McCleery

Fig 6 - NB 14 & 15

RECORD OF DECISION
GROUNDWATER REMEDIATION
OPERABLE UNIT 1
AT NEW BRIGHTON/ARDEN HILLS
SUPERFUND SITE

SEPTEMBER 1993

In accordance with Army Regulation 200-2, this document is intended to comply with the National Environmental Policy Act (NEPA) of 1969.

I. DECLARATION FOR THE RECORD OF DECISION

A. Site Name and Location

New Brighton/Arden Hills (NB/AH) Superfund Site, also known as Twin Cities Army Ammunition Plant (TCAAP), Ramsey County, Minnesota.

B. Statement of Basis and Purpose

This decision document presents the selected remedial action for addressing groundwater contamination at operable unit 1 (OU-1) of the New Brighton/Arden Hills Superfund Site in Ramsey County, Minnesota, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Minnesota Environmental Response and Liability Act (MERLA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The remedial action was selected by the United States Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA), together with the United States Army (Army) pursuant to the Federal Facilities Agreement (FFA) among the three parties.

This decision document explains the factual and legal basis for selecting the remedy for this site. The information supporting this remedial action decision is contained in the Administrative Record for this site.

C. Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

D. Description of the Selected Remedy

The NB/AH site has been divided into three operable units. The first operable unit, OU-1, addressed by the remedy selected in this ROD, consists of the North Plume of off-TCAAP contaminated groundwater. The second operable unit, OU-2, consists of the on-TCAAP soils, groundwater, sediments, and surface waters. A remedy for OU-2 is expected to be proposed in mid-1994. The third operable unit, OU-3, consists of the South Plume of off-TCAAP contaminated groundwater. A ROD has already been issued for OU-3, for which the selected remedy is to contain the South Plume by extracting groundwater from its leading edge, thus preventing further contaminant migration into areas that have not been impacted.

For OU-1, the major components of the selected remedy include the following:

- Providing an alternative water supply to residents with private wells within the North Plume
- Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area
- Extracting groundwater at the containment boundary in the North Plume near County Road E
- Pumping the extracted groundwater to the Permanent Granular Activated Carbon Water Treatment Facility (PGAC) in New Brighton for removal of volatile organic compounds (VOCs) by a pressurized GAC system
- Discharging all of the treated water to the New Brighton municipal distribution system
- Monitoring the groundwater to verify the effectiveness of the remedy

E. Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V

Date

for Charles W. Williams
Commissioner
Minnesota Pollution Control Agency

September 27, 1993
Date

Lewis D. Walker
Deputy Assistant Secretary of Army for
Environment, Safety, and Occupational Health

Date

I. DECLARATION FOR THE RECORD OF DECISION

A. Site Name and Location

New Brighton/Arden Hills (NB/AH) Superfund Site, also known as Twin Cities Army Ammunition Plant (TCAAP), Ramsey County, Minnesota.

B. Statement of Basis and Purpose

This decision document presents the selected remedial action for addressing groundwater contamination at operable unit 1 (OU-1) of the New Brighton/Arden Hills Superfund Site in Ramsey County, Minnesota, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Minnesota Environmental Response and Liability Act (MERLA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The remedial action was selected by the United States Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA), together with the United States Army (Army) pursuant to the Federal Facilities Agreement (FFA) among the three parties.

This decision document explains the factual and legal basis for selecting the remedy for this site. The information supporting this remedial action decision is contained in the Administrative Record for this site.

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Actual or threatened releases of hazardous substances from this site, if not addressed by implementing this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

D. Description of the Selected Remedy

The NB/AH site has been divided into three operable units. The first operable unit, OU-1, addressed by the remedy selected in this ROD, consists of the North Plume of off-TCAAP contaminated groundwater. The second operable unit, OU-2, consists of the on-TCAAP soils, groundwater, sediments, and surface waters. A remedy for OU-2 is expected to be proposed in mid-1994. The third operable unit, OU-3, consists of the South Plume of off-TCAAP contaminated groundwater. A ROD has already been issued for OU-3, for which the selected remedy is to contain the South Plume by extracting groundwater from its leading edge, thus preventing further contaminant migration into areas that have not been impacted.

For OU-1, the major components of the selected remedy include the following:

- Providing an alternative water supply to residents with private wells within the North Plume
- Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area
- Extracting groundwater at the containment boundary in the North Plume near County Road E
- Pumping the extracted groundwater to the Permanent Granular Activated Carbon Water Treatment Facility (PGAC) in New Brighton for removal of volatile organic compounds (VOCs) by a pressurized GAC system
- Discharging all of the treated water to the New Brighton municipal distribution system
- Monitoring the groundwater to verify the effectiveness of the remedy

E. Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V

Sept. 30, 1993
Date

Charles W. Williams
Commissioner
Minnesota Pollution Control Agency

Date

Lewis D. Walker
Deputy Assistant Secretary of Army for
Environment, Safety, and Occupational Health

Date

I. DECLARATION FOR THE RECORD OF DECISION

A. Site Name and Location

New Brighton/Arden Hills (NB/AH) Superfund Site, also known as Twin Cities Army Ammunition Plant (TCAAP), Ramsey County, Minnesota.

B. Statement of Basis and Purpose

This decision document presents the selected remedial action for addressing groundwater contamination at operable unit 1 (OU-1) of the New Brighton/Arden Hills Superfund Site in Ramsey County, Minnesota, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Minnesota Environmental Response and Liability Act (MERLA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The remedial action was selected by the United States Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA), together with the United States Army (Army) pursuant to the Federal Facilities Agreement (FFA) among the three parties.

This decision document explains the factual and legal basis for selecting the remedy for this site. The information supporting this remedial action decision is contained in the Administrative Record for this site.

C. Assessment of the Site

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D. Description of the Selected Remedy

The NB/AH site has been divided into three operable units. The first operable unit, OU-1, addressed by the remedy selected in this ROD, consists of the North Plume of off-TCAAP contaminated groundwater. The second operable unit, OU-2, consists of the on-TCAAP soils, groundwater, sediments, and surface waters. A remedy for OU-2 is expected to be proposed in mid-1994. The third operable unit, OU-3, consists of the South Plume of off-TCAAP contaminated groundwater. A ROD has already been issued for OU-3, for which the selected remedy is to contain the South Plume by extracting groundwater from its leading edge, thus preventing further contaminant migration into areas that have not been impacted.

For OU-1, the major components of the selected remedy include the following:

- Providing an alternative water supply to residents with private wells within the North Plume
- Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area
- Extracting groundwater at the containment boundary in the North Plume near County Road E
- Pumping the extracted groundwater to the Permanent Granular Activated Carbon Water Treatment Facility (PGAC) in New Brighton for removal of volatile organic compounds (VOCs) by a pressurized GAC system
- Discharging all of the treated water to the New Brighton municipal distribution system
- Monitoring the groundwater to verify the effectiveness of the remedy

E. Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V

Date

Charles W. Williams
Commissioner
Minnesota Pollution Control Agency

Date

Lewis D. Walker

9/29/93

Lewis D. Walker
Deputy Assistant Secretary of Army for
Environment, Safety, and Occupational Health

Date

II. DECISION SUMMARY

A. Site Name, Location, and Description

The NB/AH site consists of a 25-square-mile area located in Ramsey County and Hennepin County, Minnesota just north of the Minneapolis-St. Paul metropolitan area. This includes the 4-square-mile TCAAP facility and portions of seven nearby communities: New Brighton, Arden Hills, St. Anthony, Shoreview, Mounds View, Columbia Heights, and Minneapolis (Figure 1). Land use in this generally suburban area is mixed residential, commercial, and industrial. As presently defined, the site covers much of the U.S. Geological Survey's New Brighton, Minnesota 7.5-minute quadrangle.

The site consists of gently rolling, postglacial terrain with several hills and surface water bodies, including lakes and streams, but no extreme relief. The site is located within the Rice Creek watershed. Rice Creek and its surrounding marshes and woodlands provide cover for a variety of vegetation and wildlife. Much of the lowland area adjacent to Rice Creek has lush and vigorous vegetation creating a wildlife habitat well suited to small animals.

The TCAAP facility is an inactive small arms ammunition manufacturing plant. It is currently operated by Federal Cartridge Company (FCC) and used by two manufacturing lessees, Alliant Techsystems (previously a branch of Honeywell, Inc.) and 3M Corporation. Approximately 1,000 people are currently employed at TCAAP.

B. Site History and Enforcement Activities

TCAAP has been used to manufacture, store, and test small arms ammunition and related materials since 1941. Information from past studies indicates that between 1941 and 1981, waste materials such as VOCs, heavy metals, corrosive materials, and explosives were disposed of at 14 source areas within TCAAP. In 1981, the MPCA and the Minnesota Department of Health (MDH) began groundwater sampling and analysis. Samples were collected from wells in the TCAAP area. The analytical results from these samples indicated that municipal and private drinking water wells and wells at TCAAP were contaminated by VOCs. As a result, the following actions were taken:

- The City of New Brighton abandoned several municipal wells and either placed on standby or deepened several others.
- The Village of St. Anthony decommissioned one well and connected a portion of the village with Roseville water supplies for an indefinite but temporary period.
- A number of New Brighton/Arden Hills residents drawing contaminated groundwater from private wells were provided with municipal water through the construction of a water main extension.
- Residents of the Arden Manor Trailer Park drawing contaminated groundwater from private wells were provided with new wells to supply potable water. The wells were provided by Arden Manor Trailer Park, which was later reimbursed by the Army.

The NB/AH site was proposed for inclusion on the National Priorities List (NPL) in July 1982 and finalized in September 1983, with a Hazard Ranking System (HRS) score of 59 and a ranking of 43 on the NPL. In 1981, the Army began a Phase I investigation at TCAAP which involved a significant quantity of monitoring wells and sampling efforts designed to identify the overall contribution of TCAAP to the groundwater contamination. In 1983, EPA's Field Investigation Team completed a documentation record and site assessment for the site. The assessment documented high concentrations of VOCs in groundwater at the site. Releases of these compounds from the site to surface water and direct human contact with the compounds were also documented. The elevated HRS score and correspondingly high NPL ranking reflect the following site conditions: 1) the relatively large number of individuals exposed to contaminated groundwater through their potable water supplies, and 2) the potentially carcinogenic nature of the compounds.

The NB/AH site, as currently defined, consists primarily of portions of several regional aquifers that are contaminated to differing degrees with VOCs. Concentrations for several of these compounds exceed current health-based criteria. The affected aquifers supply water to TCAAP and the municipalities of New Brighton, St. Anthony, Fridley, Mounds View, and Shoreview. On TCAAP itself, contamination of soils, sediments, and surface waters is also of concern.

PROBLEM DEFINITION

Groundwater contamination emanating from TCAAP, identified as the primary source of groundwater contamination within the area of the NB/AH site, has posed a potential health hazard. This hazard potentially results from direct human contact (dermal contact, inhalation, or ingestion) of groundwater contaminated with industrial solvents including trichloroethene (TCE), dichloroethene (DCE), trichloroethane (TCA), and dichloroethane (DCA). Studies concerning VOCs in groundwater within the study area have been undertaken primarily by the Army, Alliant Techsystems, MPCA, EPA, and private entities. These studies have largely involved the installation and sampling of monitoring wells and water quality surveys of production, municipal, and residential wells. The objectives and results of the studies are summarized as follows.

PREVIOUS STUDIES

Army reports of investigations and studies at TCAAP in 1983 and 1984 identified major and minor disposal areas on the facility that were sources of release or threatened release of hazardous substances (mainly VOCs). In their review of these reports, EPA and MPCA noted that additional information was needed to address the extent and magnitude of contaminated groundwater, to fill data gaps relative to off-site contamination, and to complete an assessment of the disposal areas identified on TCAAP.

In 1984 and 1985, the Army submitted investigative reports addressing VOC contamination at Alliant-TCAAP buildings 103 and 502 (Sites I and K). The reports indicated that the buildings' operations were a source of VOC-contaminated groundwater migrating towards Rice Creek from Building 103, and also to the west or southwest from the Building 502 area. As a result of these findings, Alliant announced a three-phase off-TCAAP investigation on July 28, 1984, to supplement work being conducted by MPCA to identify off-TCAAP sources of release.

In the spring of 1985, EPA initiated an investigation of the force mains outside TCAAP because a number of documented breaks had occurred in the line in the study area and because VOCs and other hazardous wastes and metals had been detected in the sewer sediments on TCAAP.

Also in 1985, MPCA released the Phase I Final Report, New Brighton/Arden Hills, Minnesota Multi-Point Source Remedial Investigation. The report identified four potential source areas of VOC release in the study area that had possibly contaminated the groundwater. The source areas included two areas at TCAAP and two areas adjacent to TCAAP. A second phase of the off-TCAAP RI, Phase IA, was initiated in July 1986 and completed in February, 1991. The purpose of the Phase IA RI was to further define the nature and extent of groundwater contamination in off-TCAAP areas.

In 1988, the Army initiated an on-TCAAP RI designed to characterize the nature and extent of contamination within the facility boundary, addressing soils, sediments, surface waters, and groundwater. The on-TCAAP RI was completed in April, 1991.

Additionally, in 1991, EPA completed the Human Health Risk Assessment and the Army completed the Environmental Risk Assessment. The completion of these four documents led to the development of feasibility studies for final remedial actions at the NB/AH site.

INTERIM REMEDIAL ACTIONS

Most of the interim remedial actions (IRAs) taken at TCAAP have been implemented under the Army Installation Restoration Program (IRP). These actions have been coordinated with federal and state regulatory agencies prior to implementation. Alliant Techsystems entered into an agreement with the Army in 1985 to investigate and pursue the cleanup of sites at TCAAP associated with Alliant operations. Industrial operations at TCAAP have generated most of the contamination currently migrating from the site. The IRAs being conducted by the Army and Alliant have concentrated on contaminant source control, with a focus on individual site cleanups and groundwater (aquifer) remediation. Actions that have already been taken can be divided into the categories of : a) alternative water supplies, b) unilateral actions by the Army, c) actions with EPA and state concurrence, and d) other actions initiated by EPA, MPCA, and/or Army.

a) Alternative Water Supplies

In addition to the previously mentioned alternative water supplies that were provided shortly after the discovery of contamination at the site, the following systems have been completed:

- A temporary, followed by a permanent, granular activated carbon (GAC) treatment system constructed for the City of New Brighton by the Army as part of a litigation settlement agreement. The permanent system, completed in June 1990, presently treats water from New Brighton Wells 3, 4, 5, and 6 and has a capacity of 3800 gallons per minute (gpm).

- A temporary, followed by a permanent, GAC treatment system constructed for the Village of St. Anthony by EPA and MPCA. The permanent system is a remedial action pursuant to a ROD signed in September 1986. The system, completed in April 1991, treats water from St. Anthony Wells 3, 4, and 5 and has a capacity of 2400 gpm.

b) Unilateral Actions by the Army

Unilateral removal actions have been taken by the U.S. Army using its own delegated removal authorities under CERCLA section 104. These actions have included:

- In-situ soil vapor extraction (ISV) systems for the remediation of contaminated soils at Sites D and G on TCAAP. The ISV systems were implemented in 1986 and, since then, have removed over 115 tons of VOCs from site soils.

- A groundwater pump-and-treat system at Site A, where the surficial aquifer is contaminated with VOCs. The system, installed by the Army in 1988, utilizes liquid-phase GAC to treat extracted groundwater, which is then surface-discharged.

- Groundwater pump-and-treat systems installed in 1988 at Sites I and K, Alliant operations buildings. Groundwater underneath the buildings is contaminated with VOCs with the likely source identified as leaks from floor drains and sewer lines. The extracted groundwater is treated by air stripping. The treated groundwater from Site K is discharged to a sewer under a National Pollutant Discharge Elimination System (NPDES) permit issued by the state. The treated groundwater from Site I is discharged to the TCAAP Groundwater Recovery System (TGRS). The TGRS is more fully described in the next section.

c) Actions with EPA and State Concurrence

- In 1987, the Army implemented the Boundary Groundwater Recovery System (BGRS), for which the EPA signed a ROD in September 1987. This system initially consisted of a series of six groundwater extraction wells located along the southwest boundary of TCAAP and designed to prevent any further migration of contaminated groundwater off of TCAAP. After a period of performance monitoring, the system was expanded in 1989 to twelve wells. Eight of the BGRS wells draw water from the Hillside Sand aquifer with the other four drawing from the Prairie du Chien aquifer.

- The BGRS operates at an extraction rate of approximately 2100 gpm. Extracted water is pumped to an air stripping facility for the removal of VOCs. From there the treated water is pumped to the Arsenal Sand and Gravel Pit in the north-central portion of TCAAP, where it is discharged and allowed to infiltrate back into the ground. Over five billion gallons of water have been treated and 45 tons of VOCs have been removed by this system.

- In addition to the implementation of the BGRS, the Army subsequently installed five source control (SC) wells downgradient of Sites D, G, and I. The BGRS and SC wells together comprise the TCAAP Groundwater Recovery System (TGRS). The TGRS is designed to provide regional groundwater remediation at TCAAP and prevent additional contamination from migrating beyond the facility boundaries.

d) Other Actions Initiated by EPA, MPCA and/or Army

- Site J, the sanitary sewer system at TCAAP, has been investigated in several studies. In 1983, integrity testing was conducted on part of the upper plant sewer and on the 18-inch and 24-inch force mains. During 1984, approximately 50 percent of the sanitary sewer system (over 42,000 linear feet) was inspected, cleaned, and tested. By July 1986, cleaning of all sewer lines was completed.

- Between 1984 and 1986, Alliant Techsystems removed contaminated sludge from the sewers leading away from Building 502, containerized the sludge in drums and stored it in a building called the Retrievable Monitored Containment Structure (RMCS). In addition, in 1985, Alliant excavated PCB-contaminated soils around Building 502 and placed them in the RMCS.

- About 1400 cubic yards of PCB-contaminated soil at Site D were thermally treated in 1989. EPA prepared the ROD and the risk assessment report for this action.

- The Army completed a two-phase water management study to evaluate feasible alternatives for the disposal of treated groundwater anticipated from future remedial measures.

CERCLA ENFORCEMENT ACTIVITIES

Pursuant to Section 120 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), the Army entered into a Federal Facilities Agreement (FFA) with EPA and the State of Minnesota. The TCAAP FFA, which became effective on December 31, 1987, was the first to be negotiated between EPA and any federal agency since the enactment of SARA. The general purposes of the FFA are to:

1) Ensure that the environmental impacts associated with past and present activities at TCAAP are thoroughly investigated and that appropriate remedial actions are taken to protect the public health, welfare, and the environment.

2) Establish a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions in accordance with CERCLA/SARA, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Superfund guidance and policy, the Resource Conservation and Recovery Act (RCRA), and RCRA guidance and policy.

3) Ensure cooperation, information exchange, and participation of the parties in such actions.

The specific purposes of the agreement are to:

1) Identify interim remedial action alternatives appropriate for preventing further migration of contaminated groundwater prior to the implementation of final remedial actions for the site.

2) Establish requirements for conducting the on-TCAAP RI to determine fully the nature and extent of the threat to the public health, welfare, or the environment caused by the release and threatened release of hazardous substances, pollutants, or contaminants at TCAAP.

3) Establish requirements for conducting an FS for the site to identify, evaluate, and select alternatives for the appropriate remedial action(s) to prevent, mitigate, or abate the release or threatened release of hazardous substances, pollutants, or contaminants at the site in accordance with CERCLA and SARA.

4) Identify the nature, objective, and schedule of response actions to be taken at the site. Response actions at the site shall attain a degree of cleanup of hazardous substances, pollutants, or contaminants mandated by CERCLA and SARA.

5) Implement the selected interim and final remedial action(s).

6) Assure compliance with federal and state hazardous waste laws and regulations for matters covered by the agreement.

C. Highlights of Community Participation

The community near TCAAP has been involved in site activities since the environmental problems related to the TCAAP facility were identified. Numerous fact sheets have been sent and public meetings have been held to keep the community apprised of the various remedial activities at the site.

For the remedy selection for OU-1, the public participation requirements of CERCLA Sections 113 (k) (a) (B) (i-v) and 117 were met through the issuance of a fact sheet and Proposed Plan, notification of the availability of the Proposed Plan by newspaper, and the holding of a Public meeting on August 19, 1993. The public comment period for the Proposed Plan began on August 6, 1993, and ended on September 7, 1993.

D. Scope and Role of Operable Units Within the Overall Cleanup Strategy

The NB/AH site has been divided into three operable units. The first operable unit, OU-1, addressed by the remedy selected in this ROD, consists of the North Plume of off-TCAAP contaminated groundwater. The second operable unit, OU-2, consists of the on-TCAAP soils, groundwater, sediments, and surface waters. The third operable unit, OU-3, consists of the South Plume of off-TCAAP contaminated groundwater. A conceptual illustration of the three operable units is presented in Figure 2.

The main role of OU-1 is the containment of the North Plume of off-TCAAP contaminated groundwater, while the role of OU-3 is the containment of the South Plume. Implementation of the remedies for OU-1 and OU-3 will provide overall protection of human health and the environment. By extracting contaminated groundwater to hydraulically contain the most contaminated portions of the North Plume and fully contain the South Plume, remedial actions at OU-1 and OU-3 will also provide removal of contaminant mass from the system. However,

hazardous substances will remain in the groundwater above health-based levels for a long period of time. To mitigate this situation, a more aggressive strategy for removing contaminant mass will be integrated into the objectives of OU-2. Mass removal will be more effective in OU-2 because the source areas of contamination are located within this operable unit.

E. Summary of Site Characteristics

Within the NB/AH study area, groundwater is found in both bedrock and glacial deposit aquifers. On top of the irregular bedrock surface, a series of unconsolidated glacial sediments has been deposited. Several of these units are water-bearing and have been affected by the spread of contaminants from TCAAP.

The Prairie du Chien/Jordan Sandstone aquifer is the principal aquifer in the Twin Cities Basin. This aquifer is referred to as Unit 4. Permeability in the Prairie du Chien/Jordan Sandstone aquifer is controlled by the extent of fractures and joints in the Prairie du Chien unit and the porosity of the Jordan Sandstone unit. Groundwater flow through this aquifer is generally in a west-southwest to south-southwest direction off-TCAAP toward the Mississippi River. Recharge to the Prairie du Chien/Jordan Sandstone aquifer occurs by infiltration through the overlying glacial units.

The Hillside Sand and the Arsenal Sand are referred to as Unit 3. Within the New Brighton quadrangle, the Hillside/Arsenal Sand outcrops in four areas: the Arsenal Kame within TCAAP; the southwestern corner of the quadrangle within Minneapolis; two small areas in Columbia Heights in the vicinity of Silver Lake; and along the southern edge of Snail Lake. Except for the exposure in Minneapolis, the Hillside/Arsenal Sand directly overlies the Prairie du Chien/Jordan Sandstone aquifer; the other three surface exposures provide direct recharge to both units. The groundwater in Unit 3 flows predominantly southwest.

The Twin Cities Till overlies the Hillside Sand in much of the area and is referred to as Unit 2. The Twin Cities Till acts as an aquitard, i.e., a confining layer that prevents direct hydraulic communication between the overlying Lacustrine Deposits and the Hillside Sand below.

The Lacustrine Deposits, referred to as Unit 1, are predominantly fine to medium sands with interbedded silt layers and occasional minor peat and clay layers. These units form the shallow surface aquifer between and to the north of the Hilltop and Arden Hills moraines. Private wells installed in Unit 1 exist to the north of TCAAP. Groundwater in this unit is perched and discontinuous. Any groundwater flow is localized and toward the closest small lake.

Groundwater in aquifer Units 1, 3, and 4 has been contaminated by chemicals coming from one or more of the 14 source areas identified on the TCAAP facility. Outside TCAAP, VOCs within the North Plume migrate horizontally and downward vertically in response to corresponding hydraulic gradients. The North Plume migrates in a southwesterly direction in both the Hillside Sand and Prairie du Chien aquifers. The North and South Plumes diverge immediately off TCAAP with the South Plume moving in a more southerly direction.

F. Summary of Site Risks

A human health risk assessment for TCAAP was performed by EPA in 1991. The risk assessment evaluated the potential risks associated with the source areas at the site as well as the contaminated groundwater both on-TCAAP and off-TCAAP. It also evaluated the ways by which people could be exposed to contaminants. These potential exposure pathways are ingestion, inhalation during showering, and absorption through the skin (dermal contact) during showering or bathing with contaminated groundwater.

The public water supplies in New Brighton, St. Anthony, and the TCAAP area treat their potable water using granular activated carbon to remove organic contaminants. However, a small number of residents may rely on private drinking wells located within the North Plume. These residents are the potential receptors at risk from the contaminated groundwater.

The following compounds have been identified as the most prevalent chemicals of concern in the groundwater: chloroform; 1,1-dichloroethane; 1,1-dichloroethene; 1,2-dichloroethene; 1,1,1-trichloroethane; trichloroethene; and bis(2-ethylhexyl)phthalate. These contaminants could pose an increased carcinogenic risk to those exposed to the contamination. This risk is over and above the average or "background" level of cancer occurrence in the general population, which is about one in three or 33 percent.

Based on the EPA risk assessment, it was estimated that maximum exposure to the chemicals at the site could result in an increased cancer risk of one in one hundred (10^{-2}) or one percent. This projected increase was based on the assumption that those exposed would use untreated ground-water from private wells installed in the most contaminated part of the North Plume and that this exposure would last for an average lifetime. The projected one percent increase in the risk of cancer is well over the amount EPA and MPCA consider acceptable. Indeed, Federal and State regulations often require action when the increased cancer risk reaches the range of one in ten thousand (10^{-4}) to one in one million (10^{-6}). In addition, the Hazard Index for Carcinogenic Mixtures, as calculated from Minn. Proposed Rule 4717.7700 (see Table 7) exceeds the acceptable value of 1.0, which represents a lifetime risk level of one in one hundred thousand (10^{-5}).

Noncarcinogenic risk, such as the risk of liver damage or reproductive abnormalities, is evaluated through the calculation of a hazard index for each chemical of concern. The hazard index accounts for either the short-term (acute) or long-term (chronic) exposure via ingestion, inhalation, and dermal contact. Noncarcinogenic risk for a given contaminant exists when the hazard index is greater than one (1.0). The hazard index for one of the contaminants of concern (1,1,1-trichloroethane) in the North Plume exceeds 1.0 in two exposure areas. In addition, the Hazard Index for Noncarcinogenic Mixtures, as calculated from Minn. Proposed Rule 4717.7700 (see Table 7), exceeds the acceptable value of 1.0, which represents the health risk limit for noncarcinogenic mixtures.

The exposure areas associated with off-post Units 3 and 4 groundwater contamination are shown in Figures 3 and 4, respectively. The excess lifetime cancer risks and the hazard indices for exposure to off-TCAAP groundwater are summarized in Table 1.

In addition to the EPA-conducted human health risk assessment, the Army conducted an ecological risk assessment at TCAAP. For the most part, the ecological risk assessment

addressed on-TCAAP risks to plants and animals, and concluded that no significant risks exist. For off-TCAAP groundwater contamination, it was inferred that the contaminated groundwater in the deep aquifers does not pose any risks to plants and animals.

In summary, actual or threatened releases of hazardous substances from this site, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

G. Description of Alternatives

The Feasibility Study for OU-1 was performed in accordance with EPA guidance for Superfund Remedial Investigations and Feasibility Studies. Table 2 presents a tabular summary of the technology screening for OU-1. The potentially feasible remedial technologies retained from the screening are listed in Table 3. These technologies were combined into various remedial alternatives, which were then developed and screened. Three remedial alternatives were retained for detailed analysis:

Alternative 1: No Action

The no-action alternative is a baseline against which other alternatives are compared, as required by the NCP for Superfund sites. Under this alternative, no additional remedial action would be undertaken for the North Plume. Groundwater monitoring would continue under the existing FFA. The PGAC would continue to operate as it is currently operating and the PGRS would operate at a nominal capacity of 1,000 gpm. The no-action alternative provides no additional protection of human health or the environment.

The estimated 30-year present worth cost for continued semiannual groundwater monitoring is approximately $726,000 (Table 4).

Alternative 2: Mass Removal Alternative

This alternative includes providing an alternative water supply to residents with private wells with MDH drinking water advisories within the impacted zone, implementing drilling advisories that would regulate the installation of new private wells within the zone impacted by the contamination as a Special Well Construction Area, installing three new wells in the area of highest concentrations of contamination, pumping the extracted water to the PGAC, installing and operating an iron and manganese removal system upstream of the PGAC carbon units, and discharging a portion of the treated water to the New Brighton municipal distribution system interconnect.

The extraction well placement for this alternative is illustrated in Figure 5. The three new extraction wells (MR-1, MR-2, MR-3) would be screened in the Unit 3 and Unit 4 aquifers and would extract groundwater at a total flowrate of 2,250 gpm. Four existing PGAC wells (NB3, NB4, NB5, and NB6) would continue pumping at a rate of approximately 1,350 gpm, while the PGRS would be operated at 1,000 gpm. The extracted water from the new extraction wells would be pumped to the PGAC, which would bring its total operating flowrate to approximately 3,600 gpm. This is below the plant's maximum operating capacity of 3,800 gpm.

Pumping untreated water to the PGAC would require easements for the pipeline that would run from the new extraction wells to the PGAC. A 24-inch sanitary forcemain runs from TCAAP along 5th Ave., northwest from the TCAAP boundary to Interstate 694. This forcemain is within 0.5 miles of the proposed extraction wells. South of Interstate 694, the forcemain takes a jog and runs east along 7th Street, south along 23rd Avenue, and then south along Silver Lake Road. At this point, the forcemain is within 1,500 feet of the PGAC. A 16-inch pipe would be required to convey 2,250 gpm of untreated water at a flow velocity of about 5 feet per second. The 24-inch sanitary forcemain could serve as a secondary containment, although Minnesota does not require secondary containment at this time. About 3 miles of pipe would be required.

Alternative 2 includes the construction and operation of an oxidation/filtration system to remove the iron and manganese from the groundwater before it is pumped through the carbon adsorption units. A building area of approximately 50 feet by 100 feet is needed for this pretreatment system. Because space within the PGAC building is not available, an additional building for the inorganics treatment system is included in this alternative.

A major issue associated with Alternative 2 is that of managing excess treated water from the PGAC. The New Brighton municipal distribution system can accept a maximum of 2,500 gpm, which is far below the expected total flowrate of 3,600 gpm for this alternative.

Based on the groundwater modeling efforts, Alternative 2 is expected to remove an estimated 83% of the mass of contaminants after 30 years of operation, and an estimated 86% after 100 years. The North Plume will not be fully contained; contaminated groundwater is expected to continue migrating southward.

The estimated 30-year present worth cost for Alternative 2 is $14.2 Million. Table 5 presents a more detailed cost breakdown of this alternative.

<u>Alternative 3: Containment Alternative</u>

This alternative includes providing an alternative water supply to residents with private wells with MDH drinking water advisories within the impacted zone, implementing drilling advisories that would regulate the installation of new private wells within the zone impacted by the contamination as a Special Well Construction Area, implementing a groundwater extraction scheme for plume containment, pumping the extracted water to the PGAC, installing and operating an iron and manganese removal system upstream of the PGAC carbon units, and discharging all of the treated water to the New Brighton municipal distribution system.

The extraction well placement for this alternative is illustrated in Figure 6. The two new extraction wells (NB14 and NB15) would be screened in the Unit 4 aquifer, one near the corner of 7th Street NW and 13th Avenue, and the other in the vicinity of NB5 and NB6. The water from the new wells would be conveyed to the PGAC using the 24-inch sanitary forcemain that runs along 7th Street. Two existing PGAC wells (NB3 and NB4) would continue pumping, while the PGRS would be operated at 1,000 gpm. The extracted water from the new wells would be pumped to the PGAC, which would bring its total operating flowrate to approximately 2,200 gpm.

The construction and operation of the inorganics treatment facility is the same as described for Alternative 2.

Based on the ground-water modeling efforts, Alternative 3 is expected to remove an estimated 68% of the mass of contaminants after 30 years of operation, and an estimated 77% after 100 years. This alternative will contain the North Plume in the vicinity of County Road E and provide for the water to be treated to a TCE concentration of 5 μg/L.

The estimated 30-year present worth cost for Alternative 3 is $10.3 Million. Table 6 presents a more detailed cost breakdown of this alternative.

H. Summary of the Comparative Analysis of Alternatives

This section discusses how the alternatives retained for detailed analysis compare to one another when measured against the EPA's nine evaluation criteria for addressing Superfund sites. Each of the nine criteria are briefly described before the alternatives are evaluated against them.

1) Overall Protection of Human Health and the Environment

The analysis with respect to overall protection of human health and the environment provides a summary evaluation of how the alternative reduces the risk from potential exposure pathways through treatment, engineering, and/or institutional controls. An examination of whether alternatives pose any unacceptable short-term or cross-media impacts is also included in this analysis.

Alternative 1: The no-action alternative is not effective in preventing human exposure to contaminated water that could result in unacceptable risks to human health. Private wells may currently be located within the current or potential future plume boundaries. In some areas, there are no regulations that would prevent private citizens from locating wells within the plume boundaries. The greatest excess lifetime cancer risk estimated for exposure by an off-TCAAP resident to the contaminated groundwater is 1×10^{-2}. This value is above both the EPA range for acceptable risk (i.e., 10^{-4} to 10^{-6}) and the MPCA acceptable risk value of 10^{-5}. The EPA acceptable benchmark for noncarcinogenic risk was also exceeded in two of the exposure areas evaluated.

Alternative 2: This alternative protects human health by removing VOCs from the groundwater and by implementing institutional controls that prevent exposure to contaminated groundwater. Residents with private wells with MDH drinking water advisories located within the impacted zone will be provided with an alternative water supply. In addition, a Special Well Construction Zone will be designated that would regulate installation of wells in the impacted zone. This alternative also includes new facilities to remove iron and manganese thereby meeting all the water quality objectives for potable supply. However, it can be seen in Figure 5 that the plume breaks through between the PGAC and the PGRS; thus, the contaminants will continue to migrate towards the Mississippi River. Therefore, this alternative does not prevent the further spread of contaminated groundwater into portions of the aquifer that are significantly less contaminated and provides less protection of human health for potential well users within and beyond the current plume boundary.

Alternative 3: This alternative protects human health and the environment by containing the plume in the vicinity of County Road E, by removing VOCs from the groundwater and by implementing institutional controls that prevent exposure to contaminated groundwater. Residents with private wells with MDH drinking water advisories located within the impacted zone will be provided with an alternative water supply. In addition, drilling advisories would be implemented in the impacted zone. This alternative also includes new facilities to remove iron and manganese thereby meeting all the water quality objectives for potable supply. Figure 6 shows that this alternative provides a more effective capture zone than Alternative 2. Although the alternative does not contain the plume beyond the vicinity of County Road E, it does contain the most contaminated portions of the North Plume and prevents it from spreading further. For this reason, overall protection of human health and the environment is greater for Alternative 3 than Alternative 2.

2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The ability of each alternative to meet all of its federal and state requirements that are applicable or relevant and appropriate is noted for each alternative. The major ARARs for OU-1 are chemical-specific and action-specific, and are enumerated in Section J below. Table 7 summarizes the drinking water standards established by the Federal Safe Drinking Water Act (SDWA) and adopted by the State of Minnesota for public water supplies. Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) are the major federal ARARs for cleanup of groundwater at OU-1. Minnesota Health Risk Limits (HRLs) and Recommended Allowable Limits (RALs) are additional to be considered (TBC) criteria because they are intended to protect groundwater and present and future private well users, respectively. The most stringent standard for each compound represents the chemical-specific cleanup standard for that compound.

Alternative 1: The no-action alternative does not comply with ARARs or TBC guidance values. There are currently 12 contaminants of concern in the groundwater at concentrations above MCLs, RALs, and HRLs which would be left unaddressed in this alternative.

Alternatives 2 and 3: These alternatives provide for treatment of VOCs using the existing PGAC system and also include new facilities to remove iron and manganese thereby meeting all of the water quality objectives for potable supply. Thus, treated groundwater will be in compliance with ARARs. However, it is estimated that contaminants would remain in the aquifer at concentrations approaching but still greater than MCLs, RALs, and HRLs for more than 100 years.

3) Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence are evaluated with respect to the magnitude of residual risk and the adequacy and reliability of controls used to manage remaining waste over the long-term.

Alternative 1: The no-action alternative does not provide long-term effectiveness and permanence since the current interim treatment systems do not contain the entire plume and private wells may be located in the plume pathway. TCE and other contaminants are currently allowed to migrate towards the Mississippi River. As the plume migrates, the number of private wells that could be impacted by the advancing plume potentially increases.

Alternative 2: This alternative provides long-term effectiveness by removing contaminant mass, providing an alternative water supply to residents with private wells located within the plume boundary, and enacting drilling advisories that regulate the installation of new private wells within the North Plume as a Special Well Construction Area. However, because this alternative does not effectively contain the North Plume at any boundary, it does not provide a permanent solution to the problem.

Alternative 3: This alternative also provides long-term effectiveness by removing contaminant mass and containing the plume, providing an alternative water supply to residents with private wells located within the plume boundary, and enacting drilling advisories that regulate construction of new wells within the plume boundary. Because this alternative effectively contains the most contaminated portions of the North Plume in the vicinity of County Road E it also provides a more permanent solution to the problem.

4) Reduction of Toxicity, Mobility, and Volume Through Treatment

The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies included in the remedial alternative.

Alternative 1: The treatment systems currently in place (i.e., TGRS, PGAC, St. Anthony Municipal Water Supply) are moderately effective in reducing the volume of contaminants in the groundwater. However, these systems do not contain the plume (i.e., there is little reduction in mobility).

Alternative 2: The mass removal alternative is designed to maximize the removal of contaminant mass in the shortest amount of time. Based on computer modeling performed for this FS, the mass removal alternative is predicted to remove about 83 percent of the mass of contaminants in the groundwater within 30 years (Figure 7). Within 100 years, about 86 percent of the contaminant mass is predicted to be removed. This alternative is more effective than Alternative 3 in reducing contaminant toxicity and volume, since it removes more contaminant mass in less time. However, it is less effective in reducing mobility because it does not contain the plume at any boundary.

Alternative 3: The containment alternative also provides removal of contaminant mass. As shown in Figure 7, this alternative is predicted to remove about 68 percent of the mass of contaminants in the groundwater within 30 years, and about 77 percent within 100 years. Furthermore, because this alternative effectively contains the plume in the vicinity of County Road E, it provides greater reduction in mobility than Alternative 2.

5) Short-Term Effectiveness

The assessment against this criterion examines the effectiveness of the alternative in protecting human health and the environment during the construction and implementation of a remedy until the response objectives have been met.

Since the only activity included as part of the No Action alternative (Alternative 1) is the continuation of groundwater monitoring, it provides the greatest short-term effectiveness. Alternative 2 is the least effective in the short-term because it includes more extensive construction activities than Alternatives 1 or 3 (more wells, longer lengths of pipeline and a new

treatment facility). Alternative 3 provides a level of short-term effectiveness intermediate between Alternatives 1 and 2.

6) Implementability

The analysis of implementability evaluates the technical and administrative feasibility of the alternative and the availability of the goods and services needed to implement it.

Alternative 1: There is nothing new to implement with the no-action alternative.

Alternative 2: This alternative will be difficult to implement for the following reasons. Alternative 2 would require three additional wells capable of extracting 750 gpm each, generating approximately 2150 gpm (3.1 mgd) over a period of 50 to 100 years. The wells would have to be located in a largely residential area, and easements may be very restrictive. In addition, this alternative would extract more water than the New Brighton distribution system can accommodate. Finally, because the City of New Brighton has concerns regarding the water quality of any water coming from the Unit 3 aquifer, it will not accept this water into its distribution system (i.e., the PGAC). Therefore, if Alternative 2 were implemented, 3.1 mgd would have to be treated and disposed, for which no water management option has yet been identified.

Another problem with this alternative involves its potential ineffectiveness for vertical containment of the contamination. Existing municipal wells would be pumping continuously at a minimum rate of 1335 gpm, making the total volume of water to be generated by this alternative approximately 3500 gpm (5.0 mgd). Preferably, most of this water should be extracted from the upper portion of the Unit 4 aquifer (i.e., the Prairie du Chien) to minimize the potential of drawing contamination into the less-contaminated lower portion (i.e., the Jordan). However, the Prairie du Chien aquifer may not be able to sustain the pumping rates estimated for this extraction scenario. This means that the pumping rates of some of the Jordan wells will have to be increased, thereby increasing the potential of drawing contamination into the Jordan aquifer, where it may spread further.

Alternative 3: The containment alternative involves installing two new extraction wells, constructing a pipeline from the wells to the PGAC, constructing and operating an iron and manganese removal system, and managing the excess water generated. The new wells for this alternative would be installed near existing municipal wells, making their management easier. The construction of a pipeline will also be readily implementable, since a 24-inch sanitary forcemain currently located near the extraction wells and the PGAC can be used to convey the water. Some easements for pipe runs that connect the extraction well to the main pipeline are required; these are not expected to be difficult to obtain.

The current New Brighton water distribution system can handle a flowrate of 2,500 gpm from the PGAC. This alternative produces about 2,200 gpm of treated water from the PGAC. No additional water management options are required with this alternative. Most of this water will be extracted from the Prairie du Chien aquifer, thereby minimizing further contamination of the Jordan aquifer.

7) Cost

The cost estimates for the three alternatives are preliminary and approximate. The evaluation against this criterion compares the capital costs and operating and maintenance (O&M) costs of each alternative on a present-worth basis. The present-worth costs have been determined for 30 years at a 10 percent discount rate.

Alternative 1: There are no new costs associated with the no-action alternative. The U.S. Army will continue to pay for O&M costs for the PGAC, which have been estimated at $450,000 per year. Moreover, the Army will continue to pay the city of St. Anthony approximately $200,000 per year for the GAC used in its water treatment facility (for the first 10 years of operation). The annual costs of continued groundwater monitoring have been estimated at approximately $70,000. The estimated 30-year present worth cost for continued semiannual groundwater monitoring is approximately $726,000 (Table 4).

Alternative 2: The costs associated with this alternative include additional O&M costs for the PGAC system, construction costs for the extraction wells and the pipeline, and construction and O&M costs for the inorganics treatment facility. The total capital expenditure has been estimated at approximately $4.6 million dollars and the annual O&M costs have been estimated at approximately $900,000. The annual O&M costs include costs for both organics and inorganics treatment. The estimated 30-year present worth cost for Alternative 2 is $14.2 Million (Table 5).

Alternative 3: The costs associated with this alternative include additional O&M costs for the PGAC system, construction costs for the extraction wells and the pipeline, and construction and O&M costs for the inorganics treatment facility. The total capital expenditure has been estimated at approximately $3 million and the annual operating cost is expected to be approximately $700,000. The annual O&M costs for this alternative include costs for both VOC removal and inorganics treatment. The estimated 30-year present worth cost for Alternative 3 is $10.3 Million (Table 6).

8 & 9) State and Community Acceptance

These criteria reflect the state's and community's preferences among or concerns about each alternative.

Alternative 1: The state and the community have expressed the need for additional remedial action beyond the current interim actions in place.

Alternative 2: This alternative may not be acceptable to the community (as represented by officials of New Brighton) because they will not accept water from sources north of Interstate 694 into their distribution system. Furthermore, they are concerned about the water management problem involved with this alternative.

Alternative 3: State acceptance of this alternative is indicated by state concurrence on this ROD. The community as represented by officials of the cities of New Brighton and Fridley has strongly endorsed this alternative. Based upon comments received during the public comment period, the community accepts Alternative 3 as the selected remedy.

I. The Selected Remedy

The selected remedy for OU-1 is Alternative 3, the containment alternative. This alternative includes providing an alternative water supply to residents with private wells with MDH drinking water advisories within the impacted zone, implementing drilling advisories that would regulate the installation of new private wells within the zone impacted by the contamination as a Special Well Construction Area, implementing a groundwater extraction scheme for plume containment, pumping the extracted water to the PGAC, installing and operating an iron and manganese removal system upstream of the PGAC carbon units, and discharging all of the treated water to the New Brighton municipal distribution system.

CLEANUP STANDARDS

Following are the specific contaminant cleanup standards to be attained in the aquifer before the remedy can be considered complete:

Contaminant	Cleanup Standard µg/L	Basis
1,1-Dichloroethane	70	RAL
1,1-Dichloroethene	6	HRL*
cis-1,2-Dichloroethene	70	MCL, RAL
1,1,1-Trichloroethane	200	MCL
1,1,2-Trichloroethane	3	MCLG (proposed), HRL*
Trichloroethene	5	MCL
Other TBCs		
Hazard Index for Carcinogenic Mixture (see Table 7)	≤1.0	HRL*
Hazard Index for Noncarcinogenic Mixture (see Table 7)	≤1.0	HRL*

* *Proposed Minn. Rules, Parts 4717.7100 to 4717.7800*

The point of compliance will be along the containment boundary created by the combined pumping of the existing New Brighton wells NB3 and NB4 and new extraction wells NB14 and NB15, which groundwater modeling shows to be in the vicinity of County Road E. The area of attainment is considered to be the areal and vertical extent of the North Plume. Groundwater monitoring will be required until restoration of the aquifer is achieved.

Alternative 3 will achieve substantial risk reduction by effectively containing the contaminant plume in the vicinity of County Road E, while at the same time putting the treated water to its most beneficial use. In addition, the North Plume will be extracted until groundwater cleanup standards are achieved. The cleanup standards are based upon the ARARs identified for the remedy and upon the HRLs as proposed groundwater cleanup standards and the Minnesota RALS for private potable water supplies. Extracted groundwater will be treated to meet MCLs and non-zero MCLGs established by the SDWA. The most carcinogenic and pervasive compound, trichloroethene, will be reduced to 5µg/l or below, which corresponds to a 1.7×10^{-6}

cancer risk. The State of Minnesota RAL will be the cleanup goal for 1,1-dichloroethane because no Federal MCL/MCLG exists for this compound. For cis-1,2-dichloroethene the Minnesota MCL, the SDWA MCL, and the RAL are the same, 70 μg/L. The State of Minnesota HRL will be the cleanup goal for 1,1,-dichloroethene because it is more stringent than the Federal MCL/MCLG. The regulation of water well drilling by the State of Minnesota is the institutional control to be used to regulate drilling of private wells in the North Plume before cleanup standards are achieved.

Alternative 3 provides the best balance among the three alternatives evaluated against the nine evaluation criteria. Based on the available information, EPA and MPCA believe that the selected remedy is protective of human health and the environment, satisfies the remedial objective of plume containment, is cost-effective, and utilizes permanent solutions to the maximum extent practicable.

J. Statutory Determinations

This section discusses how the selected remedy for OU-1 meets the five statutory requirements established by CERCLA.

Protection of Human Health and the Environment

The selected remedy will provide overall protection of human health and the environment through extraction and treatment of contaminated groundwater. The extraction of the groundwater will contain the most contaminated portions of the North Plume and prevent it from spreading further. The extracted water will be treated to meet drinking water standards and discharged to a public water supply. Institutional controls on the drilling of private wells will help to regulate the installation of new exposure points within the contaminated areas at the site. No unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy.

Compliance with ARARs

The selected remedy will comply with ARARs over time. The extracted groundwater will meet the chemical-specific ARARs by undergoing treatment at the PGAC, while the action-specific ARARs will be met during the construction, operation, and monitoring phases of the remedy. The following is a list of ARARs and "to be considered" guidelines for the remedy:

Chemical-Specific

- Safe Drinking Water Act, 40 CFR Part 141, Maximum Contaminant Levels and Non-Zero Maximum Contaminant Levels - Finalized and Proposed for cis-1,2-dichloroethene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethene - Applicable for Discharge to Public Water Supply and Relevant and Appropriate for Groundwater Restoration

- Minnesota Recommended Allowable Limits, MDH Release No. 3 (Jan. 1991), for 1,1-dichloroethane and cis-1,2-dichloroethene - To Be Considered for Protection of Private Water Supplies

- Minnesota Health Risk Limits, in Proposed Minnesota Rules Parts 4717.7100 to 4717.7800 for 1,1-dichloroethene and 1,1,2-trichloroethane - To Be Considered for Groundwater Restoration; Determination of Hazard Indices for Carcinogenic and Noncarcinogenic Mixtures - To Be Considered for Groundwater Restoration

Action-Specific

- Resource Conservation and Recovery Act (RCRA), 40 CFR Part 268 Subpart D - Regulates the disposal of spent carbon - Applicable

- RCRA, 40 CFR Part 264 Subpart J - Requirements for tanks used for the treatment of waste - Applicable

- Minnesota Rules, Part 7060.0400 - Uses of Underground Waters - Relevant and Appropriate

- Minnesota Rules Chapter 4720, Public Water Supplies - Regulates community and non-community public water supplies - Applicable

- Minnesota Rules Chapter 4725, Water Well Code - Establishes well construction standards and specifies requirements for designating Special Well Construction Areas - Applicable

Cost-Effectiveness

The selected remedy provides an effective remedy proportionate to its cost. The degree of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants, and ease of implementability afforded by this remedy give it a reasonable value for its cost.

Utilization of Permanent Solutions and Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy meets the statutory requirement to utilize permanent solutions and resource recovery technologies to the maximum extent practicable.

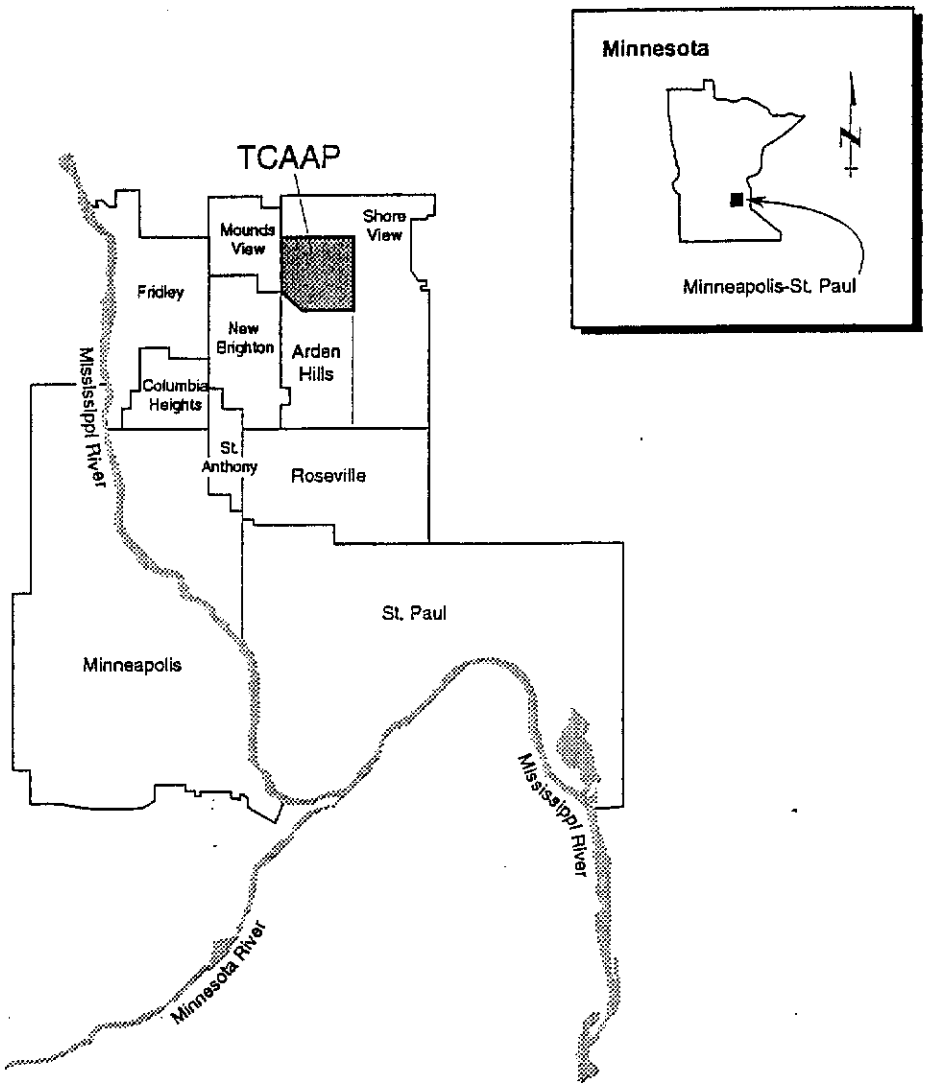
The selected remedy, Alternative 3, provides the best balance among the three alternatives with respect to the primary balancing criteria. Alternative 3 provides a greater degree of long-term effectiveness and permanence than Alternatives 1 or 2. Both Alternatives 2 and 3 provide a reduction in toxicity and volume of contaminants. In addition, Alternative 3 provides the greatest reduction in mobility among the three alternatives, and is less costly and easier to implement than Alternative 2.

Of the five primary balancing criteria, long-term effectiveness and permanence, implementability and cost were the most decisive factors in the selection decision. By using the treated groundwater in the municipal water supply system of New Brighton, the local contaminated groundwater resource is recovered and the groundwater resource is conserved. Finally, the State of Minnesota and the community support the selected remedy.

Preference for Treatment as a Principal Element

The selected remedy removes and treats VOCs in the groundwater using GAC. Therefore, it satisfies the statutory preference for remedies that employ treatment as a principal element.

APPENDIX A
LIST OF FIGURES



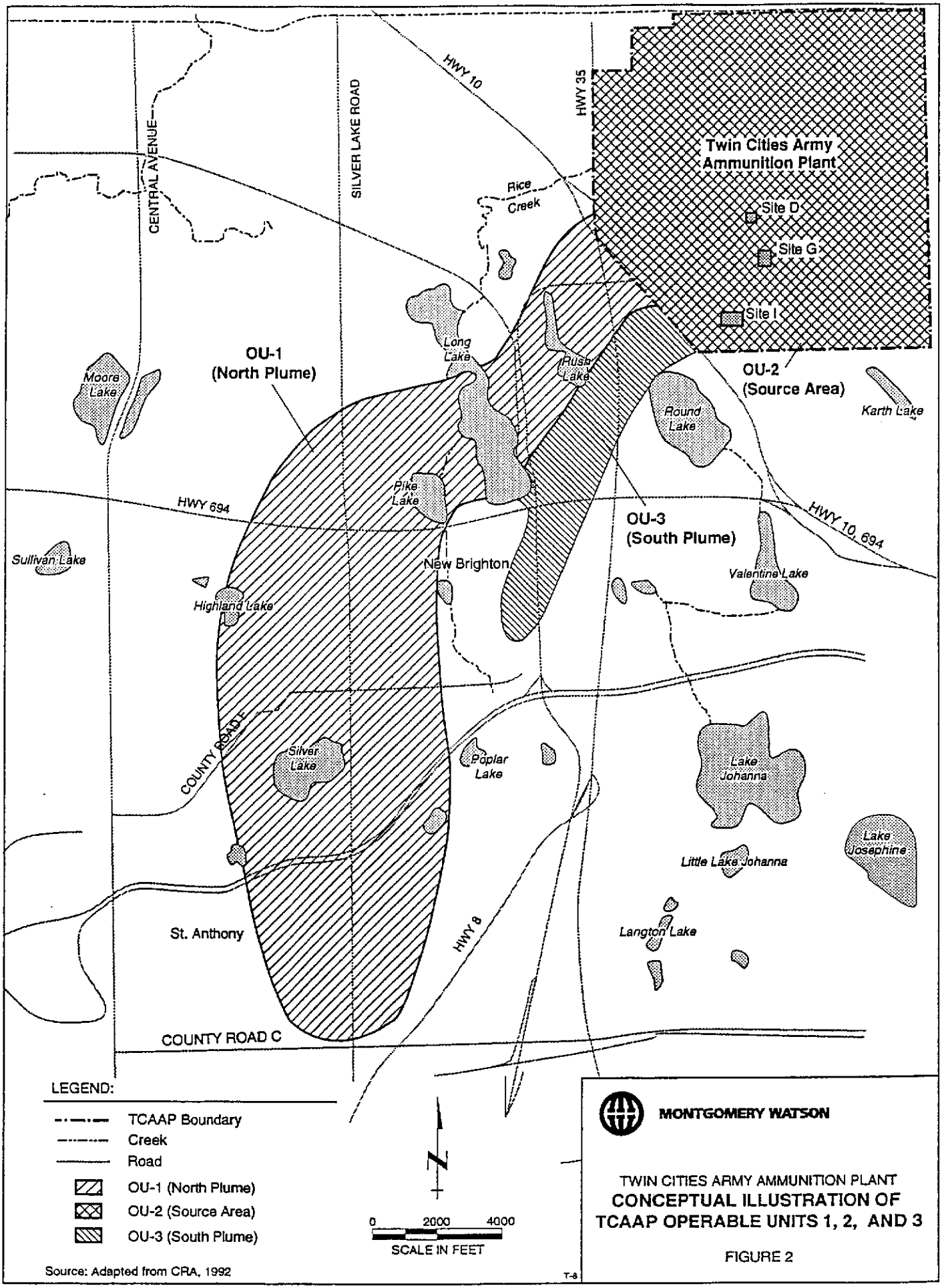
MONTGOMERY WATSON

TWIN CITIES ARMY AMMUNITION PLANT
LOCATION MAP

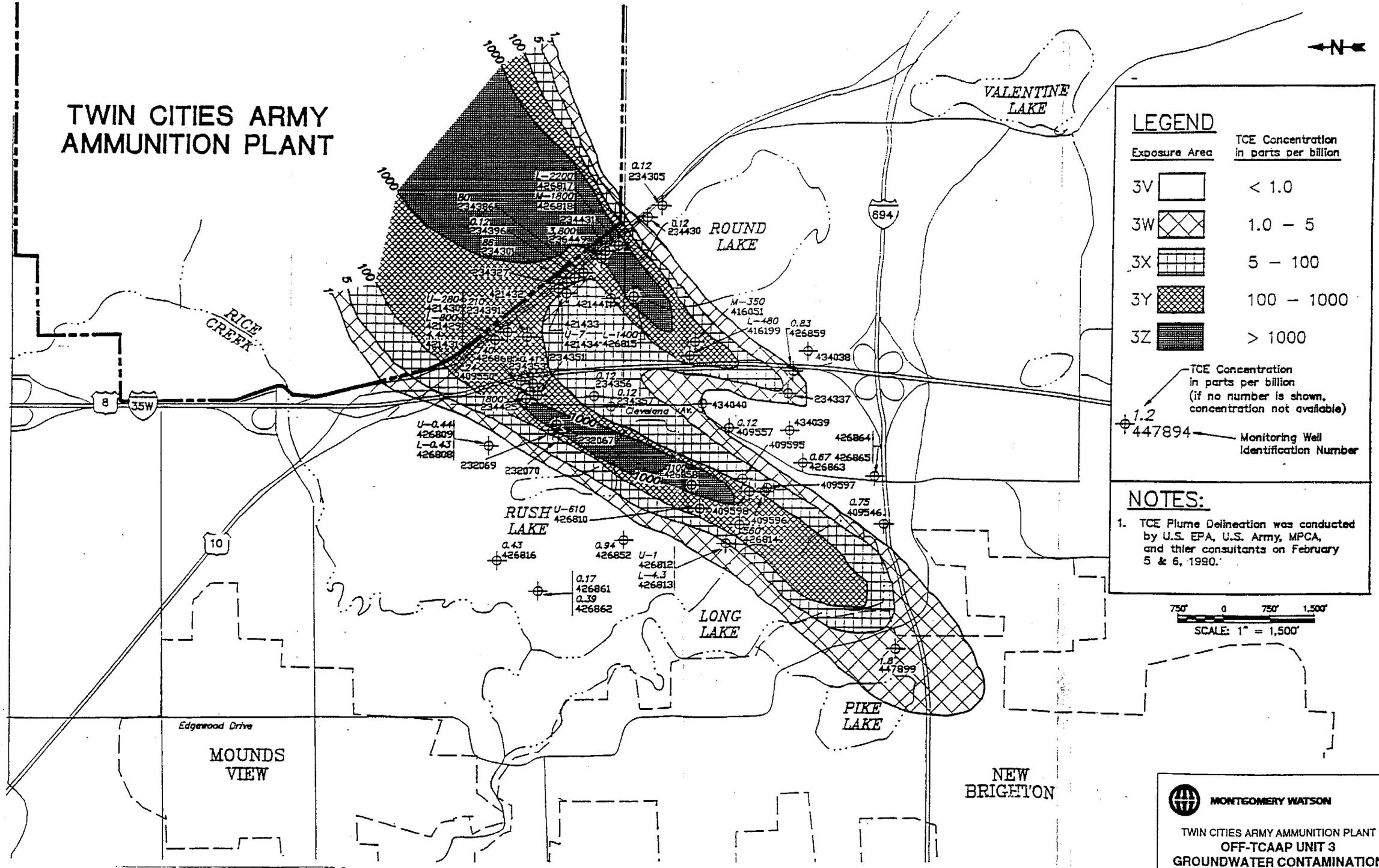
FIGURE 1

Source: Modified from ANL, 1988

4/93


HWY 10
HWY 35
CENTRAL AVENUE
SILVER LAKE ROAD
Twin Cities Army Ammunition Plant
Site D
Site G
Site I
Rice Creek
Long Lake
Rush Lake
OU-1 (North Plume)
OU-2 (Source Area)
OU-3 (South Plume)
Moore Lake
Round Lake
Karth Lake
Pike Lake
HWY 694
HWY 10, 694
Sullivan Lake
New Brighton
Valentine Lake
Highland Lake
COUNTY ROAD F
Silver Lake
Poplar Lake
Lake Johanna
Lake Josephine
Little Lake Johanna
St. Anthony
HWY 8
Langton Lake
COUNTY ROAD C
LEGEND:
TCAAP Boundary
Creek
Road
OU-1 (North Plume)
OU-2 (Source Area)
OU-3 (South Plume)
N
0
2000
4000
SCALE IN FEET
MONTGOMERY WATSON
TWIN CITIES ARMY AMMUNITION PLANT
CONCEPTUAL ILLUSTRATION OF TCAAP OPERABLE UNITS 1, 2, AND 3
FIGURE 2
Source: Adapted from CRA, 1992
T-8

TWIN CITIES ARMY AMMUNITION PLANT



SOURCE: USEPA, 1991

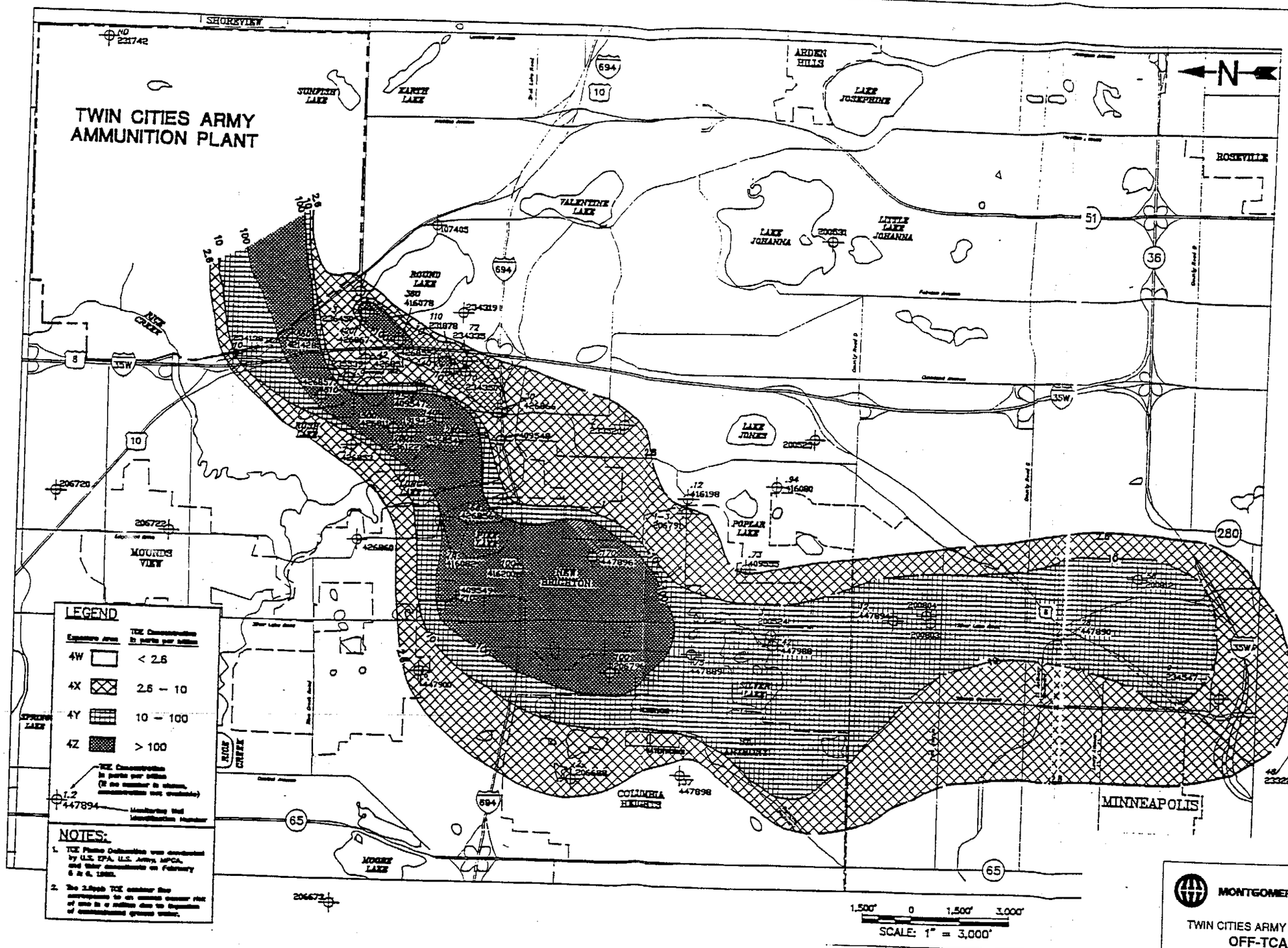
MONTGOMERY WATSON

TWIN CITIES ARMY AMMUNITION PLANT

OFF-TCAAP UNIT 3 GROUNDWATER CONTAMINATION AND EXPOSURE AREAS (AS OF 1987)

FIGURE 3

593.T

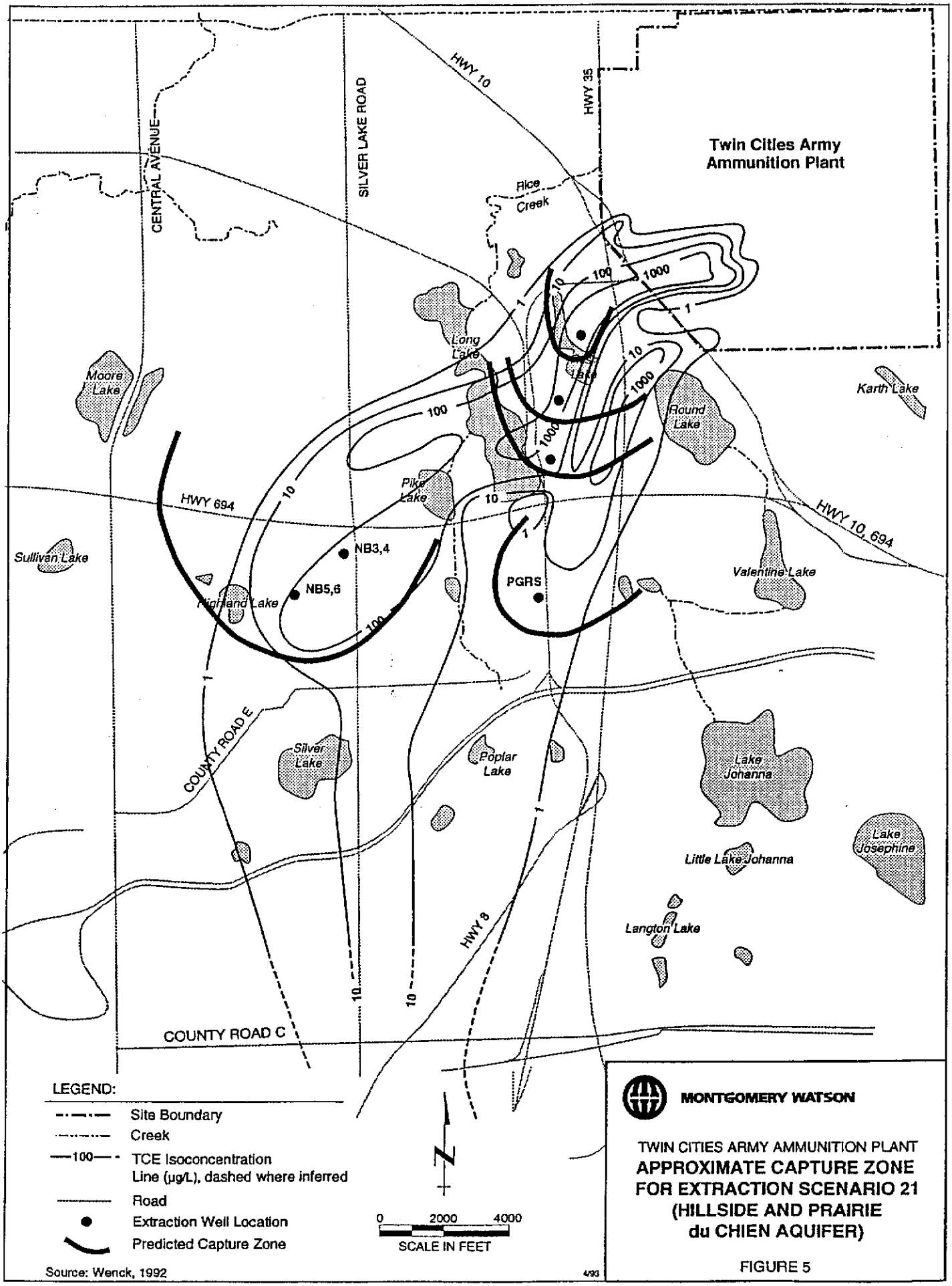


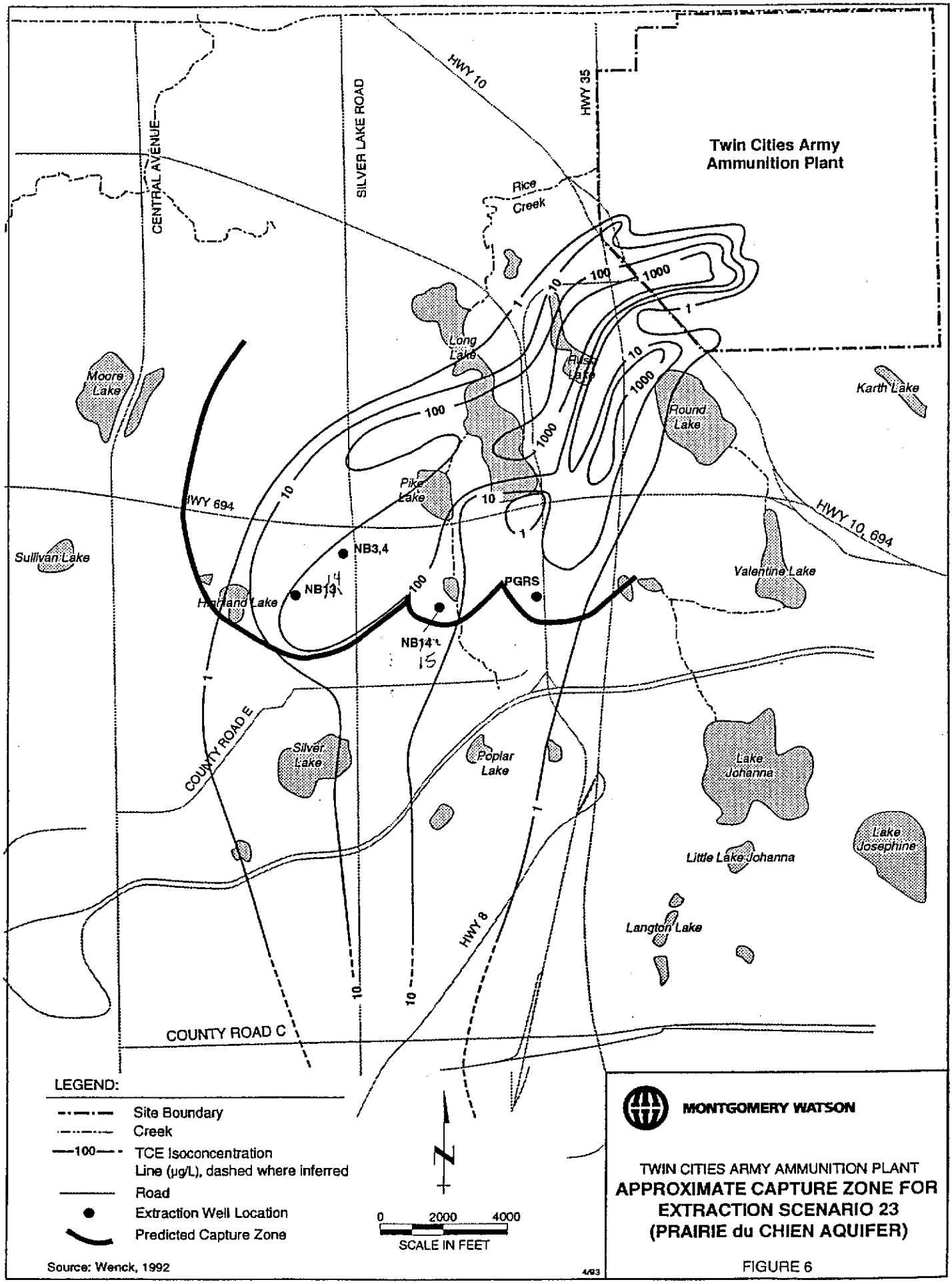
SOURCE: USEPA, 1991

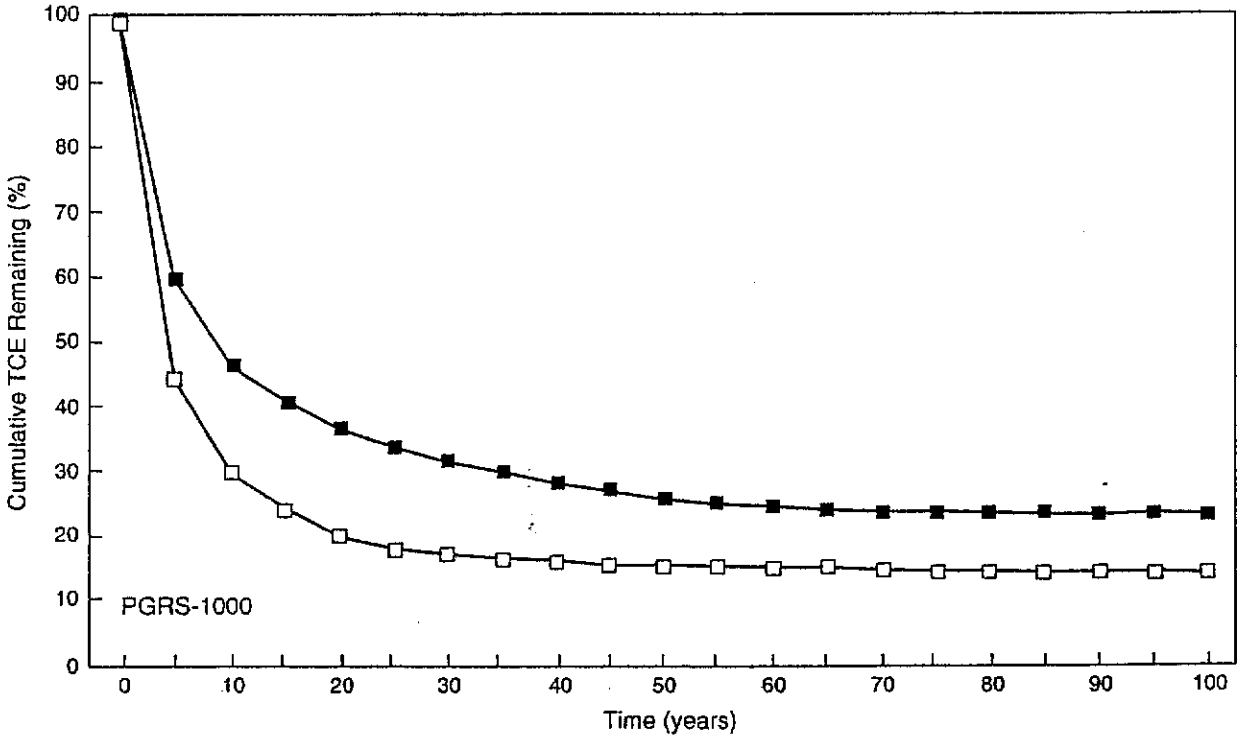
MONTGOMERY WATSON

TWIN CITIES ARMY AMMUNITION PLANT

OFF-TCAAP UNIT 4
GROUNDWATER CONTAMINATION AND EXPOSURE AREAS (AS OF 1987)


HWY 10
HWY 35
CENTRAL AVENUE
SILVER LAKE ROAD
Twin Cities Army Ammunition Plant
Rice Creek
Long Lake
Moore Lake
Karth Lake
Round Lake
Pike Lake
HWY 694
HWY 10, 694
Sullivan Lake
NB3,4
NB5,6
PGRS
Highland Lake
Valentine Lake
COUNTY ROAD E
Silver Lake
Poplar Lake
Lake Johanna
Lake Josephine
Little Lake Johanna
Langton Lake
HWY 8
COUNTY ROAD C
100
10
1
1000
LEGEND:
Site Boundary
Creek
100 TCE Isoconcentration Line (µg/L), dashed where inferred
Road
Extraction Well Location
Predicted Capture Zone
0 2000 4000
SCALE IN FEET
Source: Wenck, 1992
4/93
MONTGOMERY WATSON
TWIN CITIES ARMY AMMUNITION PLANT
APPROXIMATE CAPTURE ZONE FOR EXTRACTION SCENARIO 21 (HILLSIDE AND PRAIRIE du CHIEN AQUIFER)
FIGURE 5


Twin Cities Army Ammunition Plant
HWY 10
HWY 35
SILVER LAKE ROAD
CENTRAL AVENUE
Rice Creek
Long Lake
Island Lake
Round Lake
Karth Lake
Moore Lake
Pike Lake
HWY 694
HWY 10, 694
Sullivan Lake
Hardwood Lake
Valentine Lake
NB3,4
NB13
NB14
PGRS
COUNTY ROAD E
Silver Lake
Poplar Lake
Lake Johanna
Little Lake Johanna
Lake Josephine
Langton Lake
HWY 8
COUNTY ROAD C
1
10
100
1000
LEGEND:
Site Boundary
Creek
100 TCE Isoconcentration Line (µg/L), dashed where inferred
Road
Extraction Well Location
Predicted Capture Zone
0 2000 4000
SCALE IN FEET
Source: Wenck, 1992
4/93
MONTGOMERY WATSON
TWIN CITIES ARMY AMMUNITION PLANT
APPROXIMATE CAPTURE ZONE FOR EXTRACTION SCENARIO 23 (PRAIRIE du CHIEN AQUIFER)
FIGURE 6



LEGEND

- ■ SC23 (Alternative 3)
- □ SC21 (Alternative 2)

MONTGOMERY WATSON

TWIN CITIES ARMY AMMUNITION PLANT

TCE REMAINING - ALTERNATIVES COMPARISON

FIGURE 7

Source: ETA, 1992

4/93

APPENDIX B
LIST OF TABLES

TABLE 1

SUMMARY OF RISKS FOR EXPOSURE TO OFF-TCAAP GROUND WATER
PROBABLE AND REASONABLE MAXIMUM EXPOSURES
CURRENT AND PROBABLE FUTURE & RME FUTURE LAND USE CONDITIONS
(Page 1 of 4)

Exposure Area/Unit	Pathway	Exposure	Upperbound Excess Cancer Risks	Acute Hazard Indices		Chronic Hazard Indices	
			Resident	Child[a]	Adult	Child[a]	Adult
1S Unit 1	Ingestion	Probable[b]	4E-08	3.7E-03	1.3E-03	3.7E-03	1.3E-03
		RME[c]	2E-07	7.0E-03	3.4E-03	7.0E-03	3.4E-03
	Inhalation	Probable	2E-07	--	--	--	--
		RME	2E-06	--	--	--	--
	Dermal Contact	Probable	6E-08	3.1E-03	1.6E-03	4.0E-03	2.1E-03
		RME	3E-07	1.0E-02	5.1E-03	1.2E-02	6.2E-03
TOTAL		Probable	3E-07	ND	ND	ND	ND
		RME	3E-06	ND	ND	ND	ND
3V Unit 3	Ingestion	Probable	4E-06	3.3E-01	1.1E-01	3.3E-01	1.2E-01
		RME	2E-05	6.6E-01	2.5E-01	5.3E-01	2.6E-01
	Inhalation	Probable	2E-06	NA	NA	1.0E-04	1.6E-05
		RME	2E-05	NA	NA	7.5E-04	1.2E-04
	Dermal Contact	Probable	4E-06	1.8E-02	8.6E-03	1.3E-02	5.8E-03
		RME	5E-05	3.3E-02	1.7E-02	4.4E-02	2.3E-02
TOTAL		Probable	1E-05	ND	ND	ND	ND
		RME	9E-05	ND	ND	ND	ND
3W Unit 3	Ingestion	Probable	4E-06	2.0E-03	7.1E-04	5.6E-03	2.0E-03
		RME	2E-05	5.6E-03	2.7E-03	1.5E-02	7.5E-03
	Inhalation	Probable	2E-06	NA	NA	9.2E-04	1.4E-04
		RME	2E-05	NA	NA	6.1E-03	9.3E-04
	Dermal Contact	Probable	6E-06	2.5E-03	1.3E-03	7.0E-03	3.6E-03
		RME	6E-05	1.1E-02	5.7E-03	3.2E-02	1.6E-02
TOTAL		Probable	1E-05	ND	ND	ND	ND
		RME	1E-04	ND	ND	ND	ND

SOURCE: USEPA, 1991

TABLE 1

SUMMARY OF RISKS FOR EXPOSURE TO OFF-TCAAP GROUND WATER
PROBABLE AND REASONABLE MAXIMUM EXPOSURES
CURRENT AND PROBABLE FUTURE & RME FUTURE LAND USE CONDITIONS
(Page 2 of 4)

Exposure Area/Unit	Pathway	Exposure	Upperbound Excess Cancer Risks	Acute Hazard Indices		Chronic Hazard Indices	
			Resident	Child[a]	Adult	Child[a]	Adult
3X Unit 3	Ingestion	Probable	2E-05	1.6E-02	5.6E-03	8.3E-02	3.0E-02
		RME	1E-04	4.6E-02	2.3E-02	2.6E-01	1.3E-01
	Inhalation	Probable	1E-06	NA	NA	4.8E-04	7.3E-06
		RME	1E-04	NA	NA	2.6E-03	3.8E-04
	Dermal Contact	Probable	3E-06	1.8E-02	9.5E-03	9.4E-02	4.8E-02
		RME	2E-04	8.9E-02	4.5E-02	4.9E-01	2.5E-01
TOTAL		Probable	6E-05	ND	ND	ND	ND
		RME	4E-04	ND	ND	ND	ND
3Y Unit 3	Ingestion	Probable	4E-04	3.3E-01	7.4E-02	1.2E+00[a]	3.8E-01
		RME	2E-03	6.9E-01	4.2E-01	3.0E+00[a]	1.6E+00[a]
	Inhalation	Probable	6E-06	NA	NA	3.2E-02	5.0E-03
		RME	2E-03	NA	NA	1.2E-01	1.9E-02
	Dermal Contact	Probable	5E-04	4.9E-01	2.6E-01	1.3E+00[a]	6.9E-01
		RME	4E-03	1.3E+00[a]	6.5E-01	5.3E+00[a]	2.7E+00[a]
TOTAL		Probable	1E-03	ND	ND	ND	ND
		RME	8E-03	ND	ND	ND	ND
3Z Unit 3	Ingestion	Probable	6E-04	6.8E-01	2.4E-01	1.1E+00[a]	4.9E-01
		RME	2E-03	1.0E+00[a]	4.7E-01	1.8E+00[a]	8.4E-01
	Inhalation	Probable	5E-04	NA	NA	2.4E-02	3.7E-03
		RME	4E-03	NA	NA	1.3E-01	1.9E-02
	Dermal Contact	Probable	9E-04	4.3E-01	2.1E-01	9.1E-01	4.6E-01
		RME	6E-03	1.2E+00[a]	6.1E-01	2.6E+00[a]	1.3E+00[a]
TOTAL		Probable	2E-03	NA	ND	ND	ND
		RME	1E-02	NA	ND	ND	ND

TABLE 1

SUMMARY OF RISKS FOR EXPOSURE TO OFF-TCAAP GROUND WATER
PROBABLE AND REASONABLE MAXIMUM EXPOSURES
CURRENT AND PROBABLE FUTURE & RME FUTURE LAND USE CONDITIONS
(Page 3 of 4)

Exposure Area/Unit	Pathway	Exposure	Upperbound Excess Cancer Risks	Acute Hazard Indices		Chronic Hazard Indices	
			Resident	Child[a]	Adult	Child[a]	Adult
4W Unit 4	Ingestion	Probable	2E-05	8.8E-01	3.2E-01	8.3E-01	3.0E-01
		RME	1E-04	8.8E-01	4.2E-01	9.0E-01	4.4E-01
	Inhalation	Probable	1E-05	NA	NA	1.0E-03	1.6E-04
		RME	1E-04	NA	NA	7.5E-03	1.1E-03
	Dermal Contact	Probable	1E-05	1.6E-02	8.3E-03	3.0E-02	1.6E-02
		RME	2E-04	6.1E-02	3.2E-02	1.1E-01	5.7E-02
TOTAL		Probable	4E-05	ND	ND	ND	ND
		RME	4E-04	ND	ND	ND	ND
4X Unit 4	Ingestion	Probable	8E-05	6.0E+00[d]	2.2E+00[d]	6.7E+00[d]	2.4+00[d]
		RME	2E-04	6.2E+00[d]	2.9E+00[d]	7.4E+00[d]	3.6E+00[d]
	Inhalation	Probable	1E-06	NA	NA	1.1E-03	1.7E-04
		RME	1E-05	NA	NA	8.4E-03	1.2E-03
	Dermal Contact	Probable	3E-06	1.5E-01	1.0E-01	2.4E-01	1.3E-01
		RME	2E-05	3.4E-01	1.8E-01	4.4E-01	2.3E-01
TOTAL		Probable	8E-05	ND	ND	ND	ND
		RME	2E-04	ND	ND	ND	ND
4Y Unit 4	Ingestion	Probable	2E-05	1.5E-02	5.4E-03	2.6E-02	9.5E-03
		RME	4E-05	2.1E-02	1.0E-02	3.7E-02	1.8E-02
	Inhalation	Probable	1E-05	NA	NA	1.8E-03	2.8E-04
		RME	7E-05	NA	NA	8.2E-03	1.2E-03
	Dermal Contact	Probable	3E-05	1.8E-02	9.2E-03	4.4E-02	2.3E-02
		RME	1E-04	3.8E-02	1.9E-02	5.8E-02	3.0E-02
TOTAL		Probable	6E-05	ND	ND	ND	ND
		RME	2E-04	ND	ND	ND	ND

TABLE 1

SUMMARY OF RISKS FOR EXPOSURE TO OFF-TCAAP GROUND WATER
PROBABLE AND REASONABLE MAXIMUM EXPOSURES
CURRENT AND PROBABLE FUTURE & RME FUTURE LAND USE CONDITIONS
(Page 4 of 4)

Exposure Area/Unit	Pathway	Exposure	Upperbound Excess Cancer Risks	Acute Hazard Indices		Chronic Hazard Indices	
			Resident	Child[a]	Adult	Child[a]	Adult
4Z Unit 4	Ingestion	Probable	3E-04	1.1E+00[b]	4.0E-01	1.3+00[b]	4.7E-01
		RME	1E-03	1.4E+00[c]	6.6E-01	1.9E+00[c]	8.6E-01
	Inhalation	Probable	2E-04	NA	NA	1.9E-02	3.0E-03
		RME	1E-03	NA	NA	1.0E-01	1.5E-02
	Dermal Contact	Probable	2E-04	2.4E-01	1.2E-01	5.1E-01	2.6E-01
		RME	3E-03	8.4E-01	4.3E-01	1.2E+00[c]	6.1E-01
TOTAL		Probable	7E-04	ND	ND	ND	ND
		RME	6E-03	ND	ND	ND	ND

SUMMARY OF TECHNOLOGY AND PROCESS OPTIONS SCREENING

Technology	Treatment Effectiveness	Implementability	Cost	Result of Initial Screening	Comments
INSTITUTIONAL CONTROLS					
Groundwater Monitoring	None	Easy	Moderate	Eliminate	Extensive groundwater monitoring program exists
Alternative Water Supply (a)	**None**	**Moderate**	**Low**	**Consider**	**Includes well abandonment and hook-up to municipal system**
Use Restrictions	None	Difficult	Low	Eliminate	Restrictions are difficult to verify long-term
Drilling Advisories	**None**	**Moderate**	**Low**	**Consider**	**Restrictions are difficult to enforce and verify long-term**
CONTAINMENT					
Gradient Control Wells	**None**	**Moderate**	**Moderate**	**Consider**	**See Table 4-4 for Extraction/Removal Options**
Slurry Wall	None	Difficult	High	Eliminate	Requires impermeable substrate
GROUNDWATER TREATMENT - Organics					
Physical Treatment					
Air Stripping	High	Difficult	Moderate	Eliminate	Community acceptance may be difficult
Activated Carbon Adsorption	**High**	**Easy**	**Moderate**	**Consider**	**Cost-effective; presently being used for PGAC**
Resin Adsorption	Moderate	Easy	High	Eliminate	Less cost-effective than carbon adsorption for removing VOCs
Chemical Treatment					
Ultraviolet (UV) Oxidation	High	Moderate	High	Eliminate	Not cost-effective for dilute waste streams
Biological Treatment					
Methanotrophic Biodegradation (Aerobic)	High	Difficult	Moderate	Eliminate	Not yet demonstrated for full-scale remediation
Reductive Dehalogenation (Anaerobic)	Moderate	Difficult	Moderate	Eliminate	Not yet demonstrated for full-scale remediation
GROUNDWATER TREATMENT - Inorganics					
Physical Treatment					
Coagulation/flocculation	Low	Moderate	Moderate	Eliminate	Particulate removal proces; typically used with precipt. process
Filtration	**Low**	**Moderate**	**Low**	**Consider**	**Often used as polishing step to remove particulates**
Resin Adsorption	High	Moderate	High	Eliminate	Secondary treatment of regenerant required
Reverse Osmosis	High	Moderate	High	Eliminate	Concentrates waste; secondary treatment required
Chemical Treatment					
Oxidation/Reduction	**High**	**Low**	**Moderate**	**Consider**	**Effective for both iron and manganese**
Precipitation	High	Moderate	High	Eliminate	Costly; best suited for high flows and high concentrations
WATER MANAGEMENT OPTIONS					
Municipal Usage	**N/A**	**Moderate**	**Moderate**	**Consider**	**Maximum beneficial use of the resource**
Discharge to Rice Creek	N/A	Difficult	High	Eliminate	Long pipeline required; difficult and costly to implement
On-Post Groundwater Recharge: Gravel Pit	N/A	Difficult	High	Eliminate	Long pipeline required; difficult and costly to implement
On-Post Groundwater Recharge: Wells	N/A	Difficult	High	Eliminate	Long pipeline required; difficult and costly to implement
On-Post Groundwater Recharge: Trench	N/A	Difficult	High	Eliminate	Long pipeline required; difficult and costly to implement
Discharge to Pike Lake/Long Lake	N/A	Difficult	High	Eliminate	Requires additional treatment; ice safety concern

(a) Bold indicates that the technology is considered for further evaluation

TABLE 3

POTENTIALLY FEASIBLE TREATMENT TECHNOLOGIES AND PROCESS OPTIONS

General Response Actions	Technologies/Process Options
Institutional Controls	Alternative Water Supply Drilling Advisories
Removal/Extraction Options	Scenario 21 Scenario 23
Groundwater Treatment	Liquid-phase GAC, Oxidation/Filtration
Water Management Options	Municipal Usage

TABLE 4

COST ESTIMATE FOR
ALTERNATIVE 1: NO ACTION ALTERNATIVE

Item/Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
ANNUAL OPERATING AND MAINTENANCE COSTS				
Continued Groundwater Monitoring Program (semiannually)				
Sample Collection and Analysis	2	per year		$50,000
Consulting and Reporting services		lump sum		$20,000
		TOTAL ANNUAL COST		$70,000
PRESENT WORTH				
		Interest Rate	10%	
		Years	30	
		TOTAL PRESENT WORTH		$726,000

TABLE 5

COST ESTIMATE FOR
ALTERNATIVE 2: MASS REMOVAL ALTERNATIVE

Item/Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
CAPITAL COSTS (CC)				
Additional Groundwater Monitoring				
Well Drilling and Installation	10	each	$22,500	$225,000
Preparation of Monitoring Plan		lump sum		$15,000
Extraction Wells	3	each	$80,000	$240,000
Conveyance System to PGAC				
Inspection/cleaning	15,840	each	$4	$63,360
Pipeline Installation	15,840	feet	$20	$316,800
Pump	1	each	$20,000	$20,000
Alternative Water Supply				
Abandon Private Wells	200	each	$1,500	$300,000
Hook-up to Municipal Supply	20,000	linear feet	$15	$300,000
Inorganics Treatment				
Equipment Costs (EC)				
influent surge tank	1	each	$85,000	$85,000
transfer pumps	2	each	$12,000	$24,000
greensand filters	5	each	$80,000	$400,000
KMnO4 storage tank	1	each	$10,000	$10,000
chemical feed pumps	2	each	$3,500	$7,000
		Total Inorganics Treatment EC		$526,000
Installation (30% EC)				$157,800
Mechanical (40% of EC)				$210,400
Electrical (10% of EC)				$52,600
Instrumentation (10% of EC)				$52,600
Building Costs	5,000	square feet	$100	$500,000
Site Preparation	1	lump sum	$70,000	$70,000
		Subtotal Construction Costs (CC)		$3,049,560
Engineering Design (10% of CC)				$304,960
Administration Costs (17% of CC)				$518,430
Contingency (25% of CC)				$762,390
		TOTAL CAPITAL COSTS		$4,635,340
ANNUAL OPERATING AND MAINTENANCE COSTS				
Continued Groundwater Monitoring Program (semiannually)				
Sample Collection and Analysis	2	per year		$46,000
Consulting and Reporting Services		lump sum		$15,000
Additional Groundwater Monitoring Program (semiannually)				
Sample Collection and Analysis	2	per year		$48,000
Consulting and Reporting Services		lump sum		$15,000
Inorganics Treatment (Fe & Mn removal)				
Labor	1	man-year	$100,000	$100,000
Energy	580,000	kw-hr	$0.10	$58,000
Chemicals		lump sum	$98,000	$98,000
Equipment Maintenance		2% of EC		$105,200
Monitoring		lump sum		$2,500
Additional Organics Treatment (PGAC at 3,585 gpm)				
Carbon Changeout	213,300	pounds	$1.50	$319,950
Chemicals		lump sum	$10,100	$10,100
Maintenance		lump sum	$6,800	$6,800
Labor	1	man-year	$100,000	$100,000
		TOTAL ANNUAL COST		$924,550
PRESENT WORTH				
		Interest Rate	10%	
		Years	30	
		TOTAL PRESENT WORTH		$14,200,000

TABLE 6

COST ESTIMATE FOR
ALTERNATIVE 3: CONTAINMENT ALTERNATIVE

Item/Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
CAPITAL COSTS (CC)				
Additional Groundwater Monitoring				
Well Drilling and Installation	10	each	$22,500	$225,000
Preparation of Monitoring Plan		lump sum		$15,000
Extraction Well	1	each	$80,000	$80,000
Conveyance System to PGAC				
Inspection/cleaning	5,280	each	$4	$21,120
Pipeline Installation	5,280	feet	$20	$105,600
Pump	1	each	$20,000	$20,000
Alternative Water Supply				
Abandon Private Wells	200	each	$1,500	$300,000
Hook-up to Municipal Supply	20,000	linear feet	$15	$300,000
Inorganics Treatment				
Equipment Costs (EC)				
influent surge tank	1	each	$85,000	$85,000
transfer pumps	2	each	$12,000	$24,000
greensand filters	2	each	$80,000	$160,000
KMnO4 storage tank	1	each	$10,000	$10,000
chemical feed pumps	2	each	$3,500	$7,000
		Total Inorganics Treatment EC		$286,000
Installation (30% EC)				$85,800
Mechanical (40% of EC)				$114,400
Electrical (10% of EC)				$28,600
Instrumentation (10% of EC)				$28,600
Building Costs	3,000	square feet	$100	$300,000
Site Preparation	1	lump sum	$70,000	$70,000
		Subtotal Construction Costs (CC)		$1,980,120
Engineering Design (10% of CC)				$198,010
Administration Costs (17% of CC)				$336,620
Contingency (25% of CC)				$495,030
		TOTAL CAPITAL COSTS		$3,009,780
ANNUAL OPERATING AND MAINTENANCE COSTS				
Continued Groundwater Monitoring Program (semiannually)				
Sample Collection and Analysis	2	per year		$46,000
Consulting and Reporting Services		lump sum		$15,000
Additional Groundwater Monitoring Program (semiannually)				
Sample Collection and Analysis	2	per year		$48,000
Consulting and Reporting Services		lump sum		$15,000
Inorganics Treatment (Fe & Mn removal)				
Labor	1	man-year	$100,000	$100,000
Energy	420,000	kw-hr	$0.10	$42,000
Chemicals		lump sum	$33,000	$33,000
Equipment Maintenance		2% of EC		$57,200
Monitoring		lump sum		$2,500
Additional Organics Treatment (PGAC at 2,250 gpm)				
Carbon Changeout	158,000	pounds	$1.50	$237,000
Chemicals		lump sum	$6,200	$6,200
Maintenance		lump sum	$2,800	$2,800
Labor	1	man-year	$100,000	$100,000
		TOTAL ANNUAL COST		$704,700
PRESENT WORTH				
		Interest Rate	10%	
		Years	30	
		TOTAL PRESENT WORTH		$10,310,000

TABLE 7

DRINKING WATER CRITERIA/GUIDELINES
FOR PUBLIC AND PRIVATE WELL SUPPLIES

Compound	Maximum Contaminant Level (MCL) (µg/l)	Recommended Allowable Limit (RAL) (µg/l)	Health Risk Limit (HRL) (µg/l)
1,1-Dichloroethane	-	70	-
1,1-Dichloroethene	7	6	6
cis-1,2-Dichloroethene	70*	70	-
1,1,1-Trichloroethane	200	600	-
1,1,2-Trichloroethane	5*	3	3
Trichloroethene	5	30	-
Hazard Index for Carcinogenic Mixtures	-	-	See Note 4
Hazard Index for Noncarcinogenic Mixtures	-	-	See Note 5

* Proposed MCL.
\- Does not exist

Notes:
1. Maximum contaminant levels are specified in the Primary Drinking Water Regulations (40 CFR 141).
2. Recommended Allowable Limits are specified in Release No. 3, Minnesota Department of Health, January 1991.
3. Health Risk Limits are proposed values as of April 19, 1993.
4. To determine if the health risk limit for a mixture of carcinogens is exceeded, a hazard index must be calculated using the following procedure (Minnesota State Register, Proposed Rule 4717.7700):

   A. A hazard index shall be determined for substances or chemicals with a toxic endpoint of cancer as specified in Proposed Rule 4717.7650 using the following equation:

$$Hazard\ index = \frac{E_{C_1}}{HRL_{C_1}} + \frac{E_{C_2}}{HRL_{C_2}} + \text{-----} + \frac{E_{C_n}}{HRL_{C_n}}$$

   where: (1) E_{C_n} represents the concentration of the first, second, ...nth carcinogen detected in groundwater; and
   (2) HRL_{C_n} represents the health risk limit of the first, second, ...nth carcinogen as specified in Proposed Rule 4717.7500.

   B. A hazard index of one indicates a lifetime risk level of one in 100,000.
   C. A hazard index of one equals the health risk limit.
   D. A hazard index greater than one exceeds the health risk limit.

5. To determine if the health risk limit for a mixture of systemic toxicants is exceeded, a hazard index must be calculated using the following procedure (Minnesota State Register, Proposed Rule 4717.7700):

   A. The substances or chemicals detected in the groundwater must be grouped by toxic endpoint as specified in Proposed Rule 4717.7650.
   B. When two or more substances or chemicals have the same toxic endpoint, a hazard index must be determined for each group of substances or chemicals with the same toxic endpoint using the following equation:

$$Hazard\ index = \frac{E_{ST_1}}{HRL_{ST_1}} + \frac{E_{ST_2}}{HRL_{ST_2}} + \text{-----} + \frac{E_{ST_n}}{HRL_{ST_n}}$$

   where: (1) E_{ESTn} represents the concentration of the first, second, ... nth systemic toxicant detected in groundwater; and
   (2) HRL_{STan} represents the health risk limit of the first, second, ... nth systemic toxicant as specified in Proposed Rule 4717.7500.

   C. A hazard index of one equals the health risk limit.
   D. A hazard index greater than one exceeds the health risk limit.

Responsiveness Summary
New Brighton/Arden Hills Operable Unit 1
Record of Decision

I. OVERVIEW

The public comment period for the proposed plan began on August 6 and ended on September 7, 1993. A public notice summarizing the proposed plan and announcing the public comment period and public meeting was printed in the Minneapolis Star Tribune and the St. Paul Pioneer Press August 4, 1993. In addition, the public notice was mailed to all individuals, groups and organizations which comprise the Twin Cites Army Ammunition Plant mailing list.

During the public comment period one written response was received from a citizen, supporting the preferred alternative.

At the public meeting, which was held on Thursday, August 19, 1993 at the Shoreview Community Center, several questions were received from the audience. The questions were technical in nature, relating to the rate of movement of the North Plume and to the location and depth of one of the proposed extraction wells in Alternative 3. Those questions and the responses to them are summarized in Section III of this responsiveness summary. A transcript of the public meeting minutes has been included in the Administrative Record for the Site.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

Contaminated groundwater has been an issue of very high concern in the communities surrounding TCAAP since it was first discovered by MPCA in 1981. The focus of community concerns has been possible health effects from contamination at the site, the apparent delays in getting the site cleaned up, and the role and responsibility of the U.S. Army in addressing these concerns. The Army has been the focus of several lawsuits by the City of New Brighton, the Village of St. Anthony and a citizens' groups over these concerns. These lawsuits have since been settled.

Interim remedial actions taken by the U.S. EPA and the U.S. Army, particularly those involving the provision of alternate water supplies to affected residents, have addressed some of the local community concerns. With the signing of the Federal Facility Agreement among the Army, EPA and MPCA in 1987, a more coordinated effort toward site remediation was begun. This effort has included an improved community relations effort based upon a community relations plan submitted by the Army and approved by EPA and MPCA in January, 1991.

Following are highlights of past community relations actions taken by the Army, EPA and MPCA at the Site:

July 1981: Operators of public water supplies in the City of New Brighton and the Arden Manor Trailer Park were notified in person by Army officials of contamination and information was distributed to water users.

September 1981: News release announced the presence of contamination on-site at TCAAP. A meeting to discuss the contamination problem was held with state and local public officials and affected residents.

May 1983: Public meeting held to discuss the recommendation for a Granular Activated Carbon (GAC) treatment system to be used for temporary water supply at New Brighton.

June 1985: Remedial Investigation Phase I information presented to the New Brighton City Council.

June 1986: Public meeting held to discuss the recommendation of a Feasibility Study to replace New Brighton Well #7.

May 10, 1987 - June 1, 1987: Public notice of Draft Record of Decision (ROD) and Public Meeting concerning the Boundary Groundwater Recovery System at TCAAP.

July 1987: News conference conducted by Attorney General for the State of Minnesota and the Army to announce the signing of the Federal Facility Agreement (FFA) for the TCAAP Environmental Restoration Program.

February 2, 1988: Informational meeting held for residents of Edgetown Acres/Shoreview regarding Site A. Those in attendance were informed that testing of private shallow wells would be conducted as a result of findings of apparent low levels of contamination discovered at Site A, at the northwest corner of TCAAP.

May 23, 1989: Public meeting held for the Record of Decision on the Interim Remedial Action Plan, Site D: PCB-Contaminated Soils.

November 7-9, 1989: Community interviews conducted by U.S. Army representatives with participation by EPA and MPCA.

November 18, 1991: Public meeting held to announce the completion and discuss the results of the on-TCAAP and off-TCAAP remedial investigations.

August 18, 1992: Public meeting held for the Record of Decision, Operable Unit 3 groundwater remedy.

Ongoing community relations activities at TCAAP include:

Technical Review Committee (TRC): Established in 1985 pursuant to SARA, Section 211, the TRC is open to the public and held at least quarterly.

TCAAP Environmental Restoration Program Hotline: Established in 1987 to respond to questions from the public.

TCAAP Environmental Update: Published monthly and mailed to all of those on the community relations mailing list.

III. SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

One written comment from a citizen supporting the preferred alternative was received during the public comment period. Following is a summary of the verbal comments received during the public meeting and the responses to those comments.

Comment: The commenter wanted to know at what rate the North Plume is expanding southward now.

Response: Based upon the information that was gathered during the remedial investigations and the groundwater modeling effort performed for the site, the maximum velocity of the plume is likely on the order of hundreds of feet per year.

Comment: The commenter noted that the proposed location of New Brighton Well #13 appears to be west and north of a majority of the one hundred microgram per liter line. It also appears that much of the contaminant mass has already gone past the location where the well would be drilled. The commenter asked how the containment boundary could be established beyond the well.

Response: The effect of pumping Well #13, and all of the wells which are a part of the proposed remedy, will be to create capture zones which intersect and which extend beyond the actual locations of the wells. The operation of these wells will reverse the gradient of groundwater flow within the estimated capture zones and draw downstream contamination back into the wells.

Comment: The commenter wanted to know what the depth of Well #13 would be.

Response: Well #13 will be a Prairie du Chien well, about 130 feet deep.

Comment: The commenter asked if the aquifer could be deeper than 130 feet.

Response: The major regional aquifer system, the Prairie du Chien/Jordan, is certainly deeper than 130 feet. However, contamination does not extend through the entire depth of the aquifer. At the location of Well #13, contamination is mostly located in the Prairie du Chien.

IV. REMAINING CONCERNS

No remaining public concerns regarding the Operable Unit 1 remedial action have been identified.

TWIN CITIES ARMY AMMUNITION PLANT
INSTALLATION RESTORATION PROGRAM

Administrative Record File For New Brighton/Arden Hills NPL Site
Operable Unit - 1

Record Of Decision Index

November 1, 1993

Prepared by:

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Purchase Order No. 317201
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I. THE RECORD OF DECISION INDEX

The Index identifies documents in the Administrative Record file for the New Brighton/Arden Hills NPL Site, Operable Unit-1 ("OU-1"). The Index is broken down into three (3) categories which correspond to the physical structure of the Administrative Record file. These categories are:

A. Site Specific Documents
B. Non-Site Specific Documents
C. Public Participation Documents

Site Specific Documents are those documents which qualify for inclusion in the Administrative Record file and relate to the New Brighton/Arden Hills NPL Site. Non-Site Specific Documents are those documents which qualify for inclusion in the Administrative Record file, but do not specifically relate to the Site. Public Participation Documents are those documents which relate to public involvement in and acceptance of the selected remedial alternatives. Within each of these three (3) categories, the documents are listed on the Index in chronological order. Specific author reports are also provided for some Site Specific and Non-Site Specific Documents. The documents listed on these reports are also arranged in chronological order.

Generally, documents referenced on the Index may be located in the Administrative Record file by going to the category placement for the document (i.e., Site Specific, Non-Site Specific or Public Participation) and then locating the document by its date. Cross-referenced documents may be located in the Administrative Record for previous Records of Decision ("RODs") by following the same procedure. Except as otherwise indicated, most Non-Site Specific Documents are in the public domain and therefore not physically located within the Administrative Record file. Sufficient information is given on this Index to locate the document in the public domain.

TWIN CITIES ARMY AMMUNITION PLANT
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TAB 1

Site-Specific Documentation:
Includes site specific reports, studies,
correspondence and other documentation.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
00/00/00	Sampling, testing data, chain of custody forms, Quality Assurance/Quality Control documentation for referenced reports is available from Army Environmental Center, Aberdeen Proving Ground, Maryland; contact TCAAP RPM for further information and access to these records.				
00/00/00	Field Sampling Quality Assurance Guide	STS Consultants, Ltd.			
01/11/77	Water Quality Geohydrologic Consultation, TCAAP	Army Environmental Hygiene Agency		No. 24-0286-77	01
10/00/78	Installation Assessment TCAAP	United States Army Toxic and Hazardous Materials Agency		129	12
01/09/79	Potable/Recreational Water Quality Survey	Army Environmental Hygiene Agency		No. 31-66-0187-79; No. 32-66-0188-79	01
03/31/79	Environmental Impact Assessment	Berg, D.J. Federal Cartridge Company			01
10/15/80	Report of Hydrogeologic Study of Former Northwest Petroleum Site, Minnesota Transfer Railway Property	Soil Exploration Co.		No. 120-5952	01
12/04/80	Report of Hydrogeologic Study, Former Northwest Petroleum Company Site, City of New Brighton Property	Soil Exploration Co.		No. 120-6603; P.O. No. 11525	01
05/00/81	Installation Assessment TCAAP	Bionetics Corporation		Contract No. 68-03-2844 (TS-PIC-0066)	12
09/00/81	Water Decontamination Study TCAAP	Saunders & Thomas, Inc.			01
09/04/81	Alternative Water Supply for New Brighton (Sampling Results and Emergency Action Plan)	Kanner, Michael Minnesota Pollution Control Agency	Bartlet, Richard United States Environmental Protection Agency		01
09/25/81	Study of Subsurface Contamination	Soil Exploration Co.		P.O. #1210-03; SEC #120-7709	12
09/30/81	Subsurface Exploration for Soil and Groundwater Contamination - Honeywell Inc.	Soil Exploration Co.		P.O. #376434; SEC #120-7678-A	12
10/05/81	Contamination of New Brighton Municipal Wells	Albin, D.R.	Lee, S.		01

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
		Department of Interior	Minnesota Pollution Control Agency		
10/13/81	Emergency Action Plan/Twelve Point Plan	Briemhurst, Lewis J. Minnesota Pollution Control Agency	Bartlet, Richard United States Environmental Protection Agency		01
11/05/81	Review of Geologic and Hydrogeologic Data and Reports	STS Consultants, Ltd.		92765	01
11/12/81	Groundwater Study, Former Northwest Petroleum Company Site, New Brighton, Minnesota	Soil Exploration Co.		No. 120-7621; P.O. No. 12234	01
12/00/81	Final Submittal Potable Water Source Alternatives for TCAAP	Sanders & Thomas, Inc.		P.O. No. 1212-08; Proj. No. 05-4811	
02/05/82	Off-TCAAP Investigation	Bonner, J.E. Department of the Army	Breimhurst Minnesota Pollution Control Agency		01
03/00/82	Recommendations for Future Hydrogeologic Work in New Brighton/Arden Hills Area	CH2M Hill		TDD-FS-8112-19	01
05/00/82	Preliminary Engineering Design and Cost Estimates for Potable Water Service TCAAP	Eugene A. Hickok and Associates			01
08/00/82	Potential Groundwater Contamination Sources Twin Cities/New Brighton	Bionetics Corporation		Contract No. 68-03-2844; TS-PIC-2001	01
08/12/82	Sample Results from New Brighton/Arden Hills Groundwater Site	Hess, Paul Ecology and Environment, Inc.		TDD No. FD5-8112-10	01
09/02/82	Preliminary Results of Phase I Survey (35 Well Samples 7/82)	Department of the Army			01
11/00/82	Potential Groundwater Contamination Sources Twin Cities/New Brighton (Addendum)	Bionetics Corporation		Contract No. 68-03-2844; TS-PIC-82001	01
11/00/82	Evaluation of Waste Water Constituents, TCAAP	Eugene A. Hickok and Associates			01

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/12/82	Remedial Investigation - Action Memorandum	Breimhurst, Lewis J. Minnesota Pollution Control Agency	Bartlet, Richard United States Environmental Protection Agency		01
11/16/82	Work Plan, Soil and Groundwater Investigation	Barr Engineering Company			01
01/00/83	Remedial Action Master Plan	Remedial Planning Field Investigation Team CH2M Hill		EPA No. 01-5V40.01; W65140	01
01/13/83	New Brighton/Arden Hills Groundwater Contamination - Report on Testing of 150 Drinking Wells	Hess, Paul G. Ecology and Environment, Inc.		TDD #F5-8112-10A	01
03/00/83	Report on Sampling Results from New Brighton-Shoreview, Ramsey County	Field Investigation Team Ecology and Environment, Inc. CH2M Hill		TDD No. R05-8208-02A	01
03/00/83	Sewer Line and Manhole Inspection Report	Professional Services Group, Inc.			
03/00/83	Study of TCE in Sewers Near Bldg. 502, TCAAP	Eugene A. Hickok and Associates			01
03/30/83	Report on Water Supply System for St. Anthony, Minnesota	Bonestroo, Rosene, Anderlik & Associates, Inc. Barr Engineering Company			03
04/00/83	Scope of Work for Phase II of TCAAP Environmental Contamination Survey	Department of the Army			03
05/00/83	Final Feasibility Study, Temporary Water Supply, New Brighton, Minnesota	CH2M Hill		EPA No. 22.5M40.0	01
05/16/83	TCAAP Environmental Contamination Survey Phase I Report: Vol. I (Contamination Rpt.); Vol. II (Geotechnical Rpt.); Vol. III (Geotechnical Appendix)	STS Consultants, Ltd.		DRXTH-AS-CR-83197	06
06/00/83	Final Alternative Screening Temporary Water Supply, St. Anthony, Minnesota	CH2M Hill		EPA No. 22.5M40.0	04

DOC_DATE	T' "	AUTHOR	RCPNT	REF#	XREF
06/00/83	Waste Water Pretreatment Evaluation Final Report	Eugene A. Hickok and Associates			01
06/27/83	Feasibility Study Temporary Water Supply, Private Well Users New Brighton/Arden Hills	CH2M Hill		W65340.00/EPA22.5M40.0	02
06/27/83	Alternative Screening Temporary Water Supply, St. Anthony, Minnesota	CH2M Hill		W65340.00; EPA 22.5M40.0	02
06/27/83	Record of Decision: Interim Remedial Measure - Granular Activated Carbon filter for New Brighton Well Nos. 5 and 6	Lee Thomas United States Environmental Protection Agency			01
07/00/83	Phase I - Sampling Program, Storm Sewer Discharge TCAAP Bldg. 103	Conestoga-Rovers & Associates, Inc.		1219	03
09/00/83	Work Statement, Engineering Analysis of Alternative Remedial Measures for Contamination Services at TCAAP	Department of the Army			03
09/00/83	Feasibility Study for Pretreatment of Metal Finishing Dept. Bldg. 502	Environmental Process, Inc.			01
09/00/83	Waste Water Pretreatment Evaluation, Water Quality Engineering Consultation	Army Environmental Hygiene Agency		No. 32-24-0463-84	01
09/01/83	Final Report Phase I - PCB Sampling Program Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1219	12
09/19/83	Record of Decision: Extension of Municipal Water Supply to New Brighton/Arden Hills private well users	Thomas, Lee United States Environmental Protection Agency			02
10/00/83	Twin Cities Army Ammunition Plant Bldg. 103, Final Report Phase I - Sampling Program Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.		1244	12
10/00/83	Final Report on Exfiltration Tests of Selected Gravity Sanitary Sewers for TCAAP	Professional Services Group, Inc.			

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/00/83	Final Report on Pressure Tests of TCAAP's 18-Inch and 24-Inch Diameter Sanitary Sewer Force Mains	Professional Services Group, Inc.			
11/24/83	Phase II - Sampling Program, Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1282	12
12/16/83	Preliminary Concept Plan, TCAAP (Tast Order 4) (Phase I - Component D)	Roy F. Weston, Inc.		DACA87-82-C-0063	08
12/30/83	An Evaluation of the Hydrogeologic Controls of the Waste Energy Systems Site, Walburn Industrial Park, New Brighton, Minnesota	R.H. Hoagberg Associates, Inc.			03
00/00/84	Historic Properties Report Twin Cities Army Ammunition Plant	MacDonald and Mack Partnership		CX-0001-2-0033	06
01/00/84	Summary Report, Treatment of the Municipal Water Supply at New Brighton by Granular Activated Carbon	Barr Engineering Company			05
01/00/84	Sewer Sediment Testing Report	Eugene A. Hickok and Associates			
03/00/84	Geophysical Survey of Southwest Boundary at TCAAP	Glaccum, Robert A. Technos, Inc.		Rpt. No. DRXTH-AS-CR-84280	05
03/14/84	Regional Remedial Investigation	Conestoga-Rovers & Associates, Inc.		1372	03
03/27/84	Feasibility Report for Temporary and Permanent Water Service from Roseville, Minnesota	Short-Elliott-Hendrickson, Inc.		SEH No. 84090	03
04/00/84	Sewer Cleaning, Testing and Inspection Plan for TCAAP	Professional Services Group, Inc.			
04/18/84	Definition of Volatile Organics in Soil Bldgs. 502 TCAAP	Haycock, Donald H. Conestoga-Rovers & Associates, Inc.	Jaska, James Environmental Manager Honeywell	1282	03
06/00/84	Twin Cities Army Ammunition Plant, Engineering Analysis of Alternative Remedial Measures - Phase III Report -	Roy F. Weston, Inc.		Contract No. DACA87-82C-0063; Rpt. No. DRXTH-AS-CR-84295	05

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Vol. II (Appendix)				
06/00/84	Twin Cities Army Ammunition Plant, Engineering Analysis of Alternative Remedial Measures - Phase III Report - Vol. I	Roy F. Weston, Inc.		Contract No. DACA87-82C-0063; Rpt. No. DRXTH-AS-CR-84295	05
06/00/84	Final Report Remedial PCB Investigation/Feasibility Study Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1282	12
06/30/84	Environmental Contamination Survey Phase III Report: Vol. I (Source Assessment); Vol. II (Geotechnical Rpt.); Vol. III (Geotechnical Appendix); Vol. IV (Electrical Soil Resistivity Study); Vol. V (Source Assessment Appendix)	STS Consultants, Ltd.		Rpt. No. DRXTH-AS-CR-84289	03
07/18/84	Work Plan for New Brighton/Arden Hills Remedial Investigation: Phase I	Battelle			03
07/26/84	Report on Finding of Phase II, Tasks B-2 and C-2, Hydrogeologic Consultation on the Trio Solvent Chemical Spill	R.K. Hoagberg Associates, Inc.			04
08/00/84	Twin Cities Army Ammunition Plant Bldg. 103, Remedial Investigation Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.		1281	12
08/00/84	Twin Cities Army Ammunition Plant Bldg. 103 Remedial Feasibility Study, Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.			
08/02/84	Record of Decision: Initial Remedial Alternative Selection - Interconnection Between City of Roseville and St. Anthony	Adamkus, Valdas V. United States Environmental Protection Agency			03
09/00/84	Bldg. 502 Baseline Study, Sewer Integrity Television Inspection Survey, TCAAP Environmental Investigation	Donohue & Associates, Inc.		Project No. 13589	04
09/20/84	Technical Proposal and Cost Estimate for Tasks C-3 and	R.H. Hoagberg Associates, Inc.		RHA Rpt. No. 8414	04

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	D-1, Hydrogeologic Consultation on the Trio Solvent Chemical Spill, New Brighton, Minnesota				
10/00/84	Twin Cities Army Ammunition Plant Bldg. 502, Remedial Feasibility Study Bldg. 502 Sewers	Conestoga-Rovers & Associates, Inc.		1251	12
10/00/84	TCAAP Bldg. 502, Baseline Study, Assessment of Sewer Water and Sediment Control	Conestoga-Rovers & Associates, Inc.		1251	12
10/00/84	Safety Plan Study for Solvent Stripping from Soil at TCAAP	Roy F. Weston, Inc.		W.O. No. 2281-01-11	08
10/00/84	Groundwater Remedial Action Alternative Analysis at TCAAP, Scope of Work	STS Consultants, Ltd.			06
12/00/84	TCAAP Sewer System Evaluation Survey, Interim Report	Professional Services Group, Inc.			12
12/00/84	Potable Source Water Study, TCAAP	Eugene A. Hickok and Associates			05
12/00/84	TCAAP Bldg. 103, Supplemental Remedial Investigation/Feasibility Study, Bldg. 103	Conestoga-Rovers & Associates, Inc.		1281	12
01/00/85	TCAAP Bldg. 103 Remedial Work Plan	Conestoga-Rovers & Associates, Inc.		1496	12
01/00/85	Technical Work Plan Submittal, New Brighton/Arden Hills Force Main Remedial Investigation (Volume I)	Camp, Dresser & McKee, Inc.			09
01/00/85	TCAAP Bldg. 103, Addendum to Supplemental Remedial Investigation/Feasibility Study, Bldg. 103	Conestoga-Rovers & Associates, Inc.		1281	12
01/09/85	Addendum Report to Source Assessment Volume I, Phase II, TCAAP	STS Consultants, Ltd.			06
02/00/85	Project Operation Plan for New Brighton/Arden Hills Multi-Point Source Remedial Investigation	Camp, Dresser & McKee, Inc.			12
02/00/85	Report on Preliminary Survey of Industrial Waste	CH2M Hill		TDD No. RS-8301-05A	04

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Disposal Practices for New Brighton/Arden Hills (FIT 5 Report)	Ecology and Environment, Inc.			
02/00/85	Storm Sewer Evaluation and Sediment Testing at TCAAP	Eugene A. Hickok and Associates		P.O. No. 3335-01	04
03/00/85	TCAAP Bldg. 103, Final Engineering Report, Sewer Grouting Program Bldg. 103	Conestoga-Rovers & Associates, Inc.		1496	12
03/00/85	Groundwater Monitoring Study, AMC Open Burning/Open Detonation Facilities	Army Environmental Hygiene Agency		Study No. 38-26-0457-86	08
03/00/85	Volatile Organic Compound, Remedial Investigation, TCAAP Bldg. 502 and Vicinity	Conestoga-Rovers & Associates, Inc.		1461	12
03/29/85	TCAAP Bldg. 502, Final Engineering Report, Sewer Cleaning Program, Bldg. 502 (Appendices E, F & G)	Conestoga-Rovers & Associates, Inc.		1498	
03/29/85	TCAAP Bldg. 502, Final Engineering Report, Sewer Cleaning Program Bldg. 502 (Appendices A, B, C & D)	Conestoga-Rovers & Associates, Inc.		1498	
04/00/85	Work Plan Groundwater Remedial Action Alternatives Analysis	STS Consultants, Ltd. D'Appolonia Ltd.		92797K	12
04/16/85	Project Operations Plan Soil and Groundwater Investigation, Trio Solvents/Butchers Spur Site, New Brighton, Minnesota	Donohue & Associates, Inc.			04
05/00/85	Contract Documents and Specifications, Installation of Groundwater Collection Drain Bldg. 103	Conestoga-Rovers & Associates, Inc.			04
05/00/85	New Brighton/Arden Hills Phase I Multi-Point Source Remedial Investigation and Revisions	Camp, Dresser & McKee, Inc.			04
05/00/85	In-Situ Solvent Stripping from Soils, Pilot Study	Roy F. Weston, Inc.		DAAK11-82C-0017	08
05/00/85	U.S. EPA Comments on Groundwater Remedial Action Alternatives Analysis Work Plan (4/85)	Waldvogel, Karen Site Manager	Wyatt, Bill U.S. Army AMCCOM		

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
02/00/87	Off-TCAAP, Phase II, Herbst Landfill, Data Report	Conestoga-Rovers & Associates, Inc.		1638	09
02/12/87	Farmstead Well Inventory and Assessment, TCAAP	Nielson, Robert C. Federal Cartridge Company			06
02/17/87	Phase I 96-10-8 Triangle Supplement Report	Conestoga-Rovers & Associates, Inc.		1695	12
03/00/87	TCAAP Bldg. 502, Final Engineering Report, Sewer Cleaning Program	Conestoga-Rovers & Associates, Inc.		1498	04
03/00/87	Feasibility Study of Carbon Treatment for New Brighton Municipal Wells	Wenck Associates, Inc.			09
03/00/87	Remedial Monitoring Plan TCAAP Bldgs. 103 and 502	Conestoga-Rovers & Associates, Inc.			04
03/00/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Monitoring Plan	Conestoga-Rovers & Associates, Inc.			06
03/00/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Quality Assurance Project Plan	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	06
03/31/87	Record of Decision: Remedial Alternative Selection - Operable Unit for Provision of Alternative Water Supply (Granular Activated Carbon Water Treatment for St. Anthony Well Nos. 3, 4 and 5)	Adamkus, Valdas V. United States Environmental Protection Agency			05
04/00/87	Off-TCAAP Study, Phase III: Aquifer Characterization Scope of Work	Conestoga-Rovers & Associates, Inc.		1695	04
04/00/87	Off-TCAAP, Phase II, Old Miller Dump Site, Data Report	Conestoga-Rovers & Associates, Inc.		1638	09
04/01/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Extraction Well Pumping Report	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	06
04/16/87	Necessity of Wasting TCAAP Extracted Groundwater to	Goudreault, Paul			07

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Surface Water	Minnesota Pollution Control Agency			
04/20/87	Evaluation of Interim Response Action for TCAAP Production Wells	International Technologies Corporation	Terho, Darryl Federal Cartridge Company	302301	06
05/01/87	Health and Safety Plan for Conducting Remedial Activities at TCAAP	International Technologies Corporation			08
05/08/87	Proposed Operation of In-Situ Volatilization Systems at TCAAP Sites D and G.	Federal Cartridge Company			08
06/01/87	Technical Comments on Boundary Groundwater Recovery System	Minnesota Pollution Control Agency			06
06/11/87	Technical Comments on Draft Remedial Design Work Plan for Alternative Water Supply	Minnesota Pollution Control Agency			04
06/18/87	Record of Decision: Operable Unit for Groundwater Remediation Program Phase I: Boundary Groundwater Recovery System	Walker, Lewis D. Department of the Army			06
07/00/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Start-Up, Operation and Maintenance Manual (Vol. I) and Programmable Control Manual (Vol. II)	Conestoga-Rovers & Associates, Inc.			08
07/13/87	Boundary Groundwater Recovery System	Kalitowski, Thomas J Minnesota Pollution Control Agency	Adamkus, Valdas V. United States Environmental Protection Agency		07
08/00/87	Off-TCAAP Study, Phase III: Plume Definition Report (Volumes I and II)	Conestoga-Rovers & Associates, Inc.		1695	04
08/12/87	Federal Facilities Agreement	Department of the Army/Minnesota Pollution Control Agency/			07
08/31/87	Boundary Groundwater Recovery System	Adamkus, Valdas V.	Walker, Lewis D.		07

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
		United States Environmental Protection Agency	Department of the Army		
09/02/87	TCE Permability Study	International Technologies Corporation		303301	08
09/10/87	Boundary Groundwater Recovery System	Walker, Lewis D. Department of the Army	Adamkus, Valdas V. United States Environmental Protection Agency		07
09/25/87	Record of Decision: Gradient Control System for Southwest Boundary of TCAAP	Adamkus, Valdas V. United States Environmental Protection Agency			07
10/00/87	Remedial Design Work Plan for Alternate Water Supply Volume I - Technical Submittal for New Brighton/Arden Hills	Camp, Dresser & McKee, Inc.		Doc. #108-PPI-WP-FJGP-1; Work Assignment 420-5N40	12
10/08/87	Boundary Groundwater Recovery System	Adamkus, Valdas V. United States Environmental Protection Agency	Walker, Lewis D. Department of the Army		07
10/26/87	Final Remedial Investigation Trio Solvents, New Brighton, Minnesota	Delta Environmental Consultants		Delta No. 10-87-068	09
11/00/87	Chemical Grouting Report, TCAAP	Visu-Sewer Clean & Seal, Inc.		Req. No. 270896	
11/00/87	Volatile Organic Compound Remedial Investigation Addendum, Kendall Degreaser Investigation, Bldg. 502, TCAAP	Conestoga-Rovers & Associates, Inc.		1499	09
11/00/87	Interim Remedial Action-Boundary Groundwater Recovery System: Monitoring Plan, TCAAP	Conestoga-Rovers & Associates, Inc.		DAA09-76-0030	
11/00/87	Installation Restoration Program, Boundary Groundwater Recovery System, Quality Assurance Project Plan, Interim Remedial Action Monitoring Program, TCAAP	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	04

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Investigation Work Plan for TCAAP			ANL/EES-LD-5	
08/00/88	Results of Borehole Geophysics and Video Inspections, Off-Post Study TCAAP	Minnesota Geophysical Associates, Inc.			12
08/05/88	Litigation Settlement Agreement (LitSAG) Between City of New Brighton and U.S. Department of the Army				
08/24/88	Renewal of Request to Reconsider Decision on New Brighton Well No. 13	Walker, Lewis D. Department of the Army	Adamkus, Valdas V. United States Environmental Protection Agency		04
09/00/88	Project Quality Control Plan for Installation Restoration Program at TCAAP	Interpoll Laboratories, Inc.			
09/07/88	Off-Site Remedial Investigation (City of St. Anthony Water Quality Analysis)	Willet, Gerald L. (Commissioner, Minnesota Pollution Control Agency) Kleinrath, Arthur (Remedial Project Manager, U.S. EPA)	Oster, Clarence (Department of the Army) Walker, Lewis D. (Department of the Army)		
09/22/88	New Brighton Well No. 13	Adamkus, Valdas V. United States Environmental Protection Agency	Walker, Lewis D. Department of the Army		04
10/00/88	Chemical Grouting Report, TCAAP	Visu-Clean & Seal, Inc.		Reg. No. 270961	04
10/28/88	Pumping Rates for Modified Boundary Groundwater Recovery System	Boevers, Brian; Rovers, Frank; Petrie, John; Haycock, Don and Fedy, Bob Conestoga-Rovers & Associates, Inc.	Sola, Don Conestoga-Rovers & Associates, Inc.	2687-31	
12/00/88	Final Remedial Investigation Report for New Brighton/Arden Hills TCAAP Force Main	Camp, Dresser & McKee, Inc.		Doc. No. 108-R11-RT-GSWG-1; Work Assignment No. 102-5L40	04
12/07/88	Plume Groundwater Recovery System	Pickering, R.H. Location Manager Honeywell	Commander's Representative Department of the Army		

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
01/28/89	Amended Record of Decision: Replacement Well for New Brighton Well No. 7				04
02/08/89	Plume Groundwater Recovery System Alternatives Preliminary Letter Report	Massey, Rodney E. (Dir. Groundwater & Solid Waste Div., Minnesota Pollution Control Agency) Kleinrath, Arthur (Project Manager, U.S. EPA)	Oster, Clarence Project Manager Department of the Army		
02/27/89	Pump Tests, TCAAP	STS Consultants, Ltd.		STS Proj. No. 92797-XA	
05/02/89	Addendum: Health and Safety and Security Plan for Conducting Remedial Activities at TCAAP	International Technologies Corporation			
06/00/89	TCAAP Potable Water Management Study Phase I	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0070	
06/00/89	Preliminary Health Assessment for the New Brighton/Arden Hills NPL Site	Agency for Toxic Substances and Disease Registry			
06/21/89	Focused Feasibiltiy Study, TCAAP, Plume Groundwater Recovery System	Conestoga-Rovers & Associates, Inc.		2738	12
07/24/89	Comments on Proposed Scope of Work for Potable Water Management Study	Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Kleinrath, Arthur (U.S. EPA)	Oster, Clarence Remedial Project Manager Department of the Army		
08/00/89	City of Fridley: Report on Water System Study	Howard, Needles, Tamment & Bergendoff			
08/09/89	Consistency Test for Boundary Groundwater Recovery System Annual Monitoring Report	Massey, Rodney E. (Dir. Groundwater & Solid Waste Div., Minnesota Pollution Control Agency) Kleinrath, Arthur (U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
09/00/89	Closed Circuit Television Inspection for TCAAP	Visu-Sewer Clean & Seal, Inc.			

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
09/00/89	Installation Restoration Program TCAAP 1988 Annual Monitoring Report (Volumes I - IV)	Wenck Associates, Inc.			
09/25/89	Phase II Water Management Study	Mogren, Thomas D. General Manager St. Paul Board of Water Commissioners	Mahady, James Project Manager J.M. Montgomery Consulting Engineers, Inc.		
10/00/89	Interim Remedial Action, 1988 Boundary Groundwater Recovery System, Annual Monitoring Report and Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAAA09-76-E-0030	12
10/06/89	Phase II Scope of Work TCAAP Potable Water Management Study	Schulte, Theodore E. Commander's Representative Department of the Army	Kleinrath, Arthur (U.S. EPA); Tuffard, Sarah (Evan Drives, DNR) Englund, Gary (Chief Water Supply Section, Dept. of Natural Resources) Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency)		
10/10/89	Fate of Treated Groundwater from TCAAP	Englund, Gary Chief, Section of Water Supply & Well Mgmt. Minnesota Department of Health	Schulte, Theodore E. Department of the Army		
10/20/89	U.S. EPA Comments on Scope of Work for Water Management Study	Kleinrath, Arthur Remedial Project Manager United States Environmental Protection Agency	Fix, Michael R. Department of the Army		
10/23/89	Scope of Work - Regional Potable Water Management Study	Schmitt, Mark Project Manager Minnesota Pollution Control Agency	Fix, Michael R. Remedial Project Manager Department of the Army		
11/01/89	Aquifer Characterization Study, Off-TCAAP Study, Phase III: Supplement	Conestoga-Rovers & Associates, Inc.		1119	12

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/02/89	Results of Monitoring Well Installation and Sampling for FCC at TCAAP - On and Off Post, New Brighton/Arden Hills Well Nos. 414-U4, 03L137, 03L138	Minnesota Geophysical Associates		P.O. No. 9174-03; W.O. No. A6664	
11/14/89	TCAAP Use Groundwater Extraction Well Water	Schulte, Theodore E. Commander's Representative Department of the Army	All TCAAP Tenants		
11/22/89	TCAAP Groundwater Recovery System Discharge Sample Results	Schulte, Theodore E. Commander's Representative Department of the Army	Kleinrath, Arthur (U.S. EPA) Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency)		
02/12/90	TCAAP Potable Water Management Study, Phase I	Schulte, Theodore E. Commander's Representative Department of the Army	Kleinrath, Arthur (U.S. EPA) Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Englund, Gary (Chief Water Supply Section, Minnesota Department of Health)		
03/01/90	Request for Comments and Notice of Public Meeting to Review TCAAP Water Management Study Phase I Report	Sande, Gerald Rice Creek Water Shed District	McCleery, Martin Remedial Project Manager Department of the Army		
03/13/90	Comments on TCAAP Water Management Study, Phase I Report	Keefe, Steve Metropolitan Council	Sande, Gerald A. Rice Creek Watershed District		
03/16/90	Fate of Treated Groundwater from TCAAP	Englund, Gary Minnesota Department of Health	Schulte, Theodore E. Commander's Representative Department of the Army		
03/19/90	City of New Brighton's Comments on TCAAP Water Management Study Phase I	Proper, Les Director of Public Works City of New Brighton	Rice Creek Watershed District		
03/19/90	Position Paper: Water Supply and Management of Excess Water from TCAAP Installation Restoration Program	Barr Engineering Company Messerli & Kramer			

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03/19/90	Comments on TCAAP Water Management Study, Phase I	Ahl, R. Charles Director of Public Works Village of Shoreview	Rice Creek Watershed District Board		
03/20/90	TCAAP Water Management Study	Flora, John G. Director of Public Works City of Fridley	Rice Creek Watershed District		
03/22/90	Effluent Limitations for Discharge to Long Lake	Johnson, Bruce L. Team Leader Industrial Enforcement Unit Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
03/26/90	Comments on TCAAP Water Management Study, Phase I	Gerbensky, Michael P. Hydraulics Project Engineer Minnesota Department of Transportation	Mahady, James J.M. Montgomery Consulting Engineers, Inc.		
04/00/90	Installation Restoration Program, TCAAP, 1990 Annual Monitoring Plan (Volumes 1-3)	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
04/02/90	TCAAP Water Management Study	Mogren, Thomas D. General Manager St. Paul Bd. of Water Commissioners	Mahady, James J. J.M. Montgomery Consulting Engineers, Inc.		
04/06/90	Tour of TCAAP water remediation and distribution system	Mogren, Thomas D. General Manager St. Paul Bd. of Water Commissioners	Schulte, Theodore E. Commander's Representative Department of the Army		
04/09/90	Augmentation of Snail Lake	Satt, Mark President Snail Lake Improvement Ass'n	Maki, Steve Federal Cartridge Company		
04/12/90	Comments on TCAAP Water Management Study Phase I Report	Harnack, Ronald D. Administrator Permits and Land Use Section Department of Natural Resources	Board of Managers Rice Creek Watershed District		

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
04/14/90	Augmentation of Snail Lake	Sandberg, Frank E.	Maki, Steve Federal Cartridge Company		
04/30/90	TCAAP Water Management Study	Sarkozy, Steven R. City Manager City of Roseville	Mahady, James J.M. Montgomery Consulting Engineers, Inc.		
05/00/90	Installation Restoration Program, TCAAP, 1989 Annual Monitoring Report (Volumes I - III)	Wenck Associates, Inc.			12
05/07/90	Technical Support Services for Installation Restoration Program: Task 4 - Develop a Groundwater Model in Support of Feasibility Study for TCAAP and Vicinity - Steady State Calibration Results	Engineering Technologies Associates, Inc.		DAAA15-89-0009/0004	
05/21/90	Interim Remedial Action, TCAAP Groundwater Recovery System, 1989 Annual Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	12
06/01/90	Addendum to TCAAP Water Management Study - Lake Augmentation	J.M. Montgomery Consulting Engineers, Inc.			
06/07/90	Snail/Turtle Lakes - TCAAP Pumping	Stine, John L. Regional Hydrologist Department of Natural Resources	Maki, Steve Federal Cartridge Company		
06/12/90	TCAAP Water Management Study	Flora, John G. (Dir. of Pulbic Works, City of Fridley) Proper, Les (Dir. of Public Works, City of New Brighton)	Mahady, James J. Rice Creek Watershed District		
06/14/90	TCAAP Water Appropriation	Stine, John L. Regional Hydrologist Department of Natural Resources	Woods, Steve District Engineer Rice Creek Watershed District		
06/14/90	Potential use of Plume Groundwater Recovery System water in Record of Decision	Kleinrath, Arthur Remedial Project Manager United States Environmental	Benke, Robert Mayor City of New Brighton		

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		Protection Agency			
06/26/90	Preliminary TCAAP Effluent Evaluation	Sparks, Curtis J. Chief, Program Development Section, Water Quality Division Minnesota Pollution Control Agency	Mahady, James J.M. Montgomery Consulting Engineers, Inc.		
06/27/90	TCAAP Site G Recharge Test	Schulte, Theodore E. Commander's Representative Department of the Army			
07/17/90	Consistency Test: 1988 Annual Monitoring Report	Massey, Rodney (Dir. Groundwater & Solid Waste Div., Minnesota Pollution Control Kleinrath, Arthur (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
07/30/90	Interagency Agreement Between DOA and ATSDR	Walker, Lewis D. (Department of the Army) Johnson, Barry L. (Ass't Administrator-Agency for Toxic and Hazardous Substances			
08/22/90	ANL's Response to Comments from Minnesota Pollution Control Agency/CDM draft Calibration and Sensitivity Analyses for Local-Scale Model at TCAAP	Durham, Lisa A. Argonne National Laboratory	Boston, Juan; Bowser, Dennis United States Army Toxic and Hazardous Materials Agency		
08/24/90	Review of 1989 Annual Monitoring Report; and 1989 TCAAP Groundwater Recovery System Annual Monitoring Report and Monitoring Plan for TCAAP	Chaudhry, Majid A. Site Manager PRC Environmental Management, Inc.	Kleinrath, Arthur Remedial Project Manager United States Environmental Protection Agency	Work Assignment No. 04-5P40; Contract No. 68-W8-0084	
09/25/90	Revised Scope of Work and Cost Estimate for TCAAP Groundwater Recharge Model Study	Mahady, James Project Manager J.M. Montgomery Consulting Engineers, Inc.	Sande, Gerald Rice Creek Watershed District		

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
10/12/90	Federal Facilities Agreement Modification Relating to Timetable for Annual Monitoring Report	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Schmidt, Mark (Project Manager, Minnesota Pollution Control Agency)	McCleery, Martin Remedial Project Manager Department of the Army		
10/15/90	J.M. Montgomery Water Management Study Phase II	Barounis, Thomas Remedial Project Manager United States Environmental Protection Agency	McCleery, Martin Remedial Project Manager Department of the Army		
10/16/90	J.M. Montgomery Water Management Study	Schmitt, Mark Project Manager Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
10/26/90	Minnesota Pollution Control Agency Comments on Wenck 1989 Annual Monitoring Report for TCAAP	Massey, Rodney E. Director, Groundwater and Solid Waste Division Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
11/19/90	Federal Facilities Agreement, Field Modification Relating to Timetable for Annual Monitoring Report	Theodore E. Schulte Commander's Representative Department of the Army	Barounis, Thomas United States Environmental Protection Agency		
11/19/90	Federal Facilities Agreement, Field Modifications Relating to Timetable for Annual Monitoring Report	Theodore E. Schulte Commander's Representative Department of the Army	Schmitt, Mark Project Manager Minnesota Pollution Control Agency		
11/29/90	Focused Groundwater Model Work Scope	J.M. Montgomery Consulting Engineers, Inc.			
12/03/90	Response to Comment Letters from Minnesota Pollution Control Agency and U.S. EPA about Presentation at 10/2/90 Project Update Meeting at TCAAP Regarding Water Management Study	Schulte, Theodore E. Commander's Representative Department of the Army	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency)		
12/06/90	Minnesota Pollution Control Agency Request for Additional Scenarios to be evaluated with ANL	Schmitt, Mark Project Manager	McCleery, Martin Remedial Project Manager		

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	groundwater flow model.	Minnesota Pollution Control Agency	Department of the Army		
01/00/91	Recharge Test, TCAAP Site G	Conestoga-Rovers & Associates, Inc.		1687-22(18)	
01/00/91	Final Engineering Report: Boundary Groundwater Recovery System	Conestoga-Rovers & Associates, Inc.		1687-24 (98)	
02/00/91	Phase IA Multi-Point Source Groundwater Remedial Investigation, New Brighton/Arden Hills, Minnesota	Camp, Dresser & McKee, Inc.			12
02/00/91	Installation Restoration Program-TCAAP Groundwater Recovery System: Interim Remedial Action-TCAAP Groundwater Recovery System 1990 Annual Monitoring Report (Volumes 1 & 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	
02/06/91	Scope of Work and Estimated Cost for Detailed Hydraulic Data Evaluation/Advective Transport Modeling TCAAP Site	Nicklin, Michael E. J.M. Montgomery Consulting Engineers, Inc.	Sande, Gerald A. Board of Managers Rice Creek Watershed District		
02/11/91	Wenck 1989 Annual Monitoring Plan (Part I)	Benker, Keith W. Wenck Associates, Inc.	Terho, Darryl Federal Cartridge Company		
03/00/91	Modeling Groundwater Flow for the TCAAP Site and Vicinity	Argonne National Laboratory			
03/00/91	TCAAP Air Quality Volatile Organic Compound Survey	Federal Cartridge Company			
03/00/91	Review of the FY 90 Annual Monitoring Report	Chaudhry, Majid Site Manager PRC Environmental Management, Inc.		Work Assignment No. 04-5P40; Contract No. 68-W8-0084	
03/28/91	Consistency Test for 1989 Annual Monitoring Report	Massey, Rodney E. (Dir. Groundwater & Solid Waste Div., Minnesota Pollution Control Agency) Barounis, Thomas ()	McCleery, Martin Remedial Project Manager Department of the Army		
03/29/91	Preliminary Evaluation of Combined Demand for Potable	Barr Engineering Company			

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Water Cities of New Brighton and Fridley, Minnesota				
04/00/91	Final Report Human Health Risk Assessment, New Brighton/Arden Hills, Superfund Site including TCAAP, Vols. I and II	PRC Environmental Management, Inc.		ARCS No. 68-W8-0084/Work Assignment No. 04-5P40	12
04/00/91	Installation Restoration Program, Remedial Investigation, TCAAP: Volume 1 (Text); Volume 2 (Appendices A-F); Volume 3 (Appendix G); Volume 4 (Appendices H-I)	Biang, R.P., et al. Argonne National Laboratory		CETHA-IR-CR-91015; ANL/EAIS/LD-6	
04/08/91	U.S. EPA's Comments on FY 90 Annual Monitoring Report	Barounis, Thomas Remedial Project Manager United States Environmental Protection Agency	Schulte, Theodore E. Commander's Representative Department of the Army		
05/28/91	TCAAP 1989 Annual Monitoring Report (Part I)	Benker, Keith W. Wenck Associates, Inc.	McCleery, Martin Remedial Project Manager Department of the Army		
05/30/91	Work Plan for Plume Groundwater Recovery System Treatment System Design Data Collection	Barr Engineering Company			
06/00/91	Modeling Groundwater Flow for TCAAP and Vicinity	Durham, L.A., et al. Argonne National Laboratory		ANL/EAIS/TM-53	
06/00/91	Installation Restoration Program, TCAAP Groundwater Recovery System, Interim Remedial Action-TCAAP Groundwater Recovery System 1989 Annual Monitoring Report and Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	
06/10/91	Plume Groundwater Recovery System Study Project	Beasley, John H. Acting Chief, Environmental Law Department of the Army	Proper, Les City of New Brighton		
07/00/91	Groundwater Recharge Model for Evaluation of Groundwater Recharge Alternatives at TCAAP - Water	J.M. Montgomery Consulting Engineers, Inc.			

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	Management Study Phase II				
07/00/91	Installation Restoration Program, TCAAP, Fiscal Year 1990 Annual Monitoring Report	Wenck Associates, Inc.			12
07/00/91	Interim Remedial Action, TCAAP Groundwater Recovery System, Site I and Site K, Annual Monitoring Report (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	12
08/29/91	Private Well Survey	Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
09/00/91	Installation Restoration Program TCAAP Water Management Study Phase II, Volume 1: Feasibility Study Report	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0410	
09/00/91	Plume Groundwater Recovery System Alternatives Evaluation	Conestoga-Rovers & Associates, Inc. Barr Engineering Company		3877(2)	
09/00/91	Installation Restoration Program TCAAP Water Management Study Phase II, Volume 2: Appendices	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0402	
09/03/91	Review Comments on Groundwater Recharge Model for Evaluation of Groundwater Alternatives at TCAAP	PRC Environmental Management, Inc.		Work Assignment 04-05P40; ARCS Contract No. 68-W8-0084	
09/13/91	Minnesota Pollution Control Agency Audit of Quarter 16 TCAAP Data	Schulte, Theodore E. Commander's Representative Department of the Army	Plant Manager Federal Cartridge Company Twin Cities Army Ammunition Plant		
10/01/91	Minnesota Pollution Control Agency Comments on J.M. Montgomery, Water Management Study, Phase II	Schmitt, Mark Project Manager Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
10/03/91	U.S. EPA Comments on the Preliminary Draft, TCAAP Water Management Study, Phase I	Barounis, Thomas Remedial Project Manager United States Environmental	McCleery, Martin Remedial Project Manager Department of the Army		

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		Protection Agency			
10/04/91	Ecological Assessment TCAAP (2/90-4/91) and Appendices	Paul, J.T. Army Environmental Hygiene Agency			
11/19/91	Ecological Assessment - Consistency Determination	Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
12/00/91	TCAAP Water Management Study, Phase II (Volumes I and II)	J.M. Montgomery Consulting Engineers, Inc.			12
12/00/91	Proposal for a Project to Identify and Locate Privately-Owned Wells in Area Downgradient of TCAAP	S.S. Papadopolous & Associates, Inc.			
12/03/91	Consistency Test: 1990 Annual Monitoring Report for TCAAP	Schmitt, Mark (Project Manager, MN Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
12/04/91	Requirements for TCAAP Quarterly/Annual Army Quality Assurance Reports	Wayne Mattsfield QA Coordinator Minnesota Pollution Control Agency	Schmitt, Mark Project Manager Minnesota Pollution Control Agency		
12/04/91	Consistency Determination for Scope of Work for Private Well Survey	Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
12/06/91	Requirements for TCAAP Quarterly/Annual Army Quality Assurance Reports	Schmitt, Mark Project Manager Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
12/13/91	Requirements for TCAAP Quarterly/Annual Army Quality Assurance Reports	Theodore E. Schulte Commander's Representative Department of the Army	Plant Manager Federal Cartridge Company Twin Cities Army Ammunition Plant		

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12/18/91	TCAAP Production Well Reconstruction or Abandonment	Schulte, Theodore E. Commander's Representative Department of the Army	Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)		
12/26/91	Response to Agency Review Comments Water Management Study, Phase II	Nicklin, Michael E. Principal Engineer J.M. Montgomery Consulting Engineers, Inc.	Barounis, Thomas Remedial Project Manager United States Environmental Protection Agency		
12/26/91	Response to Agency Review Comments, Water Management Study, Phase II	Nicklin, Michael E. Principal Engineer J.M. Montgomery Consulting Engineers, Inc.	Schmitt, Mark Project Manager Minnesota Pollution Control Agency		
01/00/92	Preliminary Report of Findings Site F Soils Investigation TCAAP.	Wenck Associates, Inc.			
01/10/92	TCAAP Water Management Study Phase II, Final Report	Schulte, Theodore E. Commander's Representative Department of the Army	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Schmitt, Mark (Project Manager, Minnesota Pollution Control Agency)		
02/04/92	Technical Support Services for Installation Restoration Program: Task 4 - Develop a Groundwater Model in Support of Feasibility Study for TCAAP and Vicinity	Engineering Technologies Associates, Inc.		DAAA15-89-D-0009/0004	
02/05/92	Federal Facilities Agreement Modifications	Schmitt, Mark (Project Leader, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)	McCleery, Martin Remedial Project Manager Department of the Army		
02/11/92	Request to Abandon Gravel Pit Wells	Schmitt, Mark Project Manager Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
02/14/92	Federal Facilities Agreement Modifications	Fix, Michael R.	Barounis, Thomas		

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		Acting Commander's Representative Department of the Army	United States Environmental Protection Agency		
02/14/92	Federal Facilities Agreement Modifications	Fix, Michael R. Acting Commander's Representative Department of the Army	Schmitt, Mark Project Manager Minnesota Pollution Control Agency		
02/14/92	Federal Facilities Agreement Minor Modifications (Exhibit 1)	Department of Army Minnesota Pollution Control Agency United States Environmental Protection Agency			
02/24/92	Department of Natural Resources Amended Water Appropriation Permit #87-6048	Milles, David B. Supervisor, Permits Unit Department of Natural Resources	Schulte, Theodore E. Commander's Representative Department of the Army		
03/00/92	Plume Groundwater Recovery System Design Data Collection Study	Conestoga-Rovers & Associates, Inc. Barr Engineering Company			12
03/03/92	Federal Facilities Agreement Attachment 4 Modifications	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Schmidt, Mark (Project Manager, Minnesota Pollution Control Agency)	McCleery, Martin Remedial Project Manager Department of the Army		
03/03/92	TCAAP Project Managers Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
03/13/92	Request to Abandon Gravel Pit Wells	Barounis, Thomas Remedial Project Manager United States Environmental Protection Agency	McCleery, Martin Remedial Project Manager Department of the Army		
03/25/92	Off-Post Well Elevations	Schulte, Theodore E. Commander's Representative Department of the Army	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Schmit, Mark (Project Manager, Minnesota Pollution Control Agency)		

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04/00/92	TCAAP Feasibility Study, Final Work Plan, Data Item A003, Contract No. DAAA 15-90-D-0011, Delivery Order	J.M. Montgomery Consulting Engineers, Inc.		DAAA 15-90-D-0011	
04/07/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
04/07/92	Groundwater Model in Support of Feasibility Study - Modeling Progress	Engineering Technologies Associates, Inc.		DAAA-15-89-D-0009/0004	12
05/05/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
05/11/92	Federal Facilities Agreement Amendment No. 1	Theodore E. Schulte Commander's Representative Department of the Army	Barounis, Thomas United States Environmental Protection Agency		
05/14/92	OU-3 Feasibility Study	Conestoga-Rovers & Associates, Inc.		3877(4)	12
05/19/92	Potential New Brighton/Fridley Interconnection	Beasley, John H. Lieutenant Colonel Department of the Army	City Council of the City of Fridley		
06/02/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
06/08/92	Federal Facilities Agreement - Amendment No. 1	Theodore E. Schulte Commander's Representative Department of the Army			
06/09/92	Consistency Test for TCAAP Feasibility Study Work Plan	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Romano, Dagmar (Project Manager, Minnesota Pollution Control Agency)	McCleery, Martin Remedial Project Manager Department of the Army		

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		Protection Agency			
07/21/92	Consistency Test for TCAAP Feasibility Work Plan - Satisfaction of Conditions 1 and 2	Schulte, Theodore E. Commander's Representative Department of the Army	Barounis, Thomas (U.S. EPA) Romano, Dagmar (Minnesota Pollution Control Agency)		
07/22/92	Work Plan for Feasibility Study, New Brighton/Fridley Water Distribution System Interconnection	Barr Engineering Company Howard, Needles, Tammeno, Bergendoff			
08/00/92	Development of a Groundwater Model in Support of the Feasibility Study for TCAAP and Vicinity	Engineering Technologies Associates, Inc.		Contract No. DAAA15-89-D-0009/0004	
08/00/92	Statement of Work, TCAAP Well Inventory Phase II	S.S. Papadopolous & Associates, Inc.			
08/04/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
08/17/92	Final Work Plan for Feasibility Study New Brighton/Fridley Water Distribution System	Barr Engineering Company; Howard Needles Tammen & Bergendoff			
09/01/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
09/15/92	Inventory of Water-Supply Wells in the Vicinity of TCAAP - Phase I Report	S.S. Papadopolous & Associates, Inc.			
09/18/92	Inventory of Water-Supply Wells in Vicinity of TCAAP, Phase I Report	Fix, Michael R. Commander's Representative Department of the Army	Romano, Dagmar (Project Manager, Minnesota Pollution Control Agency) Barounis, Thomas (Remedial Project Manager, U.S. EPA)		
09/23/92	Abandonment of Gravel Pit Wells	Sweesy, George Plant Manager	Commander's Representative Department of the Army		

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		Federal Cartridge Company			
09/24/92	Abandonment of Gravel Pit Wells	Schulte, Theodore E. Commander's Representative Department of the Army	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Romano, Dagmar (Project Manager, Minnesota Pollution Control Agency)		
09/30/92	TCAAP On-Plant and Off-Post Monitoring Wells	Kemper & Associates, Inc.			
09/30/92	Consistency Test for TCAAP Feasibility Study Work Plan - Satisfaction of Condition No. 3	Schulte, Theodore E. Department of the Army	Barounis, Thomas (U.S. EPA) Romano, Dagmar (Minnesota Pollution Control Agency)		
09/30/92	Record of Decision: Final Remedial Measure - OU-3 - Plume Groundwater Recovery System	Walker, Lewis D./Adamkus, Valdas V./Jepsen, Cynthia C. Department of the Army; U.S. Environmental Protection Agency Minnesota Pollution Control Agency			12
10/00/92	FY 1991 Annual Monitoring Report	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
10/06/92	TCAAP Technical Review Committee Meeting Minutes	McCleery, Martin Remedial Project Manager Department of the Army			
10/08/92	Consistency Test for FY 1991 Annual Monitoring Report/FY 1993 Annual Monitoring Plan for TCAAP	Barounis, Thomas (Remedial Project Manager, U.S. EPA) Romano, Dagmar (Project Manager, MCPA)	McCleery, Martin Remedial Project Manager Department of the Army		
10/20/92	Minnesota Pollution Control Agency Comments on S.S. Papadopolous & Associates, Inc. Inventory of Water Supply Wells, Phase I Report	Romano, Dagmar Plant Manager Minnesota Pollution Control Agency	McCleery, Martin Remedial Project Manager Department of the Army		
10/21/92	U.S. EPA Review of S.S. Papadopolous & Associates, Inc. Inventory of Water Supply Wells, Phase I Report	Barounis, Thomas Remedial Project Manager	McCleery, Martin Remedial Project Manager		

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		Protection Agency			
09/08/93	Technical Review Committee Meeting Minutes	Department of the Army			
10/05/93	Technical Review Committee Meeting Minutes	Department of the Army			

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TAB 2

Site-Specific Documentation - Studies By Author:

Argonne National Laboratory

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
02/00/88	Installation Restoration Program, Preliminary Assessment, TCAAP	Argonne National Laboratory		W-31-109-ENG-38/AMXTH-IR-CR-88 002	10
02/00/88	Installation Restoration Program, Preliminary Assessment, TCAAP: Supplement	Argonne National Laboratory		W-31-109-ENG-38/AMXTH-IR-CR-88 002	10
02/12/88	Installation Restoration Program, Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, TCAAP, Appendices	Biang, R.P., et al. Argonne National Laboratory		AMXTH-IR-CR-88004	
06/00/88	Installation Restoration Program, Quality Assurance Project Plan, Remedial Investigation/Feasibility Study, TCAAP	Biang, et al. Argonne National Laboratory		AMXTH-IR-CR-88004/ANL-EES-LD-6	
06/00/88	Installation Restoration Program, Remedial Investigation Work Plan for TCAAP	Argonne National Laboratory		AMXTH-IR-CR-88003; ANL/EES-LD-5	09
03/00/91	Modeling Groundwater Flow for the TCAAP Site and Vicinity	Argonne National Laboratory			
04/00/91	Installation Restoration Program, Remedial Investigation, TCAAP: Volume 1 (Text); Volume 2 (Appendices A-F); Volume 3 (Appendix G); Volume 4 (Appendices H-I)	Biang, R.P., et al. Argonne National Laboratory		CETHA-IR-CR-91015; ANL/EAIS/LD-6	
06/00/91	Modeling Groundwater Flow for TCAAP and Vicinity	Durham, L.A., et al. Argonne National Laboratory		ANL/EAIS/TM-53	

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TAB 3

Site-Specific Documentation - Studies By Author:

Barr Engineering Company

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/16/82	Work Plan, Soil and Groundwater Investigation	Barr Engineering Company			01
03/30/83	Report on Water Supply System for St. Anthony, Minnesota	Bonestroo, Rosene, Anderlik & Associates, Inc. Barr Engineering Company			03
01/00/84	Summary Report, Treatment of the Municipal Water Supply at New Brighton by Granular Activated Carbon	Barr Engineering Company			05
03/29/91	Preliminary Evaluation of Combined Demand for Potable Water Cities of New Brighton and Fridley, Minnesota	Barr Engineering Company			
05/30/91	Work Plan for Plume Groundwater Recovery System Treatment System Design Data Collection	Barr Engineering Company			
09/00/91	Plume Groundwater Recovery System Alternatives Evaluation	Conestoga-Rovers & Associates, Inc. Barr Engineering Company		3877(2)	
03/00/92	Plume Groundwater Recovery System Design Data Collection Study	Conestoga-Rovers & Associates, Inc. Barr Engineering Company			12
07/22/92	Work Plan for Feasibility Study, New Brighton/Fridley Water Distribution System Interconnection	Barr Engineering Company Howard, Needles, Tammeno, Bergendoff			
08/17/92	Final Work Plan for Feasibility Study New Brighton/Fridley Water Distribution System	Barr Engineering Company; Howard Needles Tammen & Bergendoff			
11/00/92	Contract Documents Plume Groundwater Recovery System Water Treatment Facility	Barr Engineering Company			
02/00/93	Feasibility Evaluation New Brighton-Fridley Water Supply System Interconnection	Barr Engineering Company Maier-Stewart Associates, Inc.			
06/00/93	Addendum I: Final Report Feasibility Evaluation New Brighton-Fridley Water Supply System Interconnection	Barr Engineering Company Maier-Stewart Associates, Inc.			

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TAB 4

Site-Specific Documentation - Studies By Author:

Camp, Dresser & McKee, Inc.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
01/00/85	Technical Work Plan Submittal, New Brighton/Arden Hills Force Main Remedial Investigation (Volume I)	Camp, Dresser & McKee, Inc.			09
02/00/85	Project Operation Plan for New Brighton/Arden Hills Multi-Point Source Remedial Investigation	Camp, Dresser & McKee, Inc.			12
05/00/85	New Brighton/Arden Hills Phase I Multi-Point Source Remedial Investigation and Revisions	Camp, Dresser & McKee, Inc.			04
05/01/85	Work Plan for New Brighton Municipal Well No. 7 Phased Feasibility Study	Camp, Dresser & McKee, Inc.		Doc. No. 108-WP1-WP-BBJK-1; Work Assignment 102-5L40	12
05/08/85	Work Plan for New Brighton/Arden Hills Generic Technical Support for Document Review, New Brighton, Minnesota	Camp, Dresser & McKee, Inc.		Doc. No. 108-WP1-BBNQ-1; Work Assignment No. 102-5L40	12
04/25/86	Work Plan for New Brighton/Arden Hills Mulit-Point Source Remedial Investigation Phase I Addendum	Camp, Dresser & McKee, Inc.			04
05/05/86	Phased Feasibility Study for Alternative Water Supply, New Brighton Well No. 7	Camp, Dresser & McKee, Inc.		Doc. No. 108-FS1-RT-CPBQ-1; Work Assignment 102-5L4D.8	04
10/20/86	Phase I Final Report: New Brighton/Arden Hills, Minnesota Multi-Point Source Remedial Investigation	Camp, Dresser & McKee, Inc.			
12/10/86	Phased Feasibility Study for St. Anthony	Camp, Dresser & McKee, Inc.		Doc. No. 708-FS2-RT-DCTC-1; Work Assignment No. 102-SL40.10	05
10/00/87	Remedial Design Work Plan for Alternate Water Supply Volume I - Technical Submittal for New Brighton/Arden Hills	Camp, Dresser & McKee, Inc.		Doc. #108-PP1-WP-FJGP-1; Work Assignment 420-5N40	12
02/29/88	Phase IA Piezometer Report New Brighton/Arden Hills Multi-Point Source Remedial Investigation	Camp, Dresser & McKee, Inc.			
05/00/88	Design Report for New Brighton/Arden Hills, St. Anthony Remedial Design	Camp, Dresser & McKee, Inc.		Doc. #108-DE1-RT-GBRL-1; Work Assignment 420-5N40	12
12/00/88	Final Remedial Investigation Report for New	Camp, Dresser & McKee, Inc.		Doc. No. 108-R11-RT-GSWG-1;	04

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Brighton/Arden Hills TCAAP Force Main			Work Assignment No. 102-5L40	
02/00/91	Phase IA Multi-Point Source Groundwater Remedial Investigation, New Brighton/Arden Hills, Minnesota	Camp, Dresser & McKee, Inc.			12

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TAB 5

Site-Specific Documentation - Studies By Author:

Conestoga-Rovers & Associates, Inc.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
07/00/83	Phase I - Sampling Program, Storm Sewer Discharge TCAAP Bldg. 103	Conestoga-Rovers & Associates, Inc.		1219	03
09/01/83	Final Report Phase I - PCB Sampling Program Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1219	12
10/00/83	Twin Cities Army Ammunition Plant Bldg. 103, Final Report Phase I - Sampling Program Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.		1244	12
11/24/83	Phase II - Sampling Program, Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1282	12
03/14/84	Regional Remedial Investigation	Conestoga-Rovers & Associates, Inc.		1372	03
04/18/84	Definition of Volatile Organics in Soil Bldgs. 502 TCAAP	Haycock, Donald H. Conestoga-Rovers & Associates, Inc.	Jaska, James Environmental Manager Honeywell	1282	03
06/00/84	Final Report Remedial PCB Investigation/Feasibility Study Bldg. 502 and Vicinity, TCAAP Environmental Investigation	Conestoga-Rovers & Associates, Inc.		1282	12
08/00/84	Twin Cities Army Ammunition Plant Bldg. 103, Remedial Investigation Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.		1281	12
08/00/84	Twin Cities Army Ammunition Plant Bldg. 103 Remedial Feasibility Study, Bldg. 103 Storm Sewer Discharge	Conestoga-Rovers & Associates, Inc.			
10/00/84	Twin Cities Army Ammunition Plant Bldg. 502, Remedial Feasibility Study Bldg. 502 Sewers	Conestoga-Rovers & Associates, Inc.		1251	12
10/00/84	TCAAP Bldg. 502, Baseline Study, Assessment of Sewer Water and Sediment Control	Conestoga-Rovers & Associates, Inc.		1251	12
12/00/84	TCAAP Bldg. 103, Supplemental Remedial Investigation/Feasibility Study, Bldg. 103	Conestoga-Rovers & Associates, Inc.		1281	12
01/00/85	TCAAP Bldg. 103 Remedial Work Plan	Conestoga-Rovers & Associates, Inc.		1496	12

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
01/00/85	TCAAP Bldg. 103, Addendum to Supplemental Remedial Investigation/Feasibility Study, Bldg. 103	Conestoga-Rovers & Associates, Inc.		1281	12
03/00/85	TCAAP Bldg. 103, Final Engineering Report, Sewer Grouting Program Bldg. 103	Conestoga-Rovers & Associates, Inc.		1496	12
03/00/85	Volatile Organic Compound, Remedial Investigation, TCAAP Bldg. 502 and Vicinity	Conestoga-Rovers & Associates, Inc.		1461	12
03/29/85	TCAAP Bldg. 502, Final Engineering Report, Sewer Cleaning Program, Bldg. 502 (Appendices E, F & G)	Conestoga-Rovers & Associates, Inc.		1498	
03/29/85	TCAAP Bldg. 502, Final Engineering Report, Sewer Cleaning Program Bldg. 502 (Appendices A, B, C & D)	Conestoga-Rovers & Associates, Inc.		1498	
05/00/85	Contract Documents and Specifications, Installation of Groundwater Collection Drain Bldg. 103	Conestoga-Rovers & Associates, Inc.			04
06/00/85	TCAAP Groundwater Remediation Program, Area Investigation: Off-TCAAP	Conestoga-Rovers & Associates, Inc.		1499	06
09/00/85	Off-TCAAP Study, Phase I: 96-10-8 Triangle	Conestoga-Rovers & Associates, Inc.		1500	12
10/00/85	TCAAP Bldg. 103, Final Engineering Report, Installation of Groundwater Collection Drain Bldg. 103	Conestoga-Rovers & Associates, Inc.		1496	
10/00/85	Final Response Action Plan PCB Remediation Blgd. 502 TCAAP	Conestoga-Rovers & Associates, Inc.		1482	12
11/00/85	Volatile Organic Compound Source Control, Remedial Aaction Plan, TCAAP Bldg. 502	Conestoga-Rovers & Associates, Inc.		1499	04
02/00/86	Extraction Well Pumping Test Report (EW542U3), TCAAP Bldg. 502, Groundwater Remediation Program	Conestoga-Rovers & Associates, Inc.		1499	12
02/00/86	TCAAP, Groundwater Remediation Program Phase I Proposal	Conestoga-Rovers & Associates, Inc.		1412	06

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
04/00/87	Off-TCAAP, Phase II, Old Miller Dump Site, Data Report	Conestoga-Rovers & Associates, Inc.		1638	09
04/01/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Extraction Well Pumping Report	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	06
07/00/87	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Start-Up, Operation and Maintenance Manual (Vol. I) and Programmable Control Manual (Vol. II)	Conestoga-Rovers & Associates, Inc.			08
08/00/87	Off-TCAAP Study, Phase III: Plume Definition Report (Volumes I and II)	Conestoga-Rovers & Associates, Inc.		1695	04
11/00/87	Volatile Organic Compound Remedial Investigation Addendum, Kendall Degreaser Investigation, Bldg. 502, TCAAP	Conestoga-Rovers & Associates, Inc.		1499	09
11/00/87	Interim Remedial Action-Boundary Groundwater Recovery System: Monitoring Plan, TCAAP	Conestoga-Rovers & Associates, Inc.		DAA09-76-0030	
11/00/87	Installation Restoration Program, Boundary Groundwater Recovery System, Quality Assurance Project Plan, Interim Remedial Action Monitoring Program, TCAAP	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	04
02/00/88	Installation Restoration Program, TCAAP, Boundary Groundwater Recovery System Modification and TCAAP Groundwater Recovery System Contract Documents and Specifications	Conestoga-Rovers & Associates, Inc.			
02/18/88	Interim Remedial Action - Boundary Groundwater Recovery System Water Balance Report	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	04
02/19/88	Interim Remedial Action - Boundary Groundwater Recovery System Monitoring Plan	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	04
04/00/88	Installation Restoration Program, TCAAP, Boundary	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Groundwater Recovery System, Quality Assurance Project Plan, Interim Remedial Action Monitoring Program TCAAP				
05/00/88	Interim Remedial Action - Boundary Groundwater Recovery System Performance Assessment Report	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	
10/28/88	Pumping Rates for Modified Boundary Groundwater Recovery System	Boevers, Brian; Rovers, Frank; Petrie, John; Haycock, Don and Fedy, Bob Conestoga-Rovers & Associates, Inc.	Sola, Don Conestoga-Rovers & Associates, Inc.	2687-31	
06/21/89	Focused Feasibiltiy Study, TCAAP, Plume Groundwater Recovery System	Conestoga-Rovers & Associates, Inc.		2738	12
10/00/89	Interim Remedial Action, 1988 Boundary Groundwater Recovery System, Annual Monitoring Report and Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAAA09-76-E-0030	12
11/01/89	Aquifer Characterization Study, Off-TCAAP Study, Phase III: Supplement	Conestoga-Rovers & Associates, Inc.		1119	12
04/00/90	Installation Restoration Program, TCAAP, 1990 Annual Monitoring Plan (Volumes 1-3)	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
05/21/90	Interim Remedial Action, TCAAP Groundwater Recovery System, 1989 Annual Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	12
01/00/91	Recharge Test, TCAAP Site G	Conestoga-Rovers & Associates, Inc.		1687-22(18)	
01/00/91	Final Engineering Report: Boundary Groundwater Recovery System	Conestoga-Rovers & Associates, Inc.		1687-24 (9B)	
02/00/91	Installation Restoration Program-TCAAP Groundwater Recovery System: Interim Remedial Action-TCAAP Groundwater Recovery System 1990 Annual Monitoring Report (Volumes 1 & 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
06/00/91	Installation Restoration Program, TCAAP Groundwater Recovery System, Interim Remedial Action-TCAAP Groundwater Recovery System 1989 Annual Monitoring Report and Monitoring Plan (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	
07/00/91	Interim Remedial Action, TCAAP Groundwater Recovery System, Site 1 and Site K, Annual Monitoring Report (Volumes 1 and 2)	Conestoga-Rovers & Associates, Inc.		DAA09-76-E-0030	12
09/00/91	Plume Groundwater Recovery System Alternatives Evaluation	Conestoga-Rovers & Associates, Inc. Barr Engineering Company		3877(2)	
03/00/92	Plume Groundwater Recovery System Design Data Collection Study	Conestoga-Rovers & Associates, Inc. Barr Engineering Company			12
05/14/92	OU-3 Feasibility Study	Conestoga-Rovers & Associates, Inc.		3877(4)	12
07/00/92	TCAAP, OU-3 Feasibility Study	Conestoga-Rovers & Associates, Inc.		3877(4)	12
10/00/92	FY 1991 Annual Monitoring Report	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
03/00/93	TCAAP, OU-3, Plume Groundwater Recovery System Health and Safety Plan, Remedial Action and Construction	Conestoga-Rovers & Associates, Inc.		3877(6)	
05/00/93	TCAAP OU-3 Monitoring Plan	Conestoga-Rovers & Associates, Inc.		3877(7)	
07/00/93	Installation Restoration Program, TCAAP, FY 1992 Annual Monitoring Report	Wenck Associates, Inc./ Conestoga-Rovers & Associates, Inc.			

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TAB 6

Site-Specific Documentation - Studies By Author:

Engineering Technologies Associates, Inc.

(References are arranged in chronological order.)

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TAB 7

Site-Specific Documentation - Studies By Author:

James M. Montgomery Consulting Engineers, Inc./
Montgomery Watson

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
06/00/89	TCAAP Potable Water Management Study Phase I	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0070	
06/01/90	Addendum to TCAAP Water Management Study - Lake Augmentation	J.M. Montgomery Consulting Engineers, Inc.			
11/29/90	Focused Groundwater Model Work Scope	J.M. Montgomery Consulting Engineers, Inc.			
07/00/91	Groundwater Recharge Model for Evaluation of Groundwater Recharge Alternatives at TCAAP - Water Management Study Phase II	J.M. Montgomery Consulting Engineers, Inc.			
09/00/91	Installation Restoration Program TCAAP Water Management Study Phase II, Volume 1: Feasibility Study Report	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0410	
09/00/91	Installation Restoration Program TCAAP Water Management Study Phase II, Volume 2: Appendices	J.M. Montgomery Consulting Engineers, Inc.		Project No. 2449.0402	
12/00/91	TCAAP Water Management Study, Phase II (Volumes I and II)	J.M. Montgomery Consulting Engineers, Inc.			12
04/00/92	TCAAP Feasibility Study, Final Work Plan, Data Item A003, Contract No. DAAA 15-90-D-0011, Delivery Order	J.M. Montgomery Consulting Engineers, Inc.		DAAA 15-90-D-0011	
07/00/93	TCAAP, Feasibility Study, Final, OU-1 Feasibility Study	Montgomery Watson		Contract No. DAAA15-90-D-0011; Delivery Order 2	

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TAB 8

Site-Specific Documentation - Studies By Author:

PRC Environmental Management, Inc.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
04/00/91	Final Report Human Health Risk Assessment, New Brighton/Arden Hills, Superfund Site including TCAAP, Vols. I and II	PRC Environmental Management, Inc.		ARCS No. 68-W8-0084/Work Assignment No. 04-5P40	12

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TAB 9

Site-Specific Documentation - Studies By Author:

STS Consultants Ltd.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
00/00/00	Field Sampling Quality Assurance Guide	STS Consultants, Ltd.			
11/05/81	Review of Geologic and Hydrogeologic Data and Reports	STS Consultants, Ltd.		92765	01
05/16/83	TCAAP Environmental Contamination Survey Phase I Report: Vol. I (Contamination Rpt.); Vol. II (Geotechnical Rpt.); Vol. III (Geotechnical Appendix)	STS Consultants, Ltd.		DRXTH-AS-CR-83197	06
06/30/84	Environmental Contamination Survey Phase III Report: Vol. I (Source Assessment); Vol. II (Geotechnical Rpt.); Vol. III (Geotechnical Appendix); Vol. IV (Electrical Soil Resistivity Study); Vol. V (Source Assessment Appendix)	STS Consultants, Ltd.		Rpt. No. DRXTH-AS-CR-84289	03
10/00/84	Groundwater Remedial Action Alternative Analysis at TCAAP, Scope of Work	STS Consultants, Ltd.			06
01/09/85	Addendum Report to Source Assessment Volume I, Phase II, TCAAP	STS Consultants, Ltd.			06
04/00/85	Work Plan Groundwater Remedial Action Alternatives Analysis	STS Consultants, Ltd. D'Appolonia Ltd.		92797K	12
06/07/85	TCAAP Bedrock Valley Survey Vol. I (Contamination Report), Vol. II (Geotechnical Report); Vol. III (Geotechnical Appendix)	STS Consultants, Ltd.		AMXTH-AS-CR-85020; AMXTH-AS-CR-85019; AMXTH-AS-CR-850	09
02/00/86	Installation Restoration Program, TCAAP, Groundwater Remedial Action Alternatives Analysis	STS Consultants, Ltd.	Installation Restoration Program	AMXTH-AS-CR-86065	06
12/00/86	TCAAP, Bedrock Valley/Monitoring Well Installation Survey: Vol. I (Contamination Report); Vol. II (Geotechnical Report); Vol. III (Chemical Analytical Data); Vol. IV (Geotechnical Data)	STS Consultants, Ltd.		AMXTH-AS-CR-85020	06
12/00/87	Installation Restoration Program: TCAAP Contaminant Sources Remedial Investigation (Field Work) Geophysical Investigations Sites A-EH, 129-3; 129-5 and 129-15 and Geotechnical Data (Appendix)	STS Consultants, Ltd.		AMXTH-IR-CR-88005; STS Project No. 92797-XF	08

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
00/00/88	Off-Post Well Installations	STS Consultants, Ltd.		Proj. No. 92797-XA	
02/27/89	Pump Tests, TCAAP	STS Consultants, Ltd.		STS Proj. No. 92797-XA	

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TAB 10

Site-Specific Documentation - Studies By Author:

Wenck Associates, Inc.

(References are arranged in chronological order.)

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
09/00/85	Safety Plan for In-Situ Volatilization System at TCAAP	Wenck Associates, Inc.			08
09/00/85	Work Plan for In-Situ Volatilization System at TCAAP Sites D and G	Wenck Associates, Inc.			08
10/07/85	Work Plan For In-Situ Volatilization System at TCAAP Sites D and G (Revised)	Wenck Associates, Inc.			
04/00/86	Proposed Plan of Investigation of Site F, TCAAP (Site F Closure)	Wenck Associates, Inc.			
03/00/87	Feasibility Study of Carbon Treatment for New Brighton Municipal Wells	Wenck Associates, Inc.			09
09/00/89	Installation Restoration Program TCAAP 1988 Annual Monitoring Report (Volumes I - IV)	Wenck Associates, Inc.			
04/00/90	Installation Restoration Program, TCAAP, 1990 Annual Monitoring Plan (Volumes 1-3)	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
05/00/90	Installation Restoration Program, TCAAP, 1989 Annual Monitoring Report (Volumes I - III)	Wenck Associates, Inc.			12
07/00/91	Installation Restoration Program, TCAAP, Fiscal Year 1990 Annual Monitoring Report	Wenck Associates, Inc.			12
01/00/92	Preliminary Report of Findings Site F Soils Investigation TCAAP	Wenck Associates, Inc.			
10/00/92	FY 1991 Annual Monitoring Report	Wenck Associates, Inc. Conestoga-Rovers & Associates, Inc.			
07/00/93	Installation Restoration Program, TCAAP, FY 1992 Annual Monitoring Report	Wenck Associates, Inc./ Conestoga-Rovers & Associates, Inc.			

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TAB 11

Non-Site Specific Documents:

General Technical Documents and Literature

(References are arranged in chronological order.)

Note: Many documents identified on the Index for Non-Site Specific Documents are exempt from physical inclusion in the Administrative Record file. See 40 C.F.R. § 300.805(b). Those documents marked with an asterisk (*) in the far right-hand column are physically located in the Administrative Record file. Other documents are available in the public domain.

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/00	Non-Point Source Pollution in the Rice Creek Watershed District--The Results of 10 Years of Water Quality Monitoring; Wayzata, MN	Willenbring, P.R., et al. Eugene A. Hickok and Associates		12
00/00/35	The Relation Between the Lowering of the Piezometric Surface and the Rate of Duration of Discharge of a Well Using Groundwater Storage	Theis, C.V.	Trans. Am. Geophys. Union, V.16, p. 519-524	
00/00/64	Handbook of Applied Hydrology	Chow, Te Ven McGraw-Hill Book Co.		06
00/00/65	Geohydrology	John Wiley & Sons, Inc.		12
01/00/66	Surficial Geology of the New Brighton Quadrangle, Minnesota	Stone, J.E. Minnesota Geological Survey	Geologic Map Series, GM-2	12
00/00/67	"Response of a Finite-Diameter Well to an Instantaneous Charge of Water"	Cooper, H.H., Jr.	Water Resources, pp. 263-269	12
00/00/67	Drawdown Distribution Around a Large-Diameter Well;	S.S. Papadopolous & Associates, Inc.	Proceedings, Ground Water Symposium, American Water Resources Association, pp. 157-167	12
00/00/72	Groundwater Hydraulics	Lohman, S.W.	United States Geological Survey Professional Paper 708	12
00/00/72	Paleozoic Structure and Stratigraphy of the Twin City Region, Geology of Minnesota: A Centennial Volume	Mossler, J.H. (P.K. Sims and G.W. Morey, eds.)	pp. 485-497, St. Paul, MN	12
00/00/72	Quaternary History of Minnesota, Geology of Minnesota: A Centennial Volume	Wright, H.E. Jr. (P.K. Sims and G.W. Morey, eds.)	p. 515-547	12
00/00/72	The Dynamics of Fluids in Porous Media	American Elsevier Publishing Co.		12
00/00/72	Geologic Survey, New Brighton Quadrangle, 7.5 Minute Series (Topographic)	Department of Interior		01

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/72	Groundwater Resources In Minnesota, Geology of Minnesota: A Centennial Volume	Hogberg, R.K. (P.K. Sims and G.W. Morey-Eds.) Minnesota Geological Survey	pp. 595-602	12
00/00/73	A Galerkin Finite Element Simulation of Groundwater Contaminants on Long Island, New York	Pinder, G.F.	Water Resources Research, Vol. 9(6), pp. 1657-1669	06
00/00/75	Configuration of the Water Table and Distribution of Downward Leakage to the Prairie du Chien in the Minneapolis-St. Paul Metropolitan Area, Minnesota	D. Larson-Higdem, et al.	U.S.G.S. Open File Rpt. No. 75-342	
00/00/76	Hydrogeology of a Drift-Filled Bedrock Valley Near Lino Lakes, Anoka County, Minnesota	Winter, T.C. and Pfannkuch, H.O. United States Geological Survey		12
00/00/76	"A Case-Referent Study on Neuropsychiatric Disorders Among Workers Exposed to Solvents"	Axelson, O., et al.	Scandinavian Journal of Work and Environment Health (2:14-20)	
00/00/77	Modeling Chloride Movement in the Alluvial Aquifer at the Rocky Mountain Arsenal, Colorado	Konikow, L.F.	Water Supply Paper 2044, U.S. Geological Survey	06
00/00/78	Application of Digital Profile Modeling Techniques to Groundwater Solute Transport at Barstow, California	Robson, S.G.	Water Supply Paper No. 2050, U.S. Geological Survey	06
00/00/79	Hydraulics of Ground Water	Bear, Jacob McGraw-Hill Book Company		06
00/00/79	Groundwater	Freeze, R.A. and Cherry, J.A. Prentice-Hall		06
00/00/79	Sorption of Hydrophobic Pollutants on Natural Sediments	Kariekhoff, S.W., et al.	Water Research, Vol. 13, pp. 241-248	
00/00/80	Applied Hydrogeology Charles E. Merrill Publishing Co., Columbus, OH	Fetter, C.W., Jr.		06

DOC_DATE	TITLE	AUTHOR	REF#	XREF	
00/00/85	1:100,000 Scale Planimetric Map Series, Anoka and St. Paul, Minnesota	U.S. Geological Survey	Map #44093-A1-PL-600 and 44093-B1-TM-100		
05/00/85	In-Home Treatment Methods for Removing Volatile Organic Chemicals	Kent Sorrett et al.	Journal American Water Works Association, Vol. 77	04	
09/00/85	NIOSH Pocket Guide to Chemical Hazards	National Institute for Occupatonal Safety and Health	U.S. Government Printing Office, Washington, D.C.	12	
00/00/86	"Isotopic Investigation of Wells In and Around New Brighton, Minnesota"	Alexander, E.C. University of Minnesota		05	
00/00/86	"Sequential Dehalogenation of Chlorinated Ethenes"	Barrio-Lage, Gladys, et al. Florida International University	Environmental Science and Technology, Vol. 20, pp. 96-99		
00/00/86	Capture Zone Type Curves: A Tool for Aquifer Cleanup	Javandel, I. and Tsang, C.F.	Groundwater, Vol. 24, No. 5, pp. 616-625	06	
00/00/86	Modeling Remedial Actions at Uncontrolled Hazardous waste Sites	Boutwell, S.H., et al. Noyes Publications			
00/00/86	A Multi-Dimensional Finite-Element Code for Anlaysis of Coupled Fluid, Energy and Solute Transport (CFEST)	Gupta, S.K., et al.	Pacific Northwest Laboratory Rpt. No. PNL-4260		
00/00/86	Estimating Risk to Health. TCE in Drinking Water is Used as an Example.	Cothern, C.R., et al.	Environmental Science & Technology 20:111		
00/00/86	Groundwater and Wells	Driscoll, Fletcher G. Johnson Division		06	
02/00/86	Recommended Allowable Limits for Drinking Water	Minnesota Department of Health	Release No. 1	06	*
11/00/86	Groundwater Monitoring Report, October 1985-September 1986: General Mills East Hennepin Avenue Site	Barr Engineering Company			

DOC_DATE	TITLE	AUTHOR	REF#	XREF
04/19/93	Draft Health Risk Limits (HRLs)	Minnesota Department of Health		*

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TAB 12

Non-Site Specific Documents:

Agency for Toxic Substance and Disease Registry (ATSDR) - Toxicological Profiles

(References are arranged in chronological order.)

Note: Documents identified on the Index for Non-Site Specific Documents are exempt from physical inclusion in the Administrative Record file. See 40 C.F.R. § 300.805(b). The documents referenced on this list are available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161, (703) 487-4550.

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/88	Toxicological Profile for Benzene	Agency for Toxic Substances and Disease Registry	PB/88/208464/AS	
00/00/89	Toxicological Profile for 1,2 Dichloroethene	Agency for Toxic Substances and Disease Registry	PB/91/180364; PB/90/171422/AS	12
00/00/89	Toxicological Profile for Nickel	Agency for Toxic Substances and Disease Registry	PB/89/160378/AS	
00/00/89	Toxicological Profile for Cadmium	Agency for Toxic Substances and Disease Registry	PB/89/194476/AS	
00/00/89	Toxicological Profile for Arsenic	Agency for Toxic Substances and Disease Registry	PB/185708/AS	
00/00/89	Toxicological Profile for Methylene Chloride	Agency for Toxic Substances and Disease Registry	PB/89/194488/AS	
00/00/89	Toxicological Profile for Di (2-ethylhexyl)phthalate	Agency for Toxic Substances and Disease Registry	PB/89/194484/AS	
00/00/89	Toxicological Profile for Chloroform	Agency for Toxic Substances and Disease Registry	PB/89/160360/AS	
10/00/89	Toxicological Profile for Trichloroethylene	Agency for Toxic Substances and Disease Registry	ATSDR/TP-88/24; PB/90/127523/AS	12
00/00/90	Toxicological Profile for 1,1-Dichloroethene	Agency for Toxic Substances and Disease Registry	PB/90/182114/AS	12
00/00/90	Toxicological Profile for 1,1,1-Trichloroethane	Agency for Toxic Substances and Disease Registry	PB/91/180463/AS	12
00/00/90	Toxicological Profile for 1,1,2-Trichloroethane	Agency for Toxic Substances and Disease Registry	PB/90/196411/AS	12
00/00/90	Toxicological Profile for Zinc	Agency for Toxic Substances and Disease Registry	PB/90/171414/AS	
00/00/90	Toxicological Profile for Lead	Agency for Toxic Substances and Disease Registry	PB/90/267378/AS	
00/00/90	Toxicological Profile for Cyanide	Agency for Toxic Substances and Disease Registry	PB/90/162058/AS	
00/00/90	Toxicological Profile for Vinyl Chloride	Agency for Toxic Substances and Disease Registry	PB/90/103870/AS	
00/00/90	Toxicological Profile for Toluene	Agency for Toxic Substances and Disease Registry	PB/90/188904/AS	
00/00/90	Toxicological Profile for Tetrachloroethylene	Agency for Toxic Substances and Disease Registry	PB/90/247628/AS	
00/00/90	Toxicological Profile for Phenol	Agency for Toxic Substances and Disease Registry	PB/90/181249/AS	

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/90	Toxicological Profile for 1,2-Dichloroethane	Agency for Toxic Substances and Disease Registry	PB/90/171422/AS	
00/00/90	Toxicological Profile for Chlorothane	Agency for Toxic Substances and Disease Registry	PB/90/181264/AS	
00/00/90	Toxicological Profile for Carbon Tetrachloride	Agency for Toxic Substances and Disease Registry	PB/90/188196/AS	
00/00/90	Toxicological Profile for Bromodichloromethane	Agency for Toxic Substances and Disease Registry	PB/90/187481/AS	
12/00/90	Toxicological Profile for cis-1,2-Dichloroethene, trans-1,2-Dichloroethane and 1,2-Dichloroethane	Agency for Toxic Substances and Disease Registry	TP-90-13	
00/00/91	Toxicological Profile for 1,1-Dichloroethane	Agency for Toxic Substances and Disease Registry	PB/91/180539/AS	12
00/00/91	Toxicological Profile for Silver	Agency for Toxic Substances and Disease Registry	PB/91/180430/AS	
00/00/91	Toxicological Profile for Copper	Agency for Toxic Substances and Disease Registry	PB/91/180613/AS	
00/00/91	Toxicological Profile for Total Xylenes	Agency for Toxic Substances and Disease Registry	PB/91/181552/AS	
00/00/91	Toxicological Profile for Ethylbenzene	Agency for Toxic Substances and Disease Registry	PB/91/180372/AS	
00/00/91	Toxicological Profile for cis, trans-1,2-Dichloroethane	Agency for Toxic Substances and Disease Registry	PB/91/180364/AS	
00/00/91	Toxicological Profile for Di-n-butylphthalate	Agency for Toxic Substances and Disease Registry	PB/91/180521/AS	
00/00/93	Toxicological Profile for Vanadium	Agency for Toxic Substances and Disease Registry	PB/93/110880/AS	
00/00/93	Toxicological Profile for Thallium	Agency for Toxic Substances and Disease Registry	PB/93/110856/AS	
00/00/93	Toxicological Profile for Manganese	Agency for Toxic Substances and Disease Registry	PB/93/110781/AS	
00/00/93	Toxicological Profile for Cobalt	Agency for Toxic Substances and Disease Registry	PB/93/110724/AS	
00/00/93	Toxicological Profile for Barium	Agency for Toxic Substances and Disease Registry	PB/93/110658/AS	

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/93	Toxicological Profile for Antimony	Agency for Toxic Substances and Disease Registry	PB/93/110641/AS	
00/00/93	Toxicological Profile for 2-Butanone	Agency for Toxic Substances and Disease Registry	PB/93/110708/AS	

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TAB 13

Non-Site Specific Technical Documents:

U.S. EPA - Guidance Documents, Regulations, Health Effects Documents, Health Effects Assessments and Other Documents.

Note: Documents identified on the Index for Non-Site Specific Technical Documents are exempt from physical inclusion in the Administrative Record file, unless otherwise indicated. See 40 C.F.R. § 300.805(b). Those documents marked with an asterisk (*) in the far right-hand column are physically located in the Administrative Record file. Other documents may be obtained from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 (703) 487-4650.

DOC_DATE	TITLE	AUTHOR	REF#	XREF
00/00/00	Manual of Ground-Water Sampling Procedures	United States Environmental Protection Agency Kerr, Robert S. Environmental Research Laboratory Ada, Oklahoma	NWWA/EPA Series	12
00/00/00	Health Effects Assessment for 1,1,2-Trichloroethane	United States Environmental Protection Agency	PB86-134566	12
00/00/75	Use of the Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites	United States Environmental Protection Agency	U.S. EPA Publication No. 530 SW-168	06
12/00/79	Water-Related Environmental Fate of 129 Priority Pollutants	Office of Water Planning and Standards Office of Water and Waste Management United States Environmental Protection Agency		12
00/00/80	Ambient Water Quality Criteria Document for Dichloroethylene	United States Environmental Protection Agency	PB81-117525	
00/00/83	Treatment of Volatile Organic Compounds In Drinking Water	United States Environmental Protection Agency	EPA-600/8-83-019	04
03/00/83	Methods for Chemical Analysis of Water and Wastes	United States Environmental Protection Agency	EPA-600/4-79-020	06
05/00/83	Preparation of Soil Sampling Protocol: Techniques and Strategies	Environmental Monitoring Systems Laboratory United States Environmental Protection Agency	EPA-600/4-83-020	12
00/00/84	State of the Art Aquifer Restoration Volume II	United States Environmental Protection Agency		
00/00/84	Groundwater Protection Strategy	Office of Groundwater Protection United States Environmental Protection Agency		12
00/00/84	Health Effects Assessment Document for Trichloroethylene	United States Environmental Protection Agency	EPA-5540/1-86-046	04
02/00/84	Health Assessment Document for 1,1,1-Trichloroethane (Methyl Chloroform) (Final Report)	United States Environmental Protection Agency	PB84-1853565; EPA 600/8-82-003F	12
03/00/84	Test Method For the Determination of Inorganic Anions in Water by Ion Chromatography, Method 300.0	United States Environmental Protection Agency	EPA-600/4-84/017	
03/00/84	Aeration to Remove Volatile Organic Compounds from Groundwater - Interim Report to Office of Drinking Water	Love, Thomas O. United States Environmental Protection Agency		04

DOC_DATE	TITLE	AUTHOR	REF#	XREF
06/12/84	National Primary Drinking Water Regulations: Volatile Synthetic Organic Chemicals	United States Environmental Protection Agency	Fed. Reg. 50(114): 24330	
09/00/84	Health Effects Assessment for 1,1,1-Trichloroethane	United States Environmental Protection Agency	PB86-134566; EPA 540/1-86-005	
09/00/84	Health Effects Assessments for 1,2-Dichloroethane	United States Environmental Protection Agency	PB86-134160; EPA 86-134137	12
10/26/84	Methods for Organic Analysis of Municipal and Industrial Wastewater	United States Environmental Protection Agency	EPA Publication No. 600/4-82-057, Method 624 (49 F.R. 43323-43384)	05
10/26/84	Methods for Organic Compounds in Municipal Water and Industrial Wastewater	United States Environmental Protection Agency	EPA Publication No. 600/4-82-057, Methods 601 (49 F.R. 43261-43271)	05
06/00/85	Guidance on Feasibility Studies Under CERCLA	United States Environmental Protection Agency	EPA/540/G-85/003	04
07/00/85	Health Assessment Document for Trichloroethylene (Final Report)	United States Environmental Protection Agency	PB-85-249696; EPA 600/8-82-006F	12
08/00/85	Health Assessment Document for Vinylidene Chloride	United States Environmental Protection Agency	(Final Report) EPA 600/8-83/031F	12
11/00/85	National Primary Drinking Water Regulations: Volatile Synthetic Organic Chemicals	United States Environmental Protection Agency	40 CFR Part 141; Federal Register 40 (210): 46880-46933	05
11/00/85	National Primary Drinking Water Regulations: Synthetic Organic Chemicals, Inorganic Chemicals and Microorganisms	United States Environmental Protection Agency	40 CFR Part 141; Federal Register 50 (219): 46936-47022	05
00/00/86	Fate and Transport of Substances Leaking from Underground Storage Tanks	Camp, Dresser & McKee, Inc. Office of Underground Storage Tanks United States Environmental Protection Agency		12
00/00/86	Superfund Public Health Evaluation Manual	Office of Emergency and Remedial Response United States Environmental Protection Agency	EPA 540/1-86/060	

DOC_DATE	TITLE	AUTHOR	REF#	XREF
05/00/86	Quality Criteria for Water 1986	United States Environmental Protection Agency	EPA 440/5-86-001	
09/00/86	Water Pollution Control: National Primary Drinking Water Regulations; Radionuclides	United States Environmental Protection Agency	40 CFR part 141; Federal Register 51 (189): 34836-34862	
11/00/86	Test Methods For Evaluating Solid Wastes: Physical/Chemical Methods (3rd. Ed.)	United States Environmental Protection Agency	EPA/SW-846	
06/00/87	Addendum to the Health Assessment Document for Trichloroethylene: Updated Carcinogenicity Assessment for Trichloroethylene (External Review Draft)	United States Environmental Protection Agency	EPA 600/8-82-006FA	12
07/09/87	Memorandum from J. Winston Porter, Office of Solid Waste and Emergency Response, Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements	United States Environmental Protection Agency		12
10/00/87	Remedial Action Costing Procedures Manual	Office of Solid Waste and Emergency Response United States Environmental Protection Agency	EPA/600/8-87/049	
00/00/88	Interim Guidance for Conducting Remedial Investigation/Feasibility Study under CERCLA	Office of Emergency and Remedial Response United States Environmental Protection Agency	EPA/540/G-89/004; OSWER Directive 9355.3-10	
06/00/88	Community Relations In Superfund: A Handbook	Office of Emergency and Remedial Response United States Environmental Protection Agency	EPA/540/G-88/002; OSWER Directive 9230.0-3B	
08/00/88	CERCLA Compliance With Other Law Vol. 1	Office of Emergency and Remedial Response United States Environmental Protection Agency		
10/00/88	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final)	United States Environmental Protection Agency	OSWER Directive 9355.3-01	
00/00/89	Risk Assessment Guidance for Superfund Vol. II, Environmental Evaluation Manual	Office of Emergency and Remedial Response United States Environmental Protection Agency	EPA/540/1-89/001	
00/00/89	CERCLA Compliance With Other Laws Manual: Part II; Clean Air	Office of Solid Waste and Emergency Response		12

DOC_DATE	TITLE	AUTHOR	REF#	XREF
	Act and Other Environmental Statutes and State Requirements	United States Environmental Protection Agency		
03/00/89	Risk Assessment Guidance for Superfund--Environmental Evaluation Manual, Interim Final	United States Environmental Protection Agency		
06/15/89	Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites	United States Environmental Protection Agency Office of Solid Waste and Emergency Response	OSWER Directive 9355.0-28	*
07/00/89	Risk Assessment Guidance for Superfund--Environmental Evaluation Manual, Interim Final	United States Environmental Protection Agency		
12/00/89	Applicability of Land Disposal Restrictions to RCRA and CERCLA Groundwater Treatment Reinjection	Office of Solid Waste and Emergency Response United States Environmental Protection Agency	Directive #9234, 1-06	
12/00/89	Guide for Conducting Treatability Studies under CERCLA	United States Environmental Protection Agency	EPA/540/2-89/058	
12/00/89	Characterization of Hazardous Waste Sites - A Methods Manual: Vol. II - Available Sampling Methods (Second Ed.)	Environmental Monitoring Systems Laboratory United States Environmental Protection Agency	EPA 600/4-84-076; PB 83-206979	
12/00/89	Risk Assessment Guidance for Superfund, Vol. 1, Human Health Evaluation Part A	Office of Emergency and Remedial Response United States Environmental Protection Agency	EPA/540/1-89/002	
12/00/89	CERCLA Compliance With Other Laws Manual Part II: Clean Air Act and Other Environmental Statutes and State Requirements	Office of Solid Waste and Emergency Response United States Environmental Protection Agency		
12/00/89	Characterization of Hazardous Waste Sites--A Methods Manual: Volume II; Available Sampling Methods, Second Edition	Environmental Monitoring Systems Laboratory United States Environmental Protection Agency	EPA 600/4-84-076; PB83-206979	
05/00/90	Management of Investigation-Derived Waste During Site Investigations	United States Environmental Protection Agency	EPA/540/G-91/009	
12/03/90	Final Guidance on Administrative Records for Selecting CERCLA Response Actions	Office of Solid Waste and Emergency Response United States Environmental Protection Agency	Dir. #9833.3A-1; PB-139121	
03/00/91	Compendium of CERCLA Response Selection Guidance Documents -	Office of Waste Programs Enforcement	PB92-102052/9833.4	*

DOC_DATE	TITLE	AUTHOR	REF#	XREF
	Users Manual	United States Environmental Protection Agency		
01/00/92	Guide To Management of Investigation - Derived Wastes	Office of Solid Waste and Emergency Response United States Environmental Protection Agency	9343.3-03FS	
05/00/93	Chemical Assessment and Related Activities Database	Office of Health and Environmental Assessment, United States Environmental Protection Agency	OHEA-1-127	*

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TAB 14

Public Participation Documents

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
00/00/00	TCAAP Compendium of Newspaper Articles and Press Releases Relating to Environmental Investigation and Remediation				01
05/00/86	Superfund Program Fact Sheet, New Brighton Well No. 7	United States Environmental Protection Agency			04
08/21/86	TCAAP Tour of Environmental Cleanup of Groundwater Contamination Projects	Department of the Army			
04/28/87	TCAAP Community Relations Plan: Mailing List	Brustman, Susan M. Public Information Officer Minnesota Pollution Control Agency	Powell, Paul Department of the Army		
05/12/87	TCAAP Fact Sheet: TCAAP	Office of Public Affairs Department of the Army		87-05	
05/12/87	TCAAP Fact Sheet: TCAAP Site Geology and Hydrogeology	Office of Public Affairs Department of the Army		87-03	
05/12/87	TCAAP Fact Sheet: Glossary - Abbreviations Relating to TCAAP Environmental Cleanup	Office of Public Affairs Department of the Army		87-02	
05/12/87	TCAAP Fact Sheet: Boundary Groundwater Recovery System	Office of Public Affairs Department of the Army		87-01	
05/12/87	TCAAP Fact Sheet: Installation Restoration Program Background	Office of Public Affairs Department of the Army		87-04	
05/15/87	TCAAP Fact Sheet, Bldg. 103 Groundwater Collection/Treatment System and TCAAP Sewers	Office of Public Affairs Department of the Army		87-07	
05/15/87	TCAAP Fact Sheet: Farmstead Wells	Office of Public Affairs Department of the Army		87-06	
05/15/87	TCAAP News Release: Public Notice of Draft Record of Decision and Public Meeting Concerning the Boundary Groundwater Recovery System at TCAAP	Office of Public Affairs Department of the Army		87-01	
05/15/87	TCAAP News Release: TCAAP Sets 5/20/87 Public Meeting	Office of Public Affairs		87-02	

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	on Groundwater Recovery System	Department of the Army			
05/15/87	TCAAP News Release: Army Document Now Available for Public Review	Office of Public Affairs Department of the Army		87-03	
05/15/87	TCAAP News Release: TCAAP Hotline Established	Office of Public Affairs Department of the Army		87-04	
05/15/87	TCAAP News Release: TCAAP Mailing Lists for Concerned Citizens	Office of Public Affairs Department of the Army		87-05	
05/15/87	TCAAP News Release: Information Repositories	Office of Public Affairs Department of the Army		87-06	
05/15/87	TCAAP Fact Sheet: Army Expenditures at TCAAP	Office of Public Affairs Department of the Army		87-12	
05/15/87	TCAAP Fact Sheet: In-Situ-Volatilization	Office of Public Affairs Department of the Army		87-11	
05/15/87	TCAAP Fact Sheet: Bldg. 502 Purge Well, Air Stripping Tower; Bldg. 502-Volatile Organic Compound Source Control	Office of Public Affairs Department of the Army		87-10	
05/15/87	TCAAP Fact Sheet: Basewide Groundwater Treatment System	Office of Public Affairs Department of the Army		87-09	
05/15/87	TCAAP Fact Sheet: TCAAP Groundwater Collection and Treatment System Bldg. 103; Bldg. 103 Volatile Organic Compound Remediation	Office of Public Affairs Department of the Army		87-08	
05/19/87	Statement of Lewis D. Walker before the Minnesota Pollution Control Agency	Walker, Lewis D. Department of the Army			06
05/20/87	TCAAP Fact Sheet: Cleanup Actions at TCAAP	Office of Public Affairs Department of the Army		87-13	

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
05/20/87	Environmental Impact Hearing Held by TCAAP				06
06/08/87	TCAAP News Release: Video of TCAAP Public Meeting Schedule for Public Viewing	Office of Public Affairs Department of the Army		87-08	
06/08/87	TCAAP News Release: Video of TCAAP Public Meeting Schedule for Public Viewing	Office of Public Affairs Department of the Army		87-07	
06/22/87	TCAAP News Release: Final Record of Decision and Responsiveness Summary on Boundary Groundwater Recovery System Available For Public Review	Office of Public Affairs Department of the Army		87-10	
06/26/87	TCAAP News Release: Army Document Now Available for Public Review	Office of Public Affairs Department of the Army		87-13	
07/00/87	TCAAP Public Involvement and Response Plan	Department of the Army			
07/16/87	TCAAP Office of Public Affairs Mailing List	Office of Public Affairs Department of the Army			
08/04/87	TCAAP News Release: Army Document Now Available for Public Review	Office of Public Affairs Department of the Army		87-15	
08/06/87	Community Leaders Meeting	Oster, Clarence Department of the Army	various		
08/10/87	Transcript of Public Hearing Relating to Federal Facilities Agreement				
08/18/87	TCAAP Community Leaders Meeting: Sign-In Sheet				
10/00/87	Invitation to Dedication Ceremony of TCAAP Boundary Groundwater Recovery System	Department of the Army	various		
10/19/87	Dedication Ceremony of TCAAP Boundary Groundwater Recovery System				

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/12/87	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
11/18/87	TCAAP Community Leaders Meeting: Sign-In Sheet				
02/12/88	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
02/24/88	TCAAP Community Leaders Meeting: Agenda				
02/24/88	TCAAP Community Leaders Meeting: Sign-In Sheet				
03/04/88	TCAAP News Release: Army Makes Docuemnt Available for Public Review and Comment	Office of Public Affairs Department of the Army		87-17	
05/06/88	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
05/25/88	TCAAP Community Leaders Meeting: Sign-In Sheet				
05/31/88	TCAAP Community Leaders Meeting	Oster, Clarence C. Department of the Army	Lohman, Robert Preserve Our Land		
08/09/88	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	Dagleisch, Janet (Alt. Proj. Mgr., Minnesota Pollution Control Agency) Kleinrath, Arthur (U.S. EPA) Johnson, Maureen (Project Manager, Minnesota Pollution Control Agency)		
08/09/88	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
08/24/88	TCAAP Community Leaders Meeting: Agenda and Sign-In				

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Study Public Meeting - Sign-In Sheet				
06/00/90	Minnesota Pollution Control Agency Superfund Fact Sheet: New Brighton/St. Anthony	Minnesota Pollution Control Agency			
07/05/90	Turtle Lake-Snail Lake - TCAAP Pumping Meeting	Stine, John Line Regional Hydrologist Department of Natural Resources			
03/00/91	Minnesota Pollution Control Agency Superfund Fact Sheet: New Brighton/Arden Hills/St. Anthony - Background and History	Minnesota Pollution Control Agency		Fact Sheet #1	
03/00/91	Minnesota Pollution Control Agency Superfund Fact Sheet: New Brighton/Arden Hills/St. Anthony - Remedial Investigation Phase IA	Minnesota Pollution Control Agency		Fact Sheet #2	
05/00/91	TCAAP Community Relations Plan	Department of the Army			
10/00/91	U.S. EPA Fact Sheet: U.S. EPA Completes Study of Human Health Risks Associated with New Brighton/Arden Hills Superfund Site	United States Environmental Protection Agency			
10/30/91	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
11/00/91	USATHAMA Fact Sheet: Remedial Investigation TCAAP	United States Army Toxic and Hazardous Materials Agency			
11/00/91	USATHAMA Fact Sheet: Ecological Assessment - TCAAP	United States Army Toxic and Hazardous Materials Agency			
11/00/91	Public Meeting Notice	United States Environmental Protection Agency Department of the Army Minnesota Pollution Control Agency			

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
11/00/91	Minnesota Pollution Control Agency Fact Sheet: TCAAP/New Brighton/Arden Hills/St. Anthony - Off-TCAAP Remedial Investigation	Minnesota Pollution Control Agency			
11/13/91	Public Meeting: Remedial Investigation Studies: Attendees				
11/14/91	Public Meeting on Remedial Investigation: Agenda and Sign-In Sheet	United States Environmental Protection Agency Department of the Army Minnesota Pollution Control Agency			
11/20/91	TCAAP Technical Review Committee Meetings	Daves, Joseph Lieutenant Colonel, Commander Department of the Army	various		
08/18/92	Public Meeting Minutes TCAAP OU-3 Proposed Plan, Shoreview Community Center				12
09/00/92	TCAAP Installation Restoration Program Update	Department of the Army		1	
09/23/92	TCAAP Community Leaders Meeting	Schulte, Theodore E. Commander's Representative Department of the Army	various		
10/07/92	Chronology Regarding Drinking Water Notification Process (5/81-7/92)	Minnesota Pollution Control Agency			
12/00/92	TCAAP Installation Restoration Program Update	Department of the Army		2	
03/00/93	TCAAP Installation Restoration Program Update	Department of the Army		3	
03/15/93	TCAAP News Release: Army Makes TCAAP Installation Restoration Program Documents Available for Public Review	Office of Public Affairs Department of the Army		93-24	
04/20/93	New Brighton/Fridley Interconnection Informational				

DOC_DATE	TITLE	AUTHOR	RCPNT	REF#	XREF
	Meeting at Fridley City Council Chamber				
04/20/93	Presentation Outline: New Brighton/Fridley Interconnection Informational Meeting at Fridley City Council Chambers				
06/00/93	TCAAP Installation Restoration Program Update	Department of the Army		4	
08/00/93	Proposed Plan for Groundwater Cleanup at Operable Unit 1 of the New Brighton/Arden Hills Superfund Site	Department of the Army; United States Environmental Protection Agency; Minnesota Pollution Control Agency			
08/00/93	TCAAP Installation Restoration Program Update	Office of Public Affirs Department of the Army		Vol. 1; No. 1	
08/05/93	Public Meeting/Comment Sought	United States Environmental Protection Agency Minnesota Pollution Control Agency		St. Paul Pioneer Press, Section F	
08/06/93	Public Meeting/Comment Sought	United States Environmental Protection Agency Minnesota Pollution Control Agency		Star Tribune, pg. 2K	
08/19/93	Operable Unit 1 Public Meeting Agenda				
08/19/93	Transcript of Public Hearing Relating to Operable Unit 1				
09/17/93	TCAAP News Release: Army Consolidates Repositories	Office of Public Affairs Department of the Army		93-29	