GROUNDWATER SAMPLING AND ANALYSIS PLAN

Environmental Remediation Support for
Badger Army Ammunition Plant, Baraboo, WI

CONTRACT NUMBER W9124J-15-C-0081

Prepared for:

United States Army Environmental Command
Badger Army Ammunition Plant
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BADGER ARMY AMMUNITION PLANT

GROUNDWATER SAMPLING AND ANALYSIS PLAN

AUGUST 2016

Certification Statement

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I, Joel L. Janssen, am a licensed professional geologist in the State of Wisconsin. I, Joel L. Janssen, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct.

Joel L. Janssen, P.G. License No. 1325
Hydrogeologist, SpecPro Professional Services, LLC

8/4/16
Date

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LIST OF ACRONYMS

Army	Department of the Army
BAAP	Badger Army Ammunition Plant
CT Lab	CT Laboratories
CTET	Carbon Tetrachloride
COCs	Contaminants of Concern
DBG	Deterrent Burning Ground
DNT	Dinitrotoluene
DoD	Department of Defense
EDD	Electronic Data Deliverable
ELAP	Environmental Laboratory Accreditation Program
ES	Enforcement Standard
ERIS	Environmental Restoration Information System
GEMS	Groundwater and Environmental Monitoring System
GIS	Geographic Information System
IFCR	In-Field Conditions Report
LOD	Limit of detection
LOQ	Limit of quantification
LTM	Long Term Management
MCLs	Maximum Contaminant Levels
µg/l	Micrograms per liter
mg/l	Milligrams per liter
MNA	Monitored Natural Attenuation
NR	Natural Resources
O&M	Operation and Maintenance
PAL	Preventive Action Limit
PBG	Propellant Burning Ground
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SDG	Sample Data Group
SPS	SpecPro Professional Services, LLC
SOP	Standard Operating Procedure
TCE	Trichloroethene
VOC	Volatile Organic Compounds
WDNR	Wisconsin Department of Natural Resources
Wis. Adm. Code	Wisconsin Administrative Code
WPDES	Wisconsin Pollutant Discharge Elimination System
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

SpecPro Professional Services, LLC (SPS) contract specifies to provide long-term management (LTM) groundwater monitoring and reporting at the Badger Army Ammunition Plant (BAAP) for the Department of the Army (Army). The groundwater monitoring activities are broken into three separate site areas. BAAP-12 GW Monitoring On/Off Post is associated with groundwater contamination from on-site source areas and sampling the monitoring wells and private wells. BAAP-35 Cap & Cover Maintenance is associated with monitoring the groundwater quality around the former construction and demolition landfills License #3118 and 3646.

BAAP is located in south-central Wisconsin within Sumpter and Merrimac Townships in Sauk County. BAAP was constructed in 1942 to produce smokeless gunpowder and solid rocket propellant as munitions components for World War II. Production periods were as follows: World War II (1942 to 1945), Korean War (1951 to 1958), and Vietnam Conflict (1966 to 1975). Disposal of excess hazardous substances occurred at primarily two locations on-site: the Deterrent Burning Ground (DBG) and Propellant Burning Ground (PBG). As a result of production and waste disposal practices that were common at the time, soil and groundwater at BAAP were impacted with several contaminants of concern (COCs). Numerous site investigations and remedial actions have been conducted at BAAP. Groundwater investigation and monitoring activities at BAAP began in 1980. Groundwater impact source-related investigations and remedial actions have been conducted for four identified source areas: Central Plume area, DBG, Nitrocellulose Production Area, PBG. Groundwater in the DBG and PBG areas are impacted by dinitrotoluene (DNT) and chlorinated solvents. Groundwater in the Central Plume area is impacted by DNT. Groundwater in the Nitrocellulose Production Area is impacted by DNT. The groundwater monitoring conducted at BAAP is intended to support that monitored natural attenuation is remediating the groundwater contamination.

Figure 1 shows the monitoring well and private well locations that are monitored. Figure 1 also shows the four identified groundwater contamination plumes. The PBG Plume originates at the PBG and extends south beyond the BAAP boundary. South of BAAP, the PBG Plume turns southeast towards the Wisconsin River, just north of Prairie du Sac. The PBG Plume boundary represents the area where groundwater concentrations exceed a Chapter NR 140 Preventive Action Limit (PAL) for one or more of the following compounds: carbon tetrachloride (CTET), total DNT, ethyl ether, or trichloroethene (TCE). The DBG Plume originates at the DBG and extends southeast beyond the BAAP boundary. East of BAAP, the DBG Plume continues southeast towards Weigand's Bay which is a part of the Wisconsin River. The DBG Plume boundary represents the area where groundwater concentrations exceed a Chapter NR 140 PAL for either total DNT or 1,1,2-trichloroethane. The Central Plume originates in the middle of BAAP where rocket propellant was manufactured and extends south and southeast beyond the BAAP boundary. South of BAAP, the Central Plume continues south towards Gruber's Grove Bay which is a part of the Wisconsin River. The Central Plume boundary represents the area where groundwater concentrations exceed a Chapter NR 140 PAL for total DNT. The Nitrocellulose Production Area Plume originates in the northwestern section of BAAP where nitrocellulose was manufactured and extends south for approximately 4,000 feet. The

Nitrocellulose Production Area Plume boundary represents the area where groundwater concentrations exceed a Chapter NR 140 PAL for total DNT.

1.1 Purpose

This Groundwater Sampling and Analysis Plan (SAP) documents specific requirements in Contract W9124J-15-C-0081 to develop a comprehensive facility-wide groundwater monitoring plan. It serves as a procedural outline for personnel engaged in routine groundwater sampling and analysis activities at BAAP. It is used in conjunction with site-specific procedural documentation and specific Standard Operating Procedures (SOP). Procedures outlined are consistent with those specified for use at sites subject to the requirements of Resource Conservation and Recovery Act (RCRA), and have been adapted to meet the BAAP groundwater monitoring program and the Wisconsin Department of Natural Resources (WDNR) requirements. This SAP introduces the methods, procedures, and schedules for conducting routine groundwater monitoring at BAAP. Adherence to the protocols presented in this document assures that samples are collected in a consistent manner, representative of actual groundwater conditions, managed efficiently and effectively, and analyzed by appropriate analytical methods. This SAP outlines the process for reviewing chemical analytical data to ensure that only the highest quality data are generated.

1.2 Scope

This SAP documents activities related to routine groundwater monitoring throughout BAAP in accordance with the Contract and WDNR requirements (see Section 3.0). It is intended for use as an aid for training technical staff and as an informational guide for trained personnel involved in the collection and processing of groundwater samples and in the management of chemical analytical data generated from the analyses of those samples. It is also used by the Army to ensure that SPS is performing groundwater monitoring in accordance with applicable federal and state regulations. The requirements of this SAP are applicable to all groundwater sampling events performed to accomplish the objectives of this SAP. A BAAP groundwater sampling event consists of specific activities and relevant documentation associated with the collection, management, and analysis of groundwater samples from a distinct groundwater source. A sampling event is typically performed at an individual monitoring well or monitoring well nest that has been completed in accordance with WDNR guidance. Specific requirements and procedures for performing sampling are provided in later sections of this SAP.

1.3 Objectives

The current objective of the groundwater monitoring program is to collect and manage groundwater chemical analytical data to:

- Perform groundwater sampling in compliance with regulatory requirements and approvals as discussed in Section 3.0;
- Provide a consistent, accurate representation of actual concentrations of contaminants in the groundwater;
- Monitor the distribution, extent, and movement of contaminants in the groundwater;

- Monitor the effectiveness of corrective measures used to remediate contaminants released from hazardous waste management units to the groundwater as a result of historical operations;
- Detect the presence of contaminants not previously detected in the groundwater; and
- Determine when the corrective measures have reduced the concentrations of contaminants in the groundwater to less than the cleanup levels.

As specified in Contract W9124J-15-C-0081, SPS has been tasked with the management and implementation of groundwater monitoring activities. SPS is staffed with groundwater, hydrogeological, and analytical compliance personnel. Groundwater personnel are primarily involved in the collection of groundwater samples for assessment and remediation activities. The SPS Hydrogeologist is primarily involved in the installation, development, and maintenance of groundwater monitoring wells and the hydrogeologic interpretation of contaminant distribution and migration. The Project Chemist is responsible for reviewing all chemistry related requirements including ensuring applicable validation of the groundwater sample data results. The SPS Hydrogeologist also reviews all groundwater sample data results for quality and integrity.

2.0 LICENSE AREAS

Groundwater analytical data for the installation are organized into separate solid waste management units, as licensed by the WDNR. These include the Propellant Burning Ground (License #2814), Deterrent Burning Ground (License #3037), Landfill #5 (License #2813), Southern Perimeter and Settling Ponds (License #3499), Magazine Area (License #3491), Rocket Paste Area (License #3487), Southeast Boundary (License #3038), Off-Site Plume Area (License #3485/3493), Private/Residential Wells (License #3497), Southeast Area (License #4330), and Fuel Tank Area (License #3481).

3.0 REGULATORY CRITERIA

Groundwater sampling for monitoring contamination associated with BAAP is pursuant to the In-Field Conditions Report (IFCR) originally issued by the WDNR on September 14, 1987 (see Appendix A). This 1987 IFCR was the baseline for subsequent groundwater monitoring at BAAP. This reference is only provided as a baseline, as there is very little remaining from this first IFCR requirement. The following mentioned groundwater plan regulatory approvals are the most recent and provide the framework for the ongoing groundwater sampling at BAAP.

On September 4, 2013, the WDNR approved modifications to the residential well sampling plan (see Appendix A). The September 4, 2013 plan included the annual sampling of 51 residential wells and the semi-annual sampling of one residential well. The September 4, 2013 approval specified that quarterly sampling (monitoring wells) be conducted during the months of April, June, September, and November.

On March 5, 2014, the WDNR approved a modification to the groundwater monitoring plan by eliminating base neutral acids testing (see Appendix A).

On May 27, 2014, the WDNR approved a modification to the #2813, #3037, and #3038 licenses that are near the DBG (see Appendix A). The May 27, 2014 modification approval also included the #3038, #3118, #3487, #3499, #3646, and #4330 licenses associated with the Central Plume. The 2014 modification adjusted the sampling frequency of some wells, adjusted the parameters analyzed, removed some wells, and added some wells in these license areas.

On October 3, 2014, the WDNR approved modifications to the groundwater monitoring plan associated with seven monitoring wells located in the former Nitrocellulose Production Area (see Appendix A). The October 3, 2014 requirements included the annual sampling of three monitoring wells and the semi-annual sampling of four monitoring wells.

On January 5, 2015, the WDNR approved a modification to the groundwater monitoring plan associated with the PBG (see Appendix A). This modification applied to the #2814, #3485, #3493, and #3499 licenses that are downgradient from the PBG. The 2015 modification adjusted the sampling frequency of some wells, adjusted the parameters analyzed, removed some wells, and added some wells in these license areas.

On July 15, 2016, the WDNR approved a modification to the groundwater monitoring plan associated with the Central Plume and DBG (see Appendix A). The modification adjusted the sampling frequency of monitoring wells SEN-0501A, B & D, SEN-0502 A & D, and SEN-0503A, B & D from quarterly to semi-annual sampling. The modification adjusted the sampling frequency of monitoring well RIN-1004B from annual to semi-annual sampling. The modification also removed monitoring wells ELM-9110, ELN-8904A, ELN-8904B, S1113 and S1114 from actively being sampled.

3.1 Groundwater Cleanup Standards

Chapter NR 140 establishes Enforcement Standards (ES) and PAL for groundwater beneath the State of Wisconsin. The Wisconsin groundwater ES is consistent with federal and Wisconsin drinking water Maximum Contaminant Levels (MCLs), which applies to public water systems.

The ESs are protective of public health and welfare on the premise that the groundwater may be ingested through use as drinking water. All ESs are Public Health Groundwater Quality Standards listed in Table 1 at Section NR 140.10, Wis. Adm. Code, except sulfate, which is a Public Welfare Groundwater Quality Standard listed in Table 2 at Section NR 140.12, Wis. Adm. Code.

The PALs serve “to inform the WDNR of potential groundwater contamination problems (and to) establish the level of groundwater contamination at which the WDNR is required to commence efforts to control the contamination”. All PALs are Public Health Groundwater Quality Standards listed in Table 1 of Section NR 140.10, Wis. Adm. Code, except sulfate,

which is a Public Welfare Groundwater Quality Standard listed in Table 2 in Section NR 140.12, Wis. Adm. Code.

Effective January 1, 2011, Wisconsin's Chapter NR 140 groundwater standards were revised to include dinitrotoluene (total residues) or DNT, total. This DNT, total concentration is calculated by adding together the detections of the six DNT isomers. The ES for DNT, total is 0.05 µg/l and the PAL is 0.005 µg/l.

4.0 GROUNDWATER MONITORING SYSTEM

The locations of groundwater monitoring wells and private wells sampled on a routine basis are shown on Figure 1. Figure 2 displays the entire network of groundwater monitoring wells. As of July 2016, there are currently 304 monitoring wells associated with BAAP. During April and May 2016, 101 monitoring wells were abandoned. Figure 3 displays just the private wells within and surrounding BAAP.

All sampled monitoring wells and private wells are given a unique three-digit numeric Well ID, i.e. 360. This Well ID is used to track the well data in the on-site groundwater databases as well as the WDNR's on-line accessible Groundwater and Environmental Monitoring System (GEMS) database.

4.1 Groundwater Monitoring Wells

4.1.1 Well Identification and Designation

In general, groundwater monitoring wells are identified by a three-part alphanumeric code painted or stuck on the protective outer casing, i.e. PBN-1404B. The exception to this is those monitoring wells that were completed flush with the ground surface. The first two letters of the well identification are determined by the source area or waste management unit, i.e. BG, DB, EL, NL, NP, OA, RI, PB, SE, and SP. The exception to this is the "S" series wells installed in the 1980's. The third letter determines if the well is part of a well nest "N" or a stand-alone water table monitoring well "M". The next two numbers determine what year the well was installed, i.e. 2010 = 10 or 2015 = 15. The last two numbers indicate the order that well was installed during that year, i.e. 05 is the fifth well installed that year for that source area. The last letter determines the vertical positioning of the well screen. Wells labeled "A" are screened at or near the water table surface. Wells labeled "B" are screened below the water table, approximately 1/3 of the depth between the water table and bedrock. Wells labeled "C" are screened below the water table, approximately 2/3 of the depth between the water table and bedrock. Wells labeled "D" are screened below the water table and just above the top of the bedrock. Wells labeled "E" are screened below the water table and below the top of the bedrock. Wells labeled "F" are screened below the confining layer of bedrock (shale) in a lower bedrock aquifer. The static groundwater level in an "F" well is higher than the water table and indicates an artesian condition.

4.1.2 Groundwater Monitoring Well Security

Monitoring wells are located at a non-secure facility or on private property. Monitoring wells are equipped with locking caps that are secured at all times, except during monitoring activities conducted in accordance with this SAP or other approved site-specific project documents. The hydrogeologist maintains control over the distribution of keys to the monitoring wells.

4.1.3 Groundwater Monitoring Well Maintenance

Groundwater monitoring wells are inspected during each sampling event and annually during a routine inspection to ensure safe and secure sampling locations are maintained at all times. The inspection all checks for proper operating low-flow sampling pumps in each well (where present). A copy of the well inspection form is included in Appendix B.

4.1.4 Monitoring Well Access

Monitoring wells installed by the Army are located on property previously owned by the Army and now owned by the Bluffview Sanitary District, Ho-Chunk Nation, USDA, and WDNR. SPS will work with the Army to maintain access to the well locations located on former Army property. Monitoring wells are also located off-post, on private land. The Army maintains leases with these off-post land owners to allow the Army and its contractors to access the well locations, sample, and maintain the wells. These leases provide the Army with permission to sample the monitoring wells on this private property. SPS will coordinate any sampling or maintenance activities with each land owner. The PM will inform the COR if any issues arise with property access or property owner activities that may compromise the integrity of the monitoring well or groundwater samples collected from the monitoring well.

4.2 Private Wells

In general, private wells are identified by either the well owner's last name or the Wisconsin unique well ID number. Private wells are maintained and secured by the well owner. SPS personnel have no control over the integrity of the private wells or the well piping distribution system prior to the sampling location. SPS will coordinate all private well sampling with each individual well owner. The PM will inform the COR if any private well owner will not allow access to sample their well.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

Equipment used for the collection of groundwater samples is designed to minimize the impact on sample integrity during the sample collection process. Equipment requirements for groundwater monitoring wells consist of dedicated low-flow air bladder sampling pumps in each well, air compressor, well pump controller, flow cell to measure field parameter, water level meter, sample bottles, disposable tubing, disposable gloves, and coolers with ice.

Upon arrival at the well location, and prior to implementation of sampling activities, field personnel inspect the well location to ensure that it is safe and easily accessible for the planned work activities. They also inspect the condition of the wellhead, locking well cap, cement pad, and protective bollards. Any anomalies are noted in the field logbook and reported to the Hydrogeologist for corrective action.

During groundwater sample collection from a monitoring well, the following field parameters/geochemical parameters are collected: depth to groundwater, dissolved oxygen, oxidation reduction potential, pH, specific conductance, and temperature.

5.1 Sampling Groundwater Monitoring Wells

The Groundwater Sampling Monitoring Wells SOP describes the procedure used to sample monitoring wells equipped with low flow bladder pumps (see Appendix C).

5.2 Sampling Private Wells

The Groundwater Sampling Private Wells SOP describes the procedure used to sample private groundwater wells (see Appendix D).

5.3 Quality Control Samples

The BAAP groundwater monitoring program utilizes both field and laboratory quality control samples to ensure that program quality objectives are met.

5.3.1 Field Quality Control Samples

Field quality control samples include volatile organic compounds (VOC) trip blanks and field duplicate samples. Each day groundwater samples are collected for VOCs, a VOC trip blank is placed in a sample cooler at the beginning of the day. This VOC trip blank stays with the samples until they are delivered to the laboratory. The VOC trip blank is prepared by the laboratory with deionized water. The analytical results from the VOC trip blank can provide information about the sample storage and the laboratory's analysis of the VOC samples collected that day. The VOC trip blank results will help determine if laboratory procedures introduced contamination into the samples. Each day groundwater samples are collected, a field duplicate sample is also collected. This field duplicate is selected from the samples collected that day. A separate set of sampling containers are collected from that chosen well and labeled as a duplicate. The analytical results from the field duplicate sample help determine how accurate and precise the laboratory analysis was that day.

5.3.2 Laboratory Quality Control Samples

Laboratory quality control samples include method blanks, laboratory control samples, matrix spikes, matrix spike duplicates, and surrogate spikes. These quality control sample results are reviewed by the Project Chemist. The Project Chemist will determine if these results indicate if the groundwater analytical data is accurate and reliable.

5.4 Waste Management

Groundwater sampling generates non-hazardous waste from well water purged during stabilization of each monitoring well. This water is collected in a polyethylene drum and discharged to the Bluffview Sanitary District wastewater treatment plant (WWTP) for disposal.

6.0 SAMPLING SCHEDULE

6.1 BAAP-12 GW Monitoring On/Off Post

All groundwater sampling will be conducted in accordance with WDNR approved sampling plans and any subsequent revisions. The groundwater monitoring consists of sampling events to be conducted annually, biennially, semi-annually, or quarterly during the months of April, June, August, September, and November. Figure 1 shows the monitoring well and private well locations that are required to be monitored by the WDNR and their sampling frequency, except the monitoring associated with the former landfills License #3118 and #3646. The groundwater sampling schedules for each sampling month are included in Appendix E. These schedules outline the monitoring wells to be sampled, sampling frequency, and the analytical testing methods.

6.2 BAAP-35 Cap & Cover Maintenance – Environmental Monitoring

BAAP-35 Cap & Cover Maintenance is associated with monitoring the groundwater quality, leachate wastewater quality, and the lysimeter water quality in and around the former construction and demolition landfills License #3118 and 3646. All sampling will be conducted in accordance with WDNR approved sampling plans and any subsequent revisions. The monitoring consists of sampling events to be conducted semi-annually during the months of March and September. The sampling schedules for each sampling month, well map, and WDNR monitoring schedules are included in Appendix F. These schedules outline the monitoring wells, leachate sample points, and lysimeters to be sampled, sampling frequency, and the analytical testing methods.

7.0 ANALYTICAL TESTING

The monitoring wells and private wells are sampled for a variety of the following laboratory methods: DNT, VOC, nitrates, and sulfate. The six DNT isomers (2,3- 2,4- 2,5- 2,6- 3,4- and 3,5) are analyzed by gas chromatography and a mass spectrometer detector utilizing the selected ion monitoring technique outlined in EPA method SW 8270D. VOCs are analyzed with a GC/MS utilizing EPA method 8260C. Nitrates are analyzed by utilizing EPA method E353.2. Sulfate is analyzed by utilizing EPA method SW 9056A.

The groundwater, leachate, and lysimeter samples collected in and around the former construction and demolition landfills License #3118 and 3646 are sampled for a variety of parameters. A detailed list of the analytical testing methods is included in Appendix F.

7.1 Subcontracted Analytical Laboratory

All groundwater samples are delivered to a subcontracted laboratory. CT Laboratories (CT Lab) of Baraboo, Wisconsin has been chosen to perform all laboratory analyses. CT Lab is certified

by the State of Wisconsin in accordance with NR 149, laboratory I.D. 157066030. CT Lab is also accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 general requirements for the competence of testing and calibration laboratories. CT Lab also meets the NELAC Standard and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality Systems Manual for Environmental Laboratories. Copies of CT Lab's certifications/accreditations are included in Appendix G.

8.0 ANALYTICAL DATA MANAGEMENT

All groundwater data is stored in the on-site geographic information system (GIS) and the groundwater database which consists various Microsoft Access formats. All the groundwater data is submitted to the WDNR for storage in their on-line accessible GEMS database.

8.1 Laboratory Report

The subcontract laboratory submits the analytical data to SPS in two formats; an electronic data deliverable (EDD) and a laboratory report. Once SPS receives the laboratory data, it is run through a review and processing procedure. This procedure is summarized on the laboratory data management process diagram provided in Appendix H.

8.2 Internal Quality Control Review

8.2.1 Project Chemist

The Project Chemist is responsible for reviewing all chemistry related requirements including ensuring applicable validation of the groundwater sample data results. Appendix I includes the Laboratory Data Quality Review Procedure which details the tasks are performed by the Project Chemist during the quality control review. The Project Chemist summarizes the quality review by providing the following: a Project Narrative, Executive Summary, Well Data EDD Summary, and a Field Data EDD Summary. The Project Narrative includes a summary of the data's general usability based on review of received chain of custody, subcontractor laboratory reports and EDDs. The Executive Summary is a spreadsheet summary of all the detections in a sample data group (SDG) by sample. The Well Data EDD Summary is a spreadsheet summary of all the EDDs from all SDGs for each sampling event.

8.2.2 Project Hydrogeologist

The hydrogeologist performs a quality check of all laboratory sample data results. The VOC trip blanks are evaluated for potential cross-contamination. Sample detections are checked for interferences with standard laboratory reagents. Sample detections are also checked against historical results for each well. DNT total calculations are checked for errors. The hydrogeologist uses the laboratory data management process diagram provided in Appendix H to track the progress of the laboratory sample data. An EDD database generator was developed in Microsoft Access by previous BAAP contractors to produce various reporting outputs. This EDD database generator was programmed to output the WDNR GEMS data format (.csv file), hits tables, exceedance tables, sampled

wells tables, and transfer files to other databases. The EDD database generator exports the data into the individual BAAP license areas, because the WDNR GEMS database can only accept data according to each license area.

8.3 Data Submittal

The hydrogeologist uses the outputs from the EDD database generator to prepare case narratives for each license area. These case narratives summarize the NR 140 ES and PAL exceedances and discuss any significant findings. The hydrogeologist prepares the groundwater data submittal for review before an internal quality review is performed. The groundwater data submittal consists of the following items: letter to WDNR summarizing the groundwater sampling round, sampled wells map, sampled wells list, WDNR environmental monitoring data certification forms, case narratives, exceedance reports, hits reports, and the WDNR GEMS data format files (.csv). The EDD database generator is also used to export the proper Environmental Restoration Information System (ERIS) data format. SPS also updates the groundwater data in several Microsoft Access databases stored at the SPS office. This groundwater data will be maintained electronically on a secure server. Historical records from previous contractors will be kept in electronic format at the SPS office. All the groundwater data will remain the property of the Army and will be available upon request.

Figures

RIM-0703 (A)
RIM-1002 (S)
Nitrocellulose Production Area Plume
RIM-0705 (S) RIN-1007C (A)
RIN-1001A (S) RIN-1001C (A)
S1125 (S)
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PBM-8909 (B)
PBM-9801 (A)
PBM-0001
PBM-0002 (S)
PBM-0006 (S)
PBM-0008 (S)
PBN-8202A (S)
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PBN-8202C (S)
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NLN-8203C
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RIN-1501C
Central Plume
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RIN-1502C
RIN-1502D
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The Water's Edge subdivision
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SEN-0503B
SEN-0503D
SEN-0502A (S)
SEN-0502D
SEN-0501A (S)
SEN-0501B
SEN-0501D
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SWN-9103C
SWN-9103D
SWN-9103E
SWN-9104C (S)
SWN-9104D
PBN-9101C (S)
PBM-9001D
PBN-9102B (B)
PBN-9102C
PBM-9002D

Figure 1

Well Sampling Frequency Map
Groundwater Sampling and Analysis Plan
Badger Army Ammunition Plant

Legend

Monitoring Well Sampling Frequency

- (S) Semiannual Sampling
- (A) Annual Sampling
- (B) Biennial Sampling

Sample Frequency Descriptions:

Semiannual (twice per year)
Annual (once per year)
Biennial (once every two years)

- Sampled Private Well
- Extraction Well (not pumping)
- Groundwater Plume
- Groundwater Flow Direction
- Road
- BAAP Boundary

N

1 inch = 750 feet

0 1,400 2,800 4,200 5,600 Feet

0 0.2 0.4 0.6 0.8 Miles

D:\GIS_Projects\Groundwater_Projects\Sampling & Analysis Plan\Fig 1_Well Sampling Plan_2016.mxd

SPS SPECPRO PROFESSIONAL SERVICES

Plot Date 7/18/16

Figure 2

Monitoring Well Locations
Groundwater Sampling and Analysis Plan
Badger Army Ammunition Plant

Legend

- Monitoring Well
- Extraction Well
- Groundwater Plume
- Groundwater Flow Direction
- Source Area
- Road
- BAAP Boundary

Map Scale: 1:10,000

0 1,500 3,000 4,500 6,000 Feet

0 0.25 0.5 0.75 1 Miles

0 300 600 900 1,200 Meters

D:\GIS_Projects\Groundwater_Projects\Sampling & Analysis Plan\Fig 2_Mon_Well_Loc_Map_updated.mxd

SPS SPECPRO PROFESSIONAL SERVICES

Plot Date 7/20/16

Nitrocellulose Production Area Plume

Deterrent Burning Ground Plume

Central Plume

Propellant Burning Ground Plume

Wisconsin River

Weigand's Bay

Gruber's Grove Bay

1 inch = 200 feet

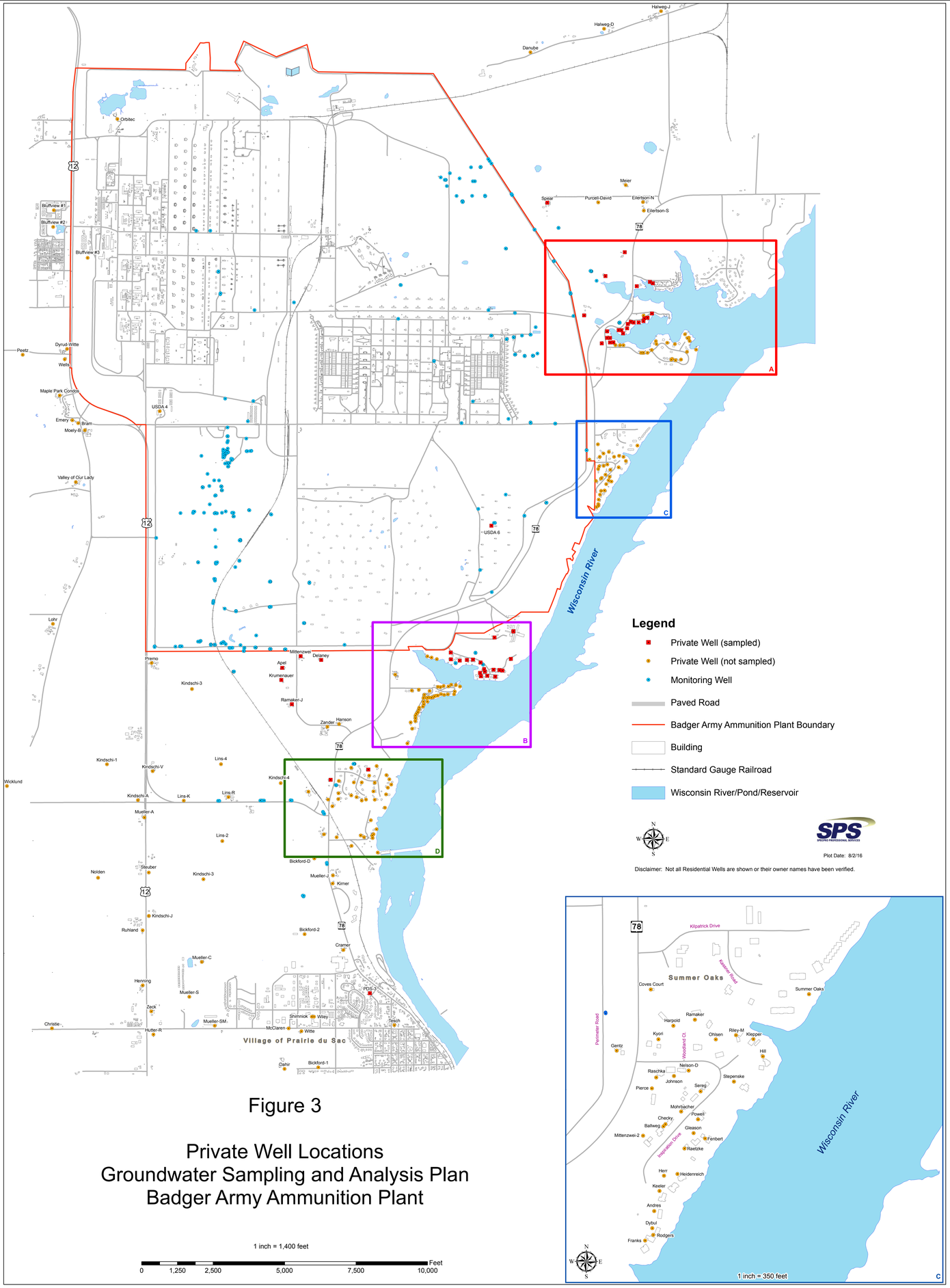


Figure 3

Private Well Locations
Groundwater Sampling and Analysis Plan
Badger Army Ammunition Plant

1 inch = 1,400 feet

0 1,250 2,500 5,000 7,500 10,000 Feet

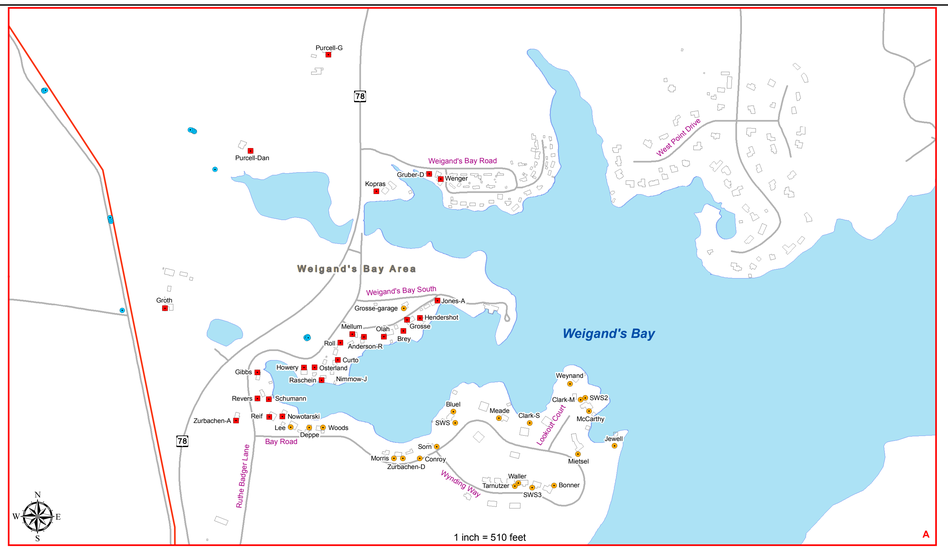
Legend

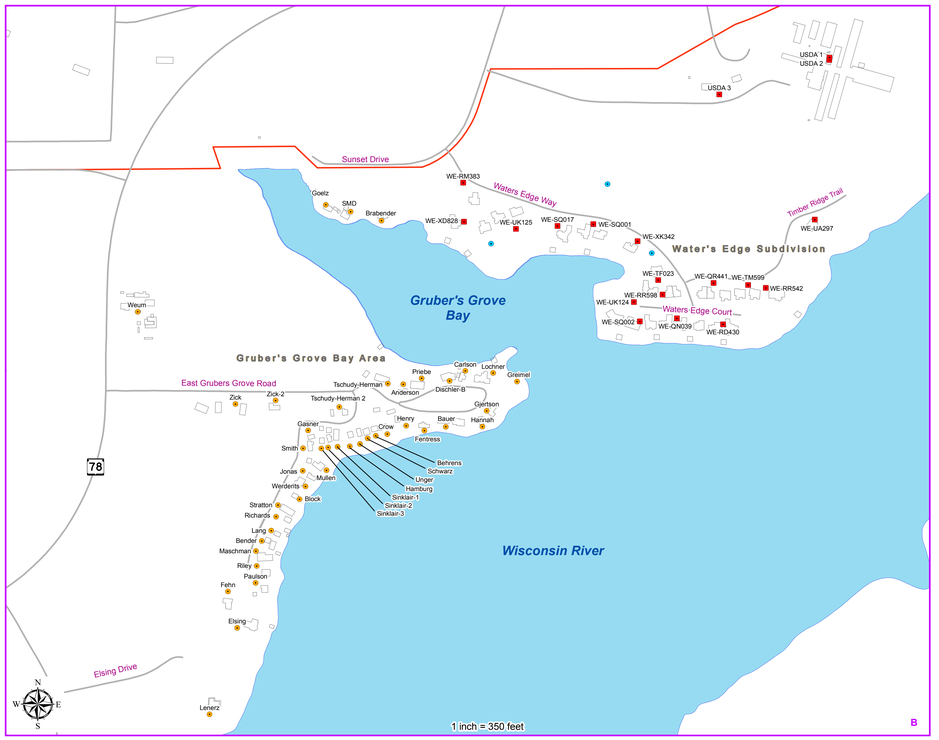
- Private Well (sampled)
- Private Well (not sampled)
- Monitoring Well
- Paved Road
- Badger Army Ammunition Plant Boundary
- Building
- Standard Gauge Railroad
- Wisconsin River/Pond/Reservoir

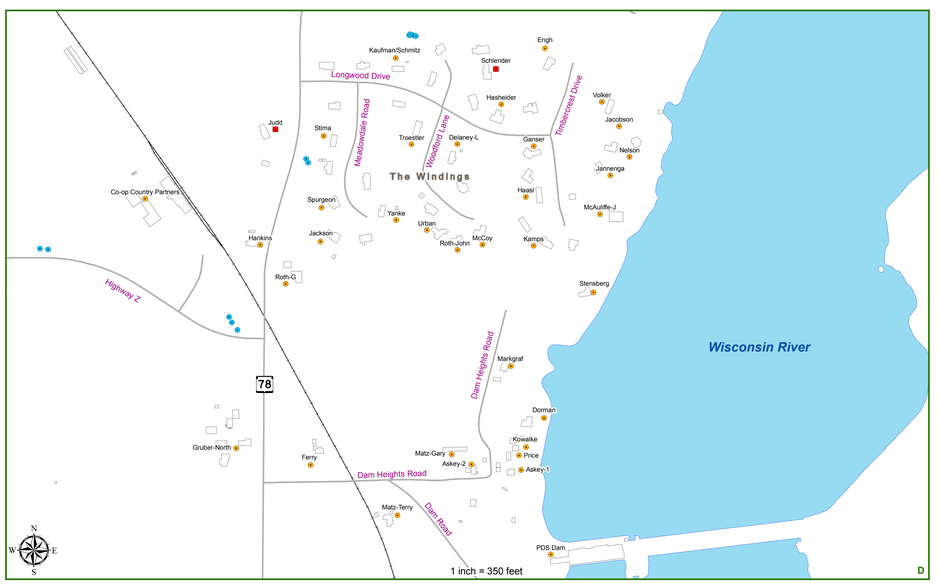
SPS — SPECIFIC PROFESSIONAL SERVICES

Plot Date: 8/2/16

Disclaimer: Not all Residential Wells are shown or their owner names have been verified.







Appendix A
Groundwater Plan Regulatory Approvals

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D Besad
Secreta

BOX 792
MADISON, WISCONSIN 5370

SEP 14 1987

IN REPLY REFER TO: 4410-2

Mr. David Fordham
U.S. Army - Olin Corporation
Badger Army Ammunitions Plant
Baraboo, WI 53913

SUBJECT: Final Review of In-field Conditions Reports at the Badger Army Ammunitions Plant (BAAP), Sauk County

Dear Mr. Fordham:

This is the final approval of the May 11, 1987 review of the infield conditions reports listed in the findings of fact. BAAP sent us these reports to satisfy the provisions of 3 special orders (Order #2A-78-1195 Propellant Burning grounds issued September 20, 1978, Consent Order #2A-81-1212A Acid. Spill area issued November 24, 1981 and Order #2A-78-1194 Existing Landfill issued September 20, 1978), the requirements of our April 16, 1982 review of the "BAAP Plant Contamination Survey" and subsequent Department recommendations and requests for information listed in the findings of fact of the attached approval.

The interim license for the hazardous waste container storage area and the thermal treatment (propellant burning grounds) remains in effect.

The Department is currently reviewing the feasibility/plan of operation report for the hazardous waste container storage area. This is the initial step in obtaining a final operating license for this facility. The Hazardous and Solid Waste Amendments (1984) to the Resource Conservation and Recovery Act (RCRA) require that any interim status facility seeking a final operating license address releases from the facility. The U.S. Environmental Protection Agency - Region V is completing a RCRA Facility Assessment (RFA) for BAAP, which will recommend a corrective action plan for the facility. If at all possible, the requirements of this in-field conditions approval will be coordinated with the corrective action plan recommended through the RFA process.

Our technical review is described in the attachment. The following is a summary of our review and the requirements of this letter.

1. The BAAP site lies in an area covered by outwash and the Johnstown Terminal Moraine located just north of the Wisconsin River in the Town of Sumpter, Sauk County. The glacial deposits consist primarily of stratified and unstratified sand and gravel deposits with some thin deposits of silty sand, silt and clay present in the terminal moraine

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area. The sandstone aquifer is not confined and is hydraulically connected to the upper sand and gravel aquifer over the majority of the plant area. Groundwater flow is primarily south and southeast towards the Wisconsin River. Depth to groundwater ranges from approximately 140 feet below the land surface at the existing landfill to about 40 feet below the land surface in the southern perimeter of the site.

2. Both soils and groundwater below the propellant burning grounds have been contaminated by a variety of inorganic and organic compounds. A plume of contaminated groundwater containing chloroform, carbon tetrachloride, trichloroethylene and 1,1,1,-trichloroethane extends 3,000 feet south of the propellant burning grounds.

3. Groundwater beneath the new acid area has been contaminated by nitrate, sulfate and sodium as a result of several acid spills.

4. Groundwater beneath the existing landfill has elevated concentrations of various inorganic compounds particularly conductivity, hardness, alkalinity, bromide, chloride, sulfate, boron, and nitrate..

5. Groundwater and soils beneath the deterrent burning grounds contain elevated concentrations of various organic and inorganic compounds primarily trichloroethane, sulfate and nitrate.

6. Groundwater in the southern perimeter contains elevated concentrations of sulfate, nitrate, conductivity and sodium.

7. Samples collected and analyzed from 11 private wells in May, 1986 bordering the BAAP facility contained no volatile organic compounds. All other water quality parameters were below groundwater standards with the exception of iron, manganese and nitrate plus nitrite nitrogen at some wells.

8. The settling ponds spoils site consists of dredge spoils containing various base neutral organic compounds, nitrocellulose, nitroglycerine and EP toxic metals.

This approval requires that BAAP submit a schedule within 60 days providing the information requested in the conditions attached. In general the approval requires BAAP to:

1. Define the depth and extent of the groundwater plumes at the propellant burning grounds, the deterrent burning ground, the existing landfill and the southern perimeter.

2. Propose remedial action and closure plans at the deterrent burning ground.

3. Take action to close the deterrent burning ground.

4. Review groundwater monitoring data and the need for monitoring in the magazine area, rocket area, nitroglycerine area, oleum pond, W, NW, N, E and SE perimeter.

5. Continue groundwater monitoring and documentation of sampling and analysis procedures.

If you have any questions regarding this plan approval, please contact Laurie Egre, Dodgeville Area Office, at (608) 935-3368, Marci A. Friedman, hydrogeologist at (608) 267-3538, or Suzanne Bangert at (608) 266-7596.

Sincerely,

Paul P. Didier

Paul P. Didier, P.E., Director
Bureau of Solid Waste Management

PPD:jmc/8371Q

cc: Laurie Egre - Dodgeville Area
Joe Brusca - SD
Systems Management Section - SW/3
Sue Bangert - SW/3
K. Bremer/B. Muno - EPA Region V

BEFORE THE
STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

CONDITIONAL PLAN APPROVAL
FOR WASTE DISPOSAL SITES AT THE BADGER ARMY AMMUNITION PLANT, SAUK COUNTY

FINDINGS OF FACT

The Department finds that:

1. The U.S. Army - Olin Corporation/Badger Army Ammunition Plant (BAAP) owns and operates the following solid waste disposal and hazardous waste management facilities and spill sites:

   a. An existing landfill (DNR ID #2813) located in the NW 1/4 of the NW 1/4 of Section 6, T10N, R7E, Town of Merrimac, Sauk County.

   b. The deterrent burning grounds (DNR ID #3037) located in the SW 1/4 of NE 1/4 of Section 1, T10N, R6E, Town of Sumpter, Sauk County.

   c. The propellant burning grounds (DNR ID #2814) and EPA I.D. No. WI-9210020054 located in the E 1/2 of NW 1/4 of Section 14, T10N, R6E and W 1/2 of the NE 1/4 of Section 14, T10N, R6E, Town of Sumpter, Sauk County.

   d. The wastewater settling lagoons (WPDES No. WI-0043974-2) located in the south of the BAAP property (N3500 E6200:E12500 Badger Coordinates).

   e. The new acid area (DNR ID #2934) located in the southern half Town of Sumpter, T10N, R6E, Sauk County.

   f. Other Solid Waste Management Units listed in the report "Certification Regarding Potential Releases from Solid Waste Management Units" submitted to EPA by BAAP on March 28, 1985.

2. The Department has issued three separate orders for these sites and facilities.

   a. Order #2A-78-1194 issued September 20, 1978 contains provisions for an environmental investigation and eventual closure of the existing landfill (#2813). It also contains provisions for an environmental investigation of the deterrent burning grounds.

   b. Order #2A-78-1195, also issued September 20, 1978, contains provisions for environmental investigations, alternate burning procedures and closure of the propellant burning grounds (#2814).

   c. Consent Order #2A-81-1212A was issued November 24, 1981 to replace Emergency Order #2A-81-1212A issued October 21, 1981. The order contains provisions for the environmental investigation and clean up of a nitric acid spill that occurred on October 7, 1981 and a sulfuric acid spill occurring June 18, 1981 both at the new acid area.

3. On April 2, 1986, the Department issued BAAP an Interim License in accordance with NR 181, Wis. Adm. Code for the hazardous waste container storage area and the thermal treatment of hazardous waste.

4. This review responds to reports prepared in response to the three orders and subsequent requests for information.

5. Environmental investigations on the perimeter of the property; the magazine, nitroglycerine and rocket areas; the settling basin and wastewater ditch; and Grubers Grove Bay are not covered in the orders. Recommendations for investigations in these areas are contained in a DNR letter dated April 16, 1982. The letter reviews the report "BAAP Contamination Survey," that was prepared by Envirodyne Engineering and received on October 19, 1981. The April, 1982 letter is the last comprehensive environmental review issued by the Department to date. The Department has received several environmental studies from BAAP since the 1981 Envirodyne study. The reports and their subjects are listed below:

   a. February 9, 1982 report titled "Engineering Report, Groundwater Monitoring Wells Synthetic Acid Plant BAAP," prepared by R.F. Sarko and Associates. The report describes soil borings and well installation at the acid spill area as required by DNR order #2A-81-1212A.

   b. November 4, 1982 report titled "Geological and Soils Survey and Groundwater Monitoring Program," prepared by Warzyn Engineering Inc. The report contains studies on geology, groundwater and soil contamination at the existing landfill, the deterrent burning grounds and the propellant burning grounds.

   c. October, 1983 report titled "Establishment of Five Groundwater Monitoring Wells, Physical Analysis of Soil Samples and Chemical Analyses of Groundwater Samples," prepared by R.F. Sarko and Associates and received June 14, 1984. The report describes soil borings and well installation along the southern boundary of the plant.

   d. June 11, 1985 report titled "Hazardous Waste Study No. 37-26-0339-85 Phase 4 of AMC Open-Burning/Open-Detonation Grounds Evaluation Investigation of Soil Contamination at the Open-Burning Ground, Badger Army Ammunition Plant Baraboo, Wisconsin, 8-15 May 1984," prepared by U.S. Army Environmental Hygiene Agency (USAEHA). The report describes soil contamination and groundwater contamination at the propellant burning grounds including the burning pads, contaminated waste pits and abandoned waste pits.

   e. November 8, 1985 report titled "Appendix C, Badger Army Ammunition Plant" from "U.S. Army Environmental Hygiene Agency Groundwater Monitoring Study No. 38-26-0457-86 AMC Open-Burning/Open-Detonator Facilities, February 1984 - March 1985," prepared by USAEHA. The report contains a discussion and summary of groundwater contamination by metals, explosive compounds and purgeable organic priority pollutants.

f. November, 1985 report titled "Soil Sampling Analysis and Evaluation of the settling ponds spoils site BAAP," prepared by Foth and Van Dyke and received June 2, 1986. The report contains chemical analyses of the sludge in the settling ponds and recommends that BAAP prepare a risk assessment.

g. January 7, 1986 letter from D. Fordham of BAAP titled "Status of Burning Ground Activities for July - December 1985."

h. January 21, 1986 report titled "Subsurface Investigation Olin Corporation Contract OB/P71863 Badger Army Ammunition Plant Baraboo, Wisconsin," prepared by Warzyn Engineering Inc. and received February 27, 1986. The report contains well construction, soil boring and groundwater monitoring results for one well installed east of the existing landfill at the eastern property boundary and one well nest installed south of Well S1103 at the southern property boundary.

i. January 27, 1986 letter from BAAP outlining burning procedures at the propellant burning grounds.

j. February 21, 1986 report titled "Interim Report, Geohydrologic Study No. 38-26-0504-86 BAAP, 9 September - 9 October 1985, prepared by USAEHA and received March 31, 1986. The report contains the results of a groundwater investigation to define the horizontal extent of a plume of organic contaminants south of the propellant burning grounds.

k. Groundwater monitoring results (from 1982 to present) submitted in accordance with the Department's February 4, 1985 Memo "Interim Groundwater Monitoring at BAAP" and Consent Order #2A-81-1212A on the acid spill area.

l. September 23, 1986 report titled "Water Quality Engineering Study No. 31-24-0736-86, Groundwater Contamination Investigation, BAAP, 12-13 May 1986 containing the results of the private well sampling.

6. Additional documents considered in connection with this plan approval include the following reports and DNR response letters.

Reports

a. September 24, 1982 report titled "Feasibility Study Proposed Landfill BAAP, Baraboo, WI" prepared by Warzyn Engineering, Inc., and received April 20, 1983. The Department issued a conditional feasibility approval for the site on October 30, 1984.

b. September 24, 1982 report titled "Closure Plan, Deterrent Burning Grounds, Badger Army Ammunition Plant, Baraboo, Wisconsin," received November 4, 1982. The Department issued a conditional closure plan approval on January 23, 1986.

c. January 17, 1986 report titled "Plan of Operation U.S. Army, Corps of Engineers, Badger AAP, Wisconsin, New Sanitary Landfill," prepared by Foth & Van Dyke and Associates, Inc., and received January 30, 1986, presently under review.

d. January 16, 1986 report for the operating landfill (existing landfill #2813) titled "Continued Use and Closure Plan; U.S. Army, Corps of Engineers, Badger AAP, Wisconsin," prepared by Foth & Van Dyke and Associates, Inc., and received January 27, 1986. The Department issued a conditional continued use and closure plan approval on October 6, 1986.

DNR Response Letters

e. January 13, 1983 letter documenting a meeting between BAAP and DNR where a plan for prevention of acid spills was to be developed within 90 days.

f. June 25, 1984 Feasibility Study Completeness Determination, Proposed Landfill, BAAP, Baraboo, WI.

g. October 30, 1984 Feasibility approval for the solid waste landfill proposed to be located in the SE 1/4 of the NW 1/4, Section 7, T10N, R7E, Town of Merrimac, Sauk County, Wisconsin.

h. November 26, 1984 memo describing a November 2, 1984 acid spill and remedial action of the acid spill area.

i. February 4, 1985 memo titled "Interim Groundwater Monitoring at BAAP".

j. May 21, 1985 letter to BAAP titled "Construction of Additional Perimeter Wells at the Southern Boundary of BAAP."

k. January 23, 1986 Abandonment Plan approval for the deterrent burning grounds, BAAP.

l. January 29, 1986 letter to BAAP titled "Change in Interim Groundwater Monitoring Program."

m. February 19, 1986 Acid pond abandonment approval requiring BAAP to continue monitoring wells at Acid Spill area.

n. March 27, 1986 Plan of Operation Completeness Review BAAP.

o. April 2, 1986 interim license for the propellant burning grounds thermal treatment and hazardous waste storage.

p. May 8, 1986 letter specifying schedule for submitting groundwater results.

q. May 22, 1986 letter titled "Preliminary comments by Dodgeville Area on Risk Assessment study at the Settling Pond."

r. October 6, 1986 continued use and closure plan approval for the existing landfill.

7. Additional facts relevant to the review of the in-field conditions at the site include the following:

   a. The propellant burning ground is a hazardous waste site containing several abandoned waste pits.

   b. Hazardous constituents are present in soils at the propellant burning ground and at the deterrent burning ground.

   c. Hazardous constituents are present in groundwater beneath the propellant burning ground in concentrations above enforcement standards. The plume at the propellant burning grounds extends 3,000 feet south and is 1,400 feet wide and is moving south. Hazardous constituents have been detected in some wells at the deterrent burning grounds.

   d. Concentrations of nitrate and sulfate in groundwater exceed NR 140 enforcement standards at wells around the acid spill area.

   e. Groundwater at the existing landfill has exceeded NR 140 enforcement standards for sulfate and preventative action limits or enforcement standards for public health parameters in the past.

   f. Groundwater at the southern boundary exceeds NR 140 enforcement standards for nitrate. Some organic compounds have been detected at low concentrations at some of the wells.

   g. Analysis of samples from private water supply wells located within 1,200 feet of the BAAP property were sampled by BAAP and DNR on May 12, 1986. No volatile organic compounds or other indications of groundwater contamination were detected.

   h. The wastewater settling lagoons contain nitrocellulose.

   i. An interim groundwater monitoring program was required by the Department on January, 1985.

   j. The January, 1985 monitoring report from USAEHA proposed analyzing wells along the southern perimeter for VOC's.

8. A final groundwater monitoring program and a proposal for remedial actions at the site is necessary to protect public health, safety and welfare.

9. The closure of the deterrent burning grounds, waste pits at the propellant burning grounds and the existing landfill is necessary to protect public health, safety and welfare.

10. BAAP met with WDNR on July 21, 1987. At this meeting BAAP proposed alternate measures to define groundwater quality and protect private water supplies. BAAP and WDNR agreed on an alternate schedule.

11. As a result of BAAP's comments and the July 31, 1987 meeting the WDNR has modified several conditions. These revisions have been incorporated into this final approval.

12. The Department is requiring BAAP to monitor some private wells close to the facility for the following reasons:

    a. The facility has documented that on-site groundwater is contaminated with both inorganic and organic parameters at several locations.

    b. The extent of the contamination in several areas is not well defined.

    c. The glacial aquifer, which is contaminated in some areas, and the bedrock aquifer are hydraulically connected.

    d. Neither BAAP nor the Department has found information documenting the well construction of these private wells therefore we must assume they may contain minimal casing and could be subject to groundwater contamination if a plume should reach the well.

    e. Evaluating the need for remedial actions is just beginning.

    f. No remedial actions have been taken that would prevent the flow of contaminated groundwater toward these private wells.

    g. No remedial actions have been taken that would prevent past contaminant slugs that may have left the property boundary from reaching these private wells.

    h. Past nitrate contamination along portions of the southern perimeter has exceeded 10 mg/l nitrate. Nitrate is a public health parameter of concern to infants under 6 months of age.

    i. The Department routinely requires landfills to monitor water quality at private wells within 1200 feet of the landfill, particularly where there is documented contamination, even where monitoring wells indicate contaminants have not yet reached the property boundary.

CONCLUSIONS OF LAW

1. The Department has authority under s. 144.44, Stats., to approve a plan of operation with special conditions if the conditions are needed to ensure compliance with Chapters NR 140, 180 and 181, Wis. Adm. Code.

2. The conditions of approval set forth below are needed to assure compliance with NR 180.13, NR 181.08, NR 181 Subpart V and VI and NR 140.20, Wis. Adm. Code.

CONDITIONAL PLAN APPROVAL

The Department hereby approves the in-field conditions reports listed in Findings of Fact 5.a-1 above, subject to the conditions below.

SCHEDULE

1. By September 15, 1987 BAAP shall submit a copy of the draft report being prepared by Argonne National Laboratory so that the WDNR may comment on the recommendations before the Army's budget is finalized at the end of the fiscal year (September 30, 1987).

2. By October 15, 1987 BAAP shall provide to WDNR for approval:

   a. A preliminary schedule and a description of plans for investigations at the propellant burning ground, the existing landfill, the deterrent burning grounds and the southern perimeter.

   b. A final schedule containing the information BAAP agreed to send in their June 22,1987 letter.

   c. A final schedule to repair and/or replace wells PBN 82-02A, MW-6 (S1145), S1101, S-83-1152-A, and S-1103.

   d. A final schedule to abandon wells NAN 81-01D, NAN 81-02A, NAN-81-03A, and NAN 81-04A as required by acid spill condition 5.

3. By November 16,1987 BAAP shall provide to WDNR for approval:

   a. A final schedule for all work required in all of the conditions of this WDNR final plan modification.

   b. A copy of the scope of work for contract procurement.

   c. A final copy of the report prepared by Argonne National Laboratory for the Army.

4. BAAP shall notify the WDNR when the Army's contract is awarded.

5. BAAP shall submit a final work plan for investigations at the propellant burning ground, the existing landfill, the deterrent burning grounds and the southern perimeter by June 1, 1987 to WDNR for approval.

PROPELLANT BURNING GROUNDS #2814 (EPA ID WI9210020054)

1. BAAP shall submit a remedial action plan for WDNR approval for the contaminated groundwater plume. The plan shall contain an evaluation of the cause and significance of the contamination and a remedy to regain and maintain compliance with NR 140, Wis. Adm. Code. The plan shall include justification of why possible remedies other than those proposed are not feasible.

2. BAAP shall submit a scope of work for investigations scheduled in 1987 for Department approval. BAAP shall contact the Department at least 2 weeks before drilling any new wells in areas of contaminated groundwater to discuss any changes in drilling procedures and well construction techniques from what is approved in the scope of work.

3. BAAP shall complete the hydrogeologic study No. 38-26-0504-86 to define the extent of the groundwater plume contaminated with organic solvents. The scope of work described in Appendix F "Groundwater Monitoring Well Plan" is approved with one modification. To prevent contaminated groundwater from migrating down the borehole and contaminating deeper formations, casing shall be driven while all piezometers are drilled. BAAP may propose an alternate method to insure the deeper portion of the aquifer does not become contaminated as a result of the well drilling.

   The Department recommends using an OVA (organic vapor analyzer) meter or other appropriate instrument for organics, to analyze soils and groundwater during drilling to locate wells in areas of greatest contaminant concentration.

4. BAAP shall submit a proposal for WDNR approval to define the extent of the DNT contamination near Well PBN-5A. Conflicting analytical data shall be discussed.

5. BAAP shall propose installing additional wells around the contaminated waste area as recommended in the 8-15 May, 1984 report on soil contamination at BAAP. The extent of DNT contamination shall be defined in this area.

6. BAAP shall establish whether or not soils at the burning grounds are hazardous waste based on reactivity, EP toxicity characteristics (especially with respect to lead) or contaminated with a listed waste. The source of information in Table 1 of the 9-September to 9-October, 1985 geohydrologic study shall be provided and related to data in the 8-15 May, 1984 report.

7. BAAP shall prepare and submit a closure plan for WDNR approval in accordance with NR 181.42(8) and NR 181.46(12) for the contaminated waste area and three waste pits and other areas used in the propellant burning area. The plan shall include the following:

   a. A testing program to define the depth of contamination.

   b. A waste analysis to determine if the materials must be handled as hazardous waste. Note that soils contaminated with listed hazardous waste are hazardous.

   c. A disposal plan for contaminated soils.

   d. An engineering plan to limit infiltration, restore positive drainage and revegetate the site.

8. BAAP shall submit testing results from soils excavated from the three refuse pits at the burning ground now stored in drums in on-site bunkers. The location of the stored soils shall be specified and a final disposal method shall be proposed.

9. BAAP shall monitor groundwater quarterly within 15 days of September 15, December 15, March 15 and June 15 according to the following schedule.

   a. Wells:

PBN 82-01A (100)
PBN 82-01B (101)
PBN 82-01C (102)

PBM 82-01 (106)
PBM 82-02 (107)
MW-4 (S-1114)

PBN 82-03A (113)
PBN 82-03B (114)
PBN 82-03C (115)
MW-6 (S-1146) (112)
MW-5 (S-1145)
PBN 82-04A (121)
PBN 82-04B (122)
PBN 82-04C (123)

PBN 82-02A (103)
PBN 82-02B (104)
PBN 82-02C (105)

PBM 82-03 (109)
PBM 82-04 (110)
PBM 82-05 (111)

S-1117 (116)
PBN 82-05A (118)
PBN 82-05B (119)
PBN 82-05C (120)

   b. Parameters:

Public Health Parameters: NO_2 + NO_3 (as N)
Public Welfare Parameters: Cl, SO_4
Indicator Parameters: field pH, field specific conductance (corrected to 25° C), hardness, alkalinity
Organic Parameters: VOC's, 2,4 DNT, 2,6 DNT, pentachlorophenol
Other: groundwater elevation, color, odor and turbidity at the time of sampling

10. BAAP shall sample all wells constructed in 1985 south of the burning grounds once for 2,4,DNT; 2,6,DNT and pentachlorophenol and four times on a quarterly basis for the other parameters listed in Condition 9b.

11. BAAP shall submit all historical water quality data for BAAP water supply well #5.

ACID SPILL AREA #2934

1. The January 13, 1983 letter from the Department Southern District Hazardous Waste Specialist to BAAP stated that plans to construct a liner beneath and around tank storage facilities including a leak detection system were to have been submitted within 90 days. BAAP shall report on the status of this plan.

2. BAAP shall propose measures to decrease infiltration in areas where acid has been spilled in the past including installing clay or plastic cover and directing drainage away from the spill sites.

3. BAAP shall sample wells NAN-81-01-A(200), NAN-81-02B(202), NAN-81-03B(203), NAN-81-03C(204), NAN-81-04B(205) and NAN-81-04C(206) once

for volatile organic compounds and Ni, Cr, Cd, Pb. Wells having detectable concentrations of these parameters shall be sampled two additional times.

4. BAAP shall sample wells NAN-81-01-A (200), NAN-81-02B (202), NAN-81-03B (203), NAN-81-03C (204), NAN-81-04B (205) and NAN-81-04C (206) quarterly for sulfate and nitrate and annually in March for groundwater elevation. This groundwater elevation shall be taken on the same date. This modifies the groundwater monitoring requirements of the February 19, 1986 closure approval for the acid lagoon.

5. BAAP shall determine the condition of the wells NAN-81-01-D(201), 02-A, 03-A and 04-A. If the wells are not functional, they shall be properly abandoned.

6. BAAP shall submit historical water quality data for water supply well #2.

EXISTING LANDFILL #2813

1. Unless BAAP proves to the Department's satisfaction by December 1988 that contaminated groundwater is not present at the facility boundary near the existing landfill, BAAP shall submit a proposal to determine if the contaminated groundwater plume extends off the property boundary east of the landfill. If contamination extends past the boundary, BAAP shall define the horizontal and vertical extent of the plume off-site regardless of whether the contamination is due to the landfill or another on-site contamination source.

   Approximately 3 to 4 nested piezometers shall be installed east and southeast of the landfill along the property boundary. At least one well nest shall be installed along the property boundary north of well ELN 82-02 and at least one well nest shall be installed between well nest ELN 82-02 and S1153. The remainder of the nests shall be installed south of S-1153.

2. BAAP shall define the horizontal and vertical extent of the contaminated groundwater plume from the existing landfill within the property boundary. Approximately 2 to 3 well nests shall be installed south of the existing landfill near locations 14,600E 19,200N and 15,200E 10,200N or at other locations approved in writing by the Department.

3. BAAP shall propose the exact number of nests, number of wells in each nest, depths of the wells and location of the nests for work required in condition #1 in the final work plan. BAAP may defer work required in condition #2 until the wells in condition #1 are completed. However, BAAP must still submit a schedule for work required in condition #2. Unless an alternate proposal is approved in writing by the Department:

   a. Water table wells shall be constructed with a 10 to 15 foot screen intersecting the water table.

   b. Intermediate piezometers shall be constructed with the top of the screen 20 feet below the base of the water table well's screen.

c. Deep piezometers shall be constructed with the top of the screen 20 feet below the base of the intermediate piezometer's screen.

4. BAAP shall close and properly abandon the landfill in accordance with the approved closure plan issued October 6, 1986.

5. BAAP shall monitor groundwater quarterly within 15 days of September 15, December 15, March 15, and June 15, according to the schedule below.

The new schedule shall replace condition 6 of the Department's continued use and closure plan approval issued October 6, 1986.

a. Wells

ELN 82-01A (150)
ELN 82-01B (151)
ELN-2A (153)
ELN-2B (154)
ELN-2C (155)
ELN-3A (156)
ELN-3B (157)
ELN-3C (158)
ELN-4A (159)
ELN-4B (160)
ELN-4C (161)
S1134 (MW-2) (162)
S1135 (MW-3) (163)
S 85-1153 (164)
All new wells constructed

b. Parameters:

Public Health Parameters: Cd, Cr, NO_2 + NO_3 (as N), Pb

Public Welfare Parameters: Cl, SO_4

Indicator Parameters: field pH, field specific conductance (corrected to 25° C), hardness, alkalinity

Organic Parameters: VOC's shall be sampled for 3 consecutive quarters at wells 2A, B, C and 3A, B, C

Other: groundwater elevation, color, odor and turbidity at the time of sampling

6. BAAP shall submit historical records of water quality data for BAAP water supply well #4. Sulfate concentrations as well #4 are elevated above those of other water supply wells. BAAP shall determine if sulfate contamination at the deterrent burning ground or the existing landfill is influencing sulfate concentrations at Well #4.

7. BAAP shall provide an explanation of the source of the sulfate contamination beneath the existing landfill.

DETERRENT BURNING GROUNDS #3037

1. BAAP shall submit a proposal for WDNR approval to define the horizontal and vertical extent of contamination upgradient of the deterrent burning ground and to determine if this contamination is moving to the southeast and east. The proposal shall include installing the following wells:

a. Piezometer adjacent to water table observation well DBM-82-01.

b. A well nest near the intersection of roads about 350 feet southeast of well nest DBN1 at the deterrent burning grounds (approximate coordinates: 500,500N; 2,0784,800E).

c. Additional wells upgradient and east of the site. Well nests shall consists of a water table observation well and a piezometer. Observation wells shall have a 10 to 15 foot screen that intersects the water table. Piezometers shall have a 5 foot screen set about 20 feet below the bottom of the observation well screen.

2. BAAP shall monitor groundwater quarterly within 15 days of September 15, December 15, March 15 and June 15 according to the schedule below. This modifies condition 17 of the Department's January 23, 1986 Abandonment plan for the Deterrent Burning Grounds.

a. Wells:

DBM-82-02 (001)
DBM-82-01 (002)
DBM-82-01B (003)
DBN-82-01C (004)
S1122 (005)
All new wells constructed

b. Parameters:

Public Health Parameters: Cd, Cr, NO_2 + NO_3-N

Public Welfare Parameters: Cl, SO_4, Na

Indicator Parameters: field pH, field specific conductance (corrected to 25° C), hardness, alkalinity

Organic Parameters: VOC's, base neutral list of the EPA priority pollutant list

Other: groundwater elevation, color, odor and turbidity at the time of sampling

3. BAAP shall submit a proposal for WDNR approval to abandon the deterrent burning grounds addressing the requirements of the Department's January 23, 1986 Abandonment Plan and recent concerns regarding the classification of the soils after excavation.

SOUTHERN PERIMETER WELLS #3038

1. BAAP shall improve the monitoring network in the southern perimeter to detect any organic or inorganic contaminants from the propellant burning grounds or other sources before they leave the property boundary. Unless

otherwise approved in writing by the department, monitoring wells shall be installed at the following locations along the boundary:

Location	Well Type
S1133	DP
S-83-1147	IP DP
S-83-1148	IP DP
Between S1133 and S-83-1147	WT IP DP
Upgradient of Graf well	WT IP

WT= Water table observation well constructed with a 10 to 15 foot screen intersecting the water table.

IP= Intermediate piezometer constructed with the top of the screen 20 feet below the base of the water table well's screen.

DP= Deep piezometer constructed with the top of the screen 20 feet below the base of the intermediate piezometer's well screen

2. BAAP shall monitor groundwater quarterly with 15 days of September 15, December 15, March 15 and June 15 at the following wells:

Southern Perimeter Wells

a. Wells

Well	DNR ID	Well	DNR ID
S1101		S-83-1152A	(277)
S1133	(261)	S-83-1152B	(278)
S-83-1147	(262)	S1104	(267)
S1102	(264)	S1105	(268)
S1103	(265)	S1106	(269)
S-83-1148	(263)	S1107	(270)
S-83-1149	(266)	S1108	(271)

b. Parameters:

Public Health Parameters: Cd, NO_2 + NO_3 as N

Public Welfare Parameters: Cl, SO_4, Na

Indicator Parameters: field pH, field specific conductance (corrected to 25° C), hardness, alkalinity

Organic Parameters: VOC's, pentachlorophenol, pthalates

Other: groundwater elevation, color, odor and turbidity at the time of sampling

3. BAAP shall clarify whether Well S1101 exists and is operational. If it is not, it shall be replaced with a water table observation well at that location.

MAGAZINE AREA, ROCKET AREA, NITROGLYCERINE AREA, OLEUM POND, AND PERIMETER WELLS IN WEST, NORTH AND EAST #3038

1. BAAP shall review groundwater monitoring data for the following wells, summarize attainments and exceedances of NR 140 PALs and enforcement standards and discuss the need for or adequacy of the groundwater monitoring at those locations:

Magazine Area

S1115 (300)
S1116 (301)

Rocket Area

S1118 (302)

Nitroglycerine Area

S1119 (303)
S1125 (305)
S1150 (306)
S1124 (304)

Oleum Pond

S-83-1151 (257)

Northwest Perimeter

S1128 (252)
S1127 (253)
S1109 (260)

Western Perimeter

S1126 (251)
S1123 (250)

Southeast and Eastern Perimeter

S1110 (272)
S1111 (273)
S1112 (274)
S1113 (275)
S1114 (276)
S1121 (259)

Northern Perimeter

S1130 (255)
S1131 (256)
S1129 (254)

Miscellaneous

S1132 (258)

2. Until otherwise approved by the Department, groundwater samples from these wells shall be analyzed quarterly within 15 days of September 15, December 15, March 15 and June 15 for the following parameters:

Public Health Parameters: NO_2 + NO_3 as N

Public Welfare Parameters: Cl, SO_4

Indicator Parameters: field pH, field specific conductance (corrected to 25°C), hardness, alkalinity

Organic Parameters: Magazine Area, Rocket Area and Nitroglycerine Area only: VOC's

Other: groundwater elevation, color, odor and turbidity at the time of sampling

PRIVATE WELLS

1. If permission is granted by the well owner the following private wells shall be sampled quarterly as follows:

   a. Samples from the Premo and Schaefer well shall be analyzed for the following parameters:

      Public Health Parameters: Cd, Cr, Pb, Hg, NO3+ NO2 as N

      Public Welfare Parameters: Cl, SO4

      Indicator parameters: field pH, field specific conductance (corrected to 25°C), hardness, alkalinity

      Organic Parameters: carbon tetrachloride, chloroform

      Other: color, odor and turbidity at the time of sampling

   b. If nitrate concentrations at the Schaefer and Premo well exceed 10 mg/l BAAP shall provide an alternate source of water to those homes.

   c. Samples from the Spear well shall be collected and analyzed for the parameters in condition #1a above except that VOC's will not be required if the results of additional VOC sampling at monitoring wells at the existing landfill do not detect VOC's.

   d. If nitrate concentrations in monitoring wells upgradient from the Graf well indicate that nitrate contamination is increasing upgradient of the well, BAAP shall begin monitoring the Graf well according to the schedule in condition #1a above.

   e. The Department may change VOC monitoring requirements based on the results of future groundwater investigations at the propellant burning ground and at the southern perimeter.

SETTLING PONDS AND SETTLING PONDS SPOILS SITE

1. BAAP shall submit a closure plan for WDNR approval for the settling ponds spoils site. The report shall include:

   a. An analysis of the existing groundwater data from the monitoring well: (and private wells, if available) near the lagoons. Contaminants identified in the spoils shall be correlated to groundwater data.

b. A summary of all soil contamination data for the area from previous studies.

c. A discussion of the physical properties and chemical constituents of the sludge and sediment and an estimate of the volume of sludges vs. contaminated soils.

d. An analysis of the extent and depth of sludge and contaminated soils remaining in the settling ponds.

GENERAL CONDITIONS

1. BAAP shall submit five copies of all reports prepared in response to this letter. Three shall be sent to the Bureau of Solid Waste Management, one to the Dodgeville Area office and one to the Southern District office.

2. All groundwater monitoring results and original TAD forms shall be sent to the Dodgeville Area office. Parameters, detection limits and results for organics data not included on the TAD but required by the Department shall be securely attached to the TAD. BAAP shall submit the TAD to the Department within one week of receiving results from the U.S. Army Environmental Hygiene Lab (USAEHA). Results may be submitted up to six months after the samples are taken if the USAEHA laboratory requires this analysis time. BAAP shall call the Dodgeville area office if results will be delayed.

3. A hydrogeologist or other person qualified to perform the duties of a hydrogeologist shall observe and direct the drilling of all borings and the installation of all wells and visually describe and classify all geological samples.

4. BAAP shall submit for WDNR approval detailed well construction and development procedures proposed to be used for new wells installed at the facility to the Department for approval. The procedures shall follow the Department's Guidelines for Monitoring Well Installation dated April 9, 1985. The proposed procedures shall outline all information to be submitted in the well construction report including the format to be used. Unless otherwise approved in writing by the Department, the following procedures shall be used at a minimum for all new well construction and well development at the site.

   a. A boring log shall be recorded for each new well. Each log shall include soil descriptions (based upon undisturbed samples collected from each major soil unit at maximum 5-foot increments), method of sampling, depth of sampling, date of boring, water level measurements and date of water level measurements. All new wells should be installed without the use of drilling fluids that may affect future water quality analysis. All new wells shall be installed with factory slotted screens, appropriately sized filter pack and threaded joints. Filter fabric shall not be used around the well screens. Soil boring information for all wells shall be recorded to the depth of the bottom of the well screen. No PVC glues shall be used for either well screens or casings.

b. All new wells shall be thoroughly developed soon after installation. Development methods should include use of surge block, a bailer, a pump or an air lift pumping compressed air. Water jetting should be used only if followed by one of the other methods to remove water and fine sediments. The development method should cause water to flow rapidly in and out of the well screen in order to dislodge and remove fine particles. The Department discourages adding water to the well if the well can be developed adequately without it. If water is added, obtain it from a public or private water supply and analyze its water chemistry for the following parameters: field pH, field conductivity (adjusted to 25° C) COD, dissolved iron, alkalinity, hardness and chlorides. If the well is to be used for sampling organic contaminants, a VOC scan with quantification shall be performed on the water. Use water from the boring only if suspended sediments are first removed.

c. The development procedures shall be documented in the well construction report. As new wells are installed, documentation of the installation and development procedures shall be submitted within 60 days of the well installation. The well development documentation shall include the following items:

1) Date, time and elevation of water levels in well taken before and after development;

2) Method used for well development;

3) Time spent developing the well;

4) Volume of water removed from the well;

5) Volume of water added to the well (if any);

6) Source of water added to the well and chemical analyses;

7) Clarity of water before and after development;

8) Presence of sediment at the bottom of the well.

d. The well construction report shall include information on the construction of the well. In addition to the well development information listed above, the well construction report shall include for each well:

1) Type of well casing;

2) Type of joints (threaded);

3) Type of well screen;

4) Screen slot size;

5) Type of filter material used (sand or gravel);

6) Type of backfill;

7) Type of grout;

8) Distance from ground surface to the top of standpipe;

9) Distance from ground surface to bottom of well;

10) Thickness of concrete plug;

11) Bentonite seal(s) thickness and location;

12) Distance filter pack extends above top of well screen;

13) Length of well screen;

14) Type of drilling method;

15) Protective devices (e.g., pipe, locking cap);

16) Description of casing joints;

Much of the above information can easily be displayed on a diagram with written descriptive support. Additional elevations are needed to complete the Well Information Form required in condition 5., below.

5. The groundwater monitoring Well Information Form (WIF) shall be completed for all new wells installed at the landfill. One line of the WIF must be completed for each new well installed and submitted to the Department within 60 days of the well installation. The WIF shall be submitted in addition to the well construction report and boring logs; it does not take their place.

6. Unless otherwise approved in writing by the Department, the following procedures shall be used for all well abandonment at the site:

   a. The well shall be over-drilled using a standard casing bit with a diameter as large or larger than the previously drilled boring. The bit shall be advanced past the depth of the well screen to the maximum depth of the previously drilled boring.

   b. The drill casing shall be extracted and the boring grouted using a tremie tube with a bentonite grout. The tremie tube shall remain submerged until the borehole is filled.

   c. An abandonment report for each well which is abandoned shall be submitted to the Department as part of the Site Construction Documentation report for each phase. If any wells are abandoned after the Site Construction Documentation report is submitted a separate well abandonment report shall be submitted, to the Department within 60 days of the well abandonment. The abandonment reports shall discuss the method used to abandon each well, the material used to

backfill each well and any problems encountered. Photo documentation shall also be included.

7. BAAP shall submit for Department approval the detailed sampling and analysis procedures proposed to be used when sampling the monitoring wells at the facility. Sampling procedures shall follow the Groundwater Sampling Procedures Guidelines published by the Department in February, 1987. The analyses shall be conducted in accordance with SW 846 or other EPA approved methods. The proposal shall include a Data Collection Quality Assurance Plan and a Data Management Plan similar to RCRA corrective action plan interim final guidance document dated November, 1986. The report shall include a description of the methods to be used in obtaining, preserving and analyzing the samples. Unless otherwise approved in writing by the Department, this report shall address the following items:

   a. Devices used to measure the water level elevations, to purge wells and to retrieve samples.

   b. Procedures used to purge wells prior to collecting samples, approximate time elapsed between purging and sampling, and an example of the method used to calculate well volumes.

   c. Procedures used for cleaning samplers (such as bailers or pumps) between wells and the order of well sampling. Samples shall be collected from the least to the most contaminated well. If chemical concentrations in the wells are equivalent then upgradient wells shall be sampled before downgradient wells.

   d. The make and model of equipment used to measure specific conductance and pH in the field.

   e. Volume of samples collected and any procedures used to filter samples prior to analyses. Any procedures used for chemical preservation of samples and the time at which filtration and preservation are carried out.

   f. Methods of transporting samples to the lab, the time spent transporting samples to the lab and the time passed before the samples are analyzed in the lab.

   g. Analytical procedures used in the lab for each required chemical parameter including make and model of any automated analytical equipment used. If the procedures are exactly as described in published sources, references may be listed to fulfill this requirement.

   GC-MS volatile organic compound (VOC) scans shall be run in accordance with SW 846 method 8240 or EPA wastewater method 624. As an alternative, the analysis shall be performed using a GC/photoionization detector in accordance with SW 846 methods 8010-8020 or EPA wastewater methods 601/602.

8. All sampling and analysis shall be carried out in accordance with standard methods, with due precautions to minimize contamination of samples. The procedures below shall be followed when sampling unless alternate methods are approved in writing by the Department.

   a. Bailing: Four volumes of water shall be removed from the well and the well shall be allowed to recharge before sampling. For wells screened in fine-grained soils, wells may be bailed dry. More bailing may be required for newly constructed wells. Any abnormalities in recharging conditions shall be noted.

   b. Filtering: All samples from groundwater monitoring wells shall be filtered in the field except samples to be analyzed for organic parameters, field pH and field conductivity, or other samples where filtering is not recommended by the laboratory.

   c. Cleaning and Preservation: Sampling devices shall be rinsed with distilled water between wells. Samples requiring preservation shall be preserved in the field and shall be kept near 4°C while being transported to the lab.

   d. Quality Control: Blank samples of distilled water shall be run through the filtering apparatus periodically throughout the sampling to provide a comparison sample for inorganics and metals analyses. Bailer blanks and travel blanks of distilled water shall be analyzed for all organics sampled.

   e. Detection Limits: Detection limits used by the laboratory shall be specified. Detection limits shall be below the enforcement standards and preferably below the preventive action limits specified by NR 140, Wis. Adm. Code, where technology permits unless otherwise specified by the Department.

9. BAAP shall prepare a historical summary of the results of organics analyses. Wells that have had detectable organics shall be listed by site as has been done for inorganic results, 2,4 DNT and 2,6 DNT. The summary should include detection limits and sample values. It should also have a symbol for "not sampled". Any values not detected should be reported as less than the numerical detection limit.

10. A narrative summary of all inorganic and organic water quality results shall be prepared quarterly. The narrative shall identify parameters attaining or exceeding NR 140 preventive action limits and those attaining or exceeding enforcement standards. It shall also discuss changes in groundwater quality such as increasing or decreasing trends in parameter concentration, detection of previously undetected parameters, or the absence of previously detected parameters. The narrative shall be submitted with the turnaround documents and quarterly organics analyses summary.

11. An historical summary shall be prepared listing attainments and exceedances of NR 140 preventive action limits and enforcement standards

from October, 1985 to the present. After the Department sets PALs for indicator parameters for this site, a similar historical summary shall be prepared for the indicator parameters.

12. One of the required samples for organic compounds at the propellant burning grounds, deterrent burning grounds, existing landfill and southern perimeter wells shall be split with an independent consultant to verify laboratory analyses. The split sample shall be taken during the March, June or September sampling period of the year in which it is performed.

The Department retains the jurisdiction either to require the submission of additional information or to modify this approval at any time if, in the Department's opinion, modifications are necessary.

Unless specifically noted the conditions of this approval do not supercede or replace any previous conditions of approval for BAAP facilities.

If you believe that you have a right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to file your petition with the appropriate circuit court and serve the petition on the Department. Such a petition for judicial review shall name the Department of Natural Resources as the respondent.

This notice is provided pursuant to section 227.48(2), Stats.

Dated:

SEP 14 1987

DEPARTMENT OF NATURAL RESOURCES
For the Secretary

Paul P. Didier

Paul P. Didier, P.E., Director
Bureau of Solid Waste Management

Attachments: Review of the Infield Conditions Report

8371Q

REVIEW OF THE INFIELD CONDITIONS REPORTS FOR THE BADGER ARMY AMMUNITION PLANT

The following report summarizes the environmental conditions at the BAAP as reported in documents listed in the Department's Conditional Plan Approval dated May, 1987. The topics covered are:

1. Propellant Burning Ground #2814
2. New Acid Area #2934
3. Existing landfill #2813
4. Deterrent Burning Ground #3037
5. Southern Perimeter and Other perimeter wells
6. Private Wells
7. Settling Ponds and Settling Ponds Spoils sites.

The following brief summary of the regional geology and hydrogeology applies to the entire site:

1. Regional Geology

Glacial

The terminal moraine of the Green Bay lobe of Wisconsin glaciation runs through the west central area of the site (Attachment 1). The existing landfill, deterrent burning ground, proposed landfill and most of the settling basins are located within the terminal moraine area. The propellant burning grounds are located on an outwash plain just to the west of the moraine limits. Deposits in the terminal moraine are stratified outwash with some glacial till. Deposits in the outwash plain are outwash sands, and gravels.

Bedrock

Upper Cambrian sandstones (Mt. Simon & Eau Claire) are the youngest rocks that appear in water supply wells drilled at the site. Other bedrock deposits include the Precambrian Baraboo quartzite (exposed in northern portions of BAAP), Cambrian quartzite conglomerate (exposed along the banks of the Baraboo hills) and upper Cambrian sandstone of the Galesville, Trempeleau and Oneota formations (exposed as erosional remnants east, south and west of BAAP in highlands).

2. REGIONAL HYDROGEOLOGY

Glacial deposits extend about 240 feet below land surface according to information from water supply wells at the facility. The sandstone aquifer is not confined and is hydraulically connected to the upper sand and gravel aquifer over the majority of the plant area. The underlying Precambrian rocks are relatively impermeable and do not constitute an aquifer. According to a

1980 map prepared by Warzyn Engineering groundwater flow is primarily south and southeast towards the Wisconsin River. There is a localized westward flow away from the river in the southeastern areas due to Lake Wisconsin. Horizontal gradients on the regional map are about .0017 ft/ft in the southern portion of the property, flatter in the central portion and steeper closer to the Baraboo Hills.

Depth to groundwater ranges from about 140 feet below land surface at the existing landfill to about 40 feet below land surface in the southern perimeter of the site.

REVIEW OF INFIELD CONDITIONS REPORTS FOR THE PROPELLANT BURNING GROUND #2814

1. INTRODUCTION

The propellant burning ground (also called the south burning ground) lies in the southwest of the BAAP property just east of Rt. 12. The southern portion of the site contains two concrete burning pads and three waste pits. The northern portion contains one closed and two open waste pits (Attachments 2 and 3). The pits are no longer being used.

Both soils and groundwater at the site have been contaminated by a variety of inorganic and organic compounds. A plume of contaminated groundwater extends 3000 feet south of the site.

The March 26, 1986 report cites the burning pads and 3 waste pits located 600 feet northeast of the burning ground as the probable source of the organic contamination.

The pads and pits were used intermittently for dumping and burning solvents and other process chemicals since 1942. The last on-ground open burning was in 1983. Carbon tetrachloride was burned with propellants on the burning pads from 1942-45, 1951-56 and 1966-71. The Army burned trichloroethylene with lumber in the area of the 3 waste pits from 1966 to 1974. Because these solvents are not flammable it is likely that the majority of the liquid volatilized and/or infiltrated into the groundwater.

BAAP presented a scope of work to define the vertical extent of the contaminated groundwater plume in the February 21, 1986 geohydrologic study. According to conversation with David Fordham of BAAP, the work is scheduled for 1987. A study of remedial actions is also scheduled for 1987.

Since the propellant burning grounds has interim status and a state issued interim license and there has been a documented release of hazardous constituents, EPA has the authority under sect. 3008(h) of the Hazardous and Solid Waste Amendments to RCRA to require corrective action at all solid waste management units identified at BAAP, U.S. EPA-Region V has contracted with A.T. Kearney to conduct a RCRA Facility Assessment to define what releases have occurred and what additional information may be needed to evaluate the corrective measures which could be used at the site. This work is scheduled for 1987 and activities will involve all "solid waste management units" at the BAAP facility.

2. GEOLOGY AND HYDROGEOLOGY

The site lies on an outwash plain just to the west of the terminal moraine of the Green Bay lobe of Wisconsin glaciation. Subsoils encountered consist mostly of sand and sand and gravel deposits (Attachments 4, 5 and 6). Unlike other areas of BAAP, most of the outwash deposits in this area are stratified. Individual sand and sand and gravel units could not be correlated in the 1982 investigation performed by Warzyn Engineering. Outwash deposits extend to at least 240 feet below land surface.

The uppermost bedrock unit encountered is the Cambrian sandstones of the Dresbach group (Mt. Simon and Eau Claire). This data was obtained from several water supply wells at the plant. The underlying sandstone aquifer is unconfined and is hydraulically connected to the upper sand and gravel aquifer in most areas.

Depth to groundwater is about 80 to 100 feet below land surface. Groundwater flow is south or southwest. Horizontal hydraulic gradients are approximately 0.001 ft/ft. Vertical hydraulic gradients are generally upward (less than 0.01 ft/ft) except for nest PBN 3 where flow was horizontal and nest PBN 5 where gradients were .002 ft/ft downward.

3. SOIL CONTAMINATION

Several studies have presented data or soil contamination at the propellant burning grounds. Soil samples were obtained by Envirodyne, Inc.in 1980, Warzyn Engineering in 1982 and the U.S. Army in 1984 and 1985. The April, 1982 DNR review letter noted that soil samples contained DNT (dinitrotoluene), DEP (diethylphthalate), DBP (dibutylphthalate), DPA (diphenylamine), lead and tin as shown in the Envirodyne report.

The 1982 Warzyn study found soil samples contained high levels of sulfates and nitrates, as well as various concentrations of phthalates and trace amounts of anthracene, chloronapthalene, and naphthalene. DNT and nitrosodiphenylamines were not found during the Warzyn study although they were found during the Envirodyne study.

Appendix C to the February, 1984-March, 1985 report contains a summary of analytical results (Table C-1) describing explosives and metals detected (Attachment 7). The sample location, testing description, source of the information and testing dates are not provided.

Explosives

In the southern portion of the property, soils at the burning pads contained measurable quantities of the explosives HMX; RDX; 2,4,6, TNT; 2,6 DNT and 2,4 DNT. Only one of the three "abandoned refuse pits" were sampled. Soils in the pit contained 2,4 DNT. In the "contaminated waste area," 600 feet northeast of the burning ground, soil samples contained 2,4 DNT. Background samples contained 2,4 DNT. Samples from the "drainage" contained 2,4,6 TNT and 2,6 DNT. The sample locations were not provided.

Metals

The upper 6 inches of soil at burning pad 1 and 2 and the entire refuse pits 1 and 2 contained samples that exceeded the EP toxicity test for lead, classifying them as a hazardous waste. The 8-15 May, 1984 report contradicts the results of the February 1984 to March 1985 report. In the 8-15 May report, no TEP metals were detected in the burning ground or in the contaminated waste area.

A January 7, 1986 letter from BAAP indicates that "propellant contaminated soil was removed from the three refuse pits, samples taken and drums stored in magazines pending the results of testing by the U.S. Bureau of Mines and USAEHA laboratories." The Department has not received the results of this testing.

4. GROUNDWATER MONITORING WELLS

The following list identifies existing monitoring wells at the propellant burning grounds and assigns a DNR ID number to them. These do not include wells installed in 1985.

Well	DNR ID	Well	DNR ID
PBM 1	(106)	PBN 3A	(113)
PBM 2	(107)	PBN 3B	(114)
PBM 3	(109)	PBN 3C	(115)
PBM 4	(110)	PBN 4A	(121)
PBM 5	(111)	PBN 4B	(122)
PBN 1A	(100)	PBN 4C	(123)
PBN 1B	(101)	PBN 5A	(118)
PBN 1C	(102)	PBN 5B	(119)
PBN 2A	(103)	PBN 5C	(120)
PBN 2B	(104)	S1117	(116)
PBN 2C	(105)	MW6	(112)

5. GROUNDWATER QUALITY

Inorganic Parameters

Metals. Groundwater samples taken by Warzyn Engineering in 1982 contained cadmium and lead in concentrations above the enforcement standard (0.01 mg/l for Cd and 0.05 mg/l for Pb) Chromium was detected above the enforcement standard of 0.05 mg/l at well PBM-5 (111) once. Subsequent sampling by the USAEHA laboratory did not detect lead and cadmium.

Sampling reported in the February, 1984 - March, 1985 groundwater summary report indicated a chromium concentration of 0.10 mg/l in one well sampled on September 22, 1982. Mercury was detected at or close to the detection limit of 0.0002 mg/l at 5 wells.

Organic Parameters

Explosives. The explosive compounds (2,4,6 TNT, RDX, HMX and tetryl) have never been detected in any of the samples taken from the wells. Well PBN-2A (103) in the contaminated waste area and well PBN-5A (118) in the burning grounds contained detectable concentrations of 2,4 DNT (1 ug/l and 24 ug/l, respectively). Well PBN-5A (118) also contained 2,6 DNT (8 ug/l). The explosive 2,4 DNT and 2,6 DNT were detected in well PBN-5A (118) on 2 occasions in May, 1982 in concentrations up to 97 ug/ml. Well PBN-5A (118) is not presently on the quarterly groundwater monitoring program. The 8-15 May, 1984 study states that "explosives discovered beneath the burning ground were not a source of contamination to the groundwater under BAAP." This statement ignores the fact that well PBN-5A (118) has had detectable concentrations of DNT.

Solvents. Groundwater beneath the propellant burning grounds has been contaminated by chloroform, carbon tetrachloride, trichloroethylene and 1,1,1-trichloroethane. Other organic parameters have been detected less consistently.

Chloroform was found in all wells sampled, in concentrations up to 130 ug/l. The maximum concentration in January, 1986 was 11 ug/l. Concentrations in water table observation wells PBN-1A (100), PBN-2A (103), PBN-3A (113), PBN-4A (121) and PBN-5A (118) generally were higher than piezometers screened at depth although not all wells were sampled for all dates.

Carbon tetrachloride concentrations ranged from not detectable up to 2000 ug/l. The maximum concentration in January, 1986 was 210 ug/l. In general, concentrations in water table observation wells PBN-1A (100), PBN-2A (103), PBN-3A (113), PBN-4A (121) and PBN-5A (118) were higher than in piezometers. Exceptions were high carbon tetrachloride concentrations in piezometer PBN-3B (114) on one date and high carbon tetrachloride concentrations in piezometer PBN-5C (120) on several dates. This indicates that contaminants are spreading vertically within the aquifer.

Trichloroethylene was detected in all wells except piezometer PBN-1C (102) in concentrations up to 900 ug/l. January, 1986, concentrations range from not detected to 140 ug/l. Concentrations in well PBN-1A (100) appear higher than the piezometers. However, piezometers PBN-5B (119), PBN-5C (120) and PBN-2B (104) have high concentrations also indicating vertical movement in the aquifer.

Tetrachloroethylene was detected 6 times at concentrations from 1 to 3 ug/l in wells PBM-3 (109), PBM-1 (106), PBM-2 (107), PBN-5A (118) and MW-6 (112) only in September, 1982; January, 1983 and July, 1983.

The solvent 1,1,1-trichloroethane was detected in all wells except PBN-1B (101), PBN-1C (102), PBN-4C (123) and PBN-5B (119) in concentrations up to 1,900 ug/ml. In January, 1986, 1,1,1-trichloroethane was only found in wells PBM-4 (110) and PBM-5 (111) at concentrations up to 85 ug/l. The compound is detected sporadically. For example, well PBM-3 (109) had a concentration of 2 ug/l in May, 1982; not detected in September, 1982; 210 ug/l in January, 1983; not detected in April, 1983 and 77 ug/l in July, 1983. The sporadic results point up the importance of obtaining several samples.

The compound 1, 2-dichloroethane was detected only once at well PBN-5C (120) at a concentration of 55 ug/ml in September 1982.

The compound 1,1,2,2-tetrachloroethane was detected only once in well PBN-2A (103) at a concentration of 1 ug/l in July, 1983.

The compound 1,1,2-trichloroethane was detected only once in well PBM-2 (107) at a concentration of 15 ug/l in January, 1983.

Other Compounds. Phthalates have been detected in several wells. Most were detected in April and May, 1982 during the sampling done by Warzyn. Since that time, bis-2-ethylhexyl phthalate (BEHP) was detected at concentrations up to 120 ug/l in wells PBN-1C (102), PBN-4B (122), PBM-2 (107), PBM-1 (106), PBM-5 (111) and PBN-5C (120) sporadically in September, 1982; February, 1983; August, 1983 and December, 1985. Butylbenzyl phthalate was detected at 60 ug/l once in well PBM-2 (107) in August, 1983. Di-N-Butyl phthalate was detected once in well PBN-5A (118) at 13 ug/l in April, 1983. Diethyl phthalate has not been detected since the May, 1982 sampling.

Napthalene was detected at low concentrations (up to 4 ug/l) in all wells sampled during May, 1982 sampling. Napthalene has not been detected since then.

Groundwater Standards

The following groundwater standards were used to evaluate the organics data:

Compound	Value
Trichloroethylene[a]	1.8 ug/l
Tetrachloroethylene[a]	1.0 ug/l
1,1,1-Trichloroethane[a]	200 ug/l
1,2-Dichloroethane[a]	0.5 ug/l
1,1,2-Trichloroethane[a]	0.6 ug/l
Carbon Tetrachloride[b]	5 ug/l
Chloroform[c]	1.9 ug/l
BEHP[c]	10 ug/l
Napthalene[c]	143 ug/l
1,1,2,2-Tetrachloroethane[d]	None
2,4 DNT and 2,6 DNT[d]	

Source: a) NR 140 Wis. Adm. Code
b) Proposed EPA MCL
c) EPA water quality criteria documents (45 FR 7 9318-79341, 28 November 1980)
d) no standard

Based on these numbers, the groundwater under the burning ground site exceeds standards for trichloroethylene, carbon tetrachloride and chloroform and has occasionally exceeded enforcement standards for 1,1,1-trichloroethane. Where BEHP, 1,2-dichloroethane, 1,1,2-trichloroethane have been detected, standards were exceeded.

The September 9 - October 9, 1985 report contained results from water table observation wells installed September, 1985. According to this report, groundwater south of the burning grounds contains carbon tetrachloride, chloroform and trichloroethylene. The contaminants have migrated 75 to 125 feet vertically down through the till and outwash soils to the water table and about 3,000 feet horizontally south of the burning grounds. The maximum documented width of the plume is 1,400 feet. The depth is not defined at this time.

6. TRAVEL TIMES

The table below shows the range of travel times that theoretically could be expected for a plume moving south from the propellant burning ground. These estimates do not account for mechanisms of dispersion, retardation or volatilization which may cause contaminants to move at a rate different than the bulk groundwater flow.

Lab saturated hydraulic conductivity values (K) for permeable sand and stratified sand and gravel soils ranged from 7×10^{-2} to 2×10^{-6} cm/sec with an average of 2.6×10^{-3} cm/sec, according to the 1982 Warzyn report. Since lab values measure vertical permeability, actual field values may be higher, particularly for stratified soils where the differences in vertical and horizontal permeability are greatest.

Hydraulic gradient (i) calculated between the propellant burning grounds and the southern boundary is 0.0017 ft/ft according to the May 7, 1980 water table map prepared by Warzyn Engineering, Inc. in the preliminary environmental survey. The gradient across the burning ground as calculated from the 1982 water table contour map is 0.0027 ft/ft.

Porosity (n) for sand and for gravel ranges from 25 to 50% and 25 to 40% respectively according to the text "Groundwater" by Freeze and Cherry (p. 37). Values of 25% and 35% were chosen.

$$\text{Travel time } (v) = \frac{Ki}{n}$$

BAAP Propellant Burning Grounds Travel Time Estimates

Hydraulic Conductivity (cm/sec)	Gradient ft/ft	Porosity	Velocity ft/day	ft/yr	ft/20 yr	ft/40 yrs
K	i	n				
7×10^{-2}	.0027	.25	2.14	782	15,644	31,288
7×10^{-2}	.0017	.35	1.53	559	11,174	22,348
2.6×10^{-3}	.0027	.25	.08	29	581	1,162
2×10^{-6}	.0027	.25	6.1×10^{-5}	.02	.44	.89

Contaminants have been detected 3,000 feet south of the burning grounds. Therefore, the plume has moved at least 3,000 feet in the past 20 years, a travel time of 150 feet/year. This number is within the range of travel times calculated for the permeable soils in the first 3 cases.

REVIEW OF THE INFIELD CONDITIONS REPORTS FOR THE NEW ACID AREA #2934

1. INTRODUCTION

Several spills of nitric and sulfuric acid have occurred since 1979 in the new acid area (Attachment 8). In many cases spills were neutralized with sodium hydroxide and lime (for H_2SO_4 spills), and sodium carbonate ($NaCO_3$) for nitric acid spills. Sulfuric acid spills are documented on April 12, 1979; June 20, 1981 and October 22, 1982. Nitric acid spills were documented on September 25, 1981, October 7, 1981 and June 28, 1982. A mixed acid spill occurred November 1 and 2, 1984. In addition, a pond has been used at the new acid complex to hold the neutralized waste acid from test production runs prior to land application of the wastewater.

As a result of the June, 1981 spill of 15,000 gallons of 90% sulfuric acid and the October, 1981 spill of 16,242 gallons of 62% nitric acid, the Department issued an emergency order. The emergency order was later changed to a consen order. The order required monitoring well installation, groundwater sampling and soil leach tests. A February, 1986 closure plan for the acid lagoon required continuing groundwater monitoring. A November 26, 1984 Department memo refers to BAAP's plans to install an impermeable layer beneath the tank storage facilities.

2. GEOLOGY AND HYDROGEOLOGY

The leaching tests required by the consent order for soil samples could not be found in the files. Grain size analyses of samples reported in the 1982 report prepared by Sarko show that 5 to 20 feet of silty clay till overlies a sand and gravel outwash deposit containing some very well sorted deposits. Depth to water ranges from 130 to 140 feet below land surface (Attachment 9).

The contaminated groundwater is likely to move in a south-southeast direction regionally. However, well elevation data indicate that local flow may be radially north, toward well NAN 81-02B (202). The low hydraulic gradients and well configuration make drawing a water table contour map difficult.

Wells NAN 81-04C (206) and NAN 81-04B (205) have slight upward gradients (0.007 ft/ft). This may account for the lack of contamination in the lower piezometer.

The nearest property boundary to the new acid area lies over 7,250 feet to the east. The nearest boundary measured along a southeast-east flow path would be even further away.

3. GROUNDWATER MONITORING WELLS

The following list identifies existing monitoring wells at the new acid area and assigns a DNR ID number to them.

Well	DNR ID	Well	DNR ID
NAN 81-01A	(200)	NAN 81-03C	(204)
NAN 81-01D	(201)	NAN 81-04B	(205)
NAN 81-02B	(202)	NAN 81-04C	(206)
NAN 81-03B	(203)		

The following wells were also required to be monitored by the order:

Well	DNR ID	Well	DNR ID
S1102	(264)	S1111	(273)
S1103	(265)	S1119	(303)
S1108	(271)	S1121	(259)
S1110	(272)	S1125	(305)

4. GROUNDWATER QUALITY

Groundwater monitoring wells installed show elevated concentrations of sulfate, nitrate, conductivity and dissolved iron. Sulfate, nitrate and conductivity concentrations were plotted over time by the Department. The following trends were noted:

1. Sulfate and nitrate concentrations show peaks during 1984 and 1985. However, the nitrate peak for well NAN 81-04B (205) occurs between January and June, 1984, before the November, 1984 spill. Some combination of precipitation and additional spills may account for the slugs detected in 1984 and 1985.

2. Sulfate concentrations range from the detection limit to almost 500 mg/l. Well NAN 81-02B (202) exceeds the enforcement standard of 250 mg/l. Wells NAN 81-01A (200), NAN 81-02B (202), NAN 81-03B (203), NAN 81-03C (204) and NAN 81-04B (205) have values over the PAL of 125 mg/l. Well NAN 81-04C (206) does not exceed the PAL.

3. Nitrate values range from 1.0 mg/l to 75 mg/l. Wells NAN 81-01A (200), NAN 81-02B (202), NAN 81-03B (203), NAN 81-03C (204) and NAN 81-04B (205) exceed the enforcement standard of 10 mg/l for nitrate. Well NAN 81-04C (206) exceeds the PAL of 2 mg/l.

4. Dissolved iron does not reliably correspond with the increased sulfate and nitrate values.

5. The pH values generally range between 7 and 8. There were no values less than 6.5 indicating that acid neutralization is effective in raising the pH of infiltrating waters.

6. Sodium concentrations range from detection limits to over 200 mg/l.

7. Well NAN 81-04B (205) shows the highest concentration of nitrates and sulfates while well NAN 81-04C (206), a piezometer screened 10 feet below well (205) does not show elevated parameters.

8. Both well NAN 81-03B (203) and piezometer NAN 81-03C (204) show elevated nitrates and sulfates indicating that contamination extends at least 40 feet below the water table.

9. Monitoring results from wells S1102 (264), S1103 (265), S1108 (271), S1110 (272), S1111 (273), S1119 (303), S1121 (259) and S1125 (305) were examined for elevated sulfates or nitrates. No data was found for well S1121 (259). Wells S1125 (305), S1119 (303), S1111 (273), S1110(272) showed no or slight concentrations of nitrates or sulfates above background concentrations. Wells S1102 (264), S1103 (265), S1108 (271) show impacts of sulfate, nitrate or both. The source of that contamination is likely associated with disposal practices in the settling ponds in the southern perimeter of the facility and not with the acid spills.

10. Existing wells do show the passing of contaminant slugs from infiltrating rainwater and additional acid spills but the wells do not define the depth and extent of the plume. Facility perimeter wells are monitored for nitrate and sulfate although they are widely spaced along the property boundary. Groundwater samples from wells at the acid spill area have not been tested for hazardous constituents or all public health and parameters

REVIEW OF INFIELD CONDITIONS REPORT FOR THE EXISTING LANDFILL #2813

1. INTRODUCTION

The existing landfill is located in the northeast portion of the BAAP site (Attachment 10). About 7 acres of the site are filled. Another 57,200 yd^3 will be added as part of the continued use and closure plan approved by the Department on October 6, 1986. Wastes disposed at the site included demolition debris and office wastes including waste insulation containing asbestos. No hazardous wastes or putrescible waste were reported disposed of at this site. Groundwater at two monitoring well locations is severely impacted from landfilling operations according to the 1982 Warzyn report.

2. GEOLOGY AND HYDROGEOLOGY

The site lies within the terminal moraine area in an area of hummocky topography . Depth to bedrock is greater than 176 feet, Depth to water is about 140 feet below land surface (Attachments 11 and 12). Soil deposits consist of 2-9 feet of surface silty clay soils underlain by about 160 feet of sand or sand and gravel outwash materials. Silty clay units (maximum thickness of 3 feet) were found in all deep borings between 140 and 160 feet below land surface. The 1982 Warzyn report questions the continuity of the silty clay beneath the existing landfill or with the clay layer at the deterrent burning ground. Groundwater flow is toward the southeast with a horizontal hydraulic gradient of 0.0005 about the same as the regional water table. The most likely contaminant flow path would be first along the top of the silty clay and then within the sand and gravel aquifer if the clay is not continuous. Water table observation wells ELN 82-04A (159), ELN 82-02A (153),

ELN 82-02B (154), ELN 82-02C (155), ELN 82-01A (150) and ELN 82-03A (156), monitor the water table above the silty clay while piezometers ELN 82-04B and C (160, 161), ELN 82-01B and C (151, 152) and ELN 82-03B and C (157, 158) monitor groundwater below the silty clay layer.

3. GROUNDWATER MONITORING WELLS

The following list identifies wells at the existing landfill and assigns a DNR ID number to them.

Well	DNR ID	Well	DNR ID
ELN 82-01A	(150)	ELN 82-03C	(158)
ELN 82-01B	(151)	ELN 82-04A	(159)
ELN 82-01C	(152)	ELN 82-04B	(160)
ELN 82-02A	(153)	ELN 82-04C	(161)
ELN 82-02B	(154)	S1134 (MW-2)	(162)
ELN 82-02C	(155)	S1135 (MW-3)	(163)
ELN 82-03A	(156)	S85-1153	(164) *not on TAD yet
ELN 82-03B	(157)		

4. GROUNDWATER QUALITY

The existing landfill is contaminating groundwater downgradient of the site. Monitoring wells show elevated levels of conductivity, hardness, alkalinity, bromide, chloride, sulfate, boron and nitrate. Groundwater in all monitoring wells up and downgradient contained lead and cadmium above drinking water standards during the 1982 monitoring. Chromium exceeded enforcement standards for several dates. Cadmium concentrations were above drinking water standards at wells ELN 82-02B (154), ELN 82-02C (155), and ELN 82-03A (156) in March 1985. Lead was not detected in sampling after 1982. Chromium was detected in June, 1985 at a concentration of .043 mg/l in well ELN 82-03A (156). No explanation has been given for the sporadic presence of these parameters in the groundwater. Chloride concentrations were most elevated in well S1135 (163) (up to 94 mg/l). Sulfate concentrations exceeded groundwater standards of 250 mg/l at well ELN 82-02C (155), ELN 82-03A (156), ELN 82-03B (157), S1134 (162), and S1135 (163) (up to 990 mg/l). Boron in well ELN 82-03A (156) ranged as high as 11.7 mg/l and nitrate nitrogen ranged as high as 6 mg/l. Total organic carbon was elevated in some wells. However, a priority pollutant scan of wells ELN 82-02A (153), ELN 82-02B (154), ELN 82-02C (155), ELN 82-03A (156), ELN 82-03B (157), and ELN 82-03C (158) was conducted in January, 1985 and no organics were detected.

Well S1153 (164) was installed and sampled in October, 1985 to see if contaminated groundwater was leaving the property. No organic priority pollutants were detected except bis 2-ethylhexyl phthalate. Sulfate and chloride were not elevated above background and chromium, lead and cadmium were not detected. The report concluded that contaminated groundwater was not leaving the property in the vicinity of well S1153 (164).

There could be several reasons why well S1153 (164) has not detected contaminated groundwater when ELN 82-02, ELN 82-03 and S1135 (153 through 158 and 163) have. Contaminated groundwater appears to sink below the water table and concentrate on top of the silty clay unit as shown by well ELN 82-03A (156). Contaminants are also found below the clayey unit. Since well S1153 (164) is screened at a shallow depth at a distance of over 500 feet from the landfill, the contaminants may be present deeper in the aquifer. Well S1153 (164) does not monitor downgradient of well ELN 82-02 (153). If flow beneath the landfill is more easterly than southeasterly, off-site migration of contaminated groundwater may be occurring between well S1153 (164) and well ELN 82-02A (153). Additional wells and piezometers are needed south of well ELN 82-03A (156), and between well ELN 82-02A (153) and well S1153 (164). Since well ELN 82-02A (153) is contaminated, off-site contamination to the east must be defined.

REVIEW OF INFIELD CONDITIONS REPORTS FOR THE DETERRENT BURNING GROUND #3037

1. INTRODUCTION

The deterrent burning ground is located near the existing landfill in the northeastern portion of the BAAP property (Attachment 13). The area was used from 1971 to 1974 to burn waste products from the production of propellents. Soils have been contaminated by DNT and nitrosodiphenylamines in the burning pit area. Various polyaromatic hydrocarbons (PAH's) were detected near the lowest portion of the site. Groundwater downgradient has elevated levels of inorganic parameters and detectable organic contaminants. The upgradient well is also contaminated.

The Department issued a closure plan approval on January 23, 1986 requiring that BAAP excavate contaminated soils at the deterrent burning grounds and dispose of them in a clay lined landfill. The Department determined that these soils were not hazardous waste. There is some disagreement about this determination and the Army is re-evaluating remedial action and disposal options.

2. GEOLOGY AND HYDROGEOLOGY

The Deterrent burning ground is underlain by at least 176 feet of unconsolidated glacial deposits (Attachment 14 and 15). Beneath a surficial loess deposit and fill material, sand and sand and gravel extend 120 to 140 feet below land surface. An 11 to 25 foot thick clayey silt unit was encountered in all borings. The clay unit grades into a stratified silty clay with thin fine sand seams. The report suggests it is of glaciofluvial origin. Sand and gravel soils extend to an undetermined depth below the clayey silt unit. Depth to ground water is about 140 feet below land surface. Groundwater flow is southeast with downward vertical gradients. The horizontal hydraulic gradient is 1×10^{-2} ft/ft. Vertical gradients vary from slightly upward to slightly downward with a maximum of 5×10^{-3}ft/ft in either direction.

Where the interface between the upper sand and silty clay is saturated contaminants would likely migrate along the interface because of the sand's higher permeability. Where the interface is unsaturated, contaminants may migrate downward through the clay.

Soil Contamination

DNT was found in borings DBB-82-02 and DBB-82-04 located in the two designated burning areas up to a concentration of 176.5 ug/l. DNT is the active ingredient in the deterrents disposed of on the site and is soluble in water (270 mg/l for 2,4 DNT). Nitrosodiphenylamine an additive in plasticizers and rocket fuels was detected at these two borings. The propellant materials are the source of nitrosodiphenylamine. Polyaromatic hydrocarbons formed from incomplete combustion of various organic compounds and used in industrial processes were detected in samples from boring DBM-82-01. They may have collected in the low portion of the site. The 1982 Warzyn report recommended excavation of these materials to prevent slow leaching of these contaminants into the aquifer over time.

3. GROUNDWATER MONITORING WELLS

The following list identifies existing monitoring wells at the deterrent burning grounds and assigns a DNR ID number to them:

Well	DNR ID
DBM-82-02	(001)
DBM-82-01	(002)
DBN-82-01B	(003)
DBN-82-01C	(004)
S1122	(005)

4. GROUNDWATER QUALITY

Groundwater quality monitoring results have varied significantly over time. In the 1982 sampling by Warzyn, a variety of organic compounds including trichloroethane, benzene, tetrachloroethylene and toluene were detected at the background well. Piezometer DBN 82-01B (003) contained phthalates, DNT and nitrosodiphenylamine. Piezometer DBN 82-01C (004) contained phthalates.

In 1982 the pesticides 2,4D and silvex were detected below the PAL in wells DBM 82-01 (002) and DBM 82-02 (001) and lindane was detected above the enforcement standard in DBN 82-01C (004). Subsequent monitoring by Envirodyne Inc. (reported in the closure plan) found no pesticides above detection limits. Subsequent monitoring by BAAP consistently found trichloroethane (8-130 ug/l) and occasionally found bis 2-ethylhexyl phthalate in the upgradient well DBM 82-02 (001). No other organics have been consistently detected in the two downgradient monitoring wells since then.

Background well DBM 82-02 had high levels of sulfates (359 mg/l) and nitrates (5.28 mg/l). Downgradient well DBM 82-01 (002) contains elevated nitrates (6.35 mg/l). Cadmium was detected above the enforcement standard for all wells in the May, 1982 sampling but was not detected in subsequent sampling by BAAP. Chromium was detected at well DBM 82-02 (001) (.03 mg/l) and DBM 82-01 (002) mg/l) and DBN 82-1C (004) (.01) mg/l in January, 1983.

Subsequent concentrations have been below detection or below the PAL of 0.005 mg/l. Mercury was detected at (0.001 ug/l) at well DBM 82-01 (002) in January, 1983 but has been below detection since then.

Gross alpha radiation was measured. Chapter NR 109 (Safe Drinking Water) specifies sampling for radium 226 if the gross alpha particle activity exceeds 5 pCi/l. This was done for well DBM-82-02 (001). The radium 226 concentration was 0.30 pCi/l below the standard of 5 pCi/l.

Gross beta particle activity was also measured. Although values were no more than 15 pCi/l, less than the 50 pCi standard, an analysis for Strontium 90 was performed for well DBM-82-02 (001) and S1122 (005). Strontium 90 was not detected.

5. RECOMMENDATIONS

The 1982 Warzyn report recommended installing additional piezometers adjacent to water table well DBM-82-01 (002) and an additional well nest near the intersection of the roads southeast of the site. Wells should also be installed east of the site to define the degree and extent of upgradient contamination and to trace this contamination to the east.

REVIEW OF THE INFIELD CONDITIONS REPORTS FOR GROUNDWATER INVESTIGATIONS IN THE SOUTHERN PERIMETER AND GROUNDWATER MONITORING DATA FOR OTHER PERIMETER WELLS

1. INTRODUCTION

The Department's April 16, 1982 review letter recommended sampling and monitoring well construction at the southern property boundary because of elevated nitrate, sulfate, conductivity and sodium readings and depressed pH. Well locations were recommended by the Department in a January 3, 1983 letter. An October, 1983 report prepared by Sarko and Associates Inc. presented boring logs, well construction, and groundwater monitoring data.

2. GROUNDWATER MONITORING WELLS

The following list identifies existing monitoring wells at the southern perimeter of the facility:

Southern Perimeter:

Well	DNR ID	Well	DNR ID
S1101	No ID	S85-1152A	(277)
S1133	(261)	S85-1152B	(268)
S83-1147	(262)	S1104	(267)
S1102	(264)	S1105	(268)
S1103	(265)	S1106	(269)
S83-1148	(263)	S1107	(270)
S83-1149	(266)	S1108	(271)

3. GROUNDWATER QUALITY

Groundwater south of the settling lagoons and wastewater ditch has been contaminated with sulfate (96 mg/l) and nitrate (13 mg/l). Total dissolved solids values are also above background concentrations. Background values of both these parameters are low in the aquifer. The probable source of the contamination is past wastewater discharges along the unlined ditches leading to the settling basins.

Groundwater tested by Sarko contained cadmium concentrations from less than 0.03 mg/l to 0.064 mg/l. Chromium concentrations were at or below 0.05 mg/l with one well at 0.149 mg/l and mercury at up to 0.028 mg/l. The consultant dismissed the cadmium results as insignificant and attributed the high mercury and chromium concentrations to sample contamination.

Since that time, the maximum concentrations have been 0.005 mg/l chromium in well S83-1148(263), 0.007 mg/l lead in S1151 (south of the oleum pond) and 0.5 ug/l mercury in well 1150 (near an abandoned landfill in center of property). Cadmium has been below detection limits.

Organic sampling by Sarko found toluene and Di-N-Octyl phthalate. Samples were reanalyzed by Hazelton Raltech Laboratory for mercury and toluene and none was detected. All perimeter wells were sampled for priority pollutants in January, 1985 by BAAP. Carbon tetrachloride was detected (4 ug/l) in well S1103 (265). Bis 2-ethylhexyl phthalate was detected in wells S1105 (268) and S1115 (near rocket paste ditch).

Di-N-Octyl phthalate was detected in the blank and hexanedioic acid, dioctyl ester was detected in S1105 (268) and S1115 and the blank. The report attributed all of the detects except the carbon tetrachloride to sampling and analysis errors. The report recommended quarterly monitoring of wells S1101, S1133 (261), S1102 (264), S1103 (265), S1104 (267), S1105 (268) and S1106 (269) for purgeable organic compounds.

The Department issued a letter on May 21, 1985 recommending further investigations at the southern perimeter. The letter recommended off-site monitoring beyond the property boundary to determine if contaminants have moved off-site. A piezometer was installed at the boundary downgradient of the settling basins (well 85-1152A (277)). The well had elevated concentrations of sulfate (120 to 159 mg/l), nitrate plus nitrite nitrogen (4.77 to 8.56 mg/l) and bis 2-ethyl hexyl phthalate (11 ug/l). The piezometer (well 85-1152B (278)) had elevated levels of sulfate (53 to 79 mg/l), nitrate plus nitrite nitrogen (6.7 to 8.64 mg/l) and 110 ug/l of pentachlorophenol. Well 85-1152B is the only well in which pentachlorophenol has been detected.

We recommend concentrating additional wells west of S1102. Groundwater is this area contained the highest concentrations of sulfate and nitrate along the southern perimeter. The area is downgradient of the first settling basin. Most of the discharge to the basin seeps through the first half of this basin. The area is downgradient of the unlined drainage ditch leading to the settling basins. In addition, the wells are downgradient of the contaminated organics plume at the propellant burning grounds.

REVIEW OF PRIVATE WELL MONITORING DATA FOR WELLS SURROUNDING BAAP

Private wells around the facility were sampled in May 1986. Eleven wells were sampled, two upgradient along the western and 9 downgradient along the southern and eastern border of the site. BAAP analyzed water samples for primary and secondary drinking water standards, a complete pesticides/herbicides scan, acid extractable organics, dinitrotoluene isomers and the purgeable organic substances. The results are contained in the report "Groundwater Investigation, Badger AAP-12-13 May 1986 dated September 23, 1986." DNR split samples for volatile organics and some indicator parameters for 5 wells.

None of the synthetic organic parameters were detected. Methylene chloride was detected in all samples and the field "blank". The methylene chloride likely reflects lab contamination rather than field conditions. All other water quality parameters were below groundwater standards with the exception of iron, manganese and nitrate plus nitrate nitrogen at some wells.

Well construction information for most wells sampled was not available. Well construction information for other area wells was obtained. Contaminated groundwater at BAAP does not appear to be affecting area water supply wells at this time.

A survey of BAAP plant water supply wells was conducted in 1986 for volatile organics and primary and secondary drinking water standard parameters. The analysis did not detect VOCs. Wells #2 and #5 exceeded the .3 mg/l enforcement standard for iron. Well #4 had nitrate (1.3 mg/l) and sulfate (71 mg/l) values higher than the other wells tested. This well is north of the deterrent burning grounds and the existing landfill. Sulfates and nitrates are elevated in monitoring wells screened in glacial deposits at these sites.

REVIEW OF THE INFIELD CONDITIONS REPORT FOR THE SETTLING PONDS AND SETTLING PONDS SPOILS SITE

The settling ponds at the southern end of the BAAP property received contaminated process waters, storm runoff and filtration plant sediments. Dredge spoils from the ponds were removed hydraulically to two piles (areas I and II), and mechanically to two piles (areas III and IV).

Soils in these piles were tested in 1985. EP toxic metals were found. The only VOC's detected were methylene chloride (4 out of 40 samples) and low concentration of trichlorofluoromethane.

The major contaminants in the soil were the following compounds:

base neutral	Other
diphenylamine	nitrocellulose
2,4 dinitrotoluene	nitroglycerine (1 out of 40)
2,6 dinitrotoluene	
di-N-butylphthalate	
di-N-octylphthalate	
bis(2-ethylhexyl) phthalate	

Areas I and II contain the highest concentrations of these compounds.

A risk assessment to evaluate abandonment alternatives is being prepared.

Attachments
8421Q

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Scott Walker, Governor
Cathy Stepp, Secretary
Mark Aquino, Regional Director

South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711-5397
Telephone 608-275-3266
FAX 608-275-3338
TTY Access via relay - 711

September 4, 2013

Ms. Joan Kenney-Commander's Representative
Badger Army Ammunition Plant
S7560 USH 12
North Freedom, WI 53951

Subject: Plan Modification of the Groundwater Monitoring Program for the Badger Army Ammunition Plant

Dear Ms. Kenney:

The Department of Natural Resources (the Department) has reviewed the Army's requests to modify the groundwater monitoring program that was approved by the Department on September 14, 1987 with the last modification being approved August 15, 2005. The requests received by the Department are, "Modification to Data Validation", dated April 4, 2013, "Modification to Monitoring Well Sampling Schedule", dated June 24, 2013 and "Private Well Sampling Reduction Plan", dated May 14, 2013.

With this letter, the Department is notifying you that we have approved the requested modifications, with modifications, in the document attached to this letter. Components of modifications include:

- Elimination of external data validation for groundwater analytical results
- Modification to the monitoring well sampling schedule
- Reduction in frequency and sampled analytes for the Private Well sampling

Please contact me if you have any questions regarding this letter.

Sincerely,

Mark Giesfeldt
Bureau Director
Remediation & Redevelopment Program
Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, WI 53707
Ph. 608-267-7562
mark.giesfeldt@wisconsin.gov

c: Mike Sitton – U.S. Army, S7560 STH 12, North Freedom, WI 53951
Claire Ruenger – BTS, Inc., 1 Badger Road, Baraboo, WI 53913-5000
Greg Rudloff– USEPA Region 5, 77 W. Jackson Blvd., Chicago, IL 60604
Linda Hanefeld– WDNR Remediation and Redevelopment South Central Region Team Supervisor
Will Myers – WDNR Project Manager, SCR Fitchburg
Hank Kuehling – WDNR LTE Hydrogeologist, SCR Fitchburg

BEFORE THE STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PLAN MODIFICATION OF THE GROUNDWATER MONITORING PROGRAM
FOR THE BADGER ARMY AMMUNITION PLANT
SAUK COUNTY WISCONSIN

FINDINGS OF FACT

General Information:

Facility: Badger Army Ammunition Plant
(Located along USH 12 between Prairie du Sac and Baraboo, Wisconsin)

Owner: U.S. Department of the Army
S7560 USH 12
North Freedom, WI 53951-9588

Operator: Badger Technical Services, LLC
S7560 USH 12
North Freedom, WI 53951-9588

Contact: Joan Kenney
Installation Director/Commander's Representative
Badger Army Ammunition Plant
S7560 USH 12
North Freedom, WI 53951-9588

Consultant: Badger Technical Services, LLC
S7560 USH 12
North Freedom, WI 53951-9588

The Department finds that:

1. The U.S. Army (Army) continues to investigate and remediate groundwater contamination at the Badger Army Ammunition Plant (BAAP).

2. The Department of Natural Resources (Department) issued a "Conditional Plan Approval for Waste Disposal Sites at the Badger Army Ammunition Plant, Sauk County", dated September 14, 1987.

3. The Department issued a "Modification of Conditional Plan Approval of In-Field Conditions Report dated September 14, 1987 for Approval of Corrective Measures Selected in the Feasibility Study/Corrective Measures Study Report for the Badger Army Ammunition Plant, Sauk County, Wisconsin", dated June 1, 1995.

4. The Department issued a Groundwater Sampling Plan Approval for Badger Army Ammunition Plant, on August 15, 2005. This approval includes specific requirements, including third party validation of groundwater analyses, and the analytes and schedule for private well sampling and monitoring well sampling.

5. The Army submitted the request "Modification to Data Validation", for BAAP, dated April 4, 2013.

6. The Army submitted a request, "Modification to Monitoring Well Sampling Schedule", for BAAP, dated June 24, 2013.

7. The Army submitted a request, "Private Well Sampling Reduction Plan", for BAAP, dated May 14, 2013.

8. Based upon the information contained in the documents noted above, the Department is issuing this approval.

CONCLUSIONS OF LAW

1. The Department has the authority under chs. 289 and 292, Wisconsin Statutes, and the Wisconsin Administrative Codes listed below to issue the following approval of the modification of the September 14, 1987 In-Field Conditions Report Approval; the modification of the June 1, 1995 Plan Modification Approval; and the August 15, 2005 Groundwater Sampling Plan Modification Approval.

2. The Department has promulgated chapters NR 700 through NR 754, Wisconsin Administrative Code, establishing the minimum requirements for investigating and remediating releases of a hazardous substance to the lands and waters of the State.

3. The Department has authority under ch. NR 724, Wis. Adm. Code, to require long-term monitoring using the prescribed sampling methods and frequency for the analytes being monitored.

4. The Department has authority to require a response under ch. 160, Stats., and s. NR 140.24, Wis. Adm. Code, if a preventative action limit for a substance of public health or welfare concern has been attained or exceeded at a point of standards application.

5. The Department has authority to require a response under ch. 160, Stats., and s. NR 140.24, Wis. Adm. Code, if an enforcement standard for a substance of public health or welfare concern has been attained or exceeded at a point of standards application.

6. In accordance with the foregoing, the Department has authority under ch. 292, Stats., and s. NR 724.07, Wis. Adm. Code, to issue the following approval for the purpose of groundwater monitoring at the Badger Army Ammunition Plant.

CONDITIONS OF APPROVAL

Data Validation

1. The Department approves the discontinuation of data validation; however the Army shall continue to use a laboratory that is certified in accordance with ch. NR 149, Wis. Adm. Code.

Private Well Sampling Reduction Plan

1. The Department approves the following frequency and analytes for the private well sampling at BAAP. Wells not listed may be omitted from sampling.

Deterrent Burning Ground plume

Well Name	Well ID	Frequency	Analytes	
			DNT	VOC
Purcell-Dan	163	Annual	X	X
Anderson-R	411	Annual	X	X
Curto	412	Annual	X	X
Wenger	414	Annual	X	X
Grosse	415	Annual	X	X
Gruber-D	417	Annual	X	X
Hendershot	418	Annual	X	X
Howery	419	Annual	X	X
Nimmow-J	421	Annual	X	X
Osterland	422	Annual	X	X
Puccio	423	Annual	X	X
Raschein	424	Annual	X	X
Revers	425	Annual	X	X
Roll	426	Annual	X	X
Statz	427	Annual	X	X
Wilkinson	428	Annual	X	X
Spear	803	Annual	X	X
Brey	817	Annual	X	X
Gibbs	839	Annual	X	X
Groth	842	Annual	X	X
Jones-A	860	Annual	X	X
Kopras	874	Annual	X	X
Nowotarski	891	Annual	X	X
Olah	904	Annual	X	X

Purcell-Gladys	916	Annual	X	X
Zurbachen	967	Annual	X	X

Central plume

Well Name	Well ID	Frequency	Analyte	
			DNT	VOC
USDA 3	126	Annual	X	
USDA 6	128	Annual	X	
USDA 1	828	Annual	X	
USDA 2	829	Annual	X	
WE-TM599	129	Annual	X	
WE-RM383	153	Annual	X	
WE-RR542	156	Annual	X	
WE-QR441	157	Annual	X	X
WE-QN039	158	Annual	X	X
WE-RD430	159	Annual	X	
WE-SQ017	164	Annual	X	X
WE-SQ001	165	Annual	X	X
WE-RR598	169	Annual	X	
WE-SQ002	170	Annual	X	
WE-TF023	174	Annual	X	
WE-UK125	431	Annual	X	
WE-UK124	432	Semi-Annual	X	
WE-UA297	433	Annual	X	

Propellant Burning Ground plume

Well Name	Well ID	Frequency	Analyte	
			DNT	VOC
Delaney	152	Annual	X	X
Mittenwei	800	Annual	X	X
Judd	862	Annual	X	X
Krumenauer	875	Annual	X	X
PDS-3	911	Annual	X	X
Ramker-J	917	Annual	X	X
Schlender	931	Annual	X	X
Schiffman	998	Annual	X	X

2. Method EPA 8270sim will be used for isomers of dinitrotoluene (DNT) and Method EPA 524.2 will be used for volatile organic compounds (VOC) samples.
3. The Department reserves the authority to modify the frequency and analyte list as environmental conditions dictate.

Modification to Monitoring Well Sampling Schedule

1. The Department approves the requested monitoring schedule change, moving the March event forward to April and the December event back to November.

2. The Army shall sample monitoring wells designated for quarterly sampling in April, June, September and November.

NOTIFICATION OF APPEAL RIGHTS

If you believe that you have a right to challenge this decision, you should know that the Wisconsin statutes, administrative rules and case law establish time periods within which requests to review Department decisions must be filed. To request a contested case hearing pursuant to section 227.42, Wis. Stats., you have 30 days after the decision is mailed, or otherwise served by the Department, to serve a petition for hearing on the Secretary of the Department of Natural Resources. All requests for contested case hearings must be made in accordance with section NR 2.05(5), Wis. Adm. Code, and served on the Secretary in accordance with section NR 2.03, Wis. Adm. Code. The filing of a request contested case hearing is not a prerequisite for judicial review and does not extend the time period for filing a petition for judicial review.

For judicial review of a decision pursuant to sections 227.52 and 227.53, Wis. Stats., you must file your petition with the appropriate circuit court and serve the petition on the Department within the prescribed time period. A petition for judicial review must name the Department of Natural Resources as the respondent.

This notice is provided pursuant to section 227.48(2), Stats.

Dated September 5, 2013

Mark Giesfeldt, Director
Bureau for Remediation & Redevelopment

Will M. Myers
Remediation & Redevelopment Program Team Leader
South Central Region

From: Davis, Delbert A CTR (US)
Sent: Wednesday, March 05, 2014 12:57 PM
To: Fawcett, Debra K CTR (US); cruenger@specpro-inc.com
Cc: del.davis@specpro-inc.com
Subject: FW: BNA request
Clair,

Approval from WDNR on BNA testing

Del

From: Myers, Will M - DNR [Will.Myers@wisconsin.gov]
Sent: Wednesday, March 05, 2014 11:55 AM
To: Sitton, Robert M CIV (US); Kenney, Joan M CIV (US); Davis, Delbert A CTR (US)
Cc: Hanefeld, Linda S - DNR; Kuehling, Harlan H - DNR
Subject: BNA request

The DNR approves the Army's February 11, 2014 Base Neutral Acids (BNA) Testing as requested. You may implement this immediately.

A formal response of this approval will be included with the next plan modification.

Will (Woody) Myers
Team Leader
Bureau of Remediation & Redevelopment
Wisconsin Department of Natural Resources
phone: (608) 273-5613

From: Myers, Will M - DNR [Will.Myers@wisconsin.gov]
Sent: Tuesday, May 27, 2014 10:41 AM
To: Kenney, Joan M CIV (US)
Cc: Sitton, Robert M CIV (US); Fawcett, Debra K CTR (US); Davis, Delbert A CTR (US)
Subject: RE: 2014 Well Optimization Plan notes

This is correct and approved.

The SEN wells will need to be sampled quarterly for the time being.

Woody

From: Kenney, Joan M CIV (US) [mailto:joan.m.kenney.civ@mail.mil]
Sent: Thursday, May 22, 2014 3:33 PM
To: Myers, Will M - DNR
Cc: Sitton, Robert M CIV (US); Fawcett, Debra K CTR (US); Davis, Delbert A CTR (US)
Subject: 2014 Well Optimization Plan notes

Hi Woody,
Joel prepared the info below and the snapshots of the map (attached) and I checked it against my notes.

Based on our May 7, 2014 meeting with you, our understanding of the changes to the 2014 Well Optimization Plan are listed below. (Please carefully note the well names - RIN vs ELN wells with same following numbers can cause some confusion...)

- Change construction of future well RIN-1401A to a B level well.
- Change construction of future well RIN-1402A to a B level well.
- Eliminate new construction of wells **ELN**-1401A & C.
- Add the biennial sampling (every two years) of **ELN**-0802A & C.

During the meeting, we did not discuss changing the sampling frequency of SEN-0501 ABD, SEN-0502 AD or SEN-0503 ABD. Based on the Plan, these SEN wells would be sampled annually.
Your email indicated you wanted them sampled quarterly. We'd like to discuss the reasons for that.

We can provide you a revised map and tables of the sampling plan if that would be useful. Let us know.

And have a great Holiday long weekend. We'll be back in the office Tuesday.

Joan
608.963.3238

From: Myers, Will M - DNR [Will.Myers@wisconsin.gov]
Sent: Wednesday, May 21, 2014 12:18 PM
To: Kenney, Joan M CIV (US); Sitton, Robert M CIV (US); Davis, Delbert A CTR (US)
Cc: cruenger@specpro-inc.com; Kuehling, Harlan H - DNR; Hanefeld, Linda S - DNR; Janssen, Joel L CTR (US); Fawcett, Debra K CTR (US)
Subject: RE: 2014 Well Optimization Plan

That will work for me.

Woody

From: Kenney, Joan M CIV (US) [mailto:joan.m.kenney.civ@mail.mil]
Sent: Wednesday, May 21, 2014 12:13 PM
To: Myers, Will M - DNR; Sitton, Robert M CIV (US); Davis, Delbert A CTR (US)
Cc: cruenger@specpro-inc.com; Kuehling, Harlan H - DNR; Hanefeld, Linda S - DNR; Janssen, Joel L CTR (US); Fawcett, Debra K CTR (US)
Subject: RE: 2014 Well Optimization Plan

Woody,
Your email doesn't match our notes/map markups from our discussion so we'd like to double check with you.
Joel is gone for today but will be working on this tomorrow.
Would you be available around 11 tomorrow to discuss? (I am out in the early morning and Joel is still on restricted duty (8am-noon).
If not, are you available early next week?

Joan

From: Myers, Will M - DNR [Will.Myers@wisconsin.gov]
Sent: Wednesday, May 21, 2014 8:27 AM
To: Sitton, Robert M CIV (US); Kenney, Joan M CIV (US); Davis, Delbert A CTR (US)
Cc: Kuehling, Harlan H - DNR; Hanefeld, Linda S - DNR
Subject: 2014 Well Optimization Plan

Joan, Mike and Del:

I am approving the 2014 Well Optimization Plan with a few minor changes. The changes are:

Change well construction of well RIN-1401A to a B level well.

Eliminate new construction on the well nest RIN-1402 ACD. (These wells are not needed)

Sample well nests; SEN-0501 ABD, -0502 AD & 0503 ABD quarterly not annually.

This approval does not include well abandonment.

A formal approval will be drafted later this calendar year.

Will (Woody) Myers
Project Manager
Bureau of Remediation & Redevelopment
Wisconsin Department of Natural Resources
(☎) Phone: (608) 273-5613
(☎) Cell: (608) 535-0376

Debra K. Fawcett

From: Myers, Will M - DNR [Will.Myers@wisconsin.gov]
Sent: Friday, October 03, 2014 12:55 PM
To: Joel L. Janssen
Cc: 'Sitton, Robert M (Mike) CIV BAAAP'; Kenney, Joan M Ms BAAAP; Delbert A. Davis; Debra K. Fawcett; Brian S. Jacobs
Subject: RE: Additional Well Sampling

Joel This is correct. Please implement this sampling.

We are committed to service excellence.
Visit our survey at http://dnr.wi.gov/customersurvey to evaluate how I did.

Will (Woody) Myers
Phone: (608) 273-5613
will.myers@wisconsin.gov

From: Joel L. Janssen [mailto:joel.janssen@specpro-inc.com]
Sent: Wednesday, October 01, 2014 12:47 PM
To: Myers, Will M - DNR
Cc: 'Sitton, Robert M (Mike) CIV BAAAP'; Kenney, Joan M Ms BAAAP; Delbert A. Davis; Debra K. Fawcett; Brian S. Jacobs
Subject: Additional Well Sampling

Woody, per your request we are providing you a list of monitoring wells to add to the groundwater sampling program being conducted by the Army at the Badger Army Ammunition Plant. These seven monitoring wells are located in the former Nitrocellulose Production Area (approximately 1.2 miles north of the Propellant Burning Ground). Groundwater in these seven monitoring wells will be analyzed for the six dinitrotoluene (DNT) isomers either annually or semi-annually. DNT results from these monitoring wells will be used to establish contaminant trends and support the long-term effectiveness of monitored natural attenuation.

Annual Sampling

Well ID	*Well Name*
440	RIM-0703
479	RIN-1007C
481	RIN-1001C

Semi-annual Sampling

Well ID	*Well Name*
442	RIM-0705
478	RIM-1002
480	RIN-1001A
504	S1125

Joel Janssen
BTS, LLC
Badger Army Ammunition Plant
joel.janssen@specpro-inc.com
(608) 434-5349

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Scott Walker, Governor
Cathy Stepp, Secretary
Mark Aquino, Regional Director

South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711-5397
Telephone 608-275-3266
FAX 608-275-3338
TTY Access via relay - 711

January 5, 2015

Joan Kenney, Commander's Representative
Badger Army Ammunition Plant
S7560 U.S. Hwy 12
North Freedom, WI 53951

Subject: Propellant Burning Ground Monitoring Requirements,
Badger Army Ammunition Plant, North Freedom, WI
BRRTS number 02-57-562629

Dear Ms. Kenney:

The Department of Natural Resources has reviewed documentation for the groundwater monitoring program associated with Badger Army Ammunition Plants Propellant Burning Ground (PBG) plume. Although the Army has been performing groundwater monitoring for the plume, there is not a clear regulatory direction as to what wells are to be sampled and for what parameters and on what frequency. This letter serves to clarify the sampling program.

The schedule is attached to this letter as Table 1.

This letter does not modify any of the standing directions for the Deterrent Burning Ground or Central plume monitoring directives. In addition this letter does not modify any conditions in the plan approval for the Modified Interim Remedial Measures shutdown plan.

This plan can be modified at any time with notice from the Department if groundwater conditions dictate. The Army may implement this plan immediately.

Woody Myers
Project Manager
WI DNR

cc. Mike Sitton, BAAP

Table 1 PBG Monitoring

Well Name	Well ID	Frequency	Nitrates	VOC	DNT
On-site					
Lic. # 2814					
PBM-8909	639	B		X	X
PBM-9801	360	A		X	X
PBM-0001	367	S	X	X	X
PBM-0002	368	S	X	X	X
PBM-0006	372	S	X	X	X
PBN-8202A	613	S		X	X
PBN-8202B	614	S		X	X
PBN-8202C	615	S		X	X
PBM-0008	374	S		X	X
PBN-1401A	782	S		X	X
PBN-1401B	783	S		X	X
PBN-1401C	784	S		X	X
PBN-8205A	622	S		X	X
PBN-8205B	623	S		X	X
PBN-8205C	624	S		X	X
PBN-8503A	633	S		X	X
PBN-8903B	646	S		X	X
PBN-8903C	647	S		X	X
PBN-8502A	632	S		X	X
PBN-902BR	795	S		X	X
PBN-8902C	645	S		X	X
PBN-9301B	668	S		X	X
PBN-9301C	669	S		X	X
PBM-8907	637	A		X	X
PBN-1003C	592	A		X	X
PBN-1404B	791	S		X	X
PBN-1404C	792	S		X	X
PBN-1404D	793	S		X	X
PBN-1405F	794	B		X	X
PBN-8912A	654	S		X	X
PBN-8912B	655	S		X	X
PBN-9112C	665	S		X	X
PBN-9112D	666	S		X	X
PBN-1001C	595	S		X	X
PBN-9303B	673	S		X	X
PBN-9303C	674	S		X	X
PBN-9303D	675	S		X	X
PBN-9902D	691	S		X	X
PBN-9304D	687	S		X	X
PBN-1302A	770	S		X	X
PBN-1302B	771	S		X	X
PBN-1302C	772	S		X	X
PBN-1302D	773	S		X	X
PBN-1303A	774	S		X	X
PBN-1303B	775	S		X	X

PBN-1303C	776	S		X	X
PBN-1303D	777	S		X	X
PBN-1304A	778	S		X	X
PBN-1304B	779	S		X	X
PBN-1304C	780	S		X	X
PBN-1304D	781	S		X	X
Lic. # 3499					
S1147	709	S		X	X
SPN-8903B	718	S		X	X
SPN-8903C	719	S		X	X
SPN-9103D	725	S		X	X
S1148	710	S		X	X
SPN-8904B	720	S		X	X
SPN-8904C	721	S		X	X
SPN-9104D	726	S		X	X
Off-site					
Lic. # 2814					
PBN-9903A	692	S		X	X
PBN-9903B	693	S		X	X
PBN-9903C	694	S		X	X
PBN-9903D	695	S		X	X
Lic. #3493					
SWN-9102C	569	A		X	X
SWN-9102D	570	A		X	X
SWN-9103B	571	S		X	X
SWN-9103C	572	S		X	X
SWN-9103D	573	S		X	X
SWN-9103E	574	S		X	X
SWN-9104C	575	S		X	X
SWN-9104D	576	S		X	X
SWN-9105B	577	A		X	X
SWN-9105C	578	A		X	X
SWN-9105D	579	A		X	X
PBN-9101C	561	S		X	X
PBM-9001D	981	S		X	X
PBN-9102B	562	B		X	X
PBN-9102C	563	B		X	X
PBM-9002D	982	B		X	X

B-Biannual A-Annual S-Semi Annual

Joel L. Janssen

From: Myers, Will M - DNR <Will.Myers@wisconsin.gov>
Sent: Tuesday, June 16, 2015 7:10 AM
To: Joel L. Janssen
Cc: robert.m.sitton.civ@mail.mil; Jackson, Joan (AEC); Delbert A. Davis; Debra K. Fawcett
Subject: RE: Water's Edge Private Well Sampling

Follow Up Flag: Follow up
Flag Status: Flagged

These changes are acceptable.

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Will (Woody) Myers
Phone: (608) 273-5613
will.myers@wisconsin.gov

From: Joel L. Janssen [mailto:joel.janssen@specpro-inc.com]
Sent: Monday, June 15, 2015 5:18 PM
To: Myers, Will M - DNR
Cc: robert.m.sitton.civ@mail.mil; Jackson, Joan (AEC); Delbert A. Davis; Debra K. Fawcett
Subject: Water's Edge Private Well Sampling

Woody,
Per our discussion on June 15, 2015, we understand that well 432 WE-UK124 will move from semi-annual sampling to quarterly sampling. Well 432 has a history of 2,6-dinitrotoluene detections above the NR 140 Preventive Action Limit. Well 432 is located in the Water's Edge Subdivision adjacent to Gruber's Grove Bay.

To offset this increase in sampling of well 432, we propose to reduce the monitoring well sampling in Water's Edge. There are eight monitoring wells being sampled quarterly in Water's Edge. We propose to skip one "A" level well during the sampling rounds of November, April, and June each year. This would mean SEN-0501A would not be sampled during November, SEN-0502A would not be sampled during April, and SEN-0503A would not be sampled during June. All eight monitoring wells in Water's Edge would be sampled during September.

Please let us know if these changes to the groundwater sampling program are acceptable.

Joel Janssen, P.G.
BTS, LLC
Badger Army Ammunition Plant
joel.janssen@specpro-inc.com
(608) 434-5349

DEPARTMENT OF THE ARMY
BADGER ARMY AMMUNITION PLANT
S7273 BLUFF ROAD
MERRIMAC, WISCONSIN 53561

July 8, 2016

SUBJECT: Request to Modify Groundwater Sampling Program
Badger Army Ammunition Plant

Mr. Will Myers
Hydrogeologist
Wisconsin Department of Natural Resources - South Central Region
3911 Fish Hatchery Road
Fitchburg, WI 53711-5397

Dear Mr. Myers:

The Army is requesting a modification to the groundwater sampling program associated with the Central Plume located at the former Badger Army Ammunition Plant (BAAP). Currently the Army is sampling a total of 35 monitoring wells associated with the Central Plume. Twenty-seven of those wells are annually sampled during June. The remaining eight wells are sampled quarterly during April, June, September, and November. The Army has been monitoring the Central Plume according to the Wisconsin Department of Natural Resources (WDNR) *2014 Monitoring Well Optimization Plan* email approval dated May 27, 2014.

On July, 5, 2016, the Army submitted the June 2016 monitoring well groundwater data to the WDNR. That letter stated that dinitrotoluene (DNT) concentrations in the Central Plume have been decreasing since June 2014 and that the Central Plume is degrading/receding in conjunction with natural attenuation.

None of the six monitoring wells (RIN-1501B, RIN-1501C, RIN-1501D, RIN-1502B, RIN-1502C, and RIN-1502D installed during September and October 2015 along the eastern edge of the Central Plume had a detection of DNT during either December 2015 or June 2016. These groundwater results indicate that the new monitoring wells have defined the eastern boundary of the Central Plume (see enclosed map). The two monitoring wells, S1113 and S1114, located further east of the Central Plume have been routinely sampled by the Army since 1996 for DNT. DNT has not been detected in either S1113 or S1114, except for one minor detection of 2,5-DNT in S1114 during June 2015. S1114 has been sampled twice since June 2015 with no additional detections of DNT. The June 2015 detection of 2,5-DNT is considered to be an anomaly.

The Army is requesting that monitoring wells S1113 and S1114 be removed from the groundwater sampling program.

There are currently eight monitoring wells, SEN-0501A, B & D, SEN-0502 A & D, and SEN-0503A, B & D, located near the southern boundary of the Central Plume and in the Water's Edge Subdivision (see enclosed map). The Army has been sampling these wells quarterly since March 2005 for DNT and volatile organic compounds (VOCs). Concentrations of DNT and VOCs have been stable or declining over the past 11 years in these eight monitoring wells.

The Army requests that monitoring wells SEN-0501A, B & D, SEN-0502 A & D, and SEN-0503A, B & D be switched from quarterly to semi-annual monitoring. These eight monitoring wells would be sampled for DNT and VOCs during June and November.

Please do not hesitate to contact me at 608-434-5374 if you have any questions.

Sincerely,

Robert M. Sitton
Commander's Representative

Enclosure
Copy furn: Roger Walton, Contracting Officer's Representative

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Scott Walker, Governor
Cathy Stepp, Secretary

South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, Wisconsin 53711-5397
Telephone 608-275-3266
FAX 608-275-3338
TTY Access via relay - 711

July 15, 2016

Michael Sitton, Commanders Representative
Badger Army Ammunition Plant
S7560 Hwy 12
North Freedom, WI 53951

Subject: Groundwater Sampling Program Modification Approval

Dear Mr. Sitton:

The Department of Natural Resources (The Department) has reviewed the July 8, 2016 Request to Modify Groundwater Sampling Program, Badger Army Ammunition Plant, a request to change the sampling frequency in the groundwater monitoring program established in the Department's May 27, 2014 Monitoring Well Optimization Plan approval.

The Army's request includes removing wells S1113 and S1114 from the wells actively sampled, and the reduction of SEN-0501 A, B & D, SEN-0502 A & D and SEN-0503 A, B & D from quarterly sampling to semi-annual with no change to the sampling analytes.

The Department approves these modifications in sampling frequency.

In addition the Department has gathered sufficient data from wells ELN-8904 A & B and ELM-9110 so that these wells can be removed from the list of wells actively sampled.

The sampling frequency for well RIN-1004B should be increased from annually to semi-annually for the same sampled analytes.

This approval does not include well abandonment at this time. These wells must be maintained in the event the Department determines additional data from these wells is necessary or approves abandonment.

We appreciate the significant efforts by the Army to minimize the impacts to groundwater quality. If you have any questions or comments, please contact me at the address included above or as indicated below.

Respectfully

Will (Woody) Myers
Team Leader
Remediation & Redevelopment
(608) 273-5613

Cc. Joel Jensen ,SPS
Delbert Davis, SPS
Roger Walton, Army Environmental Command

Appendix B
Monitoring Well Inspection Form

Monitoring Well Inspection Checklist
Badger Army Ammunition Plant

Date: _____ **Inspected By:** _____

Well Name: _____ **Well No:** _____

	Yes	No*
Protective Casing:		
Solidly embedded in concrete / Bentonite	____	____
Markings clear and legible	____	____
Casing physically sound and straight	____	____
Paint in good condition	____	____
Protective casing cap in place	____	____
Cap easily removable	____	____
Lock in place	____	____
Hasp is in good condition	____	____
Lock opens easily	____	____
Inner PVC Casing:		
Cap in place or molded top	____	____
Solid w/ no signs of cracking	____	____
Vertical and straight	____	____
No spider webs or signs of small animals	____	____
Concrete / Soil Cap		
Sloped to promote runoff	____	____
Solid w/ no signs of cracking	____	____
In place w/ no signs of frost heaving	____	____
No signs of digging or erosion	____	____
Well Vicinity:		
Well is easily accessible	____	____
Area is cleared of tall grass and poison ivy	____	____
Bumper posts in place, visible and mechanically sound	____	____
Equipment:		
Pump present	____	____

*Comments/Recommendations:

_____

_____

_____

Appendix C
Groundwater Sampling Monitoring Wells
Standard Operating Procedure

STANDARD OPERATING PROCEDURE

GROUNDWATER SAMPLING MONITORING WELLS

ENVIRONMENTAL REMEDIATION SUPPORT FOR

BADGER ARMY AMMUNITION PLANT

1 JULY 2015

SpecPro Professional Services, LLC
S7560 U.S. Highway 12
North Freedom, WI 53951

1.0 Scope and Application

1.1 This Standard Operating Procedure (SOP) describes the procedure used to sample monitoring wells equipped with low flow bladder pumps.

2.0 Method Summary

2.1 Stagnant water is purged from the well before the sample is collected. Stagnant water does not represent the physical or chemical composition of groundwater.

2.2 Water is pumped from the well using a dedicated low flow bladder pump while recording the data required on the Well Purging – Field Water Quality Measurement Form (attached).

2.3 After readings have stabilized, sample containers are filled, sealed, and stored on ice.

3.0 Definitions

3.1 Deionized water: defined as water taken from a deionization system.

3.2 Chain of Custody (COC) refers to the chronological documentation or paper trail, showing collection, custody, control and transfer of samples.

4.0 Health and Safety

4.1 All chemicals should be treated as potential health hazards, and exposure to these chemicals should be minimized.

4.2 Minimum personal protection includes the use of steel-toe boots and safety glasses. Fresh non-latex gloves are required for each well.

4.3 Personnel shall read and adhere to the SPS Health and Safety Plan.

4.4 Arrive at well site and visually check area for hazards.

4.5 Park to avoid vehicle and compressor engine exhaust in cab of vehicle.

5.0 Sample Preservation, Containers, Handling, and Storage

5.1 See NR219.04 for specific sample requirements.

5.2 Containers used for sample collection will be provided by the subcontract laboratory and will be certified clean by the laboratory.

5.3 Container documentation – See Section 8.1

6.0 Interferences and Potential Problems

6.1 Sample tubing will not be reused between monitoring wells. Tubing will consist of Tygon® formulation 2475 (or equivalent). Other tubing formulations have proven to potentially contaminate samples.

6.2 Vehicle and/or air compressor exhaust.

6.3 Gasoline and/or oil for air compressor.

7.0 Equipment/Apparatus

7.1 Low flow bladder pump (dedicated) with dedicated Teflon® tubing.

7.2 Well controller box

7.3 Multi-parameter flow cell for Temperature, Oxidation Reduction Potential (ORP), Specific Conductance, Dissolved Oxygen (DO), and pH, such as Hanna HI 9828 Multiparameter Meter or equivalent.

7.4 Air Compressor.

7.5 Sample containers as required.

7.6 Non-latex gloves.

7.7 Water Level Meter.

7.8 1000 mL Graduated Cylinder

8.0 Procedure

8.1 Sample Container preparation.

8.1.1 All sample containers are provided by the subcontract laboratory.

8.1.2 As boxes of containers are opened in preparation for a sampling event, the Certificate of Analysis in the box will be verified.

8.1.3 For all samples requiring preservation, containers are preserved before leaving the laboratory. Preservation information is added to the COC.

8.2 Setup

8.2.1 On sampling day and before leaving for the field, inspect flow cell for damage and calibrate meter for D.O., Specific Conductance, and pH.

8.2.2 If collecting VOC samples, store VOC trip blanks in one of the sample coolers.

8.2.3 At each well site, unlock well cover and remove inner well cap if required.

8.2.4 Be alert for wasps or other insects inside the well cover/casing.

8.2.5 For each well that is sampled, a Well Purging – Field Water Quality Measurement Form must be completed.

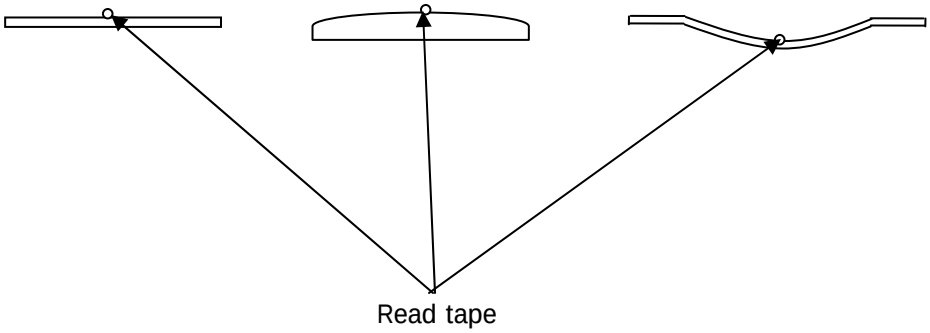
8.3 Water level measuring.

8.3.1 Wells with dedicated pumps.

- Rinse probe of the Water Level Meter with deionized water.
- Check that the pump cap is fully seated on the PVC casing.
- Turn on Water Level Meter and lower probe until bulb lights and beep sounds indicating the water table has been reached. Slightly raise/lower alternately to ensure probe is at the top of the water.
- Read the tape at the hole in the well cap as noted in the diagram below and record as "Depth to Water" to the nearest 0.01 feet.
- Subtract this value from the value in the "Well Cap Elevation" field and record the difference in the "Water Level" field.

8.3.2 Wells without dedicated pumps.

- These should be measured in the same manner.
- However, read the tape at the top of the PVC at the file mark.
- If there is no file mark, make a file mark at the highest point of the PVC and comment on the Well Purging – Field Water Quality Measurement Form.



8.4 Purging with the low flow pump.

8.4.1 Check air compressor motor for oil level and gasoline supply.

8.4.2 Start air compressor, attach air line from compressor to well control box then attach another air line from the well control box to the well fitting.

8.4.3 The flow cell should be attached to the discharge fitting on the well cap using a new piece of Tygon® 2475 (or equivalent tubing).

- The flow cell should also have a piece of tubing attached to its discharge port to facilitate collection of discharge water.
- The tubing used between the flow cell and the well should be used only once then discarded.
- All discharge water shall be placed into an approved container for disposal.
- If there is no sample or insufficient sample is produced, check the air pressure on the compressor and on the controller to verify that the correct air pressure is being provided.
- Adjust the controller pressure or cycle times to obtain a flow rate in the range of 100 ml/min to 1 L/min.
- Purge rate should never exceed 1 Liter/Minute (L/min).

8.4.4 Measure the purge rate by collecting discharge in a clear 1000 ml poly graduated cylinder for one cycle if 100mL or greater or 1 minute.

8.4.5 Record purge rate on the Well Purging – Field Water Quality Measurement Form in mL/min.

8.4.6 Record the pump pressure from the well control box as Pump Pressure on the Well Purging – Field Water Quality Measurement Form.

8.4.7 Using the water in the graduated cylinder, field observations for odor, color, and turbidity should be determined and recorded in their respective fields, when required.

8.4.8 When water starts flowing through the flow cell, start recording data on the data logger and record on the Well Purging – Field Water Quality Measurement Form the clock time, temperature, ORP, specific conductance, DO, and pH for each minute for a minimum of five readings and until readings are stabilized.

8.4.9 Stabilization occurs when at least three consecutive readings all agree within the following ranges for the following indicator parameters:

Dissolved Oxygen	0.2 mg/L
Specific Conductance	5.0 µmhos/cm for values <1000 µmhos/cm 10.0 µmhos/cm for values >1000 µmhos/cm
pH	0.1 pH units
Temperature	0.1 °C

8.4.10 If after 10 readings any of these stabilization parameters cannot be met, stabilization requirements change to the readings all agreeing within 10% over the last three or more consecutive readings starting with readings at 11 to 13 minutes.

8.4.11 If stabilization is not achieved utilizing the 10% rule after 15 readings, proceed with sampling the well, making note of the parameters that did not stabilize.

8.5 Sampling with the low flow pump.

8.5.1 A new pair of non-latex gloves will be put on at this point. The gloves will be immediately discarded once all the containers have been filled and placed on ice.

8.5.2 Remove the well discharge tubing from the flow cell.

8.5.3 Cut off and discard at least an inch of the discharge tube from the end that was attached to the flow cell.

.

8.5.4 Once the end has been cut off, proceed with filling the sample containers.

8.5.5 For any sample collected as a filtered sample, an inline filtration cartridge shall be connected at the end of the sample discharge tube. Once all bottles requiring filtration have been filled, remove filter cartridge and discard. Never reuse any filter cartridge.

8.5.6 Any sample container requiring preservation will be preserved prior to the sampling event.

8.5.7 Ensure all sample containers have been filled, and labeled before placing containers on ice in a cooler.

8.5.8 When sampling for VOCs adjust the controller pressure to achieve a flow rate of less than or equal to 0.3 L/min.

- After filling each VOC vial, check for air bubbles.
- If a bubble exists, remove cap and add a small amount of water, cap, and recheck vial for air bubbles.

8.5.9 There shall be at a minimum, one trip blank collected per day that VOC samples are collected.

8.5.10 Trip blanks shall be taken into the field in a sample cooler during sampling.

8.5.11 Record time prepared as sample time on COC.

8.6 For all other parameters the flow rate must be less than or equal to 1.0 L/min.

8.7 Record all samples on COC. Record last Field Reading Time on Well Purging – Field Water Quality Measurement Form as Time on COC.

8.8 Attach air hose from compressor to the well's freeze protection fitting.

8.9 Apply air pressure until all the excess water is blown out the sample tubing. Once the water has been blown out, disconnect the hose from the freeze protection fitting.

8.10 Clean up and secure well area after sample collection.

9.0 Maintenance and Troubleshooting

9.1 Pump Controller

9.1.1 In freezing weather, keep controller in the cab of the truck to minimize freeze up.

9.1.2 If water is not discharged from pump after 5 to 10 cycles, check tubing in well for ice.

9.1.3 If no ice is present, check Vent Timer and Pressure Timer dials.

- Normal setting should be position "B" for both dials. This will be 3 cycles/min.
- If flow is slow for deep wells, these can be adjusted to increase flow.
- Reset dials to "B" before moving to next well.
- Over time the timing on the controller may change (For example- the "B" setting will not equal 3 cycles/min). Therefore it is important to time your cycles on a daily basis and make adjustments if necessary.

9.1.4 Each day at the end of sampling, open Manual Drain valve to blow condensation out of controller.

9.2 Probe

9.2.1 D.O. Calibration Check

- Immediately after calibration of the D.O. probe, check result against Solubility of Oxygen Table.

- If pH calibration gives slope out of range error, replace pH electrode.

9.2.2 If Dissolved oxygen probe has a bubble under membrane, replace electrode.

10.0 Calculations

10.1 Liter to Gallon conversion: gal = L * 0.2642

11.0 Waste Disposal

11.1 This procedure generates non-hazardous wastes from well water purged during stabilization.

11.2 This water shall be collected in an approved polyethylene drum and will be discharged to the Bluffview Sanitary District wastewater treatment plant for disposal.

12.0 References

12.1 SPS Health and Safety Plan.
12.2 Wisconsin Department of Natural Resources, "NR 149 – Laboratory Certification and Registration".

12.3 Wisconsin Department of Natural Resources, “Groundwater Sampling Field Manual”, PUBL-DG-03896, 1996.

12.4 Wisconsin Department of Natural Resources, “Groundwater Sampling Desk Reference”, PUBL-DG-03796, 1996.

12.5 Wisconsin Department of Natural Resources, “NR219 - Analytical Test Methods and Procedures”.

SPS, LLC / BadgerAAP

Well Purging-Field Water Quality Measurement Form

Sampling Organization: SPS, LLC

Sample Collection Date: _____

Site/Facility Name: BadgerAAP

Well Number: _____

Well Name: _____

Parameters Filtered in Field: _____

_____

Purging Device: Bladder Pump: Dedicated

Pump Pressure (psi): _____

Measuring Point: Well Cap

Well Cap Elevation (feet above MSL): _____

Depth to Water (feet below well cap): _____

Water Level (feet above MSL): _____

Field Reading Time	Specific Conductivity (µS/cm)	ORP (Redox) (mv)	D.O. (mg/L)	pH (S.U.)	Temp (°C)

Stability Parameters

Temp. 0.1 C
D.O. 0.2 mg/L
pH 0.1
Sp. Cond.
5.0 uS/cm if <1000
10.0 uS/cm if >1000

Odor _____

Color_____

Turbidity_____

Purge Rate (ml/min) _____

Total Volume Purged (Liters)_____

Total Volume Purged (Gallons)_____

(liters * 0.2642)

Comments:

Sample Collector's Signature: _____

Rev. 2/2013

CHAIN OF CUSTODY

Page _____ of _____

Company:

Project Contact:

Telephone:

Project Name:

Project #:

Location:

Sampled By:

CT LABORATORIES

1230 Lange Court, Baraboo, WI 53913
608-356-2760 Fax 608-356-2766
www.ctlaboratories.com

Lab Use Only
Place Header Sticker Here:

Program:
QSM RCRA SDWA NPDES
Solid Waste Other _____

PO #

Report To:
EMAIL:
Company:
Address:

Invoice To:*
EMAIL:
Company:
Address:

**Client Special Instructions*

**Matrix:*
GW – groundwater **SW** - surface water **WW** - wastewater **DW** - drinking water
S - soil/sediment **SL** - sludge **A** - air **M** - misc/waste

**Turnaround Time*
Normal RUSH*
Date Needed: _____
Rush analysis requires prior CT Laboratories' approval
Surcharges:
24 hr 200%
2-3 days 100%
4-9 days 50%

Collection Date	Collection Time	Matrix	Grab/ Comp	Sample #	Sample ID Description	Filtered? Y/N	ANALYSES REQUESTED														Total # Containers	Designated MS/MSD	CT Lab ID # (Lab use only)
							Fill in Spaces with Bottles per Test																

Relinquished By:	Date/Time	Received By:	Date/Time
Received by:	Date/Time	Received for Laboratory by:	Date/Time

Lab Use Only
Ice Present Yes No
Temperature _____
Cooler # _____

*Party listed is responsible for payment of invoice as per CT Laboratories' terms and conditions

STANDARD OPERATING PROCEDURE

GROUNDWATER SAMPLING PRIVATE WELLS

ENVIRONMENTAL REMEDIATION SUPPORT FOR

BADGER ARMY AMMUNITION PLANT

1 JULY 2015

SpecPro Professional Services, LLC
S7560 U.S. Highway 12
North Freedom, WI 53951

1.0 Scope and Application

1.1 This Standard Operating Procedure (SOP) describes the procedure used to sample private groundwater wells.

2.0 Method Summary

2.1 Stagnant water is purged from the well before the sample is collected. Stagnant water does not represent the physical or chemical composition of groundwater.

2.2 Water is pumped from the well using a dedicated submersible pump installed in the private well by the homeowner.

2.3 After purging for at least 10 minutes, sample containers are filled, sealed, and stored on ice.

3.0 Definitions

3.1 Chain of Custody (COC) refers to the chronological documentation or paper trail, showing collection, custody, control and transfer of samples.

4.0 Health and Safety

4.1 All chemicals should be treated as potential health hazards, and exposure to these chemicals should be minimized.

4.2 Fresh non-latex gloves are required for each well.

4.3 Personnel shall read and adhere to the SPS Health and Safety Plan.

4.4 Arrive at well site and visually check area for hazards.

5.0 Sample Preservation, Containers, Handling, and Storage

5.1 See NR219.04 for specific sample requirements.

5.2 Containers used for sample collection will be provided by the subcontract laboratory and will be certified clean by the laboratory.

5.3 Container documentation – See Section 8.1

6.0 Interferences and Potential Problems

6.1 Garden hoses may be used for purging the wells, but must be removed before sampling due to potential for contamination.

Appendix D
Groundwater Sampling Private Wells
Standard Operating Procedure

6.2 Vehicle exhaust.

6.3 Indoor chemical storage cross-contamination.

7.0 Equipment/Apparatus

7.1 Sample containers as required.

7.2 Non-latex disposable gloves.

7.3 Coolers with ice.

8.0 Procedure

8.1 Sample Container preparation.

8.1.1 All sample containers are provided by the subcontract laboratory.

8.1.2 As boxes of containers are opened in preparation for a sampling event, the Certificate of Analysis in the box will be verified.

8.1.3 For all samples requiring preservation, containers are preserved before leaving the laboratory. Preservation information is added to the COC.

8.2 Collect the samples at a point prior to any treatment systems. The exact point of sample collection should be documented.

8.3 For each well that is sampled, note the sampling location, time, and testing parameters in a field log book.

8.4 If collecting VOC samples, store VOC trip blanks in one of the sample coolers.

8.5 Sampling with the private well submersible pump.

8.5.1 Start purging of the well by opening the faucet or lifting up the pump handle until there is a steady water flow. Some resident wells must be taken from an inside or outside faucet. If this is the case, turn the faucet on to begin purging.

8.5.2 After at least 10 minutes of purging, fill a clear glass jar with the sample for field measurements. A new pair of sample gloves will be put on immediately prior to filling the containers for each well. The gloves will be immediately discarded once all the containers have been filled and placed on ice. Observe the sample in the clear glass jar for odor and color. Record observations in the field log book.

8.5.3 Fill the required sample containers. Any sample bottle requiring preservation will be pre-preserved prior to the sampling event. Once all the bottles have been filled, place them on ice.

8.5.4 *Note: If there are bubbles in the sample, let the bubbles settle out in one of the amber glass bottles before transferring to the 40ml VOC vials. Record this in the field log book.

8.5.5 Record all samples on the chain of custody.

8.5.6 Before leaving, turn off the water flow and make sure the sampling area is cleaned up.

9.0 References

9.1 SPS Health and Safety Plan.

9.2 Wisconsin Department of Natural Resources, “NR 149 – Laboratory Certification and Registration”.

9.3 Wisconsin Department of Natural Resources, “Groundwater Sampling Field Manual”, PUBL-DG-03896, 1996.

9.4 Wisconsin Department of Natural Resources, “Groundwater Sampling Desk Reference”, PUBL-DG-03796, 1996.

9.5 Wisconsin Department of Natural Resources, “NR219 - Analytical Test Methods and Procedures”.

Rev. 2/2013

CHAIN OF CUSTODY

Page _____ of _____

Company:

Project Contact:

Telephone:

Project Name:

Project #:

Location:

Sampled By:

CT LABORATORIES

1230 Lange Court, Baraboo, WI 53913
608-356-2760 Fax 608-356-2766
www.ctlaboratories.com

Lab Use Only
Place Header Sticker Here:

Program:
QSM RCRA SDWA NPDES
Solid Waste Other _____

PO #

Report To:
EMAIL:
Company:
Address:

Invoice To:*
EMAIL:
Company:
Address:

**Client Special Instructions*

**Matrix:*
GW – groundwater **SW** - surface water **WW** - wastewater **DW** - drinking water
S - soil/sediment **SL** - sludge **A** - air **M** - misc/waste

**Turnaround Time*
Normal RUSH*
Date Needed: _____
Rush analysis requires prior CT Laboratories' approval
Surcharges:
24 hr 200%
2-3 days 100%
4-9 days 50%

Collection Date	Collection Time	Matrix	Grab/ Comp	Sample #	Sample ID Description	Filtered? Y/N	ANALYSES REQUESTED														Total # Containers	Designated MS/MSD	CT Lab ID # (Lab use only)
							Fill in Spaces with Bottles per Test																

Relinquished By:	Date/Time	Received By:	Date/Time
Received by:	Date/Time	Received for Laboratory by:	Date/Time

Lab Use Only
Ice Present Yes No
Temperature _____
Cooler # _____

*Party listed is responsible for payment of invoice as per CT Laboratories' terms and conditions

Appendix E
Groundwater Sampling Schedules - BAAP-12

August 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	VOC	DNT
Purcell-Dan	163	DBG	1	1
Anderson-R	411	DBG	1	1
Curto	412	DBG	1	1
Wenger	414	DBG	1	1
Grosse	415	DBG	1	1
Gruber-D	417	DBG	1	1
Hendershot	418	DBG	1	1
Howery	419	DBG	1	1
Osterland	422	DBG	1	1
Puccio	423	DBG	1	1
Raschein	424	DBG	1	1
Revers	425	DBG	1	1
Roll	426	DBG	1	1
Statz	427	DBG	1	1
Wilkinson	428	DBG	1	1
Spear	803	DBG	1	1
Brey	817	DBG	1	1
Gibbs	839	DBG	1	1
Groth	842	DBG	1	1
Jones-A	860	DBG	1	1
Kopras	874	DBG	1	1
Nowotarski	891	DBG	1	1
Olah	904	DBG	1	1
Purcell-Gladys	916	DBG	1	1
Zurbachen-A	967	DBG	1	1
USDA 3	126	Central		1
USDA 6	128	Central		1
USDA 1	828	Central		1
USDA 2	829	Central		1
WE-TM599	129	Central		1
WE-RM383	153	Central		1
WE-RR542	156	Central		1
WE-QR441	157	Central	1	1
WE-QN039	158	Central	1	1
WE-RD430	159	Central		1
WE-SQ017	164	Central	1	1
WE-SQ001	165	Central	1	1
WE-RR598	169	Central		1
WE-SQ002	170	Central		1
WE-TF023	174	Central		1
WE-UK125	431	Central		1
WE-UK124	432	Central		1
WE-UA297	433	Central		1
WE-XD828	434	Central		1
WE-XK342	435	Central		1

August 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	VOC	DNT
Delaney	152	PBG	1	1
Mittenzwei	800	PBG	1	1
Judd	862	PBG	1	1
Krumenauer	875	PBG	1	1
PDS-3	911	PBG	1	1
Ramaker-J	917	PBG	1	1
Schlender	931	PBG	1	1
Apel	998	PBG	1	1
Totals			37	53

The following samples are not included above:
one duplicate sample per day of sampling
one VOC trip blank per day of sampling

September 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	VOC	DNT
ELN-8203A	210	DBG			1
ELN-8203B	211	DBG			1
ELN-8203C	212	DBG			1
ELM-8901	216	DBG			1
ELM-8907	220	DBG			1
ELM-8908	221	DBG			1
ELM-8909	222	DBG			1
ELN-8902B	224	DBG			1
ELN-9107A	227	DBG			1
ELN-9107B	228	DBG			1
ELN-9402AR	231	DBG			1
ELM-9501	234	DBG			1
S1134R	236	DBG			1
DBM-8201	301	DBG			1
DBM-8202	302	DBG			1
DBM-8903	306	DBG			1
DBN-9501A	314	DBG			1
DBN-9501B	315	DBG			1
DBN-9501C	316	DBG			1
DBN-9501E	317	DBG			1
ELN-0801B	455	DBG			1
ELN-0801C	456	DBG			1
ELN-0801E	457	DBG			1
ELN-0802A	458	DBG		1	1
ELN-0802C	459	DBG		1	1
ELN-1001B	460	DBG			1
ELN-1001C	461	DBG			1
ELN-1001E	462	DBG			1
ELN-1002A	463	DBG			1
ELN-1002B	464	DBG			1
ELN-1002C	465	DBG			1
ELN-1002E	466	DBG			1
ELN-1003A	467	DBG			1
ELN-1003B	468	DBG			1
ELN-1003C	469	DBG			1
ELN-1003E	470	DBG			1
DBN-1001B	472	DBG			1
DBN-1001C	473	DBG			1
DBN-1001E	474	DBG			1
DBN-1002C	476	DBG			1
DBN-1002E	477	DBG			1
S1121	755	DBG			1
ELN-1502A	533	DBG			1

September 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	VOC	DNT
ELN-1502C	534	DBG			1
ELN-1503A	535	DBG			1
ELN-1503C	536	DBG			1
ELN-1504B	537	DBG			1
RIM-0703	440	DNT Screen			1
RIM-0705	442	DNT Screen			1
RIM-1002	478	DNT Screen			1
RIN-1007C	479	DNT Screen			1
RIN-1001A	480	DNT Screen			1
RIN-1001C	481	DNT Screen			1
S1125	504	DNT Screen			1
PBM-9801	360	PBG		1	1
PBM-0001	367	PBG	1	1	1
PBM-0002	368	PBG	1	1	1
PBM-0006	372	PBG	1	1	1
PBM-0008	374	PBG		1	1
PBN-9101C	561	PBG		1	1
PBN-9102B	562	PBG		1	1
PBN-9102C	563	PBG		1	1
SWN-9102C	569	PBG		1	1
SWN-9102D	570	PBG		1	1
SWN-9103B	571	PBG		1	1
SWN-9103C	572	PBG		1	1
SWN-9103D	573	PBG		1	1
SWN-9103E	574	PBG		1	1
SWN-9104C	575	PBG		1	1
SWN-9104D	576	PBG		1	1
SWN-9105B	577	PBG		1	1
SWN-9105C	578	PBG		1	1
SWN-9105D	579	PBG		1	1
PBN-1003C	592	PBG		1	1
PBN-1001C	595	PBG		1	1
PBN-8202A	613	PBG		1	1
PBN-8202B	614	PBG		1	1
PBN-8202C	615	PBG		1	1
PBN-8205A	622	PBG		1	1
PBN-8205B	623	PBG		1	1
PBN-8205C	624	PBG		1	1
PBN-8502A	632	PBG		1	1
PBN-8503A	633	PBG		1	1
PBM-8907	637	PBG		1	1
PBM-8909	639	PBG		1	1
PBN-8902C	645	PBG		1	1

September 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	VOC	DNT
PBN-8903B	646	PBG		1	1
PBN-8903C	647	PBG		1	1
PBN-8912A	654	PBG		1	1
PBN-8912B	655	PBG		1	1
PBN-9112C	665	PBG		1	1
PBN-9112D	666	PBG		1	1
PBN-9301B	668	PBG		1	1
PBN-9301C	669	PBG		1	1
PBN-9303B	673	PBG		1	1
PBN-9303C	674	PBG		1	1
PBN-9303D	675	PBG		1	1
PBN-9304D	687	PBG		1	1
PBN-9902D	691	PBG		1	1
PBN-9903A	692	PBG		1	1
PBN-9903B	693	PBG		1	1
PBN-9903C	694	PBG		1	1
PBN-9903D	695	PBG		1	1
S1147	709	PBG		1	1
S1148	710	PBG		1	1
SPN-8903B	718	PBG		1	1
SPN-8903C	719	PBG		1	1
SPN-8904B	720	PBG		1	1
SPN-8904C	721	PBG		1	1
SPN-9103D	725	PBG		1	1
SPN-9104D	726	PBG		1	1
PBN-1302A	770	PBG		1	1
PBN-1302B	771	PBG		1	1
PBN-1302C	772	PBG		1	1
PBN-1302D	773	PBG		1	1
PBN-1303A	774	PBG		1	1
PBN-1303B	775	PBG		1	1
PBN-1303C	776	PBG		1	1
PBN-1303D	777	PBG		1	1
PBN-1304A	778	PBG		1	1
PBN-1304B	779	PBG		1	1
PBN-1304C	780	PBG		1	1
PBN-1304D	781	PBG		1	1
PBN-1401A	782	PBG		1	1
PBN-1401B	783	PBG		1	1
PBN-1401C	784	PBG		1	1
PBN-1404B	791	PBG		1	1
PBN-1404C	792	PBG		1	1
PBN-1404D	793	PBG		1	1

September 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	VOC	DNT
PBN-1405F	794	PBG		1	1
PBN-8902BR	795	PBG		1	1
PBM-9001D	981	PBG		1	1
PBM-9002D	982	PBG		1	1
Totals			3	81	133

The following samples are not included above:
one duplicate sample per day of sampling
one VOC trip blank per day of sampling

November 2016
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	VOC	DNT
SEN-0501A	580	Central	1	1
SEN-0501B	581	Central	1	1
SEN-0501D	582	Central	1	1
SEN-0502A	583	Central	1	1
SEN-0502D	584	Central	1	1
SEN-0503A	585	Central	1	1
SEN-0503B	586	Central	1	1
SEN-0503D	587	Central	1	1
RIN-1004B	498	Central		1
WE-UK124	432	Central		1
Totals			8	10

The following samples are not included above:
one duplicate sample per day of sampling
one VOC trip blank per day of sampling

April 2017
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	Sulfate	VOC	DNT
WE-UK124	432	Central				1
Purcell-Dan	163	DBG			1	1
ELN-8203A	210	DBG		1	1	1
ELN-8203B	211	DBG		1	1	1
ELN-8203C	212	DBG		1	1	1
ELM-8901	216	DBG		1	1	1
ELM-8907	220	DBG		1	1	1
ELM-8908	221	DBG		1	1	1
ELM-8909	222	DBG		1	1	1
ELN-8902B	224	DBG		1	1	1
ELN-9107A	227	DBG		1	1	1
ELN-9107B	228	DBG		1	1	1
ELN-9402AR	231	DBG		1	1	1
ELM-9501	234	DBG			1	1
S1134R	236	DBG		1	1	1
DBM-8201	301	DBG		1	1	1
DBM-8202	302	DBG		1	1	1
DBM-8903	306	DBG			1	1
DBN-9501A	314	DBG			1	1
DBN-9501B	315	DBG			1	1
DBN-9501C	316	DBG			1	1
DBN-9501E	317	DBG			1	1
ELN-0801B	455	DBG			1	1
ELN-0801C	456	DBG			1	1
ELN-0801E	457	DBG			1	1
ELN-1001B	460	DBG			1	1
ELN-1001C	461	DBG			1	1
ELN-1001E	462	DBG			1	1
ELN-1002A	463	DBG			1	1
ELN-1002B	464	DBG			1	1
ELN-1002C	465	DBG			1	1
ELN-1002E	466	DBG			1	1
ELN-1003A	467	DBG			1	1
ELN-1003B	468	DBG			1	1
ELN-1003C	469	DBG			1	1
ELN-1003E	470	DBG			1	1
DBN-1001B	472	DBG			1	1
DBN-1001C	473	DBG			1	1
DBN-1001E	474	DBG			1	1
DBN-1002C	476	DBG		1	1	1
DBN-1002E	477	DBG		1	1	1
S1121	755	DBG			1	1
ELN-1502A	533	DBG			1	1
ELN-1502C	534	DBG			1	1
ELN-1503A	535	DBG			1	1

April 2017
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	Sulfate	VOC	DNT
ELN-1503C	536	DBG			1	1
ELN-1504B	537	DBG			1	1
RIM-0705	442	DNT Screen				1
RIM-1002	478	DNT Screen				1
RIN-1001A	480	DNT Screen				1
S1125	504	DNT Screen				1
PBM-0001	367	PBG	1		1	1
PBM-0002	368	PBG	1		1	1
PBM-0006	372	PBG	1		1	1
PBM-0008	374	PBG			1	1
PBN-9101C	561	PBG			1	1
SWN-9103B	571	PBG			1	1
SWN-9103C	572	PBG			1	1
SWN-9103D	573	PBG			1	1
SWN-9103E	574	PBG			1	1
SWN-9104C	575	PBG			1	1
SWN-9104D	576	PBG			1	1
PBN-1001C	595	PBG			1	1
PBN-8202A	613	PBG			1	1
PBN-8202B	614	PBG			1	1
PBN-8202C	615	PBG			1	1
PBN-8205A	622	PBG			1	1
PBN-8205B	623	PBG			1	1
PBN-8205C	624	PBG			1	1
PBN-8502A	632	PBG			1	1
PBN-8503A	633	PBG			1	1
PBN-8902C	645	PBG			1	1
PBN-8903B	646	PBG			1	1
PBN-8903C	647	PBG			1	1
PBN-8912A	654	PBG			1	1
PBN-8912B	655	PBG			1	1
PBN-9112C	665	PBG			1	1
PBN-9112D	666	PBG			1	1
PBN-9301B	668	PBG			1	1
PBN-9301C	669	PBG			1	1
PBN-9303B	673	PBG			1	1
PBN-9303C	674	PBG			1	1
PBN-9303D	675	PBG			1	1
PBN-9304D	687	PBG			1	1
PBN-9902D	691	PBG			1	1
PBN-9903A	692	PBG			1	1
PBN-9903B	693	PBG			1	1
PBN-9903C	694	PBG			1	1
PBN-9903D	695	PBG			1	1
S1147	709	PBG			1	1

April 2017
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	Nitrates	Sulfate	VOC	DNT
S1148	710	PBG			1	1
SPN-8903B	718	PBG			1	1
SPN-8903C	719	PBG			1	1
SPN-8904B	720	PBG			1	1
SPN-8904C	721	PBG			1	1
SPN-9103D	725	PBG			1	1
SPN-9104D	726	PBG			1	1
PBN-1302A	770	PBG			1	1
PBN-1302B	771	PBG			1	1
PBN-1302C	772	PBG			1	1
PBN-1302D	773	PBG			1	1
PBN-1303A	774	PBG			1	1
PBN-1303B	775	PBG			1	1
PBN-1303C	776	PBG			1	1
PBN-1303D	777	PBG			1	1
PBN-1304A	778	PBG			1	1
PBN-1304B	779	PBG			1	1
PBN-1304C	780	PBG			1	1
PBN-1304D	781	PBG			1	1
PBN-1401A	782	PBG			1	1
PBN-1401B	783	PBG			1	1
PBN-1401C	784	PBG			1	1
PBN-1404B	791	PBG			1	1
PBN-1404C	792	PBG			1	1
PBN-1404D	793	PBG			1	1
PBN-8902BR	795	PBG			1	1
PBM-9001D	981	PBG			1	1
Totals			3	16	112	117

The following samples are not included above:
one duplicate sample per day of sampling
one VOC trip blank per day of sampling

June 2017
Groundwater Sampling Schedule

Well Name	Well ID	Plume Area	VOC	DNT
SEN-0501A	580	Central	1	1
SEN-0501B	581	Central	1	1
SEN-0501D	582	Central	1	1
SEN-0502A	583	Central	1	1
SEN-0502D	584	Central	1	1
SEN-0503A	585	Central	1	1
SEN-0503B	586	Central	1	1
SEN-0503D	587	Central	1	1
WE-UK124	432	Central		1
NLN-1001A	331	Central		1
NLN-1001C	332	Central		1
NLN-8203A	258	Central		1
NLN-8203B	259	Central		1
NLN-8203C	260	Central		1
NPM-8901	506	Central		1
RIM-1003	491	Central		1
RIM-1004	494	Central		1
RIN-0701C	443	Central		1
RIN-0702C	444	Central		1
RIN-0703C	445	Central		1
RIN-1002A	492	Central		1
RIN-1002C	493	Central		1
RIN-1003A	495	Central		1
RIN-1004B	498	Central		1
RIN-1005A	496	Central		1
RIN-1005C	497	Central		1
RPM-8901	507	Central		1
S1111	751	Central		1
RIN-1501B	538	Central		1
RIN-1501C	539	Central		1
RIN-1501D	540	Central		1
RIN-1502B	541	Central		1
RIN-1502C	542	Central		1
RIN-1502D	543	Central		1
Totals			8	34

The following samples are not included above:
one duplicate sample per day of sampling
one VOC trip blank per day of sampling

Appendix F
Landfill Environmental Monitoring Schedules - BAAP-35

Landfill Sampling Schedule - September

Well ID	Well Name	License Area	Barium	Cadmium	Chromium	Iron	Manganese	Lead	Arsenic	Mercury	Nitrates	Sulfate	Chloride	Total Hardness	BOD	COD	TSS	Alkal	Odor	Color	Turb	pH	Elev	PV	TMP	Cond	VOC	BNA	PCBs
252	NLN-8201A	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
252 (D)	NLN-8201A (Dup)	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
253	NLN-8201B	3118/3646																					1						
254	NLN-8201C	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
255	NLN-8202A	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
256	NLN-8202B	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
258	NLN-8203A	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
259	NLN-8203B	3118																					1						
260	NLN-8203C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
261	NLN-8204A	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
262	NLN-8204B	3118																					1						
263	NLN-8204C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
265	NLN-8205B	3118																					1						
266	NLN-8205C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
269	NLN-9205AR	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
270	NLM-9202R	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1	1		
271	NLM-0301R	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
272	NLM-0302R	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
272 (D)	NLM-0302R (Dup)	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
296	NLM-0401	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
297	NLN-0701A 3646		1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
298	NLN-0701C	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
330	NLM-1001	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
331	NLN-1001A	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
332	NLN-1001C	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	
		total	14	21	14	21	21	21	14		21	21	21	21				21	21	21	21	21	25	21	21	21	21	14	
Other Sampling Points																													
267	Leachate (LTM8901)	3118	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	
268	Lysimeter	3118	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1	
280	Leachate (LE 01)	3646	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
333	Leachate (LE 02)	3646	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
286	Lysimeter (LS 01)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1	
288	Lysimeter (LS 03)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1	
289	Lysimeter (LS 04)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1	
290	Lysimeter (LS 05)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1	
		total	8	8	2	8	8	8	8	3	5	8	8	8	3	3	3	8	8	8	8	8		8	8	8	8	8	2

Landfill Sampling Schedule - April

Well ID	Well Name	License Area	Barium	Cadmium	Chromium	Iron	Manganese	Lead	Arsenic	Mercury	Nitrates	Sulfate	Chloride	Total Hardness	BOD	COD	TSS	Alkal	Odor	Color	Turb	pH	Elev	PV	TMP	Cond	VOC	BNA
252	NLN-8201A	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
252 (D)	NLN-8201A (Dup)	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
253	NLN-8201B	3118/3646																					1					
254	NLN-8201C	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
255	NLN-8202A	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
256	NLN-8202B	3118/3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
258	NLN-8203A	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
259	NLN-8203B	3118																					1					
260	NLN-8203C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
261	NLN-8204A	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
262	NLN-8204B	3118																					1					
263	NLN-8204C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
265	NLN-8205B	3118																					1					
266	NLN-8205C	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
269	NLN-9205AR	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
270	NLM-9202R	3118		1		1	1	1			1	1	1	1				1	1	1	1	1	1	1	1	1		
271	NLM-0301R	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
272	NLM-0302R	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
272 (D)	NLM-0302R (Dup)	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
296	NLM-0401	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
297	NLN-0701A 3646		1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
298	NLN-0701C	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
330	NLM-1001	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
331	NLN-1001A	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
332	NLN-1001C	3646	1	1	1	1	1	1	1		1	1	1	1				1	1	1	1	1	1	1	1	1		
		total	14	21	14	21	21	21	14		21	21	21	21				21	21	21	21	21	25	21	21	21		
Other Sampling Points																												
267	Leachate (LTM8901)	3118	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1		
268	Lysimeter	3118	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1
280	Leachate (LE 01)	3646	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1		
333	Leachate (LE 02)	3646	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1		
286	Lysimeter (LS 01)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1
288	Lysimeter (LS 03)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1
289	Lysimeter (LS 04)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1
290	Lysimeter (LS 05)	3646	1	1		1	1	1	1		1	1	1	1				1	1	1	1	1		1	1	1	1	1
		total	8	8	3	8	8	8	8	3	5	8	8	8	3	3	3	8	8	8	8	8		8	8	8	5	5

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
Janesville Service Center
2514 Morse Street
Janesville, WI 53545

Scott Walker, Governor
Cathy Stepp, Secretary
Mark Aquino, Regional Director
Telephone 608-743-4841
FAX 608-743-4801

October 18, 2011

File Reference: FID # 157071420
Sauk County
SW APPROVAL

Mr. R. Michael Sitton,
Real Property Accountable Officer
Badger Army Ammunition Plant
2 Badger Road
Baraboo, WI 53913-5000

Subject: Expedited Plan Modification Request to Update the Monitoring Schedule for Badger Army Landfill License # 3118.

Dear Mr. Sitton:

We have reviewed your request for an expedited plan modification to update and correct the full monitoring schedule for landfill license #3118, dated September 22, 2011 and received September 23, 2011. An update to the monitoring schedule for landfill #3118 is deemed necessary to help coordinate its schedule with the monitoring schedule of landfill #3646. The monitoring schedule for landfill #3646 was recently modified as part of the Plan of Operation Approval process for landfill expansion. TABLE 1, attached to this response, presents the revised monitoring schedule for landfill #3118.

If you have any questions about this approval, do not hesitate to call me at (608) 743-4841 or Tom Bennwitz at (608) 275-3211.

Sincerely,

James Kralick, P.G.
Hydrogeologist, SCR Waste and Materials Management Program

Cc: Tom Bennwitz – DNR SCR Fitchburg
Lisa Rutkowski – BTS SpecPro

Attachments

TABLE 1 – REVISED Groundwater Monitoring Schedule Badger Army Ammunition Plant C&D Landfill (Lic. #3118) October 18, 2011		
Monitoring Point (DNR ID)	**Frequency of Sampling**	**Parameters**
Monitoring wells: NLN 8201 A (252) NLN 8201 C (254) NLN 8202 A (255) NLN 8202 B* (256) NLN 8203 A (258) NLN 8203 C (260) NLN 8204 A (261) NLN 8204 C (263) NLN 8205 C (266) NLN 9205 AR (269) NLN 9202 R (270)	**Semi-annual** (March, September)	00010 Field Temperature in °C 00094 Field Conductivity @25 ° C 00400 Field pH 00631 Nitrate+Nitrite, dissolved 00940 Chloride, dissolved 00946 Sulfate, dissolved 01025 Cadmium, dissolved 01046 Iron, dissolved 01049 Lead, dissolved 01056 Manganese, dissolved 22413 Total Hardness, filtered 39036 Total Alkalinity, filtered 04189 Groundwater Elevation 00001 Sample Odor, if present 00002 Sample Color, if present 00003 Sample Turbidity, if present 00004 Well Broken, if applicable 00005 Well Frozen, if applicable 00006 Well Dry, if applicable
	Annual (September)	VOC Scan [NR 507 Appendix III parameters]
Water Level Wells: NLN 8201 B (253) NLN 8203 B (259) NLN 8204 B (262) NLN 8205 B (265)	**Semi-annual** (March, September)	04189 Groundwater Elevation

*Well NLN 8202 B (DNR ID #256) replaces abandoned well NLN 8202 C (DNR ID #257) on sampling schedule.

TABLE 1 continued on next page...

TABLE 1 cont. – REVISED Groundwater Monitoring Schedule Badger Army Ammunition Plant C&D Landfill (Lic. #3118) October 18, 2011		
Monitoring Point (DNR ID)	**Frequency of Sampling**	**Parameters**
Leachate Collection System: Leachate Tank (267)	**Monthly** (reported semi-annually in March, September)	00032 Leachate Volume Pumped
	Semi-annual (March, September)	00010 Field Temperature in °C 00094 Field Conductivity @25 ° C 00150 Total Suspended Solids 00310 BOD 00340 COD, unfiltered 00400 Field pH 00410 Total Alkalinity, unfiltered 00900 Total Hardness, unfiltered 00940 Total Chloride 00945 Total Sulfate 01002 Total Arsenic 01007 Total Barium 01027 Total Cadmium 01051 Total Lead 01055 Total Manganese 71900 Total Mercury 74010 Total Iron 00001 Sample Odor, if present 00002 Sample Color, if present 00003 Sample Turbidity, if present 00004 Well Broken, if applicable 00005 Well Frozen, if applicable 00006 Well Dry, if applicable
	Annual (September)	VOC Scan [NR 507 Appendix III parameters] SVOC Scan [NR 507 Appendix IV parameters]
Leachate Head Well: LH-1 (273)	**Monthly** (reported semi-annually in March, September)	00031 Leachate Depth 99423 Leachate Head Elevation

TABLE 1 continued on next page...

TABLE 1 cont. – REVISED Groundwater Monitoring Schedule
Badger Army Ammunition Plant C&D Landfill (Lic. #3118)
October 18, 2011

Monitoring Point (DNR ID)	Frequency of Sampling	Parameters
Collection Lysimeter: Lysimeter (268)	**Monthly** (reported semi-annually in March, September)	74064 Lysimeter Discharge in Gallons
	Semi-annual (March, September)	00094 Field Conductivity @25 ° C 00400 Field pH 00410 Total Alkalinity, unfiltered 00630 Total Nitrate+Nitrite 00900 Total Hardness, unfiltered 00940 Total Chloride 00945 Total Sulfate 01002 Total Arsenic 01007 Total Barium 01027 Total Cadmium 01051 Total Lead 01055 Total Manganese 74010 Total Iron VOC Scan [NR 507 Appendix III parameters] SVOC Scan [NR 507 Appendix IV parameters] [if fluid volume is limited, perform the VOC scan first, the SVOC scan second, followed by as many of the other parameters as possible]
Gas Probes/ Gas Extraction System: GP-01S (274) GP-01D (275) GP-02S (276) GP-02D (277) GV-01 (278) GV-02 (279)	**Quarterly** (March, June, September, December)	00025 Barometric Pressure (in mm of Hg) 46389 Soil Gas Pressure (in inches of water) 85547 % Methane in Air (% volume) 85550 % Oxygen in Air (% volume)

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
Toll Free 1-888-936-7463
TTY Access via relay - 711

WISCONSIN
DEPT. OF NATURAL RESOURCES

OCT 2 2 2012

Ms. Joan Kenney
Installation Director
Badger Army Ammunition Plant
2 Badger Road
Baraboo, WI 53913-5000

File Ref: FID #157053930
Sauk County
SW Approval

SUBJECT: Plan Modification Request for Final Closure Construction Modification at the Badger Army Landfill (Lic: 3646)

Dear Ms. Kenney:

We have completed our review of your plan modification request regarding the final closure construction modification at the Badger Army Ammunition Plant Construction and Demolition Landfill that was submitted on August 21, 2012 by the Army. Based on our review the plan modification request is approved, subject to compliance with chs. NR 500-538, Wis. Adm. Code, and the conditions contained in the attached approval.

You are reminded this approval does not relieve you of obligations to meet all other applicable federal, state and local permits, as well as zoning and regulatory requirements.

If you have any questions regarding this approval, please contact Tom Bennwitz at (608)275-3211 or Jim Kralick at (608) 743-4841.

Sincerely,

Dennis Mack, P.E.
Waste Management Team Leader
South Central Region

cc: Tom Bennwitz - SCR
Jim Kralick - SCR
Robert (Mike) Sitton - Badger Army Ammunition Plant
Brian Jacobs – Badger Technical Services, LLC

ENVIRONMENTAL MONITORING

Currently, thirteen monitoring wells (eight water table monitoring wells and five piezometers) have been installed to conduct semi-annual analytical groundwater sampling around the landfill. An additional monitoring well nest, scheduled to be installed to the south of proposed Phase 9, will not be necessary since that phase will not be constructed. Leachate collected from the landfill will continue to be monitored semi-annually. A lysimeter will not be installed beneath the liner of constructed Phase 6, due to its composite design. All existing lysimeters from landfill #3646 will continue to be monitored on their current schedule.

A comprehensive monitoring schedule for groundwater, leachate, lysimeters, and gas probes is included below on Tables 1, 2, 3, and 4. Groundwater, leachate, and lysimeter monitoring will generally consist of inorganic indicator parameters, metals, volatile organic compounds (VOCs, per NR 507 Appendix III), and semi-volatile organic compounds (SVOCs, per NR 507 Appendix IV). See Table 1.

The leachate monitoring program will include polychlorinated byphenols (PCBs), total mercury, leachate head elevation, leachate depth, and volume of leachate generated. See Table 2.

The lysimeter monitoring program is included for the lysimeters located beneath the first five phases developed in landfill #3646, excluding lysimeter LS02, which is slated to be abandoned in place due to a blockage in the lysimeter access piping. See Table 3.

One additional gas probe (GP-5) will be installed bringing the total number of gas probes surrounding the closed landfill (lic. #3118) and the active landfill (lic.#3646) to five. All gas probes will be monitored quarterly for methane, oxygen, soil gas pressure, and ambient air conditions. See Table 4.

Environmental monitoring will extend through active site operation and for some time into the perpetual long-term care period as determined by the Department. Monitoring data shall be reported to the Department electronically on diskettes in a format supplied by the Department, as specified in s. NR 507.26(3), Wis. Adm. Code.

TABLE 1-Schedule for Groundwater Monitoring
Badger Army Ammunition Plant Landfill (Lic. #3646)
October 2012

Monitoring Point (DNR ID)	Frequency of Sampling	Parameters	
Detection Groundwater Monitoring:	**Semi-annual** (March, September)	00010	Field Temperature in °C
		00094	Field Conductivity @25⌀C
NLN-8201A (252)		00400	Field pH
NLN-8201C (254)			
NLN-8202A (255)		00631	Nitrate+Nitrite, dissolved
NLN-8202B* (256)		00940	Chloride, dissolved
NLM-0301R (271)		00946	Sulfate, dissolved
NLM-0302R (272)			
NLM-0401 (296)		01000	Arsenic, dissolved
NLN-0701A (297)		01005	Barium, dissolved
NLN-0701C (298)		01025	Cadmium, dissolved
NLM-1001 (330)		01030	Chromium, dissolved
NLN-1001A (331)		01046	Iron, dissolved
NLN-1001C (332)		01049	Lead, dissolved
		01056	Manganese, dissolved
		22413	Total Hardness, filtered
		39036	Total Alkalinity, filtered
		04189	Groundwater Elevation
		00001	Sample Odor, if present
		00002	Sample Color, if present
		00003	Sample Turbidity, if present
		00004	Well Broken, if applicable
		00005	Well Frozen, if applicable
		00006	Well Dry, if applicable
	Annual (September)	VOC Scan [NR 507 Appendix III parameters]	
		SVOC Scan [NR 507 Appendix IV parameters]	
Water Level Wells:	**Semi-annual** (March, September)	04189	Groundwater Elevation
NLN 8201B (253)		00004	Well Broken, if applicable
		00005	Well Frozen, if applicable
		00006	Well Dry, if applicable

*Well NLN 8202 B (DNR ID #256) replaces abandoned well NLN 8202 C (DNR ID #257) on sampling schedule.

TABLE 2: Schedule for Leachate Monitoring
BAAAP Landfill (Lic. 3646) - October 2012

Monitoring Point: (DNR ID)	Frequency	Parameters
Leachate Collection System: LE 01 (280) LE 02* (333)	**Monthly** (reported semi-annually in March and September)	00032 Leachate Volume Pumped
	Semi-annual (March, September)	00010 Field Temperature in ⌀C 00094 Field Conductivity @25⌀C 00400 Field pH 00150 Total Suspended Solids 00310 BOD_5 00340 COD, unfiltered 00410 Total Alkalinity, unfiltered 00900 Total Hardness, unfiltered 00940 Chloride 00945 Sulfate, unfiltered 01002 Total Arsenic 01007 Total Barium 01027 Total Cadmium 01034 Total Chromium 01051 Total Lead 01055 Total Manganese 71900 Total Mercury 74010 Total Iron 00001 Sample odor, if present 00002 Sample color, if present 00003 Sample turbidity, if present
	Annual (September)	39516 PCBs VOC Scan [NR 507 Appendix III parameters] SVOC Scan [NR 507 Appendix IV parameters]
Leachate Head Wells: LH-1 (281) LH-2 (282) LH-3 (283) LH-4 (284) LH-5 (285) LH-6* (xxx)	**Monthly** (reported semi-annually in March and September)	00031 Leachate Depth 99423 Leachate Head Elevation

*Monitoring point will become part of the monitoring schedule as needed.

TABLE 3: Schedule for Lysimeter Monitoring (Phases 1 - 5)
BAAAP Landfill (Lic. 3646)
October 2012

Monitoring Point (DNR ID)	Frequency	Parameters
Lysimeter: LS 01 (286) LS 02 (abandoned) LS 03 (288) LS 04 (289) LS 05 (290)	**Monthly** (reported semi-annually in March and September)	74064 Lysimeter discharge in gallons 00004 Well broken, if present 00005 Well frozen, if present 00006 Well dry, if present
	Semi-annual (March, September)	00094 Field Specific Conductance (25^0) 00400 Field pH 00410 Alkalinity, unfiltered 00631 Nitrate + Nitrite, unfiltered 00900 Hardness, unfiltered 00940 Chloride 00945 Total Sulfate 01002 Total Arsenic 01007 Total Barium 01027 Total Cadmium 01051 Total Lead 01055 Total Manganese 74010 Total Iron VOC Scan [NR 507 Appendix III parameters] SVOC Scan [NR 507 Appendix IV parameters] 00001 Sample odor, if present 00002 Sample color, if present 00003 Sample turbidity, if present (If fluid volume is limited, perform the **SVOC** scan first, the **VOC** scan second, followed by as many of the other parameters as possible.)

TABLE 4: Schedule for Gas Monitoring
BAAAP Landfill (Lic. 3646)
October 2012

Monitoring Point (DNR ID)	Frequency	Parameters
Prior to Landfill Closure **Gas Probes:** GP 03 (291) GP 04 (292) GP 05* (293)	**Quarterly** (March, June, September, December. Data to be reported semi-annually in March and September)	85548 Methane percent LEL 85550 Oxygen percent volume 46389 Soil gas pressure 00011 Air temperature 00025 Barometric pressure 46381 Barometric pressure trend 00004 Well broken, if present (Ground condition and the initial and stabilized methane reading shall be recorded for each gas monitoring event. The ground condition should be reported to the Department with the other monitoring data. The initial methane reading should not be reported unless the stabilized reading falls to zero.)
After Landfill Closure (All Phases) **Gas Vents:** GV 01 (360) GV 02 (361) GV 03 (362) GV 04* (xxx) GV 05* (xxx) **Gas Probes:** GP 03 (291) GP 04 (292) GP 05* (293)	**a. Monthly** (reported semi-annually in March & September) **b. Quarterly** If the methane percent LEL is less than 25% for 12 consecutive months, then the frequency will be quarterly, (March, June, September, December), and reported semi-annually in March and September)	85548 Methane percent LEL 85550 Oxygen percent volume 46389 Soil gas pressure 00011 Air temperature 00025 Barometric pressure 46381 Barometric pressure trend 00004 Well broken, if present (Ground condition and the initial and stabilized methane reading shall be recorded for each gas monitoring event. The ground condition should be reported to the Department with the other monitoring data. The initial methane reading should not be reported unless the stabilized reading falls to zero.)

*Monitoring points will become part of the monitoring schedule as needed.

FINANCIAL RESPONSIBILITY

Closure and Long-term Care Costs: Closure proof of owner financial responsibility is required for closure of the largest constructed area without final cover. Currently the Army has four active phases (Phase 3, 4, 5, & 6). It is anticipated that final closure on Phases 3 & 4 will be complete in October of 2012. The remaining phases are projected to be closed by October of 2013.

Actions to be taken during closure and long term care, along with the associated cost estimates, are summarized below. Closure costs reflect the most expensive area to close, which includes all four phases of the existing landfill for a total of approximately 8.0 acres. Closure of all phases will require a passive gas venting system. The final cover in the first five phases includes placement of a grading/gas extraction sand layer, a clay barrier layer, a granular drainage layer, geotextile, a rooting layer and topsoil. Phase 6 includes the same closure items as Phases 1 - 5, except it includes a 40 mil geomembrane. The cost estimates assume the need to purchase sand for the drainage layer and use local borrow sources for the clay layer, rooting zone layer and topsoil.

The Closure Cost tables listed below include costs on a cell by cell basis, and total costs for all phases that are open at the time of this plan modification. Currently Phases 3 through 6 are open. Phase 6 is partially developed and the remaining approved phases are planned to not be developed. Therefore, Table 5 lists closure costs on a per cell basis and only cells that are developed will be required to provide financial assurance at that time.

BAAAP must, by Wisconsin law, make a financial commitment to provide sufficient funds to care for the landfill for a period of 40 years following landfill closure. However, BAAAP or a future owner will be responsible for long term care of the facility in perpetuity. Long term care costs reflect estimated yearly expenses for land surface care, landfill monitoring, leachate collection system, and administrative costs associated with operating the site when closed. All costs are based on 2011 unit prices and were provided by the Army based on past operating experience.

Financial Responsibility Assurance Consent Agreement: The Department of Natural Resources and the Army entered into a Financial Responsibility Assurance Consent Agreement on October 10, 2005. The agreement is pursuant to section NR 520.06(8), Wis. Adm. Code, and Executive Order 12088. Conditions 31 through 35 in the Plan of Operation Approval specify the conditions of the agreement. This Executive Order requires the head of an Executive Agency to ensure that sufficient funds for compliance with environmental regulations are requested in the Agency budget.

TABLE 5
CLOSURE COSTS
(Phases 3 -6)

LANDFILL CAP (19.4 acres)	Unit	Landfill Phases (Quantity)				Total Quantity	Unit Cost ($)	Total Cost
		3	4	5	6			
Site Preparation	Lump Sum						2,796[1]	$11,184
Grading Layer (1 foot)	Cubic Yard	4,600	4,600	4,600	6,300	20,100	4.0[2]	$80,400
Gas Vent Layer (1 foot)	Cubic Yard	4,600	4,600	4,600	6,300	20,100	17.05[3]	$342,705
Clay Placement (2 feet)	Cubic Yard	9,000	9,000	9,000	15,600	42,600	10.84	$461,784
40 mil geomembrane	Sq. Foot				166,400	166,400	1.00	$166,400
Drainage Layer (1 foot)	Cubic Yard	4,500	4,500	4,500	6,200	19,700	17.05	$335,885
8 oz. Geotextile Filter	Sq. Foot	122,500	122,500	122,500	167,600	535,100	0.4	$214,040
Rooting Zone Layer (1.5 ft.)	Cubic Yard	6,850	6,850	6,850	9,350	29,900	8.46	$252,954
Topsoil (6 inches)	Cubic Yard	2,300	2,300	2,300	4,750	11,650	8.44	$98,326
Restoration (Seed, Fertilizer & Mulch)	Acre (est.)	2.8	2.8	2.8	11[4]	19.4[4]	1,952	$37,868
LANDFILL PERIMETER WORK								
Perimeter Ditch Grading	Linear Feet	400	400	400	1150	2,350	7.1	$16,685
Excavation for Perimeter Toe Drain	Linear Foot	400	400	400	1150	2,350	6.99	$16,426
Perimeter Toe Drain Piping	Linear Feet	400	400	400	1150	2,350	12.37	$29,069
Perimeter Toe Drain Vents/Cleanouts	Each	2	2	2	4	10	3,000	$30,000
GAS MAMAGEMENT SYSTEM								
Install Gas Vents/Collection Pipes	Each	1	1	1	1	4	$3,728[5]	$14,912
ADMINISTRATIVE COSTS								
Administration	Estimate						$11,000 [6]	$55,000
Safety	Estimate						$11,000 [6]	$55,000
Engineering Management	Estimate						$45,434 [6]	$227,670
Construction Quality Assurance	Estimate						$39,210[6]	$196,050
Construction Management	Estimate						$36,800[6]	$184,000
						Average Total Closure Costs/Phase		$827,689[7]
						Sub-Total Cost (For Phases 6 - 10)		$2,826,358
						Contingency (10%)		$282,635
						Total Closure Cost for Phases 6 - 10		$3,108,994

(1) - The Army projected a lump sum cost for all ten phases at $ 27,960. The value listed is for closure of the last four phases.
(2) - The grading layer has an assumed cost for material and labor. The Army projects using onsite soil for grading layer.
(3) - All sand used in landfill closure is projected to come for off-site locations.
(4) - Includes drainage ditches and disturbed areas.
(5) - Installation includes gas vent, collection pipe, and bedding material.
(6) - Estimate based on percentage of labor cost (Operating Contractor) provided by the Army.
(7) – Estimate applies to most expensive cell to close (Does not include Administrative Costs).

ANNUAL LONG TERM CARE COSTS

(Phases 1 - 6)

Item	Quantity	Frequency	Unit Cost ($)	Estimated Annual Cost
Land Surface Care				
Mowing	1	Annual	4,800	$ 4,800
Erosion Control & Reseeding	1.7 acres (10%)	Annual	2,000/ac.	$ 3,360
Sediment Basin Cleaning	2 basins	Annual	600/basin	$ 1,200
Landfill Monitoring				
Groundwater Monitoring				
Collection		Semi-annual	3,200	$ 6,400
Analytical		Semi-annual	6,050	$ 12,100
Leachate Monitoring				
Lysimeters		monthly	400	$ 4,800
Headwells		monthly	(1)	(1)
Leachate Collection System		monthly	(1)	(1)
Gas Monitoring				
Vents/Probes		quarterly	240	$ 960
Semi-Annual Reporting		Semi-annual	2,700	$ 5,200
Leachate Collection System				
Leachate Treatment	1.429 * 10^6 gal		.004	$ 6,360
Leachate Line Cleaning	1	annual	6000	$ 6,000
Leachate Line Televising	1	5 year cycle	40,000	$ 8,000 (2)
Pump Replacement		1 per year	5,000	$ 5,000
Administrative Costs				
Administrative Support	Estimate			$ 2,000
Project Management	Estimate			$ 4,500
Electrical Utility		monthly		$ 1,481
License Fee (one-time payment)				$ 6,600
Material				$ 12,390
Contingency (10%)				$ 8,260
			Subtotal - Annual Maintenance Costs	$ 99,411
			Net Present Worth	$ 4,056,098 (3)

(1) - Leachate monitoring is combined for all three items
(2) - Leachate line televising is required every five years at a rate of $ 40,000 per event. Cost is annualized for estimate.
(3) - Estimate based on Army projections.

BEFORE THE
STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PLAN MODIFICATION
FOR THE BADGER ARMY AMMUNITION PLANT LANDFILL, (LIC #3646)

FINDINGS OF FACT

The Department of Natural Resources (Department) finds that:

1. The Badger Army Ammunition Plant (BAAAP) owns and operates a non-hazardous solid waste disposal facility located in the SE ¼ of the NW ¼ and the SW ¼ of the NE ¼ of Section 7, T10N, R7E, Town of Merrimac, Sauk County, Wisconsin.

2. A conditional plan of operational approval was issued by the Department for the Badger Army Ammunition Plant Construction and Demolition Landfill (lic #3646), dated August 3, 2004.

3. A conditional plan of operation approval for the Proposed Contiguous Expansion of the Badger Army Ammunition Plant Construction and Demolition Landfill (Lic # 3646) was issued on May 31, 2011.

4. On August 21, 2012 a plan modification request regarding final closure construction modification was submitted by the Army.

5. The information submitted as a part of the plan modification includes the following:

    a. Twenty seven plan sheets (revised plan sheets from original plan of operation for contiguous expansion).

    b. Surface water design calculations.

6. Additional documents, and conversations and activities considered in the review of this plan modification request include the following:

    a. Addendum to the Plan of Operation Approval for the Proposed Contiguous Expansion of the Badger Army Ammunition Plant Construction and Demolition Landfill (Lic # 3646) issued on July 21, 2011.

    b. Determination of Site Feasibility, Badger Army Ammunition Plant Contiguous Horizontal expansion of construction and demolition Landfill # 3646, Sauk County issued on April 21, 2011.

    c. On February 7, 2011, SpecPro, on behalf of BAAAP, submitted to the Department a proposed plan of operation for the contiguous expansion of the existing landfill. Included in the submittal was a report and appendices entitled "Plan of Operation Report: Contiguous Addition to Landfill 3646, Badger Army Ammunition Plant", and 31 accompanying plan sheets, dated February 7, 2011. This submittal was conditionally approved by the Department on May 31, 2011.

    d. On October 22, 2010, the Department received the document titled "Feasibility Report Contiguous Addition to Landfill 3646 Badger Army Ammunition Plant", dated October 2010 and submitted by SpecPro on behalf of the Army.

7. If the special conditions set forth below are complied with, the proposal will meet the requirements of chs. NR 500-538, Wis. Adm. Code.

8. The $1,650 review fee associated with this Plan Modification was paid on September 19, 2012.

CONCLUSIONS OF LAW

The Department concludes that:

1. The Department has authority under ch. 289, Stats., to modify a plan of operation approval if the modifications would not inhibit compliance with chs. NR 500 to 538, Wis. Adm Code.

2. The Department has authority to approve a plan of operation approval modification with special conditions if the conditions are needed to ensure compliance with chs. NR 500-538, Wis. Adm. Code.

3. The conditions of this approval are needed to ensure compliance with chs. NR 500-538, Wis. Adm. Code.

4. In accordance with the foregoing, the Department has the authority under s. 289.30, Stats., to issue the following conditional plan of operation approval modification.

CONDITIONAL PLAN OF OPERATION APPROVAL

The Department hereby approves the Plan of Operation for the Contiguous Expansion at the BAAAP Landfill subject to compliance with chs. NR 500-538, Wis. Adm. Code, and the following conditions:

General Conditions:

1. The design capacity of this landfill at the projected time of closure will be 830,000 cubic yards. The approved capacity under the Feasibility Determination, and Plan of Operation Approval for the Contiguous Expansion will remain at 1,450,000 cubic yards.

2. Any proposed changes to the plan or this approval shall be submitted to the Department. Written Department approval is necessary prior to implementing any changes with the exception of minor field modifications that are documented in accordance with s. NR 516.04(3)(d), Wis. Adm. Code. All field modifications shall be discussed with the Department prior to implementation. Other changes may be handled as expedited plan modifications under s. NR 514.09, Wis. Adm. Code, as appropriate.

Construction:

3. The landfill owner or operator shall notify the Department's environmental engineer assigned to this site at least one week prior to beginning each of the construction events listed below for the purpose of allowing the Department to inspect the work. A fee shall be paid to the Department for each required inspection in accordance with s. NR 520.04(5), Wis. Adm. Code. The inspection fees shall be paid at the time the construction documentation review fee is submitted to the Department.

   Final Cover Construction Events (for each phase in accordance with NR 516 of Wis. Adm. Code)

   a. Clay placement
   b. Geomembrane placement
   c. Placement of perimeter piping
   d. Completion of the West End Phase Construction
   e. Rooting zone and topsoil placement

Environmental Monitoring:

4. The landfill owner or operator shall perform environmental monitoring during both the active and the post-closure perpetual care periods in accordance with Tables 1 through 4 of the attached summary document.

5. If a preventive action limit (PAL), an alternate concentration limit (ACL) or enforcement standard (ES) is exceeded at groundwater monitoring well # NLN 8201A (DNR ID #252), NLN 8201C (DNR ID #254), NLN 8202A (DNR ID #255), NLN 8202B (DNR ID #256), NLM 0301R (DNR ID #271), NLM 0302R (DNR ID #272), NLM 0401 (DNR ID #296), NLN-0701A (297), NLN-0701C (298), NLM-1001 (299), NLN-1001A (300), or NLN-1001C (301) and the value is confirmed, the landfill owner or operator shall comply with the procedures in s. NR 508.05, Wis. Adm. Code.

6. The Army shall document and submit to the Department the results of environmental monitoring according to s. NR 507.26 (1) and (3), Wis. Adm. Code.

   Note: A signed data certification form must accompany each electronic data submittal

7. The Army shall notify the Department of results indicating that groundwater concentrations have attained or exceeded groundwater standards in accordance with s. NR 507.30, Wis. Adm. Code.

This approval is based on the information available to the Department as of the date of approval. If additional information, project changes or other circumstances indicate a possible need to modify this approval, the Department may ask you to provide further information relating to this activity. Likewise, the Department accepts proposals to modify approvals, as provided for in state statutes and administrative codes.

NOTICE OF APPEAL RIGHTS

If you believe you have a right to challenge this decision made by the Department, you should know that Wisconsin statutes and administrative codes establish time periods and requirements for reviewing Department decisions.

To seek judicial review of the Department's decision, sections 227.52 and 227.53, Stats., establish criteria for filing a petition for judicial review. You have 30 days after the decision is mailed or otherwise served by the Department to file your petition with the appropriate circuit court and serve the petition on the Department. The petition shall name the Department of Natural Resources as the respondent.

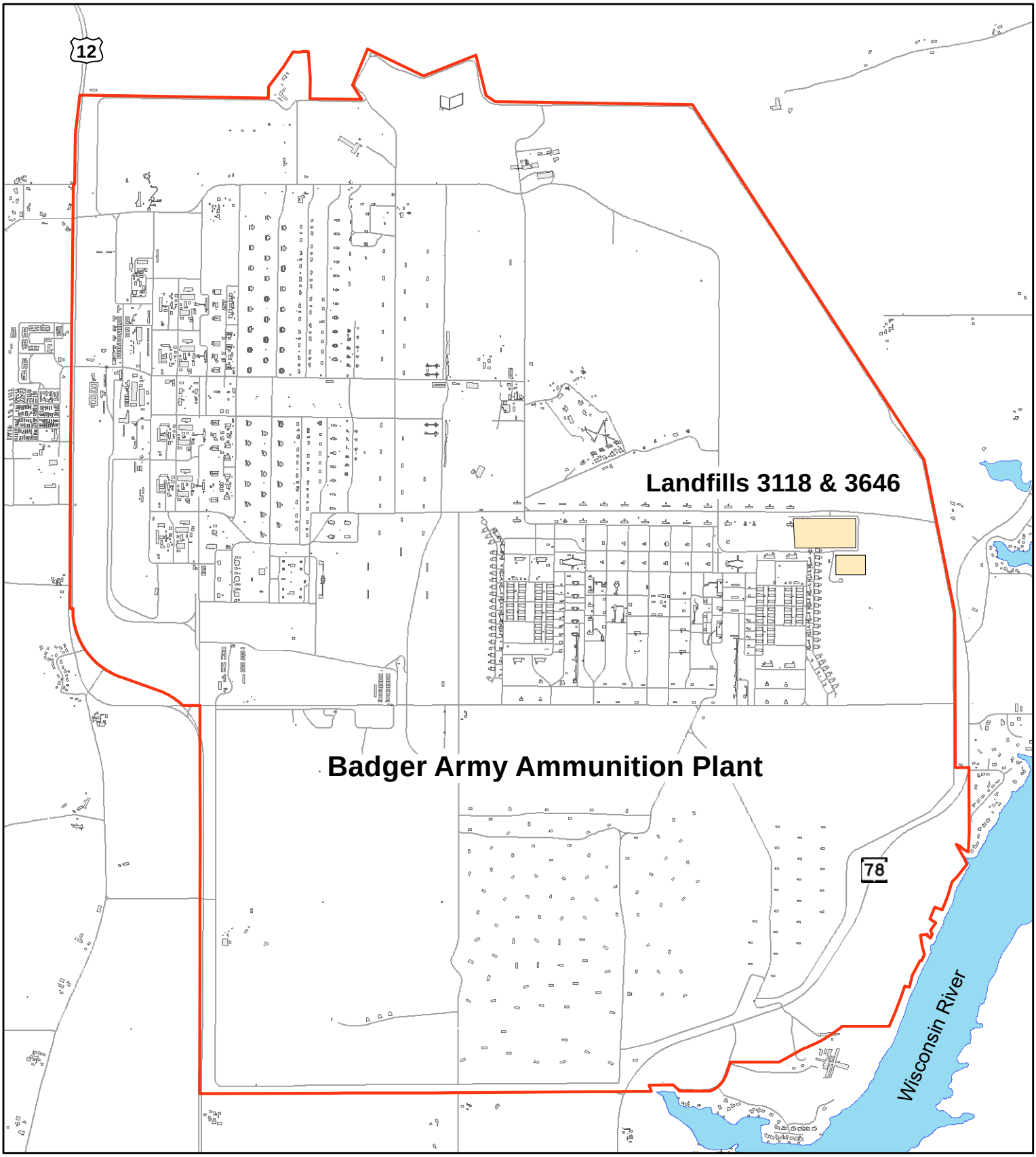
Date: OCT 2 2 2012

DEPARTMENT OF NATURAL RESOURCES
For the Secretary

Dennis Mack, P.E.
Waste Management Team Leader
South Central Region

Tom Bennwitz, P.E.
Waste Management Engineer
South Central Region

Jim Kralick, PG
Waste Management Hydrogeologist
South Central Region



Legend

- Badger Army Ammunition Plant Boundary
- Landfill Limits of Waste
- Roads
- Existing/Former Building Footprint

Figure 1

Site Location Map
Maintenance, Monitoring and LTC Plan
Badger Army Ammunition Plant

1 inch = 2,660 feet

0 2,700 5,400 8,100 Feet

SPS
SPECPRO PROFESSIONAL SERVICES

N

D:\Engineering_GIS\O&M Plan\Fig1_SITE_LOC.mxd

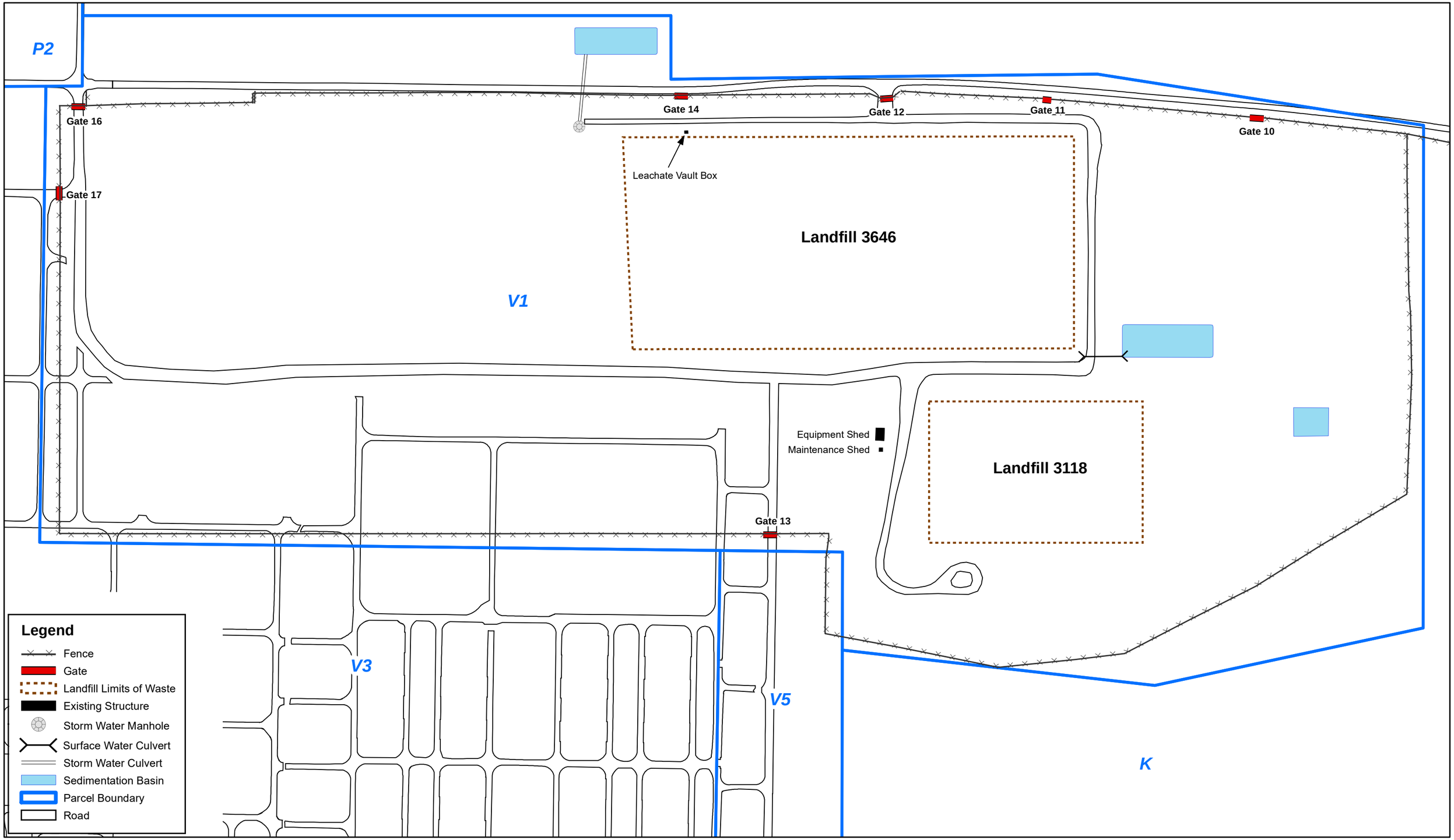


Figure 2
Landfill Area Map
Maintenance, Monitoring and LTC Plan
Badger Army Ammunition Plant

1 inch = 250 feet

0 125 250 500 Feet

D:\Engineering_GIS\O&M Plan\Fig2_LF Area Map.mxd

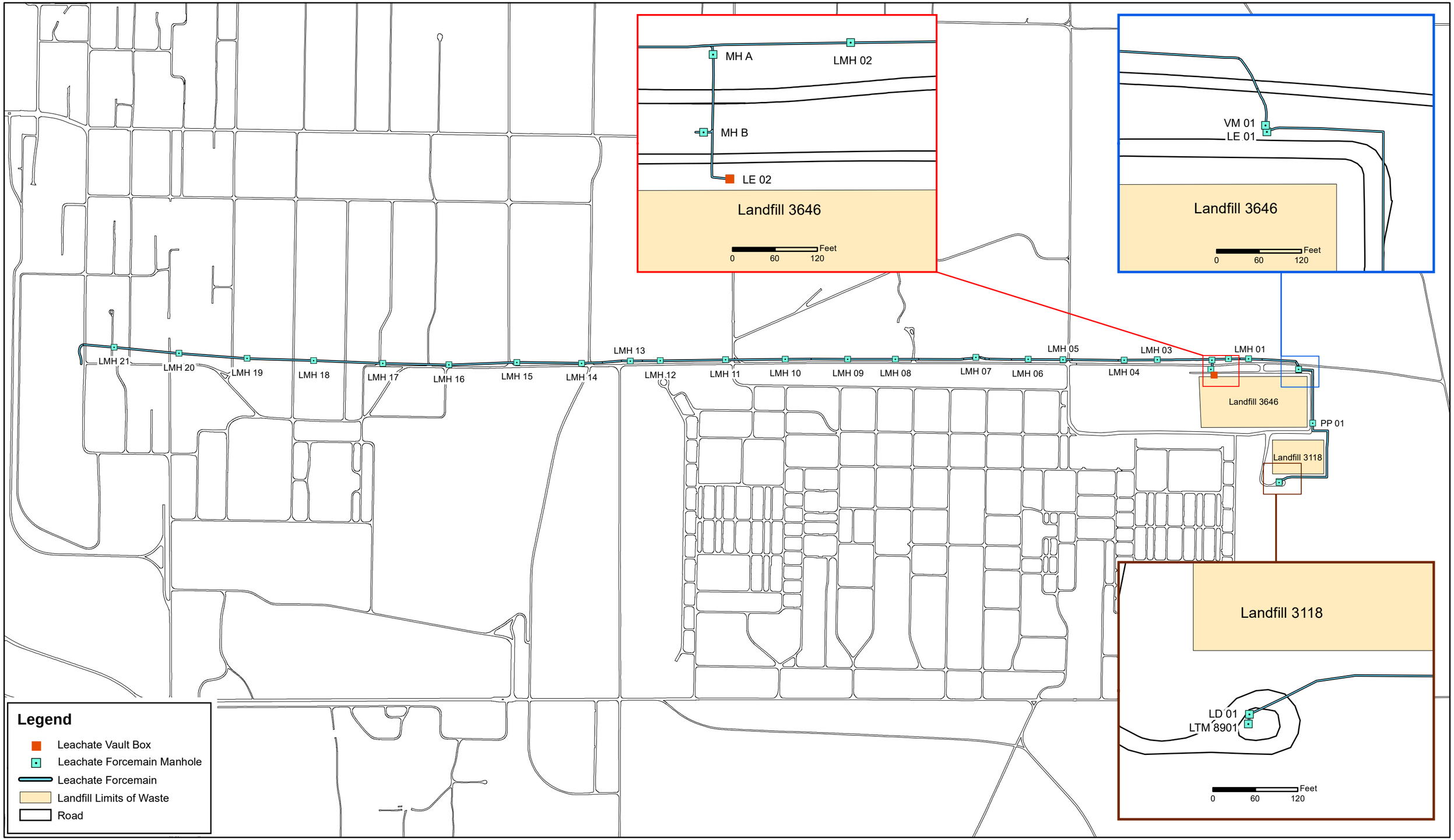


Figure 3
Leachate Forcemain and Manhole Locations
Maintenance, Monitoring and LTC Plan
Badger Army Ammunition Plant

1 inch = 1,042 feet

Feet
0 500 1,000 2,000

D:\Engineering_GIS\O&M Plan\Fig3_Leachate_Loc.mxd

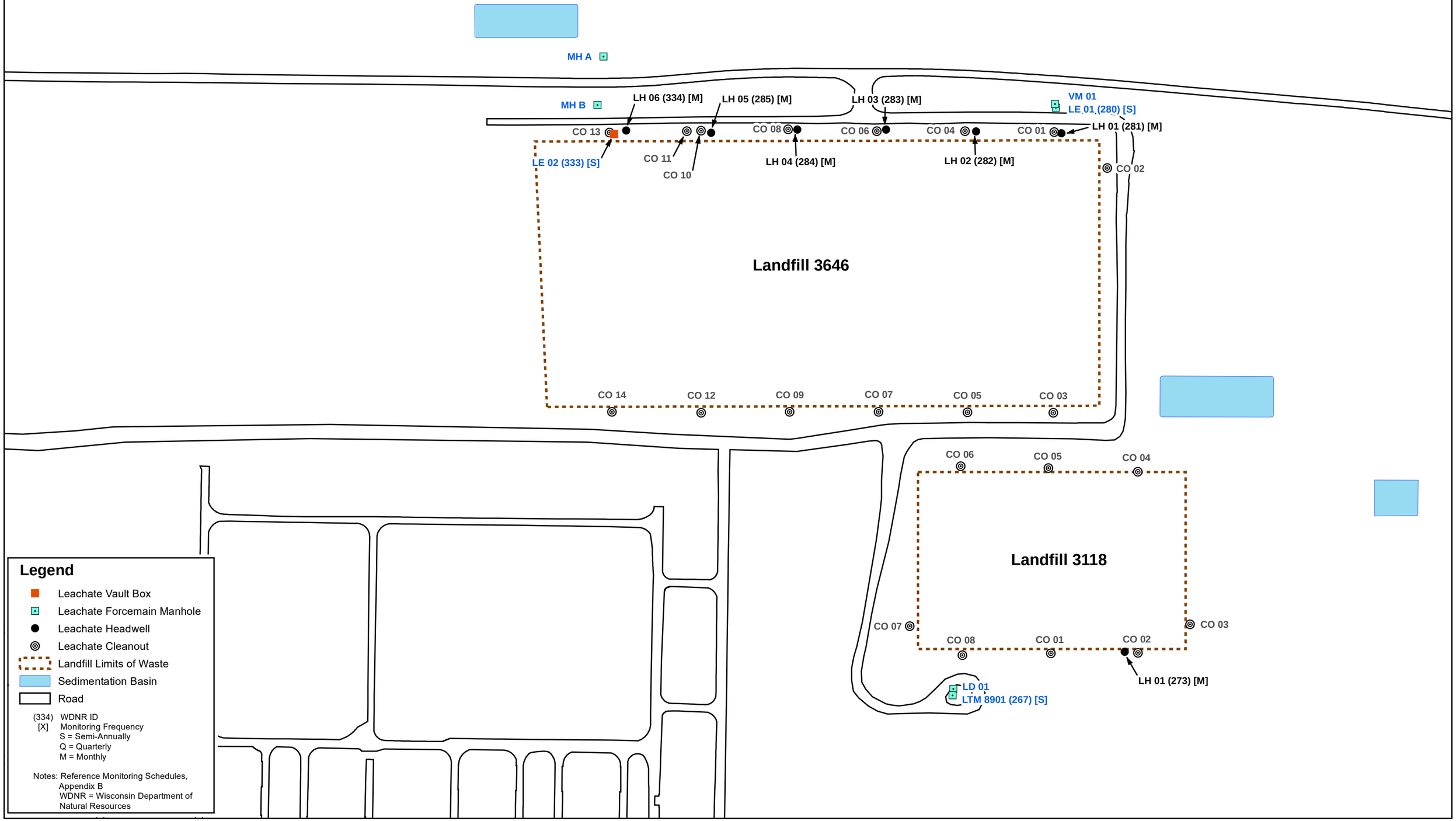


Figure 4
Leachate Environmental Monitoring Locations
Maintenance, Monitoring and LTC Plan
Badger Army Ammunition Plant

1 inch = 200 feet

0 100 200 400 Feet

D:\Engineering_GIS\O&M Plan\Fig4_Leachate_Mon.mxd

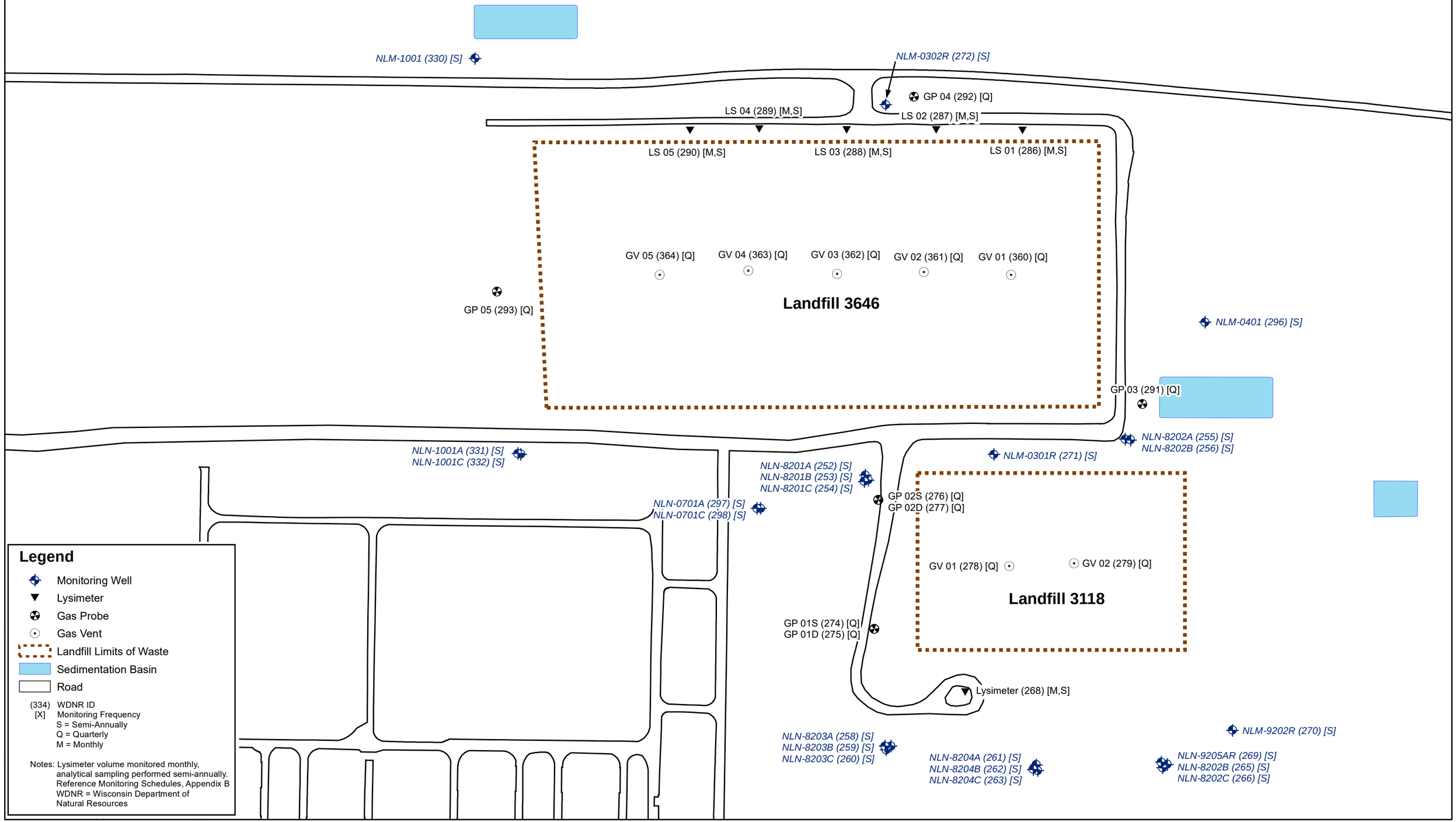


Figure 5
Environmental Monitoring Locations
Maintenance, Monitoring and LTC Plan
Badger Army Ammunition Plant

Appendix G
Laboratory Subcontractor Certifications/Accreditations

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
101 S Webster St
PO Box 7921
Madison, WI 53707-7921

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-266-2621
Fax 608-267-3579
TTY Access via relay - 711

August 12, 2015

FID: 157066030

MS. CHRISTELLE NEWSOME
CT LABORATORIES
1230 LANGE CT.
BARABOO, WI 53913

Dear Ms. Christelle Newsome:

Enclosed is your new Laboratory Certification or Registration certificate. This certificate supersedes all previous certificates.

YOUR CERTIFICATE IS AN IMPORTANT DOCUMENT. PLEASE REVIEW IT CAREFULLY FOR ERRORS AND COMPARE IT TO YOUR PREVIOUS YEAR'S CERTIFICATE. MAKE SURE THAT THIS CERTIFICATE REFLECTS THE TESTS FOR WHICH YOU APPLIED TO BE CERTIFIED. If you believe your certificate contains errors, contact the Laboratory Certification and Registration Program immediately at (608) 267-7633 or by e-mail at DNRLabCert@wisconsin.gov.

Sincerely,

Steven Geis, Chief
Environmental Science Services

State of Wisconsin
Department of Natural Resources

recognizes

Wisconsin Certification under NR 149

of

CT Laboratories

Laboratory Id: **157066030**

as a laboratory licensed to perform environmental sample analysis in support of covered environmental programs (ch. NR149.02 Note) for the parameter(s) specified in the attached Scope of Accreditation.

August 31, 2016

Expiration Date

August 12, 2015

Issued on

Steven Geis, Chief
Environmental Science Services

Cathy Stepp, Secretary
Department of Natural Resources

This certificate does not guarantee validity of data generated, but indicates the methodology, equipment, quality control practices, records, and proficiency of the laboratory have been reviewed and found to satisfy the requirements of ch. NR 149, Wis. Adm. Code.

Scope of Accreditation

CT Laboratories
1230 Lange Ct.
Baraboo, WI 53913

Laboratory Id: **157066030**
Expiration Date: **08/31/16**
Issued Date: **08/12/15**

Wisconsin Certification under NR 149
Matrix: Aqueous (Non-potable Water)

Class: General Chemistry

Alkalinity *by Colorimetry*
Alkalinity *by Titration*
Ammonia as N *by Colorimetry*
Biochemical Oxygen Demand (BOD) *by 5-d Assay*
Bromide *by IC*
Carbonaceous Oxygen Demand (cBOD) *by 5-d Assay*
Chemical Oxygen Demand (COD) *by Colorimetry*
Chloride *by IC*
Chlorophyll *by Colorimetry*
Cyanide, Available *by Colorimetry*
Cyanide, Total *by Colorimetry*
Fluoride *by IC*
Hardness, Total as CaCO3 *by ICP*
Kjeldahl Nitrogen, Total *by Colorimetry*
Nitrate *by IC*
Nitrate + Nitrite *by Colorimetry*
Nitrite *by IC*
Oil&Grease, Hexane Ext. Material (HEM) *by Grav-HEM*
Organic Carbon, Total (TOC) *by Comb-Ox*
Orthophosphate *by IC*
Phenolics, Total *by Colorimetry*
Phosphorus, Total *by Colorimetry*
Residue, Filterable (TDS) *by Grav*
Residue, Nonfilterable (TSS) *by Grav*
Residue, Total *by Grav*
Residue, Volatile (TVS) *by Grav*
Residue, Volatile, Nonfilterable (TVSS) *by Grav*
Silica *by ICP*
Specific Conductance *by ISE*
Sulfate *by IC*
Sulfide *by Titration*
pH *by ISE*

Class: Metals

Aluminum *by ICP*
Antimony *by GFAA*
Antimony *by ICP*
Arsenic *by GFAA*
Arsenic *by ICP*
Barium *by ICP*
Beryllium *by ICP*
Boron *by ICP*
Cadmium *by ICP*
Calcium *by ICP*
Chromium (Hexavalent) *by Colorimetry*
Chromium (Total) *by ICP*

Class: Metals

Cobalt *by ICP*
Copper *by ICP*
Iron *by ICP*
Lead *by GFAA*
Lead *by ICP*
Lithium *by ICP*
Magnesium *by ICP*
Manganese *by ICP*
Mercury *by Hyd-CVAA*
Molybdenum *by ICP*
Nickel *by ICP*
Potassium *by ICP*
Selenium *by GFAA*
Selenium *by ICP*
Silver *by GFAA*
Silver *by ICP*
Sodium *by ICP*
Strontium *by ICP*
Thallium *by GFAA*
Thallium *by ICP*
Tin *by ICP*
Titanium *by ICP*
Vanadium *by ICP*
Zinc *by ICP*

Class: BNA Semivolatiles

SEMIVOLATILES [BNA] (group) *by GC/MS*

Class: PAH - Polynuclear Aromatic Hydrocarbons (BN)

PAH (group) *by GC/MS*
PAH (group) *by HPLC*

Class: Explosives Residue

1,3,5-Trinitrobenzene *by HPLC*
1,3-Dinitrobenzene *by HPLC*
2,4-Dinitrotoluene *by HPLC*
2,6-Dinitrotoluene *by HPLC*
2-Amino-4,6-dinitrotoluene *by HPLC*
2-Nitrotoluene *by HPLC*
3-Nitrotoluene *by HPLC*
4-Amino-2,6-dinitrotoluene *by HPLC*
4-Nitrotoluene *by HPLC*
HMX *by HPLC*
Nitrobenzene *by HPLC*
Nitroglycerin *by HPLC*
RDX *by HPLC*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

CT Laboratories
1230 Lange Ct.
Baraboo, WI 53913

Laboratory Id: **157066030**
Expiration Date: **08/31/16**
Issued Date: **08/12/15**

Wisconsin Certification under NR 149
Matrix: Aqueous (Non-potable Water)

Class: Pesticides, Organochlorine
PESTICIDES, ORGANOCHLORINE (group) *by GC*
Class: Pesticides, Other
1,2-Dibromo-3-chloropropane (DBCP) *by GC*
Class: Petroleum Hydrocarbons
PVOC - Petroleum VOCs *by GC*
Diesel Range Organics (DRO) *by GC*
Gasoline Range Organics (GRO) *by GC*
Class: PCBs as Aroclors
PCB as AROCLORS (group) *by GC*
Class: Volatile Organics
VOLATILE ORGANICS [VOC] (group) *by GC/MS*
Ethylene Glycol *by GC*

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* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

CT Laboratories
1230 Lange Ct.
Baraboo, WI 53913

Laboratory Id: **157066030**
Expiration Date: **08/31/16**
Issued Date: **08/12/15**

Wisconsin Certification under NR 149
Matrix: Potable Water (Drinking Water)

Class: SDWA - Primary Non-metals
Cyanide - EPA 335.4
Fluoride - EPA 300.0
Nitrate - EPA 300.0
Nitrite - EPA 300.0
Class: SDWA - Primary Metals
Antimony - EPA 200.9
Arsenic - EPA 200.9
Barium - EPA 200.7
Beryllium - EPA 200.7
Cadmium - EPA 200.7
Chromium - EPA 200.7
Copper - EPA 200.7
Lead - EPA 200.9
Mercury - EPA 245.1
Nickel - EPA 200.7
Selenium - EPA 200.9
Thallium - EPA 200.9
Class: SDWA - Secondary Non-metals
Sulfate - EPA 300.0
Class: SDWA - Secondary Metals
Sodium - EPA 200.7
Class: SDWA - Trihalomethanes
THM (group) - EPA 524.2
Class: SDWA - Volatile Organics
VOCS, REGULATED (group) - EPA 524.2
VOCS, UNREGULATED (group) - EPA 524.2

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

Scope of Accreditation

CT Laboratories
1230 Lange Ct.
Baraboo, WI 53913

Laboratory Id: **157066030**
Expiration Date: **08/31/16**
Issued Date: **08/12/15**

Wisconsin Certification under NR 149
Matrix: Solid (Waste, Soil & Tissue)

Class: General Chemistry
- Ammonia as N *by Colorimetry*
- Bromide *by IC*
- Chloride *by IC*
- Cyanide, Total *by Colorimetry*
- Fluoride *by IC*
- Kjeldahl Nitrogen, Total *by Colorimetry*
- Nitrate *by IC*
- Nitrite *by IC*
- Organic Carbon, Total (TOC) *by Comb-Ox*
- Orthophosphate *by IC*
- Phenolics, Total *by Colorimetry*
- Phosphorus, Total *by Colorimetry*
- Residue, Total *by Grav*
- Sulfate *by IC*
- Sulfide *by Titration*

Class: Metals
- Aluminum *by ICP*
- Antimony *by GFAA*
- Antimony *by ICP*
- Arsenic *by GFAA*
- Arsenic *by ICP*
- Barium *by ICP*
- Beryllium *by ICP*
- Boron *by ICP*
- Cadmium *by ICP*
- Calcium *by ICP*
- Chromium (Total) *by ICP*
- Cobalt *by ICP*
- Copper *by ICP*
- Iron *by ICP*
- Lead *by GFAA*
- Lead *by ICP*
- Lithium *by ICP*
- Magnesium *by ICP*
- Manganese *by ICP*
- Mercury *by Hyd-CVAA*
- Molybdenum *by ICP*
- Nickel *by ICP*
- Potassium *by ICP*
- Selenium *by GFAA*
- Selenium *by ICP*
- Silver *by GFAA*
- Silver *by ICP*
- Sodium *by ICP*
- Strontium *by ICP*

Class: Metals
- Thallium *by GFAA*
- Thallium *by ICP*
- Tin *by ICP*
- Titanium *by ICP*
- Vanadium *by ICP*
- Zinc *by ICP*

Class: BNA Semivolatiles
- ## SEMIVOLATILES [BNA] (group) *by GC/MS*

Class: PAH - Polynuclear Aromatic Hydrocarbons (BN)
- ## PAH (group) *by HPLC*

Class: Explosives Residue
- 1,3,5-Trinitrobenzene *by HPLC*
- 1,3-Dinitrobenzene *by HPLC*
- 2,4-Dinitrotoluene *by HPLC*
- 2,6-Dinitrotoluene *by HPLC*
- 2-Amino-4,6-dinitrotoluene *by HPLC*
- 2-Nitrotoluene *by HPLC*
- 3-Nitrotoluene *by HPLC*
- 4-Amino-2,6-dinitrotoluene *by HPLC*
- 4-Nitrotoluene *by HPLC*
- HMX *by HPLC*
- Nitrobenzene *by HPLC*
- Nitroglycerin *by HPLC*
- RDX *by HPLC*

Class: Pesticides, Organochlorine
- ## PESTICIDES, ORGANOCHLORINE (group) *by GC*

Class: Petroleum Hydrocarbons
- ## PVOC - Petroleum VOCs *by GC*
- Diesel Range Organics (DRO) *by GC*
- Gasoline Range Organics (GRO) *by GC*

Class: PCBs as Aroclors
- ## PCB as AROCLORS (group) *by GC*

Class: Volatile Organics
- ## VOLATILE ORGANICS [VOC] (group) *by GC/MS*

Class: Waste Characterization Extractions
- SPLP Extraction *by Waste Extractions*
- TCLP Extraction *by Waste Extractions*

Class: Waste Characterization Assays
- Ignitability of Solids *by Waste Assays*
- Ignitability, Pensky-Martens Closed Cup *by Waste Assays*

The laboratory named above is hereby licensed under ch. NR 149, Wis. Adm. Code for the parameters listed in this attachment.
* Analyte groups are defined and listed at http://dnr.wi.gov by searching keywords "Lab Certification:".

American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

CT LABORATORIES

Baraboo, WI

for technical competence in the field of

Environmental Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 4th day of January 2015.

President & CEO
For the Accreditation Council
Certificate Number 3806.01
Valid to April 30, 2016

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CT LABORATORIES
1230 Lange Court
Baraboo, WI, 53913
Christelle Newsome Phone: (608) 356 2760
cnewsome@ctlaboratories.com

ENVIRONMENTAL

Valid To: April 30, 2016 Certificate Number: 3806.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2009 NELAC Standard, and the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality Systems Manual for Environmental Laboratories) accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Misc.- Assay, Electronic Probes (pH, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), IR Spectrometry, Titrimetry, Total Organic Carbon, Turbidity

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Classical Chemistry			
Alkalinity	----------	EPA 310.2	----------
Ammonia (as N)	----------	EPA 350.1 / SM4500-NH3 H	EPA 350.1 / 350.2 / SM4500-NH3 H
Bromide	----------	EPA 300.0 / EPA 9056 / SM4110 B	EPA 9056
Biological Oxygen Demand	----------	SM5210B	SM5210B
Chemical Oxygen Demand	----------	EPA 410.4	EPA 410.4 / SM5220 D
Chloride	----------	EPA 300.0 / EPA 9056 / SM4110 B	EPA 9056
Conductivity	----------	EPA 9050A	----------
Cyanide	----------	EPA 9010 / 9012	EPA 9012
Fluoride	----------	EPA 300.0 / EPA 9056 / SM4110 B	EPA 9056
Hardness	----------	SM2340 B / EPA 6010C	----------
Nitrate + Nitrite	----------	EPA 300.0 / 353.2 / 9056 / SM4110 B	EPA 353.2 / 9056

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8398 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Nitrate (as N)	----------	EPA 300.0 / 353.2 / 9056 / SM4110 B	EPA 353.2 / 9056
Nitrite (as N)	----------	EPA 300.0 / 353.2 / 9056 / SM4110 B	EPA 353.2 / 9056
Nitrogen, Total Kjeldahl	----------	EPA 351.2	----------
Orthophosphate (as P)	----------	EPA 300.0 / 365.1 / 9056 / SM4110 B	EPA 365.1 / 9056
Phosphorus, Total	----------	EPA 365.1 / 365.4	EPA 365.1 / 365.4
Organic Carbon, Total	----------	EPA 415.1 / 9060A	EPA 9060A / Lloyd Kahn / SM5310B
Oil and Grease / HEM	----------	EPA 1664A	EPA 9070A / 9071B
pH	----------	EPA 150.1 / 9040C / SM4500H	EPA 9045D
Phenols	----------	EPA 9066	EPA 9066
Residue, Total	----------	SM2540B	SM2540B
Residue Filterable	----------	SM2540C	SM2540C
Residue Nonfilterable	----------	SM2540D Modified / 160.2	SM2540D Modified / 160.2
Residue Total Volatile	----------	EPA 160.4	SM2540G
Sulfate	----------	EPA 300.0 / 9056 / SM4110 B	EPA 9056
Sulfide	----------	EPA 376.1 / 9034 / SM4500 SE	
Turbidity	----------	EPA 180.1	----------
Metals			
Aluminum	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Antimony	EPA 6010C	EPA 200.7 / 200.9 / 6010 / 7010	EPA 6010C / 7010
Arsenic	EPA 6010C	EPA 200.7 / 200.9 / 6010C / 7010	EPA 6010C / 7010
Barium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Beryllium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Boron	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Cadmium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Calcium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Chromium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Chromium +3	EPA 6010C	EPA 7196A	EPA 7196A
Chromium +6	EPA 6010C	EPA 7196A	EPA 7196A
Cobalt	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Copper	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Iron	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Iron Ferrous	----------	SM3500 Fe B	----------
Lead	EPA 6010C	EPA 200.7 / 200.9 / 6010C / 7010	EPA 6010C / 7010
Lithium	EPA 6010C	EPA 200.7 / EPA 6010C	EPA 6010C
Magnesium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Manganese	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Mercury	EPA 7471B	EPA 245.1 / 7470A	EPA 7471B
Molybdenum	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Nickel	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Potassium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Selenium	EPA 6010C	EPA 200.7 / 200.9 / 6010C / 7010	EPA 6010C / 7010

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Silica	----------	EPA 6010C	EPA 6010C
Silver	EPA 6010C	EPA 200.7 / 200.9 / 6010C / 7010	EPA 6010C / 7010
Sodium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Strontium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Sulfur	----------	EPA 6010C	EPA 6010C
Thallium	EPA 6010C	EPA 200.7 / 200.9 / 6010C / 7010	EPA 6010C / 7010
Tin	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Titanium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Tungsten	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Vanadium	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Zinc	EPA 6010C	EPA 200.7 / 6010C	EPA 6010C
Purgeable Organics (volatiles) Low Level			
1,1,1,2-Tetrachloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,1-Trichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2,2-Tetrachloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2-Trichloro-1,2,2-trifluoroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2-Trichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,3-Trichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,3-Trichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,4-Trichorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,4-Trimethylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dibromo-3-chloropropane (DBCP)	----------	EPA 8260B / 8260C / 8011	EPA 8260C / 8011
1,2-Dibromomethane (EDB)	----------	EPA 8260B / 8260C / 8011	EPA 8260C / 8011
1,2-Dichloro-1,2,2-trifluoroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,3-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,3-Dichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dichloro-2-butene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dioxane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1-Chlorohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2,2-Dichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2,3-Dichloro-1-propene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Butanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Chloroethyl vinyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Chlorotoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
2-Hexanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
4-Chlorotoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
4-Methyl-2-pentanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Acrylein	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Acrylonitrile	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Acetone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Benzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromochloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromodichloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromoform	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Carbon disulfide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Carbon tetrachloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloroform	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
cis-1,2-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
cis-1,3-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Cyclohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Cyclohexanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dibromochloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dibromomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dichlorodifluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dichlorofluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Diisopropyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Ethyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Ethyl benzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Ethyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Hexachlorobutadiene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Hexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Iodomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Isopropylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl iodide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl methacrylate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl tert butyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methylcyclohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methylene chloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
m & p -Xylene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Naphthalene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
n-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
n-Propylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
o-Xylene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Propylene oxide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
p-Isopropyltoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
sec-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Styrene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
tert-Butyl alcohol	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
tert-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Tetrachloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Tetrahydrofuran	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Toluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
trans-1,2-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
trans-1,3-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Trichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Trichlorofluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Vinyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Vinyl chloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Xylenes, total	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Purgeable Organics (volatiles) Medium Level			
1,1,1,2-Tetrachloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,1-Trichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2,2-Tetrachloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2-Trichloro-1,2,2-trifluoroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1,2-Trichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,1-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,3-Trichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,3-Trichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,4-Trichorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2,4-Trimethylbenzene	----------	EPA 8020A / 8260B / 8260C	EPA 8020A / 8260B / 8260C
1,2-Dibromo-3-chloropropane (DBCP)	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dibromomethane (EDB)	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,3,5-Trimethylbenzene	----------	EPA 8020A / 8260B / 8260C	EPA 8020A / 8260B / 8260C
1,2-Dichloro-1,2,2-trifluoroethane	----------	EPA 8260C	EPA 8260C
1,2-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dichloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,2-Dichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,3-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dichloro-2-butene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dichlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1,4-Dioxane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
1-Chlorohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2,2-Dichloropropane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2,3-Dichloro-1-propene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Butanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Chloroethyl vinyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
2-Chlorotoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
2-Hexanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
4-Chlorotoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
4-Methyl-2-pentanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Acetone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Benzene	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C
Bromobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromochloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromodichloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromoform	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Bromomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Carbon disulfide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Carbon tetrachloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chlorobenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloroethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloroform	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Chloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
cis-1,2-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
cis-1,3-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Cyclohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Cyclohexanone	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dibromochloromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dibromomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dichlorodifluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Dichlorofluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Diisopropyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Ethyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Ethyl benzene	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C
Ethyl ether	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Hexachlorobutadiene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Hexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Iodomethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Isopropylbenzene		EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl iodide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl methacrylate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methyl tert butyl ether	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C
Methylcyclohexane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Methylene chloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
m & p -Xylene	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C
Naphthalene	----------	EPA 8020A/8260C	EPA 8020A/8260C
n-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
n-Propylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
o-Xylene	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Propylene oxide	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
p-Isopropyltoluene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
sec-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Styrene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
tert-Butyl alcohol	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
tert-Butylbenzene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Tetrachloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Tetrahydrofuran	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Toluene	----------	EPA 8020A/ 8021B / 8260B / 8260C	EPA 8020A/ 8021B / 8260B / 8260C
trans-1,2-Dichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
trans-1,3-Dichloropropene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Trichloroethene	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Trichlorofluoromethane	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Vinyl acetate	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Vinyl chloride	----------	EPA 8260B / 8260C	EPA 8260B / 8260C
Xylenes, total	----------	EPA 8020A/ 8021B/8260C	EPA 8020A/ 8021B/8260C
Dissolved Gasses			
Carbon Dioxide	----------	RSK 175 / SM4500 CO2 D	----------
Ethane	----------	RSK 175	----------
Ethene	----------	RSK 175	----------
Methane	----------	RSK 175	----------
Extractable Organics (semivolatiles)			
1,2,4,5-Tetrachlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2,4-Trichlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2-Dichlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3-Dichlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dichlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dioxane	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
1-Methylnaphthalene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,3,4,6-Tetrachlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,5-Trichlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,6-Trichlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dichlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dimethylphenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrotoluene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dichlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dinitrotoluene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chloronaphthalene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Ethoxyethanol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methylnaphthalene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methylphenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Naphthylamine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Nitroaniline	----------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
2-Nitrophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
3 & 4-Chlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
3 & 4-Methylphenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
3,3'-Dichlorobenzidine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
3-Nitroaniline	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4,6-Dinitro-2-methylphenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Bromophenyl-phenyl ether	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloro-3-methylphenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloroaniline	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chlorophenyl-phenyl ether	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitroaniline	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitrophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Acenaphthene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Acenaphthylene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Acetophenone	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Alpha Terpineol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Aniline	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Anthracene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Atrazine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Azobenzene & 1,2-Diphenylhydrazene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzaldehyde	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzidine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo(a)anthracene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo(a)pyrene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo(b)fluoranthene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo(g,h,i)perylene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo(k)fluoranthene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzoic acid	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzyl alcohol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Biphenyl	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis(2-chloroethoxy)methane	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis(2-chloroethyl)ether	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis(2-chloroisopropyl)ether	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis(2-ethylhexyl)phthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Butylbenzylphthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Caprolactam	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Carbazole	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Chrysene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dibenzo(a,h)anthracene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dibenzofuran	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diethylphthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dimethylphthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-butylphthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-octylphthalate	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Fluoranthene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Fluorene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Hexachlorobutadiene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorocyclopentadiene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachloroethane	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachloropropene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Indeno(1,2,3-cd)pyrene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Isophorone	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Naphthalene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Nitrobenzene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
n-Nitrosodiethylamine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
n-Nitrosodimethylamine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
n-Nitroso-di-n-propylamine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
n-Nitrosodiphenylamine & Diphenylamine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosopyrrolidine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachlorophenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phenanthrene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phenol	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pyrene	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pyridine	----------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pesticides/PCBs			
Aldrin	EPA 8081B	EPA 8081B	EPA 8081B
alpha-BHC	EPA 8081B	EPA 8081B	EPA 8081B
beta-BHC	EPA 8081B	EPA 8081B	EPA 8081B
delta-BHC	EPA 8081B	EPA 8081B	EPA 8081B
gamma-BHC (Lindane)	EPA 8081B	EPA 8081B	EPA 8081B
alpha-Chlordane	EPA 8081B	EPA 8081B	EPA 8081B
gamma-Chlordane	EPA 8081B	EPA 8081B	EPA 8081B
DDD (4,4)	EPA 8081B	EPA 8081B	EPA 8081B
DDE (4,4)	EPA 8081B	EPA 8081B	EPA 8081B
DDT (4,4)	EPA 8081B	EPA 8081B	EPA 8081B
DDD (2,4)	EPA 8081B	EPA 8081B	EPA 8081B
DDE (2,4)	EPA 8081B	EPA 8081B	EPA 8081B
DDT (2,4)	EPA 8081B	EPA 8081B	EPA 8081B
Dieldrin	EPA 8081B	EPA 8081B	EPA 8081B
Endosulfan I	EPA 8081B	EPA 8081B	EPA 8081B
Endosulfan II	EPA 8081B	EPA 8081B	EPA 8081B
Endosulfan sulfate	EPA 8081B	EPA 8081B	EPA 8081B
Endrin	EPA 8081B	EPA 8081B	EPA 8081B
Endrin aldehyde	EPA 8081B	EPA 8081B	EPA 8081B
Endrin ketone	EPA 8081B	EPA 8081B	EPA 8081B
Heptachlor	EPA 8081B	EPA 8081B	EPA 8081B
Heptachlor Epoxide (beta)	EPA 8081B	EPA 8081B	EPA 8081B
Methoxychlor	EPA 8081B	EPA 8081B	EPA 8081B
Chlordane (technical)	EPA 8081B	EPA 8081B	EPA 8081B
Toxaphene (total)	EPA 8081B	EPA 8081B	EPA 8081B
Aroclor 1016	EPA 8082A	EPA 8082A	EPA 8082A

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Aroclor 1221	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1232	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1242	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1248	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1254	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1260	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1262	EPA 8082A	EPA 8082A	EPA 8082A
Aroclor 1268	EPA 8082A	EPA 8082A	EPA 8082A
Acetochlor	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Alachlor	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Atrazine	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Chlorpyrifos	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Cyanazine	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Desethylatrazine	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Desisopropylatrazine	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Metolachlor	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Metribuzin	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Simazine	----------	EPA 8270C SIM / 8270D SIM	EPA 8270C SIM / 8270D SIM
Low Level PAH			
Acenaphthene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Acenaphthylene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Anthracene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Benzo(a)anthracene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Benzo(b)fluoranthene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Benzo(k)fluoranthene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Benzo(g,h,i)perylene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Benzo(a)pyrene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Chrysene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Dibenz(a,h)anthracene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Fluoranthene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Fluorene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Indeno(1,2,3-cd)pyrene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
1-Methylnaphthalene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
2-Methylnaphthalene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Naphthalene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Phenanthrene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Pyrene	----------	EPA 8310 / 8270C SIM / 8270D SIM	EPA 8310 / 8270C SIM / 8270D SIM
Explosives			
2-Amino-4,6-dinitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
4-Amino-2,6-dinitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
1,3-Dinitrobenzene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
2,3-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
2,4-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
2,5-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
2,6-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
3,4-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
3,5-Dinitrotoluene	----------	EPA 8330A / 8330B / 8270C SIM / 8270D SIM	EPA 8330A / 8330B / 8270C SIM / 8270D SIM
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
Nitrobenzene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
2-Nitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
3-Nitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
4-Nitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
Tetryl (Methyl-2,4,6-trinitrophenylnitramine)	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
1,3,5-Trinitrobenzene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
2,4,6-Trinitrotoluene	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
3,5-Dinitroaniline	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
PETN	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
Nitroguanidine	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
Nitroglycerine	----------	EPA 8330A / 8330B	EPA 8330A / 8330B
Nitrocellulose	----------	ACOE ERDC / EPA 9056M	ACOE ERDC / EPA 9056M
Volatile Fatty Acids			
Acetic acid	----------	EPA 9056M	EPA 9056M
Butyric acid	----------	EPA 9056M	EPA 9056M
Formic acid	----------	EPA 9056M	EPA 9056M
Lactic acid	----------	EPA 9056M	EPA 9056M
Propionic acid	----------	EPA 9056M	EPA 9056M

Parameter/Analyte	Bio Tissue	Nonpotable Water	Solid Hazardous Waste
Pyruvic acid	----------	EPA 9056M	EPA 9056M
Glycols			
Ethylene glycol	----------	EPA 8015B	EPA 8015B
Propylene glycol	----------	EPA 8015B	EPA 8015B
Petroleum Hydrocarbons			
Gas Range Organics (GRO) Diesel Range Organics (DRO)	----------	EPA 8015C EPA 8015C	EPA 8015C EPA 8015C
Wisconsin GRO Wisconsin DRO	----------	WI GRO WI DRO	WI GRO WI DRO
HazardousWaste Characteristics			
Ignatibility	----------	EPA 1010 A	EPA 1010 A
Paint Filter Liquids Test	----------	----------	EPA 9095 B
Reactivity	----------	EPA SW 846 Ch 7	EPA SW 846 Ch 7
Synthetic Precipitation Leaching Procedure (SPLP)	----------	EPA 1312	EPA 1312
Toxicity Characteristic Leaching Procedure (TCLP)	----------	EPA 1311	EPA 1311
Prep & Clean-up Methods			
VOC	----------	EPA 5030B	EPA 5035
Organic Semi-volatiles	----------	EPA 3510C / 3535A / 3620C / 3640A / 3660B / 3665A	EPA 3540C / 3545 / 3545A / 3546 / 3580A 3620C / 3640A / 3660B / 3665A
Metals	----------	EPA 3005A / 3010 ./ 3015 / 3020	EPA 3050B
VOC in Air	Air		
Benzene	NIOSH 1500	----------	----------
Ethyl benzene	NIOSH 1500	----------	----------
Toluene	NIOSH 1500	----------	----------
Xylene	NIOSH 1500	----------	----------

American Association for Laboratory Accreditation

Accredited DoD ELAP Laboratory

A2LA has accredited

CT LABORATORIES

Baraboo, WI

for technical competence in the field of

Environmental Testing

In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 5.0 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

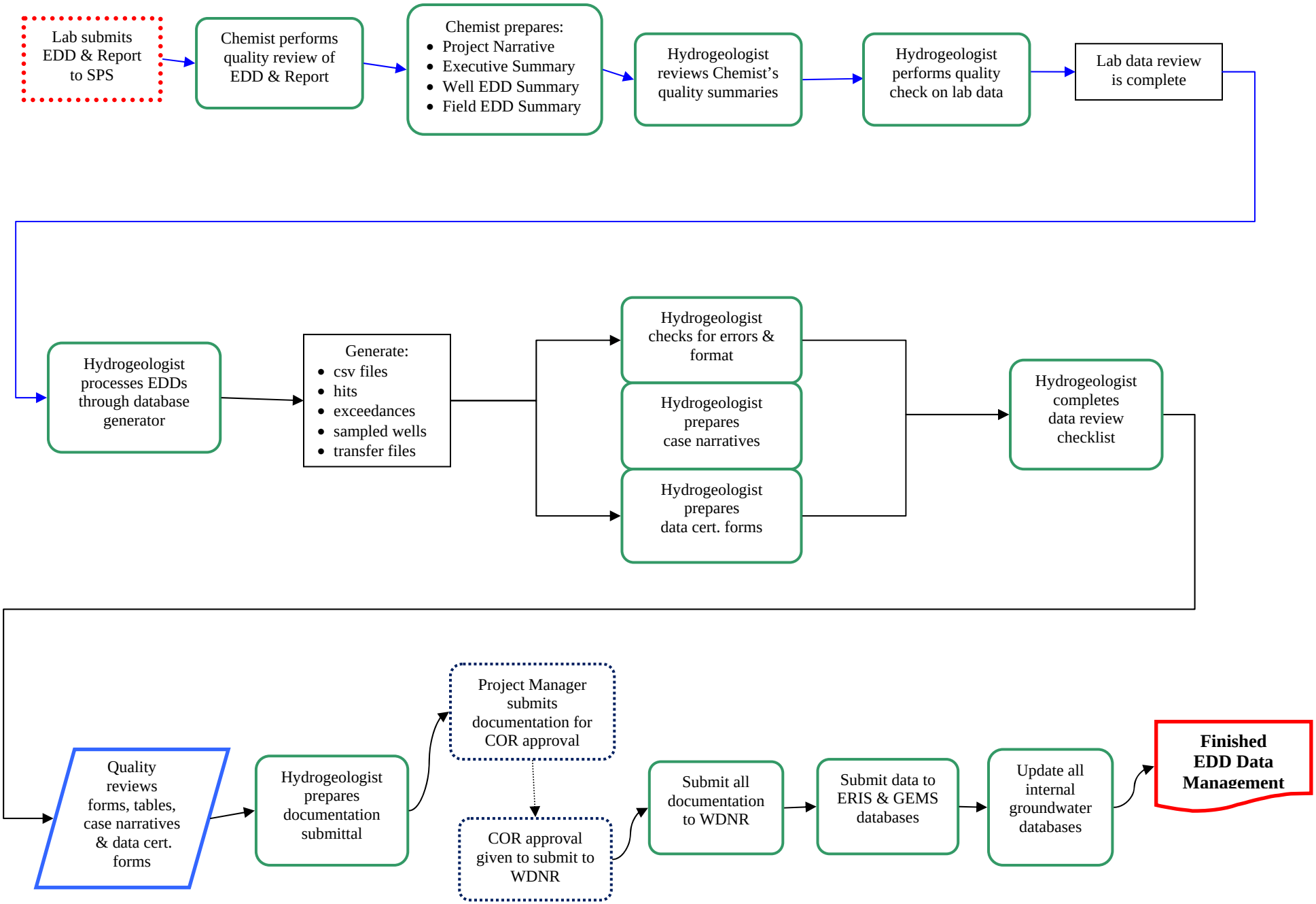
Presented this 23rd day of January 2015.

President & CEO
For the Accreditation Council
Certificate Number 3806.01
Valid to April 30, 2016

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

Appendix H
Laboratory Data Management Process Diagram

Laboratory Data Management Process Diagram



Appendix I
Laboratory Data Quality Review Procedure

1 July 2015

Laboratory Data Quality Review Procedure

The Project Chemist is responsible for reviewing all chemistry related requirements including ensuring applicable validation of the groundwater sample data results. To support the SPS Groundwater Monitoring, MIRM Shutdown and Landfill programs the following reports and spreadsheets will be provided to the SPS Hydrogeologist.

Project Narrative:

A summary of the data's general usability based on review of received COC, 3rd Party lab reports and EDDs. The Project Narrative includes a review for:

- Hold Time exceedances
- Out of Control information, such as receipt temperature
- Noted sample discrepancies
- Completeness Check – All requested tests have been completed and reported
- Accuracy Check
    - Method QC including Blank hits and Spike recoveries
    - Matrix QC including Matrix Spikes and Spike Duplicate recoveries
    - Surrogate recoveries
- Precision Check
    - Relative Percent Differences (RPDs)
        - Sample Duplicates
        - Matrix Spikes and Spike Duplicates
        - Field Duplicates (as needed)
- Trip Blank hits
- Data qualifiers

Executive Summary – Spreadsheet summary of all the hits in a Sample Data Group (SDG) by sample

Exec Summary steps:

- Dilution marker (DL) removed from Sample ID field when appropriate
- "=" flag changed to "D" flag for diluted analytes
- Remove Trip Blank Lines
- Remove Quality Control Lines
- Remove Surrogate Lines
- Remove Dinitrotoluene, total lines
- Remove all columns except SDG, FieldID, Lab Sample ID, Analyte, Result, Detection Limits, Units, Flags and Analysis Method.
- Remove all lines with U flags
- Delete "=" sign in flag fields
- Remove all flags except J or D flags
- Sort by Sample ID
- Format

Well Data EDD Summary – Spreadsheet summary of all EDDs from all SDGs.
EDD Summary steps:

- Dilution marker (DL) removed from Sample ID field when appropriate
- Quality control lines deleted
- Surrogate recovery lines deleted
- Trip Blank lines deleted
- Dinitrotoluene, total analyte name added to appropriate fields
- Copy manipulated EDD to EDD Summary
- Sorted EDD Summary by Sample Description, Well ID, Analysis method

Field EDD Summary – Spreadsheet summary of all Field EDDs from all SDGs.
(Need scans of COC and Pump-sheets)
Create spreadsheet from previous quarter
Daily sampling: COC and Pump-sheet package

- Calculate water level from pump-sheet data and document on pump-sheet
- Field data spreadsheet
    - Add or change Well ID and Well names in FieldID and NativeID columns for all wells (from pump-sheets)
    - Add or change Well ID in sampledescrption column for all wells (from pump-sheets)
    - Enter Field data into excel spreadsheet for the quarter
    - Verify data entry by comparison to pump-sheets
    - Sort by FieldID

Well Issues/Comments – Spreadsheet containing a list of wells with characteristic (odor) and/or maintenance issues identified during sampling and documented on the pump-sheet, sorted by well #.