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WORK PLAN REMEDIATION OF SOLID WASTE MANAGEMENT UNIT 39 (SWMU 39) TCE PLUME MILLINGTON SUPPACT TN
10/01/2011
LEE & RYAN

WORK PLAN

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:

NAVFAC Midwest
Building 1A, 201 Decatur
Great Lakes, IL 60088

Contract Number: N40083-11-D-0028
Task Order Number: 0001

Submitted by:

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October 2011

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Lee & Ryan does hereby certify that, to the best of its knowledge and belief, the technical data delivered herewith under this contract is complete, accurate, and complies with all requirements of the contract.

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Project Name: **Remediation of SWMU 39 TCE Plume**
Project Number: **N40083-11-D-0028 - 0001**

Declaration of Understanding

I have read and understand this Work Plan and agree to abide by the procedures and limitations specified within.

Name	*Signature*	*Employer*	*Date*

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1.0 Introduction

Lee & Ryan Environmental Consulting, Inc. (Lee & Ryan) prepared this Work Plan (WP) for remediation of a Solid Waste Management Unit 39 (SWMU 39) Trichloroethylene (TCE) plumes and degradation compounds located at NSA Mid-South, Millington, TN (see **Figures 1** and **2**). The activities to be performed are part of the tasks required by the Department of Navy under Contract No. N40083-11-D-0028, Task Order Number: 0001. This work is being conducted as part of the U.S. Navy Installation Restoration Program (IRP).

The purpose of this WP is to describe each phase of work and corresponding tasks necessary to complete the scheduled corrective actions for SWMU 39 to achieve the site closure objectives contained within the Task Order (TO) Performance Work Statement (PWS). Below are the performance objectives for this TO.

- Remediate existing TCE plume to achieve allowable Maximum Contaminant Levels (MCLs) for TCE and degradation compounds throughout the plume extent, allowing for site closure without restrictions or land use controls.
- Perform verification groundwater sampling at the completion of the remedial action, no later than 36 months from award date, to document achievement of cleanup standards within the plume. Three supplemental rounds of quarterly effectiveness monitoring will be performed to document long-term achievement of MCLs in groundwater.
- Prepare a report to document the completion of physical work and verification sampling pursuant to RCRA Corrective Action requirements.
- Obtain final approval from NAVFAC and obtain regulatory concurrence from Tennessee Department of Environment and Conservation (TDEC) and the U.S. EPA.
- Develop long term monitoring plan subject to NAVFAC and TDEC review and approval.
- Remove and dispose of a concrete foundation remaining from the demolishing of Building-74.
- Excavate and dispose of chlorinated VOC impacted soil underlying a portion of the Building-74 concrete foundation ; and
- Backfill, grade to maintain drainage, seed area impacted by the removal of the concrete slab and impacted soils.

This WP is comprised of the following sections:

Section 1.0 **Introduction**: this section presents the purpose of the report and the TO performance objectives.

Section 2.0 **Site Conditions:** the purpose of this section is to summarize the Site conditions observed during a site reconnaissance by Lee & Ryan on October 13, 2011. The Site conditions are summarized in the Environmental Conditions Report provided as Submittal No: 5, Transmittal No: 6 submitted to NAVFAC on November 1, 2011.

Section 3.0 **Regulatory Framework**: this section describes the federal regulatory framework within which this remedial action is being conducted.

Section 4.0 **Project Requirements:** this section summarizes the primary remedial activities planned for SWMU 39 required to achieve the performance objectives.

Section 5.0 **TO Schedule and Milestones**: this section describes the task sequence on a time line and milestones for this TO.

Section 6.0 **Pre-Construction Activities**: this section describes the mobilization and site set-up procedures associated with field work activities required to achieve the performance objectives.

Section 7.0 **Site Work**: this section describes the field activities that will be executed to complete the physical work on site including personnel and equipment.

Section 8.0 **Traffic Control Plan**: this section will discuss and graphically display the traffic patterns that will be used by the contractor and subcontractors.

Section 9.0 **Report Requirements**: this section lists the reporting requirements and key submittals required under the TO.

Section 10.0 **Quarterly Monitoring**: this section describes the purpose and general procedures for conducting groundwater sampling from the existing monitoring wells.

Section 11.0 **Long-Term Monitoring**: long-term monitoring is not anticipated under this TO

Section 12.0 **Waste Management**: this section lists each type of waste stream expected throughout the project.

Section 13.0 **Exit Strategy**: this section discusses the procedures for field demobilization and regulatory closure of the site.

Section 14.0 **Project Quality Control**: this section describes the application of the quality control standards for the project.

Section 15.0 **Stormwater Pollution Prevention**: a stormwater pollution prevention (SWPP) plan is not required for this project due to the work area (concrete pad) being less than 1.0 acres. However, this section will describe measures to control erosion, pollutant runoff, and other potential adverse impacts to stormwater.

Section 16.0 **Temporary Environmental Controls**: this section will describe the controls that will be implemented to prevent adverse impacts to natural resources and the surrounding environment.

Section 17.0 **Choice of Technology**: this section will summarize the technology approved for this project.

Section 18.0 **Monitoring Plan**: this section will describe the site monitoring necessary to complete closure requirements within the 42 month TO schedule.

2.0 Site Conditions

The site conditions were observed during a site reconnaissance by representatives of Lee & Ryan, teaming partner TolTest, subcontractor JBL, and NAVFAC representatives on October 13, 2011. The observations were reported with photographic documentation in the *Environmental*

Conditions Report, Submittal No: 5, Transmittal No: 6, submitted to NAVFAC on November 1, 2011.

The subject property, SWMU 39, was noted to be approximately 3.90 acres in size and bordered by Kearsarge Avenue to the west, South Navy Circle to the north, Kittyhawk Avenue to the east, and a working dog training facility (Building S-212) to the south. The property in the immediate vicinity of SWMU 39 appeared to be used for industrial purposes, with apparent green space located east of Kittyhawk Avenue (see **Figure 3** for a Site Layout Map showing the key site features and surrounding land use).

On October 13, 2011, Lee & Ryan observed the SWMU 39 property to include a 1-story building structure (Building S-203) with an adjoining asphalt parking area, a concrete foundation that remains from the demolition of former Building S-74, and the remainder of the property was observed to be maintained grass.

The concrete pad surface was observed to be weathered with cracks and surface indents. Steel rebar was observed protruding out of the concrete footers. Lee & Ryan did not observe a potential environmental concern associated with the concrete pad or the remainder of the Site during the walkover.

3.0 Regulatory Framework

The remedial action for groundwater and soil is being performed under the federal Resource Conservation and Recovery Act (RCRA) of 1976, and the federal Safe Drinking Water Act (SDWA) of 1974.

The performance objective of this project is to remediate the contaminants of concern (COCs) in groundwater and soil to levels defined by the federal statutes above so the Site can be closed without controls or restrictions for future land use. The cleanup goals for these groundwater COCs will be the SDWA MCL's. The action levels for the COCs in each media are defined below.

Groundwater

The COCs in groundwater to be remediated are trichloroethylene (TCE), and the breakdown products, cis-1,2-dichloroethane (cis-1,2-DCE), and vinyl chloride (VC). The COCs and associated MCL's are listed as follows:

- TCE - 5.0 micrograms per liter (µg/L)
- cis-1,2-DCE - 70 µg/L
- Vinyl Chloride - 2.0 µg/L

Soil

Soil sampling and characterization will not be conducted as part of the scope of this WP during the groundwater remediation and closure process. However, soil samples will be collected from the concrete pad at a localized area underlying a section of the pad as defined by EnSafe,

Inc. during a sampling event conducted on October 4-5, 2010. See **Section 8.5** of this report for a discussion of soil removal and disposal.

4.0 Project Requirements

The remedial actions for SWMU 39 will include the following primary tasks:

- Direct-push drilling in north and south plume to spatially characterize VOCs in groundwater (see **Figure 5** showing the north and south plumes).
- Subsurface injection of potassium permanganate ($KMnO_4$) in two chlorinated solvent impacted groundwater plumes.
- Quarterly groundwater monitoring of seven existing wells in the vicinity of the plumes.
- Removal and disposal of a concrete pad remaining from the demolition of Building S-74.
- Excavation and disposal of chlorinated solvent impacted soil underlying one area of the concrete pad as shown in **Figure 4** and associated site restoration.

5.0 Task Order Schedule and Milestones

See attached construction critical path schedule and associated milestones provided as **Appendix A**.

6.0 Pre-Construction Activities

Pre-construction activities will include administrative and field tasks and are summarized below:

6.1 Administrative

- submit payment and performance bond (approved October 4, 2011).
- conduct site reconnaissance (completed October 13, 2011).
- submit certificate of insurance (approved October 21, 2011).
- submit *Environmental Conditions Report* (submitted October 30, 2011).
- submit Work Plan and program documents to NAVFAC.
- secure permits (well application permits, injection permits, dig permits).
- secure identification badges and vehicle passes (Rapid Gate).
- obtain waste disposal permits.

6.2 Field

- meet with stakeholders prior to construction to review permits, logistics, etc.
- locate and mark on-site underground utilities.
- conduct a topographic survey.
- establish laydown area.

- set-up sanitary conveniences.

The administrative and field activities not yet conducted will be discussed below.

6.3 Permit Requirements

The following permits are required prior to implementation of this TO:

- A Well Application Permit (Injection-Shelby County)
- TDEC Injection Permit
- A Well Application Permit (Vertical Profile/Geophysical Survey Wells-Shelby County)
- A Dig Permit (NSA Mid-South)

Lee & Ryan submitted a Well Application Form (injection permit request form) to the Shelby County Health Department, Pollution Control Section, Water Quality Branch, on November 18, 2011. The permit is pending and is required prior to $KMnO_4$ subsurface injections.

A dig permit will be secured from NSA Mid-South prior to any subsurface or demolition activities as required by NAFVAC.

6.4 Identification Badges and Vehicle Passes

Identification badges and vehicle passes will be secured prior to on-site activities using the Rapid Gate system. If a badge or vehicle pass is lost or stolen, it will be reported immediately to the cognizant security officer. Subcontractors will be used during the project and will be escorted to and from the project location from the southeast corner Base gate (see **Figure 2**).

6.5 Underground Utilities

The *Tennessee One-Call System, Inc., the advance notification service to operators of underground facilities in Tennessee, will be contacted prior to* any intrusive activity conducted. Lee & Ryan will utilize existing utility maps for gas, water, sewer, telephone, and electricity in conjunction with the One-Call results to mark the locations of existing utilities.

6.6 Topographic Survey

Lee & Ryan will provide a topographic land survey of the site limits of this project and will set two control monuments. The above ground features will be surveyed and below ground utilities will be located per Tennessee locate service, existing mapping of the site provided by Lee and Ryan and/or NAVFAC, and above ground markers. A plan showing all topographic features surveyed will be provided including 1-foot contours.

A site survey will be conducted prior to and at the completion of field work. A land surveyor, registered in the State of TN, will survey the site features and generate a site survey plan. Lee & Ryan will establish survey control based on the known coordinate system at the Base. Once control is established, the following tasks will be completed.

The limits of the project area will be identified.

- A topographic survey will be generated using ground shots of project area in a grid pattern.
- The topographic features such as existing buildings, concrete pad, above ground utilities, landscape features, roads, sidewalks, storm sewer structures, ditches, monitoring wells, injections wells, and boring locations will be surveyed.
- The topographic and contour information will be included in the Erosion Control Plan. The geospatial data deliverables including Auto-CAD drawings will conform to the current CADD Technology Center Spatial Data Standards (SDS) and will be submitted in AutoCAD 2006 electronic format.

Lee & Ryan will provide an as-built record survey of site limits after construction activities have been completed. This survey will provide 1-foot contour intervals illustrating the proposed site features and local utilities. A drawing indicating the topographic information will also be prepared.

6.7 Laydown Area

The laydown area will be a section of the parking lot of Building S-203 as approved by NAVFAC (see **Figure 3**). The area will be used for staging equipment and supplies. The area will be kept clean, orderly, and secure.

6.8 Sanitary Conveniences

A portable sanitary system will be established on-site and located within the laydown area, prior to the start of field activities. The system will be removed once the direct-push drilling, injection drilling, and concrete pad removal tasks are completed. The system will be properly secluded from public observation and maintained by Lee & Ryan to meet the standards of the NAVFAC Project Manager.

7.0 Site Work

The site work is comprised of six components including the following:

- Conduct quarterly monitoring event – sample seven existing monitoring wells in the network.
- Direct-push subsurface investigation – characterize the concentration and distribution of VOCs in groundwater.
- Geophysical investigation – collect data on the distribution of VOCs in groundwater and corroborate data with analytical data collected from direct-push characterization.
- $KMnO_4$ injection – use the VOC distribution model to place the injection locations to maximize the effectiveness of the $KMnO_4$ treatment.
- Concrete pad removal – demolish and dispose of the concrete pad remaining from demolition of Building S-74.
- Excavate VOC impacted soil – excavate and dispose of VOC impacted soil underlying one area of the concrete pad.

- Import soil and grade site – haul soil on-site and grade site surface.
- Planting and erosion control – a mix of grass seed will be dispersed, fertilized, and watered. Periodic erosion control inspections will be conducted.

This section details the equipment and personnel to be utilized during this project. Personnel assigned to this project may change to efficiently complete the tasks defined in the contract. However, any personnel changes will be with comparable Lee & Ryan personnel. The NAVFAC Project Manager will be notified of any personnel changes for this TO in advance.

The tables below lists the equipment needed for groundwater remediation, demolition, and soil excavation, the personnel named to this project, and a list of subcontractors planned for use.

GROUNDWATER REMEDIATION, DEMOLITION AND SOIL EXCAVATION EQUIPMENT LIST			
Remediation of SWMU 39 TCE Plume, NSA Mid-South, Millington, TN			
Construction	**Drilling/Sampling**	**Health & Safety**	**Site Support**
Excavator- JD 160 36,000 pounds	*Nitrile Gloves*	*Level D Worker Safety Protection*	*Tool Lock Box*
Dozer- JD 650J Crawler Dozer	*Field Books*	*PID Monitoring Device*	*Solid Waste Dumpster*
Compactor/Roller	*Measuring Tape*	*Tyvek® Suits (as necessary)*	*KMnO4 Storage Container*
Skidsteer Uniloader- Bobcat	*Munsell Soil Chart*	*Rubber Boots (as necessary)*	*Geoprobe® Equipment Trailer*
	Laboratory Coolers/COC's	*Sanitary Port-O-Let*	*Camera*
	Ice	*Decontamination Pad*	
	5-gallon Buckets		
	250-gallon Polypropylene Tank		

Table 1: Equipment List

TABLE OF KEY TASK ORDER PERSONNEL		
Remediation of SWMU 39 TCE Plume, NSA Mid-South, Millington, TN		
Personnel	**Title**	**Key Responsibilities**
Scott Randall, LPG, CHMM	**Program Manager**	**Overall management of the program and task order contract, ensuring compliance with all applicable installation, federal, state, local regulations, as well as contract terms and conditions, monitor and control project costs and quality control, assign personnel consistent with contract requirements, and understanding and enforcing RCRA, CWA and SDWA and the state counterparts for this TO.**
Angelo Dattilo, LPG	**Project Manager**	**Direct work associated with the TO according to the approved WP, budget, schedule, CQCP and APP**
Robert Downey, LPG	**Quality Control Manager**	**Develop, maintain, and enforce the QC program.**
Brian Morgan, CHMM	**Project Quality Control Manager**	**Quality control management on site for TO.**
John Lyttle	**Site Superintendent, Site Health and Safety Officer, Competent Person, Environmental Manager**	**Manage and implement this site-specific TO, ensure that the SSHP, EPP and CQCP are enforced on-site**
Jack Moorman, CSP	**Corporate Health and Safety Manager**	**Development, implementation, oversight and enforcement of the APP/SSHP**

Table 2: Task Order Personnel

TABLE OF KEY SUBCONTRACTORS TO LEE & RYAN	
Remediation of SWMU 39 TCE Plume, NSA Mid-South, Millington, TN	
Subcontractor	**Service(s) Provided**
TolTest, Inc. (Lee & Ryan Teaming Partner)	Concrete pad removal/soil excavation and disposal
Vironex, Inc. (A.E. Drilling Services, LLC)	Injection of KMnO4 (Geoproble® services)
JBL Technical Solutions	Engineering Services
ESC Laboratories	Analytical Laboratory Services
EnSafe, Inc.	Quarterly Groundwater Monitoring

Table 3: Key Subcontractors

The site work field activities will be conducted in accordance with the project specifications, Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) 1926, OSHA 29 CFR 1910, United States Environmental Protection Agency (EPA) and the United States Army Corps of Engineers (USACE) EM 385-1-1.

7.1 Direct-Push Investigation

Lee & Ryan will begin the remedial site activities with subsurface drilling and discrete groundwater sampling at eight boring locations within the north and south TCE plumes using a Geoprobe® 8040 unit. However, additional borings may be added as deemed necessary. The proposed boring locations are shown on **Figure 5**.

The purpose of this phase of the remediation is to characterize the vertical and horizontal extents of the TCE and breakdown product contaminant concentrations in groundwater so that $KMnO_4$ injections can be targeted where the highest concentrations of contaminants exist.

The drilling activities will begin at the south plume where two borings will be advanced, and then continue at the north plume where six borings are planned. All eight borings will be advanced to approximately 100 feet below ground surface (BGS), or to the top of a confining laterally continuous clay unit identified in previous investigations at the Base. The clay unit surface represents the bottom of the Cockfield Formation and the top of the Cook Mountain Formation.

Once the borehole is drilled to the targeted depth, a 2-inch diameter polyvinyl chloride (PVC) temporary groundwater monitoring well will be placed in the bottom of the borehole and extends to ground surface. Each 10-foot section of the PVC piping will have a 2-foot, 10-millimeter slotted PVC well screen. The 10-foot sections with 2-foot slotted screens will be placed from the bottom of the borehole to approximately 40 feet BGS or the top of the saturated Cockfield Formation. Ten foot sections of PVC piping will be added to the PVC piping from 40 feet BGS to ground surface. The borehole will be allowed to collapse against the PVC casing as close to ground surface as possible. Any remaining vacant space in the borehole annulus from 40 feet BGS to ground surface will be backfilled with bentonite slurry. From these wells,

geophysical and groundwater data will be collected. See **Figure 6** for a schematic of a typical electrical resistivity sensor well.

The geophysical data will be collected from apparatus that will attach to the outside of the PVC piping across each 10-foot section in saturated soil. The 10-foot sections are expected to range from approximately 40–100 feet BGS. The installation procedure will be discussed in Section 8.3.

Discreet groundwater samples will be collected after the temporary monitoring wells are constructed. A total of six samples from each well will be collected using a bladder pump across each 2-foot screened interval. Each 10-foot section will be sealed off one at a time with an inflatable packer. For example, the first discreet groundwater sample will be collected from 90-100 feet BGS. The packer will be lowered with the bladder to the 90-100 foot interval and the packer inflated with air from the surface to seal off the 10-foot interval. The bladder pump will be used to collect a discreet groundwater sample from 90-100 feet. Once the sample is collected, the packer will be deflated, and the packer and bladder pump will be raised to the 80-90 depth interval for the second sample from that boring. The process is repeated until six groundwater samples are collected from that boring location. A total of 48 groundwater samples will be collected (6 samples x 8 wells = 48 samples), plus quality assurance quality control samples (see the *Uniform Federal Policy* (*UFP) for Quality Assurance Project Plan (QAPP)* that accompanies this WP submittal for a *Field Sampling Plan* which describes the rationale and number of quality control samples to be collected).

Each grab groundwater sample will be collected into three, 40-milliliter (ml) laboratory supplied vials with hydrochloric acid preservative and capped with Teflon® septa for analysis of VOCs using U.S. EPA Method 8260. The U.S. EPA laboratory methods will be derived from U.S. EPA, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition, November 1986.

Once the sample containers are filled, they will be properly labeled in the field and immediately packed in iced coolers for transport with chain-of-custody documentation to ESC Laboratories located in Mt. Juliet, Tennessee. ESC Laboratories is a National Environmental Laboratory Accreditation Program (NELAP) certified laboratory.

7.1.1 Decontamination Pad

A temporary decontamination pad will be constructed in the laydown area and verified to be in working order prior to the start of any site operations. The purpose of the decontamination pad is to provide secondary containment for KMnO4 mixing activities, a place for decontamination of drilling rods and tools, and use as a a temporary storage area for purged groundwater water The equipment for the decontamination area will include the following:

- Temporary decontamination pad and sump
- Clean water supply
- Detergent solution
- Brushes
- One 250-gallon polypropylene tank

- Gravel/pea stone

A construction specification diagram of the decontamination pad is provided in the **Appendix C**, Environmental Protection Plan (EPP), Section F.2.d.

7.2 Geophysical Investigation

The construction of the temporary groundwater monitoring wells will simultaneously include the installation of the geophysical apparatus needed to conduct the survey. Of the eight borings, borehole geophysical electrical resistivity probes will be installed in eight borings (two in north plume and six in south plume). A metal sensor will be placed on the outside of the PVC piping spaced approximately 5-feet apart to cover the entire length of the screened interval. The sensor must be in contact with groundwater. A wire will be connected to each clamp and run to ground surface. The wires however, will be bundled at approximately 2-3 feet above the shallowest clamp for ease of access at the ground surface.

Once the temporary monitoring well with the geophysical apparatus is emplaced, a computer controlled transponder/receiver will be attached to the sensors and Lee & Ryan personnel will download the background readings to a laptop with appropriate software. The data will be analyzed and processed to produce a 3-dimensional model of the aquifer. The analytical data obtained from the discreet sampling event will be used to verify the geophysical results.

The geophysical survey combined with the analytical data will allow the first round of $KMnO_4$ injections to be strategically placed to maximize the remediation of VOCs in the shortest time frame possible. In sum, the geophysical data collected will be used to:

- Evaluate current site conditions (post groundwater sampling),
- Monitor (in real time) the proposed treatment injections, and
- Evaluate the effectiveness of that treatment (post-treatment survey).

The use of this approach will help maintain the critical path schedule by potentially reducing or eliminating a second round of Geoprobe® drilling for characterization and a second round of $KMnO_4$ injections.

The survey would be conducted in three stages in the order below.

1. A borehole electrical resistivity survey (pre-treatment) to establish background conditions.
2. A borehole electrical resistivity survey (during-treatment) to monitor the injection process in real time.
3. A borehole electrical resistivity survey (post-treatment) to evaluate the effectiveness of treatment.

<u>Borehole Electrical Resistivity Survey (Pre-Treatment)</u>

The objective of using the information obtained from the high-resolution survey is to potentially emit or reduce the second round of Geoprobe® groundwater characterization and $KMnO_4$ injections. The objective will be achieved by evaluating the conductivity zones which are likely to have higher contaminant concentrations in conjunction with the analytical data for VOC analysis.

Borehole Electrical Resistivity Survey (During Treatment)

Having established the geophysical survey network, readings will be collected while injecting the $KMnO_4$ to monitor the treatment of the contaminants in real time. The $KMnO_4$ solution has high electrical conductivity properties due to the presence of the potassium ion. This will show up as a change in the electrical properties of the aquifer and will be easily detected by the array of geophysical detection devices (metal clamps).

Borehole Electrical Resistivity Survey (Post-Treatment)

After the analytical data is collected and analyzed from discreet sampling, combined with the first depiction of a 3-dimensional model of the aquifer, a second survey will be conducted simultaneously with the second quarterly groundwater sampling event (1 of 12, 2nd Quarter 2012). After analysis of the groundwater and geophysical data, a determination will be made as to where a second round of Geoprobe® drilling and $KMnO_4$ injections will be necessary.

7.3 Potassium Permanganate ($KMnO_4$) Injections

The remediation of chlorinated solvent impacted groundwater will be conducted by Vironex, based in Bowie, Maryland, via the subsurface injection of $KMnO_4$ in liquid form. The boreholes used for $KMnO_4$ injections will be drilled by A.E. Drilling Services, LLC, based in Greenville, South Carolina, using a Geoprobe® 8040. A.E. Drilling Services, LLC is a licensed water well drilling company in the State of Tennessee (#709).

The first injection event is estimated to be completed in six business days – three per plume. At each plume, Vironex will inject the $KMnO_4$ with 1.75-inch outer diameter, top-down 5-foot injection tool, into an existing injection well (IW), and in two separate boreholes. The IW in the north plume is noted as 16LF, and in the south plume is 2ILF (see **Figure 4**).

The injection zone will span from a depth range of 70-105 feet BGS in all six injection points. Vironex will use a five foot, top down injection tool to target the treatment zones. A total of 1,542 pounds of $KMnO_4$ will be used during the first injection event at a reagent dose/volume of 1% solution, using 3,050 gallons /location. Therefore, the total injection volume will be 18,300 gallons. The injection flow rate, per injection location is expected to be 10 gallons per minute (GPM); however, Vironex will manifold three simultaneous locations (1 IW + 2 boreholes) to achieve a total flow rate of 30 GPM.

Lee & Ryan will provide a water source for the injection event and Vironex will be responsible for the hydrant meter and back flow preventer. Lee & Ryan will provide, provide secure storage, manage unused chemical, and be is responsible for contacting the federal Department of Homeland Security (DHS) as required for chemical storage.

Vironex will demonstrate that the digital flow measuring devices are accurate to within the manufacturer's specifications at project startup. A well head adapter will be used for the existing IWs. Vironex will provide spill control equipment including drop inlet mats, spill kits/shop vacuums, etc. The injection locations (four) will be backfilled per state regulations.

A summary of the $KMnO_4$ mixing and injection standard operating procedures is provided as **Appendix B**.

7.4 Concrete Pad Removal

Building S-74 was constructed in 1943 and operated as NSA Mid-South's dry cleaning facility until operations ceased in 1981. Building S-74 was demolished in 1995 but the building slab was left in-place. The concrete pad will be demolished, and transported off-site and disposed as part of the scope of this project.

The concrete pad is approximately 16,426 square feet in area, two feet thick, and the perimeter is approximately 778 feet in length. Therefore, approximately 1,217 cubic yards of concrete will be excavated, transported, and disposed at the BFI North Shelby Landfill (BFI Landfill), 7107 Old Millington Road, Millington, TN, located approximately five miles west-southwest of the NSA Mid-South Base. The BFI Landfill is approved to be operated by the TDEC as a Class III municipal solid waste facility with permit number DML790000122. The traffic routes are described in **Section 8.0** of this WP.

The concrete will be broken up using an excavator with a jackhammer attachment. An end-loader will be used to transfer and load the concrete into the tri-axle trucks. The concrete will be transported to the BFI North Shelby Landfill. Once the concrete is pad is removed, the exposed ground surface will be graded using a bull dozer.

Subsequently, imported soil and topsoil will be delivered and placed on the graded surface. A dozer will spread and compact the soil. The excavation will be backfilled in 12-inch lifts so that it matches the surrounding grades. Each lift will be compacted to 95% of Proctor. Once the site reaches the correct elevations, approximately 2-inches of topsoil mixture will be applied to the site and a grass seed mixture applied. Straw matting or similar product will be applied to prevent erosion and provide protection while the new cover establishes itself.

The imported soil and topsoil will be analytically tested prior to delivery. The imported soil will be tested for total petroleum hydrocarbon (TPH) gasoline range organics (GRO), and TPH diesel range organics (DRO), using Method by SW-846 method 8015; and the toxicity characteristic leaching procedure (TCLP) for the eight RCRA metals using U.S. EPA Methods 6010B, 7470-7471, VOCs using U.S. EPA Method 8260, and semi-volatile organic compounds (SVOCs) using U.S. EPA Method 8270.

The total volume of imported soil and topsoil will be determined once the concrete pad and impacted soil is entirely removed. It is unclear how deep the concrete footers were constructed in the subsurface, and if the pad is uniformly 2-feet thick, for example.

7.5 Excavation of VOC Impacted Soil

Due to the historical use of Building S-74 as a dry cleaning facility, Building S-74 was designated as SWMU 39 by the NSA Mid-South's Resource Conservation and Recovery Act (RCRA) Corrective Action Program. A RCRA Facility Investigation (RFI) was performed at SWMU 39 in 1998 and 1999, and chlorinated solvents were identified in groundwater and soil at the Site.

Following-up on the results of the RFI, EnSafe, Inc. conducted a further site investigation of the concrete pad and underlying soil on October, 4-5, 2010. The sampling results indicated that soil was impacted with chlorinated solvents underlying the concrete slab in sample 039SHA20 at

the depth range of 0.5 to 1.0, and 3.0 to 3.5 feet BGS as described in the *SWMU 39 Sub-Slab Sampling Tech Memo Report* dated December 10, 2010 (see **Figure 4**).

Based on the findings in the *Technical Memorandum*, soil from location 039SHA20 contained VOC concentrations, specifically, 1,2,4-trimethylbenzene and ethylbenzene that exceed the EPA's Regional Screening Levels (RSLs) for Residential Soil, indicating a potential exposure risk if the slab were removed and the site were reused for residential purposes. Also at this sample location, 1,1,2-trichloroethane, benzene, ethylbenzene, tetrachloroethylene (PCE), toluene, trichloroethylene (TCE), and total xylenes detections were reported above the respective Maximum Contaminant Level for Soil to Groundwater RSLs.

Per the recommendations provided in the *Technical Memorandum* by EnSafe, Inc., Lee & Ryan will excavate an approximate 20-foot square by 5-foot deep volume of soil (4.6 cubic yards or 6.3 tons) in the vicinity of sample location 039SHA20I2 as shown on **Figure 4**. Once the concrete is removed, an approximate 4.6 cubic yards of soil will be excavated, transported, and disposed at the BFI North Shelby Landfill. Confirmatory samples will be taken upon completion of excavation activities for documentation and verification. Confirmatory soil samples will be analyzed for VOCs using EPA Method 5035/8260B and collected with Encore samplers.

If the confirmatory sampling results for any VOC are above the U.S. EPA RSLs for Residential Soil for closure, additional excavation, removal, and confirmatory sampling will be repeated. The site and surrounding area that is disturbed will be restored via grading and vegetating to match the surrounding landscape.

7.6 Project Site Restoration

The project site will be restored upon completion of the concrete pad and impacted soil removal. The site ground surface will first be graded to a smooth surface. Once graded, off-site soil and topsoil will be imported and graded across the disturbed ground surface to allow proper surface water drainage, and prevent ponding of surface water runoff.

As discussed in the EPP, Section K.5., the imported soil and topsoil will be backfilled in 12-inch lifts to match the surrounding grades. Each lift will be compacted to 95% of Proctor. Approximately 2-inches of topsoil mixture will be applied to the site. Straw matting or similar product will be applied to prevent erosion and allow seed to germinate and stabilize the topsoil.

Disturbed areas including temporary haul routes, access points support areas, or ruts or scarring in the soil will be re-graded and covered with imported topsoil and brought to the original condition with proper drainage.

The imported common soil fill and topsoil will meet the same specifications. The topsoil (vegetative layer) will be capable of sustaining plant growth and will be placed and graded to match original conditions.

The soil excavation areas will be seeded after the Site has been regraded. After preparing the topsoil, a seed/mulch/fertilizer mixture will be applied in designated areas. Lee & Ryan will vegetate the graded soil within 24 hours of topsoil placement, and water all seeded areas within 72 hours of placement of seed. Water operations will not flood adjacent areas, erode soil seed, or cause damage to the seeded areas.

Seeding areas will be maintained and watered a minimum of once per week, or as needed, to aid germination and ensure a proper stand of grass. Once vegetation is established, Lee & Ryan will return to the Site and remove the erosion control mechanisms.

During demolition, soil excavation, and site restoration, periodic inspections of the construction site will be conducted to monitor stormwater by a licensed professional engineer licensed in the State of Tennessee, and have an Erosion Prevention and Sediment Control certification. An inspection will be conducted after a rain event of 0.5 inches in a 24-hour period.

8.0 Traffic Control Plan

This traffic control plan describes the logistics necessary for vehicular activity during the remediation of SWMU 39. Once approved by the NAVFAC Project Manager, Lee & Ryan will implement the plan during any time when field activities are being conducted.

The attached **Figure 7** is a regional map of the NSA Mid-South facility showing the job location, the southeast (contractors) gate, surrounding highways, major arteries, and the location of the BFI landfill. **Figure 8** shows the jobsite and the vehicular traffic patterns for tri-axle vehicle and other anticipated vehicle traffic. The types of vehicles expected to operate on-site and/or access the site include, but not limited to, the following:

- Tri-axle dump trucks.
- Heavy equipment such as an excavator, end-loader, a Geoprobe® 8040, and a $KMnO_4$ injection rig.
- Passenger cars used by the prime contractor employees, subcontractors, laborers, federal, state, and local officials, and security.
- Vendor vehicles delivering and/or picking up diesel fuel, construction supplies, overnight packages, wastewater from sanitary stations, and solid waste.
- Service vehicles to identify utility and communication infrastructure.

The traffic control plan also includes the laydown area which is shown on **Figure 9**. The laydown area will be used for staging $KMnO_4$, the $KMnO_4$ injection rig, temporary monitoring well supplies, the Geoprobe® support trailer, the sanitary station, and miscellaneous supplies and materials.

9.0 Report Requirements

This section details the reporting requirements and deliverables for this contract. Upon authorization to commence work after approval of the required submittals, Lee & Ryan will fulfill the document and reporting requirements of the contract. All documents and reports will be submitted to the NAVFAC Project Manager (NAVFAC Project Manager). These reports and deliverables will include the following:

- Quarterly Monitoring Reports.
- Interim Measures Progress Reports.
- Project Progress Reports.
- Monthly Summary Report of Field Tests.

- Meeting Minutes.
- Combined Contractor Production Report/Contractor Quality Control Report.
- Updated Construction Schedule.
- Documentation of Permit Modification for Removal of SWMU.
- Letter of Treatment to the State.
- Final Closure Report.

The annual Interim Measures Progress Report will be submitted each year, summarizing the results of the quarterly monitoring events conducted for that year, until the remedial goal is met.

Meeting minutes of regulatory agency, Navy and/or Activity meetings will be submitted to the NTR within 10 calendar days after each meeting.

Lee & Ryan will review/update the project schedule monthly and provide as an electronic deliverable (email only for this electronic deliverable). The updated schedule will be coordinated with, and approved by the NAVFAC Project Manager.

Navy Installation Restoration Information Solution (NIRIS)

Tabular and spatial data will be uploaded to the Navy Installation Restoration Information Solution (NIRIS) system in accordance with the current NIRIS standard operating procedures (SOPs). All analytical data generated by the laboratory will be reviewed by Lee & Ryan's Project Chemist to ensure the validity of the reported data prior to submittal to NIRIS. The NIRIS data submittals will be coordinated with the Command NIRIS Regional Data Manager (RDM) Robert McGee or Mike Kuhn for inclusion into NIRIS.

Lee & Ryan will submit all relevant environmental tabular data using the NIRIS Electronic Data Deliverable (NEDD) format as outlined in the current NEDD SOP. Lee & Ryan will identify the appropriate NEDD tables to populate and obtain approval from the NAVFAC Project Manager to ensure completeness.

The reports will be delivered as four hard copy and four compact discs in editable Microsoft Word 2007 and editable Auto-CAD 2006 drawings. All plans/reports requiring regulatory and Navy approval will be revised until they are final.

Records Management

Lee & Ryan will submit all documentation in accordance with the Environmental Restoration Recordkeeping Program Manual, Appendix G, NAVFAC Contractor Work Instruction (https://niris.navfac.navy.mil/Document_Management/Knowledge_Base/Sop_Documentation/ER%20Recordkeeping%20Manual.pdf). The documentation will include Administrative Record files, and post-decision files and site files. Copies of all correspondence will be available to the NAVFAC Project Manager.

10.0 Quarterly Monitoring and Reporting

Quarterly monitoring of existing groundwater monitoring wells and reporting is required for groundwater closure. Lee & Ryan will conduct up to 12 quarterly groundwater sampling

events or four per year. The number of events will depend on the analytical results. Three quarterly verification groundwater sampling events will be conducted at the completion of the remedial action (beginning no later than 36 months from the date of award and concluding no later than 42 months following the data of award) to document achievement of cleanup standards within the two plumes.

Following each quarterly sampling event, a quarterly report will be submitted to the NAVFAC Project Manager, and an annual Interim Measures Progress Report will be submitted each year summarizing the quarterly sampling events.

A total of 11 groundwater monitoring wells comprise the network for SWMU 39; however, seven will be sampled on a quarterly basis as required by the contract and include the following wells:

1. 039G02LF
2. 039G03LF
3. 039G04LF
4. 039G10LF
5. 039G12LF
6. 039G13LF
7. 039G22LF

The monitoring wells are shown on **Figure 4**. Historical groundwater analytical data indicates that VOCs have consistently been observed in monitoring wells 039G03LF, 039G04LF, and 039G22LF. The COCs observed in these wells are TCE, cis-1,2-DCE, and vinyl chloride (VC). The most recent sampling event was conducted in February 2011, and the results were summarized in the *2011 Interim Measures Progress Report SWMU 39*, dated October 2011, prepared by EnSafe, Inc. and Spectra Tech, Inc. and submitted to NAVFAC. A summary of the most current groundwater conditions for the three impacted wells as presented in the *2011 Interim Measures Progress Report* are discussed below.

MW 039G03LF

According to the report, MW 039G03LF, located at the north edge of the site, indicates TCE concentrations began to decrease consistently in November 2007 from a concentration of 99 μg/L and have remained at, or below 1 μg/L for the past five quarterly sampling events (February 2010 through February 2011). As is consistent with reductive dechlorination of TCE, cis-1,2-DCE concentrations have increased, peaking at 200 μg/L in the May 2010 sampling event and declining over the last three quarterly events to 160 μg/L in November 2010 and February 2011. Low concentrations of VC (1 μg/L) have been detected during the last four sampling events (May 2010 through February 2011) suggesting cis-1,2 DCE reduction also is occurring.

039G04LF

In MW 039G04LF, located in the south-central part of the site, TCE concentrations have decreased from a high of 320 μg/L in January 2005, to historic lows through 2010 and 2011 monitoring, with 15 μg/L detected in February 2011. Conversely, historic high cis-1,2-DCE

concentrations were detected over the last four sampling events with concentrations ranging between 260 (August 2010) and 350 µg/L (November 2010) — an increase of about 30 percent over the previous four quarters of monitoring (May 2009 through February 2010). VC has been detected in three of the last four sampling events suggesting that cis-1,2-DCE reduction is occurring in the plume in the vicinity of this well.

039G22LF

In MW 039G22LF, located on the northwestern side of the main plume and side gradient relative to MW 039G04LF, TCE concentrations decreased from a maximum of 81 µg/L in January 2005, to less than the method detection limit of 1 µg/L in February 2009. TCE concentrations remained less than the method detection during the four most recent sampling events in 2010/2011. Concentrations of cis-1,2-DCE reached a historical high of 250 µg/L in November 2010 indicating TCE dechlorination conditions are firmly established.

Other MWs associated with the site, some of which are located outside of the treatment area, either have not exhibited TCE or concentrations consistently have remained less than the 5 µg/L MCL.

The groundwater samples will be analyzed for VOCs via U.S. EPA Method 8260. The field parameters pH, oxygen reduction potential (ORP), dissolved oxygen (DO), conductivity and turbidity will be measured at each well for each sampling event. Wells 039G14LF and 039G15LF historically have not been sampled except for water levels. Therefore, during each quarterly sampling event, water levels will be collected from the seven wells listed above, and wells 039G14LF and 039G15LF for a total of nine wells.

Water from well development and sampling will be transferred from the well directly into 5-gallon pales, covered with lids, and temporarily stored on-site on the decontamination pad. When the sampling event is complete, the pales will be driven to the a 500-gallon polypropylene tank located next to the NSA Mid-South, Southside Fire Station for later disposal by personnel at NSA Mid-South.

Groundwater monitoring will be performed by a two-person crew. Groundwater sampling activities will include well sampling, collection of static water levels, management of investigation derived waste (IDW), and coordinating the delivery of samples to ESC Lab Sciences.

11.0 Long-Term Monitoring

There is no long-term monitoring required for this project beyond the 42 month time frame for this TO.

12.0 Waste Management

LEE & RYAN anticipates the following waste streams will be generated during the performance of this project.

- Purged groundwater.
- Disposable Nitrile® gloves.

- Sanitary waste.
- General rubbish.
- Soil.
- Concrete.
- Steel rebar.
- Decontamination pad wastewater.

Purged groundwater will be temporarily staged in 5-gallon pales, on top of the decontamination pad located in the laydown area, and transported to a 500-gallon polypropylene tank located next to the NSA Mid-South, Southside Fire Station. The water in the tank will be managed by NSA Mid-South personnel.

Any solid waste generated such as disposable Nitrile® gloves and general rubbish will be disposed in a temporary receptacle on-site for later disposal at the BFI North Shelby Landfill (BFI Landfill), Millington, an off-site TDEC permitted sanitary landfill.

Sanitary waste will be contained on-site in a temporary storage facility. The waste will be managed by the subcontractor who will deliver and pick-up the temporary facility and waste contained therein.

The soil, concrete, and rebar will be loaded directly on tri-axle dump trucks and transported and disposed at the BFI Landfill. A copy of waste manifests and load tickets will be provided in the contract closeout report.

Lee & Ryan will coordinate with NSA Mid-South personnel regarding disposal of any investigative-derived waste and wastewater generated in accordance with federal, state and local laws, regulations, and instructions. Lee & Ryan will obtain all permits and pay all disposal fees that may be required.

Lee &Ryan will regularly cleanup the job site and keep adjacent properties free from accumulations of waste materials, rubbish, and windblown debris resulting from demolition, excavation, and drilling operations. If waste debris is accidentally dropped on adjacent sidewalks, streets, or parking lots, the debris will be immediately picked up, disposed, and the surface where it landed will be swept clean.

All mixing operations ($KMnO_4$) will be performed on the decontamination pad. In the event of a spill, the decontamination pad will provide secondary containment and a mechanism to permit the recovery of the solution leaks or spills are contained and managed.

13.0 Exit Strategy

Following completion of Site activities, Lee & Ryan will remove equipment, materials and temporary facilities from the site. The remaining temporary erosion and sediment controls will remain until the vegetation is established in the former construction pad area. Any landscaped areas damaged by construction equipment, including re-seeding of grassy areas, and re-planting of trees/shrubs will be repaired by Lee & Ryan.

Traces of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, and stockpiles of excess or waste materials will be removed. Any temporary roads and parking areas will be re-graded to conform to surrounding contours.

Once the NAVFAC Project Manager approves the restoration efforts and the chance of erosion control is negligible, the controls will be removed.

A final inspection will be done to ensure the site has been restored to specification requirements and is in a condition that is satisfactory to all parties. Relevant field documentation, reports, manifests and the final site survey will be submitted as the Final Project Report package. Upon completion of the final inspection the as-built drawings will be provided to the NAVFAC Project Manager.

14.0 Project Quality Control

Project management will be implemented to manage resources, control quality, and ensure the safest and most efficient execution of the project as possible. The Lee & Ryan and TolTest support network will provide guidance and technical advice before and during the execution of site activities.

Members of this staff will be called upon on when needed to assist with the project. Health and Safety personnel will be available on and off-site to ensure the project is safely executed in compliance with applicable laws, regulations, and policies.

See the *UFP QAPP* for this project that accompanies this submittal for specific quality control procedures.

14.1 Project Personnel

This section details the personnel to be utilized during this project and their respective responsibilities.

14.1.1 Project Manager

The Project Manager, Mr. Angelo Dattilo, is the key operational manager of project activities and is responsible for the following:

- Maintaining clear, up-to-date communications with the NSA Mid-South representatives;
- Coordinating resources required to complete the project;
- Monitoring personnel, compliance with regulations, procedures, and contractual requirements;
- Allocating Lee & Ryan resources to individual tasks, including the selection of a Site Superintendent, and/or project personnel;
- Monitoring the project schedule and budget;
- Overseeing site activities and day-to-day management; and
- Overseeing the administrative and support functions for the project.

14.1.2 Site Superintendent/Competent Person

The Site Superintendent, Mr. John Lyttle, is the Competent Person and is responsible for maintaining files for task execution, site safety oversight, inspections, and project performance. Mr. Lyttle's responsibilities will include but are not limited to the following:

- Conduct daily tailgate safety meetings to disseminate information to project personnel necessary to accomplish each day's activities;
- Monitor all activities by project personnel to include subcontractors and document all site progress;
- Review operation plans;
- Provide on-site decision making to perform all operational tasks according to specifications;
- Provide administrative support, supervision, and management of all contractor; and subcontractor personnel, equipment, and materials.
- Submit daily progress reports.

During this project, the Site Superintendent will serve as the OSHA competent person as per 29 CFR 1926.32(f). Responsibilities of the competent person include, but are not limited to the following:

- setting up the designated work area;
- ensuring work integrity;
- establishing fall protection;
- ensure safe excavation;
- ensuring adherence to regulatory procedures;
- conducting daily safety meetings; and
- performing equipment inspections.

14.1.3 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) is Mr. John Lyttle and is responsible for implementing the Accident Prevention Plan (APP), provide site safety oversight, conduct safety inspections, and overall project performance. Mr. Lyttle's responsibilities will include, but are not limited to the following:

- implement the Site-Specific Health and Safety Plan (SS HASP) in the field;
- maintain Lee & Ryan Corporate and SS health and safety documentation;
- conduct daily Tool Box training prior to project start-up;
- inspect materials and equipment received and stored on-site to ensure safety compliance;
- inspect onsite safety and health equipment to ensure proper operation and accuracy;
- issue and make available personal protection equipment (PPE); and troubleshoot field health and safety issues and provide feedback and suggestions to the Lee & Ryan Project Manager, and the NAVFAC Project Manager.

14.1.4 Quality Control Manager

As Quality Control (QC) Manager, Mr. Brian Morgan will be responsible for the implementation and adherence to the Lee & Ryan Corporate QC Program and ensuring the project performance conforms to the applicable project specifications and drawings provided in the solicitation. In addition, Mr. Morgan will perform the following key tasks:

- implement 3 Phase Control to include preparatory, initial, and follow up inspections;
- document quality control and quality assurance activities; and
- inspect materials and equipment received on-site to ensure compliance with contract requirements.
- support the SSHO.

14.1.5 Technical Support

Technical support will be given to the Lee & Ryan Project Manager on an as-needed basis. This team provides review and support for issues concerning reporting, regulatory requirements, safety, and quality control. This team includes chemists, scientists, engineers, and experienced craftsmen as necessary

15.0 Stormwater Pollution Prevention

A stormwater pollution prevention plan (SWPPP) is not required for this project since the concrete pad area is less than one acre. However, a Demolition Plan (DP) and an Erosion Control Plan (ECP) will be prepared and submitted under separate cover once the initial topographic survey is completed.

Lee & Ryan will prepare the necessary civil engineering plans needed for disturbing the area associated with this project required by the DP and ECP. Using a topographic and boundary survey plan of the site, the DP and ECP will be submitted.

The ECP will be based on the outline below.

A. Incorporate existing topography and contour information to determine drainage patterns on site

B. Identify name of receiving waters

C. Identify wetlands and/or other surface waters

D. Identify site features and sensitive areas to be protected

E. Identify erosion and sediment control best management practices

    1. Temporary stabilization practices
    2. Permanent stabilization practices
    3. Temporary structural practices
    4. Materials management

F. Identify permanent stormwater best management practices

1. Stormwater management
2. Velocity dissipation
3. Post construction operation and maintenance

G. Identify potential sources of pollution

H. Develop sequencing of erosion control measures installation and construction on site

I. Incorporate erosion control notes

J. Incorporate erosion control details

K. Utilize the Required Forms During Stormwater Inspections

1. Construction Storm Water Inspectiontg Report

16.0 Temporary Environmental Controls

The natural resources within the project boundaries and outside the limits of permanent work will be protected using temporary environmental controls such as covering stormwater inlets with fabric, and the use of silt fencing, straw bales, and/or coconut logs were necessary. Other controls needed for the potential to generate dust and excessive noise is discussed in this section.

The natural resources will restored to an equivalent or improved condition upon completion of the project if adversely impacted as determined by the NAVFAC Project Manager. The activities for this project will be confined to within the limits of the work specified in the Contract TO.

Dust Control

Dust will be maintained at all times during working and non-working periods. Vehicle traffic will be kept at a minimum in areas where dust could be generated. If dust requires control, Lee & Ryan will sprinkle with water and/or treat with a dust suppressant. Dry power brooming will not be conducted; rather vacuuming, wet mopping, wet sweeping, or wet power brooming methods will be implemented.

Noise

Lee & Ryan will minimize the activities that could cause excessive noise including drilling, injecting, demolishing concrete, soil excavation, and operating vehicles. The site work will be conducted during normal work hours. The Site Superintendent will work with the SSHO and NAVFAC Project Manager to implement noise mitigation strategies.

17.0 Choice of Technology

Lee & Ryan considered a range of technologies to remediate VOC impacted groundwater and the injection of $KMnO_4$ was selected for this contract. However, other remedial options were considered and listed below.

1) pump and treat (P&T);

2) air sparge (AS) with soil vapor extraction (SVE);

3) the combination of 1) and 2);

4) continuation of reductive dechlorination;

5) monitored natural attenuation (MNA); and

6) in-situ injection of chemical oxidant (ISCO) with several potential different chemicals.

The project requires the complete remediation of COCs in groundwater to below Federal MCLs within 36 months, followed by verification sampling in three consecutive quarters or within 42 months or less from the time of the reward.

The groundwater impacts are in a highly permeable, sandy, water-bearing unit at a depth range of approximately 50 to 100 feet BGS. The desired timeframe for remediation, the physical setting, the lack of additional physical information regarding the impacted zone (i.e. pilot testing of some of the above listed technologies), and the required remediation end point were key factors that affected the selected remedial alternative. For these reasons ISCO was selected as the remedial technology for SWMU 39 that will achieve the performance objectives within the required timeframe of 36 months.

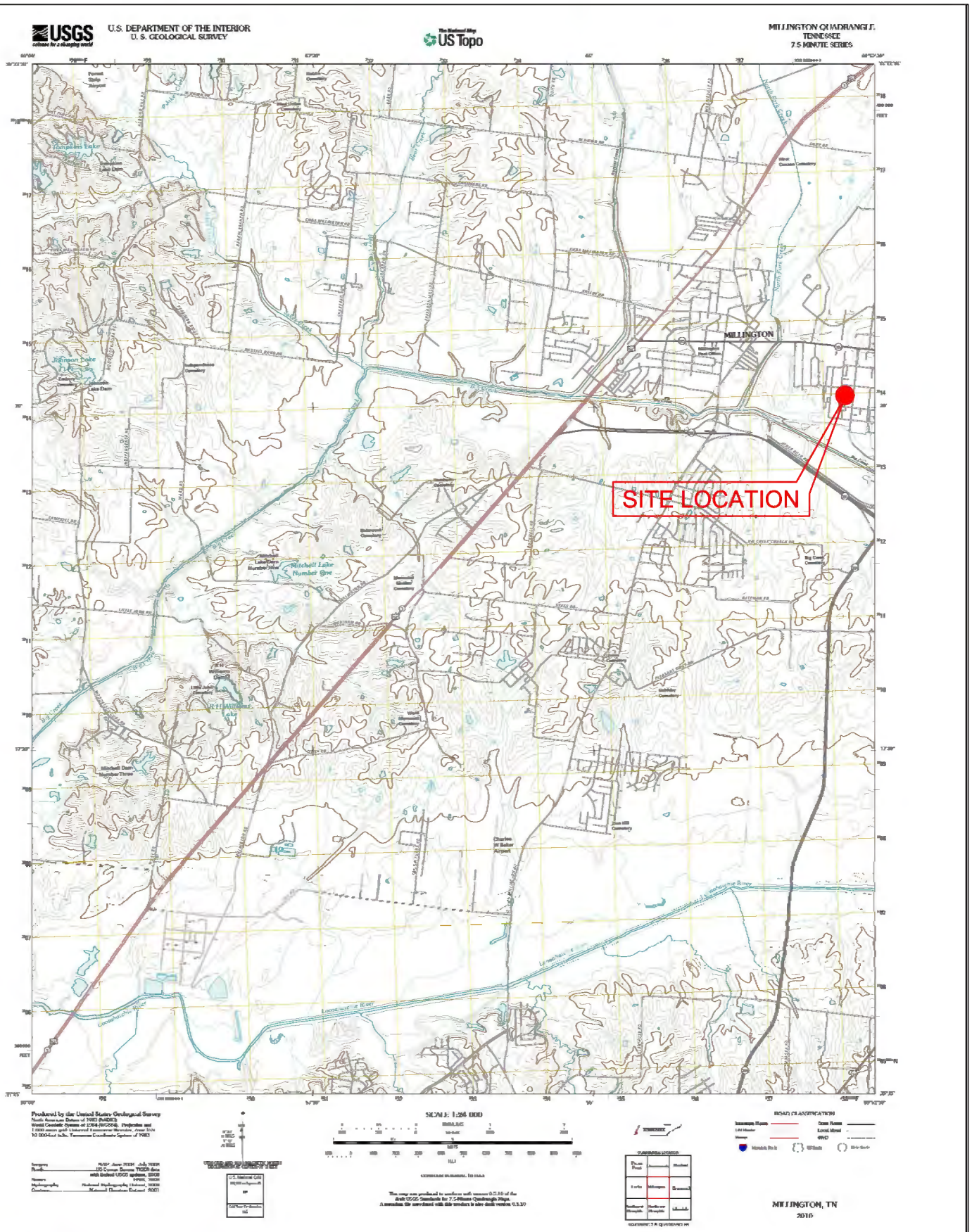
Potassium permanganate was the chosen oxidant for this site based on expected concentrations of VOC degradation compounds, the nature of the groundwater bearing unit in which the impacts exist, and the demonstrated effectiveness of the $KMnO_4$ at similar sites Lee & Ryan has successfully remediated.

18.0 Monitoring Plan

The monitoring plan for remediation of groundwater mainly consists of quarterly groundwater sampling and analysis, geophysical data analysis, erosion control monitoring during and after demolition and excavation, and monitoring of the planted grass seed after re-grading. No other monitoring is required for this contract.

FIGURES

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054



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Scale : Not To Scale

Site Vicinity Map

SWMU 39
NSA Mid-South
Millington, TN

Date: 10/25/11

Project # 11259

Figure 1

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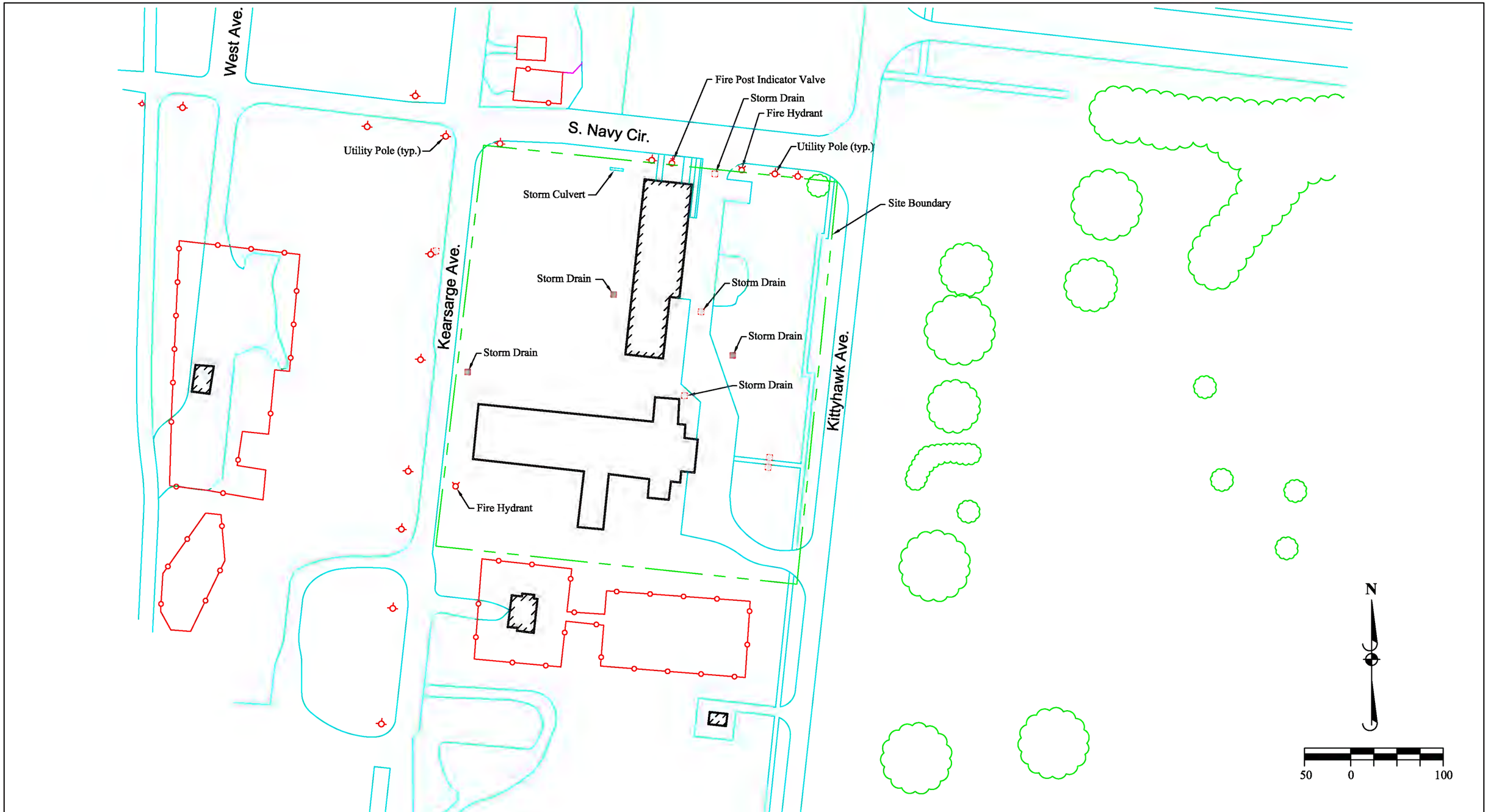
NSA Mid-South Base Map
SWMU 39
NSA Mid-South
Millington, TN

Date: 10/25/11

Project # 11259

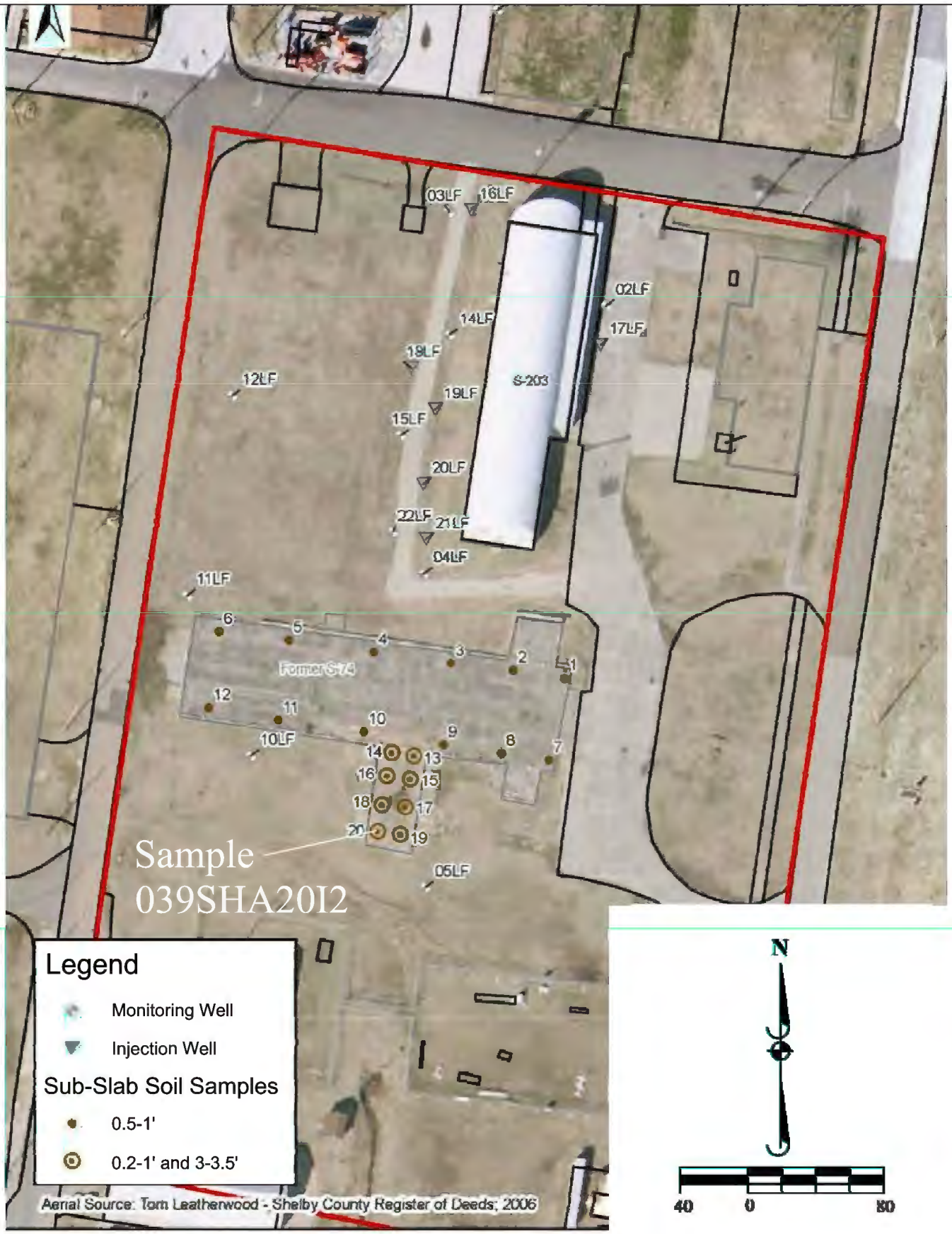
Figure 2

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 2 - Base Map.dwg, 11/16/2011 4:18:10 PM, Adobe PDF.pc3



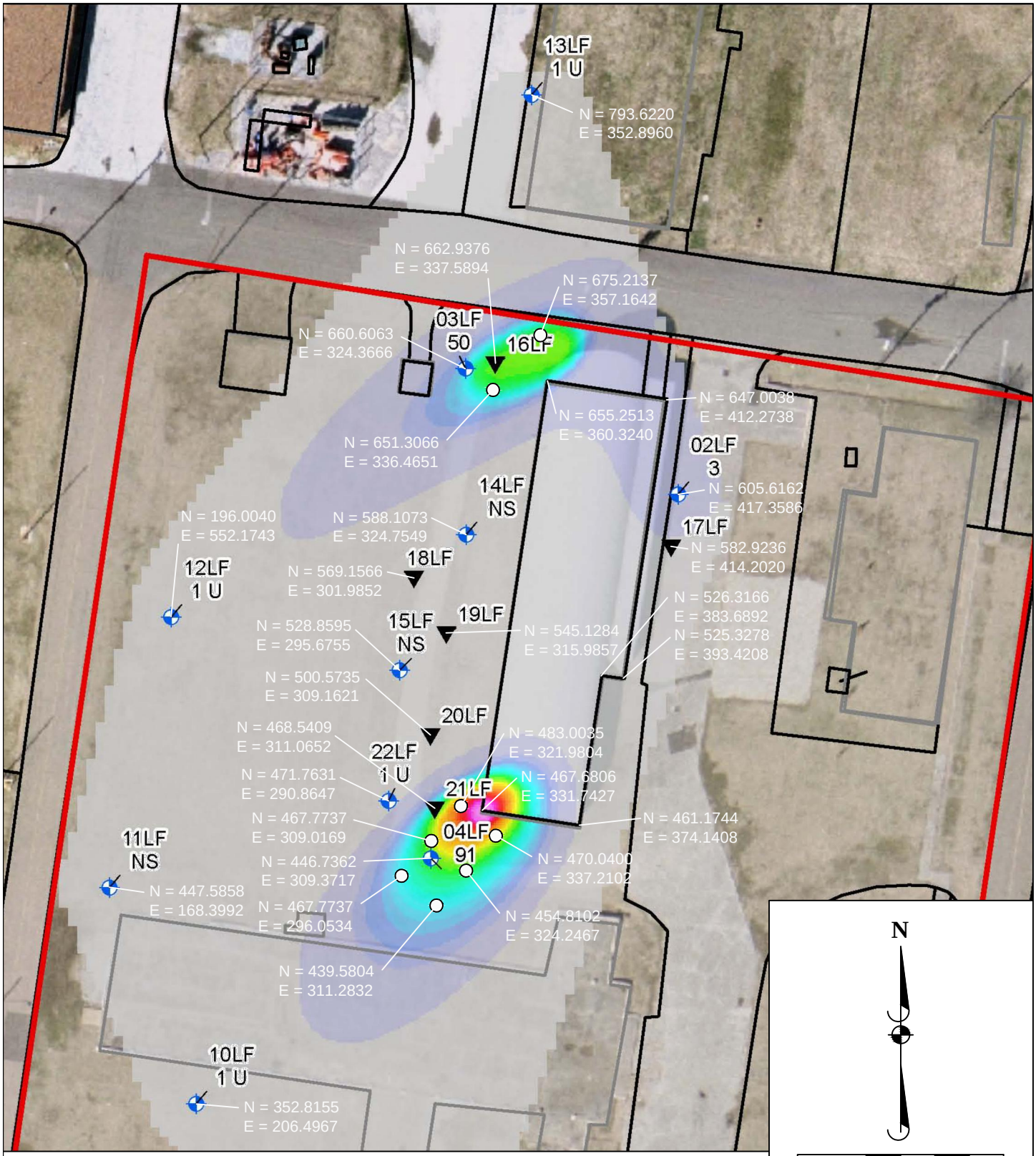
LEGEND		Symbols and Abbreviations:	LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	SWMU 39 Site Layout Map	SWMU 39 NSA Mid-South Millington, TN	Figure 3
Drawn By: CW						
Checked By: AD						
Date Drawn: 10/25/11	Revised: -				Scale : 1" = 100'	Project # 11259

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 3 - Location Map.dwg, 10/31/2011 2:19:56 PM, Adobe PDF.pc3



LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	**Concrete Sub-Slab Soil Samples Map** SWMU 39 NSA Mid-South Millington, TN	Date: 11/15/11
		Project # 11259
Scale : 1"=80'		**Figure 4**

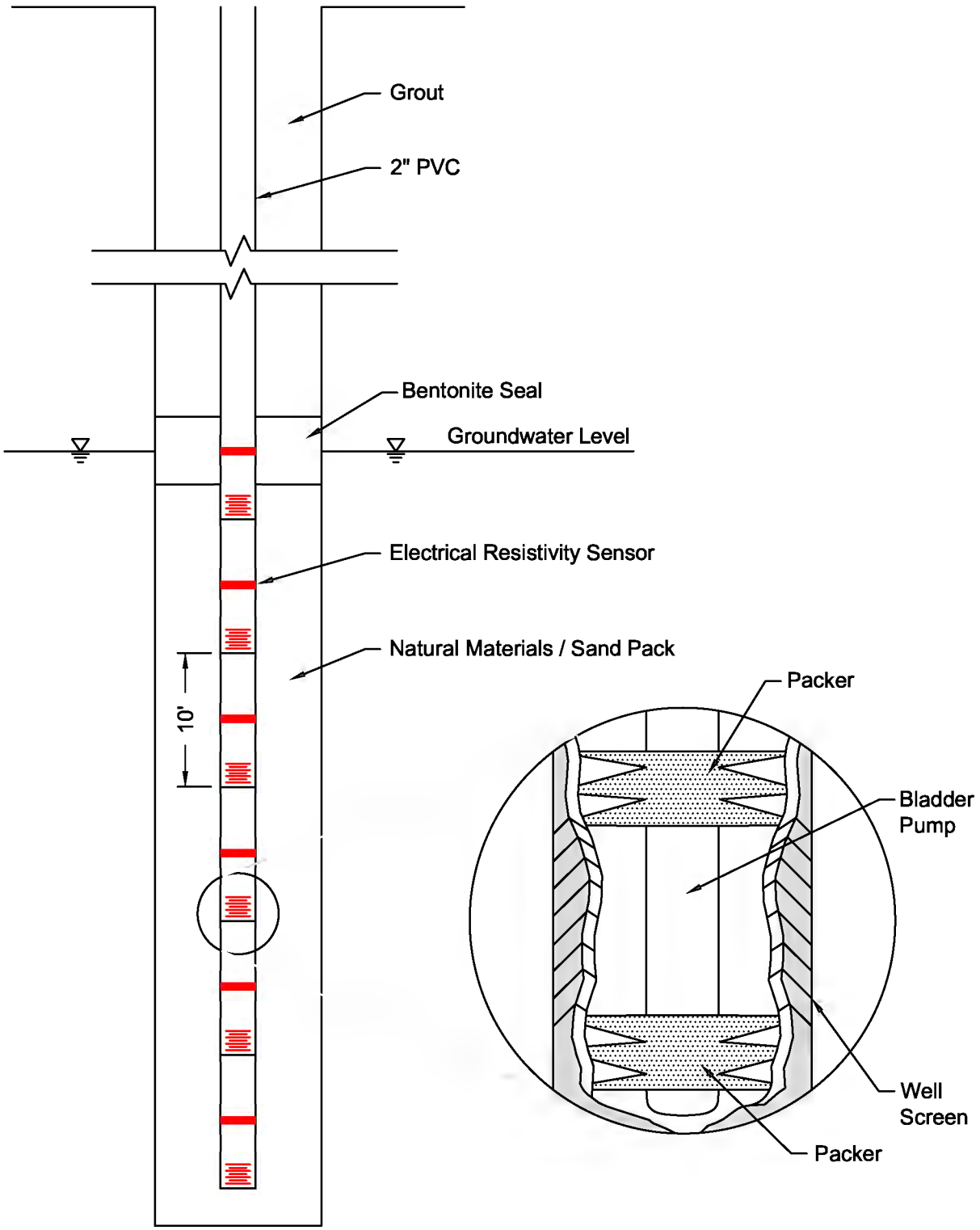
M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 4 - Slab sampling Map.dwg, 11/17/2011 9:23:36 AM, Adobe PDF.pc3



Legend

○ = Assessment Well ▼ = Injection Well ⊕ = Monitoring Well

LEE & RYAN ENVIRONMENTAL • CONSTRUCTION • ENGINEERING	LEGEND		Proposed Sampling Locations
	Project # 11259		
SWMU 39 NSA Mid-South Millington, TN	Drawn By: CW	Checked By: LC	
	Date Drawn: 11/22/11	Revised: -	**Figure 5**



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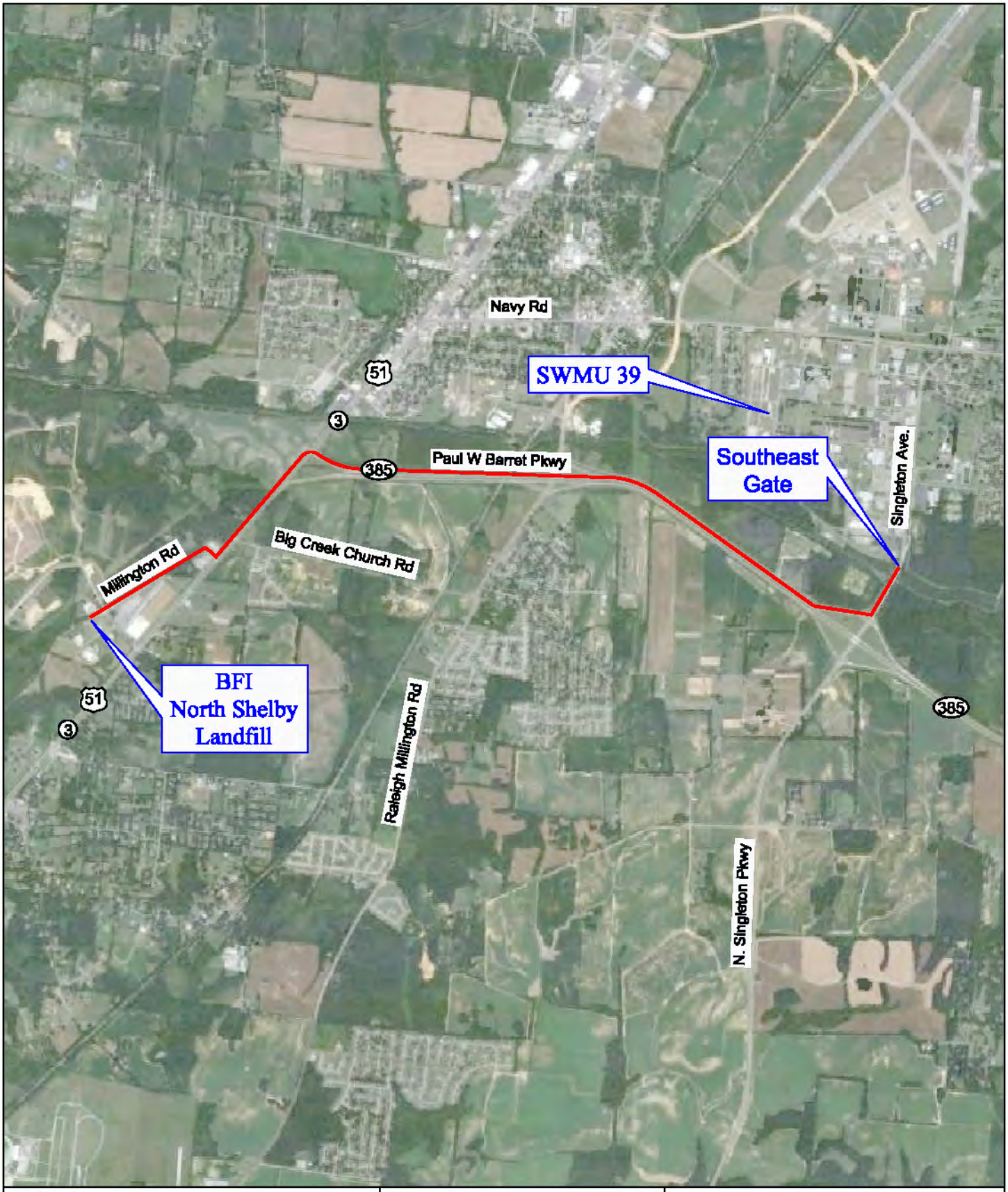
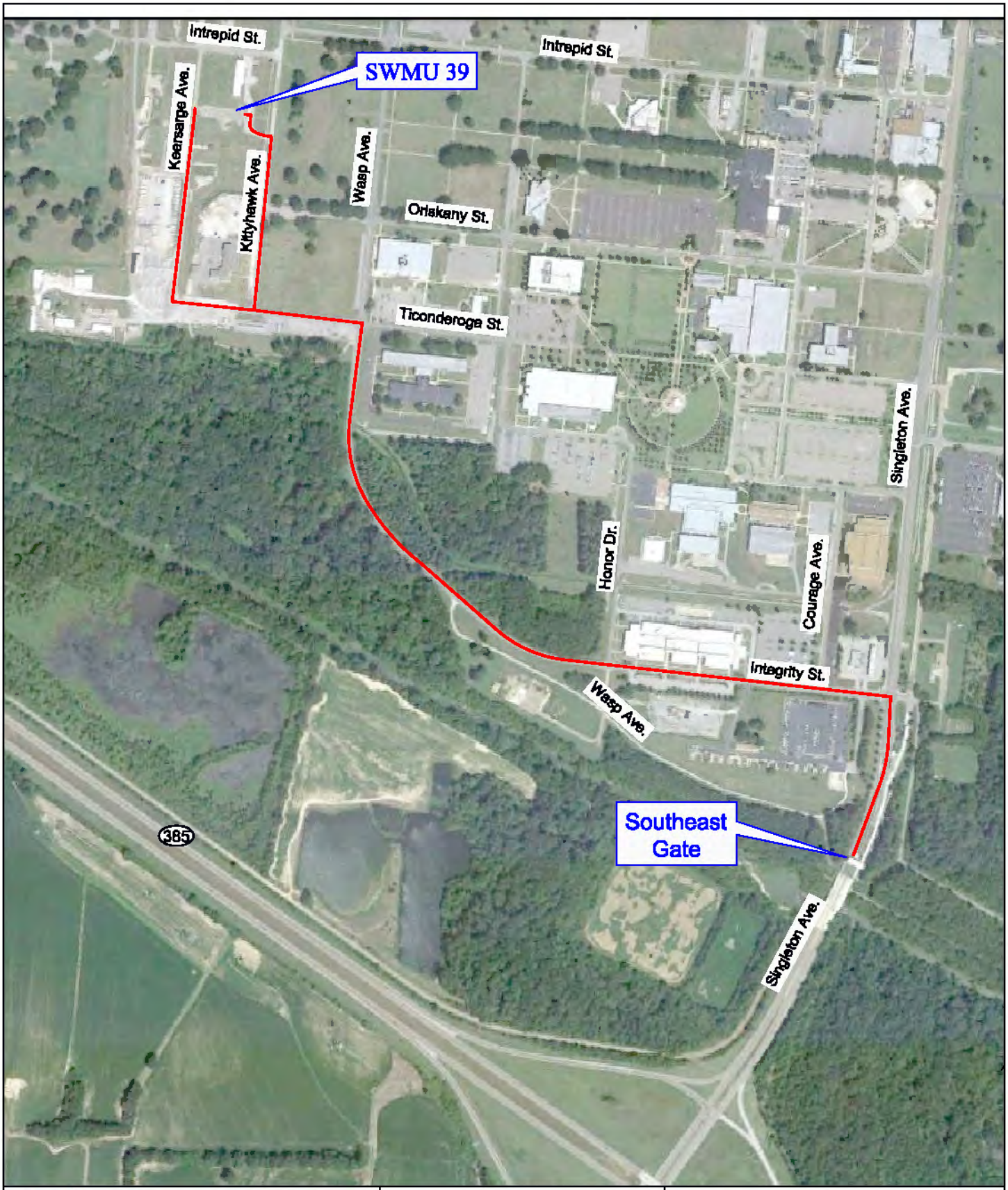
LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	Project # 11259		Typical Assessment / Electrical Resistivity Sensor Well
SWMU 39 NSA Mid-South Millington, TN	Drawn By: CW	Checked By: LC	
	Date Drawn: 11/18/11	Revised: -	**Figure 6**



LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	Project # 11259		Traffic Routing Plan From Southeast Gate to the BFI North Shelby Landfill
SWMU 39 NSA Mid-South Millington, TN	Drawn By: CW	Checked By: AD	
	Date Drawn: 11/15/11	Revised: -	**Figure 7**



LEE & RYAN
ENVIRONMENTAL •CONSTRUCTION •ENGINEERING

SWMU 39
NSA Mid-South
Millington, TN

Project # 11259		Traffic Routing Plan From Site to Southeast Gate
Drawn By: CW	Checked By: AD	
Date Drawn: 11/15/11	Revised: -	**Figure 8**

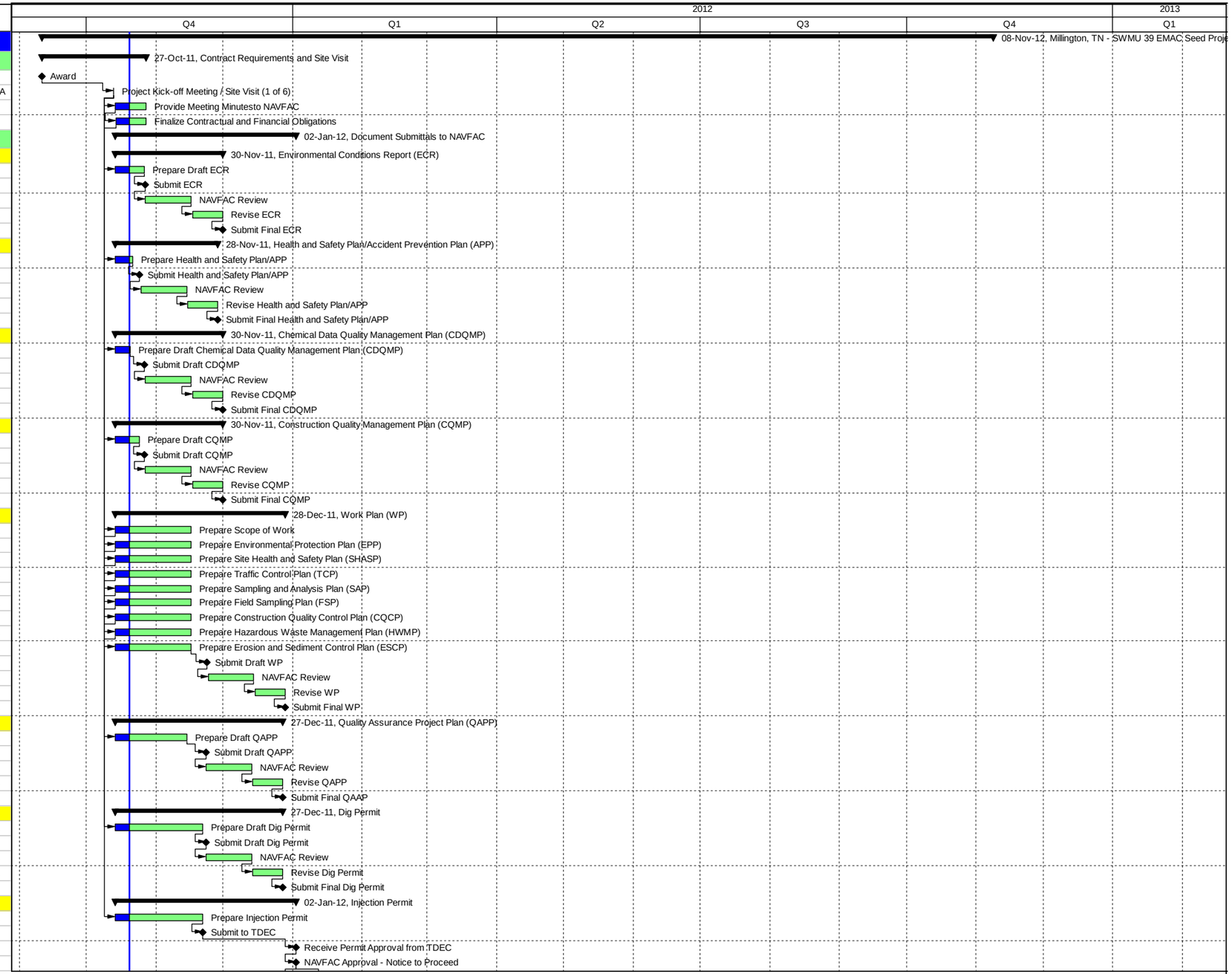
LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	Project # 11259		Site Laydown Area
SWMU 39 NSA Mid-South Millington, TN	Drawn By: CW	Checked By: AD	
	Date Drawn: 11/15/11	Revised: -	**Figure 9**

APPENDIX A

Construction Schedule

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Activity ID	Activity Name	Original Duration	Start	Finish
Millington, TN - SWMU 39 EMAC Seed Project - Int		280	11-Sep-11 A	08-Nov-12
Contract Requirements and Site Visit		22	11-Sep-11 A	27-Oct-11
A1000	Award	0	11-Sep-11 A	
A1010	Project Kick-off Meeting / Site Visit (1 of 6)	1	13-Oct-11 A	13-Oct-11 A
A1020	Provide Meeting Minutesto NAVFAC	10	14-Oct-11 A	27-Oct-11
A1025	Finalize Contractual and Financial Obligations	10	14-Oct-11 A	27-Oct-11
Document Submittals to NAVFAC		53	14-Oct-11 A	02-Jan-12
Environmental Conditions Report (ECR)		30	14-Oct-11 A	30-Nov-11
A1620	Prepare Draft ECR	9	14-Oct-11 A	26-Oct-11
A1630	Submit ECR	0	27-Oct-11	
A1640	NAVFAC Review	15	27-Oct-11	16-Nov-11
A1650	Revise ECR	10	17-Nov-11	30-Nov-11
A1660	Submit Final ECR	0		30-Nov-11
Health and Safety Plan/Accident Prevention Plan (APP)		28	14-Oct-11 A	28-Nov-11
A1670	Prepare Health and Safety Plan/APP	6	14-Oct-11 A	21-Oct-11
A1680	Submit Health and Safety Plan/APP	0		24-Oct-11
A1690	NAVFAC Review	15	25-Oct-11	14-Nov-11
A1700	Revise Health and Safety Plan/APP	10	15-Nov-11	28-Nov-11
A1710	Submit Final Health and Safety Plan/APP	0		28-Nov-11
Chemical Data Quality Management Plan (CDQMP)		30	14-Oct-11 A	30-Nov-11
A1720	Prepare Draft Chemical Data Quality Management Plan (CDQ	5	14-Oct-11 A	20-Oct-11
A1730	Submit Draft CDQMP	0		26-Oct-11
A1740	NAVFAC Review	15	27-Oct-11	16-Nov-11
A1750	Revise CDQMP	10	17-Nov-11	30-Nov-11
A1760	Submit Final CDQMP	0		30-Nov-11
Construction Quality Management Plan (CQMP)		30	14-Oct-11 A	30-Nov-11
A1770	Prepare Draft CQMP	7	14-Oct-11 A	24-Oct-11
A1780	Submit Draft CQMP	0		26-Oct-11
A1790	NAVFAC Review	15	27-Oct-11	16-Nov-11
A1800	Revise CQMP	10	17-Nov-11	30-Nov-11
A1810	Submit Final CQMP	0		30-Nov-11
Work Plan (WP)		50	14-Oct-11 A	28-Dec-11
A1820	Prepare Scope of Work	24	14-Oct-11 A	16-Nov-11
A1830	Prepare Environmental Protection Plan (EPP)	24	14-Oct-11 A	16-Nov-11
A1840	Prepare Site Health and Safety Plan (SHASP)	24	14-Oct-11 A	16-Nov-11
A1850	Prepare Traffic Control Plan (TCP)	24	14-Oct-11 A	16-Nov-11
A1860	Prepare Sampling and Analysis Plan (SAP)	24	14-Oct-11 A	16-Nov-11
A1870	Prepare Field Sampling Plan (FSP)	24	14-Oct-11 A	16-Nov-11
A1880	Prepare Construction Quality Control Plan (CQCP)	24	14-Oct-11 A	16-Nov-11
A1890	Prepare Hazardous Waste Management Plan (HWMP)	24	14-Oct-11 A	16-Nov-11
A1900	Prepare Erosion and Sediment Control Plan (ESCP)	24	14-Oct-11 A	16-Nov-11
A1910	Submit Draft WP	0		23-Nov-11
A1920	NAVFAC Review	15	24-Nov-11	14-Dec-11
A1930	Revise WP	10	15-Dec-11	28-Dec-11
A1940	Submit Final WP	0		28-Dec-11
Quality Assurance Project Plan (QAPP)		49	14-Oct-11 A	27-Dec-11
A1950	Prepare Draft QAPP	22	14-Oct-11 A	14-Nov-11
A1960	Submit Draft QAPP	0	23-Nov-11	
A1970	NAVFAC Review	15	23-Nov-11	13-Dec-11
A1980	Revise QAPP	10	14-Dec-11	27-Dec-11
A1990	Submit Final QAAP	0		27-Dec-11
Dig Permit		49	14-Oct-11 A	27-Dec-11
A2000	Prepare Draft Dig Permit	27	14-Oct-11 A	21-Nov-11
A2010	Submit Draft Dig Permit	0	23-Nov-11	
A2020	NAVFAC Review	15	23-Nov-11	13-Dec-11
A2030	Revise Dig Permit	10	14-Dec-11	27-Dec-11
A2040	Submit Final Dig Permit	0		27-Dec-11
Injection Permit		53	14-Oct-11 A	02-Jan-12
A2050	Prepare Injection Permit	27	14-Oct-11 A	21-Nov-11
A2060	Submit to TDEC	0		21-Nov-11
A2070	Receive Permit Approval from TDEC	0		02-Jan-12
A2080	NAVFAC Approval - Notice to Proceed	0		02-Jan-12

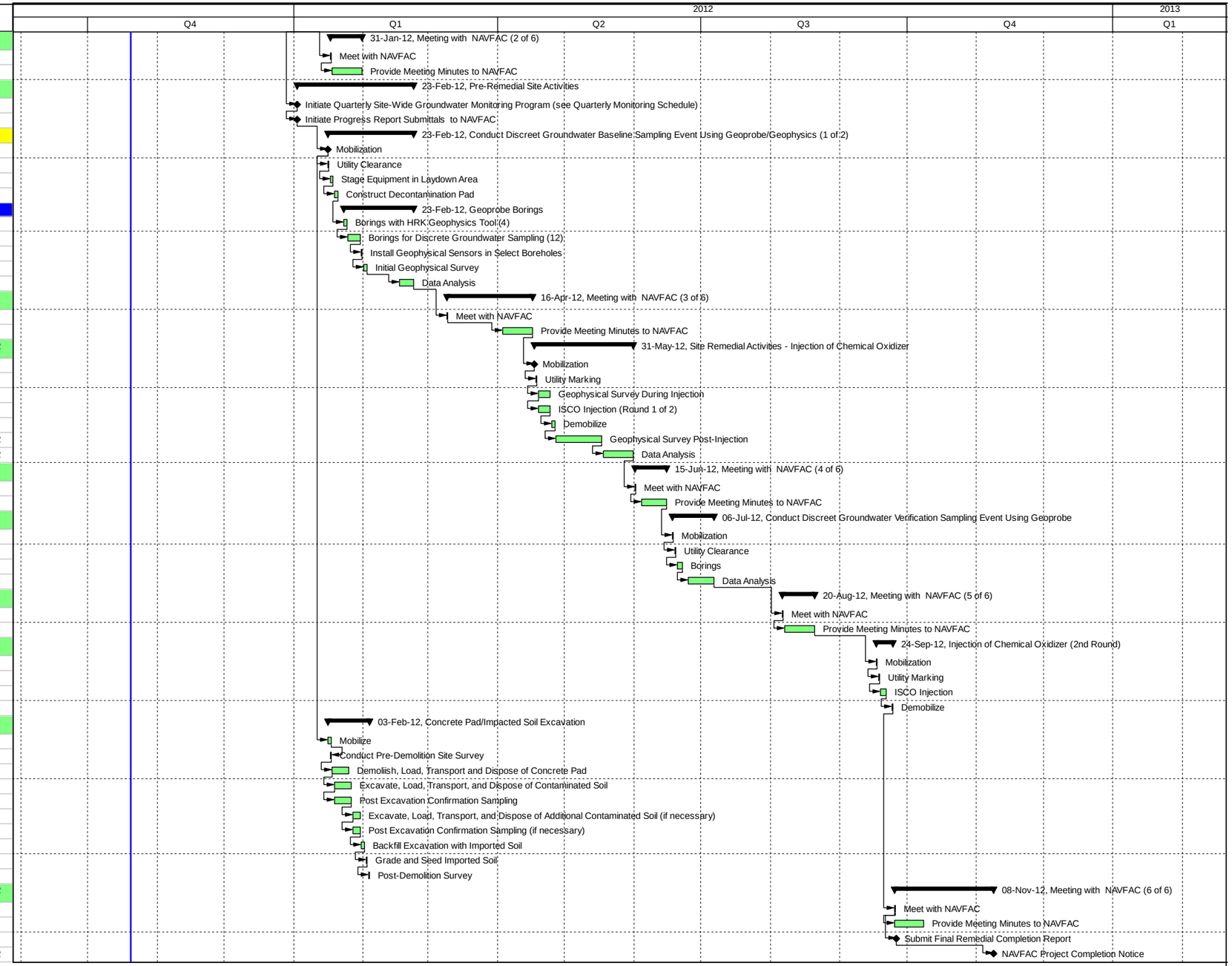


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Millington, TN - SWMU 39 EMAC Seed Project - Interim Measures/Removal Action

LEE & RYAN

Activity ID	Activity Name	Original Duration	Start	Finish
Meeting with NAVFAC (2 of 6)		11	17-Jan-12	31-Jan-12
A2090	Meet with NAVFAC	1	17-Jan-12	17-Jan-12
A2100	Provide Meeting Minutes to NAVFAC	10	18-Jan-12	31-Jan-12
Pre-Remedial Site Activities		38	02-Jan-12	23-Feb-12
A2110	Initiate Quarterly Site-Wide Groundwater Monitoring Program	0		02-Jan-12
A2120	Initiate Progress Report Submittals to NAVFAC	0		02-Jan-12
Conduct Discreet Groundwater Baseline Sampling Event Usin		29	16-Jan-12	23-Feb-12
A2130	Mobilization	0	16-Jan-12	
A2140	Utility Clearance	1	16-Jan-12	16-Jan-12
A2150	Stage Equipment in Laydown Area	2	17-Jan-12	18-Jan-12
A2160	Construct Decontamination Pad	2	19-Jan-12	20-Jan-12
Geoprobe Borings		24	23-Jan-12	23-Feb-12
A2	Borings with HRK Geophysics Tool (4)	2	23-Jan-12	24-Jan-12
A2	Borings for Discrete Groundwater Sampling (12)	4	25-Jan-12	30-Jan-12
A2	Install Geophysical Sensors in Select Boreholes	1	31-Jan-12	31-Jan-12
A2	Initial Geophysical Survey	2	01-Feb-12	02-Feb-12
A2	Data Analysis	5	17-Feb-12	23-Feb-12
Meeting with NAVFAC (3 of 6)		27	09-Mar-12	16-Apr-12
A2220	Meet with NAVFAC	1	09-Mar-12	09-Mar-12
A2230	Provide Meeting Minutes to NAVFAC	10	03-Apr-12	16-Apr-12
Site Remedial Activities - Injection of Chemical Oxidi		33	17-Apr-12	31-May-12
A1270	Mobilization	0	17-Apr-12	
A1280	Utility Marking	1	18-Apr-12	18-Apr-12
A1285	Geophysical Survey During Injection	4	19-Apr-12	24-Apr-12
A1286	ISCO Injection (Round 1 of 2)	4	19-Apr-12	24-Apr-12
A1287	Demobilize	2	25-Apr-12	26-Apr-12
A1290	Geophysical Survey Post-Injection	15	27-Apr-12	17-May-12
A1300	Data Analysis	10	18-May-12	31-May-12
Meeting with NAVFAC (4 of 6)		11	01-Jun-12	15-Jun-12
A2240	Meet with NAVFAC	1	01-Jun-12	01-Jun-12
A2250	Provide Meeting Minutes to NAVFAC	10	04-Jun-12	15-Jun-12
Conduct Discreet Groundwater Verification Samplin		15	18-Jun-12	06-Jul-12
A2260	Mobilization	1	18-Jun-12	18-Jun-12
A2270	Utility Clearance	1	19-Jun-12	19-Jun-12
A2280	Borings	3	20-Jun-12	22-Jun-12
A2290	Data Analysis	10	25-Jun-12	06-Jul-12
Meeting with NAVFAC (5 of 6)		11	06-Aug-12	20-Aug-12
A2300	Meet with NAVFAC	1	06-Aug-12	06-Aug-12
A2310	Provide Meeting Minutes to NAVFAC	10	07-Aug-12	20-Aug-12
Injection of Chemical Oxidizer (2nd Round)		6	17-Sep-12	24-Sep-12
A2320	Mobilization	1	17-Sep-12	17-Sep-12
A2330	Utility Marking	1	18-Sep-12	18-Sep-12
A2340	ISCO Injection	3	19-Sep-12	21-Sep-12
A2350	Demobilize	1	24-Sep-12	24-Sep-12
Concrete Pad/Impacted Soil Excavation		15	16-Jan-12	03-Feb-12
A1530	Mobilize	2	16-Jan-12	17-Jan-12
A1540	Conduct Pre-Demolition Site Survey	1	17-Jan-12	17-Jan-12
A1550	Demolish, Load, Transport and Dispose of Concrete Pad	6	18-Jan-12	25-Jan-12
A1560	Excavate, Load, Transport, and Dispose of Contaminated Soil	6	19-Jan-12	26-Jan-12
A1570	Post Excavation Confirmation Sampling	6	19-Jan-12	26-Jan-12
A1580	Excavate, Load, Transport, and Dispose of Additional Contam	2	27-Jan-12	30-Jan-12
A1590	Post Excavation Confirmation Sampling (if necessary)	2	27-Jan-12	30-Jan-12
A1600	Backfill Excavation with Imported Soil	2	31-Jan-12	01-Feb-12
A1610	Grade and Seed Imported Soil	1	02-Feb-12	02-Feb-12
A1615	Post-Demolition Survey	1	03-Feb-12	03-Feb-12
Meeting with NAVFAC (6 of 6)		33	25-Sep-12	08-Nov-12
A2360	Meet with NAVFAC	1	25-Sep-12	25-Sep-12
A2370	Provide Meeting Minutes to NAVFAC	10	25-Sep-12	08-Oct-12
A2380	Submit Final Remedial Completion Report	0	26-Sep-12	
A2390	NAVFAC Project Completion Notice	0		08-Nov-12

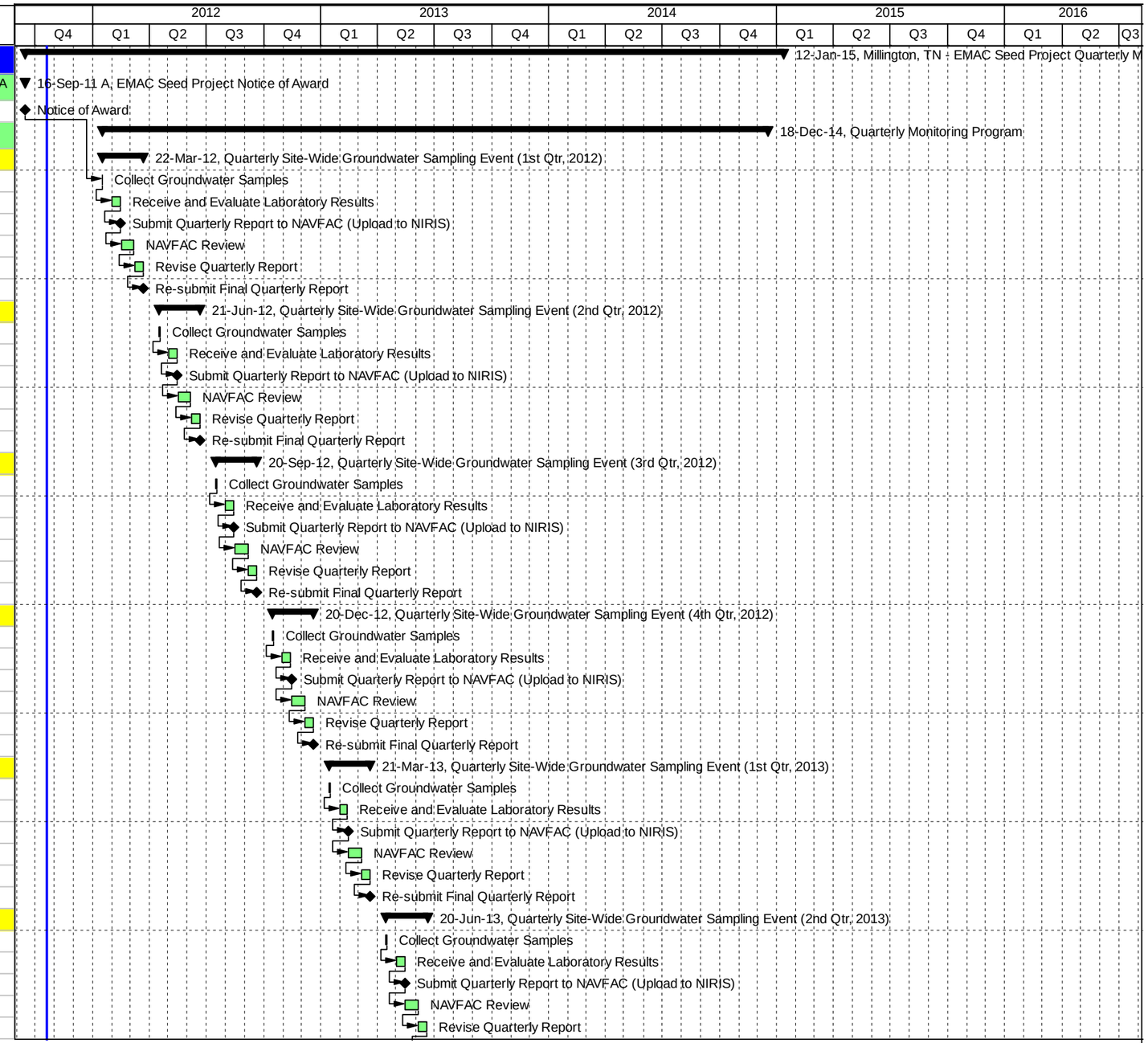


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Millington, TN - SWMU 39 EMAC Seed Project - Interim Measures/Removal Action

LEE & RYAN

Activity ID	Activity Name	Original Duration	Start	Finish
Millington, TN - EMAC Seed Project Quarterly Mon		815	16-Sep-11 A	12-Jan-15
EMAC Seed Project Notice of Award		0	16-Sep-11 A	16-Sep-11 A
A1060	Notice of Award	0	16-Sep-11 A	
Quarterly Monitoring Program		763	16-Jan-12	18-Dec-14
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 201		48	16-Jan-12	22-Mar-12
A1000	Collect Groundwater Samples	2	16-Jan-12*	17-Jan-12
A1010	Receive and Evaluate Laboratory Results	10	01-Feb-12	14-Feb-12
A1020	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	15-Feb-12	
A1030	NAVFAC Review	15	16-Feb-12	07-Mar-12
A1040	Revise Quarterly Report	10	08-Mar-12	21-Mar-12
A1050	Re-submit Final Quarterly Report	0	22-Mar-12	
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 20:		48	16-Apr-12	21-Jun-12
A1070	Collect Groundwater Samples	2	16-Apr-12*	17-Apr-12
A1080	Receive and Evaluate Laboratory Results	10	02-May-12	15-May-12
A1090	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	16-May-12	
A1100	NAVFAC Review	15	17-May-12	06-Jun-12
A1110	Revise Quarterly Report	10	07-Jun-12	20-Jun-12
A1120	Re-submit Final Quarterly Report	0	21-Jun-12	
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 201		48	16-Jul-12	20-Sep-12
A1130	Collect Groundwater Samples	2	16-Jul-12*	17-Jul-12
A1140	Receive and Evaluate Laboratory Results	10	01-Aug-12	14-Aug-12
A1150	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	15-Aug-12	
A1160	NAVFAC Review	15	16-Aug-12	05-Sep-12
A1170	Revise Quarterly Report	10	06-Sep-12	19-Sep-12
A1180	Re-submit Final Quarterly Report	0	20-Sep-12	
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 201		48	15-Oct-12	20-Dec-12
A1190	Collect Groundwater Samples	2	15-Oct-12*	16-Oct-12
A1200	Receive and Evaluate Laboratory Results	10	31-Oct-12	13-Nov-12
A1210	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	14-Nov-12	
A1220	NAVFAC Review	15	15-Nov-12	05-Dec-12
A1230	Revise Quarterly Report	10	06-Dec-12	19-Dec-12
A1240	Re-submit Final Quarterly Report	0	20-Dec-12	
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 201		48	14-Jan-13	21-Mar-13
A1250	Collect Groundwater Samples	2	14-Jan-13*	15-Jan-13
A1260	Receive and Evaluate Laboratory Results	10	30-Jan-13	12-Feb-13
A1270	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	13-Feb-13	
A1280	NAVFAC Review	15	14-Feb-13	06-Mar-13
A1290	Revise Quarterly Report	10	07-Mar-13	20-Mar-13
A1300	Re-submit Final Quarterly Report	0	21-Mar-13	
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 20:		48	15-Apr-13	20-Jun-13
A1310	Collect Groundwater Samples	2	15-Apr-13*	16-Apr-13
A1320	Receive and Evaluate Laboratory Results	10	01-May-13	14-May-13
A1330	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	15-May-13	
A1340	NAVFAC Review	15	16-May-13	05-Jun-13
A1350	Revise Quarterly Report	10	06-Jun-13	19-Jun-13

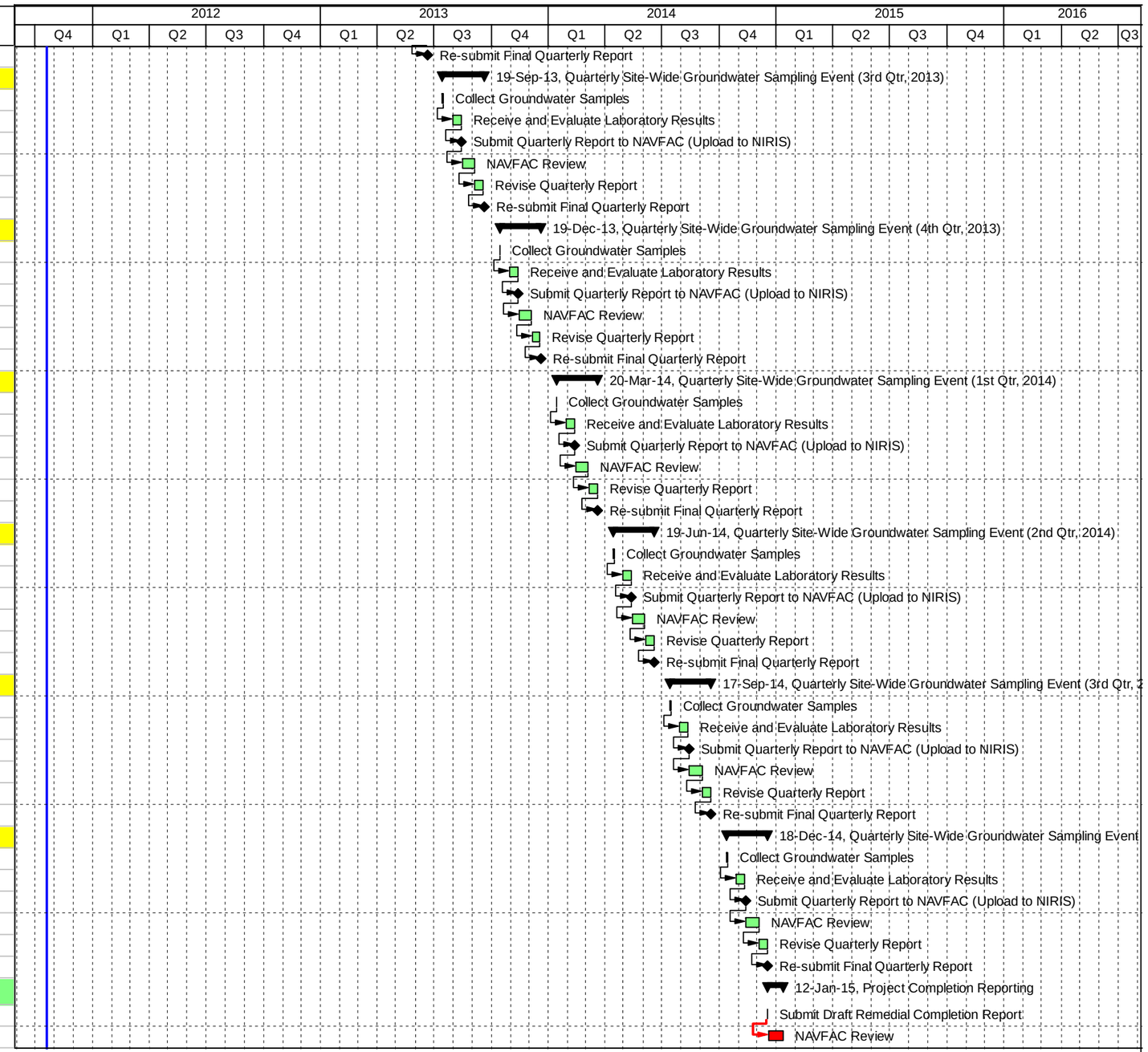


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Millington, TN - EMAC Seed Project Quarterly Monitoring Program

LEE & RYAN

Activity ID	Activity Name	Original Duration	Start	Finish
A1360	Re-submit Final Quarterly Report	0	20-Jun-13	
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 201		48	15-Jul-13	19-Sep-13
A1370	Collect Groundwater Samples	2	15-Jul-13*	16-Jul-13
A1380	Receive and Evaluate Laboratory Results	10	31-Jul-13	13-Aug-13
A1390	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	14-Aug-13	
A1400	NAVFAC Review	15	15-Aug-13	04-Sep-13
A1410	Revise Quarterly Report	10	05-Sep-13	18-Sep-13
A1420	Re-submit Final Quarterly Report	0	19-Sep-13	
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 201		48	14-Oct-13	19-Dec-13
A1430	Collect Groundwater Samples	2	14-Oct-13*	15-Oct-13
A1440	Receive and Evaluate Laboratory Results	10	30-Oct-13	12-Nov-13
A1450	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	13-Nov-13	
A1460	NAVFAC Review	15	14-Nov-13	04-Dec-13
A1470	Revise Quarterly Report	10	05-Dec-13	18-Dec-13
A1480	Re-submit Final Quarterly Report	0	19-Dec-13	
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 201		48	13-Jan-14	20-Mar-14
A1490	Collect Groundwater Samples	2	13-Jan-14*	14-Jan-14
A1500	Receive and Evaluate Laboratory Results	10	29-Jan-14	11-Feb-14
A1510	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	12-Feb-14	
A1520	NAVFAC Review	15	13-Feb-14	05-Mar-14
A1530	Revise Quarterly Report	10	06-Mar-14	19-Mar-14
A1540	Re-submit Final Quarterly Report	0	20-Mar-14	
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 20		48	14-Apr-14	19-Jun-14
A1550	Collect Groundwater Samples	2	14-Apr-14*	15-Apr-14
A1560	Receive and Evaluate Laboratory Results	10	30-Apr-14	13-May-14
A1570	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	14-May-14	
A1580	NAVFAC Review	15	15-May-14	04-Jun-14
A1590	Revise Quarterly Report	10	05-Jun-14	18-Jun-14
A1600	Re-submit Final Quarterly Report	0	19-Jun-14	
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 201		48	14-Jul-14	17-Sep-14
A1610	Collect Groundwater Samples	2	14-Jul-14*	15-Jul-14
A1620	Receive and Evaluate Laboratory Results	10	30-Jul-14	12-Aug-14
A1630	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	13-Aug-14	
A1640	NAVFAC Review	15	14-Aug-14	03-Sep-14
A1650	Revise Quarterly Report	10	04-Sep-14	17-Sep-14
A1660	Re-submit Final Quarterly Report	0		17-Sep-14
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 201		48	13-Oct-14	18-Dec-14
A1670	Collect Groundwater Samples	2	13-Oct-14*	14-Oct-14
A1680	Receive and Evaluate Laboratory Results	10	29-Oct-14	11-Nov-14
A1690	Submit Quarterly Report to NAVFAC (Upload to NIRIS)	0	12-Nov-14	
A1700	NAVFAC Review	15	13-Nov-14	03-Dec-14
A1710	Revise Quarterly Report	10	04-Dec-14	17-Dec-14
A1720	Re-submit Final Quarterly Report	0	18-Dec-14	
Project Completion Reporting		16	18-Dec-14	12-Jan-15
A1730	Submit Draft Remedial Completion Report	1	18-Dec-14*	18-Dec-14
A1740	NAVFAC Review	15	19-Dec-14	12-Jan-15

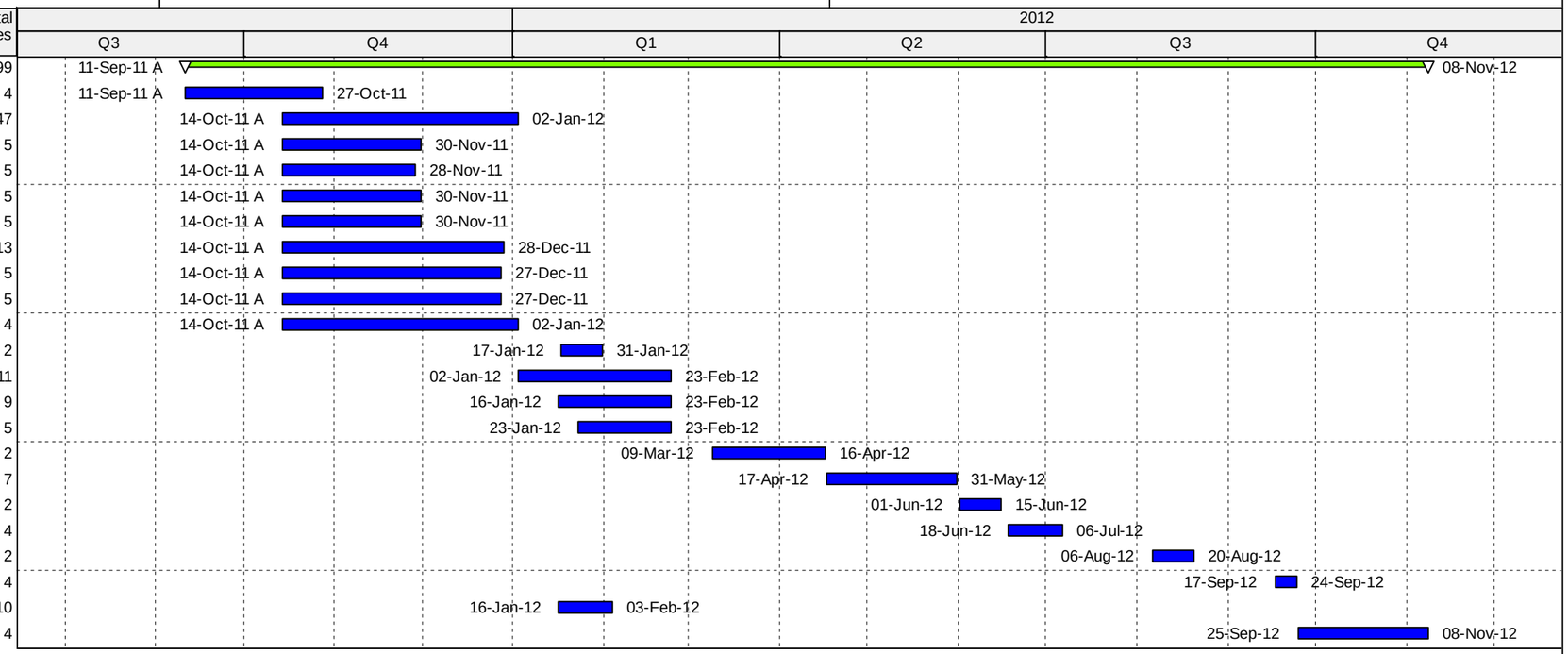


Actual Work
Remaining Work
Critical Remaining Work
Milestone
Summary

Millington, TN - EMAC Seed Project Quarterly Monitoring Program

LEE & RYAN

WBS Name	Total Activities	Start	Finish
Millington, TN - SWMU 39 EMAC Seed Project - Interim Measures/Remo	99	11-Sep-11 A	08-Nov-12
Contract Requirements and Site Visit	4	11-Sep-11 A	27-Oct-11
Document Submittals to NAVFAC	47	14-Oct-11 A	02-Jan-12
Environmental Conditions Report (ECR)	5	14-Oct-11 A	30-Nov-11
Health and Safety Plan/Accident Prevention Plan (APP)	5	14-Oct-11 A	28-Nov-11
Chemical Data Quality Management Plan (CDQMP)	5	14-Oct-11 A	30-Nov-11
Construction Quality Management Plan (CQMP)	5	14-Oct-11 A	30-Nov-11
Work Plan (WP)	13	14-Oct-11 A	28-Dec-11
Quality Assurance Project Plan (QAPP)	5	14-Oct-11 A	27-Dec-11
Dig Permit	5	14-Oct-11 A	27-Dec-11
Injection Permit	4	14-Oct-11 A	02-Jan-12
Meeting with NAVFAC (2 of 6)	2	17-Jan-12	31-Jan-12
Pre-Remedial Site Activities	11	02-Jan-12	23-Feb-12
Conduct Discreet Groundwater Baseline Sampling Event Using Ge	9	16-Jan-12	23-Feb-12
Geoprobe Borings	5	23-Jan-12	23-Feb-12
Meeting with NAVFAC (3 of 6)	2	09-Mar-12	16-Apr-12
Site Remedial Activities - Injection of Chemical Oxidizer	7	17-Apr-12	31-May-12
Meeting with NAVFAC (4 of 6)	2	01-Jun-12	15-Jun-12
Conduct Discreet Groundwater Verification Sampling Event Using Gec	4	18-Jun-12	06-Jul-12
Meeting with NAVFAC (5 of 6)	2	06-Aug-12	20-Aug-12
Injection of Chemical Oxidizer (2nd Round)	4	17-Sep-12	24-Sep-12
Concrete Pad/Impacted Soil Excavation	10	16-Jan-12	03-Feb-12
Meeting with NAVFAC (6 of 6)	4	25-Sep-12	08-Nov-12

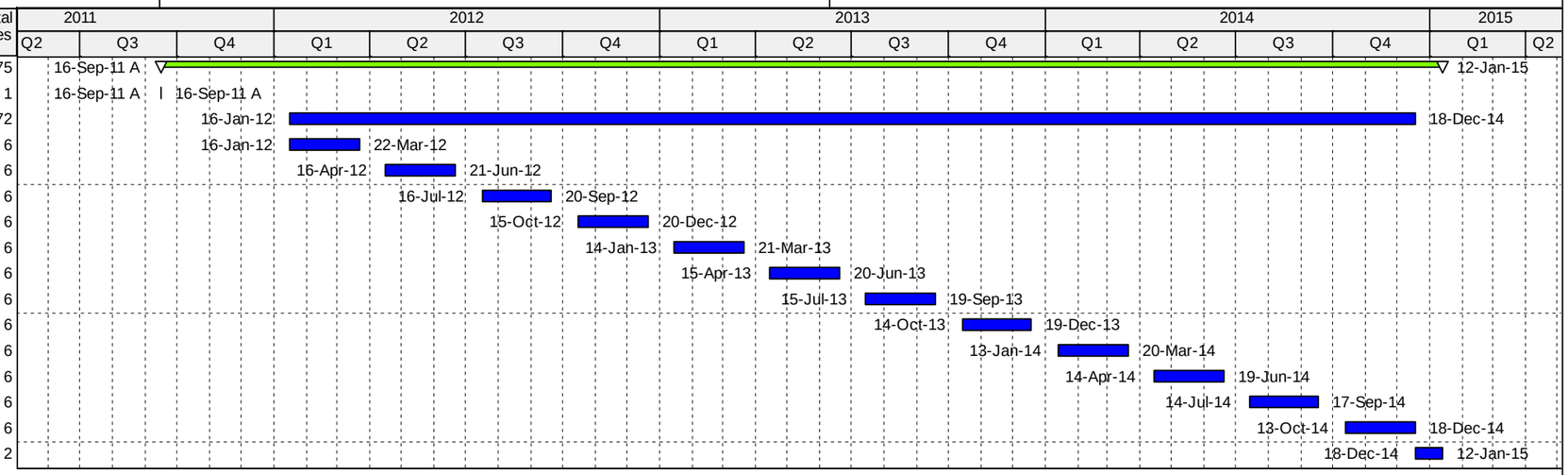


All Projects
Summary
WBS Elements below Project

LEE & RYAN

Millington, TN - EMAC Seed Project Quarterly Monitoring Program | WBS Layout | 21-Oct-11

WBS Name	Total Activities	Start	Finish
Millington, TN - EMAC Seed Project Quarterly Monitoring Program	75	16-Sep-11 A	12-Jan-15
EMAC Seed Project Notice of Award	1	16-Sep-11 A	16-Sep-11 A
Quarterly Monitoring Program	72	16-Jan-12	18-Dec-14
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 2012)	6	16-Jan-12	22-Mar-12
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 2012)	6	16-Apr-12	21-Jun-12
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 2012)	6	16-Jul-12	20-Sep-12
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 2012)	6	15-Oct-12	20-Dec-12
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 2013)	6	14-Jan-13	21-Mar-13
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 2013)	6	15-Apr-13	20-Jun-13
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 2013)	6	15-Jul-13	19-Sep-13
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 2013)	6	14-Oct-13	19-Dec-13
Quarterly Site-Wide Groundwater Sampling Event (1st Qtr, 2014)	6	13-Jan-14	20-Mar-14
Quarterly Site-Wide Groundwater Sampling Event (2nd Qtr, 2014)	6	14-Apr-14	19-Jun-14
Quarterly Site-Wide Groundwater Sampling Event (3rd Qtr, 2014)	6	14-Jul-14	17-Sep-14
Quarterly Site-Wide Groundwater Sampling Event (4th Qtr, 2014)	6	13-Oct-14	18-Dec-14
Project Completion Reporting	2	18-Dec-14	12-Jan-15



All Projects | Summary | WBS Elements below Project

Millington, TN - EMAC Seed Project Quarterly Monitoring Program

LEE & RYAN

APPENDIX B

Vironex Injection Standard Operating Procedures

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Potassium Permanganate
Mixing and Injection
Standard Operating Procedures

March 2008

"Bringing Chemistry and Contaminants Together"

For the Consulting Community

Reproduction and distribution of this document without the express written consent of VIRONEX is strictly prohibited. The methodology and approaches presented herein are proprietary to VIRONEX.

Vironex Potassium Permanganate Mixing and Injection - DPT

Vironex utilizes various Direct Push Technology (DPT) Rig Platforms to advance specially designed 1.5", 1.75" and 2.125" O.D. injection tools, capable of top-down or bottom-up injection. Vironex targets one (1) to five (5) foot injection zones, this allows for proper vertical distribution of reagents throughout the target treatment interval.

Specific Rig Platform and Injection Tool selection is dependent on specific site conditions, project requirements and performance objectives.

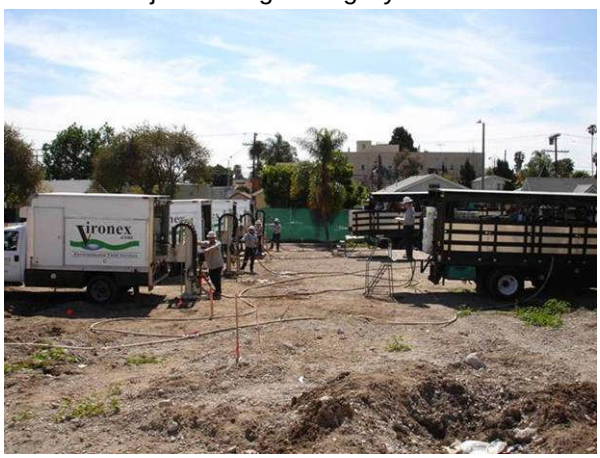
Potassium Permanganate is blended with water to the desired concentration in batches in the onboard mix tanks. The mixed solution is then injected using a dedicated pumping system that is capable of providing specified pressures and flow rates as well as the desired volumes based on the project design. Pressure, flow rate, and concentration can all be adjusted as needed on our self-contained injection unit.

The injection rig mixers and the metering manifold, eliminates the cost and associated logistics related to off-rig mixing tanks.

Once the first target treatment interval has been reached, desired volume of mixed solution will be injected into the formation, upon completion, the tooling will then be either advanced or retracted to the next treatment interval for injection. Upon completion of the injection, the injection tooling will be removed from the borehole. The borehole is backfilled with appropriate backfilling material and then patched at the surface to match existing surface material.

Custom Designed Injection Rigs

Injection Rig Mixing Systems

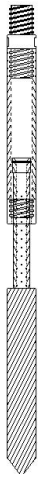


Simultaneous DPT Injection – 4 Points

Vironex Injection Process – Injection Tools

Vironex has developed customized injection tooling to provide for targeted distribution of reagents in the subsurface. These tools are designed for both top-down or bottom-up injection to meet the injection needs of our customers.

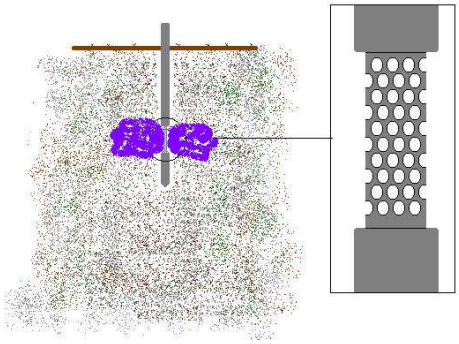
These specially designed 1.5”, 1.75“ and 2.125” O.D. injection tools target one (1) to five (5) foot injection zones. The Injection Tools are machined from 4130 Chromium-Molybdenum Alloy Steel or Stainless Steel, depending on reagent compatibility.



2.125” Bottom-Up Injection Tool With 1 Foot Screen

Bottom-Up injection, two simultaneous points

2.125” Top-Down Injection Tool With 1 Foot Screen



Product delivery through lateral injection

2.125” Jetting Tool

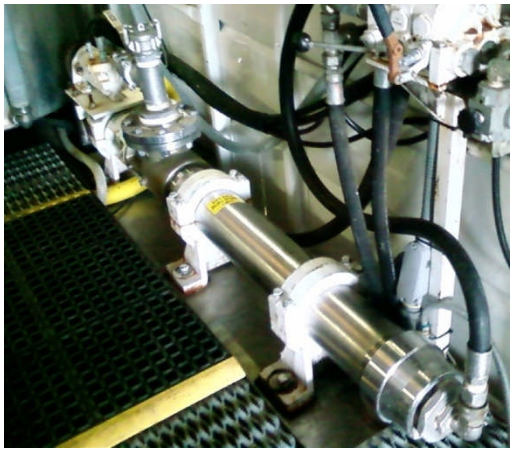
Vironex Injection Process – Pumps

Vironex used three main pumping systems for delivery of reagents. These pumps include air diaphragm pumps for low pressure applications, progressive cavity pumps for moderate pressure applications, and piston pumps for high pressure applications.

All pumping systems are compatible with the reagents to be delivered. Vironex pumps are rated for the following injection rates and pressures:

- Air Diaphragm:
  - 0-100 gpm / 0-120 psi
- Progressive Cavity:
  - 0-100 gpm / 0-400 psi
- Piston:
  - 0-9 gpm / 0-1500 psi

Air Diaphragm Pump



Progressive Cavity Pump

Double Piston Pump

Vironex Injection Process – Monitoring

Vironex monitors injection flow rate, total flow, and injection pressure inside the injection rig and at the injection point if required. This data is recorded and included in an injection report.

Vironex utilizes digital turbine flow meters to measure injection rates and total flow.

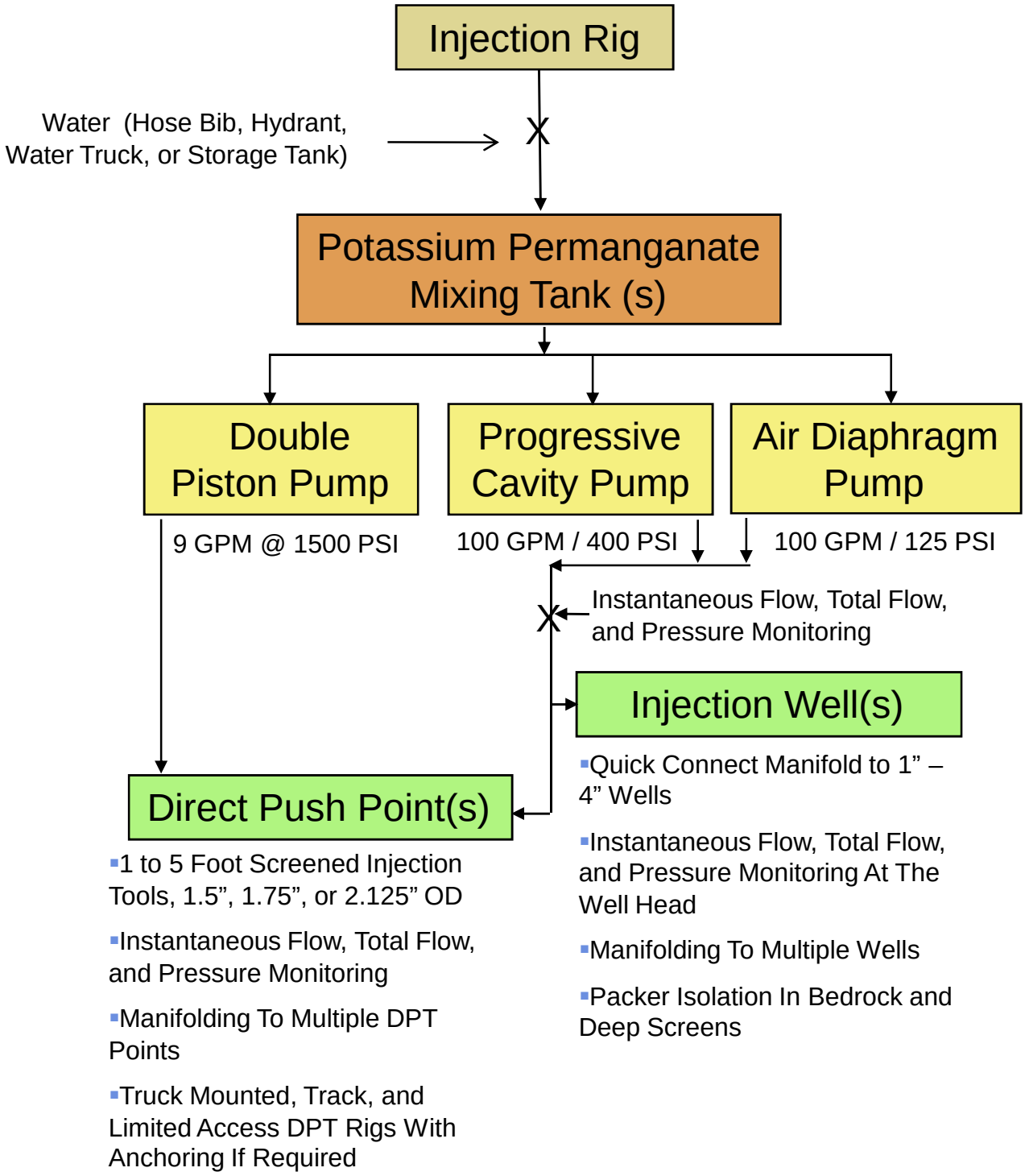
Product Flow/Pressure Manifold

Product Flow/Pressure Monitoring

Injection Well Monitoring

DPT Point Monitoring

Vironex Potassium Permanganate Mixing and Injection Process Flow



Safety

Safety is an integral part of Vironex's philosophy and work day. We believe that safety is best achieved using a proactive approach which begins with training. All Vironex operators are required to receive and maintain certain fundamental training courses, including 40 hour OSHA training, plus annual 8 hour refresher courses. Additionally, all Vironex operators receive thorough and ongoing training on various forms of Direct Push Technology (DPT), remedial injection systems and compounds, and all equipment and tooling used by Vironex field personnel.

Tailgate Safety Meeting

Each Vironex office conducts monthly staff and safety meetings to ensure that training and safety remain at the forefront of our corporate values. Vironex has dedicated Regional and Corporate Safety Officers to monitor and address all safety concerns on a regional as well as national level.

Safety Shower and Eye Wash

Remediation compounds require proper handling and can not be treated casually. The mixture and concentrations of various compounds is an evolving process, and it is imperative that the client is intimately familiar with applicable MSDS information, the characteristics of each compound and their associated risks. Such information and any concerns relative to the safety of the proposed remedial compounds should be brought to the attention of Vironex immediately.

Vironex develops a project specific Health and Safety Plan for all injection projects. Prior to initiation of injection, the Vironex Remediation Crew Chief holds a safety tailgater to discuss the Health and Safety Plan with the injection crew, our client and other project stakeholders. Prior to initiating injection each following day, a safety tailgater is held every morning with our crew and our client to discuss whether any changes in work practices or modifications to the Health and Safety plan are required.

PPE and Safety Equipment

APPENDIX C

Environmental Protection Plan

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

ENVIRONMENTAL PROTECTION PLAN

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:

NAVFAC Midwest
Building 1A, 201 Decatur
Great Lakes, IL 60088

Contract Number: N40083-11-D-0028
Task Order Number: 0001

Submitted by:

Lee & Ryan Environmental Consulting, Inc.
1707 Melody Lane
Greenfield, IN 46140
Phone: 800-680-8987
Fax: 317-467-6588

October 2011
Revised January 2012

ENVIRONMENTAL PROTECTION PLAN

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:
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Great Lakes, IL 60088

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Task Order Number: 0001

Lee & Ryan does hereby certify that, to the best of its knowledge and belief, the technical data delivered herewith under this contract is complete, accurate, and complies with all requirements of the contract.

PREPARED BY:

Project Engineer
(616) 644-1954

Lon Michael Cooper, PE — 1/18/2012 (Date)

APPROVED BY:

Quality Control Manager
(765) 318-3561

Robert Downey, LPG — 1/18/2012 (Date)

Project Manager
(317) 753-4239

Angelo Dattilo, LPG — 1/18/2012 (Date)

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Project Name: **Remediation of SWMU 39 TCE Plume**
Project Number: **N40083-11-D-0028 – CTO 0001**

Revision Summary

The revisions to Submittal # 7 will be hereafter known as Submittal # 7a and will, in its totality, supersede any and all previously provided #7 Work Plan submittals.

The revisions to Submittal # 7 Work Plan – Appendix C Environmental Protection Plan (EPP) and Work Plan – Appendix D Accident Prevention Plan (APP), are outlined in the table below.

Commenter	*Submittal Number/ Name*	*Comment*	*Revision*
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP,	Provide a letter of designation for the Environmental Manager and training certification showing the individual has the appropriate training in accordance with the specification. The plan shall be signed and dated by the Environmental Manager. Paragraph 2.0 states, "Mr. Angelo Dattilo will serve as the Environmental Manager". The designation letter identifies Mr. John Lyttle	A new designation letter identifying Mr. Angelo Dattilo, LPG as the Environmental Manager is Appendix A in the EPP, which is Appendix C of the revised Work Plan, Submittal 7a.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	The HAZWOPER Certification for Mr. John Lyttle is not legible.	A legible copy of this certificate replaced the old copy in Appendix D of the EPP
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	No documentation of HAZCOM Training was provided for employees.	HAZCOM Training certificates were not provided for Lee & Ryan employees because training in HAZCOM is included in both the 40 hour HAZWOPER and 8 hour refresher for the HAZWOPER. TolTest employees, John Lyttle and Shannon Wonders both have separate and specific HAZCOM training and their

			certificates are included in the Appendix D of the EPP, which is Appendix C in the Revised Work Plan, Submittal 7a.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Paragraph 6.1 identified BFI Landfill as the disposal facility for contaminated soils. Has the Contractor coordinated with BFI? Will this require a special waste permit?	We have coordinated with BFI and are in the process of getting the soil approved through the Tennessee and BFI. This material will require a special waste permit. We will coordinate with the Installation Environmental Division for this and any other permits regarding this project.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Please ensure the erosion control plan is submittal to the Installation Environmental Division for review and coordination.	The erosion control plan will be submitted to the Installation Environmental Division for review and coordination.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Please have the Contractor clarify paragraph 8.1.3. There is no tank located at the NSA Fire Department; the tank is located at containment area 1625. Will Contractor provide test result for water to determine appropriate disposal method.	Section 8.1.3 has been modified to reflect containment area 1625 and not NSA Fire Department as the location of the tank that can be used for monitoring well purge water. We will provide test results for this purge water to the Installation Environmental Division for the determination of an appropriate disposal method.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Regarding paragraph 8.3.2, the Installation Environmental Director shall notify appropriate organizations/response centers.	Section 8.3.2 has been modified to reflect that the Installation Environmental Director is the entity that is responsible for notifications to organizations/response centers.
Ursula P. Robinson,	7 / Work Plan Appendix C	All hazardous waste generated on board this basae shall be turned over	If hazardous waste is encountered/generated on

REM	EPP	to the Navy for proper disposal.	board the base, it will be turned over to the Navy (coordination through Installation Environmental Division) for proper disposal.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Reference the Environmental Conditions Report, Paragraph 2.0 indentifies a NAVFAC Office at Building S-75. Building S-75 no longer exists, please address.	Reference to Building S-75 has been removed from the Environmental Conditions Report.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Numerous HAZWOPER certifications are out of date; please address.	When initially compiling certifications for this work, Lee & Ryan did not know when the work would commence and therefore did not know exactly what field staff would be available to perform the field work. We provided more employees and corresponding certifications than were actually required to complete the task order. Some certifications expired during the submittal and submittal review process. We currently have a presumed timeframe for the commencement of the work and have narrowed our potential field staff. To simplify the appendix that contains the certifications, (Appendix D of the EPP, which is Appendix C of the Work Plan, Submittal 7a (Revised), we currently have provided the certifications of personnel that we have some certainty in using on-site during this task order. When we determine if another employee may be used on-site

			for this task order, we will provide their resume and required certifications.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	What work will Mr. Jack Moorman be performing?	Mr. Jack Moorman, C.S.P., is our Safety and Health Manage. As such he is/was responsible for the development, implementation, oversight, and enforcement of the SSHSP. He signed and dated the SSHSP prior to submittal. Initial on-site safety briefing will be presented by him to all site workers before the first day of remedial work. Mr. Moorman will be onsite during the first day of remedial activities and at the startup of each new major phase of work, and visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the SSHP. He will be notified of all emergencies in accordance with the emergency action plan. Any changes to Health and Safety operations on site or to this plan, will be through the direction of the Health and Safety Manager, Jack Moorman.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Contractors shall provide legible copies of all weight tickets for all trash/debris/waste removed showing weight in tons, disposal costs, name/location of disposal facility.	Lee & Ryan will provide legible copies of all weight tickets for all trash/debris/waste removed showing weight in tons, disposal costs, name/location of disposal facility.
Ursula P.	7 / Work Plan	All containers are to be covered at all	Lee & Ryan will manage all

Robinson, REM	Appendix C EPP	times except when the container is being added to or emptied.	trash/debris/waste in a manner to assure that all containers will be covered at all times except when the container is being added to or emptied.
Ursula P. Robinson, REM	7 / Work Plan Appendix C EPP	Nuisance dust shall be kept to a minimum; dampened with water to minimize visible emission.	Lee & Ryan will manage on-site activities to assure that nuisance dust will be kept to a minimum; dampened with water to minimize visible emission.

Project Name: **Remediation of SWMU 39 TCE Plume**
Project Number: **N40083-11-D-0028 - 0001**

Declaration of Understanding

I have read and understand this Environmental Protection Plan and agree to abide by the procedures and limitations specified within.

Name	*Signature*	*Employer*	*Date*

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LIST OF ACRONYMS

ABG	Ammunition Burning Grounds
ACM	Asbestos Containing Materials
AHA	Activity Hazard Analysis
AIHA	American Industrial Hygiene Association
APR	Air purifying respirator
CFR	Code of Federal Regulation
COTR	Contracting Officer's Technical Representative
CPR	Cardiopulmonary Resuscitation
DDESB	Department of Defense Explosive Safety Board
DOT	Department of Transportation
EPA	Environmental Protection Agency
EPDM	Ethylene Propylene Diene Monomer
ESS	Explosive Safety Submittal
f/cc	Fibers per cubic centimeter
HASP	Health and Safety Plan
HEPA	High-Efficiency Particulate Air
lpm	Liters per minute
MCE	Mixed Cellulose Ester
mm	Millimeter
MSDS	Material Safety Data Sheet
NAVFAC	Naval Facilities Engineering Command
NIOSH	National Institute for Occupational Safety and Health

NIST	National Institute of Standards and Technology
NOSSA	Naval Ordnance Safety and Security Activity
NSA	Naval Support Activity
NVLAP	National Voluntary Laboratory Accreditation Program
OSHA	Occupational Safety and Health Administration
PAPR	Powered Air Purifying Respirators
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PES	Potentially Explosive Structure
Poly	Polyethylene sheeting
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
RACM	Regulated Asbestos Containing Materials
SOW	Scope of Work
SSHO	Site Safety and Health Officer
SSHP	Site Specific Health Plan
TCLP	Toxicity Characteristic Leaching Procedure
TD	Thermal Decomposition
TWA	Time Weighted Average
ug/m3	Micrograms per cubic meter
um	Microns
USACE	United States Army Corp of Engineers
UXO	Unexploded Ordnance
WP	Work Plan

1.0 Introduction

Lee & Ryan Environmental Consulting, Inc. (Lee & Ryan) is pleased to submit the following Environmental Protection Plan (EPP) for Remediation of the SWMU 39 TCE Plume at NSA Mid-South located in Millington, TN 38054. The activities to be performed are part of the tasks required by the Department of Navy (NAVFAC) under Contract No. N40083-11-D-0028, Task Order Number: 0001.

1.1 Purpose

The purpose of this EPP is fourfold:

- Minimize the hazards to human health and the environment that might arise due to the nature of the remedial activities.
- Provide protection for the natural resources and environment during the life of the project.
- Plan for and provide environmental protective measures to control any pollution that might develop as a result of remedial operations.
- Plan for and provide the environmental protective measures required to correct any conditions that develop during site work associated with the project.

This EPP was prepared in accordance with the guidance provided by NAVFAC at the Initial Project meeting and fulfills the requirements set forth in Section 01 57 19.00 20, Temporary Environmental Controls, Section 1.6 of the contract, meeting the requirements outlined in the regulations listed below:

- Code of Federal Regulations:
  - 29 CFR 1910, Subpart G: Occupational Health and Environmental Control
  - 40 CFR 261: Identification and Listing of Hazardous Waste
  - 40 CFR 262: Generators of Hazardous Waste
  - 40 CFR 263: Transporters of Hazardous Waste
  - 40 CFR 264: Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
  - 40 CFR 300: National Oil and Hazardous Substances Pollution Contingency Plan
  - 49 CFR 178: Shipping Container Specification
- U.S. Army Corps of Engineers (USACE):
  - COE EP-1165-2-304: 1976 Floodplain Regulations for Floodplain Management

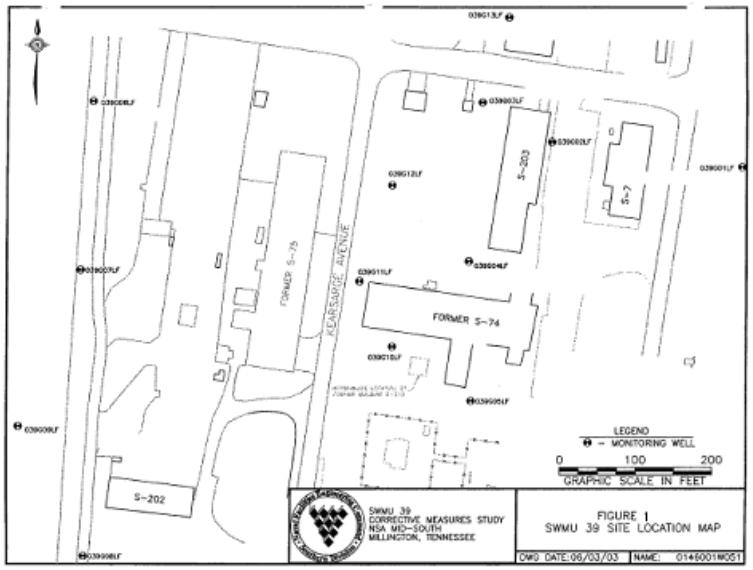
This EPP is intended for use during all phases of the remedial actions at the site. It establishes guidelines that will be followed during activities at the site and will be used in conjunction with the other project plans and documents.

1.2 Project Background and Scope of Work

The Site, SWMU 39, is located at the NSA Mid-South base approximately 150 feet east of Kearsarge Avenue, across from the boiler plant located on the south side of NSA Mid-South

(see **Figure 1** below). SWMU 39 is approximately 3.90 acres in size and is bordered by Kearsarge Avenue to the west, South Navy Circle to the north, Kittyhawk Avenue to the east, and a working dog training facility (Building S-212) to the south.

The SWMU 39 property includes a 1-story building structure (Building S-203) with an adjoining asphalt parking area, a concrete foundation that remains from the demolition of former Building S-74, and the remainder of the property was maintained grass. These features of the property were observed by Lee & Ryan during a site walkover conducted with NAVFAC representatives on October 13, 2011. Building S-74 was built in 1943 and operated as a laundry until 1981.



As part of the U.S. Navy Installation Restoration Program, a RCRA Facility Investigation (RFI) was conducted in 1998 and 1999, that identified the chlorinated solvents, perchloroethylene (PERC) and trichloroethylene (TCE) in the fluvial soil deposits and groundwater beneath the existing slab at concentrations exceeding RCRA action levels. Subsequent investigations defined a groundwater contaminant plume in the vicinity of the building. In 2005, EnSafe, Inc., began to treat the chlorinated solvents using enhanced bio-remediation by creating a reducing environment that is conductive to anaerobic microbes responsible for dechlorination. Although the TCE and PERC concentrations have dropped over time, they still do not meet the required cleanup levels.

Lee & Ryan was retained to remediate the contaminant plume at SWMU 39 and remove the concrete slab and impacted soils under it that remain from building S-74. The main objective of this project is to remediate two existing chlorinated solvent plumes in groundwater to achieve the allowable Maximum Contaminant Levels (MCLs) for TCE and its degradation compounds allowing for site closure. The goal of the project is to have no restrictions and no need for land use controls.

After evaluating a number of remedial options, Lee & Ryan proposed using in-situ chemical oxidation (ISCO) to treat the groundwater contaminant plumes, and excavate the impacted soils from under a portion of the concrete storage pad. A solution of potassium permanganate

($KMnO_4$) will be injected into the plumes. Potassium permanganate is an oxidizer, which directly attacks organic materials including the chlorinated solvents present at the site, and breaks the material down to harmless by-products.

Prior to injecting the oxidant, Lee & Ryan personnel will evaluate the contaminant's distribution throughout the aquifer by advancing eight borings in the vicinity of the two contaminant plumes and vertically profiling the aquifer via the collection of groundwater samples and analysis of volatile organic compounds (VOCs). In addition, geophysical sensors will be installed in the borings to collect electrical resistivity data, which, together with the analytical results, will be used to develop a 3-dimensional model of the contaminant plumes.

Previous studies have shown electrical resistivity measurements to be effective in evaluating the distribution of chlorinated solvents within an aquifer. This information will be used to develop the treatment plan for the ISCO injection event, i.e. the quantity, concentrations, and locations for the injection of the chemical oxidants. In addition, geophysical measurements will be collected during treatment and post-treatment to evaluate the oxidants distribution within the aquifer and its effectiveness in remediating the contaminants.

1.3 Material to be Encountered

Analytical testing performed by EnSafe, Inc., identified the presence of chlorinated solvents, primarily PERC and TCE, in the soils and groundwater at the site. The reported concentrations exceeded the respective RCRA action levels and the Federal drinking water MCLs. Lee & Ryan, and its subcontractor's personnel, will expect to encounter both impacted soil and groundwater during the remedial efforts at the site.

In addition, selected project personnel will be working with and may come into contact with the chemical oxidant, $KMnO_4$, during the ISCO injection(s) procedures.

2.0 Environmental Manager

The Project Manager, Angelo Dattilo, will serve as the Environmental Manager. A copy of his appointment letter is attached as **Appendix A**. As both the project and environmental manager, Mr. Dattilo is responsible for completing the project, while ensuring that the environment and health and safety of project personnel are protected. He will delegate responsibility for the implementation, maintenance, and compliance of the project activities to other personnel, as required.

The following sections describe the personnel and required chain-of-command that will assist him in controlling and directing EPP activities at the site

2.1 Site Health and Safety Officer (SHSO)

The SHSO will be Mr. John Lyttle and will be responsible for all health and safety activities related to the project including but not limited to the following:

- Training on-site personnel,
- Air monitoring activities,
- Decontamination of equipment leaving the site,

- Providing personal protective equipment and clothing, and
- Implementing decontamination and emergency response procedures.

The SHSO has the authority to stop any operation that threatens the health and/or safety of the team or surrounding populace. The SHSO, who is dual-hatted as the Site Superintendent, will conduct the daily EPP inspections and health and safety activities as required. The SHSO also serves as a back-up Emergency On-site Coordinator.

2.2 Site Superintendent

The Site Superintendent is responsible for field implementation of the EPP procedures. In addition, Mr. Lyttle will be responsible for the health and safety program as discussed above. This responsibility includes advising site workers of the specific health and safety requirements and consulting with the Environmental Manager regarding appropriate changes to the EPP and SHSP. The Site Superintendent also serves as the back-up Emergency On-Site Coordinator.

2.3 Emergency Coordinator

The Emergency Coordinator (EC) will implement and coordinate all EPP procedures during spills and releases. During an emergency, the EC will activate alarm systems, identify the problem, assess the health or environmental hazards, notify emergency response agencies, and take all reasonable measures to stabilize the situation. The EC will also be responsible for follow-up activities after the incident such as treating, storing, or disposing of residues and impacted soils, decontamination and maintenance of emergency equipment, and submission of any reports. The EC is also responsible for conducting daily project meetings. The Site Superintendent serves as the EC and will be on-site during all remediation operations.

2.4 Site Personnel

All site personnel will be responsible for working in a safe and healthy manner, and will comply with all applicable local, state, and federal rules and regulations.

3.0 Pre-Construction Survey Results

On October 13, 2011, representatives of Lee & Ryan, TolTest, Inc., JBL, and NAVFAC conducted a survey of the SWMU 39 property. Observations made during the site visit were summarized in a report entitled: *Environmental Conditions Report*. A copy of the report is attached as **Appendix B**.

4.0 Hazardous Waste Materials Management

The following section contains information regarding the materials that will be used on-site and that have the potential to be involved in a spill or release. Table C-1 lists quantities of materials that may be present on site by their type.

Table C-1

Material Inventory

Material	Units[1]	Location
Diesel Fuel	Gallons	Vehicle/Fuel Storage Area
Gasoline	Gallons	Vehicle/Fuel Storage Area
Oil	Quarts	Vehicle/Fuel Storage Area
Acids/Preservatives	<1 Gallon[2]	Site Field Office
Potassium Permanganate[3]	Pounds (Dry)	Decontamination Pad

Notes: The exact quantities will be determined during remedial activities.

1) Amount and storage requirements will be determined based on need.

2) Quantity and type of sample preservatives will be identified and provided by the laboratory based on the final contractor sampling and analysis plan. Sample bottles will be prepared prior to arrival. Because of the size of the project, quantities will be minimal.

3) Oxidant will be brought in as a dry powder and mixed on site as needed. No oxidant will be stored at the site between injections.

4.1 On- Site Materials

The constituents of concern, TCE, PERC, and related compounds, are present in both soils and groundwater at the site.

4.2 Airborne Contaminant Releases

Although minimal, the potential exists for vapor-contaminated airborne particles to be released during site remedial activities. During these activities, organic vapor concentrations will be monitored using a photoionization detector (PID) or similar device, in accordance with the Site Health & Safety Plan.

4.3 Fuel and Flammable Liquids

Due to the short time frame of the excavation activities, an on-site fuel storage area is not necessary. With the exception of the heavy construction equipment (excavator, dozer, compactor, etc.), all vehicles will be fueled at an off-site gas station. Heavy construction equipment will be refueled by tanker truck, as required.

4.4 Potassium Permanganate

The oxidant, $KMnO_4$ will be brought on to the site for the in-situ treatment of the groundwater contaminant plume. The $KMnO_4$ will be mixed with water and injected into the aquifer using a Geoprobe® or similar drill rig. The solution will be mixed and stored on the decontamination pad, so that, in the event of a release, there is secondary containment. The exact quantity of $KMnO_4$ to be used for each injection will be determined during the contaminant distribution assessment. Potassium permanganate will not be stored on-site between injections.

4.5 Other Materials of Concern

Other materials necessary to complete the project, with the potential for spills and/or releases are listed below. The exact quantity and type of these materials will be determined during remedial activities.

- Acids for sample preservation.
- Sand/gravel materials for backfill within the excavation.
- Fertilizer, soil, and topsoil for restoration operations.

4.6 Material Compatibility

Lee & Ryan does not anticipate that any of the materials mentioned in Sections 1 through 5 will come into contact with each other during site operations. All of the compatibility data that exists for each material are noted on the MSDS sheets attached as **Appendix C**.

5.0 29, 40, and 49 CFR Employee Training Documentation

All employees involved with hazardous waste operations and emergency response on site are required to attend and complete an Occupational Health and Safety Administration (OSHA) 40 hour health and safety course (Hazardous Waste Operations and Emergency Response) in accordance with 29 CFR 1910-120. Employees already having this training will have attended an eight-hour OSHA refresher course within the last year. Copies of this documentation for the Lee & Ryan management team are attached as **Appendix D**.

All personnel involved with the project will complete the on-line ECATTs training for NAVFAC NSA Mid-South, Millington, Tennessee. Copies of the training certificates are attached as **Appendix E**.

A minimum of one hour of site-specific training will be provided for each employee or sub-contractor. The training program will ensure that personnel are able to respond effectively to emergencies by familiarizing them with the procedures and equipment systems directly applicable to the project including drilling procedures, neutralization of $KMnO_4$, procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment; communication of alarm procedures; site evacuation procedures; and shutdown of operations. In addition, the employee-training program will address other aspects of the EPP such as preventive maintenance, inspection and monitoring, housekeeping practices, etc. Training documentation will be maintained by the Site Superintendent.

Job specific EPP and health and safety instructions will be reviewed before beginning each new phase of work. A daily health and safety meeting will be conducted by the SHSO or Site Superintendent to discuss current project site safety considerations, changes in operations, or any other training deemed necessary by the SHSO. Documentation of these meetings will be maintained by the Site Superintendent.

6.0 Solid Waste Management

As stated earlier, previous investigations have shown that the soils underlying the concrete storage pad are contaminated with chlorinated solvents at concentrations exceeding RCRA cleanup criteria. Lee & Ryan proposes to remediate these impacted soils by demolishing and removing the concrete pad and then excavating the impacted soils and transporting them as solid-waste to a RCRA Subpart D landfill. In addition, Lee & Ryan intends to install a number of monitoring wells at the site as part of the groundwater remediation program. Soil cuttings, generated by the drilling operations, will be managed as a solid waste.

Lee & Ryan's proposed managerial procedures for both waste streams are described in the following sections.

6.1 Excavation Areas

The concrete storage pad overlying the TCE contaminated soils will be broken up, removed, and placed directly into tri-axle for transport to BFI's North Shelby Landfill (BFI Landfill), located at 7107 Old Millington Road, in Millington, Tennessee, approximately five miles west-southwest of the NSA Mid-South base. The BFI Landfill is approved to operate by the Tennessee Department of Environmental Conservation (TDEC) as a Class III municipal solid waste facility with permit number DML790000122. In the event the tri-axles are not available for loading, the contractor may continue to break-up the concrete and create small stockpiles to permit quicker loading once the tri-axles do arrive.

Once exposed, the affected soils will be excavated and loaded directly onto a tri-axle for transport to the same disposal facility. No affected soils will be stockpiled at the site.

6.2 Monitoring Well Installation

Eight borings will be advanced on-site and fitted with specially designed well screens for subsequent groundwater sampling to assess the contaminant distribution within the aquifer. Upon completion of the assessment, the aquifer will be treated using in-situ chemical oxidation (ISCO).

Lee & Ryan anticipates that this phase of the work will generate small quantities of soil cuttings. The cuttings will be transported to the concrete storage pad and then loaded onto tri-axles for transportation to the BFI Landfill.

7.0 Environmental Permit Requirements

Based on the scope of work, three permits must be obtained for remediation activities can begin at the site. These are:

- A Well Application Permit (Injection-Shelby County)
- State Injection Permit (TDEC)
- A Well Application Permit (Vertical Profile/Geophysical Survey Wells-Shelby County)
- A Dig Permit (NSA Mid-South)

Copies of the permit applications are attached as **Appendix F**.

In addition, an Erosion Control Plan (ECP) will be submitted to and approved by the NAVFAC Project Manager before remediation activities can begin at the site. Lee & Ryan's subcontractor, JBL, will conduct a pre-construction topographic survey of the site and will be used to prepare the ECP.

Furthermore, Lee & Ryan will prepare and submit notification letters to NAVFAC, Shelby County, and State personnel as required prior to initiating any remedial activities at the site. Copies of the notification letters will be provided to the NTR as they are generated.

A brief discussion of the required permits is provided below.

7.1 Well Application Permit (Injection)

Lee & Ryan submitted a well application form to the Shelby County Health Department, Pollution Control Section, Water Quality Branch, on November 15, 2011. This permit is required prior to $KMnO_4$ injection or any other subsurface boring activities.

7.2 Well Application Permit (Vertical Profile/Geophysical Survey Wells)

Once a contractor has been selected, and the scope of work finalized, Lee & Ryan will submit a well application form to the Shelby County Health Department, Pollution Control Section to obtain a permit for the installation of the vertical profile/geophysical survey wells.

7.3 Dig Permit

A permit to install the wells, demolish the concrete pad, and excavate the impacted soils will be secured from NSA Mid-South prior to any subsurface or demolition activities. The dig permit is required prior to conducting any subsurface intrusive activities at NSA Mid-South.

8.0 Spill Response

This section outlines areas of potential spills and the procedures that will be used to prevent them. In addition, it discusses the actions to be taken to contain and clean-up a spill should one occur.

8.1 Potential Spill Sources and Spill Prevention Practices

Because of the nature of the project, the potential for a spill is minimal. The following section identifies potential sources and details Lee & Ryan's procedures to prevent a spill.

8.1.1 Excavation Areas

The concrete storage pad overlying the TCE contaminated soils will be removed and placed directly into tri-axles for transport to the RCRA Subpart D waste disposal facility. Lee & Ryan does not anticipate encountering or recovering any fluids during this phase of the project. Any spills would consist of solid material which could be swept up and placed back in the trucks.

To prevent spillage:

- The tri-axle's will not be overloaded. Road weight limits will not be exceeded.
- Soils, concrete, and other debris will not exceed the height of the tri-axle bed walls.
- Bed loads will be covered with a canvas tarp or other approved material.
- Soils and other debris will be broomed off of the tires, ledges, bumpers, etc. prior to the tri-axle leaving the site.
- Prior to leaving the site, all vehicles shall be inspected and routed to the decontamination pad for either dry and/or wet decontamination of exterior and/or wheels.

8.1.2 Vehicle Refueling

Because of the project's short duration and low fuel requirements, vehicle fuels and oils will not be stored on-site. Company vehicles will not be fueled on-site. Fuel for generators, cutting equipment, or other small internal combustion engines, may be brought on-site as long as it is in USDOT approved storage containers and less than 5-gallons in size. A fuel tanker will be brought in to fill the heavy construction equipment and drill rig(s). Under no circumstances will fuel be stored overnight at the facility.

During refueling operations, an equipment operator must remain with the vehicle to ensure that the fuel tanks are not overfilled. Vehicles will be refueled on the storage pad for as long as the pad is there. Thereafter, the vehicles will be refueled on the road. All vehicular traffic and machinery will be shut down during refueling operations.

8.1.3 Aquifer Assessment and Treatment

A number of borings will be advanced on the site and fitted with specially designed well screens to assess the contaminant distribution within the aquifer. Upon completion of the assessment, the aquifer will be treated using in-situ chemical oxidation. Lee & Ryan anticipates that this phase of the work will generate:

- Soil Cuttings
- Well Development Water
- Well Sampling Purge Water

In addition, a solution of $KMnO_4$ will be mixed at the site for injection into the aquifer.

The soil cuttings will be transported to the concrete storage pad where they can be placed in tri-axles for transportation to the disposal facility. Any spillage can be easily cleaned up.

Water from well development and sampling will be stored in 5-gallon pales covered with lids, and stored on the decontamination pad. When the sampling event has been completed, the 5-gallon pales will be hauled with a vehicle to a temporary 500-gallon polypropylene tank stored at Containment Area 1625 until disposed by NSA personnel; or be transferred to the on-site, temporary 250-gallon polypropylene storage tank used to support the decontamination pad as discussed below.

All mixing operations ($KMnO_4$) will be performed on the decontamination pad. In the event of a spill, the decontamination pad provides secondary containment and a mechanism to permit the recovery of the solution. Once mixed, the solution will be injected into the aquifer using the injection wells already present on the site and a Geoprobe® drill rig. A leak or spill could release $KMnO_4$ solution to the environment.

8.2 Emergency and Decontamination Equipment

In the event of a spill the following site equipment will be available:

8.2.1 Small Scale Emergency Equipment

Small-scale emergency equipment will include dry chemical, ABC rated fire extinguishers; spill control equipment; absorbent materials; decontamination equipment; air supplied respirators; radiotelephone equipment; windsocks; and various hand tools. This equipment will be made accessible to all on-site workers. Locations of such equipment will be posted at Lee & Ryan's temporary office. Additional emergency equipment may include:

- Photoionization detector
- Lower Explosive Limit, O_2 meter
- Pressure washer
- Generator – 5 kilowatt (KW)
- Visqueen®
- Sorbent sausage

8.2.2 Large-Scale Emergency Equipment

During the demolition and excavation phase of the project, large-scale emergency equipment will be present at the site, including a front-end loader, bulldozer, and excavator. Once this phase of the work is completed, no heavy equipment will be kept on site. Other emergency equipment will be available from local fire department and other agencies if needed.

8.2.3 Spill Response Materials

Lee & Ryan will provide spill response materials, as required. Spill response equipment will include absorbent materials, chemical neutralizers (for $KMnO_4$), and any other spill containment devices necessary to prevent migration.

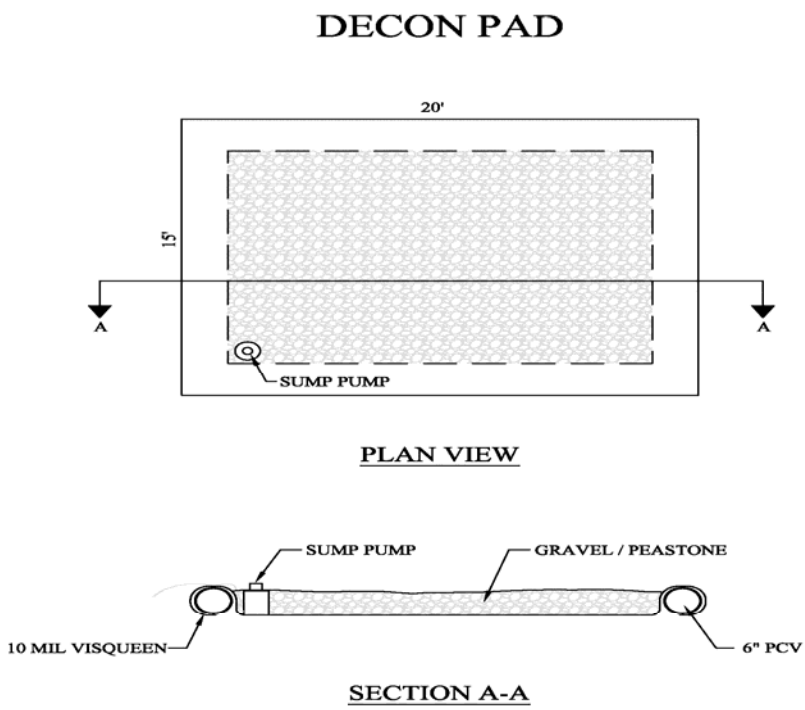
All equipment will be tested and maintained as necessary to assure its proper operation in a time of emergency. After an emergency, all of the equipment will be decontaminated, cleaned, and refit/refilled for its intended use before normal operations resume.

8.2.4 Decontamination Equipment

Decontamination equipment will be provided, installed, and verified to be in working order prior to the start of any site operations. Equipment for the decontamination area includes the following:

- Temporary decontamination pad and sump
- Clean water supply
- Detergent solution
- Brushes
- One 250-gallon polypropylene tank
- Gravel/pea stone
- One sump pump
- 10-millimeter (mm) Visqueen®
- 6-inch diameter polyvinyl chloride (PVC) piping

The decontamination pad will be constructed in general accordance with the following diagram.



8.3 Spill Response Actions

All spills or emergencies require prompt and deliberate action. In the event of such an emergency, it will be necessary to follow an established set of procedures as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

In the event of an emergency, the following actions will be taken:

- The individual identifying the emergency will activate the emergency signal and take immediate steps to address the situation (e.g. close a valve, stop refueling, apply first aid, etc.) as long as it is safe to do so.
- No further entry of visitors, contractors, trucks, tri-axles, etc. will be permitted. Vehicle traffic within the site will cease in order to allow for the safety of personnel and the movement of emergency equipment (see the *Work Plan*, Section 8.0 for the traffic control plan).
- Shut off all machinery, if it is safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a headcount and await further instructions from the emergency coordinator.
- The emergency coordinator will assess the situation and determine the size and nature of the incident:
  - Chemical release
  - Fire/explosion
  - Medical emergency
  - Hazardous weather

He will then assign personnel to assist with the cleanup or response, as necessary.

8.3.1 Small Spill

In the event of minor hazardous material releases (small spills of low toxicity), workers in the affected area will report to the contamination reduction zone. Small spills or leaks (generally less than 55-gallons) will require an initial evacuation of at least 50 feet in all directions to allow for cleanup and prevent exposure. After evaluating the extent of the release and its potential hazards, the emergency coordinator, or his designee, will determine if evacuation is required. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

Small spills may include solid materials or liquid materials being mishandled, dumped, leaked, knocked over, etc. Any solid material spillage will be immediately contained, collected and placed back on the concrete pad for later disposal. Any fuel/liquid spillages will be contained, treated with an absorbent, solidified if necessary, and then collected for disposal at the appropriate facility.

The oxidant, $KMnO_4$, will be mixed on the decontamination/containment pad. Any spills will be neutralized and then pumped into the temporary storage tank for future disposal.

8.3.2 Large Spill

In the event of a major hazardous material release (large spills of high toxicity or greater than 55 gallons), workers will be evacuated from the site. Workers will assemble at the daily designated rally point for a headcount by their foreman and to await further instruction.

The emergency coordinator will notify the Installation Environmental Director of the situation and any further notification of appropriate organizations/response centers shall be performed by the Installation Environmental Director.

The emergency coordinator will assign personnel to assist with the cleanup as required. The spill will be contained using a combination of:

- Absorbent materials (such as boom)
- Heavy equipment to create a berm or excavation to direct the flow of material and capture it.

Once the situation is under control, the emergency coordinator will notify the NTR of the release.

Tanker trucks or other equipment will be brought in to recover the spilled materials and transport them to a waste disposal facility as required.

9.0 Protection of Natural Resources

This section established the procedures to be used by Lee & Ryan to protect the site's natural resources.

9.1 Land Resources

In general, Lee & Ryan does not anticipate the need for any clearing operations at the site. All reasonable attempts will be made to keep the staging and excavation areas to a minimum. Some damage (ruts, scrapes, etc.) to the ground surface may be created during drilling operations. These will be restored as appropriate.

It is expected that restoration of the site will occur immediately after the concrete pad and impacted soils have been removed. Disturbed areas will be re-graded and seeded as necessary, in accordance with the work plan.

9.2 Tree Protection

Not applicable. There are no trees at the site.

9.3 Replacement of Damaged Landscape Features

As stated previously, all damaged areas will be regarded, and restored as necessary.

9.4 Temporary Construction

As stated in Section F.2.d., a temporary decontamination pad will be constructed on the site. The pad will be removed once both $KMnO_4$ injections, demolition, and soil removal tasks have been completed.

No other temporary construction is planned for the site.

9.5 Stream Crossings

Not applicable.

9.6 Fish and Wildlife

Not applicable.

9.7 Wetland Areas

Not applicable.

10.0 Protection of Historical and Archeological Resources

According to the information currently available, there are no historical or archaeological resources present at the site. In the event, that such a resource is discovered during the course of remedial actions, all work will cease immediately and the NTR will be notified.

11.0 Stormwater Management and Control

This section outlines storm-water management and control measures for the project. Additional measures will be provided in the Erosion Control Plan, which is to be submitted as an addendum to the Work Plan.

11.1 Ground Cover

The site is vegetated (grass), relatively flat-lying, and has some drainage ditches along the roadway to control storm-water runoff. For the most part, Lee & Ryan does not anticipate that much of the area will be disturbed by the proposed operations.

11.1.1 Project Activities

Demolition of the storage pad and excavation of the impacted soils underlying it are expected to contribute to erosion and sedimentation issues at the site. Care will be taken to minimize

disruption to the ground surface as much as possible and temporary measures will be installed to minimize erosion and control sedimentation.

Drilling operations performed as part of the evaluation and subsequent treatment of the aquifer are not expected to disturb the ground cover. It is possible that some rutting will occur as the heavy vehicles are driven over the site. These areas will be restored and reseeded as appropriate once drilling operations have been completed.

11.2 Erodible Soils

The surficial soils at the site consist of a fine grained silt and are not considered to be erodible unless disturbed or sloped at angles above 5 to 6 degrees. Since much of the site is flat, this is not an issue. However, there is a drainage ditch located in the vicinity of the concrete storage pad, which could be affected if disturbed. Lee & Ryan will install temporary measures (silt fencing, straw bales, etc.) to prevent erosion in these areas.

11.3 Temporary Measures

This section describes the various temporary measures that will be used to control and manage storm-water runoff during earthmoving activities at the site. All controls will comply with the Erosion and Sedimentation Control plans.

11.3.1 Silt Fences

Silt fencing will be installed adjacent to any slopes, swales, or drainage ditches located in the vicinity work. The silt fencing will be installed in accordance with the Erosion Control Plan. Additional fencing will be placed as necessary to accommodate site conditions as directed by the Site Superintendent and/or the NAVFAC Project Manager.

11.3.2 Straw Build Barriers

Straw bales will be used in places where flow over disturbed areas must be minimized while vegetation is protected or established. Locations of straw bales or similar erosion control methodology such as filter fabric, coir logs, etc. will be decided in the field.

11.3.3 Straw Mats

Straw mats will be placed on any slopes that have been regarded and reseeded to prevent erosion and permit the grass an opportunity to establish itself. Straw mats are bio-degradable and will not have to be removed once remediation has been completed.

11.3.4 Other Best Applicable Technologies

Lee & Ryan will take other measures as necessary to control and manage storm-water.

11.4 Runoff

Erosion and sedimentation control facilities, as specified in the Erosion Control Plan, will minimize the run-on/runoff affecting the project site. The existing drainage ditches and swales in the topography will be used to divert storm-water runoff around the project site. Turbidity curtains, silt fencing, and other best practices will be installed in accordance with the Erosion Control plan to prevent sedimentation in the drainage ditches and storm-water culverts in the vicinity of the site.

11.5 Vegetation and Mulch

After excavation of the impacted soils has been completed, the disturbed area will be re-graded and re-seeded. The excavation will be backfilled in 12-inch lifts so that it matches the surrounding grades. Each lift will be compacted to 95% of Proctor. Once the site reaches the correct elevations, approximately 2-inches of topsoil mixture will be applied to the site and a grass seed mixture applied. Straw mat or similar product will be applied to prevent erosion and provide protection while the new cover establishes itself.

APPENDIX A

Environmental Manager Appointment Letter

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

January 17, 2012

NSA Mid-South
Millington, TN – EMAC Seed Project
N40083-11-D-0028 CTO 0001
SWMU 39

RE: *REVISED*- Environmental Manager Appointment Letter
Contract # N40083-11-D-0028 CTO 0001
Section 3.2 Appendix A

TO WHOM IT MAY CONCERN:

I Scott Randall, Program Manager for Lee and Ryan Environmental Consulting, Inc., do hereby appoint and convey to:

Angelo Dattilo, LPG
1707 Melody Lane
Greenfield, IN 46140

all duties and responsibilities of the Project Environmental Manager for the project known as SWMU 39 EMAC Seed Project, Project Contract # N0083 – 11- D-0028 CTO 0001.

Pursuant to this appointment, Angelo Dattilo, LPG will be responsible for managing and implementing the Environmental Protection Plan (EPP) as described in his contract and will have the authority to direct the removal and replacement of non-conforming work.

Respectfully,

LEE & RYAN ENVIRONMENTAL CONSULTING, INC.

Scott Randall

Scott Randall, L.P.G., C.H.M.M.
Program Manager

APPENDIX B

Environmental Conditions Report

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

ENVIRONMENTAL CONDITIONS REPORT

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:

NAVFAC Midwest
Building 1A, 201 Decatur
Great Lakes, IL 60088

Contract Number: N40083-11-D-0028
Task Order Number: 0001

Submitted by:

Lee & Ryan Environmental Consulting, Inc.
1707 Melody Lane
Greenfield, IN 46140
Phone: 800-680-8987
Fax: 317-467-6588

October 2011
Revised January 2012

ENVIRONMENTAL CONDITIONS REPORT

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:
NAVFAC Midwest
Building 1A, 201 Decatur
Great Lakes, IL 60088

Contract Number: N40083-11-D-0028
Task Order Number: 0001

Lee & Ryan does hereby certify that, to the best of its knowledge and belief, the technical data delivered herewith under this contract is complete, accurate, and complies with all requirements of the contract.

PREPARED BY:

Senior Project Manager
(800) 680-8987

1/18/2012
Angelo Dattilo, LPG (Date)

APPROVED BY:

Program Manager
(800) 680-8987

1/18/2012
Scott Randall, LPG, CHMM (Date)

Note: *This document is proprietary; revision controlled, and is intended strictly for use by Lee & Ryan in support of specific contractual responsibilities. Copying or further dissemination in any manner is not permitted without written authorization by Lee & Ryan except as may be agreed between Lee & Ryan and the Navy in the terms and conditions of the applicable contract.*

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ENVIRONMENTAL CONDITIONS REPORT

1.0 Introduction

As part of the U.S. Navy Installation Restoration Program (IRP), Lee & Ryan Environmental Consulting, Inc. (L&R) and TolTest, Inc., (TolTest), prepared this Environmental Conditions Report (ECR) for solid waste management unit (SWMU) 39 located on the south side of Naval Support Activity (NSA) Mid-South (formerly Naval Air Station [NAS] Memphis), Millington, TN (see **Figures 1** and **2**).

The ECR complies with the Contract Task Order described in Solicitation N40083-11-R-0005 and subsequent contract number N40083-11-0028, Part 3.0 Environmental and Natural Resources Protection, Section 3.2 Submittals. Specifically, Part 3.0, Section 3.2, outlines the following guidance to be addressed:

- Provide and maintain protection of natural resources and the surrounding environment during the project.
- Plan and provide for environmental protective measures to control pollution as required throughout the duration of the project.
- Plan and provide for environmental protective measures, as required, to correct conditions that may develop throughout the course of the project.

2.0 General Site Conditions

The SWMU 39 property was traversed by representative of Lee & Ryan, teaming partner, TolTest, subcontractor JBL and NAFVAC representatives during a planned site walk on October 13, 2011 at approximately 11:30 AM. The observations made during said site walk are summarized in the sections below. Site photographs were taken during the site reconnaissance are provided in **Appendix A**.

2.1 Site Description

The subject property, SWMU 39, is approximately 3.90 acres in size and is bordered by Kearsarge Avenue to the west, South Navy Circle to the north, Kittyhawk Avenue to the east, and a working dog training facility to the south (Building S-212). The property in the immediate vicinity of SWMU 39 appeared to be industrial, and a park exists east of Kittyhawk Avenue (see **Figure 3**).

On October 13, 2011, Lee & Ryan and TolTest observed the SWMU 39 property to include a 1-story building structure (Building S-203) with an adjoining asphalt parking area, a concrete foundation that remains from the demolition of former Building S-74 (demolished in 1995), and the remainder of the property was observed to be maintained grass.

The concrete pad is approximately 16,426 square feet in size with the perimeter being approximately 778 feet. The concrete pad is approximately 2.0 feet thick with steel supports for steel beams. As part of this Contract Task Order, the pad will be demolished and disposed off-site at a NAVFAC approved sanitary waste landfill.

2.2 Topography

The subject property and surrounding area was characterized as relatively level with low relief. An apparent swale exists between Building S-203 and the concrete pad. The surface water drainage appears to be south and west to a north-south trending drainage ditch which flows into Big Creek Drainage Canal.

2.3 Potential Receptors

SWMU 39 is located approximately 600 feet east of the nearest off-site residence. The surface water discharges to the Big Creek Drainage Canal located approximately 1,500 feet south of the subject property.

The two most proximal groundwater production wells are located approximately 2,00 feet north (PW-5), and approximately 2,000 feet north (PW-5) of SWMU 39 (see Figure 2). The wells are screened in the Fort Pillow Aquifer at 1,450 feet below ground surface (BGS), and 1,435 feet BGS, respectively. The Flour Island formation is a confining unit above the screened intervals.

2.4 Site Natural Resources and Surrounding Environment

Lee & Ryan and TolTest identified the natural resources on-site to include planted trees located on-site along Kittyhawk Avenue, soil and groundwater, the park located across Kittyhawk Avenue, and the Big Creek Drainage Canal.

2.5 Environmental Protective Measures to Control Pollution

Environmental protective measures will be implemented throughout the project to protect natural resources on and off-site, and provide protective measures to control pollution in several ways including management of chemicals, erosion control, stormwater management, and vehicular traffic controls during the life of the project.

Lee & Ryan observed five stormwater drains on-site and are shown on **Figure 3**. A warning sign was observed immediately adjacent to the stormwater inlet located near the northeast corner of the concrete pad. The warning sign stated "No Dumping Drains to Creek".

Lee & Ryan and TolTest will cover the stormwater drains during drilling, potassium permanganate (KMnO4) injection, and during demolition activities. Furthermore, as outlined in the Erosion Control Plan to be included in the Work Plan, the potential for sediment run-off during drilling, injection, demolition, and excavation will be minimized by the use of straw bales, coir logs, silt fencing, and/or other means necessary.

Vehicles will be inspected before mobilizing on-site to minimize the possible release and migration of fluids such as motor oil and transmission fluid. A temporary secondary containment structure will be placed underneath the injection mixing trailer in case of a release of KMnO4. If dry and dusty conditions exist during any activity, a dust control suppressant or other means of controlling dust will be implemented upon approval of the NAVFAC project manager.

The vehicular traffic and on-site work activities will be conducted in a way to minimize the potential for adverse environmental impacts to occur including damage to Building S-203 and

the adjoining parking area, the trees located adjacent to Kittyhawk Avenue, to other vehicular traffic coming into and out of the parking area, and the physical features on-site during mobilization such as the stormwater culvert, stormwater drains, the fire hydrant, and injection and monitoring wells.

A Site Specific Health and Safety Plan will be an attachment to the Work Plan and will address spill mitigation procedures, storage of chemicals, and other related items. An Erosion Control Plan will also be included in the Work Plan and will describe the materials and procedures necessary to minimize the generation of sediment and manage stormwater runoff.

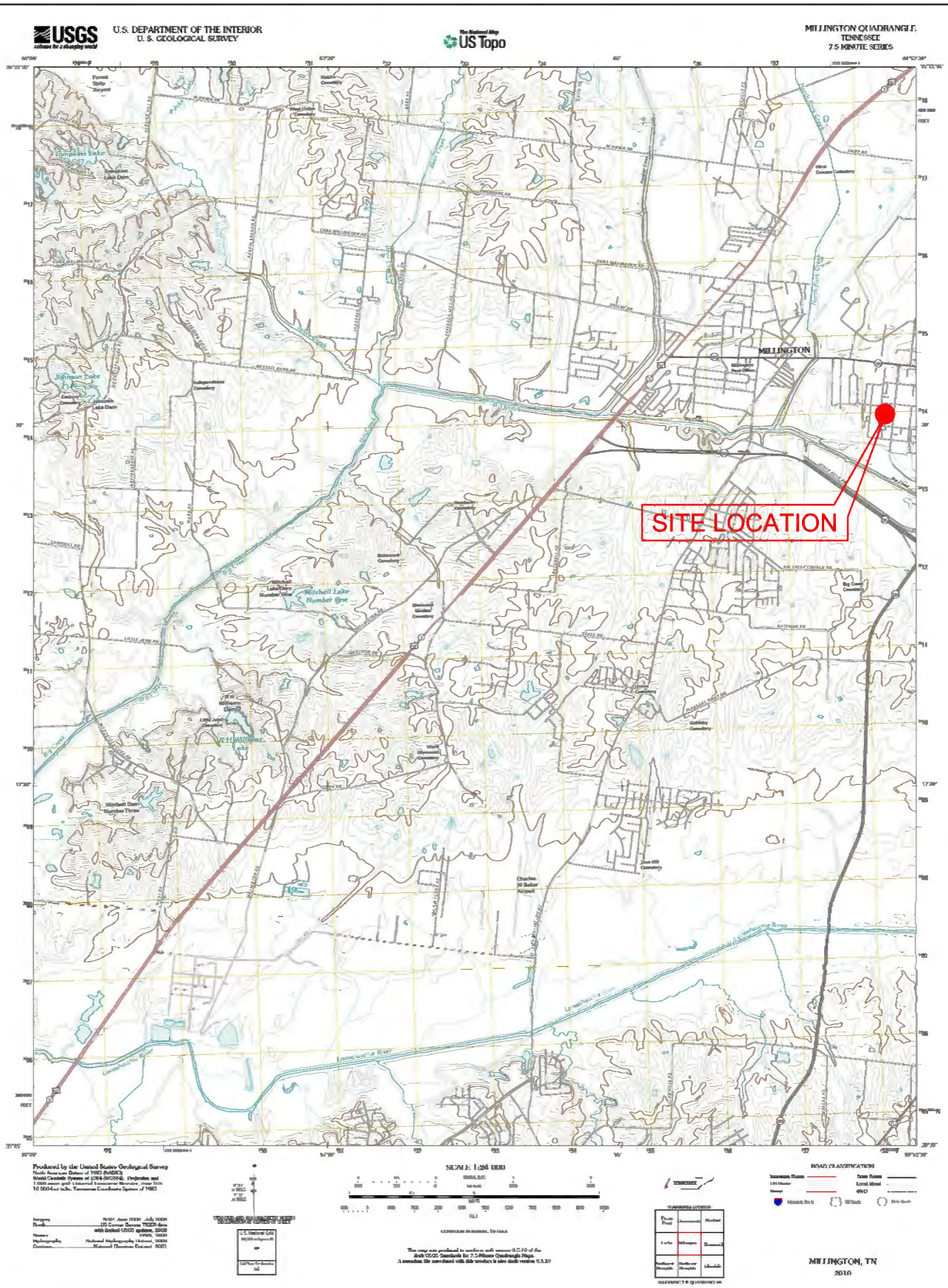
3.0 References

EnSafe/Allen & Hoshall, Assembly F Site Investigation Plan, RCRA Facility Investigation, Confirmatory Sampling Investigation SWMUs 20, 22 and 63, 30 and 39, Revision 1, July 8, 1996.

FIGURE 1

Site Vicinity Map

Environmental Conditions Report
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054



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Scale : Not To Scale

Site Vicinity Map

SWMU 39
NSA Mid-South
Millington, TN

Date: 10/25/11

Project # 11259

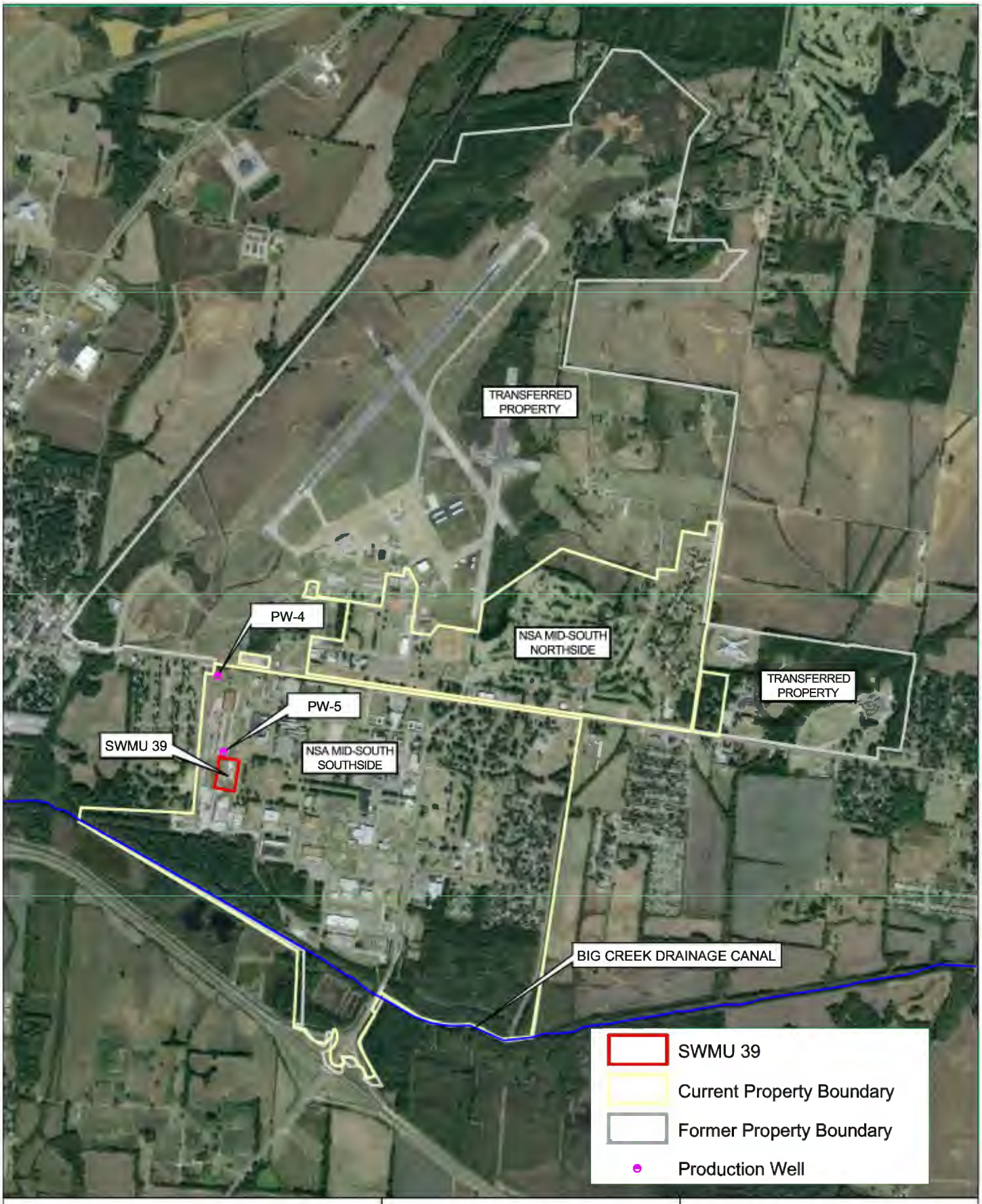
Figure 1

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 1 - Vicinity Map.dwg, 10/25/2011 9:29:35 AM, Adobe PDF.pc3

FIGURE 2

NAVFAC Base Map

Environmental Conditions Report
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054



LEE & RYAN
ENVIRONMENTAL •CONSTRUCTION •ENGINEERING

Scale : Not To Scale

NAVFAC Base Map
SWMU 39
NSA Mid-South
Millington, TN

Date: 10/25/11

Project # 11259

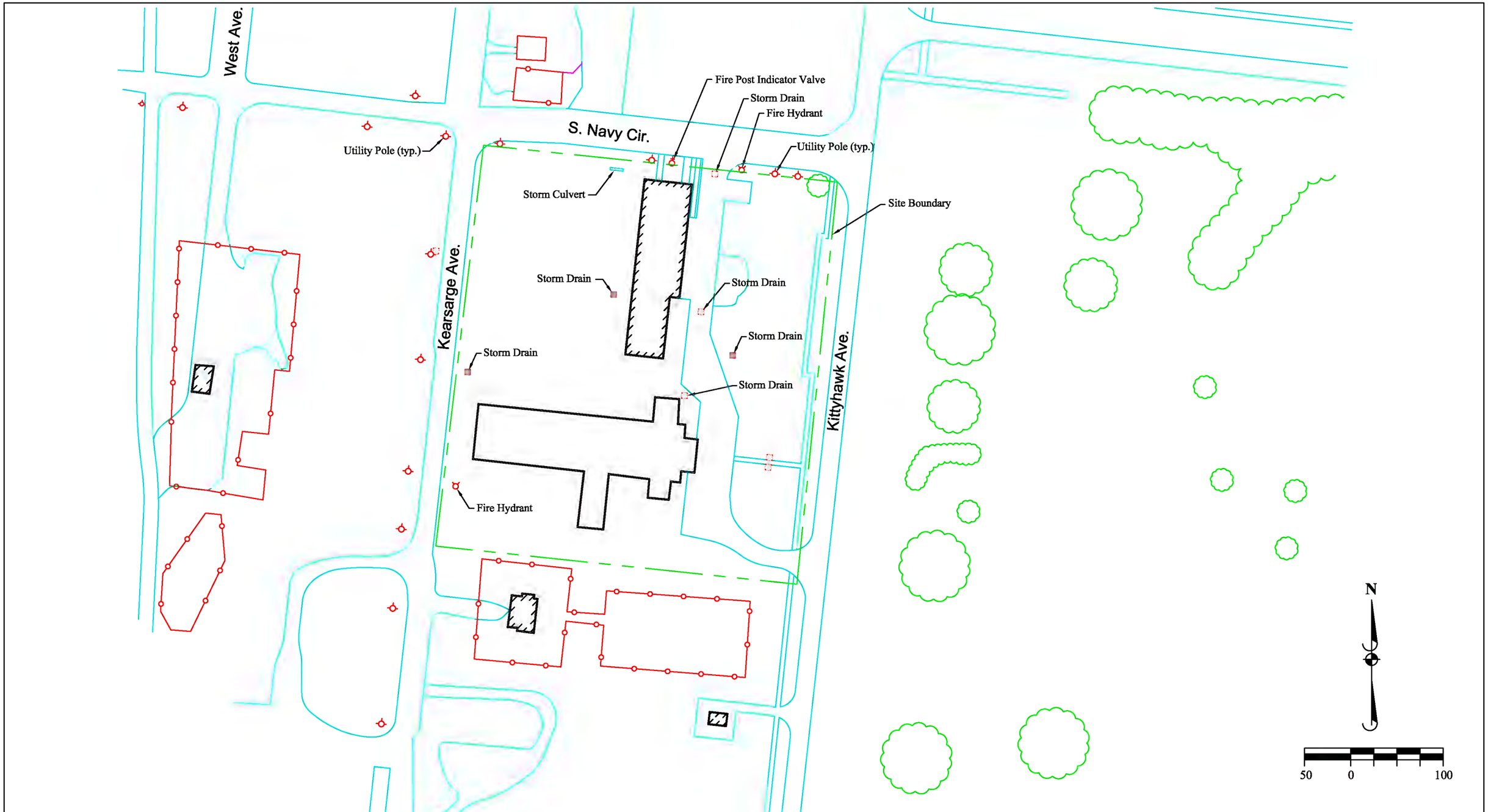
Figure 2

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 2 - Base Map.dwg, 10/31/2011 4:12:19 PM, Adobe PDF.pc3

FIGURE 3

SWMU 39 Layout Map

Environmental Conditions Report
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054



LEGEND		Symbols and Abbreviations:	LEE & RYAN ENVIRONMENTAL •CONSTRUCTION •ENGINEERING	SWMU 39 Site Layout Map	SWMU 39 NSA Mid-South Millington, TN	Figure 3
Drawn By: CW						
Checked By: AD						
Date Drawn: 10/25/11	Revised: -				Scale : 1" = 100'	Project # 11259

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\11259 - Fig. 3 - Location Map.dwg, 10/31/2011 2:19:56 PM, Adobe PDF.pc3

APPENDIX A

Site Photographs

Environmental Conditions Report
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Figure 1:

Photo of north and west side of SWMU 39 looking northeast along Kearsarge Avenue. Note the concrete pad in the forground.

Figure 2:

Photo of the concrete pad with a stormwater drain in the foreground looking southwest. Note blue circular sign on asphalt.

Figure 3:

The blue sign indicates that stormwater inlet drains to creek.

Figure 4:

View of concrete pad looking east. Note the park area across Kittyhawk Avenue**.**

Figure 5:

View of concrete pad looking north.

Figure 6:

View of adjacent dog training facility looking south from the west side of the concrete pad.

Figure 7:

View of grassy area between the east side of the concrete pad and building the right. Note the swale on the left.

Figure 8:

View of stormwater drain and injection well located immediately north of the building looking northwest.

Figure 9:

View of stormwater drain looking north along Kearsarge Road that forms the western property boundary.

Figure 10:

View of the Building S-203 and adjoining parking lot that will be the lay down area, looking north.

Figure 11:

View of stormwater drain located on the east side of the building parking lot looking southwest.

Figure 12:

View of a monitoring and injection well located on the north side of the property looking southwest. Note the stormwater culvert to the right.

Figure 13:

View of west side of property looking north along Kearsarge Avenue. Note the entrance ramp to the concrete foundation on the right.

Figure 14:

View of an injection well located on the north side of the property looking south.

APPENDIX C

MSDS Sheets

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

MATERIAL SAFETY DATA SHEET

Diesel Fuel (All Types)

MSDS No. 9909

EMERGENCY OVERVIEW
CAUTION!
OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT
EFFECTS CENTRAL NERVOUS SYSTEM
HARMFUL OR FATAL IF SWALLOWED

Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause moderate eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer.
If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

NFPA 704 (Section 16)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800) 424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732) 750-6000
MSDS INTERNET WEBSITE: www.hess.com (See Environment, Health, Safety & Social Responsibility)

SYNONYMS: Ultra Low Sulfur Diesel (ULSD); Low Sulfur Diesel; Motor Vehicle Diesel Fuel; Diesel Fuel #2; Dyed Diesel Fuel; Non-Road, Locomotive and Marine Diesel Fuel; Tax-exempt Diesel Fuel

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and CHEMICAL INFORMATION ON INGREDIENTS

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Diesel Fuel (68476-34-6)	100
Naphthalene (91-20-3)	Typically < 0.01

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher. Diesel fuel may be dyed (red) for tax purposes. May contain a multifunctional additive.

3. HAZARDS IDENTIFICATION

EYES
Contact with liquid or vapor may cause mild irritation.

SKIN
May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined - see Section 11 Toxicological Information.

IARC classifies whole diesel fuel exhaust particulates as probably carcinogenic to humans (Group 2A). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	> 125 ^{o}F (> 52 ^{o}C) minimum PMCC
AUTOIGNITION POINT:	494 ^{o}F (257 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):	0.6
UPPER EXPLOSIVE LIMIT (%):	7.5

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Diesel fuel, and in particular low and ultra low sulfur diesel fuel, has the capability of accumulating a static electrical charge of sufficient energy to cause a fire/explosion in the presence of lower flashpoint products such as gasoline. The accumulation of such a static charge occurs as the diesel flows through pipelines, filters, nozzles and various work tasks such as tank/container filling, splash loading, tank cleaning; product sampling; tank gauging; cleaning, mixing, vacuum truck operations, switch loading, and product agitation. There is a greater potential for static charge accumulation in cold temperature, low humidity conditions.

Documents such as 29 CFR OSHA 1910.106 "Flammable and Combustible Liquids, NFPA 77 Recommended Practice on Static Electricity, API 2003 "Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents and ASTM D4865 "Standard Guide for Generation and Dissipation of Static

Electricity in Petroleum Fuel Systems" address special precautions and design requirements involving loading rates, grounding, bonding, filter installation, conductivity additives and especially the hazards associated with "switch loading." ["Switch Loading" is when a higher flash point product (such as diesel) is loaded into tanks previously containing a low flash point product (such as gasoline) and the electrical charge generated during loading of the diesel results in a static ignition of the vapor from the previous cargo (gasoline).]

Note: When conductivity additives are used or are necessary the product should achieve 25 picosiemens/meter or greater at the handling temperature.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Components (CAS No.)	Source	Exposure Limits TWA/STEL	Note
Diesel Fuel: (68476-34-6)	OSHA	5 mg/m, as mineral oil mist	
	ACGIH	100 mg/m^3 (as totally hydrocarbon vapor) TWA	A3, skin
Naphthalene (91-20-3)	OSHA	10 ppm TWA	
	ACGIH	10 ppm TWA / 15 ppm STEL	A4, Skin

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION
A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE
Clear, straw-yellow liquid. Dyed fuel oil will be red or reddish-colored.

ODOR
Mild, petroleum distillate odor

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	320 to 690 oF (160 to 366 ^{o}C)
VAPOR PRESSURE:	0.009 psia @ 70 ^{o}F (21 ^{o}C)
VAPOR DENSITY (air = 1):	> 1.0
SPECIFIC GRAVITY (H_2O = 1):	0.83 to 0.88 @ 60 ^{o}F (16 ^{o}C)
PERCENT VOLATILES:	100 %
EVAPORATION RATE:	Slow; varies with conditions
SOLUBILITY (H_2O):	Negligible

10. STABILITY and REACTIVITY

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID and INCOMPATIBLE MATERIALS
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers; Viton ®; Fluorel ®

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute dermal LD50 (rabbits): > 5 ml/kg
Acute oral LD50 (rats): 9 ml/kg
Primary dermal irritation: extremely irritating (rabbits)
Draize eye irritation: non-irritating (rabbits)
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenic: OSHA: NO IARC: NO NTP: NO ACGIH: A3

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

MUTAGENICITY (genetic effects)
This material has been positive in a mutagenicity study.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:	Diesel Fuel	Placard (International Only):
HAZARD CLASS and PACKING GROUP:	3, PG III	
DOT IDENTIFICATION NUMBER:	NA 1993 (Domestic) UN 1202 (International)	
DOT SHIPPING LABEL:	None	
		Use Combustible Placard if shipping in bulk domestically

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the *de minimis* levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

CALIFORNIA PROPOSITON 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Diesel Engine Exhaust (no CAS Number listed)	10/01/1990

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) and Class D, Division 2, Subdivision B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	0	
	FIRE:	2	
	REACTIVITY:	0	

Refer to NFPA 704 "Identification of the Fire Hazards of Materials" for further information

HMIS® HAZARD RATING	HEALTH:	1 *	* Chronic
	FIRE:	2	
	PHYSICAL:	0	

SUPERSEDES MSDS DATED: 02/28/2001

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212) 642-4900
API	American Petroleum Institute (202) 682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General info: (800) 467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades **MSDS No. 9950**

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 ^{o}F (-43°C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 ^{o}F (>280 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR
A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^{o}F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^{o}F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

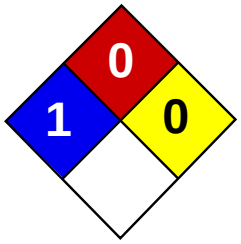
ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.



Health	2
Fire	0
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Potassium permanganate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium permanganate

Catalog Codes: SLP4912, SLP3892, SLP1075

CAS#: 7722-64-7

RTECS: SD6475000

TSCA: TSCA 8(b) inventory: Potassium permanganate

CI#: Not available.

Synonym: Potassium Permanganate, Biotech Grade

Chemical Name: Potassium Permanganate

Chemical Formula: KMnO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium permanganate	7722-64-7	100

Toxicological Data on Ingredients: Potassium permanganate, Biotech: ORAL (LD50): Acute: 1090 mg/kg [Rat]. 2157 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator). Possibly corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: organic materials, metals, combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of organic materials, of metals.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Spontaneously flammable on contact with ethylene glycol. Potassium Permanganate being conveyed through propylene tube ignited the tube. When solid hydroxylamine is brought into contact with solid potassium permanganate, there is produced immediately a with flame. Potassium permanganate decomposes hydrogen trisulfide so rapidly that sufficient heat is liberated to ignite the trisulfide. When Antimony or arsenic and solid potassium permanganate are ground together, the metals ignite.

Special Remarks on Explosion Hazards:
Take care in handling as explosions may occur if it is brought in contact with organic or other readily oxidizable substances, either in solution or in dry state. Explosive in contact with sulfuric acid or hydrogen peroxide. Potassium permanganate + acetic acid or acetic anhydride can explode if permanganate is not kept cold. Explosions can occur when permanganates come on contact with benzene, carbon disulfide, diethyl ether, ethyl alcohol, petroleum, or oganic matter. Contact with glycerol

may produce explosion. Crystals of potassium permanganate explode vigorously when ground with phosphorous. A mixture of .5% potassium permanganate + ammonium nitrate explosive caused an explosion 7 hrs. later. Addition of Potassium permanganate + dimethylformamide to give a 20% solution led to an explosion after 5 min. During a preparation of chlorine by addition of the concentrated acid (Hydrochloric acid) to solid potassium permanganate, a sharp explosion occurred on one occasion.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as organic materials, metals, acids.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 5 Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Sweetish, astringent.

Molecular Weight: 158.03 g/mole

Color: Purple. (Dark.)

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: Decomposes.

Critical Temperature: Not available.

Specific Gravity: 2.7 @ 15 C (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, acetone.

Solubility:
Easily soluble in methanol, acetone. Partially soluble in cold water, hot water. Soluble in Sulfuric Acid

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:
Highly reactive with organic materials, metals, acids. Reactive with reducing agents, combustible materials.

Corrosivity: Not available.

Special Remarks on Reactivity:
It is a powerful oxidizing agent. Incompatible with reducing agents, acids, formaldehyde, ammonium nitrate, dimethylformamide, glycerol, combustible materials, alcohols, arsenites, bromides, iodides, charcoal, organic substances, ferrous or mercurous salts, hypophosphites, hyposulfites, sulfites, peroxides, oxalates, ethylene glycol, Manganese salts in air oxidize the toxic sulfur dioxide to more toxic sulfur trioxide. Can react violently with most metal powders, ammonia, ammonium salts, phosphorous, many finely divided organic compounds (materials), flammable liquids, acids, sulfur.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1090 mg/kg [Rat]. Lowest Published Lethal Dose: LDL[Woman] - Route: Oral; Dose: 100 mg/kg LDL[Human] - Route: Oral; Dose: 143 mg/kg.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of eye contact (corrosive), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (Male and Female fertility) based on animal data. May affect genetic material (mutagenetic) based on animal data.

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Potassium permanganate UNNA: 1490 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Potassium permanganate Illinois toxic substances disclosure to employee act: Potassium permanganate Illinois chemical safety act: Potassium permanganate New York release reporting list: Potassium permanganate Rhode Island RTK hazardous substances: Potassium permanganate Pennsylvania RTK: Potassium permanganate Massachusetts RTK: Potassium permanganate Massachusetts spill list: Potassium permanganate New Jersey: Potassium permanganate New Jersey spill list: Potassium permanganate Louisiana spill reporting: Potassium permanganate California Director's list of Hazardous Substances: Potassium permanganate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive solid.

DSCL (EEC):
R8- Contact with combustible material may cause fire. R22- Harmful if swallowed. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:50 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

APPENDIX D

Employee OSHA Certification Documentation

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Lon Michael Cooper

has successfully completed a course of instruction in

HAZARDOUS SITE INVESTIGATION

conducted by

SOIL AND MATERIAL ENGINEERS, INC., ATLANTA, GEORGIA

January 13-17, 1986

DATE

Barbara D. Foster

Barbara D. Foster, R.N.
Corporate Health and Safety Officer

SOIL & MATERIAL ENGINEERS, INC.

John H. Brewer

John H. Brewer, Ph.D., P.E.
Vice President

Training Course Completion Card

See Photo ID

Safety Unlimited, Inc.

Certifies That

LON MICHAEL COOPER

has sucessfully completed

8 Hour HAZWOPER Refresher Training

In Accordance W/Federal OSHA Regulation 29 CFR 1910.120(e), (p) & (q)

And all State OSHA and EPA Regulations As Well

(See back side for more information)

110222543170	2/22/2011	Jules Griggs
Certificate #	Date Issued	Training Director

BCSP | BOARD OF CERTIFIED SAFETY PROFESSIONALS

208 Burwash Ave., Savoy, IL 61874 | P: +1 217-359-9263 | F: +1 217-359-0055
E: bcsp@bcsp.org | W: bcsp.org

Having met the applicable requirements defined by its bylaws,
BCSP hereby authorizes the use of

Certified Safety Professional (CSP)
to
Jack T Moorman

Valid Until	Certificate #	Recertification Due
12/31/2011	18961	12/31/2011

SECRETARY

Certificate of Completion

OSHAcampus.com
powered by 360training.com

This Certifies That

_____

is awarded this certificate for

Credit Hours:

Completion Date:

_____

Student Signature

Michael Millsap,

360training.com, Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

This course complies with OSHA 29 CFR 1910.120.

360training.com ♦ 13801 North Mo pac, Suite 100 ♦ Austin, TX 78727 ♦ 888-360-TRNG ♦ www.360training.com

American Red Cross

This recognizes that
Brian Morgan
has completed the requirements for
CPR-Adult
conducted by
Toltest, Inc.
Date completed: **05/04/2011**
The American Red Cross recognizes
this certificate is valid from
completion date for: **2 Years**

American Red Cross

This recognizes that
Brian Morgan
has completed the requirements for
Standard First Aid
conducted by
Toltest, Inc.
Date completed: **05/04/2011**
The American Red Cross recognizes
this certificate is valid from
completion date for: **2 Years**

American Red Cross

This recognizes that
Brian Morgan
has completed the requirements for
AED-Adult
conducted by
Toltest, Inc.
Date completed: **05/04/2011**
The American Red Cross recognizes
this certificate is valid from
completion date for: **2 Years**

OSHA 600467646

U.S. Department of Labor
Occupational Safety and Health Administration

Brian Morgan

has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety & Health

(Trainer) 1/7/10 (Date)

Business and Industry
Training Group
Ivy Tech State College
Terre Haute, Indiana

Brian D. Morgan

has, on this date *March 16, 1996*

satisfactorily completed *40* **hours of**

training in *Hazardous Materials Waste-Site Worker*

at *Ivy Tech State College, Terre Haute, Indiana*

Instructor

College Official

ENTACT

Confined Space Training

CERTIFICATE OF COMPLETION

OSHA 1910.146

Authorized entrants, attendants, supervisors, rescue and emergency personnel
Permit space identification and entry permit process
Hazard identification and appropriate equipment
Atmospheric testing

Communication

Brian Morgan

Evan McShirley, Certified Instructor

September 30, 2004

the Crosby group, inc.

Certificate of Achievement

awarded to

BRIAN MORGAN

For completion of the following training sessions

RISK MANAGEMENT, THE BASIC RIGGING PLAN, INSPECTION OF HARDWARE, CHAIN SLINGS & SLINGS, THE RIGGING TRIANGLE, APPLICATION OF HARDWARE, SLINGS & CHAIN SLINGS

as a part of the

Crosby Communication System

on this 21st *day of* April *2009*

"If it's Crosby, It's Quality"

President

Director of Training

OSHAcampus.com™
powered by 360training.com

CERTIFICATE OF COURSE COMPLETION

Student's Name	Course Title	Course Completion Date MM / DD / YYYY
Jacob Teuschler	Hazwoper 40 Hour Course in compliance with the 29 CFR 1910.120 Standard	03/06/2008 16:24 CST

Student's Signature	Certificate Number	Approved # of Hours
	873829	40

IACET The Continuing Education Unit ®

360training.com, Inc. has been reviewed and approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 8405 Greensboro Drive, Suite 800, McLean, VA 22102-5120. 360training.com, Inc. has awarded 4 CEUs to participants who successfully complete this program.

1.0 Safety CM Points

I hereby attest and certify that I personally took the above named safety lesson in accordance to OshaCampus guidelines. I further state that I have paid for the course and that I did not use another's work (Plagiarism). Students should retain certificates and refer to course instructions to receive official certification where necessary.

360training
Corporate Headquarters
13801 N. Mo-Pac, Suite 100
Austin, Texas 78727
tel: 888-360-8764
fax: 512-727-7683
email: support@360training.com

Certificate of Completion

OSHAcampus.com
powered by 360training.com

This Certifies That

Jacob Teuschler

is awarded this certificate for

8 Hr HAZWOPER Refresher

Credit Hours: 8

Completion Date: 12/22/2011 09:20 CST

AUTHORIZED IACET PROVIDER

Student Signature

Michael Millsap,

360training.com, Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

This course complies with OSHA 29 CFR 1910.120.

360training.com ♦ 13801 North Mo pac, Suite 100 ♦ Austin, TX 78727 ♦ 888-360-TRNG ♦ www.360training.com

Compliance Environmental Resources, Inc.
7002 Graham Road
Suite 202
Indianapolis, IN 46220
317-863-0008

Steven W. Cooper

Has completed the 40 Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course in compliance with 29 CFR 1910.120 (e). He will have met the criteria for certification upon completion of 24 hours of supervised training.

Christopher A. Kinsey, CHMM, CET
Instructor

Issue Date: 12/04/02

Certificate of Completion

OSHAcampus.com
powered by 360training.com

This Certifies That

Steve Cooper

is awarded this certificate for

8 Hr HAZWOPER Refresher

Credit Hours: 8

Completion Date: 11/14/2011 15:34 CST

AUTHORIZED IACET PROVIDER

Student Signature

Michael Millsap,

360training.com, Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

This course complies with OSHA 29 CFR 1910.120.

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Certificate of Completion

OSHAcampus.com
powered by 360training.com

This Certifies That

Shane Schmidt

is awarded this certificate for

8 Hr HAZWOPER Refresher

Credit Hours: 8

Completion Date: 11/11/2011 14:23 CST

AUTHORIZED IACET PROVIDER

Student Signature

Michael Millsap

Michael Millsap,

360training.com, Inc. has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102; (703) 506-3275.

This course complies with OSHA 29 CFR 1910.120.

360training.com ♦ 13801 North Mo pac, Suite 100 ♦ Austin, TX 78727 ♦ 888-360-TRNG ♦ www.360training.com

ampus.com

Certificate of Training

Awarded to

Shannon Wonders

has successfully completed 40 Hours
of Haz-Woper Technician Training
and is familiar with the requirements of
OSHA Standard 1910.120

Issued this 27th day of October 2011

Gary K. Yurt
Instructor
ISTS, Inc.
Prospect, KY 40059

Certificate No. 102711-02

Certificate of Training

Awarded to

Shannon Wonders

has successfully completed 4 Hours

of Haz-Com Training

and is familiar with the requirements of

OSHA Standard 1910.1200

Issued this 24th day of October 2011

Gary K. Yurt
Instructor
ISTS, Inc.
Prospect, KY 40059

U.S. ARMY CORPS OF ENGINEERS

PROFESSIONAL DEVELOPMENT SUPPORT CENTER
HUNTSVILLE, ALABAMA

CERTIFICATE

This is to certify that

Shannon Wonders

has completed the Corps of Engineers Training Course

CONSTRUCTION QUALITY MANAGEMENT FOR CONTRACTORS

Given at Louisville ABC (Location) By CELRL-CD-Q (Instructional District) 02/20/08 (Date)

Wesley Barber
Facilitator

Gary L. Anderson
Chief, USACE Professional Development Support Center

THIS CERTIFICATE EXPIRES FIVE YEARS FROM DATE OF ISSUE

OSHA 600467570

U.S. Department of Labor
Occupational Safety and Health Administration

Shannon Wonders

has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety & Health

(Trainer) 12/17/09 (Date)

Certificate of Training

Awarded to

John Lyttle

has successfully completed 8 Hours
of Haz-Woper Technician Refresher Training
and is familiar with the requirements of
OSHA Standard 1910.120

Issued this 27th day of October 2011

Chris Haunz
Instructor
ISTS, Inc.
Prospect, KY 40059

Certificate No. 102811-04

© 2009 Masterpiece Studios, Inc.

Certificate of Completion

This certifies that

John Lyttle

has successfully completed training for

Hazard Recognition

on this day

02/10/2011

Authorized Signature

Certificate of Completion

This certifies that

John Lyttle

has successfully completed training for

Hazard Communication

on this day

02/10/2011

Authorized Signature

ONSITE ENVIRONMENTAL

This is to certify that

John M. Lyttle

402-19-4606

has successfully completed Onsite's 40 hour "HAZWOPER" training and is in compliance with 29 CFR 1910.120 (e). This also stands for completion of the following training:

Confined Spaces — *Hearing Conservation*

Lockout/Tagout — *Electrical Safety*

At

Clarkesville, Tn

On

February 24, 1995

ONSITE ENVIRONMENTAL STAFFING
TRAINING CERTIFICATION
GEORGIA, USA

February 22, 1996
Expiration Date
#40-1194

Greg Stannard
Health & Safety Director

U.S. ARMY CORPS OF ENGINEERS

PROFESSIONAL DEVELOPMENT SUPPORT CENTER
HUNTSVILLE, ALABAMA

CERTIFICATE

This is to certify that

John Lyttle
TolTest, Inc.

has completed the Corps of Engineers Training Course

CONSTRUCTION QUALITY MANAGEMENT FOR CONTRACTORS

THIS CERTIFICATE, CENAO-09-1209 EXPIRES 16 November 2014

Given at **Maumee, OH** (Location) By **Norfolk** (Instructional District) **16 November 2009** (Date)

Kenneth A. Newton, P. E.
Facilitator

THIS CERTIFICATE EXPIRES FIVE YEARS FROM DATE OF ISSUE

Chief, USACE Professional Development Support Center

OSHA 600398935

U.S. Department of Labor
Occupational Safety and Health Administration

John Lyttle

has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety & Health

(Trainer) 11/19/09 (Date)

HEARTSAVER FIRST AID CPR AED

Heartsaver®
First Aid CPR AED

American Heart Association®

PEEL HERE

John M. Lyttle

This card certifies that the above individual has successfully completed the objectives and skills evaluations in accordance with the curriculum of the AHA Heartsaver First Aid CPR AED Program. Optional completed modules are those **NOT** marked out:

Child CPR AED Infant CPR Written test

12/2011
Issue Date

12/2013
Recommended Renewal Date

HEARTSAVER FIRST AID CPR AED

Training Center Name: Gibson General Hospital TC ID #: IN01625

TC Info: Princeton, In 47670 812-385-3401
City, State ZIP Phone

Course Location: Gibson General Hospital

Instructor Name: Kimberly Drennan Inst. ID #: 05080864460

Holder's Signature

© 2011 American Heart Association *Tampering with this card will alter its appearance.* 90-1820

KENTUCKY FIRE COMMISSION
STATE FIRE RESCUE TRAINING

KCTCS

Midwest Consortium for Hazardous Waste Worker Training

This is to certify that

Lee E. Carolan

has successfully completed the following course

8-Hr Hazardous Waste Site Refresher
Per 29 CFR 1910.120

As conducted by the Kentucky State Fire Commission and the Midwest Consortium for Hazardous Waste Worker Training

March 11, 2011	*KCTCS0311118HR01*
Date	*Certification Number*

Director, Hazardous Materials Training Center

RESOLUTION, INCORPORATED
1101-A DARBYTOWN DRIVE
NASHVILLE, TN. 37207
(615) 865-8813

Certifies That

Identification

Number: ASBIR11050979

LEE E. CAROLAN

Has on May 11, 2011, in Louisville, KY attended and successfully completed the requirements and passed the examination with a score of 70% or better on May 11, 2011, of the course entitled;

ASBESTOS INSPECTOR REFRESHER

Training was in accordance with 40 CFR Part 763 (AHERA) approved by the State of Tennessee and the Commonwealth of Kentucky. The above student received requisite training for asbestos accreditation under Title II of the Toxic Substances Control Act (TSCA).

Conducted At: 447 Farmington Ave.
Louisville, KY 40209

Expiration Date: May 11, 2012

Inspector training_____
(pre-requisite to Management Planner training)

Ron Francis – Training Manager

Steve Swift - Instructor

APPENDIX E

Employee ECATTS Certification Documentation

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

ECATTS

Certificate of Accomplishment

Dattilo, Angelo J.

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Indiana	0.5	977953	Nov-05-2011
Asbestos for Contractors: Indiana	0.5	977960	Nov-05-2011
Building Construction, Demolition or Renovation	0.5	981134	Nov-08-2011
Drinking Water for Contractors: Indiana	0.5	981141	Nov-08-2011
Environmental Management System Awareness Training	0.5	977945	Nov-05-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	987354	Nov-15-2011
Hazardous Materials	0.5	981148	Nov-08-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	977926	Nov-05-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	987342	Nov-15-2011
Project Manager	0.5	977947	Nov-05-2011

Nov-15-2011

Jerome S. Arcaro, Vice President, Academic Development
International Center for Leadership Development, Inc.
1375 Birch Crest Court
Lake Mary, FL 32746
Phone: (407) 833-8232
Fax: (407) 833-8662

ECATTS

Certificate of Accomplishment

Knueven, Thomas W

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Illinois	0.5	984825	Nov-10-2011
Air/Emissions for Contractors: Indiana	0.5	984779	Nov-10-2011
Air/Emissions for Contractors: Tennessee	0.5	984671	Nov-10-2011
Asbestos for Contractors: Illinois	0.5	984829	Nov-10-2011
Asbestos for Contractors: Indiana	0.5	984782	Nov-10-2011
Asbestos for Contractors: Tennessee	0.5	984676	Nov-10-2011
Building Construction, Demolition or Renovation	0.5	984677	Nov-10-2011
Drinking Water for Contractors: Illinois	0.5	984835	Nov-10-2011
Drinking Water for Contractors: Indiana	0.5	984785	Nov-10-2011
Drinking Water for Contractors: Tennessee	0.5	984680	Nov-10-2011
Environmental Management System	0.5	984820	Nov-10-2011
Environmental Management System Awareness	0.5	984769	Nov-10-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	984646	Nov-10-2011
Environmental Requirements for Contractors: NAVSTA Great Lakes	0.5	984822	Nov-10-2011
Environmental Requirements for Contractors: NSA Crane	0.5	984775	Nov-10-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	984667	Nov-10-2011
Hazardous Materials	0.5	984681	Nov-10-2011
Hazardous Waste for Contractors: Illinois	0.5	984838	Nov-10-2011
Hazardous Waste for Contractors: Indiana	0.5	984792	Nov-10-2011
Hazardous Waste for Contractors: Tennessee	0.5	984686	Nov-10-2011
Natural and Cultural Resources for Contractors: Illinois	0.5	984840	Nov-10-2011

Course	Credit Hours	S/N	Date
Natural and Cultural Resources for Contractors: Indiana	0.5	984794	Nov-10-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	984687	Nov-10-2011
Overview of Environmental Compliance for Contractors: Illinois	0.5	984819	Nov-10-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	984748	Nov-10-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	984619	Nov-10-2011
PCBs Management	0.5	984688	Nov-10-2011
Pesticides for Contractors: Illinois	0.5	984842	Nov-10-2011
Pesticides for Contractors: Indiana	0.5	984798	Nov-10-2011
Pesticides for Contractors: Tennessee	0.5	984689	Nov-10-2011
Petroleum, Oils, and Lubricants Management for Contractors: Illinois	0.5	984843	Nov-10-2011
Petroleum, Oils, and Lubricants Management for Contractors: Indiana	0.5	984803	Nov-10-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	984691	Nov-10-2011
Pollution Prevention	0.5	984692	Nov-10-2011
Project Manager	0.5	984655	Nov-10-2011
Recycling	0.5	984695	Nov-10-2011
Solid Waste for Contractors: Illinois	0.5	984844	Nov-10-2011
Solid Waste for Contractors: Indiana	0.5	984806	Nov-10-2011
Solid Waste for Contractors: Tennessee	0.5	984699	Nov-10-2011
Spill Response	0.5	984701	Nov-10-2011
Storage Tanks for Contractors: Illinois	0.5	984848	Nov-10-2011
Storage Tanks for Contractors: Indiana	0.5	984809	Nov-10-2011
Storage Tanks for Contractors: Tennessee	0.5	984705	Nov-10-2011
Stormwater for Contractors: Illinois	0.5	984852	Nov-10-2011
Stormwater for Contractors: Indiana	0.5	984811	Nov-10-2011
Stormwater for Contractors: Tennessee	0.5	984714	Nov-10-2011
Waste Management Guidelines	0.5	984720	Nov-10-2011
Wastewater for Contractors: Illinois	0.5	984855	Nov-10-2011
Wastewater for Contractors: Indiana	0.5	984814	Nov-10-2011
Wastewater for Contractors: Tennessee	0.5	984729	Nov-10-2011
Wetlands for Contractors: Illinois	0.5	984857	Nov-10-2011
Wetlands for Contractors: Indiana	0.5	984816	Nov-10-2011
Wetlands for Contractors: Tennessee	0.5	984731	Nov-10-2011

Nov-10-2011

Jerome S. Arcaro, Vice President, Academic Development
International Center for Leadership Development, Inc.
1375 Birch Crest Court
Lake Mary, FL 32746
Phone: (407) 833-8232
Fax: (407) 833-8662

ECATTS

Certificate of Accomplishment

Downey, Robert A

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Environmental Management System Awareness Training: NSA Mid-South	0.5	989561	Nov-17-2011
Project Manager	0.5	991385	Nov-19-2011

Nov-21-2011

Jerome S. Arcaro, Vice President, Academic Development
International Center for Leadership Development, Inc.
1375 Birch Crest Court
Lake Mary, FL 32746
Phone: (407) 833-8232
Fax: (407) 833-8662

ECATTS

Certificate of Accomplishment

Randall, Scott E

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Environmental Management System Awareness Training: NSA Mid-South	0.5	986461	Nov-14-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	986457	Nov-14-2011

Nov-14-2011

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International Center for Leadership Development, Inc.
1375 Birch Crest Court
Lake Mary, FL 32746
Phone: (407) 833-8232
Fax: (407) 833-8662

ECATTS

Certificate of Accomplishment

Smith, Mona L

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Indiana	0.5	985453	Nov-11-2011
Air/Emissions for Contractors: Tennessee	0.5	976212	Nov-03-2011
Asbestos for Contractors: Indiana	0.5	985465	Nov-11-2011
Asbestos for Contractors: Tennessee	0.5	976227	Nov-03-2011
Building Construction, Demolition or Renovation	0.5	976230	Nov-03-2011
Drinking Water for Contractors: Indiana	0.5	985470	Nov-11-2011
Drinking Water for Contractors: Tennessee	0.5	976239	Nov-03-2011
Environmental Management System Awareness	0.5	985435	Nov-11-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	976104	Nov-03-2011
Environmental Requirements for Contractors: NSA Crane	0.5	985442	Nov-11-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	976202	Nov-03-2011
Hazardous Materials	0.5	976967	Nov-04-2011
Hazardous Waste for Contractors: Indiana	0.5	985484	Nov-11-2011
Hazardous Waste for Contractors: Tennessee	0.5	976995	Nov-04-2011
Natural and Cultural Resources for Contractors: Indiana	0.5	985489	Nov-11-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	976998	Nov-04-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	985414	Nov-11-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	976015	Nov-03-2011
PCBs Management	0.5	977006	Nov-04-2011
Pesticides for Contractors: Indiana	0.5	985493	Nov-11-2011
Pesticides for Contractors: Tennessee	0.5	977210	Nov-04-2011

Course	Credit Hours	S/N	Date
Petroleum, Oils, and Lubricants Management for Contractors: Indiana	0.5	985498	Nov-11-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	977204	Nov-04-2011
Pollution Prevention	0.5	977011	Nov-04-2011
Project Manager	0.5	976186	Nov-03-2011
Recycling	0.5	977033	Nov-04-2011
Solid Waste for Contractors: Indiana	0.5	985503	Nov-11-2011
Solid Waste for Contractors: Tennessee	0.5	977047	Nov-04-2011
Spill Response	0.5	977060	Nov-04-2011
Storage Tanks for Contractors: Indiana	0.5	985509	Nov-11-2011
Storage Tanks for Contractors: Tennessee	0.5	977168	Nov-04-2011
Stormwater for Contractors: Indiana	0.5	985520	Nov-11-2011
Stormwater for Contractors: Tennessee	0.5	977175	Nov-04-2011
Waste Management Guidelines	0.5	977189	Nov-04-2011
Wastewater for Contractors: Indiana	0.5	985528	Nov-11-2011
Wastewater for Contractors: Tennessee	0.5	977200	Nov-04-2011
Wetlands for Contractors: Indiana	0.5	985535	Nov-11-2011
Wetlands for Contractors: Tennessee	0.5	977203	Nov-04-2011

Nov-11-2011

Jerome S. Arcaro, Vice President, Academic Development
International Center for Leadership Development, Inc.
1375 Birch Crest Court
Lake Mary, FL 32746
Phone: (407) 833-8232
Fax: (407) 833-8662

ECATTS

Certificate of Accomplishment

Smith, Mona L

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Illinois	0.5	985555	Nov-11-2011
Air/Emissions for Contractors: Indiana	0.5	985453	Nov-11-2011
Air/Emissions for Contractors: Tennessee	0.5	976212	Nov-03-2011
Asbestos for Contractors: Illinois	0.5	985559	Nov-11-2011
Asbestos for Contractors: Indiana	0.5	985465	Nov-11-2011
Asbestos for Contractors: Tennessee	0.5	976227	Nov-03-2011
Building Construction, Demolition or Renovation	0.5	976230	Nov-03-2011
Drinking Water for Contractors: Illinois	0.5	985562	Nov-11-2011
Drinking Water for Contractors: Indiana	0.5	985470	Nov-11-2011
Drinking Water for Contractors: Tennessee	0.5	976239	Nov-03-2011
Environmental Management System	0.5	985547	Nov-11-2011
Environmental Management System Awareness	0.5	985435	Nov-11-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	976104	Nov-03-2011
Environmental Requirements for Contractors: NAVSTA Great Lakes	0.5	985551	Nov-11-2011
Environmental Requirements for Contractors: NSA Crane	0.5	985442	Nov-11-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	976202	Nov-03-2011
Hazardous Materials	0.5	976967	Nov-04-2011
Hazardous Waste for Contractors: Illinois	0.5	985565	Nov-11-2011
Hazardous Waste for Contractors: Indiana	0.5	985484	Nov-11-2011
Hazardous Waste for Contractors: Tennessee	0.5	976995	Nov-04-2011
Natural and Cultural Resources for Contractors: Illinois	0.5	986612	Nov-14-2011

Course	Credit Hours	S/N	Date
Natural and Cultural Resources for Contractors: Indiana	0.5	985489	Nov-11-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	976998	Nov-04-2011
Overview of Environmental Compliance for Contractors: Illinois	0.5	985546	Nov-11-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	985414	Nov-11-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	976015	Nov-03-2011
PCBs Management	0.5	977006	Nov-04-2011
Pesticides for Contractors: Illinois	0.5	986614	Nov-14-2011
Pesticides for Contractors: Indiana	0.5	985493	Nov-11-2011
Pesticides for Contractors: Tennessee	0.5	977210	Nov-04-2011
Petroleum, Oils, and Lubricants Management for Contractors: Illinois	0.5	986617	Nov-14-2011
Petroleum, Oils, and Lubricants Management for Contractors: Indiana	0.5	985498	Nov-11-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	977204	Nov-04-2011
Pollution Prevention	0.5	977011	Nov-04-2011
Project Manager	0.5	976186	Nov-03-2011
Recycling	0.5	977033	Nov-04-2011
Solid Waste for Contractors: Illinois	0.5	986621	Nov-14-2011
Solid Waste for Contractors: Indiana	0.5	985503	Nov-11-2011
Solid Waste for Contractors: Tennessee	0.5	977047	Nov-04-2011
Spill Response	0.5	977060	Nov-04-2011
Storage Tanks for Contractors: Illinois	0.5	986628	Nov-14-2011
Storage Tanks for Contractors: Indiana	0.5	985509	Nov-11-2011
Storage Tanks for Contractors: Tennessee	0.5	977168	Nov-04-2011
Stormwater for Contractors: Illinois	0.5	986678	Nov-14-2011
Stormwater for Contractors: Indiana	0.5	985520	Nov-11-2011
Stormwater for Contractors: Tennessee	0.5	977175	Nov-04-2011
Waste Management Guidelines	0.5	977189	Nov-04-2011
Wastewater for Contractors: Illinois	0.5	986684	Nov-14-2011
Wastewater for Contractors: Indiana	0.5	985528	Nov-11-2011
Wastewater for Contractors: Tennessee	0.5	977200	Nov-04-2011
Wetlands for Contractors: Illinois	0.5	986686	Nov-14-2011
Wetlands for Contractors: Indiana	0.5	985535	Nov-11-2011
Wetlands for Contractors: Tennessee	0.5	977203	Nov-04-2011

Nov-14-2011

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Hennessy, Andrea J

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Course	Credit Hours	S/N	Date
Environmental Management System Awareness Training: NSA Mid-South	0.5	977596	Nov-04-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	977550	Nov-04-2011

Nov-04-2011

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Teuschler, Jacob M

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Course	Credit Hours	S/N	Date
Environmental Management System Awareness Training: NSA Mid-South	0.5	977157	Nov-04-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	976075	Nov-03-2011

Nov-04-2011

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Cooper, Lon M

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Course	Credit Hours	S/N	Date
Environmental Management System Awareness Training: NSA Mid-South	0.5	983411	Nov-09-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	983361	Nov-09-2011

Nov-09-2011

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Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Indiana	0.5	985500	Nov-11-2011
Air/Emissions for Contractors: Tennessee	0.5	985430	Nov-11-2011
Asbestos for Contractors: Indiana	0.5	985512	Nov-11-2011
Asbestos for Contractors: Tennessee	0.5	985439	Nov-11-2011
Building Construction, Demolition or Renovation	0.5	985440	Nov-11-2011
Drinking Water for Contractors: Indiana	0.5	985514	Nov-11-2011
Drinking Water for Contractors: Tennessee	0.5	976207	Nov-03-2011
Environmental Management System Awareness	0.5	985504	Nov-11-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	985398	Nov-11-2011
Environmental Requirements for Contractors: NSA Crane	0.5	985496	Nov-11-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	985429	Nov-11-2011
Hazardous Materials	0.5	976213	Nov-03-2011
Hazardous Waste for Contractors: Indiana	0.5	985524	Nov-11-2011
Hazardous Waste for Contractors: Tennessee	0.5	985451	Nov-11-2011
Natural and Cultural Resources for Contractors: Indiana	0.5	985517	Nov-11-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	976217	Nov-03-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	985481	Nov-11-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	976189	Nov-03-2011
PCBs Management	0.5	976201	Nov-03-2011
Pesticides for Contractors: Indiana	0.5	985485	Nov-11-2011
Pesticides for Contractors: Tennessee	0.5	976194	Nov-03-2011

Course	Credit Hours	S/N	Date
Petroleum, Oils, and Lubricants Management for Contractors: Indiana	0.5	985488	Nov-11-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	985423	Nov-11-2011
Pollution Prevention	0.5	976191	Nov-03-2011
Project Manager	0.5	976190	Nov-03-2011
Recycling	0.5	976196	Nov-03-2011
Solid Waste for Contractors: Indiana	0.5	985538	Nov-11-2011
Solid Waste for Contractors: Tennessee	0.5	985456	Nov-11-2011
Spill Response	0.5	985459	Nov-11-2011
Storage Tanks for Contractors: Indiana	0.5	985540	Nov-11-2011
Storage Tanks for Contractors: Tennessee	0.5	985467	Nov-11-2011
Stormwater for Contractors: Indiana	0.5	985545	Nov-11-2011
Stormwater for Contractors: Tennessee	0.5	985476	Nov-11-2011
Waste Management Guidelines	0.5	985419	Nov-11-2011
Wastewater for Contractors: Indiana	0.5	985531	Nov-11-2011
Wastewater for Contractors: Tennessee	0.5	976222	Nov-03-2011
Wetlands for Contractors: Indiana	0.5	985536	Nov-11-2011
Wetlands for Contractors: Tennessee	0.5	985405	Nov-11-2011

Nov-11-2011

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Schmidt, Shane R

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Illinois	0.5	991120	Nov-18-2011
Air/Emissions for Contractors: Indiana	0.5	991199	Nov-18-2011
Air/Emissions for Contractors: Tennessee	0.5	975970	Nov-03-2011
Asbestos for Contractors: Illinois	0.5	991126	Nov-18-2011
Asbestos for Contractors: Indiana	0.5	991210	Nov-18-2011
Asbestos for Contractors: Tennessee	0.5	975976	Nov-03-2011
Building Construction, Demolition or Renovation	0.5	975981	Nov-03-2011
Drinking Water for Contractors: Illinois	0.5	991133	Nov-18-2011
Drinking Water for Contractors: Indiana	0.5	991222	Nov-18-2011
Drinking Water for Contractors: Tennessee	0.5	975989	Nov-03-2011
Environmental Management System	0.5	991082	Nov-18-2011
Environmental Management System Awareness	0.5	991189	Nov-18-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	975923	Nov-03-2011
Environmental Requirements for Contractors: NAVSTA Great Lakes	0.5	991110	Nov-18-2011
Environmental Requirements for Contractors: NSA Crane	0.5	991193	Nov-18-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	975965	Nov-03-2011
Hazardous Materials	0.5	975990	Nov-03-2011
Hazardous Waste for Contractors: Illinois	0.5	991139	Nov-18-2011
Hazardous Waste for Contractors: Indiana	0.5	991230	Nov-18-2011
Hazardous Waste for Contractors: Tennessee	0.5	976005	Nov-03-2011
Natural and Cultural Resources for Contractors: Illinois	0.5	991142	Nov-18-2011

Course	Credit Hours	S/N	Date
Natural and Cultural Resources for Contractors: Indiana	0.5	991232	Nov-18-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	976014	Nov-03-2011
Overview of Environmental Compliance for Contractors: Illinois	0.5	991074	Nov-18-2011
Overview of Environmental Compliance for Contractors: Indiana	0.5	991188	Nov-18-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	975910	Nov-03-2011
PCBs Management	0.5	976016	Nov-03-2011
Pesticides for Contractors: Illinois	0.5	991147	Nov-18-2011
Pesticides for Contractors: Indiana	0.5	991235	Nov-18-2011
Pesticides for Contractors: Tennessee	0.5	975928	Nov-03-2011
Petroleum, Oils, and Lubricants Management for Contractors: Illinois	0.5	991150	Nov-18-2011
Petroleum, Oils, and Lubricants Management for Contractors: Indiana	0.5	991239	Nov-18-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	976019	Nov-03-2011
Pollution Prevention	0.5	975940	Nov-03-2011
Project Manager	0.5	975926	Nov-03-2011
Recycling	0.5	976022	Nov-03-2011
Solid Waste for Contractors: Illinois	0.5	991154	Nov-18-2011
Solid Waste for Contractors: Indiana	0.5	991245	Nov-18-2011
Solid Waste for Contractors: Tennessee	0.5	976027	Nov-03-2011
Spill Response	0.5	976032	Nov-03-2011
Storage Tanks for Contractors: Illinois	0.5	991162	Nov-18-2011
Storage Tanks for Contractors: Indiana	0.5	991253	Nov-18-2011
Storage Tanks for Contractors: Tennessee	0.5	976036	Nov-03-2011
Stormwater for Contractors: Illinois	0.5	991173	Nov-18-2011
Stormwater for Contractors: Indiana	0.5	991263	Nov-18-2011
Stormwater for Contractors: Tennessee	0.5	976044	Nov-03-2011
Waste Management Guidelines	0.5	976053	Nov-03-2011
Wastewater for Contractors: Illinois	0.5	991177	Nov-18-2011
Wastewater for Contractors: Indiana	0.5	991219	Nov-18-2011
Wastewater for Contractors: Tennessee	0.5	975955	Nov-03-2011
Wetlands for Contractors: Illinois	0.5	991156	Nov-18-2011
Wetlands for Contractors: Indiana	0.5	991216	Nov-18-2011
Wetlands for Contractors: Tennessee	0.5	975948	Nov-03-2011

Nov-18-2011

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COOPER, STEVEN W

Has successfully completed the following competencies:

Course	Credit Hours	S/N	Date
Air/Emissions for Contractors: Tennessee	0.5	979781	Nov-07-2011
Asbestos for Contractors: Tennessee	0.5	979847	Nov-07-2011
Building Construction, Demolition or Renovation	0.5	979883	Nov-07-2011
Drinking Water for Contractors: Tennessee	0.5	979924	Nov-07-2011
Environmental Management System Awareness Training: NSA Mid-South	0.5	979589	Nov-07-2011
Environmental Requirements for Contractors: NSA Mid South	0.5	979704	Nov-07-2011
Hazardous Materials	0.5	980023	Nov-07-2011
Hazardous Waste for Contractors: Tennessee	0.5	980179	Nov-07-2011
Natural and Cultural Resources for Contractors: Tennessee	0.5	980248	Nov-07-2011
Overview of Environmental Compliance for Contractors: Tennessee	0.5	979512	Nov-07-2011
PCBs Management	0.5	980300	Nov-07-2011
Pesticides for Contractors: Tennessee	0.5	980316	Nov-07-2011
Petroleum, Oils, and Lubricants Management for Contractors: Tennessee	0.5	980334	Nov-07-2011
Pollution Prevention	0.5	980369	Nov-07-2011
Project Manager	0.5	979595	Nov-07-2011
Recycling	0.5	980375	Nov-07-2011
Solid Waste for Contractors: Tennessee	0.5	980421	Nov-07-2011
Spill Response	0.5	980446	Nov-07-2011
Storage Tanks for Contractors: Tennessee	0.5	980468	Nov-07-2011
Stormwater for Contractors: Tennessee	0.5	980527	Nov-07-2011
Waste Management Guidelines	0.5	981748	Nov-08-2011

Course	Credit Hours	S/N	Date
Wastewater for Contractors: Tennessee	0.5	981754	Nov-08-2011
Wetlands for Contractors: Tennessee	0.5	981766	Nov-08-2011

Nov-08-2011

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APPENDIX F

Environmental Permits

Environmental Protection Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

SHELBY COUNTY HEALTH DEPARTMENT
POLLUTION CONTROL SECTION
WATER QUALITY BRANCH
814 Jefferson Avenue
Memphis, Tennessee 38105
(901) 222-9599 and fax (901) 222-9561

WELL APPLICATION FORM

SECTIONS I, II, III AND IX MUST BE COMPLETED BY THE WELL OWNER.
SECTIONS IV THRU VIII MUST BE COMPLETED BY THE WELL DRILLER.
APPLICANT AND DRILLER MUST SIGN THE APPLICATION

I. WELL OWNER

Name of Owner/Establishment NSA Mid-South
Contact Name and Title Jim Heide Name of Company NSA Mid-South, DOD NAVY
Mailing Address 5722 Integrity Drive
City Memphis State TN Zip Code 38054
Business Phone Number 901-874-5367 Home Phone Number _____

II. WELL LOCATION

Address Intersection of South Navy Circle and Kittyhawk Avenue Zip Code 38054
Well is Approximately 0.045 Miles N S E W Of Kittyhawk Avenue Road/Street/Hwy
Well Identification Number Existing wells are 21LF and 16LF Land Size in Acres 3.897

III. TYPE OF WELL TO BE INSTALLED

Water Production _____
Dewatering _____
Soil Boring _____
Geoprobe _____
Direct Push X (4 plus the use of two injection wells)
Other X use two existing injection wells (21LF & 16LF)

Monitoring _____
A) Ground Water Quality _____
B) Methane Gas _____
C) Water Level _____
D) Leachate _____
E) Gas Movement _____
F) Chemical Movement _____

Specify X: the four direct push injection points are temporary and will be backfilled. Two existing injection wells will used.

IV. WELL DRILLER

Drilling Company A.E. Drilling Services, LLC Tennessee Well Drillers License Number 709
Representative Mark Lassiter, P.G. - President
Tennessee P.E./R.P.G. Number 00005526 Representative Angelo J. Dattilo
Mailing Address Two United Way City Greenville State SC Zip Code 29607
Business Phone Number (864) 288-1968 Fax Number (864) 288-2272

V. TYPE OF WORK

New Well _____
Repair _____
Replacement _____

Fill and Abandonment _____
Chemical Treatment _____
Other X groundwater remediation

VI. WATER WELL CONSTRUCTION INFORMATION

Expected depth of the well in feet _____
Type of water source used during construction of the well _____
Well casing: Type of Material _____ Diameter _____ Wall Thickness _____

VII. MONITORING WELL INFORMATION

Number of Monitoring Wells to be installed 4_____ Proposed depth of wells _____
Substance (s) to be analyzed from well a. _____ b._____ c._____
Sampling method to be used Bailor _____ Pump _____
How often will the well be sampled? _____

VIII. WATER WELL USAGE INFORMATION

Residential _____	Farm _____	Sprinkler System _____
Commercial _____	Irrigation _____	Water Livestock _____
Industrial _____	Retain lake level _____	Other _____

IX. ADDITIONAL INFORMATION THAT IS REQUIRED

1. How many existing wells are on the property? Active 185 Inactive _____ None _____
2. The following must accompany any application that is submitted:
   A.) Plot plan that includes all information required as stated in the Regulations
   B.) A $25.00 dollar application processing fee
   C.) When an Emergency Permit is issued for any work an additional $50.00 dollars
   D.) All monitoring well, soil boring or similar applications require an inspection fee of $100.00 dollars, with the exception of water production wells.
   E.) A sketch or diagram of any proposed monitoring well must be enclosed

The applicant as well as the well driller agrees to comply with all regulations outlined in the Shelby County Well Construction Code as they relate to the construction and maintenance of a well in Shelby County. All applicable fees as well as the paperwork submitted are accurate as outlined in the regulations. By signing this application the applicant and well driller agree to comply with all of the regulatory requirements outlined in the Shelby County Well Construction Code.

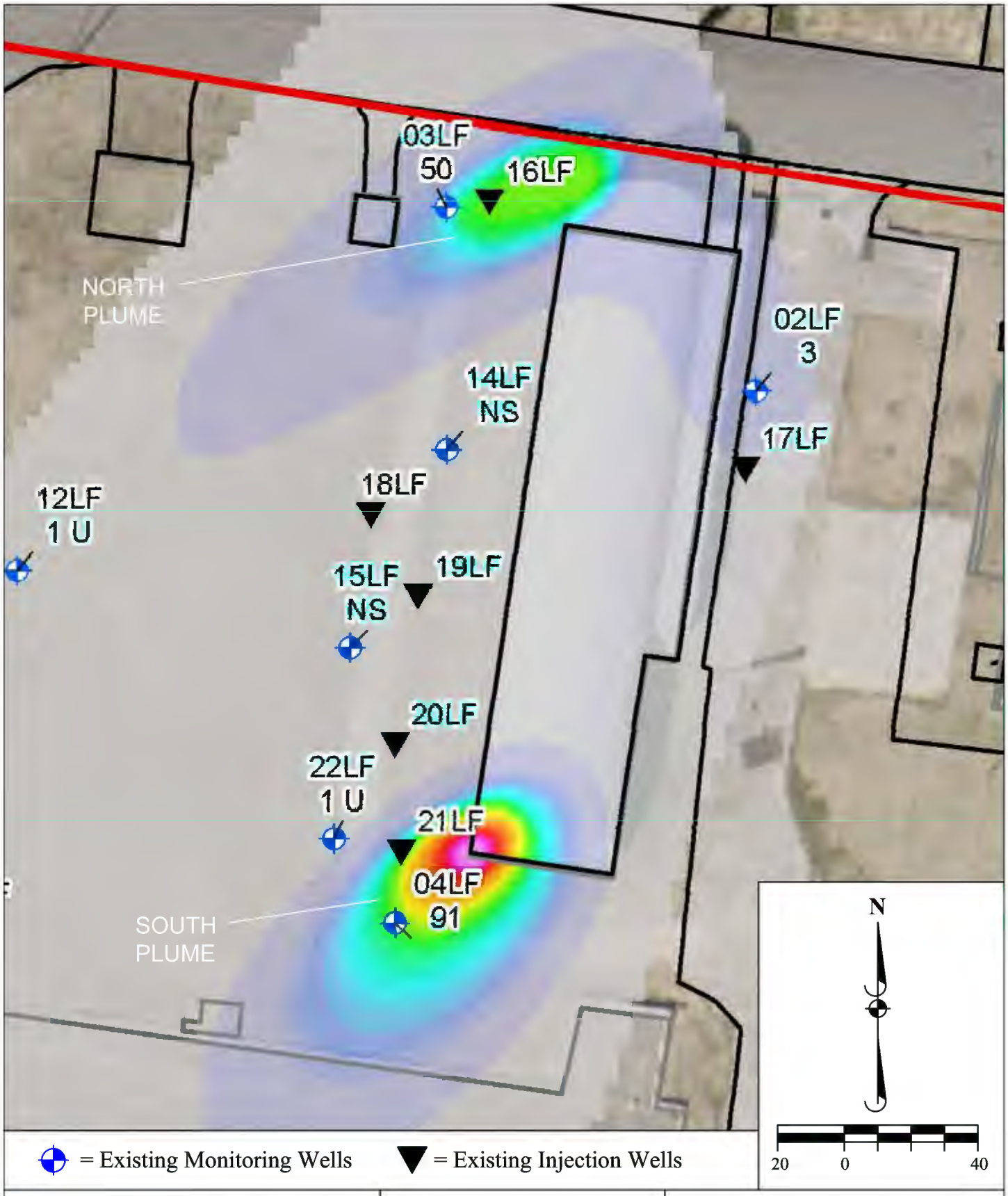
Signature of Well Owner James Heide Date 10/14/2011

Signature of Well Driller _____ Date _____

Remarks: The Health Department reserves the right to supplement the general requirements by an addendum as may be required. If the application is approved by the Health Department, a Construction Permit will be issued in writing to the selected well driller with a copy to the applicant. No construction is to begin until the permit has been received and the permit shall be kept at the construction site until the well or other work has been completed.

FOR DEPARTMENT USE ONLY

Date Application Received _____ **Approval/Denial Date** _____ **Permit Rejected** _____
Permit Granted _____ **Conditions** _____ **Permit Number** _____
Log Number _____ **Handy Map Page & Section** _____
Departmental Signature _____



= Existing Monitoring Wells ▼ = Existing Injection Wells

LEE & RYAN
ENVIRONMENTAL •CONSTRUCTION •ENGINEERING

SWMU 39
NSA Mid-South
Millington, TN

Project # 19901		Existing Injection Wells
Drawn By: CW	Checked By: AD	
Date Drawn: 11/10/11	Revised: -	**Figure 1**

M:\Projects\2011 Projects\Environmental\11259 - EMAC Remediation of TCE Plume - Millington, TN\DWG\existing injection wells.dwg, 11/10/2011 2:05:38 PM, Adobe PDF

2010 INTERIM MEASURES PROGRESS REPORT
SWMU 39

NAVAL SUPPORT ACTIVITY MID-SOUTH
MILLINGTON, TENNESSEE

Revision: 1

EnSafe Job Number:
0888807924

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Midwest
Great Lakes, Illinois

Prepared by:

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Oak Ridge, Tennessee 37830
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October 2010

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Acronyms

1,2-DCE	1,2-dichloroethylene
DO	dissolved oxygen
IMs	interim measures
mg/L	milligram per liter
MNA	monitored natural attenuation
NSA	Naval Support Activity
O&M	operation and maintenance
ORP	oxidation-reduction potential
SWMU	Solid Waste Management Unit
TCE	trichloroethylene
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound
μg/L	microgram per liter

EXECUTIVE SUMMARY

This annual progress report presents the monitoring data associated with the 2009/early 2010 interim measures (IMs) for Solid Waste Management Unit 39 (SWMU 39) at Naval Support Activity (NSA) Mid-South. IMs for this SWMU address chlorinated solvent contamination within the fluvial deposits aquifer beneath the site. These IMs consist of two parts:

- enhanced bioremediation that is designed to mitigate hazards and threats to human health and the environment from the most contaminated locations within SWMU 39 through the use of a carbon substrate injected into select locations of the plume to stimulate reductive dechlorination of the solvents

- monitored natural attenuation (MNA) that is being implemented as the long-term remedy for groundwater exhibiting lower concentrations of chlorinated solvents

As part of the IMs, injection wells were installed at selected locations within the chlorinated solvent plume at SWMU 39 for introduction of a carbon substrate into the aquifer to stimulate the reductive dechlorination of the solvents. Additionally, other groundwater monitoring wells were installed to provide sufficient data to better evaluate the remediation effectiveness. Monthly substrate injections began February 2, 2005, and continue to the present.

Analytical results from quarterly effectiveness monitoring through February 2010 indicate that the injections of sodium acetate and ammonium phosphate continue to stimulate the reductive dechlorination of trichloroethylene (TCE) and other volatile organic compounds (VOCs). Results from groundwater samples collected from monitoring well 039G22LF indicates TCE has been converted to cis-1,2-dichloroethylene (cis-1,2-DCE). TCE has been below laboratory method reporting limits in monitoring well 039G22LF for the past five sampling events. A similar response is quantified in groundwater samples collected from monitoring wells 039G03LF and 039G04LF, where conversion of TCE has also resulted in elevated concentrations of cis-1,2-DCE. TCE concentrations have decreased to 1 µg/L in monitoring well 039G03LF and 39 µg/L in monitoring well 039G04LF in groundwater samples collected during the February 2010 sampling event. Trace levels of VC have been detected in the groundwater associated with monitoring well 039G03LF and monitoring well 039G04LF, which have historically shown VC less than the laboratory method detection limits. The oxidation-reduction potential (ORP), hydrogen, and methane data all indicate the aquifer remains anaerobic, likely in the sulfate-reducing to methanogenic range, which is ideal for ongoing reductive dechlorination.

The 2009/2010 groundwater analytical data set indicates reductive dechlorination conditions are firmly established at SWMU 39 and TCE has been successfully remediated in groundwater samples collected from most site monitoring wells. At this time, the only groundwater samples which consistently exceed the maximum contaminant level (MCL) for TCE is from monitoring well 039G04LF; with TCE concentrations ranging from 39 µg/L and 76 µg/L in 2009/2010. However, this monitoring well has exhibited a 70% decline in TCE concentrations since IMs began in February 2005.

Since the remedial goals have been achieved in most of the monitoring wells with the exception of monitoring well 039G04LF, the remedy should transition to MNA and injections should be suspended. Suspending injections will enable the aquifer to convert back to its natural aerobic state which is necessary for aerobic degradation of the cis-1,2-DCE. Potential contaminant rebound associated with any untreated/residual TCE will also be evaluated through the ongoing quarterly monitoring. If contaminant concentrations rebound to within 50% of the historic TCE highs detected in monitoring wells 039G04LF and 039G03LF (or 160 µg/L and 55 µg/L, respectively) for two consecutive events; the Navy will reactivate the substrate injections. Given the proposed contingency of resuming injections, if warranted, the Navy proposes that MNA at the SWMU 39 continue until contaminant concentrations fall below required cleanup levels or until otherwise determined by the base cleanup team.

1.0 INTRODUCTION

Figure 1-1 is an aerial map of the base and the surrounding area that shows the Solid Waste Management Unit 39 (SWMU 39) and Naval Support Activity (NSA) Mid-South. SWMU 39 is within the Navy-retained, Southside portion of the base and was the former laundry and dry cleaning facility for the base. In February 2005, interim corrective measures were implemented at SWMU 39 to address trichloroethylene (TCE) contaminated groundwater in the fluvial deposits aquifer. These interim corrective measures consist of two parts:

- enhanced bioremediation that is designed to mitigate hazards and threats to human health and the environment from the most contaminated locations within SWMU 39

- monitored natural attenuation (MNA) that is being implemented as the long-term remedy in less contaminated portions of the plume

This interim measures (IM) progress report presents a comprehensive summary of data collected since IMs began and the most recent quarterly monitoring events — May 2009, August 2009, November 2009, and February 2010.

Since February 2, 2005, six substrate-injection wells have been used to inject designed quantities of nutrients (carbon and a nitrogen-based compound) on a monthly basis to stimulate reductive dechlorination of TCE. Seven monitoring wells are sampled quarterly for chemical and geochemical analyses to evaluate the effectiveness of the IMs and plume stability. Figure 1-2 shows monitoring well and injection well locations. In June 2009, following the evaluation of the base's monitoring well management plan, seven monitoring wells and two piezometers were abandoned at SWMU 39 due to their inactivity or their history of being contaminant-free due to their position relative to the plume boundaries.

Section 2.0 summarizes field activities detailing injection frequencies, volumes, and monitoring. Since start-up, field monitoring data and laboratory analytical data have been collected quarterly. Section 3.0 presents analytical data from the four most recent quarterly sampling events with historical data and an evaluation of the effectiveness of the remedy.

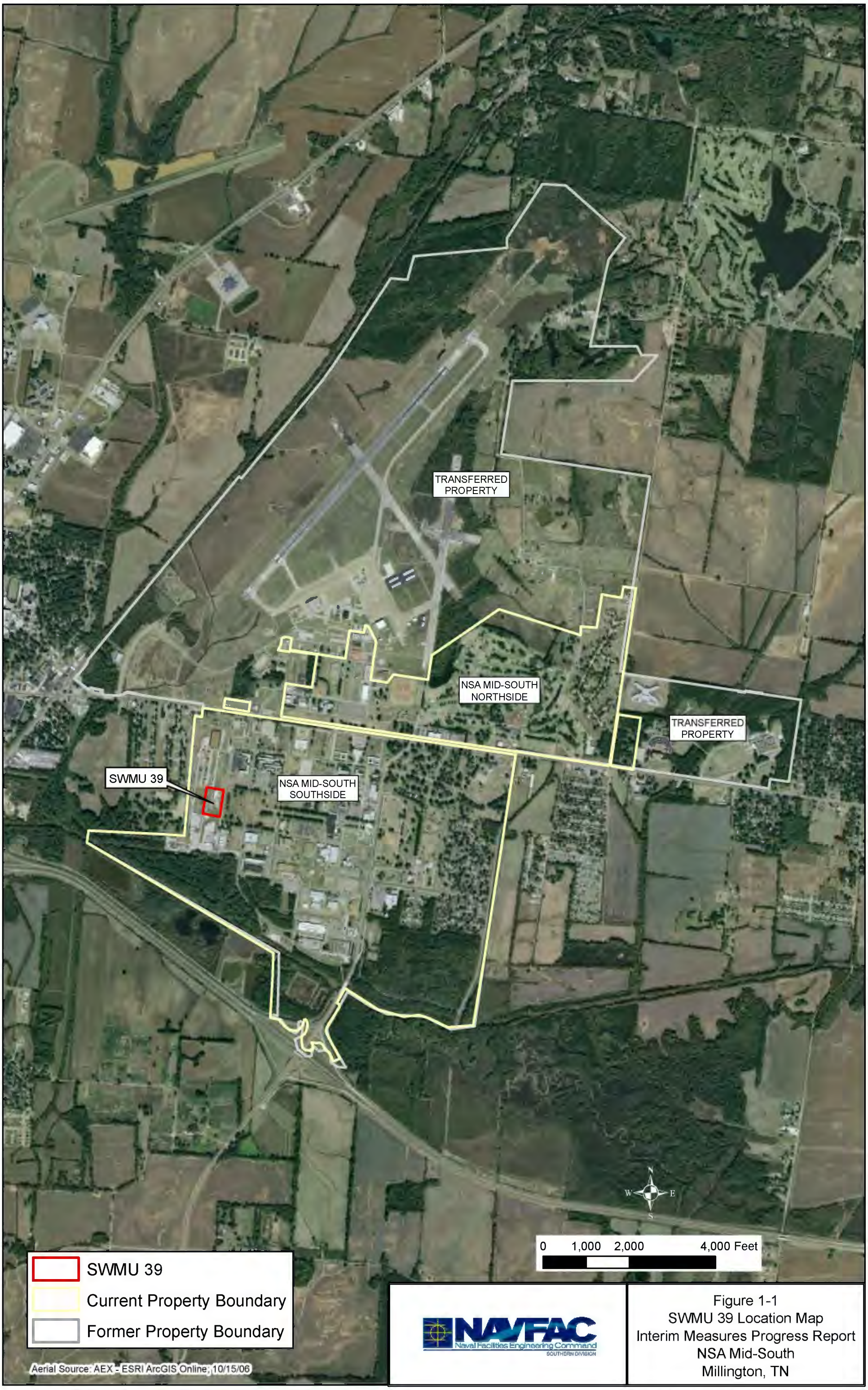

Figure 1-1
SWMU 39 Location Map
Interim Measures Progress Report
NSA Mid-South
Millington, TN

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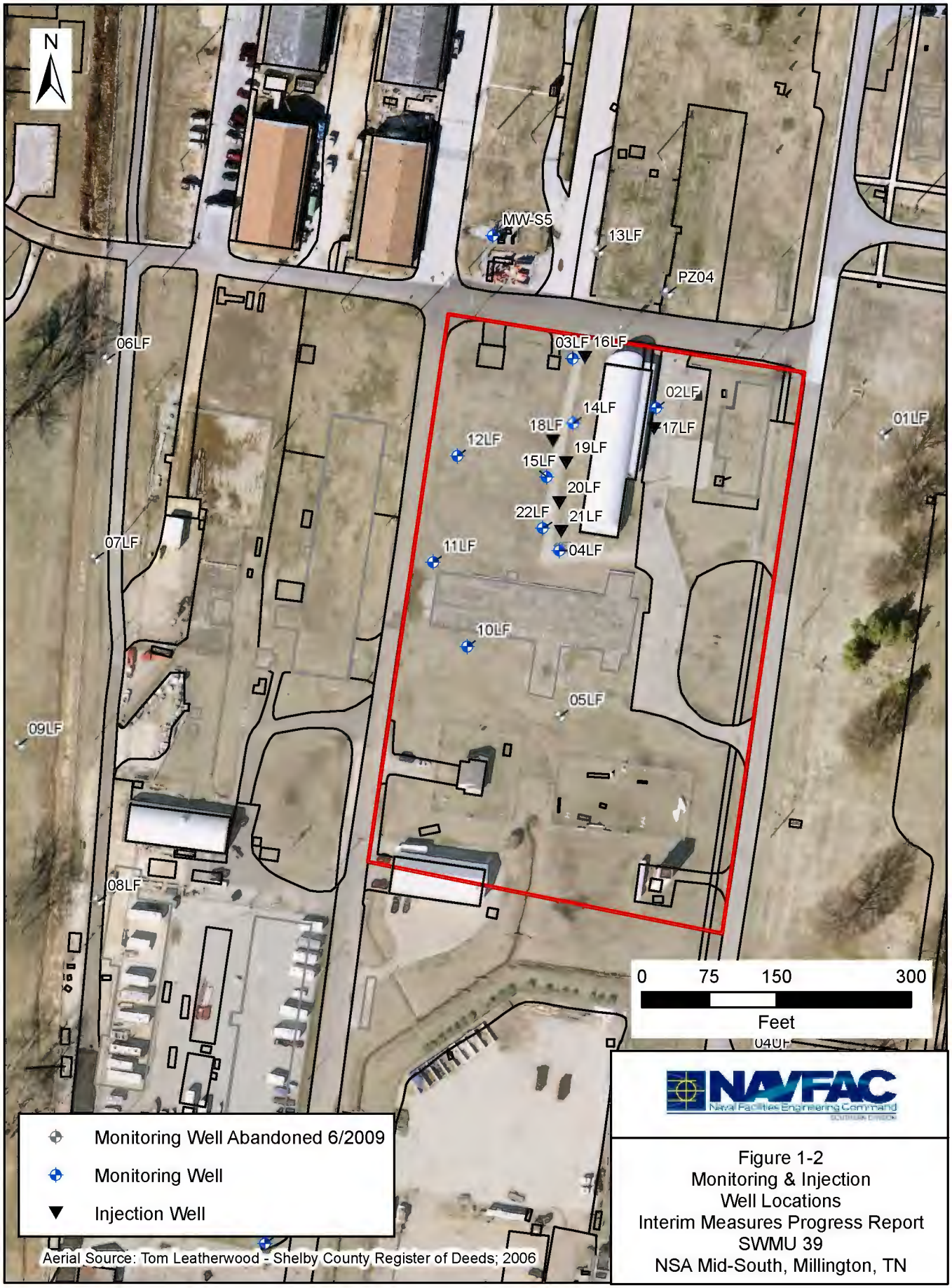

NAVFAC
Naval Facilities Engineering Command

Figure 1-2
Monitoring & Injection
Well Locations
Interim Measures Progress Report
SWMU 39
NSA Mid-South, Millington, TN

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2.0 SUMMARY OF FIELD ACTIVITIES

2.1 Substrate Injection

Sodium acetate is injected into the fluvial deposits aquifer monthly to create the reducing conditions necessary for TCE biodegradation. In addition, designed quantities of ammonium phosphate are injected as a micronutrient for microorganisms. These biostimulants are mixed in powder form and added to the injection wells in a liquid stream. All injections are performed using a gravity feed system.

Each monthly injection event consists of adding 100 gallons of dissolved sodium acetate and ammonium phosphate solution to each injection well. The solution contains 50 pounds of sodium acetate and 0.5 pounds of diammonium phosphate dissolved in 100 gallons of potable water. Mixing of the solution and injection are performed in all injection wells in a single day. As of February 2010, a total of 2,650 pounds of sodium acetate and 26.5 pounds of diammonium phosphate have been injected into each SWMU 39 injection well.

2.2 Quarterly Groundwater Sampling

Groundwater samples were collected from seven (7) SWMU 39 monitoring wells in May 2009, August 2009, November 2009, and February 2010 and have been compared with historical data to monitor remediation effectiveness. Samples are analyzed for the parameters/analytes presented in Table 2-1.

Water levels are measured during each quarterly sampling event in all monitoring wells to assess the groundwater flow direction in the fluvial deposits aquifer at the site. Water levels varied between 9 and 13 feet below land surface and calculated groundwater elevations were used to generate the potentiometric maps of the fluvial deposits aquifer provided in Figures 2-1 through 2-4 for the four quarterly events. The potentiometric maps indicate a south to southwest groundwater flow direction consistent with the historical flow directions.

2.3 Well Abandonment

Nine monitoring wells and two piezometers were abandoned in June 2009 as part of the base-wide well closure initiative to remove inactive monitoring wells. As shown on Figure 1-2, the majority of the monitoring wells were on the west and north portions of the site and off the plume centerlines. The monitoring wells were closed due to a history of being contaminant-free and/or inactivity. The rationale for the monitoring well closures is provided in the approved technical memorandum *Recommendation to Plug and Abandon Monitoring Wells* (Spectra Tech, October 20, 2008). The summary of the monitoring well abandonment activity is provided in the *Well Abandonment Activities at NSA Mid-South Report* (Spectra Tech, July 6, 2009).

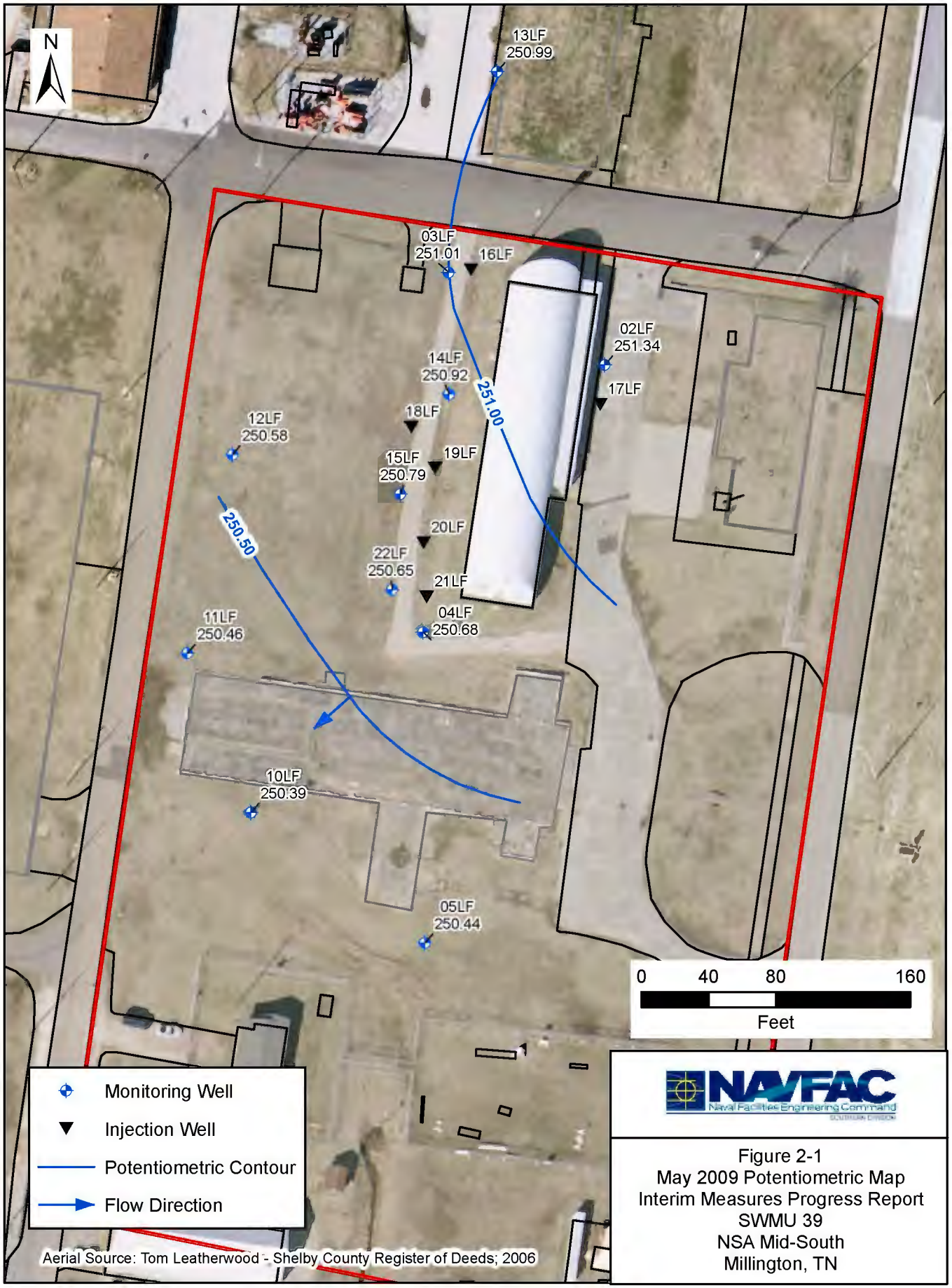


Figure 2-1
May 2009 Potentiometric Map
Interim Measures Progress Report
SWMU 39
NSA Mid-South
Millington, TN

5/24/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_14_39.mxd

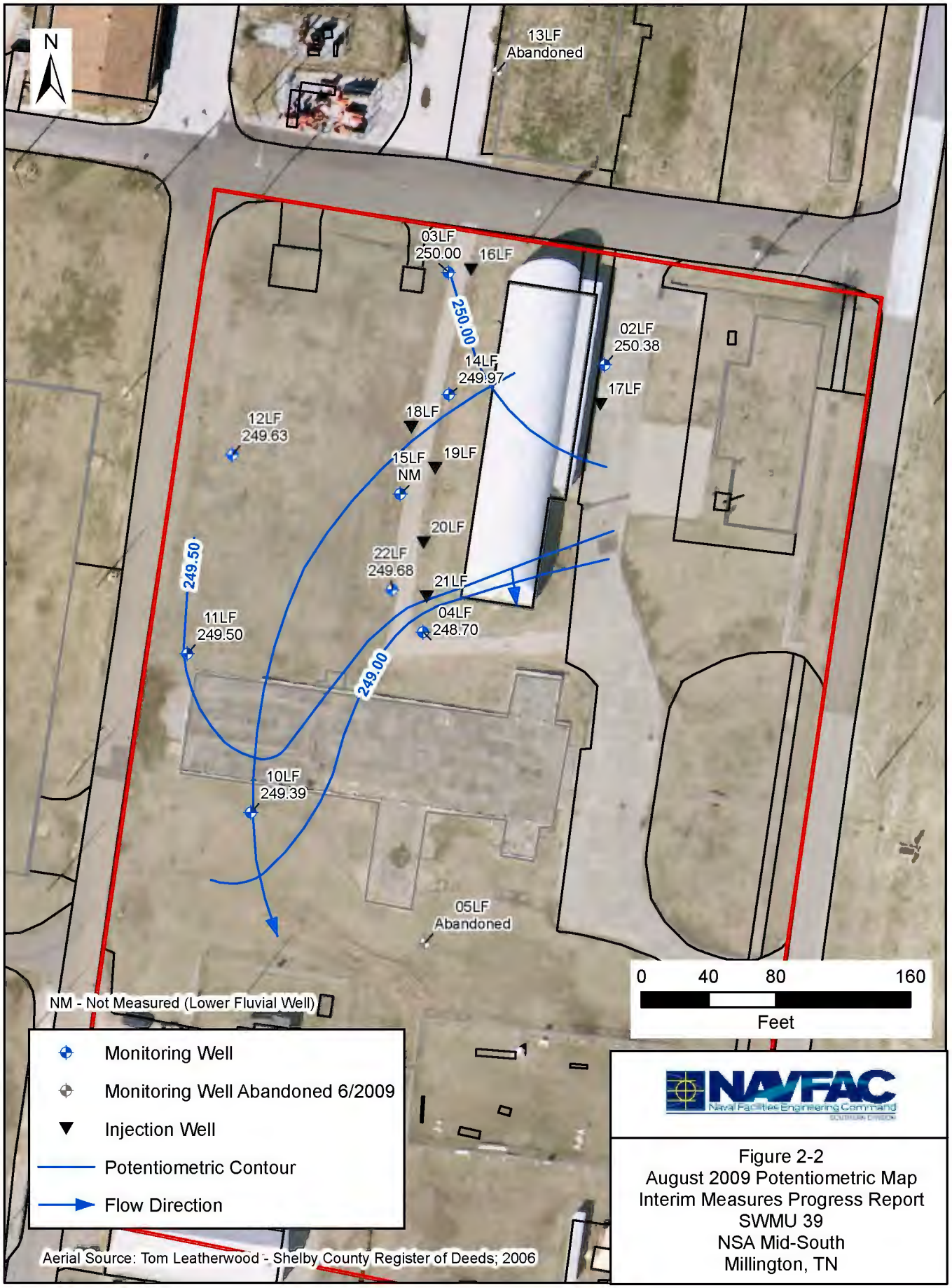


Figure 2-2
August 2009 Potentiometric Map
Interim Measures Progress Report
SWMU 39
NSA Mid-South
Millington, TN

5/24/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_14_39.mxd

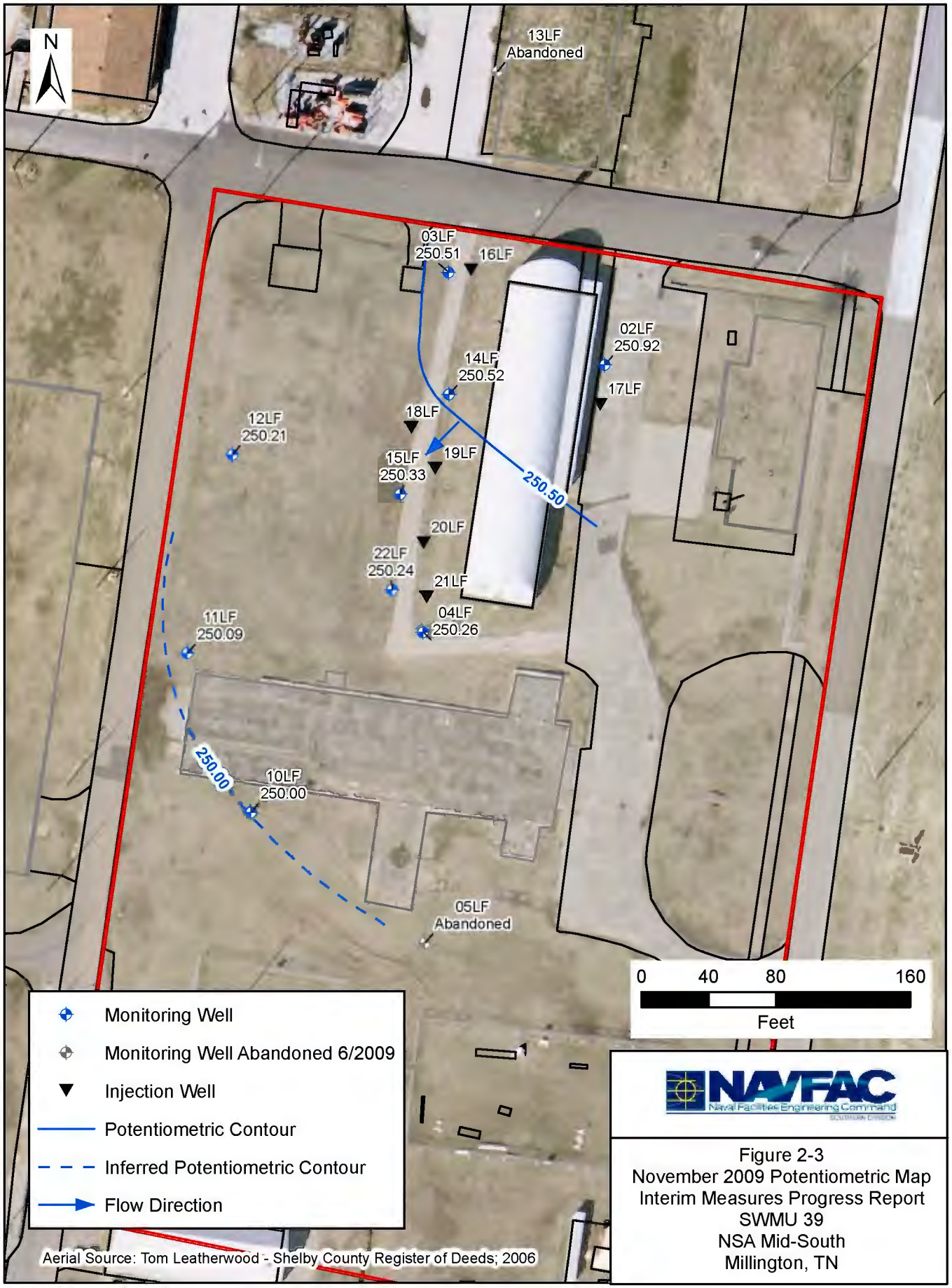


Figure 2-3
November 2009 Potentiometric Map
Interim Measures Progress Report
SWMU 39
NSA Mid-South
Millington, TN

5/24/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_14_39.mxd

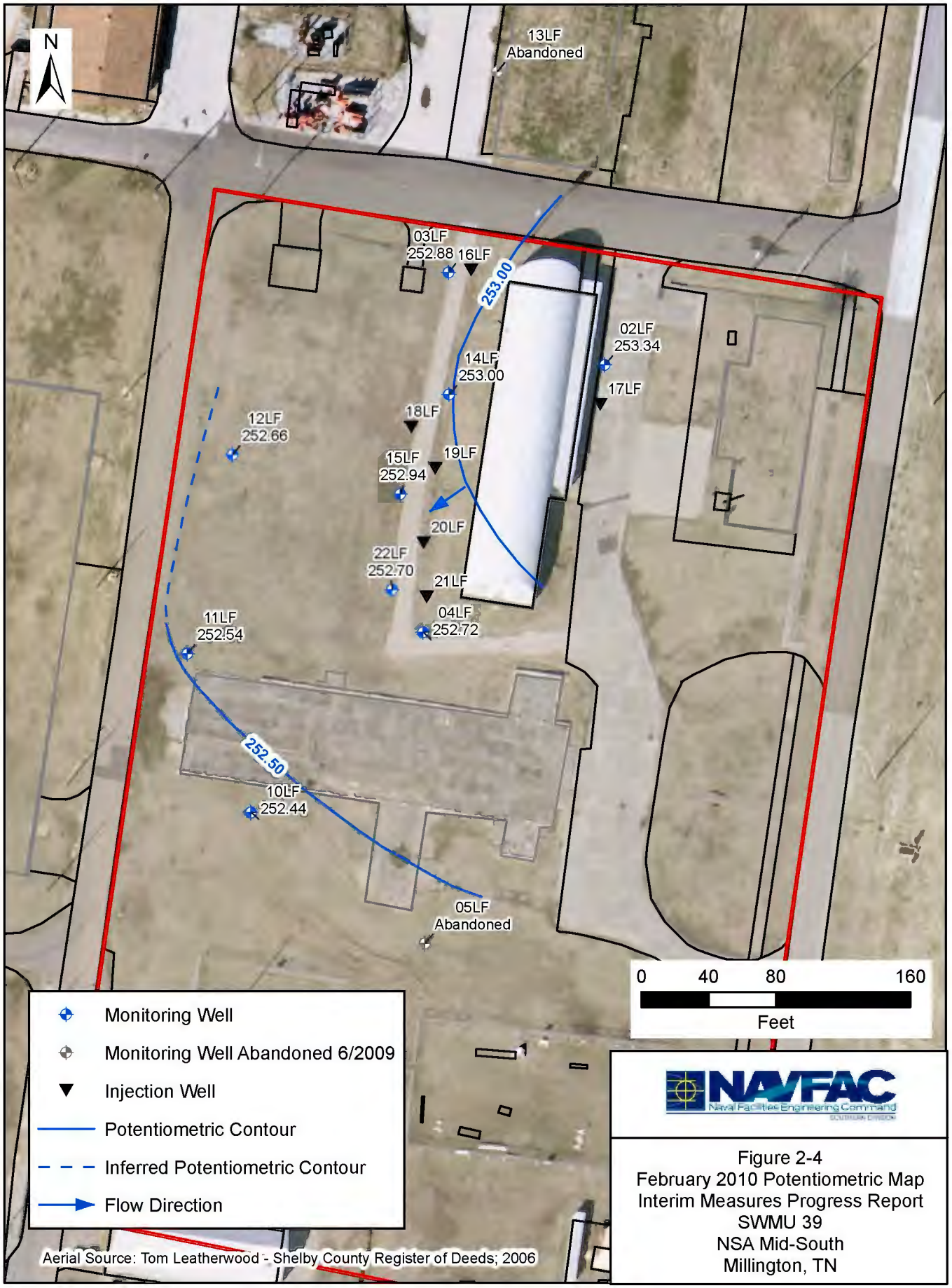


Figure 2-4
February 2010 Potentiometric Map
Interim Measures Progress Report
SWMU 39
NSA Mid-South
Millington, TN

5/24/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_14_39.mxd

Table 2-1
Enhanced In-Situ Bioremediation Quarterly Sampling Parameters/Analytes

Parameter/Analyte	Method
Laboratory	
VOCs	SW8260B
Hydrogen	AM20GAX
Methane, ethane, and ethene	8015MOD
Nitrate	E353.2
Total Iron	SW6010B
Volatile Fatty Acids	AM21G
TOC	SW9060
Field	
Ferrous iron	portable colorimeter
Sulfate and sulfide	portable colorimeter
DO	YSI 55 DO meter calibrated before use per manufacturer's instructions
ORP	YSI 55 DO meter calibrated before use per manufacturer's instructions
Conductivity	YSI 55 DO meter calibrated before use per manufacturer's instructions
Turbidity	LaMotte 2020e/i
pH	YSI 55 DO meter calibrated before use per manufacturer's instructions
Temperature	YSI 55 DO meter calibrated before use per manufacturer's instructions
Alkalinity	portable colorimeter
Chloride	portable colorimeter
Phosphorus and ammonia nitrogen	portable colorimeter

Notes:
VOCs — volatile organic compounds
DO — dissolved oxygen
TOC — total organic carbon
ORP — oxidation-reduction potential

3.0 RESULTS AND ANALYSIS

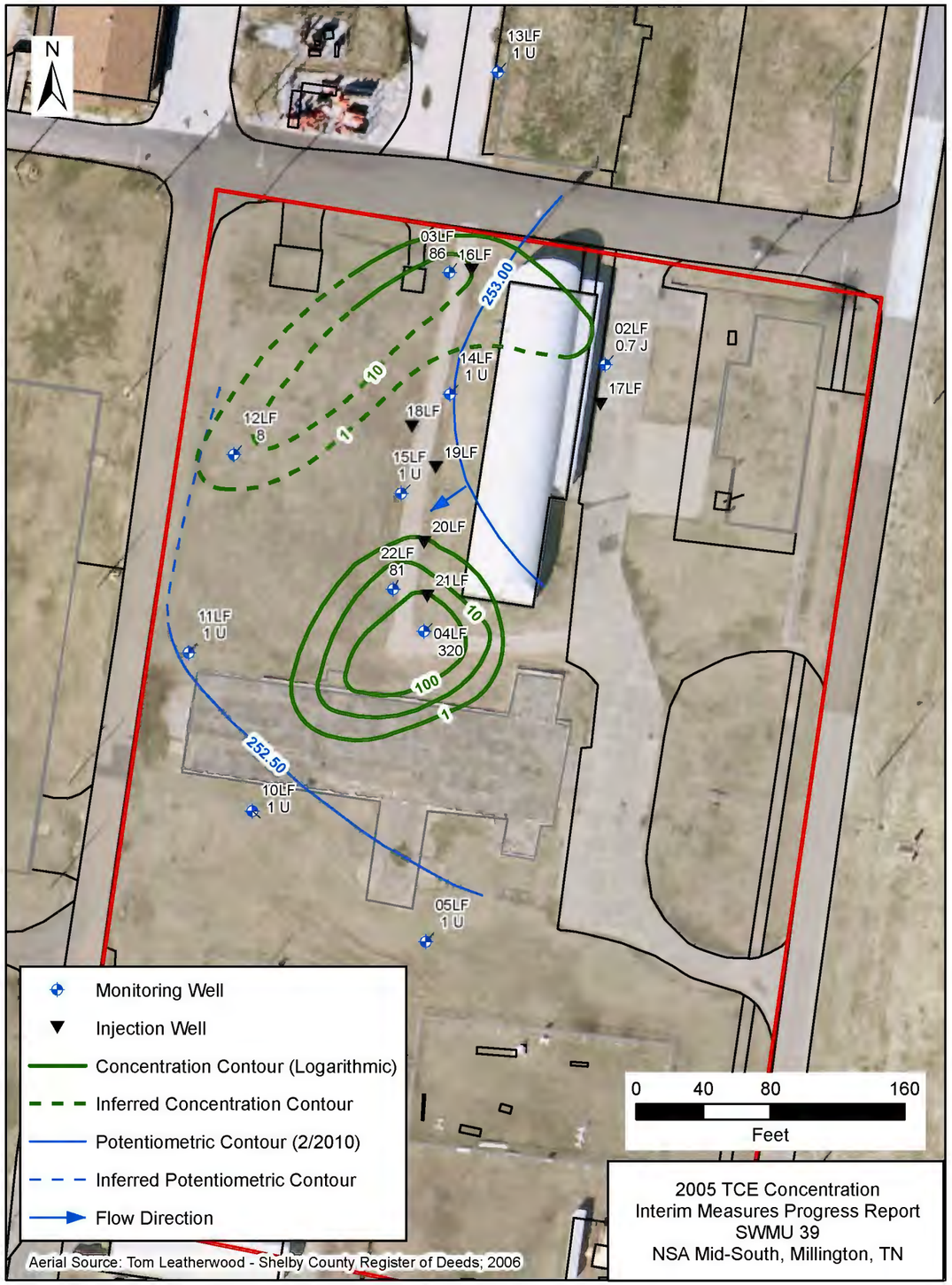
Figures 3-1 and 3-2 are illustrations showing cis-1,2-DCE and TCE plume geometries for the baseline year 2005 compared to 2010 data. Trend graphs 3-1, 3-2, and 3-3 have been prepared for the three key monitoring wells (039G03LF, 039G04LF, and 039G22LF) where TCE contamination has been consistently observed. These graphs have been generated for both VOCs and select geochemical data. Only the VOCs of primary concern — TCE, cis-1,2-dichloroethylene (cis-1,2-DCE), and vinyl chloride (VC) — identified in groundwater samples collected from the select monitoring wells within the treatment area are included in these graphs. Appendix A presents complete laboratory analytical results for the IMs monitoring period from May 2009 through February 2010. Appendix B presents summary tables of VOC and geochemical results since IMs began. Groundwater sampling forms containing water quality parameters collected during well purging (pH, DO, ORP, turbidity and temperature) are provided in Appendix C.

VOC Trends

Groundwater samples collected from several monitoring wells indicate the ongoing degradation of TCE.

- In monitoring well 039G03LF, located at the north edge of the site (Trend Graph 3-1), TCE concentrations began to decrease in November 2007 (99 µg/L) and in February 2010 reached a historical low (1.0 µg/L). Consistent with reductive dechlorination patterns, cis-1,2-DCE concentrations have increased during the same time period. Low concentrations of VC (0.6 µg/L) began to be detected in samples collected from monitoring well 039G03LF for the first time in May 2008, suggesting that cis-1,2 DCE reduction is also occurring.

- In monitoring well 039G04LF, located in the south central part of the site (Trend Graph 3-2), TCE concentrations have decreased from a pre-IM high of 320 µg/L in January 2005 to 39 µg/L the last quarter of monitoring. Cis-1,2-DCE concentrations have increased from less than 20 µg/L in 2005 to 250 µg/L in February 2010. VC has been detected sporadically over the past year suggesting that cis-1,2-DCE reduction is occurring.



2005 TCE Concentration
Interim Measures Progress Report
SWMU 39
NSA Mid-South, Millington, TN

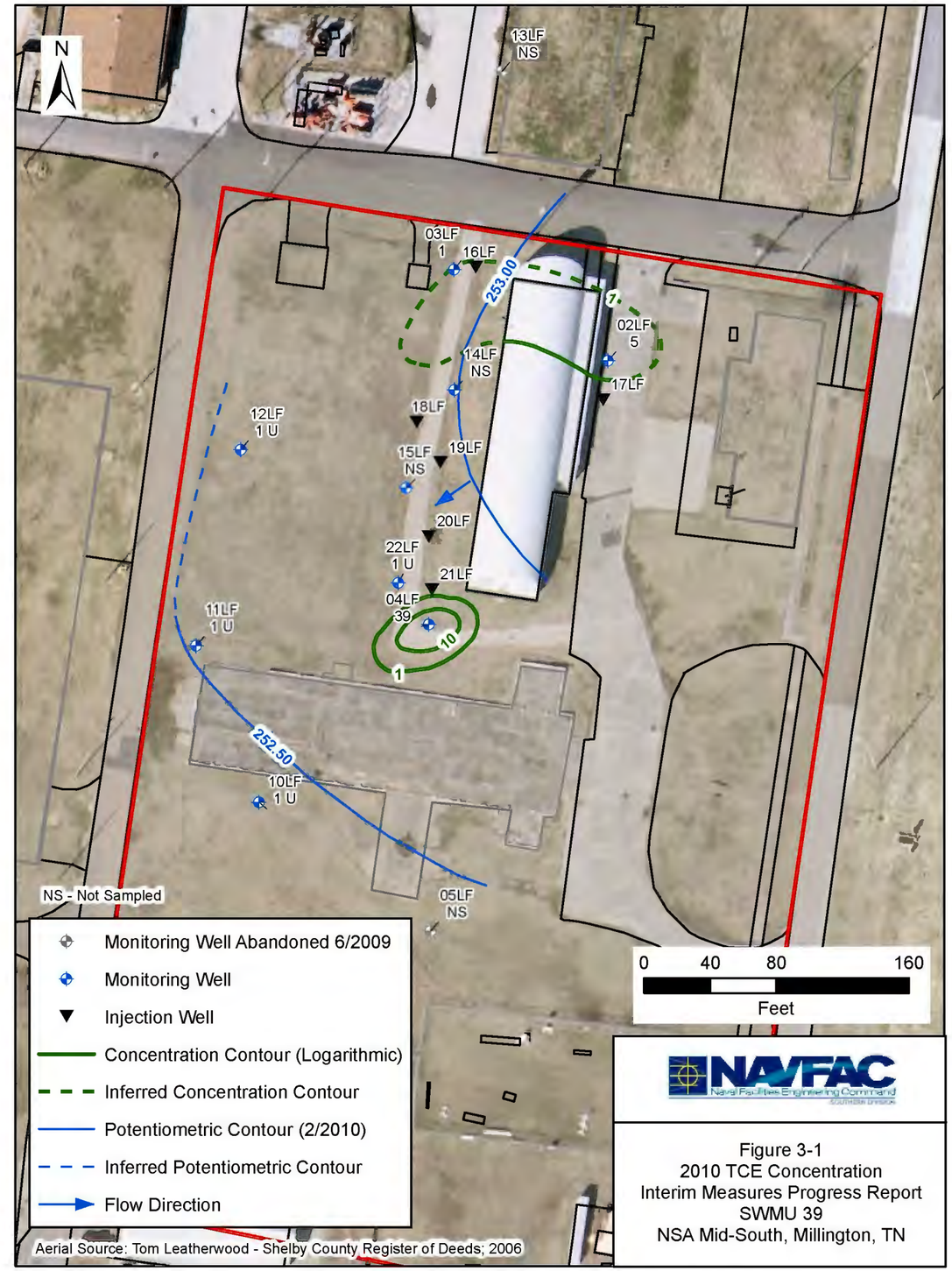
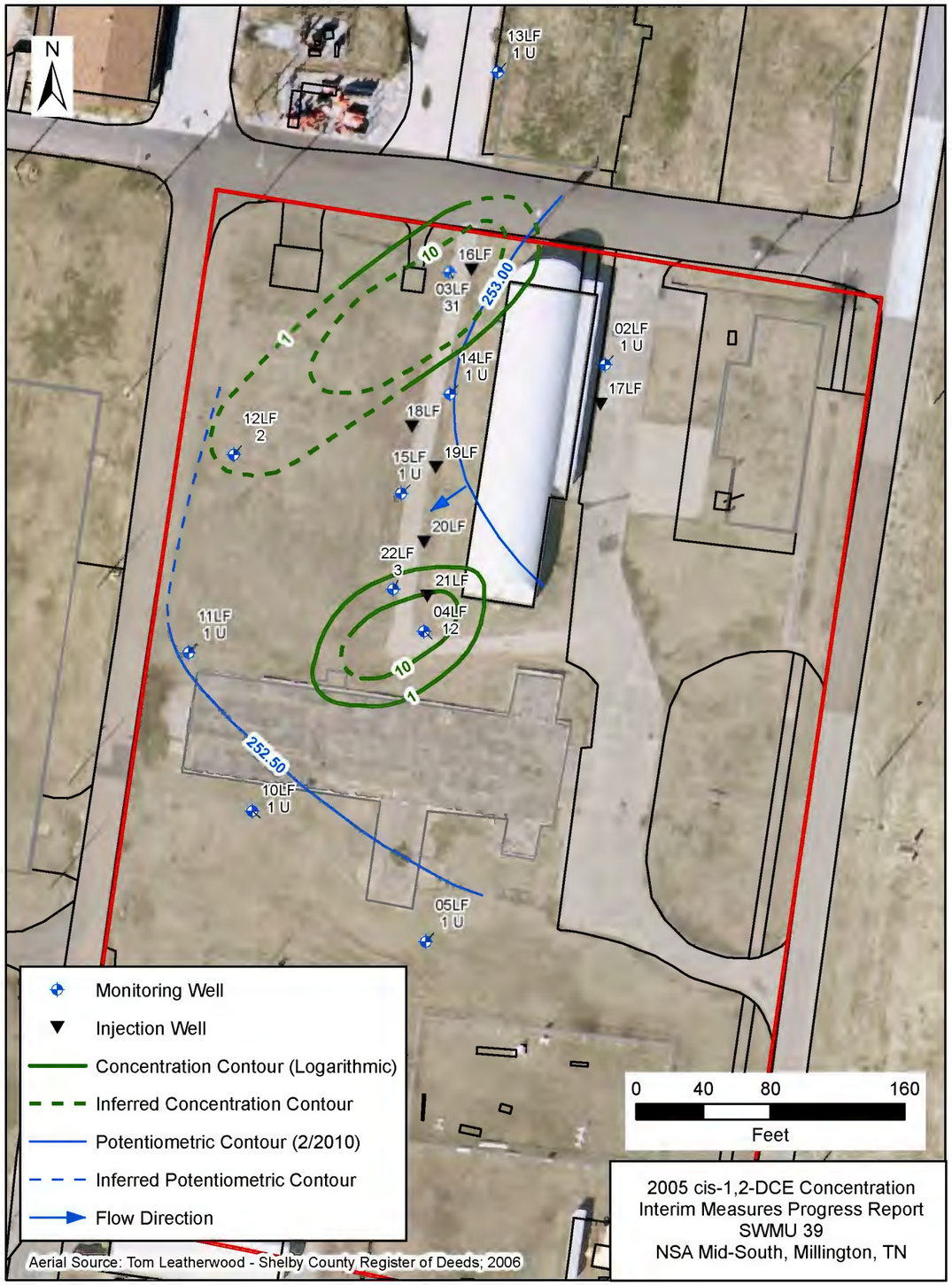


Figure 3-1
2010 TCE Concentration
Interim Measures Progress Report
SWMU 39
NSA Mid-South, Millington, TN

6/25/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_39_TCE_DCE.mxd



2005 cis-1,2-DCE Concentration
Interim Measures Progress Report
SWMU 39
NSA Mid-South, Millington, TN

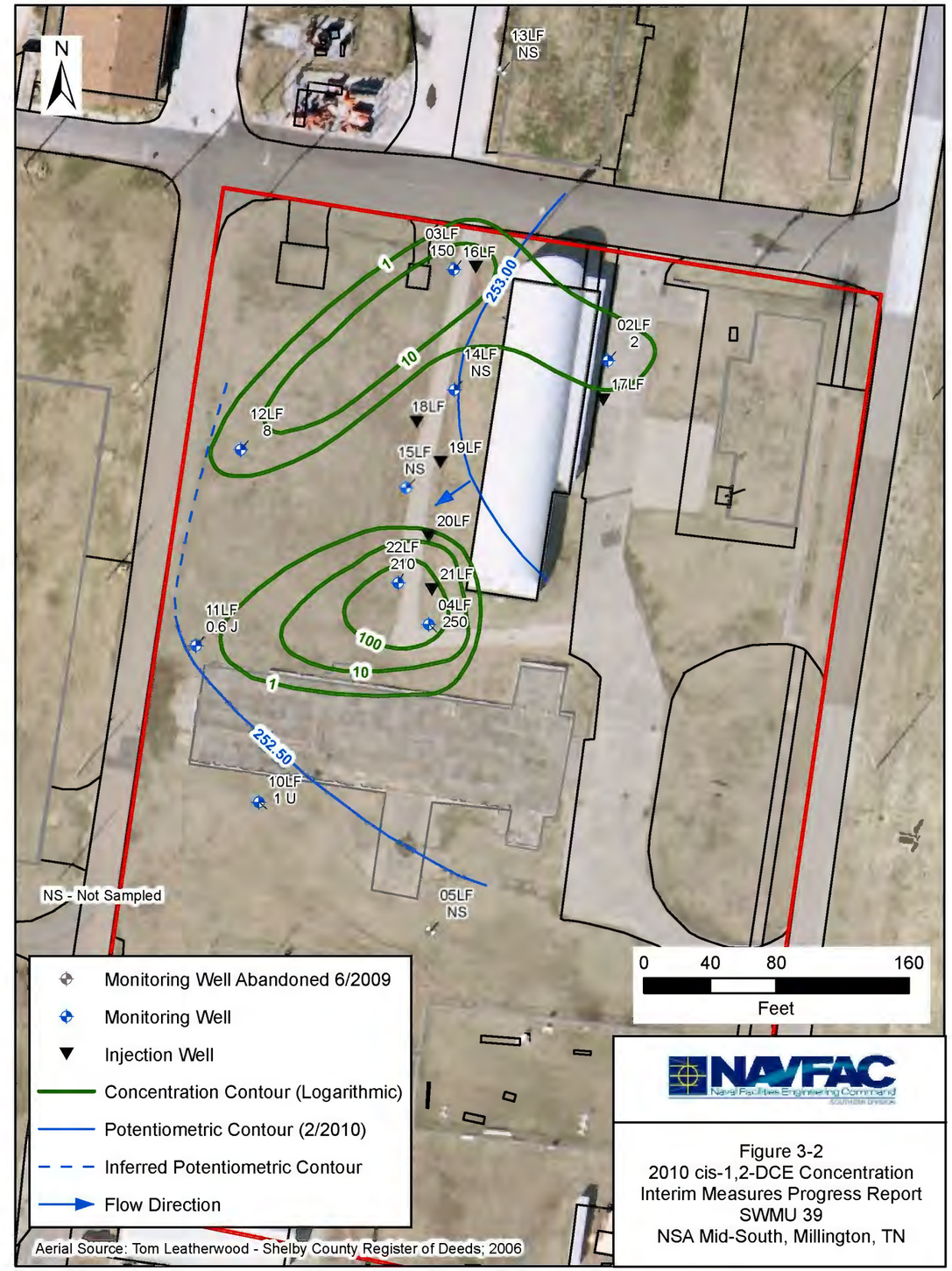
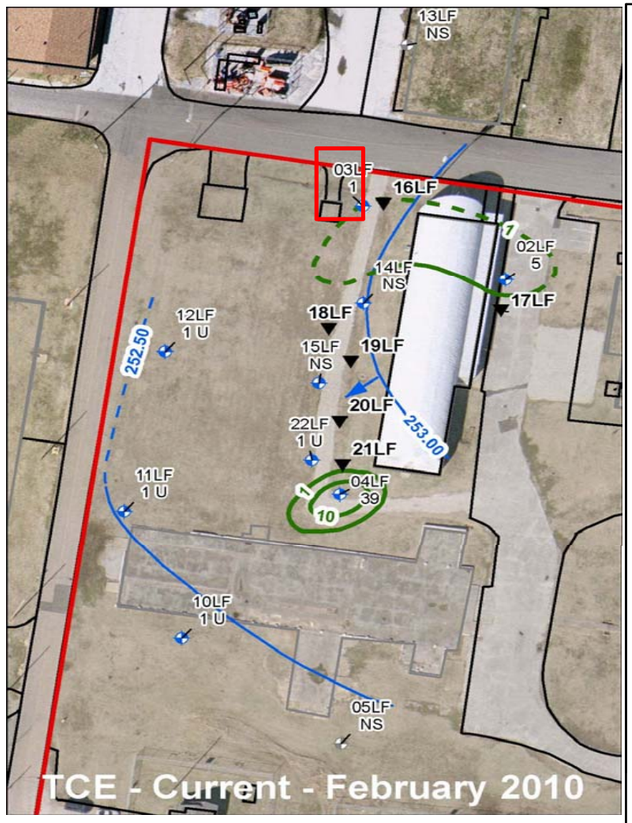
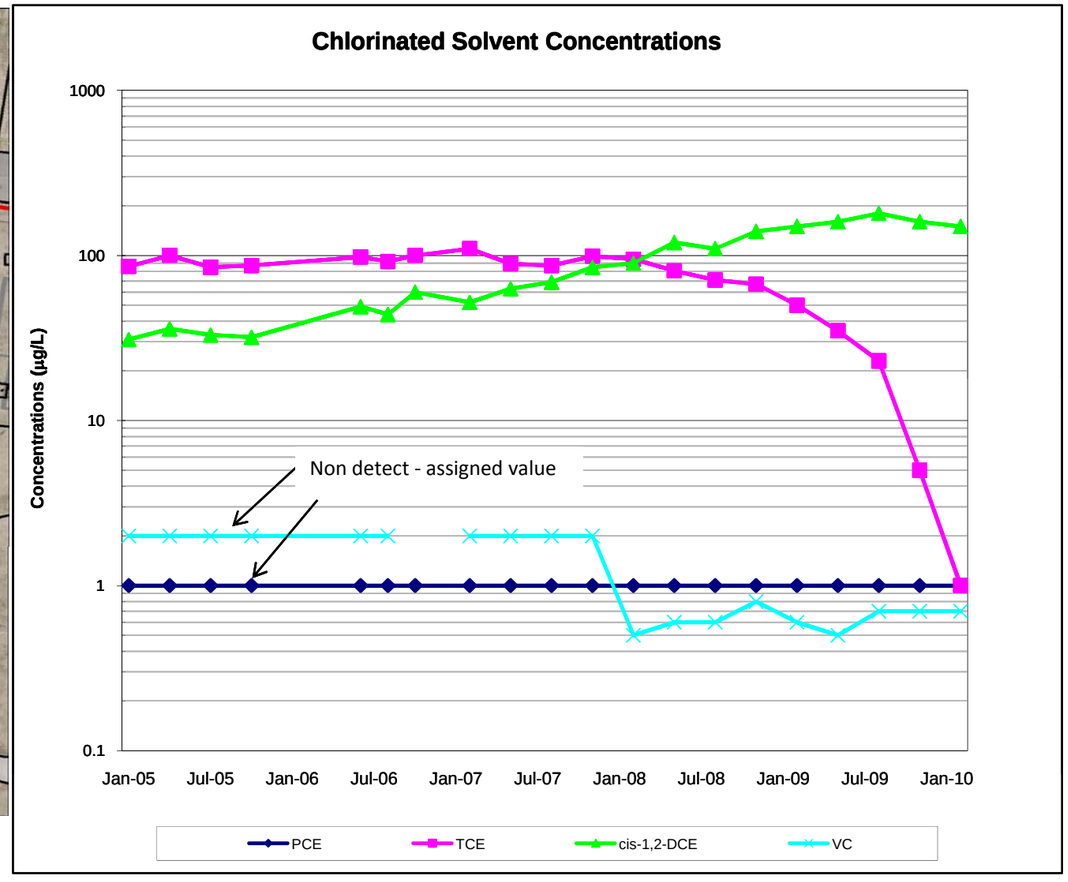


Figure 3-2
2010 cis-1,2-DCE Concentration
Interim Measures Progress Report
SWMU 39
NSA Mid-South, Millington, TN

6/25/2010 D:\projects\NsaMidSouth\arcgis_projects\swmu_39_TCE_DCE.mxd



Monitoring Well
Injection Well



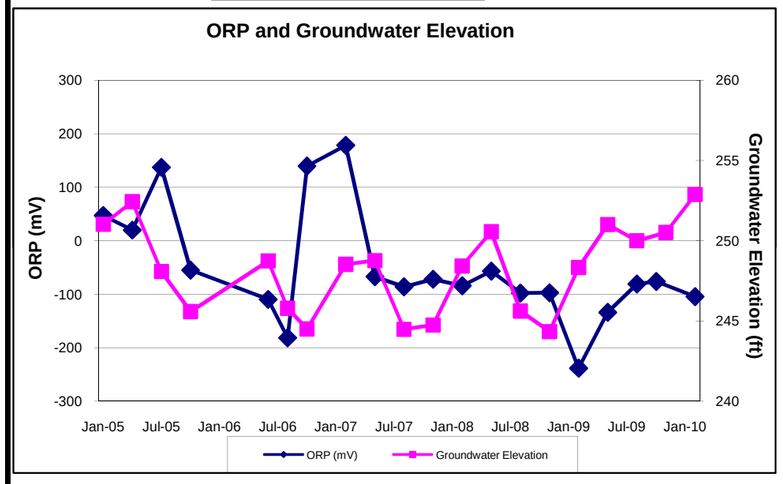
Trend Graph 3-1 Monitoring Well 039G03LF

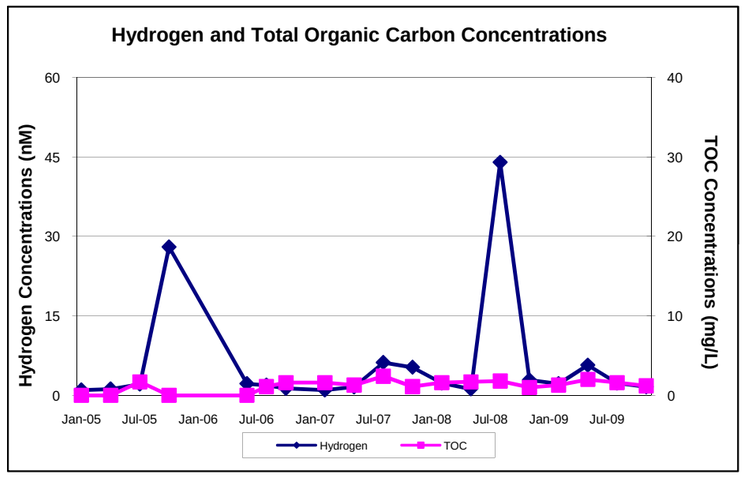
Date	Contaminants (µg/L)			
	PCE	TCE	cis-1,2-DCE	VC
Jan-05	1 U	86	31	2 U
Apr-05	1 U	100	36	2 U
Jul-05	1 U	85	33	2 U
Oct-05	1 U	87	32	2 U
Jun-06	1 U	98	49	2 U
Aug-06	1 U	92	44	2 U
Oct-06	1 U	100	60	2 U
Jan-07	1 U	110	52	2 U
May-07	1 U	89	63	2 U
Aug-07	1 U	87	69	2 U
Nov-07	1 U	99	85	2 U
Feb-08	1 U	95	90 J	2 U
May-08	1 U	81	120	0.6 J
Aug-08	1 U	71	110	0.6 J
Nov-08	1 U	67	140 J	0.6 J
Feb-09	1 U	50	150	0.6 J
May-09	1 U	35	160	0.5J
Aug-09	1 U	23	180	0.7J
Nov-09	1 U	5	160	0.7J
Feb-10	1 U	1	150	0.7J

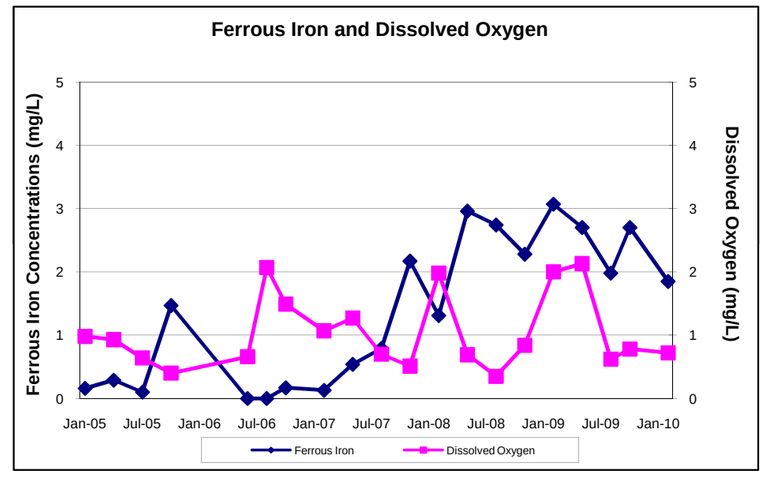
Notes:

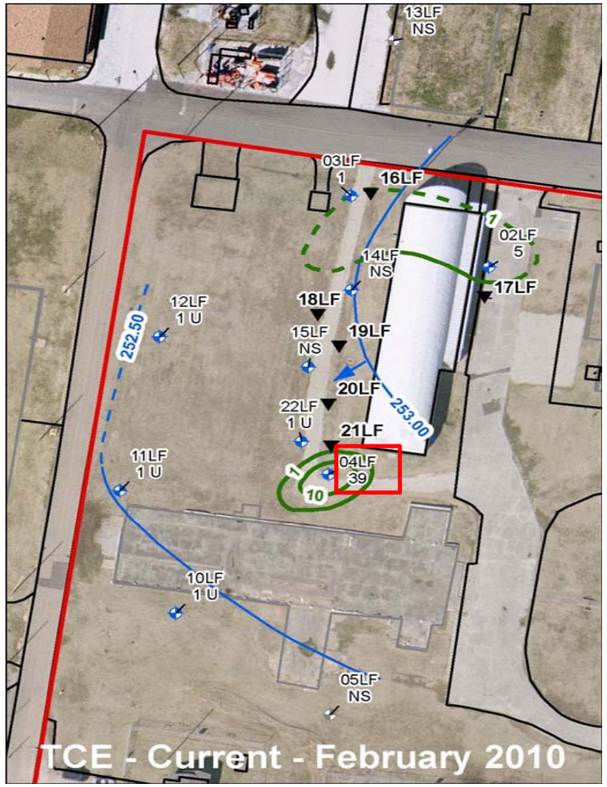
J Estimated

U Below Detection Limits

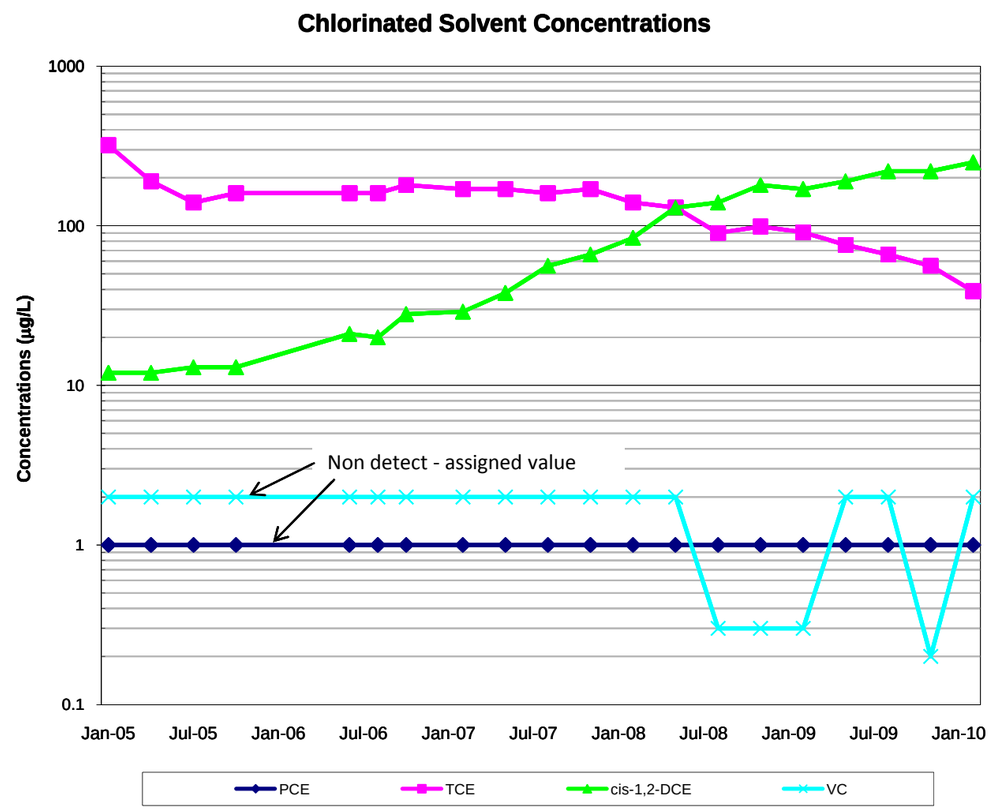








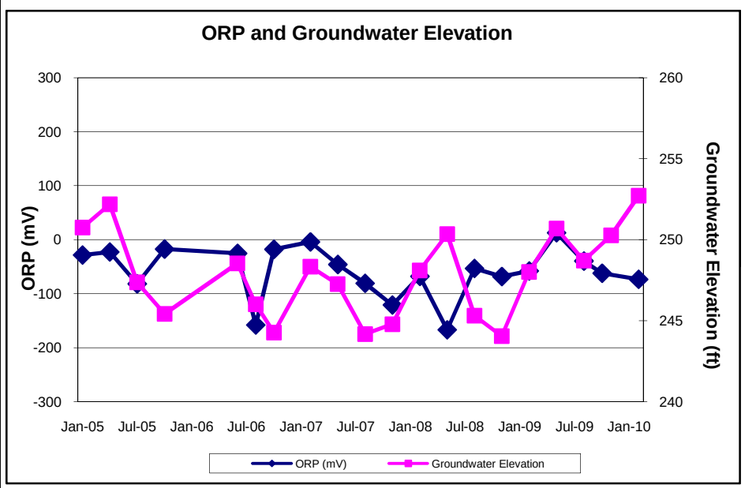
Monitoring Well
Injection Well

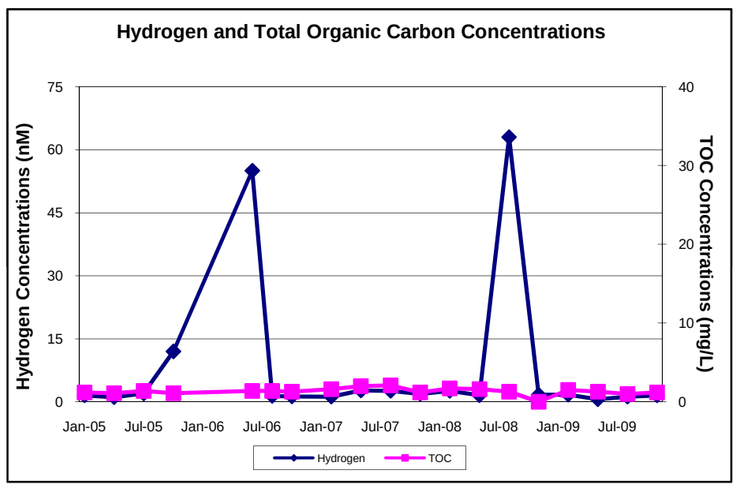


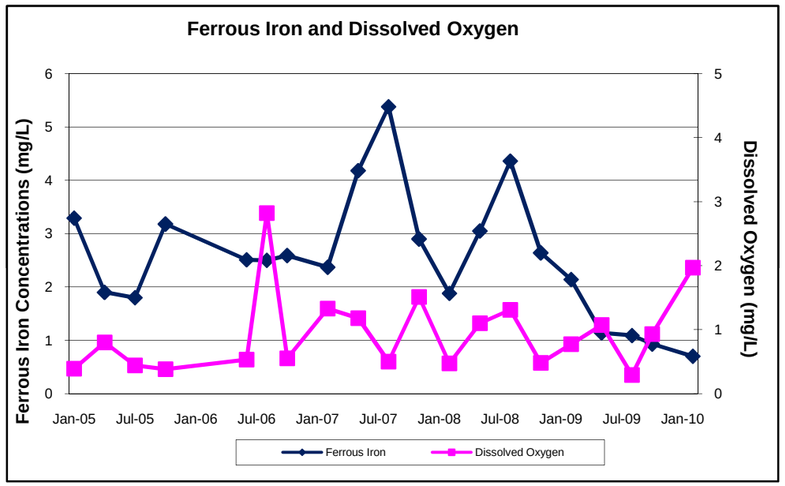
Trend Graph 3-2 Monitoring Well 039G04LF

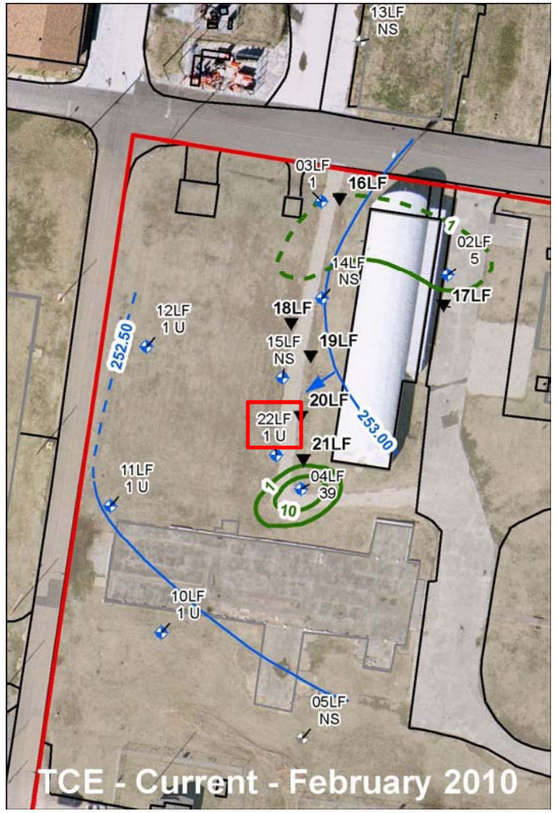
Date	Contaminants (µg/L)			
	PCE	TCE	cis-1,2-DCE	VC
Jan-05	1 U	320 D	12	2 U
Apr-05	1 U	190	12	2 U
Jul-05	1 U	140	13	2 U
Oct-05	1 U	160	13	2 U
Jun-06	1 U	160	21	2 U
Aug-06	1 U	160	20	2 U
Oct-06	1 U	180	28	2 U
Jan-07	1 U	170	29	2 U
May-07	1 U	170	38	2 U
Aug-07	1 U	160	56	2 U
Nov-07	1 U	170	66	2 U
Feb-08	1 U	140	84 J	2 U
May-08	1 U	130	130	2 U
Aug-08	1 U	90	140	0.3 J
Nov-08	1 U	99 J	180 J	0.3 J
Feb-09	1 U	91	170	0.3 J
May-09	1 U	76	190	2U
Aug-09	1 U	66	220	2U
Nov-09	1 U	56	220	0.2J
Feb-10	1 U	39	250	2U

Notes: U Below Detection Limits
J Estimated

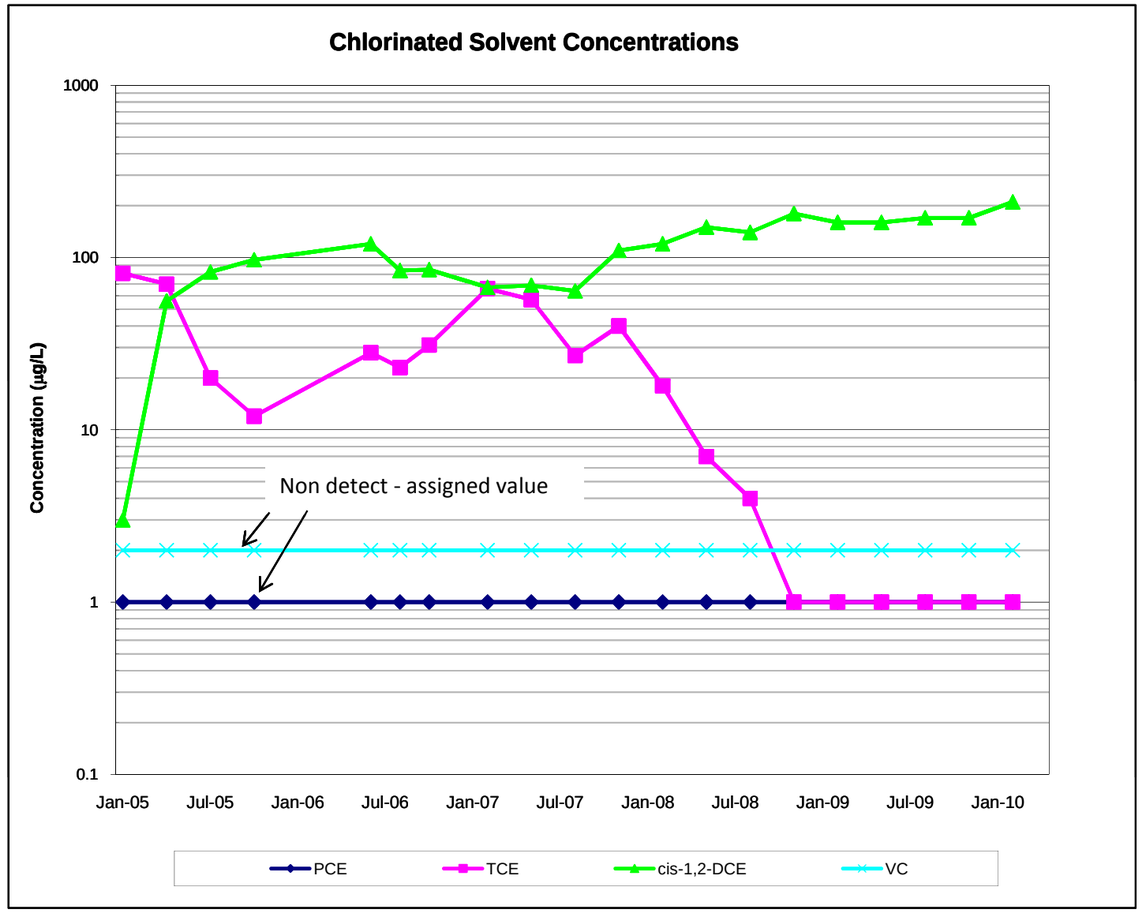








Monitoring Well
Injection Well

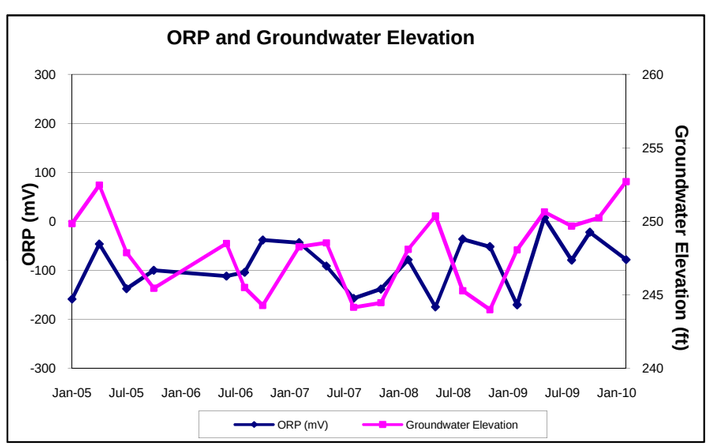


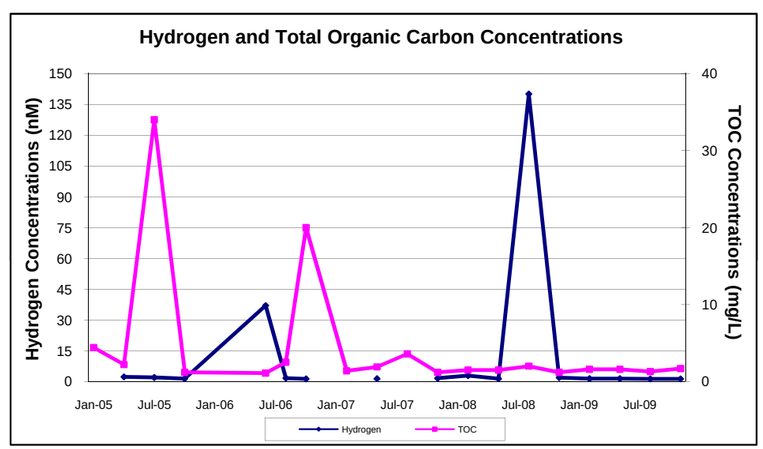
Trend Graph 3-3
Monitoring Well
039G22LF

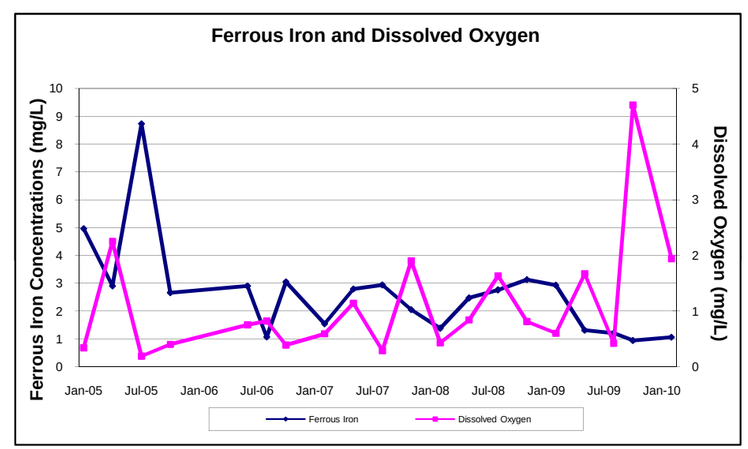
Date	Contaminants (µg/L)			
	PCE	TCE	cis-1,2-DCE	VC
Jan-05	1 U	81	3	2 U
Apr-05	1 U	70	56	2 U
Jul-05	1 U	20	82.5	2 U
Oct-05	1 U	12	97	2 U
Jun-06	1 U	28	120	2 U
Aug-06	1 U	23	84	2 U
Oct-06	1 U	31	85	2 U
Jan-07	1 U	66	67	2 U
May-07	1 U	57	69	2 U
Aug-07	1 U	27	64	2 U
Nov-07	1 U	40	110	2 U
Feb-08	1 U	18	120	2 U
May-08	1 U	7	150	2 U
Aug-08	1 U	4	140	2 U
Nov-08	1 U	1 J	180 J	2 U
Feb-09	1 U	1 U	160	2 U
May-09	1 U	1 U	160	2 U
Aug-09	1 U	1 U	170	2 U
Nov-09	1 U	1 U	170	2 U
Feb-10	1 U	1 U	210	2 U

Notes:

J Estimated
U Below Detection Limits







- In monitoring well 039G22LF, located on the northwest edge of the main plume and side gradient relative to monitoring well 039G04LF (Trend Graph 3-3), TCE concentrations have decreased from a maximum of 81 µg/L in January 2005 to less than the method detection limit (1 µg/L) during the last five quarters. Cis-1,2-DCE concentrations reached 210 µg/L in February 2010, suggesting dechlorination conditions are firmly established in the fluvial deposits aquifer in the vicinity of this monitoring well.

Other monitoring wells associated with the site, some of which are located outside of the treatment area, have either no detections or relatively low detections of chlorinated solvents. Figure 3-1 shows the February 2010 TCE laboratory analytical results for groundwater collected from the sampled monitoring wells which include: 039G02LF, 039G10LF, 039G11LF, and 039G12LF (see Appendix B, Table B-1). In general, these monitoring wells are upgradient, downgradient, or side-gradient of the treatment area and, therefore, have only low, if any, VOC contamination.

Geochemical Evaluation

Geochemistry at SWMU 39 also suggests the aquifer is anaerobic:

- ORP is uniformly negative in groundwater collected from monitoring wells 039G03LF, 039G04LF, and 039G22LF, indicating the aquifer is at least iron- to sulfate-reducing.

- Hydrogen concentrations are elevated above 1 nanomolar (nM), indicating the aquifer is at least sulfate-reducing (Table B-2 in Appendix B).

- Methane data for the 2009/2010 period (Appendix B, Table B-2) indicate sustained methanogenesis (as indicated by relatively stable concentrations in each monitoring well) supporting the anaerobic condition of the aquifer.

- Ferrous iron concentrations have remained relatively stable during the 2009/2010 period confirming anaerobic conditions.

- Trace ethene concentrations have been detected sporadically in groundwater with maximum concentrations during 2009/2010 being observed in monitoring well 039G22LF (0.22 µg/L). These data suggest that VC reduction may occur.[1]

[1] Ethene/ethane concentrations at NSA Mid-South generally are very low, which may be a function of fluvial deposit geochemistry and the volatile/ephemeral nature of the constituents.

Earlier evaluation of the 2007/2008 data suggested that, with methane concentrations consistently elevated above 10,000 µg/L and stable TCE concentrations methanogenic bacteria were inhibiting reductive dechlorination. Methane concentrations in general have decreased to less than 10,000 µg/L, but remain stable, indicating methanogenisis is still occurring. However, the decrease in TCE concentrations and the corresponding increase in cis-1,2-DCE generation suggest that microbial consortia equilibrium has shifted toward conditions more favorable to reductive dechlorination.

Analytical data continue to indicate generally low levels of TOC are available in groundwater in the fluvial deposits. The absence of higher carbon residual may be attributable to a combination of microbial consumption rates and a non-uniform distribution of substrates associated with vertical hydraulic gradients and aquifer matrix heterogeneities. The 2009/2010 groundwater analytical data set indicates reductive dechlorination conditions are firmly established at SWMU 39 and TCE has been successfully remediated in most of the monitoring wells associated with the site. The maximum TCE detection remains in monitoring well 039G04LF (39 µg/L) which has exhibited a 70% decrease in TCE concentrations since IMs began in February 2005.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The injection of the sodium acetate and ammonium phosphate solution to the fluvial deposits aquifer has resulted in the successful reductive dechlorination of TCE in the groundwater beneath SWMU 39. Historically, the fluvial deposits aquifer beneath SWMU 39 has been slightly to moderately aerobic and has had generally low concentrations of natural carbon. However, the enhanced bioremediation system of supplemented carbon and nutrients has converted conditions in the aquifer from predominantly aerobic to anaerobic. The most noticeable effects can be seen in TCE mass reductions and increases in cis-1,2-DCE concentrations. Groundwater in the area of monitoring well 039G04LF is the only location where the MCL for TCE has been consistently exceeded. However, in light of the TCE reductions from a high of 320 µg/L to 39 µg/L it is expected to continue undergoing reductive dechlorination.

Since the remedial goals have been achieved in most of the monitoring wells except monitoring well 039G04LF, the remedy should transition to the MNA portion of the selected remedy and injections should be suspended. Suspending injections will enable the aquifer to convert back to its natural aerobic state that is necessary for aerobic degradation of the cis-1,2-DCE and vinyl chloride. Potential contaminant rebound associated with any untreated/residual TCE will also be evaluated through the ongoing quarterly monitoring. If contaminant concentrations rebound to within 50% of the historic TCE highs detected in monitoring wells 039G04LF (or 160 µg/L) and 039G03LF (55 µg/L) for two consecutive events; the Navy will reactivate the substrate injections. Given the proposed contingency of resuming injections, if warranted, the Navy proposes that MNA at the SWMU 39 continue until contaminant concentrations fall below required cleanup levels or until otherwise determined by the base cleanup team.

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APPENDIX D

Accident Prevention Plan

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

ACCIDENT PREVENTION PLAN

Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Submitted to:

NAVFAC Midwest
Building 1A, 201 Decatur
Great Lakes, IL 60088

Contract Number: N40083-11-D-0028
Task Order Number: 0001

Submitted by:

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Revised January 2012

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Lee & Ryan does hereby certify that, to the best of its knowledge and belief, the technical data delivered herewith under this contract is complete, accurate, and complies with all requirements of the contract.

PREPARED BY:

Health and Safety Director
(317) 910-0236

Jack Moorman, CSP — 1/18/2012 (Date)

APPROVED BY:

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(317) 453-7983

Scott Randall, LPG, CHMM — 1/18/2012 (Date)

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Angelo Dattilo, LPG — 1/18/2012 (Date)

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Project Name: **Remediation of SWMU 39 TCE Plume**
Project Number: **N40083-11-D-0028 – CTO 0001**

Revision Summary

The revisions to Submittal # 7 will be hereafter known as Submittal # 7a and will, in its totality, supersede any and all previously provided #7 Work Plan submittals.

The revisions to Submittal # 7 Work Plan – Appendix C Environmental Protection Plan (EPP) and Work Plan – Appendix D Accident Prevention Plan (APP), are outlined in the table below.

Commenter	*Submittal Number/ Name*	*Comment*	*Revision*
Dennis C. Jantzen / Ben Simes, RPM	7 / Work Plan Appendix D APP	Site Superintendent cannot serve a dual role as SHSO	John Lyttle will act as SHSO and Brian Morgan will act as Site Superintendent.
Dennis C. Jantzen / Ben Simes, RPM	7 / Work Plan Appendix D APP	Procedures for reporting man hours worked was not located in the submitted APP	Procedures for reporting man hours worked is located in Section 19 of the revised APP, (Appendix D) of the Work Plan (Submittal 7a).
Dennis C. Jantzen / Ben Simes, RPM	7 / Work Plan Appendix D APP	Drinking water provision, toilet and washing facilities was not located in the submitted APP	These provisions have been added to Section 8.1.3 of the revised APP (Appendix D) of the Work Plan (Submittal 7a).
Dennis C. Jantzen / Ben Simes, RPM	7 / Work Plan Appendix D APP	At least 2 employees on each shift shall be qualified / certified to administer First Aid and CPR. Names and certifications of said employees were not located.	Brian Morgan, Site Superintendent and John Lyttle, SHSO are the two designated, First Aid/CPR qualified and certified project employees- See Appendix D of Appendix C- EPP of the Work Plan (Submittal 7a)

Project Name: **Remediation of SWMU 39 TCE Plume**
Project Number: **N40083-11-D-0028 - 0001**

Declaration of Understanding

I have read and understand this Accident Prevention Plan and agree to abide by the procedures and limitations specified within.

Name	*Signature*	*Employer*	*Date*

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Attachment 2 ..... Incident Investigation Procedure and Reporting Forms
Attachment 3 ..... Material Safety Data Sheet (MSDS) Information
Attachment 4 ..... Activity Hazard Analysis
Attachment 5 ..... Daily Inspection and Report Forms
Attachment 6 ..... Employee Safety Culture Enhancement Program (Incentives)

1.0 Introduction

Lee & Ryan Environmental Consulting, Inc. (Lee & Ryan) prepared this Task Order specific Accident Prevention Plan (APP) which incorporates the Site Safety and Health Plan (SSHP) and Activity Hazard Analyses in accordance with Contract Documents. This APP, under the direction of the Contract Documents, will outline the guidelines and methodologies that will be used to protect the health and safety of on-site personnel, visitors, and the public. This Plan will be in effect for the duration of the Remediation of SWMU 39 TCE Plume project performed at NSA Mid-South Millington, TN, for the NAVFAC Midwest, IPT.

Lee & Ryan is committed to providing and maintaining safe working conditions for all employees and any personnel on or around the work site and shall take all precautions to ensure this mission. The Lee & Ryan Executive Management team, Corporate Health and Safety Manager and Project Supervisory personnel are responsible for organizing, planning, executing and controlling the actions necessary to implement the Safety policy throughout the organization at all levels.

1.1 Site: SWMU 39 at NSA Mid-South, Millington, TN

Project Description: The planned remedial technology for this project is the injection of potassium permanganate (KMnO4) In situ chemical oxidation (ISCO), in the zones of highest TCE concentrations that define the cores of each of the two plumes. Injection will be conducted in one event, with possible additional events to be determined during process, via existing treatment wells and placement of Geoprobe® borings. Subsequent dispersion of KMnO4 is anticipated to breakdown TCE and its daughter products that define the impacted TCE plumes.

2.0 Scope of Work

The remedial actions for SWMU 39 will include the following primary tasks:

- Direct-push drilling in north and south plume to spatially characterizes VOCs in groundwater.
- Subsurface injection of potassium permanganate (KMnO4) in two chlorinated solvent impacted groundwater plumes.
- Quarterly groundwater monitoring of seven existing wells in the vicinity of the plumes.
- Removal and disposal of a concrete pad remaining from the demolition of Building S-74.
- Excavation and disposal of chlorinated solvent impacted soil underlying one area of the concrete pad located at SWMU 39.

2.1 Site Preparation

The site work is comprised of six components including the following:

- Conduct quarterly monitoring event – sample seven existing monitoring wells in the network.

- Direct-push subsurface investigation – characterize the concentration and distribution of VOCs in groundwater.
- Geophysical investigation – collects data on the distribution of VOCs in groundwater and corroborate data with analytical data collected from direct-push characterization.
- KMnO4 injection – use the VOC distribution model to place the injection locations to maximize the effectiveness of the KMnO4 treatment.
- Concrete pad removal – demolish and dispose of the concrete pad remaining from demolition of Building S-74.
- Excavate VOC impacted soil – excavate and dispose of VOC impacted soil underlying one area of the concrete pad.
- Import soil and grade site – haul soil on-site and grade site surface.
- Planting and erosion control – a mix of grass seed will be dispersed, fertilized, and watered. Periodic erosion control inspections will be conducted.

2.2 Duration of Project

Remediation activities must be completed within nine calendar months from the award date and the contract contains two 1-year option periods for a total maximum term not to exceed 42 months.

3.0 Project Organization and Management

Project organization, responsibilities, lines of communication, and reporting procedures to be implemented during the execution of this project are described in the following subsections.

The Lee & Ryan Accident Prevention Plan (APP) utilizes a Health and Safety Management System (HSMS) that encompasses the Lee & Ryan Health and safety Plan, Subcontractor handbook, Employee Safety Handbook/training, and individual programs. Each part of the HSMS outlines the responsibilities of Lee & Ryan employees and subcontractors to meet the standards issued by the Secretary of Labor at 29 Code of Federal Regulations (CFR) Part 1926, 29 CFR Part 1910 and USACE EM385-1-1.

Program Manager: Scott Randall, L.P.G., C.H.M.M.

The Program Manager will have overall project responsibility for Lee & Ryan at the senior management level.

Project Manager: Angelo Dattilo, L.P.G.

The Project Manager will be on-site as needed and will attend project progress meetings periodically. The Project Manager ensures the Project Team recognizes the findings, opinions and control of the personnel involved in the implementation and completion of the project.

On-Site Superintendent: Brian Morgan

The On-site Project Manager reports directly to the Project Manager and is responsible for the day-to-day activities at the project site. The Site Superintendent is also responsible for conducting the daily safety briefing and on-site enforcement of the SSHSP.

Safety and Health Manager: Jack Moorman, C.S.P.

The Safety and Health Manager is responsible for the development, implementation, oversight, and enforcement of the SSHSP. The Safety and Health Manager will sign and date the SSHSP prior to submittal. Initial on-site safety briefing will be presented to all site workers before the first day of remedial work. The Safety manager will be onsite during the first day of remedial activities and at the startup of each new major phase of work, and visit the site as needed and at least once per month for the duration of activities, to audit the effectiveness of the SSHP. The Safety manager will be notified of all emergencies in accordance with the emergency action plan. Any changes to Health and Safety operations on site or to this plan will be through the direction of the Health and Safety Manager.

Site Safety and Health Officer(s): John Lyttle

With the assistance of supplemental specialists to meet continual operations coverage, the Site Safety and Health Officer will be responsible for implementation of the Site-Specific Health and Safety Plan during work operations. The SSHO will serve as competent person for daily operations and responsible for all safety required permits and have the authority to ensure site compliance with all Federal, state and OSHA standards including specific standards in this SSHSP.

The SSHO will ensure that all site specific Activity Hazard Analysis are used and current for the daily task. Review daily briefings and identify safety precautions related to upcoming tasks and maintain daily health and safety inspection logs. The SSHO will investigate, review and implement corrective procedures prior to operation resumption after a health or safety related incident.

Site Safety and Health Technicians: To be determined upon award of contract

For each work crew in the exclusion zone, one person, designated as a Safety and Health technician, will perform activities such as air monitoring, decontamination, and safety oversight on behalf of the SSHO. They must have appropriate training equivalent to the SSHO in each specific area for which they have responsibility and report to and be under the supervision of the SSHO.

Insurance Company (Workman's Comp): Liberty Mutual; Wausau Business Insurance Company; Managed by the Tobias Insurance Group 9247 North Meridian Street Suite 300 P.O. Box 90380 Indianapolis, Indiana 46290-0380

TEL: (317) 844-7759

4.0 Site Characterization

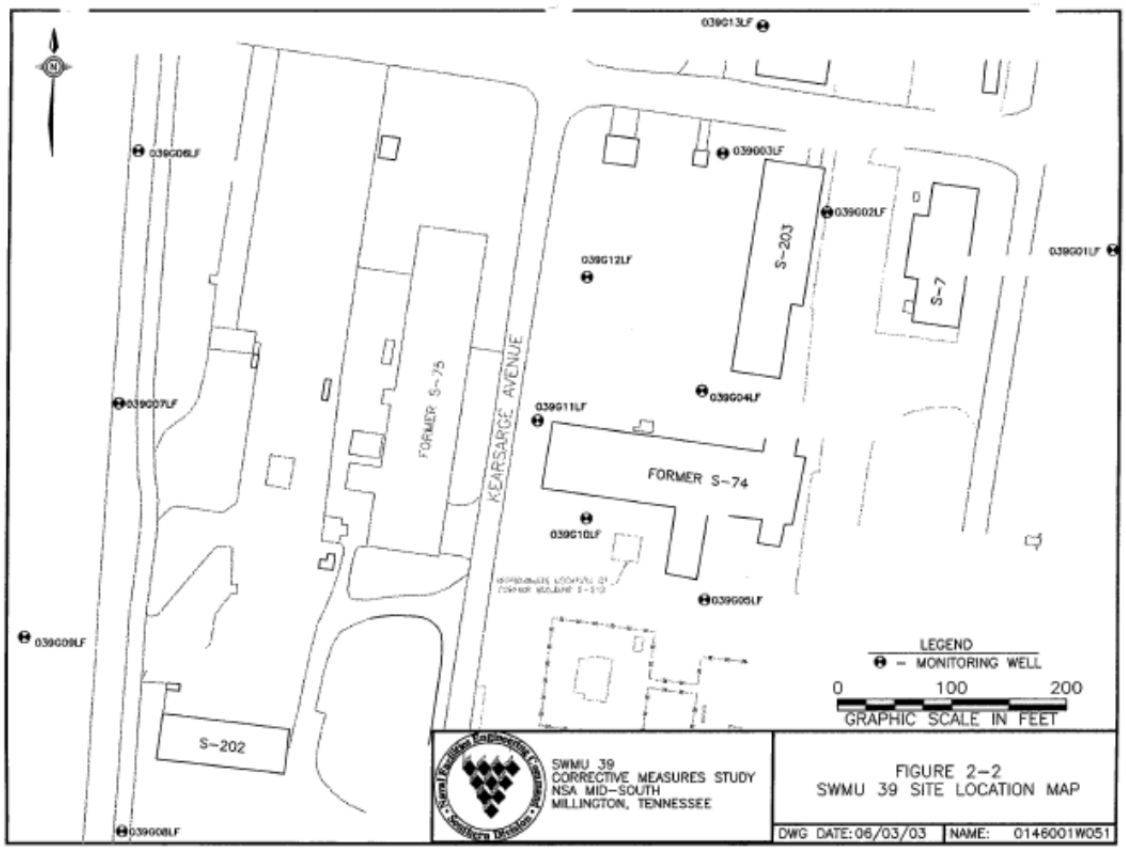
4.1 Site Evaluation

The site evaluation is based on contract specifications, project documents, and site visits by Lee & Ryan personnel. The aforementioned scope of work will be completed in accordance with all federal and state safety codes including reports and notifications.

SWMU 39 is located approximately 150 feet east of Kearsarge Avenue across from and east of the boiler plant (former Building S-75) on the NSA Mid-South Southside. SWMU 39 consists of

the area in the vicinity of Building S-203, the concrete slab remaining from former Building S-74, and the area of former Building S-212.

Building S-74 was built in 1943 and operated as a laundry and dry cleaning facility until 1981. It was demolished in 1995. The remaining Building S-74 concrete foundation is surrounded by grassy areas. PCB transformers were formerly stored on the south end of the Building S-74 concrete slab. In May 1996, a UST located approximately 100 feet south of the Building S-74 concrete slab was removed by a Navy subcontractor. Former Building S-212 was used to store dry cleaning solvent; the area is now covered with grass. Surface drainage flows south and west across the site.



The SWMU 39 Plume remediation project does not present a greater risk than other previous remediation/construction jobs taken on by Lee & Ryan. Material Safety Data Sheets (MSDS) for any hazardous materials specific to this project will be forwarded to the Contracting Officer as they become available on-site.

4.2 Hazard Identification

Site-specific hazards associated with the completion of the referenced project include the following:

- Demolition hazards
- Hazardous material

- Hazardous Wastes
- Chemical hazards/VOC
- Power tool operation
- Equipment operations
- Electrical safety
- Ladder/scaffold/scissors lift/articulating boom lift safety
- Environmental conditions related to heat, plants, and pests

4.3 General Onsite Monitoring

Initial Exposure Monitoring / Air sampling will be conducted during excavation and in-situ treatment using a variety of media to identify the major classes of airborne contaminants and their concentrations. Initial testing will be conducted wearing level C protective outer garments with respiratory protection including VOC cartridges. Air samples using air monitoring pumps will be collected downwind from the designated source along the axis of the wind direction. Work upwind, until reaching or getting as close as possible to the source. Levels of protection for subsequent sampling should be based upon the results obtained and the potential for an unexpected release of chemicals.

4.4 Perimeter Monitoring

Due to the size of the project, fixed-location monitoring may not be necessary depending on the initial readings. If a larger than expected release of VOC concentrations is discovered, additional testing including the development of exclusion areas may be needed. The Site Safety Officer will evaluate the integrity of the site's clean areas and may adjust the Exclusion, CRZ and Supply zones as necessary.

4.5 Periodic Monitoring

Site conditions and thus atmospheric chemical conditions may change following the initial characterization. For this reason, monitoring will be repeated periodically, especially when:

- Work begins on a different portion of the site.
- Different contaminants are being handled.
- A markedly different type of operation is initiated (e.g., barrel opening as opposed to exploratory well drilling).

4.6 Personal Monitoring

The selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, will be conducted at the beginning of the project excavation, changes in soil attributes or when perimeter monitoring shows an increased level of sample is present. This approach is based on the rationale that the probability of significant exposure varies directly with distance from the source. If workers closest to the source are not significantly

exposed, then all other workers are, presumably, also not significantly exposed and probably do not need to be monitored. This will be used in the adjustment of the SSHSP as determined by the Safety and Health Manager and COR.

Since occupational exposures are linked closely with active material handling, personal air sampling should not be necessary until site mitigation has begun. Personal monitoring samples should be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the face piece. These samples represent the actual inhalation exposure of workers who are not wearing respiratory protection and the potential exposure of workers who are wearing respirators.

5.0 Certification and Training Requirements

All Lee & Ryan and appropriate subcontractor personnel will have completed a Hazardous Waste Operations and Emergency Response (HAZWOPER) Occupational Safety and Health Administration (OSHA) 40-hour course in performing work associated with the renovation activities. The project superintendent, project manager and/or site safety representative will have completed the OSHA 30-hour Construction Safety Course.

- All employees will attend on-site orientation training for the aforementioned site-specific hazards prior to working on site.
- All crane operators will be certified per 29 CFR 1926 Subpart N, and have certification to operate in Tennessee.
- All new Lee & Ryan employees will undergo initial safety training as required by Lee & Ryan's Corporate Health and Safety Program. All contract employees new to the Site will be trained in site-specific hazards and contractor safety under Lee & Ryan's contractor safety policy.
- Any additional training will be conducted as required under the project control procedures.
- All employees will receive an initial safety briefing of the scope of work for the project as well as the SSHSP.
- All employees will sign a declaration that they have read or have been read this SSHSP and understand its contents and requirements prior to beginning work activities.

6.0 Personal Protective Equipment

As outlined in Lee & Ryan's HSMS – 211 PPE/AHA program, 29 CFR 1910.132(d) requires that Lee & Ryan assess the workplace to determine if the hazards that require the use of personal protective equipment (PPE), such as head, eye, face, hand, or foot protection, are present or are likely to be present. If hazards or the likelihood of hazards are found, Lee & Ryan management will select appropriate PPE and require that affected employees use properly fitted PPE suitable for protection from these hazards. In addition, Lee and Ryan management will certify, in writing, that a workplace hazard assessment for PPE has been performed that identifies the workplace evaluated, the person certifying the evaluation, and the dates of the evaluation. Although identification of possible property damage losses is important, the primary objective

of an AHA is to identify the risk of injury associated with systems or equipment, a task or series of tasks, and to recommend solutions to reduce the risk to a standard or acceptable level.

An AHA facilitates the discovery and evaluation of hazards that exist in the workplace and the selection of control measures to reduce or eliminate the hazard. Once the hazards have been identified, an evaluation by technically qualified safety personnel will determine the priority for the establishment of appropriate control measures. Based on the potential severity and risk of injury or property damage, hazards will be promptly eliminated or controlled.

From initial surveys conducted, the site PPE components will include: a Modified Level "D".

The minimum Personal Protection Equipment (PPE) required for performance of the contract includes:

- American National Standards Institute (ANSI) compliant safety footwear
- Canvas or leather gloves*
- Impermeable nitrile gloves*
- Work clothes, coveralls (Level C or D)*
- Hard Hat
- Hearing protection*
- Safety glasses/goggles

*These items will be worn on an as needed based after a PPE hazard assessment as outlined in HSMS-211. Each contractor and subcontractor will be responsible for providing their own required PPE while on-site.

7.0 Medical Surveillance Program

All Lee & Ryan employees, contractors, subcontractors and visitors entering the exclusion/CRZ zone must be HAZWOPER 40 hour trained and in addition must be part of a medical surveillance program prior to working in these areas. Lee & Ryan will maintain a copy of the training and medical clearance to work certificates in the construction trailer for review by the COR or medical representative for auditing purposes. The Safety and Health Manager will ensure:

7.1 Frequency of Examinations

- Every 12 months
- If and when the participant develops signs and symptoms indicating a possible overexposure due to an uncontrolled release of a hazardous substance on the project.
- Upon termination or reassignment to a job where medical surveillance program participation is not required, unless his/her previous annual examination/consultation was less than 6 months prior to reassignment or termination.
- On a schedule specified by the occupational physician.

7.2 Content of Physical Examinations/Consultation

- Baseline health conditions and exposure history.
- Allergies/sensitivity/susceptibility to hazardous substances exposure.
- Ability to wear personal protective equipment inclusive of NIOSH certified respirators under extreme temperature conditions.
- Fitness to perform assigned duties.

Provide the occupational physician with the following information for each medical surveillance program participant:

- Information on the employee's anticipated or measured exposure.
- A description of any PPE used or to be used.
- A description of the employee's duties as they relate to the employee's exposures (including physical demands on the employee and heat/cold stress).
- A copy of 29 CFR 1910.120, or 29 CFR 1926.65.
- Information from previous examinations not readily available to the examining physician.
- A copy of Section 5.0 of NIOSH 85-115.
- Information required by 29 CFR 1910 Section .134.

7.3 Physician's Written Opinion

Obtain and furnish to the Safety and Health Manager; and the employee before work begins, a copy of the physician's written opinion for each employee.

Address the employee's ability to perform hazardous waste site remediation work and containing the following:

- The physician's verification of the employee's fitness to perform duties as well as recommended limitations upon the employee's assigned work and/or PPE usage.
- The physician's opinion about increased risk to the employee's health resulting from work; and
- A statement that the employee has been informed and advised about the results of the examination.

8.0 General Safety Requirements

Lee & Ryan utilizes a Health and Safety Management System (HSMS) that encompasses the Lee & Ryan Health and Safety Plan, Subcontractor handbook, and individual programs. Each part of the HSMS outlines the responsibilities of Lee & Ryan employees and subcontractors to meet the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910. In addition, work will also be performed in compliance with all pertinent provisions of the latest version of the U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual, EM 385-1-1, as applicable. Any noncompliance activities or conditions that pose a

serious or imminent danger to the health or safety of the public or government personnel will be reported to the COR with applicable corrective action.

All employees/personnel will receive instructions on the health and safety concerns involved with the project at the health and safety briefing to be held prior to work commencement. A health and safety meeting will be conducted weekly, prior to beginning any work activities. Safety meetings will address suspected and potential hazards involved with the tasks to be performed and the necessary precautions to be taken to deal with these hazards. A Health and Safety Briefing Log is provided in Attachment 1.

All employees, contractors, and visitors have the ability to stop the movement due to safety concerns. Supervisors/safety representatives will identify and correct the issue prior to continuation.

8.1 General Basic Requirements and Rules

- Accident Prevention—Prior to the commencement of new tasks an Activity Hazard Analysis (AHA) will be conducted in accordance with HSMS-211: PPE/ Activity Hazard Analysis (AHA) plan. Each AHA/PPE assessment will be provided to the NAVFAC COR as requested.
- Daily Inspections—Daily inspections of the work area will be performed. If evidence of any deficiencies is discovered within the work zone, work will stop until the necessary safeguards have been completed.
- Material and Equipment Staging—Staging areas for materials, equipment and heavy lifting will minimize the impact on employee access to the jobsite and traffic flow.
- Commons Area Housekeeping—Grounds accessible during work hours will remain clear of materials and tools in accordance with HSMS-001 housekeeping procedures. At the end of shift, all materials and tools will be placed in storage until next day work. Trash and unused material will be disposed of in proper receptacles.
- Reporting Hazards and Injuries—Site employees will promptly report all unsafe conditions, injuries, accidents, and "near misses" to their immediate supervisor. The supervisor will inform the SSHO immediately and record on the daily log. Injuries will be reported to the SSHO and evaluated for further treatment if needed. Severe injuries and potential OSHA recordable injuries will be reported to the Lee & Ryan Safety and Health Manager when determination has been made to send the employee to the clinic. Assistance for medical treatment determination may be made by the Health and Safety department or experienced health professional. As outlined in HSMS-120 investigations will be conducted and reported to the Safety and Health Manager. Injuries will be reported to the COR via the Safety and Health Manager or a designated representative. The use of radios supplemented by landline communications shall be used for reporting all incidents.
- Hot Work—Hot work activities that take place outside of a designated welding area will require a Hot Work Permit and only properly trained personnel will perform hot work activities. In addition, all combustible materials within 35 feet of the work area will be removed or protected with a suitable flame resistant material, an adequate fire extinguisher will be available, and the proper PPE will be worn. Due to the outdoor nature of the project

a "fire watch" may not be needed. Determination of need and permits will be managed by the SSHO.

- Eye and Face Protection—Eye and face protection is required if there is a danger from flying objects or particles (whenever there is grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes. A portable emergency eyewash will be readily accessible at the work site.
- Proper Dress—Appropriate work clothes, gloves, and shoes or boots will be worn for the zone outlined in the program.
- Head protection (hardhats), Safety toed work-boots, long pants, sleeved shirts and safety glasses will be worn at all times on the worksite. Visitor safety gear will be available for use in the Lee & Ryan construction trailer.
- Exclusion zone personnel will be required to wear modified "D" work gear. This includes shoe covering and impermeable outerwear. This gear will be removed in the CRZ zone and disposed of in proper hazardous waste containers within the CRZ. Site workers will not eat, drink, smoke or enter vehicles with Tyvek covers, contaminated gloves or washing hands after removal of PPE. Tasks that require employees to be located near water during elevated water level will require the use of personal flotation devices.
- Safety Guards—Machines or other equipment may be operated only if all guards and safety devices are in place and in proper operating condition.
- Equipment Maintenance—A pre-use inspection will be performed before using any equipment or tool. All equipment will be kept in safe working condition. Any defective tools or equipment will be brought to the attention of the employee's immediate supervisor. Defective tools or equipment will not be used.
- Proper Use and Care of PPE—An AHA/PPE assessment will be conducted to ensure proper PPE is being utilized per the requirements of HSMS-211. Employees will properly maintain and care for all PPE.
- Required Training before Use of Equipment—Employees operating powered/motorized equipment will be trained before unsupervised operation. A copy of certifications and training requirements will be maintained by the Lee & Ryan safety department.
- Marked Work Areas—All work areas will be properly marked and guarded.
- Safety Barriers—Safety barriers will be maintained at all times.
- Warning Signs—Warning signs, such as "Hard Hat Area" "CRZ" "Exclusion Zone" and regulated public warning signs will be posted and maintained throughout the duration of the project as needed.

8.1.1 Tools

- Defective Tools—Defective tools will be tagged and removed from service immediately.
- Electrical Safety—Power tools will be either grounded or double-insulated and be used with a Ground Fault Circuit Interrupter (GFCI).
- Disconnecting Tools—Tools will be disconnected before changing drills, blades or bits, or attempting repair or adjustment.

- Attending to Tools—No running tool will be left unattended under any circumstances.
- Guards for Saws—Power saws, table saws, and radial arm saws will have operation blade guards installed and used.
- Prohibition on Use of Unsafe or Defective Hand Tools—Unsafe or defective hand tools will not be used. Items watched and removed from the Site will include:
    - Sprung jaws on wrenches
    - Mushroomed heads of chisels or punches
    - Cracked or broken handles of any tool
    - Any other unsafe conditions
    - Knives will not be used without proper PPE (cut resistant gloves) and procedures listed in AHA.
- Guards for Portable Abrasive Grinders—Portable abrasive grinders will have guards that cover the upper and back portions of the abrasive wheel. Wheel speed ratings will never be less than the grinder Rotations per Minute (RPM) speed.
- Compressed Air Pressure for Cleaning—Compressed air pressure will be reduced to less than 30 pounds per square inch (psi) and performed only with effective chip guarding and proper PPE.
- Use of Powder-Actuated Tools—Only trained employees will operate powder-actuated tools.
- Compliance with OSHA and ANSI Standards for Employee Tools—Any employee-furnished tools will meet all OSHA and ANSI requirements. The SSHO will review tool for safety standards.
- Ladders, Scaffolds, Scissors Lifts and Articulating Boom Lifts—Only trained personnel will use ladders, scissors lifts and articulating boom lifts. A pre-use inspection will be performed on all equipment and a competent scaffold person will be on-site at all times when scaffold systems are in use. A personal fall arrest system will be worn by occupants of the articulating boom lift and during scaffolding set-up and tear-down when proper guardrails and walk-boards are not in place.

8.1.2 Housekeeping

- Critical Role of Housekeeping—Recognize that housekeeping provides the foundation for a safe work environment by helping to prevent accidents and fires and creates a positive attitude in the work area.
- Material Storage—Materials will be stored or piled in a stable manner to prevent falling.
- Removal of Debris—Combustible scrap, debris, and garbage will be removed at frequent and regular intervals.
- Safe Passage for Critical Areas—Emergency escape routes, roadways and common areas will be kept clear of standing material for safe travel of people and machinery.

- Equipment Staging and Storage—Equipment will be staged and stored so as not to endanger personnel on-site or individuals that may have to be transported from the area in the case of an emergency.
- Report Housekeeping—Housekeeping is critical due to the project timeframe and multiple crews. Housekeeping issues will be reported using the Safety Observation Communication Report found in the Lee & Ryan trailer or with the SSHO.

8.1.3 Industrial Hygiene and Occupational Health

- Environmental Conditions—Wearing of hats, use of sun block protection with an SPF of 30 or greater, and other protective measures will be taken to safeguard against sun exposure. Site safety representatives will monitor the weather and determine a course of action regarding heat stress measures.
- During the course of site activities bottled water will be available to workers on site. Disposal of plastic bottles will be in accordance with the Navy Green Initiative.
- A Portable hand washing station will be provided during Concrete Demolition, Soil Excavation, and Chemical Oxidizer Injections. During other site activities that do not involve these activities, on-base washing facilities will be used as directed by Navy personnel.
- On base toilet facilities will be used during site activities, specific locations to be used will be as directed by Navy personnel.
- Physical Hazards—Because of dense Site vegetation, which may hide ruts, cause skin irritation, and harbor insects/pests, Lee & Ryan will:
    - Recommend employees walk in open areas away from overgrowth when not wearing hats or wearing insect repellant.
    - The possibility of poisonous plants (i.e., Poison Ivy, Poison Oak, and Poison Sumac) is on site. Instructions will be made not handle such poisonous plants without gloves.
    - Dust may form in some areas due to heat and humidity variables. Notify the quality control to use non-potable water sprays of the area.

8.1.3.1 Vegetation Tutorial

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in spring and summer; with yellowing leaves anytime especially in dry areas.

Leaves may achieve bright reds in fall, but plants lose its (yellowed, then brown) leaves in winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol, a colorless or pale yellow oil that oozes from any cut or crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Become familiar with the identity of these plants (see below). Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

Contamination with poison ivy, sumac or oak can happen through several pathways, including:

- Direct skin contact with any part of the plant (even roots once above ground foliage has been removed).
- Contact with clothing that has been contaminated with the oil.

Poison Ivy

Poison Sumac

Poison Oak

- Contact from removing shoes that have been contaminated.
- Sitting in a vehicle that has become contaminated.
- Contact with any objects or tools that have become contaminated.
- Inhalation of particles generated by weed whacking, chipping, vegetation clearing

If you must work on a site with poison ivy, sumac or oak the following precautions are necessary:

- Do not drive vehicles onto the site where it will come into contact with poison ivy, sumac or oak.

Vehicles which need to work in the area, such as drill rigs or heavy equipment must be washed as soon as possible after leaving the site.

All tools used in the poison ivy, sumac or oak area, including those used to cut back poison oak, surveying instruments used in the area, air monitoring equipment or other test apparatus must be decontaminated before they are placed back into the site vehicle. If on-site decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated. Personal protective equipment, including Tyvek coveralls, gloves, and boot covers must be worn. PPE must be placed into plastic bags and sealed if they are not disposed immediately into a trash receptacle.

- As soon as possible, following the work, shower to remove any potential contamination. Any body part with suspected or actual exposure should be washed with Zanfel, Tecnu or other product designed for removing urushiol. If you do not have Zanfel or Tecnu wash

with cold water. Do not take a bath, as the oils can form and invisible film on top of the water and contaminate your entire body upon exiting the bath.

8.1.3.2 Tick Tutorial

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch (6.4 mm) in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray only outside of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions (vegetation above knee height, tick endemic area) or when tasks (e.g., having to sit or kneel in vegetation) diminish the effectiveness of the other controls mentioned above, bug-out suits (check with your local or regional warehouse) or Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Avoid habitats where possible; reduce the abundance through habitat disruption or application of acracide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

8.2 Provisions for Medical Attention

Provisions will be made to ensure:

- Prompt medical attention is available in case of serious injury (including provisions for communications and transportation). A first-aid kit will be available at the project site with supervisory personnel trained in first aid/ Cardiopulmonary Resuscitation (CPR).
- Emergency contact listing will be posted at the worksite with closest hospital/clinic and Emergency Medical Service (EMS) telephone numbers.
- Employees will report each morning in fit condition to work and will not be intoxicated or otherwise impaired because of personal habits.
- Employees taking prescribed medications will make the determination as to their availability to perform duties. Operators of heavy equipment will inform supervisors of medications causing drowsiness and their ability to perform tasks prior to operations.

9.0 Site Control Measures

9.1 Work Zones

Initial anticipated work zone boundaries (exclusion zone, contamination reduction zone, support zone, all access points and decontamination areas) will be clearly delineated on the site drawings. Initial Work zone boundaries will be based on the contamination characterization data and the hazard/risk analysis presented in the project solicitation. As work progresses and field conditions are monitored, work zone boundaries may be modified (and site drawings modified) with approval of the Contracting Officer. Work zones will be identified and marked in the field (using fences, tape, signs, etc.). The most current site map, showing work zone boundaries and locations of decontamination facilities will be posted in the onsite office. Work zones will consist of the following:

- Exclusion Zone (EZ): The exclusion zone is the area where hazardous contamination is either known or expected to occur and the greatest potential for exposure exists. Control entry into this area and exit may only be made through the CRZ.
- Contamination Reduction Zone (CRZ): The CRZ is the transition area between the Exclusion Zone and the Support Zone. The personnel and equipment decontamination areas will be separate and unique areas located in the CRZ.
- Support Zone (SZ): The Support Zone is defined as areas of the site, other than exclusion zones and contamination reduction zones, where workers do not have the potential to be exposed to hazardous substances or dangerous conditions resulting from hazardous waste operations. Secure the Support Zone against active or passive contamination. Site offices, parking areas, and other support facilities must be located in the Support Zone.

9.2 Personal Hygiene and Decontamination

Personnel entering the EZ or CRZ or otherwise exposed to hazardous chemical vapors, gases, liquids, or contaminated solids must decontaminate themselves and their equipment prior to exiting the contamination reduction zone (CRZ) and entering the support zone. Chapter 10.0 of NIOSH 85-115 will be followed when preparing decontamination procedures. Employees will be trained during site orientation in the procedures and enforce the procedures throughout site operations.

9.2.1 Decontamination Facilities

The Site Safety and Health Officer's will identify the location and proper decontamination techniques for the varying phases of the project. Initially set up a decontamination line in the CRZ. Employees must exit the exclusion zone through the CRZ and implement the following decontamination procedures and techniques:

- Scrub and rinse water proof outer garments, remove all outer garments and hand and face wash. Disposable outer garments (Tyvek coveralls and booties) will be discarded and placed in a proper disposal can located in the CRZ.

- Showers, if needed, must comply with 29 CFR 1910, Section.141 and EM 385-1-1, 02 C, Washing Facilities.
- Initial personnel decontamination equipment includes the following: buckets and brushes, paper towels, and a used PPE storage drum.

9.2.2 Equipment Decontamination

Decontamination of vehicles and equipment used in the EZ shall be decontaminated in the CRZ prior to leaving the site. A vehicle/equipment decontamination station will be constructed within the CRZ for decontaminating vehicles and equipment leaving the EZ. A decontamination station pad, which meets the site decontamination needs for all vehicles and larger equipment decontamination. The pad will be constructed to capture decontamination water, including overspray, and allow for collection and removal of the decontamination water using sumps, dikes and ditches as required.

9.3 Decontamination Procedures

Procedures for equipment decontamination must be developed and utilized to prevent the spread of contamination into the SZ and offsite areas. These procedures must address disposal of contaminated products and spent materials used on the site, including containers, fluids, oils, etc. Assume any item taken into the EZ to be contaminated and perform an inspection and decontaminate. Vehicles, equipment, and materials must be cleaned and decontaminated prior to leaving the site. Handle construction material in such a way as to minimize the potential for contaminants being spread and/or carried offsite. Prior to exiting the site, vehicles and equipment must be monitored to ensure the adequacy of decontamination.

10.0 Employee Safety Incentives

To enhance the safety culture within Lee & Ryan and subcontract employees, a safety "incentive" program has been developed to focus on leading indicators rather than rewarding lagging indicators. Attachment 7 of this plan is the outline for the Lee & Ryan "Bonus Buck" program. This program involves supervisors and site workers communicating and driving towards the goal of correcting issues before they become an incident or injury. Using this immediate recognition, reward and goal approach to safety develops a safety culture and sustainable program. All personnel working on site are eligible to participate in the program.

11.0 Emergency Contact Information

11.1 Emergency Management

Beginning 1 Oct, the NSA Mid-South Main Gate (across from NFCU on Navy Road) will be operating on reduced hours. The gate will be open 0600-2200 M-F, and closed on weekends. The South/Singleton Gate (adjacent the NEX mini-mart) will continue 24-hour service, as will the automated gate on Navy Road (barring changes in ThreatCon, or mechanical issues). This is because of a reduced number of guards.

Emergency Numbers	Area Code – 901
From On-Base Phone	911
From Cell Phone	874-7911
Dispatch (Non-Emergency)	874-5533
Emergency Management	874-5119
Environmental	874-5462
Pass and ID	874-5581
Public Works Officer	874-5207

Weather: National Weather Service (NOAA) for Millington, TN

Web site address:

http://forecast.weather.gov/afm/PointClick.php?lat=35.33440&lon=-89.88830

Injury: Call 911 or see First-Aid below

First Aid/CPR:

Initial: Site Safety and Health Officer

Name: Brian Morgan, Site Superintendent

Address: Lee & Ryan Environmental Consultants
1707 Melody Lane
Greenfield, IN 46140

Telephone: 317-509-2841 - Cell
317-467-6577 - Office
317-467-6588 - Fax
bmorgan@leeandryan.com

11.2 Medical Treatment

If an employee suffers an injury greater than first aid and must go for medical treatment, the State of Tennessee requires Lee & Ryan to offer the employee a panel of physicians.

The employer shall designate a group of three (3) or more physicians or surgeons not associated together in practice from which the injured employee shall have the privilege of selecting the operating surgeon or the attending physician. (A listing follows this section). If the injury is a back injury, the panel shall be expanded to four (4), one of whom must be a doctor of chiropractic.

If the injury requires the treatment of physician or surgeon who practices orthopedic or neuroscience medicine then the employer may appoint a panel of physicians or surgeons practicing orthopedic or neuroscience medicine consisting of five (5) physicians, with no more than four (4) physicians affiliated in practice together. The employee may select a treating physician or surgeon from the employer panel.

11.3 Non Critical and Follow-Up Care

Plan Type: Preferred Provider Organization

NSA Mid-South Address: 5722 Integrity Drive, Millington, TN

Distance: 20 Mile(s)

Provider Specialties: Occupational Medicine

Concentra Medical Centers 2831 Airways Blvd., Suite 102, Bldg. A Memphis, TN 38132 901-348-0200 Est. Distance: 19.2 miles	Occupational Health Centers of the Southwest 2831 Airways Blvd. Memphis, TN 38132 866-944-6046 Est. Distance: 19.2 miles
Mardis, Mariah, Robinson & Associates 1785 Nonconnah Blvd., Suite 120 Memphis, TN 38132 901-345-6700 Est. Distance: 19.3 miles	Concentra Urgent Care 3965 S. Mendenhall Road, Suite 6 Memphis, TN 38115 901-365-1800 Est. Distance: 19.8 miles
Occupational Health Centers of the Southwest 3965 S. Mendenhall Rd. Memphis, TN 38115 888-997-2669 Est. Distance: 19.8 Miles	

11.4 Emergency Care

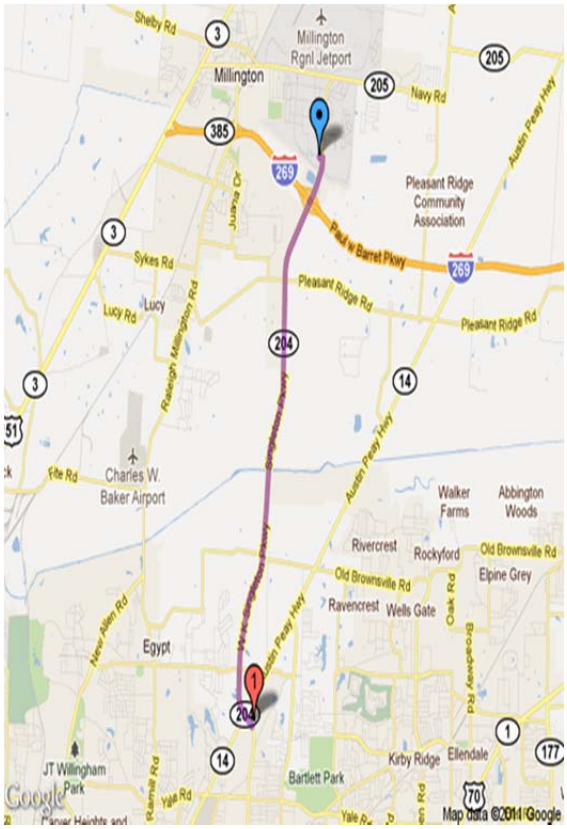
Provider Map and Directions

Methodist Healthcare- North Hospital
3960 New Covington Pike
Memphis, TN 38128
901-516-5200

Plan Name: **Prime Health Services**

Approximate Distance: **6.60 mile(s)**

Driving Directions		
From:5722 Integrity Drive Millington, TN	To:3960 New Covington Pike Memphis, TN 38128	
Head east on Integrity St toward Courage Ave Restricted usage road		354 ft.
Take the 2nd right onto Singleton Ave Partial restricted usage road		0.4 mi
Continue onto TN-204 S/Singleton Pkwy Continue to follow TN-204 S Destination will be on the left		6.5 mi
Estimated driving time: 12 minutes		7.0 mi



12.0 Emergency Response Plan

The following standard emergency response procedures will be implemented by on-site personnel if needed. The SSHO will be notified of any emergency situation on-site and will be responsible for ensuring that the proper procedures are followed. In the event of an evacuation, all personnel must meet at a predetermined location so that all personnel can be accounted for.

12.1 Personnel Injury

Upon notification that an injury has occurred, the designated emergency signal will be implemented (normally an air horn or via mobile radio) and all operations in the immediate area will cease. The rescue team will move the injured person(s) to a predetermined location for evaluation by the proper on-site personnel. The Site Safety Officer will begin proper first-aid

and contact will be made for an ambulance service as well as the designated medical facility (as needed, based on extent of injury).

If the cause of the injury or loss of the injured person does not affect the performance of site operations/personnel, work activities may continue with the SSHO beginning the aforementioned first-aid practices. If the cause of the injury increases health and safety risks to other site personnel, operations will cease until the risk is removed or minimized.

Incident investigation forms and supporting documents are provided in Attachment 2. The completed Incident Investigation Form will include activities on the Site when the incident occurred, site diagram, witness statements, and photographs of location of the accident.

12.2 Fire / Explosion

Upon notification of a fire or explosion on-site, the designated emergency signal will be implemented and all Site personnel will assemble at a predetermined location a safe distance away from the fire/explosion area. The fire department and local emergency management unit will be notified.

12.3 Spill Control

In the event of an unforeseen spill of a substance regulated by 40 CFR 302, 40 CFR 355, and /or regulated under the state or local laws, the Project Superintendent will notify the Lee & Ryan Safety and Health Director immediately. The SSHO will ensure that the proper notifications are made to the state and local officials, if a reportable quantity of regulated material is released into the environment. A spill kit will be on-site and used in the event of a fuel release during refueling operations or oil or fuel leak from vehicles and/or equipment. The regulated substance will be contained and removed as quickly as possible in order to minimize the impact to the project site. All fueling operations will be supervised at all times.

12.4 PPE and Equipment Failure

If any Site personnel's PPE fails and it affects the protection factor that person, they will be relocated immediately to an area where the PPE can be properly removed, repaired, and/or replaced.

If any equipment on-site fails to operate correctly, the Project Manager and the Project Superintendent/SSHO will be notified. The Project Manager and Project Superintendent/SSHO, together with on-site personnel, will determine the effect of the downed equipment on continuing work activities. If the equipment failure affects the health and safety of personnel, or delays the completion of the scope of work, the situation will be further evaluation and appropriate actions will be taken.

12.5 Emergency Escape Routes

A designated emergency escape route for personnel will be available for use in situations where egress is limited. This route will be identified by the Site Superintendent/ NSA Mid-South representative and will be addressed during review of the Site Safety and Health Plan.

12.6 Storm Protection

In the event of a storm warning, as identified by weather service radio, including gale force winds or stronger, every practical precaution to minimize danger to personnel, to the work being performed, and adjacent properties will be taken. These precautions include, but are not limited to:

- Removing or securing loose materials
- Removing tools and equipment from exposed locations
- Removing or securing any scaffolding or temporary structures
- Stopping of heavy equipment operations if lightening is in the area as determined by 10 miles from storm path as reported by weather radio maintained by Lee & Ryan trailer
- Having all personal take cover in an adequate structure if a tornado warning is issued
- Ensuring at least 30-minutes have passed since the last lighting strike before resuming work

12.7 Sirens and Meanings

- 3 minute steady siren means Tornado seek shelter immediately
- Winding Up and Down Siren 30 second intervals severe thunderstorm warning There is no longer an all clear signal

12.8 Heat / Cold Stress

Heat/cold stress monitoring, which can include body temperature, pulse rate and signs and symptoms, will be administered by the on-site safety officer when appropriate according to the ambient temperatures for the Site during operations. Site personnel performing continuous work under extreme weather conditions will be monitored on an average of every 45–60 minutes (time increments may increase/decrease depending on the required level of protection donned while working) to prevent potential heat/cold stress situations.

Sweating is one way the body uses to maintain a stable temperature in the face of heat, activity and impermeable clothing (Tyvek, raingear etc.) both increase heat inside the body and hinder the evaporation process.

Sweating is only effective if the humidity level is low enough to permit evaporation and if the fluids and salts that are lost are adequately replaced.

If the body cannot dispose of excess heat, it will begin to store it. When this happens, the body's core temperature rises and the heart rate increases. An overheated person will begin to lose concentration, become irritable, and may even lose the desire to drink. The next step is fainting and then possibly death if the individual is not cooled down.

12.9 Dangerous Heat Disorders

Here is what you should know about the more dangerous symptoms of heat stress and how to treat them:

Heat stroke—The most serious health problem with signs including:

1. Mental confusion, delirium, convulsions or coma;
2. A body temperature of 106 degrees F or higher;
3. Hot, dry skin with no sweating.

Note: Victims of heat stroke will die if not treated promptly. Seek medical help, move victim to a cool area, and soak the clothing in cool water. Vigorously fan the victim until help arrives.

Heat exhaustion—Signs are clammy skin, weakness, nausea, headache, and body temperature higher than normal. Treatment involves resting in a cool area and drinking water or, better yet, an electrolyte sports beverage to restore minerals lost during sweating.

Heat cramps—This painful condition indicates that you have been drinking lots of water, but you haven't replaced the salts lost. Drinking electrolyte solutions should help. Don't massage the cramping area.

Note: Experts no longer recommend using salt tablets to treat heat cramps.

Take precautions to prevent becoming a victim of heat stress:

- Gradually adjust to a hot climate by working shorter hours at first and then increasing the time exposure and workload slowly over a period of days.
- Take plenty of rest breaks in a cool area.
- Drink a lot of fluids, including water and sports beverages. Avoid caffeinated or alcoholic drinks.
- Occasionally douse yourself with water.
- Wear lightweight, loose fitting clothing, including a brimmed hat and sunglasses.
- Apply all-day sunscreen to avoid sunburn.

13.0 Environmental Protective Measures

13.1 Spill and Discharge Control

Hazardous materials associated with this project are interspersed in the contaminated soil. Liquid material is likely to be uncommon, however if pooling of material is found, the SSHO will follow liquid materials transfer as defined below. This includes transfer of fuel or hazardous materials between containers. Materials brought on-site will be reported to the COR prior to transport.

Contaminated soil shipping and transport is included in the Lee & Ryan QAPP and Work Plan for Task Order 0001.

If the spill or discharge is reportable, and/or human health or the environment is threatened, contact the NSA Mid-South Emergency Management Department at 901-874-5749 or 901-874-5119, and the Contracting Officer will be notified as soon as possible.

13.2 Liquid Materials Transfer Safety

Liquid material transfers would include the permanganate solution as part of the remediation process; refueling of equipment in the CRZ or EZ and decontamination runoff from the equipment cleaning pads. The following procedures may be used at any time and identified in the AHA prior to performing the task.

Remove liquids and residues from the tanks using explosion-proof or air-driven pumps. Electrically bond the tank and pump motors and suction hoses to prevent electrostatic ignition hazards. Use of a hand pump will be permitted to remove the last of the liquid from the bottom of the tanks. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck must be vapor free, locate the truck upwind from the tank and outside the path of probable vapor travel. Discharge the vacuum pump exhaust gases through a hose of adequate size and length downwind of the truck and tank area. Vacuum truck operating and safety practices must conform to API RP 2219. Collect tank residues in drums, tanks, or tank trucks labeled according to 49 CFR 171 and 49 CFR 17 and disposed of as specified. Disconnect and drain fittings and lines of their contents after the materials have been transferred and the tanks have been exposed. Do not spill contents into the environment during cutting or disconnecting of tank fittings. Transfer materials drained into DOT-approved drums for storage and/or transportation. Only non-sparking or non-heat producing tools shall be used to disconnect and drain or to cut through tank fittings.

Electrical equipment (e.g., pumps, portable hand tools, etc.) used for tank preparation must be explosion-proof. Following cutting or disconnecting of the fittings, plug openings leading to the tanks.

13.3 Drum and Container Handling

Excavated soils will be placed in designated areas of the CRZ for sampling. Employees will wear the appropriate level PPE for sampling of materials. When the sampled soils have been categorized for contaminates or clean, they will be loaded into a transfer vehicle meeting the necessary DOT compliant standards and transferred to the proper landfills.

14.0 General Contact Information

Name	Office	Mobile (24 Hours)
Scott Randall, Program Manager	(800) 680-8987	(317) 453-7983
Angelo Dattilo, Project Manager	(800) 680-8987	(317) 753-4239
John Lyttle, Site Health and Safety Officer	(901) 872-1077	(910) 987-1320
Brian Morgan, Site Superintendent	(800) 680-8987	(317) 509-2841
Jack Moorman, Safety & Health Director	(800) 680-8987	(317) 910-0236

Note: Keep emergency numbers posted on the job site

15.0 Material Safety Data Sheet (MSDS) Information

Material	Exposure Symptoms	First Aid/CPR Instructions
TBD	See MSDS	See MSDS

MSDS forms are included as Attachment 3. Contaminant information sheets are included in this area. MSDS sheets are provided with material deliveries and will be incorporated into the Site Safety and Health plan as the materials are received on-site.

16.0 Activity Hazard Analysis

Activity hazard analysis forms are included as Attachment 4.

17.0 Permits, Applications, and Approvals Documentation

Prior to the beginning of remediation activities, all required federal and state permits will be obtained.

18.0 Incident and Injury Recordkeeping

Lee & Ryan will record and maintain all necessary forms and documentation about our safety program as well as all recordable injuries and illnesses according to law. The following records will be maintained:

OSHA Form 301—Injury and Illness Incident Report

All line supervisors are required to fill out the OSHA Form 301 for each injury or illness that is considered recordable under OSHA regulations (29 CFR 1904). The supervisor must fill out the form within 7 calendar days after finding out about the injury or illness. A copy of this record should be sent to the Safety Department. The supervisor must keep these records for a period of 5 years.

- OSHA FORM 300—Log of Work-Related Injuries and Illnesses

The Safety Department is responsible for entering the information on the OSHA Form 300 within 7 calendar of receiving notice of a recordable illness or injury. Each location will maintain its own 300 log. The Safety department will maintain an overall Lee & Ryan 300 log for corporate reporting and recordkeeping.

- OSHA FORM 300A—Summary of Work-Related Injuries and Illnesses

At the end of each calendar year, the Director of Safety will review the OSHA 300 Log to verify that the entries are complete and accurate. This information will be summarized and entered on OSHA FORM 300A. The Summary will be signed and dated by a company executive and will be posted at each managed location in a conspicuous place available to all employees from February 1 to April 30.

- Workers' Compensation Forms

The Director of Safety is responsible for maintaining these records. Each state maintains their own program. Each project that includes work in duration longer than 30 days will be reported to the insurance carrier by the safety department. They are retained for a period of three years after the completion of the project.

19.0 Hours reporting criteria

In order to maintain correct recording Total Recordable Injury Rates (TRIR) and Days Away/Restricted Time (DART) rates per OSHA and contractual requirements, Lee & Ryan use the following criteria:

Non-Exempt – Hours are maintained by timesheet or timeclocks and verified by supervisors. This information is entered into the controller time system. This information includes all overtime worked.

Exempt – Employees times are tracked in the system on a 40 hour workweek. To account for overtime not shown in the time recording program, an additional 10 hours is added to each exempt employee's weekly record. This results in 50 hours per week for TRIR/DART formula determination. This meets Department of Labor guidelines and Generally Accepted Accounting Practices for average exempt employee hours of service worked.

Lee & Ryan will add up all the hours in the weekly total. Then count the number of exempt employees and multiply the employees by weeks worked times 10 hours to account for overtime not expressed on the hour report. This is added to the total hours and presented on the 300A.

Hours worked during the duration of projects will be reported to the Contracting Officer as needed.

20.0 Required Submittals

Submittals and deliverables, as required, will be made in accordance with the Contract Specifications. Current records providing factual evidence that require quality control activities and/or tests have been performed will be maintained. These records will include the work of subcontractors and suppliers and will be on an acceptable format that will consist of, but not limited to:

- Contractor/subcontractor and associated responsibilities
- Equipment operation hours, including hours worked, idle, or down for repair
- Test and control activities performed, including results, type of control phase, and any deficiencies with corrective action taken
- Work performed each day, including location, description, and by whom
- Quantity of materials received on-site with statement of acceptability and storage
- Off-site surveillance activities, including the actions taken
- Job safety evaluations stating what was checked, results, and instructions/corrective action
- Instructions given/received and conflicts in plans/or specifications

20.1 Daily Reports

Daily activity reports will be completed, which will include the following information. (An example of the Daily Report Submittal Form is included in Attachment 5.)

- The date
- Summary of weather conditions
- Summary of locations where construction is occurring
- Summary of work performed on that date with location, description, and personnel performing the work
- Equipment and personnel working on the project
- Test sampling performed and personnel conducting sampling acquisition
- Written instructions from Site Superintendent for retesting or change of work
- Level of PPE during work performed
- Summary of any meetings held and attendees
- Job safety evaluations stating what is checked, results, and corrective action taken
- Description of all materials used and references or results of testing and documentation
- Description of materials received with a statement for acceptability and storage
- Review of submittals with contract reference, whom and action taken
- Inspection data sheets
- Corrective measures reports
- Acceptance reports
- Impacts to schedule if applicable
- Exceptions reports

21.0 General Quality Control Requirements

All federal, state, and local regulations concerning this renovation/rehabilitation project will be adhered to during the activities performed on-site as indicated in the Contract Specifications. The following information details the quality control practices to be adhered to during the project.

21.1 Protection of Existing Structures and Equipment

All structures, equipment, and environment on or adjacent to the work site, which are not to be removed and do not interfere with the scope of work required under the Contract Specifications, will be properly preserved and protected during the implementation and completion of the activities.

21.2 Operations and Designated Staging and/or Storage Area(s)

The staging/storage area(s) will be properly marked and secured for the duration of the project.

ATTACHMENT 1

Health and Safety Briefing Log and Discussion

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Health and Safety Briefing Log	
Date:	
Start Time:	
Issues Discussed:	
1.	6.
2.	7.
3.	8.
4.	9.
5.	10.
ATTENDEES	
Print Name and Company	Signature
Meeting Conducted by:	Signature:
Name (Site Health and Safety Coordinator):	Signature:

Discussion Ideas for the Production Health and Safety Meeting

- ☐ Emergency response plan, emergency vehicle (full of fuel) and muster point.
- ☐ Route to medical aid (hospital or other facility).
- ☐ Work hours, is night work planned?
- ☐ Hand signals around heavy equipment.
- ☐ Traffic control.
- ☐ Pertinent Regulations.
- ☐ Above and below ground utilities (energized or de-energized).
- ☐ Material Safety Data Sheets (MSDS).
- ☐ To who, what, why, and when to report an incident.
- ☐ Fire extinguisher and first-aid kit locations.
- ☐ Excavations, trenching sloping and shoring.
- ☐ Personal Protective Equipment (PPE) and training.
- ☐ Safety equipment and training.
- ☐ Emergency telephone and telephone numbers (may not be 911).
- ☐ Eye wash stations and washroom locations.
- ☐ Energy lock-out/tag-out procedures. Location of “kill Switches” etc.
- ☐ Weather restrictions.
- ☐ Site security. Site hazards. Is special/hazardous waste present?
- ☐ Traffic and people movements.
- ☐ Working around machinery (both static and mobile).
- ☐ Sources of ignition, static electricity etc.
- ☐ Stings, bites, large animals and other naturally related injuries.
- ☐ Working above grade.
- ☐ Working at isolated sites.
- ☐ Decontamination procedures (both personnel and equipment).
- ☐ Falls, trips, sprains and lifting injuries (how to prevent).
- ☐ Right to refuse unsafe work.
- ☐ Adjacent property issues (residence, business, school, daycare center).

ATTACHMENT 2

Incident Investigation Procedure and Reporting Forms

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Incident Investigation Procedure

When an incident occurs, the investigator must act quickly. No two situations are alike, but normally the following is correct.

A. Attend to the injured employee.

B. Secure the accident scene.

C. Notify your immediate supervisor.

The amount of action will depend on the severity of the accident. Follow established company procedure. Begin your investigation as soon as possible.

Be objective. Don't let emotions or your own opinions cloud your investigation. Proceed as follows:

A. Interview everyone who saw or was involved in the accident, including the victim (may have to be done at a later date). Use this procedure.

    1. Put them at ease. Explain that you are finding facts. Not placing fault.

    2. Interview "on the spot" if possible.

    3. Interview each person separately, group interviews create confusion.

    4. Encourage the person to tell "what they saw."

    5. Ask open-ended questions: "What? How? Where? When?"

    6. Repeat the story back for confirmation.

    7. End on a positive note.

    8. Keep the pipeline open. Some individuals remember important facts later.

B. Observe the accident scene. Look for obvious defects in equipment, tools, and the object causing the injury. In some cases, photos or drawings may help.

C. Record critical information promptly, do not delay. Use a prepared form to help remember key questions.

D. Gather facts, not opinions. Use them to identify activities that contributed to the accident.

E. Make conclusions based on facts and knowledge, not suppositions.

F. Make recommendations to correct physical hazards, revise job procedures, and identify employee training needs.

Questions to Ask

There are certain key questions that will help a foreman to complete a thorough investigation. The following will work in many instances:

1. What was the victim doing at the time of the accident?
2. Was the victim authorized and qualified to do this operation?
3. Were approved procedures being followed?
4. Was the victim familiar with the job and procedures?
5. Is the job or process new to the area?
6. Were proper tools or equipment being used?
7. Was the proper supervision being provided?
8. Had the victim received hazard potential training prior to the accident?
9. What was the location of the accident?
10. What was the physical condition of the area when the accident occurred?
11. What were witnesses doing at the time of the accident?
12. What immediate or temporary action could have prevented the accident or minimized its effect?
13. What long-term or permanent action could have prevented the accident or minimized its effect?
14. Had corrective action been recommended in the past but not adopted?

Other questions may be needed—depending on the accident.

Investigation Tools Checklist

_____ Bound notebook

_____ Clipboard/pad, pens, and pencils

_____ Graph paper

_____ Paint stick (yellow/black)

_____ Chalk (yellow/white)

_____ Camera, with film and flash

_____ Video camera with tape

_____ Cassette recorder and spare cassette tapes

_____ Straight edge rule for scale reference in photos

_____ Tape measure (preferably 100 foot)

_____ Scotch, masking, and duct tape

_____ High-visibility plastic tape to demarcate area

_____ Identification tags

_____ Flashlight

_____ First-aid kit

_____ Appropriate personal protective equipment (PPE)

_____ Sturdy gloves

_____ Specimen containers

_____ Hazard monitoring equipment

_____ Accident investigator's checklist and report forms

_____ Interview or statement forms

Incident Report Form

Part 1 GENERAL INFORMATION

Who was involved _____ Age ____ Dept. _____
Last First MI

Employee # _____ Sex: M F Employment Status: P/T F/T Temporary Shift _____

Date of Accident ____/____/____ Time _____ AM or PM Location _____

Job _____ Activity at Time of Accident _____

Part 2 DESCRIPTION OF INCIDENT

_____

_____

_____

_____

_____

_____

Witnesses: _____

Part 3 WHAT WAS THE CAUSE OF THE INCIDENT?

Determine the cause by analyzing all the contributing factors if a person, machine, or other physical condition was involved. Find out **HOW** and **WHY.**

A. Describe any ***UNSAFE*** acts:

_____

_____

_____

B. Describe any ***UNSAFE*** conditions:

_____

_____

_____

C. Describe the ***FUNDAMENTAL INCIDENT CAUSE***:

_____

_____

_____

Part 4 **WHAT CORRECTIVE ACTIONS WILL BE TAKEN?**

What have you done or what do you recommend changing or modifying to prevent the recurrence of a similar accident?

_____

_____

_____

Has it been done? Yes No If Not, Why? Explain
_____

_____

_____

_____

_____/_____ /_____
Supervisor/Investigator Signature **Date** **Reviewed and Approved By**

ATTACHMENT 3

Material Safety Data Sheet (MSDS) Information

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

ATSDR

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

TRICHLOROETHYLENE **CAS # 79-01-6**

This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). What is trichloroethylene? Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers. Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical. **What happens to trichloroethylene when it enters the environment?** Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time. Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air. Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time. Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment. Trichloroethylene does not build up significantly in plants and animals. **How might I be exposed to trichloroethylene?** Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid. Drinking, swimming, or showering in water that has been contaminated with trichloroethylene. Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site. Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment. **How can trichloroethylene affect my health?** Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating. Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service Agency for Toxic Substances and Disease Registry

Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is "reasonably anticipated to be a human carcinogen." The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is "probably carcinogenic to humans."

Is there a medical test to show whether I've been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn't available at most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.
The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8- hour workday, 40-hour workweek.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

TETRACHLOROETHYLENE CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). What is tetrachloroethylene?

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products. Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels. **What happens to tetrachloroethylene when it enters the environment?** Much of the tetrachloroethylene that gets into water or soil evaporates into the air. Microorganisms can break down some of the tetrachloroethylene in soil or underground water. In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain. It does not appear to collect in fish or other animals that live in water. **How might I be exposed to tetrachloroethylene?** When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air. When you drink water containing tetrachloroethylene, you are exposed to it. **How can tetrachloroethylene affect my health?** High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high." In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known. Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service Agency for Toxic Substances and Disease Registry

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been ex- posed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

VINYL CHLORIDE CAS # 75-01-4

Division of Toxicology and Environmental Medicine ToxFAQsTM July 2006

This fact sheet answers the most frequently asked health questions (FAQs) about vinyl chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. HIGHLIGHTS: Exposure to vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride? Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials. Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride. **What happens to vinyl chloride when it enters the environment?** Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface. Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful. ‘ Small amounts of vinyl chloride can dissolve in water. Vinyl chloride is unlikely to build up in plants or animals that you might eat. **How might I be exposed to vinyl chloride?** Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills. Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace. Drinking water from contaminated wells. **How can vinyl chloride affect my health?** Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death. Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, Public Health Service Agency for Toxic Substances and Disease Registry

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

How can families reduce the risk of exposure to vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

Is there a medical test to show whether I've been exposed to vinyl chloride?

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride.

The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The
EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

11/19/2009

Potassium Permanganate Solution, 0.1M
MSDS # 584.10

Section 1: **Product and Company Identification**

Potassium Permanganate Solution, 0.1M

Synonyms/General Names: Chameleon Mineral
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300
CANUTEC (Canada): 613-424-6666

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: **Hazards Identification**

Violet solution, no odor.
HMIS (0 to 4)

Health	**1**
Fire Hazard	**0**
Reactivity	**0**

WARNING! Moderate oxidizing agent and slightly toxic by ingestion. Target organs: None known

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: **Composition / Information on Ingredients**

Potassium Permanganate (7722-64-7), 1-2%. Water (7732-18-5), 98-99%.

Section 4: **First Aid Measures**

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 cups of water or milk to drink.
Induce vomiting immediately.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: **Fire Fighting Measures**

Oxidizing agent. When heated to decomposition, emits acrid fumes of manganese oxides and potassium hydroxide.
Protective equipment and precautions for firefighters: Use foam or dry chemical to extinguish fire.
Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Contain spill with sand or absorbent material and place in sealed bag or container for disposal. Ventilate and wash spill area after pickup is complete. See Section 13 for disposal information.

Section 7: Handling and Storage

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in General Storage Area [Green Storage] with other items with no specific storage hazards. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Exposure guidelines: Potassium Permanganate: OSHA PEL: Not Available, ACGIH: TLV: Not Available, STEL: Not Available..
11/19/2009

Section 9: Physical and Chemical Properties

Molecular formula	$KMnO_4$.	**Appearance**	Violet solution solid.	
Molecular weight	158.04	**Odor**	No odor.	
Specific Gravity	1.02 g/mL @ 20°C.	**Odor Threshold**	N/A.	
Vapor Density (air=1)	N/A.	**Solubility**	Soluble in water .	
Melting Point	N/A.	**Evaporation rate**	N/A.	*(Butyl acetate = 1).*
Boiling Point/Range	N/A.	**Partition Coefficient**	N/A.	*(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.	
Flash Point:	N/A.	**LEL**	N/A.	
Autoignition Temp.:	N/A.	**UEL**	N/A.	

N/A = Not available or applicable

Section 10: Stability and Reactivity

Stability: Stable under normal conditions of use and storage.
Incompatibility: Reducing agents, alcohols, bromides, iodides, charcoal, hydrochloric acid, organic material, ferrous or mercurous salt, sulfites, peroxides or oxalates.
Shelf life: Indefinite shelf life, store in cool, dry environment.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Redness, tearing, itching, burning, conjunctivitis. ***Skin***: Redness, itching.
Ingestion: Irritation and burning sensations of mouth and throat, nausea, vomiting and abdominal pain. ***Inhalation***: Irritation of mucous membranes, coughing, wheezing, shortness of breath,
Chronic Effects: No information found.
Sensitization: none expected
Potassium Permanganate: LD50 [oral, rat]; 1090mg/kg; LC50 [rat]; N/A; LD50 Dermal [rabbit]; N/A Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Toxic to beneficial microorganisms (e.g. soil and sewage treatment microorganisms).. Do not release to environment.

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Small amounts of this material may be suitable for sanitary sewer or trash disposal.

Section 14: Transport Information

DOT Shipping Name: Not regulated by DOT.	**Canada TDG:** Not regulated by TDG.
DOT Hazard Class:	**Hazard Class:**
Identification Number:	**UN Number:**

Section 15: Regulatory Information

EINECS: Listed (231-760-3) .
WHMIS Canada: C, E: Oxidizing material, Corrosive.
TSCA: All components are listed or are exempt.
California Proposition 65: Not listed.

The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: November 19, 2009
Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. ***S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.***

ATTACHMENT 4

Activity Hazard Analysis

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Activity Hazard Analysis (AHA)

Activity/Work Task: Injection of Chem Ox	Overall Risk Assessment Code (RAC) (Use highest code)	**H**
Project Location: NAVFAC-SMU 39, Millington TN	**Risk Assessment Code (RAC) Matrix**	
Contract Number: N40083-11-D-0028-0001		
Date Prepared: 10/4/2011		
Prepared by (Name/Title): Mike Jeffries, SSHO		
Reviewed by (Name/Title): Jack Moorman, HS Dir		
Notes: (Field Notes, Review Comments, etc.)		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Moving Equipment	Struck by/Caught Between	1. Class II reflective clothing/PPE must be worn at all times 2. Operators look before moving 3. Ground personnel make eye contact with operator before walking behind or around machines 4. Do not place self between vehicles and stationary materials, buildings or equipment.	**M**
Loading/unloading applicator equipment/tubes	Stuck by, strains.	1. Use proper rigging 2. Do not overload machines with load 3. Following moving equipment rules 4. Store material in orderly fashion that it will not tip over or block access/egress	**M**
Manual material Lifting	Strains	1. Personnel shall ensure that they observe proper lifting techniques and shall minimize movements such as over reaching, bending and twisting. 2. Personnel shall not lift more than 50 lbs. without help from a co-worker(s) or mechanical assistance. 3. Use a dolly or other mechanical method when practical.	**M**

Drilling	Struck by, cutting, twisting	1. Operate drill rig in accordance with operator manual 2. Only certified / competent operators are allowed in area 3. Use barrier tape to section off exclusion area 4. Only trained employees allowed in drilling area 5. No employee will be allowed to “handguide” bit without proper guards in place 6. Spotter will man emergency stop at all times 7. Gloves will not be worn near operating bit Point Of Operation	**H**
Chemical use	Contamination, poisoning, spills	1. Familiarize w/ MSDS 2. Wear nitrile or neoprene gloves 3. Avoid contact with skin. Wash affected areas with water and mild soap immediately 4. Close container when not in use. 5. Spills will be contained and cleaned up immediately with absorbents 6. Potential spills anticipated for this project will be small - < 5 gal 7. Large scale spills must be handled by experienced personnel only 8. Report large scale spills to the SSHO	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Drilling rig GeoProbe Injection system Water Storage Tanks Chemical oxidizer (KMNO4) Pumps Tubing Generator Full body harness w/lanyard 5 mA GFCI First aid kit Fire extinguisher ANSI safety boots Power cords Safety eyewear Gloves Hardhat Respiratory protection as needed High Visibility clothing	30 Hour OSHA construction-Supervisors 10 hour OSHA construction – L&R employees Site indoc safety - all First aid/CPR – Supervisors SSHO Fall protection – As needed Pre-job daily briefing - All Qualified equipment operator – Specific operators Chemical Oxidizer injection operator – qualified applicator	Monthly first aid kit Injection equipment pre use Daily power cord GFCI pre use MSDS for oxidizer Water tanks Drilling rig pre-operation / guards

Activity Hazard Analysis (AHA)

Activity/Work Task: Project Mobilization/demobilization	Overall Risk Assessment Code (RAC) (Use highest code)	**H**
Project Location: NAVFAC-SMU 39, Millington TN	**Risk Assessment Code (RAC) Matrix**	
Contract Number: N40083-11-D-0028-0001		
Date Prepared: 10/4/2011		
Prepared by (Name/Title): Mike Jeffries, SSHO		
Reviewed by (Name/Title): Jack Moorman, HS Dir		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)
This includes mobilization for the drilling rig and concrete pad removal

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Moving Equipment	Struck by/Caught Between	1. Class II reflective clothing/PPE must be worn at all times 2. Operators look before moving 3. Ground personnel make eye contact with operator before walking behind or around machines 4. Do not place self between vehicles and stationary materials, buildings or equipment	**H**
	Falling from heights	1. 6 ft fall protection rule applies to all situations except when on top of engine compartment of machines	**L**
	Loading/unloading material	1. Use proper rigging 2. Do not overload machines with load 3. Following moving equipment rules 4. Store material in orderly fashion that it will not tip over or block access/egress	**M**
Placement of remedial equipment	Struck By	1. Class II reflective clothing/PPE must be worn at all times 2. Operators look before moving 3. Ground personnel make eye contact with operator before walking behind or around trailer or equipment	**H**
Marking of injection grid points	Struck by Utility disruption	1. Use proper tool for hammering or placing of stakes 2. Ensure utilities have been marked	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Excavator Generator Full body harness w/lanyard 5 mA GFCI First aid kit Fire extinguisher ANSI safety boots Power cords Safety eyewear Gloves Hardhat Respiratory protection as needed High Visibility clothing	30 Hour OSHA construction-Supervisors 10 hour OSHA construction – L&R employees Site indoc safety - all First aid/CPR – Supervisors SSHO Fall protection – As needed Pre-job daily briefing - All Qualified equipment operator – Specific operators	SSHO daily inspection Weekly inspections Monthly first aid kit Monthly fire extinguisher Fall protection pre use Heavy equipment pre use Daily power cord GFCI pre use

Activity Hazard Analysis (AHA)

Activity/Work Task: Concrete pad demolition	Overall Risk Assessment Code (RAC) (Use highest code)	**H**
Project Location: NAVFAC-SMU 39 Bldg S-74, Millington TN	**Risk Assessment Code (RAC) Matrix**	
Contract Number: N40083-11-D-0028-0001		
Date Prepared: 10/4/2011		
Prepared by (Name/Title): Mike Jeffries, SSHO		
Reviewed by (Name/Title): Jack Moorman, HS Dir		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)
Demolition of the concrete pad of bldg. S-74

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Moving Equipment	Struck by/Caught Between	1. Class II reflective clothing/PPE must be worn at all times 2. Operators look before moving 3. Ground personnel make eye contact with operator before walking behind or around machines 4. Do not place self between vehicles and stationary materials, buildings or equipment.	**M**
Loading/unloading equipment	Stuck by, strains,	1. Use proper rigging 2. do not overload machines with load 3. following moving equipment rules 4. store material in orderly fashion that it will not tip over or block access/egress	**M**
Manual material Lifting	Strains	1. Personnel shall ensure that they observe proper lifting techniques and shall minimize movements such as over reaching, bending and twisting. 2. Personnel shall not lift more than 50 lbs. without help from a co-worker(s) or mechanical assistance. 3. Use a dolly or other mechanical method when practical.	**M**

Demolition / jackhammer	Struck by, shaking, noise	1. Operate jack hammer in accordance with operator manual 2. Only certified / competent operators are allowed in area 3. Use barrier tape to section off work area 4. Only trained employees allowed in demolition area 5. Spotter will ensure area remains free of unauthorized people and inform operator of unseen/unheard hazards 6. Operator and all employees in area will wear hearing protection. 7. Operator will wear gloves, preferably with cushioned palms	**H**
Excavation	Existing Utilities,	1. Excavation work to be conducted under the supervisor of the competent person. 2. Identify the location of any subsurface obstructions. 3. Protect/support exposed subsurface installations. 4. Excavate by hand within 2 feet of active underground installations to locate them. 5. Use nonconductive tools within 2 feet of energized direct buried cable.	**L**
	Manual Lifting Hazards	1. Personnel shall ensure that they observe proper lifting techniques and shall minimize movements such as over reaching, bending and twisting. 2. Personnel shall not lift more than 50 lbs. without help from a co-worker(s) or mechanical assistance. 3. Use a dolly or other mechanical method to move drums of soil/water that are generated.	**M**
	Inclement Weather	1. Job activity will be shut down if weather poses imminent danger. 2. Inspect excavations a minimum of each shift to ensure soil cohesion and identify any adverse conditions.	**L**

	Sides of excavation can cave in	1. Excavation work to be conducted under the supervisor of the competent person. 2. Protect against fall into trench where depths exceed 6 feet. 3. Erect barricades, stop logs, and/or warning signals where mobile equipment operators have obstructed view of the excavation edge. 4. Complete initial and daily Competent Person Inspections. 5. Determine soil type. Use protective support system (sloping, shoring, shielding) where Competent Person identifies cave-in potential. 6. Provide means of egress (ladder, ramp, stairway) for every 25 feet of travel where depths are 4 feet or greater. 7. Conduct pre-job walk down with excavation crew. 8. Implement dust control measures as necessary. 9. Protect workers from loose and falling rock along the excavation face. 10. Shore or brace adjoining structures to prevent shifting/collapse. 11. Regularly inspect trenches for conditions.	**M**
	Falls in or around the excavation	1. Assign a Competent Person to the Excavation Work. 2. Protect against fall into trench where depths exceed 6 feet. 3. Ensure that all personnel entering the excavation or working within 6 feet of the excavation have received excavation safety training. 4. Regularly inspect trenches for conditions.	**M**
	Heavy equipment	1. Perform equipment inspections prior to use. Make repairs as necessary. Never use damaged or comprised equipment. 2. Implements must be lowered to ground and the parking brake engaged when not in use. 3. Equipment must be equipped with seat belts, rollover protective structures, back up alarms, and a minimum 5BC fire extinguisher. 4. Level D PPE including reflective vests must be worn when working in and around heavy equipment. 5. Do not enter the swing radius of heavy equipment. Never	

		approach heavy equipment from a blind spot. Make eye contact with operator and receive approval before approaching heavy equipment. 6. Use spotters and flagmen when loading and unloading heavy equipment. 7. Never stand under a suspended load or ride double on heavy equipment.	
	Haul trucks	1. Inspect haul truck prior to use. Make repairs as necessary. Do not use damaged or comprised equipment. 2. Remain in the cab of the truck when being loaded. 3. Use audible signs to communicate with equipment operators. 4. Observe local traffic laws. 5. Remove loose debris from tailgate prior to leaving site.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Jack Hammer Backhoe First aid kit Fire extinguisher ANSI safety boots Power cords Safety eyewear Gloves Hardhat Respiratory protection as needed Hearing protection Barricade tape High Visibility clothing	30 Hour OSHA construction-Supervisors 10 hour OSHA construction – L&R employees Site indoc safety - all First aid/CPR – Supervisors SSHO Fall protection – As needed Pre-job daily briefing - All Qualified equipment operator – Specific operators	Monthly first aid kit Injection equipment pre use GFCI pre use MSDS for contaminants DOT dump truck pre-haul inspection

Activity Hazard Analysis (AHA)

Activity/Work Task: Groundwater Sampling	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location: NAVFAC-SMU 39, Millington TN	**Risk Assessment Code (RAC) Matrix**	
Contract Number: N40083-11-D-0028-0001		
Date Prepared: 10/4/2011		
Prepared by (Name/Title): Mike Jeffries, SSHO		
Reviewed by (Name/Title): Jack Moorman, HS Dir		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
Collect sample from monitoring wells	Manual material Lifting	1. Personnel shall ensure that they observe proper lifting techniques and shall minimize movements such as over reaching, bending and twisting. 2. Personnel shall not lift more than 50 lbs. without help from a co-worker(s) or mechanical assistance. 3. Use a dolly or other mechanical method when practical.	**M**
	Hand tool/equipment usage	1. Operate according to the manufacturer's instructions. 2. Associates will be familiar with the proper use of the tool being used. 3. Tools will be maintained according to manufacturer's recommendations. 4. Tools will be inspected before each use. 5. Damaged or defective tools will be placed out of operation until repaired or replaced. 6. Secure work with clamps or a vise, freeing both hands to operate the tool. 7. Be sure to keep good footing and maintain good balance. 8. The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts.	**L**

		9. Work areas should be well lighted and free of obstructions and potential hazards. 10. Pneumatic tools should never be pointed at other personnel. 11. Use the right tool for the job.	
	Chemical/hazardous material /water spill	1. Wear nitrile or neoprene gloves and disposable suit. 2. Avoid contact with skin. Wash affected areas with water and mild soap immediately. 3. Close container when not in use. 4. Familiarize w/ MSDS. 5. Spills will be contained and cleaned up immediately with absorbents. 6. Potential spills anticipated for this project will be small - < 5 gal. 7. Large scale spills must be handled by experienced personnel only. 8. Report large scale spills to the SSHO.	**L**
	Electrical	1. Use GFCI for electrical connections from generator to submersible pump 2. Use one extension cord long enough to meet length of run 3. Inspect cord and GFCI for cuts to insulation 4. Connect tool to cord before connecting cord to generator 5. Unplug cord by grasping molded plug not cord	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Submersible pump Water level indicator YSI Meter Drums Generator 5 mA GFCI ANSI safety boots Power cords Safety eyewear Gloves Hardhat Respiratory protection as needed High Visibility clothing	30 Hour OSHA construction-Supervisors 10 hour OSHA construction – L&R employees Site indoc safety - all First aid/CPR – Supervisors SSHO Pre-job daily briefing - All Environmental scientist	Daily power cord GFCI pre use

Activity Hazard Analysis (AHA)

Activity/Work Task: Project Mobilization/demobilization	Overall Risk Assessment Code (RAC) (Use highest code)	**H**
Project Location: NAVFAC-SMU 39, Millington TN	**Risk Assessment Code (RAC) Matrix**	
Contract Number: N40083-11-D-0028-0001		
Date Prepared: 10/4/2011		
Prepared by (Name/Title): Mike Jeffries, SSHO		
Reviewed by (Name/Title): Jack Moorman, HS Dir		

Severity	**Probability**				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	**E**	**E**	**H**	**H**	**M**
Critical	**E**	**H**	**H**	**M**	**L**
Marginal	**H**	**M**	**M**	**L**	**L**
Negligible	**M**	**L**	**L**	**L**	**L**

Notes: (Field Notes, Review Comments, etc.)
This includes mobilization for the drilling rig and concrete pad removal

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible.

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Moving Equipment	Struck by/Caught Between	1. Class II reflective clothing/PPE must be worn at all times. 2. Operators look before moving. 3. Ground personnel make eye contact with operator before walking behind or around machines. 4. Do not place self between vehicles and stationary materials, buildings or equipment.	**H**
	Falling from heights	1. 6 ft fall protection rule applies to all situations except when on top of engine compartment of machines.	**L**
	Loading/unloading material	1. Use proper rigging. 2. Do not overload machines with load. 3. Following moving equipment rules. 4. Store material in orderly fashion that it will not tip over or block access/egress.	**M**
Placement of remedial equipment	Struck By	1. Class II reflective clothing/PPE must be worn at all times. 2. Operators look before moving. 3. Ground personnel make eye contact with operator before walking behind or around trailer or equipment.	**H**
Marking of injection grid points	Struck by Utility disruption	1. Use proper tool for hammering or placing of stakes. 2. Ensure utilities have been marked.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Excavator Generator Full body harness w/lanyard 5 mA GFCI First aid kit Fire extinguisher ANSI safety boots Power cords Safety eyewear Gloves Hardhat Respiratory protection as needed High Visibility clothing	30 Hour OSHA construction-Supervisors 10 hour OSHA construction – L&R employees Site indoc safety - all First aid/CPR – Supervisors SSHO Fall protection – As needed Pre-job daily briefing - All Qualified equipment operator – Specific operators	SSHO daily inspection Weekly inspections Monthly first aid kit Monthly fire extinguisher Fall protection pre use Heavy equipment pre use Daily power cord GFCI pre use

ATTACHMENT 5

Daily Inspection and Report Forms

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

DAILY LOG

LEE & RYAN

CONTRACT NO. _____ DATE _____

L&R PROJECT NO. _____ DAY _____

PROJECT NAME _____

LOCATION SUMMARY _____

WEATHER		
TEMPERATURE	8 A.M.	
	NOON	
	4 P.M.	
PRECIPITATION	TYPE	
	INCH	

LEE & RYAN

EMPLOYEE NAME	CLASSIFICATION	LOCATION/DESCRIPTION OF WORK	HOURS

SUBCONTRACTORS

CONTRACTOR	EMPLOYEE NAME	CLASSIFICATION	LOCATION/DESCRIPTION OF WORK	HOURS

_____

KEY ACTIVITIES	MILESTONES HIT

MATERIALS DELIVERED	EQUIPMENT DELIVERED/RETURNED

TESTS/INSPECTIONS	UNRESOLVED ISSUES/DELAYS

HOT WORK ACTIVITES	ICRA EVENTS

ACCIDENTS/INJURIES	VISITORS TO THE SITE

Other General Notes:

SUPERINTENDENT SIGNATURE

Daily Safety Inspection Report

JOB_____**DATE**_____ **INSPECTOR**_____

Item	Yes	No	N/A	Description
1				Tools and materials are placed in storage/toolbox
2				Trash and scrap has been properly disposed in trash receptacles
3				Differing Site Conditions: If applicable, all smoke and dust controls barriers will be in place and approved by infection control and safety prior to beginning of work or any demolition work
4				Employees and Contractors have received safety briefing of upcoming day's work
5				Employees are wearing proper PPE at proper times
6				Safety Observation Communication Reports have been identified, inspected and corrected
7				AHA/JHA/JSA has been reviewed prior to starting new task
8				MSDSs are available and current
9				Barriers, signs, and guards are in place to prevent entry from unauthorized people
10				GFCIs used in damp locations/outdoor areas
11				Fire extinguishers accessible near hot work areas
12				Schedule of Work Progress
13				Hazardous materials in cabinet when not in use
14				Hazardous materials are labeled
15				Gas cylinders capped when not in use and stored correctly when not in use for 24 hours
Other safety issues not covered				

Weekly Safety Inspection Report

Job Name: _____ **Inspected by:** _____ **Date:** _____

1. Job Information

Description	Yes	No
Telephone number for the nearest medical center posted?		
Are Weekly Safety Meetings up to date?		
Work areas properly signed and barricaded?		
Is each employee instructed in the recognition and avoidance of unsafe conditions?		
Are first aid supplies readily accessible?		
Are telephone numbers, physicians, hospitals and ambulances conspicuously posted?		
Are potable drinking water and toilet facilities available at the site?		
Is work area generally orderly?		
Are AHAs/JHAs available and accessible to all employees?		

Notes and Corrective Actions:

_____

_____

2. Fire Prevention

Description	Yes	No
Are adequate fire extinguishers, checked and accessible?		
Is the telephone number of fire department posted?		
Are “No Smoking” signs posted and enforced near flammables?		

Notes and Corrective Actions:

_____

_____

3. Hand, Power & Powder Actuated Tools

Description	Yes	No
Are hand tools inspected regularly for broken handles and mushroom heads?		
Are guards in place on machines, such as saws?		
Are the correct tools being used for job at hand?		
Are operators of powder actuated tools licensed?		

Notes and Corrective Actions:

_____

_____

4. Personal Protective Equipment

Description	Yes	No
Are hard hats being worn?		
Are safety glasses being worn?		
Are respirators used when required?		
Is protective hearing gear being worn when required?		
Are traffic vests being worn?		

Notes and Corrective Actions:

_____

_____

5. Vehicles

Description	Yes	No
Do vehicles and earth moving equipment with an obstructed view to the rear have a backup alarm or used with an observer?		
Do vehicles and earth moving equipment have seat belts and are they used?		
Are flagmen wearing reflectorized garments and using flags, sign paddles, or lights?		

Notes & Corrective Actions:

_____

_____

6. Unsafe Acts or Practices Observed

Description	Yes	No

Notes and Corrective Actions:

_____

_____

Signature _____ Date _____

For detailed information on Construction Standards for the Construction Industry see the OSHA Standards at 29 CFR Part 1926.

ATTACHMENT 6

Employee Safety Culture Enhancement Program (Incentives)

Accident Prevention Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Safety Bonus Buck Program

In an effort to increase safety awareness, and employee morale, we will begin a bonus buck program. This is for all Lee & Ryan employees, both field and office personnel.

The program consists of safety Bonus Bucks and management involvement. By utilizing this form of safety observation/recognition program, all employees become involved in the safety process of continuous improvement. Identify – Implement - Review

HOW IT WORKS

If an employee is observed working in a safe manner and following HSMS company safety standards or identifying environmental, health or safety issues, the employee will receive a "Bonus Buck". Some examples are listed below.

The observer will approach the employee, state the identified action, sign the front and write the observation on the back of the buck. Larger denomination bucks may be awarded for greater work towards safety.

Once ten bucks are awarded they may be turned in to the site manager for a $10 gift card. The gift card may be to a restaurant, department store or cash card. The site manager will verify the signature and employee's name on the front of the card and review the write up on the back of the card for relevance to the program.

Site supervisors / management and safety committee members may award Bucks. Site supervisors /management and safety committee members may receive bucks, but it needs to be awarded by a higher level employee i.e. Site managers award supervisors, safety committee by supervisors and above. Site managers can be awarded by Safety manager, Project manager and above.

The site manager will ensure that the bucks are signed and described on the back before awarding cards.

Examples of buck awards:

- Wearing proper PPE consistently for a week.
- Consistent housekeeping for one week.
- Attending weekly/monthly safety training.
- Using barricades properly
- Review AHA for first time
- Approaching customer/employee in a courteous manner when violating safety policies
- Correcting any safety hazards/behaviors
- Properly completing a Safety Observation Communication Report

Examples of greater amounts:

- Presenting toolbox = 2 bucks
- Presenting safety training for site/company = 5 bucks
- Developing safety training video, powerpoint for site company = 10 bucks
- Participate in safety standard development = 5 bucks
- Develop AHA = 5 bucks

Other amounts may be awarded as requested through the Health and Safety department.

Materials: bonus bucks will be printed at each site and be distributed to supervisors and safety committee members. Sites will make the determination on the types of cards to distribute, but shall be acceptable to the employee receiving the card.

LEE & RYAN
LEE & RYAN
Employee
Observer
SAFETY BUCK

LEE & RYAN
LEE & RYAN
Employee
Observer
SAFETY BUCK

LEE & RYAN
LEE & RYAN
Employee
Observer
SAFETY BUCK

APPENDIX E

Emergency and Hazardous Chemical Inventory Forms

Work Plan
Remediation of SWMU 39 TCE Plume
NSA Mid-South
Millington, TN 38054

Lee & Ryan Hazardous Material forms
Supplement to HSMS – 206
Hazmin program

HAZARDOUS MATERIAL INCIDENT REPORTING INFORMATION*

DATE_____ TIME_____ AGENCY_____

NAME OF CALLER_____ TELEPHONE NUMBER_____

TYPE OF INCIDENT / ACCIDENT_____ LOCATION_____

TIME OF OCCURRENCE_____ ANY INJURY / DEATH? YES NO

PLACARD YES € NO € IF YES, IDENTIFICATION NUMBER_____

MATERIAL / PRODUCT INVOLVED (CORRECT SPELLING)_____

TYPE OF CONTAINER_____ AMOUNT_____ SPILL SIZE_____

ENDANGERED AREA_____ POPULATION AREA_____ SPILL MOVEMENT YES NO

WATER BODIES / STREAMS INVOLVED? YES € NO € IF YES, NAME?_____

IMMEDIATE THREAT € HUMAN € WILDLIFE € WATER SUPPLY € FISHLIFE € OTHER___

CURRENT WEATHER CONDITIONS (AT THE SCENE)
WIND SPEED & DIRECTION_____TEMPERATURE_____
CLIMATE_____

CURRENT OR POTENTIAL HEALTH PROBLEM_____

_____

SHIPPER / MANUFACTURER NAME_____ ADDRESS_____
PHONE NUMBER_____

TRUCK DRIVER IDENTIFICATION NAME_____ ADDRESS_____
PHONE NUMBER_____

PERSONNEL / AGENCY AT SCENE_____

OTHER FACTS / REMARKS_____

_____

_____

_____

* The Lee & Ryan H&S manager (317-910-0236, 24 hour emergency phone number) must be notified as soon as possible after submission of incident report.

WRITTEN HAZARDOUS MATERIAL INCIDENT REPORT FOLLOW-UP REPORT

DATE_____ TIME_____

CONTACT PERSON:_____

ADDRESS:_____

PHONE:_____(WORK)_____(HOME)

LOCATION OF INCIDENT:_____

_____

IDENTITY OF SUBSTANCE / MATERIAL_____

TRADE NAME:_____

CHEMICAL NAME: _____CAS # _____

_____ _____

_____ _____

_____ _____

IS THIS SUBSTANCE ON THE SARA 302 LIST? YES NO DO NOT KNOW

WHAT QUANTITY OF THE SUBSTANCE WAS RELEASED?_____

_____

WHAT TIME DID THE RELEASE BEGIN?_____

WHAT WAS THE DURATION OF THE RELEASE?_____

WHAT MEDIA WAS AFFECTED BY THE RELEASE (AIR/WATER/SOIL)?_____

IDENTIFY KNOWN ACUTE OR CHRONIC HEALTH RISKS_____

_____

WHAT PERTINENT MEDICAL ADVICE WAS ISSUED?_____

_____

CHEMICAL SUMMARY AND INFORMATION

List Of Hazardous Materials / Reportable Chemicals

Chemical Name	CAS Number	SARA 302 Y/N	Location	Quantity

Spill Notification Procedures

- Call Fire Department
- Call Ambulance (If needed)
- Call Public Safety Center (Sheriff's Office)
    - If no answer at Fire Department or the Public Safety Center call the State Emergency Release Hotline and report the spill.
- Evacuate building or immediate area if on worksite! (Optional)
- If possible, turn off power to property to prevent possible fires / explosions prior to evacuating property.
- If possible, prevent chemicals from entering sewers and floor drains.
- If possible, prevent on-lookers / bystanders from entering the property / affected area.
- Stay up-wind from the affected area.

Reporting
GENERAL GUIDELINES

Toxic Chemical Release Forms (313)

Toxic Chemical release reporting (313) is limited to facilities in SIC Codes 20 - 39 with 10 or more full time employees, but may, as indicated above, apply to farms or ranches with on-site manufacturing operations.

Title III also includes various provisions for civil, administrative and criminal penalties and citizen suits for failure to comply with the requirements of the law.

Lee & Ryan is exempt for this standard and Form R reporting criteria. Materials brought onto facilities will be reported in quantity form to meet the customer's form R requirement.