INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

FISCAL YEAR 1999 ANNUAL PERFORMANCE REPORT

Prepared for:

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

OCTOBER 2000
FINAL REPORT

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

October 3, 2000

REPLY TO THE ATTENTION OF:
SRF-5J

Mr. Martin R. McCleery
Remedial Project Manager
Twin Cities Army Ammunition Plant
4700 Highway 10 - Suite A
Arden Hills MN 55112-3928

Subject: Consistency Test for the Fiscal Year 1999 Annual Performance Report, Twin Cities Army Ammunition Plant, Arden Hills, Minnesota

Dear Mr. McCleery:

Staff at the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) have completed review of the redline changes to the Twin Cities Army Ammunition Plant , Fiscal Year 1999 Annual Performance Report. The redline changes, received by letter dated September 15, 2000, reflect the changes to the draft version of the report discussed and agreed to by the U.S. Army, EPA and MPCA.

You are hereby advised that, in accordance with Chapter XIV of the Federal Facility Agreement, with the incorporation of the aforementioned redline page changes, the Twin Cities Army Ammunition Plant, Fiscal Year 1999 Annual Performance Report passes the Consistency Test.

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
Project Manager
Site Remediation Section
Metro District
Minnesota Pollution Control Agency

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

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Distribution is limited to
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Other requests for the documents
must be referred to:

Commander
Twin Cities Army Ammunition Plant
4700 Highway 10, Suite A
Arden Hills, Minnesota
55112-3928

Prepared for:

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

U.S. ARMY CORPS OF ENGINEERS
WENCK ASSOCIATES, INC.

OCTOBER 2000
FINAL REPORT

ALLIANT TECHSYSTEMS, INC.
CONESTOGA-ROVERS & ASSOCIATES, LTD.

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APPENDICES

List of Acronyms

Alliant	-	Alliant Techsystems, Inc.
Army	-	U.S. Army
CRA	-	Conestoga-Rovers and Associates, Inc.
EE/CA	-	Engineering Evaluation/Cost Analysis
FFA	-	Federal Facilities Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
gpm	-	Gallons per Minute
IRA	-	Interim Remedial Action
MCES	-	Metropolitan Council Environmental Services
MCLs	-	Maximum Contaminant Levels
MCLGs	-	Maximum Contaminant Level Goals
MDH	-	Minnesota Department of Health
MPCA	-	Minnesota Pollution Control Agency
NBM	-	New Brighton Municipal
NPL	-	National Priorities List
O&M	-	Operation and Maintenance
OU	-	Operable Unit
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
ROD	-	Record of Decision
SDWA	-	Safe Drinking Water Act

List of Acronyms (Cont.)

SVE	-	Soil Vapor Extraction
TCAAP	-	Twin Cities Army Ammunition Plant
TGRS	-	TCAAP Groundwater Recovery System
TSCA	-	Toxic Substances Control Act
μg/l	-	Micrograms per liter
USAEC	-	U.S. Army Environmental Center
USEPA	-	U.S. Environmental Protection Agency
VOCs	-	Volatile Organic Compounds
Wenck	-	Wenck Associates, Inc.

SECTION 1

1.0 Executive Summary

This Fiscal Year 1999 (FY 1999) 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 1999 is defined as the period from October 1, 1998, through September 30, 1999.

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 suppose to?*

Table 1-1, at the end of this section, summarizes the status of remedial actions at the end of FY 1999. Following are highlights of the accomplishments for each operable unit.

Operable Unit 1 (OU1): Deep Groundwater

OU1 consists of the "north" plume of 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 1999:

- One residence was connected to the municipal water supply.
- Abandonment of one private water supply well was still being pursued with one well owner.
- In general, the wells were not pumped in strict accordance with the designed program in the first half of FY 1999, but were in compliance during the latter half. More specifically:
  - NBM #4: Pumped at 3 to 6 percent below design in first half of FY 1999, and 1 to 3 percent above design in the latter half. However, pumping of NBM #3 (located very close to Well No. 4) during the first half of FY 1999 exceeded the 3 to 6 percent shortage.
  - NBM #14: Pumped approximately 6 to 16 percent above design throughout FY 1999, though it was out of service for routine maintenance between January 20 and March 5, 1999.
  - NBM #15: Pumped, on average, about 19 percent below design during the first half of FY 1999 and about 27 percent above design during the latter half.
- Groundwater modeling conducted as part of a pump test analysis showed significant containment, though possibly not complete containment. Subsequent contouring of measured water levels suggests the system provided complete containment of

groundwater contamination exceeding the cleanup levels in the Prairie du Chien. Groundwater quality trends, though perhaps premature, support the interpretation of containment. The USEPA and MPCA have expressed some concern regarding the evaluation of containment, and have suggested adding additional monitoring wells. Discussions are ongoing between the Army, USEPA, and MPCA in regard to OU1 containment. Future water level and water quality evaluations are needed to verify containment.

- It is recommended that the Army work with the City of New Brighton to explore increasing the pumping at NBM #15 to strengthen containment provided by the system.
- The PGAC treated 1.2 billion gallons of water and removed 1,458 pounds of VOCs during FY 1999.
- The effluent of the PGAC was in compliance with the applicable Safe Drinking Water Act criteria.
- The treated groundwater was beneficially used in the New Brighton municipal water supply system.
- The extent and magnitude of contamination in the North Plume did not change significantly; however, at most wells, the concentrations decreased.
- The Minnesota Department of Health was reviewing a request by the Minnesota Pollution Control Agency (MPCA) to expand the boundary of the Special Well Construction Area to the southwest.

Operable Unit 2 (OU2)

OU2 is defined as the 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 1999 are:

- Shallow Soil Sites
  - Completion of soil remediation at Site A, with 11,308 tons of soil excavated, treated, and transported off-site for disposal in calendar year 1999 (a total of 21,905 tons including work performed in calendar year 1998).
  - Completion of soil remediation at Site 129-5 with 136 tons of soil excavated, treated, and transported off-site for disposal in calendar year 1999.
  - Initiation of soil remediation at Sites E and H, with excavation, treatment and off-site disposal of 13,952 and 11,391 tons of soil, respectively. Both sites were estimated to be 80 percent complete.
  - The remedial action design for an SVE system (including a FY 1999 – added air sparging component) for Site A VOC-contaminated soils was approved, with construction initiated in late calendar year 1999.
  - The phytoremediation demonstration project continued at Sites C and 129-3 and was given approval for another year. This demonstration project was not part of the OU2 ROD.
- Deep Soil Sites
  - The shallow SVE systems were shut off in late FY 1998 to allow testing at individual vents, which was performed in early FY 1999. The report, which was still under review at the end of FY 1999, recommended that both shallow systems remain off.
  - A pilot study was performed at Site D to evaluate the effectiveness of deeper SVE vents. The report, which was still under review at the end of FY 1999, concluded that deep soil venting systems are not necessary at Sites D or G.
  - A work plan for site close-out was prepared and was under review at the end of FY 1999. The work plan presents shallow and deep soil sampling plans for Sites D and G that are intended to show that clean-up goals have been met.

- Site A Shallow Groundwater
  - The eight-well extraction system, which has been operating since May 1994, continued to provide containment and mass removal.
  - The system pumped at an average rate of 29.7 gallons per minute during FY 1999 versus the design rate to achieve containment of 25 gallons per minute.
  - During FY 1999, the system removed approximately 3.5 pounds of VOCs, with a cumulative mass removal of 30 pounds since May 1994.
  - The extracted water was discharged to the sanitary sewer system in compliance with all discharge criteria.
  - Source characterization/remediation work in FY 1999 included completion of metals-contaminated soils removal, and design for a soil vapor extraction/air sparging system.
  - Overall, the groundwater extraction system has reduced contaminant concentrations in groundwater. Two primary areas remaining to be remediated are: in the vicinity of extraction well 01U353 for cis-1,2-dichloroethene, and in the vicinity of monitoring well 01U108 for tetrachloroethene and trichloroethene.
- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 1999. Four of the seven wells scheduled for sampling were dry.
  - The Work Plan for evaluating the feasibility of dual phase extraction was completed.
- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 4,508,180 gallons of water and maintained a continuous zone of capture downgradient of Building 103. A total of 9.24 pounds of VOCs were removed in FY 1999.

- The extracted water was discharged to Rice Creek in compliance with all discharge criteria.

- Deep Groundwater
  - The TGRS operated in accordance with the OU2 ROD.
  - The TGRS continued to create a continuous zone of capture along the southwest TCAAP boundary that extends beyond the 5 μg/l trichloroethene contour.
  - In FY 1999, the TGRS extracted and treated 1,177,206,200 gallons of water. The mass of VOCs removed was 4,878 pounds. The total VOC mass removed by the TGRS through FY 1999 is 172,167 pounds.
  - Beginning in November 1997, wells B12 and SC4 were shut down due to reductions in the plume size, as per agreements with the MPCA and USEPA.

Operable Unit 3 (OU3): Deep Groundwater

- The PGRS continued to operate as designed.
- The PGRS is containing the leading edge of the South Plume.
- In FY 1999, a total of 524,942,000 gallons of water were treated by the PGRS, removing 1.5 pounds of VOCs.
- PGRS effluent VOC concentrations met or were below all applicable drinking water criteria in FY 1999.
- The treated groundwater was beneficially used in the New Brighton municipal water supply system.

Table

Table 1-1

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component	Is the component being implemented?	Is the component doing what it is suppose 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	The boundary is being expanded.
#3: Groundwater Containment	Yes	Yes	No	Future verification is needed.
#4: Removal of VOCs by GAC (Discharge Quality)	Yes	Yes	No	--
#5: Discharge of Treated Water	Yes	Yes	No	--
#6: Groundwater Monitoring	Yes	Yes	No	--
Overall Remedy	Yes	Yes	No	--
Operable Unit 2: Shallow Soil Sites				
#1-7: Soil Remediation				
Site A	Yes	Yes	No	Soil excavation completed in 1999. SVE system construction is scheduled to be completed in 2000.
Site C	No	No	No	Excavation is scheduled for 2000. A phytoremediation project is currently underway.
Site E	Yes	Partially	No	Site partially excavated in 1999; to be completed in 2000.

Table 1-1 (continued)

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component	Is the component being implemented?	Is the component doing what it is suppose to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Shallow Soil Sites (continued)				
#1-7: Soil Remediation (continued)				
Site H	Yes	Partially	No	Site partially excavated in 1999; to be completed in 2000.
Site 129-3	No	No	No	Excavation is scheduled for 2000. A phytoremediation project is currently underway.
Site 129-5	Yes	Yes	No	Soil excavation completed in 1999
#8: Groundwater Monitoring	No	No	No	Starts after #1-7 are completed
#9: Characterization of Dumps:				
Site B	Yes	Yes	No	Site B was characterized in FY 1999; no further action was required.
Site 129-15	Yes	Partially	No	Site 129-15 was characterized in FY 1999; the need for a CERCLA soil cover is being evaluated.

Table 1-1 (continued)

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component		Is the component being implemented?	Is the component doing what it is suppose to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Soil Sites					
#1:	Groundwater Monitoring	Yes	Yes	No	--
#2:	Restrict Site Access	Yes	Yes	No	--
#3:	SVE Systems	Yes	Yes	No	Deep SVE pilot study was completed in FY 1999; a report recommending not to install deep SVE systems was under review.
#4:	Enhancements to SVE Systems	Yes	Yes	No	Optimization testing was completed in FY 1999; a report recommending the systems remain off was under review.
#5:	Maintain Existing Site Caps	Yes	Yes	No	--
#6:	Maintain Surface Drainage Controls	Yes	Yes	No	--
#7:	Characterize Shallow Soils and Dump	Yes	Partially	No	Investigation of "tar-like" substances at Site G was completed in FY 1999; no further action was required.
Overall Remedy		Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component	Is the component being implemented?	Is the component doing what it is suppose 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	Partially	No	Excavation of metals-contaminated soils completed in FY 1999. An air sparging/SVE remedial design to address VOC-contaminated soils was under review at the end of FY 1999.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component	Is the component being implemented?	Is the component doing what it is suppose to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site I Shallow Groundwater				
#1: Groundwater Monitoring	Partially	Partially	No	OU2 ROD predesign work is in progress
#2: Groundwater Extraction	No	No	No	See above
#3: POTW Discharge	No	No	No	See above
#4: Additional Investigation	No	No	No	See above
Overall Remedy	No	No	No	See above
Operable Unit 2: Site K Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Sentinel Wells	Yes	No	No	Wells installed in FY 2000
#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	No	OU2 ROD predesign work in progress
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 1999
Twin Cities Army Ammunition Plant

Remedy Component	Is the component being implemented?	Is the component doing what it is suppose to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Groundwater				
#1: Hydraulic Containment and Contaminant Mass Removal	Yes	Yes	No	The work plan for optimizing the TGRS was implemented in FY 1999
#2: Groundwater Treatment	Yes	Yes	No	
#3: Treated Water Discharge	Yes	Yes	No	
#4: Institutional Controls	Yes	Yes	No	
#5: Review of New Technologies	Yes	Yes	No	
#6: Groundwater Monitoring	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	
Operable Unit 3: Deep Groundwater				
#1: Groundwater Extraction	Yes	Yes	No	
#2: Groundwater Treatment	Yes	Yes	No	
#3: Use of Water for Municipal Supply	Yes	Yes	No	
#4: Groundwater Monitoring	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	

SECTION 2

2.0 Introduction

2.1 PURPOSE

This Fiscal Year 1999 Annual Performance Report is intended to:

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

for remedial actions in conjunction with the Twin Cities Army Ammunition Plant (TCAAP), and its role in the New Brighton/Arden Hills Superfund site. Fiscal Year 1999 (FY 1999) extended from October 1, 1998, through September 30, 1999.

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 and groundwater contamination on TCAAP. OU2 also includes the shallow Site A plume which 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

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). Minor modifications to the FFA were agreed to by these parties 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.

A key aspect of this report was the development of performance standards 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 1999, this document presents proposed monitoring for future years (Appendix A). The monitoring plan shows

FY 1999 through FY 2003. The FY 1999 monitoring plan indicates the work for which results are included in this report. The FY 2000 monitoring plan is in progress. The intent is that the monitoring plan will always be a revolving 5-year timespan--in other words, next year FY 1999 will drop off and FY 2004 will be added.

This report represents the collaboration of work performed by the U.S. Army (Army) and Alliant Techsystems Inc. (Alliant). On behalf of the Army, the Corps of Engineers contracted Wenck Associates, Inc. (Wenck) to prepare Sections 2.0 through 6.0, and 11.0 of this report. On behalf of Alliant Techsystems Inc., Conestoga-Rovers & Associates (CRA) prepared Sections 7.0 through 10.0. Wenck and CRA both contributed to Section 1.0.

2.2 SITE DESCRIPTION

The Twin Cities Army Ammunition Plant is a government-owned facility located in Arden Hills, Minnesota, in the northern portion of the Minneapolis-St. Paul metropolitan area (Figure 2-1). The facility occupies approximately a four-square mile area immediately east of U.S. Interstate Highway 35W and north of Ramsey County Highway 96. Alliant Techsystems Inc. is the contracted operator and the prime tenant on the installation.

TCAAP was constructed in 1941 to provide small-caliber ammunition for the military needs of the United States. Production began in 1941 and then alternated between periods of activity and shutdown. TCAAP was placed in "standby" status in 1976; and then in 1992, its status was changed to "modified caretaker" which indicates that it will no longer be maintained for the production of ammunition.

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 have previously been remediated. The remaining sites are addressed in the OU2 ROD.

Three other sites, the Grenade Range, the Outdoor Firing Range, and the Trap Range are being addressed as Removal Actions separate from the OU2 ROD; therefore, they are not specifically addressed in this report.

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.1, 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 as Appendices B.2 and B.3. The well index lists wells of concern, the TCAAP designation, Minnesota unique number, and any other name(s) the wells may have.

2.4 DATA COLLECTION, MANAGEMENT, AND PRESENTATION

Performance monitoring data was collected in accordance with the:

- FY 1999 Monitoring Plan for Groundwater Monitoring Wells
- FY 1999 Monitoring Plan for Remedial Treatment Systems
- FY 1999 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

Data was collected principally by two parties: CRA on behalf of Alliant Techsystems, and Barr Engineering on behalf of the City of New Brighton. Appendix C presents a discussion of data collection, management, and presentation. The comprehensive groundwater level and groundwater quality databases from 1987 to present are contained on a CD-ROM in Appendix D. Tables showing FY 1999 data are presented following the text at the end of the section in which they are referenced. Graphs showing trichloroethene trends over time are presented in Appendix E. Pumping data for nearby municipal, commercial, and industrial wells is presented in Appendix F.

Was data collection complete (do we have the information needed to evaluate performance)?

With the exception of a few minor deviations, the data set for FY 1999 is complete. Appendix C.3 provides explanations for the deviations.

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

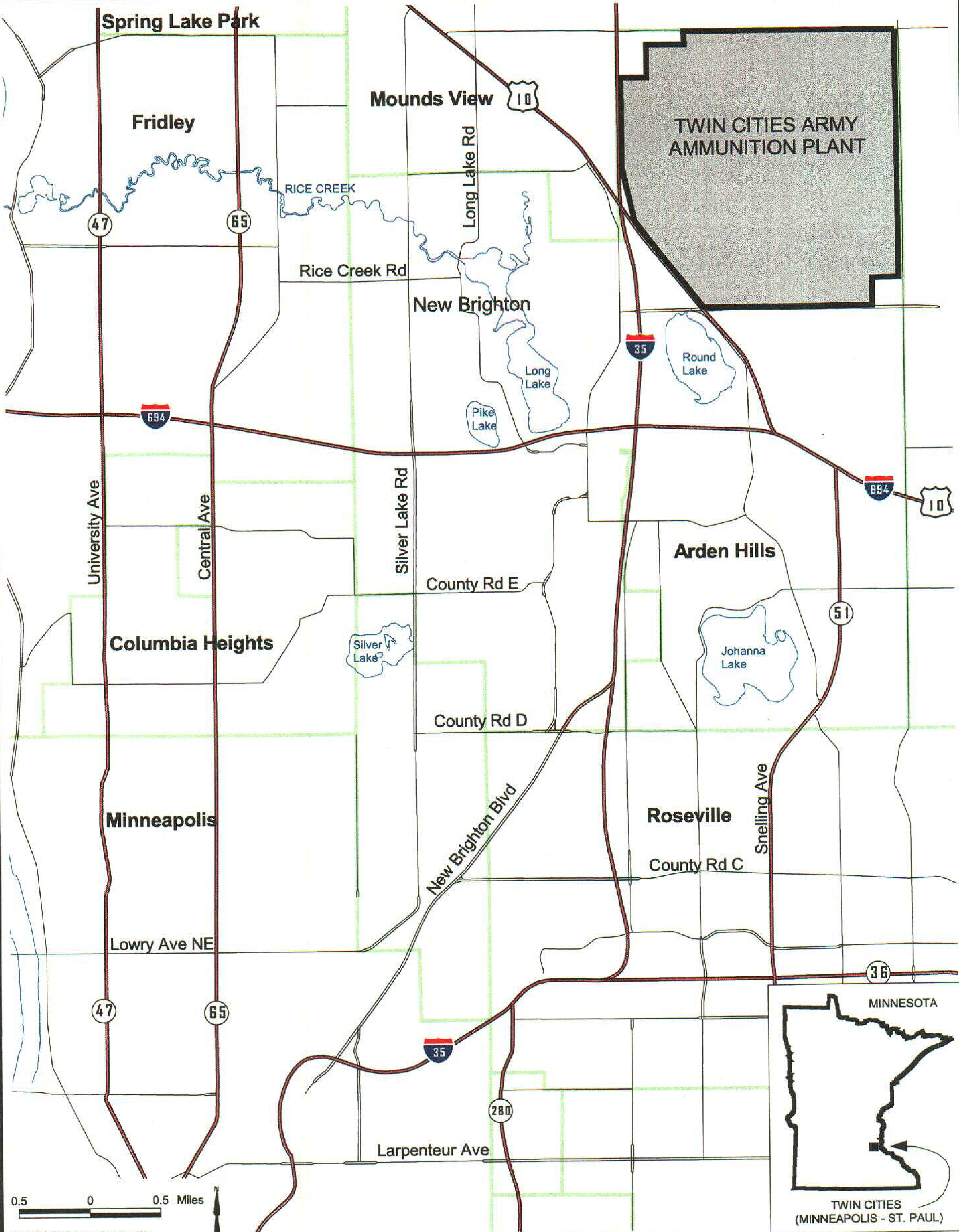
Yes. The data was collected, analyzed, and validated in accordance with the "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996). Data validation records are on file with the Army, and are available for review. The databases (Appendix D) and data tables in the various report sections show the data qualifiers and flagging codes associated with the data. The qualifiers and flagging codes are explained in Appendix C.

2.5 FIVE-YEAR REVIEW

A five-year review was performed for the New Brighton/Arden Hills Superfund Site, including all three operable units. Operable Unit 3 triggered the five-year review since it had the first signed ROD. Although five-years had not elapsed for the other two operable units, the decision was made to review all three operable units at the same time for the sake of efficiency and completeness. In this manner, all three operable units will move forward on the same five-year review cycle. This statutory-required review was performed by the U.S. Army for review by the MPCA and USEPA, Region V. The purpose of the five-year review was to evaluate whether remedial actions remain protective of human health and the environment at sites where hazardous waste remains on-site at levels that do not allow for unrestricted use. A site inspection was conducted on March 16, 1999, by the USEPA, MPCA, U.S. Army, Alliant Techsystems, and other interested parties. The Five-Year Review Report was finalized in September 1999 (Wenck, 1999).

Separate from the Five-Year Review Report, the U.S. Army, USEPA, and MPCA are in the process of reviewing the institutional controls requirements for the site, based upon the latest USEPA guidance on institutional controls.

Figures



TWIN CITIES ARMY AMMUNITION PLANT	COPYRIGHT Wenck	OCT 2000
Site Location Map	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 2-1

L:0003/0003-61/apr file/99report.apr/figure 2-2

TWIN CITIES ARMY AMMUNITION PLANT	Wenck	OCT 2000
TCAAP Site Boundaries	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 2-2

SECTION 3

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 <u>all</u> well owners 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; 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 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 is underway, but is not yet completed. An update to the TCAAP Alternate Water Supply Construction Report was completed in March 1999 by Montgomery Watson, documenting additional work conducted under the program. The MDH prepared a Health Consultation addressing health risks for nine wells which were not abandoned because of either lack of response from the well owner, well owner refusal of the offer to abandon, or the water use was deemed acceptable. The MDH Health Consultation was under review at the end of FY 1999.

Within the North Plume, are there any well owners which meet the criteria, but have not yet been provided an alternate water supply?

No. The Bochnak residence at 2600 St. Anthony Boulevard was connected to municipal water supply in July 1999. The former house well (234368) will be used for irrigation water.

Within the North Plume, are there any wells which meet the criteria, but have not yet been abandoned?

Yes. Abandonment of the old irrigation well (234369) at the Bochnak residence (2600 St. Anthony Boulevard) was still pending at the end of FY 1999. Property access issues were being resolved with the homeowner.

Did the boundary of the North Plume get any bigger during FY 1999, as defined by the 1 μg/l contour line?

No. Figure 3-1 illustrates the 1 μg/l contour line for trichloroethene in Upper Unit 4 for the years 1993 through 1999. Trichloroethene is in general the most widespread of the chemicals of concern for OU1, and the area impacted is greatest in Upper Unit 4. This figure indicates there was no appreciable change in the 1 μg/l contour for the North Plume (or the South Plume for OU3).

Were any new wells discovered within the North Plume during FY 1999?

Yes. Additional wells were added to the well inventory database as the result of reviewing the MDH database (see Appendix G).

Were any water supply wells within the North Plume sampled during FY 1999 (outside of those included in the OU1 performance monitoring plan)?
Yes. Two wells were sampled in FY 1999 and the results are presented in Table 2.8 of Appendix G.

Were any well owners offered an alternate water supply and/or well abandonment during FY 1999? The only new offers were follow-up by the Army on the two wells at the Bochnak residence as described on the previous page.

Is any sampling of water supply wells (excluding those included in the OU1 performance monitoring plan) proposed prior to the next report?
Yes. The proposed monitoring is presented in Table 3.1 of Appendix G.

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 to the southwest to ensure that the southern boundary fully encompassed the plume. The MDH was reviewing this issue at the end of FY 1999.

Are any changes or additional actions required for this remedy component?
No; beyond the MDH completing their review of the boundary extension issue in FY 2000 and revising the boundary, as appropriate.

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 approximately ⅓ mile south of Interstate 694, east of Silver Lake Road, as shown on Figure 3-1.
- NBM #3 has been designated as an alternate containment/production well for times when one of the three primary wells are not in operation. NBM #5 and NBM #6 are considered secondary alternates.

The OU1 remedy is 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 oversite services. The OU1 remedy is being paid for by the Army.

During FY 1999, Montgomery Watson prepared the Draft TCAAP OU1 Remedial Action Report, which addresses construction of the extraction system. They also prepared the Draft OU1 Pumping Test Report with analysis of the pump tests performed at NBM #14 and #15 in July 1998. At the end of FY 1999, both reports were under review.

The Army, USEPA, and MPCA are having ongoing discussions to clarify the intent and evaluate the performance of this remedy component.

Performance Standard (how do you know when you're done):
When the containment boundary created by the extraction system is providing complete capture of all groundwater with contaminant concentrations exceeding the cleanup standards specified on page 18 of the OU1 ROD. The cleanup standards are shown in Table 3-1.

During FY 1999, did the OU1 extraction system provide complete capture (at the containment boundary) of all groundwater exceeding the cleanup standards specified on page 18 of the OU1 ROD?
The FY 1999 water level contour information suggests that the OU1 extraction system is providing complete containment in the Prairie du Chien, which it was designed to achieve. There is some uncertainty to this conclusion (as discussed below); hence, future water level and water quality evaluation is needed to verify this interpretation.

With regard to the underlying Jordan, there may be contamination above the cleanup standards which is not being completely contained. The OU1 ROD, and subsequent remedial design work, did not specifically address the Jordan. The Army, USEPA, and MPCA are discussing this matter.

The following paragraphs describe in more detail the evaluation of containment in the Prairie du Chien.

Pumping Rates

Table 3-3 presents the monthly pumping volumes for each extraction well and Figure 3-2 illustrates the 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 Army, USEPA, and MPCA are currently discussing whether or not these design rates remain appropriate. Figure 3-2 shows the slight variability in monthly pumping targets based on the varying number of days. The figure also shows how when one well goes off-line (in this case NBM #14 between January 20 and March 5, 2000), the pumping is increased at other wells (in this case NBM #3 and #15).

Figure 3-2 indicates that pumping at NBM #4 was 3 to 6 percent below the target for the first half of FY 1999, but was 1 to 3 percent above the targets during the second half. Pumping at NBM #15 was, on average, about 19 percent below the target for the first half, and about 27 percent above for the second half. Pumping at NBM #14 was approximately 6 to 16 percent above the target throughout FY 1999. When you consider the pumping at NBM #3, the overall system was below the targets only during the first three months of FY 1999. The problems early in FY 1999 were primarily related to the City of New Brighton working to balance their water supply needs and increase the interconnection flow to the City of Fridley. Consistent pumping above targets is expected in the future, which will contribute to a higher level of confidence for evaluation of containment.

Water Level Contour Analysis

To assist in evaluation of containment, the FY 1998 Annual Performance Report recommended that two additional rounds of water level measurements be performed in the vicinity of the OU1 extraction system. This work was completed and Table 3-2 presents the FY 1999 water level data. Appendix H presents water level contour maps showing the estimated line of capture.

The FY 1999 water level contours suggest that the OU1 extraction system is providing complete containment in the Prairie du Chien. The area with the highest uncertainty is between NBM #3/4 and NBM #15, which is depicted by a deflection in the water level contours and the capture line on the figures in Appendix H. These contour maps, along with discussion, were submitted to the USEPA and MPCA in a Wenck Memorandum dated December 13, 1999.

Capture Calculations

In addition to analysis of water level contours, the Wenck Memorandum presents capture calculations which were used to check the capture limits. The calculations yield capture estimates smaller than what was derived from the water level contours; however, they agree reasonably well. The MPCA and USEPA have stated that this discrepancy contributes to their uncertainty with regard to containment.

Groundwater Modeling

As part of their pump test analysis for NBM #14 and #15, Montgomery Watson performed groundwater modeling using WinFlow. The modeling results indicated there is significant containment, but probably not complete containment. However, it is likely that the discrepancy between the model results and the observed water level contours can be explained by the assumed model input for contribution of flow from the Prairie du Chien at NBM #3/4. As discussed in the Wenck Memorandum, Montgomery Watson assumed 66% contribution from the Prairie du Chien, when the pump test transmissivity results suggest that 90% contribution would be a better assumption.

Water Quality Analysis

Over the long-term, water quality data will be useful in evaluating containment. If containment is being achieved, we should see decreases in contaminant concentrations downgradient of the extraction system. It is expected that it will take several years to see these trends develop. Trichloroethene concentration versus time graphs are presented in Appendix E. For wells 04U877 (near the capture line between NBM #14 and #15) and 04U871 (further downgradient), the concentrations have generally been decreasing since late 1996. This coincides with when NBM #14 came on-line, and along with NBM #3 and NBM #4, was providing interim containment. A similar, but less clear trend is depicted for 04U872 (even further downgradient). At 04U875 (downgradient of the western edge of containment), the concentrations exhibit an overall downward trend since 1993. These decreasing trends support the statement that the extraction system is providing complete containment in the Prairie du Chien.

Prairie du Chien Summary

The capture lines derived based on water level contours indicate that the OU1 extraction system is providing complete containment in the Prairie du Chien. Capture calculations and modeling yield capture limits which match reasonably well, but are smaller, which introduces some uncertainty. Groundwater contaminant concentrations downgradient of the extraction system generally exhibit decreasing trends which supports containment. The USEPA and MPCA have expressed some concern regarding the evaluation of containment, and have suggested adding additional monitoring wells. Discussions are ongoing between the Army, USEPA, and MPCA in regard to OU1 containment. Ongoing water level and water quality monitoring are needed to verify containment.

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

The limit of capture shown on the figures in Appendix H indicate that the extraction system is pumping enough water to achieve containment. The area of greatest concern is in the middle of the plume between NBM #4 and NBM #15.

To better balance the capture and alleviate possible doubts, it is recommended that the Army explore, with the City of New Brighton, the possibility of pumping more water from NBM #15, and possibly less water from NBM #14. Increased pumping at NBM #15 would create greater drawdown, which would presumably be noticeable in future water level contour maps. This would enhance the level of certainty for containment.

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 ⅓ 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.

During FY 1999, did the treated water meet the MCLs and non-zero MCLGs established by the SDWA for the OU1 chemicals of concern?
Yes. Table 3-4 shows that the PGAC effluent met the performance standard during FY 1999.

The 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 3-4 shows that one carbon change-out occurred in FY 1999 in late April/May 1999.

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 3-5 summarizes the performance monitoring requirements, responsible parties, and the specific documents which contain the monitoring plans.

Were the groundwater monitoring requirements for this remedy met?
In general, yes. The FY 1999 monitoring plan is shown in Appendix A.1 and explanations for deviations are provided in Appendix C.3.

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 the 1998/1999 Well Inventory Update (Appendix G).
- 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. Note that only one monitoring well is

scheduled to be sampled in FY 2000, as this is the first "off year" in the biennial monitoring program previously agreed to with the USEPA and MPCA.

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

Yes. It is recommended to change the monitoring frequency for 04U855 from annual to biennial after FY 2000 (this change is reflected in the monitoring plan in Appendix A.1). In the past, when the other OU1 wells were switched from annual to biennial frequency, there was concern regarding variability in the data at 04U855. Because of some seemingly unusual data in 1992–1993, the decision was made to continue sampling 04U855 annually. Since 1995, there have been no detections in this well, so it is appropriate to discontinue annual sampling (see graph in Appendix E).

Also, it is proposed to delete well 233221 from the monitoring program (this change is shown in the monitoring plan in Appendix A.1). The well was formerly owned by Reuben Meats, but is now owned by R&D Systems. As indicated in the monitoring plan deviation letter (Appendix C.3), a sample was not collected in FY 1999 because the well was not in operation. The new owner has disconnected the pump and does not intend to operate the well. As shown on Figure B-1 (in Appendix B), this well is located at the far south end of the study area. While helpful in determining the west edge of the plume, it was not a critical well.

To assist in evaluation of OU1 containment, it is proposed to change the monitoring frequency for 04U871, 04U872, and 04U877 from biennial to annual (this change is shown in Appendix A.1).

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? Table 3-1 presents the FY 1999 water quality data for OU1. Trichloroethene trend graphs for Deep Groundwater monitoring wells are presented in Appendix E. The graphs are grouped by Operable Unit, and then hydrogeologic unit. The graphs best illustrate the long-term changes that have occurred throughout OU1. As discussed previously, wells downgradient of the extraction system generally show decreasing concentrations.

The FY 1999 trichloroethene concentrations are shown in plan view on Figures 3-3 through 3-5, and in cross-section view on Figure 3-6. As previously introduced, Figure 3-1 illustrates how the 1 μg/l contour has changed between 1993 and 1999 for Upper Unit 4. Similarly, Figure 3-7 shows how the 100 μg/l contour has changed.

Collectively, these figures indicate the following changes compared to last year:

1. For Upper Unit 3 (Figure 3-3), the trichloroethene concentration at 03U822 increased from 16.90 μg/l to 375 μg/l. This caused the 100 μg/l to shift south and west, which also pushed the 1 and 10 μg/l contours out. The trend graph for 03U822 (Appendix E) shows that concentrations at this well have increased since 1993. A similar dramatic increase has occurred at the nested well, 03L822.

2. For Lower Unit 3 (Figure 3-4), the trichloroethene concentration at 409557 increased from <0.56 to 16 μg/l, causing the 1 and 10 μg/l contours to shift east. The trend graph (Appendix E) shows that in 1992, the concentration at 409557 was nearly 10 μg/l, but all other years it has been less than 1 μg/l.

3. Also for Lower Unit 3 (Figure 3-4), last year's contour map showed a "break" in the 100 μg/l contour based on concentrations at 03L809 (67.30 μg/l) and 03L853 (90.10 μg/l). This year the concentration at 03L809 increased to 150 μg/l while 03L853 decreased to 78 μg/l. As shown on cross-section A-A′ (Figure 3-6), 03L853 is actually screened at a depth equivalent to Upper Unit 3. Hence, for this year's contour map, the 100 μg/l contour in Lower Unit 3 is shown extending continuously from TCAAP, south to near Highway 694.

4. For Upper Unit 4 (Figure 3-5), well 04U847 was sampled for the first time since 1995. Last year's plume contour map depicted a "break" in the 100 μg/l contour in the vicinity of 04U847 based on the decreasing historical trend at this well. The well was added to the monitoring program to verify the "break." Unexpectedly, the trichloroethene concentration was 1,300 μg/l, which is comparable to the level at this well back in 1993. This year's value resulted in losing the "break" in the 100 μg/l contour, and adding a 1,000 μg/l contour.

5. Also for Upper Unit 4 (Figure 3-5), the trichloroethene concentration at 04U844 decreased from 470 to 22 μg/l, causing the 100 μg/l contour to shrink further west upgradient of the extraction system.

6. Overall, the 100 μg/l contour got smaller for Upper Unit 4 as illustrated on Figure 3-7. Figure 3-5 shows that the only monitoring well in OU1 with a concentration greater than 100 μg/l is 04U847 (discussed above). NBM #14 has concentrations greater than 100 μg/l, so there must still be an area with concentrations this high. On Figure 3-5, this is depicted as a relatively narrow area extending from 04U847 down to NBM #14. Well 04U850 was added back to the monitoring program for FY 1999 in anticipation that it would show the center of the plume approaching the extraction wells. When 04U850 was last

sampled in 1995, the trichloroethene concentration was 340 μg/l. The result for FY 1999 was 32 μg/l, so the center of the plume appears to be east of 04U850. Downgradient of the extraction system, concentrations also appear to have decreased below 100 μg/l based on the concentration at 04U871 decreasing from 113 to 89 μg/l.

7. As noted earlier in Section 3.0, Figure 3-1 shows that the 1 μg/l contour did not appreciably change for Upper Unit 4. The 10 μg/l contour also did not change significantly.

8. With respect to the Jordan, near the TCAAP boundary at PJ#806, the trichloroethene concentration decreased from 420 to 300 μg/l. In the vicinity of the OU1 extraction wells, from west to east, the trichloroethene concentrations were:

	FY 1999	FY 1998
04J839	1.80 μg/l	1.74 μg/l
04J836	4.20 μg/l	3.91 μg/l
04J837	60.00 μg/l	147 μg/l
04J838	46.00 μg/l	39.80 μg/l

Downgradient of the extraction system at NBM #5 and #6 (both completed in the Jordan only), the concentrations were 150 and 90 μg/l, respectively. This information indicates that there is relatively widespread contamination in the Jordan above the cleanup levels specified in the OU1 ROD. The current extraction system was not designed to achieve containment in the Jordan.

9. Vertical gradients for well nests throughout OU1 are presented in Table 3-6. In general for OU1, the gradients indicate that groundwater moves downward from the Prairie du Chien into the Jordan. At the 836 well nest near NBM #4, the flow is upward from the Jordan into the Prairie du Chien. NBM #4 is completed through both formations. The fact that the gradient is upward suggests that water is removed faster from the Prairie du Chien than the Jordan, which is inducing water to move upward. At well nest 836, near NBM #4, most of the trichloroethene is in the Prairie du Chien (26 μg/l) versus the Jordan (4.20 μg/l). Thus, while NBM #4 captures water from both the Prairie du Chien and the Jordan, most of the water is from the more contaminated portion of the aquifer. At the 837 well nest near NBM #15 and the 838 well nest near NBM #14, the gradients are downward; however, pumping has reduced the magnitude. The gradients are approximately two times less than at the 839 well nest located further west, near the capture limit of the wells.

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

Table 3-3 shows that the PGAC removed 1,458 pounds of VOCs during FY 1999. The relative contribution from each extraction well was highest to the east (NBM #14) and lowest to the west (NBM #4).

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

Tables

TABLE 3-1
OU1 Groundwater Quality Data: FY 1999

		Trichloroethene	1,1-Dichloroethene	cis-1,2-Dichloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane
OU1 Cleanup Level (1)		5	6	70	200	3	70
03L822	09-Jun-99	**650.00**	**56.00**	JP 6.90	74.00	**<10.00**	36.00
03L841	14-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
03L846	09-Jun-99	JP 0.69	<1.00	<1.00	<1.00	<1.00	JP 0.29
03L853	15-Jun-99	**78.00**	2.90	JP 0.44	7.70	<1.00	2.60
03M843	14-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
03U822	09-Jun-99	**375.00**	**23.00**	3.90	21.00	<1.00	26.00
03U824	16-Jun-99	**89.00**	2.60	JP 0.37	6.90	<1.00	2.20
03U824 D	16-Jun-99	**86.00**	2.80	JP 0.42	7.10	<1.00	2.50
03U831	15-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
04J834	10-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
04J836	16-Jun-99	4.20	<1.00	<1.00	JP 0.51	<1.00	<1.00
04J837	10-Jun-99	**60.00**	3.70	JP 0.61	6.40	<1.00	2.90
04J838	10-Jun-99	**46.00**	2.30	<1.00	2.30	<1.00	1.90
04J838 D	10-Jun-99	**44.00**	2.10	JP 0.28	2.20	<1.00	1.90
04J839	17-Jun-99	1.80	<1.00	<1.00	<1.00	<1.00	<1.00
04J882	10-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
04U834	10-Jun-99	**75.00**	3.80	JP 0.57	6.00	<1.00	2.90
04U836	16-Jun-99	**26.00**	1.70	<1.00	3.70	<1.00	1.20
04U837	10-Jun-99	**16.00**	JP 0.96	JP 0.33	JP 1.00	<1.00	JP 0.99
04U838	10-Jun-99	**11.00**	JP 0.56	<1.00	JP 0.99	<1.00	JP 0.49
04U839	17-Jun-99	2.70	<1.00	<1.00	<1.00	<1.00	<1.00
04U841	14-Jun-99	**19.00**	3.70	JP 0.58	10.00	<1.00	2.10
04U843	14-Jun-99	**22.00**	**6.80**	JP 0.34	7.80	<1.00	4.80
04U844	15-Jun-99	**22.00**	1.30	<1.00	3.20	<1.00	JP 0.69
04U846	09-Jun-99	JP 0.30	<1.00	<1.00	<1.00	<1.00	2.50
04U847	29-Jun-99	**1300.00**	**110.00**	12.00	160.00	<1.00	**93.00**
04U850	09-Jun-99	**32.00**	3.00	<1.00	3.60	<1.00	2.40
04U855	11-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

TABLE 3-1
OU1 Groundwater Quality Data: FY 1999

			Trichloroethene	1,1-Dichloroethene	cis-1,2-Dichloroethene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane
OU1 Cleanup Level (1)			5	6	70	200	3	70
04U871		11-Jun-99	**89.00**	4.80	JP 0.68	7.70	<1.00	3.40
04U872		09-Jun-99	**38.00**	2.00	JP 0.33	2.80	<1.00	1.80
04U875		09-Jun-99	**12.00**	JP 0.69	<1.00	1.70	<1.00	JP 0.66
04U877		14-Jun-99	**13.00**	JP 0.84	JP 0.35	JP 0.61	<1.00	JP 0.96
04U879		11-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
04U880		14-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
04U881		15-Jun-99	1.10	<1.00	<1.00	<1.00	<1.00	<1.00
04U882		10-Jun-99	**17.00**	JP 0.88	<1.00	1.70	<1.00	JP 0.65
04U883		14-Jun-99	JP 0.66	<1.00	<1.00	<1.00	<1.00	<1.00
200524		09-Jun-99	**24.00**	1.20	<1.00	1.30	<1.00	JP 1.00
200803		09-Jun-99	**21.00**	JP 1.00	<1.00	JP 0.81	<1.00	JP 0.84
200803	D	09-Jun-99	**22.00**	JP 1.00	<1.00	JP 0.80	<1.00	JP 0.83
206688		09-Jun-99	**9.70**	JP 0.66	<1.00	1.70	<1.00	JP 0.62
206793		09-Jun-99	**16.00**	JP 0.90	<1.00	2.00	<1.00	JP 0.64
206796		09-Jun-99	**150.00**	**7.50**	<5.00	15.50	**<5.00**	JP 4.65
206797		09-Jun-99	**90.00**	JP 4.20	<5.00	12.00	**<5.00**	JP 2.75
234546		15-Jun-99	**50.00**	2.70	JP 0.30	3.50	<1.00	2.00
409547		11-Jun-99	<1.00	JP 0.38	1.10	JP 0.86	<1.00	JP 0.80
409548		14-Jun-99	2.80	JP 0.61	<1.00	<1.00	<1.00	1.10
409548	D	14-Jun-99	2.90	JP 0.64	<1.00	<1.00	<1.00	1.10
409549		11-Jun-99	4.40	<1.00	<1.00	JP 0.63	<1.00	<1.00
409549	D	11-Jun-99	**5.00**	JP 0.27	<1.00	JP 0.66	<1.00	<1.00
409550		15-Jun-99	**425.00**	**JP 17.80**	<25.00	75.00	**<25.00**	JP 9.75
409555		11-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
409556		11-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
409557		11-Jun-99	**16.00**	**9.40**	1.70	14.00	<1.00	11.00
409597		15-Jun-99	**180.00**	**17.00**	2.00	26.00	JP 0.29	15.00
512761		15-Jun-99	**69.00**	3.70	JP 0.43	7.00	<1.00	2.30
PJ#318		10-Jun-99	**7.30**	JP 0.40	<1.00	JP 0.37	<1.00	JP 0.42

Notes: (1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD. Bolding indicates exceedance of the cleanup level or reporting limits higher than the cleanup level.
JP The value is below the reporting limit, but above the method detection limit.
D Duplicate sample.

TABLE 3-2
OU1 Groundwater Level Data: FY 1999

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
03L822	876.6	27-May-99	833.24
03L841	911.3	27-May-99	841.00
03L846	887.6	27-May-99	828.46
03L853	888.8	27-May-99	834.03
03M843	885.7	27-May-99	834.26
03U822	876.7	27-May-99	833.26
03U824		03-Jun-99	833.30
03U831	888.6	27-May-99	833.34
04J834	946.1	27-May-99	805.39
04J836	1001.49 *	27-May-99	823.72
04J836	1001.49 *	07-Jul-99	1001.49
04J836	1001.49 *	05-Aug-99	1001.49
04J837	929.35 *	27-May-99	824.22
04J837	929.35 *	07-Jul-99	929.35
04J837	929.35 *	05-Aug-99	929.35
04J838	880.18 *	27-May-99	825.71
04J838	880.18 *	07-Jul-99	880.18
04J838	880.18 *	05-Aug-99	880.18
04J839	987.94 *	27-May-99	824.31
04J839	987.94 *	07-Jul-99	987.94
04J839	987.94 *	05-Aug-99	987.94
04J864	906.2	27-May-99	825.77
04J864	906.2	07-Jul-99	908.79
04J864	906.2	05-Aug-99	908.79
04J866	908.5	27-May-99	826.31
04J866	908.5	07-Jul-99	910.69
04J866	908.5	05-Aug-99	910.69
04J882	884.8	27-May-99	803.07
04U834	945.7	27-May-99	809.16
04U836	1000.64 *	27-May-99	822.63
04U836	1000.64 *	07-Jul-99	1000.64
04U836	1000.64 *	05-Aug-99	1000.64
04U837	929.15 *	27-May-99	826.20
04U837	929.15 *	07-Jul-99	929.15
04U837	929.15 *	05-Aug-99	929.15
04U838	880.49 *	27-May-99	827.33
04U838	880.49 *	07-Jul-99	880.49
04U838	880.49 *	05-Aug-99	880.49
04U839	987.73 *	27-May-99	827.08
04U839	987.73 *	07-Jul-99	987.73

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
04U839	987.73 *	05-Aug-99	987.73
04U841	911.5	27-May-99	842.50
04U843	886.1	27-May-99	833.47
04U844	884.5	27-May-99	831.84
04U846	888.4	27-May-99	827.08
04U846	888.4	07-Jul-99	889.46
04U846	888.4	05-Aug-99	889.46
04U847		03-Jun-99	842.00
04U850	916.8	27-May-99	826.97
04U850	916.8	07-Jul-99	918.99
04U850	916.8	05-Aug-99	918.99
04U851	913.4	27-May-99	828.12
04U851	913.4	07-Jul-99	914.51
04U851	913.4	05-Aug-99	914.51
04U852	902.9	03-Jun-99	826.63
04U852	902.9	07-Jul-99	905.66
04U852	902.9	05-Aug-99	905.66
04U855	896.1	27-May-99	831.58
04U863	893.1	27-May-99	832.11
04U863	893.1	07-Jul-99	895.33
04U863	893.1	05-Aug-99	895.33
04U864	906.4	27-May-99	827.92
04U864	906.4	07-Jul-99	908.67
04U864	906.4	05-Aug-99	908.67
04U865	913.0	03-Jun-99	828.63
04U865	913.0	07-Jul-99	915.60
04U865	913.0	05-Aug-99	915.60
04U866	908.4	27-May-99	825.89
04U866	908.4	07-Jul-99	910.60
04U866	908.4	05-Aug-99	910.60
04U871	957.1	27-May-99	818.94
04U871	957.1	07-Jul-99	959.11
04U871	957.1	05-Aug-99	959.11
04U872	952.2	27-May-99	816.89
04U875	1013.6	27-May-99	818.59
04U875	1013.6	07-Jul-99	1015.72
04U875	1013.6	05-Aug-99	1015.72
04U877	920.9	27-May-99	825.49
04U877	920.9	07-Jul-99	923.08
04U877	920.9	05-Aug-99	923.08
04U879	945.6	27-May-99	827.26

TABLE 3-2
OU1 Groundwater Level Data: FY 1999

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
04U879	945.6	07-Jul-99	948.12
04U879	945.6	05-Aug-99	948.12
04U880	972.0	27-May-99	814.89
04U881	976.5	27-May-99	813.18
04U882	917.7	27-May-99	807.91
04U883	948.6	27-May-99	805.37
200524	946.5	27-May-99	813.60
200803	1012.7	27-May-99	811.00
200804	1015.0	27-May-99	814.83
206792	890.8	27-May-99	817.66 P
206793	999.0	27-May-99	821.96
206796	965.0	27-May-99	815.51
206797	1025.8	27-May-99	821.73
409547	896.0	27-May-99	836.03
409548	867.0	27-May-99	828.63

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
409548	867.0	07-Jul-99	872.19
409548	867.0	05-Aug-99	872.19
409549	921.3	27-May-99	827.43
409549	921.3	07-Jul-99	923.23
409549	921.3	05-Aug-99	923.23
409550	912.0	27-May-99	843.13
409555	923.0	27-May-99	820.38
409556	960.0	27-May-99	826.78
409557	896.0	27-May-99	833.32
409597	880.3	27-May-99	833.32
500691	891.2	27-May-99	831.86
500691	891.2	07-Jul-99	893.95
500691	891.2	05-Aug-99	893.95
512761		27-May-99	803.31
554216	890.8	27-May-99	832.78 P
582628		27-May-99	821.74 P
PJ#318	983.0	27-May-99	811.79

Notes:

1) TOS = Top of Surface which represents the ground surface elevation in feet above mean sea level (MSL). The TOS elevations were retrieved from the USAEC IRDMIS. All data are referenced to TOS elevations surveyed by Kemper and Associates, Inc. during July through September 1992.

* = Reference elevation is top of casing (TOC) not TOS. Data provided by CRA.

P = Pumping

Table 3-3

OU1 PUMPING/VOC MASS REMOVAL DATA

PGAC Wells

MTH/YR	ITEMS	WELL # 3	WELL # 4	WELL # 5	WELL # 6	WELL # 14	WELL # 15	Total PGAC WELLS
Oct-98	Pumpage (Thousands of gals.)	2,767	35,504	767	130	32,493	20,147	91,808
	VOC Level (ppb)	30	75	180	110	270	180	
	Total VOCs (lbs)	1	22	1	0	73	30	128
Nov-98	Pumpage (Thousands of gals.)	6,495	33,696	516	394	31,851	20,249	93,201
	VOC Level (ppb)	35	68	175	100	240	170	
	Total VOCs (lbs)	2	19	1	0	64	29	115
Dec-98	Pumpage (Thousands of gals.)	4,324	35,298	274	89	33,682	22,267	95,934
	VOC Level (ppb)	26	69	180	105	190	140	
	Total VOCs (lbs)	1	20	0	0	53	26	101
Jan-99	Pumpage (Thousands of gals.)	9,336	35,559	725	85	20,546	32,695	98,946
	VOC Level (ppb)	29	63	194	107	250	164	
	Total VOCs (lbs)	2	19	1	0	43	45	110
Feb-99	Pumpage (Thousands of gals.)	16,097	31,771	8,878	199	0	40,872	97,817
	VOC Level (ppb)	25	73	171	102	220	188	
	Total VOCs (lbs)	3	19	13	0	0	64	100
Mar-99	Pumpage (Thousands of gals.)	8,472	34,905	961	108	29,518	28,117	102,081
	VOC Level (ppb)	31	74	200	120	240	220	
	Total VOCs (lbs)	2	22	2	0	59	52	136
Apr-99	Pumpage (Thousands of gals.)	4,337	35,945	110	116	34,040	29,326	103,874
	VOC Level (ppb)	31	76	210	120	240	190	
	Total VOCs (lbs)	1	23	0	0	68	47	139
May-99	Pumpage (Thousands of gals.)	2,352	37,778	147	136	35,531	36,237	112,181
	VOC Level (ppb)	24	62	200	120	250	140	
	Total VOCs (lbs)	0	20	0	0	74	42	137
Jun-99	Pumpage (Thousands of gals.)	4,364	36,254	167	160	34,409	40,953	116,307
	VOC Level (ppb)	22	54	180	110	220	120	
	Total VOCs (lbs)	1	16	0	0	63	41	122
Jul-99	Pumpage (Thousands of gals.)	7,324	37,714	0	715	35,670	42,641	124,064
	VOC Level (ppb)	22	54	190	120	260	120	
	Total VOCs (lbs)	1	17	0	1	77	43	139
Aug-99	Pumpage (Thousands of gals.)	4,595	37,365	228	135	35,354	41,824	119,501
	VOC Level (ppb)	31	50	200	130	250	100	
	Total VOCs (lbs)	1	16	0	0	74	35	126
Sep-99	Pumpage (Thousands of gals.)	2,157	36,707	112	103	34,446	39,020	112,545
	VOC Level (ppb)	24	42	170	110	220	88	
	Total VOCs (lbs)	0	13	0	0	63	29	105
Fiscal Year 1999 Totals								
	Pumpage (Thousands of gals.)	72,620	428,496	12,885	2,370	357,540	394,348	1,268,259
	Total VOCs (lbs)	15	226	18	1	711	483	1,458

Table 3-4

PGAC Effluent Water Quality

		QUARTERLY INFLUENT WELL MONITORING						MONTHLY OPERATIONAL PERFORMANCE MONITORING															
								Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
SAMPLE DATE	COMPOUND (PPB)	Well #3	Well #4	Well #5	Well #6	Well #14	Well #15	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between March 22 - March 31, 1993. "B" Vessels become the Lead Vessels.																							
04/19/93	Total VOCs	424	277	156	0			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
05/19/93	Total VOCs	432	265	237	159			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
06/08/93	Total VOCs	301	340	191	159			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
07/28/93	Total VOCs	248	270	206	147			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
08/26/93	Total VOCs	377	328	215	158			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
09/23/93	Total VOCs	323	234	140	155			NS	0	NS	0	NS	0	NS	0	NS	1	NS	3	NS	0	NS	0
10/12/93	Total VOCs	297	290	181	139			0	0	0	0	0	1	0	1	0	3	0	5	0	1	0	1
11/22/93	Total VOCs	410	313	215	169			0	3	0	3	0	4	0	4	0	5	0	6	0	3	0	3
GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between December 1, 1993 - January 10, 1994. "A" Vessels become the Lead Vessels.																							
12/28/93	Total VOCs	414	293	389	0			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
01/13/94								0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
01/24/94	Total VOCs	459	292	269	182			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
02/23/94	Total VOCs	383	322	204	213			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
03/28/94	Total VOCs	478	382	168	150			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
04/30/94	Total VOCs	397	336	135	166			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
05/31/94	Total VOCs	404	386	168	135			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
06/30/94	Total VOCs	412	312	169	149			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
07/28/94	Total VOCs	270	269	156	134			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
08/29/94	Total VOCs	385	288	177	132			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
09/30/94	Total VOCs	209	214	158	121			0	NS	0	NS	0	NS	0	NS	0	NS	1	NS	0	NS	0	NS
10/31/94	Total VOCs	203	226	156	126			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between October 26 - December 6, 1994. "B" Vessels become the Lead Vessels.																							
11/29/94	Total VOCs	203	226	156	126			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
12/07/94	Total VOCs	197	239	154	132			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
01/31/95	Total VOCs	212	240	135	113			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
02/28/95	Total VOCs	209	240	132	109			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
03/31/95	Total VOCs	241	240	170	123			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
04/30/95	Total VOCs	258	280	145	108			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
05/31/95	Total VOCs	230	232	133	107			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
06/30/95	Total VOCs	216	237	136	127			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
07/31/95	Total VOCs	225	188	135	105			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
08/31/95	Total VOCs	215	159	148	110			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
09/30/95	Total VOCs	225	188	135	105			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
10/31/95	Total VOCs	174	184	182	181			NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
11/30/95	Total VOCs	154	177	176	106			NS	2.5	NS	3.7	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
GAC Replaced in contactors 1B, 2B, 3B, 4B, 5A, 5B, 6B, 7B, 8B between December 5 - December 20, 1995. "A" Vessels become the Lead Vessels.																							
12/31/95	Total VOCs	206	212	158	126			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
01/31/96	Total VOCs	201	200	173	135			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
02/28/96	Total VOCs	189	203	191	177			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
03/31/96	Total VOCs	177	179	198	177			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
04/30/96	Total VOCs	174	173	159	125			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
05/31/96	Total VOCs	162	218	144	134			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
06/30/96	Total VOCs	135	254	147	133			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
07/31/96	Total VOCs	125	205	143	121			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
08/31/96	Total VOCs	117	234	181	125			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
09/30/96	Total VOCs	104	221	173	123			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
10/31/96	Total VOCs	113	158	153	108			0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
11/30/96	Total VOCs	95	200	130	109			0	NS	1.4	NS	1.1	NS	3	NS	2.3	NS	1.1	NS	0	NS	0	NS
12/31/96	Total VOCs	103	193	155	100	279		1.3	0	3	0	1.8	0	4.2	0	4.8	0	1.9	0	1.6	0	1.2	0

Table 3-4

PGAC Effluent Water Quality

QUARTERLY INFLUENT WELL MONITORING | MONTHLY OPERATIONAL PERFORMANCE MONITORING

SAMPLE DATE	COMPOUND (PPB)	Well #3	Well #4	Well #5	Well #6	Well #14	Well #15	Contactor #1 A	Contactor #1 B	Contactor #2 A	Contactor #2 B	Contactor #3 A	Contactor #3 B	Contactor #4 A	Contactor #4 B	Contactor #5 A	Contactor #5 B	Contactor #6 A	Contactor #6 B	Contactor #7 A	Contactor #7 B	Contactor #8 A	Contactor #8 B
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between January 7, 1997 - January 21, 1997. "B" Vessels become the Lead Vessels.																							
01/31/97	Total VOCs	105	135	218	132	306		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
02/28/97	Total VOCs	112	110	192	107	279		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
03/31/97	Total VOCs	97	98	182	104	252		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
04/30/97	Total VOCs	51	151	197	110	284		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
05/31/97	Total VOCs	52	150	197	115	285		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
06/30/97	Total VOCs	98	120	250	150	300		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
07/31/97	Total VOCs	62	95	222	132	268		NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
08/31/97	Total VOCs	44	122	247	197	240		NS	0	NS	0	NS	0	NS	3.1	NS	0	NS	1.1	NS	2.9	NS	0
09/30/97	Total VOCs	47	146	202	137	214		0	1.8	0	1.9	0	2.6	0	6.2	0	0	0	3	0	4.9	0	1.7
10/31/97	Total VOCs	75	82	262	171	298		0	4.9	0	6	0	7.7	0	9.8	0	3.3	0	7.8	0	11	0	5.1
GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between November 5, 1997 - November 21, 1997. "A" Vessels become the Lead Vessels.																							
11/30/97	Total VOCs	34	101	197	102	216		0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
12/31/97	Total VOCs	54.5	91.5	136	100	193		0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
01/31/98	Total VOCs	45	97	220	137	245		0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
02/28/98	Total VOCs	45	90	200	125	252		0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
03/31/98	Total VOCs	45	77	160	131	210	110	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
04/30/98	Total VOCs	56	78	180	131	310	140	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
05/31/98	Total VOCs	38	87	144	131	173	146	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
06/30/98	Total VOCs	23	30	150	95	230	110	0	NS	0	NS	2.3	NS	2	NS	0	NS	0	NS	1	NS	0	NS
07/31/98	Total VOCs	27	67	135	104	252	153	3.5	0	3.5	0	3.7	0	6.5	0	2.5	0	2.7	0	0	0	2.7	0
08/31/98	Total VOCs	41	48	172	108	257	166	6.8	0	6	0	6	0	9.7	0	4.6	0	5.2	0	7.3	0	5.8	0
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between September 8, 1998 - September 21, 1998. "B" Vessels become the Lead Vessels.																							
09/30/98	Total VOCs	43	63	220	130	370	220	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
10/31/98	Total VOCs	30	75	180	110	270	180	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
11/30/98	Total VOCs	35	68	175	100	240	170	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
12/31/98	Total VOCs	26	69	180	105	190	140	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
01/31/99	Total VOCs	29	63	194	107	250	164	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
02/28/99	Total VOCs	25	73	171	102	220	188	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	1.8	NS	0
03/31/99	Total VOCs	31	74	200	120	240	220	0	0	0	2.2	0	2.9	0	0	0	0	0	0	0	0	0	0
04/30/99	Total VOCs	31	76	210	120	240	190	0	0	0	3.7	0	5.1	0	0	0	2.2	0	2.5	0	2.3	0	2.5
" GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between April 26 - May 26, 1999. "A" Vessels become the Lead Vessels.																							
05/31/99	Total VOCs	24	62	200	120	250	140	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
06/30/99	Total VOCs	22	54	180	110	220	120	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
07/31/99	Total VOCs	22	54	190	120	260	120	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
08/31/99	Total VOCs	31	50	200	130	250	100	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
09/30/99	Total VOCs	24	42	170	110	220	88	3.1	NS	2.6	NS	2.3	NS	1.8	NS	1.8	NS	1.4	NS	2.2	NS	1.6	NS
10/31/99	Total VOCs	30	46	180	130	230	86	14	0	14	0	12	0	11	0	11	0	10	0	12	0	9.5	0

Table 3-5

Summary of OU1 Monitoring Requirements

Remedy Component		Monitoring Requirements	Responsible 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 (in the Annual 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)

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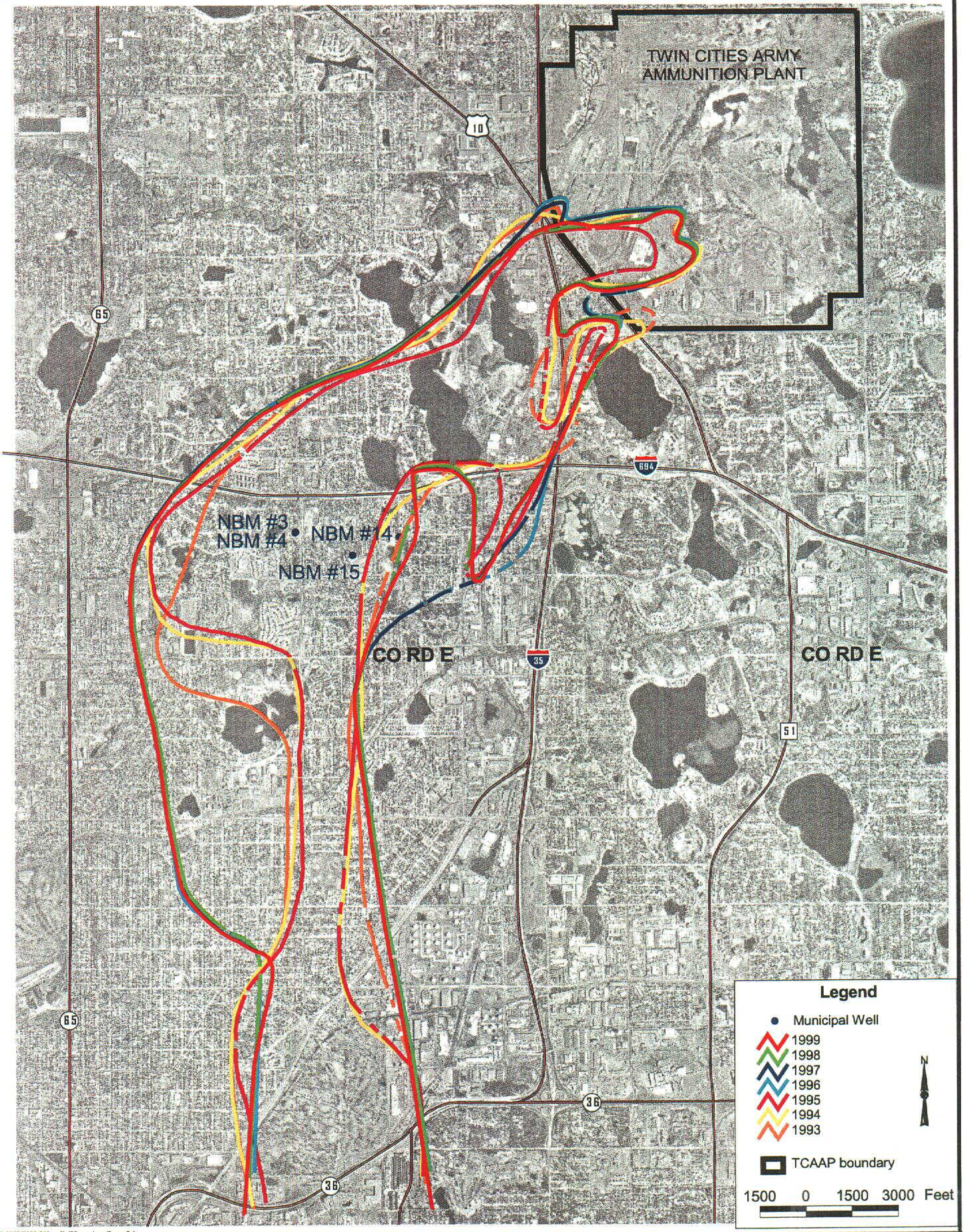
Table 3-6

OU1 Vertical Hydraulic Gradients

	Mid-Screen (or hole) Elevation (ft)	Groundwater Elevation (ft) 12/03/1996	05/29/1997	12/02/1997	06/01/1998	09/01/1998	06/01/1999
03U811	803	842.5	842.1	842.3	843.0	No Data	842.8
03L811	689	841.8	841.2	841.5	842.1		842.0
Difference	114	0.7	0.9	0.8	0.9		0.8
Vertical Gradient		.006	.008	.007	.008		.007
03U822	786	No Data	No Data	833.0	833.7	No Data	833.3
03L822	761	833.9	830.6	833.0	833.7		833.2
Difference	25	-	-	0.0	0		0.1
Vertical Gradient		-	-	.000	.000		.004
04U834	570	811.0	809.0	811.4	808.8	No Data	809.2
04J834	496	807.8	804.7	808.1	804.9		805.4
Difference	74	3.2	4.3	3.3	3.9		3.8
Vertical Gradient		.043	.058	.045	.053		.051
03L841	760	840.3	840.4	840.3	841.2	No Data	841.0
04U841	682	841.2	841.1	841.9	842.7		842.5
Difference	78	-0.9	-0.7	-1.60	-1.5		-1.5
Vertical Gradient		-.012	-.009	-.021	-.019		-.019
03L846	760	829.5	828.4	828.5	829.3	No Data	828.5
04U846	674	828.5	827.6	827.3	828.1		827.1
Difference	86	1.0	0.8	1.200	1.2		1.4
Vertical Gradient		.012	.009	.014	.014		.016
04U882	600	810.2	808.0	810.4	807.4	No Data	807.9
04J882	455	772.8	769.3	806.9	803.2		803.1
Difference	145	37.4	38.7	3.5	4.2		4.8
Vertical Gradient		.258	.267	.024	.029		.033
04U836(MW1)	663					824.0	822.7
04J836(MW2)	554					824.2	823.7
Difference	109					-0.2	-1.0
Vertical Gradient						-.002	-.009
04U837(MW3)	653					826.5	826.2
04J837(MW4)	555					824.6	824.2
Difference	98					1.9	2
Vertical Gradient						.019	.020
04U838(MW5)	659					827.5	827.3
04J838(MW6)	556					826.1	825.7
Difference	103					1.4	1.6
Vertical Gradient						.014	.016
04U839(MW7)	626					827.3	827.1
04J839(MW8)	556					824.1	824.3
Difference	70					3.2	2.8
Vertical Gradient						.046	.040

Note: Negative sign denotes upward vertical gradient.

Figures



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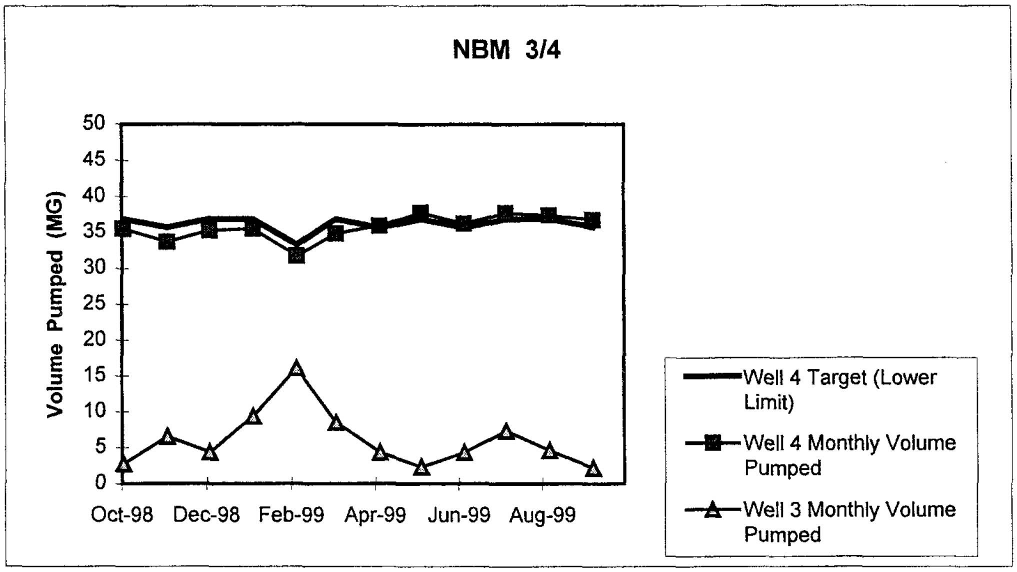
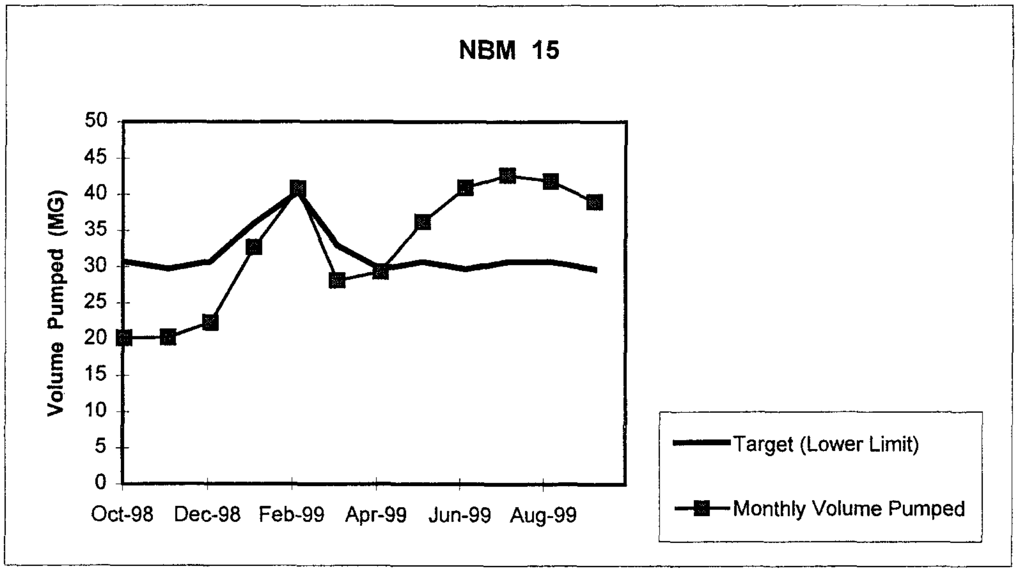
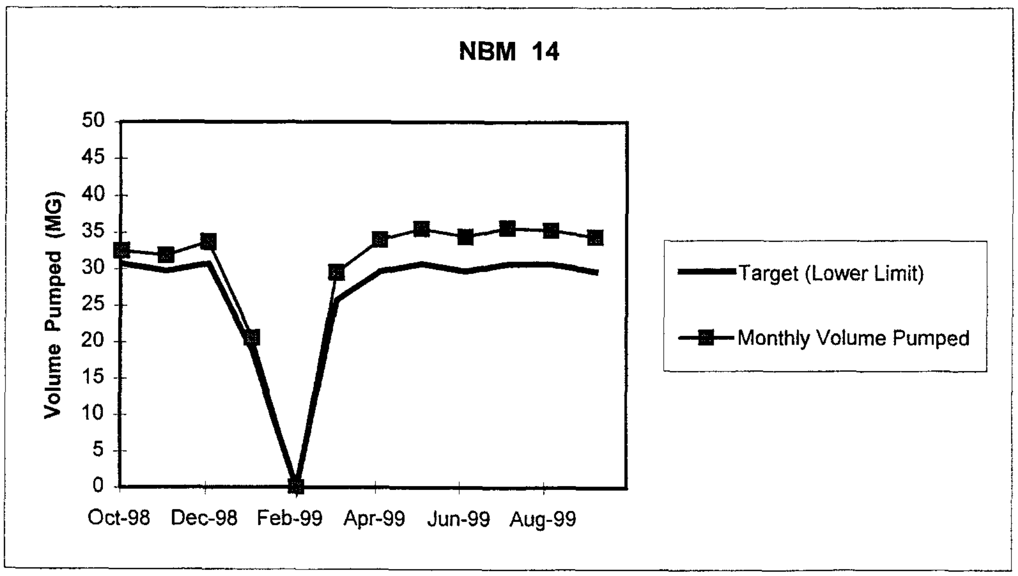
TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	OCT 2000
Upper Unit 4 1 ug/l Trichloroethene Isoconcentration Map		Figure 3-1







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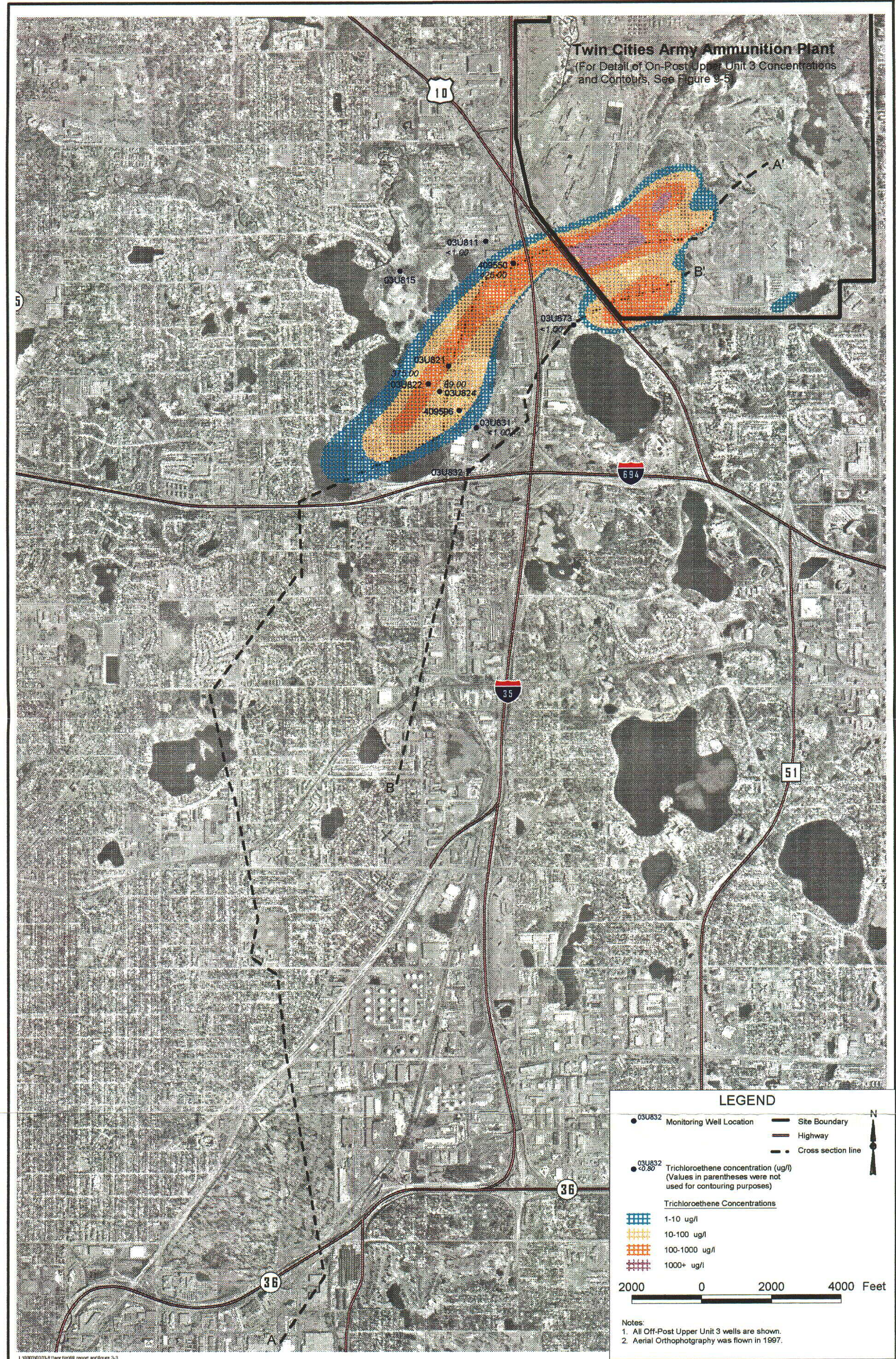
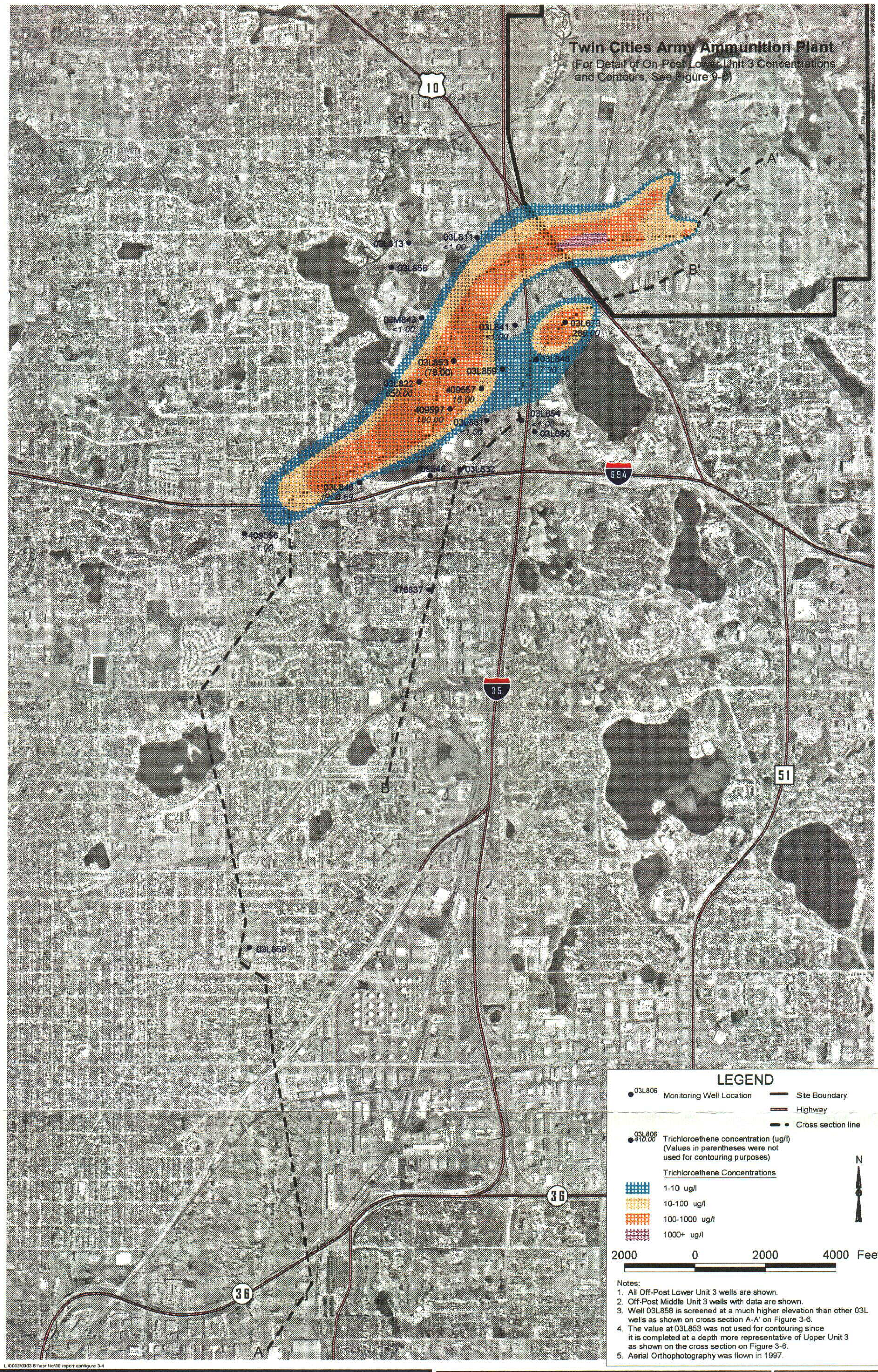
TWIN CITIES ARMY AMMUNITION PLANT	Wenck	OCT 2000
OU1 Well Pumping Rates vs. Targets	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359	Figure 3-2



TWIN CITIES ARMY AMMUNITION PLANT	Wenck	OCT 2000
OU1 & OU3, Upper Unit 3 Trichloroethene, Isoconcentration Map Summer 1999	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 3-3



TWIN CITIES ARMY AMMUNITION PLANT

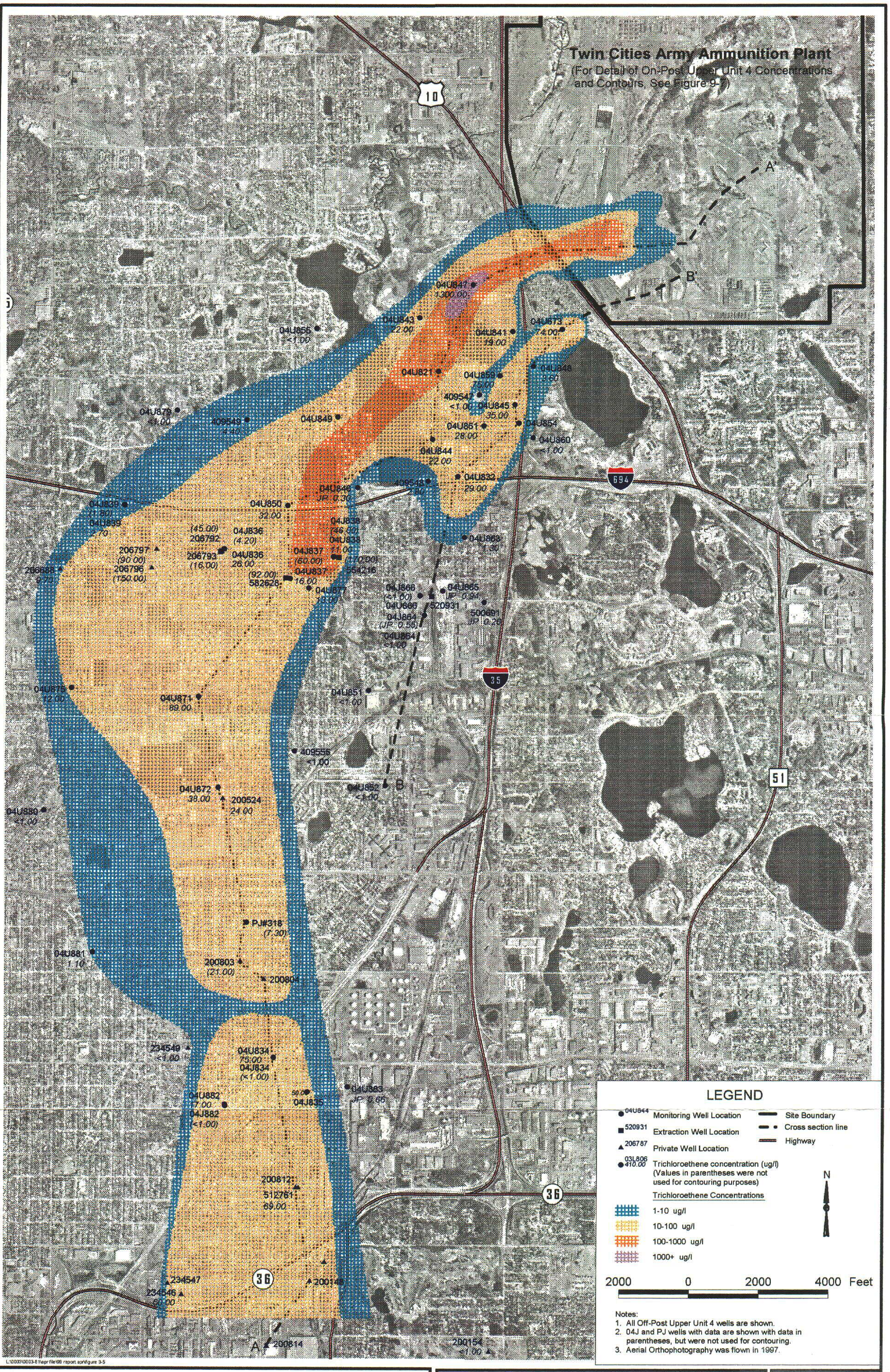
OU1 & OU3, Lower Unit 3 Trichloroethene, Isoconcentration Map
Summer 1999

Wenck Associates, Inc.
Environmental Engineers

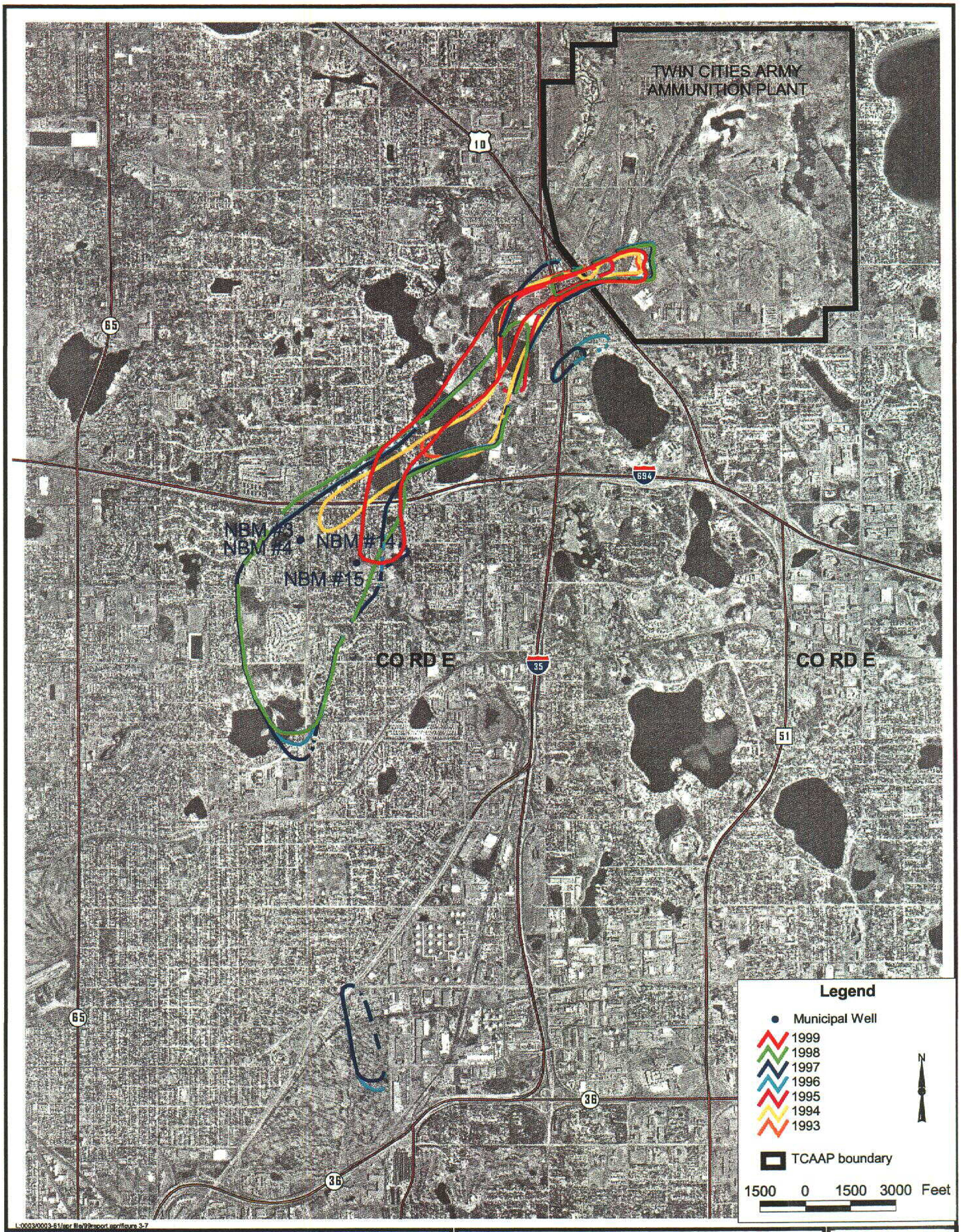
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

OCT 2000

Figure 3-4



TWIN CITIES ARMY AMMUNITION PLANT	Wenck	OCT 2000
OU1 & OU3, Upper Unit 4 Trichloroethene, Isoconcentration Map Summer 1999	Wenck Associates, Inc. Environmental Engineers; 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 3-5



TWIN CITIES ARMY AMMUNITION PLANT

Upper Unit 4
100 ug/l Trichloroethene Isoconcentration Map

Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

OCT 2000

Figure 3-7

SECTION 4

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.

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. Activities during FY 1999 were:

- Completion of Site A metals-contaminated soil excavation, treatment, and disposal.
  - In calendar year 1999, approximately 11,308 tons of soil was excavated, transported to the on-TCAAP Corrective Action Management Unit (CAMU), stabilized, and transported off-site as non-hazardous waste for disposal at permitted facilities. Approximately 147 tons of debris was also excavated and transported off-site to a permitted disposal facility.
  - Site A remediation had been initiated in 1998. The combined two-year totals are 21,905 tons of soil and 311 tons of debris.
  - The Site A Close-out Report will be prepared by Stone & Webster to document the above work.
- An air sparging system was incorporated into the soil vapor extraction system remedial action design for Site A VOC-contaminated soils. The remedial action design was approved and construction was initiated in late calendar year 1999.
- Completion of Site 129-5 soil excavation, treatment, and disposal.
  - In calendar year 1999, 136 tons of soil was excavated and treated/disposed in the same manner as described above for Site A.
  - No debris was encountered or removed from Site 129-5.
  - The Site 129-5 Close-out Report will be prepared by Stone & Webster to document the above work.
- Initiated soil excavation, treatment, and disposal at Site E.
  - In calendar year 1999, 13,952 tons of soil and 45 tons of debris were excavated and disposed in the same manner as described above for Site A.

This quantity comprises approximately 80 percent of the total anticipated quantity for Site E.

  - Work was suspended for the winter and will resume in Spring 2000.

- Initiated soil excavation, treatment, and disposal at Site H.
  - In calendar year 1999, 11,391 tons of soil and 25 tons of debris were excavated and disposed of in the same manner as described for Site A. This quantity comprises approximately 80 percent of the total anticipated quantity for Site H.
  - Work was suspended for the winter and will resume in Spring 2000.
- A stormwater pond for the on-TCAAP CAMU was approved and constructed to better manage stormwater generated within the CAMU, improving its operational efficiency.
- The second year of the phytoremediation demonstration project was completed in FY 1999 at Sites C and 129-3, and approval was given for another year. This demonstration project was not part of the OU2 ROD.

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?
No. The intent of this remedy component is to verify that soil characterization and/or remediation activities do not somehow cause impacts to groundwater. As such, the five-year

monitoring period is intended to start after completion of remedy components #1 through 7 described in the previous section. Thus, specifically for this remedy component, there was no monitoring performed in FY 1999. Given the anticipated schedules of completing remedy components #1 through 7, it is estimated that the five-year verification monitoring will begin in the years 2000 and/or 2001 at the various shallow soil sites.

Through a future report, a monitoring plan will be developed for this remedy component. The plan will address the following items for each of the shallow soil sites:

- The well(s) to be sampled
- The frequency of sampling
- The analytical parameters
- The cleanup levels
- How the data will be compared to the cleanup levels (e.g., all data must be below the criteria, or mean values, etc.).

With respect to bullets 3 and 4, the OU2 ROD specifies shallow groundwater contaminant cleanup levels for Site A (Table 1), but not for the other shallow soil sites.

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.

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 Close-out Report was prepared by Stone & Webster which was still under review at the end of FY 1999 ("Site B Dump Investigation, Characterization, and Close-out Report"). At Site 129-15, characterization revealed that construction of a soil cover is necessary. The site characterization and cover construction (when completed) will be documented in a Close-out Report prepared by Stone & Webster.

SECTION 5

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 may exist 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 nearest to Sites D and G in accordance with the FY 1999 Monitoring Plan.

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

Figure 5-1 shows the locations of the wells nearest to Site D (03U096, 03U093, and 03U018) and Site G (03U094 and 03U014), along with trichloroethene concentrations. Figures 5-2 through 5-6 present trend graphs for these wells.

Downgradient of Site D at wells 03U096 (Figure 5-2) and 03U093 (Figure 5-3), the concentrations over the past five years show an overall decline. In contrast, at well 03U018 (Figure 5-4), the concentrations have increased the past two years, after previous declines. It is unclear if the increases are related to a "rebound effect" since the SVE system was shut-off, or if they are simply fluctuations in the data. The historical graph on Figure 5-4 shows fluctuations of similar or greater magnitude over the past 10 years.

Downgradient of Site G, the concentrations have remained relatively stable at well 03U094 (Figure 5-5) the last three years. At well 03U014 (Figure 5-6), the concentrations have remained below the cleanup level the past four years.

Table 5-1 presents the FY 1999 data from these five wells for the deep groundwater chemicals of concern. The table shows that four of the five wells still exceed the cleanup level for trichloroethene, two wells exceed the cleanup level for 1,1-dichloroethene, and one well exceeds the cleanup level for 1,1,1-trichloroethane.

During the years of SVE operation (1986 – 1998), trichloroethene concentrations in groundwater decreased from 10,000's to less than 500 μg/l. The most dramatic improvement has been at well 03U093 (Figure 5-3). Overall, these results indicate that the 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 100 times greater than the cleanup levels. This suggests the possibility of residual contamination, which 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 (a final report is anticipated 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 1999 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. TCAAP is fenced with locking gates controlled by the operating contractor, Alliant Techsystems.

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 existing system at Site D consists of 39 shallow vents (depths of 33–54 feet) and one deep vent (depth of 150 feet). At Site G there are 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 since their startup in 1986. However, due to declining mass removal rates, the Site D and G SVE systems were shutdown on July 24 and August 6, 1998, to evaluate the need for their continued operation.
- The intent of this remedy component was to add additional deep vents, as needed, at both sites to address presumably contaminated soils below the existing SVE systems. Also, the existing systems were to be modified, as needed, to improve VOC mass removal.

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. Activities during FY 1999 included:

- Sampling of shallow system vents was conducted in early FY 1999. The results are documented in a report prepared by Alliant Techsystems, "Results of Sampling and Analysis of SVE Vents at Sites D and G". This report, which was still under review at the end of FY 1999, recommends that both shallow systems remain off due to the low, asymptotic mass removal rates.

- A pilot study was conducted at Site D in early FY 1999 to evaluate the need for deep soil SVE systems. Results are documented in a report prepared by Stone & Webster, "Site D SVE Pilot Study", which was still under review at the end of FY 1999. The report concluded that deep soil systems are not necessary at Sites D or G.
- A work plan for site close-out was prepared by Stone & Webster, which included sampling of shallow and deep soils at Sites D and G in order to show that cleanup goals have been met. This work plan was still under review at the end of FY 1999.

Have the deep SVE systems been installed?

No. Deep systems are not anticipated to be required (see above discussion).

Have the shallow SVE systems been modified?

No. Modifications to the shallow SVE systems are not anticipated to be required (see above discussion).

Were the monitoring requirements for this remedy component met?

Yes. Since both systems were off throughout FY 1999, no monitoring was performed (except for the vent sampling study described on the previous page).

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

From startup in 1986, through their shutdown in 1998, the Site D and G SVE systems removed 116,199 pounds and 104,418 pounds, respectively. Totals for individual vents were not monitored.

Are the air emissions in exceedance of any discharge criteria?

No. Since the two systems were off in FY 1999, no emissions occurred.

Were there any significant operation and maintenance problems in FY 1999 (greater than 24 hour shutdown)?

No. Both systems were off throughout FY 1999.

Is any monitoring proposed prior to the next report?

No. Since shallow SVE systems are anticipated to be left off and deep systems are not anticipated to be required, no monitoring is anticipated to be conducted.

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. See discussion in Section 5.3.

Are any evaluations proposed prior to the next report?

The two reports on the shallow and deep SVE systems will be finalized in FY 2000. The work plan for site close-out, when finalized, will be implemented in FY 2000.

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 caps are maintained in adequate condition.

Is this remedy component being implemented?
Yes. Alliant Techsystems inspects the caps during monthly operation and maintenance inspections.

Are there any problems with the caps?
No problems were observed in FY 1999.

Were any maintenance activities performed for the caps in FY 1999? No.

Are any maintenance activities planned prior to the next report?
No, except for cutting of any trees or bushes, as necessary.

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 caps, and surface water flows off at a rate that does not cause erosion problems with the cap.

Is this remedy component being implemented?
Yes. Alliant Techsystems inspects the drainage conditions during routine operation and maintenance inspections.

Are there any problems with the surface drainage controls? No.

Were any maintenance activities performed for the surface drainage controls in FY 1999?
No.

Are any maintenance activities planned prior to the next report? No.

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. Investigation of the "tar-like substances" at Site G was conducted in early FY 1999. Results are documented in "Final Field Investigation Report, Site G Tar-Like Material," prepared by Stone & Webster. This report was finalized in late FY 1999 and recommended no further action on the Site G tar-like material. Additional actions being considered, once the SVE systems are removed, include metals characterization in shallow soils at Site D and evaluation of the cap at Site G.

Is any characterization work proposed prior to the next report? No.

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)?

Maybe. Soil sampling for site close-out will be implemented in FY 2000, as previously described, to determine if remediation is complete.

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?

No, the determination has not been made.

Table

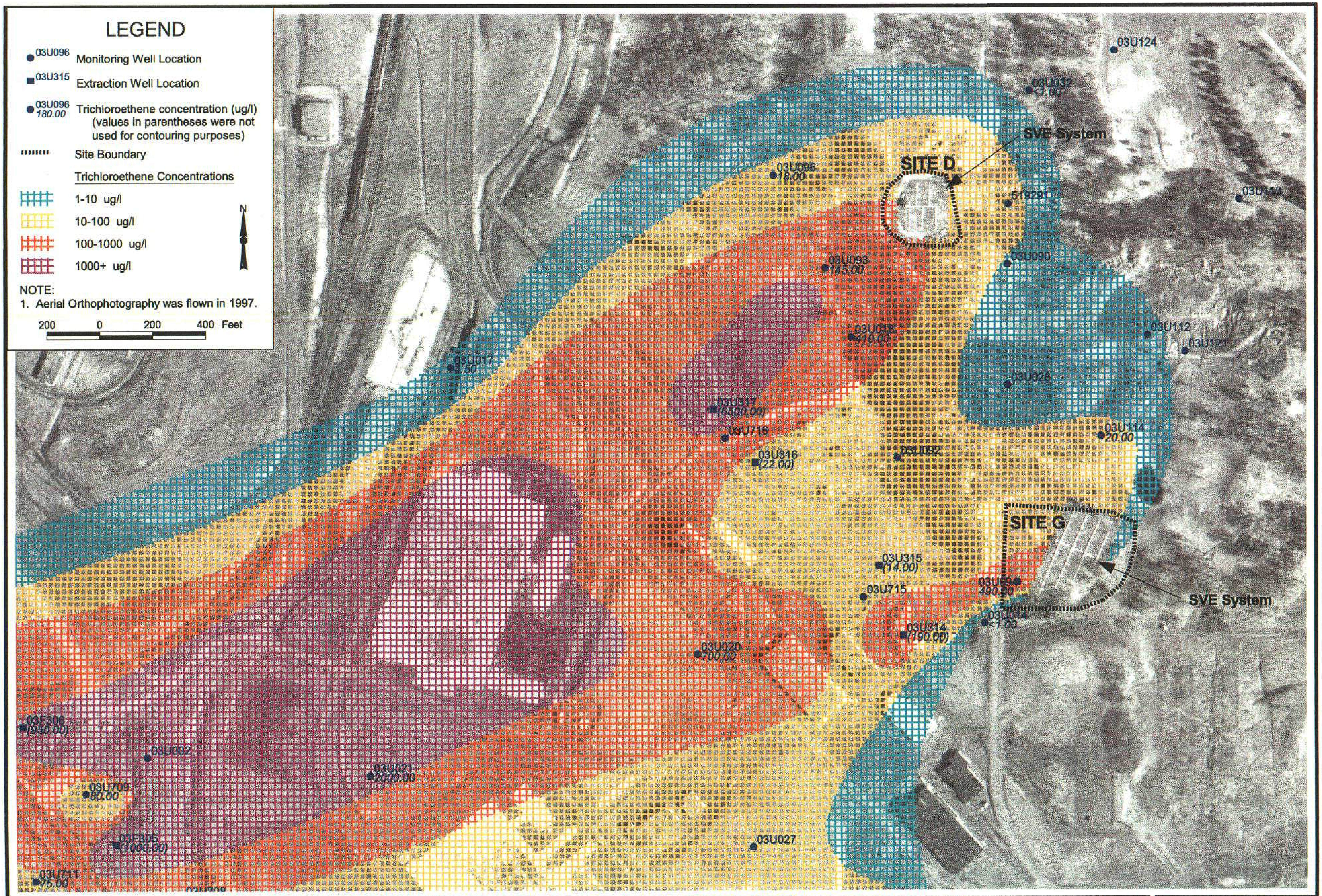
TABLE 5-1

Deep Groundwater Data Near Sites D and G: FY 1999

			Tetrachloroethene (ug/l)	Trichloroethene (ug/l)	1,1-Dichloroethene (ug/l)	cis-1,2-Dichloroethene (ug/l)	1,1-Dichloroethane (ug/l)	1,1,1-Trichloroethane (ug/l)	1,2-Dichloroethane (ug/l)
OU2 Cleanup Level[1]			5	5	7	70	70	200	5
Site D									
03U018		29-Jun-99	**<10.00**	**410.00**	**JP 8.80**	27.00	13.00	48.00	**<10.00**
03U093		30-Jun-99	**<5.00**	**145.00**	JP 3.55	<5.00	JP 3.60	23.50	**<5.00**
03U096		30-Jun-99	<1.00	**18.00**	1.70	<1.00	2.90	4.80	<1.00
Site G									
03U014		18-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
03U014	D	18-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
03U094		30-Jun-99	**<10.00**	**490.00**	**13.00**	<10.00	JP 2.80	**250.00**	**<10.00**

Notes: [1] Cleanup levels for Deep Groundwater from Table 1 of the OU2 ROD. Bolding indicates exceedance of the cleanup level, or reporting limits higher than the cleanup level.
JP = The value is below the reporting limit, but above the method detection limit.
D = Duplicate sample

Figures



TWIN CITIES ARMY AMMUNITION PLANT	Wenck	OCT 2000
Location of Wells Nearest to Sites D and G	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359-0429	Figure 5-1

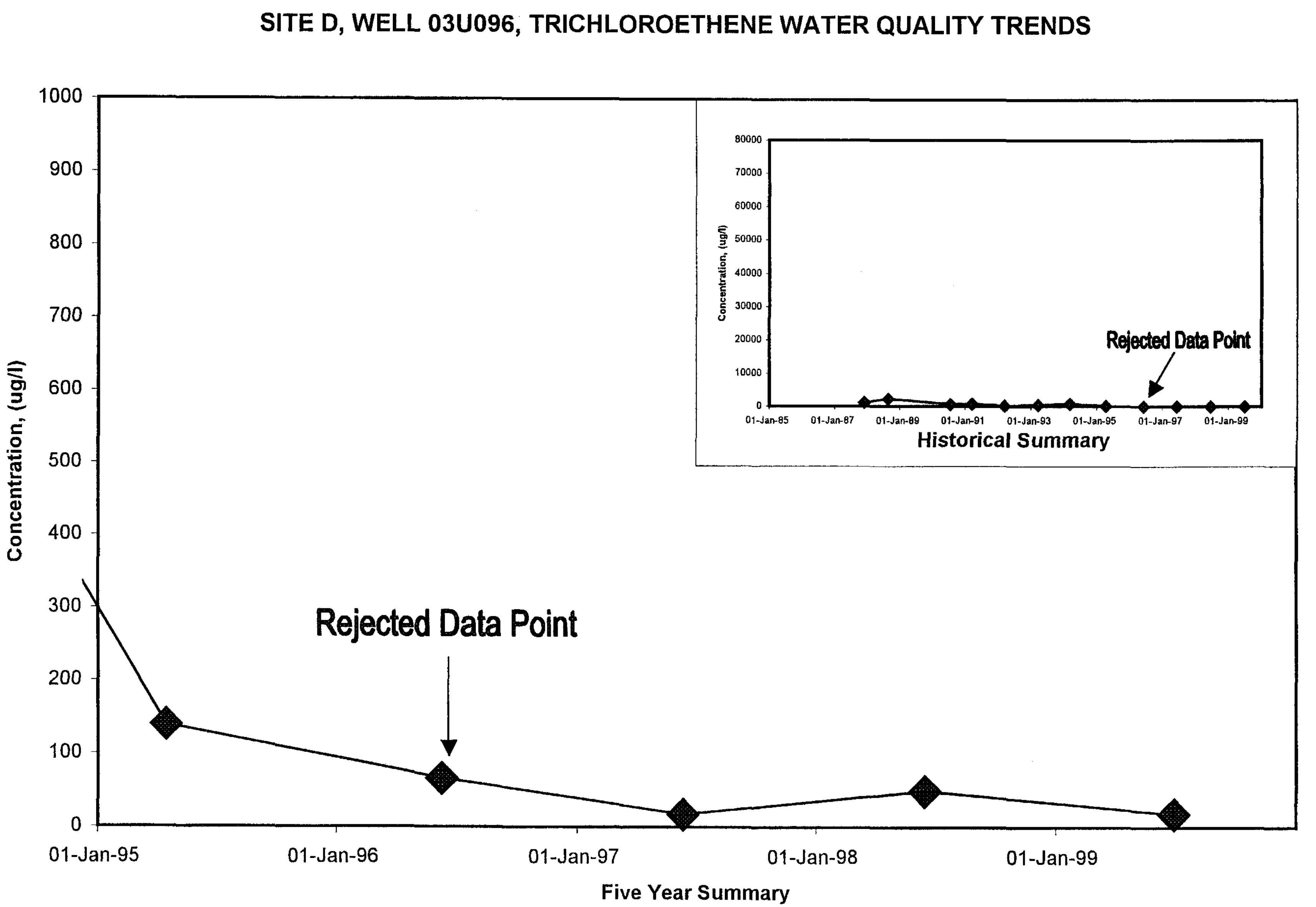


Figure 5-2
Wenck Associates, Inc.
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SITE D, WELL 03U093, TRICHLOROETHENE WATER QUALITY TRENDS

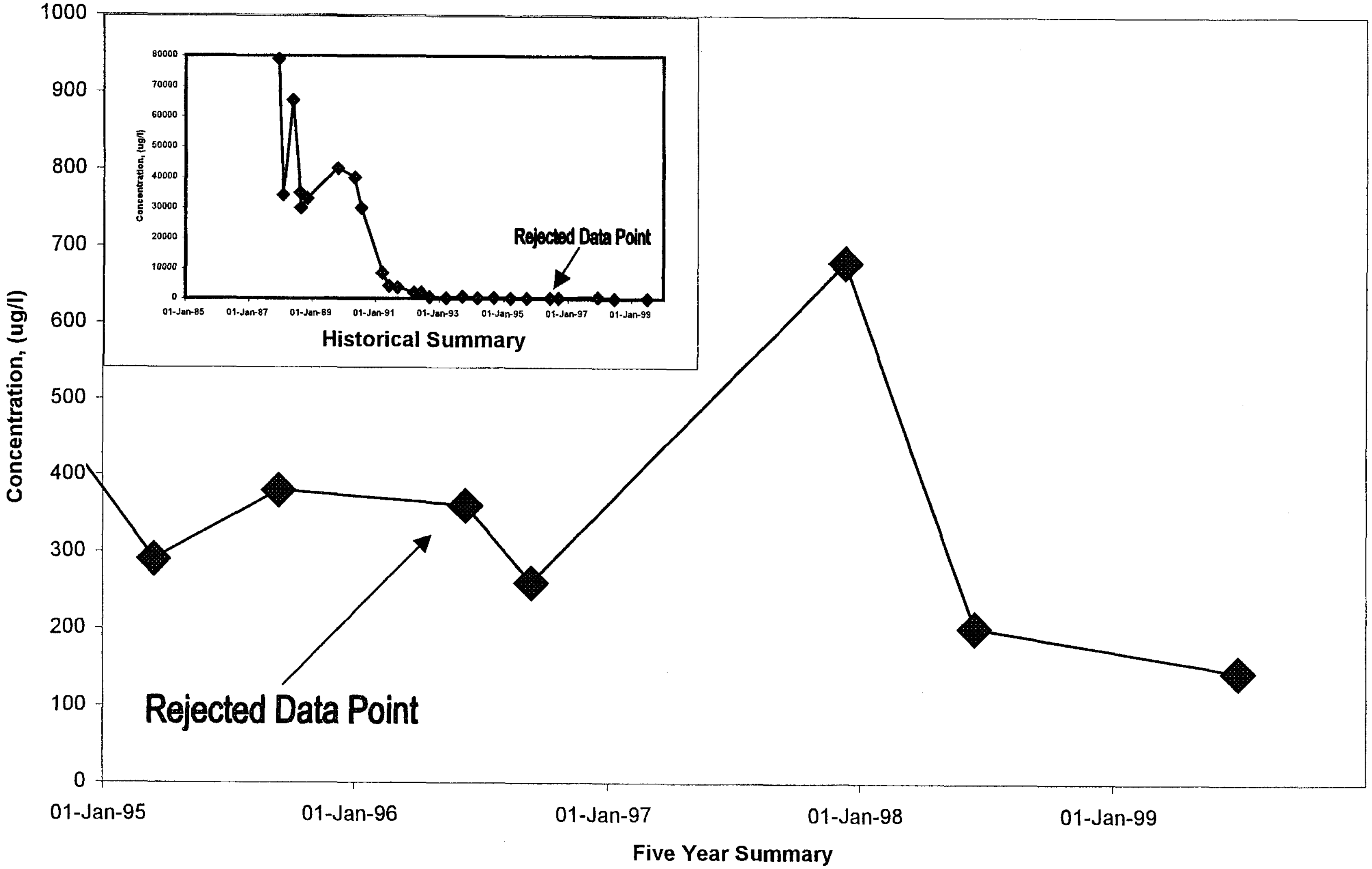

Figure 5-3
Wenck Associates, Inc.
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SITE D, WELL 03U018, TRICHLOROETHENE WATER QUALITY TRENDS

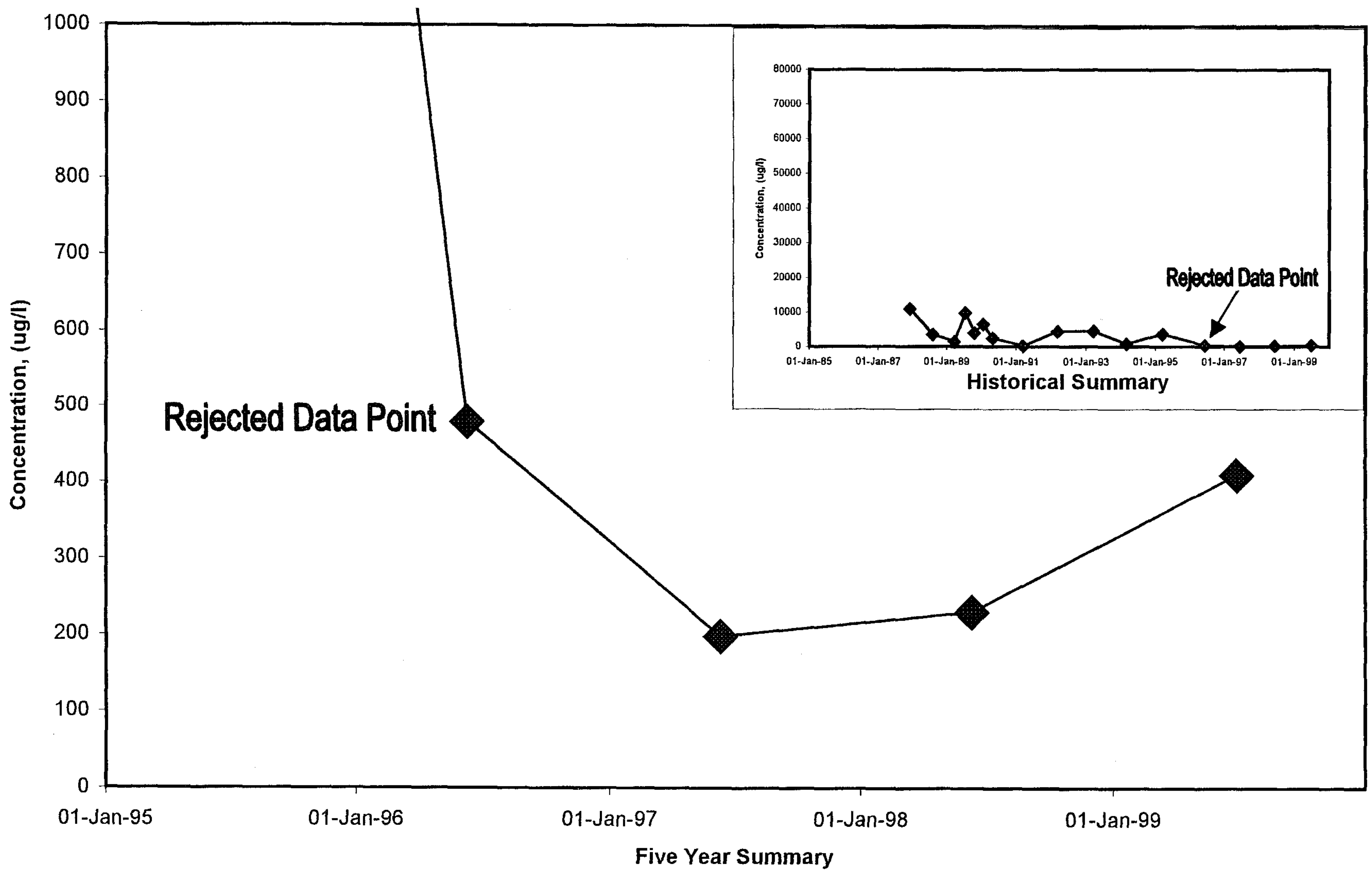

Figure 5-4
Wenck Associates, Inc.
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SITE G, WELL 03U094, TRICHLOROETHENE WATER QUALITY TRENDS

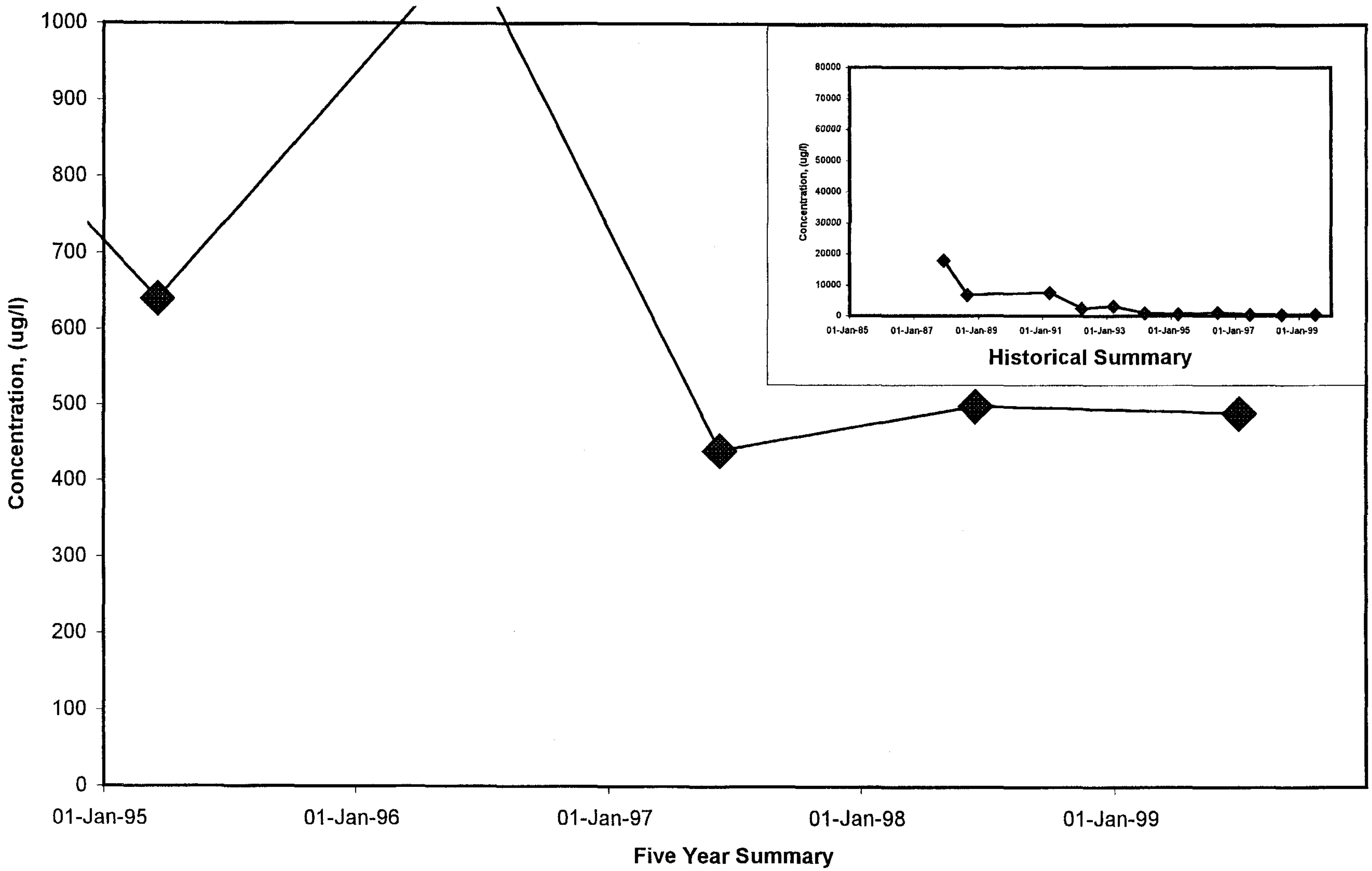

Figure 5-5
Wenck Associates, Inc.
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SITE G, WELL 03U014, TRICHLOROETHENE WATER QUALITY TRENDS

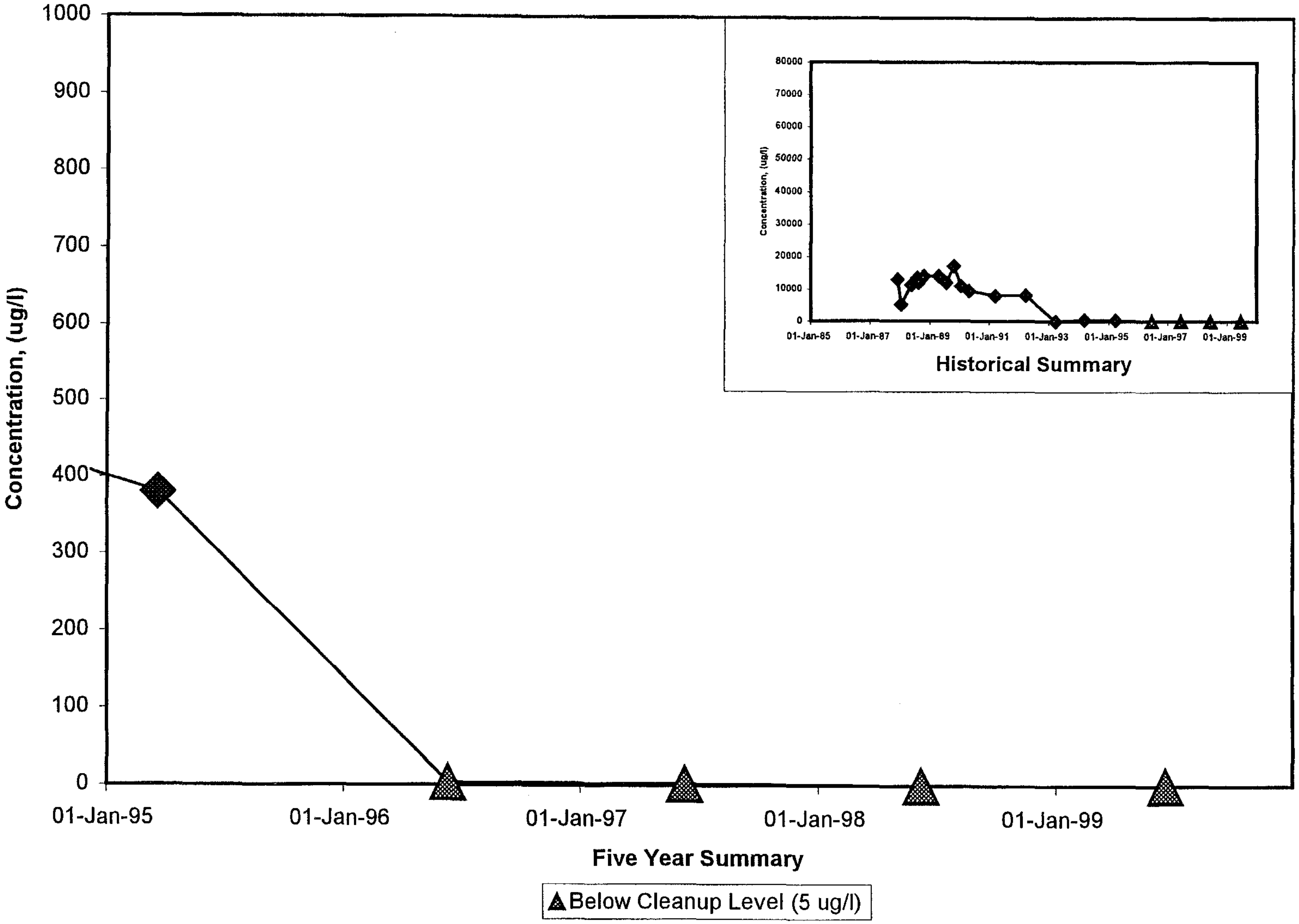

Figure 5-6
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SECTION 6

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 consists of eight extraction wells installed along two lines downgradient of the source area. 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 which 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–#4 and evaluation of the overall remedy. Table 6-1 summarizes the performance monitoring requirements, responsible parties, and the documents which contain the monitoring plans. The FY 1999 Monitoring Plan is included in Appendix A. Figure 6-1 illustrates the wells and piezometers associated with Site A and highlights those sampled in FY 1999.

Were the groundwater monitoring requirements for this remedy met?

Yes, with one note. The reporting limit, or Contract required detection limit (CRDL) for antimony (10 μg/l) is greater than the cleanup level of 6 μg/l. However, the method detection limit (MDL) for antimony is 2.96 μg/l. The laboratory will report any values between the MDL and CRDL and flag them as estimated. No estimated values were reported for FY 1999.

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 the 1998/1999 Well Inventory Update (Appendix G).
- Monitoring of the extraction wells (pumping volumes, water levels, and water quality) and treatment system effluent will be performed 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) 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-section view on Figure 6-2. The one partially penetrating well, 01U353, was completed in silt to sandy clay units which 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.

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 6-6 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 6-2 shows the monthly average pumping rate for each extraction well along with the target pumping rates for containment. The table shows that the average pumping rate for the entire system in FY 1999 was 29.7 gpm, which exceeds the flowrate of 25 gpm determined necessary to achieve containment.

Table 6-3 presents water level data collected during FY 1999 at Site A. Figure 6-3 presents a water level contour map using the data from May 26, 1999. Figure 6-3 shows the influence of pumping at the 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.

Were there any significant operation and maintenance problems in FY 1999 (greater than 24 hour shutdown)?

Yes. Table 6-4 summarizes O&M notes for FY 1999.

Are any changes or additional actions required for this remedy component? Yes. Consideration should be given to shutting off some or all of the downgradient extraction wells (01U355–358). It is likely that the Army will make this proposal in a separate letter sometime in 2000.

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.

Has the MDH issued a Special Well Construction Area Advisory for the area impacted by Site A?
Yes, it was issued in June 1996.

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

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

Did the boundary of the Site A plume get any bigger, as defined by the 1 μg/l contour? No. Figure 6-4 shows the 1 μg/l contour line for 1,2-dichloroethene (the chemical of concern at Site A with the biggest plume footprint). There were no significant changes from last year.

Were any new water supply wells discovered within the Site A plume? No.

Were any water supply wells within the Site A plume sampled during FY 1999? No.

Were any well owners offered an alternate supply and/or well abandonment in FY 1999? No.

Are there any alternate water supply hookups or well abandonments proposed prior to the next report? No.

Is any sampling of water supply wells proposed prior to the next report? Yes. The proposed monitoring is presented in the 1998/1999 Well Inventory Update (Appendix G).

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 Special Discharge Permit as shown in Table 6-5.

During FY 1999, was the discharge water in compliance with the Industrial Discharge Permit requirements?
Yes. Table 6-5 shows that the effluent water quality was below the discharge criteria every month in FY 1999.

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; trichloroethene; tetrachloroethene; and total mercury, and annually for pH; Total Suspended Solids; and Chemical Oxygen Demand (see Appendix A.2).

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

6.5 REMEDY COMPONENT #5: SOURCE CHARACTERIZATION/ REMEDIATION

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

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

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

Remediation work has been implemented. Stone and Webster completed removal of metal-contaminated soils in FY 1999 (see Section 4.1 of this report). Design of an air sparging/SVE system to remediate VOC-contaminated soils was approved and construction was initiated in late calendar year 1999.

Is any characterization work or remediation work proposed prior to the next report?
Yes. Construction of the air sparging/SVE system should be completed in 2000, followed by system startup and O&M.

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, p. 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 6-6 shows the exceedances in wells at Site A during FY 1999. Figure 6-5 shows that the area with tetrachloroethene exceedances extends from the source area (near 01U108) downgradient to near 01U126. The tetrachloroethene exceedances do not extend to the first line of extraction wells. Table 6-6 shows that trichloroethene exceedances are also limited to near the source area (01U108). Figure 6-4 shows that the 1,2-dichloroethene exceedances are limited to extraction well 01U353 and an area immediately upgradient, but not extending back to the source area.

Table 6-6 also shows that antimony remains above the cleanup level at 01U103.

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

Groundwater contaminant concentrations at Site A generally decreased compared to last year's data. An exception was that the 1,2-dichloroethene concentration increased at 01U108 (near the source area) from 6.63 to 30 μg/l. All wells downgradient of the first line of extraction wells (01U351–354), including extraction wells 01U355–358, had water quality results remaining below the cleanup levels. Figures 6-6 through 6-9 present trend graphs of 1,2-dichloroethene; trichloroethene; and tetrachloroethene for representative wells to illustrate these points:

- 01U108 – Near the source area
- Extraction Wells 01U351 – 01U354: the first line of extraction wells (1,2-dichloroethene only)
- Extraction Wells 01U355 – 01U358: the second line of extraction wells (1,2-dichloroethene only)
- 01U902 – Downgradient of the extraction system

Figure 6-4 presents the FY 1999 contour map for 1,2-dichloroethene. Changes from FY 1998 are:

1. The concentration at 01U108 increased above 10 μg/l, resulting in a shift of the 10 μg/l contour line.
2. The concentrations at 01U139 and extraction wells 01U355 – 01U357 decreased below 10 μg/l, resulting in a shrinking of the 10 μg/l contour line in the vicinity of the second line of extraction wells.
3. In contrast to past years, the contamination is depicted as a single plume versus two plumes. The "two plume" interpretation had been based largely on the consistent absence of contamination in well 01U125 (see Figure 6-4). As shown on cross-section B-B′ (Figure 6-2), well 01U125 is screened near the water table, whereas all other wells are screened completely, or nearly completely, through the Unit 1 aquifer. It is possible, even likely, that there is contamination in the vicinity of 01U125, but that it is deeper in the Unit 1 aquifer, below the well screen. As further evidence for a "single plume" interpretation is that Stone & Webster's investigation work only found one source for chlorinated VOCs. This new interpretation does not affect the design or performance of the extraction well system.

As a different perspective on the contaminant conditions, Figure 6-2 presents several cross-sections with 1,2-dichloroethene concentrations and contours showing the same changes described above.

How much VOC mass has been removed?

Based on the calculated VOC mass removal rates for the total effluent, Table 6-7 shows that the system removed approximately 3.5 pounds of VOCs in FY 1999, with a cumulative VOC mass removal of nearly 30 pounds since system startup on May 31, 1994.

Has 10 years elapsed since signing of the OU2 ROD? No.

Do additional remedial measures need to be addressed?

No. In fact consideration should be given to shutting off some or all of the downgradient extraction wells (01U355–358). It is likely that the Army will make this proposal in a separate letter sometime in 2000.

Tables

Table 6-1

Summary of Site A Shallow Groundwater Monitoring Requirements

Remedy Component	Monitoring Requirements	Responsible 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	• None		
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 Removal Action Pumping Data

Average Flow Rate (GPM)

	01U351	01U352	01U353	01U354	01U355	1-5 Subtotal	01U356	01U357	01U358	6-8 Subtotal	Total
Target GPM Month						**15.0**				**10.0**	**25.0**
Oct-98	3.51	3.00	3.59	3.52	3.34	16.96	4.24	1.49	4.20	9.93	26.89
Nov-98	4.00	3.73	3.36	4.44	4.82	20.35	3.65	1.82	4.89	10.36	30.71
Dec-98	3.77	3.62	4.05	4.13	3.53	19.10	4.93	1.72	4.12	10.77	29.87
Jan-99	4.23	2.75	4.29	4.65	3.88	19.80	4.37	2.18	3.53	10.08	29.88
Feb-99	3.55	3.48	3.49	4.16	3.95	18.63	4.04	1.97	4.04	10.05	28.68
Mar-99	3.66	4.15	4.19	4.13	4.45	20.58	4.36	2.06	4.63	11.05	31.63
Apr-99	4.14	4.18	4.42	4.09	4.27	21.10	4.44	1.58	4.45	10.47	31.57
May-99	3.95	3.60	3.89	3.86	3.60	18.90	3.41	1.47	4.22	9.10	28.00
Jun-99	4.22	4.22	4.37	4.36	4.42	21.59	4.44	1.65	4.55	10.64	32.23
Jul-99	2.69	3.79	4.00	4.00	4.29	18.77	4.24	1.47	4.04	9.75	28.52
Aug-99	3.76	3.93	4.02	3.96	3.99	19.66	4.43	1.29	4.37	10.09	29.75
Sep-99	3.84	3.35	3.80	3.80	4.20	18.99	4.09	1.67	4.45	10.21	29.20
FY 99 Average	**3.78**	**3.65**	**3.96**	**4.09**	**4.06**	**19.54**	**4.22**	**1.70**	**4.29**	**10.21**	**29.74**

Source: Conestoga-Rovers and Associates

TABLE 6-3
Site A Groundwater Level Data: FY 1999

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
01U038	900.3	26-May-99	893.23
01U039	897.5	26-May-99	882.91
01U040	892.5	26-May-99	884.83
01U041	898.3	26-May-99	893.61
01U063	892.6	26-May-99	885.23
01U067	897.4	26-May-99	894.94
01U102	905.2	26-May-99	888.73
01U103	904.1	26-May-99	890.78
01U104	899.1	26-May-99	894.01
01U105	901.4	26-May-99	895.32
01U106	896.8	26-May-99	890.91
01U107	899.2	26-May-99	892.90
01U108	904.3	26-May-99	890.19
01U109	903.0	26-May-99	895.41
01U110	897.2	26-May-99	895.81
01U115	900.3	26-May-99	884.83
01U116	902.7	26-May-99	885.18
01U117	902.7	26-May-99	886.32
01U118	901.8	26-May-99	889.10
01U119	898.1	26-May-99	893.39
01U120	902.2	26-May-99	889.72
01U125	901.1	26-May-99	885.62
01U126	903.3	26-May-99	888.16
01U127	902.9	26-May-99	890.31
01U133	900.7	26-May-99	892.54
01U135	900.0	26-May-99	882.69
01U136	898.8	26-May-99	879.89
01U137	900.9	26-May-99	887.34
01U138	904.6	26-May-99	884.47
01U139	901.5	26-May-99	883.80
01U140	899.0	26-May-99	883.22
01U141	898.0	26-May-99	885.13
01U145	901.4	26-May-99	885.72
01U146	903.5	26-May-99	885.19
01U147	902.8	26-May-99	886.03
01U148	902.6	26-May-99	885.19

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
01U151	904.7	26-May-99	884.59
01U152	901.0	26-May-99	884.37
01U153	899.9	26-May-99	883.60
01U154	898.9	26-May-99	883.50
01U155	897.9	26-May-99	882.83
01U156	897.8	26-May-99	882.72
01U157	901.9	26-May-99	884.56
01U158	901.1	26-May-99	884.03
01U351	904.0	5-Oct-98	884.02 P
01U351	904.0	3-Nov-98	883.60 P
01U351	904.0	2-Dec-98	883.57 P
01U351	904.0	5-Jan-99	882.70 P
01U351	904.0	2-Feb-99	882.45 P
01U351	904.0	2-Mar-99	879.25 P
01U351	904.0	12-Apr-99	882.00 P
01U351	904.0	4-May-99	883.05 P
01U351	904.0	26-May-99	883.93 P
01U351	904.0	20-Jul-99	885.10 P
01U351	904.0	4-Aug-99	884.85 P
01U351	904.0	7-Sep-99	884.45 P
01U352	901.0	5-Oct-98	882.81 P
01U352	901.0	3-Nov-98	882.78 P
01U352	901.0	2-Dec-98	883.28 P
01U352	901.0	5-Jan-99	879.43 P
01U352	901.0	2-Feb-99	881.28 P
01U352	901.0	2-Mar-99	880.76 P
01U352	901.0	12-Apr-99	880.18 P
01U352	901.0	4-May-99	881.68 P
01U352	901.0	26-May-99	880.13 P
01U352	901.0	20-Jul-99	882.98 P
01U352	901.0	4-Aug-99	883.48 P
01U352	901.0	7-Sep-99	883.07 P
01U353	902.0	5-Oct-98	881.40 P
01U353	902.0	3-Nov-98	881.02 P
01U353	902.0	2-Dec-98	880.60 P
01U353	902.0	5-Jan-99	877.87 P
01U353	902.0	2-Feb-99	879.07 P
01U353	902.0	2-Mar-99	879.04 P
01U353	902.0	12-Apr-99	877.82 P
01U353	902.0	4-May-99	879.27 P
01U353	902.0	26-May-99	883.42 P
01U353	902.0	20-Jul-99	880.61 P
01U353	902.0	4-Aug-99	881.12 P
01U353	902.0	7-Sep-99	880.69 P
01U354	903.8	5-Oct-98	883.92 P
01U354	903.8	3-Nov-98	883.42 P
01U354	903.8	2-Dec-98	883.20 P
01U354	903.8	5-Jan-99	882.07 P
01U354	903.8	2-Feb-99	882.02 P
01U354	903.8	2-Mar-99	881.80 P
01U354	903.8	12-Apr-99	881.37 P
01U354	903.8	4-May-99	882.42 P
01U354	903.8	26-May-99	883.52 P
01U354	903.8	20-Jul-99	884.47 P
01U354	903.8	4-Aug-99	884.32 P
01U354	903.8	7-Sep-99	884.07 P
01U355	899.9	5-Oct-98	880.88 P
01U355	899.9	3-Nov-98	879.63 P
01U355	899.9	2-Dec-98	878.85 P

TABLE 6-3
Site A Groundwater Level Data: FY 1999

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
01U149	901.3	26-May-99	885.01
01U150	901.3	26-May-99	884.46
01U355	899.9	26-May-99	879.13 P
01U355	899.9	20-Jul-99	879.53 P
01U355	899.9	4-Aug-99	879.53 P
01U355	899.9	7-Sep-99	879.37 P
01U356	899.5	5-Oct-98	877.15 P
01U356	899.5	3-Nov-98	875.80 P
01U356	899.5	2-Dec-98	875.25 P
01U356	899.5	5-Jan-99	876.35 P
01U356	899.5	2-Feb-99	875.05 P
01U356	899.5	2-Mar-99	874.67 P
01U356	899.5	12-Apr-99	872.85 P
01U356	899.5	4-May-99	876.15 P
01U356	899.5	26-May-99	877.75 P
01U356	899.5	20-Jul-99	877.30 P
01U356	899.5	4-Aug-99	876.55 P
01U356	899.5	7-Sep-99	877.46 P
01U357	899.1	5-Oct-98	879.93 P
01U357	899.1	3-Nov-98	877.43 P
01U357	899.1	2-Dec-98	880.43 P
01U357	899.1	5-Jan-99	876.93 P
01U357	899.1	2-Feb-99	874.93 P
01U357	899.1	2-Mar-99	870.99 P
01U357	899.1	12-Apr-99	875.16 P
01U357	899.1	4-May-99	876.33 P
01U357	899.1	26-May-99	877.53 P
01U357	899.1	20-Jul-99	877.08 P
01U357	899.1	4-Aug-99	883.63 P*
01U357	899.1	7-Sep-99	878.12 P
01U358	898.3	5-Oct-98	873.73 P
01U358	898.3	3-Nov-98	873.90 P
01U358	898.3	2-Dec-98	877.95 P
01U358	898.3	5-Jan-99	875.05 P
01U358	898.3	2-Feb-99	875.35 P
01U358	898.3	2-Mar-99	875.35 P
01U358	898.3	12-Apr-99	873.35 P
01U358	898.3	4-May-99	873.65 P
01U358	898.3	26-May-99	877.25 P
01U358	898.3	20-Jul-99	876.45 P
01U358	898.3	4-Aug-99	875.05 P
01U358	898.3	7-Sep-99	875.86 P
01U901	901.5	26-May-99	882.17
01U902	901.3	26-May-99	883.90
01U903	903.7	26-May-99	885.76
01U904	899.4	26-May-99	882.77

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
01U355	899.9	5-Jan-99	880.13 P
01U355	899.9	2-Feb-99	876.98 P
01U355	899.9	2-Mar-99	875.96 P
01U355	899.9	12-Apr-99	876.03 P
01U355	899.9	4-May-99	877.33 P

Notes: (1) TOS = Top of Surface which represents the ground surface elevation in feet above mean sea level (MSL). The TOS elevations were retrieved from USAEC IRDMIS. All data are referenced to TOS elevations surveyed by Kemper and Associates, Inc. during July through September 1992.

* Water level unusually high. Pump was making a whining noise.

P = Pumping

TABLE 6-4

TCAAP - SITE A
OPERATION AND MAINTENANCE NOTES
FISCAL YEAR 1999

October
10/09-13/98 treatment system was shutdown for scheduled cleaning. Down Time: 95.0 Hours
10/14/98 EW#4 motor failed and was replaced. Down Time: 20.0 Hours
10/30/98 EW#6 overload breaker had tripped and was reset. Down Time: 19.5 Hours

November
11/12-18/98 EW6 pump and motor had failed and were replaced. Down Time: 156 Hours
11/13-18/98 EW3 pump and motor had failed and were replaced. Down Time: 132 Hours

December
11/30/98 to 12/01/98, Treatment system was shutdown for scheduled cleaning. Down Time: 32.25
12/25/98, Site A pumphouse inspection was not performed due to Christmas holiday.

January
01/01/99, Site A pumphouse inspection was not performed due to New Years Day holiday.
01/12-15/99, Treatment system was shutdown for scheduled cleaning. Down Time: 73.75 Hours.
01/18-19/99, EW8 pump and motor had failed and were replaced. Down Time: 86 Hours.
01/18-21/99, EW2 pump and motor had failed and were replaced. Down Time: 120 Hours.
01/22/99, EW8 flowmeter was failing and was replaced. Down Time 0.5 Hour.

February
02/22-24/99, Treatment system was shutdown for scheduled cleaning. Down Time: 52.75 Hours.
02/25-26/99, Treatment system was shutdown for scheduled base solution treatment. Down Time: 24.5 Hours.

March
03/01-02/99, EW1 ball valve was found to be nearly closed, after it was opened, the well operated normally. Down Time: 0.0 Hours
03/01-02/99, EW6 flowmeter had failed and was replaced. Down Time: 0.5 Hour
03/11-16/99, EW1 pump and motor had failed twice and were replaced. Down Time: 144.0 Hours

TABLE 6-4

TCAAP - SITE A
OPERATION AND MAINTENANCE NOTES
FISCAL YEAR 1999

April
04/05-07/99, Site A pumphouse, system was shutdown for scheduled cleaning. Down Time: 48.0 Hours
04/07-09/99, extraction well #7, pump and motor had failed and were replaced. Down Time: 53.5 Hours

May
05/05, EW2 breaker had tripped and was reset. Down Time: 20 Hours.
05/07-05/10, EW5 pump and motor had failed and were replaced. Down Time: 89 Hours.
05/15-05/17, EW6 pump and motor had failed and were replaced. Down Time: 52 Hours.
05/21-05/25, Treatment system was shut down for scheduled cleaning. Down Time: 90 Hours.
05/25/99, EW4 shut down to replace pipe nipple above pitless adapter. Down Time: 1 Hour.

June
No Notes

July
07/06 - 07/07/99, Extraction system was shut down for scheduled cleaning and maintanence. Down Time: 32.5 Hours
07/08 - 07/09/99, Extraction system was shut down for scheduled base solution treatment. Down Time: 31 Hours
07/09 - 07/13/99, EW-1 electrical disconnect failed and was replaced. Down Time: 96.5 Hours
07/13 - 07/16/99, EW-7 pump and motor failed and were replaced. Down Time: 68.5 Hours

August
No Notes

September
9/13/99, Treatment system shutdown for reinstallation of rebuilt effluent flowmeter. Down Time: 1.0 Hour
9/28 - 9/30/99, Extraction system was shut down for scheduled cleaning and maintanence. Down Time: 53.75 Hours
9/30/99, EW-2 pump and motor operating incorrectly and were replaced while system was down for scheduled cleaning.

TABLE 6-5
Site A Removal Action Effluent Water Quality

		cis-1,2-Dichloroethene (ug/l)	trans-1,2-Dichloroethene (ug/l)	Tetrachloroethene (ug/l)	Tricholorethene (ug/l)	Mercury (ug/l)	pH	Chemical Oxygen Demand (ug/l)	Total Suspended Solids (ug/l)
Discharge Criteria		3000 for total 1,2-Dichloroethene		3000	3000	100		None	None
Effluent-A	05-Oct-98	27.00	JP 1.00	JP 0.43	1.30	<0.10			
Effluent-A	03-Nov-98	26.00	JP 0.90	<1.00	1.10	<0.10			
Effluent-A	02-Dec-98	36.00	JP 1.00	<1.00	1.20	<0.10			
Effluent-A	05-Jan-99	25.00	JP 0.78	<1.00	1.10	<0.10			
Effluent-A	02-Feb-99	25.00	JP 0.99	<1.00	1.20	JP <0.50			
Effluent-A	02-Mar-99	22.00	JP 0.82	JP 0.50	1.20	<0.10			
Effluent-A	12-Apr-99	25.00	JP 0.92	<1.00	1.50	<0.10			
Effluent-A	04-May-99	25.00	JP 0.91	<1.00	JP 0.64	<0.10			
Effluent-A	01-Jun-99	19.00	JP 0.80	<1.00	JP 0.99	<0.10	7.31	<10000.00	<10000.00
Effluent-A	20-Jul-99	25.00	JP 0.96	JP 0.26	1.20	<0.10			
Effluent-A	04-Aug-99	24.00	JP 0.87	<1.00	JP 1.00	<0.10			
Effluent-A	07-Sep-99	26.00	JP 0.87	JP 0.31	1.20	<0.10			

Note: JP = The value is below the reporting limit, but above the method detection limit.

TABLE 6-6
Site A Groundwater Quality Data: FY 1999

		Tetrachloroethene (ug/l)	Trichloroethene (ug/l)	1,1-Dichloroethene (ug/l)	1,2-Dichloroethane (ug/l)	cis-1,2-Dichloroethene (ug/l)	Chloroform (ug/l)	Benzene (ug/l)	Antimony (ug/l)
Site A Cleanup Level (1)		7.0	30.0	6.0	4.0	70.0	60.0	10.0	6.0
01U039	02-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U102	02-Jun-99	1.90	JP 0.42	<1.00	<1.00	2.60	<1.00	<1.00	
01U103	02-Jun-99	JP 0.41	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	**61.20**
01U108	02-Jun-99	**92.00**	**33.00**	<1.00	<1.00	30.00	<1.00	<1.00	
01U115	02-Jun-99	<1.00	<1.00	<1.00	<1.00	JP 0.49	<1.00	<1.00	
01U115 D	02-Jun-99	<1.00	<1.00	<1.00	<1.00	JP 0.60	<1.00	<1.00	
01U116	02-Jun-99	<1.00	JP 0.36	<1.00	<1.00	<1.00	<1.00	<1.00	
01U117	02-Jun-99	2.90	1.80	<1.00	<1.00	13.00	<1.00	<1.00	
01U125	02-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U125 D	02-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U126	02-Jun-99	**18.00**	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U138	02-Jun-99	JP 0.27	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U139	02-Jun-99	<1.00	JP 0.66	<1.00	<1.00	5.00	<1.00	JP 0.50	
01U140	02-Jun-99	<1.00	JP 0.26	<1.00	<1.00	4.20	<1.00	1.50	
01U157	02-Jun-99	<1.00	JP 0.68	<1.00	<1.00	3.00	<1.00	<1.00	
01U158	02-Jun-99	<1.00	<1.00	<1.00	<1.00	1.30	<1.00	<1.00	
01U351	01-Jun-99	JP 0.48	1.20	<1.00	<1.00	JP 1.00	<1.00	<1.00	
01U352	01-Jun-99	1.60	5.30	<1.00	<1.00	35.00	<1.00	JP 0.44	
01U353	01-Jun-99	<1.00	1.60	<1.00	<1.00	**110.00**	<1.00	5.90	
01U354	01-Jun-99	<1.00	JP 0.41	<1.00	<1.00	1.20	<1.00	<1.00	
01U355	01-Jun-99	<1.00	JP 0.46	<1.00	<1.00	5.10	<1.00	JP 0.30	
01U356	01-Jun-99	<1.00	<1.00	<1.00	<1.00	4.60	<1.00	<1.00	
01U357	01-Jun-99	<1.00	<1.00	<1.00	<1.00	4.50	<1.00	JP 0.53	
01U358	01-Jun-99	<1.00	<1.00	<1.00	<1.00	2.40	<1.00	JP 0.46	
01U901	02-Jun-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	
01U902	02-Jun-99	<1.00	JP 0.53	<1.00	<1.00	12.00	<1.00	<1.00	**<10.00**
01U903	03-Jun-99	<1.00	JP 0.44	<1.00	<1.00	JP 0.32	<1.00	<1.00	
01U903 D	03-Jun-99	<1.00	JP 0.49	<1.00	<1.00	JP 0.33	<1.00	<1.00	
01U904	02-Jun-99	<1.00	<1.00	<1.00	<1.00	1.50	<1.00	<1.00	**<10.00**

Notes: (1) Cleanup levels for Site A Shallow Groundwater are from Table 1 of the OU2 ROD. Bolding indicates exceedance of the cleanup level or reporting limits higher than the cleanup level.
JP The value is below the reporting level, but above the method detection limit.
D Duplicate sample.

TABLE 6-7

SITE A

SUMMARY OF VOC MONTHLY REMOVAL

FISCAL YEAR 1999

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, 1998					75,069,305	26.28
OCTOBER	28.00	1.30	29.30	8.35E-09	1,197,610	0.29
NOVEMBER	26.00	1.10	27.10	8.35E-09	1,332,610	0.30
DECEMBER	37.00	1.20	38.20	8.35E-09	1,331,240	0.42
JANUARY	25.00	1.10	26.10	8.35E-09	1,335,920	0.29
FEBRUARY	25.00	1.20	26.20	8.35E-09	1,153,690	0.25
MARCH	22.00	1.20	23.20	8.35E-09	1,408,110	0.27
APRIL	25.00	1.50	26.50	8.35E-09	1,365,200	0.30
MAY	25.00	0.00	25.00	8.35E-09	1,254,030	0.26
JUNE	19.00	0.00	19.00	8.35E-09	1,404,220	0.22
JULY	25.00	1.20	26.20	8.35E-09	1,268,260	0.28
AUGUST	24.00	1.00	25.00	8.35E-09	1,326,610	0.28
SEPTEMBER	26.00	1.20	27.20	8.35E-09	1,268,960	0.29
TOTAL GALLONS PUMPED AND VOC'S REMOVED FOR FISCAL YEAR 1999					15,646,460	3.46
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP					90,715,765	29.74

Notes:

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

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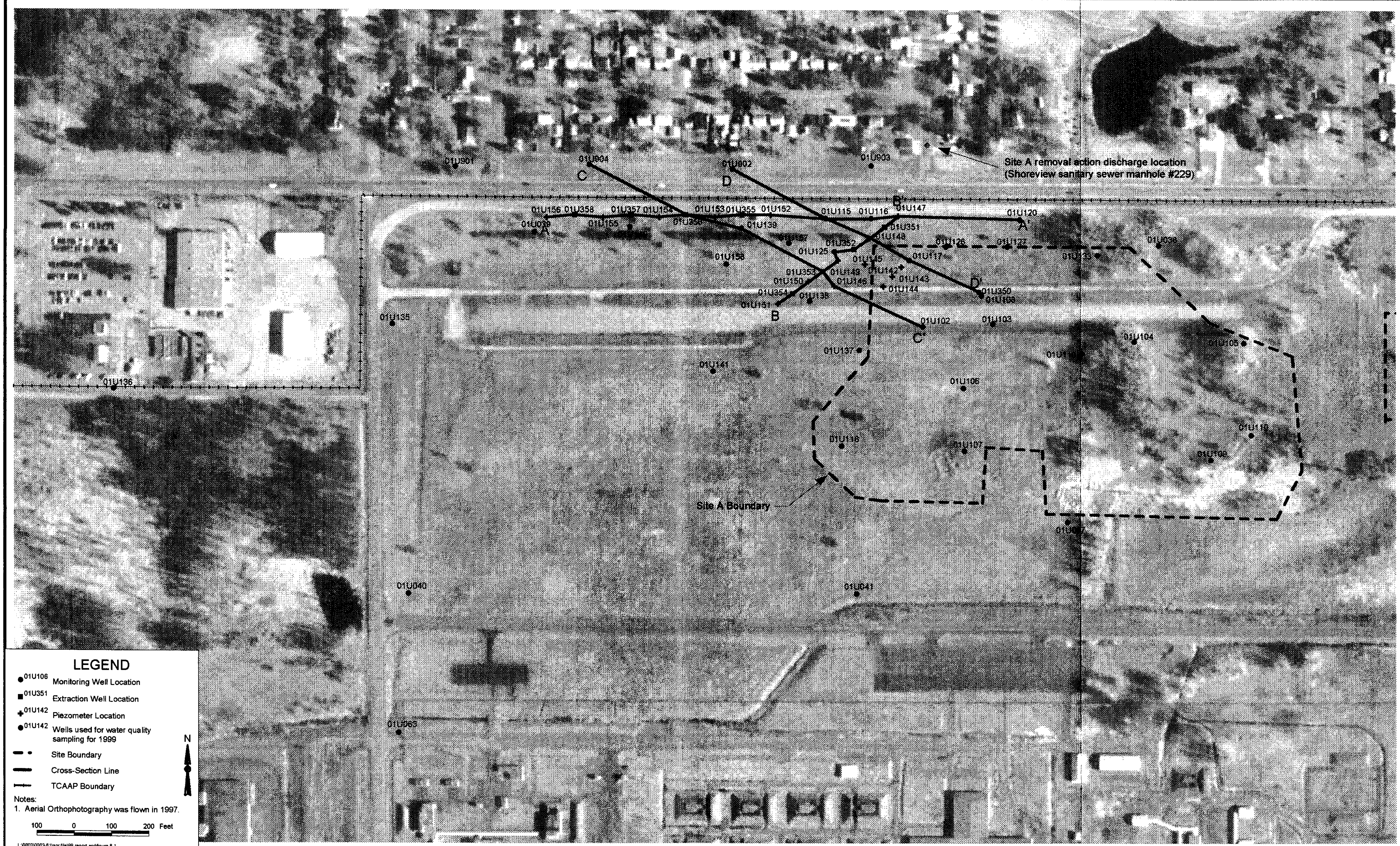
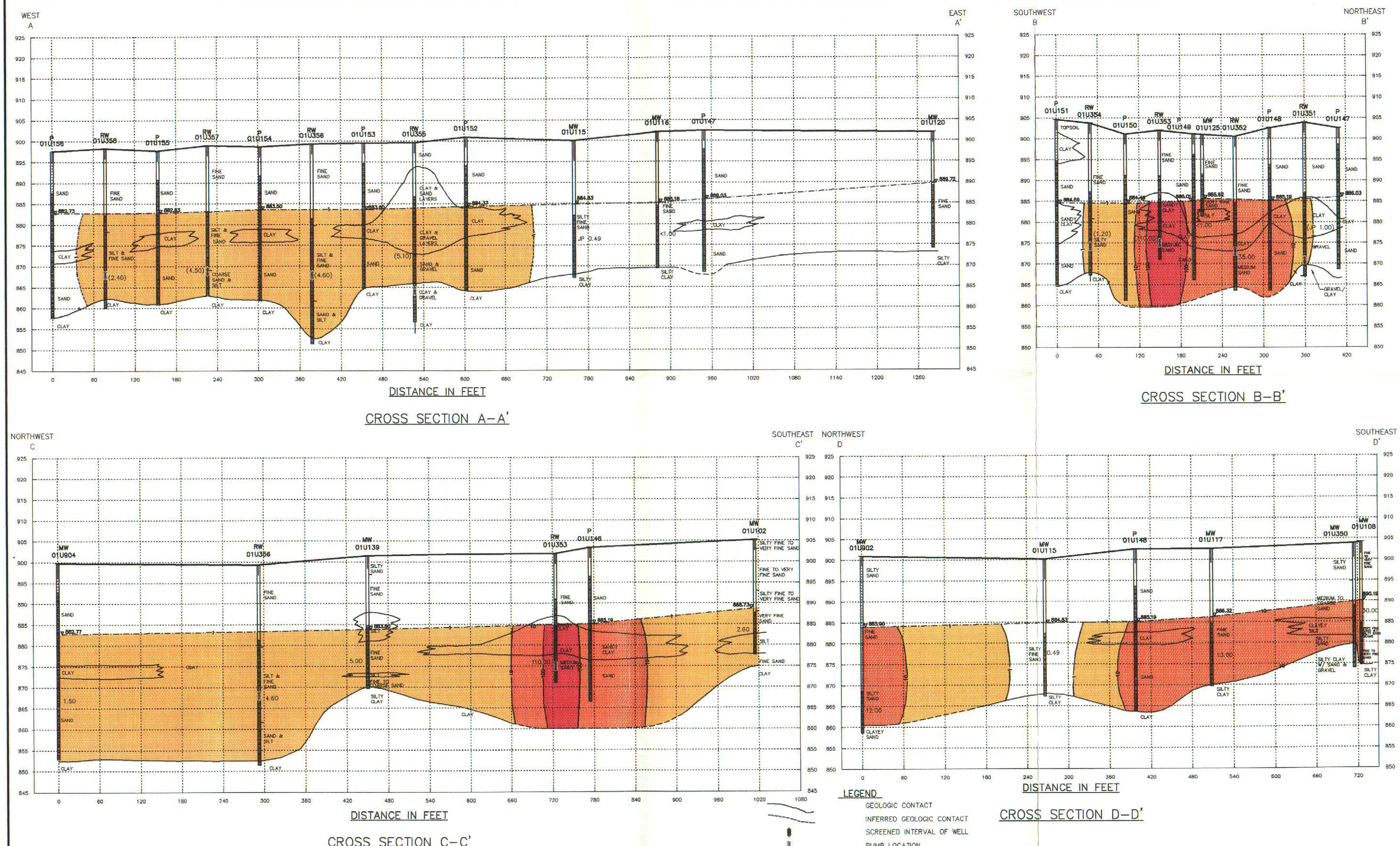
Source: Conestoga-Rovers and Associates

Figures



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	OCT 2000
Site A, Well Location Map		Figure 6-1



LEGEND

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- SCREENED INTERVAL OF WELL
- PUMP LOCATION
- 13.80 — 1,2-DICHLOROETHENE CONCENTRATION (ug/l) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)
- 10 — ISOCONCENTRATION CONTOUR (ug/l)
- 885.0 — WATER LEVEL SURFACE
- SLIGHT CHANGE IN GEOLOGIC UNIT (MARK LOCATED ALONG WELL STAFF)
- MW — MONITORING WELL
- RW — RECOVERY WELL
- P — PIEZOMETER

NOTE:

1. 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.

FILE	TCAX01B4.DWG
DATE	4-28-00 L:

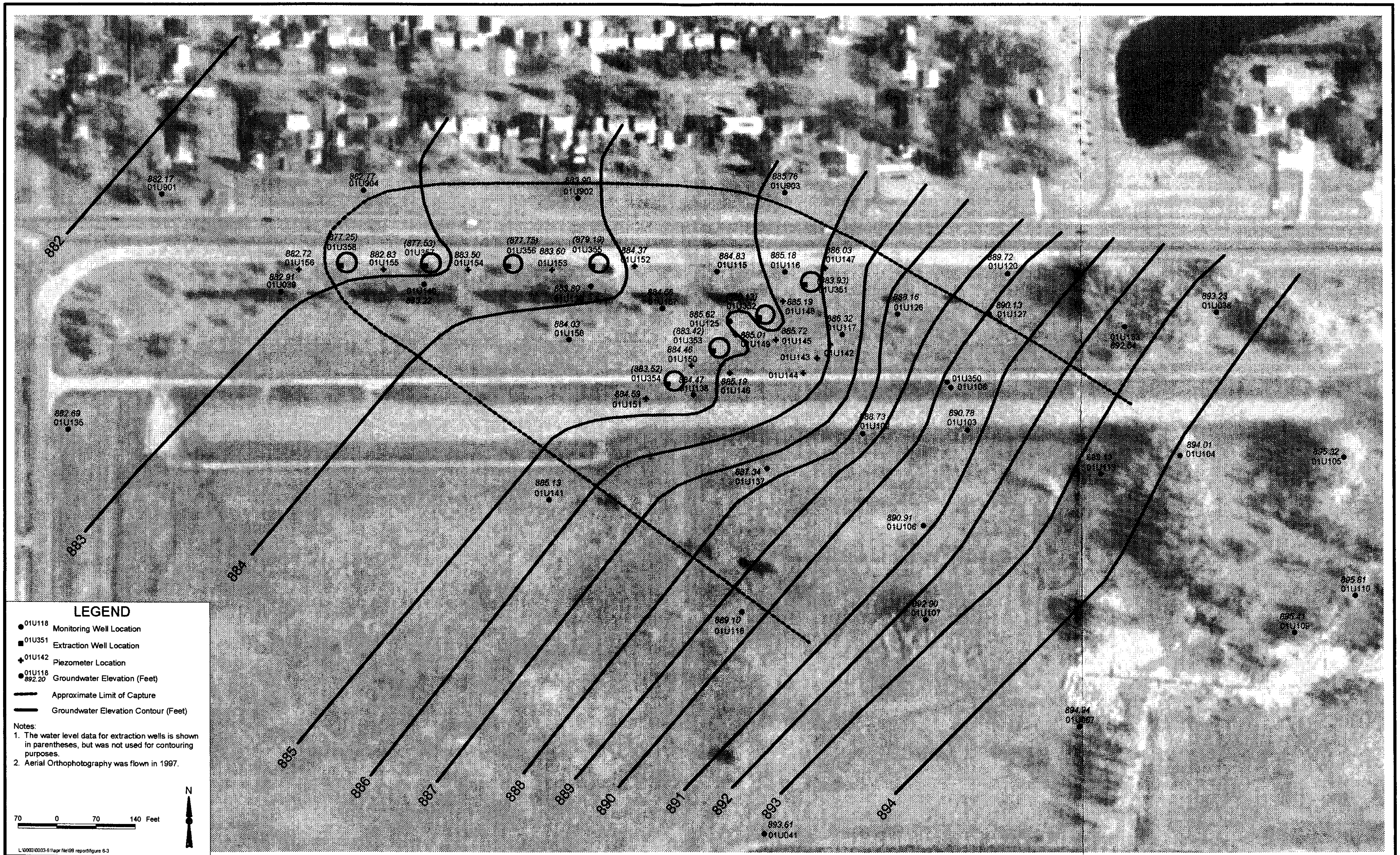
TWIN CITIES ARMY AMMUNITION PLANT

Site A, 1,2-Dichloroethene Cross Sections A-A', B-B', C-C', D-D', Summer 1999

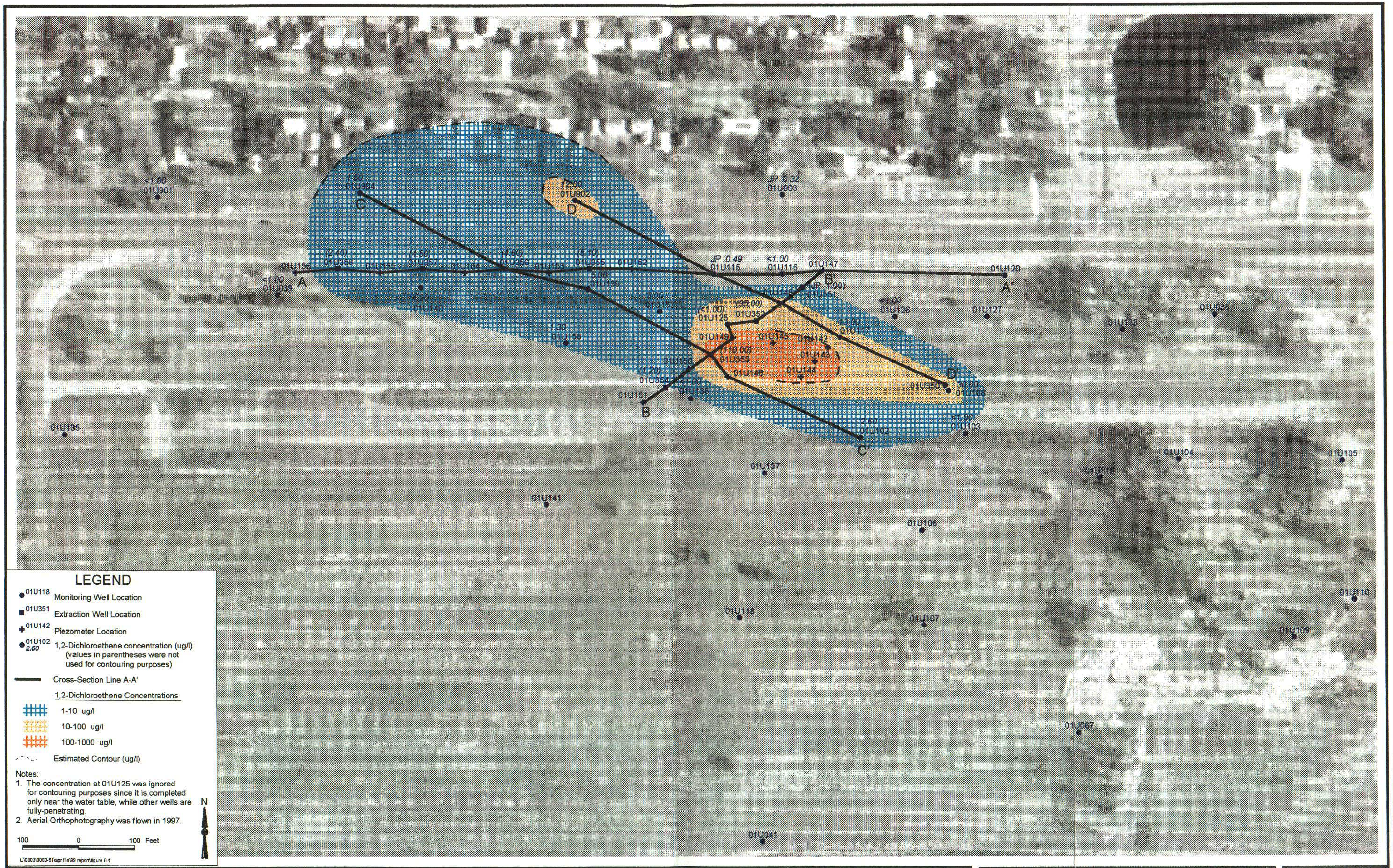
Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359

OCT 2000

Figure 6-2



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	OCT 2000
Site A, Unit 1, Potentiometric Map -- Summer 1999		Figure 6-3



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 1,2-Dichloroethene Isoconcentration Map, Summer 1999

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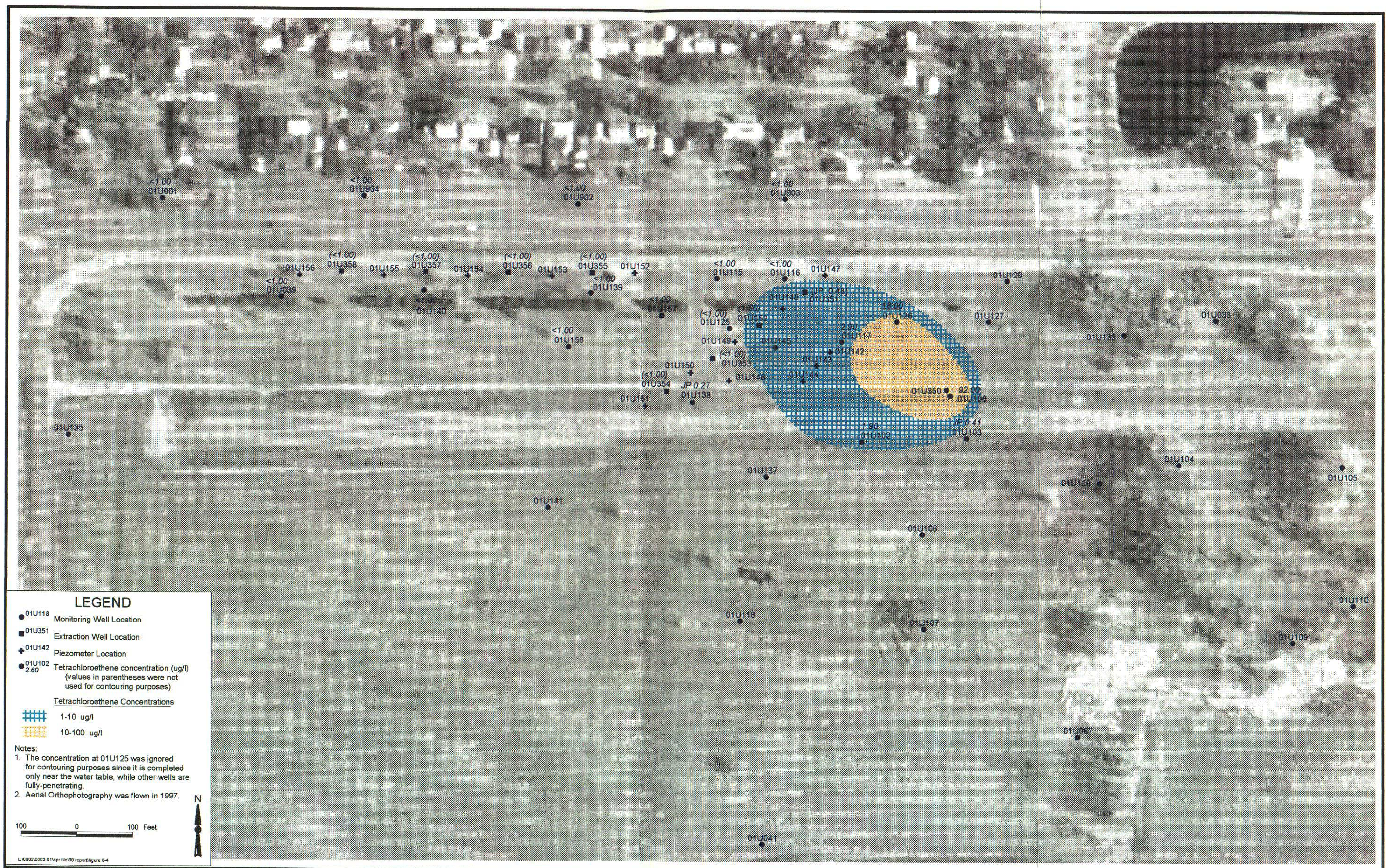
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

OCT 2000

Figure 6-4



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 Tetrachloroethene Isoconcentration Map, Summer 1999

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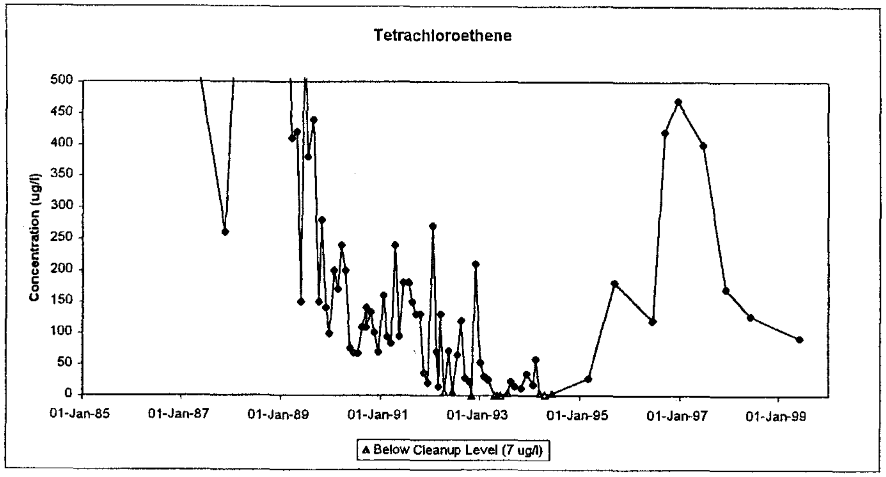
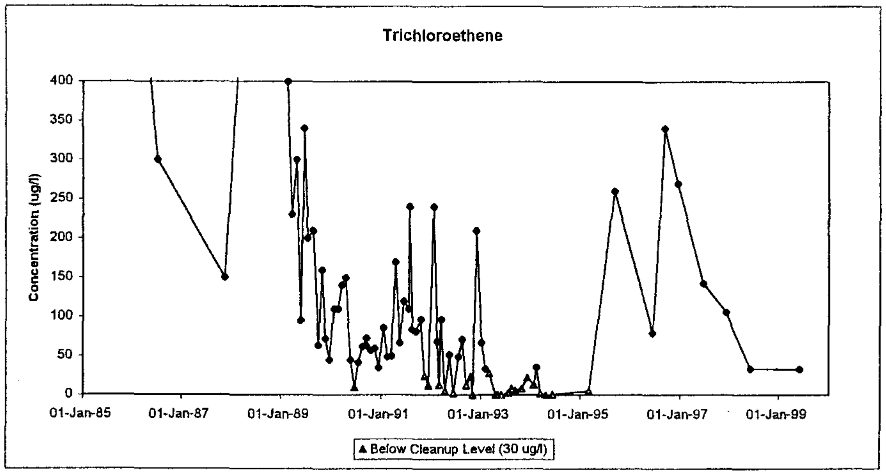
Figure 6-5

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

TWIN CITIES ARMY AMMUNITION PLANT





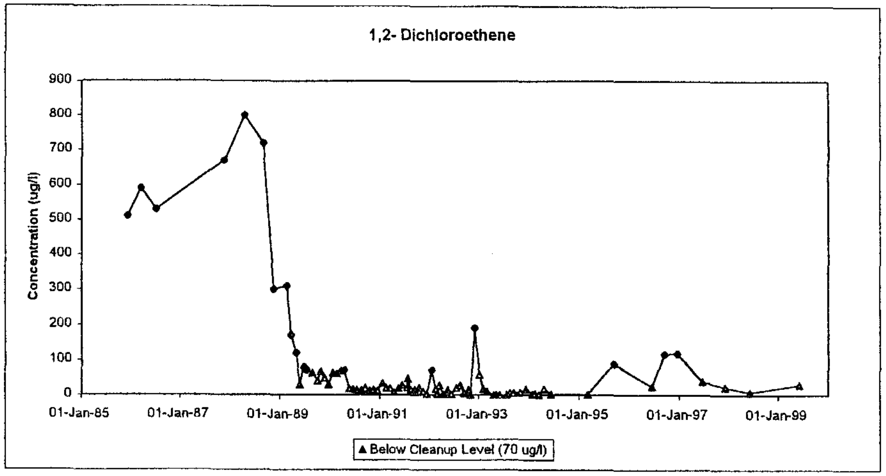


Figure 6-6
Wenck Associates, Inc.
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SITE A, 1,2-DICHLOROETHENE WATER QUALITY TRENDS: RECOVERY WELLS

TWIN CITIES ARMY AMMUNITION PLANT

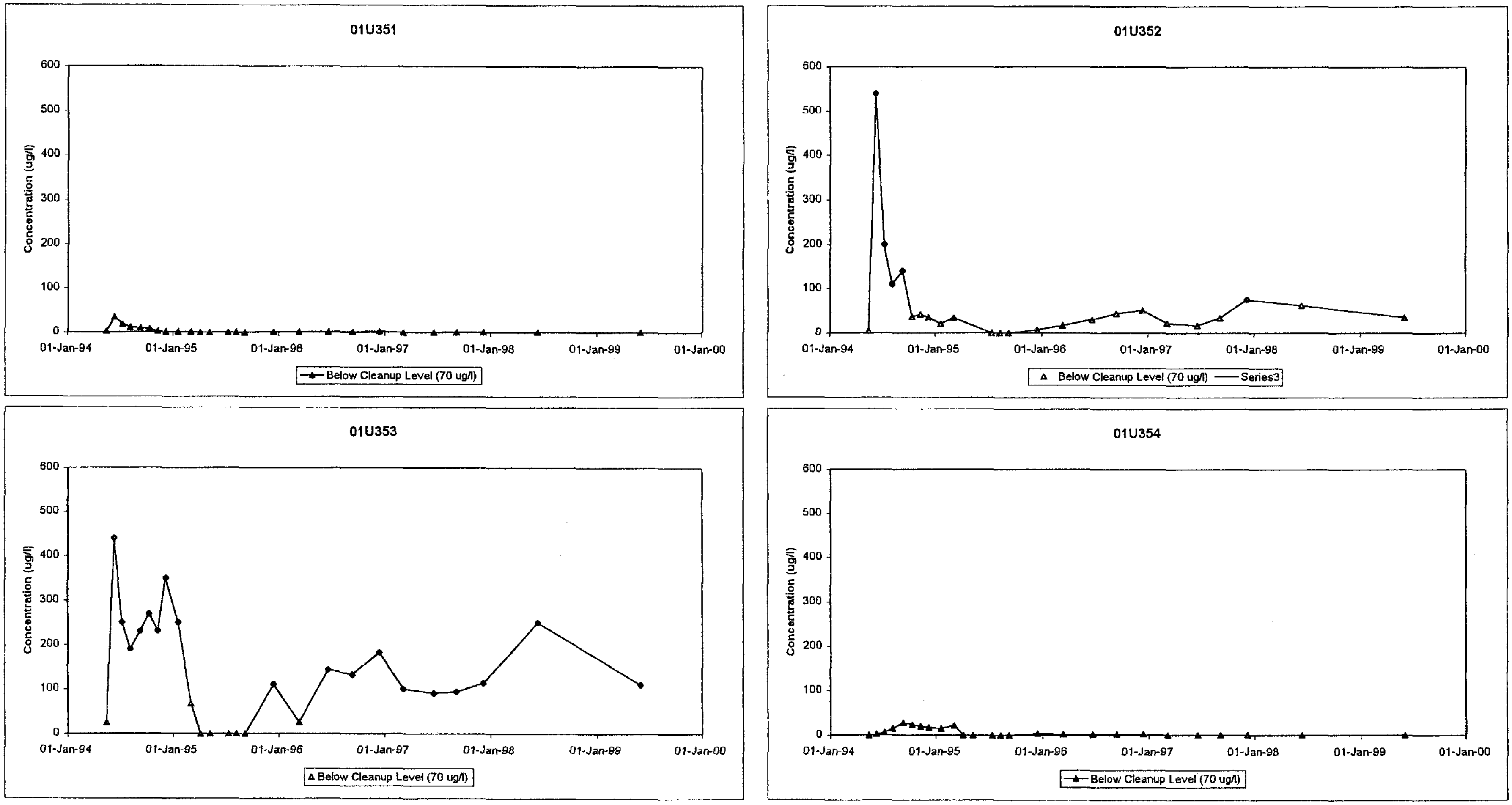

Figure 6-7
Wenck Associates, Inc.
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SITE A, 1,2-DICHLOROETHENE WATER QUALITY TRENDS: RECOVERY WELLS

TWIN CITIES ARMY AMMUNITION PLANT

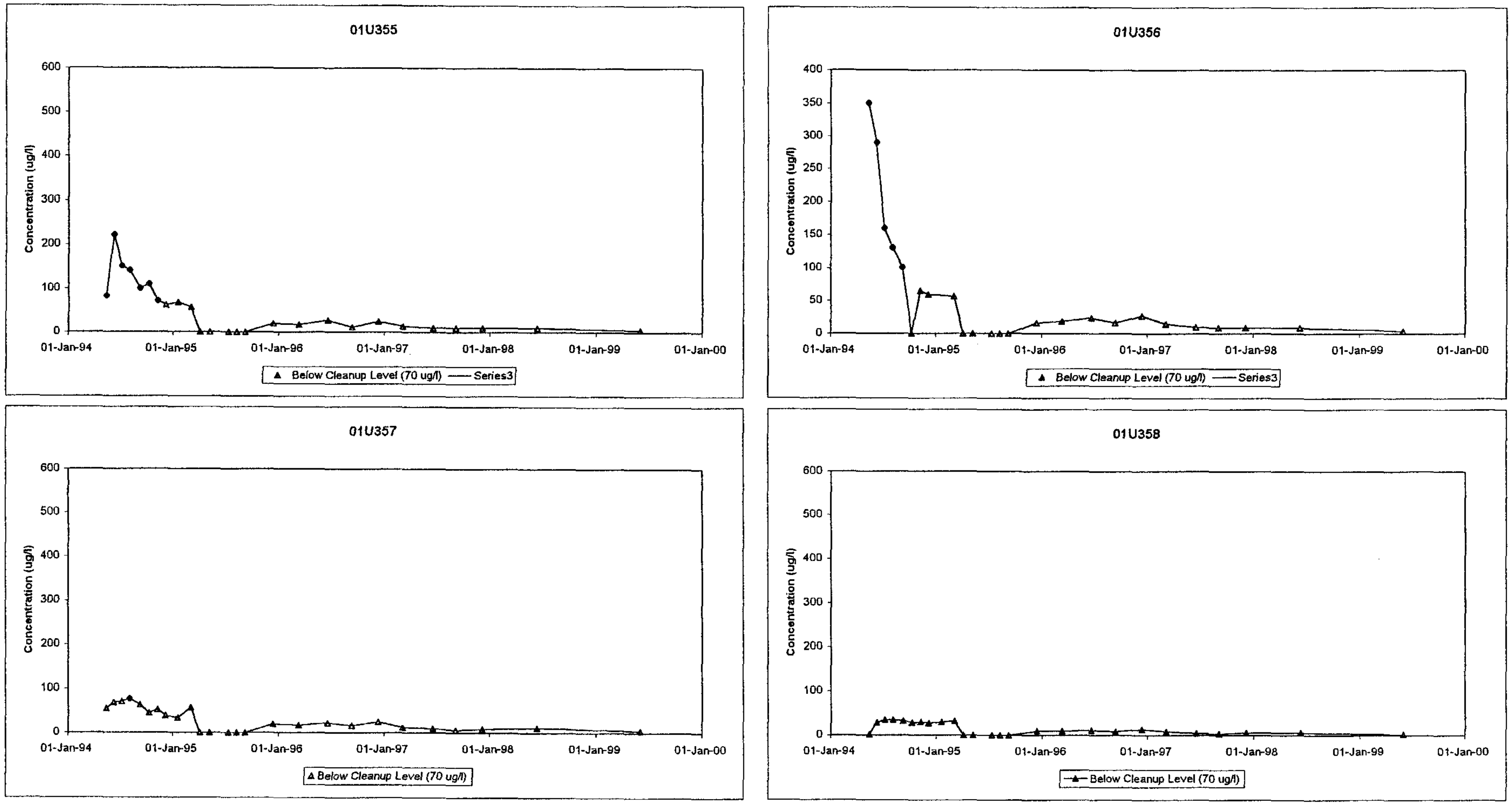

Figure 6-8
Wenck Associates, Inc.
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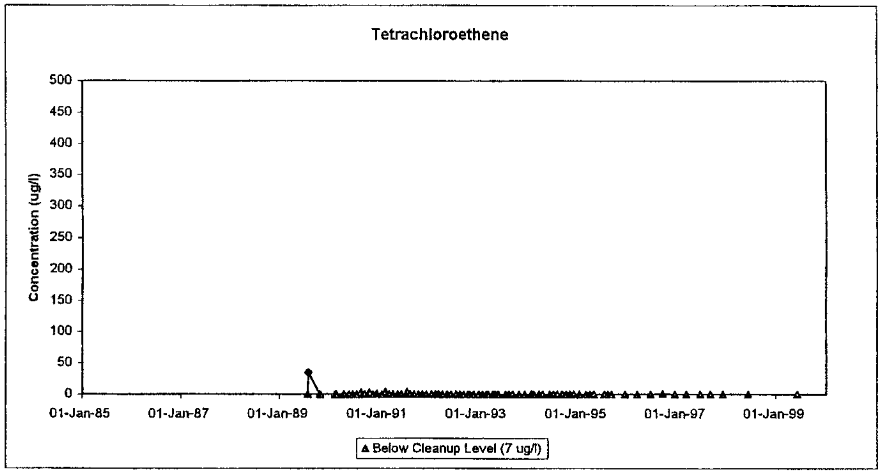
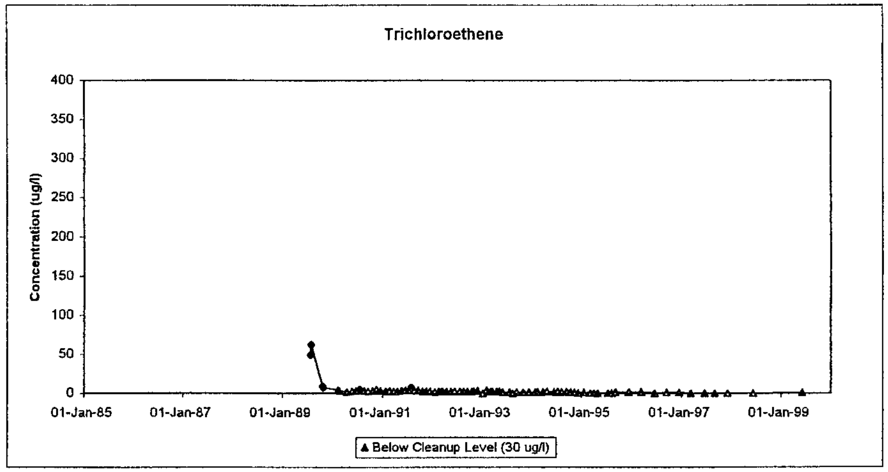
SITE A, WELL 01U902, TETRACHLOROETHENE, TRICHLOROETHENE, 1,2-DICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT





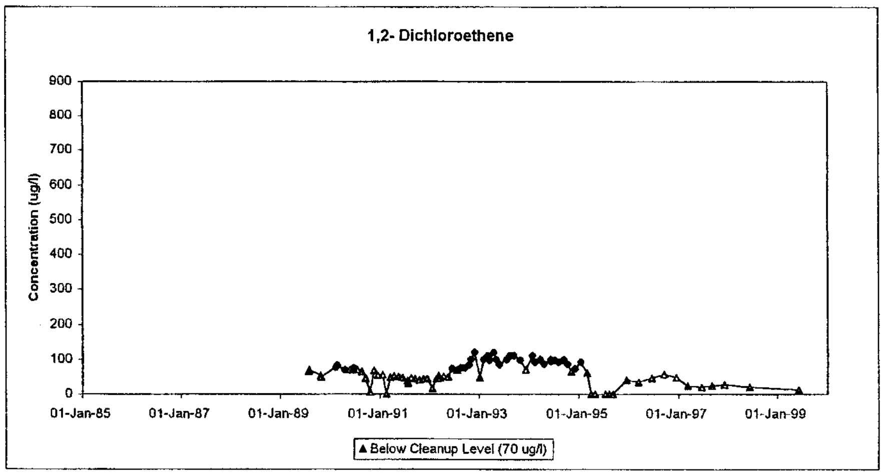


Figure 6-9
Wenck Associates, Inc.
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SECTION 7

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.

Monitoring in FY 1999 addressed the VOCs identified in the groundwater beneath the western portion of Building 502. The selected remedy in the OU2 ROD consists of four components, which incorporate the use of an existing well for groundwater extraction and additional investigation beneath the building slab. The additional investigation and Predesign Investigation Work Plan (Work Plan) are complete. The selected remedy has been modified and now consists of a dual-phase extraction system, which combines groundwater extraction with soil vapor extraction, to be installed beneath Building 502.

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?

Partially. Monitoring at Site I in FY 1999 was conducted according to the monitoring plan for FY 1999, which did not address the final remedy in the OU2 ROD. Appendix A summarizes the FY 1999 monitoring plan and any deviations are explained in Appendix C.3.

Seven Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during 1999. These wells are 01U064, 01U636, 01U639, 01U640, I01-MW, I02-MW, and I05-MW. Figure 7-1 shows these well locations. Wells 01U639, I01-MW, I02-MW, and I05-MW, were dry at the time of sampling (June 3, 1999). The dry wells yielded water when originally installed. Samples from the remaining wells were analyzed using EPA Method 601 for VOCs.

What were the monitoring results for FY 1999?

Table 7-1 presents the results of the FY 1999 analyses. The VOCs present in the wells are consistent with past data which identified VOCs in Unit 1 at Site I.

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 Work Plan for implementing the remedy has been submitted to the regulators and has received approval.

The Work Plan consists of a dual phase extraction pilot test.

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 Work Plan is complete. Work began in FY 2000.

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 a regulator 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 extraction technology to the site.

Overall Remedy for Site I Shallow Groundwater
The remedy specified in the OU2 ROD (as modified in the RD work plan) will be implemented in FY 2000. Monitoring in FY 1999 was consistent with the FY 1999 monitoring plan. The following conclusions are made for FY 1999:

- 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 extraction technology to be planned.

Is additional monitoring proposed prior to the next report?

Yes. Appendix A presents the FY 1999 – FY 2003 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 final design of the remedial action.

Tables

TABLE 7.1

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCLE*	*12DCLP*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
01U064	6/3/99	0.35 JP	< 1	0.43 JP	1.5	< 1	< 1	61	3.6	< 1	< 1	< 1	4.1	< 1	< 1	2.2
01U064	6/3/99	0.34 JDP	< 1 D	0.44 JDP	1.3 D	< 1 D	< 1 D	57 D	3 D	< 1 D	< 1 D	< 1 D	3.6 D	< 1 D	< 1 D	2 D
01U636	6/3/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
01U639	6/3/99	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U640	6/3/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP
I01MW	6/3/99	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I02MW	6/3/99	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I05MW	6/3/99	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

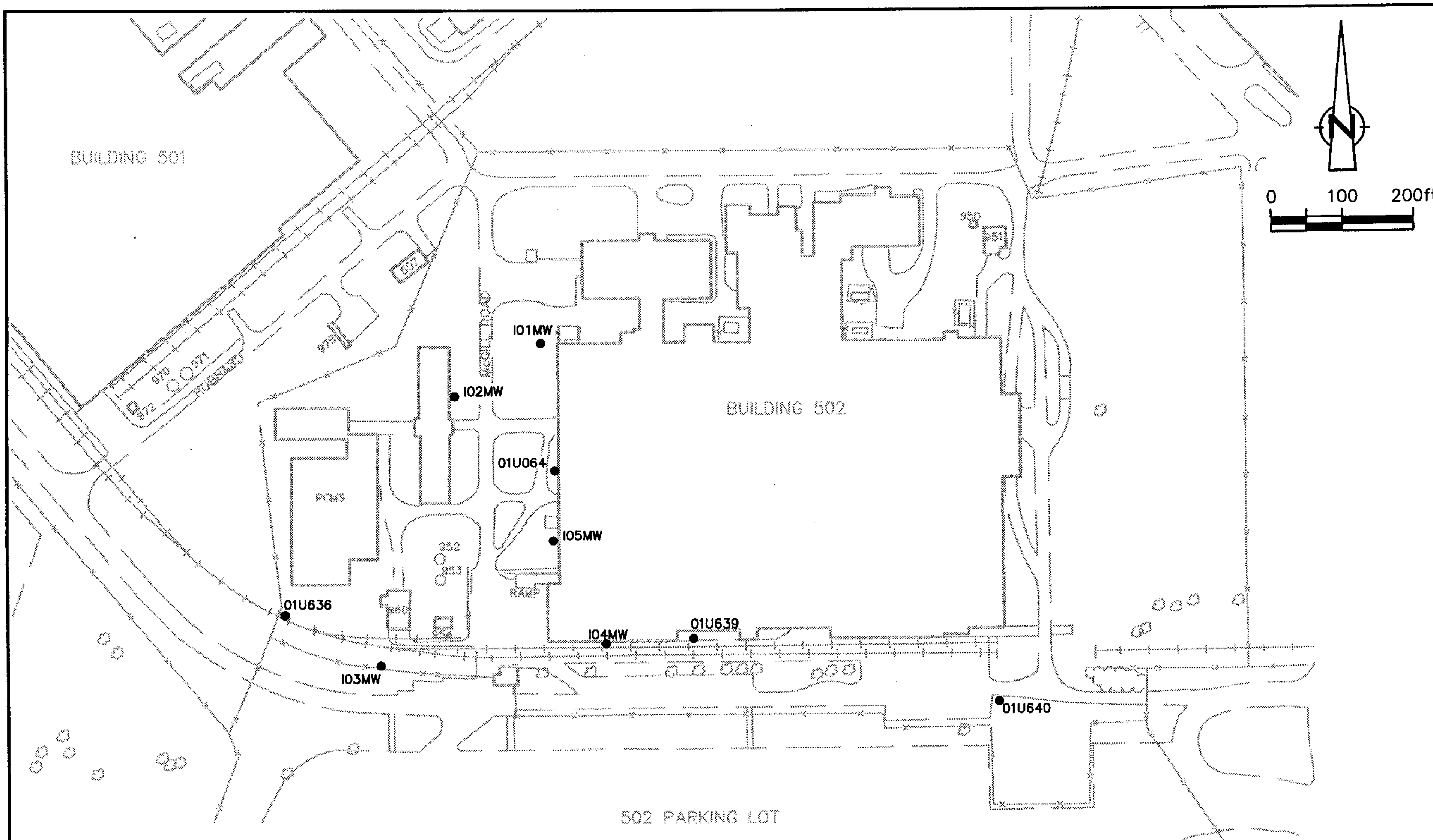
Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
Dry - Sample not collected because well was dry.

TABLE 7.2

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
SITE I, TCAAP
NEW BRIGHTON, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Responsible Party*	*Documents Containing the Monitoring Plan*
#1 Groundwater Monitoring	a. Groundwater quality and water levels to track remedy progress	Alliant	Future monitoring plans in Annual Performance Report
#2 Groundwater Extraction	a. Extracted water volumes and rates	Alliant	Future monitoring plans in Annual Performance Report
#3 POTW Discharge	a. Water quality data for system effluent to demonstrate compliance with discharge requirements	Alliant	Future monitoring plans in Annual Performance Report
#4 Additional Investigation	a. As per work plan	Alliant	Future monitoring plans in Annual Performance Report
Overall Remedy	a. Water quality data to evaluate attainment	Alliant	Future monitoring plans in Annual Performance Report

Figure



LEGEND

● UNIT 1 MONITORING WELL LOCATION

figure 7–1

SITE I, UNIT 1 GROUNDWATER QUALITY MONITORING LOCATIONS

Twin Cities Army Ammunition Plant

CRA

13399–43(001)GN–SP004 JAN 25/2000

SECTION 8

8.0 Operable Unit 2: Site K Shallow Groundwater

Volatile organic compound (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 1999 monitoring plan and any deviations are explained in Appendix C.3. Monitoring was as follows:

<u>Treatment System</u>
On a monthly basis, the original treatment system effluent flow rate was measured by using a bucket and stopwatch and by flow meter. The original treatment system was replaced with new treatment equipment. The new equipment has a superior flow meter. Bucket and stopwatch flow rate measurement was not performed after shutdown of the original system. Additional

monitoring was also performed which consisted of sampling the treatment system effluent monthly and influent quarterly.

During FY 1999, the treatment system functioned properly. The original treatment equipment flowmeter that measures the discharge from the trench had frequently malfunctioned due to fouling. During FY 1999, a regular cleaning schedule was implemented and the meter was periodically checked for accuracy and corrected using coincidental bucket test data. Appendix J.3 summarizes operational data and events at the groundwater extraction and treatment system.

Groundwater Monitoring

Water levels are collected semi-annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. FY 1999 monitoring was performed in accordance with the Monitoring Plan included as Appendix A. The comprehensive monitoring well sampling was conducted in June 1998. Figures 8-1 and 8-2 present 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. The well installation and sampling began in early FY 2000. Figure 8-2 shows the location of the Unit 3 sentinel well.

8.3 REMEDY COMPONENT #3: HYDRAULIC CONTAINMENT

Description: "Use of existing interceptor/recovery trench to contain 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 clean up 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 8-1. Figure 8-3 presents a plan view of the groundwater contours from the May round of groundwater level measurement. At nested wells, the 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 8-4. As seen in the figure, groundwater both upgradient and downgradient of the trench is captured and collected. The upward gradient beneath the trench indicates that groundwater does not migrate below the trench. The monitoring coverage provided by the bundle piezometers demonstrates complete vertical and horizontal hydraulic capture.

Figure 8-5 presents the trichloroethene concentrations from the June 1999 annual sampling event. Trichloroethene concentrations range from non-detect to 75,000 μg/l. Comparison of Figure 8-5 to the groundwater contour maps indicates that the VOC plume is hydraulically contained by the treatment system. Table 8-2 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, Figure 8-5 was 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 1998.

Trichloroethene was detected downgradient of the trench, at well 01U617, with a concentration of 0.35 μg/l. This well is within the hydraulic capture zone of the trench.

Were there any major operational changes during the year?

Yes. The original air stripping tower and controls were replaced with a new fluidized bed type air stripper system. The new system began operation on June 21, 1999. The new air stripper is less prone to fouling and is expected to require less maintenance and be more reliable than the old system. The old system was shutdown on July 15, 1999.

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 clean up standards.

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

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 below.

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. Influent and effluent analytical results are presented in Table 8-3 and Table 8-4. The discharge met all the treatment requirements. Table 8-5 presents the VOC mass removal and monthly flow rates. A total of 4,508,180 gallons of water and 92.4 pounds of VOCs were removed from the aquifer in FY 1999.

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. Work began in early FY 2000.

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 1999 – 2003 Monitoring Plan. Table 8-6 presents the Site K monitoring requirements. The monitoring plan is subject to review based on the results of the additional investigation and final design of the remedial action.

Tables

TABLE 8.1

GROUNDWATER ELEVATION (FT. AMSL)
FISCAL YEAR 1999
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Well ID	*TOC Elevation*	*5/27/99*
01U047	880.31	875.47
01U048	885.32	875.55
01U052	886.51	875.75
01U065	883.90	874.48
01U128	883.69	876.05
01U601	892.68	884.56
01U602	889.35	883.67
01U603	887.31	879.78
01U604	888.98	879.54
01U605	887.76	878.56
01U607	891.01	884.65
01U608	889.30	883.96
01U609	889.33	883.65
01U611	889.29	884.07
01U612	886.91	879.26
01U613	892.07	884.28
01U615	888.66	879.62
01U616	890.37	881.09
01U617	887.72	879.72
01U618	891.52	881.60
01U619	891.75	884.19
01U620	888.65	880.88
01U621	886.57	880.45
01U624A	889.88	880.61
01U624B	889.88	880.60
01U624C	889.91	880.61
01U624D	889.89	880.61
01U625A	886.92	880.07
01U625B	886.91	880.04
01U625C	886.91	880.02
01U625D	886.92	880.09
01U626A	886.87	879.87
01U626B	886.88	879.84
01U626C	886.88	879.88
01U626D	886.88	879.91
01U627A	886.46	880.31
01U627B	886.47	879.98
01U627C	886.47	879.94
01U627D	886.48	879.91
01U628A	887.82	880.02
01U628B	887.83	879.98
01U628C	887.82	879.92
01U628D	887.84	879.91
K01MW	891.24	886.82
K02MW	891.35	886.38
K04MW	887.66	880.96

TABLE 8.2

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCLE*	*12DCLP*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
OW103 (01U603)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
OW104 (01U604)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
OW111 (01U611)	6/1/99	< 100	< 100	< 100	< 100	< 100	< 100	1800	< 100	< 100	< 100	< 100	120	< 100	< 100	75000
OW115 (01U615)	6/1/99	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	700 650 D	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	< 25 < 25 D	230 225 D	< 25 < 25 D	< 25 < 25 D	3800 3700 D
OW117 (01U617)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	1.7	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.35 JP
OW118 (01U618)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	0.6 JP	< 1	< 1	< 1	< 1	< 1	< 1	11	2.2
OW119 (01U619)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	160	0.8 JP
OW121 (01U621)	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	3.2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
01U128	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	7.7	< 1	< 1	< 1	< 1	0.85 JP	< 1	< 1	< 1
K04MW	6/1/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.5

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

TABLE 8.3

TREATMENT SYSTEM CONCENTRATIONS (ORGANICS)
FISCAL YEAR 1999
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Sample Location	*Date*	*C2H3CL*	*TRCLE*	*11DCE*	*11DCLE*	*C12DCE*	*T12DCE*	*12DCLE*	*111TCA*	*TCLEA*	*CCL4*	*CHCL3*	*CH2CL2*
Effluent	10/6/98	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	10/6/98	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	11/3/98	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	11/3/98	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	12/1/98	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	12/1/98	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	1/5/99	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	1/5/99	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	2/2/99	<0.151	0.38 J	<0.156	<0.0796	0.34 J	<0.0892	<0.0413					
Effluent	2/2/99	<0.151D	0.37J D	<0.156D	<0.0796D	<0.23 D	<0.0892D	<0.0413D					
Effluent	3/2/99	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	3/2/99	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	4/6/99	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	4/6/99	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	5/4/99	<0.151	<0.143	<0.156	<0.0796	<0.230	<0.0892	<0.0413					
Effluent	5/4/99	<0.151D	<0.143D	<0.156D	<0.0796D	<0.230D	<0.0892D	<0.0413D					
Effluent	6/1/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575					
Effluent	6/1/99	<0.106 D	<0.0686 D	<0.0882D	<0.0950 D	<0.974 D	<0.0575 D	<0.0575 D					
Effluent	6/21/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575	<0.0759	<0.192	<0.0727	<0.0646	<0.136
Effluent	6/23/99	<0.106	4.1	<0.0882	<0.0950	1.2	<0.0575	<0.0575	<0.0759	<0.192	<0.0727	<0.0646	<0.136
Effluent	6/28/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575	<0.0759	<0.192	<0.0727	<0.0646	<0.136
Effluent	7/6/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575					
Effluent	7/6/99	<0.106 D	<0.0686 D	<0.0882D	<0.0950 D	<0.974 D	<0.0575 D	<0.0575 D					
Effluent	8/6/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575					
Effluent	8/6/99	<0.106 D	<0.0686 D	<0.0882D	<0.0950 D	<0.974 D	<0.0575 D	<0.0575 D					
Effluent	9/8/99	<0.106	<0.0686	<0.0882	<0.0950	<0.0974	<0.0575	<0.0575					
Effluent	9/8/99	<0.106 D	<0.0686 D	<0.0882D	<0.0950 D	<0.974 D	<0.0575 D	<0.0575 D					
Influent	12/1/98	1.0	250	<0.156	<0.0796	63	10	<0.0413					
Influent	3/2/99	0.83 J	250	<0.156	<0.0796	55	8.2	<0.0413					
Influent	6/1/99	0.61 J	190	<0.0882	<0.0950	44	6.8	<0.0575					
Influent	6/21/99	0.64 J	490	<0.0882	<0.0950	68	10	<0.0575	<0.0759	<0.192	<0.0727	<0.0646	<0.136
Influent	6/23/99	0.60 J	350	<0.0882	<0.0950	55	9	<0.0575	<0.0759	<0.192	<0.0727	<0.0646	<0.136
Influent	6/28/99	<2.7	130	<2.2	<2.4	28	5.7 J	<1.5	<1.9	<4.8	<1.8	<1.6	<3.4
Influent	9/8/99	0.78 J	140	<0.0882	0.25 J	36	6.8	<0.0575					

Notes:
Concentrations in μg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Result is less than reporting level, but greater than instrument detection limit.

TABLE 8-4

TREATMENT SYSTEM CONCENTRATIONS (INORGANICS)
FISCAL YEAR 1999
SITE K TCAAP
NEW BRIGHTON, MINNESOTA

Sample Location	*Date*	*Lead*	*Mercury*	*Cyanide*	*Total Phosphorus*	*Copper*	*Zinc*	*Silver*
Effluent	12/01/1998	<0.866	<0.0614	<1.47	60	<2.95	<5.59	<1.00 (1)
Effluent	03/02/1999	<0.866	<0.0614	<1.47	66.6	<3.46	<11.9	<1.00 (1)
Effluent	06/01/1999	<1.27	<0.0427	<5.70	43.1	<3.46	<11.9	<0.186
Effluent	09/08/2000	2.1 B	<0.0427	<5.70	166	<3.46	13.4	<0.186

Notes:

Concentration in µg/L.

J - Value is estimated.

(1) Due to low MS/MSD recoveries, the associated quantitation limit should be qualified as estimated.

B - The value is between MDL and CRDL.

TABLE 8.5

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 1999
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Month	*VOC Influent* [1,2] *(μg/L)*	*Water Treated* [3] *(million gallon)*	*Total VOCs Into Treatment Center (lbs/quarter)*	*VOC Effluent* [1] *(μg/L)*	*Total VOCs Out Of Treatment Center* [2] *(lbs/quarter)*	*Total VOCs Removed By Stripping Towers (lbs/quarter)*
December	324.00	0.92105	2.49	0.0	0.000	2.49
March	313.20	0.69178	1.81	0.0	0.000	1.81
June	241.40	1.04756	2.11	0.0	0.000	2.11
September	183.30	1.84779	2.83	0.0	0.000	2.83
Total		**4.50819**				**9.24**

Notes:

[1] VOC concentrations do not include estimated concentrations for compounds detected below the reporting limit

[2] VOC influent and effluent data is collected in the third month of every quarter. Data is used to calculate VOC's removed for the quarter.

[3] New treatment system started on 6/21/99. Old treatment system shut down on 7/15/99.

TABLE 8.6

SUMMARY OF MONITORING REQUIREMENTS
SITE K, TCAAP
NEW BRIGHTON, MINNESOTA

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

Figures

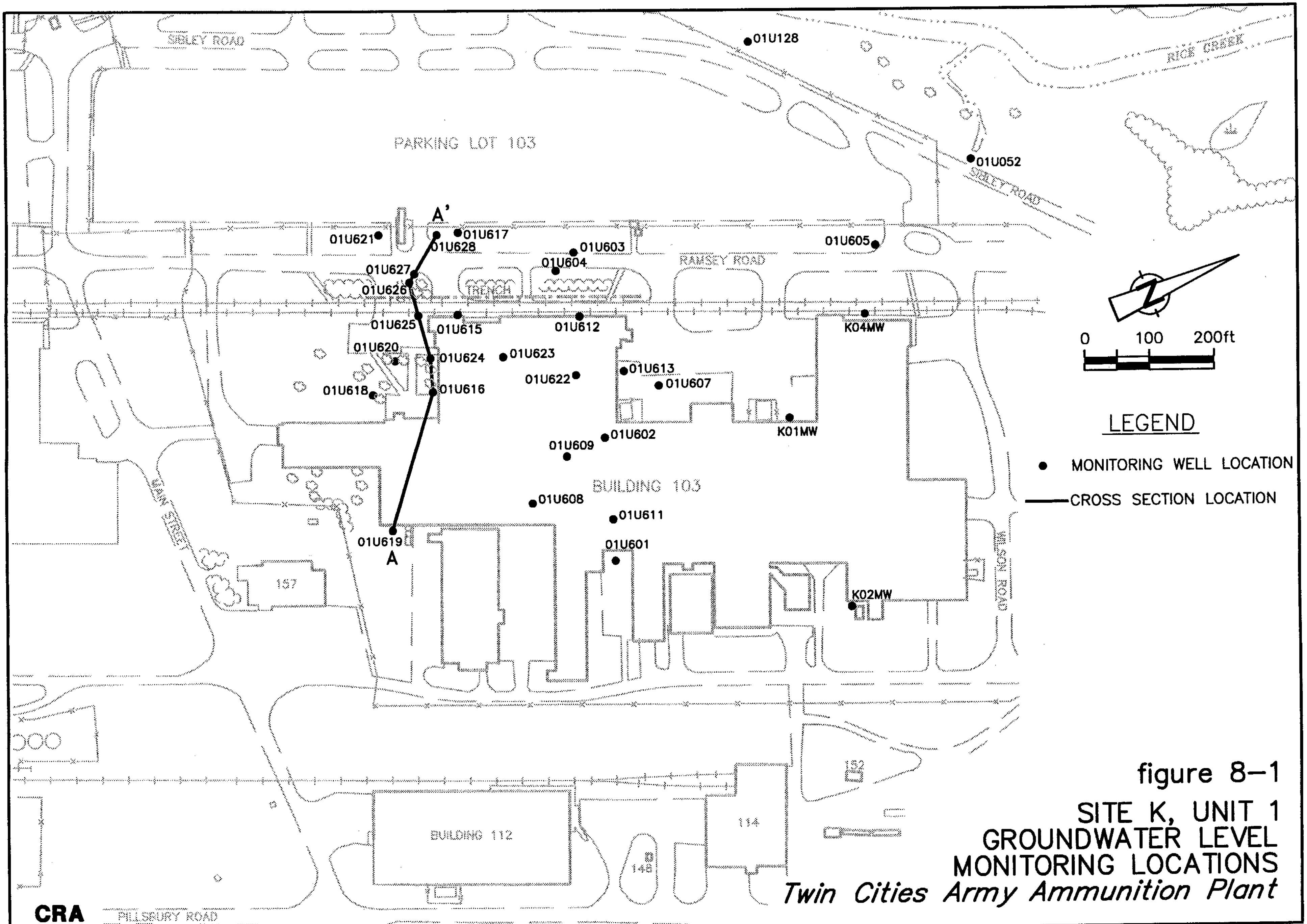


figure 8-1

SITE K, UNIT 1
GROUNDWATER LEVEL
MONITORING LOCATIONS
Twin Cities Army Ammunition Plant

13399-43(001)GN-SP002 JAN 25/2000

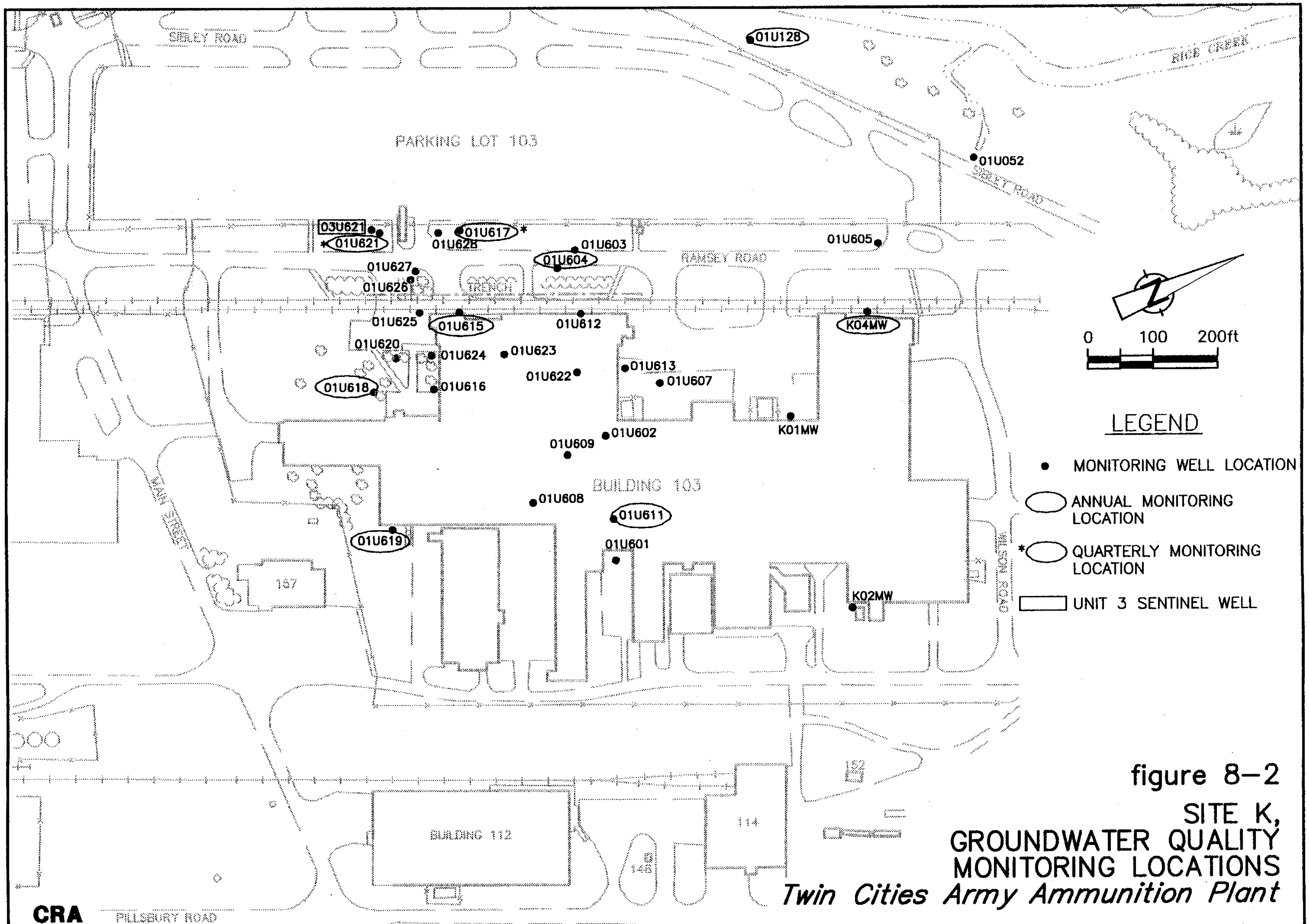


figure 8-2

SITE K,
GROUNDWATER QUALITY
MONITORING LOCATIONS
Twin Cities Army Ammunition Plant

CRA

13399-43(001)GN-SP003 SEP 13/2000

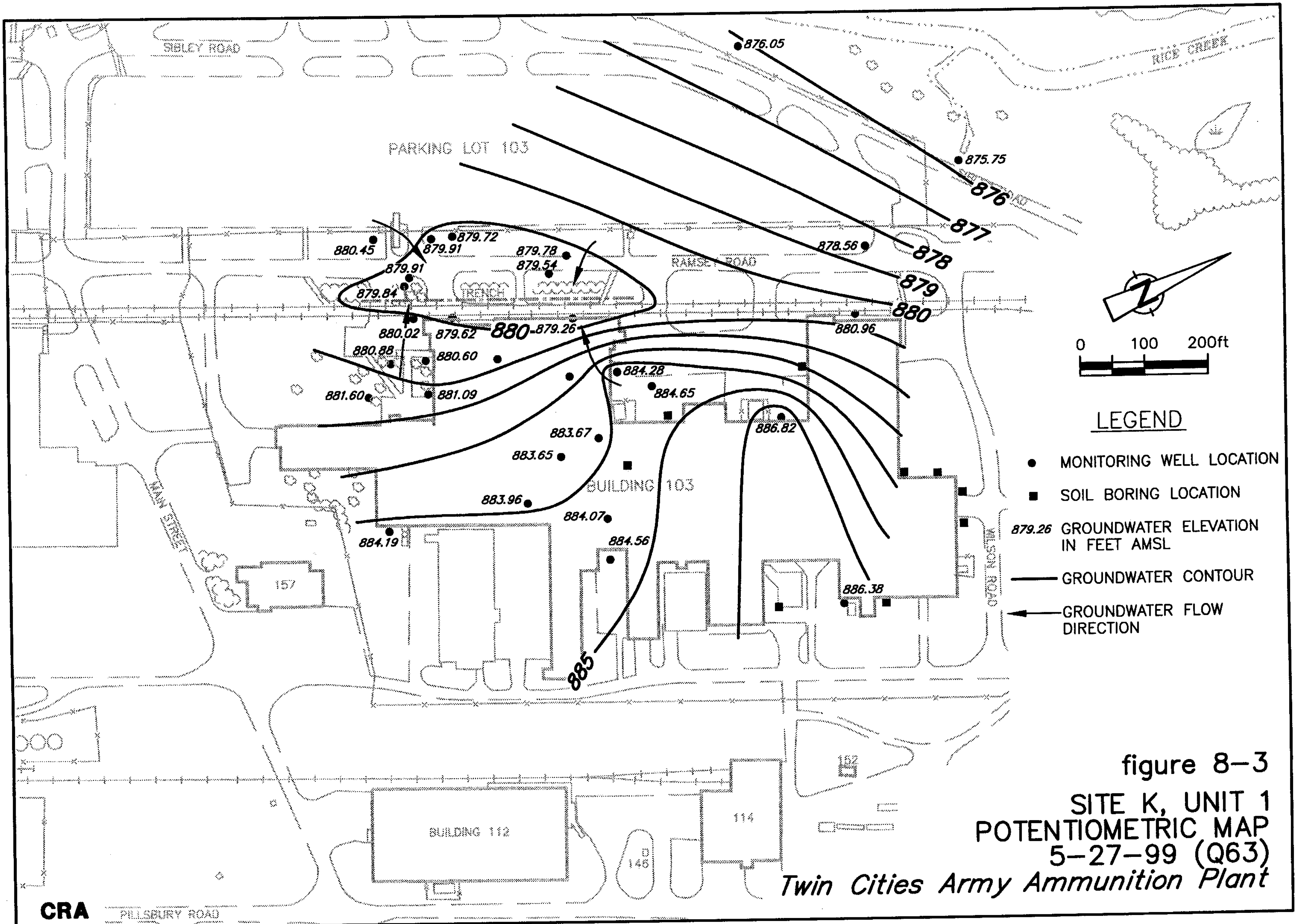


figure 8-3

SITE K, UNIT 1
POTENTIOMETRIC MAP
5-27-99 (Q63)
Twin Cities Army Ammunition Plant

13399-43(001)GN-SP005 MAR 08/2000

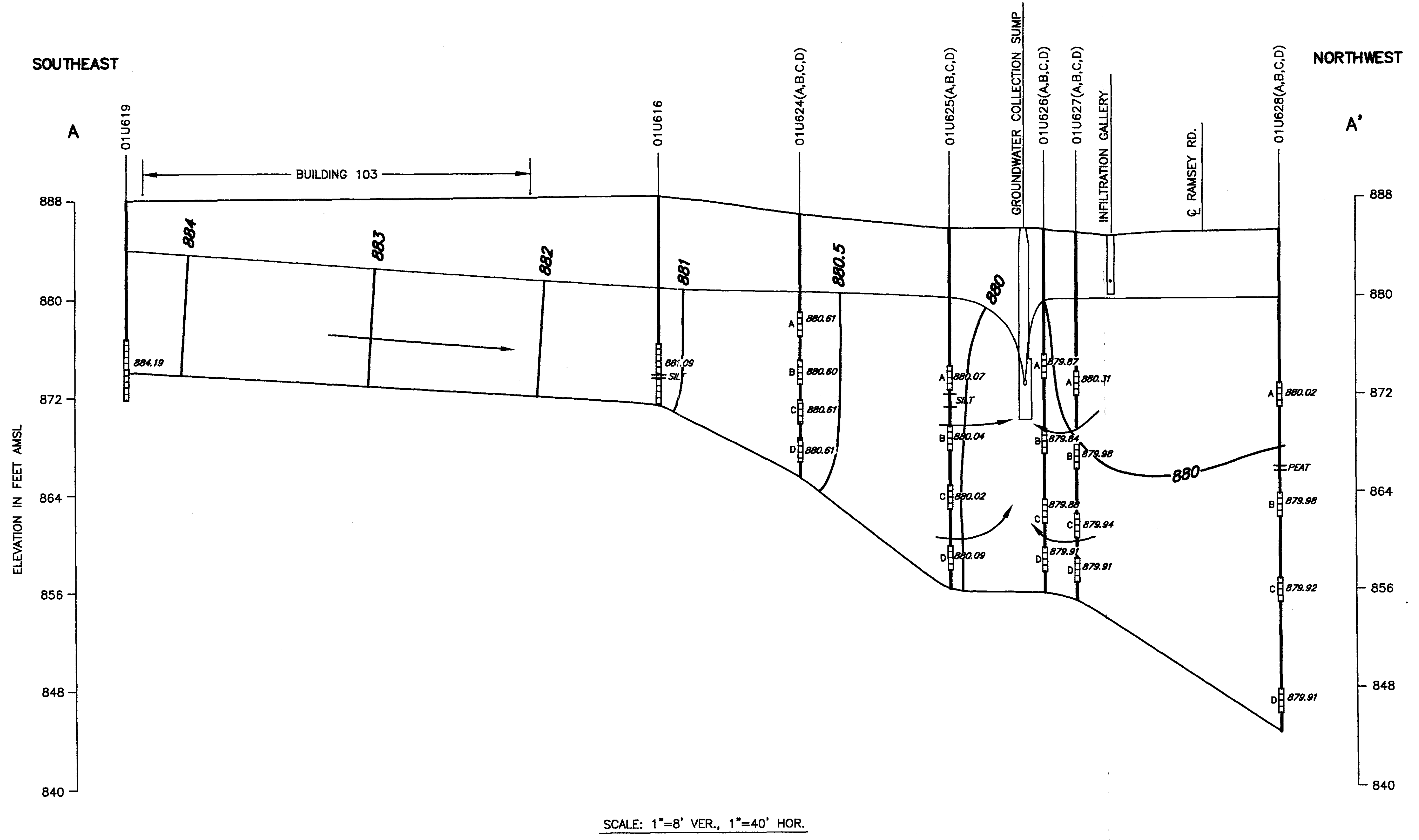


figure 8-4

SITE K, HYDROGEOLOGIC CROSS SECTION A-A'
5-27-99 (Q63)
Twin Cities Army Ammunition Plant

CRA

13399-43(001)GN-SP006 MAR 08/2000

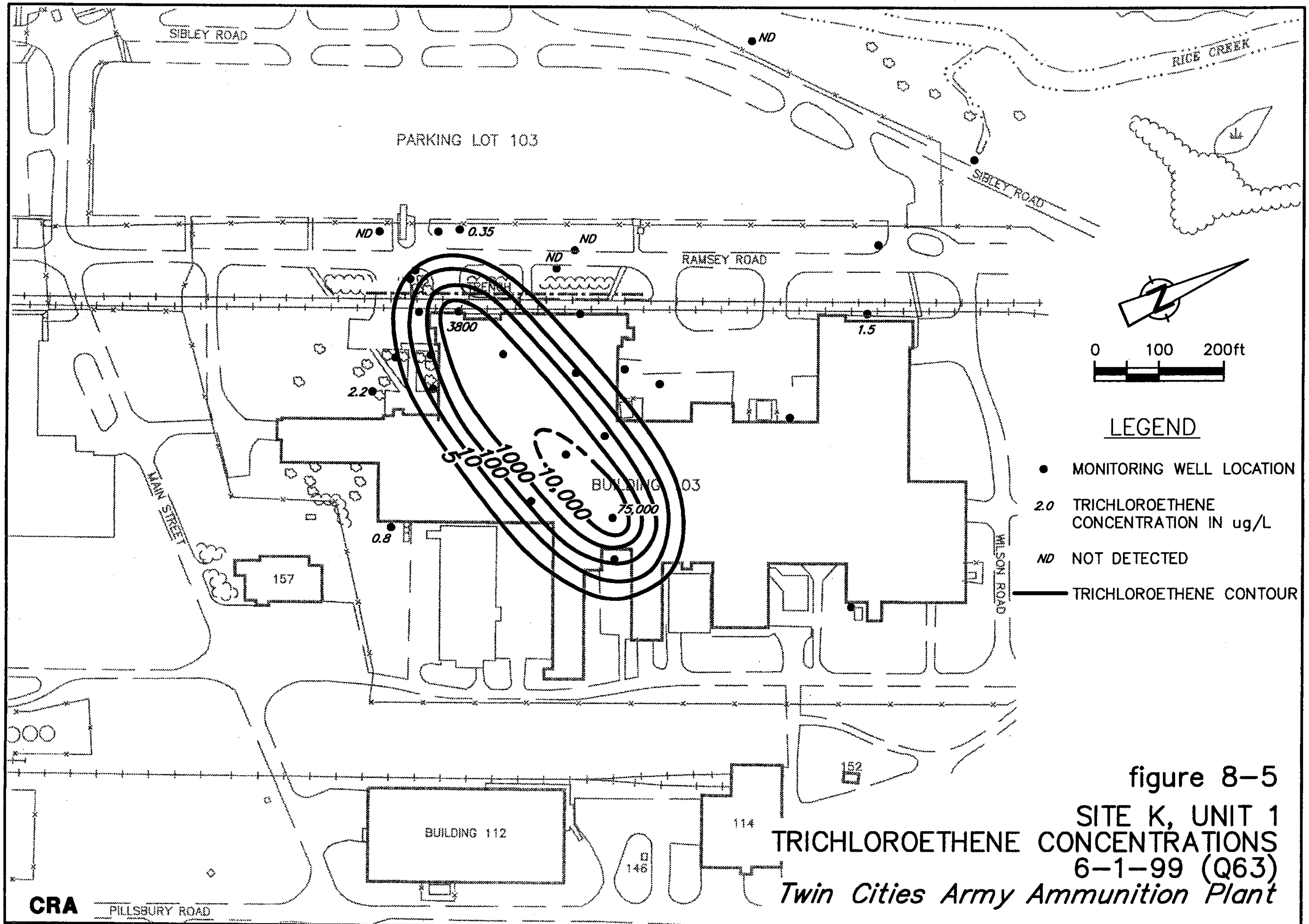


figure 8-5

SITE K, UNIT 1
TRICHLOROETHENE CONCENTRATIONS
6-1-99 (Q63)
Twin Cities Army Ammunition Plant

13399-43(001)GN-SP014 APR 20/2000

SECTION 9

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 1998 through September 1999.

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) which 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 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 overall rate needed for the 17 extraction wells was determined to be 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 widens 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. Since 1990, the system has continued to operate at an essentially steady state condition, so, no new comparisons to ambient conditions are necessary or possible.

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 changes is presented below:

1. Source control well SC4 was shut down in 1996 in response to insignificant VOC mass removal by this well. SC4 operated at a nominal rate of 45 gpm.

2. Boundary extraction well B12 was shut down in 1996. Well B12 is the northern most extraction well and is screened across the Unit 4. The plume in the B12 area had dropped below cleanup standards for several years. Well B12 operated at a nominal rate of 190 gpm.

3. Flowrates at individual wells have been modified from time to time due to plume configuration changes and operational issues.

The original average pumping rate needed to maintain capture, as determined in the 1989 Annual Monitoring Report, was 2,450 gpm. With the reduction in plume width and shutdown of B12 in 1996, the minimum rate was revised to 2,260 gpm. The operation and maintenance program for the TGRS is designed to maintain this minimum average operating rate, and the individual well flow rates determined in 1989, with subsequent modifications.

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 trichloroethene (TCE) 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 trichloroethene 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 1999 consistent with the requirements of the OU2 ROD. Table 9-1 presents the groundwater capture and treatment requirements for the TGRS from the OU2 ROD. As such, it met the requirement for capture at the TCAAP boundary. The TGRS optimization study was initiated in FY 1999 and will continue in FY 2000.

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

<u>Summary of Operations</u>

Through FY 1999, groundwater was extracted from 11 wells along the southwest boundary of TCAAP (B1 through B11) and four wells downgradient of interior source areas on TCAAP (SC1 through SC3 and SC5). Submersible pumps in the extraction wells discharge into a common pressurized forcemain which 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 "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 50,000 to 100,000 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 designed to provide a theoretical hydraulic capacity of 2,900 gpm and a sustained daily average capacity of 2,730 gpm (by agreement with the regulators, B12 and SC4 were shut down in November 1996).

- 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 provide 6,000 – 7,000 standard cubic feet per minute (scfm) each. The blowers for Towers 3 and 4 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 (i.e., 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, 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 1999 Maintenance and Inspection Activity

Preventive Maintenance (PM): The extensive PM program allowed the operations staff to identify and repair or replace equipment to avoid a downtime failure. 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 which were identified as failing were replaced.

Verification of Flow Meters: As part of the annual PM, flow meters in the pumphouses were interchanged. 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 were critical in early identification of failing equipment. By early detection of flow rate changes, equipment repair was typically scheduled before a failure occurred.

Pumphouse Flow Tests and Motor Amperage Readings: Pumphouse lift systems were tested to determine the flow capacity and motor amperage draw. The test data were compared to the original flow capacity and amperage draw. Decreases in flow capacity or changes in current draw alerted the system operations staff to inspect suspect equipment and schedule repairs before a down time failure occurred.

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

Yes. The TGRS successfully captured and treated 1,177,206,200 gallons of contaminated water from October 1998 through September 1999. The system pumped at an average of 2,240 gpm, of which the boundary wells contributed 2,015 gpm and the source control wells contributed 225 gpm. This represents 99 percent of the rate needed to achieve capture. The above pumphouse volumes are corrected to reflect the total from treatment center meters #1 and #2, which are the most accurate for overall flow measurement. The TGRS as a whole was operational over 95 percent of the time. When the flowrate is corrected for down time, the average operational flowrate was 2,358 gpm, or 104% of the rate needed to achieve capture.

The monthly and annual volume of water pumped is presented in Tables 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.

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 1999 operational notes is presented in Appendix J.1. During FY 1999, treatment center flow meters #1 and #2 were used to measure total flow volumes used in monthly reports because they are 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 four 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 J.1. The same descriptions organized by affected pumphouse, treatment center, and forcemain is presented in Appendix J.2.

Treatment center and extraction well down times resulted primarily from failure and subsequent repair of components in the pumphouses, treatment center and electrical service.

Description of Down Time Categories

Pumphouse component failures accounted for an average of 4.5 days down time per pumphouse. These failures and repairs typically involved replacement of failed electrical components, repair of an electric check valve, flow meter, well check valve, submersible pumps and motors and/or cleaning iron or manganese sludge from the well and piping.

Treatment center component failures and repairs that caused pumphouse down time consisted of electric check valve maintenance, malfunctions and repairs, and electrical control and electrical switching equipment failures and subsequent repairs. Treatment center component failures, repairs, and adjustments accounted for an average of 13.2 days of down time.

Electrical service system failures accounted for an average of 3.1 days down time per pumphouse. Electrical storm damage was the primary cause of down time.

No system down time was categorized as miscellaneous during FY 1999.

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

The category System Modification caused 0.2 day of down time per pumphouse. All of this down time is attributable to pumphouse B2. B2 produces iron and requires cleaning every 6 to 9 months. In FY 1999, the riser pipe in pumphouse B2 was temporarily replaced with Sch. 80

PVC pipe and permanently replaced with stainless steel pipe. The higher grade of pipe allows for use of a more aggressive acid in cleaning the well.

A forcemain failure caused 2 hours of down time per pumphouse. The failure was an air release valve, located on the effluent forcemain near Site D, which was leaking and was repaired.

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

Did the system achieve hydraulic capture?

Yes. The zone of hydraulic capture for the TGRS in FY 1999 was determined by contouring the May 1999 water level data. Contours were constructed manually. Past site experience and discussions with the MPCA and EPA determined that manually constructed contours are appropriate at TCAAP due to the complexities of the flow field and the resulting need for hydrogeological expertise in interpreting the flow field. Confidence in the groundwater contours was gained during the detailed analysis presented in the 1989 Annual Monitoring Report. The 1989 report included pumping test analysis, drawdown analysis and vertical gradient analysis. The reader should consult the 1989 report for a complete analysis of hydraulic capture.

Appendix D contains the water level database for the monitoring wells. Figures 9-2, 9-3, and 9-4 present the groundwater contours for Upper Unit 3, Lower Unit 3 and Unit 4, respectively for May 1999. These figures present the potentiometric contours from three vertical portions of the aquifer.

Inspection of these figures indicates a broad area of very low horizontal gradients immediately southwest of the TGRS, which is indicative of a stagnation zone downgradient of the TGRS. In the southern portion of the TGRS there are insufficient wells to accurately contour Unit 4 capture in this part of the Site. The flat gradients do indicate there is capture of bedrock groundwater by Unit 3 extraction wells. Contaminants are not currently in Unit 4 in this area; therefore, Unit 4 is not of concern for remediation in this area of the Site and further definition of Unit 4 capture is not needed.

Table 9-6 presents the groundwater quality data for FY 1999. Figure 9-5, Figure 9-6 and Figure 9-7 present the trichloroethene contours for the Upper Unit 3, Lower Unit 3, and Upper Unit 4 Aquifers, respectively. Along the TCAAP boundary, the width of the source area above 5 μg/l trichloroethene has been shrinking since approximately 1993. Currently, there are no Unit 3 wells north of B7 above 5 μg/l trichloroethene. In Unit 4, there were no monitoring wells north of B10 above 5 μg/l. Extraction well B12 was shut down in November 1996 in response to the observed reduction in the extent of source area contamination. These declining VOC concentrations show that the TGRS has successfully reduced the source area contaminant concentration in this portion of the site.

As shown above, the zone of capture created by the TGRS extends beyond the 5 μg/l trichloroethene contour along the entire southwest TCAAP boundary, in both the Unit 3 and the Unit 4 Aquifers.

How much VOC mass was removed by the system and how is it changing with time?
As discussed above, the TGRS extracted and treated 1,177,206,200 gallons of water from October 1998 through September 1999. 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 4,878 pounds of VOCs from October 1998 through September 1999. The VOC mass is lower than the FY 1998 VOC mass removal of 6,210 pounds. The VOC mass removal rate for the TGRS has been declining since FY 1992. This reflects the overall decrease in plume concentration. Table 9-7 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed 172,167 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 B12 and SC4 are shut down, but were temporarily operated for sampling. 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's 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 I.1 presents trichloroethene versus time graphs for each extraction well. Wells B1, B2, B6, B7, B8, B9, B10, B11, B12, SC2, SC3 and SC5 exhibit declining trichloroethene concentrations over time. As is typical, these wells exhibit asymptotic decreases over time. In the past, wells B3 and B4 exhibited rising trichloroethene 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. Overall, the graphs indicate a long-term decrease in VOC concentrations.

Extraction well B6 exhibited a slight concentration increase in FY 1998 and was stable in FY 1999. This is probably due to plume redistribution following the shutdown of B12 in

FY 1996. Extraction well B7 was below the contaminant-specific requirement for trichloroethene (5 μg/l), and all other VOCs, throughout FY 1999.

These trends reflect the overall decline in source area 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, six wells, B1, B4, B5, B6, B9, SC1 and SC5, which are located in the centers of the plume, achieve the largest rates of VOC removal. These six wells together accounted for 98 percent of the VOC mass removed. Wells B7, B10 and B11, which pump on the south and north edges of the plume, removed only about 12 pounds (0.2 percent) of the total VOC mass.

The source control wells, SC1 through SC3 and SC5, together accounted for 43 percent of the VOC mass removed while accounting for only 12 percent of the water pumped by the system. SC5, in particular, removed 39 percent of the total VOC mass at a rate of only approximately 100 gpm. This illustrates the efficiency of extracting groundwater from near the source areas.

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 clean up requirements in Table 1 of the OU2 ROD.

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

Did the treatment system meet the treatment requirements in the OU2 ROD?

Yes. Influent and effluent water were sampled on a monthly basis during FY 1999. The influent/effluent database for FY 1999 is contained in Appendix I.2. TGRS influent is labeled TGRSI and effluent is labeled TGRSE. Figure 9-8 presents a graph of influent trichloroethene versus time. This graph is cumulative and includes data from before 1989, when the system consisted of only six extraction wells. Influent concentrations continued to decline in FY 1999.

The average FY 1999 influent trichloroethene concentration was 408 μg/l, down from 461 μg/l in FY 1998. Since the full-scale start-up of the TGRS, influent concentrations had not exhibited a clear trend until approximately 1993, when a decrease began. The decline corresponds with the decrease in VOC mass removal and shrinkage of the plume discussed earlier.

Figure 9-8 also includes a summary of the effluent trichloroethene concentration versus time. As indicated, the effluent was below 5 μg/l trichloroethene for all sampling events in FY 1999. A review of the FY 1999 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 trichloroethene concentrations indicates an average removal efficiency over 99.9 percent.

What was the mass of VOCs emitted into the air?

The air stripping towers remove VOCs with an efficiency of over 99.9 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 9-6. Air emissions therefore averaged 13 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 1998 through September 1999 were 4,878 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. The water elevation in the Arsenal Sand and Gravel Pit was relatively unchanged in FY 1999. Based on visual observation during FY 1999, 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 supplies 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. TCAAP will remain under Army control into the foreseeable future.

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, 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 technology will be evaluated by the Army. 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 is reporting annually on the status of any reviews of emerging technologies.

- In November 1999, Army and Alliant Techsystems attended the "Innovative Clean-up Approaches Investment in Technology Development, Results and Outlook for the Future Workshop" in Bloomington, Illinois.
- In April 1999, Army attended the "5th International Symposium on In-Situ and On-Site Bioremediation Conference" in San Diego, California.
- New technologies was an agenda item for the monthly Technical Review Committee meetings between the Army, USEPA, and MPCA. No emerging technologies were identified through this process.

Were any new technologies identified and considered to have merit during the past year?

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. Independent of the Army's review, the MPCA offers the following as results of their review:

The technical literature and conference proceedings contain evaluations and studies pertinent to the remediation of the deep groundwater at TCAAP. Many are clearly at the basic laboratory research stages. Others have the potential for full scale application. Those that are perhaps the most relevant include:

Enhancements to intrinsic anaerobic biodegradation of TCE and TCA:

Notable improvements in understanding the effect of adding specific carbon and energy sources such as lactate, acetate, butyrate, and propionate to groundwater sediments to promote and enhance reductive dehalogenation. It had been assumed that one carbon source, such as lactate, eventually would be superior in promoting biodegradation at any site. However, several studies showed that the site-specific microbial consortia in the groundwater sediments determine what amendment will be effective in promoting biodegradation. Advances are being made in understanding how to evaluate site-specific electron donors to achieve significant increases in rates of contaminant degradation rates in groundwater.

Biodegradation of chlorinated DNAPL:

DuPont published the results of studies that documented the presence of an anaerobic microbial population that is capable of degrading DNAPL-level concentrations of PCE under existing environmental conditions at the site. While it is TCE and TCA that we are interested in at TCAAP, these studies demonstrate the potential for anaerobic bioremediation of chlorinated solvent source areas.

These technologies show promise in accelerating the rate of anaerobic degradation of chlorinated solvents on the research or pilot scale level. It is possible that, in addition to the source containment system already in place at TCAAP and the effect of natural attenuation, these emerging technologies may be useful in areas of high contaminant concentration. However, none are currently developed to the point that would be applicable to the deep groundwater aquifer at TCAAP. Monitoring the results of ongoing pilot studies in the literature will be needed before determining whether to evaluate these technologies for use at TCAAP.

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

No response.

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

Yes. Alliant Techsystems is conducting pilot scale tests of two new technologies at Site K. These are Hydrogen Release Compound™ (HRC), and direct hydrogen injection with gaspermeable membranes. Both technologies are intended to enhance natural anaerobic degradation of chlorinated VOCs. These tests will be completed in late FY 2000.

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 1999 was consistent with the OU2 ROD. Appendix A summarizes the FY 1999 monitoring plan and any deviations are explained in Appendix C.3. Monitoring was as follows:

Groundwater
Groundwater samples and groundwater levels were collected in June 1999 in accordance with the FY 1999 monitoring plan. Samples were analyzed for VOCs.

Treatment System
The TGRS treatment system influent and effluent was sampled monthly during FY 1999 in accordance with the FY 1999 monitoring plan. The samples were analyzed for VOCs listed in Appendix C.2, Category 1.

Is additional monitoring proposed prior to the next report?
Yes. Table 9-9 presents the monitoring requirements for Deep Groundwater. For FY 1999 through FY 2003, biennial monitoring well sampling and water level measurements will be

conducted. The reduction in groundwater monitoring frequency is based on the stability observed over the last nine years. The TGRS extraction wells will be monitored biennially and the TGRS treatment system influent and effluent will continue to be monitored monthly to permit detailed system tracking. Appendix A presents the FY 1999 to FY 2003 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 extends beyond the 5 μg/l trichloroethene contour at the TCAAP boundary. This meets the VOC capture criterion in the OU2 ROD.

- Hydraulic capture in Unit 4 extends beyond the 5 μg/l trichloroethene contour at the TCAAP boundary. This meets the VOC capture criterion in the OU2 ROD.

- The TGRS extracted and treated 1,177,206,200 gallons of water and removed 4,878 pounds of VOCs from October 1998 to September 1999.

- Based on the extracted water quality, the source area contamination continued to decrease in concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer as it also effectively contains the contamination.

- Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

Do any additional measures need to be addressed?

No. However, consideration should be given to shutting down extraction well B7 based on the observed reduction in plume width at the TCAAP boundary. It is likely that the Army will make this proposal in a separate letter sometime in the near future.

Tables

TABLE 9.1

GROUNDWATER CAPTURE AND TREATMENT REQUIREMENTS
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Substance	*Expected Level in Discharge (ppb)*	*Operable Unit 2 Rod Requirements (ppb)*
Volatile Organic Compounds (VOCs)		
Benzene	ND	
Toluene	ND	
cis-1,2-Dichloroethene plus trans-1,2-Dichloroethene	<1	70
1,1-Dichloroethene	<1	6
1,1,1-Trichloroethane	<1	200
1,1,2-Trichloroethane	<1	
1,2-Dichloroethane	--	4
1,1,2-Trichloroethene	<5	5
1,2-Dichloropropane	--	
1,1,2,2-Tetrachloroethane	--	
Carbon Tetrachloride	--	
1,1,2-Trichlorotrifluoroethane	--	
Chloroform	<1	
Vinyl Chloride	<2	
Xylene	ND	
1,1-Dichloroethane	--	70
Tetrachloroethene	--	5
Metals		
Arsenic	NA	
Barium	NA	
Cyanide	NA	
Cadmium	NA	
Lead	NA	
Nickel	NA	
Mercury	NA	

Notes:
ND - Non-detectable
NA - Not significantly affected by remedy and expected to remain at background levels

TABLE 9.2

EXTRACTION WELL WATER PUMPED
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)																
	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	SC1	SC2	SC3	SC4	SC5	TOTAL
October 1998	9,248,400	3,717,900	6,834,000	7,117,000	9,217,200	10,920,790	9,107,100	4,567,200	6,424,500	7,591,400	3,074,800	0	1,087,900	2,288,900	3,647,800	0	3,395,700	88,240,590
November 1998	8,931,800	3,669,600	6,329,700	9,769,300	9,102,200	10,753,500	8,616,800	3,667,900	6,524,900	7,748,200	2,914,500	100	908,300	1,828,500	3,763,100	0	3,308,800	87,837,200
December 1998	8,874,300	5,574,500	9,297,700	9,899,300	10,456,500	10,927,600	12,757,400	5,420,000	6,883,200	11,686,900	4,271,500	35,400	1,208,200	1,820,000	4,147,300	8,600	3,031,100	106,299,500
January 1999	9,182,300	5,538,300	9,241,700	9,759,500	10,336,200	10,891,400	12,749,300	5,422,500	6,897,400	11,713,300	4,295,400	0	1,218,100	1,281,100	4,164,600	0	2,304,600	104,995,700
February 1999	8,058,300	4,790,500	8,076,900	8,560,500	9,172,900	9,586,000	11,562,700	4,735,000	6,082,600	11,110,000	3,741,900	0	958,600	745,500	3,813,200	0	2,590,700	93,585,300
March 1999	8,571,100	3,027,900	8,382,400	9,133,600	8,511,700	9,873,700	11,244,500	6,018,600	6,178,800	11,292,500	3,601,400	0	713,600	1,010,900	4,012,700	0	3,067,200	94,640,600
April 1999	7,788,100	3,227,800	7,539,800	9,202,900	8,794,700	10,393,700	11,210,000	5,881,400	6,535,000	12,325,600	3,878,600	0	1,087,900	1,222,300	3,920,000	0	3,127,700	96,135,500
May 1999	7,723,400	3,378,400	8,494,700	9,239,900	9,643,800	10,656,900	12,023,500	6,188,900	6,483,200	10,512,000	4,938,200	0	1,667,780	1,935,800	3,711,600	0	2,243,700	98,841,780
June 1999	7,576,300	3,857,400	8,328,700	9,133,900	9,189,900	10,461,700	10,697,000	6,092,300	6,259,200	10,815,700	4,959,800	0	1,693,400	2,190,600	3,905,300	0	2,264,000	97,425,200
July 1999	7,466,900	3,649,600	7,907,900	8,998,800	8,768,400	10,248,000	10,283,600	6,206,200	6,096,400	10,695,500	4,263,300	0	1,678,800	2,510,800	3,161,800	0	2,119,900	94,055,900
August 1999	7,897,400	4,172,500	7,989,000	9,373,900	9,030,500	10,634,600	11,874,900	6,222,200	6,548,900	10,890,200	2,971,000	0	1,691,000	2,864,500	4,074,700	0	2,482,300	98,717,600
September 1999	7,445,600	4,398,800	7,778,100	9,012,500	8,817,600	10,138,800	11,697,000	6,065,900	6,224,700	10,740,500	4,737,900	0	1,460,000	3,087,500	3,834,500	0	2,010,600	97,450,000
TOTAL FY99	98,763,900	49,003,200	96,200,600	109,201,100	111,041,600	125,486,690	133,823,800	66,488,100	77,138,800	127,121,800	47,648,300	35,500	15,373,580	22,786,400	46,156,600	8,600	31,946,300	1,158,224,870

FY89	67,563,900	69,364,850	72,257,490	75,237,700	76,328,500	100,611,510	138,278,100	42,329,200	60,613,300	54,516,600	93,534,437	60,210,340	13,867,660	20,078,880	36,660,309	12,593,300	39,307,600	1,033,353,676
FY90	70,722,300	69,450,060	73,633,450	80,511,000	71,897,000	105,220,300	117,609,400	40,747,900	59,883,400	95,227,900	40,939,800	63,867,460	11,281,750	19,278,830	35,609,300	15,260,500	37,275,400	1,008,415,750
FY91	99,482,900	102,399,960	98,521,050	104,674,800	105,191,900	137,181,500	153,080,700	63,386,100	77,083,200	130,044,100	54,094,000	95,329,240	17,111,600	23,724,440	46,611,600	20,228,000	54,182,500	1,382,327,590
FY92	103,612,700	105,175,800	104,103,100	105,741,800	106,869,400	140,681,700	155,934,000	61,053,000	78,498,200	129,041,800	52,635,900	93,170,000	17,472,600	21,165,900	50,254,500	22,045,100	53,891,100	1,401,346,600
FY93	104,610,228	97,362,300	102,039,200	102,785,395	105,885,800	140,275,000	153,555,300	60,334,400	78,395,400	129,093,800	49,765,700	90,094,600	16,887,368	24,623,700	51,413,200	25,104,180	55,980,600	1,388,206,172
FY94	99,994,100	75,083,100	98,156,900	91,607,800	93,671,400	126,439,100	140,213,900	63,403,400	71,130,200	115,719,700	48,857,400	87,868,300	17,351,750	19,244,100	45,125,400	20,715,000	46,698,300	1,261,279,850
FY95	117,949,700	68,908,100	115,358,700	104,187,500	102,308,300	141,348,900	147,788,900	68,183,400	75,017,600	128,802,200	53,372,700	100,424,400	16,572,496	23,173,800	47,176,100	24,037,800	51,323,400	1,385,933,996
FY96	125,047,900	55,550,500	129,118,200	103,113,100	106,158,000	142,485,500	100,031,500	68,182,700	80,266,000	130,823,300	50,345,100	95,047,900	7,152,620	22,803,400	50,843,300	23,411,400	51,382,800	1,341,763,220
FY97	103,065,700	63,195,800	116,976,600	91,590,200	103,636,700	141,103,600	133,956,600	60,633,500	77,677,200	129,353,600	47,439,800	10,526,600	15,381,400	24,099,800	48,925,600	3,166,500	51,146,000	1,213,035,110
FY98	115,684,000	58,471,500	119,211,700	88,388,000	104,434,700	129,709,500	137,341,100	63,132,100	69,450,500	120,372,500	51,393,600	12,100	15,379,800	21,415,000	51,647,100	200	49,964,500	1,196,007,900
FY99	98,763,900	49,003,200	96,200,600	109,201,100	111,041,600	125,486,690	133,823,800	66,488,100	77,138,800	127,121,800	47,648,300	35,500	15,373,580	22,786,400	46,156,600	8,600	31,946,300	1,158,224,870

TABLE 9.3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)									
	Extraction Wells	*Meter 1*	*Meter 2*	*Total Meters 1 & 2*	*Meter 3*	*Meter 4*	*Total Meters 3 & 4*	*Meter 5*	*Meter 6*	*Total Meters 5 & 6*
October 1998	88,240,590	49,738,000	40,631,000	90,369,000	40,557,000	42,572,000	83,129,000	4,000	2,000	6,000
November 1998	87,837,200	58,239,000	29,277,200	87,516,200	26,698,000	54,407,000	81,105,000	8,000	4,000	12,000
December 1998	106,299,500	55,051,000	51,292,000	106,343,000	39,582,000	61,344,000	100,926,000	3,000	2,000	5,000
January 1999	104,995,700	58,822,000	46,748,000	105,570,000	39,004,000	61,641,000	100,645,000	3,000	2,000	5,000
February 1999	93,585,300	53,439,000	41,000,000	94,439,000	35,397,000	54,710,000	90,107,000	1,000	1,000	2,000
March 1999	94,640,600	57,283,000	38,537,000	95,820,000	37,007,000	54,423,000	91,430,000	4,000	4,000	8,000
April 1999	96,135,500	59,354,000	39,277,000	98,631,000	34,196,000	58,284,000	92,480,000	2,000	2,000	4,000
May 1999	98,841,780	58,615,000	43,799,000	102,414,000	29,634,000	67,428,000	97,062,000	1,000	0	1,000
June 1999	97,425,200	56,603,000	43,462,000	100,065,000	27,203,000	67,847,000	95,050,000	0	0	0
July 1999	94,055,900	56,349,000	39,218,000	95,567,000	27,452,000	63,328,000	90,780,000	0	0	0
August 1999	98,717,600	60,007,000	43,210,000	103,217,000	30,672,000	70,865,000	101,537,000	0	0	0
September 1999	97,450,000	56,933,000	40,322,000	97,255,000	31,218,000	61,535,000	92,753,000	0	0	0
TOTAL 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
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

TABLE 9.4

PUMPHOUSE DOWN TIME (DAYS)
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Well Name	*FY99 Days Down*	*FY98 Days Down*	*FY97 Days Down* [(1)]	*FY96 Days Down* [(1)]
B1	12.1	19.9	34.2	0.0
B2	39.7	18.4	29.9	13.2
B3	30.6	16.1	14.9	0.0
B4	17.8	16.9	4.1	0.0
B5	9.4	29.1	4.0	0.0
B6	10.3	12.6	4.0	0.0
B7	28.4	12.3	11.1	13.8
B8	21.2	14.9	9.3	0.0
B9	9.1	27.3	4.0	0.0
B10	29.0	15.8	11.6	0.0
B11	31.9	20.6	8.5	6.1
B12	--	--	5.0	0.0
SC1	47.8	16.1	11.5	102.5
SC2	7.5	23.9	5.0	4.0
SC3	8.2	12.3	7.7	0.4
SC4	--	--	5.2	0.4
SC5	14.7	13.9	5.0	0.4

Note:
[(1)] - Days down do not include down time resulting from automatic cycling off of well field.

TABLE 9.5

FISCAL YEAR 1999 DOWN TIME (DAYS)
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Category	*Down Time (Days)*	*Affected Wells/System*
Pumphouse Component	4.5	Pumphouses
Treatment Center Component	13.2	Pumphouses
Electrical Service	3.1	Pumphouses
Miscellaneous	0	Pumphouses
Preventive Maintenance	0.3	Pumphouses
System Modification	0.2	Pumphouses
Forcemain	0	Pumphouses
TGRS (1)	19.8	Treatment System
Anticipated Down Time for Fiscal Year 2000		
Pumphouse Component	6	Pumphouses
Treatment Center Component	5.0	Pumphouses
TCAAP Electrical System	4.0	Pumphouses
Miscellaneous	0.5	Pumphouses
Preventative Maintenance	0.5	Pumphouses
System Modification/Improvement	0.1	Pumphouses
Forcemain	0	Pumphouses

Note:

(1) The down time refers to the TGRS as a whole. It is the weighted sum of pumphouse down times. Weighting is based on the target flow rate for each pumphouse.

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level (1)		200	5	6	70	4	70	5	5
03F302	12/2/98	14	0.52 JP	3.1	3.2	< 1	14	1.4	300
03F302	6/17/99	15	< 10	2.9 JP	3.8 JP	< 10	15	< 10	310
03F303	12/2/98	3.9	1.6	4.1	2.7	< 1	1.7	2.7	65
03F303	6/17/99	3.3 JP	< 5	2.05 JP	1.6 JP	< 5	< 5	< 5	10.5
03F304	12/2/98	3.9	0.45 JP	2.3	1.6	< 1	< 1	< 1	11
03F304	12/2/98	3.9 D	0.49 JDP	2.3 D	1.6 D	< 1 D	< 1 D	< 1 D	11 D
03F304	6/17/99	3.7	1.5	4	2.7	< 1	1.9	3.1	11
03F305	12/2/98	220	< 10	59	66	< 10	41	< 10	1000
03F305	6/17/99	190	< 50	55	60	< 50	32.5 JP	< 50	1000
03F306	12/2/98	65	< 10	28	34	< 10	3.9 JP	< 10	970
03F306	6/17/99	49 JP	< 50	26.5 JP	33 JP	< 50	< 50	< 50	950
03F307	12/2/98	13	< 1	12	16	< 1	2.1	< 1	325
03F307	12/2/98	13 D	< 1 D	12 D	15 D	< 1 D	2 D	< 1 D	300 D
03F307	6/17/99	11	< 10	12	16	< 10	< 10	< 10	340
03F307	6/17/99	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
03F308	12/2/98	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.9
03F308	6/17/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.8
03F312	12/1/98	< 1	< 1	< 1	0.42 JP	< 1	< 1	< 1	4.9
03F312	6/17/99	< 1	< 1	0.26 JP	0.54 JP	< 1	0.34 JP	< 1	6
03L002	6/21/99	4.2	< 2	2 JP	1.32 JP	< 2	< 2	< 2	60
03L007	6/18/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03L014	6/18/99	440	0.29 JP	14	5	< 1	3	0.38 JP	810
03L017	6/22/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.38 JP
03L018	6/29/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]		200	5	6	70	4	70	5	5
03L020	6/21/99	1.2	< 1	0.46 JP	0.8 JP	< 1	0.59 JP	< 1	48
03L077	6/22/99	19	< 10	4 JP	< 10	< 10	< 10	< 10	180
03L078	6/23/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.7 JP
03L079	6/25/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03L084	6/24/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.32 JP
03L802	6/23/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	7.4
03L806	6/23/99	80	< 25	42.5	50	< 25	6.5 JP	< 25	400
03L809	6/29/99	150	2.2	51	37	0.42 JP	6.5	< 1	150
03L809	6/29/99	160 D	2.2 D	53 D	38 D	0.41 JDP	6.8 D	< 1 D	150 D
03L811	6/28/99	< 1	< 1	0.89 JP	4.7	< 1	< 1	< 1	< 1
03L833	6/22/99	0.31 JP	< 1	0.62 JP	0.74 JP	< 1	< 1	< 1	16
03M020	6/21/99	2.4	< 1	0.72 JP	1.8	< 1	0.75 JP	< 1	85
03M802	6/23/99	0.34 JP	< 1	< 1	< 1	< 1	< 1	< 1	14
03U003	6/24/99	19	< 5	6	5 JP	< 5	8.5	< 5	155
03U003	6/24/99	19 D	< 5 D	5 D	5 DJP	< 5 D	8 D	< 5 D	160 D
03U007	6/18/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03U009	6/24/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.63 JP
03U014	6/18/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03U014	6/18/99	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
03U017	6/22/99	0.81 JP	< 1	< 1	< 1	< 1	< 1	< 1	4.5
03U018	6/29/99	48	< 10	8.8 JP	13	< 10	27	< 10	410

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]		200	5	6	70	4	70	5	5
03U020	6/21/99	525	< 25	80	14 JP	< 25	< 25	< 25	700
03U021	6/18/99	600	< 25	97.5	65	< 25	67.5	< 25	2000
03U028	6/18/99	11.5	< 5	2.5 JP	< 5	< 5	6	< 5	120
03U029	6/18/99	14	< 1	1.3	0.66 JP	< 1	13	< 1	160
03U030	6/18/99	0.57 JP	< 1	< 1	< 1	< 1	4.9	< 1	65
03U030	6/18/99	0.57 DJP	< 1 D	< 1 D	< 1 D	< 1 D	5.1 D	< 1 D	65 D
03U032	6/22/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
03U075	6/24/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.54 JP
03U077	6/22/99	22	< 10	4.5 JP	< 10	< 10	< 10	< 10	110
03U078	6/23/99	10	1.7	2.6	0.56 JP	< 1	1.5	12	160
03U078	6/23/99	10 D	1.7 D	2.4 D	0.54 JDP	< 1 D	1.5 D	11 D	150 D
03U079	6/25/99	80	< 5	11	13	< 5	60	< 5	675
03U093	6/30/99	23.5	< 5	3.55 JP	3.6 JP	< 5	< 5	< 5	145
03U094	6/30/99	250	< 10	13	2.8 JP	< 10	< 10	< 10	490
03U096	6/30/99	4.8	< 1	1.7	2.9	< 1	< 1	< 1	18
03U099	6/28/99	2.6	< 1	< 1	< 1	< 1	< 1	< 1	7.1
03U114	6/25/99	3.9	< 1	0.54 JP	< 1	< 1	< 1	< 1	20
03U301	12/1/98	30	< 10	< 10	< 10	< 10	69	< 10	940
03U301	6/17/99	30	< 10	3.3 JP	< 10	< 10	66	< 10	970
03U314	12/1/98	75	< 1	7.6	4.3	< 1	1.3	< 1	190
03U314	6/17/99	68	< 1	5.8	3.5	< 1	1 JP	< 1	190

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level (1)		200	5	6	70	4	70	5	5
03U315	12/1/98	4.2	< 1	0.68 JP	< 1	< 1	< 1	< 1	15
03U315	6/17/99	3.2	< 1	0.59 JP	0.31 JP	< 1	< 1	< 1	14
03U316	12/22/98	5.8	< 1	0.65 JP	0.68 JP	< 1	< 1	< 1	23
03U316	6/17/99	4.9	< 1	0.49 JP	0.59 JP	< 1	< 1	< 1	22
03U317	12/1/98	1500	5 JP	46	31	< 10	< 10	12	5500
03U317	6/17/99	2100	< 100	53 JP	40 JP	< 100	< 100	< 100	6500
03U659	6/24/99	< 10 JP	< 10	< 10	< 10	< 10	28	< 10	200
03U671	6/24/99	16	< 1	4.1	2	< 1	0.45 JP	1.3	85
03U672	6/24/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.5 JP
03U672	6/24/99	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	0.38 JDP
03U701	6/28/99	2.4	< 1	0.35 JP	0.26 JP	< 1	0.49 JP	< 1	21
03U702	6/24/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	2.8
03U703	6/23/99	3.4	0.39 JP	0.63 JP	< 1	< 1	1 JP	9.7	27
03U708	6/23/99	44	< 10	10 JP	7.3 JP	< 10	6 JP	2.6 JP	170
03U708	6/23/99	48 D	< 10 D	11 D	7.5 JDP	< 10 D	6 JDP	2.7 JDP	180 D
03U709	6/25/99	19	< 1	12	14	< 1	0.36 JP	< 1	80
03U710	6/30/99	46	< 10	6.2 JP	6 JP	< 10	13	< 10	320
03U711	6/28/99	21	< 1	8.3	9.6	< 1	0.71 JP	1.9	75
03U801	6/29/99	0.26 JP	< 1	< 1	< 1	< 1	0.83 JP	< 1	55
03U803	6/29/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.41 JP
03U804	6/28/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.34 JP

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]		200	5	6	70	4	70	5	5
03U805	6/29/99	< 1	< 1	0.35 JP	0.38 JP	< 1	0.6 JP	< 1	0.97 JP
03U806	6/23/99	< 25	< 25	13.8 JP	17.5 JP	< 25	< 25	< 25	325
03U811	6/28/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J077	6/22/99	140	< 10	77	82	< 10	25	< 10	990
04J077	6/22/99	150 D	< 10 D	76 D	81 D	< 10 D	27 D	< 10 D	1000 D
04J702	6/21/99	3	< 1	0.79 JP	0.41 JP	< 1	< 1	< 1	26
04J708	6/23/99	0.7 JP	< 1	0.43 JP	0.77 JP	< 1	< 1	< 1	6.1
04J713	6/22/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.5
04U002	6/21/99	1 JP	< 1	0.52 JP	0.73 JP	< 1	< 1	< 1	7.4
04U007	6/18/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U020	6/21/99	< 1	< 1	< 1	0.4 JP	< 1	< 1	< 1	3.6
04U027	6/22/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U077	6/22/99	19	< 10	5.7 JP	< 10	< 10	< 10	< 10	190
04U510	6/18/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U701	6/28/99	1.4	< 1	0.4 JP	< 1	< 1	< 1	< 1	16
04U702	6/21/99	1.4	< 1	0.44 JP	< 1	< 1	< 1	< 1	15
04U708	6/23/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.2
04U709	6/25/99	1.4	< 1	0.8 JP	0.85 JP	< 1	< 1	< 1	22
04U711	6/28/99	2.8	< 1	0.91 JP	1.4	< 1	< 1	< 1	1.9
04U713	6/22/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.6

TABLE 9.6

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]		200	5	6	70	4	70	5	5
04U802	6/23/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.58 JP
04U806	6/23/99	160	< 10	68	96	< 10	15	< 10	500
04U833	6/22/99	0.64 JP	< 1	0.34 JP	0.49 JP	< 1	< 1	< 1	44
PJ#309	12/2/98	4	< 1	1.5	1.7	< 1	0.63 JP	< 1	24
PJ#309	6/17/99	4.3	< 1	1.6	1.8	< 1	0.76 JP	< 1	27
PJ#310	12/2/98	21	< 1	7.7	7.6	< 1	2.3	< 1	140
PJ#310	6/17/99	19.5	< 5	7.5	8	< 5	2.4 JP	< 5	155
PJ#310	6/17/99	21 D	< 5 D	8.5 D	8 D	< 5 D	2.5 JPD	< 5 D	160 D
PJ#311	12/2/98	0.86 JP	< 1	< 1	< 1	< 1	< 1	< 1	7.4
PJ#311	6/17/99	0.71 JP	< 1	< 1	< 1	< 1	< 1	< 1	6.8
PJ#313	12/22/98	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
PJ#313	6/17/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
PJ#313	6/17/99	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
PJ#806	6/23/99	32.5	< 25	20.3 JP	21.3 JP	< 25	< 25	< 25	300

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
[1] Cleanup levels for TGRS are from the OU2 ROD. Shading indicateds exceedence of the cleanup level.

TABLE 9.7

VOC MASS LOADING SUMMARY
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Well	*% Contribution to VOC Mass Removal*	*FY 1998 Total Pounds VOC Mass Removed*
B1	5.0	255
B2	0.4	19
B3	0.3	16
B4	23.1	1126
B5	18.6	909
B6	7.2	349
B7	0.0	2
B8	0.3	17
B9	2.3	110
B10	0.2	8
B11	0.0	2
B12	(Shut down)	0
SC1	2.5	123
SC2	1.0	47
SC3	0.1	7
SC4	(Shut down)	0
SC5	39.0	1888
Fiscal Year 1999 Total (lbs)		*4878*
Daily Average (lbs/day)		*13*

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
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		*172,167*

TABLE 9.8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCLE*	*12DCLP*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
03F302	12/2/98	14	0.52 JP	3.1	3.2	< 1	< 1	14	< 1	< 1	< 1	< 1	< 1	1.4	< 1	300
(B1)	6/17/99	15	< 10	2.9 JP	3.8 JP	< 10	< 10	15	< 10	< 10	< 10	< 10	< 10	< 10	< 10	310
03F303	12/2/98	3.9	1.6	4.1	2.7	< 1	< 1	1.7	< 1	< 1	< 1	< 1	< 1	2.7	< 1	65
(B2)	6/17/99	3.3 JP	< 5	2.05 JP	1.6 JP	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	10.5
03F304	12/2/98	3.9	0.45 JP	2.3	1.6	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	11
(B3)	12/2/98	3.9 D	0.49 JDP	2.3 D	1.6 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	11 D
	6/17/99	3.7	1.5	4	2.7	< 1	< 1	1.9	< 1	< 1	< 1	0.29 JP	< 1	3.1	< 1	11
03F305	12/2/98	220	< 10	59	66	< 10	< 10	41	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1000
(B4)	6/17/99	190	< 50	55	60	< 50	< 50	32.5 JP	< 50	< 50	< 50	< 50	< 50	< 50	< 50	1000
03F306	12/2/98	65	< 10	28	34	< 10	< 10	3.9 JP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	970
(B5)	6/17/99	49 JP	< 50	26.5 JP	33 JP	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	< 50	950
03F307	12/2/98	13	< 1	12	16	< 1	< 1	2.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	325
(B6)	12/2/98	13 D	< 1 D	12 D	15 D	< 1 D	< 1 D	2 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	300 D
	6/17/99	11	< 10	12	16	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	340
03F308	12/2/98	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.9
(B7)	6/17/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.8
03F312	12/1/98	< 1	< 1	< 1	0.42 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	4.9
(B11)	6/17/99	< 1	< 1	0.26 JP	0.54 JP	< 1	< 1	0.34 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6
03U301	12/1/98	30	< 10	< 10	< 10	< 10	< 10	69	< 10	< 10	< 10	< 10	< 10	< 10	< 10	940
(SC1)	6/17/99	30	< 10	3.3 JP	< 10	< 10	< 10	66	< 10	< 10	< 10	< 10	< 10	< 10	< 10	970
03U314	12/1/98	75	< 1	7.6	4.3	< 1	< 1	1.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	190
(SC2)	6/17/99	68	< 1	5.8	3.5	< 1	< 1	1 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	190
03U315	12/1/98	4.2	< 1	0.68 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.52 JP	< 1	< 1	< 1	15
(SC3)	6/17/99	3.2	< 1	0.59 JP	0.31 JP	< 1	< 1	< 1	< 1	< 1	< 1	0.46 JP	< 1	< 1	< 1	14
(SC4)	12/22/98	5.8	< 1	0.65 JP	0.68 JP	< 1	< 1	< 1	< 1	< 1	< 1	0.77 JP	< 1	< 1	< 1	23
03U316	6/17/99	4.9	< 1	0.49 JP	0.59 JP	< 1	< 1	< 1	< 1	< 1	< 1	0.45 JP	< 1	< 1	< 1	22
03U317	12/1/98	1500	5 JP	46	31	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	12	26	5500
(SC5)	6/17/99	2100	< 100	53 JP	40 JP	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	6500
PJ#309	12/2/98	4	< 1	1.5	1.7	< 1	< 1	0.63 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	24
(B8)	6/17/99	4.3	< 1	1.6	1.8	< 1	< 1	0.76 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	27
PJ#310	12/2/98	21	< 1	7.7	7.6	< 1	< 1	2.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	140
(B9)	6/17/99	19.5	< 5	7.5	8	< 5	< 5	2.4 JP	< 5	< 5	< 5	< 5	< 5	< 5	< 5	155
	6/17/99	21 D	< 5 D	8.5 D	8 D	< 5 D	< 5 D	2.5 JPD	< 5 D	< 5 D	< 5 D	< 5 D	< 5 D	< 5 D	< 5 D	160 D

TABLE 9.8

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCLE*	*12DCLP*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
PJ#311	12/2/98	0.86 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	7.4
(B10)	6/17/99	0.71 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6.8
PJ#313	12/22/98	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
(B12)	6/17/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	6/17/99	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D

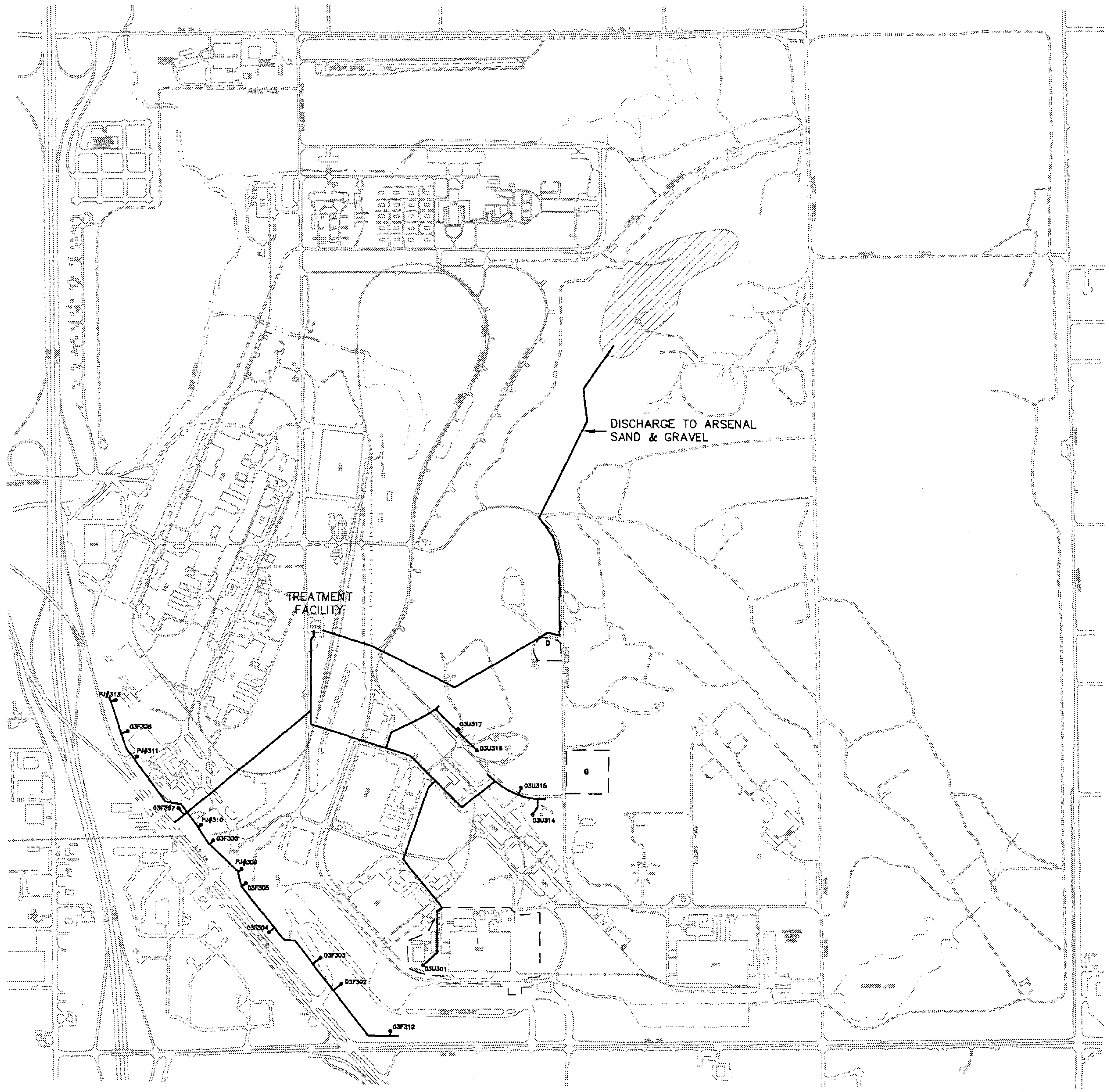
Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

TABLE 9.9

SUMMARY OF OU2 DEEP GROUNDWATER MONITORING REQUIREMENTS
TGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Responsible 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

Figures



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
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

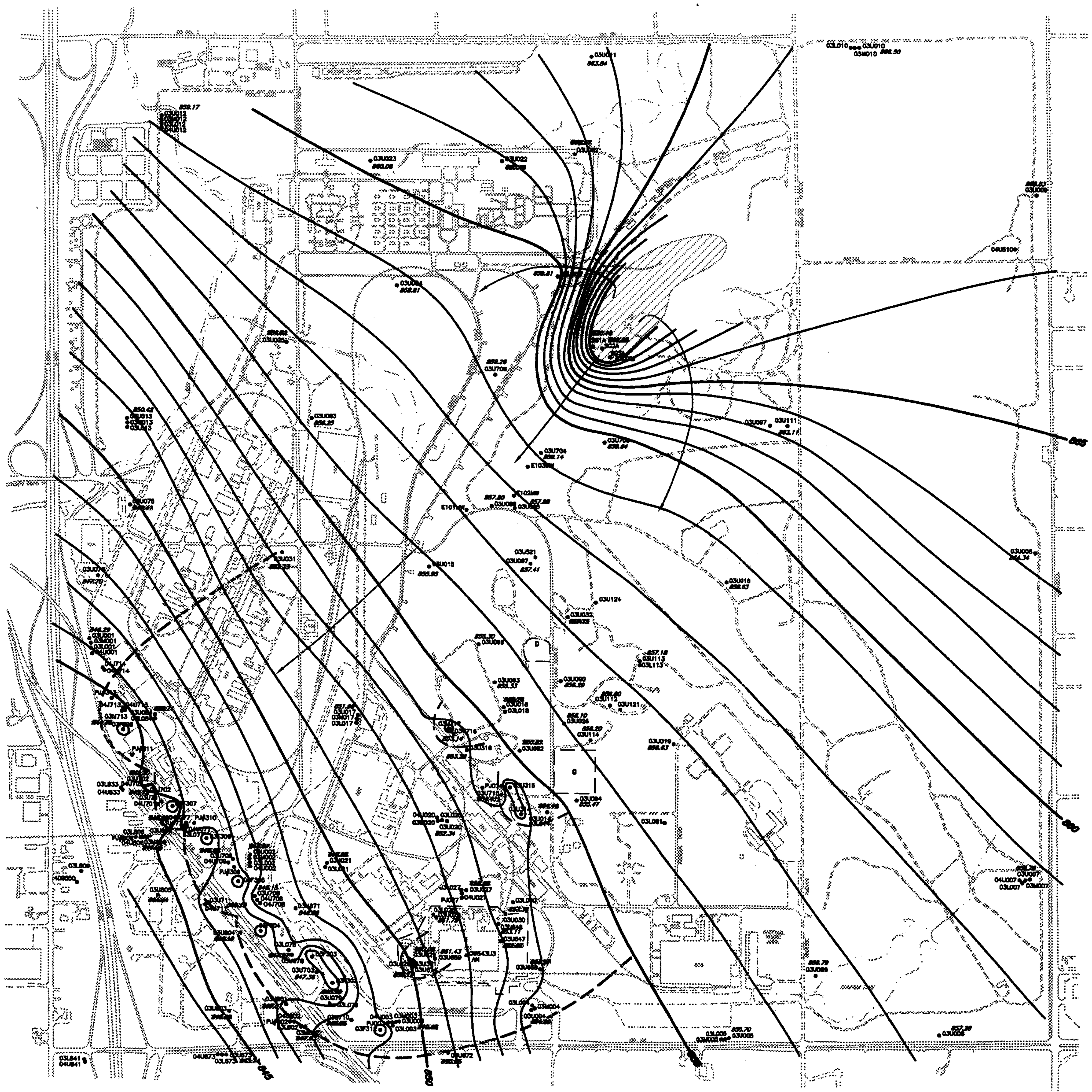
figure 9–1

TGRS LAYOUT

Twin Cities Army Ammunition Plant

CRA

13399–43(001)GN–SP018 JUN 05/2000



0 400 1200ft

LEGEND

PRIMARY ROAD
SECONDARY ROAD
RAILROAD
DRAINAGE
BUILDING
BUILDING REMOVED
SOURCE AREA
WELL LOCATION
844.52 GROUNDWATER ELEVATION IN FEET AMSL
GROUNDWATER CONTOUR
DIRECTION OF GROUNDWATER FLOW
LIMIT OF CAPTURE
NOTE: GROUNDWATER CONTOURS ARE INTERPOLATED FROM THE DATA POINTS SHOWN.
NA NOT AVAILABLE
ARSENAL SAND AND GRAVEL PIT TREATED WATER DISCHARGE AREA. (APPROXIMATE BOUNDARIES)

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
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

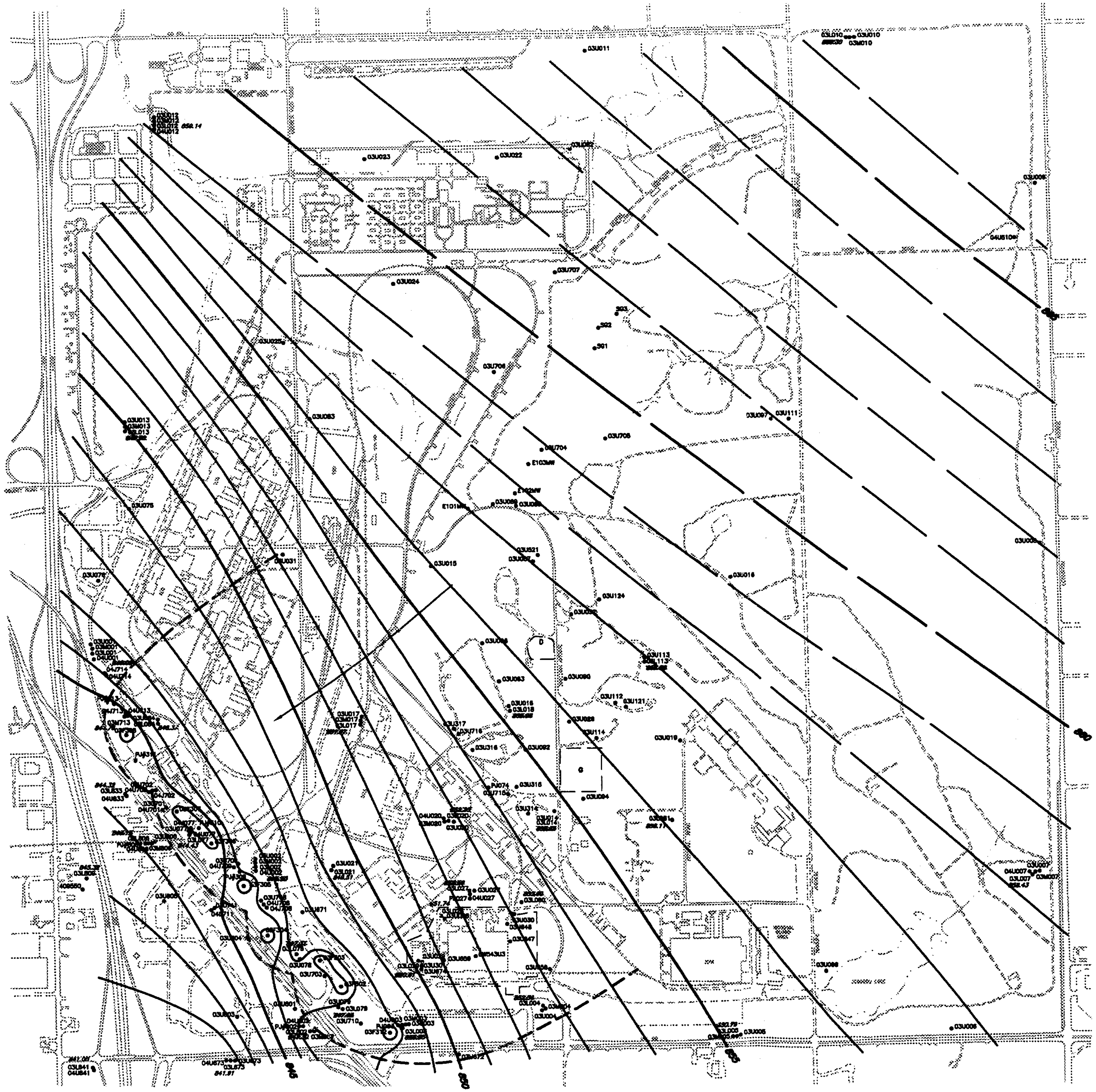
figure 9–2

OU2, UPPER UNIT 3, POTENTIOMETRIC MAP, 5–25–99 (Q63)

Twin Cities Army Ammunition Plant

CRA

13399–43(001)GN–SP015 APR 25/2000



0 400 1200ft

LEGEND

- PRIMARY ROAD
- SECONDARY ROAD
- RAILROAD
- DRAINAGE
- BUILDING
- BUILDING REMOVED
- SOURCE AREA
- WELL LOCATION
- *844.52* GROUNDWATER ELEVATION IN FEET AMSL
- GROUNDWATER CONTOUR
- DIRECTION OF GROUNDWATER FLOW
- LIMIT OF CAPTURE

NOTE: GROUNDWATER CONTOURS ARE INTERPOLATED FROM THE DATA POINTS SHOWN.

- *NA* NOT AVAILABLE
- ARSENAL SAND AND GRAVEL PIT TREATED WATER DISCHARGE AREA. (APPROXIMATE BOUNDARIES)

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
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

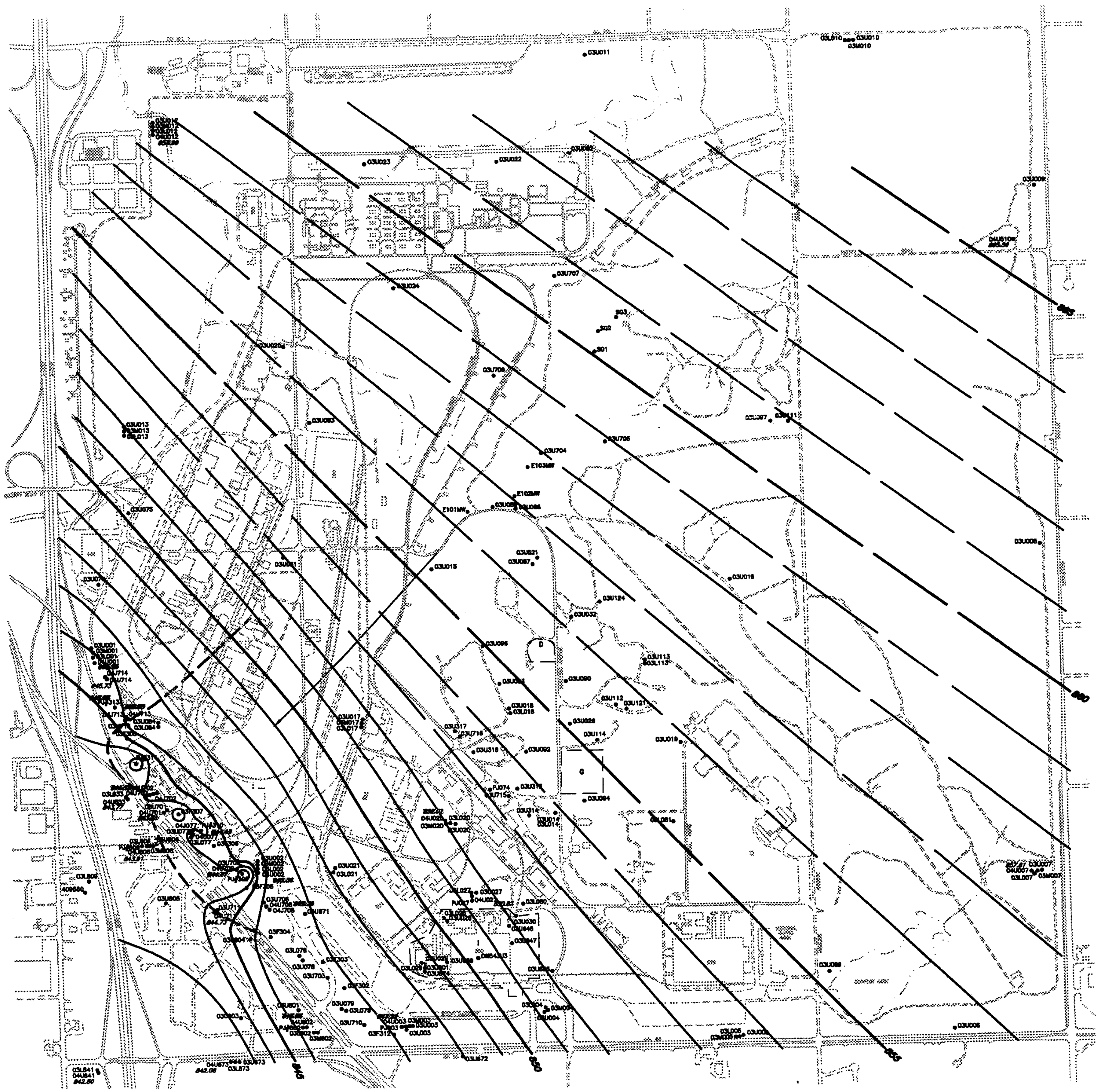
figure 9–3

OU2, LOWER UNIT 3, POTENTIOMETRIC MAP, 5–25–99 (Q63)

Twin Cities Army Ammunition Plant

CRA

13399-43(001)GN-SP016 APR 25/2000



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
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

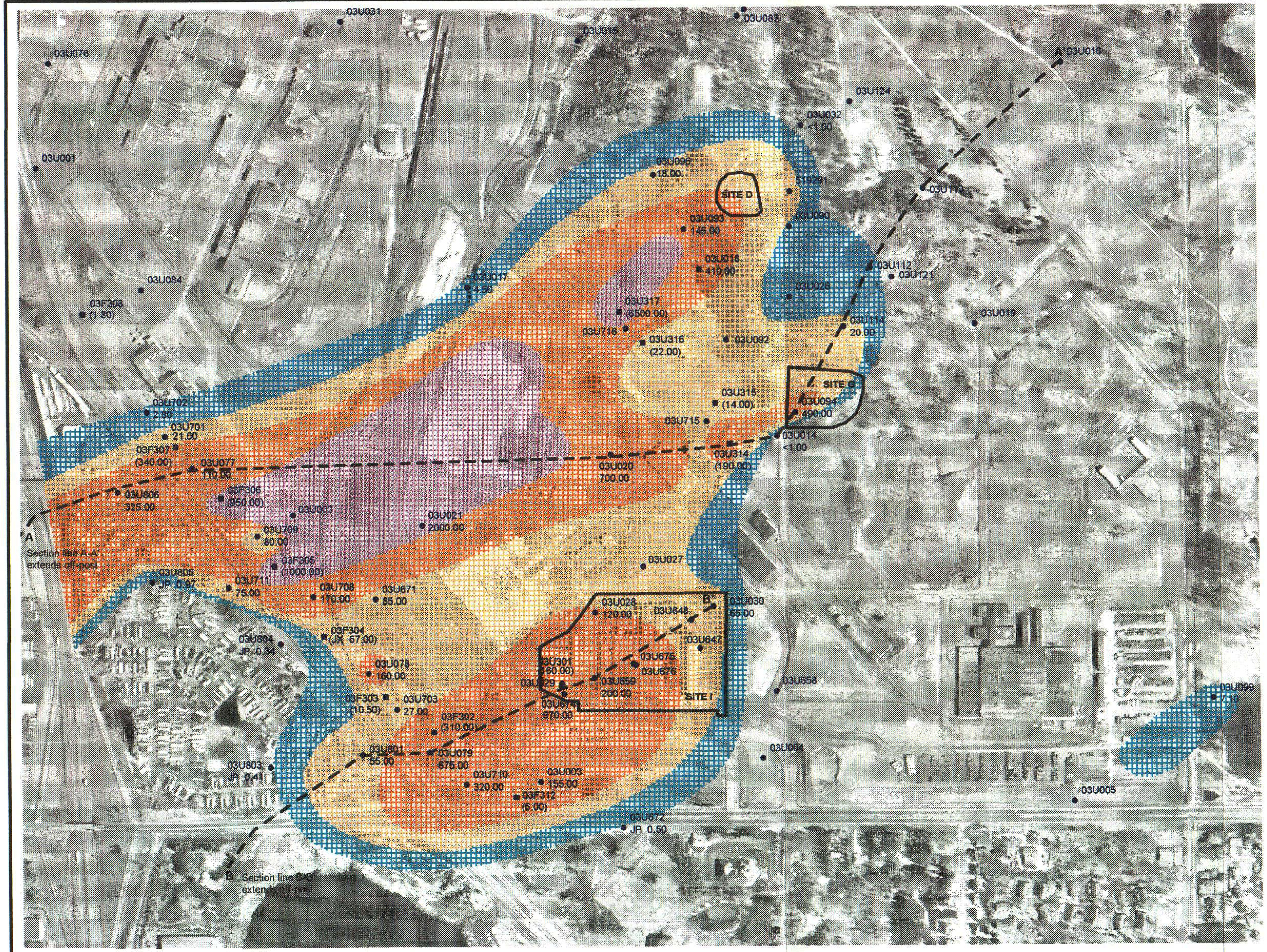
figure 9–4

OU2, UPPER UNIT 4, POTENTIOMETRIC MAP, 5–25–99 (Q63)

Twin Cities Army Ammunition Plant

CRA

13399–43(001)GN–SP017 APR 25/2000



LEGEND

- 03U096 Monitoring Well Location
- 03U315 Extraction Well Location
- 03U096 180.00 Trichloroethene concentration (ug/l) (values in parentheses were not used for contouring purposes)
- Site Boundary
- Cross-Section Line

Trichloroethene Concentrations

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

Notes:
1. 03F and 03U extraction wells are shown with data in parentheses, but concentrations were not used for contouring.
2. Aerial Orthophotography was flown in 1997.
3. Extraction well name conversions:

03F302	B-1
03F303	B-2
03F304	B-3
03F305	B-4
03F306	B-5
03F307	B-6
03F308	B-7
03F312	B-11
03U301	SC-1
03U314	SC-2
03U315	SC-3
03U316	SC-4
03U317	SC-5

N

600 0 600 Feet

TWIN CITIES ARMY AMMUNITION PLANT

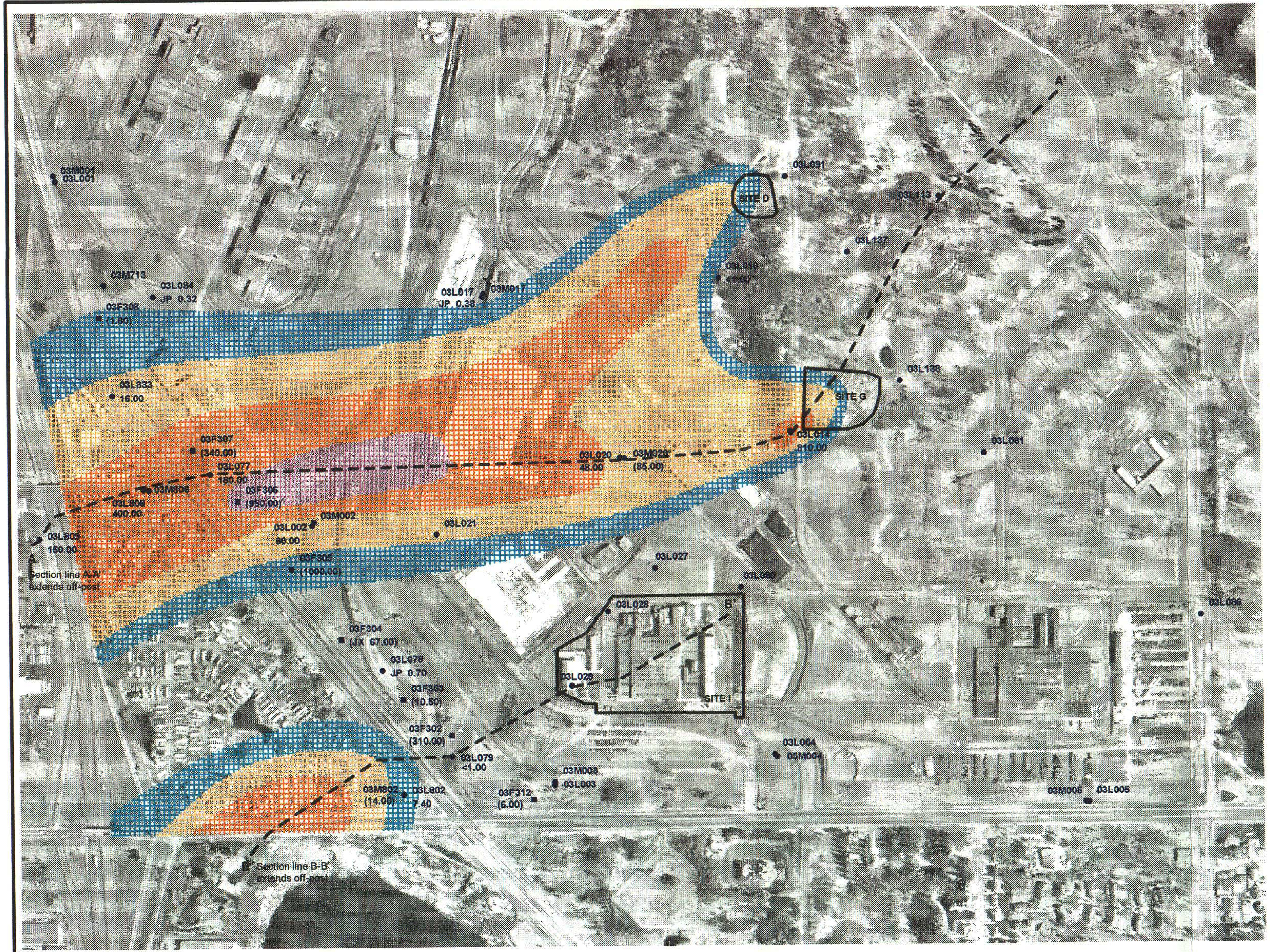
OU2, Upper Unit 3, Trichloroethene Map, Summer 1999

Wenck

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

OCT 2000

Figure 9-5



LEGEND

- 03L091 Monitoring Well Location
- 03F305 Extraction Well Location
- 03L091 180.00 Trichloroethene concentration (ug/l) (values in parentheses were not used for contouring purposes)
- Site Boundary
- Cross-Section Line

Trichloroethene Concentrations

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

Notes:
1. Middle Unit 3 wells with data are shown with data in parentheses, but were not used for contouring.
2. 03F extraction wells are shown with data in parentheses, but were not used for contouring.
3. Aerial Orthophotography was flown in 1997.
4. Extraction well name conversions:

03F302	B-1
03F303	B-2
03F304	B-3
03F305	B-4
03F306	B-5
03F307	B-6
03F308	B-7
03F312	B-11

N

600 0 600 Feet

L:\0003\0003-61\apr file99 report apr\figure 9-6

TWIN CITIES ARMY AMMUNITION PLANT

OU2, Lower Unit 3 Trichloroethene Isoconcentration Map, Summer 1999

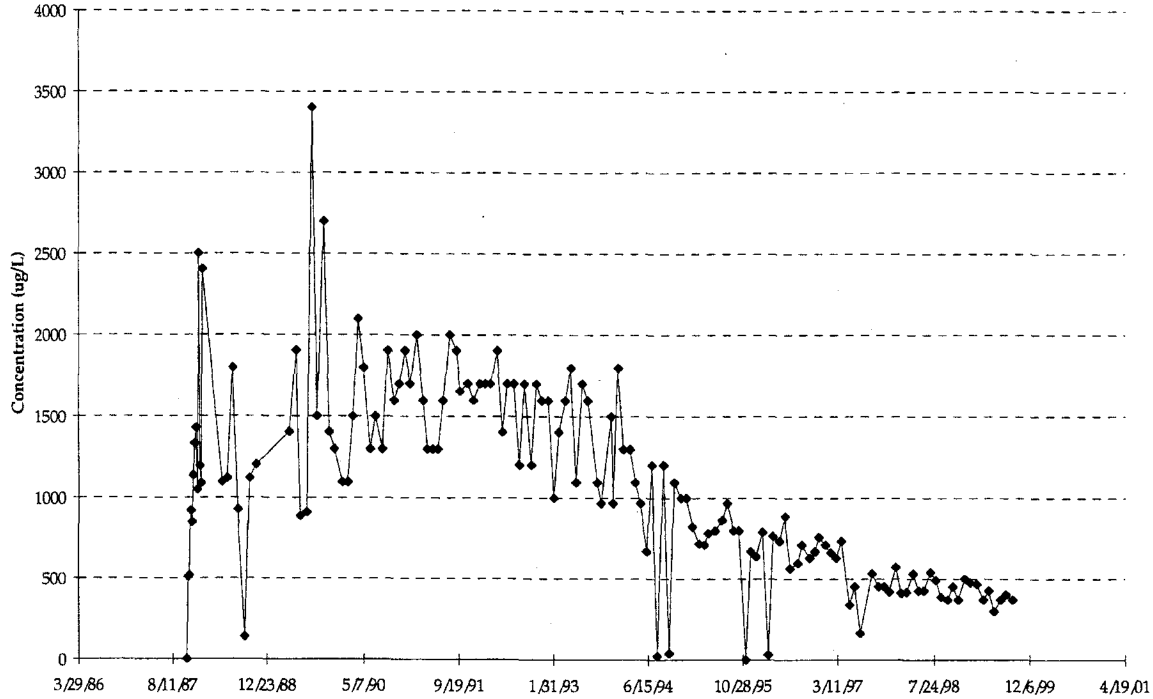
COPYRIGHT Wenck
Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

OCT 2000

Figure 9-6

TWIN CITIES ARMY AMMUNITION PLANT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	OCT 2000
OU2, Upper Unit 4, Trichloroethene Isoconcentration Map, Summer 1999		Figure 9-7

TRCLE vs. TIME - INFLUENT



TRCLE vs. TIME - EFFLUENT

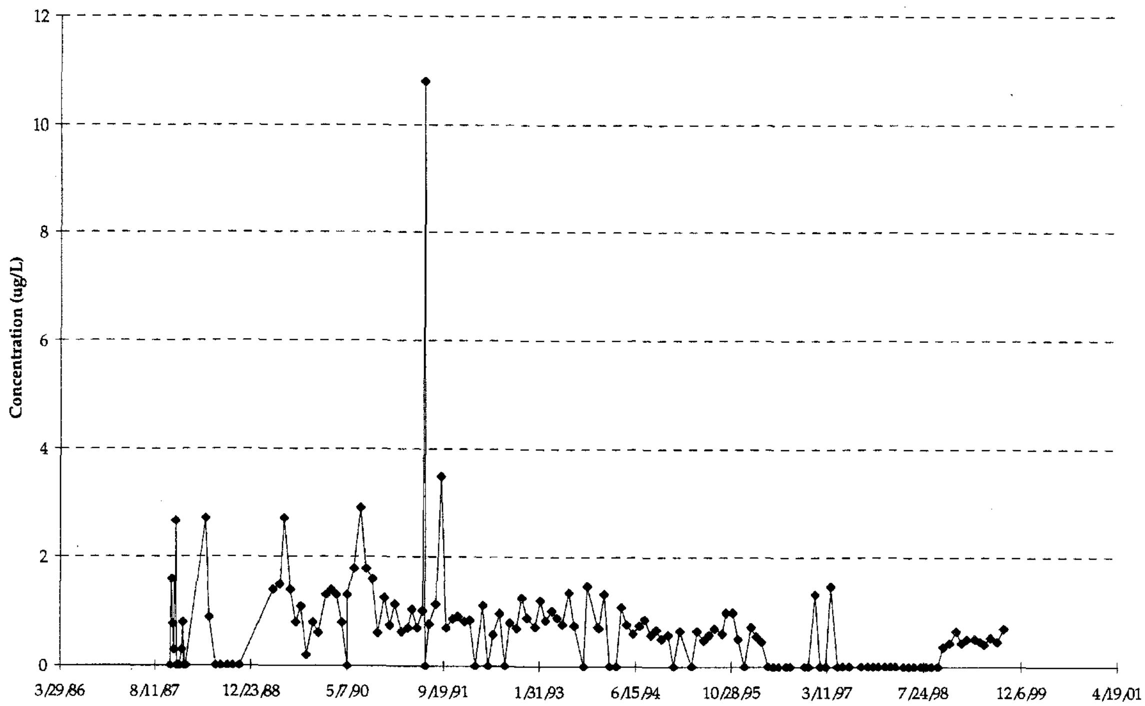


figure 9–8

OU2, TGRS TREATMENT SYSTEM PERFORMANCE

Twin Cities Army Ammunition Plant

CRA

13399–43(001)GN–SP012 APR 19/2000

SECTION 10

10.0 Operable Unit 3: Deep Groundwater

The reference for the OU3 ROD is:

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.

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. This section of the report presents the monitoring results from the FY 1999 operation of the PGRS and documents treatment and groundwater capture performance.

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 has been in full scale operation since May 1994.

Is the PGRS containing the south plume?
Yes. The zone of hydraulic capture for the PGRS in FY 1999 was determined by manually contouring the water level data. Appendix K.1 contains the water level database for the monitoring wells. Appendix H presents the groundwater contours for the Prairie du Chien aquifer (the aquifer of concern) for May, July, and August 1999. These figures illustrate the zone of capture for the PGRS.

Based on monitoring well data, contaminants are not found in the Unit 3 or Jordan Sandstone aquifer in this area, which lie above and below the Prairie du Chien, respectively (see Appendix B for a description of the aquifer units). Therefore, the Unit 3 and Jordan Sandstone aquifer are not of concern for remediation in this area of the Site and further definition of Unit 3 and Jordan Sandstone capture is not needed.

<u>Vertical Gradients</u>
Table 10-1 presents a summary of the vertical gradients for nested wells shown on Figure 3-1.

FY 1999 data is comparable to the historic data which indicate an upward gradient between the Unit 3 and the Prairie du Chien immediately southwest of TCAAP. South of well nest 859, vertical gradients reverse to a downward trend. This downward gradient is also indicated in the Unit 3 VOC plume which extends to 03L859. The vertical gradient and analytical data suggests that the VOC plume is moving from the Unit 3 into the Prairie du Chien under this downward vertical gradient.

Table 10-1 shows that there is a downward vertical gradient between the Prairie du Chien and the Jordan Sandstone at well nest 864. However, this downward vertical gradient has been reduced since pumping began. Nearer to extraction well NBM #13 (completed in the Prairie du Chien) at well nest 866, the drawdown within the Prairie du Chien was sufficient to create an upward vertical gradient between the Jordan and Prairie du Chien in FY 1999.

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 GAC treatment system has been in operation since 1994. The City of New Brighton operates the system as part of their municipal water system.

Is treatment meeting the requirements of the OU3 ROD?

Yes. Influent and effluent water was sampled on a monthly basis during FY 1999 and the results are provided in Table 10-2. PGRS influent is labeled NB13I and effluent is labeled NB13E. Table 10-3 presents a summary of monthly VOC removal for FY 1999 and Figure 10-2 shows the influent trichloroethene concentration versus time. The average FY 1999 influent trichloroethene concentration was <1.0 μg/l. Figure 10-2 indicates that influent concentrations continue to decrease. The influent to the treatment system ranged from <1 μg/l to 1.8 μg/l trichloroethene in FY 1999.

Figure 10-2 also presents a summary of the effluent trichloroethene concentration versus time. As indicated, the effluent has remained below the contaminant-specific requirements for all VOC compounds. The presence of chloroform in the effluent is most likely due to chlorination in the treatment train as part of the iron removal system.

How much VOC mass did the system remove?

The PGRS extracted and treated 524,942,000 gallons of water from October 1998 through September 1999 (Appendix K.2) for an average of 998 gpm. A total of 5 days of partial down time occurred during FY 1999 (February 22-26). The down time was the result of maintenance related to shock chlorination, some mechanical work and regeneration of the iron/manganese filter.

Based on the average monthly VOC concentrations from the NBM#13 influent for FY 1999, the PGRS removed approximately 1.5 pounds of VOCs from October 1998 through September 1999. A summary of the PGRS monthly pumping volumes and VOC mass removal is shown in Table 10-3. The total VOC mass removed from the PGRS from startup through FY 1999 is 132 pounds. The purpose of the PGRS is to contain the leading edge of the south plume, where VOC concentrations are low. Therefore, the VOC mass removal is generally low.

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

Description: "Discharge of treated ground water 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 established a municipal water supply interconnection with the City of Fridley in 1994. This has allowed them to accept the discharge from the PGRS on a full time basis since its start up in May 1994. The City of New Brighton operates the well and treatment system.

10.4 REMEDY COMPONENT #4: GROUNDWATER MONITORING

Description: "Monitoring of the ground water 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 1999 monitoring plan and any deviations are explained in Appendix C.3. Monitoring was as follows:

Groundwater

Groundwater samples and water level measurements for the annual event were collected in June 1999. All samples were analyzed for VOCs using the Army Environmental Center (USAEC) Method N83. Monitoring wells used for water levels and sampling for the PGRS are shown on Figure 10-1. Appendix K.1 presents the water level database.

Treatment System

CRA collected treatment system influent and effluent samples in October and November 1999. Samples were collected by the City of New Brighton from the treatment facility on a monthly basis beginning in December 1999. The extraction well flow measurements are provided in Appendix K.2.

Is additional monitoring proposed prior to the next report?

Yes. Table 10-4 presents the monitoring requirements for OU3. For FY 1999 through FY 2003, biennial monitoring well sampling and water level measurements will be conducted. This change is based on stability observed over the last several years. Treatment system influent and effluent will continue to be monitored monthly. Appendix A presents the FY 1999 – FY 2003 monitoring plan.

10.5 OVERALL REMEDY FOR OU3

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

The PGRS continued to operate as designed during FY 1999. If contaminants were present above ARARs in the area, the PGRS would be effective at containing the southward migration of the plume.

FY 1999 total VOC concentrations at NBM #13 exhibited stability throughout the year. All VOCs were non-detect except for trichloroethene, which was detected in October 1998, November 1998, and June 1999. All detections were below the requirements of the ROD.

Chemical Performance

South VOC Plume

Table 10-5 presents the FY 1999 groundwater quality data. A total of 24 monitoring wells were sampled in June 1999 for the annual monitoring event. The treatment system was monitored monthly and the influent data represents groundwater from NBM #13, which is completed in the Prairie du Chien formation.

Prairie du Chien

A distribution of the trichloroethene concentration above 1 μg/l is provided in Figure 3-5 and in cross-section in Figure 3-6. As shown, the trichloroethene plume extends approximately 1-1/4 miles southwest of TCAAP. The plume no longer extends as far as NBM #13 at concentrations above ARARs. Monitoring wells beyond NBM #13 to the south are non-detect for trichloroethene.

Unit 3

Three of the Unit 3 wells sampled exhibited concentrations above the MCLs. A distribution of the Unit 3 trichloroethene concentrations above 1 μg/l is provided in Figures 3-3 and 3-4 and in cross-section in Figure 3-6. As shown, the trichloroethene plume in the Unit 3 extends only approximately 1/2 mile from TCAAP, and does not extend into the area of NBM #13. The Unit 3 plume has remained stable for the last several years.

Jordan Sandstone

Trichloroethene was detected in well 04J864, at 0.55 $\mu g/l$.

Are any changes or additional actions required for OU3?

Yes. In FY 2000, the pumping rate at NBM #13 was reduced to 400 gpm. This change was approved by the agencies based on the consistently low VOC concentration in the extraction well and monitoring wells. Additional monitoring was implemented to evaluate the result of the pumping rate reduction. The results of this change and the monitoring will be reported in the FY 2000 Annual Performance Report.

Tables

TABLE 10.1

VERTICAL HYDRAULIC GRADIENTS
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

	Mid-Screen (or hole) Elevation (ft)	*Groundwater Elevation (ft)*	
		6/1/98	*5/27/99*
03U673	792.1	843.33	843.14
03L673	764.1	842.11	841.91
Difference	28	-1.22	-1.23
Vertical Gradient		-0.044	-0.044
03L673	764.1	842.11	841.91
04U673	691.1	842.3	842.06
Difference	73	0.19	0.15
Vertical Gradient		0.003	0.002
03L832	718.3		832.03
04U832	652.2	- -	832.02
Difference	66.1	- -	-0.01
Vertical Gradient		- -	0.000
03M848	778.1	839.95	839.71
03L848	736.6	840.41	840.20
Difference	41.5	0.46	0.49
Vertical Gradient		0.011	0.012
03L848	736.6	840.41	840.20
04U848	666.6	841.2	841.02
Difference	70	0.79	0.82
Vertical Gradient		0.011	0.012
03L854	744.9	837.29	836.92
04U854	641.9	832.98	832.77
Difference	103	-4.31	-4.15
Vertical Gradient		-0.042	-0.040
03L859	763.8	837.81	837.40
04U859	673.8	840.97	840.61
Difference	90	3.16	3.21
Vertical Gradient		0.035	0.036
03L860	764.1	837.46	837.24
04U860	660.1	832.81	832.72
Difference	104	-4.65	-4.52
Vertical Gradient		-0.045	-0.043

TABLE 10.1

VERTICAL HYDRAULIC GRADIENTS
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

	Mid-Screen (or hole) Elevation (ft)	*Groundwater Elevation (ft)*	
		6/1/98	*5/27/99*
03L861	760.6	835.53	835.14
04U861	658.6	833.09	832.76
Difference	102	-2.44	-2.38
Vertical Gradient		-0.024	-0.023
04U864	650.7	828.87	827.92
04J864	548.7	826.4	825.77
Difference	102	-2.47	-2.15
Vertical Gradient		-0.024	-0.021
04U866	650	827.42	825.89
04J866	553	827.02	826.31
Difference	97	-0.4	0.42
Vertical Gradient		-0.004	0.004

Note:
Negative sign denotes downward vertical gradient

TABLE 10.2

TREATMENT SYSTEM ANALYTICAL SUMMARY
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCE*	*12DCLE*	*12DCLP*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
NB13E	10/5/98	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1	0.4 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1
NB13E	11/3/98	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1	0.47 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1
NB13E	12/21/98	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.6	--	< 1	< 1	< 1
NB13E	1/14/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.2	--	< 1	< 1	< 1
NB13E	2/11/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13E	3/17/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13E	4/6/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.4	--	< 1	< 1	< 1
NB13E	5/18/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.5	--	< 1	< 1	< 1
NB13E	6/21/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.5	--	< 1	< 1	< 1
NB13E	7/13/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.7	--	< 1	< 1	< 1
NB13E	8/30/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.4	--	< 1	< 1	< 1
NB13E	9/27/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	1.4	--	< 1	< 1	< 1
NB13I	10/5/98	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.9	1.8
NB13I	10/5/98	< 1 D	< 1 D	< 1 D	< 1 D	--	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	1.8 D
NB13I	11/3/98	< 1 D	< 1 D	< 1 D	< 1 D	--	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	1.2 D	1.8 D
NB13I	12/21/98	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	1/14/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	2/11/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	3/17/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	4/6/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	5/18/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	6/21/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	1.4
NB13I	7/13/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	8/30/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1
NB13I	9/27/99	< 1	< 1	< 1	< 1	< 2	< 1	< 1	--	< 1	< 1	< 5	< 1	--	< 1	< 1	< 1

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

TABLE 10.3

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Month	*VOC Influent* [1] *(µg/L)*	*Water Treated (million gallon)*	*Total VOCs Into Treatment Center (lbs)*	*VOC Effluent* [2] *(µg/L)*	*Total VOCs Out Of Treatment Center (lbs)*	*Total VOCs Removed By Carbon System (lbs)*
October '98	1.80	43.676	0.66	0.40	0.15	0.51
November '98	1.90	41.888	0.66	0.47	0.16	0.50
December '98	0.00	43.611	0.00	0.0	0.00	0.00
January '99	0.00	45.459	0.00	0.0	0.00	0.00
February '99	0.00	35.760	0.00	0.0	0.00	0.00
March '99	0.00	45.798	0.00	0.0	0.00	0.00
April '99	0.00	44.264	0.00	0.0	0.00	0.00
May '99	0.00	45.837	0.00	0.0	0.00	0.00
June '99	1.40	44.083	0.52	0.0	0.00	0.52
July '99	0.00	44.342	0.00	0.0	0.00	0.00
August '99	0.00	45.875	0.00	0.0	0.00	0.00
September '99	0.00	44.349	0.00	0.0	0.00	0.00
TOTAL		**524.942**				**1.53**

Notes:

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

(2) VOC effluent concentrations assumed to be zero if no data was available.

TABLE 10.4

SUMMARY OF OU3 MONITORING REQUIREMENTS
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Remedy Component		*Monitoring Requirements*	*Responsible Party*	*Documents Containing the Monitoring Plan*
#1 Groundwater Extraction	a.	Water levels to draw contour maps demonstrating capture	Alliant	OU3 Monitoring Plan in Annual Report
	b.	Pumping rates and volumes for comparison to design flow rates	Alliant	OU3 Monitoring Plan in Annual Report
#2 Groundwater Treatment	a.	Influent/effluent monitoring to verify compliance and calculate mass removal	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	New Brighton	New Brighton's Monitoring Plan
#4 Groundwater Monitoring	a.	As above	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

TABLE 10.5

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
PGRS Cleanup Level [1]		200	3	6	70	70[2]	70	--	5
03L673	6/4/99	< 1	< 1	0.88 JP	0.86 JP	--	9.4	< 1	280
03L848	6/4/99	< 1	< 1	< 1	< 1	--	0.42 JP	< 1	7.3
03L854	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
03L861	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
03L861	6/7/99	< 1 D	< 1 D	< 1 D	< 1 D	--	< 1 D	< 1 D	< 1 D
03M848	6/4/99	< 10	< 10	3.7 JP	3.8 JP	--	29	< 10	700
03M848	6/4/99	< 10 D	< 10 D	3.7 JDP	4.1 JDP	--	30 D	< 10 D	650 D
03U673	6/4/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04J864	6/4/99	< 1	< 1	< 1	< 1	--	< 1	< 1	0.55 JP
04J866	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04U673	6/4/99	< 1	< 1	0.28 JP	< 1	--	2.6	< 1	74
04U832	6/7/99	4.4	< 1	2.2	2.1	--	2.4	< 1	29
04U845	6/7/99	< 1	< 1	< 1	< 1	--	1.7	< 1	35
04U848	6/4/99	< 1	< 1	< 1	< 1	--	< 1	< 1	3.6
04U851	6/8/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04U852	6/8/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04U859	6/7/99	27	0.3 JP	10	6.6	--	2.4	< 1	75
04U860	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04U861	6/7/99	2	< 1	2.4	3.1	--	14	< 1	28

TABLE 10.5

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
04U863	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	1.3
04U864	6/4/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
04U865	6/8/99	< 1	< 1	< 1	< 1	--	< 1	< 1	0.94 JP
500691	6/7/99	< 1	< 1	< 1	< 1	--	< 1	< 1	0.26 JP
MW15H	6/8/99	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
NB13E	10/5/98	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
NB13E	11/3/98	< 1	< 1	< 1	< 1	--	< 1	< 1	< 1
NB13E	12/21/98	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	1/14/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	2/11/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	3/17/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	4/6/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	5/18/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	6/21/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	7/13/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	8/30/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13E	9/27/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	10/5/98	< 1	< 1	< 1	< 1	--	< 1	< 1	1.8
NB13I	10/5/98	< 1 D	< 1 D	< 1 D	< 1 D	--	< 1 D	< 1 D	1.8 D
NB13I	11/3/98	< 1	< 1	< 1	< 1	--	< 1	< 1	1.8
NB13I	12/21/98	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	1/14/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	2/11/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	3/17/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	4/6/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	5/18/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	6/21/99	< 1	< 1	< 1	< 1	< 2	--	< 1	1.4
NB13I	7/13/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	8/30/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1
NB13I	9/27/99	< 1	< 1	< 1	< 1	< 2	--	< 1	< 1

TABLE 10.5

GROUNDWATER QUALITY DATA
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*1,1,1-Trichloroethane*	*1,1,2-Trichloroethane*	*1,1-Dichloroethene*	*1,1-Dichloroethane*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.
(1) Cleanup levels for PGRS are from the OU3 ROD. Shading indicates exceedence of the cleanup level.
(2) Cleanup level is specifically for cis-1,2-Dichloroethene, not total.

Figures

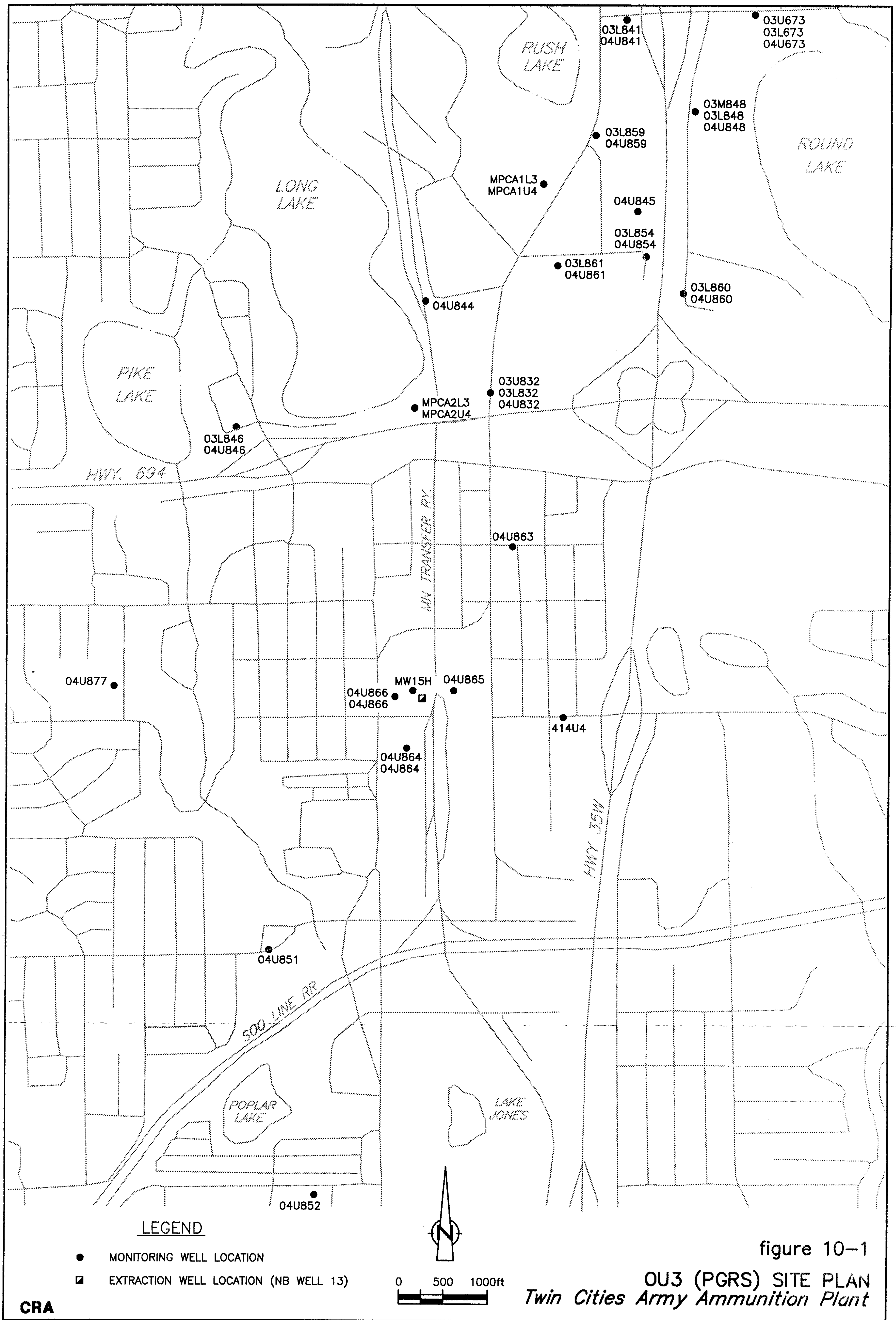


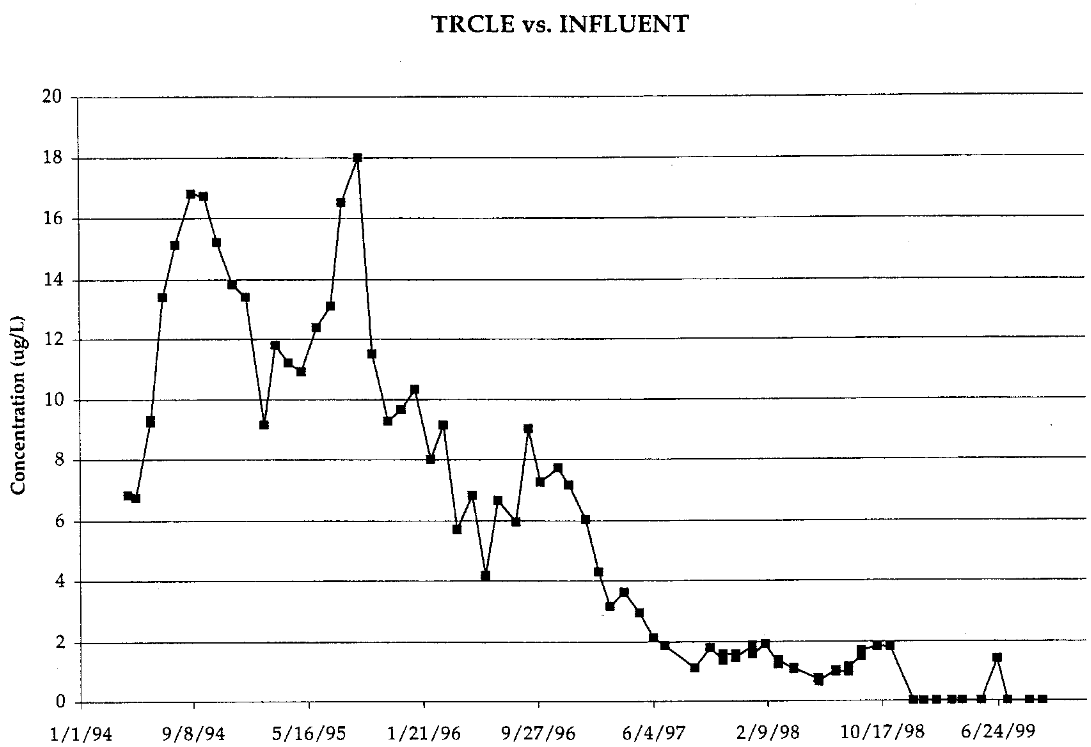
figure 10-1

OU3 (PGRS) SITE PLAN

Twin Cities Army Ammunition Plant

CRA

13399-43(001)GN-SP001 JAN 25/2000



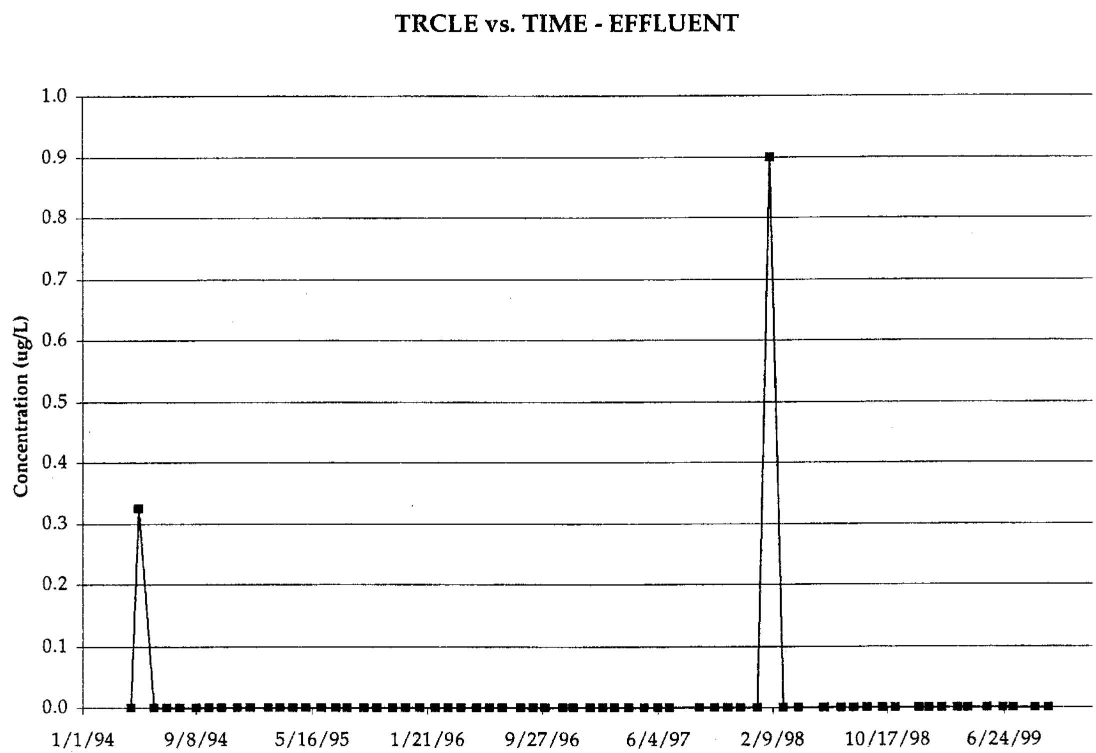


figure 10-2

OU3 (PGRS) TRCLE vs. TIME

Twin Cities Army Ammunition Plant

CRA

13399-43(001)GN-SP013 APR 19/2000

SECTION 11

11.0 Other Installation Restoration Activities During FY 1999

Appendix L briefly summarizes the status of other activities at TCAAP which are related to the Installation Restoration Program, but are not required in the RODs for OU1 through OU3. They are not part of the performance evaluation or the performance monitoring programs.

SECTION 12

12.0 References

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APPENDIX A

Appendix A

FY 1999 – FY 2003 Monitoring Plans

A.1 Groundwater Monitoring Wells

A.1 FY 1998 – FY 2002 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 Techsystems Inc., the tenant.

(B) Indicates that the monitoring is the responsibility of the U.S. Army.

(1) "L (A or B)" denotes a water level measurement by the appropriate party.

(2) "1 (A or B)" denotes a water quality sampling by the appropriate party, with the numbers representing analytical parameter categories. The parameters within each category are outlined in Appendix C.2.

(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
  - 3.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 for Category 1 if in production at time of sample collection.

(5) For Category 2, analysis is only required for antimony.

(6) Background monitoring location.

(7) For Category 7, analysis is only required for benzene.

(8) Quarterly water levels and water quality for FY 2000 only (12/99, 3/00, 6/00, 9/00).

(9) Sample quarterly from September 2000 through June 2001 (Sept., Dec., March, June).

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan		(1,2)			Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
Operable Unit 1 - [illegible]											
01U	01U807			—	—	—	—	—	—	—	
01U	01U813			—	—	—	—	—	—	—	
01L	01L813			—	—	—	—	—	—	—	
01L	01L816			—	—	—	—	—	—	—	
01L	01L821			—	—	—	—	—	—	—	
01L	01L822			—	—	—	—	—	—	—	
01L	01L823			—	—	—	—	—	—	—	
03U	03U811			1,L(A)	—	1,L(B)	—	1,L(B)	OR	1.a	
03U	03U815			—	—	—	—	—	—	—	
03U	03U821			—	—	—	—	—	—	—	
03U	03U822			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03U	03U824			1,L(B)	—	—	—	—	—	—	Sealed 1999
03U	03U831			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03U	409550	PCA 6U3		1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
03U	409596	BS118U3		—	—	1,L(B)	—	1,L(B)	OR	None	
03M	03M843			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03L	03L811			1,L(A)	—	1,L(B)	—	1,L(B)	OR	1.a	
03L	03L813			—	—	—	—	—	—	—	
03L	03L822			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
03L	03L841			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03L	03L846			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03L	03L853			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
03L	03L856			—	—	—	—	—	—	—	
03L	03L858			—	—	—	—	—	—	—	
03L	409546	PCA2L3		—	—	—	—	—	—	—	
03L	409556	PCA4L3		1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03L	409557	PCA1L3		1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
03L	409597	BS118L3		1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
PC	04U821			—	—	—	—	—	—	—	
PC	04U834			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
PC	04U836	MW-1		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U837	MW-3		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U838	MW-5		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U839	MW-7		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U841			1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U843			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	3.b	
PC	04U844			1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U846			1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U847			1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U849			—	—	—	—	—	—	—	
PC	04U850			1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	04U855			1,L(B)	1,L(B)	1,L(B)	—	1,L(B)	1.a, OR	3.b	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan			(1,2)		Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
PC	04U871			1,L(B)	—	1,L(B)	1,L(B)	1,L(B)	OR	3.b	
PC	04U872			1,L(B)	—	1,L(B)	1,L(B)	1,L(B)	OR	3.b	
PC	04U875			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	3.b	
PC	04U877			1,L(B)	—	1,L(B)	1,L(B)	1,L(B)	OR	3.b	
PC	04U879			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	3.b	
PC	04U880			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	3.b	
PC	04U881			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
PC	04U882			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
PC	04U883			1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	None	
PC	191942	BS118U4		—	—	1,L(B)	—	—	—	—	One-time event
PC	200154	UM Golf Course		1 (B)	—	1 (B)	—	1 (B)	1.a, OR	—	
PC	206688	Cloverpond		1 (B)	—	1 (B)	—	1 (B)	1.a, OR	—	
PC	234547	Hnywell Ridgway		—	—	—	—	—	—	—	
PC	409547	PCA1U4		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	409548	PCA2U4		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	409549	PCA3U4		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
PC	409555	PCA5U4		1,L(B)	—	1,L(B)	—	1,L(B)	1.a, OR	3.b	
PC	512761	Gross Golf Course #2		1,L(B)	—	1,L(B)	—	1,L(B)	OR	—	
PC	554216	New Brighton #14									See Appendix A.2
PC	582628	New Brighton #15									See Appendix A.2
J	04J834			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
J	04J835			—	—	—	—	—	—	—	
J	04J836	MW-2		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
J	04J837	MW-4		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
J	04J838	MW-6		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
J	04J839	MW-8		1,L(B)	—	1,L(B)	—	1,L(B)	OR	3.b	
J	04J882			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
J	200524	St. Anthony #5	(4)	1(B)	—	1(B)	—	1(B)	OR	—	
J	200803	St. Anthony #4	(4)	1(B)	—	1(B)	—	1(B)	OR	—	
J	206796	New Brighton #5	(4)								See Appendix A.2
J	206797	New Brighton #6	(4)								See Appendix A.2
PC/J	200804	St. Anthony #3	(4)	1(B)	—	1(B)	—	1(B)	OR	—	
PC/J	200812	Gross Golf #1		—	—	—	—	—	—	—	
PC/J	206792	New Brighton #4									See Appendix A.2
PC/J	206793	New Brighton #3	(4)								See Appendix A.2
PC/J	234549	Reiner		1(B)	—	1(B)	—	1(B)	1.a, OR	—	
PC/J	PJ#318			1,L(B)	—	1,L(B)	—	1,L(B)	OR	None	
PC/J/S	233221	R & D Systems		1(B)	—	—	—	—	1a	—	
UNK	234546	Hnywell Ridgway		1(B)	—	1(B)	—	1(B)	OR	—	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan			(1,2)		Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments

Operable Unit 2

Site A Removal Action

01U	01U038			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U039		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U040			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U041			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U063			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U067			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U102		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U103		(7)(5)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	OR	4.b	
01U	01U104			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U105			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U106			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U107			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U108		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U109			L(B)	—	—	—	—	—	—	Sealed 1999
01U	01U110			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U115		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U116		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U117		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U118			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U119			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U120			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U125		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U126		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U127			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U133			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U135			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U136			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U137			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U138		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U139		(7)(9)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U140		(7)(9)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U141			L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U142	Piezometer		—	—	—	—	—	—	—	
01U	01U143	Piezometer		—	—	—	—	—	—	—	
01U	01U144	Piezometer		—	—	—	—	—	—	—	
01U	01U145	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U146	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U147	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U148	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U149	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U150	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/ Water Quality Plan			(1,2)		Purpose For Monitoring (3)		
Unit	*Well I.D.*	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
01U	01U151	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U152	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U153	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U154	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U155	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U156	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	—	4.b	
01U	01U157		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U158		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.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	(9)								See Appendix A.2
01U	01U356	EW-6	(9)								See Appendix A.2
01U	01U357	EW-7	(9)								See Appendix A.2
01U	01U358	EW-8									See Appendix A.2
01U	01U901		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U902		(9)(7)(5)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	OR	4.b	
01U	01U903		(7)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	1,7,L(B)	OR	4.b	
01U	01U904		(9)(7)(5)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	1,2,7,L(B)	OR	4.b	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan		(1,2)			Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
Site I Remedial Action											
01U	01U004			---	---	---	---	---	---	---	
01U	01U054			---	---	---	---	---	---	---	
01U	01U064			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	01U132			---	---	---	---	---	---	---	
01U	01U631			---	---	---	---	---	---	---	
01U	01U632			---	---	---	---	---	---	---	
01U	01U634			---	---	---	---	---	---	---	
01U	01U635			---	---	---	---	---	---	---	
01U	01U636			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	01U638			---	---	---	---	---	---	---	
01U	01U639			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	01U640			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	01U642			---	---	---	---	---	---	---	
01U	01U652			---	---	---	---	---	---	---	
01U	01U666			---	---	---	---	---	---	---	
01U	01U667			---	---	---	---	---	---	---	
01U	01U668			---	---	---	---	---	---	---	
01U	01U675			---	---	---	---	---	---	---	
01U	482086	I01MW		1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	482087	I05MW		1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	482088	I02MW		1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1a, OR	1a, OR	
01U	482089	I04MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	
01U	482090	I03MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan	(1,2)				Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	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			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,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			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U604			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,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			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,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)	—	3.a	
01U	01U615			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U616			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U617			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U618			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U619			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U620			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U621			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	3.a	
01U	01U622			—	—	—	—	—	—	—	
01U	01U623			—	—	—	—	—	—	—	
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		1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,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	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
TCAAP Groundwater Recovery System											
03F	03F302	B1									See Appendix A.2
03F	03F303	B2									See Appendix A.2
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									See Appendix A.2
03F	03F312	B11									See Appendix A.2
03U	03U001			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U002			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U003			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U004			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U005			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U006			L(A)	—	—	—	—	—	—	Sealed 2000
03U	03U007		(6)	1,L(A)	—	1,L(A)	—	1,L(A)	Background	1.a	
03U	03U008			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U009		(6)	1,L(A)	—	1,L(A)	—	1,L(A)	Background	1.a	
03U	03U010			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U011			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U012			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U013			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U014			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U015			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U016			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U017			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U018			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U019			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U020			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U021			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U022			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U023			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U024			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U025			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U026			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U027			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U028			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U029			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U030			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U031			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U032			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U075			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U076			L(A)	—	L(A)	—	L(A)	—	1.a	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan			(1,2)		Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
03U	03U077			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U078			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U079			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U082			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U083			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U084			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U087			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U088			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U089			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U090			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U092			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U093			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	03U094			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	03U096			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U097			—	—	—	—	—	—	—	
03U	03U099			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	03U111			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U112			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U113			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U114			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U121			—	—	—	—	—	—	—	
03U	03U124			—	—	—	—	—	—	—	
03U	03U129			—	—	—	—	—	—	—	
03U	03U301	SC1									See Appendix A.2
03U	03U314	SC2									See Appendix A.2
03U	03U315	SC3									See Appendix A.2
03U	03U316	SC4									See Appendix A.2
03U	03U317	SC5									See Appendix A.2
03U	03U521			—	—	—	—	—	—	—	
03U	03U647			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U648			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U658			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U659			1,L(A)	—	1,L(A)	—	1,L(A)	—	1.a	
03U	03U671			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U672			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U674			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U675			—	—	—	—	—	—	—	
03U	03U676			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U701			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U702			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U703			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U704			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U705			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U706			L(A)	—	L(A)	—	L(A)	—	1.a	
03U	03U707			L(A)	—	L(A)	—	L(A)	—	1.a	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan		(1,2)			Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
03U	03U708			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	03U709			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U710			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U711			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U715			L(A)	---	L(A)	---	L(A)	---	1.a	
03U	03U716			L(A)	---	L(A)	---	L(A)	---	1.a	
03U	03U801			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	03U803			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U804			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U805			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03U	03U806			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
03U	519288	E101-MW		---	---	---	---	---	---	---	
03U	519289	E102-MW		---	---	---	---	---	---	---	
03U	519290	E103-MW		---	---	---	---	---	---	---	
03U	519291	1291501-MW		---	---	---	---	---	---	---	
03M	03M001			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M002			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M003			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M004			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M005			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M007			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M010			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M012			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M013			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M017			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M020			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03M	03M713			L(A)	---	L(A)	---	L(A)	---	1.a	
03M	03M802			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03M	03M806			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L001			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L002			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L003			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L004			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L005			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L007		(6)	1,L(A)	---	1,L(A)	---	1,L(A)	Background	1.a	
03L	03L010			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L012			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L013			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L014			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L017			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L018			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L020			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L021			L(A)	---	L(A)	---	L(A)	---	1.a	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan		(1,2)			Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
03L	03L027			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L028			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L029			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L077			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L078			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L079			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L080			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L081			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L084			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L086			---	---	---	---	---	---	---	
03L	03L091			---	---	---	---	---	---	---	
03L	03L113			L(A)	---	L(A)	---	L(A)	---	1.a	
03L	03L137			---	---	---	---	---	---	---	
03L	03L138			---	---	---	---	---	---	---	
03L	03L802			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L806			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L809			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
03L	03L833			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U001			L(A)	---	L(A)	---	L(A)	---	1.a	
PC	04U002			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U003			L(A)	---	L(A)	---	L(A)	---	1.a	
PC	04U007		(6)	1,L(A)	---	1,L(A)	---	1,L(A)	Background	1.a	
PC	04U012			L(A)	---	L(A)	---	L(A)	---	1.a	
PC	04U020			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U027			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U077			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U510		(6)	1,L(A)	---	1,L(A)	---	1,L(A)	Background	1.a	
PC	04U701			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U702			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U708			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U709			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U711			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U713			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U714			L(A)	---	L(A)	---	L(A)	---	1.a	
PC	04U802			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
PC	04U806			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
PC	04U833			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
J	04J077			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
J	04J702			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
J	04J708			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
J	04J713			1,L(A)	---	1,L(A)	---	1,L(A)	OR	1.a	
J	04J714			L(A)	---	L(A)	---	L(A)	---	1.a	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan			(1,2)		Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
PC/J	PJ#003			L(A)	---	L(A)	---	L(A)	---	1.a	
PC/J	PJ#027			L(A)	---	L(A)	---	L(A)	---	1.a	
PC/J	PJ#074			---	---	---	---	---	---	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									See Appendix A.2
PC/J	PJ#313	B12									See Appendix A.2
PC/J	PJ#501	TCAAP #1		---	---	---	---	---	---	---	
PC/J	PJ#502	TCAAP #2		---	---	---	---	---	---	---	
PC/J	PJ#503	TCAAP #3		---	---	---	---	---	---	---	
PC/J	PJ#802			L(A)	---	L(A)	---	L(A)	---	1.a	
PC/J	PJ#806			1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
SG	Staff Gauges			L(A)	---	---	---	---	---	---	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
Unit 1 Wells											
01U	01U003			—	—	—	—	—	—	—	
01U	01U011			—	—	—	—	—	—	—	
01U	01U012			—	—	—	—	—	—	—	
01U	01U022			—	—	—	—	—	—	—	
01U	01U033			—	—	—	—	—	—	—	
01U	01U034			—	—	—	—	—	—	—	
01U	01U035			—	—	—	—	—	—	—	
01U	01U036			—	—	—	—	—	—	—	
01U	01U037			—	—	—	—	—	—	—	
01U	01U043			—	—	—	—	—	—	—	
01U	01U044			—	—	—	—	—	—	—	
01U	01U045			—	—	—	—	—	—	—	
01U	01U046			—	—	—	—	—	—	—	
01U	01U050			—	—	—	—	—	—	—	
01U	01U051			—	—	—	—	—	—	—	
01U	01U053			—	—	—	—	—	—	—	
01U	01U054			—	—	—	—	—	—	—	
01U	01U060			—	—	—	—	—	—	—	
01U	01U062			—	—	—	—	—	—	—	
01U	01U072			—	—	—	—	—	—	—	
01U	01U085			—	—	—	—	—	—	—	
01U	01U098			—	—	—	—	—	—	—	
01U	01U100			—	—	—	—	—	—	—	
01U	01U101			—	—	—	—	—	—	—	
01U	01U122			—	—	—	—	—	—	—	
01U	01U130			—	—	—	—	—	—	—	
01U	01U131			—	—	—	—	—	—	—	
01U	01U524			—	—	—	—	—	—	—	
01U	01U525			—	—	—	—	—	—	—	
01U	01U526			—	—	—	—	—	—	—	
01U	01U527			—	—	—	—	—	—	—	
01U	01U803			—	—	—	—	—	—	—	
01U	01U805			—	—	—	—	—	—	—	
01U	01U806			—	—	—	—	—	—	—	
01L	01L811			—	—	—	—	—	—	—	

Appendix A.1

FY 1999 - FY 2003 Monitoring Plan for Groundwater Monitoring Wells

Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 99	Jun 00	Jun 01	Jun 02	Jun 03	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03U	03U832			—	—	—	—	—	—	—	
03M	03M848			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03L	03L673			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03L	03L832			L(B)	—	L(B)	—	L(B)	—	1.a	
03L	03L848			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03L	03L854			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03L	03L859			L(A)	—	L(A)	—	L(A)	—	1.a	
03L	03L860			L(A)	—	L(A)	—	L(A)	—	1.a	
03L	03L861			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
03L	476837	MW15H		1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U414	414U4	8	—	1,L(A)	—	—	—	—	—	
PC	04U673			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U832			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U845			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U848			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U851			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U852			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U854			L(A)	—	L(A)	—	L(A)	—	1.a	
PC	04U859			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U860			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U861			1,L(A)	—	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U863	323U4	8	1,L(A)	1,L(A)	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U864	324U4	8	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
PC	04U865	325U4	8	1,L(A)	1,L(A)	1,L(A)	—	1,L(A)	OR	1.a	
PC	04U866	326U4	8	L(A)	1,L(A)	L(A)	—	L(A)	OR	1.a	
PC	520931	NBM #13									See Appendix A.2
J	04J864	324 J	8	1,L(A)	1,L(A)	1,L(A)	1,L(A)	1,L(A)	OR	1.a	
J	04J866	326 J	8	1,L(A)	1,L(A)	1,L(A)	—	1,L(A)	OR	1.a	

A.2 Remedial Treatment Systems

Appendix A.2
FY 2000 - FY 2003 Monitoring Plan for Remedial Treatment Systems

OU1: DEEP GROUNDWATER(1)

Location	Sampling Frequency	Parameters
• Extraction Wells NBM#4, #14, and #15 (also NBM #3, #5, and #6)	- Monthly	- Pumping Volumes
	- Monthly	- Cat. 1(2)
• PGAC Effluent	- Monthly	- Cat. 1(2)

OU2: SITES D & G SOIL VAPOR EXTRACTION (SVE) SYSTEMS [Only if Operating!]

Location	Sampling Frequency	Parameters
• Site D	- Monthly	- Flowrate, TRCLE, 111TCE
• Site G	- Monthly	- Flowrate, cis-12DCE, TRCLE, 111TCE

OU2: SITE A SHALLOW GROUNDWATER

Location	Sampling Frequency	Parameters
• Extraction Wells 01U351-01U358	- Monthly	- Pumping Volumes
	- Monthly	- Water Levels
	- Annual (4)	- Cat. 1(2), Benzene
• Extraction/Discharge System Effluent	- Monthly	- 12DCE, TRCLE, TCLEE, Hg
	- Annually (3)	- pH, COD, and TSS

OU2: SITE K REMEDIAL ACTION

Location	Sampling Frequency	Parameters
• Treatment System Effluent (Outfall 391 (010))	- See Appendix A.3	- See Appendix A.3
• Extracted Groundwater	- Monthly	- Volume

OU2: TCAAP GROUNDWATER RECOVERY SYSTEM (TGRS)

Location	Sampling Frequency	Parameters
• Extraction Wells	- Semi-Annually	- Water Levels and Cat. 1(2)
• Treatment System Influent	- Monthly	- Cat. 1(2)
	- Monthly	- Volume
• Treatment System Effluent	- Monthly	- Cat. 1(2)

OPERABLE UNIT 3 PLUME GROUNDWATER RECOVERY SYSTEM (PGRS)(1)

Location	Sampling Frequency	Parameters
• Extraction Well (NBM#13)	- Monthly	- Pumping Volume
	- Monthly	- Cat. 1(2)
• Treatment System Effluent	- Monthly	- Cat. 1(2)

NOTE:

(1) Performed by the City of New Brighton using their QAPP.
(2) The parameter list for Category 1 is presented in Appendix C.2.
(3) Sampling TSS/COD annually if the following conditions are met:
- After an Industrial Discharge permit issuance, four consecutive routine self-monitoring reports must exhibit a TSS of 125 mg/l or less and a COD of 250 mg/l or less (50% of the Strength Charge limits).
- The Permittee must have no history of Strength Charge from this system.
- The Permittee must formally apply for this reduced reporting requirement through a letter illustrating the above points.

(4) Sample 01U355, 01U356, and 01U357 quarterly from September 2000 through June 2001 (Sept., Dec., March, June).

A.3 Surface Water

Appendix A.3

FY 1999 - FY 2003 Monitoring Plan for Surface Water

Analysis	Units	Outfall 010 Site K Effluent	20700 Rice Crk In	20800 Rice Crk Out
Flow Rate	M gal/day	Continuous	Q	Q
Total Flow	M gal	M	- -	- -
pH		Q	Q	Q
Cyanide	ug/l	Q	Q	Q
Copper	ug/l	Q	Q	Q
Lead	ug/l	Q	Q	Q
Mercury	ug/l	Q	Q	Q
Phosphorus (Total)	mg/l	Q	Q	Q
Silver	ug/l	Q	Q	Q
Zinc	ug/l	Q	Q	Q
Trichloroethene	ug/l	Q	Q	Q
1,1-Dichloroethene	ug/l	Q	Q	Q
1,1-Dichloroethane	ug/l	Q	Q	Q
cis-1,2-Dichloroethene	ug/l	Q	Q	Q
Trans-1,2-Dichloroethe	ug/l	Q	Q	Q
Vinyl Chloride	ug/l	Q	Q	Q
1,2-Dichloroethane	ug/l	Q	Q	Q

Notes:
M = Analysis required once a month
Q = Analysis required once a quarter

APPENDIX B

Appendix B

Hydrogeologic Units, Well Nomenclature, and Well Index

B.1 Description of Hydrogeologic Units and Well Nomenclature

Appendix B.1

Description of Hydrogeologic Units and Well Nomenclature

On- and off-post wells have been installed in four hydrogeologic units beneath the site. These hydrogeologic units, as referred to in this report, 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. Well designations consist of six characters, such as 03U093. The first two characters represent the hydrogeologic unit in which the well is completed, as follows:

01	-	Unit 1
03	-	Unit 3
04	-	Unit 4: Prairie du Chien Group <u>or</u> Jordan Formation
PJ	-	Unit 4: Prairie du Chien Group <u>and</u> Jordan Formation

The third character represents the relative position of the well screen or open hole within the specified hydrogeologic unit, as follows:

U	-	upper portion
M	-	middle portion
L	-	lower portion
J	-	Jordan Sandstone
F	-	fully penetrating Unit 3
#	-	open hole (total or partial thickness)

The remaining three characters represent the well number, as follows:

001 thru 500	USAEC wells and additional wells installed by others adjacent to an existing well with the 001-500 designation.
501 thru 600	TCAAP wells.
601 thru 800	On-post Alliant Techsystems Inc. wells.
801 thru 999	Off-post Alliant Techsystems Inc. wells.

Off-post wells installed by parties other than USAEC, TCAAP, or Alliant Techsystems Inc. are designated by their Minnesota unique number. A well-designation cross-reference guide is included as Appendices B.2 and B.3, which lists all wells of concern, the USAEC designation or Minnesota unique number, and any other name(s) the wells may have.

B.2 TCAAP Well Index Sorted by Minnesota Unique Number

Note:

In the "Well Type" column of the following index, the different types are 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

TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
107405		ROEBKE	OFF	UN				
110485		NEW BRIGHTON #12	OFF	MUNI				P-21
114410	03U521		OFF	MON			F-7	
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				V-24
191942		118PDC/MODEL STONE	OFF	MON				R-24
194701	01U620	OW120U1	ON	MON			F-3	
194702	01U621	PW121U1	ON	MON			F-3	
194703	01U622	OW122U1	ON	MON			F-3	
194704	01U623	OW123U1	ON	MON			F-3	
194716	01U634	OW504U1	ON	MON			J-5	
194717	01U638	OW508U1		MON				
194718	01U639	OW509U1	ON	MON			K-6	
194719	01U640	OW510U1	ON	MON			K-6	
194720	01U631	OW501U1	ON	MON				
194721	01U632	OW502U1		MON				
194722	01U635	OW505U1	ON	MON				
194723	01U636	OW506U1	ON	MON.			K-5	
194724	01U642	OW512U1	ON	MON			K-7	
194725	01U612	OW112U1	ON	MON		194758	E-3	
194726	01U613		ON	MON		194759	E-3	
194727	01U615	OW115U1	ON	MON		194760	F-3	
194728	01U616	OW116U1	ON	MON		194761	F-3	
194729	01U617	OW117U1	ON	MON		194770	F-3	
194730	01U618	OW118U1	ON	MON		194771	F-3	
194772	01U619	PW119U1	ON	MON			F-3	
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				Z-23
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	✓			BB-23
200154		U OF M GOLF COURSE	OFF	IRR				CC-25
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				V-21
200525		PLETSCHER	OFF	UN				

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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.				X-22
200804		ST. ANTHONY #3	OFF	MUNI				X-22
200812		GROSS GOLF COURSE #1	OFF	COM				AA-22
200814		AMERICAN LINEN	OFF	IND				CC-22
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				T-20
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	✓		E-2	
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓		D-8	
206750		SHORE #4	OFF	MUNI				
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓		H-5	
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.			F-4	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓		H-5	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND			G-4	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND			H-4	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓		I-6	
206760	03M509		ON	MON			J-6	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM			J-6	
206787		MOUNDSVIEW H.S.	OFF	P.S.				S-25
206789		NEW BRIGHTON #1	OFF	MUNI	✓			
206791		NEW BRIGHTON #7	OFF	MUNI				U-23
206792		NEW BRIGHTON #4						
206793		NEW BRIGHTON #3	OFF	MUNI				S-21
206794		NEW BRIGHTON #9	OFF	MUNI				T-21
206795		NEW BRIGHTON #8	OFF	MUNI				T-21
206796		NEW BRIGHTON #5	OFF	MUNI				
206797		NEW BRIGHTON #6	OFF	MUNI				T-21
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				
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND			C-12	
231845		MNDOT CIVIL DEFENSE TRAIN.	ON/OFF	P.S.			A-4	
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND 8/	✓		D-8	
231857	03M505			ABAND	✓		K-12	
231878		MENGELKOCH #2	OFF	UN				R-25
232067		NBR 135	OFF	UN				

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
232069		UHIL	OFF	UN				
233221		REUBEN MEAT	OFF	DOM				CC-20
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓			Z-21
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			G-2	0-25
234136	03M001	S1M3	ON	MON			G-2	0-25
234137	03L001	S1L3	ON	MON			G-2	0-25
234138	04U001	S1U4	ON	MON			G-2	0-25
234139	03U002	S2U3	ON	MON			I-4	P-25
234140	03M002	S2M3	ON	MON			I-4	P-25
234141	03L002	S2L3	ON	MON			I-4	P-25
234142	03U003	S3U3	ON	MON			K-5	Q-26
234143	03M003	S3M3	ON	MON			K-5	Q-26
234144	03L003	S3L3	ON	MON			K-5	Q-26
234145	03U004	S4U3	ON	MON			K-7	
234146	03M004	S4M3	ON	MON			K-7	
234147	03L004	S4L3	ON	MON			K-7	
234148	03U005	S5U3	ON	MON			K-9	
234149	03U006	S6U3	ON	MON			K-11	
234150	03U007	S7U3	ON	MON			J-12	
234151	03M007	S7M3	ON	MON			J-12	
234152	03L007	S7L3	ON	MON			J-12	
234153	03U008	S8U3	ON	MON			F-12	
234154	03U009	S9U3	ON	MON			B-12	
234155	03U010	S10U3	ON	MON			A-10	
234156	03M010	S10M3	ON	MON			A-10	
234157	03L010	S10L3	ON	MON			A-10	
234158	03U011	S11U3	ON	MON			A-7	
234159	03U012	S12U3	ON	MON			B-3	
234160	03M012	S12M3	ON	MON			B-3	
234161	03L012	S12L3	ON	MON			B-3	
234162	03U013	S13U3	ON	MON			E-2	
234163	03M013	S13M3	ON	MON			E-2	
234164	03L013	S13L3	ON	MON			E-2	
234165	03U014	S14U3	ON	MON			I-7	P-27
234166	03U015	S15U3	ON	MON			F-5	
234167	03U016	S16U3	ON	MON			F-9	0-27
234168	03U017	S17U3	ON	MON			H-5	
234169	03M017	S17M3	ON	MON			H-5	
234170	03L017	S17L3	ON	MON			H-5	
234171	03U018	S18U3	ON	MON			H-6	
234172	03U019	S19U3	ON	MON			H-8	
234173	03U020	S20U3	ON	MON			I-6	P-26
234174	03M020	S20M3	ON	MON			I-6	P-26
234175	03L020	S20L3	ON	MON			I-6	P-26
234176	03U021	S21U3	ON	MON			J-4	P-26
234193	04U003	S3U4	ON	MON			K-5	Q-26
234194	04U002	S2U4	ON	MON			I-4	P-25

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location	
							On-post	Off-post
234195	04U007	S7U4	ON	MON			J-12	
234196	04U012	S12U4	ON	MON			B-3	
234197	04U020	S20U4	ON	MON			I-6	P-26
234198	01U004	S4U1	ON	MON			K-7	
234199	01U011	S11U1	ON	MON			A-7	
234200	01U012	S12U1	ON	MON			B-3	
234201	01U022	S22U1	ON	MON			B-6	
234202	01U033	S33U1	ON	MON			A-10	
234204	01U034	S34U1	ON	MON			A-8	
234205	01U035	S35U1	ON	TEST			A-7	
234206	01U036	S36U1	ON	MON			A-7	
234207	01U037	S37U1		MON				
234208	01U038	S38U1		MON			A-6	
234209	01U039	S39U1	ON	MON			A-4	
234210	01U040	S40U1	ON	MON			B-4	
234211	01U041	S41U1	ON	MON			B-5	
234212	01U044	S44U1	ON	MON			C-4	
234215	01U045	S45U1	ON	MON			D-4	
234216	01U046	S46U1	ON	MON			D-4	
234217	01U047	S47U1	ON	MON			E-2	
234218	01U048	S48U1		MON			E-2	
234221	01U050	S50AU1		MON			H-2	
234222	01U051	S51U1	ON	MON			H-2	
234223	01U052	S52U1	ON	MON			E-3	
234225	01U053	S53AU1	ON	MON			K-4	
234227	01U054	S54AU1		MON			K-5	
234235	01U060	S60U1	ON	MON			J-10	
234237	01U062	S62U1	ON	MON			J-3	
234239	01U063	S63U1	ON	MON			B-4	
234240	01U064	S64U1	ON	MON			J-6	
234241	01U065	S65U1	ON	MON			F-2	
234243	01U067	S67U1	ON	MON			B-6	
234250	01U072	S72AU1	ON	MON			E-9	
234301		DEWITT	OFF	UN				
234305		GLENN BEGGIN	OFF	UN				
234319		HIDE & TALLOW #1	OFF	UN				P-25
234327		BRESKE	OFF	UN				
234335		MENGELKOCH #1	OFF	UN				R-25
234337		MENGELKOCH #3	OFF	UN	✓			R-25
234350		GORDON	OFF	UN				
234351		YEMPA	OFF	UN				
234352		1206 12TH AV NW	OFF	UN				R-23
234353		LENTSCH'S ICE WK.	OFF	UN				P-25
234355		KINGDOM HALL	OFF	UN				
234356		NORDQUIST P43	OFF	UN				Q-25
234357		PHILLIPS PET P46	OFF	UN				P-25
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	✓			P-25

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234430		CMIEL	OFF	UN	✓			Q-26
234431		HARSTAD	OFF	UN				
234463		KEN SOLIE	OFF	UN				V-21
234546		HONEYWELL RIDGEWAY	OFF	UN				BB-21
234547		HONEYWELL RIDGEWAY	OFF	UN				BB-21
234549		REINER	OFF	IRR				Y-21
235539		OLD HOTEL	OFF	UN				Q-24
235557		HIDDEN FALLS PARK W.WELL	OFF	P.S.				
235565	PJ#074	S74PJ		MON			I-6	
235619		SHRINERS HOSPITAL	OFF	P.S.				
235735		FLOUR CITY ARCHITECTURAL	OFF	COM				
235748	03L014	S14L3	ON	MON			I-7	P-27
235749	03L018	S18L3	ON	MON			H-6	
235750	03L021	S21L3	ON	MON			J-4	P-26
235751	03L027	S27L3	ON	MON			J-6	
235752	03L028	S28L3		MON			J-6	
235753	03L029	S29L3		MON		236066	K-5	P-26
236066	03U094	S94U3	ON	MON			I-7	P-27
236067	03L091	S91L3	ON	MON			G-7	
236068	03L086	S86L3	ON	MON			J-9	
236069	03U084	S84U3	ON	MON			H-3	0-25
236070	03L081	S81L3	ON	MON			I-8	
236071	03L080	S80L3	ON	MON			J-6	
236072	03U079	S79U3	ON	MON			K-5	Q-26
236073	03U078	S78U3	ON	MON			J-4	P-26
236074	03L078	S78L3	ON	MON			J-4	P-26
236075	03U077	S77U3	ON	MON			I-3	P-25
236076	03L077	S77L3	ON	MON			I-3	P-25
236077	03U076	S76U3	ON	MON			G-2	
236078	03U075	S75U3	ON	MON			F-2	
236079	03L005	S5L3	ON	MON			K-9	
236080	03L113	WF1L3	ON	MON			G-8	0-27
236122		NWR	OFF	ABAND				Q-24
236176	01U003	S3U1	ON	MON			K-5	Q-26
236177	01U043	S43AU1		MON			C-5	
236178	03U022	S22U3		MON			B-6	
236179	03U023	S23U3		MON			B-5	
236180	03U024	S24U3		MON			C-5	
236181	03U025	S25U3		MON			D-4	
236182	03U026	S26U3	ON	MON			H-7	
236183	03U027	S27U3		MON			J-6	
236184	03U028	S28U3		MON			J-6	
236185	03U029	S29U3		MON			K-5	P-26
236186	03U030	S30U3		MON			J-6	P-26
236187	03U031	S31U3		MON			F-4	
236188	03U032	S32U3		MON			G-7	
236189	01U601	OW101U1	ON	MON			F-3	
236190	01U602	OW102U1	ON	MON			F-3	
236191	01U603	OW103U1	ON	MON			E-3	
236192	01U604	OW104U1	ON	MON			E-3	
236193	01U605	OW10571	ON	MON			E-3	
236194	01U524	FA4U1	ON	PIEZ.			I-3	

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236195	01U527	FV8U1	ON	PIEZ.			I-3	
236196	01U525	FW5U1	ON	PIEZ.			J-4	
236197	01U526	FV12U1	ON	PIEZ.			I-4	
236437	PJ#802	T2PJ	OFF	MON		421437	K-4	Q-26
236449	03U801	T1U3	OFF	MON			K-4	Q-26
236450	04U802	T2U4	OFF	MON			K-4	Q-26
236452	01U803	T3U1	OFF	TEST		424053	K-3	Q-25
236453	03U803	T3U3	OFF	MON		421434	K-3	Q-25
236455	03U804	T4U3	OFF	MON		421433	J-4	P-25
236457	01U805	T5U1	OFF	MON		424060	J-3	P-25
236458	03U805	T5U3	OFF	MON		421432	J-3	P-25
236460	01U806	T6U1	OFF	MON		424058	I-3	P-25
236461	03U806	T6U3	OFF	MON		421431	I-3	P-25
236462	03M806	T6M3	OFF	MON		421430	I-3	P-25
236463	03L806	T6L3	OFF	MON		421429	I-3	P-25
236464	04U806	T6U4	OFF	MON		421428	I-3	P-25
236465	PJ#806	T6PJ	OFF	MON		421427	I-3	P-25
236468	PJ#003	S3PJ	ON	MON			K-5	Q-26
236469	PJ#027	S27PJ	ON	MON			J-6	
236471	01U807	T7U1	OFF	TEST		424059		
236476	03U082	S82U3	ON	MON			B-7	
236478	03U083	S83U3	ON	MON			E-4	
236479	01U085	S85U1	ON	MON			D-4	
236480	03U087	S87U3	ON	MON			F-6	
236482	03U088	S88U3	ON	MON			F-6	
236483	03U089	S89U3	ON	MON			F-6	
236485	03U090	S90U3	ON	MON			H-7	
236487	03U092	S92U3	ON	MON			H-6	
236489	03U093	S93U3	ON	MON			H-6	
236491	03U096	S96U3	ON	MON			G-6	
236493	03U097	S97U3	ON	MON			E-9	
236494	01U098	S98U1	ON	MON			J-10	
236495	03U099	S99U3	ON	MON			K-10	
236497	01U100	S100U1	ON	MON			B-9	
236498	01U101	S101U1	ON	MON			B-8	
236499	01U102	S102U1	ON	MON			A-5	
236500	01U103	S103U1	ON	MON			A-6	
236501	01U104	S104U1	ON	MON			A-6	
236502	01U105	S105U1	ON	MON			A-6	
236503	01U106	S106U1	ON	MON			A-6	
236504	01U107	S107U1	ON	MON			B-6	
236505	01U108	S108U1	ON	MON			A-6	
236506	01U109	S109U1	ON	MON			B-6	
236507	01U110	S11OU1	ON	MON			B-6	
236508	03U111	S111U3	ON	MON			E-9	
236510	03U112	S112U3	ON	MON			H-7	0-27
242124	03U113	WF1U3	ON	MON			G-8	0-27
242125	03U114	WF2U3	ON	MON			H-7	0-27
242127	01U607	OW107U1	ON	MON			E-3	
242128	01U608	OW108U1	ON	MON			F-3	
242129	01U609	OW109U1	ON	MON			F-3	
242130	01U610	OW110U1	ON	MON				

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242131	01U611	OW111U1	ON	MON			E-3	
242132	03U647	OW517U3	ON	MON			J-6	
242133	03U648	OW518U3	ON	MON			J-6	P-26
242134	01U652	OW522U1	ON	MON			J-6	
242135	01U666	OW536U1	ON	MON			K-5	
242136	01U667	OW537U1	ON	MON			J-6	
242137	01U668	OW538U1	ON	MON			J-6	
242138	04U027	S27U4		MON			J-6	
242153	01U813	H3U1	OFF	MON				P-23
242160	03L079	S79L3	ON	MON			K-5	Q-26
242162		301PB	OFF	UN				
242182	01U624A	BP185A	ON	PIEZ			F-3	
242183	01U624B	BP185B	ON	PIEZ			F-3	
242184	01U624C	BP185C	ON	PIEZ			F-3	
242185	01U624D	BP185D	ON	PIEZ			F-3	
242186	01U625A	BP285A	ON	PIEZ			F-3	
242187	01U625B	BP285B	ON	PIEZ			F-3	
242188	01U625C	BP285C	ON	PIEZ			F-3	
242189	01U625D	BP285D	ON	PIEZ			F-3	
242190	01U626A	BP385A	ON	PIEZ			F-3	
242191	01U626B	BP385B	ON	PIEZ			F-3	
242192	01U626C	BP385C	ON	PIEZ			F-3	
242193	01U626D	BP385D	ON	PIEZ			F-3	
242194	01U627A	BP485A	ON	PIEZ			F-3	
242195	01U627B	BP485B	ON	PIEZ			F-3	
242196	01U627C	BP485C	ON	PIEZ			F-3	
242197	01U627D	BP485D	ON	PIEZ			F-3	
242198	01U628A	BP585A	ON	PIEZ			F-3	
242199	01U628B	BP585B	ON	PIEZ			F-3	
242200	01U628C	BP585C	ON	PIEZ			F-3	
242201	01U628D	BP585D	ON	PIEZ			F-3	
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				U-23
409546		PCA2L3	OFF	TEST				S-24
409547		PCA1U4	OFF	TEST				R-24
409548		PCA2U4	OFF	TEST				S-24
409549		PCA3U4	OFF	TEST				R-22
409550		PCA6U3	OFF	TEST				P-25
409555		PCA5U4	OFF	TEST				V-22
409556		PCA4L3	OFF	TEST				S-22
409557		PCA1L3	OFF	TEST				R-24
409595		B109U3	OFF	ABAND				R-24
409596		B118U3	OFF	MON				R-24
409597		B118L3	OFF	IND				R-24
409598		B117U3	OFF	ABAND				R-24
416051	03M848	308M3	OFF	MON				Q-25
416078	04U848	308U4	OFF	TEST				Q-25
416080	04U852	312U4	OFF	MON				V-23

TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
416081	03L858	318L3	OFF	MON				X-22
416082	04U849	309U4	OFF	MON				R-23
416143			OFF	ABAND				
416198		311U4	OFF	MON				
416199	03L848	308L3	OFF	MON				Q-25
416200	04U850	310U4	OFF	MON				S-22
420713		HERBST LANDFILL	OFF	MON				
421425	03U659	OW529U3	ON	MON			J-6	P-26
421426	03U658	OW528U3	ON	MON			K-7	
421438	03U671	PO-1	ON	MON			J-4	P-26
421440	03U672	PD2U3	OFF	MON			K-6	Q-26
421441	03U673	PD3U3	OFF	MON			L-3	Q-25
424052	01L822	NW2L1	OFF	TEST				Q-24
424054	01L821	NW1L1	OFF	TEST				Q-24
424055	01L811	H1L1	OFF	TEST				P-24
424056	01L816	H6L1	OFF	ABAND	✓			P-24
424057	01U808	T8U1	ON	MON			J-2	
424061	01L823	NW3L1	OFF	TEST				S-24
424062	01L813	H3L1	OFF	TEST				P-23
426808	03U811	H1U3	OFF	TEST				P-24
426809	03L811	H1L3	OFF	TEST				P-24
426810	03U821	NW1U3	OFF	TEST				Q-24
426811	04U821	NW1U4	OFF	TEST				Q-24
426812	03U822	NW2U3	OFF	TEST				Q-24
426813	03L822	NW2L3	OFF	TEST				Q-24
426814	03U824	NW4U3	OFF	TEST				R-24
426815	03L673	PD3L3	OFF	TEST			L-3	Q-25
426816	03L813	H3L3	OFF	TEST				P-23
426817	03L802	T2L3	OFF	TEST			K-4	Q-26
426818	03M802	T2M3	OFF	TEST			K-4	Q-26
426842	03F302	B1	ON	REM			K-5	Q-26
426843	03F303	B2	ON	REM			K-4	P-26
426844	03F304	B3	ON	REM			J-4	P-25
426845	03F305	B4	ON	REM			J-3	P-25
426846	03F306	B5	ON	REM			I-3	P-25
426847	03F307	B6	ON	REM			I-3	P-25
426848	03U701	701U3	ON	MON			I-3	P-25
426849	04U701	701U4	ON	MON			I-3	P-25
426850	03U702	702U3	ON	MON			I-3	P-25
426851	04U841	301U4	OFF	TEST				Q-25
426852	03M843	303M3	OFF	TEST				Q-24
426853	04U843	303U4	OFF	TEST				Q-24
426854	04U844	304U4	OFF	TEST				R-24
426855	04U845	305U4	OFF	MON				R-25
426856	04U846	306U4	OFF	MON				S-22
426857	04U847	307U4	OFF	MON				P-24
426858	03L853	313L3	OFF	MON				Q-24
426859	03L854	314L3	OFF	MON				R-25
426860	04U855	315U4	OFF	MON				Q-22
426861	03L856	316L3	OFF	MON				P-23
426862	03U815	H5U3	OFF	TEST				P-23
426863	03U831	OM1U3	OFF	TEST				R-24

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SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
426864	03U832	OM2U3	OFF	TEST				R-24
426865	03L832	OM2L3	OFF	TEST				R-24
426866	04U832	OM2U4	OFF	TEST				R-24
426867	04U673	PD3U4	OFF	TEST			L-3	Q-25
426868	03L809	T9L3	OFF	MON				P-25
426876	04U702	702U4	ON	MON			I-3	P-25
426877	04U077	ST77U4	ON	MON			I-3	P-25
426878	03U703	703U3		MON			K-4	P-26
426879	03U708	708U3	ON	MON			J-4	P-25
426880	04U708	708U4	ON	MON			J-4	P-25
426881	03U709	709U3	ON	MON			J-3	P-25
426882	04U709	709U4	ON	MON			J-3	P-25
426883	03U704	704U3	ON	MON			E-7	
426884	03U705	705U3	ON	MON			E-7	
426885	03U706	706U3	ON	MON			E-6	
426886	03U707	707U3	ON	MON			C-7	
427410	01U120		ON	MON			A-6	
427411	01U115		ON	MON			A-5	
427412	01U116		ON	MON			A-5	
427413	01U117		ON	MON			A-5	
427414	01U118		ON	MON			B-5	
427415	01U119		ON	MON			A-6	
434031	04U711	711U4	OFF	MON			J-3	P-25
434032	03U710	71OU3	ON	MON			K-5	Q-26
434033	03U711	711U3	OFF	MON			J-3	P-25
434034	04U861	321U4	OFF	MON				R-24
434035	04U860	320U4	OFF	MON				R-25
434036	04U859	319U4	OFF	MON				Q-25
434037	03L841	301L3	OFF	MON				Q-25
434038	03L860	320L3	OFF	MON				R-25
434039	03L861	321L3	OFF	MON				R-24
434040	03L859	319L3	OFF	MON				Q-25
439701	04U854	314U4	OFF	MON				R-25
440884	03U121		ON	MON			H-7	
440885	03M005	ST-5-M3	ON	MON			K-9	
440886	03U129		ON	MON			D-9	
440887	03L084	ST84L3	ON	MON			H-3	0-25
440888	01U122		ON	MON			A-8	
440889	01U125		ON	MON			A-5	
440890	01U126		ON	MON			A-6	
440891	01U127		ON	MON			A-6	
440892	01U128		ON	MON			E-3	
440893	01U133		ON	MON			A-6	
440894	01U134		OFF	MON				
440895	01U130		ON	MON			G-2	
440896	03U124		ON	MON			G-7	
447889	04U871	401U4	OFF	MON				U-21
447890	04U882	412U4	OFF	MON				Z-22
447891	04U881	411U4	OFF	MON				X-20
447892	04U883	413U4	OFF	MON				Z-23
447893	01U350		ON	MON			A-6	
447894	PJ#318	318U4	OFF	MON				X-22

TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
447895	04U880	410U4	OFF	MON				V-19
447896	04U877	407U4	OFF	MON				T-22
447898	04U875	405U4	OFF	MON				U-20
447899	03L846	306L3	OFF	MON				S-22
447900	04U879	409U4	OFF	MON				R-21
447988	04U872	402U4	OFF	MON				V-21
447998	01U135		ON	MON			A-4	
447999	01U136		ON	MON			A-3	
453821	03U317	SC-5	ON	REM			H-6	
453822	03U316	SC-4	ON	REM			H-6	
453823	03F308	B7	ON	REM			H-2	0-25
453824	03F312	B11	ON	REM			K-5	Q-26
453825	PJ#309	B8	ON	REM			J-3	P-25
453826	PJ#310	B9	ON	REM			I-3	P-25
453827	PJ#311	B10	ON	REM			H-2	P-25
453828	PJ#313	B12	ON	REM			H-2	0-25
453829	04J708		ON	MON			J-3	P-25
453830	04J713		ON	MON			H-2	0-25
453831	03M713		ON	MON			H-2	0-25
453832	04U714		ON	MON			G-2	0-25
453833	03U715	SM1	ON	MON			I-6	
453834	03U716	SM2	ON	MON			H-6	
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				Z-21
482708	04J835		OFF	MON				Z-22
482709	04J834		OFF	MON				Y-22
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON				T-24
500694	03L137		ON	MON				
505189	01U137		ON	MON			A-5	
505190	01U138		ON	MON			A-5	
505191	01U139		ON	MON			A-5	
505192	01U140		ON	MON			A-5	
505193	01U141		ON	MON			A-5	
505209	01U902		OFF	MON			A-5	
505210	01U901	H3U1	OFF	MON			A-4	
505618	03L138		ON	MON				
508115	04U322	322U4	OFF	MON				T-24
508117	04J702		ON	MON			I-3	P-25
508118	04J077		ON	MON				
508119	04U713		ON	MON			H-2	0-25
508120	04J714		ON	MON			G-2	0-25
508122	03U314	SC-2	ON	REM			I-6	P-27
509083		NEW BRIGHTON #11	OFF	MUNI				T-23

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SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
512761		GROSS GOLF #2	OFF	IRR				AA-22
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				Y-22
519956	03L833		OFF	MON			I-2	P-25
519957	04U833		OFF	MON			I-2	P-25
520931		NEW BRIGHTON #13	OFF	MUNI				T-24
524047	04U865	325U4	OFF	MON				T-24
524048	04J866	326J	OFF	MON				T-24
524049	04U866	326U4	OFF	MON				T-24
524050	04U864	324U4	OFF	MON				T-24
524051	04J864	324J	OFF	MON				T-24
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.				
538051	01U351		ON	REM				
538052	01U352		ON	REM				
538053	01U353		ON	REM				
538054	01U354		ON	REM				
538055	01U355		ON	REM				
538056	01U356		ON	REM				
538057	01U357		ON	REM				
538058	01U358		ON	REM				
538059	01U904		OFF	MON				
538060	01U903		OFF	MON				
538062	01U157		ON	MON				
538063	01U158		ON	MON				
	PJ#006		ON	MON				
	01U131							
	01U132							
	01U142							
	01U143							
	01U144							
	03U301	SC-1	ON	REM			K-5	P-26
	03L306		ON	MON				
	03U315	SC-3		REM			I-6	
	01U653			MON				
554216		NEW BRIGHTON #14	OFF	MUNI				T-23
	03U674	OW541U3	ON	MON			K-5	
	01U675							
	03U675							

TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
	03U676	OW543U3	ON	MON			J-6	
	04U842			MON				
	03L843	303L3	OFF	MON				Q-24
		MW15D	OFF	MON				
		MW15S	OFF	MON				
		Staff Gauge 1						
		Staff Gauge 2						
		Staff Gauge 3						
582628		NEW BRIGHTON #15	OFF	MUNI				
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				

B.3 TCAAP Well Index Sorted by IRDMIS Number

Note:

In the "Well Type" column of the following index, the different types are 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

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
424055	01L811	H1L1	OFF	TEST				P-24
424062	01L813	H3L1	OFF	TEST				P-23
424056	01L816	H6L1	OFF	ABAND	✓			P-24
424054	01L821	NW1L1	OFF	TEST				Q-24
424052	01L822	NW2L1	OFF	TEST				Q-24
424061	01L823	NW3L1	OFF	TEST				S-24
236176	01U003	S3U1	ON	MON			K-5	Q-26
234198	01U004	S4U1	ON	MON			K-7	
234199	01U011	S11U1	ON	MON			A-7	
234200	01U012	S12U1	ON	MON			B-3	
234201	01U022	S22U1	ON	MON			B-6	
234202	01U033	S33U1	ON	MON			A-10	
234204	01U034	S34U1	ON	MON			A-8	
234205	01U035	S35U1	ON	TEST			A-7	
234206	01U036	S36U1	ON	MON			A-7	
234207	01U037	S37U1		MON				
234208	01U038	S38U1		MON			A-6	
234209	01U039	S39U1	ON	MON			A-4	
234210	01U040	S40U1	ON	MON			B-4	
234211	01U041	S41U1	ON	MON			B-5	
236177	01U043	S43AU1		MON			C-5	
234212	01U044	S44U1	ON	MON			C-4	
234215	01U045	S45U1	ON	MON			D-4	
234216	01U046	S46U1	ON	MON			D-4	
234217	01U047	S47U1	ON	MON			E-2	
234218	01U048	S48U1		MON			E-2	
234221	01U050	S50AU1		MON			H-2	
234222	01U051	S51U1	ON	MON			H-2	
234223	01U052	S52U1	ON	MON			E-3	
234225	01U053	S53AU1	ON	MON			K-4	
234227	01U054	S54AU1		MON			K-5	
234235	01U060	S60U1	ON	MON			J-10	
234237	01U062	S62U1	ON	MON			J-3	
234239	01U063	S63U1	ON	MON			B-4	
234240	01U064	S64U1	ON	MON			J-6	
234241	01U065	S65U1	ON	MON			F-2	
234243	01U067	S67U1	ON	MON			B-6	
234250	01U072	S72AU1	ON	MON			E-9	
236479	01U085	S85U1	ON	MON			D-4	
236494	01U098	S98U1	ON	MON			J-10	
236497	01U100	S100U1	ON	MON			B-9	
236498	01U101	S101U1	ON	MON			B-8	
236499	01U102	S102U1	ON	MON			A-5	
236500	01U103	S103U1	ON	MON			A-6	
236501	01U104	S104U1	ON	MON			A-6	
236502	01U105	S105U1	ON	MON			A-6	
236503	01U106	S106U1	ON	MON			A-6	
236504	01U107	S107U1	ON	MON			B-6	
236505	01U108	S108U1	ON	MON			A-6	
236506	01U109	S109U1	ON	MON			B-6	
236507	01U110	S11OU1	ON	MON			B-6	
427411	01U115		ON	MON			A-5	

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
427412	01U116		ON	MON			A-5	
427413	01U117		ON	MON			A-5	
427414	01U118		ON	MON			B-5	
427415	01U119		ON	MON			A-6	
427410	01U120		ON	MON			A-6	
440888	01U122		ON	MON			A-8	
440889	01U125		ON	MON			A-5	
440890	01U126		ON	MON			A-6	
440891	01U127		ON	MON			A-6	
440892	01U128		ON	MON			E-3	
440895	01U130		ON	MON			G-2	
	01U131							
	01U132							
440893	01U133		ON	MON			A-6	
440894	01U134		OFF	MON				
447998	01U135		ON	MON			A-4	
447999	01U136		ON	MON			A-3	
505189	01U137		ON	MON			A-5	
505190	01U138		ON	MON			A-5	
505191	01U139		ON	MON			A-5	
505192	01U140		ON	MON			A-5	
505193	01U141		ON	MON			A-5	
	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			A-6	
538051	01U351		ON	REM				
538052	01U352		ON	REM				
538053	01U353		ON	REM				
538054	01U354		ON	REM				
538055	01U355		ON	REM				
538056	01U356		ON	REM				
538057	01U357		ON	REM				
538058	01U358		ON	REM				
236194	01U524	FA4U1	ON	PIEZ.			I-3	
236196	01U525	FW5U1	ON	PIEZ.			J-4	
236197	01U526	FV12U1	ON	PIEZ.			I-4	
236195	01U527	FV8U1	ON	PIEZ.			I-3	

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SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
236189	01U601	OW101U1	ON	MON			F-3	
236190	01U602	OW102U1	ON	MON			F-3	
236191	01U603	OW103U1	ON	MON			E-3	
236192	01U604	OW104U1	ON	MON			E-3	
236193	01U605	OW10571	ON	MON			E-3	
242127	01U607	OW107U1	ON	MON			E-3	
242128	01U608	OW108U1	ON	MON			F-3	
242129	01U609	OW109U1	ON	MON			F-3	
242130	01U610	OW110U1	ON	MON				
242131	01U611	OW111U1	ON	MON			E-3	
194725	01U612	OW112U1	ON	MON		194758	E-3	
194726	01U613		ON	MON		194759	E-3	
194727	01U615	OW115U1	ON	MON		194760	F-3	
194728	01U616	OW116U1	ON	MON		194761	F-3	
194729	01U617	OW117U1	ON	MON		194770	F-3	
194730	01U618	OW118U1	ON	MON		194771	F-3	
194772	01U619	PW119U1	ON	MON			F-3	
194701	01U620	OW120U1	ON	MON			F-3	
194702	01U621	PW121U1	ON	MON			F-3	
194703	01U622	OW122U1	ON	MON			F-3	
194704	01U623	OW123U1	ON	MON			F-3	
242182	01U624A	BP185A	ON	PIEZ			F-3	
242183	01U624B	BP185B	ON	PIEZ			F-3	
242184	01U624C	BP185C	ON	PIEZ			F-3	
242185	01U624D	BP185D	ON	PIEZ			F-3	
242186	01U625A	BP285A	ON	PIEZ			F-3	
242187	01U625B	BP285B	ON	PIEZ			F-3	
242188	01U625C	BP285C	ON	PIEZ			F-3	
242189	01U625D	BP285D	ON	PIEZ			F-3	
242190	01U626A	BP385A	ON	PIEZ			F-3	
242191	01U626B	BP385B	ON	PIEZ			F-3	
242192	01U626C	BP385C	ON	PIEZ			F-3	
242193	01U626D	BP385D	ON	PIEZ			F-3	
242194	01U627A	BP485A	ON	PIEZ			F-3	
242195	01U627B	BP485B	ON	PIEZ			F-3	
242196	01U627C	BP485C	ON	PIEZ			F-3	
242197	01U627D	BP485D	ON	PIEZ			F-3	
242198	01U628A	BP585A	ON	PIEZ			F-3	
242199	01U628B	BP585B	ON	PIEZ			F-3	
242200	01U628C	BP585C	ON	PIEZ			F-3	
242201	01U628D	BP585D	ON	PIEZ			F-3	
194720	01U631	OW501U1	ON	MON				
194721	01U632	OW502U1		MON				
194716	01U634	OW504U1	ON	MON			J-5	
194722	01U635	OW505U1	ON	MON				
194723	01U636	OW506U1	ON	MON.			K-5	
194717	01U638	OW508U1		MON				
194718	01U639	OW509U1	ON	MON			K-6	
194719	01U640	OW510U1	ON	MON			K-6	
194724	01U642	OW512U1	ON	MON			K-7	
242134	01U652	OW522U1	ON	MON			J-6	
	01U653			MON				

TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
242135	01U666	OW536U1	ON	MON			K-5	
242136	01U667	OW537U1	ON	MON			J-6	
242137	01U668	OW538U1	ON	MON			J-6	
	01U675							
236452	01U803	T3U1	OFF	TEST		424053	K-3	Q-25
236457	01U805	T5U1	OFF	MON		424060	J-3	P-25
236460	01U806	T6U1	OFF	MON		424058	I-3	P-25
236471	01U807	T7U1	OFF	TEST		424059		
424057	01U808	T8U1	ON	MON			J-2	
242153	01U813	H3U1	OFF	MON				P-23
505210	01U901	H3U1	OFF	MON			A-4	
505209	01U902		OFF	MON			A-5	
538060	01U903		OFF	MON				
538059	01U904		OFF	MON				
426842	03F302	B1	ON	REM			K-5	Q-26
426843	03F303	B2	ON	REM			K-4	P-26
426844	03F304	B3	ON	REM			J-4	P-25
426845	03F305	B4	ON	REM			J-3	P-25
426846	03F306	B5	ON	REM			I-3	P-25
426847	03F307	B6	ON	REM			I-3	P-25
453823	03F308	B7	ON	REM			H-2	0-25
453824	03F312	B11	ON	REM			K-5	Q-26
234137	03L001	S1L3	ON	MON			G-2	0-25
234141	03L002	S2L3	ON	MON			I-4	P-25
234144	03L003	S3L3	ON	MON			K-5	Q-26
234147	03L004	S4L3	ON	MON			K-7	
236079	03L005	S5L3	ON	MON			K-9	
234152	03L007	S7L3	ON	MON			J-12	
234157	03L010	S10L3	ON	MON			A-10	
234161	03L012	S12L3	ON	MON			B-3	
234164	03L013	S13L3	ON	MON			E-2	
235748	03L014	S14L3	ON	MON			I-7	P-27
234170	03L017	S17L3	ON	MON			H-5	
235749	03L018	S18L3	ON	MON			H-6	
234175	03L020	S20L3	ON	MON			I-6	P-26
235750	03L021	S21L3	ON	MON			J-4	P-26
235751	03L027	S27L3	ON	MON			J-6	
235752	03L028	S28L3		MON			J-6	
235753	03L029	S29L3		MON		236066	K-5	P-26
236076	03L077	S77L3	ON	MON			I-3	P-25
236074	03L078	S78L3	ON	MON			J-4	P-26
242160	03L079	S79L3	ON	MON			K-5	Q-26
236071	03L080	S80L3	ON	MON			J-6	
236070	03L081	S81L3	ON	MON			I-8	
440887	03L084	ST84L3	ON	MON			H-3	0-25
236068	03L086	S86L3	ON	MON			J-9	
236067	03L091	S91L3	ON	MON			G-7	
236080	03L113	WF1L3	ON	MON			G-8	0-27
500694	03L137		ON	MON				
505618	03L138		ON	MON				
	03L306		ON	MON				
231854	03L522	ARSENAL GRAVEL PIT	ON	ABAND	✓		D-8	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
206725	03L523	ARSENAL GRAVEL PIT	ON	ABAND	✓		D-8	
426815	03L673	PD3L3	OFF	TEST			L-3	Q-25
426817	03L802	T2L3	OFF	TEST			K-4	Q-26
236463	03L806	T6L3	OFF	MON		421429	I-3	P-25
426868	03L809	T9L3	OFF	MON				P-25
426809	03L811	H1L3	OFF	TEST				P-24
426816	03L813	H3L3	OFF	TEST				P-23
426813	03L822	NW2L3	OFF	TEST				Q-24
426865	03L832	OM2L3	OFF	TEST				R-24
519956	03L833		OFF	MON			I-2	P-25
434037	03L841	301L3	OFF	MON				Q-25
	03L843	303L3	OFF	MON				Q-24
447899	03L846	306L3	OFF	MON				S-22
416199	03L848	308L3	OFF	MON				Q-25
426858	03L853	313L3	OFF	MON				Q-24
426859	03L854	314L3	OFF	MON				R-25
426861	03L856	316L3	OFF	MON				P-23
416081	03L858	318L3	OFF	MON				X-22
434040	03L859	319L3	OFF	MON				Q-25
434038	03L860	320L3	OFF	MON				R-25
434039	03L861	321L3	OFF	MON				R-24
234136	03M001	S1M3	ON	MON			G-2	0-25
234140	03M002	S2M3	ON	MON			I-4	P-25
234143	03M003	S3M3	ON	MON			K-5	Q-26
234146	03M004	S4M3	ON	MON			K-7	
440885	03M005	ST-5-M3	ON	MON			K-9	
234151	03M007	S7M3	ON	MON			J-12	
234156	03M010	S10M3	ON	MON			A-10	
234160	03M012	S12M3	ON	MON			B-3	
234163	03M013	S13M3	ON	MON			E-2	
234169	03M017	S17M3	ON	MON			H-5	
234174	03M020	S20M3	ON	MON			I-6	P-26
231857	03M505			ABAND	✓		K-12	
206760	03M509		ON	MON			J-6	
453831	03M713		ON	MON			H-2	0-25
426818	03M802	T2M3	OFF	TEST			K-4	Q-26
236462	03M806	T6M3	OFF	MON		421430	I-3	P-25
426852	03M843	303M3	OFF	TEST				Q-24
416051	03M848	308M3	OFF	MON				Q-25
234135	03U001	S1U3	ON	MON			G-2	0-25
234139	03U002	S2U3	ON	MON			I-4	P-25
234142	03U003	S3U3	ON	MON			K-5	Q-26
234145	03U004	S4U3	ON	MON			K-7	
234148	03U005	S5U3	ON	MON			K-9	
234149	03U006	S6U3	ON	MON			K-11	
234150	03U007	S7U3	ON	MON			J-12	
234153	03U008	S8U3	ON	MON			F-12	
234154	03U009	S9U3	ON	MON			B-12	
234155	03U010	S10U3	ON	MON			A-10	
234158	03U011	S11U3	ON	MON			A-7	
234159	03U012	S12U3	ON	MON			B-3	
234162	03U013	S13U3	ON	MON			E-2	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
234165	03U014	S14U3	ON	MON			I-7	P-27
234166	03U015	S15U3	ON	MON			F-5	
234167	03U016	S16U3	ON	MON			F-9	0-27
234168	03U017	S17U3	ON	MON			H-5	
234171	03U018	S18U3	ON	MON			H-6	
234172	03U019	S19U3	ON	MON			H-8	
234173	03U020	S20U3	ON	MON			I-6	P-26
234176	03U021	S21U3	ON	MON			J-4	P-26
236178	03U022	S22U3		MON			B-6	
236179	03U023	S23U3		MON			B-5	
236180	03U024	S24U3		MON			C-5	
236181	03U025	S25U3		MON			D-4	
236182	03U026	S26U3	ON	MON			H-7	
236183	03U027	S27U3		MON			J-6	
236184	03U028	S28U3		MON			J-6	
236185	03U029	S29U3		MON			K-5	P-26
236186	03U030	S30U3		MON			J-6	P-26
236187	03U031	S31U3		MON			F-4	
236188	03U032	S32U3		MON			G-7	
236078	03U075	S75U3	ON	MON			F-2	
236077	03U076	S76U3	ON	MON			G-2	
236075	03U077	S77U3	ON	MON			I-3	P-25
236073	03U078	S78U3	ON	MON			J-4	P-26
236072	03U079	S79U3	ON	MON			K-5	Q-26
236476	03U082	S82U3	ON	MON			B-7	
236478	03U083	S83U3	ON	MON			E-4	
236069	03U084	S84U3	ON	MON			H-3	0-25
236480	03U087	S87U3	ON	MON			F-6	
236482	03U088	S88U3	ON	MON			F-6	
236483	03U089	S89U3	ON	MON			F-6	
236485	03U090	S90U3	ON	MON			H-7	
236487	03U092	S92U3	ON	MON			H-6	
236489	03U093	S93U3	ON	MON			H-6	
236066	03U094	S94U3	ON	MON			I-7	P-27
236491	03U096	S96U3	ON	MON			G-6	
236493	03U097	S97U3	ON	MON			E-9	
236495	03U099	S99U3	ON	MON			K-10	
236508	03U111	S111U3	ON	MON			E-9	
236510	03U112	S112U3	ON	MON			H-7	0-27
242124	03U113	WF1U3	ON	MON			G-8	0-27
242125	03U114	WF2U3	ON	MON			H-7	0-27
440884	03U121		ON	MON			H-7	
440896	03U124		ON	MON			G-7	
440886	03U129		ON	MON			D-9	
	03U301	SC-1	ON	REM			K-5	P-26
508122	03U314	SC-2	ON	REM			I-6	P-27
	03U315	SC-3		REM			I-6	
453822	03U316	SC-4	ON	REM			H-6	
453821	03U317	SC-5	ON	REM			H-6	
114410	03U521		OFF	MON			F-7	
242132	03U647	OW517U3	ON	MON			J-6	
242133	03U648	OW518U3	ON	MON			J-6	P-26

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
421426	03U658	OW528U3	ON	MON			K-7	
421425	03U659	OW529U3	ON	MON			J-6	P-26
421438	03U671	PO-1	ON	MON			J-4	P-26
421440	03U672	PD2U3	OFF	MON			K-6	Q-26
421441	03U673	PD3U3	OFF	MON			L-3	Q-25
	03U674	OW541U3	ON	MON			K-5	
	03U675							
	03U676	OW543U3	ON	MON			J-6	
426848	03U701	701U3	ON	MON			I-3	P-25
426850	03U702	702U3	ON	MON			I-3	P-25
426878	03U703	703U3		MON			K-4	P-26
426883	03U704	704U3	ON	MON			E-7	
426884	03U705	705U3	ON	MON			E-7	
426885	03U706	706U3	ON	MON			E-6	
426886	03U707	707U3	ON	MON			C-7	
426879	03U708	708U3	ON	MON			J-4	P-25
426881	03U709	709U3	ON	MON			J-3	P-25
434032	03U710	71OU3	ON	MON			K-5	Q-26
434033	03U711	711U3	OFF	MON			J-3	P-25
453833	03U715	SM1	ON	MON			I-6	
453834	03U716	SM2	ON	MON			H-6	
236449	03U801	T1U3	OFF	MON			K-4	Q-26
236453	03U803	T3U3	OFF	MON		421434	K-3	Q-25
236455	03U804	T4U3	OFF	MON		421433	J-4	P-25
236458	03U805	T5U3	OFF	MON		421432	J-3	P-25
236461	03U806	T6U3	OFF	MON		421431	I-3	P-25
426808	03U811	H1U3	OFF	TEST				P-24
426862	03U815	H5U3	OFF	TEST				P-23
426810	03U821	NW1U3	OFF	TEST				Q-24
426812	03U822	NW2U3	OFF	TEST				Q-24
426814	03U824	NW4U3	OFF	TEST				R-24
426863	03U831	OM1U3	OFF	TEST				R-24
426864	03U832	OM2U3	OFF	TEST				R-24
508118	04J077		ON	MON				
508117	04J702		ON	MON			I-3	P-25
453829	04J708		ON	MON			J-3	P-25
453830	04J713		ON	MON			H-2	0-25
508120	04J714		ON	MON			G-2	0-25
482709	04J834		OFF	MON				Y-22
482708	04J835		OFF	MON				Z-22
596629	04J836	MW-2	OFF	MON				
596631	04J837	MW-4	OFF	MON				
596633	04J838	MW-6	OFF	MON				
596635	04J839	MW-8	OFF	MON				
524051	04J864	324J	OFF	MON				T-24
524048	04J866	326J	OFF	MON				T-24
482707	04J882		OFF	MON				Z-21
234138	04U001	S1U4	ON	MON			G-2	0-25
234194	04U002	S2U4	ON	MON			I-4	P-25
234193	04U003	S3U4	ON	MON			K-5	Q-26
234195	04U007	S7U4	ON	MON			J-12	
234196	04U012	S12U4	ON	MON			B-3	

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
234197	04U020	S20U4	ON	MON			I-6	P-26
242138	04U027	S27U4		MON			J-6	
426877	04U077	ST77U4	ON	MON			I-3	P-25
508115	04U322	322U4	OFF	MON				T-24
500691	04U414	414U4/EZ SELF SERVICE	OFF	MON				T-24
231742	04U510	GRENADE PLANT PROOF RANGES	ON	IND			C-12	
426867	04U673	PD3U4	OFF	TEST			L-3	Q-25
426849	04U701	701U4	ON	MON			I-3	P-25
426876	04U702	702U4	ON	MON			I-3	P-25
426880	04U708	708U4	ON	MON			J-4	P-25
426882	04U709	709U4	ON	MON			J-3	P-25
434031	04U711	711U4	OFF	MON			J-3	P-25
508119	04U713		ON	MON			H-2	0-25
453832	04U714		ON	MON			G-2	0-25
236450	04U802	T2U4	OFF	MON			K-4	Q-26
236464	04U806	T6U4	OFF	MON		421428	I-3	P-25
426811	04U821	NW1U4	OFF	TEST				Q-24
426866	04U832	OM2U4	OFF	TEST				R-24
519957	04U833		OFF	MON			I-2	P-25
519836	04U834		OFF	MON				Y-22
596628	04U836	MW-1	OFF	MON				
596630	04U837	MW-3	OFF	MON				
596632	04U838	MW-5	OFF	MON				
596634	04U839	MW-7	OFF	MON				
426851	04U841	301U4	OFF	TEST				Q-25
	04U842			MON				
426853	04U843	303U4	OFF	TEST				Q-24
426854	04U844	304U4	OFF	TEST				R-24
426855	04U845	305U4	OFF	MON				R-25
426856	04U846	306U4	OFF	MON				S-22
426857	04U847	307U4	OFF	MON				P-24
416078	04U848	308U4	OFF	TEST				Q-25
416082	04U849	309U4	OFF	MON				R-23
416200	04U850	310U4	OFF	MON				S-22
406198	04U851	311U4	OFF	MON				U-23
416080	04U852	312U4	OFF	MON				V-23
439701	04U854	314U4	OFF	MON				R-25
426860	04U855	315U4	OFF	MON				Q-22
434036	04U859	319U4	OFF	MON				Q-25
434035	04U860	320U4	OFF	MON				R-25
434034	04U861	321U4	OFF	MON				R-24
471394	04U863	323U4	OFF	MON				
524050	04U864	324U4	OFF	MON				T-24
524047	04U865	325U4	OFF	MON				T-24
524049	04U866	326U4	OFF	MON				T-24
447889	04U871	401U4	OFF	MON				U-21
447988	04U872	402U4	OFF	MON				V-21
447898	04U875	405U4	OFF	MON				U-20
447896	04U877	407U4	OFF	MON				T-22
447900	04U879	409U4	OFF	MON				R-21
447895	04U880	410U4	OFF	MON				V-19
447891	04U881	411U4	OFF	MON				X-20

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Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Off-post
447890	04U882	412U4	OFF	MON				Z-22
447892	04U883	413U4	OFF	MON				Z-23
236468	PJ#003	S3PJ	ON	MON			K-5	Q-26
	PJ#006		ON	MON				
236469	PJ#027	S27PJ	ON	MON			J-6	
235565	PJ#074	S74PJ		MON			I-6	
453825	PJ#309	B8	ON	REM			J-3	P-25
453826	PJ#310	B9	ON	REM			I-3	P-25
453827	PJ#311	B10	ON	REM			H-2	P-25
453828	PJ#313	B12	ON	REM			H-2	0-25
447894	PJ#318	318U4	OFF	MON				X-22
206754	PJ#501	TWIN CITIES ARSENAL NO. 1	ON	P.S.			F-4	
206756	PJ#502	TWIN CITIES ARSENAL NO. 2	ON	IND			G-4	
206758	PJ#503	TWIN CITIES ARSENAL NO. 3	ON	IND			H-4	
206724	PJ#504	TWIN CITIES ARSENAL	OFF	ABAND	✓		E-2	
206753	PJ#506	TWIN CITIES ARSENAL NO. 6	ON		✓		H-5	
206755	PJ#507	TWIN CITIES ARSENAL NO. 7	ON	ABAND	✓		H-5	
206759	PJ#508	TWIN CITIES ARSENAL NO. 8	ON	ABAND	✓		I-6	
206760	PJ#509	TWIN CITIES ARSENAL NO.9	ON	DOM			J-6	
236437	PJ#802	T2PJ	OFF	MON		421437	K-4	Q-26
236465	PJ#806	T6PJ	OFF	MON		421427	I-3	P-25
107405		ROEBKE	OFF	UN				
110485		NEW BRIGHTON #12	OFF	MUNI				P-21
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				V-24
191942		118PDC/MODEL STONE	OFF	MON				R-24
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				Z-23
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	✓			BB-23
200154		U OF M GOLF COURSE	OFF	IRR				CC-25
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				V-21
200525		PLETSCHER	OFF	UN				

TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
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.				X-22
200804		ST. ANTHONY #3	OFF	MUNI				X-22
200812		GROSS GOLF COURSE #1	OFF	COM				AA-22
200814		AMERICAN LINEN	OFF	IND				CC-22
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				T-20
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				
206750		SHORE #4	OFF	MUNI				
206787		MOUNDSVIEW H.S.	OFF	P.S.				S-25
206789		NEW BRIGHTON #1	OFF	MUNI	✓			
206791		NEW BRIGHTON #7	OFF	MUNI				U-23
206792		NEW BRIGHTON #4						
206793		NEW BRIGHTON #3	OFF	MUNI				S-21
206794		NEW BRIGHTON #9	OFF	MUNI				T-21
206795		NEW BRIGHTON #8	OFF	MUNI				T-21
206796		NEW BRIGHTON #5	OFF	MUNI				
206797		NEW BRIGHTON #6	OFF	MUNI				T-21
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.			A-4	
231878		MENGELKOCH #2	OFF	UN				R-25
232067		NBR 135	OFF	UN				
232069		UHIL	OFF	UN				
233221		REUBEN MEAT	OFF	DOM				CC-20
233222		LOWRY GROVE TRAILER	OFF	ABAND	✓			Z-21
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				P-25
234327		BRESKE	OFF	UN				
234335		MENGELKOCH #1	OFF	UN				R-25

TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
234337		MENGELKOCH #3	OFF	UN	✓			R-25
234350		GORDON	OFF	UN				
234351		YEMPA	OFF	UN				
234352		1206 12TH AV NW	OFF	UN				R-23
234353		LENTSCH'S ICE WK.	OFF	UN				P-25
234355		KINGDOM HALL	OFF	UN				
234356		NORDQUIST P43	OFF	UN				Q-25
234357		PHILLIPS PET P46	OFF	UN				P-25
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	✓			P-25
234430		CMIEL	OFF	UN	✓			Q-26
234431		HARSTAD	OFF	UN				
234463		KEN SOLIE	OFF	UN				V-21
234546		HONEYWELL RIDGEWAY	OFF	UN				BB-21
234547		HONEYWELL RIDGEWAY	OFF	UN				BB-21
234549		REINER	OFF	IRR				Y-21
235539		OLD HOTEL	OFF	UN				Q-24
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				Q-24
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				S-24
409547		PCA1U4	OFF	TEST				R-24
409548		PCA2U4	OFF	TEST				S-24
409549		PCA3U4	OFF	TEST				R-22
409550		PCA6U3	OFF	TEST				P-25
409555		PCA5U4	OFF	TEST				V-22
409556		PCA4L3	OFF	TEST				S-22
409557		PCA1L3	OFF	TEST				R-24
409595		B109U3	OFF	ABAND				R-24
409596		B118U3	OFF	MON				R-24
409597		B118L3	OFF	IND				R-24
409598		B117U3	OFF	ABAND				R-24
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				

TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location On-post	Well Location Off-post
482088		I02-MW	ON	MON				
482089		I04-MW	ON	MON				
482090		I03-MW	ON	MON				
509083		NEW BRIGHTON #11	OFF	MUNI				T-23
512761		GROSS GOLF #2	OFF	IRR				AA-22
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				T-24
554216		NEW BRIGHTON #14	OFF	MUNI				T-23
582628		NEW BRIGHTON #15	OFF	MUNI				
		MW15D	OFF	MON				
		MW15S	OFF	MON				
		Staff Gauge 1						
		Staff Gauge 2						
		Staff Gauge 3						

APPENDIX C

Appendix C

FY 1999 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 1999 was comprised of Quarter 61 (October through December), Quarter 62 (January through March), Quarter 63 (April through June), and Quarter 64 (July through September). Water sampling and water level measurements were conducted in accordance with the TCAAP "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996).

Data collected at TCAAP is stored in the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS). The IRDMIS is managed by Potomac Research, Inc. (PRI) on behalf of the USAEC.

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 1999 Annual Monitoring Plan which established the monitoring responsibilities for both:

- The Army (to be performed by Alliant the contracted operator)
- Alliant - the tenant and responsible party

Water level monitoring and groundwater sampling were conducted by CRA for both parties, and the laboratory analysis was performed by DataChem Laboratories.

For water level measurements, CRA measured the depth to water from the top of the well casing. Using the distance from the top of the casing to the ground surface, which is surveyed when each well is constructed, CRA determined the depth to water from the ground surface. This information was then submitted to PRI for entry into the IRDMIS. The IRDMIS contains ground-surface elevations measured to tenths of a foot.

Appendix C.2 summarizes the individual parameters included within each analytical category (or family of related parameters) as indicated in the Groundwater Monitoring Plan. Halogenated volatile organic compounds (Category 1) were the parameters of primary interest, while select wells were sampled for aromatic volatile organic compounds (Category 7), and antimony (Category 2). Appendix C.3 presents clarifications and deviations from the FY 1999 Annual Monitoring Plan.

All laboratory data was submitted to PRI for entry into the IRDMIS. Data validation was conducted in accordance with procedures and requirements outlined in the TCAAP QAPP. The data validation reports are on file with the Army. Appendices C.4 through C.6 present explanations for the flagging codes and data qualifiers used with data reporting.

2.2 Groundwater Elevation Contour Maps

Groundwater elevation contour maps were prepared using Quarter 63 data. Individual maps were developed for Upper Unit 3, Lower Unit 3, and Upper Unit 4. These maps are presented as figures which follow the text for the relevant sections. The on-post groundwater elevation contour maps were prepared by CRA.

Groundwater elevation contour maps were not prepared for the Middle Unit 3 aquifer since there are not enough wells screened in this aquifer to justify contouring. However, the data from Middle Unit 3 wells are shown in parentheses on the Lower Unit 3 contour maps. The Middle

Unit 3 elevations were not used to derive the contour lines, unless there were no nearby Lower Unit 3 wells to rely upon. In general, the difference in water levels between Middle Unit 3 and Lower Unit 3 is insignificant.

For the same reason, wells completed in the Jordan aquifer (04J), and wells completed as open holes intersecting both the Prairie du Chien and Jordan (PJ#), were not used for preparing the Upper Unit 4 groundwater elevation contours. These elevations are shown on the Upper Unit 4 contour maps with the data in parentheses.

2.3 Groundwater Quality Contour Maps and Cross-Sections

The most extensive sampling event performed during FY 1999 was in June (Quarter 63). This data was used to prepare contour maps and cross-sections to illustrate the spatial distribution of groundwater contamination.

Groundwater quality contour maps were generated by hand, based on the observed contaminant concentrations and the extent of past site contamination.

Contour maps are provided for trichloroethene, as this is the principal contaminant on a concentration basis. Contour maps were prepared by Wenck for OU2 (on-post) and OU1/OU3 combined (off-post), with individual maps for Upper Unit 3, Lower Unit 3, and Upper Unit 4. To complement the groundwater quality contour maps, cross-sections have been prepared to illustrate the vertical distribution of trichloroethene. One section line passes through the source area at Site G and follows the north plume (OU1) off-post, extending past Gross Golf Course (well 512761). A second section line passes through the source area at Site I and traces the south plume (OU3) off-post through the Plume Groundwater Recovery System (PGRS).

Contaminant concentrations for Middle Unit 3 wells are shown in parentheses on the Lower Unit 3 contour maps, but were not used for contouring purposes except when no Lower Unit 3 wells are in the vicinity. Similarly, wells completed in the Jordan aquifer (04J) and wells completed as open holes intersecting both the Prairie du Chien and Jordan aquifers (PJ#) are shown with the data in parentheses on the Upper Unit 4 maps, but were not used to develop contour lines.

Contaminant concentrations at recovery wells are also shown in parentheses on the 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.

For Site A, isoconcentration contour maps were developed for 1,2-dichloroethene (as this is the most widespread contaminant at Site A) and tetrachloroethene (which illustrates the source area). Site A cross-sections were also prepared which illustrate 1,2-dichloroethene. Contour maps for Site A were prepared only for Unit 1 since this is the only contaminated aquifer.

3.0 GROUNDWATER PUMPING

Groundwater pumping data was collected to aid in evaluating the effect which the pumping has on the shape and migration of the contaminant plume. The data was compiled primarily from a database maintained by the Minnesota Department of Natural Resources (MDNR). The MDNR database includes all permitted wells in Minnesota. Permits are required for wells with pumping rates greater than 10,000 gallons per day or 1,000,000 gallons per year.

The MDNR anticipates having 1999 pumping data available in May 2000. This information will be added to the FY 1999 Annual Performance Report when it becomes available.

Groundwater pumping data for the Cities of New Brighton and St. Anthony was obtained directly from city personnel, and not from the MDNR database. As shown by the data in Appendix F, the pumping from these two municipalities historically includes the vast majority of the groundwater use in the vicinity of the TCAAP plume.

Appendix F includes all permitted wells in the vicinity of the plume and is divided into "High Capacity Wells" and "Other Wells." High capacity wells are defined as those wells with a permitted pumping rate of greater than or equal to 50 gallons per minute. On-TCAAP recovery wells are not included in Appendix F.

C.2 Chemical Analysis Categories

APPENDIX C.2

USAEC CHEMICAL ANALYSIS CATEGORIES APPLICABLE TO TCAAP GROUNDWATER MONITORING

CATEGORY 1

Carbon Tetrachloride	CCL4
Chloroform	CHCL3
Methylene Chloride	CH2CL2
Vinyl Chloride	C2H3CL
Tetrachloroethylene	TCLEE
Trichloroethylene	TRCLE
1,1-Dichloroethylene	11DCE
1,1-Dichloroethane	11DCLE
1,1,1-Trichloroethane	111TCE
1,1,2-Trichlorethane	112TCE
1,1,2-Trichlorotrifluoroethane	TCLTFE
Cis-1,2-Dichloroethylene	C12DCE
Trans-1,2-Dichloroethylene	T12DCE

CATEGORY 2

Antimony	SB

*[**Note:** USAEC Category 2 includes other metals, but these are not applicable for current monitoring at TCAAP.]*

CATEGORY 7

Benzene	C6H6

*[**Note:** USAEC Category 7 includes other aromatic VOCs, but these are not applicable for current monitoring at TCAAP.]*

C.3 Explanations for Missed Monitoring

CRA
Conestoga-Rovers & Associates
1801 Old Highway 8, Suite #114
St. Paul, Minnesota 55112
(651) 639-0913 Office (651) 639-0923 Fax

June 7, 2000

Reference No. 13391

James Persoon, Ph.D.
ALLIANT TECHSYSTEMS, INC.
4700 Highway 10
Building 105, Suite F / MN24
Arden Hills, Minnesota 55112-3928

Dear Dr. Persoon:

Re: Clarifications and Deviations from Operable Unit One, Site A, Surface Water, Site D, and Site G Monitoring Programs - Fiscal Year 1999

Water quality sampling, water level measurement, air quality monitoring, and documentation for Site A, Operable Unit One Groundwater, Sites D and G SVE Systems, and Surface Water for Fiscal Year 1999 (FY99) were performed in accordance with the approved 1999 Annual Monitoring Plan (AMP) and the "Twin Cities Army Ammunition Plant, Remedial Design/Remedial Action, Quality Assurance Project Plan," (QAPP) September 1996.

All required water quality samples were collected and water level measurements were recorded as listed in the FY99 AMP with the following comments and exceptions:

Operable Unit One

Monthly sampling of the PGAC effluent and New Brighton production wells #4, #14, and #15 was completed by the City of New Brighton according to the City's Quality Assurance Project Plan.

Deviations from the groundwater monitoring well monitoring were as follows:

June 1999

- St. Anthony Well #3 was not sampled because it was not in operation.
- Private well 233221 (Reuben Meats) was not sampled because it was not in operation. Reuben Meats is no longer in business, R&D Systems is now in business at that location.
- Monitoring well 04U847 was sampled and the water level measured according to a revision to the FY99 AMP documented in Alliant's memo dated June 1, 1999.
- Water levels were measured in the following monitoring wells according to a revision to the FY99 AMP documented in Alliant's memo June 1, 1999: 04U836, 04J836, 04U837, 04J837, 04U838, 04J838, 04U839, 04J839, 04U846, 04U850, 04U851, 04U852, 04U863, 04U864, 04J864, 04U865, 04U866, 04J866, 04U871, 04U875, 04U877, 04U879, 409548 (PCA2U4), 409549 (PCA3U4).

July and August 1999

- Water levels were measured in the following monitoring wells according to a revision to the FY99 AMP documented in Alliant's memo June 1, 1999: 04U836, 04J836, 04U837, 04J837, 04U838, 04J838, 04U839, 04J839, 04U846, 04U850, 04U851, 04U852, 04U863, 04U864, 04J864, 04U865, 04U866, 04J866, 04U871, 04U875, 04U877, 04U879, 409548 (PCA2U4), 409549 (PCA3U4).

Site A

There were no deviations from the FY99 AMP for the Site A extraction system or the monitoring well monitoring.

Surface Water

There were no deviations from the FY99 AMP for the surface water monitoring.

Site D and Site G

The SVE systems at Sites D and G were shutdown for the entire year; therefore, the effluent was not sampled monthly from either system.

Please call if you have any questions.

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

Charles F. Cooke for

Jason Twaddle, P.E.

JT/bam/39
c.c. Keith Benker; Wenck

Conestoga-Rovers & Associates
1801 Old Highway 8, Suite #114
St. Paul, Minnesota 55112
(651) 639-0913 Office (651) 639-0923 Fax

June 7, 2000

Reference No. 1496, 3877, 4304, 13399-30

Mr. Marty McCleery
TWIN CITIES ARMY AMMUNITION PLANT
ATTN: SIOTC-EV
4700 HWY 10 -Suite A
Arden Hills, MN 55112-3928

Mr. David Gosen
ALLIANT TECHSYSTEMS, INC.
MN11-2115
600 Second Street Northeast
Hopkins, MN 55343

Dear Mr. McCleery and Mr. Gosen:

Re: Deviations from TGRS, Site I, Site K and PGRS Sampling Programs – 1999 Fiscal Year

Water quality sampling, water level measurement, and documentation for the TGRS, Site I, Site K, and PGRS Fiscal Year 1999 (FY99) all were performed in accordance with the approved FY99 Annual Monitoring Plan (AMP), plan amendments, and the "Installation Restoration Program Quality Assurance Project Plan for the Remedial Investigation/Feasibility Study at the Twin Cities Army Ammunition Plant", USATHAMA, June 1988.

All required water quality samples were collected and water level measurements were recorded as listed in the AMP with the following comments and exceptions:

TGRS (OPERABLE UNIT 2 DEEP GROUNDWATER)

October 1998 and November 1998

- No deviations from the AMP occurred during FY99.

December 1998

- Monitoring of the treatment system and pumphouses was performed on December 1 and 2, 1998. Repairs at the pumphouses B12 and SC4 delayed monitoring at these pumphouses until December 22, 1998.

June 1999

- A groundwater level measurement was not performed at well OW543U3 because the flush mount well cap could not be removed from the well.
- In accordance with a revision to the AMP, documented in Alliants' memo dated June 1, 1999, at monitoring well 04U414 the water level was measured and at 03M020 a sample was collected and the water level was measured

July 1999 through August 1999

- At monitoring well 04U414 the water level was measured according to a revision to the AMP documented in Alliants' memo dated June 1, 1999.
- Monitoring wells 03U084, 03U015, 03U705, 03U706, 03L021, 03L001, 03M713, 04U001, 04U714, 04J714, 04U003, and PJ#003 were not sampled. The requirement for sampling was deleted by a revision to the AMP documented in Alliant's memo dated June 1, 1999.

September 1999

- No deviations from the AMP occurred during this period.

SITE I (BUILDING 502)

October 1998 through May 1999

- No deviations from the AMP occurred during this period.

June 1999

- CRA attempted to perform groundwater level measurements on monitoring wells 01U639, I02MW, I04MW, and I05MW; however, groundwater elevations could not be calculated because these wells were dry.
- Groundwater samples were not collected from 01U639, I02MW, I04MW, and I05MW during the June sampling round, as the wells were dry.
- There was insufficient groundwater at well 01U640 to perform measurement of field parameters.

July 1999 through September 1999

- No deviations from the AMP occurred during this period.

SITE K (BUILDING 103)

October 1998 through May 1999

- No deviations from the AMP occurred during this period.

June 1999

- Wells 01U603, 01U604, 01U611, 01U617, and 01U618 purged dry prior to collecting samples for field parameters and for laboratory analysis.
- Additional treatment system samples were collected to document adequate treatment performance of new treatment system.

July 1999 through September 1999

- No deviations from the AMP occurred during this period.

PGRS (OPERABLE UNIT 3 DEEP GROUNDWATER)

October 1998 and November 1998

- No deviations from the AMP occurred during this period.

December 1998 through May 1999

- The City of New Brighton performed sampling. A summary of the data was forwarded for use in the FY99 Annual Performance Report. CRA has not validated this data.

June 1999

- No deviations from the AMP occurred during this period.

July 1999 through September 1999

- The City of New Brighton performed sampling. A summary of the data was forwarded for use in the FY99 Annual Performance Report. CRA has not validated this data.

If you have any questions, please do not hesitate to contact us.

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

Charles F. Cooke

Charles F. Cooke, P.E.

CFC/jm/25
c.c. Keith Benker; Wenck
Brian Boevers; CRA

C.4 IRDMIS Flagging Codes

ELEMENT IS USED IN THE FOLLOWING IR RECORDS AND DATA BASE TABLES:

IRDMIS Record Record Type	Column(s)	IRDMIS Data Base DB Table(s)	DB Column
*	132	chem/cqc	flag_codes
	133		
	134		
	135		
	136		
	137		
	138		
	139		
		flag_quals_desc	f_q_code

* Any valid chemical or radiological record type

ELEMENT SIZE AND CHARACTERISTICS:

IRDMIS Record:	1 upper-case alphabetical character, full field (as many as 8 per record)	
IRDMIS Data Base:	chem/cqc:	as many as 8 Flagging Codes per record
	flag_quals_desc:	1 Flagging Code per record

ELEMENT DESCRIPTION:

Code assigned by the **Laboratory** to indicate other-than-usual analytical conditions or results.

ACCEPTABLE CRITERIA:

NOTE: **Flagging Codes marked with * were changed effective 1 February 1993! Flagging Codes marked with ** were changed effective with the introduction of Version 5.2 of the IRDMIS Data Entry and Validation Subsystem (PC IRDMIS) software!**

* A — Analyte found in trip blank as well as in field samples . The analyte was detected in the field sample and the trip blank for the same cooler. To be used for volatiles only.

B — Analyte found in the method blank or QC blank as well as the sample. This Code is to be used when an analyte was detected and quantitated at higher than normal background levels. For metals in soil, the following rules must be followed:

(1) If the analyte is detected in the method blank, both the field and QC samples are to be flagged.

(2) If the analyte is detected in the QC blank, only the QC samples are to be flagged.

C — Analysis was confirmed. This Code is to be used when a confirmation analysis bears out the reported result (if it is above the CRL or MDL). The confirmation analysis must use a different column or analytical technique.

D — Duplicate analysis. This Code is used to distinguish analytical results when duplicate analyses are required. Flag only the second (duplicate) sample.

ACCEPTABLE CRITERIA: (CONT.)

E No longer in use.

F Sample filtered prior to analysis. This Code is to be used when results of filtered samples are to be differentiated from non-filtered samples. This Code is also to be used when filtering of samples (as a first step in the sample preparation) is a deviation from the approved method SOP. This Code may be used to indicate both field and laboratory filtering. It is not to be used when filtering the extract is the normal procedure.

* G Analyte found in rinse blank as well as field sample. The analyte was detected in the field sample as well as that day's rinse blank for the same equipment type.

** H **No longer in use after introduction of Version 5.2 of PC IRDMIS.**

* I Interferences in sample cause the quantitation and/or identification to be suspect. This Code is to be used when matrix interferences may mask detection of the target analyte. Must always be used with Flagging Code J.

* ** J Value is estimated because of one of the following conditions:

Interferences in the sample (use Flagging Codes J and I)
or
The value is below the method detection level but above the instrumental detection level (use Flagging Codes J and P)
or
The value is above the upper reporting level of the method (use Flagging Codes J and X).

This Code must always be used with Flagging Code I, P, or X. Both the J and I and the J and X combinations may be used both for methods demonstrated under the 1990 QA Program and for methods validated under the 1993 QA Guidelines. The J and P combination is only to be used for methods validated under the 1993 QA Guidelines.

* K Reported results affected by interferences or high background. This Code is to be used when analyte levels at or near the CRL or MDL cannot be accurately quantified down to the CRL/MDL due to interferences. This Code will allow a laboratory to input a higher CRL/MDL, rather than defaulting to the Methods data base. **(Formerly Flagging Code G)**

* ** L **No longer in use after introduction of Version 5.2 of PC IRDMIS.**

** M **No longer in use after introduction of Version 5.2 of PC IRDMIS.**

* N Tentatively identified compound (result of a GC/MS library search) with a match greater than 70%. To be used when specified in the contract/task order.

ACCEPTABLE CRITERIA: (CONT.)

* O **No longer in use.**

* P Value is less than the method reporting level but greater than the instrumental detection limit. This Code must always be used with J. This Code is only to be used for methods validated under the 1993 QA Guidelines.

* Q Confirmatory analysis was performed; however, sample interference obscured the area where the peak of interest would have appeared. To be used when the peak of interest fell within the retention-time window on the primary column, but the retention-time window on the secondary column was masked by interferences.

R Non-target compound analyzed for but not detected (must be used with a Boolean of ND). This Code is used only for those analytes (in GC/MS methods) which were not performance demonstrated or validated. To be used when specified in the contract/task order.

S Non target compound analyzed for and detected. This Code is used only for those analytes (in GC/MS methods) which were not performance demonstrated or validated. Also used to report tentatively identified compounds which are quantitated against an internal standard. To be used when specified in the contract/task order.

T Non-target compound analyzed for but not detected (must be used with a Boolean of ND). This Code is used only for those analytes (in non-GC/MS methods) which were not performance demonstrated or validated.

U Analysis is unconfirmed. This Code is to be used when a confirmatory analysis was performed but does not verify the analytical results from the initial analysis.

V Sample was subjected to unusual storage/preservation condition. To be used when samples are received at the laboratory at greater than 4° C, or were not correctly preserved in the field.

W Single analyte required from a multi-analyte method. This Code is to be used when field samples are to be analyzed for a subset of the demonstrated/validated analytes.

** X Analyte concentration is above the upper reporting level. This Flagging Code is to be used when analyte concentrations exceed the upper reporting level and the laboratory feels that additional dilutions are not warranted. This Code is also to be used when no sample or extract remains to make additional dilutions. It must also be used whenever a Boolean of GT is used.

* Y Tentatively identified compound (result of a GC/MS library search) with a match of less than 70%, but peak area is greater than 35% of the internal standard. To be used when specified in the contract/task order.

ACCEPTABLE CRITERIA: (CONT.)

*	Z	Non-target compound analyzed for and detected. This Code is used only for those analytes (in non-GC/MS methods) which were not performance demonstrated or validated.
*	1	Result less than the CRL but greater than the Criteria of Detection (COD). Can only be used for methods which were performance demonstrated under the 1990 QA Program.
*	2	Ending calibration not within acceptable limits. This Code is to be used for an analyte for which the ending calibration is still unacceptable after multiple attempts.
*	3	Internal standard(s) not within acceptable limits.
* **	4	Analyte quantitated on the secondary column, when this is not the normal practice.
* **	7	**No longer in use after introduction of Version 5.2 of PC IRDMIS.**
**	8	Analyte recovery outside of certified range but within acceptable limits. This Flagging Code is to be used when analyte recoveries exceed the upper limit of the certified range by less than 15% and the laboratory feels a dilution is not warranted. **No longer in use after introduction of Version 5.2 of PC IRDMIS (formerly Flagging Code X).**
**	9	Non-demonstrated/validated method performed for USAEC. This Code is to be used to identify Method 00 or NTAM data which was produced under contract to USAEC.

ACCEPTABLE ENTRIES:

A Analyte found in trip blank as well as in field samples.
B Analyte found in the method blank or QC blank as well as the sample.
C Analysis was confirmed.
D Duplicate analysis.
F Sample filtered prior to analysis.
G Analyte found in rinse blank as well as field sample.
I Interferences in sample make quantitation and/or identification to be suspect.
J Value is estimated.
K Reported results are affected by interferences or high background.
N Tentatively identified compound (match greater than 70%).
P Results less than reporting level but greater than instrumental detection limit.
Q Sample interference obscured peak of interest.
R Non-target compound analyzed for but not detected (GC/MS methods).
S Non-target compound analyzed for and detected (GC/MS methods).
T Non-target compound analyzed for but not detected (non-GC/MS methods).
U Analysis is unconfirmed.
V Sample subjected to unusual storage/preservation conditions.

ACCEPTABLE ENTRIES: (CONT.)

W Single analyte required from a multi-analyte method.
X Analyte concentration is above the upper reporting level.
Y Tentatively identified compound (match less than 70%).
Z Non-target compound analyzed for and detected (non-GC/MS methods).
1 Result less than CRL but greater than COD.
2 Ending calibration not within acceptable limits.
3 Internal standard(s) not within acceptable limits.
4 Analyte quantitated on the secondary column.
9 Non-demonstrated/validated method performed for USAEC.

C.5 IRDMIS Data Qualifiers

ELEMENT IS USED IN THE FOLLOWING IR RECORDS AND DATA BASE TABLES:

IRDMIS Record		IRDMIS Data Base	
Record Type	Column(s)	DB Table(s)	DB Column
*	140	chem/cqc	data_quals
	141		
	142		
	143		
	144		
	145		
	146		
	147		
		flag_quals_desc	f_q_code

* Any valid chemical or radiological record type

ELEMENT SIZE AND CHARACTERISTICS:

IRDMIS Record:	1 upper-case alphabetical character, full field (as many as 8 per record)	
IRDMIS Data Base:	chem/cqc:	as many as 8 Data Qualifiers per record
	flag_quals_desc:	1 Data Qualifier per record

ELEMENT DESCRIPTION:

Code assigned only by the USAEC Chemist to indicate data acceptance or rejection based on other-than-usual analytical conditions or results.

ACCEPTABLE CRITERIA:

? Control chart either not received or not yet approved by USAEC. This Qualifier is automatically set when a lot file has been loaded but the corresponding control chart has not been approved.

I The low-spike recovery is high. To be used for the single low spike in Class 1 methods and the duplicate low spikes in Class 1P.

J The low-spike recovery is low. To be used for the single low spike in Class 1 methods and the duplicate low spikes in Class 1P.

K Missed holding times for extraction and preparation (Hold Time 1). This Qualifier is automatically set when the extraction/preparation holding time is exceeded. **(Formerly Flagging Code K)**

L Missed holding time for sample analysis (Hold Time or Hold Time 2). This Qualifier is automatically set when the analytical holding time is exceeded. **(Formerly Flagging Code L)**

M The high-spike recovery is high. To be used for the duplicate high spikes in Class 1 and 1P methods. Also to be used for the single spike in Class 1A and 1B methods and for the duplicate spikes in Class 1M methods.

ACCEPTABLE CRITERIA: (CONT.)

N The high-spike recovery is low. To be used for the duplicate high spikes in Class 1 and 1P methods. Also to be used for the single spike in Class 1A and 1B methods and for the duplicate spikes in Class 1M methods.

O Low spike recoveries excessively different. To be used only for the duplicate low spikes in Class 1P methods.

P High spike recoveries excessively different. To be used for the duplicate high spikes in Class 1 and 1P methods. Also to be used for the duplicate spikes in Class 1M methods.

Q Surrogate(s) in field sample outside of acceptable limits as specified by EPA CLP. To be followed by number of surrogates failing criteria (1 - 9). To be used only for field samples. **(Formerly Flagging Code Q)**

R Data is rejected and is not usable.

ACCEPTABLE ENTRIES:

?	Control chart not yet approved by USAEC.
1-9	Number of surrogates failing EPA CLP criteria (used with Data Qualifier Q)
I	The low-spike recovery is high.
J	The low-spike recovery is low.
K	Missed holding time for extraction and preparation.
L	Missed holding time for sample analysis.
M	The high-spike recovery is high.
N	The high-spike recovery is low.
O	Low spike recoveries excessively different.
P	High spike recoveries excessively different.
Q	Surrogate recovery outside of acceptable CLP limits (field samples only).
R	Data is rejected.

APPENDIX D

Appendix D

Groundwater Database Disk

APPENDIX E

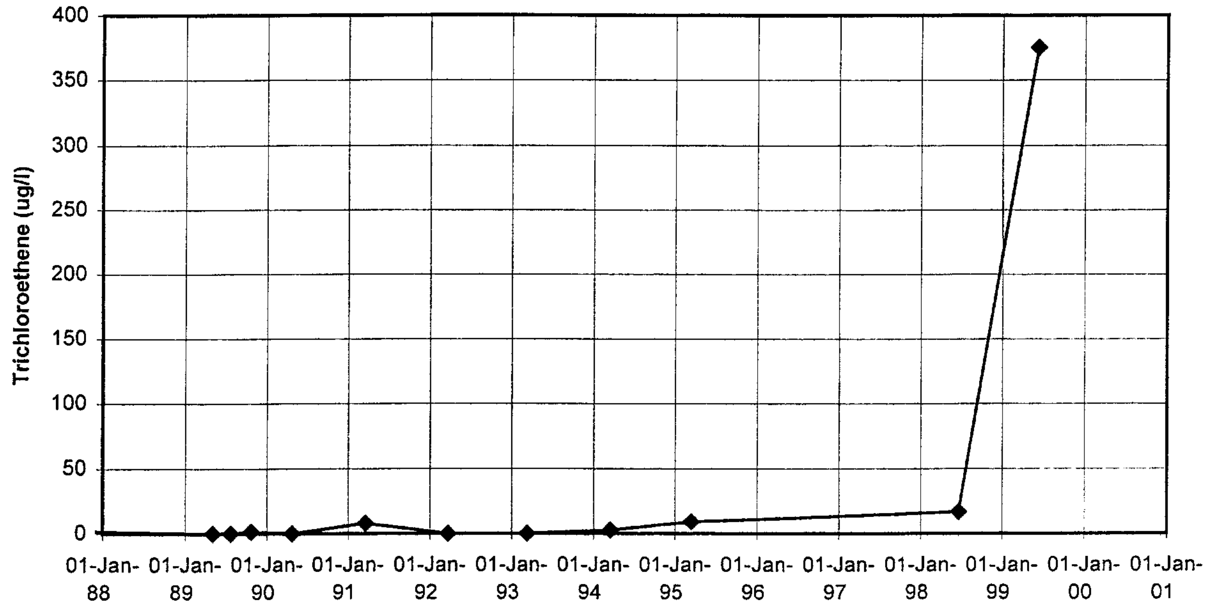
Appendix E

Trichloroethene Trends

OU1

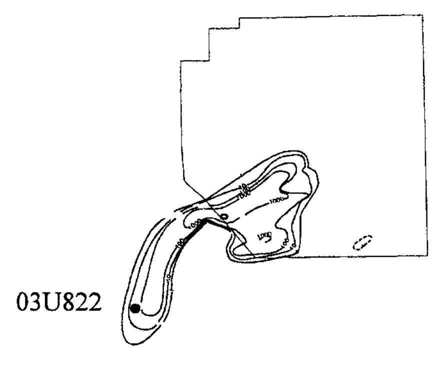
Upper Unit 3 Wells

03U822



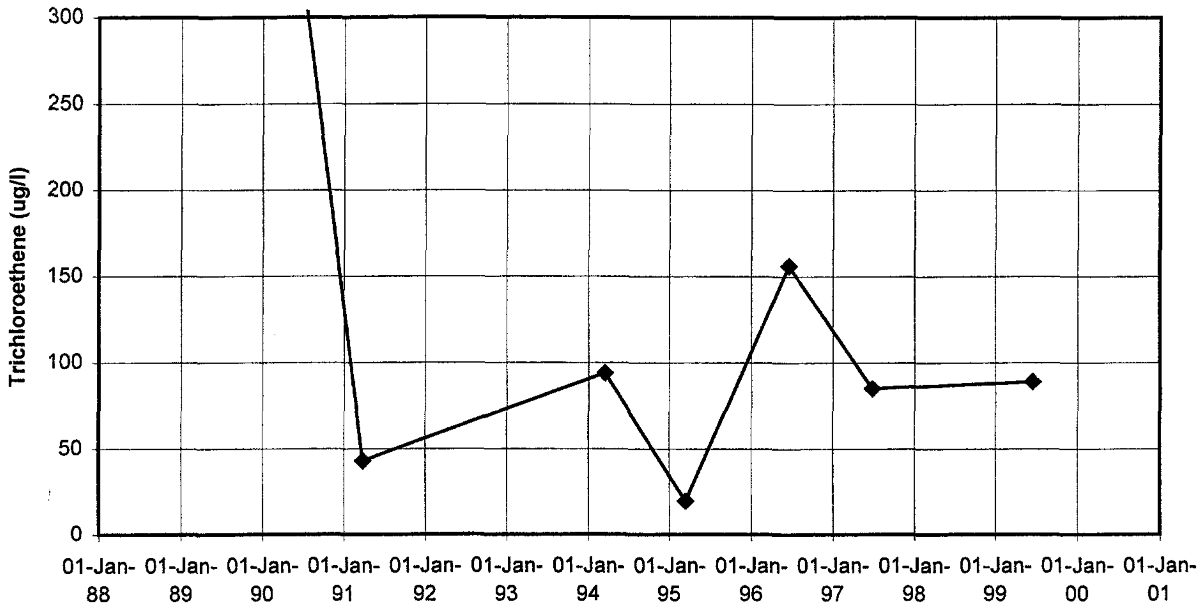
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



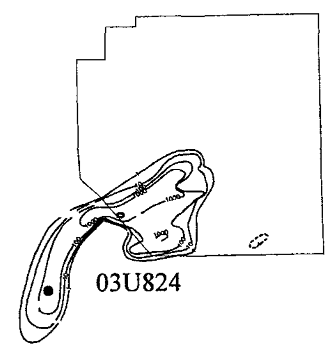
Well Location

03U824

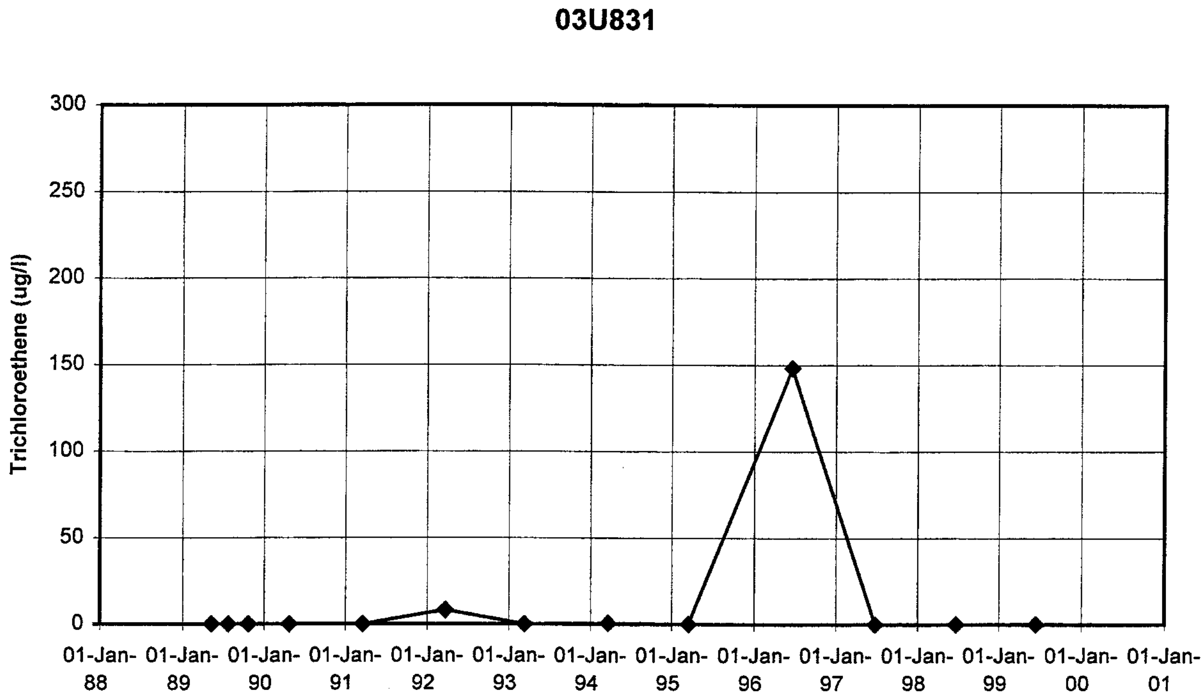


Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.

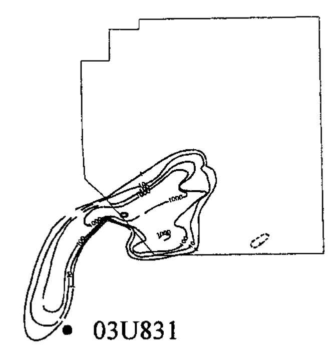


Well Location



Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

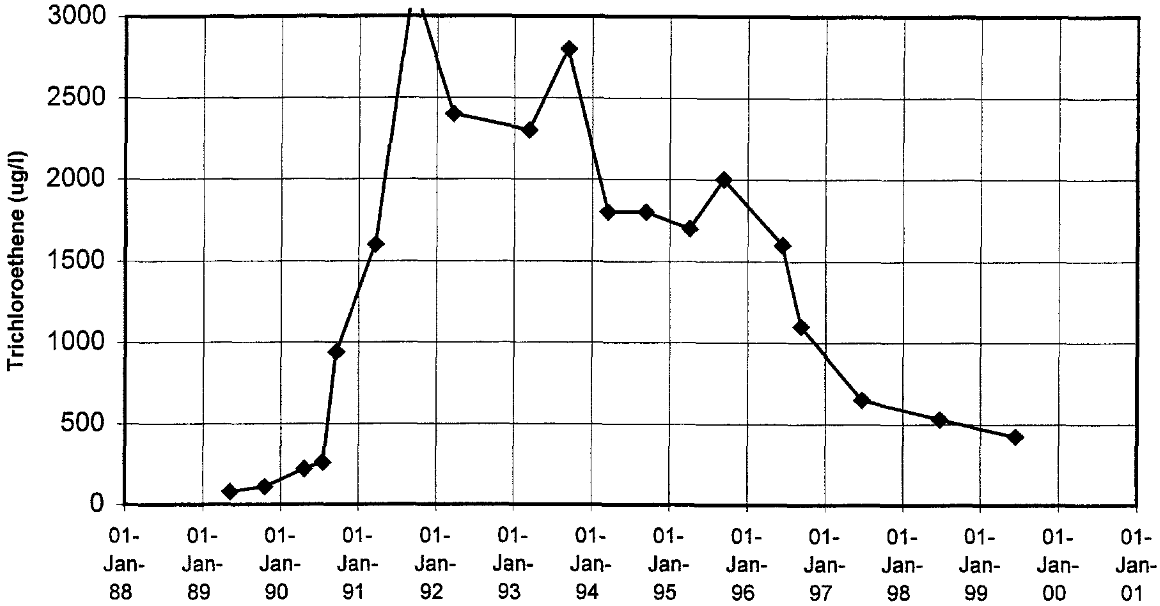
Note:
Plume map is from FY 1998.



Well Location

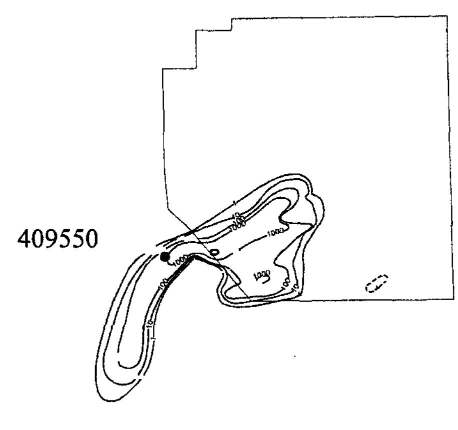
N:\0003\61\Graphs\Off-U3\03U831.doc\TNW-lmh

409550



Well Purpose:
Monitor the progress of groundwater cleanup.

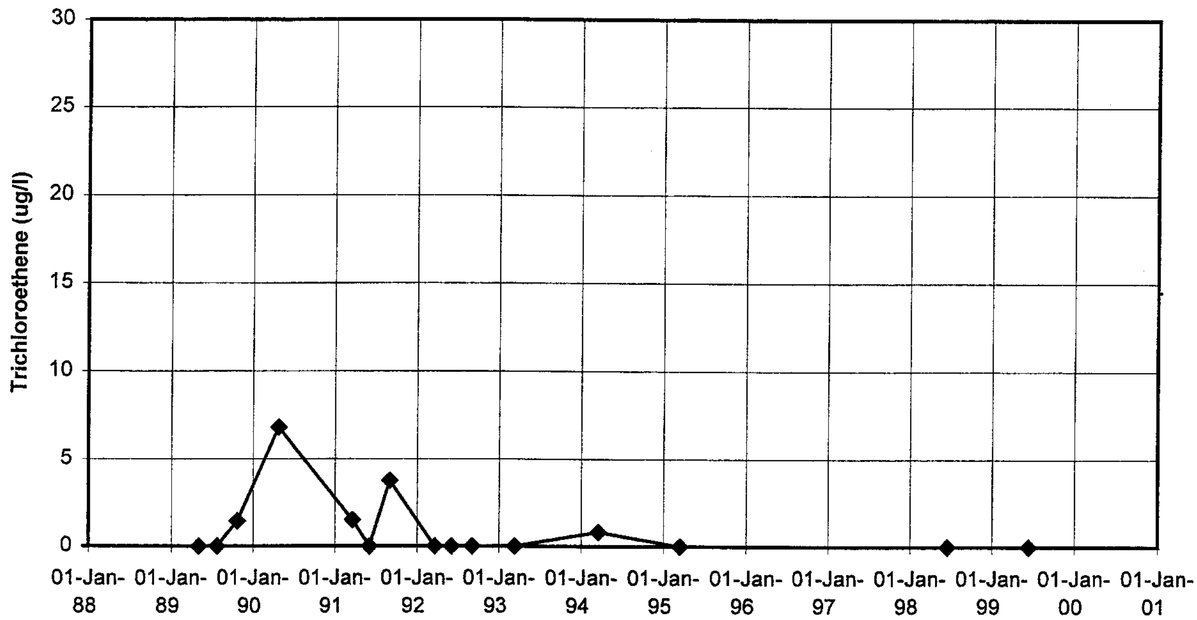
Note:
Plume map is from FY 1998.



Well Location

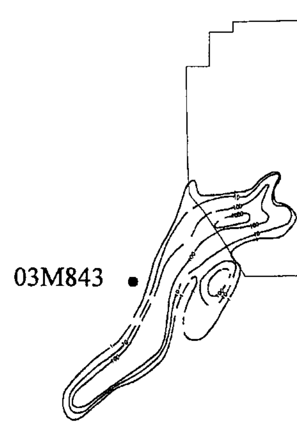
Middle and Lower Unit 3 Wells

03M843



Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

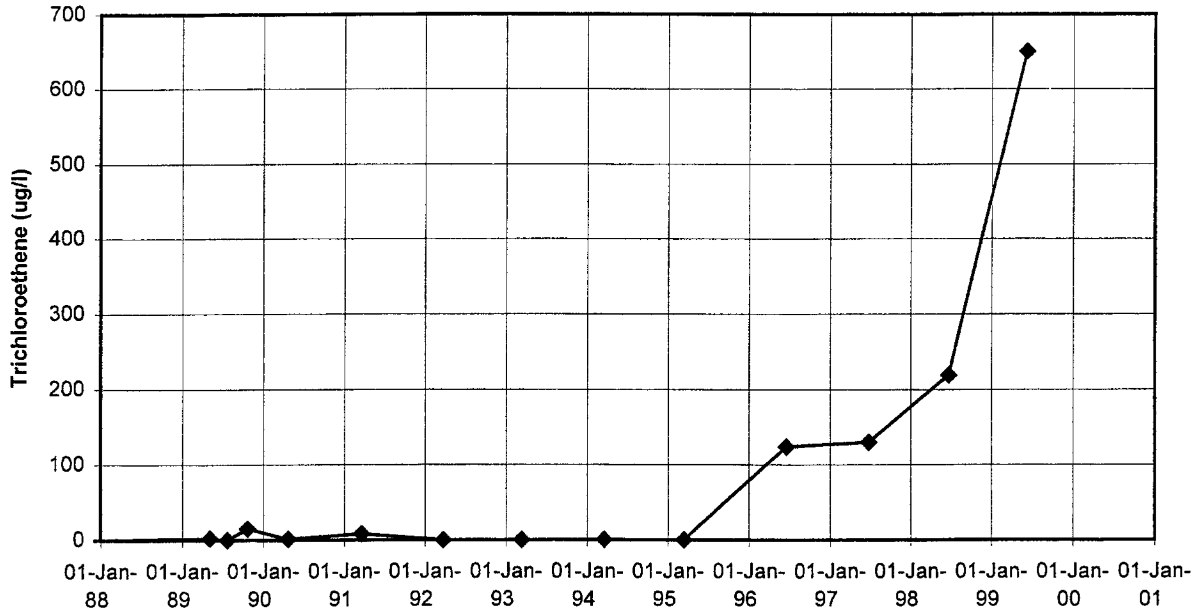
Note:
Plume map is from FY 1998.



Well Location

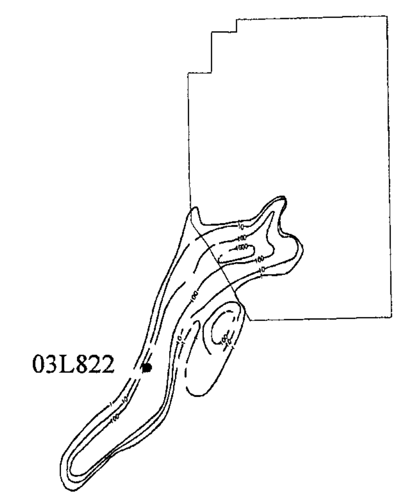
N:\0003\61\Graphs\Off-L3\03M843.doc\TNW-lmh

03L822



Well Purpose:
Monitor the progress of groundwater cleanup.

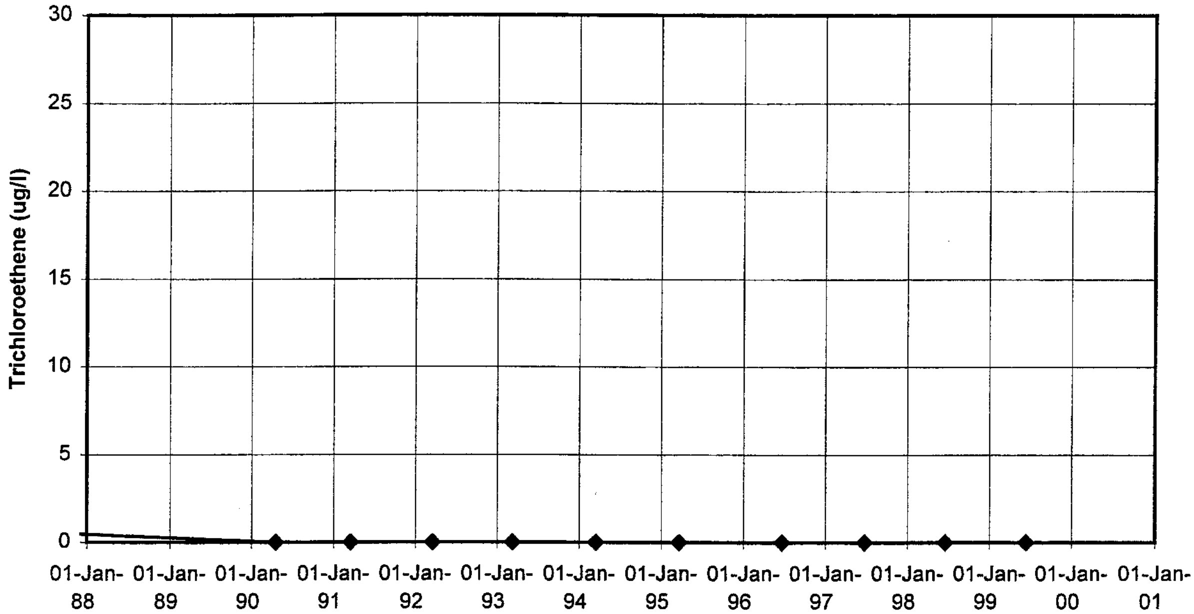
Note:
Plume map is from FY 1998.



Well Location

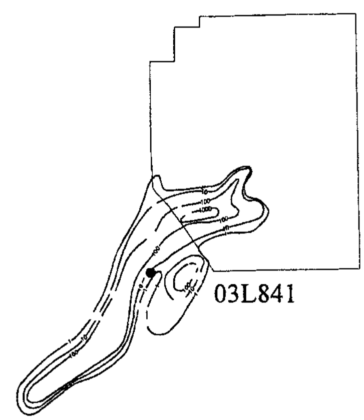
N:\0003\61\Graphs\Off-L3\03L822.doc\TNW-lmh

03L841



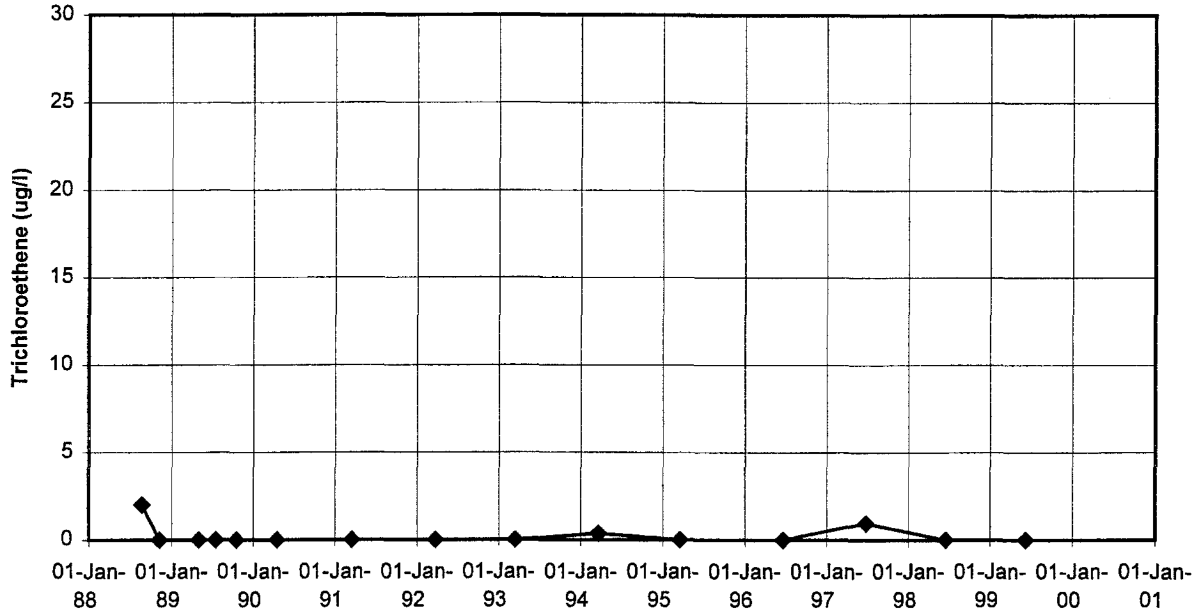
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



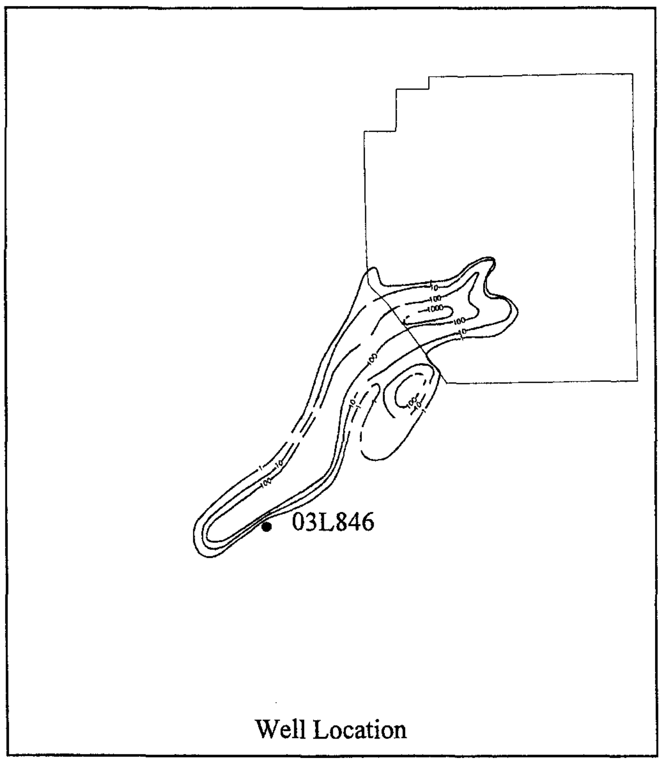
Well Location

03L846



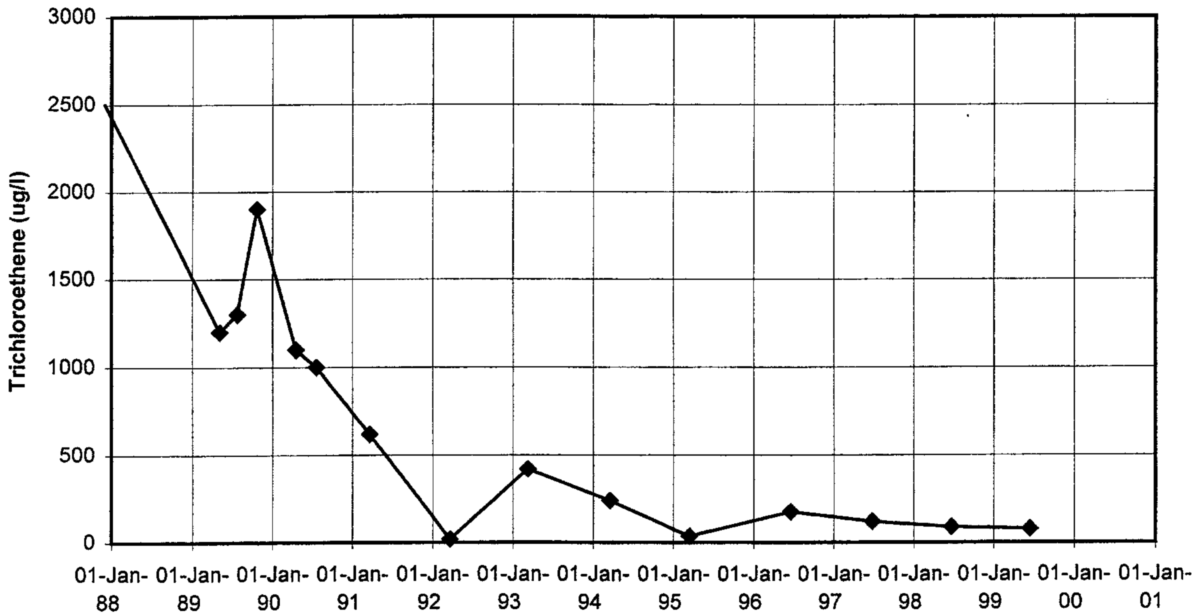
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



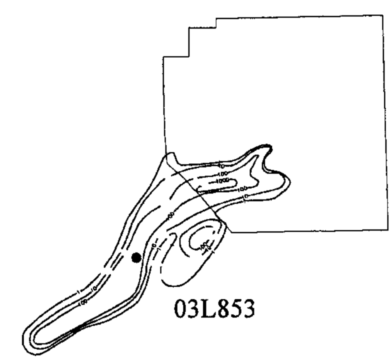
N:\0003\61\Graphs\Off-L3\03L846.doc\TNW-lmh

03L853



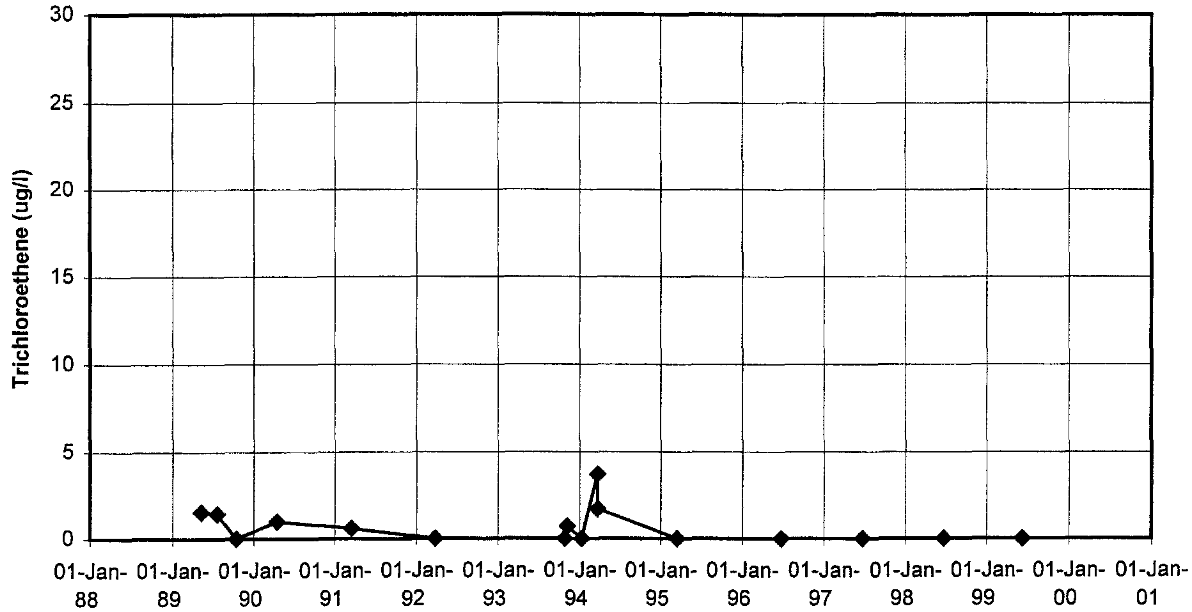
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



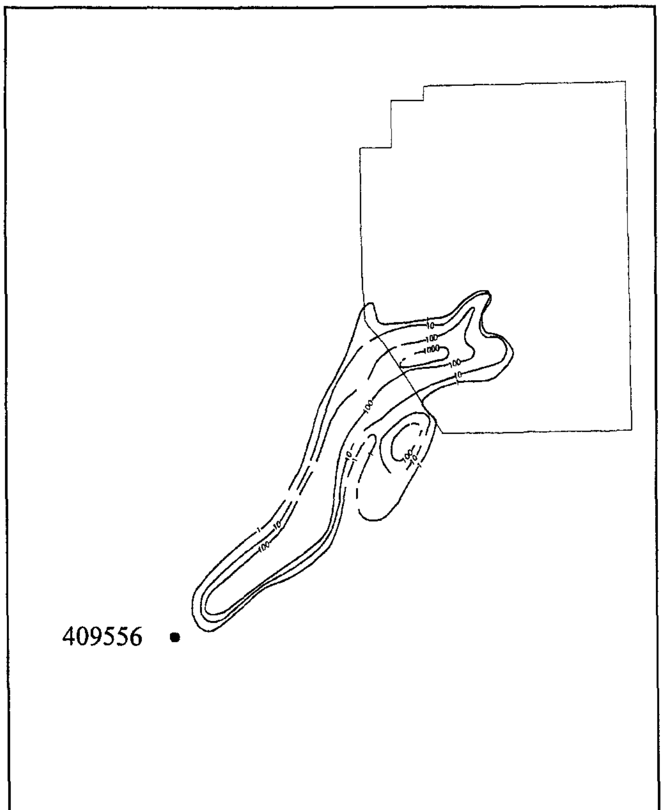
Well Location

409556



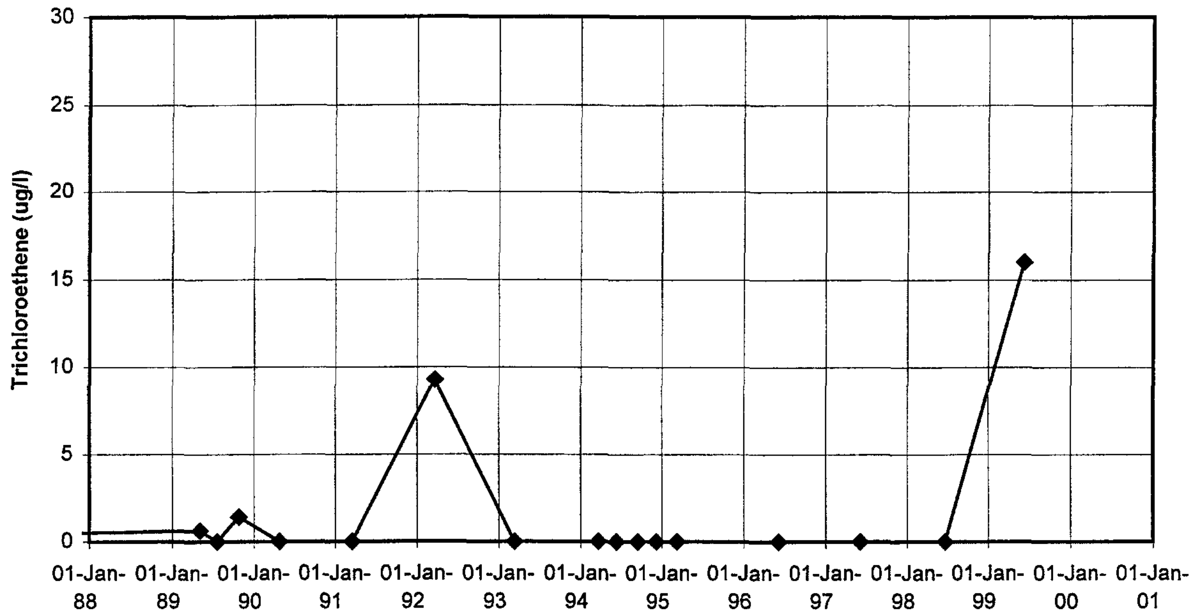
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.

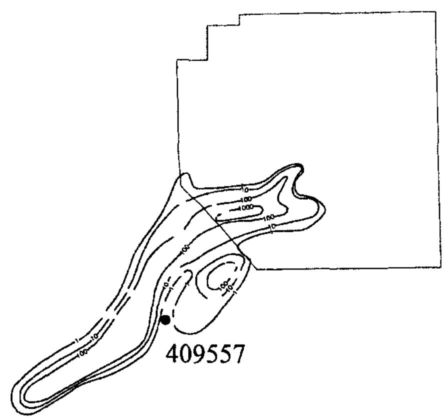


Well Location

409557

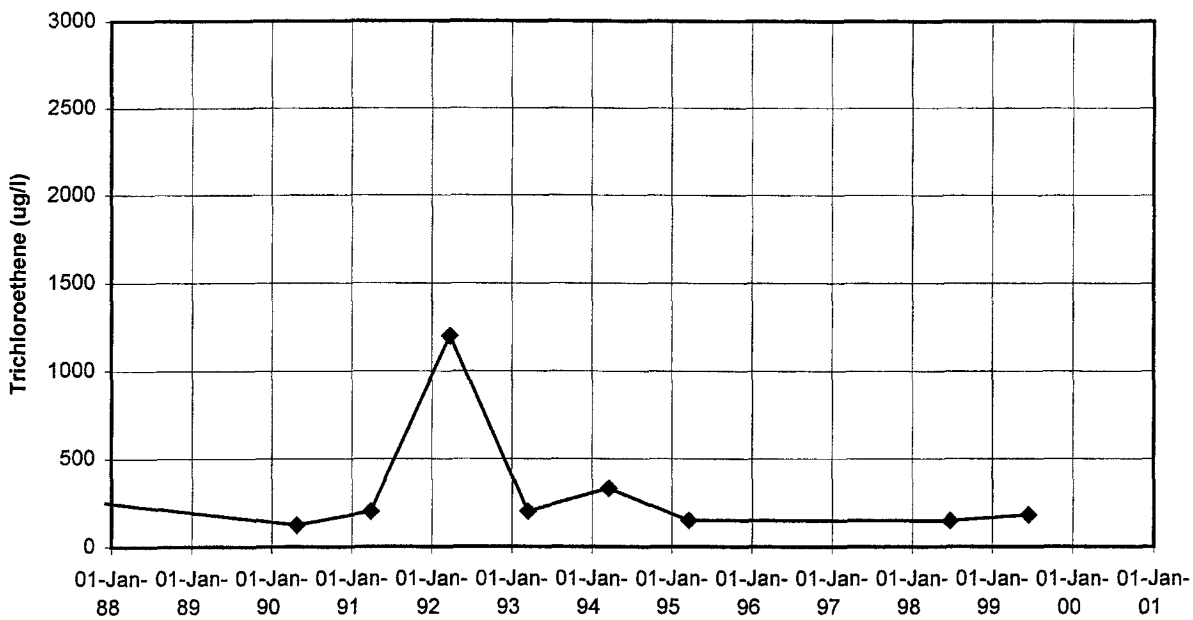


Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.
Note:
Plume map is from FY 1998.



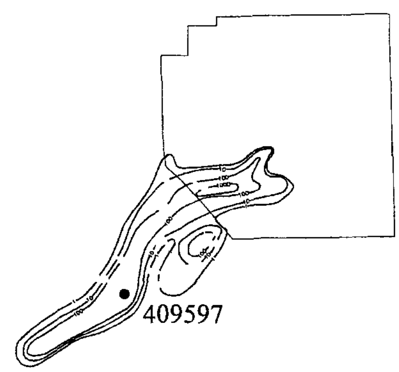
Well Location

409597



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.

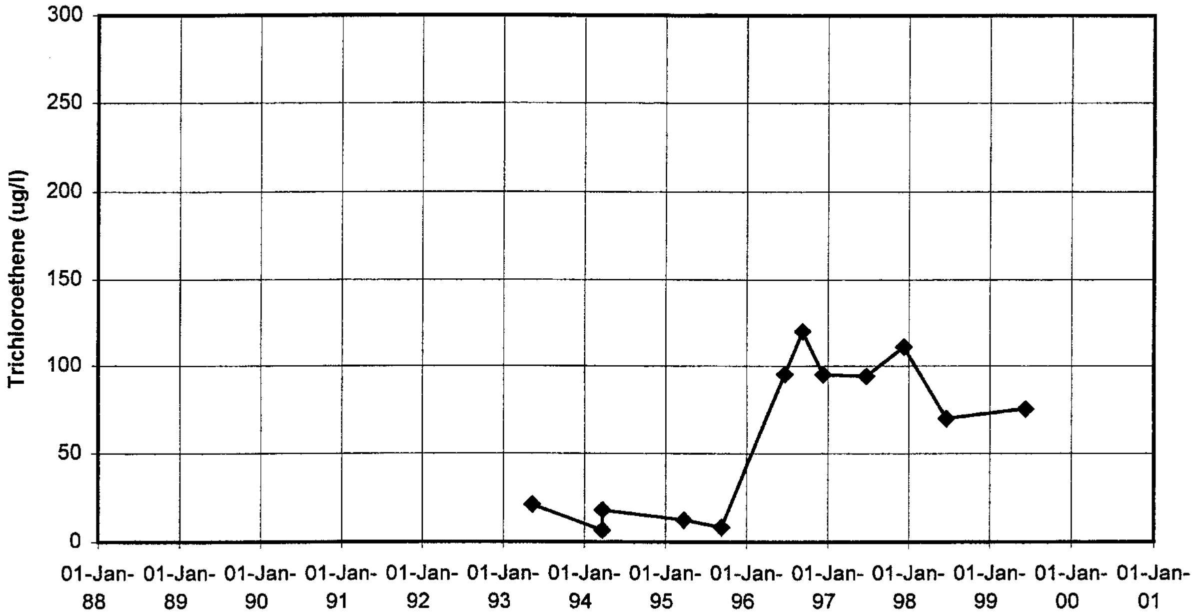


Well Location

N:\0003\61\Graphs\Off-L3\409597.doc\TNW-lmh

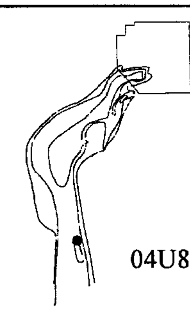
Unit 4 Wells

04U834



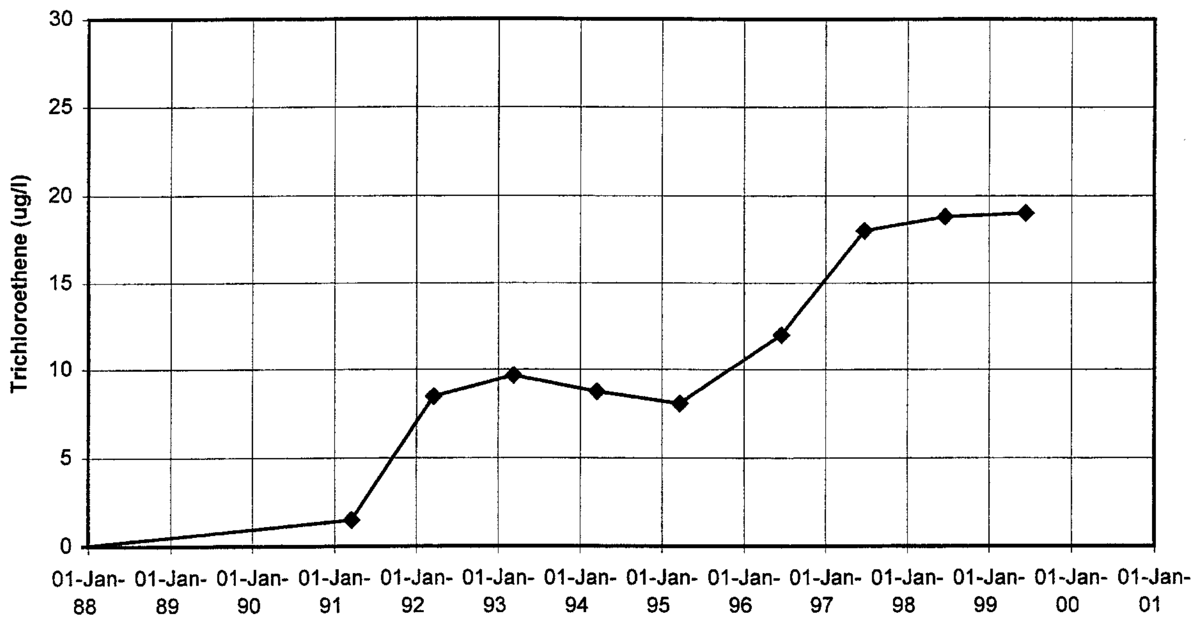
Well Purpose:
Monitor changes downgradient of the OU1 containment system.

Note:
Plume map is from FY 1998.



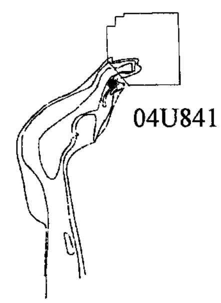
Well Location

04U841



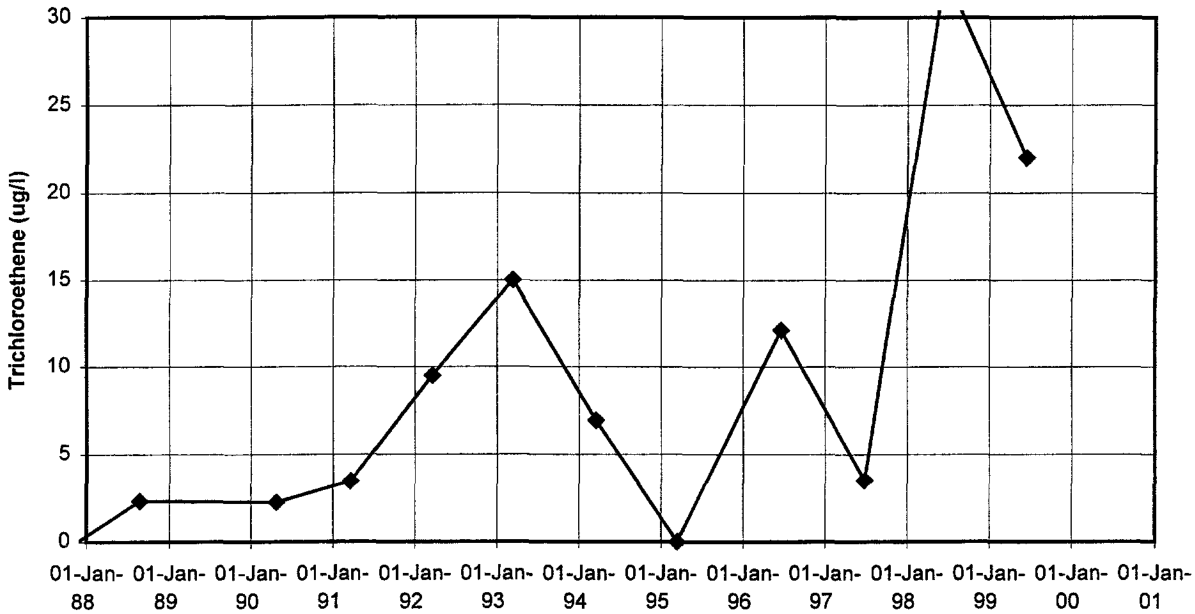
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



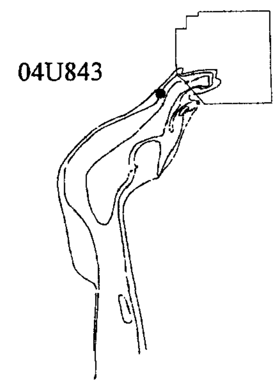
Well Location

04U843



Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

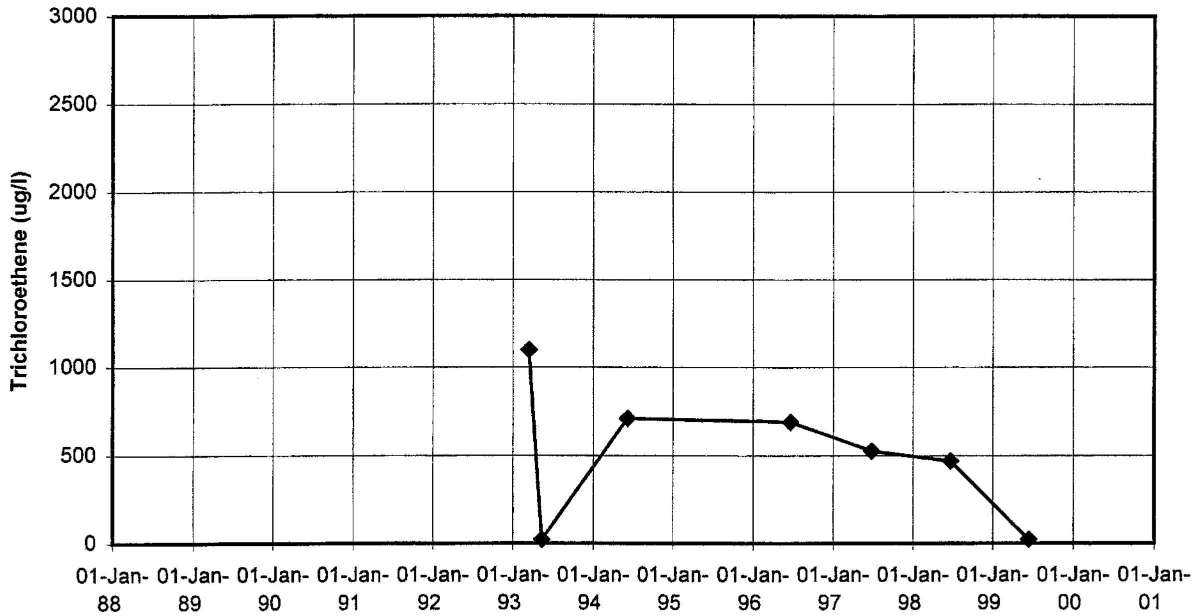
Note:
Plume map is from FY 1998.



Well Location

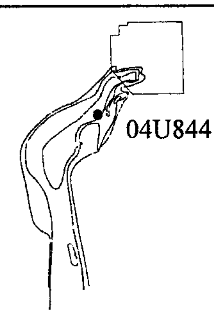
N:\0003\61\Graphs\Off-U4\04U843.doc\TNW-lmh

04U844



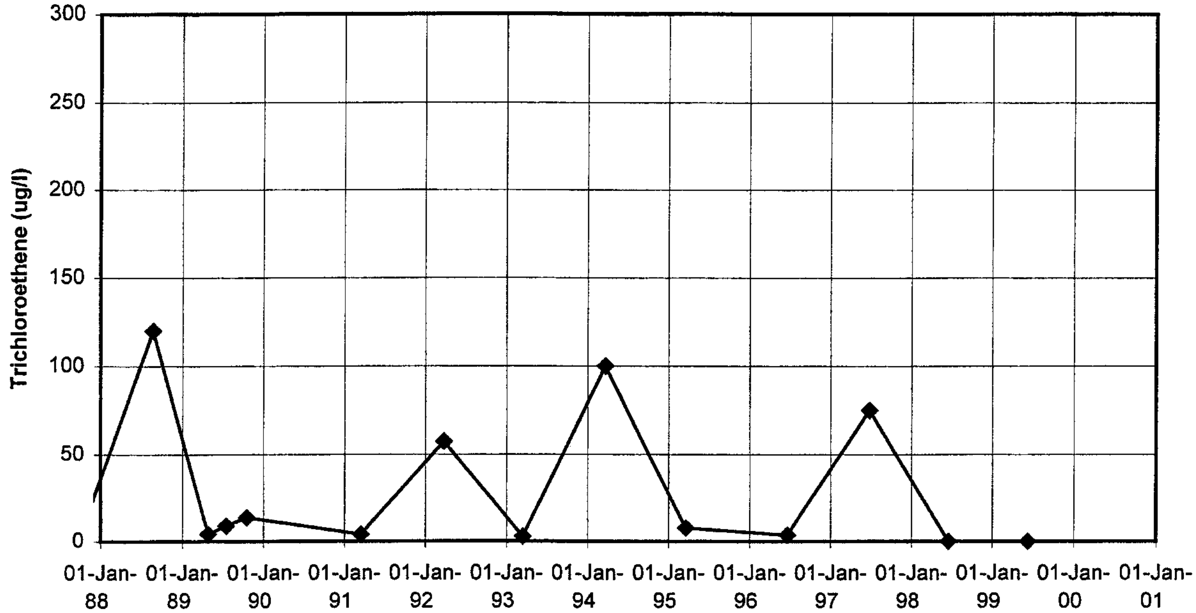
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



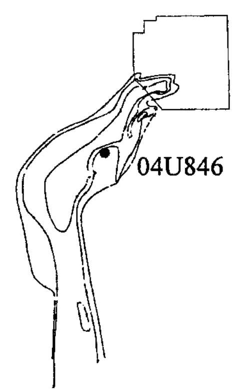
Well Location

04U846



Well Purpose:
Monitor the progress of groundwater cleanup.

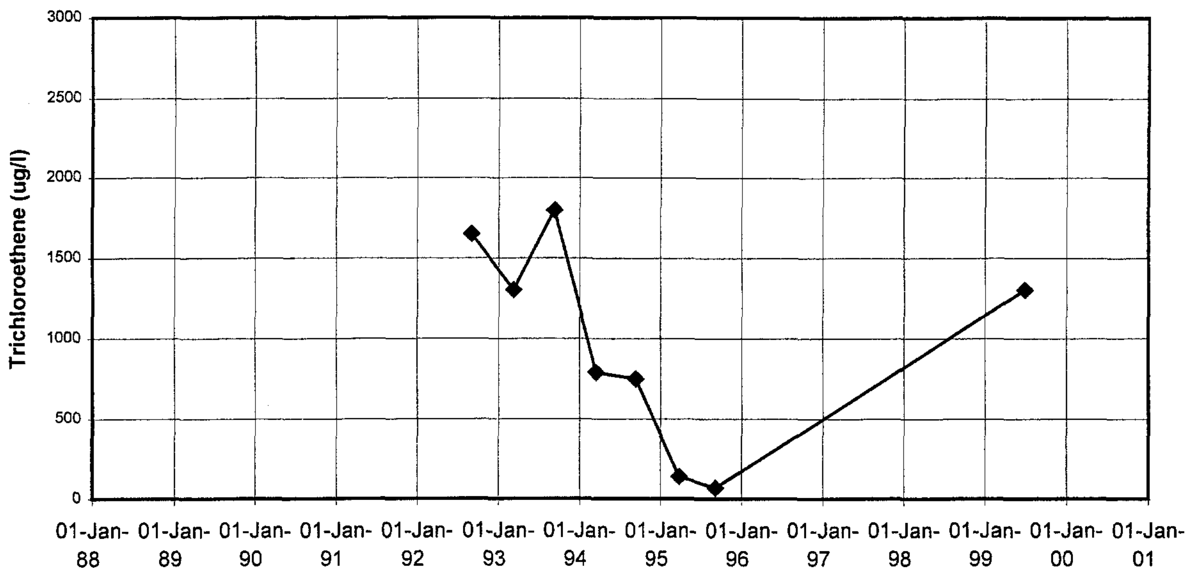
Note:
Plume map is from FY 1998.



Well Location

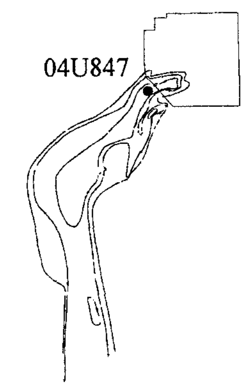
N:\0003\61\Graphs\Off-U4\04U846.doc\TNW-lmh

04U847



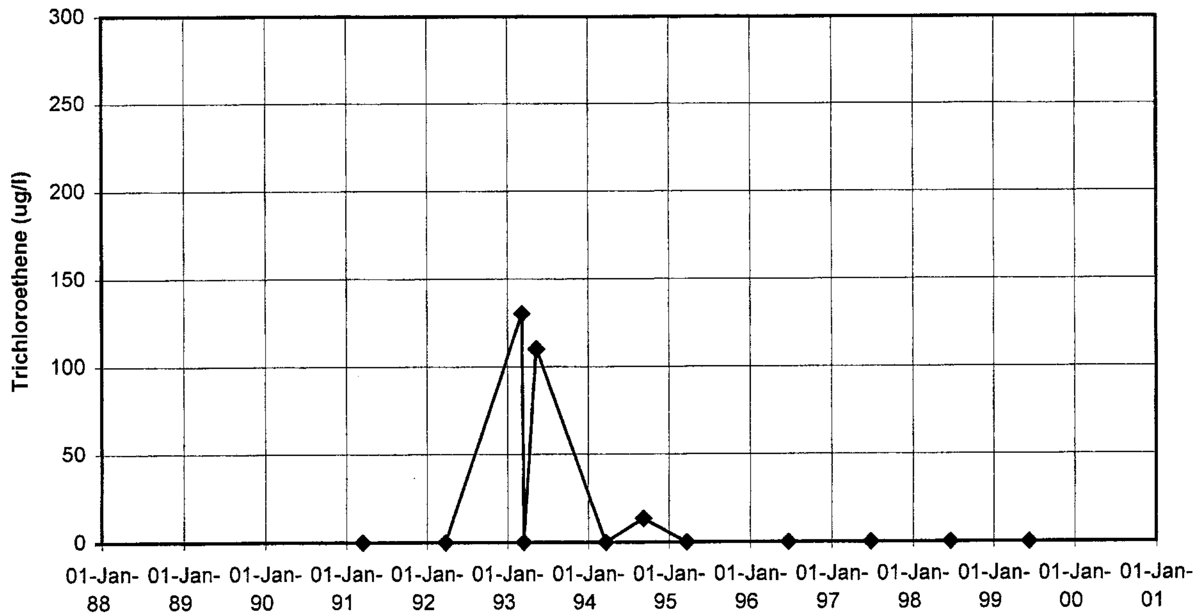
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



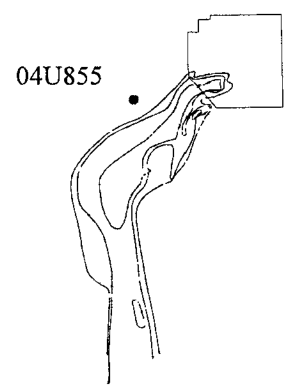
Well Location

04U855



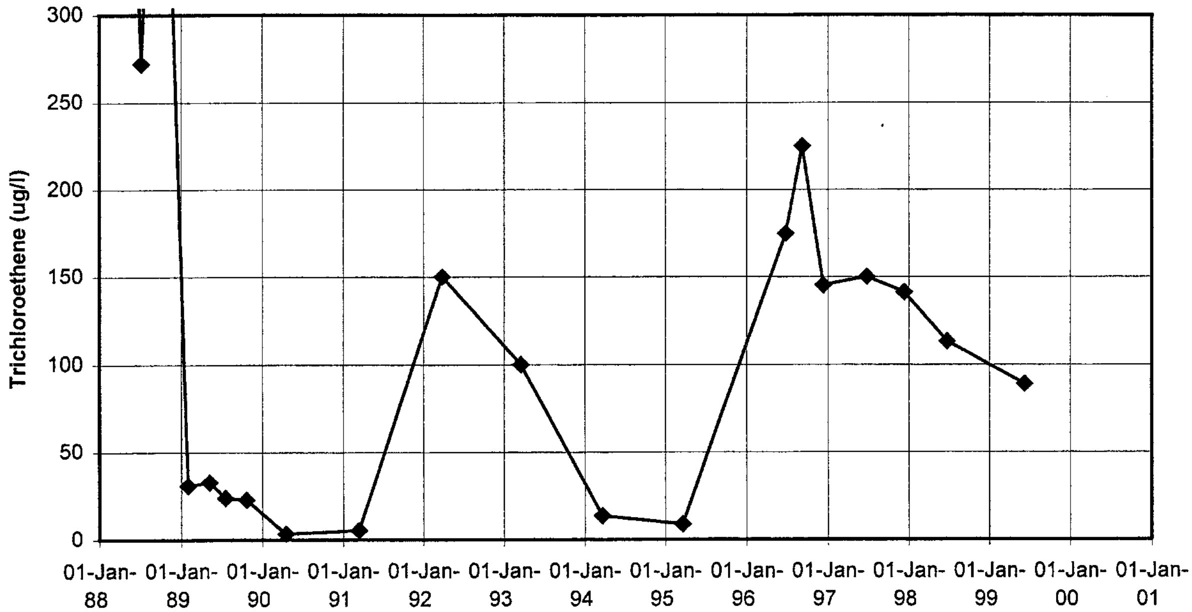
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map from FY 1998.



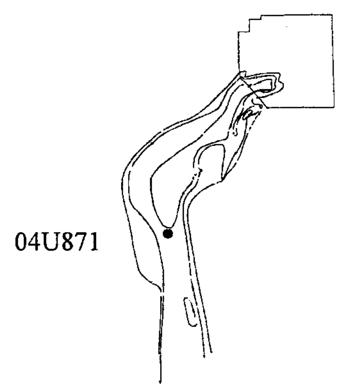
Well Location

04U871



Well Purpose:
Monitor the progress of groundwater cleanup.

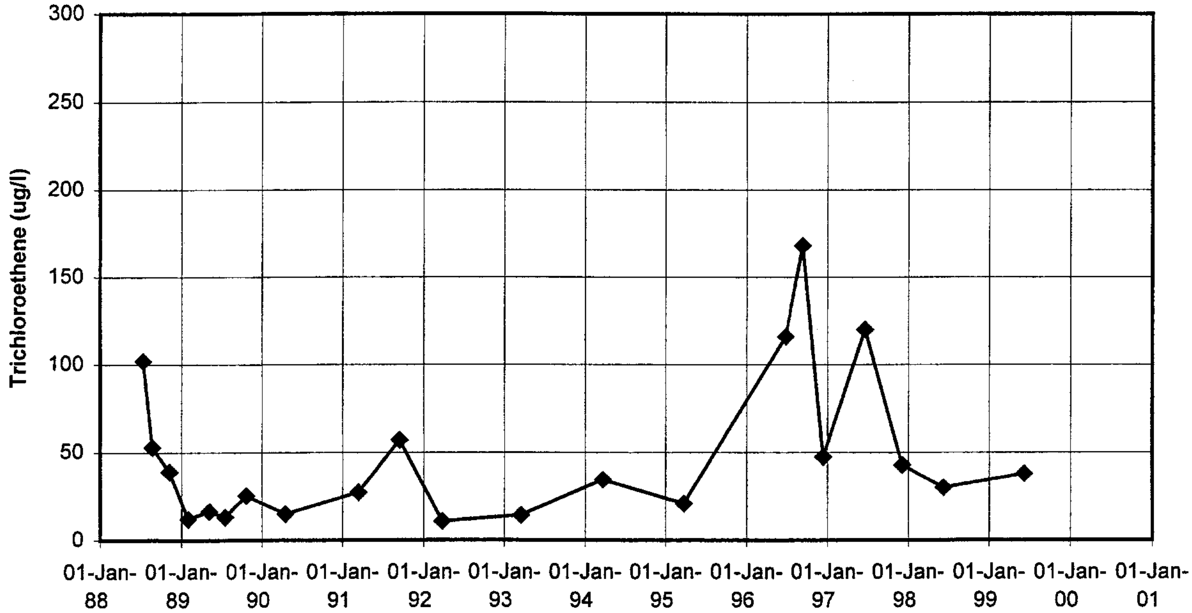
Note:
Plume map is from FY 1998.



Well Location

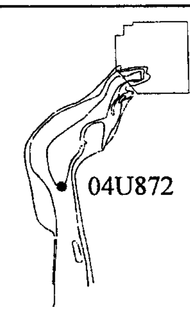
N:\0003\61\Graphs\Off-U4\04U871.doc\TNW-lmh

04U872



Well Purpose:
Monitor the progress of groundwater cleanup.

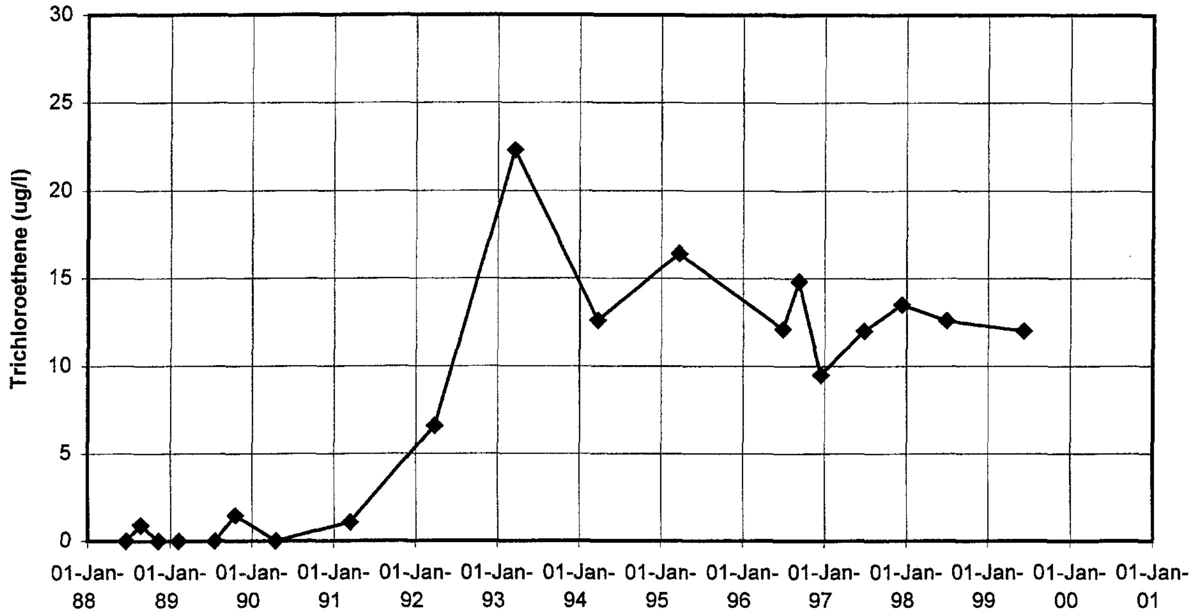
Note:
Plume map is from FY 1998.



Well Location

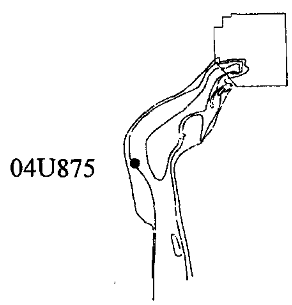
N:\0003\61\Graphs\Off-U4\04U872.doc\TNW-lmh

04U875



Well Purpose:
Monitor the progress of groundwater cleanup.

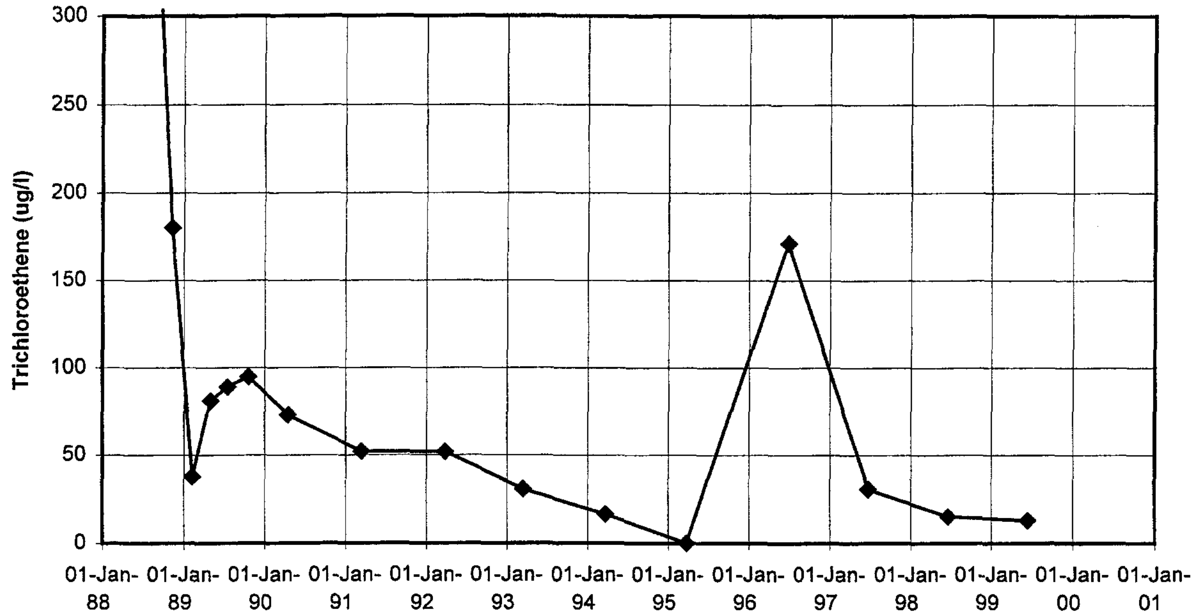
Note:
Plume map is from FY 1998.



Well Location

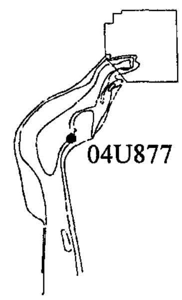
N:\0003\61\Graphs\Off-U4\04U875.doc\TNW-lmh

04U877



Well Purpose:
Monitor the progress of groundwater cleanup.

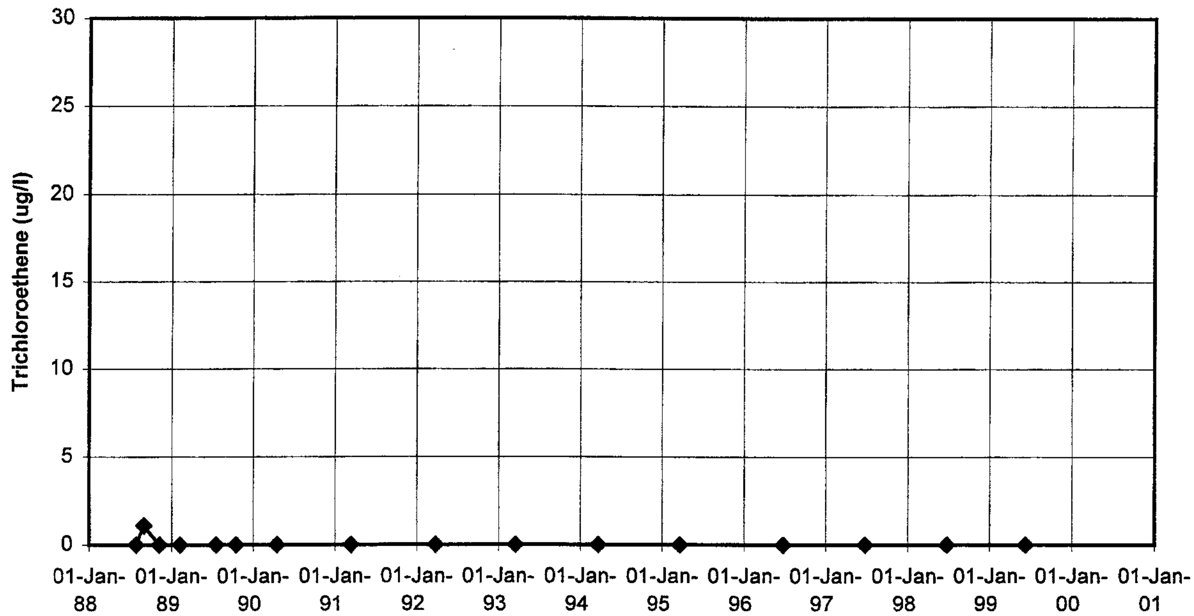
Note:
Plume map is from FY 1998.



Well Location

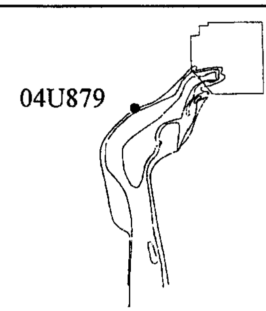
N:\0003\61\Graphs\Off-U4\04U877.doc\TNW-lmh

04U879



Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

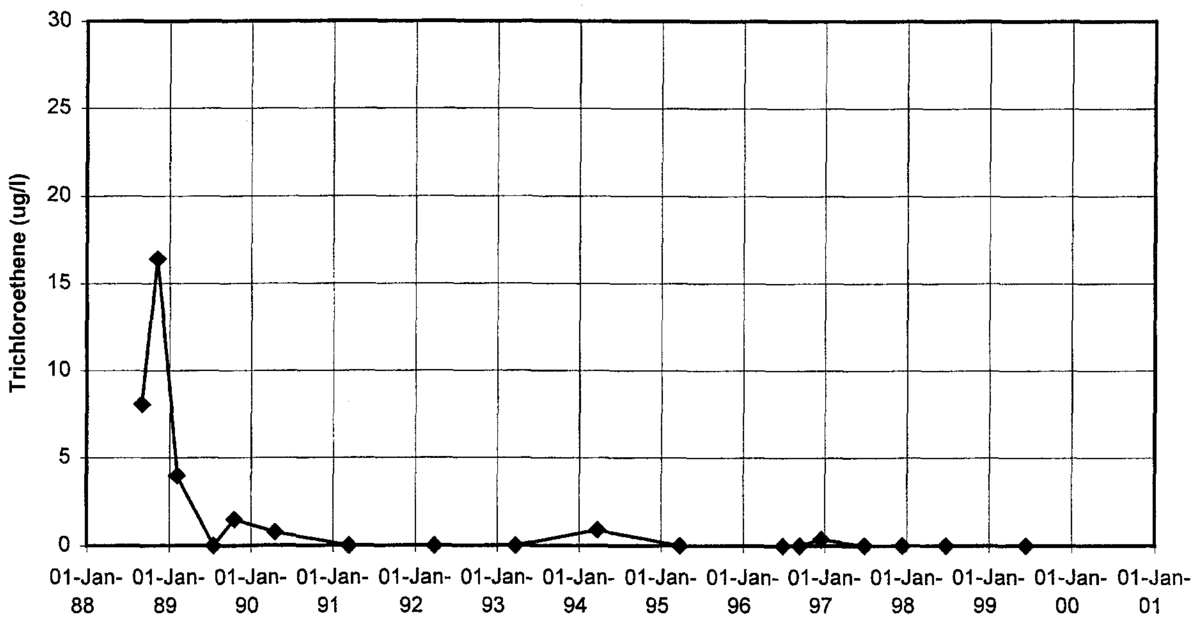
Note:
Plume map is from FY 1998.



Well Location

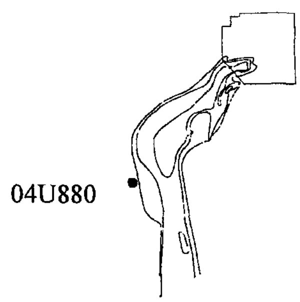
N:\0003\61\Graphs\Off-U4\04U879.doc\TNW-lmh

04U880



Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

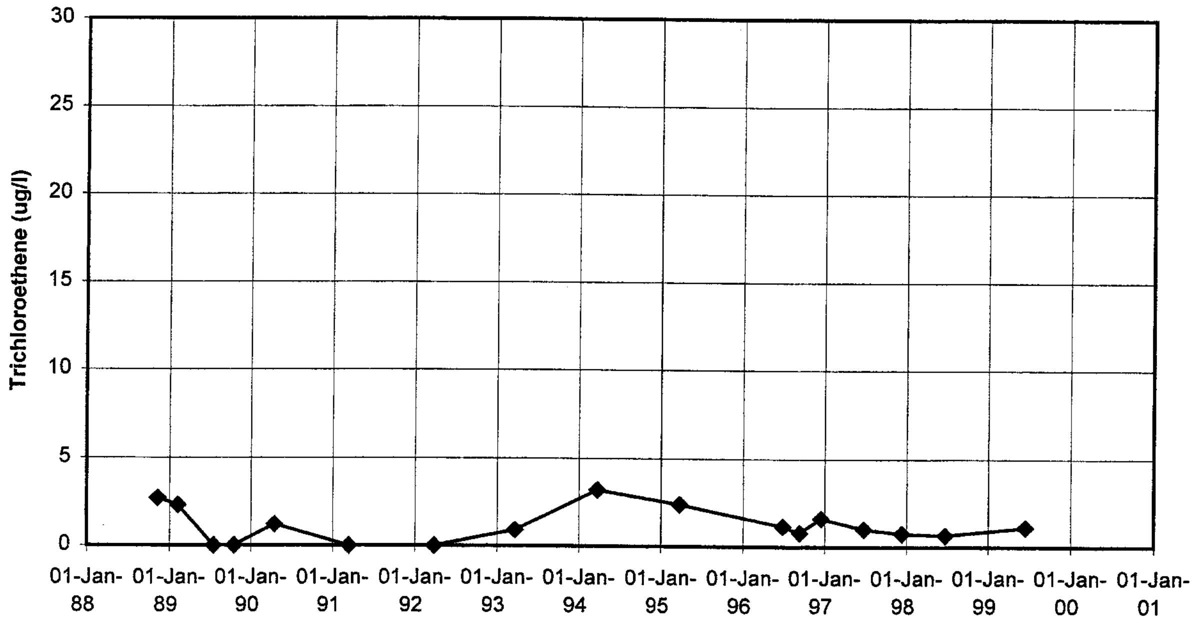
Note:
Plume map is from FY 1998.



Well Location

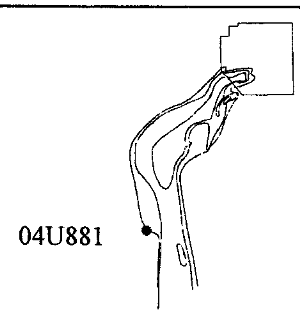
N:\0003\61\Graphs\Off-U4\04U880.doc\TNW-lmh

04U881



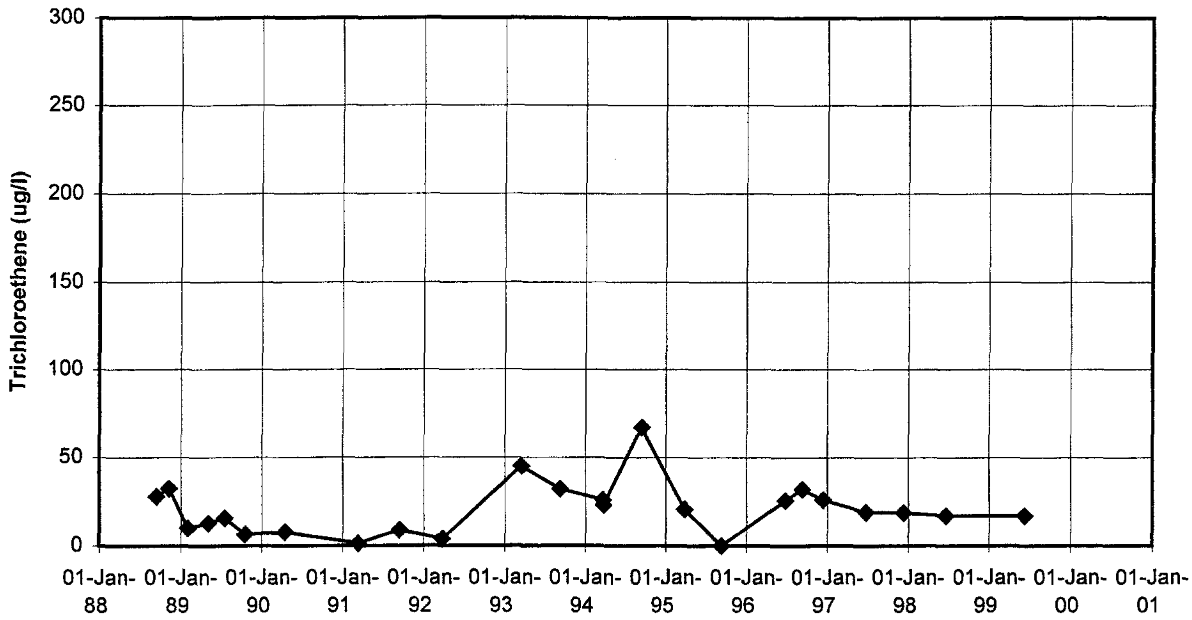
Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



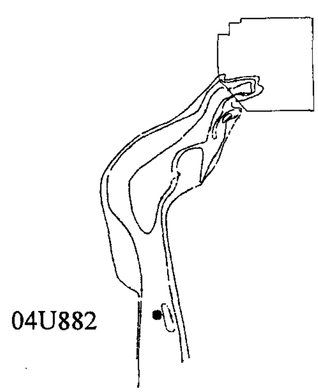
Well Location

04U882



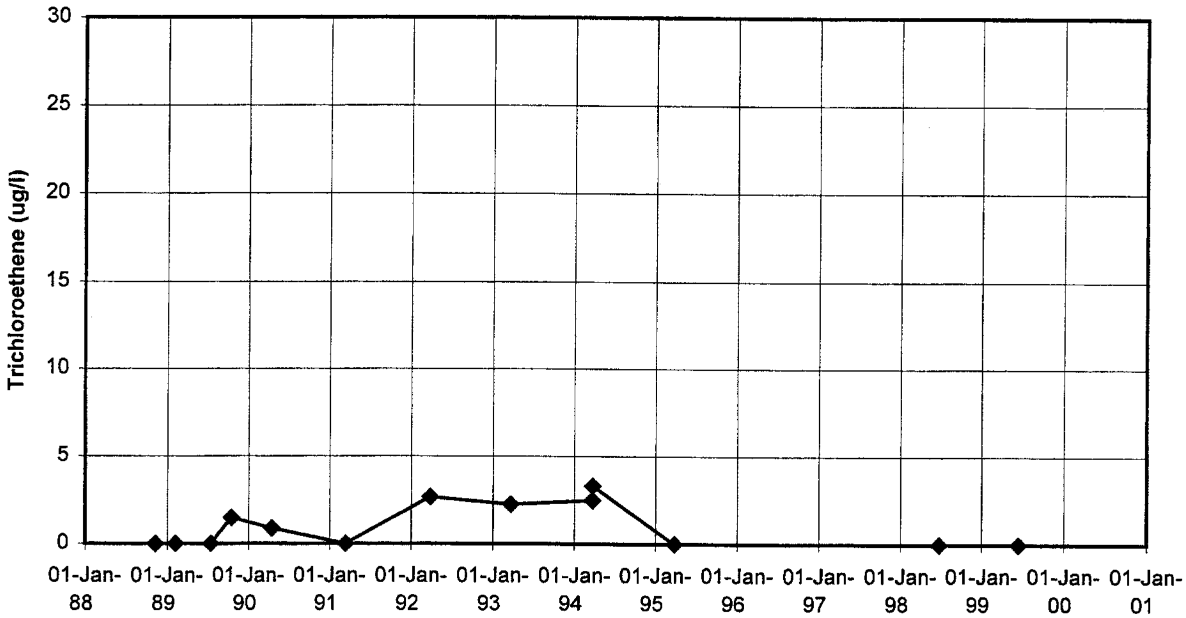
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



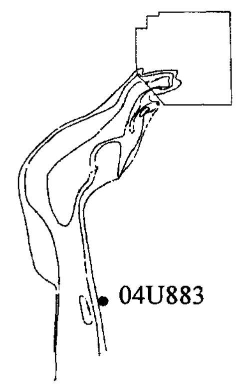
Well Location

04U883



Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

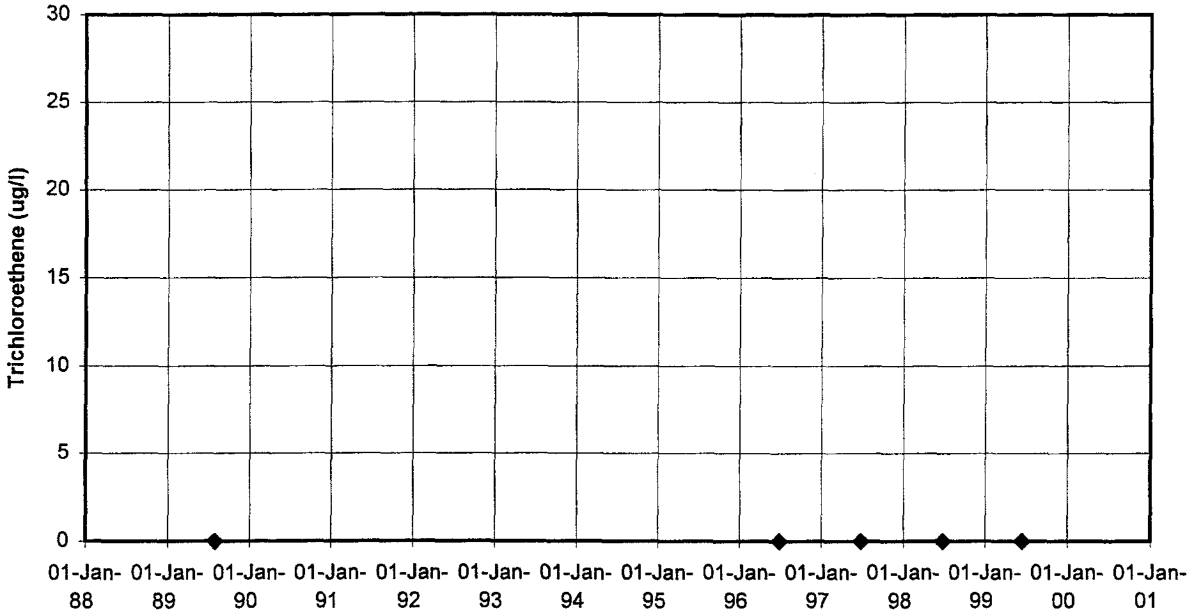
Note:
Plume map is from FY 1998.



Well Location

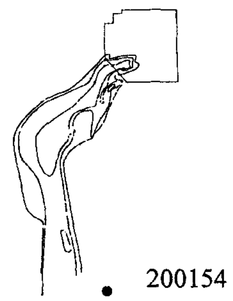
N:\0003\61\Graphs\Off-U4\04U883.doc\TNW-lmh

200154



Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

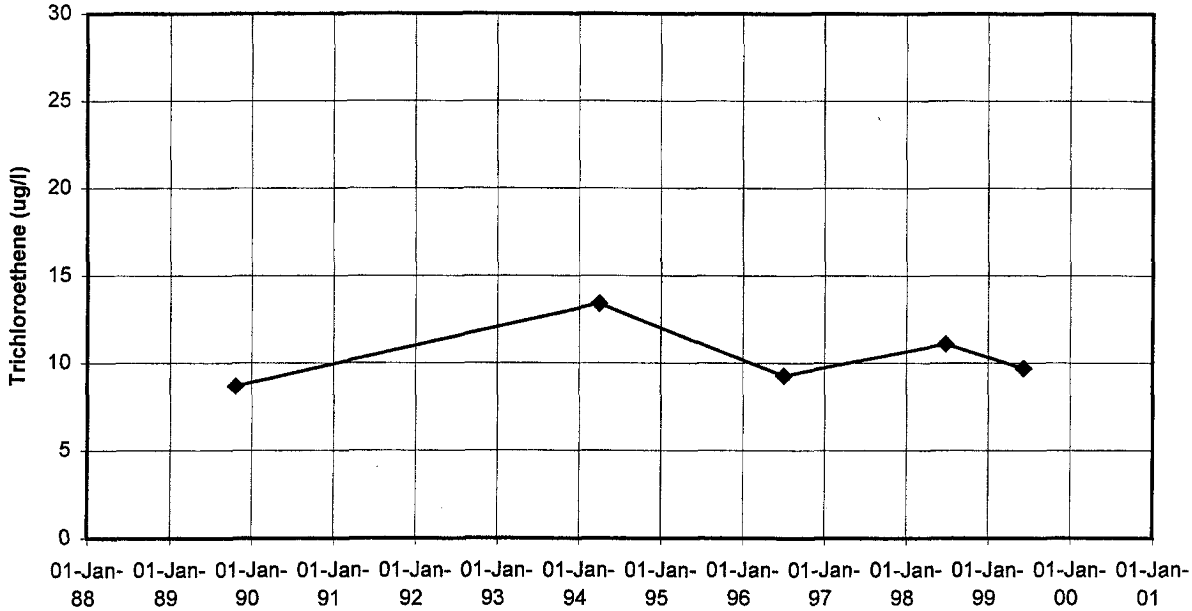
Note:
Plume map is from FY 1998.



Well Location

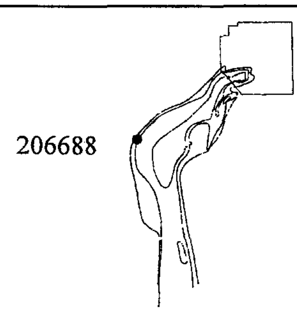
N:\0003\61\Graphs\Off-U4\200154.doc\TNW-lmh

206688



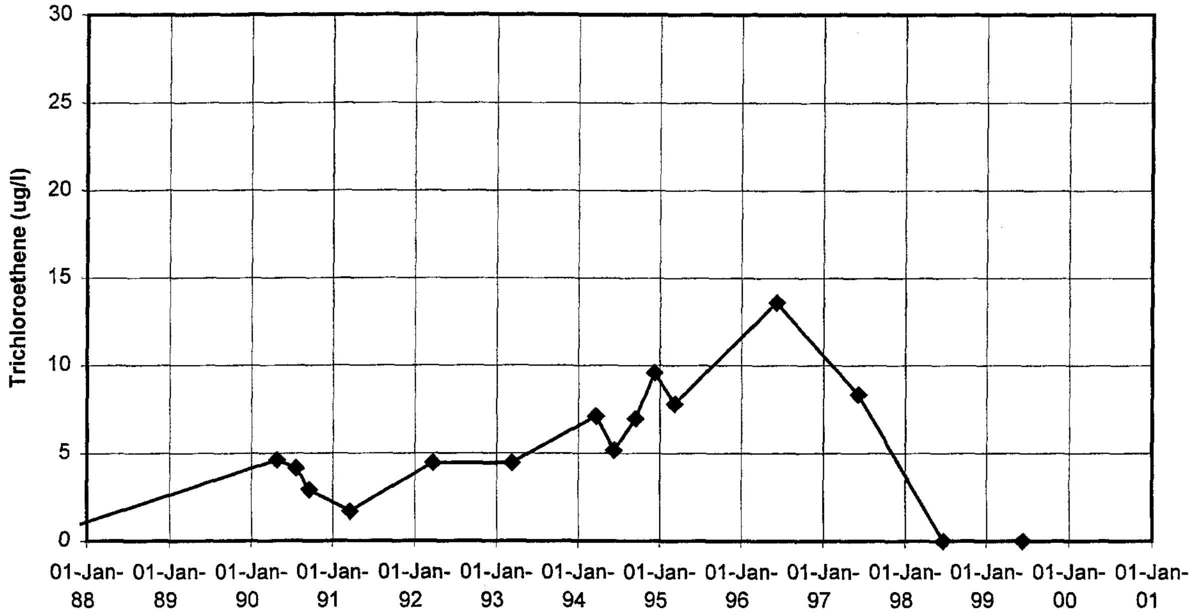
Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



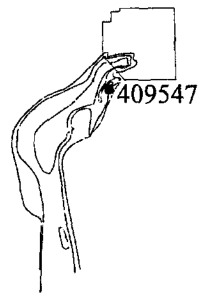
Well Location

409547



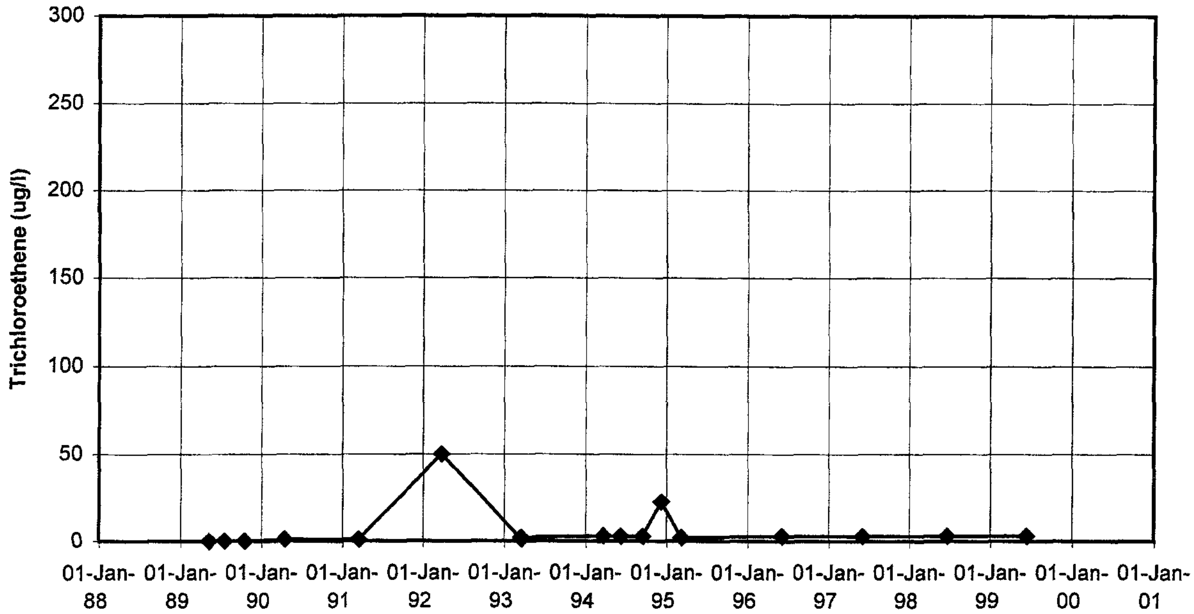
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



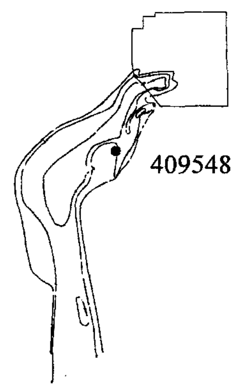
Well Location

409548



Well Purpose:
Monitor the progress of groundwater cleanup.

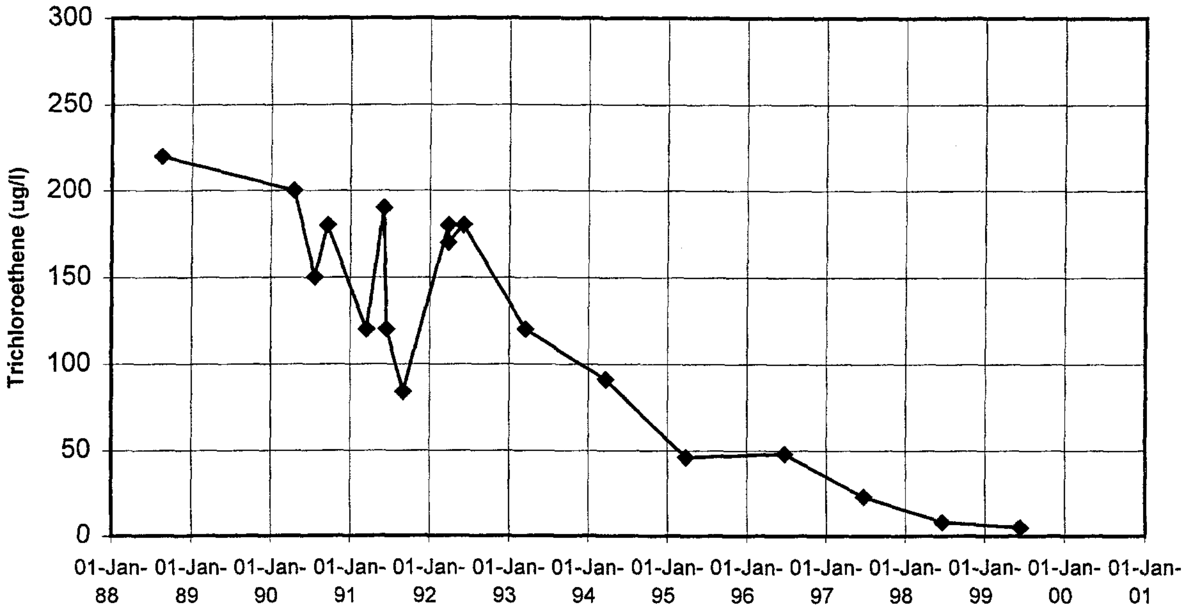
Note:
Plume map is from FY 1998.



Well Location

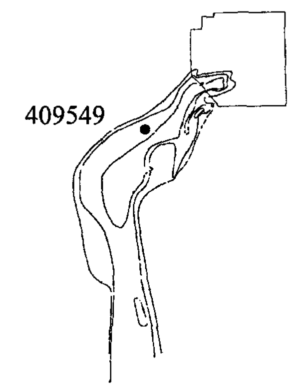
N:\0003\61\Graphs\Off-U4\409548.doc\TNW-lmh

409549



Well Purpose:
Monitor the progress of groundwater cleanup.

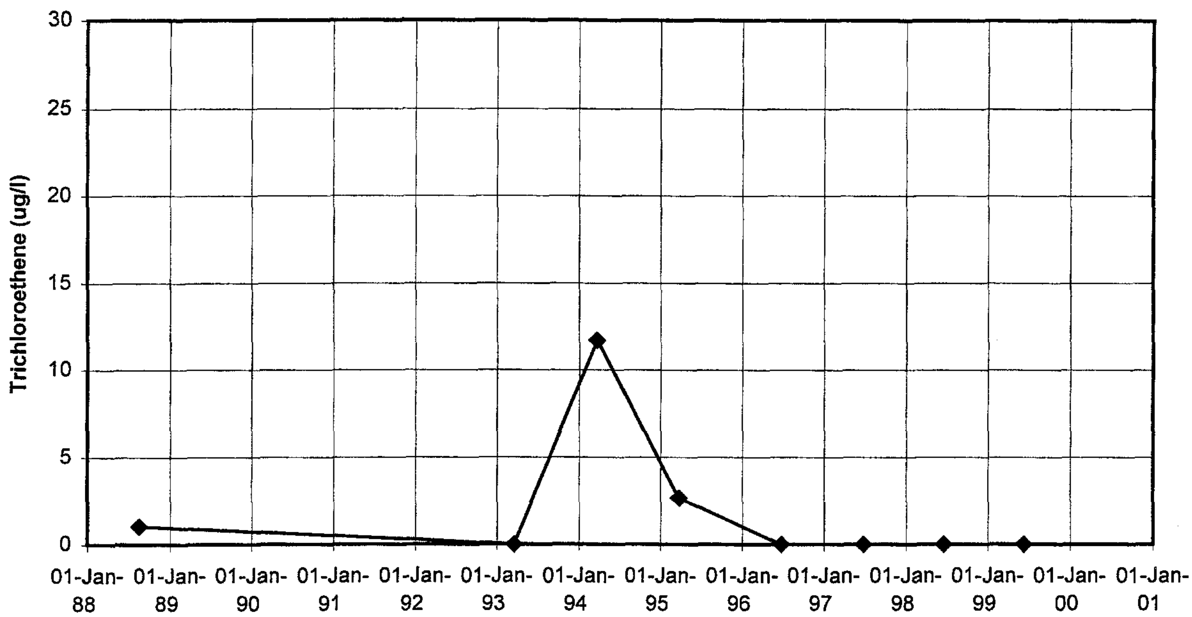
Note:
Plume map is from FY 1998.



Well Location

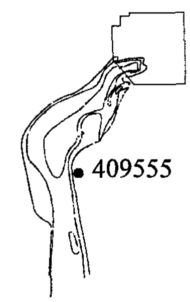
N:\0003\61\Graphs\Off-U4\409549.doc\TNW-lmh

409555



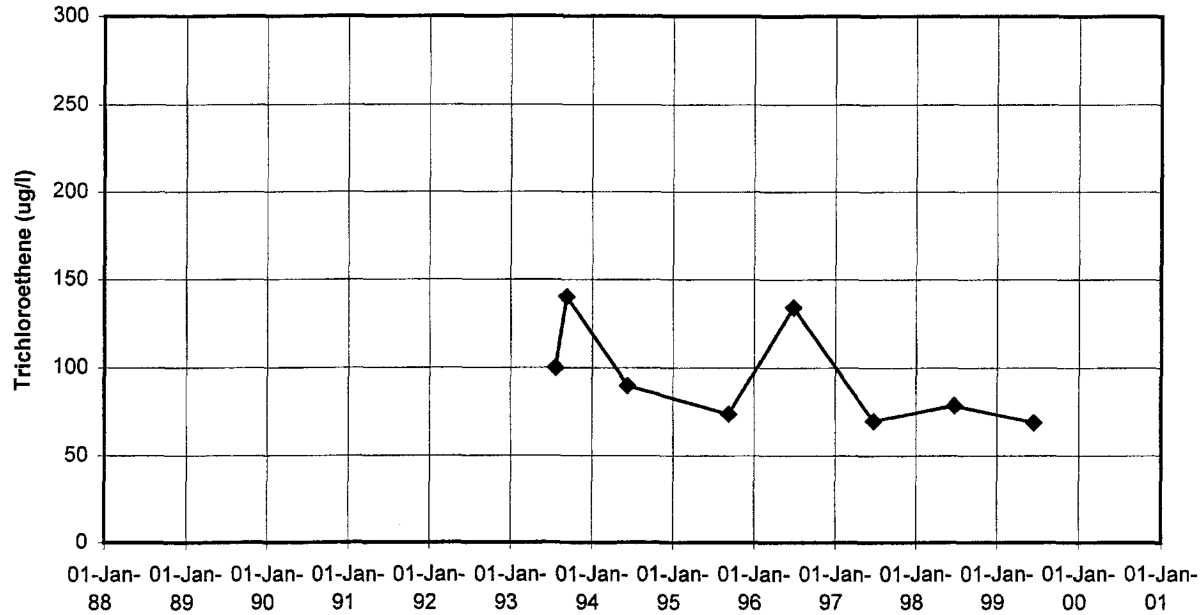
Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



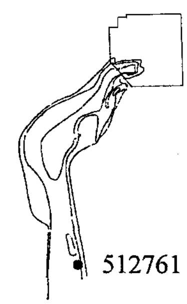
Well Location

512761



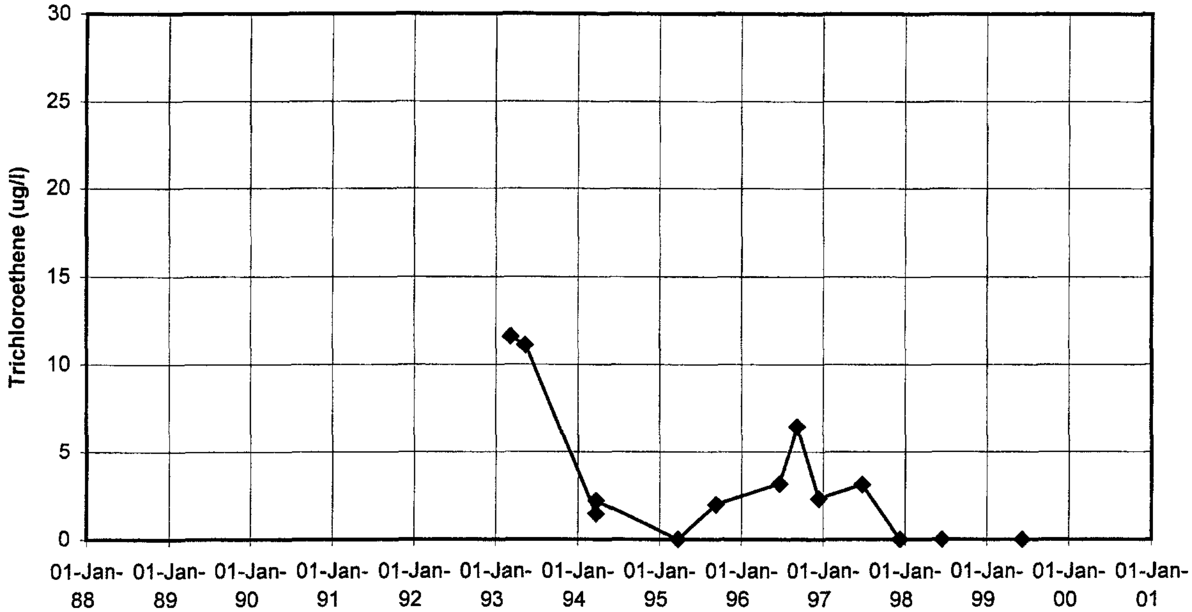
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



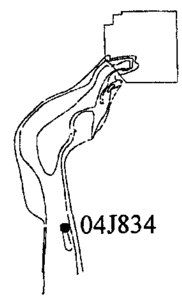
Well Location

04J834



Well Purpose:
Monitor the progress of groundwater cleanup.

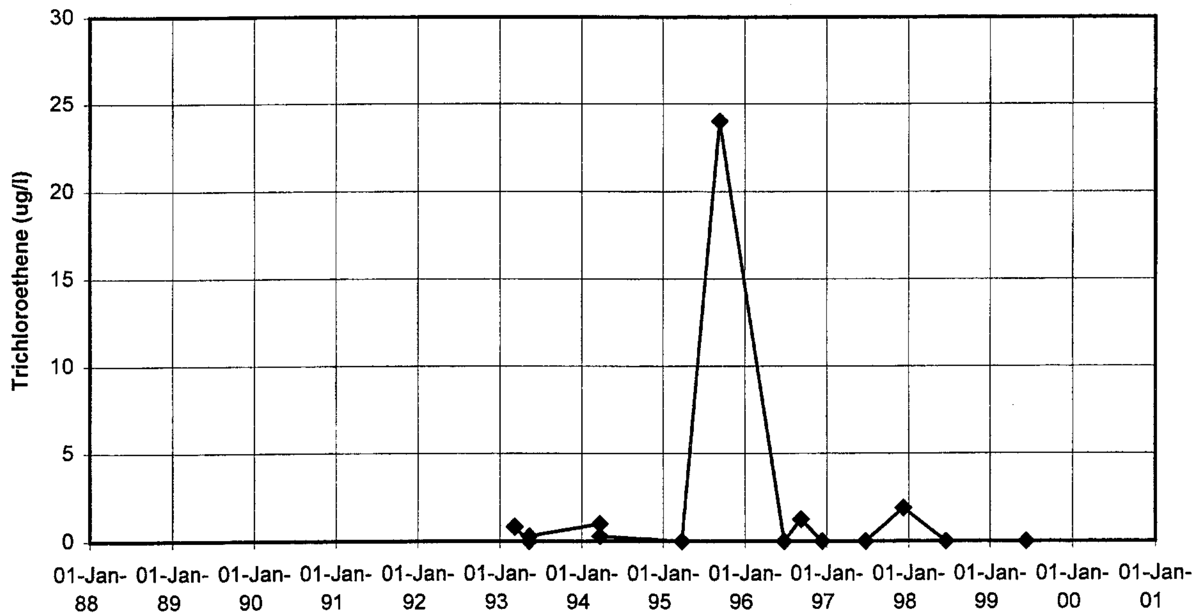
Note:
Plume map is from FY 1998.



Well Location

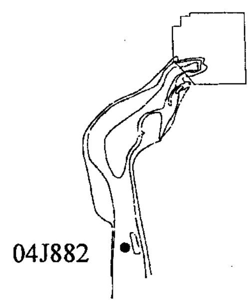
N:\0003\61\Graphs\Off-U4\04J834.doc\TNW-lmh

04J882



Well Purpose:
Monitor the progress of groundwater cleanup.

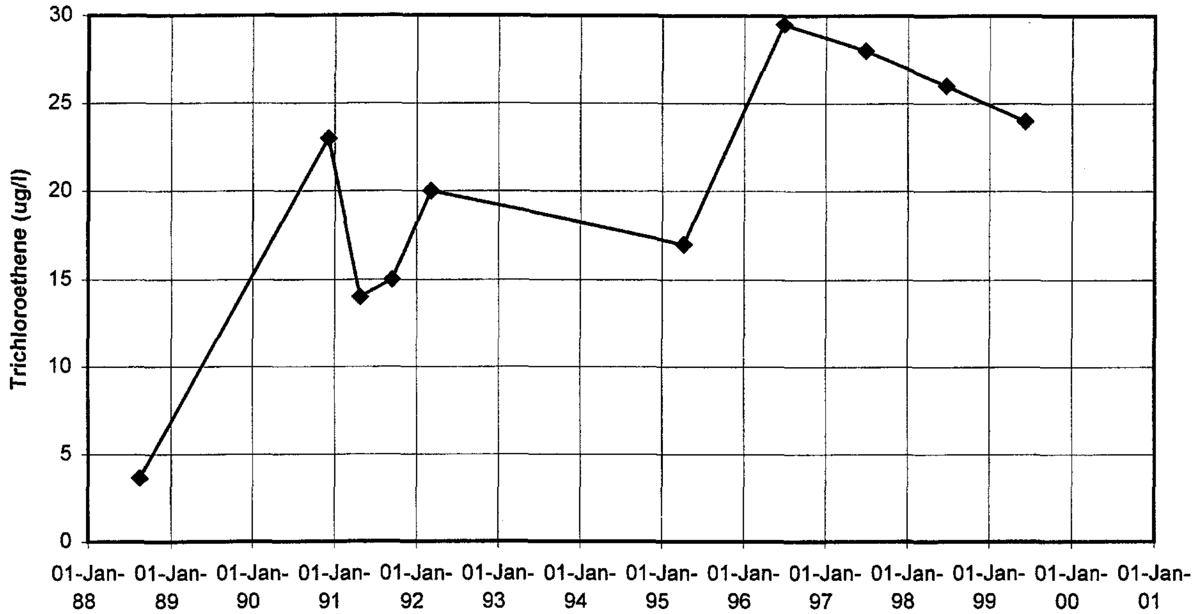
Note:
Plume map is from FY 1998.



Well Location

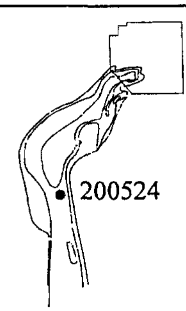
N:\0003\61\Graphs\Off-U4\04J882.doc\TNW-lmh

200524



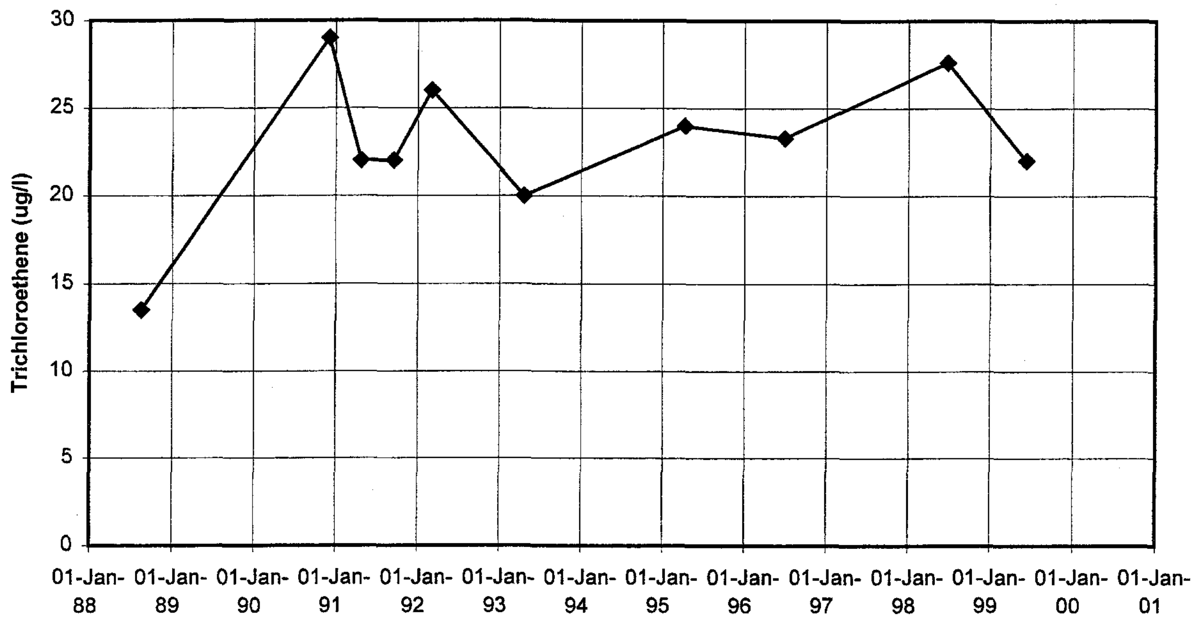
Well Purpose:
Monitor the progress of groundwater cleanup.
This is St. Anthony Municipal Well #5.

Note:
Plume map is from FY 1998.



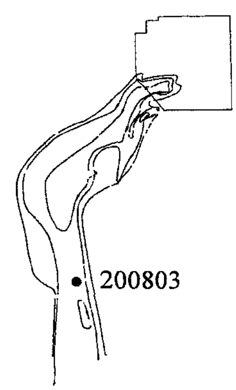
Well Location

200803



Well Purpose:
Monitor the progress of groundwater cleanup.
This is St. Anthony Municipal Well #4.

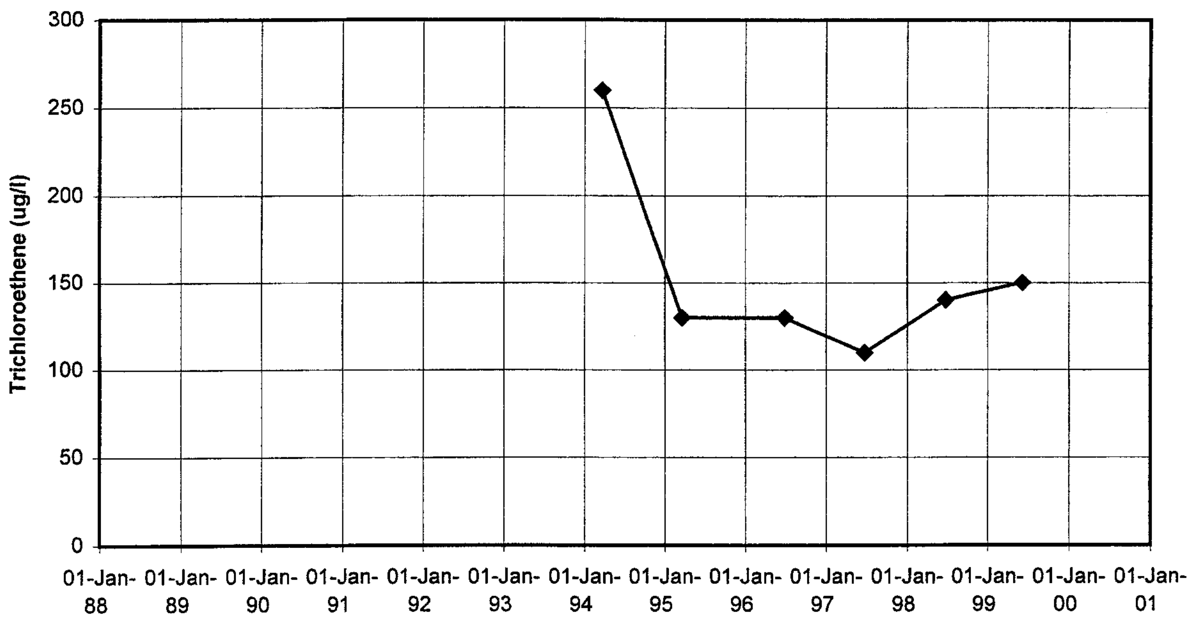
Note:
Plume map is from FY 1998.



Well Location

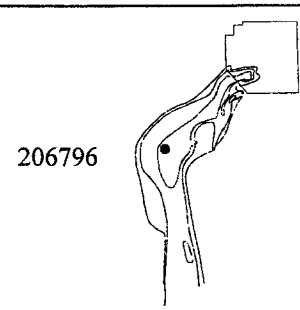
N:\0003\61\Graphs\Off-U4\200803.doc\TNW-lmh

206796



Well Purpose:
Monitor the progress of groundwater cleanup.
This is New Brighton Municipal Well #5.

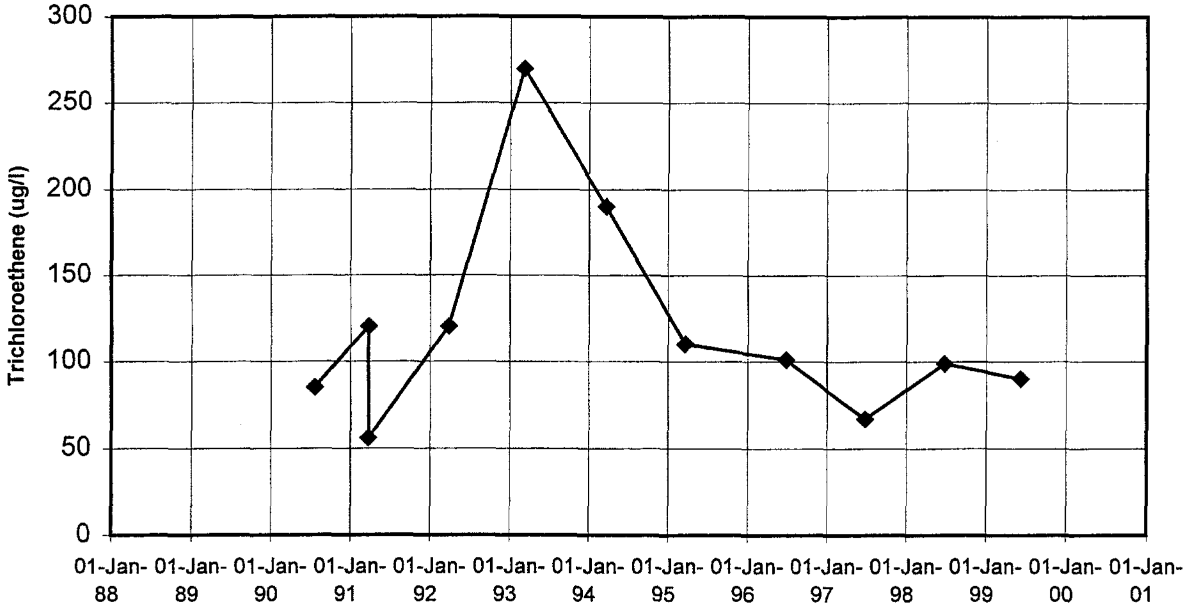
Note:
Plume map is from FY 1998.



Well Location

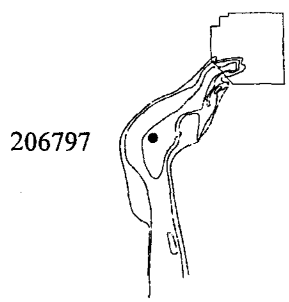
N:\0003\61\Graphs\Off-U4\206796.doc\TNW-lmh

206797



Well Purpose:
Monitor the progress of groundwater cleanup.
This is New Brighton Municipal Well #6.

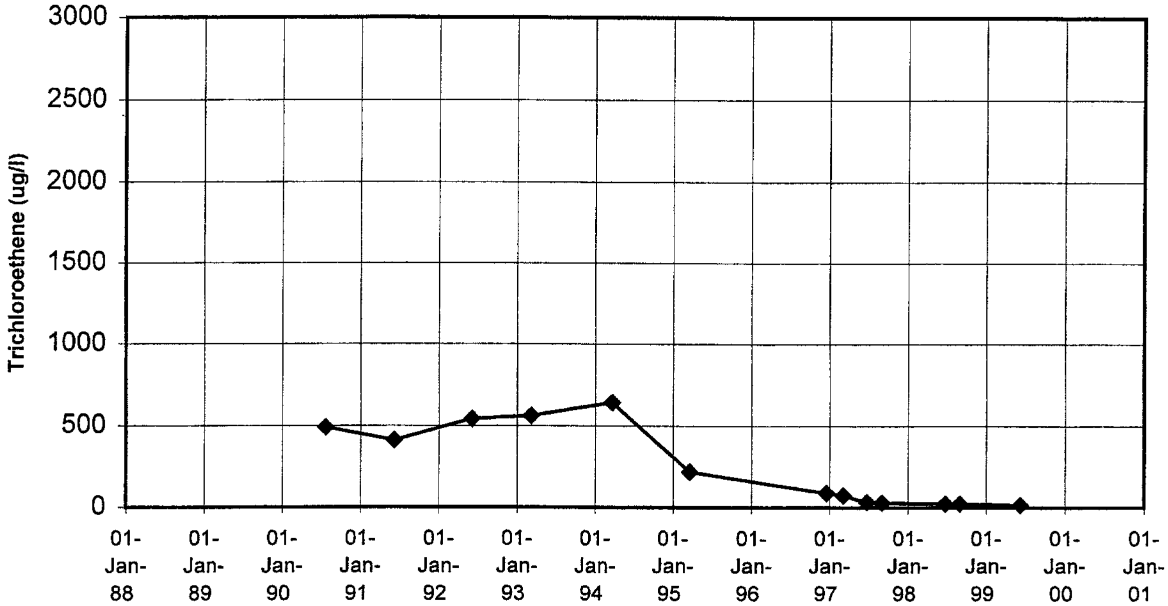
Note:
Plume map is from FY 1998.



Well Location

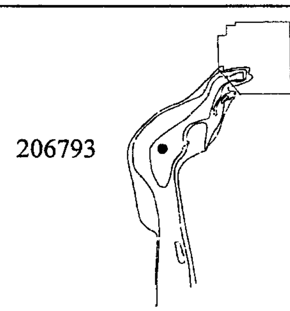
N:\0003\61\Graphs\Off-U4\206797.doc\TNW-lmh

206793



Well Purpose:
Monitor the progress of groundwater cleanup.
This is New Brighton Municipal Well #3.

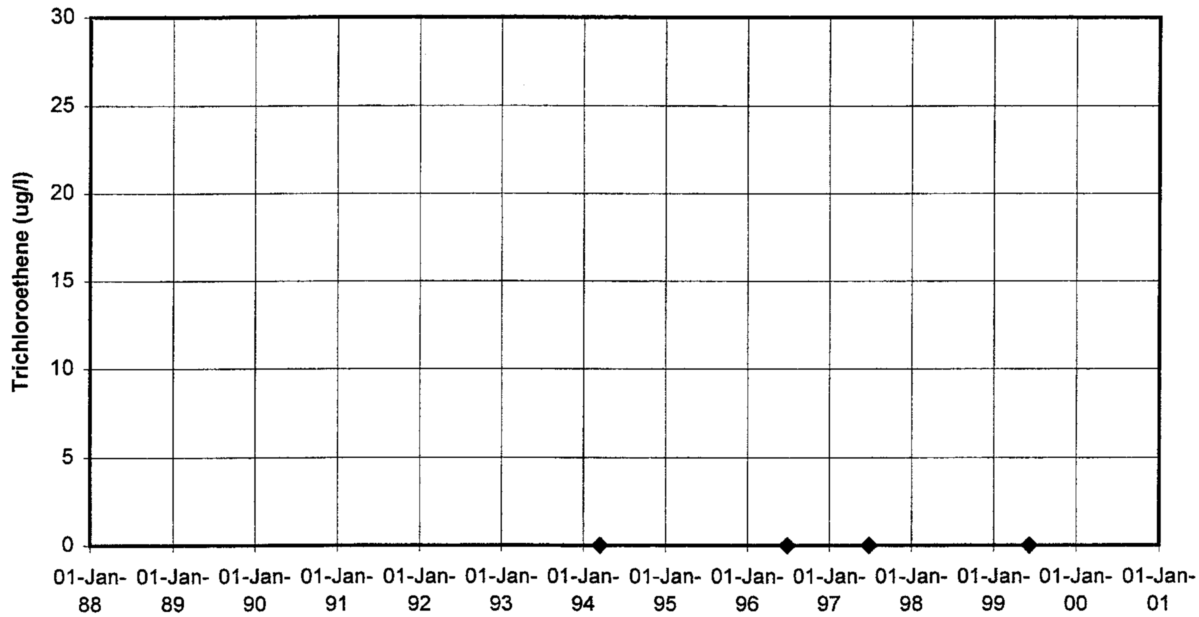
Note:
Plume map is from FY 1998.



Well Location

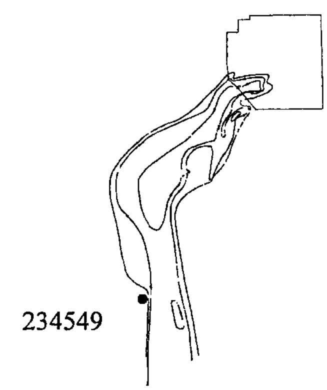
N:\0003\61\Graphs\Off-U4\206793.doc\TNW-lmh

234549



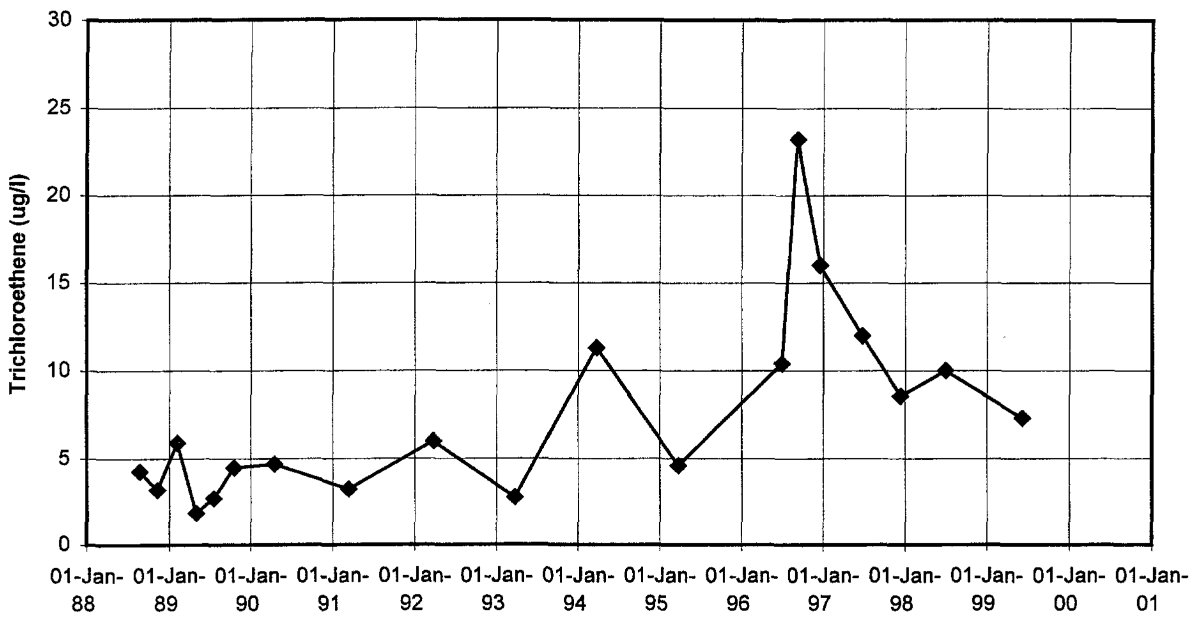
Well Purpose:
To check that the edge of the plume does not spread outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



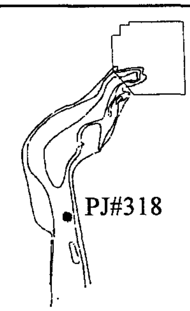
Well Location

PJ#318



Well Purpose:
Monitor the progress of groundwater cleanup.

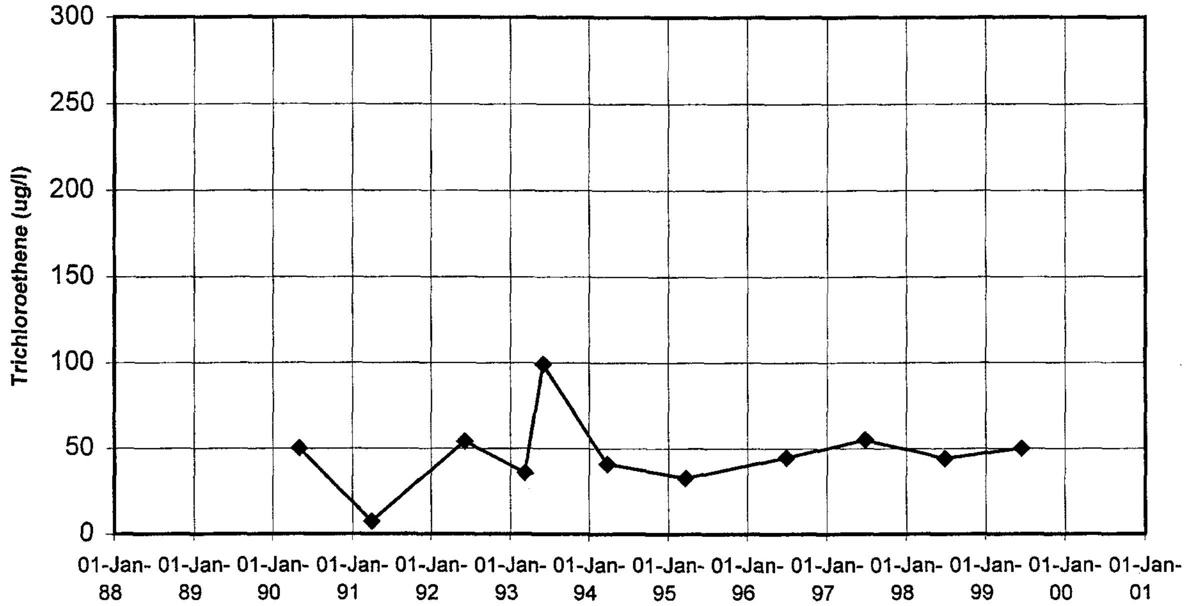
Note:
Plume map is from FY 1998.



Well Location

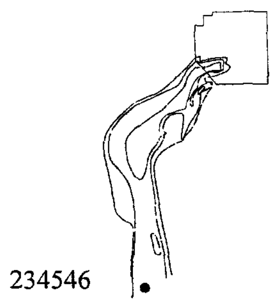
N:\0003\61\Graphs\Off-U4\PJ#318.doc\TNW-lmh

234546



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.

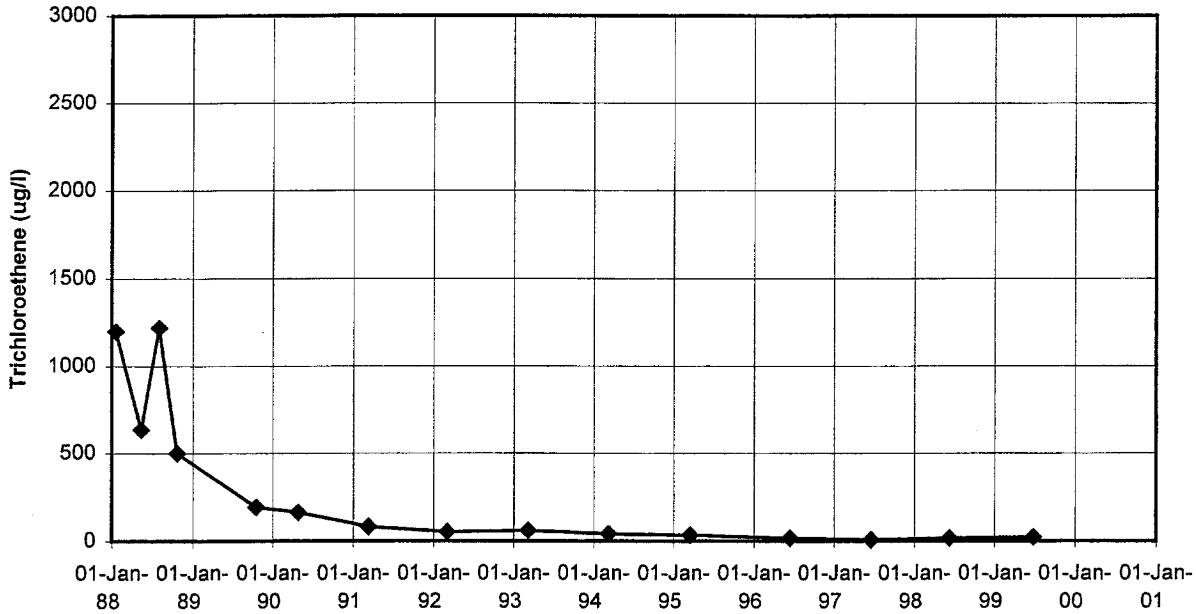


Well Location

OU2

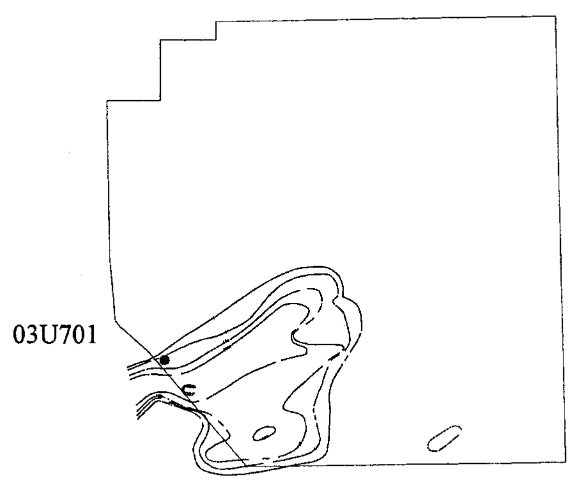
Upper Unit 3 Wells

03U701



Well Purpose:
Monitor the progress of groundwater cleanup.

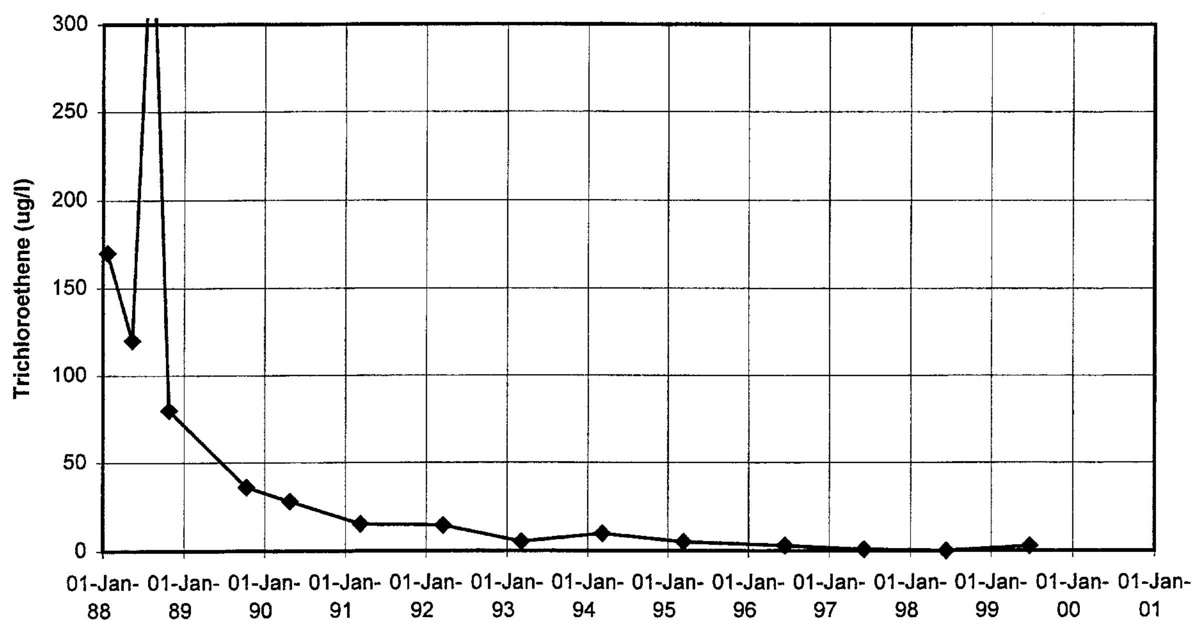
Note:
Plume map is from FY 1998.



Well Location

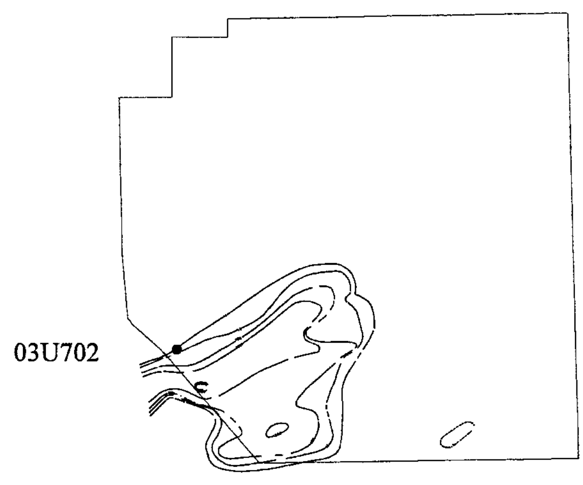
N:\0003\61\Graphs\On-U3\03U701.doc\TNW-lmh

03U702



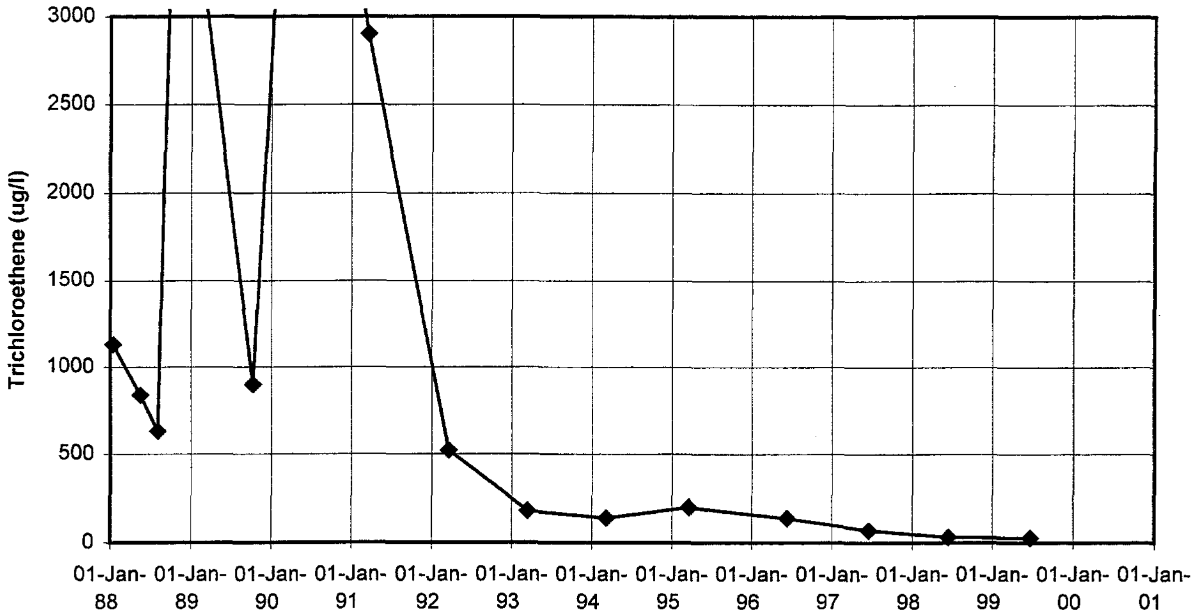
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



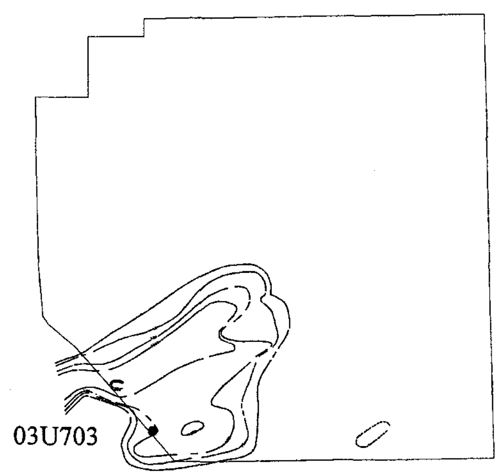
Well Location

03U703



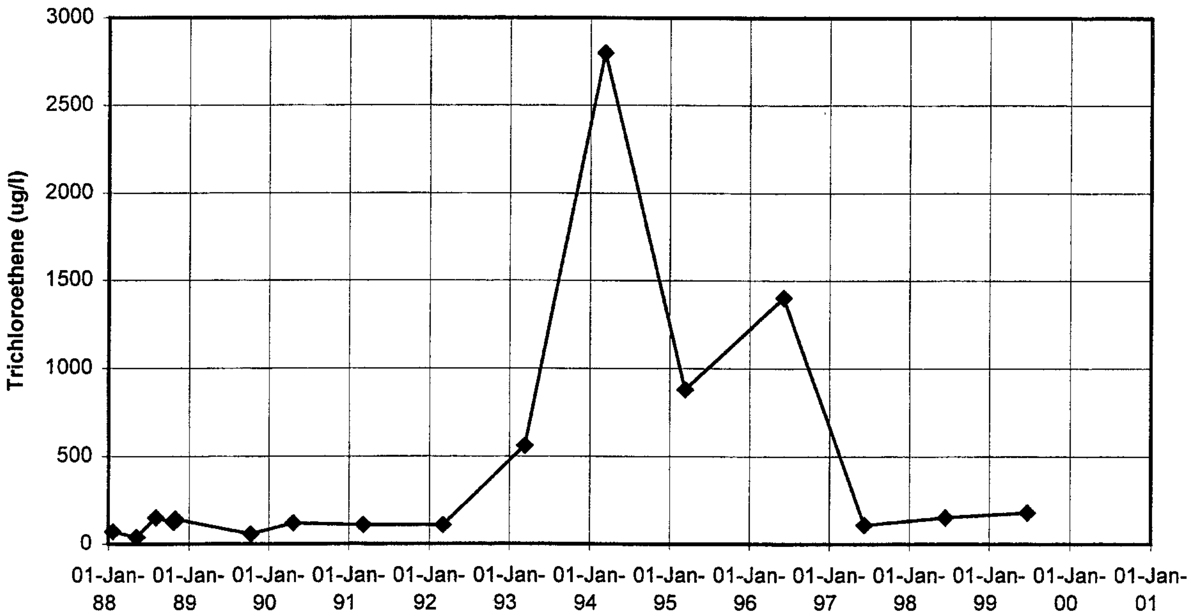
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



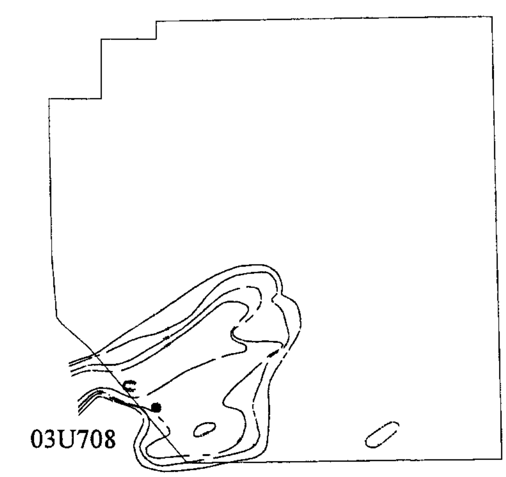
Well Location

03U708



Well Purpose:
Monitor the progress of groundwater cleanup.

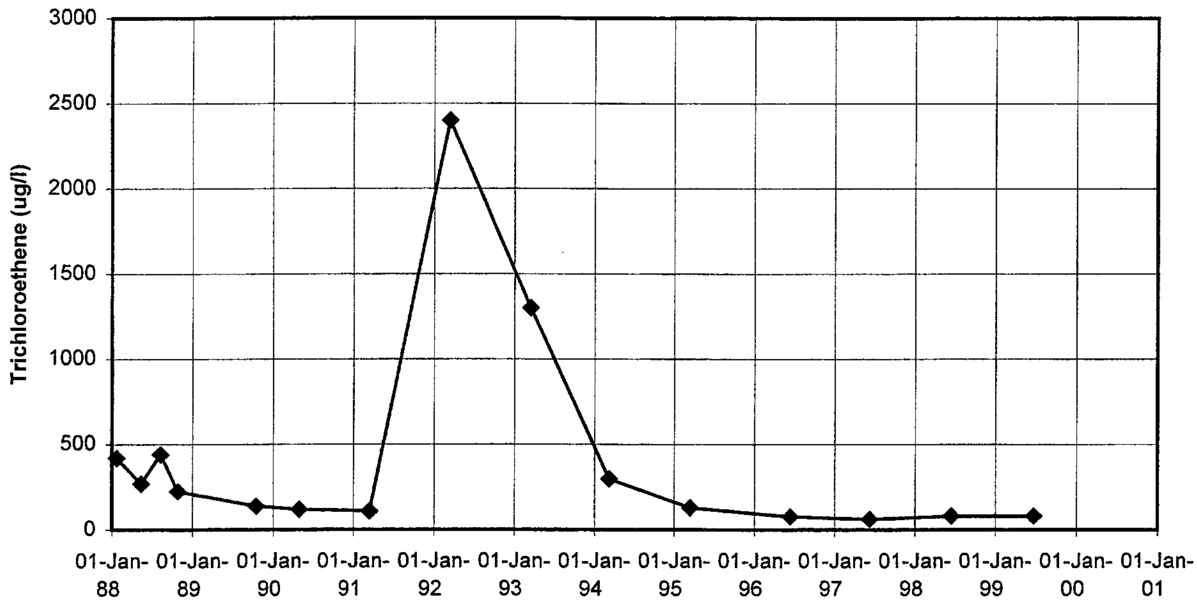
Note:
Plume map is from FY 1998.



Well Location

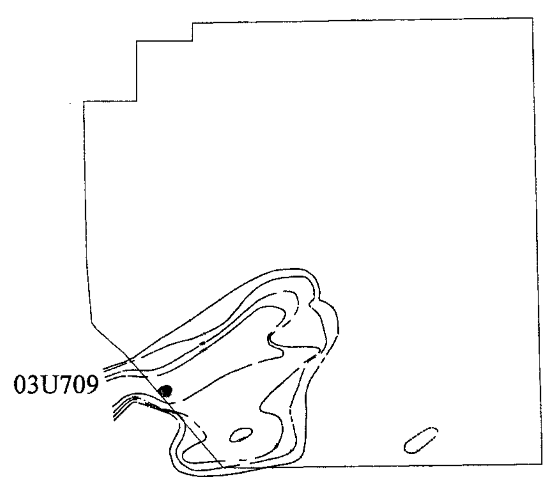
N:\0003\61\Graphs\On-U3\03U708.doc\TNW-lmh

03U709



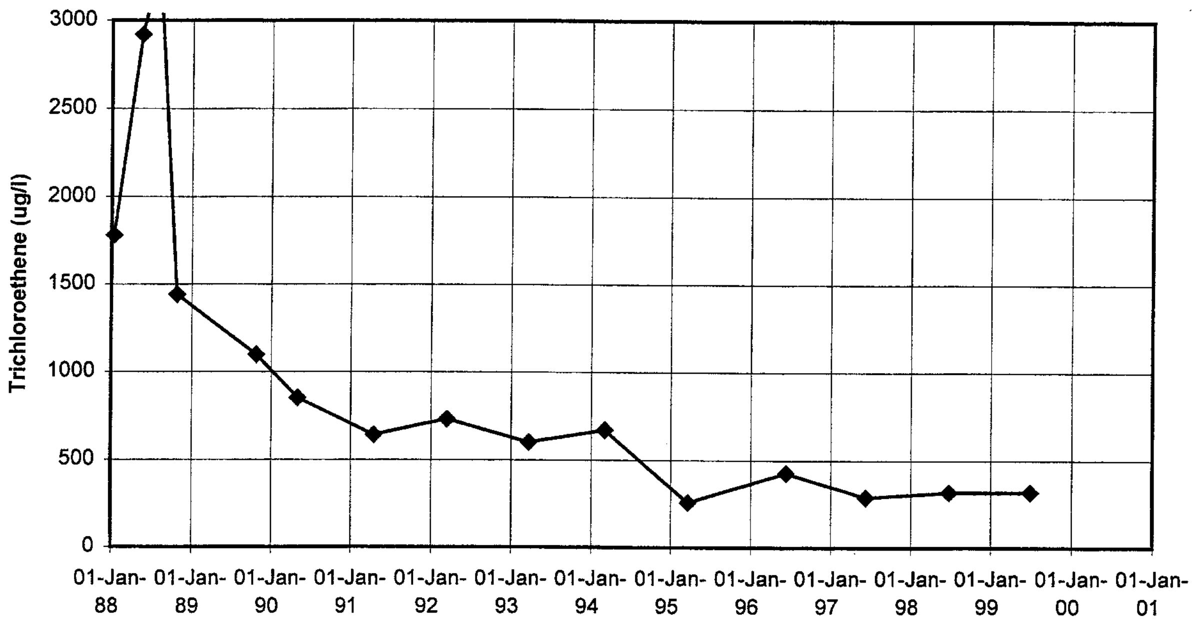
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



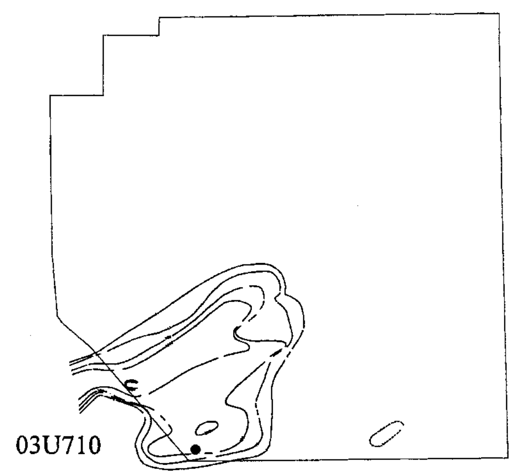
Well Location

03U710



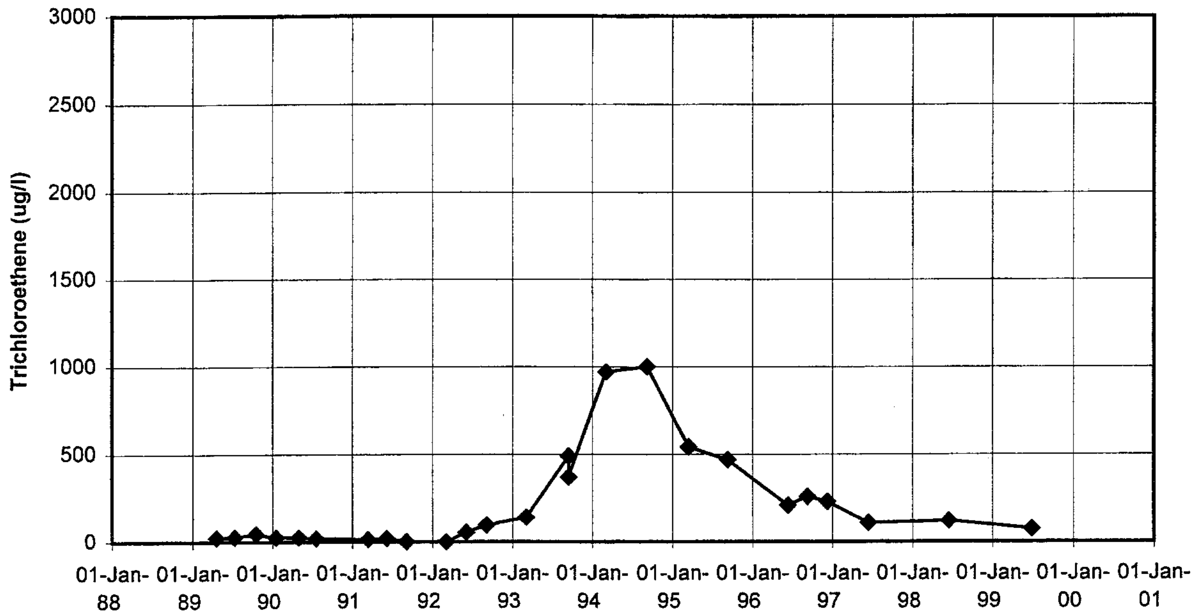
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



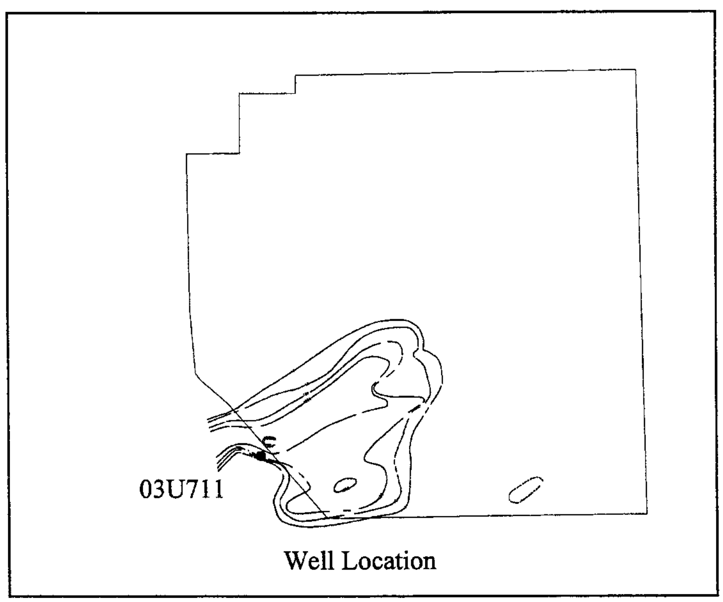
Well Location

03U711



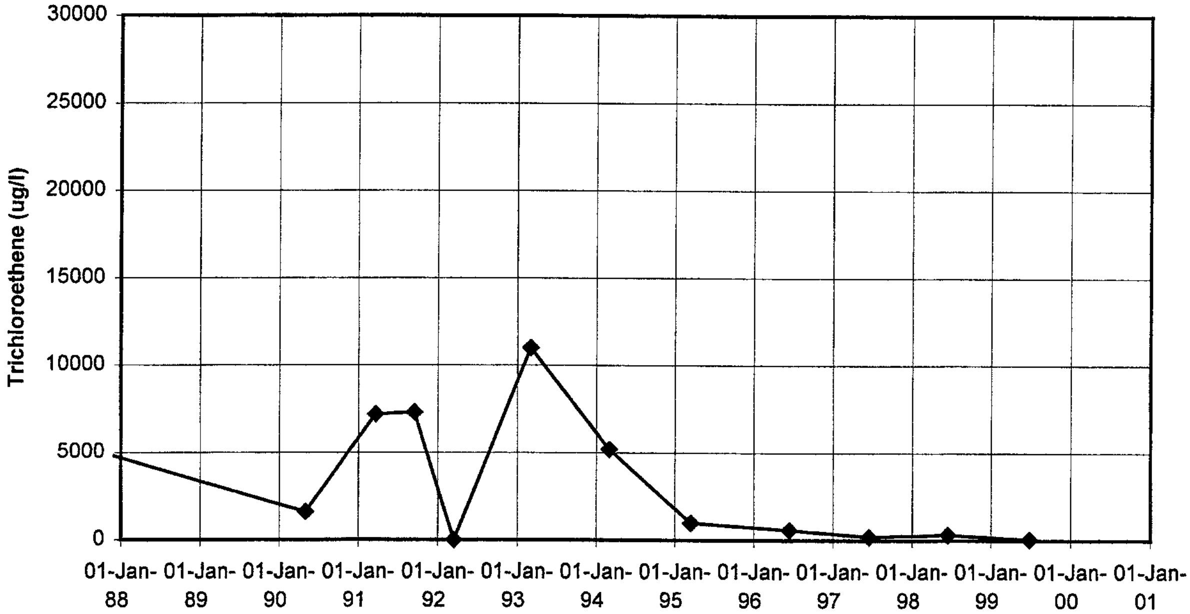
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



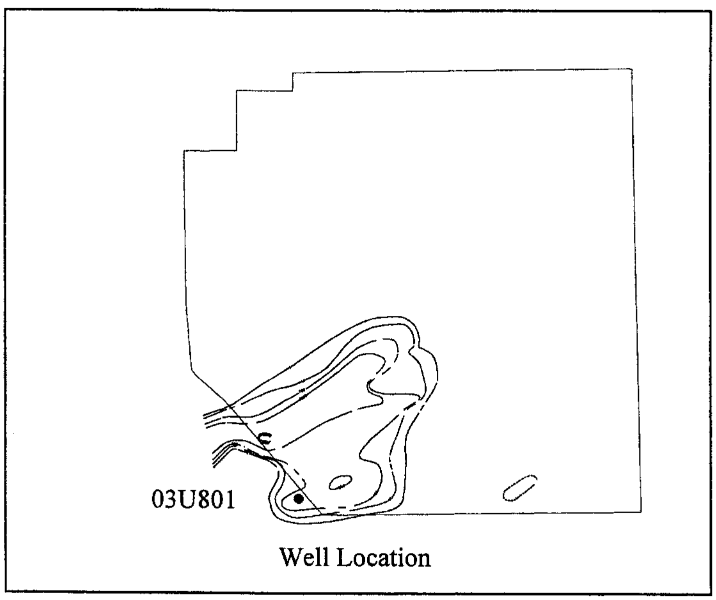
N:\0003\61\Graphs\On-U3\03U711.doc\TNW-lmh

03U801



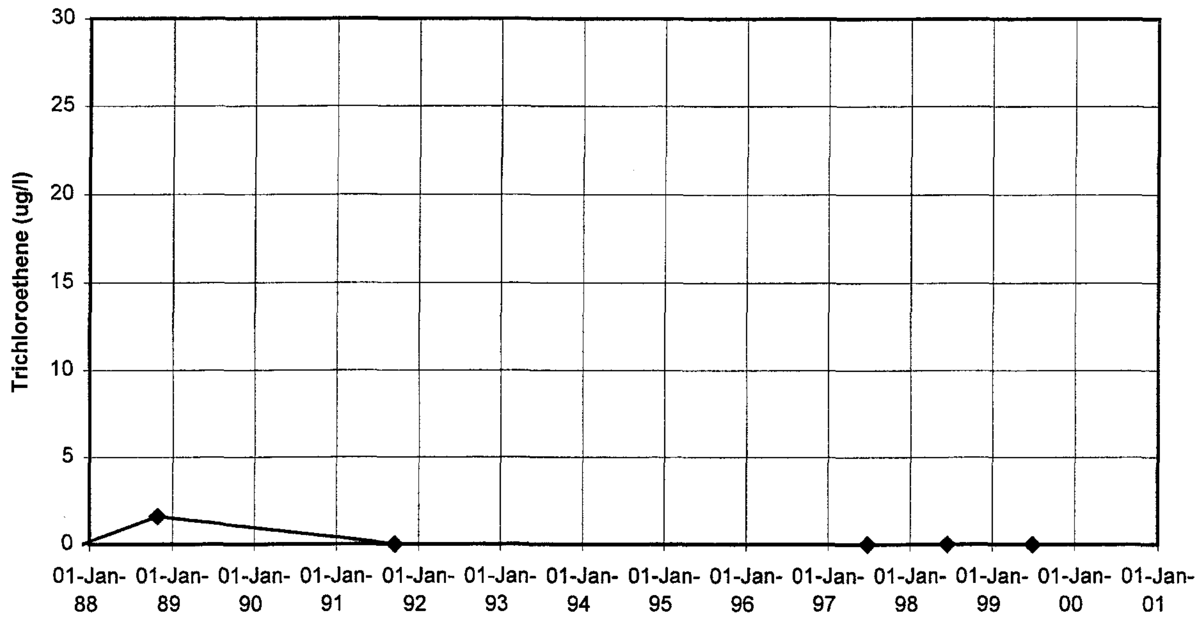
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



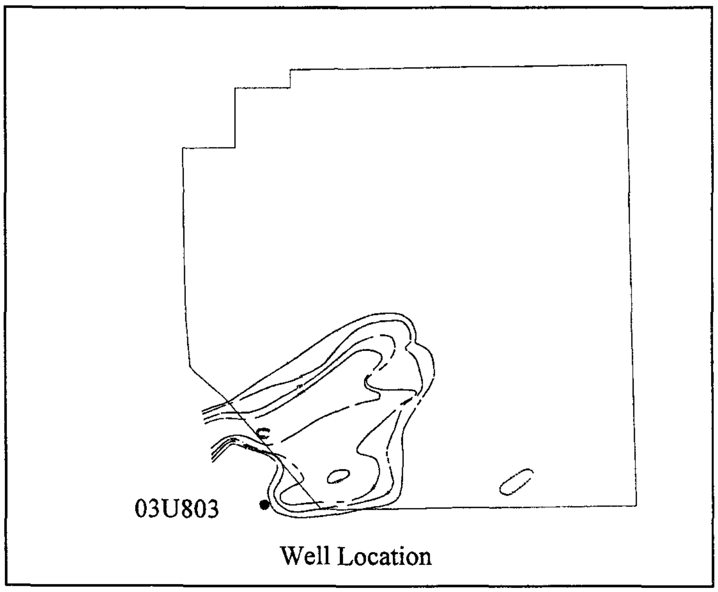
N:\0003\61\Graphs\On-U3\03U801.doc\TNW-lmh

03U803

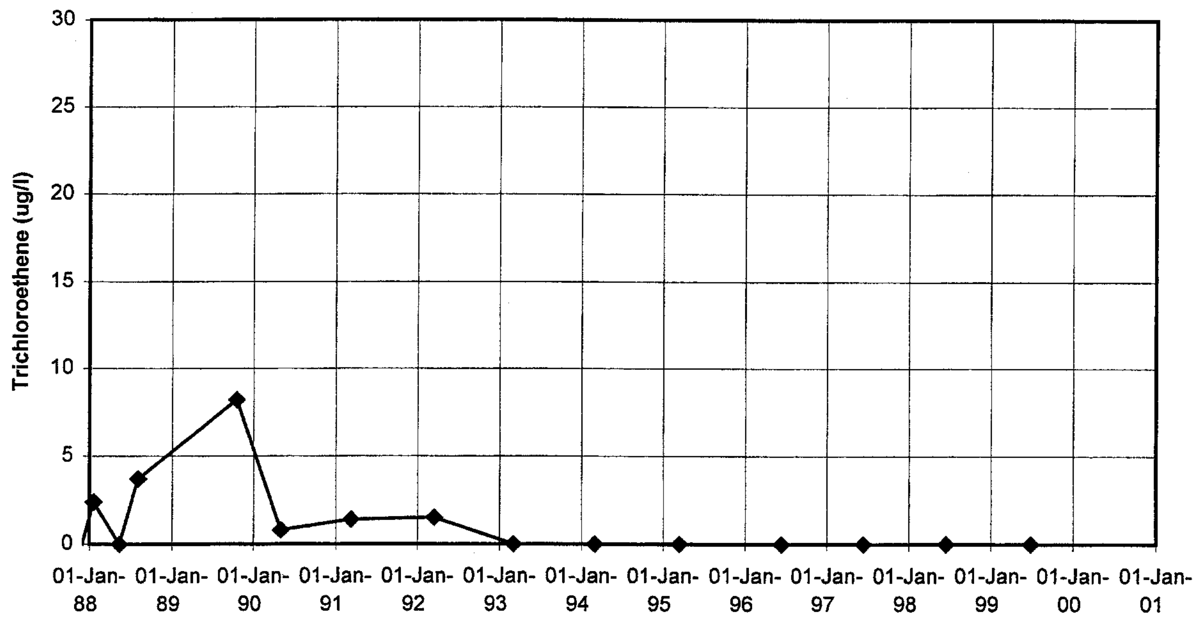


Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.

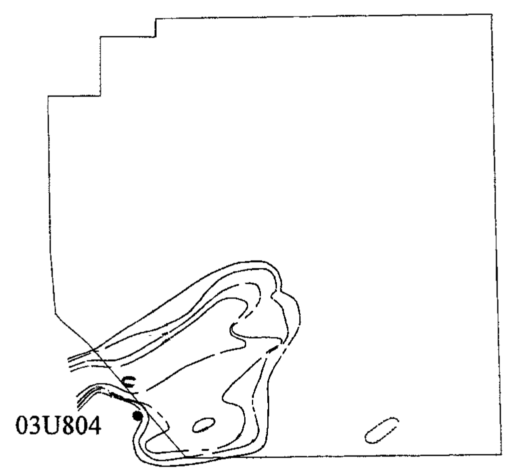


03U804



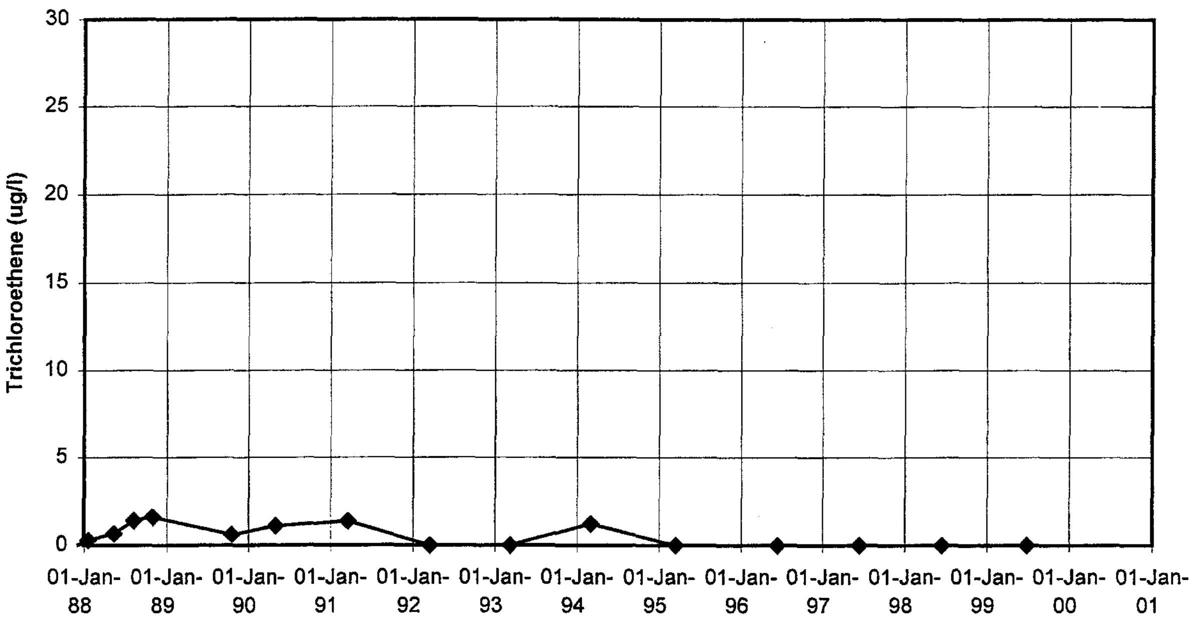
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



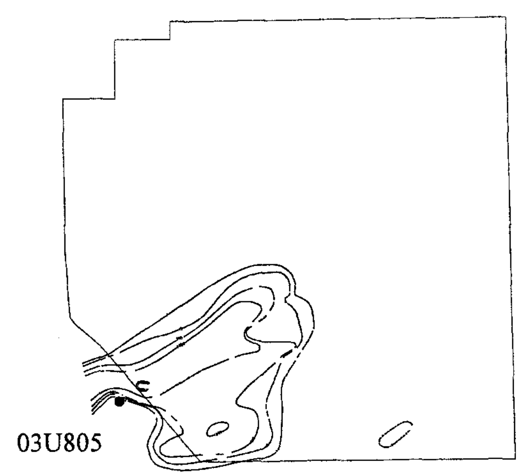
Well Location

03U805



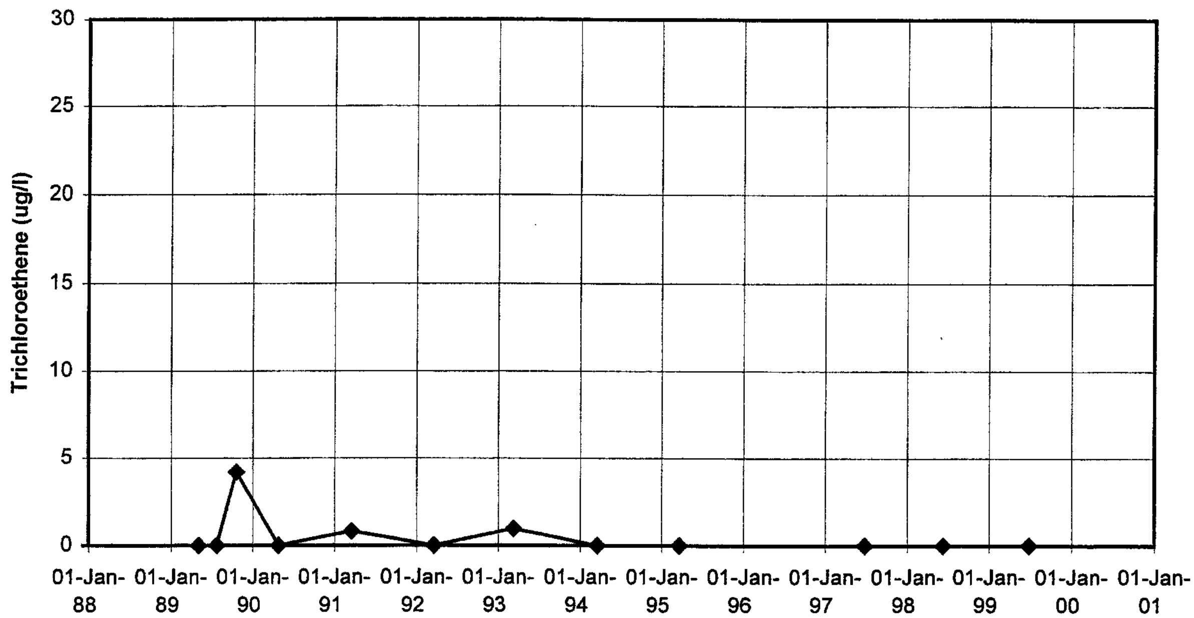
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



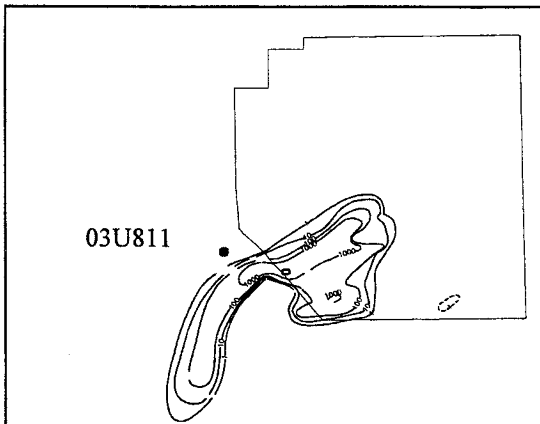
Well Location

03U811



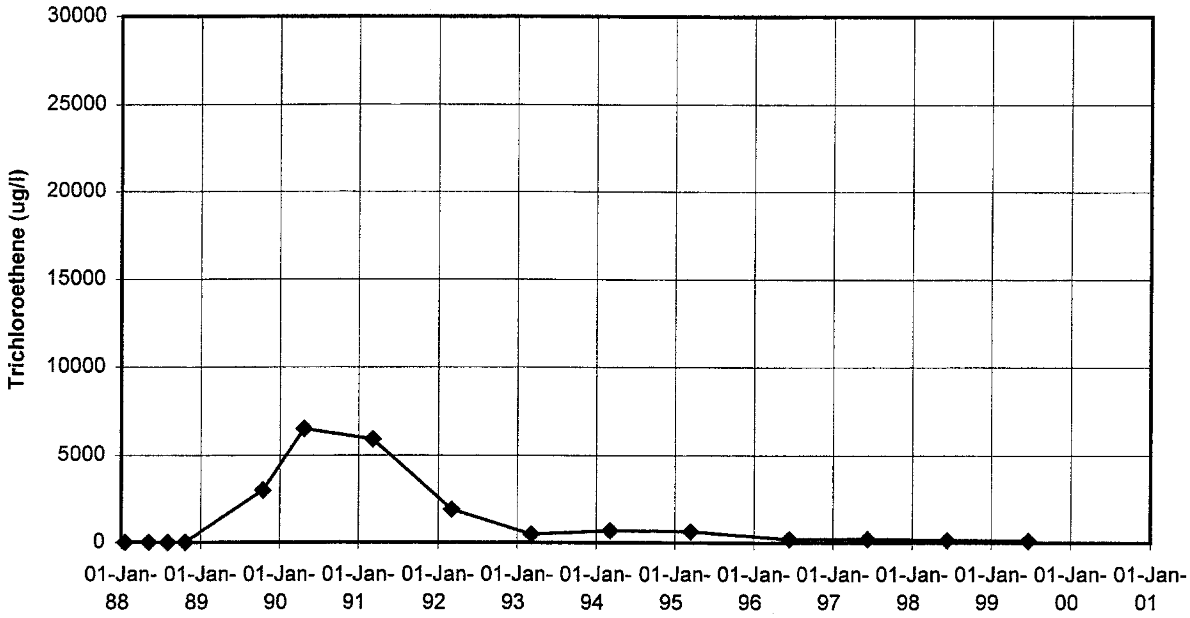
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



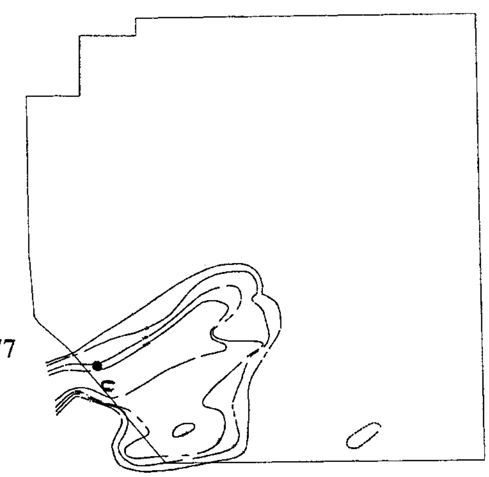
Well Location

03U077



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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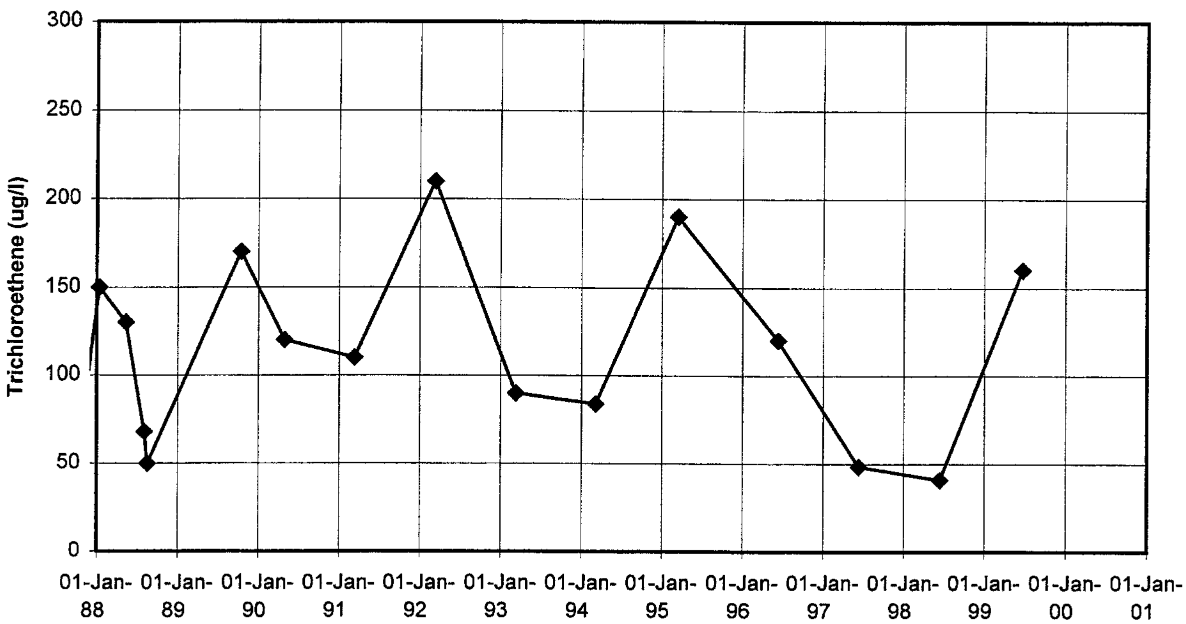
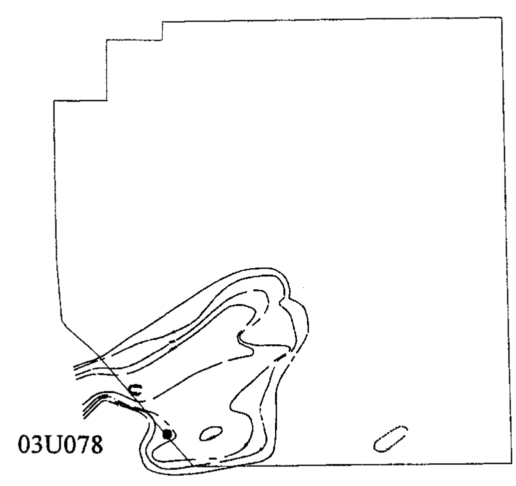
03U078



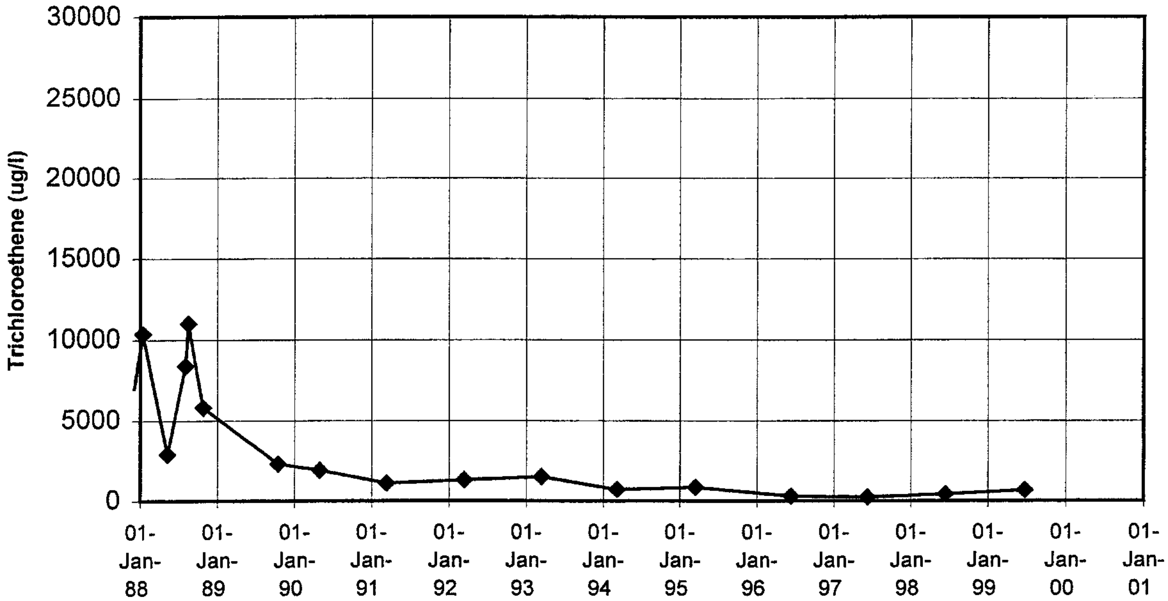
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



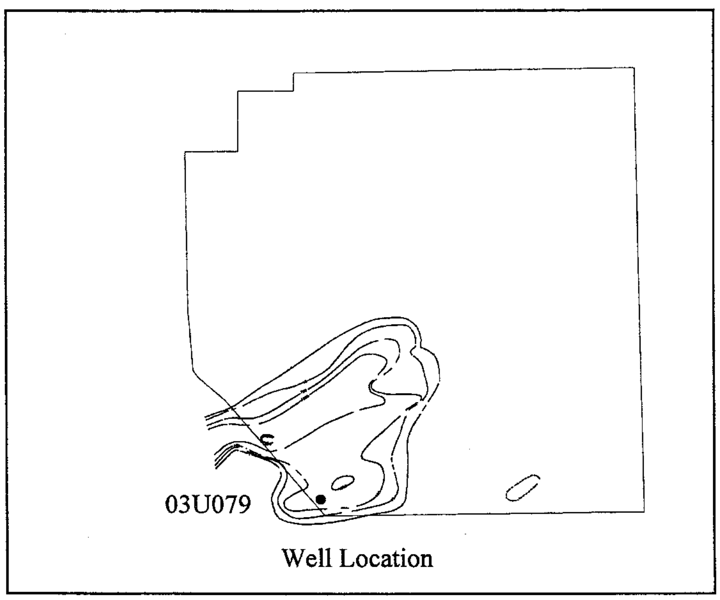
Well Location

03U079



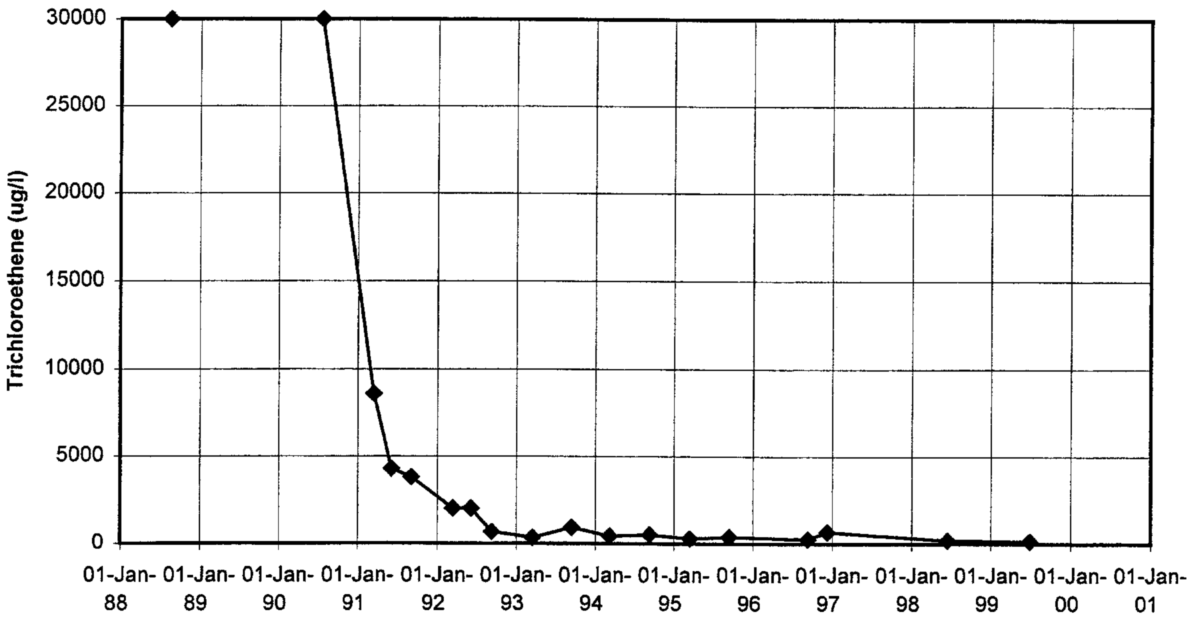
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



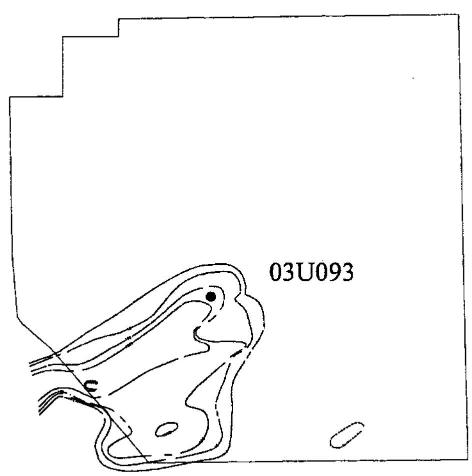
N:\0003\61\Graphs\On-U3\03U079.doc\TNW-lmh

03U093



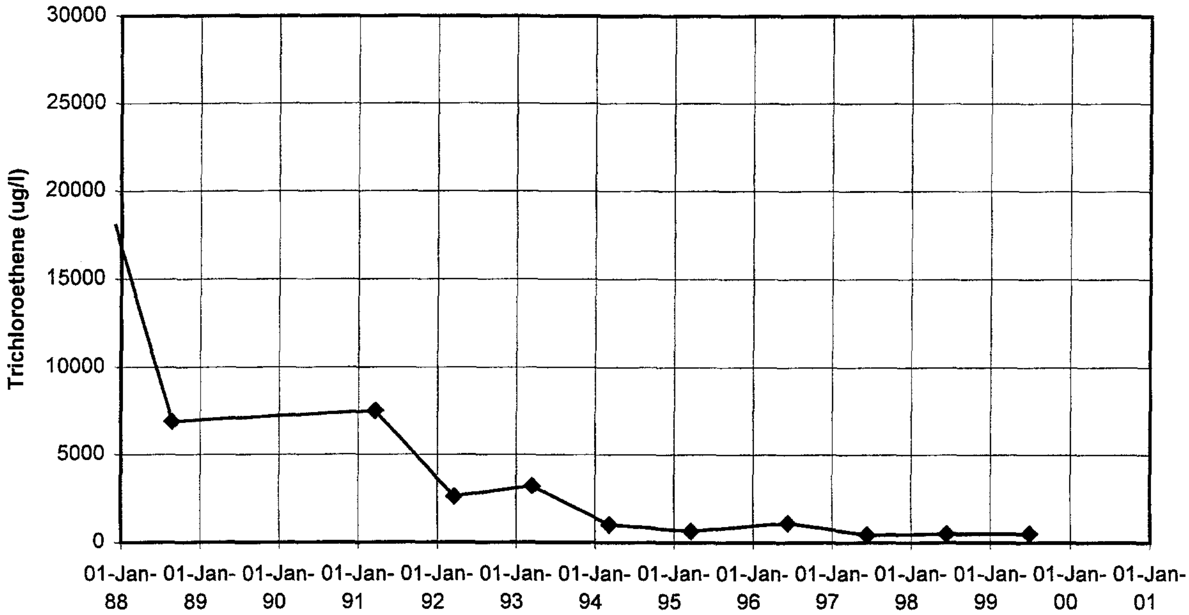
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



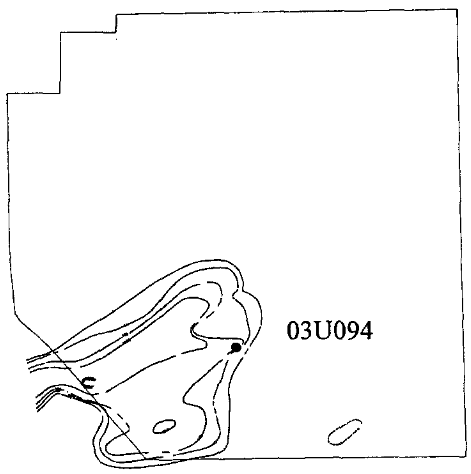
Well Location

03U094



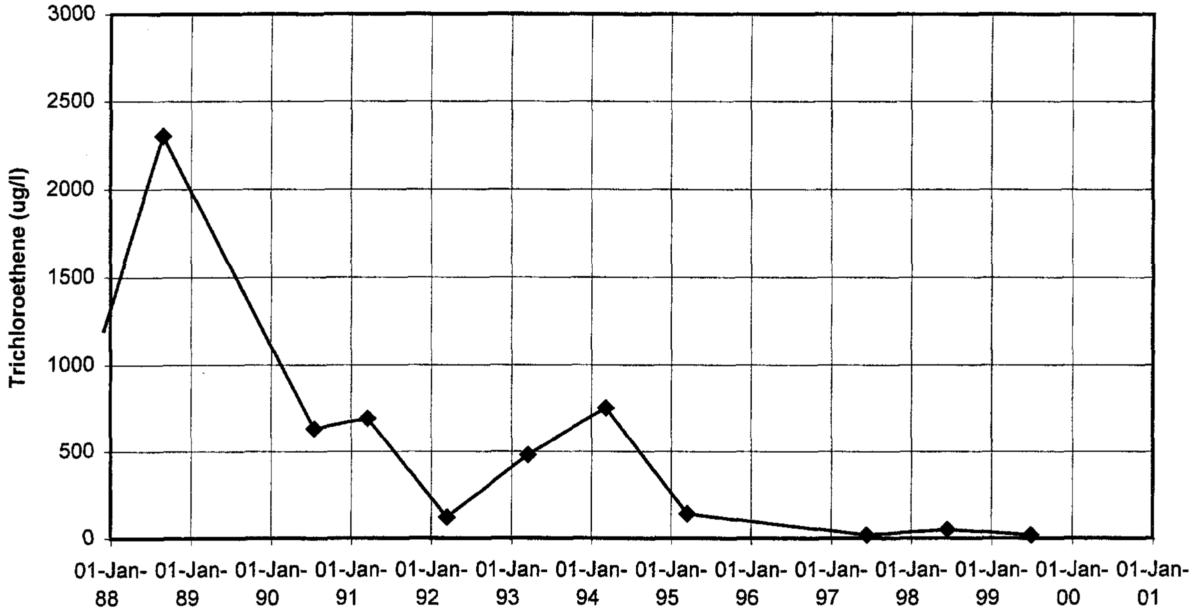
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



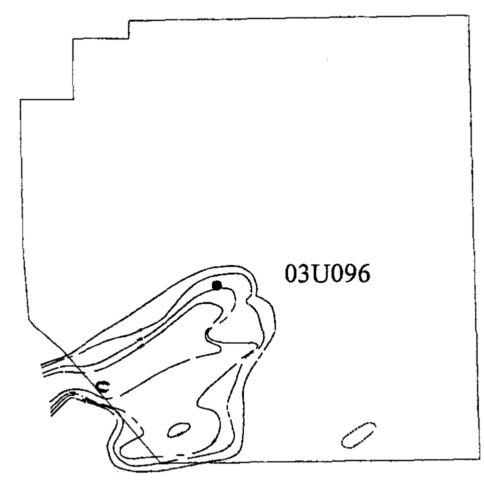
Well Location

03U096



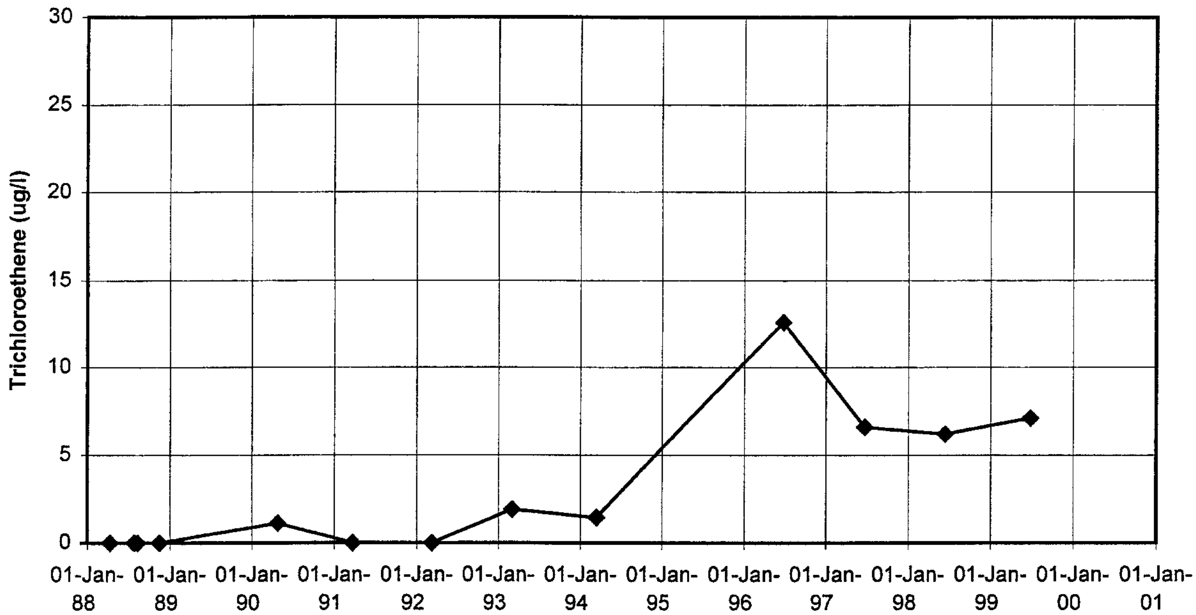
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



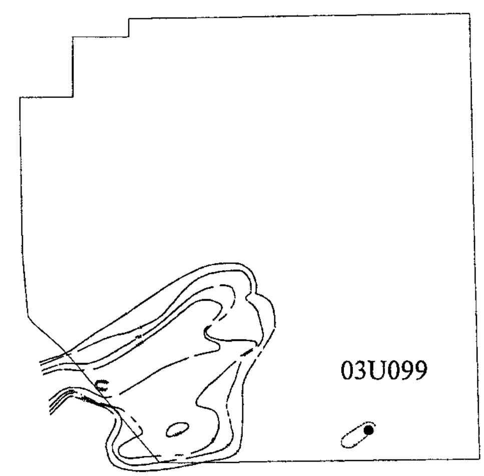
Well Location

03U099



Well Purpose:
Monitor deep groundwater downgradient of Site H.

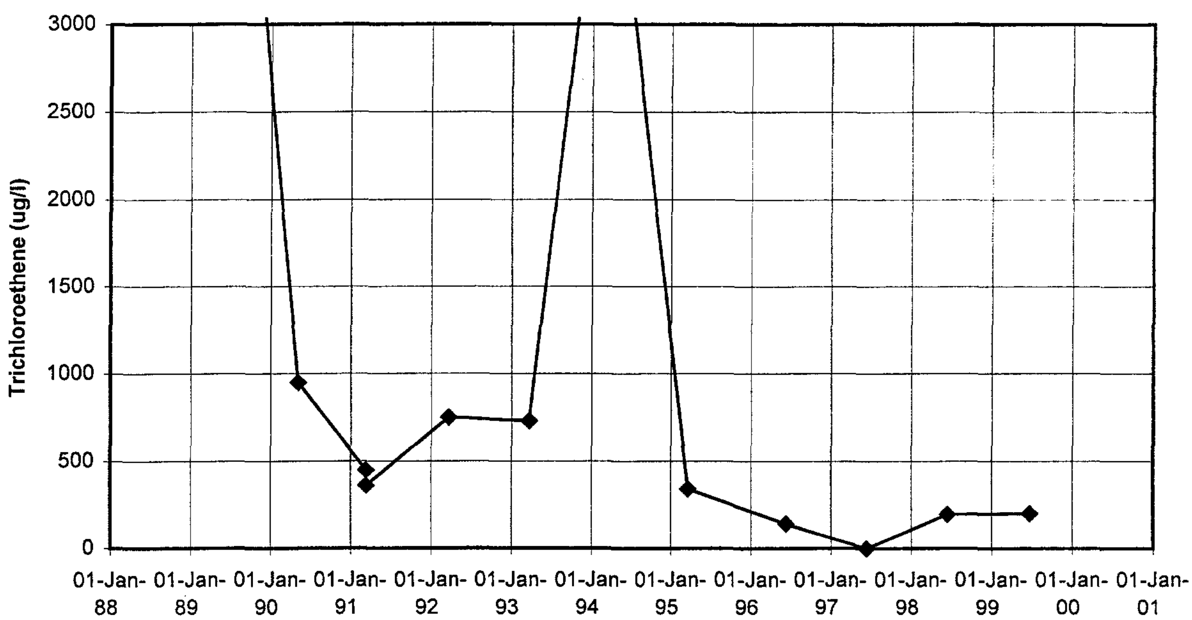
Note:
Plume map is from FY 1998.



Well Location

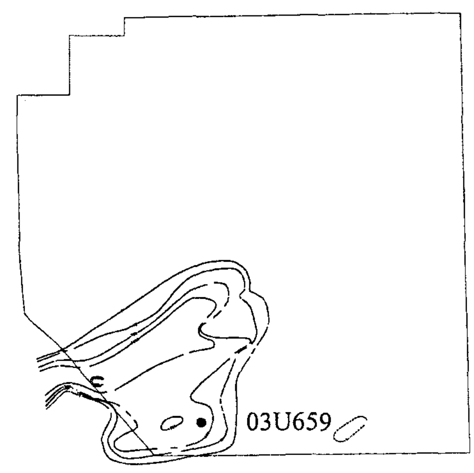
N:\0003\61\Graphs\On-U3\03U099.doc\TNW-lmh

03U659



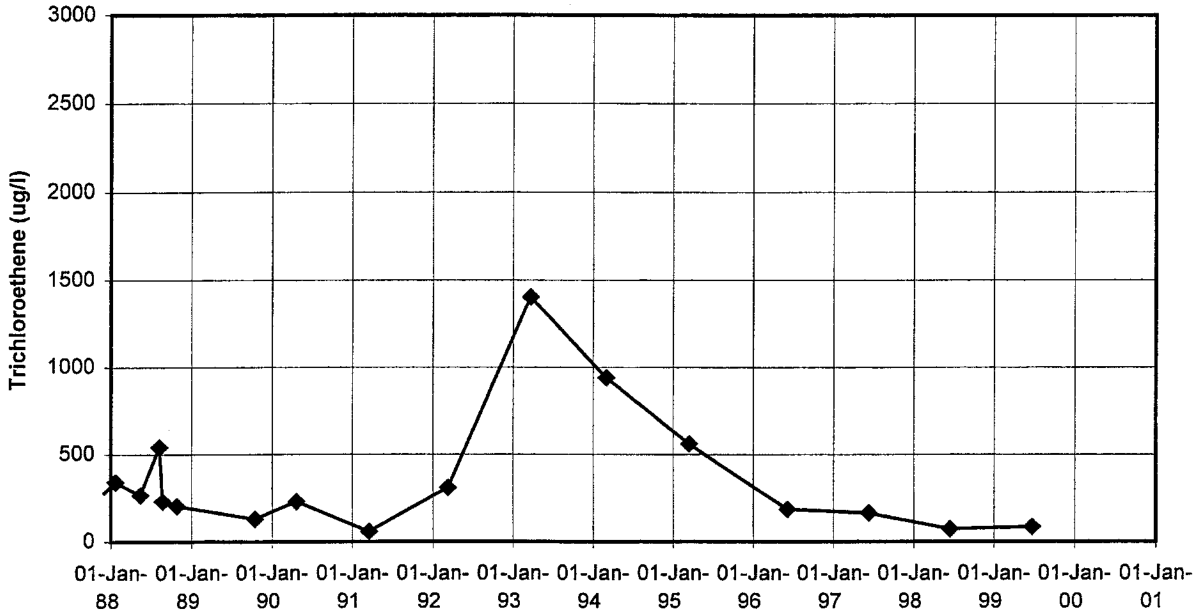
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



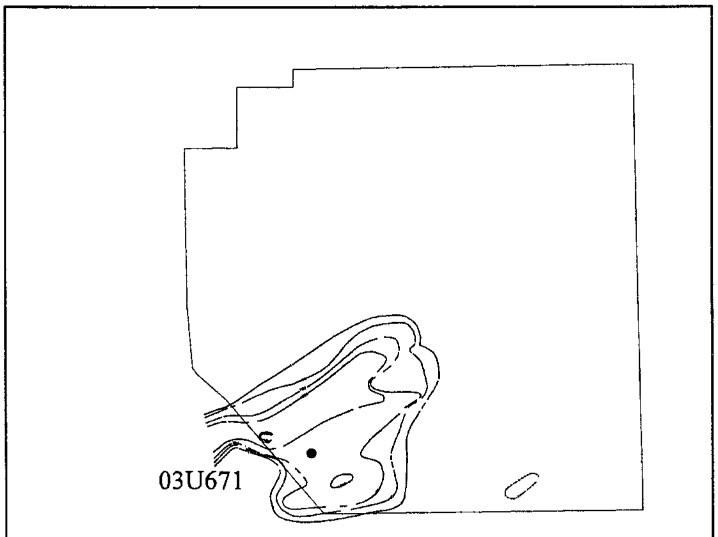
Well Location

03U671



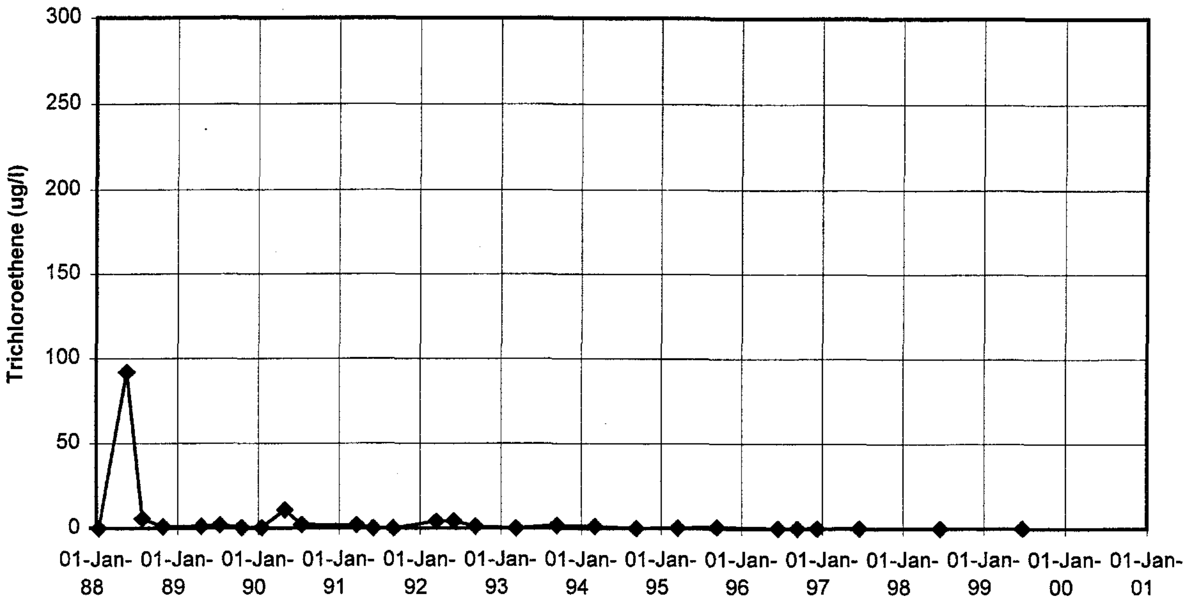
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



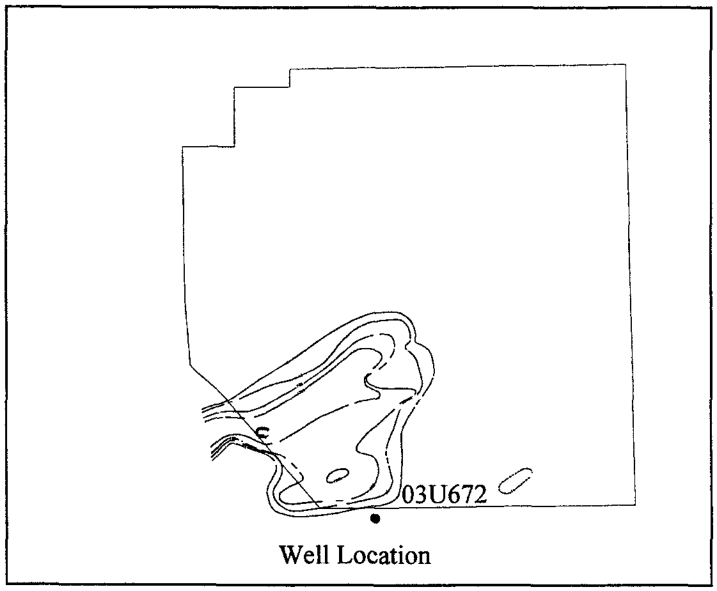
Well Location

03U672

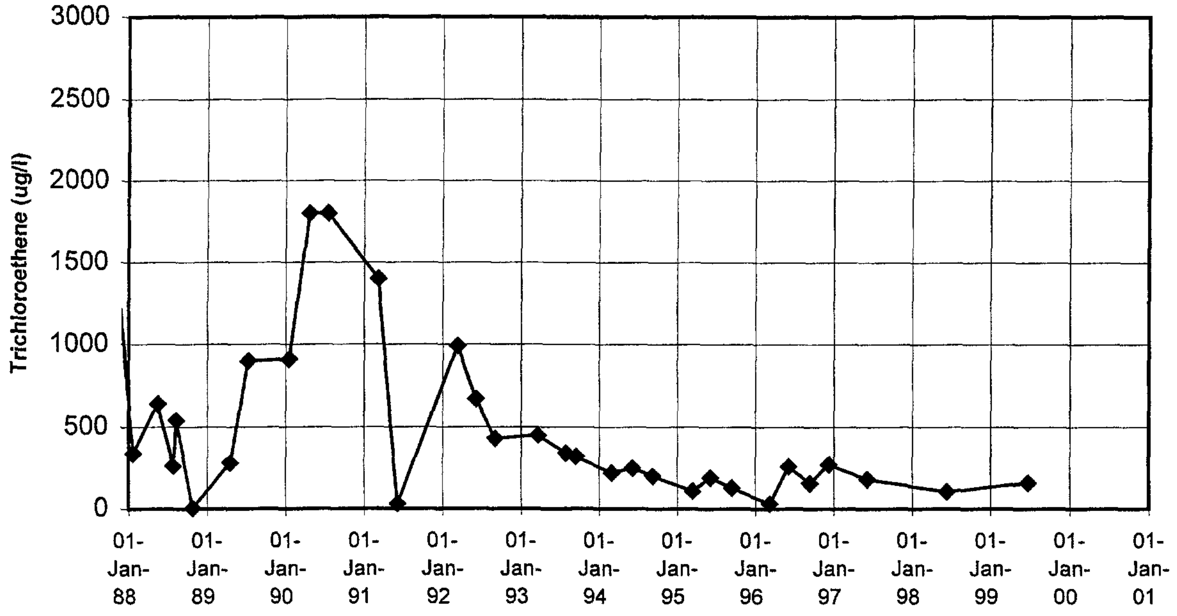


Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the TGRS.

Note:
Plume map is from FY 1998.

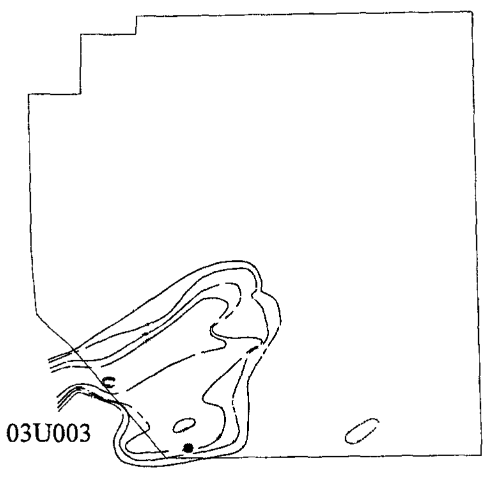


03U003



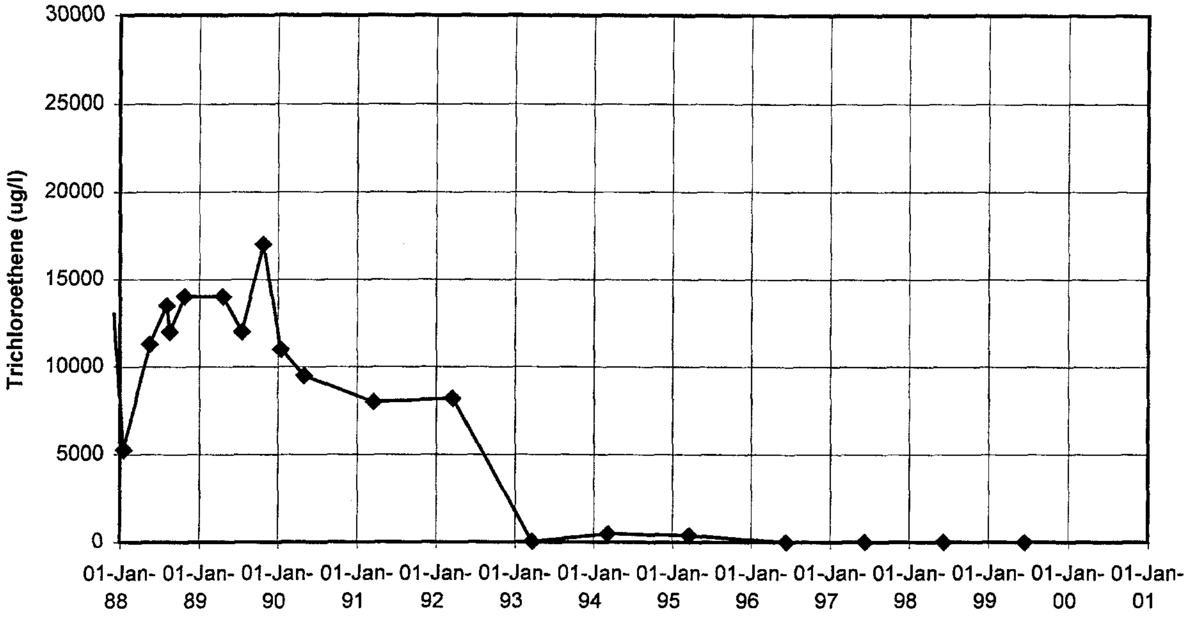
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



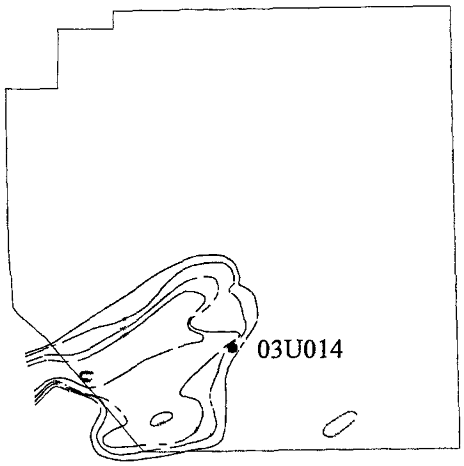
Well Location

03U014



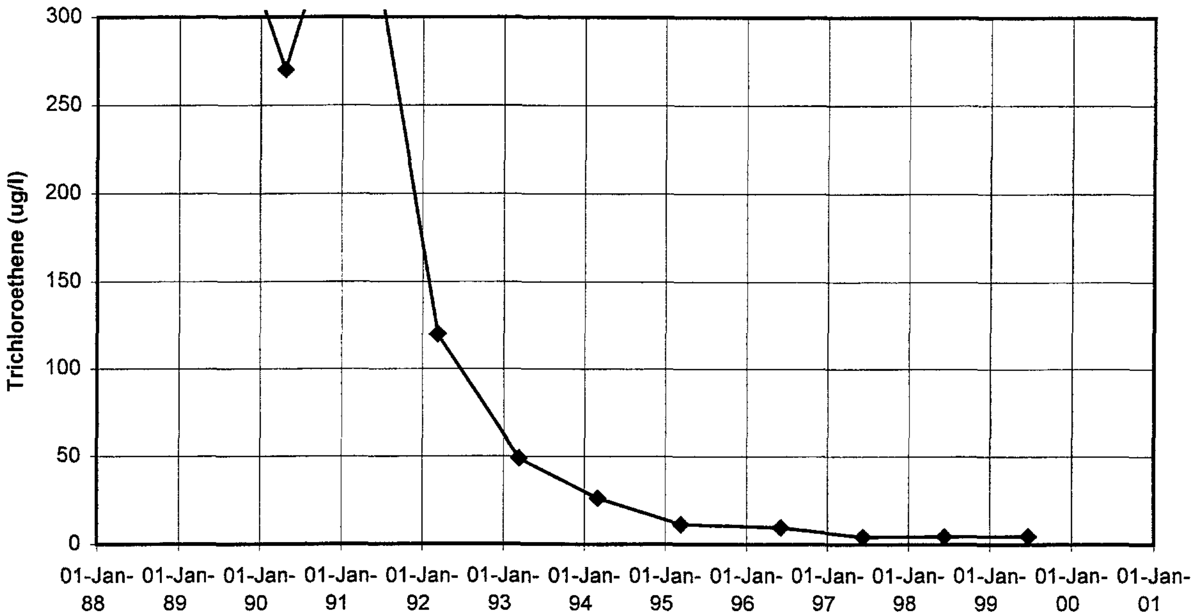
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



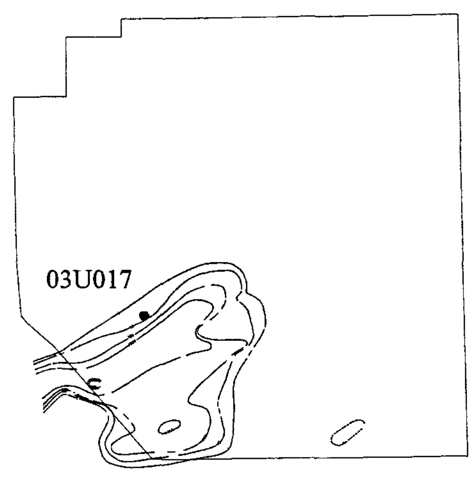
Well Location

03U017



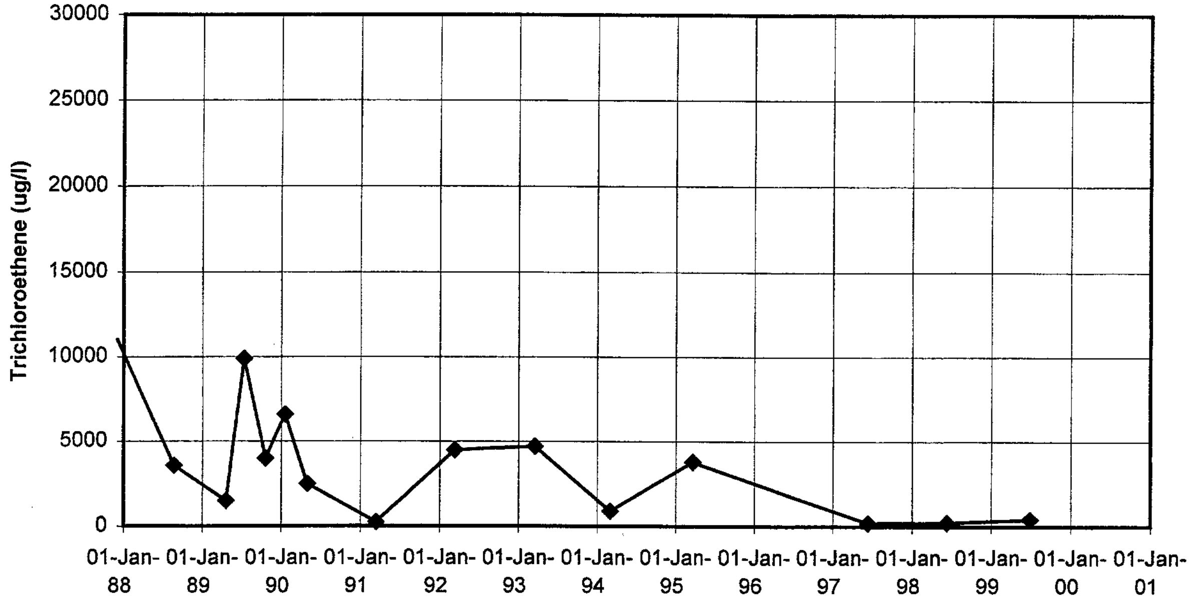
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



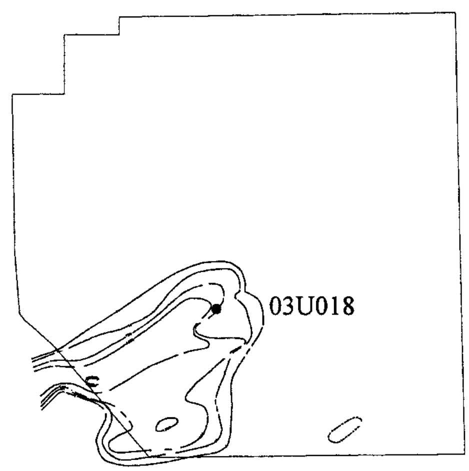
Well Location

03U018



Well Purpose:
Monitor the progress of groundwater cleanup.

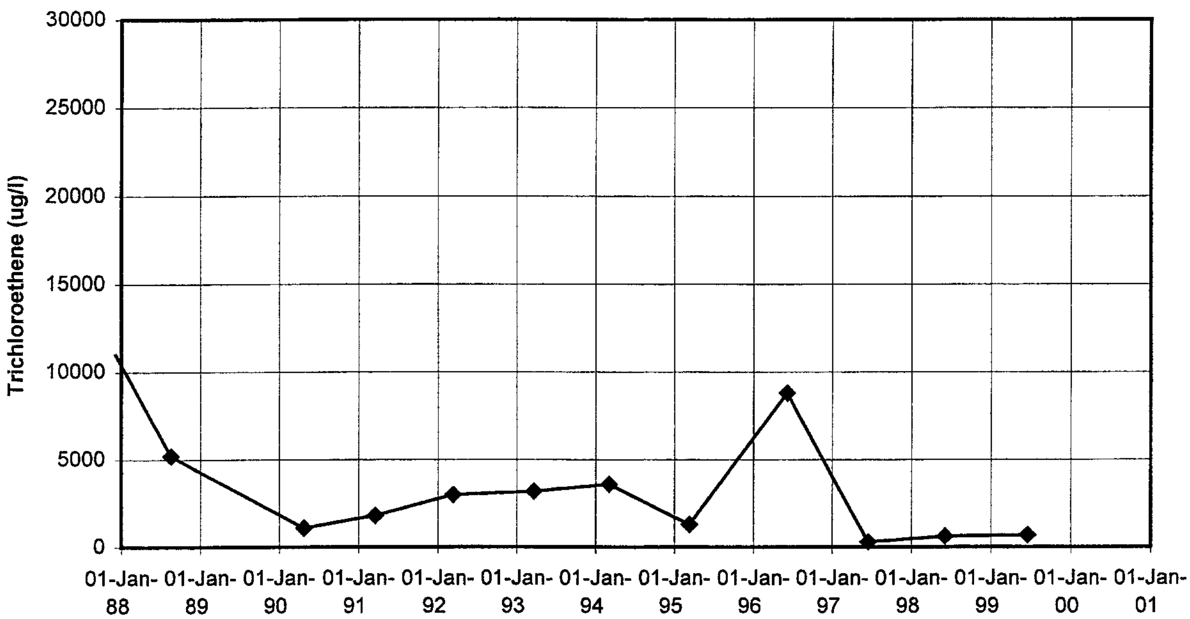
Note:
Plume map is from FY 1998.



Well Location

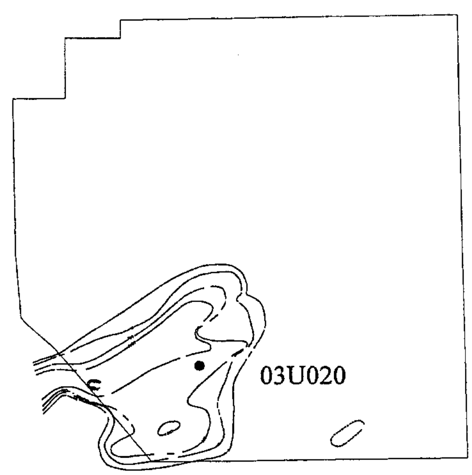
N:\0003\61\Graphs\On-U3\03U018.doc\TNW-lmh

03U020



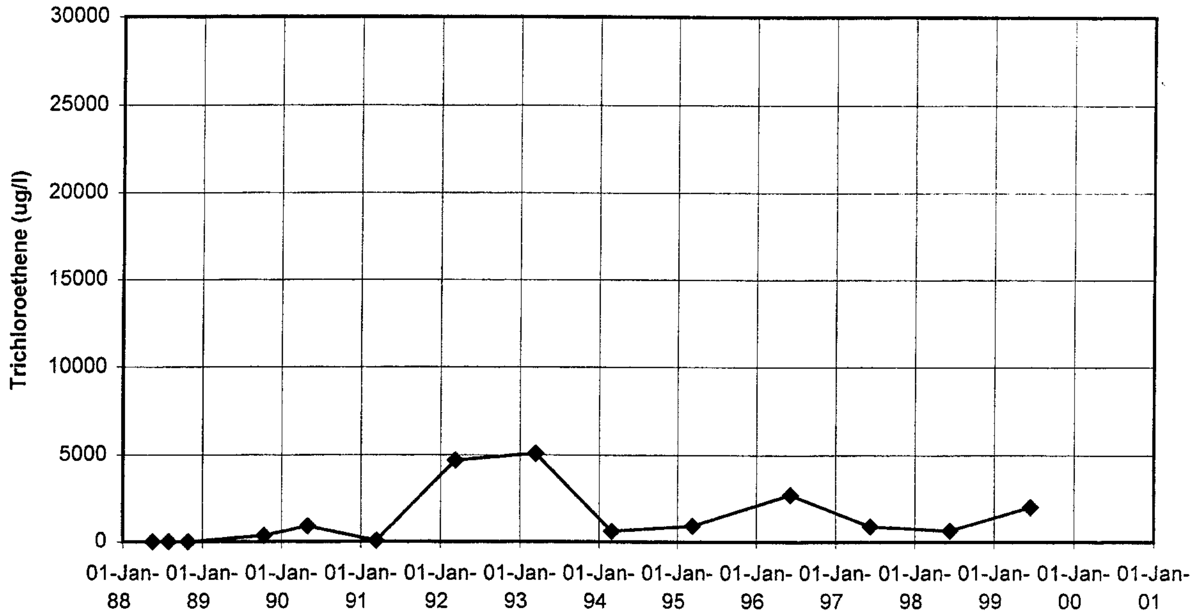
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



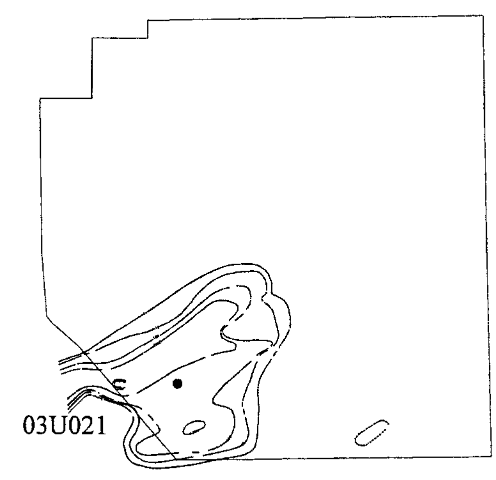
Well Location

03U021



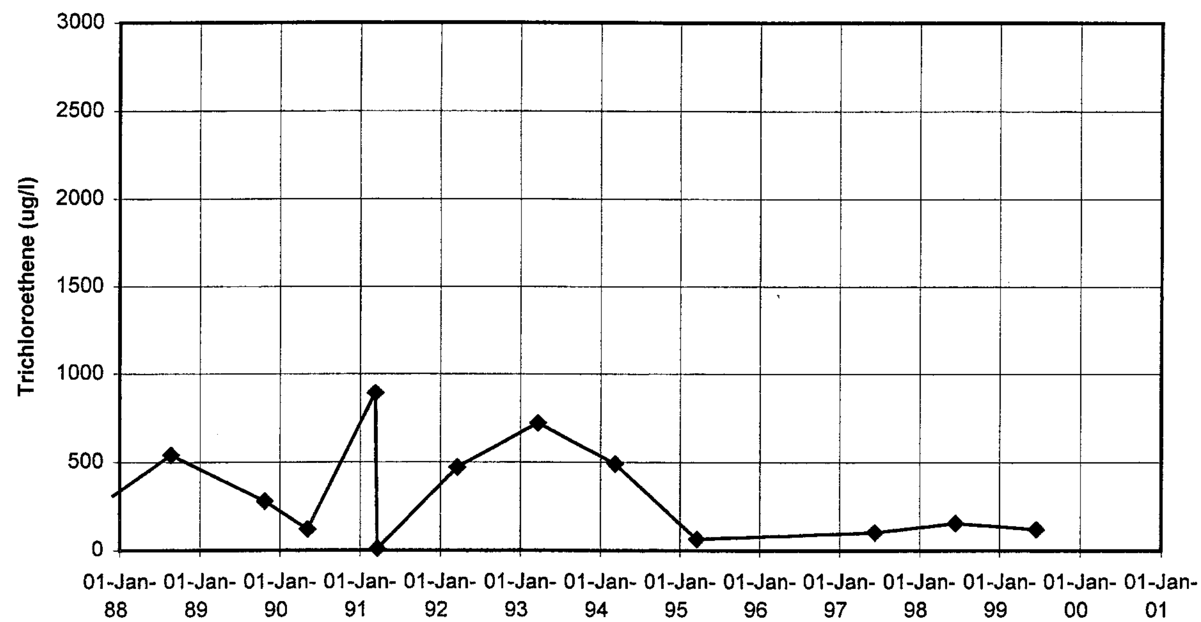
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



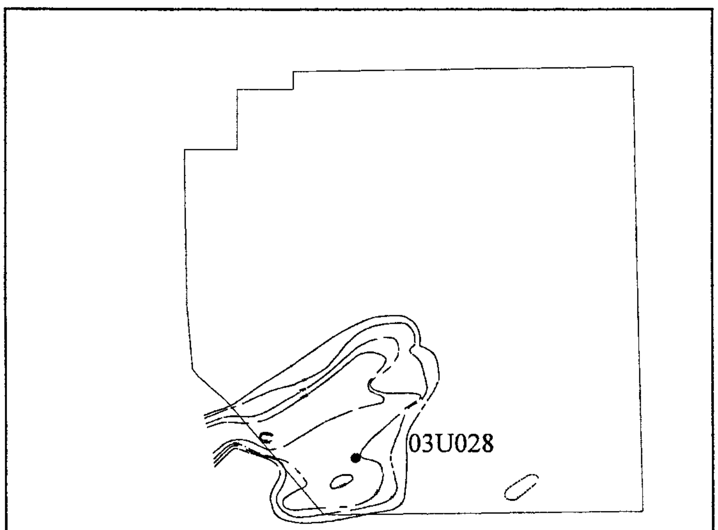
Well Location

03U028



Well Purpose:
Monitor the progress of groundwater cleanup.

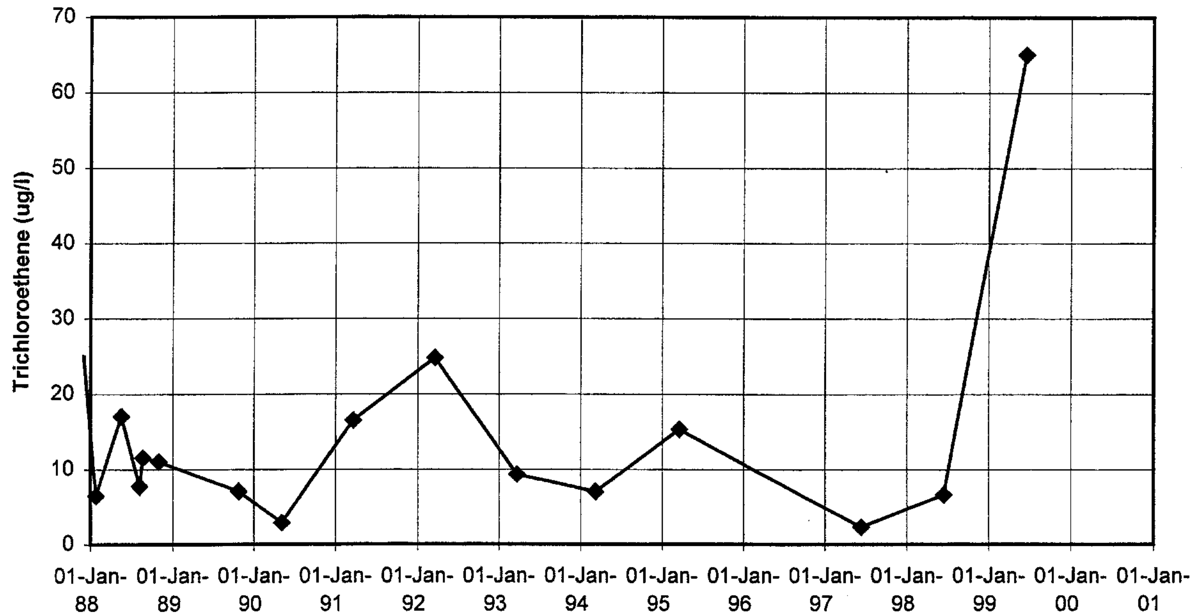
Note:
Plume map is from FY 1998.



Well Location

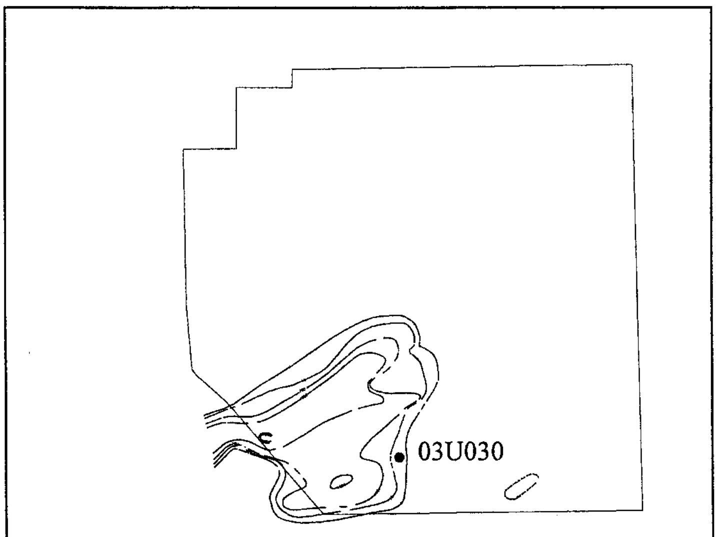
N:\0003\61\Graphs\On-U3\03U028.doc\TNW-lmh

03U030



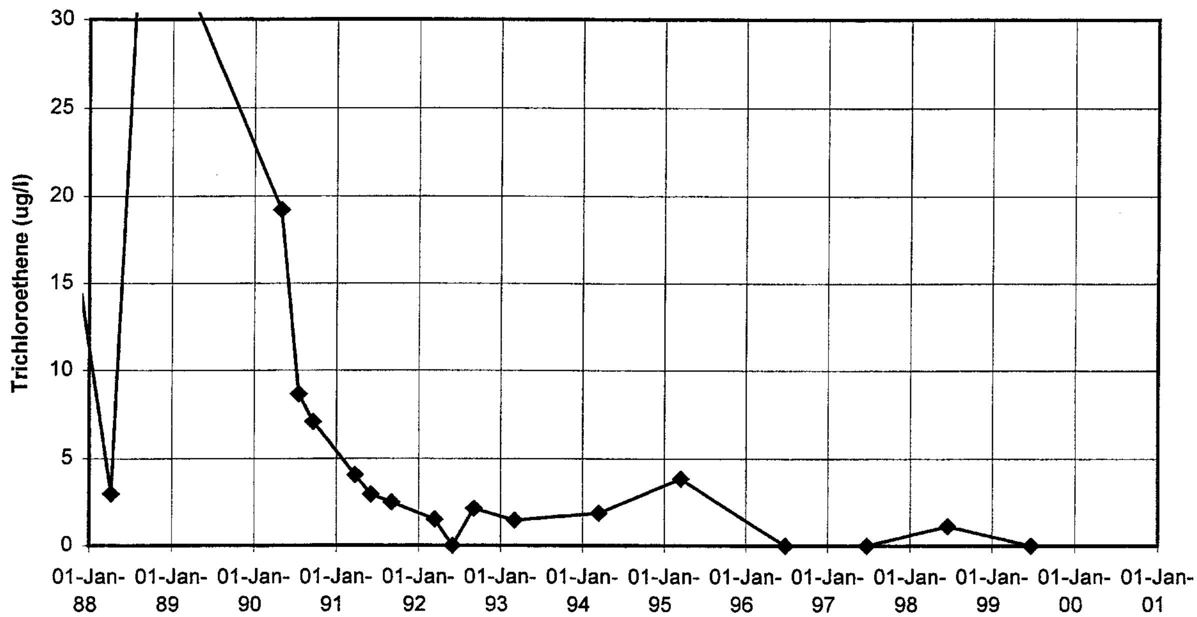
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



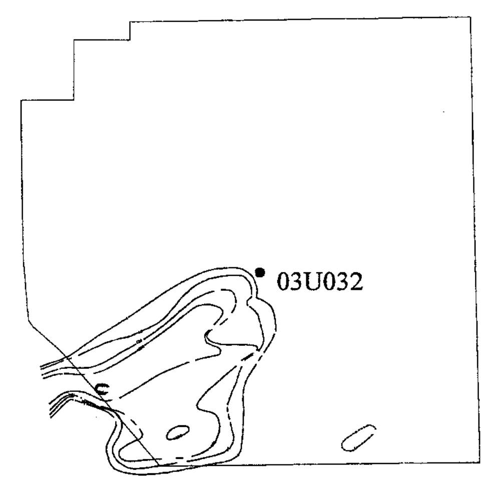
Well Location

03U032



Well Purpose:
Monitor the progress of groundwater cleanup.

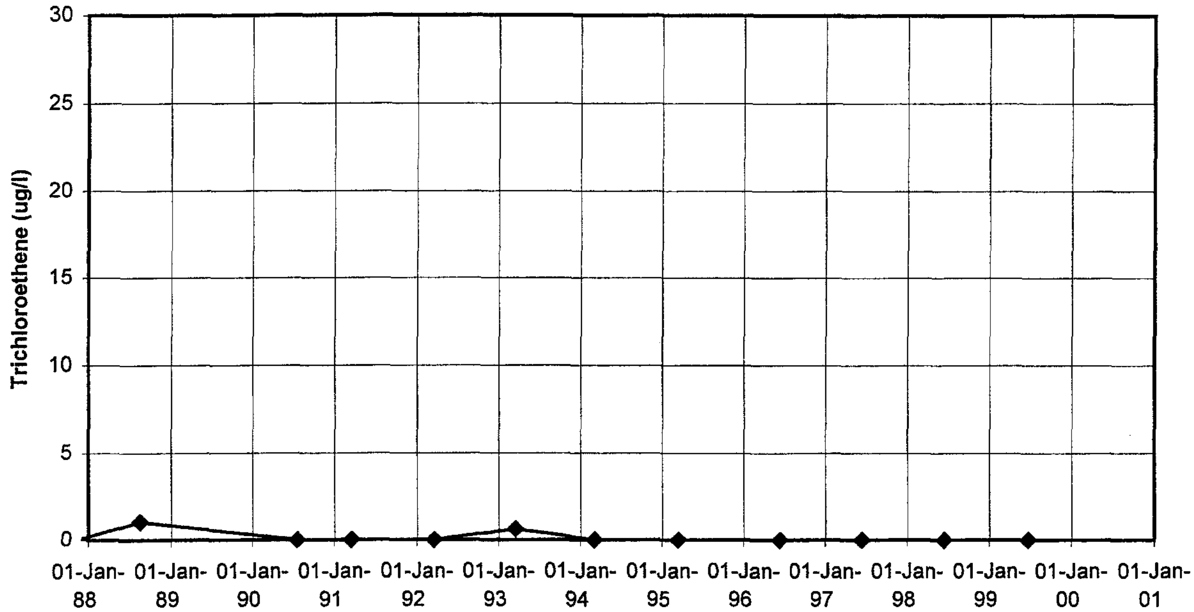
Note:
Plume map is from FY 1998.



Well Location

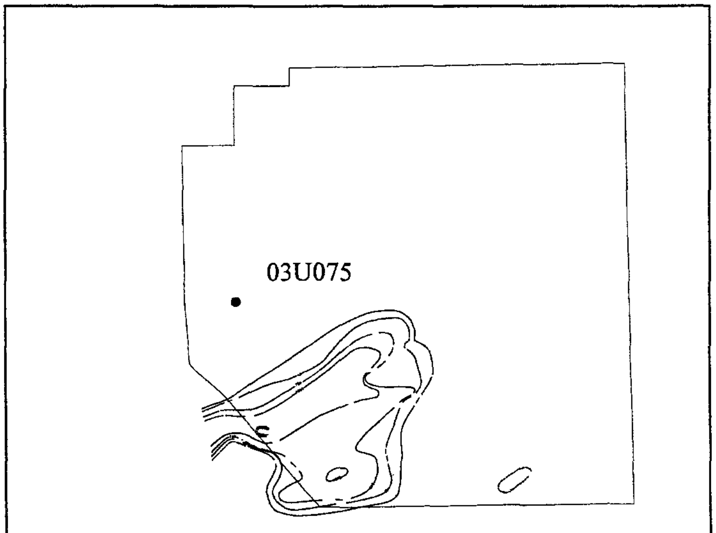
N:\0003\61\Graphs\On-U3\03U032.doc\TNW-lmh

03U075



Well Purpose:
Monitor deep groundwater downgradient of Site K.

Note:
Plume map is from FY 1998.

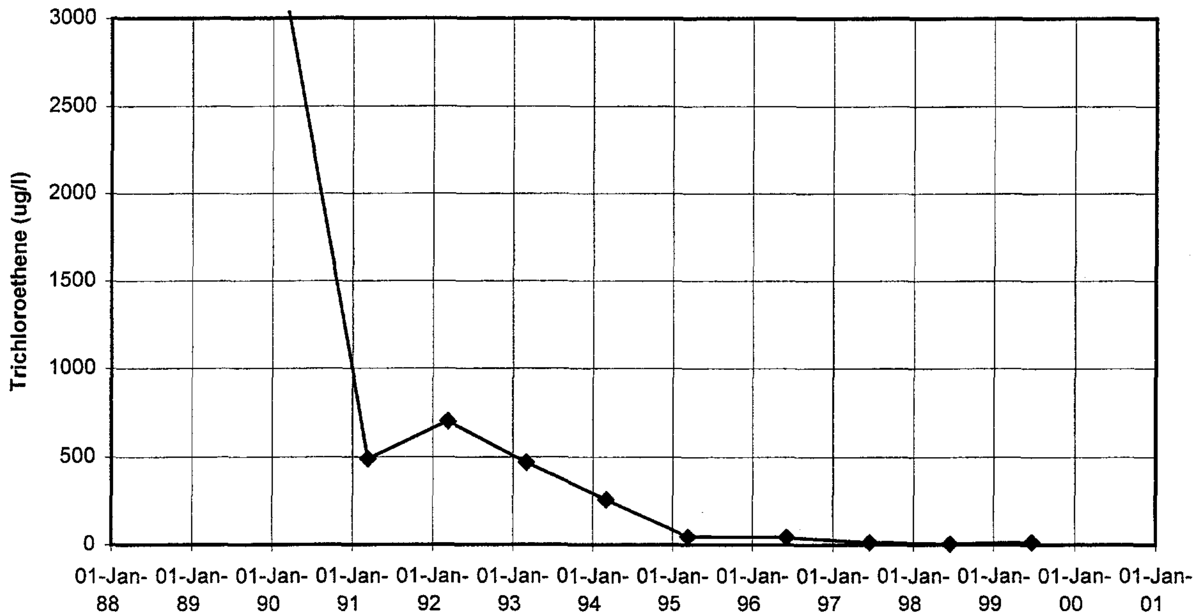


Well Location

N:\0003\61\Graphs\On-U3\03U075.doc\TNW-lmh

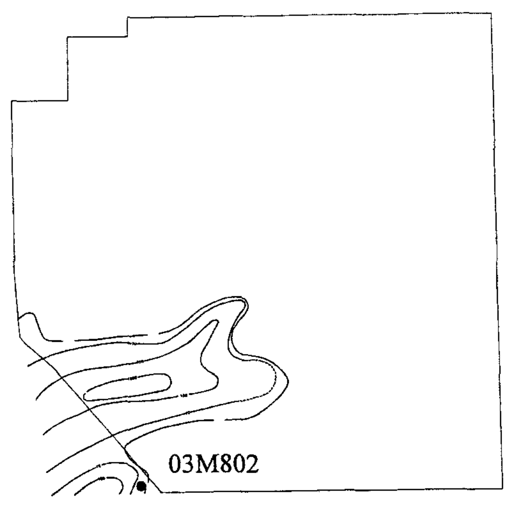
Middle and Lower Unit 3 Wells

03M802



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

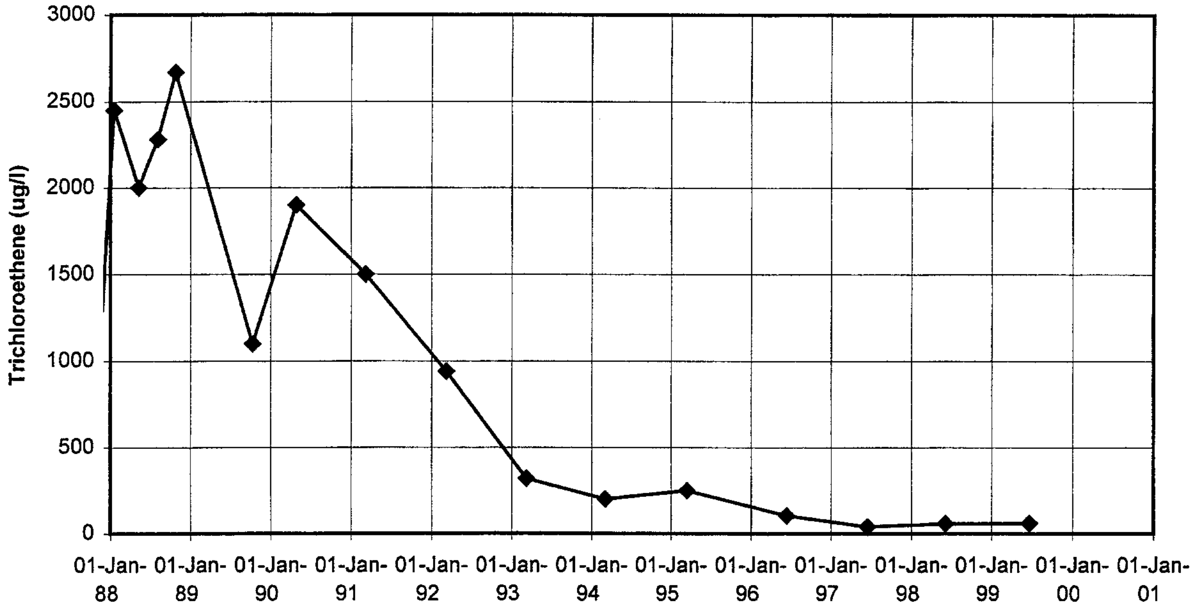
Note:
Plume map is from FY 1998.



Well Location

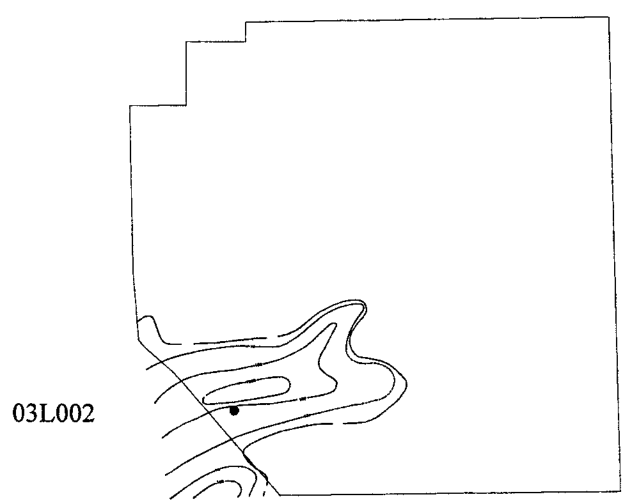
N:\0003\61\Graphs\On-L3\03M802.doc\TNW-lmh

03L002

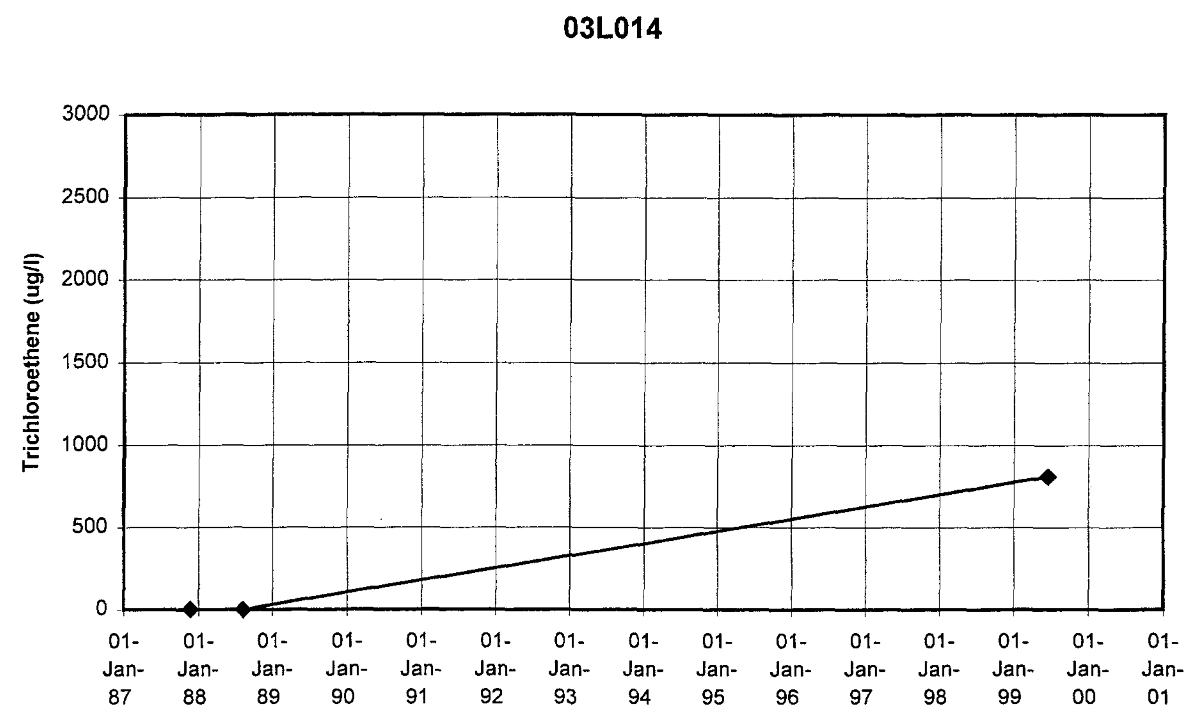


Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.

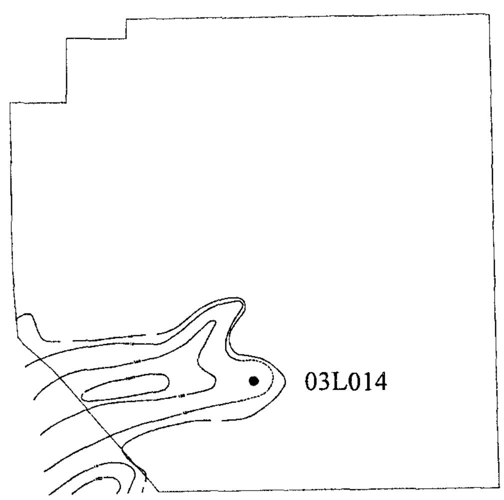


Well Location



Well Purpose:
Monitor the progress of groundwater cleanup.

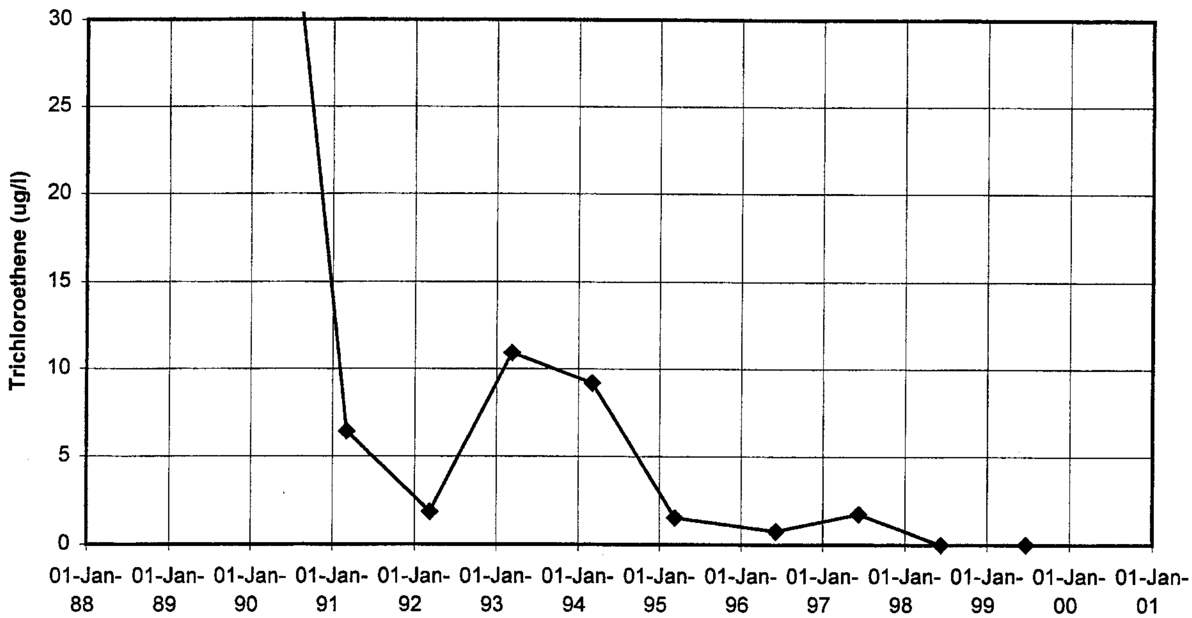
Note:
Plume map is from FY 1998.



Well Location

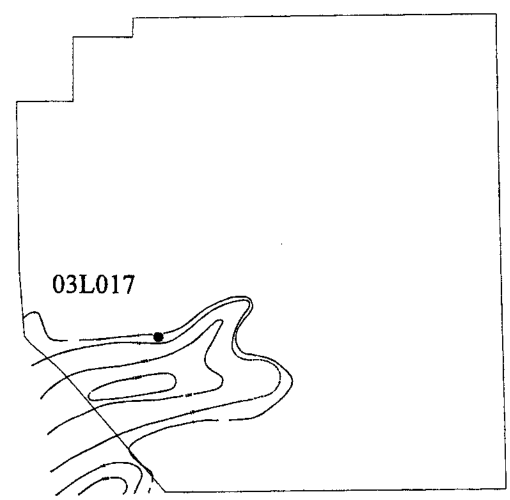
N:\0003\61\Graphs\On-L3\03L014.doc\TNW-lmh

03L017



Well Purpose:
Monitor the progress of groundwater cleanup.

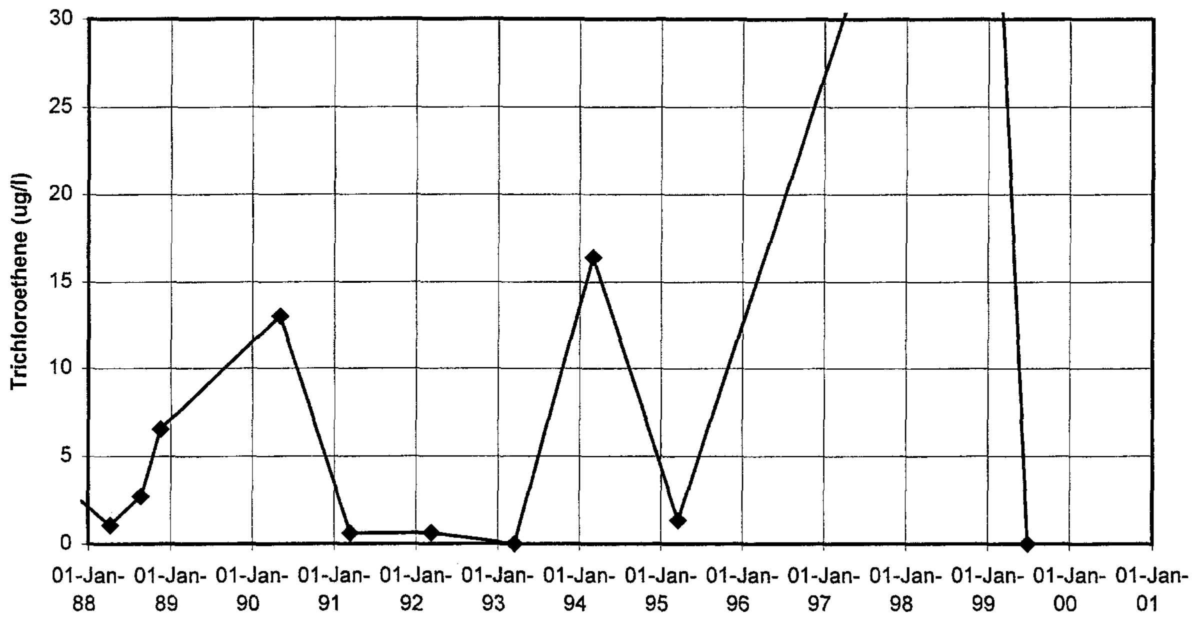
Note:
Plume map is from FY 1998.



Well Location

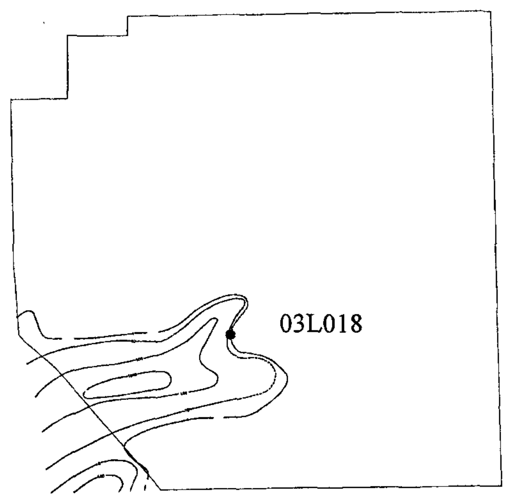
N:\0003\61\Graphs\On-L3\03L017.doc\TNW-lmh

03L018



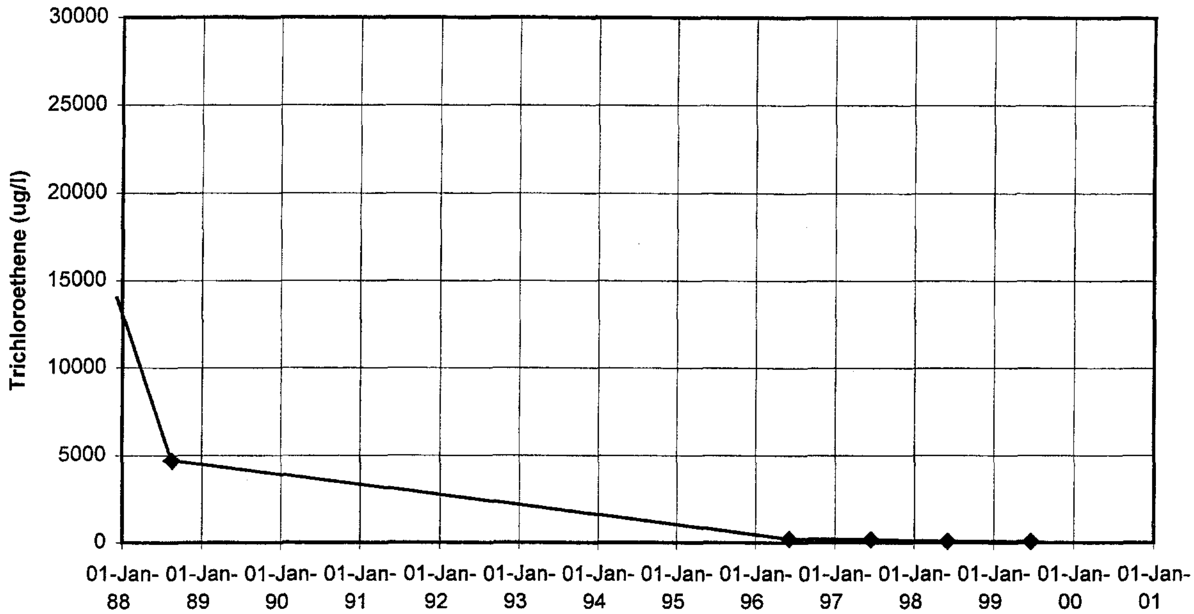
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



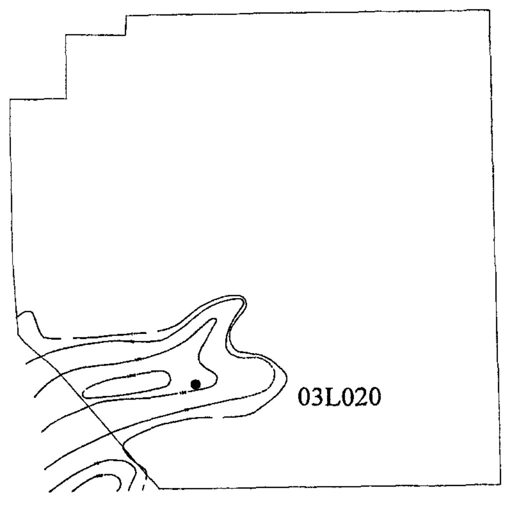
Well Location

03L020



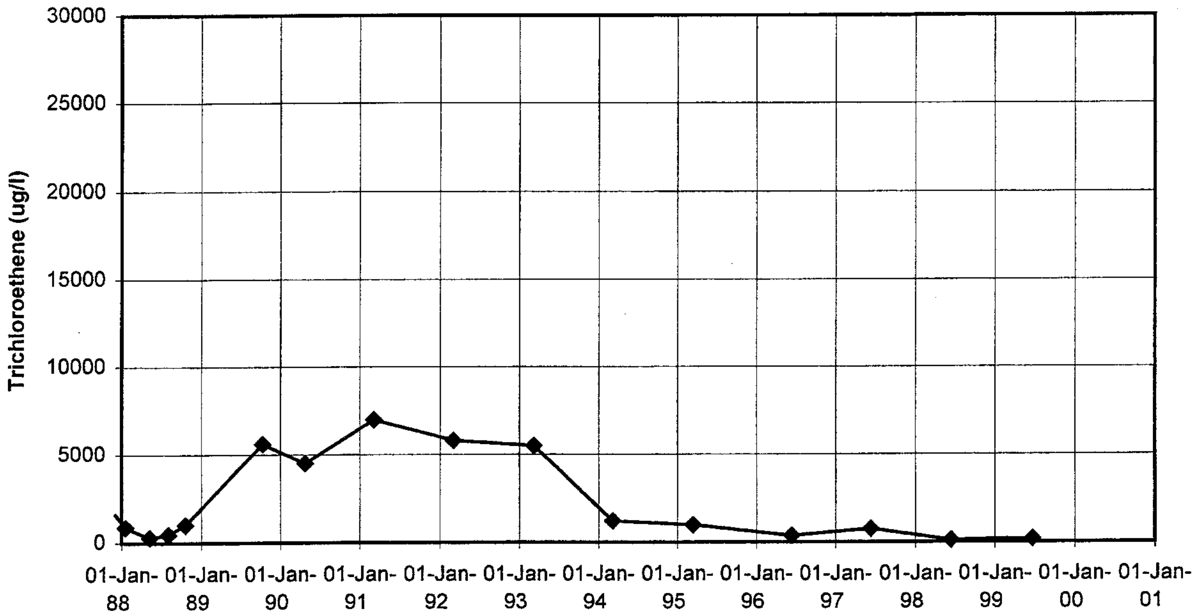
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



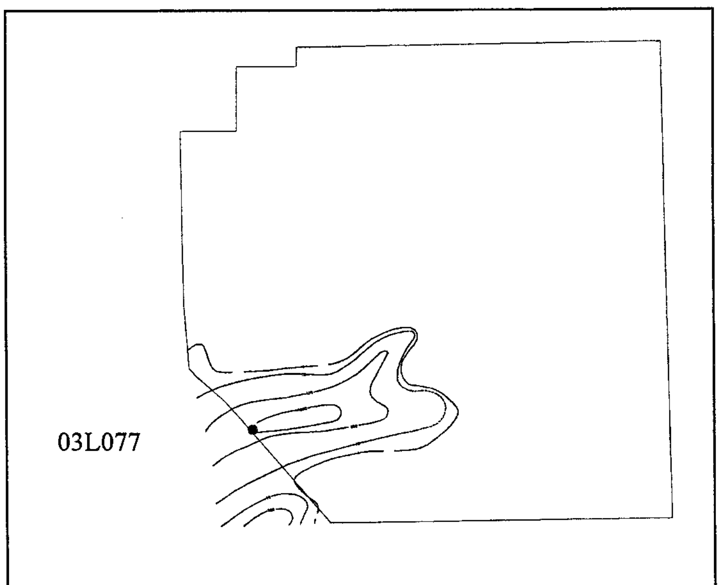
Well Location

03L077



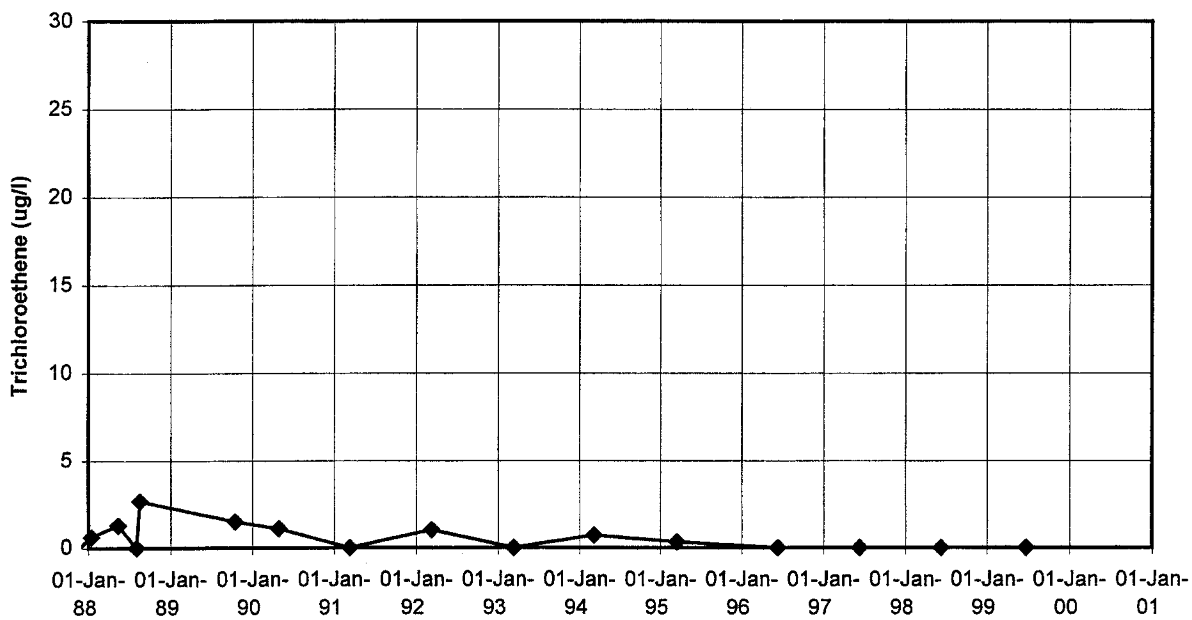
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



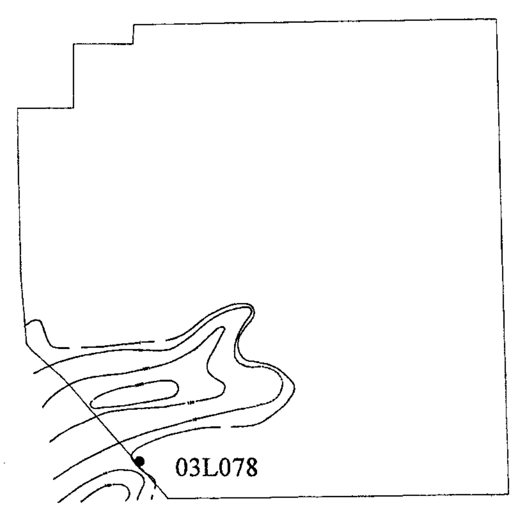
Well Location

03L078



Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the TGRS.

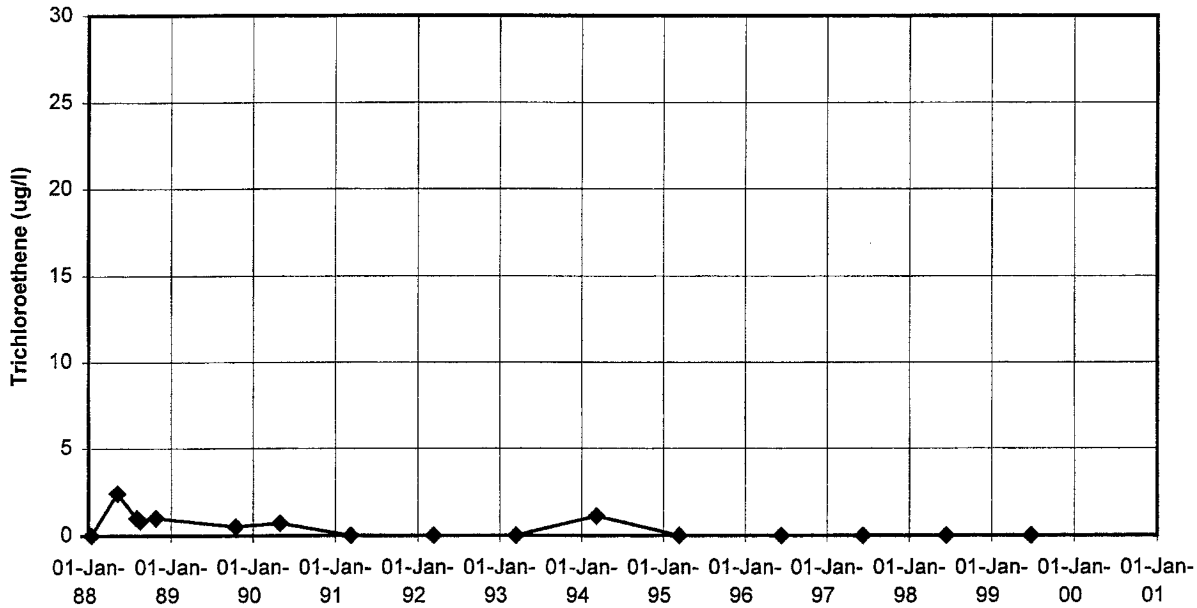
Note:
Plume map is from FY 1998.



Well Location

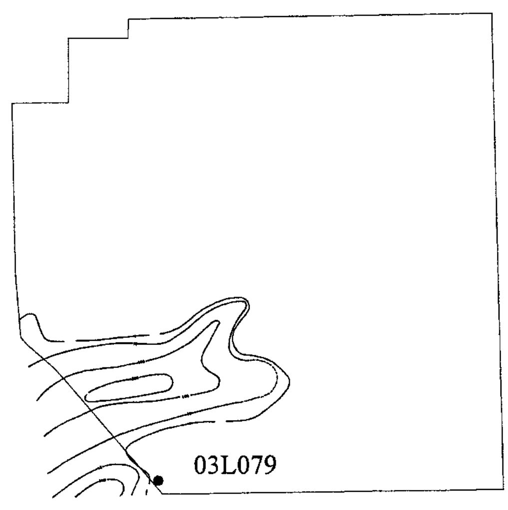
N:\0003\61\Graphs\On-L3\03L078.doc\TNW-lmh

03L079



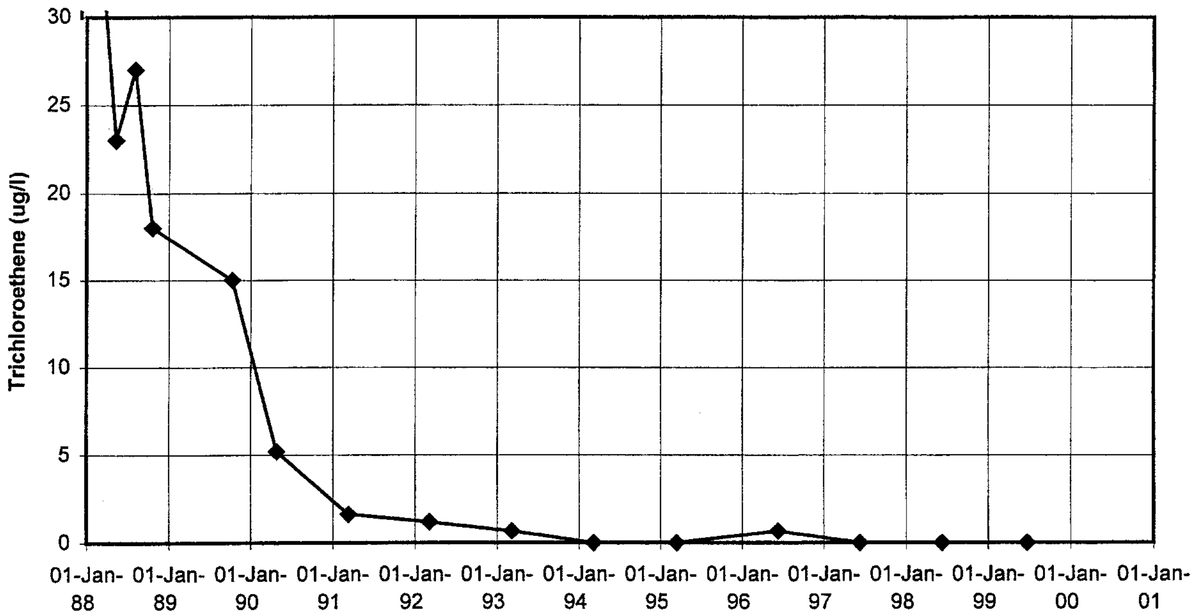
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



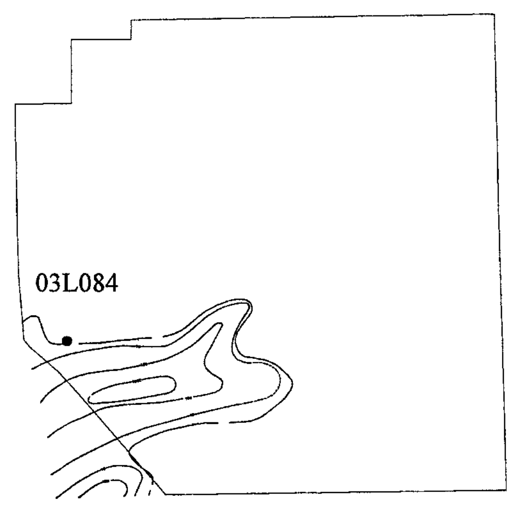
Well Location

03L084



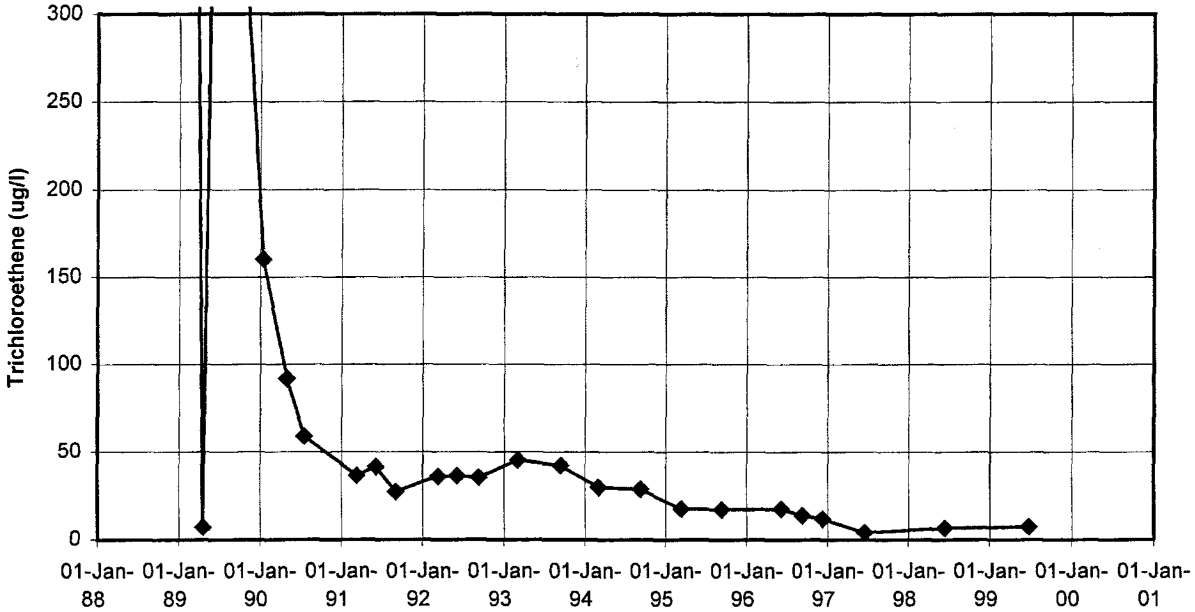
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



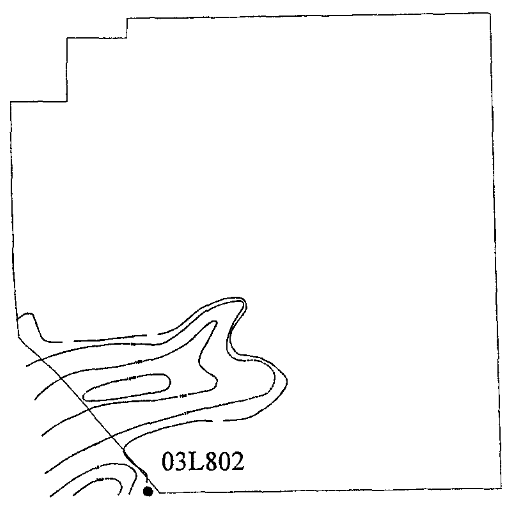
Well Location

03L802



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

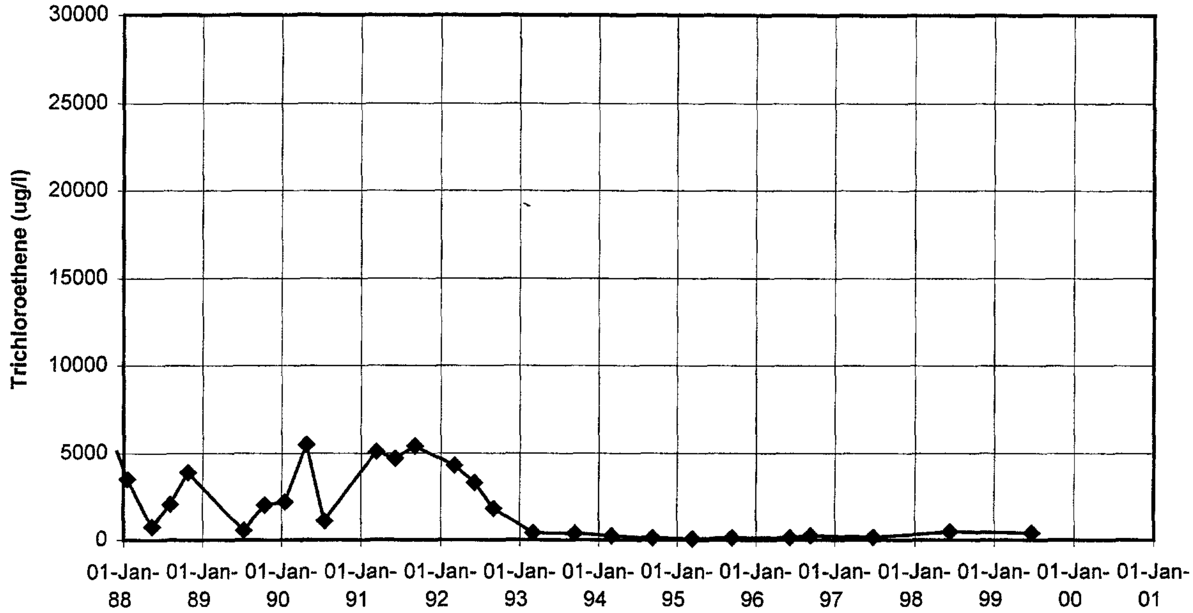
Note:
Plume map is from FY 1998.



Well Location

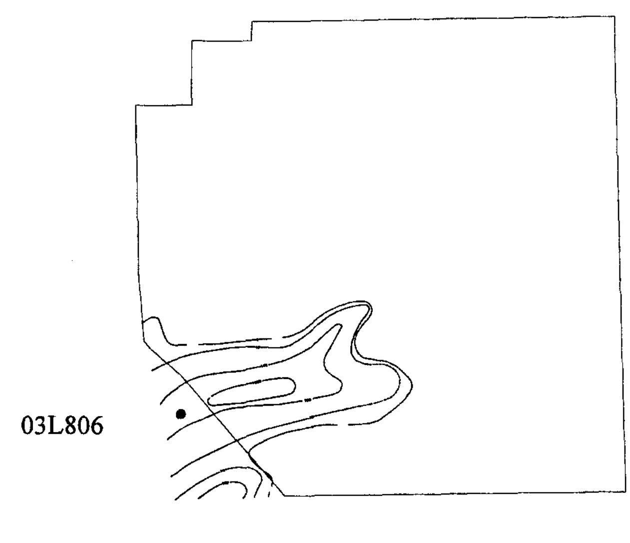
N:\0003\61\Graphs\On-L3\03L802.doc\TNW-lmh

03L806



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

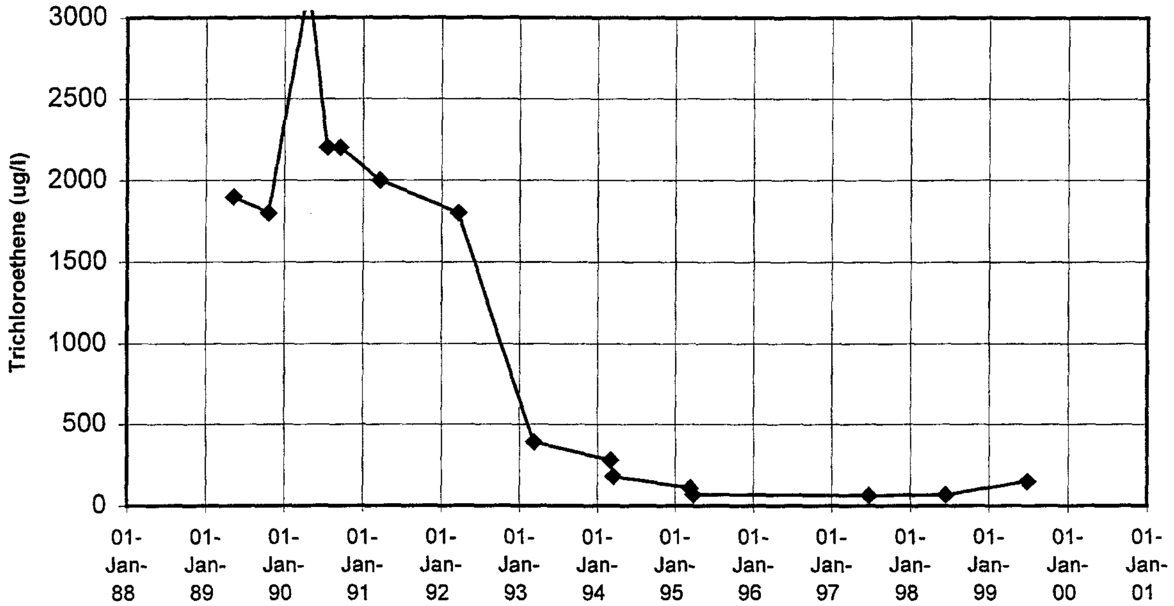
Note:
Plume map is from FY 1998.



Well Location

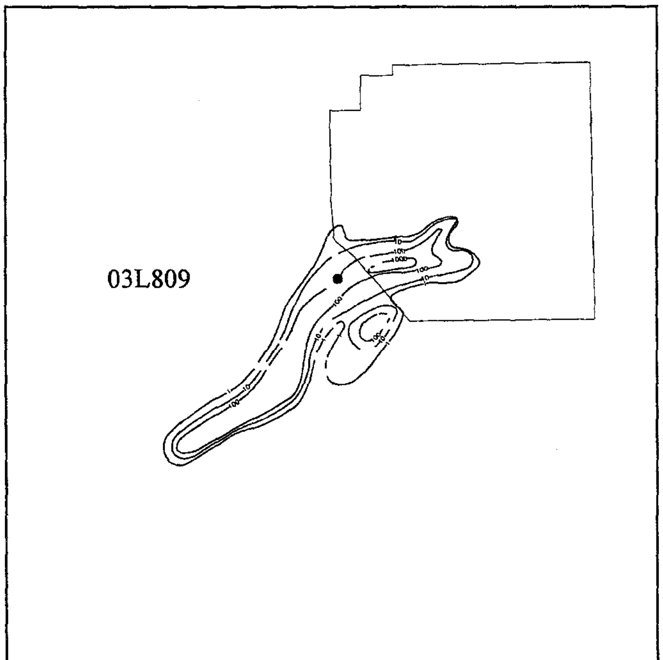
N:\0003\61\Graphs\On-L3\03L806.doc\TNW-lmh

03L809



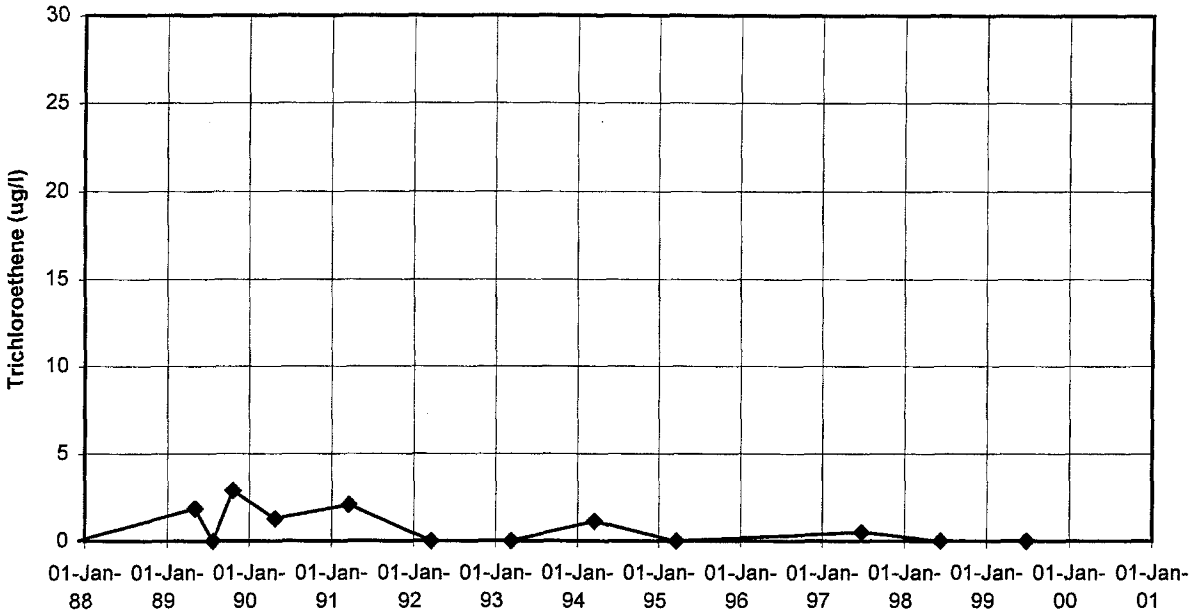
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Impact of Biannual Frequency:
The data has been relatively consistent since 1993. Even if the concentration unexpectedly increased, no additional remedial action would be implemented. The water in this area is captured by the OU1 containment system, and private wells in this area are addressed through the alternate water supply and abandonment program. Hence, there would be no detrimental impact with a biannual frequency.



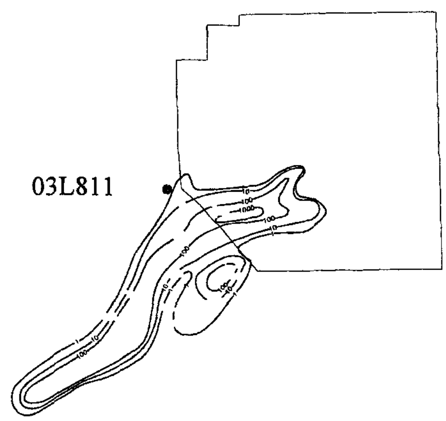
Well Location

03L811



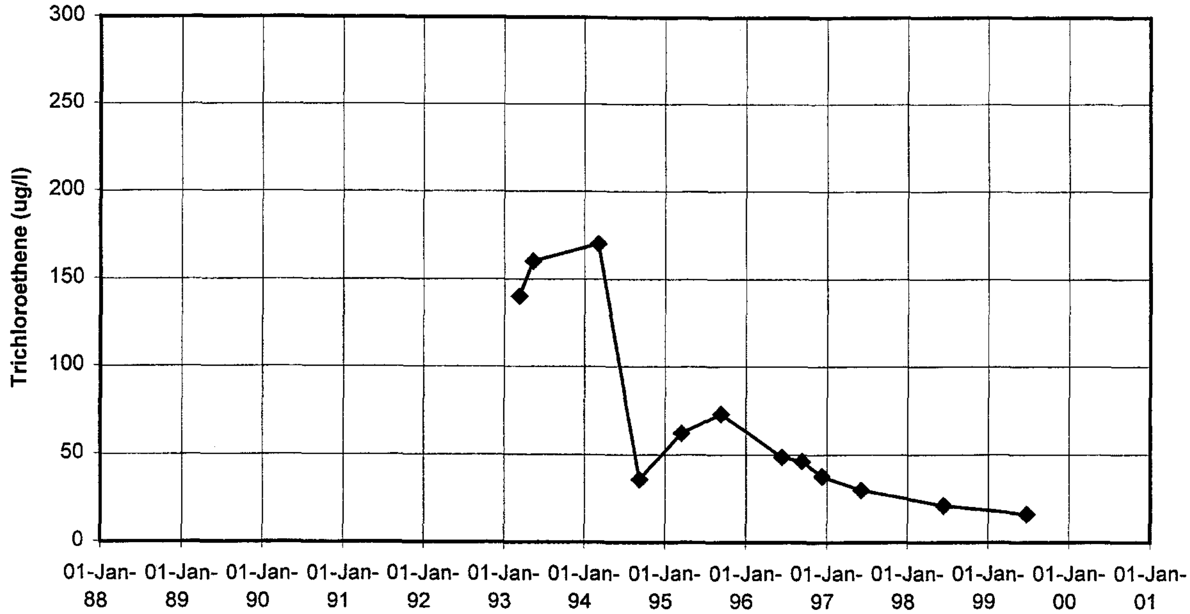
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



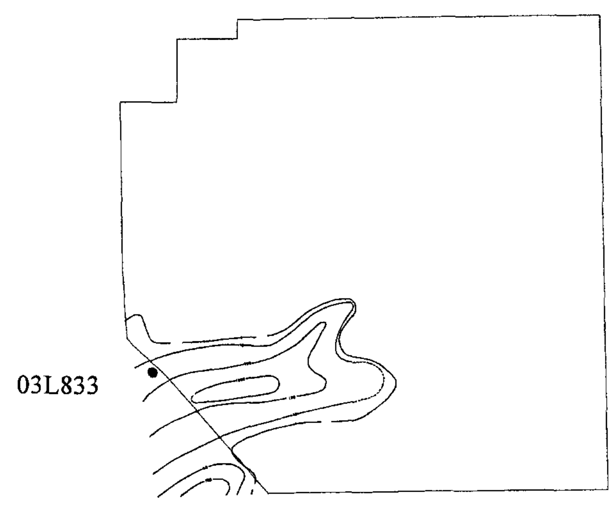
Well Location

03L833



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

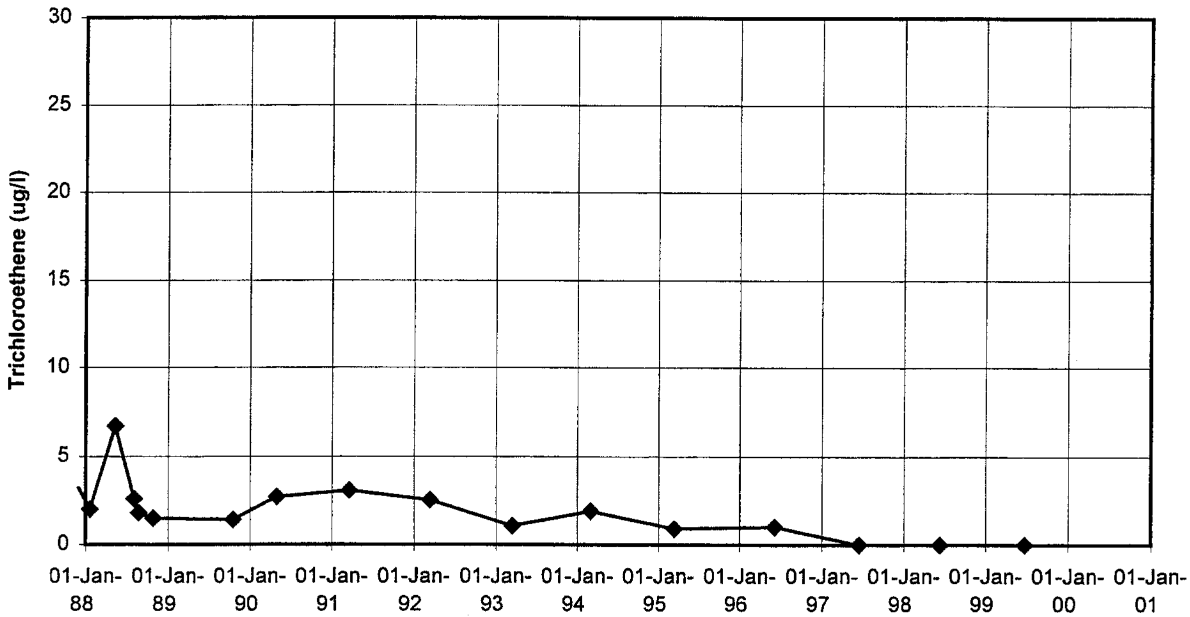
Note:
Plume map is from FY 1998.



Well Location

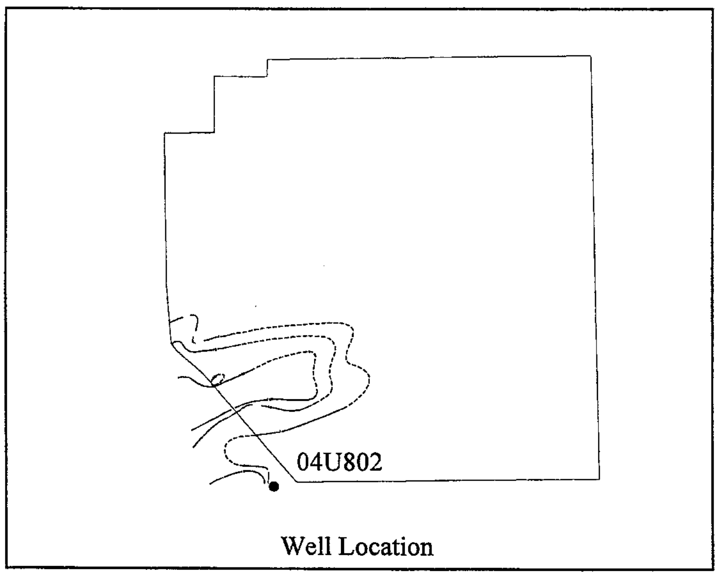
Unit 4 Wells

04U802



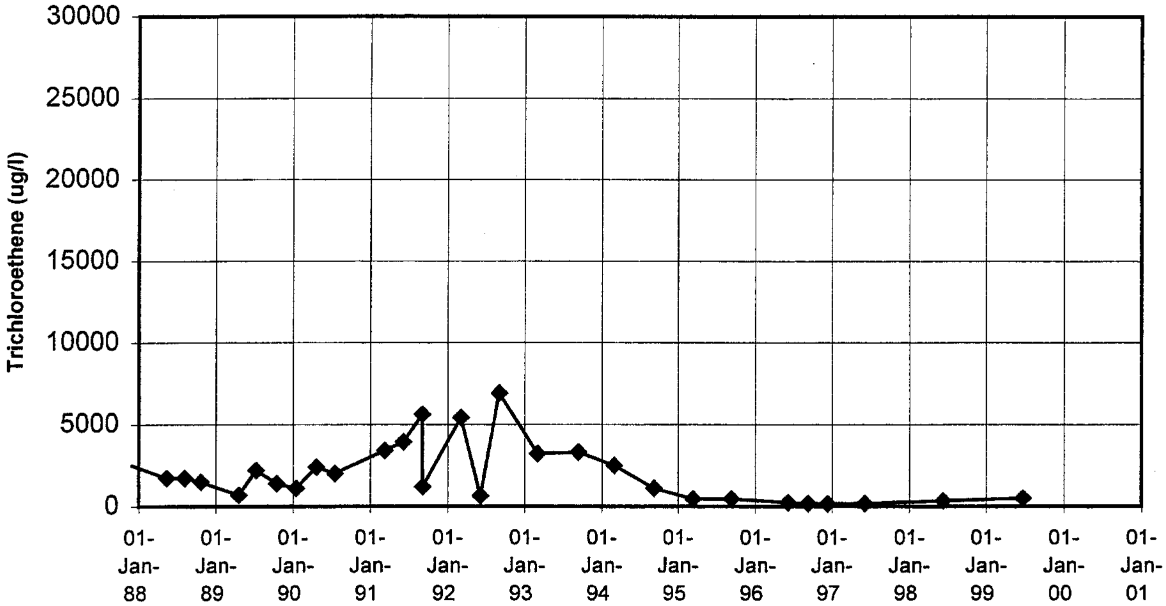
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



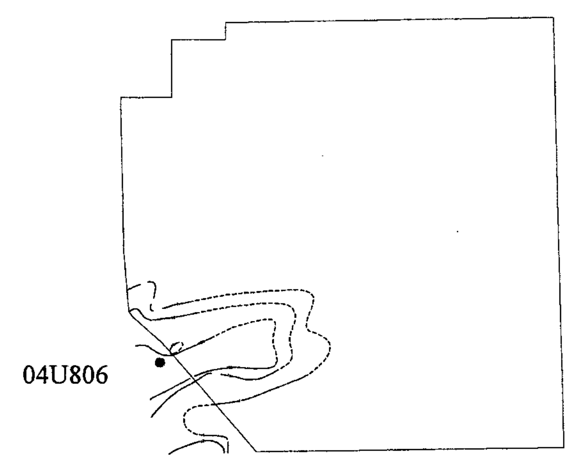
N:\0003\61\Graphs\On-U4\04U802.doc\TNW-lmh

04U806



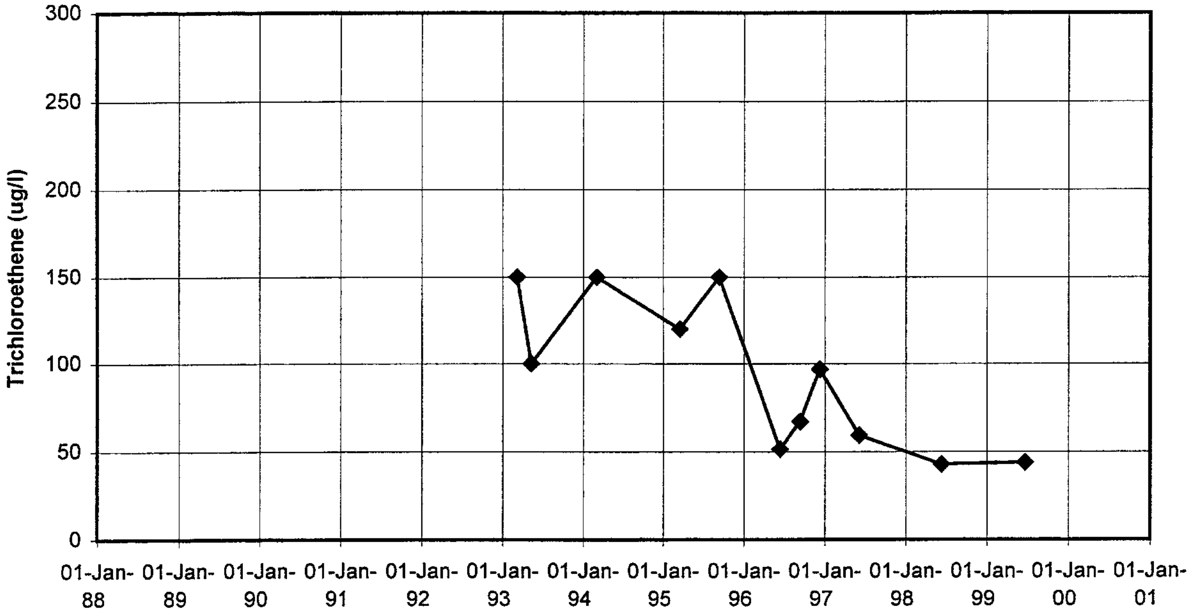
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



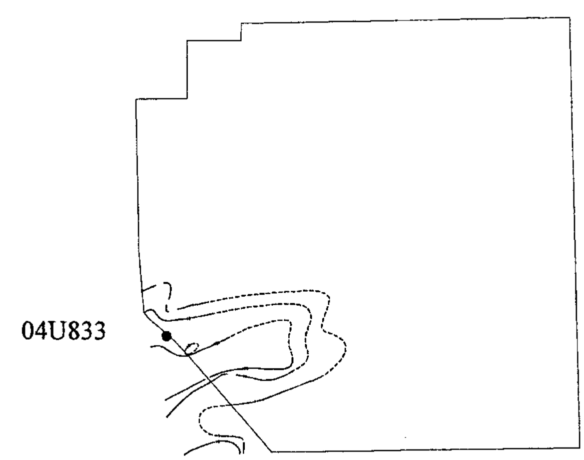
Well Location

04U833



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

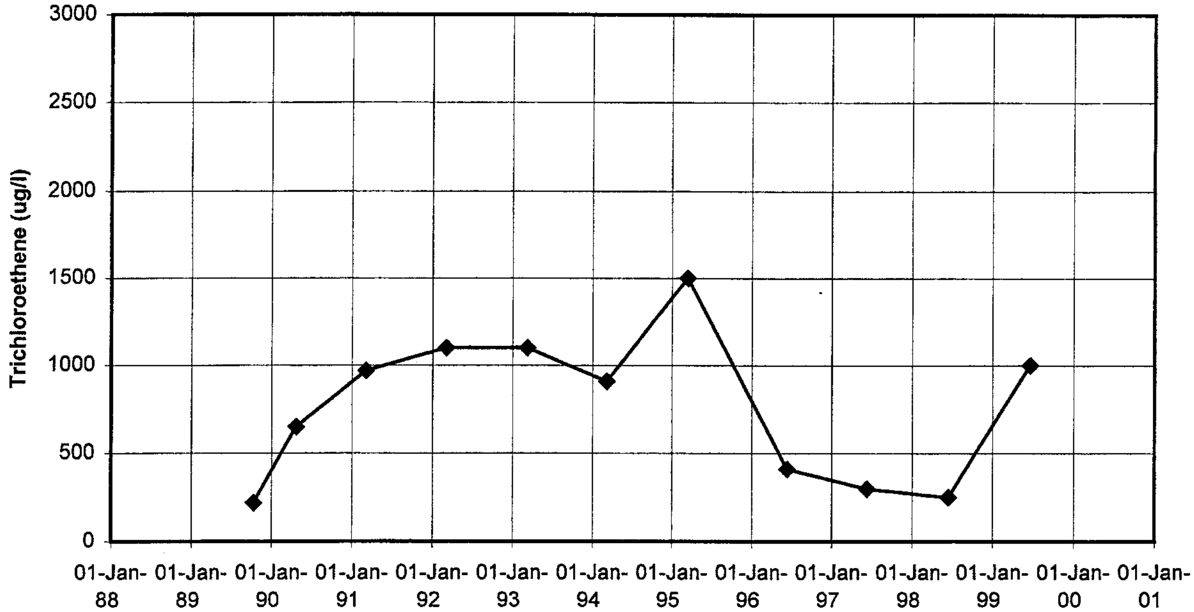
Note:
Plume map is from FY 1998.



Well Location

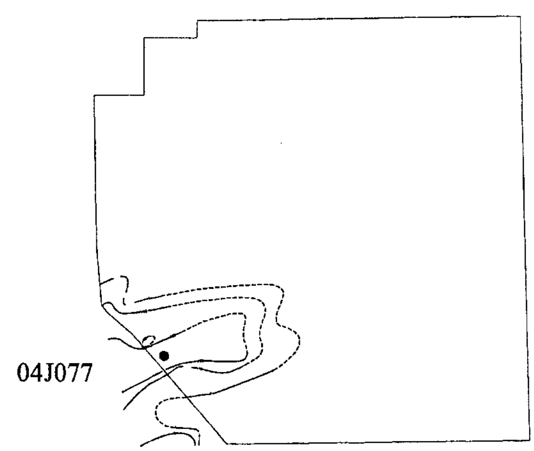
N:\0003\61\Graphs\On-U4\04U833.doc\TNW-lmh

04J077



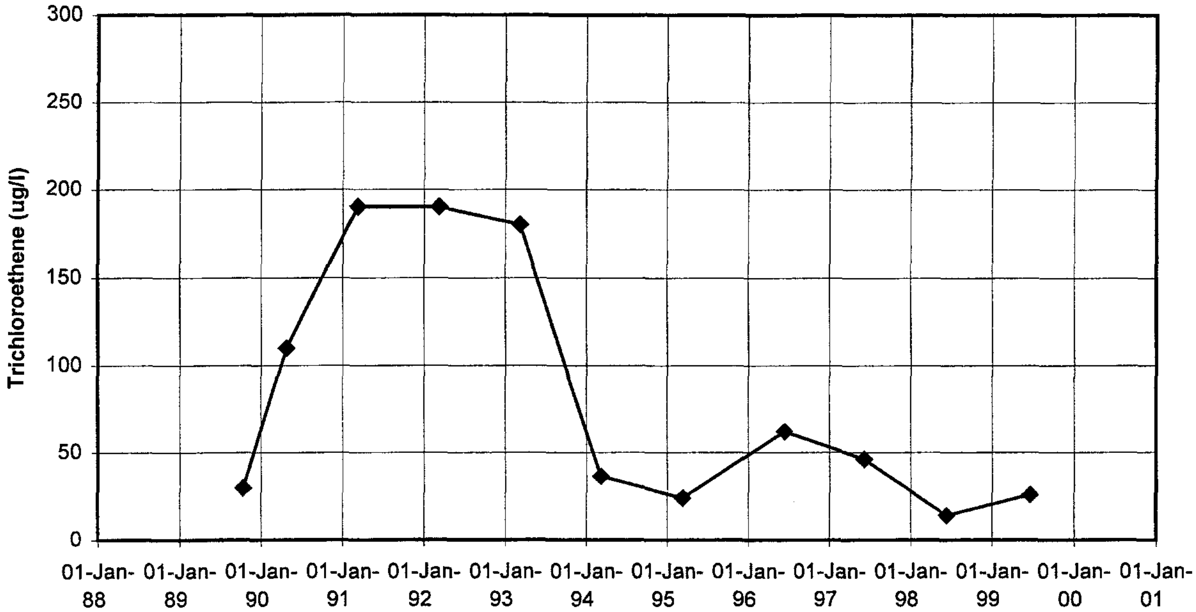
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



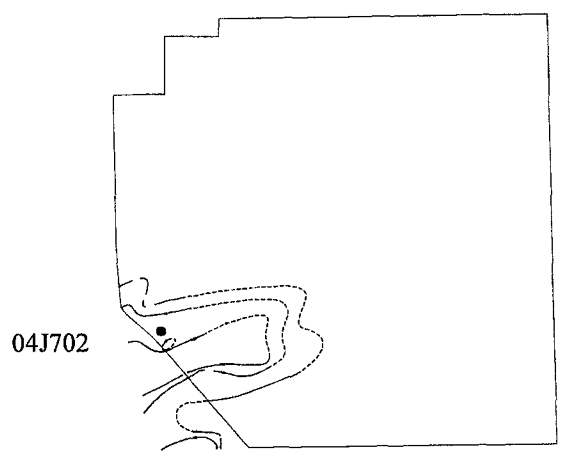
Well Location

04J702



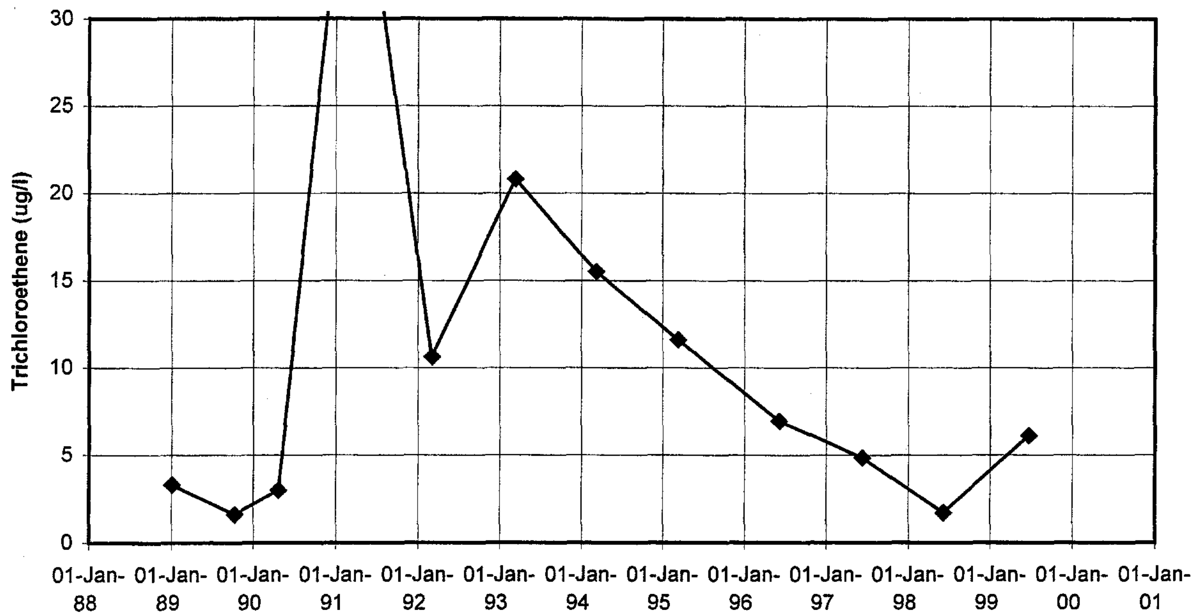
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



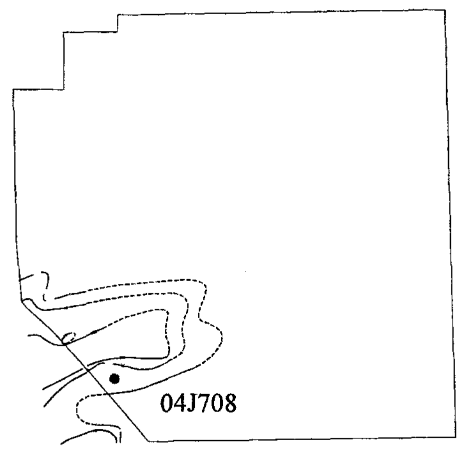
Well Location

04J708



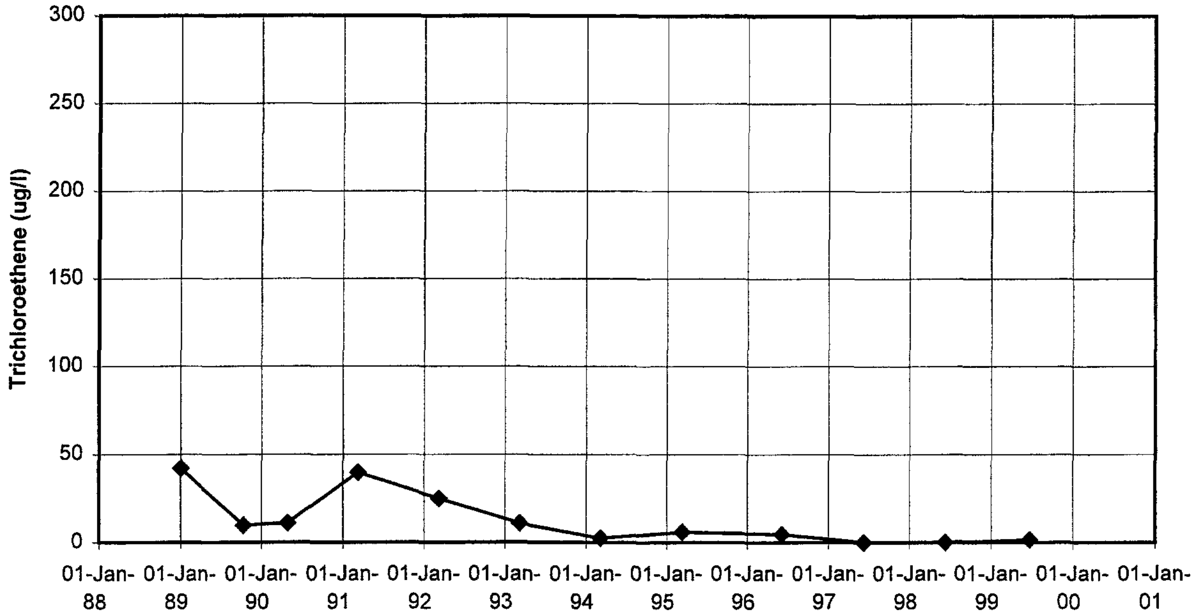
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



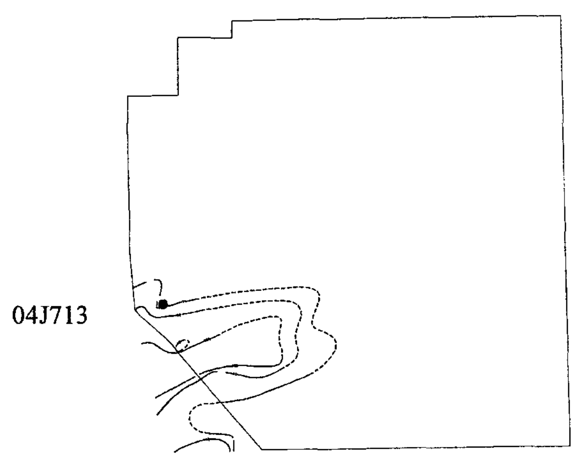
Well Location

04J713



Well Purpose:
Monitor the progress of groundwater cleanup.

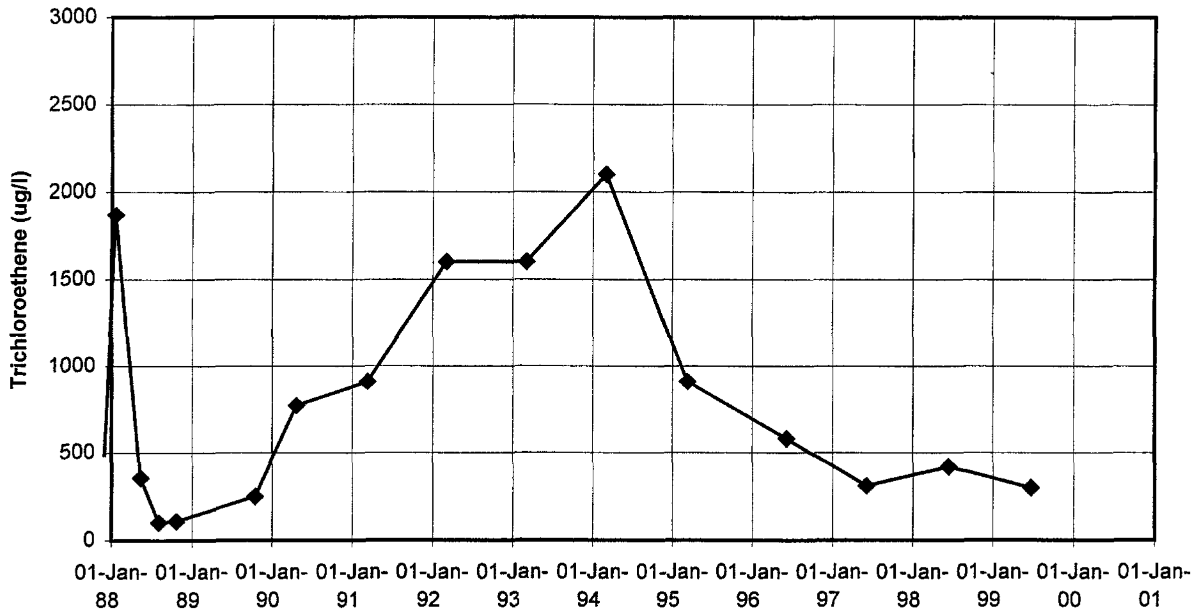
Note:
Plume map is from FY 1998.



Well Location

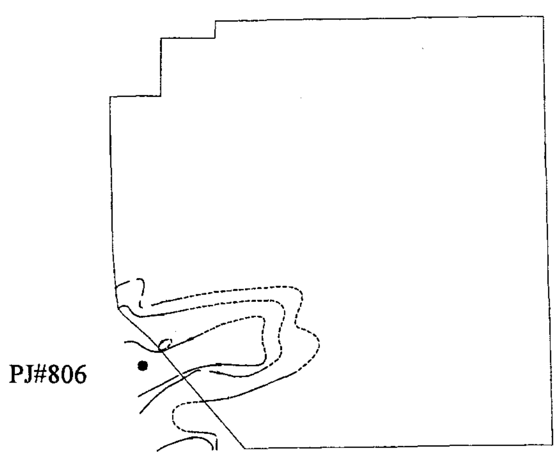
N:\0003\61\Graphs\On-U4\04J713.doc\TNW-lmh

PJ#806



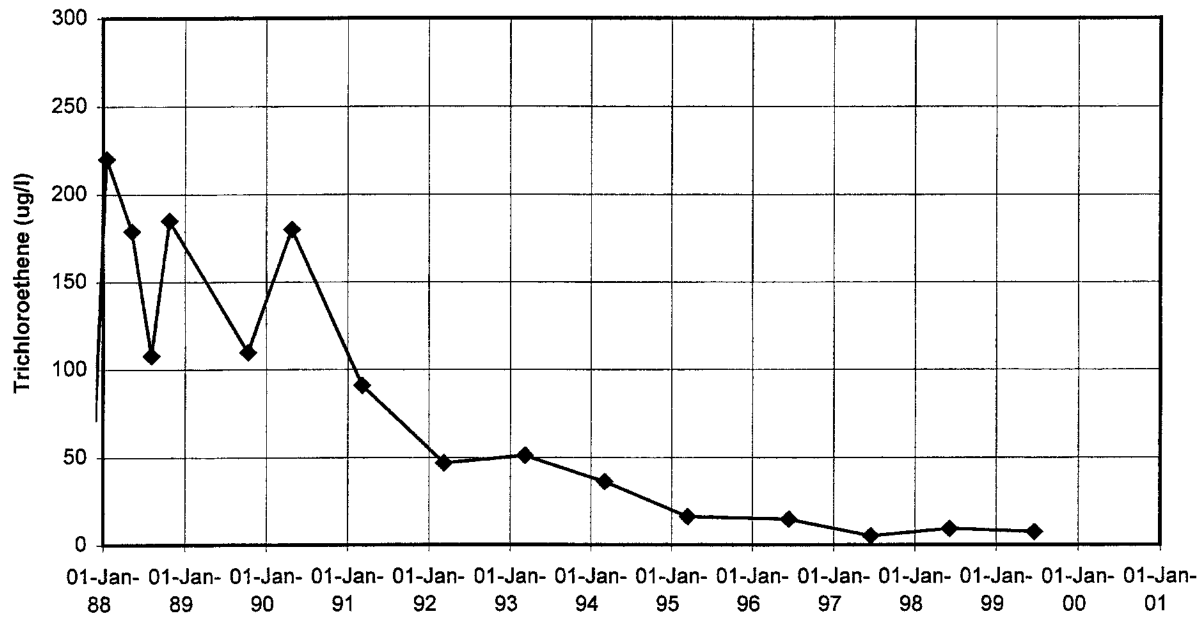
Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.



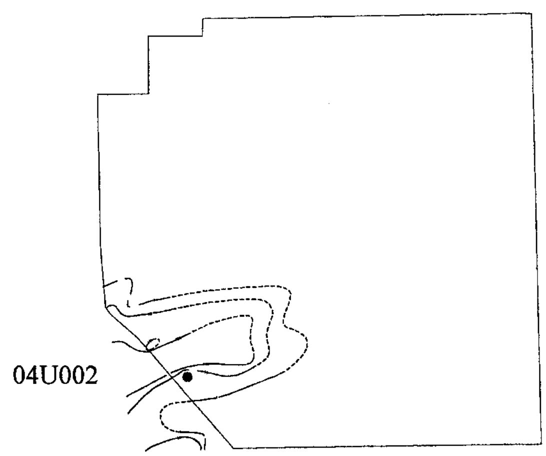
Well Location

04U002



Well Purpose:
Monitor the progress of groundwater cleanup.

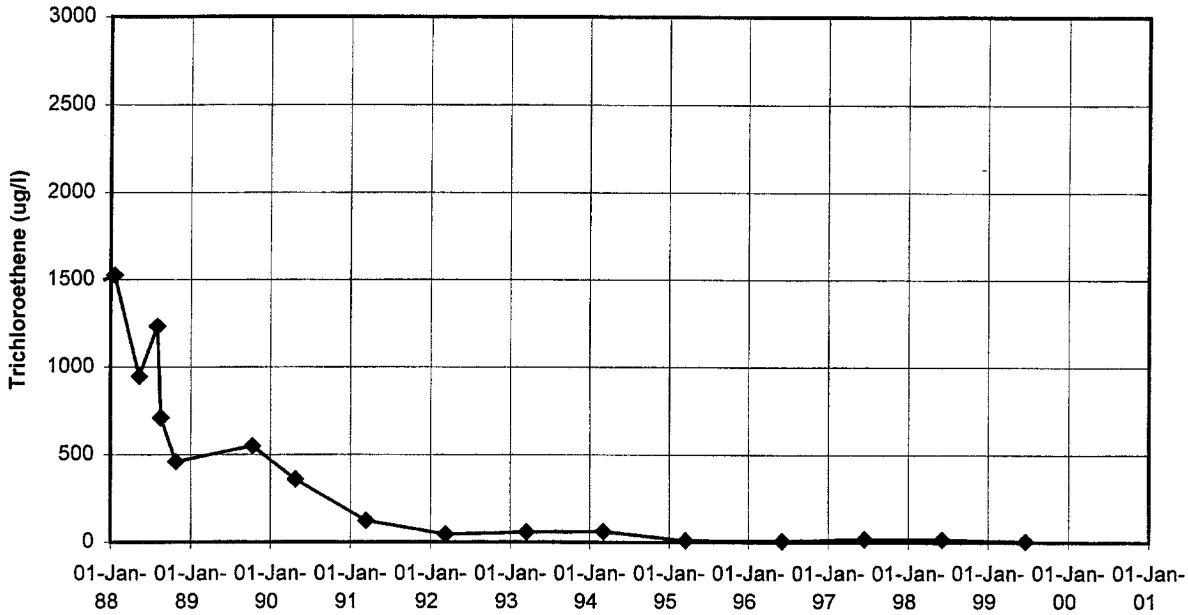
Note:
Plume map is from FY 1998.



Well Location

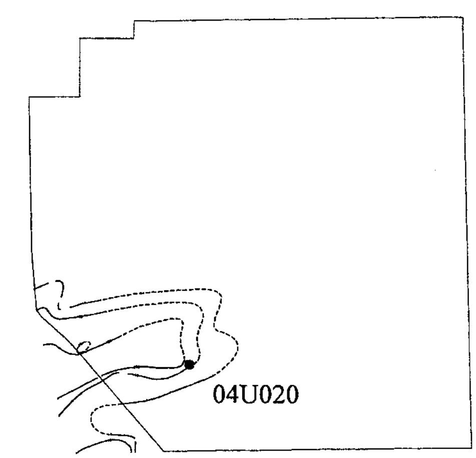
N:\0003\61\Graphs\On-U4\04U002.doc\TNW-lmh

04U020



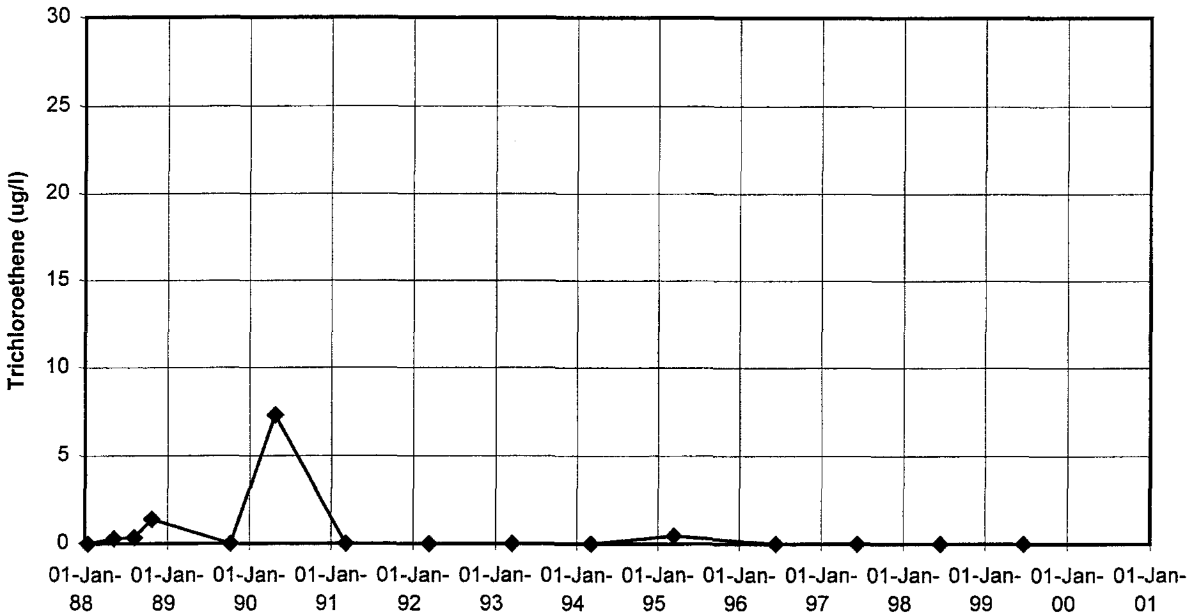
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



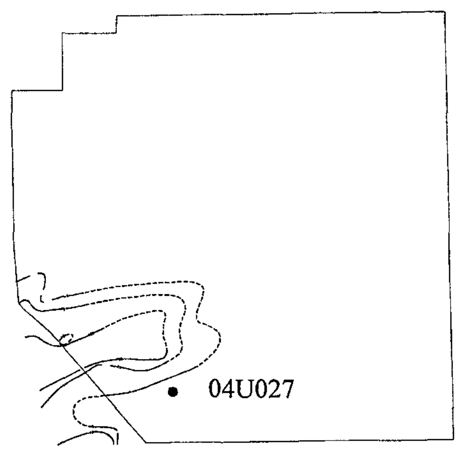
Well Location

04U027



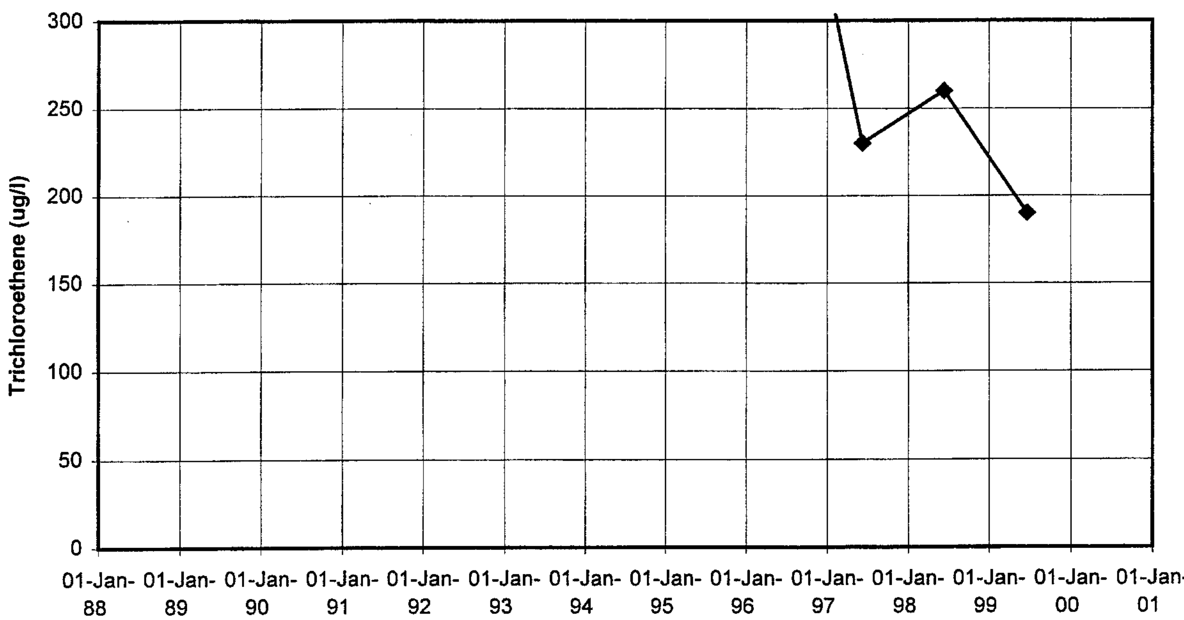
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the TGRS.

Note:
Plume map is from FY 1998.



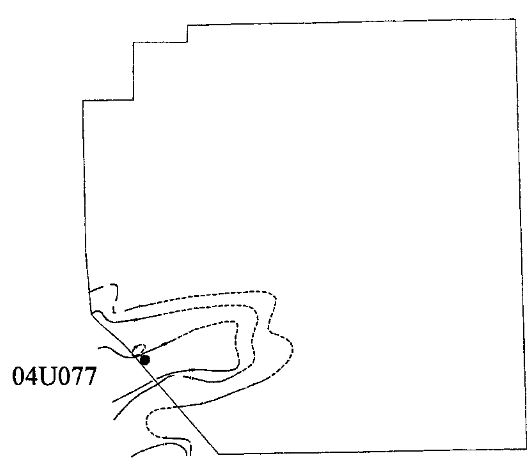
Well Location

04U077



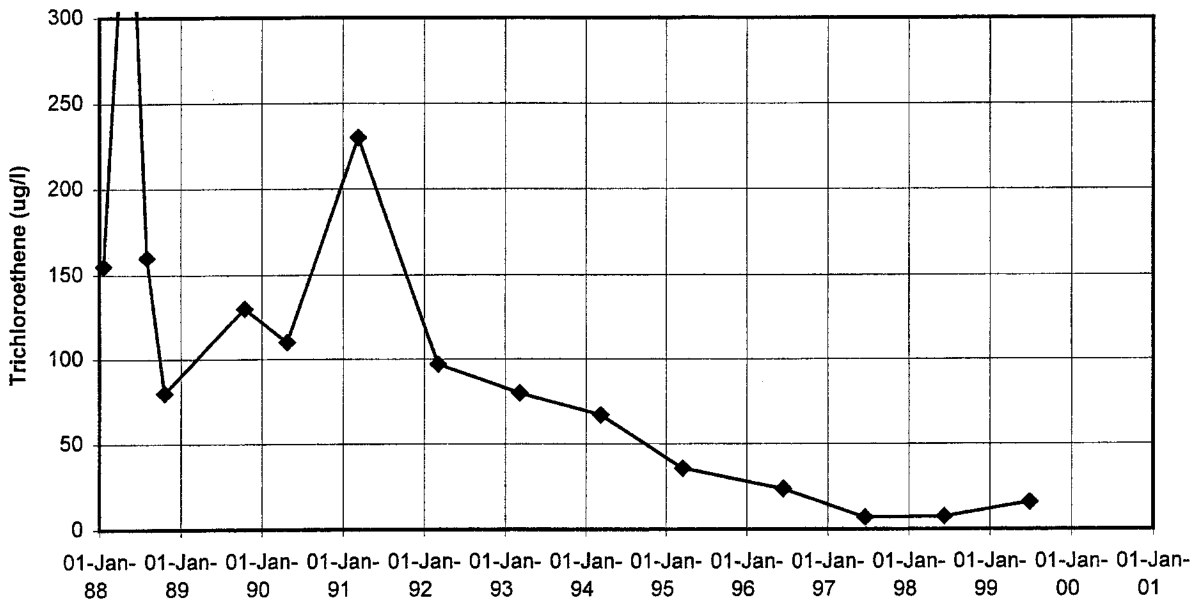
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



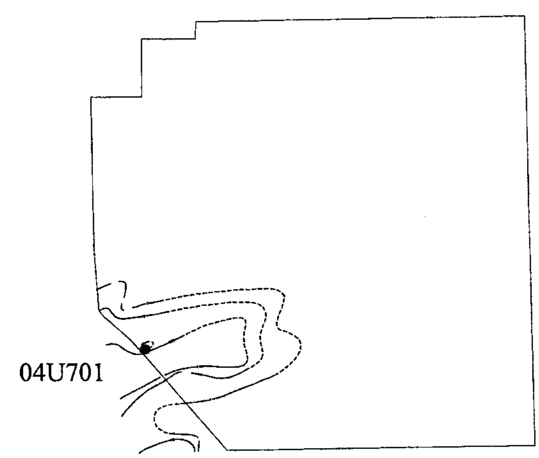
Well Location

04U701



Well Purpose:
Monitor the progress of groundwater cleanup.

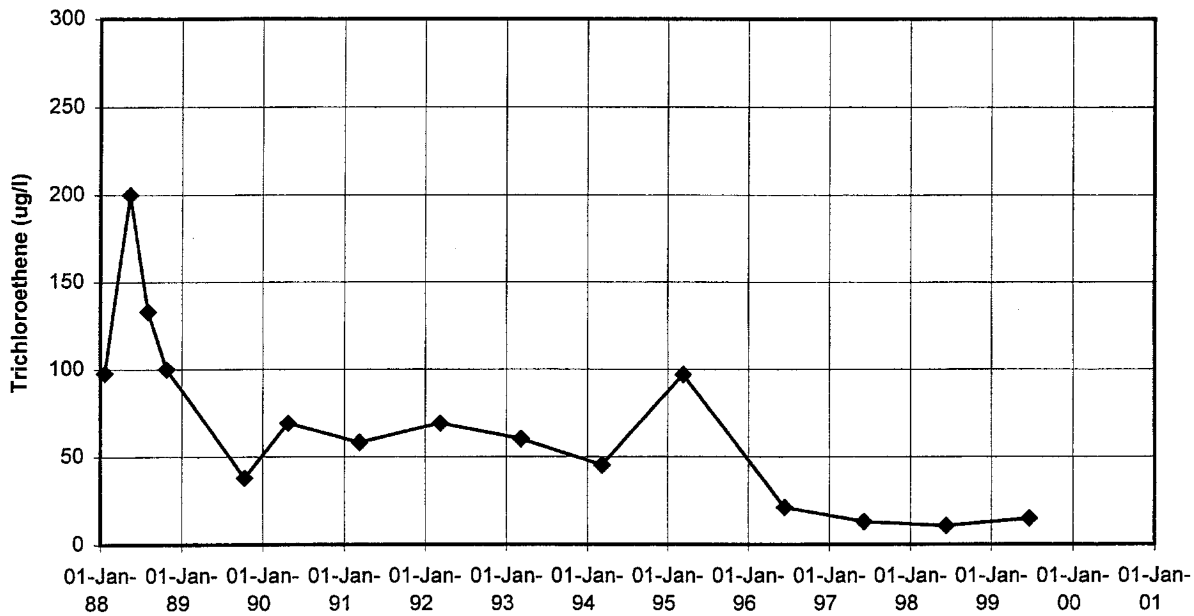
Note:
Plume map is from FY 1998.



Well Location

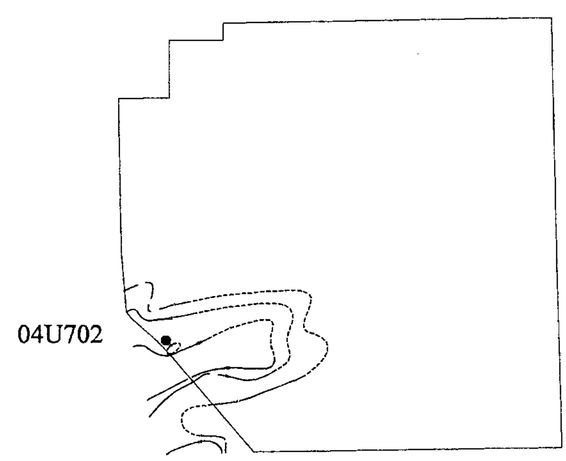
N:\0003\61\Graphs\On-U4\04U701.doc\TNW-lmh

04U702



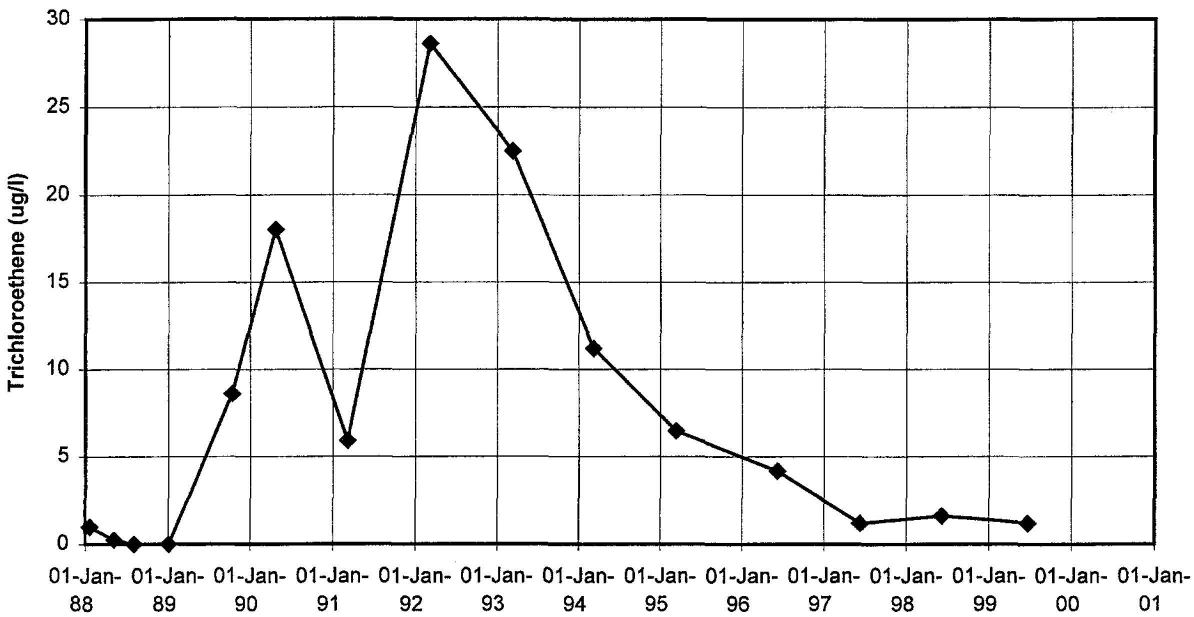
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



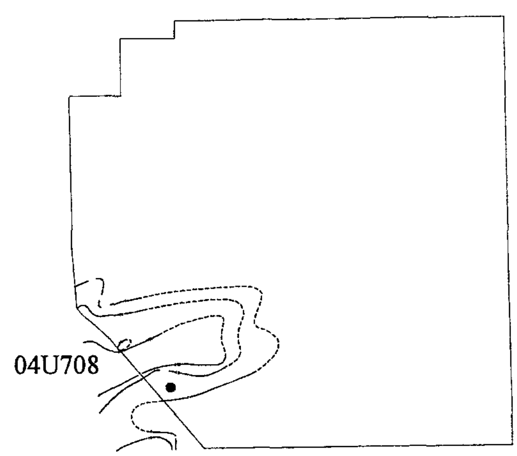
Well Location

04U708



Well Purpose:
Monitor the progress of groundwater cleanup.

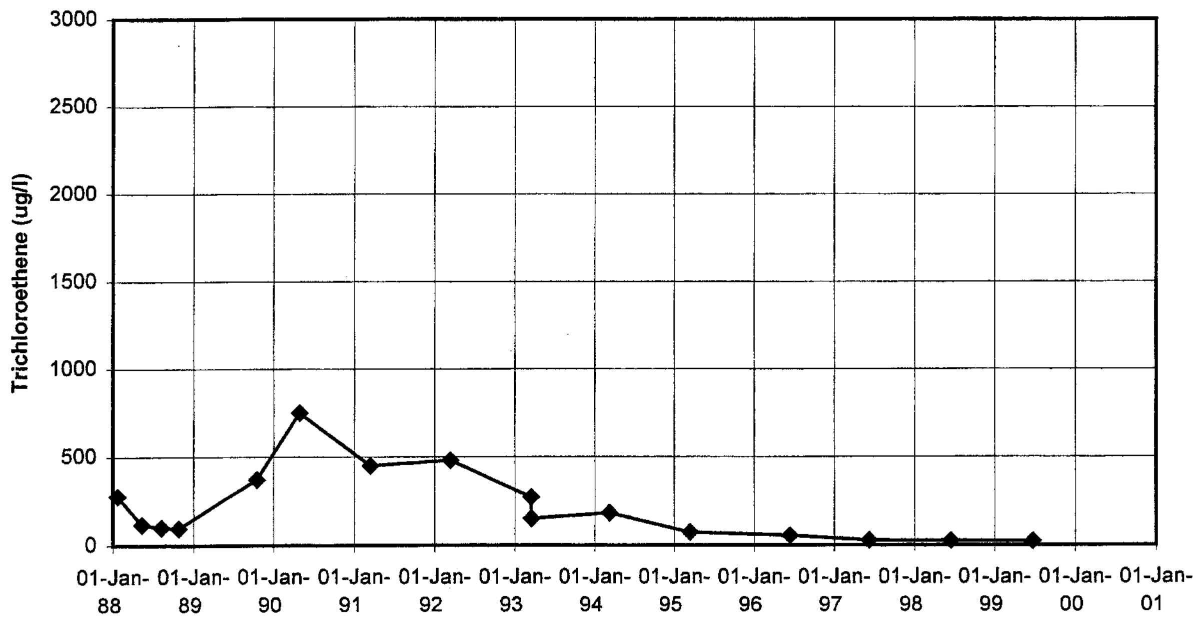
Note:
Plume map is from FY 1998.



Well Location

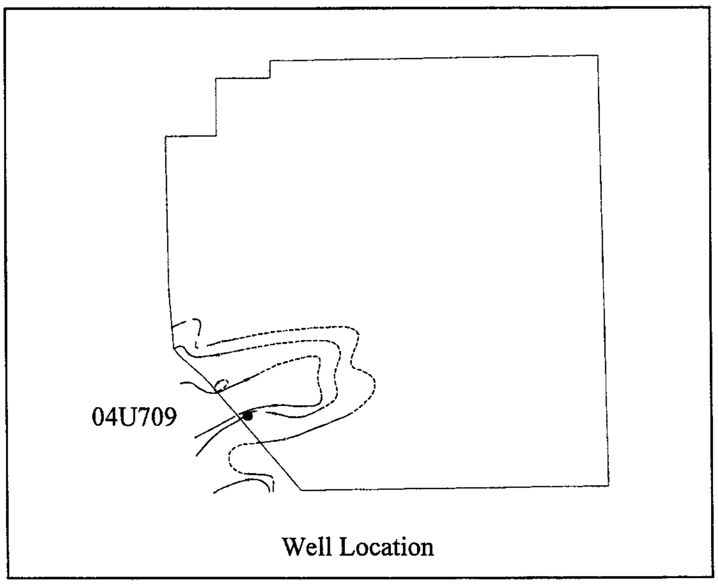
N:\0003\61\Graphs\On-U4\04U708.doc\TNW-lmh

04U709



Well Purpose:
Monitor the progress of groundwater cleanup.

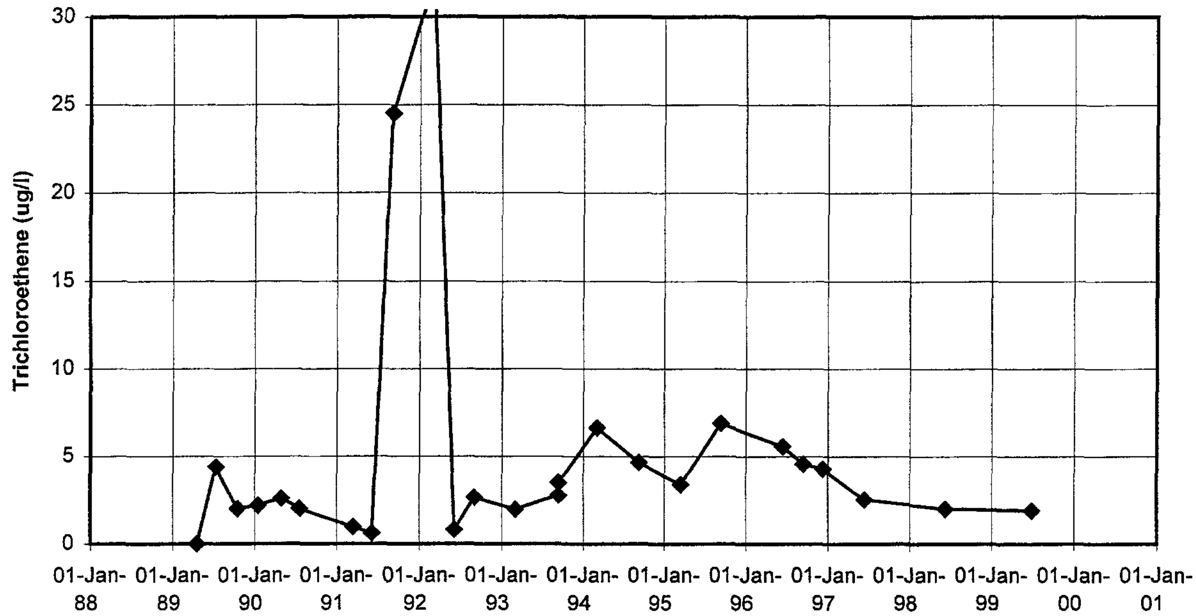
Note:
Plume map is from FY 1998.



Well Location

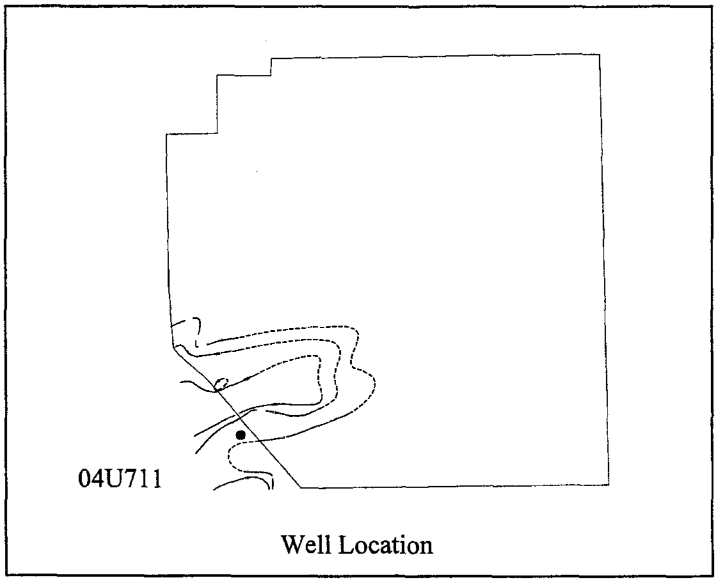
N:\0003\61\Graphs\On-U4\04U709.doc\TNW-lmh

04U711

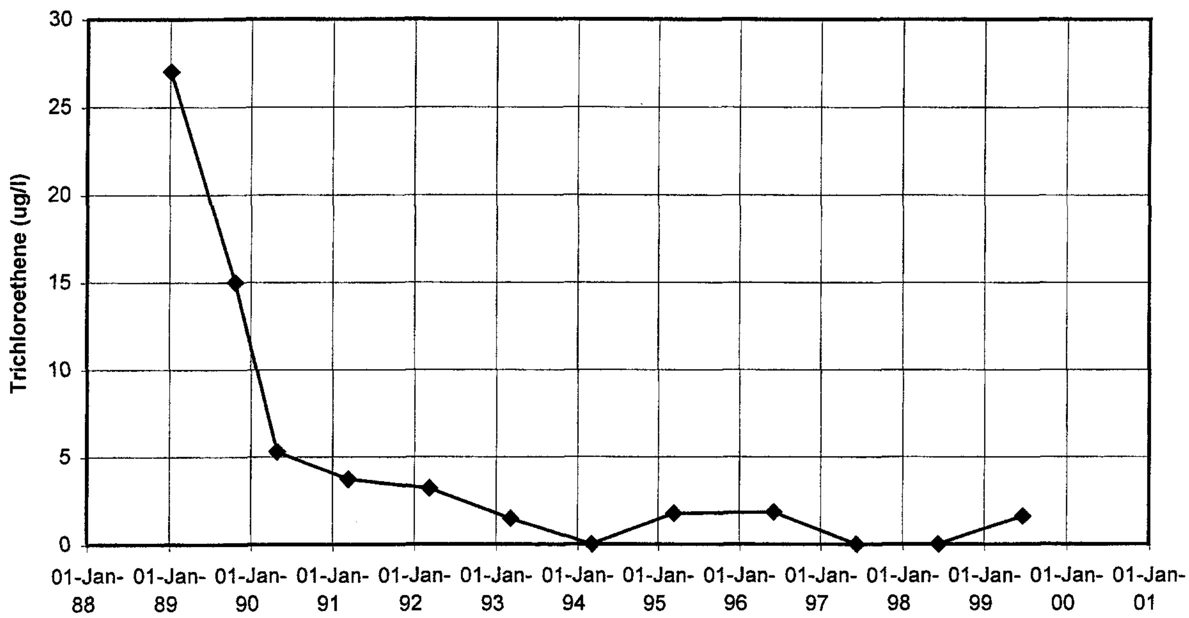


Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the TGRS.

Note:
Plume map is from FY 1998.

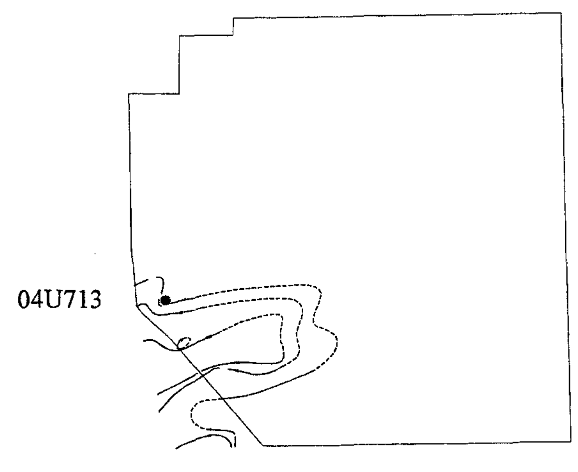


04U713



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.

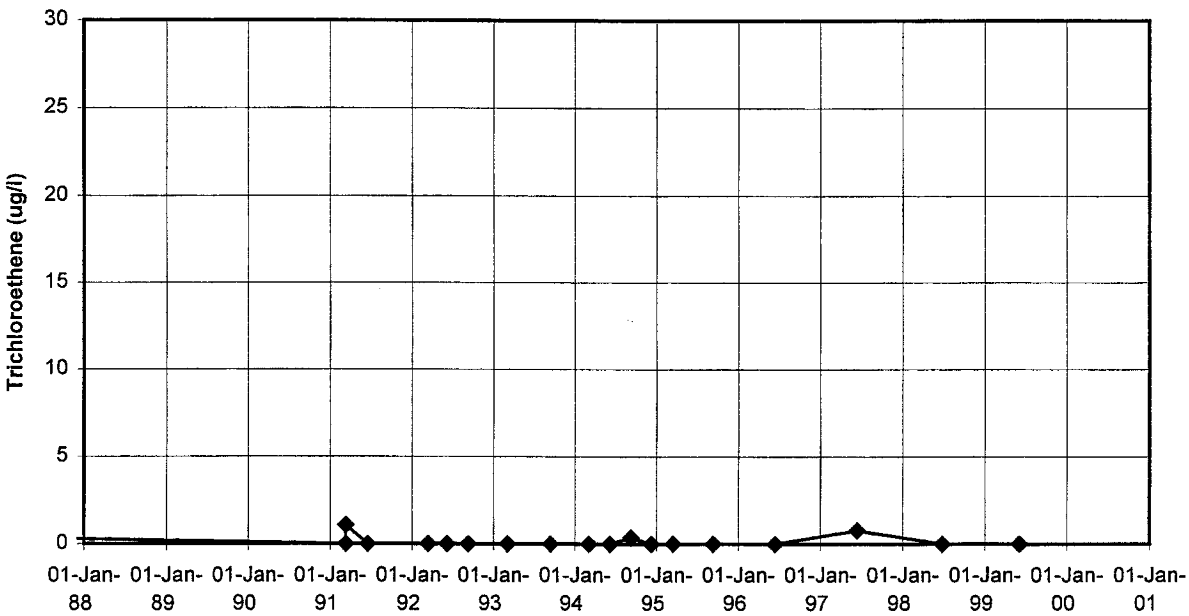


Well Location

OU3

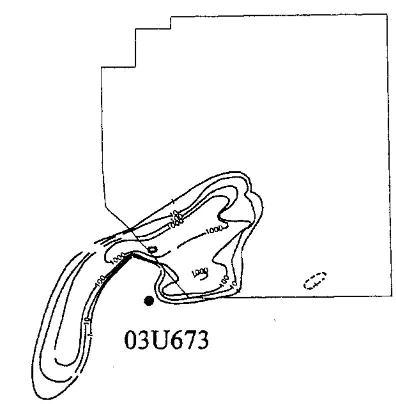
Upper Unit 3 Wells

03U673



Well Purpose:
Monitor the progress of groundwater cleanup.

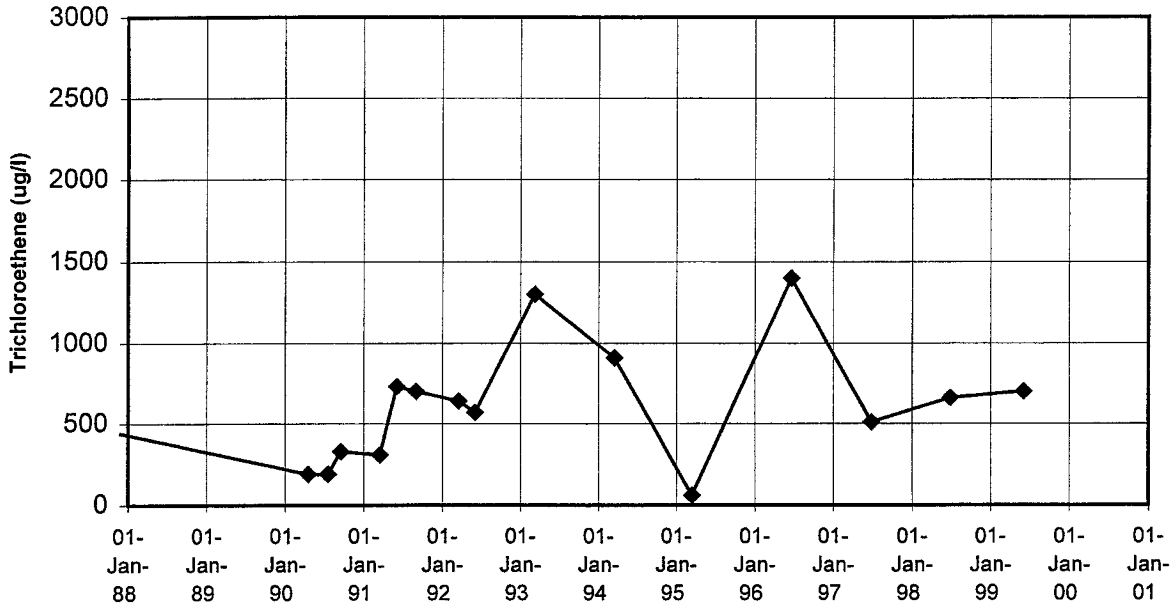
Note:
Plume map is from FY 1998.



Well Location

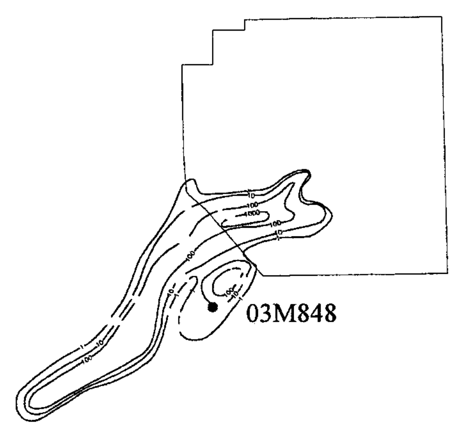
Middle and Lower Unit 3 Wells

03M848



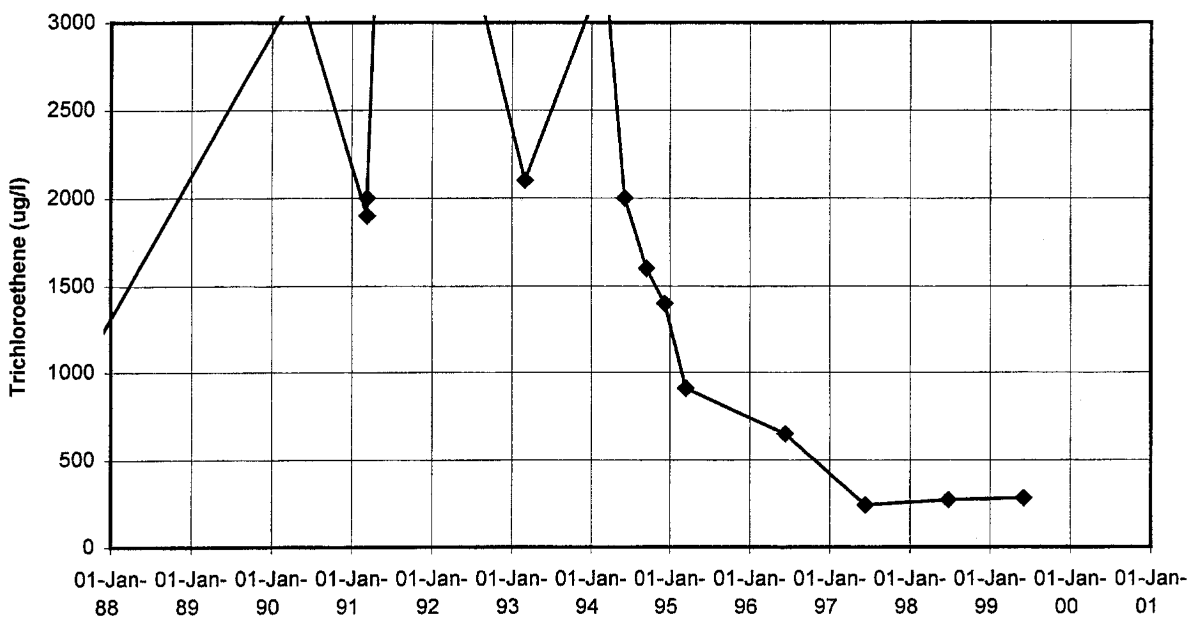
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



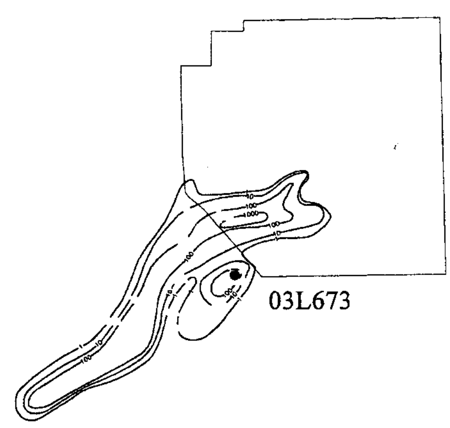
Well Location

03L673



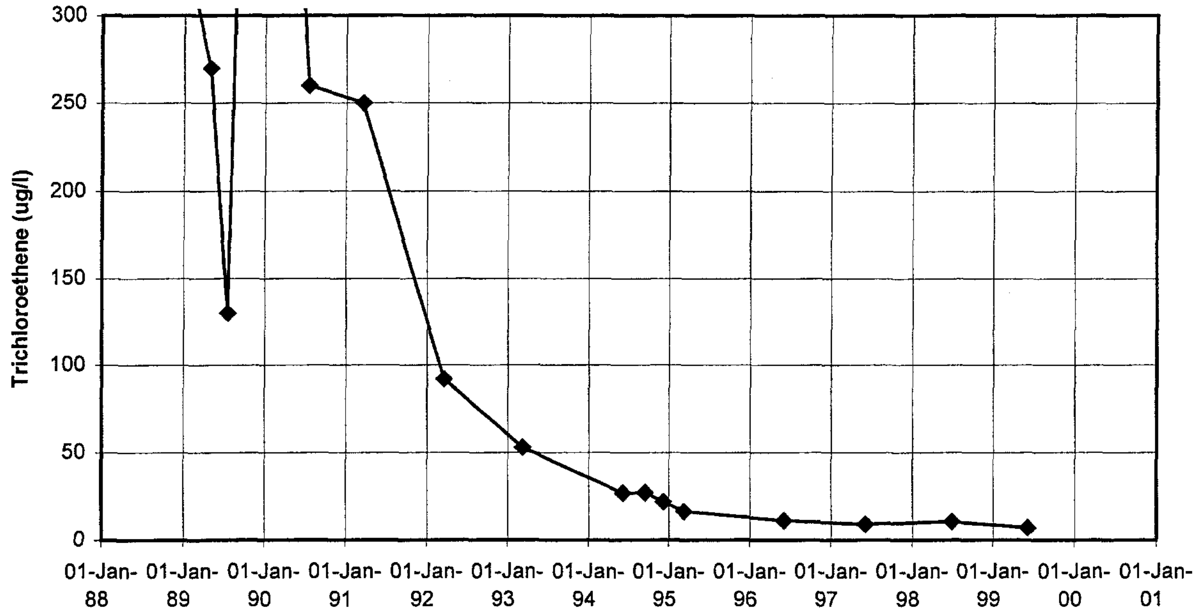
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



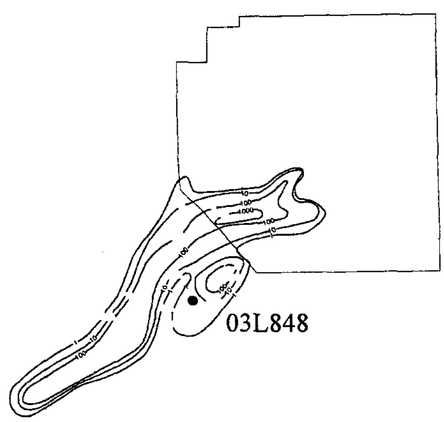
Well Location

03L848



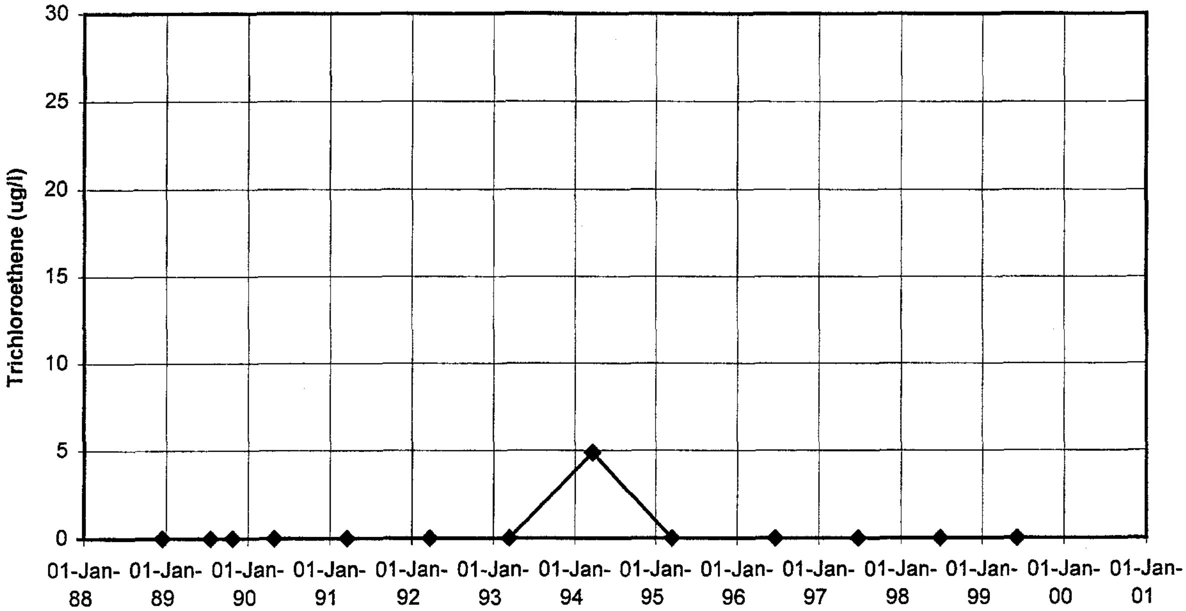
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



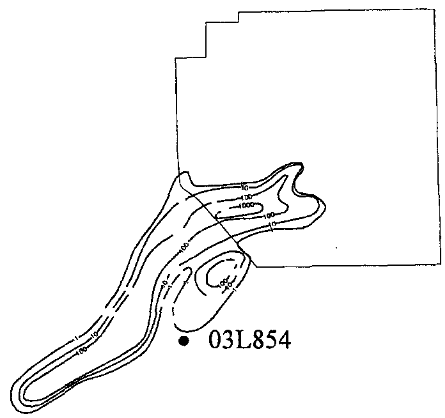
Well Location

03L854



Well Purpose:
Verify the downgradient extent of contamination in Unit 3.

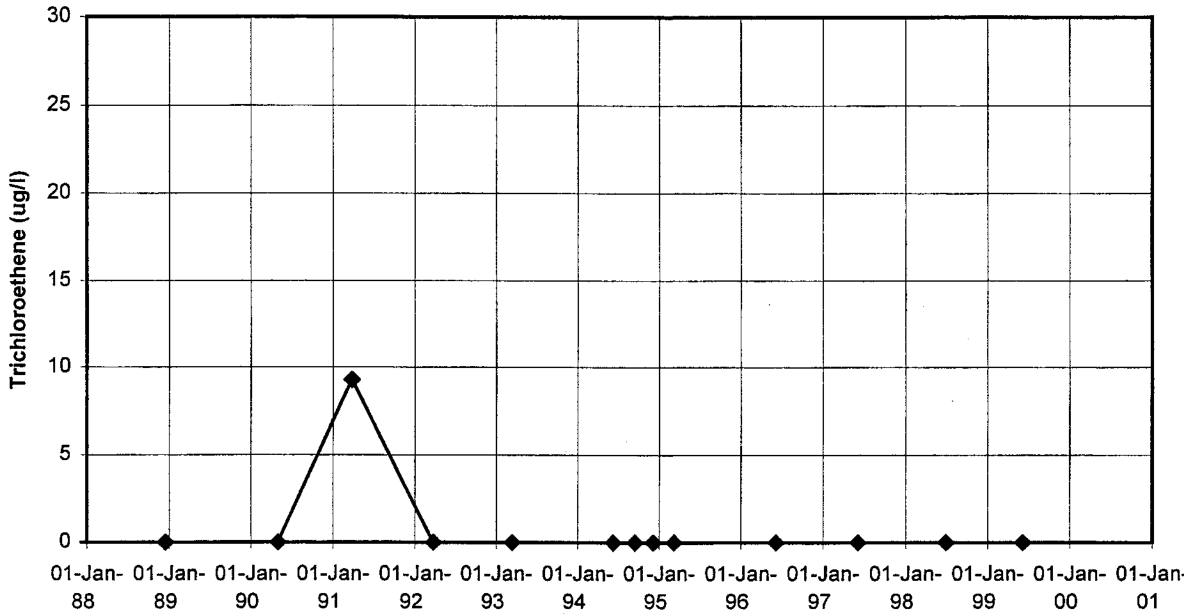
Note:
Plume map is from FY 1998.



Well Location

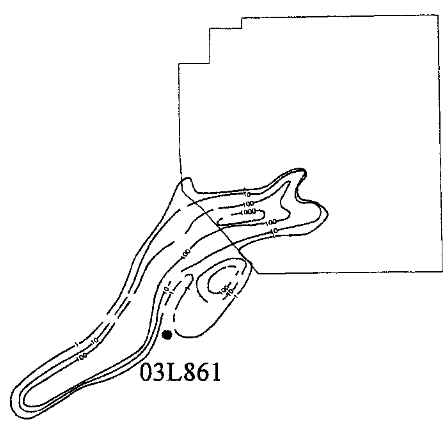
N:\0003\61\Graphs\Off-L3\03L854.doc\TNW-lmh

03L861



Well Purpose:
Verify the downgradient extent of contamination in Unit 3.

Note:
Plume map is from FY 1998.



Well Location

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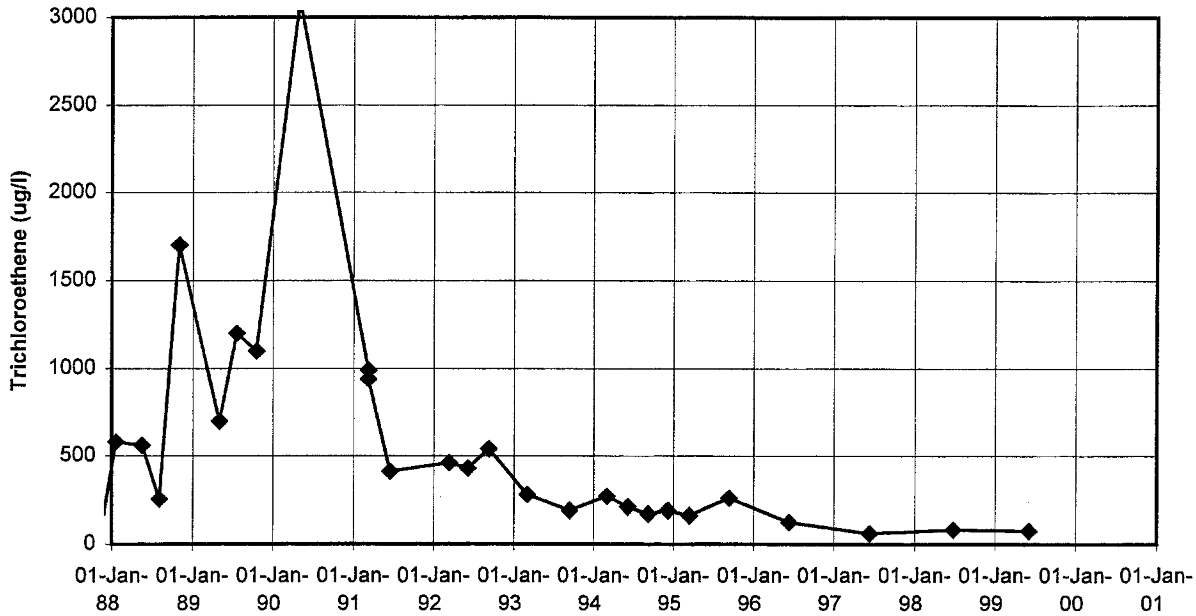
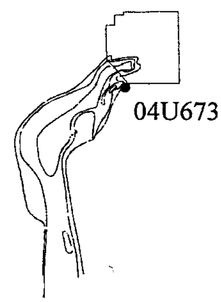
Unit 4 Wells

04U673



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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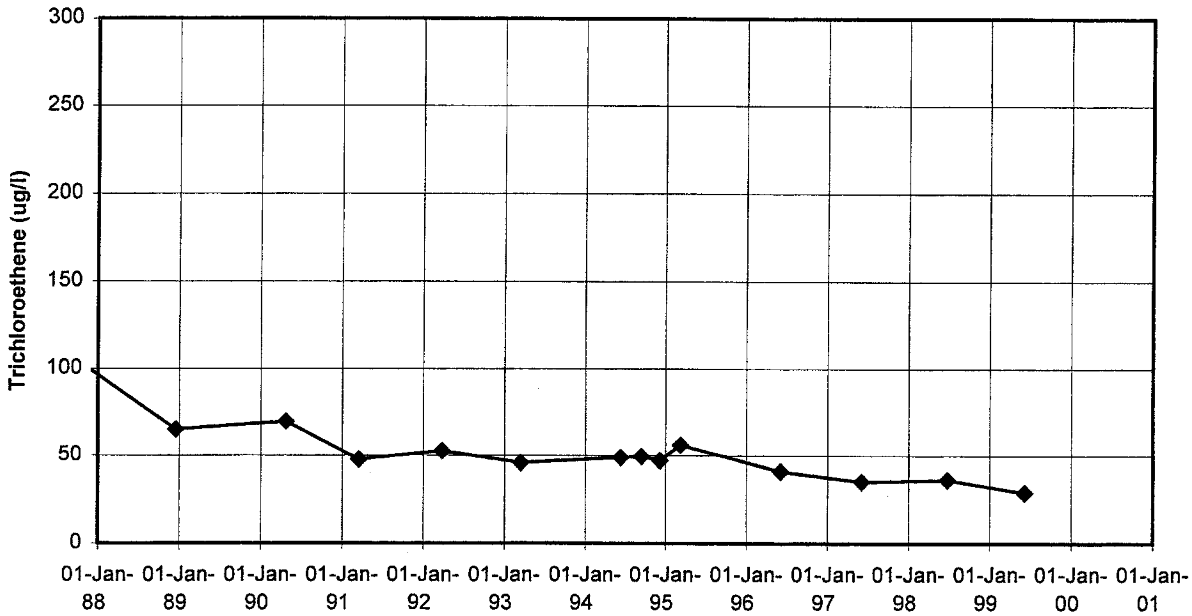
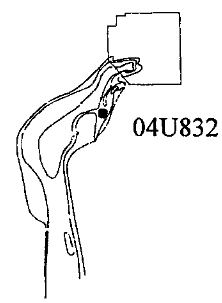
04U832



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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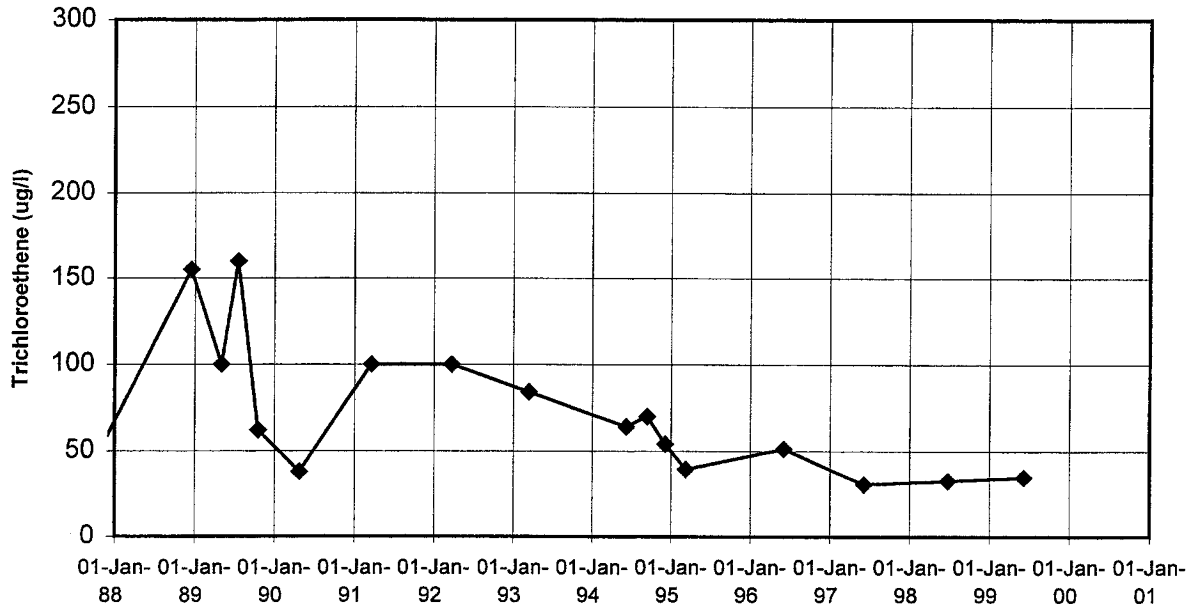
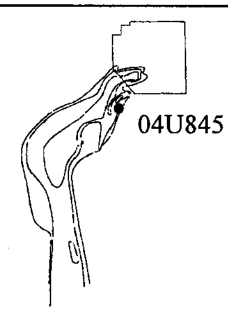
04U845



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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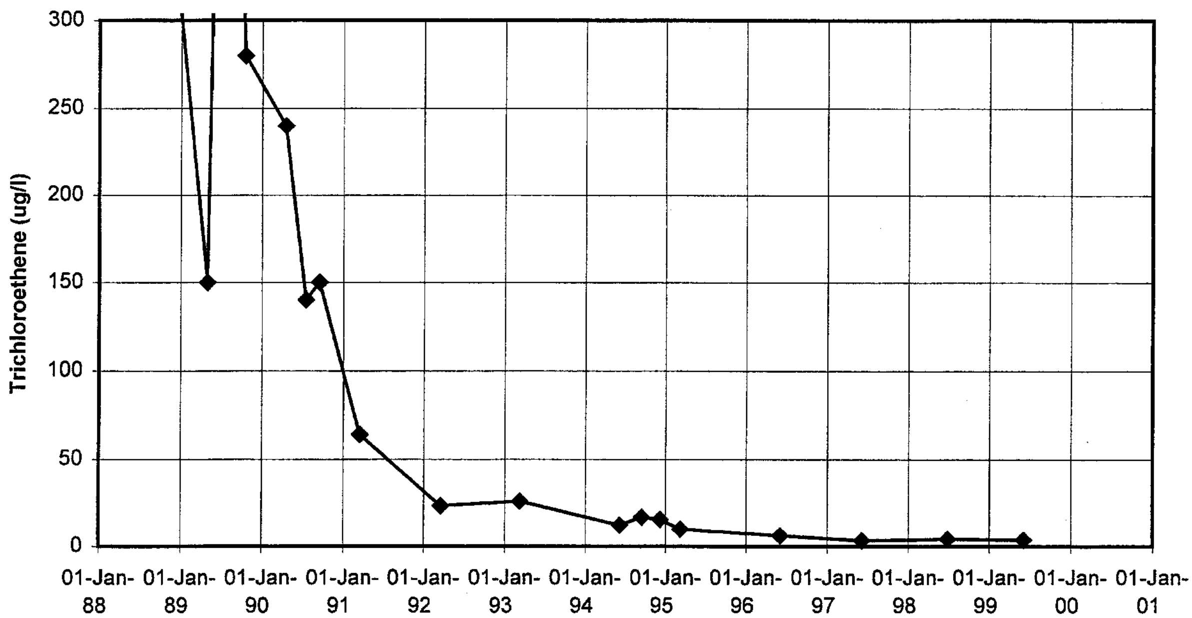
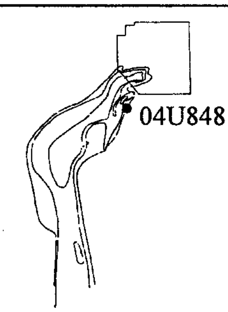


Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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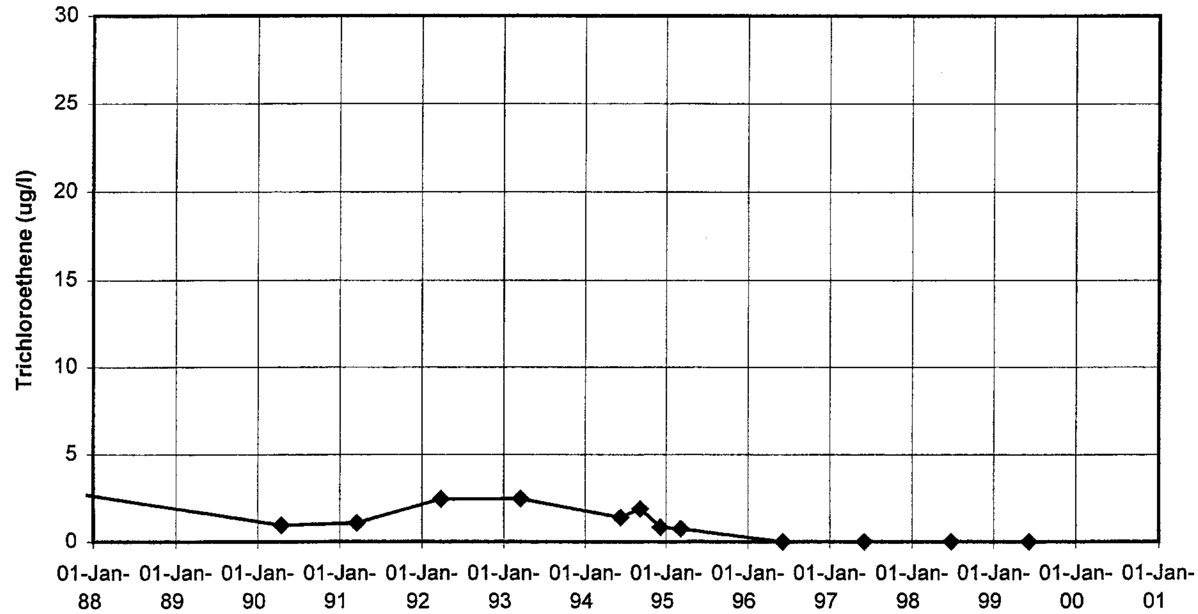
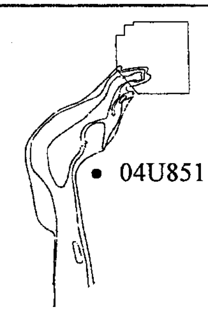
04U851



Well Purpose:
Monitor the progress of groundwater cleanup downgradient of the PGRS.

Note:
Plume map is from FY 1998.



Well Location

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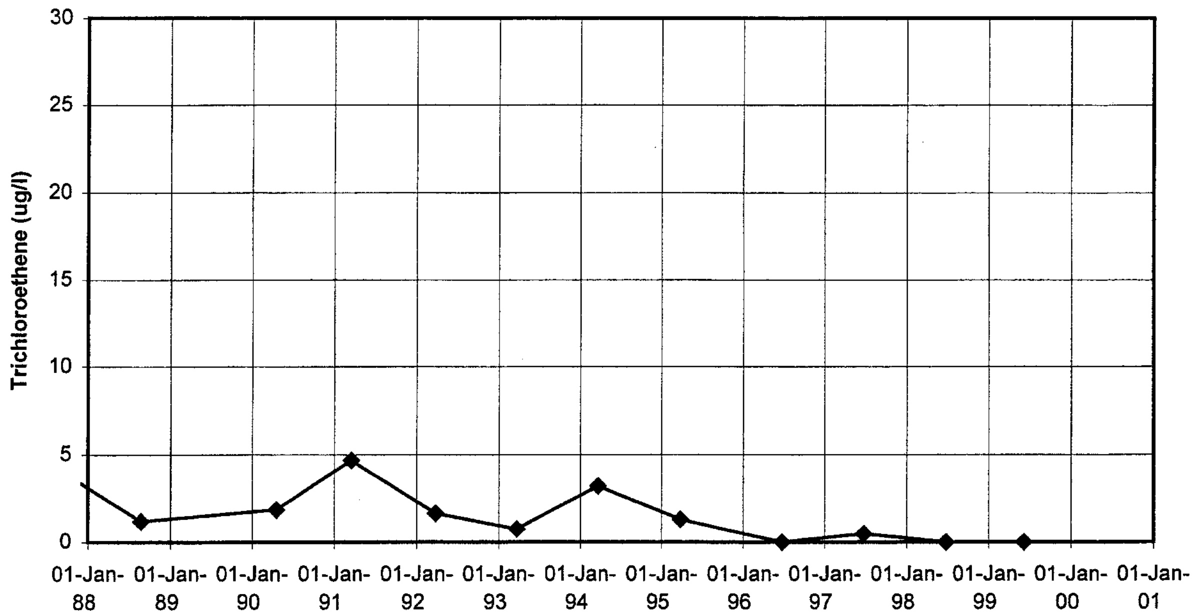
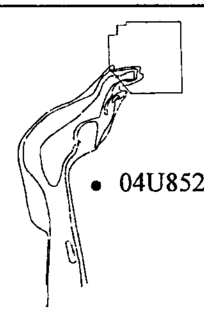
04U852



Well Purpose:
Monitor the progress of groundwater cleanup downgradient of the PGRS.

Note:
Plume map is from FY 1998.



Well Location

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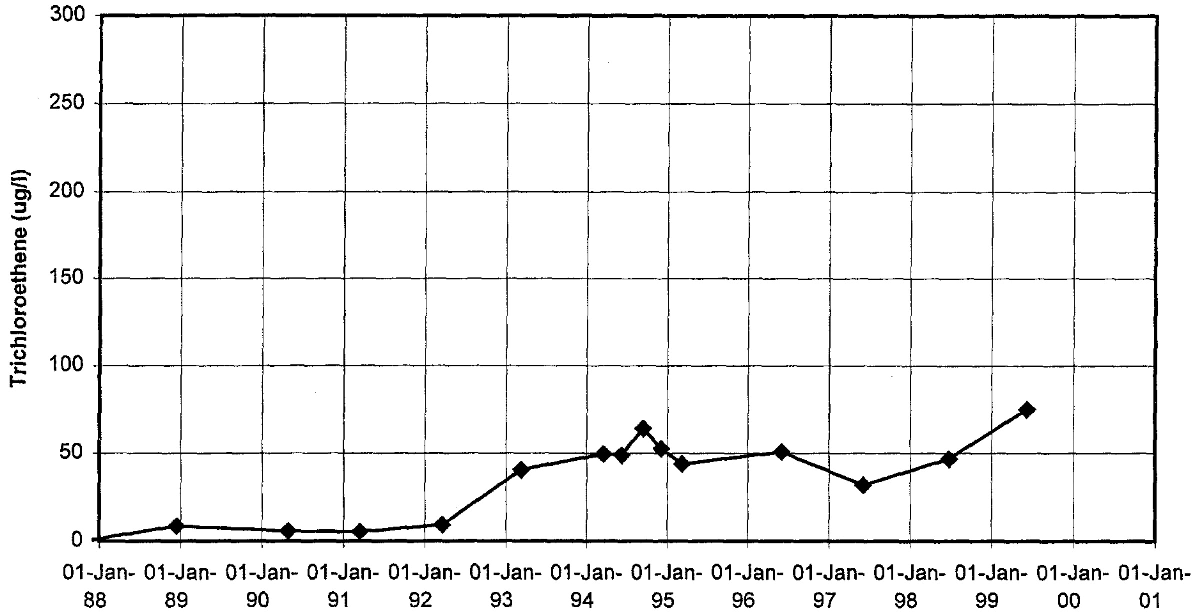
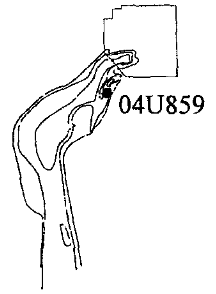


Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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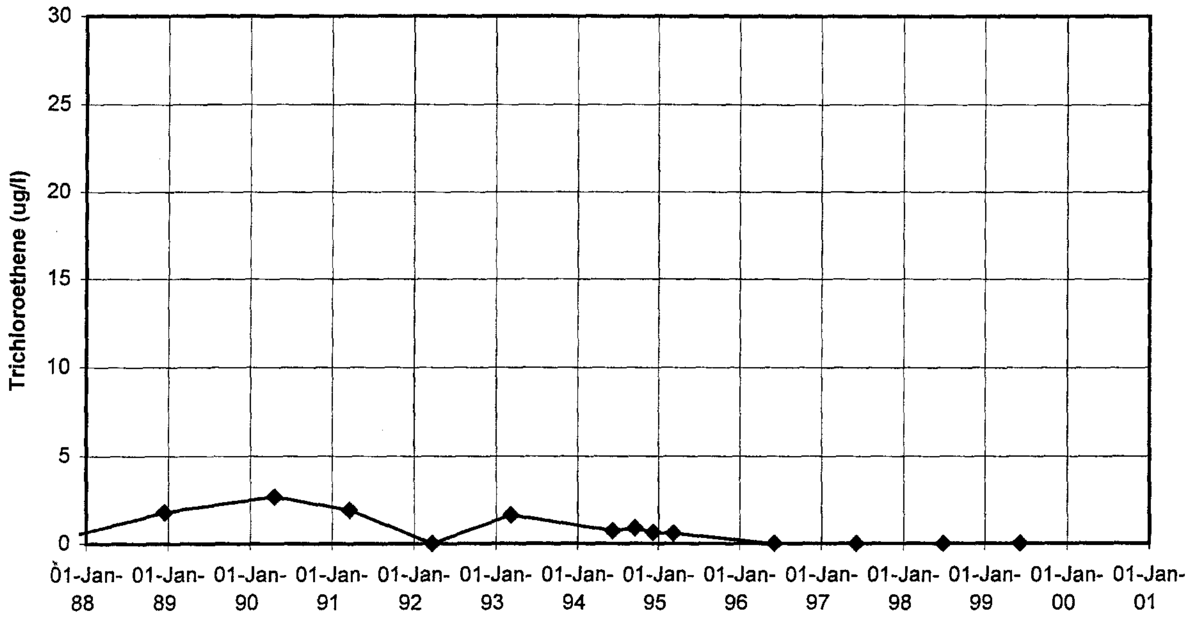
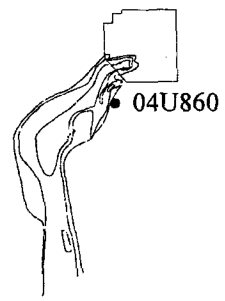


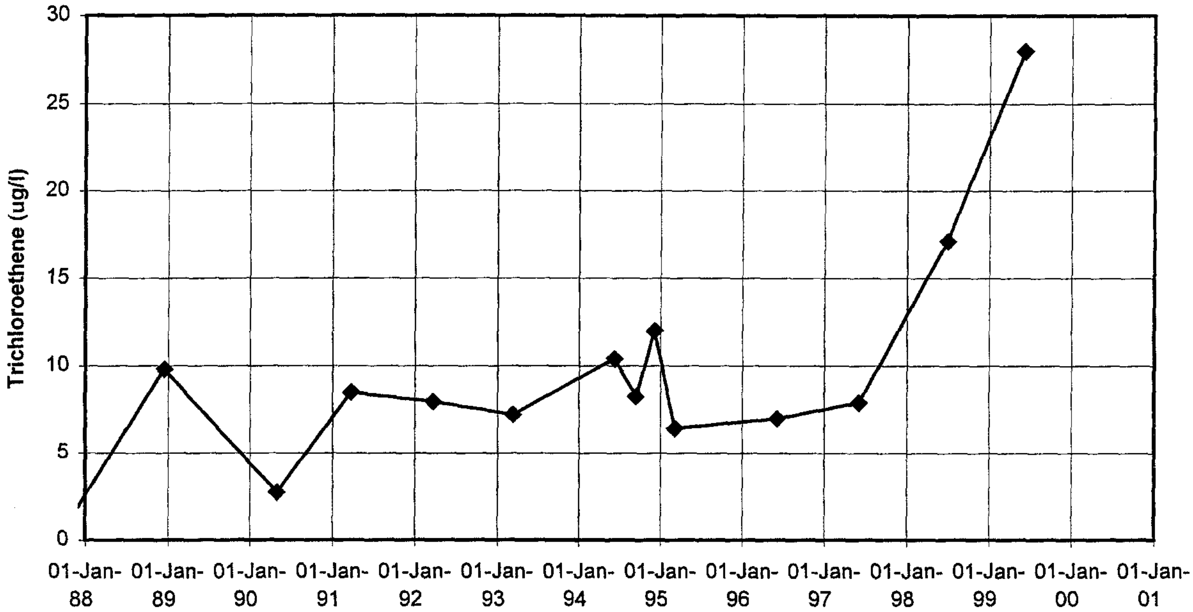
Well Purpose:
To check that the edge of the plume does not spread outside the containment boundary of the PGAC system, or outside the area for alternate water supply and abandonment.

Note:
Plume map is from FY 1998.



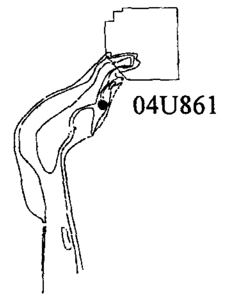
Well Location

04U861



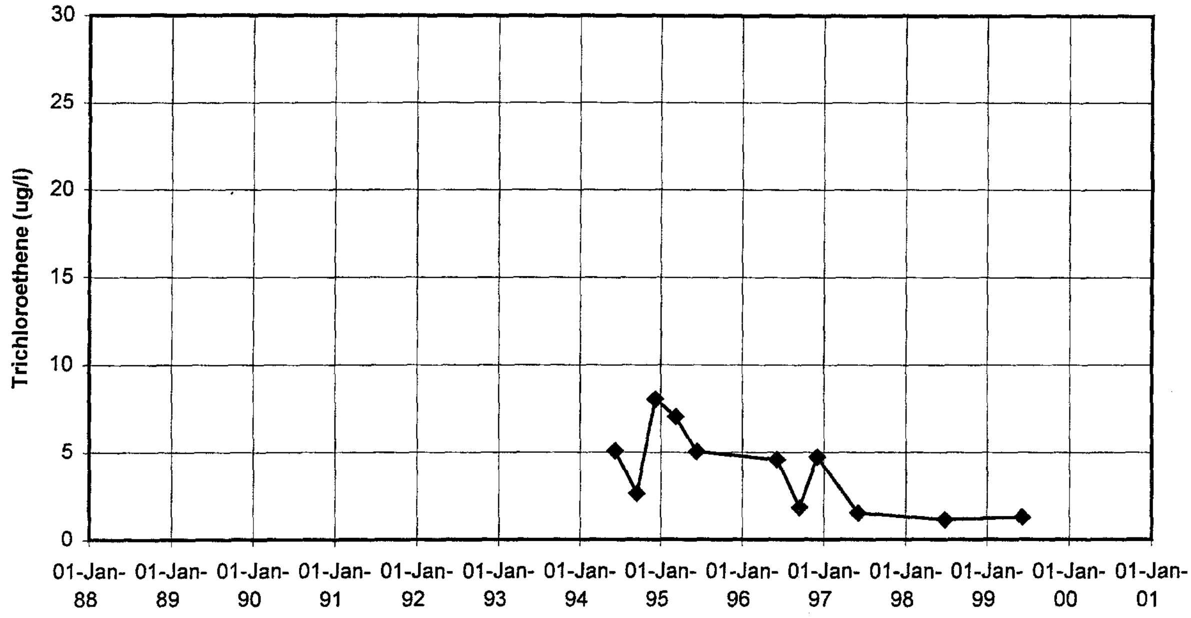
Well Purpose:
Monitor the separation between OU1 and OU3.

Note:
Plume map is from FY 1998.



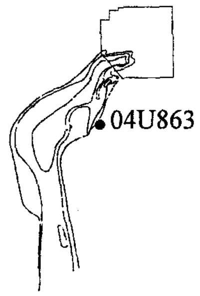
Well Location

04U863



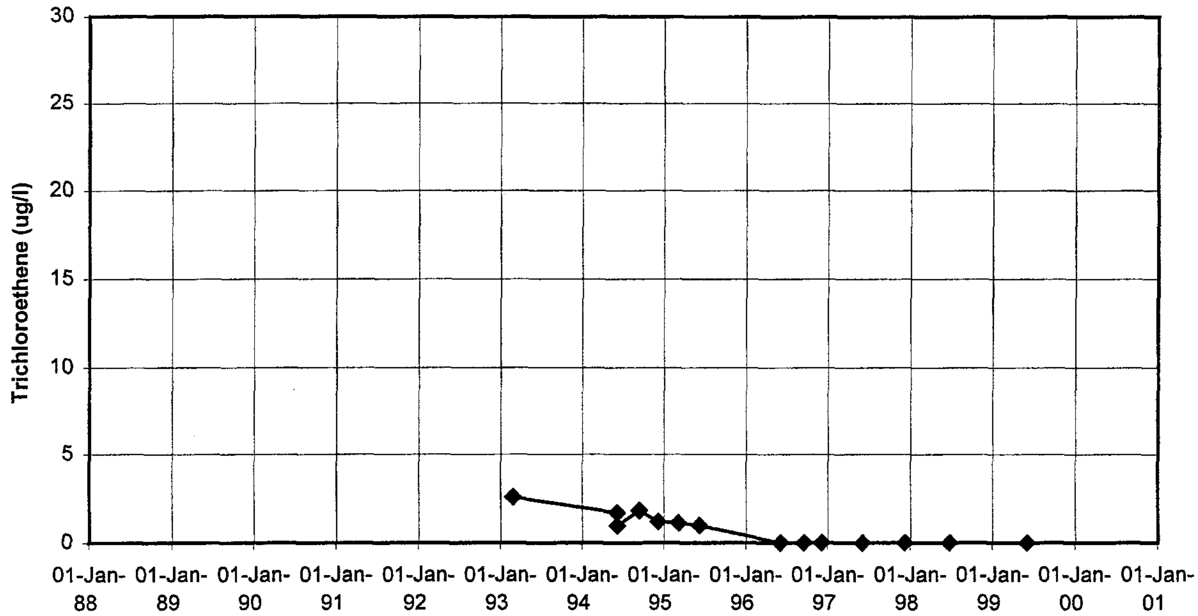
Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



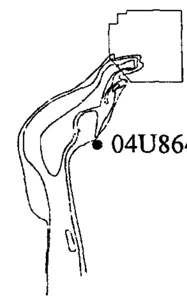
Well Location

04U864



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the PGRS.

Note:
Plume map is from FY 1998.



Well Location

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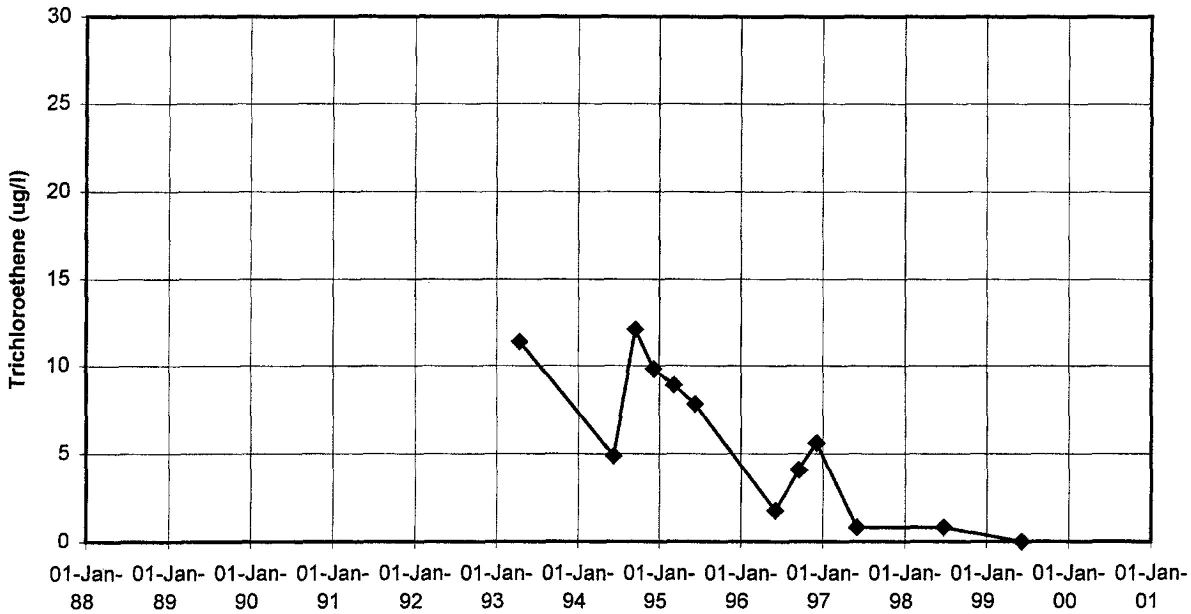
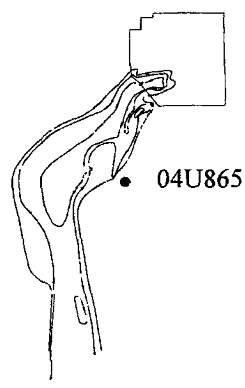
04U865



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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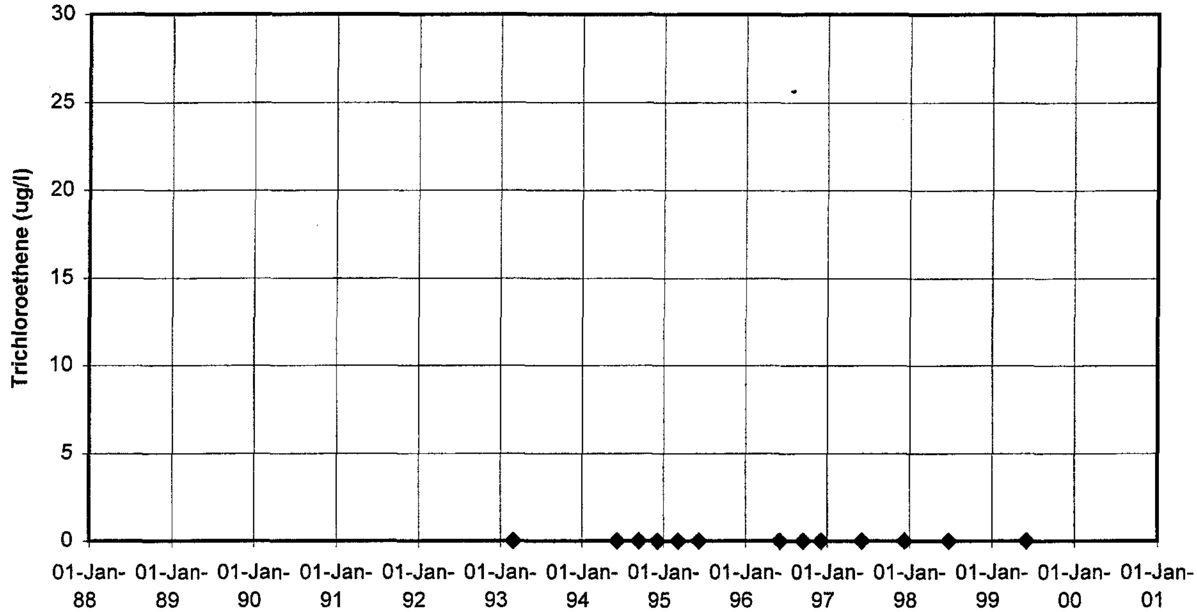
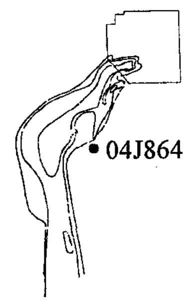
04J864



Well Purpose:
Monitor the progress of groundwater cleanup immediately downgradient of the PGRS.

Note:
Plume map is from FY 1998.



Well Location

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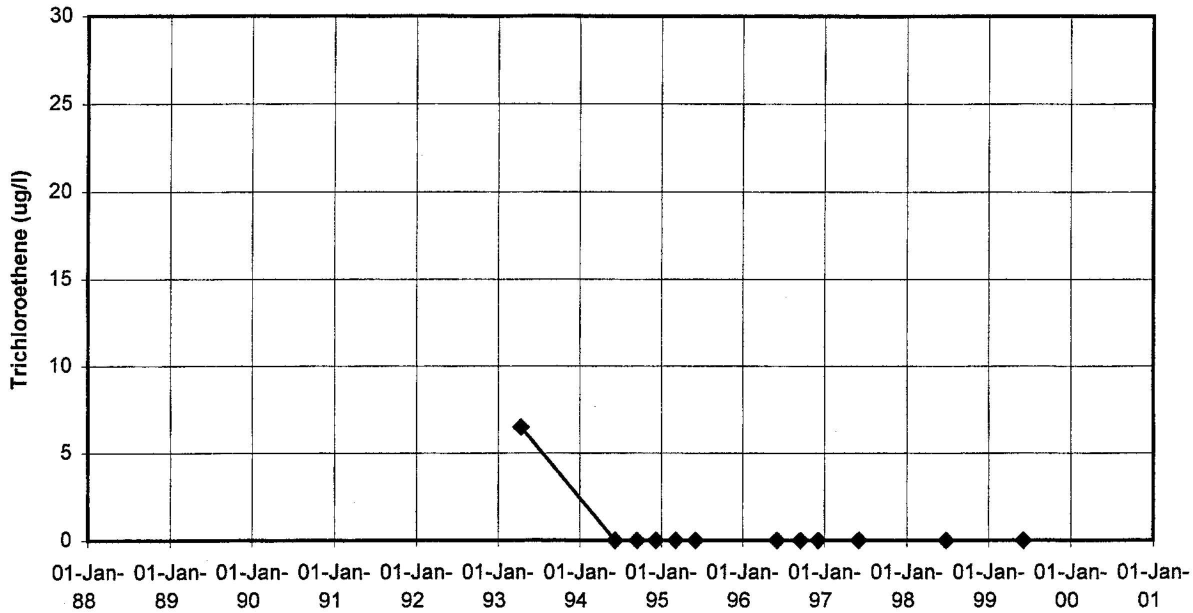
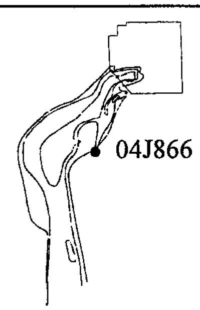
04J866



Well Purpose:
Monitor the progress of groundwater cleanup.

Note:
Plume map is from FY 1998.



Well Location

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APPENDIX F

Appendix F

Municipal/Private Well Groundwater Pumping Data

Appendix F
Municipal/Private Well Groundwater Pumping Data

Permit No.	Applicant	Permitted Appropriation (MMGal/yr)	Permitted Pumping Rate (GPM)	MN Unique Well No.	Township	Range	Section	Quarter Sections	Pumping Volume 1994 (MMGal)	Pumping Volume 1995 (MMGal)	Pumping Volume 1996 (MMGal)	Pumping Volume 1997 (MMGal)	Pumping Volume 1998 (MMGal)	Pumping Volume 1999 (MMGal)
High Capacity Wells														
690434	American Linen Supply	156.0	850.0	200814	29	23	18	DABC	60.300	64.700	68.800	73.800	90.200	NA
236512	Darling International, Inc.	20.0	100.0	236512	30	23	20	DDB	NA	1.159	1.100	1.000	0.700	NA
756231	Honeywell Inc	565.0	2000.0											
				234547	29	23	18	BB	NA	195.669	176.800	121.300	228.900	NA
				234546	29	23	18	BB	NA	420.857	283.800	456.800	482.700	NA
756255	Mengelkoch Company	18.0												
	Well No. 1		100.0	NA	30	23	21	CACD	NA	0.000	NA	0.000	1.000	NA
	Well No. 2		60.0	231878	30	23	21	CACD	NA	2.503	2.500	2.300	1.000	NA
886105	Midland Hills	49.0	1000.0											
	Well No. 2			NA	29	23	17	NA	27.300	0.270	1.200	20.900	26.900	NA
	Well No. 3			NA	29	23	17	NA	0.000	0.000	NA	19.400	25.300	NA
866124	Minneapolis Park/RC	26.0	500.0	200812	29	23	7	DACA	NA	0.061	NA	0.000	NA	NA
936161	Minneapolis Park/RC	41.0	700.0	512761	29	23	7	DAC	8.300	9.648	18.500	12.700	53.500	NA
700157	City of New Brighton	1725.0	11425.0											
	Well # 3			206793	30	23	29	BADD	168.800	96.091	219.379	194.964	70.927	94.109
	Well # 4			206792	30	23	30	BADD	181.200	110.130	297.390	245.673	278.577	395.793
	Well # 5			206796	30	23	30	CBD	198.300	171.438	91.214	35.685	47.099	12.404
	Well # 6			206797	30	23	30	CBAA	248.200	214.601	97.004	21.319	16.040	2.271
	Well #8			206795	30	23	30	BDA	22.300	6.866	2.847	0.490	5.812	0.516
	Well #9			206794	30	23	30	CABA	0.000	0.000	0.000	0.000	0.023	0.000
	Well #10			161432	30	23	32	DBC	19.600	23.810	20.152	7.246	20.732	0.932
	Well #11			509083	30	23	29	BCA	5.200	5.572	6.535	6.154	5.221	0.094
	Well #12			110485	30	23	18	AC	19.400	26.957	4.637	4.973	15.499	1.603
	Well #13			520931	30	23	29	AC	334.700	477.422	460.495	525.921	471.048	477.393
	Well #14			554216	30	23	29	BDB	NC	NC	2.192	563.592	401.057	363.137
	Well #15			582628	30	23	30		NC	NC	NC	NC	223.032	435.625

Appendix F
Municipal/Private Well Groundwater Pumping Data

Permit No.	Applicant	Permitted Appropriation (MMGal/yr)	Permitted Pumping Rate (GPM)	MN Unique Well No.	Township	Range	Section	Quarter Sections	Pumping Volume 1994 (MMGal)	Pumping Volume 1995 (MMGal)	Pumping Volume 1996 (MMGal)	Pumping Volume 1997 (MMGal)	Pumping Volume 1998 (MMGal)	Pumping Volume 1999 (MMGal)
856084	Paper Calmenson & Co.	30.000	500.000	200148	29	23	17	BBB	NA	0.000	NA	0.000	NA	NA
600907	City of St. Anthony	NA	NA											
	Well # 3			200804	29	23	6	DA	99.800	0.000	107.209	115.837	35.485	0.000
	Well #4			200803	29	23	6	AC	151.600	143.229	39.501	75.392	116.956	164.215
	Well #5			200524	30	23	31	CA	62.900	160.793	195.401	157.039	162.216	165.529
796041	U of MN	60.0	700.0	149740	29	23	16	BDB	4.300	6.619	4.300	5.600	8.000	NA
856178	U of MN	27.0	675.0	200154	29	23	17	DBC	16.900	14.957	22.800	20.500	18.900	NA
946217	Fore, Inc.	18.0	120.0	NA	30	23	26	CAC	NC	NC	5.500	1.100	4.100	NA
976069	Concordia Academy	1.0	100.0	NA	29	23	12	CBB	NC	NC	0.000	0.500	0.400	NA
Other Wells														
916084	Alliant Techsystems Inc.(PW-1)	21.0	9.0	462112	30	23	20	ADC	NA	4.592	2.700	0.000	NA	NA
916084	Alliant Techsystems Inc.(PW-2)		4.0	462968	30	23	20	ADC	NA	1.969	1.000	0.000	NA	NA
866104	Bell Lumber and Pole Co.(PW-1	26.3	0.0	439723	30	23	29	DCC	0.000	0.626	5.300	5.300	8.000	NA
	Bell Lumber and Pole Co.(PW-3)		1.1	449194	30	23	29	CDD	0.200	0.177	0.300	0.300	0.100	NA
	Bell Lumber and Pole Co.(PW-2)		1.2	449193	30	23	29	DCC	0.500	0.159	0.300	0.300	0.400	NA
866053	Indianhead Truck Line	10.0	NA	200067	29	23	4	CCD	0.000	0.016	0.000	0.000	0.000	NA
846113	Minn Metal Finish	6.0	48.0	122253	29	24	13	CDBC	NA	2.300	0.400	1.400	1.300	NA
670637	Old Dutch Foods Inc.	88.0	NA	200076	29	23	8	BDC	40.400	34.400	35.900	27.500	31.800	NA

Notes:
NA = Data Not Available
NC = Well Not Yet Constructed
PT = Water Appropriation Permit Terminated, No Water Being Pumped

APPENDIX G

Appendix G

Inventory of Wells in the Vicinity of TCAAP
1998/1999 Update

CRA

INVENTORY OF WELLS
IN THE VICINITY OF TCAAP
1998/1999 UPDATE

PREPARED FOR:
UNITED STATES ARMY SIOTC-EV
TWIN CITIES ARMY AMMUNITION PLANT

PREPARED BY:
CONESTOGA-ROVERS & ASSOCIATES
UNDER CONTRACT TO:
ALLIANT TECHSYSTEMS INC.

OCTOBER 2000
REF. NO. 15065 (1)

Prepared By:

Conestoga-Rovers & Associates
1801 Old Highway 8 NW, Suite 114
St. Paul, Minnesota 55112
(651) 639-0913 Office (651) 639-0913 Fax

web: http:\\www.craworld.com

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(Following Report)

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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) has prepared this Inventory of Wells in the Vicinity of Twin Cities Army Ammunition Plant (TCAAP) - 1998/1999 Update (Well Inventory) on behalf of Alliant Techsystems Inc. for the United States Army (Army). The purpose of the Well Inventory is to identify wells that have been impacted by contaminants from TCAAP or have the potential to be impacted by TCAAP contaminants. The Well Inventory Study Area was defined by the Minnesota Pollution Control Agency (MPCA) and the United States Environmental Protection Agency (USEPA) as:

- North of the western half of TCAAP one-half mile;
- West of TCAAP following County I/Osborne Road to Highway 65/Central Avenue, south on Highway 65/Central Avenue to the Mississippi River, then following the River southeast to Marshall Avenue; and
- East of TCAAP along Lexington Avenue south to County E, west on County E/Lake Johanna Boulevard to Fairview Avenue, south on Fairview to Larpenteur Avenue, west on Larpenteur to Cleveland Avenue, south on the alignment of Cleveland Avenue to Marshall Avenue, then west on Marshall to the Mississippi River.

The Study Area includes portions of Anoka, Hennepin, and Ramsey counties, and covers all or parts of the municipalities of Arden Hills, Columbia Heights, Falcon Heights, Fridley, Lauderdale, Minneapolis, Mounds View, New Brighton, Roseville, Saint Anthony, Saint Paul, and Shoreview. The Study Area is shown on Figure 1.1.

In June 1996, the Minnesota Department of Health (MDH) issued a restriction on constructing new wells in the area potentially affected by TCAAP contaminants. Both the MDH Special Well Construction Area and the Study Area were modified in 1999 to closely match each other. The Well Inventory database is based on this area.

1.1 HISTORY/BACKGROUND

In August 1991, the MPCA and USEPA requested that the Army conduct a study to identify private wells in the vicinity of TCAAP. Under the direction of Federal Cartridge Company, S.S. Papadopulos and Associates, Inc. (SSP&A) completed Phase I of the Well Inventory study in September 1992 (SSP&A, 1992) and Phase II in December 1993 (SSP&A, 1993).

The Phase I Well Inventory resulted in a database containing records for 1,503 wells. The wells were classified according to the potential risk (high, low, or negligible), for exposure to TCAAP contaminants, on the basis of the geographic location of the well relative to the area of contaminated groundwater and the aquifer penetrated by the well. Wells with insufficient information to classify were placed into a fourth category.

The Phase II Well Inventory contained a database of 1,071 wells. A total of 179 Category 1 and Category 4 wells not sampled within the previous five years were compiled into a preliminary list of wells to sample. Both Phase I and Phase II of the investigation included as part of their effort, information on new, sealed, and newly disclosed wells obtained from the files of the MDH.

During the spring of 1994, information on new, sealed, and newly disclosed wells was again obtained from the files of MDH to update the database. The 1993 database update was completed through March 1994. Results were reported by SSP&A (1994).

Wenck Associates Inc. conducted a Phase III of the Well Inventory investigation in 1994 (Wenck, 1995). The chief objective of the Phase III study was to "finalize the disposition of wells at risk". Field checking 230 wells, sampling 84 wells classified as high risk, and summarizing the results of the water quality analyses accomplished the objective. The Phase III database contained information on 1,086 wells.

In 1995, SSP&A conducted another update to the Well Inventory, the 1994 Update Report. The objectives of the 1994 Update were to identify new wells in the Study Area from MDH records and to clarify MPCA comments on the Phase III report. SSP&A obtained information on wells reported to the MDH between March 25, 1994, and April 30, 1995. After adding the list of wells obtained from MDH, the 1994 Update Report contained a database of 1,687 wells.

CRA assumed the responsibility of conducting the Well Inventory for the 1995 Update, which included incorporating comments from the MPCA on the 1994 Update. Sealed records and newly constructed well information was obtained from the MDH for the period of January 1, 1995 to May 28, 1996, and was incorporated into the 1995 Update. The 1995 Update contained information on 2,081 wells. Wells within the 5 $\mu g/L$ trichloroethene plume were recommended for sampling and wells with missing information were identified so that they could be investigated for further information.

CRA then prepared the 1996/1997 Update. Several wells were recategorized based on information obtained during a phone and field survey of wells identified in the 1995 Update as requiring additional information. Also, 14 wells were sampled to determine if they were contaminated with TCAAP contaminants. The 1996/1997 Update was updated with the MDH records of sealed and newly constructed wells for the period of May 29, 1996, through September 30, 1997. MPCA comments on the 1995 Update were also incorporated into the 1996/1997 Update.

1.2 1998/1999 UPDATE OBJECTIVES

The objectives of the 1998/1999 Update were to:

- Revise the Study Area and the MDH Special Well Construction Area boundaries to match, and update the database accordingly;
- Obtain a complete record of wells within the Study Area from the MDH and compare it to the Well Inventory database to ensure that our database has all of the records from the MDH files;
- Obtain a listing of unique numbers for the S-numbered wells to delete any duplicated wells on the S-numbered well list;
- Update the database based on surveys of well owners (wells identified as requiring more information or requiring sampling in the 1996/1997 Update);
- Sample wells as recommended in the 1996/1997 Update;
- Recommend wells for sampling and analysis; and
- Recommend wells for alternate water supply and/or abandonment.

1.3 REPORT STRUCTURE

This report is organized into three sections and one appendix. Section 1.0 contains the history of the Well Inventory and the objectives of this report. Section 2.0 describes the Well Inventory database and the changes incorporated in the 1998/1999 Update. Section 3.0 presents the recommendations based on the results of the database update for 1998/1999. This report, the text, tables, and figures, is also available in an electronic format on the CD in Appendix A. The electronic format is linked, to allow the user to move back and forth between the text, tables, and figures.

In the interest of paper conservation, the database is only available in electronic format on the CD in Appendix A. The database is available as an Excel spreadsheet to allow the user to sort, search, and find information on individual wells. As an enhancement to the 1998/1999 Update, we have added a program (e:Dat) to the CD that links well information to map locations for the existing water supply wells. e:Dat allows the user to access the same information available on the Excel spreadsheet, with increased flexibility, and also adds the ability to visually locate the well on a map at the same time. The CD contains a user's guide to help you install and use e-Dat. The CD also contains an Excel spreadsheet of the analytical database.

2.0 1998/1999 TCAAP WELL INVENTORY DATABASE

This section of the report presents the well categories, modifications to the database for the 1998/1999 Update, and the results of our informational surveys, research, and sampling.

2.1 WELL CATEGORIES

The well categories used for the 1998/1999 Update are described in Table 2.1. Wells are categorized based on one criterion, whether or not they can produce water from one of the aquifers contaminated by TCAAP activities (aquifer of concern).

The aquifers of concern are defined by the 1 $\mu g/L$ trichloroethene (TCE) contour for the Unit 3 and Unit 4 aquifers and the 1 $\mu g/L$ 1,2-dichloroethene contour for the Unit 1 aquifer north of TCAAP. The contours were taken from the 1998 Annual Performance Report (APR), the most recent contours available for the preparation of this Report.

A buffer area is added to an aquifer of concern to create an area of concern. The buffer area for the Unit 3 and Unit 4 aquifers of concern are a quarter mile outside the 1 $\mu g/L$ TCE contour, as shown on Figure 2.1. The area of concern nearest TCAAP has both the Unit 3 and Unit 4 as aquifers of concern. The area of concern further from TCAAP has just the Unit 4 as an aquifer of concern.

City streets delineate the buffer area for the Unit 1 aquifer of concern north of TCAAP. The area of concern for the Unit 1 aquifer is presented on Figure 2.2.

2.2 DATABASE MODIFICATIONS FOR THE 1998/1999 UPDATE

Modifications to the database for the 1998/1999 Update primarily consisted of: incorporating new wells found through a comparison of the MDH's database to the existing database, incorporating the findings of the informational survey and well sampling conducted during 1999, and incorporating the results of the 1999 well abandonment/alternate water supply program.

As a result of these modifications, the 1998/1999 Update database contains 4,090 wells. This is approximately double the number of wells in last years update. Most of the wells were added to Category 6 (nonsupply wells) and Category 7 (sealed/abandoned wells). The number of nonsupply wells increased to 986 and the number of sealed/abandoned wells increased to 2,196. A breakdown of the number of wells in each category is presented on Table 2.2.

The number of Category 1 (within the 1 $\mu g/L$ contour) and Category 2 (within the buffer area) wells was reduced from 127 to 92 by correcting inaccurate information, recategorizing wells based on plume changes, and reducing the buffer areas. Table 2.3 presents a listing of Category 1 and Category 2 wells. Eighteen wells were added to Categories 1 or 2; twelve of these were added as a result of CRA's review of the County Well Index (CWI), as described below, and six were added as a result of CRA's informational survey of Category 4a wells (Section 2.3). Table 2.4 presents the wells added to Categories 1 and 2.

The number of Category 4 wells (unknown depth, aquifer, or location) was reduced from 205 to 57 by completing missing information. The number of Category 3 wells (not in an area of concern) is now 714. An additional 31 wells were placed in Category 5 (field checked but could not locate).

In an effort to verify that the Well Inventory database is complete, CRA obtained an electronic version of the MDH's database for the Study Area. The MDH's database was current through July 28, 1999. This database was compared to the existing Well Inventory database for duplication. Wells that were not duplicated were added to the database. Most of the additional wells are monitoring or abandoned wells, although, 12 Category 1 wells were added to the database because of this review. The list of wells generated from the MDH was also checked for corrections to the database (e.g. wells sealed since the last report).

We also obtained a list of abandoned wells from the MDH for the Study Area. We checked this list of abandoned wells against our database and updated records where appropriate.

CRA obtained information from SSP&A and Wenck on the S-designated wells in an effort to verify the data on those wells. SSP&A originally labeled these, which were apparently given to 650 to 700 residences and businesses that potentially had a well. The MDH, MPCA, and municipalities identified the original potential well locations. SSP&A could not provide any additional information because the employee involved has since left.

Wenck, in cooperation with the MGS in 1994, assigned approximately 126 of the S-designated wells with unique well numbers. These were field checked by Wenck and confirmed to exist. Many other "S" wells have since been field checked or compared to

MDH or MGS records, which has further confirmed their existence. The information on the remaining S wells is limited, which has impeded further investigations.

Also for the 1998/1999 Update, CRA conducted an informational survey to verify or determine locations and depths of wells. The wells that were researched were identified in the 1996/1997 Update as requiring more information. Information was added to many wells as a result of this survey. Additional database changes were made based on our attempts to sample wells. Section 2.3 presents a discussion of the informational survey and sampling program.

The 1998/1999 well abandonment/alternate water supply program included two wells. One of these wells (234320, Lindahl) was abandoned and, therefore, recategorized. The second well (234369, Bochnak) is scheduled to be abandoned in the near future. Five wells from the 1997 well abandonment/alternate water supply program (234350, Gordon Rendering; 200812 & 512761, Gross Golf Course; 231878 & 234335, Menglekoch) have well owners who want to continue use of the wells for nonpotable uses. The use of the wells for nonpotable purposes was confirmed by the MDH.

Two tables provide information on specific changes made to the database on individual wells. Table 2.5 lists the wells identified in the 1996/1997 Update as requiring further information, and the changes made to those well records, where enough information was available. Table 2.6 provides a summary of other category changes made to the Well Inventory database.

In reviewing the database, 267 wells were deleted from the database. Table 2.7 lists these wells, along with the reason they were deleted. Most wells were deleted because they were outside the Study Area; many of those were a result of changing the eastern boundary of the Study Area. Other wells were deleted because they were duplicate entries, never constructed, or were found to be elevator shafts, which the MDH permitted similarly to wells in the past.

Data for all of the wells currently in the database are contained on an Excel spreadsheet. The spreadsheet is available electronically on a CD in Appendix A. The CD also contains a program called e:Dat, which allows the user to easily locate wells on a Site map and quickly obtain database information for the wells. With the e:Dat program, the user can access database information and map locations for the Category 1, 2, 3, and 4a wells by unique number, address, or last name.

2.3 1999 SAMPLING PROGRAM AND INFORMATIONAL SURVEY

Sampling Program

In the summer of 1999, CRA sampled wells recommended for sampling in the 1996/1997 Update. The criteria used in the 1996/1997 Update to recommend wells for sampling were: well is a Category 1a, 1b, or 1c; well is not sampled under another sampling program; well was not sampled in 1997; and owner has not accepted or rejected an Army offer to abandon.

A letter was sent to well owners, requesting permission to sample their wells. A total of 11 well owners were sent letters. The letters were followed up by phone calls. Of the eleven wells, only two were sampled. The remaining wells were not sampled for the reasons listed below:

Unique No.	*Name*	*Result of Sampling Attempt*
225745	Health Partners	Abandoned
234305	Beggin	Abandoned
234469	Palwski	Sampled
249113	Wyttenbach	Nonresponsive, wouldn't talk with us
249127	Casey	Abandoned
249607	Foerster	Pump not operational
537801	Midwest Industrial	Declined sampling (well used for irrigation)
NA	Kingbury	Abandoned
NA	Scott	Abandoned
NA	Emde (Berthiaume)	Not operational (cut off and filled to 4' bgs)
S00444	Mpls Parks & Rec	Sampled

The sample from the Minneapolis Parks and Recreation well had VOC detections below the Minnesota Health Risk Limit (HRL). The sample from the Palwski well did not have any detection. A summary of the analytical results for this sampling round is provided in Table 2.8. A historical summary of analytical results for wells in the Well Inventory is provided in an Excel spreadsheet on the CD in Appendix A. This historical summary includes wells sampled by the MPCA, Wenck, and CRA.

Informational Survey

CRA conducted an informational survey of wells that were recommended in the 1996/1997 Update for further research. Most of these wells were Category 4 wells, wells with insufficient information to categorize them. Information was obtained through phone calls, site visits, historical records, the CWI, and assistance from the MGS, MDH, and municipalities. The results of this survey and research effort are presented in Table 2.5.

We initially conducted an extensive search of the CWI for missing information on the wells. We also collaborated with the MGS and examined their files for information that would allow us to recategorize the wells. If we still needed information, we began field checking the wells for information.

Wells that had addresses in the database were field checked and the well owner was interviewed to obtain missing information, where the well owner was available. When the database contained a name without an address, we looked up phone numbers and called the potential well owner to interview them. For some wells with names not in current phone books, we researched historical phone books for names of individuals or businesses to obtain an address for a well. We then field checked the address of the well to find a current well owner to interview. We left letters at the doors of some well owners that we could not reach in a final effort to contact some well owners. Nearly all of those did not respond.

The wells we still needed information for, we compiled into lists and asked the MGS and MDH to research their files again. Their research resulted in information for a limited number of wells.

Many wells were recategorized as sealed (Category 7a) or assumed sealed (Category 7b) based on information provided by the MDH or well owners. Several wells were deleted from the database, primarily because they were found to be out of the Study Area. Having the CWI for the entire state helped identify several wells that were not in the Study Area. Only six wells were placed in Category 1. The addresses of several wells could not be found and do not appear to exist after field investigation. These wells have been placed in Category 5, many of these could be assumed abandoned, because of new construction at the property.

Sufficient information could not be obtained to recategorize approximately 27 Category 4 wells. Most of these do not have enough information in the database to conduct a field check of the well. The CWI, MDH, and the MGS also could not provide enough information to locate the wells. These wells remain in Category 4.

3.0 RECOMMENDATIONS

This section provides recommendations for wells to sample and wells to abandon and/or offer alternate water supply.

Recommendations for Sampling

Most of the Category 1, Category 2, and Category 4a wells are recommended for sampling in 2000. The Army is recommending the wells in these categories be sampled at five year intervals, as appropriate, to continue monitoring the effect of the TCAAP plume on wells in these categories. Some wells from Categories 1, 2, and 4a are not recommended for sampling for the following reasons:

- Category 1d and 2d wells because they do not have operational pumps;
- Well is sampled under another sampling program (e.g. the AMP);
- Well was sampled, or attempted, in 1999 for the Well Inventory; or
- Owner has accepted or rejected the Army's offer to abandon the well.

In addition, one Category 3 well in the Area of Concern north of TCAAP (adjacent to Site A) is recommended for sampling. As recommended in the 1996/1997 Update, this area was researched to determine which residences do not have a municipal water hookup. The depths of the wells at addresses without municipal water were then looked up in the database, to determine if they were screened in the Unit 1 aquifer. One Category 3 well screened in the Unit 1 aquifer was found at addresses without municipal water, and is therefore, recommended for sampling.

Wells recommended for sampling in 2000 are listed in Table 3.1. Locations of all Category 1 and Category 2 wells in the Unit 3 and Unit 4 aquifers are shown on Plan 1. Locations of the three Category 1 wells in the Unit 1 aquifer north of TCAAP, and the one Category 3 well without municipal water that is screened in the Unit 1, are shown on Figure 2.2.

Before sampling the Category 4a wells, an attempt will be made to measure the well depth. Category 4a wells are within an Area of Concern, but the depth is unknown. If the depth can be measured, and if it is determined that the well is not screened in an aquifer of concern (effectively changing it to a Category 3 well), a sample will not be collected.

Recommendations for Abandonment/Alternate Water Supply

CRA also reviewed the criteria provided in the TCAAP Operable Unit 1 Alternate Water Supply Plan (Montgomery Watson, 1995) to recommend wells for alternate water supply/abandonment. No wells are recommended for the Army to offer alternate water supply or abandonment.

The purpose of the selection criteria is to protect human health or the environment. The selection criteria for recommending wells for alternate water supply are:

- The well use results in potential exposure to groundwater contaminants;
- The existing source of water (well) is abandoned in accordance with the well abandonment selection criteria;
- No other viable or existing source of water is currently available to replace the contaminated water supply; and
- The Army is in agreement that a need exists for an alternate water supply as a result of impacts from TCAAP-related contaminants.

The selection criteria for recommending wells for abandonment are:

- Wells constructed prior to issuance of Special Area Well Advisories;
- Wells located and completed within the off-TCAAP groundwater contaminant plume;
- Wells impacted by TCAAP-related contaminants; and
- Wells that have or had a use that constitutes an exposure to TCAAP-related contaminants.

INDEX OF ABBREVIATIONS

Aquifer Designations

QWTA	Unit 1
Q___	Unit 3
Hillside	Unit 3

Upper Unit 4

OPDC	Prairie du Chien
OPCJ	Prairie du Chien/Jordan
ODCR	Decorah Shale
OSTP	St. Peter
ODSP	Decorah-St. Peter
OPVL	Platteville
OSCJ	St. Peter - Jordan
CJDN	Jordan
OPSP	Platteville - St. Peter
ODPL	Decorah - Platteville
OSPC	St. Peter/Prairie du Chien
CJEC	Jordan - Eau Claire
OPSL	Platteville or Prairie du Chien - St. Lawrence (?)
OPST	Platteville - St. Peter (?)
CJSL	Jordan - St. Lawrence
OPCG	Prairie du Chien - Galesville
OSSL	Shakopee - St. Lawrence (?)
OPSL	Platteville - St. Lawrence
OSCS	Shakopee - St. Lawrence (?)
OSSL	Shakopee - St. Lawrence (?)
OPSL	Platteville or Prairie du Chien - St. Lawrence (?)
OSCS	Shakopee - St. Lawrence (?)
OSTL	(?)
OPCR	(?)

Lower Unit 4

CFIG	Franconian/Ironton/Galesville
CMTS	Mt. Simon
PMSU	Precambrian
CIPU	Ironton - Precambrian
CSLF	St. Lawrence - Franconian
CFRN	Franconian
MTPL	Multiple Aquifer

Source

MDH	Minnesota Department of Health
CRA	Conestoga-Rovers & Associates
CWI	County Well Index
MGS	Minnesota Geological Society
MPCA	Minnesota Pollution Control Agency
MUN	Municipal

Subsection Designation

Wells are located using the township, range, section, and subsection. The subsection is presented by a series of up to six letters. Each letter represents a division of the previous area into quarters. The letters represent the following portions of that area:

A	Northeast
B	Northwest
C	Southwest
D	Southeast

Note:
(?) Assumed because these formations are not listed with the Minnesota Geological Survey abbreviation directory.

REFERENCES

Conestoga-Rovers & Associates. 1997. Inventory of Wells in the Vicinity of TCAAP, 1995 Update. March 1997.

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Montgomery Watson. 1995. Twin Cities Army Ammunition Plant. Operable Unit 1 Alternate Water Supply Plan. Report prepared for U.S. Army Corps of Engineers, Omaha District.

S.S. Papadopulos & Associates. 1992. Inventory of Water-Supply Wells in the Vicinity of the Twin Cities Army Ammunition Plant, Phase I Report. Report prepared for Federal Cartridge Company, Arden Hills, MN, 2 vols.

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Wenck Associates, Inc. 1995. Inventory of Water-Supply Wells in the Vicinity of the Twin Cities Army Ammunition Plant, Phase III Report. Report prepared for Federal Cartridge Company, Arden Hills, MN.

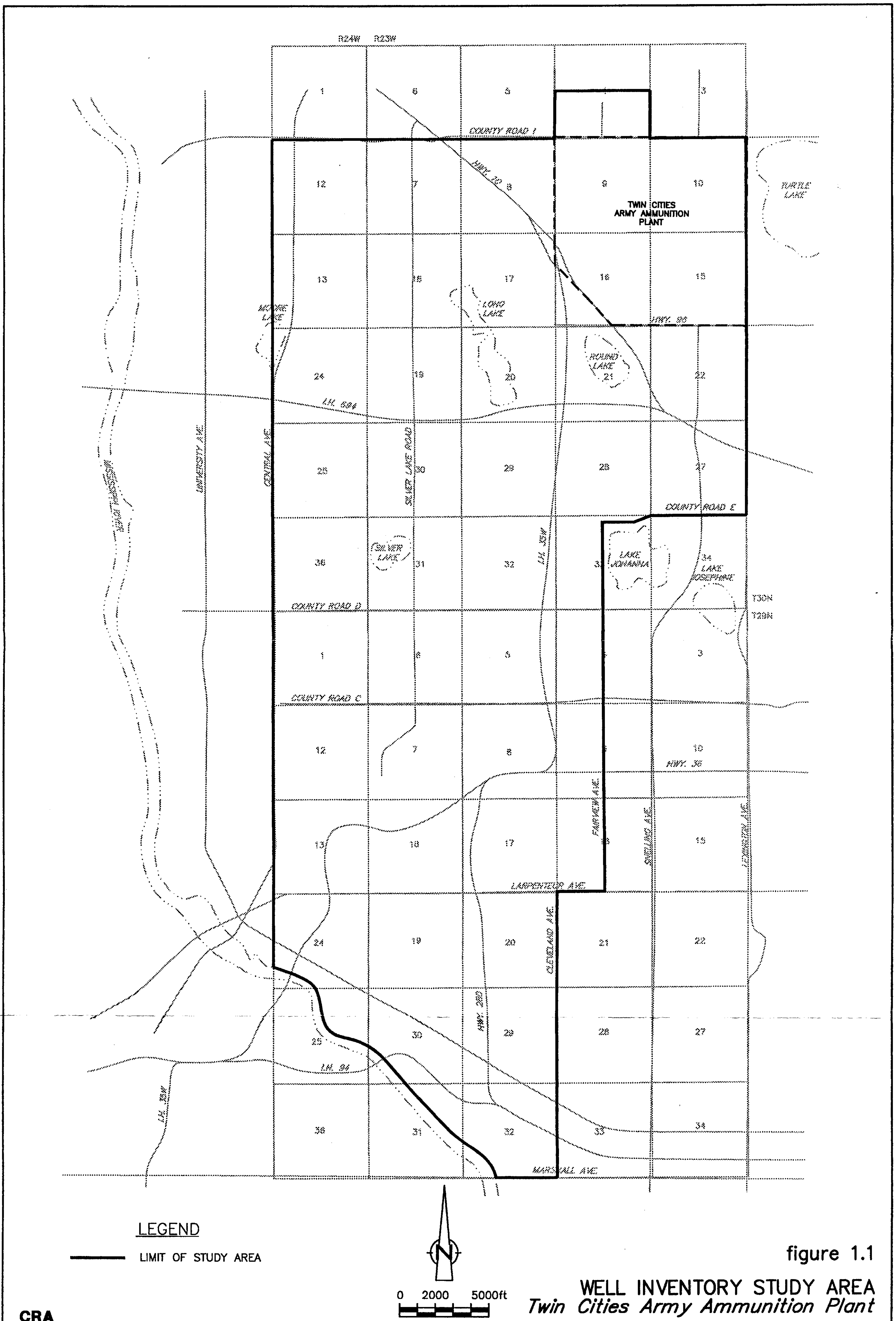


figure 1.1

WELL INVENTORY STUDY AREA
Twin Cities Army Ammunition Plant

15065-20(001)GN-SP001 JAN 06/2000

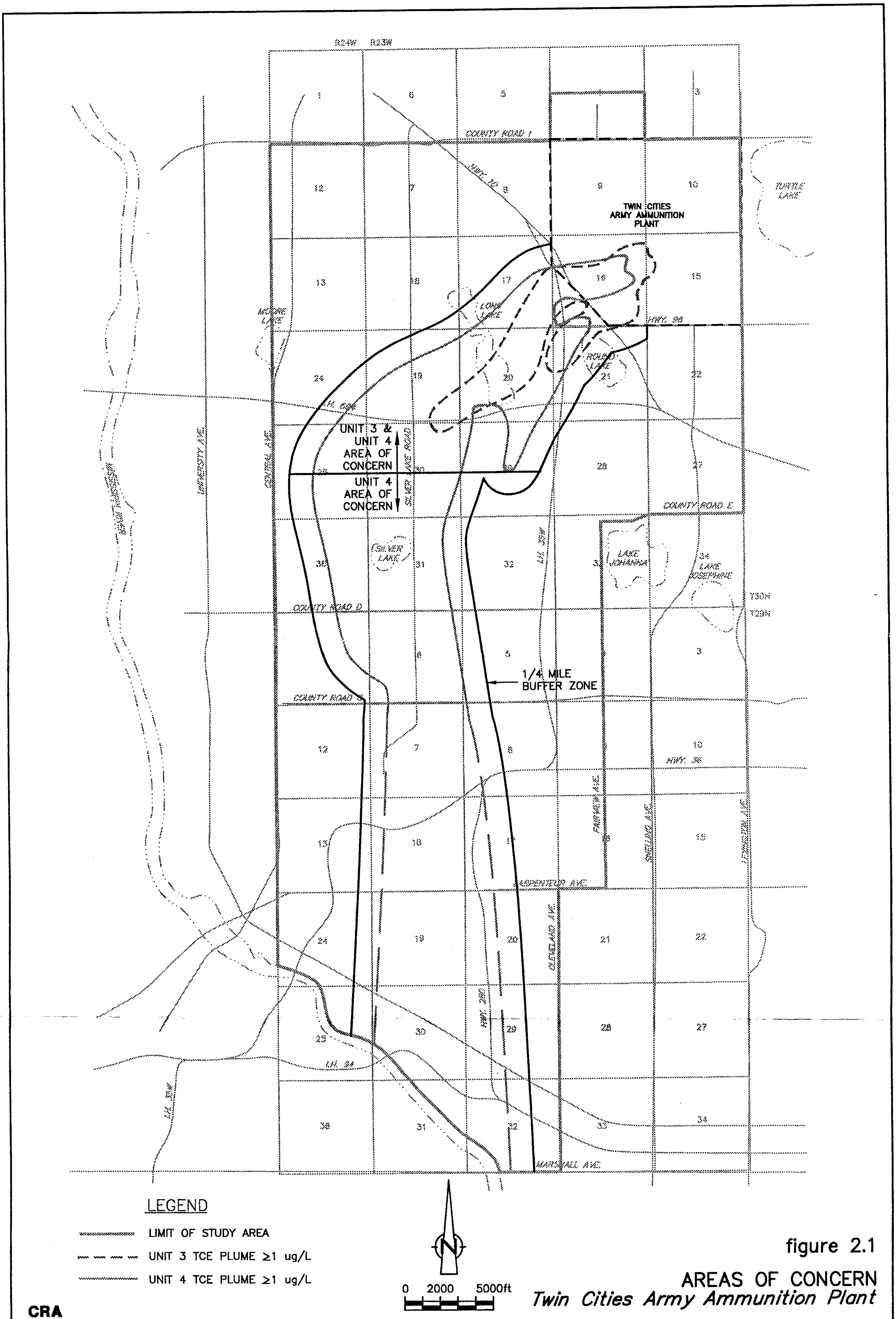
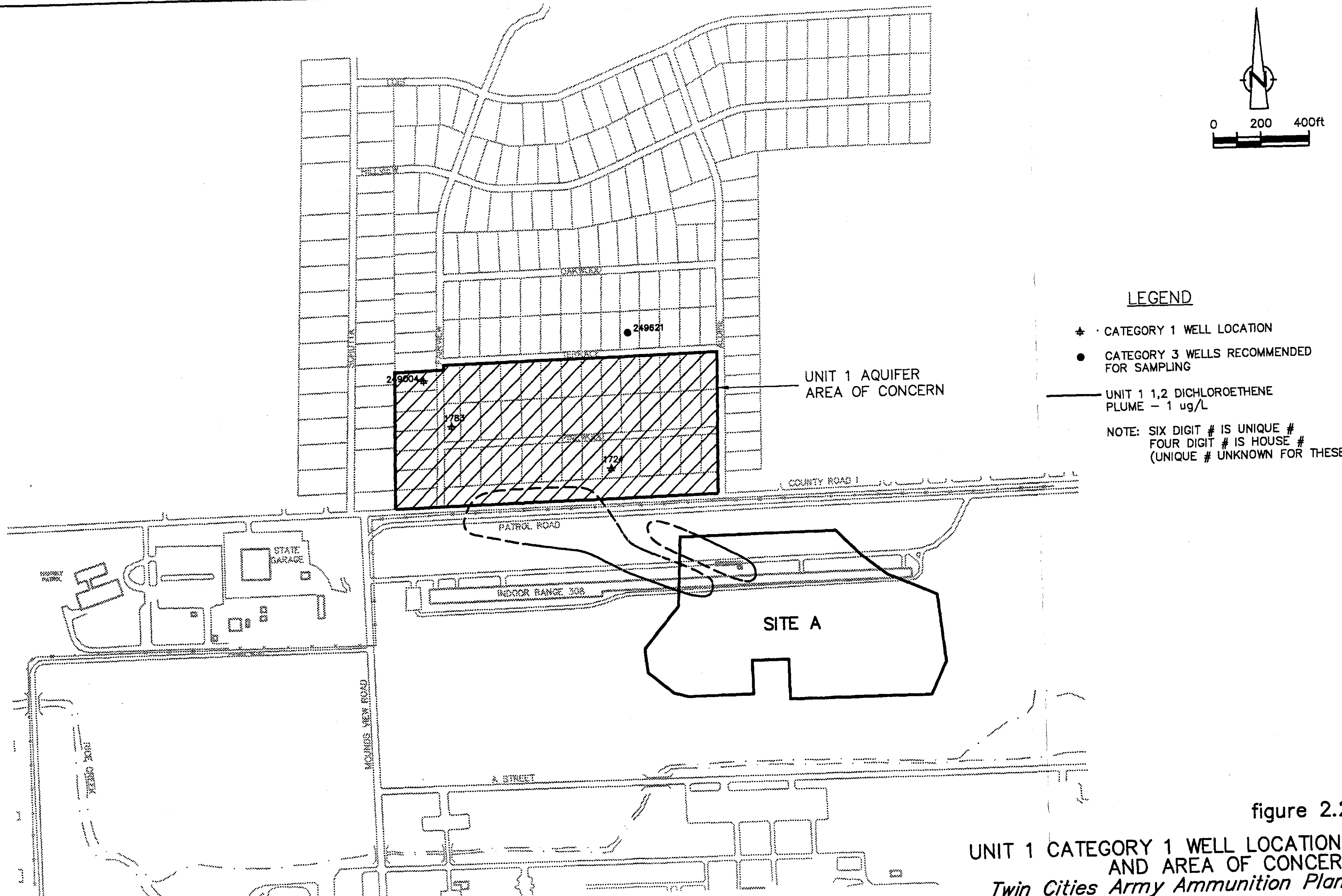


figure 2.1

AREAS OF CONCERN

Twin Cities Army Ammunition Plant

15065-20(001)GN-SP003 JAN 06/2000



LEGEND

- CATEGORY 1 WELL LOCATION
- CATEGORY 3 WELLS RECOMMENDED FOR SAMPLING
- UNIT 1 1,2 DICHLOROETHENE PLUME – 1 ug/L

NOTE: SIX DIGIT # IS UNIQUE #
FOUR DIGIT # IS HOUSE #
(UNIQUE # UNKNOWN FOR THESE)

figure 2.2

UNIT 1 CATEGORY 1 WELL LOCATIONS AND AREA OF CONCERN

Twin Cities Army Ammunition Plant

CRA

15065–20(001)GN–SP004 APR 26/2000

TABLE 2.1

WELL CATEGORIES
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Category	*Subcategory*	*Explanation*
1		Water supply wells screened in an aquifer of concern. 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
2		Water supply wells in an area of concern, inside the buffer lines, but outside the 1 $\mu g/L$ 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 outside the area of concern, or within the area of concern, but not screened in an aquifer of concern.
4		Water supply wells in the Study Area, but insufficient information to determine if the well is in an aquifer of concern:
	4a	• Unknown depth or aquifer
	4b	• Unknown location. Wells with both an unknown depth and an unknown location are included in 4b.
5		Well in the study area but 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 2.2

NUMBER OF WELLS BY CATEGORY
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Category	*Subcategory*	*Explanation*	*Primary Category*	*Subcategory*
1		Water supply wells screened in an aquifer of concern. Wells are divided into the following subcategories:	70	
	1a	Drinking water well		29
	1b	Nondrinking but possible contact water		18
	1c	Nondrinking, noncontact water		13
	1d	Well is inoperable or has not been used for several years		10
2		Water supply wells in an area of concern, inside the buffer lines, but outside the 1 $\mu g/L$ contour, screened in an aquifer of concern. Wells are divided into the following	22	
	2a	Drinking water well		6
	2b	Nondrinking but possible contact water		3
	2c	Nondrinking, noncontact water		9
	2d	Well is inoperable or has not been used for several years		4
3		Water supply wells within the Study Area that are outside the area of concern, or within the area of concern, but not screened in an aquifer of concern.	714	
4		Water supply wells in the Study Area, but insufficient information to determine if the well is in an aquifer of	57	
	4a	Unknown depth or aquifer		33
	4b	Unknown location. Wells with both an unknown depth and an unknown location are included in 4b.		24
5		Well in the study area but field checked and not located. No further action is recommended for these wells.	45	
6		Nonsupply wells (primarily monitoring wells).	986	
7		Sealed or abandoned wells. Wells are divided into the following subcategories:	2196	
	7a	Documented as sealed/abandoned		2062
	7b	Undocumented as sealed, or improperly abandoned		134
		TOTAL NUMBER OF WELLS	4,090	

TABLE 2.3

CATEGORY 1 AND CATEGORY 2 WELLS
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Depth	Category	Last Name	Street	City
200524	30	23	31	CAAAAB	472	1a	St Anthony Village 5	Silver Lake Rd	New Brighton
200603	29	23	19	CADABC	1110	1a	Miller Milling		
200803	29	23	6	ACCACC	541	1a	St Anthony, City Of	2900 Kenzie Tr	St Anthony
200804	29	23	6	ACCBAD	541	1a	St Anthony, City Of	2900 Kenzie	St Anthony
200805	29	23	6	ACCCAC	427	1a	St Anthony, City Of	3357 Silver Lake Rd	St Anthony
206792	30	23	30	BADDDC	500	1a	New Brighton, City Of	700 Silver Lake Rd	New Brighton
206793	30	23	30	BADDDB	493	1a	New Brighton, City Of	700 Silver Lake Rd	New Brighton
206796	30	23	30	CBAABD	501	1a	New Brighton, City Of	3001 5th St NW	New Brighton
206797	30	23	30	CBABAB	522	1a	New Brighton, City Of	3001 5th St NW	New Brighton
234317	30	23	16	CA	285	1a	Big Ten Supper Club	4703 Hwy. 10	Arden Hills
234356	30	23	16	CC	100	1a	Nordquist	1873 Old Hwy. 8	New Brighton
234368	29	23	7	BA	82	1a	Bochnak	2600 St. Anthony Blvd.	Minneapolis
235539	30	23	17	DDDACA	345	1a	Jackson, Manley		
235566	30	23	16	CACC	286	1a	Big Ten Supper Club		
240684	30	23	32		330	1a		15th And Co.Rd. 80	
247434	29	23	7		386	1a	Lowry Grove		
249004	30	23	4	D	38	1a	Gamradt	5567 Fairview Ave.	Shoreview
249608	29	23	20	B	375	1a	Rapit Printing Inc	2520 Larpenteur Ave.	Lauderdale
249898	29	23	6	CCCDCC	251	1a		2901 Roosevelt St.	
250107	29	23	8	BAABCC	423	1a		2630 County Road C	
250769	29	23	6	DAABBC	258	1a		3600 33rd St. NE	
433298	29	23	32	DCBA	500	1a	Town And Country Golf Course	2279 Marshall Ave	St Paul
463528	29	23	19	CBCACD		1a	Burlington Northern Rr	2575 Doswell	St. Paul
497941	29	23	30		140	1a			
509052	29	23	31	ADABCD	302	1a	Shriners Hospital	2025 E River Rd	Minneapolis
554216	30	23	29	BDB	295	1a	New Brighton, City Of	Seventh St. NW	New Brighton
582628	30	23	30		345	1a	New Brighton 15		
S00444	29	23	30	CBCA	236	1a	Minneapolis Parks & Rec Dept	Ontario & E River Rd	Minneapolis
S00490	29	23	32	C	500	1a	Resident	435 Otis Ave	St Paul
200173	29	23	29	CBBBDC	525	1b	KSTP Radio TV	3415 University Ave	St Paul
200812	29	23	7	DACACD	498	1b	Minneapolis Parks & Rec Dept	2201 St Anthony Blvd NE	Minneapolis
206688	30	24	25	ACBA	360	1b	Fouts	1635 W Innsbruck Cr.	Heights
231878	30	23	21	CBBCDA	237	1b	Mengelkoch Co	119 Ne 14th St.	New Brighton
234301	30	23	16	CD	183	1b	Dewitt	4651 Hwy. 10	Arden Hills
234335	30	23	21	CB	287	1b	Mengelkoch Co	119 Ne 14th St.	New Brighton
234352	30	23	20	CB	120	1b	White	1206 12th Ave. NW	New Brighton
234369	29	23	7	BA	310	1b	Bochnak	2600 St Anthony Blvd	Minneapolis
234421	30	23	17	AD	270	1b	Biochem	2151 Mustang Dr.	New Brighton

TABLE 2.3

CATEGORY 1 AND CATEGORY 2 WELLS
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Depth	Category	Last Name	Street	City
234469	29	23	7	AB	500	1b	Palwski	2816 Hwy 88	St Anthony
234544	29	23	18	C	500	1b	Hillcrest Shopper, Inc.	2201 Kennedy St NE	Minneapolis
234549	29	23	6	CC	265	1b	Reiner	2600 30th Ave. NE	St. Anthony
236512	30	23	21	CBBB	300	1b	Gordon Rendering Co		
242207	29	23	7	CACDDB	468	1b	Sunset Memorial Cemetery	2250 St. Anthony Blvd. NE	Minneapolis
243411	29	23	7	CAAAB	475	1b	Sunset Memorial Cemetery	2250 St Anthony Blvd. NE	Minneapolis
249632	30	24	25	AD	240	1b	Montzka	2301 N Upland Crest NE	Heights
512761	29	23	7	DAC	437	1b	Minneapolis Parks & Rec Dept	2201 St Anthony Blvd NE	Minneapolis
537801	30	23	17	AD	165	1b	Midwest Industrial	4759 Old Hwy 8	New Brighton
127537	30	23	20	ADCCDD	117	1c	Midwest Asphalt	1400 Old Hwy. 8	New Brighton
200180	29	23	32	DCBADC	500	1c	Town And Country Golf Course	2279 Marshal Ave	St Paul
200522	30	23	31	ABBAD	254	1c	Pemtom	Silver Lake Rd	New Brighton
200523	30	23	31	ABCCAD	255	1c	Pemton	Silver Lake Rd & County Rd E	New Brighton
200818	29	23	30	BADDCD	433	1c	Commercial Gas Co	2633 4th St SE	Minneapolis
206724	30	23	9	CCBCBD	464	1c	TC Ordinance Plant		Arden Hills
206754	30	23	16	ABBBD	340	1c	TC Ordinance Plant, No 1	Mounds View Road	Arden Hills
206756	30	23	16	BADADC	335	1c	TC Ordinance Plant, No 2	Mounds View Road	Arden Hills
225906	29	23	8	CBBABA	551	1c	St Paul Terminal Warehouse		Roseville
234350	30	23	20	DA	300	1c	Darling International	119 Nw 14th St.	New Brighton
S00010	29	23	30	BDA	500	1c	American National Can Co	150 26th Ave SE	Minneapolis
S00425	29	23	30	BD	280	1c	American National Can Co	150 26th Ave SE	Minneapolis
S00437	29	23	30	AD	450	1c	Northern Star Co	3171 5th St SE	Minneapolis
	30	23	4	D	30	1d	Schenk	1783 Pinewood Dr.	Shoreview
	30	23	4	D	35	1d	Berthiaume	1724 Pinewood Dr	Shoreview
234304	30	23	21	AB	100	1d	Cmiel	4549 Lakeshore Pl	Arden Hills
234338	30	23	20	BB	210	1d	Bosell	1575 14th Ave. NW	New Brighton
234339	30	23	20	BB	90	1d	Schuessler	1657 14th Ave NW	New Brighton
234340	30	23	19	CD	180	1d	Loren	1100 27th Ave. NW	New Brighton
236438	29	23	32	AACDCC	800	1d	Waldorf Paper No.5		
249153	30	23	17		72	1d	Markely Labs	1853 Old Hwy. 8	New Brighton
249194	29	23	19	CA	500	1d	Murphy Warehouse Co	2130 Elm St SE	Minneapolis
249607	29	23	17	C	500	1d	Foerster	2443 Larpenteur Ave	Lauderdale
206689	30	24	25	CCACBA	223	2a	Foster	4629 Polk St NE	Fridley
206763	30	23	21	AAABBD	142	2a	Zenench	1600 W Hwy 96	Arden Hills
234380	30	23	21	AA	160	2a	Podlasek	4410 N Snelling Ave	Arden Hills
249113	30	23	29	BA	80	2a	Wyttenbach	990 11th Av NW	New Brighton
S00457	29	23	32	A	518	2a	Bartusch Packing Co	565 N Cleveland Ave	St Paul
S00458	29	23	32	A	518	2a	Bartusch Packing Co	567 N Cleveland Ave	St Paul

TABLE 2.3

CATEGORY 1 AND CATEGORY 2 WELLS
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*T*	*R*	*S*	*Subsection*	*Depth*	*Category*	*Last Name*	*Street*	*City*
200176	29	23	32	AACC	745	2b	Waldorf Paper Products	2236 Myrtle Ave	St Paul
200179	29	23	32	ADDAAD	516	2b	Farm Oyl	2125 Wabash Ave	St Paul
234571	30	23	19	AA	200	2b	Leiser	1901 17th St. NW	New Brighton
	29	23	32		790	2c	Rock-Tenn	2250 Wabash Ave.	Saint Paul
200076	29	23	8	BDCA	550	2c	Old Dutch Foods, Inc	2375 Terminal Rd	St Paul
200150	29	23	17	BCCC	555	2c	University Of Minnesota	2533 Larpenteur	Lauderdale
200178	29	23	32	ADDA	504	2c	Farm Oyl	2125 Wabash Ave	St Paul
200263	29	24	13	DDA	425	2c	Land O'lakes Creameries	2215 Ne Kennedy St	Minneapolis
233520	30	23	29	DBADBB	232	2c	Macgillis And Gibbs Co	440 Fifth Ave NW	New Brighton
235778	29	23	29	DCCCDB	345	2c	Specialty Manufacturing Co	2356 University Ave	St Paul
236029	29	24	13	DADCCB	435	2c	Hillcrest Shopper	2201 Kennedy St NE	Minneapolis
S00517	29	23	32		758	2c	Rock-Tenn	2211 Wabash Ave	St Paul
233221	29	24	13	DACDDA	500	2d	R & D Systems	2201 Kennedy St NE	Minneapolis
234366	30	23	29	BA	75	2d	Zehnle	978 11th Ave NW	New Brighton
234558	30	23	19	BAC	140	2d	Nyholm	1587 26th Ave NW	New Brighton
234569	29	23	7	BB	200?	2d	Waldron	2525 St Anthony Blvd	St Anthony

TABLE 2.4

NEW CATEGORY 1 AND CATEGORY 2 WELLS
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique No.	*Old Category*	*New Category*	*Reason*
200603	--	1a	Review of the MDH database
234304	4a	1d	Depth was provided to CRA
234369	4a	1b	Depth was provided to CRA
235539	--	1a	Review of the MDH database
235566	--	1a	Review of the MDH database
236438	--	1d	Review of the MDH database
236512	--	1b	Review of the MDH database
240684	--	1a	Review of the MDH database
247434	--	1a	Review of the MDH database
249194	4a	1d	Depth was provided to CRA
249898	--	1a	Review of the MDH database
250107	--	1a	Review of the MDH database
250769	--	1a	Review of the MDH database
497941	--	1a	Review of the MDH database
582628	--	1a	Review of the MDH database
2250 Wabash	4a	2c	Depth was provided to CRA
S00425	4a	1c	Depth was provided to CRA
S00517	4a	2c	Depth was provided to CRA

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
20372					U	A	790	MTPL		Drew		4a		Deleted. Searched all Drew Ave in the Twin Cities area and none are located in the Study Area. The unique number shown appears to be a typo (only 5-digits). However, searched wells 203572 and 203752 which were also in Hennepin Co. and on Drew Ave., but out of Study Area.
104897	34	28	25	CCACDD	U	A			Resident	20210 Hillside Dr		4b		Deleted, out of Study Area.
105190					D	A	83		Kaunzner, Darrell	29911 109th Ave North	Hanover	4b		Deleted, out of the Study Area. According to Mrs. Kaunzner there is nor was a W. L. Kaunzner in Minnesota. However, Mrs. Kaunzner stated that they have a well which is in Hanover in Hennepin County. (PJS 9/7/99)
105242					D	A	214		Weber, Nordeen Jr.			4b		Phone book check for Webers - contacted the following numbers: 651-483-2251 and 651-459-3802. However, no additional information available. (PJS 12/6/99)
105271					D	A	137		Nelson, Roger			4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
105294					D	A	193		Daleiden, Clifford	5365 Harff Rd.	Greenfield	4a		Deleted, out of Study Area. According to Mrs. Clifford Daleiden, they have a well and have lived at this address for 50 years, which is in Hennepin County. (PJS 9/9/99)
107090	120	24	35	ACD	U	A						4b		Deleted, out of Study Area.
114374	116	23	6	CBDBCB	U	A						4b		Deleted, out of Study Area.
126565					D	A	127		Marvin George Bldrs Inc	Hassan Hills		4b		Deleted, Hassan Hills is located out of the Study Area.
126764					D	A	118		Christian Realty	Hassan Township		4b		Deleted. McAlpine Drilling, Dayton, MN (driller) provided location, out of Study Area.(PJS 9/14/99)
128143					D	A	120		Beckholtz			4b		Deleted, out of Study Area.
132487					D	A	70		Christian Bldrs #88			4b		Deleted, out of study area. West Hunter lake addition, block 5, lot 6,7 - Addition not in Hennepin, Anoka, or Ramsey Co.
137182					U	A			Rogers Well Co.	17555 Duck Lake Trail	Eden Prairie	4b		Deleted. Phone book (1991) check, address is located out of the Study Area. (PJS 9/9/99)

TABLE 2.5

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
141460	30	24	12	DBCC	M				Cummings - Power Generation	1400 73 Ave NE	Fridley	4b	6	Field checked (PJS 9/7/99) and found a number of monitoring wells at this location.
145793					D	A	90		Manick			4b		Deleted, out of Study Area.
146359	120	24	1	CCDBDB	U	A						4b		Deleted, out of Study Area.
148132					D	A	190		Velie, Vance			4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
158039					U	A			Stevens Well Co.	6240 Hwy 12 West	Maple Plain	4b		Deleted, out of Study Area.
163479					M		250		Lakeside Industries	4400 78th St. West	Bloomington	4b		Deleted, out of Study Area.
163655					D	A	190		Christian Bldrs					Deleted, out of Study Area. Island view estates addition, block 1, lot 23 - Addition not in Hennepin, Ramsey, or Anoka Co.
169700					D	A	190		Christian Bldrs	Tucker Road	Rogers	4b		Deleted. McAlpine Bros, Rogers, MN, (driller) provided location, out of Study Area. (PJS 9/14/99)
170267					U	A				Willow Dr		4b		Deleted, out of Study Area.
172651					U	A				Wildhurst Tr		4b		Deleted, out of Study Area.
180922					U	A		CJDN				4b		Appears to be a monitoring well, because the CWI shows monthly water levels since 1983.
184909					U	A				Pioneer Tr	Eden Prairie	4b		Deleted, the only Pioneer trail in Hennepin county is in Eden Prairie, out of
191102	120	23	25		D	A	101		Christian Bldrs	Hwy 152 and 94	Hassan Twnsp	4b		Deleted. McAlpine Bros, Rogers, MN, (driller) provided location, out of Study Area. (PJS 9/14/99)
192091					U	A				Elmwood, MN		4b		No such town in Minnesota. This well does not appear to be located in the Study Area. However, not enough information to continue the search.
201192					U	A						4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
206854	115	22	3	CDDDBB	U	A		CJDN				4b		Deleted, out of Study Area.
206855	115	22	3	CDDDAB	U	A		CJDN				4b		Deleted, out of Study Area.
206953	120	24	14	AAADAB	U	A						4b		Deleted, out of Study Area.
207243	115	21	31	BBABBC	U	A				41St Ave N		4b		Deleted, out of Study Area.
210647	119	35	2	BDBABB	U	A				Lake & Taft Ln		4b		Deleted, out of Study Area.
218019	120	24	1	ABCDAD	U	A						4b		Deleted, out of Study Area.
218021	120	24	14	AAADAB	U	A						4b		Deleted, out of Study Area.
223845	29	23	30	ABCDDC	I	I	458		Chicago & NW Rail Road	530 25th Ave SE	Minneapolis	4b	7a	Name change as per MDH Sealing Record.

TABLE 2.5

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
233433	30	23	17	DDDACA	D	A	345	OPCJ	Jackson	1330 Washington Ave N		4a	5	Field checked contact address (8/13/99), however, business was removed and new building under construction. Field checked well location according to T, R, S coordinates, the buildings shown on the 7.5 minute quad in the vicinity of this well have been removed. Assumed that the well was abandoned. (PJS 9/8/99)
234302	30	23	16	CD	D	I			Friedland	4643 Hwy 10	Arden Hills	4a	5	Mr. Friedland, owner, stated that he is on city water and knows of no well. (PJS 8/5/99)
234304	30	23	21	AB	D	I	100		Cmiel	4549 Lakeshore Pl	Arden Hills	4a	1d	Mrs. Cmiel, owner, stated that she is on city water and their well was disconnected yrs ago. (PJS 8/5/99)
234333	30	23	21	AA	D	U			Podlasek	4430 N Snelling Ave	Arden Hills	4a	3	Field checked and the address is actually located in Section 22bb, which is between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
234355	30	23	16	CC	D	I			Kingdom Hall	1987 Mound St	New Brighton	4a		Knocked on door a few times and then delivered a letter on 12/9/99. No response.
234369	29	23	7	BA	IR	A	310		Bochnak	2600 St Anthony Blvd	Minneapolis	4a	1b	Adam Gordon, Montgomery Watson, provided the depth and stated that this well will be abandoned on behalf of the Army. (JT 12/14/99)
234373	30	23	21	CA	D	I			Bushway	646 14th St NE	Arden Hills	4b	7b	According to the City of Arden Hills, the residence was removed for the construction of the existing development. The well was abandoned in the process.
234415	30	23	4	DC	D	I		Unit 1	Lewandowski	1811 County Rd I	Shoreview	4a	3	Mr. Lewandowski, owner, stated that he is on city water and his well was disconnected yrs ago. (PJS 8/5/99)
234427	30	23	21	AB	D	U			Hammond	8071 Long Lake Rd	Mounds View	4a		Delete. Field Checked, out of study area. (PJS 7/22/99)
234453	30	23	29	DD	D	I			Johnson	291 2nd St NW	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)

CHANGES TO WELLS IDENTIFIED FOR FURTHER
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TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	*T*	*R*	*S*	*Subsection*	*Use*	*Status*	*Depth*	*Aquifer*	*Name*	*Address*	*City*	*Old Cat*	*New Cat*	*Notes*
234476	29	23	7	BD	D	I			Scott	2613 27th Ave NE	Saint Anthony	4a	7a	Mrs. Scott, owner, stated that she has been on city water since they bought the house and that the well was abandoned earlier this year. (PJS 8/6/99) Address matched with MDH sealing record. (KC 12/99)
234503	29	23	17	BA	D	I			Herrick	2111 Fairways Ln	Roseville	4a	7b	Owner, Mrs Wilson, stated that well was abandoned in 1985 or 1986. (PJS 8/3/99)
234511	29	23	20	AA	D	I			Lindberg	2120 W Larpenteur	Roseville	4a		City of Falcon Hts stated that the building (an old school house) was purchased by the U of M and currently abandoned. No well info available. (PJS 8/2/99)
234532												4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
234537												4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
234543	30	23	32	CB	U	I			Peele	492 Rolls Rd	New Brighton	4a	5	Mrs. Peele, owner, for 30 yrs stated that there has been no well and has been on city water since the beginning. (PJS
234544	29	23	18	C	C	A	500	MTPL	R and D Systems	2201 Kennedy St NE	Minneapolis	2d	1b	New owner. Scott Tankenoff - prior manager of the property (Hillcrest), was not sure of the well construction but assumed it was open hole through the bedrock area. (PJS 8/13/99)
234545												4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
234548	30	23	31	DBD	M	I	178.5		Thermo-King	1951 Old Highway 8	New Brighton	4a	6	Change to a monitoring well 10 yrs ago. Manager stated that the previous consultants would abandon this well when monitoring was completed. (PJS 7/23/99)
234555	29	24	12	DCA					Egey	1927 Hayes St NE	Minneapolis	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
234568	29	23	6	DAD			200		Thomsen	4 88 NE		4b		Phone book Check (1991): Possible 2816 Hwy 88, St. Anthony, Hennepin County.
234658					U							4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)

CHANGES TO WELLS IDENTIFIED FOR FURTHER
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TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	*T*	*R*	*S*	*Subsection*	*Use*	*Status*	*Depth*	*Aquifer*	*Name*	*Address*	*City*	*Old Cat*	*New Cat*	*Notes*
239450	29	24	13			U	350		Standard Sausage	1307 South 4th	Minneapolis	5		Deleted as out of the Study Area. Found address in 1950 phone book. Field checked, both 4th street south and 4th Avenue south. (PJS 12-3-99)
239465					U	A	256		Lennox, Don	17145 NW Navajo St.	Andover	4b		Deleted. According to Mr. Lennox, this well was related to a previous home in Andover, which is out of the Study Area.
239466					U	A	128		Lennox, Don Jr.	7201 NE East River Road	Fridley	4b		Deleted. Phone book check (1991) and according to son, Don Lennox, address is out of Study Area.
239468	29	24			U	A	253		Cedar Lake Shops			4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
239469	29	24			U	A	200		Great Northern Railway	Boom Island Tower		4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
239472					U	A	163		Hyland Park 2			4b		Deleted, out of study area. John Barton, Hennepin Parks, stated that this appears to be a well located in the lower picnic area at Hyland park. The depth matches his records for this well. (PJS 10/5/99)
239473					U	A	173		Hyland Park			4b		Deleted, out of study area. John Barton, Hennepin Parks, stated that this is likely one their wells but is unsure which one, because the depths do not match his records. (PJS 10/5/99)
249126	29	23	6	DB	U	I			Schrunk	3108 32nd Ave NE	Saint Anthony	4a	7b	The owner stated that when they replaced the old house in 1991 the city required they abandon the well. (PJS 8/6/99)
249129	29	23	6	CB					Sroga	3201 Stinson Blvd NE	Saint Anthony	4a	5	Mr. Sroga stated that during his time (30 yrs) he has been on city water and has no well. (PJS 7/27/99)
249131	30	23	29	D	U	I			Resident	411 First St NW	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)
249132	30	23	32	C	U	I			Bryan	711 Old Hwy 8	New Brighton	4a	7b	The residence at this address has been removed for the existing development - the well was removed in the process. (PJS 8/4/99)

TABLE 2.5

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Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
249150	29	23	6	BB	U	U			Barres	3511 Stinson Blvd NE	Saint Anthony	4a		Knocked on door a few times and then delivered a letter on 12/9/99. No response.
249154	30	23	17	A	U	I			Bhakta	4889 Old Hwy 8	Mounds View	4a	7b	No well, Abandoned by previous owner, Field interview with Mr. Bhakta. (PJS 7/22/99)
249156	30	23	29	D	U	I			Normandale Properties	305 2nd St NW	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)
249157	30	23	29	D	U	I			Normandale Properties	305 2nd St NW	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)
249158	30	23	29	D	U	I			Normandale Properties	305 2nd St NW	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)
249168	29	23	20	A	U	U			Hess	1583 Northrup St	Falcon Heights	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
249169	29	23	17	C					Hayden	1813 Eustis St	Lauderdale	4a	5	Mrs. Hayden, owner for 33 yrs stated that she knows of no well. On city water. (PJS 8/2/99)
249170	29	23	17	C					Lenartz	1760 Pleasant St	Lauderdale	4a	5	Mrs. Lenartz, owner for 1.5 yrs stated that no well was disclosed during the purchase. On city water. (PJS 8/2/99)
249171	29	23	32	AA	U	I			McDonald's	2213 University Ave	Saint Paul	4a	5	Construction project manager, Jerry Roper, stated that the building was on city water since 1975, and that no well has been on this site. (PJS 8/11/99)
249173	29	24	12	AB	AC	I			Hollywood Group Four, Inc	2815 Johnson St NE	Minneapolis	4a	3	Located between the buffer zone and the Study Area. Mr. Ed Finley, developer, stated that the building is under renovation and the well will be abandoned. (PJS 8/12/99)
249175	29	24	13	BC					South Studios	1331 Tyler St NE	Minneapolis	4a		Deleted as an elevator. Mr. Greenstein, manager stated that no well exists, but they have an elevator. (PJS 8/11/99)

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Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
249177	29	23	17	A	U	I			Schoen	2096 Fairways Ln	Roseville	4a	3	City changed from St. Paul to Roseville. This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
249180	29	23	8		U	U			Anderson Produce/St. Paul Properties	2296 Terminal Rd	Roseville	4a	5	Rental property, maintenance personnel stated there has never been a well and have always been on city water. (PJS
249181	29	23	20	B	U	U			Luther NW Theological Seminary	1578 Eustis St	Lauderdale	4a	5	Kathy Richardson, secretary of campus services, stated that she spoke with her maintenance personnel and no wells are or have been on this property, they have always been on city water. (PJS 8/5/99)
249182	29	23	20	B	U	U			Luther NW Theological Seminary	1588 Eustis St	Lauderdale	4a	5	Kathy Richardson, secretary of campus services, stated that she spoke with her maintenance personnel and no wells are or have been on this property they have always been on city water. (PJS 8/5/99)
249183	29	23	20	B	U	U			Luther NW Theological Seminary	1598 Eustis St	Lauderdale	4a	5	Kathy Richardson, secretary of campus services, stated that she spoke with her maintenance personnel and no wells are or have been on this property because they have always been on city water. (PJS 8/5/99)
249192	29	23	30		I	I			Reichhold Chemicals	525 25th Ave SE	Minneapolis	4a	7b	Jon Oldum, Team Leader for Reichhold Chemicals, stated that all wells associated with the facility were abandoned. (PJS 9/17/99)
249193	29	23	30	AD	I	I			1st Industrial	504 Malcolm Ave SE	Minneapolis	4a	7b	Business changed from Lewis Bolt and Nut Company. Paul Hide, Realastate Recycling, stated that all wells (previously used for processing and recently used for monitoring) were abandoned. (PJS 10/4/94)
249194	29	23	19	CA	C	I	~500 ft	PDCJN	Murphy Warehouse Co	2130 Elm St SE	Minneapolis	4a	1d	Wayne, Site Plan Engineer, stated they are on city water and the well pump has been disconnected. (PJS 8/12/99)
249195	29	23	17	DD	IR	A			Gibbs Farm Museum	2097 W Larpenteur Ave	Falcon Heights	4a	3	Site manager, Ted Lau, stated that the well is used for irrigation and city water is used for drinking, etc. Depth was unknown. The well is sampled annually by the State, the parameters were unknown. (PJS

TABLE 2.5

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Unique No.	*T*	*R*	*S*	*Subsection*	*Use*	*Status*	*Depth*	*Aquifer*	*Name*	*Address*	*City*	*Old Cat*	*New Cat*	*Notes*
249621	30	23	4	DC	D	A	25	UNIT 1	Stenger Jr	1719 Terrace Dr	Shoreview	4a	3	Located between the buffer zone and the Area of Study - change to Category 3. Still uses his well water, no municipal water. (PJS 7/22/99)
249623	30	24	25	AAA	U	I			Best Western	5201 Central Ave NE	Fridley	4a	5	Chief Engineer (for 1 yr) stated that the utility plans of the site show no well and that they are on city water. (PJS 8/10/99)
293244					U	A				Mississippi La, Hennepin Co.		4b		Deleted, out of Study Area - No Mississippi Lane found in the study area.
400229	151	43	33		U	A	199		Harold Derosier	Northridge Farms		4b		Deleted, out of Study Area.
401201					D	A	61		Rehbein Const			4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
415975	115	22	9	BDCCBB	U	A		CJDN	Shakopee 7			4b		Deleted, out of Study Area.
449111	116	24	13	BDBCDC	U	A	430		Victoria 2	81st St.	Victoria	4b		Deleted, out of Study Area.
452938						U						4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
452939						U						4b		The MDH and the MGS researched this well, but could not find any additional information. (PJS 1999)
463528	29	23	19	CBCACB	U	A		OPDC	Burlington Northern RR	2575 Doswell St. Paul	Saint Paul	1a	1a	Rick Sutherland 612-782-3310 supplied the exact address.
480649	30	23	20	DACD	M	I			U S Postal Service	1255 Old Hwy 8	New Brighton	4a	7b	Monitoring well abandoned in 1997. (PJS 7/21/99)
480650	30	23	20	DACD	M	I			U S Postal Service	1255 Old Hwy 8	New Brighton	4a	7b	Monitoring well abandoned in 1997. (PJS 7/21/99)
480651	30	23	20	DACD	M	I			U S Postal Service	1255 Old Hwy 8	New Brighton	4a	7b	Monitoring well abandoned in 1997. (PJS 7/21/99)
553735					U	I			Roseville Area High School	1261 Highway 36	Roseville	4b	7b	Gary Hegner, maintenance manager, stated that the well was abandoned and no longer used. (PJS 8/6/99)
561313					U				J. Scotty Builders	9900 Highbluff Lane	Hamel	4b		Deleted, out of Study Area.
197308					D	A	101		Dan Mor, Inc	11316 Colorado		4b		Deleted, out of the Study Area. No Colorado named streets in the Study Area. Contact: 7644 Humbolt Ave. N. Brooklyn Park , MN 55444.
S00060	30	23	21	A	D	I			Tanasichuk	1660 W Hwy 96	Arden Hills	4a	7b	Owner stated that the well was abandoned this year and switched to city water. (PJS 7/26/99)

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
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Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
S00225	30	23	28	BD	D	A			Wingert	1834 Venus Ave	Arden Hills	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3. City change to Arden Hills.
S00262	29	23	20	A	U	I			Harlander	2105 Folwell St	Falcon Heights	4a	5	Owner (27 yrs) stated that there was never a well, always on city water. (PJS 8/10/99)
S00287	29	23	17	CA					Roggenbuck	1909 Carl St	Lauderdale	4a	5	Mr. Roggenbuck, owner for 11 yrs stated that he knows of no well. On city water. (PJS 7/27/99)
S00312	30	23	20	D	U	U			Minnesota Diversified	1901 13th St NW	New Brighton	4a	7a	No such address. (PJS 7/26/99) Address matches MDH sealed well record. (KC 12/99)
S00409	29	23	6	BB	U				Ohara	3553 Stinson Blvd NE	Saint Anthony	4a		Knocked on door a few times and then delivered a letter on 12/9/99. No response.
S00410	29	23	6	BB	U				Iacarella	3555 Stinson Blvd NE	Minneapolis	4a		Knocked on door a few times and then delivered a letter on 12/9/99. No response.
S00413					U	U			Norquist Campground			4b		Searched phone books and other records but could not obtain any additional information.
S00415									Park		Arden Hills	4b	5	Dave Winkle, 20 yrs with Arden Hills parks and Rec. stated that none of the Arden Hills parks have a well - all use city water. (PJS 7/26/99)
S00425	29	23	30	BD	I	A	280	OSP/OPC	American National Can Co	150 26th Ave SE	Minneapolis	4a	1c	Thomas Miller, engineer, provided the depth information. (PJS 9/7/99)
S00428	29	24	24	AA	U	I			Resident	1715 E Hennepin Ave	Minneapolis	4a	5	Field checked and the address associated to this well no longer exists. (PJS
S00431	29	23	30	BD	U	U			Associated Trans Services	2428 Delaware St SE	Minneapolis	4a	5	Field checked and the address associated to this well no longer exists. (PJS
S00440	29	24	13		C	A			Minnesota Metal Finishing	409 Fillmore NE	Minneapolis	4a		Deleted as a duplicate of 122253. Business has only one well.
S00442	29	24	23	AB					State Land Dept	501 Hennepin Ave E	Minneapolis	4a		Deleted as an elevator. Employees stated that there was no well and they had an old elevator. (PJS 8/12/99)
S00446	29	23	15	CD	C	I	265		Gold Eagle Wash	1233 Larpenteur	Roseville	4a		Deleted. Field checked and location is at Section 15cd, out of Study Area. Owner stated that he is on city water, and that he plans to abandon the well. (PJS 8/5/99)

TABLE 2.5

CHANGES TO WELLS IDENTIFIED FOR FURTHER INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	*T*	*R*	*S*	*Subsection*	*Use*	*Status*	*Depth*	*Aquifer*	*Name*	*Address*	*City*	*Old Cat*	*New Cat*	*Notes*
S00454	29	24	24	DD	C	I			University Centre	1919 W University Ave	Saint Paul	4a	7b	Mike Goodgarden, building manager, stated that the well was abandoned 2-1/2 yrs ago. (PJS 8/6/99)
S00459	29	24	13	B	C	I			General Metalware Co	1401 Central Ave NE	Minneapolis	4a	5	Hennepin park worker stated that the building at this address has been removed and a park has been established - no well exists. (PJS 8/11/99)
S00470									Salvation Army	2950 W County Rd E	New Brighton	4b	5	According to property personnel, no well exists on the property. (PJS 7/27/99)
S00471					U	I			R Komarek/Nelson-Miller Cons			4b		Searched phone books and other records but could not obtain any additional information.
S00491	29	23	32	BA	U	I			MN Diversified Industries Inc/FOR SALE	666 Pelham Blvd	Saint Paul	4a		Property for sale. Lee Selton, maintenance, stated well was inactive since 1970, on city water, depth unknown.
S00493	29	23	32	A	U	U			Business	470 N Prior Ave	Saint Paul	4a	5	No such address. Talked to the businesses at 460 and 480 N Prior Avenue and neither had wells. (PJS 8/10/99)
S00496	29	23	32	B	U	I			Northland	692 N Prior Ave	Saint Paul	4a	7b	Management company (JLT) stated that the well was abandoned 3 yrs ago. (PJS 8/11/99)
S00497	29	23	29	AB	U	U			Resident	1066 Raymond Ave	Saint Paul	4a	5	The well associated to 1066 Raymond does not exist. The manager, Leslie Angel, of the apartment building at 1068 Raymond stated that the building is recent and they have no well. It appears that 1066 Raymond was removed and the apartment built in its place.
S00498	29	23	29	AB	U	U			Resident	1077 Raymond Ave	Saint Paul	4a	5	According to neighbor business, this address was a former truck terminal which was removed some years ago for a road diversion. (PJS 8/10/99)
S00513	29	23	29	DC					Specialty Building Services	2356 University Ave W	Saint Paul	4a		Deleted as an elevator. Bruce Lambrecht, manager, stated that there is no well, but they have an elevator. (PJS 8/11/99)
S00514	29	23	29	CB	U	U			Resident	2699 University Ave W	Saint Paul	4a	5	Field checked 2699 University East and West for St. Paul and Mpls and no address at either locations. The resident at this address have since been removed and new buildings constructed. The well was likely removed (PJS 8/10/99)

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
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Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
S00515	29	23	32	AD					Roseville properties	2103 Wabash Ave	Saint Paul	4a		Deleted as an elevator. Mark Rankoni, manager, stated that there was no well, but they have an elevator. (PJS 8/12/99)
S00516	29	23	32						Farm Oyl	2127 Wabash Ave	Saint Paul	4a		Deleted as an elevator. Manager stated there was no well, but they have an elevator. (PJS 8/10/99)
S00517	29	23	32		C	A	758		Rock-Tenn	2211 Wabash Ave	Saint Paul	4a	2c	Well #1, constructed in 1923 according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99)
S00518	29	23	32		C	I		MTPL	Rock-Tenn	2247 Wabash Ave	Saint Paul	4a	7b	Well #2, abandoned according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99)
S00519	29	23	32	AC	C	I			Rock-Tenn	2250 Wabash Ave	Saint Paul	4a	7b	Well #3, abandoned according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99)
S00520	29	23	32		C	A	859		Rock-Tenn	2290 Wabash Ave	Saint Paul	4a	2c	Deleted as duplicate of 200177. (JJT 1/11/00) Well #4, constructed in 1943 according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99)
S00521	29	23	32		C	A	800	MTPL	Rock-Tenn	2300 Wabash Ave	Saint Paul	4a	2d	Deleted as duplicate of 236438. (JJT 1/11/00) Well #5, constructed in 1946 according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99)
S00522	29	23	32						Scaffold Service Inc.	2523 Wabash Ave	Saint Paul	4a		Deleted as an elevator. Doug Radke, owner, stated that he has no well and has an elevator. (PJS 8/12/99)
S00527	30	24	25	A	U				Astrup	1735 Innsbruck Pky W	Columbia Heights	4a	5	Homeowner stated they have lived at this address since 1975. They are on city water and do not have a well. (PJS 1/11/00)
S00530	30	23	30	BD	U				Peters	674 Silver Lake Rd	New Brighton	4a	7b	Owner of 6 yrs stated that no well is on the property. City water is used. (PJS 7/27/99)
S00547						U				University Ave		4b		Not enough information to search for this well.

TABLE 2.5

CHANGES TO WELLS IDENTIFIED FOR FURTHER
INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
S00549	29	23	7	D	D	A	~400		Sunset Memorial Park (D)	2250 St. Anthony Blvd.	Minneapolis	4b		Deleted as duplicate of 242207 or 243411. Assumed to be Sunset Memorial Cemetery Park, no other Sunset Parks exist. Sherri Hoitomt, maintenance mgr, stated that they have two wells (about 400 ft deep). The water from these wells is used in the rest rooms, and for irrigation. Bottled water is used for drinking. (PJS 10/4/99)
S00550	29	23	7	D	D	A	~400		Sunset Memorial Park (S)	2250 St. Anthony Blvd.	Minneapolis	4b		Deleted as duplicate of 242207 or 243411. Assumed to be Sunset Memorial Cemetery Park, no other Sunset Parks exist. Sherri Hoitomt, maintenance mgr, stated that they have two wells (about 400 ft deep). The water from these wells is used in the rest rooms, and for irrigation. Bottled water is used for drinking purposes. Duplicate of 242207 or 243411. (PJS 10/4/99)
S00551					U	U			Tamarack Care Temp			4b		Searched phone books and other records but could not obtain any additional information.
S00559	29	24	13	A	U				Delorme, Larry	1668 Mississippi St	Fridley	4a	3	Location is out of the buffer zone. Phone # 612/571-5458
S00565	29	24	13	C	U				Gergen	6133 Wood La NE	Fridley	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
S00570	29	24	13	B	U				Kohlhase	6434 Taylor St NE	Fridley	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
S00571	29	24	13	B	U				Labandz	1356 64th Ave	Fridley	4a	3	This well is located between the buffer zone and the Study Area. Regardless of the well depth, this well is a category 3.
S00610	29	24	23	D	U	U			Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	4a		Deleted, out of study area. (PJS 7/30/99)
S00618	29	24	13	A	U	I	380		Stillman	2112 Broadway St NE	Minneapolis	4a	7a	Well abandoned 3 yrs ago - H103251.
S00624	29	24	23	D	U	U			Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	4a		Deleted, out of study area. (PJS 7/30/99)
S00625	29	24	23	D	U	U			Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	4a		Deleted, out of study area. (PJS 7/30/99)
S00644									Great Lakes Pipe Line Co	County Rd C & Minn Transf RR	Columbia Heights	4b		Deleted as duplicate of unique # 249190
S00647									Oak Grove Mobile Home Park			4b		Deleted as duplicate of unique # 249108
S00649									Northrup		New Brighton	4b		Deleted as duplicate of unique # 249134

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INFORMATION IN THE 1996/1997 UPDATE
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique No.	T	R	S	Subsection	Use	Status	Depth	Aquifer	Name	Address	City	Old Cat	New Cat	Notes
S00650									CME		New Brighton	4b		Only CME found in the vicinity of the study area was located on the 24th floor of the Piper-Jaffery Tower. (PJS 7/30/99)
S00651	29	23	19			MW				Como & 19Th		4b	6	Monitoring wells at this intersection and possible duplicate of 180916 or 403277. (PJS 7/30/99)
					D	I			Nesley	1666 Highway 96		4a	5	Residence no longer exists. Removed for the existing Orthodox church which is on city water. (PJS 7/21/99)
									Frederickson	2900 30th Ave N		4a		Deleted. Out of Study Area. Field checked(PJS 7/28/99).
	30	23			D	I	>71		Poser, Ann	1975 W County Rd D	Arden Hills	4a	3	Well is in the front yard but disconnected - on city water. Pump was measured at 71', water level was measured at 69'. (PJS 7/29/99)
										1851 Highway 96	Arden Hills	4a	5	No residence or business at or near this address. (PJS 7/21/99)
					D	I			Hom Furniture	1203 W County Rd E	Arden Hills	4a	7b	Former Owner, Kevin Carrol, Stated that: The building switched to city water some time ago and the well was abandoned. (PJS 7/27/99)
									Basic Industries	1275 Old Highway 8	New Brighton	4a	5	Property was purchased 5 yrs ago and the buyer stated that the disclosure agreement showed no well. On city water. (PJS 8/4/99) Sealed well number matched with this address. (KC 12/99)
									E/M Corp	2172 Old Highway 8	New Brighton	4a	5	Environmental personnel (for 20 years) stated that there has never been a well on this property. (PJS 7/22/99)
	30	23	32						Windsor Green Association	229 Windsor Lane	New Brighton	4a	5	According to maintenance personnel: No well, and the complex has been on city water since 1966. (PJS 7/29/99)
										5830 Stinson Blvd	New Brighton	4a	5	Field checked (PJS 7/29/99) and no such address.
									Brighton Shores Townhome	Long Lake Road & I694	New Brighton	4b	5	Management group personnel (for 6 years) stated that: The complex has always been on city water and there is no known well. (PJS 7/26/99)
									General Office Products	2050 Old Highway 8	New Brighton	4a	7b	Jack Boss, manager, stated that they have never had a well. On city water. (PJS 8/4/99) Deleted as a duplicate of 235567.

TABLE 2.5

CHANGES TO WELLS IDENTIFIED FOR FURTHER
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Unique No.	*T*	*R*	*S*	*Subsection*	*Use*	*Status*	*Depth*	*Aquifer*	*Name*	*Address*	*City*	*Old Cat*	*New Cat*	*Notes*
										639 6th Ave NW	New Brighton	4a	7b	Field checked (PJS 7/29/99 and 12/9/99) and building was burned and the residence removed. Contact at the City of New Brighton (Kevin Lock) said well was abandoned. (PJS 12/10/99)
	30	23	32							91 1St St SE	New Brighton	4a	7b	City of New Brighton personnel stated that the residence was removed and the well was abandoned for the existing development. (PJS 7/27/99)
	30	23	4						Stein	1718 Pinewood Dr	Shoreview	4a	5	On city water, no known well. (PJS 8/6/99)
	30	23	4	D		I				1710 Pinewood Dr	Shoreview	4a	7b	Owner stated that the home was recently purchased in 1998, and the well disclosure showed that the well was capped. (PJS 8/6/99)
	30	23	4		D	I	<80?		Johnson	1719 Pinewood Dr	Shoreview	4a	7b	Switched to city water in January 1989 and the well was abandoned by Husnik Sewer Service. (PJS 7/27/99)
	30	23	4	50	D	I			Schumacher, Walter P	1724 Terrace Dr	Shoreview	4a	7b	Home owner stated that the well was abandoned 7 or 8 years ago and that they are on city water. (PJS 7/22/99)
	30	23	4	D		I			Paulsen	1733 Pinewood Dr	Shoreview	4a	7b	Owner stated that the home was purchased in 1992, and the well was capped by the previous owner. (PJS
	29	23	32		C	A	790	MTPL	Rock-Tenn	2250 Wabash Ave	Saint Paul	4a	2c	Well #6, constructed in 1956 according to environmental manager, Gary Kaziuzewicz. (PJS 9/2/99) This well added to the database.

Notes:

Abbreviations Under Use Column:
- U - Unknown
- AC - Air Conditioning
- C - Commercial
- D - Domestic
- I - Industrial
- IR - Irrigation
- M - Monitoring Well

Abbreviations Under Status Column:
- A - Active
- I - Inactive
- U - Unknown

TABLE 2.6

CATEGORY CHANGES MADE TO WELL INVENTORY
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*Old Category*	*New Category*	*Comments*
161496	3	7a	MDH reported as sealed
107405	2a	3	Buffer zone change
112344	2a	3	Buffer zone change
126866	2a	3	Buffer zone change
134328	7b	7a	MDH reported as sealed
191901	6	7a	MDH reported as sealed
200070	7b	7a	MDH reported as sealed
200072	7b	7a	MDH reported as sealed
200151	3	7a	MDH reported as sealed
200152	7b	7a	MDH reported as sealed
200154	2b	3	Buffer zone change
200157	7b	7a	MDH reported as sealed
200174	2c	3	Buffer zone change
200175	2c	7a	MDH reported as sealed
200177	1b	3	1998 plume contours
200180	2c	1c	1998 plume contours
200263	1c	2c	1998 plume contours
200384	2b	3	Buffer zone change
200385	2c	3	Buffer zone change
200388	1b	3	1998 plume contours
200393	7b	7a	MDH reported as sealed
200819	2d	7a	MDH reported as sealed
206689	1a	2a	1998 plume contours
206725	6	7a	MDH reported as sealed
206753	7b	7a	MDH reported as sealed
206755	7b	7a	MDH reported as sealed
206759	7b	7a	MDH reported as sealed
206762	7b	7a	MDH reported as sealed
206763	1a	2a	1998 plume contours
206787	2b	3	Buffer zone change
206788	2a	3	Buffer zone change
206789	7b	7a	MDH reported as sealed
206791	7b	7a	MDH reported as sealed
206798	7b	7a	MDH reported as sealed
223844	7b	7a	MDH reported as sealed
223845	4b	7a	MDH reported as sealed
225745	1b	7b	Based on field check, well is sealed
227302	3	7a	MDH reported as sealed
231741	2a	3	Buffer zone change
231854	6	7a	MDH reported as sealed

TABLE 2.6

CATEGORY CHANGES MADE TO WELL INVENTORY
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*Old Category*	*New Category*	*Comments*
232065	6	7a	MDH reported as sealed
233221	2c	2d	1998 plume contours
233520	1c	2c	1998 plume contours
233752	3	7a	MDH reported as sealed
233764	3	7a	MDH reported as sealed
233841	3	7a	MDH reported as sealed
233876	3	7a	MDH reported as sealed
234010	2c	3	Buffer zone change
234305	1b	7b	Based on field check, well is sealed
234306	1a	3	1998 plume contours
234307	1a	3	1998 plume contours
234308	2a	3	Buffer zone change
234309	2a	3	Buffer zone change
234310	2a	3	Buffer zone change
234311	2a	3	Buffer zone change
234312	2a	3	Buffer zone change
234313	2a	3	Buffer zone change
234318	2a	7a	MDH reported as sealed
234320	1a	7a	MDH reported as sealed
234331	2a	3	Buffer zone change
234343	2a	3	Buffer zone change
234344	2a	3	Buffer zone change
234366	1d	2d	1998 plume contours
234374	2a	3	Buffer zone change
234403	3	7a	MDH reported as sealed
234405	2a	3	Buffer zone change
234425	7b	7a	MDH reported as sealed
234426	1a	7a	MDH reported as sealed
234429	2a	3	Buffer zone change
234431	7b	7a	MDH reported as sealed
234441	3	7a	MDH reported as sealed
234465	4a	7a	MDH reported as sealed
234466	7b	7a	MDH reported as sealed
234476	4a	7a	MDH reported as sealed
234564	4a	7a	MDH reported as sealed
234565	3	7a	MDH reported as sealed
236439	1c	3	1998 plume contours
242219	1a	3	1998 plume contours
244637	3	7a	MDH reported as sealed
247102	7b	7a	MDH reported as sealed

TABLE 2.6

CATEGORY CHANGES MADE TO WELL INVENTORY
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*Old Category*	*New Category*	*Comments*
247609	2d	7a	MDH reported as sealed
249007	1a	3	1998 plume contours
249113	1a	2a	1998 plume contours
249127	3	7b	Based on field check, well is sealed
249141	3	7a	MDH reported as sealed
249148	2b	3	Buffer zone change
249162	2b	3	Buffer zone change
249195	1b	3	1998 plume contours
249602	1b	3	1998 plume contours
249607	1b	1d	Based on field check, well is non-operational
249639	1a	3	1998 plume contours
249825	3	7a	MDH reported as sealed
420705	6	7a	MDH reported as sealed
420712	6	7a	MDH reported as sealed
433298	2a	1a	1998 plume contours
452773	3	7a	MDH reported as sealed
452774	7b	7a	MDH reported as sealed
461047	6	7a	MDH reported as sealed
462247	6	7a	MDH reported as sealed
471306	3	7a	MDH reported as sealed
478982	6	7a	MDH reported as sealed
478984	6	7a	MDH reported as sealed
478985	6	7a	MDH reported as sealed
479757	6	7a	MDH reported as sealed
479758	6	7a	MDH reported as sealed
480785	1a	3	1998 plume contours
480951	6	7a	MDH reported as sealed
480952	6	7a	MDH reported as sealed
480953	6	7a	MDH reported as sealed
483693	6	7a	MDH reported as sealed
483694	6	7a	MDH reported as sealed
483695	6	7a	MDH reported as sealed
483696	6	7a	MDH reported as sealed
483711	6	7a	MDH reported as sealed
508115	6	7a	MDH reported as sealed
514204	6	7a	MDH reported as sealed
514205	6	7a	MDH reported as sealed
514206	6	7a	MDH reported as sealed
517502	6	7a	MDH reported as sealed
517503	6	7a	MDH reported as sealed

TABLE 2.6

CATEGORY CHANGES MADE TO WELL INVENTORY
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*Old Category*	*New Category*	*Comments*
517504	6	7a	MDH reported as sealed
519153	6	7a	MDH reported as sealed
519154	6	7a	MDH reported as sealed
519155	6	7a	MDH reported as sealed
519156	6	7a	MDH reported as sealed
521396	6	7a	MDH reported as sealed
521397	6	7a	MDH reported as sealed
521398	6	7a	MDH reported as sealed
521399	6	7a	MDH reported as sealed
522493	6	7a	MDH reported as sealed
522494	6	7a	MDH reported as sealed
522495	6	7a	MDH reported as sealed
522496	6	7a	MDH reported as sealed
523375	6	7a	MDH reported as sealed
523376	6	7a	MDH reported as sealed
523377	6	7a	MDH reported as sealed
523400	6	7a	MDH reported as sealed
523401	6	7a	MDH reported as sealed
523402	6	7a	MDH reported as sealed
523403	6	7a	MDH reported as sealed
523404	6	7a	MDH reported as sealed
541543	7b	7a	Same as H0034648
552529	6	7a	MDH reported as sealed
557616	6	7a	MDH reported as sealed
560546	6	7a	MDH reported as sealed
560664	6	7a	MDH reported as sealed
560665	6	7a	MDH reported as sealed
560666	6	7a	MDH reported as sealed
561436	6	7a	MDH reported as sealed
561676	6	7a	MDH reported as sealed
561677	6	7a	MDH reported as sealed
561733	6	7a	MDH reported as sealed
565825	6	7a	MDH reported as sealed
565826	6	7a	MDH reported as sealed
565827	6	7a	MDH reported as sealed
570312	6	7a	MDH reported as sealed
572082	2a	7a	MDH reported as sealed
575976	6	7a	MDH reported as sealed
575985	6	7a	MDH reported as sealed
575986	6	7a	MDH reported as sealed

TABLE 2.6

CATEGORY CHANGES MADE TO WELL INVENTORY
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*Old Category*	*New Category*	*Comments*
575987	6	7a	MDH reported as sealed
576220	6	7a	MDH reported as sealed
576224	6	7a	MDH reported as sealed
576945	6	7a	MDH reported as sealed
190292	7a	7a	Change address to 2450 38th Ave S
190291	7a	7a	Change address to 2450 38th Ave S
1275 Old Highway 8	4a	7a	MDH reported as sealed
1690 Terrace	1a	7b	Based on field check, well is sealed
1691 Pinewood	1a	7b	Based on field check, well is sealed
1705 Roselawn Ave.	7a	7a	Add H0038705 to unique number
1724 Pinewood	1a	1d	Based on field check, well is non-operational
177 Cleveland Ave.	7a	7a	Add H0021682 to unique number
1843 County Road C	7a	7a	Add H0034644 to unique number
1898 Noble Road	3	7a	Add H0137391 to unique number
Hagel	2b	3	Buffer zone change
S00231	3	7a	MDH reported as sealed
S00312	4a	7a	MDH reported as sealed
S00468	6	7a	MDH reported as sealed
S00475	1a	3	1998 plume contours
S00477	1a	3	1998 plume contours
S00490	2a	1a	1998 plume contours
S00529	1c	3	1998 plume contours
S00575	3	7a	MDH reported as sealed
S00618	4a	7a	MDH reported as sealed
S00634	7b	7a	MDH reported as sealed

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*T*	*R*	*S*	*Subsection*	*Use*	*Cat*	*Name*	*Street Address*	*City*	
20372					Unknown	4b		Drew		1999-Unique number shown appears to be a mistake. No Drew Ave/St. in Twin Cities.
100161	29	23	21	DCAD	Public Supply	3	MN Dept Of Conservation	1265 Snelling Ave N	St Paul	1999-Out of Study Area.
104897					Unknown	4b	Resident	20210 Hillside Dr		1999-Out of Study Area.
105190					Domestic	4b	Kaunzner	29911 109th Ave. North	Hanover	1999-Out of Study Area.
105294					Domestic	4b	Daleiden	5365 Harff Rd.	Greenfield	1999-Out of Study Area.
107090	120	24	35	ACD	Unknown	4b				1999-Out of Study Area.
114374	116	23	6	CBDBCB	Unknown	4b				1999-Out of Study Area.
114387	29	23	16	DDADDC	Domestic	3	Crowley	1769 N Snelling Ave	Falcon Hts	1999-Out of Study Area.
126060	30	23	34	CACADD	Domestic	3	Resident	3270 N Hamline Ave	New Brighton	1999-Out of Study Area.
126565					Domestic	4b	Marvin George Bldrs Inc	Hassan Hills		1999-Out of Study Area.
126764					Domestic	4b	Christian Realty	Hassan Township		1999-Driller provided location which is Out of Study Area.
128143					Domestic	4b	Beckholtz			1999-Out of Study Area.
132487					Domestic	4b	Christian Bldrs			1999-Out of Study Area.
135502	29	23	21	CCAAAA	Public Supply	3	University Of Minnesota	Commonwealth & Gortner NW	St Paul	1999-Out of Study Area.
135503	29	23	21	CBADDA	Industrial	3	University Of Minnesota	Fitch & Gortner N	St Paul	1999-Out of Study Area.
135504	29	23	21	BDCDDA	Monitoring	7b	University Of Minnesota		St Paul	1999-Out of Study Area.
135506	29	23	21	CBADDA	Monitoring	7b	University Of Minnesota		St Paul	1999-Out of Study Area.
135508	29	23	21	CBADAC	Monitoring	7b	University Of Minnesota		St Paul	1999-Out of Study Area.
135513	29	23	21	CBADDB	Monitoring	7b	University Of Minnesota		St Paul	1999-Out of Study Area.
135514	29	23	21	CBADCA	Monitoring	7b	University Of Minnesota		St Paul	1999-Out of Study Area.
137182					Unknown	4b	Rogers Well Co.	17555 Duck Lake Trail	Eden Prairie	1999-Out of Study Area.
138915	30	23	34	ABAAAD	Commercial	3	Mcgough Const	1240 W County Rd E	New Brighton	1999-Out of Study Area.
145793					Domestic	4b	Manick			1999-Out of Study Area.
146359					Unknown	4b				1999-Out of Study Area.
149740	29	23	16	DBCADA	Irrigation	3	University Of Minnesota	St Paul Campus	St Paul	1999-Out of Study Area.
158039					Unknown	4b	Stevens Well Co.	6420 Hwy 12 West	Maple Plain	1999-Out of Study Area.
163479					Other	4b	Lakeside Industries	4400 78th St. West	Bloomington	1999-Out of Study Area.
163655					Domestic	4b	Christian Bldrs			1999-Out of Study Area.
163691	29	24	23	AA	Domestic	3	Stewart	609 4th Ave SE	Minneapolis	1999-Out of Study Area.
169700					Domestic	4b	Christian Bldrs	Tucker Road	Rogers	1999-Out of Study Area. McAlpine Bros (driller) provided location.
170267					Unknown	4b		Willow Dr		1999-Out of Study Area.
172651					Unknown	4b		Wildhurst Tr		1999-Out of Study Area.
184909					Unknown	4b		Pioneer Tr	Eden Prairie	1999-Out of Study Area.

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
185808	29	23	21	CBADAD	Monitoring	7b	University Of Minnesota	Fitch Ave & Gortner	St Paul	1999-Out of Study Area.
185809	29	23	21	CBDDDD	Monitoring	6	University Of Minnesota		St Paul	1999-Out of Study Area.
185810	29	23	21	CACCCC	Monitoring	7b	University Of Minnesota	Commonwealth & Gortner Ave	St Paul	1999-Out of Study Area.
191102					Domestic	4b	Christian Bldrs	Hwy 152 and 94	Hassan Township	1999-Out of Study Area.. McAlpine Bros (driller) provided location.
194191	29	23	33	BACBDA	Domestic	3	Richter Vinegar Co	582 Prior Ave N	St Paul	1999-Out of Study Area.
197308					Domestic	4b	Dan Mor, Inc	11316 Colorado		1999-Out of Study Area.
200062	29	23			Domestic	3	Walstrom	1236 W Hoyt	St Paul	1999-Out of Study Area.
200069	29	23	4	DDCBAD	Commercial	3	Glendenning	1665 W County Rd C	Roseville	1999-Out of Study Area.
200083	29	23	9	AADDBA	Commercial	3	Polar Food Locker	Snelling And County Rd C	Roseville	1999-Out of Study Area.
200095	29	23	9	DDCAAC	Domestic	3	Regmer	2212 Haddington Rd	Roseville	1999-Out of Study Area.
200135	29	23	16	AAABDB	Domestic	3	Garley	1610 W County Rd B	Roseville	1999-Out of Study Area.
200136	29	23	16	ACACDC	Domestic	3	Baker	1987 Herschel	Roseville	1999-Out of Study Area.
200138	29	23	16	ADDABC	Domestic	3	Koiss	15 Midoaks Ln	Roseville	1999-Out of Study Area.
200142	29	23	16	DDBADD	Domestic	3	Muller	1766 Fry St	Falcon Hts	1999-Out of Study Area.
200143	29	23	16	DDCADB	Domestic	3	Conlin	1756 N Fry	Falcon Hts	1999-Out of Study Area.
200159	29	23	21	AAAAB	Commercial	3	Farmers Union Grain Terminal	Snelling And Larpenteur	St Paul	1999-Out of Study Area.
200160	29	23	21	BCABAB	Public Supply	3	University Of Minnesota	1980 Folwell Ave	St Paul	1999-Out of Study Area.
200161	29	23	21	DCADAA	Public Supply	3	MN Dept Of Conservation	1265 Snelling Ave N	St Paul	1999-Out of Study Area.
200169	29	23	28	ABBD	Unknown	3	Canada Natl. Railway	Fair Grounds #1		1999-Out of Study Area.
200170	29	23	28	ABBD	Unknown	3	Canada Natl. Railway	Fair Grounds #2		1999-Out of Study Area.
200171	29	23	28	CBDAAB	Industrial	3	Plating, Inc	888 Prior Ave N	St Paul	1999-Out of Study Area.
200181	29	23	33	ACABCA	Industrial	7a	Huot Mnfg Co	550 N Wheeler Ave & Charles	St Paul	1999-Out of Study Area.
200183	29	23	33	BABA	Monitoring	7a	Aluminum Corp Of America	1902 W Minnehaha Ave	St Paul	1999-Out of Study Area.
200184	29	23	33	BBDDAA	Commercial	3	Midway Ice And Fuel	University And Prior	St Paul	1999-Out of Study Area.
200185	29	23	33	BACCCB	Industrial	3	Cedar Sanitary Ice	601 N Prior	St Paul	1999-Out of Study Area.
200186	29	23	33	BCBDCC	Commercial	3	University Of Minnesota	1919 W University Ave	St Paul	1999-Out of Study Area.
200187	29	23	33	CCBD	Commercial	3	Mpls St Paul Sanitary	Roblyn And Terrace Pk	St Paul	1999-Out of Study Area.
200188	29	23	33	DACBAB	Public Supply	7a	Midway Hospital	1700 University	St Paul	1999-Out of Study Area.
200189	29	23	33	DACDAC	Commercial	3	Victor Rosenbloom Coop Plati	1605 Iglehart And Fry	St Paul	1999-Out of Study Area.
200375	29	24	23	ACCDCB	Commercial	2b	Exposition Bldg	Central Ave And Main	Minneapolis	1999-Out of Study Area.
200382	29	24	23	DAAABB	Commercial	2b	Blue Ribbon Food Service	528 University Ave	Minneapolis	1999-Out of Study Area.
200529	30	23	33	DCCC	Public Supply	3	Ind School Dist	Arden Hills	New Brighton	1999-Out of Study Area.

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
200530	30	23	33	DDABDB	Public Supply	3	Nazareth Hall Seminary	3003 N Snelling Ave	Arden Hills	1999-Out of Study Area.
200531	30	23	33	DDBBDB	Public Supply	3	Nazareth Hall Seminary	3003 N Snelling Ave	Arden Hills	1999-Out of Study Area.
200630	29	24	23	DBAAAC	Industrial	3	Pillsbury	335 Main St. SE	Minneapolis	1999-Out of Study Area.
200631	29	24	23	ABDADD	Commercial	2b	Central Creamery Co	123 5th St SE	Minneapolis	1999-Out of Study Area.
206800	30	23	34	BCBCAB	Domestic	3	Rengel	3450 Siems Ct	Arden Hills	1999-Out of Study Area.
206823	30	23	34	BDCACA	Domestic	3		3461 Glen Arden Ct	Arden Hills	1999-Out of Study Area.
206824	30	23	34	CADBAD	Domestic	3	Wallace	1366 Cummings La	Arden Hills	1999-Out of Study Area.
206825	30	23	34	CDAADB	Municipal	3	Josephine-Johanna Lakes	Nw Shore Of Lake Josephine	Arden Hills	1999-Out of Study Area.
206854	115	22	3	CDDDBB	Unknown	4b				1999-Out of Study Area.
206855	115	22	3	CDDDAB	Unknown	4b				1999-Out of Study Area.
206953	120	24	14	AAADAB	Unknown	4b				1999-Out of Study Area.
207243	115	21	31	BBABBC	Unknown	4b		41St Ave N		1999-Out of Study Area.
210647	119	35	2	BDBABB	Unknown	4b		Lake & Taft Ln		1999-Out of Study Area.
212641	30	23	34	BCDDA	Domestic	3	Larson	3413 Snelling N	Arden Hills	1999-Out of Study Area.
218019	120	24	1	ABCDAD	Unknown	4b				1999-Out of Study Area.
218021	120	24	14	AAADAB	Unknown	4b				1999-Out of Study Area.
223600	29	23	21	BABABA	Domestic	3	Labalstrs	1900 W Larpenteur	Falcon Hts	1999-Out of Study Area.
223837	29	23	21	CBAABD	Unknown	3	University Of Minnesota	Farm Campus	St Paul	1999-Out of Study Area.
223838	29	23	28	BCBBCC	Industrial	3	Berchems Ready Mix Concrete	2058 Kasota Ave	St Paul	1999-Out of Study Area.
225652	30	23	33	ABDBDA	Public Supply	3	Johanna Lake		Arden Hills	1999-Out of Study Area.
233289	29	23	16	ACCA		3				1999-Out of Study Area.
233505	29	23	33	BABDBD	Industrial	3	Univac Plant No 2	Prior & Minnehaha Ave	St Paul	1999-Out of Study Area.
233721	29	23	4	DAAACC	Commercial	3	Countryside Restaurant	2851 N Snelling	Roseville	1999-Out of Study Area.
233724	29	23	4	ACBC	Domestic	3		1811 Standbridge	Roseville	1999-Out of Study Area.
233731	29	23	4	ACBC	Domestic	3		1778 Lydia Ave	Roseville	1999-Out of Study Area.
233732	29	23	4	ACBB	Domestic	3		1775 Lydia Ave	Roseville	1999-Out of Study Area.
233751	30	23	34	BACA	Domestic	3	Miller	1428 Arden Pl	Arden Hills	1999-Out of Study Area.
233782	30	23	34	BABD	Domestic	3		1406 Arden Pl	Arden Hills	1999-Out of Study Area.
233788	29	23	16	ACCB	Domestic	3	Reinardt	1800 Ryan	Roseville	1999-Out of Study Area.
233789	29	23	16	ACCA	Domestic	3	Underbakke	1788 Ryan	Roseville	1999-Out of Study Area.
233791	30	23	34	BCAA	Domestic	3		1455 Skiles La	Arden Hills	1999-Out of Study Area.
233793	29	23	16	ACBDBB		3				1999-Out of Study Area.
233821	30	23	34	BADC	Domestic	3		1400 Forest La	Arden Hills	1999-Out of Study Area.
233822	30	23	34	BDAD	Domestic	3	Smith	3448 Glen Arden Rd	Arden Hills	1999-Out of Study Area.
233823	30	23	34	BDAA	Domestic	3	Curtis	3466 Glen Arden Rd	St Paul	1999-Out of Study Area.
233828	29	23	16	ACAC	Domestic	3		1987 Hereschel	Roseville	1999-Out of Study Area.
233829	29	23	16	ACAC	Domestic	3		2001 Hereschel	Roseville	1999-Out of Study Area.
233837	30	23	33	ACCC	Domestic	3		1833 Lake Lane W	Arden Hills	1999-Out of Study Area.
233873	29	23	9	ADDB	Domestic	3	Stark	1630 Bruce St	Roseville	1999-Out of Study Area.
233874	29	23	9	ADDB	Domestic	3		1622 Bruce St	Roseville	1999-Out of Study Area.

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
233902	29	23	16	DDDB	Domestic	3		1717 St Mary	Falcon Hts	1999-Out of Study Area.
233919	29	23	32	A	Unknown	3	Resident	473 N Cleveland	St Paul	1999-Out of Study Area.
234427	30	23	21	AB	Domestic	4a	Hammond	8071 Long Lake Rd	Mounds View	1999-Out of Study Area.
234458	30	23	34	BB	Domestic	3	Kuehn	3581 Ridgewood Rd	Arden Hills	1999-Out of Study Area.
234460	30	23	34	BB	Domestic	3	Mitchell	3568 Siems Ct	Arden Hills	1999-Out of Study Area.
234461	30	23	34	BC	Domestic	3	Lundgren	3487 Ridgewood Road	Arden Hills	1999-Out of Study Area.
234489	29	23	16	AD	Domestic	3	Smiglewski	1749 W Roselawn Ave	Roseville	1999-Out of Study Area.
234496	29	23	4	AD	Domestic	3	Briese	1654 Millwood	Roseville	1999-Out of Study Area.
234508	29	23	9	AC	Domestic	3	Weiss	1776 Bruce Ave	Roseville	1999-Out of Study Area.
234510	29	23	9	AB	Domestic	3	Mandel	2490 Beacon St	Roseville	1999-Out of Study Area.
234559	30	23	34	BA	Irrigation	3	Corpstein	3544 Snelling Ave N	Arden Hills	1999-Out of Study Area.
235581	29	24	23	ACAC		7b	Foremost Dairy			1999-Out of Study Area.
236084	29	24	23	DAACBA		7a	National Purity Soap	110 Fifth Ave SE	Minneapolis	1999-Out of Study Area.
239450	29	24	13			5	Standard Sausage	1307 South 4th	Minneapolis	1999-Out of Study Area.
239465					Unknown	4b	Lennox	17145 NW Navajo St	Andover	1999-Out of Study Area.
239466					Unknown	4b	Lennox	7201 NE East River Road	Fridley	1999-Out of Study Area.
239472					Unknown	4b	Hyland Park 2			1999-Out of Study Area.
239473					Unknown	4b	Hyland Park			1999-Out of Study Area.
242364	29	23	21	CBAD	Other	3	University Of Minnesota	St Paul Campus	St Paul	1999-Out of Study Area.
243162	29	23	16	ACCABD	Domestic	3		1778 Ryan	Roseville	1999-Out of Study Area.
243166	30	23	34	CCCBBD	Domestic	3		3170 Asbury St	Arden Hills	1999-Out of Study Area.
243168	30	23	34	CAABCD	Domestic	3		1385 Cummings La	Arden Hills	1999-Out of Study Area.
243169	30	23	34	CABADD	Domestic	3	Selleck	1399 Cummings La	Arden Hills	1999-Out of Study Area.
244714	29	23	21	BCDACA	Public Supply	7b	University Of Minnesota	St Paul Campus	St Paul	1999-Out of Study Area.
244753	30	23	34	BACCCA	Domestic	3	Hustad		Arden Hills	1999-Out of Study Area.
244794	29	23	16	DDDBBB	Domestic	3			Falcon Hts	1999-Out of Study Area.
249117	29	23	28	D	Unknown	3	Newcome	3936 Dellview Ave	Arden Hills	1999-Out of Study Area.
249175	29	24	13	BC	Unknown	4a	South Studios	1331 Tyler St NE	Minneapolis	1999-Assumed to be an elevator based on manager interview.
249176	29	23	28	DD	Unknown	3	Carlson	747 N Snelling Ave	St Paul	1999-Out of Study Area.
249912	29	23	33			7a	Merrill	1731 University Ave	St Paul	1999-Out of Study Area.
293244					Unknown	4b		Mississippi La		1999-Out of Study Area.
400229	151	43	33		Unknown	4b	Derosier	Northridge Farms		1999-Out of Study Area.
405651	29	24	23	DADAAC	Industrial	2b	Metal-Matic Inc	629 SE 2nd St	Minneapolis	1999-Out of Study Area.
415975	115	22	9	BDCCBB	Unknown	4b	Shakopee 7			1999-Out of Study Area.
428296	29	23	33	CCCCCC	Other	6	Q Petroleum Corp	2057 Marshall Ave	St Paul	1999-Out of Study Area.
428297	29	23	33	CCCCCD	Other	6	Q Petroleum Corp	2057 Marshall Ave	St Paul	1999-Out of Study Area.
428298	29	23	33	CCCCCA	Other	6	Q Petroleum Corp	2057 Marshall Ave	St Paul	1999-Out of Study Area.
429491	29	24	23	ACCD		3	Minneapolis Pz No. 1, Site 18	Between 3rd Ave Bridge, 3rd Ave S		1999-Out of Study Area.

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
433278	29	23	21	DCAD	Other	3	Dept Of Natural Resources	Carnes & Nelson	St Paul	1999-Out of Study Area.
441493	29	24	23		Other	3	Minneapolis	Hennepin Ave	Minneapolis	1999-Out of Study Area.
443457	29	23	33	CCB		7a	Pro Stop Service Station	Cleveland Ave N (& Wabash)	St Paul	1999-Out of Study Area.
448015	29	23	33	BC		7a	Zane May	475 Prior Ave N	St Paul	1999-Out of Study Area.
448016	29	23	33	BC		7a	Zane May	475 Prior Ave N	St Paul	1999-Out of Study Area.
448017	29	23	33	BC		7a	Zane May	475 Prior Ave N	St Paul	1999-Out of Study Area.
449111	116	24	13	BDBCDC	Unknown	4b	Victoria 2	81st St.		1999-Out of Study Area.
465451	29	24	23	DBB	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
465469	29	24	23	CAA	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
465470	29	24	23	CAA	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
465473	29	24	23	CAA	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
465474	29	24	23	CAA	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
474039	29	23	33	BC		7a	Zane May	475 Prior Ave N	St Paul	1999-Out of Study Area.
479016	29	24	23	BAC		7b	Yellow Cab Company	105 First NE	Minneapolis	1999-Out of Study Area.
485626	29	23	33	DAD	Monitoring?	6	Mobil Oil Corp/Uno-Ven Co	326 Snelling Ave N	St Paul	1999-Out of Study Area.
496969	29	24	23	DBB	Monitoring	6	Northern States Power Co		Minneapolis	1999-Out of Study Area.
497377	29	24	23	DAB		7a	U S Postal Service	210 First S	Minneapolis	1999-Out of Study Area.
518961	29	23	33	DDB	Monitoring	7a	Lambrose	1825 University W	St Paul	1999-Out of Study Area.
519942	29	23	33	BBC	Unknown	7a	C E S Storage Warehouse	429 Prior	St Paul	1999-Out of Study Area.
521390	29	23	33	DDB	Monitoring	7a	Lambrose	1825 University Ave W	St Paul	1999-Out of Study Area.
521391	29	23	33	DDB	Monitoring	7a	Lambrose	1825 University Ave W	St Paul	1999-Out of Study Area.
521401	29	23	33	DDB	Monitoring	7a	Lambrose	1825 University Ave W	St Paul	1999-Out of Study Area.
522029	29	23	33	DCB	Monitoring	7a	Lubbers	1717 University Ave	St Paul	1999-Out of Study Area.
522030	29	23	33	DCB	Monitoring	7a	Lubbers	1717 University Ave	St Paul	1999-Out of Study Area.
522031	29	23	33	DCB	Monitoring	7a	Lubbers	1717 University Ave	St Paul	1999-Out of Study Area.
522069	29	23	33	DCB	Unknown	7a	Coggins	1745 University Ave	St Paul	1999-Out of Study Area.
522087	29	23	33	DCB		7a	Lubbers	1717 University Ave	St Paul	1999-Out of Study Area.
526900	29	23	33	DDB		7a	Lambrose	1825 University Ave W	St Paul	1999-Out of Study Area.
540712	29	23	33			7a	Towle Real Estate Company	429 Prior Ave N	St Paul	1999-Out of Study Area.
544058	29	24	24	C	Other	3		909 Main	Minneapolis	1999-Out of Study Area.
544059	29	24	24	C	Other	3		909 Main	Minneapolis	1999-Out of Study Area.

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
544078	29	23	28	BB	Other	3	Board Of Social Ministry	2040 Como	St. Paul	1999-Out of Study Area.
553552	29	23	28	BAB		7a	St Paul, City Of	Stella And Como	St Paul	1999-Out of Study Area.
561313					Unknown	4b	J. Scotty Builders	9900 Highbluff Lane	Hamel	1999-Out of Study Area.
564380	30	23	27	B	Elevator	3	Bethel College	3900 Bethel Dr	Arden Hills	1999-Elevator.
568182	29	23	33	DDD	Monitoring	6	Total Petroleum Inc.	Carrol	St Paul	1999-Out of Study Area.
568830	29	24	23	A	Monitoring	6	Metal-Matic	629 Second St SE		1999-Out of Study Area.
568831	29	24	23	A	Monitoring	6	Metal-Matic	629 Second St SE		1999-Out of Study Area.
568832	29	24	23	A	Monitoring	6	Metal-Matic	629 Second St SE		1999-Out of Study Area.
568839	29	23	33	BBD	Monitoring	6	Har-Mar Inc.	1780 University Ave W	St Paul	1999-Out of Study Area.
568840	29	23	33	BBD	Monitoring	6	Har-Mar Inc.	1810 University	St Paul	1999-Out of Study Area.
568841	29	23	33	BBD	Monitoring	6	Har-Mar Inc.	1810 University	St Paul	1999-Out of Study Area.
1900291	30	23	31	CCC		7a	Apache Plaza Ltd	2450 38th Ave	St. Anthony	Same as 190291
H0046913	29	23	21	DAD		7a	MN State Fair	Dan Patch Ave (& Cooper St)	St Paul	1999-Out of Study Area.
H0046914	29	23	21	DAD		7a	MN State Fair	Cooper (& Wright)	St Paul	1999-Out of Study Area.
H0056050	29	23	33	BCB		7a	Dart Transit Company			1999-Out of Study Area.
H0056080	29	23	33	ADD		7a	Cooperative Plating	1605 Iglehart Ave	St Paul	1999-Out of Study Area.
H0056095	29	23	33	BBC		7a	Cp Rail System			1999-Out of Study Area.
H0064821	29	23	33	CCB		7a	Harcos Chemicals, Inc.	584 Fairview Ave N	St Paul	1999-Out of Study Area.
H0065202	29	23	33	BBC		7a	MN Dot			1999-Out of Study Area.
H0069183	29	23	28	BCB		7a	Cemstone Products	2058 Energy Park Dr	St Paul	1999-Out of Study Area.
H0071275	29	23	33	B CB		7a	University Properties,	2102 University Ave W	St Paul	1999-Out of Study Area.
H0104682	29	23	16	A		7a	Prudential Homes	2008 Beacon St	Roseville	1999-Out of Study Area.
S00061	30	23	34	A	Unknown	3	Kaihoi	1400 Arden Pl	Arden Hills	1999-Out of Study Area.
S00069	30	23	34	CC	Unknown	3	Daly	1556 Edgewater Ave	Arden Hills	1999-Out of Study Area.
S00076	30	23	34	BD	Unknown	3	Paulson	3430 Glen Arden Rd	Arden Hills	1999-Out of Study Area.
S00184	29	23	4	ADA	Unknown	3	Handke	1674 Stanbridge Av	Roseville	1999-Out of Study Area.
S00214	30	23	34	BA	Unknown	3	Skooglun	1391 Arden Pl	Arden Hills	1999-Out of Study Area.
S00215	30	23	34	CD	Unknown	3	Nf	1415 Glenhill Rd	Arden Hills	1999-Out of Study Area.
S00233	30	23	34	CC	Unknown	3	Cox	3161 Ridgewood Rd	Arden Hills	1999-Out of Study Area.
S00234	30	23	34	CA	Unknown	3	Mondry	3263 Snelling Ave N	Arden Hills	1999-Out of Study Area.
S00236	30	23	34	CA	Unknown	3	Kulman	3279 Snelling Ave N	Arden Hills	1999-Out of Study Area.
S00237	30	23			Unknown	3	Resident	3331 N Snelling	Arden Hills	1999-Out of Study Area.
S00238	30	23	34	BC	Unknown	3	Mohn	3401 Snelling Ave N	Arden Hills	1999-Out of Study Area.
S00239	30	23	34	BC	Unknown	3	Michels	3436 Siems Ct	Arden Hills	1999-Out of Study Area.
S00240	30	23	34	BC	Unknown	3	Tsai	3461 Siems Ct	Arden Hills	1999-Out of Study Area.
S00249	29	23	21	C	Unknown	3	Commonwealth Terrace Coop	1250 Fifield Ave	Falcon Hts	1999-Out of Study Area.
S00253	29	23	16	D	Unknown	3	Wahl	1747 N Snelling Ave	Falcon Hts	1999-Out of Study Area.
S00257	29	23	16	D	Unknown	3	Douglas	1777 N Fry St	Falcon Hts	1999-Out of Study Area.
S00258	29	23	16	D	Unknown	3	O'Connell	St Mary's St	Falcon Hts	1999-Out of Study Area.

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	*T*	*R*	*S*	*Subsection*	*Use*	*Cat*	*Name*	*Street Address*	*City*	
S00266	29	23	21		Unknown	3	Minnesota State Agri Society		Falcon Hts	1999-Out of Study Area.
S00267	29	23	21		Unknown	3	Minnesota, State Of	Minnesota State	Falcon Hts	1999-Out of Study Area.
S00268	29	23	21		Unknown	3	Steak & Case Prime Steak Hs	MN State Fairgrounds	Falcon Hts	1999-Out of Study Area.
S00323	29	23	16	AA	Domestic	3	Resident	1643 Eldridge Ave	Roseville	1999-Out of Study Area.
S00335	29	23	16	ADDA	Domestic	3	Clausen	1957 Snelling Ave N	Roseville	1999-Out of Study Area.
S00340	29	23	16	AACD	Domestic	3	Gilbert	2064 Fry St	Roseville	1999-Out of Study Area.
S00354	29	23	16	ADD	Domestic	3	Harrison	32 Midoaks Ln	Roseville	1999-Out of Study Area.
S00357	30	23	3	DDCC	Unknown	3	Larson	1170 W Cty Rd I	Shoreview	1999-Out of Study Area.
S00358	30	23	3	DB	Unknown	3	Resident	1201 Silverthorn Ct	Shoreview	1999-Out of Study Area.
S00359	30	23	3	DB	Unknown	3	Lacasse	1279 Silverthorn Dr	Shoreview	1999-Out of Study Area.
S00360	30	23	3	DCC	Unknown	3	C W Houle Inc	1300 W Cty Rd I	Shoreview	1999-Out of Study Area.
S00361	30	23	3	CD	Unknown	3	Indykiewicz	1451 W Cty Rd I	Shoreview	1999-Out of Study Area.
S00402	30	23	3	D	Unknown	3	Nf	5711 N Lexington Ave	Shoreview	1999-Out of Study Area.
S00403	30	23	3	CAAA	Unknown	3	Schmitz	5747 Hamline Ave N	Shoreview	1999-Out of Study Area.
S00440	29	24	13		Unknown	4a	Minnesota Metal Finishing	409 Fillmore NE	Minneapolis	1999-Duplicate of 122253, business only has one well.
S00442	29	24	23	AB	Unknown	4a	State Land Dept	501 Hennepin Ave E	Minneapolis	1999-Employee stated that they have no wells, but had an old elevator.
S00446	29	23	17	BA	Unknown	4a	Gold Eagle Wash	1233 Larpenteur	Roseville	1999-Location is at section 15 CD, Out of the Study Area.
S00480	29	23	28	AA	Unknown	3	Resident	1533 Como Ave	St Paul	1999-Out of Study Area.
S00487	29	23	33	D	Unknown	3	Resident	1607 Inglehart Ave	St Paul	1999-Out of Study Area.
S00488	29	23	33	A	Unknown	3	Resident	1900 Minnehaha Ave	St Paul	1999-Out of Study Area.
S00492	29	23	33	BD	Unknown	3	Northern States Power Co	582 Prior Ave N	St Paul	1999-Out of Study Area.
S00494	29	23	33	BB	Unknown	3	Mirodan Leasing Inc	601 Prior Ave N	St Paul	1999-Out of Study Area.
S00499	29	23	33		Unknown	3	Resident	192 N Snelling Ave	St Paul	1999-Out of Study Area.
S00501	29	23	33	AD	Unknown	3	Kilau & Miller	597 Snelling Ave N	St Paul	1999-Out of Study Area.
S00502	29	23	28	AA	Unknown	3	J L Shiely Co	1101 Snelling Ave N	St Paul	1999-Out of Study Area.
S00503	29	23	28	AA	Unknown	3	J L Shiely Co	1101 Snelling Ave N	St Paul	1999-Out of Study Area.
S00510	29	23	33		Unknown	3	Resident	1660 University Ave W	St Paul	1999-Out of Study Area.
S00511	29	23	33	BD	Unknown	3	University Of Minnesota	1927 W University Ave	St Paul	1999-Out of Study Area.
S00513	29	23	29	DC	Unknown	4a	Specialty Building Services	2360 University Ave W	St Paul	1999-Manager stated no well, but have an elevator.
S00515	29	23	32	AD	Unknown	4a	Roseville Properties	2103 Wabash Ave	St Paul	1999-Manager stated no well, but have an elevator.
S00516	29	23	32		Unknown	4a	Farm Oyl	2127 Wabash Ave	St Paul	1999-Manager stated no well, but have an elevator.
S00520	29	23	32		Unknown	2d	Rock-Tenn	2300 Wabash Ave	St. Paul	1999-Duplicate of 236438.
S00521	29	23	32		Unknown	2c	Rock-Tenn	2290 Wabash Ave	St. Paul	1999-Duplicate of 200177.
S00522	29	23	32		Unknown	4a	Scaffold Service Inc.	2523 Wabash Ave	St Paul	1999-Manager stated no well, but have an elevator.

TABLE 2.7

WELLS DELETED FROM DATABASE
TCAAP WELL INVENTORY 1998/1999 UPDATE

Unique #	T	R	S	Subsection	Use	Cat	Name	Street Address	City	
S00549	29	23	7	D	Domestic	4b	Sunset Memorial Park (D)	2250 St Anthony Blvd	Minneapolis	1999-Duplicate of 242207 or 243411.
S00550	29	23	7	D	Domestic	4b	Sunset Memorial Park (S)	2250 St Anthony Blvd	Minneapolis	1999-Duplicate of 242207 or 243411.
S00568	30	23	34	B	Unknown	3	Huot, Sr	3521 Snelling Av	Arden Hills	1999-Out of Study Area.
S00576	29	23	33	A	Unknown	3	Northern States Power Co	582 Prior Ave N	St Paul	1999-Out of Study Area.
S00577	29	23	33	A	Unknown	3	Northern States Power Co	582 Prior Ave N	St Paul	1999-Out of Study Area.
S00610	29	24	23	D	Unknown	4a	Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	1999-Out of Study Area.
S00616	29	23	28	C	Unknown	3	Rosenkran	3650 Cleveland Ave N	Arden Hills	1999-Out of Study Area.
S00624	29	24	23	D	Unknown	4a	Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	1999-Out of Study Area.
S00625	29	24	23	D	Unknown	4a	Minneapolis Parks & Rec Dept	100 13th Ave S	Minneapolis	1999-Out of Study Area.
S00644					Unknown	4b	Great Lakes Pipe Line Co	County Rd C & Minn Transf RR	Columbia Hts	1999-Duplicate of 249190.
S00647						4b	Oak Grove Mobile Home Park			1999-Duplicate of 249108.
S00649						4b	Northrup		New Brighton	1999-Duplicate of 249134.
S00652	30	23	34	B		3		3466 Glen Arden Rd	Arden Hills	1999-Out of Study Area.
W30011	30	23	34	B		3	Millard	3466 Glenarden Rd	Arden Hills	1999-Out of Study Area.
						7b	General Office Products	2050 Old Highway 8	New Brighton	1999-Duplicate of 235567.
	30	23	34	CC		3		1517 Glenhill Rd	Arden Hills	1999-Out of Study Area.
	29	23	16	AD		3		1640 Ridgewood La N	Roseville	1999-Out of Study Area.
	29	23	4			3	Grekoff	1815 Lydia Ave		1999-Out of Study Area.
	30	23	34	B		3		3470 Siems Ct	Arden Hills	1999-Out of Study Area.
						4a	Frederickson	2900 30th Ave N		1999-Out of Study Area.

TABLE 2.8

1999 ANALYTICAL DATA
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Analand	*Units*	*234469 Palwski 2816 Hwy 88 7/1/99*	*S00444 Mpls. Park & Rec. Ontario & E River Rd 7/1/99*	*S00444 Mpls. Park & Rec. Ontario & E River Rd 7/1/99 Duplicate*
1,1,1-Trichloroethane	µg/L	< 1	< 1	< 1
1,1,2-Trichloroethane	µg/L	< 1	< 1	< 1
1,1,2-Trichlorotrifluoroethane	µg/L	< 1	< 1	< 1
1,1-Dichloroethane	µg/L	< 1	< 1	< 1
1,1-Dichloroethene	µg/L	< 1	< 1	< 1
1,2-Dichloroethane	µg/L	< 1	< 1	< 1
cis-1,2-Dichloroethene	µg/L	< 1	1.8	1.7
trans-1,2-Dichloroethene	µg/L	< 1	< 1	< 1
1,2-Dichloropropane	µg/L	< 1	< 1	< 1
Carbon tetrachloride	µg/L	< 1	< 1	< 1
Chloroform	µg/L	< 1	< 1	< 1
Methylene chloride	µg/L	< 1	< 1	< 1
Tetrachloroethene	µg/L	< 1	< 1	< 1
Trichloroethene	µg/L	< 1	0.86J	1.1
Vinyl chloride	µg/L	< 1	< 1	< 1

Notes:
J - Analand is estimated. Results below the reporting limit and above the method detection limit.

TABLE 3.1

WELLS RECOMMENDED FOR SAMPLING
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique	*Location*					*Previous*					
Number	*T*	*R*	*S*	*Subsection*	*Use*	*Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*
200603	29	23	19	CADABC	Public Supply		1110	1a	Miller Milling		
200805	29	23	6	ACCCAC	Municipal		427	1a	City of St Anthony	3357 Silver Lake Rd	St Anthony
234356	30	23	16	CC	Domestic	3/21/94	100	1a	Nordquist	1873 Old Hwy 8	New Brighton
234368	29	23	7	BA	Domestic	7/22/97	82	1a	Bochnak	2600 St Anthony Blvd	Minneapolis
235539	30	23	17	DDDACA	Domestic		345	1a	Jackson		
235566	30	23	16	CACC	Commerical		286	1a	Big Ten Supper Club		
240684	30	23	32		Domestic		330	1a		15th & Cty Rd 80	
247434	29	23	7		Public Supply		386	1a	Lowry Grove		
249004	30	23	4	D	Domestic	3/22/94	38	1a	Gamradt	5567 Fairview Ave	Shoreview
249608	29	23	20	B	Domestic	7/18/97	375	1a	Rapit Printing Inc	2520 Larpenteur Ave	Lauderdale
249898	29	23	6	CCCDCC	Domestic		251	1a		2901 Roosevelt St	
250107	29	23	8	BAABCC	Commerical		423	1a		2630 Cty Rd C	
250769	29	23	6	DAABBC	Domestic		258	1a		3600 33rd St NE	
433298	29	23	32	DCBA	Domestic		500	1a	Town And Country Golf Course	2279 Marshall Ave	St Paul
463528	29	23	19	CBCACD	Unknown			1a	Burlington Northern Railroad	2575 Doswell	St Paul
497941	29	23	30		DW		140	1a			
509052	29	23	31	ADABCD	Medical	3/22/94	302	1a	Shriners Hospital	2025 E River Rd	Minneapolis
S00490	29	23	32	C	Unknown		500	1a	Resident	435 Otis Ave	St Paul
200173	29	23	29	CBBBDC	Irrigation/Cool	3/22/94	525	1b	KSTP Radio TV	3415 University Ave	St Paul
234352	30	23	20	CB	Irrigation	6/27/97	120	1b	White	1206 12th Ave NW	New Brighton
234421	30	23	17	AD	Industrial	7/17/97	270	1b	BioChem	2151 Mustang Dr	New Brighton
234544	29	23	18	C	Commercial	7/29/86	500	1b	Hillcrest Shopper, Inc	2201 Kennedy St NE	Minneapolis
236512	30	23	21	CBBB	Industrial		300	1b	Gordon Rendering Co		
249632	30	24	25	AD	Irrigation	7/18/97	240	1b	Montzka	2301 N Upland Crest NE	Columbia Heights
127537	30	23	20	ADCCDD	Commercial	7/17/97	117	1c	Midwest Asphalt	1400 Old Hwy 8	New Brighton
200180	29	23	32	DCBADC	Commercial		500	1c	Town And Country Golf Course	2279 Marshal Ave	St Paul
200522	30	23	31	ABBAD	Commercial		254	1c	Pemtom	Silver Lake Rd	New Brighton
200523	30	23	31	ABCCAD	Commercial		255	1c	Pemton	Silver Lake Rd & Cty Rd E	New Brighton
200818	29	23	30	BADDCD	Industrial		433	1c	Commercial Gas Co	2633 4th St SE	Minneapolis
206724	30	23	9	CCBCBD	Public Supply		464	1c	TC Ordnance Plant		Arden Hills
206754	30	23	16	ABBBD	Industrial	3/17/94	340	1c	TC Ordnance Plant No 1	Mounds View Rd	Arden Hills
206756	30	23	16	BADADC	Industrial	3/17/94	335	1c	TC Ordnance Plant No 2	Mounds View Rd	Arden Hills
225906	29	23	8	CBBABA	Industrial		551	1c	St Paul Terminal Warehouse		Roseville
S00010	29	23	30	BDA	Industrial		500	1c	American National Can Co	150 26th Ave SE	Minneapolis

TABLE 3.1

WELLS RECOMMENDED FOR SAMPLING
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique Number	*Location* T	R	S	*Subsection*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*
S00425	29	23	30	BD	Unknown		280	1c	American National Can Co	150 26th Ave SE	Minneapolis
S00437	29	23	30	AD	Industrial		450	1c	Northern Star Co	3171 5th St SE	Minneapolis
206689	30	24	25	CCACBA	Domestic		223	2a	Foster	4629 Polk St NE	Fridley
206763	30	23	21	AAABBD	Domestic	3/23/94	142	2a	Zenench	1600 W Hwy 96	Arden Hills
234380	30	23	21	AA	Domestic	6/1/82	160	2a	Podlasek	4410 N Snelling Ave	Arden Hills
S00457	29	23	32	A	Unknown		518	2a	Bartusch Packing Co	565 N Cleveland Ave	St Paul
S00458	29	23	32	A	Unknown		518	2a	Bartusch Packing Co	567 N Cleveland Ave	St Paul
200176	29	23	32	AACC	Industrial		745	2b	Waldorf Paper Products	2236 Myrtle Ave	St Paul
200179	29	23	32	ADDAAD	Industrial		516	2b	Farm Oyl	2125 Wabash Ave	St Paul
234571	30	23	19	AA	Irrigation	7/24/97	200	2b	Leiser	1901 17th St NW	New Brighton
200076	29	23	8	BDCA	Industrial	3/22/94	550	2c	Old Dutch Foods, Inc	2375 Terminal Rd	St Paul
200150	29	23	17	BCCC	Industrial	12/12/84	555	2c	University of Minnesota	2533 Larpenteur	Lauderdale
200178	29	23	32	ADDA	Industrial		504	2c	Farm Oyl	2125 Wabash Ave	St Paul
200263	29	24	13	DDA	Commercial		425	2c	Land O'Lakes Creameries	2215 NE Kennedy St	Minneapolis
233520	30	23	29	DBADBB	Industrial	8/26/88	232	2c	MacGillis & Gibbs Company	440 5th Ave NW	New Brighton
235778	29	23	29	DCCCDB	Air Condition		345	2c	Specialty Manufacturing Co	2356 University Ave	St Paul
236029	29	24	13	DADCCB	Commercial		435	2c	Hillcrest Shopper	2201 Kennedy St NE	Minneapolis
S00517	29	23	32		Unknown		758	2c	Rock-Tenn	2211 Wabash Ave	St Paul
	29	23	32				790	2c	Rock-Tenn	2250 Wabash Ave.	Saint Paul
249621	30	23	4	DC	Unknown		25	3	Stenger Jr	1719 Terrace Dr	Shoreview
234341	30	23	31	DD	Industrial			4a	Murphy Rigging & Erecting	2225 Cty Rd D	New Brighton
234355	30	23	16	CC	Domestic	3/1/84		4a	Kingdom Hall	1987 Mound St	New Brighton
234363	30	23	20	BB	Domestic			4a	Resident	1603 14th Ave NW	New Brighton
234475	30	23	31	CA	Domestic			4a	Rissell	2805 Silver Ln NE	Minneapolis
234511	29	23	20	AA	Domestic			4a	Lindberg	2120 W Larpenteur	Roseville
234520	29	23	7	BA	Domestic			4a	Thompson	2832 Coolidge St NE	St Anthony
249112	30	23	20	CC	Domestic			4a	Rabbi	1176 Long Lake Rd	New Brighton
249114	30	23	29	BD	Unknown			4a	Schwab	642 8th Ave NW	New Brighton
249118	30	23	29	BD	Unknown			4a	Cameron	1003 7th St NW	New Brighton
249150	29	23	6	BB	Unknown			4a	Barres	3511 Stinson Blvd NE	St Anthony
249184	29	23	17	C	Unknown			4a	Warner	1964 Carl St	Lauderdale
249185	29	23	17	CC	Unknown			4a	Novotny	1706 Malvern St	Lauderdale
249191	29	23	8	C	Irrigation			4a	Wells	1651 Millwood Ave	Roseville
S00002	29	23	17		Irrigation			4a	Midland Hills Country Club	2001 N Fulham St	Roseville

TABLE 3.1

WELLS RECOMMENDED FOR SAMPLING
TCAAP WELL INVENTORY - 1998/1999 UPDATE

Unique Number	*Location*				*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*
	T	*R*	*S*	*Subsection*							
S00294	29	23	20	BB	Unknown			4a	Western Remodelers	2520 W Larpenteur Ave	St Paul
S00295	29	23	17	C	Unknown			4a	Alfson	2351 Summer St	Lauderdale
S00311	30	23	19	CAA	Domestic			4a	Anderson	1390 Silver Lake Rd	New Brighton
S00409	29	23	6	BB	Unknown			4a	Ohara	3553 Stinson Blvd NE	St Anthony
S00410	29	23	6	BB	Unknown			4a	Iacarella	3555 Stinson Blvd NE	Minneapolis
S00432	29	23	19		Unknown			4a	Curth Maulding Corp	27th Ave SE & GNRR	Minneapolis
S00462	30	23	31	A	Unknown			4a		2053 Old Hwy 8	New Brighton
S00491	29	23	32	BA	Unknown			4a	MN Diversified Industries Inc	666 Pelham Blvd	St Paul
S00608	30	23	31	A	Unknown			4a	Grundtner	136 Oakwood Dr	New Brighton
								4a		444 County Rd D, Bldg B	New Brighton
								4a		366 County Rd D, Bldg C	New Brighton
	30	23	29					4a	Goldman	30 12th Ave NW	New Brighton
	30	23						4a	Kirkland	281 Silver Lake Rd S	New Brighton
								4a	Polynesian Village	1417 NW 10th St	New Brighton
	30	23	19					4a		1263 12th Ave NW	New Brighton
								4a		1405 Old Highway 8	New Brighton
	30	23	30					4a	The Barbers	381 Silver Lake Rd	New Brighton
								4a	Donatelle	401 County Rd E2	New Brighton
								4a	Sayer	4483 N Snelling Ave	Arden Hills

NOTES:

- If well pump is inoperable, and the well owner is not using the well, the well will not be sampled.
- The depth of the Category 4a wells will be measured, if possible before sampling. If the depth indicates the well is not screened in an aquifer of concern. The well will not be sampled.

APPENDIX H

Appendix H

OU1 Water Level Contour Maps

TWIN CITIES ARMY AMMUNITION PLANT

OU1 Water Level Map – May 27-28, 1999

COPYRIGHT Wenck Associates, Inc. Environmental Engineers

Wenck

1800 Pioneer Creek Center
Maple Plain, MN 55359

DEC. 1999

ATTACHMENT 7

TWIN CITIES ARMY AMMUNITION PLANT

OU1 Water Level Map – July 7, 1999

COPYRIGHT Wenck Associates, Inc. Environmental Engineers

Wenck

1800 Pioneer Creek Center
Maple Plain, MN 55359

DEC. 1999

ATTACHMENT 8

TWIN CITIES ARMY AMMUNITION PLANT

OU1 Water Level Map — August 5, 1999

COPYRIGHT Wenck Associates, Inc. Environmental Engineers

Wenck 1800 Pioneer Creek Center Maple Plain, MN 55359

DEC. 1999

ATTACHMENT 9

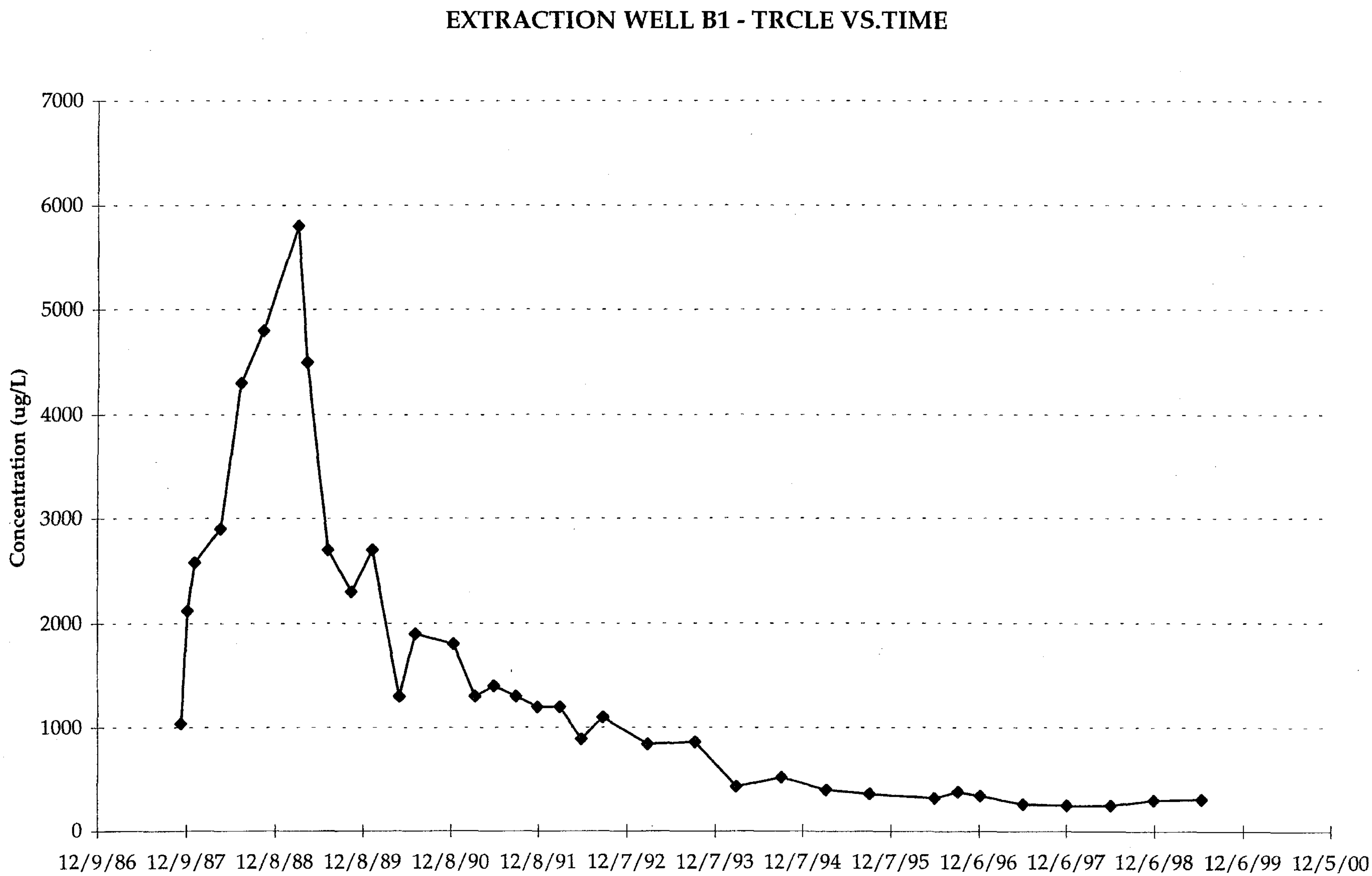
APPENDIX I

Appendix I

TGRS Chemical Data

I.1 Extraction Well – TRCLE vs. Time

APPENDIX I.1



EXTRACTION WELL B1 - TRCLE VS.TIME
Concentration (ug/L)
7000
6000
5000
4000
3000
2000
1000
0
12/9/86
12/9/87
12/8/88
12/8/89
12/8/90
12/8/91
12/7/92
12/7/93
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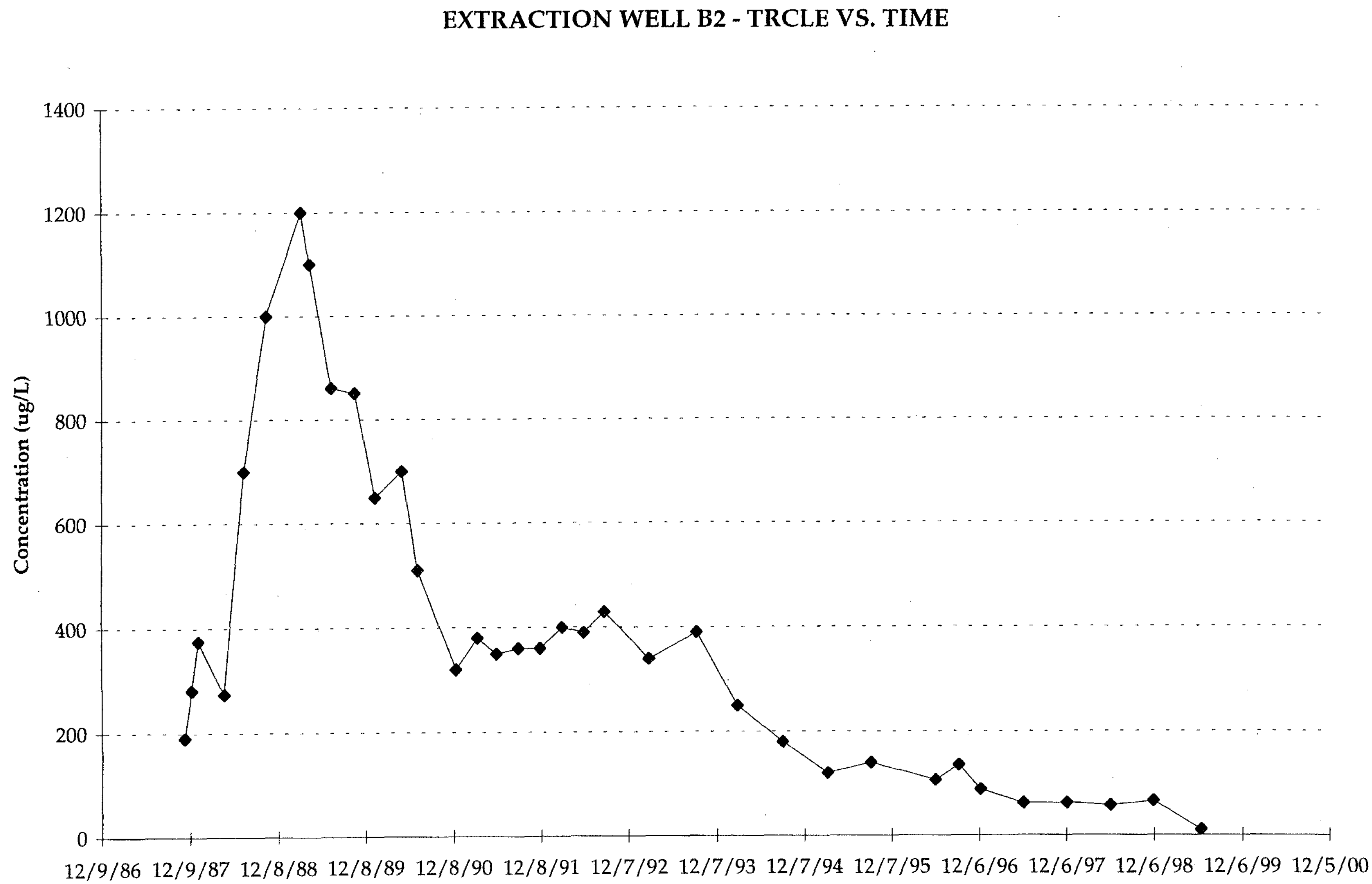
12/5/00

APPENDIX I.1


EXTRACTION WELL B2 - TRCLE VS. TIME
Concentration (ug/L)
1400
1200
1000
800
600
400
200
0
12/9/86
12/9/87
12/8/88
12/8/89
12/8/90
12/8/91
12/7/92
12/7/93
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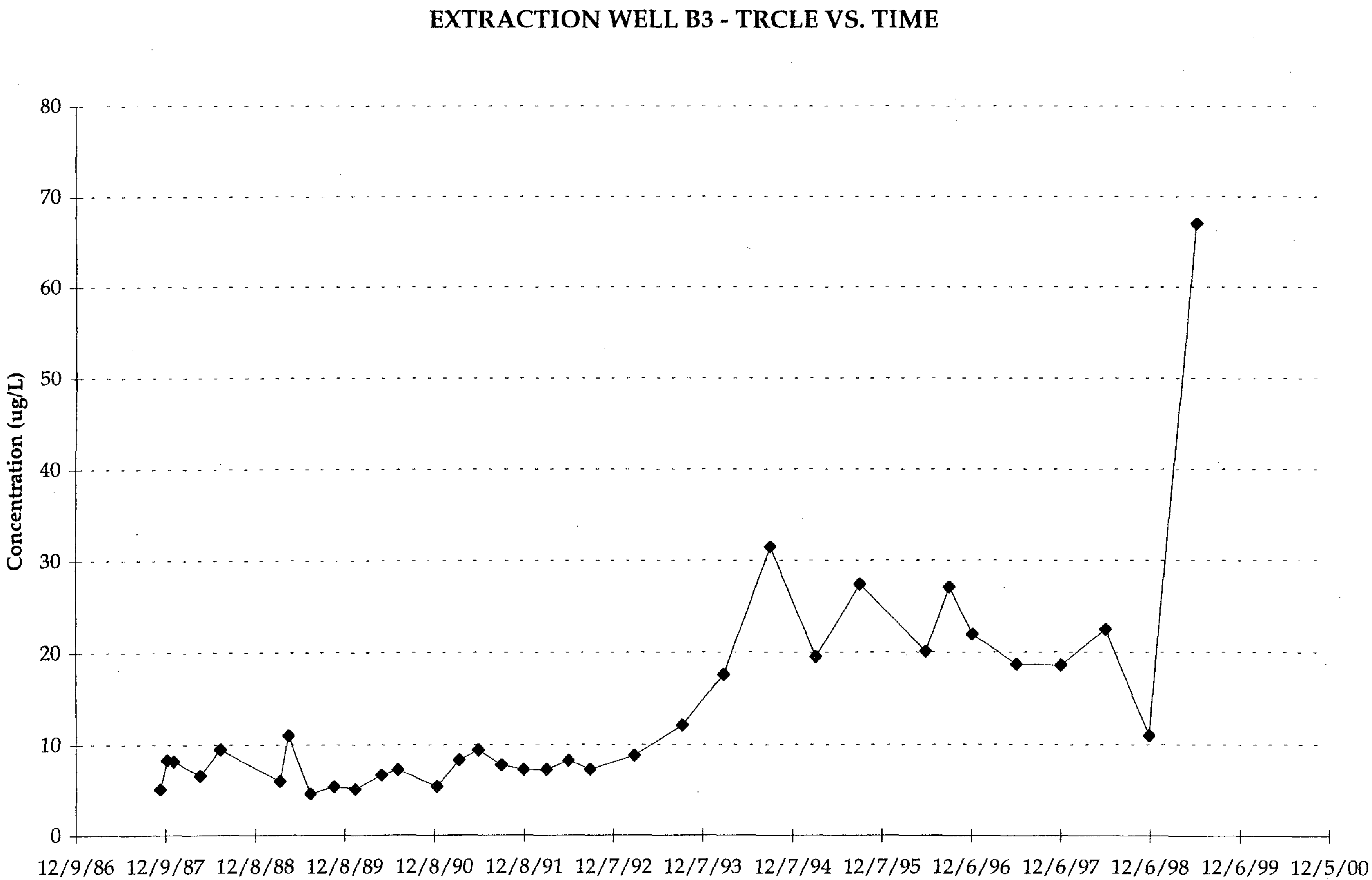
12/5/00

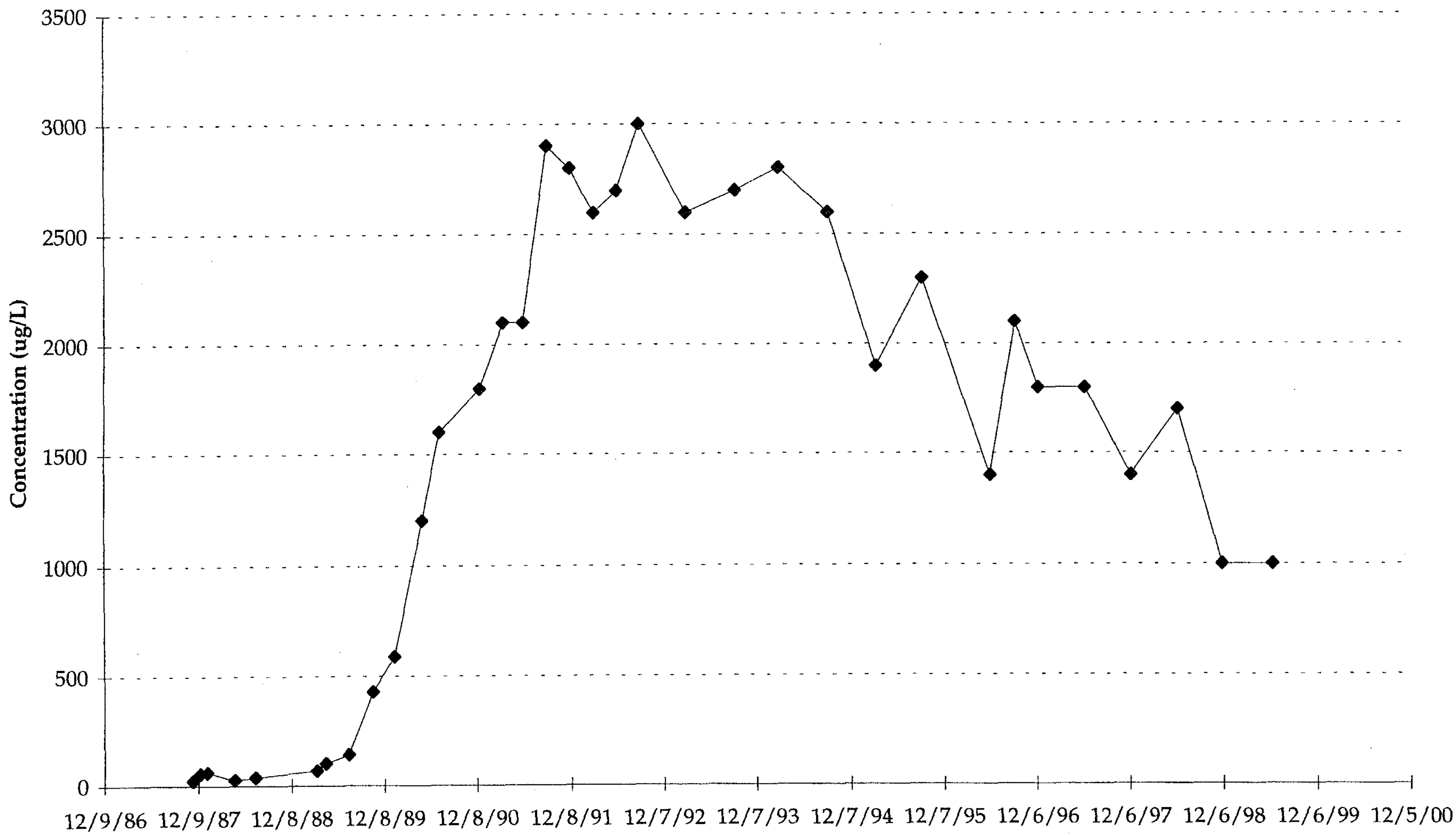
APPENDIX I.1



CRA 13399 (1)

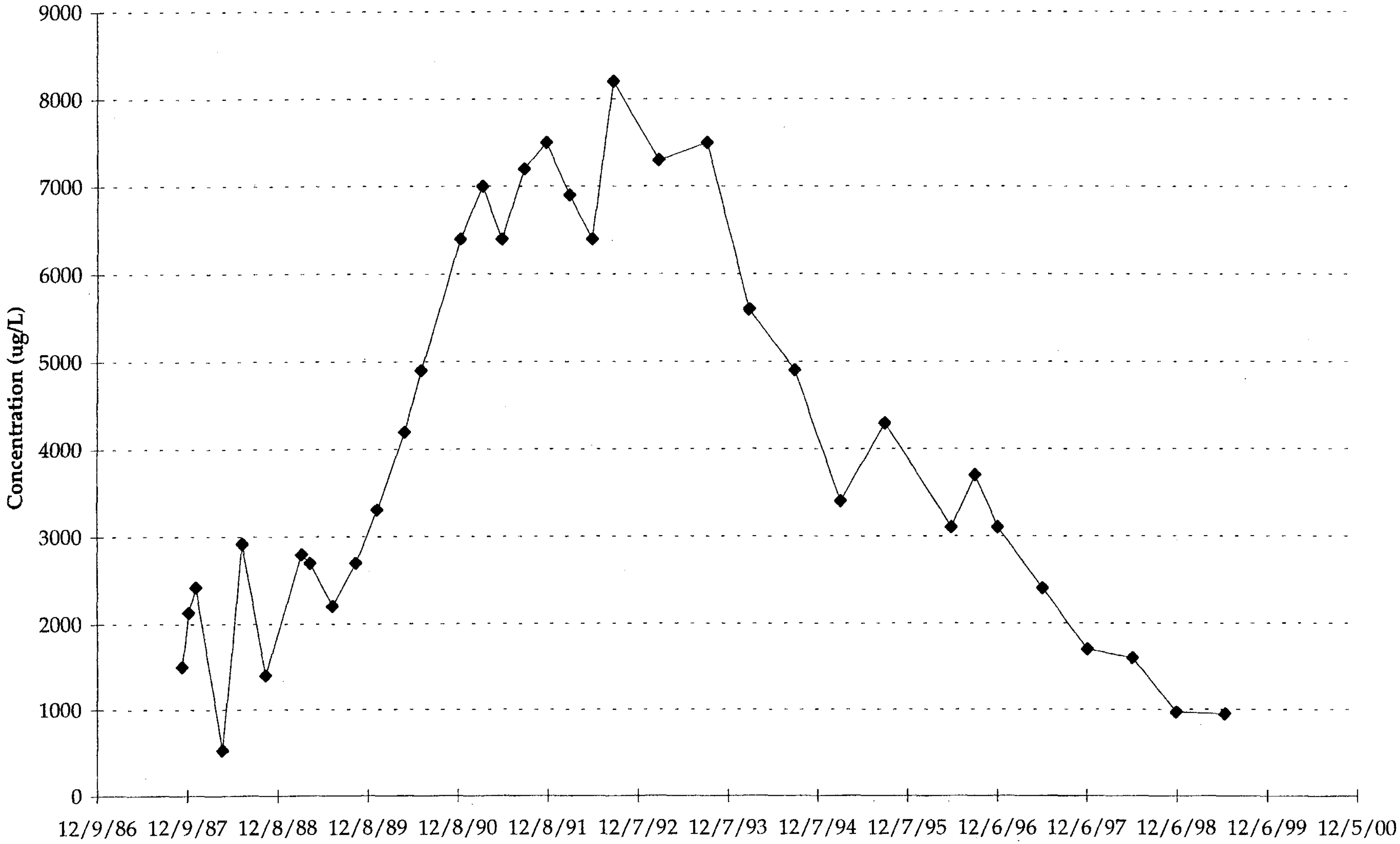
APPENDIX I.1

EXTRACTION WELL B4 - TRCLE VS. TIME



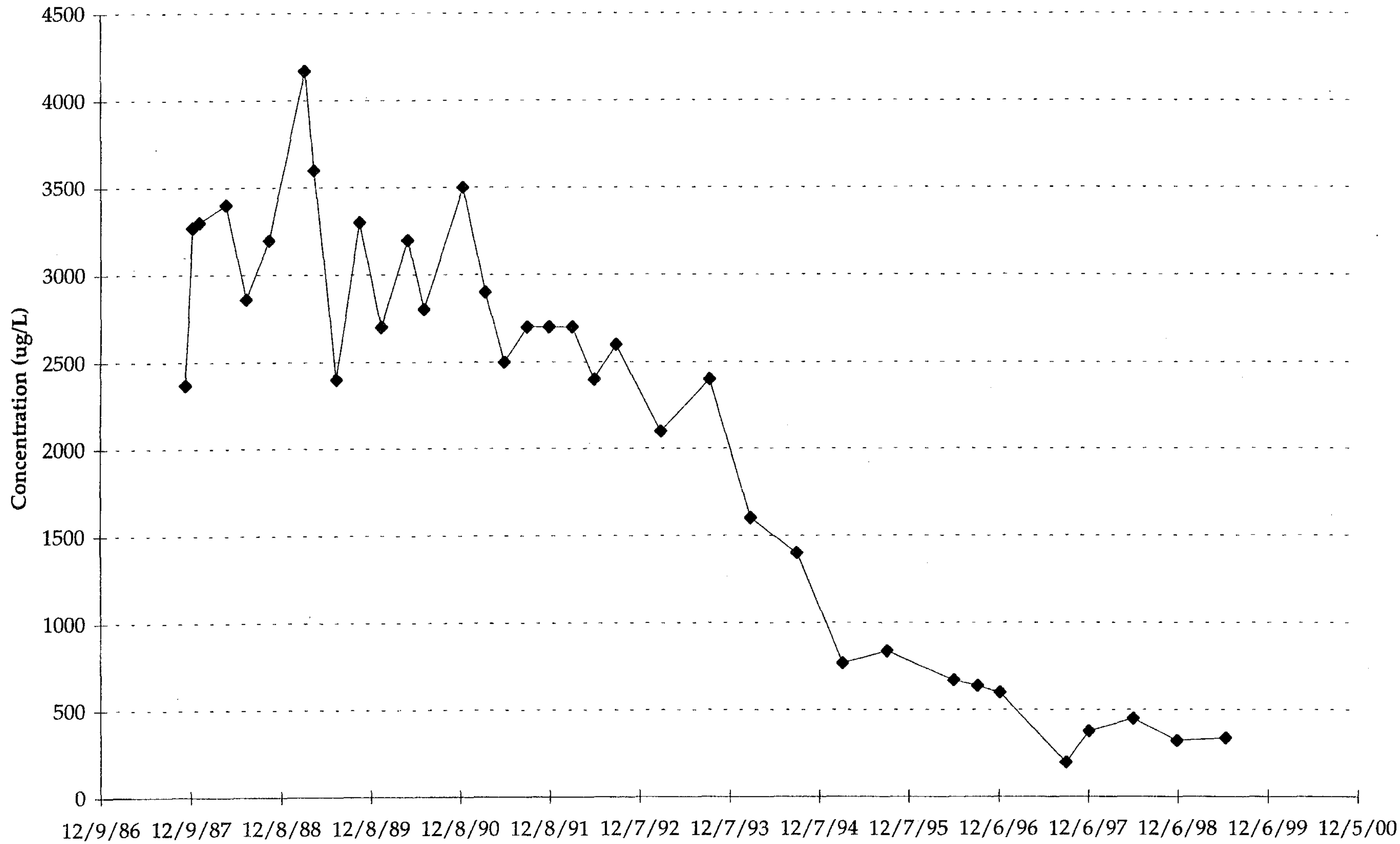
APPENDIX I.1

EXTRACTION WELL B5 - TRCLE VS. TIME

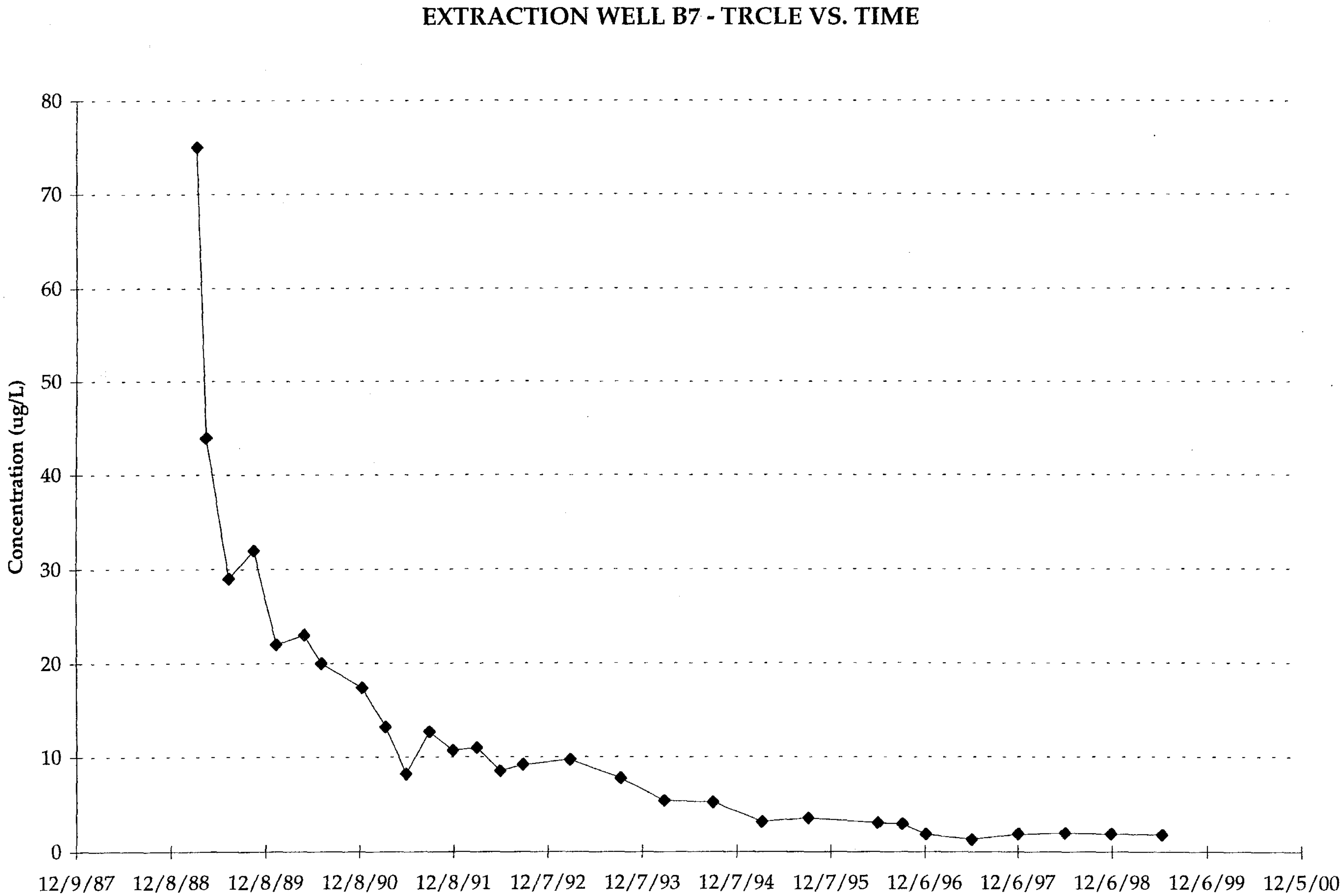


APPENDIX I.1

EXTRACTION WELL B6 - TRCLE VS. TIME



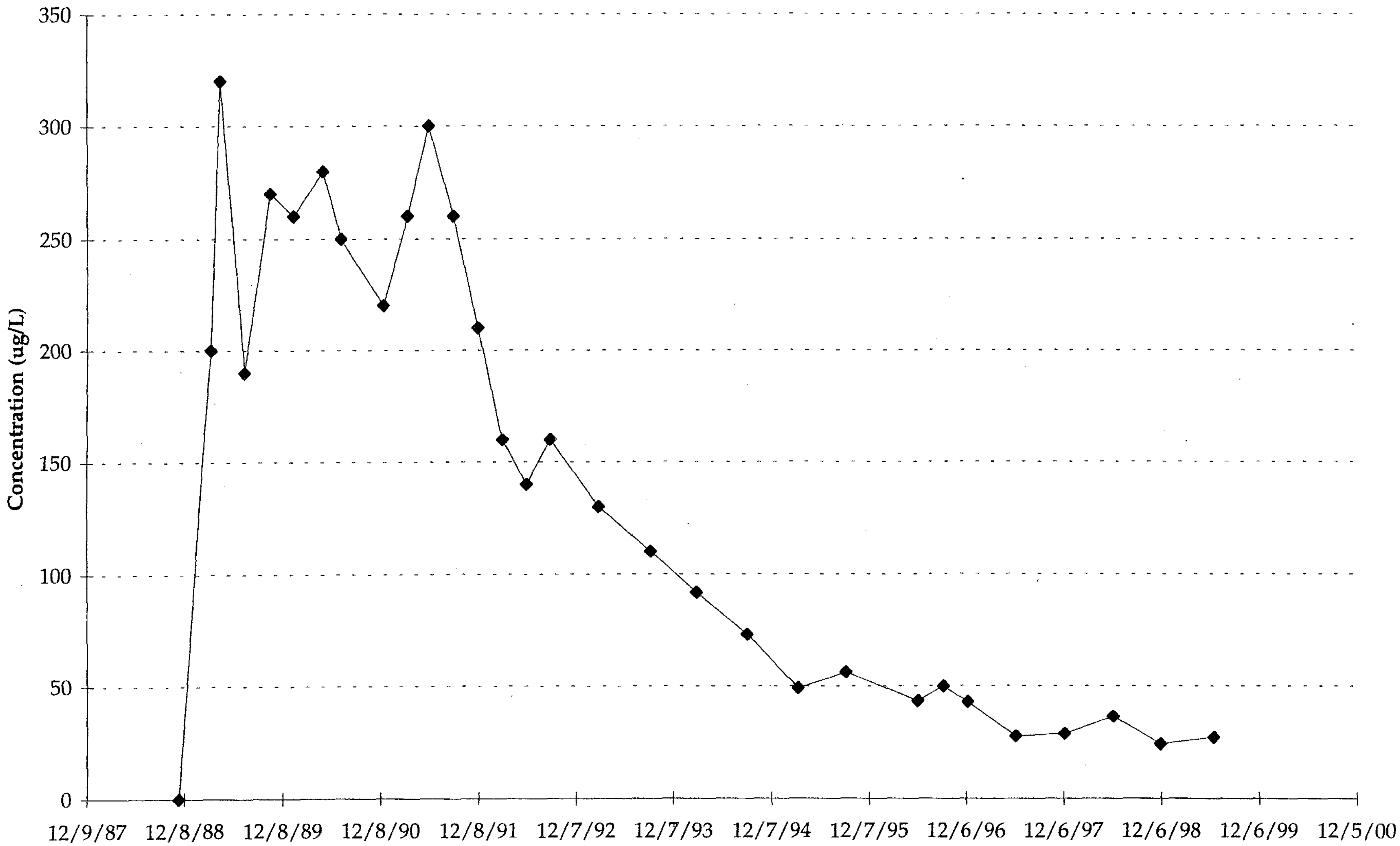
APPENDIX I.1



CRA 13399 (1)

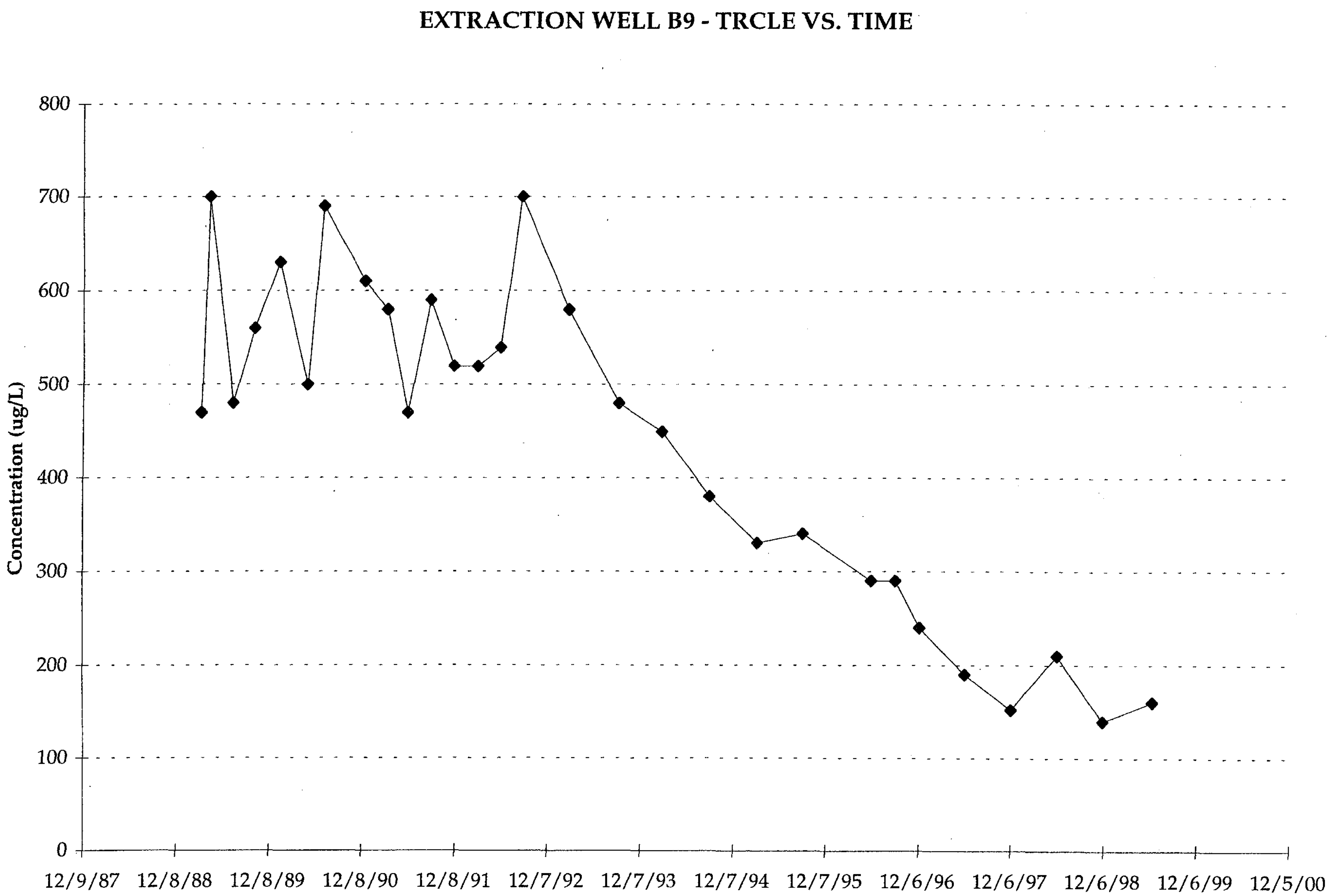
APPENDIX I.1

EXTRACTION WELL B8 - TRCLE VS. TIME



CRA 13399 (1)

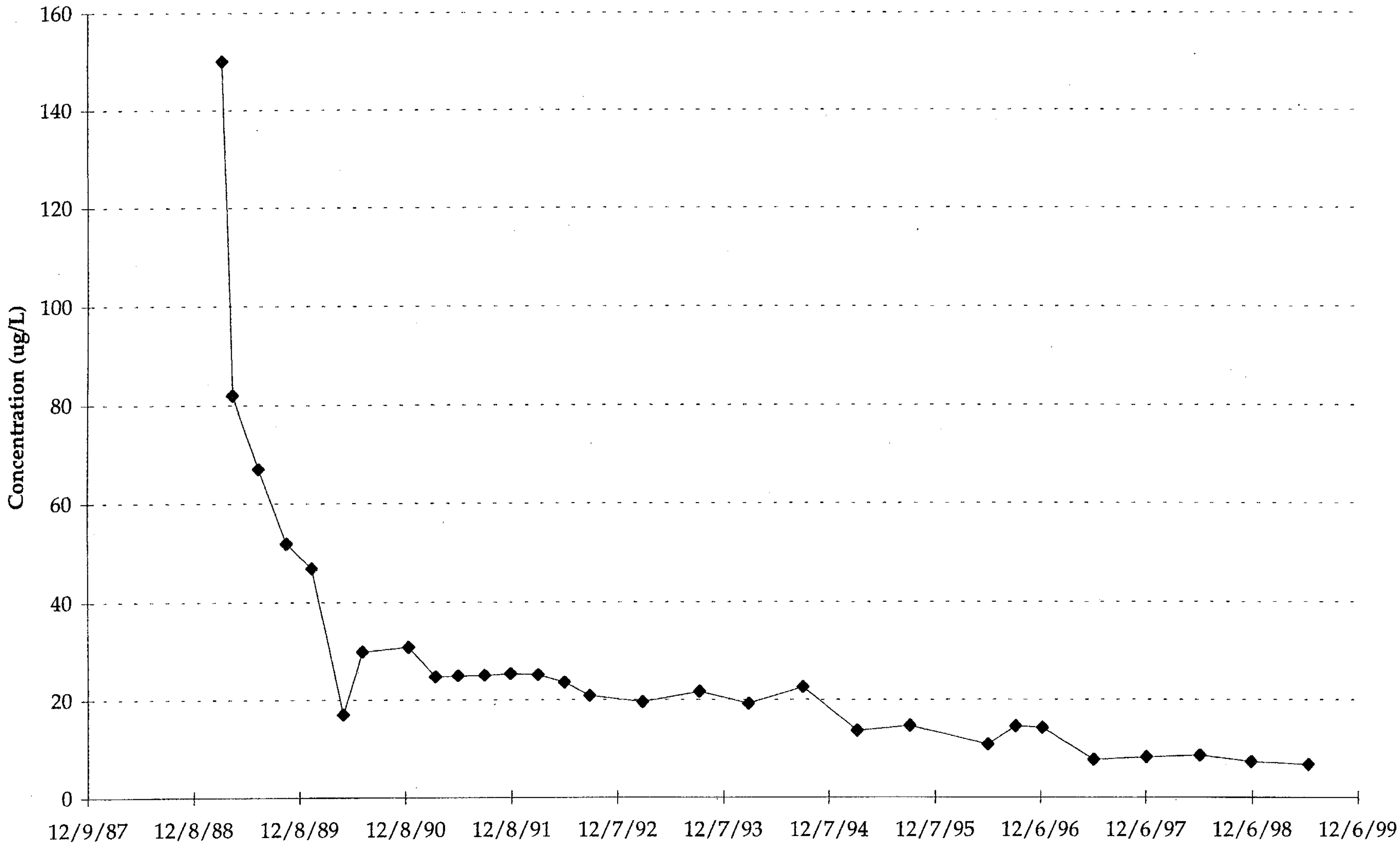
APPENDIX I.1



CRA 13399 (1)

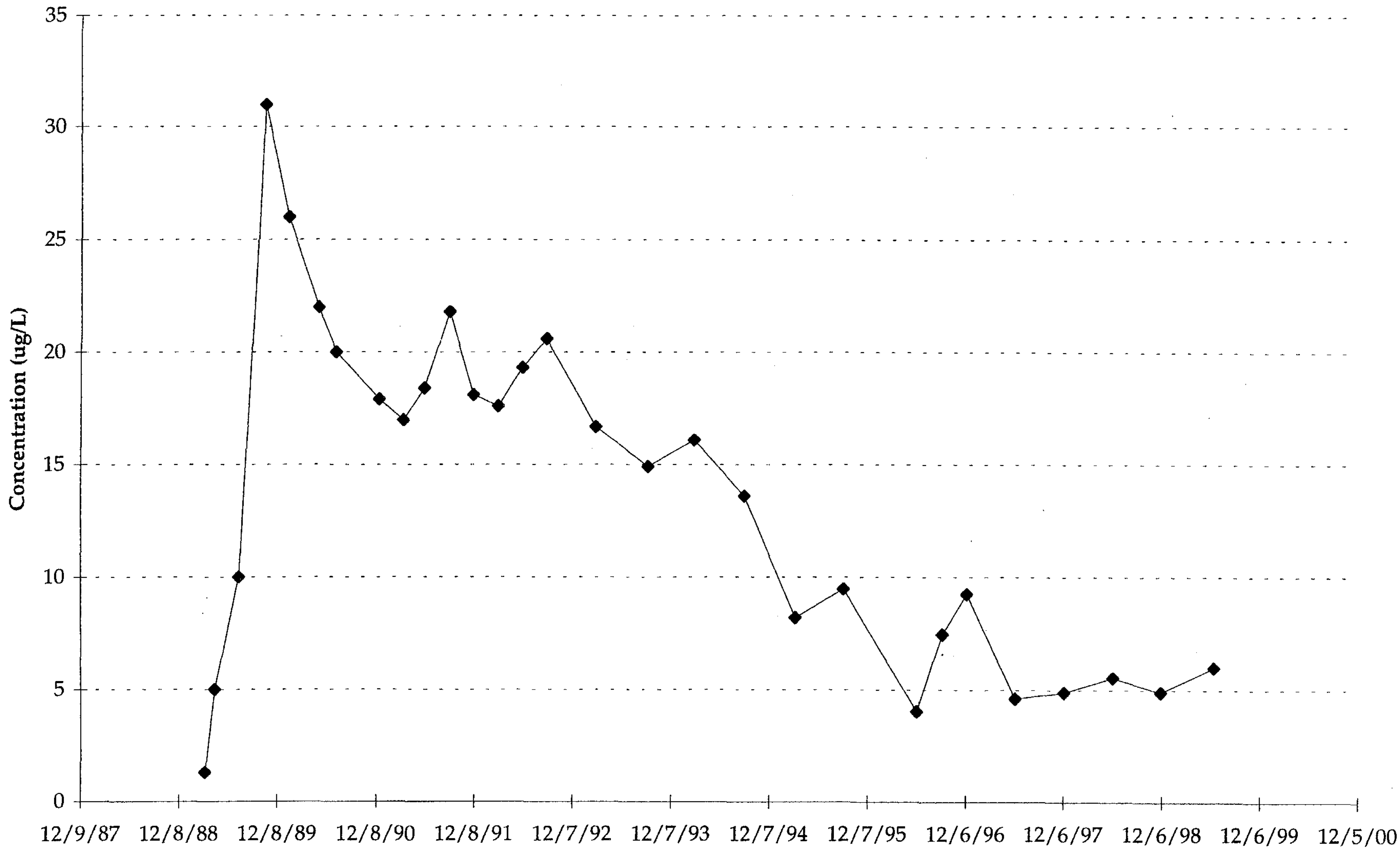
APPENDIX I.1

EXTRACTION WELL B10 - TRCLE VS. TIME



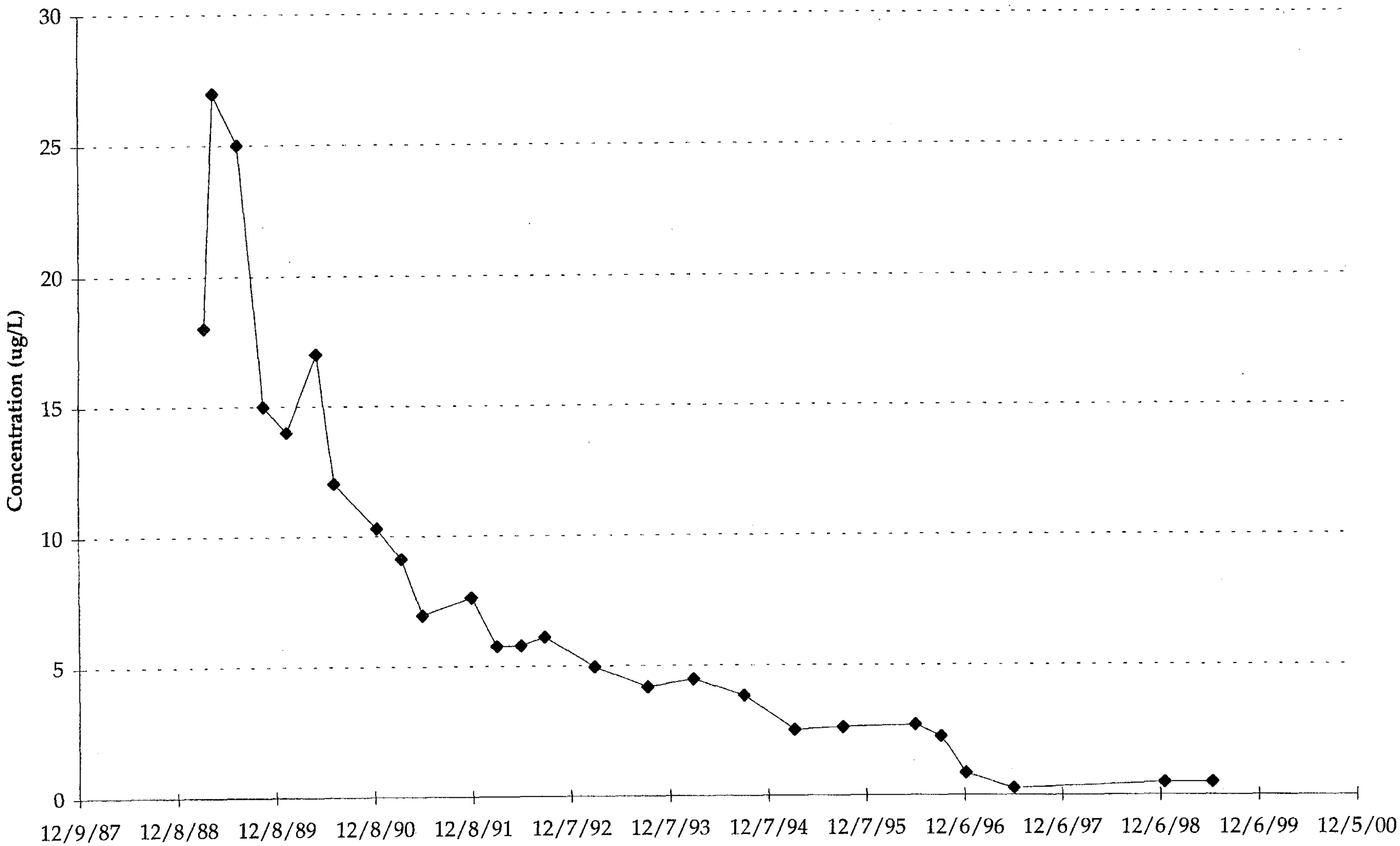
APPENDIX I.1

EXTRACTION WELL B11 - TRCLE VS. TIME



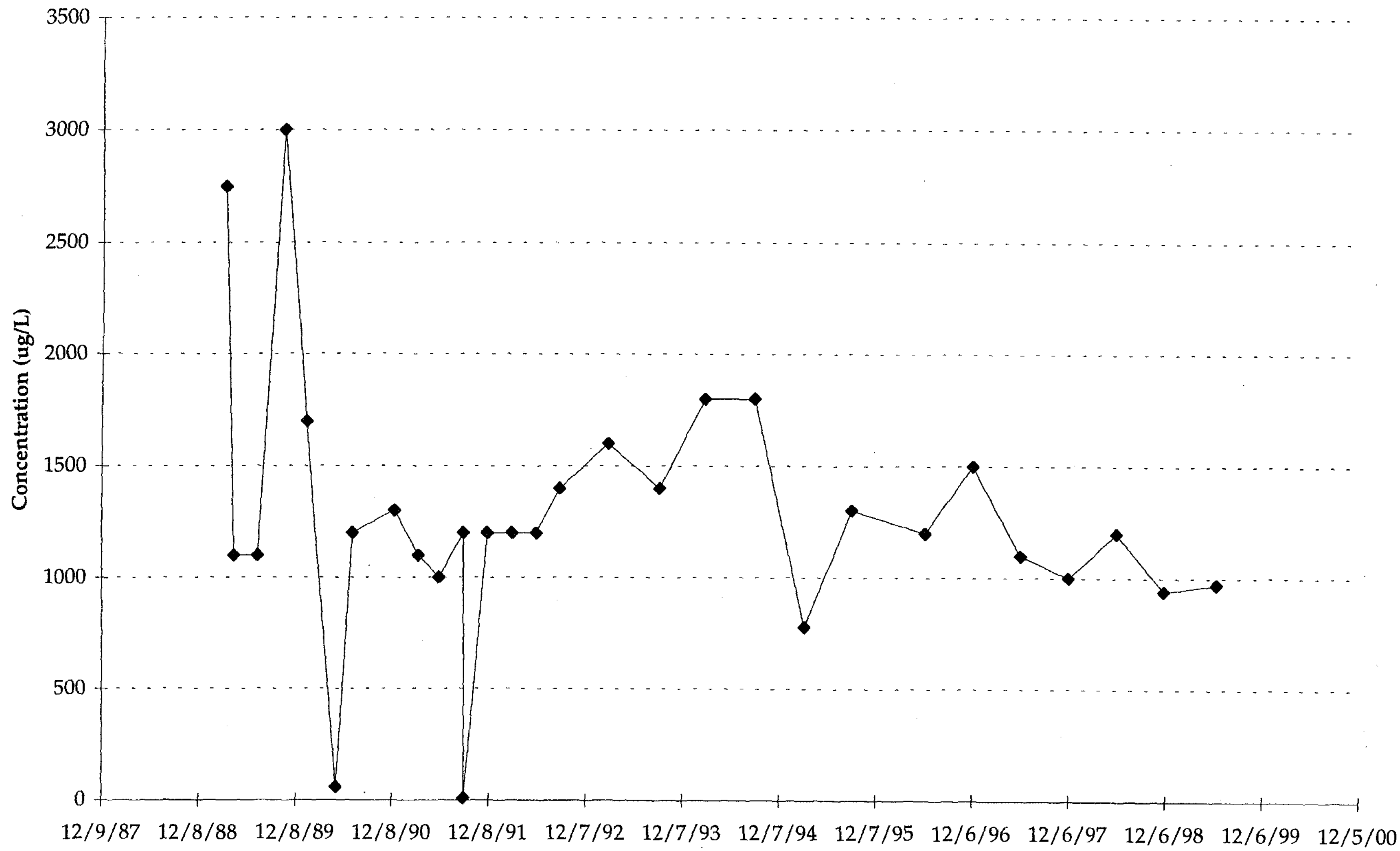
APPENDIX I.1

EXTRACTION WELL B12 - TRCLE VS. TIME



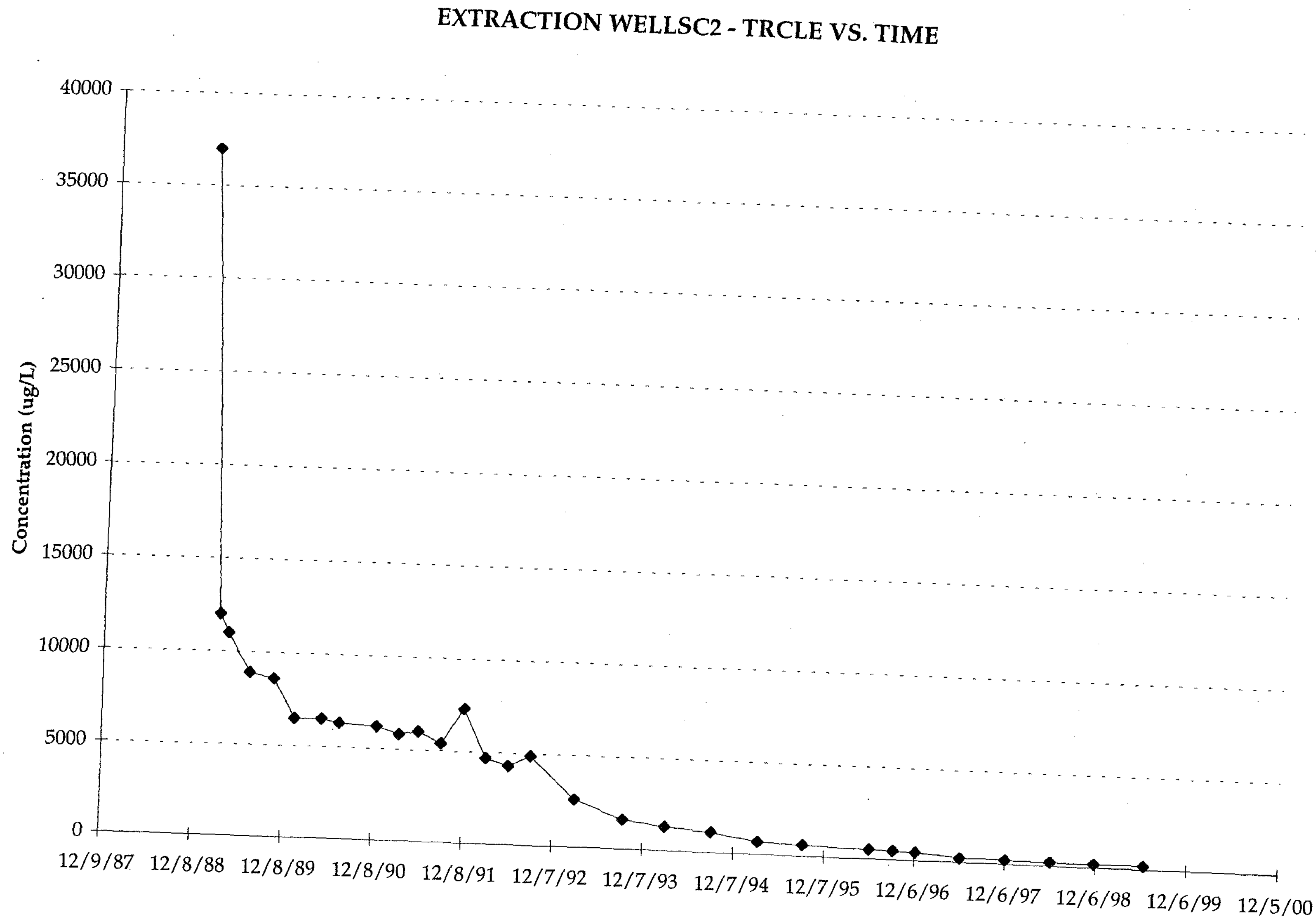
APPENDIX I.1

EXTRACTION WELL SC1 - TRCLE VS. TIME

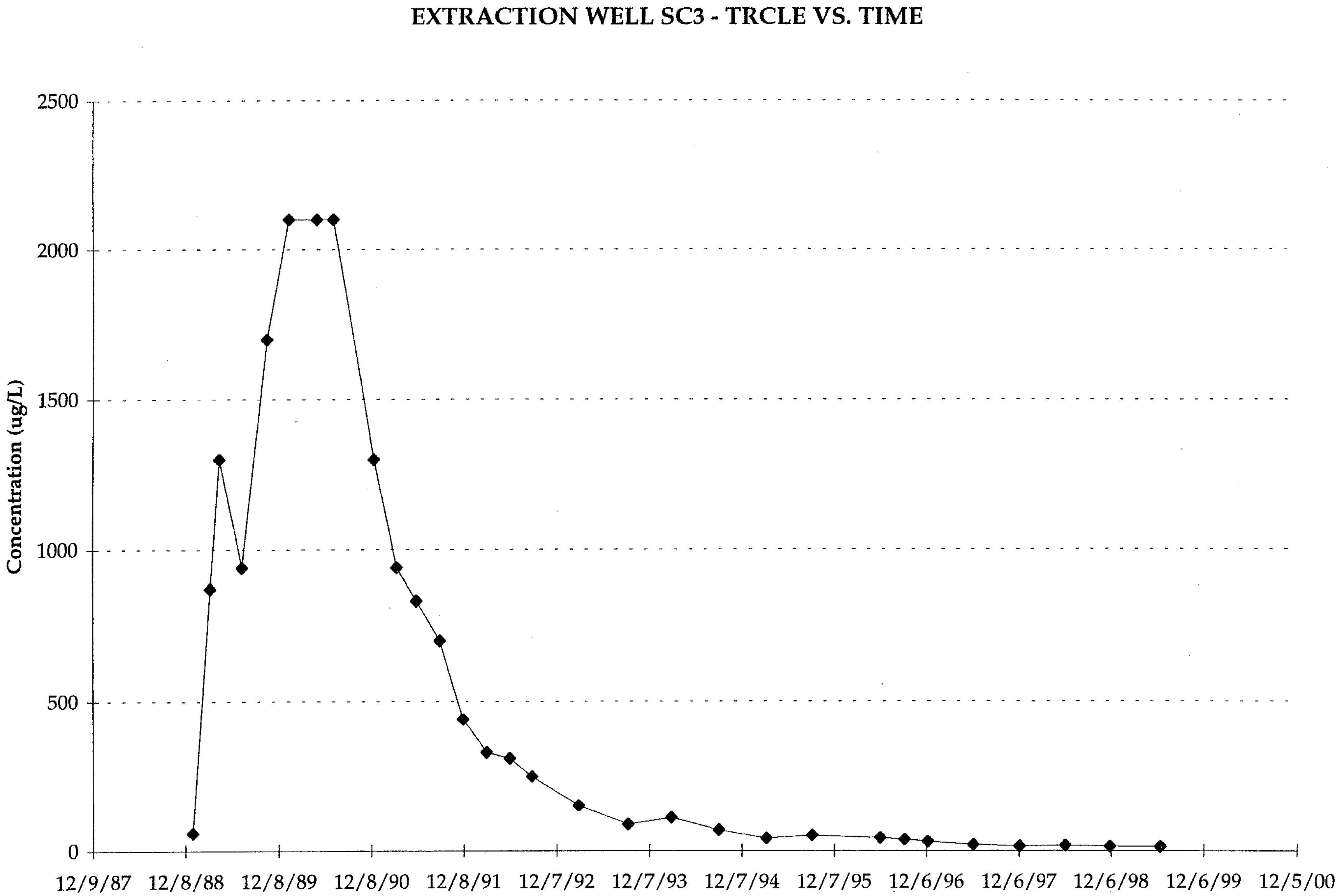


CRA 13399 (1)

APPENDIX I.1

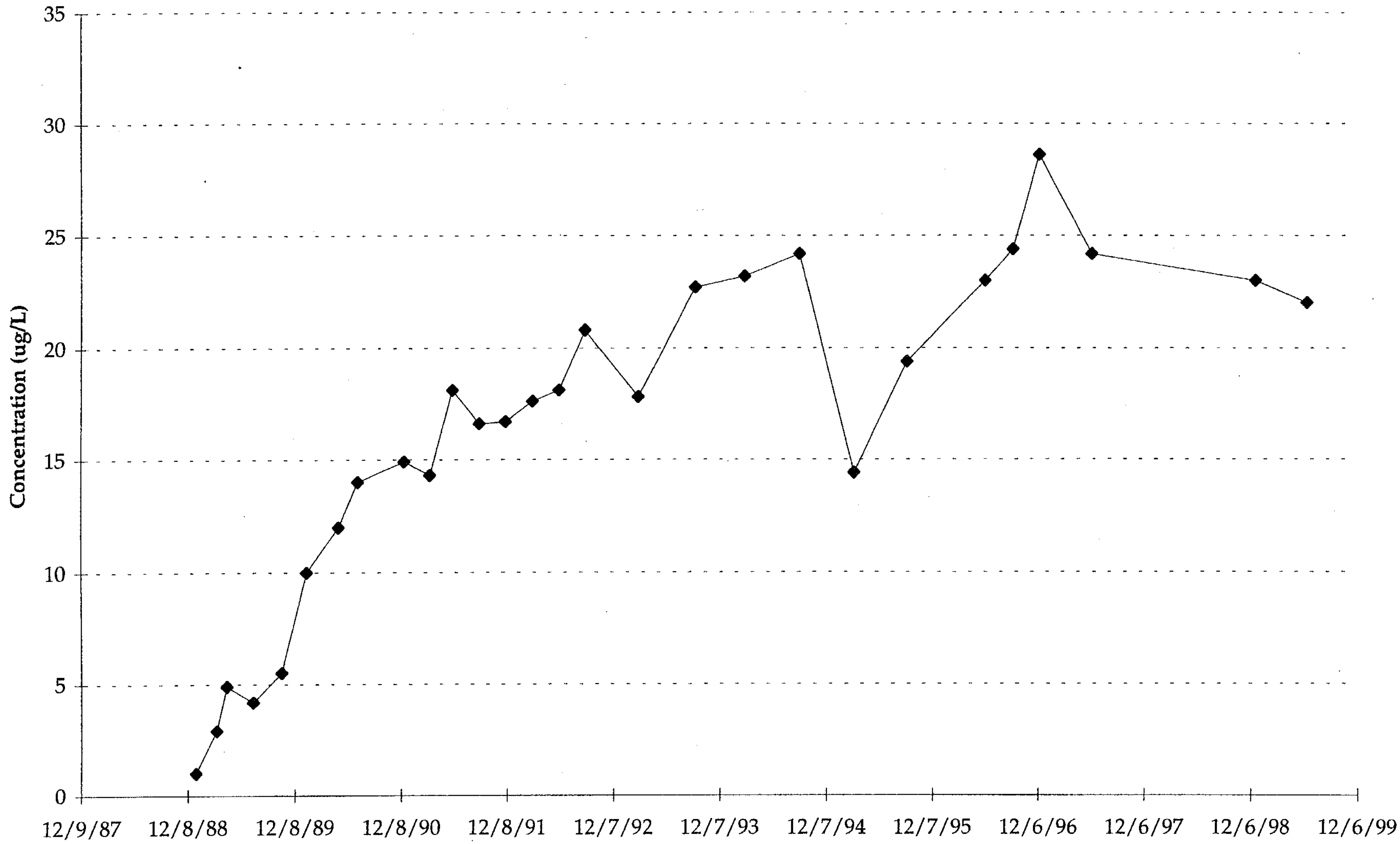


CRA 13399 (1)

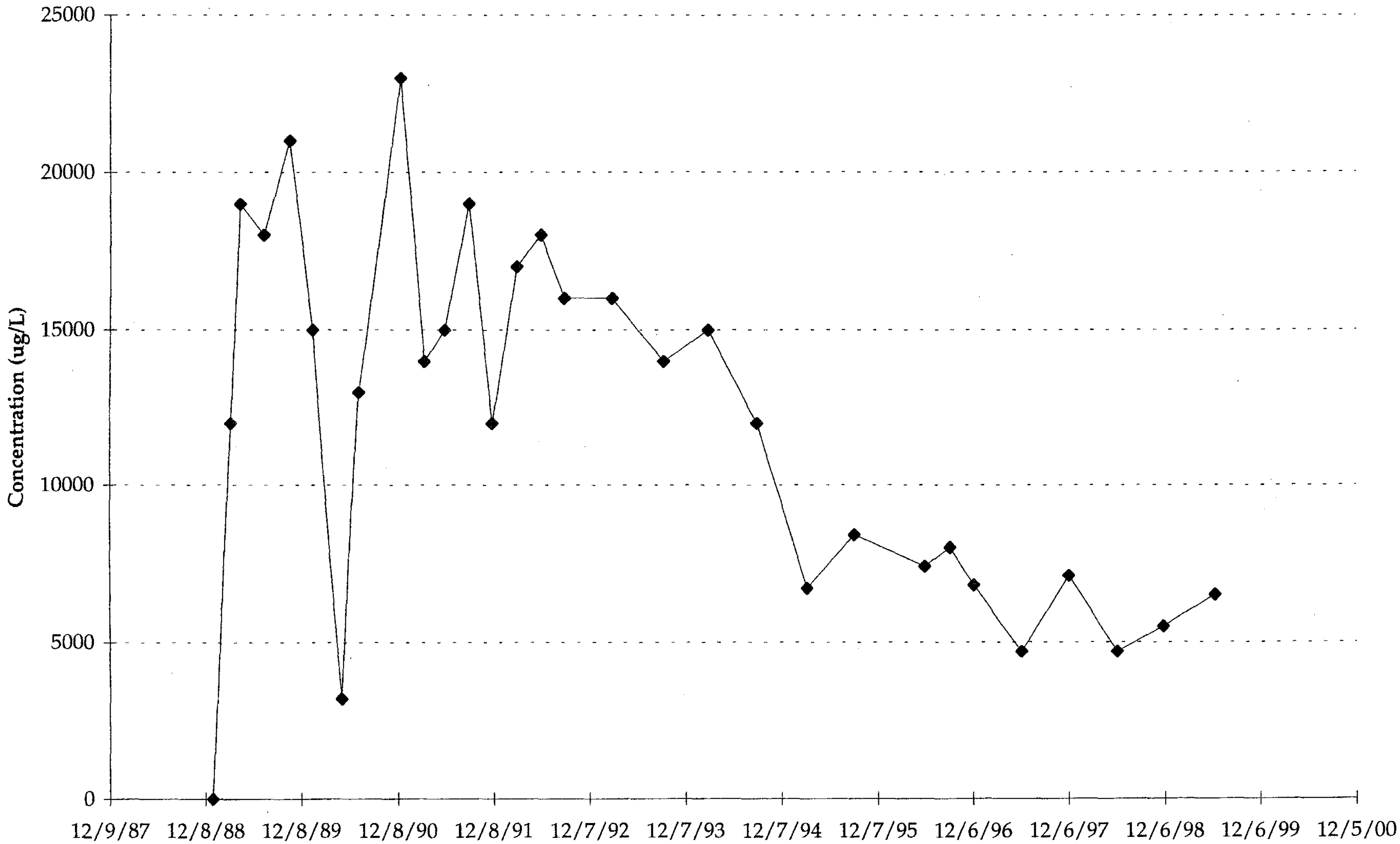

EXTRACTION WELL SC3 - TRCLE VS. TIME
Concentration (ug/L)
2500
2000
1500
1000
500
0
12/9/87
12/8/88
12/8/89
12/8/90
12/8/91
12/7/92
12/7/93
12/7/94
12/7/95
12/6/96
12/6/97
12/6/98
12/6/99
12/5/00

APPENDIX I.1

EXTRACTION WELL SC4 - TRCLE VS. TIME



EXTRACTION WELL SC5 - TRCLE VS. TIME



I.2 FY 1999 Influent/Effluent Database TGRS, TCAAP

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	10/5/98	111TCE	BKVQ 012	< 1	
TGRSE	10/5/98	111TCE	BKVQ 013	< 1	D
TGRSE	11/3/98	111TCE	BLMV 012	< 1	
TGRSE	11/3/98	111TCE	BLMV 013	< 1	D
TGRSE	12/1/98	111TCE	BMCM 004	< 1	
TGRSE	12/1/98	111TCE	BMCM 005	< 1	D
TGRSE	1/5/99	111TCE	BMMB 006	< 1	D
TGRSE	1/5/99	111TCE	BMMB 003	< 1	
TGRSE	2/2/99	111TCE	BMSW 006	< 1	D
TGRSE	2/2/99	111TCE	BMSW 003	< 1	
TGRSE	3/3/99	111TCE	BMZK 003	< 1	
TGRSE	3/3/99	111TCE	BMZK 006	< 1	D
TGRSE	4/12/99	111TCE	BNJV 004	< 1	D
TGRSE	4/12/99	111TCE	BNJV 003	< 1	
TGRSE	5/7/99	111TCE	BNLN 006	< 1	D
TGRSE	5/7/99	111TCE	BNLN 003	< 1	
TGRSE	6/1/99	111TCE	BNNQ 006	< 1	D
TGRSE	6/1/99	111TCE	BNNQ 003	< 1	
TGRSE	7/6/99	111TCE	BNXJ 006	< 1	D
TGRSE	7/6/99	111TCE	BNXJ 003	< 1	
TGRSE	8/4/99	111TCE	BPFF 004	< 1	D
TGRSE	8/4/99	111TCE	BPFF 003	< 1	
TGRSE	9/7/99	111TCE	BPMQ 007	< 1	D
TGRSE	9/7/99	111TCE	BPMQ 004	< 1	
TGRSE	10/5/98	112TCE	BKVQ 013	< 1	D
TGRSE	10/5/98	112TCE	BKVQ 012	< 1	
TGRSE	11/3/98	112TCE	BLMV 012	< 1	
TGRSE	11/3/98	112TCE	BLMV 013	< 1	D
TGRSE	12/1/98	112TCE	BMCM 005	< 1	D
TGRSE	12/1/98	112TCE	BMCM 004	< 1	
TGRSE	1/5/99	112TCE	BMMB 006	< 1	D
TGRSE	1/5/99	112TCE	BMMB 003	< 1	
TGRSE	2/2/99	112TCE	BMSW 006	< 1	D
TGRSE	2/2/99	112TCE	BMSW 003	< 1	
TGRSE	3/3/99	112TCE	BMZK 006	< 1	D
TGRSE	3/3/99	112TCE	BMZK 003	< 1	
TGRSE	4/12/99	112TCE	BNJV 004	< 1	D
TGRSE	4/12/99	112TCE	BNJV 003	< 1	
TGRSE	5/7/99	112TCE	BNLN 006	< 1	D
TGRSE	5/7/99	112TCE	BNLN 003	< 1	
TGRSE	6/1/99	112TCE	BNNQ 006	< 1	D
TGRSE	6/1/99	112TCE	BNNQ 003	< 1	
TGRSE	7/6/99	112TCE	BNXJ 006	< 1	D
TGRSE	7/6/99	112TCE	BNXJ 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	8/4/99	112TCE	BPFF 004	< 1	D
TGRSE	8/4/99	112TCE	BPFF 003	< 1	
TGRSE	9/7/99	112TCE	BPMQ 007	< 1	D
TGRSE	9/7/99	112TCE	BPMQ 004	< 1	
TGRSE	10/5/98	11DCE	BKVQ 013	< 1	D
TGRSE	10/5/98	11DCE	BKVQ 012	< 1	
TGRSE	11/3/98	11DCE	BLMV 012	< 1	
TGRSE	11/3/98	11DCE	BLMV 013	< 1	D
TGRSE	12/1/98	11DCE	BMCM 004	< 1	
TGRSE	12/1/98	11DCE	BMCM 005	< 1	D
TGRSE	1/5/99	11DCE	BMMB 006	< 1	D
TGRSE	1/5/99	11DCE	BMMB 003	< 1	
TGRSE	2/2/99	11DCE	BMSW 006	< 1	D
TGRSE	2/2/99	11DCE	BMSW 003	< 1	
TGRSE	3/3/99	11DCE	BMZK 006	< 1	D
TGRSE	3/3/99	11DCE	BMZK 003	< 1	
TGRSE	4/12/99	11DCE	BNJV 004	< 1	D
TGRSE	4/12/99	11DCE	BNJV 003	< 1	
TGRSE	5/7/99	11DCE	BNLN 006	< 1	D
TGRSE	5/7/99	11DCE	BNLN 003	< 1	
TGRSE	6/1/99	11DCE	BNNQ 006	< 1	D
TGRSE	6/1/99	11DCE	BNNQ 003	< 1	
TGRSE	7/6/99	11DCE	BNXJ 006	< 1	D
TGRSE	7/6/99	11DCE	BNXJ 003	< 1	
TGRSE	8/4/99	11DCE	BPFF 004	< 1	D
TGRSE	8/4/99	11DCE	BPFF 003	< 1	
TGRSE	9/7/99	11DCE	BPMQ 007	< 1	D
TGRSE	9/7/99	11DCE	BPMQ 004	< 1	
TGRSE	10/5/98	11DCLE	BKVQ 013	< 1	D
TGRSE	10/5/98	11DCLE	BKVQ 012	< 1	
TGRSE	11/3/98	11DCLE	BLMV 012	< 1	
TGRSE	11/3/98	11DCLE	BLMV 013	< 1	D
TGRSE	12/1/98	11DCLE	BMCM 005	< 1	D
TGRSE	12/1/98	11DCLE	BMCM 004	< 1	
TGRSE	1/5/99	11DCLE	BMMB 006	< 1	D
TGRSE	1/5/99	11DCLE	BMMB 003	< 1	
TGRSE	2/2/99	11DCLE	BMSW 006	< 1	D
TGRSE	2/2/99	11DCLE	BMSW 003	< 1	
TGRSE	3/3/99	11DCLE	BMZK 006	< 1	D
TGRSE	3/3/99	11DCLE	BMZK 003	< 1	
TGRSE	4/12/99	11DCLE	BNJV 004	< 1	D
TGRSE	4/12/99	11DCLE	BNJV 003	< 1	
TGRSE	5/7/99	11DCLE	BNLN 006	< 1	D
TGRSE	5/7/99	11DCLE	BNLN 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	6/1/99	11DCLE	BNNQ 006	< 1	D
TGRSE	6/1/99	11DCLE	BNNQ 003	< 1	
TGRSE	7/6/99	11DCLE	BNXJ 006	< 1	D
TGRSE	7/6/99	11DCLE	BNXJ 003	< 1	
TGRSE	8/4/99	11DCLE	BPFF 004	< 1	D
TGRSE	8/4/99	11DCLE	BPFF 003	< 1	
TGRSE	9/7/99	11DCLE	BPMQ 004	< 1	
TGRSE	9/7/99	11DCLE	BPMQ 007	< 1	D
TGRSE	10/5/98	12DCLE	BKVQ 013	< 1	D
TGRSE	10/5/98	12DCLE	BKVQ 012	< 1	
TGRSE	11/3/98	12DCLE	BLMV 012	< 1	
TGRSE	11/3/98	12DCLE	BLMV 013	< 1	D
TGRSE	12/1/98	12DCLE	BMCM 005	< 1	D
TGRSE	12/1/98	12DCLE	BMCM 004	< 1	
TGRSE	1/5/99	12DCLE	BMMB 006	< 1	D
TGRSE	1/5/99	12DCLE	BMMB 003	< 1	
TGRSE	2/2/99	12DCLE	BMSW 006	< 1	D
TGRSE	2/2/99	12DCLE	BMSW 003	< 1	
TGRSE	3/3/99	12DCLE	BMZK 006	< 1	D
TGRSE	3/3/99	12DCLE	BMZK 003	< 1	
TGRSE	4/12/99	12DCLE	BNJV 004	< 1	D
TGRSE	4/12/99	12DCLE	BNJV 003	< 1	
TGRSE	5/7/99	12DCLE	BNLN 006	< 1	D
TGRSE	5/7/99	12DCLE	BNLN 003	< 1	
TGRSE	6/1/99	12DCLE	BNNQ 006	< 1	D
TGRSE	6/1/99	12DCLE	BNNQ 003	< 1	
TGRSE	7/6/99	12DCLE	BNXJ 006	< 1	D
TGRSE	7/6/99	12DCLE	BNXJ 003	< 1	
TGRSE	8/4/99	12DCLE	BPFF 004	< 1	D
TGRSE	8/4/99	12DCLE	BPFF 003	< 1	
TGRSE	9/7/99	12DCLE	BPMQ 007	< 1	D
TGRSE	9/7/99	12DCLE	BPMQ 004	< 1	
TGRSE	10/5/98	12DCLP	BKVQ 013	< 1	D
TGRSE	10/5/98	12DCLP	BKVQ 012	< 1	
TGRSE	11/3/98	12DCLP	BLMV 012	< 1	
TGRSE	11/3/98	12DCLP	BLMV 013	< 1	D
TGRSE	12/1/98	12DCLP	BMCM 005	< 1	D
TGRSE	12/1/98	12DCLP	BMCM 004	< 1	
TGRSE	1/5/99	12DCLP	BMMB 006	< 1	D
TGRSE	1/5/99	12DCLP	BMMB 003	< 1	
TGRSE	2/2/99	12DCLP	BMSW 006	< 1	D
TGRSE	2/2/99	12DCLP	BMSW 003	< 1	
TGRSE	3/3/99	12DCLP	BMZK 006	< 1	D
TGRSE	3/3/99	12DCLP	BMZK 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	4/12/99	12DCLP	BNJV 004	< 1	D
TGRSE	4/12/99	12DCLP	BNJV 003	< 1	
TGRSE	5/7/99	12DCLP	BNLN 006	< 1	D
TGRSE	5/7/99	12DCLP	BNLN 003	< 1	
TGRSE	6/1/99	12DCLP	BNNQ 006	< 1	D
TGRSE	6/1/99	12DCLP	BNNQ 003	< 1	
TGRSE	7/6/99	12DCLP	BNXJ 006	< 1	D
TGRSE	7/6/99	12DCLP	BNXJ 003	< 1	
TGRSE	8/4/99	12DCLP	BPFF 004	< 1	D
TGRSE	8/4/99	12DCLP	BPFF 003	< 1	
TGRSE	9/7/99	12DCLP	BPMQ 007	< 1	D
TGRSE	9/7/99	12DCLP	BPMQ 004	< 1	
TGRSE	10/5/98	C12DCE	BKVQ 013	< 1	D
TGRSE	10/5/98	C12DCE	BKVQ 012	< 1	
TGRSE	11/3/98	C12DCE	BLMV 012	< 1	
TGRSE	11/3/98	C12DCE	BLMV 013	< 1	D
TGRSE	12/1/98	C12DCE	BMCM 004	< 1	
TGRSE	12/1/98	C12DCE	BMCM 005	< 1	D
TGRSE	1/5/99	C12DCE	BMMB 006	< 1	D
TGRSE	1/5/99	C12DCE	BMMB 003	< 1	
TGRSE	2/2/99	C12DCE	BMSW 006	< 1	D
TGRSE	2/2/99	C12DCE	BMSW 003	< 1	
TGRSE	3/3/99	C12DCE	BMZK 006	< 1	D
TGRSE	3/3/99	C12DCE	BMZK 003	< 1	
TGRSE	4/12/99	C12DCE	BNJV 004	< 1	D
TGRSE	4/12/99	C12DCE	BNJV 003	< 1	
TGRSE	5/7/99	C12DCE	BNLN 006	< 1	D
TGRSE	5/7/99	C12DCE	BNLN 003	< 1	
TGRSE	6/1/99	C12DCE	BNNQ 006	< 1	D
TGRSE	6/1/99	C12DCE	BNNQ 003	< 1	
TGRSE	7/6/99	C12DCE	BNXJ 006	< 1	D
TGRSE	7/6/99	C12DCE	BNXJ 003	< 1	
TGRSE	8/4/99	C12DCE	BPFF 004	< 1	D
TGRSE	8/4/99	C12DCE	BPFF 003	< 1	
TGRSE	9/7/99	C12DCE	BPMQ 007	< 1	D
TGRSE	9/7/99	C12DCE	BPMQ 004	< 1	
TGRSE	10/5/98	C2H3CL	BKVQ 013	< 1	D
TGRSE	10/5/98	C2H3CL	BKVQ 012	< 1	
TGRSE	11/3/98	C2H3CL	BLMV 012	< 1	
TGRSE	11/3/98	C2H3CL	BLMV 013	< 1	D
TGRSE	12/1/98	C2H3CL	BMCM 005	< 1	D
TGRSE	12/1/98	C2H3CL	BMCM 004	< 1	
TGRSE	1/5/99	C2H3CL	BMMB 006	< 1	D
TGRSE	1/5/99	C2H3CL	BMMB 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	2/2/99	C2H3CL	BMSW 006	< 1	D
TGRSE	2/2/99	C2H3CL	BMSW 003	< 1	
TGRSE	3/3/99	C2H3CL	BMZK 006	< 1	D
TGRSE	3/3/99	C2H3CL	BMZK 003	< 1	
TGRSE	4/12/99	C2H3CL	BNJV 004	< 1	D
TGRSE	4/12/99	C2H3CL	BNJV 003	< 1	
TGRSE	5/7/99	C2H3CL	BNLN 006	< 1	D
TGRSE	5/7/99	C2H3CL	BNLN 003	< 1	
TGRSE	6/1/99	C2H3CL	BNNQ 006	< 1	D
TGRSE	6/1/99	C2H3CL	BNNQ 003	< 1	
TGRSE	7/6/99	C2H3CL	BNXJ 006	< 1	D
TGRSE	7/6/99	C2H3CL	BNXJ 003	< 1	
TGRSE	8/4/99	C2H3CL	BPFF 004	< 1	D
TGRSE	8/4/99	C2H3CL	BPFF 003	< 1	
TGRSE	9/7/99	C2H3CL	BPMQ 007	< 1	D
TGRSE	9/7/99	C2H3CL	BPMQ 004	< 1	
TGRSE	3/3/99	C6H6	BMZK 003	< 1	
TGRSE	3/3/99	C6H6	BMZK 006	< 1	D
TGRSE	4/12/99	C6H6	BNJV 004	< 1	D
TGRSE	4/12/99	C6H6	BNJV 003	< 1	
TGRSE	10/5/98	CCL4	BKVQ 012	< 1	
TGRSE	10/5/98	CCL4	BKVQ 013	< 1	D
TGRSE	11/3/98	CCL4	BLMV 012	< 1	
TGRSE	11/3/98	CCL4	BLMV 013	< 1	D
TGRSE	12/1/98	CCL4	BMCM 005	< 1	D
TGRSE	12/1/98	CCL4	BMCM 004	< 1	
TGRSE	1/5/99	CCL4	BMMB 003	< 1	
TGRSE	1/5/99	CCL4	BMMB 006	< 1	D
TGRSE	2/2/99	CCL4	BMSW 003	< 1	
TGRSE	2/2/99	CCL4	BMSW 006	< 1	D
TGRSE	3/3/99	CCL4	BMZK 006	< 1	D
TGRSE	3/3/99	CCL4	BMZK 003	< 1	
TGRSE	4/12/99	CCL4	BNJV 004	< 1	D
TGRSE	4/12/99	CCL4	BNJV 003	< 1	
TGRSE	5/7/99	CCL4	BNLN 006	< 1	D
TGRSE	5/7/99	CCL4	BNLN 003	< 1	
TGRSE	6/1/99	CCL4	BNNQ 006	< 1	D
TGRSE	6/1/99	CCL4	BNNQ 003	< 1	
TGRSE	7/6/99	CCL4	BNXJ 003	< 1	
TGRSE	7/6/99	CCL4	BNXJ 006	< 1	D
TGRSE	8/4/99	CCL4	BPFF 004	< 1	D
TGRSE	8/4/99	CCL4	BPFF 003	< 1	
TGRSE	9/7/99	CCL4	BPMQ 007	< 1	D
TGRSE	9/7/99	CCL4	BPMQ 004	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	10/5/98	CH2CL2	BKVQ 013	< 1	D
TGRSE	10/5/98	CH2CL2	BKVQ 012	< 1	
TGRSE	11/3/98	CH2CL2	BLMV 012	< 1	
TGRSE	11/3/98	CH2CL2	BLMV 013	< 1	D
TGRSE	12/1/98	CH2CL2	BMCM 005	< 1	D
TGRSE	12/1/98	CH2CL2	BMCM 004	< 1	
TGRSE	1/5/99	CH2CL2	BMMB 006	< 1	D
TGRSE	1/5/99	CH2CL2	BMMB 003	< 1	
TGRSE	2/2/99	CH2CL2	BMSW 006	< 1	D
TGRSE	2/2/99	CH2CL2	BMSW 003	< 1	
TGRSE	3/3/99	CH2CL2	BMZK 006	< 1	D
TGRSE	3/3/99	CH2CL2	BMZK 003	< 1	
TGRSE	4/12/99	CH2CL2	BNJV 004	< 1	D
TGRSE	4/12/99	CH2CL2	BNJV 003	< 1	
TGRSE	5/7/99	CH2CL2	BNLN 006	< 1	D
TGRSE	5/7/99	CH2CL2	BNLN 003	< 1	
TGRSE	6/1/99	CH2CL2	BNNQ 006	< 1	D
TGRSE	6/1/99	CH2CL2	BNNQ 003	< 1	
TGRSE	7/6/99	CH2CL2	BNXJ 006	< 1	D
TGRSE	7/6/99	CH2CL2	BNXJ 003	< 1	
TGRSE	8/4/99	CH2CL2	BPFF 004	< 1	D
TGRSE	8/4/99	CH2CL2	BPFF 003	< 1	
TGRSE	9/7/99	CH2CL2	BPMQ 007	< 1	D
TGRSE	9/7/99	CH2CL2	BPMQ 004	< 1	
TGRSE	10/5/98	CHCL3	BKVQ 013	< 1	D
TGRSE	10/5/98	CHCL3	BKVQ 012	< 1	
TGRSE	11/3/98	CHCL3	BLMV 012	< 1	
TGRSE	11/3/98	CHCL3	BLMV 013	< 1	D
TGRSE	12/1/98	CHCL3	BMCM 004	< 1	
TGRSE	12/1/98	CHCL3	BMCM 005	< 1	D
TGRSE	1/5/99	CHCL3	BMMB 006	< 1	D
TGRSE	1/5/99	CHCL3	BMMB 003	< 1	
TGRSE	2/2/99	CHCL3	BMSW 006	< 1	D
TGRSE	2/2/99	CHCL3	BMSW 003	< 1	
TGRSE	3/3/99	CHCL3	BMZK 003	< 1	
TGRSE	3/3/99	CHCL3	BMZK 006	< 1	D
TGRSE	4/12/99	CHCL3	BNJV 004	< 1	D
TGRSE	4/12/99	CHCL3	BNJV 003	< 1	
TGRSE	5/7/99	CHCL3	BNLN 006	< 1	D
TGRSE	5/7/99	CHCL3	BNLN 003	< 1	
TGRSE	6/1/99	CHCL3	BNNQ 006	< 1	D
TGRSE	6/1/99	CHCL3	BNNQ 003	< 1	
TGRSE	7/6/99	CHCL3	BNXJ 006	< 1	D
TGRSE	7/6/99	CHCL3	BNXJ 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	8/4/99	CHCL3	BPFF 004	< 1	D
TGRSE	8/4/99	CHCL3	BPFF 003	< 1	
TGRSE	9/7/99	CHCL3	BPMQ 007	< 1	D
TGRSE	9/7/99	CHCL3	BPMQ 004	< 1	
TGRSE	10/5/98	T12DCE	BKVQ 012	< 1	
TGRSE	10/5/98	T12DCE	BKVQ 013	< 1	D
TGRSE	11/3/98	T12DCE	BLMV 012	< 1	
TGRSE	11/3/98	T12DCE	BLMV 013	< 1	D
TGRSE	12/1/98	T12DCE	BMCM 005	< 1	D
TGRSE	12/1/98	T12DCE	BMCM 004	< 1	
TGRSE	1/5/99	T12DCE	BMMB 006	< 1	D
TGRSE	1/5/99	T12DCE	BMMB 003	< 1	
TGRSE	2/2/99	T12DCE	BMSW 006	< 1	D
TGRSE	2/2/99	T12DCE	BMSW 003	< 1	
TGRSE	3/3/99	T12DCE	BMZK 006	< 1	D
TGRSE	3/3/99	T12DCE	BMZK 003	< 1	
TGRSE	4/12/99	T12DCE	BNJV 004	< 1	D
TGRSE	4/12/99	T12DCE	BNJV 003	< 1	
TGRSE	5/7/99	T12DCE	BNLN 006	< 1	D
TGRSE	5/7/99	T12DCE	BNLN 003	< 1	
TGRSE	6/1/99	T12DCE	BNNQ 006	< 1	D
TGRSE	6/1/99	T12DCE	BNNQ 003	< 1	
TGRSE	7/6/99	T12DCE	BNXJ 006	< 1	D
TGRSE	7/6/99	T12DCE	BNXJ 003	< 1	
TGRSE	8/4/99	T12DCE	BPFF 004	< 1	D
TGRSE	8/4/99	T12DCE	BPFF 003	< 1	
TGRSE	9/7/99	T12DCE	BPMQ 004	< 1	
TGRSE	9/7/99	T12DCE	BPMQ 007	< 1	D
TGRSE	10/5/98	TCLEE	BKVQ 013	< 1	D
TGRSE	10/5/98	TCLEE	BKVQ 012	< 1	
TGRSE	11/3/98	TCLEE	BLMV 012	< 1	
TGRSE	11/3/98	TCLEE	BLMV 013	< 1	D
TGRSE	12/1/98	TCLEE	BMCM 005	< 1	D
TGRSE	12/1/98	TCLEE	BMCM 004	< 1	
TGRSE	1/5/99	TCLEE	BMMB 006	< 1	D
TGRSE	1/5/99	TCLEE	BMMB 003	< 1	
TGRSE	2/2/99	TCLEE	BMSW 003	< 1	
TGRSE	2/2/99	TCLEE	BMSW 006	< 1	D
TGRSE	3/3/99	TCLEE	BMZK 006	< 1	D
TGRSE	3/3/99	TCLEE	BMZK 003	< 1	
TGRSE	4/12/99	TCLEE	BNJV 004	< 1	D
TGRSE	4/12/99	TCLEE	BNJV 003	< 1	
TGRSE	5/7/99	TCLEE	BNLN 006	< 1	D
TGRSE	5/7/99	TCLEE	BNLN 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	6/1/99	TCLEE	BNNQ 006	< 1	D
TGRSE	6/1/99	TCLEE	BNNQ 003	< 1	
TGRSE	7/6/99	TCLEE	BNXJ 006	< 1	D
TGRSE	7/6/99	TCLEE	BNXJ 003	< 1	
TGRSE	8/4/99	TCLEE	BPFF 004	< 1	D
TGRSE	8/4/99	TCLEE	BPFF 003	< 1	
TGRSE	9/7/99	TCLEE	BPMQ 007	< 1	D
TGRSE	9/7/99	TCLEE	BPMQ 004	< 1	
TGRSE	10/5/98	TCLTFE	BKVQ 013	< 1	D
TGRSE	10/5/98	TCLTFE	BKVQ 012	< 1	
TGRSE	11/3/98	TCLTFE	BLMV 012	< 1	
TGRSE	11/3/98	TCLTFE	BLMV 013	< 1	D
TGRSE	12/1/98	TCLTFE	BMCM 004	< 1	
TGRSE	12/1/98	TCLTFE	BMCM 005	< 1	D
TGRSE	1/5/99	TCLTFE	BMMB 006	< 1	D
TGRSE	1/5/99	TCLTFE	BMMB 003	< 1	
TGRSE	2/2/99	TCLTFE	BMSW 006	< 1	D
TGRSE	2/2/99	TCLTFE	BMSW 003	< 1	
TGRSE	3/3/99	TCLTFE	BMZK 003	< 1	
TGRSE	3/3/99	TCLTFE	BMZK 006	< 1	D
TGRSE	5/7/99	TCLTFE	BNLN 006	< 1	D
TGRSE	5/7/99	TCLTFE	BNLN 003	< 1	
TGRSE	6/1/99	TCLTFE	BNNQ 006	< 1	D
TGRSE	6/1/99	TCLTFE	BNNQ 003	< 1	
TGRSE	7/6/99	TCLTFE	BNXJ 006	< 1	D
TGRSE	7/6/99	TCLTFE	BNXJ 003	< 1	
TGRSE	8/4/99	TCLTFE	BPFF 004	< 1	D
TGRSE	8/4/99	TCLTFE	BPFF 003	< 1	
TGRSE	9/7/99	TCLTFE	BPMQ 007	< 1	D
TGRSE	9/7/99	TCLTFE	BPMQ 004	< 1	
TGRSE	10/5/98	TRCLE	BKVQ 012	< 1	
TGRSE	10/5/98	TRCLE	BKVQ 013	< 1	D
TGRSE	11/3/98	TRCLE	BLMV 012	0.37	JP
TGRSE	11/3/98	TRCLE	BLMV 013	0.37	DJP
TGRSE	12/1/98	TRCLE	BMCM 004	0.44	JP
TGRSE	12/1/98	TRCLE	BMCM 005	0.42	JDP
TGRSE	1/5/99	TRCLE	BMMB 006	0.65	JDP
TGRSE	1/5/99	TRCLE	BMMB 003	0.66	JP
TGRSE	2/2/99	TRCLE	BMSW 006	0.43	JDP
TGRSE	2/2/99	TRCLE	BMSW 003	0.41	JP
TGRSE	3/3/99	TRCLE	BMZK 006	0.48	JDP
TGRSE	3/3/99	TRCLE	BMZK 003	0.5	JP
TGRSE	4/12/99	TRCLE	BNJV 004	0.52	JDP
TGRSE	4/12/99	TRCLE	BNJV 003	0.5	JP

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	5/7/99	TRCLE	BNLN 006	0.46	JDP
TGRSE	5/7/99	TRCLE	BNLN 003	0.47	JP
TGRSE	6/1/99	TRCLE	BNNQ 006	0.35	JDP
TGRSE	6/1/99	TRCLE	BNNQ 003	0.4	JP
TGRSE	7/6/99	TRCLE	BNXJ 006	0.54	JDP
TGRSE	7/6/99	TRCLE	BNXJ 003	0.48	JP
TGRSE	8/4/99	TRCLE	BPFF 004	0.47	JPD
TGRSE	8/4/99	TRCLE	BPFF 003	0.43	JP
TGRSE	9/7/99	TRCLE	BPMQ 007	0.69	JDP
TGRSE	9/7/99	TRCLE	BPMQ 004	0.41	JP
TGRSI	10/5/98	111TCE	BKVQ 014	67.5	
TGRSI	11/3/98	111TCE	BLMV 015	75	
TGRSI	12/1/98	111TCE	BMCM 007	70	
TGRSI	1/5/99	111TCE	BMMB 008	82.5	
TGRSI	2/2/99	111TCE	BMSW 008	90	
TGRSI	3/3/99	111TCE	BMZK 008	75	
TGRSI	4/12/99	111TCE	BNJV 008	75	
TGRSI	5/7/99	111TCE	BNLN 008	70	
TGRSI	6/1/99	111TCE	BNNQ 008	47.5	
TGRSI	7/6/99	111TCE	BNXJ 008	62.5	
TGRSI	8/4/99	111TCE	BPFF 006	70	
TGRSI	9/7/99	111TCE	BPMQ 003	65	
TGRSI	10/5/98	112TCE	BKVQ 014	< 1	
TGRSI	11/3/98	112TCE	BLMV 015	< 1	
TGRSI	12/1/98	112TCE	BMCM 007	0.54	JP
TGRSI	1/5/99	112TCE	BMMB 008	< 1	
TGRSI	2/2/99	112TCE	BMSW 008	0.52	JP
TGRSI	3/3/99	112TCE	BMZK 008	0.72	JP
TGRSI	4/12/99	112TCE	BNJV 008	< 1	
TGRSI	5/7/99	112TCE	BNLN 008	< 1	
TGRSI	6/1/99	112TCE	BNNQ 008	< 1	
TGRSI	7/6/99	112TCE	BNXJ 008	< 1	
TGRSI	8/4/99	112TCE	BPFF 006	0.44	JP
TGRSI	9/7/99	112TCE	BPMQ 003	< 1	
TGRSI	10/5/98	11DCE	BKVQ 014	7.1	
TGRSI	11/3/98	11DCE	BLMV 015	11	
TGRSI	12/1/98	11DCE	BMCM 007	10	
TGRSI	1/5/99	11DCE	BMMB 008	12	
TGRSI	2/2/99	11DCE	BMSW 008	10	
TGRSI	3/3/99	11DCE	BMZK 008	10	
TGRSI	4/12/99	11DCE	BNJV 008	9	
TGRSI	5/7/99	11DCE	BNLN 008	12	
TGRSI	6/1/99	11DCE	BNNQ 008	7.5	
TGRSI	7/6/99	11DCE	BNXJ 008	9.8	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	8/4/99	11DCE	BPFF 006	9.4	
TGRSI	9/7/99	11DCE	BPMQ 003	8.4	
TGRSI	10/5/98	11DCLE	BKVQ 014	7.6	
TGRSI	11/3/98	11DCLE	BLMV 015	13	
TGRSI	12/1/98	11DCLE	BMCM 007	12	
TGRSI	1/5/99	11DCLE	BMMB 008	12	
TGRSI	2/2/99	11DCLE	BMSW 008	12	
TGRSI	3/3/99	11DCLE	BMZK 008	11	
TGRSI	4/12/99	11DCLE	BNJV 008	10	
TGRSI	5/7/99	11DCLE	BNLN 008	13	
TGRSI	6/1/99	11DCLE	BNNQ 008	8.5	
TGRSI	7/6/99	11DCLE	BNXJ 008	11	
TGRSI	8/4/99	11DCLE	BPFF 006	10	
TGRSI	9/7/99	11DCLE	BPMQ 003	9.2	
TGRSI	10/5/98	12DCLE	BKVQ 014	< 1	
TGRSI	11/3/98	12DCLE	BLMV 015	< 1	
TGRSI	12/1/98	12DCLE	BMCM 007	< 1	
TGRSI	1/5/99	12DCLE	BMMB 008	< 1	
TGRSI	2/2/99	12DCLE	BMSW 008	< 1	
TGRSI	3/3/99	12DCLE	BMZK 008	< 1	
TGRSI	4/12/99	12DCLE	BNJV 008	< 1	
TGRSI	5/7/99	12DCLE	BNLN 008	< 1	
TGRSI	6/1/99	12DCLE	BNNQ 008	< 1	
TGRSI	7/6/99	12DCLE	BNXJ 008	< 1	
TGRSI	8/4/99	12DCLE	BPFF 006	< 1	
TGRSI	9/7/99	12DCLE	BPMQ 003	< 1	
TGRSI	10/5/98	12DCLP	BKVQ 014	< 1	
TGRSI	11/3/98	12DCLP	BLMV 015	< 1	
TGRSI	12/1/98	12DCLP	BMCM 007	< 1	
TGRSI	1/5/99	12DCLP	BMMB 008	< 1	
TGRSI	2/2/99	12DCLP	BMSW 008	< 1	
TGRSI	3/3/99	12DCLP	BMZK 008	< 1	
TGRSI	4/12/99	12DCLP	BNJV 008	< 1	
TGRSI	5/7/99	12DCLP	BNLN 008	< 1	
TGRSI	6/1/99	12DCLP	BNNQ 008	< 1	
TGRSI	7/6/99	12DCLP	BNXJ 008	< 1	
TGRSI	8/4/99	12DCLP	BPFF 006	< 1	
TGRSI	9/7/99	12DCLP	BPMQ 003	< 1	
TGRSI	10/5/98	C12DCE	BKVQ 014	3.1	
TGRSI	11/3/98	C12DCE	BLMV 015	6.6	
TGRSI	12/1/98	C12DCE	BMCM 007	6	
TGRSI	1/5/99	C12DCE	BMMB 008	6.1	
TGRSI	2/2/99	C12DCE	BMSW 008	5.5	
TGRSI	3/3/99	C12DCE	BMZK 008	5.5	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	4/12/99	C12DCE	BNJV 008	5.1	
TGRSI	5/7/99	C12DCE	BNLN 008	6.7	
TGRSI	6/1/99	C12DCE	BNNQ 008	4.9	
TGRSI	7/6/99	C12DCE	BNXJ 008	6	
TGRSI	8/4/99	C12DCE	BPFF 006	5.5	
TGRSI	9/7/99	C12DCE	BPMQ 003	5.7	
TGRSI	10/5/98	C2H3CL	BKVQ 014	< 1	
TGRSI	11/3/98	C2H3CL	BLMV 015	< 1	
TGRSI	12/1/98	C2H3CL	BMCM 007	< 1	
TGRSI	1/5/99	C2H3CL	BMMB 008	< 1	
TGRSI	2/2/99	C2H3CL	BMSW 008	< 1	
TGRSI	3/3/99	C2H3CL	BMZK 008	< 1	
TGRSI	4/12/99	C2H3CL	BNJV 008	< 1	
TGRSI	5/7/99	C2H3CL	BNLN 008	< 1	
TGRSI	6/1/99	C2H3CL	BNNQ 008	< 1	
TGRSI	7/6/99	C2H3CL	BNXJ 008	< 1	
TGRSI	8/4/99	C2H3CL	BPFF 006	< 1	
TGRSI	9/7/99	C2H3CL	BPMQ 003	< 1	
TGRSI	3/3/99	C6H6	BMZK 008	< 1	
TGRSI	4/12/99	C6H6	BNJV 008	< 1	
TGRSI	10/5/98	CCL4	BKVQ 014	< 1	
TGRSI	11/3/98	CCL4	BLMV 015	< 1	
TGRSI	12/1/98	CCL4	BMCM 007	< 1	
TGRSI	1/5/99	CCL4	BMMB 008	< 1	
TGRSI	2/2/99	CCL4	BMSW 008	< 1	
TGRSI	3/3/99	CCL4	BMZK 008	< 1	
TGRSI	4/12/99	CCL4	BNJV 008	< 1	
TGRSI	5/7/99	CCL4	BNLN 008	< 1	
TGRSI	6/1/99	CCL4	BNNQ 008	< 1	
TGRSI	7/6/99	CCL4	BNXJ 008	< 1	
TGRSI	8/4/99	CCL4	BPFF 006	< 1	
TGRSI	9/7/99	CCL4	BPMQ 003	< 1	
TGRSI	10/5/98	CH2CL2	BKVQ 014	< 1	
TGRSI	11/3/98	CH2CL2	BLMV 015	< 1	
TGRSI	12/1/98	CH2CL2	BMCM 007	< 1	
TGRSI	1/5/99	CH2CL2	BMMB 008	< 1	
TGRSI	2/2/99	CH2CL2	BMSW 008	< 1	
TGRSI	3/3/99	CH2CL2	BMZK 008	< 1	
TGRSI	4/12/99	CH2CL2	BNJV 008	< 1	
TGRSI	5/7/99	CH2CL2	BNLN 008	< 1	
TGRSI	6/1/99	CH2CL2	BNNQ 008	< 1	
TGRSI	7/6/99	CH2CL2	BNXJ 008	< 1	
TGRSI	8/4/99	CH2CL2	BPFF 006	< 1	
TGRSI	9/7/99	CH2CL2	BPMQ 003	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	10/5/98	CHCL3	BKVQ 014	< 1	
TGRSI	11/3/98	CHCL3	BLMV 015	< 1	
TGRSI	12/1/98	CHCL3	BMCM 007	< 1	
TGRSI	1/5/99	CHCL3	BMMB 008	< 1	
TGRSI	2/2/99	CHCL3	BMSW 008	< 1	
TGRSI	3/3/99	CHCL3	BMZK 008	< 1	
TGRSI	4/12/99	CHCL3	BNJV 008	< 1	
TGRSI	5/7/99	CHCL3	BNLN 008	< 1	
TGRSI	6/1/99	CHCL3	BNNQ 008	< 1	
TGRSI	7/6/99	CHCL3	BNXJ 008	< 1	
TGRSI	8/4/99	CHCL3	BPFF 006	< 1	
TGRSI	9/7/99	CHCL3	BPMQ 003	< 1	
TGRSI	10/5/98	T12DCE	BKVQ 014	< 1	
TGRSI	11/3/98	T12DCE	BLMV 015	< 1	
TGRSI	12/1/98	T12DCE	BMCM 007	< 1	
TGRSI	1/5/99	T12DCE	BMMB 008	< 1	
TGRSI	2/2/99	T12DCE	BMSW 008	< 1	
TGRSI	3/3/99	T12DCE	BMZK 008	< 1	
TGRSI	4/12/99	T12DCE	BNJV 008	< 1	
TGRSI	5/7/99	T12DCE	BNLN 008	< 1	
TGRSI	6/1/99	T12DCE	BNNQ 008	< 1	
TGRSI	7/6/99	T12DCE	BNXJ 008	< 1	
TGRSI	8/4/99	T12DCE	BPFF 006	< 1	
TGRSI	9/7/99	T12DCE	BPMQ 003	< 1	
TGRSI	10/5/98	TCLEE	BKVQ 014	0.7	JP
TGRSI	11/3/98	TCLEE	BLMV 015	0.56	JP
TGRSI	12/1/98	TCLEE	BMCM 007	0.61	JP
TGRSI	1/5/99	TCLEE	BMMB 008	0.59	JP
TGRSI	2/2/99	TCLEE	BMSW 008	0.6	JP
TGRSI	3/3/99	TCLEE	BMZK 008	0.73	JP
TGRSI	4/12/99	TCLEE	BNJV 008	0.61	JP
TGRSI	5/7/99	TCLEE	BNLN 008	0.58	JP
TGRSI	6/1/99	TCLEE	BNNQ 008	0.48	JP
TGRSI	7/6/99	TCLEE	BNXJ 008	0.59	JP
TGRSI	8/4/99	TCLEE	BPFF 006	0.58	JP
TGRSI	9/7/99	TCLEE	BPMQ 003	0.6	JP
TGRSI	10/5/98	TCLTFE	BKVQ 014	1.1	
TGRSI	11/3/98	TCLTFE	BLMV 015	< 1	
TGRSI	12/1/98	TCLTFE	BMCM 007	< 1	
TGRSI	1/5/99	TCLTFE	BMMB 008	< 1	
TGRSI	2/2/99	TCLTFE	BMSW 008	< 1	
TGRSI	3/3/99	TCLTFE	BMZK 008	0.98	JP
TGRSI	5/7/99	TCLTFE	BNLN 008	< 1	
TGRSI	6/1/99	TCLTFE	BNNQ 008	< 1	

APPENDIX I.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	7/6/99	TCLTFE	BNXJ 008	< 1	
TGRSI	8/4/99	TCLTFE	BPFF 006	< 1	
TGRSI	9/7/99	TCLTFE	BPMQ 003	< 1	
TGRSI	10/5/98	TRCLE	BKVQ 014	375	
TGRSI	11/3/98	TRCLE	BLMV 015	450	
TGRSI	12/1/98	TRCLE	BMCM 007	375	
TGRSI	1/5/99	TRCLE	BMMB 008	500	
TGRSI	2/2/99	TRCLE	BMSW 008	475	
TGRSI	3/3/99	TRCLE	BMZK 008	470	
TGRSI	4/12/99	TRCLE	BNJV 008	375	
TGRSI	5/7/99	TRCLE	BNLN 008	425	
TGRSI	6/1/99	TRCLE	BNNQ 008	300	
TGRSI	7/6/99	TRCLE	BNXJ 008	375	
TGRSI	8/4/99	TRCLE	BPFF 006	400	
TGRSI	9/7/99	TRCLE	BPMQ 003	375	

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

APPENDIX J

Appendix J

TGRS Operational Data and Site K Operational Data

J.1 FY 1999 Inspection and Maintenance Activities TGRS, TCAAP

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES TGRS, TCAAP

OCTOBER 1998 NOTES

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/01-09/98	Pumphouse B4, Pump, motor and 1 joint of riser pipe fell to bottom of well. They were retrieved and replaced with new equipment. Down Time: 264.0 Hours.
10/3/98	Pumphouse B3, The o-ring in the pitless adapter was leaking and was replaced. The pumphouse was already shut down due to reduced treatment center capacity. Down Time: None.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5 Hours.
10/06-07/98	Pumphouse B10, The pump and motor failed on 10/6/98 and were replaced on 10/07/98. Down Time: 26.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/6/98	Treatment Center, Electric Check Valve No. 3, closed without command and was reset. The control piping was flushed. Down Time: None.
10/8/98	Forcemain, Altitude valve control piping was leaking and leak was corrected. Down Time: None.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/10-13/98	Pumphouse B9, Motor overloads have tripped several times and on 10/12/98 they were upsized from W65 to W63. On 10/13/98 the starter contacts were repaired. Down Time: 42.5 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was

	replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
10/29/98	Pumphouse B11, The pumphouse was shut down for replacement of the flow meter cover gasket. Down Time: 0.5 Hours.
10/29/98	Pumphouse B6, The pumphouse flow meter measuring chamber assembly replaced. Down Time: 1.0 Hour.

NOVEMBER 1998 NOTES

11/1/98	Pumphouse B4, The pumphouse ECV opening speed control valve was leaking, and was replaced. Down Time: None.
11/3/98	Pumphouse B2, The pumphouse was shutdown for pulling and replacement of the riser pipe with Sch. 80 PVC pipe with brass couplings. Down Time : 8.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/9/98	Treatment Center, Air Stripping Tower No. 1 distribution nozzle was repaired. Down Time: None.
11/9-13/98	Pumphouse B2, A Tee was added to the pumphouse piping. The well and pump were then cleaned by recirculating acid. Down Time: 4.5 Hours.
11/10/98	Pumphouse B5, The pumphouse ECV was modulating excessively. The ECV control piping and components were cleaned by flushing and brushing, and then adjusted. ECV operation was then observed. Down Time: None.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

11/11/98	Treatment Center, A small leak was repaired in the potable water supply to ECVs Nos. 1 & 2. Down Time: None.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
11/26/98	Daily inspection was not performed due to Thanksgiving holiday. Down Time: None.

DECEMBER 1998 NOTES

12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
12/11/98	Treatment Center, ECVs #3 and #4 were closing very slowly and were adjusted. Down Time: None.
12/15/98	Forcemain, An air release valve near Site D, which was repaired on 12/11/98, was replaced 12/15/98. Down Time: None.
12/15/98	Treatment Center, Blower No. 1 was shutdown to facilitate replacement of a failing drive belt. Down Time: None.
12/18/98	Pumphouse B2, The 3-way solenoid valve was venting water and was replaced. Down Time 0.25 Hours.
12/19-24/98	Pumphouse SC5, The flowmeter was malfunctioning and was repaired. Down Time: 0.5 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

12/25/98	Daily inspection was not performed due to Christmas holiday. Down Time: None.
12/30/98	Pumphouses SC2,SC3, and SC5, The pumphouses experienced a power loss. Down Time: 1.0 Hours.

JANUARY 1999 NOTES

1/1/99	Daily inspection was not performed due to New Years Day holiday. Down Time: None.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
01/05-15/99	Pumphouse SC3, The pumphouse wall heater had failed and was repaired. Down Time: None.
1/12/99	Pumphouses B3, B4, and B5, The pumphouse ECV control piping failures were repaired. Down Time: None.
01/06-14/99	Pumphouse SC5, The pumphouse was shutdown to pull and replace the pump and motor. Down Time: 192.0 Hours.
1/19/99	Pumphouse SC5, The pumphouse was shutdown to facilitate changing the flowmeter measuring assembly. Down Time: 0.25 Hours.
1/20/99	Treatment Center, Blower #2 was shutdown to change a drive belt, which had failed. Down Time: 0.25 Hours.
1/21/99	Pumphouse SC2, The pumphouse flowmeter had stopped on 01/19/99 and was replaced on 01/21/99. Down Time: 0.5 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

FEBRUARY 1999 NOTES

2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
2/11/99	Pumphouse B4, The pumphouse air release valve and nipple were leaking. The air release valve, isolation valve, and nipple were replaced. Down Time: None.
2/12/99	Pumphouse B3, A remote PLC data card from the control panel had failed and was replaced. Down Time: None.
2/16/99	Pumphouse B7, The electric check valve gland nut had failed and was replaced. Down Time: None.
02/20-22/99	Pumphouse SC1, Daily inspection showed the pumphouse was down. Blown fuses were replaced. Down Time: 66.5 Hours.
2/23/99	Forcemain, The Snelling Ave. back pressure valve was adjusted to reduce backpressure and allow increased flow. Down Time: None.
2/23/99	Pumphouse B10, The pumphouse electric check valve gland nut had failed and was replaced. Down Time: None.
2/23/99	Pumphouse B9, The pumphouse flowmeter cover plate was leaking. The cover plate bolts were tightened to stop leak. Down Time: None.
2/24/99	Pumphouse B7, The door vent cover plate was missing and was replaced. Down Time: None.
2/26/99	Pumphouse B3, The TGRS was shutdown to facilitate repairs to the pumphouse sampling piping. Down Time: 0.5 Hours.

MARCH 1999 NOTES

3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/9/99	Pumphouse SC1, The submersible pump was down. The Alliant electrician

	found blown fuses in the control panel and replaced them. Down Time: 19.0 Hours.
03/10-12/99	Pumphouse B8, Flowrates had fallen and trouble shooting indicated the pump was worn and needed replacing. The pump and motor were pulled and replaced along with the riser pipe. The well was also cleaned with a brush, then bailed, acid treated, surged, and bailed. Down Time: 48.0 Hours.
03/10-19/99	Pumphouse SC1, Repetitive fuse failures were traced to failed submersible motor,. The pump and motor were replaced along with riser pipe and check valve. The well was also cleaned with a brush, then bailed, acid treated, surged, and bailed. Down Time: 216.0 Hours.
03/17-20/99	Pumphouse B2, Stainless steel riser pipe installed to allow acid treatment with stronger acid. During replacement, the well was brushed, bailed and acid treated. Down Time: 52.0 Hours.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
03/23-24/99	Pumphouse SC2, Pumphouse flowrates had decreased, indicating the iron silt was fouling the pump and piping. The pump and motor were replaced, 3 inch diameter Sch. 80 PVC riser pipe installed, and the well acid treated. Down Time: 32 Hours.
03/23-24/99	Pumphouse B5, Daily inspection found the 480V disconnect switch to have failed shutting down the pumphouse. The switch was replaced and the pumphouse restarted. Down Time: 48.0 Hours.
03/21-31/99	Pumphouse B2, The submersible pump began to fail. A new pump was ordered and installed upon delivery. During repair the well was surged and bailed for 1/2 day. Down Time: 205.0 Hours.

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FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.

APRIL 1999 NOTES

04/01-02/99	Pumphouse B2, The pumphouse flow meter was clogged with debris from well cleaning. The meter was cleaned on 04/02/99. Down Time: None.
04/01-09/99	Pumphouse SC1, Failed fuses were replaced as part of pump and motor replacement. Down Time 194.0 Hours.
4/2/99	Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 - 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/7/99	Pumphouse B5, The well was cycling due to over production and resulting low pumping water level in well. Down Time: None.
4/7/99	Treatment Center, The auto dialer called out indicating an alarm, which later automatically reset. Down Time : None.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.
04/08-09/99	Pumphouse SC5, The pumping water level was below pump inlet and the pump cavitating. The ECV was also modulating erratically. The ECV adjusted to increase back pressure held on pump. Down Time: None.
4/10/99	Pumphouse SC5, Well cycling due to low pumping water level. Down Time: None.
04/10-12/99	Pumphouse SC1, Motor starter overloads had tripped, were reset, and pump restarted. Down Time: 48.0 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES TGRS, TCAAP

4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/18/99	Pumphouses B1,B2,B3,B7, Electrical service to the pumphouses had failed. Down Time: Pumphouses B1, B3 - 21 Hours, Pumphouse B2 - 38 Hours, Pumphouse B7 - 20.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.
4/20/99	Treatment Center, Autodialer called out indicating an alarm which later automatically reset. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
04/22-30/99	Pumphouse SC5, The pumphouse flow rate has decreased due to difficulties with ECV. Down Time: None.
4/28/99	Pumphouse SC1, The flow rate decreased at this pumphouse for an unknown reason. Down Time: None.
4/28/99	Pumphouse SC2, The pumphouse was shut down to install an additional section of PVC riser pipe. Down Time: 2.5 Hours.
4/30/99	Pumphouse B10, A failed emergency operation solenoid valve on ECV was replaced. Down Time: None.

MAY 1999 NOTES

5/1/99	Pumphouse SC5, The electric check valve control harness was replaced with a new harness and the valve body was inspected. Down Time: 6.5 Hours.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouse SC3, The pumphouse shut down on 5/3 due to leaking pitless O-ring. The O-ring was replaced on 5/5/99. Down Time: 51 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/19/99	Pumphouse SC5, The pumphouse found down. ECV control harness was flushed the pumphouse restarted. Down Time: 9.0 Hours.
5/21/99	Treatment Center, A pin hole leak in potable water supply pipe to ECV Nos. 1 & 2 was repaired. Down Time: None.
5/27/99	Treatment Center, The well field cycled for an unknown reason. Down Time: None.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.

JUNE 1999 NOTES

6/9/99	Pumphouse B7, The pumphouse was shut down while repair and adjustment of water level sensor was made. Down Time: 3.0 Hours.
6/11/99	Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.
6/14/99	Forcemain, TCAAP elevated tank isn't filling at normal rate. Troubleshooting was performed on Snelling Avenue back pressure valve and altitude valve. Down Time: None.
6/18/99	Forcemain, TCAAP elevated tank isn't filling at normal rate. Troubleshooting was performed on Snelling Avenue back pressure valve and altitude valve. Down Time: None.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES TGRS, TCAAP

6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.

JULY 1999 NOTES

7/1/99	Pumphouse B10, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/2/99	Treatment Center, Electric Check Valve No.4 closed without command. The PDU was reset and restarted. Down Time: 0.25 Hours.
7/2/99	Pumphouse B3, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/3/99	Pumphouse B7, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/5/99	The Daily Inspection was not performed due to the holiday weekend. Meter Readings are estimated. Down Time: None.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES TGRS, TCAAP

AUGUST 1999 NOTES

8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/10/99	Pumphouse B2, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 6 Hours.
8/10/99	Treatment Center, The telephone line servicing the autodialer was repaired. The data cable between RTU1 and Master PLC for water level control system was also repaired. Down Time: None.
8/13/99	Treatment Center, Autodialer called out indicating a power failure and the system reset on its own. Down Time: None.
8/14/99	Treatment Center, ECV #2 did not open on command, causing well field to cycle. The PDU was reset and restarted. Down Time: None.
8/22/99	Treatment Center, ECV #2 did not open on command causing well field to cycle. The PDU was reset and restarted. Down Time: None.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

SEPTEMBER 1999 NOTES

09/01-03/99	Pumphouse B11, The pump and motor were pulled from the well. The riser pipe and foot valve were replaced. A polyethylene pipe was fished from well. Down Time: 77.5 Hours.
9/01-03/99	Pumphouse SC1, The pumphouse was also down during repairs to B11. SC1 control functions require B11 to be operating for SC1 to operate. Down Time: 77.5 Hours.

APPENDIX J.1

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
TGRS, TCAAP

9/2/99	Pumphouse B2, Pumphouse did not restart when directed to by the PLC. The pumphouse was reset and restarted. Down Time: 2.25 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/5/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: None.
9/6/99	The Daily Inspection was not performed due to the holiday. Meter Readings are estimated. Down Time: None.
9/11/99	Treatment System, Autodialer called out, but system automatically reset and then continued to operate. Down Time: None.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

J.2 1999 Events TGRS, TCAAP

TCAAP NOTES

FORCEMAIN

10/8/98	Forcemain, Altitude valve control piping was leaking and leak was corrected. Down Time: None.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
12/15/98	Forcemain, An air release valve near Site D, which was repaired on 12/11/98, was replaced 12/15/98. Down Time: None.
2/23/99	Forcemain, The Snelling Ave. back pressure valve was adjusted to reduce back pressure and allow increased flow. Down Time: None.
6/14/99	Forcemain, TCAAP elevated tank isn't filling at normal rate. Troubleshooting was performed on Snelling Avenue back pressure valve and altitude valve. Down Time: None.
6/18/99	Forcemain, TCAAP elevated tank isn't filling at normal rate. Troubleshooting was performed on Snelling Avenue back pressure valve and altitude valve. Down Time: None.

TREATMENT CENTER

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/6/98	Treatment Center, Electric Check Valve No. 3, closed without command and was reset. The control piping was flushed. Down Time: None.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.

10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/9/98	Treatment Center, Air Stripping Tower No. 1 distribution nozzle was repaired. Down Time: None.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/11/98	Treatment Center, A small leak was repaired in the potable water supply to ECVs Nos. 1 & 2. Down Time: None.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
11/26/98	Daily inspection was not performed due to Thanksgiving holiday. Down Time: None.
12/11/98	Treatment Center, ECVs #3 and #4 were closing very slowly and were adjusted. Down Time: None.
12/15/98	Treatment Center, Blower No. 1 was shutdown to facilitate replacement of a failing drive belt. Down Time: None.

12/25/98	Daily inspection was not performed due to Christmas holiday. Down Time: None.
1/1/99	Daily inspection was not performed due to New Years Day holiday. Down Time: None.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/20/99	Treatment Center, Blower #2 was shutdown to change a drive belt, which had failed. Down Time: 0.25 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/7/99	Treatment Center, The auto dialer called out indicating an alarm, which later automatically reset. Down Time : None.
4/20/99	Treatment Center, Autodialer called out indicating an alarm which later automatically reset. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/21/99	Treatment Center, A pin hole leak in potable water supply pipe to ECV Nos. 1 & 2 was repaired. Down Time: None.
5/27/99	Treatment Center, The well field cycled for an unknown reason. Down Time: None.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/2/99	Treatment Center, Electric Check Valve No.4 closed without command. The PDU was reset and restarted. Down Time: 0.25 Hours.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/5/99	The Daily Inspection was not performed due to the holiday weekend. Meter Readings are estimated. Down Time: None.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.

8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/10/99	Treatment Center, The telephone line servicing the autodialer was repaired. The data cable between RTU1 and Master PLC for water level control system was also repaired. Down Time: None.
8/13/99	Treatment Center, Autodialer called out indicating a power failure and the system reset on its own. Down Time: None.
8/14/99	Treatment Center, ECV #2 did not open on command, causing well field to cycle. The PDU was reset and restarted. Down Time: None.
8/22/99	Treatment Center, ECV #2 did not open on command causing well field to cycle. The PDU was reset and restarted. Down Time: None.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/5/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: None.
9/6/99	The Daily Inspection was not performed due to the holiday. Meter Readings are estimated. Down Time: None.
9/11/99	Treatment System, Autodialer called out, but system automatically reset and then continued to operate. Down Time: None.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B1

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.

10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command. The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.

3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 – 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/18/99	Pumphouses B1,B2,B3,B7, Electrical service to the pumphouses had failed. Down Time: Pumphouses B1, B3 – 21 Hours, Pumphouse B2 - 38 Hours, Pumphouse B7 - 20.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B2

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/3/98	Pumphouse B2, The pumphouse was shutdown for pulling and replacement of the riser pipe with Sch. 80 PVC pipe with brass couplings. Down Time : 8.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/9-13/98	Pumphouse B2, A Tee was added to the pumphouse piping. The well and pump were then cleaned by recirculating acid. Down Time: 4.5 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.

11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours..
12/18/98	Pumphouse B2, The 3-way solenoid valve was venting water and was replaced. Down Time 0.25 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
03/17-20/99	Pumphouse B2, Stainless steel riser pipe installed to allow acid treatment with stronger acid. During replacement, the well was brushed, bailed and acid treated. Down Time: 52.0 Hours.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/21-31/99	Pumphouse B2, The submersible pump began to fail. A new pump was ordered and installed upon delivery. During repair the well was surged and bailed for 1/2 day. Down Time: 205.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.

04/01-02/99	Pumphouse B2, The pumphouse flow meter was clogged with debris from well cleaning. The meter was cleaned on 04/02/99. Down Time: None.
4/2/99	Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 – 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/18/99	Pumphouses B1,B2,B3,B7, Electrical service to the pumphouses had failed. Down Time: Pumphouses B1, B3 - 21 Hours, Pumphouse B2 - 38 Hours, Pumphouse B7 - 20.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/11/99	Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.

6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/10/99	Pumphouse B2, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 6 Hours.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Pumphouse B2, Pumphouse did not restart when directed to by the PLC. The pumphouse was reset and restarted. Down Time: 2.25 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.

9/15/99 Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

9/19/99 Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B3

10/01-06/98 Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.

10/3/98 Pumphouse B3, The o-ring in the pitless adapter was leaking and was replaced. The pumphouse was already shut down due to reduced treatment center capacity. Down Time: None.

10/05-13/98 Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.

10/06-09/98 Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.

10/15/98 Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.

10/20/98 Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.

10/21/98 Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.

11/4/98 Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.

11/05-13/98 Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.

11/11/98 Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.

11/18/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.

11/22/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.

11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/12/99	Pumphouses B3, B4, and B5, The pumphouse ECV control piping failures were repaired. Down Time: None.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
2/12/99	Pumphouse B3, A remote PLC data card from the control panel had failed and was replaced. Down Time: None.
2/26/99	Pumphouse B3, The TGRS was shutdown to facilitate repairs to the pumphouse sampling piping. Down Time: 0.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.

03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 – 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/18/99	Pumphouses B1,B2,B3,B7, Electrical service to the pumphouses had failed. Down Time: Pumphouses B1, B3 - 21 Hours, Pumphouse B2 - 38 Hours, Pumphouse B7 - 20.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset

and restarted. Down Time: 1.0 Hour.

6/11/99	Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/2/99	Pumphouse B3, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.

9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B4

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/01-09/98	Pumphouse B4, Pump, motor and 1 joint of riser pipe fell to bottom of well. They were retrieved and replaced with new equipment. Down Time: 264.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/1/98	Pumphouse B4, The pumphouse ECV opening speed control valve was leaking, and was replaced. Down Time: None.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.

12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/12/99	Pumphouses B3, B4, and B5, The pumphouse ECV control piping failures were repaired. Down Time: None.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
2/11/99	Pumphouse B4, The pumphouse air release valve and nipple were leaking. The air release valve, isolation valve, and nipple were replaced. Down Time: None.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.

5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.

9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B5

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/10/98	Pumphouse B5, The pumphouse ECV was modulating excessively. The ECV control piping and components were cleaned by flushing and brushing, and then adjusted. ECV operation was then observed. Down Time: None.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.

12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/12/99	Pumphouses B3, B4, and B5, The pumphouse ECV control piping failures were repaired. Down Time: None.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-24/99	Pumphouse B5, Daily inspection found the 480V disconnect switch to have failed shutting down the pumphouse. The switch was replaced and the pumphouse restarted. Down Time: 48.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/2/99	Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/7/99	Pumphouse B5, The well was cycling due to over production and resulting low pumping water level in well. Down Time: None.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.

04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.

8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B6

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
10/29/98	Pumphouse B6, The pumphouse flow meter measuring chamber assembly replaced. Down Time: 1.0 Hour.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.

11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
4/19/99	Pumphouses B1-B6, Pumphouse control panels were inspected and mislabeling of low water level alarm lights corrected. Down Time: None.

04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.

8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B7

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.

11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/16/99	Pumphouse B7, The electric check valve gland nut had failed and was replaced. Down Time: None.
2/24/99	Pumphouse B7, The door vent cover plate was missing and was replaced. Down Time: None.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours;

03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

3/28/99 All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.

4/2/99 Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.

4/4/99 Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.

4/6/99 Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 – 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.

4/8/99 Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.

4/11/99 Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.

4/18/99 Pumphouses B1,B2,B3,B7, Electrical service to the pumphouses had failed. Down Time: Pumphouses B1, B3 - 21 Hours, Pumphouse B2 - 38 Hours, Pumphouse B7 - 20.5 Hours.

04/21-22/99 Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.

5/1/99 Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.

5/4/99 Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

5/12/99 Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

5/13/99 Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

5/14/99 Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.

5/29/99 Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.

6/9/99 Pumphouse B7, The pumphouse was shut down while repair and adjustment of water level sensor was made. Down Time: 3.0 Hours.

6/11/99 Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.

6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/3/99	Pumphouse B7, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B8

10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.

12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
03/10-12/99	Pumphouse B8, Flowrates had fallen and trouble shooting indicated the pump was worn and needed replacing. The pump and motor were pulled and replaced along with the riser pipe. The well was also cleaned with a brush, then bailed, acid treated, surged, and bailed. Down Time: 48.0 Hours.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.

4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.

8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B9

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/10-13/98	Pumphouse B9, Motor overloads have tripped several times and on 10/12/98 they were upsized from W65 to W63. On 10/13/98 the starter contacts were repaired. Down Time: 42.5 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.

11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
2/23/99	Pumphouse B9, The pumphouse flowmeter cover plate was leaking. The cover plate bolts were tightened to stop leak. Down Time: None.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.

4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.

8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B10

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-07/98	Pumphouse B10, The pump and motor failed on 10/6/98 and were replaced on 10/07/98. Down Time: 26.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.

11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/23/99	Pumphouse B10, The pumphouse electric check valve gland nut had failed and was replaced. Down Time: None.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures.

The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/2/99	Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 - 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
4/30/99	Pumphouse B10, A failed emergency operation solenoid valve on ECV was replaced. Down Time: None.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/11/99	Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.

6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Pumphouse B10, The pumphouse was shut down during replacement of the ECV control harness. Down Time: 8 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

PUMPHOUSE B11

10/01-06/98	Treatment Center, Wet well pump No. 1 motor, starter and MCC disconnect switch for wet well pump #1 failed and was replaced. Pumphouses B2, B3, B7, B10, B11 shut down due to reduced treatment center capacity. Down Time: 127.5 Hours.
10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.
10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
10/29/98	Pumphouse B11, The pumphouse was shut down for replacement of the flow meter cover gasket. Down Time: 0.5 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours.

11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
3/28/99	All pumphouses, A system wide power failure occurred shutting down the pumphouses until NSP completed repairs. Down Time: 16.5 Hours.
4/2/99	Pumphouses B2,B5,B7,B10,B11, Pumphouses were shut down to accommodate repair of ECV#2 in treatment center. Down Time: 6.0 Hours.

4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
4/6/99	Pumphouses B1, B2, B3, B7, B10, B11, Electrical storm cut power to B1, B2, B3 and part of the extraction system was shut down until power could be restored. Down Time: Pumphouses B1, B2, B3 - 26.5 Hours, Pumphouses B7, B10, B11 - 8.5 Hours.
4/8/99	Treatment Center, ECV#1 control harness was replaced and pumphouses B2, B3, B7, B8, B10, and B11 were shut down to accommodate reduced treatment center capacity. Down Time: 7.0 Hours.
4/11/99	Pumphouses B1-B12, SC1-SC5, A storm caused a power outage to the boundary wells. The treatment center was shut down pending restoration of power. Down Time: 3.5 Hours.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/11/99	Treatment Center, Pumphouses B2, B3, B7, B10, B11 were shut down to facilitate repair of bearings on blower No. 3. Down Time: 4.0 Hours.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.

7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/10/99	Treatment Center, ECV #3 closed without command and upon inspection we found that the replacement PDU main circuit board would not energize the ECV operating solenoid valves when commanded to do so. Pumphouses B2, B3, B7, B10 and B11 were shut down until PDU circuit board could be replaced. Down Time: 14.5 Hours.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
09/01-03/99	Pumphouse B11, The pump and motor were pulled from the well. The riser pipe and foot valve were replaced. A polyethylene pipe was fished from well. Down Time: 77.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

SC1

10/05-13/98	Treatment Center, Pump Director Unit No. 2 keeps blowing fuses. Several solenoid valve control wires were replaced. A relay on the main board had several bad contacts, which were cleaned pending replacement. Pumphouses B2, B3, B7, B8, B10, B11, SC1 were shut down due to reduced treatment center capacity. Down Time: 78.5.0 Hours.

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/15/98	Treatment Center, The control harness on treatment center ECV #4 was replaced. Pumphouses B2, B3, B7, B8, B10, SC1 were shut down due to reduced treatment center capacity. Down Time: 5.0 Hours.
10/20/98	Treatment Center, ECV #4 valve seals were replaced and the liner refurbished. Pumphouses B1, B2, B3, B7, B8, B10, B11, and SC1 were shut down due to reduced treatment center capacity. Down Time: 9.0 Hours.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/4/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shutdown to accommodate repairs to the pump director unit. Down Time: 27.0 Hours.
11/05-13/98	Treatment Center, Pumphouses B2, B3, B7, B8, B10, B11 and SC1 were shut down to facilitate the repair of MCC disconnect switches for wet well pump Nos. 2 & 3. Down Time: 168.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.

1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
2/11/99	Pumphouses B1-6, B8, B9, B11, and SC1, There was a electrical service interruption due to a blown fuse. NSP repaired the failure. Down Time: 15.5 Hours.
02/20-22/99	Pumphouse SC1, Daily inspection showed the pumphouse was down. Blown fuses were replaced. Down Time: 66.5 Hours.
3/2/99	Pumphouses B1-B6, B8, B9, B11, and SC1, Pumphouses were down until NSP could restore failed power. Down Time: 16.0 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/9/99	Pumphouse SC1, The submersible pump was down. The Alliant electrician found blown fuses in the control panel and replaced them. Down Time: 19.0 Hours.
03/10-19/99	Pumphouse SC1, Repetitive fuse failures were traced to failed submersible motor,. The pump and motor were replaced along with riser pipe and check valve. The well was also cleaned with a brush, then bailed, acid treated, surged, and bailed. Down Time: 216.0 Hours.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/22-23/99	Treatment Center, Electric check valve #2 closed without command twice and the pumphouses B3, B6, B10, B11 and SC1 were shut down until further repairs could be performed. Down Time: 12.5 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
04/01-09/99	Pumphouse SC1, Failed fuses were replaced as part of pump and motor replacement. Down Time 194.0 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
04/10-12/99	Pumphouse SC1, Motor starter overloads had tripped, were reset, and pump restarted. Down Time: 48.0 Hours.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
4/28/99	Pumphouse SC1, The flow rate decreased at this pumphouse for an unknown reason. Down Time: None.

5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/01-03/99	Pumphouse SC1, The pumphouse was also down during repairs to B11. SC1 control

functions require B11 to be operating for SC1 to operate. Down Time: 77.5 Hours.

9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

SC2

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/25/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.
11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.

12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
12/30/98	Pumphouses SC2,SC3, and SC5, The pumphouses experienced a power loss. Down Time: 1.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
1/21/99	Pumphouse SC2, The pumphouse flowmeter had stopped on 01/19/99 and was replaced on 01/21/99. Down Time: 0.5 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.
03/23-24/99	Pumphouse SC2, Pumphouse flowrates had decreased, indicating the iron silt was fouling the pump and piping. The pump and motor were replaced, 3 inch diameter Sch. 80 PVC riser pipe installed, and the well acid treated. Down Time: 32 Hours.
4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.

04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
4/28/99	Pumphouse SC2, The pumphouse was shut down to install an additional section of PVC riser pipe. Down Time: 2.5 Hours.
5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouses B1, B2, B3, B11 and SC2, Flowrates at these pumphouses have decreased so a bucket test was conducted to trouble shoot this flow decrease. Down Time: None.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.

8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

SC3

10/06-09/98	Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.
10/9/98	Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.
10/21/98	Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.
11/11/98	Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.
11/18/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.
11/22/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.
11/22/98	Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours
11/24/98	Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.

11/25/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.

11/25/98 Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.

12/11/98 Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.

12/30/98 Pumphouses SC2,SC3, and SC5, The pumphouses experienced a power loss. Down Time: 1.0 Hours

1/1/99 Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.

01/05-15/99 Pumphouse SC3, The pumphouse wall heater had failed and was repaired. Down Time: 0.0 Hours.

1/25/99 Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.

1/26/99 Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.

3/4/99 Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.

3/21/99 Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.

03/23-26/99 Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

03/23-26/99 Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced.
The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April.
Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

4/4/99 Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.

04/21-22/99 Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.

5/1/99	Treatment Center, The normal operation solenoid valve on ECV No. 4 was replaced. Down Time: 1.0 Hours for all Pumphouses.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/5/99	Pumphouse SC3, The pumphouse shut down on 5/3 due to leaking pitless O-ring. The O-ring was replaced on 5/5/99. Down Time: 51 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.
7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.

8/24/99 Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

9/2/99 Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.

9/13/99 Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.

9/15/99 Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

9/15/99 Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.

9/19/99 Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

SC5

10/06-09/98 Treatment Center, Electric Check Valve No. 4, will not close when commanded to do so. The ECV controls were inspected and the emergency closing solenoid valve was replaced. Down Time: 5.0 Hours.

10/9/98 Treatment Center, Float switch operation and controls were verified; wet wells, foot valves, and stripping tower hold down bolts were inspected. Pumphouse B1-B12, SC1-SC5 were shut down due to reduced treatment center capacity. Down Time: 8.0 Hrs. for Pumphouses B1, B4, B5, B6, B9, SC2, SC3, SC5; down time for all other pumphouses included in 10/5-13/98 note.

10/21/98 Treatment Center, ECV No. 4 did not open on command. Control valve settings were inspected and adjusted. Down Time 4.0 Hours.

11/11/98 Treatment Center, ECV No. 4 did not close on command . The valve controls were flushed and adjusted. Down Time: 13.0 Hours.

11/18/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.

11/22/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 5.5 Hours.

11/22/98 Treatment Center, Flow meter No. 2 had failed and was replaced. Down Time: 1.5 Hours

11/24/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 1.0 Hour.

11/25/98 Treatment Center, Electric Check Valve #3 had closed without command. The PDU was reset and restarted. Down Time: 0.5 Hours.

11/25/98	Treatment Center, The MCC disconnect switch for WWP No. 2 had tripped and was reset. Down Time: 1.5 Hours.
12/11/98	Forcemain, The TGRS was turned off to facilitate repairs to an air release valve located on the effluent forcemain near Site D. Down Time: 1.5 Hours for all Pumphouses, except for B3 and SC5 which were down for 2.0 Hours.
12/19-24/98	Pumphouse SC5, The flowmeter was malfunctioning and was repaired. Down Time: 0.5 Hours
12/30/98	Pumphouses SC2,SC3, and SC5, The pumphouses experienced a power loss. Down Time: 1.0 Hours.
1/1/99	Treatment Center, ECV#1 closed without command. AST#4 subsequently froze and then flooded when WWP#1 restarted. The TGRS was shut down until AST#4 and blower #4 thawed and drained. Drain holes were drilled in the blower housing. Down Time: 5.0 Hours.
01/06-14/99	Pumphouse SC5, The pumphouse was shutdown to pull and replace the pump and motor. Down Time: 192.0 Hours.
1/19/99	Pumphouse SC5, The pumphouse was shutdown to facilitate changing the flowmeter measuring assembly. Down Time: 0.25 Hours.
1/25/99	Treatment Center, The TGRS was shut down to facilitate measuring the dimensions of the wet well pump assemblies. Down Time: 1.5 Hours.
1/26/99	Treatment Center, Electric check valve #1 failed to open on startup causing the well field to cycle. Down Time: 0.5 Hours.
3/4/99	Treatment Center, Electric check valve #2 closed without command, causing the well field to cycle. The pump director unit was reset and restarted. Down Time: 1.0 Hour.
3/21/99	Treatment Center, Electric check valve #2 closed without command twice, causing the well field to cycle and requiring service work on the valve. Down Time: 3.0 Hours.
03/23-26/99	Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced. The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April. Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

03/23-26/99 Treatment Center, PDU No. 2 alarms were frequently triggered by ECV No. 2 failures. The normal operation solenoid coil was replaced.
The circuit boards in PDU No. 2 were replaced as well as a fuse in the PLC. The control harness on ECV No. 2 was scheduled for replacement in April.
Down Time: 03/23-24/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 13.5 Hours; 03/24-26/99 Pumphouses B1, B3, B6, B7, B10, B11 and SC1 - 48.5 Hours; 03/24/99 Pumphouses B8, B9, SC2, SC3 and SC5 - 3.0 Hours.

4/4/99	Treatment Center, Electric check valve #4 had closed without command and PDU was reset. Down Time: 1.0 Hour.
04/08-09/99	Pumphouse SC5, The pumping water level was below pump inlet and the pump cavitating. The ECV was also modulating erratically. The ECV adjusted to increase back pressure held on pump. Down Time: None.
4/10/99	Pumphouse SC5, Well cycling due to low pumping water level. Down Time: None.
04/21-22/99	Treatment Center, The system was shutdown as part of Annual Preventative Maintenance. Down Time: 7.0 Hours on 04/22/99.
04/22-30/99	Pumphouse SC5, The pumphouse flow rate has decreased due to difficulties with ECV. Down Time: None.
5/1/99	Pumphouse SC5, The electric check valve control harness was replaced with a new harness and the valve body was inspected. Down Time: 6.5 Hours.
5/4/99	Treatment Center, Electric check valve No. 4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
5/12/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/13/99	Treatment Center, ECV No. 2 did not open on startup, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
5/14/99	Treatment Center, The system shut down in order to repair terminal block in Extraction Well Monitoring Panel. Down Time: 1.0 Hour.
5/19/99	Pumphouse SC5, The pumphouse found down. ECV control harness was flushed the pumphouse restarted. Down Time: 9.0 Hours.
5/29/99	Treatment Center, Electric check valve No. 2 did not open at startup. The PDU was reset and restarted. Down Time: 1.0 Hour.
6/25/99	Treatment Center, PDU No. 4 indicated a failure of ECV No. 4. The PDU was reset and restarted. Down Time: 8.0 Hours.
6/27/99	Treatment Center, Electric Check Valve #2 did not open on startup. The PDU was reset and restarted. Down Time: 1.0 Hours.
7/1/99	Treatment System, Lightning strike caused a brief power outage. Down Time: 0.5 Hours all Pumphouses.
7/4/99	Treatment Center, Electric Check Valve No.4 did not open on command. The speed control valves were adjusted and the PDU was reset and restarted. Down Time: 0.75 Hours.
7/20/99	Treatment System, The system shut down to allow for replacement of timers and relays in PDUs Nos. 3 and 4. Down Time: 4 Hours.

7/25/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/26/99	Treatment System, The system was down due to a power outage at Bldg. 116 caused by storm. Down Time: 14.5 Hours.
7/29/99	Treatment System, The pumphouses were allowed to cycle while Laughlin Electric tested ECV limit switch wiring. Down Time: 1 Hour.
8/9/99	Treatment System, The system shut down to facilitate replacement of main circuit board in PDU No. 3. Down Time: 1.5 Hours.
8/10/99	Treatment Center, ECV#3 closed without command causing well field to cycle. Down Time: 1 Hour.
8/24/99	Treatment Center, ECV #4 closed without command causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.
9/2/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 2.0 Hours.
9/13/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.5 Hours.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/15/99	Treatment System, ECV No. 2 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 1.0 Hour.
9/19/99	Treatment System, ECV#4 closed without command, causing well field to cycle. The PDU was reset and restarted. Down Time: 0.5 Hours.

J.3 FY 1999 Inspection and Maintenance Activities Site K, TCAAP

APPENDIX J.3

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
SITE K, TCAAP

October 1998	**Notes:**
10/14/98	The tower was shutdown for the packing change out and blower belt replacement. Down Time: 5.5 Hours.
November 1998	**Notes:**
11/16-18/98	The tower was shutdown for the packing to be changed. Additionally, corrected an electrical service problem. Down Time: 49.0 Hours.
December 1998	**Notes:**
12/30/98	The tower was shutdown for the packing change out. Down Time: 4.0 Hours.
January 1999	**Notes:**
1/31/99	System down and would not restart. Alliant electrician trouble shoots and corrects electrical controls failure.
February 1999	**Notes:**
02/04/99	The tower was shutdown for the packing change out. Down Time: 4.0 Hours.
March 1999	**Notes:**
03/11/99	The tower was shutdown for the packing to be changed and piping flushed, due to increased VOCs. Down Time: 5.0 Hours.
April 1999	**Notes:**
4/9/99	System down and would not restart. Alliant electrician trouble shoots and corrects electrical controls failure.
04/20/99	The tower packing was changed and a clean distributor nozzle installed. Down Time: 7.0 Hours.
May 1999	**Notes:**
5/15-19/99	System restarted after replacement of electrical service conductors. Down Time: 120 Hours.

APPENDIX J.3

FISCAL YEAR 1999 INSPECTION AND MAINTENANCE ACTIVITIES
SITE K, TCAAP

June 1999	**Notes:**
6/7/99	Sump pump was removed from manhole. Collection manhole cleaned. Down Time: 6.5 Hours.
6/9/99	The tower packing was changed and a clean distributor nozzle was installed. Down Time: 6.5 Hours
6/21/99	New treatment system began discharging to sewer at 12:30 P.M. Flows are summarized on the following page. System start up commissioning and debugging continues. Replace influent those due to failure. Rebalance system to continue operation.

July 1999	**Notes:**
7/1-31/99	Continue balancing and debugging new treatment system.
7/8/99	Replaced belt on original treatment system.
7/15/99	Original treatment system was shutdown at 17:30.

August 1999	**Notes:**
8/12/99	High water level in AST sump. Down time: 19 Hours.
8/17/99	High water level in AST sump. Down time: 17 Hours.

September 1999	**Notes:**
9/1/99	High water level in AST sump. Down Time: 12 Hours.
9/7/99	High water level in AST sump. Down Time: 48 Hours.
9/13/99	High water level in AST sump. Down Time: 48 Hours.
9/21-24/99	High water level in AST sump. Down Time: 31 Hours.

APPENDIX K

Appendix K

PGRS Hydraulic, Operational and Chemical Data

K.1 Historical Groundwater Elevations (FT. AMSL) PGRS, TCAAP

APPENDIX K.1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*3/30/94*	*3/31/94*	*4/10/94*	*4/17/94*	*4/18/94 (AM)*	*4/18/94 (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

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*4/18/94 (PM)*	*4/19/94*	*4/20/94*	*4/21/94*	*4/22/94*	*4/25/94*
03U673	897.84	844.74	844.10	844.00	844.04	844.13	844.67
03L673	898.44	843.86	843.12	843.09	843.09	843.17	843.58
04U673	898.34	844.04	843.29	843.27	843.26	843.34	843.73
03U832	886.82	835.43	834.87	834.98	835.08	835.17	835.37
03L832	886.85	835.27	834.71	834.85	834.99	835.07	835.24
04U832	885.31	835.11	834.59	834.74	834.89	834.98	835.12
03L841	911.91	843.21	842.42	842.39	842.39	842.50	842.90
04U841	912.47	843.42	842.59	842.59	842.56	842.67	843.03
04U844	886.74	835.08	834.47	834.64	834.76	834.83	835.01
04U845	894.91	836.84	836.26	836.38	836.47	836.53	836.80
03L846	888.54	832.81	832.48	832.63	832.71	832.72	832.83
04U846	889.46	831.91	831.51	832.16	832.27	832.22	832.31
03M848	904.12	841.79	841.15	841.11	841.15	841.25	841.69
03L848	903.91	842.27	841.58	841.55	841.59	841.70	842.11
04U848	903.92	843.07	842.32	842.29	842.28	842.42	842.80
04U851	914.51	831.44	830.98	831.45	831.70	831.65	831.76
04U852	905.66	829.40	828.94	829.32	829.49	829.41	829.59
03L854	892.41	839.21	838.66	838.62	838.70	838.93	839.27
04U854	891.95	835.50	834.97	835.11	835.22	835.40	835.49
03L859	903.55	839.79	839.21	839.16	838.72	839.47	839.77
04U859	903.73	842.68	841.93	841.92	841.92	842.12	842.39
03L860	896.79	839.45	838.92	838.89	838.94	839.06	839.52
04U860	896.61	835.46	834.89	835.08	835.21	835.23	835.46
03L861	891.35	837.80	837.24	837.21	837.29	837.54	837.83
04U861	890.91	835.61	835.06	835.22	835.36	835.49	835.60
04U863	895.33	834.93	834.44	834.63	834.70	834.88	835.06
04U864	908.67	831.80	831.30	832.26	833.04	833.04	833.16
04J864	908.79	829.15	828.31	828.54	828.52	828.28	828.45
04U865	915.60	832.16	831.66	832.80	833.64	833.69	833.79
04U866	910.60	830.96	830.51	831.60	832.40	832.39	832.46
04J866	910.69	829.79	828.94	829.23	829.21	829.22	829.13
04U877	923.08	831.34	830.95	831.54	831.71	831.64	831.76
MPCA1L3	898.25	838.34	837.76	837.73	837.81	838.02	838.33
MPCA1U4	898.60	836.68	836.08	836.14	836.20	836.36	836.57
MPCA2L3	872.05	833.83	833.33	833.60	833.74	833.74	833.88
MPCA2U4	872.19	832.85	832.39	832.83	832.93	832.93	832.98
414U4	893.95	834.61	834.10	834.37	834.59	834.65	834.82
MW15H	911.52	835.23	834.61	834.72	834.83	834.92	835.14
NB WELL 13	914.66	- -	824.16	829.86	- -	832.78	- -

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*4/26/94*	*4/28/94*	*4/29/94*	*5/2/94 0.49*	*5/9/94 0.43*	*5/16/94 0.48*
03U673	897.84	844.90	843.92	843.92	844.20	844.37	843.97
03L673	898.44	843.76	842.98	842.94	843.21	843.27	842.91
04U673	898.34	843.91	843.15	843.11	843.38	843.43	843.08
03U832	886.82	835.44	834.81	834.82	835.25	835.04	834.44
03L832	886.85	835.28	834.64	834.70	835.13	834.91	834.31
04U832	885.31	835.15	834.50	834.61	835.02	834.81	834.19
03L841	911.91	843.10	842.28	842.26	842.52	842.56	842.26
04U841	912.47	843.22	842.45	842.44	842.69	842.72	842.39
04U844	886.74	835.00	834.39	834.45	834.86	834.65	834.05
04U845	894.91	836.84	836.20	836.30	836.69	836.51	835.93
03L846	888.54	832.87	832.39	832.44	832.69	832.45	832.07
04U846	889.46	832.01	831.32	831.91	832.15	831.68	831.18
03M848	904.12	841.90	841.04	841.02	841.30	841.41	841.01
03L848	903.91	842.31	841.46	841.45	841.72	841.81	841.40
04U848	903.92	842.96	842.20	842.17	842.42	842.46	842.10
04U851	914.51	831.66	830.84	830.88	831.60	831.26	830.60
04U852	905.66	829.48	828.93	828.86	829.51	829.29	828.53
03L854	892.41	839.51	838.57	838.58	838.88	839.03	838.55
04U854	891.95	835.52	834.87	835.10	835.49	835.23	834.58
03L859	903.55	840.02	839.09	839.08	839.40	839.50	839.04
04U859	903.73	842.59	841.78	841.79	842.05	842.08	841.71
03L860	896.79	839.72	838.84	838.81	839.12	839.28	838.78
04U860	896.61	835.39	834.84	835.00	835.35	835.11	834.47
03L861	891.35	838.04	837.14	837.15	837.47	837.54	836.99
04U861	890.91	835.62	835.00	835.13	835.53	835.30	834.71
04U863	895.33	834.94	834.38	834.40	834.95	834.73	834.02
04U864	908.67	832.61	831.25	831.28	832.89	832.27	830.77
04J864	908.79	828.25	828.26	827.87	828.51	828.76	827.29
04U865	915.60	832.15	831.59	831.62	833.75	832.68	831.35
04U866	910.60	830.94	830.35	830.44	832.08	831.65	830.15
04J866	910.69	828.84	828.98	828.54	829.17	829.48	827.90
04U877	923.08	831.58	830.62	830.83	831.45	831.11	830.61
MPCA1L3	898.25	838.54	837.63	837.64	837.97	838.01	837.51
MPCA1U4	898.60	836.67	835.95	836.02	836.38	836.19	835.69
MPCA2L3	872.05	833.91	833.25	833.32	833.77	833.45	832.93
MPCA2U4	872.19	832.94	832.24	832.41	832.89	832.52	831.96
414U4	893.95	834.60	834.02	834.04	834.72	834.45	833.68
MW15H	911.52	835.24	834.60	834.62	835.04	834.76	834.14
NB WELL 13	914.66	822.66	822.16	822.21	822.66	830.87	821.81

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*5/23/94*	*6/20/94 0.49*	*7/19/94 0.60*	*10/10/94*	*1/27/95*	*3/6/95*
03U673	897.84	844.35	844.01	845.00	843.06	843.42	843.31
03L673	898.44	843.20	842.81	844.33	842.23	842.24	842.12
04U673	898.34	843.34	842.95	843.93	842.43	842.39	842.24
03U832	886.82	834.31	833.55	833.48	832.65	833.36	833.24
03L832	886.85	834.14	833.33	833.25	832.49	833.20	833.48
04U832	885.31	833.99	833.19	833.09	832.39	833.07	833.14
03L841	911.91	842.50	842.10	843.37	841.48	841.55	841.42
04U841	912.47	842.60	842.20	843.55	841.71	841.65	841.53
04U844	886.74	833.90	833.18	833.20	832.29	833.09	833.16
04U845	894.91	835.83	835.16	835.29	834.23	834.94	834.94
03L846	888.54	831.96	831.16	830.78	830.16	830.74	830.92
04U846	889.46	830.91	830.06	829.74	829.44	830.11	830.23
03M848	904.12	841.31	840.84	841.46	839.75	840.21	840.14
03L848	903.91	841.69	841.18	841.95	840.28	840.62	frozen
04U848	903.92	842.36	841.94	843.02	841.27	841.40	841.27
04U851	914.51	830.23	829.20	829.01	828.85	829.72	829.87
04U852	905.66	827.90	plugged	826.62	826.83	827.91	828.13
03L854	892.41	838.81	838.26	838.30	836.93	837.56	837.59
04U854	891.95	834.44	833.63	833.60	832.83	833.52	833.54
03L859	903.55	839.30	838.79	839.07	837.48	838.14	838.15
04U859	903.73	841.92	841.51	842.57	840.83	840.96	840.88
03L860	896.79	839.09	838.51	838.54	837.22	837.86	837.84
04U860	896.61	834.31	833.57	833.41	832.75	833.38	833.43
03L861	891.35	837.17	836.55	836.54	835.25	835.99	836.03
04U861	890.91	834.53	833.78	833.76	832.97	833.63	833.66
04U863	895.33	833.82	832.92	832.79	832.18	832.85	832.95
04U864	908.67	830.76	829.72	829.55	829.07	829.71	829.88
04J864	908.79	826.49	825.46	825.93	825.04	826.81	826.92
04U865	915.60	831.14	830.22	830.04	829.54	830.14	830.24
04U866	910.60	829.96	828.90	828.72	828.28	828.97	829.22
04J866	910.69	827.25	826.26	826.71	825.71	827.46	827.57
04U877	923.08	830.30	829.34	828.98	828.84	829.50	829.76
MPCA1L3	898.25	837.70	837.13	837.27	835.82	836.58	836.59
MPCA1U4	898.60	835.64	835.03	835.22	834.05	834.74	834.80
MPCA2L3	872.05	832.75	831.94	831.81	831.12	831.89	831.93
MPCA2U4	872.19	831.78	830.93	830.71	830.14	830.91	830.99
414U4	893.95	833.44	832.55	832.43	831.91	832.59	832.67
MW15H	911.52	834.12	833.30	833.12	832.36	833.11	833.19
NB WELL 13	914.66	- -	820.58	820.26	819.41	819.66	819.66

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*6/21/95 8:00 A.M.*	*9/5/95*	*12/14/95*	*3/5/96*	*5/28/96*	*9/16/96*
03U673	897.84	843.59	842.55	843.33	843.28	843.84	842.44
03L673	898.44	842.76	841.34	842.14	842.23	842.84	840.97
04U673	898.34	842.96	841.49	842.29	842.38	843.00	841.08
03U832	886.82	833.02	832.57	833.26	833.55	834.26	831.27
03L832	886.85	832.82	832.40	833.11	833.40	834.55	831.09
04U832	885.31	832.63	832.27	832.97	833.27	833.89	830.93
03L841	911.91	842.03	840.53	841.48	841.47	842.13	840.18
04U841	912.47	842.23	840.69	841.59	841.63	842.30	840.27
04U844	886.74	832.59	832.22	833.00	833.26	833.75	830.99
04U845	894.91	834.64	834.06	834.87	835.07	835.70	832.94
03L846	888.54	830.62	830.20	830.51	830.94	831.51	828.83
04U846	889.46	829.35	829.25	829.69	830.08	830.17	827.71
03M848	904.12	840.39	839.38	840.18	frozen	840.85	838.97
03L848	903.91	840.91	840.48	840.61	frozen	841.28	839.39
04U848	903.92	841.82	840.49	841.33	frozen	841.99	840.08
04U851	914.51	828.58	828.55	829.49	829.91	829.86	827.25
04U852	905.66	826.08	826.04	827.66	828.16	827.76	obstructed
03L854	892.41	837.56	836.87	837.63	837.65	838.41	836.06
04U854	891.95	833.00	832.68	833.46	833.71	834.36	831.41
03L859	903.55	838.12	837.33	838.14	838.13	838.95	836.53
04U859	903.73	841.42	840.09	840.95	841.00	841.63	839.47
03L860	896.79	837.83	837.11	837.90	837.92	838.66	836.58
04U860	896.61	832.98	832.57	833.40	833.59	834.30	831.38
03L861	891.35	835.86	835.23	836.03	836.09	836.89	834.22
04U861	890.91	833.20	832.80	833.59	833.75	834.45	831.56
04U863	895.33	832.42	832.09	832.76	833.14	833.75	830.86
04U864	908.67	829.10	829.01	829.50	829.97	830.23	827.63
04J864	908.79	824.22	824.77	827.23	827.49	826.50	823.55
04U865	915.60	829.50	829.33	829.67	830.41	830.63	827.84
04U866	910.60	828.24	828.14	828.40	829.06	829.14	826.74
04J866	910.69	825.13	825.55	827.80	828.07	827.17	824.83
04U877	923.08	828.63	828.71	829.14	829.53	829.48	827.06
MPCA1L3	898.25	836.45	835.79	836.58	836.63	837.35	834.80
MPCA1U4	898.60	834.49	833.89	834.68	834.85	835.45	832.73
MPCA2L3	872.05	831.43	831.08	831.63	832.03	832.55	829.74
MPCA2U4	872.19	830.31	830.07	830.62	830.99	831.36	828.69
414U4	893.95	832.03	830.77	832.48	832.90	833.36	830.57
MW15H	911.52	832.85	832.41	833.02	833.34	834.10	831.10
NB WELL 13	914.66	819.66	819.66	816.10	820.01	819.66	819.66

APPENDIX K.1

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*TOC Elevation*	*12/3/96*	*5/30/97*	*9/2/97*	*12/6/97*	*6/1/98*	*5/27/99*
03U673	897.84	842.16	842.39	--	842.03	843.33	843.14
03L673	898.44	840.99	841.06	--	840.99	842.11	841.91
04U673	898.34	841.13	841.21	--	841.19	842.30	842.06
03U832	886.82	832.31	831.36	--	--	--	--
03L832	886.85	832.16	831.22	--	--	--	832.03
04U832	885.31	832.04	831.11	--	831.76	832.38	832.02
03L841	911.91	840.31	840.34	--	--	--	--
04U841	912.47	840.48	840.42	--	--	--	--
04U844	886.74	832.02	831.23	--	--	--	--
04U845	894.91	833.93	833.23	--	833.74	834.46	834.19
03L846	888.54	829.46	828.41	--	--	--	--
04U846	889.46	828.49	827.60	--	--	--	--
03M848	904.12	839.01	838.99	--	838.80	839.95	839.71
03L848	903.91	frozen	839.40	--	839.27	840.41	840.20
04U848	903.92	840.22	840.18	--	840.17	841.20	841.02
04U851	914.51	828.46	827.97	--	827.93	828.61	828.12
04U852	905.66	obstructed	--	--	826.57	826.74	826.63
03L854	892.41	836.38	836.20	--	836.10	837.29	836.92
04U854	891.95	832.56	831.68	--	832.44	832.98	832.77
03L859	903.55	836.68	836.77	--	836.62	837.81	837.40
04U859	903.73	839.84	839.82	--	839.83	840.97	840.61
03L860	896.79	836.68	836.49	--	836.39	837.46	837.24
04U860	896.61	832.53	831.41	--	832.33	832.81	832.72
03L861	891.35	834.79	834.41	--	834.47	835.53	835.14
04U861	890.91	832.65	831.79	--	832.43	833.09	832.76
04U863	895.33	831.88	830.92	--	831.80	832.33	832.11
04U864	908.67	828.59	828.68	--	828.02	828.87	827.92
04J864	908.79	825.99	825.07	--	826.32	826.40	825.77
04U865	915.60	829.01	829.05	--	828.57	829.30	828.63
04U866	910.60	827.43	826.23	--	826.30	827.42	825.89
04J866	910.69	826.54	825.76	--	826.80	827.02	826.31
04U877	923.08	827.85	827.45	--	--	--	--
MPCA1L3	898.25	835.34	835.04	--	--	--	--
MPCA1U4	898.60	833.66	832.99	--	--	--	--
MPCA2L3	872.05	830.62	829.66	--	--	--	--
MPCA2U4	872.19	829.54	828.58	--	--	--	--
414U4	893.95	831.64	830.72	830.40	831.64	832.12	831.86
MW15H	911.52	832.11	831.08	--	831.66	832.36	832.02
NB WELL 13	914.66	818.33	827.94	--	816.59	816.21	815.46

K.2 Daily Pumping Summary for FY 1999
(in 1,000 gallons) PGRS, TCAAP

APPENDIX K.2

DAILY PUMPING SUMMARY (IN 1,000 GALLONS)
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Day	*October* 1998	*November* 1998	*December* 1998	*January* 1999	*February* 1999	*March* 1999	*April* 1999	*May* 1999	*June* 1999	*July* 1999	*August* 1999	*September* 1999
1	1.44	1.382	1.316	1.389	1.51	1.513	1.447	1.449	1.512	1.512	1.512	1.512
2	1.382	1.441	1.439	1.433	1.44	1.448	1.503	1.512	1.152	1.448	1.475	1.448
3	1.44	1.381	1.383	1.383	1.512	1.512	1.448	1.448	1.512	1.513	1.449	1.512
4	1.381	1.44	1.441	1.437	1.448	1.448	1.448	1.501	1.448	1.448	1.509	1.449
5	1.44	1.382	1.358	1.382	1.512	1.512	1.449	1.443	1.512	1.512	1.446	1.506
6	1.382	1.43	1.439	1.478	1.448	1.449	1.445	1.514	1.448	1.448	1.512	1.449
7	1.436	1.392	1.383	1.448	1.513	1.511	(1)	1.447	1.513	1.512	1.448	1.511
8	1.381	1.409	1.44	1.512	1.448	1.449	2.96	1.512	1.448	1.449	1.513	1.448
9	1.44	1.412	1.382	1.449	1.512	1.511	1.449	1.448	1.512	1.512	1.448	1.513
10	1.382	1.393	1.441	1.512	1.448	1.449	1.513	1.512	1.414	1.448	1.512	1.448
11	1.44	1.429	1.381	1.448	1.512	1.413	1.447	1.448	1.512	1.512	1.448	1.512
12	1.382	1.383	1.44	1.512	1.449	1.448	1.512	1.513	1.449	1.448	1.512	1.448
13	1.44	1.054	1.381	1.448	1.512	1.512	1.448	1.448	1.513	1.513	1.448	1.512
14	(1)	1.44	1.44	1.513	1.448	1.448	1.512	1.512	1.447	1.448	1.512	1.449
15	2.822	1.381	1.373	1.448	1.511	1.512	1.449	1.448	1.512	1.512	1.448	1.512
16	1.381	1.44	1.439	1.512	1.28	1.449	1.511	1.511	1.448	1.448	1.513	1.448
17	1.44	1.382	1.382	1.443	1.512	1.507	1.449	1.45	1.513	1.512	1.447	1.512
18	1.382	1.441	1.44	1.512	1.448	1.387	1.511	1.511	1.448	1.448	1.512	1.448
19	1.441	1.373	1.381	1.448	1.499	1.512	1.449	1.449	1.512	1.512	1.449	1.513
20	1.381	1.439	1.441	1.512	1.448	1.448	1.512	1.511	1.448	1.448	1.512	1.448
21	1.34	1.383	1.382	1.449	1.512	1.511	1.45	1.448	1.512	1.512	1.448	1.512
22	1.355	1.44	1.431	1.512	0.952	1.449	1.511	1.513	1.448	0.575	1.512	1.448
23	1.441	1.382	1.39	1.448	(1)	1.513	1.449	1.448	1.512	0.789	1.448	1.511
24	1.382	1.441	1.421	1.512	0.037	1.373	1.511	1.512	1.449	1.513	1.513	1.45
25	1.5	1.382	1.401	1.448	0.102	1.511	1.448	1.448	1.511	1.524	1.448	1.511
26	1.381	1.44	1.411	1.512	0.787	1.448	1.513	1.512	1.448	1.58	1.512	1.449
27	1.44	1.383	1.411	1.444	1.512	1.512	1.448	1.449	1.512	1.448	1.448	1.511
28	1.382	1.44	1.4	1.507	1.448	1.507	1.512	1.512	1.458	1.389	1.512	1.448
29	1.421	1.383	1.421	1.448	--	1.513	1.448	1.448	1.512	1.449	1.449	1.462
30	1.381	1.39	1.394	1.512	--	1.511	1.512	1.512	1.448	1.512	1.513	1.449
31	1.44	--	1.429	1.448	--	1.512	--	1.448	--	1.448	1.447	--
	43.676	41.888	43.611	45.459	35.76	45.798	44.264	45.837	44.083	44.342	45.875	44.349

Notes:
(1) Midnight volume totalizer values needed for daily volume calculation are missing from historical database. The first non-null value shown following missing data represents total volume for all preceding missing data.

K.3 FY 1999 Influent/Effluent Database PGRS, TCAAP

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	Sample Date	Chemical	Lot ID	Concentration	Flag Codes/ Data Qualifiers
NB13E	10/5/98	111TCE	BKVQ 005	< 1	
NB13E	11/3/98	111TCE	BLMV 005	< 1	
NB13E	12/21/98	111TCE		< 1	
NB13E	1/14/99	111TCE		< 1	
NB13E	2/11/99	111TCE		< 1	
NB13E	3/17/99	111TCE		< 1	
NB13E	4/6/99	111TCE		< 1	
NB13E	5/18/99	111TCE		< 1	
NB13E	6/21/99	111TCE		< 1	
NB13E	7/13/99	111TCE		< 1	
NB13E	8/30/99	111TCE		< 1	
NB13E	9/27/99	111TCE		< 1	
NB13E	10/5/98	112TCE	BKVQ 005	< 1	
NB13E	11/3/98	112TCE	BLMV 005	< 1	
NB13E	12/21/98	112TCE		< 1	
NB13E	1/14/99	112TCE		< 1	
NB13E	2/11/99	112TCE		< 1	
NB13E	3/17/99	112TCE		< 1	
NB13E	4/6/99	112TCE		< 1	
NB13E	5/18/99	112TCE		< 1	
NB13E	6/21/99	112TCE		< 1	
NB13E	7/13/99	112TCE		< 1	
NB13E	8/30/99	112TCE		< 1	
NB13E	9/27/99	112TCE		< 1	
NB13E	10/5/98	11DCE	BKVQ 005	< 1	
NB13E	11/3/98	11DCE	BLMV 005	< 1	
NB13E	12/21/98	11DCE		< 1	
NB13E	1/14/99	11DCE		< 1	
NB13E	2/11/99	11DCE		< 1	
NB13E	3/17/99	11DCE		< 1	
NB13E	4/6/99	11DCE		< 1	
NB13E	5/18/99	11DCE		< 1	
NB13E	6/21/99	11DCE		< 1	
NB13E	7/13/99	11DCE		< 1	
NB13E	8/30/99	11DCE		< 1	
NB13E	9/27/99	11DCE		< 1	
NB13E	10/5/98	11DCLE	BKVQ 005	< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13E	11/3/98	11DCLE	BLMV 005	< 1	
NB13E	12/21/98	11DCLE		< 1	
NB13E	1/14/99	11DCLE		< 1	
NB13E	2/11/99	11DCLE		< 1	
NB13E	3/17/99	11DCLE		< 1	
NB13E	4/6/99	11DCLE		< 1	
NB13E	5/18/99	11DCLE		< 1	
NB13E	6/21/99	11DCLE		< 1	
NB13E	7/13/99	11DCLE		< 1	
NB13E	8/30/99	11DCLE		< 1	
NB13E	9/27/99	11DCLE		< 1	
NB13E	12/21/98	12DCE		< 2	
NB13E	1/14/99	12DCE		< 2	
NB13E	2/11/99	12DCE		< 2	
NB13E	3/17/99	12DCE		< 2	
NB13E	4/6/99	12DCE		< 2	
NB13E	5/18/99	12DCE		< 2	
NB13E	6/21/99	12DCE		< 2	
NB13E	7/13/99	12DCE		< 2	
NB13E	8/30/99	12DCE		< 2	
NB13E	9/27/99	12DCE		< 2	
NB13E	10/5/98	12DCLE	BKVQ 005	< 1	
NB13E	11/3/98	12DCLE	BLMV 005	< 1	
NB13E	12/21/98	12DCLE		< 1	
NB13E	1/14/99	12DCLE		< 1	
NB13E	2/11/99	12DCLE		< 1	
NB13E	3/17/99	12DCLE		< 1	
NB13E	4/6/99	12DCLE		< 1	
NB13E	5/18/99	12DCLE		< 1	
NB13E	6/21/99	12DCLE		< 1	
NB13E	7/13/99	12DCLE		< 1	
NB13E	8/30/99	12DCLE		< 1	
NB13E	9/27/99	12DCLE		< 1	
NB13E	10/5/98	12DCLP	BKVQ 005	< 1	
NB13E	11/3/98	12DCLP	BLMV 005	< 1	
NB13E	12/21/98	12DCLP		< 1	
NB13E	1/14/99	12DCLP		< 1	
NB13E	2/11/99	12DCLP		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13E	3/17/99	12DCLP		< 1	
NB13E	4/6/99	12DCLP		< 1	
NB13E	5/18/99	12DCLP		< 1	
NB13E	6/21/99	12DCLP		< 1	
NB13E	7/13/99	12DCLP		< 1	
NB13E	8/30/99	12DCLP		< 1	
NB13E	9/27/99	12DCLP		< 1	
NB13E	10/5/98	C12DCE	BKVQ 005	< 1	
NB13E	11/3/98	C12DCE	BLMV 005	< 1	
NB13E	10/5/98	C2H3CL	BKVQ 005	< 1	
NB13E	11/3/98	C2H3CL	BLMV 005	< 1	
NB13E	12/21/98	C2H3CL		< 1	
NB13E	1/14/99	C2H3CL		< 1	
NB13E	2/11/99	C2H3CL		< 1	
NB13E	3/17/99	C2H3CL		< 1	
NB13E	4/6/99	C2H3CL		< 1	
NB13E	5/18/99	C2H3CL		< 1	
NB13E	6/21/99	C2H3CL		< 1	
NB13E	7/13/99	C2H3CL		< 1	
NB13E	8/30/99	C2H3CL		< 1	
NB13E	9/27/99	C2H3CL		< 1	
NB13E	10/5/98	CCL4	BKVQ 005	< 1	
NB13E	11/3/98	CCL4	BLMV 005	< 1	
NB13E	12/21/98	CCL4		< 1	
NB13E	1/14/99	CCL4		< 1	
NB13E	2/11/99	CCL4		< 1	
NB13E	3/17/99	CCL4		< 1	
NB13E	4/6/99	CCL4		< 1	
NB13E	5/18/99	CCL4		< 1	
NB13E	6/21/99	CCL4		< 1	
NB13E	7/13/99	CCL4		< 1	
NB13E	8/30/99	CCL4		< 1	
NB13E	9/27/99	CCL4		< 1	
NB13E	10/5/98	CH2CL2	BKVQ 005	< 1	
NB13E	11/3/98	CH2CL2	BLMV 005	< 1	
NB13E	12/21/98	CH2CL2		< 5	
NB13E	1/14/99	CH2CL2		< 5	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13E	2/11/99	CH2CL2		< 5	
NB13E	3/17/99	CH2CL2		< 5	
NB13E	4/6/99	CH2CL2		< 5	
NB13E	5/18/99	CH2CL2		< 5	
NB13E	6/21/99	CH2CL2		< 5	
NB13E	7/13/99	CH2CL2		< 5	
NB13E	8/30/99	CH2CL2		< 5	
NB13E	9/27/99	CH2CL2		< 5	
NB13E	10/5/98	CHCL3	BKVQ 005	0.4	JP
NB13E	11/3/98	CHCL3	BLMV 005	0.47	JP
NB13E	12/21/98	CHCL3		1.6	
NB13E	1/14/99	CHCL3		1.2	
NB13E	2/11/99	CHCL3		< 1	
NB13E	3/17/99	CHCL3		< 1	
NB13E	4/6/99	CHCL3		1.4	
NB13E	5/18/99	CHCL3		1.5	
NB13E	6/21/99	CHCL3		1.5	
NB13E	7/13/99	CHCL3		1.7	
NB13E	8/30/99	CHCL3		1.4	
NB13E	9/27/99	CHCL3		1.4	
NB13E	10/5/98	T12DCE	BKVQ 005	< 1	
NB13E	11/3/98	T12DCE	BLMV 005	< 1	
NB13E	10/5/98	TCLEE	BKVQ 005	< 1	
NB13E	11/3/98	TCLEE	BLMV 005	< 1	
NB13E	12/21/98	TCLEE		< 1	
NB13E	1/14/99	TCLEE		< 1	
NB13E	2/11/99	TCLEE		< 1	
NB13E	3/17/99	TCLEE		< 1	
NB13E	4/6/99	TCLEE		< 1	
NB13E	5/18/99	TCLEE		< 1	
NB13E	6/21/99	TCLEE		< 1	
NB13E	7/13/99	TCLEE		< 1	
NB13E	8/30/99	TCLEE		< 1	
NB13E	9/27/99	TCLEE		< 1	
NB13E	10/5/98	TCLTFE	BKVQ 005	< 1	
NB13E	11/3/98	TCLTFE	BLMV 005	< 1	
NB13E	12/21/98	TCLTFE		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13E	1/14/99	TCLTFE		< 1	
NB13E	2/11/99	TCLTFE		< 1	
NB13E	3/17/99	TCLTFE		< 1	
NB13E	4/6/99	TCLTFE		< 1	
NB13E	5/18/99	TCLTFE		< 1	
NB13E	6/21/99	TCLTFE		< 1	
NB13E	7/13/99	TCLTFE		< 1	
NB13E	8/30/99	TCLTFE		< 1	
NB13E	9/27/99	TCLTFE		< 1	
NB13E	10/5/98	TRCLE	BKVQ 005	< 1	
NB13E	11/3/98	TRCLE	BLMV 005	< 1	
NB13E	12/21/98	TRCLE		< 1	
NB13E	1/14/99	TRCLE		< 1	
NB13E	2/11/99	TRCLE		< 1	
NB13E	3/17/99	TRCLE		< 1	
NB13E	4/6/99	TRCLE		< 1	
NB13E	5/18/99	TRCLE		< 1	
NB13E	6/21/99	TRCLE		< 1	
NB13E	7/13/99	TRCLE		< 1	
NB13E	8/30/99	TRCLE		< 1	
NB13E	9/27/99	TRCLE		< 1	
NB13I	10/5/98	111TCE	BKVQ 003	< 1	
NB13I	10/5/98	111TCE	BKVQ 004	< 1	D
NB13I	11/3/98	111TCE	BLMV 003	< 1	
NB13I	11/3/98	111TCE	BLMV 004	< 1	D
NB13I	12/21/98	111TCE		< 1	
NB13I	1/14/99	111TCE		< 1	
NB13I	2/11/99	111TCE		< 1	
NB13I	3/17/99	111TCE		< 1	
NB13I	4/6/99	111TCE		< 1	
NB13I	5/18/99	111TCE		< 1	
NB13I	6/21/99	111TCE		< 1	
NB13I	7/13/99	111TCE		< 1	
NB13I	8/30/99	111TCE		< 1	
NB13I	9/27/99	111TCE		< 1	
NB13I	10/5/98	112TCE	BKVQ 003	< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	10/5/98	112TCE	BKVQ 004	< 1	D
NB13I	11/3/98	112TCE	BLMV 003	< 1	
NB13I	11/3/98	112TCE	BLMV 004	< 1	D
NB13I	12/21/98	112TCE		< 1	
NB13I	1/14/99	112TCE		< 1	
NB13I	2/11/99	112TCE		< 1	
NB13I	3/17/99	112TCE		< 1	
NB13I	4/6/99	112TCE		< 1	
NB13I	5/18/99	112TCE		< 1	
NB13I	6/21/99	112TCE		< 1	
NB13I	7/13/99	112TCE		< 1	
NB13I	8/30/99	112TCE		< 1	
NB13I	9/27/99	112TCE		< 1	
NB13I	10/5/98	11DCE	BKVQ 003	< 1	
NB13I	10/5/98	11DCE	BKVQ 004	< 1	D
NB13I	11/3/98	11DCE	BLMV 003	< 1	
NB13I	11/3/98	11DCE	BLMV 004	< 1	D
NB13I	12/21/98	11DCE		< 1	
NB13I	1/14/99	11DCE		< 1	
NB13I	2/11/99	11DCE		< 1	
NB13I	3/17/99	11DCE		< 1	
NB13I	4/6/99	11DCE		< 1	
NB13I	5/18/99	11DCE		< 1	
NB13I	6/21/99	11DCE		< 1	
NB13I	7/13/99	11DCE		< 1	
NB13I	8/30/99	11DCE		< 1	
NB13I	9/27/99	11DCE		< 1	
NB13I	10/5/98	11DCLE	BKVQ 003	< 1	
NB13I	10/5/98	11DCLE	BKVQ 004	< 1	D
NB13I	11/3/98	11DCLE	BLMV 003	< 1	
NB13I	11/3/98	11DCLE	BLMV 004	< 1	D
NB13I	12/21/98	11DCLE		< 1	
NB13I	1/14/99	11DCLE		< 1	
NB13I	2/11/99	11DCLE		< 1	
NB13I	3/17/99	11DCLE		< 1	
NB13I	4/6/99	11DCLE		< 1	
NB13I	5/18/99	11DCLE		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	6/21/99	11DCLE		< 1	
NB13I	7/13/99	11DCLE		< 1	
NB13I	8/30/99	11DCLE		< 1	
NB13I	9/27/99	11DCLE		< 1	
NB13I	12/21/98	12DCE		< 2	
NB13I	1/14/99	12DCE		< 2	
NB13I	2/11/99	12DCE		< 2	
NB13I	3/17/99	12DCE		< 2	
NB13I	4/6/99	12DCE		< 2	
NB13I	5/18/99	12DCE		< 2	
NB13I	6/21/99	12DCE		< 2	
NB13I	7/13/99	12DCE		< 2	
NB13I	8/30/99	12DCE		< 2	
NB13I	9/27/99	12DCE		< 2	
NB13I	10/5/98	12DCLE	BKVQ 003	< 1	
NB13I	10/5/98	12DCLE	BKVQ 004	< 1	D
NB13I	11/3/98	12DCLE	BLMV 003	< 1	
NB13I	11/3/98	12DCLE	BLMV 004	< 1	D
NB13I	12/21/98	12DCLE		< 1	
NB13I	1/14/99	12DCLE		< 1	
NB13I	2/11/99	12DCLE		< 1	
NB13I	3/17/99	12DCLE		< 1	
NB13I	4/6/99	12DCLE		< 1	
NB13I	5/18/99	12DCLE		< 1	
NB13I	6/21/99	12DCLE		< 1	
NB13I	7/13/99	12DCLE		< 1	
NB13I	8/30/99	12DCLE		< 1	
NB13I	9/27/99	12DCLE		< 1	
NB13I	10/5/98	12DCLP	BKVQ 003	< 1	
NB13I	10/5/98	12DCLP	BKVQ 004	< 1	D
NB13I	11/3/98	12DCLP	BLMV 003	< 1	
NB13I	11/3/98	12DCLP	BLMV 004	< 1	D
NB13I	12/21/98	12DCLP		< 1	
NB13I	1/14/99	12DCLP		< 1	
NB13I	2/11/99	12DCLP		< 1	
NB13I	3/17/99	12DCLP		< 1	
NB13I	4/6/99	12DCLP		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	5/18/99	12DCLP		< 1	
NB13I	6/21/99	12DCLP		< 1	
NB13I	7/13/99	12DCLP		< 1	
NB13I	8/30/99	12DCLP		< 1	
NB13I	9/27/99	12DCLP		< 1	
NB13I	10/5/98	C12DCE	BKVQ 003	< 1	
NB13I	10/5/98	C12DCE	BKVQ 004	< 1	D
NB13I	11/3/98	C12DCE	BKVQ 003	< 1	
NB13I	11/3/98	C12DCE	BKVQ 004	< 1	D
NB13I	10/5/98	C2H3CL	BKVQ 003	< 1	
NB13I	10/5/98	C2H3CL	BKVQ 004	< 1	D
NB13I	11/3/98	C2H3CL	BKVQ 003	< 1	
NB13I	11/3/98	C2H3CL	BKVQ 004	< 1	D
NB13I	12/21/98	C2H3CL		< 1	
NB13I	1/14/99	C2H3CL		< 1	
NB13I	2/11/99	C2H3CL		< 1	
NB13I	3/17/99	C2H3CL		< 1	
NB13I	4/6/99	C2H3CL		< 1	
NB13I	5/18/99	C2H3CL		< 1	
NB13I	6/21/99	C2H3CL		< 1	
NB13I	7/13/99	C2H3CL		< 1	
NB13I	8/30/99	C2H3CL		< 1	
NB13I	9/27/99	C2H3CL		< 1	
NB13I	10/5/98	CCL4	BKVQ 003	< 1	
NB13I	10/5/98	CCL4	BKVQ 004	< 1	D
NB13I	11/3/98	CCL4	BLMV 003	< 1	
NB13I	11/3/98	CCL4	BLMV 004	< 1	D
NB13I	12/21/98	CCL7		< 1	
NB13I	1/14/99	CCL8		< 1	
NB13I	2/11/99	CCL9		< 1	
NB13I	3/17/99	CCL10		< 1	
NB13I	4/6/99	CCL11		< 1	
NB13I	5/18/99	CCL12		< 1	
NB13I	6/21/99	CCL13		< 1	
NB13I	7/13/99	CCL14		< 1	
NB13I	8/30/99	CCL15		< 1	
NB13I	9/27/99	CCL16		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	5/18/99	CH2CL10		< 5	
NB13I	6/21/99	CH2CL11		< 5	
NB13I	7/13/99	CH2CL12		< 5	
NB13I	8/30/99	CH2CL13		< 5	
NB13I	9/27/99	CH2CL14		< 5	
NB13I	10/5/98	CH2CL2	BKVQ 003	< 1	
NB13I	10/5/98	CH2CL2	BKVQ 004	< 1	D
NB13I	11/3/98	CH2CL2	BLMV 003	< 1	
NB13I	11/3/98	CH2CL2	BLMV 004	< 1	D
NB13I	12/21/98	CH2CL5		< 5	
NB13I	1/14/99	CH2CL6		< 5	
NB13I	2/11/99	CH2CL7		< 5	
NB13I	3/17/99	CH2CL8		< 5	
NB13I	4/6/99	CH2CL9		< 5	
NB13I	10/5/98	CHCL3	BKVQ 003	< 1	
NB13I	10/5/98	CHCL3	BKVQ 004	< 1	D
NB13I	11/3/98	CHCL3	BLMV 003	< 1	
NB13I	11/3/98	CHCL3	BLMV 004	< 1	D
NB13I	12/21/98	CHCL6		< 1	
NB13I	1/14/99	CHCL7		< 1	
NB13I	2/11/99	CHCL8		< 1	
NB13I	3/17/99	CHCL9		< 1	
NB13I	4/6/99	CHCL10		< 1	
NB13I	5/18/99	CHCL11		< 1	
NB13I	6/21/99	CHCL12		< 1	
NB13I	7/13/99	CHCL13		< 1	
NB13I	8/30/99	CHCL14		< 1	
NB13I	9/27/99	CHCL15		< 1	
NB13I	10/5/98	T12DCE	BKVQ 003	< 1	
NB13I	10/5/98	T12DCE	BKVQ 004	< 1	D
NB13I	11/3/98	T12DCE	BLMV 003	< 1	
NB13I	11/3/98	T12DCE	BLMV 004	< 1	D
NB13I	12/21/98	T12DCE		--	
NB13I	1/14/99	T12DCE		--	
NB13I	2/11/99	T12DCE		--	
NB13I	3/17/99	T12DCE		--	
NB13I	4/6/99	T12DCE		--	
NB13I	5/18/99	T12DCE		--	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	6/21/99	T12DCE		- -	
NB13I	7/13/99	T12DCE		- -	
NB13I	8/30/99	T12DCE		- -	
NB13I	9/27/99	T12DCE		- -	
NB13I	10/5/98	TCLEE	BKVQ 003	< 1	
NB13I	10/5/98	TCLEE	BKVQ 004	< 1	D
NB13I	11/3/98	TCLEE	BLMV 003	< 1	
NB13I	11/3/98	TCLEE	BLMV 004	< 1	D
NB13I	12/21/98	TCLEE		< 1	
NB13I	1/14/99	TCLEE		< 1	
NB13I	2/11/99	TCLEE		< 1	
NB13I	3/17/99	TCLEE		< 1	
NB13I	4/6/99	TCLEE		< 1	
NB13I	5/18/99	TCLEE		< 1	
NB13I	6/21/99	TCLEE		< 1	
NB13I	7/13/99	TCLEE		< 1	
NB13I	8/30/99	TCLEE		< 1	
NB13I	9/27/99	TCLEE		< 1	
NB13I	10/5/98	TCLTFE	BKVQ 003	< 1	
NB13I	10/5/98	TCLTFE	BKVQ 004	< 1	D
NB13I	11/3/98	TCLTFE	BLMV 003	< 1	
NB13I	11/3/98	TCLTFE	BLMV 004	< 1	D
NB13I	12/21/98	TCLTFE		< 1	
NB13I	1/14/99	TCLTFE		< 1	
NB13I	2/11/99	TCLTFE		< 1	
NB13I	3/17/99	TCLTFE		< 1	
NB13I	4/6/99	TCLTFE		< 1	
NB13I	5/18/99	TCLTFE		< 1	
NB13I	6/21/99	TCLTFE		< 1	
NB13I	7/13/99	TCLTFE		< 1	
NB13I	8/30/99	TCLTFE		< 1	
NB13I	9/27/99	TCLTFE		< 1	
NB13I	10/5/98	TRCLE	BKVQ 003	1.8	
NB13I	10/5/98	TRCLE	BKVQ 004	1.8	D
NB13I	11/3/98	TRCLE	BLMV 003	1.9	
NB13I	11/3/98	TRCLE	BLMV 004	1.2	D
NB13I	12/21/98	TRCLE		< 1	

APPENDIX K.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 1999
PGRS, TCAAP
NEW BRIGHTON, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
NB13I	1/14/99	TRCLE		< 1	
NB13I	2/11/99	TRCLE		< 1	
NB13I	3/17/99	TRCLE		< 1	
NB13I	4/6/99	TRCLE		< 1	
NB13I	5/18/99	TRCLE		< 1	
NB13I	6/21/99	TRCLE		1.4	
NB13I	7/13/99	TRCLE		< 1	
NB13I	8/30/99	TRCLE		< 1	
NB13I	9/27/99	TRCLE		< 1	

Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

APPENDIX L

Appendix L

Other Installation Restoration Activities During FY 1999

L.1 Other Installation Restoration Activities During FY 1999

Appendix L.1

Other Installation Restoration Activities During FY 1999

This appendix is intended to give the reader a brief overview of other activities at TCAAP which are related to the Installation Restoration Program, but are not required by the RODs for OU1 through OU3. These activities are not part of the performance evaluation or the performance monitoring programs.

A. BACKGROUND MONITORING

1. Deep Groundwater

In order to periodically 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). The FY 1999 results, along with the report figure which illustrates each well, are:

Well	FY 1999 Result (μg/l)	Report Figure
03U007	<1.00	9-5
03U009	JP 0.63	9-5
03L007	<1.00	9-6
04U007	<1.00	9-7
04U510	<1.00	9-7

The data qualifier "JP" means that the value is between the contract required reporting limit and the method detection limit. Previous results for 03U009 were all non-detect. Future monitoring will help determine whether this year's value is an anomaly (perhaps cross-contamination) or if it is truly indicative of contamination moving beneath TCAAP from off-site.

These locations will be sampled again in FY 2001 as shown in Appendix A.1 (the wells are listed under TGRS in the appendix).

2. Surface Water

The FY 1999 – FY 2003 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 meet the Final Modified Substantive Requirements Document (MN U000579) dated November 19, 1997. The data for Outfall 010 is presented in Table 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 L-1). This monitoring is simply intended to establish baseline characteristics for Rice Creek. The FY 1999 data is presented in Appendix L.2.

B. AQUATIC STUDIES

The U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) led the following studies for Sunfish Lake and Round Lake during FY 1999:

- Tier II Ecological Risk Assessment Work Plan (approved)
- Field Work for Tier II Ecological Risk Assessment

C. GRENADE RANGE

Alliant Techsystems prepared and submitted a removal action Work Plan, which was under review at the end of FY 1999. Upon approval of the work plan, the removal action to address contaminated soils was scheduled for early FY 2000.

D. OUTDOOR FIRING RANGE

Alliant Techsystems prepared and submitted a removal action Work Plan, which was approved in FY 1999. The removal action to address contaminated soils was scheduled for early FY 2000.

E. #150 RESERVOIR AREA

A small area of contamination was found near the water storage reservoir in FY 1999. Alliant Techsystems sampled the area and prepared a characterization report. This area was cleaned up as part of the removal action at the Outdoor Firing Range, and documentation was included with the Outdoor Firing Range removal report.

F. TRAP RANGE

Alliant Techsystems prepared and submitted a preliminary assessment for the Trap Range. The report, which was still under review at the end of FY 1999, recommends no further action at this site.

G. NATURAL ATTENUATION STUDY

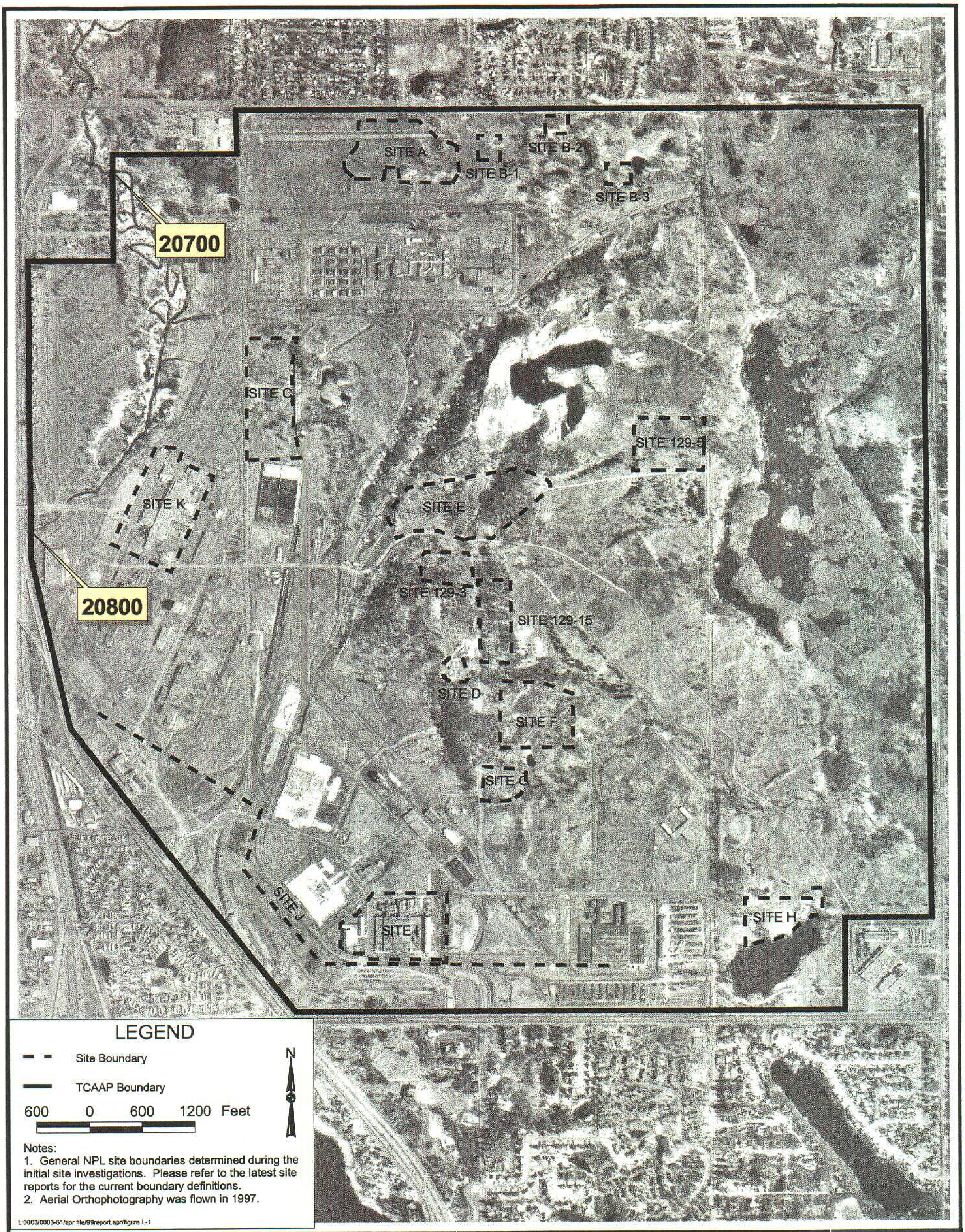
The USEPA funded and led a study of natural attenuation processes for the deep groundwater beneath TCAAP. Water quality sampling was performed in FY 1997 and additional sampling was performed in FY 1998. A report was under review during FY 1999, and is anticipated to be finalized in FY 2000.

H. PHYTOREMEDIATION STUDY

In FY 1997, the U.S. Army Environmental Center agreed to fund and lead a demonstration study of phytoremediation of soil at TCAAP. In FY 1998, a Work Plan was approved and the study was initiated. Corn was planted at Sites C and 129-3 in May 1998. The corn was harvested in August, at which time mustard was planted. The mustard was harvested later in the fall, early FY 1999. The study was continued for a second growing season, in FY 1999. During FY 1999, the study was extended for a third growing season (FY 2000). This should be the final year, since Stone & Webster is scheduled to complete soil remediation at Sites C and 129-3 in FY 2000.

I. PRIMER/TRACER AREAS 135 AND 535

Site evaluations are planned at these sites, pending receipt of funding in FY 2000.



TWIN CITIES ARMY AMMUNITION PLANT	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	OCT 2000
Surface Water Monitoring Locations		Figure L-1

L.2 Surface Water Quality Data: FY 1999

Appendix L.2
Surface Water Quality Data: FY 1999

							11DCE	11DCLE	12DCLE	C12DCE	C2H3CL	T12DCE	TRCLE	C6H6	AG	CU	CYN	HG	P4	PB	ZN
20700	GL	UB	03-Dec-98	Q61	98U02762	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	JP 5.25	<10.00	<0.10	66.4	<100.00	JP 10.90
20700	GL	UB	03-Dec-98	Q61	98U02762	Lot	BLVP 015	BLVP 015	BLVP 015	BLVP 015	BLVP 015	BLVP 015	BLVP 015		BLZF 007	BLZF 007	BLVQ 003	BLTV 007	BLWK 003	BLZF 007	BLZF 007
20700	GL	UB	02-Mar-99	NPD	99U00554	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	JP 5.34	<10.00	JP 0.10	39.9	<100.00	<20.00
20700	GL	UB	02-Mar-99	NPD	99U00554	Lot	BMZK 015	BMZK 015	BMZK 015	BMZK 015	BMZK 015	BMZK 015	BMZK 015	BMZK 015	BNBB 008	BNBB 008	BMZZ 004	BMYJ 010	BMZF 004	BNBB 008	BNBB 008
20700	GL	UB	02-Jun-99	NPD	99U01095	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	<20.00	<10.00	<0.10	86.3	<100.00	<20.00
20700	GL	UB	02-Jun-99	NPD	99U01095	Lot	BNNQ 012	BNNQ 012	BNNQ 012	BNNQ 012	BNNQ 012	BNNQ 012	BNNQ 012		BNMF 008	BNMF 008	BNMR 005	BNMG 007	BNMP 005	BNMF 008	BNMF 008
20700	GL	UB	08-Sep-99	NPD	99U02126	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	43.5	<10.00	<0.10	274	<100.00	<20.00
20700	GL	UB	08-Sep-99	NPD	99U02126	Lot	BPPD 006	BPPD 006	BPPD 006	BPPD 006	BPPD 006	BPPD 006	BPPD 006		BPND 007	BPND 007	BPPC 004	BPMV 007	BPMZ 004	BPND 007	BPND 007
20800	GL	UB	03-Dec-98	Q61	98U02761	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		JP 5.00	JP 5.21	<10.00	<0.10	96	<100.00	31.3
20800	GL	UB	03-Dec-98	Q61	98U02761	Lot	BLVP 014	BLVP 014	BLVP 014	BLVP 014	BLVP 014	BLVP 014	BLVP 014		BLZF 003	BLZF 003	BLVQ 002	BLTV 006	BLWK 002	BLZF 003	BLZF 003
20800	GL	UB	02-Mar-99	NPD	99U00553	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	29.2	<100.00	<20.00
20800	GL	UB	02-Mar-99	NPD	99U00553	Lot	BMZK 014	BMZK 014	BMZK 014	BMZK 014	BMZK 014	BMZK 014	BMZK 014	BMZK 014	BNBB 007	BNBB 007	BMZZ 003	BMYJ 009	BMZF 003	BNBB 007	BNBB 007
20800	GL	UB	02-Jun-99	NPD	99U01093	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	<20.00	<10.00	<0.10	80.2	<100.00	<20.00
20800	GL	UB	02-Jun-99	NPD	99U01093	Lot	BNNQ 010	BNNQ 010	BNNQ 010	BNNQ 010	BNNQ 010	BNNQ 010	BNNQ 010		BNMF 003	BNMF 003	BNMR 003	BNMG 003	BNMP 003	BNMF 003	BNMF 003
20800 D	GL	UB	02-Jun-99	NPD	99U01094	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	<20.00	<10.00	0.168	52.4	<100.00	<20.00
20800 D	GL	UB	02-Jun-99	NPD	99U01094	Lot	BNNQ 011	BNNQ 011	BNNQ 011	BNNQ 011	BNNQ 011	BNNQ 011	BNNQ 011		BNMF 007	BNMF 007	BNMR 004	BNMG 006	BNMP 004	BNMF 007	BNMF 007
20800	GL	UB	08-Sep-99	NPD	99U02125	Value	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00		<10.00	<20.00	<10.00	<0.10	272	<100.00	<20.00
20800	GL	UB	08-Sep-99	NPD	99U02125	Lot	BPPD 003	BPPD 003	BPPD 003	BPPD 003	BPPD 003	BPPD 003	BPPD 003		BPND 003	BPND 003	BPPC 003	BPMV 006	BPMZ 003	BPND 003	BPND 003