

RECORD OF DECISION AMENDMENT

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

MAY 2006

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Acronyms

Alliant	– Alliant Techsystems Inc.
ARARs	– Applicable or Relevant and Appropriate Requirements
Army	– United States Army
BGRS	– Boundary Groundwater Recovery System
CERCLA	– Comprehensive Environmental Response, Compensation, and Liability Act
FFA	– Federal Facilities Agreement
GAC	– Granular Activated Carbon
gpm	– gallons per minute
MCLs	– Maximum Contaminant Levels
MPCA	– Minnesota Pollution Control Agency
NB/AH	– New Brighton Arden Hills/Twin Cities Army Ammunition Plant Superfund Site
NBCGRS	– New Brighton Contaminated Groundwater Recovery System
NBM #13	– New Brighton Municipal Well #13
NCP	– National Oil and Hazardous Substances Pollution Contingency Plan
NPL	– National Priorities List
OU1	– Operable Unit 1
OU1TG	– Operable Unit 1 Technical Group
OU1TGTM	– OU1 Technical Group Technical Memorandum
OU2	– Operable Unit 2
OU3	– Operable Unit 3
PGAC	– Permanent Granular Activated Carbon
PGRS	– Plume Groundwater Recovery System
RAB	– Restoration Advisory Board
ROD	– Record of Decision
TCAAP	– Twin Cities Army Ammunition Plant
TCE	– Trichloroethene
TGRS	– TCAAP Groundwater Recovery System
USEPA	– U.S. Environmental Protection Agency
VOCs	– Volatile Organic Compounds

1.0 Introduction

1.1 PROPOSED CHANGE IN THE REMEDY

In September 1993, a Record of Decision (ROD) was prepared addressing Operable Unit 1 (OU1) of the New Brighton Arden Hills/Twin Cities Army Ammunition Plant Superfund Site (NB/AH Superfund Site). The ROD presented the selected remedial action to address groundwater contamination in OU1. OU1 consists of what is described in past investigations as the North Plume of contamination emanating from the Twin Cities Army Ammunition Plant (TCAAP).

OU1 is one of three Operable Units established for the NB/AH Superfund Site. Figure 1 shows the location of the Operable Units at TCAAP. The primary contaminant of concern is trichloroethene (TCE) with other related compounds in lower concentrations. OU1 addresses the North Plume of groundwater contamination located off of TCAAP. Operable Unit 2 (OU2) address soils, shallow groundwater, and deep groundwater on the TCAAP facility itself. Operable Unit 3 addresses the South Plume of groundwater contamination off of TCAAP. The North Plume and the South Plume are distinguished by their geographic location off-TCAAP and by their separate source areas on-TCAAP.

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §9601, et seq. and Executive Order 12980, the United States Army (Army) is the lead agency for response actions at the Superfund Site. All remedial actions are subject to the provisions of the Federal Facilities Agreement (1987) among the Army, U.S. Environmental Protection Agency (USEPA), and the Minnesota Pollution Control Agency (MPCA).

Through evaluation of the OU1 groundwater monitoring results, including a statistical evaluation (discussed herein), the Army has determined that a modification to the selected remedy is appropriate.

The selected remedy for OU1 in the ROD was Alternative 3, which included the following major components:

1. Providing alternate water supplies to residents with private wells within the North Plume.
2. Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area.
3. Extracting groundwater at the containment boundary in the North Plume near County Road E.
4. 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 granular activated carbon (GAC) system.
5. Discharging all of the treated water to the New Brighton municipal distribution system.
6. Monitoring the groundwater to verify effectiveness of the remedy.

This proposed ROD amendment substantially affects item number three, Extracting groundwater at the containment boundary near County Road E. The amended ROD would require USEPA and MPCA approved aggregate groundwater extraction rates at the New Brighton Contaminated Groundwater Recovery System (NBCGRS), and remove the requirement for demonstrating

hydraulic containment at County Road E. Future changes to the pumping rates would be subject to consistency test approval by the USEPA and MPCA.

In addition, item number six will be modified to specifically address the statistical approach to measuring effectiveness discussed below and in Section 3. Progress toward remedial goals (aquifer restoration) will be demonstrated by utilizing statistical analyses of the chemical groundwater monitoring data to show control and reduction of the plume size and concentration. The remedial objectives and Applicable or Relevant and Appropriate Requirements (ARARs) will remain unchanged. The basis for this change (explained in more detail later in this report) is a statistical analysis, completed by a technical group drawn from the major project stakeholders, showing that aquifer restoration is occurring at the current operating rates in New Brighton, without a complete demonstration of hydraulic capture.

The other components of the remedy will remain unchanged. This proposed amendment consists, essentially, of continuing current operations consistent with the past 11 years of operation with the addition of an annual statistical analysis of concentration trends rather than hydraulic capture analysis.

1.2 PROCEDURE FOR CHANGING THE REMEDY

Under Section 117 of CERCLA and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), if a new, proposed remedial action differs in any significant respect from a final remedial action plan, the lead agency is required to publish an explanation of the significant differences and the reasons such changes were made. The decision to change the remedy for OU1 constitutes such a significant difference. It is a fundamental change in the remedy, necessitating the issuance of a new proposed plan and an amended ROD.

This ROD amendment and all supporting documents will become part of the NB/AH Administrative Record file in accordance with Section 300.825(a)(2) of the NCP. The Administrative Record is available during business hours and is located at:

Twin Cities Army Ammunition Plant
4700 Highway 10, Suite A
Arden Hills, MN 55112

1.3 PUBLIC COMMENT PERIOD

In accordance with Section 300.435(c)(2)(i) of the NCP, the Army issued a Proposed Plan and a newspaper notice of the proposed ROD modification in March 2006. A public comment period was held from March 23, 2006 to April 24, 2006. A public meeting was held on April 4, 2006. The Army, MPCA, USEPA, RAB, and City of New Brighton were available at the meeting. There was one attendee from the public at the public meeting. The meeting was recorded by a court reporter and the transcript of the meeting is part of the administrative record. No objections to the plan were raised at the meeting. No written comments were received during the comment period.

2.0 Background

2.1 SITE HISTORY

The NB/AH site consists of a 25-square mile area. It includes the 4-square mile area of the original TCAAP facility and portions of seven nearby communities: New Brighton, Arden Hills, St. Anthony, Shoreview, Mounds View, Columbia Heights, and Minneapolis. The NB/AH site has been divided into three operable units, as discussed in Section 1.

TCAAP was constructed in 1941 to produce small-caliber ammunition for the United States military. Production activities included manufacturing small arms ammunition and related materials, proof-testing small arms ammunition and related items as required, and handling and storing strategic and critical materials for other government agencies. Ammunition production and related activities have occurred periodically, commensurate with operations in wars, conflicts, and other national emergencies. Information from past studies indicates that between 1941 and 1981, waste materials such as VOCs, heavy metals, corrosive materials, and explosives were used and disposed of at a number of locations within TCAAP. The use and disposal of these materials at TCAAP resulted in soil and groundwater contamination at the facility.

The primary contaminant identified in the groundwater at OU1 is TCE. Some breakdown products of TCE have also been detected. The source of TCE in the OU1 groundwater has been attributed to disposal of solvents at two former disposal sites on TCAAP. These sites are designated Site D and Site G and are being addressed under the OU2 ROD. The TCE migrated through the soil at Sites D and G to the deep groundwater. Groundwater flow then carried the contaminants off-TCAAP.

The first phase of large-scale groundwater extraction at TCAAP (the Boundary Groundwater Recovery System or BGRS) started operating in October 1987. Full-scale startup of the TCAAP Groundwater Recovery System (TGRS) in Operable Unit 2 began in 1989.

The TGRS was an expansion of the BGRS and incorporated additional boundary extraction wells and additional source control wells at Sites D and G, the source of the Operable Unit 1 plume (North Plume).

The remedial system for OU1 is known as the New Brighton Contaminated Groundwater Recovery System or NBCGRS. The NBCGRS consists of the New Brighton well field, a granular activated carbon treatment system, and a connection into the municipal water system for the City of New Brighton. The City of New Brighton operates the NBCGRS under an agreement with the Army. The NBCGRS began operating in April 1993 at a nominal rate of 2,200 gallons per minute (gpm) as specified in the ROD. In order to maintain the pumping rates needed to comply with the ROD during times of low water demand the City of New Brighton municipal system is connected to the City of Fridley municipal water system. This allows New Brighton to distribute excess water to Fridley during periods of low demand. The interconnection with Fridley was negotiated between the Army, New Brighton, and Fridley.

The remedial system for OU3 is known as the Plume Groundwater Recovery System (PGRS) and consists of a single extraction well (called New Brighton Municipal Well #13 or NBM #13), a granular activated carbon treatment system, and a connection into the municipal water system for the City of New Brighton. The City of New Brighton operated the PGRS under an agreement with Alliant Techsystems Inc. (Alliant). The PGRS began operating in April 1994 at a nominal rate of 1,000 gallons per minute (gpm). Under an agreement between Alliant, the MPCA, and the USEPA, the rate at the PGRS was reduced to 400 gpm in July 1999, in response to decreasing influent concentrations to below the cleanup standards.

The Agencies accepted the recommendation from Alliant to shut down the PGRS as an interim operational change and it was placed in standby mode in August 2001. While the PGRS was

placed in standby mode for remediation purposes, NBM #13 has been used occasionally by the City of New Brighton to supplement its water supply since that time, primarily during summer months. Alliant is currently pursuing a ROD amendment to make the shut down of the PGRS permanent based on 5 years of monitoring data showing that concentrations remain below cleanup standards at the PGRS.

With the shut down of the PGRS, the NBCGRS comprises the major source for the municipal water system for New Brighton.

2.2 SITE GEOLOGY/HYDROGEOLOGY

The TCAAP area regional geology, beginning at ground surface, consists of four stratigraphic layers that have been assigned the nomenclature of Unit 1 through Unit 4 for reference purposes. The four geologic units are presented in Figure 2 and are as follows:

- Unit 1 – Surficial deposits, consisting primarily of alluvial sediments that range from 0 to 50 feet in thickness.

- Unit 2 – Twin Cities Till, containing a complex mixture of gray and reddish-brown clay with gravel and sand. Unit 2 ranges from 0 to 125 feet in thickness.

- Unit 3 – Hillside and Arsenal Sand, with minor lenses of silt, gravel, and sandy clay. Unit 3 ranges from 100 to 447 feet in thickness at TCAAP and decreases to where it no longer exists in the New Brighton area south of Interstate 694.

- Unit 4 – Bedrock. This unit consists of Prairie du Chien dolomite and Jordan Sandstone, which, together, are up to 200 feet thick where present. The Jordan Sandstone is underlain by the St. Lawrence Formation, a dolomitic shale.

Groundwater in the TCAAP area has been classified into similar units corresponding to the geologic units described above, with the exception of the Unit 2 till, which is an aquitard and is not considered a water-bearing unit at the Site. Following are summaries of the three water-bearing units in the TCAAP area:

- Unit 1 – Unit 1 generally contains perched groundwater when underlain by Unit 2. This groundwater predominantly migrates to nearby streams or lakes and discharges to surface water.
- Unit 3 – Unit 3 consists of the Hillside Sand aquifer that is approximately 100 feet thick at the southwest boundary at TCAAP. Groundwater in Unit 3 migrates southwest and west from TCAAP. The thickness of the Unit 3 aquifer decreases to the southwest of TCAAP to the point where it does not exist south of I-694 in New Brighton. Unit 3 is hydraulically connected to the underlying Unit 4.
- Unit 4 – Unit 4 consists of the Prairie du Chien dolomite and Jordan Sandstone, which are up to 200 feet thick. Groundwater within the Unit 4 flows southwest from TCAAP. Unit 4 is hydraulically connected to the Unit 3 formation. Unit 4 overlies the St. Lawrence Formation, which is a regional confining bed and constitutes the base of the active flow regime for TCAAP studies.

The remedial systems in OU1 and OU3 and the TGRS in OU2 address groundwater contamination in the Unit 3 and Unit 4 aquifers, also described as “deep groundwater” in the Annual Reports and other documents. These aquifers are also used for municipal and private supply in the New Brighton area. Contamination from TCAAP is limited to the Unit 3 and Unit 4 aquifers in OU1 and OU3. The Special Well Construction Area applies to a defined geographic area of the Unit 3 and Unit 4 aquifers.

2.3 1993 ROD-SELECTED REMEDY

The NB/AH site was listed on the National Priorities List (NPL) in September 1983 based on the results of samples collected from wells in the TCAAP area. The analytical results from these samples indicated that municipal wells, drinking water wells, and wells at TCAAP were contaminated with VOCs. In July 1993, a Feasibility Study was completed for OU1 that identified the environmental contamination associated with OU1 and provided and evaluated remedial alternatives for addressing that contamination. In September 1993, the ROD for OU1 was issued that documented the selected remedies and cleanup standards for this operable unit.

The selected remedy for OU1 in the ROD was Alternative 3, which included the following major components:

1. Providing alternate water supplies to residents with private wells within the North Plume.
2. Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area.
3. Extracting groundwater at the containment boundary in the North Plume near County Road E.
4. 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.
5. Discharging all of the treated water to the New Brighton municipal distribution system.
6. Monitoring the groundwater to verify effectiveness of the remedy.

3.0 Basis for the Fundamental Change to the Selected Remedy

3.1 HISTORY OF ROD AMENDMENT CHANGE

Since the implementation of the OU1 ROD, the Army, the USEPA, the MPCA, and the Restoration Advisory Board (RAB) (the parties), have been engaged in determining if the requirement for a hydraulic containment boundary near County Road E has been met. The parties have been unable to reach an agreement on this issue. The crux of the issue is that the Army has been unable to demonstrate to the agencies, with an adequate degree of certainty, that a complete hydraulic containment boundary has been formed. The parties agree that the amount of additional investigation and monitoring necessary to reach a level of certainty is impractical and expensive, given the apparent remedial progress being achieved.

The chemical data from monitoring wells and the remedial systems on- and off-TCAAP have shown significant decreases in concentration since the start-up of the systems and the North Plume appears to be stable or decreasing in geographic extent. Based on this apparent improvement in water quality, the parties agreed to consider developing a new method(s), based on chemical data, for evaluating performance of the NBCGRS. The apparent improvements in groundwater quality, if found to be statistically valid, would indicate that the objectives of the OU1 ROD are being met, whether or not there is complete hydraulic capture.

In 2003, the parties formed the Operable Unit 1 Technical Group (OUITG) comprised of scientific specialists from each of the parties and the City of New Brighton. The OUITG conducted a series of meetings and in the fall of 2004, finalized a report entitled: the "OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1", dated December 2004 (referred to hereafter as the OUITGTM). This report

presents a statistical method to evaluate trends in chemical data to support ongoing evaluation of the remedial progress in OU1 due to the performance of the NBCGRS and the TGRS.

The report also presents an evaluation of the current data (through fiscal year 2003) that supports the initial observations that the groundwater quality is improving and the plume is stable or shrinking over time. The report found that the observations of apparent improvement in the groundwater quality, that started the discussion of a ROD amendment, are statistically valid.

Based on this finding, the Army is recommending amending the OU1 ROD by removing the requirement for complete hydraulic capture near County Road E and replacing it with a requirement for maintaining pumping rates at the NBCGRS consistent with the past operation. These rates have been shown to be sufficient to cause the intended improvements to the groundwater quality envisioned in the original ROD. Future modifications to the rates would be subject to USEPA and MPCA approval.

In June 2005, the OU1TG was convened to create an addendum to the OU1TGTM to specifically address the Jordan Sandstone portion of the Unit 4 aquifer. A technical memorandum was prepared (Titled *Modification #1 to: "OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1, prepared by the Army, Dated December 2004," July 2005*) that creates a specific well group and additional statistical methods for the Jordan portion of the aquifer.

3.2 SUMMARY OF STATISTICAL METHODS

The OU1TGTM and Modification #1 developed a series of six well groups designed to address specific aspects of the remedy evaluation. For each group, the appropriate statistical tools were specified and the statistical response threshold was identified that would trigger closer scrutiny by the Army and regulators (MPCA and USEPA). The six groups, and their purposes are:

Group 1: Downgradient of the TGRS. This zone is the area downgradient of the TGRS capture zone. This zone should show overall reductions over time in response to TGRS mass removal and containment. However, it is also the stagnation zone of the TGRS so groundwater velocities are reduced and response may be slow. Furthermore, individual wells near the stagnation zone may show increases in contaminant concentrations during some points in time, as the plume shifts in response to changes in pumping.

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

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

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

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

Group 6: Jordan Aquifer Wells. This group includes monitoring wells screened in the Jordan portion of the Unit 4 aquifer. These wells will help identify the long-term contaminant trends in the Jordan Aquifer (representing the bottom of the OU1 plume) and support potential future evaluations of remedial changes to address the Jordan portion of the OU1 Plume.

4.0 Description of New Remedy and Changes in Expected Outcome

The remedy selected in the OU1 ROD included groundwater extraction at the NBCGRS with municipal use of the treated water. Since the startup of the TGRS (nearly 15 years ago) and the NBCGRS (12 years ago), the North Plume has exhibited decreasing concentrations at a large majority of the wells. Similarly, the influent VOC contaminant concentrations to the TGRS and NBCGRS have been decreasing, with a corresponding decrease in VOC mass removal, indicating a decrease in the VOC mass remaining in the aquifer.

The proposed remedy differs from the 1993 ROD in that the requirement to demonstrate capture at the NBCGRS will be removed and replaced with a requirement to demonstrate statistically valid water quality improvements (according to the methods described in the OU1TGTM, allowing for potential future revisions to the method if deemed appropriate and approved by the USEPA and MPCA). All other requirements will remain in place.

The change in the remedy will have no effect on the remedial action objectives. There are five remedial action objectives for the OU1 groundwater that are designed to protect human health and the environment from exposure to contaminants:

- Prevent human exposure to water contaminated with carcinogens in excess of the MCLs, RALs, and HRLs and having a total excess cancer risk for all contaminants of greater than 10^{-4} to 10^{-6} .
- Prevent human exposure to water with concentrations of noncarcinogens greater than MCLs, RALs, and HRLs or having a threshold noncancer hazard index greater than 1.0.
- Restore the aquifer to its highest use, i.e., potability, as defined by the most stringent and promulgated state and federal standards (MCLs, RALs, or HRLs).

- Contain the plume within the boundary of County Road E (to the extent practicable) while also maximizing mass removal.
- Prevent ecological exposure to contaminants.

Source: (J.M. Montgomery Inc., July 1993, TCAAP Feasibility Study, Final OU1 FS)

Therefore, maintaining the groundwater extraction, treatment, and municipal use components of the remedy while amending the method for determining compliance to one of a statistical evaluation of the data is appropriate at this time. Mass removal will continue with the operation of the remedial systems. Groundwater monitoring will give adequate warning for appropriate action in the unlikely event the North Plume does begin to grow or advance in the future.

5.0 Comparative Analysis

The amended remedy, as presented in this ROD amendment, is nearly the same as the Containment Remedy (Alternative 3) presented and discussed in the OU1 ROD. It retains extraction at the NBCGRS, preventing public exposure and reducing plume mass.

A brief comparison of the amended alternative and the original alternative, based on the information obtained from the studies completed since the ROD was signed, against the nine evaluation criteria is presented below:

1. **Overall Protection of Human Health and the Environment**

The amended remedy is protective of human health and the environment since the objective of containment is demonstrated by showing that the plume is effectively contained, using statistical methods. Other aspects of the remedy including continued groundwater monitoring, treatment of water for municipal use, and the prevention of a completed exposure pathway because of the Special Well Construction Area, remain unchanged.

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

Contaminants of concern would remain above cleanup standards in the North Plume within the foreseeable future under the amended remedy and the original remedy. Under the amended remedy, the North Plume is shrinking; therefore, progress will continue towards meeting cleanup standards. Continuing the remedy under the amended conditions will meet the ARARs in a similar timeframe as envisioned in the original remedy.

3. **Long-Term Effectiveness and Permanence**

The statistical analysis demonstrates the long-term goals of aquifer restoration are being met by the remedy, as it has been operated since 1993. The aquifer restoration observed is consistent with the remedial objectives of the original remedy. The remedy is permanent because contaminants are removed through GAC treatment.

4. **Reduction of Toxicity, Mobility, or Volume Through Treatment**

The treatment component of the remedy remains unchanged. Thus, the reduction of toxicity, mobility, and volume of contaminants remains effective.

5. **Short-Term Effectiveness**

The remedy is in-place and operating so the short-term effectiveness is already addressed.

6. **Implementability**

The amended remedy, in essence, has already been implemented. A groundwater monitoring program is in place.

7. **Cost**

The amended remedy will have a similar cost compared to the original remedy. The ongoing operation and maintenance costs for the NBCGRS are unchanged. The cost of ongoing groundwater monitoring remains essentially the same.

8. **State Acceptance**

This ROD amendment has been discussed with the MPCA, which also participated in the statistical evaluations, and State acceptance is anticipated.

9. **Community Acceptance**

This ROD Amendment has been discussed with the City of New Brighton and the RAB, which also participated in the statistical evaluations. A notice of a public meeting on April 4, 2006 and a brief description of this proposed ROD Amendment was printed in

the local newspaper (as discussed in Section 1.3) in accordance with Section 300.435(c)(2)(i) of the NCP. No written comments were received during the comment period. Based on the lack of comments the community accepts the proposed ROD Amendment.

5.1 RESULTS OF COMPARISON USING THE NINE CRITERIA

Both alternatives meet the threshold criterion of providing protection of human health and the environment. Also both alternatives require 30 or more years to meet the ARARs.

The amended remedy is preferred based on evaluation of the balancing criteria. The proposed remedy is lower in cost than the original remedy. The remedy has similar short term effectiveness to the original remedy. The remedy meets ARARs in a similar fashion to the original remedy. The amended remedy is implementable (from the standpoint of existing operation and the statistical analysis required) and has similar “long-term effectiveness” and “reduction in toxicity, mobility or volume” to the original remedy.

5.2 THE AMENDED REMEDY

Following are the proposed amendments to the six elements of the ROD, with the changed elements highlighted:

1. Providing alternate water supplies to residents with private wells within the North Plume.
2. Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area.

3. Extracting groundwater from the North Plume using the NBCGRS, subject to the following:
 - a. the initial aggregate groundwater extraction rate shall be consistent with the long-term operating history of the NBCGRS;
 - b. future decreases in the aggregate extraction rate shall be determined by the Army, USEPA, and MPCA using a transparent public process and rational engineering, scientific, and economic analyses at least as rigorous as those employed in the feasibility study that was the basis for the original remedy selection;
 - c. future changes to the aggregate or individual well extraction rates shall be made so as to assure that the rate of restoration of the aquifer will not be slowed or result in a duration of remedy longer than was contemplated by the original ROD;
 - d. the facilities comprising the NBCGRS may be modified as necessary to assure the restoration of the full areal and vertical extent of the aquifer in a timeframe as contemplated in 3 c, above.
4. Pumping the extracted groundwater to the PGAC Water Treatment Facility in New Brighton for removal of VOCs by a pressurized GAC system.
5. Discharging all of the treated water to the New Brighton municipal distribution system.
6. Monitoring the groundwater to verify effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrations.

The last requirement (No. 6) will be met by evaluating the groundwater chemical data according to statistical methods contained in the "OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1", dated December 2004

(and any subsequent addendums or revisions approved by the USEPA and MPCA). The statistical analysis will be conducted annually and will be reported in the Annual Performance Reports.

All other aspects of the ROD will remain unchanged and applicable as will the reporting requirements, consistency test requirements, and other requirements of the Federal Facilities Agreement (FFA) and subsequent agreements among the USEPA, MPCA, and Army.

6.0 Statutory Determinations

This section discusses how the amended remedy meets the five statutory requirements established by Section 121 of CERCLA.

6.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The amended remedy is protective of human health and the environment since the objective of containment is demonstrated by showing that the plume is effectively contained. Other aspects of the remedy including continued groundwater monitoring, treatment of water for municipal use, the lack of a completed exposure pathway because of the Special Well Construction Area, and the continued operation of the TGRS remain unchanged.

6.2 COMPLIANCE WITH ARARS

Contaminants of concern would remain above cleanup standards in the North Plume within the foreseeable future under the amended remedy and the original remedy. Under the amended remedy, the North Plume is shrinking; therefore, progress will continue towards meeting cleanup standards. Continuing the remedy under the amended conditions will meet the ARARs in a similar time frame as envisioned in the original remedy.

6.3 COST EFFECTIVENESS

The amended remedy will have a similar cost compared to the original remedy. The ongoing operation and maintenance costs for the NBCGRS are unchanged. The cost of ongoing groundwater monitoring remains essentially the same.

6.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCES RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

Because the NBCGRS removes and treats contaminant mass, the amended remedy provides a measure of permanence.

6.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The NBCGRS treats groundwater to levels appropriate for municipal use. Treatment as a principal element of the amended remedy is unchanged.

Richard C. Karl

Richard C. Karl
Director, Superfund Division
U.S. Environmental Protection Agency
Region V

6-7-06

Date

Tim Scherkenbach

Tim Scherkenbach
Director, Remediation Division
Minnesota Pollution Control Agency

15 May 2006

Date

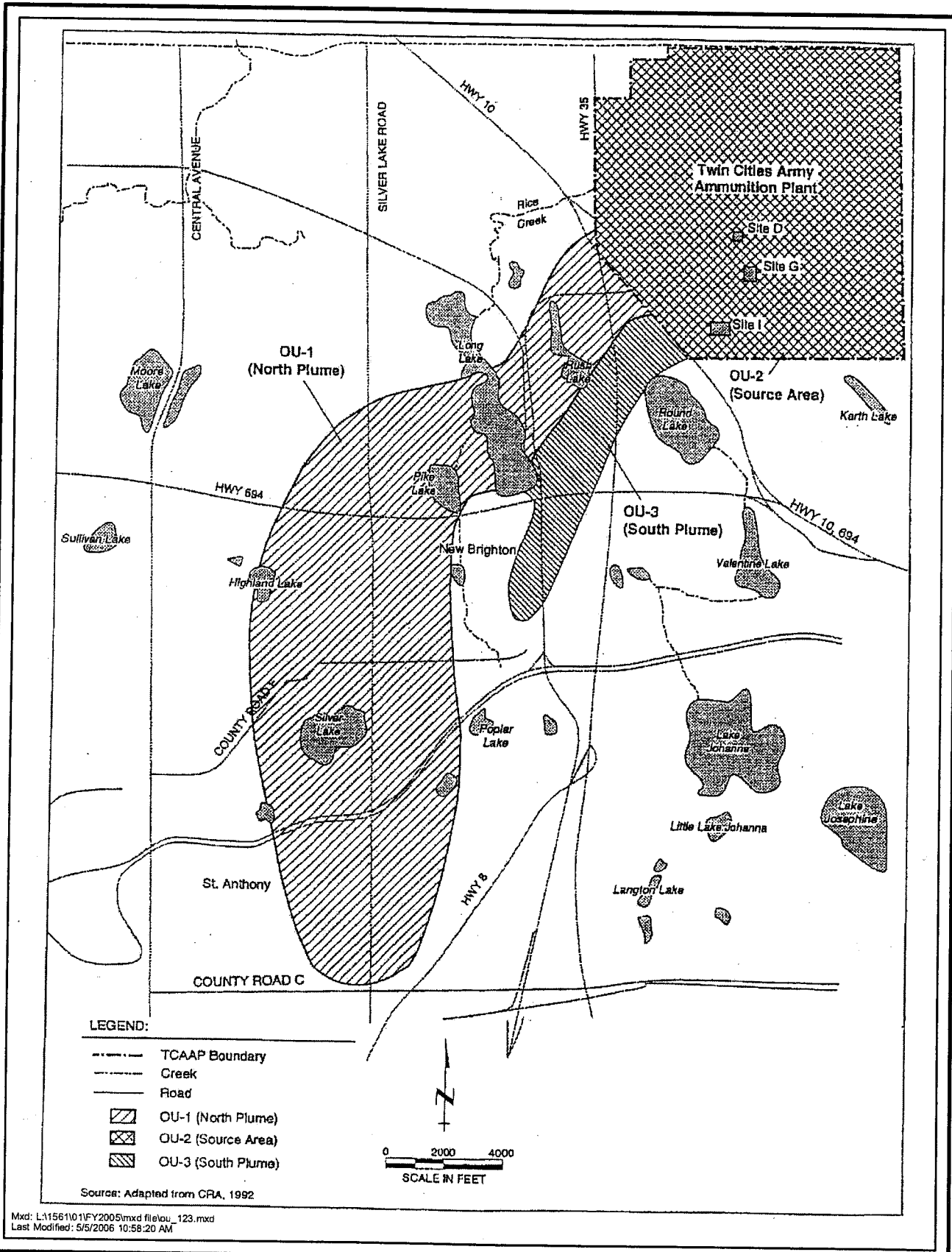
Michael Fix

Michael Fix
Commander's Representative
Twin Cities Army Ammunition Plant

10 May 2006

Date

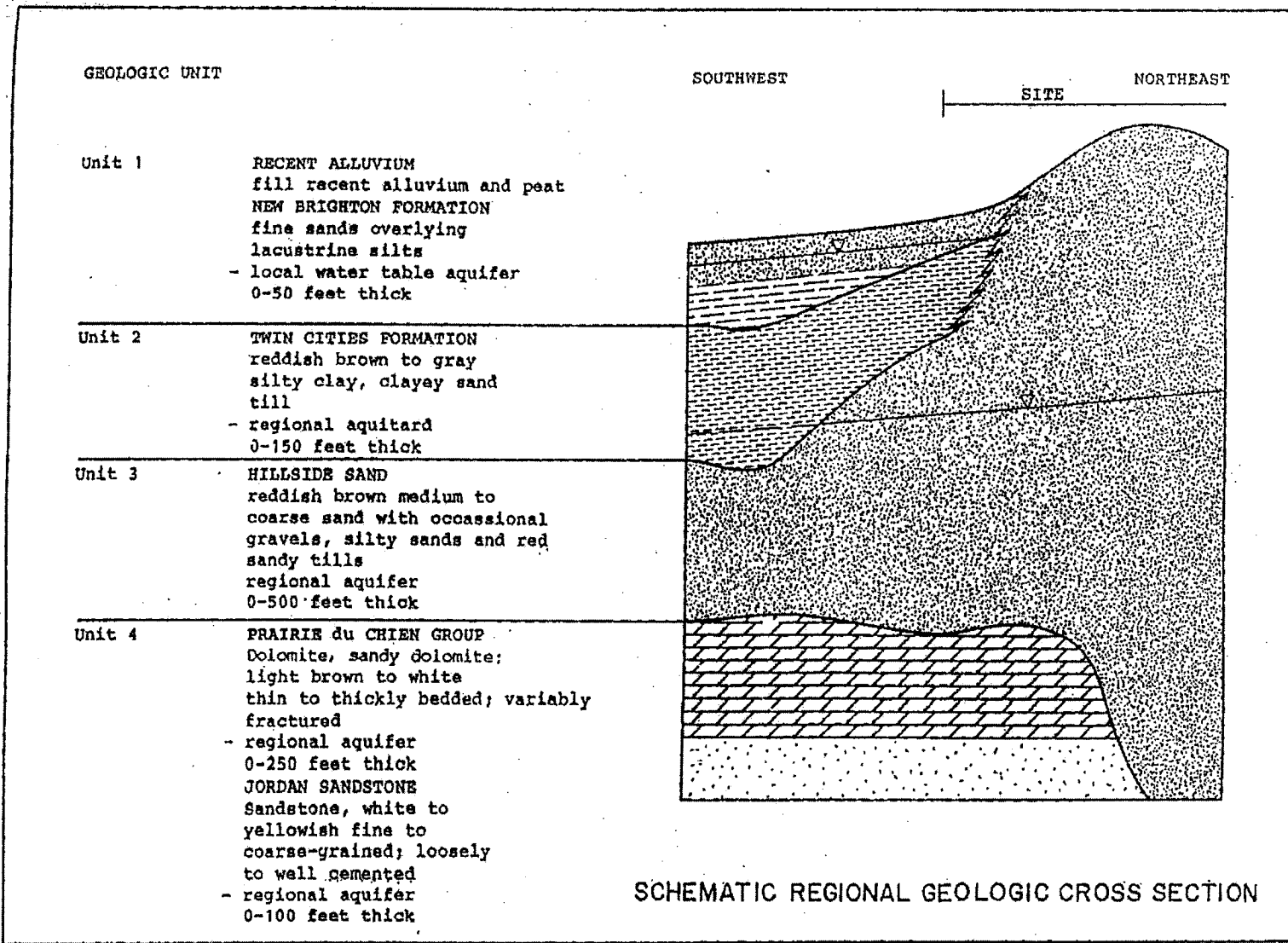
Figures



TWIN CITIES ARMY AMMUNITION PLANT
 Conceptual Illustration of TCAAP
 Operable Units 1, 2 and 3

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

FY 2005
 Figure 1



SCHEMATIC REGIONAL GEOLOGIC CROSS SECTION

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