INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT

FISCAL YEAR 2000 ANNUAL PERFORMANCE REPORT

Prepared for:

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

November 2001
FINAL REPORT

Minnesota Pollution Control Agency

November 20, 2001

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

RE: Consistency Test for the Fiscal Year 2000 Annual Performance Report, Twin Cities Army Ammunition Plant, Arden Hills, Minnesota

Dear Mr. McCleery:

Staff at the Minnesota Pollution Control Agency (MPCA) and the U.S. Environmental Protection Agency (U.S. EPA) have completed review of the redline changes to the Twin Cities Army Ammunition Plant Fiscal Year 2000 Annual Performance Report (Report). The redline changes, received by letter dated June 21, 2001, and subsequently submitted by email dated October 18, 2001, were reviewed by MPCA staff and U.S. EPA. Agreement among MPCA, U.S. EPA, and Army was reached at comments resolution meetings on June 12, 2001, and November 15, 2001. Agreement was reached at the November 15, 2001, comments resolution meeting regarding the changes to the Report requested in the MPCA staff letter dated November 1, 2001, and these changes will be incorporated in to the Report.

As discussed previously with Army, the regulators noted certain insufficiencies associated with the Quality Assurance/Quality Control for the Report. Please note that in subsequent years, the data must be validated per requirements in the RD/RA Quality Assurance Project Plan.

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 2000 Annual Performance Report passes the Consistency Test.

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

Sincerely,

Dagmar Romano

Dagmar Romano
Project Manager
Site Remediation Section
Metro District

Dagmar Romano
for Tom Barounis
U.S. Environmental Protection Agency

DR:csa

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

November 2001
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
AS/SVE	-	Air Sparging/Soil Vapor Extraction
BGRS	-	Boundary Groundwater Recovery System
CRA	-	Conestoga-Rovers and Associates, Inc.
CRDL	-	Contract Required Detection Limit
DNAPL	-	Dense Non-Aqueous Phase Liquid
EE/CA	-	Engineering Evaluation/Cost Analysis
FFA	-	Federal Facilities Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
gpm	-	Gallons per Minute
HRC	-	Hydrogen Release Compound
IRA	-	Interim Remedial Action
MCES	-	Metropolitan Council Environmental Services
MCLs	-	Maximum Contaminant Levels
MCLGs	-	Maximum Contaminant Level Goals
MDH	-	Minnesota Department of Health
MDL	-	Method Detection Limit
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

List of Acronyms (Cont.)

PGRS	-	Plume Groundwater Recovery System
PLC	-	Programmable Logic Controller
PM	-	Preventative Maintenance
POTW	-	Publicly-Owned Treatment Works
ROD	-	Record of Decision
scfm	-	Standard Cubic Feet per Minute
SDWA	-	Safe Drinking Water Act
SVE	-	Soil Vapor Extraction
TCAAP	-	Twin Cities Army Ammunition Plant
TGRS	-	TCAAP Groundwater Recovery System
TSCA	-	Toxic Substances Control Act
$\mu g/l$	-	Micrograms per liter
USAEC	-	U.S. Army Environmental Center
USEPA	-	U.S. Environmental Protection Agency
VOCs	-	Volatile Organic Compounds
Wenck	-	Wenck Associates, Inc.

List of Chemical Abbreviations

Note: The abbreviations below are those required for data entry into the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS).

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

List of Chemical Abbreviations (Cont.)

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

SECTION 1

1.0 Executive Summary

This Fiscal Year 2000 (FY 2000) 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 2000 is defined as the period from October 1, 1999, through September 30, 2000.

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 2000. 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 2000:

- Abandonment of one private water supply was completed (Bochnak).
- Some of the private well monitoring that was recommended in the 1998/1999 Well Inventory Update was completed in FY 2000, but continued effort will be required in FY 2001 to complete it.
- The extraction wells were not pumped in strict accordance with the designed program in FY 2000. Specifically:
  - NBM #4: Pumping rates followed the target rates very closely throughout FY 2000.
  - NBM #14: Pumping rates were widely varied and were below target rates in 6 of 12 months.
  - NBM #15: Pumping rates were widely varied and were below target rates in 5 of 12 months.
- The Army, USEPA, and MPCA continued discussions regarding performance of the OU1 remedy. A memorandum evaluating containment in the Prairie du Chien is being reviewed as a Consistency Item separate from this report. Similarly, a memorandum will be prepared to evaluate conditions in the Jordan.
- The PGAC treated 1.2 billion gallons of water and removed 1,035 pounds of VOCs during FY 2000.

- 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 was not monitored since this was the first "off year" in the biennial monitoring program.
- The Minnesota Department of Health expanded the boundary of the Special Well Construction Area to the southwest in December 1999.

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 2000 are:

- Shallow Soil Sites
  - Construction of an air sparging/soil vapor extraction system to remediate VOC contaminated soils and source area groundwater at Site A. Start-up procedures were initiated in FY 2000.
  - Completion of soil remediation at Site H, with excavation, treatment and off-site disposal of an additional 188 tons of soil (resulting in a project total of 11,579 tons including the quantity from 1999).
  - The phytoremediation demonstration project was terminated at Sites C and 129-3. This demonstration project was not part of the OU2 ROD.
  - Continuation of soil remediation at Site E, with excavation, treatment, and off-site disposal of an additional 12,842 tons of soil (resulting in a project total-to-date of 26,794 tons including the quantity from 1999).

- Initiation of soil remediation at Site C, with excavation, treatment, and off-site disposal of 10,902 tons of soil.

- 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 subsequent report which recommended that both shallow systems remain off was approved in FY 2000.
  - A soil investigation for VOCs in shallow and deep soils at Sites D and G was conducted to show that clean-up goals have been met. The results showed that deep soils had met cleanup goals at both sites and that the deep SVE systems were not needed at either site. The results also showed that the shallow soils at Site D met cleanup goals and that the shallow SVE system at Site D can be dismantled. The shallow SVE system at Site G may or may not need to be operated with modifications. The report is currently under review.
- Site A Shallow Groundwater
  - The eight-well extraction system, which has been operating since May 1994, continued to provide containment and mass removal.
  - The eight extraction wells operated until July 11, 2000, when the downgradient line of four extraction wells was shut off because concentrations declined below cleanup levels beyond the "first line" of extraction wells. The four extraction wells in the "first line" operated through the remainder of FY 2000.
  - The system pumped at an average rate of 28.6 gallons per minute through June 2000 versus the design rate to achieve containment of 25 gallons per minute. From July through September 2000, the first line of extraction wells pumped an average rate of 15.4 gpm, exceeding the 15 gpm design rate.
  - During FY 1999, the system removed approximately 2.9 pounds of VOCs, with a cumulative mass removal of 33 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 2000 included construction of an air sparging/soil vapor extraction system. Start-up procedures for this system were initiated in FY 2000.
- 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, trichloroethene, and cis-1,2 dichloroethene.

- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 2000. Five of the seven wells scheduled for sampling were dry.
  - A pilot test for evaluating the feasibility of dual phase extraction was completed and a draft report was submitted to the Agencies.
- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 5,224,650 gallons of water and maintained a continuous zone of capture downgradient of Building 103. A total of 12.7 pounds of VOCs were removed in FY 2000.
  - The extracted water was discharged to Rice Creek in compliance with all discharge criteria.
  - An upper Unit 3 sentinel well was installed. The Unit 3 sentinel well and lower Unit 1 sentinel wells were sampled.
  - Additional characterization of the unsaturated Unit 1 soil was completed. A report is being prepared.

- Deep Groundwater
  - The TGRS operated in accordance with the OU2 ROD.
  - The TGRS operated at a rate sufficient to continue to create a continuous zone of capture along the southwest TCAAP boundary that extends beyond the 5 μg/l trichloroethene contour.
  - In FY 2000, the TGRS extracted and treated 1,183,258,000 gallons of water. The mass of VOCs removed was 4,499 pounds. The total VOC mass removed by the TGRS through FY 2000 is 176,666 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.
- Under an agreement with the Agencies, the PGRS pumping rate was reduced from a nominal rate of 1,000 gpm to 400 gpm in December 1999 in response to declining VOC concentrations (to below ROD requirements) at the leading edge of the plume. The influent to the PGRS treatment system has been below the ROD requirements since 1997.
- A report titled "Plume History Evaluation, Operable Unit 3," dated October 10, 2000, was submitted to the Agencies. This report documents the history of plume size and concentration reductions throughout OU3. Based on the dramatic reductions in plume size and concentration, the report recommends shutting down the PGRS. Comments from the Agencies are pending as of the end of January 2001.
- In FY 2000, a total of 274,608,000 gallons of water were treated by the PGRS.

- PGRS influent and effluent VOC concentrations were below all applicable drinking water criteria in FY 2000. The influent samples were non-detect for all VOCs in FY 2000. Thus, the PGRS removed a negligible mass of VOCs.
- The treated groundwater was beneficially used in the New Brighton municipal water supply system.

Table

Table 1-1

Status of Remedial Actions: FY 2000

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 was expanded in FY 2000.
#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. AS/SVE system construction and startup was completed in 2000.
Site C	Yes	Partially	No	Site partially excavated in 2000; to be completed in 2001, if funding is available. Phytoremediation project was terminated.
Site E	Yes	Partially	No	Site partially excavated in 1999; further excavated in 2000; to be completed in 2001.

Table 1-1 (continued)

Status of Remedial Actions: FY 2000

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	Yes	No	Site partially excavated in 1999; completed in 2000.
Site 129-3	Yes	Partially	No	Site partially excavated in 2000; to be completed in 2001, if funding is available. Phytoremediation project was terminated.
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	Yes	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. CERCLA soil cover design was under review in 2000; to be constructed in 2001.

Table 1-1 (continued)

Status of Remedial Actions: FY 2000

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 (Deep)	Yes	Yes	No	Investigation for VOCs in shallow and deep soils was conducted in FY 2000. Deep SVE systems will not be required at Sites D or G. Site D SVE can be closed out; Site G SVE may or may not be operated with enhancements.
#4: Enhancements to SVE Systems	Yes	Yes	No	Optimization testing was completed in FY 1999; a report recommending the systems remain off was approved in FY 2000. The Site D SVE system will be dismantled. The Site G SVE system may or may not be operated with enhancements (see #3 above).
#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. Characterization of non-VOC contaminants to be completed at Site D in FY 2001.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2000

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 was completed in FY 1999. An AS/SVE system was constructed in FY 2000 to address VOC-contaminated soils.
Overall Remedy		Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2000

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	Pilot study completed in FY 2000.
#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	Yes	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	Pilot study initiated in FY 2000.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2000

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	Groundwater reconfiguration analysis of the TGRS continued in FY 2000.
#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	PGRS flowrate was reduced to 400 gpm in FY 2000.
#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 2000 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 2000 (FY 2000) extended from October 1, 1999, through September 30, 2000.

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 2000, this document presents proposed monitoring for future years (Appendix A). The monitoring plan shows

FY 2000 through FY 2004. The FY 2000 monitoring plan indicates the work for which results are included in this report. The FY 2001 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 2000 will drop off and FY 2005 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 prime tenant on the installation and was also the contracted operator during FY 2000. Tecumseh/Wenck Installation Support Services is the contracted operator for FY 2001.

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.

Five other sites, the Grenade Range, the Outdoor Firing Range, the Trap Range, and the 135 and 535 Primer/Tracer Areas are being addressed as Removal Actions separate from the OU2 ROD; 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 2000 Monitoring Plan for Groundwater Monitoring Wells
- FY 2000 Monitoring Plan for Remedial Treatment Systems
- FY 2000 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

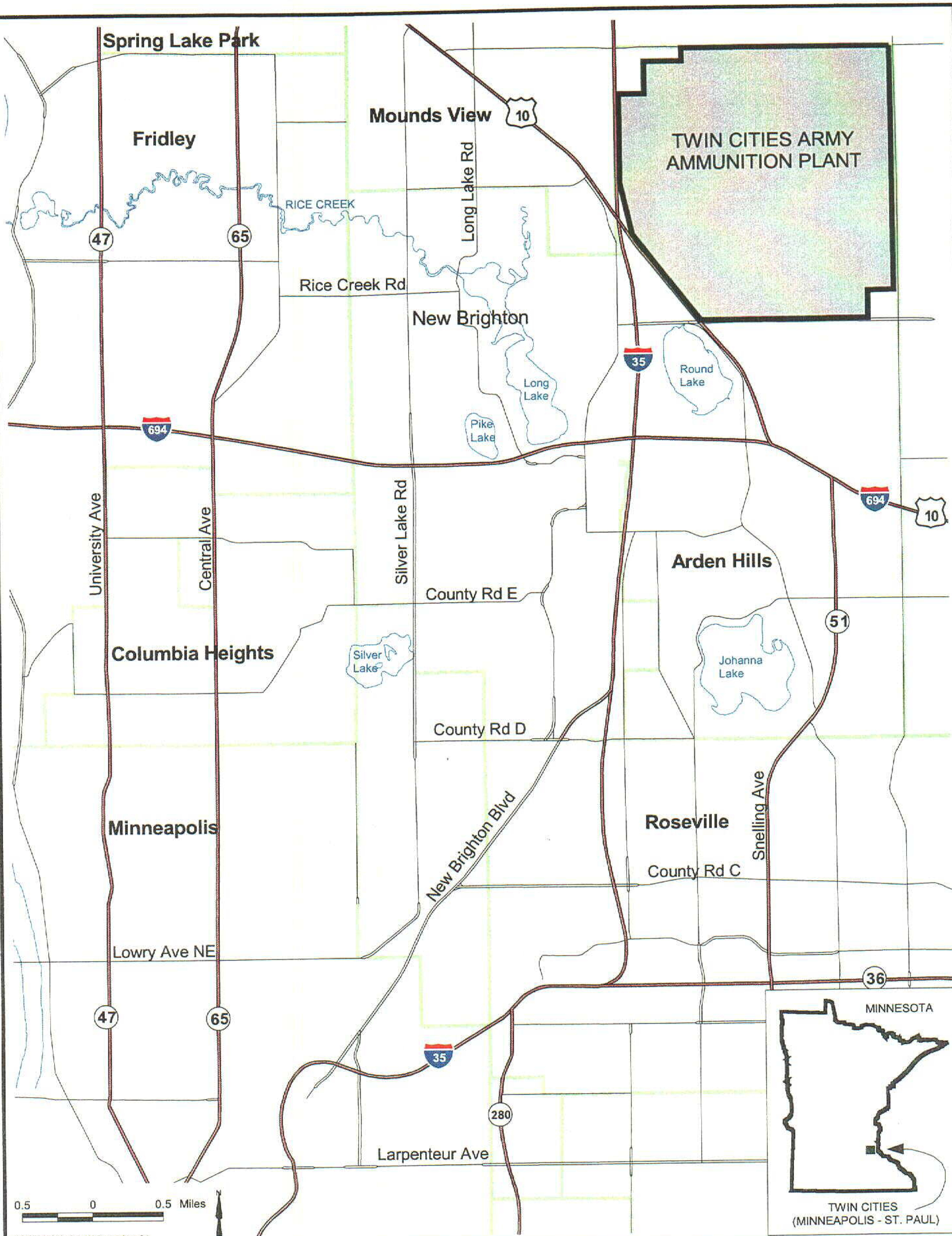
Data was collected principally by two parties: CRA on behalf of Alliant Techsystems, and Barr Engineering on behalf of the City of New Brighton. Appendix C presents a discussion of data collection, management, and presentation. The comprehensive groundwater level and groundwater quality databases from 1987 to present are contained on a CD-ROM in Appendix D. Tables showing FY 2000 data are presented following the text at the end of each section in which it is referenced.

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 2000 is complete. Appendix C.2 provides explanations for the deviations.

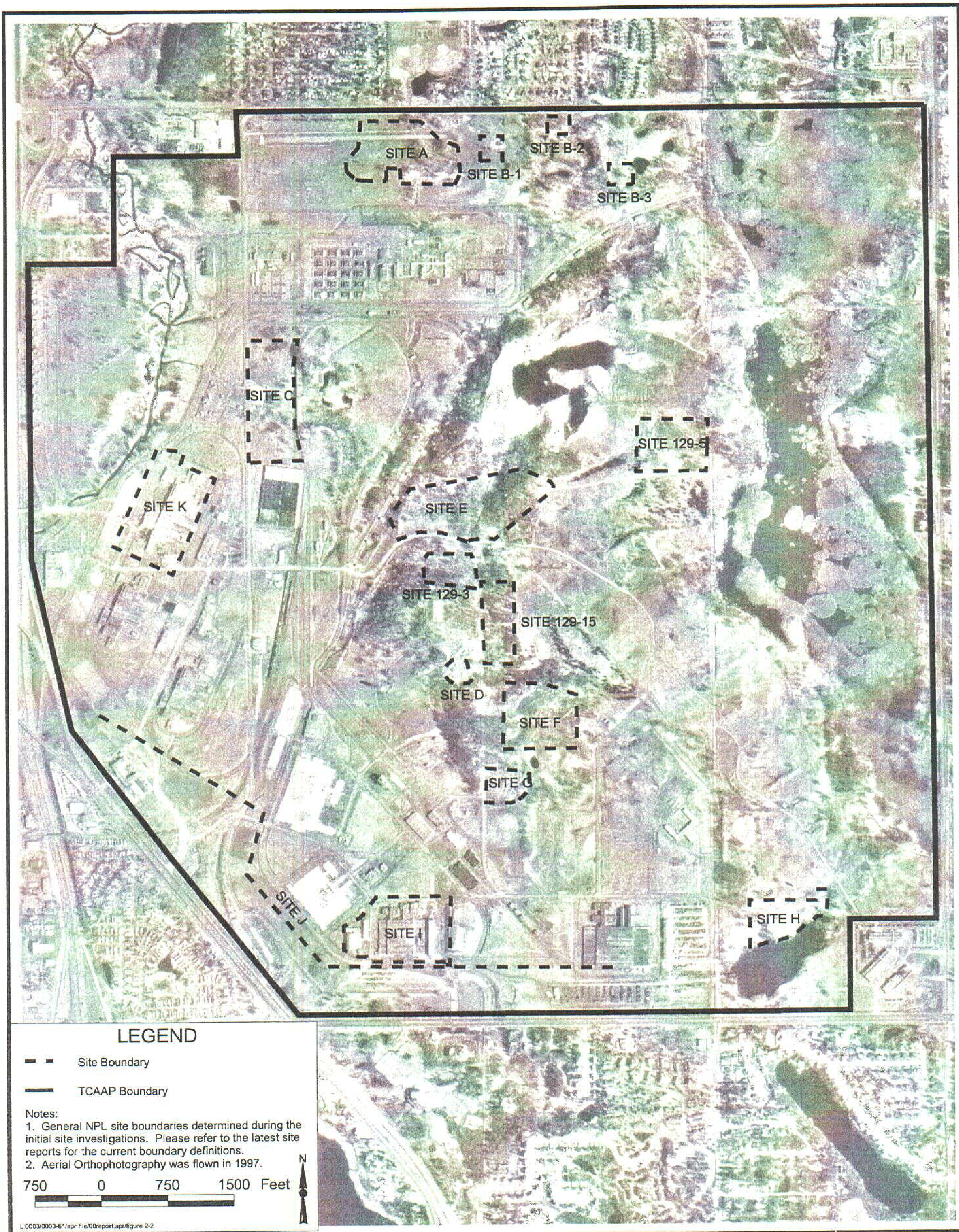
Was the data assessed (are we making decisions based on technically-sound information)?
Yes. The data was collected, analyzed, and assessed in accordance with the "Remedial Design/Remedial Action, Quality Assurance Project Plan" (Montgomery Watson, 1996), with the exception of performing "full validation" on 10 percent of the data. This requirement will be met in future years. 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. Data assessment for each sampling event is summarized in the memoranda included in Appendix C.5.

One of the data assessment memos notes that the sample set from the TGRS Treatment System dated May 2000 had a trip blank with very high Volatile Organic Compounds (VOCs) levels. The May data for both the TGRS influent and effluent are comparable to data for the other months of FY 2000, as reported in this Annual Performance Report. Therefore, it does not appear that the sample label for the trip blank was switched with a TGRS sample. As was stated in the data assessment memo, the sample submitted as a trip blank was obviously not a trip blank. It is not clear where this sample came from or how it got mislabeled. The surrogate recoveries for all of the samples reported in the May TGRS lab report were within the recovery limits and were unaffected by the trip blank issue.

Figures



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



TWIN CITIES ARMY AMMUNITION PLANT	COPYRIGHT Wenck	FY 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 all 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 implemented and will be an ongoing program maintained by the Army. Updates to the TCAAP Alternate Water Supply Construction Report were completed on April 17, 2000 and August 2, 2000 by Montgomery Watson. The April 17, 2000 update was the addition of Appendix A to the report containing the

MDH Health Consultation, which addressed health risks for nine wells that 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 approved by the Agency for Toxic Substances and Disease Registry just prior to the update. The August 2, 2000 update documented abandonment of the Bochnak well, as described below.

Did the boundary of the North Plume get any bigger during FY 2000, as defined by the 1 μg/l contour line?

No data available. FY 2000 was the "off year" in the biennial monitoring program as shown in Appendix A.

Were any new water supply wells discovered within the North Plume during FY 2000? No.

Were any water supply wells within the North Plume sampled during FY 2000 (outside of those included in the OU1 performance monitoring plan)? If yes, what were the findings?

Yes. Thirteen wells were sampled in FY 2000 and the results are presented in Table 3-1, with well locations shown on Figure 3-1. This sampling represents partial completion of the sampling recommended in the 1998/1999 Well Inventory Update (Table 3.1 of Appendix G of the FY 1999 Annual Performance Report).

As shown in Table 3-1, five of the 13 wells had no detections of the OU1 chemicals of concern. One well (Big Ten Supper Club) had five of the six chemicals of concern detected; however, this well owner did not respond to a previous offer to enter the Alternate Water Supply and Well Abandonment Program. Seven wells had one or more detectable chemicals of concern. Information on these wells will need to be further reviewed to determine if they meet the criteria for an offer to enter the Alternate Water Supply and Well Abandonment Program.

Were any well owners offered an alternate water supply and/or well abandonment during FY 2000? No. The Army followed up on abandonment of the Bochnak residence well, as described previously, but no new offers were made.

Within the North Plume, are there any well owners which meet the criteria, but have not yet been provided an alternate water supply?
No known wells; however, the seven wells that were previously mentioned require further investigation to determine if an offer should be made.

Within the North Plume, are there any wells which meet the criteria, but have not yet been abandoned?
No known wells; however, the seven wells that were previously mentioned require further investigation to determine if an offer should be made. Note that the old irrigation well (234369) at the Bochnak residence (2600 St. Anthony Boulevard) was abandoned on May 18, 2000.

Is any sampling of water supply wells (excluding those included in the OU1 performance monitoring plan) proposed prior to the next report?
Yes. Since the proposed monitoring presented in Table 3.1 of Appendix G of the FY 1999 Annual Performance Report was not completed in FY 2000, continued efforts will be made during FY 2001 to sample those wells that can be sampled. Appendix E contains a table summarizing the status of the well inventory sampling effort.

Are there any changes or additional actions required for this remedy component?
No changes are required. When the water supply well sampling is completed the well inventory should be updated. It is anticipated that this update will be included as an Appendix to the FY 2001 Annual Performance Report.

3.2 REMEDY COMPONENT #2: DRILLING ADVISORIES

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

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

Has the MDH issued a Special Well Construction Area Advisory?
Yes. It was issued in June 1996. In addition to covering OU1, the Special Well Construction Area also encompasses OU3 and the OU2 Site A shallow groundwater plume. In June 1999, the MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The new area is shown on Figure 3-1.

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

3.3 REMEDY COMPONENT #3: GROUNDWATER CONTAINMENT

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

- This remedy component consists of recovering deep (Unit 4) groundwater using three City of New Brighton municipal wells: NBM #4, #14, and #15. New Brighton municipal well #4 (NBM #4) was an existing well completed in both the Prairie du Chien and Jordan. NBM #14 and NBM #15 were constructed in the Prairie du Chien as part of the remedy and began pumping in December 1996 and March 1998, respectively. The locations of the three recovery wells are approximately ⅓ mile south of Interstate 694, east of Silver Lake Road.
- 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 oversight services. The OU1 remedy is being paid for by the Army.

During FY 2000, the TCAAP OU1 Remedial Action Report, which addresses construction of the extraction system, was finalized by Montgomery Watson.

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

During FY 2000, did the OU1 extraction system provide complete capture (at the containment boundary) of groundwater exceeding the cleanup standards specified on page 18 of the OU1 ROD?

The Army, USEPA, and MPCA continued discussions throughout FY 2000 in regard to containment within the Prairie du Chien and the Jordan. Wenck prepared a technical memorandum addressing hydraulic analysis of containment within the Prairie du Chien in December 1999. That memorandum is currently under review and revision as a separate Consistency Item from this Annual Performance Report. Likewise, the Army is preparing a technical memorandum addressing conditions in the Jordan. Therefore, this Annual Performance Report only discusses the pumping rates and water quality trends for the extraction wells. Since this was the first "off year" in the biennial monitoring program, monitoring well water quality and water level data were not collected during FY 2000.

<u>Pumping Rates</u>

Table 3-2 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 having ongoing discussions as to whether or not these design rates remain appropriate. Figure 3-2 shows variability in monthly pumping targets, in some cases due to the variable number of days in each month and in some cases, due to one well going off-line causing the target pumping rates to increase at other wells.

Figure 3-2 indicates that pumping at NBM #4 followed the target very closely in FY 2000. Pumping at NBM #15 was much more erratic, with five months being below the target and seven months being above the target. Pumping at NBM #14 was similarly erratic. The variability in pumping rates results from a combination of water demand and maintenance issues. The Army continues to work with the City of New Brighton to reinforce the importance of meeting the month-to-month pumping targets.

Extraction Well Water Quality

Trend graphs for total VOCs in NBM #3, #4, #14 and #15 are shown on Figures 3-3 to 3-6, respectively. At NBM #3, total VOCs decreased dramatically between 1994 and 1998, and since 1998, have been relatively stable at about 30 μg/l. NBM #4 also exhibits a similar decrease between 1994 and 1998, and since 1998, has shown a relatively slight decreasing trend to its current level of about 50 μg/l. NBM #14 has shown a decreasing trend since its startup in December 1996, and is currently at about 150 μg/l. NBM #15 has fluctuated since its startup in March 1998 and has not shown any clear trend to date. Total VOC results for NBM #15 are also currently at about 150 μg/l.

While not conclusive in and of itself, the decreasing water quality trends at the extraction wells support the interpretation that the OU1 system is making progress towards aquifer restoration.

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

Potential changes and/or additional actions will be addressed through review and approval of the technical memorandums previously referenced.

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 2000, did the treated water meet the MCLs and non-zero MCLGs established by the SDWA for the OU1 chemicals of concern?

Yes. Table 3-3 shows that the PGAC effluent met the performance standard during FY 2000.

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 3-3 shows that two carbon change-outs occurred in FY 2000, one in January/February 2000 and one in May/June 2000. Contactor #8 was not sampled during the latter half of FY 2000 because it was off line to replace a valve.

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

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

3.5 REMEDY COMPONENT #5: DISCHARGE OF TREATED WATER

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

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

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

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

3.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

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

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

Is this remedy component being implemented?

Yes. Performance monitoring programs have been established to collect the data required to verify the effectiveness of remedy components #1 through #5. Table 3-4 summarizes the performance monitoring requirements, implementing parties, and the specific documents which contain the monitoring plans.

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

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

- 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 of the FY 1999 Annual Performance Report). The status of this sampling (which was started in FY 2000 but not completed) is shown in Appendix E.
- 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.

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

No. However, it should be noted that the monitoring frequency for 04U855 will change from annual to biennial after FY 2000 as recommended in the FY 1999 Annual Performance Report. This well had been kept at an annual frequency when the other OU1 wells were switched from annual to biennial frequency, due to concern regarding variability in the data at 04U855 (unusual data in 1992–1993). The results of 04U855 in FY 2000 showed no detections for the chemicals of concern. Thus, since 1995, there have been no trichloroethene detections in this well, and it was appropriate to discontinue annual sampling (see Figure 3-7).

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?
Since this year was the first "off year" in the biennial monitoring program, OU1 water quality data were not collected from monitoring wells during FY 2000. As stated previously, the water quality trends at the extraction wells show decreasing concentrations, which indicates progress towards aquifer restoration.

How much VOC mass has been removed (at each well and total)?
Table 3-2 shows that the PGAC removed 1,035 pounds of VOCs during FY 2000. The relative contribution from each extraction well was 15% from NBM #4 and about 40% each from NBM #14 and #15 (with a combined 5% from other extraction wells).

Besides the changes already discussed, are any other changes or additional actions required for OU1?
Potential changes and/or additional actions will be addressed through review and approval of the technical memorandums previously referenced.

Tables

Table 3-1

Well Inventory Sampling Results: FY 2000

Well	Address	Name	Date Analyzed	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
Wells with no detections:									
127537	1400 Old Hwy 8	Midwest Asphalt	11-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
200076	2375 Terminal Rd	Old Dutch Foods, Inc.	27-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
249608	2520 Larpenteur Ave	Rapit Printing, Inc	27-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
249608 D	2520 Larpenteur Ave	Rapit Printing, Inc	27-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
249632	2301 N Upland Crest NE	Montzka, Harold	11-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
S00311	1390 Silver Lake Road	Ingelbrecht, Brenda	27-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Wells with one or more detections:									
234356	1873 Old Hwy 8	Nordquist, Robert	11-Sep-00	<1.00	2.3	0.31 J	1.6	<1.00	4.8
234352	1206 12th Ave NW	Nutter, Aaron	27-Sep-00	<1.00	**7.3**	1.4	0.27 J	<1.00	10
234421	2151 Mustang Dr	BioChem	27-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	0.19 J
236439	2250 Wabash Ave	Rock-Tenn	27-Sep-00	<1.00	<1.00	2.5	<1.00	<1.00	0.18 J
433298	300 Mississippi River Blvd N	Town & Country Golf	13-Sep-00	1.4	<1.00	4.8	<1.00	<1.00	0.17 J
509052	2025 E River Road	Shriners Hospital	11-Sep-00	<1.00	<1.00	0.28 J	<1.00	<1.00	<1.00
S00437	3171 5th St SE	Northern Star Co	11-Sep-00	<1.00	<1.00	0.51 J	<1.00	<1.00	<1.00
Wells with one or more detections that have previously declined (or not responded to) an offer under the Alternate Water Supply and Well Abandonment Program:									
235566	4703 Hwy 10	Big Ten Supper Club	11-Sep-00	**28**	**6.8**	2.6	18	<1.00	5.8

Notes: (1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD. Bolding indicates exceedance of the cleanup level. Concentrations in µg/l.

J The value is below the reporting limit, but above the method detection limit.

D Duplicate Sample

N:\0003\62\FY00APR\Tables\Table_3-1

Table 3-2

OU1 Pumping/VOC Mass Removal Data: FY 2000

PGAC Wells

MTH/YR	ITEMS	WELL # 3	WELL # 4	WELL # 5	WELL # 6	WELL # 14	WELL # 15	Total PGAC WELLS
Oct-99	Pumpage (Thousands of gals.)	15,512	15,846	681	146	34,238	32,312	98,735
	VOC Level (ppb)	30	NS	180	130	230	86	
	Total VOCs (lbs)	4	0	1	0	66	23	94
Nov-99	Pumpage (Thousands of gals.)	10,285	30,941	245	225	34,035	33,926	109,657
	VOC Level (ppb)	19	47	160	110	130	110	
	Total VOCs (lbs)	2	12	0	0	37	31	82
Dec-99	Pumpage (Thousands of gals.)	9,278	24,608	150	143	35,350	37,698	107,227
	VOC Level (ppb)	28	51	170	110	130	99	
	Total VOCs (lbs)	2	10	0	0	38	31	83
Jan-00	Pumpage (Thousands of gals.)	1,324	37,921	142	139	35,238	28,962	103,726
	VOC Level (ppb)	26	46	180	94	110	130	
	Total VOCs (lbs)	0	15	0	0	32	31	79
Feb-00	Pumpage (Thousands of gals.)	7,917	24,513	816	98	33,041	27,262	93,647
	VOC Level (ppb)	26	54	170	94	100	120	
	Total VOCs (lbs)	2	11	1	0	28	27	69
Mar-00	Pumpage (Thousands of gals.)	8,208	31,562	655	305	35,008	27,209	102,947
	VOC Level (ppb)	31	58	180	110	110	120	
	Total VOCs (lbs)	2	15	1	0	32	27	78
Apr-00	Pumpage (Thousands of gals.)	5,479	21,875	14,559	1,538	34,520	32,245	110,216
	VOC Level (ppb)	34	54	140	110	120	150	
	Total VOCs (lbs)	2	10	17	1	35	40	105
May-00	Pumpage (Thousands of gals.)	5,931	36,727	3,117	78	31,841	27,208	104,902
	VOC Level (ppb)	31	58	170	110	140	150	
	Total VOCs (lbs)	2	18	4	0	37	34	95
Jun-00	Pumpage (Thousands of gals.)	1,098	26,844	117	114	22,479	15,232	65,884
	VOC Level (ppb)	47	70	210	150	160	200	
	Total VOCs (lbs)	0	16	0	0	30	25	72
Jul-00	Pumpage (Thousands of gals.)	110	37,822	129	117	19,690	42,936	100,804
	VOC Level (ppb)	32	55	160	120	120	120	
	Total VOCs (lbs)	0	17	0	0	20	43	80
Aug-00	Pumpage (Thousands of gals.)	136	37,648	277	454	25,218	43,170	106,903
	VOC Level (ppb)	37	58	220	150	200	170	
	Total VOCs (lbs)	0	18	1	1	42	61	123
Sep-00	Pumpage (Thousands of gals.)	107	35,712	142	137	26,154	39,980	102,232
	VOC Level (ppb)	27	40	140	95	120	110	
	Total VOCs (lbs)	0	12	0	0	26	37	75
Fiscal Year 2000 Totals								
	Pumpage (Thousands of gals.)	65,385	362,019	21,030	3,494	366,812	388,140	1,206,880
	Total VOCs (lbs)	15	154	26	3	423	412	1,035

Table 3-3

PGAC Effluent Water Quality: FY 2000

		QUARTERLY INFLUENT WELL MONITORING						MONTHLY OPERATIONAL PERFORMANCE MONITORING															
SAMPLE	COMPOUND							Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
DATE	(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	268	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 3-3

PGAC Effluent Water Quality: FY 2000

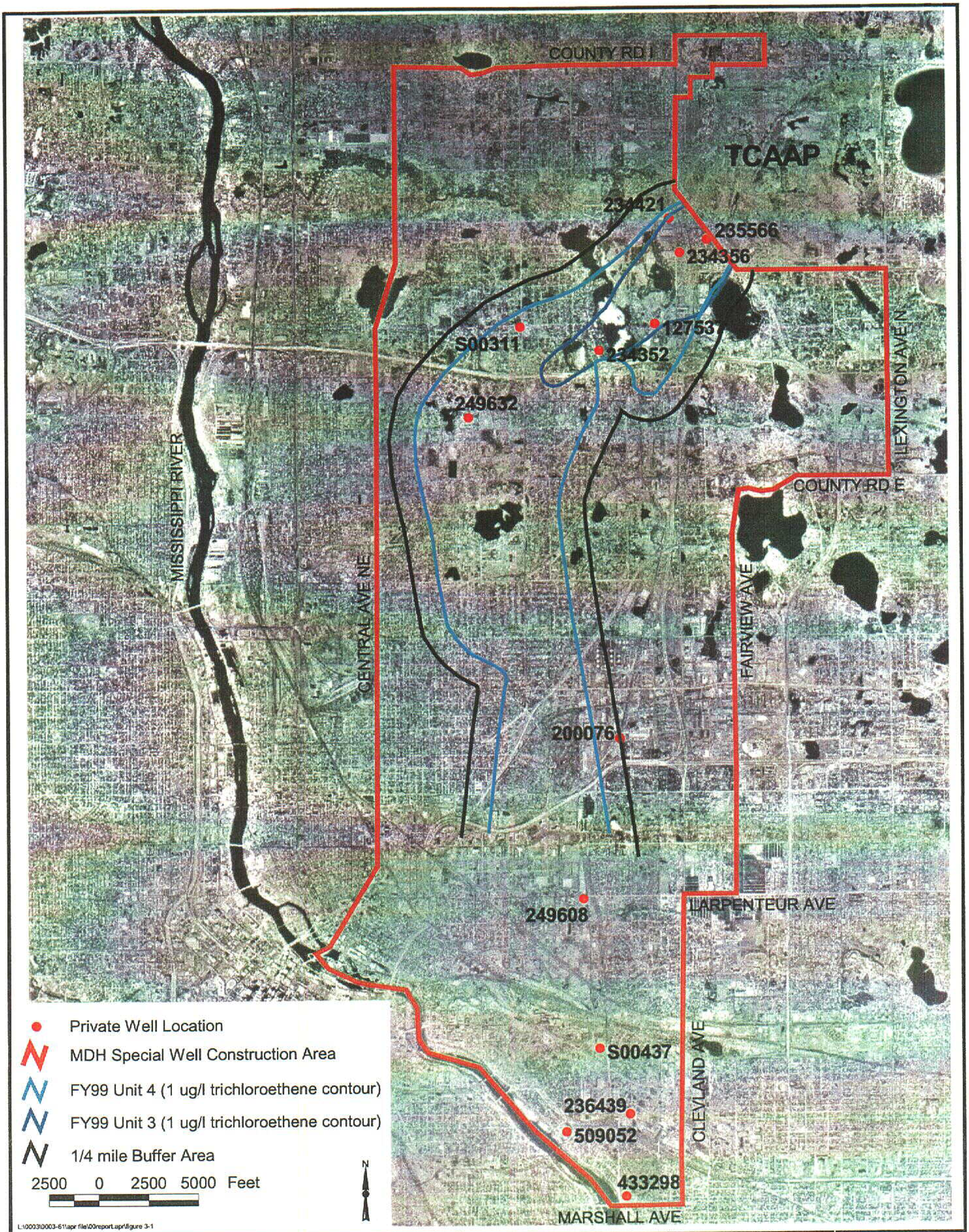
SAMPLE DATE	COMPOUND (ppb)	QUARTERLY INFLUENT WELL MONITORING Well #3	Well #4	Well #5	Well #6	Well #14	Well #15	MONTHLY OPERATIONAL PERFORMANCE MONITORING Contactor #1 A	Contactor #1 B	Contactor #2 A	Contactor #2 B	Contactor #3 A	Contactor #3 B	Contactor #4 A	Contactor #4 B	Contactor #5 A	Contactor #5 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	NS	180	130	230	86	14	0	14	0	12	0	11	0	11	0	10	0	12	0	9.5	0
11/22/99	Total VOCs	19	48	160	110	130	110	15	0	14	0	13	0	12	0	11	0	10	0	11	0	9.9	0
12/16/99	Total VOCs	28	51	170	110	130	99	19	0	15	0	13	0	13	0	11	0	11	0	13	0	11	0
GAC Replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A between January 11-February 24, 2000. "B" Vessels become the Lead Vessels.																							
1/25/00	Total VOCs	26	46	180	94	110	130	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
2/28/00	Total VOCs	26	54	170	94	100	120	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
3/16/00	Total VOCs	31	58	180	110	110	120	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
4/24/00	Total VOCs	34	54	140	110	120	150	NS	14	NS	3.6	NS	8.2	NS	8.8	NS	5.3	NS	6.6	NS	2.6	NS	NS
5/16/00	Total VOCs	31	58	170	110	140	150	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	NS	NS
GAC Replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B between May 31-June 2, 2000. "A" Vessels become the Lead Vessels.																							
6/28/00	Total VOCs	47	70	210	150	160	200	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	NS	NS
7/17/00	Total VOCs	32	55	160	120	120	120	0	0	0	NS	0	0	0	NS	0	NS	0	NS	0	NS	NS	NS
8/29/00	Total VOCs	37	58	220	150	200	170	8.8	0	0	NS	2.9	0	4.5	NS	0	NS	0	NS	0	NS	NS	NS
9/14/00	Total VOCs	27	40	140	95	120	110	7.3	0	1.5	NS	3.8	0	5	NS	2.1	NS	2.8	NS	NS	NS	NS	NS

Table 3-4

Summary of OU1 Monitoring Requirements

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

Figures



TWIN CITIES ARMY AMMUNITION PLANT

Well Inventory Sampling Locations

Wenck

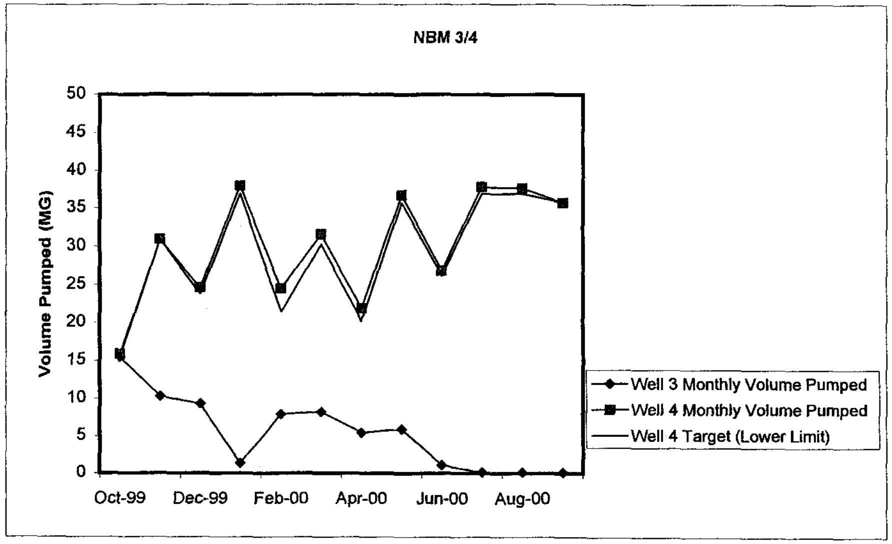
Wenck Associates, Inc. Environmental Engineers

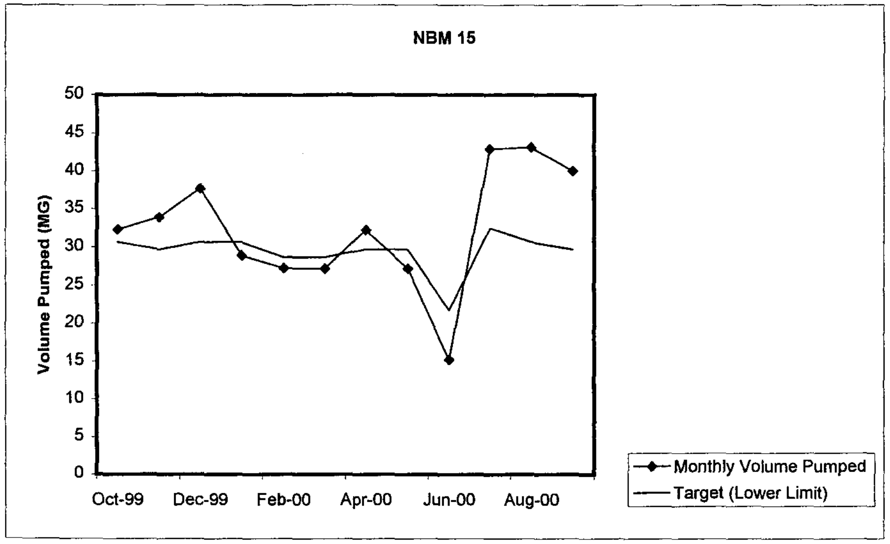
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2000

Figure 3-1

OU1 WELL PUMPING RATES VS. TARGETS
TWIN CITIES ARMY AMMUNITION PLANT





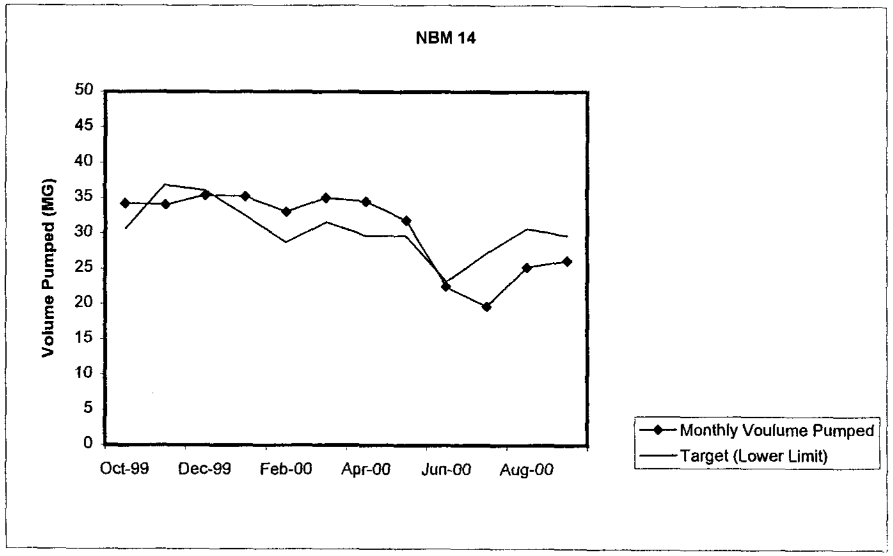


Figure 3-2
Wenck Associates, Inc.

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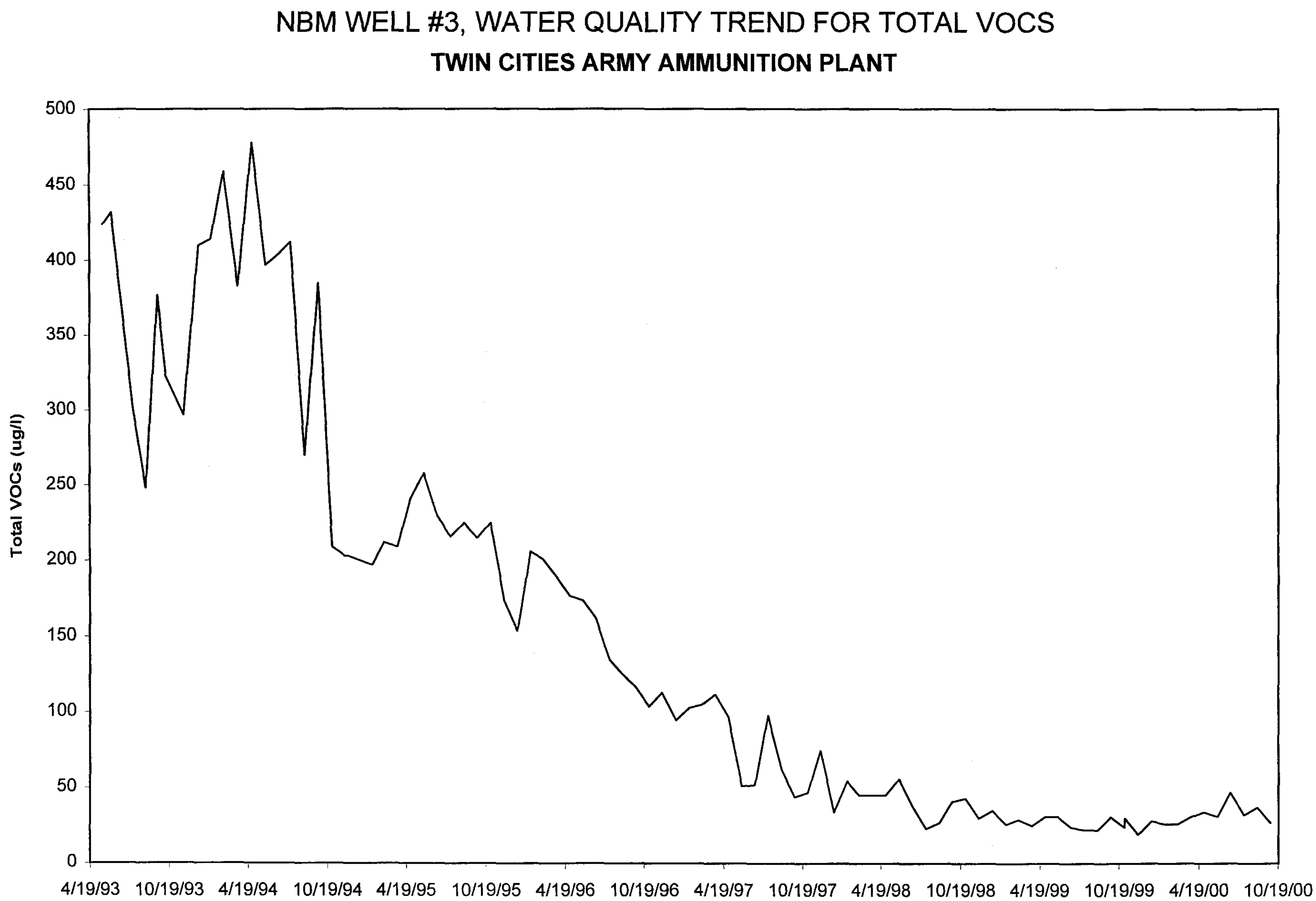

Figure 3-3
Wenck Associates, Inc.

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NBM WELL #4, WATER QUALITY TREND FOR TOTAL VOCS
TWIN CITIES ARMY AMMUNITION PLANT

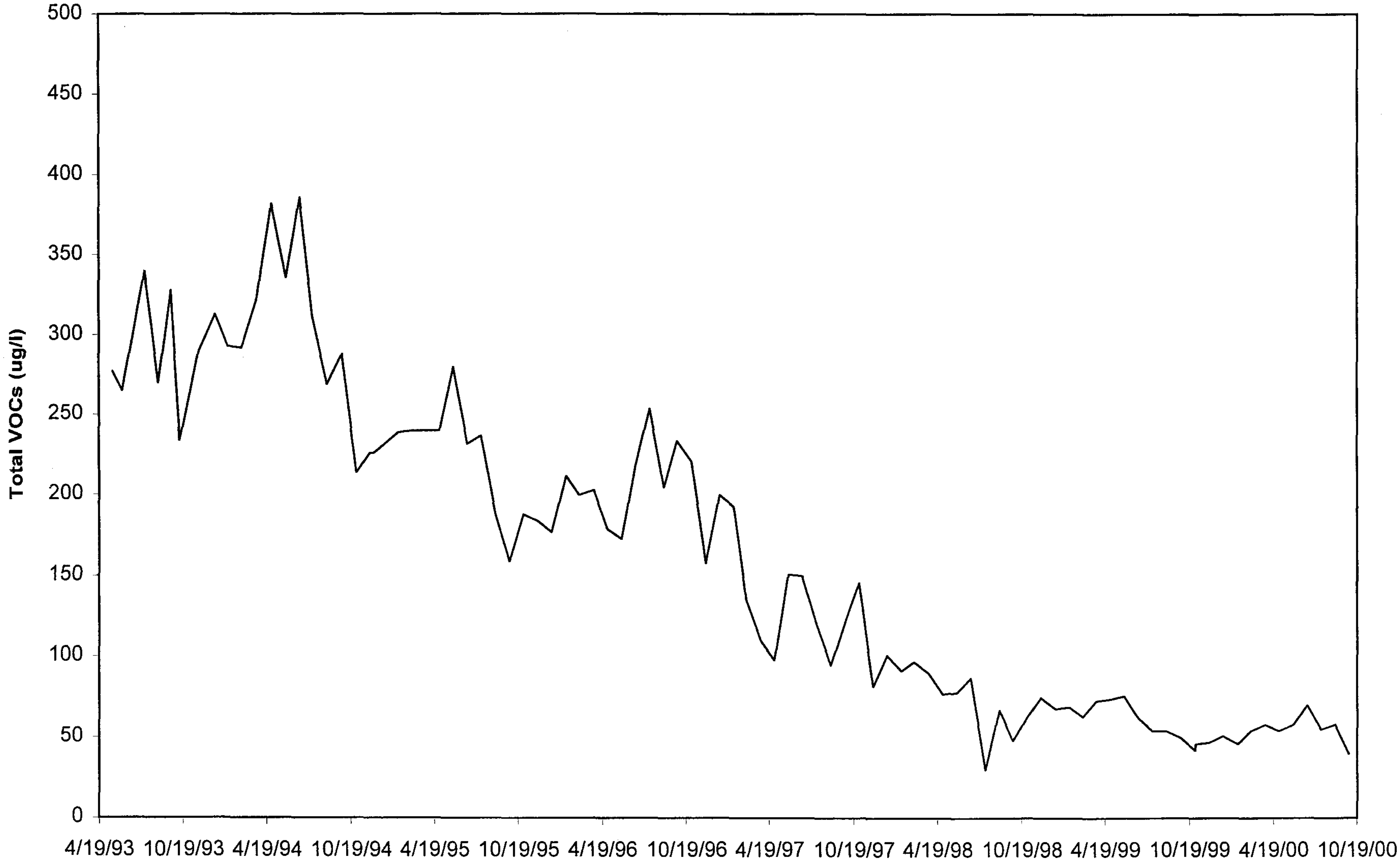

Figure 3-4
Wenck Associates, Inc.

N:\0003\62\FY00APR\Figures\PGAC EffluentNBM#4

NBM WELL #14, WATER QUALITY TREND FOR TOTAL VOCS
TWIN CITITES ARMY AMMUNITION PLANT

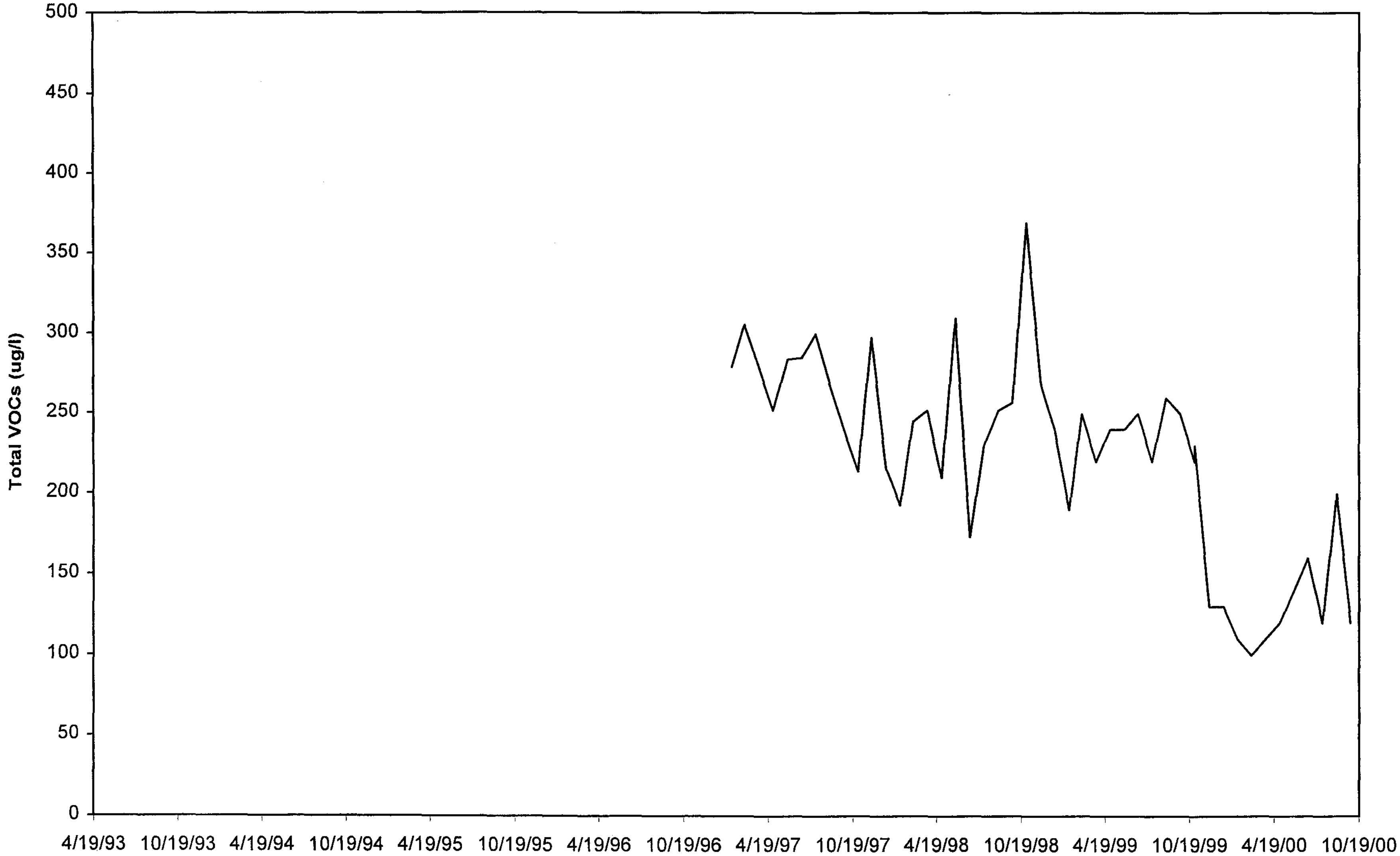

Figure 3-5
Wenck Associates, Inc.

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NBM #15, WATER QUALITY TREND FOR TOTAL VOCS
TWIN CITIES ARMY AMMUNITION PLANT

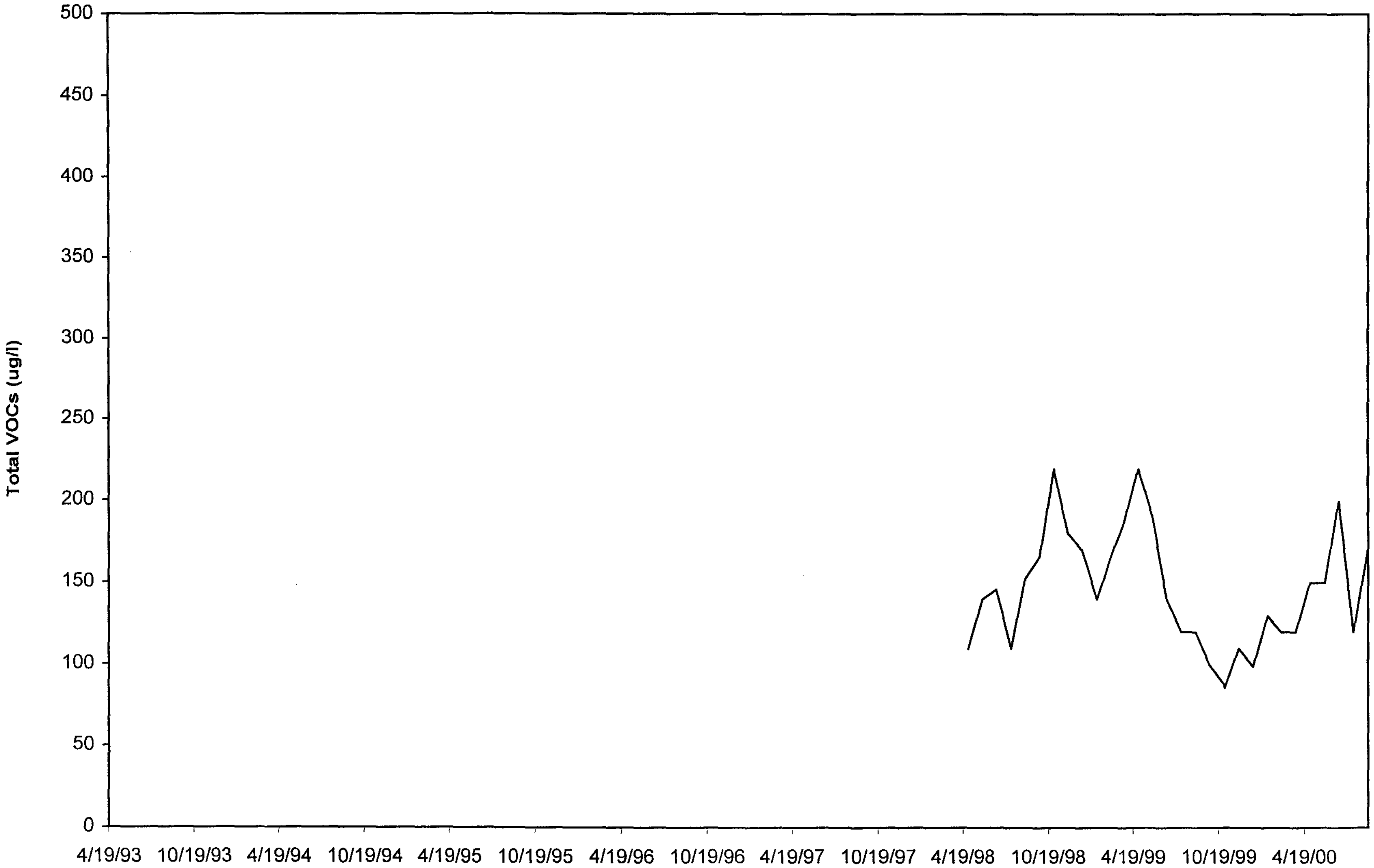

Figure 3-6
Wenck Associates, Inc.

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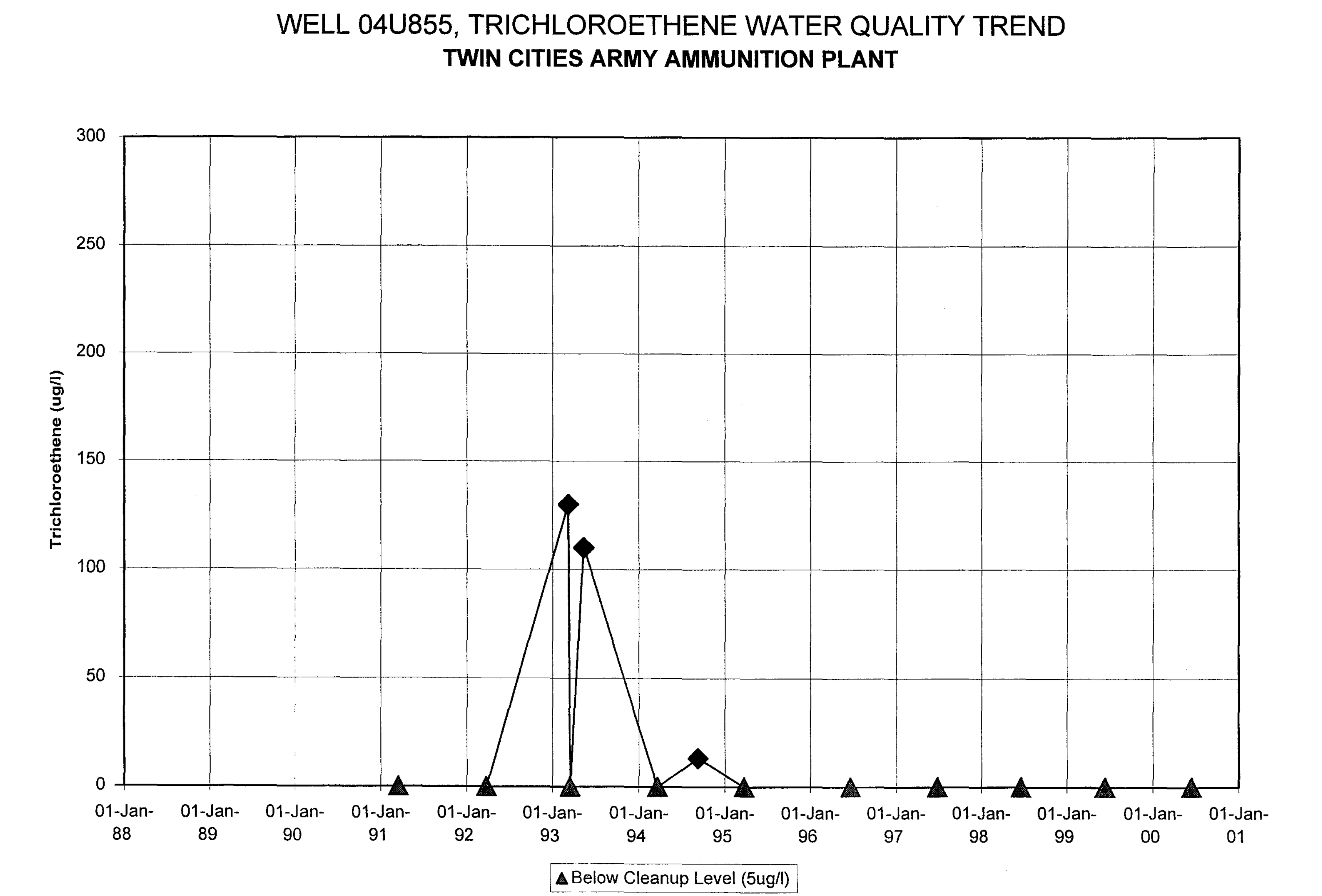

Figure 3-7
Wenck Associates, Inc.

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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 2000 were:

- Prepared a Close-out Report for Site A metals-contaminated soil excavation, treatment, and disposal. Site A remediation had been initiated in FY 1998 and was completed in calendar year 1999. The Site A Close-out Report that documents this work was prepared by Stone & Webster and was under regulatory review at the end of FY 2000.
- Performed construction and startup of the air sparging/soil vapor extraction (AS/SVE) system for remediation of Site A VOC-contaminated soils and source area groundwater.
- Prepared a Close-out Report for Site 129-5 soil excavation, treatment, and disposal. Site 129-5 remediation was completed in calendar year 1999. The Site 129-5 Close-out Report that documents this work was prepared by Stone & Webster and was under regulatory review at the end of FY 2000.
- Continued Site E soil excavation, treatment, and disposal.
  - In FY 2000, 12,842 tons of soil were excavated, stabilized, and transported off-site as non-hazardous waste for disposal at permitted disposal facilities. The project-to-date Site E soil quantity, including the total from 1999, is 26,794 tons.
  - Work was suspended for the winter and will resume in Spring 2001.
- Completed Site H soil excavation, treatment, and disposal.
  - In FY 2000, 188 tons of soil were excavated, stabilized, and transported off-site as non-hazardous waste for disposal at permitted disposal facilities. The final Site H soil quantity, including the total from 1999, was 11,579 tons.

  - A cap was placed over the Site H dump area.
  - The Site H Close-out Report that documents this work will be prepared by Stone & Webster in FY 2001.
- Initiated Site C soil excavation, treatment, and disposal.
  - In calendar year 2000, 10,902 tons of soil were excavated, stabilized, and transported off-site as non-hazardous waste for disposal at permitted disposal facilities.
  - Work was suspended for the winter and will resume in Spring 2001, if funding is available.
- Initiated Site 129-3 soil excavation, treatment, and disposal.
  - In calendar year 2000, 1,418 tons of soil were excavated, stabilized, and transported off-site as non-hazardous waste for disposal at permitted disposal facilities.
  - Work was suspended for the winter and will resume in Spring 2001, if funding is available.
- Initiated preparation of a work plan for removal of the on-TCAAP Corrective Action Management Unit (CAMU). The discovery of asbestos at shallow soil sites has rendered further use of the CAMU impractical.

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 2000. A monitoring plan will need to be developed for this remedy component prior to implementing it. 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 must be below the criteria, 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 received consistency in FY 2000 ("Site B Dump Investigation, Characterization, and Close-out Report"). At Site 129-15, characterization revealed that construction of a soil cover is necessary. A draft work plan for the Site 129-15 dump cover was still under review at the end of FY 2000.

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 two wells that are nearest to Sites D and G in accordance with the FY 2000 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 location of the well nearest to Site D (03U093) and Site G (03U094), along with trichloroethene concentrations. Figures 5-2 and 5-3 present trichloroethene trend graphs for these wells.

Downgradient of Site D at well 03U093 (Figure 5-2), the concentrations over the past five years show an overall decline. Downgradient of Site G at well 03U094 (Figure 5-3), the concentrations have remained relatively stable the last four years.

Table 5-1 presents the FY 2000 data from these two wells for the deep groundwater chemicals of concern. The table shows that both wells still exceed the cleanup level for trichloroethene, and 03U094 also exceeds the cleanup level for 1,1-dichloroethene and 1,1,1-trichloroethane. One compound, 1,2-dichloroethane, was inadvertently missed in the FY 2000 event. This compound will be included in future events.

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 5-2). 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 (finalized in FY 2000).

Is any groundwater sampling proposed prior to the next report?

Yes. As shown in Appendix A.1, wells 03U096, 03U093, and 03U018 (Site D) and 03U094 and 03U014 (Site G) will be sampled in June 2001 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.

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 2000 included:

- The report which documents the FY 1999 sampling results for shallow system vents ("Results of Sampling and Analysis of SVE Vents at Sites D and G", prepared by Alliant Techsystems) received consistency in FY 2000. The report recommended that both shallow systems remain off due to the low, asymptotic mass removal rates.
- A soil investigation was conducted to determine VOC concentrations in shallow and deep soils at both Sites D and G. No samples from Site D had VOC concentrations above soil cleanup goals. Two locations at Site G had VOC concentrations that may be above cleanup goals; however, the goals for Site G may be recalculated using additional site-specific data. The investigation results for both sites and the potential alternatives for Site G are presented in "Sites D and G Shallow and Deep Soil VOC Investigation Report," prepared by Stone & Webster. This report was under regulatory review at the end of FY 2000.

Have the deep SVE systems been installed?

No. Deep systems will not be required (see above discussion).

Have the shallow SVE systems been modified?

No. Modifications to the shallow SVE system at Site D will not be required (see above discussion). The VOC investigation report may or may not recommend modified operation of the Site G shallow SVE system.

Were the monitoring requirements for this remedy component met?

Yes. Since both systems were off throughout FY 2000, no monitoring was performed.

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 2000, no emissions occurred.

Were there any significant operation and maintenance problems in FY 2000 (greater than 24 hour shutdown)?

No. Both systems were off throughout FY 2000.

Is any monitoring proposed prior to the next report?

No. However, if modified operation of the Site G shallow SVE system were to be recommended, the VOC closeout report would specify the monitoring requirements that would need to be performed.

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?
As explained previously, no enhancements to the Site D SVE system will be necessary and this system will likely be dismantled in FY 2001. Enhancement to the Site G SVE system, if any , will be determined in the VOC investigation report, which should be finalized in FY 2001.

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 inspected the caps during monthly operation and maintenance inspections.

Are there any problems with the caps?

No problems were observed in FY 2000.

Were any maintenance activities performed for the caps in FY 2000? 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 inspected 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 2000?

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 received consistency in late FY 1999 and recommended no further action on the Site G tar-like material. The Army will be preparing a work plan for characterization of non-VOC contaminants in Site D shallow soils in FY 2001.

Is any characterization work proposed prior to the next report?
Yes. Stone & Webster will prepare a work plan for characterization of Site D shallow soils and will implement the work plan upon regulatory approval.

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)?
Based on the previously discussed VOC investigation results, SVE remediation is complete at Site D. At Site G, SVE remediation may or may not be complete, to be determined through completion of the investigation report.

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

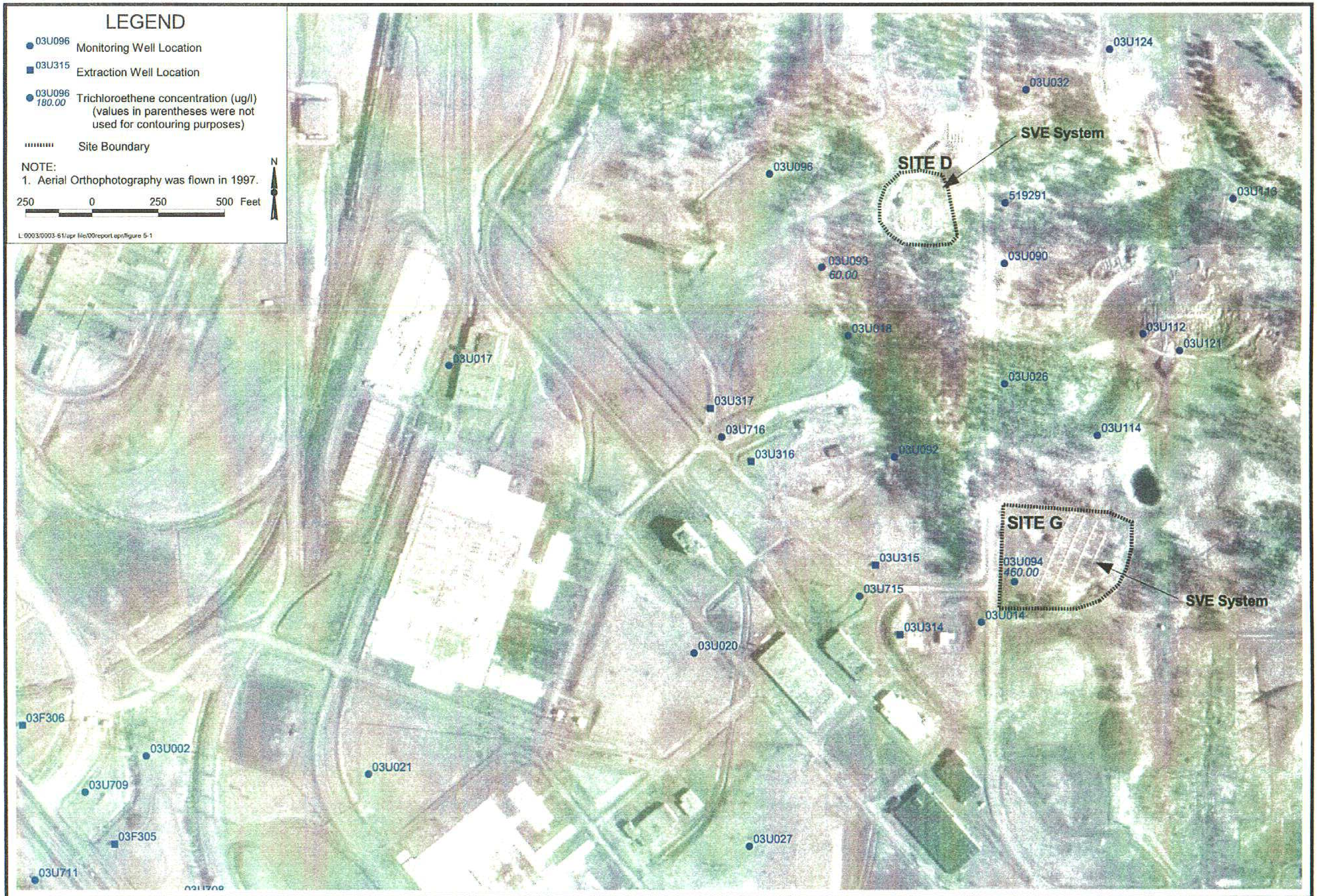
TABLE 5-1

Deep Groundwater Data Near Sites D and G: FY 2000

			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	6	70	70	200	4
Site D									
	03U093	21-Jun-00	<1.00	**60.00**	JP 0.92	JP 0.33	JP 1.00	5.80	NS
Site G									
	03U094	21-Jun-00	**<10.00**	**460.00**	**12.00**	JP 1.60	JP 3.90	**270.00**	NS

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.
NS = Parameter was not included in lab analysis.

Figures



TWIN CITIES ARMY AMMUNITION PLANT

Location of Wells Nearest to Sites D and G

Wenck

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

FY 2000

Figure 5-1

SITE D, WELL 03U093, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITITES ARMY AMMUNITION PLANT

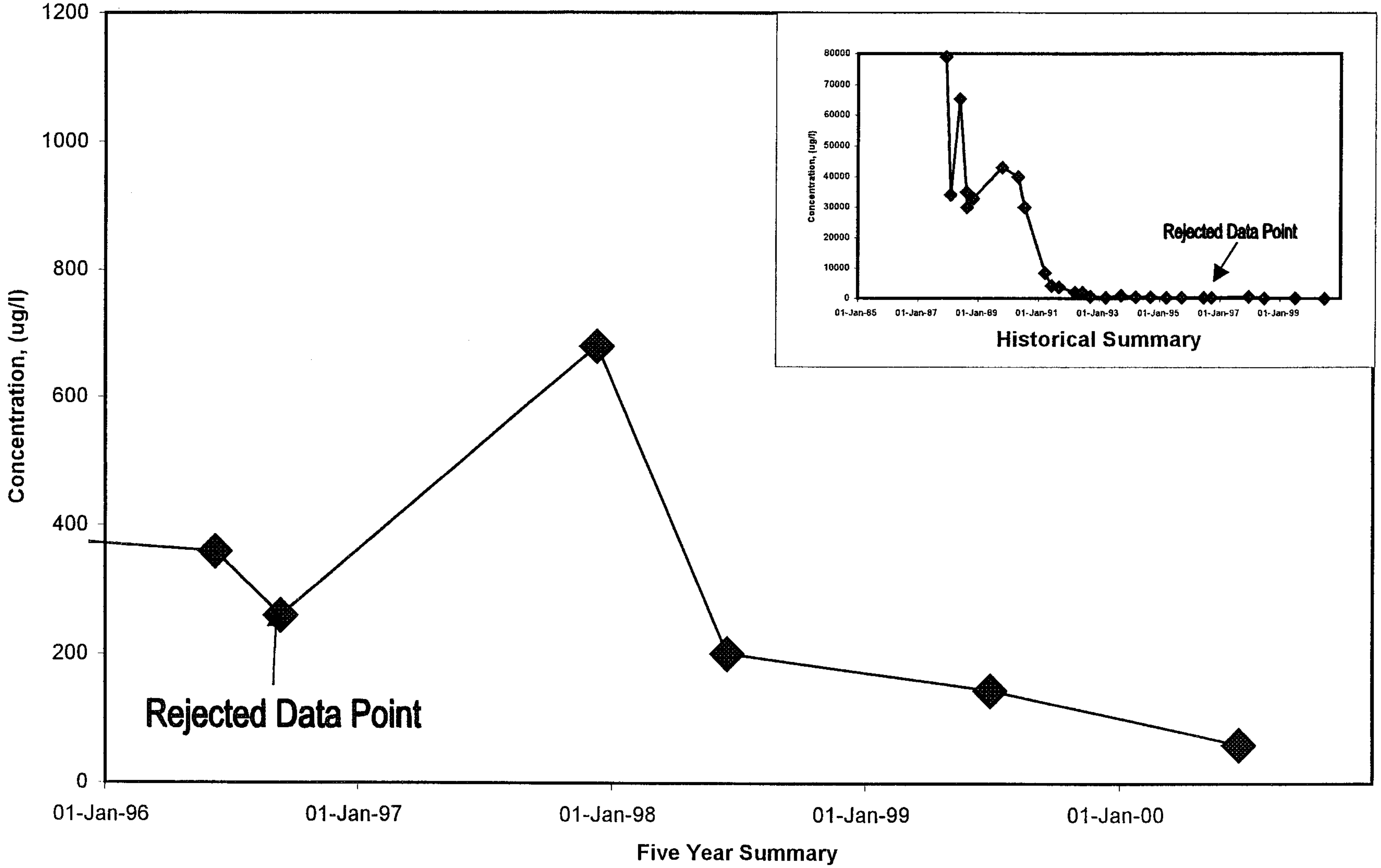


Figure 5-2
Wenck Associates, Inc.

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SITE G, WELL 03U094, TRICHLOROETHENE WATER QUALITY TRENDS
TWIN CITIES ARMY AMMUNITION PLANT

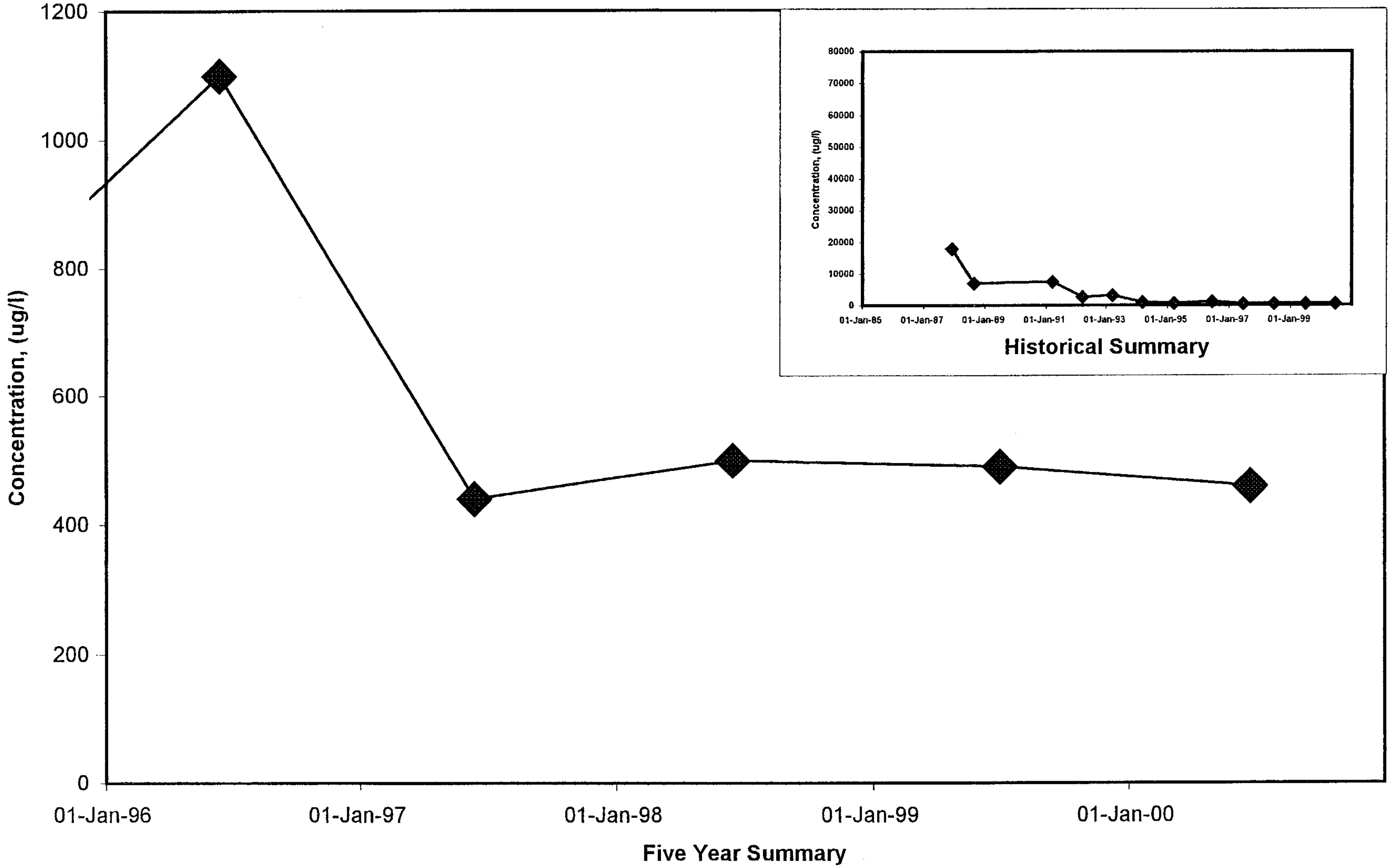

Figure 5-3
Wenck Associates, Inc.

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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 to #4 and evaluation of the overall remedy. Table 6-1 summarizes the performance monitoring requirements, implementing parties, and the documents which contain the monitoring plans. The FY 2000 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 2000.

Were the groundwater monitoring requirements for this remedy met?

Generally yes, with the following exceptions:

- 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 reports any values between the MDL and CRDL and flags them as estimated. Therefore, laboratory analyses for antimony will report the presence of antimony if it is present above 3 μg/l, which is below the cleanup level.
- Explanations for missed monitoring are presented in Appendix C.2. Of particular relevance to a later recommendation, 01U125 was not sampled because it was dry.
- 1,2-Dichloroethane was inadvertently excluded from the list of analytes in the June 2000 Site A monitoring event. This compound will be included in the analyte list for future events.

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 of the FY 1999 Annual Performance Report).
- 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? Yes. Two monitoring changes are recommended:

- Discontinue monitoring of 01U125. As noted previously, it was dry in FY 2000. Even when it can be sampled, its shallow depth does not yield results that are consistent with other surrounding wells that are fully penetrating (it was clean in FY 1999 but is likely missing deeper contamination that other wells are detecting).
- Switch the monitoring frequency at 01U103, 01U108, and 01U350 from annual to quarterly as stated in the conceptual design report for the Site A AS/SVE system.

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-sectional 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.
- Wells 01U355 through 01U358, the line of extraction wells downgradient of the "first line" of extraction wells, were shut off (with regulatory approval) on July 7, 2000, and remained off for the remainder of FY 2000. This had been recommended in the FY 1999 Annual Performance Report due to: 1) the

downgradient extraction wells were below the cleanup levels, and 2) the known area of groundwater having cleanup goal exceedances was within the capture area of the first line of extraction wells. One year of quarterly monitoring was started in September 2000 and will end in June 2001, assuming all sampling results show that concentrations have remained below cleanup levels. The quarterly monitoring requirement is included in Appendix A.1.

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 target pumping rate for wells 01U351 through 01U355 is 15 gpm. Even with 01U355 off, the target pumping rate remains at 15 gpm. Table 6-2 shows that the average pumping rate for FY 2000 (17.7 gpm) exceeded the target. The target pumping rate of 10 gpm for 01U356 through 01U358 (applicable through June 2000) was exceeded (10.1 gpm average through June 2000). The average pumping rate for the entire system was 28.6 gpm through June 2000, which exceeded the target rate of 25 gpm.

Table 6-3 presents water level data collected during FY 2000 at Site A. Figure 6-3 presents a water level contour map using the data from June 1, 2000 (prior to shutting down the second line of recovery wells). 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.

Decreasing concentrations of cis-1,2-dichloroethene in 01U902 (downgradient of the extraction system) are also evidence of the extraction system's capture zone (Figure 6-9). The cis-1,2-dichloroethene concentration has been reduced from a historical high around 100 µg/l to 8.9 µg/l in FY 2000.

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 2000.

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

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

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

Performance Standard (how do you know when you're done):
When the MDH has issued a Special Well Construction Area Advisory and when well owners who qualify have been offered and provided with alternate water supply and/or have had their wells abandoned (or the offers have been rejected).

Is the remedy component being implemented?
Yes. The OU1 Alternate Water Supply and Well Abandonment Program is underway and was expanded to cover the area affected by the OU2 Site A Shallow Groundwater plume. See Section 3.1 of this report.

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

Yes, it was issued in June 1996. The boundary was revised in early FY 2000 to more fully encompass the OU1 plume. This revision did not affect the boundary for the Site A vicinity.

Did the boundary of the Site A plume get any bigger during FY 2000, as defined by the 1 μg/l contour?

No. Figure 6-4 shows the 1 μg/l contour line for cis-1,2-dichloroethene (the chemical of concern at Site A with the biggest plume footprint). There were no significant 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 2000? If yes, what were the findings? No.

Were any well owners offered an alternate supply and/or well abandonment in FY 2000? No.

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.

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 of the FY 1999 Annual Performance Report). This monitoring was not completed in FY 2000, due to a late start in FY 2000 and due to the October 1, 2000 operating contractor transition. Tecumseh/Wenck Installation Support Services has been tasked with completing this monitoring work in FY 2001. Appendix E contains a table summarizing the status of the well inventory sampling effort at the end of FY 2000.

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 2000, 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 2000.

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; 1,1,1-trichloroethane; and total mercury (see Appendix A.2). Note that this permit was reissued by MCES on August 25, 2000. The new permit contained slightly different monitoring requirements from the previous permit: 1,1,1-trichloroethane was added in place of tetrachloroethene and annual monitoring for pH, suspended solids, and chemical oxygen demand was eliminated. Appendix A.2 reflects these new monitoring requirements.

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). Construction of an air sparging/soil vapor extraction (AS/SVE) system to remediate VOC-contaminated soils was completed in FY 2000. Startup of the SVE system was initiated by Stone & Webster on August 23, 2000 and startup of the AS system was initiated on September 5, 2000. Startup procedures and minor construction modifications were still ongoing at the end of FY 2000.

Is any characterization work or remediation work proposed prior to the next report?
Yes. Continuous operation of the AS/SVE system should begin in early FY 2001.

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 2000. Figure 6-5 shows that the area with tetrachloroethene exceedances extends from the source area (near 01U108 and 01U350) 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 and 01U350). Figure 6-4 suggests that the cis-1,2-

dichloroethene exceedances are limited to extraction well 01U353 and an area immediately upgradient, but not extending back to the source area. However, results for 01U350 are not shown on Figure 6-4 (since it was not monitored in June 2000). The August 2000 results for 01U350 showed that cis-1,2-dichlorethene was 95 μg/l (above the cleanup level).

In comparison to the FY 1999 cis-1,2-dichloroethene plume map, the concentrations at extraction well 01U353 decreased below 100 μg/l, resulting in elimination of the 100 μg/l contour from the contour map (note the previous discussion regarding 01U350). Also, the concentration at 01U902 decreased below 10 μg/l, resulting in elimination of the isolated 10 μg/l "pocket" that had been shown at this well.

Table 6-6 also shows that antimony decreased below the cleanup level at 01U103.

What impact is the groundwater extraction system having on contaminant concentrations? Groundwater contaminant concentrations at Site A were generally comparable to last year's data. Wells at and downgradient of the first line of extraction wells generally showed stable or slightly decreasing concentrations. Wells in and just downgradient of the source area generally showed slightly increased concentrations (01U117, 01U126, and 01U108). 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 cis-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 (cis-1,2-dichloroethene only)
- Extraction Wells 01U355 – 01U358: the second line of extraction wells (cis-1,2-dichloroethene only)
- 01U902 – Downgradient of the extraction system

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

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 2.9 pounds of VOCs in FY 2000, with a cumulative VOC mass removal of nearly 33 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.

Tables

Table 6-1

Summary of Site A Shallow Groundwater Monitoring Requirements

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

Table 6-2

Site A Removal Action Pumping Data: FY 2000

Average Flow Rate (GPM)

	01U351	01U352	01U353	01U354	01U355	1-5 Subtotal	01U356	01U357	01U358	6-8 Subtotal	Total
Target GPM Month						**15.0**(2)				**10.0**(3)	**25.0**(3)
Oct-99	3.88	4.03	3.99	4.23	4.07	20.2	4.87	1.67	4.79	11.3	31.5
Nov-99	3.46	3.33	3.52	3.58	3.82	17.7	3.72	1.37	4.23	9.3	27.0
Dec-99	3.17	3.68	3.56	3.05	3.51	17.0	4.39	1.26	4.04	9.7	26.7
Jan-00	3.92	4.03	3.87	3.98	4.26	20.1	4.64	1.68	4.77	11.1	31.2
Feb-00	3.71	3.31	3.81	3.80	3.71	18.3	4.72	1.62	4.35	10.7	29.0
Mar-00	4.08	3.96	3.76	4.11	4.00	19.9	4.36	1.72	3.70	9.8	29.7
Apr-00	2.93	3.59	3.56	3.91	3.46	17.4	4.53	1.12	3.22	8.9	26.3
May-00	3.83	3.67	3.92	3.87	4.03	19.3	3.91	1.66	4.28	9.9	29.2
Jun-00	3.12	3.34	3.00	3.36	3.77	16.6	4.50	1.67	4.30	10.5	27.1
Jul-00	4.22	3.96	3.54	4.15	1.38	17.3	1.57	0.69	1.73	4.0	21.2
Aug-00	2.86	3.59	2.85	3.33	0.43	13.1	0.44	0.23	0.43	1.1	14.2
Sep-00	4.08	4.09	3.68	3.89	0.00	15.7	0.00	0.00	0.00	0.0	15.7
FY 2000 Average	**3.61**	**3.72**	**3.59**	**3.77**	**3.04**	**17.7**	**3.47**	**1.22**	**3.32**	**10.1** (4)	**28.6** (4)

Notes:

(1) Recovery wells 01U355 through 01U358 were shut off on July 11, 2000, and remained off through the end of FY 2000, except that these four wells were pumped for approximately 3 days in August following an acid cleaning/base solution treatment.

(2) This goal applies whether recovery well 01U355 is running or not.

(3) These goals only apply to the period before July 11, 2000.

(4) These averages exclude July, August and September 2000.

Source: Conestoga-Rovers and Associates

TABLE 6-3

Site A Groundwater Level Data: FY 2000

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)
01U038	900.3	01-Jun-00	888.80
01U039	897.5	01-Jun-00	880.26
01U040	892.5	01-Jun-00	880.89
01U041	898.3	01-Jun-00	890.68
01U063	892.6	01-Jun-00	880.48
01U067	897.4	01-Jun-00	890.83
01U102	905.2	01-Jun-00	885.22
01U103	904.1	01-Jun-00	886.62
01U104	899.1	01-Jun-00	889.34
01U105	901.4	01-Jun-00	890.64
01U106	896.8	01-Jun-00	886.32
01U107	899.2	01-Jun-00	887.45
01U108	904.3	01-Jun-00	886.24
01U110	897.2	01-Jun-00	892.02
01U115	900.3	01-Jun-00	881.89
01U116	902.7	01-Jun-00	882.19
01U117	902.7	01-Jun-00	883.20
01U118	901.8	01-Jun-00	884.92
01U119	898.1	01-Jun-00	888.77
01U120	902.2	01-Jun-00	886.01
01U125	901.1	01-Jun-00	Dry
01U126	903.3	01-Jun-00	884.68
01U127	902.9	01-Jun-00	886.39
01U133	900.7	01-Jun-00	888.10
01U135	899.9	01-Jun-00	880.10
01U136	898.8	01-Jun-00	877.75
01U137	972.5	01-Jun-00	883.93
01U138	965.6	01-Jun-00	881.38
01U139	901.2	01-Jun-00	880.86
01U140	898.8	01-Jun-00	880.40
01U141	897.7	01-Jun-00	881.83
01U145	886.4	01-Jun-00	882.54
01U146	881.8	01-Jun-00	881.90
01U147	902.8	01-Jun-00	883.01
01U148	902.6	01-Jun-00	882.08
01U149	901.3	01-Jun-00	881.81
01U150	901.3	01-Jun-00	881.40
01U151	904.7	01-Jun-00	881.48
01U152	901.0	01-Jun-00	881.48
01U153	899.9	01-Jun-00	880.71
01U155	897.9	01-Jun-00	880.23
01U156	897.8	01-Jun-00	880.18
01U157	901.9	01-Jun-00	881.56
01U158	901.1	01-Jun-00	880.98
01U351	904.0	05-Oct-99	883.61 P
01U351	904.0	02-Nov-99	883.47 P
01U351	904.0	08-Dec-99	882.65 P
01U351	904.0	04-Jan-00	883.47 P
01U351	904.0	05-Feb-00	881.90 P
01U351	904.0	07-Mar-00	881.55 P
01U351	904.0	06-Apr-00	881.50 P
01U351	904.0	02-May-00	881.30 P
01U351	904.0	01-Jun-00	880.60 P
01U351	904.0	06-Jul-00	880.60 P
01U351	904.0	15-Aug-00	881.23 P
01U351	904.0	05-Sep-00	880.95 P
01U352	901.0	05-Oct-99	882.63 P
01U352	901.0	02-Nov-99	882.16 P
01U352	901.0	08-Dec-99	881.13 P
01U352	901.0	04-Jan-00	880.86 P
01U352	901.0	05-Feb-00	879.93 P
01U352	901.0	07-Mar-00	880.13 P
01U352	901.0	06-Apr-00	879.33 P
01U352	901.0	02-May-00	879.26 P
01U352	901.0	01-Jun-00	879.33 P
01U352	901.0	06-Jul-00	880.48 P
01U352	901.0	15-Aug-00	882.61 P
01U352	901.0	05-Sep-00	880.83 P
01U353	902.0	05-Oct-99	879.94 P
01U353	902.0	02-Nov-99	879.84 P
01U353	902.0	08-Dec-99	878.92 P
01U353	902.0	04-Jan-00	880.27 P
01U353	902.0	05-Feb-00	878.42 P
01U353	902.0	07-Mar-00	877.02 P
01U353	902.0	06-Apr-00	877.42 P
01U353	902.0	02-May-00	877.82 P
01U353	902.0	01-Jun-00	875.57 P
01U353	902.0	06-Jul-00	878.67 P
01U353	902.0	15-Aug-00	878.54 P
01U353	902.0	05-Sep-00	878.72 P
01U354	903.8	05-Oct-99	883.37 P
01U354	903.8	02-Nov-99	883.15 P
01U354	903.8	08-Dec-99	882.72 P
01U354	903.8	04-Jan-00	882.94 P
01U354	903.8	05-Feb-00	881.72 P
01U354	903.8	07-Mar-00	881.17 P
01U354	903.8	06-Apr-00	880.72 P
01U354	903.8	02-May-00	880.72 P
01U354	903.8	01-Jun-00	880.32 P
01U354	903.8	06-Jul-00	880.62 P
01U354	903.8	15-Aug-00	881.09 P
01U354	903.8	05-Sep-00	881.02 P
01U355	899.9	05-Oct-99	879.41 P
01U355	899.9	02-Nov-99	878.61 P
01U355	899.9	08-Dec-99	879.18 P

TABLE 6-3

Site A Groundwater Level Data: FY 2000

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)	
01U355	899.9	04-Jan-00	877.41	P
01U355	899.9	05-Feb-00	877.68	P
01U355	899.9	07-Mar-00	876.43	P
01U355	899.9	06-Apr-00	875.83	P
01U355	899.9	02-May-00	876.28	P
01U355	899.9	01-Jun-00	874.33	P
01U355	899.9	06-Jul-00	875.93	P
01U355	899.9	15-Aug-00	882.02	
01U355	899.9	05-Sep-00	882.03	
01U356	899.5	05-Oct-99	874.98	P
01U356	899.5	02-Nov-99	875.98	P
01U356	899.5	08-Dec-99	874.25	P
01U356	899.5	04-Jan-00	874.66	P
01U356	899.5	07-Mar-00	873.20	P
01U356	899.5	06-Apr-00	871.35	P
01U356	899.5	02-May-00	872.24	P
01U356	899.5	01-Jun-00	872.14	P
01U356	899.5	06-Jul-00	872.60	P
01U356	899.5	15-Aug-00	881.53	
01U356	899.5	05-Sep-00	881.65	
01U357	899.1	05-Oct-99	877.20	P
01U357	899.1	02-Nov-99	876.49	P
01U357	899.1	08-Dec-99	880.33	P
01U357	899.1	04-Jan-00	875.78	P
01U357	899.1	05-Feb-00	874.18	P
01U357	899.1	07-Mar-00	874.38	P
01U357	899.1	06-Apr-00	876.93	P
01U357	899.1	02-May-00	874.38	P
01U357	899.1	01-Jun-00	872.03	P
01U357	899.1	06-Jul-00	874.03	P
01U357	899.1	15-Aug-00	881.06	
01U357	899.1	05-Sep-00	881.18	
01U358	898.3	05-Oct-99	874.40	P
01U358	898.3	02-Nov-99	874.85	P
01U358	898.3	08-Dec-99	873.55	P
01U358	898.3	04-Jan-00	876.41	P
01U358	898.3	05-Feb-00	872.90	P
01U358	898.3	07-Mar-00	872.45	P
01U358	898.3	06-Apr-00	874.95	P
01U358	898.3	02-May-00	873.35	P
01U358	898.3	01-Jun-00	871.35	P
01U358	898.3	06-Jul-00	870.60	P
01U358	898.3	15-Aug-00	880.67	
01U358	898.3	05-Sep-00	880.75	
01U901	901.5	01-Jun-00	879.94	
01U902	901.3	01-Jun-00	881.36	
01U903	903.7	01-Jun-00	883.06	
01U904	899.4	01-Jun-00	880.36	

Well	TOS (1) (ft)	Date	Groundwater Elev.(ft)

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.

(2) Recovery Wells 01U355 through 01U358 were shut off on July 11, 2000, and remained off through the end of FY 2000.

(3) P = Pumping

TABLE 6-4

SITE A
OPERATION AND MAINTENANCE NOTES
FISCAL YEAR 2000

October
No Notes

November
11/08 - 11-10/99, Extraction system was shut down for scheduled cleaning and maintanence. Down Time: 55.75 Hours
11/11 - 11/12/99, Extraction system was shut down for scheduled base solution treatment. Down Time: 25.75 Hours
11/14/99 - 11/16/99, EW-6 pump and motor failed and were replaced. Down Time: 47.25 Hours
11/15/99 - 11/16/99, EW-7 pump and motor failed and were replaced. Down Time: 30.75 Hours
11/30/99, EW-5 pressure gauge and flow control valve were replaced. Down Time: 0.5 Hour

December
12/3-12/6/99 - Breaker had tripped on EW-5 and had to be reset. Down Time 59 Hours
12/6-12/8/99 - Pump and motor replaced at EW-7. Down Time: 47.75 Hours
12/21-12/23/99 - Scheduled treatment system maintenance and cleaning. Down Time: 51.75 Hours
12/23-12/27/99 - Meter body and coupling replaced at EW-4. Down Time: 97.25 Hours
12/27-12/29/99 - Pump and motor replaced at EW-1. Down Time: 51.5 Hours
12/29/99 - "O" ring replaced at EW-8. Down Time: 0.5 Hour

January
1/30/00 - Flow control valves replaced with globe valves at EW3 and EW6. Down Time: 0.25 Hours

February
1/31-2/1/00 - Pump and motor were replaced at EW4. Down Time: during system cleaning
1/31-2/2/00 - Scheduled treatment system maintenance and cleaning. Down Time: 55.5 Hours
2/14-2/16/00 - Pump and motor replaced at EW2. Down Time: 42 Hours.

March
3/13-3-15/00 - Scheduled treatment system maintenance and acid cleaning. Down Time: 47.5 Hours
3-16-17/00 - Scheduled treatment system base cleaning. Down Time: 24.5 Hours
3/20/00 - Daily inspection was not completed due to human error.
3/21/00 - Replace pipe nipple, check valve, and pitless adapter at EW 3. Down Time: 1 hour.

April
3/31-4/4/00 - Pump and motor replaced at EW1. Down Time: 94.5 Hours
4/3-4/4/00 - Pump and motor replaced at EW2. Down Time: 33 Hours
4/17-21/00 - Pump and motor replaced at EW5. Down Time: 100.75 Hours.
4/17-21/00 - Pump and motor replaced at EW8. Down Time: 101.75 Hours.
4/24-26/00 - Scheduled treatment system maintenance and acid cleaning. Down Time: 48 Hours

TABLE 6-4

SITE A
OPERATION AND MAINTENANCE NOTES
FISCAL YEAR 2000

<u>May</u>
5/26-5/31/00 - Pump and motor replaced at EW6. Exact down time is unknown because a failed check valve allowed backflow of a minimum of 680 gallons of water into the well.

<u>June</u>
6/5 to 6/6/00 - Extraction system shut down for scheduled maintenance and cleaning. Down Time: 30.25 Hours
6/8/00 - Pitless adapter replaced at EW5. Down Time: 1 Hour
6/11 to 6/13/00 - Pump and motor replaced at EW7. Down Time: 48 Hours
6/12 to 6/15/00 - EW4 shut down for well redevelopment. Down Time: 73 Hours
6/15 to 6/20/00 - EW3 shut down for well redevelopment. Down Time: 118.5 Hours
6/20 to 6/23/00 - EW2 shut down for well redevelopment. Down Time: 70.5 Hours
6/23 to 6/28/00 - EW1 shut down for well redevelopment. Down Time: 119 Hours
6/28 to 6/30/00 - EW3 shut down for continued well redevelopment. Down Time: 48 Hours

<u>July</u>
7/11/00 - EW5, EW6, EW7, and EW8 were shut down as approved by the MPCA.

<u>August</u>
8/1 to 8/4/00 - EW1 pump, motor, and upper check valve were replaced. Down Time: 79.5 Hours
8/7 to 8/9/00 - System shut down for scheduled 6 week cleaning. Down Time: 54.5 Hours
8/7 to 8/14/00 - EW5-EW8 operated during system cleaning.
8/9/00 - EW3 pump and motor replaced. Wire from pump to top of well and O-ring also replaced. Down Time: Concurrent with system cleaning.
8/10 to 8/11/00 - System shut down for routine cleaning following acid cleaning. Down Time: 26 Hours
8/11/00 - EW2 pitless adapter repaired and O-ring replaced. Down Time: 1 Hour
8/16/00 - EW3 pitless adapter O-ring replaced. Down Time: 0.5 Hour
8/15 to 8/16/00 - EW2 pump and motor replaced. Down Time: 21 Hours

<u>September</u>
9/18 to 9/19/00 - System shut down for scheduled 6 week cleaning. Down Time: 29.25 Hours
9/30/00 - Last day that CRA took meter readings.

TABLE 6-5

Site A Removal Action Effluent Water Quality
FY 2000

		cis-1,2-Dichloroethene (ug/l)	trans-1,2-Dichloroethene (ug/l)	Tetrachloroethene (ug/l)	Trichloroethene (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	2	5 to 11	None	None
Effluent-A	05-Oct-99	26.00	JP 0.99	JP 0.28	JP 0.99	<0.10			
Effluent-A	02-Nov-99	24.00	JP 0.82	<1.00	1.20	JP 0.06			
Effluent-A	08-Dec-99	27.00	JP 0.98	JP 0.35	1.30	<0.10			
Effluent-A	04-Jan-00	25.00	JP 0.97	<1.00	1.10	<0.10			
Effluent-A	04-Feb-00	21.00	JP 0.86	JP 0.25	JP 0.98	<0.10			
Effluent-A	07-Mar-00	27.00	1.30	<1.00	1.10	<0.10			
Effluent-A	05-Apr-00	22.00	JP 0.96	JP 0.28	1.20	<0.10			
Effluent-A	02-May-00	22.00	JP 0.98	JP 0.26	1.20	<0.10			
Effluent-A	09-Jun-00	22.00	JP 1.00	<1.00	1.10	<0.10	7.32	<10000.00	<10000.00
Effluent-A	06-Jul-00	18.00	JP 0.89	JP 0.20	JP 0.88	<0.10			
Effluent-A	14-Aug-00	32.00	JP 0.96	JP 0.41	1.30	<0.10			
Effluent-A	05-Sep-00	30.00	JP 0.85	JP 0.33	1.40	<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 2000

		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	07-Jun-00	<1.00	<1.00	<1.00	NS	JP 0.36	<1.00	<1.00	
01U102	07-Jun-00	JP 0.91	JP 0.48	<1.00	NS	1.30	<1.00	<1.00	
01U103	08-Jun-00	<1.00	<1.00	<1.00	NS	<1.00	<1.00	<1.00	JP 3.87
01U103	17-Aug-00	JP 0.55	<1.00	<1.00	NS	<1.00	<1.00	<1.00	
01U108	08-Jun-00	**190.00**	**54.00**	<1.00	NS	15.00	<1.00	<1.00	
01U108	17-Aug-00	**140.00**	**35.00**	<1.00	NS	27.00	<1.00	<1.00	
01U108 D	17-Aug-00	**120.00**	**33.00**	<1.00	NS	26.00	<1.00	<1.00	
01U115	08-Jun-00	<1.00	JP 0.31	<1.00	NS	JP 0.64	<1.00	<1.00	
01U116	08-Jun-00	<1.00	JP 0.34	<1.00	NS	JP 0.26	<1.00	<1.00	
01U117	08-Jun-00	5.50	7.00	<1.00	NS	23.00	<1.00	<1.00	
01U126	08-Jun-00	**25.00**	<1.00	<1.00	NS	<1.00	<1.00	<1.00	
01U138	07-Jun-00	<1.00	<1.00	<1.00	NS	<1.00	<1.00	<1.00	
01U138 D	07-Jun-00	<1.00	<1.00	<1.00	NS	<1.00	<1.00	<1.00	
01U139	08-Jun-00	<1.00	JP 0.70	<1.00	NS	5.00	<1.00	JP 0.49	
01U139	06-Sep-00	<1.00	JP 0.44	<1.00	NS	12.00	<1.00	JP 0.86	
01U140	07-Jun-00	<1.00	JP 0.26	<1.00	NS	5.40	<1.00	1.70	
01U140	06-Sep-00	<1.00	JP 0.26	<1.00	NS	4.40	<1.00	1.30	
01U157	08-Jun-00	<1.00	JP 0.56	<1.00	NS	1.70	<1.00	<1.00	
01U158	07-Jun-00	<1.00	<1.00	<1.00	NS	1.30	<1.00	<1.00	
01U350	17-Aug-00	**220.00**	**76.00**	<1.00	NS	**110.00**	JP 0.26	<1.00	
01U351	09-Jun-00	JP 0.38	JP 0.93	<1.00	NS	1.10	<1.00	<1.00	
01U351 D	09-Jun-00	JP 0.37	JP 0.94	<1.00	NS	1.20	<1.00	<1.00	
01U352	09-Jun-00	JP 1.00	4.10	<1.00	NS	41.00	<1.00	JP 0.31	
01U353	09-Jun-00	<1.00	1.50	<1.00	NS	**95.00**	<1.00	3.20	
01U354	09-Jun-00	<1.00	JP 0.34	<1.00	NS	JP 0.96	<1.00	<1.00	
01U355	09-Jun-00	<1.00	JP 0.32	<1.00	NS	4.00	<1.00	<1.00	
01U355	06-Sep-00	<1.00	JP 0.23	<1.00	NS	2.80	<1.00	<1.00	
01U356	09-Jun-00	<1.00	<1.00	<1.00	NS	4.80	<1.00	JP 0.30	
01U356	06-Sep-00	<1.00	JP 0.25	<1.00	NS	3.10	<1.00	JP 0.29	
01U357	09-Jun-00	<1.00	<1.00	<1.00	NS	4.10	<1.00	JP 0.73	
01U357	06-Sep-00	<1.00	JP 0.24	<1.00	NS	7.10	<1.00	2.00	
01U358	09-Jun-00	<1.00	<1.00	<1.00	NS	2.90	<1.00	JP 0.50	
01U901	07-Jun-00	<1.00	<1.00	<1.00	NS	JP 0.28	<1.00	<1.00	
01U902	07-Jun-00	<1.00	JP 0.39	<1.00	NS	8.90	<1.00	<1.00	**<10.00**
01U902	06-Sep-00	<1.00	JP 0.34	<1.00	NS	9.30	<1.00	<1.00	
01U903	07-Jun-00	<1.00	JP 0.42	<1.00	NS	JP 0.46	<1.00	<1.00	
01U904	07-Jun-00	<1.00	<1.00	<1.00	NS	1.60	<1.00	<1.00	**<10.00**
01U904 D	07-Jun-00	<1.00	<1.00	<1.00	NS	1.50	<1.00	<1.00	**<10.00**
01U904	06-Sep-00	<1.00	<1.00	<1.00	NS	1.70	<1.00	<1.00	
01U904 D	06-Sep-00	<1.00	<1.00	<1.00	NS	1.70	<1.00	<1.00	

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.
NS Parameter was not included in lab analysis.

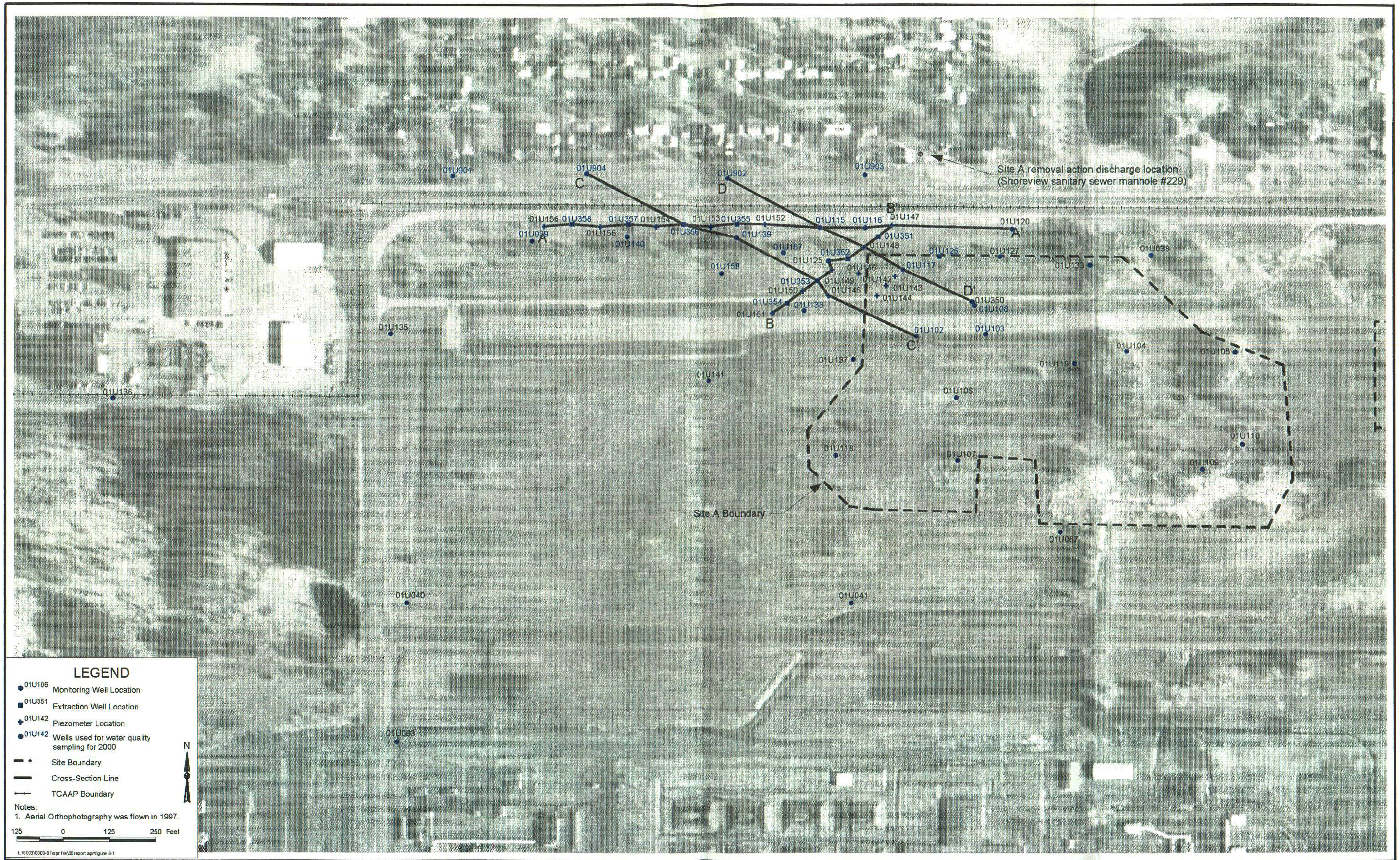
TABLE 6-7

SITE A
SUMMARY OF VOC MONTHLY REMOVAL
FISCAL YEAR 2000

MONTH	cis-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, 1999					90,715,765	29.74
OCTOBER	26.00	0.00	26.00	8.35E-09	1,400,680	0.30
NOVEMBER	24.00	1.20	25.20	8.35E-09	1,168,080	0.25
DECEMBER	27.00	1.30	28.30	8.35E-09	1,189,880	0.28
JANUARY	25.00	1.10	26.10	8.35E-09	1,389,290	0.30
FEBRUARY	21.00	0.00	21.00	8.35E-09	1,214,050	0.21
MARCH	28.30	1.10	29.40	8.35E-09	1,327,340	0.33
APRIL	22.00	1.20	23.20	8.35E-09	1,135,110	0.22
MAY	22.00	1.20	23.20	8.35E-09	1,301,370	0.25
JUNE	22.00	1.10	23.10	8.35E-09	1,173,190	0.23
JULY	18.00	0.00	18.00	8.35E-09	951,090	0.14
AUGUST	32.00	1.30	33.30	8.35E-09	628,530	0.17
SEPTEMBER	30.00	1.40	31.40	8.35E-09	683,960	0.18
TOTAL GALLONS PUMPED AND VOC'S REMOVED FOR FISCAL YEAR 2000					13,562,570	2.87
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP					104,278,335	32.61

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

Figures



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Well Location Map

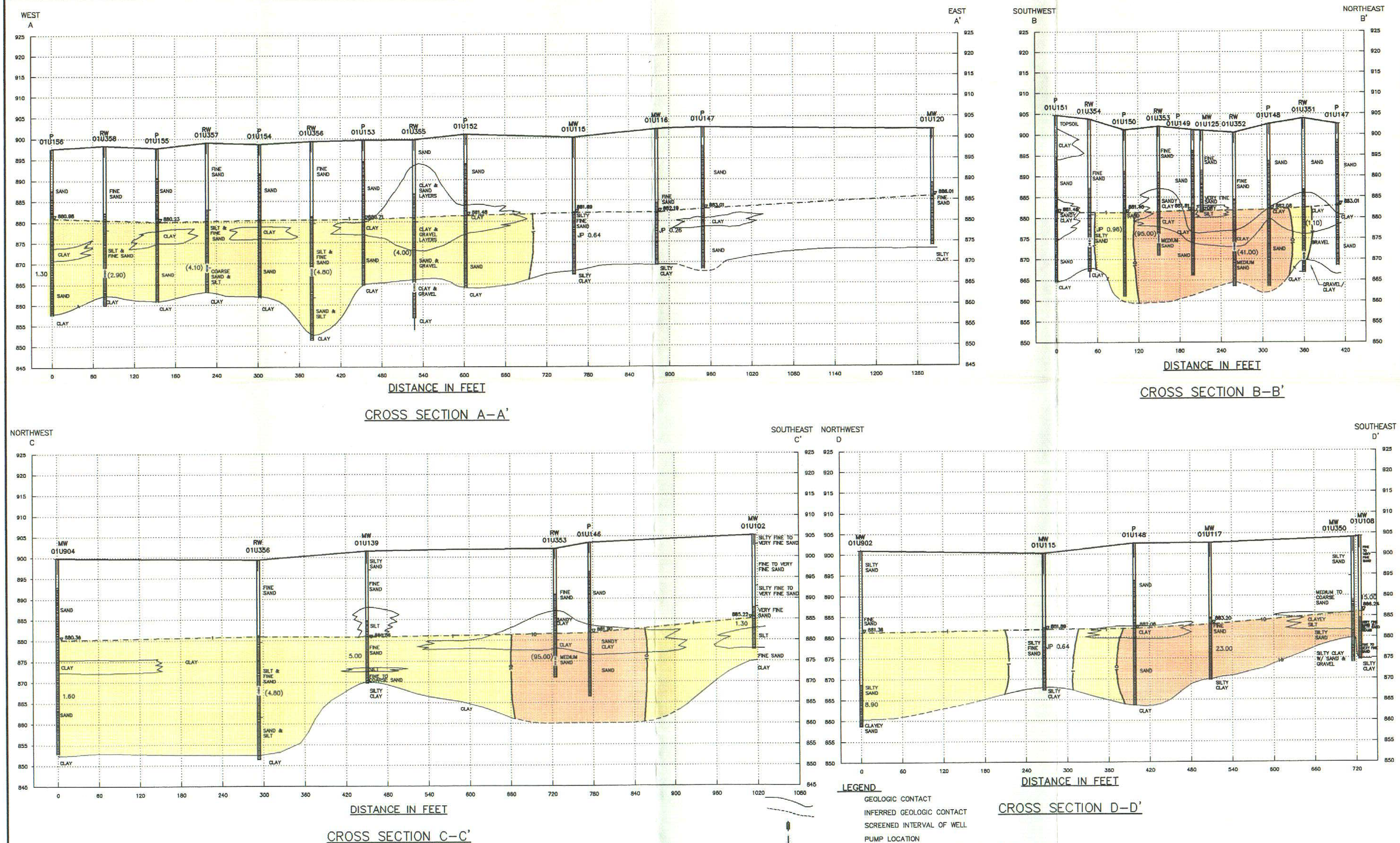
Wenck

Wenck Associates, Inc.
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2000

Figure 6-1



CROSS SECTION A–A'

CROSS SECTION B–B'

CROSS SECTION C–C'

CROSS SECTION D–D'

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.

LEGEND

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- SCREENED INTERVAL OF WELL
- PUMP LOCATION
- 13.80 CIS–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

FILE	TCAX01B4.DWG
DATE	1-8-01 L:

TWIN CITIES ARMY AMMUNITION PLANT

Site A, cis–1,2–Dichloroethene Cross Sections A–A', B–B', C–C', D–D', Summer 2000

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

FY 2000

Figure 6-2

TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1, Potentiometric Map -- Summer 2000

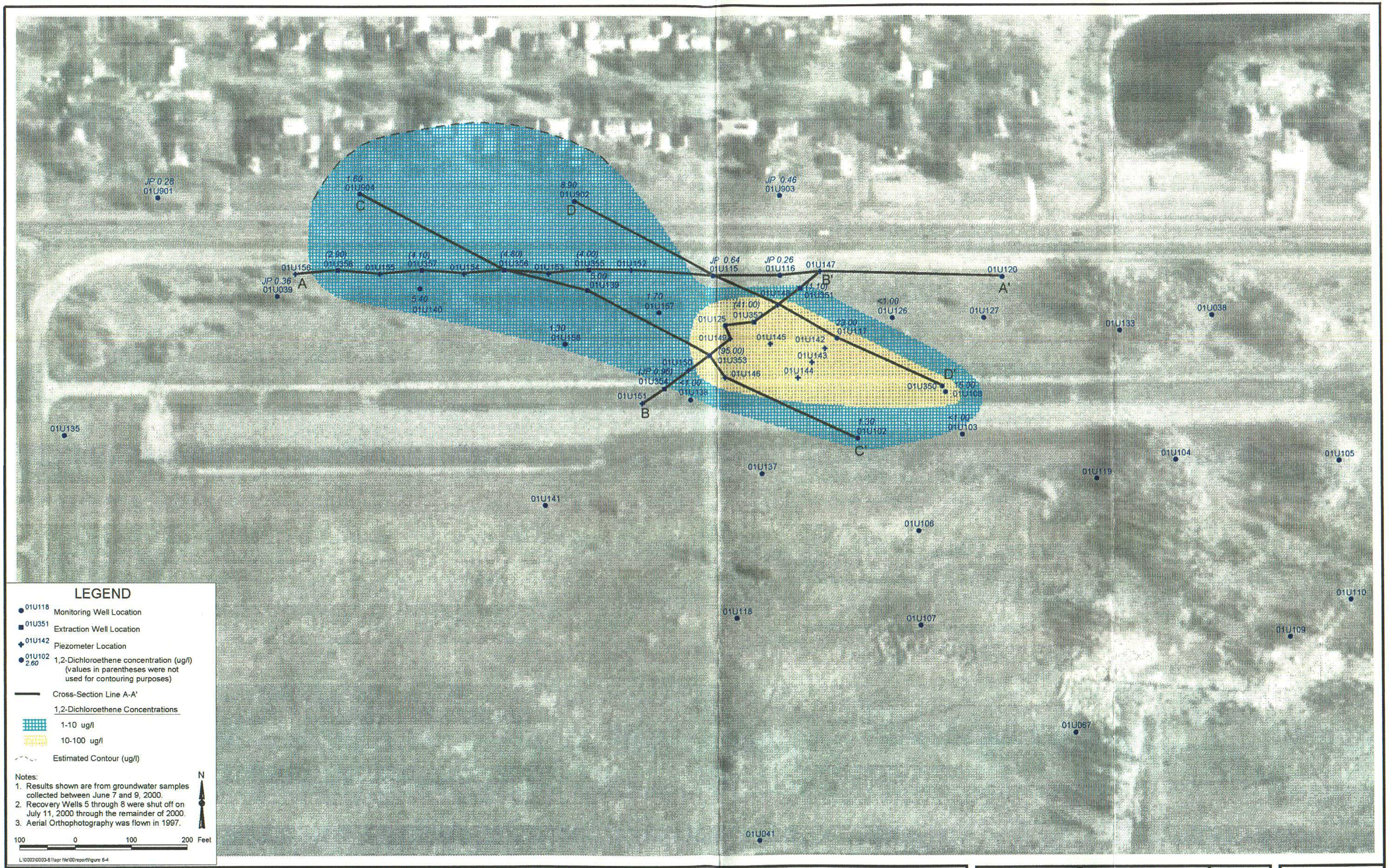
Wenck

Wenck Associates, Inc.
Environmental Engineers

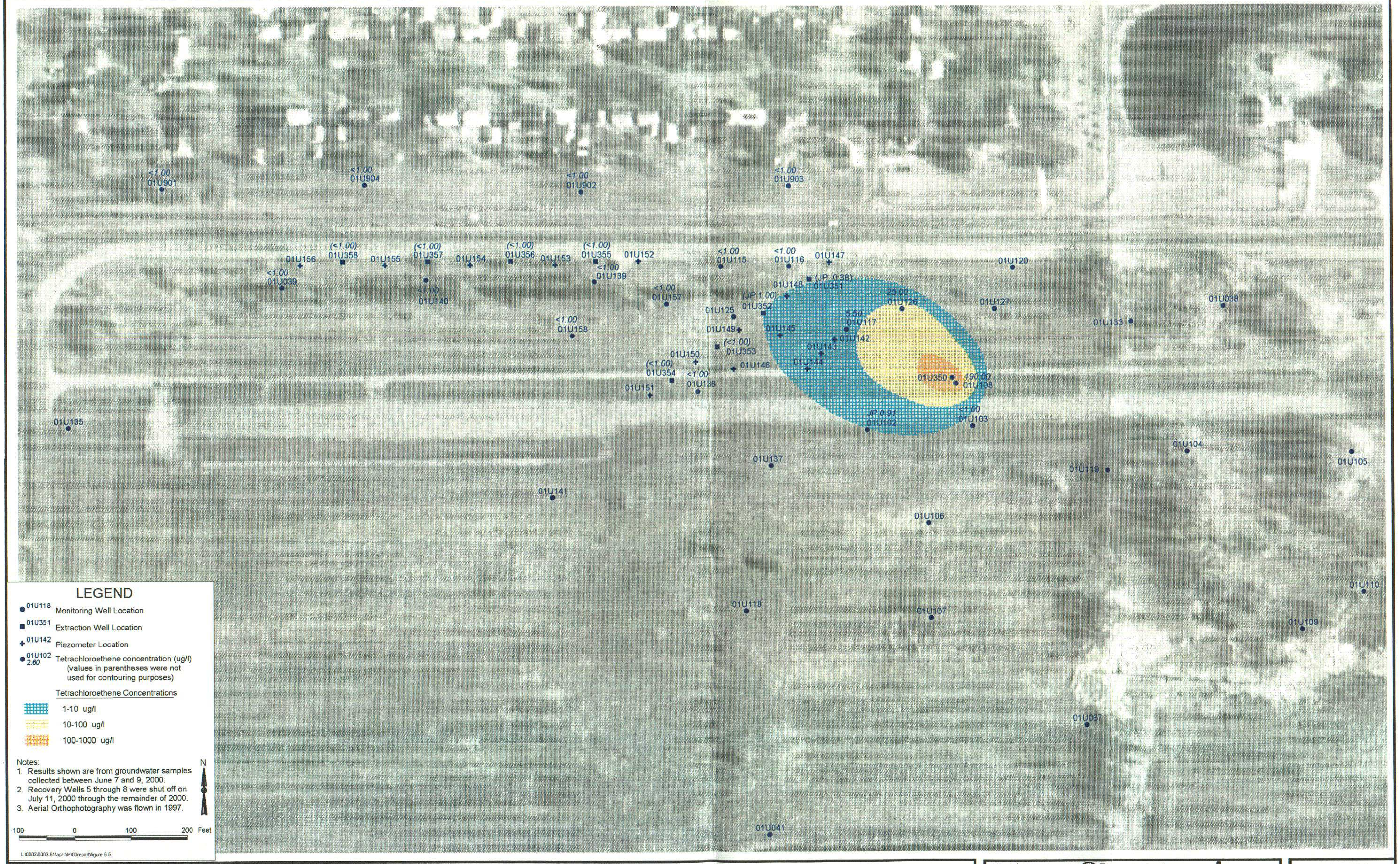
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2000

Figure 6-3



TWIN CITIES ARMY AMMUNITION PLANT		FY 2000
Site A, Unit 1 cis-1,2-Dichloroethene Isoconcentration Map, Summer 2000	Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 6-4



TWIN CITIES ARMY AMMUNITION PLANT

Site A, Unit 1 Tetrachloroethene Isoconcentration Map, Summer 2000

Wenck

Wenck Associates, Inc.
Environmental Engineers

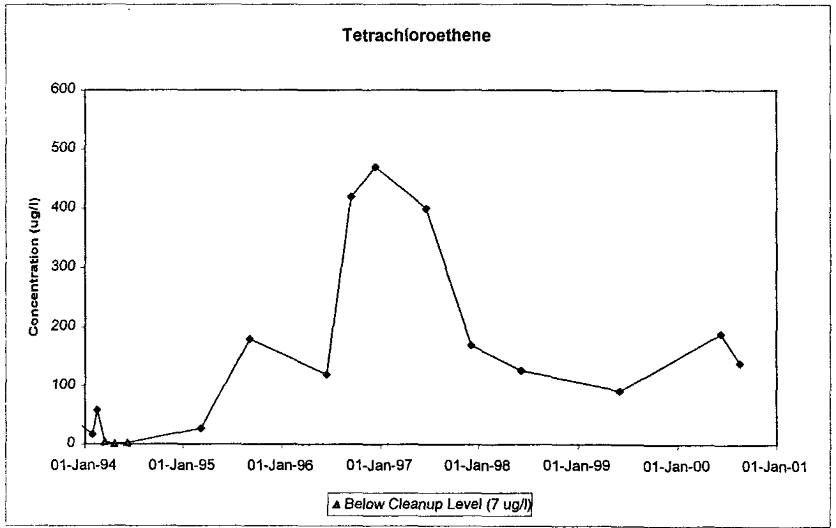
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

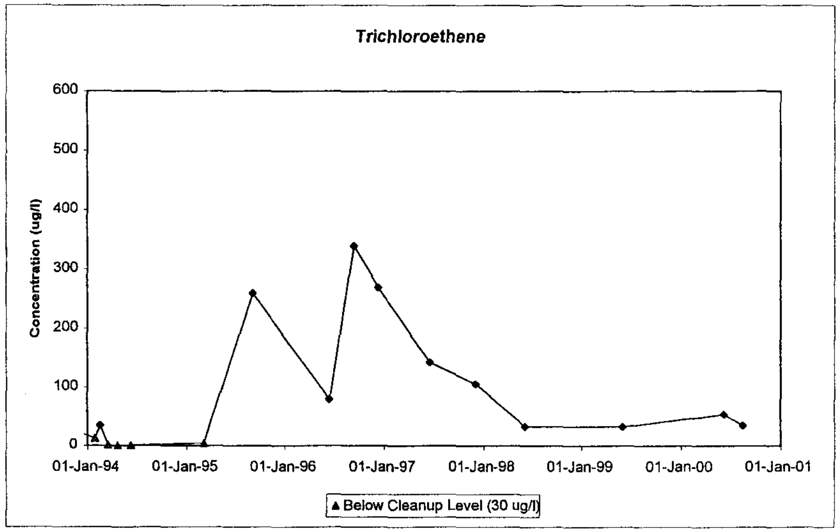
FY 2000

Figure 6-5

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

TWIN CITIES ARMY AMMUNITION PLANT





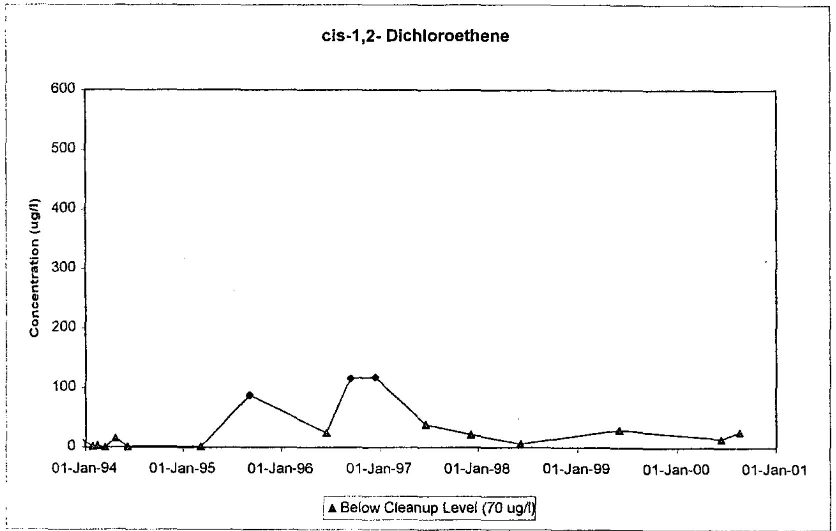


Figure 6-6
Wenck Associates, Inc.

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

TWIN CITIES ARMY AMMUNITION PLANT

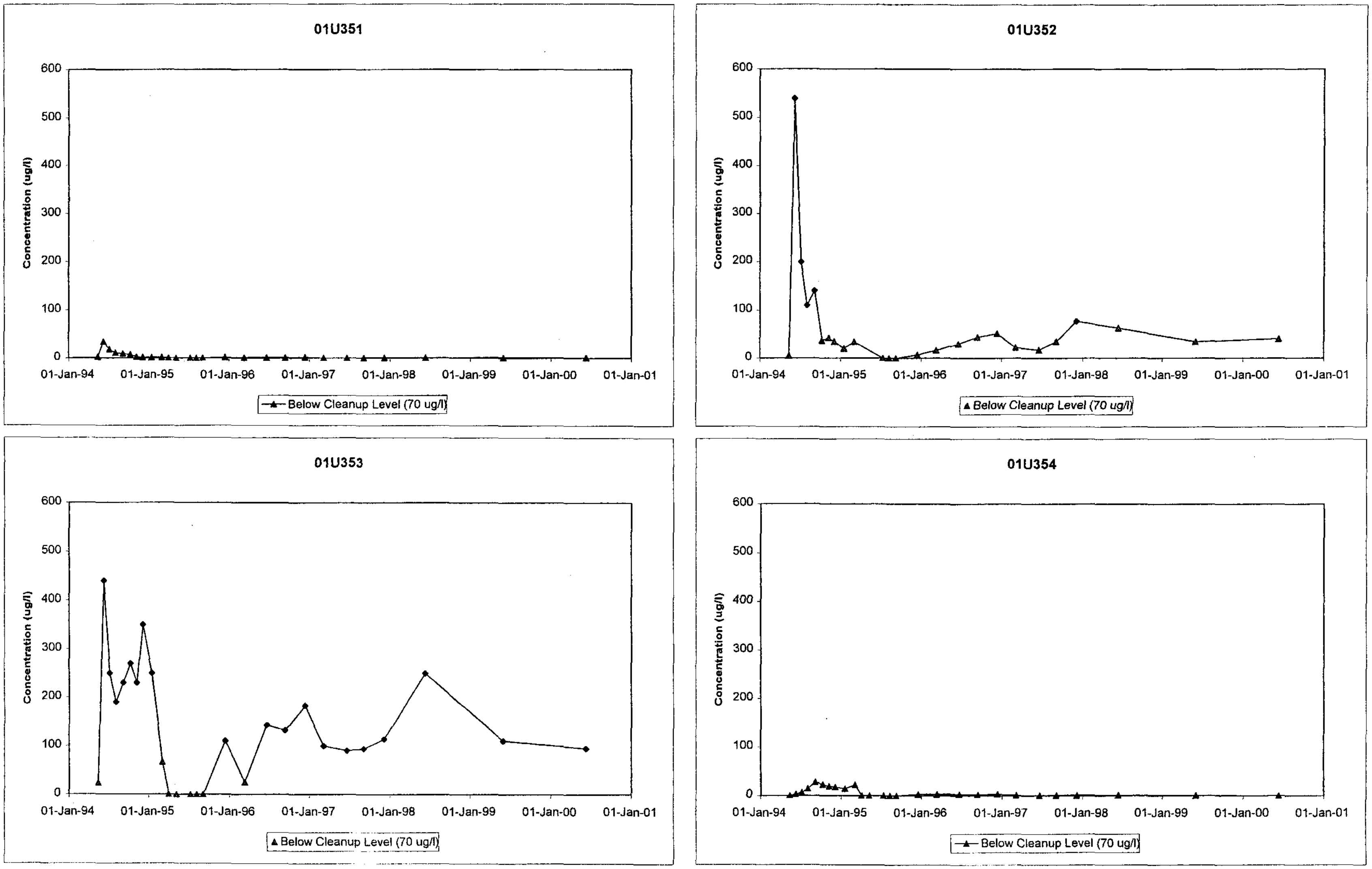

Figure 6-7
Wenck Associates, Inc.

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

TWIN CITIES ARMY AMMUNITION PLANT

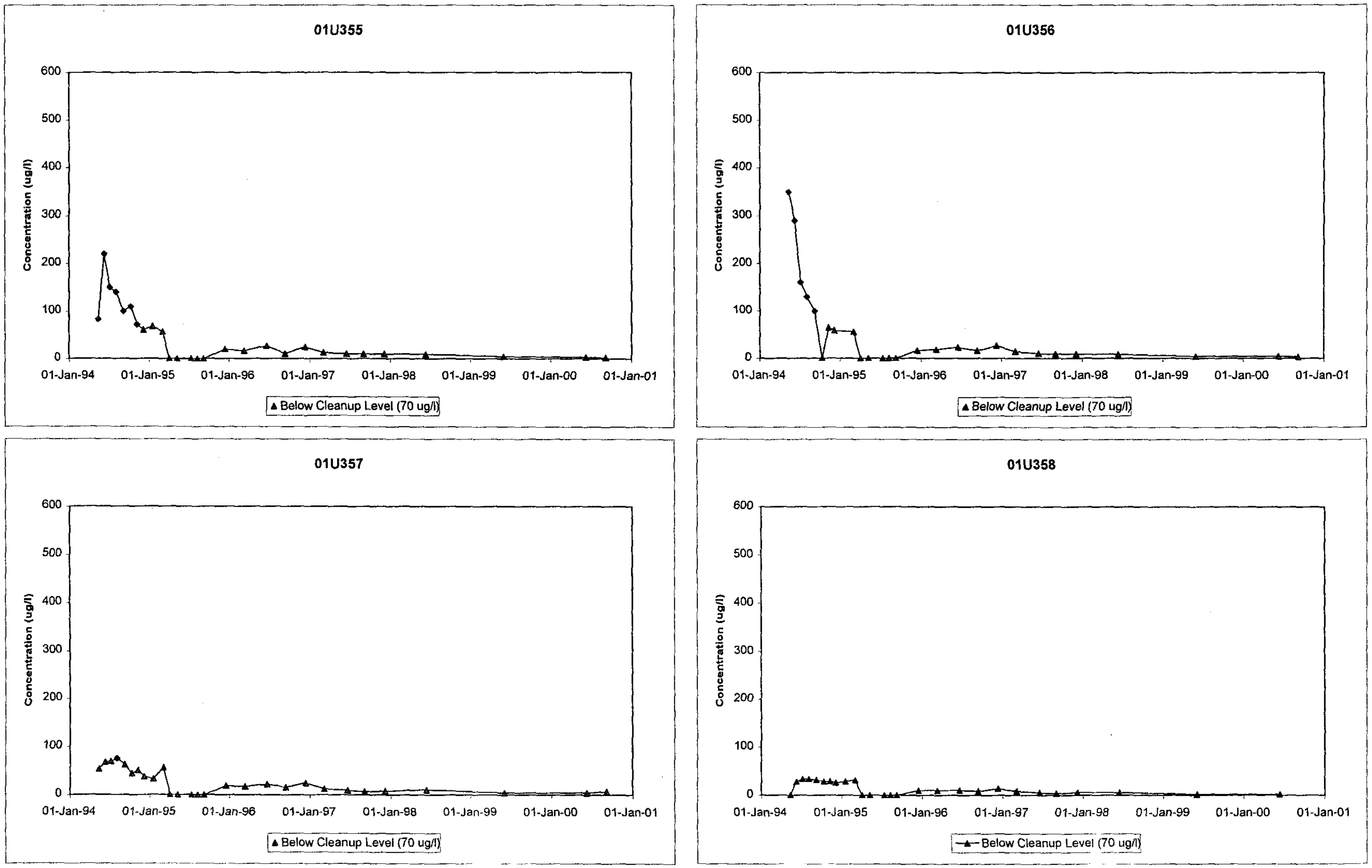

Figure 6-8
Wenck Associates, Inc.

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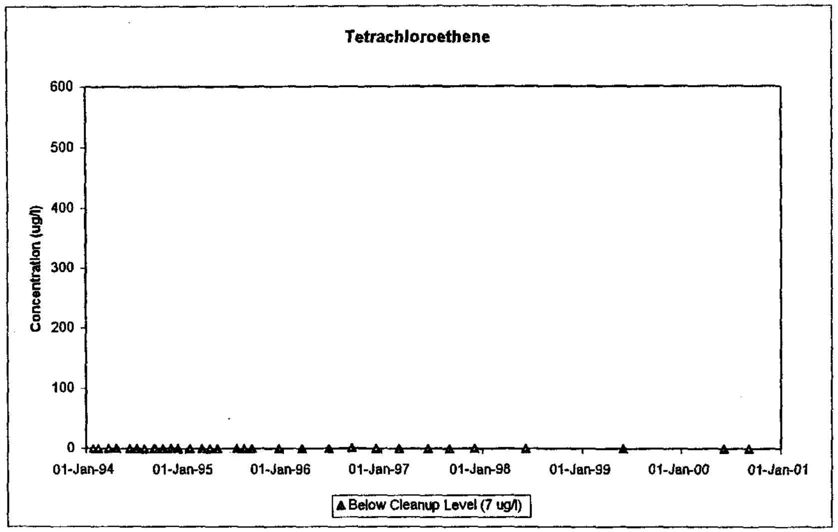
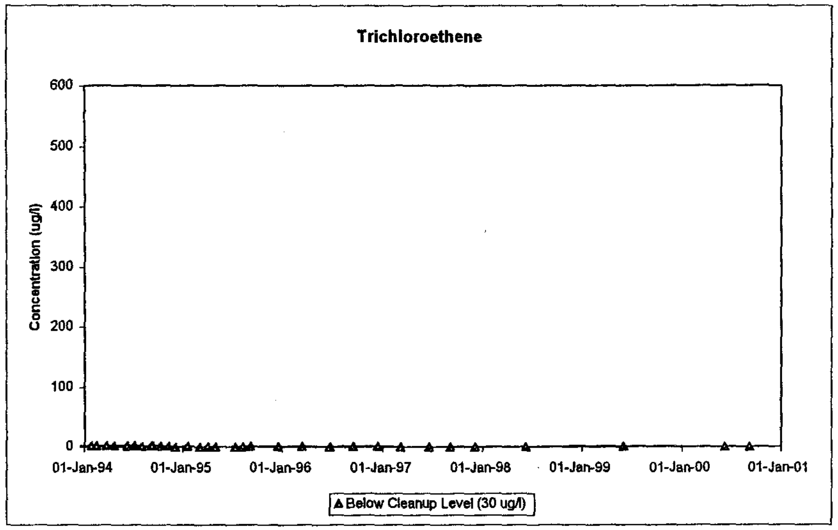
SITE A, WELL 01U902, TETRACHLOROETHENE, TRICHLOROETHENE, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS

TWIN CITIES ARMY AMMUNITION PLANT





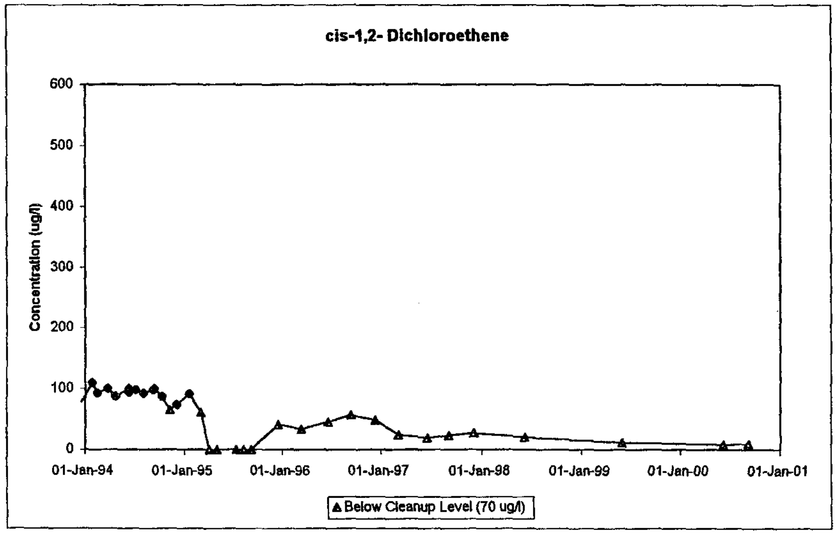


Figure 6-9
Wenck Associates, Inc.

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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 2000 addressed the VOCs identified in the Unit 1 groundwater beneath the western portion of Building 502. The selected remedy in the OU2 ROD consists of four components, 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. Based on these documents the selected remedy was modified to consist of a dual phase vacuum extraction system, which combines groundwater extraction with soil vapor extraction, to be installed beneath Building 502.

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 2000 was conducted according to the monitoring plan for FY 2000, which did not address the final remedy in the OU2 ROD. Appendix A summarizes the FY 2000 monitoring plan and any deviations are explained in Appendix C.2.

Seven Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during FY2000. These wells are 01U064, 01U636, 01U639, 01U640, I01-MW, I02-MW, and I05-MW. Figure 7-1 shows these well locations. Wells 01U639, 01U640, I01-MW, I02-MW, and I05-MW, were dry at the time of sampling (June 1, 2000). The dry wells yielded water when originally installed. The fact that these wells were dry illustrates the discontinuous nature of the Unit 1 aquifer at Site I. Samples from the remaining wells were analyzed using EPA Method 8260 for VOCs.

What were the monitoring results for FY 2000?

Table 7-1 presents the results of the FY 2000 analyses. The VOCs present in the wells are consistent with past data, which identified VOCs in Unit 1 at Site I. Figure 7.2 presents trichloroethene and 1,2-dichloroethene results for monitoring well 01U064 versus time.

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. As discussed above, the report on dual phase vacuum extraction has been submitted to the Agencies. The final remedy is subject to Agency approval.

7.3 REMEDY COMPONENT #3: POTW DISCHARGE

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

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

Has the remedy component been implemented?
No. As discussed above, the report on dual phase vacuum extraction has been submitted to the Agencies. The final remedy is subject to Agency approval.

7.4 REMEDY COMPONENT #4: ADDITIONAL INVESTIGATION

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

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

Has the remedy component been implemented?

Yes. The results of the additional investigation were included in the Work Plan. The additional investigation resulted in a pilot study to evaluate the applicability of dual phase vacuum extraction technology to the site.

Overall Remedy for Site I Shallow Groundwater

The remedy specified in the OU2 ROD was modified in the RD work plan. The final scope of the remedy will be determined in FY 2001 after the Agencies complete the review of the dual phase vacuum extraction pilot test report.

Monitoring in FY 2000 was consistent with the FY 2000 monitoring plan. The following conclusions are made for FY 2000:

- VOCs continue to be present in the Unit 1 aquifer beneath the western portion of Building 502.

- The additional investigation work identified the sources of VOCs in the Unit 1 aquifer beneath Building 502 and allowed for an evaluation of dual phase vacuum extraction technology to be completed.

Is additional monitoring proposed prior to the next report?

Yes. Appendix A presents the FY 2000 – FY 2004 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 2000
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
01U064	6/6/00	<1	<1	0.79 JP	2.2	150	20	<1	<1	<1	9.4	<1	<1	1.5
01U636	6/6/00	0.35 JP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
01U639	6/1/00	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
01U640	6/1/00	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I01MW	6/1/00	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I02MW	6/1/00	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
I05MW	6/1/00	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry

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

TABLE 7.2

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
FISCAL YEAR 2000
SITE I, TCAAP
ARDEN HILLS, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Implementing 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

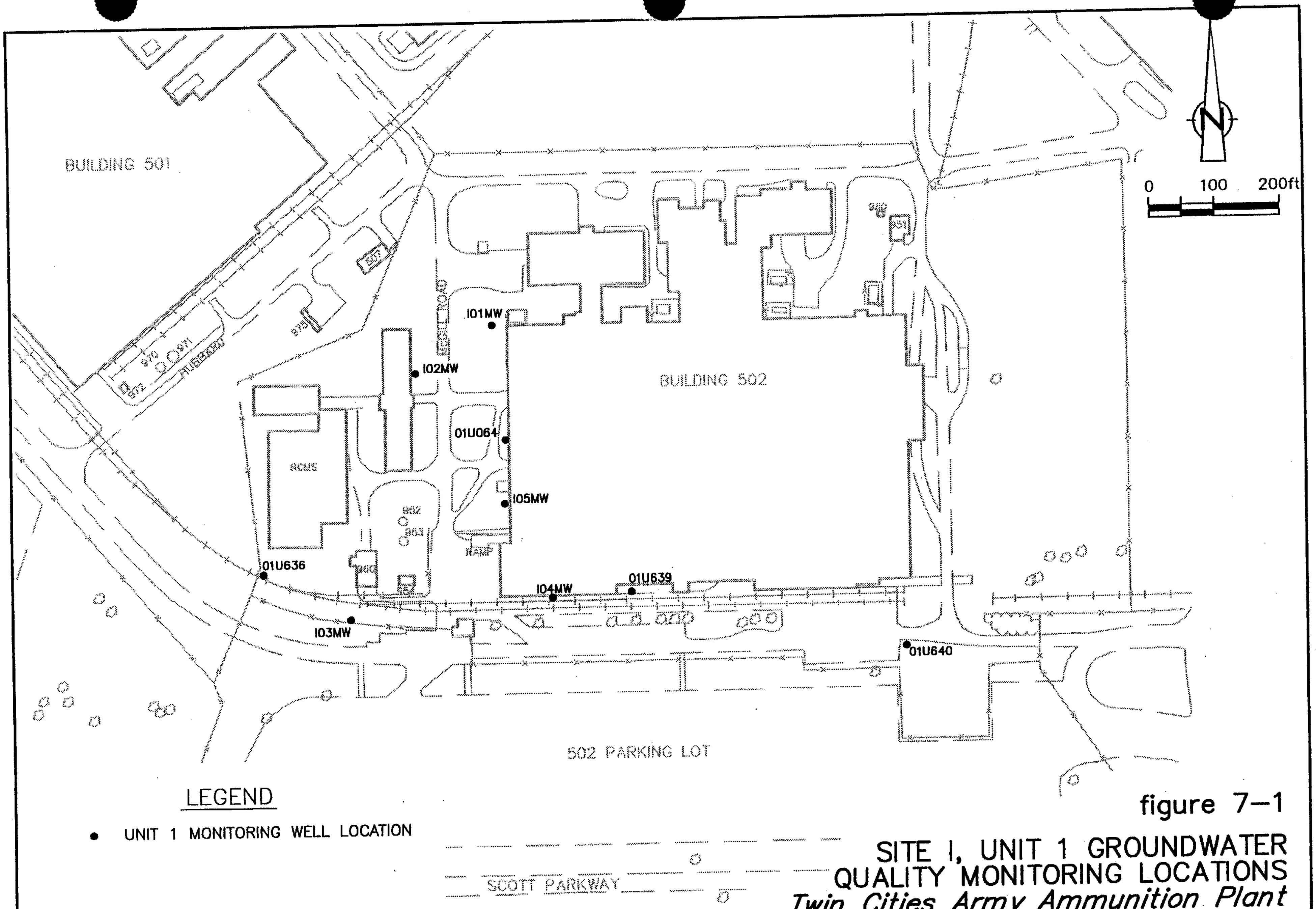
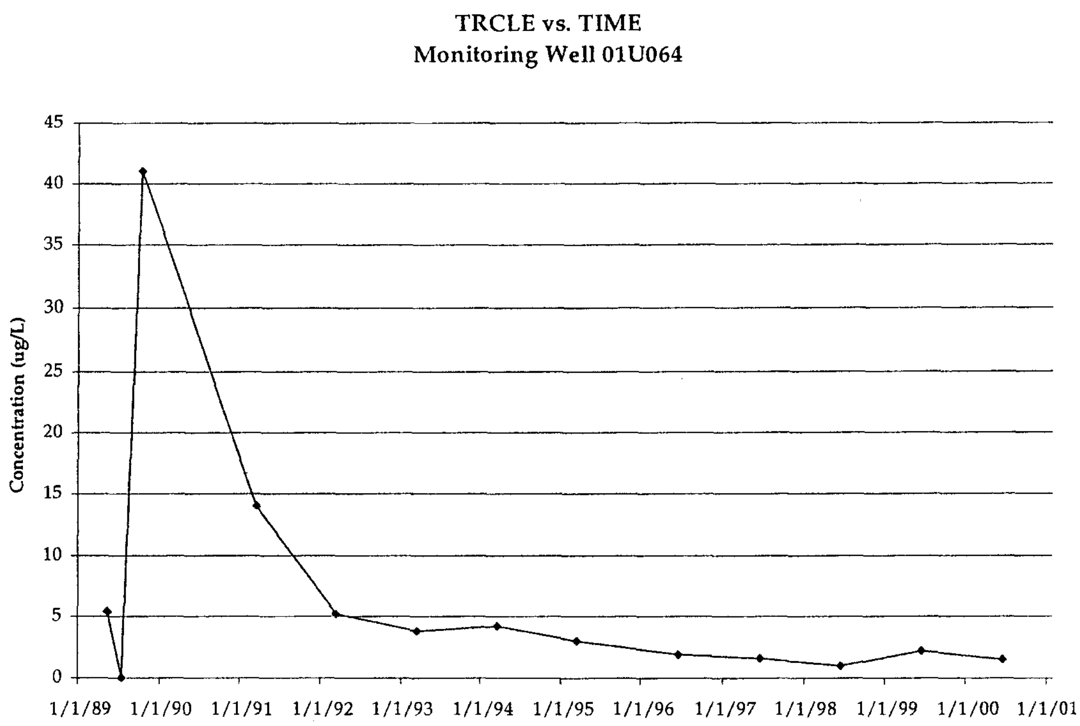


figure 7–1

SITE I, UNIT 1 GROUNDWATER QUALITY MONITORING LOCATIONS
Twin Cities Army Ammunition Plant

CRA

15213–43(002)GN–SP004 DEC 21/2000



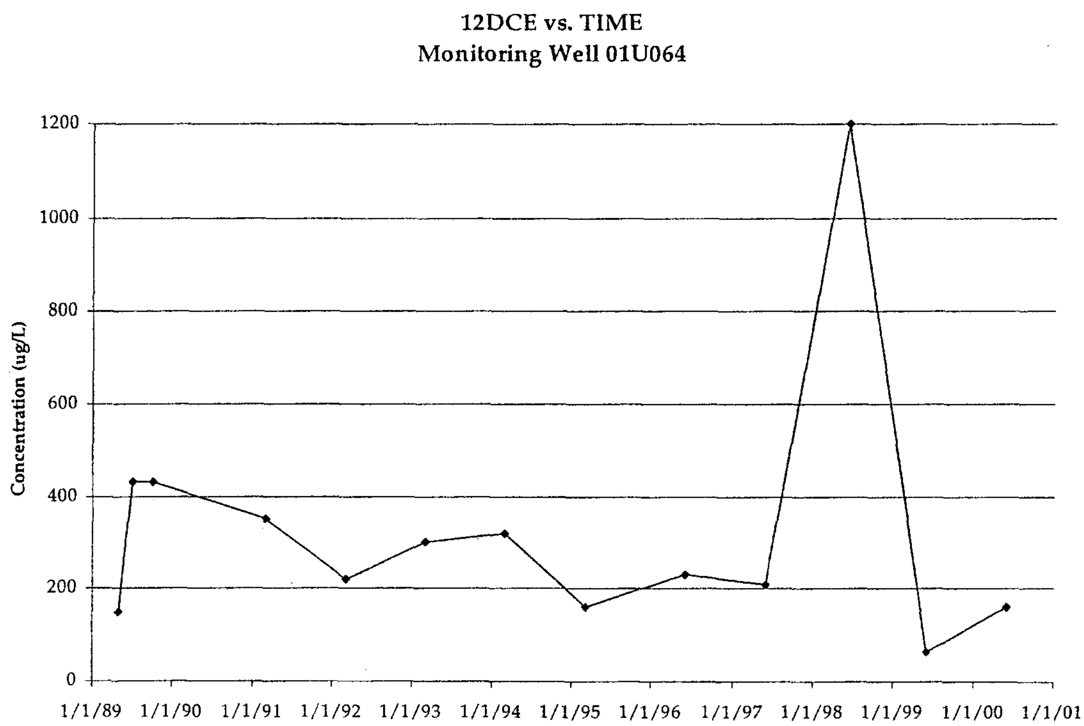


figure 7–2

SITE I, WELL 01U064, WATER QUALITY TRENDS
Twin Cities Army Ammunition Plant

CRA

15213–43(002)GN–SP011 JUN 19/2001

SECTION 8

8.0 Operable Unit 2: Site K Shallow Groundwater

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

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

8.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

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

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

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2000 monitoring plan and any deviations are explained in Appendix C.2.

Water levels are collected semi-annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. FY 2000 monitoring was performed in accordance with the Monitoring Plan included as Appendix A. The comprehensive monitoring well sampling was conducted in June 2000. 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 in February 1999. The upper Unit 3 sentinel well was installed in February 2000.

Existing piezometers were used to accomplish the deep Unit 1 sentry monitoring. Piezometers 01U625D, 01U626D, 01U627D and 01U628D were used since they monitor the base of the Unit 1 aquifer near the trench. The issue is the potential for DNAPLs to migrate beneath the trench along the Unit1/Unit2 interface. These piezometers are screened at that interface.

Figure 8-2 shows the location of the upper Unit 3 sentinel well (03U621) and the piezometers. This well was installed to monitor the potential for VOCs to migrate through the Unit 2 till and into the Unit 3 aquifer.

What are the results of the Unit 1 piezometer sampling?
The piezometers (Unit 1 sentinel wells) were sampled in March 2000. The Unit 3 sentinel well (03U621) was sampled in March, July and September 2000. It is scheduled for sampling in January 2001 for the last quarterly sample required by the Work Plan. The results of the samples collected during FY 2000 are presented in Table 8-1. The VOCs detected in the piezometers are at low concentrations and consistent with VOCs detected in other wells at Site K. They are not indicative of DNAPLs at the top of Unit 2. The only VOC detected in the Unit 3 sentinel well

was chloroform in the March sample at a concentration less than the reporting limit. Detection of chloroform was an anomalous event.

8.3 REMEDY COMPONENT #3: HYDRAULIC CONTAINMENT

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

Performance Standard (how do you know when you're done):
When the trench is operating as designed and capturing all groundwater exceeding the 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 8-2. Figure 8-3 presents a plan view of the groundwater contours from the June round of groundwater level measurement. At nested wells, the numerically lowest water elevation was used to create the plan view contours. Monitoring wells downgradient of the extraction trench show consistently higher water levels than those near and upgradient of the trench. This demonstrates that the horizontal hydraulic gradient has been reversed toward the extraction trench due to system operation.

Vertical capture was also effective as illustrated on Figure 8-4. 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 piezometer demonstrates complete vertical and horizontal hydraulic capture.

Figure 8-5 presents the trichloroethene concentrations from the June 2000 annual sampling event. Trichloroethene concentrations range from non-detect to 24,000 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 8-1 presents the monitoring well sampling data. The plume was originally defined based on data from all of the monitoring wells. The current monitoring well network is used to confirm the plume contours and measure the progress of remediation. Thus, 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 1999.

Trichloroethene was detected downgradient of the trench, at well 01U617, with a concentration of 0.41 μg/l. This well is within the hydraulic capture zone of the trench.

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.

Were there any major operational changes during the year?

No. The original air stripping tower and controls were replaced with a new fluidized bed type air stripper system on June 21, 1999. During FY 2000, the treatment system functioned properly. The new air stripper is less prone to fouling and requires less maintenance. The treatment system was operational 93% of FY 2000. During FY 2000, a regular maintenance schedule was maintained. A thorough inspection and cleaning of the system was performed in June and July 2000. Appendix F.1 summarizes operational data and events at the groundwater extraction and treatment system.

8.5 REMEDY COMPONENT #5: TREATED WATER DISCHARGE

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

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

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

Is the remedy component being implemented?

Yes. See discussion in Section 8.6.

8.6 REMEDY COMPONENT #6: DISCHARGE MONITORING

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

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

Is the remedy component being implemented?
Yes. Treatment system monitoring consisted of monthly effluent samples and quarterly influent samples. 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 5,224,650 gallons of water and 12.7 pounds of VOCs were removed from the aquifer in FY 2000. The cumulative mass removal is 105.1 pounds of VOCs.

8.7 REMEDY COMPONENT #7: ADDITIONAL INVESTIGATION

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

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

Is the remedy component being implemented?
Yes. The Work Plan was approved in FY 1999. Work began in February 2000. A report of the investigation results is planned for early 2001.

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 2000 – 2004 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.

8.9 OTHER ACTIVITY

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 gas-permeable membranes. Both technologies are intended to enhance natural anaerobic degradation of chlorinated VOCs. These tests will be completed in late FY 2000 and reported in FY 2001.

Tables

TABLE 8.1

GROUNDWATER QUALITY DATA
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	Date	111TCE	112TCE	11DCE	11DCLE	C12DCE	C2H3CL	CCL4	CH2CL2	CHCL3	T12DCE	TCLEE	TCLTFE	TRCLE
01U128	6/6/00	< 1	< 1	< 1	< 1	11	< 1	< 1	< 1	< 1	1.8	< 1	< 1	< 1
OW103 (01U603)	6/6/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
(01U604)	6/6/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.31 JP
OW111 (01U611)	6/6/00	< 100	< 100	< 100	< 100	1100	< 100	< 100	< 100	< 100	120	< 100	< 100	24000
OW115 (01U615)	6/6/00	< 100	< 100	< 100	< 100	920	< 100	< 100	< 100	< 100	290	< 100	< 100	3800
OW117 (01U617)	6/6/00	< 1	< 1	< 1	< 1	2.2	< 1	< 1	< 1	< 1	0.32 JP	< 1	< 1	0.41 JP
OW118 (01U618)	6/6/00	< 1	< 1	< 1	< 1	0.62 JP	< 1	< 1	< 1	< 1	< 1	< 1	6.5	1.6
OW119 (01U619)	6/6/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	22	1.7
OW121	6/6/00	< 1	< 1	< 1	< 1	2.5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
(01U621)	6/6/00	< 1 D	< 1 D	< 1 D	< 1 D	2.7 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D
01U625D	3/9/00	< 5	< 5	< 5	< 5	2.75 JP	< 5	< 5	< 5	< 5	< 5	< 5	425	5
01U626D	3/9/00	< 1	< 1	< 1	< 1	0.36 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.56 JP
01U627D	3/9/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
01U628D	3/8/00	< 1	< 1	< 1	< 1	9.2	< 1	< 1	< 1	< 1	0.45 JP	< 1	< 1	1.8
03U621	3/8/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.63 JP	< 1	< 1	< 1	< 1
	7/19/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	9/6/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
K04MW	6/6/00	< 1	< 1	< 1	3.1	0.45 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	4.2

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 8.2

GROUNDWATER ELEVATIONS (FT. AMSL)
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Well ID	*TOC Elevation*	*3/8/00*	*6/1/00*	*7/18/00*	*9/6/00*
01U047	880.31		873.29		
01U048	885.32		873.51		
01U052	886.51		874.11		
01U065	883.90		873.60		
01U128	883.69		873.45		
01U601	892.68		883.76		
01U602	889.35		882.94		
01U603	887.31		876.36		
01U604	888.98	875.81	875.71		
01U605	887.76		876.36		
01U607	891.01		884.17		
01U608	889.30		882.72		
01U609	889.33		882.82		
01U611	889.29		883.49		
01U612	886.91		877.10		
01U613	892.07		883.70		
01U615	888.66		875.56		
01U616	890.37		877.70		
01U617	887.72		876.14		
01U618	891.52		878.05		
01U619	891.75		882.24		
01U620	888.65		877.19		
01U621	886.57		876.99		
01U622	889.43				
01U623	889.44				
01U624A	889.88		dry		
01U624B	889.88		876.82		
01U624C	889.91		876.82		
01U624D	889.89		876.82		
01U625A	886.92		876.20		
01U625B	886.91		876.15		
01U625C	886.91		876.16		
01U625D	886.92	875.84	876.15		
01U626A	886.87		876.07		
01U626B	886.88		875.86		
01U626C	886.88		875.90		
01U626D	886.88	875.64	875.95		
01U627A	886.46		876.87		
01U627B	886.47		876.08		
01U627C	886.47		876.05		
01U627D	886.48	875.88	876.06		
01U628A	887.82		876.80		
01U628B	887.83		876.58		
01U628C	887.82		876.30		
01U628D	887.84	875.97	876.26		
K01MW	891.24		887.17		
K02MW	891.35		888.01		
K04MW	887.66	878.38	878.89		
03U621	887.01	851.09		849.55	848.59

TABLE 8.3

TREATMENT SYSTEM CONCENTRATIONS (ORGANICS)
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Date*	*C2H3CL*	*TRCLE*	*11DCE*	*11DCLE*	*C12DCE*	*T12DCE*	*12DCLE*
Effluent	10/5/99	< 0.106	0.27 J	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	10/5/99	< 0.106	< 0.0686 D	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	11/2/99	< 0.106	< 0.0686	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	11/2/99	< 0.106 D	< 0.0686 D	< 0.0882 D	< 0.095 D	< 0.0974 D	< 0.0575 D	< 0.0575 D
Effluent	12/7/99	< 0.106	< 0.0686	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	12/7/99	< 0.106 D	< 0.0686 D	< 0.0882 D	< 0.095 D	< 0.0974 D	< 0.0575 D	< 0.0575 D
Effluent	1/4/00	< 0.106	< 0.0686	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	1/4/00	< 0.106 D	< 0.0686 D	< 0.0882 D	< 0.095 D	< 0.0974 D	< 0.0575 D	< 0.0575 D
Effluent	2/1/00	< 0.106	0.31 J	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	2/1/00	< 0.106	0.33 JD	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	3/7/00	< 0.106	0.43 J	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	3/7/00	< 0.106	0.44 JD	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	4/4/00	< 0.106	0.52 J	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	4/4/00	< 0.106	0.45 JD	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	5/2/00	< 0.106	< 0.0686	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	5/2/00	< 0.106 D	< 0.0686 D	< 0.0882 D	< 0.095 D	< 0.0974 D	< 0.0575 D	< 0.0575 D
Effluent	6/5/00	< 0.106	0.37 J	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	6/5/00	< 0.106	0.36 JD	< 0.0882	< 0.095	< 0.0974	< 0.0575	< 0.0575
Effluent	7/6/00	< 0.141	0.21 J	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Effluent	7/6/00	< 0.141	0.16 JD	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Effluent	8/1/00	< 0.141	0.32 J	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Effluent	8/1/00	< 0.141	0.33 JD	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Effluent	9/5/00	< 0.141	0.24 J	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Effluent	9/5/00	< 0.141	0.19 JD	< 0.116	< 0.0773	< 0.0783	< 0.0761	< 0.0778
Influent	12/7/99	0.94 J	180	< 0.0882	< 0.095	56	10	< 0.0575
Influent	3/7/00	0.92 J	220	< 0.0882	< 0.095	51	8.2	< 0.0575
Influent	6/5/00	0.93 J	250	< 0.0882	< 0.095	60	9.2	< 0.0575
Influent	9/5/00	1.1	240	< 0.116	0.16 J	64	7.9	< 0.0575

Notes:
Concentrations in μg/L.
D - Duplicate analysis.
J - Value is estimated.

TABLE 8.4

TREATMENT SYSTEM CONCENTRATIONS (INORGANICS)
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

Sample Location	*Date*	*Cyanide*	*Total Phosphorus*	*Copper*	*Lead*	*Mercury*	*Silver*	*Zinc*
Effluent	12/7/99		345	<3.5	2.61	<0.0427	0.248	55.1
Effluent	12/9/99	<5.7						
Effluent	3/7/00	<7.8	373	<3.46	<1.27	<0.0401	<0.186	27.2
Effluent	6/5/00	<7.8	291	<5.58	<0.63	<0.0401	<0.154	33.4
Effluent	9/5/00	<7.8	203	13.9	<0.63	<0.0401	0.809	24.1

Notes:
Concentration in $\mu g/L$.

TABLE 8.5

SUMMARY OF QUARTERLY VOC REMOVAL
FISCAL YEAR 2000
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	246.00	1.31033	2.69	0.0	0.000	2.69
March	279.20	0.98618	2.30	0.0	0.000	2.30
June	319.20	1.39635	3.72	0.0	0.000	3.72
September	313.00	1.53178	4.00	0.0	0.000	4.00
Total		**5.22465**				**12.71**

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 VOCs 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
ARDEN HILLS, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Implementing 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

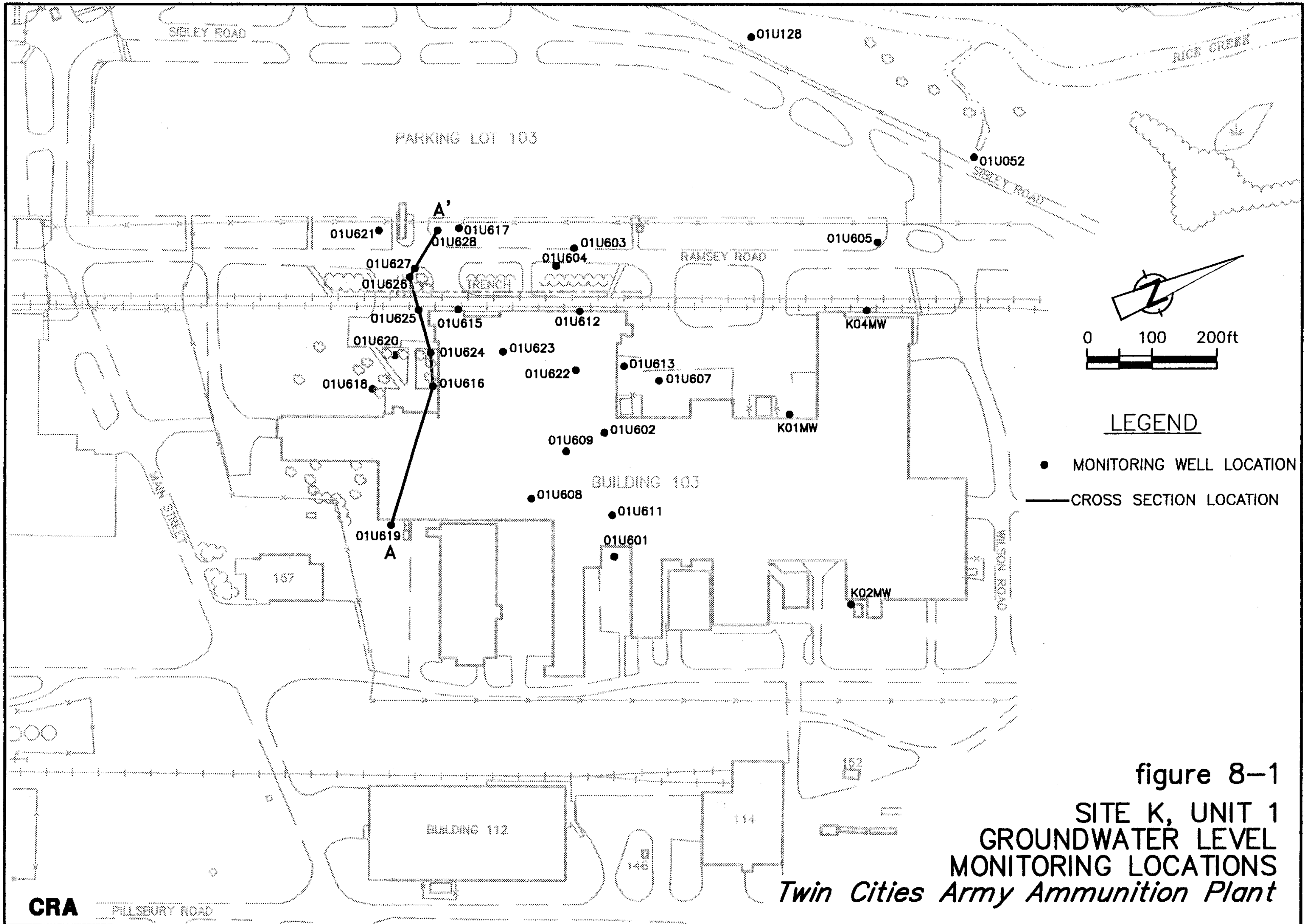


figure 8–1

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

15213–43(002)GN–SP002 DEC 21/2000

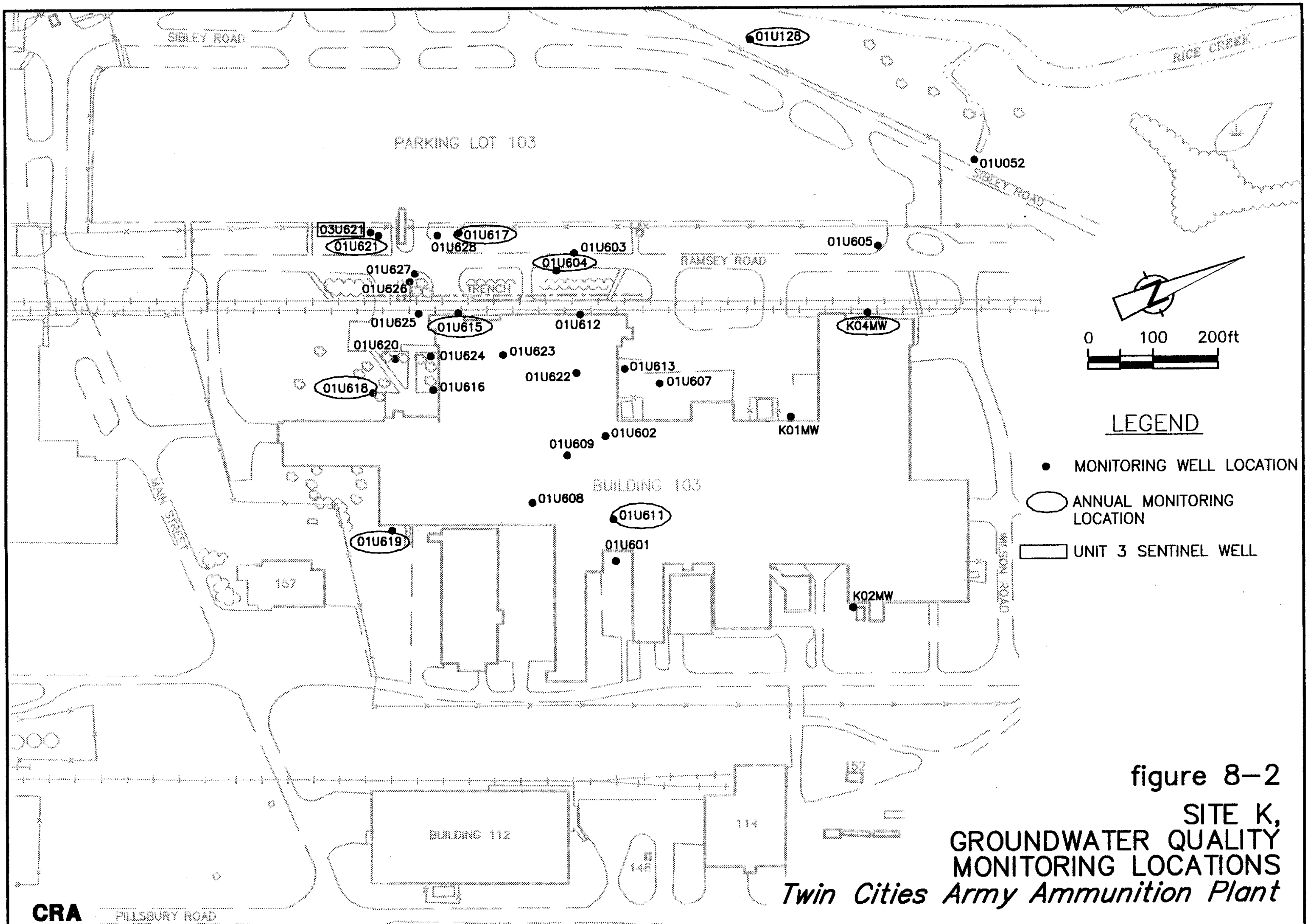


figure 8-2

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

15213-43(002)GN-SP003 JAN 09/2001

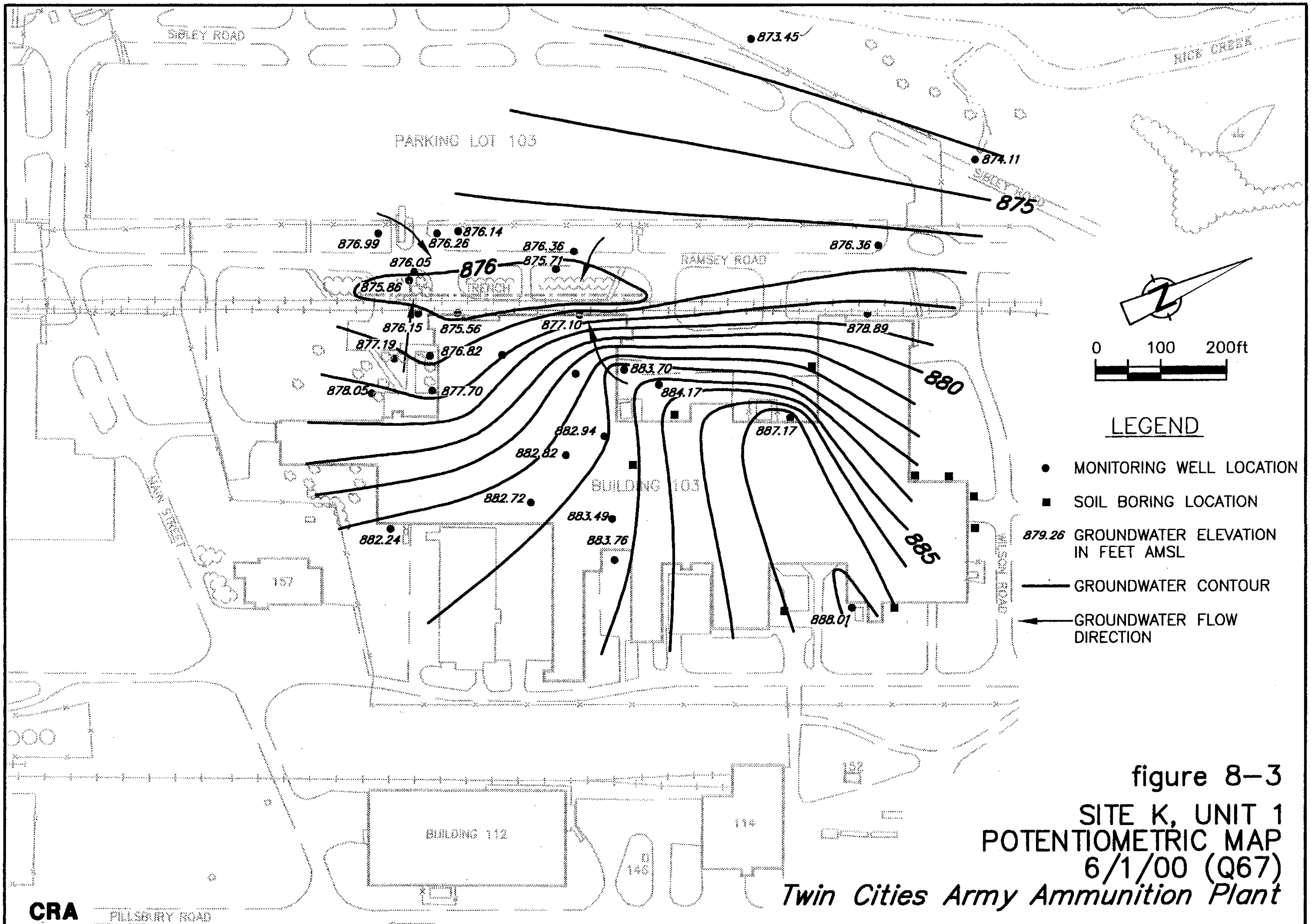


figure 8–3

SITE K, UNIT 1
POTENTIOMETRIC MAP
6/1/00 (Q67)
Twin Cities Army Ammunition Plant

15213–43(002)GN–SP006 DEC 21/2000

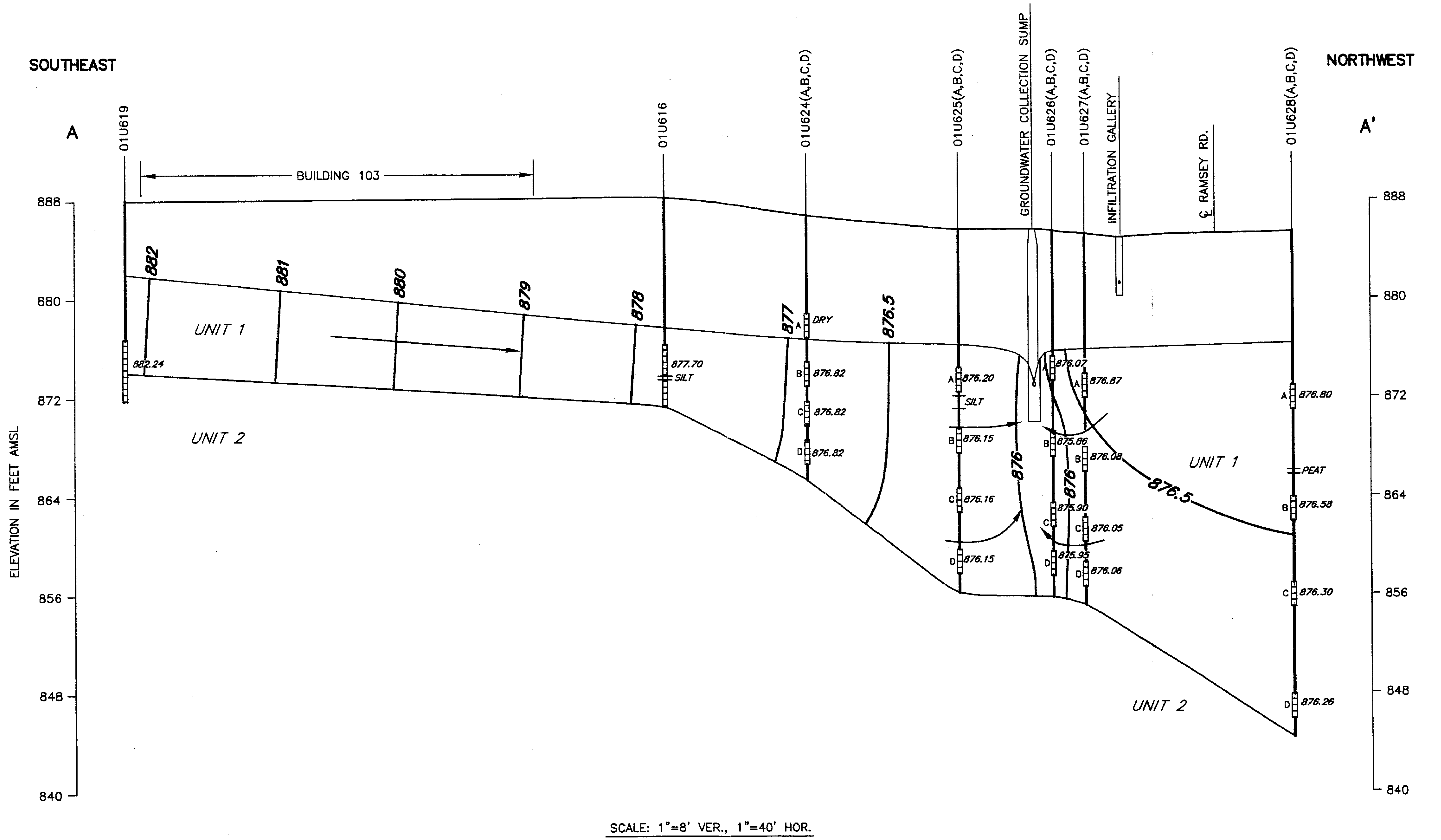


figure 8–4

SITE K, HYDROGEOLOGIC CROSS SECTION A–A'
6/1/00 (Q67)
Twin Cities Army Ammunition Plant

CRA

15213–43(002)GN–SP007 JUN 18/2001

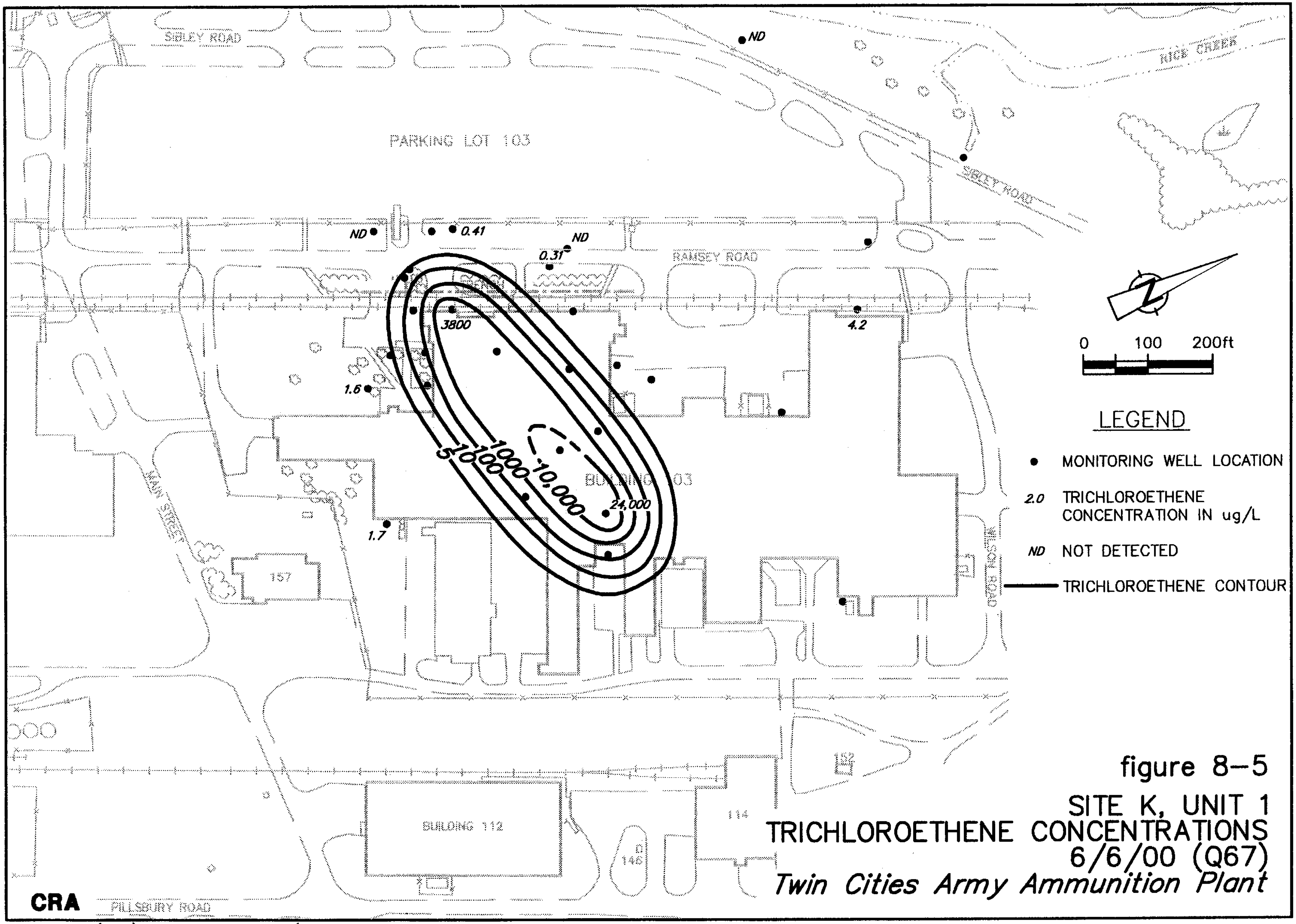


figure 8-5

SITE K, UNIT 1
TRICHLOROETHENE CONCENTRATIONS
6/6/00 (Q67)
Twin Cities Army Ammunition Plant

15213-43(002)GN-SP005 DEC 21/2000

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 1999 through September 2000.

<u>Historical Design and Evaluation of TGRS Remedial Action</u>

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 2000 consistent with the requirements of the OU2 ROD. Table 9-1 presents the cleanup 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 into FY 2001.

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

Summary of Operations

Through FY 2000, 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 "softened" and then "polished" with granular activated carbon (GAC) prior to distribution at TCAAP. Currently, the Arsenal Sand and Gravel Pit option is utilized for the majority of treated water. The TCAAP, through its distribution system, uses approximately 60,000 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.

<u>FY 2000 Maintenance and Inspection Activity</u>

<u>Preventive Maintenance (PM)</u>: 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 1,183,258,000 gallons of contaminated water from October 1999 through September 2000. The system pumped at an average rate of 2245 gpm, of which the boundary wells contributed 2033 gpm and the source control wells contributed 212 gpm. This represents 99 percent of the rate needed to achieve capture. The above pump house 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 97 percent of the time. When the flow rate is corrected for down time, the average operational flowrate was 2,311 gpm, or 102% 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 pump house metered monthly flow volumes of each extraction well and historical flow data. Table 9-3 presents the combined pump house-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 2000 operational notes is presented in Appendix F.2. During FY 2000, 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 five years, is presented in Table 9-4. A summary of average down time for the pumphouses and the treatment center by the category of failure is presented in Table 9-5. A description of each down time event, organized chronologically, is presented in Appendix F.2. The same descriptions organized by affected pumphouse, treatment center, and forcemain is presented in Appendix F.3.

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

Description of Down Time Categories

Pumphouse component failures accounted for an average of 6.2 days down time per pumphouse. The majority of down time was due to significant efforts to rehabilitate extraction wells.

- Pumphouse B2: the well screen and packing were redeveloped, scale deposits were removed from the casing, and a new submersible pump and motor were installed in the well.
- Pumphouse B6: the well screen and packing were redeveloped, scale deposits were removed from the casing, a new submersible pump and motor were installed, and a new well head was installed.
- Pumphouse SC1: the well screen and packing were redeveloped, and scale deposits were removed from the casing.
- Pumphouse SC2: the well and lift system were cleaned by circulating acid through the well and components, and scale deposits were removed from the casing.
- Pumphouse SC3: a new submersible pump and motor were installed, and scale deposits were removed from the casing.
- Pumphouse SC5: well screen and packing were redeveloped and a higher capacity submersible pump and motor were installed in the well.

Other causes of down time included troubleshooting and replacement of failed PLC modules in pumphouses B8 and B11.

Treatment center component failures and repairs that caused pumphouse down time consisted of electric check valve maintenance, malfunctions and repairs, and electrical control equipment failures and subsequent repairs. Treatment center component failures, repairs, and adjustments accounted for an average of 2.7 days of down time.

Electrical service system failures accounted for an average of 1.5 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 2000.

Preventative maintenance procedures accounted for an average of 0.5 days of down time per pumphouse. Preventative maintenance procedures are described in the project Operation and Maintenance Manual.

The category System Modification caused 0.7 day of down time per pumphouse. During FY2000, the PLC system hardware and software were upgraded along with increased control of wet well pump/electric check valve controls. In summary, the major benefit of the upgrade is increased system reliability through:

- Increased reliability of the treatment center by allowing PLC to automatically reset some of the wet well/electric check valve failures;
- Ability to locally reset pumphouse failures; and
- Printed log of system stop and start commands and alarms.

The lift system in pumphouse B1 was also upsized to better handle the higher target flow rate of 235 GPM. Originally, the target flow rate for pumphouse B1 was 200 GPM, but this target was increased to offset the reduced capacity of pumphouse B2.

A forcemain failure caused 0.1 day of down time per pumphouse. Forcemain failures were due to repairs on the back pressure valve located in the chamber on Snelling Avenue and the altitude valve located in the vault at the water tower.

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

Did the system achieve hydraulic capture?

Yes. As discussed in section 9.1, the TGRS achieved the required overall flow rate needed to achieve capture. FY 2000 was the first "off year" of the new biennial monitoring program. In

FY2000 there were not comprehensive monitoring well sampling and water level collection events. Thus, water elevation contour and plume concentration contour maps were not prepared. Based on the consistency observed over the previous 13 years of monitoring and reporting, it can be concluded that the system achieved capture based on the consistency in operation in FY 2000.

Confidence in the groundwater capture was developed 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.

How much VOC mass was removed by the system and how is it changing with time?
As discussed above, the TGRS extracted and treated 1,183,258,000 gallons of water from October 1999 through September 2000. 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 4499 pounds of VOCs from October 1999 through September 2000. The VOC mass is 8% lower than the FY 1999 VOC mass removal of 4878 pounds. The VOC mass removal rate for the TGRS has been declining since FY 1992. This reflects the overall decrease in plume concentration. Table 9-6 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed 176,666 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 9-7 presents a summary of these sampling results. Variations in detection limits from round to round are the result of varying sample dilution performed by the laboratory. Dilutions are required due to the high concentrations of some analytes. The location of the extraction wells is presented on Figure 9-1.

Appendix G.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 or slightly declining through FY 2000. This is probably due to plume redistribution following the shutdown of B12 in FY 1996. Extraction well B7 has been stable and below the contaminant-specific requirement for trichloroethene (5 μg/l), and all other VOCs from March 1995 through FY 2000.

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

As Table 9-6 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 55 percent of the VOC mass removed while accounting for only 12 percent of the water pumped by the system. SC5, in particular, removed 52 percent of the total VOC mass at a rate of only approximately 71 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 2000. The influent/effluent database for FY 2000 is contained in Appendix G.2. TGRS influent is labeled TGRSI and effluent is labeled TGRSE. Figure 9-2 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 2000.

The average FY 2000 influent trichloroethene concentration was 363 μg/l, down from 408 μg/l in FY 1999. 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 9-2 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 2000. A review of the FY 2000 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 99.7 percent.

What was the mass of VOCs emitted into the air?
The air stripping towers remove VOCs with an efficiency of approximately 99.7 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 9-6. Air emissions therefore averaged 12.3 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 1999 through September 2000 were 4,499 pounds.

9.3 REMEDY COMPONENT #3: TREATED WATER DISCHARGE

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

Performance Standard (how do you know when you're done):
When the gravel pit is accommodating the discharge from the treatment system and allowing it to recharge to the aquifer.

Is the remedy component being implemented?
Yes. Based on visual observation during FY 2000, 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 August 2000, the Army, MPCA, and USEPA attended the "USEPA Federal Facilities Remediation Seminar" in Chicago, Illinois.
- In May 2000, the Army, Alliant Techsystems, MPCA, and USEPA attended the "Second International Conference on Remediation of Chlorinated and Recalcitrant Compounds" in Monterey, California.
- New technologies is an ongoing agenda item for the monthly Technical Review Committee meetings between the Army, USEPA, and MPCA. No emerging technologies were identified through the process during FY 2000.

Were any new technologies identified and considered to have merit during FY 2000?

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

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

No response.

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

Yes. The pilot scale test being conducted at Site K (see Section 8.9) will be reported in 2001. These technologies involve in-situ treatment of chlorinated organic compounds. As such, these technologies have potential application to deep groundwater.

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 2000 was consistent with the OU2 ROD. Appendix A summarizes the FY 2000 monitoring plan and any deviations are explained in Appendix C.2. Monitoring was as follows:

Groundwater

Groundwater samples from the extraction wells were collected in December 1999 and June 2000 in accordance with the FY 2000 monitoring plan. Samples were analyzed for VOCs.

Treatment System

The TGRS treatment system influent and effluent was sampled monthly during FY 2000 in accordance with the FY 2000 monitoring plan.

Is additional monitoring proposed prior to the next report?

Yes. Table 9-8 presents the monitoring requirements for Deep Groundwater. For FY 2000 through FY 2004, 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 2000 to FY 2004 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 5μg/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 1,183,258,000 gallons of water and removed 4,499 pounds of VOCs from October 1999 to September 2000.

- 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?

The TGRS reconfiguration plan is expected to be finalized in FY 2001. This plan will address the optimization of the TGRS as required by the OU2 ROD.

Tables

TABLE 9.1

GROUNDWATER CLEANUP LEVELS
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

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

TABLE 9.2

EXTRACTION WELL WATER PUMPED
FISCAL YEAR 2000
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 1999	7,810,100	4,640,100	8,114,600	9,331,700	9,030,200	10,438,500	12,167,500	6,326,100	6,464,600	11,316,100	5,375,800	0	1,672,800	2,289,300	3,951,100	0	2,293,500	101,222,000
November 1999	7,380,300	4,733,900	7,705,700	8,974,700	8,711,900	9,916,700	11,662,400	6,114,100	6,195,700	10,835,700	5,208,400	0	1,603,800	1,437,500	3,781,600	0	2,340,400	96,602,800
December 1999	7,867,350	4,719,100	8,003,750	9,370,100	8,725,650	10,214,300	12,094,450	6,360,300	6,462,450	11,266,700	5,403,800	4,700	1,673,650	1,231,100	3,973,800	1,500	2,194,450	99,567,150
January 2000	7,796,850	4,498,200	8,284,350	9,254,700	10,036,050	10,045,200	12,045,250	6,351,900	6,381,050	11,070,000	5,115,400	0	1,615,650	1,003,600	3,902,900	0	2,289,850	99,690,950
February 2000	7,073,500	4,071,100	9,096,500	8,116,500	9,282,000	9,097,500	11,005,600	5,883,000	5,947,000	10,430,400	4,798,200	0	1,520,300	1,009,500	3,481,600	0	2,789,800	93,602,500
March 2000	7,595,300	4,661,400	8,802,900	8,282,100	9,983,200	9,667,500	10,865,100	6,269,100	6,727,500	10,343,100	4,637,200	0	1,558,400	1,517,800	2,960,200	0	2,278,800	96,149,600
April 2000	7,456,600	3,938,400	9,486,300	8,042,200	9,685,800	8,948,200	10,951,300	5,444,600	6,631,900	10,711,200	4,254,300	0	931,300	2,174,300	2,160,200	0	1,826,400	92,643,000
May 2000	8,795,100	3,296,900	10,225,400	8,192,800	9,594,500	1,712,700	11,651,800	6,155,400	7,180,000	10,424,500	4,806,800	0	1,566,600	2,140,100	1,889,300	0	2,219,700	89,851,600
June 2000	10,406,800	3,399,500	9,685,100	7,215,100	8,654,400	9,217,400	10,524,500	6,124,000	6,714,300	10,080,900	4,185,000	4,800	1,206,000	1,747,500	1,689,600	1,350	4,201,500	95,057,750
July 2000	9,884,000	4,183,400	9,564,300	6,830,100	8,067,500	8,707,100	9,858,400	5,919,400	6,562,900	9,885,500	4,072,600	0	1,202,300	1,884,100	1,656,000	0	5,027,000	93,304,600
August 2000	9,493,300	4,018,700	10,100,100	7,555,100	8,314,300	9,501,100	10,180,300	6,102,500	6,849,100	10,156,800	4,347,000	0	1,310,400	2,147,000	2,092,300	0	4,633,400	96,801,400
September 2000	9,775,800	3,453,700	9,524,300	7,311,300	7,902,800	9,168,600	9,050,600	6,043,100	6,833,000	10,186,900	4,500,500	0	1,332,700	2,322,600	2,152,500	0	4,396,600	93,955,000
TOTAL FY00	101,335,000	49,614,400	108,593,300	98,476,400	107,988,300	106,634,800	132,057,200	73,093,500	78,949,500	126,707,800	56,705,000	9,500	17,193,900	20,904,400	33,691,100	2,850	36,491,400	1,148,448,350

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
FY00	101,335,000	49,614,400	108,593,300	98,476,400	107,988,300	106,634,800	132,057,200	73,093,500	78,949,500	126,707,800	56,705,000	9,500	17,193,900	20,904,400	33,691,100	2,850	36,491,400	1,148,448,350

TABLE 9.3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 2000
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 1999	101,222,000	59,244,000	42,307,000	101,551,000	29,201,000	68,316,000	97,517,000	0	0	0
November 1999	96,602,800	56,622,000	40,582,000	97,204,000	27,060,000	66,605,000	93,665,000	0	0	0
December 1999	99,567,150	58,767,000	41,513,500	100,280,500	27,900,500	69,667,000	97,567,500	0	0	0
January 2000	99,690,950	58,624,000	41,784,500	100,408,500	28,510,500	69,493,000	98,003,500	0	0	0
February 2000	93,602,500	53,652,000	41,146,000	94,798,000	28,986,000	26,096,000	55,082,000	0	0	0
March 2000	96,149,600	53,412,000	45,664,000	99,076,000	34,747,000	52,755,000	87,502,000	0	0	0
April 2000	92,643,000	55,556,000	39,730,000	95,286,000	31,124,000	56,288,000	87,412,000	0	0	0
May 2000	89,851,600	60,195,000	34,535,000	94,730,000	46,815,000	37,486,000	84,301,000	0	0	0
June 2000	95,057,750	60,737,000	40,841,000	101,578,000	45,890,000	44,016,000	89,906,000	0	0	0
July 2000	93,304,600	59,360,000	39,754,000	99,114,000	30,734,000	56,471,000	87,205,000	0	0	0
August 2000	96,801,400	59,555,000	42,523,000	102,078,000	30,104,000	59,251,000	89,355,000	0	0	0
September 2000	93,955,000	57,865,000	39,289,000	97,154,000	28,637,000	57,363,000	86,000,000	0	0	0
TOTAL FY00	1,148,448,350	635,724,000	489,669,000	1,183,258,000	389,709,000	663,807,000	1,053,516,000	0	0	0
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
FY00	1,148,448,350	635,724,000	489,669,000	1,183,258,000	389,709,000	663,807,000	1,053,516,000	0	0	0

TABLE 9.4

PUMPHOUSE DOWN TIME (DAYS)
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well Name	*FY00 Down Time (Days)*	*FY99 Down Time (Days)*	*FY98 Down Time (Days)*	*FY97 Down Time (Days)* (1)	*FY96 Down Time (Days)* (1)
B1	8	12.1	19.9	34.2	0.0
B2	19	39.7	18.4	29.9	13.2
B3	9	30.6	16.1	14.9	0.0
B4	6	17.8	16.9	4.1	0.0
B5	6	9.4	29.1	4.0	0.0
B6	32	10.3	12.6	4.0	0.0
B7	12	28.4	12.3	11.1	13.8
B8	9	21.2	14.9	9.3	0.0
B9	5	9.1	27.3	4.0	0.0
B10	8	29.0	15.8	11.6	0.0
B11	12	31.9	20.6	8.5	6.1
B12	--	--	--	5.0	0.0
SC1	19	47.8	16.1	11.5	102.5
SC2	7	7.5	23.9	5.0	4.0
SC3	7	8.2	12.3	7.7	0.4
SC4	--	--	--	5.2	0.4
SC5	12	14.7	13.9	5.0	0.4

Note:
(1) Days down do not include down time resulting from automatic cycling of well field due to electric check valve failures.

TABLE 9.5

DOWN TIME (DAYS) BY CATEGORY
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Category	*Down Time (Days)*	*Affected Wells/System*
Pumphouse Component	6.2	Pumphouses
Treatment Center Component	2.7	Pumphouses
Electrical Service	1.5	Pumphouses
Miscellaneous	0.0	Pumphouses
Preventive Maintenance	0.5	Pumphouses
System Modification	0.7	Pumphouses
Forcemain	0.1	Pumphouses
TGRS [(1)]	10.5	Treatment System

Anticipated Down Time for Fiscal Year 2001

Pumphouse Component	6	Pumphouses
Treatment Center Component	5	Pumphouses
Electrical Service	4	Pumphouses
Miscellaneous	0.1	Pumphouses
Preventive Maintenance	0.5	Pumphouses
System Modification	0.1	Pumphouses
Forcemain	0.1	Pumphouses

TABLE 9.6

VOC MASS LOADING SUMMARY
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Well	*% Contribution to VOC Mass Removal*	*FY 2000 Total Pounds VOC Mass Removed*
B1	9.6	433.4
B2	0.6	25.0
B3	0.2	10.3
B4	14.6	658.9
B5	12.2	549.5
B6	5.0	224.0
B7	0.0	1.4
B8	0.4	17.5
B9	2.0	89.8
B10	0.1	6.1
B11	0.1	2.8
B12	(Shut down)	0.0
SC1	2.5	112.2
SC2	0.5	24.1
SC3	0.1	2.6
SC4	(Shut down)	0.0
SC5	52.0	2341.2
Fiscal Year 2000 Total (lbs)		*4499*
Daily Average (lbs/day)		*12*

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
2000		4,499
1999		4,878
1998		6,132
1997		6,210
1996		10,655
1995		13,355
1994		15,070
1993		20,165
1992		24,527
1991		26,760
1990		18,005
1989	(First year of full scale system)	19,510
1988		4,800
1987		2,100
Total		*176,666*

TABLE 9.7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
03F302	12/7/99	13	0.4 JP	3.1	3.1	13	< 1	< 1	< 1	< 1	< 1	1.8	< 1	275
(B1)	6/9/00	11	< 1	2.9	3	12	< 1	< 1	< 1	< 1	< 1	1.4	< 1	840
03F303	12/7/99	3.1	1.3	3.5	2.2	1.9	< 1	< 1	< 1	< 1	< 1	3.3	< 1	60
(B2)	6/9/00	2.1	1.3	2.4	1.5	1.6	< 1	< 1	< 1	0.24 JP	< 1	2.7	< 1	58
03F304	12/7/99	1.8	0.34 JP	1.5	1.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6.8
(B3)	6/9/00	3.5	< 1	2	1.5	0.35 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	8.3
03F305	12/7/99	160	< 10	48	50	32	< 10	< 10	< 10	< 10	< 10	< 10	< 10	780
(B4)	6/9/00	120	< 10	36	37	23	< 10	< 10	< 10	< 10	< 10	< 10	< 10	630
03F306	12/7/99	42	< 10	24	28	3.7 JP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	750
(B5)	12/7/99	40 D	< 10 D	22 D	27 D	3.6 JPD	< 10 D	< 10 D	< 10 D	< 10 D	< 10 D	< 10 D	< 10 D	750 D
	6/9/00	28	< 10	18	20	2.7 JP	< 10	< 10	< 10	< 10	< 10	< 10	< 10	550
03F307	12/7/99	9.4 JP	< 10	11	13	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	290
(B6)	6/9/00	6.1	< 1 D	6.4	7.6	1.3	< 1	< 1 D	< 1 D	< 1 D	< 1	< 1 D	< 1 D	250
	6/9/00	6 D	< 1	6.3 D	7.5 D	1.3 D	< 1 D	< 1	< 1	< 1	< 1 D	< 1	< 1	240 D
03F308	12/7/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.5
(B7)	6/9/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.5
03F312	12/7/99	< 1	< 1	< 1	0.56 JP	0.42 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6
(B11)	6/9/00	< 1	< 1	0.31 JP	0.6 JP	0.49 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6
03U301	12/7/99	27	< 10	< 10	< 10	62	< 10	< 10	< 10	< 10	< 10	< 10	< 10	850
(SC1)	6/9/00	28	< 10	3.7 JP	< 10	68	< 10	< 10	< 10	< 10	< 10	< 10	< 10	850
03U314	12/7/99	60	< 1	5.3	3	1.1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	160
(SC2)	6/9/00	31	< 1	3	1.8	0.69 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	87.5
03U315	12/7/99	2.3	< 1	0.4 JP	< 1	< 1	< 1	< 1	< 1	0.46 JP	< 1	< 1	< 1	10
(SC3)	6/9/00	0.9 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6.9
(SC4)	12/7/99	9.2	< 1	1 JP	0.98 JP	< 1	< 1	< 1	< 1	0.53 JP	< 1	< 1	< 1	31
03U316	12/7/99	9.1 D	< 1 D	1.1 D	0.98 JPD	< 1 D	< 1 D	< 1 D	< 1 D	0.49 JPD	< 1 D	< 1 D	< 1 D	29 D
	6/9/00	3.1	< 1	0.35 JP	0.39 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	18
03U317	12/7/99	2200	< 100	63 JP	38 JP	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100	7000
(SC5)	6/9/00	2100	< 100 D	64 JP	40 JP	< 100	< 100	< 100 D	< 100 D	< 100 D	< 100	< 100 D	< 100 D	6800
	6/9/00	2200 D	< 100	72 JPD	40 JPD	< 100 D	< 100 D	< 100	< 100	< 100	< 100 D	< 100	< 100	7200 D
PJ#309	12/7/99	5.1	< 1	2	1.9	0.87 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	26
(B8)	6/9/00	5	< 1	1.8	1.7	0.83 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	24

TABLE 9.7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
PJ#310	12/7/99	18	< 1	7.5	6.9	2.3	< 1	< 1	< 1	< 1	< 1	< 1	< 1	150
(B9)	6/9/00	13	< 1	5.6	5.2	1.8	< 1	< 1	< 1	< 1	< 1	< 1	< 1	120
PJ#311	12/7/99	0.68 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6.3
(B10)	6/9/00	0.72 JP	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	6.2
PJ#313	12/7/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
(B12)	6/9/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

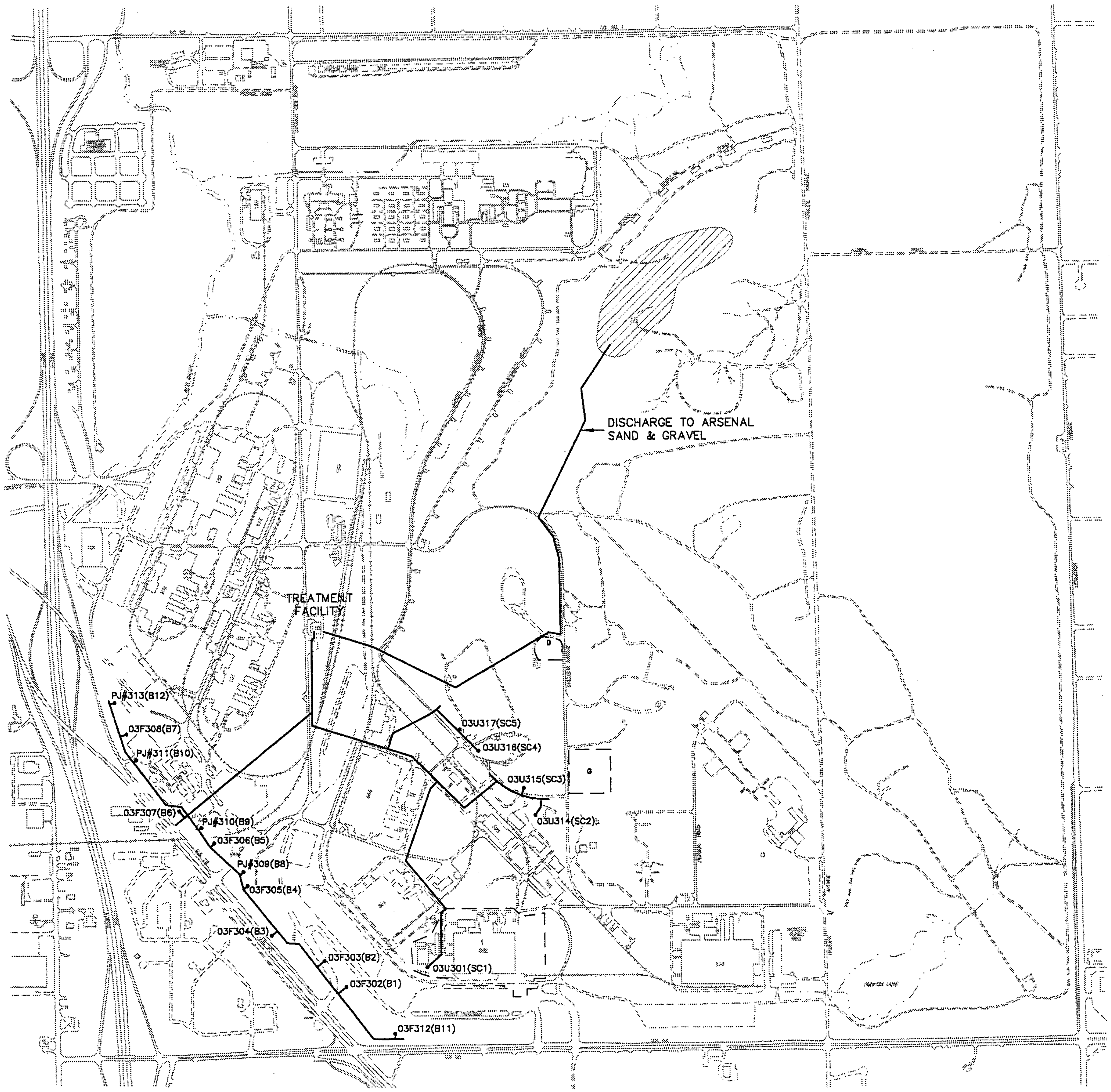
Notes:
Concentration in µg/L.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

TABLE 9.8

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

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

Figures



N

0 400 1200ft

LEGEND

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

EXTRACTION WELL NAME CROSS REFERENCE

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

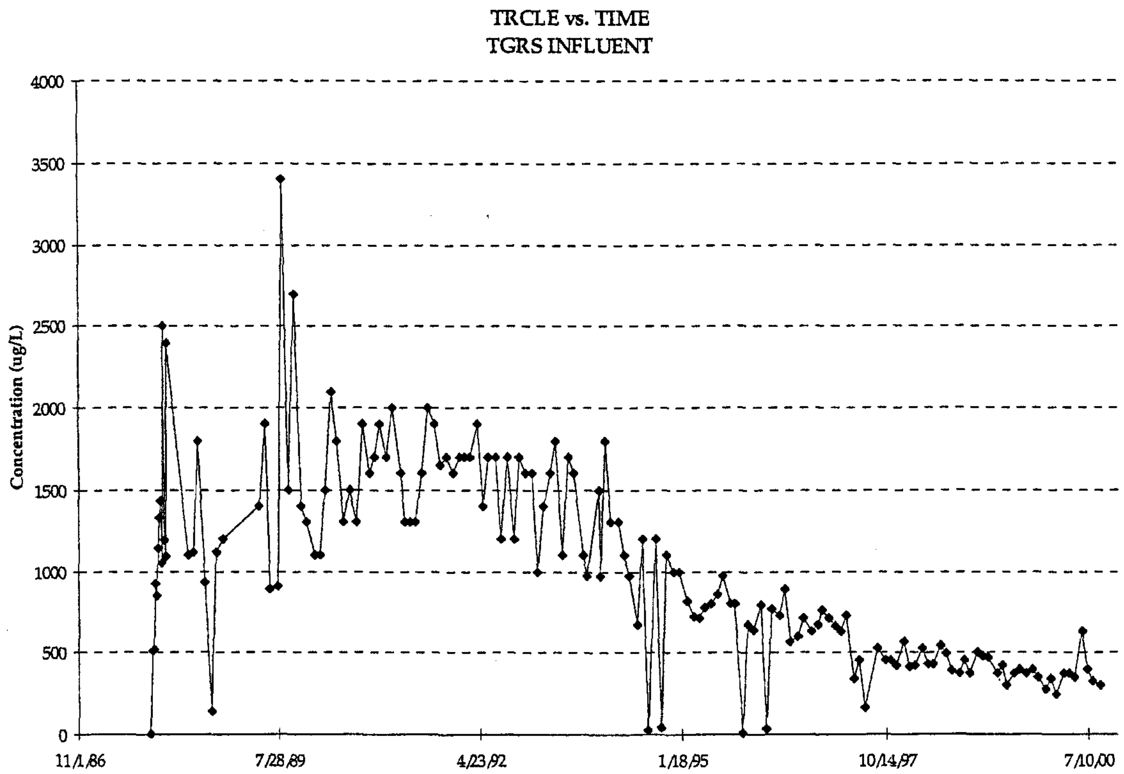
figure 9–1

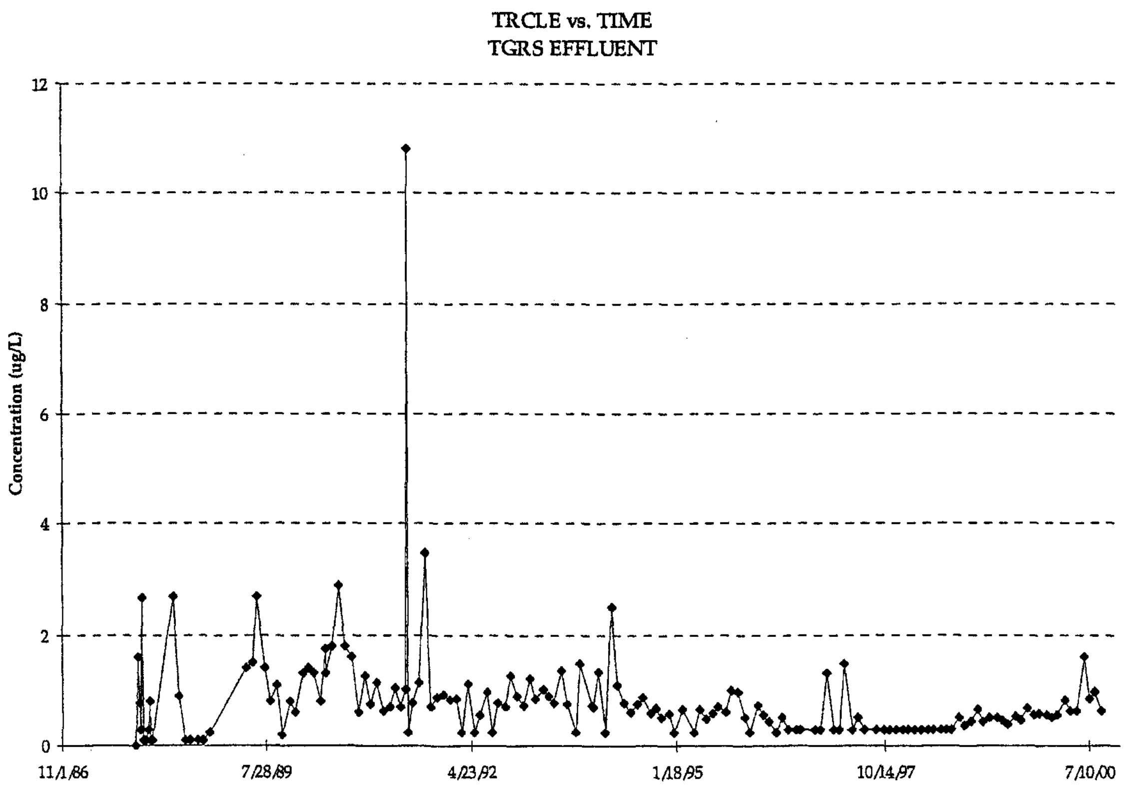
TGRS LAYOUT

Twin Cities Army Ammunition Plant

CRA

15213–43(002)GN–SP008 DEC 21/2000





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

figure 9–2

OU2, TGRS TREATMENT SYSTEM PERFORMANCE

Twin Cities Army Ammunition Plant

CRA

15213–43(002)GN–SP009 DEC 21/2000

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 2000 operation of the PGRS and documents treatment and groundwater capture performance.

In 1997 the PGRS influent dropped to below the ROD required limits for all VOCs. In December 1999, under an agreement with the Agencies, the PGRS pumping rate was reduced from a nominal rate of 1000 gpm to 400 gpm to help determine if the reductions in concentration were the result of actual plume decreases or the result of dilution from over pumping. In conjunction with the flow rate decrease, a quarterly monitoring program was undertaken to monitor for potential "rebound" in VOC concentrations. As of the end of FY 2000, no rebound was observed and a review of the historical database for all of OU3 and the associated source area in OU2 revealed that the entire south plume had dramatically decreased in size and concentration since the early 1990s. The concentration decreases were such that the leading edge of the south plume, at the PGRS, dropped below the ROD requirements.

The results of this evaluation were presented to the Agencies on September 6, 2000, and a report titled "Plume History Evaluation, Operable Unit 3" was submitted to the Agencies on October 10, 2000. The report documents the history of plume size and concentration reductions throughout OU3. Based on the dramatic reductions in plume size and concentration, the report recommends shutting down the PGRS. Comments from the Agencies are pending as of the end of January 2001.

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?

The intent of this ROD requirement is being met. The monitoring data indicates that the south plume no longer extends as far as the PGRS at concentrations above the ROD requirements. Figures in the FY 1999 Annual Performance Report, the last year that comprehensive monitoring of the South Plume was conducted, indicate that the southern edge of the South Plume (1 μg/l plume) was in the vicinity of monitoring well 04U863. Samples collected in FY 2000 from 04U863 were below 1 μg/l, indicating that the southern edge of the South Plume was somewhat north of 04U863. Thus, the containment provided by the PGRS is of no consequence.

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 2000 and the results are provided in Table 10-1. PGRS influent is labeled NB13I and effluent is labeled NB13E. Table 10-2 presents a summary of monthly VOC removal for FY 2000 and Figure 10-2 shows the influent trichloroethene concentration versus time. The average FY 2000 influent trichloroethene concentration was <1.0 μg/l (below detection limits for all rounds).

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 because it is not present in the influent.

How much VOC mass did the system remove?

The PGRS extracted and treated 274,608,000 gallons of water from October 1999 through September 2000 (Appendix H.1), for an average of 521 gpm. A total of 8.5 days of full or partial down time were reported during FY 2000. The down time was the result of failure and repair of a chlorine booster pump. GAC was also changed out during FY 2000 and no down time was reported with this work.

Since the monthly VOC concentrations from the NBM#13 influent for FY 2000 were non-detect throughout the year the PGRS removed a negligible mass of VOCs from October 1999 through September 2000. A summary of the PGRS monthly pumping volumes and VOC mass removal is shown in Table 10-2. The total VOC mass removed from the PGRS from startup through FY 2000 is 132 pounds.

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

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

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

When the City of New Brighton is able to accept the entire discharge from the PGRS, and is doing so on a full time basis.

Is the remedy component being implemented?

Yes. The City of New Brighton 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 groundwater to verify the effectiveness of the remedy." (OU3 ROD, page 2)

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

When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?

Yes. Appendix A summarizes the FY 2000 monitoring plan and any deviations are explained in Appendix C.2. Monitoring was as follows:

Groundwater

Groundwater samples and water level measurements were collected from seven wells in December 1999, March 2000, June 2000, and September 2000. The purpose of this sampling was to monitor for potential VOC concentration "rebound" in the vicinity of the PGRS following the pumping rate reduction in December 1999. All samples were analyzed for VOCs using SW846 8260. Monitoring wells used for water levels and sampling for the PGRS are shown on Figure 10-1. The specific role of each well is provided in Appendix A. Appendix H.2 presents the water level database.

Treatment System

Samples were collected by the City of New Brighton from the treatment facility on a monthly basis beginning in December 1998 and all through FY 2000. Treatment system influent and effluent analytical data are provided in Appendix H.3. The extraction well flow measurements are provided in Appendix H.1.

Is additional monitoring proposed prior to the next report?

Yes. The existing OU3 monitoring requirements are presented in Table 10-3. For FY 2000 through FY 2004, biennial monitoring well sampling and water level measurements are planned. Treatment system influent and effluent will continue to be monitored monthly. Appendix A presents the FY 2000 – FY 2004 monitoring plan. This plan is subject to significant revision (for OU3) based on the outcome of the recommendation to shut down the PGRS, as discussed earlier. A new monitoring plan will be implemented if the PGRS is shut down.

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 2000. There are, however, no wells exhibiting VOC concentrations above the ROD requirements in the vicinity of the PGRS. FY 2000 total VOC concentrations at NBM #13 were non-detect. All detection limits were below the requirements of the ROD.

Chemical Performance

Table 10-4 presents the FY 2000 groundwater quality data. A total of 7 monitoring wells were sampled on four occasions in FY 2000. The treatment system, presented in Table 10-1, was monitored monthly and the influent data represents groundwater from NBM #13, which is completed in the Prairie du Chien formation.

All the monitoring well data was below the ROD requirements. Trichloroethene was the only compound detected and was below 1 $\mu g/L$ in all cases. It was detected at wells 04U863, 4U865, and 04U866. No trend is evident and there was no "rebound" in concentrations following the reduction in the PGRS pumping rate.

The influent samples to the treatment system were non-detect for VOCs in all eleven rounds of sampling. Detection limits were below the ROD requirements for all compounds.

Are any changes or additional actions required for OU3?

Yes. Alliant's recommendation to shut down the PGRS and implement a new monitoring plan is currently under review. This issue will be resolved in FY 2001.

Tables

TABLE 10.1

TREATMENT SYSTEM ANALYTICAL SUMMARY
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*12DCE*	*12DCLE*	*12DCLB*	*12DCLP*	*13DCLB*	*14DCLB*	*2CLEVE*	*BRDCLM*	*C13DCP*	*C2H3CL*	*CCL4*	*C2H5CL*
NB13E	10/19/99	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	12/16/99	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	1/25/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	2/28/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	3/16/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	4/24/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	5/16/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	6/28/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	7/17/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	9/5/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13E	9/14/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	10/19/99	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	12/16/99	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	1/25/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	2/28/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	3/16/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	4/24/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	5/16/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	6/28/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	7/17/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	9/5/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0
NB13I	9/14/00	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10 (1)	<1.0	<1.0	<1.0	<1.0	<1.0

TABLE 10.1

TREATMENT SYSTEM ANALYTICAL SUMMARY
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*C6H6*	*CCL3F*	*CH2CL2*	*CHBR3*	*CH3CL*	*CHCL3*	*CLC6H5*	*DBRCLM*	*ETC6H5*	*MEC6H5*	*T13DCP*	*TCLEA*	*TCLEE*	*TRCLE*	*XYLEN*
NB13E	10/19/99	<1.0	<1.0	<5.0	<1.0	<1.0	1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	12/16/99	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	1/25/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	2/28/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	3/16/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	4/24/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	5/16/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	6/28/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	7/17/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	9/5/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13E	9/14/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	10/19/99	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	12/16/99	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	1/25/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	2/28/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	3/16/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	4/24/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	5/16/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	6/28/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	7/17/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	9/5/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0
NB13I	9/14/00	<1.0	<1.0	<5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<3.0

Notes:
Concentration in μg/L.
August 2000 samples were lost in shipment to laboratory, therefore, samples were re-collected on 9/5/00 to fulfill August monthly monitoring requirements.
No sampling was conducted in November 1999.
Samples were collected and analyzed by Barr Engineering.
(1) Estimated value, QA/QC criteria not met.

TABLE 10.2

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Month	*VOC Influent (µg/L)*	*Water Treated (million gallon)*	*Total VOCs Into Treatment Center (lbs)*	*VOC Effluent (µg/L)*	*Total VOCs Out Of Treatment Center (lbs)*	*Total VOCs Removed By Carbon System (lbs)*
October '99	0.00	45.968	0.00	0.0	0.00	0.00
November '99	NS	21.339	--	NS	--	--
December '99	0.00	14.319	0.00	0.0	0.00	0.00
January '00	0.00	19.822	0.00	0.0	0.00	0.00
February '00	0.00	20.784	0.00	0.0	0.00	0.00
March '00	0.00	22.120	0.00	0.0	0.00	0.00
April '00	0.00	21.530	0.00	0.0	0.00	0.00
May '00	0.00	21.908	0.00	0.0	0.00	0.00
June '00	0.00	21.525	0.00	0.0	0.00	0.00
July '00	0.00	21.454	0.00	0.0	0.00	0.00
August '00	0.00	22.272	0.00	0.0	0.00	0.00
September '00	0.00	21.567	0.00	0.0	0.00	0.00
TOTAL		**274.608**				**0.00**

Notes:
NS - Not Sampled. City Well #3 was not sampled in November because of scheduling conflicts and carbon change out.

TABLE 10.3

SUMMARY OF OU3 MONITORING REQUIREMENTS
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Remedy Component		*Monitoring Requirements*	*Implementing 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 10.4

GROUNDWATER QUALITY DATA
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*ample Date*	*111TCE*	*112TCE*	*11DCE*	*11DCLE*	*C12DCE*	*C2H3CL*	*CCL4*	*CH2CL2*	*CHCL3*	*T12DCE*	*TCLEE*	*TCLTFE*	*TRCLE*
PGRS Cleanup Level [(1)]		200	3	6	70	70	--	--	--	--	--	--	--	5
04J864	12/20/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J864	03/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J864	06/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J864	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J866	12/21/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J866	03/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J866	03/09/00	< 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
04J866	06/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04J866	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U863	12/21/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.69 JP
04U863	03/10/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.51 JP
04U863	06/12/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.67 JP
04U863	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.60 JP
04U864	12/20/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U864	12/20/99	< 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
04U864	03/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U864	06/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U864	06/09/00	< 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
04U864	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
04U865	12/21/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.76 JP
04U865	03/10/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.5 JP
04U865	06/12/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.43 JP
04U865	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.5 JP
04U866	12/21/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.82 JP
04U866	03/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.81 JP
04U866	06/09/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.7 JP
04U866	09/06/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.66 JP
04U866	09/06/00	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	< 1 D	0.59 JP,
414U4	12/21/99	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
414U4	03/10/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
414U4	06/12/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
414U4	09/05/00	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 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.
[(1)] Cleanup levels for PGRS are from the OU3 ROD.

Figures

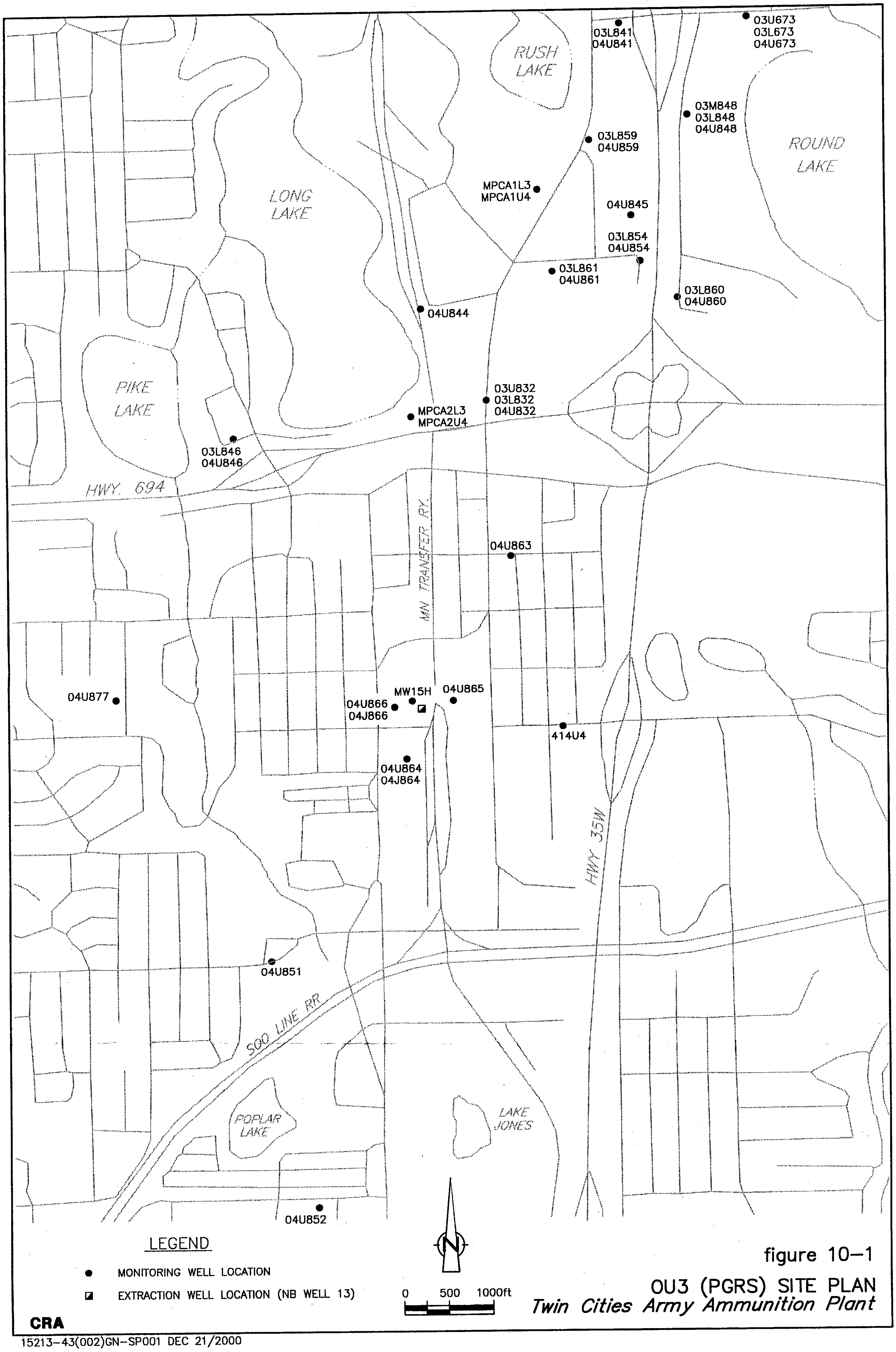


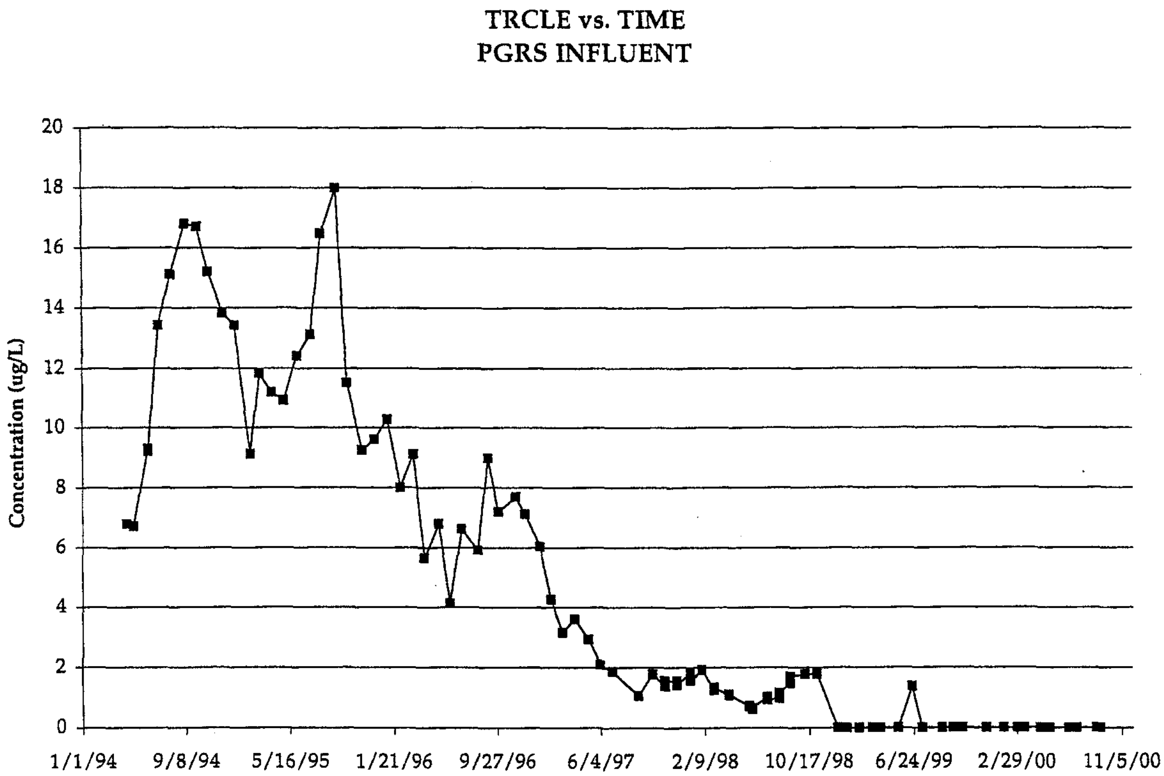
figure 10-1

OU3 (PGRS) SITE PLAN

Twin Cities Army Ammunition Plant

CRA

15213-43(002)GN-SP001 DEC 21/2000



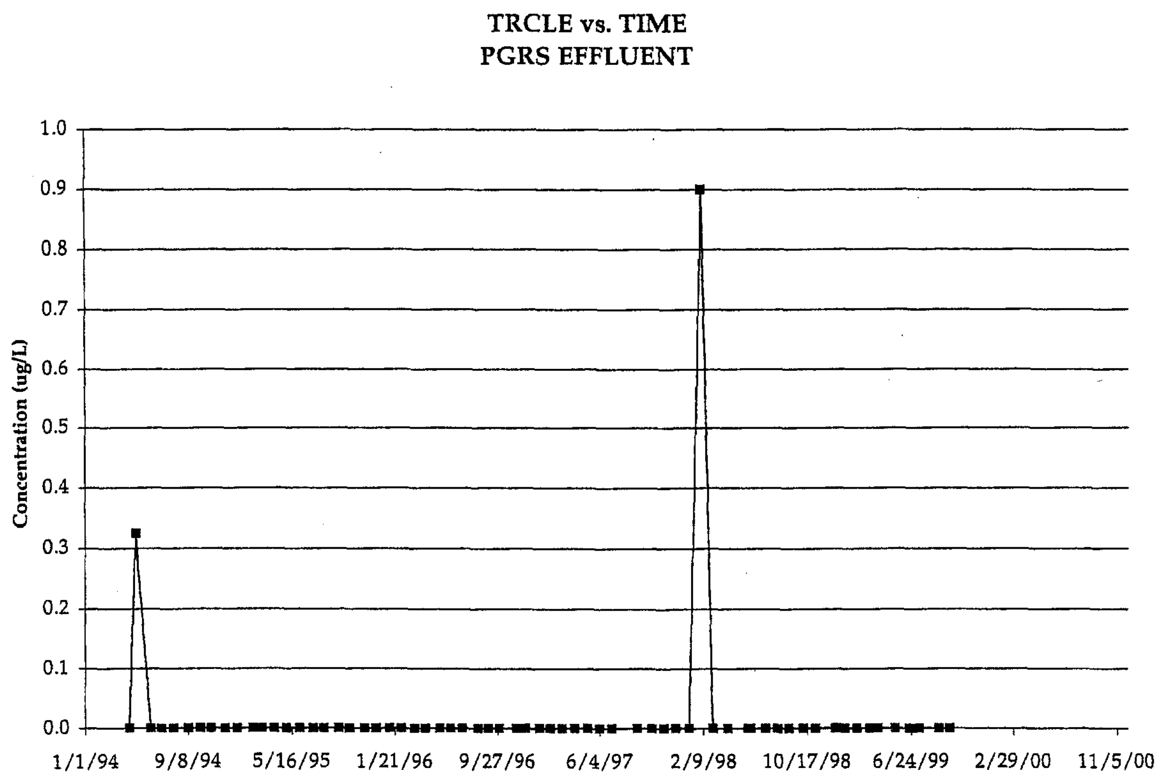


figure 10-2

OU3 (PGRS) TRCLE vs. TIME

Twin Cities Army Ammunition Plant

CRA

15213-43(002)GN-SP010 JAN 04/2001

SECTION 11

11.0 Other Installation Restoration Activities During FY 2000

Appendix I 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

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

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Montgomery Watson, 1999. "Final Alternate Water Supply Construction Report for Period 1997 through 1998". March 1999 (updated April 17, 2000 and August 2, 2000).

"Record of Decision, Groundwater Remediation Operable Unit 3 at New Brighton/Arden Hills Superfund Site." September 1992.

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Wenck Associates, Inc. and Conestoga-Rovers and Associates. "Fiscal Year 1999 Annual Monitoring Report." October 2000.

APPENDIX A

Appendix A

FY 2000 – FY 2004 Monitoring Plans

A.1 Groundwater Monitoring Wells

A.1 FY 2000 – FY 2004 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) "Q (A or B)" denotes a water quality sampling by the appropriate party. The required analyte list for each specific site is shown in Appendix A.4.

(3) The designations refer to the following purposes:

- ❖ Operable Unit 1 Water Quality
  - 1.a = To contour the perimeter of the plume which defines the area of concern for alternate water supply/well abandonment
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 1 Water Levels
  - 3.b = To contour water levels for evaluation of containment
- ❖ Site A Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site A Water Levels
  - 2.b = To contour water levels for evaluation of containment
- ❖ Site I Water Quality
  - 1.a = To track remedy progress
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site I Water Levels
  - 1.a = To track remedy progress
- ❖ Site K Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site K Water Levels
  - 3.a = To contour water levels for evaluation of containment
- ❖ TGRS Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ TGRS Water Levels
  - 1.a = To contour water levels for evaluation of containment
- ❖ Operable Unit 3 Water Quality
  - OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 3 Water Levels
  - 1.a = To contour water levels for evaluation of containment

(4) Sample if in production at time of sample collection.

(5) Sample quarterly from September 2000 through June 2001 (Sept., Dec., March, June), due to shutting off "second line" of Site A extraction wells.

(6) Sample quarterly during operation of Site A AS/SVE system.

(7) Quarterly water levels and water quality for FY 2000 only (Dec., March, June, and Sept.).

(8) Quarterly water levels and water quality for FY 2000 and FY 2001 only (Dec., March, June, and Sept.).

(9) Quarterly water levels and water quality for first year following well construction.

Appendix A.1
FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
Operable Unit 1											
01U	01U807			---	---	---	---	---	---	---	
01U	01U813			---	---	---	---	---	---	---	
01L	01L813			---	---	---	---	---	---	---	
01L	01L816			---	---	---	---	---	---	---	
01L	01L821			---	---	---	---	---	---	---	
01L	01L822			---	---	---	---	---	---	---	
01L	01L823			---	---	---	---	---	---	---	
03U	03U811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U815			---	---	---	---	---	---	---	
03U	03U821			---	---	---	---	---	---	---	
03U	03U822			---	Q,L(B)		Q,L(B)	---	1.a, OR	None	
03U	03U824			---	---	---	---	---	---	---	Sealed 2000
03U	03U831			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	409550	PCA 6U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03U	409596	BS118U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03M	03M843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03L	03L813			---	---	---	---	---	---	---	
03L	03L822			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L841			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L846			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L853			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L856			---	---	---	---	---	---	---	
03L	03L858			---	---	---	---	---	---	---	
03L	409546	PCA2L3		---	---	---	---	---	---	---	
03L	409556	PCA4L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409557	PCA1L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409597	BS118L3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U821			---	---	---	---	---	---	---	
PC	04U834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U836	MW-1		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U837	MW-3		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U838	MW-5		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U839	MW-7		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U841			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U844			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U846			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U847			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U849			---	---	---	---	---	---	---	
PC	04U850			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U855			Q,L(B)	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U871			---	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	

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FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
PC	04U872			---	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U875			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U877			---	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U879			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U880			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U881			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	04U882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U883			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	191942	BS118U4		---	Q,L(B)	---	---	---	---	---	One-time event
PC	200154	UM Golf Course		---	Q (B)	---	Q (B)	---	1.a, OR	---	
PC	206688	Cloverpond		---	Q (B)	---	Q (B)	---	1.a, OR	---	
PC	234547	Hnywell Ridgway		---	---	---	---	---	---	---	
PC	409547	PCA1U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409548	PCA2U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409549	PCA3U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409555	PCA5U4		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	512761	Gross Golf Course #2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	554216	New Brighton #14									See Appendix A.2
PC	582628	New Brighton #15									See Appendix A.2
J	04J834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	04J835			---	---	---	---	---	---	---	
J	04J836	MW-2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J837	MW-4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J838	MW-6		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J839	MW-8		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	200524	St. Anthony #5	(4)	---	Q(B)	---	Q(B)	---	OR	---	
J	200803	St. Anthony #4	(4)	---	Q(B)	---	Q(B)	---	OR	---	
J	206796	New Brighton #5									See Appendix A.2
J	206797	New Brighton #6									See Appendix A.2
PC/J	200804	St. Anthony #3	(4)	---	Q(B)	---	Q(B)	---	OR	---	
PC/J	200812	Gross Golf #1		---	---	---	---	---	---	---	
PC/J	206792	New Brighton #4									See Appendix A.2
PC/J	206793	New Brighton #3									See Appendix A.2
PC/J	234549	Reiner		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC/J	PJ#318			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC/J/SL	233221	R & D Systems		---	---	---	---	---	---	---	No longer in operation
UNK	234546	Hnywell Ridgway		---	Q(B)	---	Q(B)	---	OR	---	

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Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
Operable Unit 2											
Site A Removal Action											
01U	01U038			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U039			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U040			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U041			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U063			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U067			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U102			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U103		(6)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U104			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U105			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U106			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U107			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U108		(6)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U109			---	---	---	---	---	---	---	Sealed 1999
01U	01U110			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U115			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U116			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U117			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U118			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U119			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U120			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U125			Q,L(B)	---	---	---	---	OR	2.b	
01U	01U126			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U127			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U133			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U135			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U136			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U137			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U138			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U139		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U140		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U141			L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U142	Piezometer		---	---	---	---	---	---	---	
01U	01U143	Piezometer		---	---	---	---	---	---	---	
01U	01U144	Piezometer		---	---	---	---	---	---	---	
01U	01U145	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U146	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U147	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U148	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U149	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U150	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	

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Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
01U	01U151	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U152	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U153	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U154	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U155	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U156	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	2.b	
01U	01U157			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U158			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U350		(6)	---	Q,L(B)	Q,L(B)	---	---	OR	2.b	
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	(5)								See Appendix A.2
01U	01U356	EW-6	(5)								See Appendix A.2
01U	01U357	EW-7	(5)								See Appendix A.2
01U	01U358	EW-8									See Appendix A.2
01U	01U901			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U902		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U903			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	
01U	01U904		(5)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	2.b	

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Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
Site I Remedial Action											
01U	01U004			---	---	---	---	---	---	---	
01U	01U054			---	---	---	---	---	---	---	
01U	01U064			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U132			---	---	---	---	---	---	---	
01U	01U631			---	---	---	---	---	---	---	
01U	01U632			---	---	---	---	---	---	---	
01U	01U634			---	---	---	---	---	---	---	
01U	01U635			---	---	---	---	---	---	---	
01U	01U636			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U638			---	---	---	---	---	---	---	
01U	01U639			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U640			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	01U642			---	---	---	---	---	---	---	
01U	01U652			---	---	---	---	---	---	---	
01U	01U666			---	---	---	---	---	---	---	
01U	01U667			---	---	---	---	---	---	---	
01U	01U668			---	---	---	---	---	---	---	
01U	01U675			---	---	---	---	---	---	---	
01U	482086	I01MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482087	I05MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482088	I02MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	
01U	482089	I04MW		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	

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Well Information				Combined Water Level/Water Quality Plan (1,2)					Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	Jun 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
Site K Remedial Action											
01U	01U047			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U048			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U052			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U065			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U128			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U601			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U602			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U603			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U604			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U605			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U607			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U608			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U609			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U611			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U612			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U613			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U615			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U616			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U617			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U618			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U619			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U620			L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	01U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,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		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	482084	K02-MW		L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
01U	482085	K01-MW		L(A)	L(A)	L(A)	L(A)	L(A)	—	3.a	
03U	03U621		(9)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments

TCAAP Groundwater Recovery System

Unit	Well I.D.	Common Name	Notes	Jun 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
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)	---	---	1.a	
03U	03U002			---	L(A)	---	L(A)	---	---	1.a	
03U	03U003			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U004			---	L(A)	---	L(A)	---	---	1.a	
03U	03U005			---	L(A)	---	L(A)	---	---	1.a	
03U	03U006			---	---	---	---	---	---	---	Sealed 2000
03U	03U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U008			---	L(A)	---	L(A)	---	---	1.a	
03U	03U009			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U010			---	L(A)	---	L(A)	---	---	1.a	
03U	03U011			---	L(A)	---	L(A)	---	---	1.a	
03U	03U012			---	L(A)	---	L(A)	---	---	1.a	
03U	03U013			---	L(A)	---	L(A)	---	---	1.a	
03U	03U014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U015			---	L(A)	---	L(A)	---	---	1.a	
03U	03U016			---	L(A)	---	L(A)	---	---	1.a	
03U	03U017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U019			---	L(A)	---	L(A)	---	---	1.a	
03U	03U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U022			---	L(A)	---	L(A)	---	---	1.a	
03U	03U023			---	L(A)	---	L(A)	---	---	1.a	
03U	03U024			---	L(A)	---	L(A)	---	---	1.a	
03U	03U025			---	L(A)	---	L(A)	---	---	1.a	
03U	03U026			---	L(A)	---	L(A)	---	---	1.a	
03U	03U027			---	L(A)	---	L(A)	---	---	1.a	
03U	03U028			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U029			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U030			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U031			---	L(A)	---	L(A)	---	---	1.a	
03U	03U032			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U075			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U076			---	L(A)	---	L(A)	---	---	1.a	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
03U	03U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U082			---	L(A)	---	L(A)	---	---	1.a	
03U	03U083			---	L(A)	---	L(A)	---	---	1.a	
03U	03U084			---	L(A)	---	L(A)	---	---	1.a	
03U	03U087			---	L(A)	---	L(A)	---	---	1.a	
03U	03U088			---	L(A)	---	L(A)	---	---	1.a	
03U	03U089			---	L(A)	---	L(A)	---	---	1.a	
03U	03U090			---	L(A)	---	L(A)	---	---	1.a	
03U	03U092			---	L(A)	---	L(A)	---	---	1.a	
03U	03U093			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U094			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U096			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U097			---	---	---	---	---	---	---	
03U	03U099			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U111			---	L(A)	---	L(A)	---	---	1.a	
03U	03U112			---	L(A)	---	L(A)	---	---	1.a	
03U	03U113			---	L(A)	---	L(A)	---	---	1.a	
03U	03U114			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U121			---	---	---	---	---	---	---	
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)	---	---	1.a	
03U	03U648			---	L(A)	---	L(A)	---	---	1.a	
03U	03U658			---	L(A)	---	L(A)	---	---	1.a	
03U	03U659			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U671			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U672			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U674			---	L(A)	---	L(A)	---	---	1.a	
03U	03U675			---	---	---	---	---	---	---	
03U	03U676			---	L(A)	---	L(A)	---	---	1.a	
03U	03U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U703			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U704			---	L(A)	---	L(A)	---	---	1.a	
03U	03U705			---	L(A)	---	L(A)	---	---	1.a	
03U	03U706			---	L(A)	---	L(A)	---	---	1.a	
03U	03U707			---	L(A)	---	L(A)	---	---	1.a	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
03U	03U708			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U710			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U711			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U715			---	L(A)	---	L(A)	---	---	1.a	
03U	03U716			---	L(A)	---	L(A)	---	---	1.a	
03U	03U801			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U803			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U804			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U805			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	519288	E101-MW		---	---	---	---	---	---	---	
03U	519289	E102-MW		---	---	---	---	---	---	---	
03U	519290	E103-MW		---	---	---	---	---	---	---	
03U	519291	1291501-MW		---	---	---	---	---	---	---	
03M	03M001			---	L(A)	---	L(A)	---	---	1.a	
03M	03M002			---	L(A)	---	L(A)	---	---	1.a	
03M	03M003			---	L(A)	---	L(A)	---	---	1.a	
03M	03M004			---	L(A)	---	L(A)	---	---	1.a	
03M	03M005			---	L(A)	---	L(A)	---	---	1.a	
03M	03M007			---	L(A)	---	L(A)	---	---	1.a	
03M	03M010			---	L(A)	---	L(A)	---	---	1.a	
03M	03M012			---	L(A)	---	L(A)	---	---	1.a	
03M	03M013			---	L(A)	---	L(A)	---	---	1.a	
03M	03M017			---	L(A)	---	L(A)	---	---	1.a	
03M	03M020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M713			---	L(A)	---	L(A)	---	---	1.a	
03M	03M802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M806			---	L(A)	---	L(A)	---	---	1.a	
03L	03L001			---	L(A)	---	L(A)	---	---	1.a	
03L	03L002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L003			---	L(A)	---	L(A)	---	---	1.a	
03L	03L004			---	L(A)	---	L(A)	---	---	1.a	
03L	03L005			---	L(A)	---	L(A)	---	---	1.a	
03L	03L007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03L	03L010			---	L(A)	---	L(A)	---	---	1.a	
03L	03L012			---	L(A)	---	L(A)	---	---	1.a	
03L	03L013			---	L(A)	---	L(A)	---	---	1.a	
03L	03L014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L021			---	L(A)	---	L(A)	---	---	1.a	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
03L	03L027			---	L(A)	---	L(A)	---	---	1.a	
03L	03L028			---	L(A)	---	L(A)	---	---	1.a	
03L	03L029			---	L(A)	---	L(A)	---	---	1.a	
03L	03L077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L080			---	L(A)	---	L(A)	---	---	1.a	
03L	03L081			---	L(A)	---	L(A)	---	---	1.a	
03L	03L084			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L086			---	---	---	---	---	---	---	
03L	03L091			---	---	---	---	---	---	---	
03L	03L113			---	L(A)	---	L(A)	---	---	1.a	
03L	03L137			---	---	---	---	---	---	---	
03L	03L138			---	---	---	---	---	---	---	
03L	03L802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L806			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L809			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L833			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U001			---	L(A)	---	L(A)	---	---	1.a	
PC	04U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U003			---	L(A)	---	L(A)	---	---	1.a	
PC	04U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U012			---	L(A)	---	L(A)	---	---	1.a	
PC	04U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U510			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U711			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U714			---	L(A)	---	L(A)	---	---	1.a	
PC	04U802			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U833			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J077			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J714			---	L(A)	---	L(A)	---	---	1.a	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
PC/J	PJ#003			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#027			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#074			---	---	---	---	---	---	---	
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)	---	---	1.a	
PC/J	PJ#806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
SG	Staff Gauges			---	---	---	---	---	---	---	

Appendix A.1

FY 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	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 2000 - FY 2004 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 00	Jun 01	Jun 02	Jun 03	Jun 04	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03U	03U832			—	—	—	—	—	—	—	
03M	03M848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L832			—	—	—	—	—	—	—	
03L	03L848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L854			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	03L859			—	L(A)	—	L(A)	—	—	1.a	
03L	03L860			—	L(A)	—	L(A)	—	—	1.a	
03L	03L861			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
03L	476837	MW15H		—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U414	414U4	(7)	Q,L(A)	Q,L(A)	—	—	—	—	—	
PC	04U673			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U832			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U845			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U848			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U851			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U852			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U854			—	L(A)	—	L(A)	—	—	1.a	
PC	04U859			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U860			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U861			—	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U863	323U4	(7)	Q,L(A)	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U864	324U4	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U865	325U4	(8)	Q,L(A)	Q,L(A)	—	Q,L(A)	—	OR	1.a	
PC	04U866	326U4	(8)	Q,L(A)	Q,L(A)	—	L(A)	—	OR	1.a	
PC	520931	NBM #13									See Appendix A.2
J	04J864	324 J	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J866	326 J	(8)	Q,L(A)	Q,L(A)	—	Q,L(A)	—	OR	1.a	

A.2 Remedial Treatment Systems

Appendix A.2
FY 2000 - FY 2004 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 - Monthly	- Pumping Volumes - Water Quality (2)
• PGAC Effluent	- Monthly	- Water Quality (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, C12DCE, TRCLE, 111TCE

OU2: SITE A SHALLOW GROUNDWATER

Location	Sampling Frequency	Parameters
• Extraction Wells 01U351-01U358	- Monthly - Monthly (4) - Annual (4)	- Pumping Volumes - Water Levels Water Quality (2)
• Extraction/Discharge System Effluent	- Monthly	- C12DCE, T12DCE, TRCLE, 111TCE, HG (3)

OU2: SITE A AIR SPARGING/SVE SYSTEM [Only if Operating!]

Location	Sampling Frequency	Parameters
• SVE Emissions	- Monthly (5) - Twice per Month (6)	- USEPA Method TO14 List - Flowrate

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 Water Quality (2)
• Treatment System Influent	- Monthly - Monthly	- Water Quality (2) - Volume
• Treatment System Effluent	- Monthly	- Water Quality (2)

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

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

NOTE:

(1) Performed by the City of New Brighton using their Sampling and Analysis Plan.
(2) The required analyte list for each specific site is presented in Appendix A.4.
(3) Site A effluent sampling frequency and parameters are as required by the MCES Special Discharge Permit (#2194).
(4) Sample 01U355, 01U356, and 01U357 quarterly and record water levels from September 2000 through June 2001 (Sept., Dec., March, June). 01U358 is not being sampled or monitored for water level.
(5) Site A AS/SVE emissions sampling may be reduced to once per 2 months after steady-state condition is reached.
(6) Site A AS/SVE flowrate measurements to be daily for 1st month and weekly for 2nd month.

A.3 Surface Water

Appendix A.3

FY 2000 - FY 2004 Monitoring Plan for Surface Water

Analysis	Analytical Method	Units	Outfall 010 Site K Effluent	20700 Rice Crk In	20800 Rice Crk Out
Flow Rate	- -	M gal/day	Continuous	A	A
Total Flow	- -	M gal	M	- -	- -
pH	(field)		Q	A	A
Cyanide	9012A	ug/l	Q	A	A
Copper	6020	ug/l	Q	A	A
Lead	6020	ug/l	Q	A	A
Mercury	7470A	ug/l	Q	A	A
Phosphorus (Total)	365.4	mg/l	Q	A	A
Silver	7761	ug/l	Q	A	A
Zinc	6020	ug/l	Q	A	A
Trichloroethene	8260B	ug/l	Q	A	A
1,1-Dichloroethene	8260B	ug/l	Q	A	A
1,1-Dichloroethane	8260B	ug/l	Q	A	A
Cis-1,2-Dichloroethene	8260B	ug/l	Q	A	A
Trans-1,2-Dichloroethene	8260B	ug/l	Q	A	A
Vinyl Chloride	8260B	ug/l	Q	A	A
1,2-Dichloroethane	8260B	ug/l	Q	A	A

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

A.4 Site Specific Lists of Required Analytes

Appendix A.4
Site Specific Lists of Required Analytes

Note: Cleanup levels (in ug/l) from each Record of Decision are shown below for use in determining the required method detection limits. Also note that these lists represent the minimum list of analytes. A larger analyte list may be utilized by the monitoring organization, if so desired.

OU1 (DEEP GROUNDWATER) (1)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

SITE A (SHALLOW GROUNDWATER) (2)

Antimony*	6
1,1-Dichloroethene	6
1,2-Dichloroethane	4
Benzene	10
Chloroform	60
cis-1,2-Dichloroethene	70
Tetrachloroethene	7
Trichloroethene	30

*Antinomy is only monitored at 01U103, 01U902 and 01U904 on an annual basis.

SITE I (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30
Vinyl Chloride	0.2

SITE K (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30

OU2 (DEEP GROUNDWATER) (2)

1,1,1-Trichloroethane	200
1,1-Dichloroethane	70
1,1-Dichloroethene	6
1,2-Dichloroethane	4
cis-1,2-Dichloroethene	70
Tetrachloroethene	5
Trichloroethene	5

OU3 (DEEP GROUNDWATER) (3)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

NOTES:

(1) From page 18 of the OU1 Record of Decision.
(2) From Table 1 of the OU2 Record of Decision.
(3) From Page 26 of the OU3 Record of Decision.

Analytical Methods:
Volatile Organic Compounds: SW-846 Method 8260B
Antimony: SW-846 Method 6020

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 conceptually illustrated on Figure B-1 and are described below:

Unit 1: This unit, referred to as the Fridley Formation, consists of alluvium and lacustrine deposits above the Twin Cities Formation (Unit 2). The formation is made up of fine- to medium-grained sand and clayey silt which acts as an unconfined aquifer with an estimated hydraulic conductivity of 8.3×10^{-3} cm/sec (International Technology Corp. 1992). The Unit 1 deposits are discontinuous at TCAAP and ranges in thickness from zero to 50 feet. They are predominantly limited to the north, east, and southwest portions of the site. Groundwater in Unit 1 is also discontinuous.

Unit 2: Known as the Twin Cities Formation, (Unit 2) consists of Quaternary aged glacial till and, similar to Unit 1, is discontinuous at TCAAP. Unit 2 is generally regarded as an aquitard to vertical migration of groundwater; however, sand and gravel lenses may contain water.

Unit 3: This unit consists primarily of the Quaternary aged Hillside Sand Formation which is continuous beneath TCAAP. Near the center of TCAAP, the Hillside Sand Formation is overlain by the Arsenal Sand, which forms a kame. There is no distinct lithologic contact between the Hillside Sand and the Arsenal Sand, and both are considered included in Unit 3. Unit 3 ranges in thickness from 25 to 450 feet. For monitoring purposes, the Unit 3 aquifer thickness has been arbitrarily subdivided into thirds designated as upper, middle, and lower.

Unit 4: This unit consists collectively of bedrock from the Prairie du Chien Group and Jordan Formation (Ordovician and Cambrian periods, respectively). For monitoring purposes, the Prairie du Chien Group is referred to as Upper Unit 4, while the Jordan Formation is Lower Unit 4. The Jordan Formation varies from fine- to coarse-grained quartz sandstone. The Prairie du Chien Group in the TCAAP area consists of a finely crystalline dolomite of the Oneota Formation, as well as quartz sandstone and dolomite members of the Shakopee Formation. A more detailed description of the bedrock geology can be found in the Remedial Investigation Report (Argonne National Laboratory, 1991).

In order to identify the hydrogeologic unit in which each well is completed, the United States Army Environmental Center (USAEC), formerly the United States Army Toxic and Hazardous Materials Agency (USATHAMA), developed a standardized identification system for wells at TCAAP. Well designations consist of six characters, such as 03U093. The first two characters represent the hydrogeologic unit in which the well is completed, as follows:

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

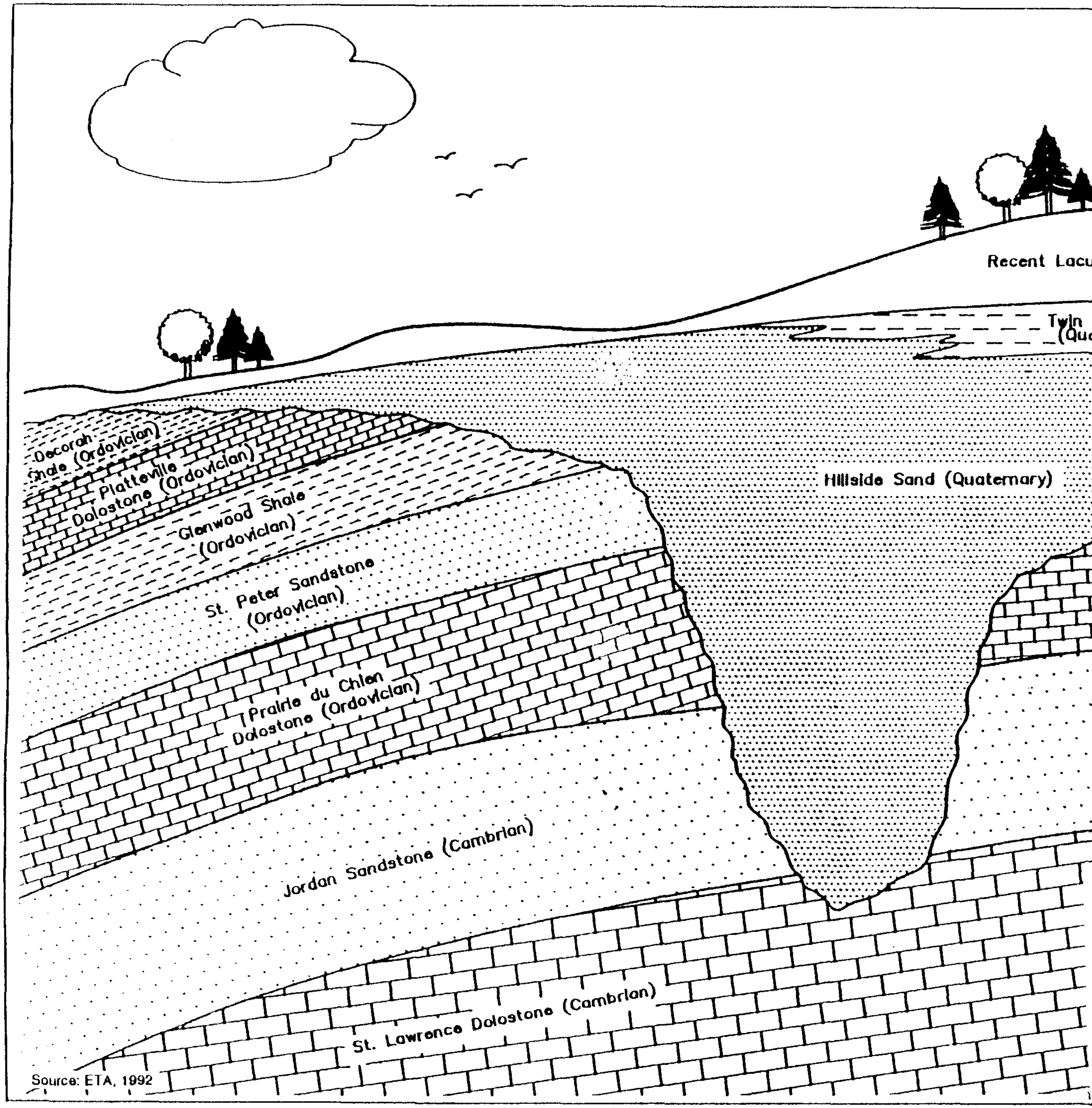
The third character represents the relative position of the well screen or open hole within the specified hydrogeologic unit, as follows:

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

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

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



Twin Cities Army Ammunition Plant

Figure B-1

Conceptual Illustration of
TCAAP Site Geology

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				
200531		NAZARETH	OFF	UN				

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
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 8/9	✓		D-8	
231857	03M505			ABAND	✓		K-12	
231878		MENGELKOCH #2	OFF	UN				R-25
232067		NBR 135	OFF	UN				
232069		UHIL	OFF	UN				
233221		REUBEN MEAT	OFF	DOM				CC-[illegible]

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
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
234195	04U007	S7U4	ON	MON			J-12	
234196	04U012	S12U4	ON	MON			B-3	
234197	04U020	S20U4	ON	MON			I-6	P-26

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
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
234430		CMIEL	OFF	UN	✓			Q-26
234431		HARSTAD	OFF	UN				
234463		KEN SOLIE	OFF	UN				V-21
234546		HONEYWELL RIDGEWAY	OFF	UN				BB-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
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	
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

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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
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				
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	

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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
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
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				

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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
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-2

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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
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	

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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
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
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

TCAAP WELL INDEX
SORTED BY UNIQUE NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location	
							On-post	Off-post
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							
	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				

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
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

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
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	
427412	01U116		ON	MON			A-5	

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
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	
236189	01U601	OW101U1	ON	MON			F-3	
236190	01U602	OW102U1	ON	MON			F-3	

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
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				
242135	01U666	OW536U1	ON	MON			K-5	
242136	01U667	OW537U1	ON	MON			J-6	
242137	01U668	OW538U1	ON	MON			J-6	

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
	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	
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

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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
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	
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	

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
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
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	

TCAAP WELL INDEX
SORTED BY IRDMIS NUMBER

Minnesota Unique #	IRDMIS #	Common Name	Well Location	Well Type	Well Sealed	Second Unique #	Well Location	
							On-post	Off-post
	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	
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

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
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
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

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
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				
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				

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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
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
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				

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
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				
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

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
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 2000 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 2000 was comprised of Quarter 65 (October through December), Quarter 66 (January through March), Quarter 67 (April through June), and Quarter 68 (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 2000 Annual Monitoring Plan (Appendix A) which established the monitoring responsibilities for both:

- The Army (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 A.4 contains analyte lists which are referenced by the monitoring plans in Appendix A and which are site-specific, based on the chemicals of concern. Halogenated volatile organic compounds were the parameters of primary interest, while select wells were sampled for aromatic volatile organic compounds and antimony. Appendix C.2 presents clarifications and deviations from the FY 2000 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.3 and C.4 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 for Sites A and K shallow groundwater using Quarter 67 data. Since FY 2000 was the "off year" in the biennial monitoring program, no data was available for preparation of Units 3 or 4 groundwater elevation contour maps.

2.3 Groundwater Quality Contour Maps and Cross-Sections

The most extensive sampling event performed during FY 2000 was in June (Quarter 67). At Sites A and K, 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. Since FY 2000 was the "off year" in the biennial monitoring program, no data was available for preparation of Unit 3 or 4 groundwater quality contour maps.

For Site A, isoconcentration contour maps were developed for cis-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 cis-1,2-dichloroethene. Contour maps for Site A were prepared only for Unit 1 since this is the only contaminated aquifer.

Contaminant concentrations at recovery wells are 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.

C.2 Deviations from Monitoring Program

APPENDIX C.2
DEVIATIONS FROM MONITORING PROGRAM
FISCAL YEAR 2000, TCAAP

OU1 DEEP GROUNDWATER

No deviaitons from the sampling program.

OU2: SITE A SHALLOW GROUNDWATER

February 2000
Groundwater elevation was not measured at 01U356 due to water leaking from pitless adapter inside well casing.

May 2000
No tripblank results for the monthly sampling event, as the submitted tripblank had elevated concentrations.

June 2000
Groundwater elevation was not measured at 01U109, as location was abandoned.

Groundwater elevation was not measured at 01U154 as well was obstructed.

Groundwater elevation was not measured, and sample was not collected at 01U125 as well was dry.

OU2: SITE I SHALLOW GROUNDWATER

June 2000
Groundwater elevations were not measured and samples were not collected from the following wells, as they were dry; 01U639, 01U640, 482086, 482087, 482088, 482090.

No field parameters were collected from 01U636, due to insufficient groundwater volume.

OU2: SITE K SHALLOW GROUNDWATER

May 2000
No tripblank results for the monthly sampling event, as the submitted tripblank had elevated concentrations.

June 2000
The following wells were purged dry after only 1 set of field readings: 01U604, 01U611, 01U615, 01U617, 01U618, K04-MW.

No field parameters were recorded at 01U603 due to an insufficient volume of groundwater.

01U624 was not sampled as it was dry.

OU2 DEEP GROUNDWATER (TGRS)

May 2000
No tripblank results for the monthly sampling event, as the submitted tripblank had elevated concentrations.

June 2000
The following wells were sampled on June 15-16, 2000, then resampled on June 21, 2000, due to high DO readings: 03UO93, 03U094, 03U099, 03U708.

OU3 DEEP GROUNDWATER (PGRS)

No deviations from the sampling program.

SURFACE WATER

No deviations from the sampling program.

C.3 IRDMIS Flagging Codes

1.08 Flagging Code

Element Description

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

Element Size and Characteristics

IRDMIS Record

1 uppercase alphabetical character, full field (as many as 8 per record)

IRDMIS Database

chem/cqc: as many as 8 Flagging Codes per record
flag_quals_desc: 1 Flagging Code per record

Element is Used in the Following IR Records and Database Tables

IRDMIS Record		IRDMIS Database	
Record Type	Column(s)	DB Table(s)	DB Column
Any valid chemical or radiological record type	143 144 145 146 147 148 149 150	chem/cqc	flag_codes
		flag_quals_desc	f_q_code

Acceptable Criteria ** signifies an obsolete term but is retained in the code for past reference.*

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; used for volatiles only.

B Analyte found in the method blank or QC blank as well as the sample. This code is 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 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.

E **NOT USED.**

F Sample filtered prior to analysis. This code is used when results of filtered samples are to be differentiated from non-filtered samples. This code is also 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 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 **NOT USED.**

I Interferences in sample cause the quantitation and/or identification to be suspect. This code is 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:
(1) Interferences in the sample (use Flagging codes J and I)
(2) The value is below the method detection level but above the instrumental detection level (use Flagging codes J and P)
(3) 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 used for methods validated under the 1993 QA Guidelines.

K Reported results affected by interferences or high background. This code is 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 database.

L **NOT USED.**

M **NOT USED.**

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

O **NOT USED.**

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 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. 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; 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; 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 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; 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 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 used when analyte concentrations exceed the upper reporting level and the laboratory feels that additional dilutions are not warranted. This code is also 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. Used when specified in the contract/task order.

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 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 **NOT USED.**

8 **NOT USED.**

9 Non-demonstrated/validated method performed for USAEC. This code is 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.
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.4 IRDMIS Data Qualifiers

1.30 Data Qualifier

Element Description

Code assigned only by the USAEC Chemist to indicate data acceptance or rejection based on abnormal analytical conditions or results.

Element Size and Characteristics

IRDMIS Record

1 uppercase alphabetical character, full field (as many as 8 per record)

IRDMIS Database

chem/cqc	as many as 8 Data Qualifiers per record
flag_quals_desc	1 Data Qualifier per record

Element is Used in the Following IR Records and Database Tables

IRDMIS Record		IRDMIS Database	
Record Type	Column(s)	DB Table(s)	DB Column
Any valid chemical or radiological record type	151 152 153 154 155 156 157 158	chem/cqc flag_quals_desc	data_quals f_q_code

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; 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; 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; used for the duplicate high spikes in Class 1 and 1P methods. Also used for the single spike in Class 1A and 1B methods and for the duplicate spikes in Class 1M methods.

N The high-spike recovery is low; used for the duplicate high spikes in Class 1 and 1P methods. Also 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; used only for the duplicate low spikes in Class 1P methods.

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

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.
R Data is rejected.

C.5 Data Validation Memoranda

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MEMORANDUM

TO: Jason Twaddle REF. NO.: 15065-30

FROM: Ruth L. Mickle DATE: October 2, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
June, 2000, Sampling Event
TCAAP OU1 Site in Arden Hills, Minnesota

The following details a data quality assessment and validation for one water sample collected June 13, 2000, at TCAAP OU1 Site in Arden Hills, Minnesota. The sample identified as 04U855 was analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Period

The holding time period for VOC analyses is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

RLM/bam/44

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MEMORANDUM

TO: Jason Twaddle

REF. NO.: 15065-30

FROM: Ruth L. Mickle

DATE: January 10, 2000

C.C.: Analytical Data File
Lisa LeMoine

RE: **Data Quality Assessment and Validation for One Water Sample Collected October 1999 at TCAAP Site A in St. Paul, Minnesota**

The following details a data quality assessment and validation for one water sample collected during the October 1999 sampling event at TCAAP Site A in St. Paul, Minnesota. The sample identified as Effluent (W-991005-DN-05) was analyzed for: volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates:
VOC - EPA 8260B
Mercury - SW 7470

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. The results were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

There were no field QA/QC samples associated with the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

RLM/dc/9

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Ruth L. Mickle	DATE:	January 21, 2000
C.C.:	Analytical Data File Lisa LeMoine		

RE: **Data Quality Assessment and Validation for Water Samples Collected November and December 1999 at TCAAP Site A in St. Paul, Minnesota**

The following details a data quality assessment and validation for water samples collected during the November and December 1999 sampling events at TCAAP Site A in St. Paul, Minnesota. The effluent samples identified as W-991102-DN-07 and W-991208-RF-01 were analyzed for: volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The majority of method blank sample data were reported to be free from detectable concentrations of target analytes. The mercury method blank associated with sample W-991102-DN-07 yielded a detection (0.079 ug/l). The associated mercury result for sample W-991102-DN-07 should be qualified as nondetect (0.079U).

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates:
VOC - EPA 8260B
Mercury - SW 7470

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. The results were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

There were no field QA/QC samples associated with the sampling events.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualification noted.

RLM/br/12

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MEMORANDUM

TO: Jason Twaddle

REF. NO.: 15065-30

FROM: Grant Anderson GDA

DATE: February 15, 2000

C.C.: Analytical Data File
Lisa LeMoine

RE: **Data Quality Assessment and Validation for One Water Sample Collected January 4, 2000, at TCAAP Site A in Arden Hills, Minnesota**

The following details a data quality assessment and validation for one water sample collected January 4, 2000 at TCAAP Site A in Arden Hills, Minnesota. The sample identified as Effluent A (W-000104-DN-01) was analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates:

VOC - SW 8260B
Mercury - SW 7470

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

There were no field QA/QC samples associated with this sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/14

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Grant Anderson GDA	DATE:	March 16, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation for One Water Sample Collected February 4, 2000, at the TCAAP Site A in Arden Hills, Minnesota**

The following details a data quality assessment and validation for one water sample collected February 4, 2000, at the TCAAP Site A in Arden Hills, Minnesota. The sample identified as Effluent A (W-000204-RF-07) was analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

---

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260B, Mercury - SW 7470.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples associated with this sampling event consisted of a trip blank sample.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank was reported to be free from detectable concentrations of target analytes, indicating that cross-contamination was unlikely.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/17

CRA

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MEMORANDUM

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TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Grant Anderson	DATE:	April 13, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation for One Water Sample Collected March 7, 2000, at the TCAAP Site A in Arden Hills, Minnesota**

The following details a data quality assessment and validation for one water sample collected March 7, 2000, at the TCAAP Site A in Arden Hills, Minnesota. The sample identified as Effluent A (W-000307-RF-08) was analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

---

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260B, Mercury - SW 7470.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with this sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/20

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MEMORANDUM

TO: Jason Twaddle REF. NO.: 15065-30

FROM: Grant Anderson GDA DATE: May 2, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
April 5, 2000, Sampling Event
TCAAP Site A in Arden Hills, Minnesota

The following details a data quality assessment and validation for one water sample collected April 5, 2000, at TCAAP Site A in Arden Hills, Minnesota. The sample identified as Effluent A (W-000405-RF-07) was analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

---

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260B, Mercury - SW 7470.
2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with this sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/22

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Grant Anderson GA	DATE:	May 31, 2000
C.C.:	Lisa LeMoine		
RE:	**Data Quality Assessment and Validation May 2, 2000, Sampling Event TCAAP Site A in Arden Hills, Minnesota**		

The following details a data quality assessment and validation for one water sample collected May 2, 2000, at TCAAP Site A in Arden Hills, Minnesota. The sample identified as Effluent A was analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

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1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260B, Mercury - SW 7470.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with this sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/25

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MEMORANDUM

TO: Jason Twaddle REF. NO.: 15065-30

FROM: Grant Anderson DATE: July 25, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
June 2000 Sampling Events
TCAAP Site A in Arden Hills, Minnesota

The following details a data quality assessment and validation for water samples collected June 7-9, 2000, at the TCAAP Site A in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for one or more of the parameters listed in Table 2. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for the analyses are listed in Table 2. On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

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1 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples associated with the sampling events consisted of two trip blank samples, one field blank sample, two rinsate blank samples, and three field duplicate sample sets.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, two trip blank samples were submitted to the laboratory for VOC analysis. With the exception of methylene chloride, the trip blank samples were within acceptance criteria. As a result, the methylene chloride result for sample W-000609-PS-313 should be qualified as non-detect (1.0U).

As a check for cleanliness of the sampling environment, a field blank sample was collected as an authentic sample for labeling and submission to the laboratory. The field blank sample was identified as W-000609-PS-319. The field blank sample was reported to be free from detectable concentrations of target analytes, indicating that contamination from the sampling environment was unlikely.

As a check for cleanliness of sampling equipment, two rinsate blank samples were collected as authentic samples for labeling and submission to the laboratory. The rinsate blank samples were identified as W-000608-PS-208 and W-000607-PS-107. The rinsate blank samples were reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment occurred.

Overall precision for the sampling event was monitored using field duplicate sample sets. The field duplicate sample sets were identified as:

W-000607-PS-105/W-000607-PS-106;
W-000607-PS-203/W-000607-PS-204; and
W-000609-PS-310/W-000609-PS-311.

The RPDs for positive values from the field duplicate sets were calculated and were found to be within acceptance criteria, indicating that overall precision was adequate.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

GDA/bam/31
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
SITE A - TCAAP SITE
JUNE 2000 SAMPLING EVENTS

Sample ID	*Sample Location*
W-000608-PS-102	01U157
W-000607-PS-103	01U901
W-000607-PS-104	01U903
W-000607-PS-105	01U904
W-000607-PS-106	01U904 (dup)
W-000607-PS-107	R.B. (01U902)
W-000607-PS-108	01U902
W-000607-PS-200	01U039
W-000607-PS-201	01U140
W-000607-PS-202	01U158
W-000607-PS-203	01U138
W-000607-PS-204	01U138 (dup)
W-000607-PS-205	01U102
W-000608-PS-206	01U103
W-000608-PS-207	01U108
W-000608-PS-208	R.B. (01U108)
W-000608-PS-209	01U126
W-000608-PS-210	01U116
W-000608-PS-211	01U115
W-000608-PS-212	01U139
W-000608-PS-213	01U117
W-000609-PS-309	EFFLUENT-A
W-000609-PS-310	01U351
W-000609-PS-311	01U351 (dup)
W-000609-PS-312	01U352
W-000609-PS-313	01U353
W-000609-PS-314	01U354
W-000609-PS-315	01U355
W-000609-PS-316	01U356
W-000609-PS-317	01U357
W-000609-PS-318	01U358
W-000609-PS-319	F.B. (01U358)

TABLE 2

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
SITE A - TCAAP SITE
JUNE 2000 SAMPLING EVENTS

Analysis - Method [1]	*Holding Time* [2]
Volatile Organic Compounds (VOC) - SW 8260B	14 days
Chemical Oxygen Demand - EPA 410.4	28 days
pH - EPA 150.1	analyze immediately
Total Suspended Solids (TSS) - EPA 160.2	7 days
Metals - SW 6010B/7000 Series	6 months (mercury - 28 days)

Notes:

1 Methods were derived from:
- SW - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 and current revisions/updates.
- EPA- "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20, March 1983 with its revisions/updates.

2 Holding time periods are based from sample collection date to sample analysis date.

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Grant Anderson GA	DATE:	September 11, 2000
C.C.:	Lisa LeMoine		
RE:	**Data Quality Assessment and Validation July and August, 2000, Sampling Events TCAAP Site A in Arden Hills, Minnesota**		

The following details a data quality assessment and validation for two water samples collected July 6 and August 14, 2000, at TCAAP Site A in Arden Hills, Minnesota. The samples were identified as Effluent A (7/6) and Effluent A (8/14) and were analyzed for volatile organic compounds (VOCs) and mercury[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC	14 days from sample collection to analysis
Mercury	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260B, Mercury - SW 7470.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with these sampling events.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/37

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MEMORANDUM

O:	Jason Twaddle	REF. NO.:	15065-30
ROM:	Grant Anderson	DATE:	September 29, 2000
.C.:	Lisa LeMoine		

.E: **Data Quality Assessment and Validation**
Site A September 2000, Sampling Event
TCAAP Site in Arden Hills, Minnesota

he following details a data quality assessment and validation for Site A samples collected on September 5 nd 6, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed or volatile organic compounds (VOCs). In addition, Effluent-A sample was analyzed for mercury[1]. The nalyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality ssurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC (8260B)	14 days from sample collection to analysis
Mercury (7470)	28 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates, and "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples associated with this sampling event consisted of a trip blank, a rinsate blank, and a field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank sample was within acceptance criteria.

As a check for cleanliness of the sampling equipment, a rinsate blank sample was collected as an authentic sample for labeling and submission to the laboratory. The rinsate blank sample was identified as R.B. (01U902). The rinsate blank sample was within acceptance criteria.

Overall precision for the sampling event was monitored using the field duplicate sample set 01U904/01U904 (dup). The RPDs for positive values from the field duplicate sets were calculated and were found to be within acceptance criteria.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/46
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP SITE A
SEPTEMBER 2000 SAMPLING EVENT

Sample ID
01U139
01U140
01U355
01U356
01U357
01U902
R.B. (01U902)
01U904
01U904 (dup)
Effluent-A

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-12
FROM:	Ruth L. Mickle	DATE:	October 2, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
August, 2000, Sampling Event (PRE-SVE START-UP)
TCAAP Site A in Arden Hills, Minnesota

The following details a data quality assessment and validation for water samples collected August 17, 2000, at TCAAP Site A in Arden Hills, Minnesota. The samples are identified in Table 1 and were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Period

The holding time periods for VOC analyses is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC for the sampling event consisted of a trip blank sample, a rinsate blank sample, and one field duplicate set.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank sample yielded detections of methylene chloride and acetone. The associated sample data should be qualified as noted in Table 2.

As a check for cleanliness of sampling equipment, one rinsate blank was collected as an authentic sample for labeling and submission to the lab. The rinsate sample was identified as 01U350 . The rinsate blank sample yielded detections of several target analytes. However, since the associated data was previously qualified or the rinsate detections were within criteria, no qualification was required based on rinsate blank data.

Overall precision for the sampling event was monitored using field duplicate samples: 01U108/01U108 duplicate. The relative percent difference (RPD) values for positive parameter results were found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted.

RLM/bam/43

TABLE 1

SUMMARY OF SAMPLE IDENTIFICATION NUMBERS
TCAAP SITE A
AUGUST 2000 SAMPLING EVENT

00U03590

00U03591

00U03592

00U03593

00U03594

00U03595

TABLE 2

ANALYTES DETECTED IN TRIP BLANK
TCAAP SITE A
AUGUST 2000 SAMPLING EVENT

Analyte	*Blank Conc (ug/l)*	*Assoc Samples*	*Qualifier* [1]
Acetone	7.1	01U350	7.2U
		01U108	6.4U
		01U108 dupl	4.8U

Note:
[1] Sample results should be qualified as:
U - The analyte result is non-detect with the associated value being the quantitation limit.

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MEMORANDUM

TO: Jason Twaddle

REF. NO.: 4304

FROM: Grant Anderson

DATE: July 2, 2001

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
Site I June 2000 Sampling
TCAAP Site - Arden Hills, Minnesota

The following details a data quality assessment and validation for water samples collected on June 6, 2000, at the TCAAP Site I in Arden Hills, Minnesota. The samples identified as 01U636 and 01U064 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

HOLDING TIME PERIODS

The holding time period for VOC analyses is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time period.

METHOD BLANK SAMPLES

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample was reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

SURROGATE COMPOUND PERCENT RECOVERIES (SURROGATE RECOVERIES)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 VOC method was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates: SW 8260B.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

LABORATORY CONTROL SAMPLE (LCS) PERCENT RECOVERIES

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) RESULTS

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

FIELD QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

There were no field QA/QC samples associated with this sampling event.

OVERALL ASSESSMENT

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/ma/2

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Grant Anderson GA	DATE:	January 10, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation for Water Samples Collected from Site K during the October, November, and December 1999, Sampling Events at the Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota**

The following details a data quality assessment and validation for water samples collected from Site K on October 5, November 2, and December 7, 9, 1999, at the TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for one or more of the parameters listed in Table 2. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for the analyses are listed on Table 2. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

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1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling events included three field duplicate sample sets.

Overall precision for the sampling event was monitored using field duplicate sample sets:

EFF/EFF (dup) - 10/5;
EFF/EFF (dup) - 11/2; and,
EFF/EFF (dup) - 12/7.

Based on RPD data from the field duplicate sample sets, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

GDA/bam/56
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
SITE K - TCAAP SITE
OCTOBER - DECEMBER 1999 SAMPLING EVENTS

Sample ID
EFF 10/5
EFF (dup) 10/5
EFF 11/2
EFF (dup) 11/2
EFF 12/7
EFF 12/9
EFF (dup) 12/7
INF 12/7

TABLE 2

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
SITE K - TCAAP SITE
OCTOBER - DECEMBER 1999 SAMPLING EVENTS

Analysis - Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) - SW 8260B	14 days
Total Phosphorous - EPA 365.4	28 days
Cyanide - SW 9012	14 days
Metals - SW 6010/7000 series	6 months

Notes:

[1] Methods were derived from:

SW - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 with its revisions/updates.

EPA- "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20, March 1983 with current revisions updates.

[2] Holding time periods are based from sample collection date to sample analysis date.

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Grant Anderson	DATE:	March 15, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation for Water Samples Collected from Site K during the January and February 2000, Sampling Events at the Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota**

The following details a data quality assessment and validation for water samples collected from Site K on January 4 and February 1, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for VOCs[1]. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

1 VOC method (8260B) was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition, November 1986 with current revisions/updates.

2 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling events consisted of two field duplicate sample sets.

Overall precision for the sampling event was monitored using field duplicate sample sets:

EFF/EFF (dup) - 1/4; and,
EFF/EFF (dup) - 2/1.

Based on RPD data from the field duplicate sample sets, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

GDA/bam/61
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
SITE K - TCAAP SITE
JANUARY AND FEBRUARY 2000 SAMPLING EVENTS

Sample ID
EFF 1/4
EFF (dup) 1/4
EFF 2/1
EFF (dup) 2/1

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 1496

FROM: Grant Anderson GDA DATE: April 17, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
Site K March 2000, Sampling Event
Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota

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The following details a data quality assessment and validation for water samples collected from Site K on March 7, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF, EFF (dup), and INF, and were analyzed for one or more of the parameters listed in Table 1. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for the analyses are listed on Table 1. On the basis of sample collection dates on the chain-of-custody form and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were within acceptance criteria, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

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1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling event consisted of a field duplicate sample set.

Overall precision for the sampling event was monitored using the field duplicate sample set EFF/EFF (dup). Based on RPD data from the field duplicate sample set, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

GDA/bam/64
Enc.

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
SITE K - TCAAP SITE
MARCH 2000 SAMPLING EVENT

Analysis - Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) - SW 8260B	14 days
Total Phosphorous - EPA 365.4	28 days
Cyanide - SW 9012	14 days
Metals - SW 6010/7000 series	6 months (Mercury - 28 days)

Notes:

[1] Methods were derived from:

SW - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 with its revisions/updates.

EPA- "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20, March 1983 with current revisions updates.

[2] Holding time periods are based from sample collection date to sample analysis date.

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 1496

FROM: Grant Anderson DATE: May 10, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
Site K Treatment System
April 2000, Sampling Event
Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota

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The following details a data quality assessment and validation for water samples collected from Site K on April 4, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF and EFF (dup), and were analyzed for VOCs[1]. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of a method blank sample. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 VOC method (8260B) was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition, November 1986 with current revisions/updates.

2 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

<u>Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results</u>

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

<u>Laboratory Control Sample (LCS)</u>

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

<u>Field Quality Assurance/Quality Control (QA/QC) Samples</u>

The field QA/QC samples for the sampling events consisted of a field duplicate sample set.

Overall precision for the sampling event was monitored using the field duplicate sample set EFF/EFF (dup). Based on RPD data from the field duplicate sample set, the overall level of precision was found to be acceptable.

<u>Overall Assessment</u>

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Grant Anderson	DATE:	May 31, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
Site K Treatment System
May 2000, Sampling Event
Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota

---

The following details a data quality assessment and validation for water samples collected from Site K on May 2, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples identified as EFF and EFF (dup), and were analyzed for VOCs[1]. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of a method blank sample. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 VOC method (8260B) was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd Edition, November 1986 with current revisions/updates.

2 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling events consisted of a field duplicate sample set.

Overall precision for the sampling event was monitored using the field duplicate sample set EFF/EFF (dup). Both samples in the field duplicate sample set were reported to be free from detectable concentrations of target analytes. Therefore, no assessment of the overall precision could be made.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

GDA6/bam/69

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Grant Anderson	DATE:	July 7, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
Site K June 2000, Sampling Event
Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota

The following details a data quality assessment and validation for water samples collected from Site K on June 5 and 6, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for one or more of the parameters listed in Table 2. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for the analyses are listed on Table 1. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were within acceptance criteria, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall method performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling event consisted of a trip blank sample, a rinsate blank sample, and two field duplicate sample sets.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank sample was within acceptance criteria.

As a check for cleanliness of sampling equipment, a rinsate blank sample was collected as an authentic sample for labeling and submission to the laboratory. The rinsate blank sample, R.B. (01U615), was reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment had occurred.

Overall precision for the sampling event was monitored using field duplicate sample sets: EFF/EFF (dup) and 01U621/01U621 (dup). Based on RPD data from the field duplicate sample sets, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

GDA/bam/72
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
SITE K - TCAAP SITE
JUNE 2000 SAMPLING EVENT

Sample ID	*Sample Location*
W-000605-PS-01	EFF
W-000605-PS-02	EFF (dup)
W-000605-PS-03	INF
W-000606-PS-04	01U611
W-000606-PS-05	01U604
W-000606-PS-06	01U615
W-000606-PS-07	R.B. (01U615)
W-000606-PS-08	01U617
W-000606-PS-09	01U128
W-000606-PS-10	01U621
W-000606-PS-11	01U621 (dup)
W-000606-PS-12	01U618
W-000606-PS-13	01U619
W-000606-PS-14	482083
W-000606-PS-15	01U603

TABLE 2

SUMMARY OF ANALYTICAL PARAMETERS
AND HOLDING TIME PERIODS
SITE K - TCAAP SITE
JUNE 2000 SAMPLING EVENT

Analysis - Method[1]	*Holding Time*[2]
Volatile Organic Compounds (VOC) - SW 8260B	14 days
Total Phosphorous - EPA 365.4	28 days
Cyanide - SW 9012	14 days
Metals - SW 6010/7000 series	6 months (Mercury - 28 days)

Notes:

[1] Methods were derived from:

SW - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 with its revisions/updates.

EPA- "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20, March 1983 with current revisions updates.

[2] Holding time periods are based from sample collection date to sample analysis date.

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Grant Anderson GSA	DATE:	October 27, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
Site K July and August 2000, Sampling Events
Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota

---

The following details a data quality assessment and validation for water samples collected from Site K on July 6 and August 1, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF(7/6), EFF (dup - 7/6), EFF (8/1), and EFF (dup - 8/1) and were analyzed for volatile organic compounds (VOCs). The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for VOC analysis is 14 days from sample collection to completion of analysis On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were within acceptance criteria, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPDs) were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria.

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1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling event consisted of two field duplicate sample sets.

Overall precision for the sampling event was monitored using the field duplicate sample set EFF(7/6)/EFF (dup - 7/6), EFF (8/1)/EFF (dup - 8/1). Based on RPD data from the field duplicate sample sets, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used without qualification.

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	1496
FROM:	Ruth Mickle	DATE:	October 12, 2000
C.C.:	Lisa LeMoine		
RE:	**Data Quality Assessment and Validation Site K September 2000, Sampling Event Twin Cities Army Ammunition Plant (TCAAP) Site in Arden Hills, Minnesota**		

The following details a data quality assessment and validation for water samples collected from Site K on September 5, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF, EFF (dup), and INF, and were analyzed for one or more of the parameters listed in Table 1. The analyses were performed by Datachem Laboratories, Inc. (Datachem), in Salt Lake City, Utah. The quality assurance criteria were defined by the quality assurance project plan (QAPP)[1].

Holding Time Periods

The holding time periods for the analyses are listed on Table 1. On the basis of sample collection dates on the chain-of-custody form and analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were within acceptance criteria, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for volatile organic compounds (VOC) analyses was monitored using surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical methods on various matrices, MS/MSD percent recoveries and relative percent difference values (RPD) were determined for the analyses. The majority of MS/MSD results for project-related samples were within acceptance criteria. Sample EFF

1 Application of relevant quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

yielded lead percent recoveries were below the lower control limit. As a result, the associated lead data for sample EFF should be qualified as estimated(UJ).

Laboratory Duplicate Samples (DUP)

To assess the long-term precision of the analytical methods on various matrices, relative percent difference values (RPD) for duplicate results were determined for select metals analyses. The majority of DUP results for project-related samples were within acceptance criteria. The copper RPD for sample EFF was outside the established control limit. As a result, copper data for sample EFF should be qualified as estimated (J).

Laboratory Control Sample (LCS)

Overall performance for the analyses was monitored by means of LCS. The LCS recoveries were within acceptance criteria, indicating that overall performance was adequate.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples for the sampling event consisted of a field duplicate sample set.

Overall precision for the sampling event was monitored using the field duplicate sample set EFF/EFF (dup). Based on RPD data from the field duplicate sample set, the overall level of precision was found to be acceptable.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision pertaining to the above criteria, and may be used with the qualifications noted.

RM/dc/79
Enc.

TABLE 1

SUMMARY OF ANALYTICAL PARAMETERS AND HOLDING TIME PERIODS SITE K - TCAAP SITE SEPTEMBER 2000 SAMPLING EVENT

Analysis - Method [1]	*Holding Time* [2]
Volatile Organic Compounds (VOC) - SW 8260B	14 days
Total Phosphorous - EPA 365.4	28 days
Cyanide - SW 9012	14 days
Metals - SW 6010/7000 series	6 months (Mercury - 28 days)

Notes:

[1] Methods were derived from:

SW - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 with its revisions/updates.

EPA- "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20, March 1983 with current revisions updates.

[2] Holding time periods are based from sample collection date to sample analysis date.

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	13399-30
FROM:	Ruth L. Mickle	DATE:	January 13, 2000
C.C.:	Analytical Data File Lisa LeMoine		

RE: **Data Quality Assessment and Validation for TGRS Treatment System Samples Collected during October and November 1999 at the TGRS TCAAP Site in Arden Hills, Minnesota**

The following details a data quality assessment and validation for extraction well and monitoring well samples collected during the October and November 1999 sampling events at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples are identified in Table 1. The samples were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

1 Method was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates:
VOC - EPA 8260B

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the sampling events included trip blanks and field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, trip blanks were submitted to the laboratory for VOC analysis. The trip blank associated with the November 1999 event yielded a methylene chloride detection. The associated methylene chloride result for sample TGRSI 11/99 should be qualified as nondetect (1U). The remaining trip blank data were within acceptance criteria.

Overall precision was measured by evaluating the results of field duplicate sample sets: TGRSE/TGRSE duplicate 10/99, TGRSE/TGRSE duplicate 11/99. The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualification noted above.

RLM/dc/36

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP TGRS SITE
OCTOBER & NOVEMBER 1999 SAMPLING EVENTS

TGRSE 10/5/99

TGRSI 10/5/99

WETWELL #1 10/5/99

TGRSE 11/2/99

TGRSI 11/2/99

WETWELL #1 11/2/99

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MEMORANDUM

TO: Chuck Cooke

REF. NO.: 15213-30

FROM: Ruth L. Mickle

DATE: January 13, 2000

C.C.: Analytical Data File
Lisa LeMoine

RE: **Data Quality Assessment and Validation for TGRS Treatment System Samples Collected during December 1999 at the TGRS TCAAP Site in Arden Hills, Minnesota**

The following details a data quality assessment and validation for monitoring well and extraction system samples collected during the December 1999 sampling event at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples are identified in Table 1. The samples were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

1 Method was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates:
VOC - EPA 8260B

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the sampling event included a trip blank and field duplicate samples.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank was submitted to the laboratory for VOC analysis. With the exception of methylene chloride, the trip blank was free of target analytes. Since there were no associated methylene chloride detections, no qualification was required based on trip blank results.

Overall precision was measured by evaluating the results of field duplicate sample sets: TGRSE/TGRSE dup, 03U316/03U316 dup, 03U306/03U306 dup. The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

RLM/dc/3

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP TGRS SITE
DECEMBER 1999 SAMPLING EVENT

TGRSE 12/7/99	O3F303
TGRSI 12/7/99	O3F304
WETWELL #1 12/7/99	O3F305
O3U301	PJ#309
O3U314	O3F306
O3U315	PJ#310
O3U316	O3F307
O3U317	PJ#311
O3F312	O3F308
O3F312	PJ#313
O3F302	

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	15213-32
FROM:	Grant Anderson	DATE:	March 16, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation for TGRS Treatment System Samples Collected during the January and February 2000, Sampling Events at the TGRS TCAAP Site in Arden Hills, Minnesota**

The following details a data quality assessment and validation for extraction system samples collected during the January and February 2000, sampling events at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples are identified in Table 1. The samples were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody forms and analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

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1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries, relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the sampling event included two trip blank samples and two field duplicate sample sets.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, two trip blank samples were submitted to the laboratory for VOC analysis. With the exception of methylene chloride, the trip blanks were free of target analytes. Since there were no associated methylene chloride detections, no qualification was required based on trip blank results.

Overall precision was measured by evaluating the results of field duplicate sample sets:
TGRSE/TGRSE dup - 1/4;
TGRSE/TGRSE dup - 2/1.

The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/9

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP TGRS SITE
JANUARY AND FEBRUARY 2000 SAMPLING EVENTS

TGRSE 1/4

TGRSE 1/4 (dup)

TGRSI 1/4

WETWELL #1 1/4

TGRSE 2/1

TGRSE 2/1 (dup)

TGRSI 2/1

WETWELL #1 2/1

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 15213-32

FROM: Grant Anderson GDA DATE: April 14, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
TGRS Treatment System
March 2000, Sampling Event, TCAAP Site, Arden Hills, Minnesota

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The following details a data quality assessment and validation for extraction system samples collected on March 7, 2000, at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and analytical report provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

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1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) values of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for this sampling event included a trip blank sample and a field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. With the exception of methylene chloride, the trip blanks were free of target analytes. Since there were no associated methylene chloride detections, no qualification of data was required based on trip blank results.

Overall precision was measured by evaluating the results of the field duplicate sample set TGRSE/TGRSE dup. The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/12
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP TGRS SITE
MARCH 2000 SAMPLING EVENT

TGRSE

TGRSE (dup)

WETWELL #1

TGRSI

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 15213-32

FROM: Grant Anderson GRA DATE: May 8, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
TGRS Treatment System
April 2000, Sampling Event, TCAAP Site, Arden Hills, Minnesota

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The following details a data quality assessment and validation for extraction system samples collected on April 4, 2000, at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF, EFF (dup), WETWELL #1, and INF, and were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. With the exception of methylene chloride, the method blank sample data were reported to be free from detectable concentrations of target analytes. As a result, the methylene chloride result for samples EFF, WETWELL #1, and INF should be qualified as non-detect (1U).

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

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1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) values of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for this sampling event included a trip blank sample and a field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. With the exception of methylene chloride, the trip blanks were free of target analytes. Associated methylene chloride data was previously qualified based on method blank data.

Overall precision was measured by evaluating the results of the field duplicate sample set TGRSE/TGRSE (dup). The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

GDA/bam/14

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	15213-32
FROM:	Grant Anderson	DATE:	May 31, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
TGRS Treatment System
May 2000, Sampling Event, TCAAP Site, Arden Hills, Minnesota

The following details a data quality assessment and validation for extraction system samples collected on May 2, 2000, at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF, EFF (dup), WETWELL #1, and INF and were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) values of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for this sampling event included a trip blank sample and a field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank was found to contain elevated concentrations of VOCs. The elevated levels caused instrument shut down. The sample submitted was obviously not a trip blank. It is not known where the sample came from or how it was mislabeled. No further analyses of the trip blank took place. Therefore, no assessment of cross-contamination could be made.

Overall precision was measured by evaluating the results of the field duplicate sample set TGRSE/TGRSE (dup). The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/18

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	15213-32
FROM:	Grant Anderson	DATE:	September 19, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
TGRS Treatment System, Monitoring Well, and Extraction Well Sampling
June, July, and August 2000
TCAAP Site, Arden Hills, Minnesota

The following details a data quality assessment and validation for extraction system and monitoring well samples collected on June 9, 13, 14, 15, 21, July 6, and August 1, 2000, at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples identified in Table 1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

ding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) values of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating that an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the sampling events included four trip blank samples, one rinsate blank sample, two field blank samples and six field duplicate sample sets.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blanks yielded detectable concentrations for methylene chloride and trichloroethene. However, none of the associated samples required qualification based on trip blank results.

As a check for cleanliness of sampling equipment, a rinsate blank sample was collected as an authentic sample for labeling and submission to the laboratory. The rinsate blank sample was identified as W-000615-PS-189. The rinsate blank sample was reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment occurred.

As a check for cleanliness of the sampling environment, two field blank samples were collected as authentic samples for labeling and submission to the laboratory. The field blank samples were identified as W-000609-PS-164 and W-000609-PS-177. The field blank samples reported to be free from detectable concentrations of target analytes, indicating that cross-contamination from the sampling environment was unlikely.

Overall precision was measured by evaluating the results of field duplicate sample sets. The field duplicate sample sets are listed in Table 2. The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/28
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP TGRS SITE
JUNE, JULY, AND AUGUST 2000 SAMPLING EVENTS

Sample IDs

04U806	PJ#311
PJ#806	EFF (6/9)
03U806	EFF (dup - 6/9)
04U833	WETWELL #1 (6/9)
04U833 (dup)	INF (6/9)
03U801	03U317
04J077	03U317 (dup)
R.B. (03U708)	03U316
03U708	03U315
03U093	03U314
03U094	03U301
03U099	F.B. (03U301)
03F303	03F312
03F304	03F302
03F305	TGRSE (7/6)
PJ#309	TGRSE (dup - 7/6)
03F306	WETWELL #1 (7/6)
PJ#310	TGRSI (7/6)
03F307	TGRSI (8/1)
03F307 (dup)	TGRSE (8/1)
PJ#313	TGRSE (dup - 8/1)
F.B. (PJ#313)	WETWELL #1 (8/1)
03F308	

TABLE 2

FIELD DUPLICATE SAMPLE SET
IDENTIFICATION NUMBERS
TCAAP TGRS SITE
JUNE, JULY, AND AUGUST 2000 SAMPLING EVENTS

04U833/04U833 (dup)

03F307/03F307 (dup)

EFF (6/9)/EFF (dup - 6/9)

03U317/03U317 (dup)

TGRSE (7/6)/TGRSE (dup - 7/6)

TGRSE (8/1)/TGRSE (dup - 8/1)

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 15213-32

FROM: Grant Anderson for DATE: October 16, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
TGRS Treatment System Sampling
September 2000
TCAAP Site, Arden Hills, Minnesota

The following details a data quality assessment and validation for extraction system samples collected on September 5, 2000, at the TGRS TCAAP Site in Arden Hills, Minnesota. The samples were identified as EFF, EFF (dup), INF, and Wetwell #1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analysis is 14 days from sample collection to analysis. On the basis of sample collection dates on the chain-of-custody form and the analytical report provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of a method blank sample. The method blank sample was reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that sample performance was adequate.

1 VOC Method 8260B was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, November 1986 and updates.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD)

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) values of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating that an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the September sampling event consisted of a field duplicate sample set.

Overall precision was measured by evaluating the results of the field duplicate sample set EFF/EFF (dup). The RPD values for the positive field duplicate data were calculated and found to be acceptable, indicating an adequate level of precision was achieved.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/31

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TELEPHONE: (651) 639-0913
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MEMORANDUM

TO: Chuck Cooke
REF. NO.: 3877

FROM: Grant Anderson GA
DATE: January 24, 2000

C.C.: Analytical Data File

RE: **Data Quality Assessment and Validation for Water Samples Collected during the PGRS December 1999, Sampling Event at the TCAAP Site in St. Paul, Minnesota**

The following details a data quality assessment and validation for nine water samples collected on December 20 and 21, 1999, at the TCAAP PGRS Site in St. Paul, Minnesota. The samples identified in Table 1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analyses is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of a method blank sample. The method blank sample was within acceptance criteria.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for this sampling event consisted of one trip blank sample, one rinsate blank sample, and one field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank results were within acceptance criteria, indicating that cross-contamination was unlikely.

As a check for cleanliness of sampling equipment, a rinsate blank was collected as an authentic sample for labeling and submission to the laboratory. The rinsate blank sample was identified as R.B. (04U863). The rinsate blank sample was reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment occurred.

Overall precision was measured by evaluating the results of the field duplicate sample set 04U864/04U864 (dup). Both sample results were reported to be non-detect for target analytes, therefore, no assessment of precision could be made.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/14
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP PGRS SITE
DECEMBER 1999 SAMPLING EVENT

Sample ID
04U864
04U864 (dup)
04J864
04U866
04J866
04U863
R.B. (04U863)
04U865
414U4

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MEMORANDUM

TO: Chuck Cooke REF. NO.: 3877

FROM: Ruth Mickle DATE: April 25, 2000

C.C.: Analytical Data File

RE: **Data Quality Assessment and Validation for Water Samples Collected during the PGRS March 2000, Sampling Event at the TCAAP Site in New Brighton, Minnesota**

The following details a data quality assessment and validation for nine water samples collected on March 10-11, 2000, at the TCAAP PGRS Site in New Brighton, Minnesota. The samples identified in Table 1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

lding Time Periods

The holding time period for VOC analyses is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of a method blank sample. The method blank sample was within acceptance criteria.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for this sampling event consisted of one trip blank sample, one rinsate blank sample, and one field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank results were within acceptance criteria, indicating that cross-contamination was unlikely.

As a check for cleanliness of sampling equipment, a rinsate blank was collected as an authentic sample for labeling and submission to the laboratory. The rinsate blank sample was identified as R.B. (04U865). The rinsate blank sample was reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment occurred.

Overall precision was measured by evaluating the results of the field duplicate sample set 04J866/04J866 (dup). Both sample results were reported to be non-detect for target analytes, therefore, no assessment of precision could be made.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/15
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP PGRS SITE
MARCH 2000 SAMPLING EVENT

Sample ID
04U864
04J864
04U866
04J866
04J866 dup.
04U863
R.B. (04U865)
04U865
414U4

MN FI[illegible] COPY

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MEMORANDUM

TO:	Chuck Cooke	REF. NO.:	3877
FROM:	Grant Anderson GA	DATE:	October 23, 2000
C.C.:	Lisa LeMoine		
RE:	**Data Quality Assessment and Validation PGRS Sampling June and September 2000 TCAAP Site, New Brighton, Minnesota**		

The following details a data quality assessment and validation for water samples collected on June 9, 12, September 5 and 6, 2000, at the TCAAP PGRS Site in New Brighton, Minnesota. The samples identified in Table 1 were analyzed for volatile organic compounds (VOCs)[1]. The analyses were performed by Datachem Laboratories (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time period for VOC analyses is 14 days from sample collection to completion of analysis. On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time period.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

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1 Method was derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates: VOC - SW 8260.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. The MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC)

The field QA/QC samples for the sampling events consisted of one trip blank sample, two rinsate blank samples, and two field duplicate sample sets.

To evaluate the possibility of contamination arising from sample transport, the environment and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank results were within acceptance criteria, indicating that cross-contamination was unlikely.

As a check for cleanliness of sampling equipment, two rinsate blanks were collected as authentic samples for labeling and submission to the laboratory. The rinsate blank samples were identified as R.B. (04U865) - 6/12/00, and R.B. (04U865) - 9/6/00. The rinsate blank samples were reported to be free from detectable concentrations of target analytes, indicating that adequate decontamination of sampling equipment occurred.

Overall precision was measured by evaluating the results of field duplicate sample sets 04U864/04U864 (dup) - 6/9/00 and 04U866/04U866 (dup) - 9/6/00. Based on RPD values of the duplicate sets, the overall level of precision was adequate.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/dc/19
Enc.

TABLE 1

SAMPLE IDENTIFICATION NUMBERS
TCAAP PGRS SITE
JUNE AND SEPTEMBER 2000 SAMPLING EVENTS

Sample ID	*Sample Date*
04J864	6/9/00
04U864	6/9/00
04U864 (dup)	6/9/00
04U866	6/9/00
04J866	6/9/00
04U863	6/12/00
04U865	6/12/00
414U4	6/12/00
R.B (04U865)	6/12/00
414U4	9/5/00
04U864	9/6/00
04J864	9/6/00
04J866	9/6/00
04U866	9/6/00
04U866 (dup)	9/6/00
R.B (04U865)	9/6/00
04U865	9/6/00
04U863	9/6/00

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MEMORANDUM

MN FILE COPY

TO: Jason Twaddle

REF. NO.: 15065-30

FROM: Grant Anderson GSA

DATE: April 13, 2000

C.C.: Lisa LeMoine

RE: **Data Quality Assessment and Validation**
Surface Water; ~~March 2000,~~ December 1999 & March 2000, Sampling Event
TCAAP Site in Arden Hills, Minnesota

The following details a data quality assessment and validation for Surface Water samples collected on December 7, 1999, and March 8, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as 20700 (12/7), 20800 (12/7), 20700 (3/8), and 20800 (3/8), and were analyzed for volatile organic compounds (VOC), metals, total phosphorous, and cyanide[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC (8260B)	14 days from sample collection to analysis
Select Metals (6010B/7470)	6 months (Mercury - 28 days) from sample collection to analysis
Total Phosphorus (365.4)	28 days from sample collection to analysis
Cyanide (335.3)	14 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. With the exception of total phosphorous,

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates, and "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", February 1994 and "National Functional Guidelines for Inorganic Data Review", February 1994.

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the method blank sample data were reported to be free from detectable concentrations of target analytes. As a result, the total phosphorous result for sample 20800 (3/8) should be qualified as non-detect (91U).

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with these sampling events.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualification noted above.

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Grant Anderson GPA	DATE:	August 29, 2000
C.C.:	Lisa LeMoine		

RE: **Data Quality Assessment and Validation**
Surface Water; June 2000, Sampling Event
TCAAP Site in Arden Hills, Minnesota

The following details a data quality assessment and validation for Surface Water samples collected on June 7, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as 20800, F.B. (20800), 20700, and 20700 (dup), and were analyzed for volatile organic compounds (VOC), metals, total phosphorous, and cyanide[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC (8260B)	14 days from sample collection to analysis
Select Metals (6010B/7470)	6 months (mercury - 28 days) from sample collection to analysis
Total Phosphorus (365.4)	28 days from sample collection to analysis
Cyanide (335.3)	14 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody form and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank samples were reported to

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates, and "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

be free from detectable concentrations of target analytes, indicating that laboratory contamination was unlikely.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved.

Field Quality Assurance/Quality Control (QA/QC) Samples

The field QA/QC samples associated with this sampling event consisted of a trip blank, a field blank, and a field duplicate sample set.

To evaluate the possibility of contamination arising from sample transport, the environment, and/or shipping, a trip blank sample was submitted to the laboratory for VOC analysis. The trip blank sample was reported to be free from detectable concentrations of target analytes, indicating that cross-contamination was unlikely.

As a check for cleanliness of the sampling environment, a rinsate blank sample was collected as an authentic sample for labeling and submission to the laboratory. The field blank sample was identified as F.B. (20800). The field blank sample was reported to be free from detectable concentrations of target analytes, indicating that cross-contamination from the sampling environment was unlikely.

Overall precision for the sampling event was monitored using the field duplicate sample set 20700/20700 (dup). The RPDs for positive values from the field duplicate sets were calculated and were found to be within acceptance criteria.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used without qualification.

GDA/bam/36

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MEMORANDUM

TO:	Jason Twaddle	REF. NO.:	15065-30
FROM:	Ruth Mickle	DATE:	October 18, 2000
C.C.:	Lisa LeMoine		
RE:	**Data Quality Assessment and Validation Surface Water; September 2000, Sampling Event TCAAP Site in Arden Hills, Minnesota**		

The following details a data quality assessment and validation for Surface Water samples collected on September 7, 2000, at the TCAAP Site in Arden Hills, Minnesota. The samples were identified as 20700 and 20800, and were analyzed for volatile organic compounds (VOC), metals, total phosphorous, and cyanide[1]. The analyses were performed by DataChem Laboratories Inc. (Datachem) in Salt Lake City, Utah. The quality assurance criteria were established in the associated quality assurance project plan (QAPP)[2].

Holding Time Periods

The holding time periods for the analyses are as follows:

VOC (8260B)	14 days from sample collection to analysis
Select Metals (6010B/7470)	6 months (Mercury - 28 days) from sample collection to analysis
Total Phosphorus (365.4)	28 days from sample collection to analysis
Cyanide (335.3)	14 days from sample collection to analysis

On the basis of sample collection dates on the chain-of-custody forms and the analytical reports provided by Datachem, the analyses were completed within the specified holding time periods.

Method Blank Samples

Contamination of the samples contributed by laboratory conditions or procedures was monitored by the concurrent preparation and analysis of method blank samples. The method blank sample data were reported to be free from detectable concentrations of target analytes.

1 Methods were derived from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd edition, November 1986 and updates, and "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

2 Application of quality assurance criteria was consistent with "National Functional Guidelines for Organic Data Review", October 1999 and "National Functional Guidelines for Inorganic Data Review", February 1994.

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Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC analyses was monitored by surrogate recoveries. The surrogate recoveries for the analyses were within acceptance criteria, indicating that individual sample performance was adequate.

Laboratory Control Sample (LCS) Percent Recoveries

LCS were examined to assess the accuracy of the laboratory procedures. The percent recoveries for the LCS were within the established control limits, indicating the methods achieved adequate accuracy.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results

To assess the long-term accuracy and precision of the analytical method on various matrices, matrix spike percent recoveries and relative percent difference (RPD) of the spike recoveries were determined for the analyses. The majority of MS/MSD results for project-related samples were within acceptance criteria, indicating an adequate level of accuracy and precision was achieved. Sample 20800 yielded silver percent recoveries below the lower control limit. Also, the RPD for the MS/MSD results was above the upper control limit. As a result, the associated silver data for samples 20800 and 20700 should be qualified as nondetect (UJ).

Field Quality Assurance/Quality Control (QA/QC) Samples

There were no field QA/QC samples associated with the sampling event.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision and may be used with the qualifications noted above.

GDA/bam/47

APPENDIX D

Appendix D

Groundwater Database Disk

APPENDIX E

Appendix E

Status of Well Inventory Sampling

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
sampled	127537	Commercial	7/17/97	117	2c	Midwest Asphalt	1400 Old Hwy 8	New Brighton	Sampled 8/31/00 (W-000831-PS-03). Contact: David Blanski (612-937-8033)
sampled	200076	Industrial	3/22/94	550		Old Dutch Foods, Inc	2375 Terminal Rd	St Paul	Sampled 9/15/00 (W-000915-PS-08). Contact: Darrell Skogen, 651-633-8810.
abandoned	200150	Industrial	12/12/84	555	~~2c~~ 7b	~~University of Minnesota~~ Lighnting and Transit Research Bldg	2533 Larpenteur	Lauderdale	Well abandoned according to Fay Thompson, 612-626-3676
can sample	200173	Irrigation/Cool	3/22/94	525	1b	KSTP Radio TV	3415 University Ave	St Paul	Bruce Hagerty, maintenance, (651-642-4400) is checking to see if there is a good place to collect the sample. Will call back. PJS 9/28/00.
not sampled	200176	Industrial		~~745~~ 758	2b	Waldorf Paper Products(Rock-Tenn)	2236 Myrtle Ave	St Paul	One of four wells at this location. Contact: Gary Kaziukewicz, 651-641-4709. This well was not operating for sampling. Duplicate of S00517.
abandoned	200178	Industrial		504	~~2c~~ 7b	Farm Oyl	2125 Wabash Ave	St Paul	Robert Larson responded by letter, and stated that "there are no wells at this address and have been on city water for decades".
abandoned	200179	Industrial		516	~~2b~~ 7b	Farm Oyl	2125 Wabash Ave	St Paul	Robert Larson responded by letter, and stated that "there are no wells at this address and have been on city water for decades".
abandoned	200180	Commercial		500	1c	Town And Country Golf Course	300 Mississippi River Blvd N	St Paul	One of two wells at this location - this one was not sampled because the plumbing was difficult to isolate.
abandoned	200263	Commercial		425	~~2c~~ 7b	Land O'Lakes Creameries	2215 NE Kennedy St	Minneapolis	Spoke To Steve Zadnichek, and no wells on the property. All operations and boilers use city water.
letter returned	200522	Commercial		254	1c	Pemtom	Silver Lake Rd	New Brighton	Contact: Stan Hurbst 612-937-0716 for more info. Message left on 9/29/00. WENCK, 1994 could not find this well.
letter returned	200523	Commercial		255	1c	Pemton	Silver Lake Rd & Cty Rd E	New Brighton	Contact: Stan Hurbst 612-937-0716 for more info. Message left on 9/29/00. WENCK, 1994 could not find this well.
no response	200603	Public Supply		1110	1a	Miller Milling	2500 Marshall Ave	St. Paul	Talked with Kevin Ball, vice president of operations on 9/28/00. Except for their office, which is located in the Grain Exchange Building. No properties are or were used by Miller Milling at this address or in Minnesota altogether. They have been in business since 1986 and have no knowledge of any well. *Visit address*.

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
abandoned	200805	Municipal		427	~~1a~~ 7a	City of St Anthony	3357 Silver Lake Rd	St Anthony	Jay Hartman, City of St. Anthony - abandoned. Well # 2.
no response	200818	Industrial		433	1c	Commercial Gas Co	2633 4th St SE	Minneapolis	Tried Minnegasco - no help. Not listed with the phone company. *Visit adress*
no response	206689	Domestic		223	2a	Foster, Fred	4629 Polk St NE	Fridley	Called 9/13/00, no response (PJS). Phone: 763-493-4043
abandoned	206724	Public Supply		464	~~1c~~ 7a	TC Ordnance Plant		Arden Hills	Sealed, 1999 AMR
abandoned	206754	Industrial	3/17/94	340	~~1c~~ 7a	TC Ordnance Plant No 1	Mounds View Rd	Arden Hills	Sealed, 1999 AMR
abandoned	206756	Industrial	3/17/94	335	~~1c~~ 7a	TC Ordnance Plant No 2	Mounds View Rd	Arden Hills	Sealed, 1999 AMR
abandoned	206763	Domestic	3/23/94	142	~~2a~~ 7b	Zenench	1600 W Hwy 96	Arden Hills	Well closed years ago, PJS, 9/13/00. Phone: 636-0206
delete	225906	Industrial		551	1c	St Paul Terminal Warehouse		Roseville	According to WENCK, 1994, Out of the study area. Bldg#2 machine shop (CWI).
info complete	233520	Industrial	8/26/88	232	**6 or 7**	MacGillis & Gibbs Company	440 5th Ave NW	New Brighton	MPCA, Fred Campbell, Site under remediation. Business not in operation. Well either abandoned or used as a monitoring well. *Confirm category by site visit.*
letter returned	234341	Industrial			4a	Murphy Rigging & Erecting	2225 Cty Rd D	New Brighton	Letter returned. No such number. Wenck, 1994, no such address. *Visit address*
sampled	234352	Irrigation	6/27/97	120	1b	**Aaron Nutter**	1206 12th Ave NW	New Brighton	Sampled 9/18/00 (W-000918-PS-10). Mr. Nutter (651-636-0306) stated that well water was used only for outside faucet, irrigation.
not sampled	234355	~~Domestic~~ **Irrigation**	3/1/84	**105**	~~4a~~ **1b**	Kingdom Hall	1987 Mound St	New Brighton	Contacted by phone, allowed sampling, but pump was plumbed directly to irrigation and the system and could not be sampled. On city water for all other purposes. Phone: 651-633-5527. *Call back to arrange sampling.*
sampled	234356	Domestic	3/21/94	100	1a	Nordquist, **Robert**	1873 Old Hwy 8	New Brighton	Sampled 9/1/00 (W000901-PS-06).
no response	234363	Domestic			4a	Resident	1603 14th Ave NW	New Brighton	Wenck, 1994, could not find this address. *Visit address*
not sampled	234368	~~Domestic~~ **Irrigation**	7/22/97	82	~~1a~~ **1b**	Bochnak	2600 St Anthony Blvd	Minneapolis	Out of the aquifer of concern.
no response	234380	Domestic	6/1/82	160	2a	Podlasek, **Fransis**	4410 N Snelling Ave	Arden Hills	Called 9/13/00, no response (PJS). Phone: 636-2270
sampled	234421	Industrial	7/17/97	270	1b	BioChem	2151 Mustang Dr	New Brighton	Sampled 9/18/00 (W-000918-PS-11 MS/MSD).
no response	234475	Domestic			4a	Rissell	2805 Silver Ln NE	Minneapolis	

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
letter returned	234511	Domestic			4a	Lindberg	2120 W Larpenteur	Roseville	*Visit address*
abandoned	234520	Domestic			~~4a~~ 7b	Thompson, Melissa	2832 Coolidge St NE	St Anthony	Well sealed according to Ms. Thompson
no response	234544	Commercial	7/29/86	500	1b	~~Hillcrest Shopper, Inc~~ R&D	2201 Kennedy St NE	Minneapolis	Abandoned building found nothing, WENCK 1994.
no response	234571	Irrigation	7/24/97	200	2b	Leiser	1901 17th St NW	New Brighton	Non-published phone. WENCK, 1994 also could not reach this resident.
delete	235539	Domestic		345	1a	Jackson, Manley	1330 Washington N. Av	Mpls	"Old Hotel" contact and well address according to the CWI, therefore, out of the study area. Similar findings by WENCK in 1994.
sampled	235566	Commercial		286	1a	Big Ten Supper Club	4703 Hwy 10	New Brighton	Sampled 9/1/00 (W-000901-PS-05) open hole: 250' - 286'
abandoned	235778	Air Condition		345	~~2c~~ 7b	Limited Partnership	2356 University Ave	St Paul	Phase I and II by STS, Bob Degroot, and no known well.
no response	236029	Commercial		435	2c	~~Hillcrest Shopper (Reuben Meats)~~ R&D	2201 Kennedy St NE	Minneapolis	Wenck, 1994, well was not in use. Didn't want it to be sampled anyway.
sampled	236439			790	2c	Waldorf Paper Products(Rock-Tenn)	2250 Wabash Ave.	Saint Paul	Sampled 9/19/00 (W-000919-PS-09). One of four wells at this location. Contact: Gary Kaziukewicz, 651-641-4709. Duplicate of unlisted - changed as shown. Delete the well with no unique number.
not sampled	236512	Industrial		300	~~1b~~ 1d	Gordon Rendering Co		New Brighton	John Bohanna (972-281-4490). Operation shut down power disconnected. PJS 8/22/00.
more info	240684	Domestic		330	1a		15th & Cty Rd 80		CWI - open hole: 276' - 330'
abandoned	247434	Public Supply		386	~~1a~~ 7b	Lowry Grove Mobile Home and RV Park		St. Anthony	Margie Gillespie, mgr, (612-781-3148) stated that the well they used to have has been abandoned 10 yrs ago (at least). PJS 9/5/00.
not sampled	249004	Domestic	3/22/94	38	1a	Gamradt	5567 Fairview Ave	Shoreview	Max Gamrandt (651-786-5181), stated he was on city water and his well was not operating. Will call when he fixes it. PJS, 9-12-00
no response	249112	Domestic			4a	Rabbi	1176 Long Lake Rd	New Brighton	
no response	249114	Unknown			4a	Schwab	642 8th Ave NW	New Brighton	
no response	249118	Unknown			4a	Cameron, David	1003 7th St NW	New Brighton	Contacted 9/20/00 by phone - no response. 651-636-4694
no response	249150	Unknown			4a	Barres, M	3511 Stinson Blvd NE	St Anthony	Unlisted number
letter returned	249184	Unknown			4a	Warner	1964 Carl St	Lauderdale	Letter returned. WENCK, 1994, on city water, not aware of any wells.
no response	249185	Unknown			4a	Novotny	1706 Malvern St	Lauderdale	
no response	249191	Irrigation			4a	Wells	1651 Millwood Ave	Roseville	

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
sampled	249608	Domestic	7/18/97	375	1a	Rapit Printing Inc	2520 Larpenteur Ave	Lauderdale	Sampled 9/21/00 (W-000921-PS-12 and W-000921-PS-13, Dup)
declined sampling	249621	Unknown		25	3	Stenger Jr	1719 Terrace Dr	Shoreview	Contacted by phone, and does not want any samples collected 9/13/00. Phone: 651-786-1204
sampled	249632	Irrigation	7/18/97	240	1b	Montzka, Harold	2301 N Upland Crest NE	Columbia Heights	Sampled 8/31/00 (W-000831-PS-02).
abandoned	249898	Domestic		251	~~1a~~ 7b	Hill, James and Patricia	2901 Roosevelt St	St. Anthony	Patricia Hill - well abandoned several years ago.
letter returned	250107	Commercial		423	1a		2630 Cty Rd C	Roseville	Letter returned - no such number.
no response	250769	Domestic		258	1a		3600 33rd St NE	St. Anthony	
sampled	433298	Domestic		500	1a	Town And Country Golf Course	300 Mississippi River Blvd N	St Paul	Sampled 9/5/00 (W-000905-PS-07). Contact: William Larson 651-646-6743.
info complete	463528	Unknown			~~1a~~ 6	Burlington Northern Railroad	2575 Doswell	St Paul	Appeared to be a monitoring well. This property is owned by Minnesota Commercial Railway. Met with Ray Duran (651-646-2010) and he knew of no wells used by his company nor were there any buildings. However, there were three monitoring wells at this location.
letter returned	497941	DW		140	1a		315 Grant E St. 55404	Mpls	Letter returned - no such number. Owner address according to the CWI, well address not given. Also a dewatering well.
sampled	509052	Medical	3/22/94	302	1a	Shriners Hospital	2025 E River Rd	Minneapolis	Sampled 9/1/00 (W-000901-PS-04) . Contact: Denis Campbell.
not sampled	~~S00425~~ 756236	~~Unknown~~ Industrial		280	1c	~~American National Can~~ Pechiney Plastic Packaging, Inc.	150 26th Ave SE	Minneapolis	The unique # for this well is 756236. Thomas Miller, engineering mgr, 612-378-3349- only knows of one well (records show two at this address). He said we could probably collect a sample, but has not returned subsequent calls.
no response	S00002	Irrigation			4a	Midland Hills Country Club	2001 N Fulham St	Roseville	Contact: Scott Austin, 651-631-1545. Called a number of times and he has returned but can't seem to connect.
delete	S00010	Industrial		500	1c	~~American National Can~~ Pechiney Plastic Packaging, Inc.	150 26th Ave SE	Minneapolis	This well should be deleted. Thomas Miller, engineering mgr, 612-378-3349- only knows of one well (records show two at this address), has no info on this well. He said we could probably collect a sample, but has not returned subsequent calls.
no response	S00294	Unknown			4a	Western Remodelers	2520 W Larpenteur Ave	St Paul	
no response	S00295	Unknown			4a	Alfson	2351 Summer St	Lauderdale	

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
sampled	S00311	Domestic			4a	~~Anderson~~ Inglebrech, Brenda	1390 Silver Lake Rd	New Brighton	Sampled 9/21/00 (W-000921-PS-14). Field checked and could not measure depth, but this is a 4-inch diameter with a submersible pump. Likely a drift well and probably in the aquifer of concern. This resident is not on city water and uses the well water for all functions.
no response	S00409	Unknown			4a	Ohara	3553 Stinson Blvd NE	St Anthony	
no response	S00410	Unknown			4a	Iacarella	3555 Stinson Blvd NE	Minneapolis	
abandoned	S00432	Unknown			~~4a~~ 7b	~~Curth Maulding Corp~~ Kurth Malting	27th Ave SE & GNRR	Minneapolis	Dan Truchon, elevator supervisor, stated that only the grain elevator remains. All other associated buildings were removed and associated wells abandoned about 15 years ago. PJS 9/12/00.
sampled	S00437	Industrial		450	1c	Northern Star Co	3171 5th St SE	Minneapolis	Sampled 8/31/00 (W-000831-PS-01. Contact: Patch Howitz (612-339-8981), on city water. Pumphouse located at 543 Malcolm NE.
abandoned	S00457	Unknown		518	~~2a~~ 7a	~~Bartusch Packing Co~~ Rihm Motor Co.	565 N Cleveland Ave	St Paul	John Rihm, owner, (651-646-7833). Stated well was abandoned. Sealing #H46930
abandoned	S00458	Unknown		518	~~2a~~ 7a	~~Bartusch Packing Co~~ Rihm Motor Co.	567 N Cleveland Ave	St Paul	John Rihm, owner, (651-646-7833). Stated well was abandoned. Sealing #H46931.
letter returned	S00462	Unknown			4a		2053 Old Hwy 8	New Brighton	Letter returned , no such number.
letter returned	S00490	Unknown		500	1a	Resident	435 Otis Ave	St Paul	Letter returned , no such number.
not sampled	S00491	Unknown			4a	MN Diversified Industries Inc	666 Pelham Blvd	St Paul	According to last years study (1999) by CRA of this location, Lee Selton, stated that the well has been inactive since 1970 and the building was on city water. The building continues to be unoccupied.
delete	S00517	Unknown		758	2c	Waldorf Paper Products(Rock-Tenn)	2211 Wabash Ave	St Paul	Delete this well. Duplicate of 200176. Contact: Gary Kaziukewicz, 651-641-4709.
no response	S00608	Unknown			4a	Grundtner	136 Oakwood Dr	New Brighton	Wenck, 1994, no such address.
letter returned					4a		444 County Rd D, Bldg B	New Brighton	Letter returned , no such number.
letter returned					4a		366 County Rd D, Bldg C	New Brighton	Letter returned , no such number.
no response					4a	Goldman	30 12th Ave NW	New Brighton	
not sampled					4a	Delores McCalla	281 Silver Lake Rd S	New Brighton	Field checked for sampling on 9/18/00, and the well was not functional. Resident is on city water.
no response					4a	Polynesian Village	1417 NW 10th St	New Brighton	Phone #: 651-636-0850. Called several times and left messages - no response.
abandoned					~~4a~~ 7b	Lawin, Bruce	1263 12th Ave NW	New Brighton	Mr. Lawin, has been at this address for ten years and knows of no well. On city water.
letter returned					4a		1405 Old Highway 8	New Brighton	Letter returned , no such number.

APPENDIX E

STATUS OF 2000 SAMPLING EFFORT
TCAAP WELL INVENTORY

Status	*Unique Number*	*Use*	*Previous Sample Date*	*Depth*	*Category*	*Name*	*Street Address*	*City*	*Remarks*
no response					4a	The Barbers	381 Silver Lake Rd	New Brighton	
abandoned					~~4a~~ **7b**	Donatelle	401 County Rd E2	New Brighton	**Phone message from Carl Donatelle on 8/22/00, stated that no wells are located on his property.**
no response					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.
- Bold print denotes new information from year 2000.

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 μg/L contour, screened in an aquifer of concern. Wells are divided into the following subcategories:
	2a	• Drinking water well
	2b	• Nondrinking but possible contact water
	2c	• Nondrinking, noncontact water
	2d	• Well is inoperable or has not been used for several years
3		Water supply wells within the Study Area that are 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

APPENDIX F

Appendix F

TGRS, Site K, and PGRS Operational Data

F.1 Inspection and Maintenance Activities, Fiscal Year 2000, Site K, TCAAP

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

October 1999	**Notes:**
10/1/99	High water level in AST sump. Down Time: 18.5 hours
10/8/99	High water level in AST sump. Down time: 22 hours
10/8-11/99	High water level in AST sump. Down time: 39.5 hours
10/13/99	High water level in AST sump. Down time: 9.5 hours
10/14/99	High water level in AST sump. Down time: 22 hours
10/14-18/99	High water level in AST sump. Down time: 72 hours
10/19/99	High water level in AST sump. Down time: 13.5 hours
10/21/99	10/21/99 - High water level in AST sump. Down time: 19 hours
10/25/99	High water level in AST sump. Down time: 13.8 hours
10/27/99	High water level in AST sump. Down time: 31 hours
10/28/99	High water level in AST sump. Down time: 7.5 hours
10/29/99	High water level in AST sump. Down time: 6 hours
November 1999	**Notes:**
11/1-2/99	System was not restarted after maintenance. Down time: 24 hours
11/11/99	Monthly inspection performed. Down time: 0 hours
11/24/99	High water level in AST sump. Down time: 6 hours
11/30/99	System down due to ice buildup on tower. Space heater turned on because building heater functioning erratically. Down time: 6 hours
December 1999	**Notes:**
12/20/99	System off due to "low building temperature". Down time: 40 hours
12/20-21/99	High water level in AST sump. Blower overloads tripping. Alliant electrician inspects and adiusts overload settine. orders new contractor. Down time: 11 hours
12/27-28/99	High water level in AST sump. Sump was drained, and building heated to 70 degrees before restartine. Down time: 18 hours
12/29/99	Building heater stopped working Alliant electrician inspected and repaired. Down time: 0 hours

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

January 2000	**Notes:**
1/6/00	System down due to "low air flow". Down time: 6 hours
1/10/00	System down due to "low air flow". Down time: 4 hours
1/11/00	High water level in AST sump. Down time: 0.5 hours
1/28/00	High water level in AST sump. Down time: 5.5 hours
1/28/00	Replaced building heater over-temp cutout switch. Down time: 0 hours
1/31/00	Acid washed sump sight glass. Down time: 0 hours
February 2000	**Notes:**
2/7/00	High water level in AST sump. Down time: 25 hours
2/10/00	System down due to "low air flow". Down time: 5 hours
2/22/00	High water level in AST sump. Down time: 4 hours
2/23/00	System down due to "low air flow". Down time: 1 Hour
2/25/00	System down due to "low air flow". Down time: 3 hours
March 2000	**Notes:**
3/6/00	Acid washed sump sight glass. Down time: 0 hours
3/10-14/00	Alliant electrician installs new blower motor contactor. Contactor overload is adjusted too low and overload trips during or after blower start up. Down time: 67 hours
3/17/00	Acid washed sump sight glass. Down time: 0 hours
3/20/00	Daily inspection not performed due to human error. Down time: 0 hours
April 2000	**Notes:**
4/10/00	Cleaned sump sight glass and performed monthly preventive maintenance. Down
4/13/00	Cleaned sump sight glass. Down time: 0 hours
4/24/00	Cleaned sump sight glass. Down time: 0 hours
May 2000	**Notes:**
5/1/00	Air stripper high/high alarm on. System reset. Down time: 0 hours
5/2/00	System reset. Down time: 0 hours
5/3/00	Air stripper high/high alarm on. System reset. Down time: 0 hours
5/8/00	Drained sump and acid washed site glass. Down time: 0 hours

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

5/12/00	Low air flow alarm on. System reset. Down time: 9.5 hours
5/17/00	Air stripper high/high alarm on. System reset. Down time: 22 hours
5/22/00	Drained sump and acid washed site glass. Down time: 0 hours
5/29/00	Daily inspection not performed in observance of Memorial Day holiday. Down time: 0
June 2000	**Notes:**
6/5/00	Acid washed sump sight glass. Down time: 0 hours
6/12/00	Acid washed sump sight glass. Down time: 0 hours
6/20/00	Acid washed sump sight glass. Down time: 0 hours
6/26/00	Acid washed sump sight glass. Down time: 0 hours
6/29/00	System down for annual PM inspection/work. Down time: 4 hours
July 2000	**Notes:**
7/3/00	Reset high water flow rate. Perform portion of first year inspection. Down time: 0
7/4/00	Meter reading not performed in observance of Independence Day. Down time: 0 hours
7/5/00	Reset high water flow rate. Down time: 24 hours
7/7/00	Treatment system down due to power outage from storm. Meter reading estimated. Down time: 36 hours
7/10/00	Perform portion of first year inspection. Down time: 0 hours
7/17/00	Monthly inspection and cleaned sight sump glass. Down time: 0 hours
August 2000	**Notes:**
8/7/00	Acid washed sump sight glass. Down time: 0 hours
8/8/00	System cycled off upon arrival. Down time: 0 hours
8/14/00	Acid washed sump sight glass. Down time: 0 hours
8/22/00	System down due to "AST Low Air Flow". Down time: 2 hours
8/22/00	Alarm light bulb on outside of building was replaced. Down time: 0 hours
8/22/00	Acid washed sump sight glass. Down time: 0 hours
8/23/00	Alarm light bulb on outside of building was replaced. Down time: 0 hours
8/28/00	Acid washed sump sight glass. Down time: 0 hours
September 2000	**Notes:**

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

9/3/00	System down due to low air flow. Down time: 20 hours
9/5/00	Sump sight glass cleaned. Down time: 0 hours
9/11/00	Monthly inspection conducted. Down time: 0 hours
9/18/00	Sump sight glass cleaned. Down time: 0 hours
9/22/00	Air flow baffle adjusted. Down time: 0 hours
9/25/00	Sump sight glass cleaned. Down time: 0 hours

F.2 Inspection and Maintenance Activities, Fiscal Year 2000, TGRS, TCAAP

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

October 1999 **Notes:**

10/9/99 Treatment Center: ECV #4 closed without command.
Down time: 0 hours

10/12/99 Treatment Center: ECV#2 did not open on command.
Down time: 0.5 hours

10/25/99 Treatment Center: Treatment system shut down to facilitate replacement of packing on Wet Well Pump #2.
Down time: 2 hours

10/27/99 Forcemain: The altitude valve failed to close over filling the elevated tank. The TGRS was shut down to facilitate repairs.
Down time: 1.5 hours

November 1999 **Notes:**

11/5/99 Pumphouse B2: Low water level light found on, pump shut down until repairs made to ECV controls.
Down time: 23.5 hours

11/8/99 Treatment Center: ECV #4 closed without command.
Down time: 0.5 hours

11/17/99 Treatment Center: ECV #4 closed without command and motor starter for pump #2 tripped.

11/19/99 Treatment Center: ECV #2 did not open on start up.
Down time: 1 hour

11/25/99 Treatment Center: Meter readings estimated due to Thanksgiving holiday.
Down time: 0 hours

11/29/99 Treatment Center: ECV #4 closed without command. Changed cartridge filter and valve operated normally.
Down time: 1 hour

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

11/30/99 Treatment Center: ECV #4 closed without command. Adjusted closing speed valve and valve functioned properly.
Down time: 1 hour

December 1999 Notes:

12/4/99 Treatment Center: ECV #4 did not open on command. ECV speed control valves adjusted and valve operated properly.
Down time: 0.5 hours

12/7/99 Pumphouses B12 and SC4: The wells were purged as part of the semiannual extraction well sampling event.
Down time: 0 hours

12/25/99 Treatment Center: Meter readings are estimated due to Christmas holiday.
Down time: 0 hours

12/28/99 Treatment Center: ECV #2 closed without command. The valve was reset and control piping flushed. Valve was operated and it functioned properly.
Down time: 1 hour

12/29/99 Treatment Center: ECV #2 did not open on command. ECV control valves were adjusted and valve operation observed. Valve functioned properly.
Down time: 1 hour

12/31/99 Treatment Center: ECV #2 did not open on command. The PDU was reset and valve functioned properly.
Down time: 1 hour

January 2000 Notes:

1/6/00 Treatment Center: ECV #4 would not open on command. ECV control valves adjusted and valve functioned properly.
Down time: 2.5 hours

1/6/00 Pumphouse SC2: Pumphouse SC2 would not remain in operation because ECV indicator collar was loose and not indicating ECV had functioned. Adjusted collar.
Down time: 2.5 hours

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

1/10/00	Pumphouses B11 and SC2: No power to pumphouses B11 and SC2. NSP corrected failure.
1/16/00	Treatment Center: ECV #2 did not open on start up. Cycled the pump director unit 3 times and observed normal operation. Down time: 0 hours
1/25/00	Pumphouse B3: Replaced pump and motor at pumphouse B3. Brushed and bailed out the inside casing. Down time: 9 hours
1/29/00	Treatment Center: ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 0.5 hours
February 2000	**Notes:**
2/9/00	Pumphouse SC2: Reduced flow rate due to fouling by iron sludge. Clean well and lift system by circulating acid through the well, pump, flow meter and piping. Down time: 52 hours
2/10/00	Pumphouse SC5: Reduced flow rate because wells hydraulic capacity has declined. Down time: 0 hours
2/12/00	Treatment Center: ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 3 hours
2/14/00	Pumphouse SC5: Pumphouse would run in "Hand" but not "Automatic" operating mode. Installed new A-B power supply. Down time: 4 hours
2/18/00	Pumphouse SC2: Complete cleaning of well started on 2/9 by circulating acid through the well, pump, flow meter and piping. Down time: 24 hours

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/20/00	Treatment Center: ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 1.5 hours
2/21/00	Pumphouses B1, B4, B6, B7, B9, SC2, SC3 and SC5: Reduced flow rates. Attempted to adjust flow rates to target flow rates. Down time: 0 hours
2/29/00	Pumphouse B6: Measured current stick up of outer casing at 0.97 feet above concrete slab.
March 2000	**Notes:**
3/2/00	Treatment Center: Replaced control harness on ECV #3. Shut down pumphouses B3, B7, B10, B11, SC1 and WWP #1 to accommodate reduced system capacity during repair. Down time: 25.5 hours (B3, B7, B10, B11, SC1)
3/11-14/00	Treatment Center: ECV #4 closed without command 4 times. Pumphouses B3, B7, B10, and SC1 were shut down pending repair of ECV. Adjustments made to ECV and normal operation solenoid replaced. Down time: 20 hours (B3, B7, B10, SC1 on 3/11-12/00), 30 hours (B11 on 3/11-12/00), 2.5 hours (B3, B7, B10, B11, SC1 on 3/13/00)
3/12/00	Pumphouses SC2 and SC3: Not operating due to open circuit on power pole. NSP closed circuit and pumphouses were restarted. Down time: 12 hours
3/14/00	Pumphouse B10: Electric check valve vibrating and rattling. Replace valve body with new body assembly. Down time: 10 hours
3/14-31/00	Pumphouse SC5: The well is producing fine particulates plugging the flow meter, causing erroneously low meter readings. Down time: 0 hours
3/20/00	Treatment Center: ECV #2 failed to open on start up. The PDU was reset and the valve cycled valve several times. Observed normal operation. Down time: 0 hours

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

3/23/00	Pumphouse B1: Replaced size 2 motor starter with size 3 starter. Down time: 6 hours
3/23/00	Pumphouse SC5: Replaced 480V 30 Amp disconnect switch with 60 Amp switch and installed 50 Amp time delay type fuses. Down time: 2 hours
3/24/00	Pumphouse B1: Replaced failed water level control circuit board. Down time: 2 hours
3/27/00	Pumphouse SC3: Pump not operating because motor failed. Install new pump, motor, electrical wire and 2 joints of riser pipe. Also, brush and bail casing. Down time: 76 hours
April 2000	**Notes:**
4/2-4/00	Treatment Center: Autodialer sensing an alarm condition at PDU #4 although no alarm condition exists. Replaced main board in PDU #4. Down time: 1 hour
4/2/00	Treatment Center: ECV #4 control harness replaced. Down time: 4 hours
4/5-12/00	Pumphouse SC5: Pumphouse flow meter not functioning properly. Clogging due to fine sand produced by well. Turbine assembly changed twice. Down time: 1 hour
4/9/00	Treatment Center: ECV #2 control harness replaced. Down time: 4 hours
4/9-10/00	Pumphouse B7: Pumphouse not restarted after ECV #2 rebuild; human error. Down time: 17 hours
4/11/00	Treatment Center: System shut down to gather information on PLC system. Down time: 1 hour

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

4/12-24/00 Pumphouse SC1: Extraction well shut down for redevelopment.
Down time: 287 hours

4/18-21/00 Pumphouses B8 and B11: Lift systems are not operating. Replaced sub I/O scanner module.

4/18/00 Treatment Center: AST #1 and #4 were shut down for inspection by tower refurbishing contractor.
Down time: 4 hours

4/22/00 Forcemain: Elevated tank and ground storage reservoir have low water levels. Snelling Avenue back pressure valve not maintaining adequate back pressure. Changed strainer screen and adjusted back pressure to 34 psi at Snelling Avenue valve.
Down time: 0 hours

4/24-30/00 Pumphouse B2: Extraction well shut down for redevelopment.
Down time: 129 hours

May 2000 **Notes:**

5/1-5/00 Pumphouse B2: The pumphouse was shut down for well redevelopment and pump & motor replacement.
Down time: 136.5 hours

5/2-25/00 Pumphouse B6: The pumphouse was shut down for redevelopment, well head replacement, pump, motor, riser pipe, check valve replacement.
Down time: 576 hours

5/5/00 Treatment Center: ECV #2 did not open on command. The fault was reset and valve functioned properly.
Down time: 2.5 hours

5/8/00 Pumphouses B1, B5, B7, and B11: Lubricated noisy exhaust fan motor at B1; re-tied loose conductor wires to contact 3 on AC input card at B5; installed sealtite conduit between well head and junction box at B7; and cut back and reterminated conductor and cleaned contacts and tightened 480 V disconnect switch at B11.
Down time: 0.5 hours (B1, B5), 1.5 hours (B7), 1 hour (B11)

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

5/8/00	Treatment Center: ECV #3 would not close on command. Repairs performed on 5/30-6/1.
5/9/00	Treatment Center: System shutdown for testing of new PLC and software. Down time: 1 hour
5/10/00	Pumphouse B2: O-ring leaking at the pitless adapter. Replaced faulty O-ring with new O-ring. Down time: 18 hours
5/10/00	Treatment Center: Performed electrical and operational equipment inspections. Down time: 2.8 hours
5/18/00	Treatment Center: Performed inspection of air stripping towers. Down time: 6.3 hours
5/18/00	Pumphouse B1: The well was not producing at its available capacity. The pumphouse was shut down to repair the lift system. Brushed casing and bailed debris from the well, replaced the pump, motor, riser pipe and fittings. Down time: 8.5 hours
5/25/00	Treatment Center: Well field cycling. Reset pump director #2 and ECV No. 2 functioned properly. Down time: 3 hours
5/28/00	Pumphouse B6: The collar on the indicator stem (an ECV component) was out of adjustment. The adjustment was made and pumphouse functioned properly. Down time: 48 hours
5/29/00	Treatment Center: TGRS meter readings were not performed in observance of the Memorial Day holiday. Down time: 0 hours
5/30/00	Pumphouse SC5: The pumphouse was shut down for redevelopment and pump and motor replacement. Down time: 13 hours
June 2000	**Notes:**

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

5/30-6/1/00	Treatment Center: ECV #3 was disassembled, a seal kit was installed, the piston and liner were cleaned, the valve reassembled and tested. Down time: 9 hours (B2, B3, B7, B11, SC1 on 5/31/00)
6/1-8/00	Pumphouse SC5: The pumphouse was shut down for redevelopment and pump and motor replacement. Down time: 179 hours
6/10/00	Treatment Center: ECV #2 did not open on command. Reset the pump director and the valve functioned acceptably. Down time: 1 hour
6/19/00	Treatment Center: The potable water line was leaking at copper elbow between ECV #1 and #2. Replaced damaged section of copper piping. Down time: 0 hours
6/19/00	Pumphouse B2: Replaced water level electrode and wire and set electrode to a depth of 98 feet. Down time: 3 hours
6/21/00	Pumphouse B7: Pumphouse would not operate due to a failed water level sensing board. Replaced water level board. Down time: 21 hours
6/20-23/00	Treatment Center: Several programmable logic controller components (central processor, input card, output card) were replaced and revised operating logic was installed and preliminarily tested during this period. Down time: 9.0 hours
July 2000	**Notes:**
7/3/00	Pumphouse B10: Removed and replaced globe valve and sample port. Down time: 4 hours
7/7-9/00	Pumphouses B1-B11: Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/7-20/00	Pumphouse SC1: SC1 not running in Auto mode. Started up in Manual mode on 7/10/00. On 7/20/00 ATK personnel replaced a failed relay in the pumphouse control panel.
7/13/00	Treatment Center: Testing of PLC required pumphouses to be shut down. Down time: 1 hour
7/17/00	Treatment Center: Testing of PLC required pumphouses to be shut down. Down time: 1 hour
7/19/00	Treatment Center: Testing of PLC required pumphouses to be shut down. Down time: 1 hour
7/20/00	Treatment Center: Testing of PLC required treatment system to be shut down. Down time: 1.5 hours
7/21/00	Treatment Center: Testing of PLC required treatment system to be shut down. Down time: 1.5 hours
7/23/00	Pumphouse B6: Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down time: 12 hours
7/25/00	Pumphouse B6: Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down time: 11 hours
7/28/00	Pumphouse B6: Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down Time: 5 hours
August 2000	**Notes:**
8/4/00	Pumphouse B6: Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Water level probe was rehung in the water level tube. Down Time: 6.5 hours

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/7/00	Treatment Center: Autodialer indicates TGRS fail, PDU #1, "Insufficient pump pressure on start up". Pumphouses B1, B2, B7, B8, B10, B11, SC1, and SC3 were off. Reset motor control center - wet well pump #1 bay. Reset PDU #1. Cycled PDU #1 three times. Observed normal operation. Down time: 14 hours (B1, B2, B7, B8, B10, B11, SC1, SC3)
8/9/00	Pumphouses B1-B12 and SC1-SC5: Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
8/22/00	Treatment Center: Potable water line feeding ECV #1 and #2 was leaking. Replaced leaking section of copper piping. Down time: 0 hours
8/24/00	Pumphouse B1: Pumphouse cycling off and on. Failure to be trouble shot. Down time: 15 hours
8/29/00	Pumphouse B1: Pumphouse cycling, replaced water level control board. Down time: 1 hour
September 2000	**Notes:**
9/3/00	Pumphouses B1, B4, B5, and SC5: Pumphouses were found in failure mode. "Hand-Off-Auto" Switch at each pumphouse were turned from "Auto" to "Off" and back to "Auto". Normal operation was observed at each pumphouse. Down time: 11 hours (B1), 21 hours (B4, B5, SC5)
9/9/00	Pumphouse B3: Lift system not operating, I/O adapter card fault light on. Power to control panel was cycled off and back on. Normal operation was observed. Down time: 22 hours
9/14-18/00	Pumphouses B1, B3, B5, and B7: Pumphouses cycling due to water level sensing circuit. Cleaned water level electrodes and verified electrodes are submersed in water. Reset pumphouses at main PLC. Down time: 6 hours (B1), 6.5 hours (B3), 7 hours (B5), 54 hours (B7)

APPENDIX F.2

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/20/00	Treatment Center: Flow meter from ECV #1 inoperable. Removed inoperable flow meter and installed a rebuilt flow meter. Treatment Center meter #1 reading estimated. Down time: 1.5 hours

F.3 Events By Location, Fiscal Year 2000, TGRS, TCAAP

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

B1

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
3/23/00	Replaced size 2 motor starter with size 3 starter. Down time: 6 hours
3/24/00	Replaced failed water level control circuit board. Down time: 2 hours
5/8/00	Lubricated noisy exhaust fan motor at B1. Down time: 0.5 hours
5/18/00	The well was not producing at its available capacity. The pumphouse was shut down to repair the lift system. Brushed casing and bailed debris from the well, replaced the pump, motor, riser pipe and fittings. Down time: 8.5 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Pump sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse.
8/24/00	Pumphouse cycling off and on. Failure to be trouble shot. Down time: 15 hours
8/29/00	Pumphouse cycling, replaced water level control board. Down time: 1 hour
9/3/00	Pumphouse was found in failure mode. "Hand-Off-Auto" Switch at pumphouse was turned from "Auto" to "Off" and back to "Auto". Normal operation was observed at pumphouse. Down time: 11 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

9/14-18/00	Pumphouse cycling due to water level sensing circuit. Cleaned water level electrodes and verified electrodes are submersed in water. Reset pumphouse at main PLC. Down time: 6 hours

B2

11/5/99	Low water level light found on, pump shut down until repairs made to ECV controls. Down time: 23.5 hours
4/24-30/00	Extraction well shut down for redevelopment. Down time: 129 hours
5/1-5/00	The pumphouse was shut down for well redevelopment and pump & motor replacement. Down time: 136.5 hours
5/10/00	O-ring leaking at the pitless adapter. Replaced faulty O-ring with new O-ring. Down time: 18 hours
6/19/00	Replaced water level electrode and wire and set electrode to a depth of 98 feet. Down time: 3 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

B3

1/25/00	Replaced pump and motor at pumphouse B3. Brushed and bailed out the inside casing. Down time: 9 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
9/9/00	Lift system not operating, I/O adapter card fault light on. Power to control panel was cycled off and back on. Normal operation was observed. Down time: 22 hours
9/14-18/00	Pumphouse cycling due to water level sensing circuit. Cleaned water level electrodes and verified electrodes are submersed in water. Reset pumphouse at main PLC. Down time: 6.5 hours

B4

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
9/3/00	Pumphouse was found in failure mode. "Hand-Off-Auto" Switch at pumphouse were turned from "Auto" to "Off" and back to "Auto". Normal operation was observed at pumphouse. Down time: 21 hours

B5

5/8/00	Re-tied loose conductor wires to contact 3 on AC input card at B5. Down time: 0.5 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
9/3/00	Pumphouse was found in failure mode. "Hand-Off-Auto" Switch at pumphouse were turned from "Auto" to "Off" and back to "Auto". Normal operation was observed at pumphouse. Down time: 21 hours
9/14-18/00	Pumphouse cycling due to water level sensing circuit. Cleaned water level electrodes and verified electrodes are submersed in water. Reset pumphouses at main PLC. Down time: 7 hours

B6

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
2/29/00	Measured current stick up of outer casing at 0.97 feet above concrete slab. Down time: 0 hours
5/2-25/00	The pumphouse was shut down for redevelopment, well head replacement, pump, motor, riser pipe, check valve replacement. Down time: 576 hours
5/28/00	The collar on the indicator stem (an ECV component) was out of adjustment. The adjustment was made and pumphouse functioned properly. Down time: 48 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/23/00	Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down time: 12 hours
7/25/00	Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down time: 11 hours
7/28/00	Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Down Time: 5 hours
8/4/00	Pumphouse is shutting down due to low water level. The low water level probe was not reaching desired depth due to equipment in the well. Water level probe was rehung in the water level tube.
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

B7

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
4/9-10/00	Pumphouse not restarted after ECV #2 rebuild; human error. Down time: 17 hours
5/8/00	Installed sealtite conduit between well head and junction box at B7. Down time: 1.5 hours
6/21/00	Pumphouse would not operate due to a failed water level sensing board. Replaced water level board. Down time: 21 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
9/14-18/00	Pumphouse cycling due to water level sensing circuit. Cleaned water level electrodes and verified electrodes are submersed in water. Reset pumphouse at main PLC. Down time: 54 hours

B8

4/18-21/00	Lift system are not operating. Replaced sub I/O scanner module. Down time: 86.5 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

B9

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

B10

3/14/00	Electric check valve vibrating and rattling. Replace valve body with new body assembly. Down time: 10 hours
7/3/00	Removed and replaced globe valve and sample port. Down time: 4 hours
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

B11

1/10/00	No power to pumphouse. NSP corrected failure. Down time: 3 hours
4/18-21/00	Lift system not operating. Replaced sub I/O scanner module. Down time: 86.5 hours
5/8/00	Cut back and reterminated conductor and cleaned contacts and tightened 480 V disconnection switch. Down time: 1 hour
7/7-9/00	Severe storm passes through and knocks out power to boundary wells. Inspection performed after the storm. Down time: 46 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

B12

12/7/99	Well was purged as part of the semiannual extraction well sampling event. Down time: 0 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

SC1

4/12-24/00	Extraction well shut down for redevelopment. Down time: 287 hours
7/7-20/00	SC1 not running in Auto mode. Started up in Manual mode on 7/10/00. On 7/20/00 ATK personnel replaced a failed relay in the pumphouse control panel. Down time: 21.5 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

SC2

1/6/00	Pumphouse SC2 would not remain in operation because ECV indicator collar was loose and not indicating ECV had functioned. Adjusted collar. Down time: 2.5 hours
2/9/00	Reduced flow rate due to fouling by iron sludge. Clean well and lift system by circulating acid through the well, pump, flow meter and piping. Down time: 52 hours
2/18/00	Complete cleaning of well started on 2/9 by circulating acid through the well, pump, flow meter and piping. Down time: 24 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
3/12/00	Not operating due to open circuit on power pole. NSP closed circuit and pumphouse was restarted. Down time: 12 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

SC3

2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
3/12/00	Not operating due to open circuit on power pole. NSP closed circuit and pumphouse was restarted. Down time: 12 hours
3/27/00	Pump not operating because motor failed. Install new pump, motor, electrical wire and 2 joints of riser pipe. Also, brush and bail casing. Down time: 76 hours
8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

SC4

12/7/99	Well was purged as part of the semiannual extraction well sampling event. Down time: 0 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours

SC5

2/10/00	Reduced flow rate because wells hydraulic capacity has declined. Down time: 0 hours
2/14/00	Pumphouse would run in "Hand" but not "Automatic" operating mode. Installed new A-B power supply. Down time: 4 hours
2/21/00	Reduced flow rate. Attempted to adjust flow rate to target flow rate. Down time: 0 hours
3/14-31/00	The well is producing fine particulates plugging the flow meter, causing erroneously low meter readings. Down time: 0 hours
3/23/00	Replaced 480V 30 Amp disconnect switch with 60 Amp switch and installed 50 Amp time delay type fuses. Down time: 2 hours
4/5-12/00	Pumphouse flow meter not functioning properly. Clogging due to fine sand produced by well. Turbine assembly changed twice. Down time: 1 hour
5/30/00	The pumphouse was shut down for redevelopment and pump and motor replacement. Down time: 13 hours
6/1-8/00	The pumphouse was shut down for redevelopment and pump and motor replacement. Down time: 179 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

8/9/00	Sample port piping has failed due to corrosion. Replaced sample port piping with a saddle style connection and installed 3/4" ball valve and boiler drain fitting at each pumphouse. Down time: 4 hours
9/3/00	Pumphouse was found in failure mode. "Hand-Off-Auto" Switch at pumphouse was turned from "Auto" to "Off" and back to "Auto". Normal operation was observed at pumphouse. Down time: 21 hours

TREATMENT CENTER

10/9/99	ECV #4 closed without command. Down time: 0 hours
10/12/99	ECV#2 did not open on command. Down time: 0.5 hours
10/25/99	Treatment system shut down to facilitate replacement of packing on Wet Well Pump #2. Down time: 2 hours
11/8/99	ECV #4 closed without command. Down time: 0.5 hours
11/17/99	ECV #4 closed without command and motor starter for pump #2 tripped. Down time: 0.5 hours
11/19/99	ECV #2 did not open on start up. Down time: 1 hour
11/25/99	Meter readings estimated due to Thanksgiving holiday. Down time: 0 hours
11/29/99	ECV #4 closed without command. Changed cartridge filter and valve operated normally. Down time: 1 hour
11/30/99	ECV #4 closed without command. Adjusted closing speed valve and valve functioned properly.

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

12/4/99	ECV #4 did not open on command. ECV speed control valves adjusted and valve operated properly. Down time: 0.5 hours
12/25/99	Meter readings are estimated due to Christmas holiday. Down time: 0 hours
12/28/99	ECV #2 closed without command. The valve was reset and control piping flushed. Valve was operated and it functioned properly. Down time: 1 hour
12/29/99	ECV #2 did not open on command. ECV control valves were adjusted and valve operation observed. Valve functioned properly. Down time: 1 hour
12/31/99	ECV #2 did not open on command. The PDU was reset and valve functioned properly. Down time: 1 hour
1/6/00	ECV #4 would not open on command. ECV control valves adjusted and valve functioned properly. Down time: 2.5 hours
1/16/00	ECV #2 did not open on start up. Cycled the pump director unit 3 times and observed normal operation. Down time: 0 hours
1/29/00	Treatment Center: ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 0.5 hours
2/12/00	ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 3 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

2/20/00	ECV #4 closed without command. Cycled the pump director unit 3 times and observed normal operation. Down time: 1.5 hours
3/2/00	Replaced control harness on ECV #3. Shut down pumphouses B3, B7, B10, B11, SC1 and WWP #1 to accommodate reduced system capacity during repair. Down time: 25.5 hours (B3, B7, B10, B11, SC1)
3/11-14/00	ECV #4 closed without command 4 times. Pumphouses B3, B7, B10, and SC1 were shut down pending repair of ECV. Adjustments made to ECV and normal operation solenoid replaced. Down time: 20 hours (B3, B7, B10, SC1 on 3/11-12/00), 30 hours (B11 on 3/11-12/00),
3/20/00	ECV #2 failed to open on start up. The PDU was reset and the valve cycled valve several times. Observed normal operation. Down time: 0 hours
4/2/00	ECV #4 control harness replaced. Down time: 4 hours
4/2-4/00	Autodialer sensing an alarm condition at PDU #4 although no alarm condition exists. Replaced main board in PDU #4. Down time: 1 hour
4/9/00	ECV #2 control harness replaced. Down time: 4 hours
4/11/00	System shut down to gather information on PLC system. Down time: 1 hour
4/18/00	AST #1 and #4 were shut down for inspection by tower refurbishing contractor. Down time: 4 hours
5/5/00	ECV #2 did not open on command. The fault was reset and valve functioned properly. Down time: 2.5 hours

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

5/8/00	ECV #3 would not close on command. Repairs performed on 5/30-6/1. Down time: 0 hours
5/9/00	System shutdown for testing of new PLC and software. Down time: 1 hour
5/10/00	Performed electrical and operational equipment inspections. Down time: 2.8 hours
5/18/00	Performed inspection of air stripping towers. Down time: 6.3 hours
5/25/00	Well field cycling. Reset pump director #2 and ECV No. 2 functioned properly. Down time: 3 hours
5/29/00	TGRS meter readings were not performed in observance of the Memorial Day holiday. Down time: 0 hours
5/30-6/1/00	ECV #3 was disassembled, a seal kit was installed, the piston and liner were cleaned, the valve reassembled and tested. Down time: 9 hours (B2, B3, B7, B11, SC1 on 5/31/00)
6/10/00	ECV #2 did not open on command. Reset the pump director and the valve functioned acceptably.
6/19/00	The potable water line was leaking at copper elbow between ECV #1 and #2. Replaced damaged section of copper piping. Down time: 0 hours
6/20-23/00	Several programmable logic controller components (central processor, input card, output card) were replaced and revised operating logic was installed and preliminarily tested during this period. Down time: 9.0 hours
7/13/00	Testing of PLC required pumphouses to be shut down. Down time: 1 hour

APPENDIX F.3

EVENTS BY LOCATION
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

7/17/00	Testing of PLC required pumphouses to be shut down. Down time: 1 hour
7/19/00	Testing of PLC required pumphouses to be shut down. Down time: 1 hour
7/20/00	Testing of PLC required treatment system to be shut down. Down time: 1.5 hours
7/21/00	Testing of PLC required treatment system to be shut down. Down time: 1.5 hours
8/7/00	Autodialer indicates TGRS fail, PDU #1, "Insufficient pump pressure on start up". Pumphouses B1, B2, B7, B8, B10, B11, SC1, and SC3 were off. Reset motor control center - wet well pump #1 bay. Reset PDU #1. Cycled PDU #1 three times. Observed normal operation.
8/22/00	Potable water line feeding ECV #1 and #2 was leaking. Replaced leaking section of copper piping.
9/20/00	Flow meter from ECV #1 inoperable. Removed inoperable flow meter and installed a rebuilt flow meter. Treatment Center meter #1 reading estimated. Down time: 1.5 hours

FORCEMAIN

10/27/99	The altitude valve failed to close over filling the elevated tank. The TGRS was shut down to facilitate repairs. Down time: 1.5 hours
4/22/00	Elevated tank and ground storage reservoir have low water levels. Snelling Avenue back pressure valve not maintaining adequate back pressure. Changed strainer screen and adjusted back pressure to 34 psi at Snelling Avenue valve. Down time: 0 hours

F.4 Operating Notes, Fiscal Year 2000, PGRS, TCAAP

APPENDIX F.4

OPERATING NOTES
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

October 1999	**None.**
November 1999	**None.**
December 1999	**Notes:**
12/27/99 - 1/4/00	Well #13 shut down due to a chlorine booster pump failure. Down time: 8.5 days
January 2000	**Notes:**
1/11/00	PGACWTF carbon vessel changeout began.
February 2000	**None.**
March 2000	**Notes:**
3/6/00	PGACWTF carbon vessel changeout completed.
April 2000	**Notes:**
4/13 - 4/23/00	Well #3 and Well #4 shut down during mechanical alternations of respective well houses. Down time: 11 days
May 2000	**None.**
June 2000	**None.**
July 2000	**None.**
August 2000	**None.**
September 2000	**None.**

APPENDIX G

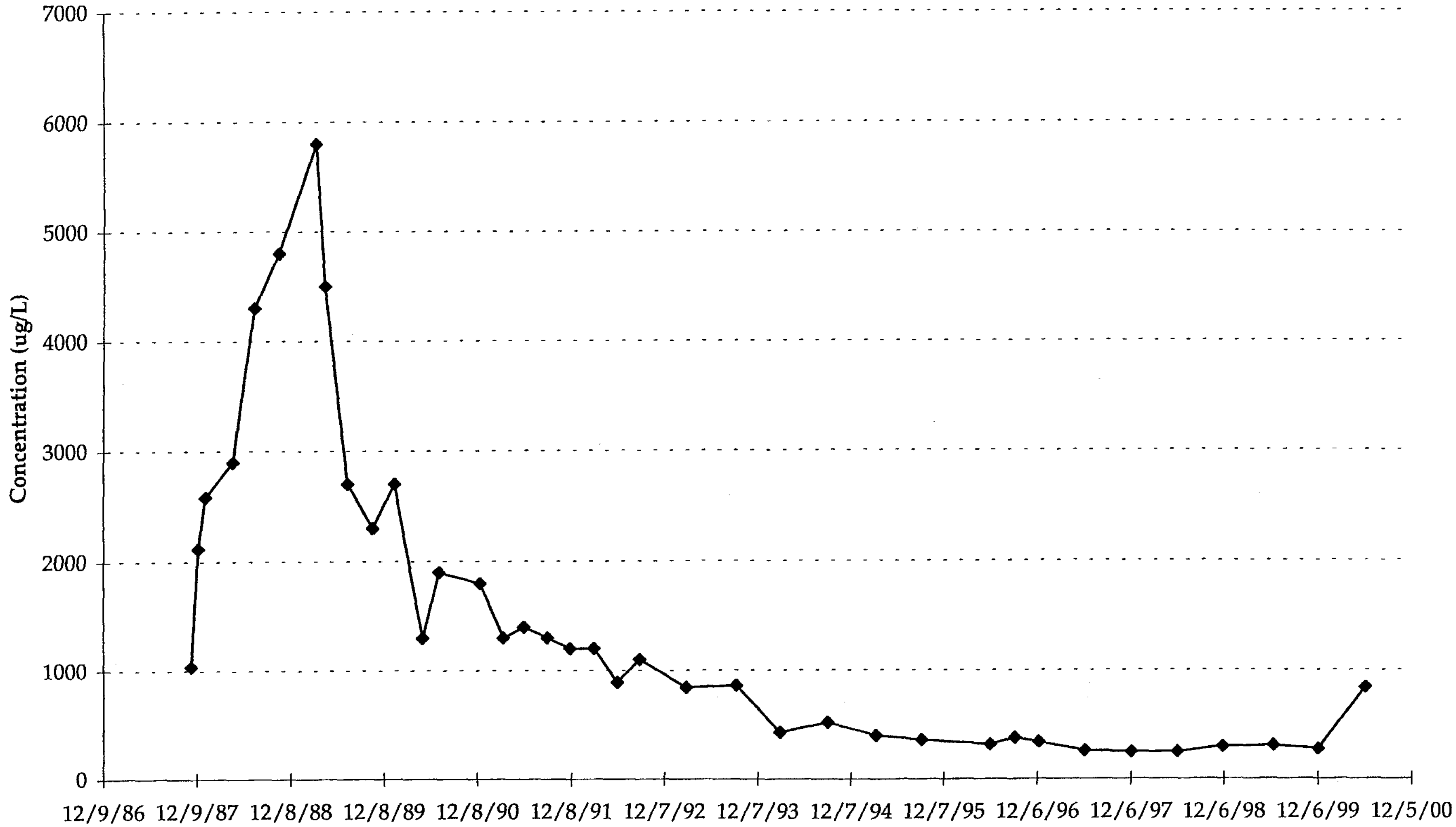
Appendix G

TGRS Chemical Data

G.1 Extraction Well – TRCLE vs. Time

APPENDIX G.1

EXTRACTION WELL B1 - TRCLE VS.TIME

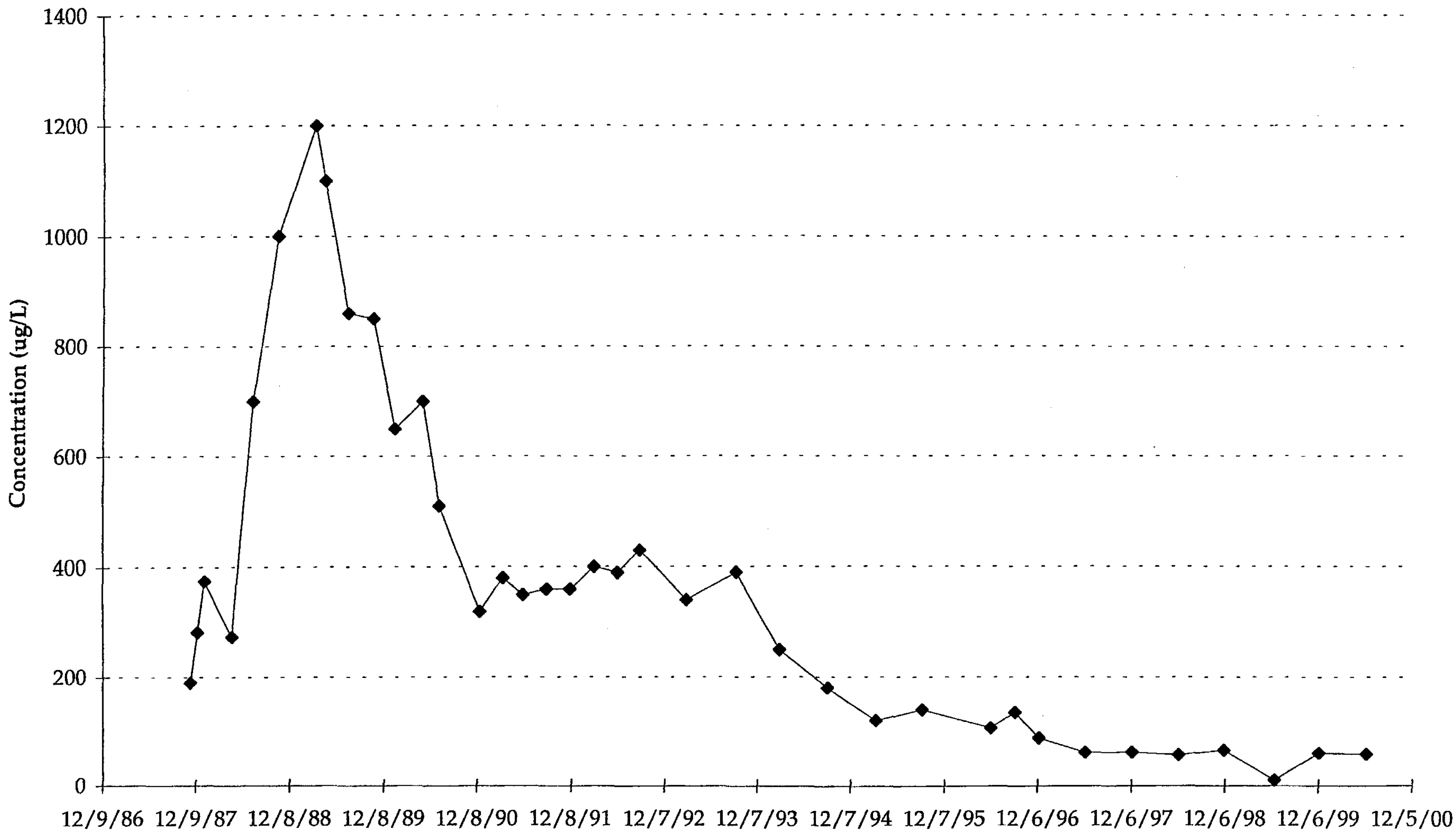


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

APPENDIX G.1

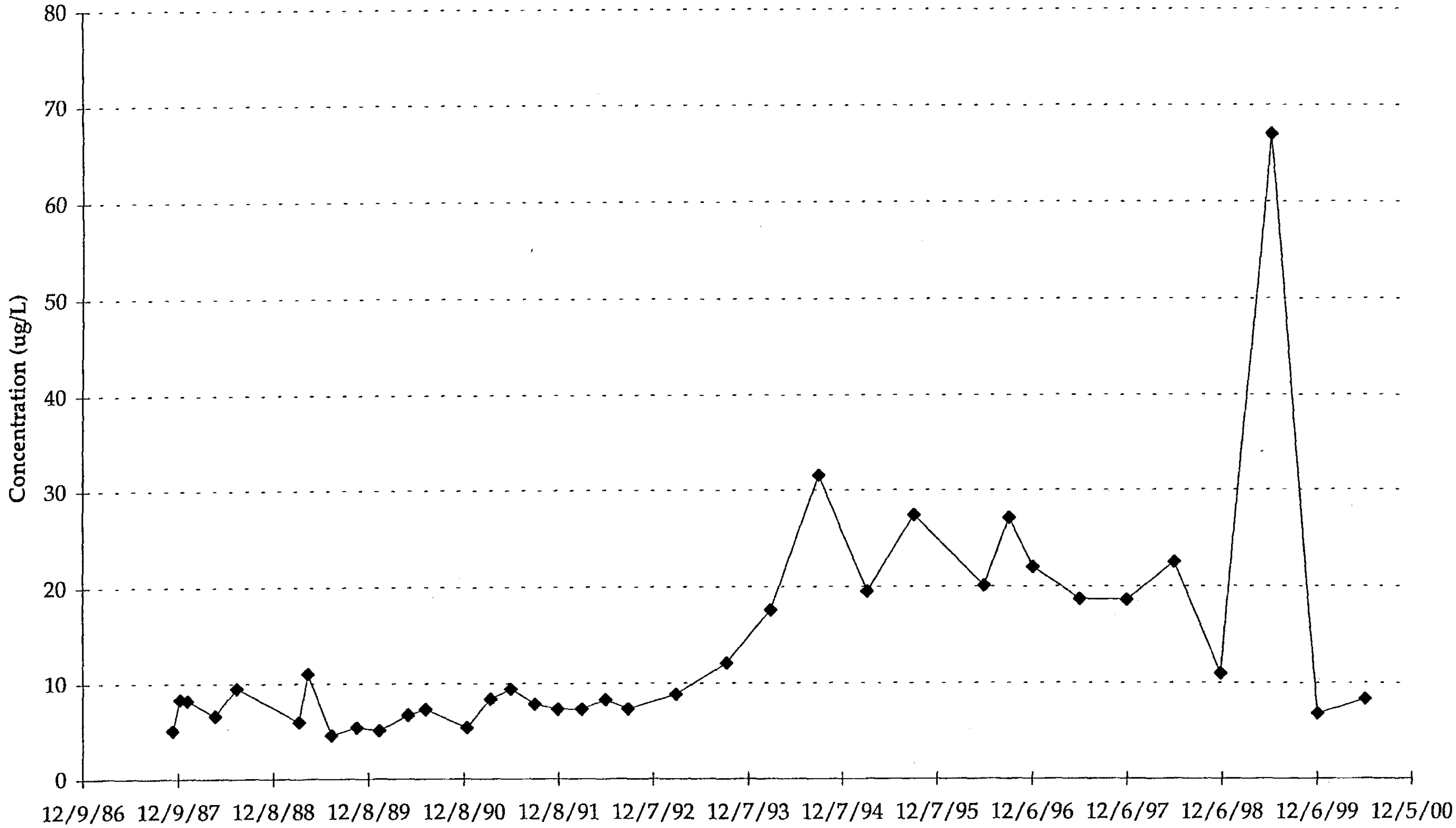
EXTRACTION WELL B2 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

EXTRACTION WELL B3 - TRCLE VS. TIME

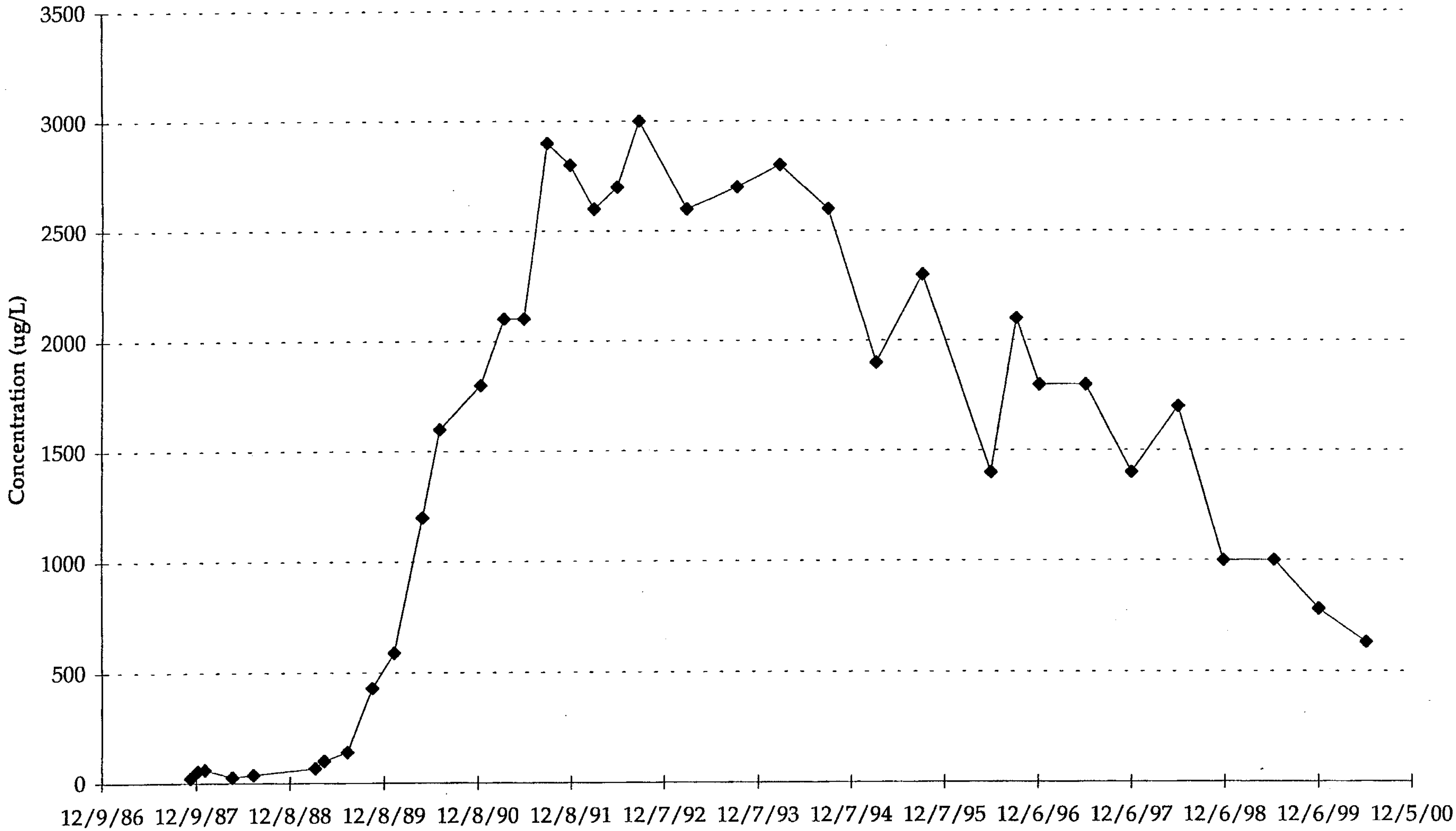


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

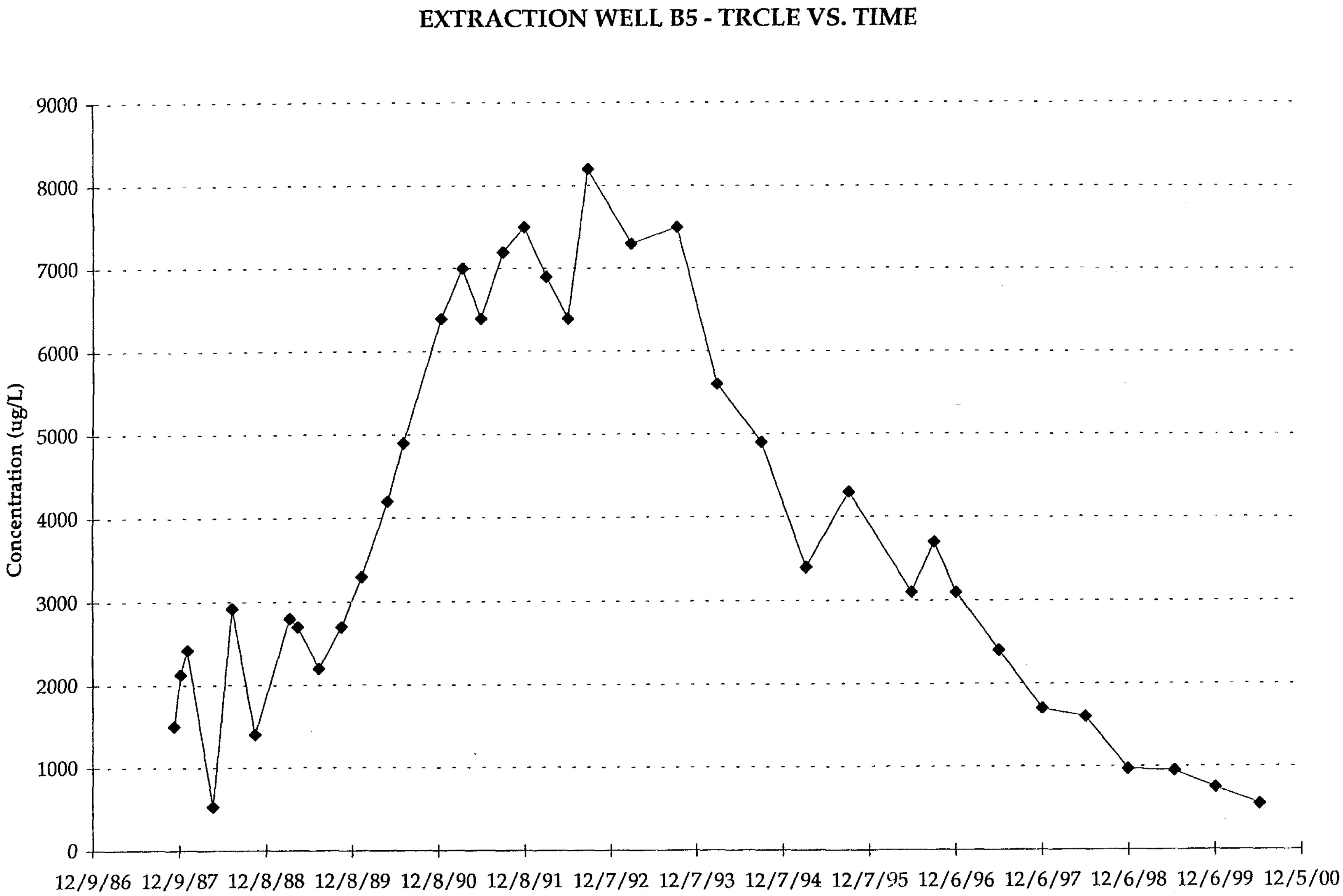
APPENDIX G.1

EXTRACTION WELL B4 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

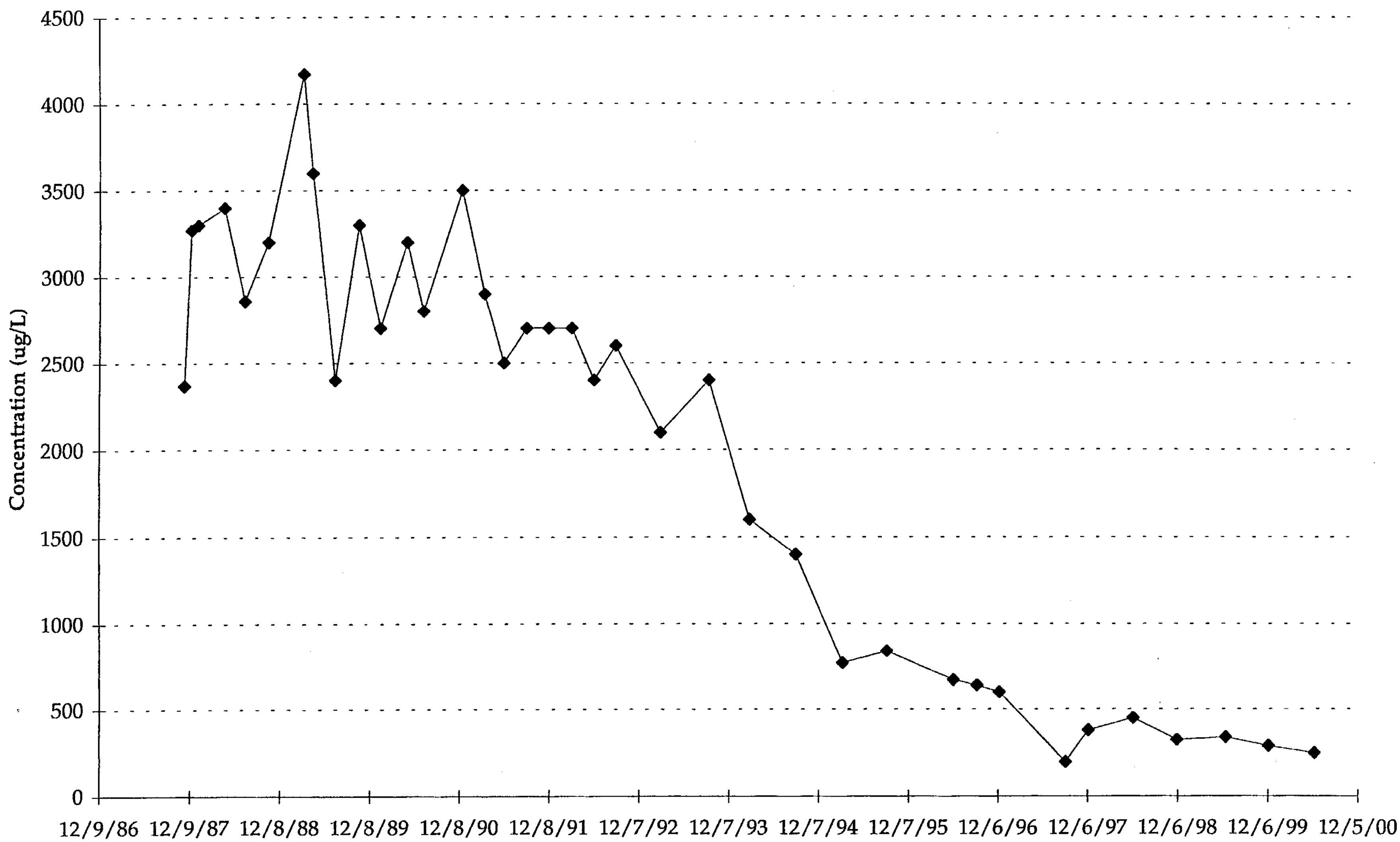


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

APPENDIX G.1

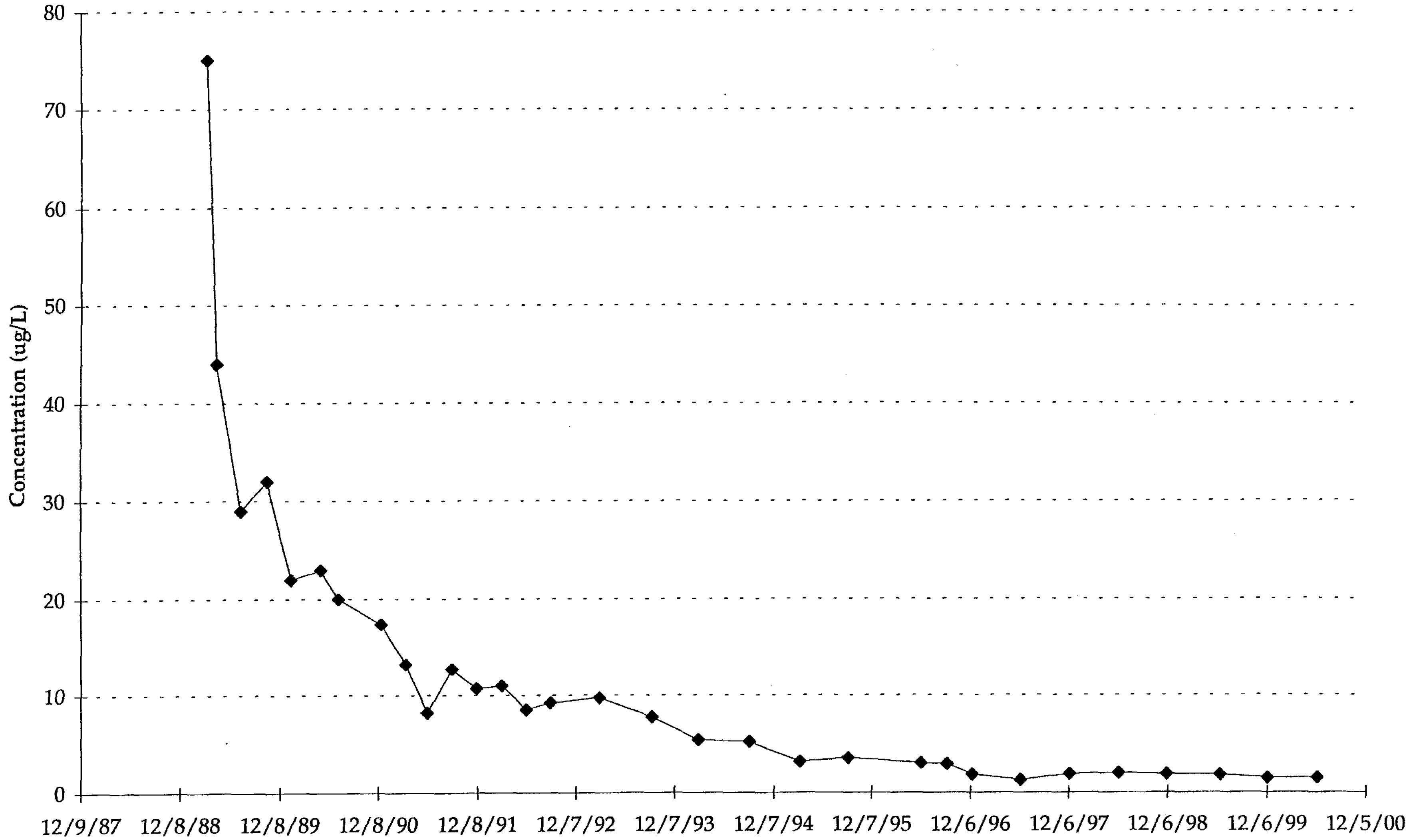
EXTRACTION WELL B6 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

EXTRACTION WELL B7 - TRCLE VS. TIME

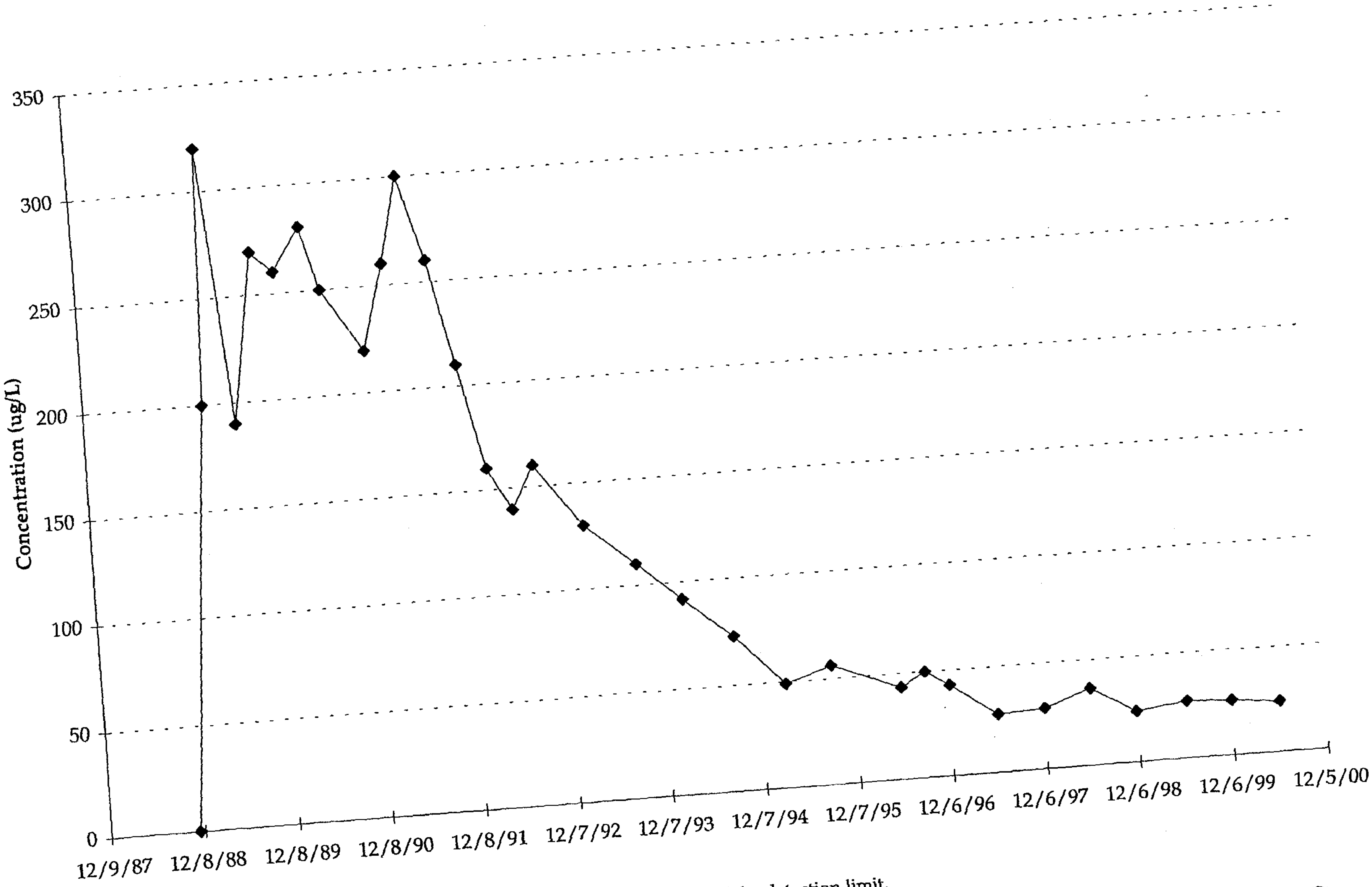


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

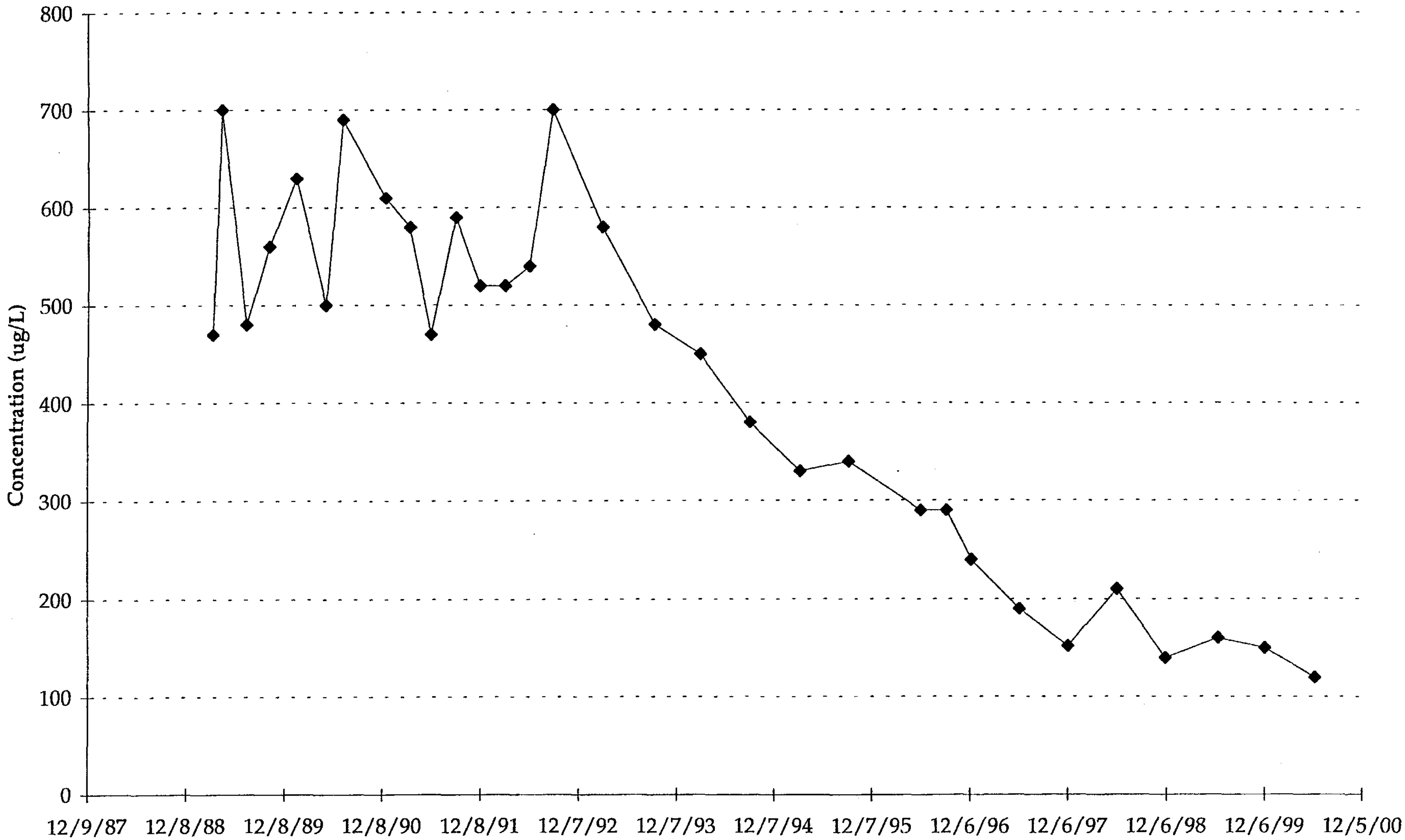
APPENDIX G.1

EXTRACTION WELL B8 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

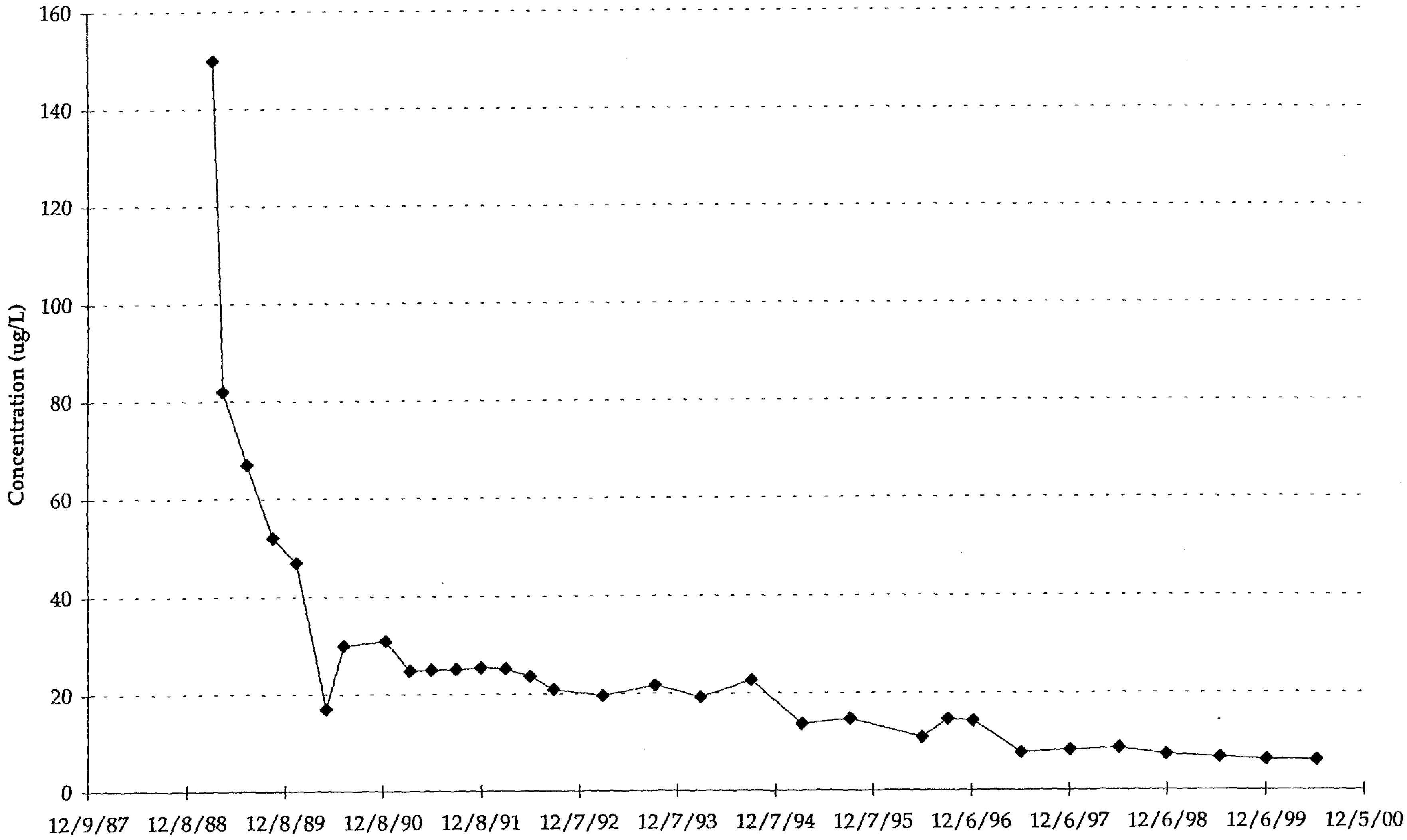
EXTRACTION WELL B9 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

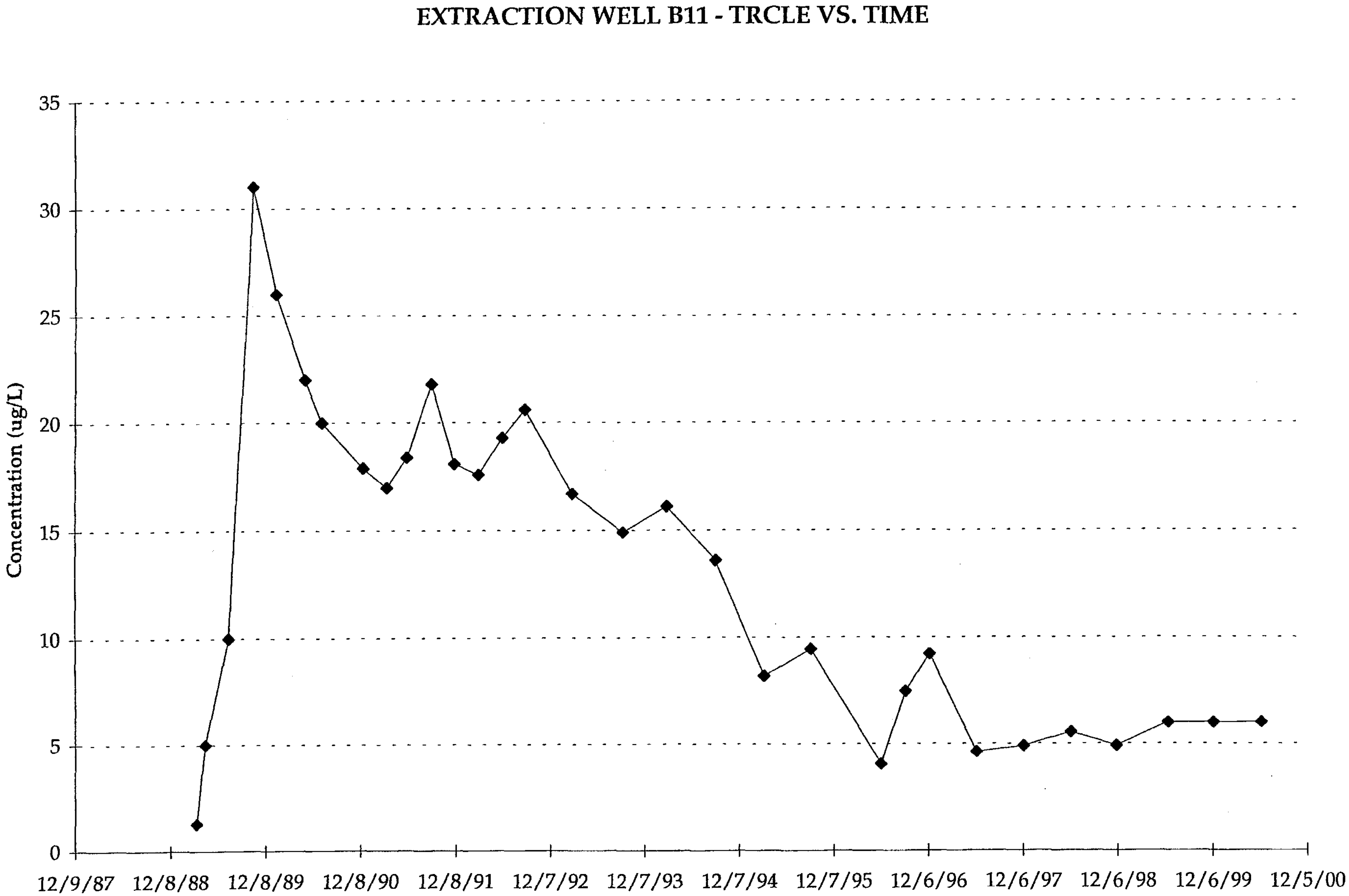
EXTRACTION WELL B10 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 1

APPENDIX G.1

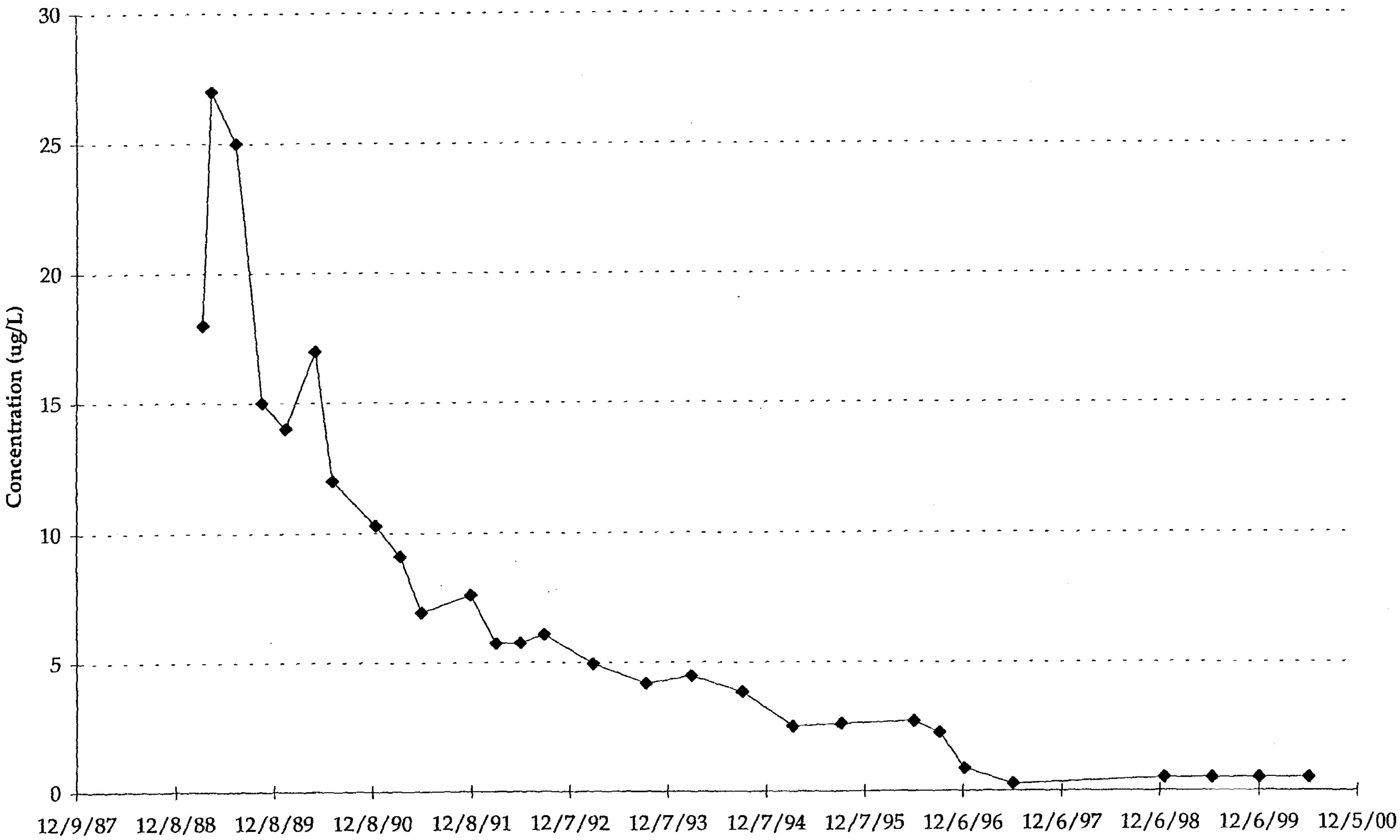


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

APPENDIX G.1

EXTRACTION WELL B12 - TRCLE VS. TIME

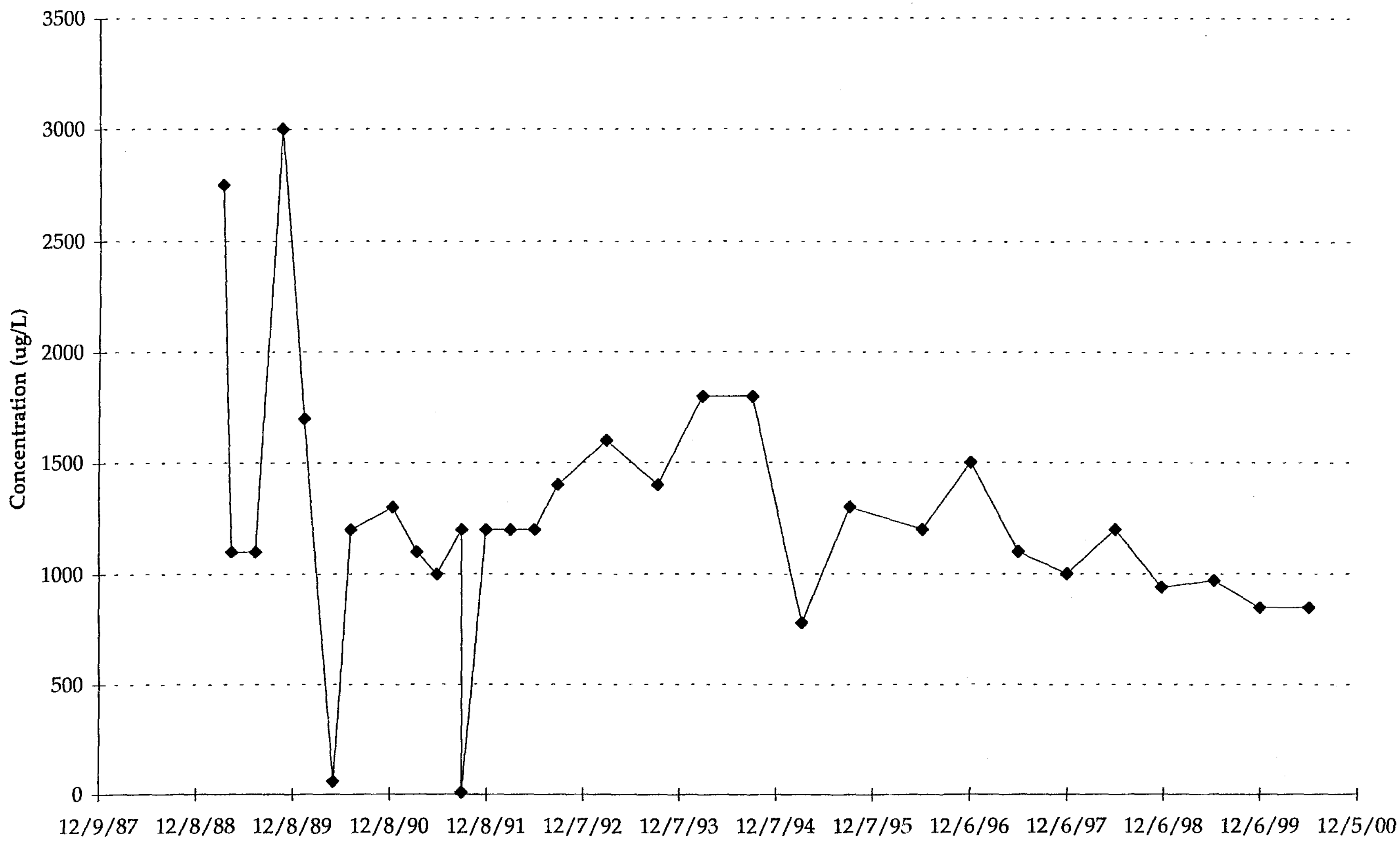


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15

APPENDIX G.1

EXTRACTION WELL SC1 - TRCLE VS. TIME

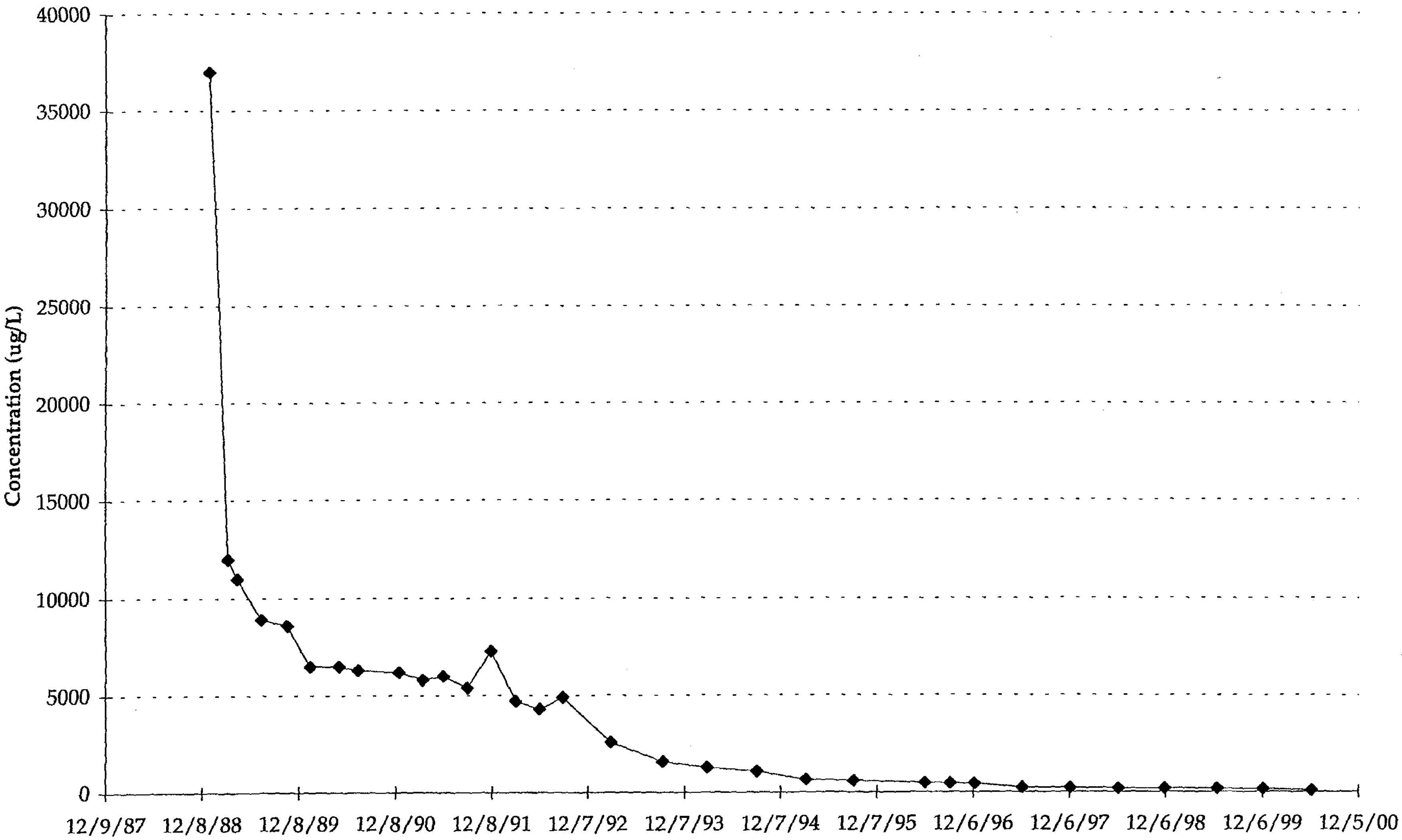


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

APPENDIX G.1

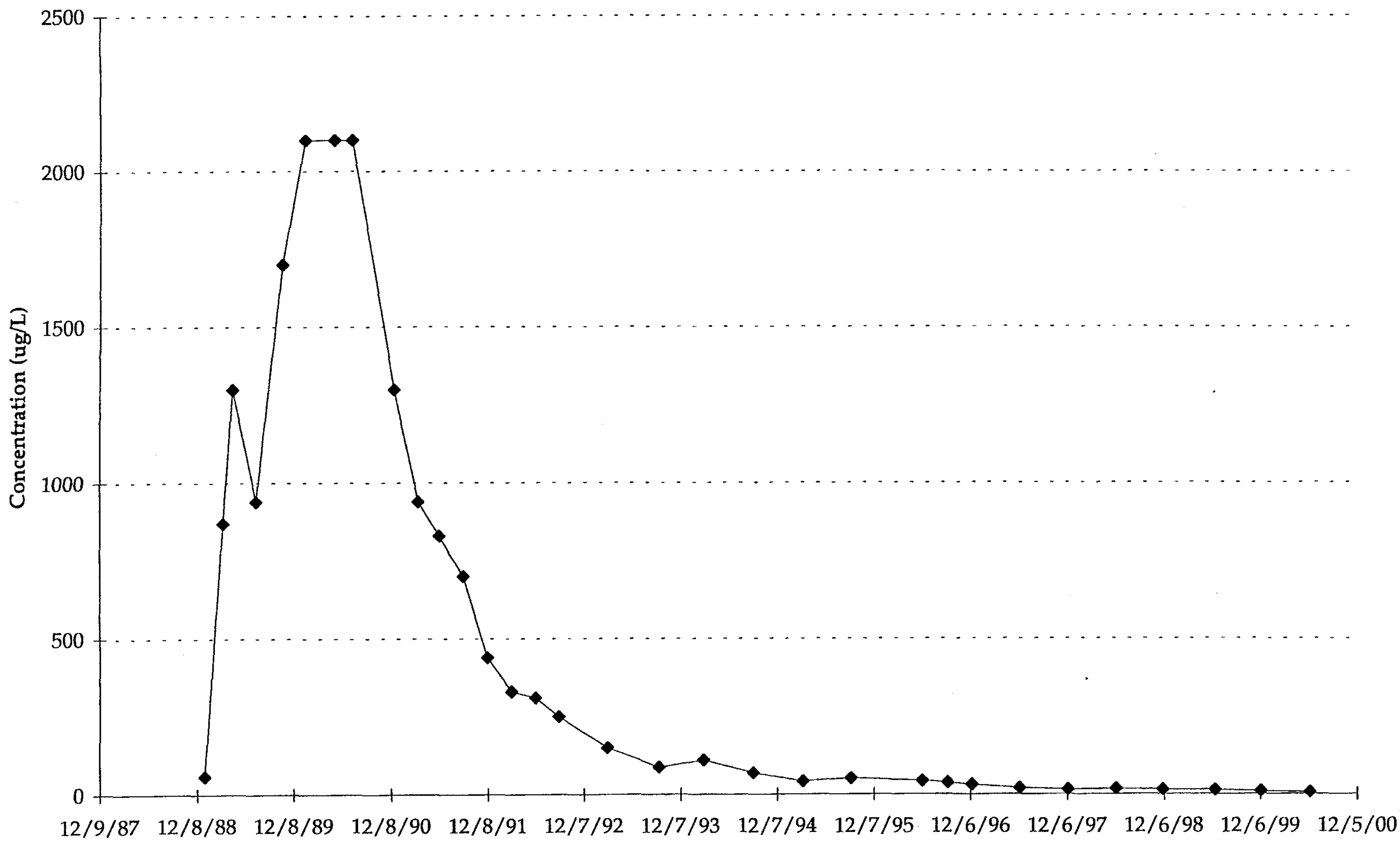
EXTRACTION WELLSC2 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

EXTRACTION WELL SC3 - TRCLE VS. TIME

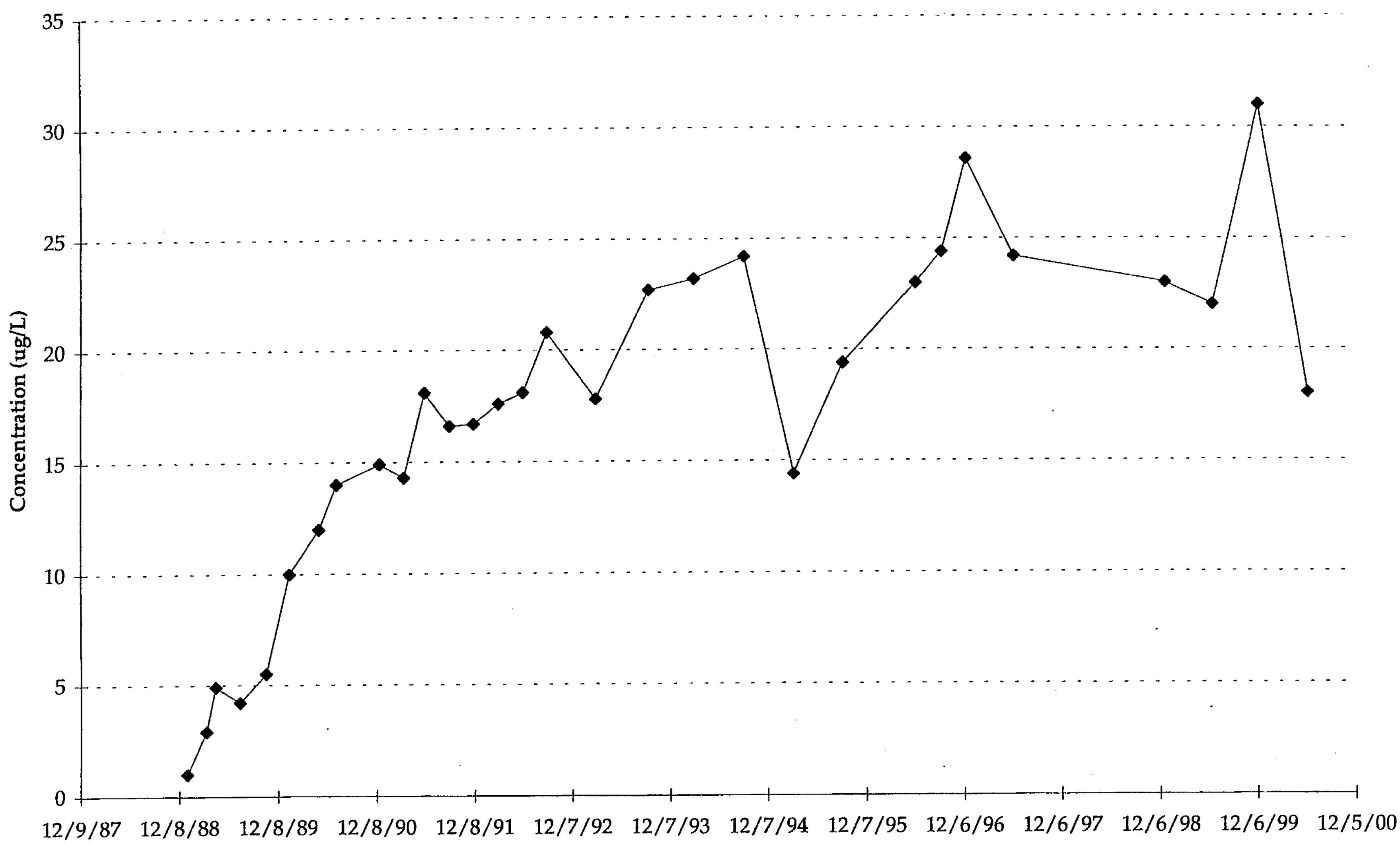


Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

APPENDIX G.1

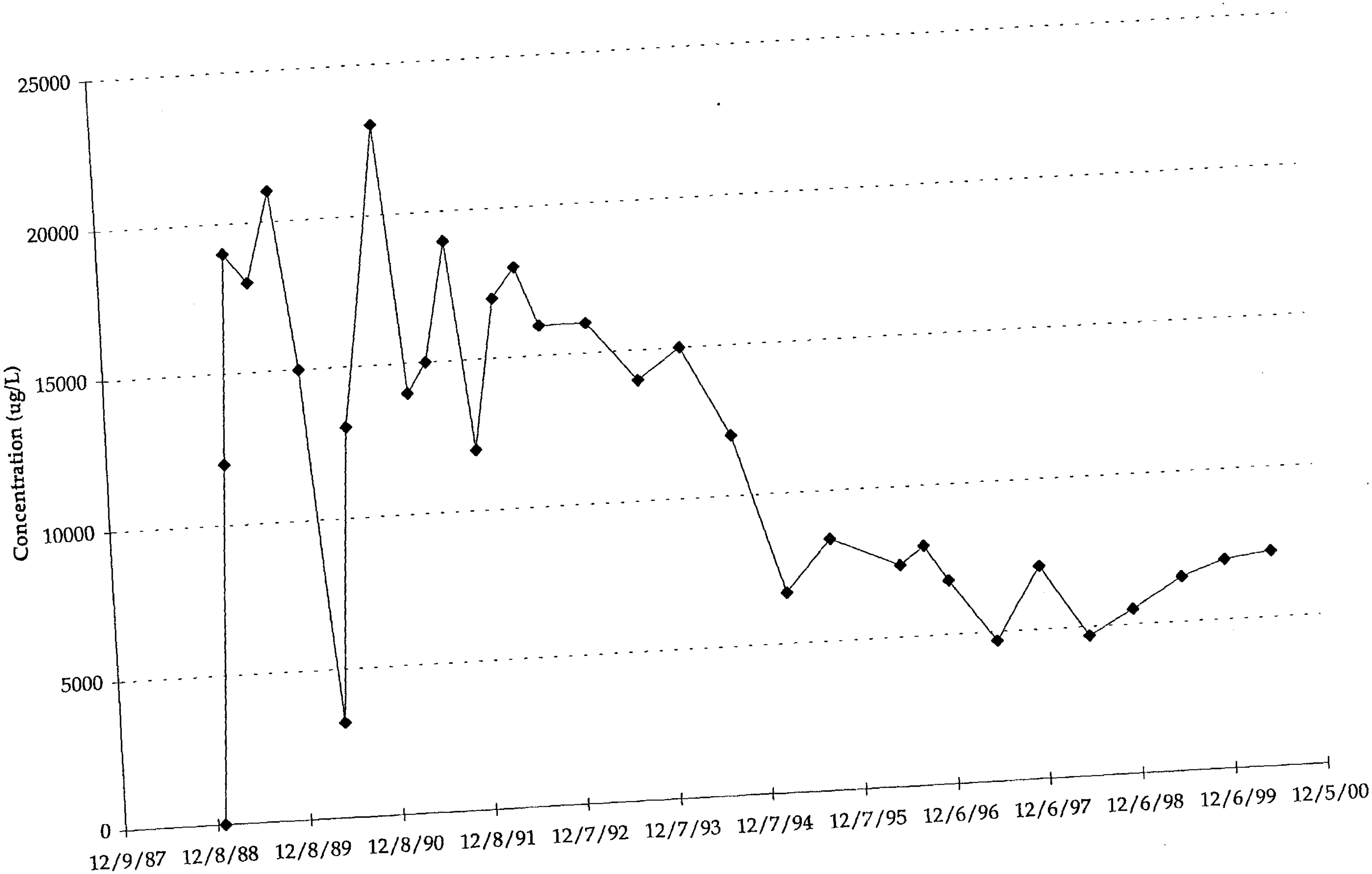
EXTRACTION WELL SC4 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

APPENDIX G.1

EXTRACTION WELL SC5 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as half the detection limit.

CRA 15213 (1)

G.2 Influent/Effluent Database, Fiscal Year 2000, TGRS, TCAAP

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	10/05/99	111TCE	BPYF 004	< 1	
TGRSE	10/05/99	111TCE	BPYF 005	< 1	D
TGRSE	11/02/99	111TCE	BQSW 004	< 1	
TGRSE	11/02/99	111TCE	BQSW 005	< 1	D
TGRSE	12/07/99	111TCE	BRLK 004	< 1	
TGRSE	12/07/99	111TCE	BRLK 005	< 1	D
TGRSE	01/04/00	111TCE	BRWD 004	< 1	
TGRSE	01/04/00	111TCE	BRWD 007	< 1	D
TGRSE	02/01/00	111TCE	BSPS 004	< 1	
TGRSE	02/01/00	111TCE	BSPS 005	< 1	D
TGRSE	03/07/00	111TCE	BTFC 003	< 1	
TGRSE	03/07/00	111TCE	BTFC 006	< 1	D
TGRSE	04/04/00	111TCE	BTPN 003	< 1	
TGRSE	04/04/00	111TCE	BTPN 006	< 1	D
TGRSE	05/02/00	111TCE	BTZG 007	< 1	D
TGRSE	05/02/00	111TCE	BTZG 004	< 1	
TGRSE	06/09/00	111TCE	BVRC 009	< 1	D
TGRSE	06/09/00	111TCE	BVRC 008	< 1	
TGRSE	07/06/00	111TCE	BVXG 006	< 1	D
TGRSE	07/06/00	111TCE	BVXG 003	< 1	
TGRSE	08/01/00	111TCE	BWFY 005	< 1	D
TGRSE	08/01/00	111TCE	BWFY 004	< 1	
TGRSE	09/05/00	111TCE	BWJJ 010	< 1	D
TGRSE	09/05/00	111TCE	BWJJ 009	< 1	
TGRSE	10/05/99	112TCE	BPYF 004	< 1	
TGRSE	10/05/99	112TCE	BPYF 005	< 1	D
TGRSE	11/02/99	112TCE	BQSW 004	< 1	
TGRSE	11/02/99	112TCE	BQSW 005	< 1	D
TGRSE	12/07/99	112TCE	BRLK 005	< 1	D
TGRSE	12/07/99	112TCE	BRLK 004	< 1	
TGRSE	01/04/00	112TCE	BRWD 007	< 1	D
TGRSE	01/04/00	112TCE	BRWD 004	< 1	
TGRSE	02/01/00	112TCE	BSPS 004	< 1	
TGRSE	02/01/00	112TCE	BSPS 005	< 1	D
TGRSE	03/07/00	112TCE	BTFC 006	< 1	D
TGRSE	03/07/00	112TCE	BTFC 003	< 1	
TGRSE	04/04/00	112TCE	BTPN 006	< 1	D
TGRSE	04/04/00	112TCE	BTPN 003	< 1	
TGRSE	05/02/00	112TCE	BTZG 007	< 1	D
TGRSE	05/02/00	112TCE	BTZG 004	< 1	
TGRSE	06/09/00	112TCE	BVRC 009	< 1	D

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	06/09/00	112TCE	BVRC 008	< 1	
TGRSE	07/06/00	112TCE	BVXG 006	< 1	D
TGRSE	07/06/00	112TCE	BVXG 003	< 1	
TGRSE	08/01/00	112TCE	BWFY 004	< 1	
TGRSE	08/01/00	112TCE	BWFY 005	< 1	D
TGRSE	09/05/00	112TCE	BWJJ 010	< 1	D
TGRSE	09/05/00	112TCE	BWJJ 009	< 1	
TGRSE	10/05/99	11DCE	BPYF 004	< 1	
TGRSE	10/05/99	11DCE	BPYF 005	< 1	D
TGRSE	11/02/99	11DCE	BQSW 005	< 1	D
TGRSE	11/02/99	11DCE	BQSW 004	< 1	
TGRSE	12/07/99	11DCE	BRLK 005	< 1	D
TGRSE	12/07/99	11DCE	BRLK 004	< 1	
TGRSE	01/04/00	11DCE	BRWD 007	< 1	D
TGRSE	01/04/00	11DCE	BRWD 004	< 1	
TGRSE	02/01/00	11DCE	BSPS 004	< 1	
TGRSE	02/01/00	11DCE	BSPS 005	< 1	D
TGRSE	03/07/00	11DCE	BTFC 003	< 1	
TGRSE	03/07/00	11DCE	BTFC 006	< 1	D
TGRSE	04/04/00	11DCE	BTPN 006	< 1	D
TGRSE	04/04/00	11DCE	BTPN 003	< 1	
TGRSE	05/02/00	11DCE	BTZG 007	< 1	D
TGRSE	05/02/00	11DCE	BTZG 004	< 1	
TGRSE	06/09/00	11DCE	BVRC 009	< 1	D
TGRSE	06/09/00	11DCE	BVRC 008	< 1	
TGRSE	07/06/00	11DCE	BVXG 006	< 1	D
TGRSE	07/06/00	11DCE	BVXG 003	< 1	
TGRSE	08/01/00	11DCE	BWFY 005	< 1	D
TGRSE	08/01/00	11DCE	BWFY 004	< 1	
TGRSE	09/05/00	11DCE	BWJJ 010	< 1	D
TGRSE	09/05/00	11DCE	BWJJ 009	< 1	
TGRSE	10/05/99	11DCLE	BPYF 004	< 1	
TGRSE	10/05/99	11DCLE	BPYF 005	< 1	D
TGRSE	11/02/99	11DCLE	BQSW 005	< 1	D
TGRSE	11/02/99	11DCLE	BQSW 004	< 1	
TGRSE	12/07/99	11DCLE	BRLK 005	< 1	D
TGRSE	12/07/99	11DCLE	BRLK 004	< 1	
TGRSE	01/04/00	11DCLE	BRWD 007	< 1	D
TGRSE	01/04/00	11DCLE	BRWD 004	< 1	
TGRSE	02/01/00	11DCLE	BSPS 005	< 1	D
TGRSE	02/01/00	11DCLE	BSPS 004	< 1	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	03/07/00	11DCLE	BTFC 006	< 1	D
TGRSE	03/07/00	11DCLE	BTFC 003	< 1	
TGRSE	04/04/00	11DCLE	BTPN 006	< 1	D
TGRSE	04/04/00	11DCLE	BTPN 003	< 1	
TGRSE	05/02/00	11DCLE	BTZG 007	< 1	D
TGRSE	05/02/00	11DCLE	BTZG 004	< 1	
TGRSE	06/09/00	11DCLE	BVRC 009	< 1	D
TGRSE	06/09/00	11DCLE	BVRC 008	< 1	
TGRSE	07/06/00	11DCLE	BVXG 006	< 1	D
TGRSE	07/06/00	11DCLE	BVXG 003	< 1	
TGRSE	08/01/00	11DCLE	BWFY 005	< 1	D
TGRSE	08/01/00	11DCLE	BWFY 004	< 1	
TGRSE	09/05/00	11DCLE	BWJJ 010	< 1	D
TGRSE	09/05/00	11DCLE	BWJJ 009	< 1	
TGRSE	10/05/99	12DCLE	BPYF 004	< 1	
TGRSE	10/05/99	12DCLE	BPYF 005	< 1	D
TGRSE	11/02/99	12DCLE	BQSW 005	< 1	D
TGRSE	11/02/99	12DCLE	BQSW 004	< 1	
TGRSE	10/05/99	12DCLP	BPYF 004	< 1	
TGRSE	10/05/99	12DCLP	BPYF 005	< 1	D
TGRSE	11/02/99	12DCLP	BQSW 005	< 1	D
TGRSE	11/02/99	12DCLP	BQSW 004	< 1	
TGRSE	10/05/99	C12DCE	BPYF 004	< 1	
TGRSE	10/05/99	C12DCE	BPYF 005	< 1	D
TGRSE	11/02/99	C12DCE	BQSW 004	< 1	
TGRSE	11/02/99	C12DCE	BQSW 005	< 1	D
TGRSE	12/07/99	C12DCE	BRLK 005	< 1	D
TGRSE	12/07/99	C12DCE	BRLK 004	< 1	
TGRSE	01/04/00	C12DCE	BRWD 007	< 1	D
TGRSE	01/04/00	C12DCE	BRWD 004	< 1	
TGRSE	02/01/00	C12DCE	BSPS 004	< 1	
TGRSE	02/01/00	C12DCE	BSPS 005	< 1	D
TGRSE	03/07/00	C12DCE	BTFC 006	< 1	D
TGRSE	03/07/00	C12DCE	BTFC 003	< 1	
TGRSE	04/04/00	C12DCE	BTPN 006	< 1	D
TGRSE	04/04/00	C12DCE	BTPN 003	< 1	
TGRSE	05/02/00	C12DCE	BTZG 007	< 1	D
TGRSE	05/02/00	C12DCE	BTZG 004	< 1	
TGRSE	06/09/00	C12DCE	BVRC 009	< 1	D
TGRSE	06/09/00	C12DCE	BVRC 008	< 1	
TGRSE	07/06/00	C12DCE	BVXG 006	< 1	D

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	07/06/00	C12DCE	BVXG 003	0.18	JP
TGRSE	08/01/00	C12DCE	BWFY 005	< 1	D
TGRSE	08/01/00	C12DCE	BWFY 004	< 1	
TGRSE	09/05/00	C12DCE	BWJJ 009	< 1	
TGRSE	09/05/00	C12DCE	BWJJ 010	< 1	D
TGRSE	10/05/99	C2H3CL	BPYF 004	< 1	
TGRSE	10/05/99	C2H3CL	BPYF 005	< 1	D
TGRSE	11/02/99	C2H3CL	BQSW 005	< 1	D
TGRSE	11/02/99	C2H3CL	BQSW 004	< 1	
TGRSE	12/07/99	C2H3CL	BRLK 005	< 1	D
TGRSE	12/07/99	C2H3CL	BRLK 004	< 1	
TGRSE	01/04/00	C2H3CL	BRWD 007	< 1	D
TGRSE	01/04/00	C2H3CL	BRWD 004	< 1	
TGRSE	02/01/00	C2H3CL	BSPS 004	< 1	
TGRSE	02/01/00	C2H3CL	BSPS 005	< 1	D
TGRSE	03/07/00	C2H3CL	BTFC 006	< 1	D
TGRSE	03/07/00	C2H3CL	BTFC 003	< 1	
TGRSE	04/04/00	C2H3CL	BTPN 006	< 1	D
TGRSE	04/04/00	C2H3CL	BTPN 003	< 1	
TGRSE	05/02/00	C2H3CL	BTZG 007	< 1	D
TGRSE	05/02/00	C2H3CL	BTZG 004	< 1	
TGRSE	06/09/00	C2H3CL	BVRC 009	< 1	D
TGRSE	06/09/00	C2H3CL	BVRC 008	< 1	
TGRSE	07/06/00	C2H3CL	BVXG 006	< 1	D
TGRSE	07/06/00	C2H3CL	BVXG 003	< 1	
TGRSE	08/01/00	C2H3CL	BWFY 005	< 1	D
TGRSE	08/01/00	C2H3CL	BWFY 004	< 1	
TGRSE	09/05/00	C2H3CL	BWJJ 010	< 1	D
TGRSE	09/05/00	C2H3CL	BWJJ 009	< 1	
TGRSE	10/05/99	CCL4	BPYF 004	< 1	
TGRSE	10/05/99	CCL4	BPYF 005	< 1	D
TGRSE	11/02/99	CCL4	BQSW 005	< 1	D
TGRSE	11/02/99	CCL4	BQSW 004	< 1	
TGRSE	12/07/99	CCL4	BRLK 005	< 1	D
TGRSE	12/07/99	CCL4	BRLK 004	< 1	
TGRSE	01/04/00	CCL4	BRWD 007	< 1	D
TGRSE	01/04/00	CCL4	BRWD 004	< 1	
TGRSE	02/01/00	CCL4	BSPS 004	< 1	
TGRSE	02/01/00	CCL4	BSPS 005	< 1	D
TGRSE	03/07/00	CCL4	BTFC 006	< 1	D
TGRSE	03/07/00	CCL4	BTFC 003	< 1	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	04/04/00	CCL4	BTPN 006	< 1	D
TGRSE	04/04/00	CCL4	BTPN 003	< 1	
TGRSE	05/02/00	CCL4	BTZG 007	< 1	D
TGRSE	05/02/00	CCL4	BTZG 004	< 1	
TGRSE	06/09/00	CCL4	BVRC 009	< 1	D
TGRSE	06/09/00	CCL4	BVRC 008	< 1	
TGRSE	07/06/00	CCL4	BVXG 006	< 1	D
TGRSE	07/06/00	CCL4	BVXG 003	< 1	
TGRSE	08/01/00	CCL4	BWFY 005	< 1	D
TGRSE	08/01/00	CCL4	BWFY 004	< 1	
TGRSE	09/05/00	CCL4	BWJJ 010	< 1	D
TGRSE	09/05/00	CCL4	BWJJ 009	< 1	
TGRSE	10/05/99	CH2CL2	BPYF 004	< 1	
TGRSE	10/05/99	CH2CL2	BPYF 005	< 1	D
TGRSE	11/02/99	CH2CL2	BQSW 005	< 1	D
TGRSE	11/02/99	CH2CL2	BQSW 004	< 1	
TGRSE	12/07/99	CH2CL2	BRLK 005	< 1	D
TGRSE	12/07/99	CH2CL2	BRLK 004	< 1	
TGRSE	01/04/00	CH2CL2	BRWD 007	< 1	D
TGRSE	01/04/00	CH2CL2	BRWD 004	< 1	
TGRSE	02/01/00	CH2CL2	BSPS 004	< 1	
TGRSE	02/01/00	CH2CL2	BSPS 005	< 1	D
TGRSE	03/07/00	CH2CL2	BTFC 006	< 1	D
TGRSE	03/07/00	CH2CL2	BTFC 003	< 1	
TGRSE	04/04/00	CH2CL2	BTPN 006	< 1	D
TGRSE	04/04/00	CH2CL2	BTPN 003	0.58	BJP
TGRSE	05/02/00	CH2CL2	BTZG 007	< 1	D
TGRSE	05/02/00	CH2CL2	BTZG 004	< 1	
TGRSE	06/09/00	CH2CL2	BVRC 009	< 1	D
TGRSE	06/09/00	CH2CL2	BVRC 008	< 1	
TGRSE	07/06/00	CH2CL2	BVXG 006	< 1	D
TGRSE	07/06/00	CH2CL2	BVXG 003	< 1	
TGRSE	08/01/00	CH2CL2	BWFY 005	< 1	D
TGRSE	08/01/00	CH2CL2	BWFY 004	< 1	
TGRSE	09/05/00	CH2CL2	BWJJ 010	< 1	D
TGRSE	09/05/00	CH2CL2	BWJJ 009	< 1	
TGRSE	10/05/99	CHCL3	BPYF 004	< 1	
TGRSE	10/05/99	CHCL3	BPYF 005	< 1	D
TGRSE	11/02/99	CHCL3	BQSW 004	< 1	
TGRSE	11/02/99	CHCL3	BQSW 005	< 1	D
TGRSE	12/07/99	CHCL3	BRLK 004	< 1	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	12/07/99	CHCL3	BRLK 005	< 1	D
TGRSE	01/04/00	CHCL3	BRWD 007	< 1	D
TGRSE	01/04/00	CHCL3	BRWD 004	< 1	
TGRSE	02/01/00	CHCL3	BSPS 004	< 1	
TGRSE	02/01/00	CHCL3	BSPS 005	< 1	D
TGRSE	03/07/00	CHCL3	BTFC 006	< 1	D
TGRSE	03/07/00	CHCL3	BTFC 003	< 1	
TGRSE	04/04/00	CHCL3	BTPN 006	< 1	D
TGRSE	04/04/00	CHCL3	BTPN 003	< 1	
TGRSE	05/02/00	CHCL3	BTZG 007	< 1	D
TGRSE	05/02/00	CHCL3	BTZG 004	< 1	
TGRSE	06/09/00	CHCL3	BVRC 009	< 1	D
TGRSE	06/09/00	CHCL3	BVRC 008	< 1	
TGRSE	07/06/00	CHCL3	BVXG 006	< 1	D
TGRSE	07/06/00	CHCL3	BVXG 003	< 1	
TGRSE	08/01/00	CHCL3	BWFY 005	< 1	D
TGRSE	08/01/00	CHCL3	BWFY 004	< 1	
TGRSE	09/05/00	CHCL3	BWJJ 010	< 1	D
TGRSE	09/05/00	CHCL3	BWJJ 009	< 1	
TGRSE	10/05/99	T12DCE	BPYF 004	< 1	
TGRSE	10/05/99	T12DCE	BPYF 005	< 1	D
TGRSE	11/02/99	T12DCE	BQSW 005	< 1	D
TGRSE	11/02/99	T12DCE	BQSW 004	< 1	
TGRSE	12/07/99	T12DCE	BRLK 005	< 1	D
TGRSE	12/07/99	T12DCE	BRLK 004	< 1	
TGRSE	01/04/00	T12DCE	BRWD 007	< 1	D
TGRSE	01/04/00	T12DCE	BRWD 004	< 1	
TGRSE	02/01/00	T12DCE	BSPS 004	< 1	
TGRSE	02/01/00	T12DCE	BSPS 005	< 1	D
TGRSE	03/07/00	T12DCE	BTFC 003	< 1	
TGRSE	03/07/00	T12DCE	BTFC 006	< 1	D
TGRSE	04/04/00	T12DCE	BTPN 006	< 1	D
TGRSE	04/04/00	T12DCE	BTPN 003	< 1	
TGRSE	05/02/00	T12DCE	BTZG 007	< 1	D
TGRSE	05/02/00	T12DCE	BTZG 004	< 1	
TGRSE	06/09/00	T12DCE	BVRC 008	< 1	
TGRSE	06/09/00	T12DCE	BVRC 009	< 1	D
TGRSE	07/06/00	T12DCE	BVXG 006	< 1	D
TGRSE	07/06/00	T12DCE	BVXG 003	< 1	
TGRSE	08/01/00	T12DCE	BWFY 005	< 1	D
TGRSE	08/01/00	T12DCE	BWFY 004	< 1	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	09/05/00	T12DCE	BWJJ 010	< 1	D
TGRSE	09/05/00	T12DCE	BWJJ 009	< 1	
TGRSE	10/05/99	TCLEE	BPYF 004	< 1	
TGRSE	10/05/99	TCLEE	BPYF 005	< 1	D
TGRSE	11/02/99	TCLEE	BQSW 005	< 1	D
TGRSE	11/02/99	TCLEE	BQSW 004	< 1	
TGRSE	12/07/99	TCLEE	BRLK 005	< 1	D
TGRSE	12/07/99	TCLEE	BRLK 004	< 1	
TGRSE	01/04/00	TCLEE	BRWD 007	< 1	D
TGRSE	01/04/00	TCLEE	BRWD 004	< 1	
TGRSE	02/01/00	TCLEE	BSPS 004	< 1	
TGRSE	02/01/00	TCLEE	BSPS 005	< 1	D
TGRSE	03/07/00	TCLEE	BTFC 006	< 1	D
TGRSE	03/07/00	TCLEE	BTFC 003	< 1	
TGRSE	04/04/00	TCLEE	BTPN 006	< 1	D
TGRSE	04/04/00	TCLEE	BTPN 003	< 1	
TGRSE	05/02/00	TCLEE	BTZG 004	< 1	
TGRSE	05/02/00	TCLEE	BTZG 007	< 1	D
TGRSE	06/09/00	TCLEE	BVRC 009	< 1	D
TGRSE	06/09/00	TCLEE	BVRC 008	< 1	
TGRSE	07/06/00	TCLEE	BVXG 006	< 1	D
TGRSE	07/06/00	TCLEE	BVXG 003	< 1	
TGRSE	08/01/00	TCLEE	BWFY 005	< 1	D
TGRSE	08/01/00	TCLEE	BWFY 004	< 1	
TGRSE	09/05/00	TCLEE	BWJJ 010	< 1	D
TGRSE	09/05/00	TCLEE	BWJJ 009	< 1	
TGRSE	10/05/99	TCLTFE	BPYF 004	< 1	
TGRSE	10/05/99	TCLTFE	BPYF 005	< 1	D
TGRSE	11/02/99	TCLTFE	BQSW 005	< 1	D
TGRSE	11/02/99	TCLTFE	BQSW 004	< 1	
TGRSE	12/07/99	TCLTFE	BRLK 004	< 1	
TGRSE	12/07/99	TCLTFE	BRLK 005	< 1	D
TGRSE	01/04/00	TCLTFE	BRWD 007	< 1	D
TGRSE	01/04/00	TCLTFE	BRWD 004	< 1	
TGRSE	02/01/00	TCLTFE	BSPS 004	< 1	
TGRSE	02/01/00	TCLTFE	BSPS 005	< 1	D
TGRSE	03/07/00	TCLTFE	BTFC 006	< 1	D
TGRSE	03/07/00	TCLTFE	BTFC 003	< 1	
TGRSE	04/04/00	TCLTFE	BTPN 006	< 1	D
TGRSE	04/04/00	TCLTFE	BTPN 003	< 1	
TGRSE	05/02/00	TCLTFE	BTZG 007	< 1	D

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSE	05/02/00	TCLTFE	BTZG 004	< 1	
TGRSE	06/09/00	TCLTFE	BVRC 009	< 1	D
TGRSE	06/09/00	TCLTFE	BVRC 008	< 1	
TGRSE	07/06/00	TCLTFE	BVXG 006	< 1	D
TGRSE	07/06/00	TCLTFE	BVXG 003	< 1	
TGRSE	08/01/00	TCLTFE	BWFY 005	< 1	D
TGRSE	08/01/00	TCLTFE	BWFY 004	< 1	
TGRSE	09/05/00	TCLTFE	BWJJ 010	< 1	D
TGRSE	09/05/00	TCLTFE	BWJJ 009	< 1	
TGRSE	10/05/99	TRCLE	BPYF 004	0.56	JP
TGRSE	10/05/99	TRCLE	BPYF 005	0.48	JDP
TGRSE	11/02/99	TRCLE	BQSW 005	0.5	JPD
TGRSE	11/02/99	TRCLE	BQSW 004	0.59	JP
TGRSE	12/07/99	TRCLE	BRLK 005	0.45	JPD
TGRSE	12/07/99	TRCLE	BRLK 004	0.56	JP
TGRSE	01/04/00	TRCLE	BRWD 007	0.45	JPD
TGRSE	01/04/00	TRCLE	BRWD 004	0.52	JP
TGRSE	02/01/00	TRCLE	BSPS 004	0.57	JP
TGRSE	02/01/00	TRCLE	BSPS 005	0.47	JDP
TGRSE	03/07/00	TRCLE	BTFC 003	0.83	JP
TGRSE	03/07/00	TRCLE	BTFC 006	0.8	JPD
TGRSE	04/04/00	TRCLE	BTPN 006	0.57	JPD
TGRSE	04/04/00	TRCLE	BTPN 003	0.62	JP
TGRSE	05/02/00	TRCLE	BTZG 007	0.63	JPD
TGRSE	05/02/00	TRCLE	BTZG 004	0.64	JP
TGRSE	06/09/00	TRCLE	BVRC 009	1.6	D
TGRSE	06/09/00	TRCLE	BVRC 008	1.6	
TGRSE	07/06/00	TRCLE	BVXG 006	0.86	DJP
TGRSE	07/06/00	TRCLE	BVXG 003	0.83	JP
TGRSE	08/01/00	TRCLE	BWFY 005	0.94	JPD
TGRSE	08/01/00	TRCLE	BWFY 004	0.96	JP
TGRSE	09/05/00	TRCLE	BWJJ 010	0.64	JPD
TGRSE	09/05/00	TRCLE	BWJJ 009	0.61	JP
TGRSI	10/05/99	111TCE	BPYF 008	62.5	
TGRSI	11/02/99	111TCE	BQSW 003	67.5	
TGRSI	12/07/99	111TCE	BRLK 003	50	
TGRSI	01/04/00	111TCE	BRWD 003	67	
TGRSI	02/01/00	111TCE	BSPS 003	45	
TGRSI	03/07/00	111TCE	BTFC 008	75	
TGRSI	04/04/00	111TCE	BTPN 008	67.5	
TGRSI	05/02/00	111TCE	BTZG 003	60	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	06/09/00	111TCE	BVRC 011	150	
TGRSI	07/06/00	111TCE	BVXG 008	67.5	
TGRSI	08/01/00	111TCE	BWFY 003	65	
TGRSI	09/05/00	111TCE	BWJJ 012	52.5	
TGRSI	10/05/99	112TCE	BPYF 008	0.74	JP
TGRSI	11/02/99	112TCE	BQSW 003	0.33	JP
TGRSI	12/07/99	112TCE	BRLK 003	< 1	
TGRSI	01/04/00	112TCE	BRWD 003	< 1	
TGRSI	02/01/00	112TCE	BSPS 003	0.31	JP
TGRSI	03/07/00	112TCE	BTFC 008	0.28	JP
TGRSI	04/04/00	112TCE	BTPN 008	< 1	
TGRSI	05/02/00	112TCE	BTZG 003	< 1	
TGRSI	06/09/00	112TCE	BVRC 011	< 1	
TGRSI	07/06/00	112TCE	BVXG 008	< 1	
TGRSI	08/01/00	112TCE	BWFY 003	0.33	JP
TGRSI	09/05/00	112TCE	BWJJ 012	0.29	JP
TGRSI	10/05/99	11DCE	BPYF 008	11	
TGRSI	11/02/99	11DCE	BQSW 003	9.6	
TGRSI	12/07/99	11DCE	BRLK 003	8.2	
TGRSI	01/04/00	11DCE	BRWD 003	9.2	
TGRSI	02/01/00	11DCE	BSPS 003	6.8	
TGRSI	03/07/00	11DCE	BTFC 008	7.3	
TGRSI	04/04/00	11DCE	BTPN 008	8.2	
TGRSI	05/02/00	11DCE	BTZG 003	8.9	
TGRSI	06/09/00	11DCE	BVRC 011	9.2	
TGRSI	07/06/00	11DCE	BVXG 008	7.6	
TGRSI	08/01/00	11DCE	BWFY 003	7.8	
TGRSI	09/05/00	11DCE	BWJJ 012	5.7	
TGRSI	10/05/99	11DCLE	BPYF 008	11	
TGRSI	11/02/99	11DCLE	BQSW 003	10	
TGRSI	12/07/99	11DCLE	BRLK 003	8.6	
TGRSI	01/04/00	11DCLE	BRWD 003	9.7	
TGRSI	02/01/00	11DCLE	BSPS 003	7.7	
TGRSI	03/07/00	11DCLE	BTFC 008	8.1	
TGRSI	04/04/00	11DCLE	BTPN 008	8.4	
TGRSI	05/02/00	11DCLE	BTZG 003	8.8	
TGRSI	06/09/00	11DCLE	BVRC 011	10	
TGRSI	07/06/00	11DCLE	BVXG 008	7.2	
TGRSI	08/01/00	11DCLE	BWFY 003	7.5	
TGRSI	09/05/00	11DCLE	BWJJ 012	5.5	
TGRSI	10/05/99	12DCLE	BPYF 008	< 1	

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	11/02/99	12DCLE	BQSW 003	< 1	
TGRSI	10/05/99	12DCLP	BPYF 008	< 1	
TGRSI	11/02/99	12DCLP	BQSW 003	< 1	
TGRSI	10/05/99	C12DCE	BPYF 008	5.7	
TGRSI	11/02/99	C12DCE	BQSW 003	5.6	
TGRSI	12/07/99	C12DCE	BRLK 003	4.8	
TGRSI	01/04/00	C12DCE	BRWD 003	5.2	
TGRSI	02/01/00	C12DCE	BSPS 003	4.1	
TGRSI	03/07/00	C12DCE	BTFC 008	4.3	
TGRSI	04/04/00	C12DCE	BTPN 008	4.5	
TGRSI	05/02/00	C12DCE	BTZG 003	5	
TGRSI	06/09/00	C12DCE	BVRC 011	4.5	
TGRSI	07/06/00	C12DCE	BVXG 008	5.9	
TGRSI	08/01/00	C12DCE	BWFY 003	4.8	
TGRSI	09/05/00	C12DCE	BWJJ 012	3.8	
TGRSI	10/05/99	C2H3CL	BPYF 008	< 1	
TGRSI	11/02/99	C2H3CL	BQSW 003	< 1	
TGRSI	12/07/99	C2H3CL	BRLK 003	< 1	
TGRSI	01/04/00	C2H3CL	BRWD 003	< 1	
TGRSI	02/01/00	C2H3CL	BSPS 003	< 1	
TGRSI	03/07/00	C2H3CL	BTFC 008	< 1	
TGRSI	04/04/00	C2H3CL	BTPN 008	< 1	
TGRSI	05/02/00	C2H3CL	BTZG 003	< 1	
TGRSI	06/09/00	C2H3CL	BVRC 011	< 1	
TGRSI	07/06/00	C2H3CL	BVXG 008	0.24	JP
TGRSI	08/01/00	C2H3CL	BWFY 003	< 1	
TGRSI	09/05/00	C2H3CL	BWJJ 012	< 1	
TGRSI	10/05/99	CCL4	BPYF 008	< 1	
TGRSI	11/02/99	CCL4	BQSW 003	< 1	
TGRSI	12/07/99	CCL4	BRLK 003	< 1	
TGRSI	01/04/00	CCL4	BRWD 003	< 1	
TGRSI	02/01/00	CCL4	BSPS 003	< 1	
TGRSI	03/07/00	CCL4	BTFC 008	< 1	
TGRSI	04/04/00	CCL4	BTPN 008	< 1	
TGRSI	05/02/00	CCL4	BTZG 003	< 1	
TGRSI	06/09/00	CCL4	BVRC 011	< 1	
TGRSI	07/06/00	CCL4	BVXG 008	< 1	
TGRSI	08/01/00	CCL4	BWFY 003	< 1	
TGRSI	09/05/00	CCL4	BWJJ 012	< 1	
TGRSI	10/05/99	CH2CL2	BPYF 008	< 1	
TGRSI	11/02/99	CH2CL2	BQSW 003	0.33	JP

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	12/07/99	CH2CL2	BRLK 003	< 1	
TGRSI	01/04/00	CH2CL2	BRWD 003	< 1	
TGRSI	02/01/00	CH2CL2	BSPS 003	< 1	
TGRSI	03/07/00	CH2CL2	BTFC 008	< 1	
TGRSI	04/04/00	CH2CL2	BTPN 008	0.5	BJP
TGRSI	05/02/00	CH2CL2	BTZG 003	< 1	
TGRSI	06/09/00	CH2CL2	BVRC 011	< 1	
TGRSI	07/06/00	CH2CL2	BVXG 008	< 1	
TGRSI	08/01/00	CH2CL2	BWFY 003	< 1	
TGRSI	09/05/00	CH2CL2	BWJJ 012	< 1	
TGRSI	10/05/99	CHCL3	BPYF 008	< 1	
TGRSI	11/02/99	CHCL3	BQSW 003	< 1	
TGRSI	12/07/99	CHCL3	BRLK 003	< 1	
TGRSI	01/04/00	CHCL3	BRWD 003	< 1	
TGRSI	02/01/00	CHCL3	BSPS 003	< 1	
TGRSI	03/07/00	CHCL3	BTFC 008	< 1	
TGRSI	04/04/00	CHCL3	BTPN 008	< 1	
TGRSI	05/02/00	CHCL3	BTZG 003	< 1	
TGRSI	06/09/00	CHCL3	BVRC 011	< 1	
TGRSI	07/06/00	CHCL3	BVXG 008	< 1	
TGRSI	08/01/00	CHCL3	BWFY 003	< 1	
TGRSI	09/05/00	CHCL3	BWJJ 012	< 1	
TGRSI	10/05/99	T12DCE	BPYF 008	< 1	
TGRSI	11/02/99	T12DCE	BQSW 003	< 1	
TGRSI	12/07/99	T12DCE	BRLK 003	< 1	
TGRSI	01/04/00	T12DCE	BRWD 003	< 1	
TGRSI	02/01/00	T12DCE	BSPS 003	< 1	
TGRSI	03/07/00	T12DCE	BTFC 008	< 1	
TGRSI	04/04/00	T12DCE	BTPN 008	< 1	
TGRSI	05/02/00	T12DCE	BTZG 003	< 1	
TGRSI	06/09/00	T12DCE	BVRC 011	< 1	
TGRSI	07/06/00	T12DCE	BVXG 008	< 1	
TGRSI	08/01/00	T12DCE	BWFY 003	< 1	
TGRSI	09/05/00	T12DCE	BWJJ 012	< 1	
TGRSI	10/05/99	TCLEE	BPYF 008	0.6	JP
TGRSI	11/02/99	TCLEE	BQSW 003	0.66	JP
TGRSI	12/07/99	TCLEE	BRLK 003	0.48	JP
TGRSI	01/04/00	TCLEE	BRWD 003	0.57	JP
TGRSI	02/01/00	TCLEE	BSPS 003	0.43	JP
TGRSI	03/07/00	TCLEE	BTFC 008	0.52	JP
TGRSI	04/04/00	TCLEE	BTPN 008	0.63	JP

APPENDIX G.2

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
TGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Lot ID*	*Concentration*	*Flag Codes/ Data Qualifiers*
TGRSI	05/02/00	TCLEE	BTZG 003	0.55	JP
TGRSI	06/09/00	TCLEE	BVRC 011	1.1	
TGRSI	07/06/00	TCLEE	BVXG 008	0.74	JP
TGRSI	08/01/00	TCLEE	BWFY 003	0.68	JP
TGRSI	09/05/00	TCLEE	BWJJ 012	0.59	JP
TGRSI	10/05/99	TCLTFE	BPYF 008	< 1	
TGRSI	11/02/99	TCLTFE	BQSW 003	< 1	
TGRSI	12/07/99	TCLTFE	BRLK 003	< 1	
TGRSI	01/04/00	TCLTFE	BRWD 003	< 1	
TGRSI	02/01/00	TCLTFE	BSPS 003	< 1	
TGRSI	03/07/00	TCLTFE	BTFC 008	< 1	
TGRSI	04/04/00	TCLTFE	BTPN 008	< 1	
TGRSI	05/02/00	TCLTFE	BTZG 003	< 1	
TGRSI	06/09/00	TCLTFE	BVRC 011	2.1	
TGRSI	07/06/00	TCLTFE	BVXG 008	1.1	
TGRSI	08/01/00	TCLTFE	BWFY 003	< 1	
TGRSI	09/05/00	TCLTFE	BWJJ 012	< 1	
TGRSI	10/05/99	TRCLE	BPYF 008	400	
TGRSI	11/02/99	TRCLE	BQSW 003	350	
TGRSI	12/07/99	TRCLE	BRLK 003	275	
TGRSI	01/04/00	TRCLE	BRWD 003	340	
TGRSI	02/01/00	TRCLE	BSPS 003	240	
TGRSI	03/07/00	TRCLE	BTFC 008	375	
TGRSI	04/04/00	TRCLE	BTPN 008	375	
TGRSI	05/02/00	TRCLE	BTZG 003	350	
TGRSI	06/09/00	TRCLE	BVRC 011	630	
TGRSI	07/06/00	TRCLE	BVXG 008	400	
TGRSI	08/01/00	TRCLE	BWFY 003	325	
TGRSI	09/05/00	TRCLE	BWJJ 012	300	

Notes:
Concentration in μg/L.
B - Analyte found in the method blank or QC blank as well as the sample.
D - Duplicate analysis.
J - Value is estimated.
P - Results less than reporting level but greater than instrumental detection limit.

APPENDIX H

Appendix H

PGRS Hydraulic, Operational and Chemical Data

H.1 Daily Pumping Summary (in 1,000 gallons), Fiscal Year 2000, PGRS, TCAAP

APPENDIX H.1

DAILY PUMPING SUMMARY (IN 1,000 GALLONS)
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Day	*October 1999*	*November 1999*	*December 1999*	*January 2000*	*February 2000*	*March 2000*	*April 2000*	*May 2000*	*June 2000*	*July 2000*	*August 2000*	*September 2000*
1	1.512	1.449	0.196	0.000	0.720	0.715	0.718	0.720	0.720	0.716	0.717	0.720
2	1.449	1.511	0.000	0.000	0.673	0.720	0.686	0.717	0.720	0.699	0.717	0.721
3	1.511	1.448	0.126	0.000	0.719	0.717	0.720	0.720	0.720	0.716	0.717	0.719
4	1.448	1.507	0.000	0.429	0.717	0.720	0.716	0.720	0.716	0.720	0.720	0.718
5	1.513	1.449	0.000	0.717	0.720	0.717	0.720	0.716	0.721	0.720	0.716	0.718
6	1.448	1.512	0.064	0.720	0.717	0.720	0.717	0.720	0.720	0.263	0.720	0.720
7	1.511	1.448	0.379	0.716	0.719	0.716	0.720	0.716	0.720	0.417	0.717	0.720
8	1.448	1.512	0.720	0.720	0.717	0.720	0.717	0.721	0.716	0.720	0.720	0.714
9	1.512	1.448	0.716	0.716	0.720	0.704	0.719	0.716	0.720	0.720	0.716	0.720
10	1.449	1.513	0.720	0.721	0.716	0.719	0.717	0.720	0.716	0.716	0.720	0.720
11	1.512	1.448	0.720	0.716	0.720	0.717	0.720	0.716	0.721	0.720	0.716	0.720
12	1.449	1.512	0.717	0.720	0.717	0.720	0.717	0.720	0.716	0.717	0.721	0.717
13	1.512	1.448	0.720	0.717	0.720	0.716	0.719	0.717	0.719	0.720	0.716	0.720
14	1.447	1.512	0.716	0.720	0.716	0.720	0.720	0.720	0.719	0.716	0.720	0.719
15	1.508	0.478	0.722	0.716	0.720	0.717	0.720	0.716	0.719	0.720	0.717	0.717
16	1.448	0.053	0.547	0.720	0.717	0.720	0.718	0.708	0.718	0.717	0.719	0.720
17	1.512	0.000	0.481	0.717	0.721	0.720	0.717	0.701	0.720	0.720	0.717	0.720
18	1.448	0.032	0.720	0.720	0.716	0.720	0.720	0.720	0.720	0.716	0.718	0.718
19	1.512	0.052	0.720	0.717	0.720	0.719	0.720	0.717	0.720	0.720	0.719	0.716
20	1.449	0.000	0.717	0.720	0.716	0.721	0.720	0.720	0.719	0.717	0.719	0.720
21	1.512	0.000	0.716	0.717	0.720	0.716	0.716	0.716	0.675	0.720	0.719	0.717
22	1.448	0.000	0.716	0.719	0.717	0.720	0.720	0.720	0.717	0.716	0.719	0.720
23	1.512	0.000	0.720	0.717	0.718	0.717	0.721	0.716	0.720	0.720	0.719	0.720
24	1.448	0.007	0.717	0.720	0.716	0.719	0.716	0.718	0.716	0.716	0.720	0.720
25	1.507	0.000	0.722	0.717	0.718	0.717	0.720	0.719	0.720	0.720	0.716	0.716
26	1.449	0.000	0.715	0.720	0.717	0.720	0.720	0.720	0.720	0.717	0.720	0.721
27	1.511	0.000	0.312	0.716	0.720	0.716	0.720	0.717	0.720	0.695	0.720	0.720
28	1.449	0.000	0.000	0.720	0.716	0.584	0.717	0.720	0.720	0.716	0.721	0.716
29	1.512	0.000	0.000	0.717	0.721	0.716	0.719	0.716	0.716	0.718	0.720	0.720
30	1.447	0.000	0.000	0.720	--	0.721	0.720	0.720	0.721	0.716	0.716	0.720
31	1.575	--	0.000	0.717	--	0.716	--	0.385	--	0.710	0.720	--
	45.968	21.339	14.319	19.822	20.784	22.120	21.530	21.908	21.525	21.454	22.272	21.567

H.2 Historical Groundwater Elevations (FT. AMSL), PGRS, TCAAP

APPENDIX H.2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*TOC Elevation*	*3/30/94*	*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
ARDEN HILLS, 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	- -

APPENDIX H.2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	4/26/94	4/28/94	4/29/94	5/2/94	5/9/94	5/16/94
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
ARDEN HILLS, MINNESOTA

Location	*TOC Elevation*	*5/23/94*	*6/20/94*	*7/19/94*	*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
ARDEN HILLS, 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 H.2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, 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

APPENDIX H.2

HISTORICAL GROUNDWATER ELEVATIONS (FT. AMSL)
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	TOC Elevation	12/20/99	3/9/00	6/5/00	9/5/00
03U673	897.84	--	--	--	--
03L673	898.44	--	--	--	--
04U673	898.34	--	--	--	--
03U832	886.82	--	--	--	--
03L832	886.85	--	--	--	--
04U832	885.31	--	--	--	--
03L841	911.91	--	--	--	--
04U841	912.47	--	--	--	--
04U844	886.74	--	--	--	--
04U845	894.91	--	--	--	--
03L846	888.54	--	--	--	--
04U846	889.46	--	--	--	--
03M848	904.12	--	--	--	--
03L848	903.91	--	--	--	--
04U848	903.92	--	--	--	--
04U851	914.51	--	--	--	--
04U852	905.66	--	--	--	--
03L854	892.41	--	--	--	--
04U854	891.95	--	--	--	--
03L859	903.55	--	--	--	--
04U859	903.73	--	--	--	--
03L860	896.79	--	--	--	--
04U860	896.61	--	--	--	--
03L861	891.35	--	--	--	--
04U861	890.91	--	--	--	--
04U863	895.33	832.36	832.80	817.42	831.59
04U864	908.67	829.19	829.50	827.35	828.22
04J864	908.79	826.99	827.49	827.95	825.62
04U865	915.60	830.11	830.30	833.09	829.19
04U866	910.60	827.53	827.82	848.44	826.59
04J866	910.69	827.50	827.98	826.34	826.24
04U877	923.08	--	--	--	--
MPCA1L3	898.25	--	--	--	--
MPCA1U4	898.60	--	--	--	--
MPCA2L3	872.05	--	--	--	--
MPCA2U4	872.19	--	--	--	--
414U4	893.95	832.10	832.77	833.05	831.31
MW15H	911.52	--	--	--	--
NB WELL 13	914.66	--	--	--	--

H.3 Influent/Effluent Database, Fiscal Year 2000, PGRS, TCAAP

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	10/19/99	11DCLE	<1.0
NB13I	10/19/99	11DCE	<1.0
NB13I	10/19/99	12DCE	<2.0
NB13I	10/19/99	111TCE	<1.0
NB13I	10/19/99	112TCE	<1.0
NB13I	10/19/99	TRCLE	<1.0
NB13I	10/19/99	C6H6	<1.0
NB13I	10/19/99	BRDCLM	<1.0
NB13I	10/19/99	CHBR3	<1.0
NB13I	10/19/99	CCL4	<1.0
NB13I	10/19/99	CLC6H5	<1.0
NB13I	10/19/99	C2H5CL	<1.0
NB13I	10/19/99	2CLEVE	<10 (1)
NB13I	10/19/99	CHCL3	<1.0
NB13I	10/19/99	CH3CL	<1.0
NB13I	10/19/99	DBRCLM	<1.0
NB13I	10/19/99	12DCLE	<1.0
NB13I	10/19/99	12DCLB	<1.0
NB13I	10/19/99	13DCLB	<1.0
NB13I	10/19/99	14DCLB	<1.0
NB13I	10/19/99	12DCLP	<1.0
NB13I	10/19/99	C13DCP	<1.0
NB13I	10/19/99	T13DCP	<1.0
NB13I	10/19/99	ETC6H5	<1.0
NB13I	10/19/99	CH2CL2	<5.0
NB13I	10/19/99	TCLEA	<1.0
NB13I	10/19/99	TCLEE	<1.0
NB13I	10/19/99	MEC6H5	<1.0
NB13I	10/19/99	CCL3F	<1.0
NB13I	10/19/99	C2H3CL	<1.0
NB13I	10/19/99	XYLEN	<3.0
NB13I	12/16/99	11DCLE	<1.0
NB13I	12/16/99	11DCE	<1.0
NB13I	12/16/99	12DCE	<2.0
NB13I	12/16/99	111TCE	<1.0
NB13I	12/16/99	112TCE	<1.0
NB13I	12/16/99	TRCLE	<1.0
NB13I	12/16/99	C6H6	<1.0
NB13I	12/16/99	BRDCLM	<1.0
NB13I	12/16/99	CHBR3	<1.0
NB13I	12/16/99	CCL4	<1.0
NB13I	12/16/99	CLC6H5	<1.0
NB13I	12/16/99	C2H5CL	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	12/16/99	2CLEVE	<10 (1)
NB13I	12/16/99	CHCL3	<1.0
NB13I	12/16/99	CH3CL	<1.0
NB13I	12/16/99	DBRCLM	<1.0
NB13I	12/16/99	12DCLE	<1.0
NB13I	12/16/99	12DCLB	<1.0
NB13I	12/16/99	13DCLB	<1.0
NB13I	12/16/99	14DCLB	<1.0
NB13I	12/16/99	12DCLP	<1.0
NB13I	12/16/99	C13DCP	<1.0
NB13I	12/16/99	T13DCP	<1.0
NB13I	12/16/99	ETC6H5	<1.0
NB13I	12/16/99	CH2CL2	<5.0
NB13I	12/16/99	TCLEA	<1.0
NB13I	12/16/99	TCLEE	<1.0
NB13I	12/16/99	MEC6H5	<1.0
NB13I	12/16/99	CCL3F	<1.0
NB13I	12/16/99	C2H3CL	<1.0
NB13I	12/16/99	XYLEN	<3.0
NB13I	1/25/00	11DCLE	<1.0
NB13I	1/25/00	11DCE	<1.0
NB13I	1/25/00	12DCE	<2.0
NB13I	1/25/00	111TCE	<1.0
NB13I	1/25/00	112TCE	<1.0
NB13I	1/25/00	TRCLE	<1.0
NB13I	1/25/00	C6H6	<1.0
NB13I	1/25/00	BRDCLM	<1.0
NB13I	1/25/00	CHBR3	<1.0
NB13I	1/25/00	CCL4	<1.0
NB13I	1/25/00	CLC6H5	<1.0
NB13I	1/25/00	C2H5CL	<1.0
NB13I	1/25/00	2CLEVE	<10 (1)
NB13I	1/25/00	CHCL3	<1.0
NB13I	1/25/00	CH3CL	<1.0
NB13I	1/25/00	DBRCLM	<1.0
NB13I	1/25/00	12DCLE	<1.0
NB13I	1/25/00	12DCLB	<1.0
NB13I	1/25/00	13DCLB	<1.0
NB13I	1/25/00	14DCLB	<1.0
NB13I	1/25/00	12DCLP	<1.0
NB13I	1/25/00	C13DCP	<1.0
NB13I	1/25/00	T13DCP	<1.0
NB13I	1/25/00	ETC6H5	<1.0
NB13I	1/25/00	CH2CL2	<5.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	1/25/00	TCLEA	<1.0
NB13I	1/25/00	TCLEE	<1.0
NB13I	1/25/00	MEC6H5	<1.0
NB13I	1/25/00	CCL3F	<1.0
NB13I	1/25/00	C2H3CL	<1.0
NB13I	1/25/00	XYLEN	<3.0
NB13I	2/28/00	11DCLE	<1.0
NB13I	2/28/00	11DCE	<1.0
NB13I	2/28/00	12DCE	<2.0
NB13I	2/28/00	111TCE	<1.0
NB13I	2/28/00	112TCE	<1.0
NB13I	2/28/00	TRCLE	<1.0
NB13I	2/28/00	C6H6	<1.0
NB13I	2/28/00	BRDCLM	<1.0
NB13I	2/28/00	CHBR3	<1.0
NB13I	2/28/00	CCL4	<1.0
NB13I	2/28/00	CLC6H5	<1.0
NB13I	2/28/00	C2H5CL	<1.0
NB13I	2/28/00	2CLEVE	<10 (1)
NB13I	2/28/00	CHCL3	<1.0
NB13I	2/28/00	CH3CL	<1.0
NB13I	2/28/00	DBRCLM	<1.0
NB13I	2/28/00	12DCLE	<1.0
NB13I	2/28/00	12DCLB	<1.0
NB13I	2/28/00	13DCLB	<1.0
NB13I	2/28/00	14DCLB	<1.0
NB13I	2/28/00	12DCLP	<1.0
NB13I	2/28/00	C13DCP	<1.0
NB13I	2/28/00	T13DCP	<1.0
NB13I	2/28/00	ETC6H5	<1.0
NB13I	2/28/00	CH2CL2	<5.0
NB13I	2/28/00	TCLEA	<1.0
NB13I	2/28/00	TCLEE	<1.0
NB13I	2/28/00	MEC6H5	<1.0
NB13I	2/28/00	CCL3F	<1.0
NB13I	2/28/00	C2H3CL	<1.0
NB13I	2/28/00	XYLEN	<3.0
NB13I	3/16/00	11DCLE	<1.0
NB13I	3/16/00	11DCE	<1.0
NB13I	3/16/00	12DCE	<2.0
NB13I	3/16/00	111TCE	<1.0
NB13I	3/16/00	112TCE	<1.0
NB13I	3/16/00	TRCLE	<1.0
NB13I	3/16/00	C6H6	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	3/16/00	BRDCLM	<1.0
NB13I	3/16/00	CHBR3	<1.0
NB13I	3/16/00	CCL4	<1.0
NB13I	3/16/00	CLC6H5	<1.0
NB13I	3/16/00	C2H5CL	<1.0
NB13I	3/16/00	2CLEVE	<10 (1)
NB13I	3/16/00	CHCL3	<1.0
NB13I	3/16/00	CH3CL	<1.0
NB13I	3/16/00	DBRCLM	<1.0
NB13I	3/16/00	12DCLE	<1.0
NB13I	3/16/00	12DCLB	<1.0
NB13I	3/16/00	13DCLB	<1.0
NB13I	3/16/00	14DCLB	<1.0
NB13I	3/16/00	12DCLP	<1.0
NB13I	3/16/00	C13DCP	<1.0
NB13I	3/16/00	T13DCP	<1.0
NB13I	3/16/00	ETC6H5	<1.0
NB13I	3/16/00	CH2CL2	<5.0
NB13I	3/16/00	TCLEA	<1.0
NB13I	3/16/00	TCLEE	<1.0
NB13I	3/16/00	MEC6H5	<1.0
NB13I	3/16/00	CCL3F	<1.0
NB13I	3/16/00	C2H3CL	<1.0
NB13I	3/16/00	XYLEN	<3.0
NB13I	4/24/00	11DCLE	<1.0
NB13I	4/24/00	11DCE	<1.0
NB13I	4/24/00	12DCE	<2.0
NB13I	4/24/00	111TCE	<1.0
NB13I	4/24/00	112TCE	<1.0
NB13I	4/24/00	TRCLE	<1.0
NB13I	4/24/00	C6H6	<1.0
NB13I	4/24/00	BRDCLM	<1.0
NB13I	4/24/00	CHBR3	<1.0
NB13I	4/24/00	CCL4	<1.0
NB13I	4/24/00	CLC6H5	<1.0
NB13I	4/24/00	C2H5CL	<1.0
NB13I	4/24/00	2CLEVE	<10 (1)
NB13I	4/24/00	CHCL3	<1.0
NB13I	4/24/00	CH3CL	<1.0
NB13I	4/24/00	DBRCLM	<1.0
NB13I	4/24/00	12DCLE	<1.0
NB13I	4/24/00	12DCLB	<1.0
NB13I	4/24/00	13DCLB	<1.0
NB13I	4/24/00	14DCLB	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	4/24/00	12DCLP	<1.0
NB13I	4/24/00	C13DCP	<1.0
NB13I	4/24/00	T13DCP	<1.0
NB13I	4/24/00	ETC6H5	<1.0
NB13I	4/24/00	CH2CL2	<5.0
NB13I	4/24/00	TCLEA	<1.0
NB13I	4/24/00	TCLEE	<1.0
NB13I	4/24/00	MEC6H5	<1.0
NB13I	4/24/00	CCL3F	<1.0
NB13I	4/24/00	C2H3CL	<1.0
NB13I	4/24/00	XYLEN	<3.0
NB13I	5/16/00	11DCLE	<1.0
NB13I	5/16/00	11DCE	<1.0
NB13I	5/16/00	12DCE	<2.0
NB13I	5/16/00	111TCE	<1.0
NB13I	5/16/00	112TCE	<1.0
NB13I	5/16/00	TRCLE	<1.0
NB13I	5/16/00	C6H6	<1.0
NB13I	5/16/00	BRDCLM	<1.0
NB13I	5/16/00	CHBR3	<1.0
NB13I	5/16/00	CCL4	<1.0
NB13I	5/16/00	CLC6H5	<1.0
NB13I	5/16/00	C2H5CL	<1.0
NB13I	5/16/00	2CLEVE	<10 (1)
NB13I	5/16/00	CHCL3	<1.0
NB13I	5/16/00	CH3CL	<1.0
NB13I	5/16/00	DBRCLM	<1.0
NB13I	5/16/00	12DCLE	<1.0
NB13I	5/16/00	12DCLB	<1.0
NB13I	5/16/00	13DCLB	<1.0
NB13I	5/16/00	14DCLB	<1.0
NB13I	5/16/00	12DCLP	<1.0
NB13I	5/16/00	C13DCP	<1.0
NB13I	5/16/00	T13DCP	<1.0
NB13I	5/16/00	ETC6H5	<1.0
NB13I	5/16/00	CH2CL2	<5.0
NB13I	5/16/00	TCLEA	<1.0
NB13I	5/16/00	TCLEE	<1.0
NB13I	5/16/00	MEC6H5	<1.0
NB13I	5/16/00	CCL3F	<1.0
NB13I	5/16/00	C2H3CL	<1.0
NB13I	5/16/00	XYLEN	<3.0
NB13I	6/28/00	11DCLE	<1.0
NB13I	6/28/00	11DCE	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	6/28/00	12DCE	<2.0
NB13I	6/28/00	111TCE	<1.0
NB13I	6/28/00	112TCE	<1.0
NB13I	6/28/00	TRCLE	<1.0
NB13I	6/28/00	C6H6	<1.0
NB13I	6/28/00	BRDCLM	<1.0
NB13I	6/28/00	CHBR3	<1.0
NB13I	6/28/00	CCL4	<1.0
NB13I	6/28/00	CLC6H5	<1.0
NB13I	6/28/00	C2H5CL	<1.0
NB13I	6/28/00	2CLEVE	<10 (1)
NB13I	6/28/00	CHCL3	<1.0
NB13I	6/28/00	CH3CL	<1.0
NB13I	6/28/00	DBRCLM	<1.0
NB13I	6/28/00	12DCLE	<1.0
NB13I	6/28/00	12DCLB	<1.0
NB13I	6/28/00	13DCLB	<1.0
NB13I	6/28/00	14DCLB	<1.0
NB13I	6/28/00	12DCLP	<1.0
NB13I	6/28/00	C13DCP	<1.0
NB13I	6/28/00	T13DCP	<1.0
NB13I	6/28/00	ETC6H5	<1.0
NB13I	6/28/00	CH2CL2	<5.0
NB13I	6/28/00	TCLEA	<1.0
NB13I	6/28/00	TCLEE	<1.0
NB13I	6/28/00	MEC6H5	<1.0
NB13I	6/28/00	CCL3F	<1.0
NB13I	6/28/00	C2H3CL	<1.0
NB13I	6/28/00	XYLEN	<3.0
NB13I	7/17/00	11DCLE	<1.0
NB13I	7/17/00	11DCE	<1.0
NB13I	7/17/00	12DCE	<2.0
NB13I	7/17/00	111TCE	<1.0
NB13I	7/17/00	112TCE	<1.0
NB13I	7/17/00	TRCLE	<1.0
NB13I	7/17/00	C6H6	<1.0
NB13I	7/17/00	BRDCLM	<1.0
NB13I	7/17/00	CHBR3	<1.0
NB13I	7/17/00	CCL4	<1.0
NB13I	7/17/00	CLC6H5	<1.0
NB13I	7/17/00	C2H5CL	<1.0
NB13I	7/17/00	2CLEVE	<10 (1)
NB13I	7/17/00	CHCL3	<1.0
NB13I	7/17/00	CH3CL	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	7/17/00	DBRCLM	<1.0
NB13I	7/17/00	12DCLE	<1.0
NB13I	7/17/00	12DCLB	<1.0
NB13I	7/17/00	13DCLB	<1.0
NB13I	7/17/00	14DCLB	<1.0
NB13I	7/17/00	12DCLP	<1.0
NB13I	7/17/00	C13DCP	<1.0
NB13I	7/17/00	T13DCP	<1.0
NB13I	7/17/00	ETC6H5	<1.0
NB13I	7/17/00	CH2CL2	<5.0
NB13I	7/17/00	TCLEA	<1.0
NB13I	7/17/00	TCLEE	<1.0
NB13I	7/17/00	MEC6H5	<1.0
NB13I	7/17/00	CCL3F	<1.0
NB13I	7/17/00	C2H3CL	<1.0
NB13I	7/17/00	XYLEN	<3.0
NB13I	9/5/00	11DCLE	<1.0
NB13I	9/5/00	11DCE	<1.0
NB13I	9/5/00	12DCE	<2.0
NB13I	9/5/00	111TCE	<1.0
NB13I	9/5/00	112TCE	<1.0
NB13I	9/5/00	TRCLE	<1.0
NB13I	9/5/00	C6H6	<1.0
NB13I	9/5/00	BRDCLM	<1.0
NB13I	9/5/00	CHBR3	<1.0
NB13I	9/5/00	CCL4	<1.0
NB13I	9/5/00	CLC6H5	<1.0
NB13I	9/5/00	C2H5CL	<1.0
NB13I	9/5/00	2CLEVE	<10 (1)
NB13I	9/5/00	CHCL3	<1.0
NB13I	9/5/00	CH3CL	<1.0
NB13I	9/5/00	DBRCLM	<1.0
NB13I	9/5/00	12DCLE	<1.0
NB13I	9/5/00	12DCLB	<1.0
NB13I	9/5/00	13DCLB	<1.0
NB13I	9/5/00	14DCLB	<1.0
NB13I	9/5/00	12DCLP	<1.0
NB13I	9/5/00	C13DCP	<1.0
NB13I	9/5/00	T13DCP	<1.0
NB13I	9/5/00	ETC6H5	<1.0
NB13I	9/5/00	CH2CL2	<5.0
NB13I	9/5/00	TCLEA	<1.0
NB13I	9/5/00	TCLEE	<1.0
NB13I	9/5/00	MEC6H5	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13I	9/5/00	CCL3F	<1.0
NB13I	9/5/00	C2H3CL	<1.0
NB13I	9/5/00	XYLEN	<3.0
NB13I	9/14/00	11DCLE	<1.0
NB13I	9/14/00	11DCE	<1.0
NB13I	9/14/00	12DCE	<2.0
NB13I	9/14/00	111TCE	<1.0
NB13I	9/14/00	112TCE	<1.0
NB13I	9/14/00	TRCLE	<1.0
NB13I	9/14/00	C6H6	<1.0
NB13I	9/14/00	BRDCLM	<1.0
NB13I	9/14/00	CHBR3	<1.0
NB13I	9/14/00	CCL4	<1.0
NB13I	9/14/00	CLC6H5	<1.0
NB13I	9/14/00	C2H5CL	<1.0
NB13I	9/14/00	2CLEVE	<10 (1)
NB13I	9/14/00	CHCL3	<1.0
NB13I	9/14/00	CH3CL	<1.0
NB13I	9/14/00	DBRCLM	<1.0
NB13I	9/14/00	12DCLE	<1.0
NB13I	9/14/00	12DCLB	<1.0
NB13I	9/14/00	13DCLB	<1.0
NB13I	9/14/00	14DCLB	<1.0
NB13I	9/14/00	12DCLP	<1.0
NB13I	9/14/00	C13DCP	<1.0
NB13I	9/14/00	T13DCP	<1.0
NB13I	9/14/00	ETC6H5	<1.0
NB13I	9/14/00	CH2CL2	<5.0
NB13I	9/14/00	TCLEA	<1.0
NB13I	9/14/00	TCLEE	<1.0
NB13I	9/14/00	MEC6H5	<1.0
NB13I	9/14/00	CCL3F	<1.0
NB13I	9/14/00	C2H3CL	<1.0
NB13I	9/14/00	XYLEN	<3.0
NB13E	10/19/99	11DCLE	<1.0
NB13E	10/19/99	11DCE	<1.0
NB13E	10/19/99	12DCE	<2.0
NB13E	10/19/99	111TCE	<1.0
NB13E	10/19/99	112TCE	<1.0
NB13E	10/19/99	TRCLE	<1.0
NB13E	10/19/99	C6H6	<1.0
NB13E	10/19/99	BRDCLM	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	10/19/99	CHBR3	<1.0
NB13E	10/19/99	CCL4	<1.0
NB13E	10/19/99	CLC6H5	<1.0
NB13E	10/19/99	C2H5CL	<1.0
NB13E	10/19/99	2CLEVE	<10 (1)
NB13E	10/19/99	CHCL3	1.5
NB13E	10/19/99	CH3CL	<1.0
NB13E	10/19/99	DBRCLM	<1.0
NB13E	10/19/99	12DCLE	<1.0
NB13E	10/19/99	12DCLB	<1.0
NB13E	10/19/99	13DCLB	<1.0
NB13E	10/19/99	14DCLB	<1.0
NB13E	10/19/99	12DCLP	<1.0
NB13E	10/19/99	C13DCP	<1.0
NB13E	10/19/99	T13DCP	<1.0
NB13E	10/19/99	ETC6H5	<1.0
NB13E	10/19/99	CH2CL2	<5.0
NB13E	10/19/99	TCLEA	<1.0
NB13E	10/19/99	TCLEE	<1.0
NB13E	10/19/99	MEC6H5	<1.0
NB13E	10/19/99	CCL3F	<1.0
NB13E	10/19/99	C2H3CL	<1.0
NB13E	10/19/99	XYLEN	<3.0
NB13E	12/16/99	11DCLE	<1.0
NB13E	12/16/99	11DCE	<1.0
NB13E	12/16/99	12DCE	<2.0
NB13E	12/16/99	111TCE	<1.0
NB13E	12/16/99	112TCE	<1.0
NB13E	12/16/99	TRCLE	<1.0
NB13E	12/16/99	C6H6	<1.0
NB13E	12/16/99	BRDCLM	<1.0
NB13E	12/16/99	CHBR3	<1.0
NB13E	12/16/99	CCL4	<1.0
NB13E	12/16/99	CLC6H5	<1.0
NB13E	12/16/99	C2H5CL	<1.0
NB13E	12/16/99	2CLEVE	<10 (1)
NB13E	12/16/99	CHCL3	<1.0
NB13E	12/16/99	CH3CL	<1.0
NB13E	12/16/99	DBRCLM	<1.0
NB13E	12/16/99	12DCLE	<1.0
NB13E	12/16/99	12DCLB	<1.0
NB13E	12/16/99	13DCLB	<1.0
NB13E	12/16/99	14DCLB	<1.0
NB13E	12/16/99	12DCLP	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	12/16/99	C13DCP	<1.0
NB13E	12/16/99	T13DCP	<1.0
NB13E	12/16/99	ETC6H5	<1.0
NB13E	12/16/99	CH2CL2	<5.0
NB13E	12/16/99	TCLEA	<1.0
NB13E	12/16/99	TCLEE	<1.0
NB13E	12/16/99	MEC6H5	<1.0
NB13E	12/16/99	CCL3F	<1.0
NB13E	12/16/99	C2H3CL	<1.0
NB13E	12/16/99	XYLEN	<3.0
NB13E	1/25/00	11DCLE	<1.0
NB13E	1/25/00	11DCE	<1.0
NB13E	1/25/00	12DCE	<2.0
NB13E	1/25/00	111TCE	<1.0
NB13E	1/25/00	112TCE	<1.0
NB13E	1/25/00	TRCLE	<1.0
NB13E	1/25/00	C6H6	<1.0
NB13E	1/25/00	BRDCLM	<1.0
NB13E	1/25/00	CHBR3	<1.0
NB13E	1/25/00	CCL4	<1.0
NB13E	1/25/00	CLC6H5	<1.0
NB13E	1/25/00	C2H5CL	<1.0
NB13E	1/25/00	2CLEVE	<10 (1)
NB13E	1/25/00	CHCL3	<1.0
NB13E	1/25/00	CH3CL	<1.0
NB13E	1/25/00	DBRCLM	<1.0
NB13E	1/25/00	12DCLE	<1.0
NB13E	1/25/00	12DCLB	<1.0
NB13E	1/25/00	13DCLB	<1.0
NB13E	1/25/00	14DCLB	<1.0
NB13E	1/25/00	12DCLP	<1.0
NB13E	1/25/00	C13DCP	<1.0
NB13E	1/25/00	T13DCP	<1.0
NB13E	1/25/00	ETC6H5	<1.0
NB13E	1/25/00	CH2CL2	<5.0
NB13E	1/25/00	TCLEA	<1.0
NB13E	1/25/00	TCLEE	<1.0
NB13E	1/25/00	MEC6H5	<1.0
NB13E	1/25/00	CCL3F	<1.0
NB13E	1/25/00	C2H3CL	<1.0
NB13E	1/25/00	XYLEN	<3.0
NB13E	2/28/00	11DCLE	<1.0
NB13E	2/28/00	11DCE	<1.0
NB13E	2/28/00	12DCE	<2.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	2/28/00	111TCE	<1.0
NB13E	2/28/00	112TCE	<1.0
NB13E	2/28/00	TRCLE	<1.0
NB13E	2/28/00	C6H6	<1.0
NB13E	2/28/00	BRDCLM	<1.0
NB13E	2/28/00	CHBR3	<1.0
NB13E	2/28/00	CCL4	<1.0
NB13E	2/28/00	CLC6H5	<1.0
NB13E	2/28/00	C2H5CL	<1.0
NB13E	2/28/00	2CLEVE	<10 (1)
NB13E	2/28/00	CHCL3	<1.0
NB13E	2/28/00	CH3CL	<1.0
NB13E	2/28/00	DBRCLM	<1.0
NB13E	2/28/00	12DCLE	<1.0
NB13E	2/28/00	12DCLB	<1.0
NB13E	2/28/00	13DCLB	<1.0
NB13E	2/28/00	14DCLB	<1.0
NB13E	2/28/00	12DCLP	<1.0
NB13E	2/28/00	C13DCP	<1.0
NB13E	2/28/00	T13DCP	<1.0
NB13E	2/28/00	ETC6H5	<1.0
NB13E	2/28/00	CH2CL2	<5.0
NB13E	2/28/00	TCLEA	<1.0
NB13E	2/28/00	TCLEE	<1.0
NB13E	2/28/00	MEC6H5	<1.0
NB13E	2/28/00	CCL3F	<1.0
NB13E	2/28/00	C2H3CL	<1.0
NB13E	2/28/00	XYLEN	<3.0
NB13E	3/16/00	11DCLE	<1.0
NB13E	3/16/00	11DCE	<1.0
NB13E	3/16/00	12DCE	<2.0
NB13E	3/16/00	111TCE	<1.0
NB13E	3/16/00	112TCE	<1.0
NB13E	3/16/00	TRCLE	<1.0
NB13E	3/16/00	C6H6	<1.0
NB13E	3/16/00	BRDCLM	<1.0
NB13E	3/16/00	CHBR3	<1.0
NB13E	3/16/00	CCL4	<1.0
NB13E	3/16/00	CLC6H5	<1.0
NB13E	3/16/00	C2H5CL	<1.0
NB13E	3/16/00	2CLEVE	<10 (1)
NB13E	3/16/00	CHCL3	<1.0
NB13E	3/16/00	CH3CL	<1.0
NB13E	3/16/00	DBRCLM	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	3/16/00	12DCLE	<1.0
NB13E	3/16/00	12DCLB	<1.0
NB13E	3/16/00	13DCLB	<1.0
NB13E	3/16/00	14DCLB	<1.0
NB13E	3/16/00	12DCLP	<1.0
NB13E	3/16/00	C13DCP	<1.0
NB13E	3/16/00	T13DCP	<1.0
NB13E	3/16/00	ETC6H5	<1.0
NB13E	3/16/00	CH2CL2	<5.0
NB13E	3/16/00	TCLEA	<1.0
NB13E	3/16/00	TCLEE	<1.0
NB13E	3/16/00	MEC6H5	<1.0
NB13E	3/16/00	CCL3F	<1.0
NB13E	3/16/00	C2H3CL	<1.0
NB13E	3/16/00	XYLEN	<3.0
NB13E	4/24/00	11DCLE	<1.0
NB13E	4/24/00	11DCE	<1.0
NB13E	4/24/00	12DCE	<2.0
NB13E	4/24/00	111TCE	<1.0
NB13E	4/24/00	112TCE	<1.0
NB13E	4/24/00	TRCLE	<1.0
NB13E	4/24/00	C6H6	<1.0
NB13E	4/24/00	BRDCLM	<1.0
NB13E	4/24/00	CHBR3	<1.0
NB13E	4/24/00	CCL4	<1.0
NB13E	4/24/00	CLC6H5	<1.0
NB13E	4/24/00	C2H5CL	<1.0
NB13E	4/24/00	2CLEVE	<10 (1)
NB13E	4/24/00	CHCL3	<1.0
NB13E	4/24/00	CH3CL	<1.0
NB13E	4/24/00	DBRCLM	<1.0
NB13E	4/24/00	12DCLE	<1.0
NB13E	4/24/00	12DCLB	<1.0
NB13E	4/24/00	13DCLB	<1.0
NB13E	4/24/00	14DCLB	<1.0
NB13E	4/24/00	12DCLP	<1.0
NB13E	4/24/00	C13DCP	<1.0
NB13E	4/24/00	T13DCP	<1.0
NB13E	4/24/00	ETC6H5	<1.0
NB13E	4/24/00	CH2CL2	<5.0
NB13E	4/24/00	TCLEA	<1.0
NB13E	4/24/00	TCLEE	<1.0
NB13E	4/24/00	MEC6H5	<1.0
NB13E	4/24/00	CCL3F	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	4/24/00	C2H3CL	<1.0
NB13E	4/24/00	XYLEN	<3.0
NB13E	5/16/00	11DCLE	<1.0
NB13E	5/16/00	11DCE	<1.0
NB13E	5/16/00	12DCE	<2.0
NB13E	5/16/00	111TCE	<1.0
NB13E	5/16/00	112TCE	<1.0
NB13E	5/16/00	TRCLE	<1.0
NB13E	5/16/00	C6H6	<1.0
NB13E	5/16/00	BRDCLM	<1.0
NB13E	5/16/00	CHBR3	<1.0
NB13E	5/16/00	CCL4	<1.0
NB13E	5/16/00	CLC6H5	<1.0
NB13E	5/16/00	C2H5CL	<1.0
NB13E	5/16/00	2CLEVE	<10 (1)
NB13E	5/16/00	CHCL3	<1.0
NB13E	5/16/00	CH3CL	<1.0
NB13E	5/16/00	DBRCLM	<1.0
NB13E	5/16/00	12DCLE	<1.0
NB13E	5/16/00	12DCLB	<1.0
NB13E	5/16/00	13DCLB	<1.0
NB13E	5/16/00	14DCLB	<1.0
NB13E	5/16/00	12DCLP	<1.0
NB13E	5/16/00	C13DCP	<1.0
NB13E	5/16/00	T13DCP	<1.0
NB13E	5/16/00	ETC6H5	<1.0
NB13E	5/16/00	CH2CL2	<5.0
NB13E	5/16/00	TCLEA	<1.0
NB13E	5/16/00	TCLEE	<1.0
NB13E	5/16/00	MEC6H5	<1.0
NB13E	5/16/00	CCL3F	<1.0
NB13E	5/16/00	C2H3CL	<1.0
NB13E	5/16/00	XYLEN	<3.0
NB13E	6/28/00	11DCLE	<1.0
NB13E	6/28/00	11DCE	<1.0
NB13E	6/28/00	12DCE	<2.0
NB13E	6/28/00	111TCE	<1.0
NB13E	6/28/00	112TCE	<1.0
NB13E	6/28/00	TRCLE	<1.0
NB13E	6/28/00	C6H6	<1.0
NB13E	6/28/00	BRDCLM	<1.0
NB13E	6/28/00	CHBR3	<1.0
NB13E	6/28/00	CCL4	<1.0
NB13E	6/28/00	CLC6H5	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	6/28/00	C2H5CL	<1.0
NB13E	6/28/00	2CLEVE	<10 (1)
NB13E	6/28/00	CHCL3	<1.0
NB13E	6/28/00	CH3CL	<1.0
NB13E	6/28/00	DBRCLM	<1.0
NB13E	6/28/00	12DCLE	<1.0
NB13E	6/28/00	12DCLB	<1.0
NB13E	6/28/00	13DCLB	<1.0
NB13E	6/28/00	14DCLB	<1.0
NB13E	6/28/00	12DCLP	<1.0
NB13E	6/28/00	C13DCP	<1.0
NB13E	6/28/00	T13DCP	<1.0
NB13E	6/28/00	ETC6H5	<1.0
NB13E	6/28/00	CH2CL2	<5.0
NB13E	6/28/00	TCLEA	<1.0
NB13E	6/28/00	TCLEE	<1.0
NB13E	6/28/00	MEC6H5	<1.0
NB13E	6/28/00	CCL3F	<1.0
NB13E	6/28/00	C2H3CL	<1.0
NB13E	6/28/00	XYLEN	<3.0
NB13E	7/17/00	11DCLE	<1.0
NB13E	7/17/00	11DCE	<1.0
NB13E	7/17/00	12DCE	<2.0
NB13E	7/17/00	111TCE	<1.0
NB13E	7/17/00	112TCE	<1.0
NB13E	7/17/00	TRCLE	<1.0
NB13E	7/17/00	C6H6	<1.0
NB13E	7/17/00	BRDCLM	<1.0
NB13E	7/17/00	CHBR3	<1.0
NB13E	7/17/00	CCL4	<1.0
NB13E	7/17/00	CLC6H5	<1.0
NB13E	7/17/00	C2H5CL	<1.0
NB13E	7/17/00	2CLEVE	<10 (1)
NB13E	7/17/00	CHCL3	<1.0
NB13E	7/17/00	CH3CL	<1.0
NB13E	7/17/00	DBRCLM	<1.0
NB13E	7/17/00	12DCLE	<1.0
NB13E	7/17/00	12DCLB	<1.0
NB13E	7/17/00	13DCLB	<1.0
NB13E	7/17/00	14DCLB	<1.0
NB13E	7/17/00	12DCLP	<1.0
NB13E	7/17/00	C13DCP	<1.0
NB13E	7/17/00	T13DCP	<1.0
NB13E	7/17/00	ETC6H5	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	7/17/00	CH2CL2	<5.0
NB13E	7/17/00	TCLEA	<1.0
NB13E	7/17/00	TCLEE	<1.0
NB13E	7/17/00	MEC6H5	<1.0
NB13E	7/17/00	CCL3F	<1.0
NB13E	7/17/00	C2H3CL	<1.0
NB13E	7/17/00	XYLEN	<3.0
NB13E	9/5/00	11DCLE	<1.0
NB13E	9/5/00	11DCE	<1.0
NB13E	9/5/00	12DCE	<2.0
NB13E	9/5/00	111TCE	<1.0
NB13E	9/5/00	112TCE	<1.0
NB13E	9/5/00	TRCLE	<1.0
NB13E	9/5/00	C6H6	<1.0
NB13E	9/5/00	BRDCLM	<1.0
NB13E	9/5/00	CHBR3	<1.0
NB13E	9/5/00	CCL4	<1.0
NB13E	9/5/00	CLC6H5	<1.0
NB13E	9/5/00	C2H5CL	<1.0
NB13E	9/5/00	2CLEVE	<10 (1)
NB13E	9/5/00	CHCL3	<1.0
NB13E	9/5/00	CH3CL	<1.0
NB13E	9/5/00	DBRCLM	<1.0
NB13E	9/5/00	12DCLE	<1.0
NB13E	9/5/00	12DCLB	<1.0
NB13E	9/5/00	13DCLB	<1.0
NB13E	9/5/00	14DCLB	<1.0
NB13E	9/5/00	12DCLP	<1.0
NB13E	9/5/00	C13DCP	<1.0
NB13E	9/5/00	T13DCP	<1.0
NB13E	9/5/00	ETC6H5	<1.0
NB13E	9/5/00	CH2CL2	<5.0
NB13E	9/5/00	TCLEA	<1.0
NB13E	9/5/00	TCLEE	<1.0
NB13E	9/5/00	MEC6H5	<1.0
NB13E	9/5/00	CCL3F	<1.0
NB13E	9/5/00	C2H3CL	<1.0
NB13E	9/5/00	XYLEN	<3.0
NB13E	9/14/00	11DCLE	<1.0
NB13E	9/14/00	11DCE	<1.0
NB13E	9/14/00	12DCE	<2.0
NB13E	9/14/00	111TCE	<1.0
NB13E	9/14/00	112TCE	<1.0
NB13E	9/14/00	TRCLE	<1.0

APPENDIX H.3

INFLUENT/EFFLUENT DATABASE
FISCAL YEAR 2000
PGRS, TCAAP
ARDEN HILLS, MINNESOTA

Location	*Sample Date*	*Chemical*	*Concentration*
NB13E	9/14/00	C6H6	<1.0
NB13E	9/14/00	BRDCLM	<1.0
NB13E	9/14/00	CHBR3	<1.0
NB13E	9/14/00	CCL4	<1.0
NB13E	9/14/00	CLC6H5	<1.0
NB13E	9/14/00	C2H5CL	<1.0
NB13E	9/14/00	2CLEVE	<10 (1)
NB13E	9/14/00	CHCL3	<1.0
NB13E	9/14/00	CH3CL	<1.0
NB13E	9/14/00	DBRCLM	<1.0
NB13E	9/14/00	12DCLE	<1.0
NB13E	9/14/00	12DCLB	<1.0
NB13E	9/14/00	13DCLB	<1.0
NB13E	9/14/00	14DCLB	<1.0
NB13E	9/14/00	12DCLP	<1.0
NB13E	9/14/00	C13DCP	<1.0
NB13E	9/14/00	T13DCP	<1.0
NB13E	9/14/00	ETC6H5	<1.0
NB13E	9/14/00	CH2CL2	<5.0
NB13E	9/14/00	TCLEA	<1.0
NB13E	9/14/00	TCLEE	<1.0
NB13E	9/14/00	MEC6H5	<1.0
NB13E	9/14/00	CCL3F	<1.0
NB13E	9/14/00	C2H3CL	<1.0
NB13E	9/14/00	XYLEN	<3.0

Notes:

Concentration in μg/L.

August samples were lost in shipment to laboratory, therefore, samples were re-collected on 9/5/00 to fulfill August monthly monitoring requirements.

No sampling was conducted in November 1999.

Samples were collected and analyzed by Barr Engineering for City of New Brighton.

(1) Estimated value, QA/QC criteria not met.

APPENDIX I

Appendix I

Other Installation Restoration Activities During FY 2000

I.1 Other Installation Restoration Activities During FY 2000

Appendix I.1

Other Installation Restoration Activities During FY 2000

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

No data is available since this was the "off year" in the biennial monitoring program, as shown in Appendix A.

2. Surface Water

The FY 2000 – FY 2004 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 I-1). This monitoring is simply intended to establish baseline characteristics for Rice Creek. Monitoring will be conducted annually beginning with FY 2001 (previous years had been quarterly). The FY 2000 data is presented in Appendix I.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 2000:

- Field Work for Tier II Ecological Risk Assessment
- Amphibian report received regulatory consistency

C. GRENADE RANGE

The removal action to address contaminated soils was completed in early FY 2000. Alliant Techsystems was working on a removal action report at the end of FY 2000.

D. OUTDOOR FIRING RANGE

The removal action to address contaminated soils was completed in early FY 2000. Alliant Techsystems was working on a removal action report at the end of 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 in early FY 2000. Documentation was included with the Outdoor Firing Range removal action report, which was being prepared at the end of FY 2000.

F. TRAP RANGE

Alliant Techsystems prepared and submitted a preliminary assessment for the Trap Range. The report, which was approved in FY 2000, recommends no further action at this site.

G. NATURAL ATTENUATION STUDY

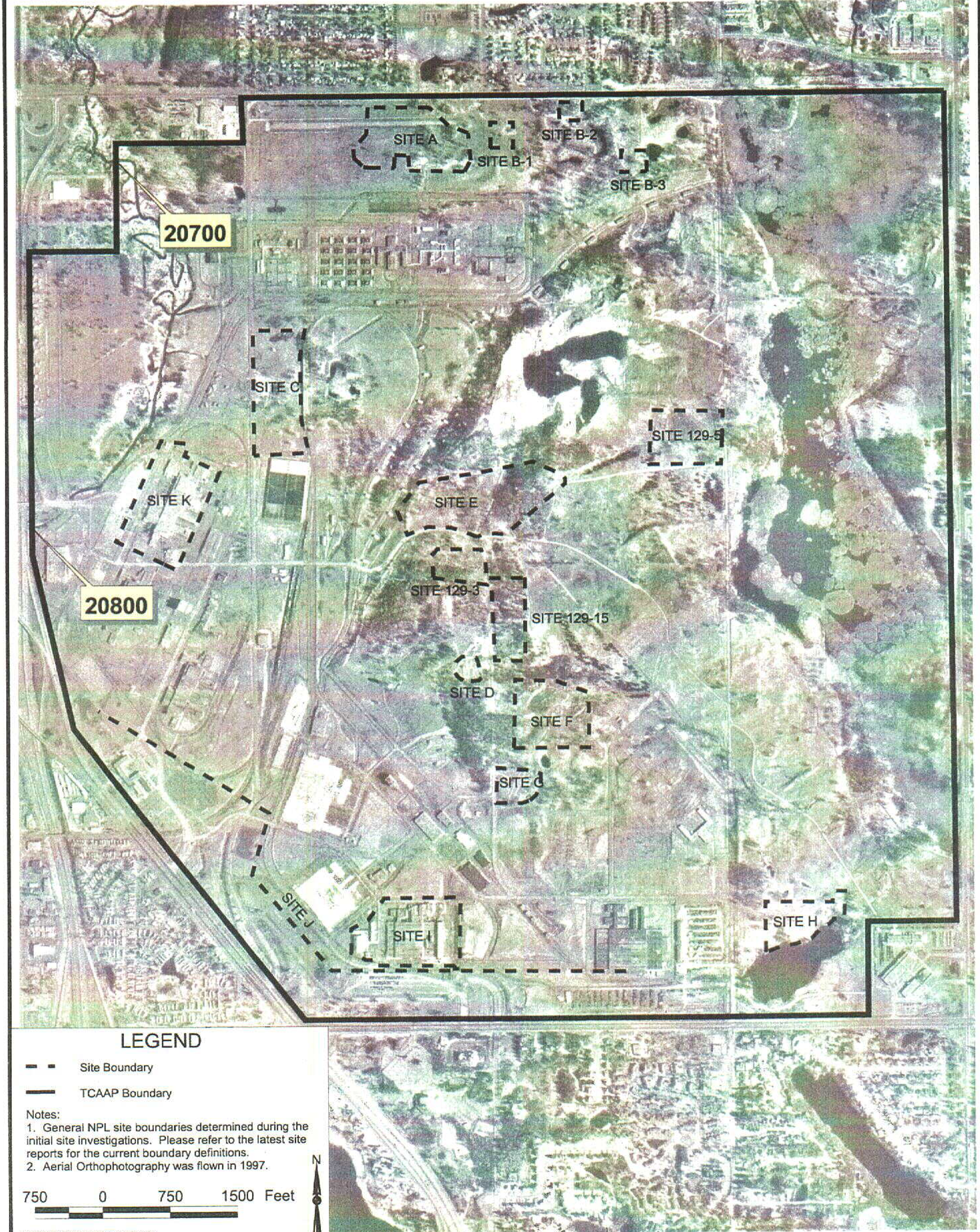
The USEPA funded and led a study of natural attenuation processes for the deep groundwater beneath TCAAP. Water quality sampling was performed in FY 1997 and additional sampling was performed in FY 1998. A report was finalized in FY 2000. A natural attenuation study at Site A was also finalized in FY 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. The study was intended to be extended for a third growing season (FY 2000), when it was discovered that lead was migrating into the shallow groundwater at Site C. This resulted in termination of the study at both sites and the Army received a Notice of Violation for the impacts to shallow groundwater. The Army is working with MPCA enforcement staff to implement corrective actions. A phytoremediation study report was being prepared at the end of FY 2000.

I. PRIMER/TRACER AREAS 135 AND 535

At the end of FY 2000, Alliant Techsystems was working on preliminary assessment reports for both of these sites.



LEGEND

- - Site Boundary

— TCAAP Boundary

Notes:
1. General NPL site boundaries determined during the initial site investigations. Please refer to the latest site reports for the current boundary definitions.
2. Aerial Orthophotography was flown in 1997.

750 0 750 1500 Feet

N

L:0003/0003-61/apr file/00report apr/figure I-1

TWIN CITIES ARMY AMMUNITION PLANT	COPYRIGHT Wenck Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2000
Surface Water Monitoring Locations		Figure I-1

I.2 Surface Water Quality Data: FY 2000

Appendix I.2
Surface Water Quality Data : FY 2000

		11DCE (ug/l)	11DCLE (ug/l)	12DCLE (ug/l)	C12DCE (ug/l)	C2H3CL (ug/l)	T12DCE (ug/l)	TRCLE (ug/l)	AG (ug/l)	CU (ug/l)	CYN (ug/l)	HG (ug/l)	P4 (ug/l)	PB (ug/l)	ZN (ug/l)
20700	07-Dec-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	94.00	<100.00	<20.00
20700	08-Mar-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	JP 7.52	<10.00	<0.10	<20.00	<100.00	<20.00
20700	07-Jun-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	105.00	<100.00	<20.00
20700 D	07-Jun-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	138.00	<100.00	JP 10.90
20700	07-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	172.00	<100.00	<20.00
20800	07-Dec-99	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	JP 20.00	<10.00	<0.10	71.10	JP 100.00	<20.00
20800	08-Mar-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	91.00	<100.00	JP 13.40
20800	07-Jun-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	130.00	<100.00	<20.00
20800	07-Sep-00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<20.00	<10.00	<0.10	179.00	<100.00	<20.00

J = Value is estimated.
P = Results less than reporting level but greater than the instrument detection limit.