02137

US Army
Engineering & Support Center
Huntsville, AL

FINAL

Work Plan
SEAD-59 and 71
Time Critical Removal Action
Seneca Army Depot Activity
Romulus, NY

Contract No. GS-10F-0115K
Delivery Order No. DACA87-02-F-0137

ENSR Corporation
August 2002
Document Number 09090-029-100

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1.0 INTRODUCTION

On August 1, 2002, the United States Army Engineering & Support Center located in Huntsville, Alabama (hereafter referred to as the USACE), issued Delivery Order No. DACA87-02-F-0137 (the award document) to ENSR Corporation (ENSR) for the Time Critical Removal Actions at SEAD 59 and SEAD 71 of the Seneca Army Depot Activity (SEDA), Romulus, New York. This work plan has been prepared to comply with the requirements of paragraphs 3.3.1 and A.1.5.4 of the award document, a complete copy of which is presented in Appendix A.

SEAD 59 is a fill area located west of building 135 at the SEDA. This SEAD is located on both sides of a dirt access road that extends from Administration Avenue to Building 311. It is a known fill area used for the past disposal of concrete, asphalt, metal, wood, chain link fencing, 55 gallon drums, and paint cans. Areas of petroleum hydrocarbon staining have also been documented in SEAD 59.

SEAD 71 is an alleged paint disposal area located between the two railroad tracks servicing buildings 114 and 127, approximately 200 feet west of 4th Avenue. It is rumored that paints and/or solvents were disposed of in pits at this SEAD. Debris identified in test pits dug at this site included construction debris, chain link fencing, sheet metal, asphalt, stone slabs, bricks, piping, railroad ties and one crushed twenty gallon drum.

A detailed discussion of the background information, site characterization and past efforts that have lead to this Time Critical Removal Action (TCRA) can be found in Section 1.0, GENERAL STATEMENT OF SERVICES, of the award document.

2.0 PROJECT OBJECTIVES

The project objective is stated in section 2.0, OBJECTIVE, of the award document. It states:

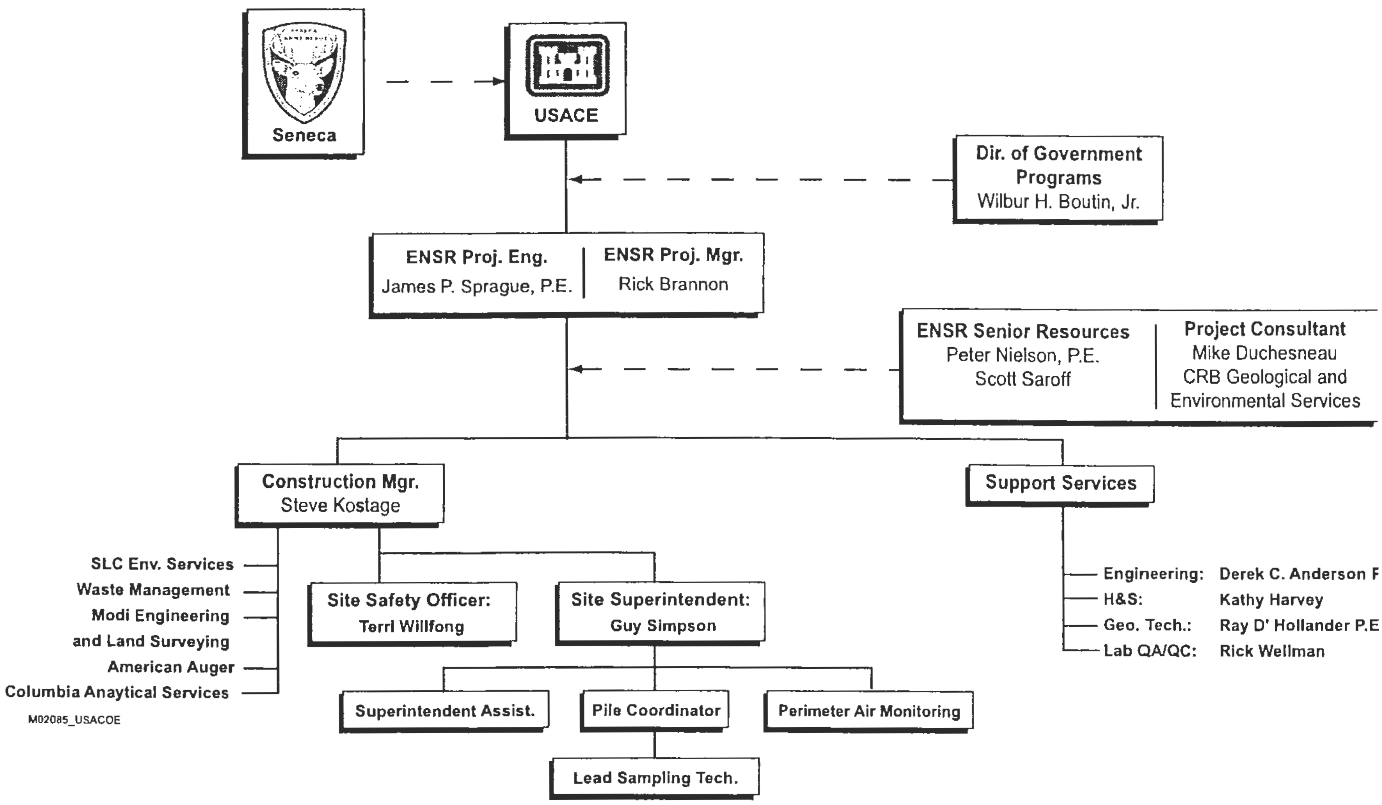
> "In general, the purpose of this action is to remove the source of semivolatile organic compounds, pesticides, PCBs, and metal contamination at the sites and thereby reduce the potential for further contamination of soils and groundwater."

The award document notes that, due to the uncertain nature of the contents of the disposal areas, removal, rather than an attempt at in-situ treatment, was the most logical choice. A copy of the complete award document is presented in Appendix A.

3.0 PROJECT ORGANIZATION

The organization chart below presents ENSR's project organization. The chart graphically represents the lines of authority and communications that the project staff will follow. The roles and responsibilities of each key position in the structure are explained further below.

Figure 3.1 Organization Chart



Mr. Rick Brannon will serve as the Project Manager. He will be responsible for the overall performance of the project including;

- Project Schedule
- Project Cost Control
- Project Quality
- Contract/Work Order Management

He will serve as the point of contact for the project stakeholders for any issue. Mr. Brannon will maintain a leadership role to provide direction/advice on technical issues as well as contract and quality issues. He will support the Construction Manager in obtaining and maintaining the appropriate resources for the project. Mr. Brannon will maintain an open line of communication with the stakeholders and ensure that all deliverables, communications and presentations are in accordance with the project specifications, the stakeholders expectations and sound project management practices.

Mr. James Sprague will serve as the Project Engineer and Quality Control Systems Manager. Mr. Sprague will attend the USACE's Construction Quality Management for Contractors course at the first opportunity. He will focus on providing engineering support to the project team with special attention to the construction team during field work. He will maintain a regular presence at the site, but will not be at the site full time. During those times that Mr. Sprague is not at the project site the Site Superintendent will have full Quality Control authority. Mr. Sprague will be on site for all preparatory phase and initial phase quality inspections. Mr. Sprague will be directly responsible for development of the project plans and reports, regulatory conformance and contract conformance as outlined in the Project Quality Control Plan. He will delegate appropriate specific Quality Control responsibilities to project team task leaders.

Mr. Steve Kostage will serve as the Construction Manager and be responsible for the planning and execution of the field work for this project. He will maintain a regular presence at the site but in general will be assigned to the project part-time. Mr. Kostage will be the point of contact for all ENSR subcontractors and directly responsible for their quality of work. He will directly support the Site Safety Officer in the implementation and maintenance of the Site Health and Safety Plan. He will attend the project meetings and presentations and support the Project Manager to meet the stakelholder's communication expectations. Mr. Kostage will support the Construction Superintendent with identifying, requesting and securing project resources.

Mr. Guy Simpson will be ENSR's full-time representative at the project site as the Construction Superintendent. He will be directly responsible for the day-to-day management and supervision of the project resources and subcontractors. Mr. Simpson will be responsible for assisting the Construction Manager in planning the project work with a specific focus on short-term issues. He will be the daily point of contact for the USACE's on-site representative. Mr. Simpson will also be responsible for quality control issues as delegated by the Quality Control System Manager in the Project Quality Control Plan.

Ms. Terri Willfong will coordinate the development, implementation and maintenance of the Health and Safety Plan. She will interact daily with all site personnel to oversee and communicate health and safety issues. Ms. Willfong will conduct daily health and safety meetings with the site personnel and work with the project team to maintain a safe work environment. She will also be responsible for quality issues relating to site safety as outlined and delegated by the Quality Control Systems Manager in the Project Quality Control Plan.

Mr. Craig Stiles will serve as the Field Sampling Task Leader. He will be responsible for coordinating the collection, documentation and shipment of all analytical samples required by the project. Mr. Stiles will be delegated Quality Control responsibilities for these activities. These samples will include waste characterization samples collected from the soil stockpiles, confirmation samples collected from the excavations, and if necessary waste water samples to be collected from the waste water storage tanks. He will coordinate the activities of the other sampling technicians assigned to the project and serve as the sampling point of contact to the Stockpile Coordinator and the Construction Superintendent.

Mr. Rick Wellman will serve as the Data Quality Manager and will be delegated Quality Control responsibility for this task. Mr. Wellman will be responsible for the review of all analytical data received to ensure it is in compliance with the Quality Assurance Project Plan. He will provide input to the Field Sampling Task Leader and the Stockpile Coordinator to assist them in accomplishing their specific task. Mr. Wellman will also interact directly with the subcontracted analytical laboratory in a proactive manner to prevent data quality deficiencies to the extent possible.

Mr. Tony Kwiec will serve as the Stockpile Coordinator. He will be responsible for tracking the piles of excavated materials while they are in storage at the project site as well as through their disposition. Mr. Kwiec will coordinate the placement, sampling, backfilling and off-site disposition of each pile. He will be delegated Quality Control responsibility for these activities.

Other staff will participate in this work as described in the attached plans.

4.0 REMOVAL ACTION

4.1 PROJECT UNDERSTANDING

ENSR understands that the minimum requirements of the Time-Critical Removal Action for SEADs 59 & 71 are to excavate, stage, segregate and appropriately dispose of soils suspected of being contaminated with semi-volatile organic compounds, pesticides, PCBs and heavy metals at the SEDA. The work will be preformed in compliance with the award document, Section C, 1.0 General Statement of Services.

The object of the removal action is to remove the source of the contaminants, reduce the potential for further contamination of the environment and reduce the threat to the surrounding population.

Site work will concentrate on excavating the areas identified in Figures 3.1 and 3.2 of the Final Action Memorandum For Removal Actions At SWMUs SEAD - 59 And SEAD - 71, Seneca Army Depot Activity, April 2002 (the Action Memorandum), see Figure 1. Soils will be excavated to the anticipated depths and/or to a point where visual evidence of potential contamination is no longer apparent. If verification samples demonstrate that the concentrations of the contaminants are below the TAGM-derived clean-up levels, then the areas will be deemed acceptably remediated. If verification samples demonstrate otherwise, then excavation will continue at a rate of 12-inches prior to another sampling event.

Excavated materials will be segregated to remove drums, cans and other observed debris as well as to isolate visibly contaminated soils. A detailed explanation of how the excavation and spoils will be managed follows in Section 4.2.

ENSR has taken a practical look at the scope of work, project goals and key technical/logistical factors and has developed the schedule presented in Appendix B. The focus of the schedule is to complete the site work and deliver the draft Removal Completion Report by 06 December 02. The schedule is based on:

- Reasonable excavation rates (app. 1,500 CY/D).
- Reliable analytical turn-around (2-5 days).
- Reasonable loads for off-site disposal (30 trucks per day).
- Reasonable backfill rate (app. 1,500 CY/D).
- Activities being conducted concurrently (excavation, load-out, backfill, etc.).
- SEAD 71 and small SEAD 59 excavations being done concurrent with Area 1, SEAD 59.
- Restoration and demobilization concurrent with final load-out.

The management of the stockpiles of excavated soil has been identified as the activity critical to maintaining the project schedule. Activities relating to this are:

- Sampling, analysis and data management;
- Characterization of soil/material;
- Coordination with transporter(s) and disposal facilities;
- Load-out and tracking of off-site shipments; and
- Backfilling with clean spoils.

An experienced task leader will be responsible for all stockpile management activities. He will be the focal point of all that happens to a stockpile after being created, and he will continually monitor and coordinate the activities. This will ensure that there is room for newly excavated material, samples are obtained, data is received and digested, and material is moved either off-site for disposition or is utilized to backfill and grade the site excavations.

4.2 EXCAVATION APPROACH

Prior to the start of excavation activities, the following tasks will be completed:

- Site Clearing
- Installation of Security fencing and establishment of work zones
- Construction of the Truck/Equipment Decontamination Area. The existing concrete pad located South of building 128 will be utilized.
- Construction of Personnel Decontamination Area
- Utility survey
- Dust Control Measures Implemented
- Erosion Control Measures Implemented

Staging for SEDA-59, Area 1, will be constructed as per the specifications and clarifications provided. This area will be approximately 100' x 300' and located South of the oil storage tank and the gravel road. Staging for all other excavations will be located adjacent to the excavation. These staging areas will be constructed using 20 Mil. HDPE or equivalent liner and hay bail berms.

ENSR may excavate SEAD-71 and SEAD-59 Areas-2, 3, 4 and others concurrent with excavation of SEAD-59 area 1. Excavation of Area-1 will start in the Northwest corner and proceed East and South to the limits of excavation. As soil is excavated a spotter will inspect the material for debris and suspect materials such as paint cans, drums, etc. When debris or other materials are located they will either be loaded into a designated truck to be stockpiled separately or placed adjacent to the excavation areas for later transport to the staging area depending on volume. Soil will be loaded into dump trucks or a rubber tired loader for transportation to the staging area.

At the staging area the soil will be dumped in an area designated by the stockpile coordinator. Soil will be inspected again for debris as it is being dumped. After each load has been inspected it will be added to a stockpile. Individual stockpiles will contain up to 500 cubic yards. A rubber tired loader or small dozer will be used to build the stockpiles. The stockpile coordinator will be responsible to tracking each stockpile as it is generated. He will perform the following tasks:

- Once generated a unique identifier will be assigned. For example 59 (for SEAD 59), 1 (area 1), 1 for first stockpile from this area, 59-1-1.
- Each stockpile will be sub-divided into 150 cubic yard lots and each lot will be sampled
- At the close of business each day a map will be updated with the location of each pile located.
- A spreadsheet will be maintained which tracks pile number, where the stockpiled material originated (SEAD and area), if it has been sampled, results of sampling and final disposition.
- As stockpiles are shipped off site for disposal information will be transferred to a disposal database.

Excavation of all other areas will be conducted in the same manner as Area-1 except that a rubber tire loader will be used to stockpile soil adjacent to the excavation. Sloping/benching is not anticipated to be necessary in SEAD-71. Excavations within SEAD-59 in excess of four feet will be sloped or benched as necessary. Sloping and benching will be used sparingly, but appropriately, to avoid increased quantities of soil to be managed.

ENSR will take post excavation samples of Area-1 in three initial phases. Backfilling will proceed following receipt of authorization from the SEDA field representative. All excavations will be backfilled and regraded so as to prevent erosion, control run-off and prevent ponding. It is anticipated that backfill operations will start in the SEAD-71 and SEAD-59 smaller areas and proceed to the Northeast side of SEAD-59 Area 1.

Excavations will be surveyed to verify quantities.

4.3 CONTROL OF RUN-ON & RUN-OFF

Run-on waters in the excavated, material staging, and load-out areas will be controlled by installing berms and ditches to divert storm waters from these areas. Berms will be placed upgrade of open excavation areas as work proceeds. These berms will be constructed of sand or clean fill material. Location of berms will be determined in the field after assessing conditions. Run-on waters in the staging areas will be controlled in the same way, however the grade in these areas may be adjusted during construction to facilitate control of run-off water. Smaller staging areas will be completely covered with polyethylene sheeting to prevent run-on water from contacting suspect soils. Load out areas will be covered with polyethylene sheeting during operation and broken down nightly.

Run-off waters will be collected within the excavation and staging areas. In excavation areas, the bottom of the excavation will be graded or channeled to a collection point within the excavation from which the water can be transferred to holding tanks if necessary. Where possible staging areas will be graded to one or more corners where either a sump or berm can be used to control the water. If grading is not practical additional berms will be installed to contain run-off water.

Controls such as silt fencing, hay bales, or soil berms will be installed as required during operations to prevent migration of sediments and erosion. All run-on, run-off and erosion control measures will be inspected daily and repaired as necessary. Water management and control measures will be constructed through out the project duration and will be adjusted as field conditions warrant.

When necessary collected run-off water will be transferred to holding tanks staged on site. Once a holding tank has been filled, solids will be allowed to settle prior to sampling the water. When sample results have been received, the water will be decanted from the holding tank for disposal at the Town of Romulus WWTP. Solids collected from holding tanks will be added to an existing lots of soil.

4.4 MITIGATION OF SPREAD OF CONTAMINATION INTO ALL MEDIA

ENSR will utilize berms, dikes, drainage swales, silt fencing and other means described in Section 4.3 to control and direct surface waters and waters generated during excavation, stockpiling and load-out. These waters will be redirected and/or collected for sampling, analysis, and disposal at an off site facility.

An equipment/truck decontamination pad will be constructed North of Building 128. The decontamination pad will have a berm on all four sides, be lined with a 40 mil. HDPE liner and graded to a sump. A pressure washer will be used to decontaminate all equipment and trucks that have entered the work areas prior to leaving the site. Before arriving at the decontamination pad a gross decontamination will be completed on polyethylene sheeting to remove as much soils as possible in the excavation area. Satellite personnel decontamination areas will be located at each work area. These sites will be stocked with appropriate PPE, hand wash stations, drinking water, first aid kit, and eye washs.

Soil/debris load-out areas will be controlled. Six-millimeter polyethylene sheeting will be placed under each load-out location. Prior to leaving an area each truck will be inspected and gross soils swept or brushed clean. Soils collected on the sheeting will be returned to the stockpile from which it was generated. The sheeting will be inspected after each truck has been loaded and replaced as necessary.

Equipment that is moving from one excavation to another will have a gross decontamination preformed prior to it leaving the work area. Soils will be shoveled, swept or brushed off the equipment, tracks and tires onto polyethylene sheeting.

Water mist will be utilized to control dust and VOC emissions in active areas. Polyethylene sheeting will also be utilized as a barrier on exposed material to control emissions.

All stockpiled soil, debris and other wastes will be staged and stored on the constructed staging areas. Each staging area will be constructed, operated, and maintained to segregate wastes, control water run-on/off and prevent the spread of contaminants. Each individual pile will be covered by a tarp to prevent erosion by wind or rain. The staging area will be lined with a 20-millimeter HDPE (or equivalent) liner. The liner will be inspected daily and repaired as necessary to prevent the potential spread of contamination.

Project air quality will be evaluated and documented during activities. The perimeter air monitoring will be conducted in accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) (Rev. 1, 06/00), presented in Appendix C, and the NYSDEC TAGM 4031 (Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 27, 1989), presented in Appendix D. Based on requirements specified in the NYSDOH CAMP, the perimeter air-monitoring program will consist of real-time perimeter measurements for total volatile organic compounds (VOCs) and respirable airborne dust particulate (particulate matter less than 10 microns – PM_{10}). Section 3.1.8 of the Field Sampling Plan, presented in Appendix E, specifically addresses the perimeter air-monitoring program.

4.5 MANAGEMENT OF MATERIAL FOR OFF-SITE DISPOSITION

Load-out will start on, or about, day 9 of site work (excluding mobilization and site set-up), and is planned to continue through the end of site activities. Based on the estimated volumes, load-out will focus on the non-hazardous soils generated by the project, and happen at approximately 30 truckloads per day.

Representatives of the transportation companies will be required to attend an orientation prior to the start of load-out activities. The orientation will cover:

- Traffic patterns
- Project safety issues
- Communication issues
- Load-out procedures
- Documentation issues
- SEDA specific issues

The orientation will be summarized in a handout that will be expected to be passed along to each driver involved with the load-out activities. The Transportation Company will be required to document that pertinent information was delivered to each driver, or drivers will not be loaded.

Each truck and trailer will be scaled upon arriving at SEDA. Once an empty weight is obtained the truck will be directed to the staging area and loaded with material. Each trailer will have a tarp placed over each load prior to leaving the staging area, as well as the truck and trailer decontaminated. The truck and trailer will be directed back to the scale and a release weight recorded. Once a final weight is recorded the proper paperwork (BOL/Manifest) will be completed before the load is released to leave SEDA.

Coordination of the load-out activities will be done by the Stockpile Coordinator. Each load will be tracked utilizing a worksheet provided to them as they arrive at SEDA. The worksheet will record:

- Transportation Company
- Trailer No.
- Pile No. loaded from
- Tarped – Yes
- BOL/Manifest No.
- Arrival time/date
- Driver's name
- Time loaded
- Filled weight
- Release time
- Truck No.
- Material to be loaded
- Decon – Yes
- Destination

All shipments to off-site facilities will be tracked utilizing the worksheet and an ENSR-developed database. The database allows for easy cross-referencing, reporting and quantifying.

ENSR anticipates that other materials will be loaded and managed for off-site disposition. These items represent a small volume and will be managed on a case-by-case basis. Example of these materials are:

- Drums and parts of drums
- Paint cans
- Water
- Hazardous soils and debris
- Non-hazardous debris

4.6 WASTE DISPOSAL MANAGEMENT

After excavated materials are identified as not meeting the TAGM-derived clean-up criteria, they will be analyzed for total PCBs, TCLP VOC, TCLP SVOC, TCLP pesticides and TCLP metals based on the specifications in the scope of work and disposal facility requirements. Based on the results of this analysis and the source of the material, wastes will be managed as one of the following wastes streams:

- Non-hazardous soil;
- Non-hazardous debris (from the excavation as well as project generated);
- Misc. hazardous debris (from the excavation as well as project generated);
- Hazardous soil; and
- Collected water.

Non-hazardous soil and debris will be managed at High Acres Landfill, 425 Perinton Parkway, Fairport, NY.

Hazardous debris and soils will be managed at CWM Chemical Services (LLC), 1550 Balmer Road, Model City, NY.

The water collected from decontamination operations and run-on/run-off control will be discharged to the Seneca County Sewer District via an on-site sanitary sewer. All waters will be appropriately tested and approved for discharge prior to release.

Wastes will be "packaged" utilizing the following methods:

- Non-hazardous debris and soil will be loaded into DOT approved dump trucks and/or dump trailers
- Large/bulk hazardous debris and soil will be loaded into DOT approved dump trucks, dump trailers and/or roll-off boxes
- Small misc. hazardous debris may be loaded into DOT approved drums, overpacks, cubic yard boxes, and/or roll-off boxes
- Collected waters will be discharged via the on-site sanitary sewer.

4.7 SITE RESTORATION

Prior to demobilization, the following site restoration activities will be completed.

- Final backfilling and grading of disturbed areas will be completed. It is anticipated that SEAD-59, Area-1 will not be reconstructed to its pre-excavation elevations. This area will be backfilled and graded so that it drains to the Southwest corner of the excavation. A combination of grading and/or drainage ditches will be used to accomplish the desired drainage. All other excavations will similarly be backfilled and graded to drain. For many of the smaller areas this will result in restoring them to their original grades.
- Excavated areas and those vegetated areas that have been disturbed during operations will be seeded with orchard mix grass seed.
- Any drainage control features such as diversion ditches or berms disturbed by site operations will be restored to a functioning condition.
- All equipment and materials will be demobilized.
- The equipment decontamination area and all staging areas will be removed. Sand used in these areas will be sampled and managed appropriately based on the analytical results. Liner material will be removed and transported for disposal to an off-site landfill. Final grading of these areas will be completed, any sumps constructed will be backfilled.
- A final inspection and housekeeping sweep of the work areas will be completed.

5.0 SAMPLING AND ANALYSIS

See Appendix F for the Quality Assurance Project Plan and Appendix E for the Field Sampling Plan. All sampling and analysis conducted as a portion of this project will be completed in accordance with these plans.

6.0 PROJECT QUALITY CONTROL

See Appendix G for the Project Quality Control Plan.

7.0 SITE SAFETY

A Health and Safety Plan (HASP) has been developed (See Appendix H) to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard and the USACE Safety and Health Requirements Manual (EM 385-1-1).

8.0 PROJECT DOCUMENTATION

ENSR recognizes that documenting the work to be accomplished by this project is vital to the USACE's long term effort to convert the SEDA to civilian use. This project will generate a significant amount of documentation while it is being executed. ENSR will maintain the project documentation master files in the on-site office trailer. These files will be maintained continuously throughout the course of the project. Items that will be preserved in the project documentation files include:

- The daily and weekly reports (blank copies are presented in Appendix I)
- The monthly status reports
- The daily updates of the soil stockpile map
- The analytical sample chain of custody's
- The analytical results received from the laboratory
- The waste shipment documentation, whether manifest or bills of laden.
- HASP receipt acknowledgements
- Survey updates
- Accident reports

At the completion of the project a Removal Report will be assembled and submitted to the USACE. This report will include, as appendices, all of the records listed above. The report will comply with the requirements called out in the Award document in paragraph 3.4 and A.1.5.6. This completion report will serve as a complete record of the project as it was executed.

9.0 SUBMITTALS

Submittals and submittal management are addressed in Section 4.0 of the Project Quality Control Plan presented in Appendix G.

APPENDIX A

ORDER FOR SUPPLIES OR SERVICES

(Contractor must submit four copies of invoice.)

OMB No. 0704-0187
Expires Dec 31, 1993

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Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0187), Washington, DC 20503.

PLEASE DO NOT RETURN YOUR FORM TO EITHER OF THESE ADDRESSES.
SEND YOUR COMPLETED FORM TO THE PROCUREMENT OFFICIAL IDENTIFIED IN ITEM 6.

1. CONTRACT/PURCH ORDER NO	2. DELIVERY ORDER NO.	3. DATE OF ORDER (YYMMDD)	4. REQUISITION/PURCH REQUEST NO.	5. PRIORITY
GS-10F-0115K	DACA87-02-F-0137	02AUG01	W31RY021989480	

6. ISSUED BY CODE
US ARMY ENGINEERING & SUPPORT CENTER
CEHNC-CT
4820 UNIVERSITY SQUARE
HUNTSVILLE, AL 35816

7. ADMINISTERED BY (If other than 6) CODE
ORDNANCE & ENGINEERING TEAM/CT-E
ATTN: EVELYN KELLEY
256-895-1317
HUNTSVILLE, AL 35816

8. DELIVERY FOB
[X] DEST
[ ] OTHER
(See Schedule if other)

9. CONTRACTOR CODE 0FAY3 FACILITY CODE
NAME AND ADDRESS:
ENSR CORPORATION
281 CENTENIAL AVE
PISCATAWAY, NJ 08854

10. DELIVER TO FOB POINT BY (Date) (YYMMDD) 03 DEC 31

11. MARK IF BUSINESS IS
[ ] SMALL
[ ] SMALL DISAD-VANTAGED
[ ] WOMEN-OWNED

12. DISCOUNT TERMS NET 30

13. MAIL INVOICES TO SEE SECTION G

14. SHIP TO CODE

15. PAYMENT WILL BE MADE BY CODE
SEE SECTION G

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. TYPE OF ORDER
DELIVERY [X] This delivery order is issued on another Government agency or in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE [ ] Reference your ... furnish the following on terms specified herein.
ACCEPTANCE. THE CONTRACTOR HEREBY ACCEPTS THE OFFER REPRESENTED BY THE NUMBERED PURCHASE ORDER AS IT MAY PREVIOUSLY HAVE BEEN OR IS NOW MODIFIED, SUBJECT TO ALL OF THE TERMS AND CONDITIONS SET FORTH, AND AGREES TO PERFORM THE SAME.

ENSR Corporation	[signature]	Frank Sweet, Vice President	08/02/02
NAME OF CONTRACTOR	SIGNATURE	TYPED NAME AND TITLE	DATE SIGNED

[X] If this box is marked, supplier must sign Acceptance and return the following number of copies:

17. ACCOUNTING AND APPROPRIATION DATA/LOCAL USE

18. ITEM NO	19. SCHEDULE OF SUPPLIES/SERVICE	20. QUANTITY ORDERED/ACCEPTED*	21. UNIT	22. UNIT PRICE	23. AMOUNT
	SEE SCHEDULE				

* If quantity accepted by the Government is same as quantity ordered, indicate by X. If different, enter actual quantity accepted below quantity ordered and encircle.

24. UNITED STATES OF AMERICA
BY: EDNA SHERIDAN [signature] 8-1-2002 CONTRACTING/ORDERING OFFICER

25. TOTAL $1388998.30
29. DIFFERENCES

26. QUANTITY IN COLUMN 20 HAS BEEN
[ ] INSPECTED [ ] RECEIVED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED

DATE — SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE

27. SHIP. NO. [ ] PARTIAL [ ] FINAL
28. D.O. VOUCHER NO.
30. INITIALS
32. PAID BY
33. AMOUNT VERIFIED CORRECT FOR
31. PAYMENT [ ] COMPLETE [ ] PARTIAL [ ] FINAL
34. CHECK NUMBER
35. BILL OF LADING NO.

36. I certify this account is correct and proper for payment.
DATE — SIGNATURE AND TITLE OF CERTIFYING OFFICER

37. RECEIVED AT	38. RECEIVED BY (Print)	39. DATE RECEIVED (YYMMDD)	40. TOTAL CONTAINERS	41. S/R ACCOUNT NUMBER	42. S/R VOUCHER NO.

This is a Firm Fixed Price (FFP) delivery order issued under the instant General Service Administration Contract as statedin Block 1, page 1.

The contractor shall provide the Time Critical Removal Actions set forth in the Statement of work (Section C). The contractor is responsible for all necessary labor, supplies, equipment and any other cost necessary to satisfactorily complete the requirement.

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	TIME CRITICAL REMOVAL ACTION (SEAD-59/71) ACRN AA funded amount	1.00	Lump Sum	$1,388,998.80	$1,388,998.80
0001	Site visit, records review and preparation of work plans		LT	$ 35,522.00	$ 35,522.00
0002	Removal Action				
0002AA	SEAD-59			$1,121,787.40	
	2.1 Soil Excavation				
	First 20,000 CY	20,000 (Est.) CY		$28.12	$ 562,400.00
	Over 20,000 CY	3,100 (Est.) CY		$23.48	$ 72,788.00
	2.2 Off Site Disposal of Soil as Non-Hazardous				
	First 7,000 CY	7,000 (Est.) CY		$62.65	$ 438,550.00
	Over 600 CY	600 (Est.) CY		$62.65	$ 37.590.00.
	2.3 Off Site Disposal of Drums, debris, Soils, etc (Hazardous)				
	First 30 CY	30 (Est.) CY		$298.84	$ 8,965.20
	Over 30 CY	5 (Est.) CY		$298.84	$ 1,494.20
0002AB	SEAD-71			$ 105,216.40	
	3.1 Soil Excavation				
	First 800 CY	800 (Est.) CY		$ 28.57	$ 22,856.00
	Over 800 CY	75 (Est.) CY		$ 23.48	$ 1,761.00
	3.2 off site Disposal of Soils (Non-Hazardous)				
	First 800 CY	800 (Est.) CY		$ 62.65	$ 50, 120.00
	Over 800 CY	75 (Est.) CY		$ 62.65	$ 4, 698.75
	3.3 Off-Site Disposal of Drums, Soil, Debris (Hazardous)				
	First 20 CY	30 (Est.) CY		$298.84	$ 8,965.20
	Over 20 CY	5 (Est.) CY		$298.84	$ 1,494.20
	3.4 From Off Site Borrow				
	First 800 CY	800 (Est.) CY		$ 17.51	$ 14,008.00
	Over 800 CY	75 (Est.) CY		$ 17.51	$ 1,313.25

Note: All quantities of soil are estimated, in-place volumes. A conversion are 1.5 tons/CY may be used for soil disposal

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003	Project Management, Weekly and Final Reports Totals		LT	$126,473.00	$ 126,473.00

TOTAL **$1,388,998.80**

TIME CRITICAL REMOVAL ACTIONS
AT THE
FILL AREA WEST OF BUILDING 135 (SEAD-59)
AND AT
THE ALLEGED PAINT DISPOSAL AREA (SEAD-71),
SENECA ARMY DEPOT ACTIVITY, ROMULUS, NEW YORK

1.0 GENERAL STATEMENT OF SERVICES

1.1 Background.

1.1.1 General. An Expanded Site Inspection (ESI) and Phase I Remedial Investigation (RI) have been performed at the Fill Area West of Building 135 (SEAD-59) and at the Alleged Paint Disposal Area (SEAD-71) at the Seneca Army Depot Activity (SEDA) in Romulus, NY. Releases of contaminants and the physical presence of drums, paint cans and debris have been documented. The depot has officially been closed by the DoD and the US Army and in accordance with the Base Realignment and Closure (BRAC) process, portions of the depot are now being released to the public and private sectors for reuse. As increased access is afforded, the potential for exposure to any residual chemicals that are present at these two sites is increased. Therefore, this removal action is considered time-critical.

The goal of the proposed time-critical removal action at SEADs-59 and 71 is (1) to eliminate and contain an identified source of residual chemical materials in the soil and (2) to remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment. While removal of drums, paint cans, and other containers is the focus of the planned removal actions for both sites, the potential for contamination to be present in the soils and groundwater that surround these items will also be addressed by this action.

1.1.2 Site Characterization.

1.1.2.1 Base Description and History. This section provides a brief overview of SEDA. The SEDA facility is situated on the western flank of a topographic high between Cayuga and Seneca lakes in the Finger Lakes region of central New York. The SEDA was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army since that time. The post generally consists of an elongated central area for storage of ammunitions and weaponry in Quonset-style buildings, an operations and administration area in the eastern portion, and an army barracks area at the north end of the depot. The base was expanded to encompass a 1,524-meter airstrip, formerly the Sampson Air Force Base. The mission of the SEDA was: (1) receiving, storing, and distributing ammunition and explosives, (2) providing receipt, storage, and distribution of items that support special weapons, and (3) performing depot-level maintenance, demilitarization, and surveillance on conventional ammunition and special weapons. The depot formerly employed approximately 1,000 civilian and military personnel.

1.1.2.2 Site Descriptions.

1.1.2.2.1 SEAD-59 (Fill Area West of Building 135) is located in the east-central portion of SEDA. The site encompasses an area along both sides of an unnamed dirt road which is the access road to Building 311 and runs perpendicular to the south side of Administration Avenue terminating at Building 311 (See Figure in Appendix 2). SEAD-59 is comprised of two areas, one area located north of the access road to Building 311 and one area located to the south of the road. Each area is characterized by different topography with the area to south of the road being relatively flat and sloping gently to the west and the area to the north of the road containing a fill area with approximately 10 feet of relief. The entire western border of the site is defined by a north-south trending drainage ditch. A drainage swale that flows east to west parallels the railroad tracks that form the northern boundary of

SEAD-59. At the northwestern corner of the site, the drainage swale turns to the north and flows under the railroad tracks. Drainage ditches are also located on each side of the access road to Building 311 and flow from east to west into the drainage ditch in the western portion of the site. SEAD-59 was used for the disposal of construction debris and oily sludges. SEDA personnel have indicated that there may be a large quantity of miscellaneous "roads and grounds" waste buried at the site. It is not known when the disposal took place.

1.1.2.2.2 SEAD- 71 (Alleged Paint Disposal Area) is located in the east-central portion of SEDA. The site is located approximately 200 feet west of 4th Avenue near Buildings 127 and 114 (Figure in Appendix 2). The entire site is approximately 350 feet by 100 feet and bounded on the north and south by railroad tracks serving Buildings 114 and 127. A chain-link fence borders the east side of the site. The topography is relatively flat with a gentle slope to the southwest. It is rumored that paints and/or solvents were disposed of in burial pits at SEAD- 71. It is not known what other activities occurred here. No dates of disposal are available nor is there any information on the number of suspected disposal pits.

1.1.2.3 **Site-Specific Geology**

1.1.2.3.1 Based on the results of the drilling program conducted for the ESI at SEAD-59, fill material, till, weathered dark gray shale, and competent gray-black shale are the four major geologic units present on-site. At most of the boring locations very little topsoil was present. Several of the borings were drilled on a gravel surface, and no topsoil was encountered at these locations. Fill material was encountered in the borings located within the fill area north of the access road. The fill was lithologically similar to the till in that it was characterized as silt with minor components of sand and shale fragments, but was different from the till in color, which tended to be gray brown or tan, and by the presence of gravel, asphalt, wood and other organic material. The fill was found up to a depth of 10.5 feet. The till was characterized as light brown in color and composed of silt, very fine sand, and clay, with minor components of gray-black shale fragments. Larger shale fragments (rip-up clasts) were observed at some locations at the top of the weathered shale. The thickness of the till ranged from 3.1 to 8.6 feet. The weathered shale that forms the transition between till and competent shale was encountered at five of the nine boring locations. Competent gray-black shale was observed at two spots at 8.0 and 10.5 feet below grade, respectively. At the remaining boring locations bedrock was inferred from the point of auger or spoon refusal at depths ranging from 9.5 to 20.5 feet below grade.

1.1.2.3.2 Based on the results of the subsurface exploration conducted for the ESI at SEAD- 71, till, calcareous weathered shale, and competent shale are the three major types of geologic materials present on-site. The till in the storage area was characterized as olive gray clay with little silt, very fine sand, and shale fragments (up to 1 inch in diameter) and ranged in thickness between 4.7 and 7.8 feet. In the southern section of the storage area, the till consisted of light brown silt with little clay and trace amounts of shale fragments (up to 1 inch in diameter). Large shale fragments (rip-up clasts) were observed at or near the till/weathered shale contact at all soil boring locations. In the western half of the site, the till consisted of olive gray silt and was found to be approximately 4 feet thick. The weathered shale that forms the transition between the till and competent shale was encountered at all soil boring and test pit locations. The depth of the weathered shale ranged from 4.7 to 8.3 feet below ground surface. Competent, calcareous gray shale was encountered at depths between 5.2 and 9.4 feet below ground surface.

1.1.2.4 **Site-Specific Hydrology And Hydrogeology**

1.1.2.4.1 **SEAD-59**. Surface water flow from precipitation events is controlled by local topography. The area to the south of the access road slopes gently to the west. Surface water flow in this area is to the west and it is likely to be captured by the north-south trending drainage swale located in the western portion of the site and by the drainage ditch which parallels the south side of the access road. In the area north of the access road, a hill composed of fill material has approximately 10 feet of vertical relief. To the west, the hill slopes steeply to the north-south trending drainage swale,

which flows north and eventually flows under the railroad tracks north of the site. To the north, the hill slopes to a sustained drainage ditch approximately two feet deep. This ditch originates east of the site near Building 128 and flows west paralleling the railroad tracks and the northern boundary of SEAD-59. At the northwestern comer of the site, the drainage swale flows north under the railroad tracks. To the east, the hill slopes downward to a graded gravel surface used for storing large equipment. Surface water from this area also drains into the northern drainage swale, flowing along the northern boundary of the site, as described above. To the south, the hill slopes to the access road that runs through the site. Surface water from this southern portion of the hill drains into the drainage ditch that parallels the access road on the north side. This drainage ditch flows west and intersects the north flowing drainage ditch in the western portion of SEAD-59. Based on the data collected during the ESI, the groundwater flow direction is primarily southwest across SEAD-59.

1.1.2.4.2 SEAD- 71. Surface water flow from precipitation events is controlled by local topography, although there is little topographic relief on the site. There are no sustained surface water bodies on-site. In the fenced storage area located in the eastern half of the site, the area is covered with asphalt, which provides an impermeable surface resulting in an increased amount of surface water runoff from the site. Based on topographic relief, surface water flow is to the southwest toward the SEDA railroad tracks (to the south), which are topographically lower than the site. Based on the data collected during the ESI, the groundwater flow direction in the till/weathered shale aquifer on the site is to the west-southwest.

1.2 Land Use. The SEDA is situated between Seneca Lake and Cayuga Lake and encompasses portions of Romulus and Varick Townships. Land use in this region of New York is largely agricultural, with some forestry and public land (school, recreational and state parks). The most recent land use report is that issued by Cornell University (Cornell 1967). This report classifies in further detail land uses and environments of this region. Agricultural land use is categorized as inactive and active use. Inactive agricultural land consists of land committed to eventual forest regeneration, land waiting to be developed, or land presently under construction. Active agricultural land surrounding SEDA consists largely of cropland and cropland pasture. Forest land adjacent to SEDA is primarily under regeneration with sporadic occurrence of mature forestry. Public and semi-public land use surrounding and within the vicinity of SEDA includes Sampson State Park, Willard Psychiatric Center, and Central School (at the Town of Romulus).
Sampson State Park entails approximately 1,853 acres of land and includes a boat ramp on Seneca Lake. Historically, Varick and Romulus Townships within Seneca County developed as an agricultural center supporting a rural population. However, increased population occurred in 1941 due to the opening of SEDA. Population has progressed since then largely due to the increased emphasis on promoting tourism and recreation in this area.

The 10,587-acre SEDA facility was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army (DOA) since that date. From its inception in 1941 until 1995, SEDA's primary mission was the receipt, storage, maintenance, and supply of military items, including munitions and equipment. The Depot's mission changed in early 1995 when the Department of Defense (DOD) recommended closure of the SEDA under its Base Realignment and Closure (BRAC) process. This recommendation was approved by Congress on
September 28, 1995. In accordance with the requirements of the BRAC process, the Seneca County Board of Supervisors established the Seneca Army Depot Local Redevelopment Authority (LRA) in October 1995. The primary responsibility assigned to the LRA was to plan and oversee the redevelopment of the Depot. The Reuse Plan and Implementation Strategy for Seneca Army Depot was adopted by the LRA and approved by the Seneca County Board of Supervisors on October 22, 1996. Under this plan and subsequent amendment, areas within the Depot were classified as to their most likely future use. These areas included: housing, institutional, industrial, an area for the existing navigational LORAN transmitter, recreational/conservation and an area designated for a future prison. The LRA (now known as the Seneca County Industrial Development Agency (SCIDA)) has established that the area including SEAD-59 and SEAD- 71 will be used for Planned Industrial Development. Since SEDA was formally closed in September, 2000, the Army will be responsible ensure that both sites can be used for the intended purpose.

1.3 Contamination Assessment. Geophysical surveys and test pits were performed during the ESI and RI to identify burial sites at SEAD-59 and 71. Soil (surface, subsurface), soil gas, and groundwater were collected and analyzed as part of the investigations (Appendix A). The results are presented in the Draft Phase I Remedial Investigation (RI) SEAD-59 and SEAD- 71, the ESI Report for Seven Low Priority AOCs -SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71 (Parsons ES, 1995a) and the Expanded Site Inspection -Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59, December 1995. The following sections summarize the nature and extent of contamination identified at these sites.

1.3.1 Soil Gas Survey.

1.3.1.1 SEAD-59. A total of 241 soil gas points were sampled and analyzed during the Phase I RI investigation at
SEAD-59. This sampling effort revealed one large area and four smaller areas of elevated total volatile organic compounds (VOCs) (Appendix A). The larger area of elevated soil gas encompasses most of SEAD-59, extending

from north of the unnamed dirt road to the west of the 60,000 gallon oil storage tank, including the mounded fill area. The highest soil gas hits were within the boundaries of the fill area. Maximum total VOC hits of greater than 10 ppmv were observed at three separate locations within the fill area. The four smaller areas of elevated soil gas containing VOCs were detected in an area southeast of the fill area, an area directly southwest of the fill area, another area south of the fill area, and an additional area northwest of the fill area.

1.3.1.2 SEAD- 71. A soil gas survey has not been performed at SEAD- 71.

1.3.2 Geophysics.

1.3.2.1 SEAD-59. Four seismic refraction profiles were performed, during the ESI, on 4 lines positioned along each boundary line of SEAD-59. The seismic refraction profiles detected 5 to 10 feet of unconsolidated overburden (1,050 to 1,730 ft/sec) overlying bedrock (10,500 to 15,500 ft/sec). Saturated overburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock sloped to the west, generally following the surface topography. Based upon the results of the seismic survey, the groundwater flow direction was also expected to be to the west, following the slope of the bedrock surface.

Electromagnetic (EM-31, EM-61) surveys were performed for the ESI and the Phase I RI at SEAD-59 to delineate the limits of the landfill and to identify locations where metallic objects were buried. The ESI EM-31 survey detected eight anomalies of unknown origin, though no clearly defined boundaries of the large fill area in the northeastern portion of the EM grid could be determined based upon the geophysical results. The electromagnetic (EM-61) survey performed for the Phase I RI at SEAD-59 detected 39 localized anomalies which could not be attributed to surface features and are due to unknown buried sources.

Ground penetrating radar (GPR) data were acquired for the ESI at SEAD-59. A small disposal pit was detected in the southeastern portion of the area investigated. Twelve of the 17 suspected buried metallic object locations revealed by the GPR survey were situated within the suspected disposal area in the northeastern quadrant of SEAD-59. Ten of the GPR anomaly locations were either situated over a localized EM anomaly or within 15 feet of a localized EM anomaly.

GPR data were also acquired for the Phase I RI at SEAD-59 over each distinct EM-61 anomaly to provide better characterization of the suspected metallic sources. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

1.3.2.2 SEAD- 71. Four seismic refraction profiles were performed as part of the geophysical investigations for the ESI on four lines positioned along each boundary line of the storage area in the eastern half of SEAD-71. The seismic refraction profiles detected 6 to 9 feet of unconsolidated overburden (1,125 to 1,500 ft/sec) overlying bedrock (12,800 to 16,200 ft/sec). Saturated oyerburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock slopes to the west, generally following the surface topography. Based on the results of the seismic survey, the groundwater flow direction is also expected to be to the west, following the slope of the bedrock surface. An EM-31 survey was performed for the ESI at SEAD-71 in the western half of the site to help locate the burial pits. Interferences from many cultural effects along the perimeter of the surveyed area complicated the interpretation of the data. A review of the EM-31 data from SEAD-71 revealed one area, in the south central portion of the grid, where both the apparent conductivity and the in-phase response decreased noticeably. One other area of increased apparent ground conductivity measurements was detected along the west-central portion of the grid, however, an associated in-phase response was not observed.

GPR data was acquired for the ESI at SEAD-71. The data from these surveys revealed an underground utility line or conduit running northwest -southeast across the northeastern corner of the storage compound. One area of anomalous subsurface reflections, typical of reflections from metallic objects, was detected in the south-central portion of the storage compound. The GPR survey conducted in the area west of the storage compound revealed five localized anomalies and three zones with multiple anomalies. The source of these EM-31 and the GPR anomalies was identified during test pit excavations as construction debris composed of chain link fencing, sheet metal, asphalt, and a crushed, yellow, twenty gallon drum. Weathered shale, encountered at a depth of 5.5 feet, limited any further advancement of the excavation. There were no readings above background levels (0 ppm of organic vapors and 10-15 micro rems per hour of radiation) during the excavations.

GPR data were also acquired for the Phase I RI at SEAD-71. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

1.3.3 Test Pitting Program.

1.3.3.1 SEAD-59. A total of 24 test pits were excavated at SEAD-59 to investigate the nature of the geophysical and soil gas anomalies and to collect chemical data to identify the presence of constituents of concern. The excavated debris consisted of concrete, asphalt, metal, wood, chain link fencing, 55-gallon drums, and paint cans. Areas of petroleum hydrocarbon stained and paint stained soils were also detected.

1.3.3.2 SEAD-71. A total of six test pits were excavated at SEAD-71 to characterize the source of the geophysical anomalies. One test pit revealed oil-stained soils. The excavated debris consisted of construction debris composed of chain link fencing, sheet metal, asphalt, stone slabs, bricks and piping. A crushed, yellow, twenty gallon drum and railroad ties were also found.

1.3.4 Summary of Affected Media.

1.3.4.1 SEAD-59. The ESI and Phase I RI conducted at SEAD-59 identified several areas which have been impacted by releases of volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, heavy metals.

1.3.4.1.1 Soil Data. Sampling conducted in SEAD-59 indicated impacts to soils from volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, metals. A total of 20 soil samples were collected from soil borings and test pits as part of the ESI for SEAD-59. A total of 105 samples were collected during the Phase I RI for field screening and 34 of those samples were sent to the laboratory for confirmatory analysis.

In the fill area, polyaromatic hydrocarbon (PAH) compounds were found in surface soil and subsurface soil samples at concentrations exceeding the criteria specified in the Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives. Total petroleum hydrocarbons were detected in the majority of the soil samples collected from the fill area. In the area directly southwest of the fill area, there is both physical and chemical evidence of the presence of hydrocarbons. In the area south of the fill area, several paint cans containing paint were found. BTEX constituents were detected in the sample from this location at concentrations exceeding the associated TAGM criteria and Cleanup Levels (NYSDEC, 1992).

1.3.4.1.2 Groundwater Data. The analytical results of the groundwater analyses indicate that the groundwater at SEAD-59 has been moderately impacted by total petroleum hydrocarbons and, to a lesser extent, by metals and semivolatile organic compounds. Total petroleum hydrocarbons were detected at low concentrations in each of the downgradient groundwater samples, and were undetected in the upgradient groundwater samples. Iron and sodium were detected at concentrations above their associated groundwater criteria in both the upgradient and the downgradient groundwater samples. Thallium was found in the upgradient and one downgradient groundwater sample at concentrations above the federal MCL. Manganese was found in one downgradient sample at a concentration above the state groundwater criteria. One SVOC was reported at estimated concentrations above groundwater TAGMs. The results of the ESI have identified significant releases of BTEX and PAH compounds in the materials comprising the fill area and disposal pits at SEAD-59. It is important to note that trace quantities of total petroleum hydrocarbons detected in the fill materials are presumably being leached into the groundwater beneath the site. Therefore, the data suggest that affected media at SEAD-59 may have the potential to impact the modeled receptors.

1.3.4.2 SEAD-71. Soil and groundwater were sampled as part of the ESI conducted at SEAD-71 in 1994. Soils were also sampled as part of the Phase I RI conducted in 1998. Sampling and analyses were based upon historical usage of the area for the disposal of paint and solvents. The results of this investigation were detailed in the ESI and Phase I RI reports (Parsons ES, April 1995, July 1998). To evaluate whether each media (soil and

groundwater) is being impacted, the chemical analysis data were compared to available New York State and Federal standards, guidelines, and criteria.
Only those state standards which are more stringent than federal requirements were used as criteria.

1.3.4.2.1 **Soil Data**. A total of 21 surface soil samples were obtained for chemical analysis as part of the Phase I RI for SEAD-71. Nine soil samples were collected from 4 test pits and screened for BTEX compounds using immunoassay field screening tests. Five test pit soil samples from the 4 test pits were sent to the laboratory for chemical analysis. The Phase I RI confirmed the findings of the ESI conducted at SEAD-71. No burial pit for paint and solvents was uncovered during either investigation, although the investigations did indicate the soils at SEAD-71 have been impacted by the waste materials which have been disposed of in at least one disposal pit on site. At three test pit locations, polynuclear aromatic hydrocarbons (PAHs) were present at concentrations exceeding the criteria specified in the Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC 1992). Heavy metals concentrations above the associated criteria values were also present in these three test pits. There is clear evidence that surface soils at SEAD-71 have been impacted by waste materials disposed in the area. Both PAHs and heavy metals were detected above their associated criteria in every surface soil sample collected during the Phase I RI.

1.3.4.2.2 **Groundwater Data**. Groundwater at the site has not been significantly impacted. Metals were the only constituents detected, with a total 20 for SEAD-71. Out of the 20 metals found, five (aluminum, iron, lead, manganese, and thallium) were detected at concentrations above the lowest associated state or federal criteria.

1.4 **State And Local Actions To Date.** There have been no related state or local actions to date at the SEAD-59 and 71. However, state and local authorities have been active in reviewing the ESI work plans and reports, and have provided oversight for the field work.

1.5 **Potential For Continued State/Local Response.** There are no known plans for state or local response at the site. The removal action proposed in this action memorandum will be conducted by the Army. State authorities will continue to be given the opportunity to review and comment on site documents.

1.6 **Location**. SEDA is a US Army facility located in Seneca County, New York. SEDA occupies approximately 10,600 acres. It is bounded on the west by State Route 96A and on the east by State Route 96. The cities of Geneva and Rochester are located to the northwest (14 and 50 miles, respectively); Syracuse is 50 miles to the northeast and Ithaca is 31 miles to the south. The surrounding area is generally used for farming.

1.7 **Regulatory Status**. SEDA was included on the Federal Facilities National Priorities List on 13 July 1989. Consequently, all work to be performed under this contract shall be performed according to CERCLA guidance and the Federal Facilities Agreement in effect for Seneca Army Depot (Reference 11.1).

1.8 **Statutory Authority**. Authority for responding to releases or threats of releases from a hazardous waste site is addressed in section 104 of CERCLA, as amended. The Army has been delegated the response authority for Army sites, whether or not the sites are on the National Priorities List of the U.S. Environmental Protection Agency (EPA). Under CERCLA Section 104(b), the Army is authorized to investigate, survey, test, or gather other data required to identify the existence, extent, and nature of contaminants, including the extent of danger to human health or welfare and the environment. In addition, the Army is authorized to undertake planning, engineering, and other studies or
investigations appropriate to directing response actions that prevent, limit, or mitigate the risk to human health or welfare and the environment.

1.9 **Basis of this Removal.** The "Expanded Site Inspection Report for Eight Moderately Low Priority AOCs - SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59" (Reference 11.2), the "Expanded Site Inspection Report for Seven Low Priority AOCs -SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71" (Reference 11.3), the "Final, Project Scoping Plan for Performing a CERCLA Remedial Investigation / Feasibility Study (RI/FS) at the Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71)" (Reference 11.4), the "Final, Phase I Remedial Investigation (RI) at SEAD-59 and SEAD- 71." (Reference 11.5) and the "Draft, Decision Document For Removal Actions at SWMU's SEAD-59 and SEAD-71, Seneca Army Depot

Activity." (Reference 11.6) are the basis under which the removal activities provided for under this Statement of Work (SOW) are to be carried out.

2.0 OBJECTIVE

The objective of this Statement of Work is to perform a Time Critical Removal Action at two sites at Seneca ADA as defined in this SOW and as laid out in the design documents. In general, the purpose of this action is to remove the source of semivolatile organic compounds, pesticides, PCBs, and metal contamination at the sites and thereby reduce the potential for further contamination of soils and groundwater. This work should eliminate the potential for future remedial actions. Because the impetus for the removal action at both sites is the presence of drums and paint cans, and due to the uncertain nature of the contents, excavation and disposal, rather than any sort of in-situ treatment of these items is logical.

3.0 DETAILED DESCRIPTION OF SERVICES

3.1 <u>General Requirements</u>.

3.1.1 All work performed by the Contractor shall be designed and implemented in a manner which complements earlier investigations and shall conform to this SOW, the approved design and the requirements of EPA, NYSDEC and SEDA. All work shall be performed under the general supervision of a Professional Engineer registered in the State of New York. All work shall be performed on a firm fixed-price basis.

3.1.2 All volumes referenced in this SOW are in-place volumes. Payment will be made based upon actual in-place volumes and not excavated, expanded volumes. The Contractor shall be responsible for performing survey work necessary to determine that required excavation depths and extents have been attained.

3.2 <u>(Task 1) Site Visit and Records Review</u>. The Contractor shall visit the sites for the purpose of gaining familiarity with the physical characteristics of each site. Additionally, the Contractor shall review pertinent records and prior investigations.

3.3 <u>Time Critical Removal Actions</u>.

3.3.1 <u>(Task 2) Preparation of Work Plans</u>. Using the project layout/progression given in Appendix 1 of this SOW, ~~and the design documents,~~ the Contractor shall prepare a complete Work Plan for the removal actions to be carried out. The Contractor shall layout all aspects of the work to be done. At a minimum, the plan shall include:

- Construction Quality Control (QC) and Government Quality Assurance (QA): to be conducted IAW NYD Specification 01440 and ER 1180-1-6. Copies can be provided electronically if requested.
- Sampling and Analysis Plan: to include Data Quality Objectives
- Site Safety Plan IAW ER 385-1

3.3.2 <u>(Task 3) Time Critical Removal Action at SEAD-59</u>.

3.3.2.1 The Contractor shall provide the personnel, equipment and resources to properly excavate and stage 23,100 CY of soils and geophysical anomalies per this SOW and the design documents. Additionally, the Contractor shall segregate drums, cans, visibly contaminated soils and debris for testing and off-site disposal. The Contractor shall be responsible for testing the excavated soils that remain and disposing of soils that fail to meet TAGM-derived cleanup levels. These cleanup levels are presented in Appendix 1. All associated activities shall be performed according to this SOW and the design documents.

3.3.2.2 The Contractor shall take verification samples as shown in the design documents. If these samples demonstrate that the concentrations of the contaminants are below the TAGM-derived cleanup values for the 1) protection of groundwater, 2) protection of human health, and 3) protection of fish and wildlife, then SEAD-59 shall be considered to have been acceptably remediated.

3.3.2.3 The Contractor shall replace soils that meet TAGM-derived cleanup levels back in the excavation following completion of the required verification sampling. The Contractor shall also be responsible for restoring the site. Fill materials that are demonstrated to comply with TAGM-derived cleanup levels shall be used to backfill and restore the site.

3.3.3 (Task 4) Time Critical Removal Action at SEAD-71.

3.3.3.1 The Contractor shall provide the personnel, equipment and resources to properly excavate and stage 860 CY of soils from the SEAD-71 site as per this SOW and the design documents. Additionally, the Contractor shall segregate visibly contaminated soils and debris for testing and off-site disposal. The Contractor shall be responsible for testing the excavated soils that remain and disposing of soils that fail to meet TAGM-derived cleanup levels. These cleanup levels are presented in Appendix 1. All associated activities shall be performed according to this SOW and the design documents.

3.3.3.2 The Contractor shall take verification samples as shown in the design documents. If these samples demonstrate that the concentrations of the contaminants are below the TAGM-derived cleanup values for the 1) protection of groundwater, 2) protection of human health, and 3) protection of fish and wildlife, then SEAD-71 shall be considered to have been acceptably remediated.

3.3.3.3 The Contractor shall replace soils that meet TAGM-derived cleanup levels back in the excavation following completion of the required verification sampling. The Contractor shall also be responsible for restoring the site. Fill materials that are demonstrated to comply with TAGM-derived cleanup levels shall be used to backfill and restore the site.

3.3.4 (Task 6) Weekly Reports. During field work, the Contractor shall submit Weekly Reports according to the distribution in paragraph 4.7.2 and in the quantities shown in 4.7.3, "Letter Reports". These reports shall address the following:

- A summary of work completed in the field. Upon request, copies of trip reports and/or field logs shall be provided.
- Anticipated or actual delay of a scheduled field activity, to include basis and any effect on subsequent events or scheduled activities.
- Minutes of all formal Project Manager or other formal meetings held during the preceding period, at which the Contractor is in attendance.
- Status report on all milestones met on schedule during the period, report and explanation for any milestones not met during the preceding period and an assessment of milestones scheduled for the next reporting period.
- Outside inspection reports, audits, or other administrative information developed during the preceding period, including notice of any outside inspections or audits scheduled during the next reporting period.
- Permit status as applicable.
- Personnel staffing status or update.
- Community relations activity update.
- Sampling data

3.4 (Task 7) Removal Completion Report. At the conclusion of field work, the Contractor shall submit a Removal Completion Report to the distribution in Section 4.7.2 in the quantities shown in paragraph 4.7.3. This report shall not only present a recapitulation of the work that was done but shall also include discussions of the following:

- Confirmation sample results and how those results demonstrate success in the removal area
- Conclusions regarding overall success at each site.
- Discussions/Recommendations that support a finding of "No Further Action" at each site.

~~**3.5 (Task 8) Post Removal Support.** Following approval of the Removal Completion Report, the Contractor shall be responsible for the preparation of the Proposed Remedial Action Plan (PRAP) and the Record of Decision (ROD). Both documents shall be prepared in accordance with the existing EPA guidance documents.~~

3.6 (Task 9) Project Management. The Contractor shall manage the order in accordance with the GSA FSS basic contract SOW. The Contractor shall perform all project management associated with this TO as a part of this task including, but not limited to, preparing and submitting a master network schedule, cost and manpower plan, monthly progress reports, monthly individual performance report and cost/schedule variance report, work task proposals and a program plan.

4.0 SUBMITTALS AND PRESENTATIONS

4.1 Format and Content. Documents shall present all data, analyses, and recommendations and shall be prepared in accordance with the suggested Format as presented in the RI/FS Guidance Manual. All drawings shall be of engineering quality in drafted form with sufficient details to show interrelations of major features on the installation site map. When drawings are required, data may be combined to reduce the number of drawings. The report shall consist of 8-½ x 11" pages with drawings folded, if necessary, to this size. A decimal paragraphing system shall be used, with each section and paragraph of the reports having a unique decimal designation. The report covers shall consist of vinyl 3-ring binders and shall hold pages firmly while allowing easy removal, addition, or replacement of pages. A report title page shall identify the Contractor, the Corps of Engineers, New York District, and the data. The Contractor identification shall not dominate the title page. Each page of draft and draft-final reports shall be stamped "DRAFT" and "DRAFT-FINAL", respectively. Each report shall identify the members and title of the Contractor's staff which had significant, specific input into the report's preparation or review. Submittals shall include incorporation of all previous review comments accepted by the Contractor as well as a section describing the disposition of each comment. Disposition of comments submitted with the final report shall be separate from the report document. All final submittals shall be sealed by the registered Professional Engineer-In-Charge.

4.2 Presentations. The Contractor shall make presentations of work performed according to the schedule in paragraph 4.6. Each presentation shall consist of a summary of the work accomplished and anticipated followed by an open discussion among those present. The Contractor shall provide a minimum of two persons at the meetings which are expected to last one day each.

4.3 Conference Minutes. The Contractor shall be responsible for taking notes and preparing the minutes of all conferences, presentations, and review meetings. Conference notes shall be prepared in typed form and the original furnished to the Contracting Officer (within five (5) working days after date of conference) for concurrence and inclusion in the next monthly report. This report shall include the following items as a minimum:

a. The date and place the conference was held with a list of attendees. The roster of attendees shall include name, organization, and telephone number;

b. Written comments presented by attendees shall be attached to each report with the conference action noted. Conference action as determined by the Government's Project Manager shall be "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted;

c. Comments made during the conference and decisions affecting criteria changes must be recorded in the basic conference notes. Any augmentation of written comments should be documented by the conference notes.

4.4 Confirmation Notices. The Contractor shall be required to provide a record of all discussions, verbal directions, telephone conversations, etc., participated in by the Contractor and/or representatives on matters relative to this contract and the work. These records, entitled "Confirmation Notices", shall be numbered sequentially and shall fully identify participating personnel, subject discussed, and any conclusions reached. The Contractor shall forward to the Contracting Officer, within five (5) working days, a reproducible copy of said confirmation notices. Distribution of said confirmation notices shall be made by the Government.

4.5 Progress Reports and Charts. The Contractor shall submit progress reports to the Contracting Officer with each request for payment. The progress reports shall indicate work performed and problems incurred during the payment period. Upon award, the Contractor shall, within 15 days, prepare a progress chart to show the proposed schedule for completion of the project. The progress chart shall be prepared in reproducible form and submitted to the Contracting Officer for approval. The actual progress shall be updated and submitted by the 15th of each month and may be included with the request for payment.

4.6 **Proposed Schedule.** The schedule for the removal and the post removal work follows:

Notice To Proceed	August 1, 2002
Draft Work Plan	August 16, 2002
Comments to Contractor	August 23, 2002
Final Work Plan	August 30, 2002
Initiation of Field Work	September 6, 2002
Completion of Field Work	November 8, 2002
Draft Removal Report	December 6, 2002
Comments to Contractor	December 13, 2002
Draft-Final Removal Report	December 20, 2002
Comments to Contractor	January 12, 2003
Final Removal Report	January 31, 2003
Meetings/Presentations	TBD

4.7 Submittals.

4.7.1 General Submittal Requirements.

4.7.1.1 Distribution. The Contractor is responsible for reproduction and distribution of all documents. The Contractor shall furnish copies of submittals to each addressee listed in paragraph 4.7.2 in the quantities listed in the document submittal list. Submittals are due at each of the addresses not later than the close of business on the dates shown in paragraph 4.6.

4.7.1.2 Partial Submittals. Partial submittals will not be accepted unless prior approval is given.

4.7.1.3 Cover Letters. A cover letter shall accompany each document and indicate the project, project phase, the date comments are due, to whom comments are submitted, the date and location of the review conference, etc., as appropriate. (Note that, depending on the recipient, not all letters shall contain the same information). The contents of the cover letters should be coordinated with CENAN-PM prior to the submittal date. The cover letter shall not be bound into the document.

4.7.1.4 Supporting Data and Calculations. The tabulation of criteria, data, circulations, etc., which are performed but not included in detail in the report shall be assembled as appendices. Criteria information provided need not be reiterated, although it should be referenced as appropriate. Persons performing and checking calculations are required to place their full names on the first sheet of all supporting calculations, etc., and initial the following sheets. These may not be the same individual. Each sheet should be dated.

4.7.1.5 Reproducibles. One camera-ready, unbound copy of each submittal shall be provided to the Contracting Officer in addition to the submittals required in the document and submittal list.

4.7.2 Addresses.

Commander
U.S. Army Engineering and Support Center, Huntsville
ATTN: CEHND-PM (Mr. Greene)
4820 University Square
Huntsville, AL 35816

Commander's Representative
Seneca ADA
ATTN: SMASE-CO (Bld.123, Mr. Absolom)
P.O. Box 9
5786 State Route 96
Romulus, New York, 14541-5001

Commander
USACHPPM (PROV)
ATTN: MCHB-ME-R (Mr. Hoddinott)
Building E1677
Aberdeen Proving Ground, MD
21010-5422

Commander
US Army Engineer District, New York
Seneca Office for Project Management
ATTN: Ms. Janet Fallo, Bld.125
P.O. Box 9
5786 State Route 96
Romulus, New York, 14541-5001

Commander
U.S. Army Environmental Center,
ATTN: Mr. Clayton Kim

Commander
US Army Engineer District, New York
Seneca Office for Project Management

Aberdeen Proving Ground, MD
21010-5422

ATTN: Mr. Thomas Battaglia, Bld.125
P.O. Box 9
5786 State Route 96
Romulus, New York, 14541-5001

Commander
U.S. Army Engineering and Support Center,
Huntsville
ATTN: CEHNC-CT-E (Ms. E. Sheridan)
4820 University Square
Huntsville, AL 35816

4.7.3 Document and Submittal List

	DRAFT	DRAFT-FINAL	FINAL
CEHND-PM	3	3	3
CEHNC-CT	1	1	1
AEC	1	1	1
SMASSE-CO	3	8	8
CENAN	3	3	3
MCHB-ME-R	5	5	5
TOTAL	16	21	21

5.0 SAFETY REQUIREMENTS

5.1 Site activities in conjunction with this project may pose unique safety hazards which require specialized expertise to effectively address and eliminate.

5.2 Prior to commencement of field activities, the Contractor shall submit for review an amendment to the Work Plan SHERP which is to contain the following:

5.2.1 A discussion of the Contractor's organization structure, to include lines of authority of the Contractor and all subcontractors, shall be provided along with an organization chart showing the lines of authority for safety and health from site level to corporate management. Each person assigned specific safety and health responsibilities shall be identified and pertinent qualifications and experience shall be described.

5.2.2 Documentation of compliance with training and medical surveillance requirements for affected employees shall be provided. A format for such documentation is provided in the Work Plan SHERP.

6.0 QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS

The Contractor shall perform all sampling and analysis activities according to the requirements presented in the Work Plan.

7.0 SOIL BORING AND MONITORING WELL REQUIREMENTS

All drilling, installation and sampling activities shall be performed according to the requirements presented in the Work Plan.

8.0 SURVEY REQUIREMENTS

All surveying shall be completed according to the requirements presented in the Work Plan.

9.0 MANAGEMENT OF FUNDS

No transfer of funds by the Contractor between tasks will be allowed without the prior approval of the Contracting Officer or the Contracting Officer's Representative.

10.0 PUBLIC AFFAIRS

The Contractor shall not publicly disclose any data generated or reviewed under this contract. The Contractor shall refer all requests for site information to the SEDA Public Affairs Office and requests for contract information shall be forwarded to the Contracting Officer, Huntsville Division. Reports and data generated under this contract shall become the property of the Department of Defense and distribution to any other source by the Contractor unless authorized by the Contracting Officer, is prohibited. The Contractor shall notify the Contracting Officer and Installation Public Affairs Office prior to any contacts with regulatory agencies.

11.0 REFERENCES

11.1 "Federal Facility Agreement under CERCLA Section 120 in the matter of Seneca Army Depot, Romulus, New York", Docket No. II-CERCLA-FFA-00202, USEPA, U.S. Department of the Army, and the New York State Department of Environmental Conservation, November 1990.

11.2 "Expanded Site Inspection Report for Eight Moderately Low Priority AOCs -SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59", Parsons ES, 1995 .

11.3 "Expanded Site Inspection Report for Seven Low Priority AOCs -SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71", Parsons ES, 1995.

11.4 "Final, Project Scoping Plan for Performing a CERCLA Remedial Investigation / Feasibility Study (RI/FS) at the Fill Area West of Building 135 (SEAD-59), and the Alleged Paint Disposal Area (SEAD-71)", Parsons ES, April 1997.

11.5 "Final, Phase I Remedial Investigation (RI) at SEAD-59 and SEAD- 71.", Parsons ES, November 2001.

11.6 "Draft, Decision Document For Removal Actions at SWMU's SEAD-59 and SEAD-71, Seneca Army Depot Activity.", Parsons ES, April 2001.

APPENDIX A

DETAILED DESCRIPTION OF REQUIREMENTS

A.1.0 DETAILED DESCRIPTION OF REQUIREMENTS

A.1.1 MOBILIZATION

A.1.1.1 Off Site Or On Site Borrow Pit. Prior to starting the removal actions, the RA Contractor shall locate an off-site or on-site borrow pit that will be used to provide clean backfill. The RA Contractor shall be responsible for evaluating and certifying alternative borrow pit sites to ensure that the borrow material used for site backfill operations is clean. The borrow soil must be sampled and analyzed, and the results of the analyses must be provided to the Army prior to its use at the site. There must be enough borrow material available to meet the project requirements. The RA Contractor shall estimate the amount of borrow available prior to the initiation of the work. The RA Contractor shall submit a report that presents the data collected from the potential borrow pit(s) evaluated. This report shall include a site plan of the alternative sites along with an estimate of the quantity of borrow material available. The report shall present chemical and physical laboratory analysis results.

A.1.1.2 Utilities. The RA Contractor shall be responsible for the mobilization of necessary temporary site facilities for the performance of this removal action. The RA contractors shall provide and maintain all temporary site utilities needed. Temporary site utilities may include telephone, electricity, natural gas (if required), potable water and sanitation facilities. Non-potable water, telephone and electric services are available in the area for tie-in by the RA Contractor. The RA Contractor shall furnish portable sanitation facilities, communications equipment and potable water. Payment for telephone, electricity and water will be through SEDA.

A.1.1.3 Site Clearance. The RA Contractor shall locate, identify, mark, and protect site structures and utilities from damage. The RA Contractor shall protect survey benchmarks from damage or displacement. The RA Contractor shall remove surface debris and clear areas required for site access and excavation.

A.1.1.4 Site Security. The RA Contractor shall be responsible for limiting and controlling personnel and wildlife entry into the exclusion zone, excavation, and any other potentially hazardous locations. The RA Contractor shall construct a security fence around the work areas.

A.1.1.5 Decontamination Facility. This section describes the basic requirements for decontamination activities that must be completed during, and the facilities that must be developed for, each removal action site.

A.1.1.5.1 The RA Contractor shall supply all labor, materials, and equipment needed to design, construct, and equip decontamination facilities in accordance with these specifications.

A.1.1.5.2 The RA Contractor shall decontaminate all excavation and transport equipment prior to its:

- use at a new site,
- removal from SEDA,
- use for handling of clean borrow materials intended for backfilling.

A.1.1.5.3 The RA Contractor shall design and operate decontamination facilities in a manner that ensures that all of the debris resulting from, and the materials used during, the decontamination process are captured and recovered prior to their release to the surrounding environment.

A.1.1.5.4 Fluids and solids generated during decontamination activities will be segregated, and recovered. Fluids and solids may be separated by allowing the mixed wastes to flow into a lined sump where they are allowed to settle. The top layer of liquids will be decanted from the sump and placed into appropriate containers for transport to storage, treatment, and disposal facilities. Recovered solids will be added to the excavated soils stockpiled for disposal, or placed in other suitable transport containers for subsequent transport and disposal at off-site facilities.

A.1.1.5.5 All personnel protective equipment used during site operations will be segregated from other removal action debris and collected as a separate stream for off-site disposal at approved facilities.

A.1.2 SITE OPERATIONS

A.1.2.1 Staging Areas. The RA Contractor shall construct, operate and maintain separate staging areas for the temporary storage and stockpiling of clean and contaminated soil. Additional requirements for the staging areas are provided below:

A.1.2.1.1 The locations of the staging areas established for clean and contaminated soil shall be clearly marked and identified on the site plan. Each staging area shall have sufficient capacity for up to 6 days volume of soil.

A.1.2.1.2 The RA Contractor shall underline all staging areas with 2 to 3 inches of sand covered by a 40-mil HDPE (or equivalent) liner.

A.1.2.1.3 The RA Contractor shall use berms or equivalent means to prevent surface water run-on and run-off from the designated staging areas.

A.1.2.1.4 The RA Contractor shall cover all soil stockpiles with a tarp that is weighted appropriately to prevent erosion of the pile by wind, rain, snow, or storm water. All soil stockpiles shall be covered to the fullest extent possible. Storage piles shall be covered at all times when they are not being actively worked.

A.1.2.1.5 The RA Contractor shall minimize vehicular traffic on staging area liners to prevent damage to the liner. The RA Contractor shall use only rubber-tired loaders in the staging area to minimize damage to the liner.

A.1.2.1.6 The RA Contractor shall inspect storage pile liners and covering tarps at least once per work day. If the integrity of the liner or the covering tarp is breached, the breach shall be immediately repaired or the contents of the stockpile shall be moved to another location that is constructed per the specifications defined above.

A.1.2.1.7 If a stockpile is relocated due to a failure of the liner or covering tarp, the new location will be marked on the site plan and reported to the Army.

A.1.2.2 Preparation For Excavation. The RA Contractor shall survey and mark each site to delineate the proposed extent of the excavation. Tasks that require surveying are layout of the soil excavations, sampling locations, and preparation of the project record drawings. All surveying shall be done under the supervision of a New York licensed and registered surveyor. The RA Contractor shall identify the required excavation lines, levels, contours, and datum used to delineate the extent of the proposed excavation. The RA Contractor shall identify and protect existing structures, utilities and existing benchmarks from damage during the site operations.

A.1.2.3 Excavation. The RA Contractor shall be responsible for excavation of areas contaminated with semivolatile
organic compounds, pesticides/PCBs or metals as are described below. Specifications pertinent to the excavation of contaminated soil are provided below.

A.1.2.3.1 The extent of the proposed excavations may be modified as are required to comply with other parts of this subsection, which are provided subsequently.

A.1.2.3.2 SEAD-59. SEAD-59 consists of two areas that are located north and south of an access road that bisects the site from east to west. The area north of the road is a fill area and the area south of the road was used as a staging area for heavy equipment and construction materials. As part of the removal action at SEAD-59, approximately 23,100 cy of soil will be excavated. The fill area (Area 1) will be excavated. Geophysical anomalies located south of the road will be excavated. Drums, paint cans, and construction debris will be screened out and disposed off-site. Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the TAGM-derived clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. Soils from SEAD-59 are not expected to exceed TCLP limits and will be disposed of at an off-site, Subtitle D, solid waste industrial landfill. Soils with concentrations of metals, pesticides, and SVOCs below the cleanup goals will be backfilled into the former fill area and the area south of the road. The sites will be regraded. ~~A two-foot thick vegetative cover will be placed over the former fill area.~~ It is assumed that

NYCRR Part 360 will no longer apply because the fill area is being removed. The remaining areas will be covered with crushed stone. The excavations at SEAD-59 will be dewatered and the water placed in holding tanks. Any groundwater collected will be treated and disposed in accordance with all state and federal regulations. During the excavation process, the sides of the excavation may be sloped to the levels required by OSHA. Shoring or bracing may also be used. Site groundwater will be monitored on a semi-annual basis and analyzed for SVOCs, Total Petroleum Hydrocarbons, and metals at SEAD-59. Four additional monitoring wells will be installed at the site as required. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

A.1.2.3.3 SEAD-71. At SEAD-71, geophysical anomalies and soils with concentrations exceeding the TAGM-derived soil cleanup goals for the site will be excavated. Paint cans and debris will be screened out and disposed off site. Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the TAGM-derived clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. These soils will be treated on-site using phosphate stabilization. Once treatment of necessary soils has occurred, these contaminated soils would be transported to an off-site, Subtitle D, solid waste industrial landfill for disposal. Soils with concentrations below the cleanup goals will be backfilled into SEAD- 71. ~~The area will be covered with crushed stone~~. Site groundwater will be monitored on a semi-annual basis and analyzed for metals at SEAD-71. Three additional monitoring wells will be installed at the site as required. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

A.1.2.3.4 The RA Contractor shall excavate and manage all contaminated soil from each of the removal action sites. The minimum extent of the required excavation in each area is defined in the decision documents. The excavation limits shown shall be considered as initial. The RA Contractor shall collect soil samples along the perimeter and bottoms of the areas excavated, and analyze the samples to confirm that the proposed limits of excavation meet the specified performance standards. These samples shall be analyzed for semivolatile organic compounds, pesticides and metals via US EPA SW-846 Methods 8270 (semivolatile organic compounds), 8081 (pesticides/PCBs), and 6010 et. al. (metals), respectively, or other approved methods. The resulting data shall be compared to TAGM-derived cleanup levels. Compliance with the requirements of the excavation via this means shall be based on the determination that all resulting analytical data is less than or equal to the TAGM-derived cleanup levels identified in this specification.

A.1.2.3.5 The RA Contractor shall collect samples of the excavated soil and submit them for analysis to develop source characterization data needed by the disposal facility.

A.1.2.3.6 Backfill of the excavation shall not begin until the confirmational sample laboratory results are reviewed and the final limits of excavation are defined. If the laboratory results indicate that additional soils must be excavated, the RA Contractor shall notify the KO.

A.1.2.3.7 Excavations shall be made and maintained in accordance with the Grading and Excavation Plan submitted by the RA Contractor and approved by the Army. The RA Contractor shall grade the upper perimeter edge of the excavation to prevent surface water inflow into the open excavation.

A.1.2.3.8 The RA Contractor shall use appropriate dust suppression and vapor control measures to minimize emissions from the excavation. The RA Contractor shall conduct air monitoring in accordance with the NYSDOH "Community Air Monitoring Plan". Should the air monitoring action levels be exceeded, work shall be stopped until appropriate air emission control measures can be instituted.

A.1.2.3.9 The RA Contractor shall notify the Army of any unexpected subsurface conditions and discontinue work in the affected area until notified to resume work. Work is to continue in unaffected portions of the site.

A.1.2.3.10 Excavation shall not be conducted during periods of inclement weather (i.e., rain or snow events).

A.1.2.3.11 The RA Contractor shall stockpile all excavated soils in accordance with these specifications pending off-site transport and disposal.

A.1.2.3.12 The RA Contractor shall record the volume of material excavated and report this volume to the Army as part of the weekly reports required in these specifications.

A.1.2.3.13 The RA Contractor shall carefully set the excavation rate in areas with high concentrations of volatile organics emissions. The RA Contractor shall include excavation procedures for the high concentration areas in the workplan.

A.1.2.3.14 The RA Contractor shall prepare a drawing that documents the extent of the excavations.

A.1.2.4 Backfilling. The RA Contractor shall provide all labor, material and equipment needed to backfill the complete excavations. Additional details pertinent to the completion of the backfill operations are provided below.

A.1.2.4.1 The RA Contractor shall backfill excavation with certified, clean backfill. The backfill shall come either from an off-site facility or from a location on-site. The RA Contractor shall provide documentation that certifies that the material used as backfill is clean and free of undesirable substances including debris, rubble, wood, chemicals, etc. The documentation shall include laboratory testing results of soil samples collected from the borrow pit and a description of
the location of the borrow pit.

A.1.2.4.2 Testing results of the soil samples from each borrow pit must be submitted and approval granted prior to the use of any material as backfill. At least one sample shall be collected from each borrow pit and analyzed for the following parameters:

- TAL Metals
- TCL Organic compounds (volatile and semi-volatile organic compounds)
- PCB/Pesticides

Analytical results shall be compared to the TAGM-derived cleanup levels to determine whether the backfill is clean, and suitable for use, as backfill.

A.1.2.4.3 The RA Contractor shall visually inspect each load of backfill to assure that the material is similar to the material that was sampled in the borrow pit and tested. Also, the RA Contractor shall collect grab samples from three trucks of fill each day and check the head space of the samples for volatile organic compounds. The material from the
truck may not be backfill until the results of the headspace analysis is complete.

A.1.2.4.4 Satisfactory borrow materials for use as backfill shall be selected from materials designated as GW-Gravel, well graded; GM -Gravels, mixed, non plastic, fines; GC -Gravels, clayey-plastic, fines; SW -Sands, well graded; SM -Sands, mixed-plastic, fines; or SC -Sands, clayey-plastic, fines in ASTM D 2487 "Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)". The selected backfill shall be free of roots and other organic matter, trash, debris, frozen materials, and stones larger than 3 inches in any dimension. Any material classified as SM shall not have more than 25 percent by weight passing the No.200 sieve.

A.1.2.4.5 The RA Contractor shall not backfill an excavation if standing water is present in the excavation. The water either shall be allowed to naturally infiltrate through the base of the excavation or shall be pumped from the excavation and treated prior to disposal.

A.1.2.4.6 All material backfilled into the excavation shall be compacted enough to support the construction traffic. The final grading plan shall allow for proper drainage after any estimated subsidence of the backfilled material has taken place.

A.1.2.5 Disposal.

A.1.2.5.1 Disposal Of Contaminated Soil. The RA Contractor shall provide all labor, material, and equipment necessary to dispose of the contaminated soil. All disposal operations shall be completed in accordance with prevailing environmental statutes, laws, and regulations. This section describes the disposal requirements for all soils residue, and decontamination residuals generated as part of this removal action.

A.1.2.5.1.1 SEDA and the Army shall be identified as the Generator of all project-derived wastes (i.e., excavated soil, wastewater, PPE and miscellaneous debris -e.g., tarps and plastic sheeting). The RA Contractor shall be identified as the Generator of any waste resulting due to the release of a hazardous material from his equipment or resulting from improper use of chemical materials at the site.

A.1.2.5.1.2 The RA Contractor shall comply with all applicable federal, state, and local regulations. At a minimum, the RA Contractor shall identify and comply with all hazardous and solid waste, and transportation requirements.

A.1.2.5.1.3 The RA Contractor shall be responsible for determining whether the waste residuals generated from the excavation processes are hazardous wastes. Wastes include any excavated soil, waste oils or lubricants, hydraulic fluids, coolants, plastic sheeting, used personnel protection equipment and other miscellaneous debris.

A.1.2.5.1.4 The RA Contractor shall specify analytical determinations that shall be performed to assess the nature of the contamination contained in all excavated soils and other wastes generated during the identified removal actions.

A.1.2.5.1.5 The RA Contractor shall collect, secure analytical services and obtain results from a state certified laboratory identifying the contents of all generated waste streams resulting from the removal action. The RA Contractor shall provide the generated data to the Army and to the proposed disposal facility for review.

A.1.2.5.1.6 The RA Contractor shall obtain approval from the Army of all off-site disposal facilities that are selected to receive wastes from SEDA.

A.1.2.5.1.7 All waste shall be disposed off-site at a permitted waste treatment storage and disposal facility.

A.1.2.5.1.8 The RA Contractor shall transport all generated waste materials from the removal actions from the site of the excavation and on-site stockpiles to the selected disposal site. All waste transportation shall be completed following procedures that are necessary to document the transfer of the waste from SEDA, over public roads, to the approved disposal site.

A.1.2.5.1.9 At a minimum, the RA Contractor shall document the quantity and type of waste materials moved from SEDA each day to an approved disposal site. At a minimum, collected records shall include a listing of all quantities and types of wastes transported. If necessary, bills of lading and hazardous waste manifests shall be prepared and entered into the project files to document the transportation to and disposal of materials at off-site licensed and approved landfills.

A.1.2.5.2 Treatment Of Water.

A.1.2.5.2.1 The RA Contractor shall store all wastewater in portable tanks appropriate for managing wastewater. The RA Contractor shall ensure that the tanks used have been constructed in accordance with all applicable codes and standards. The RA Contractor shall visually inspect all tanks for leaks and shall replace all leaking tanks.

A.1.2.5.2.2 The RA Contractor shall treat all wastewater on site using either an air stripper column or an activated charcoal system and shall discharge the treated water in accordance with the approved discharge permit.

A.1.2.5.2.3 Following treatment of wastewater, the RA Contractor shall discharge all treated waters from this removal action including groundwater to a nearby drainage ditch. The RA Contractor shall include in the site plans all specific testing requirements for this discharge permit, and shall be responsible for meeting these testing requirements.

A.1.2.6 Drainage Control.

A.1.2.6.1 Runon Control. The RA Contractor shall implement and maintain, for the duration of the removal action, run on control measures to prevent non-excavation related and non-contaminated surface water from entering the work areas of the site. These measures shall consist of berms and ditches, as are necessary, that redirect the flow of surface water around the excavation site to the historic surface water discharge points.

A.1.2.6.2 Runoff Control. The RA Contractor shall implement and maintain, for the duration of the removal action, measures to prevent surface water from leaving the area of the excavation sites or stockpiles. These measures shall include berms or ditches that capture surface water in the work area for subsequent testing and disposal. The RA Contractor shall construct berms around all staging areas to prevent runoff from the stockpiled materials. Any collected runoff from the staging areas shall be collected and disposed of in accordance with the requirements of these
specifications.

A.1.2.6.3 Excavation Drainage. The RA Contractor shall provide pumps, hoses, and any other equipment necessary to remove accumulated water from the open excavation. The RA Contractor shall be required to remove water from the excavation when necessary to continue excavation activities, or if a safety threat exists. The water from the excavation shall be collected and treated in accordance with the requirements of these specifications.

A.1.2.7 Erosion/Dust Control

A.1.2.7.1 Erosion Control. The RA Contractor shall provide the materials and labor required to control erosion of soils originating from the site. These measures may include limiting the exposure area, placement of hay bales and silt fences or berms.

A.1.2.7.2 Dust Control. The RA Contractor shall take necessary measures, in addition to those required by federal, state, and local regulations, to eliminate or minimize the migration of dust off site due to site activities. At a minimum, the RA Contractor shall follow the requirements of the NYSDEC TAGM HWR-89-4031, "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites," October, 27, 1989 (or most recent version) and the monitoring requirements in these specifications.

A.1.2.8 Air Monitoring And Action Levels

A.1.2.8.1 General. The RA Contractor shall monitor the emissions from the excavations and soil staging areas to
assure compliance with all federal, state, and local regulations. Monitoring shall be conducted in accordance with the NYSDEC TAGM, "Fugitive Dust Suppression and Particulate Monitoring at Inactive Hazardous Waste Sites," October 27, 1989 (or most recent version), and with the New York State Department of Health "Community Air Monitoring Plan."

A.1.2.8.2 Calibration. The RA Contractor shall calibrate all air monitoring equipment weekly in accordance with the manufacturer's instructions, and shall maintain records of all calibrations. These records shall be made available to the Army's representative or to the regulators upon request.

A.1.2.9 Confirmatory Sampling And Analysis.

A.1.2.9.1 General. Confirmatory sampling shall be performed by the RA Contractor to verify the successful removal of soil and sediment containing semivolatile organic compound, pesticide/PCB, or metal contaminants. The RA Contractor shall be responsible for confirmatory sampling and analysis in the excavations. This section describes the requirements for confirmatory sampling and analysis.

A.1.2.9.2 Sampling Locations.

A.1.2.9.2.1 Soil. The RA Contractor shall collect confirmatory soil samples from the perimeter of excavations and the bottom of the excavations to confirm that the performance standards have been met. These samples shall be analyzed for the volatile and semivolatile organic compounds, pesticides and PCBs, and metals as are appropriate.

A.1.2.9.2.2 Wastewater. The RA Contractor shall collect samples of the wastewater resulting from all site operations, including excavation dewatering, precipitation onto contaminated soil stockpiles, and spent washwater to ensure proper treatment and disposal.

A.1.2.9.3 Sampling And Analysis

A.1.2.9.3.1 Sample Locations, Frequency And Types

A.1.2.9.3.1.1 Soil. The excavation limits shown in the figure in Appendix 2 shall be considered as preliminary and
subject to change. Confirmatory samples shall be collected from the perimeters and bottoms of at least one per excavation and one sample from every 200 feet of excavation perimeter or at least one per wall. These samples shall be analyzed for VOC's, semi-volatile organic compounds, pesticides and PCBs and metals. If these samples indicate that additional contaminated soil or sediment remains at the site then additional soil and sediment shall be excavated until subsequent testing confirms that all impacted material has been excavated.

A.1.2.9.3.1.2 Wastewater. Samples of wastewater shall be collected as necessary to ensure proper treatment and discharge of the wastewater.

A.1.2.9.3.1.3 Sampling Equipment Decontamination. The RA Contractor shall use disposable sampling equipment wherever possible to minimize decontamination requirements. When reusable equipment is used, the RA Contractor shall decontaminate all equipment prior to use in sampling. The decontamination procedure shall consist of successive washes in the following order:

- Potable water rinse
- Wash with laboratory grade detergent (Alconox or equivalent)
- Distilled water rinse
- Methanol rinse
- Hexane rinse
- Distilled water rinse

If samples are to be analyzed for metals, a nitric acid rinse and an additional distilled water rinse shall be added between steps 3 and 4. All decontamination wastes shall be disposed of off-site as hazardous waste.

A.1.2.9.3.1.4 Sample Volumes. Containers. and Preservation. The RA Contractor shall ensure that all sample containers, preservation, packaging, and holding times are in accordance with EPA Region 2 and NYSDEC protocols. All samples collected shall be properly logged, labeled, packaged, and stored in an iced cooler immediately after collection and until arrival at the laboratory. All samples shall be accompanied by a completed chain-of-custody form that can be used to document sample custody.

A.1.2.9.3.1.5 Laboratory Analyses. All soil samples shall be analyzed for volatile and semi-volatile organic compounds using NYSDEC Analytical Services Protocols (ASP). Soil samples shall be analyzed for toxicity characteristic by TCLP using EPA SW-846 Method 1311. The RA Contractor shall ensure that the laboratory is capable of providing reporting limits below the soil cleanup levels so that reported non-detect values may be compared to the cleanup levels. The RA Contractor shall ensure that the selected laboratory has been approved by NYSDEC and the Corps of Engineers, Missouri River Division.

A.1.2.9.4 Demobilization And Site Restoration.

A.1.2.9.4.1 Demobilization. Following completion and acceptance of the work by the Contracting Officer, the RA Contractors shall provide all Contractor and subcontractor labor and materials required to decontaminate, dismantle, package, and transport from the site all Contractor or subcontractor equipment, materials, and personnel. Demobilization shall not be complete until site restoration is complete.

A.1.2.9.4.2 Removal. At the completion of the removal actions, the RA Contractor shall remove all temporary facilities, utility services, and debris, unless otherwise directed by the Army's representative. The RA Contractor shall restore the area in accordance with these specifications.

A.1.2.9.4.3 Site Restoration

A.1.2.9.4.3.1 General. The RA Contractor shall restore the sites to their original condition except as described in these specifications or as directed by the Army. The RA Contractor shall grade the excavation sites to approximate the original site conditions. As necessary, the RA Contractor shall bring in documented clean fill to make up for any volume losses. The RA Contractor shall also grade the sites to minimize erosion during the revegetation period.

~~**A.1.2.9.4.3.2 Revegetation.** The RA Contractor shall revegetate the sites using grass seed upon completion of~~ the backfill operations and demobilization. The RA Contractor shall revegetate the backfilled excavations and all work areas in which site work has killed off the vegetation.

A.1.2.9.4.3.3 Materials

A.1.2.9.4.3.3.1 Fill. Satisfactory materials for use as fill shall be materials classified in ASTM D 2487 as GW, GM,
GC, SW, SM, SC and shall be free from roots and other organic matter, trash, debris, frozen materials, and stores larger than 3 inches in any dimension. Any material classified as SM shall have not more than 25 percent by weight passing the No.200 sieve.

A.1.2.9.4.3.3.2 Topsoil. Topsoil shall be fertile, naturally friable, silty soil, with characteristics of typical soil in the vicinity that produces heavy crops, grass and other vegetation, obtained from naturally well-drained areas. The topsoil shall be reasonably free from subsoil, weeds and other vegetation and from clay lumps or stones. Soil shall have a pH between 5.5 to 7.6. The RA Contractor shall have representative topsoil samples tested by a soil-test chemist and a copy of the test and recommendations for additives shall be furnished to the site representative prior to commencing work. Quantity given for the following materials used for conditioning and seeding shall be adjusted as required by the soil chemist recommendations.

A.1.2.9.4.3.3.3 Limestone. Limestone shall consist of ground calcareous or dolomitic limestone, 95% to pass a No.20 sieve and at least 50% to pass a No. 100 sieve. Limestone shall conform to the standards of the Federal and state laws relating to commercial fertilizers.

A.1.2.9.4.3.3.4 Fertilizer. Fertilizer shall be applied in granular dry form and shall be a slow-release type product
specifically designed for starting grass seed. The chemical analysis shall be (approximately) 15-10-10 applied at the rate designated by the soil-test chemist. The fertilizer shall conform to the requirements of the appropriate Federal and State laws relating to commercial fertilizers, and be delivered dry in original, unopened containers bearing the manufacturer's

A.1.2.9.4.3.3.5 Grass Seed. Grass seed shall meet the requirements of the appropriate state and Federal agricultural and vegetable seed laws. Grass seed shall contain Kentucky Blue, Red Top, Fescue and Creeping Bent. Red Top shall not exceed 20% of the mixture. Alternate types of permanent seed mixtures of equal quality may be used, if in the opinion of the RA Contractor's soil-chemist they are more suitable to the local climate and conditions provided that 80% of permanent grasses and not clover is used in any traffic areas. Weeds and inert material shall not exceed 2%.

A.1.2.9.4.3.3.6 Mulch. Mulch shall consist of hay mulch or straw mulch.

A.1.2.9.4.3.4 Application

A.1.2.9.4.3.4.1 Topsoil. The areas to be covered with topsoil shall be rough graded to the appropriate required sub-grades and shall be maintained in a true and even condition. Finish grading shall include any necessary repairs to previously rough graded areas. Immediately prior to dumping and spreading the topsoil, the sub-grade, wherever compacted by traffic or other causes, shall be loosened by disking or scarifying to a depth of at least two inches to permit bonding of the topsoil to the sub-grade. Topsoil shall be spread evenly to a compacted thickness of 6 inches over all required areas and shall be rolled and raked until it is clean and free from irregularities, and is at the finished grades. Topsoil shall not be placed on frozen, excessively wet or dry sub-grade.

A.1.2.9.4.3.4.2 Fertilizer and Limestone. After the topsoil has been spread to the required thickness, ground li~~mestone shall be distributed uniformly over the topsoil at a rate of 5 pounds per 100 square feet. After disking in of~~

the ground limestone, fertilizer shall be spread at a rate of 2 pounds per 100 square feet or as recommended by the soil chemist. Subsequent to liming and fertilization, the topsoil areas shall be scarified by disking in two directions at right angles to each other, or by other approved methods, in such a manner that the topsoil shall be thoroughly incorporated into the top two inches of the subgrade. Prior to seeding, the surface of the topsoil shall be raked free of all stones and other objectionable material.

A.1.2.9.4.3.4.3 Grass Seed. No seeding shall be done during windy weather or when the ground is frozen, wet or otherwise non-tillable. As soon as the seed is sown, it shall be thoroughly covered with a thin layer of topsoil by raking,
harrowing or dragging. The areas shall be uniformly seeded using not less than 4 pounds per 100 square yards of area. The seed shall be raked in lightly and rolled with a light roller.

A.1.2.9.4.3.5 Maintenance. Seeded areas shall be protected and maintained by watering, mowing and replanting as
necessary for at least 30 days and as much longer as is necessary to establish a uniform stand of the specified grasses and until acceptance. The RA Contractor shall be responsible for the watering of all seeded areas which shall be kept moist. The Army's representative's decision shall prevail in the event a dispute develops with the RA Contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has started shall be watered to a minimum depth of two inches to assure continuing growth. Watering shall be done in a manner which shall provide uniform coverage, prevent erosion and prevent damage to the finished surface by the watering equipment. The RA Contractor shall furnish sufficient watering equipment. Prior to acceptance of the project, the RA Contractor shall be responsible for
mowing the grass on all flat or rolling slopes from level, to and including 4 to 1 slopes to a height of 2" when the grass
has attained a height of 3". The grass on all slopes steeper than 4 to 1 shall be cut to a height of 2" at such time as a stable turf has been established in the judgement of the Army's representative. Seeded areas shall be cut at least 3 times; none of which shall be closer than ten (10) days apart. The RA Contractor shall cut and maintain the lawn and field areas until they are judged by the Army's representative to be at least 95% satisfactory.

A.1.3 Documentation/Recordkeeping

A.1.3.1 Daily Logs. The RA Contractor shall maintain daily logs that include the quantities of the soil excavated and treated the previous day and copies of all analytical data received the previous day. The daily logs shall also include any air monitoring results obtained the previous day and the volume of water treated the previous day.

A.1.3.2 Weekly Reports. The RA and Asbestos Contractor shall submit weekly reports each Monday morning to the Contracting Officer or his representative. The weekly reports shall summarize the daily logs from the previous week, and address administrative issues. Topics which shall be included in the weekly report are:

- A summary of the work completed.
- A discussion of the work planned for the upcoming week period.
- A review of problems that arose during the previous week and the resolution to each item.
- Documentation of health and safety meetings
- A review of health and safety issues
- Site visitor logs

A.1.4 Performance Schedule. The RA Contractor shall complete each of the project tasks within the time frame presented in the Contract Data Requirements List.

A.1.5 Deliverable Data

A.1.5.1 The RA Contractor shall prepare and submit a CDAP in accordance with ER 1110-1-263 and DD Forms 1423 and 1664-1.

A.1.5.2 The RA Contractor shall prepare and submit a written certification of the HSP in accordance with DD Forms 1423 and 1664-1.

A.1.5.3 The RA Contractor shall prepare and submit an SSHP in accordance with DD Forms 1423 and 1664-1.

A.1.5.4 The RA Contractor shall prepare and submit a Work Plan in accordance with DD Forms 1423 and 1664-1.

A.1.5.5 The RA Contractor shall prepare and submit weekly progress reports in accordance with DD Forms 1423 and 1664-1.

A.1.5.6 The RA Contractor shall prepare and submit a Final Report at the conclusion of the treatment period in accordance with DD Forms 1423 and 1664-1.

A.1.5.7 The RA Contractor shall submit all deliverable data to the Contracting Officer or his representatives. The Contracting Officer or his representatives will review the submissions to determine whether they meet the minimum contract requirements and will accept or reject them accordingly. The RA Contractor shall correct the deficiencies of the rejected deliverables and resubmit them within 30 days of rejection. The Contracting Officer's acceptance of any submittal does not constitute or imply approval or endorsement, and in no way relieves the RA Contractor of his responsibility to meet all the requirements of this document.

TAGM-DERIVED CLEANUP GOALS
TIME-CRITICAL REMOVAL ACTION AT THE FILL AREA WEST OF BUILDING 135 (SEAD-59)

Parameter	Units	Number of Analyses	Number of Detections	Frequency of Detection	Maximum	Number Above TAGM
VOLATILE ORGANIC COMPOUNDS						
Benzene	UG/KG	56	3	5.4%	5900	2
Toluene	UG/KG	56	9	16.1%	830000	1
Total Xylenes	UG/KG	56	6	10.7%	1000000	1
SEMIVOLATILE ORGANIC COMPOUNDS						
Benzo(a)anthracene	UG/KG	56	44	78.6%	67000	3
Benzo(a)pyrene	UG/KG	56	43	76.8%	70000	17
Benzo(b)fluoranthene	UG/KG	56	46	82.1%	58000	3
Benzo(k)fluoranthene	UG/KG	56	41	73.2%	48000	1
Chrysene	UG/KG	56	45	80.4%	63000	3
Dibenz(a,h)anthracene	UG/KG	56	34	60.7%	17000	6
Fluoranthene	UG/KG	56	46	82.1%	160000	1
Indeno(1,2,3-cd)pyrene	UG/KG	56	42	75.0%	34000	3
Naphthalene	UG/KG	56	35	62.5%	29000	0
Phenanthrene	UG/KG	56	46	82.1%	140000	2
Pyrene	UG/KG	55	47	85.5%	120000	1

(1) Refer to Attachment A for extensive explanation of derivation of new TAGMs.
(2) Total SVOCs should not exceed 500,000 ug/kg and individual SVOCs should not exceed 50,000 ug/kg according to NYSDEC TAGM 4046. TOTAL SVOCs REFERS TO ALL SVOCs NOT JUST THOSE LISTED IN THE TABLE.

TAGM-DERIVED CLEANUP GOALS
TIME-CRITICAL REMOVAL ACTION AT THE FORMER PAINT DISPOSAL AREA (SEAD-71)

Parameter	Units	Number of Analyses	Number of Detections	Frequency of Detection	Maximum	Number Above TAGM
SEMIVOLATILE ORGANIC COMPOUNDS						
Anthracene	UG/KG	34	27	79.41%	100000	3
Benzo[a]anthracene	UG/KG	34	32	94.12%	150000	9
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	16
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	10
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	8
Chrysene	UG/KG	34	32	94.12%	150000	14
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	11
Fluoranthene	UG/KG	34	33	97.06%	440000	7
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	8

Naphthalene	UG/KG	34	15	44.12%	46000	0
Phenanthrene	UG/KG	34	32	94.12%	290000	6
Pyrene	UG/KG	34	33	97.06%	280000	7
METALS						
Lead	MG/KG	34	34	100.00%	3470	

(1) Refer to Attachment A for an extensive explanation of derivation of new TAGMs.

(2) Total SVOCs should not exceed 500,000 ug/kg and individual SVOCs should not exceed 50,000 ug/kg according to NYSDEC TAGM 4046.

APPENDIX B

SITE MAPS PREVIOUSLY PROVIDED WITH RFQ

ARE HEREIN INCORPORATED BY REFERENCE AND FORM A PART OF THIS DOCUMENT

SECTION G
CONTRACT ADMINISTRATION DATA

G.1 ADMINISTRATION DATA

G.1.1 CONTRACT ADMINISTRATION OFFICE

Commander
U.S. Army Engineering and Support Center, Huntsville
4820 University Square
Huntsville, AL 35816-1822

G.1.2 CONTRACTING OFFICER

Edna Sheridan
U.S. Army Engineering and Support Center, Huntsville
Attn: CEHNC-CT-E
4820 University Square
Huntsville, AL 35816-1822

G.1.3 CONTRACT SPECIALIST

Evelyn Kelley
U.S. Army Engineering and Support Center, Huntsville
Attn: CEHNC-CT-E
4820 University Square
Huntsville, AL 35816-1822
Phone No. 256-895-1317

G.1.4 PROGRAM MANAGER

Marshall Greene
U.S. Army Engineering and Support Center, Huntsville
Attn: CEHNC-IS-FS
4820 University Square
Huntsville, AL 35816-1822
Phone No. 256-895-1464

G.1.5 INSTALLATION PROJECT MANAGER

Janet Fallo
U.S. Army Engineer District, New York
Seneca Office for Project Management
P. O. Box 9, 5786 State Route 96
Romulus, New York 14541-5001
Phone No. 607-869-1248

G.1.6 Technical and Installation Representatives:

Thomas C. Battaglia
(See G.1.5)
607.869.1353

G.2 BILLING PROCEDURES

G.2.1 The contractor shall submit invoices in accordance with the approved milestone schedule. Billings for shall be submitted pursuant to FAR clause 52.232-1, Payments. Monthly billing is authorized.

G.2.2 PAYMENT AND BILLING OFFICE
The contractor shall submit all invoices/vouchers for payment and processing to:

Submit invoices to:
USACE, New York District
Jacob K. Javitz Federal Bldg
ATTN: CENAN-RM-B, Room 2011
26 Federal Plaza
New York, NY 10278-0090
(Original plus one)

U.S. Army Engineering and Support Center
4820 University Square
ATTN: CEHNC-CT-E
Huntsville, AL 35816-1822
(One copy)

Payment will be made by:
Finance Center - Millington
USACE Finance Center
Attn: CEHNC-RM-F
5720 Integrity Drive
Millington, TN 38504-5005

G.3 ACCOUNTING AND APPROPRIATION DATA
AA: 97 NA x 0510.40GL A0 2001 08 8001 61366R41000 19016 2512 41741F 00000000000
AMOUNT: $1,388,998.80

Direct citing is authorized . New York District, U. S. Army Corps of Engineers is the responsible paying office. The contractor shall submit invoices directly to the facility identified at Paragraph G.2.2.

G.4 CONTRACTOR PAYMENT ADDRESS
ENSR Corporation
P. O. Box 17589
Newark,, NJ 07194

G.6 CONFERENCES: Periodic meetings shall be scheduled whenever request by the Contractor or directed by the Contracting Officer for the resolution of questions or problems encountered in the performance of the work. The Contractor and/or the appropriate representative(s) shall be required to attend and participate in all conferences pertinent to the work required under this contract as directed by the Contracting Officer.

G.6.1 252.242-7??? POSTAWARD CONFERENCE (DEC 1991)
The Contractor agrees to attend any postaward conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation subpart 42.5.

SECTION H Special Contract Requirements

H.1

- **52.211-5000 Evaluation of Subdivided Items (Mar 1995). Item Numbers 2 and 3 are subdivided into two or more estimated quantities and are to be separately priced. The Government will evaluate each these items on the basis of total price of its sub-items.**
- **52.211-5001 Variations in Estimated Quantities - Subdivided items (Mar 1995). The variation in estimated quantities clause is applicable only to Items 2 and 3**
  - **Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.**
  - **Where the actual quantity of work performed for items 2 and 3 is less than 85% of the quantity of the first sub-item listed under such item, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.**
  - **If the actual quantity of work performed under items 2 and 3 exceeds 115% or is less than 85% of the total estimated quantity of the sub-items under that item and/or if the quantity of the work performed under the second sub-item or any subsequent subitem under items 2 and 3 exceeds 115% or is less than 85% of the estimated quantity of any such subitem, and if such variation causes an increase or a decrease in the time required for performance of this contract, the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.**

FAR Variation in Estimated Quantities Clause 52.211-18 is incorporated herein by reference.

H.2 52.106-4001 CONTRACTING OFFICER'S INSTRUCTIONS

a. The Contractor will not accept any instructions issued by any person other than the Contracting Officer or the Contracting Officer's Representative (COR). If a COR is appointed, the appointment will be done by letter to the COR with the scope of the COR's authority set forth in the appointment letter. A copy of the appointment letter will be furnished to the Contractor.

b. No change in the scope or within the scope of this contract which would effect a change in any term or provision of this contract shall be made except by a modification executed by the Contracting Officer. The contractor is responsible for ensuring that all contractor personnel are knowledgeable and cognizant of this contract provision. Changes to contract effort accepted and performed by contractor personnel outside of the contract without specific authorization of the Contracting Officer shall be the responsibility of the Contractor.

c. No information other than that which may be contained in an authorized modification to the contract duly issued by the Contracting Officer which may be received from any person employed by the U.S. Government or otherwise, will be considered as grounds for deviation from any stipulation of this purchase instrument or reference drawings and/or specification.

(End of Clause)

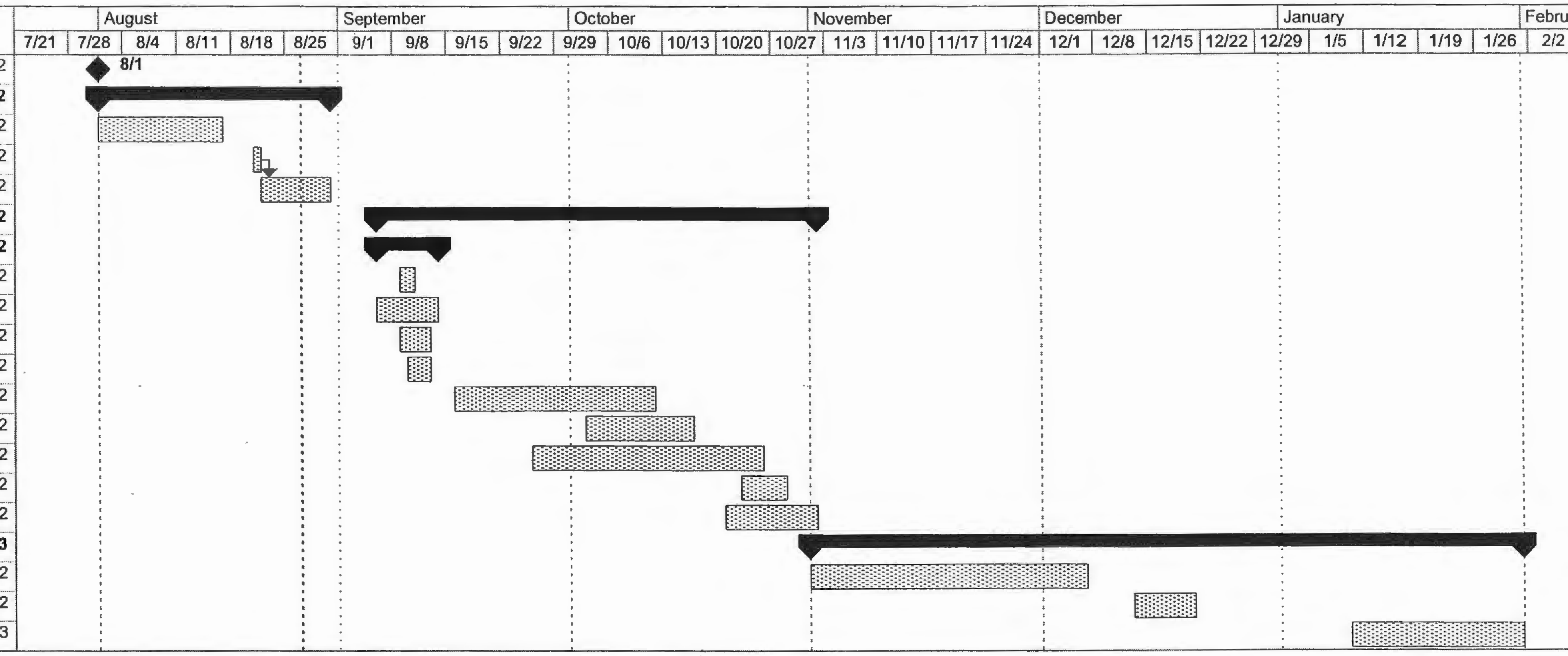
SECTION H
SPECIAL CONTRACT REQUIREMENTS

H.3 APPROVALS.

Approvals for backfill will be provided within ten (10) days of submission of request. Should the approval exceed ten days, the contractor shall immediately notify, in writing, the Contracting Officer.

APPENDIX B

ID	Task Name	Duration	Start	Finish
1	Notice to Proceed	0 days	Thu 8/1/02	Thu 8/1/02
2	**Work Plan**	**22 days**	**Thu 8/1/02**	**Fri 8/30/02**
3	Draft Work Plan Development	12 days	Thu 8/1/02	Fri 8/16/02
4	Draft Work Plan Conference	1 day	Wed 8/21/02	Wed 8/21/02
5	Development of Final Work Plan	7 days	Thu 8/22/02	Fri 8/30/02
6	**Field Activities**	**41 days**	**Fri 9/6/02**	**Fri 11/1/02**
7	**Mobilization**	**6 days**	**Fri 9/6/02**	**Fri 9/13/02**
8	Survey	2 days	Mon 9/9/02	Tue 9/10/02
9	Delivery of trailer, equip and supplies	6 days	Fri 9/6/02	Fri 9/13/02
10	Construction of decon pad, storage areas	4 days	Mon 9/9/02	Thu 9/12/02
11	Marking/designation of work areas	3 days	Tue 9/10/02	Thu 9/12/02
12	Excavation	20 days	Mon 9/16/02	Fri 10/11/02
13	Backfill Operations	10 days	Thu 10/3/02	Wed 10/16/02
14	Off-site Disposition	22 days	Thu 9/26/02	Fri 10/25/02
15	Site Restoration	4 days	Wed 10/23/02	Mon 10/28/02
16	Demobilization	10 days	Mon 10/21/02	Fri 11/1/02
17	**Removal Report**	**66 days**	**Fri 11/1/02**	**Fri 1/31/03**
18	Draft Removal Report Development	26 days	Fri 11/1/02	Fri 12/6/02
19	Draft-Final Removal Report Development	6 days	Fri 12/13/02	Fri 12/20/02
20	Final Removal Report Development	16 days	Fri 1/10/03	Fri 1/31/03



Project: SEAD-59 & 71 TCRA
Date: Tue 8/27/02

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

APPENDIX C

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all <u>ground intrusive</u> activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring parteulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

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APPENDIX D

October 27, 1989

New York State Department of Environmental Conservation

MEMORANDUM

TO: Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs
FROM: Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation
SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM--FUGITIVE DUST SUPPRESSION ~~AND PARTICULATE~~ MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES
DATE: OCT 2 7 1989

TAGM-4031

Michael J O'Toole

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM_{10}); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM_{10} is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m^3 over a 24-hour averaging time and 50 ug/m^3 over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

(1) Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

(2) Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.

(3) Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

Object to be measured: Dusts, Mists, Aerosols
Size range: <0.1 to 10 microns
Sensitivity: 0.001 mg/m^3
Range: 0.001 to 10 mg/m^3
Overall Accuracy: $\pm$10% as compared to gravimetric analysis of stearic acid or reference dust

Operating Conditions:
Temperature: 0 to 40°C
Humidity: 10 to 99% Relative Humidity

Power: Battery operated with a minimum capacity of eight hours continuous operation

Automatic alarms are suggested.

MDA: N/A any longer

Particulate levels will be monitored immediately downwind at the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

(4) In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

(5) The action level will be established at 150 ug/m^3 over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.

(6) It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM_{10} at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

(7) The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

1. Applying water on haul roads.
2. Wetting equipment and excavation faces.
3. Spraying water on buckets during excavation and dumping.
4. Hauling materials in properly tarped or watertight containers.
5. Restricting vehicle speeds to 10 mph.
6. Covering excavated areas and material after excavation activity ceases.
7. Reducing the excavation size and/or number of excavations.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the 150 ug/m^3 action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

(8) If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m^3 and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

cc: E. Sullivan
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Reg. Citizen Participation Specs.

APPENDIX E

US Army
Engineering & Support Center
Huntsville, AL

FINAL

Field Sampling Plan
SEAD-59 and 71
Time Critical Removal Action
Seneca Army Depot Activity
Romulus, NY

Contract No. GS-10F-0115K
Delivery Order No. DACA87-02-F-0137

ENSR Corporation
August 2002
Document Number 09090-029-100

CONTENTS

EXHIBITS

LIST OF FIGURES

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1.0 PROJECT BACKGROUND

1.1 Background

An Expanded Site Inspection (ESI) and Phase I Remedial Investigation (RI) have been performed at the fill area west of Building 135 (SEAD-59) and at the alleged paint disposal area (SEAD-71) at the Seneca Army Depot Activity (SEDA) in Romulus, NY. (See Figure 1-1 for site locations.) Releases of contaminants and the physical presence of drums, paint cans and debris have been documented. The depot has officially been closed by the DoD and the US Army and in accordance with the Base Realignment and Closure (BRAC) process, portions of the depot are now being released to the public and private sectors for reuse. As increased access is afforded, the potential for exposure to any residual chemicals that are present at these two sites is increased. Therefore, this removal action is considered time-critical.

The goal of the proposed time-critical removal action at SEAD-59 and SEAD-71 is to eliminate and contain an identified source of residual chemical materials in the soil and to remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment. While removal of drums, paint cans, and other containers is the focus of the planned removal actions for both sites, the potential for contamination to be present in the soils and groundwater that surround these items will also be addressed by this action.

This Field Sampling Plan (FSP) has been prepared by the USACE's contractor, ENSR International (ENSR), and is the first part of a Sampling and Analysis Plan (SAP); the second part is a Quality Assurance Project Plan (QAPP). The FSP was prepared according to the US Army Corps of Engineers Publication Number EM 200-1-3, *Engineering and Design - Requirements for the Preparation of Sampling and Analysis Plans*, and provides detailed procedures for investigation sampling activities, including equipment and instrumentation use; sample preservation and storage; maintenance of field records; decontamination procedures; sample transport and chain-of-custody protocols; laboratory analytical requirements; and quality assurance/quality control measures.

The QAPP has also been prepared in conjunction with the FSP as part 2 of the SAP to cover all aspects of the sampling program. DQOs and specific procedures relating to quality assurance for this project can be found in the QAPP. The QAPP is included in this FSP by reference.

1.2 Objectives

The objective of the field sampling program is to provide and record data elements necessary to plan for or provide for the removal of the source of semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and metal contamination at the sites and thereby reduce the potential for further contamination of soils and groundwater. This work should eliminate the potential for future remedial actions.

The sampling proposed in this FSP has been designed to provide the information necessary to complete the time-critical removal action and characterize the media for disposal.

Significant elements of this plan include: sampling of excavated soils staged in windrows, confirmatory / clearance soil sampling of the excavations, sampling of excavation water including site run-on and run-off, sampling of containers removed from the excavations, sampling of off-site source areas for clean fill, monitoring well installation, air monitoring and miscellaneous sampling requirements.

Samples will be analyzed for targeted chemicals previously identified or suspected from past activities at the site.

Figure 1: Site Location Map

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Figure 1A: Soil Areas to be Remediated

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization, including the field team members, is discussed in Section 3.0 of the Work Plan. The Work Plan discusses the personnel and organizations that are necessary for timely execution of the project tasks. It includes a Project Organization Chart that details the responsibilities of individual personnel or organizations and provides lines of reporting to ensure the smooth conduct of the work.

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3.0 PROJECT SCOPE AND OBJECTIVES

This time-critical project is focussed on the excavation, characterization and appropriate disposal of impacted soils from SEAD-59 and SEAD-71. In order to accomplish this project, several different sampling tasks are required. These are outlined below and discussed in detail in Section 5.0.

3.1 Task Description

3.1.1 Excavation and Staging of Impacted Soils

During the excavation and staging of impacted soil, analytical efforts will be undertaken in two phases. As soil is being excavated from a certain area, it will be staged in 500 to 600 cubic yard (cy) windrows. Soils will be collected from each 150 cy section of the windrow, composited by section and prepared for submission to the laboratory. Two sets of bottleware will be filled at the same time from the same composite sample for the two different phases of testing.

The first round of testing will focus on determining if the soil meets the requirements of the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation's Technical and Administrative Guidance Memorandum #4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (TAGM 4046). If the soil meets the Recommended Soil Cleanup Objectives (RSCOs) outlined in TAGM 4046, then no further testing is required. The soil will be used on site as backfill for the excavation.

If the soil does not meet the RSCOs, additional testing for the characteristics of hazardous waste will be performed. This full Resource Conservation and Recovery Act (RCRA) characterization will provide a determination of whether the soil in the subject windrow must be disposed of off site as a hazardous material.

3.1.2 Sampling of Excavations

After an excavation has been carried to its presumed completion, samples will be collected from the walls and the base of the excavation and tested for compliance with TAGM 4046. The results of this analytical work will determine if the excavation is complete or if more soil must be removed.

3.1.3 Sampling of Excavation Water

During the site work, any excavation water, run on and run off will be collected in 20,000 gallon FRAC tanks. Water and soapy water from the decontamination of various pieces of equipment will also be collected in these FRAC tanks. After each FRAC tank has been filled and allowed to settle, a sample of the water will be collected and analyzed for parameters requested by the wastewater treatment facility that will be receiving the water. When the results of the sampling are returned, the water will be removed for disposal, and the sediment in the tank applied to one of the staged windrows awaiting disposal.

3.1.4 Sampling of Containers

As the excavation proceeds, any drums, paint cans or other containers will be segregated from the soil and staged in a separate area. If these containers are not empty, the contents will be sampled for full RCRA characterization. The analytical results will be used to determine how each container is to be disposed.

3.1.5 Fill Material Sampling

One off site borrow pit has been designated for potential use as a source of fill material for the project. If this pit is used, one sample of material will be collected for full characterization to determine compliance with TAGM 4046. If compliance is not demonstrated, material from that pit will not be used as backfill.

Also, a minimum of three samples of fill material will be collected each day from three different trucks (one sample per truckload). These samples will be tested in the field using a photoionization detector (PID) that provides a qualitative indication of the presence of volatile organic compounds.

3.1.6 Waste Residuals

Waste residuals developed during the project, including disposable sampling tools, plastic sheeting and disposable personal protective equipment will not be sampled for chemical analysis. Rather, they will be collected and labeled according to the materials (debris window(s), wastewater FRAC tanks, excavations, etc.) they may have come in contact with. As the analytical results of the debris windrow samples become available, the residuals will be discarded as either hazardous or non-hazardous waste accordingly.

Decontamination wastes developed from the methanol, hexane and nitric acid rinses of sampling equipment will be containerized separately for disposal. These materials will not be sampled prior to disposal as hazardous wastes.

3.1.7 Monitoring Well Installation

This project includes the installation of a total of seven monitoring wells, four in SEAD-59 and three in SEAD-71. Soil sampling will take place only to characterize the soils for the purpose of the boring log development. No samples of either soil or groundwater will be collected for chemical analysis.

3.1.8 Perimeter Air Monitoring

Project air quality will be evaluated and documented during soil cleanup activities at SEAD 59 and SEAD 71 by instituting a perimeter air monitoring program. The purpose of the perimeter air monitoring program is to limit public exposure to potential airborne contaminant releases due to the soil cleanup activities. The perimeter air monitoring will be conducted in general accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP) (Rev. 1, 06/00) and the NYSDEC TAGM 4031 (Fugitive Dust Suppression and Particulate Monitoring Program at inactive Hazardous Waste Sites, October 27, 1989). Based on requirements specified in the NYSDOH CAMP, the perimeter air monitoring program will consist of real-time perimeter measurements for total volatile organic compounds (VOCs) and respirable airborne dust particulates (particulate matter less than 10 microns – PM_{10}).

3.2 Applicable Regulations and Standards

The following applicable regulations and standards will be referenced throughout this Field Sampling Plan:

- NYSDEC Division of Environmental Remediation's Technical and Administrative Guidance Memorandum #4046, *Determination of Soil Cleanup Objectives and Cleanup Levels* (TAGM 4046)

- NYSDEC Division of Environmental Remediation's Technical and Administrative Guidance Memorandum #4031, *Fugitive Dust Suppression and Particulate Monitoring Program at inactive Hazardous Waste Sites* (TAGM 4031)

- NYSDOH Generic Community Air Monitoring Plan (CAMP)

- RCRA 40 CFR Part 261, Subpart C, *Characteristics of Hazardous Waste*

3.3 Project Schedule

The project schedule is included in Appendix A of the Work Plan.

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4.0 FIELD SAMPLING DETAIL

Refer to the QAPP (Part Two of this SAP) for a more detailed description of the analytical program.

This section provides the detailed description of the field activities that were outlined in the preceding section.

4.1 Excavation and Staging of Impacted Soils

4.1.1 Sample Collection

All excavated materials will be staged in windrows of 500 to 600 cy. Dump trucks and loaders will be used to move the soils to the staged windrows. As the windrow is being built, each 150 cy section will be staked. As a 150 cy section of the windrow is completed, a sampling technician will collect samples from four different locations of the 150 cy section using a hand auger, shovels and trowels, as necessary. The technician will take care to sample the full depth of the windrow section. The four samples will be placed on a clean plastic sheet, and will be composited to form a representative sample from that section of the windrow.

Sample bottleware obtained from the laboratory for both Phase I and Phase II analytical work will be filled from this representative sample. All filled bottleware will be returned to the laboratory; Phase II analyses will be placed on hold pending the receipt of the Phase I analytical results.

4.1.2 Sample Analysis

4.1.2.1 Phase I Sample Analysis

Soil sample analysis for Phase I will include comprehensive testing to determine if the soil meets the requirements of TAGM 4046. This includes analysis for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TAL metals, pesticides and PCBs.

4.1.2.2 Phase II Sample Analysis

If any of the analytical results indicate that the RSCOs of TAGM 4046 are exceeded in a particular windrow, the windrow will be disposed of off-site. If VOCs are exceeded, the soils will be disposed of in a non-hazardous, Subtitle D industrial landfill. If PCBs are exceeded, the soils will be disposed of in a hazardous waste landfill.

If SVOCs, PPMs or pesticides are exceeded, then the Phase II analytical work will be performed. That work includes analysis for SVOCs, RCRA metals and/or pesticides as appropriate using the Toxicity Characteristic Leaching Procedure (TCLP). In addition, tests for ignitability, corrosivity and reactivity will also be performed. The results of the Phase II analyses will dictate the correct disposal facility for the soils from that particular windrow.

4.1.3 Sample Numbering

Windrow samples will be numbered as follows:

WS – XX – YY – ZZZ – A

WS designates that the sample is from a windrow. XX is the SEAD number, either 59 or 71. YY is a one- or two-character alphanumeric designating the area number within the SEAD. Area numbers for SEAD-59 are 1, 2, 3 and 4. Area numbers for SEAD-71 are A, B, C, D, E1, E2, and E3. ZZZ is the three-digit windrow number, provided to the sampler by the Pile Coordinator (i.e. 104, 036, 002). A is the number of the 150 cy section of the windrow from which the sample is derived.

4.2 Sampling of Excavations

Sampling of excavations will be performed to clear the excavations for backfilling and closure.

4.2.1 Sample Collection

Excavation walls and floors will be sampled to determine if excavation has been completed in that particular area. One grab sample per base and one grab sample from each wall of the excavation will be collected, for a total of five samples for each excavation. However, if any wall of an excavation exceeds 200 feet in length, one grab sample from each 200 foot section or fraction thereof will be collected. For example, if a wall is 447 feet long, a total of three wall samples will be collected from that wall.

An exception to this is SEAD-59, Area-1. SEAD-59, Area-1 will be excavated from east to west, and will sampled in three phases: Phase I after approximately one-third of the horizontal limits (east to west) has been excavated, Phase II at the two-thirds mark, and Phase III at the completion of the western third of the excavation. This will allow backfilling of the first third to begin before the completion of the whole excavation.

Samples will be collected using disposable sampling scoops from the interior of an excavation or from the bucket of a backhoe if outside of the excavation.

4.2.2 Sample Analysis

Excavation sample analysis will include comprehensive testing to determine if the soil meets the requirements of TAGM 4046. This includes analysis for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), TAL metals, pesticides and PCBs. If the RSCOs are met, then the excavation will be cleared for backfilling. If the RSCOs are not met, additional excavation will have to be undertaken.

4.2.3 Sample Numbering

These clearance samples will be numbered as follows:

CL – XX – YY – ZZZ

CL designates that the sample is a clearance sample from an excavation. XX is the SEAD number, either 59 or 71. YY is a one- or two-character alphanumeric designating the area number within the SEAD. Area numbers for SEAD-59 are 1, 2, 3 and 4. Area numbers for SEAD-71 are A, B, C, D, E1, E2, and E3.

ZZZ is a three-character alphanumeric designating if it is a wall or a floor sample, and the number of the sample. Floor samples will usually carry the designation F01, except where the excavations are phased as in SEAD-59, Area-1, where designations should be sequential (F02, F03, etc.). Wall samples will be designated as in the following examples: WN2 for second sample from the north wall, WE1 for first sample from the east wall, WW3 for the third sample from the west wall.

It is understood that the excavations will not line up with the compass points; however, the designation of a wall as a "south" wall, for example, should be done with an understanding that it is the most closely south-facing wall of the four. Meticulous notes will be maintained by the sampling technician regarding the orientation of the excavation and the location of samples.

4.3 Sampling of Excavation Water

Excavation wastewater, including run off, run on and decontamination rinse water will be collected on site in 20,000 gallon FRAC tanks. After filling, these tanks will be allowed to settle for a minimum of 72 hours before sampling.

4.3.1 Sample Collection

Samples will be collected from the top of the tank using a dedicated disposable polyethylene bailer lowered into the tank with nylon rope.

4.3.2 Sample Analysis

The Town of Romulus wastewater treatment plant will be accepting the site wastewater for treatment. They require the following list of analytes: pH, total dissolved solids (TDS), total suspended solids (TSS), biological oxygen demand (BOD), ammonia as nitrogen and total priority pollutant metals (PPMs).

Based on the analytical results, the contents of the FRAC tank will be emptied directly into the on site sewer for disposal.

4.3.3 Sample Numbering

The wastewater samples will be numbered as follows:

WW – XX – TTTT -- MMDD

WW indicates that it is a wastewater sample. XX is the SEAD number, either 59 or 71. TTTT indicates the tank number. MMDD is the month and the day that the sample is collected. It is anticipated that one tank may service a number of areas in a particular SEAD, and that the tank may be used several time over the length of the project.

4.4 Sampling of Containers

Drums, paint cans, and other containers are expected to be excavated during the site activities. These will be segregated into a separate staging area.

4.4.1 Sample Collection

Each container that is holding material will be sampled using an appropriate means such as a coliwasa or thief sampler for drums, and beakers or dippers for smaller containers. Solids may require a chisel and hammer. To the maximum extent possible, the sampler will be both dedicated and disposable.

4.4.2 Sample Analysis

These miscellaneous samples must be characterized for disposal as hazardous waste. The full RCRA analytical suite will be used for these materials, including TCLP VOCs, SVOCs, RCRA metals and pesticides/herbicides, and total PCBs. In addition, a paint filter test and tests for ignitability, corrosivity and reactivity will also be performed.

4.4.3 Sample Numbering

The samples of miscellaneous containerized wastes will be numbered as follows:

MC – XX – YY – ZZZZ

MC indicates that it is a sample from a miscellaneous container. XX is the SEAD number, either 59 or 71. YY is a one- or two-character alphanumeric designating the area number within the SEAD. Area numbers for SEAD-59 are 1, 2, 3 and 4. Area numbers for SEAD-71 are A, B, C, D, E1, E2, and E3.

ZZZZ is a unique container number assigned by the sampling technician to the container being sampled. The container is to be clearly labeled with the number XX – YY – ZZZZ in the field, and meticulous notes will be maintained in the field logbook concerning the type of container, dimensions, capacity, appearance (color, condition, etc.), contents (solid, liquid), amount of capacity filled, and other distinguishing information such a label contents.

4.5 Fill Material Sampling

Fill material from an off-site borrow pit may be used to augment the on site fill. Prior to accepting any material from the pit on site, the fill material will be sampled to determine if it meets the requirements of TAGM 4046.

4.5.1 Sample Collection

A sample will be collected from the face of the borrow pit anticipated to be the source of material to be delivered to the SEDA. It will be collected from at least three inches behind the face of the pit using shovels and scoops as appropriate.

4.5.2 Sample Analysis

The soil sample will be submitted for analysis for VOCs, SVOCs, TAL metals, pesticides/herbicides and PCBs. If any of the RSCOs listed in TAGM 4046 are exceeded in the analytical results, the borrow pit will be rejected as a source of fill material for the project.

4.5.3 Sample Designation

The fill material sample will be designated as follows:

FM – XX

FM indicates that the sample is fill material. XX is the number of the source pit, assigned sequentially, for example FM-01.

4.5.4 Headspace Sampling

A minimum of three samples a day will be collected from trucks supplying fill material to the site. Only one sample will be collected from one truck. These grab samples will be collected using scoops from the bed of the truck. They will be sealed in glass containers with an aluminum foil septum and allowed to volatilize for approximately 5 minutes. The headspace in the jar will then be sampled by puncturing the aluminum foil with the probe of a PID. The results of this headspace analysis will be maintained by the sampling technician in a field log in which is noted, at a minimum, the trailer number, sampling time and date, and the PID reading. Also recorded will be calibrations of the PID, performed in the morning and in the evening of each day of sampling.

4.6 Perimeter Air Monitoring

Project air quality will be evaluated and documented during soil cleanup activities at SEAD 59 and SEAD 71 by instituting a perimeter air monitoring program. The purpose of the perimeter air monitoring program is to limit public exposure to potential airborne contaminant releases due to the soil cleanup activities. The perimeter air monitoring will be conducted in general accordance with the NYSDOH Generic Community Air Monitoring Plan (CAMP) (Rev. 1, 06/00) and the NYSDEC TAGM 4031 (Fugitive Dust Suppression and Particulate Monitoring Program at inactive Hazardous Waste Sites, October 27, 1989). Based on requirements specified in the NYSDOH CAMP, the perimeter air monitoring program will consist of real-time perimeter measurements for total volatile organic compounds (VOCs) and respirable airborne dust particulates (particulate matter less than 10 microns – PM_{10}).

4.6.1 Monitoring Locations

Continuous perimeter monitoring for VOCs and airborne particulates will be conducted at perimeter locations upwind and downwind of soil removal activities at the excavation and materials handling areas for SEAD 59 and SEAD 71. There will be one upwind and two downwind perimeter monitoring sites. The upwind site will be used to document existing (baseline) VOC and particulate levels, and the downwind sites will document VOC and particulate levels due to Project soil cleanup activities. ENSR will operate two downwind perimeter monitoring sites instead of one due to the overall size of the project excavation areas, and the likelihood of excavation activities occurring simultaneously at SEAD-59 and SEAD-71.

Meteorological data (W/S, W/D, sigma theta, temperature, and relative humidity/dew point) will also be monitored on-site at a central location throughout the remediation program. Perimeter air monitor siting will be based on the measured daily wind direction, and monitoring sites may be moved during the day to new perimeter locations, if necessary, to accommodate wind shifts.

4.6.2 Daily Air Monitoring Schedule and Data Collection Intervals

Perimeter air monitoring will begin daily upon commencement of remedial activities, and will operate continuously during all remediation activities that could result in fugitive air emissions. Data from all perimeter monitoring, as well as all on-site meteorological data, will be continuously logged as 15-minute averages. Monitoring data and on-site meteorological data will be downloaded at the end of each workday to an on-site PC, and then electronically copied to final storage on a central data base system at ENSR's Syracuse, NY office.

4.6.3 Continuous VOC Air Monitoring

Real-time perimeter measurements of total VOCs will be performed using a RAE Systems MiniRAE 2000 portable photo ionization detector (PID) or equivalent, and conducted in general accordance with the NYSDOH CAMP. Real-time VOC monitors will be operated continuously at two downwind perimeter locations during any intrusive excavation and material handling activities. A real-time VOC monitor will also be operated periodically, as necessary, at one perimeter location downwind of non-intrusive activities such as the collection of soil and sediment samples. To document baseline VOC concentrations, real-time VOC measurements will be conducted at one upwind perimeter location the beginning of each perimeter air monitoring day and periodically throughout the day.

Each VOC monitor will be calibrated according to manufacturer's recommendations. Calibrations will be conducted each morning at the beginning of on-site activities with an appropriate concentration of isobutylene.

Each VOC monitor will be equipped with an audible alarm that will indicate any exceedence of 15-minute total VOC action levels as determined in the NYSDOH CAMP. Immediate verbal notification will be given to the Site Safety Officer by ENSR's on-site technician when VOC action levels are exceeded at any perimeter monitoring location.

4.6.4 Continuous Particulate Air Monitoring

Real-time perimeter measurements of airborne particulates will be conducted in general accordance with the NYSDOH CAMP and NYSDEC TAGM 4031 using a MIE DataRAM or equivalent, using near-forward light scattering to detect airborne particles. Each DataRAM monitor will be configured to respond only to dust particles $\leq$ 10 microns in diameter (PM_{10}). Particulate monitors will be operated continuously at two downwind perimeter locations and one upwind perimeter location during any intrusive excavation and soil material handling activities.

Each particulate monitor will be calibrated in accordance with manufacturer instructions. Calibrations will be conducted at the beginning of on-site activities using the monitor's internal zero and span calibration features.

Each particulate monitor will be equipped with an audible alarm that will indicate any exceedence of 15-minute PM_{10} action levels as determined in the NYSDOH CAMP. Immediate verbal notification will be given to the Site Safety Officer by ENSR's on-site technician when PM_{10} action levels are exceeded at any downwind monitoring location.

4.6.5 Meteorological Monitoring

An 8-foot tripod-mounted meteorological station will be erected at a central location on-site. The tower will be equipped with sensors to measure wind speed and direction, sigma theta, temperature, and relative humidity/dew point on a continuous basis during remedial activities. The station will be installed before remediation activities begin. A Climatronics F460 or WMIII system will be used for meteorological measurements. The Odessa data logger provided with the meteorological system also includes a digital standard deviation (sigma) processor that calculates the wind fluctuation (sigma theta). Sigma theta is an important parameter to observe during remediation activity, so that the potential for fugitive emissions to change direction during slow wind periods can be documented.

Meteorological sensors will be calibrated by ENSR prior to shipment for field use, and again upon conclusion of the operational period. Sensors will be properly oriented in accordance with manufacturer instructions. All data collected during the monitoring program will be routinely screened for potential operational problems. General weather conditions will be recorded in the field notebook or on field forms to be compared with meteorological data.

4.6.6 Field Operations and Quality Control

Routine field operations for the perimeter air monitoring program will coincide with the soil removal field activities at SEAD-59 and SEAD-71, which are assumed to occur over a contiguous period. During the air monitoring, ENSR will provide one on-site technician to conduct routine operation according to the project requirements. The ENSR technician is responsible for routine inspection of the equipment operation, daily calibration, data collection, and daily oral reporting of the results to the Site Safety Officer and ENSR air monitoring task manager.

Instrument performance will be confirmed through calibration checks. Calibrations will be performed in accordance with manufacturer recommendations. Daily calibrations will be performed on VOC and particulate monitors to test instrument drift.

Real-time sampling results for VOCs and particulates will be immediately reported by ENSR'S on-site technician to the Site Safety Officer to allow prompt evaluation and response to potential emission problems when action levels have been exceeded and shut-down and startup criteria are met.

A field log book and sensor calibration field forms will be maintained by ENSR throughout the sampling effort. Information to be recorded by ENSR will include:

- Description of remediation activities conducted during sample collection;
- Any corrective actions used due to elevated, real-time monitoring readings such as shut-downs, covering stockpiles, reduced work pace, etc.;
- Monitoring equipment installation, operation and removal dates;
- Monitoring equipment calibration and maintenance dates and results;
- General field weather conditions on sampling days;
- Any unusual situations which may affect samples or sampling;

- Project number and location;
- Monitoring start and stop times;

4.6.7 Data Reporting

Data reporting will consist of weekly status reports and a final report summary. A weekly status report memorandum will be submitted by the ENSR air monitoring task manager by e-mail or facsimile. Each weekly status report will present a summary of the data collected for the previous week and discussion of any action level exceedences of VOCs or airborne particulates.

After completion of the monitoring program, all monitoring data will be reported in a section of the overall Project completion report. The section will present a summary and discussion of the following:

- site conditions
- monitoring methodology
- monitoring locations
- instrument calibration results
- monitoring results

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5.0 FIELD PROCEDURES

5.1 Laboratory Analytical Methodologies

Laboratory analytical services will be performed by Columbia Analytical Services, Inc., of Rochester, New York. The analytical work elements to be performed by each laboratory will be determined by the Project Manager prior to the initiation of field work.

The media to be sampled during implementation for this project include excavated soil and excavation water, fill material and the contents of waste containers. Analysis methods are defined by EPA SW-846 (EPA 1986, 1994c, 1996) and American Society for Testing and Materials (ASTM) methodology. The following brief narrative describes the analytical technique and instrument detection for the analytical methodologies.

- Volatile organic compounds (VOCs) by USEPA Method 8260B (totals and TCLP);
- Semi-volatile organic compounds (SVOCs) by USEPA Method 8270C (totals and TCLP);
- TAL Metals by USEPA Method 6010B (totals and TCLP);
- Mercury by USEPA Method 7471A (total and TCLP);
- Cyanide by USEPA Method 9012A;
- Pesticides by USEPA Method 80801A (totals and TCLP);
- Polychlorinated Biphenyls (PCBs) by USEPA Method 8082 (totals);
- pH by USEPA Method 150.1;
- Total Dissolved Solids (TDS) by USEPA Method 160.1;
- Total Suspended Solids (TSS) by USEPA Method 160.2;
- Biologic Oxygen Demand (BOD-5) by USEPA Method 405.1;
- Ammonia as nitrogen by USEPA Method 350.1/350.2;
- Ignitability by ASTM Method E-502-84 (SW846 1010);
- Reactivity by USEPA Methods 9012 and 9030A (SW846 Chapter 7.4); and
- Corrosivity by USEPA Method 9045.

The QAPP provides detailed information on the analytical requirements for each medium or for a specific task. Please refer to the QAPP for information regarding analytical procedural requirements for the activity being performed.

5.2 Ambient Temperature Headspace Field Screening

Soil samples will be field screened for organic vapors using a photoionization detector (PID). Prior to soil screening, instruments must be properly calibrated. All calibration data will be recorded in the field logbook.

The following ambient temperature headspace (ATH) screening procedure will be adhered to when using a PID:

- Samples must be collected from freshly uncovered soil.
- Partially fill (one-third to one-half) a glass sample jar with the sample to be analyzed; total capacity of the jar may not be less than 8 ounces (250 mL). Sample containers must be quickly and tightly sealed with an aluminum foil septum between the jar and cap.
- Headspace vapors will develop in the container for a least 10 minutes but no more than 1 hour. Containers must be agitated for 15 seconds at the beginning and at the end of the headspace development period. Headspace temperatures within the container must be warmed to at least 40°F.
- After headspace development, insert the probe through the aluminum foil to a point about one-half the headspace depth. The container opening must be minimized and care taken to avoid uptake of water droplets and soil particles.
- The highest meter reading will be recorded, which normally will occur between 2 and 5 seconds after probe insertion. If an erratic response occurs due to high organic vapor concentrations or high headspace moisture content, a note to that effect will accompany headspace data.
- All headspace data will be logged in the field logbook.
- The field team will measure ATH using a PID with a 10.2 eV lamp.

5.3 Sample Labeling and Documentation

Each sample container will have an individual sample label. Sample labels will have an adhesive coating on the back to stick to sample containers. Each sample label will contain the following information:

- Project number
- Project name
- Date and time of sample collection

- Preservative, where applicable
- Sample identification (ID) number
- Sample location
- Requested analyses, where applicable
- Sampler's initials

5.4 Quality Control Samples

Samples for quality control (QC) purposes will be collected during the course of the project to document that field decontamination procedures are being adequately followed and as a determination that the laboratory data is accurate and comparable. The four types of quality control samples will be collected during the course of this project are:

- Field Duplicate QC Samples;
- Matrix Spike/Matrix Spike Duplicates;
- Equipment Rinse Blanks; and
- Trip Blanks.

Details of the various types of quality control samples and their objectives are present below.

5.4.1 Field Duplicate QC Samples

These samples are collected by the field sampling team for analysis by the contract laboratory. The identity of duplicate QC samples is to be held blind to the analysts, and the purpose of these samples is to provide site specific, field-originated information regarding the homogeneity of the sampled matrix and the consistency of the field effort. These samples will be collected concurrently with the primary environmental samples to equally represent the medium at a given time and location. Field duplicate QC samples will be collected from each medium addressed by this project and submitted to the contractor laboratory for identical analysis as the primary environmental sample it duplicates.

Field Duplicate samples will be collected and analyzed at a frequency of 5 percent (1 in 20), or at a minimum of one per matrix sampled.

The samples of field duplicate QC samples will be numbered as follows:

FD – XX – YY – ZZ

FD indicates that it is a field duplicate sample for quality control purposes. XX is the SEAD number, either 59 or 71. YY is a two-character alphanumeric designating the sample type. WS will be used to designate a duplicate sample from a soil windrow. CL designates a clearance sample from an excavation. WW indicates a wastewater sample. MC designates a sample from a miscellaneous container. MW indicates a soil sample collected from a monitoring well borehole. ZZ is a one or two-character numeric number indicating the field duplicate number for that particular matrix.

5.4.2 Matrix Spike/Matrix Spike Duplicate QC Samples

These samples are collected by the field team for analysis by the contract laboratory. These samples will be collected concurrently with the primary environmental samples to equally represent the medium at a given time and location. Matrix spike/matrix spike duplicate QC samples will be collected from each medium addressed by this project and submitted to the contractor laboratory for identical analysis as the primary environmental sample it duplicates.

Matrix spike/matrix spike duplicate QC samples will be collected and analyzed at a frequency of 5 percent (1 in 20), or at a minimum of one per matrix sampled.

The samples for matrix spike/matrix spike duplicate analysis will be numbered as per the directions given in the sample numbering sections 4.1.1, 4.1.2 and 4.1.3 with the suffix – MS/MSD added to the sample designation

5.4.3 Equipment Rinsate QC Samples

These samples are collected by the field team from the water rinsate collected from the decontamination activities. They will comprise samples of analyte-free water which has been rinsed over the decontaminated sampling equipment, collected and submitted for analysis of the parameters of interest. They are employed to assess the effectiveness of the decontamination process, the potential for cross-contamination between sampling locations, and incidental field contamination.

Equipment rinsate samples will be collected at a frequency of one per every twenty samples submitted that were collected using decontaminated field equipment.

The samples of equipment rinsate QC samples will be numbered as follows:

ER-MM-DD

ER indicates that it is an equipment rinsate sample for quality control purposes. MM indicates the month during which the sample is collected. DD indicates the day of the month on which the sample was collected.

5.4.4 Trip Blank QC Samples

These samples consist of containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until they are returned for analysis. The purpose of the trip blank QC samples is to determine whether samples are being contaminated during transit to the laboratory or during sample collection. For this project, one trip blank sample will be submitted for each shipment of water samples designated for volatile organic analysis.

5.5 Field Documentation

A field activities logbook will be maintained for all daily sampling activities. This logbook provides a record of sample collection, including time sampled and by whom, along with any other comments that will aid in the ability to reconstruct sampling activities without reliance on memory. Any deviation from the sampling plan will be logged, including justification and circumstances. Entries will be made in waterproof, black ink. In the case of an error, corrections will be made by crossing a single line through the incorrect information and entering the correct information. All corrections will be initialed and dated.

Photographic documentation of significant visual field observations will be collected and recorded on a photo log. The log will include time, date, and location of photograph and may include direction, photo subject, scale, and other relevant information.

Additional field documentation may be required for each specific sampling method and is described in detail in the exhibits to this document. These field documents may include the following forms:

- Boring log form
- Monitoring well construction record
- Field parameter form
- Chain-of-custody form
- Photo log

The Field Team Leader or designee will be responsible for organizing the appropriate log forms into a three-ring or comb binder for the sampling team(s).

5.6 Sample Storage, Transport, and Chain of Custody

Following sample collection and labeling, samples will be packaged for transport to the analytical laboratory. Samples will be stored in a cooler with ice, ice packs, or dry ice, and delivered to the on-site laboratory courier the same day they are collected. Packaging procedures for the samples are discussed in detail in the QAPP (Part 2 of this SAP).

- Coolers will be picked up at the site by a designated courier or laboratory personnel. Coolers may also be delivered to the laboratory by contractor personnel within 24 hours of sample collection.
- Clear tape may be placed around each sample label to prevent labels from falling off (with the exception of volatile organic analysis [VOA] samples).
- The coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.

Chain-of-custody procedures will be followed in accordance with standard EPA protocol in order to track the custody of the samples. The chain-of-custody form is designed to document the transfer of samples from the field to the laboratory. As such, the form summarizes the contents of the shipment and tracks the dates and times of any custody transfer, and signatures of all parties relinquishing and receiving the samples. The sampler must sign the chain-of-custody form(s) in the designated "sampler" space and the "relinquished by" space. The pink copy of the form is then removed from the back, and the white and yellow forms are placed in the sealed plastic bag and sealed inside the cooler. When completed, this form will contain the following information:

- Sample numbers (corresponding to the sample ID numbers on the sample labels)
- Project number
- Project/client name and location
- Sampler's signature
- Custody seal number
- Date/time of sample collection
- Type of samples (e.g., sludge, soil, groundwater)
- Analytical requirements
- Number and type of containers (e.g., 40-ml glass VOA, stainless steel sleeve)
- Remarks (e.g., samples filtered in the field, high headspace, etc.)
- Date/time samples relinquished by
- Date/time samples received by

From the time the sample is collected, it will be under the direct control of contractor personnel. If a sample cooler is left unattended, it must be secured with a custody seal and signed by the responsible party. The custody seal will have an identification number on it, which will be recorded on the chain-of-custody form. Before contractor personnel relinquish the samples to the designated courier or a laboratory representative picking up the samples from the site, the seals will be removed and their condition documented in the field activities logbook. The samples will then be relinquished to the designated courier or laboratory representative, and the chain-of-custody forms will be sealed inside the cooler. New custody seals will be placed on the outside of the cooler, with their identification number recorded on the chain-of-custody form.

In the event that a courier, such as Federal Express, is used to transport samples, the chain-of-custody form will be sealed inside the cooler, taped to the top lid in a sealed bag, and custody seals will be taped on the outside edges of the cooler or across the cooler latch. The designated courier will not sign the chain-of-custody form, but will provide either a bill-of-lading or air bill showing they received the cooler and who the cooler is being shipped to. The bill-of-lading (air bill) number will be indicated in the field activities logbook and a copy of the bill-of-lading (air bill) form will be retained until the cooler arrives at the laboratory.

Copies of the chain-of-custody forms will be returned by the laboratory with the analytical results. The form will indicate personal custody of the sample by dated signature and the analytical suite for each sample. More than one sample may appear on a form.

5.7 Sampling Equipment Decontamination Procedures

5.7.1 Sampling Equipment

The reusable sampling equipment will be decontaminated after each sample is collected to minimize the potential for cross-contamination between samples. Where appropriate, disposable sampling equipment (disposable Teflon bailers, filters, discharge tubing, etc.) should be used to reduce the chances for cross-contamination.

5.7.2 Small Equipment Decontamination Procedures

Decontamination solutions will be prepared for cleaning sampling equipment in the field, unless otherwise specified in the implementing documentation. The field decontamination procedure for sampling equipment will include, at a minimum, washing equipment in each of the following solutions:

- Solution #1 – Potable water rinse/flush
- Solution #2 – Non-ionic detergent (i.e., Alconox) and potable water scrub
- Solution #3 – Distilled water rinse/flush
- Solution #4 – Methanol rinse/flush
- Solution #5 – Hexane rinse/flush
- Solution #6 – Distilled water rinse/flush

If samples are to be analyzed for metals, a nitric acid rinse/flush and an additional distilled water rinse/flush shall be added between steps 3 and 4. All decontamination wastes shall be disposed of off-site as hazardous waste.

Any deviation from this procedure will be called out in the implementing documentation.

5.7.3 Large Equipment Decontamination Procedures

Large equipment that comes into contact with subsurface materials, (i.e. excavators, backhoes, front end loaders, drill rigs, etc.) will be cleaned prior to arrival at the project site and before demobilization from the project site. In addition, the drill rig will be cleaned between each monitoring well location. Soil handling equipment will also be decontaminated prior to mobilizing from one SEAD area to another and also prior to handling of clean borrow materials intended for backfilling. Finally, all PVC well materials will also be steam cleaned prior to installation for well construction.

A decontamination area will be designated by the USACE Field Engineer. If available, an existing decontamination pad will be used. If no existing decontamination pad is available, one will be constructed by the contractor. The decontamination pad will be designed and operated such that all debris resulting from, and the materials used during, decontamination are captured and recovered prior to their release to the environment.

Large equipment will be decontaminated using high-pressure steam cleaning equipment using water from a potable source. Fluids and solids generated during decontamination activities will be segregated and recovered. Liquids will be placed into DOT approved drums, sampled for waste characterization, and transported off-site for proper disposal. Recovered solids will be added to the excavated soils stockpiled for disposal.

5.8 Monitoring Well Installation

The procedures addressed in this section include those related to the drilling, installation and completion of groundwater monitoring wells. The collection of soil samples for visual description is also discussed. A total of four (4) monitoring wells are scheduled to be installed in the vicinity of SEAD-59 and three (3) monitoring wells are scheduled to be installed in the vicinity of SEAD-71 as directed in the field by the USACE Field Engineer. The USACE Field Engineer will also provide direction as to the final depth(s) for the monitoring well installations. The monitoring wells will be advanced in accordance with ENSR's Standard Operating Procedure (SOP) No. 7220—Monitoring Well Construction and Installation (See Exhibit 3). This operating procedure is in compliance with the NYSDEC general construction procedures for monitoring wells as provided in 6 NYCRR Part 360-2.11(a)(8).

5.8.1 Drilling Methods and Equipment

The monitoring wells will be installed using a truck-mounted rotary drill rig equipped with 4.25-inch inside diameter (ID) hollow-stem augers. All drilling equipment and down hole sampling tools which come in contact with subsurface materials including drill bits, augers, and casings will be decontaminated prior to project site entry and between each well location. Soil sampling equipment shall consist of 2-inch by 2-foot standard split-spoons driven by a 140-pound hammer operated by either automatic hammer equipment or a drill rig mounted cathead and rope.

5.8.2 Materials

Monitoring well construction materials are specified below.

5.8.2.1 Riser Casing, Screen, and Centralizers

The overburden monitoring wells will consist of two-inch diameter, Schedule 40 PVC casing flush-threaded to two-inch diameter, Schedule 40 PVC 0.010-inch slotted well screen. Screen lengths will be determined in the field by an ENSR field geologist and shall be designed to straddle the water table within the borehole. Stainless-steel and/or PVC centralizers shall be used for all monitoring wells installed to a depth of 15-feet below grade. A "J-plug" well cap will be installed on each monitoring well. Well materials will be decontaminated using a high-pressure steam wash prior to insertion in the borehole for well construction in accordance with Section 5.6.3 above

5.8.2.2 Filter Pack, Bentonite Seal, and Cement/Bentonite Grout

The filter pack for the monitoring wells shall consist of clean, washed #00 silica quartz sand. The bentonite seal shall consist of bentonite pellets, bentonite chips or hydrated granular bentonite. Cement/bentonite grout shall consist of one bag (94-pounds) of Portland Cement and two to three pounds of granular bentonite mixed with approximately 7.5-gallons of clean, potable water

5.8.2.3 Surface Completion

Each well will be completed with a 4-inch diameter steel or aluminum, lockable stick-up well protector set in a 2-foot diameter by 1-foot deep concrete pad. In areas where vehicle traffic is expected, or as directed by the USACE Field Engineer, flush-mount well protectors will be substituted for the stick-up well protector. Weather resistant, keyed alike pad locks will be installed on each lockable stick-up well protector or on the "J-plug well cap for wells with flush-mount well protector completions.

5.8.2.4 Water Source

Only clean, potable water will be used for well construction and equipment decontamination. The USACE Field Engineer will designate an on-site source of potable water to be used for this project. It will be the responsibility of the drilling contractor to load and transport the potable water to the appropriate work area where it will be used.

5.8.2.5 Delivery, Storage and Handling of Well Materials

All well construction materials shall be delivered to the site, staged and handled in such a manner as to prevent damage to or contamination of the materials. A material staging area will be designated by the USACE Field Engineer. Portland Cement, concrete and bentonite materials will be stored on wooden pallets and covered with a PVC tarp or equivalent to prevent rain water, surface runoff or other precipitation from affecting the material.

5.8.3 Well Installation

5.8.3.1 Borehole Advancement

The boreholes for the monitoring wells will be advanced using a truck-mounted rotary drill rig equipped with 4.25-inch ID hollow-stem augers in accordance with ENSR's Standard Operating Procedure (SOP) No. 7220—Monitoring Well Construction and Installation (See Exhibit 3). The augers will be advanced in two-foot intervals to accommodate continuous split-spoon sampling in accordance with Section 5.7.3.2. The locations and final depths of the boreholes for the monitoring wells will be determined in the field by the USACE Field Engineer. Soil cuttings generated during the drilling of the boreholes will be placed in the windrows of excavated soils for disposal.

5.8.3.2 Split-Spoon Soil Sampling

Soil samples shall be collected on a continuous basis in two-foot intervals during the drilling of each monitoring well borehole in accordance with ENSR's SOP No. 7115—Subsurface Soil Sampling by Split-Spoon (See Exhibit 2). Each soil sample will be inspected and classified by a ENSR field geologist according to the Burmister Soil Classification System and the United Soil Classification System (USCS). All data relevant to each sample will be recorded on a Soil Boring Log including the sample identification number, sample depth, blow counts per 6-inch interval, sample recovery, and sample description. A separate Soil Boring Log will be completed for each monitoring well borehole.

A representative portion of each sample will be placed in a glass sample jar and analyzed by ambient temperature headspace field screening techniques detailed in Section 5.2 above.

Soil samples to be submitted for laboratory analysis shall be placed into the appropriate laboratory-supplied, sterile sample containers, handled and submitted for a analysis in accordance with Sections 5.3—Sample Labeling and Documentation, 5.4—Field Documentation, and 5.5—Sample Storage, Transport and Chain-of-Custody above.

5.8.3.3 Borehole Diameter and Depth

The boreholes will be advanced using 4.25-inch hollow-stem augers which produce a borehole of approximately 8 to 9-inches in diameter. The final depths of the boreholes will be determined in the field by the USACE Field Engineer.

5.8.3.4 Screen and Well Casing Placement

Well screens will be designed to straddle the top of the water table with approximately 2-feet of the well screen installed above the water table so that they may be monitored for the presence of free phase floating product (LNAPL). It is anticipated that 10-foot long screening sections will be installed at the site. Well riser will be flushed threaded to the well screen. Well riser lengths will be determined in the field so as to produce an approximate 2.5-foot stick-up for installations where stick-up well protectors are used or to be approximately 5-inches below grade for installations where flush-mount well protectors are to be installed.

5.8.3.5 Filter Pack Placement

The filter pack for each well will be consist of No. 00 quartz silica sand and shall be placed around the well screening in accordance with ENSR's SOP No. 7220—Monitoring Well Construction and Installation (See Exhibit 3).

5.8.3.6 Bentonite Seal

The bentonite seal for each monitoring well shall consist of bentonite pellets, bentonite chips or hydrated granular bentonite and shall be placed around the well above the filter pack in Accordance with ENSR's SOP No. 7220—Monitoring Well Construction and Installation (See Exhibit 3). If bentonite pellets or chips are installed above the water table, a minimum of 10-gallons of potable water will be poured onto the bentonite, and the bentonite chips/pellets will be allowed to hydrate for a minimum of 30-minutes prior to installation of the cement/bentonite grout seal.

5.8.3.7 Concrete Pad/Protective Cover Placement

The protective cover for each well will be set into a 2-foot diameter concrete pad in accordance with ENSR's SOP No. 7220—Monitoring Well Construction and Installation (See Exhibit 3). The USACE Field Engineer will determine if stick-up or flush-mount well protectors are to be used for each well installation.

5.8.3.8 Well Identification

Each well will be labeled with its unique identification number using a permanent marker. The wells identification number will be applied to the "J-plug" well cap and to the outer surface of stick-up well protectors.

5.8.3.9 Well Development

Each monitoring well will be developed to establish a good hydraulic connection with the surrounding native soils. The wells will be developed in accordance with ENSR's SOP No. 7221—Monitoring Well Development. Well development water will be collected in DOT-approved steel drums and staged on-site pending receipt of analytical results from the well sampling (to be performed by others under a separate contract). If it is determined, based on analytical results that the development water meets New York State Groundwater Standards, then the water may be released to the facility's storm sewer system. If it is determined that the development water does not meet New York State Groundwater Standards, then the water will be transported off-site for proper disposal. Groundwater sampling will be conducted by others under a separate contract.

5.9 Equipment Calibration

Monitoring equipment used for this project will be calibrated, at a minimum, daily each morning before the start of work. ENSR will follow the manufacture's calibration instructions that are detailed in the owner's manual for each type of instrument. The two types of meters that will be calibrated daily are:

- MiniRAE 2000 portable (PID) or equivalent; and
- PDR-3 Miniram dust and aerosol monitor, or equivalent.

Equipment calibration will be documented in the field log book. Such documentation shall include, at a minimum, the following information:

- Date and time of calibration;
- Equipment type;
- Equipment serial number;
- Calibration gas concentration (if applicable);
- Precalibration equipment reading;
- Post calibration equipment reading;

- Calibrator's initials; and
- Notes or comments evaluating the success of the calibration

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6.0 REFERENCES

New York Code of Rules and Regulations, Title 6, Part 360, *Solid Waste Management Facilities,* November 1996: Section 2.11(a)(8), *Monitoring Wells and Piezometers.*

New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4031, *Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites*, October 27, 1989.

NYSDEC Division of Environmental Remediation's TAGM #4046, *Determination of Soil Cleanup Objectives and Cleanup Levels*, January 24, 1994.

New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan* (CAMP), Rev. 1, June 2000.

RCRA 40 CFR Part 261, Subpart C, *Characteristics of Hazardous Waste*

US Army Corps of Engineers Publication Number EM 200-1-3, *Engineering and Design - Requirements for the Preparation of Sampling and Analysis Plans.*

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EXHIBITS

SOP NUMBER: 7110

Surface Soil Sampling

Date:	2^{nd} Qtr. 1994
Revision Number:	1
Author:	Charlie Martin
Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This standard operating procedure (SOP) describes the methods used for obtaining surface soil samples for physical and/or chemical analysis. For purposes of this SOP, surface soil (including shallow subsurface soil) is loosely defined as soil that is present within 5 feet of the ground surface and can be sampled with the use of readily available and easy-to-operate sampling equipment. Various types of sampling equipment are used in the collection of surface soil samples and include spoons or scoops, trowels, shovels, and hand or bucket augers.

The purpose of this SOP is to provide a specific method and/or procedure to be used in the collection of surface soil samples which, if followed properly, will promote consistency in sampling and provide a basis for sample representativeness.

This SOP is generally applicable to surface and shallow depth soils which are unconsolidated and are of low to moderate density. Higher density or compacted soils may require use of drill rigs or other powered equipment to effectively obtain representative samples.

It should be noted that other specific state and/or federal agency standard operating procedures may be in existence in certain areas which may require deviation from this sampling procedure. The applicability of other agency operating procedures, which may differ from ENSR's SOP, needs to be determined prior to start of the sampling program. Deviations from this SOP to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the project work plan, and must be documented in the field project notebook when they occur.

1.2 General Principles

Surface soil sampling generally involves use of hand-operated equipment to obtain representative soil samples from the ground surface and to shallow depths below the ground surface. If soil conditions are appropriate, surface soil sampling, following the procedures described in this SOP, can provide representative soil samples in an efficient manner.

1.3 Quality Assurance Planning Considerations

Project personnel should follow specific quality assurance guidelines for sampling as outlined in the site-specific QAPP and/or Sampling Plan. Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements typically suggest the collection of a sufficient quantity of field duplicate, field blank, and equipment blank samples.

1.4 Health and Safety Considerations

Surface soil sampling may involve chemical exposure hazards associated with the type of contaminants present in surface soil. When surface soil sampling is performed, adequate Health and Safety measures must be taken to protect sampling personnel. These measures must be addressed in the project Health and Safety Plan (HASP). This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing sampling, and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Sampling Personnel

It will be the responsibility of the sampling personnel to conduct surface soil sampling in a manner consistent with this SOP. The above individual will be responsible for the proper use and maintenance of all types of equipment used for obtaining surface soil samples, and the collection, labeling, handling and storage of all samples until further chain-of-custody procedures are undertaken.

2.2 Sampling Coordinator

Large sampling programs may require additional support personnel such as a sampling coordinator. The sampling coordinator is responsible for providing management support such as maintaining an orderly sampling process, providing instructions to sampling personnel regarding sampling locations, and fulfilling sample documentation requirements, thereby allowing sampling personnel to collect samples in an efficient manner.

2.3 Project Manager

It is the responsibility of the project manager to ensure that the sampling activity is properly staffed, planned, and executed.

3.0 REQUIRED MATERIALS

3.1 Spoons or Scoops

Spoons or scoops should preferably be constructed of stainless steel as this material is abrasion resistant, can be easily decontaminated, and can be used to manually extract low to moderate density soil samples directly from the ground surface. Other spoon/scoop construction materials such as high-density polyethylene and teflon may be suitable in some applications but are difficult to use in higher density soils.

3.2 Trowel

Stainless steel construction is preferred. The blade of a trowel is generally flat or slightly curved and is 5 to 6 inches in length. Some trowels are available with depth calibrations marked on the blade.

3.3 Shovel

Shovels may be long or short-handled and are most often used for preparation of the sample collection area, i.e., for removal of surface debris or penetration of a high density/compacted surface prior to collection of the sample with another more appropriate device. Shovels may be used for the collection of samples that require large volumes of material for analysis (i.e., for bench-scale treatability studies). Shovels can also be used for scraping of test pit sidewalls in preparation for sidewall sampling using another device.

3.4 Hand Auger

This tool, commonly referred to as a soil auger, consists of a short spiral-bladed metal rod (solid-stem auger) attached to a handle. Clockwise rotation of the handle provides the cutting motion for the auger. Most of the loose soil is discharged upwards as the auger moves downwards. However, if the soil is cohesive some of it will stick to the auger flight providing a collectable sample at a measurable depth. Samples of surface soil can also be collected using a tube sampler which is attached to the end of the auger rods and advanced into the soil to extract a sample.

3.5 Bucket Auger

This device consists of a short length of hollow tube with cutting teeth at the bottom. As the handle is rotated, the sample is brought into and retained within the tube. When the auger is removed from the ground surface, the sample is retrieved from the tube with a spoon, or, if loosely consolidated, is poured directly into a collection pan or into the sample containers. Typically constructed of stainless steel, bucket augers are commonly available in diameters varying from two to four inches.

3.6 Collection Pan

A soil collection pan is often used as an intermediate sample container between removal of the sample from the ground and final bottling of the sample. Soil collection pans should preferably be constructed of stainless steel, although common household steel cooking pans may be used if the pan is lined with aluminum foil during sample collection.

3.7 Supporting Materials

- Teaspoon or spatula
- Aluminum foil
- Sample kit (i.e., bottles, labels, custody records, cooler, etc.)
- Sample logs/boring logs
- Decontamination materials
- Six-foot folding rule or tape measure for depth measurement
- Personal protective equipment (as required by the HASP)
- Field project notebook/pen

4.0 METHOD

4.1 General Procedures

Site-specific soil characteristics such as soil density and moisture will generally dictate the preferred type of sampling equipment for use at a particular site. Similarly, other project-specific requirements such as sampling depth and requested type of analysis such as physical testing (e.g., grain-size distribution) and/or chemical analysis will dictate the use of a preferred type of sampling equipment. Analytical testing requirements will indicate sample volume requirements that also will influence the selection of the appropriate type of sampling tool. The project sampling plan should define the specific requirements for collection of surface soil samples at a particular site. Should site-specific characteristics remain unidentified prior to start of the sampling program, sampling personnel should be equipped with a variety of sampling equipment to address the most likely sampling situations to be encountered.

As indicated, sample volume and sampling depth requirements should be defined in the sampling plan. This information should define the size of the hole which will be created during collection of the sample. For instance, if only a 500-ml sample will be required for analysis from a depth interval of 0 to 6 inches, an approximate 2 to 3-inch diameter hole will be needed. The indicated types of sampling equipment will generally make a minimum diameter hole of approximately 3 inches, therefore, an excess volume of soil may be generated during collection of a small volume soil sample. For samples requiring a large volume of soil, multiple holes and soil compositing may be necessary. Collection of the requisite volume of soil to meet sample volume requirements without underestimating the sample volume is the overall objective and is a technique which improves with experience.

It should be noted that some sampling programs may require the use of a sampling grid for the purpose of obtaining a statistically representative number of soil samples. This SOP does not provide information relative to construction of a sampling grid. This information may be found in other documents.

4.2 Equipment Decontamination

Regardless of the specific type of equipment used, each piece of equipment needs to be decontaminated prior to its initial use and following collection of each individual soil sample. Site-specific requirements for equipment decontamination should be outlined within the project sampling plan. Equipment decontamination procedures are specified within ENSR SOP 7600 - Decontamination of Equipment.

4.3 Collection of Samples for Volatile Organics Analysis

Collection of surface soil samples for volatile organics analysis (VOA) is different than collection of soil samples for other routine physical or chemical testing primarily because of the concern for potential loss of volatiles during the normal sample collection procedure. To limit the potential for loss of volatiles, the soil sample must be obtained as quickly and as directly as possible. This generally means that if a VOA sample is to be collected as part of a multiple analyte sample, the VOA sample portion should be obtained first. The VOA sample should also be obtained from a discrete portion of the entire collected sample and not from a sample which has been composited or homogenized from the entire sample interval. In general, it is best to collect the VOA sample by transferring the sample directly from the sampling tool into the sample bottles. Intermediate sample containers such as collection pans should not be used during collection of VOA samples.

4.4 Standard Procedures

4.4.1 Surface Preparation

At some sampling locations, the ground surface may require preparation in advance of sampling. Surface preparation can include removal of surface debris which blocks access to the actual soil surface or loosening of dense surface soils such as those encountered in heavy traffic areas, or frozen soils. If sampling equipment is used for both removal of surface debris and for collection of the soil sample, the equipment should be decontaminated prior to sample collection to reduce the potential for sample interferences between the surface debris and the underlying soil.

4.4.2 Shovel Sampling Procedure

A detailed operating procedure for proper use of a shovel for soil sampling is unnecessary. Specific requirements for sample quantity and sampling depth should be outlined within the project sampling plan.

Decontaminate the shovel in accordance with established procedures prior to use.

Once the soil sample is obtained and placed into the appropriate sample container(s) the hole from which the sample was retrieved should be filled with surrounding soils to eliminate a potential surface hazard.

4.4.3 Spoon, Scoop, and Trowel Sampling Procedure

Spoons, scoops, and trowels are of similarly designed construction and can therefore be operated in accordance with the following procedure.

Select the sampling location and prepare the surface by removal of surface debris if present. If the sample depth interval is at some depth below the ground surface, the surface soil material should also be removed as part of the surface preparation step. Surface preparation should be completed using other appropriately decontaminated sampling equipment.

Decontaminate the sampling tool in accordance with established procedures prior to use.

The soil sample should be obtained by inserting the sampling tool into the ground and rotating the tool so that a representative "column" of soil is removed from the ground.

The immediate objective is to collect the VOA sample fraction first if this is required. If the VOA sample is to be collected from the upper sampling interval, then the first scoop of soil should be used to directly fill the sample containers. If a specific depth below the ground surface has been targeted for the VOA sample, the overlying soils should be removed and discarded or placed into a soil collection pan as part of the remaining composite sample.

Regardless of whether or not a VOA sample is required, one or more cores or scoops of soil may be needed until the desired sampling depth is achieved. Removal of a representative column of soil in cohesionless soils may be difficult to achieve, however. If more soil is needed to meet sample volume requirements, additional soil cores may be collected from an immediately adjacent location.

Except for VOA samples, as each portion of the sample is removed from the ground, it should be placed into an intermediate sample container (collection pan) until the entire sample interval of soil is removed.

Once the sample interval has been collected, the soil sample should be thoroughly homogenized within the collection pan prior to bottling. Sample homogenizing is accomplished by manually mixing the entire soil sample in the collection pan with the sampling tool or with a clean teaspoon or spatula until a uniform mixture is achieved.

The appropriate sample containers should be filled with soil from the collection pan. The sampling tool may be used to fill the sample bottles. If packing of the samples into the bottles is necessary, a clean stainless steel teaspoon or spatula may be used. Use of fingers/hands to fill or pack sample containers should be avoided (this also includes VOA samples).

Once each sample container is filled, the rim and threads of the sample container will be cleaned of gross soil by wiping with a paper towel, then capped and labeled. Do not submerge the sample containers in water to clean them. Once labeled the sample containers should be placed into a cooler for protection. Sample chain-of-custody and other documentation requirements should be completed at this time.

The sampling tool and other sampling equipment should be decontaminated prior to reuse. All investigation-derived waste should be properly contained before leaving the area.

The sample hole should be backfilled to eliminate any surface hazard. The project sampling plan may indicate the requirements for backfilling of the sample hole.

4.4.4 Hand Auger Sampling

Select the sampling location and prepare the surface by removal of surface debris if present.

Decontaminate the sampling tool in accordance with established procedures prior to use.

A hand auger, or soil auger, can be used to extract shallow soil samples up to three (3) feet below the surface. Representative samples can be collected directly from the auger flight as it is withdrawn from the ground, or from the tube sampler attachment which can be advanced into the soil after augering to the desired depth.

When using the hand auger, the hole should be augered to the required depth by manually pushing and turning the auger. As the auger is turned, soils will be discharged to the ground surface, although some soil will be retained on the auger flight. Augering should be continued until the desired depth is achieved. If a composite or homogenized soil sample is the objective, those soils which have been discharged to the ground surface as well as those soils which cling to the auger flight should be homogenized within a soil collection pan prior to bottling. If a VOA sample is required, this fraction of the soil sample should be collected as soon as possible without compositing. It should be noted that soil augers cause considerable disturbance of the soil, therefore, some consideration should be given toward collection of VOA sample fractions using some other method (spoons, trowels, bucket augers may cause less disturbance).

Except for VOA sample fractions, the remainder of the soil sample should be thoroughly homogenized in the soil collection pan prior to bottling.

The appropriate sample containers should be filled with soil from the collection pan. A clean spoon or spatula may be needed to fill the sample bottles as necessary.

Once each sample container is filled, the rim and threads of the sample container will be cleaned of gross soil by wiping with a paper towel, then capped and labeled. Do not submerge the sample containers in water to clean them. Once labeled the sample containers should be placed into a cooler for protection. Sample chain-of-custody and other documentation requirements should be completed at this time.

All used sampling equipment should be decontaminated prior to reuse and investigation-derived waste should be properly contained before leaving the area.

The sample hole should be backfilled to eliminate any surface hazard. The project sampling plan may indicate the requirements for backfilling of the sample hole.

4.4.5 Bucket Auger Sampling

A bucket auger may be used to collect soil samples from depths ranging from one (1) to approximately five (5) feet. In some instances, soil samples may be collected from greater depths, but often with considerable more difficulty. Bucket augers allow for discrete depth interval sampling as the soil is retained within the hollow tube of the auger when it is extracted from the ground. It should be noted that if depth-discrete sampling is the objective, more than one auger may be necessary, with one auger used to provide access to the required sampling depth and the other (clean) auger used for sample collection.

Select the sampling location and prepare the surface by removal of surface debris, if present.

Decontaminate the sampling tool in accordance with established procedures prior to use.

When using the bucket auger, the auger should be pushed downward and rotated until the bucket becomes filled with soil. Usually a 6 to 12-inch core of soil is obtained each time the auger is inserted. Once filled, the auger should be removed from the ground and emptied into the soil collection pan. If a VOA sample is required, the sample should be taken directly from the auger using a teaspoon or spatula and/or directly filling the sample container from the auger. The augering process should be repeated until the desired sample interval has been augered and placed into the collection pan.

If the desired sample interval is located at a specific depth below the ground surface, the unwanted interval can be removed with one auger and the soil discarded. Sample collection can then proceed in normal fashion using a clean auger or following decontamination of the original auger.

Except for VOA sample fractions, the remainder of the soil sample should be thoroughly homogenized in the soil collection pan prior to bottling.

The appropriate sample containers should be filled with soil from the collection pan. Once each sample container is filled, the rim and threads of the sample container will be cleaned of gross soil by wiping with a paper towel, then capped and labeled. Do not submerge the sample containers in water to clean them. Once labeled the sample containers should be placed into a cooler for protection. Sample chain-of-custody and other documentation requirements should be completed at this time.

All used sampling equipment should be decontaminated prior to reuse and investigation-derived waste should be properly contained before leaving the area.

The sample hole should be backfilled to eliminate any surface hazard. The project sampling plan may indicate the requirements for backfilling of the sample hole.

5.0 QUALITY CONTROL

Quality control requirements for sample collection are dependent on project-specific sampling objectives. The Quality Assurance Project Plan (QAPP) will provide requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

6.0 DOCUMENTATION

Various forms are required to ensure that adequate documentation is made of the sample collection activities. These forms include:

- Field log books
- Sample collection records
- Chain-of-custody forms
- Shipping labels

The field book will be maintained as an overall log of all samples collected throughout the study. Sample collection records are generated for each sample collected and include specific information about the sample (Figure 1). Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes. Shipping labels are required if sample coolers are to be transported to the laboratory by a third party (courier service). Original and/or copies of these documents will be retained in the appropriate project files.

7.0 TRAINING/QUALIFICATIONS

Surface soil sampling is a relatively simple procedure requiring minimal training and a relatively small amount of equipment. It is, however, recommended that initial attempts be supervised by more experienced personnel. Sampling personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous materials may be present.

8.0 REFERENCES

Not applicable.

FIGURE 1 Surface Soil Sample Log

ENSR

SURFACE SOIL SAMPLE LOG

Project Number: ____________ Project Location: ____________

Sample Point No.: ____________

Date: ____________ Time:

Sample Point Description/Designation: ____________

SAMPLE COLLECTION

Equipment Used: ____________

No. of Samples Collected: Container Size: ____________

Sample Number	Depth	Type of Material	Analyses Requested

Comments:

Lab Designation ____________

Shipping ID Number: ____________

Collector's Name ____________

SOP NUMBER: 7115

Subsurface Soil Sampling by Split Spoon

Date:	3rd Qtr. 1994
Revision Number:	3
Author:	Charles Martin
Discipline:	Geosciencies

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This Standard Operating Procedure (SOP) describes the methods used in obtaining subsurface soil samples for physical and/or chemical analysis. Subsurface soil samples are obtained in conjunction with soil boring programs and provide information as to the physical and/or chemical makeup of the subsurface environment.

The purpose of this SOP is to provide a description of a specific method or procedure to be used in the collection of subsurface soil samples. Subsurface soil is defined as unconsolidated material which may consist of one or a mixture of the following materials: sand, gravel, silt, clay, peat (or other organic soils), and fill material. Subsurface soil sampling, conducted in accordance with this SOP will promote consistency in sampling and provide a basis for sample representativeness.

This SOP covers subsurface soil sampling by split-spoon only, as this is the means most often used for obtained samples of unconsolidated deposits. Other types of equipment are available for use in subsurface soil sampling, including thin-wall tube samplers (Shelby tubes), piston samplers, and continuous core barrel samplers. Information on the use of these other sampling devices may be found in several available drilling handbooks and respective state and/or federal agency technical guidance documents. The American Society for Testing and Materials (ASTM) also provides procedures for use of split-spoon and other sampling devices.

Deviations from this SOP to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the project work plan, and must be documented in the field project notebook when they occur.

1.2 General Principles

Split-spoon subsurface soil sampling generally requires use of a drilling rig and typically the hollow-stem auger or other common drilling method to generate a borehole in which to use the split-spoon sampler. The split-spoon sampler is inserted through the augers (or other type of drill casing) then is driven into the subsurface soil with a weighted hammer. The sampler is then retrieved and opened to reveal the recovered soil sample. Soil samples may be collected at a continuous interval or at pre-selected vertically spaced intervals within the borehole.

1.3 Quality Assurance Planning Considerations

Sampling personnel should follow specific quality assurance guidelines as outlined in the site-specific Quality Assurance Project Plan (QAPP). Proper quality assurance requirements should be provided which will allow for collection of representative samples from representative sampling points. Quality assurance requirements outlined in the QAPP typically suggest the collection of a sufficient quantity of field duplicate, field blank, and other samples.

1.4 Health and Safety Considerations

Subsurface soil sampling may involve chemical hazards associated with the types of contaminants potentially encountered and will always involve potential physical hazards associated with use of drilling equipment. When sampling is performed in materials which may contain hazardous constituents, or when the quality assurance objectives of the project require the use of hazardous solvents, adequate Health and Safety measures must be taken to protect sampling personnel. These measures must be addressed in the project Health and Safety Plan (HASP). This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all personnel performing sampling, and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Drilling Subcontractor

It will be the responsibility of the drilling subcontractor to provide the necessary materials for obtaining subsurface soil samples. This generally includes one or more split-spoon samplers in good operating condition and sample containers used for stratigraphic characterization samples (sample containers for environmental samples should be provided by the designated analytical laboratory). It is the drilling subcontractor's responsibility to provide and maintain their own boring logs if desired. Equipment decontamination materials should also be supplied by the subcontractor and should meet project specifications.

2.2 Project Geologist/Sampling Engineer

It will be the responsibility of the project geologist/sampling engineer to conduct subsurface soil sampling in a manner which is consistent with this SOP. The project geologist/sampling engineer will observe all activities pertaining to subsurface soil sampling to ensure that the SOP is followed, and to record all pertinent data onto a boring log. It is also the project geologist/sampling engineer's responsibility to indicate the specific targeted sampling depth or sampling interval to the drilling subcontractor. The project geologist/sampling engineer is also responsible for the collection of representative environmental or stratigraphic characterization samples once the sampling device has been retrieved and opened. Additional sample collection responsibilities include labeling, handling, and storage of samples until further chain-of-custody procedures are implemented.

3.0 REQUIRED MATERIALS

In addition to those materials provided by the subcontractor, the project geologist/sampling engineer will require:

- Project Sampling Plan, QAPP, and HASP
- Boring logs
- Teaspoon or spatula (stainless steel is recommended)
- Sample kit (bottles, labels, custody records and tape, cooler)
- Sample collection pen
- Folding rule or tape measure
- Equipment decontamination materials
- Health and safety equipment (as required by HASP)
- Field project notebook/pen

4.0 METHOD

4.1 General Method Description

Split-spoon sampling devices are typically constructed of steel and are most commonly available in lengths of 18 and 24 inches and diameters of 1.5 to 3 inches. The split-spoon consists of a tubular body with two halves that split apart lengthwise, a drive head on the upper end with a ball-check valve for venting, and a hardened steel cutting shoe at the bottom. The soil sample enters the split-spoon through the cutting shoe as the device is driven into the ground. A replaceable plastic or metal basket is often inserted into the shoe to assist with retaining samples. Once the sampler is retrieved, the drive head and cutting shoes are removed and the split-spoon halves are then separated, revealing the sample.

Sample depth intervals are usually defined on a project-specific basis with these requirements specified in the project sampling plan. Sampling intervals typically range from one (1) sample per five (5) feet of drilling to continuous sampling where the entire drilled interval is sampled.

Subsurface soil sampling is usually accomplished as part of a drilling program where a soil boring is advanced with drilling equipment to the designated depth prior to collection of a representative sample. The general procedures outlined briefly in the following section provide requirements for advancing drill casing/augers in preparation for sampling.

4.2 General Procedures - Borehole Preparation

4.2.1 Advancing Casing/Augers

Soil borings that are completed for soil sampling purposes are typically advanced using hollow-stem augers and sometimes drive-and-wash or other casing methods. The casing/augers must be of sufficient diameter to allow for soil sampling at a minimum. The casing/augers will be advanced according to project requirements to the required depth for sampling. If hollow-stem augers are used, a temporary plug shall be used in the lead auger to prevent the auger from becoming filled with drill cuttings while drilling is in progress.

4.2.2 Obstructions

For those borings which encounter obstructions, the casing/augers will be advanced past or through the obstruction if possible. Caution should be exercised when obstructions are encountered and an effort made to identify the obstruction before drilling is continued. If the obstruction is not easily drilled through or removed, the boring should be relocated to an adjacent location.

4.2.3 Use of Added Water

The use of added or recirculated water during drilling is permitted when necessary. Use of extraneous water should be minimized or avoided if possible as it may impact sample quality. Water usage should be documented in the field notebook. Sampling and analysis of added or recirculated water may be required for quality assurance purposes (refer to QAPP). If a well is installed within the completed borehole, removal of the added water may be required.

4.3 Sampling Procedure

4.3.1 Equipment Decontamination

Each split-spoon must be decontaminated prior to its initial use and following collection of each soil sample. Site-specific requirements for equipment decontamination should be outlined within the Project Sampling Plan. Equipment decontamination procedures are also outlined within SOP 7600 - Decontamination of Equipment.

4.3.2 Standard Penetration Test

The drilling subcontractor will lower the split-spoon into the borehole. Samples are generally obtained using the Standard Penetration Test (SPT) in accordance with ASTM standards (ASTM D 1586-84). Following this method, the sampler will be driven using the 140-pound hammer with a vertical free drop of 30 inches using two turns of the rope on the cathead. The number of hammer blows required for every 6 inches of penetration will be recorded on the boring log. Blowcount information is used as an indicator of soil density for geotechnical as well as stratigraphic logging purposes. Once the split-spoon has been driven to its fullest extent, or to refusal, it will be removed from the borehole.

4.3.3 Sample Recovery

The split-spoon will be immediately opened upon removal from the casing/auger. The open sampler shall then be screened for volatile organics with a photoionization device (PID) if required by the Project Sampling Plan. If the Sampling Plan also requires individual soil sample headspace screening for volatile organic compounds, then a small portion of the split-spoon sample shall be removed and properly contained for that purpose.

Sample recovery will be determined by the project geologist/sampling engineer who will examine the soil core once the sampler is opened. The length of sample shall then be measured with a folding rule or tape measure. Any portion of the split-spoon contents which are not considered part of the true sample (i.e., heaved soils) will be discarded. If the sample recovery is considered inadequate for sample characterization or analytical testing purposes, another sample should be collected from the next vertical interval if possible before drilling is reinitiated.

Adequate sample recovery for stratigraphic logging purposes and/or headspace organic vapor testing purposes should be approximately 6 inches. Adequate sample recovery for analytical testing purposes should be a minimum of 12 inches and is somewhat dependent on the type of analytical testing required. In some cases, continuous sampling over a short interval, and compositing of the sample, may be required to satisfy analytical testing requirements. Larger diameter samplers may be used if large volumes of soil are required for analytical testing.

4.3.4 Sample Containment - General

Once retrieved, the sample will be removed from the split-spoon with a teaspoon or spatula and placed into the appropriate sample container. The sample will be split if necessary to meet sampling program requirements. Sample splitting may be necessary to provide individual samples for headspace testing, visual characterization, physical testing, analytical testing, or simply for archiving purposes. In general, most sampling programs are structured around environmental characterization needs; therefore, sample portions required for analytical testing should be collected first. The Project Sampling Plan and QAPP provides specific sample container requirements for each type of sample and should be referred to for guidance.

Once filled, the sample containers should be properly capped, cleaned, and labeled, and chain-of-custody and sample preservation procedures initiated. Sampling equipment should then be properly decontaminated.

4.3.5 Sample Containment - Volatile Organic Analyses

Collection of subsurface soil samples for volatile organic analysis (VOA) is slightly more complex than collection of samples for other routine chemical or physical testing primarily because of the concern for the potential loss of volatiles during the sample collection procedure. To limit the potential for loss of volatiles, the soil sample needs to be obtained as quickly and as directly as possible from the split-spoon. This generally means that the VOA sample is to be collected and placed into the appropriate sample container first. The VOA sample should also be obtained from a discrete portion of the entire sample interval and not composited or homogenized. The remainder of the recovered sample can then be composited, homogenized or split to meet the other testing requirements. The boring log and/or sample logbook should be filled out to indicate actual sample collection depths for both VOA samples and other portions of the sample which may have been composited over a larger vertical interval.

5.0 QUALITY CONTROL

Quality control requirements are dependent on project-specific sampling objectives. The QAPP will provide requirements for sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

6.0 DOCUMENTATION

Various forms are required to ensure that adequate documentation is made of sample collection activities. These forms include:

- Boring logs
- Field log books
- Sample collection records
- Chain-of-custody records
- Shipping labels

Boring logs (Figure 1) will provide visual and descriptive information for each sample collected and are often the most critical form of documentation generated during a sampling program. The field log book is kept as a general log of activities. Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes. Shipping labels are required if sample coolers are to be transported to the laboratory by a third party (courier service). Original copies of these records should be maintained in the appropriate project files.

7.0 REFERENCES

ASTM D 1586-84

Figure 1

Sheet 1 of __

BORING LOG

Project No. ______ Date – Start ______ Finish ______ Boring ______

Project Name ______ Drilling Co. ______

Location ______ Drilling Method ______

Total Depth ______ Inspector ______ Reviewer ______

Remarks ______

Depth Feet	Sample				Graphic Log	Lithologic Description	Equipment Installed
	Type & No.	Blows per 6 in.	Depth Range	Rec.			

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SOP NUMBER: 7220

Monitoring Well Construction and Installation

Date:	3rd Qtr., 1995
Revision Number:	4
Author:	Charles Martin
Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This SOP provides guidance for installing groundwater monitoring wells. Monitoring wells are installed to monitor the depth to groundwater, to measure aquifer properties, and to obtain samples of groundwater for chemical analysis.

This SOP is applicable to installation of single monitoring wells within a borehole. The construction and installation of nested, multilevel or other special well designs is not covered within this SOP as these type of wells are not frequently constructed. This SOP applies to both overburden and bedrock monitoring wells.

Some states and EPA Regions have promulgated comprehensive guidelines for monitoring well construction and for subsurface investigation procedures. Deviations from this SOP to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the project work plan, and must be documented in the field project notebook when they occur.

1.2 General Principles

Monitoring well construction and installation generally involves drilling a borehole using conventional drilling equipment, installing commercially available well construction and filter/sealing materials, and development of the well prior to sampling. This SOP covers well construction and installation methods only. Borehole drilling and well development methods are covered under SOP-7115 (Subsurface Soil Sampling) and SOP-7221 (Monitoring Well Development), respectively.

1.3 Quality Assurance Planning Considerations

Field personnel should follow specific quality assurance guidelines as outlined in the site-specific QAPP.

The following aspects of monitoring well design and installation procedures depend on project-specific objectives which should be addressed in the QAPP and in the project work plan:

- Borehole drilling method and diameter,
- Type of construction materials for well screen, riser, filter pack and seals,
- Diameter of well materials,
- Length of well screen,
- Location, thickness, and composition of annular seals, and
- Well completion and surface protection requirements.

1.4 Health and Safety Considerations

Monitoring well installation may involve chemical hazards associated with materials in the soil or groundwater being investigated; and always involves physical hazards associated with drilling equipment and well construction methods. When wells are to be installed in locations where the aquifer and/or overlying materials may contain chemical hazards, a Health and Safety Plan (HASP) must be prepared and approved by the Health and Safety Officer before field work commences. This plan must be distributed to all field personnel and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Drilling Subcontractor

It is the responsibility of the drilling subcontractor to provide the necessary equipment for well construction and installation. Well construction materials should be consistent with project requirements.

2.2 Surveying Subcontractor

It is the responsibility of the surveying subcontractor to provide one or more of the following well measurements as specified in the project work plan: ground surface elevation, horizontal well coordinates, top of well casing elevation (i.e., top-of-casing, or measuring point elevation), and/or top of protective casing elevation.

2.3 Project Geologist/Engineer

It is the responsibility of the Project Geologist/Engineer to directly oversee the construction and installation of the monitoring well by the drilling subcontractor to ensure that the well-installation specifications defined in the project work plan are adhered to, and that all pertinent data are recorded on the appropriate forms.

2.4 Project Manager

It is the responsibility of the Project Manager to ensure that each project involving monitoring well installation is properly planned and executed.

3.0 REQUIRED MATERIAL

3.1 Well Construction Materials

Well construction materials are usually provided by the drilling subcontractor and most often consist of commercially available flush-threaded well screen and riser pipe constructed of PVC or stainless steel with a minimum 2-inch inside diameter. The length of the screen and the size of the screen slots should be specified in the project work plan.

3.2 Well Completion Materials

Well completion materials include silica sand, bentonite, cement, protective casings and locks. Completion materials are generally provided by the drilling subcontractor.

3.3 Other required materials include the following:

- Potable water supply
- Fiberglass or steel measuring tape
- Water level indicator
- Well construction diagrams (Figure 1)
- Waterproof marker or paint (to label wells)
- Health and Safety supplies

- Equipment decontamination materials
- Field project notebook/pen

4.0 METHOD

4.1 General Preparation

4.1.1 Borehole Preparation

Standard drilling methods should be used to achieve the desired drilling/well installation depths specified in the project work plan. Soil sampling, if conducted, should be conducted in accordance with ENSR SOP-7115 (Subsurface Soil Sampling).

The diameter of the borehole must be a minimum of 2 inches greater than the outside diameter of the well screen or riser pipe used to construct the well. This is necessary so that sufficient annular space is available to install filter packs, bentonite seals, and grout seals. Bedrock wells may require reaming after coring in order to provide a large enough borehole diameter for well installation.

Rotary drilling methods requiring bentonite-based drilling fluids, if selected, should be used with caution to drill boreholes that will be used for monitoring well installation. The bentonite mud builds up on the borehole walls as a filter cake and permeates the adjacent formation, potentially reducing the permeability of the material adjacent to the well screen.

If water or other drilling fluids have been introduced into the boring during drilling or well installation, samples of these fluids should be obtained and analyzed for chemical constituents that may be of interest at the site. In addition, an attempt should be made to recover the quantity of fluid or water that was introduced, either by flushing the borehole prior to well installation and/or by overpumping the well during development.

4.1.2 Well Material Decontamination

Although new well materials (well screen and riser pipe) generally arrive at the site boxed and sealed within plastic bags, it is sometimes necessary to decontaminate the materials prior to their use. Well materials should be inspected by the project geologist/engineer upon delivery to check cleanliness. If the well materials appear dirty, or if local or regional regulatory guidance requires decontamination, then well material decontamination should be performed by the drilling subcontractor in accordance with ENSR SOP-7600 (Decontamination of Equipment).

4.2 Well Construction Procedure

4.2.1 Depth Measurement

Once the target drilling depth has been reached, the drilling subcontractor will measure the total open depth of the borehole with a weighted, calibrated tape measure. Adjustments of borehole depth can be made at this time by drilling further or installing a small amount of sand filter material to achieve the desired depth. If drilling fluids were used during the drilling process, the borehole should be flushed at this time using potable water. The water table depth may also be checked with a water level indicator if this measurement cannot be obtained with the calibrated tape.

4.2.2 Centralizers

In order to install a well which is centered within the borehole, it is recommended that centralizers be used. Centralizers are especially helpful for deep well installations where it may be difficult to position the well by hand. Centralizers may not be necessary on shallow water table well installations where the well completion depth is within 25 feet of the ground surface.

4.2.3 Well Construction

The well screen and riser pipe generally are assembled by hand as they are lowered into the borehole. Before the well screen is inserted into the borehole, the full length of the slotted portion of the well screen as well as the unslotted portion of the bottom of the screen should be measured with the measuring tape. These measurements should be recorded on the well construction diagram.

After the above measurement has been taken, the drilling subcontractor may begin assembling the well. As the assembled well is lowered, care should be taken to ensure that it is centered in the hole if centralizers are not used. The well should be temporarily capped before filter sand and other annular materials are installed.

4.2.4 Filter Sand Installation

The drilling subcontractor should fill the annular space surrounding the screened section of the monitoring well to at least 1 foot above the top of the screen with an appropriately graded, clean sand or fine gravel. In general, the filter pack should not extend more than 3 feet above the top of the screen to limit the thickness of the monitoring zone. If coarse filter materials are used, an additional 1-foot thick layer of fine sand should be placed immediately above the filter pack to prevent the infiltration of sealing components (bentonite or grout) into the filter pack. As the filter pack is placed, a weighted tape should be lowered in the annular space to verify the depth to the top of the layer. Depending upon depth, some time may be required for these materials to settle. If necessary, to eliminate possible bridging or creation of voids, placement of the sand pack may require the use of a tremie pipe. Tremie pipe sandpack installations are generally suggested for deep water table wells and for wells which are screened some distance beneath the water table.

4.2.5 Bentonite Seal Installation

A minimum 2-foot thick layer of bentonite pellets or slurry seal will be installed by the drilling subcontractor immediately above the well screen filter pack in all monitoring wells. The purpose of the seal is to provide a barrier to vertical flow of water in the annular space between the borehole and the well casing. Bentonite is used because it swells significantly upon contact with water. Pellets generally can be installed in shallow boreholes by pouring them very slowly from the surface. If they are poured too quickly, they may bridge at some shallow, undesired depth. As an option, powdered bentonite may be mixed with water into a very thick slurry and a tremie pipe used to inject the seal to the desired depth.

4.2.6 Annular Grout Seal Installation

This grout seal should consist of a bentonite/cement mix with a ratio of bentonite to cement of between 1:5 and 1:20. The grout ratio should be chosen based on site conditions with a higher percentage of bentonite generally used for formations with higher porosity. A mud balance should be used if a specific mud density is required at a particular site. Grout slurry should be pumped into the annular space using a side-discharging tremie pipe located about 2 feet above the sand pack. Side discharge will help preserve the integrity of the sand pack.

In situations where the monitoring well screen straddles the water table, the seal will be in the unsaturated zone and pure bentonites (pellets or powder) will not work effectively as seals without hydration. Dry bentonite may be used if sufficient time to hydrate the seal is allowed. Seal hydration requires the periodic addition of clean water. Optionally, seals in this situation may be a cement/bentonite mixture containing up to 10 percent bentonite by weight. This type of mixture shall be tremied to the desired depth in the borehole.

The borehole annulus will be grouted with seal materials to within 3 feet of the ground surface. Drill cuttings, even those known not to be contaminated, will not be used as backfill material.

4.2.7 Well Completion

The drilling subcontractor will cut the top of the well to the desired height and install a vented (if possible), locking cap. The upper portion of the well casing can optionally be drilled to allow venting. Well casings are usually cut to be a certain height above ground surface (typically 2.5 to 3 feet) or are cut to be flush with the ground surface.

4.2.8 Protective Casing/Concrete Pad Installation

The drilling subcontractor will install a steel guard pipe on the well as a protective casing. The borehole around the guard pipe will be dug out to an approximate 2 to 3-foot radius to a minimum depth of 1 foot at the center and 6 inches at the edges. After installing the protective casing, the excavation will be filled with a concrete/sand mix. The surface of the concrete pad will be sloped so that drainage occurs away from the well. Flush-mount protective casings may not require an extensive concrete pad and should be completed such that they are slightly mounded above the surrounding surface to prevent surface water from running over or ponding on top of the casing. It should be noted, however, that in areas subject to snowfall, flush-mount casings may have to be installed so that they are entirely flush with the ground surface as they may be damaged by snow plows.

Above-ground protective casings should also be vented or should have non-air tight caps. Road box installations should not be vented. Installation of additional guard pipes may be necessary around above-ground well completions in traffic areas. Protective casings should be lockable to prevent unauthorized access.

4.2.9 Well Numbering

The project geologist/engineer will number each well casing with an indelible marker or paint to identify the well. This is particularly important with nested or paired wells to distinguish between shallow and deep wells. The well should be labeled on both the outside of the protective casing and inside beneath the protective casing lid.

4.2.10 Measuring Point Identification

The project geologist/engineer will mark the measuring point from which water level measurements will be made at a specific location along the upper edge of the well casing. PVC wells can easily be notched with a pocket knife or saw. Stainless steel wells (or PVC wells) can be marked with a waterproof marker on the outside of the well casing with an arrow pointing to the measuring point location. The measuring point is the point which will require surveying during the well elevation survey task.

4.2.11 Well Measurements

Upon completion, the following well measurements should be taken by the project geologist/engineer and recorded on the well construction diagram (Figure 1):

- Depth to static water level if water level has stabilized,
- Total length of well measured from top-of-well casing,
- Height of well casing above ground surface,
- Height of protective casing above ground surface,
- Depth of bottom of protective casing below ground surface (may be estimated).

Well screen filter pack, bentonite seal and annular seal thicknesses and depths should also be recorded on the well construction diagram.

4.2.12 Disposal of Drilling Wastes

Drill cuttings and other investigation-derived wastes such as drilling mud or well development/purge water must be properly contained and disposed of. Site-specific requirements for collection and removal of these waste materials should be outlined within the project work plan. Containment of these materials should be performed by the drilling subcontractor.

4.2.13 Well Development

At some point after installation of a well and prior to use of the well for water-level measurements or collection of water quality samples, development of the well shall be undertaken in accordance with ENSR SOP-7221 (Monitoring Well Development). Well development may be performed by the drilling subcontractor if contracted to do so, or by the project geologist/engineer or other project staff.

4.2.14 Well Elevation Survey

At the completion of the well installation program, all monitoring wells are usually surveyed to provide, at a minimum, the top-of-casing measuring point elevation for water level monitoring purposes. Other surveyed points which may be required by the project work plan include: ground surface elevation, top of protective casing elevation, and well coordinate position. Well elevation surveys are usually conducted by a surveying subcontractor.

5.0 QUALITY CONTROL

Certain quality control measures should be taken to ensure proper well completion.

5.1 The borehole will be checked for total open depth, and extended by further drilling or shortened by backfilling, if necessary, before any well construction materials are placed.

5.2 Water level and non-aqueous phase liquid (NAPL) presence will be checked during well installation to ensure that the positions of well screen, sand pack, and seal, relative to water level, conform to project requirements.

5.3 The depth to the top of each layer of packing (i.e., sand, bentonite, grout, etc.) will be verified and adjusted if necessary to conform to project requirements before the next layer is placed.

5.4 If water or other drilling fluids have been introduced into the boring during drilling or well installation, samples of these fluids may be required for analysis of chemical constituents of interest at the site.

6.0 DOCUMENTATION

All well construction data will be recorded on the Monitoring Well Construction Detail form (Figure 1). All wells will be referenced onto the appropriate site map. A field notebook and/or boring log will be used as additional means of recording data. In no case will the notebook or boring log take the place of the well construction diagram.

7.0 TRAINING/QUALIFICATIONS

Well construction and installation requires a moderate degree of training and experience as numerous drilling situations may occur which will require field decisions to be made. It is recommended that inexperienced personnel be supervised for several well installations before working on their own. Experienced drillers are also of great assistance with problem resolution in the field. Field personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous waste materials are considered to be present.

APPENDIX: DEFINITIONS

Annulus: The measured width between the borehole wall and the outside of the well screen or riser pipe.

Bentonite Seal: A granular, chip, or pellet-size bentonite material that is often used to provide an annular seal above the well screen filter pack. This seal is typically installed dry followed by in-place hydration with or without the addition of water. Hydrated bentonite is sometimes used as a grout seal.

Bottom Cap/Plug: Threaded or slip-on cap placed at the bottom of the well prior to installation. Often serves as a sump for accumulation of silt which settles within the well. The measured length from the lowermost well screen slot to the bottom of the bottom cap is known as the sump or tail pipe portion of the well.

Centralizers: Stainless steel expansion clamps which, when fitted to well screens or riser pipe, expand to contact the borehole walls positioning the well centrally within the open borehole. Centralizers assist with even positioning and distribution of filter pack and sealant materials and assist with maintaining well plumbness.

Expansion Cap/Well Cap: Cap used to cover the opening at the top of the well riser pipe. Expansion caps are equipped with a rubber gasket and threaded wing nut which, when turned, provides a watertight seal. Expansion caps may also be locked, and generally are recommended for use with flush-constructed wells where road box protective casings are also used. Other well caps may include slip-on or threaded caps made of the same material as the well casing.

Filter Pack: A well-graded, clean sand or gravel placed around the well screen to act as a filter in preventing the entry of very fine soil particles into the well.

Grout Seal: A cement/bentonite mixture used to seal a borehole that has been drilled to a depth greater than the final well installation depth or to seal the remaining borehole annulus once the well has been installed. Occasionally, pure cement or pure bentonite is used as a grout seal.

Measuring Point: A selected point at the top of the well casing (riser pipe) used for obtaining periodic water-level measurements. The measuring point should consist of either a notch or indelibly marked point on the upper surface of the casing. Typically, the highest point on the casing (if not level) is used as the measuring point. The measuring point is also the point that is surveyed when well elevation data is obtained.

Protective Casing: A locking metal casing, placed around that portion of the well riser pipe that extends above the ground surface. The protective casing is generally cemented in place when the concrete pad is constructed around the well.

Riser Pipe: The section of unperforated well casing material used to connect the well screen with the ground surface. Frequently, it is made of the same material and has the same diameter as the well screen. Riser pipe is typically available pre-cleaned and pre-threaded for immediate use.

Road Box: A protective casing that is flush-mounted with the ground around a well installation. Road boxes are used in areas where the monitoring well cannot extend above the ground surface for traffic or security reasons. Road boxes usually require a special key to open.

Tremie Pipe: A small diameter pipe which fits in the open borehole annulus and is used to inject filter sands or hydrated seal materials under pressure.

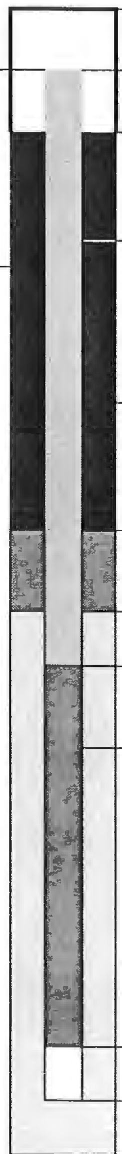
Well Screen: That portion of the well casing material that is perforated in some manner so as to provide a hydraulic connection to the aquifer. Typically a well screen is purchased pre-slotted, pre-cleaned, and pre-threaded for immediate use.

Vent Hole: Small diameter hole drilled in the upper portion of the well riser pipe which provides atmospheric venting of the well. Allows for constant equilibration of the water level with changing atmospheric conditions. In flood-prone areas, or with flush-mount wells, vent holes should not be used.

Figure 1 Monitoring Well Construction Detail

ENSR.	*Client:*	WELL ID:
	Project Number:	
	Site Location:	*Date installed:*
	Well Location: *Coords:*	*Inspector:*
	Method:	*Contractor:*

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation(feet) Datum ________
Top of Steel Guard Pipe	________	________
Top of Riser Pipe	________	________
Ground Surface (G.S.)	0.0	________
Top of Bentonite	________	________
Top of Sand	________	________
Top of Screen	________	________
▼ Stabilized Water Level	________	________
Bottom of Screen	________	________
Bottom of Tail Pipe	________	________
Bottom of Borehole	________	________

Measuring Point for Surveying & Water Levels

Cement, Bentonite, Bentonite Slurry Grout, or Native Materials

________ % Cement

________ % Bentonite

________ % Native Materials

Riser Pipe:
- Length ________
- Inside Diameter (ID) ________
- Type of Material ________

Bottom of Steel Guard Pipe

Bentonite Seal Thickness ________

Screen:
- Length ________
- Inside Diameter (ID) ________
- Slot Size ________
- Type of Material ________

Type/Size of sand ________
Sand Pack Thickness ________

Bottom of Tail Pipe:
- Length ________

Borehole Diameter ________

Approved:

________ Signature ________ Date

Describe Measuring Point:

____

SOP NUMBER: 7221

Monitoring Well Development

Date:	4th Qtr., 1994
Revision Number:	2
Author:	Charles Martin
Discipline:	Geosciences

1.0 PURPOSE AND APPLICABILITY

1.1 Purpose and Applicability

This SOP describes the methods used for developing newly installed monitoring wells and/or existing wells which may require redevelopment/rehabilitation. This SOP is applicable to monitoring wells and/or small diameter recovery wells and piezometers.

Monitoring well development and/or redevelopment is necessary for several reasons:

- To improve/restore hydraulic conductivity of the surrounding formations as they have likely been disturbed during the drilling process, or may have become partially plugged with silt,
- To remove drilling fluids (water, mud), when used, from the borehole and surrounding formations, and
- To remove residual fines from well filter materials and reduce turbidity of groundwater, therefore, reducing the chance of chemical alteration of groundwater samples caused by suspended sediments.

Respective state or federal agency (regional offices) regulations may require specific types of equipment for use or variations in the indicated method of well development. Deviations from this SOP to accommodate other regulatory requirements should be reviewed in advance of the field program, should be explained in the project work plan, and must be documented in the field project notebook when they occur.

1.2 General Principles

Well development generally involves withdrawal of an un-specified volume of water from a well using a pump, surge block or other suitable method such that, when completed effectively, the well is in good or restored hydraulic connection with the surrounding water bearing unit and is suitable for obtaining representative groundwater samples or for other testing purposes.

1.3 Quality Assurance Planning Considerations

Field project personnel should follow specific quality assurance guidelines as outlined in the site-specific Quality Assurance Project Plan (QAPP) and/or Sampling Plan. The plan should indicate the preferred method of well development at a particular site based on project objectives, aquifer conditions, and agency requirements. Specific well performance criteria such as low turbidity values to be achieved following well development should also be specified as well as any requirements for collection/containerization and disposal of well development water.

1.4 Health and Safety Considerations

Monitoring well development may involve chemical hazards associated with materials in the soil or aquifer being characterized and may involve physical hazards associated with use of well development equipment. When wells are to be installed and developed on hazardous waste investigation sites, a Health and Safety Plan must be prepared and approved by the Health and Safety Officer before field work commences. This plan must be approved by the project Health and Safety Officer before work commences, must be distributed to all field project personnel, and must be adhered to as field activities are performed.

2.0 RESPONSIBILITIES

2.1 Project Geologist/Engineer

Development or oversight of development of new monitoring wells is the responsibility of the project geologist/engineer involved in the original installation of the well. Records of well development methods and results will be retained in the project file.

2.2 Project Manager

The project manager is responsible for ensuring that the appropriate method of well development has been chosen which best meets project objectives, site hydrogeologic conditions, and/or relevant regulatory requirements.

3.0 REQUIRED MATERIALS

Well development can be performed using a variety of methods and equipment. The specific method chosen for development of any given well is governed by the purpose of the well, well diameter and materials, depth, accessibility, geologic conditions, static water level in the well, and type of contaminants present, if any.

The following list of equipment, each with their own particular application, may be used to develop and/or purge monitoring wells.

3.1 Bailer Purging

A bailer is used to purge silt-laden water from wells after using other devices such as a surge block. In some situations, the bailer can be used to develop a well by bailing and surging, often accompanied with pumping. A bailer should be used for purging in situations where the depth to static water is greater than 25 feet and/or where insufficient hydraulic head is available for use of other development methods.

3.2 Surge Block Development

Surge blocks are commercially available for use with Waterra™-type pumping systems or may be manufactured using a rubber or teflon "plunger" attached to a rod or pipe of sufficient length to reach the bottom of the well. Well drillers usually can provide surge blocks if requested. A recommended design is shown in Figure 1.

3.3 Pump Development

A pump is often necessary to remove large quantities of silt-laden ground water from a well after using the surge block. In some situations, the pump alone can be used to develop the well and remove the fines by overpumping. Since the purpose of well development is to remove suspended solids from a well and surrounding filter pack, the pump must be capable of moving some solids without damage. The preferred pump is a submersible pump which can be used in both shallow and deep ground water situations. A centrifugal pump may be used in shallow wells but will work only where the depth to static ground water is less than approximately 25 feet. Pumping may not be successful in low-yielding aquifer materials or in wells with insufficient hydraulic head.

3.4 Compressed Gas Development

Compressed gas, generally nitrogen from a tank or compressed air through a compressor, can be used to both surge and develop a monitoring well. The method works by injection of compressed gas at the bottom of the water column, driving sediment-laden water to the surface. Compressed gas can also be used for "jetting" - a process by which the gas is directed at the slots in the well screen to cause turbulence (thereby disturbing fine materials in the adjacent filter pack). Compressed gas is not limited by any depth range.

Since the compressed gas will be used to "lift" water from the monitoring well, provisions must be made for controlling the discharge from contaminated wells. This is generally accomplished by attaching a "tee" discharge to the top of the casing and providing drums to contain the discharged water. Gas-lifting should never be done in contaminated wells without providing a means to control discharge.

3.5 Other Required Materials:

- Well development records (Figure 2)
- Health and Safety equipment
- Equipment decontamination materials
- Water quality instrumentation: nephelometer, pH, temperature, specific conductance meters, as required
- Field project notebook/pen

4.0 METHOD

4.1 General Preparation

4.1.1 Well Records Review: Well completion diagrams should be reviewed to determine well construction characteristics. Formation characteristics should also be determined from review of available boring logs.

4.1.2 Site Preparation: Well development, similar to groundwater sampling, should be conducted in as clean an environment as possible. This usually requires, at a minimum, placing sheet plastic on the ground to provide a clean working area for development equipment.

4.1.3 IDW Containment: Provisions should be in place for collection and management of investigation-derived wastes (IDW), specifically well development water and miscellaneous expendable materials generated during the development process. The collection of IDW in drums or tanks may be required depending on project-specific requirements. The QAPP should specify the requirements for IDW containment.

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4.1.4 Water Level/Well Depth Measurement: The water level and well depth should be measured with a water level indicator and written on the well development record. This information is used to calculate the volume of standing water (i.e., the well volume) within the well.

4.1.5 Equipment Decontamination: All down-well equipment should be decontaminated prior to use in accordance with ENSR SOP-7600 (Decontamination of Equipment).

4.1.6 Removal of Drilling Fluids: Drilling fluids such as mud or water, if used during the drilling and well installation process, should be removed during the well development procedure. It is recommended that a minimum of 1.5 times the volume of added fluid be removed from the well during development. Drilling muds should initially have been flushed from the drilling casing during the well installation procedure with water added during the flushing process. If the quantity of added fluid is not known or could not be reasonably estimated, removal of a minimum of 10 well volumes of water is recommended during the development procedure.

4.2 Development Procedures

4.2.1 Development Method Selection

The construction details of each well shall be used to define the most suitable method of well development. Some consideration should be given to the potential degree of contamination in each well as this will impact IDW containment requirements.

The criteria for selecting a well development method include well diameter, total well depth, static water depth, screen length, the likelihood and level of contamination, and characteristics of the geologic formation adjacent to the screened interval.

The limitations, if any, of a specific procedure are discussed within each of the following procedures.

4.2.2 General Water Quality Measurements

Measure and record water temperature, pH, specific conductance, and turbidity periodically during development using the available water quality instruments. These measurements will aid in determining whether well development is proceeding efficiently, will assist in identifying when well development is complete, will determine whether the development process is effective or not with any given well and, potentially, may identify well construction irregularities (i.e., grout in well, poor well screen slot-size selection). Water quality parameters should be checked a minimum of 3 to 5 times during the development process.

4.2.3 Bailer Procedure

- As stated previously, bailers shall preferably not be used for well development but may be used in combination with a surge block to remove silt-laden water from the well.

- When using a bailer to purge well water; select the appropriate bailer, then tie a length of bailer cord onto the end of it.

- Lower the bailer into the screened interval of the monitoring well. Silt, if present, will generally accumulate within the lower portions of the well screen.

- The bailer may be raised and lowered repeatedly in the screened interval to further simulate the action of a surge block and pull silt through the well screen.

- Remove the bailer from the well and empty it into the appropriate storage container.

- Continue surging/bailing the well until sediment-free water is obtained. If moderate to heavy siltation is still present, the surge block procedure should be repeated and followed again with bailing.

- Check water quality parameters periodically.

4.2.4 Surge Block Procedure

- A surge block effectively develops most monitoring wells. This device first forces water within the well through the well screen and out into the formation, and then pulls water back through the screen into the well along with fine soil particles. Surge blocks may be manufactured to meet the design criteria shown in the example (Figure 1) or may be purchased as an adaptor to fit commercially available well purging systems such as the Waterra system.

- Insert the surge block into the well and lower it slowly to the level of static water. Start the surge action slowly and gently above the well screen using the water column to transmit the surge action to the screened interval. A slow initial surging, using plunger strokes of approximately 3 feet, will allow material which is blocking the screen to separate and become suspended.

- After 5 to 10 plunger strokes, remove the surge block and purge the well using a pump or bailer. The returned water should be heavily laden with suspended silt and clay particles. Discharge the purged water into the appropriate storage container.

- Repeat the process. As development continues, slowly increase the depth of surging to the bottom of the well screen. For monitoring wells with long screens (greater than 10 feet) surging should be undertaken along the entire screen length in short intervals (2 to 3 feet) at a time. Continue this cycle of surging and purging until the water yielded by the well is free of visible suspended material.

- Check water quality parameters periodically.

4.2.5 Pump Procedure

- Well development using only a pump is most effective in monitoring wells that will yield water continuously. Theoretically, pumping will increase the hydraulic gradient and velocity of groundwater near the well by drawing the water level down. The increased velocity will move residual fine soil particles into the well and clear the well screen of this material. Effective development cannot be accomplished if the pump has to be shut off to allow the well to recharge.

- When using a submersible pump or surface pump, set the intake of the pump or intake line in the center of the screened interval of the monitoring well.

- Pump a minimum of three well volumes of water from the well and raise and lower the pump line through the screened interval to remove any silt/laden water.

- Continue pumping water from the well until sediment-free water is obtained. This method may be combined with the manual surge block method if well yield is not rapid enough to extract silt from the surrounding formations.

- Check water quality parameters periodically.

4.2.6 Compressed Gas Procedure

- Although the equipment used to develop a well using this method is more difficult to obtain and use, well development using compressed gas is considered to be a very effective method. This method is also not limited by well depth, well diameter, or depth to static water. Caution must be exercised, however, in highly permeable formations not to inject gas into the formation. Drilling subcontractors will often provide the necessary materials as well as perform this method , if requested. When using a compressor, an oil-less compressor should be used, or an oil trap/filter should be placed on the air discharge line which enters the well.

- Lower the gas line into the well, setting it near the bottom of the screened interval. Install the discharge control equipment (i.e., tee fitting) at the well head.

- Set the gas flow rate to allow continuous discharge of water from the well.

- At intervals during gas-lifting, especially when the discharge begins to contain less suspended material , shut off the air flow and allow the water in the well to backflush through the screened interval to disturb any bridging that may have occurred. Re-establish the gas flow when the water level in the well has returned to the pre-development level.

- Continue gas-lifting and/or jetting until the discharged water is free from suspended material.

- Check water quality parameters periodically.

5.0 QUALITY CONTROL

A well has been successfully developed when one or more of the following criteria are met:

- The sediment load in the well has been eliminated or greatly reduced. Regulatory requirements may be in place which state that water turbidity values ranging from 5 to 50 NTU must be achieved at the end of the development procedure. Use of a nephelometer is required during the well development procedure to measure water turbidity if meeting a specific turbidity value is required by the regulations. Attaining low turbidity values in fine-grained formations may be difficult to achieve.

- Permeability tests conducted in accordance with ENSR SOP-7720 (Hydraulic Conductivity Testing) yield repeatable hydraulic conductivity values.

6.0 DOCUMENTATION

The Monitoring Well Development Record (Figure 2) will be completed by the geologist or hydrogeologist conducting the development. In addition, a field project notebook should be maintained detailing any problems or unusual conditions which may have occurred during the development process.

7.0 TRAINING/QUALIFICATIONS

Well development procedures vary in complexity. It is recommended that initial development attempts be supervised by more experienced personnel. Field personnel should be health and safety certified as specified by OSHA (29 CFR 1910.120(e)(3)(i)) to work on sites where hazardous waste materials are considered to be present.

8.0 REFERENCES

Standard References for Monitoring Wells, Massachusetts Department of Environmental Protection, WSC-310-91, 1991.

APPENDIX: DEFINITIONS

Bridging: A condition within the filter pack outside the well screen whereby the smaller particles are wedged together in a manner that causes blockage of pore spaces.

Hydraulic Conductivity: a characteristic property of aquifer materials which describes the permeability of the material with respect to flow of water.

Hydraulic Connection: A properly installed and developed monitoring well should have good hydraulic connection with the aquifer. The well screen and filter material should not provide any restriction to the flow of water from the aquifer into the well.

Permeability Test: Used to determine the hydraulic conductivity of the aquifer formation near a well screen. Generally conducted by displacing the water level in a well and monitoring the rate of recovery of the water level as it returns to equilibrium. Various methods of analysis are available to calculate the hydraulic conductivity from these data.

Static Water Level: The water level in a well that represents an equilibrium or stabilized condition, usually with respect to atmospheric conditions in the case of monitoring wells.

Well Surging: That process of moving water in and out of a well screen to remove fine sand, silt and clay size particles from the adjacent formation.

Well Purging: The process of removing standing water from a well to allow surrounding formation water to enter the well.

Well Screen: That portion of the well casing material that is perforated in some manner so as to provide a hydraulic connection to the aquifer. The perforated, or slotted, portion of a well is also known as the screened interval.

Figure 1
Recommended Surge Block Design

SURGE BLOCK DESIGN
(Not to Scale)

Steel washers should be 1/2" to 3/4" smaller in diameter than the well ID. Gasket can be rubber or leather and should be the same diameter or 1/8" smaller than the well ID to compensate for swelling of the leather/ Rod can be steel, fiberglass, or plastic but must be strong and lightweight.

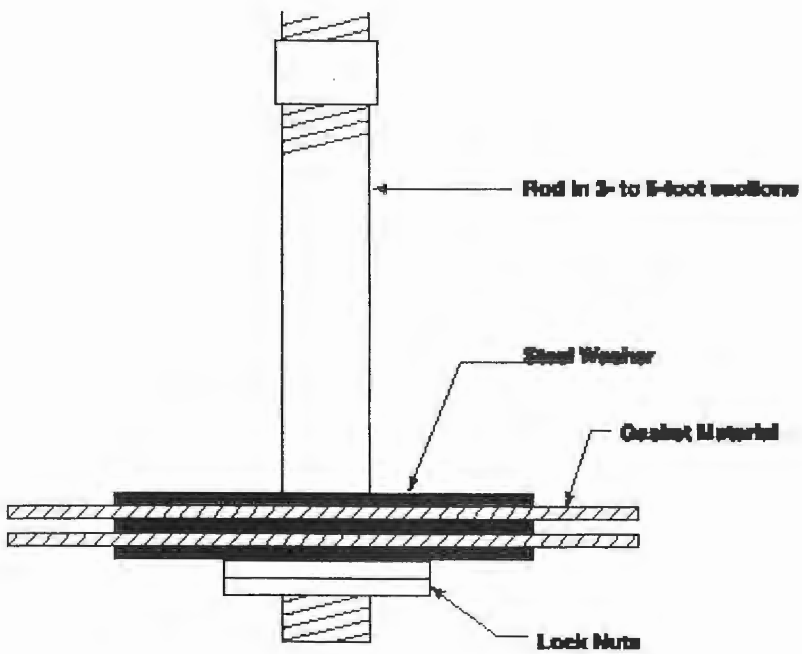


Figure 2
Well Development Record

ENSR

MONITORING WELL DEVELOPMENT RECORD

DATE: ______________________ WELL I.D.: ______________________

PROJECT NAME: ______________________ LOCATION: ______________________

PROJECT NUMBER: ______________________ DEVELOPER: ______________________

☐ ORIGINAL DEVELOPMENT ☐ REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: ______________________

WELL DATA

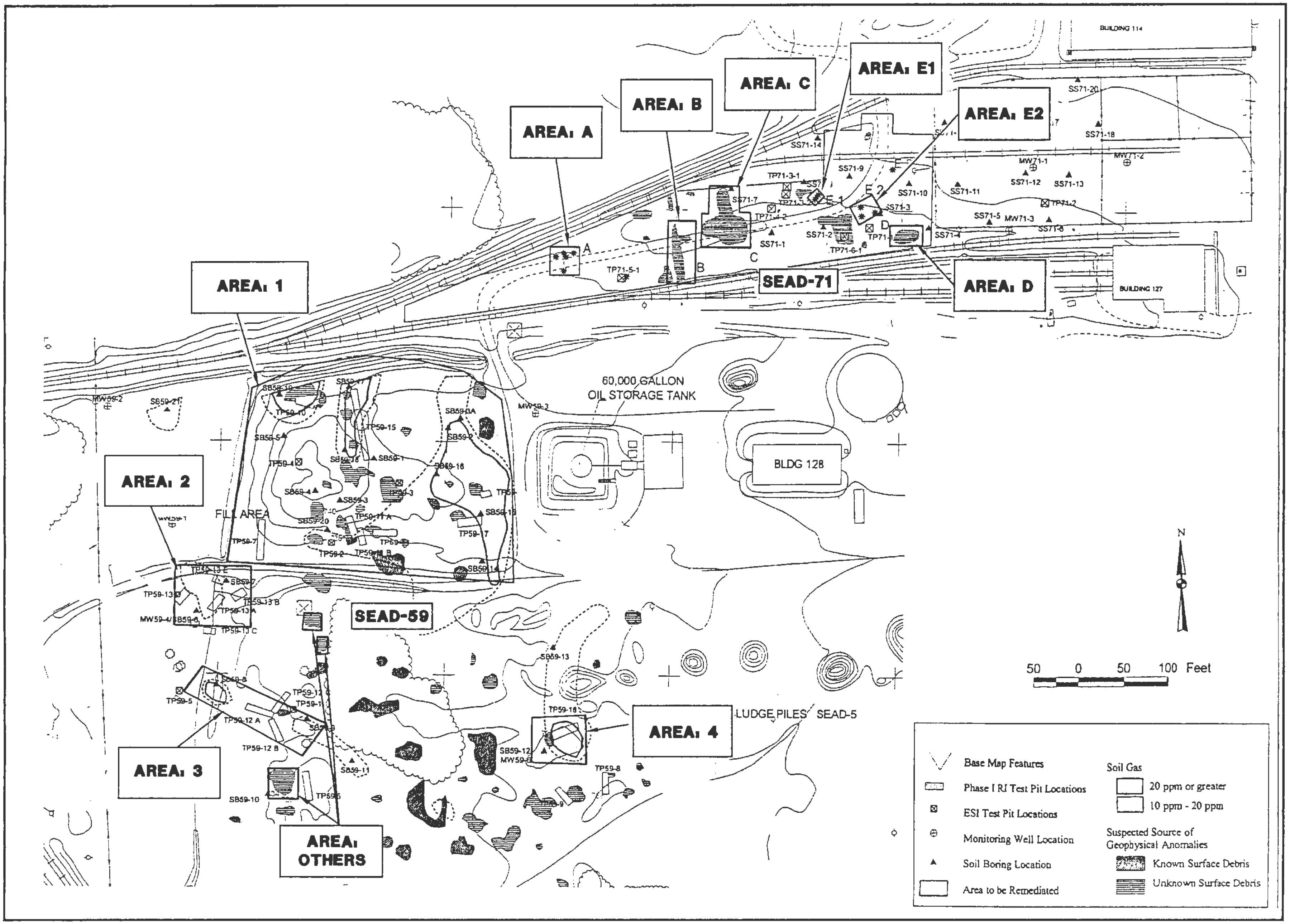
Well Diameter: ________	Geology at Screened Interval:
Total Well Depth: ________	Likely Contaminants:
Depth to Top of Screen: ________	Purge Water & Sediment Disposal Method:
Depth to Bottom of Screen: ________	
Depth to Static Water Level: ________	

DEVELOPMENT METHOD	PURGE METHOD	PERMEABILITY TEST RESULTS

ACCEPTANCE CRITERIA

Signature: Date:

FIGURES



FILENAME:

NO.	DESCRIPTION:	DATE:	BY:

REVISIONS

DESIGNED BY: JPS
DRAWN BY: DSS
CHECKED BY: JPS
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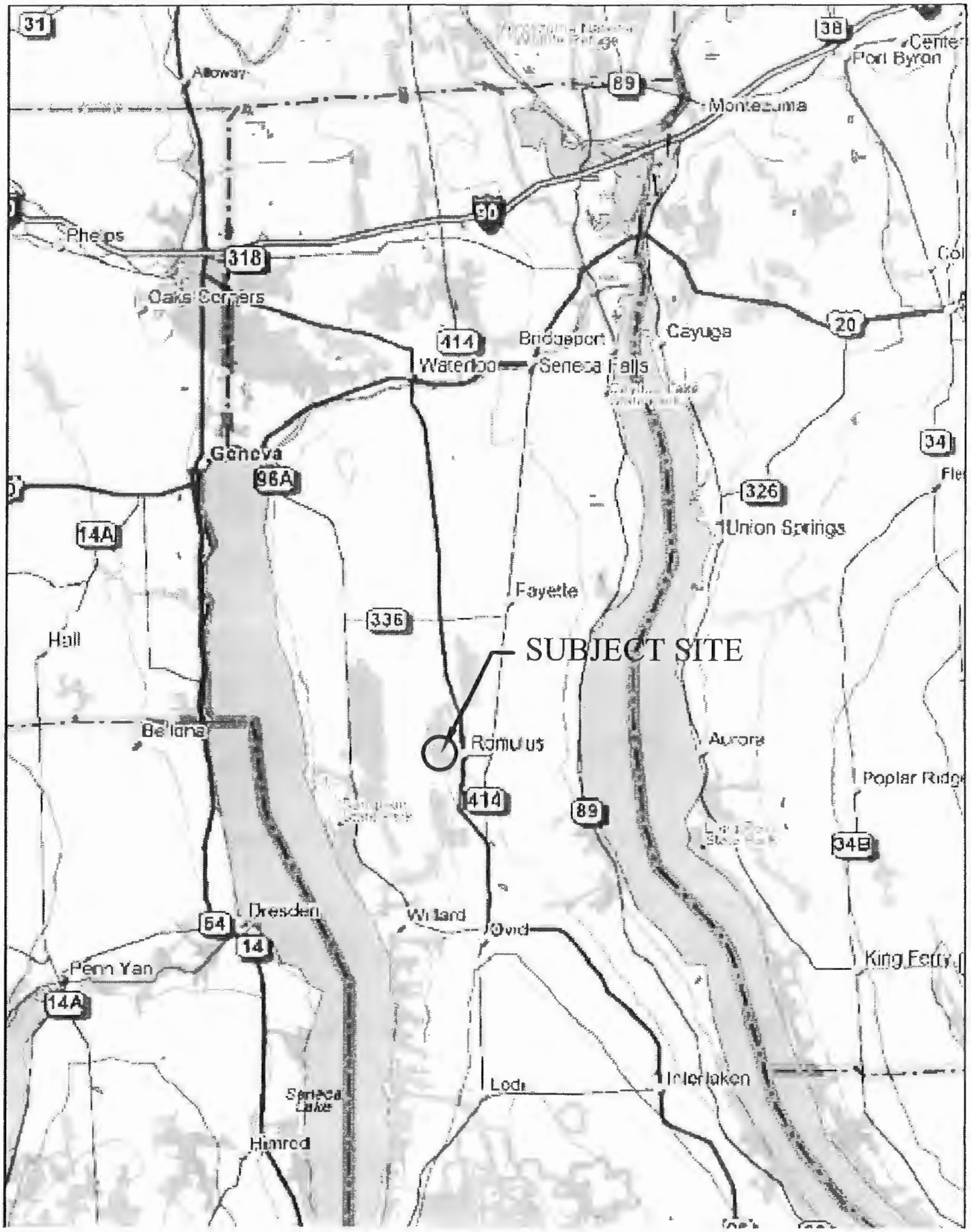
SOIL AREAS TO BE REMEDIATED

SENECA ARMY DEPOT ACTIVITY
TIME CRITICAL REMOVAL ACTION
SEAD'S 59 AND 71

SCALE: NOTED
DATE: 8/19/02
PROJECT NUMBER: 09090-029

FIGURE NUMBER: 1A

SHEET NUMBER: 1 OF 1



SITE LOCATION MAP

SENECA ARMY DEPOT ACTIVITY
TIME CRITICAL REMOVAL ACTION
SEAD'S 59 AND 71

FIGURE NUMBER: 1

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DRAWN BY:	DATE:	PROJECT NUMBER:	SHEET NUMBER:
DSS	8/19/02	09090-029	Figure1

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APPENDIX F

QUALITY ASSURANCE PROJECT PLAN
for
TIME CRITICAL REMOVAL ACTIONS
at
SEAD-59 AND SEAD-71
SENECA ARMY DEPORT ACTIVITY, ROMULUS, NY

(Revision 0)

August 2002

Prepared by:
ENSR Corporation

Prepared for:
UNITED STATES ARMY
ENGINEERING AND SUPPORT CENTER
HUNTSVILLE, ALABAMA

29 Aug 02

ENSR Project Manager — Date

8/29/2002

ENSR Data Quality Officer — Date

CAS Quality Assurance Manager — Date

DISTRIBUTION LIST

USACE Project Manager, Tom Battaglia
ENSR Project Manager, Rick Brannon
Project Quality Systems Manager, Jim Sprague
ENSR Field Team Leader, Steve Kostage
ENSR Data Quality Officer, Rick Wellman
CAS Project Manager, Mark Wilson

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the organization, data quality objectives (DQOs), planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the chemical analyses performed for the Time Critical Removal Actions at the Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71) at the Seneca Army Deport Activity (SEDA) in Romulus, New York. Specific protocols for sample handling and storage, chain-of-custody, laboratory analyses, corrective action, and data validation will be described.

This QAPP has been prepared by the U.S. Army Corps of Engineers' (USACE) contractor, ENSR Corporation (ENSR), and is one of two documents contained in the Sampling and Analysis Plan (SAP). The SAP also includes a Field Sampling Plan (FSP) which details sampling procedures, field quality control (QC), equipment decontamination, field chain-of-custody and shipping procedures, and field documentation, and is included in the QAPP by reference.

This QAPP has been prepared using guidance provided in the USACE document EM-200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001) and New York State Department of Environmental Conservation (NYSDEC) RCRA Quality Assurance Project Plan Guidance (NYSDEC, 1991). Other relevant guidance documents included *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, 1986), *Chemical Quality Assurance for Hazardous, Toxic, and Radioactive (HTRW) Projects*, EM 200-1-6 (USACE, 1997), and *Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities*, ER 1110-1-263 (USACE, 1998).

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The USACE's contractor, ENSR, will oversee the field investigation and sample analysis and will prepare data deliverables. Project management will also be provided by ENSR. The various management, QA, field, and laboratory responsibilities of key project personnel are defined below.

2.1 Project Organization Chart

The lines of authority and communication specific to this investigation are presented in Figure 2-1. This chart includes the individuals discussed below.

2.2 Management Responsibilities

USACE Project Manager

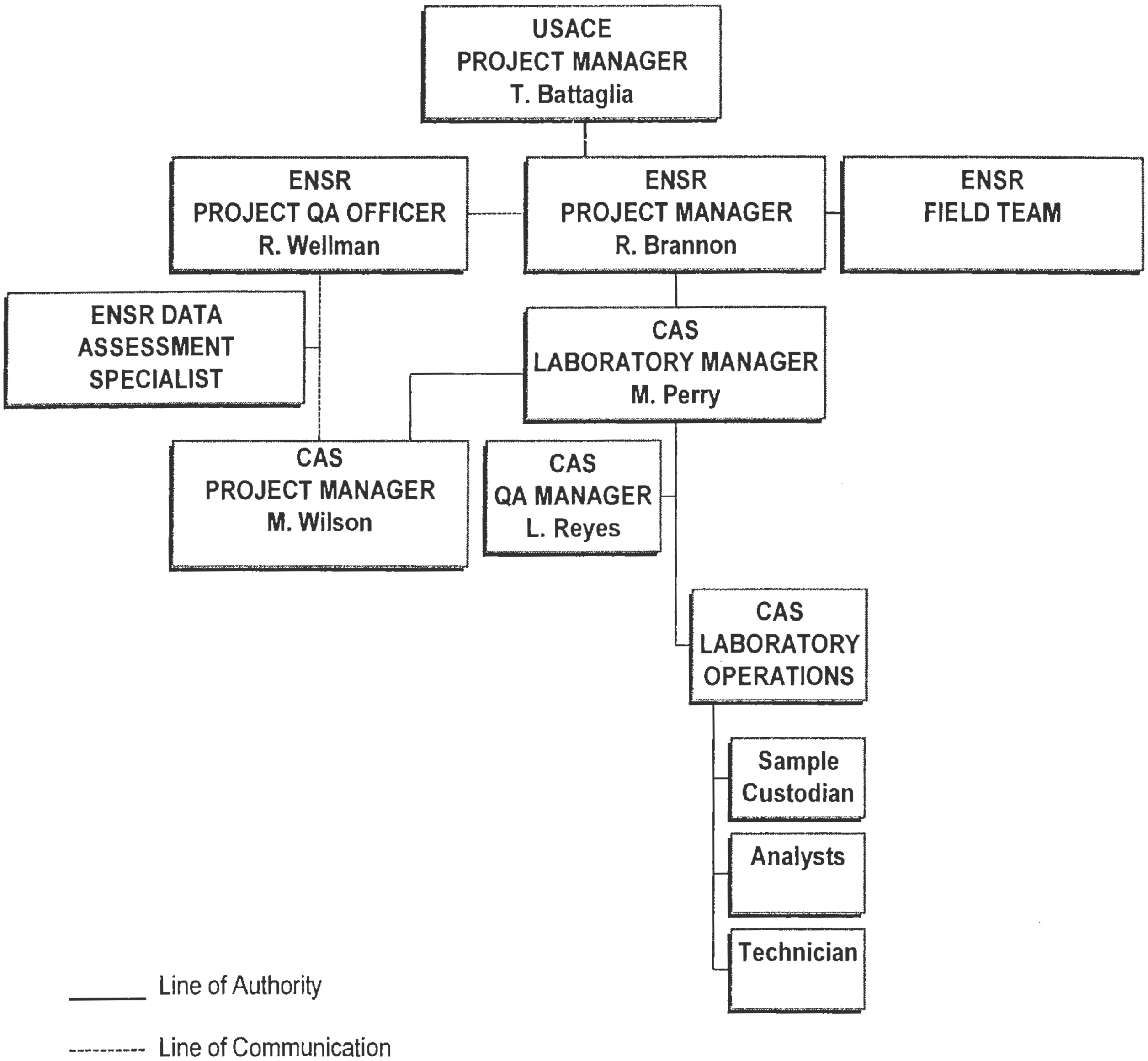
The USACE Project Manager, Tom Battaglia, is primarily responsible for project direction and decisions concerning technical issues and strategies, setting the basic program policies applicable to work assignments, and oversight of ENSR. The USACE Project Manager will communicate directly with third parties and other stakeholders and will provide the major point of contact and control for matters concerning the project.

ENSR Project Manager

The ENSR Project Manager, Rick Brannon, has responsibility for technical, financial, and scheduling matters and will serve as the main contact with the USACE. Other duties, as necessary, include

- Subcontractor procurement,
- Assignment of duties to project staff and orientation of the staff to the specific needs and requirements of the project,
- Ensuring that data assessment activities are conducted in accordance with the QAPP,
- Approval of project-specific procedures and internally prepared plans, drawings, and reports,

Figure 2-1 Project Organization



- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project, and

- Maintenance of the project file.

2.3 Quality Assurance Responsibilities

Project Quality Systems Manager

The Project Quality Systems Manager, Jim Sprague, will have overall responsibility for the quality of the project.

ENSR Data Quality Officer

The ENSR Data Quality Officer, Rick Wellman, has overall responsibility for quality assurance oversight of the chemical data analyses. The ENSR Data Quality Officer communicates directly to the ENSR Project Manager and the Project Quality Systems Manager. Specific responsibilities include:

- Preparing the QAPP,

- Reviewing and approving QA procedures, including any modifications to existing approved procedures,

- Ensuring that QA audits of the various phases of the project are conducted as required,

- Providing QA technical assistance to project staff,

- Ensuring that data validation/data assessment is conducted in accordance with the QAPP, and

- Reporting on the adequacy, status, and effectiveness of the QA program to the ENSR Project Manager.

ENSR Chemical Data Assessment Specialist

The ENSR Chemical Data Assessment Specialist reports to the ENSR Data Quality Officer. The Chemical Data Assessment Specialist is responsible for performing verification, review, and validation of the analytical data in accordance with Section 8.0 of the QAPP.

2.4 Laboratory Responsibilities

Columbia Analytical Services (CAS) of Rochester, NY, will perform the analyses. Responsibilities within the laboratory for this project are defined below.

Laboratory Manager

The Laboratory Manager is ultimately responsible for the data produced by the laboratory. Specific responsibilities include:

- Implementing and adhering to the Laboratory Quality Assurance Management Plan (LQAMP) and all corporate policies and procedures within the laboratory,
- Maintaining adequate staffing documented on organization charts, and
- Implementing internal/external audit findings corrective actions.

Laboratory QA Manager

The Laboratory QA Manager reports directly to the Laboratory Manager. Specific responsibilities include:

- Approving operation-specific Standard Operating Procedures (SOPs),
- Assessing and maintaining the LQAMP implementation within the facility operations,
- Ensuring and improving quality within facility operations,
- Recommending resolutions for ongoing or recurrent nonconformances within the laboratory,
- Performing QA assessments,
- Assisting in the preparation of and approving QAPPs, and
- Preparing a quality reports to management.

Laboratory Project Manager

The Laboratory Project Manager is the liaison between the client and the laboratory staff. Specific responsibilities of the Laboratory Project Manager includes:

- Monitoring analytical and QA project requirements for a specified project,
- Reviewing project data packages for completeness and compliance to client needs, and
- Monitoring, reviewing, and evaluating the progress and performance of projects.

Analyst

Each analyst is responsible for:

- Performing analytical methods and data recording in accordance with documented procedures,
- Performing and documenting calibration and preventive maintenance,
- Performing data processing and data review procedures,
- Reporting nonconformances to the appropriate personnel, and
- Ensuring sample and data integrity by adhering to internal chain-of-custody procedures.

Laboratory Sample Custodian

The Sample Custodian ensures implementation of proper sample receipt procedures, including maintenance of chain-of-custody. Other specific responsibilities include:

- Reporting anomalies associated with condition-upon-receipt of samples to the Laboratory Project Manager,
- Logging samples into the laboratory information management system (LIMS),
- Ensuring that all samples are stored in the proper environment, and
- Assisting with sample disposal.

2.5 Field Responsibilities

ENSR Field Team Leader (FTL)

The ENSR FTL has overall responsibility for completion of all field activities in accordance with the FSP and QAPP and is the communication link between ENSR project management and the field team. Specific responsibilities of the ENSR FTL include:

- Coordinating activities at the site,
- Assigning specific duties to field team members,
- Mobilizing and demobilizing of the field team and subcontractors to and from the site,
- Directing the activities of subcontractors on site,
- Resolving any logistical problems that could potentially hinder field activities, such as equipment malfunctions or availability, personnel conflicts, or weather dependent working conditions,
- Implementing field QC including issuance and tracking of measurement and test equipment; the proper labeling, handling, storage, shipping, and chain-of-custody procedures used at the time of sampling; and control and collection of all field documentation, and
- Assisting with report preparation.

Field Staff

The field staff reports directly to the ENSR FTL. The responsibilities of the field team include:

- Collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP and the field SOPs,
- Ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments,
- Ensuring that field documentation and data are complete and accurate, and
- Communicating any nonconformance or potential data quality issues to the ENSR FTL.

3.0 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are an integrated set of specifications that define data quality requirements based on the intended use of the data (USACE, 2001). The DQO process determines sample handling procedures, preparation and analytical methods, target analytes and their associated quantitation limits, quality control (QC) samples, and the measurement quality objectives (MQOs).

3.1 Data Use Background

An extensive discussion of the site history, regulatory background, physical description, and results of previous investigations are included in the USACE Statement of Work (SOW) and summarized in the Work Plan. The overall objective of the removal action at SEAD-59 and SEAD-71 is to (1) eliminate and contain an identified source of residual chemical materials in the soil and (2) to remove or at least lessen the magnitude of the potential threat that it represents to the surrounding populations and the environment.

The tasks that will be completed to attain this objective are detailed in the Work Plan. A summary of the tasks is provided below, along with the analyses to be performed, data quality level (DQL), and intended data usage.

Task Description	Analyses	DQL	Intended Data Use
Excavation of soil and debris, staging, and testing	VOCs, SVOCs, pesticides, PCBs, TAL metals	Definitive	Comparison of soil results to TAGM-derived clean-up levels to determine if material can be backfilled or must be disposed of off site.
Sampling of borrow pit soil	VOCs, SVOCs, PCBs, pesticides; TAL metals	Definitive	Comparison to TAGM-derived clean-up levels to determine suitability for backfilling.
Confirmatory sampling of excavations	VOCs, SVOCs, pesticides, PCBs, TAL metals	Definitive	Comparison to TAGM-derived clean-up levels to confirm that proposed limits of excavation meet performance standards
Visual inspection and measurement of headspace in backfill	Total VOCs	Screening	To monitor suitability for backfilling.

Task Description	Analyses	DQL	Intended Data Use
Waste residual testing (e.g., soil, oils, lubricants, hydraulic fluids, coolants, plastic sheeting, PPE)	TCLP VOCs, SVOCs, metals, and pesticides; ignitability, corrosivity, and reactivity	Definitive	Comparison to hazardous waste characteristics to determine disposal options.
Collect wastewater resulting from run off and excavation dewatering and test for disposal	TAL metals, BOD, cyanide, pH, TDS, TSS, and ammonia	Definitive	Comparison to Town of Romulus wastewater treatment criteria to determine acceptability for disposal.

The specific analytes that will be tested are identified in Table 3-1. Table 3-1 also specifies the DQO decision criteria and provides the laboratory Method Quantitation Limits (MQLs) for comparison.

3.2 Project Quality Objectives

The removal actions at SEAD-59 and SEAD-71 will consist of a sampling program and chemical analyses of soil, debris (if encountered during excavation), waste residuals, and water originating from surface runoff and/or excavation dewatering. The field investigation is designed to provide information that will allow timely decisions on disposal options and confirmation that the limits of excavation have been met specification. Therefore, the sampling and analysis program incorporates the following QA elements:

- A sampling program designed to obtain sufficient data to determine the levels of selected constituents in the media of interest,
- The use of sample collection and handling procedures that will ensure the representativeness and integrity of the samples,
- The use of a laboratory that has been validated by the USACE and certified by New York State Department of Health (NYSDOH).
- An analytical program designed to generate definitive data of sufficient quality and sensitivity to meet the project objectives,
- Data deliverables that will allow verification and validation of the data and reproduction of the reported results.

3.3 Measurement Quality Objectives

The following section presents the MQOs established for this program for the data quality indicators (DQIs). The DQIs include the quantitative parameters of precision, bias (accuracy), completeness, and sensitivity, as well as the qualitative elements of comparability and representativeness.

3.3.1 Precision

Precision is a measure of the degree to which two or more measurements are in agreement.

Field precision is assessed through the collection and measurement of field duplicates at a rate of one duplicate per 20 analytical samples. Field duplicate collection procedures are discussed in the FSP. Precision will be measured through the calculation of relative percent difference (RPD) as described in Section 6.2.1 of this QAPP. The objectives for field precision RPDs are shown in Tables 3-2 and 3-3.

Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. Duplicate samples may include matrix duplicates or matrix spike/matrix spike duplicates (MS/MSDs), depending on the method. The equation to be used for precision can be found in Section 6.2.1 of this QAPP. Precision control limits are provided in Tables 3-2 and 3-3.

3.3.2 Bias

Bias refers to the systematic or persistent distortion of a measurement process that causes errors in one direction. Accuracy is the degree of agreement between the observed value and an accepted reference or true value. Accuracy includes both random error and bias components.

Bias in the field is assessed through the use of trip blanks and equipment rinsate blanks and through the adherence to all sample handling, preservation, and holding time requirements. The objectives for trip blanks and equipment blanks are shown in Tables 3-2 and 3-3. Field collection procedures associated with trip blanks and equipment rinsate blanks are presented in the FSP.

Laboratory bias is assessed through the analysis of MS/MSDs, laboratory control samples (LCSs), and surrogate compounds, and the subsequent determination of percent recoveries (%Rs). The equations to be used for bias in this project can be found in Section 6.2.2 of this QAPP. Control limits are given in Tables 3-2 and 3-3.

3.3.3 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 6.2.4 of this QAPP. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 6.2.4 of this QAPP. The laboratory completeness objective is greater than 95 percent.

3.3.4 Sensitivity

Sensitivity is defined as the quantitation limits established to meet the project objectives. The analytical methodologies chosen for this project were selected based on their ability to attain the DQOs. A listing of MQLs for each target compound can be found in Table 3-1 of this QAPP. DQO criteria are also provided for comparison.

3.3.5 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the FSP and QAPP are followed and that proper sampling techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, meeting sample holding times, and analyzing and assessing field duplicate samples. The sampling network was designed to provide data representative of the area of concern. During development of this network, consideration was given to past facility processes, existing analytical data, physical setting and processes, and media of concern.

3.3.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the FSP and QAPP are followed, proper sampling techniques are used, and that analyses are conducted using standard EPA methodologies.

Table 3-1 Target Analytes, Method Quantitation Limits, and Data Quality Objective Criteria

Associated Samples (see Notes)	Parameter	CAS No.	Soil		Wastewater	
			DQO (Note 4)	MQL	DQO (Note 5)	MQL
	Volatile Organic Compounds (µg/kg or µg/L)					
1, 2	1,1,1-Trichloroethane	71-55-6	800	5		NA
1, 2	1,1,2,2-Tetrachloroethane	79-34-5	600	5		NA
2	1,1,2-Trichloroethane	79-00-5		5		NA
1, 2	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	6000	5		NA
1, 2	1,1-Dichloroethane	75-34-3	200	5		NA
1, 2	1,1-Dichloroethene	75-35-4	400	5		NA
2	1,2-Dibromo-3-chloropropane	96-12-8		5		NA
1, 2	1,2-Dibromoethane	106-93-4	100	5		NA
1, 2	1,2-Dichlorobenzene	95-50-1	7900	5		NA
2	1,2-Dichloroethane	107-06-2		5		NA
2	1,2-Dichloropropane	78-87-5		5		NA
1	1,2,3-Trichloroproane		400	5		NA
1, 2	1,2,4-Trichlorobenzene	120-82-1	3400	5		NA
1, 2	1,3-Dichlorobenzene	541-73-1	1600	5		NA
1	1,3-Dichloropropane		300	5		NA
1, 2	1,4-Dichlorobenzene	106-46-7	8500	5		NA
1, 2	2-Butanone	78-93-3		10		NA
2	2-Hexanone	591-78-6	300	10		NA
1, 2	4-Methyl-2-pentanone	108-10-1	1000	10		NA
1, 2	Acetone	67-64-1	200	10		NA
1, 2	Benzene	71-43-2	60	5		NA
2	Bromodichloromethane	75-27-4		5		NA
2	Bromoform	75-25-2		5		NA
2	Bromomethane	74-83-9		5		NA
1, 2	Carbon disulfide	75-15-0	2700	10		NA
1, 2	Carbon tetrachloride	56-23-5	600	5		NA
1, 2	Chlorobenzene	108-90-7	1700	5		NA
1, 2	Chloroethane	75-00-3	1900	10		NA
1, 2	Chloroform	67-66-3	300	5		NA
2	Chloromethane	74-87-3		5		NA
2,	cis-1,2-Dichloroethene	156-59-2		5		NA
2	cis-1,3-Dichloropropene	10061-01-5		5		NA
2	Cyclohexane	110-82-7		5		NA
1, 2	Dibromochloromethane	124-48-1	NS	5		NA
2	Dichlorodifluoromethane	75-71-8		5		NA
1, 2	Ethylbenzene	100-41-4	5500	5		NA
2	Isopropylbenzene	98-82-8		5		NA
2	Methyl acetate	79-20-9		5		NA
2	Methylcyclohexane	108-87-2		5		NA

Associated Samples (see Notes)	Parameter	CAS No.	Soil DQO (Note 4)	Soil MQL	Wastewater DQO (Note 5)	Wastewater MQL
1, 2	Methylene chloride	75-09-2	100	5		NA
2	Methyl-tert-butyl-ether	1634-04-4		5		NA
2	Styrene	100-42-5		5		NA
1, 2	Tetrachloroethene	127-18-4	1400	5		NA
1, 2	Toluene	108-88-3	1500	5		NA
1, 2	trans-1,2-Dichloroethene	156-60-5	300	5		NA
2	trans-1,3-Dichloropropene	10061-02-6		5		NA
1, 2	Trichloroethene	79-01-6	700	5		NA
2	Trichlorofluoromethane	75-69-4		5		NA
1, 2	Vinyl chloride	75-01-4	200	5		NA
1, 2	Xylenes (total)	1330-20-7	1200	5		NA
	Semivolatile Organic Compounds (µg/kg or µg/L)					
2	1,1-Biphenyl	92-52-4		330		NA
2	2,2'-Oxybis(1-Chloropropane)	108-60-1		330		NA
1, 2	2,4,5-Trichlorophenol	95-95-4	100	330		NA
2	2,4,6-Trichlorophenol	88-06-2		330		NA
1, 2	2,4-Dichlorophenol	120-83-2	400	330		NA
2	2,4-Dimethylphenol	105-67-9		330		NA
1, 2	2,4-Dinitrophenol	51-28-5	200 or MDL	1700		NA
2	2,4-Dinitrotoluene	121-14-2		330		NA
1, 2	2,6-Dinitrotoluene	606-20-2	1000	330		NA
2	2-Chloronaphthalene	91-58-7		330		NA
1, 2	2-Chlorophenol	95-57-8	800	330		NA
1, 2	2-Methylnaphthalene	91-57-6	36,400	330		NA
1, 2	2-Nitroaniline	88-74-4	430 or MDL	1700		NA
1, 2	2-Nitrophenol	88-75-5	330 or MDL	330		NA
1, 2	3,3'-Dichlorobenzidine	91-94-1		330		NA
1, 2	3-Nitroaniline	99-09-2	500 or MDL	1700		NA
2	4,6-Dinitro-2-methylphenol	534-52-1		1700		NA
2	4-Bromophenylphenyl ether	101-55-3		330		NA
1, 2	4-Chloro-3-methylphenol	59-50-7	240 or MDL	330		NA
1, 2	4-Chloroaniline	106-47-8	220 or MDL	330		NA
2	4-Chlorophenylphenyl ether	7005-72-3		330		NA
2	4-Nitroaniline	100-01-6		1700		NA
1, 2	4-Nitrophenol	100-02-7	100 or MDL	1700		NA
1, 2	Acenaphthene	83-32-9	50,000 (Note 4)	330		NA
1, 2	Acenaphthylene	208-96-8	41,000	330		NA
2	Acetophenone	98-86-2		330		NA
1	Aniline		100	330		NA
1, 2	Anthracene	120-12-7	50,000 (Note 4)	330		NA
2	Atrazine	1912-24-9		330		NA

Associated Samples (see Notes)	Parameter	CAS No.	Soil		Wastewater	
			DQO (Note 4)	MQL	DQO (Note 5)	MQL
2	Benzaldehyde	100-52-7		330		NA
1, 2	Benzo(a)anthracene	56-55-3	224 or MDL	330		NA
1, 2	Benzo(a)pyrene	50-32-8	61 or MDL	330		NA
1, 2	Benzo(b)fluoranthene	205-99-2	1100	330		NA
1, 2	Benzo(g,h,i)perylene	191-24-2	50,000 (Note 4)	330		NA
1, 2	Benzo(k)fluoranthene	207-08-9	1100	330		NA
2	Bis(2-Chloroethoxy)methane	111-91-1		330		NA
2	Bis(2-Chloroethyl)ether	111-44-4		330		NA
1, 2	Bis(2-Ethylhexyl)phthalate	117-81-7	50,000 (Note 4)	330		NA
1, 2	Butylbenzylphthalate	85-68-7	50,000 (Note 4)	330		NA
2	Caprolactam	105-60-2		330		NA
2	Carbazole	86-74-8		330		NA
1, 2	Chrysene	218-01-9	400	330		NA
1, 2	Dibenz(a,h)anthracene	53-70-3	14 or MDL	330		NA
1, 2	Dibenzofuran	132-64-9	6200	330		NA
1, 2	Diethylphthalate	84-66-2	7100	300		NA
1, 2	Dimethylphthalate	131-11-3	2000	330		NA
1, 2	Di-n-butylphthalate	84-74-2	8100	330		NA
1, 2	Di-n-octylphthalate	117-84-0	50,000 (Note 4)	330		NA
1, 2	Fluoranthene	206-44-0	50,000 (Note 4)	330		NA
1, 2	Fluorene	86-73-7	50,000 (Note 4)	330		NA
1, 2	Hexachlorobenzene	118-74-1	410	330		NA
2	Hexachlorobutadiene	87-68-3		330		NA
2	Hexachlorocyclopentadiene	77-47-4		330		NA
2	Hexachloroethane	67-72-1		330		NA
1, 2	Indeno(1,2,3-cd)pyrene	193-39-5	3200	330		NA
1, 2	Isophorone	78-59-1	4400	330		NA
1, 2	Naphthalene	91-20-3	13,000	330		NA
1, 2	Nitrobenzene	98-95-3	200 or MDL	330		NA
2	N-Nitroso-di-n-propylamine	621-64-7		330		NA
2	N-Nitrosodiphenylamine	86-30-6		330		NA
1, 2	o-Cresol (2-Methylphenol)	95-48-7	100 or MDL	330		NA
1, 2	p-Cresol (4-Methylphenol)	106-44-5	900	330		NA
1, 2	Pentachlorophenol	87-86-5	1000 or MDL	1700		NA
1, 2	Phenanthrene	85-01-8	50,000 (Note 4)	330		NA

Associated Samples (see Notes)	Parameter	CAS No.	Soil DQO (Note 4)	Soil MQL	Wastewater DQO (Note 5)	Wastewater MQL
1, 2	Phenol	108-95-2	30	330		NA
1, 2	Pyrene	129-00-0	50,000 (Note 4)	330		NA
	PCBs (µg/kg or µg/L)					
1, 2	Aroclor 1016	12674-11-2	Surface soil 1 mg/kg	33		NA
1, 2	Aroclor 1221	11104-28-2		67		NA
1, 2	Aroclor 1232	11141-16-5		33		NA
1, 2	Aroclor 1242	53469-21-9		33		NA
1, 2	Aroclor 1248	12672-29-6	Subsurface soil 10 mg/kg	33		NA
1, 2	Aroclor 1254	11097-69-1		33		NA
1, 2	Aroclor 1260	11096-82-5		33		NA
	Pesticides (µg/kg or µg/L)					
1, 2	alpha-BHC	319-84-6	110	1.7		NA
1, 2	beta-BHC	319-85-7	200	1.7		NA
1, 2	delta-BHC	319-86-8	300	1.7		NA
1, 2	gamma-BHC (Lindane)	58-89-9	60	1.7		NA
1, 2	Heptachlor	76-44-8	100	1.7		NA
1, 2	Aldrin	309-00-2	41	1.7		NA
1, 2	Heptachlor epoxide	1024-57-3	20	1.7		NA
1, 2	Endosulfan I	959-98-8	900	1.7		NA
1, 2	Dieldrin	60-57-1	44	3.3		NA
1, 2	4,4'-DDE	72-55-9	2100	3.3		NA
1, 2	Endrin	72-20-8	100	3.3		NA
1, 2	Endosulfan II	33213-65-9	900	3.3		NA
1, 2	4,4'-DDD	72-54-8	2900	3.3		NA
1, 2	Endosulfan sulfate	1031-07-8	1000	3.3		NA
1, 2	4,4'-DDT	50-29-3	2100	3.3		NA
1, 2	Methoxychlor	72-43-5	Note 4	17		NA
1, 2	Endrin ketone	53494-70-5	NS	3.3		NA
2	Endrin aldehyde	7421-93-4		3.3		NA
1, 2	alpha-Chlordane	5103-71-9	540	1.7		NA
1, 2	gamma-Chlordane	5103-74-2	540	1.7		NA
2	Toxaphene	8001-35-2		170		NA
	Metals (mg/kg or µg/L)					
2, 3	Aluminum	7429-90-5	SB	10		100
2, 3	Antimony	7440-36-0	SB	6		60
1, 2, 3	Arsenic	7440-38-2	7.5 or SB	1		10
1, 2, 3	Barium	7440-39-3	300 or SB	2		20
2, 3	Beryllium	7440-41-7	0.16 or SB	0.5		5
1, 2, 3	Cadmium	7440-43-9	1 or SB	0.5		5
2, 3	Calcium	7440-70-2	SB	50		500
1, 2, 3	Chromium (total)	7440-47-3	10 or SB	1		10

Associated Samples (see Notes)	Parameter	CAS No.	Soil		Wastewater	
			DQO (Note 4)	MQL	DQO (Note 5)	MQL
2, 3	Cobalt	7440-48-4	30 or SB	5		50
2, 3	Copper	7440-50-8	25 or SB	2		20
2, 3	Iron	7439-89-6	2000 or SB	10		100
1, 2, 3	Lead	7439-92-1	SB	0.5		5
2, 3	Magnesium	7439-95-4	SB	50		500
2, 3	Manganese	7439-96-5	SB	1		10
1, 2, 3	Mercury	7439-97-6	0.1	2.5		0.3
2, 3	Nickel	7440-02-0	13 or SB	4		40
2, 3	Potassium	7440-09-7	SB	200		2000
1, 2, 3	Selenium	7782-49-2	2 or SB	0.5		5
1, 2, 3	Silver	7440-22-4	SB	1		10
2, 3	Sodium	7440-23-5	SB	50		500
2, 3	Thallium	7440-28-0	SB	5		10
2, 3	Vanadium	7440-62-2	150 or SB	5		50
2, 3	Zinc	7440-66-6	20 or SB	2		20
General Chemistry (mg/L)						
3	BOD	E-10106		NA		2.00
3	Cyanide	57-125		NA		0.01
3	pH	E-10139		NA		1 SU
3	TDS	E-10173		NA		10.0
3	TSS	E-10162		NA		1.0
3	Ammonia	7664-41-7		NA		0.05

Notes:

NA - Analysis not applicable to media
NS – None specified
MDL – Method Detection Limit
DQO – Data quality objective criteria. Sources:
Soil - New York State TAGM 4046 - Recommended Soil Cleanup Objectives
Wastewater – Town of Romulus

SB – Site background
MQL – Method Quantitation Limit (lab-specific)

1 – Applies to soil excavation and confirmatory samples
2 – Applies to borrow pit samples
3 – Applies to wastewater samples
4- Limited to the following maximum values
Total VOCs $\leq$10 ppm
Total SVOCs $\leq$500 ppm
Individual SVOCs $\leq$50 ppm
Total pesticides $\leq$10 ppm
5 – Wastewater DQOs will be equivalent to the MQLs.

Table 3-2 Quality Control Performance Criteria for Wastewater Samples

Compound	Blank	Field Duplicate %RPD	Matrix Spike and/or LCS LCS % R[1]	MS % R[1]	% RPD[1]	Surrogate % R[1]
Metals						
Aluminum	<RL[2]	30%[3]	85-115	70-130	20	--
Antimony			85-115	70-130	20	--
Arsenic			85-115	70-130	20	--
Barium			85-115	70-130	20	--
Beryllium			85-115	70-130	20	--
Cadmium			85-115	70-130	20	--
Calcium			85-115	70-130	20	--
Chromium			85-115	70-130	20	--
Cobalt			85-115	70-130	20	--
Copper			85-115	70-130	20	--
Iron			85-115	70-130	20	--
Lead			85-115	70-130	20	--
Magnesium			85-115	70-130	20	--
Manganese			85-115	70-130	20	--
Mercury			85-115	70-130	20	--
Nickel			85-115	70-130	20	--
Potassium			85-115	70-130	20	--
Selenium			85-115	70-130	20	--
Silver			85-115	70-130	20	--
Sodium			85-115	70-130	20	--
Thallium			85-115	70-130	20	--
Vanadium			85-115	70-130	20	--
Zinc			85-115	70-130	20	--
General Chemistry						
BOD (EPA 405.1)	<RL[2]	30%[3]	49-153	70-136	20	--

Compound	Blank	Field Duplicate %RPD	Matrix Spike and/or LCS			Surrogate % R[1]
			LCS % R[1]	MS % R[1]	% RPD[1]	
Cyanide (EPA 335.4)	<RL[2]	30%[3]	85-115	75-125	20	--
pH (EPA 150.1)	<RL[2]	±0.5 SU	NA	NA	±0.1 SU	--
TDS (EPA 160.1)	<RL[2]	30%[3]	NA	NA	20	--
TSS (EPA 160.2)	<RL[2]	30%[3]	NA	NA	20	--
Ammonia (EPA 350.1)	<RL[2]	30%[3]	90-110	65-127	20	--

[1] Laboratory control limits are periodically updated. The latest control limits will be utilized at the time of sample analysis.
[2]Blank (field, trip, method) criteria apply to all target compounds analyzed and reported for a particular method.
[3]Field duplicate criteria apply to all target analyte analyzed and reported for a particular method.

Table 3-3 Quality Control Performance Criteria for Soil Samples

Compound	Blank	Field Duplicate %RPD	Matrix Spike and/or LCS LCS % R[1]	MS % R[1]	% RPD	Surrogate % R[1]
VOCs by SW-846 8260B						
Toluene-d8	–	–	–	–	–	70-130
4-Bromofluorobenzene	–	–	–	–	–	70-130
Dibromofluoromethane	–	–	–	–	–	70-130
1,1-Dichloroethene	< MQL[2]	50%[3]	75-125	70-130	50[4]	–
Trichloroethene			75-125	70-130	50[4]	–
Benzene			75-125	70-130	50[4]	–
Toluene			75-125	70-130	50[4]	–
Chlorobenzene			75-125	70-130	50[4]	–
SVOCs by SW-846 8270C						
Nitrobenzene-d5	–	–	–	–	–	45-135
2-Fluorobiphenyl	–	–	–	–	–	45-135
Terphenyl-d14	–	–	–	–	–	45-135
Phenol-d5	–	–	–	–	–	35-140
2-Fluorophenol	–	–	–	–	–	35-140
2,4,6-Tribromophenol	–	–	–	–	–	35-140
Phenol	< MQL[2]	50%[3]	60-120	45-135	50	–
2-Chlorophenol			60-120	45-135	50	–
1,4-Dichlorobenzene			60-120	45-135	50	–
n-Nitroso-di-n-propylamine			60-120	45-135	50	–
1,2,4-Trichlorobenzene			60-120	45-135	50	–
4-Chloro-3-methylphenol			60-120	45-135	50	–
Acenaphthene			60-120	45-135	50	–
4-Nitrophenol			60-120	45-135	50	–
2,4-Dinitrotoluene			60-120	45-135	50	–
Pentachlorophenol			60-120	45-135	50	–
Pyrene			60-120	45-135	50	–
Pesticides by SW-846 8018A						
Decachlorobiphenyl	–	–	–	–	–	40-140
Tetra-chloro-meta-xylene	–	–	–	–	–	40-140
Aldrin	< MQL[2]	50%[3]	50-130	40-140	50	–
gamma-BHC (Lindane)			50-130	40-140	50	–
4,4'-DDT			50-130	40-140	50	–
Dieldrin			50-130	40-140	50	–
Endrin			50-130	40-140	50	–

Compound	Blank	Field Duplicate %RPD	Matrix Spike and/or LCS LCS % R[1]	MS % R[1]	% RPD	Surrogate % R[1]
Heptachlor	<MQL[2]	50%[3]	50-130	40-140	50	–
PCBs by SW-846 8082						
Decachlorobiphenyl	–	–	–	–	–	40-140
Tetra-chloro-meta-xylene	–	–	–	–	–	40-140
Aroclor 1016	< MQL[2]	50%[3]	50-130	40-140	50	–
Aroclor 1260			50-130	40-140	50	–
Metals by SW-846 6010B/7471A						
Aluminum	< MQL[2]	50%[3]	80-120	75-125	25	–
Antimony			80-120	75-125	25	–
Arsenic			80-120	75-125	25	–
Barium			80-120	75-125	25	–
Beryllium			80-120	75-125	25	–
Cadmium			80-120	75-125	25	–
Calcium			80-120	75-125	25	–
Chromium			80-120	75-125	25	–
Cobalt			80-120	75-125	25	–
Copper			80-120	75-125	25	–
Iron			80-120	75-125	25	–
Lead			80-120	75-125	25	–
Magnesium			80-120	75-125	25	–
Manganese			80-120	75-125	25	–
Mercury			80-120	80-120	20	–
Nickel			80-120	75-125	25	–
Potassium			80-120	75-125	25	–
Selenium			80-120	75-125	25	–
Silver			80-120	75-125	25	–
Sodium			80-120	75-125	25	–
Thallium			80-120	75-125	25	–
Vanadium			80-120	75-125	25	–
Zinc			80-120	75-125	25	–

[1] Refer to Appendix I (Shell for Analytical Chemistry Requirements) of EM 200-1-3 for details.
[2]Applies to trip blanks and equipment blanks; refer to Table 5-5 for method blank criteria. Blank criteria apply to all target compounds analyzed and reported for a particular method (see Table 3-1 for list of analytes), with the exception of the common laboratory contaminants specified in the laboratory SOPs.
[3]Field duplicate criteria apply to all target analyte analyzed for a particular method (see Table 3-1).
[4]Advisory limits

4.0 SAMPLE RECEIPT, HANDLING, CUSTODY AND HOLDING TIME REQUIREMENTS

Sample handling in the field and sample packaging and shipping procedures are included in the FSP.

4.1 Sample Receipt

Samples will be received and logged in by the designated Laboratory Sample Custodian or his/her designee. Upon sample receipt, the Laboratory Sample Custodian will

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage,
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the sample receipt form,
- Compare samples received against those listed on the chain-of-custody,
- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine sample pH (if applicable) and record on the sample receipt form,
- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the waybill,
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the client,
- Attach laboratory sample container labels with unique laboratory identification and test,
- Place the samples in the proper laboratory storage.

4.2 Handling and Storage

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the LIMS. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory, type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.

- The Laboratory Project Manager and operational group leader will be notified of sample arrival.
- The completed chain-of-custody, waybills, and any additional documentation (including client notification and correspondence) will be placed in the project file.

Additional detail on laboratory custody procedures for sample receiving, sample identification, sample control, and record retention are described in CAS SOPs.

4.3 Sample Holding Times

A summary of sample container, preservation, and holding time requirements is presented in Table 4-1 (aqueous media) and Table 4-2 (solid media) of the QAPP.

Table 4-1 Aqueous Sample Container, Preservation, and Holding Time Requirements

Parameter	Container [1, 2]	Preservation	Holding Time [3]
TAL Metals	1-500 ml HDPE	HNO_3 to pH <2; cool 4°C	Mercury - 28 days, other metals - 180 days
BOD	1-1 liter HDPE	Cool 4°C	2 days
Cyanide	1-125 ml HDPE	NaOH to pH >12; cool 4°C	14 days
pH	1-125 ml HDPE	Cool 4°C	24 hours
TDS	1-250 HDPE	Cool 4°C	7 days
TSS	1-250 HDPE	Cool 4°C	7 days
Ammonia	1-250 ml HDPE	H_2SO_4 to pH <2; cool 4°C	14 days
Ignitability	2 glass vials	Cool 4°C	None established
Reactive cyanide and sulfide	1-500 ml HDPE	No headspace; cool 4°C; dark	14 days
TCLP VOCs, SVOCs, pesticides, and metals	3-1 liter glass amber	Cool 4°C	VOCs -14 days; SVOCs and pesticides – extract within 7 days, analyze within 40 days; metals – 180 days; mercury – 28 days
Ammonia	1-250 ml HDPE	H_2SO_4 to pH <2; cool 4°C	14 days

[1] Triple volume will be collected for MS/MSD samples.
[2]Equivalent bottles that meet the specifications of the method may be provided by the laboratory.
[3]Holding time begins from date of sample collection.

Table 4-2 Solid Sample Container, Preservation, and Holding Time Requirements

Parameter	Container [1, 2]	Preservation	Holding Time [3]
VOCs	3 EnCore™ samplers	Cool 4°C	Preserve within 48 hours, analyze within 14 days
% Solids	1-2 oz. plastic	Cool 4°C	None
SVOCs, pesticides, PCBs	1-8 oz. wide-mouth glass with Teflon-lined lid	Cool 4°C	Extract within 14 days, analyze within 40 days
Metals	1-8 oz. wide-mouth glass with Teflon-lined lid	Cool 4°C	Mercury - 28 days Other metals – 180 days
TCLP VOCs	1-4 oz. wide-mouth glass with Teflon-lined lid	Cool 4°C	14 days to TCLP extraction; 14 days to analysis
TCLP SVOCs, pesticides	1-8 oz. wide-mouth glass with Teflon-lined lid	Cool 4°C	14 days to TCLP extraction, 7 days to SW-846 extraction, 40 days to analysis
TCLP Metals, ignitability, reactivity, corrosivity	1-8 oz. wide-mouth glass with Teflon-lined lid	Cool 4°C	Metals – 180 days (28 for Hg) to TCLP extraction, 180 days (28 for Hg) to analysis Other parameters – None specified

[1] Double volume will be collected for MS/MSD or MS/duplicate samples except for VOCs (7 EnCore™ samplers will be collected).
[2] Equivalent bottles that meet the specifications of the method may be provided by the laboratory.
[3] Holding time begins from date of sample collection.

5.0 ANALYTICAL PROCEDURES

5.1 Chemical Analyses

All samples collected during field sampling activities for the removal actions will be analyzed by CAS:

Columbia Analytical Services
1 Mustard Street, Suite 250
Rochester, NY 14609
(585) 288-5380

Table 5-1 summarizes the analyte groups of interest, appropriate laboratory SOP number, and EPA reference method for the analytes evaluated in the investigation. The SOPs will be executed as written with the following exception:

- When performing TCLP analysis, tumbling will be halted after 18 hours and 15 minutes ± 5 minutes.

5.2 Preventive Maintenance

As part of their LQAMP, a routine preventative maintenance program is conducted by the laboratory to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees regularly perform routine schedule maintenance and repair of (or coordinate with the vendor for repair of) all instruments. All maintenance that is performed is documented in the laboratory's operating record. All laboratory instruments are maintained in accordance with manufacturer's specifications. Table 5-2 provides the frequency with which components of key analytical instruments will be serviced. Table 5-3 provides a summary of the monitoring of laboratory equipment. All maintenance procedures will be consistent with Appendix I of the USACE document EM 200-1-3 (USACE, 2001).

5.3 Calibration Procedures and Frequency

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and continuing calibration verifications. The laboratory SOPs contain a description of the calibration procedures for a specific laboratory instrument, including their frequency, acceptance criteria, and the conditions that will require recalibration. This information is summarized in Table 5-4. Calibration procedures and frequency will be consistent with Appendix I of the USACE document EM 200-1-3 (USACE, 2001).

The laboratory maintains documentation for each instrument which includes the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions, and the samples associated with these calibrations.

5.4 Laboratory QC Procedures

CAS has a QC program in place to ensure the reliability and validity of the analysis performed at the laboratories. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section which addresses the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure but in general the QC requirements include the following:

- Method blanks
- Reagent/preparation blanks (inorganic parameters)
- Instrument blanks
- MS/MSDs
- Surrogate spikes
- Laboratory duplicates
- LCSs
- Internal standard areas (gas chromatography/mass spectrometry [GC/MS] analysis)
- Mass tuning (GC/MS analysis)
- Endrin/DDT degradation checks (gas chromatography/electron capture detector [GC/ECD] analysis)
- Second, dissimilar column confirmation (GC/ECD)
- ICP serial dilutions
- ICP interference check samples

Table 5-5 summarizes the QC for each method. Additional detail on QC requirements are included in Appendix I of the USACE document EM 200-1-3 (USACE, 2001).

5.5 Performance and System Audits

5.5.1 Field Audits

A field systems audit will be conducted at the discretion of the ENSR Project Manager. The purpose of the audit will be to ensure that the approved procedures documented in the FSP and QAPP are being followed. The field audit will be conducted by the ENSR Data Quality Officer and will entail an examination of field sampling records, field measurement results, field instrument operating and calibration records, sample collection, handling, and packaging procedures, QA procedures, chain-of-custody, sample documentation, etc. (Figure 5-1). If significant deficiencies are noted during the initial audit, follow-up audits will be conducted.

During the audit, the auditor will keep detailed notes of audit findings. Preliminary results of the audit will be reviewed with the ENSR Field Manager while on site to ensure that deficiencies adversely affecting data quality are immediately identified and corrective measures initiated. Upon completion of the audit, the ENSR Data Quality Officer will prepare a written audit report, which summarizes the audit findings, identifies deficiencies and recommends corrective actions. This report will be submitted to the ENSR Project Quality Systems Manager and to the ENSR Project Manager, who will be responsible for ensuring that corrective measures are implemented and documented. The results of the audit process will be included in the QA reports to management, as described in Section 9 of the QAPP.

5.5.2 Laboratory Audits

5.5.2.1 Internal

Internal audits of laboratory systems and processes will be conducted periodically (a minimum of once annually) by the Laboratory QA Manager. The laboratory systems audits will include an examination of laboratory documentation on sample receiving, log-in, and storage; chain-of-custody procedures; sample preparation and analysis procedures, and instrument operating records. The auditor should ensure that all SOPs and method detection limit studies are current and appropriate for the matrices being analyzed. The Laboratory QA Manager will follow the procedures described in the LQAMP for internal systems audits.

Performance evaluation (PE) samples will be run periodically. These samples may be either commercially purchased or prepared by the Laboratory QA Manager, but will be blind to the laboratory. The Laboratory QA Manager will evaluate the analytical results of these PE samples to monitor laboratory performance.

5.5.2.2 External

Laboratory systems audits are conducted periodically by ENSR as part of their analytical subcontractor monitoring program. The laboratory audit includes a review of the following areas (Figure 5-2):

- QA organization and procedures,
- Personnel training and qualifications,
- Sample log-in procedures,
- Sample storage facilities,
- Analyst technique
- Adherence to laboratory SOPs and project QAPP,
- Compliance with QA/QC objectives,
- Instrument calibration and maintenance,
- Data recording, reduction, review, and reporting, and

- Cleanliness and housekeeping.

Preliminary results of the systems audit will be discussed with the Laboratory Manager, Laboratory Project Manager, and Laboratory QA Manager. A written report that summarizes audit findings and recommends corrective actions will be prepared and submitted to the Laboratory Manager for response, and to the ENSR Project Manager and ENSR Project Quality Systems Manager. The results of the audit, including resolution of any deficiencies, will be included in the QA reports to management, as described in Section 9.

5.6 Nonconformance/Corrective Actions

5.6.1 Laboratory Corrective Actions

Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, and potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts and operational group leaders, it may be necessary for the Laboratory QA Manager to approve the implementation of corrective action. Conditions during or after analysis may also automatically trigger corrective action or optional procedures. These conditions include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, etc. Table 5-5 summarizes corrective actions for internal QC checks.

The analyst may identify the need for corrective action. The operational group leader, in consultation with the staff, will approve the required corrective action to be implemented by the laboratory staff. The Laboratory QA Manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, the ENSR Data Quality Manager will be notified. All levels of project management, including the USACE, will be contacted for concurrence with the proposed corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the ENSR Project Manager. If the corrective action does not rectify the situation, the laboratory will contact the ENSR Project Manager, who will determine the action to be taken and inform the appropriate personnel.

5.6.2 Data Assessment Corrective Actions

The need for corrective action may be identified during data verification or validation. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team and whether the data to be collected is necessary to meet the required QA objectives. If the ENSR Data Quality Officer or ENSR Chemical Data Assessment Specialist identifies a corrective action situation, the ENSR

Project Manager and ENSR Project Quality Systems Manager will be notified and will be responsible for informing the appropriate personnel. As stated in Section 5.6.1, if the nonconformance causes the project objectives not be achieved, all levels of project management, including the USACE, must concur with the proposed corrective action. All corrective actions of this type will be documented by the ENSR Project Manager.

Table 5-1 Summary of Analytical Methods

Analyte Group[1]	Laboratory SOP Number[2]	Equivalent EPA Method Number[3]
Aqueous Samples		
TAL metals (exc. Hg)	MET-3010A MET-200.7/6010B	EPA 200.7
Mercury	MET-245.1	EPA 245.1
BOD	GEN-405.1	EPA 405.1
Cyanide	GEN-335.4	EPA 335.4
TDS	GEN-160.1	EPA 160.1
TSS	GEN-160.2	EPA 160.2
Ammonia	GEN-350.1	EPA 350.1
pH	GEN-150.1/9040B	EPA 150.1
Solid Samples		
VOCs	VOC-8260B	SW-846 5035 (U.S. EPA, 1986)[4] SW-846 8260B (U.S. EPA, 1986)[4]
SVOCs	EXT-3550B SOC-8270C	SW-846 3550B (U.S. EPA, 1986)[4] SW-8270C (U.S. EPA, 1986)[4]
PCBs	EXT-3550B EXT-3620B/EXT-3660B/EXT-3665B SOC-8082	SW-846 3550B[5] (U.S. EPA, 1986)[4] SW-846 3620B/3660B/3665B (U.S. EPA, 1986)[4] SW-845 8082 (U.S. EPA, 1986)[4]
Pesticides	EXT-3550B EXT-3620B/EXT-3660B SOC-8081A	SW-846 3550B[5] (U.S. EPA, 1986)[4] SW-846 3620B[6]3660B[6] (U.S. EPA, 1986)[4] SW-845 8081A (U.S. EPA, 1986)[4]
Metals (exc. mercury)	MET-3050B MET-200.7/6010B	SW-846 3050B (U.S. EPA, 1986)[4] SW-846 6010B (U.S. EPA, 1986)[4]
Mercury	MET-7471A/245.5	SW-846 7471A (U.S. EPA, 1986)[4]
Waste Characterization Samples (Solid or Aqueous)		
TCLP extraction	MET-TCLP, MET-TZHE	SW-846 1311 (U.S. EPA, 1986)[4]
Corrosivity	GEN-9045	SW-846 9045 (U.S. EPA, 1986)[4]
Ignitability	GEN-OCIGN	SW-846 1010 (U.S. EPA, 1986)[4]
Reactive Cyanide	GEN-RS/RCN GEN-9012 MIDI	SW-846 Chapter 7/9010B (U.S. EPA, 1986)[4]
Reactive Sulfide	GEN-RS/RCN	SW-846 Chapter 7/9030B (U.S. EPA, 1986)[4]

[1]See Table 3-1 for the compounds in each analyte group
[2]The most recent version of the SOP will be used at the time of analysis.
[3]References: refer to Section 10
[4]Includes updates through June 1997

Table 5-2 Preventive Maintenance for Laboratory Instruments

Instrument	Spare Parts	Activity	Frequency
GC/MS (SW-846 Methods 8260B/ 8270C)	Septa Carrier gas Filters Columns	Change septum Check carrier gas, column flow and/or inlet pressure Change carrier gas Change gas filters Change trap on Tekmar Change GC column Clean MS source Monitor vacuum Leak-check septum Check gas flow Clean VOA purge glassware Cut capillary column Replace line Replace BNA seal Clean injector port	Daily Daily As needed Semi-annually/as needed As needed As needed As needed Daily As needed As needed As needed As needed As needed As needed Daily Weekly
GC (SW-846 Methods 8081A/ 8082)	Columns Port liners Syringes	Clean detectors Check reactor temperature of ECD Clip column leader Clean injector port Check gas supply Check flow and/or inlet pressure Replace column Replace injection port liner Check syringe Change syringe	As needed Daily Daily Daily Daily Daily As needed As column change or as needed Daily As needed
ICP (SW-846 Method 6010B)	Gases O-rings Tubing	Check gases Check argon tank pressure Check aspiration tubing Check vacuum pump gauge Check cooling water system Check nebulizer Check capillary tubing Check peristaltic pump tubing Check high voltage switch Check exhaust screens Check torch, glassware, aerosol injector tube, bonnet Clean plasma torch assembly Clean nebulizer and drain chamber Clean filters Replace tubing Check o-rings	Daily Daily Daily Daily Daily Daily Daily Daily Daily Daily Daily Monthly or as needed Monthly or as needed Monthly or as needed Monthly or as needed Monthly or as needed Monthly or as needed
CVAAS (SW-846 Method 7471A, EPA 245.1)	Tubing Lamps	Change drying tube Check tubing/change tubing Check gas pressure Check aperture reading Check/change lamp Clean optical cell Lubricate pump	Daily Daily/As needed Daily Daily As needed As needed As needed

Table 5-3 Monitoring of Laboratory Equipment

Equipment Type	Activity	Frequency
Ovens	Temperature monitoring Electronics serviced	Daily As needed
Refrigerators	Temperature monitoring Refrigerant system and electronics serviced	Twice daily As needed
Balances	Calibration Manufacturer cleaning and servicing	Daily or before use Annually
High-purity water system	Conductance monitoring	Daily

Table 5-4 Summary of Calibration Frequency and Criterion for Laboratory Analytical Instruments

Instrument and Method	Calibration Frequency[1]	Calibration Standards[1]	Acceptance Criteria[1]
GC/MS VOCs by SW-846 8260B	Initial: As needed	Minimum 5 standards	CCC %RSD ≤30 SPCC RRF ≥0.10 or ≥ 30 (see method for individual compound requirements)
	Continuing: Every 12 hours	Mid-level standard	CCC %D ≤20 SPCC RRF same as initial
GC/MS SVOCs by SW-846 8270C	Initial: As needed	Minimum of 5 standards	CCC %RSD ≤30 SPCC RRF ≥0.050
	Continuing: Every 12 hours	Mid-level standard	CCC %D ≤20 SPCC RRF same as initial
GC/ECD PCBs by SW-846 8082	Initial: As needed	Minimum of 5 standards for Aroclors 1016 and 1260. Minimum of one standard (mid-level) for each of remaining Aroclors.	%RSD ≤20
	Continuing: Every 12 hours	Mid-level standard of Aroclors 1016 and 1260	%D ≤15
	Ending	Mid-level standard of Aroclors 1016 and 1260	%D ≤15
GC/ECD Pesticides by SW-846 8081A	Initial: As needed	Minimum of 5 standards	%RSD ≤20
	Continuing: Every 12 hours	Mid-level standard	%D ≤15
	Ending	Mid-level standard	%D ≤15
ICP Metals (except. Hg) by SW-846 6010B	Initial: Daily	Initial: Per manufacturer's instructions. Minimum of one standard and calibration blank.	Initial: Low-level standard ±20% or r ≥ 0.995. ICV %RSD ≤5 from replicate
	Continuing: Every 10 samples	Mid-level of each metal	±10% of true value CCV %RSD ≤5 from replicate
	Ending	Mid-level of each metal	±10% of true value CCV %RSD ≤5 from replicate
ICP Metals (except. Hg) by EPA 200.7	Initial: Daily	Initial: Per manufacturer's instructions. Minimum of one standard and calibration blank.	IPC per method specifications ICV %R = 95-105
	Continuing: Every 10 samples	Mid-level of each metal	±10% of true value
	Ending	Mid-level of each metal	±10% of true value

Instrument and Method	Calibration Frequency[1]	Calibration Standards[1]	Acceptance Criteria[1]
CVAAS Mercury by SW-846 7471A	Initial: As needed	5 standards plus blank	ICV ±10% of true value r ≥ 0.995
	Continuing: Every 10 samples	Mid-level	±20% of true value
	Ending	Mid-level	±20% of original prepared standard
CVAAS Mercury by EPA 245.1	Initial: As needed	5 standards plus blank	ICV ±5% of true value r ≥ 0.995
	Continuing: Every 10 samples	Mid-level	±20% of true value
	Ending	Mid-level	±10% of original prepared standard

[1] Additional requirements specified in Appendix I (Shell for Analytical Chemistry Requirements) in EM 200-1-3.

Table 5-5 Internal QC Checks

Parameter/ Method	QC Check	Frequencies[1]	Control Limits[1]	Laboratory Corrective Actions
VOCs 8260B	Method blanks	One per 12 hr analytical shift of a similar matrix	No target analytes above one-half MQL (common contaminants < MQL)	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	Control limits listed in Table 3-3.	Reextract or flag data (see SOP)
	MS/MSD samples	One pair per analytical batch	Control limits listed in Table 3-3	Check LCS, reanalyze, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-3	Reextraction/reanalysis of entire batch
	Internal standards	Every sample, blank, standard prior to analysis	-50 to +100% of cont. cal. standard	Reanalysis
	GC/MS mass tuning	At beginning of each 12 hr analytical shift	Control criteria listed in SOP	Recalibrate instrument until control criteria are met
SVOCs 8270C	Method blanks	One per analytical batch	No target analytes above one-half MQL (common contaminants < MQL)	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	Control limits listed in Table 3-3.	Reextract or flag data (see SOP)
	MS/MSD samples	One pair per analytical batch	Control limits listed in Table 3-3.	Check LCS, reanalyze, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-3.	Reextraction/reanalysis of entire batch
	Internal standards	Every sample, blank, standard prior to analysis	-50 to +100% of cont. cal. standard	Reanalysis
	GC/MS mass tuning	At beginning of each 12 hr analytical shift	Control criteria listed in SOP	Recalibrate instrument until control criteria are met
PCBs 8082	Method blanks	One per analytical batch	No target analytes above one halt MQL	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	Control limits listed in Table 3-3.	Reextract or flag data (see SOP)
	MS/MSD samples	One pair per analytical batch	Control limits listed in Table 3-3.	Check LCS, reanalyze, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-3.	Reextraction/reanalysis of entire batch
	2nd column confirmation	Every sample	RPD <40	Flag data

Parameter/ Method	QC Check	Frequencies[1]	Control Limits[1]	Laboratory Corrective Actions
Pesticides 8081A	Method blanks	One per analytical batch	No target analytes above one half MQL	Reextraction/reanalysis of entire batch
	Surrogate spikes	Every sample, blank, standard prior to extraction	Control limits listed in Table 3-3.	Reextract or flag data (see SOP)
	MS/MSD samples	One pair per analytical batch	Control limits listed in Table 3-3.	Check LCS, reanalyze, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-3.	Reextraction/reanalysis of entire batch
	DDT & Endrin breakdown check	Prior to initial or continuing calibration	< 15%	Analytical system maintenance
	2nd column confirmation	Every sample	RPD <40	Flag data
Metals 6010B	Reagent/prep blanks	One per analytical batch	No target analytes above one half MQL	Repreparation/reanalysis of entire prep batch
	MS samples	One per analytical batch	Control limits listed in Tables 3-2 and 3-3.	Check LCS, flag results
	Duplicate samples	One per analytical batch	RPD <25	Check analytical system, flag results
	LCS	One per analytical batch	Control limits listed in Tables 3-2 and 3-3.	Repreparation/reanalysis of entire prep batch
	Dilution test	One per analytical batch	Within 10% of original sample results	Flag results
	Interference check	Beginning of each analytical run	Control limits listed in SOP	Evaluate; reanalysis if necessary
Metals 200.7	Reagent/prep blanks	One per analytical batch	No target analytes above MQL	Repreparation/reanalysis of entire prep batch
	MS samples	One per analytical batch	Control limits listed in Table 3-2.	Check LCS, flag results
	Duplicate samples	One per analytical batch	RPD <20	Check analytical system, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Repreparation/reanalysis of entire prep batch
	Dilution test	One per analytical batch	Within 10% of original sample results	Flag results
	Interference check	Beginning of each analytical run	Control limits listed in SOP	Evaluate; reanalysis if necessary

Parameter/ Method	QC Check	Frequencies[1]	Control Limits[1]	Laboratory Corrective Actions
Mercury 7471A	Reagent/prep blanks	One per analytical batch	No target analytes above one half MQL	Repreparation/reanalysis of entire batch
	MS samples	One per analytical batch	Control limits listed in Table 3-3.	Check LCS, flag results
	Duplicate samples	One per analytical batch	RPD <20	Check analytical system, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-3.	Repreparation/reanalysis of entire batch
Mercury 245.1	Reagent/prep blanks	One per analytical batch	Not detected above MQL	Repreparation/reanalysis of entire batch
	MS samples	One per analytical batch	Control limits listed in Table 3-2.	Check LCS, flag results
	Duplicate samples	One per analytical batch	RPD <20	Check analytical system, flag results
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Repreparation/reanalysis of entire batch
BOD 405.1	Dilution water blanks	One per analytical batch	Uptake <0.2 mg/L DO	Check nutrients for growth/turbidity Check cleaning procedures
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Report, flag data
	MS samples	One per analytical batch	Control limits listed in Table 3-2.	Report, flag data
	Duplicate samples	One per analytical batch	RPD <20	Report, flag data
Cyanide 354.4	Method blanks	One per analytical batch	Not detected above MQL	Redigest/reanalyze samples in batch if sample results <10x method blank contamination
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Redigest/reanalyze samples in batch
	MS samples	One per 10 samples	Control limits listed in Table 3-2.	Report, flag data
	Duplicate samples	One per 10 samples	RPD <20	Report, flag data

Parameter/ Method	QC Check	Frequencies[1]	Control Limits[1]	Laboratory Corrective Actions
TSS 160.2	Method blanks	One per analytical batch	Not detected above MQL	Redigest/reanalyze samples in batch if sample results <10x method blank contamination
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Redigest/reanalyze samples in batch
	Duplicate samples	One per 10 samples	RPD <20	Report, flag data
TDS 160.1	Method blanks	One per analytical batch	Not detected above MQL	Redigest/reanalyze samples in batch if sample results <10x method blank contamination
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Redigest/reanalyze samples in batch
	Duplicate samples	One per 10 samples	RPD <20	Report, flag data
Ammonia 350.1	Method blanks	One per analytical batch	Not detected above MQL	Redigest/reanalyze samples in batch if sample results <10x method blank contamination
	LCS	One per analytical batch	Control limits listed in Table 3-2.	Redigest/reanalyze samples in batch
	MS samples	One per 10 samples	Control limits listed in Table 3-2.	Report, flag data
	Duplicate samples	One per 10 samples	RPD <20	Report, flag data
pH 150.1	Duplicate samples	One per 10 samples	±0.10 SU	Report, flag data

[1] Additional requirements specified in Appendix I (Shell for Analytical Chemistry Requirements) in EM 200-1
MS/MSD = Matrix Spike/Matrix Spike Duplicate
IS = Internal Standard
RL = Reporting Limit
%R = Percent Recovery
RT = Retention Time
LCS = Laboratory Control Standard
RPD = Relative Percent Difference
SOP = Standard Operating Procedure
GC/ECD = Gas Chromatograph/Electron Capture Detector
ICP = Inductively Coupled Plasma

Analytical batch defined as maximum of 20 field samples of a similar matrix

Figure 5-1 Example of Field Audit Checklist

Project: **Site Location:** **Auditor:**	
1. Was project-specific training held?	
2. Are copies of project plan (FSP, QAPP) on site and available to personnel?	
3. Are samples being collected in accordance with the project plan?	
4. Do the numbers and locations of samples conform to the project plan?	
5. Are sample locations staked or otherwise marked?	
6. Are samples labeled in accordance with the project plan?	
7. Is equipment decontamination in accordance with the project plan?	
8. Is field instrumentation being operated and calibrated in accordance with the project plan?	
9. Are samples being preserved and containerized in accordance with the project plan?	
10. Are QC samples in accordance with the types, collection procedures, and frequencies specified in the project plan?	
11. Are chain-of-custody procedures and documents in conformance with the project plan?	
12. Are field records complete, accurate, up-to-date, and in conformance to good recordkeeping procedures?	
13. Are modifications to the project plan being communicated, approved, and documented appropriately?	
Additional Comments:	
Auditor:	**Date:**

Figure 5-2 Example of Laboratory Systems Audit Checklist

Project: **Facility Location:** **Auditor:**	
Is there a written QA Program Plan/Manual?	
Is there a designated QA Officer?	
Are facilities and equipment adequate to perform the analyses of interest?	
Review procedures and engineering controls for minimizing cross contamination.	
Review most recent interlaboratory PE sample results and recent Agency audits.	
Review SOP system. Review techniques for conformance to approved SOPs.	
Are personnel qualified and trained? Is there a formal training program and are records of training and proficiency maintained?	
Is there a designated sample custodian? Is there a sample inspection checklist? Are sample log-in procedures defined in an SOP?	
Is the laboratory area secure?	
Review internal chain-of-custody procedures.	
Are instruments operated and calibrated in accordance with SOPs? Are records of calibration maintained?	
Is equipment maintained according to written protocols? Are routine and non-routine maintenance procedures documented?	
Are samples being analyzed in conformance to the cited methods?	
Are QC samples and checks being performed at the frequencies stated in the cited methods?	
Are records complete, accurate, up-to-date, and in conformance to good recordkeeping procedures?	
How are project-specific requirements communicated to the bench level?	
Review data reduction, review, and reporting processes.	
Review data archival process (paper and electronic).	
Review audit and corrective action program.	
Additional Comments:	
Auditor:	**Date:**

6.0 DATA REDUCTION/CALCULATION OF DATA QUALITY INDICATORS

6.1 Data Reduction

The equations that will be employed in reducing analytical data are presented in the analytical SOPs identified in Table 5.1 of this QAPP and will be consistent with data reduction procedures stated in the analytical methods. All sample results (including detection limits associated with nondetected results) will be corrected for sample-specific factors such as analytical dilutions, sample volume, and percent moisture (soils and other solid samples).

6.2 Calculation of Data Quality Indicators

6.2.1 Precision

The RPD between the matrix spike and matrix spike duplicate, or sample and matrix duplicate in the case of select inorganic parameters, and field duplicate pair is calculated to compare to precision DQOs (Section 3.3.1 of this QAPP). The RPD will be calculated according to the following formula.

$$RPD = \frac{(Amount\ in\ Sample\ 1 - Amount\ in\ Sample\ 2)}{0.5\,(Amount\ in\ Sample\ 1 + Amount\ in\ Sample\ 2)} x\,100$$

6.2.2 Bias

In order to assure the accuracy of the analytical procedures, a field sample will be spiked with a known amount of the analytes listed in Tables 3.2 and 3.3. At a minimum, one spiked sample ("matrix spike") should be included in every set of 20 samples tested on each instrument, for each sample matrix to be tested (i.e., soil, wastewater). The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample, determines percent recovery (%R).

Bias is similarly assessed by determining %Rs for surrogate compounds added to each field and QC sample to be analyzed for organic parameters. Bias for all analyses will be further assessed through determination of %Rs for LCSs (as well as matrix spike samples).

%R for MS/MSD results will be determined according to the following equation:

$$\%R = \frac{(Amount\ in\ Spiked\ Sample - Amount\ in\ Sample)}{Known\ Amount\ Added} x\,100$$

%R for LCS and surrogate compound results will be determined according to the following equation:

$$\%R = \frac{Experimental\ Concentration}{Known\ Amount\ Added} x\,100$$

6.2.3 Sample Quantitation/Reporting Limits

The sample quantitation limits achieved will be compared to the target MQLs listed in Table 3-1. Sample quantitation limits will be reported by the laboratory as corrected for analytical dilutions, percent solids, and sample volume. If multiple analyses are required because of analytical dilutions, the laboratory will report all analytical runs in order to ensure that the lowest possible quantitation limits are reported.

6.2.4 Completeness

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$Completeness = \frac{(number\ of\ valid\ measurements)}{(number\ of\ measurements\ planned)} x\,100$$

7.0 LABORATORY OPERATIONS DOCUMENTATION

This section discusses the requirements for laboratory recordkeeping, reporting, and document archival. Field records are discussed in the FSP.

7.1 Laboratory Records

Laboratory recordkeeping will be performed according to the following protocol. All information related to analysis will be documented in controlled laboratory logbooks, instrument printouts, or other approved forms. All entries that are not generated by an automated data system will be made neatly and legibly in permanent, waterproof ink. Information will not be erased or obliterated. Corrections will be made by drawing a single line through the error and entering the correct information adjacent to the cross-out. All changes will be initialed, dated, and, if appropriate, accompanied by a brief explanation. Unused pages or portions of pages will be crossed out to prevent future data entry. Analytical laboratory records will be reviewed by the operational group leaders on a regular basis, and by the Laboratory QA Manager periodically, to verify adherence to documentation requirements.

7.2 Data Reporting Procedures

Prior to being reported, the data will be subjected to the review process described in Section 8.1.

7.2.1 Data Package Format and Contents

Sample results will be provided as faxed data within the established rapid turnaround times (TAT) required for this project (Section 7.3.1). Hard copy deliverables will be provided within standard TAT. The laboratory will provide at least one copy of the hard copy report, which will conform to an ASP Category B deliverable.

7.2.2 Electronic Deliverables

An electronic data deliverable (EDD) will be provided on the same schedule as the hard copy data package. The EDD may be in any of the following formats: Equis, ASCII text, Microsoft Excel Worksheet, or Microsoft Access of dbf-formatted database file. At a minimum, the EDD will contain client and laboratory sample IDs, sample results, units, sample quantitation limits, method detection limits, sample collection dates and times, sample preparation dates and times, analysis dates and times, methodologies for analysis and preparation, sample matrix, dilution factors, laboratory qualifiers, laboratory name, and batch IDs.

7.3 Data Management Procedures

7.3.1 Laboratory Turnaround Time

The TAT for excavated soil and confirmatory soil sample results will be two to three business days. Wastewater sample results will be provided within two business days, with the exception of BOD. Results for BOD and for disposal characteristic parameters (e.g., TCLP, ignitability, corrositivity, and reactivity) will be provided within five business days. For samples received within normal business hours, TATs will begin on the day that samples are received in the laboratory. TATs for samples received outside normal business hours will begin the following day of business.

7.3.2 Data Archival/Retention Requirements

Records relevant to sample analysis and the reporting of results will include:

- sample receipt and log-in,
- chain-of-custody,
- client correspondence,
- sample preparation,
- sample analysis,
- instrument tuning and calibration,
- equipment maintenance,
- standard and reagent preparation,
- SOPs,
- control limits,
- MDL studies,
- peer or supervisory reviews, and
- QA audits.

Records will be maintained in a secured, limited access area as described in the LQAMP. Records will be retained for the duration of the project and for a minimum of 6 years after its termination.

7.3.3 Data Management

The data management strategy comprises the following elements:

- Assignment of unique sample codes. This code is used to track the sample from collection, through the analysis, to reporting.

- Verification and validation of analytical data (Section 8 of this QAPP).

- Loading of laboratory EDDs into a database. At a minimum, the database will contain the following fields: sample identifier, sample location, sample media type, sampling date, analysis date, laboratory analysis identifier, analyte name, concentration value, measurement units, and data qualifiers.

- Database access. Access to the database will be limited to authorized users and will be controlled by password access.

8.0 DATA ASSESSMENT PROCEDURES

8.1 Data QC Review

Prior to being released as final, laboratory data will proceed through a tiered review process. Data verification starts with the analyst who performs a 100 percent review of the data to ensure the work was done correctly the first time. It is the responsibility of the analyst to ensure that the verification of data in his or her area is complete. The data reduction and initial verification process must ensure that:

- Sample preparation and analysis information is correct and complete,
- Analytical results are correct and complete,
- The appropriate SOPs have been followed and are identified in the project records,
- Proper documentation procedures have been followed,
- All nonconformances have been documented,
- Special sample preparation and analytical requirements have been met,
- The data generated have been reported with the appropriate number of significant figures as defined by the analytical method or otherwise specified by the client.

Following the completion of the initial verification by the analyst performing the data reduction, a systematic check of the data will be performed by an experienced peer, operational group leader, or designee. This check will be performed to ensure that initial review has been completed correctly and thoroughly. Included in this review will be an assessment of the acceptability of the data with respect to:

- Adherence of the procedure used to the requested analytical method SOP,
- Correct interpretation of chromatograms, mass spectra, etc.,
- Correctness of numerical input when computer programs are used (checked randomly),
- Correct identification and quantitation of constituents with appropriate qualifiers,
- Numerical correctness of calculations and formulas (checked randomly)
- Acceptability of QC data,

- Documentation that instruments were operating according to method specifications (calibrations, performance checks, etc.),
- Documentation of dilution factors, standard concentrations, etc.,
- Sample holding time assessment.

A third-level review will be performed by the Laboratory Project Manager before results are submitted to clients. This review serves to verify the completeness of the data report and to ensure that project requirements are met for the analyses performed.

A narrative to accompany the final report will be finalized by the Laboratory Project Manager. This narrative will include relevant comments collected during the earlier reviews.

8.2 Data Verification/Validation

8.2.1 Verification of Laboratory Sample Results

Sample results received as faxes within the expedited TAT will be reviewed to ensure consistency with the MQOs (Section 3.3) This review will be the responsibility of the Data Quality Officer and will entail an evaluation of the associated QC results as follows:

- Laboratory and field blank results will be assessed to determine if contamination caused by laboratory or field activities could result in sample results that are false positives or biased high (or low in the case of negative blank contamination for metals).
- Surrogate recoveries will be reviewed for high or low biases. Surrogate recoveries of less than 10% may result in the associated data being rejected or qualified for use.
- LCS recoveries will be assessed for high or low biases. Recoveries of less than 10% may result in the associated data being rejected or qualified for use.
- MS/MSD recoveries and RPDs will be reviewed to determine bias and/or poor precision. Matrix spike recoveries of less than 10% may result in the associated data being rejected or qualified for use.
- Field duplicate results will be evaluated for agreement (as RPDs) to identify possible sample heterogeneity or problems with sample collection procedures.

Significant data quality issues noted during the verification will be brought to the immediate attention of the ENSR Project Manager.

8.2.2 Validation of Analytical Data Packages

Validation is defined as a review of the analytical data consistent with U.S. EPA's *Contract Laboratory Program, National Functional Guidelines for Organic Data Review*, and *Contract Laboratory Program, National Functional Guidelines for Inorganic Data Review* (USEPA, 1999 and 1994), modified to reflect SW-846 procedures and project-specific criteria defined in Section 3.0 of this QAPP. Essentially, all technical holding times will be reviewed, instrument performance check samples will be evaluated, results of initial and continuing calibrations will be reviewed and evaluated. Also, the results of all blanks, surrogate spikes, MS/MSDs, LCSs, and target compound identification and quantitation will be reviewed/evaluated by the data validator.

The overall completeness of each data package will also be evaluated by the data validator. Completeness checks will be administered on all data to determine whether deliverables specified in the QAPP are present.

Validation will be performed by ENSR under the direction of the ENSR Data Quality Officer and will be conducted in the event that significant data quality issues are noted during the verification process or at the request of the ENSR Project Manager.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformances with the established criteria, and validation actions (including application of data qualifiers). Data qualifiers will be consistent with EPA guidelines (U.S. EPA, 1999 and 1994) and will consist of the following:

- J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ The analyte was not detected above the sample reporting limit; however, the reporting limit is approximate.
- U The sample was analyzed for, but was not detected above the sample reporting limit.
- R The sample result is rejected due to serious deficiencies. The presence or absence of the analyte cannot be verified.

8.2.3 Verification of Electronic Data

All data that is manually entered into the database will be proofed 100 percent against the original. Electronic data will be checked 100 percent after loading against laboratory data sheets for completeness and spot checked for accuracy.

8.3 DQO Reconciliation

The field and laboratory data collected during this investigation will be used to achieve the objectives identified in Section 3 of this QAPP. The QC results associated with each analytical parameter for each matrix will be compared to the MQOs presented in Section 3.3 of this QAPP. Only data generated in association with QC results meeting the stated acceptance criteria (i.e., data determined to be valid) will be considered usable for decision making purposes.

In addition, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific, and parameter-specific basis. This assessment will be performed by the ENSR Project Manager, in conjunction with the ENSR Data Quality Officer, and the results presented and discussed in detail in the final report. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following.

- Conformance to the field methodologies and SOPs proposed in the FSP,
- Conformance to the analytical SOPs provided in the QAPP,
- Adherence to proposed sampling strategy,
- Presence of elevated detection limits due to matrix interferences or contaminants present at high concentrations,
- Presence of analytes not expected to be present at the facility,
- Conformance to verification/validation protocols included in the QAPP for laboratory data,
- Unusable data sets (qualified as "R") based on the data verification and validation results,
- Data sets identified as usable for limited purposes (qualified as "J") based on the data validation results,
- Effect of qualifiers applied as a result of data verification/validation on the ability to implement the project decision rules,
- Status of all issues requiring corrective action,
- Effect of nonconformance (procedures or requirements) on project objectives,
- Adequacy of the data as a whole in meeting the project objectives, and
- Identification of any remaining data gaps and need to reevaluate project decision rules.

9.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

QA reports will be submitted to the ENSR Project Manager and the ENSR Project Quality Systems Manager to ensure that any problems identified during the sampling and analysis programs are investigated and the proper corrective measures taken in response. The QA reports will include:

- All results of field and laboratory audits,
- Problems noted during data validation and assessment, and
- Significant QA/QC problems, recommended corrective actions, and the outcome of corrective actions.

QA reports will be prepared by the ENSR Data Quality Officer and submitted on an as-needed basis.

10.0 REFERENCES

NYSDEC. 1991. *RCRA Quality Assurance Project Plan Guidance.*

USACE. 2001. *Requirements for the Preparation of Sampling and Analysis Plan.* EM 200-1-3.

USACE. 1998. *Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Removal Activities.* ER 1110-1-263.

USACE. 1997. *Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects.* EM 200-1-6.

US EPA. 1983. *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-79-020, March 1983.

USEPA. 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, November 1986, through update III (June 1997).

USEPA. 1994a. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* EPA-540/R-94-012.

USEPA. 1994b. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* EPA-540/R-94-013.

APPENDIX G

US Army
Engineering & Support Center
Huntsville, AL

FINAL

Project Quality Control Plan
SEAD-59 and 71
Time Critical Removal Action
Seneca Army Depot Activity
Romulus, NY

Contract No. GS-10F-0115K
Delivery Order No. DACA87-02-F-0137

ENSR Corporation
August 2002
Document Number 09090-029-100

1.0 INTRODUCTION & PLAN OBJECTIVE

The Seneca Army Depot Activity (SEAD) located in Romulus, NY plans to conduct a Time Critical Removal Action (TCRA) at SEAD-59 and SEAD-71. The objective of the TCRA is to eliminate and contain an identified source of residual chemical materials in the soil and to remove, or at least lessen the magnitude of, the potential threat that it represents to surrounding populations and the environment.

The objective of this Project Quality Control Plan is to support the TCRA in accordance with Section 3.3.1 of the Project Description and Specifications and produce an end product which complies with the contract requirements.

2.0 DEFINABLE FEATURES OF THE WORK

Listed below are the definable features of the work for the Time Critical Removal Action for SEAD-59 and 71.

- Mobilization and demobilization as described in Sections 4.2 and 4.8 of the Work Plan.
- Civil work as described in Sections 4.2, 4.3, 4.4, and 4.8 of the Work Plan.
- Off site disposition as described in Sections 4.5 and 4.6 of the Work Plan.
- Sampling and analysis as described in the Quality Assurance Project Plan and the Field Sampling Plan.
- Reporting as described in Sections 7.0 of the Work Plan.

3.0 ORGANIZATION AND STAFFING

3.1 PROJECT QUALITY CONTROL ORGANIZATION

The Project Quality Systems Manager (Manager) will be assisted by a staff of qualified personnel that will focus on specific, definable features of the work as outlined in Section 2 of this plan.

The Manager will be tasked and authorized as represented in Section 3.3 and will delegate authority and responsibility to those identified in Section 3.2. The Manager will have complete authority to take actions necessary to ensure the work is being executed in compliance with the contract. This authority will be appropriately delegated to the staff controlling specific features of the work as represented in Section 3.3 of this plan.

The Manager will not be on site at all times, but his delegates will be while activities are being conducted under the specific feature of the work they have been delegated to control.

3.2 QUALITY CONTROL STAFF

Brief resumes of each member of the quality control staff are attached.

James P. Sprague, PMP, P.E. – Project Engineer/Project Quality Systems Manager

Mr. James Sprague will act as the Project Engineer and Project Quality Systems Manager. He will be responsible for overall management of this plan and have the authority to act on all matters relating to project quality for ENSR. Mr. Sprague will delegate specific elements of quality control to staff assigned to the project site for specific features of the work. He will review all quality documents completed in his behalf by his delegates and counter sign.

Mr. Sprague is a licensed Professional Engineer in the State of New York. He has 20 years of experience and a diverse engineering background working on and managing multi-disciplinary engineering teams on a variety of projects.

Derek Anderson, P.E. – Alternate Project Quality Systems Manager

Mr. Derek Anderson will act as the alternate Project Quality Systems Manager as directed and requested by Mr. Sprague.

Mr. Anderson is a licensed Professional Engineer in the State of New York. He has 15 years of experience covering a broad group of environmental and civil engineering projects.

Terri Willfong – Site Safety Officer

Ms. Terri Willfong will act as the Site Safety Officer. Ms. Willfong will carry out the duties as prescribed in Section 1.2.4 of the Health and Safety Plan. She has over 13 years of experience in site safety activities for remediation projects.

Richard Wellman – Data Quality Manager

Mr. Richard Wellman will be the Data Quality Manager as delegated by Mr. Sprague. His responsibilities are as outlined in the Quality Assurance Project Plan. Mr. Wellman has 27 years of experience in analytical chemistry, data validation and Quality Assurance and Quality Control.

Craig Stiles – Field Sampling Task Leader

Mr. Craig Stiles will act as the Field Sampling Task Leader and be responsible for Quality Control issues relating to the "Sampling and Analysis" definable feature of the work as delegated by Mr. Sprague. His responsibilities are also outlined in the Field Sampling Plan.

Mr. Stiles is a geologist with 15 years of experience which includes construction oversight, multiple categories of environmental investigation and Remedial Investigation and Feasibility Studies.

Guy Simpson – Project Superintendent

Mr. Guy Simpson will act as the Project Superintendent and be responsible for quality control issues relating to the "Mobilization and Demobilization", and the "Civil Work" definable features as delegated by Mr. Sprague. As Project Superintendent, Mr. Simpson will serve as the over all Quality System Manager at the site during those times that Mr. Sprague is absent. Mr. Simpson's other responsibilities are outlined in Section 3.0 of the Work Plan.

He has 30 years of experience managing site activities of environmental projects including managing sampling, excavation of contaminated materials, off-site removal/disposition of contaminated materials, supervision of field staff and contractors.

Tony Kwiec – Pile Coordinator

Mr. Tony Kwiec will act as the stock pile coordinator and be responsible for quality control issues relating to the "Off-site Disposition" definable feature of work as delegated by Mr. Sprague. His other duties are outlined in Section 3.0 of the Work Plan.

3.3 LETTERS OF DELEGATION AND AUTHORITY

Attachment A contains the letters outlining the specific delegated responsibilities and authority from the appropriate authorized officials and staff relating to the quality control and contract compliance with the TCRA for SEAD 59 and SEAD 71 at the Seneca Army Depot Activity, Romulus, NY.

4.0 SUBMITTAL MANAGEMENT

Quality Control Staff will be responsible to certify that all submittals are in compliance with the contract requirements and are submitted in accordance with the submittal schedule. The staff will also inspect materials before use/installation to insure compliance with the contract and/or Work Plan.

TABLE 4.0 Submittal Schedule and QC Staff Responsibilities

SUBMITTAL	DESCRIPTION AND SPECIFICATION SECTION	DUE DATE	QUALITY CONTROL REVIEW
Draft Work Plan	3.3.1	16 August 2002	Sprague
Final Work Plan	3.3.1	30 August 2002	Sprague
Weekly Report	3.3.4	Monday of each week following the initiation of field work	Sprague
Initial Progress Chart	4.5	16 August 2002	Sprague
Progress Report		7th of each month	Sprague
Draft Removal Report	3.4	6 December 2002	Sprague
Draft-Final Removal Report	3.4	20 December 2002	Sprague
Final Removal Report	3.4	31 January 2003	Sprague

5.0 THREE PHASE CONTROL TRACKING

The quality control system utilizes a three-phase control process to ensure the work is being executed in compliance with the contract and deficiencies are identified and corrected. The three phases are:

- ✓ Preparatory – This phase is conducted prior to work beginning of a definable feature of work.
- ✓ Initial – This phase is conducted at the beginning of a definable feature of work when a representative sample of the work has been completed.
- ✓ Follow-up – This phase is conducted daily during the execution of the definable feature of work.

The phases will be documented utilizing inspection tracking forms and the Daily Project Quality Control Report. The Preparatory Phase Quality Inspection check list is presented as Attachment B. This form will be completed for each definable feature of work. The Daily Project Quality Control Report will be compiled by the Project Superintendent. It is the responsibility of each Assistant Project Quality Systems Manager to report to the Project Superintendent the status of all issues pertaining to quality control that they have been given responsibility for so that the Daily Project Quality Control Report can be kept current. A blank Daily Project Quality Control Report is attached as Attachment C.

6.0 DEFICIENCY MANAGEMENT

6.1 IDENTIFICATION OF DEFICIENCIES

Deficiencies will be identified during the three phases of control and near the end of work during the Punch-Out Inspection. They will be noted and tracked on the Master List of Deficiencies as well as the specific inspection tracking form or the Daily Project Quality Control Report.

6.2 IDENTIFICATION OF CORRECTIVE ACTIONS

Once a deficiency is identified a corrective action will be immediately noted on the Master List of Deficiencies with a date for the deficiency to be corrected. If these deficiencies are identified during the Punch-Out Inspection then a specific Punch List will be generated and be incorporated in the quality control documentation.

6.3 VERIFICATION OF CORRECTIONS

Additional preparatory and initial phase inspections will be conducted immediately after the date a deficiency is to be corrected. These inspections will be documented as outlined in Section 6.1 of this plan.

7.0 REPORTING PROCEDURES

Project quality control will be documented to provide record and factual evidence that the required activities have been preformed. This documentation will be maintained through the inspection reports, the Daily Project Quality Control Report, Punch-Out Inspections, and other project documentation/reports as outlined in Section 8.0 of the Work Plan

8.0 PLAN RELATIONSHIP TO PROJECT SAFETY

This Project Quality Control Plan supports the Health and Safety Plan by specifically delegating the responsibility of the quality control issues relating to safety to the Site Safety Officer. This responsibility goes beyond the implementation and maintenance of the HASP as outlined in Section 1.2.4 of the HASP and delegates the quality control issues relating to safety for the project. These responsibilities are outlined in delegation of authority letters in Attachment A.

9.0 TRAINING OF QUALITY CONTROL STAFF

The quality control staff outlined in Section 3.0 of this plan will be briefed on their responsibilities and requirements under this plan and trained on how to comply with the inspection and reporting portions of this plan. The Quality Control System Manager will conduct this briefing and training and provide documentation for the quality control record.

The Quality Control System Manager will attend the next available course entitled "Construction Quality Management for Contractors".

ATTACHMENT A

ENSR INTERNATIONAL

ENSR International
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Westford, MA 01886

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FAX (978)589-3001
www.ensr.com

15 August 2002

Mr. James Sprague
ENSR Corporation
360 Linden Oaks
Rochester, NY 14625

RE: Assignment as Quality Control System Manager, TCRA SEAD-59 & 71
ENSR Project Number 09090-029

Dear Mr. Sprague

This letter is to confirm your assignment as ENSR's Quality Control System Manager for the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project and stop work when you find this work is not in compliance with the contract and Work Plan.

Sincerely,

for Anthony Colella

Frank R. Sweet
Vice President

cc: Rick Brannon

ENSR International
360 Linden Oaks
Rochester, NY 14625-2814
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FAX (585) 381-5392
www.ensr.com

15 August 2002

Mr. Derek C. Anderson, P.E.
ENSR Corporation
360 Linden Oaks
Rochester, NY 14625

**RE: Assignment as Alternate Project Quality Systems Manager,
TCRA SEAD - 59 & 71
ENSR Project Number 09090-029**

Dear Mr. Anderson:

This letter is to confirm your assignment as ENSR's Alternate Project Quality Systems Manager for the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project and stop work when you find this work is not in compliance with the contract and Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager
Peter Nielsen, P.E., ISC Department Manager

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15 August 2002

Ms. Terri Willfong
ENSR Corporation
2 Technology Park Dr.
Westford, MA 01866

RE: Assignment as Assistant Project Quality Systems Manager,
Site Safety Officer Task, TCRA SEAD - 59 & 71
ENSR Project Number 09090-029

Dear Ms. Willfong:

This letter is to confirm your assignment as ENSR's Assistant Project Quality Systems Manager for the Site Safety Officer Task of the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project relating to enforcing the requirements of the Health and Safety Plan (HASP) once work begins. As specified in Section 1.2.4 of the HASP, the SSO has the authority to immediately correct all situations where noncompliance with the HASP is noted and to stop work in cases where an immediate danger is perceived. Further, this assignment empowers you to stop work when you find the work is not in compliance with the contract or the Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager

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15 August 2002

Mr. Richard Wellman
ENSR Corporation
2 Technology Park Dr.
Westford, MA 01866

RE: Assignment as Assistant Project Quality Systems Manager, Data Quality Control Task, TCRA SEAD - 59 & 71 ENSR Project Number 09090-029

Dear Mr. Wellman:

This letter is to confirm your assignment as ENSR's Assistant Project Quality Systems Manager for the Data Quality Control Task of the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project relating to enforcing the requirements of the Quality Assurance Project Plan (QAPP) once work begins. This assignment empowers you to stop work when you find the work is not in compliance with the contract or the Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager

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15 August 2002

Mr. Craig Stiles
ENSR Corporation
360 Linden Oaks
Rochester, NY 14625

RE: Assignment as Assistant Project Quality Systems Manager, Field Sampling Task, TCRA SEAD - 59 & 71 ENSR Project Number 09090-029

Dear Mr. Stiles:

This letter is to confirm your assignment as ENSR's Assistant Project Quality Systems Manager for the Field Sampling Task portion of the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project relating to the "Sampling and Analysis" definable feature of the work, as the same is defined and described in the Project Quality Control Plan, the Quality Assurance Project Plan and the Field Sampling Plan. This assignment empowers you to stop work when you find the work is not in compliance with the contract or the Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager
Peter Nielsen, P.E., ISC Department Manager

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15 August 2002

Mr. Guy Simpson
ENSR Corporation
2 Technology Park Dr.
Westford, MA 01866

RE: Assignment as Assistant Project Quality Systems Manager, Project Superintendent Task, TCRA SEAD - 59 & 71 ENSR Project Number 09090-029

Dear Mr. Simpson:

This letter is to confirm your assignment as ENSR's Assistant Project Quality Systems Manager for the Project Superintendent Task of the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project relating to the "Mobilization and Demobilization" and "Civil Work" definable features of the work, as the same are defined and described in the Project Quality Control Plan, once work begins. Further, as the Project Superintendent, you are authorized to act as the over-all Quality Systems Manager during those periods when I am not at the site. This assignment empowers you to stop work when you find the work is not in compliance with the contract or the Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager

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15 August 2002

Mr. Tony Kwiec
ENSR Corporation
2 Technology Park Dr.
Westford, MA 01866

RE: Assignment as Assistant Project Quality Systems Manager,
Stockpile Manager Task, TCRA SEAD - 59 & 71
ENSR Project Number 09090-029

Dear Mr. Kwiec:

This letter is to confirm your assignment as ENSR's Assistant Project Quality Systems Manager for the Stockpile Manager Task of the Time Critical Removal Action for SEAD-59 and 71 at the Seneca Army Depot Activity, Romulus, NY. With this assignment, I delegate authority to you to inspect and review all aspects of this project relating to the "Off-site Disposition" definable features of the work, as the same is defined and described in the Project Quality Control Plan, once work begins. This assignment empowers you to stop work when you find the work is not in compliance with the contract or the Work Plan.

Very truly yours,
ENSR Corporation

James P. Sprague

James P. Sprague, PMP, P.E.
TCRA SEAD - 59 and 71 Project Quality Systems Manager

cc: Rick Brannon, TCRA SEAD - 59 and 71 Project Manager

RESUMES

Anthony Kwiec

Years of Experience: 25

Technical Specialties

- General Construction
- Decontamination and Demolition
- HAZCAT Analysis
- Health and Safety
- Construction Oversight
- Media Sampling
- Quantity Verification
- Heavy Equipment Operation
- Material Screening/Segregation
- Hazardous Waste Removal
- Confined Space Entry
- ACM Management

Professional History

- ENSR Corporation
- Classic Design Homes
- JAB Construction
- M & G Construction

Education

- High School Diploma, Midvalley High School

Certifications and Training

- OSHA 29 CFR 1910.120 HAZWOPER Training
- 8-Hour Supervisor Training
- 40-Hour Asbestos Supervisor
- First Aid/CPR
- 30-Hour OSHA General Construction Safety
- Confined Space Entry

Representative Project Experience

Confidential Client, Ohio. Construction Supervisor for the expedited and non-expedited cleanup at an active chemical manufacturing plan. Work included decontamination, asphalt/concrete capping, hot-spot excavation, riverbank stabilization, and sewer inspection and cleaning and impoundment closure.

Avtex Fiber Superfund Site, Front Royal, VA. Task Leader involved in the screening and decontamination of over 150,000 cubic yards of demolition debris, load-out of 90,000 cubic yards of wastes, management of over 10,000 cubic yards of ACM, 5,000 waste containers and 16 PCB transformers. Additional work included the removal and relocation of approximately 10,000 cubic yards of sludge from a site impoundment, decontamination and demolition of a former lead smelting facility, hot-spot excavation, decontamination of a two-million gallon tank contaminated with PCBs and the excavation/removal of several subgrade structures.

Higgins Disposal Superfund Site, Kingston, NJ. Technician/Foreman involved in exploratory excavation and removal activities at the Higgins Disposal Superfund Site. Lanfilled materials were removed for characterization, preservation as evidence, and off site disposal. The landfill was approximately 1-acre and contained roughly 12,000 cubic yards of material. Over 15,000 laboratory containers were removed and characterized on site. Most of the activities were conducted in Level B personal protective equipment. The site was backfilled, recontoured and re-vegitated.

Fort James Corporation, Riegelsville, NJ. Technician/Foreman involved in the abatement of over 20,000 square feet and 200 tons of ACM, decontamination and removal of 2,000 tons of steel equipment, piping and appurtenances and the demolition of 17 structures.

Guy C Simpson
Construction Supervisor

Years Experience: 30

Technical Specialties:

- Hazardous Waste Facilities Closures
- Construction Materials QA/QC
- Cost Estimation
- Field Construction Supervision
- Health and Safety
- Remedial Action Construction Management
- UST Investigation and Remedial Action
- Construction Document Preparation
- Landfill Cap Construction
- Liner Installation
- River/Stream Remediation
- Waste Stabilization

Construction Supervisor, Confidential Client, Franklin, Virginia - Supervised the remediation of a 'tall oil' sludge area. Activities included the removal and stabilization of over 10,000 tons of sludge.

Construction Supervisor, Confidential Client, Dover, Ohio - Supervised the execution of remedies at an active chemical manufacturing site. Activities included; concrete/asphalt/soil covers, concrete decontamination, hot-spot excavation, wastewater/process sewer inspection and cleaning, lagoon closure.

Foreman, Avtex Fibers Superfund Site, Front Royal, Virginia – Foreman for the non-time critical removal action for the buildings at the Avtex Fibers Superfund Site in Front Royal, VA. The work includes: structure and tank decontamination, selective demolition, waste management and subgrade structure remediation.

Construction Supervisor, Myers Property Superfund Site, New Jersey - Supervisor for selected remedial actions at the four-acre site. Actions included; soil sampling, removal of 1,500 cubic yards of contaminated soil, construction of an on-site groundwater treatment system, installation of extraction and reinjection wells, installation of piping system. The treatment system was constructed utilizing a historically accurate design.

James Peter Sprague, PMP, P.E.

Sr. Project Manager

Years Experience: 20

Technical Specialties:

- Civil Engineering
- Construction Document Preparation
- Construction Management and Oversight

Project Experience:

Environmental Compliance;

- Senior Environmental Engineer and author of a Spill Prevention Control and Countermeasure Plan for the Orleans County Highway Department's fuel farm in Albion, New York.
- Senior Environmental Engineer and author of a Pollution Prevention Plan for the J.G. Turner, Inc. Construction and Demolition Debris Landfill.
- Lead Environmental Engineer and primary client contact for the development of a standardized document utilized to certify existing hazardous waste storage tank systems as suitable for use.
- Project Engineer for the preparation of a Hazardous Waste Contingency Plan for General Testing Corporation, a State-certified contract laboratory in Rochester, New York.
- Project Manager for the design of storm water system improvements for Livingston County Highway Department's vehicle storage and maintenance facility. This project was pursued to comply with the NYSDEC SPDES General Permit for Storm Water Discharges.

Environmental Remediation:

- Project Manager for the design and construction certification of two groundwater migration control systems which utilized fractured bedrock trenchs or groundwater recovery wells.
- Project Engineer for concept development for an interim remedial measure to be installed at a site listed on the NYSDEC's Registry of Inactive Hazardous Waste Disposal Sites for Genesee Scrap and Tin Baling Company in Rochester, New York.
- Senior Project Engineer for the design and construction of an 840 car surface parking lot constructed on an environmentally sensitive site.

Craig A. Stiles

Project Manager/Geologist

Years Experience: 12

Technical Specialties:

- Hydrogeological Studies
- Remedial Investigation/Feasibility Studies (RI/FS)
- UST Investigation and Remedial Action
- Landfill Investigations
- Construction Oversight
- Hydrogeologic Characterization
- Liability Assessments
- Project Management
- Groundwater Monitoring and Sampling
- Environmental Impact Statements
- Health and Safety

Mr. Stiles is a field geologist and project manager within ENSR's environmental department in Rochester New York. Between 1996 and 2000, Mr. Stiles has performed 12 Phase I Environmental Site Assessments for private and commercial clients in the Western New York area.

Mr. Stiles worked as the Site Health and Safety Officer for an Army Corps of Engineering under the Formerly Utilized Sites Remedial Action Program (FUSRAP)and in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). The project was conducted at a former nuclear fual processing, research and development site in north-central Connecticut. The project objective was to determine the vertical and horizontal extent of areas with an enriched uranium concentration of greater than 20 percent as well as areas with mixed radiological and chemical impacts to soil and groundwater. This project was conducted between August and December 2000.

Mr. Stiles was responsible for the health and saftey concerns for a field crew that ranged from 8 to 16 workers including drilling and on-site laboratory subcontractors. Work conducted under the FUSRAP project included surface soil sampling, soil sampling at depth using both hand tools and a drill rig, sediment sampling using hand tools, low-flow groundwater sampling, gamma walkover surveys, ground penetrating radar surveys, concrete core sampling, surface wipe sampling of floors, walls and piping, GPS surveys and analysis by gamma specroscopy at the on-site laboratory. Mr. Stiles was also directly responsible for coordinating the field activities with the Project Field Supervisor, preparing sample shipments to the off-site laboratory, air monitoring within the on-site laboratory, and the containerization and characterization of investigation derived waste.

Richard L. Wellman

Years Experience: 20

Technical Specialties

- Analytical Chemistry
- Data Validation
- Quality Assurance/Quality Control

Professional History

- ENSR Consulting and Engineering
- Katahdin Analytical Services
- PACE Analytical Laboratories
- Resource Analysts Incorporated
- DuPont/NEN Products

Education

- BS (Chemistry) Union College
- MBA (Operations Mgmnt) Boston University

Representative Project Experience

Analytical Chemistry. Bench chemist and supervisor in industrial analytical chemistry laboratory developing gas chromatography, and high-pressure liquid chromatography analytical methods for organic compounds. Performed infra-red and nuclear magnetic resonance analyses. Supervisor and laboratory manager in environmental analytical testing laboratory performing organic, metals, and wet-chemistry analyses on water, soil and tissue. Developed methods of preparation and analysis for novel analytes. Trained staff in analytical chemistry procedures.

Data Validation. Performed data validation for organic and inorganic parameters including VOC, SVOC, PAH, Pesticides, PCBs , metals, wet chemistry and specialty analyses like explosives, dissolved gases and petroleum hydrocarbon analyses. Validation and reporting protocols include EPA Regions I, III, and V, NJDEP, and EPA National Functional Guidelines.

TetraTech/NUS, Remedial Investigation, Naval Air Station South Weymouth. QA coordinator for Phase 2. Coordinated and assisted in the validation of more than 1000 VOC, SVOC, wet chemistry, metals, and dioxin laboratory data packages. Validation was performed following EPA Region 1 Guidelines. Ensured adherence to quality assurance project plans. Coordinated field efforts with laboratories. Provided expert chemistry consulting on techniques to accommodate unusual analytes of interest and special detection limits at the site. Prepared technical specifications for chemistry sampling and analysis.

TetraTech/NUS, MA Contingency Plan Site Closure, Naval Air Station South Weymouth. QA Coordinator responsible for managing validation effort for VOC, petroleum hydrocarbon, wet chemistry and metals laboratory data packages. Ensured adherence to quality assurance project plans. Provided expert chemistry consulting on unusual analytes of interest at the site. Prepared technical specifications for chemistry sampling and analysis. Coordinated field efforts with laboratories.

Theresa A. Willfong

Years Experience: 13

Technical Specialties

- Radiological contamination assessment and cleanup
- Implementation of health and safety programs
- Multi-media air monitoring and sampling
- Respiratory protection

Professional History

- ENSR Corporation
- Bartlett Nuclear
- On-Site Environmental
- Numanco
- Brooks
- SEC
- Therm NuTech
- P.S.E.S.I.

Professional Registrations and Affiliations

- DOE Radiation Control Technician (RCT) CORE Exam

Representative Project Experience

FMC Corporation, Avtex Fibers Superfund Site Critical Removals Action Project, Front Royal, VA. Safety Coordinator for the first phase of remedial action planned at this 450-acre former rayon manufacturing facility. Major work tasks include the segregation, decontamination and treatment (as necessary) of existing demolition debris stockpiles and other accumulated solid wastes (over 4,000 containers on site); removal and disposition of a carbon disulfide recovery system; and the removal and disposition of select subgrade structures and contaminated materials contained within the structures.

Consolidated Coal Company (CONSOL), Buckeye Reclamation Landfill Superfund Site, Belmont County, OH. Safety and Health Technician assigned to assist in a project involving the remediation of contaminated soils and groundwater. Major site activities include the relocation, reconstruction and lining of a 1-mile waterway known as Kings Run; the construction of a solid waste multi-media cap over approximately 37 acres of a former municipal disposal area and a 24-acre vegetated cap over the northern part of the site; installation of various surface water management control structures such as channels, berms, and culverts; installation of a groundwater/leachate collection system; and the installation of 40 gas vents and collection piping. The extreme topography of the site, specifically the steep grades between the northern and southern portion of the site (over 400-foot drop) will present complex challenges during construction activities.

APPENDIX H

HEALTH AND SAFETY PLAN

Time Critical Removal Action
Fill Area West of Building 115 (SEAD-59) and Alleged Paint Disposal Area (SEAD-71)
Seneca Army Depot Activity
Romulus, New York

Prepared by: Kathleen Harvey ____________

Approved by: ______________________________ Date: ________________
ENSR Regional Health and Safety Manager

Approved by: ______________________________ Date: ________________
ENSR Project Manager

CONTENTS

1.0 INTRODUCTION

1.1 HASP Applicability

This site-specific Health and Safety Plan (HASP) has been developed by ENSR Corporation (ENSR). It establishes the health and safety procedures to minimize any potential risk to ENSR and contractor personnel implementing the time critical removal action at the fill area west of Building 115 (SEAD-59) and the alleged paint disposal area (SEAD-71) at the Seneca Army Depot Activity located in Romulus, New York. ENSR is implementing the removal action on behalf of the United States Army Engineering and Support Center - Huntsville.

The provisions of this plan apply to all ENSR personnel and subcontractor personnel who may potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document.

This HASP has been written to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) and the USACE Safety and Health Requirements Manual (EM 385-1-1, September 1996). All activities covered by this HASP must be conducted in complete compliance with this HASP. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

This plan will be distributed to each employee involved with the time critical removal activities occurring at SEAD-59 and SEAD-71 of the facility. Each employee must sign a copy of the attached health and safety plan receipt and acceptance form (see Attachment A). These signed sheets will be maintained on-site for the duration of the project and later maintained in ENSR's project file.

1.2 Organization/Responsibilities

The implementation of health and safety at this project location will be the shared responsibility of the ENSR Project Manager (PM), the ENSR Regional Health and Safety Manager (RHSM), the ENSR Site Superintendent (SS), the ENSR Site Safety Officer (SSO) and all other ENSR and contractor personnel.

1.2.1 ENSR Project Manager

The ENSR PM (Rick Brannon) is the individual who has the primary responsibility for ensuring the overall health and safety of this project. As such, the PM is responsible for ensuring that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the RHSM with updated information regarding environmental conditions at the site and the scope of site work;

- Providing adequate authority and resources to the on-site SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the SSO and RHSM;
- Maintaining regular communications with the SSO and, if necessary, the RHSM; and,
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project.

1.2.2 ENSR Regional Health and Safety Manager

The ENSR RHSM (Kathleen Harvey) is the individual responsible for the preparation, interpretation and modification of this HASP. Modifications to this HASP which may result in less stringent precautions cannot be undertaken by the PM or the SSO without the approval of the RHSM. Specific duties of the RHSM include:

- Writing, approving and amending the HASP for this project;
- Reviewing job hazard analyses (JHA's) after being completed by the ENSR and Contractor SSOs;
- Advising the PM and SSO on matters relating to health and safety on this site;
- Recommending appropriate personal protective equipment (PPE) and air monitoring instrumentation to protect personnel from potential site hazards;
- Conducting accident investigations in conjunction with the SSO; and,
- Maintaining regular contact with the PM and SSO to evaluate site conditions and new information which might require modifications to the HASP.

1.2.3 Site Superintendent

The SS (Guy Simpson) has direct supervision over all on-site personnel. He will coordinate daily site-specific work efforts and ensure that all activities are in strict compliance with site-specific health and safety plan. The SS must inform the SSO when site activities are changing or new operations are beginning so that enough time is available for the SSO to adequately prepare a JHA, if deemed necessary. The SS has authority to suspend all work that poses any health and safety risk.

1.2.4 ENSR Site Safety Officer

All ENSR field technicians are responsible for implementing the safety requirements specified in this HASP. However, ENSR is staffing this project with one full-time SSO. The SSO will be appointed by the PM and will be on-site during all activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once work begins. The SSO has the authority to immediately correct all situations where noncompliance with this HASP is noted and to stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have submitted a completed copy of the HASP receipt and acceptance form;
- Assuring that all personnel to whom this HASP applies have attended a pre-entry briefing prior to entering an exclusion zone;
- Maintaining a high level of health and safety consciousness among employees at the work site;
- Preparing JHA's when deemed necessary;
- Procuring and distributing the PPE needed for this project for ENSR employees;
- Procuring the air monitoring instrumentation required and performing the work area and site perimeter air monitoring;
- Verifying that all PPE and health and safety equipment used by ENSR is in good working order;
- Setting up and maintaining the work zones and assuring proper decontamination of ENSR site personnel and equipment;
- Notifying the SS and RHSM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established work areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing and subsequent safety meetings, as required by Section 10.3 of the HASP; and,
- Initiating emergency response procedures in accordance with Section 11.0 of this HASP.

1.2.5 ENSR Field Personnel and Covered Contractor Personnel

All ENSR field personnel and contractor personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP and subsequent JHA's in its entirety prior to the start of on-site work;
- Submitting a completed HASP Acceptance Form and documentation of medical surveillance and training to the ENSR PM prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work and all subsequent safety meetings;
- Bringing forth any questions or concerns regarding the content of the HASP to the SS or the SSO prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the ENSR SS and SSO; and,
- Complying with the requirements of this HASP and the requests of the SSO.

1.2.6 Contractors

In addition to other requirements referenced in this HASP, all contractors are required to:

- Provide appropriate PPE for their employees;
- Ensure, via daily inspections, that their equipment is maintained in good working condition;
- Operate their equipment in a safe manner;
- Work directly with the ENSR SSO to prepare JHA's, when necessary;
- Provide a "competent person" as defined in OSHAs Trenching and Excavation Standard; and,
- Appoint an on-site safety coordinator to interface with the ENSR SSO.

1.3 Modification of the HASP

The procedures in this HASP have been developed based on information collected during previous investigations conducted by others at SEAD-59 and SEAD-71. Every effort has been made to address the chemical hazards that may be encountered during the implementation of the work plan. Similarly, this document also discusses the physical hazards associated with the proposed excavation activities. However, unanticipated site-specific conditions or situations may occur during the implementation of this project that have not been addressed in this document. As such, this HASP must be considered a *working document* that is subject to change to meet the needs of this dynamic project.

To ensure that all chemical and physical hazards have been properly addressed, the SSO will complete a JHA prior to the beginning of each major phase of work (i.e. an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform). All JHAs will be reviewed by the RHSM prior to being implemented. Preliminary JHA's have been prepared and are presented in Attachment B of this HASP. These preliminary JHA's will be finalized on-site by the ENSR and contractor SSO's.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Seneca Army Depot Activity (SEDA) facility is located on the western flank of a topographical high between Cayuga and Seneca Lakes in the Finger Lakes region of central New York. The SEDA facility was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army since that time. The post generally consists of an elongated central area for storage of ammunitions and weaponry in Quonset-style buildings, an operations and administration area in the eastern portion and an army barracks area at the north end of the depot. The base was expanded to encompass a 1,524-meter airstrip, formerly the Sampson Air Force Base.

The mission of the SEDA was 1) receiving, storing and distributing ammunitions and explosives, 2) providing receipt, storage and distribution of items that support special weapons and 3) performing depot-level maintenance, demilitarization and surveillance of conventional ammunition and special weapons. The depot formerly employed approximately 1,000 civilian and military personnel.

The SEDA has officially been closed and in accordance with the Base Realignment and Closure (BRAC) process, portions of the depot are now being released to the public and private sectors for use. As increased access is afforded, the potential for exposure to any residual chemicals that are present at the fill area west of Building 135 (SEAD-59) and the alleged paint disposal area (SEAD-71) is increased. These areas are depicted in Figure 1 of the Work Plan.

2.2 Fill Area West of Building 135 – SEAD-59

SEAD-59 is located in the east-central portion of SEDA. The site encompasses an area along both sides of an unnamed dirt road that is the access road to Building 311. SEAD-59 is comprised of two areas. The area north of the access road is the fill area and the area located to the south of the road was used as a staging area for heavy equipment and construction materials. Each area is characterized by different topography with the area to the south of the road being relatively flat and sloping gently to the west and the area to the north, containing the fill area with approximately 10 feet of relief.

SEAD-59 was used for the disposal of construction debris and oily sludges. SEDA personnel have indicated that there may be a large quantity of miscellaneous "roads and grounds" waste buried at the site.

2.3 Alleged Paint Disposal Area – SEAD-71

SEAD-71 is also located in the east-central portion of the SEDA. The site is located approximately 200 feet west of 4th Avenue near Buildings 127 and 114. The entire site is approximately 350 feet by 100 feet and bounded to the north and south by railroad tracks serving Buildings 127 and 114. It is rumored that paints and/or solvents were disposed of in burial pits at SEAD-71.

2.4 Previous Investigations

Geophysical surveys and test pits were performed during an Environmental Site Investigation (ESI) and Remedial Investigation (RI) to identify burial sites at SEAD-59 and –71. Soil, soil gas, and groundwater were collected and analyzed at part of the investigations. These investigations identified several areas that have been impacted by releases of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons and to a lesser extent, heavy metals. The primary VOCs detected include benzene, toluene, ethylbenzene and xylene (BTEX). The primary metal of concern is lead.

Excavated debris from test pits advanced in SEAD-59 included concrete, asphalt, metal, wood, chain-link fencing, 55-gallon drums, and paint cans. Debris excavated from test pits advanced in SEAD-71 included chain-link fencing, sheet metal, asphalt, stone slabs, bricks and piping. A crushed, yellow 20-gallon drum and railroad ties were also found.

3.0 SCOPE OF WORK

3.1 Project Objective

The object of the proposed removal action at SEADs-59 and-71 is to eliminate and contain an identified source of residual chemical materials in the soil and to remove, or at least lessen, the magnitude of the potential threat that it represents to surrounding populations and the environment.

3.2 Major Project Activities

Soils in each identified area will be excavated to the anticipated depths and/or to a point where visual evidence of potential contamination is no longer apparent. Excavated materials will be segregated to remove drums, cans and other visibly obvious debris as well as to isolate visibly contaminated soils. Stockpiled soils will be sampled for disposal characterization and either loaded-out for off-site disposal or used to backfill the excavations. Post-excavation soil samples will also be collected. Backfilling of excavations will not be conducted until post-excavation soil samples indicate that the concentration of the contaminants is below the New York State Technical and Administrative Guidance Memorandum (TAGM)-derived clean-up levels.

Staging for SEAD-59 Area 1 will be located east of the excavation on the north and south sides of the dirt access road. As soil is excavated, a spotter will inspect the material for debris and suspect materials such as paint cans, drums, etc. When debris and other materials are located, they will either be loaded into a designated truck to be stockpiled separately or placed adjacent to the excavation areas for later transport to the staging area depending on volume. Soil will be loaded into dump trucks for transportation to the staging area. At the staging area, the soil will be dumped and inspected again for debris as it is being dumped. After each load has been dumped, it will be piled into 500-cubic yard lots using a rubber-tired loader. The lots will be flagged and numbered for identification.

Excavation at SEAD-71 and SEAD-59 areas 2-4 will be conducted in the same manner as Area 1 except that a rubber-tired loader will be used to stockpile soil adjacent to the excavations.

It is estimated that approximately 20 truckloads of stockpiled soils will be loaded-out per day once load-out operations begin.

Run-off waters will be collected from within the excavation and staging areas. In excavation areas, the bottom of the excavation will be graded or channeled to a collection point within the excavation where it can be transferred, via sump pump, to a holding tank. Water samples will be collected for subsequent disposal analyses. When results have been received, water will be decanted from the holding tank into a tanker for off-site transport.

3.3 Activities Associated with Mobilization and Demobilization

Prior to the start of excavation activities, the following tasks will have been completed:

- Clearing vegetation from work areas, where necessary

- Installing security fencing
- Constructing the truck/equipment decontamination area
- Performing a utility locating survey
- Installing erosion control measures

Once excavation has been completed, the following site restoration activities will be implemented:

- Final grading of disturbed area
- Seeding of vegetated areas disturbed during excavation
- Removing drainage and erosion controls
- Removing decontamination and staging areas

4.0 CHEMICAL HAZARD ASSESSMENT AND CONTROLS

4.1 Chemical Hazards

Based on the analytical results for soil sampling conducted during previous investigations at SEAD59 and SEAD-71, the primary contaminants of concern (COC) for the proposed remedial action include:

- Petroleum Hydrocarbons
- Polycyclic Aromatic Hydrocarbons
- Volatile Organic Compounds (SEAD-59)
  - Benzene
  - Toluene
  - Ethylbenzene
  - Xylenes
- Lead

4.1.1 Petroleum Hydrocarbons

The source of the petroleum hydrocarbons detected in site soils at both SEAD-59 and SEAD-71 could be related to several different original materials including gasoline, fuel oil, waste oil and machining fluids.

4.1.1.1 Gasoline

Gasoline is a clear, volatile liquid with a characteristic odor. It is a complex mixture of paraffinic, olefinic and aromatic hydrocarbons ranging from C3 to C11 compounds. Typical modern gasoline composition is 80% paraffins, 14% aromatics and 6% olefins. The mean benzene content is found to be approximately 1%. Gasoline acts as an anesthetic. Acute symptoms of overexposure include irritation of the mucous membranes of the upper respiratory tract, nose and mouth, drowsiness, headache, fatigue and drunken-like behaviors. Chronic and prolonged overexposure to the vapors of benzene, the most toxic component of gasoline, may cause damage to the blood-forming organs and is known to cause leukemia in humans. OSHA has not developed a permissible exposure limit (PEL) for gasoline. The American Conference of Governmental Industrial Hygienists (ACGIH) has recommended a threshold limit value (TLV) of 300 ppm as an 8-hour, time-weighted average (TWA). However, National Institute of Occupational Safety and Health (NIOSH) has recommended that exposures to gasoline be kept to the lowest feasible concentration due to the fact that gasoline is a potential occupational carcinogen.

4.1.1.2 Fuel Oil

Diesel fuel is generally considered to be of moderate to low toxicity. Federal or recommended airborne exposure limits have not been established for the vapors of diesel fuel. Inhalation of the vapor or mist may cause headache, dizziness, nausea, vomiting and a loss of coordination. Inhalation of high concentrations of the vapors may cause extensive pulmonary edema. Chronic direct skin contact with the liquids may produce skin irritation as a result of defatting. Repeated skin contact may also cause irritation of the hair follicles and block the sebaceous glands. This produces a rash of acne pimples and spots, usually on the arms and legs.

4.1.1.3 Waste Oil

Waste oils are generally considered to be of moderate to low toxicity. Federal or recommended airborne exposure limits have not been established for the vapors of waste oils. However, inhalation of low concentrations of the vapor of either may cause mucous membrane irritation. Inhalation of high concentrations of the vapors may cause extensive pulmonary edema. Chronic direct skin contact with the liquids may produce skin irritation as a result of defatting. Waste oils typically contain low concentrations of polycyclic aromatic hydrocarbons (PAH) compounds (incomplete combustion byproducts) and metals (contact with metal parts of the engine). Dermal contact with both PAH compounds and metals can result in dermatitis.

4.1.1.4 Machining Oils

Cutting fluids are liquids applied to a metal cutting tool to assist in the machining operation by washing away metal chips or serving as a coolant or lubricant. Cutting oil acne is the term used to describe a specific type of dermatitis experienced by machinists due to prolonged and repeated contact with cutting fluids. Prolonged and repeated contact with cutting oils has also resulted in skin cancer due to the presence of nitrosamines in synthetic, semisynthetic and soluble cutting oils (use amines and nitrites as emulsifiers and additives) or polynuclear aromatic hydrocarbons in straight oils. Federal or recommended airborne exposure limits have not been established for the vapors of machining oils.

4.1.2 Polycyclic Aromatic Hydrocarbons

The semi-volatile organic compounds identified in the soils are referred to as PAH compounds. PAH compounds are a family of multiple ring aromatic compounds commonly found in fossil fuels and formed from the incomplete combustion of organic materials. Repeated contact with PAH compounds may cause photosensitization of the skin, producing skin burns after subsequent exposure to ultra-violet light. Certain PAHs as a group are considered potential human carcinogens (CaPAH). PAH compounds are regulated by OSHA as coal-tar pitch volatiles. The PEL for coal-tar pitch volatiles is 0.2mg/m3, as an 8-hr TWA.

4.1.3 Volatile Organic Compounds

Elevated concentrations of BTEX were detected in soils collected from an area in SEAD-59 where paint cans were found during test-pitting activities. Exposure to the vapors of benzene, ethylbenzene, and toluene above their respective PELs may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and drunken-like behaviors. Prolonged overexposure to benzene vapors has detrimental effects on the blood-forming system ranging from anemia to leukemia. The PEL for benzene is 1 ppm as an 8 hour TWA. The ACGIH recommends a TLV of 0.5 ppm. The OSHA PEL for ethylbenzene is 100 ppm. The PEL for toluene is 200 ppm. However, the ACGIH recommends a TLV of 50 ppm for toluene. Xylene is a flammable, colorless liquid with an OSHA PEL of 100 ppm as an 8-hour TWA. Inhalation of xylene vapors above the PEL may result in motor activity changes, irritability and and drunken-like behaviors. Xylene vapors are also irritating to the eye.

4.1.4 Lead

The OSHA PEL for inorganic lead is 50 $\mu g/m^3$, as a 8-hr TWA. In general, the inhalation of metal dusts is irritating to the upper respiratory tract and nasal mucous membranes. Most metal dusts cause dermatitis and/or eye irritation. The early symptoms of lead poisoning, as a result of overexposure (either through ingestion or inhalation) include fatigue, sleep disturbance, headache, aching bones and muscles, digestive irregularities, abdominal pains, and decreased appetite. Chronic overexposures to lead affect the central nervous system and male and female reproductive systems. Lead has also been identified as a fetotoxin.

4.2 Hazardous Substances Brought On-Site by ENSR

4.2.1 Decontamination Solutions/Calibration Gases

A material safety data sheet (MSDS) must be available for each hazardous substance that ENSR and contractors bring on the property. This includes solutions/chemicals that will be used to decontaminate sampling equipment and air monitoring calibration gases. All containers of hazardous materials must be properly labeled in accordance with OSHA's Hazard Communication Standard.

4.2.2 On-Site Diesel Fuel Aboveground Storage Tank for Fueling Machinery

An aboveground diesel fuel tank will be located on site to facilitate the fueling of machinery. Section 5.8 addresses the hazards associated with the fueling operations.

4.3 Chemical Exposure and Control

4.3.1 Chemical Exposure Potential

There are two main potential routes of exposure to the contaminants of concern. The vapor pressure of polycyclic aromatic hydrocarbons and metals is negligible. Therefore, the inhalation of vapors is not a concern, although the inhalation of PAH and/or metal-impacted dusts is a concern as the potential for dust generation may be significant during excavation, stockpiling and loading of soils, especially is site soils are dry. The VOCs are volatile enough to pose a potential vapor hazard to those working in the immediate excavation areas, especially when large surface areas are exposed. There is also the potential for direct dermal contact with the contaminants during soil handling activities and sampling events.

4.3.2 Chemical Exposure Control

The following chemical exposure control measures will be implemented during the proposed investigations:

- Air monitoring (Section 6.1) will be conducted in the worker's breathing zone to determine exposure to vapors and dusts during soil excavation, stockpiling and load-out activities. If exposures exceed the action levels, respiratory protection as discussed in Section 7.2, will be donned.
- Water mist will be applied to the excavation sidewalls and bottom to minimize the potential for dust generation. Similar watering of haul roads, loading and stockpiling areas will also be implemented.
- Polyethylene sheeting will be placed over soil areas that are inactive and the stockpiles to prevent vapor release as well as dust generation.
- The pace of operations will be controlled so as to limit the potential for the generation of dust.
- Protective clothing, as described in Section 7.1, will be required during the collection of samples to avoid direct dermal contact with contaminated media and equipment
- Although highly unlikely, exposure to all of the contaminants of concern may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 9.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

5.0 PHYSICAL HAZARDS AND CONTROLS

5.1 Utility Hazards

5.1.1 Underground Utilities

New York law requires that, at least 48 hours prior to initiation of any subsurface work, a utility clearance be performed at the site. The contractor will contact Dig Safely New York (1-800-962-7962) to request a mark-out of underground utilities in the proposed excavation areas. In the event that local public utility organizations do not mark-out underground utility lines located on private property, the contractor will exercise due diligence and try to identify the location of any private utilities on the properties being investigated. The contractor can fulfill this requirement in several ways, including:

- obtaining as-built drawings for the areas being investigated from the facility;
- visually reviewing each excavation location with a knowledgeable site representative;
- performing a geophysical survey to locate utilities or hiring a private line locating firm to determine the location of utility lines that are present at the property;
- identifying a no-dig zone; or
- hand digging in the proposed excavation locations if insufficient data is available to accurately determine the location of the utility lines

5.1.2 Overhead Utilities

Be particularly aware of overhead power lines in the work area. Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

5.2 Machinery Traffic

Various types of machinery will be in operation to facilitate the removal, stockpiling and loading of soils. It is therefore anticipated that a large amount of trucks and other heavy machinery will be on site. Workers on foot need to be aware of the truck traffic patterns established at the site. Employees should not walk or run through active excavation areas but rather stay on the designated pedestrian walk areas. Employees on the ground will don high-visibility traffic vests so operators can more easily spot them when moving materials from one area to the other.

5.3 Working Around Heavy Equipment

Heavy equipment including bobcats, excavators, and front-end loaders will be used to facilitate the removal, stockpiling and off-loading of impacted soil. The use of such equipment poses a potential hazard to the support crew working around the equipment. Use of heavy equipment at the site requires all employees working in the exclusion zone to wear ANSI-approved hard hats, steel-toed safety shoes/boots, safety glasses and hearing protection, as well as traffic vests as indicated above.

Operators will inspect the equipment daily before use to ensure safe operating conditions and to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional (i.e reverse gear alarms are working properly).

ENSR employees will be overseeing the removal of soil and will be screening soils for the presence of debris as the soil is removed from the excavation. This will place the spotter within close proximity to the operating machinery. When working around heavy equipment, employees should:

- make sure that the operator is aware of your presence/activities;
- stay in the operator's line of sight, don't work in his/her blind spot;
- approach areas where equipment is operating from a direction visible to the operator;
- be aware of the swing radius of the excavator;
- do not walk or work underneath loads handled by digging equipment;
- do not ride in buckets of loaders;
- stand away from soil stockpile areas to avoid being struck by any spillage or falling materials.; and,
- develop a series of hand signals to facilitate communication with the operator.

5.4 Excavation Hazards

5.4.1 Cave-In

The proposed depth of the excavations in SEAD-71 is approximately three (3) feet. The depth of the excavations in SEAD-59 varies from approximately 9.5 feet in Area 4 to only 3 feet in the other locations. The depth of the large excavation in Area 1 is estimated to be 8 feet. Although this program is designed to eliminate the need for machines and/or employees to enter the excavation, field conditions may change which may require entry. The summary of cave-in prevention actions listed below is brief and is meant to remind employees of the significant hazards associated with entering an unshored excavation. It is the sole responsibility of the excavation contractor to ensure compliance with OSHA's Excavation Standard (29 CFR1926.650) and to provide a person competent in identifying excavation hazards to the project. Open excavations will be inspected daily by the contractor's competent person.

Unshored excavations will exist as soils are removed. It is anticipated that the post excavation samples will be collected remotely or from the bucket of the backhoe, hence eliminating the need to enter the excavation. If it is does become necessary for ENSR employees or ENSR subcontractors to enter an excavation, the following precautions must be implemented:

- A stairway, ladder, ramp or other similar means of egress must be located in trench excavations greater than 4 feet in depth so as to require no more than 25 feet of lateral travel for employees in the trench excavation. Remember that more than one means of egress may be required.

- The excavation must be free of accumulated water before entry is allowed.

- No person shall enter an excavation greater than 5 feet in depth unless:

  - the walls of the excavation have been sloped back to an angle not steeper than one and half horizontal to one vertical (1.5H:1V) {i.e., 34 degrees from the horizontal) as specified in 1926.652(b)

    Example - An excavation that was planned to be 5 feet deep and 3 feet wide at the base, would have to be sloped back so that it was 18 feet wide at the top.

  - the walls of the excavation have been shored in accordance with the requirements specified in 29 CFR 1926.652(c), (d), and (e) or

  - the work in the excavation is to be performed within the confines of an approved shield system (e.g., trench box) that has been constructed and is used in accordance with the requirements of 1926.652(g)

- A stand-by employee must be present at all times when employees are in the excavation.

- All materials, including spoils, shall be placed at least 2 feet from the edge of the excavation to prevent the material from rolling into the excavation. All personnel should remain 2 feet away from the edge of the excavation while personnel are in the excavation.

5.4.2 Open Excavations

Even though the site is not readily accessible by the general public, excavations should be backfilled as soon as possible after work is completed. If excavations are to be left open, the perimeter of the excavation will be marked with high-visibility snow fencing.

5.4.3 Excavations as Confined Spaces

Entry into an excavation can be considered entry into a confined space. As indicated above, entry into the excavations is not anticipated for this program. If entry is necessary, the SSO must be notified so that the appropriate air monitoring can be performed to determine if an atmospheric hazard exists that would define the excavation as a permit-required confined space. Entry into a permit-required confined space will not occur until the SSO is satisfied that all the provisions of OSHA's Permit-Required Confined Space Entry standard (29 CFR 1910.146) have been satisfactorily met.

5.5 Noise Exposure

The use of excavation and other heavy machinery will generate noise levels that will require the use of hearing protection in the immediate vicinity. Appropriate earmuffs or earplugs (i.e., with an NRR greater than 25 dB) should be worn to prevent overexposure. The general rule of thumb is that if you have to raise your voice to be understood by someone who is standing 3 to 5 feet away from you, the noise levels are likely to be above 85 dB and therefore require the use of hearing protection.

5.6 Cuts and Lacerations

Employees will be installing fencing and using knives to cut polyethylene sheeting for the decontamination area and staging areas. Also, it is likely that employees will have to manually remove some debris items that may have jagged edges or sharp metal pieces from the soil piles or machinery buckets. These items may include chain-link fencing, crushed drums, concrete and similar type construction debris. All of these activities pose a potential cut and laceration hazard to employees. Employees who are involved in these tasks should wear leather or Kevlar™ gloves to protect themselves from this potential hazard.

5.7 Container Handling

If drums are encountered during excavation activities, they will be removed, segregated and sampled for waste characterization. The procedures listed below will be used when handling drums. A JHA will also be prepared for container handling operations once the SS and SSO have a better understanding of the amount, condition and possible contents of the containers that may be removed from the excavation areas.

5.7.1 Inspection of Containers

Before any of the containers are handled, opened, or the material sampled, the containers will be visually inspected. If during the visual inspection, a container is noted bulging, unusually corroded and deteriorated, or in any other way deemed unsafe to handle, field personnel will mark it for exclusion.

None of the containers are to be opened during the inspections. This step will only involve visually inspecting the containers, as well as conducting air monitoring for organic vapors

5.7.2 Opening of Containers

The containers designated for sampling will be opened manually using a variety of non-sparking hand tools (i.e., bung opener, pliers, puncture device, etc.), as necessary. If a container cannot be opened using these non-sparking hand tools, it may be temporarily excluded from the handling activity. If a container shows slight signs of pressurization, all steps must be performed slowly and with caution. Excess pressure should be relieved prior to opening, if possible. There is a chance of the material to be expelled from the container if the pressure is not relieved properly. If necessary, this procedure can be deferred along with the containers that cannot be manually opened.

5.7.3 Sampling of Containers

Significant hazards associated with container sampling include chemical overexposure, chemical reactions, pressure release and fire. The following procedures will be used to help prevent these hazards:

- Containers that are bulging may be pressurized and will not be sampled until excess pressure has been relieved.
- Containers must be bonded and grounded to prevent static electricity when sampling liquids.
- Samples will be collected in a manner that minimizes exposure to hands and face.
- When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition.
- Controls for container opening equipment, monitoring equipment, and fire suppression equipment must be located in the sampling area.
- Employees must not stand upon or work from containers.
- There is a potential to be splashed by the material being handled. If this occurs, the employee will remove and discard the contaminated disposable PPE, and decontaminate any non-disposable PPE.

5.8 On-Site Fueling Operations

A 500-gallon AST containing diesel fuel will be located on site to service machinery. Secondary containment, in the form of plastic sheeting and earthen berms, will be established around the AST The tank will be grounded using a grounding cable. The fueling area will be posted with no smoking signs and the tank itself will be labeled in accordance with the National Fire Protection Association (NFPA) labeling system for hazardous materials. Spill equipment and a fire extinguisher will also be located in the fueling area. An MSDS for diesel fuel will be maintained in the contractor's trailer. To the extent possible, fuel deliveries will be scheduled for early morning, lunch time or after hours so that the operation can be carefully observed and not interfere with on going operations.

5.9 Back Safety

Using the proper techniques to lift and move heavy pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects.

- Use mechanical devices to move objects that are too heavy to be moved manually.
- If mechanical devices are not available, ask another person to assist you.
- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting
- Bring the load as close to you as possible before lifting
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip, trip and fall hazards

5.10 Electrical Hazards

If using portable tools that are electrically powered, follow the safety precautions listed below:

- Check to see that electrical outlets used to supply power during field operations is of the three wire grounding type.
- Extension cords used for field operations should be of the three wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO or SJTO.
- NEVER remove the ground plug blade to accommodate ungrounded outlets.
- Do not use extension cords as a substitute for fixed or permanent wiring. Do not run extension cords through openings in walls, ceilings or floors.
- Protect the cord from becoming damaged if the cord is run through doorways, windows or across pinch points.
- Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately.

- portable or temporary wiring, which is used outdoors or in other potentially wet or damp locations, must be connected to a circuit which is protected by a ground fault circuit interrupter (GFCI). GFCI's are available as permanently installed outlets, as plug-in adapters and as extension cord outlet boxes. DO NOT CONTINUE TO USE A PIECE OF EQUIPMENT THAT CAUSES A GFCI TO TRIP.

- When working in flammable atmospheres, be sure that the electrical equipment being used is approved for use in Class I, Division I atmospheres.

- Do not touch a victim who is still in contact with current. Separate the victim from the source using a dry, nonmetallic item such as a broomstick or cardboard box. Be sure your hands are dry and you are standing on a dry surface. Turn off the main electrical power switch and then begin rescue effort.

5.11 Thermal Stress

The anticipated timeframe for this excavation program is from September to November. Therefore, the hazards associated with both heat and cold stress are addressed in this HASP.

5.11.1 Heat Stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate, leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are spasms of the muscles due to excessive salt loss associated with profuse sweating.

Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea and headache. **Heat stroke** occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

<u>Early Symptoms of Heat-Related Health Problems:</u>

- decline in task performance
- excessive fatigue
- reduced coordination
- reduced vigilance

- decline in alertness
- unsteady walk
- muscle cramps
- dizziness

Susceptibility to Heat Stress Increases due to:

- lack of physical fitness
- lack of acclimation
- increased age
- dehydration
- obesity
- drug or alcohol use
- sunburn
- infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

The Effect of Personal Protective Equipment

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst. DO NOT DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK. For an 8-hour work-day, 50 ounces of fluids should be drunk.
- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid alcohol during prolonged periods of heat. Alcohol will cause additional dehydration.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the project manager, on-site field coordinator, and health and safety officer. Potable water and fruit juices should be made available each day for the field team.

Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method:

> Check radial pulse rates by using fore-and middle fingers and applying light pressure to the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beat/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle again by one-third.

5.11.2 Cold Stress

Types of Cold Stress

Cold injury is classified as either localized, as in frostbite, frostnip or chilblain; or generalized, as in hypothermia. The main factors contributing to cold injury are exposure to humidity and high winds, contact with wetness and inadequate clothing.

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30° F. The fluids around the cells of the body tissue freeze, causing the skin to turn white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

Symptoms of Cold Stress

The first symptom of frostbite is usually an uncomfortable sensation of coldness, followed by numbness. There may be a tingling, stinging or aching feeling in the effected area. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Symptoms of hypothermia, a condition of abnormally low body temperature, include uncontrollable shivering and sensations of cold. The heartbeat slows and may become irregular, the pulse weakens and the blood pressure changes. Pain in the extremities and severe shivering can be the first warning of dangerous exposure to cold.

Maximum severe shivering develops when the body temperature has fallen to 95° F. This must be taken as a sign of danger and exposure to cold must be immediately terminated. Productive physical and mental work is limited when severe shivering occurs.

Methods to Prevent Cold Stress

When the ambient temperature, or a wind chill equivalent, falls to below 40° F (American Conference of Governmental Industrial Hygienists recommendation), site personnel who must remain outdoors should wear insulated coveralls, insulated boot liners, hard hat helmet liners and insulated hand protection. Wool mittens are more efficient insulators than gloves. Keeping the head covered is very important, since 40% of body heat can be lost when the head is exposed. If it is not necessary to wear a hard hat, a wool knit cap provides the best head protection. A face mask may also be worn.

Persons should dress in several layers rather than one single heavy outer garment. The outer piece of clothing should ideally be wind and water proof. Clothing made of thin cotton fabric or synthetic fabrics such as polypropylene is ideal since it helps to evaporate sweat. Polypropylene is best at wicking away moisture while still retaining its insulating properties. Loosely fitting clothing also aids in sweat evaporation. Denim is not a good protective fabric. It is loosely woven which allows moisture to penetrate. Socks with a high wool content are best. If two pairs of socks are worn, the inner sock should be smaller and made of cotton, polypropylene or a similiar type of synthetic material that wicks away moisture. If clothing becomes wet, it should be taken off immediately and a dry set of clothing put on.

If wind conditions become severe, it may become necessary to shield the work area temporarily. The SSO and the PM will determine if this type of action is necessary. Heated break trailers or a designated area that is heated should be available if work is performed continuously in the cold at temperatures, or equivalent wind chill temperatures, of 20° F.

Dehydration occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to significant change in blood flow to the extremities. Drink plenty of fluids, but limit the intake of caffeine.

5.12 Poisonous Plants and Insects

Some of the areas are covered with high grass and small vegetation. Employees working on the site should therefore be aware of the possible presence of poisonous plants and insects.

5.12.1 Poisonous Plants

Poison ivy is a climbing plant with leaves that consist of three glossy, greenish leaflets. Poison ivy has conspicuous red foliage in the fall. Small yellowish-white flowers appear in May through July at the lower leaf axils of the plant. White berries appear from August through November. Poison ivy is typically found east of the Rockies. **Poison oak** is similar to poison ivy but its leaves are oak-like in form. Poison oak occurs mainly in the south and southwest. **Poison sumac** typically occurs as a small tree or shrub and may be 6-20 feet in height. The bark is smooth, dark and speckled with darker spots. Poison sumac is typically found in swampy areas and east of the Mississippi. The leaves have 7-13 smooth-edged leaflets and drooping clusters of ivory-white berries appear in August and last through spring.

The leaves, roots, stems and fruit of these poisonous plants contain an oil called urushiol. Contact with the irritating oil causes an intensely itching skin rash and characteristic, blister-like lesions. The oil can be transmitted on soot particles when burned and may be carried on the fur of animals, equipment and apparel.

Proper identification of these plants is the key to preventing contact and subsequent dermatitis. Wear long sleeves and pants when working in wooded areas. In areas of known infestation, wear Tyvek coveralls and gloves. Oils are easily transferred from one surface to another. If you come in contact with these poisonous plants, wash all exposed areas immediately with cool water to remove the oils. Some commercial products such as Tecnu's Poison Oak-n-Ivy Cleanser claim to further help with the removal of oils.

5.12.2 Ticks

Ticks are bloodsuckers, attaching themselves to warm-blooded vertebrates to feed. Deer ticks, which are associated with the transmission of Lyme's Disease (ticks transmit the bacteria that causes the disease) have been observed in New England and Mid-Atlantic states. Not all ticks carry the disease. Furthermore, an infected tick must attach itself for at least 24 hours before it can transmit disease. AS such, personnel should carefully inspect themselves each day for the presence of ticks or any rashes. This is important since prompt removal of the tick can prevent disease transmission. Female deer ticks are about one-quarter inch in length and are black and brick red in color. Males are smaller and all black.

Removal of the tick is important in that the tick should not be crushed and care must be taken so that the head is also removed. If the head is not completely removed or if the tick is allowed to remain for days feeding on human blood, a condition known as **tick paralysis** can develop, which is due to a neurotoxin that the tick apparently injects while engorging. This neurotoxin acts upon the spinal cord causing incoordination, weakness and paralysis.

One characteristic symptom of Lyme Disease is a bulls-eye rash that develops around the bite site. The rash appears in about 60-80% of all Lyme disease cases. Contact your RHSM immediately if you develop such a rash.

Tick season lasts from April through October; peak season is May through July. Wear light-colored clothing (easier to spot ticks) with long sleeves and make sure that shirts are tucked into pants and pants are tucked into socks or boots. Ticks have a tendency to crawl upwards. These procedures will make it more difficult for a tick to reach your skin. Studies have determined that repellants containing DEET as a main ingredient are most effective against mosquitoes and ticks. DEET can be directly applied to the exposed skin of adults and/or clothing. Permonone is another repellent however, it can only be directly applied to clothing.

5.12.3 Chiggers

Chiggers are most often found in low, damp areas where vegetation is heavy, although some species prefer dry areas. Chiggers seem to be most abundant in areas covered with shrubs and small trees where rodents are numerous. Chiggers occur in pockets or islands because a female will lay all her eggs in one spot.

In humans, chiggers can cause intense itching and small reddish welts on the skin. Chiggers attach themselves to the skin, hair follicles or pores by inserting their piercing mouthparts. When chiggers attach to humans, they are not usually noticed for some time. During feeding, they inject a fluid into the skin which dissolves tissue. Chiggers feed by sucking up the liquified tissues. Itching from chigger bites is usually noticed 4-8 hours after chiggers have attached or have been accidentally removed. The fluid injection causes welts to appear which may last for two weeks. Some people exhibit an allergic reaction to the injected fluid which results in severe swelling, itching, and fever. People mistakenly believe that chiggers embed themselves in the skin or that the welts contain chiggers. Often scratching at the welt results in secondary infection.

Chiggers prefer to attach on parts of the body where clothing fits tightly or where the flesh is thin, tender, or wrinkled. For this reason, chiggers locate in such areas as the ankles, waistline, knees, or armpits. Chiggers are easily removed from the skin by taking a hot bath or shower and lathering with soap several times. The bath will kill attached chiggers and others which are not attached.

If you are going into areas suspected of being infested with chiggers, wear protective clothing and use repellents. Repellents should be applied to legs, ankles, cuffs, waist, and sleeves by clothing application or directly to the body as directed by the label.

5.13 Inclement Weather

When there are warnings or indications of impending severe weather (heavy rains, damaging winds, tornados, thunderstorms, hurricanes, floods, snowstorms, etc), weather conditions will be monitored (i.e. a weather radio will be kept in the site trailer) and appropriate precautions will be taken to protect personnel and equipment from the effects of the forecasted weather.

5.14 Slip, Trip and Fall Hazards

5.14.1 Good Housekeeping in Work Areas

Maintaining a work environment that is free from accumulated debris is the key to preventing slip, trip and fall hazards at construction sites. Essential elements of good housekeeping include

- orderly placement of materials, tools and equipment, including the hoses to the supplied-air respiratory system;

- placing trash receptacles at appropriate locations for the disposal of miscellaneous rubbish;

- prompt removal and secure storage of items that are not needed to perform the immediate task at hand; and,

- awareness on the part of all employees to walk around, not over or on, equipment that may have be stored in the work area.

5.14.2 Debris and Other Obstacles

On any work area, it is expected that the ground may be uneven. The ground surface may be unreliable due to settling. Surface debris may be present and wet or swampy areas may exist. Employees should walk around, not over or on top of debris or trash piles. When carrying equipment, identify a path that is clear of any obstructions. It may be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

During the winter months, snow shovels and salt crystals should be kept on site to keep paths and work areas free of accumulated snow and ice.

6.0 AIR MONITORING

6.1 Work Zone Monitoring

There are two main potential routes of exposure to the contaminants of concern. The vapor pressure of polycyclic aromatic hydrocarbons and metals is negligible. Therefore, the inhalation of vapors is not a concern. However, the inhalation of PAH and/or metal-impacted dusts is a concern as the potential for dust generation may be significant during excavation, stockpiling and loading of soils, especially if site soils are dry. The VOCs are volatile enough to pose a potential vapor hazard to those working in the immediate excavation areas, especially when large surface areas are exposed. Therefore, air monitoring will be conducted in the worker's breathing zone to determine exposure to vapors and dusts during soil excavation, stockpiling and load-out activities.

6.1.1 VOC Monitoring

A photoionization detector (PID), such as a RaeSystems MiniRae 2000 PID equipped with a 10.6 ev lamp will also be used to screen the breathing zone of employees during the excavation, stockpiling and loading out of impacted soils for the presence of total VOCs and the presence of benzene. When the PID is calibrated to a 100 ppm isobutylene-in-air standard, it will read in isobutylene equivalents and will detect all of the BTEX compounds giving a total VOC concentration. However, benzene has a significantly lower PEL (1 ppm) than the other contaminants and is therefore the contaminant of concern that will trigger the need for donning respiratory protection. To obtain the concentration of benzene after getting a total VOC reading that exceeds 1 unit above background, the user will call up the correction factor for benzene (0.53) from the instrument's memory so that the PID will then read directly in units of benzene. If breathing zone concentrations of benzene are sustained (15 minutes) at 1 ppm above background, Level C respiratory protection, as described in Section7.2, will be donned. In the absence of benzene, the action level for donning respiratory protection is 50 units, based on the ACGIH TLV for toluene and its reported correction factor for the selected instrument.

6.1.2 Dust Monitoring

Dust control measures, as described in this HASP, will be implemented to control total dust levels during the excavation, stockpiling and loading out of impacted soils. A MIE Data-Ram total dust monitor, or its equivalent, will be used to monitor the effectiveness of these engineering controls and to determine if respiratory protection is required.

An action level of 2.5 mg/m3 for total dust (sustained in the breathing zone for 15-minutes) has been established for this program. This action level is based on the maximum concentration to total PAH compounds detected at either of the two SEADs and an assumption that this concentration of PAH compounds will be suspended in air for 8 hours. At a total dust concentration of 2.5 mg/m3, the actual resultant PAH concentration is well below the established OSHA PEL of 0.2 mg/m3. This action limit will also protect employees from overexposure to OSHA's action limit of 30 ug/m3.

The total dust monitor will be used to determine that total dust levels within the established restricted areas are maintained below this action level. The readings will be taken at the locations within the restricted area, and during the time periods, which are likely to represent worst case conditions. The determination of worst case will be made by the ENSR SSO and will be dependent upon such variables as the type of work being performed and number of personnel or level of activity in the zone.

6.2 Personal Air Sampling

OSHA does not require the collection of personal air sampling during the proposed activities. As such, this type of monitoring will not be conducted by ENSR during any of the proposed tasks.

6.3 Calibration and Recordkeeping

Equipment used by ENSR will be calibrated in accordance with the quality assurance plan and ENSR's standard operating procedures. A log of PID and dust readings will be kept in the field notebook. Daily calibrations will also be recorded in the field notebook.

The PID will be calibrated to a 100 ppm isobutylene-in-air standard. The dust monitor is calibrated to Arizona road dust. The dust monitor will be sent for calibration several weeks before the commencement of remedial activities at the site. In accordance with the manufacturers instructions, a zero value update will be performed every 8 hours if the unit is operated in high particle concentration (>5 mg/m3) environments. At aerosol concentrations below 1 mg/m3, this update will be performed on a weekly basis. If at any time the zero value exceeds 2.5 mg/m3, the sensor will be cleaned. If the zero value still exceeds 1.0 mg/m3, the unit will be sent out for factory calibration (manufacturers suggested maintenance). A new unit will be made immediately available.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) will be worn during soil excavation, stockpiling and loading to prevent on-site personnel from being injured by the safety hazards posed by the site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with the site's chemical contaminants. The following table describes the PPE and chemical protective clothing to be worn for general site activities and for certain specific tasks.

7.1 Chemical Protective Clothing

PPE Item	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Hard Hat	*	✓	✓	✓	✓	✓
Steel Toed Safety Shoes	✓	✓	✓	✓		
Traffic Vests			✓			
Safety Glasses with Sideshields	✓	✓	✓	✓	✓	✓
Face shield					✓	
Rain Suit						✓
Rubber Boots					✓	✓
Tyvek Coveralls			*			
Polycoated Tyvek Coveralls					✓	
Kevlar gloves	✓					
Inner PVC/Outer Nitrile Gloves				✓	✓	✓
Hearing Protection	*	✓	✓	*		

Task 1 – Fence and Decon Pad Installation
* wear hardhats ifwork is taking place within the designated exclusion zone
Task 2 – Brush Clearing
Excavation equipment will be used to remove brush.

Task 3 – Soil Excavation/Stockpiling/Loading (includes oversight and soil screening)
* - wear tyvek if visible dust can not be controlled with engineering controls

Task 4 – Post-Excavation and Waste Characterization Soil Sampling
* wear hardhats if heavy machinery is being used to help install these facilities

Task 5 – Drum Opening and Sampling

Task 6 – Machinery Decontamination

7.2 Respiratory Protection

Although engineering controls will be continuously implemented to control the release of vapors and dusts, the use of respiratory protection may be necessary. The following table outlines the action levels that will be used for donning of respiratory protection.

Contaminant	Action Level	Response
Total VOCs in the absence of benzene	50 units	Full-face air purifying respirator (APR) with combination organic vapor/P-100 cartridges
Benzene	1 –25 units >25 units	Full-face air purifying respirator with combination organic vapor/P-100 cartridges Stop work
Total Dust	2.5 mg/m3	Half- mask APR with P-100 filters (assumes no requirements for VOC protection)

Respiratory protection should also be donned if odors become objectionable at any time or if respiratory tract irritation is noticed. All employees who are expected to don respiratory protection must have successfully passed a qualitative or quantitative fit-test within the past year for the brand, model and size respirator they plan to don during the proposed activities.

7.3 Other Protective Equipment

The following additional safety items should be available at the site either in the satellite areas or in the trailer:

- Portable, hand-held eyewash bottles
- First aid kit
- Type 10A:40B:C fire extinguisher (all equipment shall be equipped with at least one such extinguisher)
- Portable communications equipment

8.0 SITE CONTROL

8.1 Work Zones

To prevent both exposure of unprotected personnel and migration of contamination, work areas along with personal protective equipment requirements will be clearly identified. ENSR designates work areas or zones as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November, 1985. They recommend the areas surrounding each of the work areas to be divided into three zones:

- Exclusion or "hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

8.1.1 Exclusion Zone

An exclusion zone will be established around each excavation and staging area. The zones will be demarcated with high-visibility fencing. Fencing will not be taken down until the excavation is backfilled. All personnel entering these areas must wear the prescribed level of protective equipment. Further, all employees entering the exclusion zone will be required to sign into the zone before entry. Exclusion zone entry sheets will be maintained by the SSO in the field trailer for the duration of the program. Documentation will be maintained in the ENSR project file once the program is completed.

8.1.2 Contamination Reduction Zone

Mini or satellite-contamination reduction zones will be established immediately adjacent, but outside of, the exclusion zone. This is where personnel will begin the sequential decontamination process (see Section 8.0) when exiting the exclusion zone. To prevent cross contamination and for accountability purposes, all personnel will enter and leave the exclusion zone through the contamination reduction zone. Heavy equipment will be decontaminated at the established machinery decon pad.

8.1.3 Support Zone

At this site, the support zone will include the contractor trailer area that is being established. Immediate work area support zones may be established. These areas will surround the perimeter of the exclusion/contamination reduction zone and will be used to store extra equipment and supplies that may be needed to facilitate work in a specific excavation location.

8.2 Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- The "buddy system" will be used at all times by all field personnel. No one is to perform field work alone. Standby team member must be intimately familiar with the procedures for initiating an emergency response.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the immediate work area and the decontamination zone.
- Smoking is prohibited in all work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the site in accordance with the project work plan.

9.0 DECONTAMINATION

9.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the site. Decontamination will occur within the contamination reduction zone. Disposable PPE will be removed in the decontamination zone and placed in lined garbage bags.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning.

Regardless of the type of decontamination system required, a container of potable water and liquid soap should be made available so employees can wash their hands before leaving the site for lunch or for the day.

9.2 Equipment Decontamination

A equipment/truck decontamination pad will be constructed at the site. The decontamination pad will have a berm on all four sides, lined with a HPDE liner and graded to a sump. A pressure washer will be used to decontaminate all equipment and trucks prior to leaving the site. Before arriving at the decontamination pad, a gross decontamination will be completed on polyethylene sheeting to remove as much soil as possible from the trucks within the actual excavation location.

10.0 MEDICAL MONITORING AND TRAINING REQUIREMENTS

10.1 Medical Monitoring

All personnel performing activities covered by this HASP must be active participants in a medical monitoring program that complies with 29 CFR 1910.120(f). Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASP.

10.2 Health and Safety Training

All personnel performing activities covered by this HASP must have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each individual must have completed an annual 8-hour refresher-training course and/or initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP. Training records will be maintained on-site by the SSO and transferred to the ENSR project file when the program is completed.

10.3 Safety Meetings

10.3.1 Pre-Entry Briefing

The SSO will conduct a pre-entry briefing before site activities begin. HASP receipt and acceptance sheets will be collected at this meeting. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project. Attendance of the pre-entry meeting is mandatory and will be documented by the ENSR SSO. An attendance form is presented in Attachment C.

10.3.2 Subsequent Meetings

The SSO will conduct daily safety meetings as part of the daily work-scheduling meeting. All employees working at the site are expected to attend these safety meetings. The SSO will document attendance at these meetings and maintain the attendance sheets with the pre-entry briefing attendance sheets in the field trailer. Records will be maintained in ENSR's project files when the program is completed.

10.3.3 Visitors

Unless support personnel, vendors, delivery personnel and other visitors to the site can meet the above outlined training and medical requirements, they will be allowed to enter the site but will be limited to the support zones.

11.0 EMERGENCY RESPONSE

A site emergency is a major event that has, or threatens to have, a detrimental physical impact on facilities, people, and/or the environment and requires immediate action. This definition applies to work locations and personnel, as well as the people and property associated with contractors and the community. Emergencies can be grouped into three categories:

- Fire, leak, spill, or release
- Medical
- Natural (hurricanes, flooding, etc.)

The SSO is responsible for initiating emergency response. In the event the SSO can not fulfill this duty, the alternate SSO will take charge.

11.1 Emergency Response

The phone numbers of the police and fire departments, ambulance service, local hospital, and ENSR representatives are provided in the emergency reference sheet. This sheet will be posted in the site vehicles and is posted in the construction trailer.

11.1.1 How to Respond to an Fire, Leak, Spill or Release

If personnel discover a fire, leak, spill or release:

- Report the emergency by site radio to the SSO orSS. Give your name, exact location, and the nature of the emergency.
- Shut down all equipment
- Leave the area unless specifically trained to deal with the emergency at hand.

11.1.1.1 Fire

ENSR employees who have been trained in the use of portable fire extinguishers are permitted to use them to extinguish incipient fires only. Each trailer will be equipped with 1-10 LB ABC multipurpose dry chemical fire extinguisher. A fire extinguisher will be placed by each door. One 20 lbs. ABC fire extinguisher will be located at each decontamination facility. All heavy equipment will be equipped with ABC multipurpose dry chemical fire extinguishers. If based on scene reconnaissance, the fire is too large to handle with existing fire extinguishers, the area will be evacuated.

11.1.1.2 Spill/Leak/Release Response

Reportable spills occurring on-site, whether liquid or solid, will be reported promptly to ENSR's SS and/or SSO. It is not anticipated, due to the nature of this project, that any reportable quantities of solid or liquid materials will be released.. However, the following section describes management of waste spills and preventive measures.

Any solids spilled during the removal action will be promptly recovered and replaced into the container they came from if possible. If container is damaged, the spill will be contained with local soil (i.e. berm) or a spill control kit. The following procedures will then be implemented.

- Notify SSimmediately.
- Isolate the spill area and control entry to the area quarantined.
- Only personnel in the proper PPE will be allowed to enter the area.
- Keep all traffic away from the spill.
- Use a water fog to suppress vapors, fumes, dust or mist if imminent release from the site is apparent.
- Remove and stockpile or containerize the waste immediately or as directed by SS.

Any liquid spilled during site activities will be promptly contained and a spill control kit will be utilized to help contain and clean up the spill. The following procedures will be implemented to reduce and eliminate any hazards:

- When a spill has been detected, all personnel and equipment will be moved away from the spill if this can be done safely and not cause any additional hazards.
- Attempt to find and eliminate the source of the spill, only if the worker is properly protected and can safely do this activity.
- By using the appropriate equipment, i.e. absorbent materials, fire extinguishers, PPE; the worker will attempt to contain the spill and clean up the hazard created by the spill.
- The materials used to clean up the spill will be placed in the appropriate containers and those containers will be properly disposed of according to regulatory requirements.
- If the worker is not able to control the spill situation, he shall immediately contact the SSO or Superintendent. The SSO and/or the Superintendent shall contact the appropriate agencies to help handle the spill

11.1.2 How to Respond to a Medical Emergency

The on-site SSO and Site Superintendent are trained in CPR and First Aid and shall have First Aid Kits for use in a medical emergency. First Aid Kits will be located in the ENSR field office, main support area, decon area and work activity locations. Eye wash stations will be available at the work activity locations, the outside of the personal decontamination facility and at the equipment decontamination area. On-site personnel have a basic knowledge of first aid and will assist the SSO. For medical emergencies that are life threatening, the appropriate community emergency services will be mobilized.

ENSR personnel within the Exclusion Zone, regardless of level of PPE, will bring the injured person out of the Exclusion Zone, bypassing the CRZ. The injured person will be ready at the CRZ for immediate evacuation by emergency personnel or local ambulance. The hospital shall be informed that the worker was not decontaminated and shall be provided a listing of site contaminants by the SSO or Superintendent.

For personnel with less serious injuries, ENSR is responsible for providing first aid care. Injuries that border being first aid cases that do require outside assistance, i.e., emergency transportation, ENSR will expedite emergency ambulance services. The ENSR or subcontractor will stabilize the injured person as much as possible within the Exclusion Zone. Emergency response personnel will enter the Exclusion Zone in appropriate PPE to conduct first aid and will remove the injured person for appropriate medical attention through the decontamination procedure.

In the event an injury or illness requires more than first aid treatment, the SSO will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the on-site project manager and the RHSM.

11.1.3 How to Respond to a Natural Emergency

ENSR will have computer access to the Weather Channel and will consult this site if inclement weather has been forcasted for the area. In the event of an impending weather emergency, such as flooding, hurricane, tornado, etc., ENSR will take appropriate precautions (e.g., secure material, gas bottles, tanks, as well as cranes and other equipment). Personnel may also be required to get off high structures or platforms. Depending on the National Weather Service warnings, operations may or may not be shut down.

11.2 Employee Training for Site Evacuation

Employees must be instructed in the site-specific aspects of emergency evacuation . Site escape routes and assembly areas will be established upon arrival to the site. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed.

11.3 Employee Accounting Method After Site Evacuation

The SSO is responsible for identifying all ENSR personnel on-site at all times. The log-in and log-out book will be used by the SSO to verify successful evacuation of all ENSR employees.

11.4 Alarm Systems/Emergency Signals

An emergency communication system must be in effect at all sites. The most simple and effective emergency communication system in many situations will be direct verbal communications. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communications must be supplemented anytime voices can not be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight can not be easily maintained amongst all ENSR personnel because of distance, terrain or other obstructions.

Due to expected high noise levels, verbal communications may not be adequate to warn employees of hazards associated with the immediate work area. Verbal communications will therefore be supplemented as described below. To further facilitate communication between he work area and the trailer, ENSR supervisors will be equipped with walkie-talkies. The trailer is also equipped with telephone service and will be used to contact local emergency responders, as needed.

If verbal communications must be supplemented, the following signals will be used:

- **ONE HORN BLAST: GENERAL WARNING**

One horn blast is used to signal relatively minor, yet important events on-site. An example of this type of event would be a minor chemical spill where there is no immediate danger to life or health yet personnel working on-site should be aware of the situation so unnecessary problems can be avoided. If one horn blast is sounded, personnel must stop all activity and equipment on-site and await further instructions from the SSO.

- **TWO HORN BLASTS: MEDICAL EMERGENCY**

Two horn blasts are used to signal a medical emergency where immediate first aid or emergency medical care is required. If two horn blasts are sounded, all first-aid and/or CPR trained personnel should respond as appropriate, all other activity and equipment should stop and personnel should await further instructions from the SSO.

- **THREE HORN BLASTS FOLLOWED BY ONE CONTINUOUS BLAST: IMMEDIATE DANGER TO LIFE OR HEALTH**

Three horn blasts followed by another extended or continuous horn blast signals a situation that could present an immediate danger to the life or health (IDLH) of all personnel on-site. Examples of possible IDLH situations could include fires, explosions, hazardous chemical spills or releases, hurricanes, tornadoes, blizzards or floods. If three horn blasts followed by a continuous blast are sounded, all activity and equipment must stop, all personnel must evacuate the site to an appropriately designated site located outside the site gate or further off-site if necessary. (Note: Unless otherwise specified, all decontamination procedures must be implemented).

11.5 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury, illness or property damage requires an accident investigation and report. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An ENSR accident investigation form, as well as the Army Corps of Engineers form, is presented in Attachment D of this HASP. Both forms must be completed and submitted in accordance with ENSR and Army Corp requirements. The injured employee's supervisor and the RHSM should be notified immediately of the injury.

If a subcontractor employee is injured, they are required to notify the SSO. Once the incident is under control, the subcontractor will submit a copy of their company's accident investigation report to the SSO. An Army Corps of Engineers accident investigation form must also be completed.

EMERGENCY REFERENCES

Ambulance:	9-1-1
Fire:	9-1-1
Police:	9-1-1
Medical Services:	315-787-4000 Geneva General Hospital 196 North St Geneva
Directions to Hospital:	From Yerkes Rd, head north on Hwy 96. Turn left onto Yale Farm Rd. Turn right onto Hwy 96A North. Bear left onto US 20 West. Turn right onto Lake St. Turn right onto Lewis St. Turn right onto Exchange St (Hwy 14 North). Turn left onto North St. Hospital is 17 miles from Yerkes Rd.

ENSR Project Representatives:

ENSR/WESTFORD, MA	978-589-3000
-Kathleen Harvey (RHSM)	x 3325
-Rick Brannon (PM)	x 3346
ENSR/ROCHESTER, NY	716-381-2210
-James Sprague (PE)	x 711

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan Receipt and Acceptance Form

Time Critical Removal Action
Fill Area West of Building 115 (SEAD-59) and Alleged Paint Disposal Area (SEAD-71)
Seneca Army Depot Activity
Romulus, New York

I have received a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name (Print) ____

Signature ________________________________ Date: ________________

Representing (Print) ____
Company Name

Attachment B

Job Hazard Analyses

JOB HAZARD ANALYSIS
Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Site Mobilization
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Site mobilization activities to support the time-critical removal action at SEAD-59 and SEAD-71 at the Seneca Army Depot Facility in Romulus, New York include the following: ▪ Clearing vegetation (anticipate using excavation equipment to facilitate this task) ▪ Installing security fencing ▪ Constructing equipment-decontamination area ▪ Performing utility survey ▪ Installing erosion control	1) Use of excavation equipment to remove vegetation 2) Cuts and Lacerations 3) Use of Power Tools 4) Slip, Trip Falls 5) Back Safety 6) Heat Stress	1) Wear hardhats, steel-toed boots and hearing protection, Pedestrians in area of operating machinery will wear traffic vests. If removing vegetation by hand, wear leather gloves. 2) Installation of fencing and/or cutting of polyethylene sheeting for decon areas may result in cuts due to contact with sharp edges and/or use of knives. Employees involved in activities that may result in cuts or lacerations will wear leather or Kevlar gloves. When handling knives: keep your free hand out of the way. Secure your work if cutting through thick material. Use only sharp blades; dull blades require more force that results in less knife control. Pull the knife toward you; pulling motions are easier to manage. Don't put your knife in your pocket. Use a self-retracting blade.

Activity: Site Mobilization
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

	7) Poisonous Plants/Insects	3) Extension cords used for mobilization efforts should be of the three wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO or SJTO. NEVER remove the ground plug blade to accommodate ungrounded outlets. Protect the cord from becoming damaged if the cord is run through doorways, windows or across pinch points. Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately. All portable or temporary wiring which is used outdoors or in other potentially wet or damp locations must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). 4) To prevent slips, trips and falls move all obstacles that are in major work paths. Follow good housekeeping. Avoid standing or walking on poly-sheeting. Perform site walkover and cover or fill in holes or ditches that are in major walking areas. 5) Use mechanical devices to move objects that are too heavy to be moved manually. If mechanical devices are not available, ask another person to assist you. Bend at the knees, not the waist. Let your legs do the lifting. Do not twist while lifting. Bring the load as close to you as possible before lifting.

JOB HAZARD ANALYSIS
Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Site Mobilization
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

		6) Wear sunscreen with minimal SPF of 15. Drink plenty of fluids. Use trailer for shade. Establish work-break regime. Review symptoms of heat-related stress with field crew. 7) Know how to identify poisonous plants and avoid when possible, Wear long sleeved shirts and pants and light-colored clothing to easily identify ticks. Perform daily tick checks. Use repellant.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
1) Excavator 2) Post-hole digger	1) Upon delivery, inspect machinery 2) Inspect power tools and cords for damage.	1) Review AHA and Site-specific HASP before starting work

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Excavation/Segregation/Stockpiling/Load-Out of Impacted Soils
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
The proposed removal action includes the excavation of residual chemical materials in soils in SEAD-59 and SEAD-71. During excavation, soils will be screened and segregated to remove drums, cans and other visibly obvious debris as well as to isolate visibly contaminated soils. Soils will be stockpiled and sampled for disposal characterization. Soils will then be loaded-out for off-site disposal of for use as backfill.	8) Utility Hazards 9) Cave-in Hazards 10) Noise 11) Traffic 12) Working Around Operating Machinery 13) Potential	1) New York One-Call System will be contacted to mark-out underground utilities at site. However, further due diligence will be required to identify utility lines. Obtain as-built drawings for the areas being investigated from the facility; visually review each excavation location with a knowledgeable site representative; perform a geophysical survey or hire a private line locating firm to determine the location of utility lines that are present at the property; identify a no-dig zone; or hand dig in the proposed excavation locations if insufficient data is available to accurately determine the location of the utility lines. 2) Unshored excavations will remain during soil removal and some of the excavations will be greater than 5 feet in depth. However, the program is set up so that equipment and personnel will not have to enter the excavation. If entry is required, all the requirements of the HASP regarding such an activity must be implemented.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Excavation/Segregation/Stockpiling/Load-Out of Impacted Soils
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

	Exposure to Vapors and Dusts 14) Thermal Stress	3) Employees will wear hearing protection with a minimum NRR of 29 db. 4) Employees will wear orange traffic vests to make themselves more visible to equipment operators. 5) Employees will be working in close proximity to operating machinery while screening and inspecting soils. Wear hard hat, safety glasses, traffic vest and steel-toed boots. Make sure that the operator is aware of your presence/activities. Stay in the operator's line of sight, don't work in his/her blind spot. Approach areas where equipment is operating from a direction visible to the operator. Be aware of the swing radius of the excavator. Do not walk or work underneath loads handled by digging equipment. Do not ride in buckets of loaders. Stand away from soil stockpile areas to avoid being struck by any spillage or falling materials. Develop a series of hand signals to facilitate communication with the operator. Stay in identified pedestrian walkways vs. equipment operation areas. 6) Air monitoring is being conducted for both VOC and petroleum vapors as well as dusts. If concentrations exceed prescribed action levels engineering controls (i.e. applying water over soils) or the donning of respirators will be necessary.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Excavation/Segregation/Stockpiling/Load-Out of Impacted Soils
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

		7) Wear sunscreen with minimal SPF of 15. In heat, drink plenty of fluids. Use trailer for shade. Establish work-break regime. Review symptoms of heat-related stress with field crew. When cold, wear insulated clothing. Seek shelter in warm areas.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
3) Excavator	1) Upon delivery, inspect machinery	2) Review AHA and Site-specific HASP before starting work

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Collection of Post-excavation and Stockpiled Soil Samples
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
The proposed removal action includes the excavation of residual chemical materials in soils in SEAD-59 and SEAD-71.Stockpiled soils will be samples for disposal characterization and post-excavation soil samples will be collected to confirm concentration of contaminants in soil left behind is below state standards.	15) Cave-in Hazards 16) Noise 17) Traffic 18) Working Around Operating Machinery 19) Potential Dermal Contact with Impacted Soils	8) Unshored excavations will remain during soil removal and some of the excavations will be greater than 5 feet in depth. However, post-excavation soil samples will be collected using remote sampling equipment or from the bucket of the backhoe. Entry into the excavation is not required. 9) Other machinery is likely to be operating during sampling activities. Employees will wear hearing protection with a minimum NRR of 29 db. 10) Equipment traffic will still be a concern during the sampling events. Employees will wear orange traffic vests to make themselves more visible to equipment operators. 11) Employees will be working in close proximity to operating machinery while collecting the required samples. Wear hard hat, safety glasses, traffic vest and steel-toed boots. Make sure that the operator is aware of your presence/activities. Stay in the operator's line of sight, don't work in his/her blind spot. Approach areas where

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Collection of Post-excavation and Stockpiled Soil Samples
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

	20) Thermal Stress	equipment is operating from a direction visible to the operator. Be aware of the swing radius of the excavator. Do not walk or work underneath loads handled by digging equipment. Do not ride in buckets of loaders. Stand away from soil stockpile areas to avoid being struck by any spillage or falling materials. Develop a series of hand signals to facilitate communication with the operator. Stay in identified pedestrian walkways vs. equipment operation areas. 12) Employees collecting samples will wear at a minimum nitrile gloves. IF determined by SSO, tyvek coveralls and boot covers may also be necessary. Wear sunscreen with minimal SPF of 15. In heat, drink plenty of fluids. Use trailer for shade. Establish work-break regime. Review symptoms of heat-related stress with field crew. When cold, wear insulated clothing. Seek shelter in warm areas.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
		3) Review AHA and Site-specific HASP before starting work.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Site Restoration
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Site restoration activities include the following tasks: ▪ Final grading of disturbed areas ▪ Seeding of vegetated areas disturbed during excavation ▪ Removing erosion controls ▪ Removing decontamination and staging areas	21) Use of heavy machinery to grade 22) Cuts and Lacerations 23) Use of Power Tools 24) Slip, Trip Falls 25) Back Safety 26) Thermal Stress	1) Wear hardhats, steel-toed boots and hearing protection. Pedestrians in area of operating machinery will wear traffic vests. 2) Removal of fencing and/or cutting of polyethylene sheeting used for decon and staging areas may result in cuts due to contact with sharp edges and/or use of knives. Employees involved in activities that may result in cuts or lacerations will wear leather or Kevlar gloves. When handling knives: keep your free hand out of the way. Secure your work if cutting through thick material. Use only sharp blades; dull blades require more force that results in less knife control. Pull the knife toward you; pulling motions are easier to manage. Don't put your knife in your pocket. Use a self-retracting blade.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Site Restoration
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

		3) Extension cords used for demobilization efforts should be of the three wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO or SJTO. NEVER remove the ground plug blade to accommodate ungrounded outlets. Protect the cord from becoming damaged if the cord is run through doorways, windows or across pinch points. Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately. All portable or temporary wiring which is used outdoors or in other potentially wet or damp locations must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). 4) To prevent slips, trips and falls move all obstacles that are in major work paths. Follow good housekeeping. Avoid standing or walking on poly-sheeting. 5) Use mechanical devices to move objects that are too heavy to be moved manually. If mechanical devices are not available, ask another person to assist you. Bend at the knees, not the waist. Let your legs do the lifting. Do not twist while lifting. Bring the load as close to you as possible before lifting.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Site Restoration
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

		6) Wear sunscreen with minimal SPF of 15. Drink plenty of fluids. Use trailer for shade. Establish work-break regime. Review symptoms of heat-related stress with field crew. When cold, wear insulated clothing. Seek shelter in warm areas
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
4) Excavator	1) Upon delivery, inspect machinery	4) Review AHA and Site-specific HASP before starting work

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Container Sampling
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
The proposed removal action includes the excavation of residual chemical materials in soils in SEAD-59 and SEAD-71.Excavated soils will be segregated to remove drums, cans and other visibly obvious debris. The contents of any removed containers will be sampled for disposal characterization.	27) Contact with hazardous materials in container	Significant hazards associated with container sampling include chemical overexposure, chemical reactions, pressure release and fire. The following procedures will be used to help prevent these hazards: • Inspect the containers for labels to determine what may be present inside • Screen the containers with a PID to determine the presence of VOCs • Containers that are bulging may be pressurized and will not be sampled until excess pressure has been relieved. • Containers must be bonded and grounded to prevent static electricity when sampling liquids. • Non-sparking tools will be used to open the container and sample the contents. • Samples will be collected in a manner that minimizes exposure to hands and face. • When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition.

JOB HAZARD ANALYSIS

Time-Critical Removal Action
SEAD-59 & SEAD-71
Seneca Army Depot Activity
Romulus, New York

Activity: Container Sampling
Prepared By : Kathleen Harvey, RHSM, ENSR
Date: August 22, 2002

		• Controls for container opening equipment, monitoring equipment, and fire suppression equipment must be located in the sampling area. • Employees must not stand upon or work from containers. • There is a potential to be splashed by the material being handled. Employees will don tyvek (for solids) or polycoated tyvek (for liquids), nitrile gloves, safety goggles and faceshield and protective shoe coverings. • Respiratory protection may be needed when sampling containers based on air monitoring. The SSO will determine what level of protection is needed.
EQUIPMENT TO BE USED	**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**
		5) Review AHA and Site-specific HASP before starting work

Attachment C

Health and Safety Plan Pre-Entry Briefing Attendance Form

Health and Safety Plan Pre-Entry Briefing Attendance Form

Time Critical Removal Action
Fill Area West of Building 115 (SEAD-59) and Alleged Paint Disposal Area (SEAD-71)
Seneca Army Depot Activity
Romulus, New York

Briefing Conducted By: ______________________________

Date Performed: ____________________

Printed Name	Signature	Representing

Attachment D

Supervisor's Accident Investigation Report Form
Army Corps of Engineers Accident Investigation Form

SUPERVISOR'S ACCIDENT INVESTIGATION REPORT

Injured Employee ______________________________ Job Title ____________________________

Home Office ______________________________ Division/Department ________________________

Date/Time of Accident ____

Location of Accident ____

Witnesses to the Accident ____

Injury Incurred? _______ Nature of Injury ____

____

Engaged in What Task When Injured? ____

____

Will Lost Time Occur? _______ How Long? ________ Date Lost Time Began ________________

Were Other Persons Involved/Injured? ____

____

How Did the Accident Occur? ____

____

____

____

____

What Could Be Done to Prevent Recurrence of the Accident? ____________________________

____

____

What Actions Have You Taken Thus Far to Prevent Recurrence? __________________________

____

____

Supervisor's Signature _________________________ Title __________________ Date _________

Reviewer's Signature _________________________ Title __________________ Date _________

Note: If the space provided on this form is insufficient, provide additional information on a separate page and attach. The completed accident investigation report must submitted to the Regional Health and Safety Manager within two days of the occurrence of the accident.

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
VERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(SPECIFY)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(SPECIFY)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see instructions)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see instructions)*

SEVERITY OF ILLNESS/INJURY (CODE) #	B. ESTIMATED DAYS LOST	C. ESTIMATED DAYS HOSPITALIZED	D. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	g. TYPE AND SOURCE OF INJURY/ILLNESS
PRIMARY (CODE) #	
SECONDARY (CODE) #	TYPE (CODE) #
f. NATURE OF ILLNESS / INJURY (CODE) #	SOURCE (CODE) #

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see instructions)*

a. ACTIVITY AT TIME OF ACCIDENT (CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END	(1) FRONT SEAT			
☐ TRUCK ☐ OTHER *(Specify)*	☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	B. OWNERSHIP	C. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see instructions)*

a. TYPE OF VESSEl/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

See attached page.

APPENDIX I

WEEKLY PROGRESS REPORT
Seneca Army Depot Activity
SEAD - 59 & SEAD - 71

DATE:

THREE WEEK LOOK AHEAD

Activities conducted for the week of :

Activities planned for the week of:

Activities planned for week of ;

Activities planned for week of ;

Percent Complete By Area:

Personnel assigned to site:

Equipment assigned to site: Anticipated quantity:

Safety issues:

Other issues:

Attachments:

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTA/______
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTA_ IS FOR ☐ F-O ☐ GOV'T. APPROVAL

ITEM NO. a.	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* b.	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8)* c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT: SPEC. PARA. NO. e.	CONTRACT REFERENCE DOCUMENT: DRAWING SHEET NO. f.	FOR CONTRACTOR USE CODE g.	VARIATION *(See instruction No. 6)* h.	FOR CE USE CODE i.

REMARKS	I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated. NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

SUBMITTAL REGISTER

(ER 415-1-10)

TITLE AND LOCATION	CONTRACTOR	CONTRACT NO.
		SPECIFICATION SECTION

					TYPE OF SUBMITTAL									CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
ACTIVITY NO	TRANSMITTAL NO.	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS
a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.

PREPARATORY PHASE QUALITY INSPECTION

1. Definable Feature of Work:

____

2. Which sections of the specifications apply and have they been reviewed?

____

____

____

____

3. Which sheets of the contract drawings show the proposed work and have they been reviewed?

____

____

____

____

4. What material and equipment is scheduled to be incorporated into the work and has it been tested, submitted and approved?

____

____

____

____

5. Have all required control inspections and testing been scheduled?

____

____

____

____

6. Is the work area prepared to receive the proposed work; has all preliminary work required been completed in compliance with the contract?

____

____

____

____

7. Is the material and equipment scheduled to be incorporated into the work on hand, has it been physically examined for compliance with the approved shop drawings and is it properly stored and protected?

8. Has an Activity Hazard Analysis been prepared for the proposed activities in compliance with EM 385-1-1, and are the required precautions from that analysis being followed?

9. Have the procedures for controlling the quality of the work, including specifically those to prevent repetitive deficiencies, been reviewed with everyone involved?

10. Has documentation of the construction tolerances and workmanship standards for this feature of the work been provided to everyone involved?

11. Has the Contracting Officer accepted the portion of the work plan that applies to the proposed work?

12. Has the USACE been notified of the Preparatory Control Phase Meeting (minimum 48 hour advance notice required)?

13. Has the Preparatory Control Phase Meeting been held and was the Initial Control Phase discussed with the involved staff?

Notes:

CQC REPORT

Corps Of Engrs. NYD

1. Project Title:

Location: Contract No.:

2. List Contractors and Subs Working This Day and areas of responsibility of each

3. Weather:

4. Description and Location of Work of the Project (also indicate days of no work)

5. Labor and Equipment Breakdown by Trade (Attach Continuation)

6. Follow-Up Inspections Performed, Results and Corrective Actions Taken:

7. Job Safety. Indicate What Was C[illegible] Results Instructions Received and corrective actions.

8. Additional Activities and Remarks (Check Appropriate Box)

[ ] a. Prep or Initial Insp. Held Attach Minutes.
[ ] b. Testing Performed. Attach Results.
[ ] c. Outstanding Deficiencies. See Attached List
[ ] d. Verbal Instructions Received.
[ ] e. Delivery of Equipment and Materials.
[ ] f. Submittal Actions.
[ ] g. Misc/Remarks.

Use Space Below To Discribe Checked Items

9. Contractor's Verification: The above report and attachments are complete and all supplies, material and Workmanship incorporated into the work are in full compliance with the contract except as noted.

Signed ______________________ Date ____________
CQC Representative

RECORD OF PREPARATORY AND INITIAL INSPECTIONS

DATE OF INSP	TYPE OF INSP	DEFINABLE FEATURE OF WORK (DESCRIBE)	REPORT NOS		PERSONS ATTENDING INSP	WAS MATL&/OR EQUIPMENT PHYSICALLY INSPECTED ?
			QA	QC		

NAD FORM 826
22 JUI

NOTE:THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK PREP/INIT INSP'S
ATTACH ADDITIONAL RESULTS OR COMMENTS A^ ^EQUIRED

LIST OF OUTSTANDING DEFICIENCIES

SH______ OF ______ DATE:__________

PROJECT TITLE:______________________________ CONTRACTOR:____________________

LOCATION:______________ CQC REPORT#________ CONTRACT #:________________________

SPEC REF OR DWG#	LOCATION ON PROJECT	DESCRIPTION OF DEFICIENCY	DATE FOUND	DATE TO BE CORRECTED	DATE CORRECTED	REMARKS

NOTE: THIS FORM SHALL BE USED BY THE CONTRACTOR TO TRACK OUTSTANDING CONSTRUCTION DEFICIENCIES

To ~~Tim Sprague~~ Rick Brannon ENSR
From Tom Battaglia
3 pgs ~~8/23/02~~ 8/27/02

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A -- Approved as submitted.

B -- Approved, except as noted on drawings.

C -- Approved, except as noted on drawings.
Refer to attached sheet resubmission required.

D -- Will be returned by separate correspondence.

E -- Disapproved (See attached).

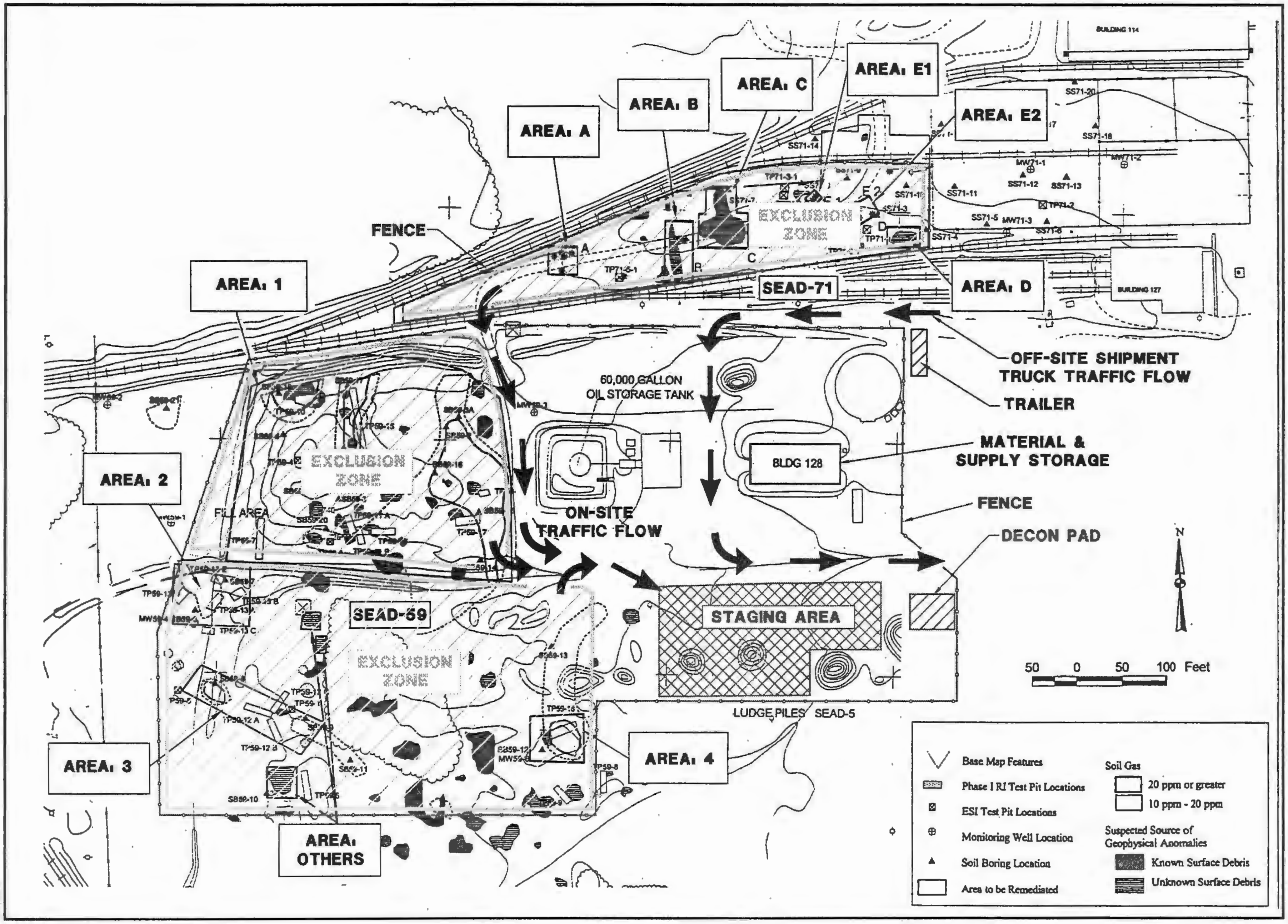
F -- Receipt acknowledged.

FX -- Receipt acknowledged, does not comply
as noted with contract requirements.

G -- Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)



DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
JPS	DSS	JPS	JPS

REVISIONS			
NO.:	DESCRIPTION:	DATE:	BY:

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SITE PLAN

SENECA ARMY DEPOT ACTIVITY
TIME CRITICAL REMOVAL ACTION
SEAD'S 59 AND 71

SCALE:	DATE:	PROJECT NUMBER:
NOTED	8/19/02	09090-029

FIGURE NUMBER: **FIGURE 1**

SHEET NUMBER: 1 OF 1