RECORD OF DECISION AMENDMENT #4

FOR

OPERABLE UNIT 2 (OU2)

NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE

January 2012

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APPENDICES

Acronyms

AHATS	-	Arden Hills Army Training Site
Alliant	-	Alliant Techsystems Inc.
ARAR	-	Applicable or Relevant and Appropriate Requirements
Army	-	U.S. Army
AVS	-	Acid Volatile Sulfides
BAP	-	Benzo(a)Pyrene
BRAC	-	Base Realignment and Closure (Division of the Army)
CERCLA	-	Comprehensive Environmental Response, Compensation, and Liability Act
COC	-	Chemical of Concern
CRA	-	Conestoga-Rovers and Associates, Inc.
EE/CA	-	Engineering Evaluation/Cost Analysis
ERA	-	Ecological Risk Assessment
ESD	-	Explanation of Significant Difference
FFA	-	Federal Facility Agreement
FS	-	Feasibility Study
FY	-	Fiscal Year
HRL	-	Health Risk Limit
LUCs	-	Land Use Controls
LUCRD	-	Land Use Control Remedial Design
MDH	-	Minnesota Department of Health
mg/kg	-	Milligrams per Kilogram
mg/L	-	Milligrams per Liter
µg/L	-	Micrograms per Liter
MNA	-	Monitored Natural Attenuation
MPCA	-	Minnesota Pollution Control Agency
NB/AH	-	New Brighton/Arden Hills
NCP	-	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	-	National Pollutant Discharge Elimination System
NPL	-	National Priorities List
OU	-	Operable Unit
PAHs	-	Polycyclic Aromatic Hydrocarbons
PRG	-	Preliminary Remediation Goal

Acronyms (Cont.)

PTA	-	Primer/Tracer Area
RAO	-	Remedial Action Objective
RAB	-	Restoration Advisory Board
RI/FS	-	Remedial Investigation/Feasibility Study
ROD	-	Record of Decision
RRG	-	Recommended Remediation Goal
SLV	-	Soil Leaching Value
SRV	-	Soil Reference Value
SVE	-	Soil Vapor Extraction
SVOC	-	Semi Volatile Organic Compound
TCAAP	-	Twin Cities Army Ammunition Plant
USACHPPM-		U.S. Army Center for Health Promotion and Preventative Medicine
USAEC	-	U.S. Army Environmental Command
USEPA	-	U.S. Environmental Protection Agency
VOC	-	Volatile Organic Compound
Wenck	-	Wenck Associates, Inc.

1.0 Introduction

1.1 PROPOSED CHANGES IN THE REMEDY

This decision document amends the Record of Decision (ROD) for Operable Unit 2 (OU2) of the New Brighton/Arden Hills Superfund Site (NB/AH site). The Site, which includes the Twin Cities Army Ammunition Plant (TCAAP), is located in Arden Hills, Minnesota. OU2 consists of affected soil, sediment, surface water, and groundwater within the boundaries of the TCAAP facility that were impacted by waste materials such as volatile organic compounds (VOCs), heavy metals, and explosives as a result of site operations and/or waste management and disposal activities that occurred in the period from 1941 to 1981. Figure 1 shows the location of TCAAP and its boundary in 1983 (i.e., the OU2 boundary) and the location of the five aquatic sites and three other sites that are addressed in this ROD amendment, which is ROD Amendment #4 for the OU2 ROD.

The OU2 ROD was issued in 1997. ROD Amendment #1 for Site C-2 (a portion of Site C) was finalized in 2007. ROD Amendments #2 and #3, along with Explanation of Significant Difference (ESD) #1 and #2, were all finalized in 2009 and documented final remedies at various soil and dump sites and also addressed land use controls (LUCs) at various soil, groundwater, and dump sites. OU2 is one of three Operable Units currently established for the NB/AH site. OU1 addresses the North Plume of groundwater contamination located off-TCAAP and OU3 addresses the South Plume of groundwater contamination off-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 12580, 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 Facility Agreement (1987)

among the Army, the U.S. Environmental Protection Agency (USEPA), and the Minnesota Pollution Control Agency (MPCA).

ROD Amendment #4 documents the remedy decisions at the following sites within OU2 (Figure 1):

- Five water bodies not previously addressed (Rice Creek, Sunfish Lake, Marsden Lake North, Marsden Lake South, and Pond G),
- An area of concern for soil contamination not previously addressed (535 Primer/Tracer Area),
- An area of concern for groundwater contamination not previously addressed (Building 102), and
- Removal of soil contamination at an area of concern previously identified, but for which a soil remedial action was not prescribed (Site K).

The proposed remedy changes address contamination in surface water at one aquatic site (Pond G) and include No Action decisions for four other aquatic sites (Rice Creek, Sunfish Lake, Marsden Lake North, and Marsden Lake South). In addition, the proposed remedy changes include final remedies for two other sites where Removal Actions have been completed or are currently in place: 1) the 535 Primer/Tracer Area (535 PTA), a soil contamination site where contamination has been reduced to below cleanup levels and No Further Action is proposed, and 2) Building 102, a shallow groundwater contamination site where an ongoing removal action will be selected as the final remedy. Lastly, the proposed remedy changes include a soil contamination site (Site K) where a Removal Action has been completed that has reduced soil VOC contamination to below cleanup levels. The 1997 ROD identified investigation of Site K soils as a remedy component (along with other groundwater remedy components as discussed in Section 2.1.4); however, it did not specify a soil remedy given the unknown location and extent of the VOC-contaminated soils (which were presumed to exist and to be the source area for VOC contamination in Site K shallow groundwater). The proposed amended remedy for Site K soils is No Further Action.

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 fundamentally differs from a final ROD with respect to scope, performance, or cost, the lead agency is required to prepare an amendment to the ROD describing the changes that are to be made, stating the reasons such changes are being made, and providing assurances that the proposed remedy satisfies the statutory requirements. The decision to change the remedy for OU2 constitutes a fundamental change in the OU2 remedy, necessitating the issuance of a new proposed plan and an amended OU2 ROD.

This OU2 ROD amendment and all supporting documents will become part of the NB/AH site 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

1.3 PUBLIC COMMENT PERIOD

In accordance with Section 300.435(c)(2)(i) of the NCP, the Army prepared a Proposed Plan and facilitated a newspaper notice of the proposed OU2 ROD modification on March 23, 2011. This notice identified a public comment period held from March 23, 2011 to April 22, 2011, and also included an offer to hold a public meeting, if requested. No public meeting was requested and 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 located in Ramsey County, Minnesota. It includes the approximately 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.

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, and ceased in 2004.

In 1983, the site was put on the National Priorities List (NPL) because USEPA and MPCA determined that hazardous substances from TCAAP had been released into the environment. The NB/AH site was divided into three operable units, as discussed in Section 1.1. Figure 1 shows the location of TCAAP and its boundary in 1983 (i.e., the OU2 boundary) and the location of the five aquatic sites and three other sites that are addressed in this ROD amendment.

Background information for each of the individual sites is presented in the remainder of this section.

2.1.1 Aquatic Sites

The five aquatic sites addressed in this ROD amendment are located within the OU2 boundary (Figure 1), and include Rice Creek, Sunfish Lake, Marsden Lake North, Marsden Lake South, and Pond G. Note that Marsden Lake is a single water body, but was broken into two separate areas for the purposes of risk assessment.

Initial aquatic site investigation work had been completed as part of the OU2 Feasibility Study (Montgomery Watson, 1997). However, when it later became evident that completion of an ecological risk assessment for aquatic sites would lag behind completion of the work on other sites in the OU2 Feasibility Study (FS), the USEPA, MPCA, and Army agreed to exclude aquatic sites from the OU2 FS. Accordingly, in October 1997, when the OU2 ROD was prepared that outlined the selected remedies for OU2, remedy decisions for the aquatic sites were not included. Remedy decisions for the aquatic sites will now be documented in this ROD amendment.

Ecological risks from surface waters and sediment were evaluated in the Tier II Ecological Risk Assessment (Tier II ERA), prepared by the United States Army Center for Health Promotion and Preventive Medicine (USACHPPM), dated 2004. Based on differing conceptual models and risk hypotheses for each of the aquatic sites, the Tier II ERA evaluated between one and five of the following ecological endpoints for each site: 1) fish, invertebrates, algae; 2) benthic organisms; 3) amphibians; 4) waterfowl, wading birds; and 5) mammals. Some of the endpoint assessments involved multiple lines of evidence. The Tier II ERA summarized the presence of ecological risk for each endpoint using a system of labels representing adverse effects as follows (from lower to higher): Not Apparent, Possible, Potential, and Confirmed. The Tier II ERA also characterized the magnitude of ecological risk as Low, Moderate, or High for each endpoint. Risks associated with human health were addressed in a human health risk assessment conducted by PRC Environmental Management for the USEPA (PRC, 1991). The human health risk assessment concluded that human exposure to surface water and sediment presents negligible risks.

The Feasibility Study for Rice Creek, Sunfish Lake, Marsden Lake, and Pond G (Wenck, 2010), subsequently referred to as the "2010 FS", was prepared to address potential ecological risks from surface waters and sediment identified in the Tier II ERA. Note that earlier iterations of the document had also included Round Lake; however, this lake was separated from this FS in order to allow completion of additional sediment investigation work in Round Lake (Round Lake is located off-TCAAP, just southwest of the OU2 boundary).

2.1.1.1 Rice Creek

Rice Creek is tributary to the Mississippi River, and flows through the northwest corner of the former TCAAP installation (Figure 2). The property along this segment of Rice Creek has since been transferred to Ramsey County as recreational space. The original TCAAP accounted for approximately 2 percent of Rice Creek's 474-square-kilometer basin and is near the downstream end of the creek. The State of Minnesota classifies Rice Creek as a "Class 1C, 2Bd, 3B water."

In the Tier II ERA, surface water was analyzed for chemicals of potential concern selected in the 1997 Tier I report (aluminum, barium, cadmium, copper, mercury, and silver). Based on the collected data and the implementation of the revised Tier II ERA chemical of concern (COC) selection criteria (USACHPPM, 2004), none of the chemicals of potential concern were measured at sufficient concentrations or frequency to be retained as COCs. This means that no chemical stressors due to TCAAP-related activities were identified. Adverse effects were not identified and the ecological risk was considered acceptable. Also, no exceedances of state water quality standards were identified.

2.1.1.2 Sunfish Lake

Sunfish Lake is a shallow 5.7-hectare lake in the southeast corner of the former TCAAP installation (Figure 3). Sunfish Lake is now on property controlled by the National Guard Bureau and licensed to the Minnesota Army National Guard. Sunfish Lake drains through

Marsden Lake. Sunfish Lake is partially fed with water entering from a ditch on the west side of the lake.

It was suspected that Site H-1, which contains an old unpermitted landfill and also included metal debris scattered on the bottom of a portion of the Sunfish Lake sediments along the north central shore, could be the specific source of COCs detected in the lake. Also, contaminated soils from the site may have been transported via runoff into the lake, and metal-contaminated leachate from the landfill may have migrated into the lake, causing metals contamination in the sediment and surface water. Site H-1 is no longer used and the upland soil areas of the site have been remediated in large part because they contained concentrations of metals that posed excessive risks to human health for soil exposures (Stone and Webster, 2002).

The selected surface water COCs evaluated in the Tier II ERA risk characterization of Sunfish Lake were cadmium, mercury, and zinc. The selected sediment COCs were aluminum, chromium, lead, vanadium, and zinc. In one of the five ecological endpoints assessed, the Tier II ERA indicated that adverse effects were "not apparent," while three endpoints indicated "possible" adverse effects with a "low" magnitude. One line of evidence (metal concentrations in sediment) indicated the "potential" for adverse effects in the benthic organism endpoint, with a "low" magnitude. However, another line of evidence indicated that the COCs in the sediments were unlikely to cause effects because sufficient Acid Volatile Sulfides (AVS) existed in the sediments to effectively bind the metals in an insoluble, biologically unavailable form. A third line of evidence, toxicity tests, was consistent with this conclusion. A fourth line of evidence indicated the benthic organism community in Sunfish Lake was similar to that observed in the reference lake. Given that adverse effects were found to be not apparent or unlikely for four endpoints, and potential with low magnitude for the fifth endpoint, the overall ecological risk was concluded to be in the low range. Therefore, no unacceptable risks were identified in Sunfish Lake. Also, no exceedances of state water quality standards were identified.

2.1.1.3 Marsden Lake North

Marsden Lake is a major feature of the former TCAAP landscape (Figure 1). It is a large, permanently flooded palustrine emergent wetland marsh of about 220 acres (including open water) located along the eastern edge of the former TCAAP installation (now on property controlled by the National Guard Bureau and licensed to the Minnesota Army National Guard). As noted previously, Marsden Lake is a single water body, but was broken into two separate areas for the purposes of risk assessment. These areas are identified as Marsden Lake North (Figure 4) and Marsden Lake South (Figure 5).

Marsden Lake (North) was defined as a distinct area to focus the assessment in terms of characterizing any potential risk due to contaminants that may have been introduced as a result of former activities at the Grenade Range. It was possible that contaminants in Grenade Range soils could have been transported via runoff into the lake, resulting in metals contamination in the surface water and sediment. Known soil contaminants at the Grenade Range were remediated to site-specific standards in 1999 (Alliant, 2001).

The Tier II ERA-selected surface water COCs evaluated in the risk characterization of Marsden Lake (North) were aluminum, barium, lead, manganese, mercury, and zinc. The selected sediment COCs were antimony, arsenic, vanadium, and Semi Volatile Organic Compounds (SVOCs). The Tier II ERA found adverse effects to be "not apparent" for one endpoint, and "possible" with "low" magnitude for three others. For the fish, invertebrates, and algae endpoint, adverse effects were considered "potential" with "moderate" magnitude. Also, some surface water concentrations for aluminum and lead were above the state water quality standards. Additional surface water testing for aluminum and lead was conducted in 12 monthly events from spring 2007 to spring 2008, with results documented in the 2010 FS. This sampling was conducted on Marsden Lake as a whole, and was not split it into north and south. The locations of the surface water samples are shown on Figure 6. The results show that the concentrations of aluminum and lead were below the state water quality standards in all of the individual sampling events. Given that adverse effects were found to be not apparent or unlikely for four endpoints,

and that additional testing showed there were no exceedances of state water quality standards for the fifth endpoint, the overall ecological risk was concluded to be in the low range.

2.1.1.4 Marsden Lake South

Marsden Lake (South) was defined as a distinct area to focus the assessment in terms of characterizing any potential risks due to contaminants that could have come from activities at the Outdoor Firing Range. It was possible that contaminants in the Outdoor Firing Range soils could have been transported via runoff into the lake, resulting in metals contamination in the surface water and sediment in the area defined as Marsden Lake (South). Known soil contaminants at the Outdoor Firing Range were remediated to site-specific standards in 1999 (Alliant, 2001).

The Tier II ERA-selected surface water COCs evaluated in the risk characterization of Marsden Lake (South) was manganese. The selected sediment COCs were aluminum, cadmium, lead, vanadium, and SVOCs. The Tier II ERA found adverse effects to be "not apparent" for one endpoint, and "possible" with "low" magnitude for three others. For the benthic organism endpoint, adverse effects were considered "potential" with "moderate" magnitude. Also, some surface water concentrations for aluminum and lead were above the state water quality standards. Additional surface water testing for aluminum and lead was conducted in 12 monthly events from spring 2007 to spring 2008, with results documented in the 2010 FS. This sampling was conducted on Marsden Lake as a whole, and was not split it into north and south. The results show that the concentrations of aluminum and lead were below the state water quality standards in all of the individual sampling events. Given that adverse effects were found to be not apparent or unlikely for four endpoints, and potential for moderate effects in one other endpoint, and given that additional testing showed there were no exceedances of state water quality standards, the overall ecological risk was concluded to be in the low range.

2.1.1.5 Pond G

Pond G is a small pond having a surface area of approximately 0.25 acres (Figure 7) and is located on property controlled by the National Guard Bureau and licensed to the Minnesota Army National Guard. The pond originally received attention (and got its name) because it is located approximately 150 feet east-northeast of TCAAP Site G, a former dump site. The watershed for runoff into Pond G is approximately 6.8 acres and includes much of Site G. Pond G is landlocked and has no outlet. Based on measurements from the sampling conducted in 2007 to 2008, the water depths in Pond G varied from 1.5 to 4.5 feet.

The wetland area associated with Pond G is estimated to be approximately 0.5 acres. The interior of the wetland is comprised of shallow open water and lacks vegetation. Vegetation along the fringe of the open water is dominated by invasive species including reed canary grass and stinging nettle. There are a few stands of trees nearby; otherwise, the area is lightly vegetated with grasses and forbs. Pond G is used by wildlife in the vicinity. The installation's red fox population uses it as one source of drinking water and wading birds are also known to frequent the pond.

The Tier II ERA-selected surface water COCs evaluated in the risk characterization of Pond G were aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cobalt, lead, manganese, selenium, and thallium. The selected sediment COCs were aluminum, antimony, arsenic, chromium, copper, lead, Aroclor 1248, SVOCs, and organochlorine pesticides. The Tier II ERA assessed two ecological endpoints for Pond G: wading birds and mammals. The risk assessment did not identify a plausible risk for adverse toxicological effects in the ecological entities evaluated at the site.

Surface water sampling results presented in the Tier II ERA included exceedances of state water quality standards for lead and aluminum. Additional Pond G surface water testing for aluminum and lead was conducted in 12 monthly events from spring 2007 to spring 2008, with results documented in the 2010 FS. The results show that the mean aluminum concentration was below

the state water quality standard, while the mean lead concentration exceeded the standard (Minnesota surface water quality standards promulgated in Minnesota Rule 7050.0222). It should be noted that the lead standard is calculated using the hardness value for the surface water, which is much lower in Pond G than other local water bodies; hence, the lead standard is also much lower for Pond G. Although the Tier II ERA did not identify a plausible risk, the exceedance of the state water quality standard for lead suggests that the water quality of Pond G may not be protective of the entire aquatic ecosystem. Lead is the only COC for Pond G surface water.

2.1.2 535 Primer/Tracer Area

The 535 Primer/Tracer Area (535 PTA) is located in the south central portion of the original TCAAP property (Figure 1), on property now under the control of the National Guard Bureau and licensed to the Minnesota Army National Guard. The 535 PTA was constructed in 1942 and included a group of manufacturing buildings used for the production of component primers and tracing compounds associated with TCAAP small caliber ammunition production from World War II through the Korean Conflict. The National Guard is currently redeveloping this area with new building(s) and appurtenances (construction was initiated after the 535 PTA removal action described herein was completed).

The Final Preliminary Assessment, prepared by Alliant Techsystems, Inc. (Alliant), December 2001, concluded that the potential soil contaminants were explosives, metals, and polynuclear aromatic hydrocarbons (PAHs). Based on the potential for contamination, the report recommended that a Site Inspection be conducted to determine if a contaminant release had occurred. Field sampling activities were conducted in May and June 2003. Surface and subsurface soil samples were collected near building sumps, sanitary sewers, historical building areas, and stormwater drainage areas, with soil samples analyzed for explosives, metals, and SVOCs. The fieldwork and findings were documented in the Summary Report (Wenck, 2005). This report documented groundwater sampling results from three monitoring wells and concluded that no further groundwater investigation was required. Site Investigation soil sample

results were compared against the Preliminary Remediation Goals (PRGs) established for TCAAP in the OU2 FS and to the Recommended Remediation Goals (RRGs) listed in the OU2 ROD. The vast majority of the results were at background levels or below the PRGs/RRGs; however, two soil samples exceeded their respective PRG/RRG and became the drivers for the Engineering Evaluation/Cost Analysis (EE/CA) investigation work: one sample from the surface soils on the northeast side of Building 535 (PAH exceedance) and one sample from a stormwater drainage ditch near an outfall on the northeast side of Building 535 (lead exceedance).

To support preparation of the 535 PTA EE/CA, additional sampling was conducted in 2007 and 2008 to define the extent and magnitude of PAH contamination at Building 535 Area and of lead contamination at the Building 535 Storm Sewer Outfall Area. These results were presented in the EE/CA (Wenck, 2009). The vertical extents were found to be generally confined to the uppermost 1 foot of soil, with very limited areas where the depth of contamination extended to approximately 2 feet.

The EE/CA report documented selection of the final 535 PTA COCs, which are PAHs and lead. The RRGs established in the EE/CA for the 535 PTA soil were based on the MPCA's guidance on risk based human health exposures to contaminated soil (MPCA, 1999) and guidance based on the pathway of contaminants leaching to groundwater (MPCA, 1998). The human health criteria, referred to as Soil Reference Values (SRVs), were developed for a number of exposure scenarios, including industrial and residential. The leaching criteria, referred to as Tier 1 Soil Leaching Values (SLVs), were developed for the protection of groundwater. For each COC, the RRG for the 535 PTA shallow soils is the industrial SRV or Tier 1 SLV, whichever is lower. The RRGs in milligrams per kilogram (mg/kg) are:

Building 535 Area:

- Benzo(a)Pyrene (BAP) Equivalent 3 mg/kg
- Fluoranthene 295 mg/kg
- Pyrene 272 mg/kg

Building 535 Storm Sewer Outfall:

- Lead 525 mg/kg

Three removal action alternatives were evaluated in the EE/CA: no action (except LUCs), construction of a soil cover, and excavation and off-site disposal of contaminated soils. The alternative that was recommended in the EE/CA and approved by the USEPA and MPCA was excavation and off-site disposal of contaminated soils that exceeded cleanup levels. An invitation for public comment on the EE/CA and its recommended alternative was published in January 2009. The Army then prepared the Action Memorandum, signed March 20, 2009, which selected the recommended remedy in the EE/CA.

The remedy was implemented in August to September 2009. Figure 8 shows the locations of the two excavation areas. The quantity of contaminated soils removed and disposed was 148 tons (lead-contaminated soils) and 734 tons (PAH-contaminated soils). Removal action work was documented in the closeout report (Wenck, 2010), which was approved by the USEPA and MPCA.

It should be noted that the closeout report for the soil removal stated that "because the cleanup levels were based on industrial use, LUCs will be required for the 535 PTA." Later review of the data from the 535 PTA soil excavation areas revealed that sample locations were actually less than the residential SRVs if a revised method of calculating the benzo[a]pyrene equivalent (BAP equivalent) was used. The revised method utilized a different method for handling "non-detect" results.

Using the revised method of BAP equivalent calculation, along with other available COC results, red/green dot maps were prepared for the Arden Hills Army Training Site (AHATS), including the 535 PTA. On these maps, green dots represented sample locations where the results were less than the residential SRVs, and red dots indicated an exceedance.

For the revised method of BAP equivalent calculation, the current MPCA calculation worksheet was used, which has a longer list of chemicals than most past analyses. All available chemical results were inserted into the worksheet. If a result was reported as "non-detect," a value of one-half the reporting limit was used in the calculation.

a. If the calculation result was less than the respective residential SRV for BAP equivalent, the database assigned a mapping value of "0" (= green dot on map).
b. If the calculation result was above the respective SRV, and there were no "non-detect" values involved in the calculation, the database assigned a mapping value of "1" (= red dot on map)
c. If the calculation result was above the respective SRV, and "non-detect" values were involved in the calculation, the database initially assigned a mapping value of "2." The results with a "2" were individually reviewed to assess the impact of using one-half the reporting limit for "non-detect" inputs.
    i. If the calculation would result in an SRV exceedance even if the "non-detect" values were ignored, then the "2" was changed to a "1."
    ii. If the SRV exceedance was caused by the use of one-half the reporting limit for "non-detect" values, then the "2" was changed to a "0."

Initially, a more conservative approach was used for the 535 PTA work, whereby all "non-detects" were handled as one-half the reporting limit in calculating the BAP equivalent, even if doing so caused exceedances of the residential SRV. Use of the revised calculation method for BAP equivalent resulted in all green dots in the vicinity of the 535 PTA soil excavation areas, indicating that the soil in the vicinity of the 535 PTA soil excavation areas is acceptable for unrestricted use. Specifically, the soil excavation areas depicted on Figure 8, plus a 15-foot wide area around the perimeter of the depicted excavation areas (i.e., the areas where perimeter samples were collected to define the required extent of contaminated soil excavation), are acceptable for unrestricted use. Land use controls for soils in other areas within the 535 PTA (outside the excavation areas) are as defined in the OU2 Land Use Control Remedial Design (LUCRD), approved by the USEPA and MPCA in September 2010.

2.1.3 Building 102 Groundwater

Building 102 is located near the center of the west edge of the original TCAAP property (Figure 1), on property that still remains part of TCAAP. Rice Creek is located about 900 feet north/northwest from the northwest corner of Building 102. Building 102 was constructed in 1942 for production of small caliber ammunition, though in later years it was also used by Honeywell and then Alliant (successor to Honeywell) for manufacturing of anti-armor cluster munitions and fuzes.

The Site is located on the lacustrine Fridley Formation (Unit 1), which is comprised of light gray to very pale brown, fine- to medium-grained sand and gray clayey silt. Immediately below Unit 1 is the Twin Cities Formation (Unit 2), a glacial till containing silt and clay with minor constituents of sand, pebbles, and cobbles. The surface of the Unit 2 clay till in the Building 102 vicinity is between 15 and 28 feet below the ground surface and the thickness of Unit 2 in this vicinity is approximately 46 feet. Unit 1 groundwater flow is approximately northward in the Building 102 vicinity, and turns to a more northwesterly flow as it travels toward Rice Creek, which the Unit 1 groundwater discharges into. The horizontal velocity of the groundwater is estimated to be 1.5 feet/day, or 560 feet/year. At a distance of 1,100 feet, the travel time from the well with the highest VOC concentrations (01U580) to Rice Creek is estimated to be approximately two years.

The Building 102 shallow (Unit 1) groundwater contamination was first identified in 2003 as a result of investigation work for the Environmental Site Assessment related to proposed transfer of TCAAP property (note that the transfer has not yet occurred). This investigation work identified chlorinated volatile organic compounds (VOCs) in groundwater, which apparently originated from degreasing chemicals (chlorinated solvents) that were known to have been used at Building 102, though there were no documented releases. Documents reviewed in the Phase I portion of the Environmental Site Assessment work suggested that degreasing operations had

taken place in Building 102, circa 1950, and were associated with re-activating production equipment for the Korean War.

Based on the Phase II ESA results, the Army conducted additional groundwater investigations including additional push-probe sampling in April 2005, installation of eight monitoring wells in September 2005, and installation of three additional monitoring wells in June 2007. The cumulative results were presented in an EE/CA (Wenck, 2008). Four COCs were identified in the EE/CA: trichloroethene, cis-1,2-dichloroethene, 1,1-dichloroethene, and vinyl chloride. The RRGs for the Building 102 groundwater COCs are the Minnesota Department of Health (MDH) Health Risk Limits (HRLs), unless the surface water standard for Rice Creek is lower than the HRL. In that case, the surface water standard is used given that the shallow (Unit 1) groundwater discharges to Rice Creek. MDH HRLs are an exposure value for a concentration of a groundwater contaminant that can be safely consumed daily for a lifetime. The RRGs in micrograms per liter (µg/L) are:

Chemical	Groundwater Standard (MDH HRL) (µg/L)	Surface Water Standard (µg/L)	RRG for Building 102 Groundwater (µg/L)
Trichloroethene	5	25	5
cis-1,2-Dichloroethene	70	(no standard)	70
1,1-Dichloroethene	6	(no standard)	6
Vinyl Chloride	0.2	0.18	0.18

The extent of trichloroethene, cis-1,2-dichloroethene, and vinyl chloride in groundwater is shown on Figures 9, 10, and 11, respectively, based on the most recent groundwater sampling event available (June 2010).

The EE/CA concluded that abiotic degradation of the chlorinated VOCs is occurring at this Site, with trichloroethene degrading to cis-1,2-dichloroethene and then vinyl chloride. Given the

groundwater velocity, the relatively short travel distance of trichloroethene, and the suspected timing of the release (circa 1950), natural degradation is clearly occurring. Microcosm studies conducted by the MPCA confirmed that abiotic degradation is occurring in Building 102 groundwater at substantial rates, and soil samples collected by the MPCA verified the presence of magnetite at the Site (chlorinated solvents in contact with magnetite will break down through non-biological means).

Three removal action alternatives were evaluated in the EE/CA: no action (except LUCs), groundwater extraction and treatment, and monitored natural attenuation (MNA). In the EE/CA, an evaluation of MNA was presented in accordance with the USEPA guidance "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites", April 1999. The alternative that was recommended in the EE/CA and approved by the USEPA and MPCA was MNA. An invitation for public comment on the EE/CA and its recommended alternative was published in July 2008. The Army then prepared the Action Memorandum, signed October 15, 2008, which selected the recommended remedy in the EE/CA. Since that time, MNA has continued to be implemented to address Building 102 groundwater.

Until groundwater cleanup levels are attained, the contamination levels existing at this site will not allow for unlimited use and unrestricted exposure to groundwater (also note that soils beneath Building 102 have not been completely investigated, which prevents unlimited use and unrestricted exposure to soils at this site). Hence, CERCLA Section 121(c) 5-year reviews and LUCs are part of the remedy for this site. LUC requirements for this site are specified in the OU2 LUCRD, approved by the USEPA and MPCA in September 2010. With regard to soils, note that the USEPA and MPCA agreed that the scope of the EE/CA would be limited to groundwater contamination because 1) the soil sampling conducted to date at Building 102 has not found VOCs above MPCA guidelines for residential use, 2) based on review of the historical records and visual observations in Building 102, there is no obvious source area for the groundwater contamination (and it could be an area as small as a few square feet), and 3) the

property upon which Building 102 rests is proposed for transfer and re-development, so it makes sense to wait until the building has been removed to look for the source area.

2.1.4 Site K Soils

Site K is located near the center of the west edge of the original TCAAP property (Figure 1), on property that still remains part of TCAAP (Site K includes the remains of the concrete floor slab of the former Building 103). Rice Creek is located immediately to the north/northwest of Site K. Construction of Building 103 was completed in 1942 for production of small caliber ammunition, though in later years it was also used by Honeywell and then Alliant (successor to Honeywell) for manufacturing of fuzes, mines, and weapons systems. Manufacturing ceased at Building 103 in 2004. Building 103 was demolished in 2006, leaving in place the concrete floor slab of the building.

Site K is located on the lacustrine Fridley Formation (Unit 1), which is underlain by the Unit 2 glacial till (see previous section for geological descriptions). Unit 1 groundwater flow in this vicinity is generally to the west/northwest towards Rice Creek.

In 1983, VOC contamination was identified in the storm sewer at Site K. Following an initial assessment in 1983, Honeywell conducted a Remedial Investigation/Feasibility Study (RI/FS) in 1984. The RI/FS showed VOC contamination in the Unit 1 aquifer at Site K and indicated that VOCs were infiltrating from the Unit 1 groundwater beneath Building 103 into the storm sewer. The contamination apparently originated from degreasing chemicals (including chlorinated solvents) that were known to have been used at Building 103, though there were no documented releases. Subsequently, additional environmental investigations were conducted to characterize potential contamination, which are summarized in the Argonne National Labs (ANL) RI Report (ANL, 1991). Additional investigation was conducted as part of the OU2 FS. Taken together, the investigations concluded that there was a defined groundwater VOC plume at Site K; however, a source in the soil had not been found. Because there were no significant detections

of VOCs in soil at that time, cleanup values for soil at Site K were not established in the OU2 ROD.

In the OU2 ROD, the selected remedy for Site K was:

- Groundwater monitoring to track remedy performance
- Installation of sentinel wells at the bottom of Unit 1 and top of Unit 3
- Use of an existing interceptor/recovery trench to contain the 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
- Additional characterization of the unsaturated Unit 1 soil

The first six components of the selected remedy were implemented prior to 2000 and are unchanged by this ROD amendment. The groundwater remedy continues to be implemented by Alliant at Site K. The final component, additional characterization of unsaturated Unit 1 soils, was intended to locate the source area for the groundwater contamination and is the subject of this ROD amendment. The soil investigation work was conducted in 2000 and consisted of soil and soil gas samples collected from direct-push probes and analyzed for VOCs. The investigation concluded that the source of the Site K groundwater VOCs was on the east side of Building 103 near a sump that had a solvent like odor. Soil investigation results were reported in the Predesign Investigation Report (CRA, 2001).

The EE/CA report (CRA, 2008) documented selection of the final Site K soil COCs, which are trichloroethene and cis-1,2-dichloroethene. The RRGs established in the EE/CA for the Site K VOC-impacted soils were based on the MPCA's industrial SRVs, and are as follows:

- Trichloroethene 46 mg/kg
- cis-1,2-Dichloroethene 22 mg/kg

Four removal action alternatives were evaluated in the EE/CA: 1) no action (except LUCs); 2) soil vapor extraction (SVE); 3) excavation, venting, and backfill; and 4) excavation and off-site disposal of contaminated soils. The alternative that was recommended in the EE/CA and approved by the USEPA and MPCA was excavation and off-site disposal of contaminated soils that exceeded cleanup levels. An invitation for public comment on the EE/CA and its recommended alternative was published in July 2008. The Army then prepared the Action Memorandum, signed October 16, 2008, which selected the recommended remedy in the EE/CA.

The remedy was implemented in June to August 2009. Figures 12 and 13 show the excavation area and verification sampling results. The quantity of contaminated soil removed and disposed was 41 tons (along with 28 tons of rubble/debris and 32 tons of clean concrete). Removal action work was documented in the completion report (CRA, 2009), which was approved by the USEPA and MPCA.

Post-excavation verification testing demonstrated that the remaining soil concentrations were not only below the industrial use SRVs (the RRGs), but also below the residential SRVs (29 mg/kg trichloroethene and 8 mg/kg cis-1,2-dichloroethene). Hence, the soils in the vicinity of the soil excavation area are acceptable for unrestricted use (with respect to unsaturated soils) and no LUCs are required. Land use controls for soils in other areas within Site K (outside the excavation area) are as defined in the OU2 LUCRD, approved by the USEPA and MPCA in September 2010. The groundwater remedy (and associated LUCs) will continue to be implemented until groundwater cleanup levels are attained.

3.0 Basis for the Fundamental Change to the Selected Remedy

Changes are needed to the OU2 ROD for the following reasons:

1) Four sites were not included in the OU2 ROD and no action decisions must be documented (Rice Creek, Sunfish Lake, Marsden Lake North, and Marsden Lake South);
2) One site was not included in the OU2 ROD and a remedy decision must be documented (Pond G);
3) One site was not included in the OU2 ROD and a non-time critical removal action has been completed (535 Primer/Tracer Area);
4) One site was not included in the OU2 ROD and a non-time critical removal action that was implemented in 2008 (MNA with LUCs) and that is currently ongoing is being selected as the final remedy per the NCP (Building 102); and
5) One site was included in the OU2 ROD but did not have a selected soil remedy specified, and a non-time critical removal action has been completed (Site K).

The fundamental change for each site is described in the following sections.

3.1 RICE CREEK

Rice Creek was not included in the OU2 ROD. The 2010 FS documents that there were no human health risks associated with Rice Creek and that ecological risk was considered acceptable. The site is acceptable for unrestricted use. No action will be conducted.

3.2 SUNFISH LAKE

Sunfish Lake was not included in the OU2 ROD. The 2010 FS documents that there were no human health risks associated with Sunfish Lake and that ecological risk was considered acceptable. The site is acceptable for unrestricted use. No action will be conducted.

3.3 MARSDEN LAKE NORTH

Marsden Lake North was not included in the OU2 ROD. The 2010 FS documents that there were no human health risks associated with Marsden Lake North and that ecological risk was considered acceptable. The site is acceptable for unrestricted use. No action will be conducted.

3.4 MARSDEN LAKE SOUTH

Marsden Lake South was not included in the OU2 ROD. The 2010 FS documents that there were no human health risks associated with Marsden Lake South and that ecological risk was considered acceptable. The site is acceptable for unrestricted use. No action will be conducted.

3.5 POND G

Pond G was not included in the OU2 ROD. The 2010 FS documents that there were no human health risks associated with Pond G. However, surface water monitoring results documented in the 2010 FS show that lead in Pond G surface water exceeds the state water quality standard for lead. Although the Tier II ERA did not identify a plausible risk, the exceedance of the state water quality standard for lead suggests that the water quality of Pond G may not be protective of the entire aquatic ecosystem. Hence, a remedy to address this exceedance must be implemented,

with the remedy decision documented in this ROD amendment. The Pond G remedial action objective (RAO) is to comply with the Class 2B Minnesota surface water quality standard.

3.6 535 PRIMER/TRACER AREA

The 535 PTA was not included in the OU2 ROD. The 2009 removal action described in Section 2.1.2 (excavation and off-site disposal of contaminated soils) eliminated the risks and potential risks to human health and the environment associated with the contaminated soil in the vicinity of the 535 PTA soil excavation areas; therefore, no further action is necessary. Unacceptable exposures to hazardous substances will not occur. The soil in the vicinity of the 535 PTA soil excavation areas is cleaned up for unrestricted use.

3.7 BUILDING 102 GROUNDWATER

Building 102 was not included in the OU2 ROD. The 2008 removal action described in Section 2.1.3 (monitored natural attenuation) has continued to be implemented to address contaminated groundwater at this site. Until groundwater cleanup levels are attained, the contamination levels existing at this site will not allow for unlimited use and unrestricted exposure to groundwater (also note that soils beneath Building 102 have not been completely investigated, which prevents unlimited use and unrestricted exposure to soils at this site).

With regard to the specific threat to the public health or welfare, there are no groundwater receptors (water supply wells) in the plume vicinity and hence there is no immediate threat to public health or welfare. If a water well were to be installed in the plume at this Site, the water supply could contain chlorinated VOCs at levels that exceed the respective HRLs. Hence, the contamination in Building 102 groundwater is a potential threat to public health or welfare. Also, with regard to the specific threat to the environment, groundwater monitoring results have continually shown that the only detectable VOC in the monitoring well adjacent to Rice Creek

(vinyl chloride) is below the Minnesota surface water standard for Rice Creek and hence there is no immediate threat to the environment. However, since Unit 1 groundwater discharges to Rice Creek and since future unanticipated increases in the contaminant concentrations could result in exceedance of a surface water standard for Rice Creek, the contamination in Building 102 groundwater will remain a potential threat to the environment. Hence, a remedy to address these potential threats to human health and the environment must be implemented, with the remedy decision documented in this ROD amendment. The RAOs for Building 102 groundwater are:

- Protect human receptors from exposure to contaminated groundwater above acceptable risk levels.
- Prevent contaminated groundwater from discharging into surface water above regulatory limits.
- Minimize further degradation of the shallow Unit 1 groundwater.

3.8 SITE K SOILS

Site K was included in the OU2 ROD with specific remedy requirements for groundwater; however, with regard to soils, the only remedy component was for "additional characterization of the unsaturated Unit 1 soil". The 2009 removal action described in Section 2.1.4 (excavation and off-site disposal of contaminated soils) eliminated the risks and potential risks to human health and the environment associated with the contaminated soil in the vicinity of the Site K soil excavation area; therefore, no further action is necessary. Unacceptable exposures to hazardous substances will not occur. The soil is cleaned up for unrestricted use in the vicinity of the Site K soil excavation area.

4.0 Description of Remedy Changes

4.1 NO ACTION SITES

No action will be conducted at Rice Creek, Sunfish Lake, Marsden Lake North, or Marsden Lake South. These sites were not included in the OU2 ROD.

4.2 NO FURTHER ACTION SITES

No further action will be conducted at the 535 Primer/Tracer Area or VOC-contaminated soils at Site K. The soils in the vicinity of the excavation areas at both the 535 PTA and Site K are acceptable for unrestricted use, as discussed previously, with no LUCs required. These sites were not included in the OU2 ROD.

4.3 BUILDING 102 GROUNDWATER

Building 102 was not included in the OU2 ROD. The selected remedy for Building 102 groundwater is the continuation of monitored natural attenuation, which began as a removal action in 2008, as described in Section 2.1.3. The remedy for Building 102 groundwater is as follows:

- Use of naturally-occurring abiotic degradation to limit plume mobility and to ultimately restore the aquifer
- Groundwater monitoring to track remedy performance and to verify that groundwater reaching Rice Creek does not exceed state surface water standards

- LUCs to restrict installation of water supply wells into the contaminated portion of the Unit 1 aquifer and to protect the infrastructure related to this alternative (monitoring wells)

Until groundwater cleanup levels are attained, the contamination levels existing at this site will not allow for unlimited use and unrestricted exposure to groundwater (also note that soils beneath Building 102 have not been completely investigated, which prevents unlimited use and unrestricted exposure to soils at this site). Hence, CERCLA Section 121(c) 5-year reviews and LUCs are part of the remedy for this site. LUC requirements for this site are specified in the OU2 LUCRD, approved by the USEPA and MPCA in September 2010.

4.4 POND G

Pond G was not included in the OU2 ROD. The selected remedy for Pond G is **Alternative PG3 In-Situ Treatment to Raise Hardness**. This alternative includes chemical alteration of Pond G surface water hardness and also includes monitoring to verify that the adjusted hardness level increases to the minimum required level.

Pond G is a relatively soft-water pond with no major inflows and a small watershed. Total hardness in Pond G ranges from 17 to 47 milligrams per liter (mg/L) and is substantially lower than other nearby lakes. Minnesota's surface water lead standard is dependent on the hardness of the water body and the lead standard decreases with decreasing hardness, meaning that the relatively low hardness of Pond G results in a relatively low standard for lead. Based on measured mean hardness in 2007-2008 of 33 mg/L, the corresponding lead standard for Pond G is 0.76 µg /L (versus the measured mean lead concentration 1 µg/L). For the maximum observed lead concentration in Pond G of 4.1 µg/L to meet the Minnesota surface water standard, total hardness in Pond G needs to be increased to a minimum level of 122 mg/L.

Manipulation of water body hardness is a relatively common process that has been widely applied in aquaculture and the restoration of acidic water bodies. Manipulation of the total hardness in a water body is typically accomplished by adding lime material, such as agricultural limestone (finely crushed limestone), quick lime or liquid lime. Agricultural limestone is the most common material applied, especially in aquaculture applications. The dissolution of lime in surface waters produces calcium carbonate, which raises the total hardness and pH of the water body. As an added measure to direct liming of the pond, it may be beneficial to also apply lime to the surface soils in the Pond G watershed, which could be done at minimal additional cost and would help in raising the total hardness and pH of stormwater runoff that flows into Pond G.

Following the lime application, a monitoring period is part of this alternative to verify the effectiveness of the remedy. Monitoring will include multiple sampling events of the Pond G surface water, which will be completed prior to the end of the review period for the next CERCLA Section 121(c) 5-year review (the review period ends September 30, 2013). This 5-year review, which must be completed and signed in 2014, will review the adequacy of the Pond G remedy and, if demonstrated to be an effective remedy, the Pond G site will be closed with no long-term maintenance, monitoring, or LUC requirements. Given the monitoring component, this alternative will include development of a monitoring plan to be approved by the MPCA and USEPA, and this plan will set forth the monitoring locations, frequencies, parameters, and procedures.

The estimated cost for this alternative is $71,000, as detailed in the 2010 FS.

5.0 Evaluation of Alternatives

Evaluation of alternatives is not necessary for the no action and soil removal action (no further action) sites included this ROD amendment. Evaluation of alternatives is only necessary for Building 102 groundwater and Pond G, since a selected remedy will continue to be implemented (Building 102 groundwater) or has yet to be implemented (Pond G).

5.1 BUILDING 102 GROUNDWATER

Three alternatives for addressing Building 102 groundwater were evaluated in the 2008 EE/CA Report:

Alternative B102-1: No Action

Alternative B102-2: Groundwater Extraction and Treatment

Alternative B102-3: Monitored Natural Attenuation **(selected)**

These three alternatives remain the most appropriate alternatives to consider at this site. In accordance with the NCP and CERCLA guidance, the No Action alternative is evaluated to determine the baseline conditions against which the other alternatives should be compared. For Alternative B102-1, no remediation or monitoring would take place under this alternative, but CERCLA Section 121(c) 5-year reviews and the existing applicable LUCs that are currently in place and that are required by the OU2 LUCRD would be continued. Alternative B102-2 is as described below. Alternative B102-3 is as described in Section 4.3.

Alternative B102-2: Groundwater Extraction and Treatment

This alternative would consist of a source area extraction well installed near monitoring well 01U580, which has the highest contamination levels. Based on capturing the width of the plume at that location, the estimated extraction well flowrate that would be needed is approximately 7 gallons per minute (gpm). This alternative would capture the portion of the plume with high contaminant concentrations. Part of the plume that exceeds clean-up levels would not be captured by the single extraction well. Given the lack of drinking water receptors and the apparent plume stability, the benefit of installing additional extraction well(s) in the downgradient, lower-concentration areas of the plume was considered minimal since the high degradation rates should cause this downgradient plume area to quickly decrease below clean-up levels once groundwater flow through the source area is cut off by operation of the extraction well. Treatment of recovered groundwater by air stripping is included in this alternative, along with discharge of treated water to surface water. A National Pollutant Discharge Elimination System (NPDES) permit (or equivalent) would need to be obtained from the MPCA to allow discharge of the treated water to surface water. The NPDES permit (or equivalent) would specify the monitoring frequency and water quality parameters and limits (quarterly VOC sampling was assumed). Permits (or substantive equivalent) from the MDH for extraction well installation and the Minnesota Department of Natural Resources for groundwater appropriation would also be required. Given the higher TCE concentrations present in the source area, discharge to sanitary sewer without pretreatment was not anticipated to be permissible. Hence, with treatment being required, treatment and discharge to surface water is expected to be more cost effective than treatment and discharge to sewer due to sewer discharge fees. Treatment of air stripper emissions is not anticipated to be required, though this would need to be verified at system start-up.

Groundwater monitoring is also part of this alternative. Annual sampling of monitoring wells is needed in order to verify that groundwater reaching Rice Creek does not exceed surface water standards and to monitor progress towards groundwater clean-up levels. Quarterly treatment system influent and effluent monitoring is also part of this alternative

in order to verify acceptable air stripper emission levels and compliance with treated water discharge limits.

This alternative would have the same LUCs as the no action alternative, plus an additional LUC to protect the infrastructure related to this alternative (monitoring wells, extraction well, buried piping, and treatment building).

Since Building 102 groundwater was not included in the OU2 ROD, there is no "original selected remedy" to compare the current (selected) Building 102 remedy against. Hence, the Building 102 groundwater remedy that is described in Section 4.3 and in the Proposed Plan for this ROD amendment will be discussed with respect to the nine criteria specified in the CERCLA RI/FS guidance document (USEPA, 1988), and relative to the other two alternatives that are noted above. Evaluation is based on information presented in the Proposed Plan and the 2008 EE/CA.

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

   Human health would be protected in all three alternatives through inclusion of an LUC to prevent installation of water supply wells into the contaminated portion of the aquifer. With regard to protection of the environment, Alternative B102-1 would not be protective since there would be no monitoring to verify that the surface water standard for Rice Creek is not being exceeded. Alternative B102-2 would protect the environment by providing capture of contaminated groundwater and thereby preventing discharge of groundwater to Rice Creek (with verification monitoring). Alternative B102-3 would protect the environment by reducing the toxicity of the contaminants through the naturally-occurring breakdown of contaminants that occurs with natural attenuation.

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

   The No Action alternative is not evaluated with respect to ARARs. Alternatives B102-2 and B102-3 would meet ARARs, and both alternatives include groundwater monitoring that would provide verification that the surface water standard ARAR is being met in the

groundwater that reaches Rice Creek (the surface water standard ARAR is the Class 2B chronic standards for trichloroethene and vinyl chloride listed in Minnesota Rule 7050.0222 and documented in Section 2.1.3). A summary of the ARARs for Building 102 groundwater alternatives is included in Appendix B. Note that where permits are listed, the CERCLA exemption from permitting may be utilized; however, the substantive requirements of the listed permit must still be met.

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

Alternative B102-1 has poor long-term effectiveness since there would be no monitoring to verify that it is protective of the environment and complies with ARARs. Alternatives B102-2 and B102-3 both have long-term effectiveness in that they would limit the mobility of the contaminants, reduce the mass of the contaminants in groundwater, and comply with ARARs. While Alternative B102-2 would remove additional contaminant mass from the groundwater, it would be transferred to the air via air stripping water treatment. Hence, MNA has an advantage in this regard because the contaminant mass would be reduced without a cross-media transfer. The timeframe to achieve clean-up levels is expected to be relatively long for both alternatives, without any significant difference (likely in excess of 30 years for both alternatives). This is largely due to the fact that the source area (soils) for the release of contaminants to groundwater has not been found, and it is expected that the residual source could cause groundwater contamination to linger for an extended period of time. Given the above factors, the groundwater extraction and MNA alternatives are both considered good in long-term effectiveness, with a slight advantage to MNA because of the cross-media factor. It should be noted that if the building slab is eventually removed as part of property transfer/redevelopment, and if the source area is then found, implementation of a remedy to address the source area soils could significantly shorten the timeframe to achieve clean-up levels (potentially to 10 years or less).

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

Alternative B102-3 limits toxicity through naturally-occurring abiotic degradation, which

breaks down the groundwater contaminants in-situ. This same process is also at work in Alternatives B102-1 and B102-2; however, Alternative B102-1 does not include any monitoring that would provide verification that contaminant breakdown continues to occur. Alternative B102-2 would limit contaminant mobility by keeping contaminated groundwater limited to the source area vicinity. However, Rice Creek should not be impacted under either alternative, and since there are no potential drinking water receptors, the advantage of keeping contaminated groundwater limited to the source area vicinity is not significant. Although Alternative B102-2 further reduces contaminant mass in the groundwater by capturing the source area groundwater and treating it, the air stripping treatment method in Alternative B102-2 would transfer contaminants to the air.

5. **Short-Term Effectiveness**

Alternatives B102-1 and B102-3 do not include any disturbance or construction, and thus have the lowest short-term risk to site workers, the community, and the environment However, since Alternative B102-1 would provide no verification that the Rice Creek surface water standard is being met, it is considered to have poor short-term effectiveness. Alternative B102-2 includes construction work (recovery well, piping, and treatment system installation), so there would be a greater risk to site workers.

6. **Implementability**

Alternative B102-1 is easily implemented from a technical perspective; however, since protection of the environment and compliance with ARARs would not be verified through monitoring, it is anticipated that this alternative would not be acceptable to the USEPA, MPCA, or the community and is therefore not administratively implementable. Comparing Alternative B102-2 and B102-3, Alternative B102-2 is moderately difficult to implement, both technically and administratively, due to the construction and permitting (or substantive equivalent) efforts that would be involved. Alternative B102-3 is already being implemented and therefore requires no new effort for implementation.

7. **Cost**

Present worth costs (2008 dollars) for the three alternatives in order of increasing cost are as follows:

B102-1	$25,000
B102-3	$300,000
B102-2	$1,200,000

These include initial implementation costs, along with long-term annual costs (if applicable).

8. **State Acceptance**

The State, with its approval of the 2008 EE/CA, has indicated its acceptance of Alternative B102-3.

9. **Community Acceptance**

An invitation for public comment on the EE/CA and its recommended alternative (MNA) was published in July 2008, which established a 30-day public comment period beginning on July 18, 2008. No comments were received. Also, for this proposed ROD modification, the Army prepared a Proposed Plan and facilitated a newspaper notice (which included identification of the preferred Building 102 groundwater remedy, Alternative B102-3) on March 23, 2011. This notice established a 30-day public comment period beginning on March 23, 2011, and also included an offer to hold a public meeting, if requested. No public meeting was requested and no written comments were received during the comment period. With no comments received, it is concluded that the community accepts Alternative B102-3.

Based on the alternatives evaluation, the selected alternative for Building 102 groundwater is **Alternative B102-3 Monitored Natural Attenuation**. This alternative protects human health and the environment, meets the RAOs, and meets ARARs. Alternative B102-1, while expected to have the same outcome, was not deemed an acceptable alternative because there would not be

any monitoring to verify protection of the environment, achievement of the RAOs, and compliance with ARARs. Alternative B102-3 was selected over Alternative B102-2 because the groundwater extraction alternative is more difficult to implement, has much higher cost, and yet provides no significant advantage over MNA with regard to protection of public health and the environment or long-term effectiveness.

5.2 POND G

Four alternatives for addressing Pond G were evaluated in the 2010 FS:

Alternative PG1: No Action

Alternative PG2: Develop a Site-Specific Water Quality Standard for Lead

Alternative PG3: In-Situ Treatment to Raise Hardness **(selected)**

Alternative PG4: Eliminate the Open Water

Each of these alternatives is described below, followed by a comparative evaluation.

Alternative PG1: No Action

In accordance with the NCP and CERCLA guidance, the No Action alternative is evaluated to determine the baseline conditions against which the other alternatives should be compared. Guidance also indicates that a No Action alternative can include monitoring, so this alternative would include limited monitoring timed to coincide with CERCLA five-year reviews. Development of an approved monitoring plan would be an initial step for this alternative, and this plan would set forth the monitoring locations, frequencies, parameters, and procedures. As discussed previously, there does not appear to be any natural processes that would appreciably reduce the lead concentration within a

reasonable period of time. Hence, monitoring would continue indefinitely, only serving to provide periodic verification that the water quality standard continues to be exceeded (i.e., verifying that the site cannot be closed).

For cost estimating purposes, it was assumed that the monitoring and reviews would be conducted throughout the 30-year cost analysis period of this FS. The estimated cost for this alternative is $51,000, as detailed in the 2010 FS.

Alternative PG2: Develop a Site-Specific Water Quality Standard for Lead

This alternative would include development of an approved monitoring plan and preparation of a report containing the analysis and justification for a site-specific surface water quality standard for lead in Pond G. This report would be subject to approval by MPCA and USEPA water quality personnel and remedial project managers. It would not be known whether the site-specific standard is higher or lower than the existing standard until the supporting monitoring and subsequent evaluation are complete.

The State of Minnesota has promulgated a surface water quality standard for lead based on controlled studies designed to measure the response of aquatic animals to toxins in laboratory tests. The criteria are based on multiple species and toxicity tests with at least one species in each of the eight families of aquatic organisms. These tests are conducted to develop both a chronic and acute standard.

The state standard may be over or under protective because they are based on a broad range of species that may or may not exist at the site, and the tests were conducted in a controlled laboratory environment where the water quality may or may not reflect conditions at the site. In recognition of these limitations, the USEPA and the State of Minnesota have developed a process for developing site-specific standards that provide the intended level of protection while accounting for biological and chemical conditions at the site.

There are three primary methods available for the development of site-specific criteria including the recalculation procedure, the water effect ratio procedure and the resident species procedure. The actual method to be used would be determined during the Remedial Design phase, with approval needed from the MPCA and USEPA. To evaluate this alternative, it was assumed that the resident species procedure would be applied, which would require toxicity testing conducted with resident species from Pond G and using Pond G water. The species from the pond would need to cover the eight required families, if possible, although the species that occur at the site might represent a narrower mix of species due to a limited range of natural environmental conditions. Because the water effect ratio can vary seasonally, testing would need to be conducted seasonally to account for these differences.

The estimated cost for this alternative is $167,000, as detailed in the 2010 FS. This cost assumes that the derived site-specific standard is higher than the measured lead concentration in Pond G surface water, thus allowing for a determination that Pond G surface water is compliant with Minnesota surface water quality requirements. However, it should be noted that this alternative carries the risk that the derived site-specific standard could be below the measured lead level in Pond G surface water (and possibly below the existing surface water quality standard). Should this be the case, then selection of one of the other alternatives presented herein would become necessary, adding onto the above cost estimate.

Alternative PG3: In-Situ Treatment to Raise Hardness **(selected)**

Refer to Section 4.4 where this alternative was previously described.

Alternative PG4: Eliminate the Open Water

This option consists of two components: 1) filling the Pond G area such that surface water would no longer pool in this area, and 2) corresponding wetland mitigation due to filling of the wetland. Given that the Pond G open water would be eliminated, no long-term water quality monitoring is associated with this alternative. Mitigation could be accomplished either by constructing a new wetland or by purchasing wetland bank credits, as further discussed below. If a new wetland is constructed to meet mitigation requirements, monitoring to verify proper establishment of wetland conditions would be required (commonly this is annual monitoring for a five-year period).

A conceptual grading plan for filling Pond G was presented in the 2010 FS. The final grading plan would be established in future remedial design documents. In essence, a segment of the ridge located just southeast of Pond G would be "graded into" the Pond G area, creating new topography that would no longer retain water at the former Pond G location. The quantity of soil that must be moved is approximately 5,000 cubic yards. The final grading plan that would be established in future remedial design documents would ensure that the volume of dirt that is needed for fill is approximately equal to the volume of dirt that is available by cutting out a segment of the ridge (i.e., cut and fill quantities would be balanced in order to avoid any excess or shortage of dirt in achieving the planned grades).

Wetland mitigation would be part of this option, conducted in accordance with Minnesota Board of Water and Soil Resources and Rice Creek Watershed District requirements. Prior to conducting the above-described grading work, a wetland delineation would be conducted to accurately establish the wetland area associated with Pond G. Mitigation could either be accomplished by constructing a new wetland or by purchasing wetland bank credits. In either case, the required mitigation ratio of the new wetland area to the Pond G wetland area would be determined by the Minnesota Board of Water and Soil Resources and Rice Creek Watershed District. If a new wetland is constructed, it would be located on federally-owned property within OU2 (which is within the Rice Creek

Watershed District). Also, if a new wetland is constructed, a conservation easement for this wetland would need to be placed on the property at the time of any future property transfer from federal control.

The estimated cost for this alternative is $145,000, as detailed in the 2010 FS. For cost estimating purposes, it was assumed that wetland mitigation would be accomplished by purchasing wetland bank credits, and that a 2 to 1 mitigation ratio would be required. The final determination of whether a new wetland is constructed or whether wetland bank credits are purchased would be made in future remedial design documents. These documents would also include the actual required mitigation ratio and, if a new wetland is constructed, would include the specific location and design of the proposed wetland area, along with the monitoring requirements for verification of wetland establishment.

Since Pond G was not included in the OU2 ROD, there is no "original selected remedy" to compare the current (selected) Pond G remedy against. Hence, the Pond G remedy that is described in the Proposed Plan for this ROD amendment will be discussed with respect to the nine criteria specified in the CERCLA RI/FS guidance document (USEPA, 1988) and relative to the other three alternatives that are noted above. Evaluation is based on information presented in the Proposed Plan and 2010 FS.

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

   Human health risk was determined to be negligible. With regard to protection of the environment, Alternative PG1 would not provide long-term protectiveness since it would not meet the surface water standard for lead. Alternative PG2 may or may not be protective (this will not be known until after the site-specific standard is determined). Alternatives PG3 and PG4 would both provide long-term protection since the surface water standard would be met. Alternative PG3 would have better short-term protectiveness than Alternative PG4, as there would be minimal ecological impacts associated with adding lime, as compared to filling the pond.

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

The No Action alternative is not evaluated with respect to ARARs. Alternative PG2 may or may not comply with the surface water standard ARAR (the surface water standard ARAR is the Class 2B chronic standard for lead as listed in Minnesota Rule 7050.0222). This will not be known until after the site-specific standard is determined. Alternatives PG3 and PG4 are both anticipated to comply with ARARs. A summary of the ARARs for Pond G alternatives is included in Appendix C. Note that where permits are listed, the CERCLA exemption from permitting may be utilized; however, the substantive requirements of the listed permit must still be met.

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

Alternative PG1 will not have long-term effectiveness or permanence because the surface water quality standard will not be met. Alternative PG2 may or may not have long-term effectiveness or permanence (this will not be known until after the site-specific standard is determined). Alternatives PG3 and PG4 would provide the greatest long-term effectiveness and permanence.

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

Alternative PG3 does not directly treat lead; however, by raising the hardness of the surface water, the toxicity of the lead is reduced. Alternative PG2 re-evaluates the toxicity and mobility through the site-specific standard process. Alternative PG4 is primarily acting to limit the mobility of the lead, since the exposure pathway of wildlife drinking water from the pond is eliminated. Alternative PG1 does not reduce toxicity, mobility, or volume.

5. **Short-Term Effectiveness**

Short-term effectiveness is considered good for Alternatives PG2, PG3, and PG4 because the actions required to implement the alternatives present minimal risk to site workers, the community, and the environment. Alternative PG2 does not include any disturbance or construction, and hence has the lowest short-term risk (assuming a successful result

from development of a site-specific standard). Alternative PG3 has a slightly greater risk to site workers and the environment when adding lime to Pond G, though this activity is not expected to produce any significant effects. The RAO would be achieved relatively quickly. Alternative PG4 includes construction work so there would be a greater risk to site workers, and filling the pond would cause the greatest short-term impacts to the environment; however, these impacts would be mitigated through replacement wetland at a 2 to 1 ratio. The RAO would be achieved relatively quickly. Alternative PG1 has poor short-term effectiveness because the surface water quality standard will not be met.

6. **Implementability**

With regard to initial implementation, Alternative PG1 would be the easiest to implement, as there would be no investigation, permitting (or substantive equivalent), or construction. Alternative PG3 would be the next easiest, since adding lime to the pond is relatively easy to accomplish. Alternative PG4 would be the next easiest, given the somewhat greater difficulty associated with permitting (or substantive equivalent) and construction. Alternative PG2 would be the most difficult to implement because of the complexity of the required monitoring and standard development. From a long-term effort perspective, Alternatives PG3 and PG4 would be the easiest because there would be no long-term monitoring, maintenance, or reviews. If Alternative PG2 resulted in a high enough site-specific standard, it too would have no long-term implementation requirements; however, a favorable outcome for this alternative is uncertain. If the outcome was unfavorable, it would clearly be the worst alternative as it would not be implementable at all.

7. **Cost**

Present worth costs for the four alternatives in order of increasing cost are as follows:

PG1	$51,000
PG3	$71,000
PG4	$145,000
PG2	$167,000

These include initial implementation costs, along with long-term annual costs (if applicable). Alternative PG2, in addition to being the highest-cost alternative, has significant cost uncertainty. It carries an inherent risk that the site-specific standard that is ultimately determined could be below the measured lead level in Pond G surface water. Should this be the case, then selection of one of the other alternatives presented herein would become necessary, adding onto the above cost estimate.

8. **State Acceptance**

The State, with its approval of the 2010 FS, has indicated its acceptance of Alternative PG3.

9. **Community Acceptance**

The Army prepared a Proposed Plan and facilitated a newspaper notice of the proposed ROD modification (including the preferred Pond G remedy, Alternative PG3) on March 23, 2011. This notice identified a public comment period held from March 23, 2011 to April 22, 2011, and also included an offer to hold a public meeting, if requested. No public meeting was requested and no written comments were received during the comment period. With no comments received, it is concluded that the community accepts Alternative PG3.

Based on the alternatives evaluation, the selected alternative for Pond G surface water is **Alternative PG3 – In-Situ Treatment to Raise Hardness**. Aside from its ability to meet the RAO and PRG, the primary factors for selecting this alternative are its short-term effectiveness (low impact to the pond with quick results) and ease of implementation. Its cost is also substantially lower than Alternatives PG2 or PG4.

Alternative PG1 (No Action) was not selected because it would not meet the threshold criteria of compliance with ARARs, due to failure to comply with the Minnesota Class 2B surface water quality standard for lead. Alternative PG2 (Develop a Site-Specific Standard for Lead) was not

selected because it has the longest implementation time, highest cost, and highest uncertainty. It would not be known whether the standard that was developed would be high enough to deem Pond G in compliance with the surface water quality standard until after this alternative had been implemented (and if it was not high enough, Alternative PG3 or PG4 would still need to have been implemented to address Pond G). Alternatives PG3 and PG4 are essentially equal in meeting the threshold criteria and RAO, and both alternatives have no long-term monitoring, maintenance, or CERCLA Section 121(c) 5-year reviews; however, Alternative PG4 would have had lower short-term effectiveness in the form of impacts to the pond due to filling (albeit with mitigation).

6.0 Statutory Determinations

This section discusses how the remedies for Building 102 and for Pond G meet the five statutory requirements established by Section 121 of CERCLA.

The four sites where no action is necessary (Rice Creek, Sunfish Lake, Marsden Lake North, and Marsden Lake South) and the two areas that are acceptable for unrestricted use (the soils in the vicinity of the excavation areas at the 535 Primer/Tracer Area and Site K) meet the statutory requirements because no remedial action (or no further remedial action) and no LUCs are necessary to ensure protection of human health and the environment.

For Site K, it should be noted that the six groundwater components of the selected remedy in the OU2 ROD (which were implemented prior to 2000) are unchanged by this ROD amendment and will continue to be implemented.

6.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

For Building 102 groundwater, the remedy protects human health because the LUC to restrict installation of water supply wells into the contaminated portion of the Unit 1 aquifer will prevent creation of an exposure pathway to the contaminated groundwater. The remedy protects the environment because the naturally-occurring abiotic degradation is reducing the toxicity of the contaminants through the naturally-occurring breakdown of contaminants that occurs with natural attenuation, with this breakdown occurring prior to reaching Rice Creek at levels that exceed state surface water quality standards. The groundwater monitoring component of the remedy will provide ongoing verification that levels are below these standards.

For Pond G, the remedy protects human health since a human health risk assessment concluded that Pond G presents negligible risks to human health. The remedy protects the environment because treating the surface water to raise the hardness will result in compliance with state water quality standards.

6.2 COMPLIANCE WITH ARARS

For Building 102 groundwater, the remedy complies with ARARs because the naturally-occurring abiotic degradation is preventing contaminated groundwater from reaching Rice Creek at levels that exceed the ARAR (state surface water quality standards). The groundwater monitoring component of the remedy will track progress towards compliance with the shallow groundwater ARARs (MDH HRLs). The remedy also complies with the other ARARs identified in Appendix B.

For Pond G, the remedy complies with ARARs because treating the surface water to raise the hardness will result in compliance with the ARAR that is the focus of the RAO (state water quality standards). The remedy also complies with the other ARARs identified in Appendix C.

6.3 COST EFFECTIVENESS

For Building 102 groundwater, the remedy is a cost effective method for addressing the shallow groundwater contamination.

For Pond G, the remedy is a cost effective method for achieving compliance with state water quality standards.

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

For Building 102 groundwater, the naturally-occurring abiotic degradation has permanence in that the degradation will continue with or without human attention or active efforts through natural means (though ongoing groundwater monitoring will be conducted to verify this).

For Pond G, the remedy provides permanence because treating the surface water to raise the hardness will result in compliance with state water quality standards and lead to site closure.

6.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

For Building 102 groundwater, the naturally-occurring abiotic degradation will break down the contaminants to acceptable levels prior to reaching Rice Creek, avoiding the need to extract and treat the contaminated groundwater.

For Pond G, the remedy provides treatment of the surface water by raising the hardness, which will result in compliance with state water quality standards.

6.6 FIVE-YEAR REVIEW REQUIREMENTS

For Building 102 groundwater, because the remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, CERCLA Section 121(c) 5-year reviews will be required for this site.

For Pond G, the remedy is expected to result in no hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted

exposure. However, following the surface water treatment, surface water monitoring is a component of the remedy to verify the effectiveness of the treatment. Monitoring will include multiple sampling events of the Pond G surface water, which will be completed prior to the end of the review period for the next 5-year review (the review period ends September 30, 2013). This 5-year review, which must be completed and signed in 2014, will review the adequacy of the Pond G remedy and, if demonstrated to be an effective remedy, the Pond G site will be acceptable for unlimited use and unrestricted exposure and will not be included in future 5-year reviews (beyond the 2014 five-year review).

William J. O'Donnell II
Chief, Operational Army and Medical Branch
Base Realignment & Closure Division

12 NOV 2011
Date

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

1-9-12
Date

Kathryn Sather
Director, Remediation Division
Minnesota Pollution Control Agency

Date

exposure. However, following the surface water treatment, surface water monitoring is a component of the remedy to verify the effectiveness of the treatment. Monitoring will include multiple sampling events of the Pond G surface water, which will be completed prior to the end of the review period for the next 5-year review (the review period ends September 30, 2013). This 5-year review, which must be completed and signed in 2014, will review the adequacy of the Pond G remedy and, if demonstrated to be an effective remedy, the Pond G site will be acceptable for unlimited use and unrestricted exposure and will not be included in future 5-year reviews (beyond the 2014 five-year review).

/William A. O'Donnell II/ D — 1 NOV 2011

William J. O'Donnell II
Chief, Operational Army and Medical Branch
Base Realignment & Closure Division

Date

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

Date

Kathryn Sather — 12/1/11

Kathryn Sather
Director, Remediation Division
Minnesota Pollution Control Agency

Date

FIGURES

Figures

OU2 ROD AMENDMENT #4

Site Map

Engineers - Scientists
Business Professionals
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Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

JAN 2012

Figure 1

OU2 ROD AMMENDMENT #4

Rice Creek Site Map with Sampling Sites

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Figure 2

OU2 ROD AMENDMENT #4

Sunfish Lake Site Map with Sampling Sites

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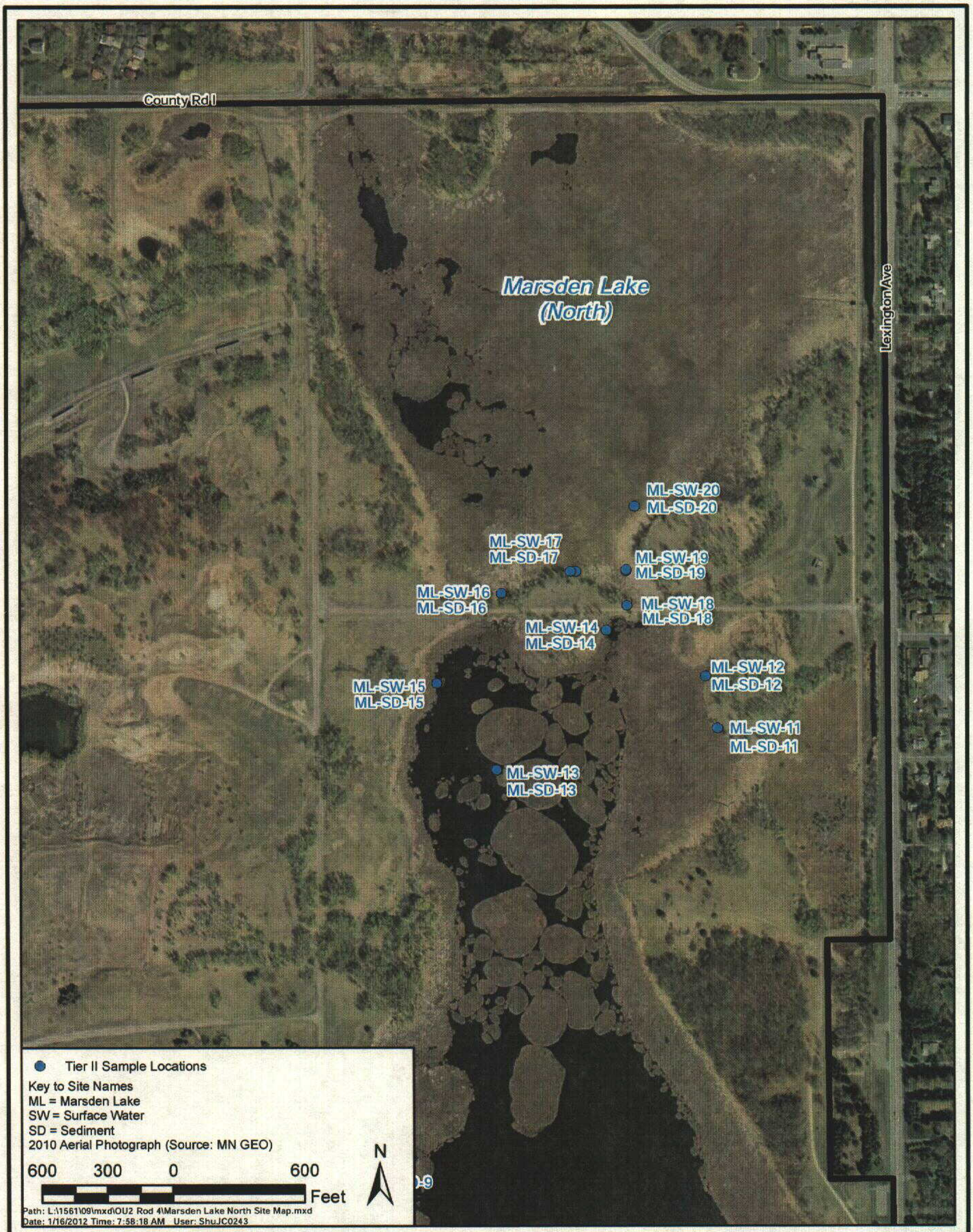
Figure 3



OU2 ROD AMENDMENT #4

Marsden Lake North Site Map with Sampling Sites

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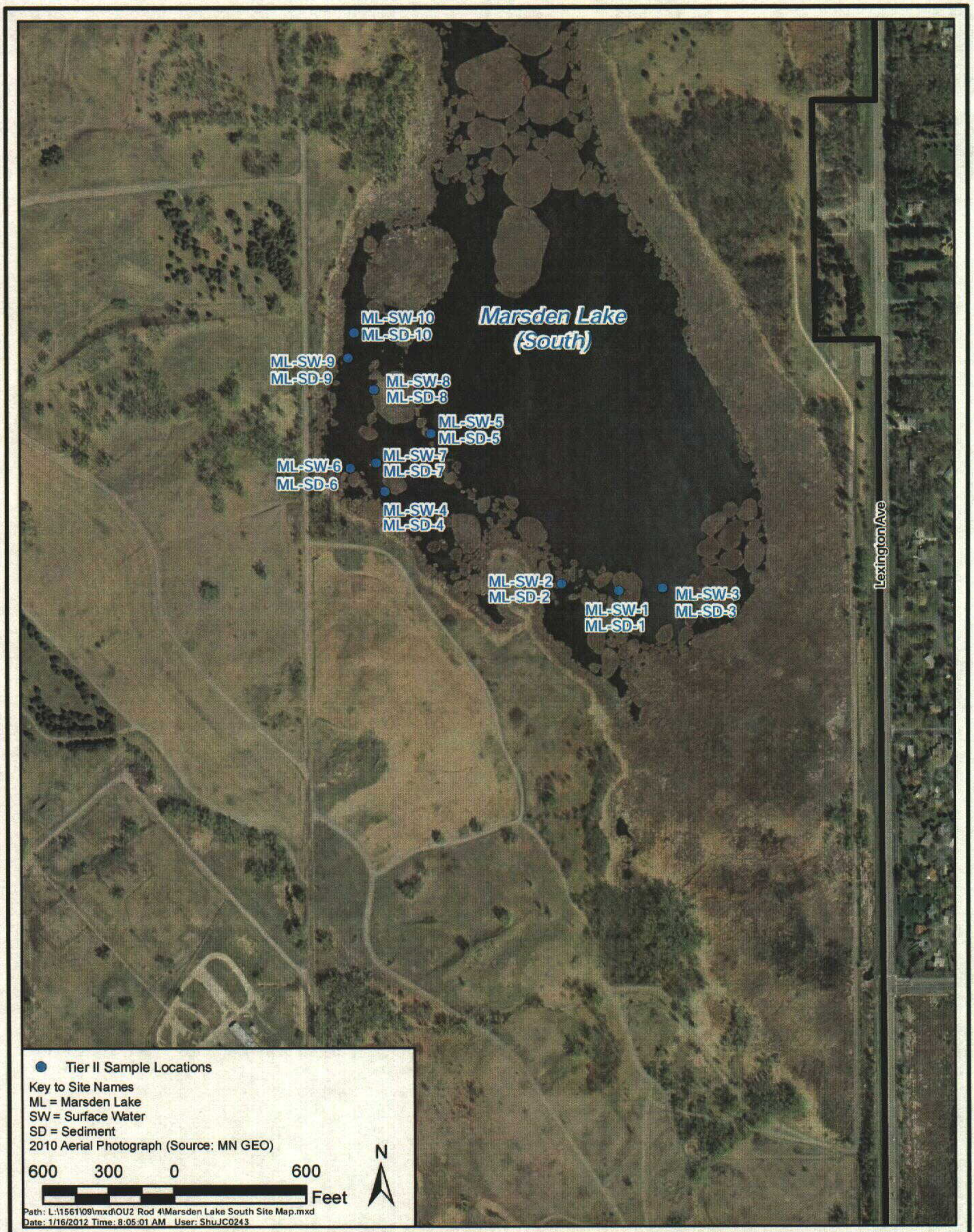
Figure 4



OU2 ROD AMENDMENT #4

Marsden Lake South Site Map with Sampling Sites

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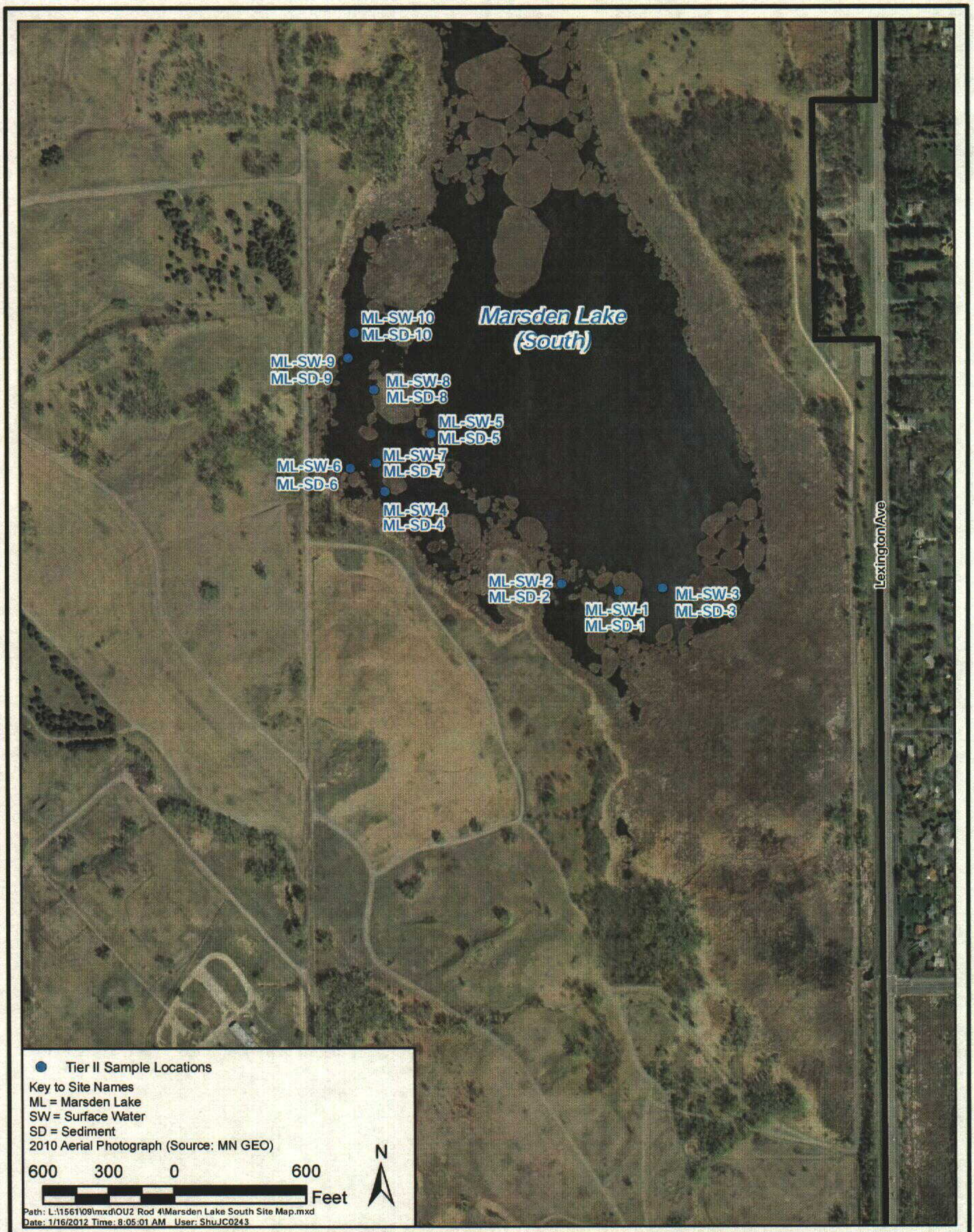
Figure 5



OU2 ROD AMENDMENT #4

Marsden Lake South Site Map with Sampling Sites

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Figure 5

OU2 ROD AMENDMENT #4

Pond G Site Map with Sampling Sites

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Figure 7

OU2 ROD AMENDMENT #4

535 Primer/Tracer Area Excavation Areas

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Figure 8

Legend

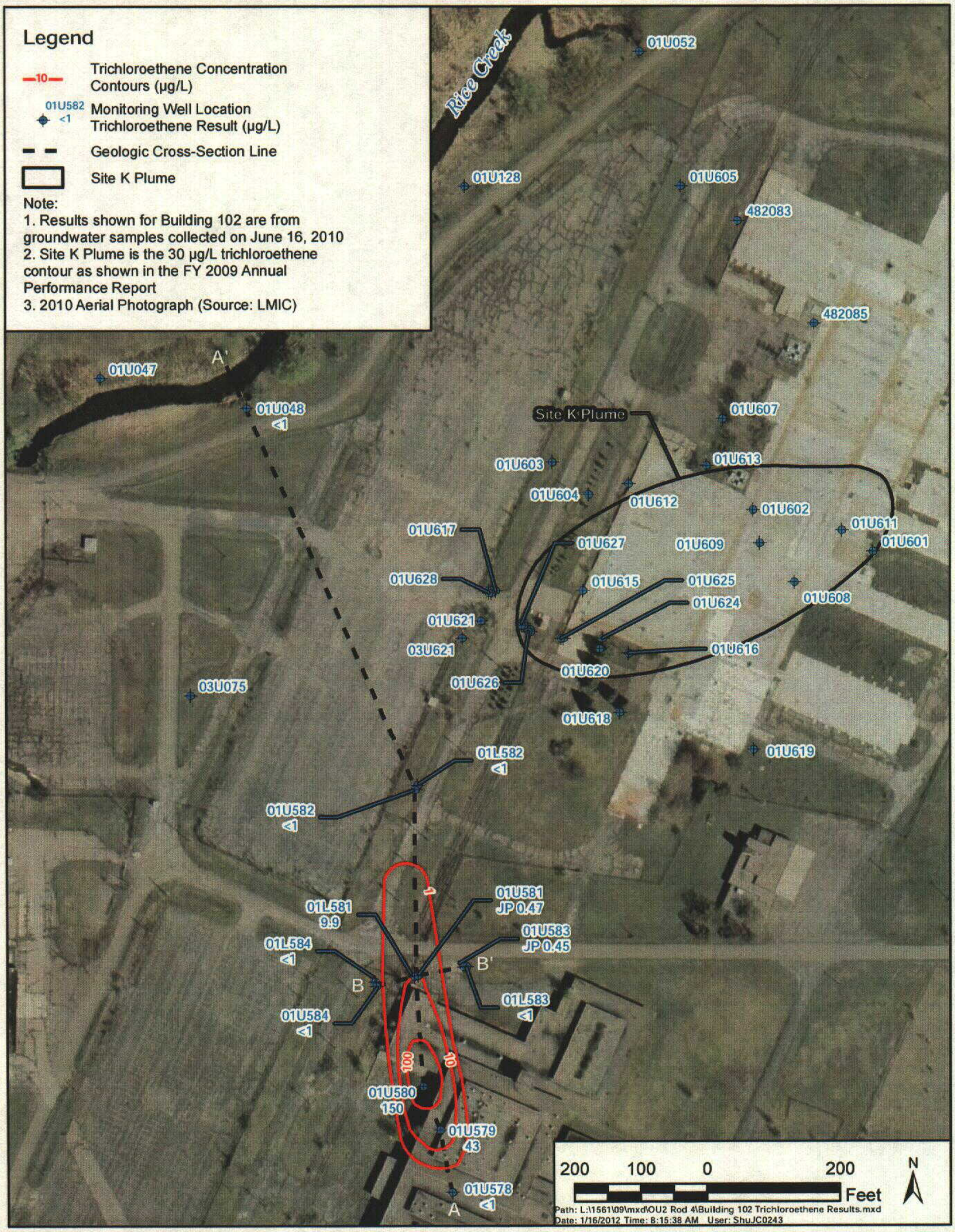
—10— Trichloroethene Concentration Contours (µg/L)

01U582 <1 Monitoring Well Location Trichloroethene Result (µg/L)

Geologic Cross-Section Line

Site K Plume

Note:
1. Results shown for Building 102 are from groundwater samples collected on June 16, 2010
2. Site K Plume is the 30 µg/L trichloroethene contour as shown in the FY 2009 Annual Performance Report
3. 2010 Aerial Photograph (Source: LMIC)



OU2 ROD AMENDMENT #4

Building 102 Trichloroethene Concentrations

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Figure 9

Legend

—10— cis-1,2-Dichloroethene Concentration Contours (µg/L)

01U582 <1 Monitoring Well Location cis-1,2-Dichloroethene Result (µg/L)

Geologic Cross-Section Line

Site K Plume

Note:
1. Results shown for Building 102 are from groundwater samples collected on June 16, 2010
2. Site K Plume is the 30 µg/L trichloroethene contour as shown in the FY 2009 Annual Performance Report
3. 2010 Aerial Photograph (Source: LMIC)

Rice Creek

01U052
01U128
01U605
482083
482085
01U607
01U613
01U603
01U604
01U612
01U602
01U611
01U601
01U617
01U627
01U609
01U628
01U615
01U625
01U624
01U608
01U621
03U621
01U616
01U620
01U626
03U075
01U618
01U619
01U047
01U048 <1
01L582 19
01U582 <1
01L581 9.4
01U581 1.4
01U583 <1
01L584 JP 0.72
01L583 <1
01U584 <1
01U580 20
01U579 6.2
01U578 <1
Site K Plume
A
A'
B
B'
1
10

200 100 0 200 Feet

N

Path: L:\1561\09\mxd\OU2 Rod 4\Building 102 cis Results.mxd
Date: 1/16/2012 Time: 8:17:39 AM User: ShuJC0243

OU2 ROD AMENDMENT #4

Building 102 cis-1,2-Dichloroethene Concentrations

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Figure 10

Legend

—2— Vinyl Chloride Concentration Contours (µg/L)

01U582 <1 Monitoring Well Location Vinyl Chloride Result (µg/L)

Geologic Cross-Section Line

Site K Plume

Note:
1. Results shown for Building 102 are from groundwater samples collected on June 16, 2010
2. Site K Plume is the 30 µg/L trichloroethene contour as shown in the FY 2009 Annual Performance Report
3. 2010 Aerial Photograph (Source: LMIC)

Rice Creek
01U052
01U128
01U605
482083
482085
01U607
Site K Plume
01U047
A
01U048 <0.05
01U603
01U613
01U604
01U612
01U602
01U617
01U611
01U627
01U609
01U601
01U628
01U615
01U625
01U608
01U624
01U621
03U621
01U616
01U620
01U626
03U075
01U618
01U619
01L582 0.19
01U582 <0.05
0.2
0.2
01U581 <1
01L581 JP 0.3
01U583 <1
01L584 <1
B
B'
01L583 <1
01U584 <1
2
01U580 <10
01U579 <1
01U578 <1
A
200 100 0 200 Feet
N
Path: L:\1561\09\mxd\OU2 Rod 4\Building 102 Vinyl Results.mxd
Date: 1/16/2012 Time: 8:19:56 AM User: ShuJC0243

OU2 ROD AMENDMENT #4

Building 102 Vinyl Chloride Concentrations

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Figure 11

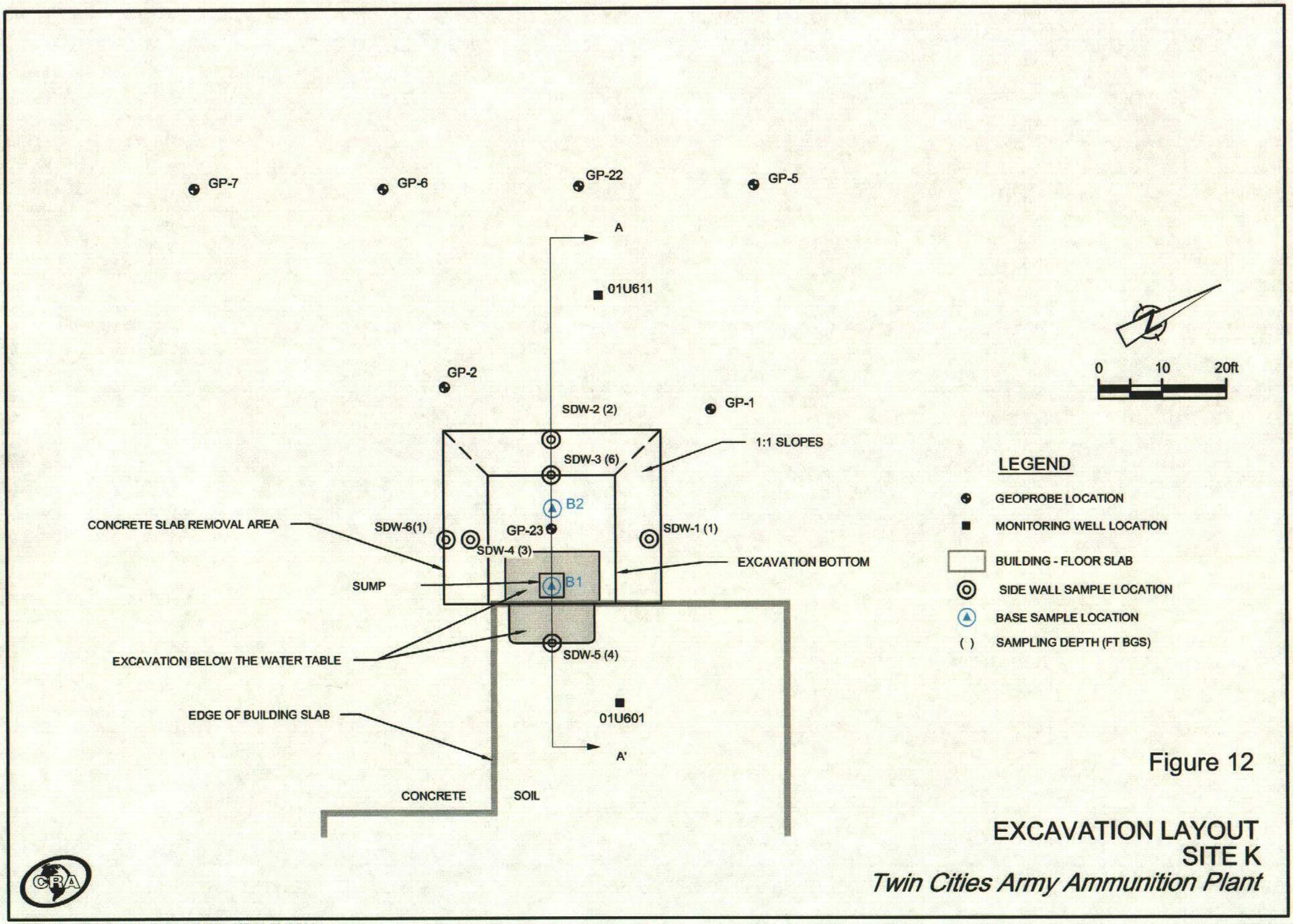
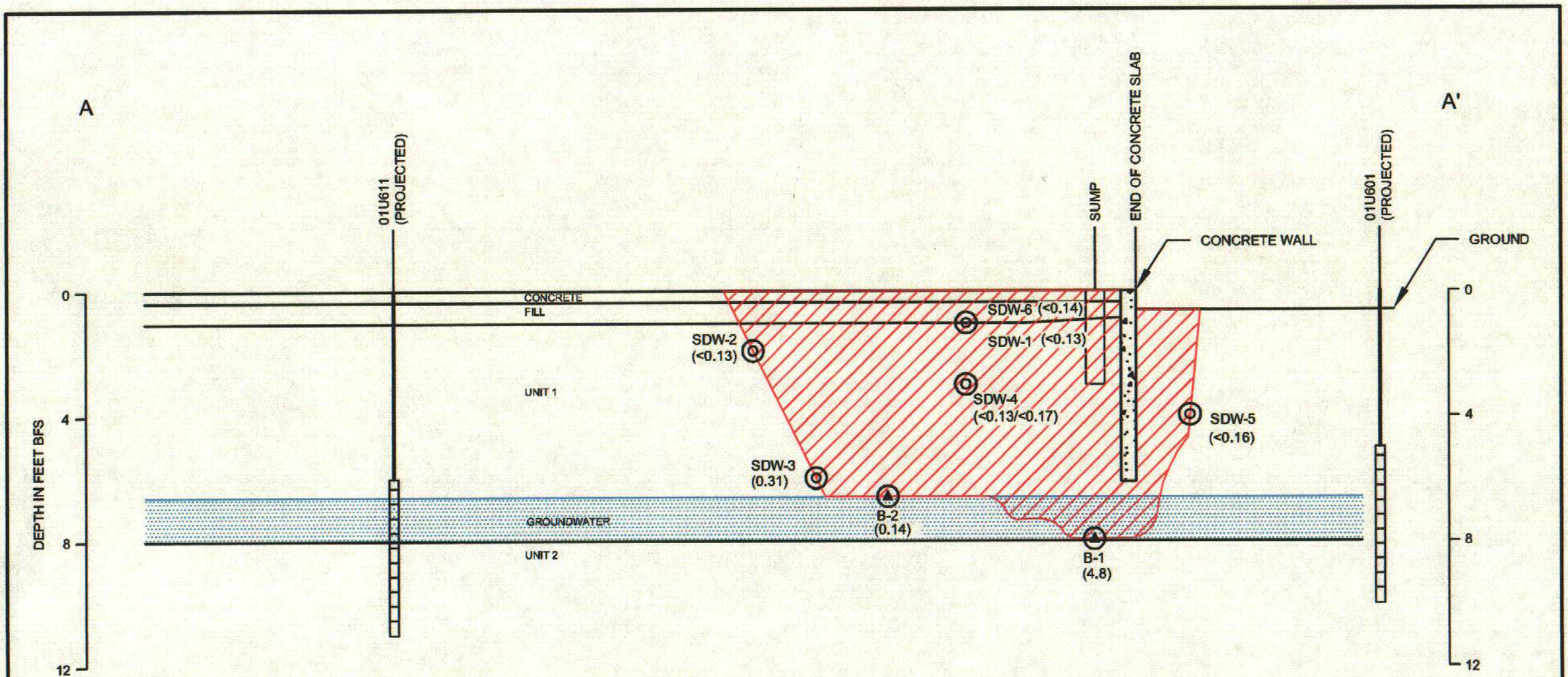


Figure 12

EXCAVATION LAYOUT
SITE K
Twin Cities Army Ammunition Plant

039669-20(MISC001)GN-DE006 NOV 10/2010



SCALE: 1"=10' HOR., 1"=5' VER.

NOTE:
1. CROSS SECTION LAYOUT SHOWN ON FIGURE 2.2.
2. SIDE WALL SAMPLE SDW-1 IS LOCATED ON THE NORTH WALL. SIDEWALL SAMPLES SDW-4 AND SDW-6 ARE LOCATED ON THE SOUTH WALL

LEGEND

- EXCAVATION AREA
- GROUNDWATER
- SIDE WALL SOIL SAMPLE LOCATION
- BASE SOIL SAMPLE LOCATION
- (<0.13) TRICHLOROETHENE RESULT IN mg/kg

Figure 13

EXCAVATION CROSS SECTION SITE K

Twin Cities Army Ammunition Plant

039669-20(MISC001)GN-DE007 NOV 10/2010

APPENDIX A

Appendix A

Responsiveness Summary

Responsiveness Summary

The Army prepared a Proposed Plan and facilitated a newspaper notice of the proposed OU2 ROD modification on March 23, 2011. This notice identified a public comment period held from March 23, 2011 to April 22, 2011, and also included an offer to hold a public meeting, if requested. No public meeting was requested and no comments were received during the comment period.

APPENDIX B

Appendix B

Building 102 Applicable or Relevant and Appropriate Requirements

Summary of ARARs for Building 102 Groundwater

ARAR	ARAR Type[1]	Regulating Agency	Rule	Alternative 2: Groundwater Extraction and Treatment	Alternative 3: Monitored Natural Attenuation (selected)
MDH Health Risk Limits (HRLs) for Groundwater	Chemical	MPCA	MN Rule 4717.7860	ARAR **(applicable)**	
Section 401 Certification (Clean Water Act)	Chemical	MPCA	MN Rule 7050.0222	ARAR (chronic standards for Rice Creek, which is a Class 2B surface water, are **relevant and appropriate** for determination of groundwater cleanup levels, since the Unit 1 groundwater at this site is discharging to Rice Creek).	
Protection of Underground Waters (Nondegradation)	Action	MPCA	MN Rule 7060.0400	ARAR, since groundwater has been impacted at this site. **(applicable)**	
Ambient Air Quality Standards	Action	MPCA	MN Rule 7009.0020	May be an ARAR, though these activities are expected to generate negligible emission of pollutants to air quality. **(potentially applicable)**	Not an ARAR, since no emissions will be generated.
Air Emission Permit[2]	Action	MPCA	MN Rule 7007.0250	Not likely to be an ARAR, though the actual emissions from an air stripper will need to be verified before a final determination is made. **(potentially applicable, but not likely)**	Not an ARAR, since no emissions will be generated.
Wells and Borings[2]	Action	MDH	MN Rule 4725	ARAR for extraction well installation, any additional wells or borings added in the future, and for eventual well sealing. **(applicable)**	ARAR for any additional wells or borings added in the future, and for eventual well sealing. **(applicable)**
Groundwater Appropriation[2]	Action	MDNR	MN Rule 6115.0620	ARAR for groundwater pumped by the extraction well. **(applicable)**	Not an ARAR, since no groundwater will be appropriated.
Discharge of Treated Water to Rice Creek[2]	Action	MPCA	MN Rule 7001.1000	ARAR for discharge of treated water from the groundwater extraction and treatment system to Rice Creek under NPDES. **(applicable)**	Not an ARAR, since no water discharge to Rice Creek will occur.
NPDES Construction Stormwater Permit[2]	Action	MPCA	MN Rules 7090.2010	ARAR, since construction activities have potential to discharge into a water of the state. **(applicable)**	Not an ARAR, since there is no construction activity.
Noise Control	Action	MPCA	MN Rule 7030.0030	May be an ARAR, since the equipment used during construction or system O&M may generate noise in exceedance of standards. **(potentially applicable)**	Not an ARAR, since no significant noise will be generated.

Notes:

1) ARAR Types: Action = Action-Specific Chemical = Chemical-Specific Location = Location-Specific

2) For ARARs that involve permits, the CERCLA exemption from permitting may be utilized; however, the substantive requirements of the listed permit must still be met and will be considered relevant and appropriate.

APPENDIX C

Appendix C

Pond G Applicable or Relevant and Appropriate Requirements

Summary of ARARs for Pond G

ARAR	ARAR Type[1]	Regulating Agency	Rule	Alternative 2: Develop a Site-Specific Water Quality Standard for Lead	Alternative 3: In-Situ Treatment to Raise Hardness (selected)	Alternative 4: Eliminate the Open Water
Section 401 Certification (Clean Water Act)	Chemical	MPCA	MN Rule 7050.0222	ARAR (Pond G surface water has been shown to exceed the Class 2B surface water quality standard in this ARAR). **(applicable)**		
Wetland Standards and Mitigation	Location	MPCA	MN Rule 7050.0186	Not an ARAR, since the wetland is not being filled or significantly altered.		ARAR, since this alternative would place fill in the wetland. **(applicable)**
Wetland Conservation Act[2]	Location	MN BWSR and Rice Creek Watershed District	MN Rules 8420.0105	Not an ARAR, since there will be no impacts to the wetland.		ARAR, since this alternative would place fill in the wetland. **(applicable)**
NPDES Stormwater Permit[2]	Action	MPCA	MN Rules 7090.2010	Not an ARAR, since there is no discharge to a water of the state.		ARAR, since construction activities have potential to discharge into a water of the state. **(applicable)**
Noise Control	Action	MPCA	MN Rule 7030.0030	Not an ARAR, since no significant noise will be generated with this alternative.	May be an ARAR, since equipment used during both of these alternatives may generate noise in exceedance of standards. **(potentially applicable)**	
Ambient Air Quality Standards	Action	MPCA	MN Rule 7009.0020	Not an ARAR, since no emissions will be generated through this alternative.	May be an ARAR, though these activities are expected to generate negligible emission of pollutants to air quality. **(potentially applicable)**	

Notes:

1) ARAR Types: Action = Action-Specific Chemical = Chemical-Specific Location = Location-Specific

2) For ARARs that involve permits, the CERCLA exemption from permitting may be utilized; however, the substantive requirements of the listed permit must still be met and will be considered relevant and appropriate.

APPENDIX D

Appendix D

References

References

Risk Assessments

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