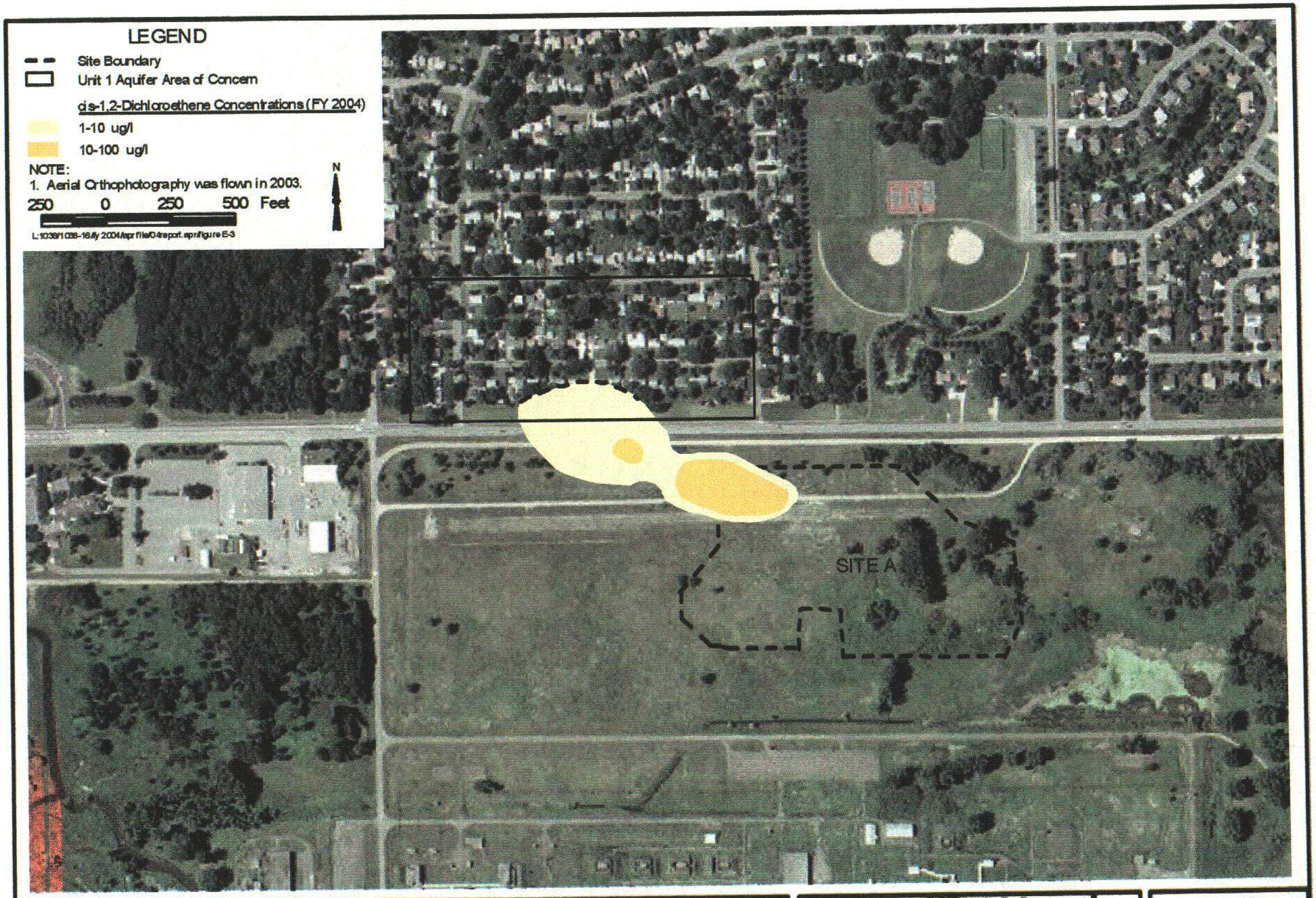
1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2004

Figure E-1



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0249	FY 2004
Areas of Concern (Unit 3 and Unit 4)		Figure E-2



TWIN CITIES ARMY AMMUNITION PLANT

Area of Concern (Unit 1)

Wenck

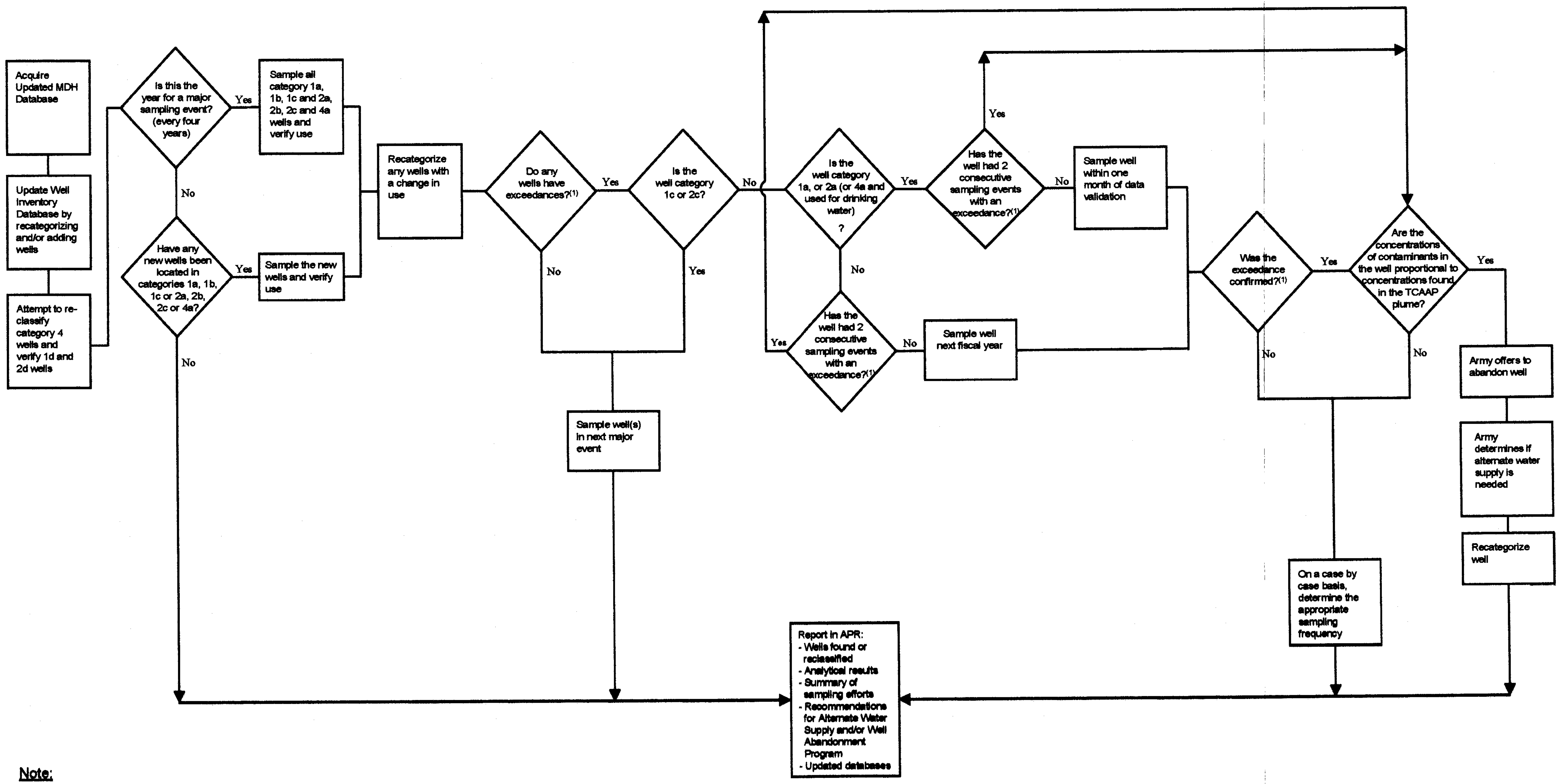
Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0249

FY 2004

Figure E-3

Figure E-4

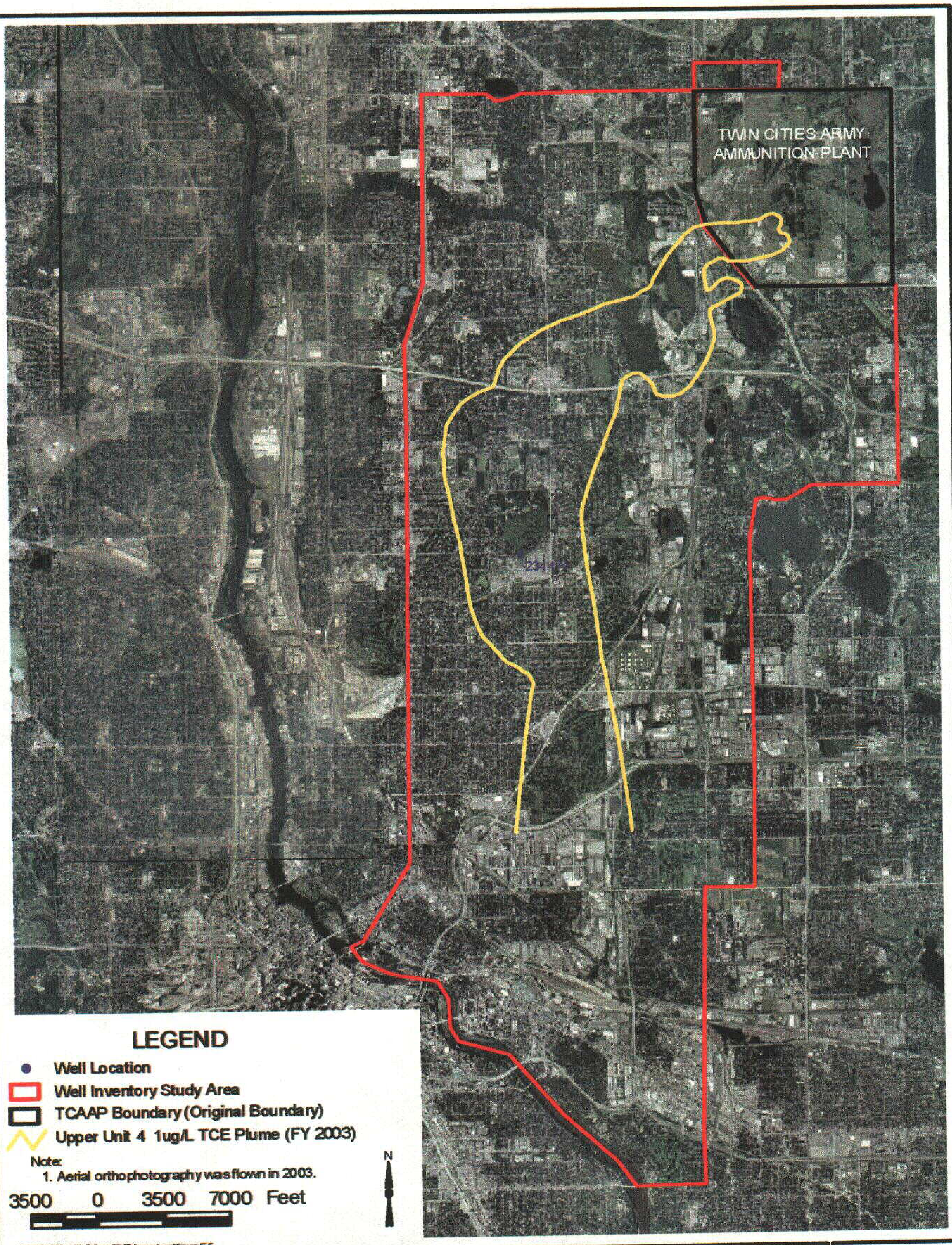
Annual Requirements for Maintaining TCAAP Well Inventory Database



Note:
(1) = Exceedance of a TCAAP Groundwater Cleanup Level

T:\1038\12\FY03 APR\Appendices\App E_Figure E-4.ppt

Wenck Associates, Inc.



TWIN CITIES ARMY AMMUNITION PLANT

FY2004 Well Inventory Sampling Locations

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1800 Pioneer Creek Center Maple Plain, MN 55359-0249

FY 2004

Figure E-5

Appendix F

Site K, TGRS, and PGRS Operational Data

TCAAP WELL INVENTORY DATABASE

The TCAAP Well Inventory Database is located on this CD-ROM in the following Microsoft Excel file:

Well_Inv.xls

F.1 Inspection and Maintenance Activities, Fiscal Year 2004, Site K, TCAAP

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

OCTOBER 2003

10-3-03, System in suspense. System downtime: None.

10-6-03, System in suspense. System downtime: None.

10-7-03, System in suspense. System downtime: None.

10-15-03, System in suspense. System downtime: None.

10-20-03, System in suspense. System downtime: None.

10-21-03, System in suspense. System downtime: None.

10-29-03, Exhaust louvers stuck open, manually closed. System downtime: None.

10-31-03, System in suspense. Perform monthly preventive maintenance. System downtime: None.

NOVEMBER 2003

11-3-03, System in suspense. System downtime: None.

11-10-03, System in suspense. System downtime: None.

11-13-03, System in suspense. System downtime: None.

11-19-03, System in suspense. System downtime: None.

11-21-03, System in suspense. System downtime: None.

11-25-03, System in suspense. System downtime: None.

11-26-03, System in suspense. System downtime: None.

DECEMBER 2003

12-02-03, System in suspense. System downtime: None.

12-05-03, System in suspense. System downtime: None.

12-08-03, Performed Monthly PM. System downtime: None.

12-17-03, System in suspense. System downtime: None.

12-18-03, System in suspense. System downtime: None.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

DECEMBER 2003 continued

12-23-03, System in suspense. System downtime: None.

12-24-03, System in suspense. System downtime: None.

12-26-03, System in suspense. System downtime: None.

JANUARY 2004

1-6-04, System down upon arrival due to High/Low Stripper Air Flow alarm. Restarted the system and static air pressure is at 30 inches H_2O. Reduced air flow to 23 inches H_2O static air. System downtime: 23 Hours.

1-08-04, System in suspense. System downtime: None.

1-12-04, System in suspense. System downtime: None.

1-14-04, System in suspense. System downtime: None.

1-16-04, System in suspense. System downtime: None.

1-19-04, System in suspense. System downtime: None.

1-20-04, System in suspense. System downtime: None.

1-21-04, System in suspense. System downtime: None.

1-22-04, Checked building heater- O.K. fan blade spins freely. System downtime: None.

1-23-04, System in suspense. Installed trim piece on east door to block small space between doors. System downtime: None.

1-27-04, System in suspense. System downtime: None.

1-28-04, System in suspense. Performed Monthly PM. System downtime: None.

1-29-04, System off due to low building temperature. Building sensor sits 1.5 feet lower than thermostat and likely cooler air in building stratified in lower portion of building. Raised building thermostat setting from 60 degrees to 65 degrees and raised space heater set point to run at higher building temperature. System downtime: 18.5 Hours.

1-31-04, System down due to High/Low Stripper Air Flow alarm. Failure corrected on Feb. 3, 2004. See February report for additional notes. System downtime: 24 Hours.

FEBRUARY 2004

from tower demister and thawed frozen packing. Restarted system and observed operation. System downtime: 74 Hours.

2/9/2004, Treatment system in suspense. System downtime: None.

2/10/2004, Treatment system in suspense. System downtime: None.

2/13/2004, Treatment system in suspense. System downtime: None.

2/17/04, Performed monthly preventative maintenance. System downtime: None.

2/18/2004, Treatment system in suspense. System downtime: None.

2/23/2004, Treatment system in suspense. System downtime: None.

2/24/2004, Treatment system in suspense. System downtime: None.

2/25/2004, Treatment system in suspense. System downtime: None.

2/26/2004, Treatment system in suspense. System downtime: None.

2/27/2004, Treatment system in suspense. System downtime: None.

MARCH 2004

3/1/04, System in suspense. System downtime: None.

3/2/04, System in suspense. System downtime: None.

3/3/04, System in suspense. System downtime: None.

3/5/04, Five inches of snow fell and melted. System downtime: None.

3/9/04, System in suspense. System downtime: None.

3/10/04, System in suspense. System downtime: None.

3/11/04, System in suspense. System downtime: None.

3/15/04, System in suspense. System downtime: None.

3/16/04, System in suspense. System downtime: None.

APPENDIX F-1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

MARCH 2004 continued

3/18/04, System in suspense. System downtime: None.

3/19/04, System in suspense. System downtime: None.

3/24/04, System in suspense. System downtime: None.

3/29/04, System in suspense. System downtime: None.

3/30/04, System in suspense. System downtime: None.

3/31/04, Perform monthly preventative maintenance. System downtime: None.

APRIL 2004

4/1/04, System in suspense. System downtime: None.

4/2/04, System in suspense. System downtime: None.

4/12/04, System in suspense. System downtime: None.

4/15/04, System in suspense. System downtime: None.

4/16/04, System in suspense. System downtime: None.

4/22/04, System in suspense. System downtime: None.

4/23/04, System in suspense. System downtime: None.

4/23/04, Perform monthly preventive maintenance. System downtime: None.

4/26/04, General note - floor is dry after rain.. System downtime: None.

MAY 2004

5/5/04, System in suspense. System downtime: None.

5/10/04, System in suspense. System downtime: None.

5/11/04, Verify operation of air intake fan, powered louvers and thermostatic controls. System downtime: None.

5/20/04, System in suspense. System downtime: None.

MAY 2004 continued

5/24/04, System in suspense. System downtime: None.

JUNE 2004

6/3/04, Increased flow rate to 15.8 GPM. Trim portion of vegetation around treatment building. System downtime: None.

6/9/04, Increased flow rate to 18.2 GPM. System downtime: None.

6/25/04, Removed, cleaned and reinstalled distributor nozzle. Small rock was plugging nozzle. Flow rate restored to 20 GPM. System downtime: 1 hour.

JULY 2004

7/1/04, Increased flow rate from 12.7 GPM to 13.3 GPM, valve full open position. System downtime: None.

7/12/04, System shut down on high water flow rate alarm (alarm set point is 22.5 GPM). Restart system and reduce flow rate to 18.0 GPM. System downtime: 77.0 Hours.

7/16/04, System in suspense. System downtime: None.

7/21/04, System in suspense. System downtime: None.

7/22/04, System in suspense. System downtime: None.

7/26/04, Reduced flow rate from 18 GPM to 16 GPM. System downtime: None.

7/27/04, System in suspense. System downtime: None.

7/28/04, Reduced flow rate from 16 GPM to 14 GPM. System downtime: None.

AUGUST 2004

8/10/04, System in suspense. System downtime: None.

8/11/04, System in suspense. System downtime: None.

8/16/04, System in suspense. System downtime: None.

8/26/04, System in suspense. System downtime: None.

8/27/04, System shut down for annual cleaning. System downtime: 5 hours.

AUGUST 2004 continued

8/30/04, Removed and cleaned nozzle; there was debris clogging it. (Flowrate = 18.7 gallons per minute at 1545 hrs.) System downtime: None.

8/31/04, Reduced flowrate to 14.3 gallons per minute. System downtime: None.

SEPTEMBER 2004

9/1/04, System in suspense. System downtime: None.

9/2/04, Reduced flow rate from 13.9 GPM to 13.5 GPM. System downtime: None.

9/3/04, Reduced flow rate from 13.5 GPM to 12.8 GPM. System downtime: None.

9/16/04, System in suspense. System downtime: None.

9/27/04, System in suspense. System downtime: None.

9/28/04, System in suspense. System downtime: None.

F.2 Maintenance Activities, Fiscal Year 2004, TGRS, TCAAP

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

October 2003

10/1/2003 Treatment System and Well Field; TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours each at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.

10/2/2003 Treatment system; Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.

10/26/2003 Pumphouse B6; B6 light flashing at PLC. Reset PLC and B6 fully operational.

Down time: 8 hours.

10/29/2003 Pumphouse B6; B6 light flashing at PLC. Reset PLC and B6 fully operational.

Down time: 20 hours.

November 2003

11/3/2003 Altitude Valve; Call from Rick Boyer, Altitude valve not closing. Tubing flare connection to filter cartridge failed. Removed and replaced section of tubing and observed normal operation.

Down time: None.

11/3/2003 Pumphouse B6; B6 flashing on well field panel, reset well field and observed normal operation.

Down time: 14 hours.

11/6/2003 Altitude valve; Altitude valve not in "Auto mode". Place both altitude valve and recycle valve in "Auto mode". Dave Knight and US Filter on site troubleshooting the drain fail. They cleared out the drain fail light and reset the altitude valves auto open and close settings and set the altitude valve for winter operation.

Down time: None.

11/6/2003 Elevated tank; Copper tubing leading from in-line filter to solenoid failed.

Down time: 1.5 hours at B1.

11/9/2003 Altitude valve; Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok.

Down time: 1.5 hours at B1, B4, B6, B8, B11 and SC1.

11/16/2003 Altitude Valve; Copper tubing failed again (including Tylok fitting). All Enviro contacted and on site to troubleshoot. Reduced valve pressure and adjusted opening and closing

Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

11/17/2003	Pumphouse B6; B6 light flashing on PLC; Reset PLC and B6 light relit normally. Down time: 11 hours.
11/21/2003	Pumphouse B9; Flow meter failed, replaced with new; adjusted previous days flow rates accordingly. Restarted pumphouse at 15:10 with meter reading at zero. Down time: None.
11/21/2003	Treatment System; Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours at B1, B3, B4, B6, B8, B11, B13, SC1 and SC5
11/28/2003	Treatment System; Blower 3 threw a belt, replaced with new. Down time: None

December 2003

12/5/2003	Treatment System; ECV #4 would not open on command; Flushed pilot, adjusted speed control valves and replaced filter cartridge. Adjusted snelling avenue valve to 29 psi. Observed normal operation. Down time: None.
12/6/2003	Treatment System; ECV #4 not closing; Flushed pilot to assist valve in closing. Pressure of forcemain surges when 3 and 4 shut off. Down time: SC2 for 8 hours.
12/7/2003 and 12/8/2003	Pumphouse SC2; Flushed control piping and set backpressure to 50. Down time: 11.5 hours.
12/9/2003	Treatment System; Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 6 hours at B8, B11 and SC1, 4 hours at B1, B13, B3, B4, B6, SC2 and SC5 .
12/10/2003	Treatment System; Calibrated meters for wet well pumps 1 and 2; Calibration showed existing meters were reading accurately. Down time: None.
12/10/2003	Pumphouses B13 and SC2; Compared the existing meters flow rates with that of a calibrated meter. SC2's meter was reading high by 13% and B13's meter was reading high by 15%. Cleaned SC2's meter and replaced B13's with the meter used for calibration. The new meter at B13 began at 1000 gallons and was started at 16:15. Down time: None, adjusted previous December flow rates accordingly.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/11/2003	Pumphouses SC2, SC5 and Altitude Valve; Power outage to source control pumphouses and altitude valve; Power line down approximately 400 feet southwest of SC2. Xcel energy responds and repairs outage. Turned pumps SC2 and SC5 on at 12:25. Down time: 11.5 hours at SC2 and 9.5 hours at SC5.
12/13/2003	Pumphouse B6; B6 light flashing on PLC. Reset PLC and B6 relit normally. Down time: 17 hours.
12/23/2003 through 12/26/2003	Pumphouse SC2; The light for SC2 is out on the PLC. Turned on the control power at SC3 and the SC2 light on the PLC relit normally. Down time: None.
12/27/03 through 12/28/2003	Pumphouses SC2 and SC5; Power out to pumphouses; Xcel Energy contacted and on site; repaired problem at substation. Down time: SC2 and SC5 for 26 hours each.
12/29/2003	Pumphouse SC5; forcemain pressure too high; flushed control piping, changed strainer screen, adjusted speed controls and reset pressure. Down time: 16 hours.
12/30/2003	Treatment Center; ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings. Down time: 4 hours at B13, 3 hours at B5 and 2 hours at B6, B8, B11 and SC1.
12/31/2003	Recent B5 meter readings show a gradual rate of decline. Compared meter rate with new calibrated meter and old meter was reading accurately. Down time: None.

January 2004

1/2/2004	Treatment System; ECV 1 not cycling and ECV 2 partially closed and not operating properly; Flushed control piping, changed filters and observed normal operation. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/2/2004	Pumphouse B6; B6 flashing on well field panel; reset well field panel and observed normal operation. Down time: 24 hours.
1/6/2004	Pumphouse B6; B6 flashing on well field panel; reset well field panel and observed normal operation. Down time: 29 hours.
1/6/2004	Pumphouse B5; Flow rate decreasing; Flushed control piping and adjusted pilot; lowered pressure from 88 psi to 80 psi and increased the flow rate. Down time: 7 hours.
1/18/2004	Treatment System; Failed belt at blower #3; replaced with new on 1/19/2004. Down time: None.
1/19/2004	Pumphouses SC2, SC5, B1, B13, B3 and B4; Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter. Down time: None.
1/26/2004	Treatment System; Observed ECV's 3 & 4 open normally; Altitude valve opened in 17 seconds. Down time: None.
1/26/2004	Pumphouse SC2; adjusted flow rate down to 55 gpm @ 69 psi. Down time: None.
1/26/2004	Pumphouse SC5; Groundwater level is at pump inlet; Adjusted flow rate down to 80 gpm @ 85 psi. Down time: 12 hours.
1/27/2004	Replaced valve on the influent sample port. Down time: None.
1/29/2004	Treatment System; Blower 2 has airflow rate of 1,000 cfm and it typically flows at 5500 cfm; inlet piping frozen; thawed and observed normal operation. Down time: None.

APPENDIX F-2

**MAINTENANCE ACTIVITIES
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA**

1/30/2004	Treatment System; Compared flow rate of existing flow meters for wet well pumps 1 and 2 against a calibrated flow meter. Meter 1 was reading 12 gpm slow and meter 2 was reading 6 gpm slow. Replaced meter 1 with calibrated meter and left meter 2 in place until meter 1 can be cleaned and calibrated. The flow rates for treatment system meters 1 and 2 have been adjusted to reflect the difference for the entire month of January 2004. Down time: None.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: B13 and SC5 for 6.5 hours each; B1, B4, B5, and B9 for 7.5 hours each; B3, B6, B8, B11 and SC2 for 10.5 hours each.

February 2004

2/5/2004	PDU3 major fault; Open and shut pilot drain valve on ECV 3 several times. Normal operation with no faults observed. Down time: None
2/6/2004	Pumphouse B3; Replaced leaking valve between the saddle tap and pressure gauge. Down time: None
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 71 hours for B3, B8 and B11; 68 hours for B9 and SC1; 60 hours for B13; 55 hours for B6 and 51 hours for SC2 and SC5.
2/6/2004	Treatment System; Installed new leak containment shrouds around base of wet well pumps 2 and 4. Down time: None
2/6/2004	Treatment System; ECV 1 will not shut off on command; Repaired low float connection to stand pipe in wet well #2 and replaced the middle low float in WW # 1 with a new float. Down time: Down time is already accounted for from time down for ECV 3 failure.
2/7/2004 through 2/8/2004	Pumphouse SC5; Forcemain pressure at 116 psi; flushed electric check valve piping and adjusted pilot; Pressure dropped and stayed at 85 psi. Down time: Down time is already accounted for from time down for ECV 3 failure.
2/7/2004	Pumphouses B13, B6 and SC2. Wells are cycling on and off; Attempted to reset well field and I/O cards in pumphouses but wells continue to cycle due to ECV 3 failure. Down time: Down time is already accounted for from time down for ECV 3 failure.
2/9/2004	B3 electric check valve contained trapped air. Flushed several times and reset. Down time: Down time is already accounted for from time down for ECV 3 failure.

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MAINTENANCE ACTIVITIES
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/9/2004	Pumphouse B13; Increased pressure to 126 psi to reduce flow rate because the pump was cavitating. Down time: None.
2/11/2004	Pumphouse SC5; Pumping rate is too low; measured water level at 125 feet, 2 feet above top of shroud; The well is producing at its available capacity. Down time: None.
2/13/2004	Treatment System; Wet well meter 2 replaced with cleaned and calibrated meter. Down time: None, however, adjusted daily volume accordingly from 2/1-13/2004.
2/14/2004	TGRS fail; 1130 call from the auto dialer. 1240, on site ECV#2 not opening on start up, adjusted control valve, now normal, reset well field panel system up, conduct DI Down time: Pumphouses B8, B11, SC1 for 1 hour each
2/18/2004	Pumphouse B3; Increased forcemain pressure from 130 psi to 134 psi to slow flow rate to 170 gpm. Down time: None.
2/18/2004	Treatment System; Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours each at B13, B6, B8, B11, SC1
2/19/2004	Pumphouse B3; Increased forcemain pressure from 134 psi to 136 psi to slow flow rate to 170 gpm. Down time: None.
2/19/2004	Pumphouse B5; Decreased forcemain pressure from 86 psi to 75 psi to increase flow rate from ~190 gpm to 215 gpm. Down time: None.
2/20/2004 through 2/23/2004	Pumphouses B11 and SC1; Lights not lit on PLC; 3 phase power failure near B11 (connection for one of the 3 lines was off on transformer pole). Contacted Laughlin Electric and Xcel to repair and 3 phase power was restored. SC-1 pump stopped because the I/O card at B11 was not active and it is paired with the SC1 card. Down time: B11 for 88 hours and SC1 for 72 hours.
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking Down time: None

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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

March 2004

3/1/2004	Pumphouse B4; 15 minute sand test performed; four to five 5 grains of sand produced. Down time: None.
3/2/2004	Pumphouse B13; Pumphouse is cylcing, low level light is on and pump is off; Increased pressure to 125 psi to slow flow rate; Restarted pump and observed normal operation. Down time: 13 hours.
3/4/2004	Pumphouse B11; Attemped to increase the flow rate at B11, but the pilot is at full open. Replaced the pilot with a new pilot but the pumping rate remained the same at 80 gpm. Down time: None.
3/11/2004 and 3/12/2004	Pumphouse SC1; Light on PLC is off; Attempted to reset PLC but SC1 light remains off; performed troubleshooting tasks but to no avail; contacted Laughlin Electric and Anik for further troubleshooting; Temporarily turned pump on in "Hand" position until repairs are made. Down time: 35 hours.
3/15/2004 through 3/20/2004	Pumphouse SC1; Laughlin Electric on site to troubleshoot but was unable to repair problem; Anik diagnosed the problem to be in the PLC in the pumphouse; The part was ordered and replaced and pumphouse restarted. Down time: 95 hours.
3/15/2004 through	Pumphouse SC5; Turned off to rehabilitate the well. Down Time: 266 hours.
3/17/2004	Pumphouse B4; Replaced wet end of pump. Deadhead pressure is at 138 psi. Down time: 8.5 hours.
3/20/2004	Treatment System; Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 3 hours at B3 and B6; 4.5 hours at B13 and 6.5 hours at B8 and B11.
3/24/2004	Elevated Storage Tank; Tower level operation switched to summer mode. Down time: None.
3/24/2004	Treatment System; Flow meter for wet well pump 4 replaced with cleaned and calibrated flow meter, same totalizer used again. Down time: None.

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3/29/2004	Pumphouse B5; Shut down and attempted to repair the electric check valve, however the problem is in the valve body and the part will have to be ordered. The valve was reassembled and the pump was restarted. Down time: 4 hours.
3/29/2004	Treatment System; Blower #3 down due to a blown fuse. Fuse was replaced and blower running. Down time: None.

April 2004

4/2/2004	Pumphouse SC1; Hans (Anik) inspects SC1 water level relay, which buzzes during low level. The relay will likely need to be replaced soon. We will continue to use it until it fails. Down time: None.
4/2/2004	Hans (Anik) measures B6 current to the pump. All volts and amps are within the proper ranges. Down time: None.
4/7/2004	Pumphouses B11, B13, SC2 and SC5; Removed existing water flow meters and replaced with cleaned and calibrated flow meters. The new B11 flow meter was installed at 2:14 pm and read 6915836. The new B13 flow meter was installed at 3:31 pm and read 14659704. The new SC2 flow meter was installed at 2:23 pm and read 8269900 and the new SC5 flow meter was installed at 2:57 and read 29864300. The flow rates are calculated on the March spreadsheet. Down time: None.
4/8/2004 through 4/12/2004	Pumphouse SC5; Opened ECV to 88 psi to increase flow rate to 100 gpm. Water level is at 129.8 feet btoc. Down time: 11 hours.
4/16/2004	Pumphouse SC5; Opened ECV to 86 psi to increase flow rate to 103 gpm. Water level is at 131.7 feet btoc. Down time: None.
4/19/2004	Pumphouse SC5; Replace pilot valve and adjust flow to 105 gpm. Adjust pressure to 88 psi. Water level at 129.7. Down time: 12 hours.

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MAINTENANCE ACTIVITIES
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4/19/2004	Pumphouse B4; water level is at 74.7 feet and the pressure is at 93 psi. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours at each pumphouse.
4/23/2004	Pumphouse SC2; Coil for solenoid valve failed and was replaced; Replaced the fuse in the output card as well. Down time: None.
4/23/2004	Pumphouses B13 and SC2; Eric Hanson (Laughlin Electric) on site for Annual Inspection. Xcel energy on site to disconnect power at B13. Down time: 3 hours at B1, B3 and B13.
4/23/2004	Pumphouse B6; B6 light flashing on PLC in Building 116; Well is cycling; Reset PLC and observed normal operation. Down time: 3 hours.
4/25/2004 and 4/26/2004	Pumphouse B5; B5 light flashing on PLC in Building 116. The well is cycling and the low level indicator is on; Increased the pressure from 72 to 74 psi. Lowered the water level sensor to 121 feet. Restarted the pump and observed normal operation. Down time: 34 hours.
May 2004	
5/3/2004	Pumphouses B13 and B6; Trending in Building 116 indicates pumps in B6 and B13 started and stopped earlier today. Down time: None.
5/4/2004	Pumphouse B6; Dead head pressure is at 129 psi. Down time: None.
5/6/2004	Treatment Center; WWP#3 flow meter changed out with newly cleaned meter from Munitech; Old meter was reading 1028 gpm, new meter reading 1022 gpm. New meter in line at 1605, 0 gallons on totalizer. Down time: None.
5/10/2004	Pumphouse B1; Dead head pressure is at 124 psi. Down time: None.
5/10/2004	Pumphouse B11; The electrical control panel has a 30 Amp disconnect with size 2 coil. Down time: None.
5/17/2004	Treatment Center; Removed clog from drain between ECV 3 and ECV4. Down time: None.

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5/19/2004	Building 116; Replaced "power on" light bulb at PDU 2. Down time: None.
5/19/2004	Altitude Valve; Will not close on command; Excercised ball valves 1 and 2 to close and open valve; Cycled valve from control panel two times and observed normal operation. Down time: None.
5/21/2004	Pumphouse SC1; There is a knocking sound from inside the flow meter; The totalizer is not advancing and the pump is on. Removed and repaired. Down time: 7 hours.
5/24/2004	Pumphouse B5; Replace body of ECV. Down time: 3 hours.
5/25/2004	Pumphouse B5; Measured flow rate with stop watch at 193.5 gpm. Down time: None.
5/25/2004	Pumphouse B6; Water level is at 153.7 feet btoc. Down time: None.
5/26/2004	Snelling Avenue Valve; Increased pressure from 15 psi to 25 psi; Changed strainer screen and flushed control piping. Down time: None.
5/26/2004	Treatment System; changed filter at ECV 4. Down time: None.
5/26/2004	Treatment System; Redi Clean chemicals for B6 development arrived. Temporarily stored on Building 116 containment pad. Down time: None.
5/26/2004	Altitude valve; Cycled valve 2 times from control panel and observed normal operation, however, valve closes in 2.5 minutes. Down time: None.
5/27/2004 through 5/31/2004	Pumphouse SC5; Light is flashing on PLC; Pressure is at 80 psi and pump is cycling; increased pressure to 90 psi and lowered water level probe to top of shroud. Water level is at 127 feet. Down time: 26 hours.
5/27/2004	Treatment System; Call from auto dialer "TGRS Fail". ECV 3 will not open on command; flushed control piping, adjusted open and closing speed valves and cycled valve operation two times. Observed normal operation. Down time: None.

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5/27/2004	Pumphouse B5; Decreased pressure from 73 psi to 70 psi to increase flow rate to 200 Down time: None.
5/28/2004	Treatment System; Water is leaking through the turbine shaft at wet well pump 4, tightened gland bushing. Water also leaking from pilot valve at ECV 3, tightened union. Down time: None.

June 2004

6/2/2004	Pumphouse SC5; Decreased pressure and increased flow rate to 102 GPM. Down time: None.
6/2/2004	Pumphouse B6; Decreased pressure and increased flow rate to 175 GPM. Down time: None.
6/7/2004	Pumphouse B5; B5 ECV is full open at approximately 200 GPM. Down time: None.
6/8/2004 through 6/9/2004	Pumphouse SC2; light is not lit on PLC in Building 116 and pump is running in pumphouse. Down time: None.
6/24/2004	Pumphouse SC5; Light flashing on PLC. Pump is cycling due to low pumping water level. Down time: 18 hours.
6/28/2004 through	Pumphouse B6; Pump turned off at 10:00 AM for redevelopment. Down time: 47.5 hours.
6/29/2004	Treatment System and Well Field; TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours at B1, B13, B3, B4, B5, B8, B9, B11, SC1, SC2 and SC5. B6 already down for redevelopment.

July 2004

7/1/2004 and 7/2/2004	Treatment System; System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: B1, B4, B5, B9 and SC2 for 38 hours each; B3, B8, B11, B13, SC1 and SC5 for 46 hours each.
7/2/2004	Pumphouse B6; B6 redevelopment work complete and B6 turned on at 12:12 PM; Dead head pressure is at 125 psi; Maximum flow rate is at 228 gpm and the pumping water level is at 133.8 feet. Set flow to 220 gpm with a PWL at 129.05 feet. Down Time: 52 hours.

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7/2/2004	Treatment System; Repaired tubing for airflow meter in blower #4. Down Time: None.
7/6/2004 through 7/8/2004	Pumphouse B11; Pump turned off to pull lift system and replace the pump (wet end only). Down time: 47 hours.
7/6/2004 through 7/7/2004	Pumphouse B13; Pump turned off to pull lift system, acid treat the well, surge the well screen, chlorinate the well and replace the pump (wet end only) with a new pump. Down time: 43 hours.
7/7/2004 and 7/8/2004	Pumphouse B1; Pump turned off to pull lift system and replace the pump (wet end) with a new stainless steel pump. Down time: 23 hours.
7/7/2004	Pumphouse B6; Pumping water level is at 121' BTOC. Static water level is at 65.87 and the flow rate is at 220 gpm. Down Time: None.
7/9/2004	Pumphouse B6; Pumping water level is at 120.25' BTOC. Static water level is at 65.87 and the flow rate is at 221 gpm. Down Time: None.
7/9/2004	Pumphouse B1; Pumping water level is at 91.3' BTOC. Static water level is at 79.3' and the flow rate is at 260 gpm. Decreased flow rate to 235 gpm. Down Time: None.
7/9/2004	Pumphouse B13; Pumping water level is at 117.5' BTOC. Static water level is at 91.8' and the flow rate is at 87 gpm. Down Time: None.
7/9/2004	Pumphouse SC1; The flow rate is at 28 gpm and the pressure is at 48 psi. Down Time: None.
7/9/2004	Pumphouse SC2; Pumping water level is at 136.1' BTOC. The flow rate is at 34 gpm and the pressure is at 67 psi. Down Time: None.
7/9/2004	Pumphouse SC5; Pumping water level is at 131.5' BTOC. The flow rate is at 107 gpm and the pressure is at 85 psi. Down Time: None.
7/10/2004	Altitude valve; The altitude valve "Closed" light is not working on the control panel. Down Time: None.

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TGRS, TCAAP
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7/11/2004	Pumphouse B9; light off on PLC in Building 116; 110 volt fuse blown in disconnect; replace with new and restart pump. Down Time: 14 hours.
7/12/2004	Pumphouse B3; Decreased flow rate to 170 gpm. Down Time: None.
7/12/2004	Pumphouse B4; Pilot is full open at 90 psi and flow rate is at 186 gpm. Down Time: None.
7/12/2004	Pumphouse B11; Adjusted flow rate to 90 gpm at 104 psi. Down Time: None.
7/12/2004	Pumphouse B1; Decreased flow rate to 235 gpm; Dead head pressure is at 155 psi. Pilot is not functioning properly. Building vent fan is not working. Down time: None.
7/12/2004	Pumphouse B8; Pilot is full open at 76 psi and flow rate is 135 gpm. Down time: None.
7/12/2004	Pumphouse B5; Pilot is full open at 74 psi and flow rate is 185 gpm. Down time: None.
7/12/2004	Pumphouse B6; Pressure is at 58 psi and flow rate is at 224 gpm. Down time: None.
7/13/2004	Pumphouse B13; Pilot is full open at 108 psi and 100 gpm. Dead head pressure is at 127 psi. Lowered the water level sensor 10 feet into the top of the well screen at 126 feet BTOC; Pumping water level is at 119.56 and slowly dropping. Down time: None.
7/13/2004 through 7/14/2004	Treatment Center; Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: B1 for 3 hours; B3, B5, B6, B11, SC1, SC2 and SC5 for 7 hours each and B8 for 10 hours.
7/14/2004	Pumphouse B13; Light flashing on PLC in Building 116; Upon inspection, the low level light is on and the valve will not open; Replace solenoid valve with new and valve would still not open. Flushed control piping, adjusted speed control valves and valve opened. Cycled valve and observed normal operation. Down time: 19 hours.

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7/16/2004	Pumphouses B1, B3, B6 and B11; Adjusted pressures to reduce flows to their respective target flow rates. Unable to adjust flow rate at B1. Down time: None.
7/19/2004	Pumphouse SC2; The SC2 light is flashing on PLC in Building 116; reset PLC and SC2 light relit normally. Down time: 14 hours.
7/21/2004	Treatment System; Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hours at each pumphouse.
7/21/2004	Pumphouse B5; Dead head pressure is at 170 psi initially, drifting slowly to 110 psi and holding. Pressure is at 74 psi, flow rate is at 174 gpm and the pumping water level is at 100.7' BTOC. There is a 30 HP pump and motor in the well and a size 2 starter. There are 40 amp fuses in the 480 V breaker box. Down time: None.
7/22/2004	Pumphouse SC2; Removed old flow meter and replaced with rebuilt flow meter. Down time: None.
7/22/2004	Altitude Valve; Valve is open and water is overflowing the water tower. Down time: None.
7/23/2004	Decreased flow rate at B1 to 232 gpm by closing gate valve. Down time: None.
7/23/2004	Pumphouse B3; Decreased flow rate to 170 gpm. Down time: None.
7/25/2004 and 7/26/2004	Pumphouses B3 and B4; TGRS influent pressure low at 35 psi but all pumphouse lights are lit on PLC. Upon inspection, the pumps in pumphouses B3 and B4 are not operating. Perform various troubleshooting operations, but to no avail. Contact Xcel Energy and they troubleshoot. The 480 volt power to each pumphouse is working properly. Anik on Site. Communication problem between pumphouses and PLC in Building 116. Reprogram the software and restart pumphouses B3 and B4 Down time: 41 hours at B3 and 39 hours at B4.
7/26/2004	Pumphouse B1; opened gate valve and adjusted pilot to 103 psi at 239 gpm. Likely the pilot will need to be replaced. Down time: None.

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7/26/2004 Pumphouse B6; The pumping water level is at 114.5 feet BTOC and the flow rate is at 220 gpm for a specific capacity of 4.5 GPM/foot.

Down time: None.

7/26/2004 Pumphouse B13; The pumping water level is at 117 feet BTOC and the flow rate is at 100 gpm for a specific capacity of 3.9 GPM/foot.

Down time: None.

7/26/2004 Snelling Avenue Valve; Effluent pressure is high; dismantle valve control piping, clean piping and reassemble. Adjust pilot to a valve pressure of 35 psi and observed normal

Down time: None.

7/27/2004 Pumphouse B13; Measured flow rate is at 105 gpm, the pumping water level is at 117.65 feet BTOC and the static water level is approximately 91.8 feet BTOC which equates to a specific capacity of 4.0 GPM/foot.

Down time: None.

7/29/2004 Pumphouse B13; The light is out at the PLC in Building 116 and the low level light is on in the pumphouse. Temporarily bypassed the low level sensor and restarted the pumphouse.

Down time: 12 hours.

August 2004

8/5/2004 Pumphouse B5; Lower flow rate than expected; Pumping water level is at 103.6' btoc; flow rate is at 170 gpm; Lower level probe is at 123' btoc and the pump inlet is at 135' btoc; There is a gurgling sound from inside the well and a high pitched rattling noise. Contacted Laughlin Electric to inspect starter for upgrade and All Enviro for troubleshooting work on pump and or lift system.

Down time: None.

8/5/2004 Pumphouse B11; Increased flow rate to 100 gpm.

Down time: None.

8/6/2004 Treatment System; ECV 3 will not open on command; flushed control piping and adjusted opening and closing speed valves and observed normal operation.

Down time: None.

8/9/2004 Treatment System; Blower 2 threw a belt; Replaced with new.

Down time: None.

8/10/2004 Pumphouse B5; Shut down to pull pump and inspect lift system; Replaced pump (wet end) and the 2 bottom sticks of pipe with new.

Down time: 4.5 hours.

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MAINTENANCE ACTIVITIES
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8/13/2004	Altitude Valve; Tower at 20.5', opened valve in "Hand", to raise the water elevation in the tank. Rick to close the valve around 30'. Down time: None.
8/18/2004	Pumphouses B1, B3, B5 and B11; Adjusted flow rates to target rate. Down time: None.
8/19/2004	Pumphouse SC5; Changed out flow meter body with new. The same totalizer was used. Down time: None.
8/22/2004	Treatment System; Potable system alarm, RTU 1 communication fail, acknowledged alarm, now normal. Down time: None.
8/22/2004	Treatment System; Potable system alarm, RTU 1 comm fail, aknowledged alarm and notified Rick Boyer via cell phone message. Down time: None.
8/24/2004 through 8/25/2004	Pumphouses B1 and B13; Lights are lit on PLC but the pumps are off. Switched out the I/O communication cards in pumphouse control panels. Switched pumps to hand and contacted Anik. Anik cleared the faults and reset the appropriate communication module. Down time: B1 and B13 for 6 hours each.
8/27/2004	Pumphouse SC2; Increased flow rate to 37 gpm; Pumping water level is 137.6 feet BTOC. Down time: None.
8/30/2004	Valve 3 flashing red on PDU, checked valve, valve stem stuck in open position, ordered new microswitch and will replace upon arrival. Down time: None.
8/30/2004	Pumphouse B5; Laughlin Electric removed and replaced old size 2 starter with a new size 3 starter. Down time: 0.5 hours.

September 2004

9/3/2004	Pumphouse SC2; Light flashing on PLC in Building 116; Trending reads pump start and stop beginning at 10 AM today; Reset PLC but SC2 continues flashing; Upon inspection of pumphouse, reset "H-O-A" switch to "Auto", flushed ECV control piping and observed normal operation. Down time: 2 hours.
9/3/2004	Altitude Valve; Turned altitude valve to open in "Hand" to fill water tower from 20.1' to 34.6'. Then turned altitude valve back to "Auto". Down time: None.

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9/8/2004	Treatment System; ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new. Down time: 4 hours at SC2 and 1.5 hours at B13, B3, B4 and B8.
9/8/2004	Pumphouse B13; Installed 126 feet of water level sensor wire with new probe in well to cycle the pump at 126 feet. Current pumping water level is at 114.2' BTOC. Down time: None.
9/13/2004	Treatment System, Snelling Avenue Valve and Well Field ; Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours at treatment system and well field.
9/16/2004	Pumphouse B5, Increased flow rate from 209 gpm to 217 gpm. Down time: None.
9/19/2004	Treatment System; ECV 4 flashing on PDU; Valve will not open on command; Flushed control piping and adjusted opening and closing control valves. Cycled valve on and off and observed normal operation. Down time: None.
9/19/2004	Treatment System; Low groundwater storage reservoir alarm on; Acknowledged alarm and informed Rick Boyer. Down time: None.
9/20/2004	Treatment System; ECV 4 flashing on PDU; Valve will not open on command; Changed filter on ECV and observed normal operation. Down time: None.
9/21/2004	Elevated Storage Tank; Water level is low at 23.2 feet; Opened altitude valve to fill; closed altitude valve at 35 feet. Reset autodialer. Down time: None.
9/27/2004	Tower at 44.6', recycle valve hand open, 1440 at 38', below alarm, closed valve. Down time: None
9/27/2004	Elevated Storage Tank; Tower is at 44.6' and alarm is on; Set recycle valve to hand open to drain; Closed valve at 38', below the alarm level. Down time: None.
9/28/2004 through	Pumphouse SC2; Heavy coating of maganese sludge on flow meter causing flow meter to read 9 GPM too fast; Replaced flow meter with new from inventory. Down time: 12 hours.

F.3 Maintenance Activities by Location, Fiscal Year 2004, TGRS, TCAAP

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse B1

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours
11/6/2003	Elevated tank; Copper tubing leading from in-line filter to solenoid failed. Down time: 1.5 hours
11/9/2003	Altitude valve; Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok. Down time: 1.5 hours
11/21/2003	Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 4 hours
1/19/2004	Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter. Down time: None.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 7.5 hours
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking Down Time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
4/23/2004	Pumphouses B13 and SC2; Eric Hanson (Laughlin Electric) on site for Annual Inspection. Xcel energy on site to disconnect power at B13. Down time: 3 hours
5/10/2004	Dead head pressure is at 124 psi. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 38 hours
7/7/2004 and 7/8/2004	Pump turned off to pull lift system and replace the pump (wet end) with a new stainless steel pump. Down time: 23 hours.
7/9/2004	Pumping water level is at 91.3' BTOC. Static water level is at 79.3' and the flow rate is at 260 gpm. Decreased flow rate to 235 gpm. Down Time: None.
7/12/2004	Decreased flow rate to 235 gpm; Dead head pressure is at 155 psi. Pilot is not functioning properly. Building vent fan is not working. Down time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 3 hours
7/16/2004	Adjusted pressure to reduce flow to target flow rate. Unable to adjust flow rate at B1. Down time: None.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily Down time: 0.5 hour
7/23/2004	Decreased flow rate at B1 to 232 gpm by closing gate valve. Down time: None.
7/26/2004	Opened gate valve and adjusted pilot to 103 psi at 239 gpm. Likely the pilot will need to be replaced. Down time: None.
8/18/2004	Adjusted flow rates to target rate. Down time: None.
8/24/2004 through 8/25/2004	Lights are lit on PLC but the pumps are off. Switched out the I/O communication cards in pumphouse control panels. Switched pumps to hand and contacted Anik. Anik cleared the faults and reset the appropriate communication module. Down time: 6 hours

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MAINTENANCE ACTIVITIES BY LOCATION
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/13/2004 Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4.

Down time: 2.5 hours

Pumphouse B3

10/1/2003 TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours

10/2/2003 Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours

11/21/2003 Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new.

Down time: 10 hours

12/9/2003 Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field.

Down time: 4 hours

1/19/2004 Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter.

Down time: None.

1/31/2004 Snelling Avenue Valve pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation.

Down time:10.5 hours

2/6/2004 Replaced leaking valve between the saddle tap and pressure gauge.

Down time: None

2/6/2004 through 2/9/2004 Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new.

Down time: 71 hours

2/9/2004 B3 electric check valve contained trapped air. Flushed several times and reset.

Down time: Down time is already accounted for from time down for ECV 3 failure.

2/18/2004 Increased forcemain pressure from 130 psi to 134 psi to slow flow rate to 170 gpm.

Down time: None.

2/19/2004 Increased forcemain pressure from 134 psi to 136 psi to slow flow rate to 170 gpm.

Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 3 hours
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
4/23/2004	Pumphouses B13 and SC2; Eric Hanson (Laughlin Electric) on site for Annual Inspection. Xcel energy on site to disconnect power at B13. Down time: 3 hours
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 46 hours
7/12/2004	Decreased flow rate to 170 gpm. Down Time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/16/2004	Adjusted pressure to reduce flow to target flow rate. Down time: None.
7/21/2004	Treatment System; Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hour
7/23/2004	Decreased flow rate to 170 gpm. Down time: None.
7/25/2004 and 7/26/2004	TGRS influent pressure low at 35 psi but all pumphouse lights are lit on PLC. Upon inspection, the pumps in pumphouses B3 and B4 are not operating. Perform various troubleshooting operations, but to no avail. Contact Xcel Energy and they troubleshoot. The 480 volt power to each pumphouse is working properly. Anik on Site. Communication problem between pumphouses and PLC in Building 116. Reprogram the software and restart pumphouses B3 and B4. Down time: 41 hours
8/18/2004	Adjusted flow rates to target rate. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/8/2004 ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new.

Down time: 1.5 hours

9/13/2004 Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4.

Down time: 2.5 hours

Pumphouse B4

10/1/2003 TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours

10/2/2003 Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours

11/9/2003 Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok.

Down time: 1.5 hours

11/21/2003 Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new.

Down time: 10 hours

12/9/2003 Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field.

Down time: 4 hours

1/19/2004 Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter.

Down time: None.

1/31/2004 Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation.

Down time: 7.5 hours

2/26/2004 Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking

Down Time: None.

3/1/2004 15 minute sand test performed; four to five grains of sand produced.

Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/17/2004	Replaced wet end of pump. Deadhead pressure is at 138 psi. Down time: 8.5 hours.
4/19/2004	Water level is at 74.7 feet and the pressure is at 93 psi. Down time: None.
4/20/2004	Shut down to perform annual maintenance. Down time: 5 hours
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 38 hours
7/12/2004	Pilot is full open at 90 psi and flow rate is at 186 gpm. Down Time: None.
7/21/2004	Treatment System; Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hour
7/25/2004 and 7/26/2004	TGRS influent pressure low at 35 psi but all pumphouse lights are lit on PLC. Upon inspection, the pumps in pumphouses B3 and B4 are not operating. Perform various troubleshooting operations, but to no avail. Contact Xcel Energy and they troubleshoot. The 480 volt power to each pumphouse is working properly. Anik on Site. Communication problem between pumphouses and PLC in Building 116. Reprogram the software and restart pumphouses B3 and B4. Down time: 39 hours
9/8/2004	ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new. Down time: 1.5 hours
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

Pumphouse B5

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/30/2003	ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings. Down time: 3 hours
12/31/2003	Recent B5 meter readings show a gradual rate of decline. Compared meter rate with new calibrated meter and old meter was reading accurately. Down time: None.
1/6/2004	Flow rate decreasing; Flushed control piping and adjusted pilot; lowered pressure from 88 psi to 80 psi and increased the flow rate. Down time: 7 hours.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 7.5 hours
2/19/2004	Decreased forcemain pressure from 86 psi to 75 psi to increase flow rate from ~190 gpm to 215 gpm. Down time: None.
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking Down Time: None.
3/29/2004	Shut down and attempted to repair the electric check valve, however the problem is in the valve body and the part will have to be ordered. The valve was reassembled and the pump was restarted. Down time: 4 hours.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
4/25/2004 and 4/26/2004	B5 light flashing on PLC in Building 116. The well is cycling and the low level indicator is on; Increased the pressure from 72 to 74 psi. Lowered the water level sensor to 121 feet. Restarted the pump and observed normal operation. Down time: 34 hours.
5/24/2004	Pumphouse B5; Replace body of ECV. Down time: 3 hours.
5/25/2004	Pumphouse B5; Measured flow rate with stop watch at 193.5 gpm Down time: None.
5/27/2004	Decreased pressure from 73 psi to 70 psi to increase flow rate to 200 gpm. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

6/7/2004	B5 ECV is full open at approximately 200 GPM. Down time: None.
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 38 hours
7/12/2004	Pilot is full open at 74 psi and flow rate is 185 gpm. Down time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily Down time: 0.5 hours
7/21/2004	Dead head pressure is at 170 psi initially, drifting slowly to 110 psi and holding. Pressure is at 74 psi, flow rate is at 174 gpm and the pumping water level is at 100.7' BTOC. There is a 30 HP pump and motor in the well and a size 2 starter. There are 40 amp fuses in the 480 V breaker box. Down time: None.
8/5/2004	Lower flow rate than expected; Pumping water level is at 103.6' btoc; flow rate is at 170 gpm; Lower level probe is at 123' btoc and the pump inlet is at 135' btoc; There is a gurgling sound from inside the well and a high pitched rattling noise. Contacted Laughlin Electric to inspect starter for upgrade and All Enviro for troubleshooting work on pump and or lift system. Down time: None.
8/10/2004	Shut down to pull pump and inspect lift system; Replaced pump (wet end) and the 2 bottom sticks of pipe with new. Down time: 4.5 hours.
8/18/2004	Adjusted flow rates to target rate. Down time: None.
8/30/2004	Laughlin Electric removed and replaced old size 2 starter with a new size 3 starter. Down time: 0.5 hour
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/16/2004 Increased flow rate from 209 gpm to 217 gpm.

Down time: None.

Pumphouse B6

10/1/2003 TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours

10/2/2003 Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours

10/26/2003 B6 light flashing at PLC. Reset PLC and B6 fully operational.

Down time: 8 hours.

10/29/2003 B6 light flashing at PLC. Reset PLC and B6 fully operational.

Down time: 20 hours.

11/3/2003 B6 flashing on well field panel, reset well field and observed normal operation.

Down time: 14 hours.

11/9/2003 Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok.

Down time: 1.5 hours

11/17/2003 B6 light flashing on PLC; Reset PLC and B6 light relit normally.

Down time: 11 hours.

11/21/2003 Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new.

Down time: 10 hours

12/9/2003 Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field.

Down time: 4 hours

12/13/2003 B6 light flashing on PLC. Reset PLC and B6 relit normally.

Down time: 17 hours.

12/30/2003 ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings.

Down time: 2 hours

1/2/2004 B6 flashing on well field panel; reset well field panel and observed normal operation.

Down time: 24 hours.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/6/2004	B6 flashing on well field panel; reset well field panel and observed normal operation. Down time: 29 hours.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 10.5 hours
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 55 hours
2/7/2004	Pumphouses B13, B6 and SC2. Wells are cycling on and off; Attempted to reset well field and I/O cards in pumphouses but wells continue to cycle due to ECV 3 failure. Down time: Down time is already accounted for from time down for ECV 3 failure.
2/18/2004	Treatment System; Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking Down Time: None.
3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 3 hours
4/2/2004	Hans (Anik) measures B6 current to the pump. All volts and amps are within the proper ranges. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
4/23/2004	B6 light flashing on PLC in Building 116; Well is cycling; Reset PLC and observed normal operation. Down time: 3 hours.
5/3/2004	Trending in Building 116 indicates pumps in B6 and B13 started and stopped earlier today. Down time: None.
5/4/2004	Dead head pressure is at 129 psi. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

5/25/2004	Water level is at 153.7 feet btoc. Down time: None.
5/26/2004	Treatment System; Redi Clean chemicals for B6 development arrived. Temporarily stored on Building 116 containment pad. Down time: None.
6/2/2004	Decreased pressure and increased flow rate to 175 GPM. Down time: None.
6/28/2004 through	Pump turned off at 10:00 AM for redevelopment. Down time: 47.5 hours.
6/29/2004	Treatment System and Well Field; TGRS turned off to upgrade PDUs in Building 116. Down time: B6 already down for redevelopment.
7/2/2004	B6 redevelopment work complete and B6 turned on at 12:12 PM; Dead head pressure is at 125 psi; Maximum flow rate is at 228 gpm and the pumping water level is at 133.8 feet. Set flow to 220 gpm with a PWL at 129.05 feet. Down Time: 52 hours.
7/7/2004	Pumping water level is at 121' BTOC. Static water level is at 65.87 and the flow rate is at 220 gpm. Down Time: None.
7/9/2004	Pumping water level is at 120.25' BTOC. Static water level is at 65.87 and the flow rate is at 221 gpm. Down Time: None.
7/12/2004	Pressure is at 58 psi and flow rate is at 224 gpm. Down time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/16/2004	Adjusted pressure to reduce flow to target flow rate. Down time: None.
7/21/2004	Treatment System; Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hours
7/26/2004	The pumping water level is at 114.5 feet BTOC and the flow rate is at 220 gpm for a specific capacity of 4.5 GPM/foot. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/13/2004 Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4.

Down time: 2.5 hours

Pumphouse B8

10/1/2003 TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours

10/2/2003 Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours

11/9/2003 Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok.

Down time: 1.5 hours

11/21/2003 Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new.

Down time: 10 hours

12/9/2003 Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field.

Down time: 6 hours

12/30/2003 ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings.

Down time: 2 hours

1/31/2004 Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation.

Down time: 10.5 hours

2/6/2004 through 2/9/2004 ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new.

Down time: 71 hours

2/14/2004 TGRS fail; 1130 call from the auto dialer. 1240, on site ECV#2 not opening on start up, adjusted control valve, now normal, reset well field panel system up, conduct DI

Down time: 1 hour

2/18/2004 Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings.

Down time: 2 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 6.5 hours
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down time: 46 hours
7/12/2004	Pilot is full open at 76 psi and flow rate is 135 gpm. Down time: None.
7/13/2004 through	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open. 3-way solenoid with new and observe normal operation. Down time: 10 hours.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hours
9/8/2004	ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new. Down time: 1.5 hours
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

Pumphouse B9

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours
11/21/2003	Flow meter failed, replaced with new; adjusted previous days flow rates accordingly. Restarted pumphouse at 15:10 with meter reading at zero. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 7.5 hours
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 68 hours
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking Down Time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 38 hours
7/11/2004	Light off on PLC in Building 116; 110 volt fuse blown in disconnect; replace with new and restart pump. Down Time: 14 hours.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hour
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

Pumphouse B11

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

11/9/2003	Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok. Down time: 1.5 hours
11/21/2003	Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 6 hours
12/30/2003	ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings. Down time: 2 hours
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 10.5 hours each.
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 71 hours
2/14/2004	TGRS fail; 1130 call from the auto dialer. 1240, on site ECV#2 not opening on start up, adjusted control valve, now normal, reset well field panel system up, conduct DI. Down time: 1 hour
2/18/2004	Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours
2/20/2004 through 2/23/2004	Pumphouses B11 and SC1; Lights not lit on PLC; 3 phase power failure near B11 (connection for one of the 3 lines was off on transformer pole). Contacted Laughlin Electric and Xcel to repair and 3 phase power was restored. SC-1 pump stopped because the I/O card at B11 was not active and it is paired with the SC1 card. Down time: 88 hours
2/26/2004	Valve position tests, full open B1, B4, B5, B6, B9, B11. B4 dead head pressure, 118 psi. B5, valve diaphram leaking. Down time: None
3/4/2004	Attemped to increase the flow rate at B11, but the pilot is at full open. Replaced the pilot with a new pilot but the pumping rate remained the same at 80 gpm. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 6.5 hours
4/7/2004	Removed existing water flow meters and replaced with cleaned and calibrated flow meters. The new B11 flow meter was installed at 2:14 pm and read 6915836. The flow rates are calculated on the March spreadsheet. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
5/10/2004	The electrical control panel has a 30 Amp disconnect with size 2 coil. Down time: None.
6/29/2004	Treatment System and Well Field; TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	Treatment System; System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 46 hours.
7/6/2004 through 7/8/2004	Pump turned off to pull lift system and replace the pump (wet end only). Down time: 47 hours.
7/12/2004	Adjusted flow rate to 90 gpm at 104 psi. Down Time: None.
7/13/2004 through 7/14/2004	Treatment Center; Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/16/2004	Adjusted pressure to reduce flow to target flow rate. Down time: None.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hour
8/5/2004	Pumphouse B11; Increased flow rate to 100 gpm. Down time: None.
8/18/2004	Adjusted flow rates to target rate. Down time: None.

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MAINTENANCE ACTIVITIES BY LOCATION
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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/13/2004 Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4.

Down time: 2.5 hours

Pumphouse B13

10/1/2003 TGRS down to complete repairs on inner seal of altitude valve.

Down time: 30 hours

10/2/2003 Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close.

Down time: 11 hours

11/21/2003 Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new.

Down time: 10 hours

12/9/2003 Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field.

Down time: 4 hours

12/10/2003 Compared the existing meters flow rates with that of a calibrated meter. B13's meter was reading high by 15%. Replaced B13's meter with the meter used for calibration. The new meter at B13 began at 1000 gallons and was started at 16:15.

Down time: None, adjusted previous December flow rates accordingly.

12/30/2003 ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings.

Down time: 4 hours

1/19/2004 Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter.

Down time: None.

1/31/2004 Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation.

Down time: 6.5 hours

2/7/2004 Pumphouses B13, B6 and SC2. Wells are cycling on and off; Attempted to reset well field and I/O cards in pumphouses but wells continue to cycle due to ECV 3 failure.

Down time: Down time is already accounted for from time down for ECV 3 failure.

2/6/2004 through 2/9/2004 Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new.

Down time: 60 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/9/2004	Increased pressure to 126 psi to reduce flow rate because the pump was cavitating. Down time: None.
2/18/2004	Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours
3/2/2004	Pump is cycling, low level light is on and pump is off; Increased pressure to 125 psi to slow flow rate; Restarted pump and observed normal operation. Down time: 13 hours.
3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 4.5 hours
4/7/2004	Removed existing water flow meters and replaced with cleaned and calibrated flow meters. The new B13 flow meter was installed at 3:31 pm and read 14659704. The flow rates are calculated on the March spreadsheet. Down time: None.
4/20/2004	Shut down to perform annual maintenance. Down time: 5 hours
4/23/2004	Eric Hanson (Laughlin Electric) on site for Annual Inspection. Xcel energy on site to disconnect power at B13. Down time: 3 hours
5/3/2004	Trending in Building 116 indicates pumps in B6 and B13 started and stopped earlier today. Down time: None.
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 46 hours
7/6/2004 through 7/7/2004	Pump turned off to pull lift system, acid treat the well, surge the well screen, chlorinate the well and replace the pump (wet end only) with a new pump. Down time: 43 hours.
7/9/2004	Pumping water level is at 117.5' BTOC. Static water level is at 91.8' and the flow rate is at 87 gpm. Down Time: None.

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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/13/2004 Pilot is full open at 108 psi and 100 gpm. Dead head pressure is at 127 psi. Lowered the water level sensor 10 feet into the top of the well screen at 126 feet BTOC; Pumping water level is at 119.56 and slowly dropping.

Down time: None.

7/14/2004 Light flashing on PLC in Building 116; Upon inspection, the low level light is on and the valve will not open; Replace solenoid valve with new and valve would still not open. Flushed control piping, adjusted speed control valves and valve opened. Cycled valve and observed normal operation.

Down time: 19 hours.

7/21/2004 Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily
Down time: 0.5 hour

7/26/2004 The pumping water level is at 117 feet BTOC and the flow rate is at 100 gpm for a specific capacity of 3.9 GPM/foot.

Down time: None.

7/27/2004 Measured flow rate is at 105 gpm, the pumping water level is at 117.65 feet BTOC and the static water level is approximately 91.8 feet BTOC which equates to a specific capacity of 4.0 GPM/foot.

Down time: None.

7/29/2004 The light is out at the PLC in Building 116 and the low level light is on in the pumphouse. Temporarily bypassed the low level sensor and restarted the pumphouse.

Down time: 12 hours.

8/24/2004 through 8/25/2004 Lights are lit on PLC but the pumps are off. Switched out the I/O communication cards in pumphouse control panels. Switched pumps to hand and contacted Anik. Anik cleared the faults and reset the appropriate communication module.

Down time: 6 hours

9/8/2004 Treatment System; ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new.

Down time: 1.5 hours

9/8/2004 Installed 126 feet of water level sensor wire with new probe in well to cycle the pump at 126 feet. Current pumping water level is at 114.2' BTOC.

Down time: None.

9/13/2004 Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4.

Down time: 2.5 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Pumphouse

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours
11/9/2003	Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok. Down time: 1.5 hours
11/21/2003	Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 6 hours
12/30/2003	ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings. Down time: 2 hours
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 68 hours
2/14/2004	TGRS fail; 1130 call from the auto dialer. 1240, on site ECV#2 not opening on start up, adjusted control valve, now normal, reset well field panel system up, conduct DI Down time: 1 hour
2/18/2004	Treatment System; Call from Time Communications-TGRS fail; PDU 3-major fault, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours
2/20/2004 through 2/23/2004	Lights not lit on PLC; 3 phase power failure near B11 (connection for one of the 3 lines was off on transformer pole). Contacted Laughlin Electric and Xcel to repair and 3 phase power was restored. SC-1 pump stopped because the I/O card at B11 was not active and it is paired with the SC1 card. Down time: 88 hours
3/11/2004 and 3/12/2004	Light on PLC is off; Attempted to reset PLC but SC1 light remains off; performed troubleshooting tasks but to no avail; contacted Laughlin Electric and Anik for further troubleshooting; Temporarily turned pump on in "Hand" position until repairs are made. Down time: 35 hours.

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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/15/2004 through 3/20/2004	Laughlin Electric on site to troubleshoot but was unable to repair problem; Anik diagnosed the problem to be in the PLC in the pumphouse; The part was ordered and replaced and pumphouse restarted. Down time: 95 hours.
4/2/2004	Hans (Anik) inspects SC1 water level relay, which buzzes during low level. The relay will likely need to be replaced soon. We will continue to use it until it fails. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
5/21/2004	There is a knocking sound from inside the flow meter; The totalizer is not advancing and the pump is on. Removed and repaired. Down time: 7 hours.
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 46 hours
7/9/2004	The flow rate is at 28 gpm and the pressure is at 48 psi. Down Time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hour
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

Pumphouse

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours

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FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/6/2003	ECV #4 not closing; Flushed pilot to assist valve in closing. Pressure of forcemain surges when 3 and 4 shut off. Down time: 8 hours.
12/7/2003 and 12/8/2003	Flushed control piping and set backpressure to 50. Down time: 11.5 hours.
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 4 hours
12/10/2003	Compared the existing meters flow rates with that of a calibrated meter. SC2's meter was reading high by 13% and B13's meter was reading high by 15%. Cleaned SC2's meter and replaced B13's with the meter used for calibration. The new meter at B13 began at 1000 gallons and was started at 16:15. Down time: None, adjusted previous December flow rates accordingly.
12/11/2003	Power outage to source control pumphouses and altitude valve; Power line down approximately 400 feet southwest of SC2. Xcel energy responds and repairs outage. Turned pumps SC2 and SC5 on at 12:25. Down time: 11.5 hours
12/23/2003 through 12/26/2003	The light for SC2 is out on the PLC. Turned on the control power at SC3 and the SC2 light on the PLC relit normally. Down time: None.
12/27/03 through 12/28/2003	Power out to pumphouses; Xcel Energy contacted and on site; repaired problem at substation. Down time: 26 hours
1/26/2004	Adjusted flow rate down to 55 gpm @ 69 psi. Down time: None.
1/19/2004	Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter. Down time: None.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 10.5 hours
2/7/2004	Wells are cycling on and off; Attempted to reset well field and I/O cards in pumphouses but wells continue to cycle due to ECV 3 failure. Down time: Down time is already accounted for from time down for ECV 3 failure.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 51 hours
4/7/2004	Removed existing water flow meters and replaced with cleaned and calibrated flow meters. The new SC2 flow meter was installed at 2:23 pm and read 8269900. The flow rates are calculated on the March spreadsheet. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours
4/23/2004	Coil for solenoid valve failed and was replaced; Replaced the fuse in the output card as well. Down time: None.
4/23/2004	Eric Hanson (Laughlin Electric) on site for Annual Inspection. Xcel energy on site to disconnect power at B13. Down time: None
6/8/2004 through 6/9/2004	Pumphouse SC2; light is not lit on PLC in Building 116 and pump is running in pumphouse. Down time: None.
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 38 hours
7/9/2004	Pumping water level is at 136.1' BTOC. The flow rate is at 34 gpm and the pressure is at 67 psi. Down Time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/19/2004	The SC2 light is flashing on PLC in Building 116; reset PLC and SC2 light relit normally. Down time: 14 hours.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily Down time: 0.5 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/22/2004	Pumphouse SC2; Removed old flow meter and replaced with rebuilt flow meter. Down time: None.
8/27/2004	Increased flow rate to 37 gpm; Pumping water level is 137.6 feet BTOC. Down time: None.
9/3/2004	Light flashing on PLC in Building 116; Trending reads pump start and stop beginning at 10 AM today; Reset PLC but SC2 continues flashing; Upon inspection of pumphouse, reset "H-O-A" switch to "Auto", flushed ECV control piping and observed normal operation. Down time: 2 hours.
9/8/2004	Treatment System; ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new. Down time: 4 hours
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours
9/28/2004 through 9/30/2004	Heavy coating of maganese sludge on flow meter causing flow meter to read 9 GPM too fast; Replaced flow meter with new from inventory. Down time: 12 hours.

Pumphouse

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours
11/21/2003	Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 4 hours
12/11/2003	Power outage to source control pumphouses and altitude valve; Power line down approximately 400 feet southwest of SC2. Xcel energy responds and repairs outage. Turned pumps SC2 and SC5 on at 12:25. Down time: 9.5 hours

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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/27/03 through 12/28/2003	Power out to pumphouses; Xcel Energy contacted and on site; repaired problem at substation. Down time: 26 hours each.
12/29/2003	Forcemain pressure too high; flushed control piping, changed strainer screen, adjusted speed controls and reset pressure. Down time: 16 hours.
1/19/2004	Compared flow rates of existing meters with a calibrated meter. All flow meters compared closely to the calibrated meter. Down time: None.
1/26/2004	Groundwater level is at pump inlet; Adjusted flow rate down to 80 gpm @ 85 psi. Down time: 12 hours.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: 6.5 hours
2/7/2004 through 2/8/2004	Pumphouse SC5; Forcemain pressure at 116 psi; flushed electric check valve piping and adjusted pilot; Pressure dropped and stayed at 85 psi. Down time: Down time is already accounted for from time down for ECV 3 failure.
2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 51 hours
2/11/2004	Measured water level in well to determine if pumping rate could be increased. Water level is at 125 feet (2 feet above top of shroud), therefore the well is producing at its available capacity. Down time: None.
3/15/2004 through 3/26/2004	Turned off to rehabilitate the well. Down Time: 266 hours.
4/7/2004	Removed existing water flow meters and replaced with cleaned and calibrated flow meters. The new SC5 flow meter was installed at 2:57 and read 29864300. The flow rates are calculated on the March spreadsheet. Down time: None.
4/8/2004 through 4/12/2004	Opened ECV to 88 psi to increase flow rate to 100 gpm. Water level is at 129.8 feet btoc. Down time: 11 hours.

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TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/16/2004	Opened ECV to 86 psi to increase flow rate to 103 gpm. Water level is at 131.7 feet btoc. Down time: None.
4/19/2004	Replace pilot valve and adjust flow to 105 gpm. Adjust pressure to 88 psi. Water level at 129.7. Down time: 12 hours.
4/20/2004	Shut down to perform annual maintenance. Down time: 5 hours
5/27/2004 through 5/31/2004	Light is flashing on PLC; Pressure is at 80 psi and pump is cycling; increased pressure to 90 psi and lowered water level probe to top of shroud. Water level is at 127 feet. Down time: 26 hours.
6/2/2004	Decreased pressure and increased flow rate to 102 GPM. Down time: None.
6/24/2004	Light flashing on PLC. Pump is cycling due to low pumping water level. Down time: 18 hours.
6/29/2004	TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours
7/1/2004 and 7/2/2004	System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: 46 hours each.
7/9/2004	Pumping water level is at 131.5' BTOC. The flow rate is at 107 gpm and the pressure is at 85 psi. Down Time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: 7 hours
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hours
8/19/2004	Changed out flow meter body with new. The same totalizer was used. Down time: None.
9/13/2004	Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

TREATMENT SYSTEM

10/1/2003	TGRS down to complete repairs on inner seal of altitude valve. Down time: 30 hours each at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/2/2003	Blown fuse at PDU 2, replaced with new. Well field cycled during the day. Timed the open and close speed of the altitude valve at 15 seconds to open and 39 seconds to close. Down time: 11 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
11/3/2003	Call from Rick Boyer, Altitude valve not closing. Tubing flare connection to filter cartridge failed. Removed and replaced section of tubing and observed normal operation. Down time: None.
11/6/2003	Altitude valve not in "Auto mode". Place both altitude valve and recycle valve in "Auto mode". Dave Knight and US Filter on site troubleshooting the drain fail. They cleared out the drain fail light and reset the altitude valves auto open and close settings and set the altitude valve for winter operation. Down time: None.
11/9/2003	Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok. Down time: 1.5 hours at B1, B4, B6, B8, B11 and SC1.
11/16/2003	Copper tubing failed again (including Tylok fitting). All Enviro contacted and on site to troubleshoot. Reduced valve pressure and adjusted opening and closing speed. Down time: None.
11/21/2003	Blown fuse at PDU 2, well field began cycling at 15:30 on 11/20/2003; Replaced blown fuse with new. Down time: 10 hours at B1, B3, B4, B6, B8, B11, B13, SC1 and SC5
11/28/2003	Blower 3 threw a belt, replaced with new. Down time: None
12/5/2003	ECV #4 would not open on command; Flushed pilot, adjusted speed control valves and replaced filter cartridge. Adjusted snelling avenue valve to 29 psi. Observed normal operation. Down time: None.
12/6/2003	ECV #4 not closing; Flushed pilot to assist valve in closing. Pressure of forcemain surges when 3 and 4 shut off. Down time: SC2 for 8 hours.
12/9/2003	Flushed pilot and changed filter at ECV #4. PDU #3 would not close on command, well field cycling; manually adjusted ECV #3 and reset well field. Down time: 6 hours at B8, B11 and SC1, 4 hours at B1, B13, B3, B4, B6, SC2 and SC5 .

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/10/2003	Calibrated meters for wet well pumps 1 and 2; Calibration showed existing meters were reading accurately. Down time: None.
12/30/2003	ECV #2 will not close on command; All Enviro contacted and on site. Replaced pilot, changed filter, flushed control piping and adjusted valve settings. Down time: 4 hours at B13, 3 hours at B5 and 2 hours at B6, B8, B11 and SC1.
1/2/2004	ECV 1 not cycling and ECV 2 partially closed and not operating properly; Flushed control piping, changed filters and observed normal operation. Down time: None.
1/18/2004	Failed belt at blower #3; replaced with new on 1/19/2004. Down time: None.
1/26/2004	Observed ECV's 3 & 4 open normally; Altitude valve opened in 17 seconds. Down time: None.
1/29/2004	Blower 2 has airflow rate of 1,000 cfm and it typically flows at 5500 cfm; inlet piping frozen; thawed and observed normal operation. Down time: None.
1/30/2004	Compared flow rate of existing flow meters for wet well pumps 1 and 2 against a calibrated flow meter. Meter 1 was reading 12 gpm slow and meter 2 was reading 6 gpm slow. Replaced meter 1 with calibrated meter and left meter 2 in place until meter 1 can be cleaned and calibrated. The flow rates for treatment system meters 1 and 2 have been adjusted to reflect the difference for the entire month of January 2004. Down time: None.
1/31/2004	Snelling Avenue Valve; Pressure at 84 psi; Well field cycling; Reset communication 1, 2 error; Reset recycle valve drain fail light; Tower did not recycle last night; Adjusted Snelling Avenue Valve to 36 psi. Observed normal operation. Down time: B13 and SC5 for 6.5 hours each; B1, B4, B5, and B9 for 7.5 hours each; B3, B6, B8, B11 and SC2 for 10.5 hours each.
2/5/2004	PDU3 major fault; Open and shut pilot drain valve on ECV 3 several times. Normal operation with no faults observed. Down time: None
2/6/2004	Installed new leak containment shrouds around base of wet well pumps 2 and 4. Down time: None
2/6/2004	Treatment System; ECV 1 will not shut off on command; Repaired low float connection to stand pipe in wet well #2 and replaced the middle low float in WW # 1 with a new float. Down time: Down time is already accounted for from time down for ECV 3 failure.

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MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/6/2004 through 2/9/2004	Treatment System; ECV 3 will not close on command; failed seal in ECV 3; All Enviro replaced with new. Down time: 71 hours for B3, B8 and B11; 68 hours for B9 and SC1; 60 hours for B13; 55 hours for B6 and 51 hours for SC2 and SC5.
2/13/2004	Treatment System; Wet well meter 2 replaced with cleaned and calibrated meter. Down time: None, however, adjusted daily volume accordingly from 2/1-13/2004.
2/14/2004	Treatment System; Call from the auto dialer, TGRS fail. ECV 2 not opening on start up, adjusted control valve and observed normal operation. Down time: Pumphouses B8, B11 and SC1 for 1 hour each.
2/18/2004	Treatment System; Call from Time Communications-TGRS fail; Major fault at PDU 3, would not open on command; Changed filter at ECV 3; Flushed control piping and adjusted valves to proper settings. Down time: 2 hours each at B13, B6, B8, B11 and SC1
3/20/2004	Call from autodialer-TGRS Fail; Major fault at ECV 2; ECV 2 would not open on command; Well field cycling; Flushed control piping, changed filter and adjusted speed control valves. Down time: 3 hours at B3 and B6; 4.5 hours at B13 and 6.5 hours at B8 and B11.
3/24/2004	Flow meter for wet well pump 4 replaced with cleaned and calibrated flow meter, same totalizer used Down time: None.
3/29/2004	Blower #3 down due to a blown fuse. Fuse was replaced and blower running. Down time: None.
4/20/2004	Treatment system and well field; Shut down to perform annual maintenance. Down time: 5 hours at each pumphouse.
5/6/2004	WWP#3 flow meter changed out with newly cleaned meter from Munitech; Old meter was reading 1028 gpm, new meter reading 1022 gpm. New meter in line at 1605, 0 gallons on totalizer. Down time: None.
5/17/2004	Removed clog from drain between ECV 3 and ECV4. Down time: None.
5/19/2004	Building 116; Replaced "power on" light bulb at PDU 2. Down time: None.
5/19/2004	Altitude Valve; Will not close on command; Excercised ball valves 1 and 2 to close and open valve; Cycled valve from control panel two times and observed normal operation. Down time: None.
5/26/2004	Snelling Avenue Valve; Increased pressure from 15 psi to 25 psi; Changed strainer screen and flushed control piping. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

5/26/2004	Changed filter at ECV 4. Down time: None.
5/26/2004	Redi Clean chemicals for B6 development arrived. Temporarily stored on Building 116 containment pad. Down time: None.
5/26/2004	Altitude valve; Cycled valve 2 times from control panel and observed normal operation, however, valve closes in 2.5 minutes. Down time: None.
5/27/2004	Call from auto dialer "TGRS Fail". ECV 3 will not open on command; flushed control piping, adjusted open and closing speed valves and cycled valve operation two times. Observed normal operation. Down time: None.
5/28/2004	Water is leaking through the turbine shaft at wet well pump 4, tightened gland bushing. Water also leaking from pilot valve at ECV 3, tightened union. Down time: None.
6/29/2004	Treatment System and Well Field; TGRS turned off to upgrade PDUs in Building 116. Down time: 24 hours at B1, B13, B3, B4, B5, B8, B9, B11, SC1, SC2 and SC5. B6 already down for redevelopment.
7/1/2004 and 7/2/2004	Treatment System; System remains down for PDU software upgrade; Treatment system and well field restarted several times during period for testing. Down Time: B1, B4, B5, B9 and SC2 for 38 hours each; B3, B8, B11, B13, SC1 and SC5 for 46 hours
7/2/2004	Repaired tubing for airflow meter in blower #4. Down Time: None.
7/10/2004	The altitude valve "Closed" light is not working on the control panel. Down Time: None.
7/13/2004 through 7/14/2004	Call from autodialer-TGRS Fail; ECV 3 will not open on command. Well field cycling. Replace normally open, 3-way solenoid with new and observe normal operation. Down time: B1 for 3 hours; B3, B5, B6, B11, SC1, SC2 and SC5 for 7 hours each and B8 for 10 hours.
7/21/2004	Anik Systems on Site performing upgrade to PDU programming; Well field turned off during daily inspection. Down time: 0.5 hours at each pumphouse.
7/22/2004	Altitude Valve; Valve is open and water is overflowing the water tower. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/25/2004 and 7/26/2004	TGRS influent pressure low at 35 psi but all pumphouse lights are lit on PLC. Upon inspection, the pumps in pumphouses B3 and B4 are not operating. Perform various troubleshooting operations, but to no avail. Contact Xcel Energy and they troubleshoot. The 480 volt power to each pumphouse is working properly. Anik on Site. Communication problem between pumphouses and PLC in Building 116. Reprogram the software and restart pumphouses B3 and B4. Down time: 41 hours at B3 and 39 hours at B4.
7/26/2004	Snelling Avenue Valve; Effluent pressure is high; dismantle valve control piping, clean piping and reassemble. Adjust pilot to a valve pressure of 35 psi and observed normal operation. Down time: None.
8/6/2004	ECV 3 will not open on command; flushed control piping and adjusted opening and closing speed valves and observed normal operation. Down time: None.
8/9/2004	Blower 2 threw a belt; Replaced with new. Down time: None.
8/22/2004	Potable system alarm, RTU 1 communication fail, acknowledged alarm, now normal. Down time: None.
8/22/2004	Potable system alarm, RTU 1 comm fail, aknowledged alarm and notified Rick Boyer via cell phone message. Down time: None.
8/30/2004	Valve 3 flashing red on PDU, checked valve, valve stem stuck in open position, ordered new microswitch and will replace upon arrival. Down time: None.
9/8/2004	ECV 3 flashing on PDU-Valve will not open on command; Changed filter, flush control piping and adjust opening and closing speed control valves. Microswitch arm not closing all the way on valve stem. Provided a temporary fix until the microswitch can be replaced with new. Down time: 4 hours at SC2 and 1.5 hours at B13, B3, B4 and B8.
9/13/2004	Treatment System, Snelling Avenue Valve and Well Field ; Turned treatment system and well field off to replace control piping on Snelling Avenue valve. All Enviro repacked glands on wet well pumps 3 and 4. Down time: 2.5 hours at treatment system and well field.
9/19/2004	ECV 4 flashing on PDU; Valve will not open on command; Flushed control piping and adjusted opening and closing control valves. Cycled valve on and off and observed normal operation. Down time: None.
9/19/2004	Low groundwater storage reservoir alarm on; Acknowledged alarm and informed Rick Boyer. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/20/2004 ECV 4 flashing on PDU; Valve will not open on command; Changed filter on ECV and observed normal operation.

Down time: None.

ELEVATED

11/6/2003 Copper tubing leading from in-line filter to solenoid failed.

Down time: 1.5 hours at B1.

11/9/2003 Tank elevation at 46.0 feet and high level alarm activated. Copper tubing failed again. Installed a new style fitting called Tylok.

Down time: 1.5 hours at B1, B4, B6, B8, B11 and SC1.

3/24/2004 Tower level operation switched to summer mode.

Down time: None.

8/13/2004 Altitude Valve; Tower at 20.5', opened valve in "Hand", to raise the water elevation in the tank. Rick to close the valve around 30'.

Down time: None.

9/3/2004 Turned altitude valve to open in "Hand" to fill water tower from 20.1' to 34.6'. Then turned altitude valve back to "Auto".

Down time: None.

9/21/2004 Water level is low at 23.2 feet; Opened altitude valve to fill; closed altitude valve at 35 feet. Reset autodialer.

Down time: None.

9/27/2004 Elevated Storage Tank; Tower is at 44.6' and alarm is on; Set recycle valve to hand open to drain; Closed valve at 38', below the alarm level.

Down time: None

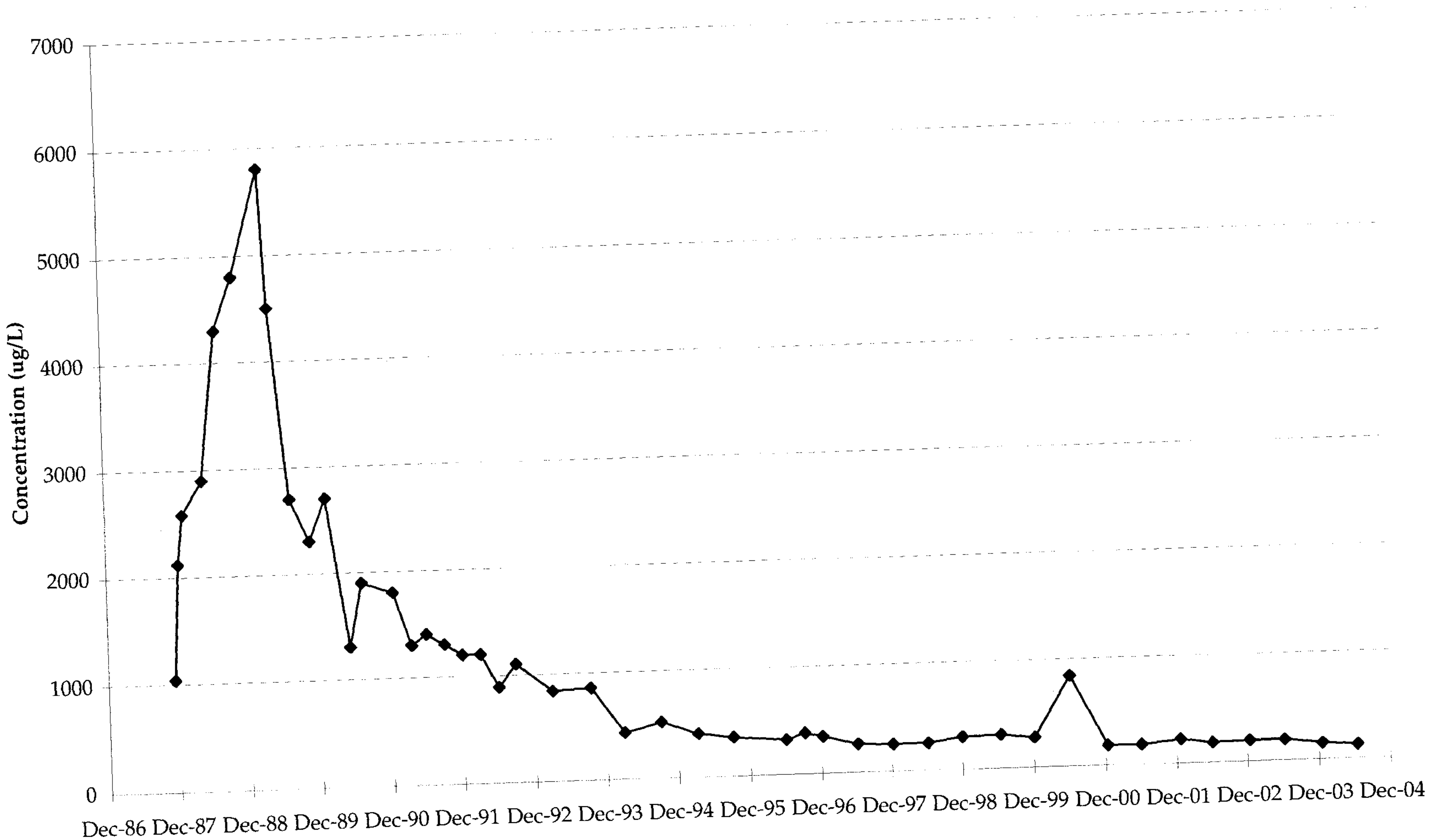
Appendix G

TGRS Chemical Data

G.1 TGRS Extraction Wells – TRCLE Versus Time

APPENDIX G-1

EXTRACTION WELL B1 - TRCLE VS.TIME

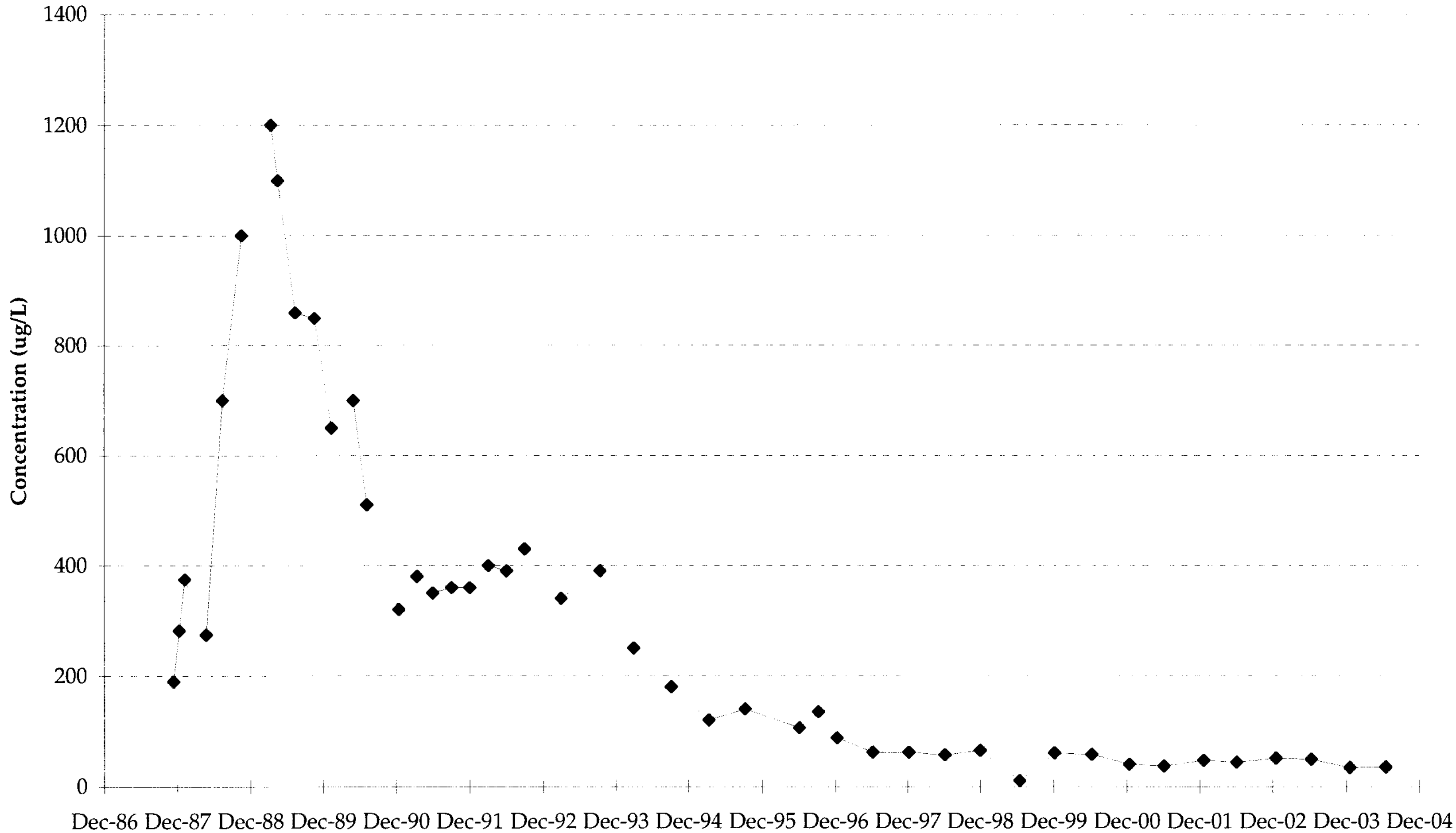


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B2 - TRCLE VS. TIME

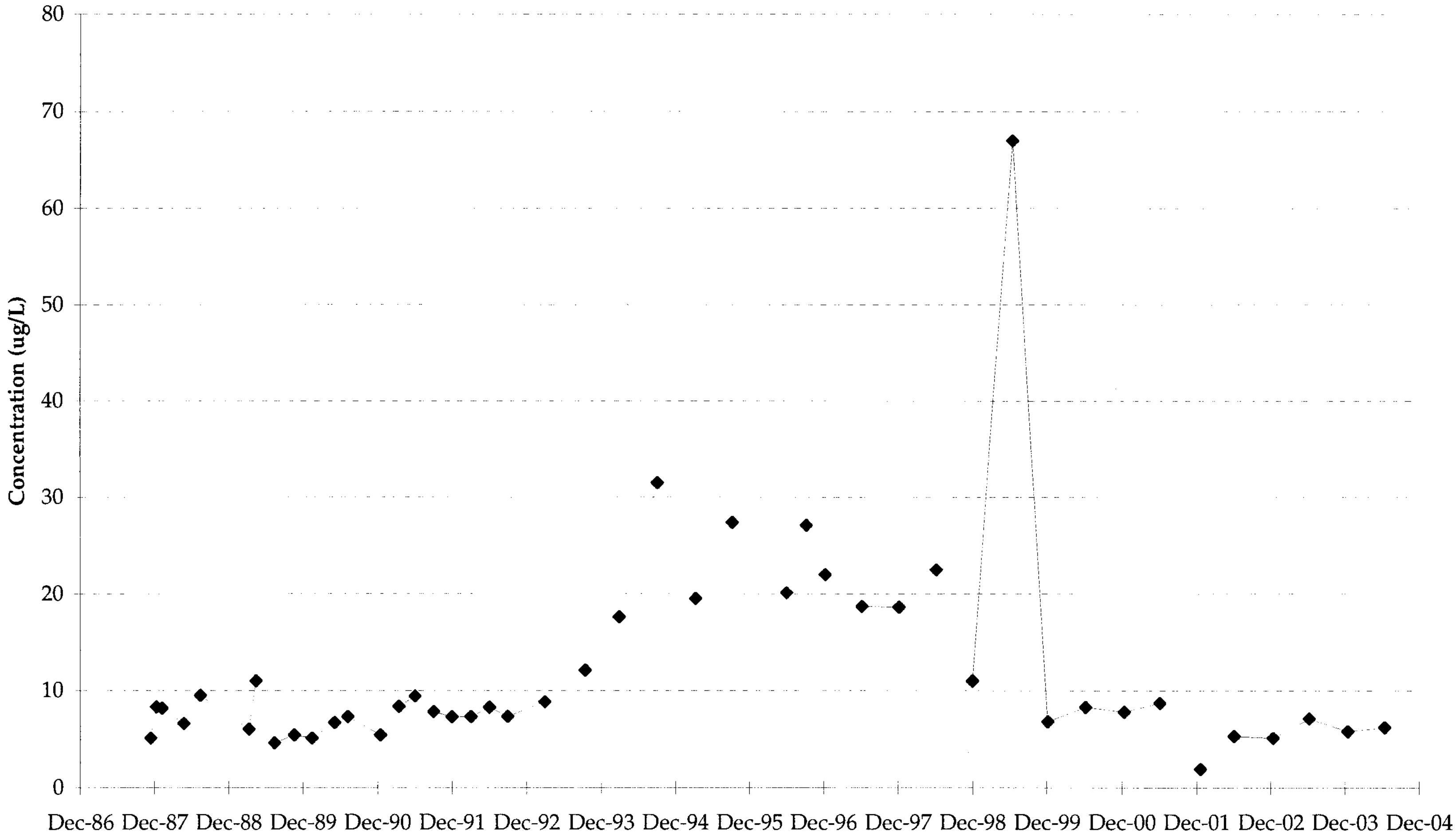


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B3 - TRCLE VS. TIME

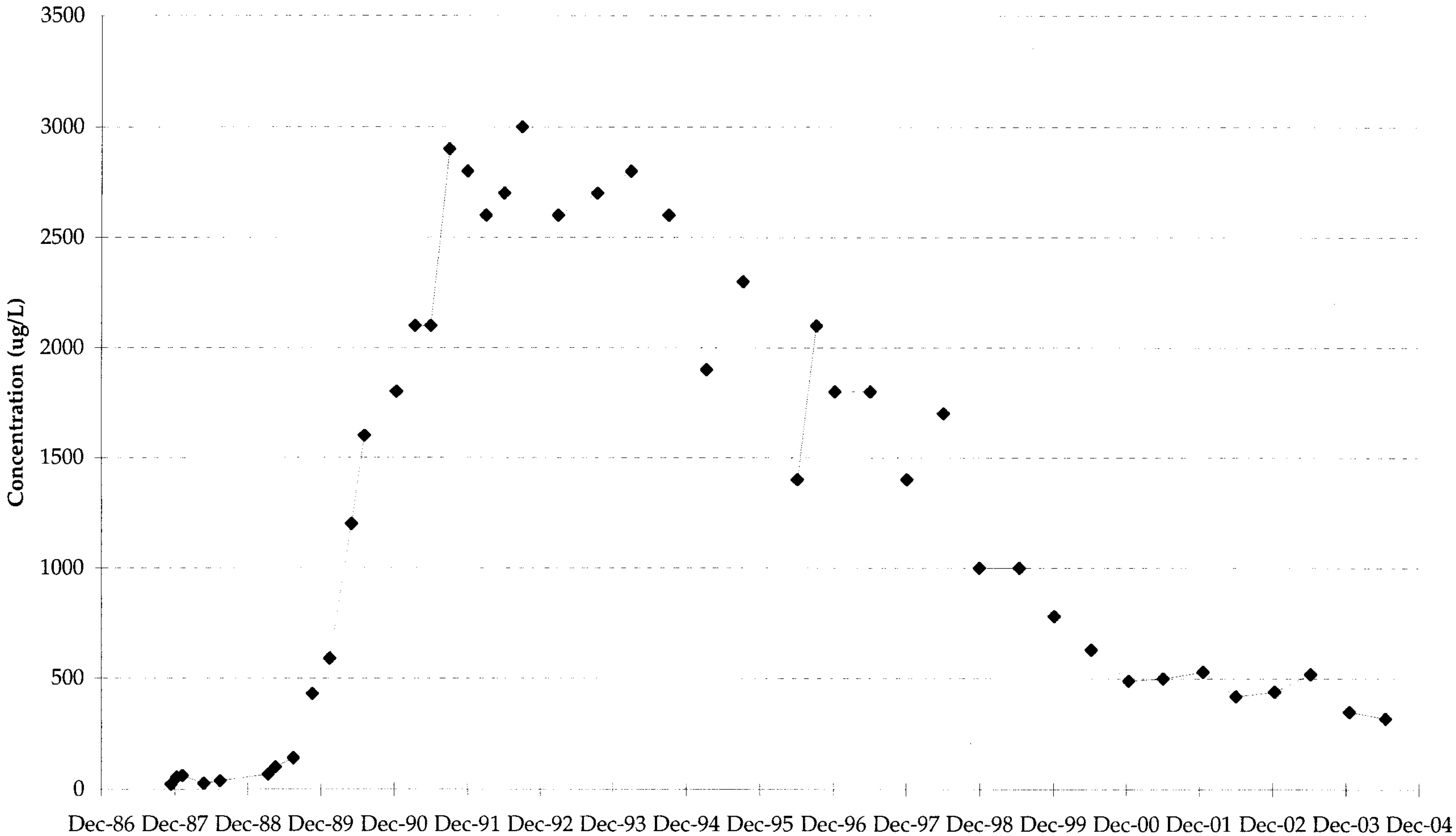


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

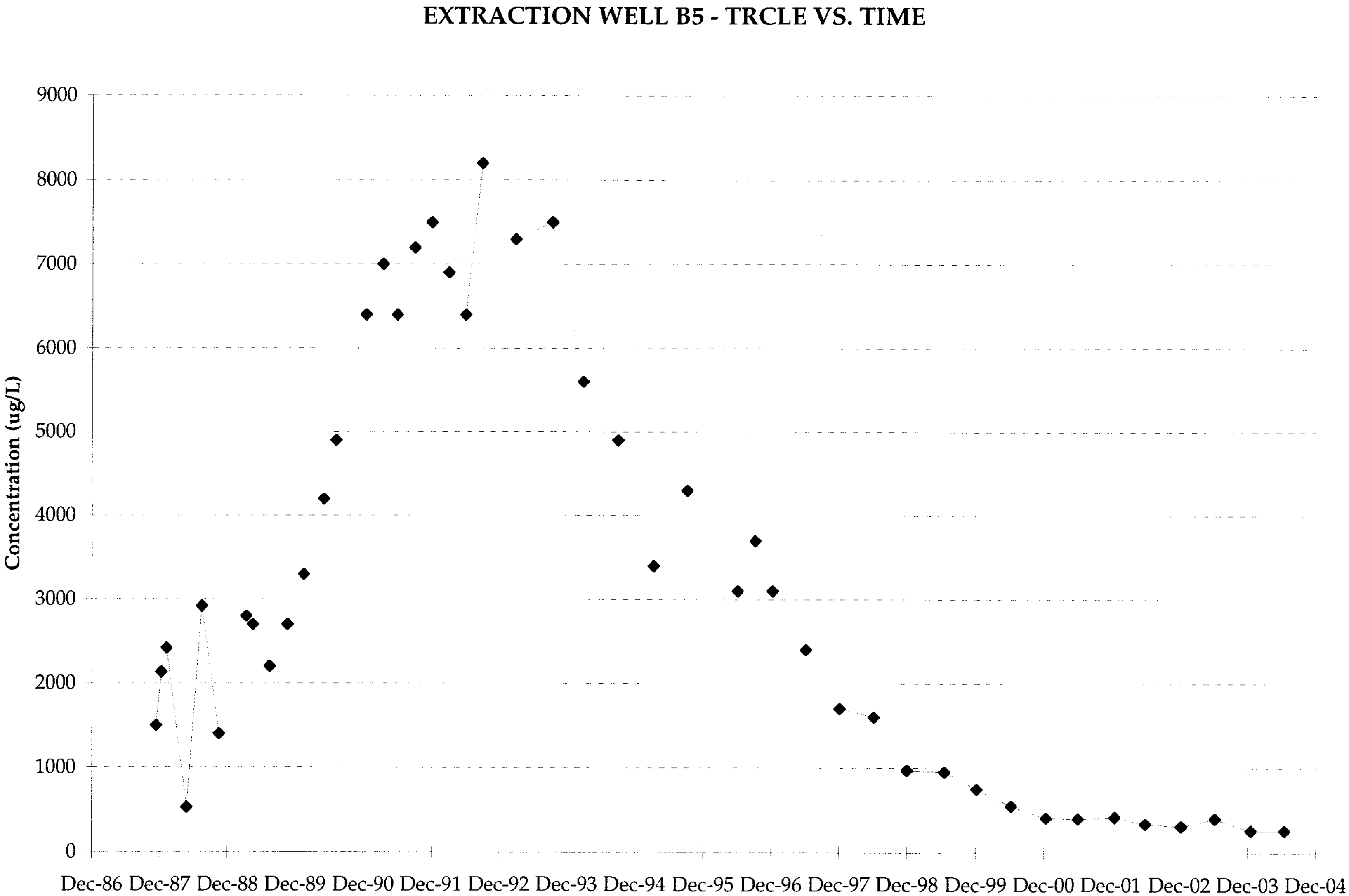
EXTRACTION WELL B4 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

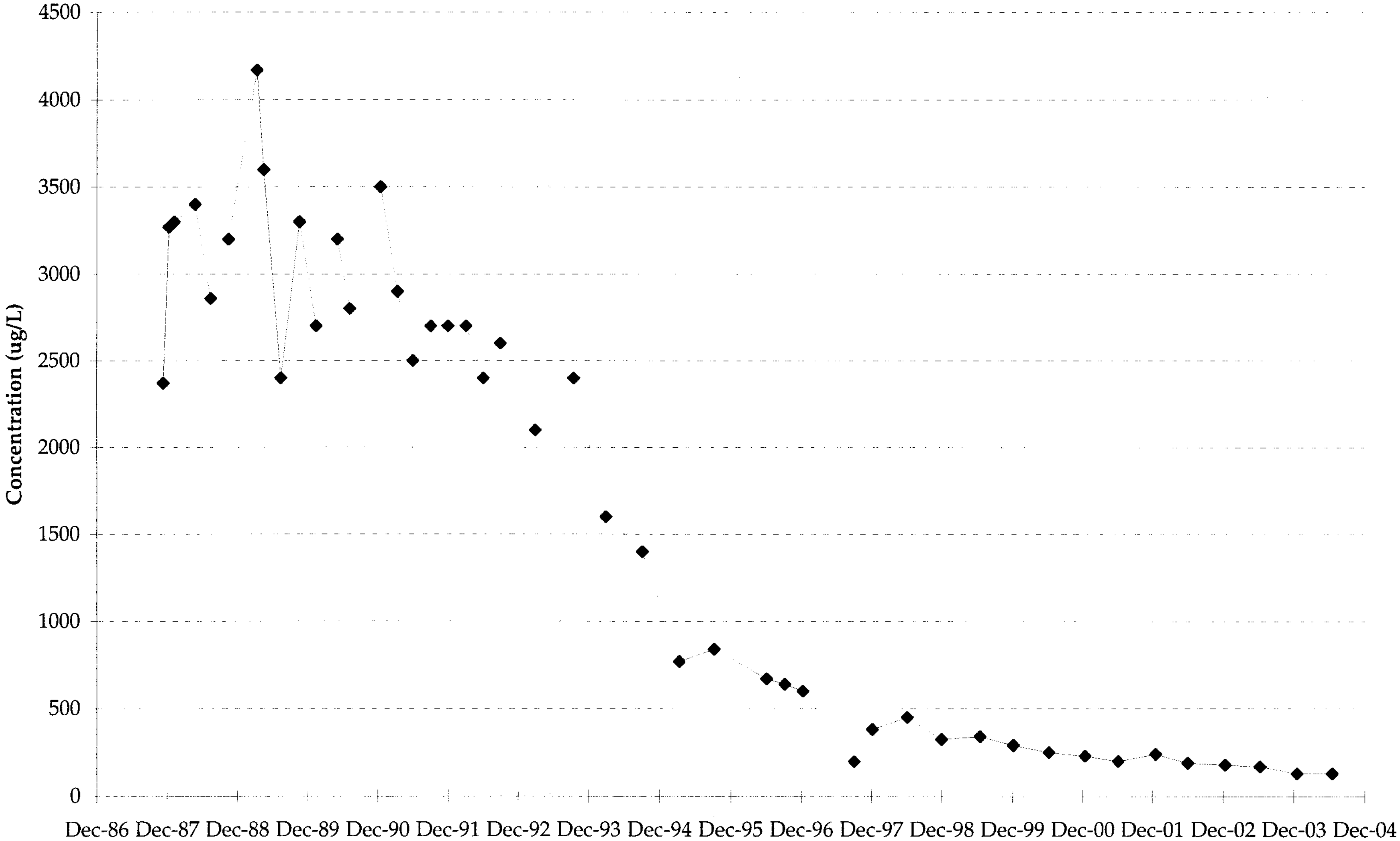


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

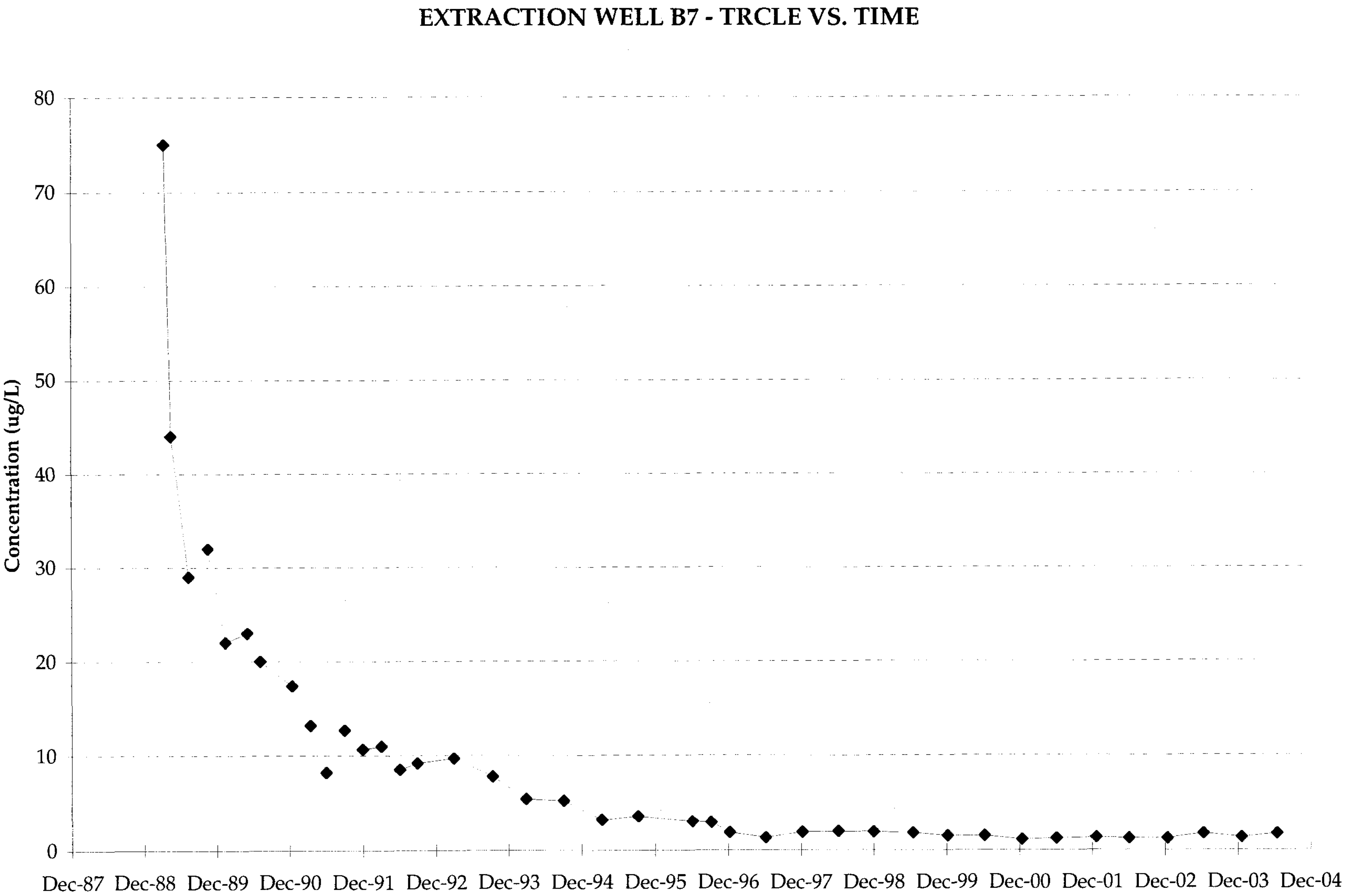
EXTRACTION WELL B6 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

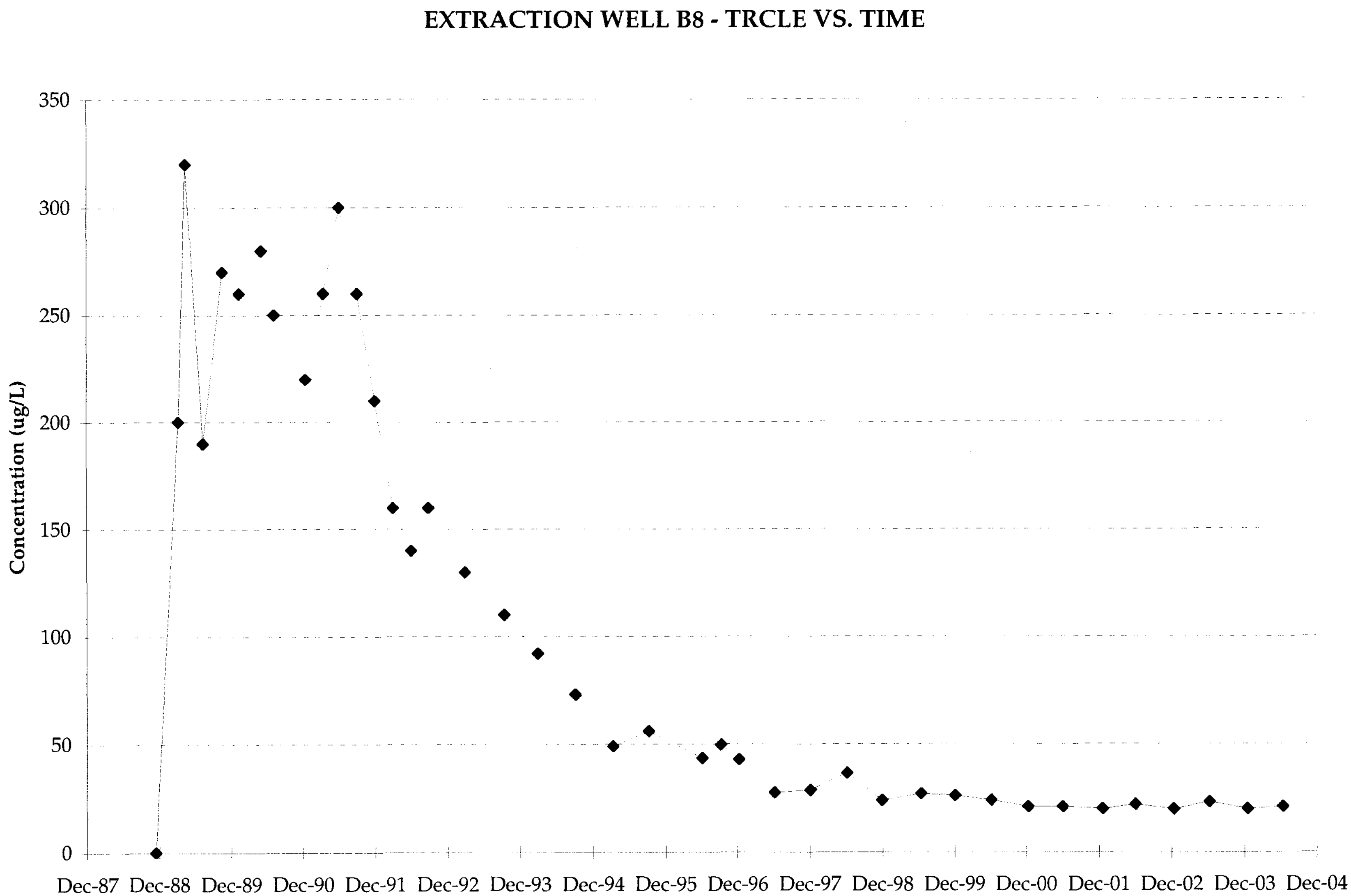
APPENDIX G-1



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

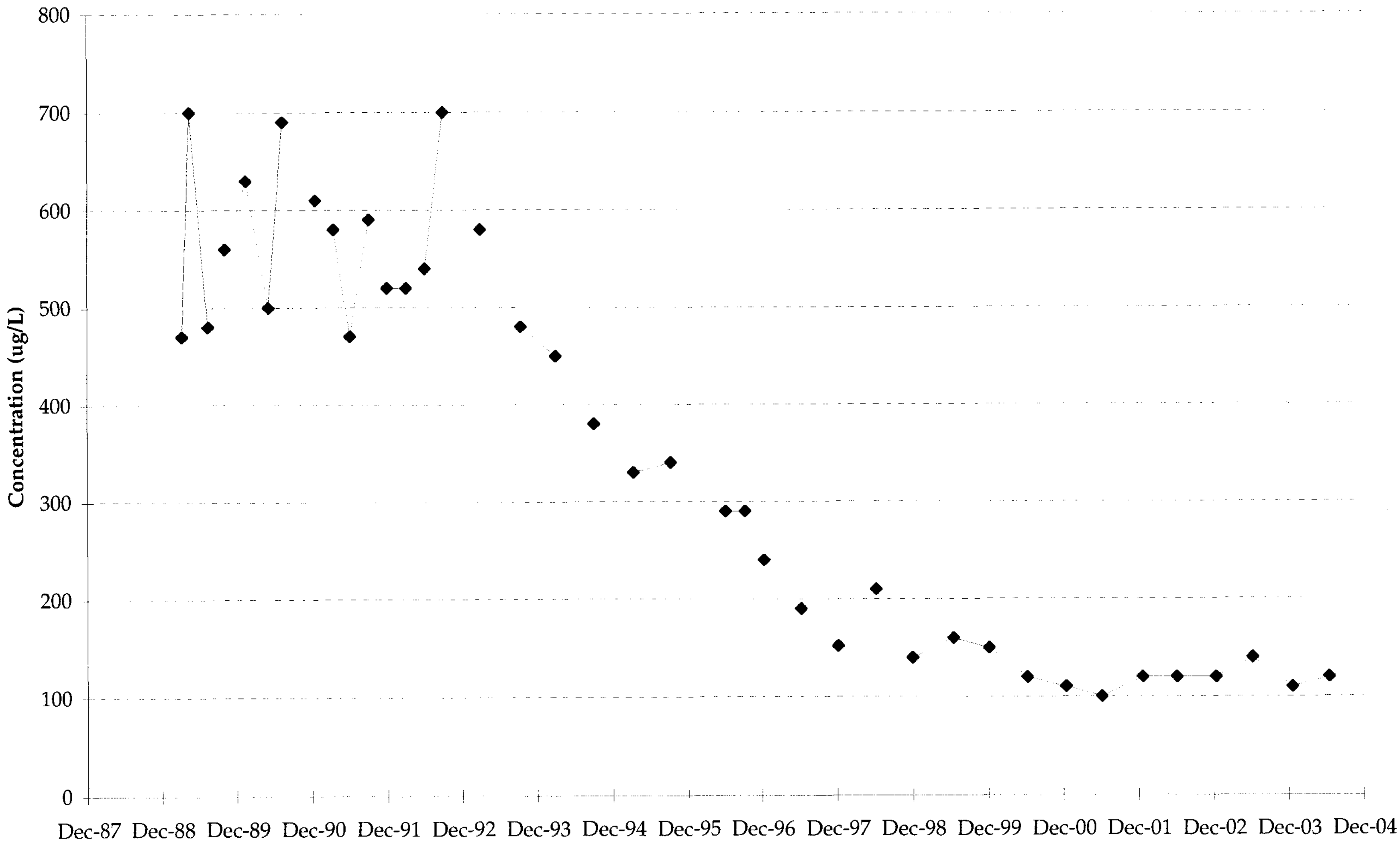


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B9 - TRCLE VS. TIME

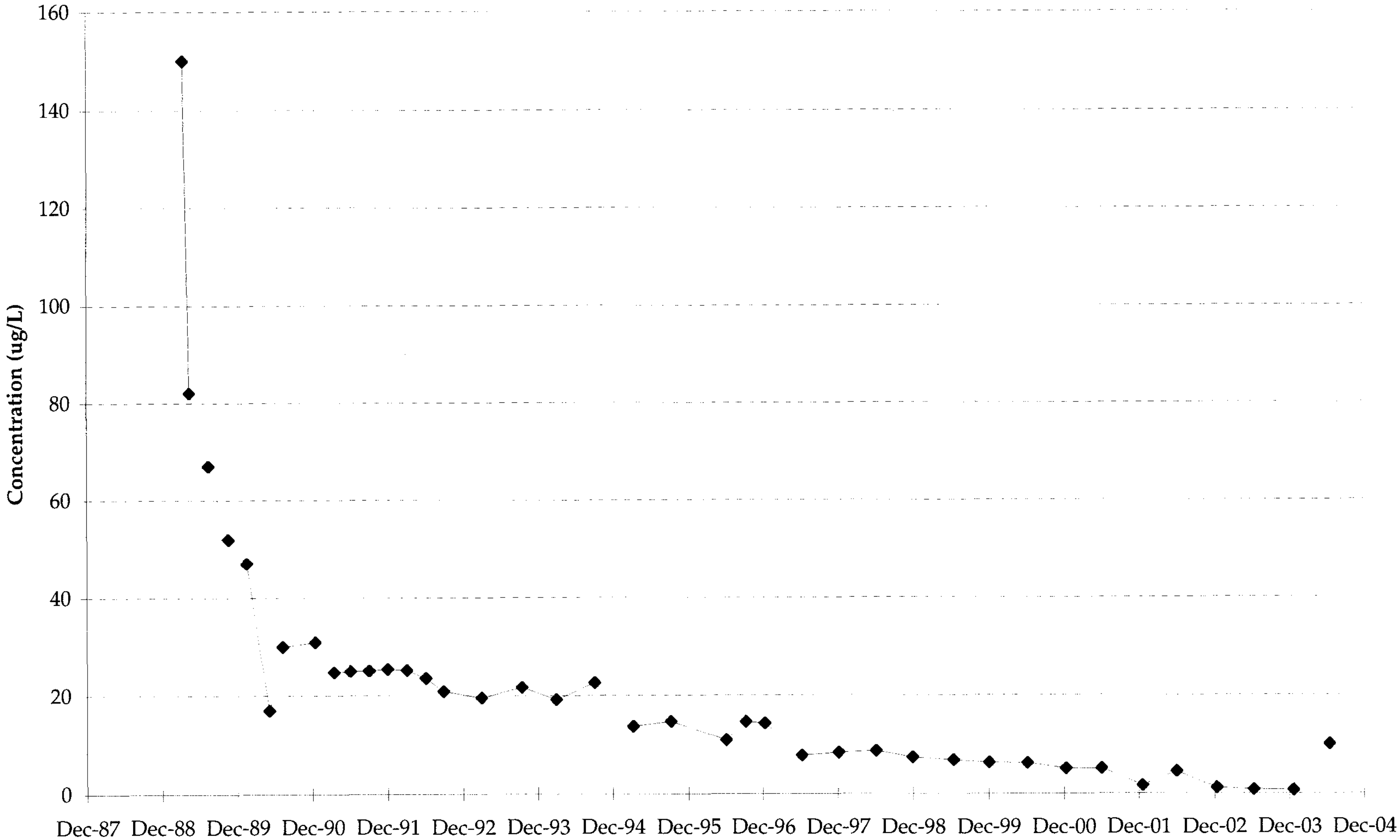


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B10 - TRCLE VS. TIME

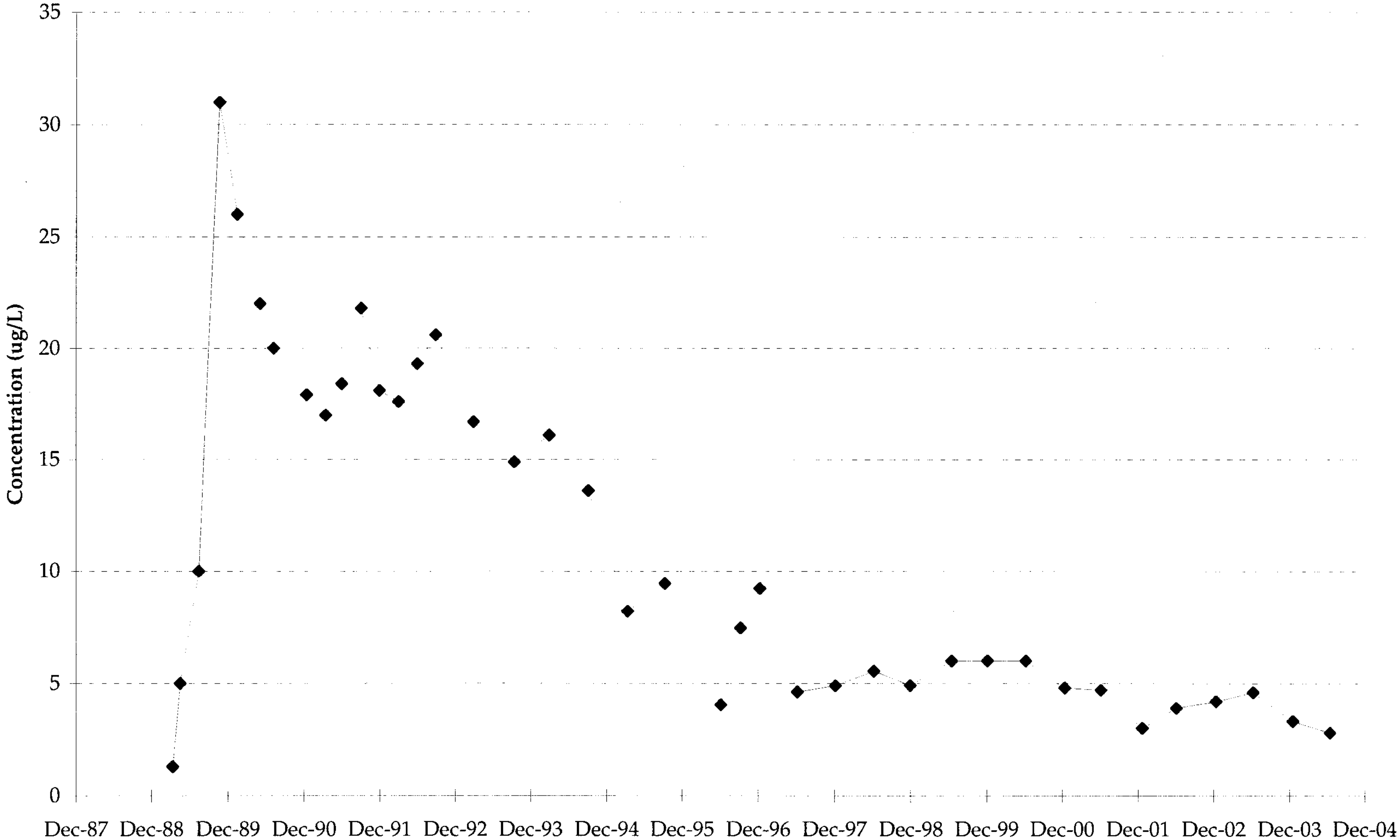


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B11 - TRCLE VS. TIME

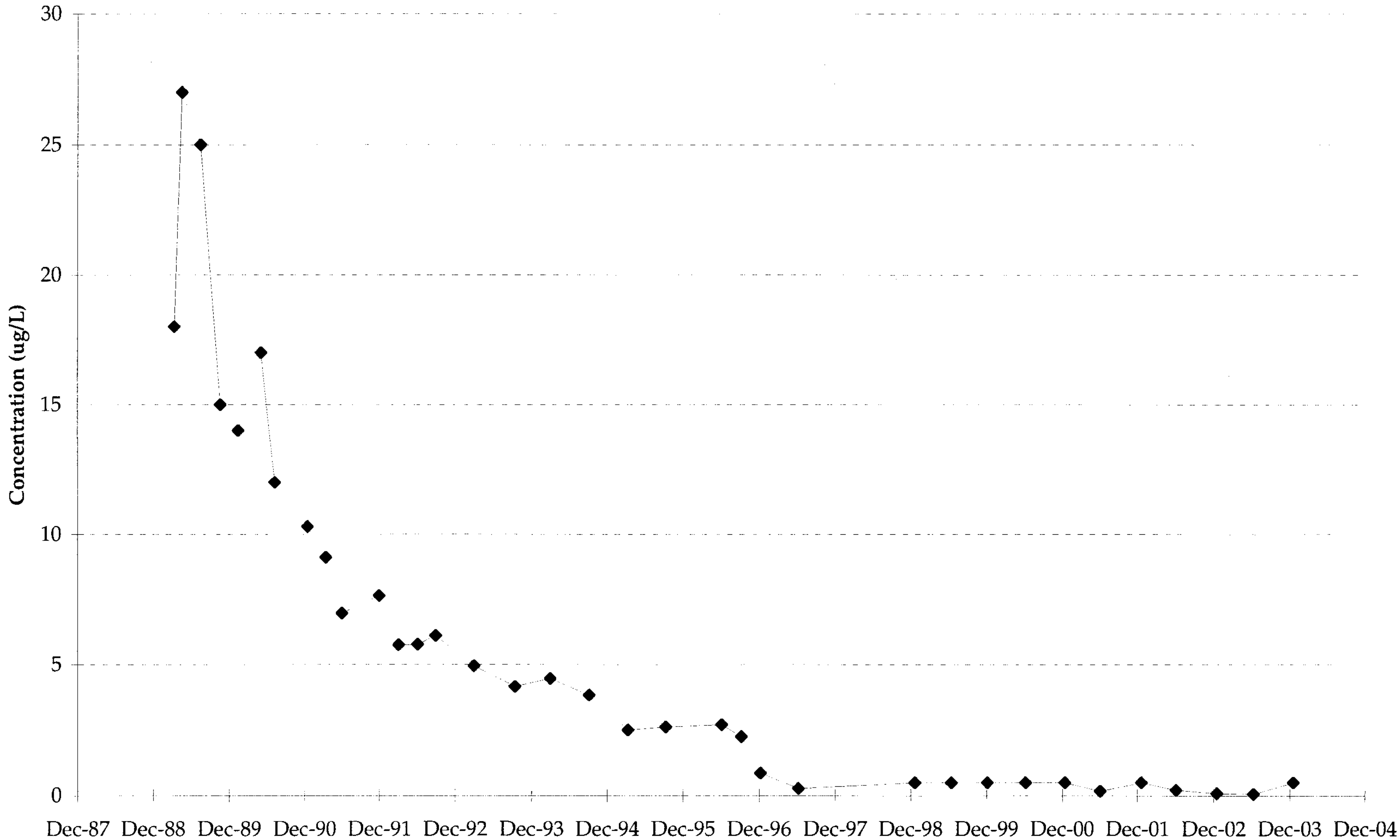


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B12 - TRCLE VS. TIME

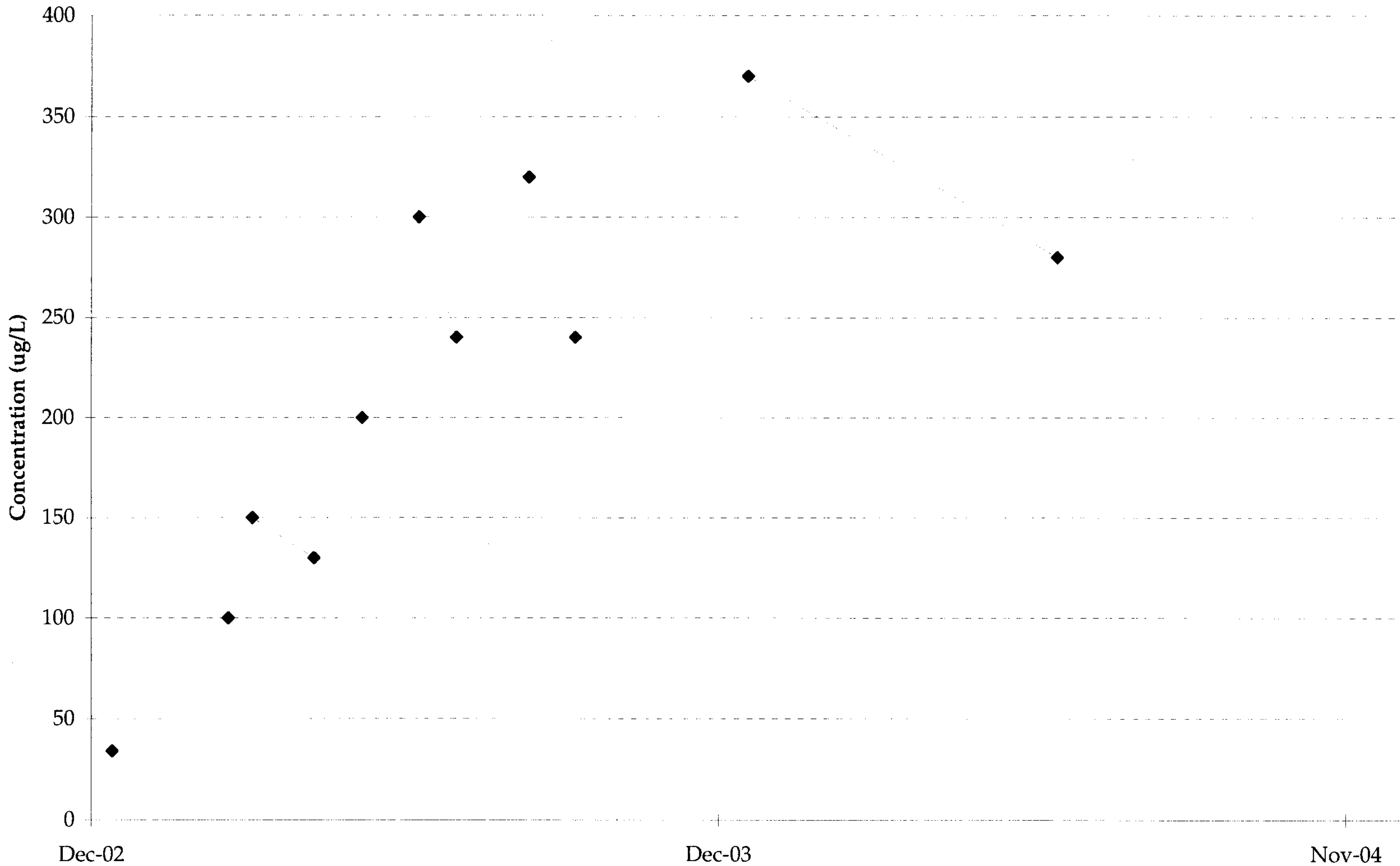


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL B13 - TRCLE VS. TIME

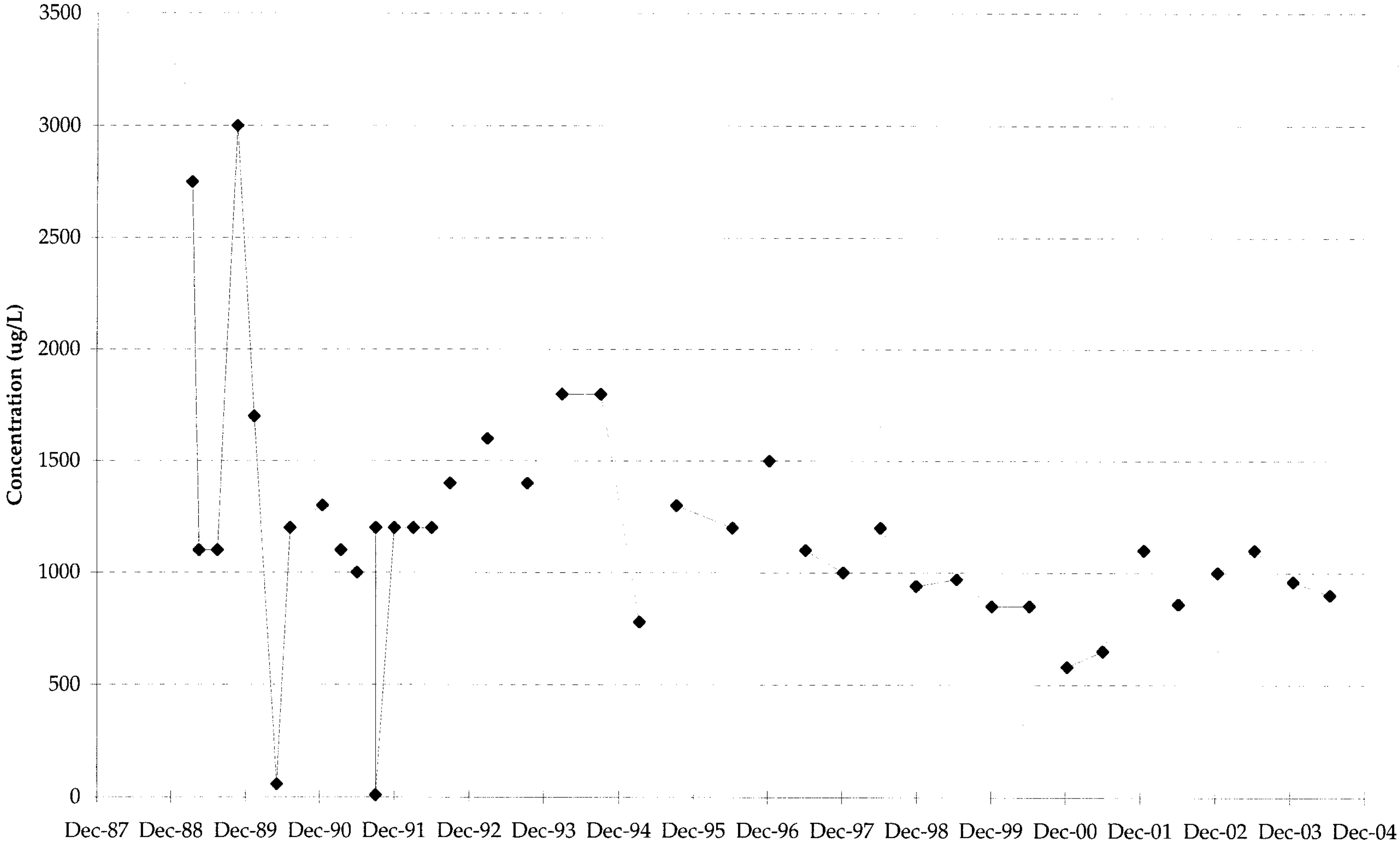


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL SC1 - TRCLE VS. TIME

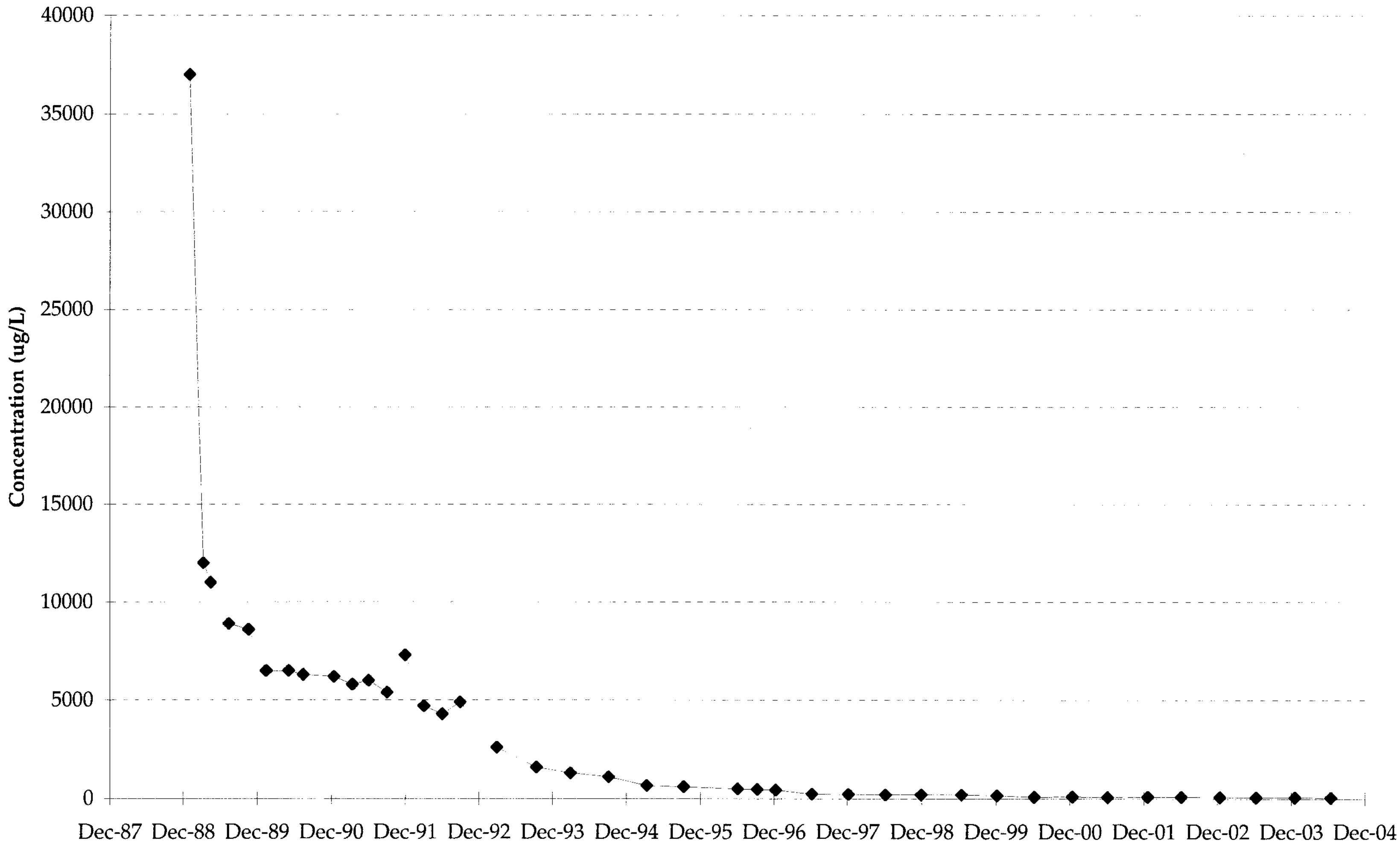


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

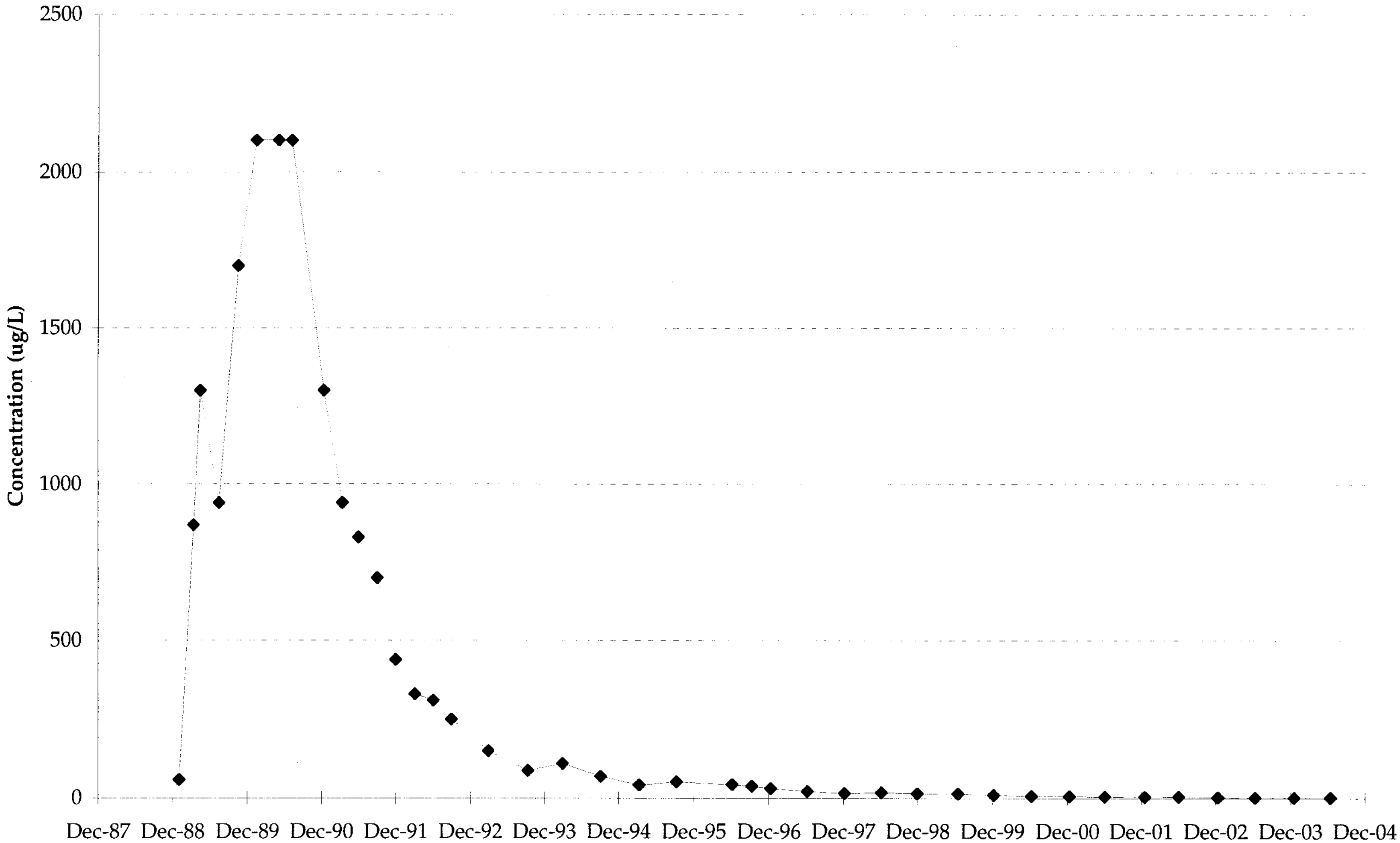
EXTRACTION WELL SC2 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G-1

EXTRACTION WELL SC3 - TRCLE VS. TIME

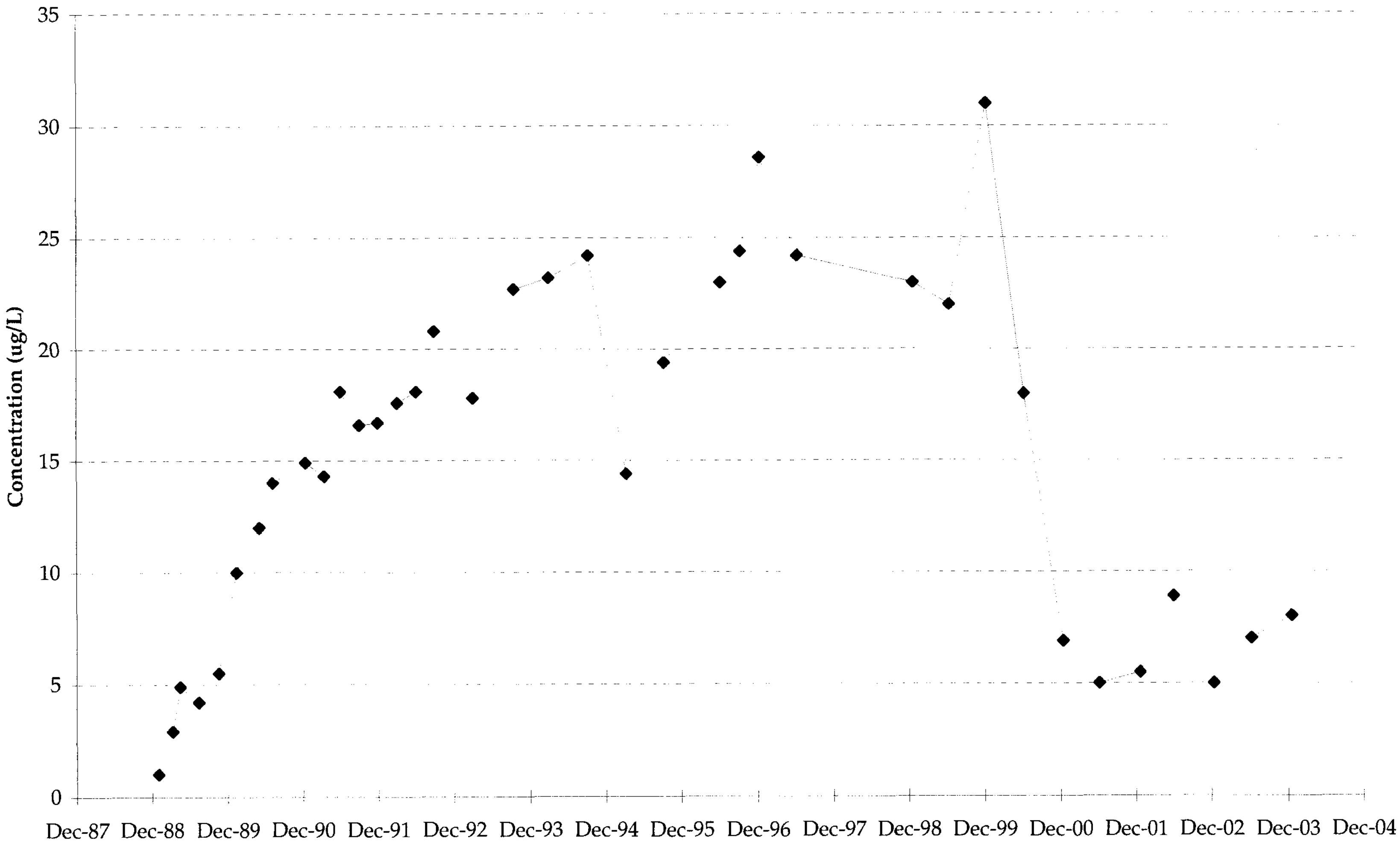


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

APPENDIX G-1

EXTRACTION WELL SC4 - TRCLE VS. TIME

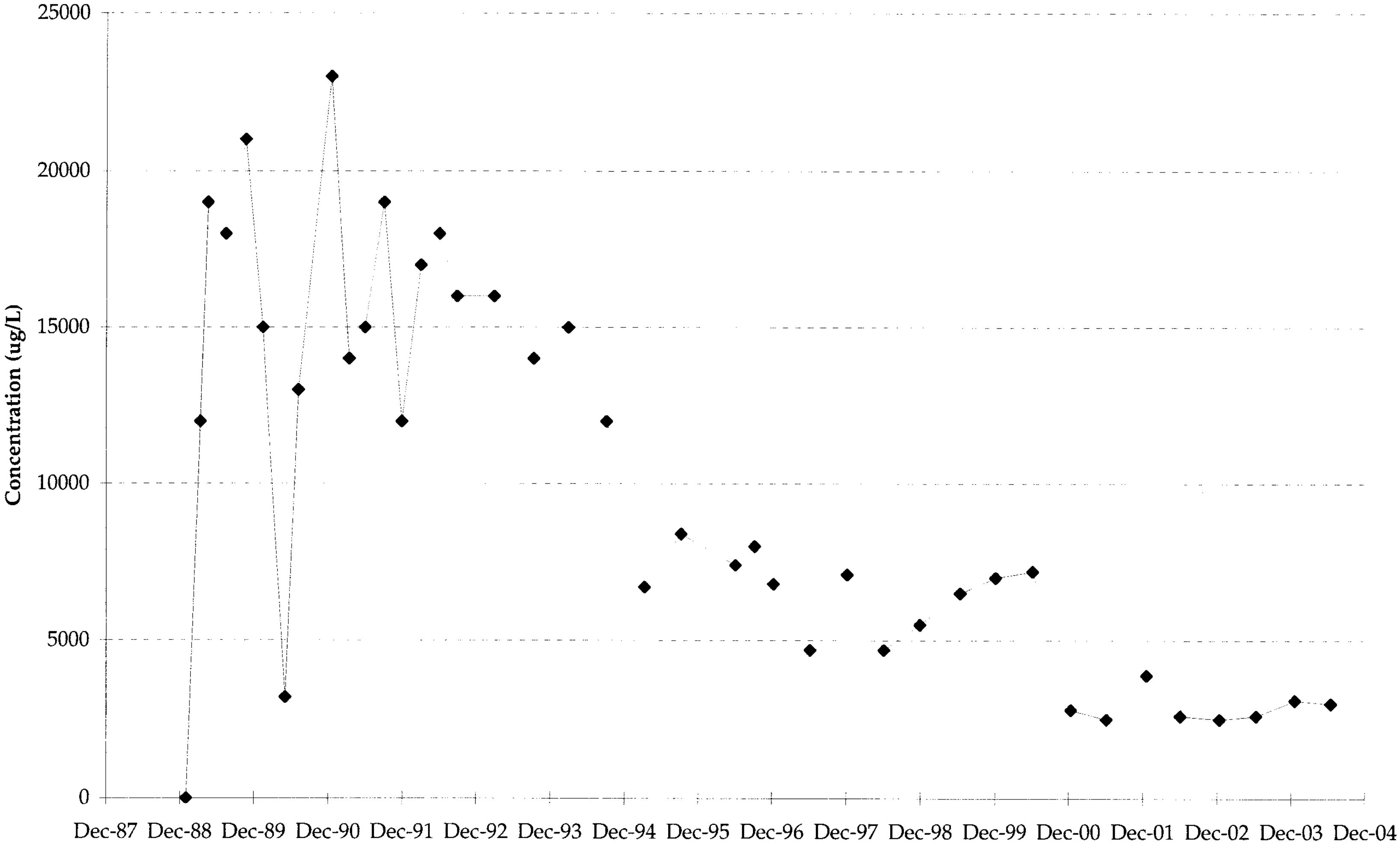


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

34878 (5)

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.

34878 (5)

G.2 Influent/Effluent Database, Fiscal Year 2004, TGRS, TCAAP

Appendix G-2

Influent/Effluent Database
Fiscal Year 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

			1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichloroethane	1,4-Dioxane	Carbon Tetrachloride
			UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Location	Date								
TGRSE	9/9/03		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	9/9/03	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	10/7/03		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	10/7/03	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	11/5/03		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	11/5/03	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	12/2/03		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	12/2/03	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	1/6/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	1/6/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	2/6/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	2/6/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	3/3/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	3/3/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	4/11/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	4/12/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	5/6/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	5/6/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	6/1/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	6/1/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	7/8/04		< 1	< 1	< 1	< 1	< 1		< 1
TGRSE	7/8/04	D	< 1	< 1	< 1	< 1	< 1		< 1
TGRSI	9/9/03		58	0.43 JP	7.2	7.3	< 1		< 1
TGRSI	10/7/03		71	< 1	8.7	9.2	< 1		< 1
TGRSI	11/5/03		68	< 1	8.2	8.4	< 1		< 1
TGRSI	12/2/03		59	0.42 P	6.7	6.1	0.51 P		< 1
TGRSI	1/6/04		58	< 1	7.8	7.7	< 1		< 1
TGRSI	2/6/04		69	0.46 P	7.1	6.8	< 1		< 1
TGRSI	3/3/04		82	< 1	9.1	9.4	< 1		< 1
TGRSI	4/12/04		92	< 1	8.4	9.5	< 1		< 1
TGRSI	5/6/04		67	0.73	7.2	6.2	< 1		< 1
TGRSI	6/1/04		71	0.38 P	7.1	7	< 1 UB 0.45		< 1
TGRSI	7/8/04		77	< 1	7	7.9	< 1		< 1

Appendix G-2

Influent/Effluent Database
Fiscal Year 2004
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

		Chloroform	cis-1,2-Dichloroethene	Freon 113	Methylene Chloride	Tetrachloroethene	trans-1,2-Dichloroethene	Trichloroethene	Vinyl Chloride
		UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
Location	Date								
TGRSE	9/9/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	9/9/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	10/7/03	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	10/7/03	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	11/5/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	11/5/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	12/2/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	12/2/03	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	1/6/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	1/6/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	2/6/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	2/6/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	3/3/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	3/3/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	4/11/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	4/12/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	5/6/04	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	5/6/04	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	6/1/04	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	6/1/04	< 1	< 1	< 1 UJ	< 1	< 1	< 1	< 1	< 1
TGRSE	7/8/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	7/8/04	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSI	9/9/03	0.13 JP	5.1	0.78 JP	< 1	0.84 JP	< 1	290	< 1
TGRSI	10/7/03	< 1	6.4	0.93 JP	< 1	< 1	< 1	590	< 1
TGRSI	11/5/03	< 1	6.1	0.87 P	< 1	< 1	< 1	400	< 1
TGRSI	12/2/03	< 1 U	5	0.63 P	< 1	0.89 P	< 1	290	< 1
TGRSI	1/6/04	< 1	5.5	0.91 P	< 1	0.81 P	< 1	270	< 1
TGRSI	2/6/04	< 1	5.1	0.85 P	< 1	0.89 P	< 1	290	< 1
TGRSI	3/3/04	< 1	7	1.1	< 1	< 1	< 1	450	< 1
TGRSI	4/12/04	< 1	6.1	1.4	< 1	1.1	< 1	400	< 1
TGRSI	5/6/04	0.22	4.5	0.78	< 1	0.96	< 1	310	< 1
TGRSI	6/1/04	0.21 P	4.8	0.79 JP	< 1	0.83 P	< 1	300	< 1
TGRSI	7/8/04	< 1	5.1	1	< 1	0.98 P	< 1	360	< 1

Appendix H

PGRS Hydraulic, Operational and Chemical Data

H.1 Influent/Effluent Database, Fiscal Year 2004, PGRS, TCAAP

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13INF. 4/5/1994	NB13INF. 4/21/1994	NB13INF. 7/28/1994	NB13INF. 8/30/1994	NB13INF. 9/13/1994	NB13INF. 10/31/1994	NB13INF. 12/27/1994	NB13INF. 1/25/1995	NB13INF. 2/14/1995	NB13INF. 3/9/1995	NB13INF. 4/7/1995	NB13INF. 5/4/1995	NB13INF. 6/15/1995	NB13INF. 7/13/1995
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**5.0**	**4.9**	**10**	**13**	**10**	**12**	**7.9**	**9.6**	**10**	**11**	**11**	**9.8**	**11**	**10**
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.1 b**	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	**7.8**	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.
Sample Date	Abbreviation	8/7/1995	9/28/1995	10/11/1995	11/28/1995	12/27/1995	1/26/1996	2/12/1996	3/28/1996	4/17/1996	5/31/1996	6/25/1996	7/18/1996	8/27/1996	9/12/1996
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**13**	**10**	**9.4**	**8.3**	**8.0**	**3.8**	**7.6**	**6.0**	**4.9**	**1.6**	**5.3**	**6.2**	**9.1**	**7.1**
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**4.3 b**	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	--
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.
Sample Date	Abbreviation	10/22/1996	11/21/1996	12/17/1996	1/30/1997	2/26/1997	3/27/1997	4/17/1997	5/22/1997	6/26/1997	7/16/1997	8/28/1997	9/17/1997	10/30/1997	11/24/1997
Dup														RMS	RMS
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**7.1**	**6.7**	**5.7**	**4.6**	**4.0**	**3.4**	**2.7**	**2.9**	**2.5**	**4.4**	**2.7**	**2.4**	**2.6**	**2.2**
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.	NB13INF.
Sample Date	Abbreviation	12/30/1997	1/29/1998	2/12/1998	3/23/1998	4/16/1998	5/20/1998	5/29/1998	6/25/1998	7/27/1998	8/20/1998	9/30/1998	10/21/1998	11/23/1998	12/21/1998
Dup		RMS	RMS	RMS	RMS	RMS	RMS	RMS	RMS						
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	**1.6**	**1.8**	**1.5**	**1.2**	**1.8**	<1.0	<1.0	<1.0	**1.0**	**1.5**	**2.1**	**1.2**	**1.2**	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	**2.2 b**	<1.0	<5.0	<5.0	<5.0	<5.0	<5.0	**12 b**	**8.6 b**	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13INF. 1/14/1999	NB13INF. 2/11/1999	NB13INF. 3/17/1999	NB13INF. 4/6/1999	NB13INF. 5/18/1999	NB13INF. 6/21/1999	NB13INF. 7/13/1999	NB13INF. 8/30/1999	NB13INF. 9/27/1999	NB13INF. 10/19/1999	NB13INF. 12/16/1999	NB13INF. 1/25/2000	NB13INF. 2/28/2000	NB13INF. 3/16/2000
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13INF. 4/24/2000	NB13INF. 5/16/2000	NB13INF. 6/28/2000	NB13INF. 7/17/2000	NB13INF. 9/5/2000	NB13INF. 9/14/2000	NB13INF. 10/12/2000	NB13INF. 11/8/2000	NB13INF. 1/29/2001	NB13INF. 2/8/2001	NB13INF. 3/7/2001	NB13INF. 4/3/2001	NB13INF. 5/23/2001	NB13INF. 6/29/2001
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13INF. 5/22/2003	NB13INF. 6/5/2003	NB13INF. 7/9/2003	NB13INF. 8/14/2003	NB13INF. 9/23/2003	NB13INF. 10/6/2003
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10*	<10*	<10*	<10*	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 4/4/1994	NB13EFF. 4/21/1994	NB13EFF. 7/28/1994	NB13EFF. 8/30/1994	NB13EFF. 9/13/1994	NB13EFF. 9/13/1994	NB13EFF. 10/31/1994	NB13EFF. 12/27/1994	NB13EFF. 12/27/1994	NB13EFF. 1/25/1995	NB13EFF. 1/25/1995	NB13EFF. 2/14/1995	NB13EFF. 3/9/1995	NB13EFF. 4/7/1995
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 4/7/1995	NB13EFF. 5/4/1995	NB13EFF. 6/15/1995	NB13EFF. 6/15/1995	NB13EFF. 7/13/1995	NB13EFF. 7/13/1995	NB13EFF. 8/7/1995	NB13EFF. 9/28/1995	NB13EFF. 10/11/1995	NB13EFF. 10/11/1995	NB13EFF. 11/28/1995	NB13EFF. 12/27/1995	NB13EFF. 10/22/1996	NB13EFF. 11/21/1996
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.7**	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	12/17/1996	1/30/1997	2/26/1997	3/27/1997	4/17/1997	5/22/1997	6/26/1997	7/16/1997	8/28/1997	8/28/1997	9/17/1997	10/30/1997	11/24/1997	11/24/1997
Dup													RMS	RMS	DUP
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	<1.0	<1.0	**1.2**	**1.1**	**1.0**	**1.2**	**1.2**	**1.8**	**2.4**	**2.2**	**1.2**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	12/30/1997	1/29/1998	2/12/1998	2/12/1998	3/23/1998	4/16/1998	4/16/1998	5/29/1998	6/25/1998	7/27/1998	8/20/1998	8/20/1998	9/30/1998	10/21/1998
Dup		RMS	RMS	RMS	RMS	RMS	RMS	DUP	RMS	RMS					
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**3.0**	**2.8**	**2.8**	**2.9**	**3.8**	**2.6**	**2.9**	**2.5**	**2.7**	**2.2**	**2.6**	**2.8**	**1.9**	**1.8**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0	<5.0	<5.0	**12 b**	**8.7 b**
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	11/23/1998	11/23/1998	12/21/1998	1/14/1999	2/11/1999	3/17/1999	4/6/1999	5/18/1999	5/18/1999	6/21/1999	7/13/1999	8/30/1999	8/30/1999	9/27/1999
Dup										DUP				DUP	
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.4**	**1.5**	**1.5**	**1.3**	<1.0	<1.0	**1.2**	**1.2**	**1.2**	**1.1**	**1.2**	<1.0	<1.0	**1.1**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 10/19/1999	NB13EFF. 4/4/1994	NB13EFF. 10/27/1995	NB13EFF. 11/28/1995	NB13EFF. 12/27/1995	NB13EFF. 1/26/1996	NB13EFF. 1/26/1996	NB13EFF. 2/12/1996	NB13EFF. 3/28/1996	NB13EFF. 4/17/1996	NB13EFF. 4/17/1996	NB13EFF. 5/31/1996	NB13EFF. 6/25/1996	NB13EFF. 7/18/1996
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.0**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**1.0 b**	**1.4**	**1.7**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	**1.4**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	**7.5**	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	7/18/1996	8/27/1996	9/12/1996	10/22/1996	10/22/1996	11/21/1996	12/17/1996	1/30/1997	1/30/1997	2/26/1997	3/27/1997	4/17/1997	4/17/1997	5/22/1997
Dup															
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.7**	**2.0**	**2.1**	**1.6**	**1.6**	**3.1**	**1.6**	**1.5**	**1.6**	**1.4**	**1.4**	**1.9**	**1.9**	**2.5**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 6/26/1997	NB13EFF. 7/16/1997	NB13EFF. 8/28/1997	NB13EFF. 9/17/1997	NB13EFF. 10/30/1997 RMS	NB13EFF. 11/24/1997 RMS	NB13EFF. 12/30/1997 RMS	NB13EFF. 1/29/1998 RMS	NB13EFF. 2/12/1998 RMS	NB13EFF. 3/23/1998 RMS	NB13EFF. 4/16/1998 RMS	NB13EFF. 5/29/1998 RMS	NB13EFF. 6/25/1998 RMS	NB13EFF. 7/27/1998
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	**1.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.6**	**1.5**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 8/20/1998	NB13EFF. 9/30/1998	NB13EFF. 10/21/1998	NB13EFF. 11/23/1998	NB13EFF. 12/21/1998	NB13EFF. 1/14/1999	NB13EFF. 2/11/1999	NB13EFF. 3/17/1999	NB13EFF. 4/6/1999	NB13EFF. 5/18/1999	NB13EFF. 6/21/1999	NB13EFF. 7/13/1999	NB13EFF. 8/30/1999	NB13EFF. 9/27/1999
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1.0	<1.0	**1.1**	**1.5**	**1.3**	<1.0	**1.3**	**1.4**	**1.6**	**1.4**	**1.5**	**1.3**	**1.6**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	**12 b**	**8.8 b**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	10/19/1999	12/16/1999	12/16/1999	1/25/2000	1/25/2000	2/28/2000	3/16/2000	3/16/2000	4/24/2000	7/17/2000	7/17/2000	9/5/2000	9/14/2000	9/14/2000
Dup				DUP		DUP			DUP			DUP			DUP
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**1.5**	**1.5**	<1.0	**3.2**	**2.8**	**2.8**	**3.0**	**2.9**	**2.8**	**2.8**	**2.3**	**2.5**	**2.3**	**2.2**
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	IRDMIS	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.	NB13EFF.
Sample Date	Abbreviation	10/12/2000	11/8/2000	11/8/2000	1/29/2001	2/8/2001	2/8/2001	3/7/2001	4/3/2001	4/3/2001	5/23/2001	5/23/2001	6/29/2001	6/5/2003	7/9/2003
Dup				DUP			DUP			DUP		DUP			
1,1-Dichloroethane	11DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichloroethylene	TRCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Benzene	C6H6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1.0	<1.0	**1.1**	**1.2**	**1.0**	<1.0	**1.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromoform	CHBR3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromomethane	CH3BR	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Carbon tetrachloride	CL4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	CLC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroethane	C2H5CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *	<10 *
Chloroform	CHCL3	**2.1**	**2.2**	**2.3**	**4.3**	**4.2**	**3.8**	**3.6**	**3.1**	**2.9**	**2.3**	**2.3**	**1.4**	<1.0	<1.0
Chloromethane	CH3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethyl benzene	ETC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methylene chloride	CH2CL2	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	MEC6H5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl chloride	C2H3CL	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes total	XYLEN	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location Sample Date Dup	IRDMIS Abbreviation	NB13EFF. 8/14/2003	NB13EFF. 9/23/2003	NB13EFF. 10/6/2003
1,1-Dichloroethane	11DCLE	<1.0	<1	<1.0
1,1-Dichloroethylene	11DCE	<1.0	<1	<1.0
1,2-Dichloroethylene	12DCE	<2.0	<2	<2.0
1,1,1-Trichloroethane	111TCE	<1.0	<1	<1.0
1,1,2-Trichloroethane	112TCE	<1.0	<1	<1.0
Trichloroethylene	TRCLE	<1.0	<1	<1.0
Benzene	C6H6	<1.0	<1	<1.0
Bromodichloromethane	BRDCLM	<1.0	<1	<1.0
Bromoform	CHBR3	<1.0	<1	<1.0
Bromomethane	CH3BR	<1.0	<1	<1.0
Carbon tetrachloride	CL4	<1.0	<1	<1.0
Chlorobenzene	CLC6H5	<1.0	<1	<1.0
Chloroethane	C2H5CL	<1.0	<1	<1.0
2-Chloroethylvinyl ether	2CLEVE	<10 *	<10 *	<10 *
Chloroform	CHCL3	<1.0	<1	<1.0
Chloromethane	CH3CL	<1.0	<1	<1.0
Chlorodibromomethane	DBRCLM	<1.0	<1	<1.0
1,2-Dichloroethane	12DCLE	<1.0	<1	<1.0
1,2-Dichlorobenzene	12DCLB	<1.0	<1	<1.0
1,3-Dichlorobenzene	13DCLB	<1.0	<1	<1.0
1,4-Dichlorobenzene	14DCLB	<1.0	<1	<1.0
1,2-Dichloropropane	12DCLP	<1.0	<1	<1.0
1,3-Dichloro-1-propene, cis	C13DCP	<1.0	<1	<1.0
1,3-Dichloro-1-propene trans	T13DCP	<1.0	<1	<1.0
Ethyl benzene	ETC6H5	<1.0	<1	<1.0
Methylene chloride	CH2CL2	<5.0	<5	<5.0
1,1,2,2-Tetrachloroethane	TCLEA	<1.0	<1	<1.0
Tetrachloroethylene	TCLEE	<1.0	<1	<1.0
Toluene	MEC6H5	<1.0	<1	<1.0
Trichlorofluoromethane	CCL3F	<1.0	<1	<1.0
Vinyl chloride	C2H3CL	<1.0	<1	<1.0
Xylenes total	XYLEN	<3.0	<3	<3.0

APPENDIX H - 1

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2004
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Notes:

--	Not analyzed.
b	Potential false positive based on blank data validation procedure.
*	Estimated value, QA/QC criteria not met.
ND	None detected.
Dup	Duplicate sample.
RMS	Routine monitoring sample.
1234	analytical data in **bold** indicates a detection.

Concentrations in ug/L

Samples were collected and analyzed by Barr Engineering for City of New Brighton.

The system was shut down per agreement with Agencies during the period June '01 through April 2003. The system was operated as needed through October 2003 and then shut down again. The system was not operated as a potable water supply system after October 2003 and there is no analytical data after October 2003.

H.2 Historical Groundwater Elevations (FT.AMSL), PGRS, TCAAP

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	3/30/1994	3/31/1994	4/10/1994	4/17/1994	4/18/1994 (AM)	4/18/1994 (noon)
03U673	897.84	843.91	844.33	844.11	843.94	844.70	844.74
03L673	898.44	843.01	843.37	843.15	842.99	843.94	843.95
04U673	898.34	843.16	843.54	843.32	843.16	844.13	844.13
03U832	886.82	834.71	835.06	834.98	835.03	835.52	835.54
03L832	886.85	834.58	834.90	834.89	834.95	835.40	835.42
04U832	885.31	834.45	834.74	834.79	835.29	835.29	835.29
03L841	911.91	842.37	842.76	842.53	842.26	843.29	843.31
04U841	912.47	842.56	842.91	842.70	842.45	843.50	843.52
04U844	886.74	834.39	834.72	834.69	834.76	835.23	835.24
04U845	894.91		836.46	836.43	836.43	836.99	836.98
03L846	888.54				832.63	832.95	832.89
04U846	889.46	831.87	831.96	832.13	832.31	832.56	832.06
03M848	904.12	840.95	841.39	841.15	841.02	841.77	841.80
03L848	903.91	841.44	841.84	841.61	841.47	842.28	842.30
04U848	903.92	842.18	842.57	842.37	842.18	843.11	843.15
04U851	914.51	831.29	831.38	831.63	831.81	832.05	831.69
04U852	905.66	829.18	829.28	829.61	829.76	830.03	829.71
03L854	892.41	838.39	838.88	838.58	838.55	839.16	839.19
04U854	891.95	834.73	835.14	835.20	835.27	835.66	835.71
03L859	903.55	838.96	839.48	839.16	839.08	839.77	839.79
04U859	903.73	841.83	842.22	841.98	841.81	842.75	842.78
03L860	896.79	838.65	839.10	838.83	838.81	839.43	839.45
04U860	896.61	834.70	835.04	835.11	835.18	835.61	835.61
03L861	891.35	836.95	837.47	837.18	837.15	837.77	837.80
04U861	890.91	834.90	835.25	835.28	835.31	835.77	835.76
04U863	895.33	834.31	834.59	834.67	834.79	835.13	835.13
04U864	908.67	832.60	832.70	832.91	833.07	833.25	832.07
04J864	908.79	827.76	828.03	828.45	829.15	829.53	829.42
04U865	915.60	833.15	833.30	833.45	833.63	833.83	832.46
04U866	910.60	831.97	832.05	832.27	832.44	832.60	831.25
04J866	910.69	828.46	828.73	829.14	829.87	830.19	830.07
04U877	923.08	831.31	831.30	831.57	831.77	831.95	831.53
MPCA1L3	898.25		838.03	837.71	837.65	838.30	838.35
MPCA1U4	898.60		836.33	836.18	836.13	836.74	836.75
MPCA2L3	872.05		833.60	833.59	833.68	834.10	833.95
MPCA2U4	872.19		832.71	832.78	832.93	833.29	832.99
414U4	893.95	834.05	834.33	834.45	834.61	834.94	834.85
MW15H	911.52		834.81	834.67	834.77	835.28	835.27
NB WELL 13	914.66						820.66

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	4/18/1994 (PM)	4/19/1994	4/20/1994	4/21/1994	4/22/1994	4/25/1994
03U673	844.74	844.10	844.00	844.04	844.13	844.67
03L673	843.86	843.12	843.09	843.09	843.17	843.58
04U673	844.04	843.29	843.27	843.26	843.34	843.73
03U832	835.43	834.87	834.98	835.08	835.17	835.37
03L832	835.27	834.71	834.85	834.99	835.07	835.24
04U832	835.11	834.59	834.74	834.89	834.98	835.12
03L841	843.21	842.42	842.39	842.39	842.50	842.90
04U841	843.42	842.59	842.59	842.56	842.67	843.03
04U844	835.08	834.47	834.64	834.76	834.83	835.01
04U845	836.84	836.26	836.38	836.47	836.53	836.80
03L846	832.81	832.48	832.63	832.71	832.72	832.83
04U846	831.91	831.51	832.16	832.27	832.22	832.31
03M848	841.79	841.15	841.11	841.15	841.25	841.69
03L848	842.27	841.58	841.55	841.59	841.70	842.11
04U848	843.07	842.32	842.29	842.28	842.42	842.80
04U851	831.44	830.98	831.45	831.70	831.65	831.76
04U852	829.40	828.94	829.32	829.49	829.41	829.59
03L854	839.21	838.66	838.62	838.70	838.93	839.27
04U854	836.50	834.97	835.11	835.22	835.40	835.49
03L859	839.79	839.21	839.16	838.72	839.47	839.77
04U859	842.68	841.93	841.92	841.92	842.12	842.39
03L860	839.45	838.92	838.89	838.94	839.06	839.52
04U860	835.46	834.89	835.08	835.21	835.23	835.46
03L861	837.80	837.24	837.21	837.29	837.54	837.83
04U861	835.61	835.06	835.22	835.36	835.49	835.60
04U863	834.93	834.44	834.63	834.70	834.88	835.06
04U864	831.80	831.30	832.26	833.04	833.04	833.16
04J864	829.15	828.31	828.54	828.52	828.28	828.45
04U865	832.16	831.66	832.80	833.64	833.69	833.79
04U866	830.96	830.51	831.60	832.40	832.39	832.46
04J866	829.79	828.94	829.23	829.21	829.22	829.13
04U877	831.34	830.95	831.54	831.71	831.64	831.76
MPCA1L3	838.34	837.76	837.73	837.81	838.02	838.33
MPCA1U4	836.68	836.08	836.14	836.20	836.36	836.57
MPCA2L3	833.83	833.33	833.60	833.74	833.74	833.88
MPCA2U4	832.85	832.39	832.83	832.93	832.93	832.98
414U4	834.61	834.10	834.37	834.59	834.65	834.82
MW15H	835.23	834.61	834.72	834.83	834.92	835.14
NB WELL 13		824.16	829.86		832.78	

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	4/26/1994	4/28/1994	4/29/1994	5/2/1994	5/9/1994	5/16/1994	5/23/1994
03U673	844.90	843.92	843.92	844.20	844.37	843.97	844.35
03L673	843.76	842.98	842.94	843.21	843.27	842.91	843.20
04U673	843.91	843.15	843.11	843.38	843.43	843.08	843.34
03U832	835.44	834.81	834.82	835.25	835.04	834.44	834.31
03L832	835.28	834.64	834.70	835.13	834.91	834.31	834.14
04U832	835.15	834.50	834.61	835.02	834.81	834.19	833.99
03L841	843.10	842.28	842.26	842.52	842.56	842.26	842.50
04U841	843.22	842.45	842.44	842.69	842.72	842.39	842.60
04U844	835.00	834.39	834.45	834.86	834.65	834.05	833.90
04U845	836.84	836.20	836.30	836.69	836.51	835.93	835.83
03L846	832.87	832.39	832.44	832.69	832.45	832.07	831.96
04U846	832.01	831.32	831.91	832.15	831.68	831.18	830.91
03M848	841.90	841.04	841.02	841.30	841.41	841.01	841.31
03L848	842.31	841.46	841.45	841.72	841.81	841.40	841.69
04U848	842.96	842.20	842.17	842.42	842.46	842.10	842.36
04U851	831.66	830.84	830.88	831.60	831.26	830.60	830.23
04U852	829.48	828.93	828.86	829.51	829.29	828.53	827.90
03L854	839.51	838.57	838.58	838.88	839.03	838.55	838.81
04U854	835.52	834.87	835.10	835.49	835.23	834.58	834.44
03L859	840.02	839.09	839.08	839.40	839.50	839.04	839.30
04U859	842.59	841.78	841.79	842.05	842.08	841.71	841.92
03L860	839.72	838.84	838.81	839.12	839.28	838.78	839.09
04U860	835.39	834.84	835.00	835.35	835.11	834.47	834.31
03L861	838.04	837.14	837.15	837.47	837.54	836.99	837.17
04U861	835.62	835.00	835.13	835.53	835.30	834.71	834.53
04U863	834.94	834.38	834.40	834.95	834.73	834.02	833.82
04U864	832.61	831.25	831.28	832.89	832.27	830.77	830.76
04J864	828.25	828.26	827.87	828.51	828.76	827.29	826.49
04U865	832.15	831.59	831.62	833.75	832.68	831.35	831.14
04U866	830.94	830.35	830.44	832.08	831.65	830.15	829.96
04J866	828.84	828.98	828.54	829.17	829.48	827.90	827.25
04U877	831.58	830.62	830.83	831.45	831.11	830.61	830.30
MPCA1L3	838.54	837.63	837.64	837.97	838.01	837.51	837.70
MPCA1U4	836.67	835.95	836.02	836.38	836.19	835.69	835.64
MPCA2L3	833.91	833.25	833.32	833.77	833.45	832.93	832.75
MPCA2U4	832.94	832.24	832.41	832.89	832.52	831.96	831.78
414U4	834.60	834.02	834.04	834.72	834.45	833.68	833.44
MW15H	835.24	834.60	834.62	835.04	834.76	834.14	834.12
NB WELL 13	822.66	822.16	822.21	822.66	830.87	821.81	

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APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	6/20/1994	7/19/1994	10/10/1994	1/27/1995	3/6/1995	6/21/1995 8:00 A.M.
03U673	844.01	845.00	843.06	843.42	843.31	843.59
03L673	842.81	844.33	842.23	842.24	842.12	842.76
04U673	842.95	843.93	842.43	842.39	842.24	842.96
03U832	833.55	833.48	832.65	833.36	833.24	833.02
03L832	833.33	833.25	832.49	833.20	833.48	832.82
04U832	833.19	833.09	832.39	833.07	833.14	832.63
03L841	842.10	843.37	841.48	841.55	841.42	842.03
04U841	842.20	843.55	841.71	841.65	841.53	842.23
04U844	833.18	833.20	832.29	833.09	833.16	832.59
04U845	835.16	835.29	834.23	834.94	834.94	834.64
03L846	831.16	830.78	830.16	830.74	830.92	830.62
04U846	830.06	829.74	829.44	830.11	830.23	829.35
03M848	840.84	841.46	839.75	840.21	840.14	840.39
03L848	841.18	841.95	840.28	840.62	frozen	840.91
04U848	841.94	843.02	841.27	841.40	841.27	841.82
04U851	829.20	829.01	828.85	829.72	829.87	828.58
04U852	plugged	826.62	826.83	827.91	828.13	826.08
03L854	838.26	838.30	836.93	837.56	837.59	837.56
04U854	833.63	833.60	832.83	833.52	833.54	833.00
03L859	838.79	839.07	837.48	838.14	838.15	838.12
04U859	841.51	842.57	840.83	840.96	840.88	841.42
03L860	838.51	838.54	837.22	837.86	837.84	837.83
04U860	833.57	833.41	832.75	833.38	833.43	832.98
03L861	836.55	836.54	835.25	835.99	836.03	835.86
04U861	833.78	833.76	832.97	833.63	833.66	833.20
04U863	832.92	832.79	832.18	832.85	832.95	832.42
04U864	829.72	829.55	829.07	829.71	829.88	829.10
04J864	825.46	825.93	825.04	826.81	826.92	824.22
04U865	830.22	830.04	829.54	830.14	830.24	829.50
04U866	828.90	828.72	828.28	828.97	829.22	828.24
04J866	826.26	826.71	825.71	827.46	827.57	825.13
04U877	829.34	828.98	828.84	829.50	829.76	828.63
MPCA1L3	837.13	837.27	835.82	836.58	836.59	836.45
MPCA1U4	835.03	835.22	834.05	834.74	834.80	834.49
MPCA2L3	831.94	831.81	831.12	831.89	831.93	831.43
MPCA2U4	830.93	830.71	830.14	830.91	830.99	830.31
414U4	832.55	832.43	831.91	832.59	832.67	832.03
MW15H	833.30	833.12	832.36	833.11	833.19	832.85
NB WELL 13	820.58	820.26	819.41	819.66	819.66	819.66

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	9/5/1995	12/14/1995	3/5/1996	5/28/1996	9/16/1996	12/3/1996
03U673	842.55	843.33	843.28	843.84	842.44	842.16
03L673	841.34	842.14	842.23	842.84	840.97	840.99
04U673	841.49	842.29	842.38	843.00	841.08	841.13
03U832	832.57	833.26	833.55	834.26	831.27	832.31
03L832	832.40	833.11	833.40	834.55	831.09	832.16
04U832	832.27	832.97	833.27	833.89	830.93	832.04
03L841	840.53	841.48	841.47	842.13	840.18	840.31
04U841	840.69	841.59	841.63	842.30	840.27	840.48
04U844	832.22	833.00	833.26	833.75	830.99	832.02
04U845	834.06	834.87	835.07	835.70	832.94	833.93
03L846	830.20	830.51	830.94	831.51	828.83	829.46
04U846	829.25	829.69	830.08	830.17	827.71	828.49
03M848	839.38	840.18	frozen	840.85	838.97	839.01
03L848	840.48	840.61	frozen	841.28	839.39	frozen
04U848	840.49	841.33	frozen	841.99	840.08	840.22
04U851	828.55	829.49	829.91	829.86	827.25	828.46
04U852	826.04	827.66	828.16	827.76	obstructed	obstructed
03L854	836.87	837.63	837.65	838.41	836.06	836.38
04U854	832.68	833.46	833.71	834.36	831.41	832.56
03L859	837.33	838.14	838.13	838.95	836.53	836.68
04U859	840.09	840.95	841.00	841.63	839.47	839.84
03L860	837.11	837.90	837.92	838.66	836.58	836.68
04U860	832.57	833.40	833.59	834.30	831.38	832.53
03L861	835.23	836.03	836.09	836.89	834.22	834.79
04U861	832.80	833.59	833.75	834.45	831.56	832.65
04U863	832.09	832.76	833.14	833.75	830.86	831.88
04U864	829.01	829.50	829.97	830.23	827.63	828.59
04J864	824.77	827.23	827.49	826.50	823.55	825.99
04U865	829.33	829.67	830.41	830.63	827.84	829.01
04U866	828.14	828.40	829.06	829.14	826.74	827.43
04J866	825.55	827.80	828.07	827.17	824.83	826.54
04U877	828.71	829.14	829.53	829.48	827.06	827.85
MPCA1L3	835.79	836.58	836.63	837.35	834.80	835.34
MPCA1U4	833.89	834.68	834.85	835.45	832.73	833.66
MPCA2L3	831.08	831.63	832.03	832.55	829.74	830.62
MPCA2U4	830.07	830.62	830.99	831.36	828.69	829.54
414U4	830.77	832.48	832.90	833.36	830.57	831.64
MW15H	832.41	833.02	833.34	834.10	831.10	832.11
NB WELL 13	819.66	816.10	820.01	819.66	819.66	818.33

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	5/30/1997	9/2/1997	12/6/1997	6/1/1998	5/27/99	12/20/99
03U673	842.39		842.03	843.33	843.14	
03L673	841.06		840.99	842.11	841.91	
04U673	841.21		841.19	842.30	842.06	
03U832	831.36					
03L832	831.22				832.03	
04U832	831.11		831.76	832.38	832.02	
03L841	840.34					
04U841	840.42					
04U844	831.23					
04U845	833.23		833.74	834.46	834.19	
03L846	828.41					
04U846	827.60					
03M848	838.99		838.80	839.95	839.71	
03L848	839.40		839.27	840.41	840.20	
04U848	840.18		840.17	841.20	841.02	
04U851	827.97		827.93	828.61	828.12	
04U852			826.57	826.74	826.63	
03L854	836.20		836.10	837.29	836.92	
04U854	831.68		832.44	832.98	832.77	
03L859	836.77		836.62	837.81	837.40	
04U859	839.82		839.83	840.97	840.61	
03L860	836.49		836.39	837.46	837.24	
04U860	831.41		832.33	832.81	832.72	
03L861	834.41		834.47	835.53	835.14	
04U861	831.79		832.43	833.09	832.76	
04U863	830.92		831.80	832.33	832.11	832.36
04U864	828.68		828.02	828.87	827.92	829.19
04J864	825.07		826.32	826.40	825.77	826.99
04U865	829.05		828.57	829.30	828.63	830.11
04U866	826.23		826.30	827.42	825.89	827.53
04J866	825.76		826.80	827.02	826.31	827.50
04U877	827.45					
MPCA1L3	835.04					
MPCA1U4	832.99					
MPCA2L3	829.66					
MPCA2U4	828.58					
414U4	830.72	830.40	831.64	832.12	831.86	832.10
MW15H	831.08		831.66	832.36	832.02	
NB WELL 13	827.94		816.59	816.21	815.46	

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	3/9/2000	6/5/2000	9/5/2000	12/18/2000	3/13/2001	6/1/2001
03U673						842.22
03L673						841.11
04U673						841.25
03U832						832.62
03L832						832.46
04U832						832.40
03L841						
04U841						
04U844						
04U845						834.54
03L846						
04U846						
03M848						839.86
03L848						840.35
04U848						841.14
04U851						828.23
04U852						827.45
03L854						837.19
04U854						833.06
03L859						837.68
04U859						837.86
03L860						837.49
04U860						831.33
03L861						835.53
04U861						833.13
04U863	832.80	817.42	831.59	831.98		832.46
04U864	829.50	827.35	828.22	829.45	828.93	829.13
04J864	827.49	827.95	825.62	826.49	826.84	826.75
04U865	830.30	833.09	829.19	830.29	829.77	831.02
04U866	827.82	848.44	826.59	827.90	827.23	827.39
04J866	827.98	826.34	826.24	827.21	827.35	827.30
04U877						
MPCA1L3						
MPCA1U4						
MPCA2L3						
MPCA2U4						
414U4	832.77	833.05	831.31	831.88		832.43
MW15H						832.47
NB WELL 13						

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	9/4/2001	12/4/2001	3/6/2002	6/5/2002	9/5/2002
03U673					
03L673					
04U673					
03U832					
03L832					
04U832					
03L841					
04U841					
04U844					
04U845					
03L846					
04U846					
03M848					
03L848					
04U848					
04U851					
04U852					
03L854					
04U854					
03L859					
04U859					
03L860					
04U860					
03L861					
04U861					
04U863			833.67	834.40	833.92
04U864	828.04	832.37	831.14	831.92	831.25
04J864	824.91	829.20	828.04	827.59	827.23
04U865	830.44	834.41	833.52	834.26	833.62
04U866	826.70	831.44	829.78	830.89	829.87
04J866	825.59	828.89	828.81	828.50	827.93
04U877					
MPCA1L3					
MPCA1U4					
MPCA2L3					
MPCA2U4					
414U4					
MW15H					
NB WELL 13					

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	12/4/2002	3/6/2003	6/4/2003	9/10/2003	12/3/2003
03U673	897.84			846.23		
03L673	898.44			845.09		
04U673	898.34			845.21		
03U832	886.82					
03L832	886.85			836.04		
04U832	885.31			818.01		
03L841	911.91					
04U841	912.47					
04U844	886.74					
04U845	894.91			838.26		
03L846	888.54					
04U846	889.46					
03M848	904.12			843.75		
03L848	903.91			844.25		
04U848	903.92			845.12		
04U851	914.51			831.81		
04U852	905.66			830.87		
03L854	892.41			840.89		
04U854	891.95			836.69		
03L859	903.55			841.44		
04U859	903.73			844.77		
03L860	896.79			841.20		
04U860	896.61			834.98		
03L861	891.35			839.14		
04U861	890.91			836.75		
04U863	893.08	834.86	836.32	835.92	834.11	834.79
04U864	908.67	832.54	833.52	833.61	831.36	832.40
04J864	908.79	829.52	830.33	829.85	827.44	829.36
04U865	915.60	834.73	836.56	835.72	834.15	835.76
04U866	910.60	830.96	831.95	831.86	830.07	830.93
04J866	910.69	829.92	831.09	830.55	828.57	829.89
04U877	923.08					
MPCA1L3	898.25					
MPCA1U4	898.60					
MPCA2L3	872.05					
MPCA2U4	872.19					
414U4	893.95			836.01		
MW15H	911.52			836.06		
NB WELL 13	914.66					

Notes:
New TOC elevation for 04U863 as of 8-13-03 is 893.08

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	3/2/2004	6/8/2004	9/14/2004
03U673			
03L673		844.16	
04U673		844.28	
03U832			
03L832			
04U832			
03L841			
04U841			
04U844			
04U845			
03L846			
04U846			
03M848			
03L848			
04U848			
04U851			
04U852			
03L854			
04U854		836.50	
03L859		840.74	
04U859			
03L860			
04U860			
03L861			
04U861			
04U863	835.23	835.82	834.65
04U864	832.77	833.64	831.73
04J864	829.88	830.05	828.39
04U865	835.02	835.85	834.46
04U866	831.33	832.41	830.13
04J866	830.74	830.74	829.06
04U877			
MPCA1L3			
MPCA1U4			
MPCA2L3			
MPCA2U4			
414U4			
MW15H			
NB WELL 13			

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	12/4/2002	3/6/2003	6/4/2003	9/10/2003	12/3/2003
03U673	897.84			846.23		
03L673	898.44			845.09		
04U673	898.34			845.21		
03U832	886.82					
03L832	886.85			836.04		
04U832	885.31			818.01		
03L841	911.91					
04U841	912.47					
04U844	886.74					
04U845	894.91			838.26		
03L846	888.54					
04U846	889.46					
03M848	904.12			843.75		
03L848	903.91			844.25		
04U848	903.92			845.12		
04U851	914.51			831.81		
04U852	905.66			830.87		
03L854	892.41			840.89		
04U854	891.95			836.69		
03L859	903.55			841.44		
04U859	903.73			844.77		
03L860	896.79			841.20		
04U860	896.61			834.98		
03L861	891.35			839.14		
04U861	890.91			836.75		
04U863	893.08	834.86	836.32	835.92	834.11	834.79
04U864	908.67	832.54	833.52	833.61	831.36	832.40
04J864	908.79	829.52	830.33	829.85	827.44	829.36
04U865	915.60	834.73	836.56	835.72	834.15	835.76
04U866	910.60	830.96	831.95	831.86	830.07	830.93
04J866	910.69	829.92	831.09	830.55	828.57	829.89
04U877	923.08					
MPCA1L3	898.25					
MPCA1U4	898.60					
MPCA2L3	872.05					
MPCA2U4	872.19					
414U4	893.95			836.01		
MW15H	911.52			836.06		
NB WELL 13	914.66					

Notes:
New TOC elevation for 04U863 as of 8-13-03 is 893.08

APPENDIX H-2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	3/2/2004	6/8/2004	9/14/2004
03U673			
03L673		844.16	
04U673		844.28	
03U832			
03L832			
04U832			
03L841			
04U841			
04U844			
04U845			
03L846			
04U846			
03M848			
03L848			
04U848			
04U851			
04U852			
03L854			
04U854		836.50	
03L859		840.74	
04U859			
03L860			
04U860			
03L861			
04U861			
04U863	835.23	835.82	834.65
04U864	832.77	833.64	831.73
04J864	829.88	830.05	828.39
04U865	835.02	835.85	834.46
04U866	831.33	832.41	830.13
04J866	830.74	830.74	829.06
04U877			
MPCA1L3			
MPCA1U4			
MPCA2L3			
MPCA2U4			
414U4			
MW15H			
NB WELL 13			

Appendix I

Other Installation Restoration Activities During FY 2004

APPENDIX I

OTHER INSTALLATION RESTORATION ACTIVITIES DURING FY 2004

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). In FY 2004 there was no sampling scheduled. Locations of these wells are shown on Figure B-3 in Appendix B. For reference the FY 2003 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 2005 as shown in Appendix A.1 (the wells are listed under TCAAP Groundwater Recovery System in the appendix).

2. Surface Water

The FY 2004 – FY 2008 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 8-3 and 8-4, 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 2004 data is presented in Table I-1. VOCs, mercury, silver, and cyanide were all non-detectable in the water entering and leaving TCAAP. There were low detections reported for copper, lead, and zinc, both entering and leaving TCAAP (at comparable levels for each analyte.

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 undergoing resolution of regulatory agency comments at the end of FY 2004. The next step will be a feasibility study to support the Risk Manager's decision with respect to "No Further Action" or "Implement a Remedy" for each aquatic site.

C. GRENADE RANGE

The removal action to address contaminated soils was completed in early FY 2000. The Grenade Range Closeout Report (prepared by Alliant) received partial regulatory approval in FY 2002, with land use control issues still needing resolution. The Groundwater Investigation Report (prepared by Alliant) also received regulatory approval in FY 2002. The remedy included additional verification groundwater monitoring. FY2004 was the last year of scheduled sampling at the Grenade Range.

The four monitoring wells at this site were sampled by TWISS in FY 2004. Locations of the wells are shown on Figure I-2. Sampling results are shown in Table I-2. Results are summarized as follows:

- Bis (2-ethylhexyl) phthalate was not detected in any of the wells.
- No PCBs were detected in any of the samples. In FY 2003, PCB-1016 was detected in GR2-1 (and the duplicate sample) at concentrations just slightly above the reporting limit of 0.1 ug/l. No PCBs (including PCB-1016) were detected in any of the Grenade Range wells in the FY 2002 sampling event (with identical reporting limits), nor were any PCBs detected in any of the wells in the FY 2001 sampling event. The FY 2004 sampling event suggests that the FY 2003 results were anomalous.
- For metals, most of the analytes were either non detectable or were detected at low levels, below the background level. Exceptions were as follows:
    - Arsenic was detected in GR1-2 at 15.7 ug/l, above the background level of 4 ug/l (the other wells were below 4 ug/l). In FY 2003, arsenic was detected in GR1-2 at 10 ug/l. Arsenic was not detected in GR1-2 in the FY 2002 sampling event (with a reporting limit of 300 ug/l), or in the FY 2001 sampling event (with a reporting limit of 3.4 ug/l). It is possible that the detections are representative of the variability surrounding the background level.
    - Cobalt was not detected above the background level. In FY 2003, cobalt was detected in GR1-2 at 1.3 ug/l and in GR2-1 at 1.1 ug/l, just slightly above the background level of 1 ug/l (the other wells were below 1 ug/l). Cobalt was not detected in either of these wells in the FY 2002 sampling event (with a reporting limit of 50 ug/l). In the FY 2001 sampling event, cobalt was detected in GR1-2 at 0.54 ug/l and was not detected in GR2-1 (with a reporting limit of 0.5 ug/l). It is likely that the detections at 1.3 and 1.1 ug/l are representative of the variability surrounding the background level.

   - Nickel was not detected above background concentrations in any of the samples. In FY 2003, nickel was detected in all four wells at concentrations ranging from 5 to 19 ug/l, above the background level of 4 ug/l. Nickel was not detected in any of the wells in the FY 2002 sampling event (with a reporting limit of 40 ug/l). In the FY 2001 sampling event, nickel was detected in GR1-1 and GR1-2 at 3.7 and 4.0 ug/l, respectively, and was not detected in GR2-1 (with a reporting limit of 1 ug/l). GR-DF1 had not yet been installed at the time of the FY 2001 event.
- Radionuclides were not detected in any of the monitoring wells, with the exception of gross beta. Gross beta detections were reported at GR1-2 and GR2-1; however, both of these detections were qualified possible false positives due to detection of gross beta in an associated blank.

It is recommended that monitoring be discontinued at the Grenade Range.

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 (prepared by Alliant) received partial regulatory approval in FY 2002, with land use control issues still needing resolution. Alliant prepared a work plan for construction of a soil cover over a portion of the 1900-yard range that is contaminated with polynuclear aromatic hydrocarbons (PAHs). The work plan received regulatory approval near the end of FY 2003. The soil cover was constructed in early FY 2004. Based on a review of the closeout report, the Army discovered that the 2-foot minimum cover thickness requirement had not been met. Repairs were planned for the first quarter of FY 2005. Construction of the soil cover will be documented in an addendum to the Outdoor Firing Range.

E. 135 AND 535 PRIMER/TRACER AREAS

Preliminary assessment reports for both of these sites were prepared by Alliant and both received regulatory approval in FY 2002. Alliant also prepared site investigation work plans for both of these sites in FY 2002. The 135 Primer/Tracer Area work plan received regulatory approval in

FY 2002 and site investigation fieldwork was completed in FY 2002. The 535 Primer/Tracer Area work plan received regulatory approval in FY 2003 and the site investigation fieldwork was also completed in FY 2003. Alliant and TWISS prepared a site investigation report for each of these sites, both of which were under MPCA and USEPA review at the end of FY 2004.

G. PROPERTY TRANSFER-RELATED ENVIRONMENTAL ACTIVITIES

While not Installation Restoration Program activities (i.e., not funded by the Defense Environmental Restoration Account), other potentially relevant environmental activities during FY 2004 included the following:

1. Investigation and Cleanup Associated with Property Transfer to Ramsey County
   Ramsey County funded and executed investigation and cleanup work for contaminants related to former Building 576 and associated infrastructure on approximately 13 acres of property being transferred from Federal control. The County performed the work in coordination with the MPCA Voluntary Investigation and Cleanup Program.
2. Phase I & II Environmental Site Assessment for 774 –Acre Excess Parcel
   The remaining 774 acres that is still under the control of TCAAP was declared excess to the needs of the Department of Defense in 2002. The Army Base Realignment and Closure Office funded environmental site assessment 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.

TABLE I-1
WATER QUALITY DATA FOR SURFACE WATER

Fiscal Year 2004

	20700 (Entering TCAAP)	20800 (Leaving TCAAP)
	09-Jun-04	09-Jun-04
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 2.7 (UB0.7)	B 2.4 (UB0.7)
Lead	B 0.69	B 0.47
Mercury	<0.100	<0.100
Silver	<1.0	<1.0
Zinc	81	96
Inorganics (ug/l)		
Cyanide	<10	<10
Total Phosphorus	B 220	<300

Notes:

B = 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 I-2
GRENADE RANGE GROUNDWATER QUALITY DATA

Fiscal Year 2004

	GR1-1	GR1-2	GR2-1	GR2-1 D	GR-DF1	Background [1]
	10-Jun-04	10-Jun-04	10-Jun-04	10-Jun-04	10-Jun-04	
SVOCs (ug/l)						
Bis (2-ethylhexyl) phthalate	<5.1	<5.1	<5.2	<5.0	<5.1	
PCBs (ug/L)						
PCB-1016	<0.100	<0.100	<0.100	<0.100	<0.100	
PCB-1221	<0.200	<0.200	<0.200	<0.200	<0.200	
PCB-1232	<0.100	<0.100	<0.100	<0.100	<0.100	
PCB-1242	<0.100	<0.100	<0.100	<0.100	<0.100	
PCB-1248	<0.100	<0.100	<0.100	<0.100	<0.100	
PCB-1254	<0.100	<0.100	<0.100	<0.100	<0.100	
PCB-1260	<0.100	<0.100	<0.100	<0.100	<0.100	
Metals (ug/l)						
Aluminum	B 5.38 (UB26)	138	<30	<30	<30	500
Arsenic	B 1.73	**15.7**	3.58	3.60	B 0.486	4
Barium	67.2	133	95.1	95.7	28.9	372
Beryllium	<2	<2	<2	<2	<2	1
Cadmium	<2	<2	<2	<2	<2	4
Chromium	B 0.410 (UB0.19)	B 0.404 (UB0.19)	B 0.361 (UB0.19)	B 0.365 (UB0.19)	B 0.652 (UB0.19)	5
Cobalt	B 0.355	B 0.579	B 0.581	B 0.591	B 0.0824	1
Lead	<2	<2	<2	<2	<2	7
Nickel	B 0.507	B 0.546	B 0.361	B 0.329	B 0.442	4
Silver	<5	<5	<5	<5	<5	4
Thallium	<2	<2	<2	<2	<2	2
Vanadium	B 0.735	B 0.566	B 0.440	B 0.453	B 1.08	17
Zinc	B 1.21 (UB1.1)	B 2.73 (UB1.1)	B 1.74 (UB1.1)	B 1.19 (UB1.1)	B 1.51 (UB1.1)	19
Radionuclides (pCi/L)						
Gross alpha	<1.11	<1.66	<1.30	<0.87	<1.07	20
Gross beta	<1.69	3.50 (JQ)	3.20 (JQ)	2.82 (JQ)	<1.77	29.5
Radium 226	<0.81	<0.43	<0.62	<0.57	<0.46	(Not Listed)
Radium 228	<0.85	<0.84	<0.74	<0.72	<0.87	(Not Listed)

Notes:

[1] The background values were cited in Table 3 of the Grenade Range Engineering Evaluation / Cost Analysis Report.

Bolding (in red color) indicates a detection that exceeds the respective background value. Note that data qualified "UB" is considered non detect).

D = Duplicate sample.

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

JQ = The reported result may be a false positive.

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.

TWIN CITIES ARMY AMMUNITION PLANT	Wenck	FY 2004
Surface Water Monitoring Locations	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure I-1

TWIN CITIES ARMY AMMUNITION PLANT

Grenade Range Monitoring Well Locations

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2004

Figure I-2

Appendix J

Annual Site Inspection Checklist
for Land Use Controls

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 28, 2004 Inspected By: Dave Fuller (TCAAP), Dave Humernick (National Guard), Keith Benker (Tecumseh/Wenck Installation Support Services)

Sites:	A	C	D	E	G	H	I	K
Site is located on property held by:	N.G.	AMC	N.G.	N.G.	N.G.	N.G.	AMC	AMC
Is the fence surrounding federally-controlled property intact?	Yes →							
Is access to the federally-controlled property still controlled by the AMC, ATK, & 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 (5)	Yes
Has there been any excavation or other man-made soil disturbance at the site?	Yes (1)	No (2)	No	No	Yes (3)	No	No	No
If excavation or soil disturbance has occurred, was prior approval given by the AMC or National Guard?	Yes	N/A	N/A	N/A	Yes	N/A	N/A	N/A
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	Yes	N/A	N/A	N/A	Yes	N/A	N/A	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 the AMC 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	N/A	N/A	N/A	N/A	N/A	N/A	No
If such systems were removed or modified, was prior approval given by the AMC 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	No (4)	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) There was excavation to repair piping outside of the Site A groundwater treatment system shed.

(2) Site C remediation has not been completed, but there was no evidence of any disturbance since work was suspended.

(3) Construction of the soil cover was completed in November 2003.

(4) Two areas of erosion were observed: one on the east slope and the other in the SE drainage swale. Both areas are outside of the fill limits. Both areas need repair.

(5) The tenant of Building 502, Alliant TechSystems, was in the process of vacating the building.

ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

Twin Cities Army Ammunition Plant

Date: July 28, 2004 Inspected By: Dave Fuller, Dave Hamernick, Keith Barker

Sites:	129-3	129-5	129-15	Grenade Range	Outdoor Firing Range	Bldg 135 P/T Area	Bldg 535 P/T Area	Phyto Demo Area	Unchar. Land
Site is located on property held by:	N.G.	N.G.	N.G.	N.G.	N.G.	AMC	N.G.	AMC	AMC/N.G.
Is the fence surrounding federally-controlled property intact?	Yes								
Is access to the federally-controlled property still controlled by the AMC, ATK, & 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 (6)	Yes	Yes	Yes	N/A
Has there been any excavation or other man-made soil disturbance at the site?	No	No	No	No	Yes (7)	No	Yes (9)	No (2)	N/A
If excavation or soil disturbance has occurred, was prior approval given by the AMC or National Guard?	N/A	N/A	N/A	N/A	Yes	N/A	Yes	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	Yes	N/A	Yes	N/A	N/A
Have any new structures or facilities (including new wells) been constructed on the site?	No	No	No	No	No	No	No	No	N/A
If new facilities or structures were constructed, was prior approval given by the AMC or National Guard?	N/A	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	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	No	N/A
If such systems were removed or modified, was prior approval given by the AMC or National Guard?	N/A	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	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	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	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	No (8)	N/A	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	N/A

Comments (Attach additional pages as necessary):

(6) The National Guard Bureau has transferred 25 acres to the Army Reserve. The transfer includes a portion of the former OFR (the southern end).

(7) Construction of the soil cover at the 1900-yd range was completed in November 2003.

(8) Erosion gullies need repair on the east side of the 1900-yd range cover.

(9) Approximately 2-6 feet of clean fill has been placed over 7-8 acres near the SE corner of the 535 PTA. Also, a stormwater detention pond has been constructed.