
FINAL
EXPLANATION OF SIGNIFICANT DIFFERENCES
CHANGE IN GROUNDWATER TREATMENT SYSTEM TO TREAT 1,4-DIOXANE AS A
CONTAMINANT OF CONCERN

NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE

Twin Cities Army Ammunition Plant

May 29, 2020

1.0 INTRODUCTION AND STATEMENT OF PURPOSE

An Explanation of Significant Differences (ESD) is required for Operable Unit (OU) 1 at the New Brighton/Arden Hills Superfund Site ("NB/AH Superfund Site", also referred to as the former Twin Cities Army Ammunition Plant or "TCAAP") to modify the Record of Decision (ROD) to add 1,4-dioxane to the list of contaminants of concern (COCs). 1,4-Dioxane is associated with the other volatile organic compounds (VOCs) that are COCs for OU1 through its use as a solvent stabilizer. The COCs (including 1,4-dioxane) are present as a result of disposal practices at TCAAP. The addition of 1,4-dioxane as a COC requires modification of the OU1 deep groundwater treatment technology used in the extraction and treatment of groundwater to include treatment of 1,4 dioxane. The permanent granular activated carbon Water Treatment Facility in New Brighton that was the primary treatment component of the original remedy was not capable of removing 1,4-dioxane to levels protective of public health, thereby necessitating the addition of a supplemental process to treat the 1,4-dioxane.

The ROD was originally signed on September 30, 1993 and was amended in 2006 (United States Environmental Protection Agency [USEPA] 1993). The change described in this ESD does not alter the overall cleanup approach documented in the September 1993 ROD and the 2006 ROD Amendment. All other aspects of the remedy remain unchanged, including extraction rates and the monitoring program. This ESD was prepared in accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 and Section 300.435(c)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This ESD will become part of the Administrative Record (AR) for TCAAP and will be available to the public at the following location(s):

<u>Location</u>	<u>Address</u>	<u>Phone Number</u>	<u>Hours of Operation</u>
TCAAP	4761 Hamline Ave N Arden Hills, MN 55112	651-356-4466	Access can be arranged by contacting Mary Lee at mary.l.lee.civ@mail.mil, or 651-356-4466

1.1 Site Name and Location

The NB/AH Superfund Site includes the former TCAAP facility in Arden Hills, Minnesota, as well as portions of several surrounding communities. The NB/AH Superfund Site is subdivided into three OUs (OU1 through OU3) as shown in Figure 1. OU1, the subject of this ESD, is located outside the former TCAAP facility boundary and consists of the “North Plume” of VOC deep groundwater contamination. OU2 includes soil, sediment, surface water, and groundwater contamination in the area that comprised the TCAAP facility in 1983, when the NB/AH Superfund Site was placed on the National Priorities List (NPL). OU2 also includes the shallow Site A groundwater plume that extends off the north end of TCAAP. OU3 is located outside the former TCAAP facility boundary and encompasses deep groundwater contamination referred to as the “South Plume”.

1.2 Identification of Lead and Support Agencies

Cleanup of TCAAP is conducted by the Army as the lead agency under the Federal Facility Agreement (FFA) signed in 1987 by the Army, USEPA, and Minnesota Pollution Control Agency (MPCA). Environmental investigations and remedial actions at TCAAP are conducted under the structure of the CERCLA. Specifically, Section 117c of CERCLA, as well as Section 300.435(c)(2)(i) of the NCP.

1.3 Summary of Circumstance Requiring an Explanation of Significant Differences

The Army has prepared this ESD to address the following:

- Add 1,4-dioxane, which was used as a solvent stabilizer and is present as a result of disposal practices at TCAAP, to the list of COCs.
- Modify the groundwater treatment technology used in the extraction and treatment system for OU1 deep groundwater to include treatment of 1,4 dioxane. The permanent granular activated carbon Water Treatment Facility in New Brighton that was the primary treatment component of the original remedy was not capable of removing 1,4-dioxane to levels protective of public health; therefore, a new treatment technology using Advanced Oxidation Process (AOP) was added to the selected remedy to treat 1,4-dioxane.

This ESD was prepared in accordance with the guidelines presented in *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA 1999), and includes all items listed in Highlight 7-2 of that document: Sample Outline and Checklist for ESDs and ROD Amendments (see Table 1 for a summary of this checklist).

Table 1. USEPA Checklist for ESDs

Component	ESD Checklist Item	Where Item is Addressed in this ESD
Introduction to the Site and Statement of Purpose	Site name and location.	Section 1.1, "Site Name and Location"
	Identification of lead and support agencies.	Section 1.2, "Lead and Supporting Agencies"

Table 1. USEPA Checklist for ESDs

Component	ESD Checklist Item	Where Item is Addressed in this ESD
	Citation of CERCLA §117(c) and NCP §300.435(c)(2)(i)	Section 1.2, "Lead and Supporting Agencies"
	Include date of ROD signature.	Section 1.2, "Lead and Supporting Agencies"
	Summary of circumstances that led to the need for an ESD.	Section 1.3, "Summary of Circumstances Requiring an Explanation of Significant Differences"
	Statement that ESD will become a part of the Administrative Record file (NCP 300.825(a)(2)).	Section 1.3, "Summary of Circumstances Requiring an Explanation of Significant Differences"
	Address of location where the files is available and hours of availability.	Section 1.0, "Introduction and Statement of Purpose"
Site History, Contamination, and Selected Remedy	Brief summary of contamination problems and site history.	Section 2.1, "Site and Contamination History"
	Present the Selected Remedy, as originally described in the ROD.	Section 2.2, "Selected Remedy"
Basis for the Document	Summarize information that prompted and supports significant differences from the Selected Remedy, including the results of the treatability studies or other information developed or provided during the remedial design process.	Section 3, "Basis for the Explanation of Significant Differences"
	Reference any information in the Administrative Record that supports the need for the change.	Section 3, "Basis for the Explanation of Significant Differences"
Description of Significant Differences or New Alternatives	Describe the significant differences between the remedy as presented in the ROD and the action now proposed, highlighting scope, performance, and cost.	Section 4.1, "Significant Differences"
	Describe any changes in Expected Outcomes that will result from the ESD.	Section 4.2, "Changes in Expected Outcomes"
Support Agency Comments	Include a summary of support agency comments on the ESD.	Section 5, "Support Agency Comments"
Statutory Determinations	State that the modified remedy satisfies CERCLA §121.	Section 6, "Affirmation of Statutory Determinations"
Public Participation Compliance	Document that the public participation requirements set out in NCP §300.435(c)(2)(i) have been met.	Section 7, "Public Participation"

Notes:

Components and checklist items are from highlight 7-2 of A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (USEPA 1999)

§ - Section

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

ESD - Explanation of Significant Differences

NCP - National Oil and Hazardous Substances Pollution Contingency Plan

ROD - Record of Decision

USEPA - United States Environmental Protection Agency

2.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

This section describes site history and contamination, specifically the deep groundwater impacts at OU1. The remedy for OU1 deep groundwater is also summarized.

2.1 Site and Contamination History

TCAAP was constructed between August 1941 and January 1943 in the northern portion of the Minneapolis – St. Paul metropolitan area, in Ramsey County, Minnesota, surrounded by the cities of New Brighton, Arden Hills, Mounds View, and Shoreview. TCAAP primarily produced and tested small-caliber ammunition and related materials for the Army. Other uses included manufacture of munitions-related components, handling/storage of strategic and critical materials for other government agencies, and various non-military activities. Production began in 1942, and operations alternated between periods of activity and standby related to wars until manufacturing ceased in 2005.

During periods of activity, solvents were used as part of some manufacturing operations. Disposal of solvents and other wastes at the TCAAP property resulted in on-site soil impacts and groundwater contamination that migrated beyond the original TCAAP boundary. Groundwater impacts were first discovered in July 1981, leading to soil and groundwater investigations on and off TCAAP. It was determined that TCAAP was the source of contamination, and the TCAAP property and area of affected groundwater contamination was placed on the NPL in 1983 as the NB/AH Superfund Site.

2.2 Selected Remedy for OU1

Remedial actions at OU1 are described in the 1993 ROD and the 2006 Amendment. The current deep groundwater remedial action is accomplished by the New Brighton Contaminated Groundwater Recovery System (NBCGRS). The NBCGRS includes extracting contaminated groundwater from the North Plume using six municipal wells (New Brighton Municipal #3, #4, #5, #6, #14, and #15) and conveying it to New Brighton's Water Treatment Plant 1 (WTP1), where it is treated to remove iron and manganese using a green sand filtration system and TCAAP VOCs using a pressurized granular activated carbon system. Following treatment, the water is discharged to the New Brighton municipal distribution system. The remedial action was chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (Title 42, United States Code, sections 9601 to 9675) and, to the extent practicable, the NCP (Title 40 of the Code of Federal Regulations, Part 300).

The ROD specified that the initial aggregate groundwater extraction rate by the NBCGRS shall be consistent with long-term NBCGRS operating history; 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; future changes to the aggregate or individual well extraction rates shall be made 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; and 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 addition, the remedy included providing alternate water supplies 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, and monitoring the groundwater to verify effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrations.

3.0 BASIS FOR THE EXPLANATION OF SIGNIFICANT DIFFERENCES

Since the ROD and 2006 Amendment were signed, Annual Performance Reviews and five-year reviews (1999, 2004, 2009, 2014, 2019) have been issued showing groundwater impacts of dissolved phase trichloroethene (TCE) at TCAAP. In early 2015, the City of New Brighton was notified by the Minnesota Department of Health (MDH) that 1,4-dioxane had been detected in New Brighton's water supply (with detections up to 6.8 micrograms per liter [$\mu\text{g/L}$]), in the Prairie du Chien and/or Jordan Aquifers. However, concentrations of 1,4-dioxane in samples collected from deeper municipal wells (Mount Simon Aquifer) were non-detect. No federal drinking water standard exists for 1,4-dioxane; however, a MDH Health Risk Limit (HRL) of 1 $\mu\text{g/L}$ is in place based on a Cancer HRL calculation. The MDH HRL for 1,4-dioxane is a chemical-specific applicable or relevant and appropriate requirement for protection of private and public water supplies and for groundwater restoration, as specified in the ROD (USEPA 1993). The majority of the 1,4-dioxane concentrations in samples collected from the NBCGRS exceed the MDH HRL. A 'remedy time-out' was placed ceasing NBCGRS operation on April 15, 2015. The City initially switched to preferential extraction from non-impacted deeper aquifer wells while evaluating treatment technologies and later connected to the City of Minneapolis water distribution system until a 1,4-dioxane remedy had been added to the NBCGRS.

In 2017, the City of New Brighton and the Army selected a new treatment technology for removing 1,4-dioxane from NBCGRS effluent: AOP. Upgrades to the New Brighton WTP1 were completed and implemented in November 2018 and pumping from the six municipal wells that comprise the NBCGRS was restarted with AOP treatment.

A supplemental, full groundwater sampling round at OU1, OU2, and OU3 monitoring wells was completed in 2015 and 2016 for 1,4-dioxane. Since then, detections of 1,4-dioxane in groundwater continues to be monitored on an annual basis and reporting has been expanded to include 1,4-dioxane concentrations and contours.

4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

The Army prepared this ESD to address the following:

- Add 1,4-dioxane to the list of COCs, which was used as a solvent stabilizer and is present as a result of disposal practices at TCAAP.
- Modify the groundwater treatment technology used in the NBCGRS extraction and treatment system for deep groundwater to include treatment of 1,4 dioxane.

4.1 Significant Differences

The OU1 ROD states the remedial action objective for TCAAP is to mitigate the potential risk of exposure of human receptors to COCs in groundwater. To date, operation of the OU1 remedy via the NBCGRS has been effective in containing impacted OU1 groundwater and preventing human exposure through groundwater extraction and treatment. Historical groundwater data trends and quality indicate there has been significant improvement in groundwater conditions in OU1 as a result of operation of both the OU2 TCAAP Groundwater Recovery System and NBCGRS. Prior to the April 2015 remedy time-out, TCE trends in the NBCGRS wells appeared to be stable for New Brighton Municipal (NBM) wells #3, #4, #14, and #15 and decreasing for NBM wells #5 and #6.

As described in Section 3.0, upgrades to New Brighton's WTP1 were made to treat 1,4-dioxane from the groundwater. Prior to implementing the upgrades, New Brighton completed extensive treatability studies to evaluate the implementability of the upgrades and, since completing the upgrades in November 2018, has continued to evaluate the performance of the new AOP treatment system. Pumping from the six NBCGRS wells resumed in November 2018 and currently, the NBCGRS and other components of the remedy are operating as intended, including the additional 1,4-dioxane treatment system (AOP). New Brighton has documented the system design, installation, and evaluations in the following documents:

- Treatability Study Results and Advanced Oxidation Process Technology Recommendation Report: 1,4-Dioxane Treatment System Addition to the New Brighton Contaminated Groundwater Recovery System, Barr, August 2016.
- Twenty-Sixth Annual Meeting on New Brighton Contaminated Groundwater Recovery System with the City of New Brighton and the United States Department of the Army: Tab 20.C: 1,4-Dioxane Response Costs Advisory, 2018.
- New Brighton Contaminated Groundwater Recovery System: Sampling and Analysis Plan, Barr, May 2019.

4.2 Changes in Expected Outcomes

Implementation of targeted 1,4-dioxane treatment will reduce 1,4-dioxane concentrations in groundwater extracted from the six municipal wells to less than its HRL prior to discharge to the New Brighton municipal distribution system. Operation of the NBCGRS with 1,4-dioxane treatment will continue to contain the plume and improve groundwater quality.

5.0 SUPPORT AGENCY COMMENTS

USEPA and MPCA had ongoing involvement in the decision-making process associated with the modification to the remedy for OU1.

6.0 AFFIRMATION OF STATUTORY DETERMINATIONS

The proposed change to the selected remedy will continue to satisfy the requirements under Section 121 of CERCLA. The modified remedy will remain protective of human health and the

environment and will continue to comply with federal and state Applicable or Relevant and Appropriate Requirements and be cost effective. Figure 3 presents the modified remedy.

7.0 PUBLIC PARTICIPATION

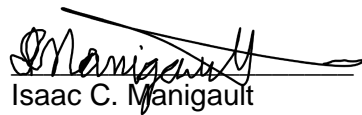
A notification to the public concerning this ESD will be made in the local newspaper after signature. The ROD and this ESD are available to the public at the following locations, as part of the Administrative Record:

- TCAAP, 470 West Highway 96 – Suite 100, Shoreview, MN 55126-3218, 651-294-4930

8.0 REFERENCES

USEPA. 1993. Record of Decision, Groundwater Remediation Operable Unit 1 at New Brighton/Arden Hills Superfund Site. EPA R35-93/246. September. Amendment #1 in May 2006.

USEPA. 1999. A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents. EPA 540-R-98-031. Washington, D.C. July.

A handwritten signature in black ink, appearing to read "Manigault", is written over a horizontal line.

Isaac C. Manigault
Colonel, U.S. Army
Commander, U.S. Army Environmental Command

12 June 2020

Date

X 

Douglas Ballotti, Director
Superfund & Emergency Management Division
Signed by: DOUGLAS BALLOTTI

30 June 2020
Date

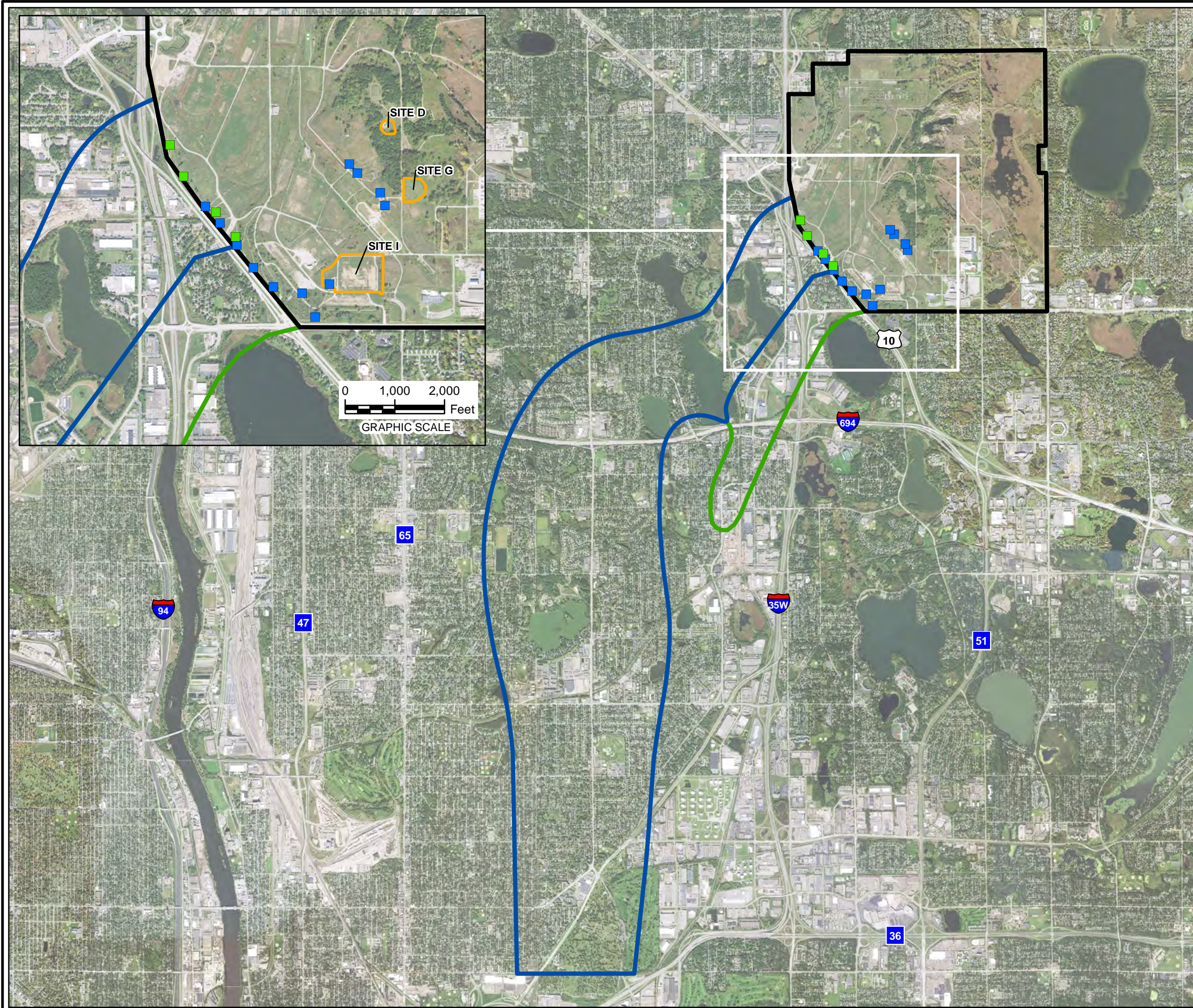
Kathryn J Sather
Kathryn J. Sather, Director
Remediation Division
Minnesota Pollution Control Agency

16 June 2020
Date

This document has been electronically signed.

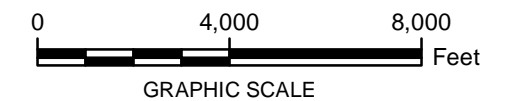
LIST OF FIGURES

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LEGEND:

- TGRS BEDROCK EXTRACTION WELL
- TGRS OVERBURDEN EXTRACTION WELL
- OPERABLE UNIT 1
- OPERABLE UNIT 2
- OPERABLE UNIT 3
- SITE BOUNDARIES



NOTES:

1. ALL LOCATIONS ARE APPROXIMATE
2. 2015 AERIAL PHOTOGRAPH (SOURCE: NAIP)

TWIN CITIES ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE LOCATION MAP



