

**EXPLANATION OF SIGNIFICANT DIFFERENCES #1  
FOR  
OPERABLE UNIT 2 (OU2)**

**CHANGES FOR GROUNDWATER SITES**

**NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE  
ARDEN HILLS, MINNESOTA**

**May 2009**

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**EXPLANATION OF SIGNIFICANT DIFFERENCES #1  
FOR  
SHALLOW GROUNDWATER SITES AND DEEP GROUNDWATER  
AT OPERABLE UNIT 2 OF THE  
NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE  
ARDEN HILLS, MINNESOTA**

**1.0 INTRODUCTION**

This Explanation of Significant Differences (ESD) addresses two of the Shallow Groundwater Sites (Sites A and Site K), and the Deep Groundwater plume that are located within Operable Unit 2 (OU2) at the New Brighton/Arden Hills (NB/AH) Superfund Site, also known as the Twin Cities Army Ammunition Plant (TCAAP), located in Arden Hills, Minnesota. The Superfund site includes TCAAP (a former small arms ammunition plant) as well as portions of several surrounding residential communities. The NB/AH site was placed on the National Priorities List (NPL) in September 1983. Figure 1 shows the Site Location Map. Figure 2 shows the TCAAP Site Layout.

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 12580, the United States Army (Army) is the lead federal agency for remedial actions at the site. All remedial actions are subject to the provisions of the Federal Facilities Agreement among the Army, U.S. Environmental Protection Agency (USEPA) and the Minnesota Pollution Control Agency (MPCA).

In 1997, the Army, USEPA, and MPCA signed a Record of Decision (ROD) that selected remedies for various sites within OU2, including Site A Shallow Groundwater, Site K Shallow Groundwater, and Deep Groundwater. Based on the completion of investigations and/or removal actions and remedial actions currently in place (groundwater pump and treat systems), the Army has determined, and USEPA and MPCA have concurred, that a modification to add Land Use Controls to the selected remedies in the ROD is necessary. Section 117(c) of CERCLA and Section 300.435(c)(2)(i) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establish procedures for explaining, documenting, and informing the public of significant changes to the remedy that occur after the ROD is signed. An ESD is required when the remedial action to be taken differs from the selected remedy stated in the ROD, but does not fundamentally alter that remedy with respect to scope, performance, or cost, which is the situation in this case.

The Shallow Groundwater remedy for Site A included the following:

- Groundwater monitoring to track plume migration and remedy performance;
- Use of existing gradient control wells to contain the contaminant plume and remove mass;
- Institutional controls to restrict new well installation and provide alternate water supplies and well abandonment as necessary;
- Discharge of extracted groundwater to a publicly owned treatment works (POTW); and
- Source characterization/remediation.

For Site A Shallow Groundwater, the modification, which is an addition to the remedy identified in the ROD, will include: 1) Land Use Controls (LUCs) to protect the groundwater monitoring and extraction system infrastructure, and 2) documentation of the removal of the source area soils as a final remedy.

The Shallow Groundwater remedy for Site K included the following:

- Groundwater monitoring to track remedy performance;
- Installation of sentinel wells at the bottom of Unit 1 and the top of Unit 3;
- Use of existing interceptor/recovery trench to contain plume and remove impacted groundwater;
- Treatment of extracted groundwater using air stripping;
- Discharge of treated groundwater to Rice Creek;
- Monitoring to track compliance with discharge requirements; and
- Additional characterization of the unsaturated Unit 1 soil.

For Site K Shallow Groundwater, the modification, which is in addition to the remedy identified in the ROD will include LUCs to: 1) protect the groundwater monitoring, extraction, and treatment system infrastructure, 2) prohibit groundwater use, and 3) to prevent human exposure to contaminated soils beneath the building slab at former Building 103.

The Deep Groundwater Remedy for OU2 included:

- Groundwater extraction to hydraulically contain the contaminated groundwater source area to the 5 micrograms per liter (ug/L) trichloroethene (TCE) concentration contour and optimize the removal of contaminants from the source area through pumping of selected wells;
- Groundwater treatment using air stripping;
- Discharge of treated groundwater to on-site gravel pit;
- Institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater;
- Review new and emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Reviews shall be performed by Army and reported on annually in accordance with the consistency provisions of the TCAAP FFA; and
- Groundwater monitoring to track remedy performance.

For Deep Groundwater, the modification, which is in additional to the remedy identified in the ROD, will include LUCs to: 1) protect the groundwater monitoring, extraction, and treatment system infrastructure, and 2) prohibit groundwater use.

This ESD 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 Office  
470 West Highway 96, Suite 100  
Shoreview, MN 55126

## 2.0 BACKGROUND

The following subsections summarize the site history and the completed removal action and/or investigations and ongoing operation of the remedial actions (pump and treat groundwater systems).

### 2.1 SITE HISTORY

The NB/AH site consists of a 25-square-mile area located in Ramsey County, Minnesota. This 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. OU2 of the NB/AH site consists of affected environmental media on the original TCAAP facility, a former small arms ammunition plant surrounded by residential communities.

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 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 volatile organic compounds (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 NB/AH site was listed on the 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 March 1997, a Feasibility Study (FS) was completed for OU2 that identified the environmental contamination associated with OU2 and provided remedial alternatives for addressing that contamination. In October 1997, the ROD for OU2 was issued that documented the selected remedies and cleanup standards for this operable unit. OU2 consists of shallow soil sites (Sites A, C, E, H, 129-3, and 129-5), dumps (Sites B and 129-15), deep soil sites (Sites D and G), shallow groundwater sites (Sites A, I, and K), and deep groundwater. This ESD is specific to Shallow Groundwater Sites A and K, and Deep Groundwater.

#### 2.1.1 Site A Shallow Groundwater

Site A is located on the northern boundary of the original TCAAP and is approximately 12.3 acres. Since the signing of the OU2 ROD, the property encompassing Site A was transferred to the Army National Guard. Site A was used between the early 1940s and 1966 for burial and/or burning of various wastes, such as sewage sludge, solvents, explosive-containing wastes, and mercury crack cases. These activities resulted in the contamination of the shallow soil and shallow groundwater with VOCs and metals. Site A was divided into five areas (A1 through A5) to delineate locations of past disposal and burning activities. The media of concern at Site A include shallow soils and shallow groundwater.

An Engineer Evaluation/Cost Analysis (EE/CA) supported the selection of extraction and treatment as the removal action to prevent off-site migration of VOCs in the shallow aquifer. Eight extraction wells were installed in 1994 and discharged to the sanitary sewer for treatment at the POTW. The 1997 OU2 ROD designated the well extraction system as part of the final remedial action. Four of the extraction wells were shut down in 2000 because the groundwater plume reduced in size. The remaining four extraction wells are still active to provide the necessary containment for the Site A Shallow Groundwater remedy. Figure 3 shows the Site A well location map. The 1997 OU2 ROD also selected stabilization, excavation, and off-site disposal of the shallow, contaminated soil. In 1998 and 1999, approximately 16,300 cy of contaminated soil were removed, stabilized and disposed at an off-site disposal facility as part of the remedial action for shallow soils.

As required by the OU2 ROD, additional site characterization was performed in 1997 that identified a disposal trench in Area A1 (Site A 1945 Trench) as the source of VOC contamination in the shallow soils. An EE/CA recommended soil vapor extraction (SVE)/air sparging as the removal action. Following approval of the EE/CA, the SVE/air sparging system was constructed and operated from 2000 through 2002. The air sparging system was operated minimally in 2001 and was shut off permanently in June 2001 due to declining SVE VOC mass removal rate and the determination that the system was no longer effective in reducing concentrations of VOCs in the soil. Additional soil samples were collected from the source area in 2002. The results suggested that the SVE system would not be able to remediate soils to meet the cleanup levels. With MPCA and USEPA's approval, the SVE/air sparging system was dismantled and the VOC-contaminated soil (approximately 688 cy) was excavated and disposed off-site in November 2002. The Site A 1945 Trench soils were cleaned up for unrestricted use. The close out report for the Site A 1945 Trench removal action was approved by USEPA and MPCA (Shaw, 2004a).

### **2.1.2 Site K Shallow Groundwater**

Site K is located in the western portion of TCAAP near Gate 1 as shown on Figure 2. The site consists primarily of Building 103 and surrounding property and occupies 21 acres of TCAAP. Site K has been used primarily for munitions manufacturing and assembly operations.

Building 103 was the first .50 caliber production facility at TCAAP. Construction began in the fall of 1941 and was completed in early 1942. With the start of the Korean conflict in 1950, Site K was reactivated for the production of small arms ammunition. Various solvents, including xylol, alcohol, paint thinner and others, were used to clean machines, parts and floors in Building 103. Small arms production gradually ceased with the end of the Korean crisis and decontamination of the building was completed by January 1958.

In August 1961, Building 103 was reactivated under a facility contract to Honeywell and activities changed from small-arms ammunition to fuzes, mines and weapons systems (MW, 1997).

Solvents used in Building 103 for degreasing, metal finishing and painting activities in mid-1970 included 1,1,1-TCE for cleaning track machines, xylene and toluene for painting and TCE for metal finishing. A number of degreasers were in operation in Building 103 between 1980 and 1985. These degreasers utilized a variety of degreasing agents, including TCE, 1,1,1-TCE, Kester 5121 and dichloroflouromethane (MW, 1997).

VOC contamination has been identified in the Unit 1 (perched aquifer) at Site K. The limits of the VOC plume in the perched groundwater have been defined to beneath and immediately west of former Building 103. A groundwater extraction trench and air stripper became operational in August 1986, which was declared to be part of the final remedy in the 1997 OU2 ROD. With respect to other ROD requirements, an upper Unit 3 sentinel well was installed in February 2000. Existing piezometers were used to accomplish the deep Unit 1 sentry well monitoring. The performance of the groundwater remedy, along with the results of the Unit 1 and Unit 3 sentry monitoring, are presented in Annual Performance Reports that are reviewed and approved by the MPCA and USEPA. An additional investigation of the unsaturated Unit 1 soils was conducted in February 2000. A report was prepared and submitted to the regulators for approval. The report was approved on December 6, 2001. The report defined the extent of VOC contaminated soils beneath Building 103 and refined the location of the source area. During FY 2006, Building 103 was demolished, leaving in place the concrete slab (floor) of the building. Figure 4 shows the Site K Unit 1 and Unit 3 groundwater monitoring locations.

### **2.1.3 Deep Groundwater**

Units 3 and 4 aquifers are continuous beneath TCAAP. Groundwater within these aquifers is a major source of off-site water supply. The Unit 3 consists of Hillside Sand Formation (generally poorly sorted gravel to cobble sand) and Unit 4 consists of the Prairie du Chien Formation (dolomite that may have solution cavities and minor interbedded quartzite sandstone) and the underlying Jordan Sandstone. On-site groundwater contamination within Units 3 and 4 has been attributed to past waste disposal activities at Sites D, G, and I. The predominant contaminants within these units are TCE and TCA (MW, 1997).

In September 1987, a ROD (1987 ROD) was prepared by the USEPA in order to implement the Interim Response Action Plan (IRAP) for TCAAP. The 1987 ROD provided specific criteria for the Boundary Groundwater Recovery System (BGRS). The BGRS consisted of six Unit 3 extraction wells that were connected by forcemain to an air stripping treatment facility. The BGRS was started on October 19, 1987.

Subsequently, additional extraction wells were added, including wells near the source areas (Sites D, G, and I). The expanded system was called the TCAAP Groundwater Recovery System (TGRS). These modifications were completed and the expanded system began operation on January 31, 1989. The TGRS was made part of the final remedy in the 1997 OU2 ROD. Figure 5 shows the TGRS layout. The system has been optimized over time to meet changing conditions, but continues to function as designed.

## **3.0 BASIS FOR THE EXPLANATION OF SIGNIFICANT DIFFERENCES**

Investigations and/or removal actions and remedial actions currently in place (especially groundwater pump and treat systems) have been completed in accordance with the requirements in the OU2 ROD. However, the Army has determined that a modification to the selected remedies is necessary. The OU2 ROD was inconsistent between sites with respect to inclusion of LUCs for groundwater, so the primary intent of this ESD is to provide such consistency.

For Site A Shallow Groundwater, the ROD prescribed “institutional controls to restrict new well installation.” At the time, the main focus was on residential areas off-TCAAP. The intent of this



ESD is to clarify that LUCs are warranted for areas where contaminant concentrations are above the cleanup levels, regardless of whether or not on federally-controlled property. Currently, the areas where groundwater contaminant concentrations are above the cleanup levels and require LUCs are located on and off the National Guard property. The purpose of the LUCs is to prevent human exposure to contaminated groundwater by restricting installation of water supply wells into the contaminated portion of the aquifer. In addition, it is prudent to incorporate LUCs to protect the groundwater monitoring and extraction system infrastructure. The OU2 ROD also prescribed "source characterization/remediation," which was accomplished through the removal actions described in Section 2.1. Through these actions, source area soils were remediated for VOC contamination, resulting in unrestricted land use conditions. Therefore, this ESD is intended to incorporate the removal of the source area soils into the final remedy.

For Site K Shallow Groundwater, the OU2 ROD did not address LUCs. Therefore, this ESD is intended to add LUCs to prevent human exposure to groundwater by restricting installation of water supply wells into the contaminated portion of the aquifer. In addition, it is prudent to incorporate LUCs to protect the groundwater monitoring, extraction, and treatment system infrastructure. With respect to the source area for the groundwater contamination, the ROD prescribed "additional characterization of the unsaturated Unit 1 soil." This activity was completed; however, because Building 103 was in use, the source area soils have not been remediated to-date. Therefore, this ESD is intended to add LUCs to prevent human exposure to the contaminated soils that remain beneath the floor slab of former Building 103.

For Deep Groundwater, the OU2 ROD included "institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater," which is consistent with the LUC added for Site A and Site K above. This ESD adds LUCs to protect the groundwater monitoring, extraction, and treatment system infrastructure.

#### **4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES AND CHANGES IN EXPECTED OUTCOME**

This ESD clarifies that the final remedy for Shallow Groundwater Sites A and K and Deep Groundwater includes the implementation of LUCs. General LUCs would include actions to be taken by the Army while the property is under Federal control, and if transferred from Federal control, then deed restrictions and State Environmental Covenants. The Army has already been restricting installation of water supply wells; avoiding land uses that could potentially disturb the groundwater monitoring, extraction, and treatment systems; and avoiding land uses that could result in exposure to contaminated soil beneath former Building 103. Therefore, the formal adoption of these LUCS in this ESD will not cause any change in the outcome of the remedy, other than to add greater assurance. The source area soils at Site A were remediated to unrestricted use levels, so the incorporation of those activities as part of the final remedy after-the-fact does not affect the outcome. Lastly, this ESD is intended to clarify that Five-year reviews will be conducted for each site until such time that hazardous substances, pollutants, or contaminants that remain on site in soil and groundwater are below levels that allow for unrestricted use and unlimited exposure.

## 5.0 SUPPORT AGENCY COMMENTS

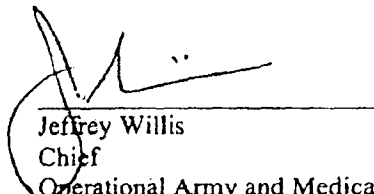
The USEPA and the MPCA have reviewed this ESD and concur with the clarifications and determinations with respect to the remedies for Shallow Groundwater at Sites A and K and Deep Groundwater.

## 6.0 STATUTORY DETERMINATIONS

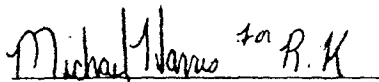
The permanent remedy as clarified by this ESD for the Shallow Groundwater Sites A and K and Deep Groundwater at the NB/AH site is protective of human health and the environment, complies with federal and state requirements, including CERCLA Section 121, that are applicable or relevant and appropriate to the remedial action, and is cost effective.

## 7.0 PUBLIC PARTICIPATION COMPLIANCE

A notice of availability and a brief description of this ESD will be printed in the local newspaper in accordance with Section 300.435(c)(2)(i) of the NCP.

  
\_\_\_\_\_  
Jeffrey Willis  
Chief  
Operational Army and Medical Branch  
Base Realignment & Closure Division

9/22/2008  
Date

  
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Richard C. Karl  
Superfund Division  
Region 5  
U.S. Environmental Protection Agency, Region V

5/01/2009  
Date

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Kathryn Sather, Director  
Remediation Division  
Minnesota Pollution Control Agency

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Date

**5.0 SUPPORT AGENCY COMMENTS**

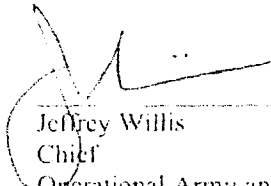
The USEPA and the MPCA have reviewed this ESD and concur with the clarifications and determinations with respect to the remedies for Shallow Groundwater at Sites A and K and Deep Groundwater.

**6.0 STATUTORY DETERMINATIONS**

The permanent remedy as clarified by this ESD for the Shallow Groundwater Sites A and K and Deep Groundwater at the NB/AH site is protective of human health and the environment, complies with federal and state requirements, including CERCLA Section 121, that are applicable or relevant and appropriate to the remedial action, and is cost effective.

**7.0 PUBLIC PARTICIPATION COMPLIANCE**

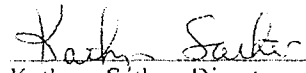
A notice of availability and a brief description of this ESD will be printed in the local newspaper in accordance with Section 300.435(c)(2)(i) of the NCP.

  
\_\_\_\_\_  
Jeffrey Willis  
Chief  
Operational Army and Medical Branch  
Base Realignment & Closure Division

9/22/08  
Date

\_\_\_\_\_  
Richard C. Karl  
Superfund Division  
Region 5  
U.S. Environmental Protection Agency, Region V

\_\_\_\_\_  
Date

  
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Kathryn Sather, Director  
Remediation Division  
Minnesota Pollution Control Agency

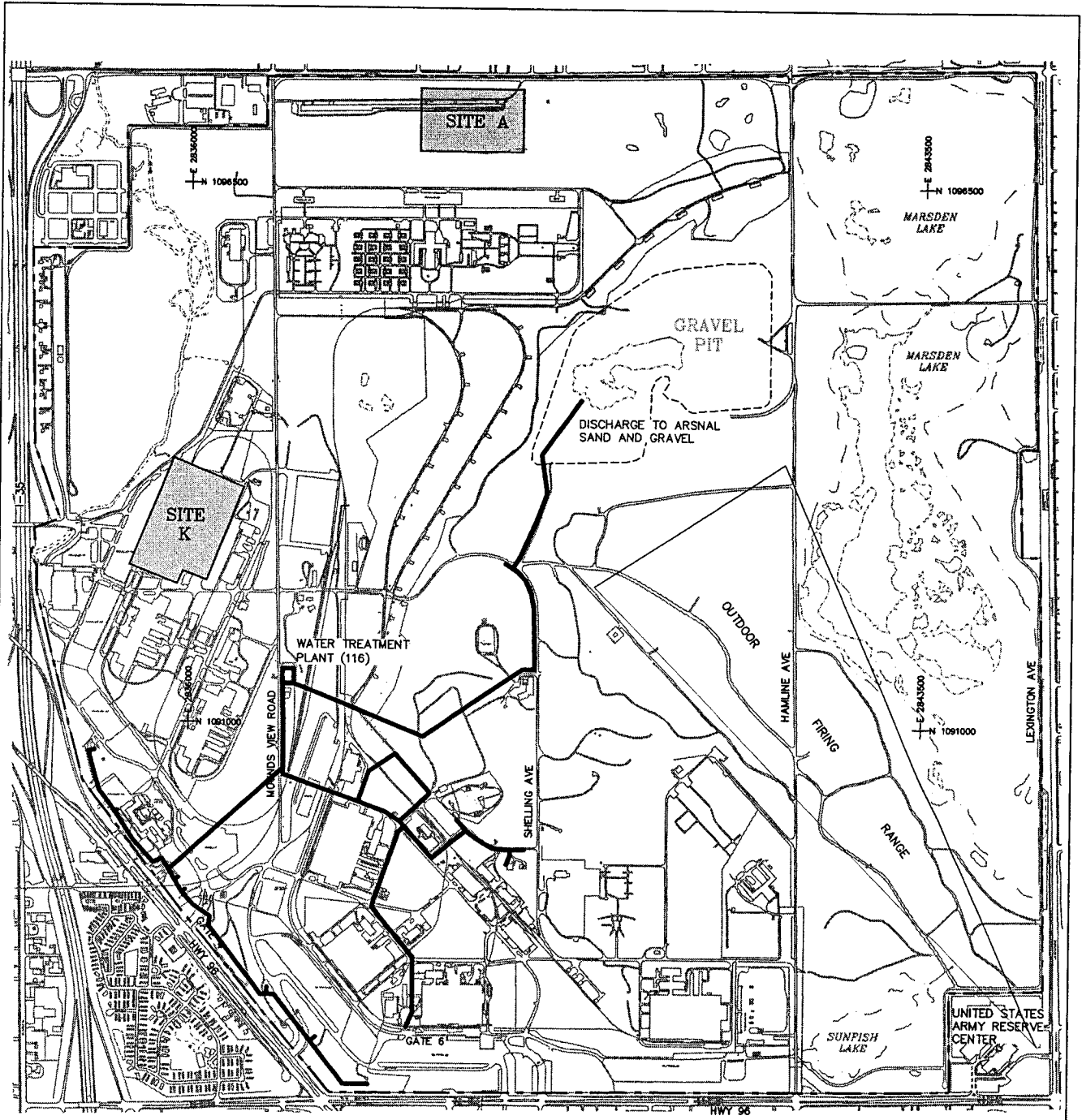
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## FIGURES

## FIGURES

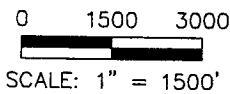


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**LEGEND**

- TCAAP GROUND WATER REMEDIATION SYSTEM
- FORMER TCAAP BOUNDARY
- REMEDIATION SITES



**U.S. ARMY  
CORPS OF ENGINEERS  
OMAHA DISTRICT**

TWIN CITIES ARMY AMMUNITION PLANT

FIGURE NUMBER

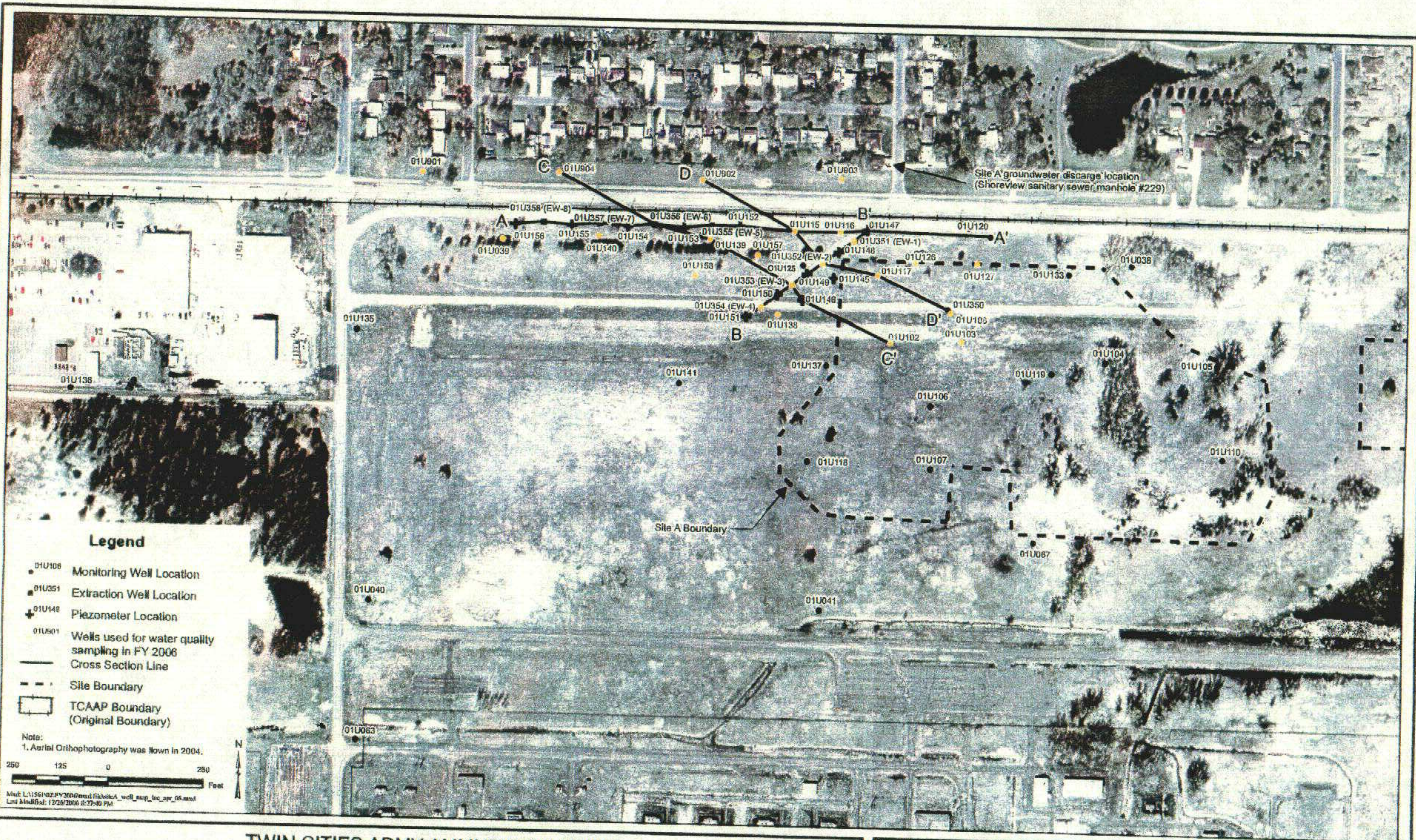
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TCAAP SITE LAYOUT



C	ISSUE TO ARMY	DPM	KR	01/23/08			
B	ISSUE TO ARMY	DPM	KR	12/03/07			
A	ISSUE TO ARMY	ERC	PSM	01/20/06			
REVISION	DESCRIPTION	CHKD	APPR	DATE			
BY	DATE	BY	DATE	BY	DATE		
DSGN	ERC 01/20/06	DRAWN	MEC 01/20/06	CHKD	ERC 01/20/06	APPR	PSM 01/20/06

PROJECT NO.	REV.	FILE NAME
10100.1504	C	10100Y08C



**Legend**

- 01U108 Monitoring Well Location
- 01U351 Extraction Well Location
- ⊕ 01U148 Piezometer Location
- 01U501 Wells used for water quality sampling in FY 2006
- Cross Section Line
- - - Site Boundary
- ▭ TCAAP Boundary (Original Boundary)

Note:  
1. Aerial Orthophotography was flown in 2004.



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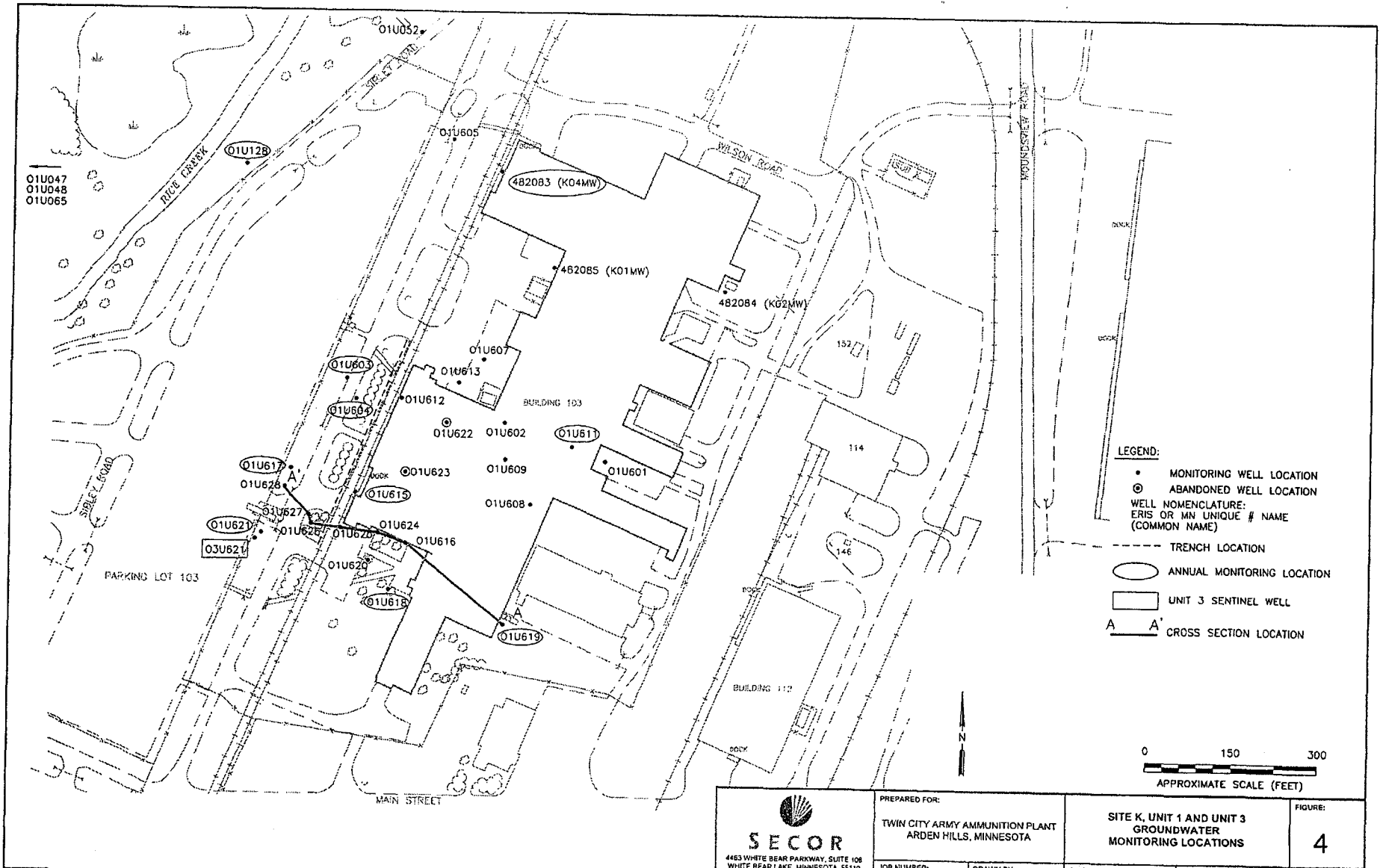
**TWIN CITIES ARMY AMMUNITION PLANT**

**Site A, Well Location Map**


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

FY 2006  
 Figure 3





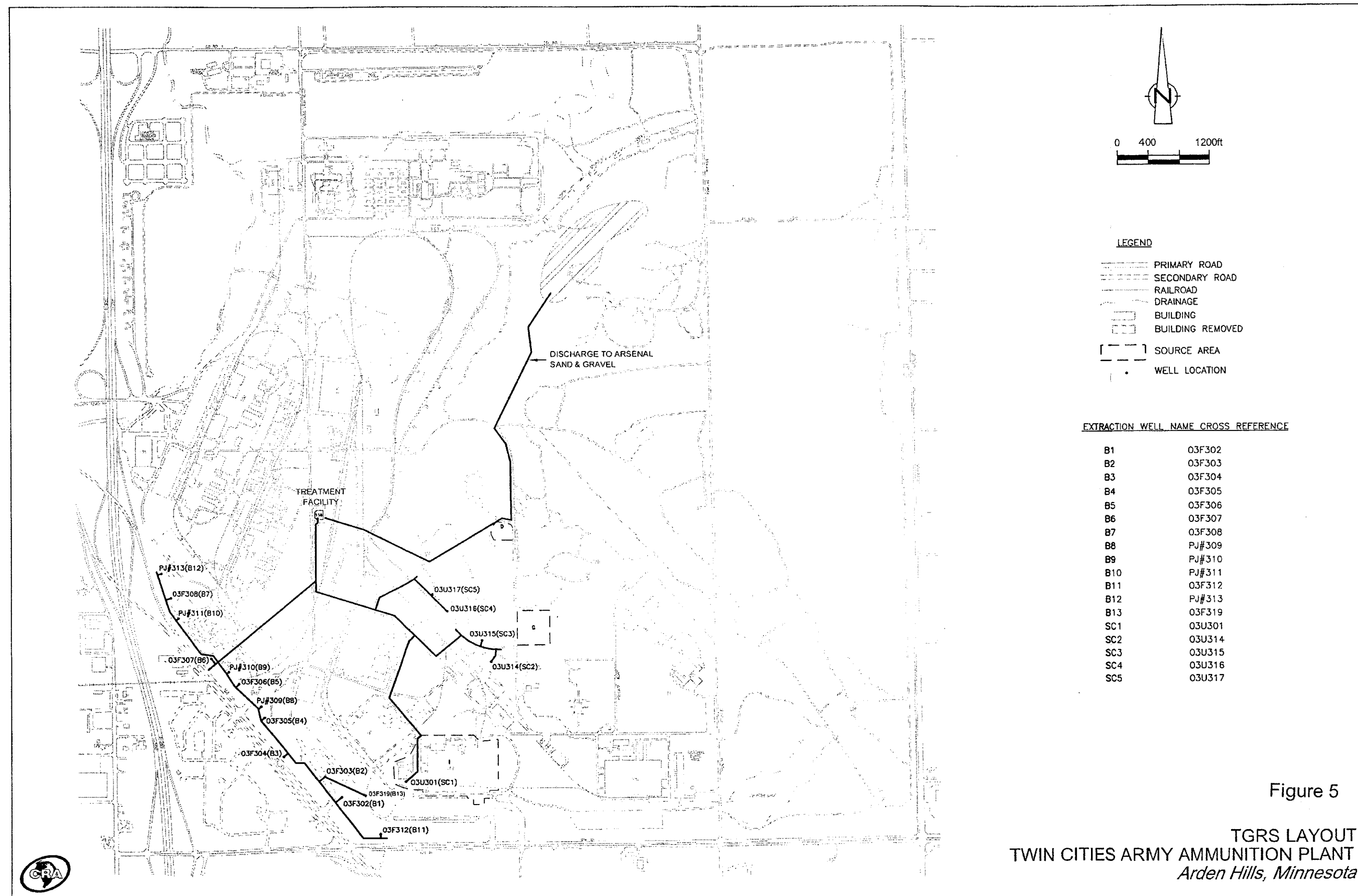


Figure 5

TGRS LAYOUT  
TWIN CITIES ARMY AMMUNITION PLANT  
Arden Hills, Minnesota



## APPENDIX A

**APPENDIX A  
REFERENCES**

## REFERENCES

Montgomery Watson (MW). 1996. Twin Cities Army Ammunition Plant Operable Unit 2 Feasibility Study Supplemental Data Report. Prepared for U.S. Army Environmental Center. June 1996.

Montgomery Watson and Conestoga Rovers Associates (MW). 1997. *Operable Unit 2 Feasibility Study, Final Report, Twin Cities Army Ammunition Plant, Arden Hills, Minnesota*. Prepared for U.S. Army Environmental Center and Alliant Techsystems, Inc. March 1997.

Shaw Environmental, Inc. (Shaw). 2004. Final Remedial Action Completion and Shallow Soil Sites Close Out Report, Twin Cities Army Ammunition Plant, Arden Hills, Minnesota, Volume VIII Site A Former 1945 Trench Activities, Revision 3. Prepared for the U.S. Army Corps of Engineers, Omaha District. January 30, 2004.

U.S. Army Environmental Center, Environmental Restoration Division (USAEC). 1997. Twin Cities Army Ammunition Plant, New Brighton/Arden Hills, Superfund Site, Operable Unit 2 Record of Decision. December 1997.

Wenck Associates, Inc. (Wenck). 2007. *Installation Restoration Program, Twin Cities Army Ammunition Plant, Fiscal Year 2006 Annual Performance Report*. Prepared for The Twin Cities Army Ammunition Plant. September 2007.