U.S. ARMY ENGINEER DIVISION
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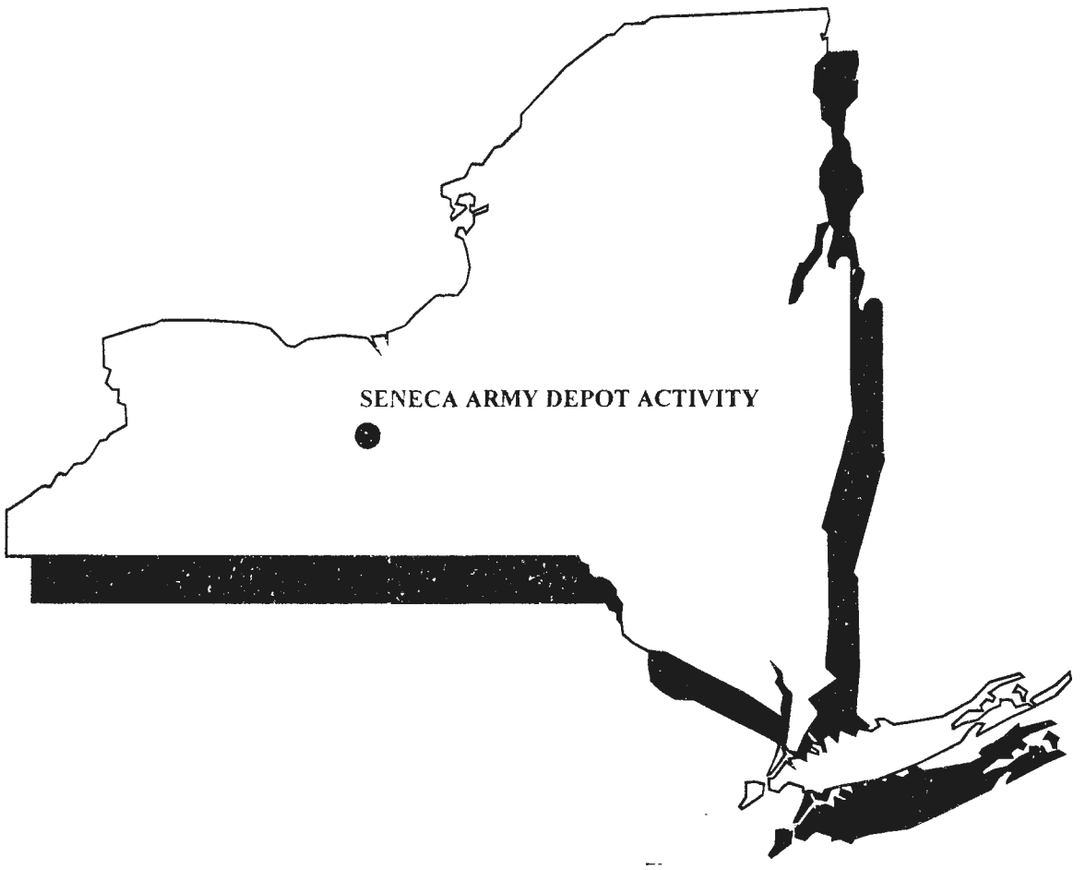

FINAL

COMPLETION REPORT FOR SIX AREAS OF CONCERN SEADs (43, 56, 69), 44A, 44B, 52, 62, AND 120B

CONTRACT NO. DACA87-95-D-0031
TASK ORDER U

MAY 2001

FINAL COMPLETION REPORT
SIX AREAS OF CONCERN
SENECA ARMY DEPOT
ROMULUS, NEW YORK

Prepared For:

Seneca Army Depot
Romulus, New York

Prepared By:

Parsons Engineering Science, Inc.
30 Dan Road
Canton, Massachusetts

Contract No. DACA87-95-D-0031
Task Order U
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EXECUTIVE SUMMARY

Parsons Engineering Science, Inc. (Parsons ES), under contract to the U.S. Army Corps of Engineers (USACOE), has prepared this Completion Report for Solid Waste Management Units (SWMUs), designated as Areas of Concern (AOCs), that are located within the Seneca Army Depot Activity (SEDA). This report has been prepared in accordance with the requirements of the Interagency Agreement (IAG) between the U.S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Army. According to Section 10.6 of the IAG, Completion Reports are to be prepared for an AOC where the Army asserts that a site poses no significant threat to public health, welfare, or the environment.

The six AOCs considered in this Completion Report are:

- SEAD-43 - Building 606-Old Missile Propellant Test Laboratory
- SEAD-56 - Building 606-Herbicide and Pesticide Storage
- SEAD-69 - Building 606-Disposal Area
- SEAD-44A - Quality Assurance Test Laboratory (West of Building 616)
- SEAD-44B - Quality Assurance Test Laboratory (Brady Road)
- SEAD-52 - Ammunition Breakdown Area
- SEAD-62 - Nicotine Sulfate Disposal Area
- SEAD-120B - Ovid Road Small Arms Range

(Note: SEAD-43, SEAD-56, and SEAD-69 are included as one AOC for this Completion Report.)

These six AOCs are grouped together in this Completion Report due to their geographical location. All six AOCs are located in the southeastern corner of the SEDA facility, within a 700-acre parcel of land that has been proposed for transfer to NY State Department of Corrections (NYSDOC).

Following the identification of these sites as AOCs, investigations were conducted to gather information to be used in determining the potential threats that these sites may pose to human health and the environment. Such investigations were conducted and are documented in the following four reports: Expanded Site Inspection (ESI) for Eight Moderately Low Priority Sites (December 1995); ESI for Seven Low Priority Sites (April 1995); SWMU Classification Report (June 1994), and Investigation of Moderate Non-Evaluated EBS Sites (May 1998). Data gathered from these previous investigations have been used in the evaluation of site threats in this Completion Report.

Threats to human health have been evaluated by comparing site concentrations in soil, groundwater, surface water, and sediment to various media-specific standards and guidelines. Additionally, screening risk assessments, or "mini-risk assessments," were also conducted to quantify the magnitude of the risk. Because these AOCs are within a parcel of land designated for use as a prison site, human risk receptors under a prison facility were evaluated. Performing the mini-risk assessment is a mechanism used to provide a quantitative risk value that can be used to support recommendations for future action. One of those future action alternatives may be "no further action" (NFA). The mini-risk assessment utilizes identical procedures as what would be used for a Baseline Risk Assessment (BRA), but uses the maximum detected concentration as the Exposure Point Concentration (EPC) instead of the Upper 95th Confidence Limit of the mean due to the uncertainties associated with evaluating a site with the smaller ESI database. If the results of the mini-risk assessment indicate acceptable risk, i.e., carcinogenic risks are less than 1E-04 or the Hazard Index (HI) is less than 1, then the site conditions meet the requirements for NFA. If appropriate, the NFA decision is documented in a Completion Report. Risks calculated at each of the six AOCs were below the acceptable risk criteria.

To assess ecological risks, soil datasets from each site were combined. The maximum value detected was used as the exposure concentration and hazard quotients (HQ) for each constituent of potential concern (COPC) were calculated for terrestrial and avian receptor species. An HQ less than one was considered acceptable (protective of ecological receptors). For COPCs with an HQ greater than one, weight-of-evidence using arithmetic average concentrations, conservatism of assumptions, and the habitat value of potentially affected areas were considered in concluding whether or not there is a significant potential for ecological risk. None of the compounds found in soil at the AOCs are considered chemicals of concern for ecological receptors analyzed.

Due to the ephemeral nature of surface water accumulation in the drainage ditches and the limited exposure of valued ecological receptors to surface water or sediment in the ditches, these media were not quantitatively assessed in this ERA. NYSDEC has established ambient water quality guidelines for various water classes and purposes. For instance, the NYSDEC Class C guidelines are designed to protect fish propagation in fresh waters. The drainage ditches at the site are not considered a classifiable water body, and do not sustain valued aquatic life (such as fish) on a continual basis. While the Class C guidelines were compared to the maximum surface water concentrations in ditches at the AOCs, these comparisons are not relevant to receptors of concern at this site.

Sediment in the drainage ditches was sampled at the AOCs. In general, the concentrations of chemicals found in sediment were similar to the concentrations measured in soil. In many cases, the sediment concentrations appear to be similar to the background soils at SEDA. Terrestrial

receptors, such as mice, may ingest or contact this sediment, as they would soil. Since the sediment is less prevalent than soil at the AOCs, and since the chemical concentrations are similar for the two media, the quantitative analysis of soil exposure for terrestrial receptors is considered representative of exposure to sediment as well. NYSDEC has established sediment criteria for the protection of wildlife, considering bioaccumulation (NYSDEC 1993). None of the compounds measured in sediment at the AOCs have listed wildlife bioaccumulation sediment criteria. Therefore, the sediment at this site complies with these potentially applicable criteria.

The results of the mini-risk assessments conducted for each site are that human health and ecological risk is negligible for all pathways considered at SEADs (43, 56, and 69), 44A, 44B, 52, 62 and 120B. Therefore, the six AOCs pose no threat to public health and the environment for the intended future use of these areas. Based on this assessment and previous investigations performed at these sites, and in accordance with the FFA and CERCLA, the Army believes that no future remedial action is required at these AOCs.

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1.0 INTRODUCTION

Parsons Engineering Science, Inc. (Parsons ES), under contract to the U.S. Army Corps of Engineers (USACOE), has prepared this Completion Report (CR) for Solid Waste Management Units (SWMUs), designated as Areas of Concern (AOC), that are located within the Seneca Army Depot Activity (SEDA). In accordance with the requirements of the Interagency Agreement (IAG) between the U.S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Army, following the identification of these sites as AOCs, investigations were conducted to gather information to be used in determining the potential and significance of threats that these sites may pose to human health and the environment. Data gathered from these previous investigations have been utilized in this evaluation of site threats. Threats to human health and the environment have been determined by comparing site concentrations to various media-specific standards and guidelines. Additionally, screening risk assessments, or "mini-risk assessments", have also been conducted to quantitate the magnitude of the risk. The resulting evaluations are presented in this Completion Report to support the decisions for final site disposition.

This CR considers six AOCs. The six AOCs are:

- SEAD-43 - Building 606-Old Missile Propellant Test Laboratory
- SEAD-56 - Building 606-Herbicide and Pesticide Storage
- SEAD-69 - Building 606-Disposal Area
- SEAD-44A - Quality Assurance Test Laboratory (West of Building 616)
- SEAD-44B - Quality Assurance Test Laboratory (Brady Road)
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- SEAD-62 - Nicotine Sulfate Disposal Area
- SEAD-120B - Ovid Road Small Arms Range

(Note: SEAD-43, SEAD-56, and SEAD-69 are included as one AOC for this Completion Report.)

These six AOCs are grouped together in this Completion Report due to their geographical location. All six AOCs are located in the southeast corner of the SEDA facility, within a 700-acre parcel of land that has been proposed for transfer to NY State Department of Corrections (NYSDOC).

The IAG describes a sequential process of identification, investigation, evaluation, remediation (if necessary) and closure for all sites where hazardous substances may have been released to the environment. Investigative and remedial efforts have been performed in accordance with the decision process outlined in the IAG. The IAG agenda begins with the initial identification of each SWMU and culminates with a Record of Decision (ROD) for each SWMU that required a remedial action. The process accounts for the diversity of site conditions that may be encountered and recognizes that a remedial action may not be appropriate for each site. It also provides for conditions where a small removal action may be an efficient way to achieve final site closure. The path that each site will follow to achieve closure is based upon the environmental quality data collected that is used to determine what threat the site may pose. Once environmental quality information has been obtained, a decision will be made as to the appropriate next sequence in the process. Site closure will be achieved through one of the various endpoints allowed by the IAG. Sites that are more severely impacted will require a larger effort for closure and will follow the process further, prior to achieving closure, than a site that has few, if any, environmental concerns.

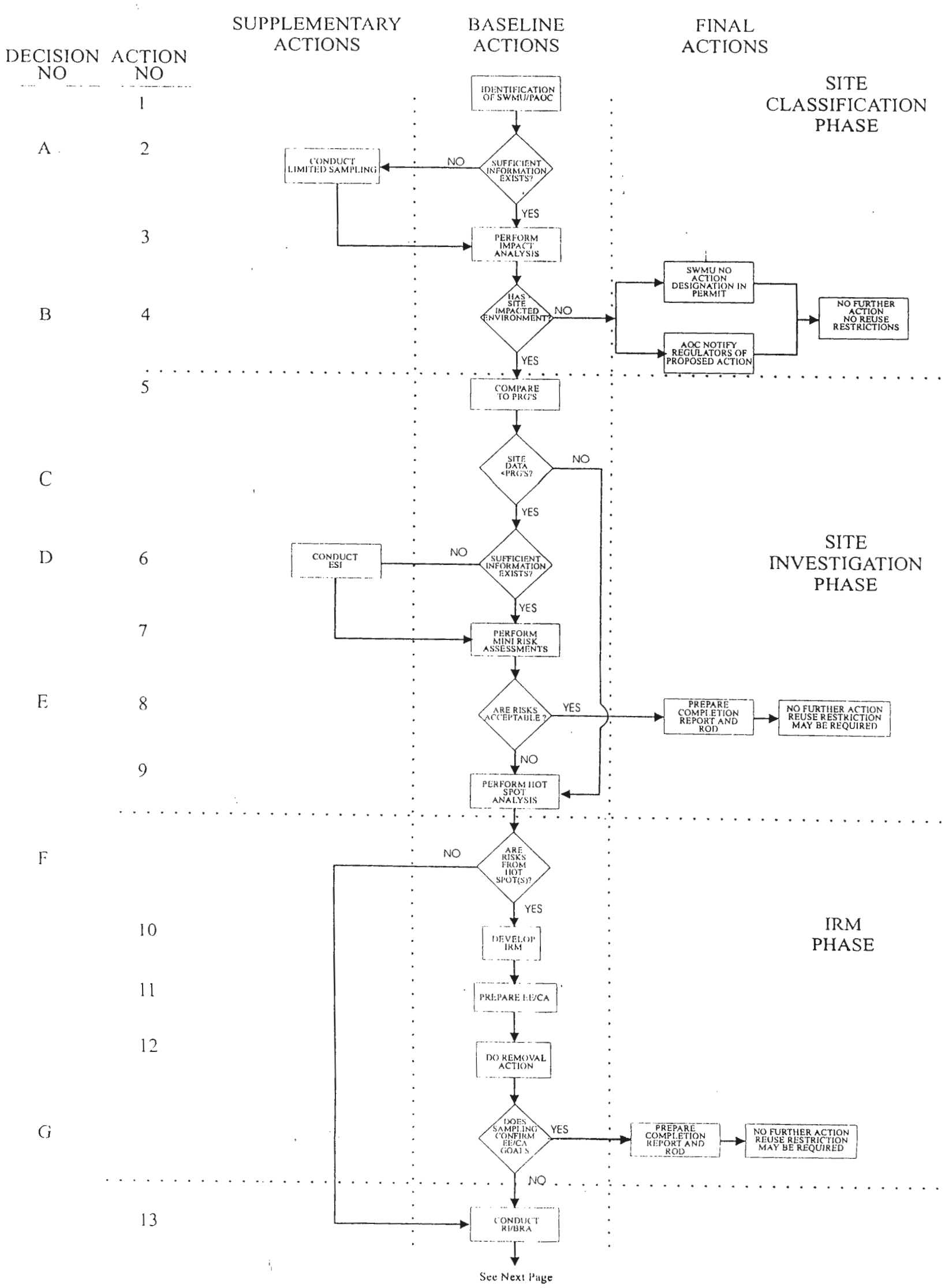
The overall decision process is depicted in **Figure 1.1-1** titled " Seneca Army Depot Activity Decision Criteria Remediation Flowchart". A key aspect of the process is to allow for a site to exit the process, requiring no further action, if site conditions are shown to meet the decision criteria. In many instances exiting the process occurs prior to conducting a full RI/FS program.

The decision process involves implementing a series of baseline actions. Decisions are integrated into the baseline action process to justify the actions to be taken. Supplemental actions, such as collecting additional data, are conducted, where necessary, to provide support for the baseline actions. The final action for each SWMU or AOC involves preparation of either a completion report, a ROD or a closeout report. These reports provide documentation that site conditions have met the requirements of the decision process.

The process is divided into six (6) distinct phases. These include:

1. The Site Classification Phase,
2. The Site Investigation Phase,
3. The Interim Remedial Measures (IRM) Phase,
4. The Remedial Investigation Phase (RI) Phase,
5. The Feasibility Study (FS) Phase, and
6. The Remedial Design/Remedial Action (RD/RA) Phase.

SENECA ARMY DEPOT ACTIVITY
Decision Criteria Flowchart



PARSONS	
PARSONS ENGINEERING SCIENCE, INC.	
CLIENT/PROJECT TITLE	SENECA ARMY DEPOT ACTIVITY
DEPT ENVIRONMENTAL ENGINEERING	DWG NO
FIGURE 1.1-1 DECISION CRITERIA REMEDIATION FLOWCHART	
Page 1 of 2	
SCALE N/A	

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SENECA ARMY DEPOT ACTIVITY
Deccision Criteria Flowchart

DECISION NO	ACTION NO	SUPPLEMENTARY ACTIONS	BASELINE ACTIONS	FINAL ACTIONS
			From Previous Page	
	13		CONDUCT RI/BRA	
H*			ARE RISKS ACCEPTABLE? See Below → YES	PREPARE COMPLETION REPORT AND ROD → NO FURTHER ACTION REUSE RESTRICTION MAY BE REQUIRED
	14		NO → PERFORM PRESUMPTIVE REMEDIAL ANALYSIS	
I			DOES PRESUMPTIVE REMEDY EXIST? NO	RI/FS/RD/RA PHASE
	15		YES → PREPARE EE/CA	
	16		DO REMOVAL ACTION	
J			DOES SAMPLING CONFIRM EE/CA GOALS → YES	PREPARE COMPLETION REPORT AND ROD → NO FURTHER ACTION REUSE RESTRICTION MAY BE REQUIRED
	17		NO → PREPARE FS	
K			SELECT REMEDY	
	18		PREPARE PRAP/ROD	
	19		PERFORM RD/RA	PREPARE CLOSEOUT REPORT → NO FURTHER ACTION

*** Detail of Decision H**

	13	From CONDUCT RI/BRA
H-1		ARE SITE SPECIFIC GUIDELINE VALUES EXCEEDED? YES
		NO
H-2		ARE RISKS ACCEPTABLE? YES → To PREPARE COMPLETION REPORT AND ROD
		NO
	14	To PERFORM PRESUMPTIVE REMEDIAL ANALYSIS

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SENECA ARMY DEPOT ACTIVITY
DEPT ENVIRONMENTAL ENGINEERING
DWG NO.
FIGURE 1.1-1
DECISION CRITERIA REMEDIATION FLOWCHART
Page 2 of 2
SCALE N/A

h:\eng\seneca\scoping\12-48-63\flowd-12.cdr

Each phase is further divided into a series of actions that result from the decisions. As depicted in **Figure 1.1-1**, each decision is identified with a letter, whereas each action is identified with a number so that the status of each site can be identified. This provides an easy mechanism to understand what decisions have been made and what decisions need to be made. Each of the six phases of the process allow the site to exit the process. The effort involved in exiting the process is dependent upon the phase involved and the information required to document that conditions are within the required limits. In some cases this involves a comparison to an appropriate State and Federal Standard, Guideline and Criteria (SGC). In other instances, this will involve completion of a remedial action or an Interim Remedial Measure (IRM).

The first phase is the site classification phase. Site classification begins with an initial identification of a site and ends with a determination that the site has either impacted the environment or it has not, in which case no further action is required and unrestricted use is allowed. At SEDA, the list of potential sites were compiled, by SEDA staff, during the preparation of the RCRA Part B permit, that requires a listing of SWMUs. The list of SWMUs was developed from a variety of sources. Active, on-going depot operations involving waste generation and management were obvious candidates for SWMUs. Past operations and lesser known disposal practices were identified from interviews with current and former depot employees. The initial list of SWMUs identified in the Part B permit application was 72. Recently, as part of the BRAC closure process, the Environmental Baseline Survey (EBS) was prepared that involved additional interviews with former employees and field reconnaissance. These efforts identified an additional 25 potential SWMUs.

The key decision point in the site classification phase involves determining whether or not site conditions have impacted the environment. In many instances this decision was made from historical records or an understanding of the processes involved, without collecting additional field data. In other instances, this required some limited sampling. Twenty-four (24) SWMUs have been eliminated from further consideration during this phases as No-Action SWMUs. This number may change as some of the newly identified sites become classified. SWMUs that proceed further in the process are considered to be Areas of Concern (AOC).
The second phase is the Site Investigation Phase. This phase involved collection of data as part of an Expanded Site Inspection (ESI), as shown in Action 6 of **Figure 1.1-1**. The ESI data are then evaluated to determine whether a threat exists at the AOC. This determination is based upon direct comparisons of the site data to background or an appropriate State and/or Federal

Standards, Guidelines and Criteria (SGC). Exceedances of an appropriate standard, guideline, or criteria are used to indicate that a threat exists. A quantitative screening risk analysis may then be performed to quantify the threat. Professional judgments are also used to evaluate the significance of the exceedances and are incorporated into the recommendations for either no further action or additional evaluations, as shown in Decision No. E.

Each media have unique Standards, Guidelines and Criteria (SGC)s that have been used for comparison. Soil data, collected during the ESI, was compared to background concentrations, or the NYSDEC Technical Administrative Guidance Memorandums (TAGM) value for recommended clean-up levels of organic and inorganic components in soil. For metals in soil, the TAGM value is either background or a pre-determined value. In instances where the TAGM value is site background, the value chosen represents the 95th percentile of the background data set that has been accumulated at the SEDA. The 95th percentile of the background database was chosen to reduce the possibility of concluding that an exceedance had occurred from a release when the exceedance was from a site sample that represents the high end of background distribution in soil. If no exceedances had been determined then the recommendation for the site is No Further Action (NFA). However, if exceedances of TAGMs or other media specific SGC are noted then further evaluation of the data is required.

If exceedances of a SCG are noted, then a "mini" risk assessment may be performed to assess whether a contaminant actually poses a risk. Performing the mini-risk assessment is a mechanism used to provide a quantitative risk value that can be used to support recommendations for future action. One of those future action alternatives may be "no further action". The mini-risk assessment utilizes identical procedures as what would be used for a Baseline Risk Assessment (BRA) but uses the maximum detected concentration as the Exposure Point Concentration (EPC) instead of the Upper 95th Confidence Limit of the mean due to the uncertainties associated with evaluating a site with the smaller ESI database. If the results of the human health mini-risk assessment indicate acceptable risk, i.e. carcinogenic risks are less than 1E-04 or the HI is less than 1, then the site conditions meet the requirements for no further action. Likewise, if the results of the ecological mini-risk assessment indicate acceptable risk, i.e. the HQs are less than 1, or ecological risk is deemed to be small based on weight-of-evidence considerations, then the site conditions meet the requirements for no further action. If appropriate, the NFA decision is documented in a Completion Report. Otherwise the site

conditions are not acceptable and the site enters the Interim Remedial Measure (IRM) phase, Decision No. E in **Figure 1.1-1.**

The IRM phase involves evaluating whether the site can attain a no further action designation via implementation of an IRM. An IRM is most likely to be a non-time critical removal action and are generally considered appropriate if :

- The problems can be attributed to discrete soil or sediment "hot spots";
- The extent of soil or sediment to be excavated is less than 1000 CYs;
- The technologies are limited to "low tech" technologies such as off-site disposal or capping;
- The pollutants involved are amenable to such technologies such as off-site disposal or capping;
- Groundwater or surface water conditions are acceptable

If deemed appropriate, an IRM can be used to eliminate a site from further consideration by preparing an Engineering Evaluation/Cost Analysis (EE/CA). The EE/CA is the decision document that presents the goals and rational for implementing the IRM and discusses the evaluations that have been conducted in support of the IRM. After the removal action has been performed, confirmatory sampling is required to document the effectiveness of the IRM in attaining the IRM goals. This information is then documented in the project completion report and the ROD.

If the conditions of the site are such that the problems are not readily solvable via an IRM then the site moves into the RI phase. This phase is identical to the process described by CERCLA and involves a multi-media sampling effort and Baseline Risk Assessment (BRA). The results of the BRA may support a no further action if the risk conditions are below the EPA target limits for risk. Otherwise, the site enters the FS stage.

The FS phase involves an initial evaluation of presumptive remedies. Presumptive remedies includes a variety of technologies for both groundwater and soil such as bioventing, off-site disposal, capping or deed restriction for soils and alternative water supply, air sparging, zero-valence iron treatment or natural attenuation with monitoring for groundwater. If presumptive remedies are not appropriate then an FS is prepared.

The final phase is the preparation of a remedial design and implementation of the remedial action. Both the FS and the RD/RA will follow guidance provided by both the EPA and the NYSDEC.

A Completion Report is similar to a Record of Decision (ROD). Each are required to document decisions that have been made in determining final site closure. RODs are required following completion of an RI/FS. Completion Reports are prepared, prior to an RI/FS, if the site conditions are such that the site does not pose a continual threat to human health and the environment due to either a removal action or following an initial site investigation.

Data from a previous site investigations have been compiled and evaluated to determine if a threat exists, as per Decision No. D, Action No. 8 of the decision criteria flowchart in **Figure 1.1-1.** Risk assessments have been performed to assess if a threat exists at each of these six (6) sites. Since risks have been found to be acceptable, No Further Action (NFA) is deemed appropriate. This Completion Report has been provided to document the process that has led to the determination of NFA, as required in Section 10.3 of the IAG.

1.1 SITE BACKGROUND

The 10,587-acre SEDA facility, constructed in 1941, has been owned by the United States Government and operated by the Department of the Army (DOA). Since its inception in 1941, SEDA's primary mission has been the receipt, storage, maintenance, and supply of military items, including munitions and equipment.

The Depot mission changed in early 1995 as a result of the Base Realignment and Closure (BRAC) process when the Department of Defense (DOD) recommended closure of the SEDA. This recommendation was approved by Congress on September 28, 1995 and the Depot is scheduled to be closed by July 2001.

In accordance with the requirements of the BRAC process, the Seneca County Board of Supervisors established, in October 1995, the Seneca Army Depot Local Redevelopment Authority (LRA). The primary responsibility assigned to the LRA is 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, conservation and an area designated for a future prison. The sites considered in this document are within the area that has been designated for use as a prison.

A brief synopsis of background information pertaining to the Depot is presented. One of the first environmental studies to be performed at the Depot was in May 1979 when the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) began an environmental evaluation of SEDA. This evaluation was undertaken "to assess the environmental quality of SEDA with regard to the use, storage, treatment, and disposal of toxic and hazardous materials" and "define any conditions which may adversely affect the health and welfare or result in environmental degradation" (USATHAMA 1980). The report concluded that geological conditions are such that contaminants, if present, could migrate in surface or subsurface waters.

In November 1986, SEDA applied for a Part B Resource Conservation and Recovery Act (RCRA) Permit to operate a hazardous waste storage facility (SWMU designation SEAD-1), a Polychlorinated Biphenyl (PCB) storage facility (SEAD-2) and a deactivation furnace (SEAD-17). The Open Burning (OB) facility and the Open Detonation (OD) facility (SEAD-23 and SEAD-45, respectively) are also currently under interim status. Under the RCRA Hazardous and Solid Waste Amendments of 1984 (HSWA), Part B Permits issued after November 8, 1984, require identification and corrective action at any SWMU located on the installation that is releasing hazardous constituents or hazardous wastes to the environment. This requirement applies to all SWMUs regardless of when the wastes were placed therein. As a result of the Congressional mandate to close the Depot, the pursuit to obtain the RCRA, Part B operating permit was withdrawn. However, as a facility operating under the interim status provisions of RCRA, closure is still a requirement.

Closure under RCRA guidelines was deferred when SEDA was proposed for the National Priority List (NPL) in July 1989. In August 1990, SEDA was finalized and listed in Group 14 on the Federal Section of the National Priority List (NPL). Following finalization on the NPL, it was agreed that subsequent remediation of targeted problem sites would become regulated under CERCLA guidelines. The IAG was developed with the EPA Region II and NYSDEC to integrate the Army's RCRA corrective action obligations with CERCLA response obligations in order to

facilitate overall coordination of investigations mandated at SEDA. Therefore, any required future investigations will be based on CERCLA guidelines and RCRA shall be considered an Applicable or Relevant and Appropriate Requirement (ARAR) pursuant to Section 121 of CERCLA.

As mandated by the EPA Region II and by NYSDEC, the U.S. Army Corps of Engineers commissioned the "Solid Waste Management Unit Classification Report" at SEDA (ERCE 1991). This report was finalized by ES on June 10, 1994. This work was performed to evaluate the effects of past solid waste management practices at identified SWMUs on the facility and to classify each SWMU as an area where "No Action is Required" or as an "Area of Concern." Areas of Concern include both (a) SWMUs where releases of hazardous substances may have occurred and (b) locations where there has been a threat of a release into the environment of a hazardous substance or constituent (including radionuclides). AOCs may include, but need not be limited to, former spill areas, landfills, surface impoundments, waste piles, land treatment units, transfer stations, wastewater treatment units, incinerators, container storage areas, scrap yards, cesspools and tanks with associated piping that are known to have caused a release into the environment or whose integrity has not been verified.

A total of 69 SWMUs and AOCs were originally identified in the ERCE SWMU Classification Report. Following the completion of the ERCE report, three additional SWMUs were added by the Army, bringing the total number of SWMUs at SEDA to 72. The total number of SWMUs and AOCs to be investigated had been finalized between the Army and NYSDEC/EPA and includes 20 No-Action SWMUs and 52 sites that were declared AOCs. The classification of all remaining SWMUs was presented in the final SWMU Classification Report (Parsons ES, 1994). Since this time, the Army had been investigating the AOCs that pose the greatest potential risk to human health and the environment on a worst-first basis. In response to the BRAC closure process, the Army has refocused its efforts by investigating and evaluating sites that are located within parcels that have the greatest reuse potential. This effort was required in order to encourage the reuse of the facility through land transfer or lease of as much of the Depot as possible prior to the end of the military mission at the Depot. The Army will still continue to close sites after the military mission is complete.

The BRAC process required a reassessment of all known and suspected waste disposal sites within the Depot. In 1996, the EBS was prepared that involved additional interviews with former employees and field reconnaissance. These efforts identified an additional 25 potential SWMUs.

In an effort to classify these suspected SWMUs, Parsons ES performed sampling during various times.

Although a total of eight (8) sites are included in this Completion Report, sites SEAD-43, 56 and 69 were all combined and investigated as one site. The total number of sites considered in this Completion Report is therefore six (6). All six AOCs were previously investigated in accordance with USEPA, Region II and NYSDEC protocols. ESIs were completed at four (4) AOCs during 1995 as part of the Eight (8) Moderately Low Priority AOCs or the Seven (7) Low Priority AOCs. One AOC, SEAD-52, was investigated in 1994 during finalization of the SWMU Classification report. The final AOC, SEAD-120B, was recently investigated as part of the effort to confirm the information and suspicions gathered during the preparation of the EBS. **Table 1.1-1** presents the AOCs that were considered in this document.

1.1.1 General Description

SEDA is located approximately 40 miles south of Lake Ontario, near Romulus, New York (**Figure 1.1-2**). The depot lies immediately west of the village of Romulus, NY, 12 miles south of the villages of Waterloo and Seneca Falls, and 2.5 miles north of the village of Ovid, NY (**Figure 1.1-2**). The nearest major cities are Rochester, NY and Syracuse, NY located 60 miles northwest and northeast, respectively. The facility is located in an uplands area, at an elevation of approximately 600 feet Mean Sea Level (MSL), that forms a divide separating two of the New York Finger Lakes, Cayuga Lake on the east and Seneca Lake on the west. Sparsely populated farmland covers most of the surrounding area. New York State Highways 96 and 96A adjoin SEDA on the east and west boundaries, respectively. **Figure 1.1-3** presents a plan view of SEDA.

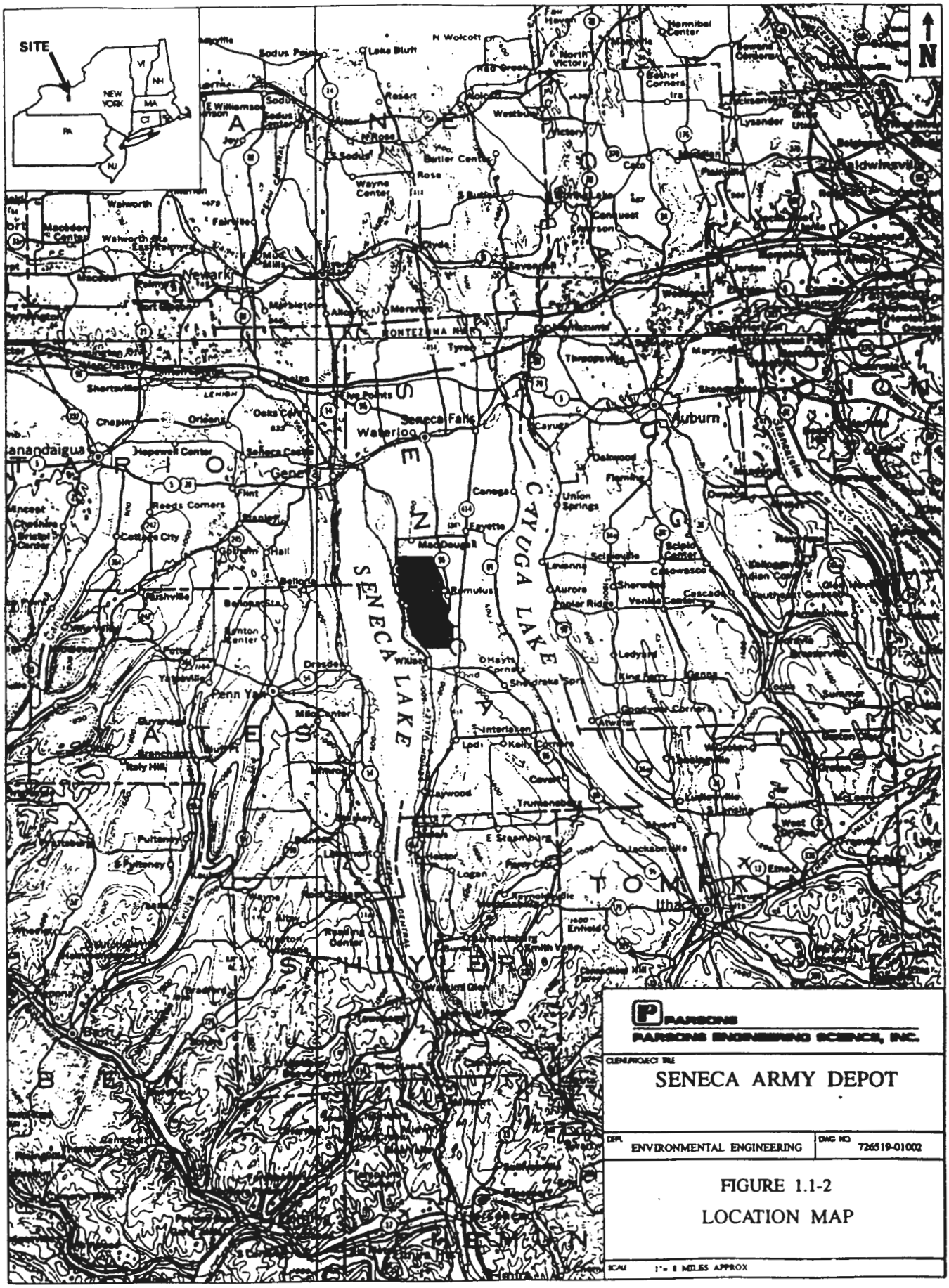
1.1.1.1 Regional Geologic Setting

The Finger Lakes uplands area is underlain by a broad north-to-south trending series of rock terraces mantled by glacial till. As part of the Appalachian Plateau, the region is underlain by a tectronically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones. **Figure 1.1-4** shows the regional geology of Seneca County. In the vicinity of SEDA, Devonian age (385 million years bp) rocks of the Hamilton group are monoclinally folded and dip gently to the south (**Figure 1.1-5**). No evidence of faulting or

TABLE 1.1-1
SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

AREA OF CONCERN	DESCRIPTION	DATE of FIELD INVESTIGATION	REFERENCE REPORT
SEAD-43	Building 606-Old Missile Propellant Test Laboratory	March - July, 1994	ESI for Eight Moderately Low Priority Sites (December 1995)
SEAD-56	Building 606-Herbicide and Pesticide Storage	March - July, 1994	ESI for Eight Moderately Low Priority Sites (December 1995)
SEAD-69	Building 606-Disposal Area	March - July, 1994	ESI for Eight Moderately Low Priority Sites (December 1995)
SEADs 44A	Quality Assurance Test Laboratory (West of Building 616)	March - July, 1994	ESI for Eight Moderately Low Priority Sites (December 1995)
SEAD-44B	Quality Assurance Test Laboratory (Brady Road)	March - July, 1994	ESI for Eight Moderately Low Priority Sites (December 1995)
SEAD-52	Ammunition Breakdown Area	December 1993	SWMU Classification Report (June 1994)
SEAD-62	Nicotine Sulfate Disposal Area	June - July, 1994	ESI for Seven Low Priority Sites (April 1995)
SEAD-120B	Ovid Road Small Arms Range	March, 1998	Investigation of Moderate Non-Evaluated EBS Sites (May 1998)

Note: SEAD-43, SEAD-56, and SEAD-69 are included as one AOC for the CR.



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SENECA ARMY DEPOT

DEPT. ENVIRONMENTAL ENGINEERING

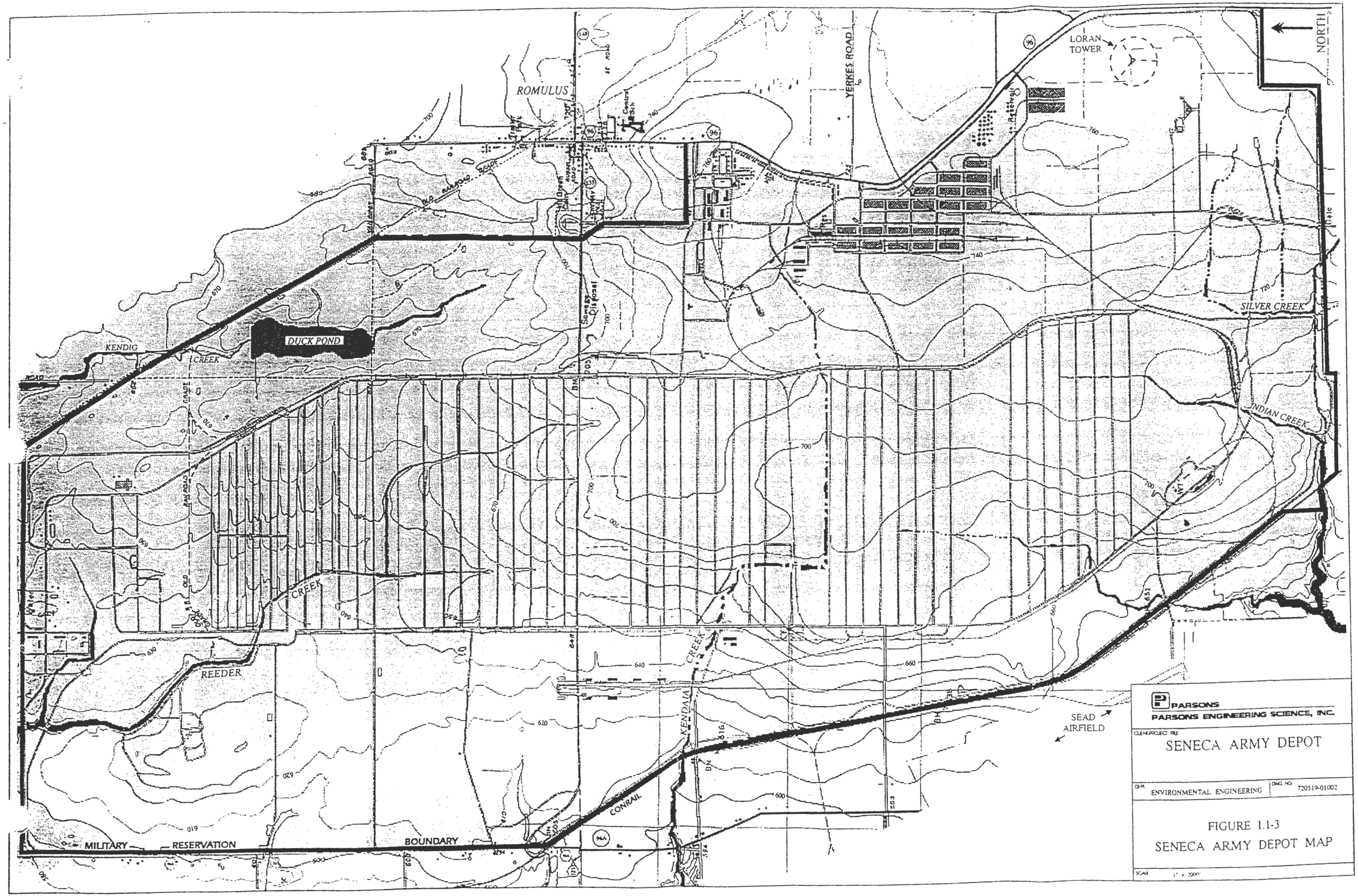
DWG NO. 726519-01002

FIGURE 1.1-2

LOCATION MAP

SCALE 1" = 8 MILES APPROX

R:\GRAPHICS\SENECA\LOCMAP.CDR(CVM)



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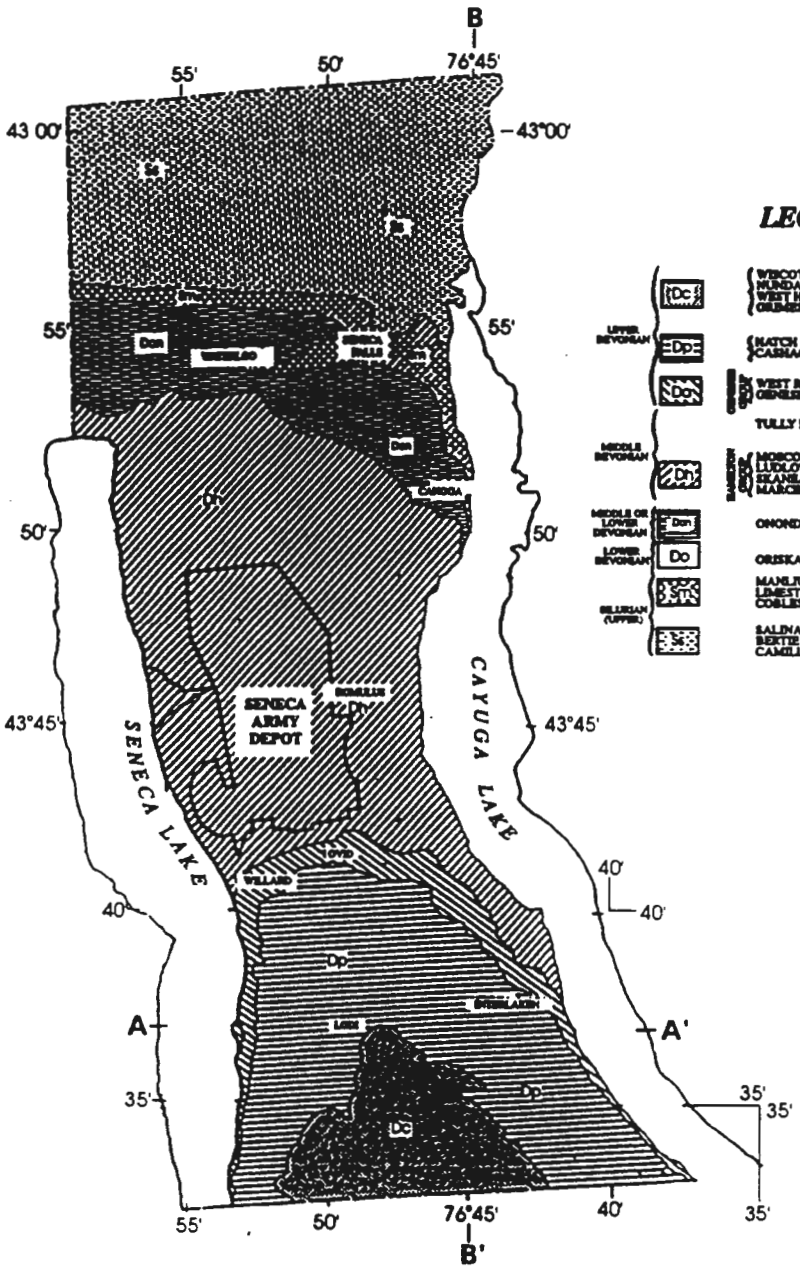
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT

DEPT. ENVIRONMENTAL ENGINEERING | DWG NO. 720519-01002

FIGURE 1.1-3
SENECA ARMY DEPOT MAP

SCALE 1" = 2000'



SOURCE: MODIFIED FROM-THE GROUND WATER RESOURCES OF SENECA COUNTY, NEW YORK: MOZOLA, A.J., BULLETIN GW-26, ALBANY, NY, 1951

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SENECA ARMY DEPOT

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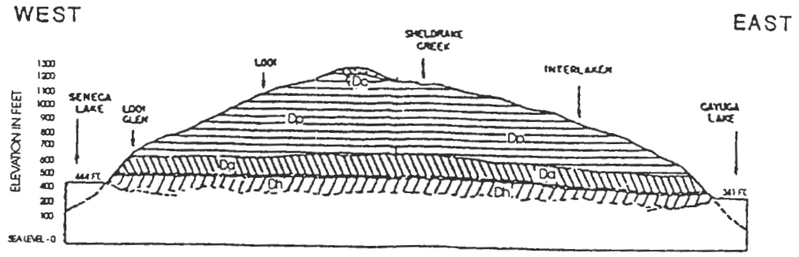
DWG NO: 726519-01002

FIGURE 1.1-4

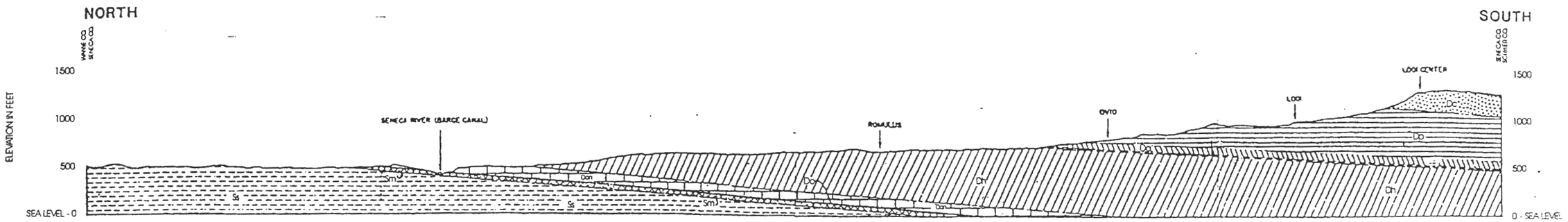
GEOLOGIC MAP OF SENECA COUNTY

SCALE: 1" = 5 MILES

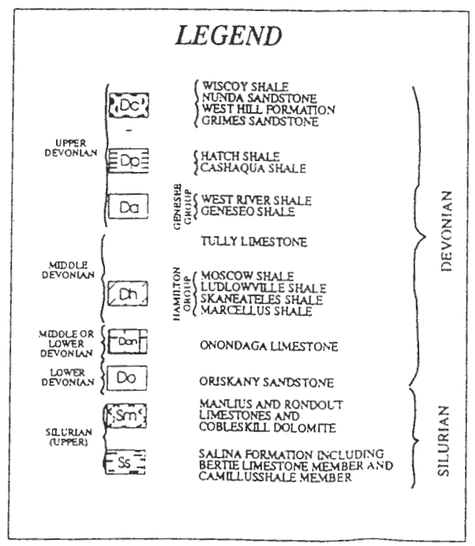
R:\GRAPHICS\SENECA\GEOLOGIC.CDR(CVM)



EAST-WEST SECTION ALONG A-A'



NORTH-SOUTH SECTION ALONG 76°50' (B-B')



SCALE
1 0 1 2 3 MILES

SOURCE:MODIFIED FROM-THE GROUND WATER RESOURCES OF SENECA COUNTY, NEW YORK: MOZOLA, A.J., BULLETIN GW-26, ALBANY, NY, 1951

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DEPT: ENVIRONMENTAL ENGINEERING | DWG. NO: 726519-01002

FIGURE 1.1-5

REGIONAL GEOLOGIC CROSS SECTIONS

SCALE: 1" = 12,000 MILES APPROXIMATE

R:\GRAPHICS\SENECA\GEOXSEC.CDR(CVM)

folding is present. The Hamilton Group is a sequence of limestones, calcareous shales, siltstones, and sandstones.

These rocks were deposited in a shallow inland sea at the north end of the Appalachian Basin (Gray, 1991). Terrigenous sediments from topographic highs associated with the Arcadian landmass of Western New England, eastern New York and Pennsylvania were transported to the west across a marine shelf (Gray, 1991). These sediments were deposited in a northeast-southwest trending trough whose central axis was near what is now the Finger Lakes (Gray, 1991).

The Hamilton Group, 600 to 1,500 feet thick, is divided into four formations. They are, from oldest to youngest, the Marcellus, Skaneateles, Ludlowville, and Moscow formations. The western portion of SEDA is generally located in the Ludlowville Formation while the eastern portion is located in the younger Moscow Formation. The Ludlowville and Moscow formations are characterized by gray, calcareous shales and mudstones and thin limestones with numerous zones of abundant invertebrate fossils that form geographically widespread encrinites, coral-rich layers, and complex shell beds. The Ludlowville Formation is known to contain brachiopods, bivalves, trilobites, corals and bryozoans (Gray, 1991). In contrast, the lower two formations (Skaneateles and Marcellus) consist largely of black and dark gray sparsely fossiliferous shales (Brett et al., 1991). Locally, the shale is soft, gray, and fissile. **Figure 1.1-6** displays the stratigraphic section of Paleozoic rocks of Central New York. The shale is extensively jointed and weathered at the contact with overlying tills. Joint spacings are 1 inch to 4 feet in surface exposures. Prominent joint directions are N 60° E, N 30° W, and N 20° E, with the joints being primarily vertical. Corings performed on the upper 5 to 8 feet of the bedrock revealed low Rock Quality Designations (RQD's), i.e., less than 5 percent with almost 100 percent recovery (Metcalf & Eddy, 1989), suggesting a high degree of weathering.

Pleistocene age (Wisconsin event, 20,000 bp) glacial till deposits overlie the shales. **Figure 1.1-7**, the physiography of Seneca County, presents an overview of the subsurface sediments present in the area. The site is shown on as lying on the western edge of a large glacial till plain between Seneca Lake and Cayuga Lake. The till matrix, the result of glaciation, varies locally but generally consists of horizons of unsorted silt, clay, sand, and gravel. The soils at the site contain varying amounts of inorganic clays, inorganic silts, and silty sands. In the central and eastern portions of SEDA, the till is thin and bedrock is exposed or within 3 feet of the surface. The thickness of the glacial till deposits at SEDA generally ranges from 1 to 15 feet.

MESOZOIC	Lower Cretaceous		MESOZOIC INTRUSIVES Kimberlite and alnoite dikes and diatremes
PALEOZOIC	Upper Devonian		CONNEAUT GROUP 600-1000 ft. (180-300 m.) Germania Formation—shale, sandstone; Whitesville Formation—shale, sandstone; Hinsdale Sandstone; Wellsville Formation—shale, sandstone; Cuba Sandstone.
			CANADAWAY GROUP 800-1200 ft. (240-370 m.) Machias Formation—shale, siltstone; Rushford Sandstone; Canadea, Canisteo, and Hume Shales; Canaseraga Sandstone; South Wales and Dunkirk Shales; in Pennsylvania: Towanda Formation—shale, sandstone.
			JAVA GROUP 300-700 ft. (90-210 m.) Wiscoy Formation—sandstone, shale; Hanover and Pipe Creek Shales.
			WEST FALLS GROUP 1100-1600 ft. (340-490 m.) Nunda Formation—sandstone, shale. West Hill and Gardeau Formations—shale, siltstone; Rorieks Glen Shale; upper Beers Hill Shale; Grimes Siltstone. lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales. Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale. "New Milford" Formation—sandstone, shale. Gardeau Formation—shale, siltstone; Rorieks Glen Shale. Slide Mountain Formation—sandstone, shale, conglomerate. Beers Hill Shale; Grimes Siltstone, Dunn Hill, Millport, and Moreland Shales
			SONYEA GROUP 200-1000 ft. (60-300 m.) In west: Cashaqua and Middlesex Shales. In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.
			GENESEE GROUP AND TULLY LIMESTONE 200-1000 ft. (60-300 m.) West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone. Ongonta Formation—shale, sandstone. Unadilla Formation—shale, siltstone. Tully Limestone.
		Middle Devonian	HAMILTON GROUP 600-1500 ft. (180-460 m.) Moscow Formation—in west: Windom and Kashong Shales, Menteth Limestone Members; in east: Cooperstown Shale Member, Portland Point Limestone Member. Ludlowville Formation—in west: Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shale Members, Centerfield Limestone Member. In east: King Ferry Shale and other members, Stone Mill Sandstone Member. Skaneateles Formation—in west: Levanna Shale and Stafford Limestone Members; in east: Butternut, Pompey, and Delphi Station Shale Members, Moltville Sandstone Member. Marcellus Formation—in west: Oatka Creek Shale Member; in east: Cardiff and Chittenango Shale Members, Cherry Valley Limestone and Union Springs Shale Members. Panther Mountain Formation—shale, siltstone, sandstone.
			ONONDAGA LIMESTONE AND ORISKANY SANDSTONE 75-150 ft. (23-45 m.) Onondaga Limestone—Seneca, Moorehouse (cherty) and Nedrow Limestone Members. Edgecliff cherty Limestone Member, local bioherms. Oriskany Sandstone.
		Lower Devonian	HELDERBERG GROUP 0-200 ft. (0-60 m.) Coeymans and Manlius Limestones; Rondout Dolostone.
			AKRON DOLOSTONE, COBLESKILL LIMESTONE, AND SALINA GROUP 700-1000 ft. (210-300 m.) Akron Dolostone; Bertie Formation—dolostone, shale. Camillus and Syracuse Formations—shale, dolostone, gypsum, salt. Cobleskill Limestone; Bertie and Camillus Formations—dolostone, shale. Syracuse Formation—dolostone, shale, gypsum, salt. Vernon Formation—shale, dolostone.
		Upper Silurian	LOCKPORT GROUP 80-175 ft. (25-55 m.) Oak Orchard and Penfield Dolostones, both replaced eastwardly by Scenondoa Formation—limestone, dolostone.
		Lower Silurian	CLINTON GROUP 150-325 ft. (40-100 m.) Decew Dolostone; Rochester Shale. Irondequoit Limestone; Williamson Shale; Wolcott Furnace Hematite; Wolcott Limestone; Sodus Shale; Bear Creek Shale; Wallington Limestone; Furnaceville Hematite; Maplewood Shale; Kodak Sandstone. Herkimer Sandstone; Kirkland Hematite; Willowvale Shale; Westmoreland Hematite; Sauquoit Formation—sandstone, shale; Oneida Conglomerate.
			MEDINA GROUP AND QUEENSTON FORMATION 0-900 ft. (0-270 m.) Medina Group: Grimsby Formation—sandstone, shale. Queenston Formation—shale, siltstone. Undifferentiated Medina Group and Queenston Formation.
		Upper Ordovician	LORRAINE GROUP 700-900 ft. (210-270 m.) Oswego Sandstone. Pulaski and Whetstone Gulf Formations—siltstone, shale
	Middle Ordovician		TRENTON GROUP 100-300 ft. (30-90 m.) Utica Shale

Hamilton group		
Moscow shale	140±	Lower two-thirds of section is a fossiliferous, soft gray calcareous shale; upper third highly friable but less calcareous and fossiliferous. Staining by iron oxide very common. Concretions present in greater abundance in lower beds, but irregular calcareous masses occur throughout section. Joints parallel, tightly sealed, trending N.85°E. and N.25°-30°W.
Ludlowville shale	140±	Lower beds are thinly laminated, light-colored, fossiliferous, shaly passage beds; overlain by hard calcareous black shales 13 to 30 centimeters thick and rich in corals and brachiopods; hard layers responsible for falls and cascades. Middle beds are less fossiliferous, soft gray argillaceous shales, rich in concretions, calcareous lenses, and occasional thin sandstone layers. Upper beds (Tichenor limestone member) are thin, irregularly bedded gray shales becoming light blue gray upon exposure, calcareous, coarsely textured, and fossiliferous. Joints parallel 8 to 50 centimeters apart, well developed but tight.
Skaneateles shale	185±	Basal beds composed of dark fissile shale. Upper shale more calcareous, grayish to bluish impure limestone layers. Joint pattern N.75°E. and N.30°W.; diagonal joints N.50°E. Joints sealed, parallel and spaced 15 centimeters to 1.2 meters apart.
Marcellus shale	50	Black, platelike, bituminous shale with occasional limestone layers in sequence, and containing zones rich in iron sulfides or calcareous concretions, often with septarian structures; very fissile, iron-stained and gray when weathered. Joint pattern N.25°W., N.65°E., 2.5 centimeters to 1.2 meters apart.

SOURCE: MODIFIED FROM THE GROUND WATER RESOURCES OF SENECA COUNTY, NEW YORK: MOZOLA, A.J., BULLETIN GW-26, ALBANY, NY, 1951

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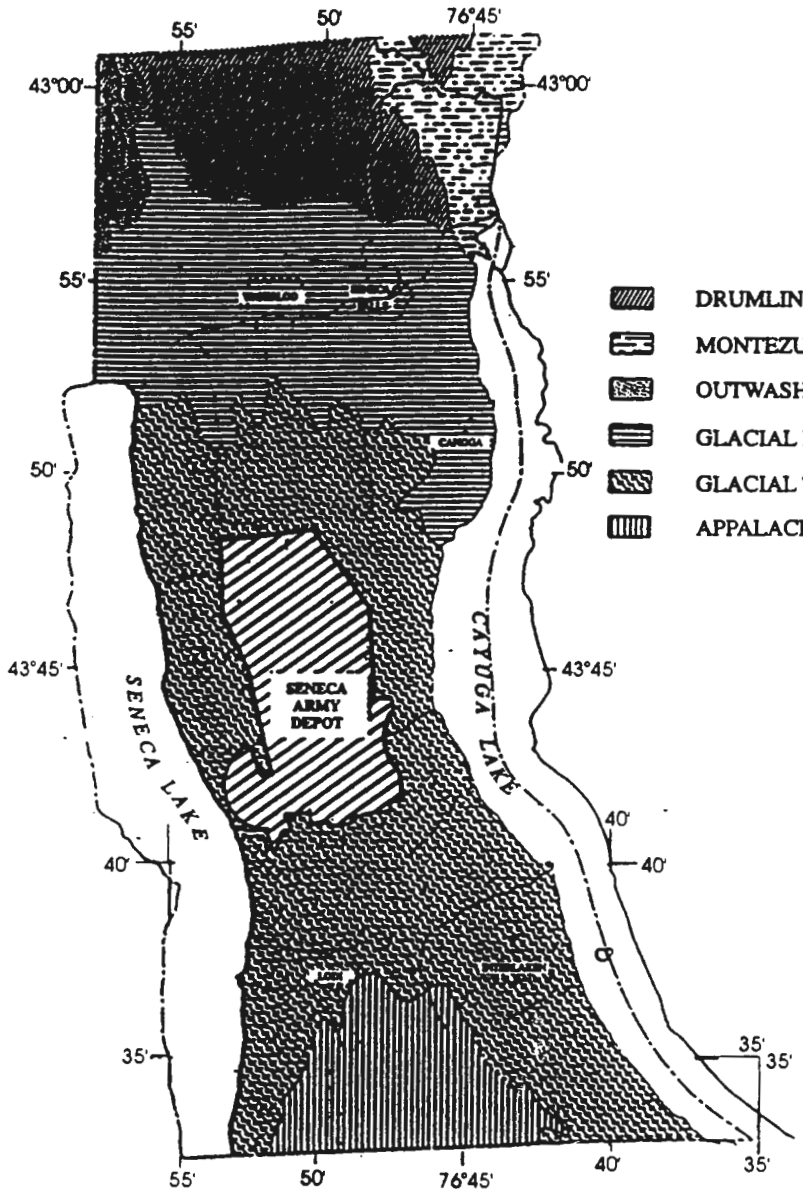
FIGURE 1.1-6
BEDROCK STRATIGRAPHIC COLUMN

SCALE

R:\GRAPHICS\SENECA\BEDSTRAT.CDR (CYM)



SOURCE: MODIFIED FROM-THE GROUND WATER RESOURCES OF SENECA COUNTY, NEW YORK: MOZOLA, A.J., BULLETIN GW-26, ALBANY, NY, 1951

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DEPT: ENVIRONMENTAL ENGINEERING | DWG NO: 726519-01002

FIGURE 1.1-7

PHYSIOGRAPHIC MAP OF SENECA COUNTY

SCALE: 1" = 5 MILES

R:\GRAPHICS\SENECA\PHYS1O.CDR(CVM)

Darien silt-loam soils, 0 to 18 inches thick, have developed over Wisconsin age glacial tills. These soils are developed on glacial till where they overlie the shale. In general, the topographic relief associated with these soils is from 3 to 8 percent. **Figure 1.1-8** presents the U.S. Department of Agriculture (USDA) General Soil map for Seneca County.

Regional background elemental concentrations for soils from the Finger Lakes area of New York State are not available. However, elemental concentrations for soils from the eastern United States and in particular, New York State are available. **Table 1.1-2** cites data on the eastern United States from a United States Geological Survey (USGS) professional paper (Shacklette and Boerngen, 1984) and data on the New York State soils from a NYSDEC report.

1.1.1.2 Regional Hydrogeologic Setting

Regionally, four distinct hydrologic units have been identified within Seneca County (Mozola A.J., 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift. Overall, the groundwater in the county is very hard, and therefore, the quality is minimally acceptable for use as potable water.

Approximately 95 percent of the wells in the county are used for domestic or farm supply and the average daily withdrawal is approximately 500 gallons, an average rate of 0.35 gallons per minute (gpm). About five percent of the wells in the county are used for commercial, industrial, or municipal purposes. Seneca Falls and Waterloo, the two largest communities in the county, are in the hydrogeologic region which is most favorable for the development of a groundwater supply. However, because the hardness of the groundwater is objectionable to the industrial and commercial establishments operating within the villages, both villages utilize surface water (Cayuga Lake and Seneca River, respectively) as their municipal supplies. The villages of Ovid and Interlaken, both of which are without substantial industrial establishments, utilize groundwater as their public water supplies. Ovid obtains its supply from two shallow gravel-packed wells, and Interlaken is served by a developed seepage-spring area.

Regionally, the water table aquifer of the unconsolidated surficial glacial deposits of the region would be expected to flow in a direction consistent with the ground surface elevations. Geologic cross-sections from Seneca Lake and Cayuga Lake have been constructed by the State of New York, (Mozola, 1951, and Crain, 1974). This information suggests that a groundwater divide exists

N

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SCALE IN MILES
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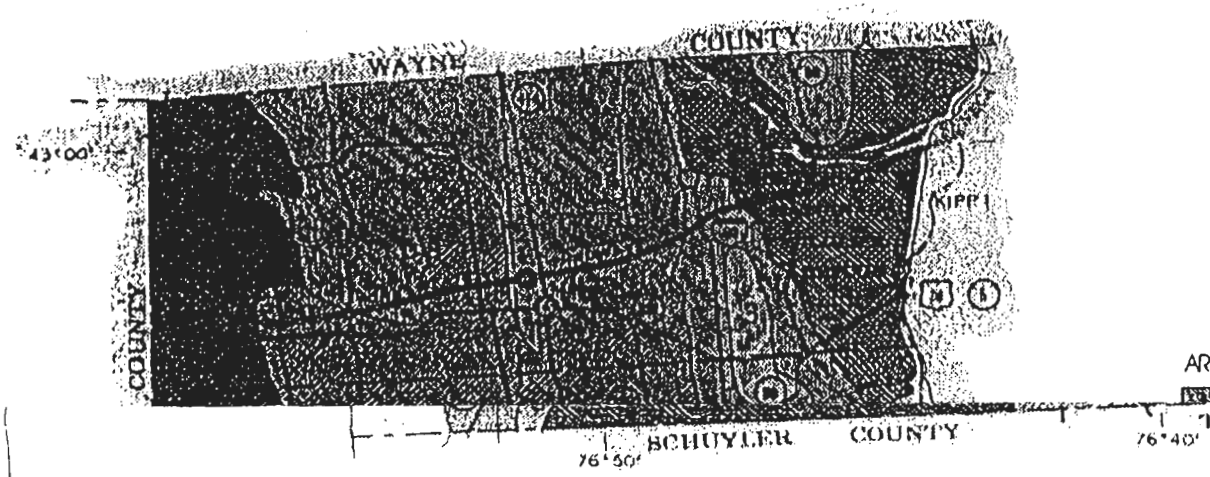

SOIL ASSOCIATIONS

AREAS DOMINATED BY HIGH-LIME SOILS DEVELOPED IN GLACIAL TILL

Ontario-Ovid association: Deep, well-drained to somewhat

SOURCE: U.S. DEPARTMENT OF ARGRICULTURE
SOIL CONSERVATION SERVICE
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

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FIGURE 1.1-8
GENERAL SOIL MAP
SENECA COUNTY, NEW YORK

SCALE 1" = 2000'

R:\GRAPHICS\SENECA\COURSOIL.CDR(CVM)

TABLE 1.1-2
BACKGROUND CONCENTRATIONS OF ELEMENTS IN SOILS OF THE EASTERN UNITED STATES WITH SPECIFIC DATA FOR NEW YORK STATE
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT

ELEMENT	CONCENTRATION RANGE (mg/kg)	GEOGRAPHIC LOCATION	MAXIMUM CONCENTRATION AT 6 AOCs (mg/kg)
Aluminum	7,000 - 100,000 1,000 - 25,000	Eastern U.S. (2) Albany Area (1)	27000
Arsenic	< 0.1 - 73 3 - 12 < 0.1 - 6.5	Eastern U.S. (2) New York State (1) Albany Area (1)	13.1
Barium	10 - 1,500 15 - 600 250 -350	Eastern U.S. (2) New York State (1) Albany Area (1)	202
Beryllium	1 - 7 0 - 1.75 0 - 0.9	Eastern U.S. (2) New York State (1) Albany Area (1)	1.2
Cadmium	Not Available 0.0001 - 1.0	Eastern U.S. (2) No Region Specified (1)	
Calcium	100 - 280,000 130 - 35,000 150 - 5,000 2,900 - 6,500	Eastern U.S. (2) New York State (1) Albany Area (1) Albany Area (1)	1.5
Chromium	1 - 1,000 1.5 - 40 1.5 - 25	Eastern U.S. (2) New York State (1) Albany Area (1)	30.7
Cobalt	< 0.3 - 70 2.5 - 60 2.5 - 6	Eastern U.S. (2) New York State (1) Albany Area (1)	20.9
Copper	< 1 - 700 < 1 - 15	Eastern U.S. (2) Albany Area (1)	212
Iron	100 - 100,000 17,000 - 25,000	Eastern U.S. (2) Albany Area (1)	40300
Lead	> 10 - 300 1 - 12.5	Eastern U.S. (2) Albany Area (1)	522
Magnesium	50 - 50,000 2,500 - 6,000 1,700 - 4,000	Eastern U.S. (2) New York State (1) Albany Area (1)	47500
Manganese	> 2 - 7,000 50 - 5,000 400 - 600	Eastern U.S. (2) New York State (1) Albany Area (1)	956
Mercury	0.01 - 3.4 0.042 - 0.066	Eastern U.S. (2) Albany Area (1)	0.17
Nickel	< 5 - 700 19.5 (mean)	Eastern U.S. (2) New York State (1) (no range available)	57.2
Potassium	50 - 37,000 47.5 - 117.5	Eastern U.S. (2) New York State (1)	3560
Selenium	> 0.1 - 3.9 Not Available	Eastern U.S. (2) No New York State Data Given (1)	1.8
Sodium	500 - 50,000 Not Available	Eastern U.S. (2) No New York State Data Given (1)	164
Vanadium	> 7 - 300 Not Available	Eastern U.S. (2) No New York State Data Given (1)	41.8

TABLE 1.1-2
BACKGROUND CONCENTRATIONS OF ELEMENTS IN SOILS OF THE EASTERN UNITED STATES WITH SPECIFIC DATA FOR NEW YORK STATE
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT

ELEMENT	CONCENTRATION RANGE (mg/kg)	GEOGRAPHIC LOCATION	MAXIMUM CONCENTRATION AT 6 AOCs (mg/kg)
Zinc	> 5 - 2,900 37 - 60	Eastern U.S. (2) Albany Area (1)	338

Notes:

1. (1) Source: McGovern, Carol E., Background Concentrations of 20 Elements in Soils with Special Regard for New York State, Wildlife Resources Center, New York Department of Environmental Conservation, Delmar, New York 12054, No Date.
2. (2) Source: Shacklette, H.T. and Boerngen, J.G., 1984, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S.G.S. Prof Paper 1270, Washington.
3. The data are for areas where surficial materials are thought to be uncontaminated, undisturbed, or areas far from pollution sources.

approximately half way between the two finger lakes. SEDA is located on the western slope of this divide and therefore regional groundwater flow is expected to be primarily westward toward Seneca Lake.

A substantial amount of information concerning the hydrogeology of the area has been compiled by the State of New York, (Mozola, 1951). No other recent state sponsored hydrogeological report is available for review. This report has been reviewed in order to better understand the hydrogeology of the area surrounding SEDA. The data indicates that within a four (4) mile radius of the site a number of wells exist from which geologic and hydrogeologic information has been obtained. This information includes: 1) the depth; 2) the yield; and 3) the geological strata the wells were drilled through. Although the information was compiled in the 1950s, these data are useful in providing an understanding and characterization of the aquifers present within the area surrounding SEDA. A review of this information suggests that three geologic units have been used to produce water for both domestic and agricultural purposes. These units include: 1) a bedrock aquifer, which in this area is predominantly shale; 2) an overburden aquifer, which includes Pleistocene deposits (glacial till); and 3) a deep aquifer present within beds of limestone in the underlying shale. The occurrence of water derived from limestone is considered to be unusual for this area and is more commonplace to the north of SEDA. The limestone aquifer in this area is between 100 and 700 feet deep. As of 1957, twenty-five wells utilized water from the shale aquifer, six wells tapped the overburden aquifer, and one used the deep limestone as a source of water.

For the six wells that utilized groundwater extracted from the overburden, the average yield was approximately 7.5 gpm. The average depth of these wells were 36 feet. The geologic material which comprises this aquifer is generally Pleistocene till, with the exception of one well located northeast of the site. This well penetrates an outwash sand and gravel deposit. The yields from the five overburden wells ranged from 4 to 15 gpm. The well located in the outwash sand and gravel deposit, drilled to 60 feet, yielded only 5 gpm. A 20-foot hand dug well, located southeasterly of the outwash well, yielded 10 gpm.

The geologic information reviewed indicates that the upper portions of the shale formation would be expected to yield small, yet adequate, supplies of water, for domestic use. For mid-Devonian shales such as those of Hamilton group, the average yields, (which are less than 15 gpm), are consistent with what would be expected for shales (LaSala, 1968). The deeper portions of the bedrock, (at depths greater than 235 feet) have provided yields up to 150 gpm. At these depths, the

high well yields may be attributed to the effect of solution on the Onondaga limestone which is at the base of the Hamilton Group. Based on well yield data, the degree of solution is affected by the type and thickness of overlying material (Mozola, 1951). Solution effects on limestones (and on shales which contain gypsum) in the Erie-Niagara have been reported by LaSala (1968). This source of water is considered to comprise a separate source of groundwater for the area. Very few wells in the region adjacent to SEDA utilize the limestone as a source of water, which may be due to the drilling depths required to intercept this water.

1.1.1.3 Local Geology

The Depot geology is characterized by gray Devonian shale with a thin weathered zone where it contacts the overlying mantle of Pleistocene glacial till. This stratigraphy is consistent over the entire site.

The predominant surficial geologic unit present is dense glacial till. The till is distributed across the entire Depot and ranges in thickness from less than 2 feet to as much as 15 feet although it is generally only a few feet thick. The till is generally characterized by brown to gray-brown silt, clay and fine sand with few fine to coarse gravel-sized inclusions of weathered shale. Larger diameter weathered shale clasts (as large as 6-inches in diameter) are more prevalent in basal portions of the till and are probably ripped-up clasts removed by the active glacier. The general Unified Soil Classification System (USCS) description of the till on-site is as follows: Clay-silt, brown; slightly plastic, small percentage of fine to medium sand, small percentage of fine to coarse gravel-sized gray shale clasts, dense and mostly dry in place, till, (ML). Grain size analyses performed by Metcalf & Eddy (1989) at the Open Burning Grounds site on glacial till samples collected during the installation of monitoring wells show a wide distribution of grain sizes. Generally, the glacial till has a high percentage of silt and clay with trace amounts of fine gravel. Another study, conducted at the same site by the United States Army Environmental Hygiene Agency (USAEHA) determined the porosity of five gray-brown silty clay (i.e., till) samples. The porosity's ranged from 34.0 percent to 44.2 percent with an average of 37.3 percent (USAEHA Hazardous Waste Study No. 37-26-0479-85).

Darian silt-loam soils, 0 to 18 inches thick, have developed over the till, however, in some locations, the agricultural soils have been eroded away and the till is exposed at the surface. The

surficial soils are poorly drained and have a silt clay loam and clay subsoil. In general, the topographic relief associated with these soils is from 3 to 8%.

A zone of gray weathered shale of variable thickness is present below the till in almost all locations drilled at SEDA. This zone is characterized by fissile shale with a large amount of brown interstitial silt and clay.

The bedrock underlying the site is composed of the Ludlowville Formation of the Devonian age Hamilton Group. Merin (1992) also cites three prominent vertical joint directions of northeast, north-northwest, and east-northeast in outcrops of the Genesse Formation 30 miles southeast of SEDA near Ithaca, New York. Three predominant joint directions, N60°E, N30°W, and N20°E are present within this unit (Mozola, 1952). These joints are primarily vertical. The Hamilton Group is a gray-black, calcareous shale that is fissile and exhibits parting (or separation) along bedding planes.

1.1.1.4 Local Hydrology/Hydrogeology

Surface drainage from SEDA flows to four creeks. In the southern portion of the depot, the surface drainage flows through ditches and streams into Indian and Silver Creeks. These creeks then flow into Seneca Lake just south of the SEDA airfield. The central part and administration area of SEDA drain into Kendaia Creek. Kendaia Creek discharges into Seneca Lake near the Lake Housing Area. The majority of the northwestern and north-central portion of SEDA drain into Reeder Creek. The northeastern portion of the depot, which includes a marshy area called the Duck Ponds, drains into Kendaia Creek and then flows north into the Cayuga-Seneca Canal and to Cayuga Lake.

Characterization of the local hydrogeology is based upon hydrogeological information obtained from previous site investigations. USATHAMA (1989) conducted single-well aquifer tests (slug tests) in the Ash Landfill area to estimate the hydraulic conductivity of the water-bearing materials underlying the site. The slug tests were performed on five shallow groundwater monitor wells (PT-11, PT-12, PT-15, PT-21 and PT-23) screened in the overburden and upper (weathered) portion of the bedrock. Slug test data were analyzed according to the method developed by Bouwer and Rice (1976). The hydraulic conductivity values generated from the slug test analysis were used in conjunction with an estimate of soil porosity and the calculated groundwater flow gradient to

develop an estimate for the average groundwater flow rate at the Ash Landfill site. Excluding PT-21, which had an unusually low hydraulic conductivity value of 5.87 x 10^{-11} centimeters per second (cm/sec) (1.66 x 10^{-7} ft/day), the average hydraulic conductivity, as determined by the slug test analysis, was 2.06 x 10^{-4} cm/sec (0.587 ft/day). Typical tight clay soils have hydraulic conductivity values that range from 3.53 x 10^{-5} to 3.53 x 10^{-8} cm/sec (Davis, 1969).

The effective porosity of the aquifer at the Ash Landfill site was estimated by ICF to be 11 percent. The average linear velocity of groundwater flow, calculated by ICF, Inc. using Darcy's law, between PT-17 and PT-18 is 2.2 x 10^{-7} ft/sec, 1.9 x 10^{-2} ft/day or, 6.9 feet per year (ft/yr) based on a hydraulic conductivity of 3.3 x 10^{-5} cm/sec (9.33 x 10^{-2} ft/day).

Data from the Ash Landfill site quarterly groundwater monitoring program and previous field investigations indicate that the saturated thickness of the till/weathered shale overburden aquifer is variable, generally ranging between 1 and 8.5 feet. However, the aquifer thickness appears to be influenced by the hydrologic cycle and some monitoring wells dry up completely during portions of the year. Based upon a review of two years of data, the variations of the water table elevations are likely a seasonal phenomenon. The overburden aquifer is thickest during the spring recharge months and thinnest during the summer and early fall. During late fall and early winter, the saturated thickness increases. This cycle of variations in the aquifer thickness appears to be consistent with what would be expected based upon an understanding of the hydrologic cycle. Although rainfall is fairly consistent at SEDA, averaging approximately 3 inches per month, evapotranspiration is a likely reason for the large fluctuations observed in the saturated thickness of the over-burden aquifer.

On-site hydraulic conductivity determinations were performed by M&E (1989) on monitoring wells MW-8 through MW-17 at the Open Burning Grounds. These wells are all screened within the glacial till unit. The data were analyzed according to a procedure described by Hvorslev (1951). The average hydraulic conductivity measured for the ten monitoring wells was 5.0x10^{-1} ft/day (1.8x10^{-4} cm/sec). The hydraulic conductivities ranged from 2.02 x 10^{-2} ft/day (7.06x10^{-6} cm/sec) to 1.47 ft/day (5.19x10^{-4} cm/sec). These hydraulic conductivity measurements were within an order of magnitude agreement with previous results reported by O'Brien and Gere (1984). O'Brien and Gere determined the average hydraulic conductivity of the till material to be approximately 2.8x10^{-1} ft/day (9.9x10^{-5}cm/sec). A comparison of the measured values with the

typical range of hydraulic conductivities for glacial tills indicates that the glacial till at the site is at the more permeable end of typical glacial till values.

Soils samples were collected during the 1984 U.S. Army Environmental Hygiene Agency (USAEHA) Phase IV investigation of the Open Burning Grounds to characterize the permeability of the burning pad soils. Soil permeabilities were measured by recompacting the soil in a mold to 95% standard proctor density. The average permeability for 5 measurements was 1.01×10^{-3} ft/day (3.56×10^{-7} cm/sec). The typical range for glacial tills, described by Freeze and Cherry (1979), is between 3×10^{-1} ft/day (1×10^{-4} cm/sec) and 3×10^{-7} ft/day (1×10^{-10} cm/sec).

1.1.1.5 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). **Figure 1.1-9** summarizes the regional and local land use. 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 is 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 total area of SEDA is 10,587 acres, of which 8,382 are designated storage areas for ammunition, storage and warehouse, and open storage and warehouse. Land use at the depot is

SENECA ARMY DEPOT

SCHOOL

SENECA ARMY AIRFIELD

STATE HOSPITAL

SAMPSON STATE PARK

GOVERNMENT HOUSING

SENECA LAKE

1/2 0 1

SCALE IN MILES

N

LEGEND

Active

Ac Cropland/cropland pasture
Ap Permanent pasture

Inactive

Ai Agriculture inactive

Forestland

Fc Brush cover up to fully stocked poles less than 30 feet
Fn Forest over 30 feet

Water

Wn Natural, any size
Wc Artificial, one acre

Wetlands

Wb Bogs, -shrub wetlands
Ww Wooded wetlands

Public

P All Categories

Residential

Rr Rural hamlet

Shoreline

Rk Shoreline developed

Outdoor Recreation

OR All categories

Transportation

Ta Airport

Source: New York Land Use and Natural Resource Inventory

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FIGURE 1.1-9

REGIONAL/LOCAL LAND USE MAP

SCALE 1" = 2000'

r:\graphics\seneca\basemap\zoning\landuse.dgn(cvm)

controlled by the facility mission. The entire facility has restricted access and is surrounded by chain-link fencing topped with barbed wire. The depot has a roadway network consisting of paved macadam, concrete, and gravel roads totaling approximately 141 miles.

During active military use, the land use was divided into three categories at the depot. The Main Post accounted for 9,832 acres and consists of an exclusion area containing partially buried, reinforced concrete igloos, general storage magazines, and warehouses. The cantonment areas of the facility consist of the North and South Posts. The North Post, at the north end of the Main Post, included troop housing, troop support, and community services. The South Post is located in the southeast portion of the facility near Route 96 and was a developed area containing warehouses, administration buildings, quarters, and community services.

The intended future use of the areas incorporating the six AOCs which are the subject of the Completion Report will be a maximum security prison in a 700-acre area that will encompass these AOCs. This reuse option would involve a public benefit property transfer from the US Army to the NYSDOC. A property transfer by the Army, according to CERCLA, Sections 120 (h)(1),(2), and (3), requires that the prospective owner must be notified that hazardous substances were possibly stored on the parcel, including the quantity and type of the substances that were stored. Under CERCLA, the content of the deed must include a covenant warranting that all remedial actions necessary to protect human health and the environment with respect to any such hazardous substances remaining on the property have been taken before the date of the transfer. In addition, Section 30 of the IAG requires that the Army notify the EPA and NYSDEC at least 90 days prior to any transfer. The Army shall ensure that all response actions undertaken will not be impeded or impaired by the transfer of the property.

1.1.1.6 Climate

Table 1.1-3 summarizes climatological data for the SEDA area. The nearest source of climatological data is the Aurora Research Farm in Aurora, New York which is approximately ten miles east of SEDA on the east side of Cayuga Lake. This research farm is administered by the Northeast Regional Climate Center located at Cornell University in Ithaca, New York. Only precipitation and temperature measurements are available from this location. The other data reported in **Table 1.1-3** were taken either from isopleth drawings from a climatic atlas, or from data collected at Syracuse, New York, which is 40 miles northeast of SEDA. Meteorological data

Table 1.1-3
Climatological Data for Seneca Army Depot Activity
Completion Report for Six Areas of Concern
Seneca Army Depot Activity

MONTH	TEMPERATURE[1] (°F) MAX	MIN	MEAN	PRECIP[1] (in) MEAN	RH[3] (%) MEAN	SUN SHINE[3] (%)	MEAN NUMBER OF DAYS[3] CLEAR	PTLY. CLDY.	CLOUDY
JAN	30.9	14.0	22.5	1.88	70	35	3	7	21
FEB	32.4	14.1	23.3	2.16	70	50	3	6	19
MAR	40.6	23.4	32.0	2.45	70	50	4	7	20
APR	54.9	34.7	44.8	2.86	70	50	6	7	17
MAY	66.1	42.9	54.5	3.17	70	50	6	10	15
JUN	76.1	53.1	64.6	3.70	70	60	8	10	12
JUL	80.7	57.2	69.0	3.46	70	60	8	13	10
AUG	78.8	55.2	67.0	3.18	70	60	8	11	12
SEP	72.1	49.1	60.7	2.95	70	60	7	11	12
OCT	61.2	39.5	50.3	2.80	70	50	7	8	16
NOV	47.1	31.4	39.3	3.15	70	30	2	6	22
DEC	35.1	20.4	27.8	2.57	70	30	2	5	24
ANNUAL	56.3	36.3	46.3	34.33	70	50	64	101	200

PERIOD	MIXING HEIGHT[2] (m)	WIND SPEED[2] (m/s)
Morning (Annual)	650	6
Morning (Winter)	900	8
Morning (Spring)	700	6
Morning (Summer)	500	5
Morning (Autumn)	600	5
Afternoon (Annual)	1400	7
Afternoon (Winter)	900	8
Afternoon (Spring)	1600	8
Afternoon (Summer)	1800	7
Afternoon (Autumn)	1300	7

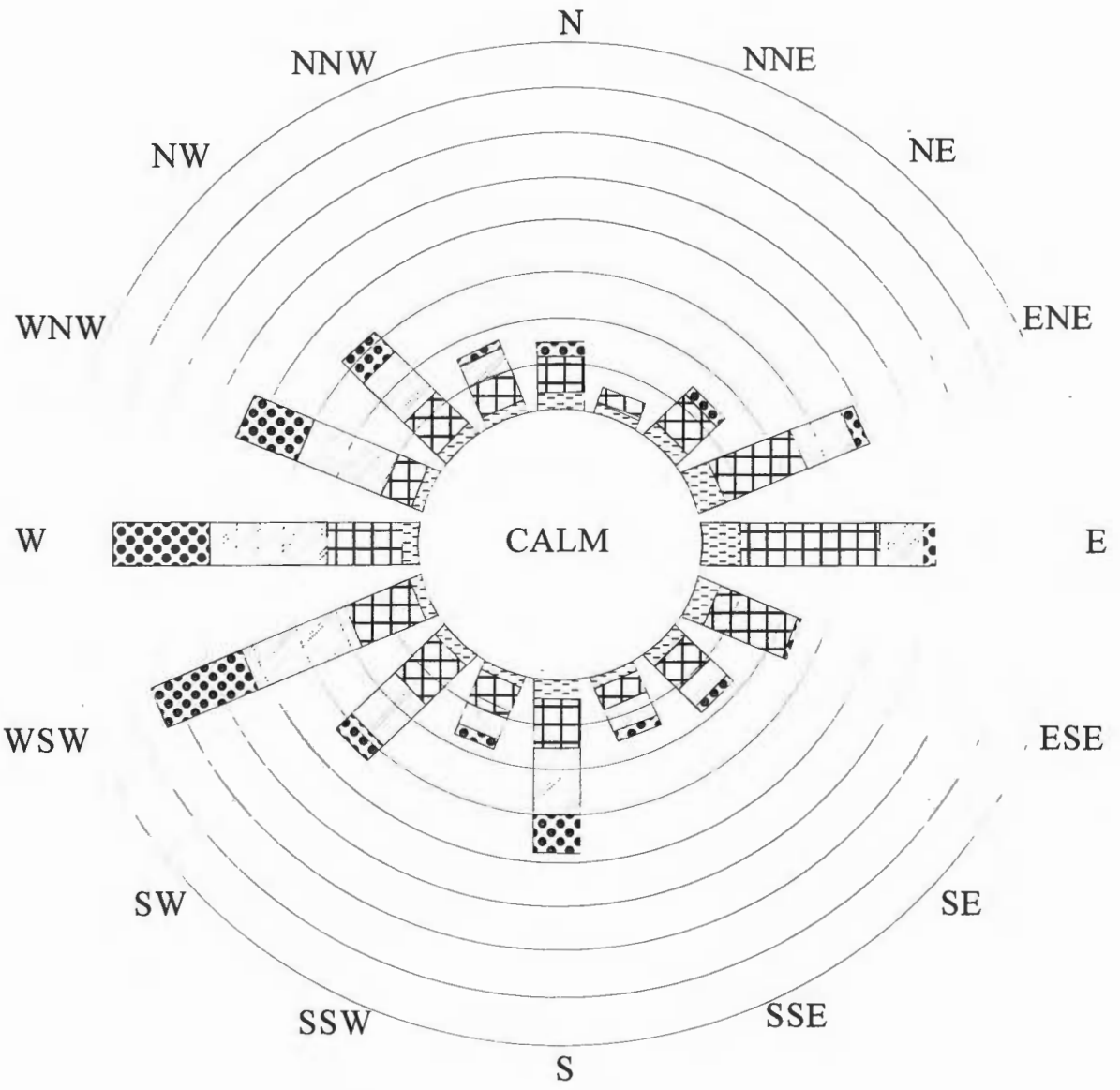
Mean Annual Pan Evaporation[3] (in) : 35
Mean Annual Lake Evaporation[3] (in) : 28
Number of episodes lasting more than 2 days (No. of episode-days)[2] :
Mixing Height < 500 m, wind speed < 2 m/s : 0 (0)
Mixing Height < 1000 m, wind speed < 2 m/s : 0 (0)
Number of episodes lasting more than 5 days (No. of episode-days)[2] :
Mixing Height < 500 m, wind speed < 4 m/s : 0 (0)

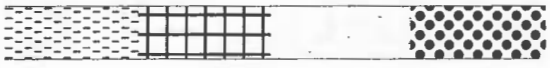
Notes:

[1] Climate of New York Climatography of the United States No. 60 National Oceanic and Atmospheric Administration, June 1982. Data for Ithaca Cornell University, NY.

[2] Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the Contiguous United States. George C. Holzworth, Jan 1972.

[3] Climate Atlas of the United States U.S. Department of Commerce, 1983.
Climate of New York Climatography of the United States No. 60. National Oceanic and Atmospheric Administration, June 1982. Data for Syracuse, NY.





NOTE: EACH DIVISION IS 2% OF TOTAL TIME

INSTALLATION: SENECA ARMY DEPOT
LOCATION OF DATA: SYRACUSE, NEW YORK
SOURCE: MODIFIED FROM:
US ARMY ENVIRONMENTAL
HYGIENE AGENCY

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CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT
REPORT
FOR SIX AREAS OF CONCERN

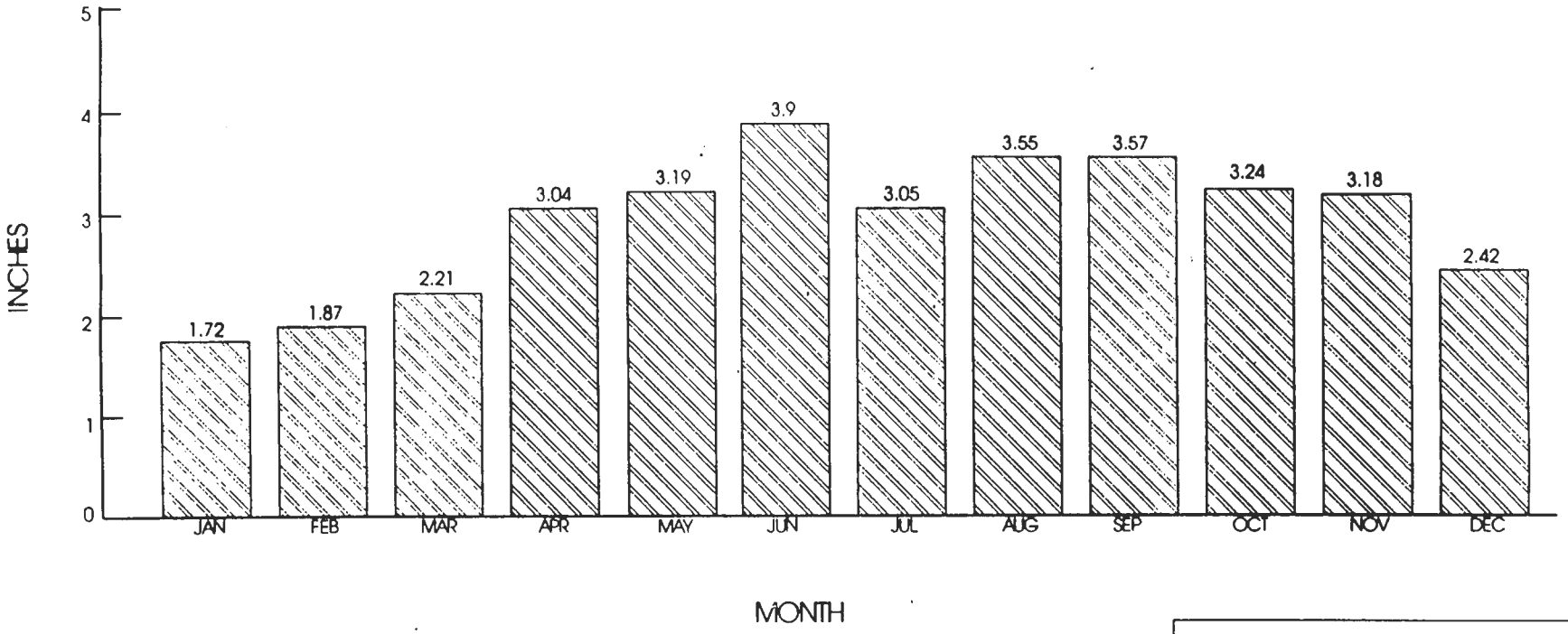
DEPT ENVIRONMENTAL ENGINEERING
DWG NO 734967-01001

FIGURE 1-10

WIND ROSE,
SYRACUSE, NEW YORK

SCALE NA

R:\PROJECT-GRAPHICS\SENECA\S46_57RI\WINDROSE CDR(CV'M)



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SENECA ARMY DEPOT ACTIVITY

COMPLETION REPORT
FOR SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING

DWG NO: 720446-01026

FIGURE 1.1-11

AVERAGE MONTHLY PRECIPITATION IN PROXIMITY OF SENECA ARMY DEPOT ACTIVITY

SCALE: NA

The Buffalo station is nearer to SEDA but almost certainly exhibits influences from Lake Erie. These influences would not be expected to be as noticeable at SEDA.

SEDA is located in the Genesee-Finger Lakes Air Quality Control Region (AQCR). The AQCR is designated as "non-attainment" for ozone and "attainment" or "unclassified" for all other criteria pollutants. Data for existing air quality in the immediate area surrounding the SEDA, however, can not be obtained since the nearest state air quality stations are 40 to 50 miles away from the depot (Rochester of Monroe County or Syracuse of Onondaga County). A review of the data for Rochester, which is in the same AQCR as SEDA, indicates that all monitored pollutants (sulfur dioxide, particulates, carbon monoxide, lead, ozone) are below state and federal limits, with the exception of ozone. In 1987, the maximum ozone concentration observed in Rochester was 0.127 parts per million (ppm). However, this value may not be representative of the SEDA area which is in a more rural area.

1.1.2 Physical Site Setting and History

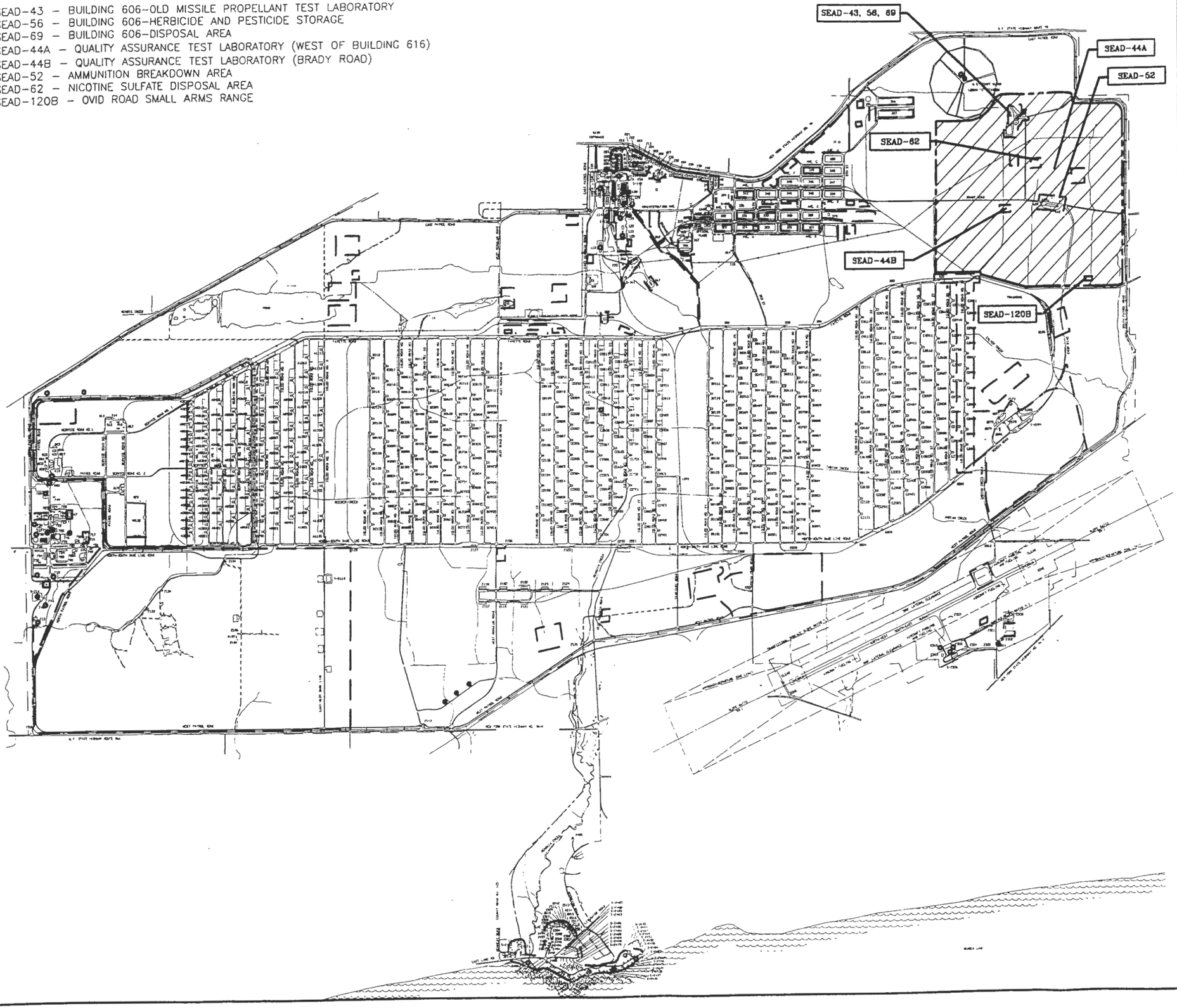
SEDA lies immediately west of the village of Romulus, NY, 12 miles south of the villages of Waterloo and Seneca Falls, and 2.5 miles north of the village of Ovid, NY. The following sections describe the physical site setting for the six (6) AOCs evaluated in this report. **Figure 1.1-12** shows the location of the six AOCs within the SEDA boundary as well as the approximate location of the proposed prison site. **Figure 1.1-13** presents the map legend which describes the symbology utilized in presenting the topological features of SEDA.

1.1.2.1.1 SEADs 43, 56 and 69 - Old Missile Propellant Test Lab, Herbicide/Pesticide Storage, and Building 606 Disposal Area

1.1.2.1.1 Physical Site Setting

SEADs 43, 56 and 69 are located in the southeast corner of the depot (**Figure 1.1-12**). These AOCs will be discussed together due to their association with Building 606. Building 606, was once used as a missile propellant test laboratory (SEAD-43). More recently, Building 606 was used as a pesticide and herbicide storage and mixing facility. An old building foundation, west of Building 606, was used for herbicide and pesticide storage (SEAD-56). A disposal area associated with these operations is also located nearby (SEAD-69). The entire area encompassing the three

SEAD-43 – BUILDING 606-OLD MISSILE PROPELLANT TEST LABORATORY
SEAD-56 – BUILDING 606-HERBICIDE AND PESTICIDE STORAGE
SEAD-69 – BUILDING 606-DISPOSAL AREA
SEAD-44A – QUALITY ASSURANCE TEST LABORATORY (WEST OF BUILDING 616)
SEAD-44B – QUALITY ASSURANCE TEST LABORATORY (BRADY ROAD)
SEAD-52 – AMMUNITION BREAKDOWN AREA
SEAD-62 – NICOTINE SULFATE DISPOSAL AREA
SEAD-120B – OVID ROAD SMALL ARMS RANGE



N

APPROXIMATE BOUNDARY OF LAND TO BE TRANSFERRED FOR PRISON SITE (APPROXIMATELY 700 ACRES)

LEGEND:

SEAD-121B NON-EVALUATED EBS SITE

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
- 8 – PARCEL NUMBER
- (2) – CATEGORY NUMBER
- PS – CONTAMINATION DESCRIPTION: PETROLEUM STORAGE
- PR – PETROLEUM RELEASE OR DISPOSAL
- HS – HAZARDOUS SUBSTANCE STORAGE
- HR – HAZARDOUS SUBSTANCE RELEASE OR DISPOSAL
- (P) – POSSIBLE (UNVERIFIED)

NON-CERCLA ISSUE (QUALIFIED) LABEL DEFINITIONS

8-190-A(P)
- 8 – PARCEL NUMBER
- 190 – FACILITY NUMBER (IF APPLICABLE)
- A – QUALIFIED
- A – QUALIFIERS: ASBESTOS-CONTAINING MATERIAL
- L – LEAD-BASED PAINT
- P – PCB
- R – RADON
- E – UXO AND/OR ORDNANCE FRAGMENTS
- RD – RADIONUCLIDES
- (P) – POSSIBLE (UNVERIFIED)

-2800 0 2800

SCALE: 1" = 2800'

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COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
Dwg No: 734067-01001

FIGURE 1.1-12
OVERALL SITE PLAN WITH AOC AND APPROXIMATE FUTURE PRISON LOCATIONS

SCALE: 1" = 2800'
REV: A

G:\SENECA\PRISONS\SITE.DWG

DESIGNATED LINETYPES AND SYMBOLS

MINOR WATERWAY

MAJOR WATERWAY

FENCE

UNPAVED ROAD

BRUSH LINE

LANDFILL EXTENTS

RAILROAD

760

GROUND SURFACE ELEVATION CONTOUR

ROAD SIGN

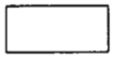
POLE

DECIDOUS TREE

GUIDE POST

FIRE HYDRANT

MANHOLE



UTILITY BOX

MAILBOX/RR SIGNAL

OVERHEAD UTILITY POLE

CORDINATE GRID (250' GRID)

NOTE: NOT ALL FEATURES APPEAR ON ALL MAPS.

R:\SENECA BLOCKS\MAPLEGEND

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SIX AREAS OF CONCERN

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Dwg No: 734967-01001

FIGURE 1.1-13
MAP LEGEND

SCALE: NA

REV: A

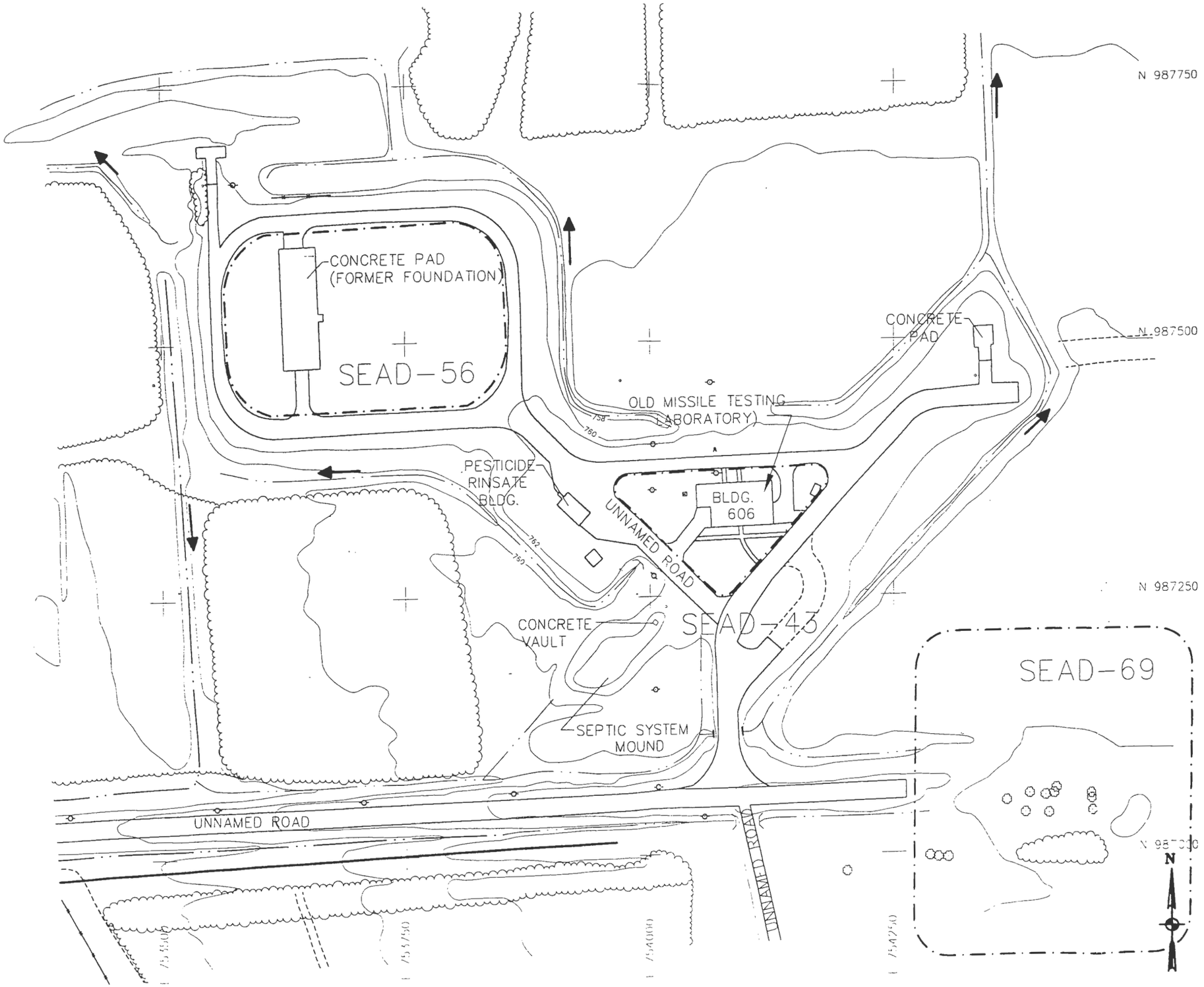

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FIGURE 1.1-14
SEAD-43, 56 AND 69
SITE PLAN

SCALE: 1" = 100'

REV: A

SWMUs is roughly 900 feet long (east-west) and 600 feet wide (north-south) (**Figure 1.1-14**).

Southwest of Building 606 is a septic system. The system includes two (2) above-ground concrete vaults which are located at either end of a 25 foot long mound. Atop the mound are several black vent pipes. Two working sump pumps are located at the most eastern end of the mound. There are two drainage swales located in the area: one to the west of the rinseate facility and another on the eastern side of Building 606. Approximately 300 feet southeast of Building 606, a road leads east to an open field that was used as a disposal area for Building 606.

The waste disposal area (SEAD-69) contains various construction debris including bricks and concrete blocks that are visible on the surface. The area of concern measures approximately 100 feet by 100 feet. The area of SEAD-69 beyond the access roadway is relatively flat and covered by vegetation (grass). An elevation difference of roughly 3 feet exists between the surface of the road (higher elevation) and the grass cover land. There are no signs of stained soil or stressed vegetation present in the grass area.

1.1.2.1.2 Site History

Building 606 was reported to have been used as a missile propellant test laboratory in the 1960's. The Old Missile Test Facility conducted QA surveillance testing. This commonly involved operational or functional testing of explosive devices. The SWMU Classification Report indicates that liquid Inhibited Red Fuming Nitric Acid (IRFNA) that was disposed of at the IRFNA disposal site (SEAD-13) was stored in the Building 606 area. During this time IRFNA and/or liquid propellants may have been released in this area. Since 1976, Building 606 has been used for herbicide/pesticide storage. The building was renovated in 1979 to include the following health and safety features: ventilation fan with lowering door vents, local exhaust for the mixing area, shower, emergency spill kits, a fire protection system connected directly with the on-post fire department, and adequate shop signs and disposal procedures. The buildings drains and concrete floors have been sealed.

Northwest of Building 606 is a concrete foundation that was associated with the old missile test facility. This was an acid storage building. The actual corrugated metal building has been moved to the Administrative area, and is now Building 132. This concrete pad has been used in the past, and currently, to aerate spill residues.

A concrete underground tank was used for intermittent storage of wastewater from the rinsing of the portable truck mounted tank used for mobile spraying operations. The mobile tank requires rinsing between dissimilar pesticide and herbicide applications. Rinseate is always used for diluent for the next application of the pesticide or herbicide. In 1989, the tank was removed and was replaced with a new tank located within a vault to comply with underground tank regulation. East of Building 606 a pesticide rinseate building was constructed. The rinseate from this process was discharged into the new tank. The contents of the tank have since been pumped out and sent to a POTW. The tank is currently empty.

In June of 1992, the building 606 water faucet was repaired by Depot employees. During the repair excavation, a floating product and a diesel fuel odor was observed. Seneca environmental personnel interviewed a Depot employee which resulted in the report of a fuel line break in a small tractor that was stored at this site several years ago, which may have resulted in the release of virgin diesel fuel.

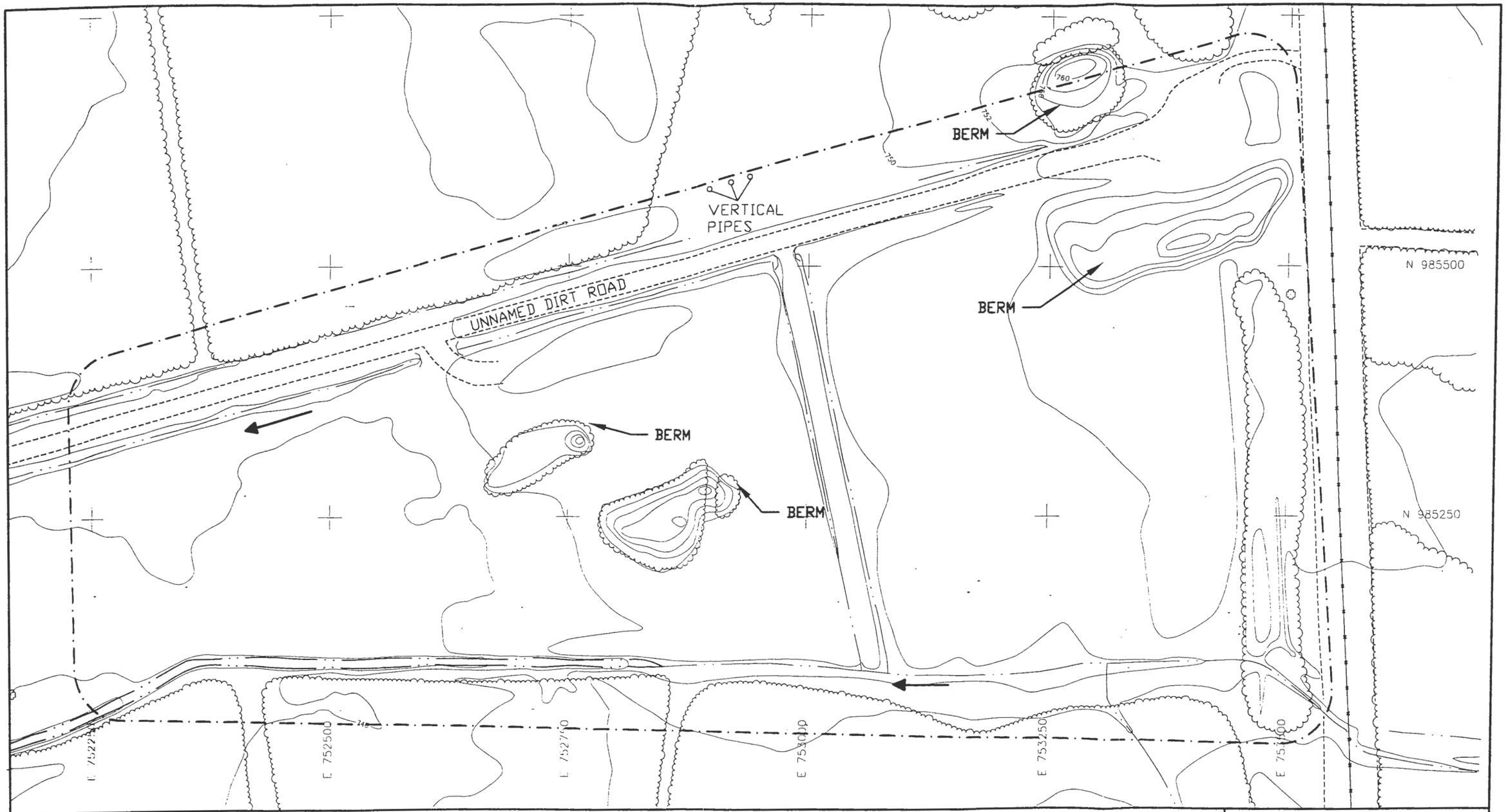
1.1.2.2 SEAD-44A QA Test Laboratory

1.1.2.2.1 Physical Site Setting

SEAD-44A is approximately 1,000 feet East of Brady Road and 1,500 feet North of South Patrol Road (**Figure 1.1-12**). The site is on an unnamed dirt road which runs parallel to South Patrol Road. Along both sides of the dirt road at SEAD-44A there are berms (**Figure 1.1-15**). These bermed areas potentially contain unexploded ordnance since they were used for QA testing. There were no visible signs of any building foundations. Along the north side of the dirt road there were three metal poles that may have been used for holding screens in place while detonating munitions. There was also a small ditch on the north side of the dirt road. There were no apparent wetlands or stressed vegetation in the area. At the end of the dirt road, on the south side, is an empty drum labeled steam waste.

1.1.2.2.2 Site History

SEAD-44A was used for quality assurance testing of CS grenades, fire devices and pyrotechnics. Mines were also detonated aboveground at the bermed area associated with SEAD-44A. Building 416 (no longer standing) was situated in the eastern portion of SEAD-44A.



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- DIRECTION OF FLOW IN DITCHES.
- APPROXIMATE EXTENT OF AOC

N

50 0 50 100 (feet)

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DEPT: ENVIRONMENTAL ENGINEERING | DWG NO: 734967-01001

FIGURE 1.1-15

SEAD-44A QUALITY ASSURANCE TEST LABORATORY
SITE PLAN

SCALE: 1" = 100' | REV: A

1.1.2.3 SEAD-44B QA Test Laboratory

SEAD-44B runs along the east side of Brady Road and occupies an area that is approximately 350 feet by 200 feet (**Figure 1.1-12**). Contained within these boundaries are two structural remains of buildings. There is an abandoned concrete foundation that is approximately 20 feet by 50 feet. Directly behind this foundation, slightly to the east, is a metal pole believed to have been used to display a red flag that was used to signal when testing was being performed. There is also a dilapidated corrugated metal shack behind the concrete foundation (**Figure 1.1-16**).

1.1.2.3.1 Physical Site Setting

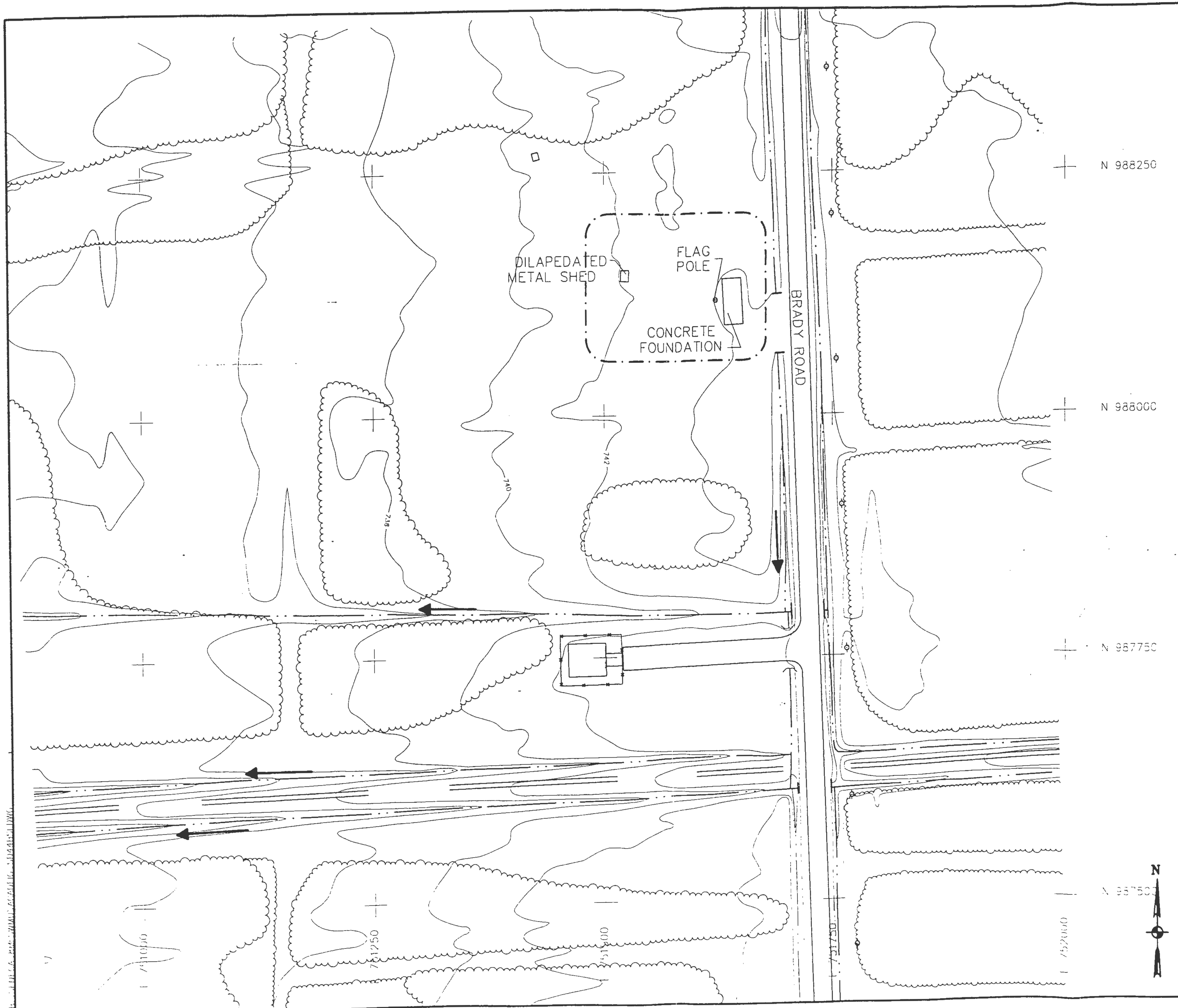
Topographically, there is a drainage ditch on the eastern border of the SEAD boundary which runs parallel to Brady Road. The vegetation around SEAD-44B is abundant with no apparent stressed vegetation. The terrain of SEAD-44B is variable with flat areas and some 1 to 2 feet high mounds of dirt which appear to have no significance.

1.1.2.3.2 Site History

SEAD-44B, like 44A, was used to store QA testing material and devices (ASR, Dec. 98, St. Louis District Corps of Engineers).

1.1.2.4 SEAD-52 - Ammunition Breakdown Area

SEAD-52 is located in the southeastern portion of SEDA as shown in **Figure 1.1-12**. The site is characterized by developed and undeveloped land as shown in **Figure 1.1-17**. East and west of the site are grassy fields with some sparse brush. Brady Road bisects the site running from north to south. The developed areas consist of Building 612, which is immediately west of Brady Road, and Buildings 608, 610 and 611, which are located east of Brady Road. Building 609, which is not part of SEAD-52, is located approximately 200 feet north of Building 612 on Brady Road and is a boiler house for Building 612. SEDA railroad tracks enter the site from the northwest and divide into two spurs which provide access to the northern side of Building 612 and the western side of Building 609. There are paved access routes on all sides of Building 612 and paved access routes to Buildings 608, 610, and 611.



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- APPROXIMATE EXTENT OF AOC
- DIRECTION OF FLOW IN DITCHES.

50 0 50 100
(feet)

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FIGURE 1.1-16
SEAD-44B QUALITY ASSURANCE TEST LABORATORY
SITE PLAN

SCALE: 1" = 100' | REV: A

N

N 987250

N 987000

N 986750

N 986500

N 986250

N 986000

E 751500

E 751750

E 752000

E 752250

E 752500

E 752750

BRADY ROAD

UNNAMED ROAD

OIL SPILL AREA

BLDG. 649

BLDG. 628

BLDG. 612

BLDG. 613

BLDG. 611

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENT
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- SURVEY MONUMENT
- SURFACE WATER FLOW DIRECTION

100 0 100 200
(feet)

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Dwg No. 734967-01001

FIGURE 1.1-17
SITE PLAN FOR
SEAD-52

SCALE: 1" = 200'

REV: A

1.1.2.4.1 Physical Site Setting

Building 612 is a concrete block structure which is approximately 60 feet wide, 300 feet long, and 15 feet high. Covered platforms are located on the north and south ends of the building. Building 608 is also a concrete block structure which is approximately 20 feet wide by 20 feet long and 12 feet high. A concrete ramp extends from the front of the building to north of the building. The buildings are cast-in-place concrete. Building 611 has dimensions of 20 feet wide by 20 feet long by 10 feet high and Building 610 is 38 feet wide by 14 feet long by 12 feet high.

The topography of SEAD-52 is relatively flat with the area to the west of Brady Road sloping gently to the west from a topographic high at Building 612. Several drainage ditches are located to the west, north, and south of Building 612. Approximately four ditches are located west of the building. One ditch flows north intersecting an east-west trending drainage ditch. One ditch flows southwest and two ditches flow west. Another ditch is located south of Building 612 and flows south paralleling Brady Road. The area to the east of Brady Road also slopes gently to the west. A north-south trending drainage ditch is located east of Buildings 608, 610, and 611. Another drainage ditch parallels the east side of Brady Road and flows south.

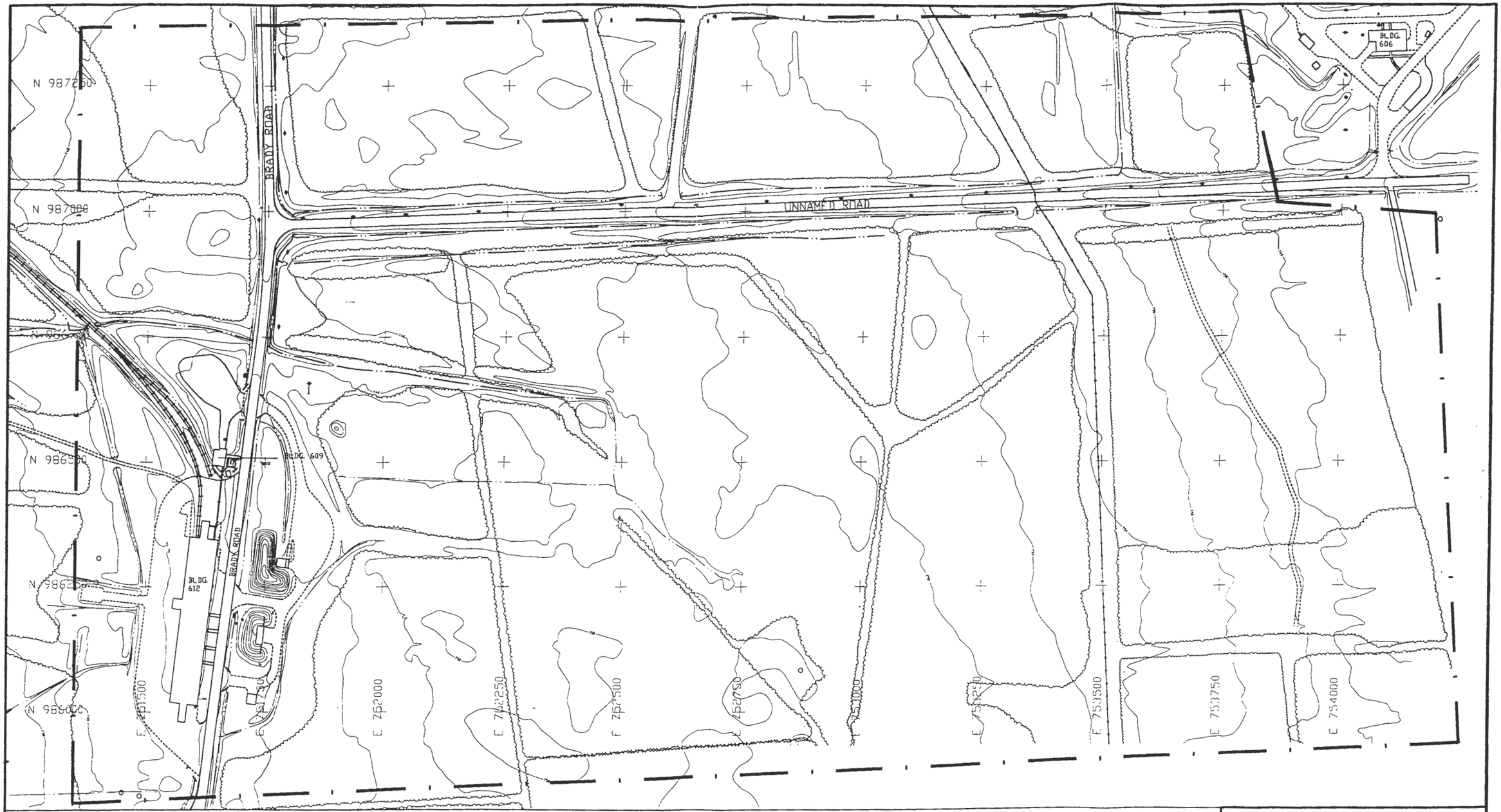
1.1.2.4.2 Site History

The Ammunition Breakdown Area (SEAD-52) has been an active site from the mid 1950s to the present time. The site consists of four buildings, Buildings 608, 610, 611 and Building 612. Building 612 has been used for the breakdown and maintenance of ammunitions; Building 608 has been used for the storage of ammunition magazines although no ammunition magazines are currently stored in the building; Building 610 has been used for ammunition powder collection; and Building 611 has been used for storage of equipment, paints, and solvents.

1.1.2.5 SEAD-62 Nicotine Sulfate Disposal Area

1.1.2.5.1 Physical Site Setting

The nicotine sulfate disposal area is located in the southeastern portion of SEDA (**Figure 1.1.-12**). It is characterized by mostly undeveloped land with the exception of bunkers and buildings along the western perimeter (**Figure 1.1-18**). The undeveloped areas are predominantly low grassland in



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- APPROXIMATE LANDFILL EXTENT
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ELECTRIC UTILITY LINE
- UNDERGROUND WATER UTILITY LINE

- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- SURVEY MONUMENT

(NOT ALL SYMBOLS MAY APPEAR ON MAP)

APPROXIMATE AOC EXTENT

N

100 0 100 200

(feet)

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Dwg No: 734987-01001

FIGURE 1.1-18
SEAD-62
SITE PLAN

SCALE: 1" = 200'

REV: A

the western portion and they become more vegetated with low brush and sparse trees in the eastern portion. The developed area in the western perimeter of the site includes Buildings 609 and 612 and two grass covered bunkers with paved access. The buildings and bunkers are separated by Brady Road. The site is bound on all sides by mostly undeveloped land. The northern boundary of the site is defined by an unnamed paved road that runs between Brady Road and Building 606 near the eastern boundary of the site. The fence separating the ammunition storage area from the unrestricted portion of the site generally forms the eastern boundary of the site. Access to most of the site is restricted by the ammunition storage area fence.

The regional topography slopes gently to the west toward Brady Road. A ditch drains several wet areas in the central and south-central portions of the site; the ditch drains west through a culvert under Brady Road.

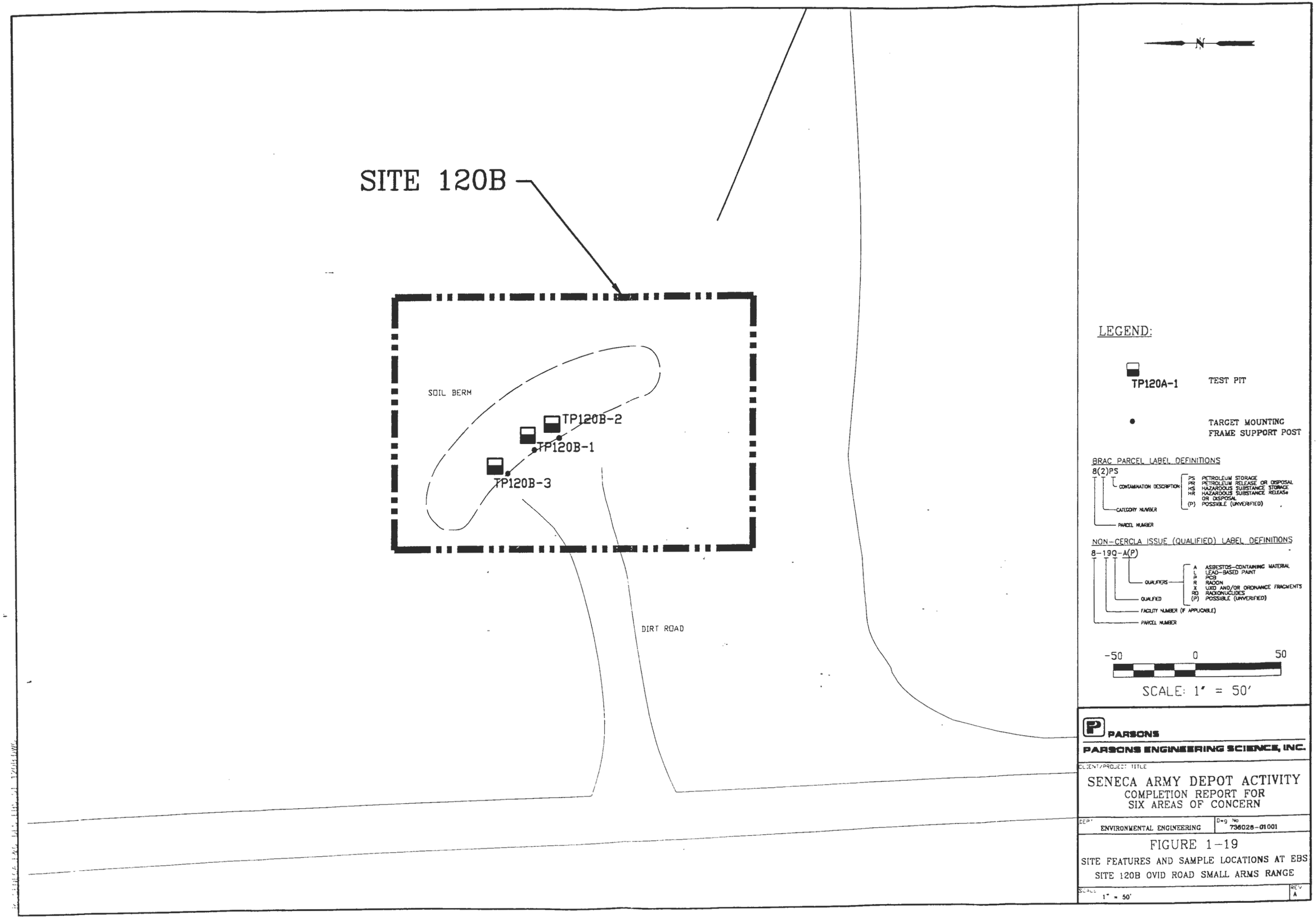
1.1.2.5.2 Site History

SEDA personnel reported finding a signed work-order for the disposal of two drums containing nicotine sulfate. The work-order was found during a transfer of office supplies from Building 606 some 10 to 20 years ago. No indication of the size of the drums or the means of disposal was recalled to have been reported on the work-order. Based upon historical disposal practices used at SEDA, base personnel believed these drums could have been disposed in the areas between or surrounding Buildings 606 and 612. Building 606 is currently used as the pesticide/herbicide storage facility. Building 612 is a munitions disassembly facility. Both buildings have been used for these operations for many years.

1.1.2.6 SEAD-120B - Ovid Road Small Arms Range

1.1.2.6.1 Physical Site Setting

The site is comprised of a 200-foot long arcuate soil berm that opens to the southwest (**Figure 1.1-19**). There is approximately 250 feet of dirt road leading from the patrol road to the base of the berm, which is covered with brush and vines. At the base of the berm, beneath the brush, there are three steel posts that are believed to be the supports for target mounting frames. Three buried 4-inch diameter clay pipes (which protruded a few inches above the ground surface) are also located at the base of the berm. These may have been used as removable target-post receptacles.


SITE 120B
SOIL BERM
TP120B-2
TP120B-1
TP120B-3
DIRT ROAD
N
LEGEND:
TP120A-1
TEST PIT
TARGET MOUNTING FRAME SUPPORT POST
BRAC PARCEL LABEL DEFINITIONS
8(2)PS
CONTAMINATION DESCRIPTION
CATEGORY NUMBER
PARCEL NUMBER
PS PETROLEUM STORAGE
PR PETROLEUM RELEASE OR DISPOSAL
HS HAZARDOUS SUBSTANCE STORAGE
HR HAZARDOUS SUBSTANCE RELEASE OR DISPOSAL
(P) POSSIBLE (UNVERIFIED)
NON-CERCLA ISSUE (QUALIFIED) LABEL DEFINITIONS
8-19Q-A(P)
QUALIFIERS
QUALIFIED
FACILITY NUMBER (IF APPLICABLE)
PARCEL NUMBER
A ASBESTOS-CONTAINING MATERIAL
L LEAD-BASED PAINT
P PCB
R RADON
X UXO AND/OR ORDNANCE FRAGMENTS
RN RADIONUCLIDES
(P) POSSIBLE (UNVERIFIED)
-50
0
50
SCALE: 1" = 50'
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN
DEPT
ENVIRONMENTAL ENGINEERING
Dwg No
736028-01001
FIGURE 1-19
SITE FEATURES AND SAMPLE LOCATIONS AT EBS
SITE 120B OVID ROAD SMALL ARMS RANGE
SCALE
1" = 50'
REV
A

1.1.2.6.2 Site History

Interviews with SEDA personnel state that this area had been used as a small arms range. Data collected during the 1995 EBS further support this claim.

2.0 PREVIOUS INVESTIGATIONS AT SIX AREAS OF CONCERN

2.1 INTRODUCTION

Information for each Area of Concern was acquired through the implementation of the field investigations associated with either an Expanded Site Inspection, the SWMU Classification process or confirmation of sites identified during the Environmental Baseline Survey. These reports are listed in Section 1.0. The reports describing these investigations outline the following procedures:

1. Geophysical Investigations,
2. Surface and Subsurface Soil Sampling,
3. Monitoring Well Installation, Development and Sampling, and
4. Surface Water and Sediment Sampling.

A site survey program was performed at SEADs 43, 56, 69, 44A, 44B, and 62. This program consisted of a field reconnaissance of the site and review of aerial photography. The reconnaissance was performed to locate general site features and confirm the presence of significant features (i.e., buildings, filled areas, waste piles, stressed vegetation, debris pits, monitoring wells, access roads). Sampling locations were identified during this initial survey. The site and surrounding area were photographed from the air on December 14, 1993 for the purpose of constructing a photogrammetric site plan with 2 foot contour intervals.

Prior to installation of monitoring wells, the groundwater flow directions were estimated on topography and to some extent on proximity to surface water. The actual locations of some borings and monitoring wells were adjusted based on the results of geophysical surveys and a more complete field reconnaissance.

2.2 METHODOLOGY

2.2.1 Geophysical Investigations

Seismic Refraction

Seismic refraction surveys were performed at SEAD-43, 56, 69, 44B, and 62 to determine the direction of groundwater flow by measuring either the depth to the water table or the depth to

bedrock. These data, along with topographic information, were used to more accurately locate the upgradient and downgradient monitoring wells.

Four 115-foot seismic refraction transects were laid out at each site. They were located approximately equidistant from the center of the AOC with each transect located near the perimeter of the AOC. The shot points were located along each profile and were used to define each individual seismic spread. The seismic data were collected using an EG&G Geometrics 24 channel seismograph. Geophone stations were placed at equal intervals along each survey line and the individual geophones were coupled to the ground by a metal spike firmly attached to their bases. When the geophones were placed on asphalt or concrete, small metal base plates replaced the metal spike on each geophone. Those geophones placed on asphalt or concrete were weighted down using small 2 to 3 pound sand bags to improve overall coupling with the ground and to help minimize background noise levels. Geophone spacings were held at 5 foot intervals for all of the surveys.

Once the seismograph set up was complete and data collection was ready to commence, the background noise level at each geophone location was monitored. The background noise was displayed on the seismograph CRT as a series of moving bars, the amplitude of which is proportional to the background noise level. This review provided information on ambient noise levels, while also highlighting malfunctioning geophones. Geophones that displayed a high level of noise were moved or had their placement adjusted.

An impact hammer was used as the seismic energy source. Due to a shallow water table (i.e., generally less than 10 feet in depth) a low energy source was sufficient to accurately image the water table surface. Five impact points were used for each geophysical spread: one located at the spread center, one at each end of the spread and one approximately 40 feet beyond each end of the spread. A paper copy of each seismic record was made in the field. Each record was reviewed for quality to insure that adequate signal to noise levels were present for the shot. Upon initial acceptance, a preliminary velocity analysis was performed in the field to define the subsurface structure along each spread. This preliminary review focused on determining if the water table surface had been properly resolved. Upon final acceptance of each shot, the seismic record was annotated to identify the transect number, the spread number, the shot point number, and the shot point location. After each record was reviewed, accepted, and annotated, the data collection procedure was repeated for the remainder of the shot points for each spread.

Subsequent to the seismic data collection, a survey was performed to provide X,Y,Z station information for the seismic shot point locations to ± 1.0 feet horizontally and ± 0.1 feet vertically. These data were used during seismic data reduction and seismic modeling.

The seismic refraction method relies upon the analysis of the arrival times of the first seismic energy at each geophone location to provide details about the subsurface geology. The time when the seismic energy arrives at each geophone location is referred to as the first break. Each seismic record was reviewed, both using the seismograph CRT and the paper records, to determine the first breaks at each geophone. This analysis was preliminarily performed in the field with the data checked after the completion of the field program. These first break data values were tabulated and used to create time-distance plots as described below.

For each seismic spread, a graph was made of the first break determinations for all of the spread shot points. These graphs display, in an X-Y plot, the first breaks (time) versus the geophone locations (distance). These time-distance plots form the basis of the geophysical interpretation. The time-distance plots were individually analyzed to assign each first break arrival to an assumed layer within the subsurface. It is estimated that up to four distinct seismic layers exist at the site. These include the unsaturated and saturated surficial deposits, the weathered bedrock, and the competent bedrock. In general, these various layers can be grouped into broad ranges of seismic velocities. As an example, unsaturated deposits will generally have a seismic velocity of less than 2,500 feet per second. By comparison, the saturated deposits should have seismic velocities in the range of 4,500 to 5,500 feet per second. The time-distance plots were interpreted to yield the velocity distribution within the subsurface. Each first break arrival was assigned to one of the above mentioned layers. This velocity analysis and layer assignment formed the basis for the data files to be used during the seismic modeling.

Once the first break analysis and layer assignments were complete, input seismic data files were created for use in the seismic modeling software. The input files included all of the information pertaining to the spread geometry, shot point locations and depths, first break arrivals, and layer assignments. The elevation data was also input into the computer files. The computer program, SIPT (Scott, 1977) was used to model the seismic data. SIPT is an interactive computer program developed by the United States Geological Survey for the inverse modeling of seismic refraction data. This program uses input seismic refraction data to create two-dimensional cross-sectional models of velocity layering within the subsurface. The program uses the delay time method to produce a first approximation of the subsurface velocity layering. This approximation is then refined through the use of iterative ray tracing and model adjustment to minimize the differences

between field measured first arrival times and the forward modeled raypath times. The program also provides various levels of velocity analyses that will be reviewed to provide diagnostic information on the model solutions.

The results of the computer modeling were reviewed in conjunction with the known geology of the site. The subsurface velocity layering was attributed to known or expected geologic units. A detailed analysis was made of the velocity distribution of the upper unsaturated materials to ensure that near surface low velocity materials were not adversely affecting the data quality and interpretation. The velocity distribution within the bedrock was also reviewed to provide information on the presence and degree of weathering and to identify any lithologic or fracture related changes within the bedrock.

EM-31 Survey

Electromagnetic (EM-31) surveys were performed at SEADs-43 and 62. The objectives of the EM-31 surveys were to delineate waste boundaries, identify the location of buried metallic objects, and identify the locations of old disposal pits. The EM-31 method was employed in conjunction with Ground Penetrating Radar (GPR) surveys so as to provide a maximum delineation of the subsurface from the geophysical investigations.

The electromagnetic data at each AOC was collected using both grid and profile based surveys. In general, the grid based surveys used either a 40 foot by 10 foot or a 20 foot by 10 foot grid spacing. Refer to the individual AOC descriptions in the following sections for the grid spacing details. The corners of the geophysical survey grids were established using a registered New York State land surveyor. The individual EM-31 survey lines and station locations were established using tape measures and a surveying level.

At all of the AOCs where EM-31 data were collected, a data logger was used to record the individual electromagnetic readings. Both the in-phase and quadrature components of the electromagnetic field were measured and recorded. These data were in turn stored on a computer and printed out at the end of each field day. For each AOC where EM-31 data were collected, a calibration area, free of cultural interference, was established. The EM-31 response was measured at this area at the start of each day. This check was made to insure that no significant meter drift was occurring during each survey.

Upon completion of each electromagnetic survey, the data were presented in both profile and contour form. Both the in-phase and quadrature components were plotted. All of these data were interpreted to identify the locations of buried metallic objects, disposal pits, waste boundaries, and areas of elevated subsurface soil apparent conductivities. These data were compared to the results of the GPR surveys to provide as complete and accurate interpretation of the subsurface conditions at each AOC as possible.

The EM-31 instrument was initially calibrated by the manufacturer. This calibration can be rechecked in the field but requires access to highly resistive rock outcrops. A secondary field calibration was performed on a daily basis to insure repeatability of measurements and to check against daily meter drift. This field calibration was the only performance evaluation that was performed on these instruments. The EM-31 data were collected at each AOC to evaluate only relative variations in subsurface conductivities. An accurate terrain conductivity was not required since the individual objectives of these surveys were to identify relative variations in subsurface conditions associated with waste boundaries, buried metallic objects, etc. During the individual AOC surveys, up to five station repeats were performed on a daily basis so as to quantitatively evaluate the overall data repeatability.

GPR Survey

The objectives of the GPR surveys were to locate buried structures (i.e., buried or filled-in pits, trenches, disposal areas) and to provide better subsurface definition of anomalies detected during the EM-31 surveys. The GPR instrument used was a hand operated GSSI SIR-3 Ground Penetrating Radar. As the equipment was pulled across the site, the reflected radar pulses were transmitted to the receiver unit where they were converted to analog signals. The analog signal was transmitted to the control unit where the signal was electronically processed and sent to the graphic recorder. The graphic recorder produced a continuous chart display on electro-sensitive paper. This real-time display enabled the operator to interpret the data on site.

An operational verification of the GPR unit was performed over a location where underground utilities were known to exist. Data acquired over this area also allowed for an approximate calculation of the two-way travel time for RADAR waves through the soils at SEDA. A two-way travel time of 7 nanoseconds per foot was established by analyzing GPR records acquired over a forced water main known to be buried 4 to 4.5 feet below grade.

2.2.2 Soil Sampling Programs

The objectives of the soil sampling program were to define the horizontal and vertical extent of contaminated soils at each of the six AOCs.

The soils investigation program was completed at all SEADs in accordance with pre-approved workplans. Sample locations were located in source areas and in hydrologic upgradient locations, the latter to establish background conditions. The groundwater flow directions were estimated for the workplan based on topography and to some extent the proximity of surface water. The locations of borings, monitoring wells and test pits were adjusted from those defined in the workplan based on the results of the geophysical investigations, which better defined the groundwater flow directions and detected anomalies.

Soil Borings

Soil borings were performed using a CME-55 drilling rig and a CME 850 drilling rig, each equipped with 4.25-inch I.D. hollow stem augers. The soil borings were advanced until spoon or auger refusal on shale was encountered. The total depth of the boring was determined by the degree of weathering of the shale. During drilling, soil samples were collected continuously at 2-foot intervals using a decontaminated 2-inch or 3-inch diameter by 2-foot long split spoon sampler according to the method described in ASTM D-1586-84. This technique involved driving a decontaminated split spoon sampler 2 feet into undisturbed soil with a rig-mounted 140 lb. hammer. Once the sample was collected, the augers were advanced to the top of the next sample interval. Samples were collected until spoon refusal on weathered or competent shale was encountered. Soil samples were classified according to the United Soil Classification System (USCS).

Soil samples were screened for volatile organic compounds using an Organic Vapor Meter (OVM) 580B and for radioactivity with a Victoreen Model 190 Radiation Monitor. Three soil samples from each soil boring were selected for chemical analysis including: 1) a surface soil sample collected from 0 to 2" below grade; this sample was collected with a stainless steel trowel after the overlying vegetation has been removed; 2) a soil sample collected immediately above the water table; and 3) the third sample based on one of the following site specific criteria: (1) visibly affected soil (e.g., oil stains), (2) elevated photoionization detection (PID) readings, or (3) a stratigraphic change such as the base of the fill or the fill/bedrock interface. If none of these occurred, then the third sample was collected at the halfway point between the samples collected at

the surface and at the water table. If similar looking split spoon samples exhibit elevated PID readings, the one with the highest concentration was submitted for chemical analysis. Samples to be analyzed for volatile organic compounds were collected first in two 40 ml vials with septum seals. The remaining soil from the spoon was mixed in a decontaminated stainless steel bowl with a decontaminated stainless steel utensil and placed in the appropriate sample containers.

After the boring was completed, it was filled to ground surface with lean grout containing at least 3% bentonite powder by volume. If groundwater was present in the borehole, the grout was pumped through a tremie pipe to the bottom of the boring. Grout was pumped in until undiluted grout discharges from the boring at ground surface. The soil brought to the surface by the augers was containerized in DOT-approved 55-gallon drums, which were labeled with the date, location, and description of wastes. Split spoon barrels were decontaminated as described in the workplan. Drilling augers were steam cleaned along with other drilling equipment between subsequent soil borings.

2.2.3 Test Pits (Geophysical Anomaly Excavations)

The objectives of test pitting were to provide a means for visual evaluation of subsurface soils and collection of soil samples, as well as to investigate anomalies discovered during the geophysical surveys. Test pit locations were marked in the field prior to performing the excavation. The excavations were performed with a backhoe using a smooth edged bucket when possible. The top 6 to 12 inches of soil were segregated so that it could be used to cover the other backfilled soils when the test pit was closed. The length and width of the excavation was kept as small as practical to minimize the potential of exposing field personnel to hazardous conditions.

The excavations were continuously monitored by Parsons ES personnel with a PID and a radiation meter. At no time was any personnel permitted to enter the excavation. The test pits were closed by backfilling the pit with the soil that was removed from it. If the pit was not to be closed immediately after the required samples had been obtained, the excavation was barricaded to prevent accidental entry by personnel working on the site. Each excavation was marked after closure as needed for identification of the sample location. A log for each test pit was prepared to record the subsurface soil conditions, monitoring data, location of samples obtained, and other information. Where appropriate, photographs of the test pits were taken.

The samples were taken from fill material based on field screening (stained soils or elevated PID readings). Test pit samples were collected using the bucket of the backhoe. The bucket was

scraped along the side of the test pit at the desired depth to allow material to fall into the bucket or scooped from the bottom of the test pit. The sample was collected from the backhoe bucket with a stainless steel trowel or scoop, mixed in a stainless steel bowl, then transferred to the appropriate sample containers. Samples for volatile analysis were collected as soon as possible from the middle of the backhoe bucket prior to mixing.

Surface Soils

Grab samples of surface soils were obtained by removing representative sections of soil from 0 to 2 inches below ground surface. Vegetation was removed prior to sample collection. Surface soil samples were collected using a stainless steel trowel or scoop and a stainless steel bowl. VOC samples were placed in the VOA vials before mixing the soil. The soil was then mixed in the bowl and placed in the appropriate sample containers.

2.2.4 Monitoring Well Installation

The groundwater investigation program was designed to obtain background water quality data, to determine groundwater flow direction, and to determine if hazardous constituents are migrating from the site in the groundwater of the overburden aquifer. When required, the proposed locations of monitoring wells were changed based on the depth to groundwater and bedrock data obtained from the geophysical surveys.

The program which was implemented was consistent with the USEPA Region II CERCLA QA Manual and the NYSDEC Technical and Administrative Guidance Manuals (TAGMS) regarding design, installation, development and collection of groundwater samples. Further, the program is in compliance with all requirements described in the NYSDEC, 6 NYCRR Part 360, Solid Waste Management Facilities Regulations, Section 360-2.11, which details groundwater monitoring well requirements.

The installation of each monitoring well began after the soil boring was completed. The soil borings were advanced to split spoon or auger refusal, which for the purposes of this investigation defined the contact between the overburden and the competent shale. During drilling, split spoon samples were collected continuously until spoon refusal using the method outlined in ASTM D-1580-84 to observe and characterize the soil conditions and geology at the well location. Only one well was installed in each boring. Once installation was begun, no breaks in the installation process were made until the well was grouted and the augers were removed.

These wells were screened from 3 feet above the water table (if space allowed) to the top of weathered or competent bedrock. Soil samples were collected as described in the soil boring program. The monitoring wells were constructed of new 2-inch schedule 40 PVC with a screen slot size of 0.010" and threaded, flush joints.

A coarse sand pack (#3 Q-Rock) was placed by a tremie pipe in the annular space between the well screen and the hollow stem auger. This sand pack did not extend more than 2 feet above the top, or 6 inches below the bottom of the screen. A finer grained 6 inch sand pack (#1 Q-Rock), was placed between the coarse sand pack and the bentonite seal to prevent infiltration of the bentonite into the coarse sand pack. A layer of bentonite pellets, ranging from 1.0 foot to 1.5 feet in thickness, was poured within the annular space to seal the well. The bentonite pellets were hydrated by pouring potable water into the annular space. After a one hour hydration period, the remaining annular space was completely filled with a lean cement grout containing at least 3% bentonite. The grout mixture was placed in the annular space using a tremie pipe. Augers were removed as the grouting progressed to prevent caving.

In untrafficked areas, wells were protected with a steel casing, 4 inches in diameter. This protective steel casing extended at least 1.5 feet below the ground surface to prevent heaving by frost. The protective casing was held in place by a 2-foot square cement pad. Weep holes were drilled at the base of the protective casing above the cement collar to allow for the drainage of water. The protective casing was installed with a locking cap and a weather resistant padlock. In trafficked areas where the steel casing may be hit, a roadway box was installed. The protective casings were marked with the well number using metal stamps. The well number was also stamped on the roadway box cover.

2.2.5 Monitoring Well Development

Subsequent to the well installations, each monitoring well was developed to insure that a proper hydraulic connection existed between the well and the surrounding aquifer.

The development of monitoring wells was performed at least 2 days after well installation and at least 7 days prior to the well sampling and monitoring activities. If the wells were slow to recharge due to the low permeability of the formation, surging and overpumping were required to be performed numerous times on each well, with complete recharge between each episode. Every

attempt was made to remove excessive turbidity from the wells because high turbidity can result in elevated metal concentrations detected in the groundwater.

The criteria for determining if the well was properly developed was based upon the guidance provided by the NYSDEC TAGM #HWR-88-4015. This guidance document specifies an upper level of allowable levels of turbidity in groundwater from monitoring wells which is considered acceptable for determining the water quality of metals in the aquifer.

Development operations were performed until the following conditions were met:

1. Water samples had the lowest possible NTUs
2. The temperature, specific conductivity and pH of the well water varied by no more than 10 percent.

The collection of representative groundwater samples is partially dependent upon the turbidity of the sample. Guidance provided by NYSDEC indicates that a valid sample is considered to be one that has a turbidity of less than 50 Nephelometric Turbidity Units (NTUs).

Temperature and specific conductivity were measured in the field using a YSI model 33 SCT meter; pH was measured in the field using an Orion model 230A pH meter. A nephelometer was used to measure turbidity. The instruction manuals for these instruments were kept with the instrument in the field.

The development procedure which was used for these wells reduced the turbidity of the water in the wells. For development of these wells, surging with a bailer for 5 to 60 minutes was performed and the water in the well was removed using a peristaltic pump at a rate of between 0.05 and 2.1 liters per minute. The surging was performed to remove any silt and clay "skin" that may have formed on the borehole wall during drilling. The relatively low flow rate water removal was performed to develop the well and surrounding formation by removing some silt and clay, while not creating an influx of large amounts of silt and clay, which are major components of the till.

2.2.6 Groundwater Sampling

Monitoring wells were sampled to evaluate the presence and extent of organic and inorganic chemical constituents present within the groundwater.

The wells were purged prior to sampling using a peristaltic pump with the dedicated Teflon tube that extended to the bottom of the well. A low flow purging method was implemented to obtain groundwater samples with the lowest possible turbidity values. Water levels in all monitoring wells were measured prior to the groundwater sample collection.

Groundwater sampling was performed in three steps: (1) remove the silt, (2) purge the water standing in the well, and (3) sample the water. Each of these steps is described in the following sections.

Silt Removal

One day prior to sampling, the depth to groundwater was measured and recorded. A previously unused piece of 3/8" OD Teflon tubing was installed in the well. The thickness of silt in the bottom of the well was determined by measuring the depth to the top of the silt. If the thickness of silt was greater than 1-inch, silt removal as described below was performed. If the thickness was less than 1-inch, then no silt removal was necessary prior to the purging process.

The Teflon tubing was connected to 1/4" Tygon tubing installed in the head of a peristaltic pump. Purging began with the bottom opening of the Teflon tube immediately above the silt layer. The silt was slowly agitated with the tube so that the silt was disturbed, became suspended, and was collected by the tube (the purge water would become silt-laden and have a dark brown-gray color indicating that the silt was being removed). An appropriate flow rate was used for the silt removal. If more force was required to adequately disturb the silt at the bottom of the well, a decontaminated one-inch stainless steel or Teflon bailer was slowly lowered to the bottom of the well to slowly agitate the silt while pumping. Silt removal was complete when the water was no longer silt-laden and dark brown-gray in color.

Monitoring Well Purging

The monitoring wells were purged prior to sampling using a peristaltic pump with a dedicated Teflon tube. Before purging, the depth to water was measured with a decontaminated electronic water level meter. The water level probe was left in the well so that the water level could be monitored continuously during purging. The purging process began with the open-end of the tube at least 6 inches from the bottom of the well. The purging flow rate was between 100 ml/min and 1600 ml/min. The purge rate was set so that pumping the well to near dryness during purging was avoided and also so that the turbidity of the groundwater sample was less than 50 NTUs. If the

water level fell below one half the static water column height, the purge rate was lowered to minimize the drawdown while still maintaining a practical purging rate. If the turbidity was greater than 50 NTUs, the purge rate was reduced to minimize the turbidity while maintaining a practical purging rate.

The exact flow rate was determined using a plastic graduated beaker and was recorded on the sampling data sheet. The water was purged into a graduated 5-gallon bucket. After approximately one well volume was removed, the time, flow rate, depth to the bottom of the opening of the Teflon tube and the total volume of water removed was recorded on the sampling data sheet. A 1-gallon plastic container was filled from the outlet side of the peristaltic pump and the temperature, turbidity, specific conductance, and pH were measured. For wells which were not purged to near dryness after one well volume had been removed, the Teflon tube was slowly raised to a point between the top of the well screen and the water surface. When two well volumes were removed, the required data (noted above) were again recorded on the data sheet. Purging of the well continued until three well volumes had been removed. After purging the third well volume, the required data (noted above) were again recorded. If necessary additional temperature, specific conductance, turbidity, and pH measurements were made on additional well volumes until their measurements stabilized (two successive measurements varying by less than 10%). Moving the location of the tube from the screened interval to a point near the top of the water surface during purging ensured the removal of any stagnant water from the well prior to sampling. After removal of the necessary well volumes, the water level was measured in the well. If the well had recovered to 95% of the original static level, then sampling of the well was performed. If the 95% recovery had not been achieved after 3 hours, then the recovery requirement for the well was reduced to 85% water level recovery prior to sampling.

For wells which were very slow to recharge, purging of groundwater, at the 100 ml/min flow rate, was continued until the well had been purged to near dryness (i.e., when the water level was at 1 foot above the bottom of the well). Again the purging process began with the open end of the Teflon tube at the bottom of the well screen or at least 6 inches from the bottom of the well. The time, flow rate, depth to the bottom of the open tube, and total volume of water removed were recorded after purging the well to near dryness. The temperature, specific conductance and pH were also recorded immediately after purging the well to near dryness. The water level was monitored with an electronic water level meter during purging. After these procedures, the well was considered to have been purged enough to ensure that the subsequent water samples collected from the well would be representative of water from the aquifer. Once purged to near dryness, the well was allowed to recover to 95% of the original static level prior to sampling. If, however, the

well had not recharged to 95% after 3 hours then the recovery requirement for the well was reduced to 85% water level recovery prior to sampling. If the well had not recharged to 85% of the original static level after six hours then sampling of the well was begun as water was available for each parameter.

Monitoring Well Sampling

Prior to collecting the groundwater sample, the Teflon purging tube was removed from the well and placed into a clean plastic bag during sampling. To sample, a decontaminated bailer was lowered into the well at a rate of 1/2-inch/sec to minimize the disturbance of water and silt in the well. When the bailer had filled with water, it was removed at a rate of 1/2-inch/sec and the appropriate sample containers were filled. If during the sampling process the well was bailed to near dryness (i.e., the bailer reaches the bottom of the well) sampling was stopped until the water level recharged to 85% of the original static level. If the water level had not recharged to 85% after 6 hours, sampling was continued the next day as water was available for each parameter. When sampling was complete, the dedicated Teflon tubing was returned to the well.

Groundwater samples collected for volatile analyses were collected first, before any of the other parameters, in a manner that would minimize the loss of volatile compounds. Sampling for the remaining parameters was carried out in the following sequence: semivolatiles, metals, cyanide, explosives, pesticides/PCB, herbicides, total petroleum, hydrocarbons, nitrates, and radionuclides. Groundwater samples were collected with the required quality assurance/quality control (QA/QC) samples, then transmitted to the laboratory for chemical analysis in accordance with the Chemical Data Acquisition Plan (CDAP).

Depending upon the activities performed at the AOC and the constituents of concern, monitoring wells were sampled for most or all of the following parameters:

1. Target Compound List (TCL) for Volatile Organic Compounds (VOC) by NYSDEC CLP
2. TCL for Semivolatiles, Pesticides and Polychlorinated Biphenyls (SVOCs, Pesticides and PCBs);
3. Target Analyte List (TAL) (Metals and Cyanide)
4. Method 8150 (Herbicides)
5. Method 8330 (Explosives)
6. Method 418.1 (Total Petroleum Hydrocarbons)
7. Method 353.2 (Nitrates)

Two rounds of water level measurements were completed for the monitoring wells. The water level data were used to determine the direction of groundwater flow within the glacial till/weathered shale aquifer.

2.2.7 Surface Water and Sediment Sampling Procedures

Surface water samples were collected by immersing a clean glass sample bottle without preservatives into the surface water body. The sample was then transferred to a pre-preserved sample bottle, if required. Temperature, conductivity, pH, and turbidity of surface water, were measured directly in the field with calibrated meters. The sample pH was measured with an Orion pH meter, Model SA230 or SA230A, conductivity and temperature were measured with a YSI Model 33 conductivity meter, and turbidity was measured with a Hach Portable Turbidimeter, Model 2100p or Model 16800.

Sediment samples were collected by scooping sediment into a decontaminated stainless steel bowl with a decontaminated trowel. Volatile Organic Compound samples were taken first, prior to any mixing of the sediments. Then, the bowl was refilled with additional sediment, if required, thoroughly mixed and the appropriate sample containers filled with sediment.

2.3 SEAD 43-OLD MISSILE PROPELLANT TEST LAB
SEAD 56-HERBICIDE/PESTICIDE STORAGE
SEAD 69-BUILDING 606 DISPOSAL AREA

Due to their respective association with Building 606, SEADs 43, 56, and 69 were investigated together as a whole. The historical nature of the activities which took place here, (propellant testing, herbicide/pesticide storage, and process disposal), indicates that several potential migrational pathways were possible. Therefore, leaching to soil, and transport via groundwater flow and surface water runoff were considered as the primary migrational pathways at SEADs 43, 56, and 69.

2.3.1 Chemicals of Interest

Chemicals of interest include VOC's, SVO's, pesticides/PCB's, heavy metals, cyanide, herbicides, nitrates, and explosives.

2.3.2 Media Investigated

Geophysics

Four (4) 115 foot long seismic refraction profiles were surveyed on 4 lines positioned along the outside boundary of SEAD-43, 56 and 69. These seismic transect locations are shown in **Figure 2.3-1**. Data from the survey were used to determine the direction of groundwater flow and to adjust monitoring well locations to assure that one monitoring well was installed upgradient and three (3) monitoring wells were installed downgradient of the SEADs. Additionally, data was used to delineate disposal pit extents (SEAD-69) and identify metallic objects.

EM-31 and GPR surveys were also performed to delineate the limits of the suspected disposal pits (SEAD-69) and to identify metallic anomalies of metallic origin at both SEAD-43, and 69. The electromagnetic data was collected from a grid laid out across the two SEADs (43, and 69). The profiles were spaced at 20 foot intervals and EM-31 measurements were taken at 10 foot intervals along each profile. GPR data was collected along profiles spaced at 50 foot intervals. Supplemental GPR data were also collected over distinct EM-31 anomalies to provide a more defined characterization of the suspected metallic sources. The locations of the EM-31 and GPR profiles are shown in **Figure 2.3-1**.

Soils

A total of ten (10) soil borings were performed at SEADs-43, 56, and 69; three (3) borings at SEAD-56 and 69, and 4 borings at SEAD-43. The soil boring locations are shown in **Figure 2.3-2**. A total thirty (30) samples from ten (10) soil borings were submitted for chemical analyses (**Table 2.3-1**). Three (3) test pits were excavated at SEAD-69 over distinct geophysical anomalies and over areas with debris on the ground surface. The test pit locations are shown in **Figure 2.3-2**. The purpose of the test pits, specific to SEAD-69, was to visually identify the contents of the disposal area for Building 606, and therefore, no samples were taken.

Groundwater

Four (4) groundwater monitoring wells were installed at SEAD-43, 56, and 69, inclusively, as shown in **Figure 2.3-2**. One monitoring well (MW43-1) was installed upgradient of SEAD-43, 56, and 69 to obtain background water quality data, while the remaining three monitoring wells were installed downgradient of the individual SEADs (SEAD-43, 56, and 69) to determine if hazardous

P2

P1

CONCRETE PAD
(FORMER FOUNDATION)

SEAD-56

OLD MISSILE TESTING
(LABORATORY)

CONCRETE
PAD

N 987750

N 987500

N 987250

N 987000

L1000N

L900N

L800N

L700N

L600N

L560N

P4

P3

PESTICIDE
RINSATE
BLDG.

BLDG.
606

UNNAMED ROAD

CONCRETE
VAULT

SEAD-43

SEAD-69

SEPTIC SYSTEM
MOUND

L1000E

L1100E

L1200E

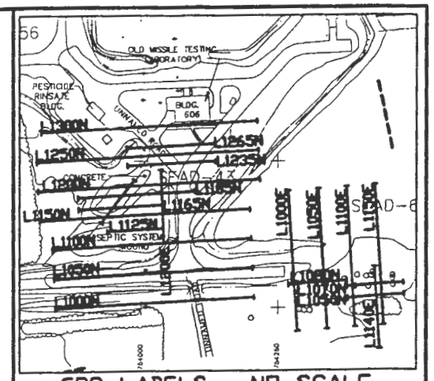
L1240E

E 754750

E 754000

E 754250

N



GPR LABELS - NO SCALE

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- 1000E — GPR TRANSECT
- P2 — SEISMIC PROFILE
- L1200E — EM TRANSECT

SEAD 43: BLDG.606 OLD MISSILE PROPELLANT TEST LABORATORY

SEAD 56: FORMER HERBICIDE AND PESTICIDE STORAGE AREA

SEAD 69: DISPOSAL AREA

50 0 50 100
(feet)

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

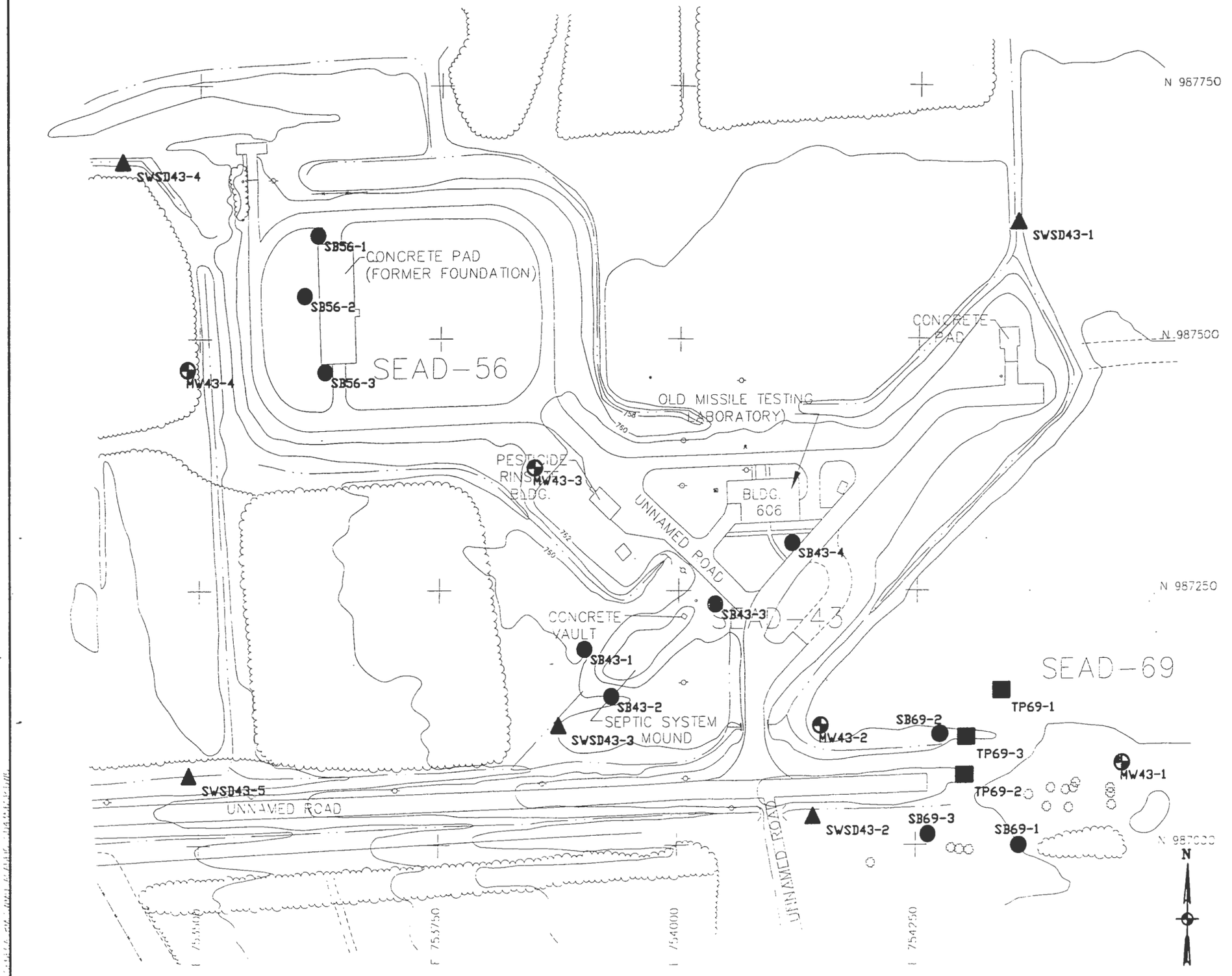
CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | Dwg No 734987-01001

FIGURE 2.3-1
SEAD-43, 56 AND 69
LOCATION OF GEOPHYSICAL SURVEYS

SCALE 1" = 100' | REV A



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- MONITORING WELL
- SURVEY MONUMENT
- SOIL BORING
- SURFACE SOIL SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER/ SEDIMENT SAMPLE
- TEST PIT

SEAD 43: BLDG.606 OLD MISSLE PROPELLANT TEST LABORATORY
SEAD 56: FORMER HERBICIDE AND PESTICIDE STORAGE AREA
SEAD 69: DISPOSAL AREA

50 0 50 100
(feet)

PARSONS
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CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
Dwg No 736026-01001

FIGURE 2.3-2
SEAD-43, 56 AND 69
LOCATION OF SAMPLING POINTS

SCALE 1" = 100'
REV A

TABLE 2.3-1
SEAD-43,56,69 SOIL BORING SAMPLING SUMMARY
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH
SB43-1	SB43-1-00	0-2"
	SB43-1-03	4-5'
	SB43-1-08	14-16'
SB43-2	SB43-2-00	0-2"
	SB43-2-03	4-6'
	SB43-2-06	10-12'
SB43-3	SB43-3-00	0-2"
	SB43-3-02	2-4'
	SB43-3-03	4-5.5'
SB43-4	SB43-4.01	12-18"
	SB43-4.02	2-4'
	SB43-4.07	12-14'
SB56-1	SB56-1-00	0-2"
	SB56-1-03	4-6'
	SB56-1-07	12-13'
SB56-2	SB56-2-00	0-2"
	SB56-2-03	4-6'
	SB56-2-05	8-10'
SB56-3	SB56-3-00	0-2"
	SB56-3-04	6-8'
	SB56-3-08	14-16'
SB69-1	SB69-1-00	0-2"
	SB69-1-05	8-10'
	SB69-1-06	10-12'
SB69-2	SB69-2-01	0-2"
	SB69-2-04	6-8'
	SB69-2-07	12-14'
SB69-3	SB69-3.01	0-2"
	SB69-3.04	6-8'
	SB69-3.06	10-12'

Notes:

1) The sample number contains the sample location with a soil boring (SB) identifier.
2) All SEAD-43,56,69 soil samples were chemically analyzed for the following: volatile organics. semivolatile organics. pesticides/PCBs. metals, cyanide, explosives, nitrates and herbicides.
3) All SEAD-43 soil samples were also analyzed for TPH.

constituents have migrated from the respective areas and to further determine the direction of groundwater flow. The presumed direction of groundwater flow at SEAD-43, 56 and 69 was to the southwest. The geophysical survey showed the direction to be more to the west-southwest. Adjustments to the monitoring well locations were based upon the seismic survey interpretation. Specifically, the upgradient monitoring well was placed on the eastern boundary of SEAD-43, 56, and 69 and the three downgradient monitoring wells were placed in a linear fashion along the southwestern side of each potentially contaminated area of SEAD-43, 56, and 69.

One (1) monitoring well was constructed at each designated location and was screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample was collected from each well and submitted for chemical analyses.

Sediment/Surface Water

A total of five (5) surface water and sediment samples were collected from SEAD-43, 56 and 69. The sampling locations are shown in **Figure 2.3-2**. The five (5) samples were collected along the various drainage swales running amongst SEAD-43, 56 and 69. Of these samples, one was collected from the drainage swale located upgradient of the site, two were taken downgradient of SEADs 43 and 56 following both possible drainage directions (northwest and southwest). The final sample was collected downgradient of the suspected disposal area for Building 606 (SEAD-69). All surface water and sediment samples were submitted for chemical analyses.

2.3.3 Analytical Program

A total of thirty (30) soil samples, three (3) groundwater samples, and five (5) surface water and sediment samples were collected from SEAD-43, 56, and 69 for chemical analysis. All of the samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals, and cyanide according to the NYSDEC CLP SOW, explosives by Method 8330, herbicides by Method 8150, and nitrates by Method 353.2.

2.4 SEAD 44A-QA TEST LABORATORY

The quality assurance test lab (SEAD-44A) was used for the testing of various pyrotechnics, firing devices, and specifically, CS grenades. The detonation of land mines occurred in aboveground bermed areas. Any potential for contamination, given the varying topography and historical site activities, could result from rainfall run-off over these berms as well as direct contact to nearby

surface water and soils. Therefore, the contaminant transport media for the chemicals of concern at SEAD-44A included soil, surface water, and groundwater. The groundwater classification in the area is GA, meaning that it is suitable for human consumption. However, no drinking water wells are known to exist at or near the area influenced by SEAD-44A.

2.4.1 Chemicals of Interest

Chemicals of interest include VOCs, SVOCs, explosives, nitrates, and heavy metals.

2.4.2 Media Investigated

Soils

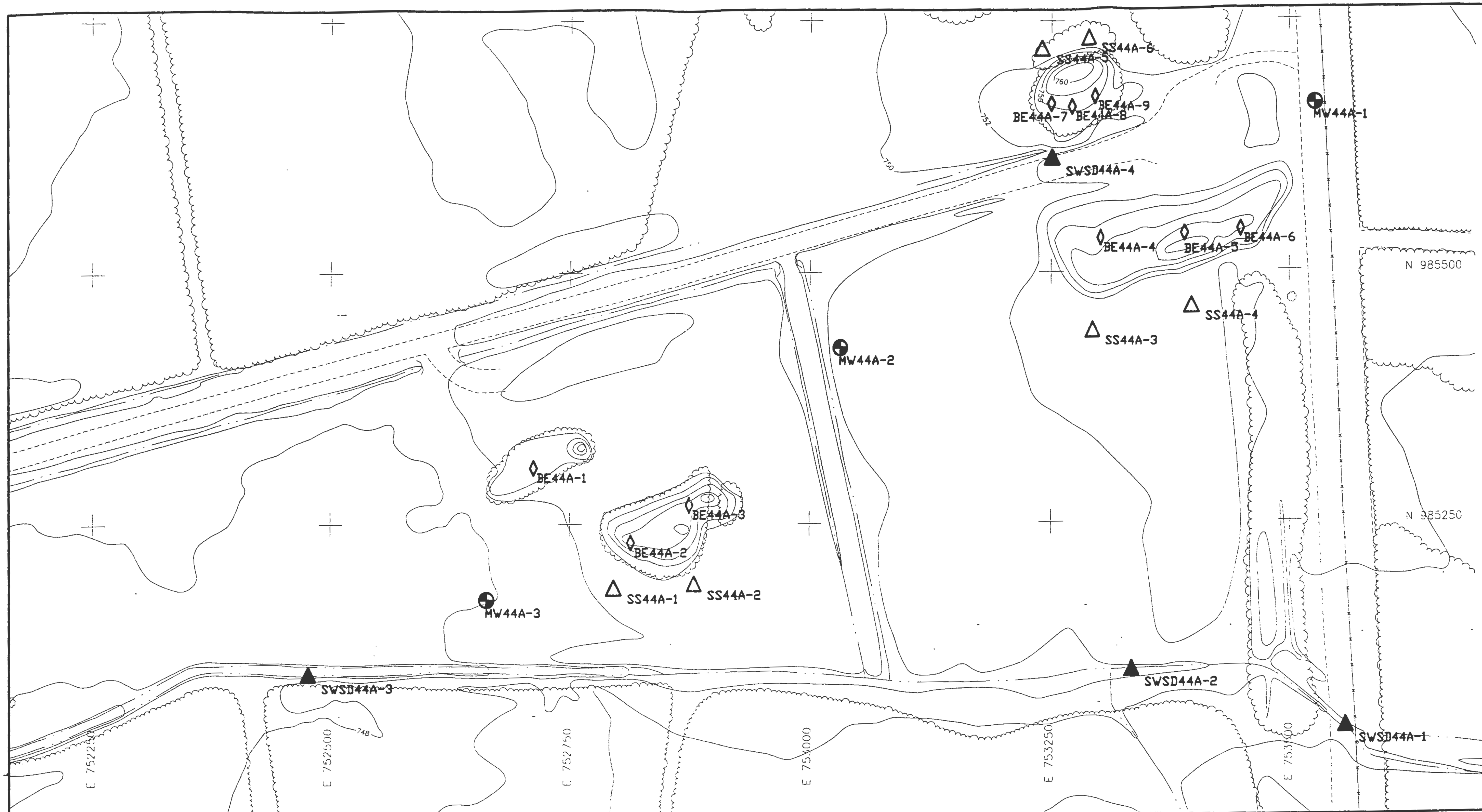
A total of nine (9) berm excavations were performed at three berms; three (3) samples were taken from each berm. The sampling locations are shown in **Figure 2.4-1**. The soil samples were collected with the use of a backhoe from a mid-depth locality within each of the three berms investigated.

Two (2) surface soil samples were collected at various points around each of the three berms from a depth of 0-2". All surface soil samples were submitted for the chemical analyses (**Table 2.4-1**).

Groundwater

Three (3) groundwater monitoring wells were installed at SEAD-44A as shown in **Figure 2.4.1**. One monitoring well (MW44A-1) was installed upgradient of the AOC to obtain background water quality data, while the remaining two monitoring wells were installed downgradient of specific berms to determine if hazardous constituents have migrated from a specific berm and to determine the direction of groundwater flow. The presumed direction of groundwater flow was to the southwest.

One monitoring well was constructed at each location and was screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample was collected from each well and tested for the parameters listed in Section 2.8.3.



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- MONITORING WELL
- SURVEY MONUMENT
- SOIL BORING
- SURFACE SOIL SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER/ SEDIMENT SAMPLE
- TEST PIT
- BERM EXCAVATION

N

50 0 50 100
(feet)

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | Dwg No: 736028-01001

FIGURE 2.4-1
SEAD-44 QUALITY ASSURANCE TEST LABORATORY
LOCATION OF SAMPLING POINTS

SCALE: 1" = 100' | REV: A

TABLE 2.4-1
SEAD-44A SOIL SAMPLING SUMMARY
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

SURFACE SOILS

SAMPLE NUMBER	SAMPLE DEPTH
SS44A-1	0-2"
SS44A-2	0-2"
SS44A-3	0-2"
SS44A-4	0-2"
SS44A-5	0-2"
SS44A-6	0-2"

TEST PITS

SAMPLE NUMBER	SAMPLE DEPTH
TP44A-1	3'
TP44A-2	3'
TP44A-3	3'
TP44A-4	3'
TP44A-5	3'
TP44A-6	3'
TP44A-7	3'
TP44A-8	7'
TP44A-9	3'

Notes

1) The sample number contains the sample location with a surface soil (SS), or test pit (TP) identifier
2) All SEAD-44A soil samples were chemically analyzed for the following. volatile organics, semivolatile organics, pesticides\PCBs, metals. cyanide, explosives, and nitrates

2.5.2 Media Investigated

Geophysics

Four (4) 115 foot long seismic refraction profiles were surveyed on 4 lines positioned along each boundary of SEAD-44B. The seismic refraction transect locations are shown in **Figure 2.5-1**. Data from the survey were used to determine the direction of groundwater flow and to adjust the monitoring well locations to assure that one monitoring well was installed upgradient and two monitoring wells were installed downgradient of SEAD-44B.

Soils

Three (3) surface soil samples were collected from a depth of 0-2". One sample was collected to the west (downgradient) of the concrete pad and flag pole. A second sample was collected in the southwestern portion of SEAD-44B, immediately downgradient of several small piles observed on the ground surface. The last sample was collected to the west (downgradient) of the dilapidated metal shed. All surface soil samples were submitted for the chemical analyses (**Table 2.5-1**).

Groundwater

Three (3) groundwater monitoring wells were installed at SEAD-44B as shown in **Figure 2.5.2**. One monitoring well (MW44B-1) was installed upgradient of SEAD-44B, east of Brady Road, to obtain background water quality data. The two remaining monitoring wells were installed downgradient of the concrete slab and the dilapidated metal shed along the western boundary of SEAD-44B to determine if hazardous constituents have migrated from SEAD-44B and to determine the direction of groundwater flow. The presumed direction of groundwater, based upon the seismic refraction survey, was to the southwest.

One monitoring well was installed at each location and was screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample was collected from each well and submitted for chemical analyses.

P3

P2
DILAPIDATED METAL SHED

P1
FLAG POLE

CONCRETE FOUNDATION

BRADY ROAD

P4

N 988250

N 988000

N 987750

N 987500

740

742

738

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL

LEGEND

P2 ---------- SEISMIC PROFILE

50 0 50 100
(Feet)

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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | Dwg No: 734967-01001

FIGURE 2.5-1
SEAD-44B QUALITY ASSURANCE TEST LABORATORY
LOCATION OF GEOPHYSICAL SURVEYS

SCALE: 1" = 100' | REV: A

TABLE 2.5-1
SEAD-44B SURFACE SOIL SAMPLING SUMMARY
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT

SAMPLE NUMBER	SAMPLE DEPTH
SS44B-1	0-2"
SS44B-2	0-2"
SS44B-3	0-2"

Notes

1) The sample number contains the sample location with a surface soil (SS) identifier
2) All SEAD-44B soil samples were chemically analyzed for the following: volatile organics, semivolatile organics, pesticides\PCBs, metals, cyanide, explosives, and nitrates

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL

LEGEND

- MONITORING WELL
- SURVEY MONUMENT
- SOIL BORING
- SURFACE SOIL SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER/ SEDIMENT SAMPLE
- TEST PIT

50 0 50 100
(feet)

PARSONS
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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETINO REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | DWG NO: 736026-01001

FIGURE 2.5-2

SEAD-44B QUALITY ASSURANCE TEST LABORATORY
LOCATIONS OF SAMPLING POINTS

SCALE: 1" = 100' | REV: A

K:\SENECA\MLSWMU\ACADDWG\SD44BSP.DWG

Surface Water and Sediment

Two (2) surface water and sediment samples were collected from SEAD-44B. The sampling locations are shown on **Figure 2.5-2**. Each of the two samples were located within a drainage ditch which runs parallel to Brady Road along the eastern boundary of SEAD-44B.

2.5.3 Analytical Program

A total of three (3) soil samples, three (3) groundwater samples, and two (2) surface water and sediment samples were collected from SEAD-44B for chemical analysis. All of the samples were analyzed for TCL, VOCs, SVOCs, Pesticides/PCBs, TAL metals, and cyanide according to the NYSDEC CLP SOW, explosives by Method 8330, and nitrates by Method 353.2.

2.6 SEAD-52 - Ammunition Breakdown Area

2.6.1 Chemicals of Interest

The constituents of concern at SEAD-52 are explosives, heavy metals, and SVOCs.

2.6.2 Chemical Analysis Results

Geophysics

A geophysical investigation was not performed at SEAD-52.

Soils

A Limited Sampling Program was performed at SEAD-52 in December 1993. A total of eighteen (18) surface soil samples were collected from a depth of 0 to 2" below ground surface and chemically analyzed for explosives by EPA Method 8330. The samples were collected from locations around Buildings 608, 611 and 612 as shown in **Figure 2.6-1**.

Bldg. 608 - Four surface soil samples, at 0-2" depth, were collected; one from each corner of the building.

N

N 987250

N 987000

N 986750

N 986500

N 986250

N 986000

N 985750

E 751000

E 751500

E 752000

E 752500

E 752750

BRADY ROAD

UNNAMED ROAD

OIL SPILL AREA

BLDG. 609

BLDG. 612

BLDG. 610

BLDG. 611

SS52-1
SS52-2
SS52-3
SS52-4
SS52-5
SS52-6
SS52-7
SS52-8
SS52-9
SS52-10
SS52-11
SS52-12
SS52-13
SS52-14
SS52-15
SS52-16
SS52-17
SS52-18

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENT
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- ⊠ SURVEY MONUMENT
- ▲ SURFACE SOIL SAMPLE

100 0 100 200
(feet)

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING

PMS No: 736026-01001

FIGURE 2.6-1
LOCATION OF SAMPLE POINTS
FOR SEAD-52

SCALE: 1" = 200'

REV: A

Bldg. 611 - Four surface soil samples, at 0-2" depth, were collected; one from each corner of the building.

Bldg. 612 - Ten surface soil samples, at 0-2" depth, were collected; one from each corner of the building, two from the long sides of the building, approximately 100 feet apart, and one from the middle of each of the shorter sides.

Groundwater

Groundwater testing was not performed at SEAD-52.

Surface Water and Sediment

Surface water and sediment testing were not performed at SEAD-52.

2.6.3 Analytical Program

The Limited Sampling Program at SEAD-52 consisted of surface soil sampling and chemical analyses for explosive compounds. No previous sampling data were available for SEAD-52 prior to this sampling program. The results of the Limited Sampling Program at SEAD-52 were presented in the SWMU Classification Report (Parsons ES, September 1994).

2.7 SEAD-62 - Nicotine Sulfate Disposal Area

It is believed two drums containing nicotine sulfate were buried in the area between or surrounding Buildings 606 and 612. SEAD-62 measures approximately one-half mile by one-quarter mile and contains several drainage swales which flow to the west. There is also a marshy area located in the south central portion of the AOC. Because contaminants from these drums have the potential to be adsorbed into the soil, the primary migration pathways are expected to be transport in groundwater and leaching into the soil.

2.7.1 Chemicals of Interest

The primary chemicals of interest are VOCs, SVOs, Pest/PCBs, herbicides, and heavy metals.

2.7.2 Media Investigated

Geophysics

Four 115 foot long seismic refraction profiles were surveyed along 4 lines positioned throughout the AOC. The seismic profile locations are shown in **Figure 2.7-1**. Data from the surveys were used in conjunction with those from the combined SEADs-43, 56, and 69 seismic refraction profiles to allow for a more comprehensive interpretation of groundwater flow direction for this area.

An EM-31 survey was performed to determine the exact location of the suspected nicotine sulfate drums. The geophysical survey grid is shown in **Figure 2.7-1**. A grid of electromagnetic data was collected across the site. Survey profiles were spaced at 50 foot intervals and electromagnetic measurements were taken at 10 foot intervals along each profile.

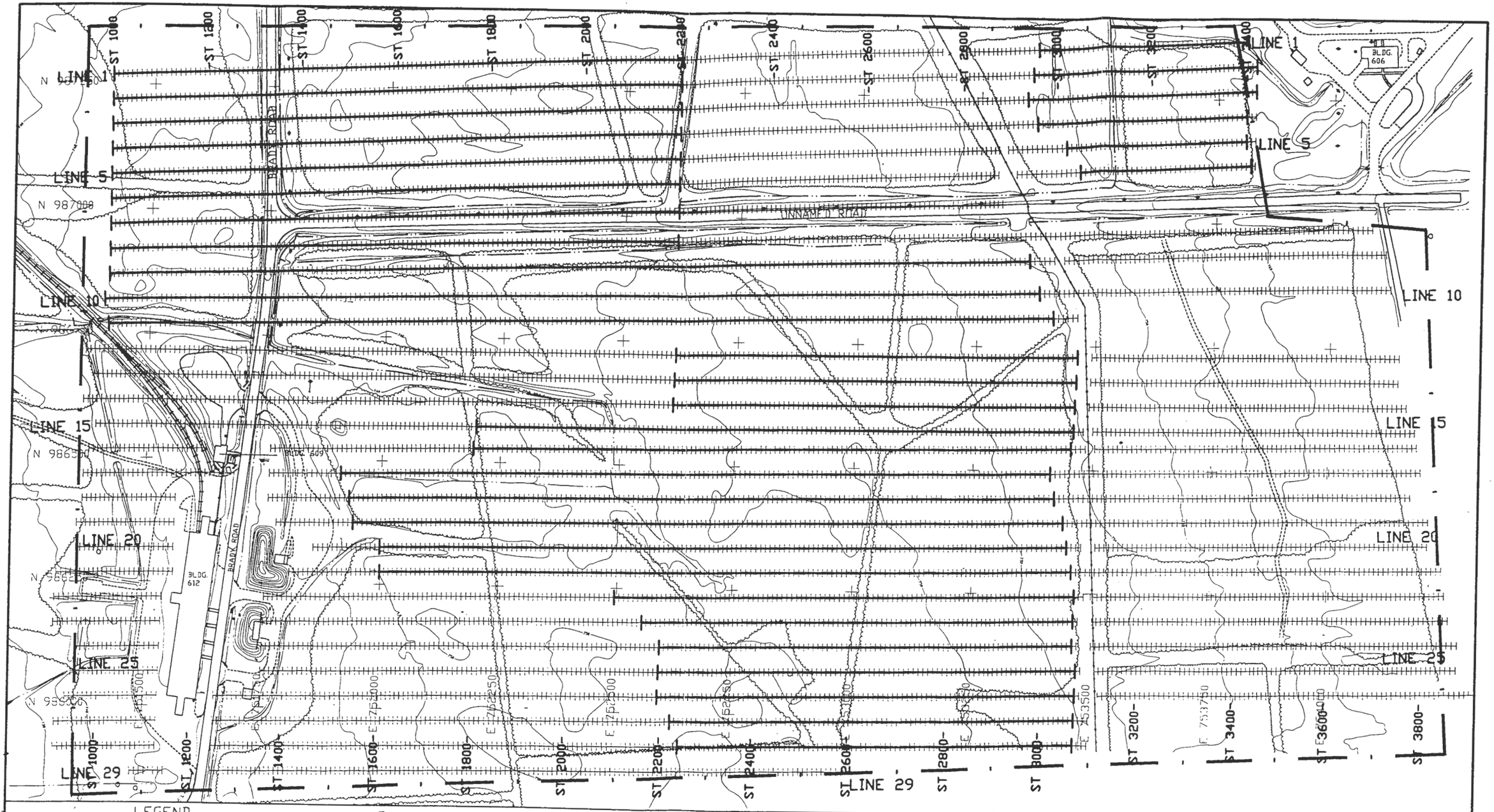
EM-31 was the primary geophysical method of investigation at SEAD-62, however, a GPR survey was also performed to provide additional data in areas of elevated ground conductivity and to characterize the source of several electromagnetic anomalies. The GPR data were collected along the same lines as the EM-31. A total of 73,600 feet of EM-31 data and 34,650 feet of GPR data were collected.

Soils

Three test pits were excavated at SEAD-62. The test pit locations are shown in **Figure 2.7-2**. Two test pits were located over electromagnetic anomalies, each located within an area of elevated ground conductivity. The third excavation was located over an EM-31 anomaly situated along the western boundary the AOC. One soil sample was collected from each test pit (**Table 2.7-1**) and was submitted for chemical analyses.

Groundwater

Three groundwater monitoring wells were installed at SEAD 62 as shown in **Figure 2.7-2**. One monitoring well (MW62-1) was installed upgradient of the two areas of high conductivity previously mentioned to obtain background water quality data. The remaining two wells, were installed adjacent to and downgradient of these areas of high conductivity to determine if hazardous constituents were present and to determine the direction of groundwater flow. The presumed direction of groundwater flow at this AOC was to the southwest, however, the geophysical survey



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- APPROXIMATE LANDFILL EXTENT
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ELECTRIC UTILITY LINE
- UNDERGROUND WATER UTILITY LINE

- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- SURVEY MONUMENT

(NOT ALL SYMBOLS MAY APPEAR ON MAP)

APPROXIMATE AOC EXTENT

LINE 15 ST3200 — EM TRANSECT AND STATION NUMBERS

N

100 0 100 200
(feet)

SHEET 1 OF 2

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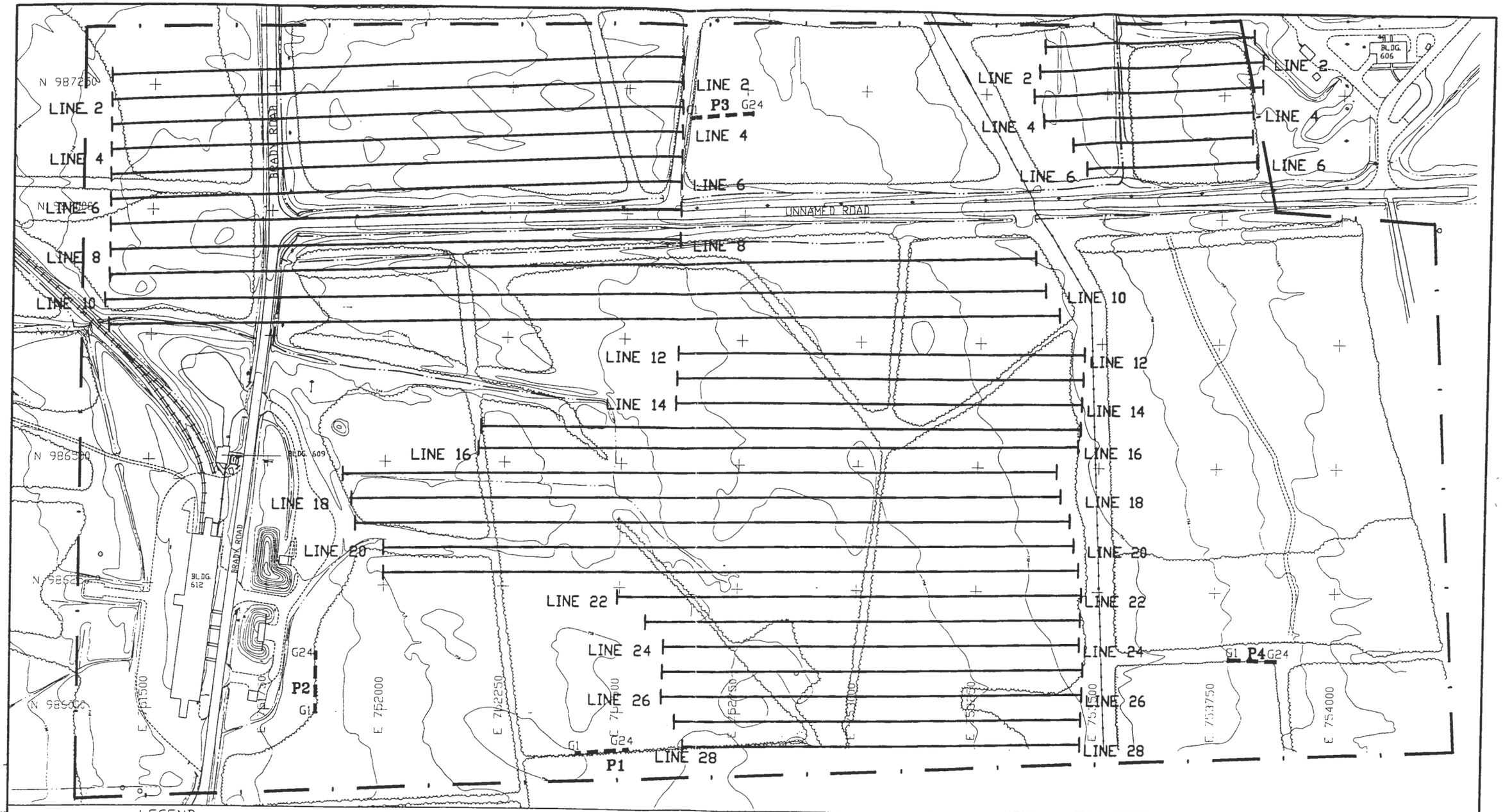
SENECA army DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
Dwg No: 734987-01001

FIGURE 2.7-1
LOCATION OF GEOPHYSICAL SURVEYS
FOR SEAD-62

SCALE: 1" = 200'
REV: A



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- APPROXIMATE LANDFILL EXTENT
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ELECTRIC UTILITY LINE
- UNDERGROUND WATER UTILITY LINE

- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- SURVEY MONUMENT
- (NOT ALL SYMBOLS MAY APPEAR ON MAP)
- APPROXIMATE AOC EXTENT

G1 P2 G24 — SEISMIC PROFILE WITH GEOPHONE NUMBERS

LINE 15 — L1300E — GPR TRANSECT

N

100 0 100 200

(feet)

SHEET 2 OF 2

PARSONS

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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | Eng No 734987-01001

FIGURE 2.7-1
LOCATION AND GEOPHYSICAL SURVEYS
FOR SEAD-62

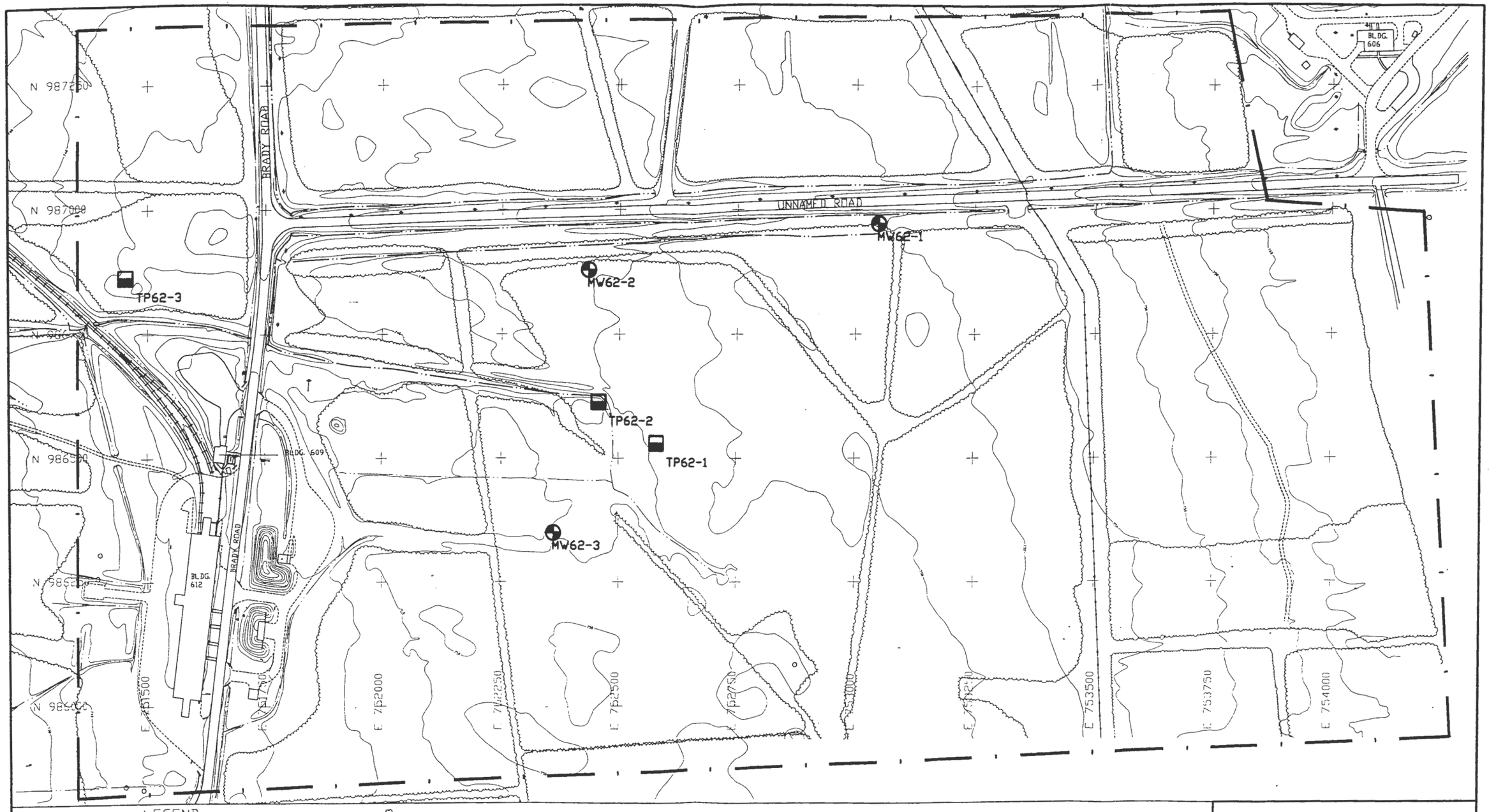
SCALE 1" = 200' | REV A

TABLE 2.7-1
SEAD-62 TEST PIT SAMPLING SUMMARY
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT

TEST PIT NUMBER	SAMPLE NUMBER	SAMPLE DEPTH
TP62-1	TP62-1	0-6"
TP62-2	TP62-2	3'
TP62-3	TP62-3	2'

Notes:

1) The sample number contains the sample location with a test pit (TP) identifier.
2) All SEAD-62 soil samples were chemically analyzed for the following: volatile organics, semivolatile organics, pesticides/PCBs, metals, cyanide, and herbicides.



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- APPROXIMATE LANDFILL EXTENT
- RAILROAD
- GROUND SURFACE ELEVATION CONTOUR (760)
- ELECTRIC UTILITY LINE
- UNDERGROUND WATER UTILITY LINE
- ROAD SIGN
- DECIDUOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- COORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- MAILBOX/RR SIGNAL
- OVERHEAD UTILITY POLE
- SURVEY MONUMENT

(NOT ALL SYMBOLS MAY APPEAR ON MAP)

APPROXIMATE AOC EXTENT

MONITORING WELL

TEST PIT

N

100 0 100 200

(feet)

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DWG No 738026-01001

FIGURE 2.7-2
SEAD-62
LOCATION OF SAMPLING POINTS

SCALE 1" = 200'

REV A

showed the direction to be more to the west. The relocation of these monitoring wells was based upon the results of the seismic survey, to assure the wells were placed in the proper upgradient and downgradient locations.

One monitoring well was constructed at each designated location and was screened over the entire thickness of the aquifer above competent bedrock. Following installation and development, one groundwater sample was collected from each well and submitted for chemical analyses.

2.7.3 Analytical Program

A total of 3 soil samples and 3 groundwater samples were collected from SEAD 62 for chemical analysis. All the samples were analyzed for the following: TCL VOCs, SVOs, and Pesticides/PCBs and TAL Metals and Cyanide according to the NYSDEC CLP SOW, and herbicides by Method 8150.

2.8 SEAD-120B - Ovid Road Small Arms Range

The small arms range near Ovid road was identified as a potential site during the preparation of the EBS. Activities that were suspected to have occurred at this site included the firing of small caliber ammunition into a berm. Following the identification of the site, Parsons ES was tasked with collecting soil samples at locations adjacent to surrounding the berm. This data was collected to determine the potential impacts that may be present at this site.

2.8.1 Chemicals of Interest

The primary chemicals of interest are SVOCs, metals, and explosives.

2.8.2 Media Investigated

Geophysics

Geophysics were not performed at SEAD-120B.

Soils

A total of six soil samples were collected at locations behind each of the target locations within the berm (**Figure 2.8-1**). The samples were collected at locations immediately behind the target posts; these locations are believed to be the impact points for the shots.

Groundwater

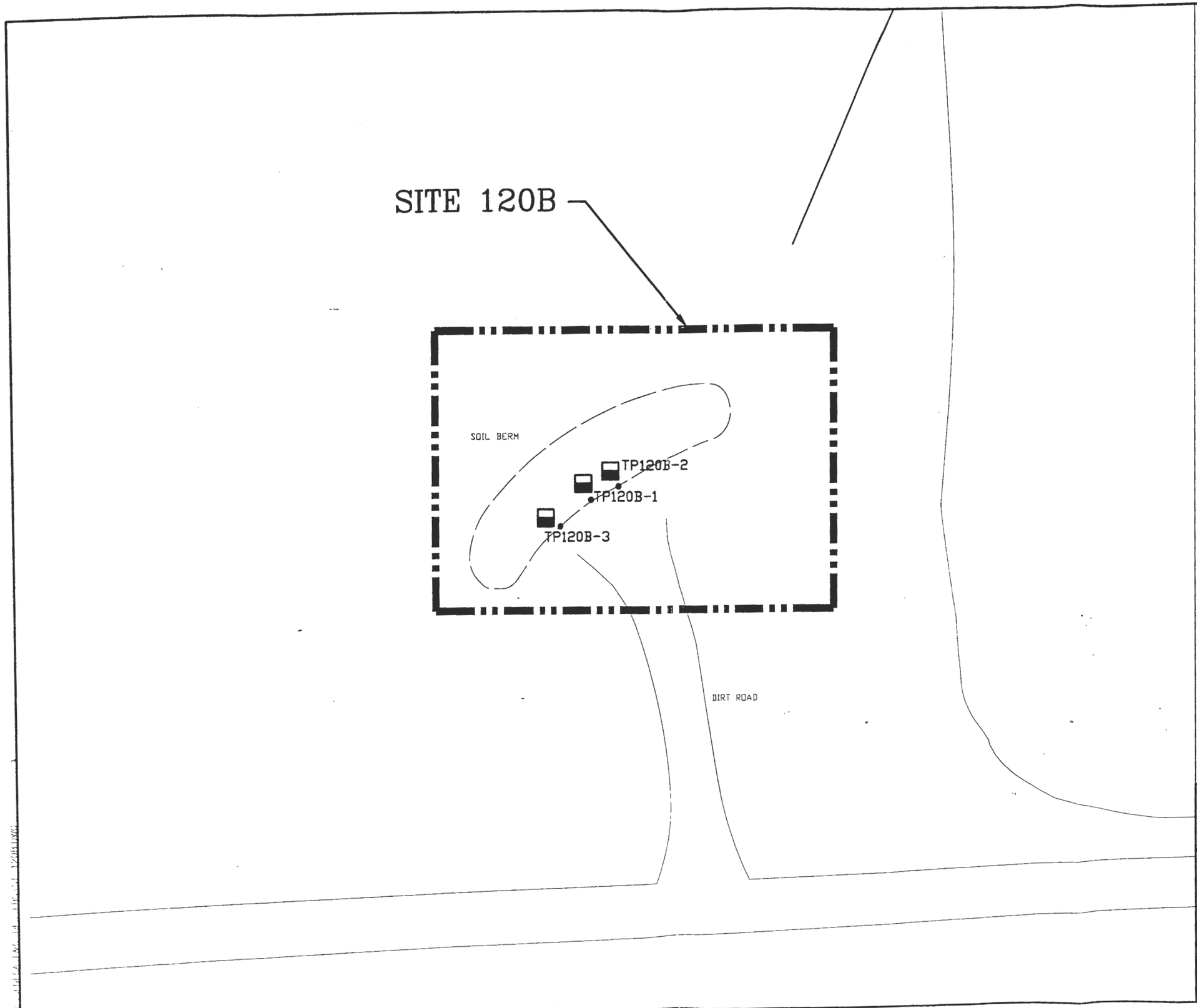
Groundwater testing was not performed at SEAD-120B.

Surface Water and Sediment

Surface water and sediment were not sampled at SEAD-120B.

2.8.3 Analytical Program

A limited sampling and analysis program was designed for SEAD-120B in order to provide the initial data for confirmation of potential concerns raised during the EBS. All the samples were analyzed for the following: SVOCs, metals, and explosives according to NYSDEC CLP SOW. All of the samples were analyzed and compared to NYSDEC TAGMs.



N

LEGEND:

TP120A-1 TEST PIT

TARGET MOUNTING FRAME SUPPORT POST

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
- PARCEL NUMBER
- CATEGORY NUMBER
- CONTAMINATION DESCRIPTION: PS PETROLEUM STORAGE; PR PETROLEUM RELEASE OR DISPOSAL; HS HAZARDOUS SUBSTANCE STORAGE; HR HAZARDOUS SUBSTANCE RELEASE OR DISPOSAL; (P) POSSIBLE (UNVERIFIED)

NON-CERCLA ISSUE (QUALIFIED) LABEL DEFINITIONS

8-19Q-A(P)
- PARCEL NUMBER
- FACILITY NUMBER (IF APPLICABLE)
- QUALIFIED
- QUALIFIERS: A ASBESTOS-CONTAINING MATERIAL; L LEAD-BASED PAINT; P PCB; R RADON; X UXO AMO/OR ORDNANCE FRAGMENTS; RD RADIONUCLIDES; (P) POSSIBLE (UNVERIFIED)

-50 0 50

SCALE: 1" = 50'

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COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | D=9 No 736026-01001

FIGURE 2.8-1

SITE FEATURES AND SAMPLE LOCATIONS AT EBS
SITE 120B OVID ROAD SMALL ARMS RANGE

SCALE: 1" = 50' | REV A

3.0 GEOLOGICAL, GEOPHYSICAL, AND HYDROLOGICAL SETTING

3.1 SEAD-43: OLD MISSILE PROPELLENT TEST LAB (BLDG. 606)
SEAD-56: HERBICIDE/PESTICIDE STORAGE
SEAD-69: BUILDING 606 DISPOSAL AREA

3.1.1 Site Geology

Fill material, till, weathered dark gray shale, and competent gray-black shale were the four major geologic units encountered at the fourteen overburden borings drilled at SEADs-43, 56, and 69. The till was stratigraphically above the weathered shale, which overlaid competent shale. At most of the boring locations, a topsoil horizon was present within 1 foot of the ground surface. The depths of the borings at SEADs-43, 56, and 69 were between 13.4 and 19.5 feet below grade.

The till was light brown or olive gray silt, very fine sand, and clay, with minor components of gray-black shale fragments. At some locations, larger shale fragments (rip-up clasts) were observed at the top of the weathered shale unit. At all soil borings within SEAD-56, there was evidence of disturbed soil. At SB56-1, SB56-2 and SB56-3, fill material was encountered to 5.8 feet, 3.8 feet, and 0.9 feet below grade, respectively.

At all borings except SB43-4, the contact between the overburden till and the bedrock was characterized by a transitional weathered shale. At approximately half of the boring locations, the top of the weathered shale was marked by interbedding of till and weathered shale. At the remaining boring locations, the contact between till and weathered shale was distinct with no interbedding. At SB43-4, no weathered shale was observed, the till directly overlaid competent bedrock.

Competent dark gray to black shale was only observed at two soil boring locations, MW43-2 (18.0 feet below grade) and SB56-1 (14.0 feet below grade). Competent bedrock was, however, encountered at six other boring locations where it was inferred from the point of auger refusal. The remaining six borings were terminated in the weathered shale at the point of spoon refusal. Specific information for each boring is listed below.

Boring Location	Depth to Bottom of Overburden (feet)	Thickness of Weathered Shale (feet)	Depth to Bedrock (feet)	Depth to Bottom of Boring (feet)
MW43-1	9.6	5.4	15.0	15.0
MW43-2	8.8	9.2	18.0	18.4
MW43-3	11.0	7.8	18.8	18.8
MW43-4	10.8	2.6	13.4	13.4
SB43-1	16.0	ND	ND	16.4
SB43-2	13.5	4.0	17.5	17.5
SB43-3	12.6	ND	ND	14.3
SB43-4	13.4	0	13.4	13.4
SB56-1	13.0	1.0	14.0	15.0
SB56-2	13.6	ND	ND	15.1
SB56-3	12.5	ND	ND	16.6
SB69-1	8.6	7.4	16.0	16.0
SB69-2	12.0	ND	ND	19.1
SB69-3	12.7	ND	ND	19.5

ND= Not Determined

3.1.2 Geophysics

3.1.2.1 Seismic Survey

The results of the seismic refraction survey conducted at SEADs 43,56, and 69 are shown in **Table 3.1-1**. The seismic refraction results indicated that 4.9 to 6.6 feet of unconsolidated overburden (1,000 ft./sec.) overlaid bedrock (8,500 to 10,700 ft./sec.). Saturated overburden was not detected by the seismic survey. Due to inherent limitations of the seismic refraction method, a thin layer of

TABLE 3.1-1
SEAD-43,56, and 69

RESULTS OF SEISMIC REFRACTION SURVEY

			Water Table		Bedrock	
Profile	Distance[1]	Ground Elevation[2]	Depth	Elevation[2]	Depth	Elevation[2]
P1	2.5	112.4			6.6	105.8
	57.5	113.4			5.8	107.6
	112.5	114.0			5.9	108.1
P2	2.5	116.0			5.3	110.7
	57.5	116.3			5.3	111.0
	112.50	116.7			5.6	111.1
P3	2.5	116.1			5.6	110.5
	57.5	117.2			6.3	110.9
	112.5	117.9			6.6	111.3
P4	2.5	121.3			6.0	115.3
	57.5	120.4			4.9	115.5
	112.5	120.3			5.3	115.0

[1]All distances are in feet along the axis of the seismic profile and were measured from geophone #1 of each profile.

[2]All elevations are relative to an arbitrary datum established at geophone #24 of the SEAD-44B seismic profile P4.

NOTE: Due to inherent limitations of the seismic refraction method, a thin layer of saturated overburden (less than 2 feet) overlying the bedrock surface would be undetectable.

saturated overburden (<2 feet) overlying the bedrock surface would be undetectable.

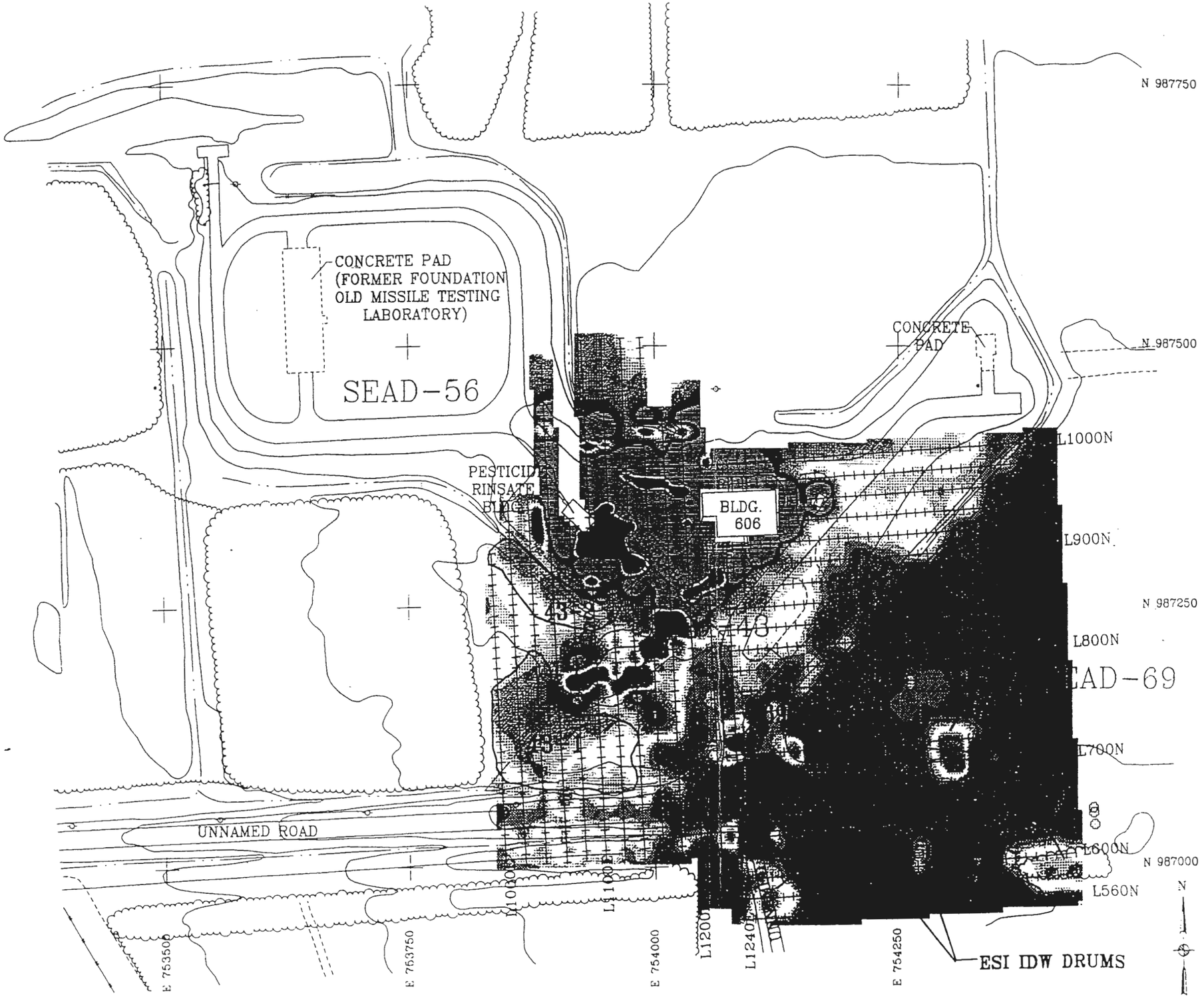
Bedrock velocities of 8,500 and 9,000 ft./sec., detected beneath profiles P3 and P4, respectively, indicated that a layer of weathered bedrock, having a thickness of 20 feet or more, was present above competent bedrock in the areas of these two profiles.

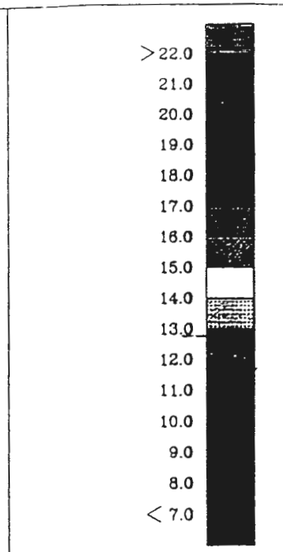
3.1.2.2 EM-31 Survey

Figure 3.1-1 shows the results of the apparent ground conductivity survey performed at SEADs 43 and 69. An area of elevated apparent ground conductivity is clearly evident in the southeastern portion of the EM grid. This area is situated immediately south and west of the mound presumably associated with the septic system being investigated as SEAD-43. A second area of elevated ground conductivity was detected in the area of the drainage swale surrounding the pesticide/herbicide rinse pad. These areas of elevated apparent ground conductivity may be due to an increase in the clay content of the soils or to and increase in the content of dissolved solids in the ground water or soil moisture. Since the most conductive soils coincided with drainage swales along the access roads around SEAD 43, road salt should be considered a possible explanation for these increases in apparent ground conductivity.

The apparent ground conductivity measured in the remaining areas of SEADs 43 and 69 showed a relatively featureless response with only 4 localized anomalies being detected. The eastern most of these anomalies (situated in the west-central portion of SEAD-69) was associated to metallic construction debris on the ground surface. This area was later identified by SEDA personnel as being the location of a small waste disposal trench which had been excavated and filled during the 1970's. The three remaining localized anomalies, as well as several low intensity anomalies detected in the southeastern corner of SEAD 69, were related to cultural effects.

Figure 3.1-2 shows the results of the in-phase response survey performed at SEADs 43 and 69. The results of the in-phase response survey showed a generally featureless response. Several isolated anomalies were detected in the southern one half of the EM grid and were correlated to the cultural effects also observed in the apparent ground conductivity results.





QUADRATURE
(mS/m)

MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENTS
RAILROAD
760 GROUND SURFACE ELEVATION CONTOUR
ROAD SIGN
DECIDOUS TREE
GUIDE POST
POLE
FIRE HYDRANT
MAILBOX/RR SIGNAL
UTILITY BOX
OVERHEAD UTILITY POLE
MANHOLE
CORDINATE GRID (250' GRID)
L1000E GPR TRANSECT
L1200E EM TRANSECT
43-2 EXTENT OR LOCATION AND IDENTIFICATION NUMBER OF ANOMALY DISCUSSED IN THE REPORT

50 0 50 100
(feet)

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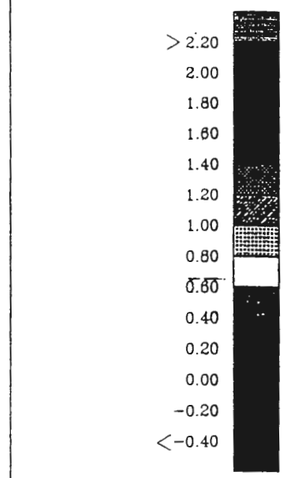
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
G+G NO. 734967-01001

FIGURE 3.1-1
SEAD-43, 56, 69 EM SURVEY
QUADRATURE SURVEY

SCALE: 1" = 100'
REV: A



MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENTS
RAILROAD
750 GROUND SURFACE ELEVATION CONTOUR

ROAD SIGN | DECIDOUS TREE | GUIDE POST | POLE

FIRE HYDRANT | MAILBOX/RR SIGNAL | UTILITY BOX

OVERHEAD UTILITY POLE | MANHOLE | CORDINATE GRID (250' GRID)

L1000E GPR TRANSECT

L1200E EM TRANSECT

43-2 EXTENT OR LOCATION AND IDENTIFICATION NUMBER OF ANOMALY DISCUSSED IN THE REPORT

50 0 50 100
(feet)

PARSONS
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DEPT ENVIRONMENTAL ENGINEERING | DWG. NO. 734967-01001

FIGURE 3.1-2
SEAD-43, 56, 69 EM SURVEY
IN-PHASE RESPONSE

SCALE REV

3.1.2.3 GPR Survey

A GPR survey was conducted at SEAD-43 to characterize the suspected septic system associated with Building 606 and at SEAD-69 to identify areas which may have received wastes generated from the former activities conducted in Building 606. No evidence of disturbed soil was found at either SEAD-43 or SEAD-69. With the exception of the GPR data acquired over the disposal trench discussed in Section 3.1.2.2, no anomalies showing discontinuities in subsurface layers or characteristic reflections from buried wastes or objects were detected.

Several small reflectors, presumably associated to buried pipes and/or conduits, were detected in the proximity of Building 606. One of the reflectors was traced over a short distance from the southern wall of Building 606 towards the mound presumably associated with the septic system. It was hoped that this pipe/conduit would lead to the leach field of the septic system (or the mound presumably associated to it), however, asphalt and compacted soils to the south of the building 606 completely attenuated all subsurface GPR signals. Further GPR investigation around the mound at SEAD-43 revealed one series of reflectors which could be associated to a buried pipe or conduit, however its axis was not in-line with that of the pipe or conduit traced from building 606. One localized reflector was detected 85 feet northwest of the mound at SEAD-43, and was found to be associated with a partially exposed buried concrete structure. A detailed GPR investigation in the area of this structure revealed several distinct reflectors at depths of 1.5 to 3 feet below grade.

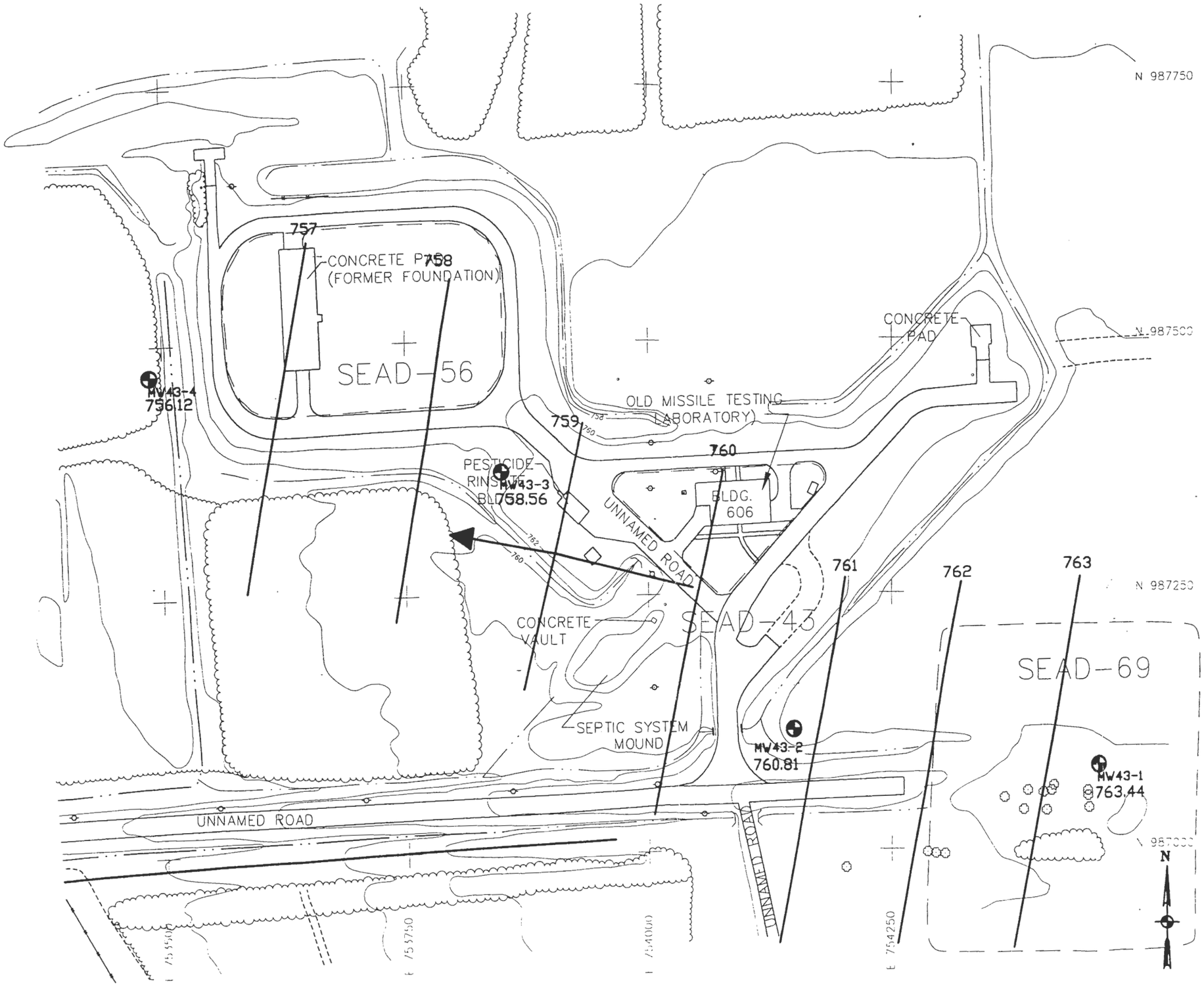
A series of GPR profiles acquired over the mound at SEAD 43 indicated the presence of several irregular shaped reflectors, varying from 5 to 15 feet in length. These reflectors were located between 2.1 and 2.4 feet below the ground surface. A continuous reflector, at a depth of 4.3 feet, was detected over the entire length of the mound. The detection of this deeper reflector indicated that the shallower reflectors were definitely non-metallic in nature and greatly reduced the probability that they were reflections from concrete structures.

3.1.2.4 Test Pitting Program

A total of three test pits were excavated in SEAD 69. Test pit TP69-3 was centered over the debris trench discussed in Section 3.1.2.2. Test pits TP-69-1 and TP69-2 were centered over 2 small piles on the ground surface.

TABLE 3.1-2
MONITORING WELL WATER LEVEL SUMMARY - SEAD-43
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

MONITORING WELL NUMBER	TOP OF PVC CASING ELEVATION (MSL)	WELL DEVELOPMENT DATE	WELL DEVELOPMENT DEPTH TO GROUNDWATER TOC (FT)	WELL DEVELOPMENT GROUNDWATER ELEVATION (MSL)	SAMPLING DATE	SAMPLING DEPTH TO GROUNDWATER TOC (FT)	SAMPLING GROUNDWATER ELEVATION (MSL)	WATER LEVEL MEASUREMENTS DATE	WATER LEVEL MEASUREMENTS DEPTH TO GROUNDWATER TOC (FT)	WATER LEVEL MEASUREMENTS GROUNDWATER ELEVATION (MSL)
MW43-1	765.96	3/20/94	2.46	763.50	7/19/94	4.08	761.88	7/6/94	2.52	763.44
								7/25/94	4.68	761.28
MW43-2	763.32	3/21/94	2.16	761.16	7/19/94	2.98	760.34	7/6/94	2.51	760.81
								7/25/94	3.59	759.73
MW43-3	762.20	3/18/94	2.78	759.42	3/28/94	2.46	759.74	7/6/94	3.64	758.56
								7/25/94	4.93	757.27
MW43-4	758.10	3/19/94	1.70	756.40	3/28/94	1.40	756.70	7/6/94	1.98	756.12
								7/25/94	3.08	755.02



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL

SEAD 43: BLDG.606 OLD MISSILE PROPELLANT TEST LABORATORY
SEAD 56: FORMER HERBICIDE AND PESTICIDE STORAGE AREA
SEAD 69: DISPOSAL AREA

MW43-1
763.44 — **MONITORING WELL WITH WATER TABLE ELEVATION**

761 — **GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES DIRECTION OF FLOW)**

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/6/94

50 0 50 100
(feet)

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
Dwg No: 734967-01001

FIGURE 3.1-3
SEAD-43, 56 AND 69
GROUNDWATER ELEVATION MAP

SCALE: 1" = 100'
REV: A

in the upper portion of the weathered shale. Recharge to the monitoring wells during sampling was good for MW43-1, MW43-3, and MW43-4, but the recharge to MW43-2 was fair to poor.

3.2 SEAD-44A: QUALITY ASSURANCE TEST LAB

3.2.1 Site Geology

Till and weathered dark gray shale were the two major geologic units present at the three overburden borings drilled at SEAD-44A. The till was stratigraphically above the weathered shale. Competent shale was not encountered at SEAD-44A. Topsoil was present at each of the borings within 1.2 feet of the surface. MW44A-1 and MW44A-3 were drilled to 10.6 and 13.5 feet below grade, respectively, and MW44A-2, which was located between the other two borings, was drilled to 30.1 feet below grade.

The till was brown or gray silt and clay with minor components of very fine sand and gray-black shale fragments. Larger shale fragments (rip-up clasts) were observed at MW44A-1 near the bottom of the boring. The till in the bottom eight feet of the boring at MW44A-2 contained an uncharacteristically large amount of shale fragments and the bottom 20 feet of the boring was unusually dense, suggesting that it belonged to the lodgement division of the till unit.

Competent shale was not encountered at any of the borings at SEAD-44A, but weathered shale was encountered at all of the borings. The top of the weathered shale interval at MW44A-1 was determined at 6.3 feet below grade, the point at which till and weathered shale became interbedded. The boring was terminated at spoon refusal (10.9 feet below grade) after drilling through 4.6 feet of the weathered shale. At the MW44A-2 soil boring, the top of the weathered shale interval was determined at 27.0 feet below grade, the point at which till and weathered shale became interbedded. The boring at MW44A-2 was terminated 30.1 feet below grade. At MW44A-3, a distinct till/weathered shale contact was observed at 10.9 feet below grade, however, but due to poor recovery, only 0.1 foot of the weathered shale was observed. MW44A-3 was terminated at spoon refusal (13.5 feet below grade).

The unusual depth of MW44A-2 and the abundance of shale fragments in the till unit at this location suggests that it was located directly on a fracture zone in the bedrock. Local bedrock lows usually result from fractures, and the increased content of shale fragments could result from the

glacial re-working of the fault gouge created during the fracture event.

3.2.2 Site Hydrology and Hydrogeology

Surface water flow at SEAD-44A is to the west and is controlled by shallow ditches along both sides of the east-west running dirt road in the center of SEAD-44A. A small sustained stream enters the southeastern corner of SEAD-44A and flows to the west along the southern edge of the site. This stream channels much of the flow from the southern half of SEAD-44A.

The groundwater flow direction in the overburden aquifer at SEAD-44A was toward the west, based on groundwater elevations measured in two monitoring wells at SEAD-44A, one monitoring well from SEAD-64C, and one monitoring well from SEAD-62 on July 25, 1994 (**Table 3.2-1** and **Figure 3.2-1**). Water levels measured in MW44A-2 suggest an anomalous low in the water table in the immediate vicinity of MW44A-2. The reason for this anomaly is uncertain, but due to the unusual density of the soil in the bottom portion of the boring, it is probable that the soils where the monitoring well was installed were relatively impermeable and the water levels that were measured in the well were not in equilibrium with the local water table.

The distribution of ground water in the aquifer was characterized by moist to saturated till directly overlying the weathered shale, and the till/weathered shale contact tended to be dry to moist in each of the borings. Recharge to the monitoring wells during sampling was good at MW44A-1 and MW44A-3, but fair to poor at MW44A-2.

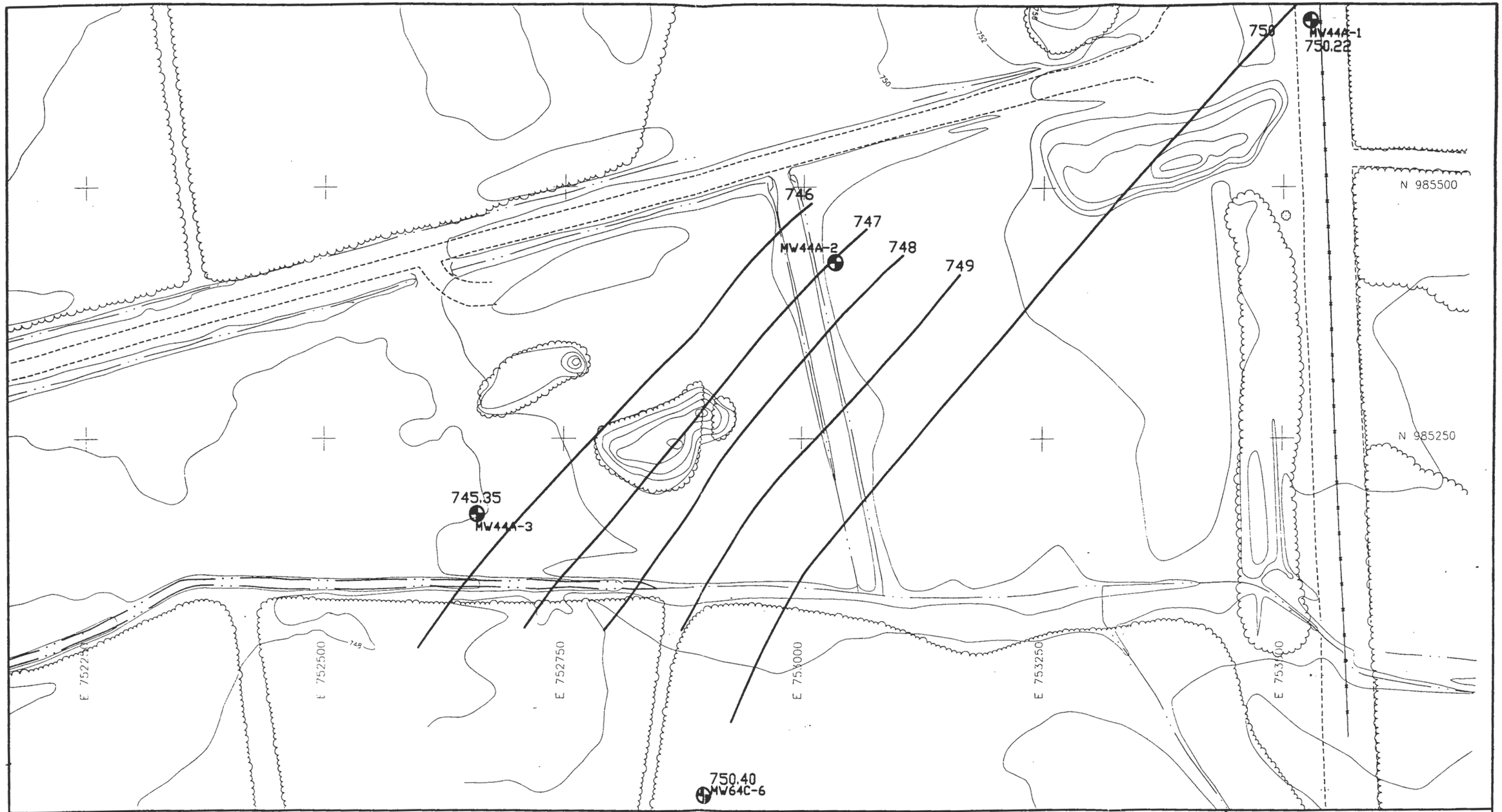
3.3 SEAD-44B: QUALITY ASSURANCE TEST LABORATORY

3.3.1 Site Geology

Till, weathered dark gray shale, and competent gray-black shale were the three major geologic units encountered at three overburden borings drilled at SEAD-44B. The till was stratigraphically above the weathered shale, which overlaid competent shale. In each of the borings, a topsoil horizon was present within 1.5 feet of the ground surface. The depths of the borings at SEAD-44B were up to 14.85 feet below grade.

TABLE 3.2-1
MONITORING WELL WATER LEVEL SUMMARY - SEAD-44A
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

MONITORING WELL NUMBER	TOP OF PVC CASING ELEVATION (MSL)	WELL DEVELOPMENT DATE	WELL DEVELOPMENT DEPTH TO GROUNDWATER TOC (FT)	WELL DEVELOPMENT GROUNDWATER ELEVATION (MSL)	SAMPLING DATE	SAMPLING DEPTH TO GROUNDWATER TOC (FT)	SAMPLING GROUNDWATER ELEVATION (MSL)	WATER LEVEL MEASUREMENTS DATE	WATER LEVEL MEASUREMENTS DEPTH TO GROUNDWATER TOC (FT)	WATER LEVEL MEASUREMENTS GROUNDWATER ELEVATION (MSL)
MW44A-1	753.77	3/5/94	2.12	751.65	7/12/94	2.92	750.85	7/6/94	2.03	751.74
								7/25/94	3.55	750.22
MW44A-2	751.71	6/20/94	15.68	736.03	7/12/94	15.08	736.63	7/6/94	16.55	735.16
								7/25/94	15.08	736.63
MW44A-3	749.81	6/20/94	3.72	746.09	7/12/94	3.76	746.05	7/6/94	2.90	746.91
								7/25/94	4.46	745.35
MW64C-6	754.57							7/25/95	4.17	750.40



NOTE: GROUNDWATER LEVEL MEASURED AT MW44A-2 WAS NOT USED TO CREATE GROUNDWATER ELEVATION CONTOURS. GROUNDWATER LEVEL MEASUREMENTS FROM SEAD 62 AND SEAD 64C WERE USED INSTEAD TO SUPPLEMENT INFORMATION FROM SEAD44A.

LEGEND

ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
CORDINATE GRID (250' GRID)
POLE
UTILITY BOX
OVERHEAD UTILITY POLE
MAILBOX/RR SIGNAL

MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENTS
RAILROAD
760 GROUND SURFACE ELEVATION CONTOUR

LEGEND

MW60-1
744.44
MONITORING WELL WITH WATER TABLE ELEVATION

744
GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES DIRECTION OF FLOW)

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/25/94

N

50 0 50 100
(Feet)

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
DWG NO: 734987-01001

FIGURE 3.2-1
SEAD-44A QUALITY ASSURANCE TEST LABORATORY
GROUNDWATER ELEVATION MAP

SCALE: 1" = 100'
REV: 1

The till was light brown or gray-brown silt and clay with minor components of gray-black shale fragments. Larger shale fragments (rip-up clasts) were observed at MW44B-2 and MW44B-3 near the till-weathered shale contact. Oxidation was observed in the upper portion of the till strata as well as the upper portion of the weathered shale.

The contact between the overburden and the bedrock at each boring location was characterized by weathered shale. The contact between overburden till and weathered shale at MW44B-1 was distinct with no interlayering of till and weathered shale. The top of the weathered shale was encountered at 8.4 feet below grade at MW44B-1, and continued for 3.75 feet to the point of auger refusal. The top of the weathered shale interval at the soil borings MW44B-2 and MW44B-3 was determined by the first appearance of interbedded till and weathered shale. The weathered shale was first encountered at a depth of 10.2 feet at MW44B-2, and continued for 2.3 feet before competent bedrock was encountered. At MW44B-3, the top of the weathered shale was observed at 9.0 feet below grade and continued for 5.7 feet before competent bedrock was encountered.

Competent shale was not encountered at MW44B-1. Competent gray-black shale was observed in split spoon samples at MW44B-2 and MW44B-3 at depths of 12.2 feet and 14.7 feet below grade, respectively.

3.3.2 Geophysics

3.3.2.1 Seismic Survey

The results of the seismic refraction survey conducted at SEAD 44B are shown in **Table 3.3-1**. The seismic refraction profiles detected 11 to 18 feet of unconsolidated overburden (1,150 to 3,400 ft./sec.) overlying bedrock (10,500 to 12,600 ft./sec.). In particular, the unconsolidated material included loose, unsaturated overburden (1,150 to 1,180 ft./sec.) and compacted, unsaturated overburden (3,000 to 3,400 ft./sec.). Saturated overburden was not detected by the seismic refraction method used at SEAD 44B. Due to inherent limitations of the seismic refraction method, a thin layer of saturated overburden (<2 feet) overlying the bedrock surface would be undetectable.

TABLE 3.3-2
MONITORING WELL WATER LEVEL SUMMARY - SEAD-44B
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

MONITORING WELL NUMBER	TOP OF PVC CASING ELEVATION (MSL)	WELL DEVELOPMENT DATE	WELL DEVELOPMENT DEPTH TO GROUNDWATER TOC (FT)	WELL DEVELOPMENT GROUNDWATER ELEVATION (MSL)	SAMPLING DATE	SAMPLING DEPTH TO GROUNDWATER TOC (FT)	SAMPLING GROUNDWATER ELEVATION (MSL)	WATER LEVEL MEASUREMENTS DATE	WATER LEVEL MEASUREMENTS DEPTH TO GROUNDWATER TOC (FT)	WATER LEVEL MEASUREMENTS GROUNDWATER ELEVATION (MSL)
MW44B-1	746.66	4/1/94	1.85	744.81	7/12/94	3.58	743.08	7/6/94	2.56	744.10
								7/25/94	5.06	741.60
MW44B-2	742.57	3/15/94	1.14	741.43	7/29/94	1.38	741.19	7/6/94	2.53	739.98
								7/25/94	4.23	738.28
MW44B-3	743.08	3/22/94	1.72	741.36	7/12/94	3.83	739.25	7/6/94	2.86	740.22
								7/25/94	4.59	738.49

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL

LEGEND

MW44B-1
744.1 — MONITORING WELL WITH WATER TABLE ELEVATION

741 — GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES DIRECTION OF FLOW)

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/6/94

50 0 50 100
(feet)

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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING
D+O No: 734967-01001

FIGURE 3.3-1
SEAD-44B QUALITY ASSURANCE TEST LABORATORY
GROUNDWATER ELEVATION MAP

SCALE: 1" = 100'
REV: A

K:\CAD\SENECA\734967\SWMU\ACAD\FIG\SU44HGW.DWG

Surface water runoff from Building 608 is to the north and east and is likely to be captured by a north-south trending drainage ditch which flows north and by the north-south trending drainage ditch located to the east of Buildings 608, 610, and 611. This ditch flows south and intersects a drainage ditch which parallels Brady Road. Surface water runoff from Building 610 is to the east into the eastern drainage ditch. The mounded areas located adjacent to Buildings 608 and 610 prevent flow from the building areas to the west.

Surface water runoff from Building 611 is to the west and south into the drainage ditch paralleling Brady Road.

3.5 SEAD-62 NICOTINE SULFATE DISPOSAL AREA

3.5.1 Site Geology

Based on the results of the drilling program, till and calcareous shale are the two major types of geologic materials present on-site. The till lies stratigraphically above the shale. At all three soil boring locations, a thin soil horizon was present within 0.9 foot of the ground surface. The depths of the borings at this site were up to 18.3 feet below the ground surface.

The till is light brown and composed of silt and very fine sand, with little clay, and little gray to dark gray shale fragments (up to 1-inch in diameter); however, large shale fragments (rip-up clasts) were observed near the till-weathered shale contact. Areas of oxidized till were noted in the middle to upper portions of the till strata.

Competent, calcareous dark gray shale was encountered at depths between approximately 6.2 and 9.8 feet below the ground surface. The elevations of the competent bedrock determined during drilling and seismic programs indicate that the shale slopes to the west, mimicking the land surface. One of the three soil borings (MW62-3) revealed a 3.5 foot thick layer of weathered shale overlying competent shale bedrock.

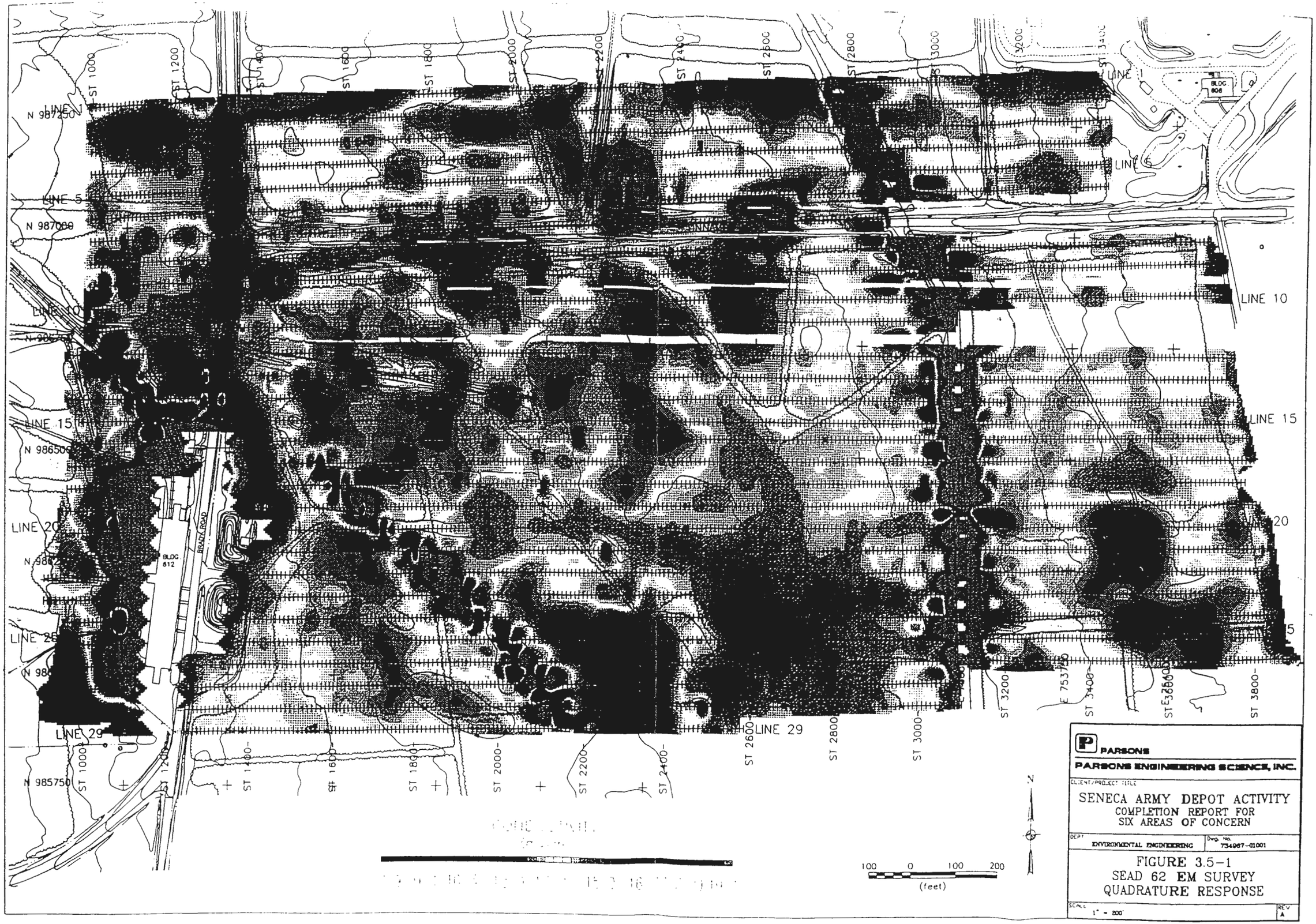
TABLE 3.5-1
SEAD-62

Results of Seismic Refraction Survey

Profile	Distance[1]	Ground Elevation[2]	Water Table		Bedrock	
			Depth	Elev[2].	Depth	Elev[2].
P1	-5	107.5			9.3	98.2
	57.5	106.6			10.5	96.1
	120	106.5			9.7	96.8
P2	-5	102.1			5.5	96.6
	120	102.1			4.0	98.1
P3	-5	108.6			11.1	97.5
	57.5	109.1			8.4	100.7
	120	109.6			9.2	100.4
P4	-5	113.5			7.1	106.4
	57.5	114.5			6.8	107.7
	120	115.2			5.6	109.6

1. All distances are in feet along the axis of each seismic profile and were measured from geophone #1 of each profile.

2. All elevations are relative to an arbitrary datum established at geophone #24 of the SEAD-44B seismic profile P4.



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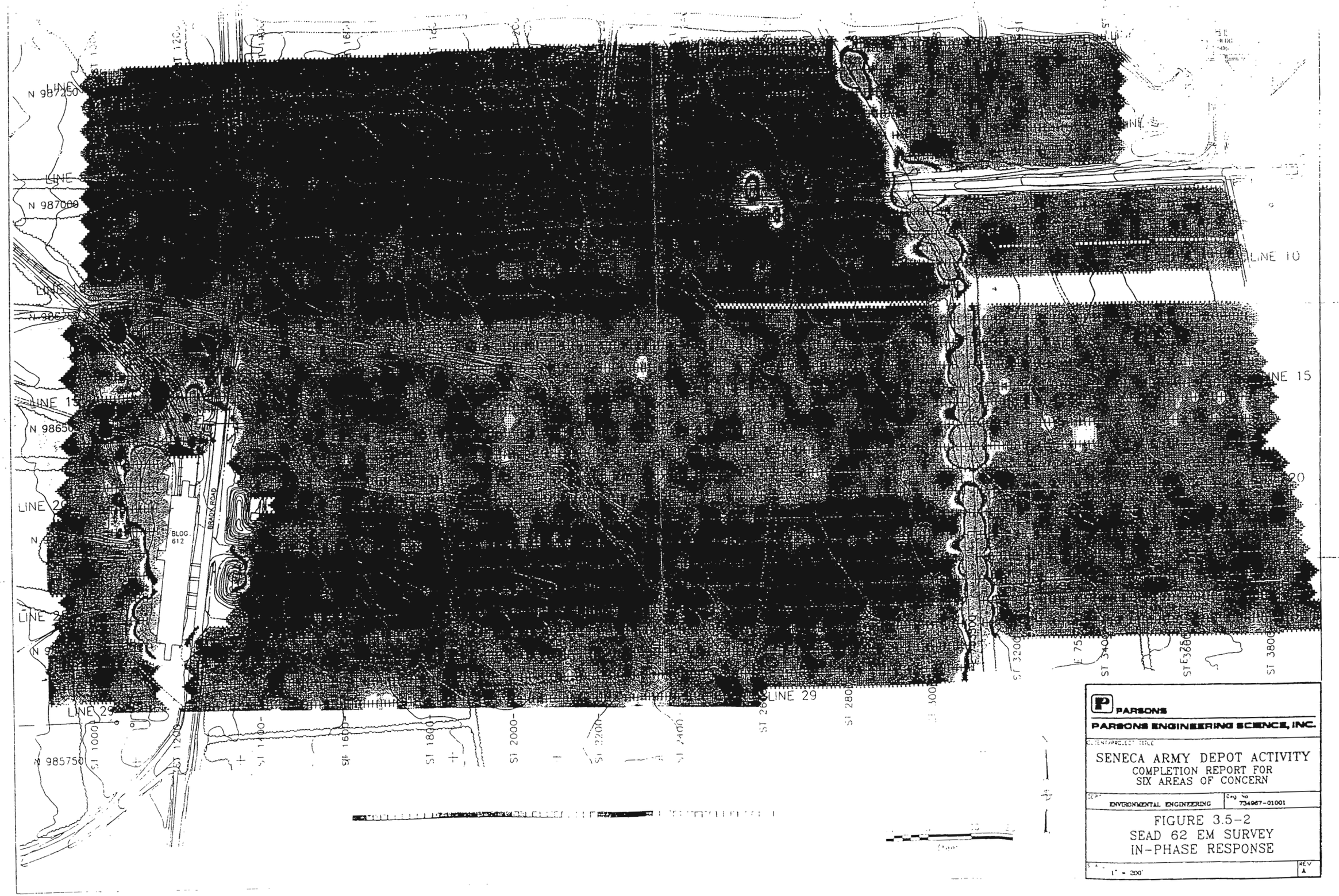
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT	Dwg. No.
ENVIRONMENTAL ENGINEERING	734967-01001

FIGURE 3.5-1
SEAD 62 EM SURVEY
QUADRATURE RESPONSE

SCALE 1" = 200' REV A



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SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING

Dwg No: 734967-01001

FIGURE 3.5-2
SEAD 62 EM SURVEY
IN-PHASE RESPONSE

SCALE: 1" = 300'

REV: A

coincided with a marshy area. All other conductivity anomalies detected in the EM-31 grid were attributed to cultural features.

The in-phase response of the EM survey at SEAD-62 is shown in **Figure 3.5-2**. Overall the site shows a generally featureless response. Two of the unknown localized anomalies as well as the three culverts mentioned above were apparent in the in-phase response data. No other anomalies were observed which could not be attributed to known cultural features.

3.5.2.3 GPR Survey

A GPR survey was conducted in all the zones of the EM grid where EM-31 anomalies of unknown origin were detected. Data quality was degraded in certain areas due to standing water in the marshy areas. The location of the GPR survey profiles are shown in **Figure 2.7-1**. No evidence of buried drums was found in any of these zones.

Typical penetration depths of the radar signals were 3 to 5 feet. Within this depth range, no evidence of disturbed soils or burial pits was evident in the areas surveyed.

3.5.2.4 Test Pitting Program

Three test pits were excavated in SEAD-62. Two test pits were excavated in the field to the east of Building 612 (TP62-1 and TP62-2), and the remaining test pit (TP62-3) was excavated in a densely vegetated area along the western boundary of SEAD-62.

TP62-3 was excavated at the EM anomaly along the northwestern boundary of SEAD-62. Metal strapping, 1.5 inches wide, and a 0.5 inch diameter metal rod were found at TP62-3. A large quantity of deteriorated red brick was also unearthed along with several large boulders, typically one to two feet in diameter.

Test pits TP62-1 and TP62-2 were centered on EM anomalies at station 2160E on L16 and station 2050E on L14, respectively. Buried metallic objects were not encountered in either excavation. TP62-1 was advanced under a concrete slab measuring 9.4 feet long by 4.5 feet wide by 0.8 feet thick. A 1.2 foot diameter hole was located in the center of the concrete slab. Remnants of yellow paint were observed on the bottom surface of the slab. Native olive gray silt was encountered at a

depth of 1 foot below the concrete slab, indicating that no previous excavation of the soils had occurred at this location. The excavation at TP62-2 revealed naturally layered soil to a depth of 4.2 feet below grade, again showing no evidence of anthropomorphic intrusions.

The excavated material was continuously screened for organic vapors and radioactivity with an OVM-580B and a Victoreen-190, respectively. No readings above background levels (0 ppm of organic vapors and 10-15 micro Rhems per hour of radiation) were observed during the excavation.

3.5.3 Site Hydrology and Hydrogeology

Surface water flow from precipitation events is controlled by local topography including a marshy area and two drainage swales (**Figure 1.1-15**). In the southeastern section of the site, surface water is believed to drain into a marshy area. The surface water flow in the western portion of the site is believed to be partly controlled by a well defined intermittent drainage swale which originates in the central section of the site and flows westward along the northern perimeter of SEAD-60. A poorly defined drainage swale located approximately 400 feet south and parallel to the above mentioned drainage swale also collects surface water from the western portion of the SEAD-62. In addition, surface water accumulates in topographically low-lying areas along the northern section of the site.

The groundwater flow direction in the till/weathered shale aquifer at SEAD-62 is to the west based on groundwater elevations measured in the three monitoring wells on July 25, 1994 (**Table 3.5-2** and **Figure 3.5-3**). Water was observed in drainage ditches where the groundwater elevation contours are above the ground surface. The groundwater contours shown in this figure are intended to represent regional flow directions at the site. The groundwater contours established from the groundwater elevation survey were not altered to attempt to illustrate detailed flow near the drainage ditches. Recharge of water to the monitoring wells during sampling was generally poor. Two of the three monitoring wells had slow recharge rates; the third monitoring well's recharge rate was good.

TABLE 3.5-2
MONITORING WELL WATER LEVEL SUMMARY - SEAD-62
COMPLETION REPORT FOR SIX AREAS OF CONCERN
SENECA ARMY DEPOT ACTIVITY

MONITORING WELL NUMBER	TOP OF PVC CASING ELEVATION (MSL)	WELL DEVELOPMENT DATE	WELL DEVELOPMENT DEPTH TO GROUNDWATER TOC (FT)	WELL DEVELOPMENT GROUNDWATER ELEVATION (MSL)	SAMPLING DATE	SAMPLING DEPTH TO GROUNDWATER TOC (FT)	SAMPLING GROUNDWATER ELEVATION (MSL)	WATER LEVEL MEASUREMENTS DATE	WATER LEVEL MEASUREMENTS DEPTH TO GROUNDWATER TOC (FT)	WATER LEVEL MEASUREMENTS GROUNDWATER ELEVATION (MSL)
MW62-1	753.01	6/21/94	2.34	750.67	7/20/94	2.92	750.09	7/6/94, 7/25/94	2.09 5.32	750.92 747.69
MW62-2	749.46	7/5/94	1.9	747.56	7/20/94	2.71	746.75	7/25/94	3.01	746.45
MW62-3	750.41	7/12/94	3.28	747.13	7/20/94	3.46	746.95	7/25/94	4.14	746.27

BRADY ROAD

UNNAMED ROAD

747

747.69
MW62-1

746

746.45
MW62-2

744

745

743

742

741

MW60-2
740.84

MW60-3
740.48

BLDG. 609

743.36
MW60-1

746.27
MW62-3

BLDG. 612

BRADY ROAD

N 98700

N 98650

N 98600

N 98550

E 751500

E 751750

E 752000

E 752250

E 752500

E 752750

E 753000

E 753250

E 753500

E 753750

E 754000

606

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- APPROXIMATE LANDFILL EXTENT
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ELECTRIC UTILITY LINE
- UNDERGROUND WATER UTILITY LINE

ROAD SIGN · DECIDUOUS TREE · GUIDE POST

FIRE HYDRANT · MANHOLE · COORDINATE GRID (250' GRID)

POLE · UTILITY BOX · MAILBOX/RR SIGNAL

OVERHEAD UTILITY POLE · SURVEY MONUMENT

(NOT ALL SYMBOLS MAY APPEAR ON MAP)

APPROXIMATE AOC EXTENT

MW62-1
747.69
MONITORING WELL WITH WATER TABLE ELEVATION

746
GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES GENERAL DIRECTION OF FLOW)

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/25/94

N

100 0 100 200
(feet)

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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING

DWG NO: 734967-01001

FIGURE 3.5*3
SEAD-62
GROUNDWATER ELEVATION MAP

SCALE: 1" = 200'

REV: A

3.6 SEAD-120B

3.6.1 Site Geology

No soil borings were performed at this location.

3.6.2 Test Pitting Program

Three test pits were excavated at SEAD-120B. Test pits TP120B-1, TP120B-2, and TP120B-3 were excavated in the central, south-central, and north-central portions of the arcuate berm, respectively. Test pits were located behind target mounting posts (potential bullet impact area). The mound soils consisted of greenish brown silt and clay. Small arms bullets of various calibers were found lodged into the mound at each test pit site. Soil samples were collected where the most projectiles were found and from the zone directly below this location.

The excavated material was continuously screened for organic vapors with an OVM-580B. No readings above background levels (0 ppm of organic vapors) were observed during the excavation.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section discusses the results of the chemical analysis for each site. Data from each media (soil, groundwater, surface water, and sediment) were compared to available New York State and Federal standards, guidelines, and criteria.

The criteria for soils were obtained from the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) titled "Determination of Soil Cleanup Objectives and Cleanup Levels" (HWR-92-4046) issued in November 1992 and revised in January 1994. This document provides criteria for soil clean-up levels based on risks to human health. Although these criteria have not been promulgated, these criteria are useful guidelines for comparing on-site soil concentrations to determine if site conditions warrant further actions.

For the metals in soil, the TAGM criteria is the greater of either a value or the SEDA background concentration. The site background values for metals in soil are the 95th percentile of a background dataset that has been compiled from approximately 55 soil samples collected over several years of investigation. The TAGM guidelines were used for the following metals: arsenic, barium, beryllium, cadmium, cobalt, copper, lead, mercury, selenium, and vanadium. The SEDA background soil concentrations were used for the following metals: aluminum, antimony, calcium, chromium, iron, magnesium, manganese, nickel, potassium, silver, sodium, thallium, and zinc.

TAGM criteria are also available for groups of compounds that do not have a specific guideline:

	Maximum Concentration
Total VOCs	10 ppm
Total SVOs	500 ppm
Individual SVOs	50 ppm
Total Pesticides	10 ppm

The groundwater criteria which were applied to this Completion Report were the NYSDEC Ambient Water Quality Class GA Standards and Guidelines.

The surface water criteria which were applied to this Completion Report were the NYSDEC Ambient Water Quality Class C Standards and Guidelines.

Some NYSDEC criteria are based on the hardness of the surface water. The average water hardness

for the SEDA site (217 mg/L) was calculated using data from two upstream surface water samples: 232 mg/L at SW-801 from the Ash Landfill remedial investigation and 201 mg/L at SW-196 from the OB Grounds remedial investigation. Hardness was used to calculate NYSDEC criteria for the following metals: cadmium, chromium, copper, lead, nickel, silver, and zinc.

Sediment criteria were guidance values from the NYSDEC Bureau of Environmental Protection, Division of Fish and Wildlife. The most stringent of the sediment criteria for wildlife, human health, or for aquatic life were used as the criteria. All of these values were listed in the sediment data tables in this section. For metals, the criteria were the more stringent of the criteria for aquatic life or the Limit of Tolerance (LOT) values (listed in the same document as the criteria).

The data tables included in this section list only those constituents which were detected in the samples from that AOC. The complete data tables, which include all constituents that were analyzed can be found in the following documents: Draft Final ESI Report - Eight Moderately Low Priority Areas of Concern, (December, 1995); Draft ESI Report - Seven Low Priority Areas of Concern (April, 1995); Draft Project Scoping Plan for Performing a CERCLA RI/FS at SEADs-52 and-60 (January 1996); and the Draft Investigation of Environmental Baseline Survey of Non-Evaluated Sites (May, 1998).

4.1 SEADs 43, 56 & 69

4.1.1 Introduction

A total of 30 surface and subsurface soil samples, 4 groundwater, 5 surface water and 5 sediment samples were collected at SEADs 43, 56 & 69. The following sections describe the nature and extent of contamination identified at SEADs-43, 56 & 69.

4.1.2 Soils

The analytical results for the 30 surface and subsurface soil samples collected as part of the SEAD-43, 56 and 69 investigations are presented in **Table 4.1-1**. The following sections describe the nature and extent of contamination in SEAD 43, 56 and 69 soils. The sample locations are shown in **Figure 2.3-2**.

TABLE 4.1-1
SOIL ANALYSIS RESULTS - SEAD-46,56,69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-43 0-0.2 06/10/94 SB43-1.00 223889	SOIL SEAD-43 4-5 06/10/94 SB43-1.03 223891	SOIL SEAD-43 14-16 06/10/94 SB43-1.08 223892	SOIL SEAD-43 0-0.2 06/10/94 SB43-2.00 223882	SOIL SEAD-43 4-6 06/10/94 SB43-2.03 223884	SOIL SEAD-43 10-12 06/10/94 SB43-2.06 223885	SOIL SEAD-43 0-0.2 06/09/94 SB43-3.00 223886	SOIL SEAD-43 2-4 06/09/94 SB43-3.02 223887
VOLATILE ORGANICS															
Methylene Chloride	ug/kg	11	26%	100	0	7	27	13 U	11 U	11 UR	12 U	11 U	11 UR	11 U	13 U
Acetone	ug/kg	16	23%	200	0	6	26	13 U	11 U	11 UR	12 U	11 U	16 UR	11 U	13 U
Chloroform	ug/kg	11	23%	300	0	6	26	13 U	11 U	11 UR	12 U	11 U	11 UR	11 U	13 U
Toluene	ug/kg	27	32%	1500	0	9	28	13 U	11 U	11 UR	12 U	11 U	11 UR	11 U	13 U
Xylene(total)	ug/kg	12	27%	1200	0	7	26	13 U	11 U	11 UR	12 U	11 U	11 UR	11 U	13 U
HERBICIDES															
2,4,5-T	ug/kg	12	3%	1900	0	1	30	12 J	5.6 U	5.3 U	6.4 U	5.5 U	5.4 U	5.5 U	6 U
Dicamba	ug/kg	11	3%		0	1	30	11 J	5.6 U	5.3 U	6.4 U	5.5 U	5.4 U	5.5 U	6 U
Dichloroprop	ug/kg	72	3%		0	1	30	72 J	56 U	53 U	64 U	55 U	54 U	55 U	60 U
MCPP	ug/kg	7700	10%		0	3	30	7300 J	5600 U	5300 U	6400 U	5500 U	5400 U	7100	7700
SEMIVOLATILE ORGANIC															
4-Methylphenol	ug/kg	580	3%	900.00	0	1	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Naphthalene	ug/kg	200	7%	13000.00	0	2	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
2-Methylnaphthalene	ug/kg	88	7%	36400.00	0	2	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Acenaphthene	ug/kg	570	7%	50000.00	0	2	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Dibenzofuran	ug/kg	310	7%	6200.00	0	2	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Fluorene	ug/kg	610	7%	50000.00	0	2	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Phenanthrene	ug/kg	5200	13%	50000.00	0	4	30	410 U	370 U	350 U	27 J	360 U	350 U	360 U	390 U
Anthracene	ug/kg	1300	10%	50000.00	0	3	30	410 U	370 U	350 U	420 U	360 U	350 U	140 J	390 U
Carbazole	ug/kg	620	10%	50000.00	0	3	30	410 U	370 U	350 U	420 U	360 U	350 U	35 J	390 U
Di-n-butylphthalate	ug/kg	62	10%	8100.00	0	3	30	410 U	370 U	350 U	420 U	360 U	350 U	20 J	390 U
Fluoranthene	ug/kg	8300	13%	50000.00	0	4	30	410 U	370 U	350 U	420 U	360 U	350 U	360 U	390 U
Pyrene	ug/kg	4700	13%	50000.00	0	4	30	410 U	370 U	350 U	42 J	360 U	350 U	240 J	390 U
Benzo(a)anthracene	ug/kg	2400	13%	224.00	2	4	30	410 U	370 U	350 U	45 J	360 U	350 U	230 J	390 U
Chrysene	ug/kg	2400	13%	400.00	2	4	30	410 U	370 U	350 U	22 J	360 U	350 U	110 J	390 U
bis(2-Ethylhexyl)phthalate	ug/kg	2700	70%	50000.00	0	21	30	510 J	370 U	70 J	25 J	360 U	350 U	120 J	390 U
Benzo(b)fluoranthene	ug/kg	1800	10%	1100.00	1	3	30	410 U	370 U	350 U	53 J	50 J	29 J	530	35 J
Benzo(k)fluoranthene	ug/kg	2000	10%	1100.00	1	3	30	410 U	370 U	350 U	420 U	360 U	350 U	100 J	390 U
Benzo(a)pyrene	ug/kg	2000	10%	61.00	3	3	30	410 U	370 U	350 U	420 U	360 U	350 U	88 J	390 U
Indeno(1,2,3-cd)pyrene	ug/kg	1200	10%	3200.00	0	3	30	410 U	370 U	350 U	420 U	360 U	350 U	75 J	390 U
Dibenz(a,h)anthracene	ug/kg	520	10%	14.00	3	3	30	410 U	370 U	350 U	420 U	360 U	350 U	88 J	390 U
Benzo(g,h,i)perylene	ug/kg	1300	10%	50000.00	0	3	30	410 U	370 U	350 U	420 U	360 U	350 U	88 J	390 U
PESTICIDES/PCBs															
Endosulfan I	ug/kg	1.2	3%	900.00	0	1	30	2.1 U	1.9 U	1.8 U	2.2 U	1.8 U	1.8 U	1.2 J	2 U
alpha-Chlordane	ug/kg	2.4	3%	540.00	0	1	30	2.1 U	1.9 U	1.8 U	2.2 U	1.8 U	1.8 U	1.8 U	2 U
METALS															
Aluminum	mg/kg	27000	100%	19520.00	2	30	30	20800	8620	16200	14700 J	11600 J	12800 J	10900 J	27000 J
Antimony	mg/kg	7.2	30%	6.00	1	9	30	0.23 UJ	0.19 UJ	0.21 UJ	0.32 UJ	0.24 J	0.23 UJ	0.24 J	0.26 J
Arsenic	mg/kg	7.1	100%	8.00	0	30	30	6.1	3.9	6.2	6.1	5.4	5.5	5.3	4.3
Barium	mg/kg	175	100%	300.00	0	30	30	145	46	54.8	104 J	72.1 J	70.9 J	60.3 J	175 J
Beryllium	mg/kg	1.2	100%	1.13	1	30	30	0.86 J	0.41 J	0.73 J	0.69 J	0.52 J	0.58 J	0.44 J	1.3
Cadmium	mg/kg	1.5	87%	2.46	0	26	30	0.96	0.21	0.98	0.68 J	0.71 J	0.64 J	0.58 J	0.7 J
Calcium	mg/kg	141000	100%	125300.00	1	30	30	8980	67800	48900	118000 J	69200 J	77400 J	41900 J	7280 J
Chromium	mg/kg	30.7	100%	30.00	2	30	30	26.2	13.3	25.7	21.2 J	18.5 J	20.5 J	15.7 J	36.7 J
Cobalt	mg/kg	20.9	100%	30.00	0	30	30	10.9	7.2 J	13.1	9.3 J	10.2 J	10.8 J	8.2 J	6.7 J
Copper	mg/kg	28.1	100%	33.00	0	30	30	21.8	24.5	24.7	21 J	22.5 J	20.3 J	23.6 J	23.8 J
Iron	mg/kg	40300	100%	37410.00	1	30	30	26800	17200	30900	26800 J	23000 J	24900 J	19200 J	28100 J
Lead	mg/kg	30.2	100%	24.40	2	30	30	19.2	7.6	6.8	19.8	8.2	8.8	19.1	12.7
Magnesium	mg/kg	47500	100%	21700.00	3	30	30	5440	17600	11500	6080 J	18500 J	12700 J	20000 J	5210 J
Manganese	mg/kg	782	87%	1100.00	0	26	30	782	387	510	546 J	416 J	493 J	593 J	182 J
Mercury	mg/kg	0.08	80%	0.10	0	24	30	0.07 J	0.01 J	0.02 J	0.06 JR	0.03 J	0.03 J	0.08 JR	0.05 JR
Nickel	mg/kg	57.2	100%	50.00	2	30	30	28.1	22.6	41.5	26.7 J	31.6 J	33.3 J	20.6 J	27 J
Potassium	mg/kg	3560	100%	2623.00	4	30	30	3560 J	2000 J	3690 J	2060	2160	2550	2550	3330
Selenium	mg/kg	1.8	63%	2.00	0	19	30	1.1	0.39 U	0.54 J	1.3	0.43 U	0.47 U	0.48 J	1.1
Sodium	mg/kg	151	87%	188.00	0	26	30	178 U	88.3 J	136 J	248 U	101 J	151 J	275 J	72.5 J
Vanadium	mg/kg	41.8	100%	150.00	0	30	30	36.7	17.6	29.8	27 J	18.8 J	20.1 J	27.1 J	41.8 J
Zinc	mg/kg	338	100%	115.00	10	30	30	98.6	116	122	91.1 J	94.7 J	59.9 J	121 J	94 J
Cyanide	mg/kg	1.7	3%	30	0	1	30	0.58 U	0.56 U	0.48 U	0.58 U	0.48 U	0.34 U	0.45 U	0.49 U
OTHER ANALYSES															
Nitrate-Nitrite-Nitrogen	mg/kg							0.94 J	0.25	0.04 U	0.01 U	0.03	0.01 U	0.08	0.64
Total Solids	%WW							80.7	89.8	94	78.8	91.6	94.4	92	83.8

TABLE 4.1-1
SOIL ANALYSIS RESULTS - SEAD-46,56,69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

PARAMETER	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-43 4-5.5 06/09/94 SB43-3.03 223688	SOIL SEAD-43 1.0-1.5 02/17/94 SB43-4.01 211724	SOIL SEAD-43 2-4 02/17/94 SB43-4.02 211725	SOIL SEAD-43 10-10.5 02/18/94 SB43-4.07 211726	SOIL SEAD-56 0-0.2 05/23/94 SB56-1.00 222124	SOIL SEAD-56 4-6 05/23/94 SB56-1.03 222125	SOIL SEAD-56 12-13 05/23/94 SB56-1.07 222126	SOIL SEAD-56 0-0.2 05/23/94 SB56-2.00 222127
VOLATILE ORGANICS															
Methylene Chloride	ug/kg	11	26%	100	0	7	27	11 U	11 U	12 U	11 UJ	11 U	11 U	4 J	11 U
Acetone	ug/kg	16	23%	200	0	6	26	11 U	15 U	12 U	20 UJ	11 U	19 U	16 UJ	11 U
Chloroform	ug/kg	11	23%	300	0	6	26	11 U	3 J	4 J	11 UJ	11 U	11 U	11 UJ	11 U
Toluene	ug/kg	27	32%	1500	0	9	28	11 U	3 J	12 U	11 J	11 U	11 U	2 J	11 U
Xylene (total)	ug/kg	12	27%	1200	0	7	26	11 U	4 J	12 U	12 J	11 U	11 U	11 UJ	11 U
HERBICIDES															
2,4,5-T	ug/kg	12	3%	1900	0	1	30	5.5 U	5.9 U	6.1 U	5.4 U	6.5 U	5.6 U	5.3 U	5.9 U
Dicamba	ug/kg	11	3%		0	1	30	5.5 U	5.9 U	6.1 U	5.4 U	6.5 U	5.6 U	5.3 U	5.9 U
Dichloroprop	ug/kg	72	3%		0	1	30	55 U	59 U	61 U	54 U	65 U	56 U	53 U	59 U
MCPP	ug/kg	7700	10%		0	3	30	5500 U	5900 U	6100 U	5400 U	6500 U	5600 U	5300 U	5900 U
SEMIVOLATILE ORGANICS															
4-Methylphenol	ug/kg	580	3%	900.00	0	1	30	360 U	620 U	1300 U	350 U	430 U	370 U	350 U	380 U
Naphthalene	ug/kg	200	7%	13000.00	0	2	30	360 U	140 J	200 J	350 U	430 U	370 U	350 U	380 U
2-Methylnaphthalene	ug/kg	88	7%	36400.00	0	2	30	360 U	46 J	88 J	350 U	430 U	370 U	350 U	380 U
Acenaphthene	ug/kg	570	7%	50000.00	0	2	30	360 U	300 J	570 J	350 U	430 U	370 U	350 U	380 U
Dibenzofuran	ug/kg	310	7%	6200.00	0	2	30	360 U	170 J	310 J	350 U	430 U	370 U	350 U	380 U
Fluorene	ug/kg	610	7%	50000.00	0	2	30	360 U	320 J	610 J	350 U	430 U	370 U	350 U	380 U
Phenanthrene	ug/kg	6200	13%	50000.00	0	4	30	360 U	2600	5200 J	350 U	430 U	370 U	350 U	380 U
Anthracene	ug/kg	1300	10%	50000.00	0	3	30	360 U	700	1300 J	350 U	430 U	370 U	350 U	380 U
Carbazole	ug/kg	620	10%	50000.00	0	3	30	360 U	350 J	620 J	350 U	430 U	370 U	350 U	380 U
Di-n-butylphthalate	ug/kg	62	10%	8100.00	0	3	30	360 U	48 J	1100 U	350 U	430 U	370 U	350 U	380 U
Fluoranthene	ug/kg	6300	13%	50000.00	0	4	30	360 U	3200	6300 J	350 U	430 U	370 U	350 U	380 U
Pyrene	ug/kg	4700	13%	50000.00	0	4	30	360 U	2700	4700 J	350 U	430 U	370 U	350 U	380 U
Benzo(a)anthracene	ug/kg	2400	13%	224.00	2	4	30	360 U	**1200**	**2400** J	350 U	430 U	370 U	350 U	380 U
Chrysene	ug/kg	2400	13%	400.00	2	4	30	360 U	**1200**	**2400** J	350 U	430 U	370 U	350 U	380 U
bis(2-Ethylhexyl)phthalate	ug/kg	2700	70%	50000.00	0	21	30	2100	2700	700 J	1300	28[illegible] J	89 J	350 U	81 J
Benzo(b)fluoranthene	ug/kg	1600	10%	1100.00	1	3	30	360 U	1000	**1600** J	350 U	430 U	370 U	350 U	380 U
Benzo(k)fluoranthene	ug/kg	2000	10%	1100.00	1	3	30	360 U	960	**2000** J	350 U	430 U	370 U	350 U	380 U
Benzo(a)pyrene	ug/kg	2000	10%	61.00	3	3	30	360 U	**1200**	**2000** J	350 U	430 U	370 U	350 U	380 U
Indeno(1,2,3-cd)pyrene	ug/kg	1200	10%	3200.00	0	3	30	360 U	600	1200 J	350 U	430 U	370 U	350 U	380 U
Dibenz(a,h)anthracene	ug/kg	520	10%	14.00	3	3	30	360 U	**300** J	**520** J	350 U	430 U	370 U	350 U	380 U
Benzo(g,h,i)perylene	ug/kg	1300	10%	50000.00	0	3	30	360 U	730	1300 J	350 U	430 U	370 U	350 U	380 U
PESTICIDES/PCBs															
Endosulfan I	ug/kg	1.2	3%	900.00	0	1	30	1.9 U	2 U	2.1 U	1.8 U	2.2 U	1.9 U	1.8 U	2 U
alpha-Chlordane	ug/kg	2.4	3%	540.00	0	1	30	1.9 U	2.4 J	2.1 U	1.8 U	2.2 U	1.9 U	1.8 U	2 U
METALS															
Aluminum	mg/kg	27000	100%	19520.00	2	30	30	10600 J	13300 J	15500 J	15200 J	4620	11700	13200	4850
Antimony	mg/kg	7.2	30%	6.00	1	9	30	0.25 UJ	4.6 J	**7.2** J	3.3 J	0.21 UJ	0.19 UJ	0.19 UJ	0.19 UJ
Arsenic	mg/kg	7.1	100%	8.00	0	30	30	4	6 J	6.5 J	4 J	3.5	6	3.5	3.3
Barium	mg/kg	175	100%	300.00	0	30	30	62.2 J	92.1 J	123 J	49.9 J	26 J	70.7	49.7	33 J
Beryllium	mg/kg	1.2	100%	1.13	1	30	30	0.48 J	0.58 J	0.74 J	0.72	0.22 J	0.59 J	0.6 J	0.22 J
Cadmium	mg/kg	1.5	87%	2.46	0	26	30	0.58 J	0.41 U	0.51 U	0.26 U	1.5	0.76 J	0.7 J	0.51 J
Calcium	mg/kg	141000	100%	125300.00	1	30	30	62400 J	60500 J	15900 J	21500 J	62200	51500	31200	66400
Chromium	mg/kg	30.7	100%	30.00	2	30	30	16.8 J	23.1	23.9	25.7	7.1	18.6	22.8	7
Cobalt	mg/kg	20.9	100%	30.00	0	30	30	8.5 J	8.7 J	13.4	15.7	3.8 J	10.7	13.6	4.5 J
Copper	mg/kg	28.1	100%	33.00	0	30	30	22.5 J	23.8	26	28.1	18.8	24.5	25.6	17.3
Iron	mg/kg	40300	100%	37410.00	1	30	30	20700 J	23900 J	30700 J	31000 J	10900	26300	29000	11500
Lead	mg/kg	30.2	100%	24.40	2	30	30	9	15.9	13.6	15.6	**30.2**	11.1	17.1	12.8
Magnesium	mg/kg	47500	100%	21700.00	3	30	30	13400 J	18800 J	7270 J	8540 J	**39500**	11700	8440	**36400**
Manganese	mg/kg	782	87%	1100.00	0	26	30	453 J	530 R	1100 R	479 R	529	575	404	533
Mercury	mg/kg	0.08	80%	0.10	0	24	30	0.04 JR	0.04 J	0.06 J	0.02 J	0.02 J	0.02 J	0.01 U	0.03 J
Nickel	mg/kg	57.2	100%	50.00	2	30	30	29.1 J	27	43.8	**53.4**	10.9	32.5	41.5	10.3
Potassium	mg/kg	3560	100%	2623.00	4	30	30	2070	1940	1740	1580	1020 J	1180	1430	1030
Selenium	mg/kg	1.8	63%	2.00	0	19	30	0.52 U	0.17 UJ	0.17 J	1.8 J	0.35 U	0.51 J	1	0.55 J
Sodium	mg/kg	151	87%	188.00	0	26	30	96.5 J	128 J	82.5 J	98.5 J	94.6 J	100 J	94.6 J	52 J
Vanadium	mg/kg	41.8	100%	150.00	0	30	30	18.3 J	24.6	28.2	21.3	10.2 J	18	17.9	10.6
Zinc	mg/kg	338	100%	115.00	10	30	30	89.8 J	71.7 J	84.4 J	**126** J	**295**	84.6	83.6	75.4
Cyanide	mg/kg	1.7	3%	30	0	1	30	0.37 U	0.56 U	0.54 U	0.51 U	0.61 U	0.42 U	0.53 U	0.55 U
OTHER ANALYSES															
Nitrate/Nitrite Nitrogen	mg/kg							0.12	1.3	1.25	0.13	0.58	0.18	0.04	1.02
Total Solids	%W/W							90.6	84.8	82.1	92.8	77.4	90.4	94.1	86.4

TABLE 4.1-1
SOIL ANALYSIS RESULTS - SEAD-46,56,69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-56 4-6 05/23/94 SB56-2.03 222128	SOIL SEAD-56 8-10 05/23/94 SB56-2.05 222129	SOIL SEAD-56 0-0.2 05/18/94 SB56-3.00 221480	SOIL SEAD-56 6-8 05/18/94 SB56-3.04 221481	SOIL SEAD-56 14-16 05/18/94 SB56-3.08 221482	SOIL SEAD-69 0-0.2 05/17/94 SB69-1.00 221354	SOIL SEAD-69 8-10 05/17/94 SB69-1.05 221483	SOIL SEAD-69 10-12 05/17/94 SB69-1.06 221484
VOLATILE ORGANICS															
Methylene Chloride	ug/kg	11	26%	100	0	7	27	12 U	11 U	12 U	11 U	3 J	15 U	11 U	3 J
Acetone	ug/kg	16	23%	200	0	6	26	6 J	5 J	12 U	11 U	11 U	15 U	11 U	11 UJ
Chloroform	ug/kg	11	23%	300	0	6	26	12 U	11 U	12 U	11 U	11 U	15 U	11 U	11 UJ
Toluene	ug/kg	27	32%	1500	0	9	28	12 U	11 U	12 U	11 U	2 J	15 U	11 U	3 J
Xylene (total)	ug/kg	12	27%	1,200	0	7	26	12 U	11 U	12 U	11 U	11 U	15 U	11 U	2 J
HERBICIDES															
2,4,5-T	ug/kg	12	3%	1900	0	1	30	5.8 U	5.6 U	6.1 U	6.1 U	5.4 U	7.4 U	5.7 U	5.4 U
Dicamba	ug/kg	11	3%		0	1	30	5.8 U	5.6 U	6.1 U	6.1 U	5.4 U	7.4 U	5.7 U	5.4 U
Dichloroprop	ug/kg	72	3%		0	1	30	58 U	56 U	61 U	61 U	54 U	74 U	57 U	54 U
MCPP	ug/kg	7700	10%		0	3	30	5800 U	5600 U	6100 U	6100 U	5400 U	7400 U	5700 U	5400 U
SEMIVOLATILE ORGANICS															
4-Methylphenol	ug/kg	580	3%	900.00	0	1	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Naphthalene	ug/kg	200	7%	13000.00	0	2	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
2-Methylnaphthalene	ug/kg	88	7%	36400.00	0	2	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Acenaphthene	ug/kg	570	7%	50000.00	0	2	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Dibenzofuran	ug/kg	310	7%	6200.00	0	2	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Fluorene	ug/kg	510	7%	50000.00	0	2	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Phenanthrene	ug/kg	5200	13%	50000.00	0	4	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Anthracene	ug/kg	1300	10%	50000.00	0	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Carbazole	ug/kg	620	10%	50000.00	0	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Di-n-butylphthalate	ug/kg	62	10%	8100.00	0	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Fluoranthene	ug/kg	6300	13%	50000.00	0	4	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Pyrene	ug/kg	4700	13%	50000.00	0	4	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Benzo(a)anthracene	ug/kg	2400	13%	224.00	2	4	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Chrysene	ug/kg	2400	13%	400.00	2	4	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
bis(2-Ethylhexyl)phthalate	ug/kg	2700	70%	50000.00	0	21	30	40 J	32 J	1300	400 U	350 U	490 U	370 U	360 U
Benzo(b)fluoranthene	ug/kg	1600	10%	1100.00	1	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Benzo(k)fluoranthene	ug/kg	2000	10%	1100.00	1	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Benzo(a)pyrene	ug/kg	2000	10%	61.00	3	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Indeno(1,2,3-cd)pyrene	ug/kg	1200	10%	3200.00	0	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Dibenz(a,h)anthracene	ug/kg	520	10%	14.00	3	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
Benzo(g,h,i)perylene	ug/kg	1300	10%	50000.00	0	3	30	380 U	370 U	400 U	400 U	350 U	490 U	370 U	360 U
PESTICIDES/PCBs															
Endosulfan I	ug/kg	1.2	3%	900.00	0	1	30	2 U	1.9 U	2.1 U	2 U	1.8 U	2.5 U	1.9 U	1.8 U
alpha-Chlordane	ug/kg	2.4	3%	540.00	0	1	30	2 U	1.9 U	2.1 U	2 U	1.8 U	2.5 U	1.9 U	1.8 U
METALS															
Aluminum	mg/kg	27000	100%	19520.00	2	30	30	12700	11700	2900	10200	9590	13900	13700	8550
Antimony	mg/kg	7.2	30%	6.00	1	9	30	0.15 UJ	0.21 UJ	0.17 UJ	0.21 UJ	0.17 UJ	0.26 UJ	0.15 UJ	0.13 UJ
Arsenic	mg/kg	7.1	100%	8.90	0	30	30	5.7	4	4.5	3.9	3.6	5.8	4.8	3.1
Barium	mg/kg	175	100%	300.00	0	30	30	70.1	49	14.4 J	53.4	43.1	132	52.7	50.9
Beryllium	mg/kg	1.2	100%	1.13	1	30	30	0.62 J	0.58 J	0.17 J	0.5 J	0.46 J	0.75 J	0.63 J	0.46 J
Cadmium	mg/kg	1.5	87%	2.46	0	26	30	0.63 J	0.58 J	0.55 J	0.67 J	0.63 J	0.83 J	0.87	0.64 J
Calcium	mg/kg	141000	100%	125300.00	1	30	30	8840	30800	111000	77700	50500	8360	26800	112000
Chromium	mg/kg	30.7	100%	30.00	2	30	30	20.8	19.9	5.4	17.3	16.7	19.9	22.6	14.1
Cobalt	mg/kg	20.5	100%	30.00	0	30	30	12.1	12.5	2.8 J	8.3 J	9.6	9.2 J	14.8	8.1
Copper	mg/kg	28.1	100%	33.00	0	30	30	23.1	23.2	11.4	19.7	17.1	20.5	23.6	16.3
Iron	mg/kg	40300	100%	37410.00	1	30	30	29200	25500	8520	21200	21600	24600	29300	17800
Lead	mg/kg	30.2	100%	24.40	2	30	30	14.8 J	12.1 J	19.3	10.2	9.8	23.9	15.6	9.1
Magnesium	mg/kg	47500	100%	21700.00	3	30	30	7550	13200	17800	18900	14700	4290	10500	**47500**
Manganese	mg/kg	782	87%	1100.00	0	26	30	421	373	502	394	386	540	373	423
Mercury	mg/kg	0.08	80%	0.10	0	24	30	0.06	0.06 J	0.01 J	0.02 J	0.01 U	0.06 J	0.02 J	0.01 J
Nickel	mg/kg	57.2	100%	50.00	2	30	30	28.6	33.4	6.8	28.6	29.7	22.5	44.8	24.1
Potassium	mg/kg	3560	100%	2623.00	4	30	30	1,250 J	1440 J	730 J	1630	1230	2140	1770	1300
Selenium	mg/kg	1.8	63%	2.00	0	19	30	0.6 J	0.52 J	0.29 U	0.36 U	0.28 U	1.4	0.28 J	0.22 U
Sodium	mg/kg	151	87%	188.00	0	26	30	50.3 J	88.4 J	86.1 J	88 J	117 J	41 U	50.2 J	111 J
Vanadium	mg/kg	41.8	100%	150.00	0	30	30	21.4	17.6	6.4 J	16.7	14	25	19.4	13
Zinc	mg/kg	338	100%	115.00	10	30	30	89	98	**139**	89.1	81.9	94.2	**162**	67.6
Cyanide	mg/kg	1.7	3%	30	0	1	30	0.55 U	0.48 U	0.54 U	1.7	0.45 U	0.5 U	0.52 U	0.43 U
OTHER ANALYSES															
Nitrate/Nitrite-Nitrogen	mg/kg							0.08	0.2	0.02	0.67	0.15	9.7	0.29	0.18
Total Solids	%W/W							86.5	90.3	82	83.4	93	67.9	89.4	92.1

TABLE 4.1-1
SOIL ANALYSIS RESULTS - SEAD-46,56,69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-69 0-0.2 02/19/94 SB69-2.01 211964	SOIL SEAD-69 6-8 05/16/94 SB69-2.04 221356	SOIL SEAD-69 12-14 05/16/94 SB69-2.07 221357	SOIL SEAD-69 0-0.2 02/18/94 SB69-3.01 211967	SOIL SEAD-69 6-8 02/18/94 SB69-3.04 212007	SOIL SEAD-69 10-12 02/18/94 SB69-3.06 211970
VOLATILE ORGANICS													
Methylene Chloride	ug/kg	11	26%	100	0	7	27	24 U	11 U	4 J	19 U	11 U	11 UR
Acetone	ug/kg	16	23%	200	0	6	26	24 U	11 U	11 UR	19 U	11 U	11 UR
Chloroform	ug/kg	11	23%	300	0	6	26	24 U	11 U	11 UR	19 U	11 U	11 UR
Toluene	ug/kg	27	32%	1500	0	9	28	24 U	11 U	27 J	11 U	11 U	4 J
Xylene (total)	ug/kg	12	27%	1200	0	7	26	24 U	11 U	11 UR	19 U	11 U	11 UR
HERBICIDES													
2,4,5-T	ug/kg	12	3%	1900	0	1	30	9.4 U	5.4 U	5.3 U	9.8 U	5.5 U	5.4 U
Dicamba	ug/kg	11	3%		0	1	30	9.4 U	5.4 U	5.3 U	9.8 U	5.5 U	5.4 U
Dichloroprop	ug/kg	72	3%		0	1	30	94 U	54 U	53 U	98 U	55 U	54 U
MCPP	ug/kg	5500	10%		0	3	30	9400 U	5400 U	5300 U	9800 U	5500 U	5400 U
SEMIVOLATILE ORGANICS													
4-Methylphenol	ug/kg	680	3%	900.00	0	1	30	680 J	350 U	350 U	650 U	360 U	350 U
Naphthalene	ug/kg	200	7%	13000.00	0	2	30	620 U	350 U	350 U	650 U	360 U	350 U
2-Methylnaphthalene	ug/kg	88	7%	36400.00	0	2	30	620 U	350 U	350 U	650 U	360 U	350 U
Acenaphthene	ug/kg	570	7%	50000.00	0	2	30	620 U	350 U	350 U	650 U	360 U	350 U
Dibenzofuran	ug/kg	310	7%	6200.00	0	2	30	620 U	350 U	350 U	650 U	360 U	350 U
Fluorene	ug/kg	610	7%	50000.00	0	2	30	620 U	350 U	350 U	650 U	360 U	350 U
Phenanthrene	ug/kg	5200	13%	50000.00	0	4	30	620 U	350 U	350 U	650 U	360 U	350 U
Anthracene	ug/kg	1300	10%	50000.00	0	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Carbazole	ug/kg	620	10%	50000.00	0	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Di-n-butylphthalate	ug/kg	62	10%	8100.00	0	3	30	620 U	350 U	350 U	62 J	25 J	350 U
Fluoranthene	ug/kg	6300	13%	50000.00	0	4	30	620 U	350 U	350 U	650 U	360 U	350 U
Pyrene	ug/kg	4700	13%	50000.00	0	4	30	620 U	350 U	350 U	650 U	360 U	350 U
Benzo(a)anthracene	ug/kg	2400	13%	224.00	2	4	30	620 U	350 U	350 U	650 U	360 U	350 U
Chrysene	ug/kg	2400	13%	400.00	2	4	30	620 U	350 U	350 U	650 U	360 U	350 U
bis(2-Ethylhexyl)phthalate	ug/kg	2700	70%	50000.00	0	21	30	690	350 U	350 U	580 J	140 J	340 J
Benzo(b)fluoranthene	ug/kg	1600	10%	1100.00	1	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Benzo(k)fluoranthene	ug/kg	2000	10%	1100.00	1	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Benzo(a)pyrene	ug/kg	2000	10%	61.00	3	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Indeno(1,2,3-cd)pyrene	ug/kg	1200	10%	3200.00	0	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Dibenz(a,h)anthracene	ug/kg	520	10%	14.00	3	3	30	620 U	350 U	350 U	650 U	360 U	350 U
Benzo(g,h,i)perylene	ug/kg	1300	10%	50000.00	0	3	30	620 U	350 U	350 U	650 U	360 U	350 U
PESTICIDES/PCBs													
Endosulfan I	ug/kg	1.2	3%	900.00	0	1	30	3.3 U	1.8 U	1.8 U	3.3 U	1.9 U	1.8 U
alpha-Chlordane	ug/kg	2.4	3%	540.00	0	1	30	3.3 U	1.8 U	1.8 U	3.3 U	1.9 U	1.8 U
METALS													
Aluminum	mg/kg	27000	100%	19520.00	2	30	30	16000 J	14100	17500	14900	11500	10900
Antimony	mg/kg	7.2	30%	6.00	1	9	30	6 UJ	0.16 UJ	0.12 J	0.37 UJ	0.23 J	0.32 J
Arsenic	mg/kg	7.1	100%	8.90	0	30	30	5.4 J	5.1	7.1	4.7	5.1	6.5
Barium	mg/kg	175	100%	300.00	0	30	30	133 J	42.7	82.1	118	80.4	80.2
Beryllium	mg/kg	1.2	100%	1.13	1	30	30	0.9 J	0.66 J	0.78	0.67 J	0.55 J	0.49 J
Cadmium	mg/kg	1.5	87%	2.46	0	26	30	0.58 U	0.83	1.1	0.31 J	0.28 J	0.23 J
Calcium	mg/kg	141000	100%	125300.00	1	30	30	7760 J	28900	22000	7510 J	**141000** J	58900 J
Chromium	mg/kg	30.7	100%	30.00	2	30	30	22.6	24.1	**30.7**	21.5	17.9	18.4
Cobalt	mg/kg	20.9	100%	30.00	0	30	30	8.9 J	17.8	20.9	8.2 J	10.5	10.8
Copper	mg/kg	28.1	100%	33.00	0	30	30	22.9	27.8	25	20.6	21.1	23
Iron	mg/kg	40300	100%	37410.00	1	30	30	27100 J	31400	**40300**	24900	22300	24200
Lead	mg/kg	30.2	100%	24.40	2	30	30	21.1	9.7	13.6	**25.2**	6.1	5.9
Magnesium	mg/kg	47500	100%	21700.00	3	30	30	4940 J	10200	9880	4730	10900	10900
Manganese	mg/kg	782	87%	1100.00	0	26	30	576 R	488	539	368	403	484
Mercury	mg/kg	0.08	80%	0.10	0	24	30	0.08 J	0.02 J	0.02 J	0.06 J	0.03 J	0.02 J
Nickel	mg/kg	57.2	100%	50.00	2	30	30	28.1	47.2	**57.2**	26.6 J	30.2 J	30 J
Potassium	mg/kg	3560	100%	2623.00	4	30	30	1930	1350	1600	1940 J	2350 J	1490 J
Selenium	mg/kg	1.8	63%	2.00	0	19	30	0.54 J	0.28 U	0.36 J	1.2 J	0.51 J	0.66 J
Sodium	mg/kg	151	87%	188.00	0	26	30	54.9 U	85.8 J	113 J	85.5 J	139 J	122 J
Vanadium	mg/kg	41.8	100%	150.00	0	30	30	28.3	20	24.5	27.6	18.4	15.7
Zinc	mg/kg	338	100%	115.00	10	30	30	**338** J	**182**	97.2	**273**	82.6	64.3
Cyanide	mg/kg	1.7	3%	30	0	1	30	0.61 U	0.48 U	0.5 U	0.92 U	0.54 U	0.47 U
OTHER ANALYSES													
Nitrate/Nitrite-Nitrogen	mg/kg							0.02 U	0.58	0.19	0.02 U	0.04	0.03
Total Solids	%W/W							62.5	93.6	95.4	51.2	91	92.8

NOTES:
a) The TAGM value for PCBs is 1000ug/Kg for surface soils and 10,000 ug/Kg for subsurface soils.
b) * As per proposed TAGM, total VOCs < 10ppm, total SVOs < 500ppm, and individual SVOs < 50ppm.
c) NA = Not Available
d) U = The compound was not detected below this concentration.
e) J = The reported value is an estimated concentration.
f) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.
g) R = The data was rejected during the data validation process.

4.1.2.1 Volatile Organic Compounds

Five volatile organic compounds were detected in 10 of the 30 soil samples collected at SEADs 43, 56 and 69. All were found at concentrations which were at least an order of magnitude below their respective TAGM values. Four of the five volatile organic compounds detected (methylene chloride, acetone, chloroform, and toluene) are considered to be common laboratory contaminants. The fifth VOC detected, xylene, occurred in only three samples, and was found at a maximum concentration of 12 µg/kg in soil sample SB43-4.07.

4.1.2.2 Semivolatile Organic Compounds

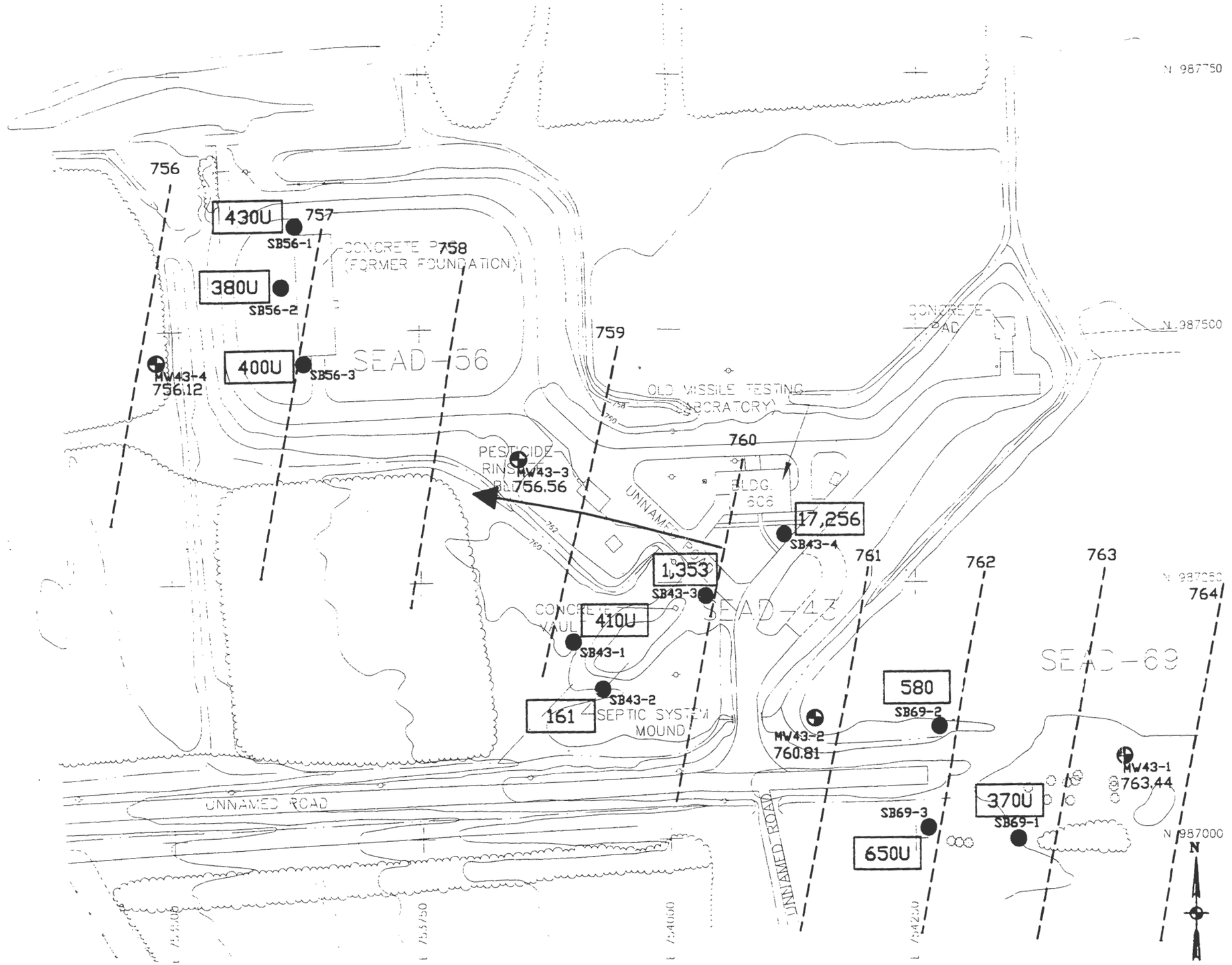
A total of 21 semivolatile organic compounds were found at varying concentrations in the soil samples collected at SEAD-43, 56 and 69. Only 6 PAH compounds, benzo(a)anthracene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(b)fluoranthene, and benzo(k)fluoranthene, were found at concentrations which exceed their respective TAGM values. All of the TAGM exceedances for these compounds were in soil samples SB43-3-00, SB43-4.01 and SB43-4.02. The highest concentrations of the PAHs found above TAGM values, as well as the highest concentrations for 12 of the 15 remaining SVOs detected at SEADs 43, 56, and 69, were found in soil sample SB43-4.02. **Figure 4.1-1** shows the distribution of PAHs in surface soils based upon the analytical results from the ESI conducted at this site.

4.1.2.3 Pesticides and PCBs

Two pesticides (endosulfan I and alpha-chlordane) were detected in 2 of the soil samples collected at SEAD-43, 56 and 69. Endosulfan I was found in sample SB-43-3.00 and was reported at a concentration of 1.2 µg/kg (the TAGM value for endosulfan I in soil is 900 µg/kg). Alpha-Chlordane was found in sample SB43-4.01 at a concentration of 2.4 µg/kg, (the TAGM value for alpha-chlordane is 540 µg/kg).

4.1.2.4 Herbicides

Four herbicides were detected in 3 of the 30 soil samples collected at SEADs 43, 56 and 69. The herbicides 2.4.5-T (12 µg/kg), dicamba (11 µg/kg), dichloroprop (72 µg/kg), and MCPP (7,300 µg/kg) were detected in surface soil sample SB43-1-00. MCPP was also found in soil sample



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 — GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- ● SOIL BORING
- 580 TOTAL PAHs (ug/kg) IN SURFACE SOILS
- MW43-1 / 763.44 MONITORING WELL WITH WATER TABLE ELEVATION
- 763 GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES DIRECTION OF FLOW)

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/6/94

SEAD 43: BLDG.606 OLD MISSLE PROPELLANT TEST LABORATORY

SEAD 56: FORMER HERBICIDE AND PESTICIDE STORAGE AREA

SEAD 69: DISPOSAL AREA

50 0 50 100
(feet)

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING | Dwg. No. 754987-01001

FIGURE 4.1-1
SEAD-43, 56 AND 69
TOTAL PAHs IN SURFACE SOILS

SCALE: 1" = 100' | REV: A

SB43-3-02 (7,700 µg/kg) and surface soil sample SB43-3-00 (7,100 µg/kg). Herbicides were not detected in the remaining 27 soil samples collected at SEAD 43, 56 and 69.

4.1.2.5 Metals

Twenty-two metals were found at varying concentrations in the 30 soil samples collected at SEADs 43, 56 and 69. Eleven of the 22 metals detected were found in one or more samples at concentrations which exceeded their respective TAGM values. The occurrences of TAGM exceedances were distributed throughout the 30 soil samples analyzed from SEADs 43, 56 and 69. Aluminum, Chromium, Iron, Magnesium, Potassium and Zinc were the most frequently detected metals and each had reported concentrations above their associated TAGM values. Zinc was found at concentrations which exceeded the TAGM value of 115 µg/kg in 10 of the 30 soil samples. A trace amount of cyanide (1.7 µg/kg) was found in soil sample SB56-3-04. This was the only detected concentration of cyanide in the 30 samples collected.

4.1.2.6 Nitroaromatics

Nitroaromatics were not detected in the soil samples collected at SEAD-43, 56 and 69.

4.1.2.7 Indicator Compounds

Nitrate/nitrite nitrogen was detected in 83% of the soil samples collected at SEADs 43, 56 and 69. Concentrations ranged from a low of 0.02 mg/kg in sample SB56-3-00 to a maximum of 9.7 mg/kg in sample SB69-1-00.

4.1.3 Groundwater

Four groundwater monitoring wells were installed as part of the SEAD-43, 56, and 69 investigation. The summary analytical results are presented in **Table 4.1-2**. The following sections described the nature and extent of the groundwater contamination identified at SEADs-43, 56 and 69.

4.1.3.1 Volatile Organic Compounds

VOCs were not detected in the groundwater samples collected at SEAD-43, 56 and 69.

TABLE 4.1-2
GROUNDWATER ANALYSIS RESULTS - SEAD-43, 56, AND 69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	MATRIX LOCATION SAMPLE DATE ES ID LAB ID SDG NUMBER UNITS	MAXIMUM	FREQUENCY OF DETECTION	NY AWQS CLASS GA	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-43 07/19/94 MW43-1 227445 45332	WATER SEAD-43 07/19/94 MW43-2 227448 45332	WATER SEAD-43 03/28/94 MW43-3 215554 43179	WATER SEAD-43 03/28/94 MW43-4 215557 43179
HERBICIDES											
2,4,5-TP (Silvex)	ug/L	0.44	25%	0.26	1	1	4	0.11 U	0.11 U	0.44 J	0.11 U
METALS											
Aluminum	ug/L	2870	100%		0	4	4	2610 J	169 J	2870	1010
Antimony	ug/L	1.5	25%	3.00	0	1	4	1.3 U	1.5 J	1 U	1 U
Arsenic	ug/L	1.5	25%	25.00	0	1	4	2 U	2 U	1.5 J	1.5 U
Barium	ug/L	113	100%	1,000.00	0	4	4	77.1 J	43.4 J	113 J	97.2 J
Calcium	ug/L	138000	100%		0	4	4	102000	112000	138000	123000
Chromium	ug/L	5.3	75%	50.00	0	3	4	3.5 J	0.4 U	5.3 J	2 J
Cobalt	ug/L	4.2	75%		0	3	4	2.2 J	0.5 U	3.3 J	4.2 J
Copper	ug/L	4	75%	200.00	0	3	4	3.3 J	0.5 U	4 J	1.9 J
Iron	ug/L	7170	100%	300.00	4	4	4	4010 J	1000	7170	1930
Lead	ug/L	2.4	25%	25.00	0	1	4	0.9 U	0.9 U	2.4 J	0.8 U
Magnesium	ug/L	46800	100%		0	4	4	27500	46800	42700	36800
Manganese	ug/L	297	100%	300.00	0	4	4	120	139	183	297
Mercury	ug/L	0.04	25%	0.70	0	1	4	0.04 J	0.04 U	0.03 U	0.03 U
Nickel	ug/L	9.4	75%	100.00	0	3	4	7.7 J	0.7 U	9.2 J	9.4 J
Potassium	ug/L	3280	100%		0	4	4	2420 J	3010 J	3280 J	3250 J
Silver	ug/L	0.7	25%	50.00	0	1	4	0.7 J	0.5 U	0.7 U	0.7 U
Sodium	ug/L	13400	100%	20,000.00	0	4	4	4600 J	8100	7410	13400
Thallium	ug/L	2.2	25%		0	1	4	2.2 J	1.9 U	1.6 U	1.6 U
Vanadium	ug/L	5.2	75%		0	3	4	4.4 J	0.5 U	5.2 J	2.3 J
Zinc	ug/L	22.5	100%	300.00	0	4	4	11 J	2.3 J	22.5 J	11.8 J
		0	0%		0	0	4				
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen	mg/L	0.06	75%	10	10	0		0.06	0.01 U	0.03 J	0.02
pH	Standard Units							7.1	7.1	7.7	7.1
Conductivity	umhos/cm							460	610	600	535
Temperature	°C							13.7	13.1	8	6.1
Turbidity	NTU							148	16.6	431	0.2

NOTES:
a) NY State Class GA Groundwater Regulations
b) NA = Not Available
d) U = The compound was not detected below this concentration.
e) J = The reported value is an estimated concentration.
f) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.
g) Federal Primary Drinking Water Maximum Contaminant Levels.
h) The value listed is an action level for copper at the tap, and not an MCL
i) The value listed is an action level for lead at the tap, and not an MCL.

4.1.3.2 Semivolatile Organic Compounds

SVOs were not detected in the groundwater samples collected at SEAD-43, 56 and 69.

4.1.3.3 Pesticides and PCBs

Pesticides and PCBs were not detected in the groundwater samples collected at SEAD-43, 56 and 69.

4.1.3.4 Herbicides

The analysis for herbicides by method 8150 revealed 2,4,5-TP (silvex) at a concentration of 0.44 µg/L in the groundwater sample from monitoring well MW43-3. This concentration is slightly above the New York Class GA groundwater criteria of 0.26 µg/L.

4.1.3.5 Metals

A total of 20 inorganic elements were detected in the groundwater at SEADs-43, 56 and 69. The reported concentrations of iron in all 4 groundwater samples were the only values which exceeded the New York AWQS Class GA criteria. The concentrations of iron ranged from a low of 1,000 µg/L in groundwater sample MW43-2 to a high of 7.170 µg/L in groundwater sample MW43-3.

4.1.3.6 Nitroaromatics

Nitroaromatics were not detected in the groundwater samples collected at SEADs-43, 56, and 69.

4.1.3.7 Indicator Compounds

The groundwater samples were analyzed for nitrate/nitrite nitrogen. Concentrations of 0.06, 0.03 and 0.02 were reported in samples MW43-1, MW43-1 and MW43-4, respectively. No indicator compounds were detected in groundwater sample MW43-2.

4.1.4 Surface Water

Five surface water samples were collected as part of the SEAD-43, 56 and 69 investigations. The summary results of the chemical analyses are presented in **Table 4.1-3**. The following sections

TABLE 4.1-3
SURFACE WATER ANALYSIS RESULTS - SEAD-43, 56, 69
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYS GUIDELINES CLASS C (a,b)	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-43 4/16/94 SW43-1-1 217864 43549 SW43-1 SA	WATER SEAD-43 4/16/94 SW43-2-1 217865 43549 SW43-2 SA	WATER SEAD-43 4/15/94 SW43-3-1 217769 43549 SW43-3 SA	WATER SEAD-43 4/15/94 SW43-3-20 217772 43549 SW43-3 DU DUP OF SW43-3	WATER SEAD-43 4/16/94 SW43-4-1 217866 43549 SW43-4 SA	WATER SEAD-43 4/15/94 SW43-5-1 217770 43549 SW43-5 SA
VOLATILE ORGANICS													
Acetone	ug/L	5	17%		0	1	6	10 U	5 J	10 U	10 U	10 U	10 U
SEMIVOLATILE ORGANICS													
4-Methylphenol	ug/L	1	17%		0	1	6	36 U	1 J	12 U	12 U	10 U	11 U
bis(2-Ethylhexyl)phthalate	ug/L	150	17%	0.6	1	1	6	150	12 U	12 U	12 U	10 U	11 U
METALS													
Aluminum	ug/L	1190	100%	100	4	6	6	400	1190	72.2 J	71.4 J	335	111 J
Barium	ug/L	55.2	100%		0	6	6	23.6 J	27.9 J	55.2 J	47.6 J	32.7 J	40.4 J
Beryllium	ug/L	0.1	17%	1100	0	1	6	0.1 J	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
Cadmium	ug/L	0.34	33%	3.85	0	2	6	0.14 J	0.1 U	0.1 U	0.1 U	0.34 J	0.1 U
Calcium	ug/L	92900	100%		0	6	6	49900	43200	92900	92800	52300	79400
Chromium	ug/L	3.3	83%	140	0	5	6	0.82 J	1.6 J	0.4 UJ	3.3 J	0.51 J	0.47 J
Copper	ug/L	2.5	100%	17.36	0	6	6	1.9 J	2.5 J	1.6 J	1.1 J	2.3 J	1.3 J
Iron	ug/L	1750	100%	300	3	6	6	397	1750	177	163	583	150
Lead	ug/L	1.4	17%	8.7	0	1	6	0.8 U	0.8 U	0.8 U	0.8 U	1.4 J	0 8 U
Magnesium	ug/L	15900	100%		0	6	6	9210	7820	15900	15900	9420	14600
Manganese	ug/L	94.6	100%		0	6	6	13.9 J	94.6	91.5 J	48.9 J	39.1	12.2 J
Mercury	ug/L	0.06	100%	0.77	0	6	6	0.04 J	0.06 J	0.06 J	0.04 J	0.04 J	0.05 J
Nickel	ug/L	277	100%	100.16	1	6	6	1.6 J	2.8 J	0.71 J	1.6 J	277	1.4 J
Potassium	ug/L	2660	100%		0	6	6	1000 J	2290 J	1520 J	1500 J	2660 J	1810 J
Sodium	ug/L	5180	100%		0	6	6	2450 J	892 J	4440 J	4550 J	3240 J	5180
Vanadium	ug/L	2.1	33%	14	0	2	6	0.89 J	2.1 J	0.7 U	0.7 U	0.69 U	0.7 U
Zinc	ug/L	1040	100%	159.6	1	6	6	5.3 J	12.1 J	3.8 J	3.9 J	1040	14.2 J
		0	0%		0	0	6						
OTHER ANALYSES													
Nitrate/Nitrite-Nitrogen	mg/L	353 2						0.01	0.02	1.42	1.17	0.02	0.04
pH	SU							9.2	8.8	7.3		7.6	7.9
Conductivity	umhos/cm							215	165	333		255	432
Temperature	°C							11	10	21		16	21
Turbidity	NTU							9.8	31.2	1.9		9.7	2.3

NOTES:

a) The New York State Ambient Water Quality standards and guidelines for Class C surface water (1998).
b) Hardness dependent values assume a hardness of 217 mg/L.
c) NA = Not Available
d) U = The compound was not detected below this concentration
e) J = The reported value is an estimated concentration.
f) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.
g) NYSDEC guidance value

describe the nature and extent of surface water contamination identified at SEAD-43, 56, and 69.

4.1.4.1 Volatile Organic Compounds

One volatile organic compound was detected in one surface water sample collected at SEADs-43, 56 and 69. Acetone, a common laboratory contaminant, was present at a concentration of 5 µg/L in surface water sample SW43-2. All four of the remaining surface water samples revealed no trace of VOCs.

4.1.4.2 Semivolatile Organic Compounds

Two semivolatile organic compounds were found in the surface water collected at SEADs-43, 56 and 69. Surface water sample SW43-2 had 1 µg/L of 4-Methylphenol and surface water sample SW43-1 had 150 µg/L of bis(2-ethylhexyl)phthalate. The concentration of 4-Methylphenol detected in surface water sample SW43-1 exceeds the New York Class C criteria for bis(2-ethylhexyl)phthalate (0.6 µg/L). Currently, no criteria exist for detected concentrations of 4-Methyphenol in New York Class C surface water.

4.1.4.3 Pesticides and PCBs

No pesticides or PCBs were found in any of the five surface water samples collected at SEADs-43, 56 and 69.

4.1.4.4 Herbicides

Herbicides were not detected in the surface water samples collected at SEADs-43, 56, and 69.

4.1.4.5 Metals

A total of 17 metals were found in the surface water samples collected at SEADs-43, 56 and 69 concentrations. Aluminum, iron, potassium, and zinc were elevated in one or more of the five surface water samples collected. The highest concentrations of aluminum (1,190 µg/L) and iron (1,750 µg/L) were detected in sample SW43-1. The highest concentrations of potassium (277 µg/L) and zinc (1,040 µg/L) were found in surface water sample SW43-4. All other detected metals were below criteria values.

4.1.4.6 Nitroaromatics

Nitroaromatic compounds were not detected in the surface water samples collected at SEAD-43, 56, and 69.

4.1.4.7 Indicator Compounds

Nitrate/nitrite nitrogen was detected in all five of the surface water samples analyzed from SEADs 43, 56 and 69. The reported concentrations of nitrate/nitrite nitrogen ranged from a low of 0.01 mg/L in sample SW43-1 to a high of 1.42 mg/L in SW43-3.

4.1.5 Sediment

Five sediment samples were collected as part of the SEAD-43, 56 and 69 investigations. The summary chemical analyses are presented in **Table 4.1-4**. The following sections describe the nature and extent of sediment contamination identified at SEAD-43, 56, and 69.

4.1.5.1 Volatile Organic Compounds

Acetone and 2-butanone were the only VOCs found in the five sediment samples collected at SEADs-43, 56 and 69. Sediment sample SD43-3 was the only sample which contained a detectable concentration of acetone (220 µg/kg). 2-butanone was detected in sediment samples SD43-1 and SD43-3 at concentrations of 19 and 49 µg/kg, respectively. These VOCs are common laboratory contaminants.

4.1.5.2 Semivolatile Organic Compounds

No semivolatile organic compounds were detected in the five sediment samples collected at SEAD-43, 56, and 69.

4.1.5.3 Pesticides and PCBs

No pesticides or PCBs were detected in the five sediment samples collected at SEAD-43, 56, and 69.

TABLE 4 1-4
SEDIMENT ANALYSIS RESULTS - SEAD-43, 56, AND 69
COMPLETION REPORT - MINI ROSK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYSDEC SEDIMENT CRITERIA	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-43 0-0.2 04/16/94 SD43-1 217861 43543	SOIL SEAD-43 0-0.2 04/16/94 SD43-2 217862 43543	SOIL SEAD-43 0.4 04/15/94 SD43-3 217764 43543	SOIL SEAD-43 0-0.2 04/16/94 SD43-4 217863 43543	SOIL SEAD-43 0.6 04/15/94 SD43-5 217766 43543
VOLATILE ORGANICS												
Acetone	ug/Kg	220	14%		0	1	5	82 U	20 U	220	32 U	65 U
2-Butanone	ug/Kg	49	29%		0	2	5	19	17 U	49	14 U	16 U
HERBICIDES												
2 4-DB	ug/Kg	110	14%		0	1	5	84 U	110	110 U	72 U	81 U
2,4,5-T	ug/Kg	23	57%		0	4	5	18	18	23 J	7 2 U	11
MCPP	ug/Kg	17000	29%		0	2	5	16000	17000	11000 U	7200 U	8100 U
NITROAROMATICS												
HMX	ug/Kg	110	29%		0	2	5	130 U	110 J	130 U	72 J	130 U
METALS												
Aluminum	mg/Kg	19600	71%		0	5	5	19600	16800	17600	13000	15400
Antimony	mg/Kg	0 37	167%	2	0	5	5	0 26 UJ	0 29 UJ	0 37 J	0 19 UJ	0 27 UJ
Arsenic	mg/Kg	9	71%	6	2	5	5	9	6.5	4 6	5,3	4 1
Barium	mg/Kg	158	71%		0	5	5	158	127	133	85.1	97 8
Beryllium	mg/Kg	0 99	71%		0	5	5	0 99 J	0 85 J	0 78 J	0 61 J	0 69 J
Cadmium	mg/Kg	0 63	71%	0 6	1	5	5	0.63 J	0 46 J	0 58 J	0 33 J	0 37 J
Calcium	mg/Kg	68900	71%		0	5	5	7220	7170	8230	68900	9030
Chromium	mg/Kg	27.4	71%	26	1	5	5	27.4	23 1	23	19.5	21
Cobalt	mg/Kg	19 7	71%		0	5	5	19.7	10.9 J	10.6 J	9.6	7 6 J
Copper	mg/Kg	30 1	71%	16	5	5	5	30.1	20.3	24.1	20.4	18.5
Iron	mg/Kg	37100	71%	20000	5	5	5	37100	28900	23800	25300	22100
Lead	mg/Kg	28.7	71%	31	0	5	5	28.7	23.2	22.2	9.8	16.7
Magnesium	mg/Kg	10500	71%		0	5	5	6870	5390	4880	10500	5180
Manganese	mg/Kg	1480	71%	460	3	5	5	1480	501	433	615	198
Mercury	mg/Kg	0 07	71%	0.15	0	5	5	0 06 J	0 04 J	0 06 J	0 03 J	0 07 J
Nickel	mg/Kg	44.3	71%	16	5	5	5	44.3	27.4	26.8	29.7	24.8
Potassium	mg/Kg	2440	71%		0	5	5	2140	2080	2320	2160	2440
Selenium	mg/Kg	1	14%		0	1	5	0 44 U	0 49 U	1 J	0 32 U	0 45 U
Sodium	mg/Kg	50	14%		0	1	5	41 3 U	45 5 U	45 3 U	50 J	42 2 U
Thallium	mg/Kg	0 75	43%		0	3	5	0 42 U	0 73 J	0 68 J	0 3 U	0 75 J
Vanadium	mg/Kg	37 4	71%		0	5	5	37.4	32.4	32 1	20 6	27 1
Zinc	mg/Kg	178	71%	120	3	5	5	122	124	105	64.3	178
		0	0%									
OTHER ANALYSES												
Nitrate/Nitrite-Nitrogen	mg/Kg	0 15	80%					0 1	0 03	0 15 J	0 06	0 02 U
Total Solids	%							59.5	62 2	48.6	69.5	62 1

NOTES

a) NYSDEC Sediment Criteria - 1994
b) A sediment is considered contaminated if either criterion is exceeded
c) 2% = 20,000 mg/Kg, 4% = 40,000 mg/Kg
d) NA = Not Available
e) U = The compound was not detected below this concentration
f) J = The reported value is an estimated concentration
g) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis

4.1.5.4 Herbicides

Three herbicides were detected in the sediment samples collected at SEADs-43, 56, and 69. The herbicides 2,4,5-T, 2,4-DB, and MCPP were all found in sample SD43-2 at concentrations of 18, 110, and 17,000 µg/kg, respectively. These were the highest concentrations of 2,4-DB and MCPP detected in the sediments at SEADs-43, 56, and 69. The maximum concentration of 2,4,5-T was 23 µg/kg in sample SD43-3.

4.1.5.5 Metals

A total of 22 metals were detected in the sediment samples collected as part of the SEAD-43, 56, and 69 investigations. Arsenic, cadmium, chromium, copper, iron, manganese, nickel, and zinc were found at concentrations which exceeded their respective criteria values. Except for zinc, the highest concentrations for the eight metals found above criteria values occurred in sample SD43-1. The highest reported concentration of zinc (178 µg/kg) was in sediment sample SD43-5.

4.1.5.6 Nitroaromatics

The analysis for explosives by Method 8330 detected HMX in 2 of the 5 sediment samples collected at SEADs-43, 56, and 69. The concentrations in sediment samples SD43-2 and SD43-4 were 110 and 72 µg/kg, respectively.

4.1.5.7 Indicator Compounds

Nitrate/nitrite-nitrogen was detected in 4 of the 5 sediment samples. Concentrations ranged from 0.03 to 0.15 µg/kg. The maximum concentration was found in sample SD43-3.

4.2 SEAD-44A

4.2.1 Introduction

A total of six surface soil samples, 9 berm excavation samples, three surface water and three sediment samples were collected at SEAD-44A. Three monitoring wells were also installed and sampled as part of this investigation. The following sections describe the nature and extent of contamination identified at SEAD-44A.

4.2.2 Soil

The analytical results for the 15 soil samples collected as part of the SEAD-44A investigation are presented in **Table 4.2-1**. The following sections describe the nature and extent of contamination in SEAD-44A soils. The sample locations are shown in **Figure 2.4-1**.

4.2.2.1 Volatile Organic Compounds

Six volatile organic compounds were detected in 8 of the 15 soil samples collected at SEAD-44A. 2-Butanone, 4-methyl-2pentanone, 2-hexanone, and toluene were all found at maximum concentrations which are well below their respective TAGMs. These four VOCs, as well as 1,1,2,2-tetrachloroethane (this compound does have an associated TAGM) was detected in only 1 of the samples analyzed from SEAD-44A. Acetone was detected in all 6 surface soil samples. The highest reported concentration of acetone was 200 µg/kg which occurred in surface soil sample SS44A-5. This concentration is equal to the TAGM for acetone.

4.2.2.2 Semivolatile Organic Compounds

A total of 23 semivolatile organic compounds were found at varying concentrations in the soil samples collected at SEAD-44A. Twelve were detected in the six surface soil samples collected, but none were found at levels exceeding TAGM levels. All measured SVOC concentrations were reported as estimated values (i.e., "J" qualifier). Subsurface berm excavations revealed TAGM exceedances for Benz(a)anthracene, chrysene, benzo(a)pyrene (BAP), and dibenz(a,h)anthracene. Berm excavation sample TP44A-7 had a BAP concentration of 1,100 µg/kg which was roughly 18 times the TAGM value of 61 µg/kg. Benzo(a)pyrene was found to be present in all 9 berm excavations performed at SEAD-44A. Benz(a)anthracene, chrysene, and dibenz(a,h) anthracene were found at concentrations which were 2 to 11 times greater than their associated TAGM values. **Figure 4.2-1** shows the sum of semivolatile organic compounds found in the soil samples collected at SEAD-44A.

4.2.2.3 Pesticides and PCBs

A total of 9 pesticide compounds were detected in the soil samples collected at SEAD-44A. The frequency of detection of the pesticides ranged from 6% for heptachlor epoxide, endrin, and endrin ketone to 41% for dieldrin. All of the pesticides detected, except dieldrin, endrin ketone and endrin aldehyde, were found at concentration which were at least an order of magnitude below their

TABLE 4 2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/13/94 SS44A-1 217678 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-2 217680 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-3 217681 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-4 217682 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-5 217683 43535
VOLATILE ORGANICS												
Acetone	ug/Kg	200	35%	200	0	6	15	73	11 J	26	18	200
2-Butanone	ug/Kg	28	6%	300	0	1	15	16 U	15 U	18 U	16 U	28
4-Methyl-2-Pentanone	ug/Kg	4	6%	1000	0	1	15	16 U	15 U	18 U	16 U	21 U
2-Hexanone	ug/Kg	4	6%		0	1	15	16 U	15 U	18 U	16 U	21 U
1,1,2,2-Tetrachloroethane	ug/Kg	2	6%	600	0	1	15	16 U	15 U	18 U	16 U	21 U
Toluene	ug/Kg	1	6%	1500	0	1	15	16 U	15 U	18 U	16 U	21 U
NITROAROMATICS												
2 4 6-Trinitrotoluene	ug/Kg	110	6%		0	1	15	130 U	130 U	130 U	130 U	110 J
SEMIVOLATILE ORGANICS												
4-Methylphenol	ug/Kg	250	12%	900	0	2	15	520 U	520 U	250 J	580 U	660 U
Naphthalene	ug/Kg	330	12%	13000	0	2	15	520 U	520 U	580 U	580 U	660 U
2-Methylnaphthalene	ug/Kg	150	6%	36400	0	1	15	520 U	520 U	580 U	580 U	660 U
Acenaphthylene	ug/Kg	72	18%	41000	0	3	15	520 U	520 U	580 U	580 U	660 U
Acenaphthene	ug/Kg	380	35%	50000	0	6	15	520 U	520 U	580 U	580 U	660 U
Dibenzofuran	ug/Kg	280	6%	6200	0	1	15	520 U	520 U	580 U	580 U	660 U
Fluorene	ug/Kg	410	35%	50000	0	6	15	520 U	520 U	580 U	580 U	660 U
Hexachlorobenzene	ug/Kg	36	12%	410	0	2	15	520 U	520 U	580 U	580 U	660 U
Phenanthrene	ug/Kg	2100	59%	50000	0	10	15	520 U	120 J	580 U	580 U	660 U
Anthracene	ug/Kg	640	41%	50000	0	7	15	520 U	520 U	580 U	580 U	660 U
Carbazole	ug/Kg	370	35%		0	6	15	520 U	520 U	580 U	580 U	660 U
Di-n-butylphthalate	ug/Kg	53	12%	8100	0	2	15	26 J	520 U	580 U	580 U	53 J
Fluoranthene	ug/Kg	2400	65%	50000	0	11	15	23 J	150 J	580 U	580 U	660 U
Pyrene	ug/Kg	2000	65%	50000	0	11	15	26 J	120 J	580 U	580 U	660 U
Benzo(a)anthracene	ug/Kg	990	59%	224	4	10	15	520 U	56 J	580 U	580 U	660 U
Chrysene	ug/Kg	1200	59%	400	4	10	15	520 U	53 J	580 U	580 U	660 U
bis(2-Ethylhexyl)phthalate	ug/Kg	940	59%	50000	0	10	15	54 J	520 U	580 U	580 U	32 J
Benzo(b)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	520 U	43 J	580 U	580 U	660 U
Benzo(k)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	520 U	52 J	580 U	580 U	660 U
Benzo(a)pyrene	ug/Kg	1100	59%	61	9	10	15	520 U	49 J	580 U	580 U	660 U
Indeno(1,2,3-cd)pyrene	ug/Kg	490	59%	3200	0	10	15	520 U	26 J	580 U	580 U	660 U
Dibenz(a,h)anthracene	ug/Kg	160	24%	14	4	4	15	520 U	520 U	580 U	580 U	660 U
Benzo(g,h,i)perylene	ug/Kg	510	53%	50000	0	9	15	520 U	520 U	580 U	580 U	660 U
PESTICIDES/PCB												
Heptachlor epoxide	ug/Kg	1 2	6%	20	0	1	15	2 7 U	2.7 U	2.9 U	3 U	3 4 U
Endosulfan I	ug/Kg	5 4	24%	900	0	4	15	2 7 U	2.7 U	2.9 U	3 U	3 4 U
Dieldrin	ug/Kg	70	41%	44	2	7	15	20 J	5.2 U	9.9 J	59	29
4,4'-DDE	ug/Kg	3.1	18%	2100	0	3	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
Endrin	ug/Kg	3 5	6%	100	0	1	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
Endosulfan II	ug/Kg	2 8	12%	900	0	2	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
4,4'-DDT	ug/Kg	5 6	18%	2100	0	3	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
Endrin ketone	ug/Kg	5 2	6%		0	1	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
Endrin aldehyde	ug/Kg	4 5	12%		0	2	15	5.2 U	5.2 U	5.7 U	5.8 U	6.6 U
METALS												
Aluminum	mg/Kg	17500	88%	19520	0	15	15	16000	15300	15300	12900	17400
Antimony	mg/Kg	10 8	136%	6	2	15	15	0.21 UJ	0 27 UJ	0.23 UJ	0 2 UJ	0.25 UJ
Arsenic	mg/Kg	7 7	88%	8 9	0	15	15	6 5	4.9	4.8	4 5	5 7
Barium	mg/Kg	164	88%	300	0	15	15	94.1	92.5	148	108	164

TABLE 4.2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/13/94 SS44A-1 217678 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-2 217680 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-3 217681 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-4 217682 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44A-5 217683 43535
Beryllium	mg/Kg	0.91	88%	1.13	0	15	15	0.56 J	0.63 J	0.72 J	0.63 J	0.91 J
Cadmium	mg/Kg	0.48	76%	2.46	0	13	15	0.26 J	0.26 J	0.36 J	0.39 J	0.48 J
Calcium	mg/Kg	77400	88%	125300	0	15	15	3460	6230	5690	4900	7160
Chromium	mg/Kg	27.1	88%	30	1	15	15	18.5	20.1	20.5	17.9	23.7
Cobalt	mg/Kg	14.5	88%	30	0	15	15	7.9 J	7.7 J	8.6 J	8.3 J	8.8 J
Copper	mg/Kg	29	88%	33	0	15	15	20.6	14.5	18.9	17.2	20
Iron	mg/Kg	34900	88%	37410	0	15	15	23300	24200	23800	21900	27400
Lead	mg/Kg	24.9	88%	24.4	1	15	15	21.6	18.6	18	16.5	22.5
Magnesium	mg/Kg	40200	88%	21700	1	15	15	3270	3970	4090	3630	4370
Manganese	mg/Kg	956	76%	1100	0	13	15	370 J	298 J	489 J	326 J	678 J
Mercury	mg/Kg	0.17	82%	0.1	2	14	15	0.05 J	0.03 J	0.05 J	0.04 J	0.07 J
Nickel	mg/Kg	41.8	88%	50	0	15	15	20.7	20.4	24	21.2	26
Potassium	mg/Kg	2530	88%	2623	0	15	15	1450	1410	1980	1410	1980
Selenium	mg/Kg	1.7	88%	2	0	15	15	1 J	0.99 J	0.93 J	1.5	1.7
Sodium	mg/Kg	142	53%	188	0	9	15	34 U	42.1 U	36 U	31 U	40 U
Vanadium	mg/Kg	30.2	88%	150	0	15	15	27.6	26.8	25.3	21.4	30.2
Zinc	mg/Kg	115	88%	115	0	15	15	85	72.4	88.6	80.5	94
OTHER ANALYSES												
Nitrate/Nitrite-Nitrogen	mg/Kg	13	100%	NA	NA			0.19	0.11	0.3	0.11	0.1
Total Solids	%W/W							63.9	64.4	57.5	56.8	50.1

TABLE 4.2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/13/94 SS44A-6 217684 43535	SOIL SEAD-44 3 02/19/94 TP44A-1 211984 42493	SOIL SEAD-44 3 02/17/94 TP44A-2 211734 42460	SOIL SEAD-44 3 02/17/94 TP44A-3 211735 42460	SOIL SEAD-44 3 02/18/94 TP44A-4 211985 42493
VOLATILE ORGANICS												
Acetone	ug/Kg	200	35%	200	0	6	15	16 J	12 U	13 U	13 U	12 U
2-Butanone	ug/Kg	28	6%	300	0	1	15	16 U	12 U	13 U	13 U	12 U
4-Methyl-2-Pentanone	ug/Kg	4	6%	1000	0	1	15	16 U	12 U	13 U	13 U	12 U
2-Hexanone	ug/Kg	4	6%		0	1	15	16 U	12 U	13 U	13 U	12 U
1,1,2,2-Tetrachloroethane	ug/Kg	2	6%	600	0	1	15	16 U	12 U	13 U	13 U	12 U
Toluene	ug/Kg	1	6%	1500	0	1	15	16 U	12 U	13 U	13 U	12 U
NITROAROMATICS												
2,4,6-Trinitrotoluene	ug/Kg	110	6%		0	1	15	130 U	130 U	130 U	130 U	130 U
SEMIVOLATILE ORGANICS												
4-Methylphenol	ug/Kg	250	12%	900	0	2	15	64 J	390 U	420 U	420 U	390 U
Naphthalene	ug/Kg	330	12%	13000	0	2	15	570 U	330 J	420 U	420 U	390 U
2-Methylnaphthalene	ug/Kg	150	6%	36400	0	1	15	570 U	150 J	420 U	420 U	390 U
Acenaphthylene	ug/Kg	72	18%	41000	0	3	15	570 U	390 U	420 U	420 U	390 U
Acenaphthene	ug/Kg	380	35%	50000	0	6	15	570 U	380 J	36 J	420 U	390 U
Dibenzofuran	ug/Kg	280	6%	6200	0	1	15	570 U	280 J	420 U	420 U	390 U
Fluorene	ug/Kg	410	35%	50000	0	6	15	570 U	410	34 J	420 U	390 U
Hexachlorobenzene	ug/Kg	36	12%	410	0	2	15	570 U	390 U	420 U	420 U	390 U
Phenanthrene	ug/Kg	2100	59%	50000	0	10	15	570 U	2100	240 J	170 J	68 J
Anthracene	ug/Kg	640	41%	50000	0	7	15	570 U	640	69 J	20 J	390 U
Carbazole	ug/Kg	370	35%		0	6	15	570 U	370 J	36 J	420 U	390 U
Di-n-butylphthalate	ug/Kg	53	12%	8100	0	2	15	570 U	390 U	420 U	420 U	390 U
Fluoranthene	ug/Kg	2400	65%	50000	0	11	15	570 U	1900	300 J	330 J	120 J
Pyrene	ug/Kg	2000	65%	50000	0	11	15	570 U	1300	220 J	250 J	100 J
Benzo(a)anthracene	ug/Kg	990	59%	224	4	10	15	570 U	970	130 J	110 J	52 J
Chrysene	ug/Kg	1200	59%	400	4	10	15	570 U	840	140 J	170 J	77 J
bis(2-Ethylhexyl)phthalate	ug/Kg	940	59%	50000	0	10	15	30 J	480	420 U	420 U	280 J
Benzo(b)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	570 U	790	120 J	170 J	62 J
Benzo(k)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	570 U	610	100 J	130 J	66 J
Benzo(a)pyrene	ug/Kg	1100	59%	61	9	10	15	570 U	780	100 J	130 J	68 J
Indeno(1,2,3-cd)pyrene	ug/Kg	490	59%	3200	0	10	15	570 U	350 J	51 J	83 J	49 J
Dibenz(a,h)anthracene	ug/Kg	160	24%	14	4	4	15	570 U	160 J	21 J	32 J	390 U
Benzo(g,h,i)perylene	ug/Kg	510	53%	50000	0	9	15	570 U	300 J	48 J	87 J	49 J
PESTICIDES/PCB												
Heptachlor epoxide	ug/Kg	1.2	6%	20	0	1	15	2.9 U	1.2 J	2.2 U	2.2 U	2 U
Endosulfan I	ug/Kg	5.4	24%	900	0	4	15	2.9 U	5.4	2.2 U	2.1 J	2.5
Dieldrin	ug/Kg	70	41%	44	2	7	15	70	3.9 U	4.2 U	4.2 U	3.9 U
4,4'-DDE	ug/Kg	3.1	18%	2100	0	3	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
Endrin	ug/Kg	3.5	6%	100	0	1	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
Endosulfan II	ug/Kg	2.8	12%	900	0	2	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
4,4'-DDT	ug/Kg	5.6	18%	2100	0	3	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
Endrin ketone	ug/Kg	5.2	6%		0	1	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
Endrin aldehyde	ug/Kg	4.5	12%		0	2	15	5.7 U	3.9 U	4.2 U	4.2 U	3.9 U
METALS												
Aluminum	mg/Kg	17500	88%	19520	0	15	15	11500	11600	14800 J	12700 J	13800
Antimony	mg/Kg	10.8	136%	6	2	15	15	0.19 UJ	0.35 J	0.3 J	10.8 J	0.57 J
Arsenic	mg/Kg	7.7	88%	8.9	0	15	15	3.5	3.8	4.1 J	3.9 J	4
Barium	mg/Kg	164	88%	300	0	15	15	116	77.9	86.2 J	93.2 J	69.3

TABLE 4 2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0 2 04/13/94 SS44A-6 217684 43535	SOIL SEAD-44 3 02/19/94 TP44A-1 211984 42493	SOIL SEAD-44 3 02/17/94 TP44A-2 211734 42460	SOIL SEAD-44 3 02/17/94 TP44A-3 211735 42460	SOIL SEAD-44 3 02/18/94 TP44A-4 211985 42493
Beryllium	mg/Kg	0 91	88%	1 13	0	15	15	0 57 J	0 44 J	0.64 J	0.52 J	0 6 J
Cadmium	mg/Kg	0 48	76%	2 46	0	13	15	0 36 J	0.22 J	0.33 U	0 41 U	0 14 J
Calcium	mg/Kg	77400	88%	125300	0	15	15	5950	31400 J	22100 J	34100 J	25200 J
Chromium	mg/Kg	27 1	88%	30	0	15	15	15	15.5	19 3	16.5	23 9
Cobalt	mg/Kg	14 5	88%	30	0	15	15	5.1 J	7.6 J	9.2	7.6 J	11 6
Copper	mg/Kg	29	88%	33	0	15	15	14	16.1	24 8	16 5	26 9
Iron	mg/Kg	34900	88%	37410	0	15	15	16500	18400	22600 J	20100 J	28400
Lead	mg/Kg	24 9	88%	24 4	1	15	15	13.9	17 3	17	18.4	19 3
Magnesium	mg/Kg	40200	88%	21700	1	15	15	2690	5920	6630 J	6430 J	7510
Manganese	mg/Kg	956	76%	1100	0	13	15	301 J	323	403 R	440 R	479
Mercury	mg/Kg	0 17	82%	0 1	2	14	15	0.05 J	**0.12**	0.04 J	0.04 J	0 02 U
Nickel	mg/Kg	41 8	88%	50	0	15	15	14.4	20 J	25 6	21.3	41 8 J
Potassium	mg/Kg	2530	88%	2623	0	15	15	1200	1150 J	1430	1310	1480 J
Selenium	mg/Kg	1 7	88%	2	0	15	15	1 3	0.69 J	0.26 J	0.29 J	0.56 J
Sodium	mg/Kg	142	53%	188	0	9	15	30.2 U	70.7 J	69 7 J	73 5 J	81 8 J
Vanadium	mg/Kg	30 2	88%	150	0	15	15	21	19.5	24.6	22 4	20 1
Zinc	mg/Kg	115	88%	115	0	15	15	59 2	71.4	76.1 J	70.7 J	73.4
OTHER ANALYSES												
Nitrate/Nitrite-Nitrogen	mg/Kg	13	100%	NA	NA			1 14	10 8	6 8	7.9	0 52
Total Solids	%W/W							58	84.5	77.7	78.8	85 1

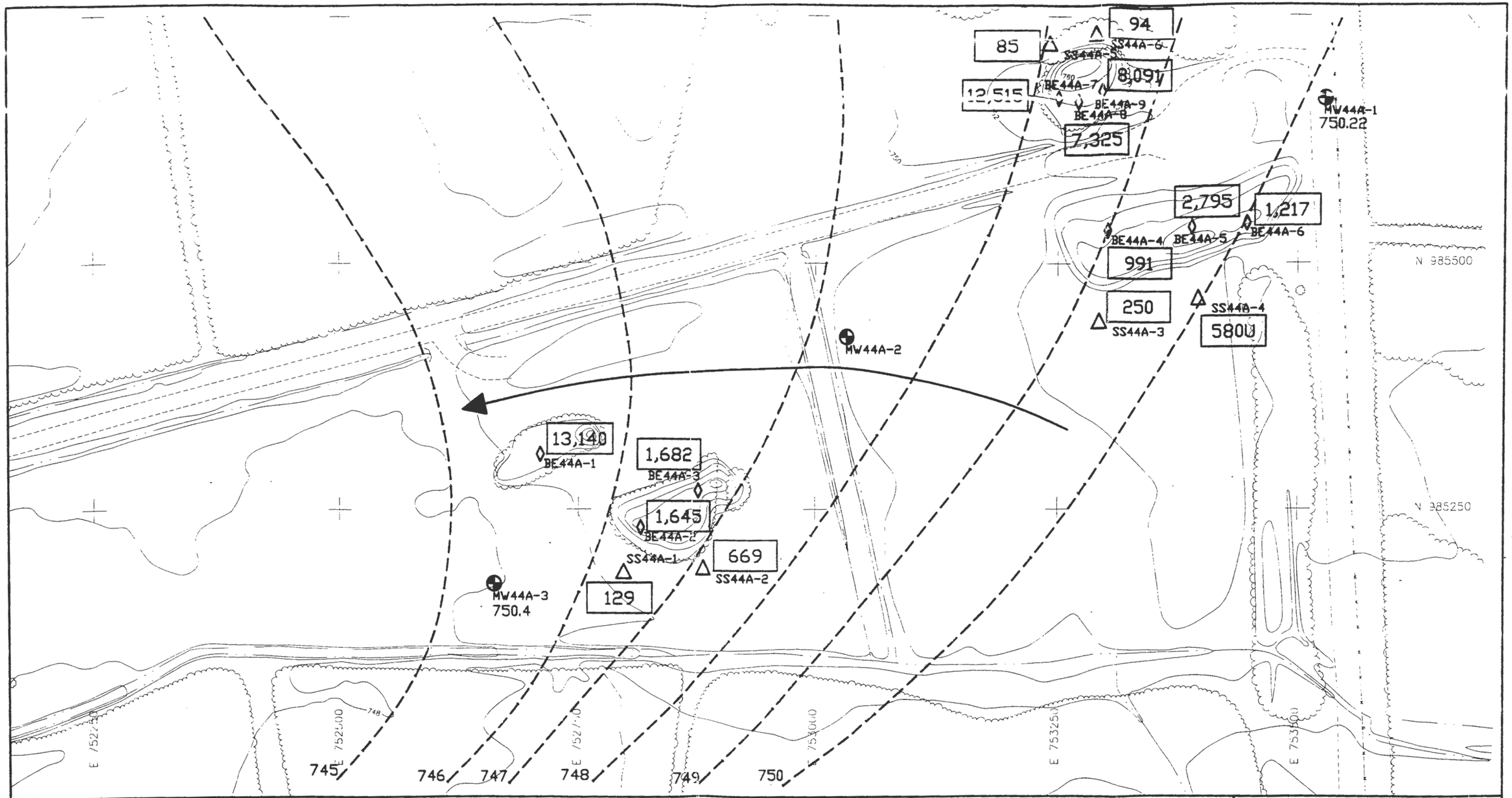
TABLE 4.2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 3 02/18/94 TP44A-5 211985 42493	SOIL SEAD-44 3 02/18/94 TP44A-6 211987 42493	SOIL SEAD-44 3 02/18/94 TP44A-7 212004 42494	SOIL SEAD-44 7 02/20/94 TP44A-8 212042 42494	SOIL SEAD-44 3 02/19/94 TP44A-9 212005 42494
VOLATILE ORGANICS												
Acetone	ug/Kg	200	35%	200	0	6	15	12 U	12 U	12 U	12 U	12 U
2-Butanone	ug/Kg	28	6%	300	0	1	15	12 U	12 U	12 U	12 U	12 U
4-Methyl-2-Pentanone	ug/Kg	4	6%	1000	0	1	15	12 U	12 U	12 U	12 U	4 J
2-Hexanone	ug/Kg	4	6%		0	1	15	12 U	12 U	12 U	12 U	4 J
1,1,2,2-Tetrachloroethane	ug/Kg	2	6%	600	0	1	15	12 U	12 U	12 U	12 U	2 J
Toluene	ug/Kg	1	6%	1500	0	1	15	12 U	12 U	1 J	12 U	12 U
NITROAROMATICS												
2,4,6-Trinitrotoluene	ug/Kg	110	6%		0	1	15	130 U	130 U	130 U	130 U	130 U
SEMIVOLATILE ORGANICS												
4-Methylphenol	ug/Kg	250	12%	900	0	2	15	400 U	410 U	430 U	430 U	400 U
Naphthalene	ug/Kg	330	12%	13000	0	2	15	400 U	410 U	430 U	430 U	22 J
2-Methylnaphthalene	ug/Kg	150	6%	36400	0	1	15	400 U	410 U	430 U	430 U	400 U
Acenaphthylene	ug/Kg	72	18%	41000	0	3	15	400 U	410 U	72 J	46 J	58 J
Acenaphthene	ug/Kg	380	35%	50000	0	6	15	21 J	410 U	40 J	22 J	23 J
Dibenzofuran	ug/Kg	280	6%	6200	0	1	15	400 U	410 U	430 U	430 U	400 U
Fluorene	ug/Kg	410	35%	50000	0	6	15	21 J	410 U	53 J	30 J	38 J
Hexachlorobenzene	ug/Kg	36	12%	410	0	2	15	36 J	24 J	430 U	430 U	400 U
Phenanthrene	ug/Kg	2100	59%	50000	0	10	15	240 J	100 J	980	510	580
Anthracene	ug/Kg	640	41%	50000	0	7	15	43 J	410 U	140 J	77 J	100 J
Carbazole	ug/Kg	370	35%		0	6	15	26 J	410 U	190 J	150 J	150 J
Di-n-butylphthalate	ug/Kg	53	12%	8100	0	2	15	400 U	410 U	430 U	430 U	400 U
Fluoranthene	ug/Kg	2400	65%	50000	0	11	15	400	190 J	2400	1200	1400
Pyrene	ug/Kg	2000	65%	50000	0	11	15	310 J	160 J	2000	910	1000
Benzo(a)anthracene	ug/Kg	990	59%	224		10	15	160 J	77 J	990	430	360
Chrysene	ug/Kg	1200	59%	400	4	10	15	200 J	94 J	1200	650	740
bis(2-Ethylhexyl)phthalate	ug/Kg	940	59%	50000	0	10	15	500	200 J	150 J	940	720
Benzo(b)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	190 J	88 J	1100	560	600
Benzo(k)fluoranthene	ug/Kg	1100	59%	1100	0	10	15	180 J	81 J	1100	640	620
Benzo(a)pyrene	ug/Kg	1100	59%	61	9	10	15	180 J	84 J	1100	600	680
Indeno(1,2,3-cd)pyrene	ug/Kg	490	59%	3200	0	10	15	120 J	61 J	490	250 J	400 J
Dibenz(a,h)anthracene	ug/Kg	160	24%	14	4	4	15	58 J	410 U	430 U	430 U	400 U
Benzo(g,h,i)perylene	ug/Kg	510	53%	50000	0	9	15	110 J	58 J	510	220 J	400 J
PESTICIDES/PCB												
Heptachlor epoxide	ug/Kg	1.2	6%	20	0	1	15	2 U	2.1 U	2.2 U	2.2 U	2.1 U
Endosulfan I	ug/Kg	5.4	24%	900	0	4	15	2 U	1.6 J	2.2 U	2.2 U	2.1 U
Dieldrin	ug/Kg	70	41%	44	2	7	15	5.8 J	4.1 U	4.3 U	4.3 U	12 J
4,4'-DDE	ug/Kg	3.1	18%	2100	0	3	15	4 U	2.8 J	2.8 J	4.3 U	3.1 J
Endrin	ug/Kg	3.5	6%	100	0	1	15	4 U	4.1 U	3.5 J	4.3 U	4 U
Endosulfan II	ug/Kg	2.8	12%	900	0	2	15	4 U	4.1 U	2.8 J	2.7 J	4 U
4,4'-DDT	ug/Kg	5.6	18%	2100	0	3	15	4 U	4.1 U	5.6	2.6 J	3.6 J
Endrin ketone	ug/Kg	5.2	6%		0	1	15	4 U	4.1 U	4.3 U	5.2 J	4 U
Endrin aldehyde	ug/Kg	4.5	12%		0	2	15	4 U	4.1 U	4.5 J	4.3 U	3.5 J
METALS												
Aluminum	mg/Kg	17500	88%	19520	0	15	15	11000	17500	16000 J	17200 J	15700 J
Antimony	mg/Kg	10.8	136%	6	2	15	15	0.33 J	0.65 J	0.31 J	0.62 J	0.4 J
Arsenic	mg/Kg	7.7	88%	8.9	0	15	15	3.7	7.7	4.7 J	6 J	6.1 J
Barium	mg/Kg	164	88%	300	0	15	15	62	124	121 J	106 J	130 J

TABLE 4 2-1
SOIL ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 3 02/18/94 TP44A-5 211986 42493	SOIL SEAD-44 3 02/18/94 TP44A-6 211987 42493	SOIL SEAD-44 3 02/18/94 TP44A-7 212004 42494	SOIL SEAD-44 7 02/20/94 TP44A-8 212042 42494	SOIL SEAD-44 3 02/19/94 TP44A-9 212005 42494
Beryllium	mg/Kg	0 91	88%	1 13	0	15	15	0 42 J	0.77 J	0 64 J	0.74 J	0.69 J
Cadmium	mg/Kg	0 48	76%	2 46	0	13	15	0.28 J	0.18 J	0.25 J	0.29 J	0.23 J
Calcium	mg/Kg	77400	88%	125300	0	15	15	77400 J	13200 J	35400 J	30100 J	11500 J
Chromium	mg/Kg	27 1	88%	30	0	15	15	16.7	27 1	21 4 J	24.7 J	24.2 J
Cobalt	mg/Kg	14 5	88%	30	0	15	15	8.4 J	14.5	8 7 J	12 9 J	14 4 J
Copper	mg/Kg	29	88%	33	0	15	15	17.8	29	21 5 J	24 4 J	25 5 J
Iron	mg/Kg	34900	88%	37410	0	15	15	19900	34900	24000 J	30000 J	31300 J
Lead	mg/Kg	24 9	88%	24.4	1	15	15	13.6	23.8	**24.9** J	18.7 J	21 4 J
Magnesium	mg/Kg	40200	88%	21700	1	15	15	**40200**	7130	6610 J	7330 J	6260 J
Manganese	mg/Kg	956	76%	1100	0	13	15	669	528	451 J	741 J	956 J
Mercury	mg/Kg	0 17	82%	0 1	2	14	15	**0.17**	0.04 J	0.06 J	0.04 J	0 04 J
Nickel	mg/Kg	41 8	88%	50	0	15	15	26.1 J	41.7 J	26 9 J	34.7 J	38.5 J
Potassium	mg/Kg	2530	88%	2623	0	15	15	2090 J	2310 J	2230 J	2530 J	1830 J
Selenium	mg/Kg	1 7	88%	2	0	15	15	0.97	0 66 J	1 1 J	0.69 J	0.67 J
Sodium	mg/Kg	142	53%	188	0	9	15	142 J	56.6 J	57.4 J	73 3 J	49 7 J
Vanadium	mg/Kg	30 2	88%	150	0	15	15	18 2	29.9	28.9 J	29.4 J	27.3 J
Zinc	mg/Kg	115	88%	115	0	15	15	62.3	115	100 J	98.6 J	94.8 J
OTHER ANALYSES												
Nitrate/Nitnte-Nitrogen	mg/Kg	13	100%	NA	NA			4	3.7	13	12.9	8.1
Total Solids	%W/W							83	80 9	77.2	77.4	81 7

NOTES
a) * = As per proposed TAGM, total VOCs < 10 ppm, total SVOs < 500 ppm, and individual SVOs < 50 ppm.
b) NA = Not Available.
c) U = The compound was not detected below this concentration.
d) J = The reported value is an estimated concentration.
e) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis
f) R = The data was rejected during the data validation process.



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- UNPAVED ROAD
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- ROAD SIGN
- DECIDOUS TREE
- GUIDE POST
- FIRE HYDRANT
- MANHOLE
- CORDINATE GRID (250' GRID)
- POLE
- UTILITY BOX
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL

MW44A-3 750.4 — MONITORING WELL WITH WATER TABLE ELEVATION

746 — GROUNDWATER ELEVATION CONTOUR (ARROW INDICATES DIRECTION OF FLOW)

GROUNDWATER LEVEL MEASUREMENTS MADE ON 7/8/94

- SURFACE SOIL SAMPLE
- SURFACE WATER/ SEDIMENT SAMPLE
- BERM EXCAVATION
- 13,140 TOTAL SVOs (ug/kg) IN SOILS

50 0 50 100 (feet)

N

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT: ENVIRONMENTAL ENGINEERING

D+O No. 734987-01001

FIGURE 4.2-1

SEAD-44A QUALITY ASSURANCE TEST LABORATORY
TOTAL SVOs IN SOIL

SCALE 1" = 100'

K:\SENECA\PMI\SWMU\ACAD\FIG\SD44SVO.DWG

respective TAGM value. Two samples with maximum concentrations of 59 and 70 µg/kg exceeded the TAGM for dieldrin (44 µg/kg). Endrin ketone and endrin aldehyde were found at maximum concentrations of 5.2 and 4.5 µg/kg, respectively. No TAGM values exist for these two compounds.

4.2.2.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44A.

4.2.2.5 Metals

A total of 21 metals were detected in the soil samples collected at SEAD-44A. Of the 21 metals reported, 4 were found in one or more of the samples at concentrations which were above TAGM limits. The reported concentrations of those metals which were found above TAGM limits were typically less than two times their associated TAGM values. The only exception was magnesium which was detected at a maximum concentration of approximately twice the associated TAGM value.

4.2.2.6 Nitroaromatics

2,4,6-Trinitrotoluene was detected in only one sample, SS44A-5, at a concentration of 110 µg/kg. There is no TAGM value for 2,4,6-TNT.

4.2.2.7 Indicator Compounds

Nitrate/nitrite-nitrogen was detected in all 15 samples collected at SEAD-44A. The reported concentrations ranged from a low of 0.1 mg/kg to a high of 13 mg/kg, found in sample TP44A-7.

4.2.3 Groundwater

Three monitoring wells were installed and sampled as part of the SEAD-44A investigation. The summary results of the chemical analyses are presented in **Table 4.2-2**. The following sections describe the nature and extent of groundwater contamination identified at SEAD-44A.

TABLE 4 2-2
GROUNDWATER ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

4/26/01

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	NY AWQS CLASS GA	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-44 07/12/94 MW44A-1 226786 45282	WATER SEAD-44 07/13/94 MW44A-2 226789 45282	WATER SEAD-44 07/12/94 MW44A-3 226790 45282
VOLATILE ORGANICS										
Acetone	ug/L	8	20%	50	0	1	3	10 U	8 J	10 U
1,1,2,2-Tetrachloroethane	ug/L	3	20%	5	0	1	3	10 U	3 J	10 U
METALS										
Aluminum	ug/L	2240	60%		0	3	3	125 J	2240	243
Arsenic	ug/L	4 1	20%	25	0	1	3	2 U	4 1 J	2 U
Barium	ug/L	104	60%	1000	0	3	3	104 J	41 6 J	52 4 J
Beryllium	ug/L	0 23	20%		0	1	3	0 1 U	0 23 J	0 1 U
Calcium	ug/L	132000	60%		0	3	3	92200	132000	102000
Chromium	ug/L	4 8	40%	50	0	2	3	0 4 U	4 8 J	0 74 J
Cobalt	ug/L	4	40%		0	2	3	0 5 U	4 J	0 95 J
Copper	ug/L	4 5	40%	200	0	2	3	0 5 U	4 5 J	1 9 J
Iron	ug/L	4810	60%	300	1	3	3	269 J	**4810**	419
Lead	ug/L	4 1	20%	25	0	1	3	0 9 U	4 1	0 89 U
Magnesium	ug/L	75600	60%		0	3	3	19000	75600	34000
Manganese	ug/L	217	60%	300	0	3	3	18 2	217	131
Mercury	ug/L	0 06	40%	0 7	0	2	3	0 04 U	0 06 J	0 05 J
Nickel	ug/L	12 3	40%	100	0	2	3	0 7 U	12 3 J	2 6 J
Potassium	ug/L	6160	60%		0	3	3	1050 J	6160	4050 J
Silver	ug/L	0 63	20%	50	0	1	3	0 63 J	0 5 U	0 5 U
Sodium	ug/L	18900	60%	20000	0	3	3	2390 J	18900	4300 J
Vanadium	ug/L	4 7	60%		0	3	3	0 63 J	4 7 J	1 4 J
Zinc	ug/L	12 8	60%	300	0	3	3	3 8 J	12 8 J	4 3 J
OTHER ANALYSES										
Nitrate/Nitrite-Nitrogen	mg/L	0.10	67%	10	0		3	0 05	0 01 U	0 1
pH	Standard Units						3	7 8	7 5	7 5
Conductivity	umhos/cm						3	410	900	550
Temperature	°C						3	13 4	14 7	15 4
Turbidity	NTU						3	10 7	693	16 8

NOTES
a) NY State Class GA Groundwater Regulations
b) NA = Not Available
d) U = The compound was not detected below this concentration
e) J = The reported value is an estimated concentration
f) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis

4.2.3.1 Volatile Organic Compounds

Two volatile organic compounds, acetone (8 µg/L) and 1,1,2,2-tetrachloroethane (3 µg/L) were detected in groundwater sample MW44A-2. The occurrence of 1,1,2,2-tetrachloroethane was below its TAGM of 5 µg/L. Currently, there is no criteria for acetone in NY AWQS Class GA groundwater.

4.2.3.2 Semivolatile Organic Compounds

No semivolatile organic compounds were found in the three groundwater samples at SEAD-44A.

4.2.3.3 Pesticides and PCBs

No pesticides or PCBs were found in the three groundwater samples at SEAD-44A.

4.2.3.4 Herbicides

The analysis for herbicides by method 8150 was not part of the analytical protocol for SEAD-44A.

4.2.3.5 Metals

Of the 19 metals found in the three groundwater wells, elevated concentrations of aluminum, iron, nickel, and sodium were noted in sample MW44A-2. Iron was the only metal found at concentrations exceeding the NYSDEC Class GA groundwater standard of 300 µg/L. A maximum concentration of 4,810 µg/L was found in the groundwater collected from monitoring well MW44A-2. Elevated concentrations of specific metals in groundwater sample MW44A-2 were likely associated with the high turbidity (693 NTUs) of the sample.

4.2.3.6 Nitroaromatics

No nitroaromatics were found in the soil samples collected at SEAD-44A.

4.2.3.7 Indicator Parameters

Nitrate/nitrite nitrogen was detected in groundwater samples MW44A-1 (0.05 µg/L) and MW44A-3 (0.1 µg/L). The detected nitrate/nitrite nitrogen concentrations were 2 to 3 orders of magnitude

below the NYSDEC Class GA groundwater standard of 10 mg/L.

4.2.4 Surface Water

Four surface water samples were collected as part of the SEAD-44A investigation. The summary results of the chemical analyses are presented in **Table 4.2-3**. The following sections describe the nature and extent of surface water contamination identified at SEAD-44A.

4.2.4.1 Volatile Organic Compounds

No volatile compounds were found in the four surface water samples collected at SEAD-44A.

4.2.4.2 Semivolatile Organic Compounds

No semivolatile organic compounds were found in the four surface water samples collected at SEAD-44A.

4.2.4.3 Pesticides and PCBs

No pesticides or PCBs compounds were found in the four surface water samples collected at SEAD-44A.

4.2.4.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44A.

4.2.4.5 Metals

A total of 17 metals were detected in the surface water samples collected at SEAD-44A. Of the 17 metals detected, aluminum, iron, nickel and zinc were found at concentrations which exceeded New York Class C surface water guidelines. Iron concentrations exceeded the NYSDEC guideline of 300 µg/L in all 4 samples. The highest concentration was 632 µg/L in sample SW44A-1. The zinc concentration in sample SW44A-1 also exceeded the guideline of 159.6 µg/L, where it was found at a concentration of 1,050 µg/L. The concentrations of zinc in the 3 remaining surface water samples were below the guideline value.

TABLE 4.2-3
SURFACE WATER ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

4/26/01

COMPOUND	UNITS	MAXIMUM	FREQUENCY OF DETECTION	NYS GUIDELINES CLASS C (a,b)	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-44 04/17/94 SW44A-1 218085 43549	WATER SEAD-44 04/17/94 SW44A-2 218086 43549	WATER SEAD-44 04/17/94 SW44A-3 218087 43549	WATER SEAD-44 04/27/94 SW44A-4 219414 43626
METALS											
Aluminum	ug/L	476	100%	100	4	4	4	**476**	**243**	**324**	**382**
Barium	ug/L	50 4	100%		0	4	4	29 6 J	27 8 J	28 6 J	50 4 J
Cadmium	ug/L	0 23	25%	3 85	0	1	4	0 23 J	0 1 U	0 1 U	0 1 U
Calcium	ug/L	156000	100%		0	4	4	41800	40600	42700	156000
Chromium	ug/L	1	100%	140	0	4	4	0 92 J	0 52 J	1 J	0 91 J
Cobalt	ug/L	1 1	25%	5	0	1	4	0 6 U	0 6 U	0 59 U	1 1 J
Copper	ug/L	4 7	100%	17 36	0	4	4	4 7 J	2 J	2 3 J	3 2 J
Iron	ug/L	632	100%	300	4	4	4	**632**	**344**	**479**	**525**
Lead	ug/L	2 2	50%	8 7	0	2	4	2 2 J	0 8 U	0 9 J	0 79 U
Magnesium	ug/L	22500	100%		0	4	4	7800	7670	8190	22500
Manganese	ug/L	165	100%		0	4	4	9 8 J	8 3 J	6 3 J	165
Mercury	ug/L	0 05	75%	0 77	0	3	4	0 05 J	0 05 J	0 05 J	0 03 U
Nickel	ug/L	174	100%	100 16	1	4	4	**174**	1 J	1 9 J	2 7 J
Potassium	ug/L	3600	100%		0	4	4	1210 J	1150 J	1100 J	3600 J
Sodium	ug/L	3420	100%		0	4	4	3420 J	2760 J	2880 J	2730 J
Vanadium	ug/L	1	50%	14	0	2	4	1 J	0 7 U	1 J	0 69 U
Zinc	ug/L	1050	100%	159.6	1	4	4	**1050**	5 6 J	10 4 J	5 5 J
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen	mg/L	0 06	100%	NA	NA			0 04	0 02	0.01	0 06
pH	Standard Units	8 7						8	8.6	8.7	7 6
Conductivity	umhos/cm	800						180	168	175	800
Temperature	°C	22.7						8 8	8 1	7 5	22 7
Turbidity	NTU	14 2						12.2	9.1	9 4	14 2

NOTES

a) The New York State Ambient Water Quality standards and guidelines for Class C surface water (1998).
b) Hardness dependent values assume a hardness of 217 mg/L.
c) NA = Not Available
d) U = The compound was not detected below this concentration.
e) J = The reported value is an estimated concentration.
f) NYSDEC guidance value

4.2.4.6 Nitroaromatics

No nitroaromatics were found in the surface water samples collected at SEAD-44A.

4.2.4.7 Indicator Compounds

Nitrate/nitrite nitrogen was found in all four of the surface water samples collected at SEAD-44A. The reported concentrations ranged from 0.01 mg/L to 0.06 mg/L. The maximum concentration, 0.06 mg/L, was found in sample SW44A-4.

4.2.5 Sediment

A total of four sediment samples were collected as part of the SEAD-44A investigation. The summary chemical analyses are presented in **Table 4.2-4**. The following sections describe the nature and extent of sediment contaminants identified at SEAD-44A.

4.2.5.1 Volatile Organic Compounds

No volatile organic compounds were detected in the four sediment samples collected at SEAD-44A.

4.2.5.2 Semivolatile Organic Compounds

Two SVOs were identified in two of the four sediment samples collected at SEAD-44A. The SVOs detected were both phthalates, and were found at low concentrations. The maximum concentration detected was 72 µg/kg of di-n-butylphthalate which was found in sediment sample SD44A-1. Phthalates are common laboratory contaminants.

4.2.5.3 Pesticides and PCBs

No pesticides or PCBs were detected in the four sediment samples collected at SEAD-44A.

4.2.5.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44A.

TABLE 4.2-4
SEDIMENT ANALYSIS RESULTS - SEAD-44A
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYSDEC SEDIMENT CRITERIA	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/17/94 SD44A-1 218073 43543	SOIL SEAD-44 0-0.2 04/17/94 SD44A-2 218075 43543	SOIL SEAD-44 0-0.2 04/17/94 SD44A-3 218076 43543	SOIL SEAD-44 0-0.2 04/27/94 SD44A-4 219399 43663
SEMIVOLATILE ORGANICS											
Di-n-butylphthalate	ug/Kg	72	25%		0	1	4	72 J	460 U	490 U	520 U
bis(2-Ethylhexyl)phthalate	ug/Kg	34	25%	7300	0	1	4	480 U	34 J	490 U	520 U
METALS											
Aluminum	mg/Kg	14000	100%		0	4	4	13400	14000	9880	13300
Antimony	mg/Kg	0.4	50%	2	0	2	4	0.4 J	0.19 J	0.27 UJ	0.16 UJ
Arsenic	mg/Kg	5.4	100%	6	0	4	4	4.9	5.4	4.4	5.2
Barium	mg/Kg	121	100%		0	4	4	121	86.8	86.1	91.2
Beryllium	mg/Kg	0.71	100%		0	4	4	0.71 J	0.67 J	0.49 J	0.66 J
Cadmium	mg/Kg	0.41	100%	0.6	0	4	4	0.37 J	0.41 J	0.26 J	0.29 J
Calcium	mg/Kg	79400	100%		0	4	4	3280	79400	12400	22400
Chromium	mg/Kg	20.7	100%	26	0	4	4	19.8	20.7	14.8	18.7
Cobalt	mg/Kg	11	100%		0	4	4	8.5 J	11	7.2 J	10.3
Copper	mg/Kg	25.6	100%	16	4	4	4	**17.5**	**25.6**	**17.9**	**18.6**
Iron	mg/Kg	26300	100%	20000	3	4	4	**23000**	**26300**	19200	**24200**
Lead	mg/Kg	13.6	100%	31	0	4	4	13.1	12.6	10.7	13.6
Magnesium	mg/Kg	12900	100%		0	4	4	4100	12900	5520	7850
Manganese	mg/Kg	510	100%	460	2	4	4	**462**	**510**	365	393 J
Mercury	mg/Kg	0.07	100%	0.15	0	4	4	0.07 J	0.05 J	0.05 J	0.03 J
Nickel	mg/Kg	31.9	100%	16	4	4	4	**25.9**	**31.9**	**23.2**	**24.2**
Potassium	mg/Kg	2760	100%		0	4	4	1640	2760	1190 J	1200
Sodium	mg/Kg	69.7	50%		0	2	4	41.4 U	69.7 J	42.3 U	52.7 J
Thallium	mg/Kg	0.53	25%		0	1	4	0.53 J	0.29 U	0.43 U	0.25 U
Vanadium	mg/Kg	24	100%		0	4	4	23.9	24	19.1	22.5
Zinc	mg/Kg	83.9	100%	120	0	4	4	83.9	70.2	62.6	66.2
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen	mg/Kg	1.39	100%	NA	NA	NA	NA	1.39	0.07	0.01	0.03
Total Solids	%W/W							68.9	71.1	67.5	63.2

NOTES:

a) NYSDEC Sediment Criteria - 1994
(based on average organic carbon level of 3.65% in sediment determined in Seneca SEAD 16/17 RI Report, Parsons ES, 1998)

b) A sediment is considered contaminated if either criterion is exceeded.

c) Chronic toxicity sediment criteria for benthic aquatic life.

d) NA = Not Available.

e) U = The compound was not detected below this concentration.

f) J = The reported value is an estimated concentration.

g) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.

h) R = The data was rejected during the data validation process.

4.2.5.5 Metals

A number of metals were detected in the sediment at SEAD-44A. Of these, antimony, calcium, magnesium, potassium, and sodium were detected at concentrations which exceeded the NYSDEC Sediment Criteria. The highest concentration of antimony was 0.4 J mg/kg which was found in the sample SD44A-1. This value was only slightly above the sediment criteria of 0.37 mg/kg. The calcium criteria of 68,900 mg/kg was exceeded in sample SD44A-2 which had a calcium concentration of 79,400 mg/kg. The maximum concentration of magnesium was detected in sample SD44A-2 (12,900 µg/kg) which was slightly greater than the sediment criteria value of 10,500 mg/kg. The potassium criteria of 2,440 mg/kg was exceeded in samples SD44A-2 (concentration of 2,760 mg/kg), while the sodium criteria of 50 mg/kg was exceeded in two samples. SD44A-2 (69.7 J mg/kg) and SD44A-4 (52.7 J mg/kg).

4.2.5.6 Nitroaromatics

No nitroaromatics were detected in the four sediment samples collected at SEAD-44A.

4.2.5.7 Indicator Compounds

Nitrate/nitrite nitrogen was detected in all 4 of the sediment samples collected at SEAD-44A. Reported concentrations ranged from 0.01 mg/kg to 1.39 mg/kg. The maximum concentration, 1.39 mg/kg, was found in sample SD44A-1.

4.3 SEAD-44B

4.3.1 Introduction

A total of three (3) surface soil samples, three (3) groundwater samples, and two (2) surface water and sediment samples were collected as part of the SEAD-44B investigation. The following sections describe the nature and extent of contamination identified at SEAD-44B.

4.3.2 Soil

The analytical results for the 3 surface soil samples collected as part of the SEAD-44B investigation are presented in **Table 4.3-1**. The following sections describe the nature and extent of contamination in SEAD-44B soils. The sample locations are shown in **Figure 2.5-2**.

TABLE 4.3-1
SOIL ANALYSIS RESULTS - SEAD-44B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

4/26/01

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/13/94 SS44B-1 217686 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44B-2 217687 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44B-3 217688 43535
VOLATILE ORGANICS										
Acetone	ug/Kg	47	100%	200	0	3	3	45	38	47
2-Butanone	ug/Kg	10	33%	300	0	1	3	10 J	18 U	14 U
SEMIVOLATILE ORGANICS										
Phenanthrene	ug/Kg	330	67%	50000	0	2	3	34 J	630 U	330 J
Anthracene	ug/Kg	35	33%	50000	0	1	3	420 U	630 U	35 J
Fluoranthene	ug/Kg	350	67%	50000	0	2	3	82 J	630 U	350 J
Pyrene	ug/Kg	380	67%	50000	0	2	3	89 J	630 U	380 J
Benzo(a)anthracene	ug/Kg	130	67%	224	0	2	3	33 J	630 U	130 J
Chrysene	ug/Kg	150	67%	400	0	2	3	52 J	630 U	150 J
bis(2-Ethylhexyl)phthalate	ug/Kg	42	67%	50000	0	2	3	34 J	630 U	42 J
Benzo(b)fluoranthene	ug/Kg	99	67%	1100	0	2	3	51 J	630 U	99 J
Benzo(k)fluoranthene	ug/Kg	110	67%	1100	0	2	3	40 J	630 U	110 J
Benzo(a)pyrene	ug/Kg	98	67%	61	1	2	3	32 J	630 U	**98** J
Indeno(1,2,3-cd)pyrene	ug/Kg	64	67%	3200	0	2	3	24 J	630 U	64 J
Dibenz(a,h)anthracene	ug/Kg	28	33%	14	1	1	3	420 U	630 U	**28** J
Benzo(g,h,i)perylene	ug/Kg	56	33%	50000	0	1	3	420 U	630 U	56 J
PESTICIDES/PCB										
Endosulfan I	ug/Kg	2	33%	900	0	1	3	2 J	3.3 U	2.4 U
Dieldrin	ug/Kg	57	33%	44	1	1	3	4.2 U	6.3 U	**57**
4,4'-DDE	ug/Kg	48	33%	2100	0	1	3	48	6.3 U	4.6 U
4,4'-DDD	ug/Kg	28	33%	2900	0	1	3	28	6.3 U	4.6 U
4,4'-DDT	ug/Kg	27	33%	2100	0	1	3	27	6.3 U	4.6 U
METALS										
Aluminum	mg/Kg	16400	100%	19520	0	3	3	11000	16400	9820
Arsenic	mg/Kg	13.1	100%	8.9	1	3	3	6.8	8.2	**13.1**
Barium	mg/Kg	136	100%	300	0	3	3	60.6	136	70.8
Beryllium	mg/Kg	0.77	100%	1.13	0	3	3	0.54 J	0.77 J	0.48 J
Cadmium	mg/Kg	0.34	100%	2.46	0	3	3	0.33 J	0.34 J	0.24 J
Calcium	mg/Kg	33300	100%	125300	0	3	3	10900	5100	33300
Chromium	mg/Kg	20.7	100%	30	0	3	3	20	20.7	15.2
Cobalt	mg/Kg	10.8	100%	30	0	3	3	10.8 J	7.8 J	8.2 J

TABLE 4.3-1
SOIL ANALYSIS RESULTS - SEAD-44B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-44 0-0.2 04/13/94 SS44B-1 217686 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44B-2 217687 43535	SOIL SEAD-44 0-0.2 04/13/94 SS44B-3 217688 43535
Copper	mg/Kg	26.2	100%	33	0	3	3	26.2	21.7	19.9
Iron	mg/Kg	24100	100%	37410	0	3	3	24100	23100	19600
Lead	mg/Kg	39.5	100%	24.4	1	3	3	**39.5**	21.4	12.4
Magnesium	mg/Kg	9660	100%	21700	0	3	3	5200	3910	9660
Manganese	mg/Kg	372	100%	1100	0	3	3	372 J	318 J	364 J
Mercury	mg/Kg	0.04	100%	0.1	0	3	3	0.02 J	0.04 J	0.02 J
Nickel	mg/Kg	34.8	100%	50	0	3	3	34.8	20.8	24.3
Potassium	mg/Kg	1880	100%	2623	0	3	3	1380	1880	1550
Selenium	mg/Kg	1.2	100%	2	0	3	3	1.1 J	1.2	0.44 J
Sodium	mg/Kg	43.2	33%	188	0	1	3	35.3 U	31.5 U	43.2 J
Vanadium	mg/Kg	28	100%	150	0	3	3	20.3	28	16.3
Zinc	mg/Kg	145	100%	115	1	3	3	**145**	73.4	68.9
OTHER ANALYSES										
Nitrate/Nitrite-Nitrogen	mg/Kg	0.47	100%	NA	NA			0.47	0.06	0.04
Total Solids	%W/W							78.1	52.4	72.5

NOTES:

a) * = As per proposed TAGM, total VOCs < 10 ppm, total SVOs < 500 ppm, and individual SVOs <50 ppm.

b) NA = Not Available.

c) U = The compound was not detected below this concentration

d) J = The reported value is an estimated concentration.

e) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.

f) R = The data was rejected during the data validation process.

4.3.2.1 Volatile Organic Compounds

Two volatile organic compounds, acetone and 2-butanone, were detected in the soil samples collected at SEAD-44B. Acetone and 2-butanone are common laboratory contaminants. Both contaminants were present at concentrations which were well below their respective TAGM values. Acetone was present in all three surface soil samples at concentrations ranging from 38 to 47 µg/kg. 2-butanone was present in only one sample, SS44B-1, at a concentration of 10 µg/kg which is well below the TAGM value of 300 µg/kg.

4.3.2.2 Semivolatile Organic Compounds

A total of 13 semivolatile organic compounds were found at varying concentrations in two of the three surface soil samples collected at SEAD-44B. In general, the concentrations of semivolatile organic compounds were low, with only two compounds exceeding their respective TAGM values in surface soil sample SS44B-3. Benzo(a)pyrene and dibenz(a,h)anthracene were detected at concentrations of 98 µg/kg and 28 µg/kg, respectively. The TAGM value for benzo(a)pyrene is 61 µg/kg while the TAGM value for dibenz(a,h)anthracene is 14 µg/kg.

4.3.2.3 Pesticides and PCBs

Five pesticides were found in two of the three surface soil samples collected at SEAD-44B. The compound dieldrin was detected at a concentration of 57 µg/kg which was slightly above the TAGM value of 44 µg/kg. No PCB compounds were detected in the soil samples collected at SEAD-44B.

4.3.2.4 Herbicides

The analysis for herbicides by method 8150 was not part of the analytical protocol for SEAD-44B.

4.3.2.5 Metals

Twenty metals were detected in the surface soils collected at SEAD-44B. Of the 20 metals detected, 3 were found at concentrations which were above their associated TAGM values. Arsenic was detected in soil sample SS44B-3 at 13.1 mg/kg which was above the TAGM value of 8.9 mg/kg. Lead was detected in a single sample (SS44B-1) at a concentration of 39.5 mg/kg, again only slightly above the TAGM value of 24.4 mg/kg. Finally, the compound Zinc detected in sample

SS44B-1 at a concentration of 145 mg/kg, compared to the TAGM value of 115 mg/kg.

4.3.2.6 Nitroaromatics

No nitroaromatics were found in the surface soil samples collected at SEAD-44B.

4.3.2.7 Indicator Compounds

Nitrate/nitrite nitrogen was detected in all 3 surface soil samples collected. Reported concentrations ranged from a low of 0.04 mg/kg in sample SS44B-3, to a maximum of 0.47 mg/kg in sample SS44B-1.

4.3.3 Groundwater

Three groundwater monitoring wells were installed as part of the SEAD-44B investigation. The summary analytical results are presented in **Table 4.3-2**. The following sections describe the nature and extent of the groundwater contamination identified at SEAD-44B.

4.3.3.1 Volatile Organic Compounds

No VOCs were found in the groundwater samples collected at SEAD-44B.

4.3.3.2 Semivolatile Organic Compounds

No SVOs were found in the groundwater samples collected at SEAD-44B.

4.3.3.3 Pesticides and PCBs

No pesticides or PCBs were found in the three groundwater samples collected at SEAD-44B.

4.3.3.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44B.

4.3.3.5 Metals

A total of 16 metals were detected in the groundwater samples collected at SEAD-44B. Iron was

TABLE 4.3-2
GROUNDWATER ANALYSIS RESULTS - SEAD-44B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

4/26/01

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NY AWQS CLASS GA	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-44 07/12/94 MW44B-1 226792 45332	WATER SEAD-44 03/29/94 MW44B-2 215835 43179	WATER SEAD-44 07/13/94 MW44B-3 226793 45332
METALS										
Aluminum	ug/L	1230	100%		0	3	3	288 J	1230	80.2 J
Barium	ug/L	77.7	100%	1000	0	3	3	72.6 J	77.7 J	39.3 J
Calcium	ug/L	120000	100%		0	3	3	120000	92000	114000
Chromium	ug/L	2.5	33%	50	0	1	3	0.4 U	2.5 J	0.4 U
Cobalt	ug/L	1.8	67%		0	2	3	0.91 J	1.8 J	0.5 U
Copper	ug/L	2.4	33%	200	0	1	3	0.5 U	2.4 J	0.5 U
Iron	ug/L	2340	100%	300	2	3	3	**666**	**2340**	231
Magnesium	ug/L	32900	100%		0	3	3	31800	22500	32900
Manganese	ug/L	219	100%	300	0	3	3	219	29.4	151
Nickel	ug/L	4.4	67%	100	0	2	3	0.73 J	4.4 J	0.69 U
Potassium	ug/L	2910	100%		0	3	3	2150 J	1360 J	2910 J
Silver	ug/L	0.7	67%	50	0	2	3	0.68 J	0.7 J	0.5 U
Sodium	ug/L	8350	100%	20000	0	3	3	7190	8350	6110
Thallium	ug/L	4.7	33%		0	1	3	4.7 J	1.6 U	1.9 U
Vanadium	ug/L	2.7	67%		0	2	3	0.5 U	2.7 J	0.63 J
Zinc	ug/L	10.4	67%	300	0	2	3	2.2 U	10.4 J	4.9 J
		0	0%		0	0	3			
OTHER ANALYSES										
Nitrate/Nitrite-Nitrogen	mg/L	0.13	100%	10			0	0.11	0.06	0.13
pH	Standard Units	8.0						7.1	8	7.2
Conductivity	umhos/cm	620.0						620	383	600
Temperature	°C	15.3						15.3	5.9	15
Turbidity	NTU	67.0						16.5	67	2.5

NOTES:

a) NY State Class GA Groundwater Regulations (1998)

b) NA = Not Available

c) U = The compound was not detected below this concentration.

d) J = The reported value is an estimated concentration.

the only metal found at concentrations above the NY AWQS Class GA criteria value of 300 µg/L. Concentrations of 2,340 and 666 µg/L, found in samples MW44B-1 and MW44B-2 respectively, were the only values for iron that exceeded Class GA groundwater criteria.

4.3.3.6 Nitroaromatics

No nitroaromatics were found in the three groundwater samples collected at SEAD-44B.

4.3.3.7 Indicator Compounds

Nitrate/nitrite-nitrogen was detected in all 3 of the groundwater samples at concentrations which were below the criteria value of 10 mg/L. The maximum nitrate/nitrite-nitrogen concentration detected was 0.13 mg/L in the groundwater sample collected from monitoring well MW44B-3.

4.3.4 Surface Water

Two surface water samples were collected as part of the SEAD-44B investigation. The summary results of the chemical analyses are presented in **Table 4.3-3**. The following sections describe the nature and extent of surface water contamination identified at SEAD-44B.

4.3.4.1 Volatile Organic Compounds

No VOCs were found in the two surface water samples collected at SEAD-44B.

4.3.4.2 Semivolatile Organic Compounds

No semivolatile organic compounds were found in the two surface water samples collected at SEAD-44B.

4.3.4.3 Pesticides and PCBs

No pesticides or PCBs were found in the two surface water samples collected at SEAD-44B.

TABLE 4.3-3
SURFACE WATER ANALYSIS RESULTS - SEAD-44B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYS GUIDELINES CLASS C	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-44 04/17/94 SW44B-1 218088 43549	WATER SEAD-44 04/17/94 SW44B-2 218089 43549
METALS									
Aluminum	ug/L	76.5	100%	100	0	2	2	76.5 J	64.4 J
Arsenic	ug/L	11.6	100%	150	0	2	2	5.8 J	11.6
Barium	ug/L	34	100%		0	2	2	34 J	33.3 J
Calcium	ug/L	93000	100%		0	2	2	87000	93000
Copper	ug/L	2.2	100%	17.36	0	2	2	1.2 J	2.2 J
Iron	ug/L	79.8	100%	300	0	2	2	79.8 J	75.5 J
Magnesium	ug/L	9070	100%		0	2	2	8990	9070
Manganese	ug/L	5.3	100%		0	2	2	2.7 J	5.3 J
Mercury	ug/L	0.05	100%	0.77	0	2	2	0.05 J	0.05 J
Nickel	ug/L	0.68	100%	100.16	0	2	2	0.68 J	0.66 J
Potassium	ug/L	3290	100%		0	2	2	2680 J	3290 J
Sodium	ug/L	73200	100%		0	2	2	73200	61000
Zinc	ug/L	2.2	100%	159.6	0	2	2	2 J	2.2 J
OTHER ANALYSES									
Nitrate/Nitrite-Nitrogen	mg/L	0.01	50%	NA	NA			0.01	0.01 U
pH	Standard Units	8.7						8.7	8.5
Conductivity	umhos/cm	700						700	690
Temperature	°C	16.5						16.2	16.5
Turbidity	NTU	2.9						2.9	2.8

NOTES:

a) The New York State Ambient Water Quality standards and guidelines for Class C surface water (1998).
b) Hardness dependent values assume a hardness of 217 mg/L.
c) NA = Not Available
d) U = The compound was not detected below this concentration.
e) J = The reported value is an estimated concentration.

4.3.4.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44B.

4.3.4.5 Metals

A total of 13 metals were found in the surface water samples analyzed at SEAD-44B. All reported concentrations of aluminum, arsenic, copper, iron, mercury, nickel, and zinc were below NY Class C guideline values. No criteria exist for the remaining 6 metals detected in the surface water at SEAD-44B.

4.3.4.6 Nitroaromatics

No nitroaromatic compounds were found in the two surface water samples collected at SEAD-44B.

4.3.4.7 Indicator Compounds

Nitrate/nitrite-nitrogen was found in one of the two samples at a concentration of 0.01 mg/L. Currently, no criteria exists for nitrate/nitrite nitrogen in NY Class C surface waters.

4.3.5 Sediment

A total of two sediment samples were collected as part of the SEAD-44B investigation. The summary chemical analyses are presented in **Table 4.3-4**. The following sections describe the nature and extent of sediment contamination identified at SEAD-44B.

4.3.5.1 Volatile Organic Compounds

2-butanone was the only volatile organic compound found in the sediment samples collected at SEAD-44B. A concentration of 12 µg/kg was found in sediment sample SD44B-2.

4.3.5.2 Semivolatile Organic Compounds

Di-n-butylphthalate was identified in both sediment samples collected at SEAD-44B. The reported concentrations of di-n-butylphthalate were 65 and 110 µg/kg in samples SD44B-1 & SD44B-2, respectively. There are no sediment criteria for di-n-butylphthalate.

TABLE 4.3-4
SEDIMENT ANALYSIS RESULTS - SEAD-44B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

4/26/01

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYSDEC SEDIMENT CRITERIA	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	SEDIMENT SEAD-44 0-0.2 04/17/94 SD44B-1 218077 43543	SEDIMENT SEAD-44 0-0.2 04/17/94 SD44B-2 218078 43543
VOLATILE ORGANICS									
2-Butanone	ug/Kg	12	50%		0	1	2	16 U	12 J
SEMIVOLATILE ORGANICS									
Di-n-butylphthalate	ug/Kg	110	100%		0	2	2	65 J	110 J
METALS									
Aluminum	mg/Kg	13000	100%		0	2	2	13000	10300
Antimony	mg/Kg	0.37	50%	2	0	1	2	0.37 J	0.3 UJ
Arsenic	mg/Kg	58.3	100%	6	2	2	2	58.3	9.4
Barium	mg/Kg	93.8	100%		0	2	2	93.8	68.6
Beryllium	mg/Kg	0.66	100%		0	2	2	0.66 J	0.53 J
Cadmium	mg/Kg	0.38	100%	0.6	0	2	2	0.38 J	0.23 J
Calcium	mg/Kg	8780	100%		0	2	2	4240	8780
Chromium	mg/Kg	19.8	100%	26	0	2	2	19.8	14.6
Cobalt	mg/Kg	11.9	100%		0	2	2	11.9	7.1 J
Copper	mg/Kg	19.1	100%	16	1	2	2	19.1	14.6
Iron	mg/Kg	28400	100%	20000	1	2	2	28400	17600
Lead	mg/Kg	17.7	100%	31	0	2	2	17.7	13.6
Magnesium	mg/Kg	4880	100%		0	2	2	4530	4880
Manganese	mg/Kg	679	100%	460	1	2	2	679	230
Mercury	mg/Kg	0.06	100%	0.15	0	2	2	0.05 J	0.06 J
Nickel	mg/Kg	28.4	100%	16	2	2	2	28.4	18.2
Potassium	mg/Kg	1500	100%		0	2	2	1500	1160 J
Sodium	mg/Kg	378	100%		0	2	2	378 J	97.6 J
Vanadium	mg/Kg	23.8	100%		0	2	2	23.8	18.5
Zinc	mg/Kg	76.3	100%	120	0	2	2	76.3	56.5
		0	0%		0	0	2		
OTHER ANALYSES									
Nitrate/Nitrite-Nitrogen	mg/Kg	0.06	100%	NA	NA	NA	NA	0.06	0.03
Total Solids	%W/W							65	61.2

NOTES:
a) NYSDEC Sediment Criteria - 1994
b) A sediment is considered contaminated if either criterion is exceeded.
c) 2% = 20,000 mg/Kg; 4% = 40,000 mg/Kg
d) NA = Not Available.
e) U = The compound was not detected below this concentration.
f) J = The reported value is an estimated concentration.
g) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.

4.3.5.3 Pesticides and PCBs

No pesticides or PCBs were detected in the two sediment samples collected at SEAD-44B.

4.3.5.4 Herbicides

The analysis for herbicides by Method 8150 was not part of the analytical protocol for SEAD-44B.

4.3.5.5 Metals

A total of twenty metals were detected in the sediment samples collected at SEAD-44B. Arsenic, copper, iron, manganese, and nickel were detected at concentrations which exceeded NYSDEC sediment criteria. The highest concentration of arsenic was 58.3 mg/kg in sample SD44B-1. This value was over 11 times the sediment criteria value of 6 mg/kg. The remaining metals, copper, iron, manganese, and nickel, were detected in excess of the NYSDEC Sediment Criteria for aquatic life. The concentrations detected for these other metals were only slightly above their associated sediment criteria.

4.3.5.6 Nitroaromatics

No nitroaromatics were detected in the two sediment samples collected at SEAD-44B.

4.3.5.7 Indicator Compounds

Nitrate/nitrite-nitrogen was detected in both sediment samples at concentrations of 0.03 and 0.06 mg/kg. The maximum concentration, 0.06 mg/kg, was found in sample SD44A-1.

4.4 SEAD-52

A Limited Sampling Program was performed at SEAD-52 in December 1993 and presented in the SWMU Classification Report (Parsons ES, September 1994). A total of nineteen (19) surface soil samples (including 18 samples and one duplicate) were collected from a depth of 0 to 2" below ground surface and chemically analyzed for explosives by EPA Method 8330. The samples were collected from locations around Buildings 608, 611 and 612 as shown in **Figure 2.6-1**. A description of the program is presented below.

Bldg. 608 - Four surface soil samples, at 0-2" depth, were collected; one from each corner of the building.

Bldg. 611 - Four surface soil samples, at 0-2" depth, were collected; one from each corner of the building.

Bldg. 612 - Ten surface soil samples, at 0-2" depth, were collected; one from each corner of the building, two from the long sides of the building, approximately 100 feet apart, and one from the middle of each of the shorter sides.

The results of the analyses are presented in **Table 4.4-1**. The results of the limited sampling indicate that the three explosive compounds, tetryl, 2,4,6-trinitrotoluene, and 2,4-dinitrotoluene, were detected in up to 10 surface soil samples. Surface soil samples SS52-1 through SS52-8, which were collected from the buildings on the east side of Brady Road, were generally free of explosive compounds, with the exception of SS52-1 and SS52-6, which contained 110 and 280 µg/kg, respectively, of the compound 2,4-dinitrotoluene.

All of the surface soil samples, except two samples, that were collected around Building 612 contained explosive compounds. 2,4-dinitrotoluene was the most frequently detected compound (found in 10 of the 18 samples) and ranged in concentration from 91 to 2100 µg/kg. The compound 2,4,6-trinitrotoluene was detected in only two samples and tetryl in only one sample. SS52-15 and SS52-16 , the two samples in which explosive compounds were not detected, were located on the southwest side of Building 612. No NYSDEC TAGM criteria are available for the explosive compounds detected.

4.5 SEAD-62

4.5.1 Introduction

A total of three subsurface soil samples were collected from three test pits at SEAD-62. A total of three groundwater samples were also collected as part of the investigation. The following sections describe the nature and extent of contamination identified at SEAD-62. The sample locations are shown in **Figure 2.7-2**.

TABLE 4 4-1
SOIL ANALYSIS RESULTS - SEAD-52
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-52 0 0.2 12/16/93 SS52-1 207145 41316 SS52-1 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-19 207163 41316 SS52-1 DU DUP OF SS52-1	SOIL SEAD-52 0 0.2 12/16/93 SS52-2 207146 41316 SS52-2 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-3 207147 41316 SS52-3 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-4 207148 41316 SS52-4 SA
NITROAROMATICS												
HMX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
RDX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3,5-Trinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3-Dinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
Tetryl	ug/Kg	150	5%		0	1	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4,6-Trinitrotoluene	ug/Kg	410	11%		0	2	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
4-amino-2,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,6-Dinitrotoluene	ug/Kg	0	0%	1000	0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	ug/Kg	2100	53%		0	10	19	110 J	120 J	130 UJ	130 UJ	130 UJ

TABLE 4.4-1
SOIL ANALYSIS RESULTS - SEAD-52
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-52 0 0.2 12/16/93 SS52-5 207149 41316 SS52-5 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-6 207150 41316 SS52-6 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-7 207151 41316 SS52-7 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-8 207152 41316 SS52-8 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-9 207153 41316 SS52-9 SA
NITROAROMATICS												
HMX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
RDX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3,5-Trinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3-Dinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
Tetryl	ug/Kg	150	5%		0	1	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4,6-Trinitrotoluene	ug/Kg	410	11%		0	2	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
4-amino-2,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,6-Dinitrotoluene	ug/Kg	0	0%	1000	0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	ug/Kg	2100	53%		0	10	19	130 UJ	280 J	130 UJ	130 UJ	490 J

TABLE 4 4-1
SOIL ANALYSIS RESULTS - SEAD-52
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-52 0 0.2 12/16/93 SS52-10 207154 41316 SS52-10 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-11 207155 41316 SS52-11 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-12 207156 41316 SS52-12 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-13 207157 41316 SS52-13 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-14 207158 41316 SS52-14 SA
NITROAROMATICS												
HMX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
RDX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3,5-Trinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
1,3-Dinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
Tetryl	ug/Kg	150	5%		0	1	19	130 UJ	150 J	130 UJ	130 UJ	130 UJ
2,4,6-Trinitrotoluene	ug/Kg	410	11%		0	2	19	130 UJ	130 UJ	130 UJ	130 UJ	160 J
4-amino-2,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,6-Dinitrotoluene	ug/Kg	0	0%	1000	0	0	19	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	ug/Kg	2100	53%		0	10	19	99 J	130 UJ	91 J	200 J	1500 J

TABLE 4 4-1
SOIL ANALYSIS RESULTS - SEAD-52
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUND	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-52 0 0.2 12/16/93 SS52-15 207159 41316 SS52-15 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-16 207160 41316 SS52-16 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-17 207161 41316 SS52-17 SA	SOIL SEAD-52 0 0.2 12/16/93 SS52-18 207162 41316 SS52-18 SA
NITROAROMATICS											
HMX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
RDX	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
1,3,5-Trinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
1,3-Dinitrobenzene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
Tetryl	ug/Kg	150	5%		0	1	19	130 UJ	130 UJ	130 UJ	130 UJ
2,4,6-Trinitrotoluene	ug/Kg	410	11%		0	2	19	130 UJ	130 UJ	410 J	130 UJ
4-amino-2,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
2-amino-4,6-Dinitrotoluene	ug/Kg	0	0%		0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
2,6-Dinitrotoluene	ug/Kg	0	0%	1000	0	0	19	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	ug/Kg	2100	53%		0	10	19	130 UJ	130 UJ	1800 J	2100 J

4.5.2 Soil

The analytical results for the three subsurface soil samples collected from the test pits are presented in **Table 4.5-1**. The following sections describe the nature and extent of contamination in SEAD-62 soils.

4.5.2.1 Volatile Organic Compounds

No volatile organic compounds were detected in the soil samples collected at SEAD-62.

4.5.2.2 Semivolatile Organic Compounds

A total of 2 semivolatile organic compounds, characterized as PAHs, were found at very low concentrations in one of the soil samples (TP62-1) collected at SEAD-62. Neither of these exceeded their respective TAGM values.

4.5.2.3 Pesticides and PCBs

No pesticide or PCB compounds were found in the soil samples collected at SEAD-62.

4.5.2.4 Herbicides

Two herbicides were found in two soil samples collected at SEAD-62. The compound 2,4,5-T was detected in samples TP62-1-1 and TP62-3-1 located in the central portion of the site. Dicamba was detected only in sample TP62-3-1. None of these concentrations were above their TAGM values.

4.5.2.5 Metals

The soil samples collected at SEAD-62 were found to contain various metals at concentrations that exceed the associated TAGM or site background values. Of the 20 metals detected in SEAD-62 soils, three (mercury, potassium, and zinc) were found in one or more samples at concentrations above their associated TAGM values, however, the exceedances were within the same order of magnitude as the TAGM value.

TABLE 4.5-1
SOIL ANALYSIS RESULTS - SEAD-62
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

COMPOUNDS	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SOIL SEAD-62 0 0.5 06/12/94 TP62-1-1 224086 44748 TP62-1 SA	SOIL SEAD-62 3 3 06/12/94 TP62-2-1 224088 44748 TP62-2 SA	SOIL SEAD-62 2 2 06/12/94 TP62-3-1 224089 44748 TP62-3 SA
SEMIVOLATILE ORGANICS										
Fluoranthene	ug/Kg	46	3.[illegible]%	50000	0	1	3	46 J	370 U	410 U
Pyrene	ug/Kg	47	33%	50000	0	1	3	47 J	370 U	410 U
HERBICIDES										
2,4,5-T	ug/Kg	10	67%	1900	0	2	3	10 J	5.6 U	6.3 J
Dicamba	ug/Kg	9.3	33%		0	1	3	7.3 U	5.6 U	9.3 J
METALS										
Aluminum	mg/Kg	16100	100%	19520	0	3	3	14800	11000	16100
Antimony	mg/Kg	0.21	33%	6	0	1	3	0.35 UJ	0.21 J	0.2 UJ
Arsenic	mg/Kg	8.4	100%	8.9	0	3	3	4.9	5.3	8.4
Barium	mg/Kg	202	100%	300	0	3	3	147	85.4	202
Beryllium	mg/Kg	0.74	100%	1.13	0	3	3	0.74 J	0.56 J	0.72 J
Cadmium	mg/Kg	0.68	100%	2.46	0	3	3	0.43 J	0.56 J	0.68 J
Calcium	mg/Kg	67900	100%	125300	0	3	3	10900	67900	17400
Chromium	mg/Kg	28.8	100%	30	0	3	3	28.8 J	17.3 J	23.6 J
Cobalt	mg/Kg	12.6	100%	30	0	3	3	9.4 J	12.6	12.6
Copper	mg/Kg	28.7	100%	33	0	3	3	22.8	22	28.7
Iron	mg/Kg	30300	100%	37410	0	3	3	27500	23200	30300
Magnesium	mg/Kg	20500	100%	21700	0	3	3	4530	20500	5340
Manganese	mg/Kg	778	100%	1100	0	3	3	323	495	778
Mercury	mg/Kg	0.11	100%	0.1	1	3	3	0.1 J	0.03 J	**0.11**
Nickel	mg/Kg	29.6	100%	50	0	3	3	26.2	29.6	26.5
Potassium	mg/Kg	2970	100%	2623	1	3	3	1630 J	2210 J	**2970** J
Selenium	mg/Kg	1.3	67%	2	0	2	3	1.3 J	0.37 U	0.99
Sodium	mg/Kg	164	100%	188	0	3	3	37.8 J	88.8 J	164 J
Vanadium	mg/Kg	33.1	100%	150	0	3	3	25.3	20.3	33.1
Zinc	mg/Kg	218	100%	115	2	3	3	**218**	67.5	**172**
PCT_SOLID	%W/W							68.5	89.5	79.6

NOTES:
a) * = As per proposed TAGM, total VOCs < 10 ppm, total SVOs < 500 ppm, and individual SVOs <50 ppm.
b) NA = Not Available.
c) U = The compound was not detected below this concentration.
d) J = The reported value is an estimated concentration.
e) UJ = The compound may have been present above this concentration, but was not detected due to problems with the analysis.
f) R = The data was rejected during the data validation process.

4.5.3 Groundwater

Three monitoring wells were installed as part of the investigation at SEAD-62. The summary analytical results are presented in **Table 4.5-2**. The following sections describe the nature and extent of the groundwater contamination identified at SEAD-62.

4.5.3.1 Volatile Organic Compounds

Benzene was the only volatile organic compound found in the groundwater samples collected at SEAD-62. The volatile organic compound was detected in both MW62-2 and MW62-3 at estimated concentrations of 2 J µg/L, which exceeded the NY AWQS Class GA standard of 1 µg/L.

4.5.3.2 Semivolatile Organic Compounds

No semi-volatile organic compounds were detected in the three groundwater samples collected at SEAD-62.

4.5.3.3 Pesticides and PCBs

No pesticides or PCBs were found in the three groundwater samples collected at SEAD-62.

4.5.3.4 Herbicides

The herbicide 2,4,5-T was found at a concentration of 0.12 µg/L in the groundwater sample from MW62-2. This concentration is not above the NY AWQS Class GA criteria value of 35 µg/L.

4.5.3.5 Metals

A total of 17 metals were detected in the ground water samples collected from SEAD-62. The compound iron was detected at concentrations between 797 mg/L and 1,160 mg/L in all three groundwater samples, which exceeded both the state criteria values of 300 mg/L. These were the only exceedances for ground water at SEAD-62.

TABLE 4 5-2
GROUNDWATER ANALYSIS RESULTS - SEAD-62
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NY AWOS CLASS GA	NUMBER ABOVE STANDARD	NUMBER OF DETECTS	NUMBER OF ANALYSES	WATER SEAD-62 07/21/94 MW62-1-1 227728 45448 MW62-1 SA	WATER SEAD-62 07/21/94 MW62-2-1 227729 45448 MW62-2 SA	WATER SEAD-62 07/20/94 MW62-3-1 227611 45448 MW62-3 SA
VOLATILE ORGANICS										
Benzene	ug/L	2	67%	1	2	2	3	10 U	2 J	2 J
HERBICIDES										
2,4,5-T	ug/L	0.12	33%	35	0	1	3	0.11 U	0 12	0.11 U
METALS										
Aluminum	ug/L	499	100%		0	3	3	499	430	173 J
Barium	ug/L	68 1	100%	1000	0	3	3	68.1 J	66 J	64 8 J
Beryllium	ug/L	0	0%		0	0	3	0.1 U	0.1 U	0 1 U
Calcium	ug/L	104000	100%		0	3	3	91700	85600	104000
Chromium	ug/L	1 4	67%	50	0	2	3	1.4 J	1.2 J	0.4 U
Cobalt	ug/L	2 5	100%		0	3	3	2 5 J	1.1 J	0.56 J
Copper	ug/L	0 54	33%	200	0	1	3	0.54 J	0.5 U	0.5 U
Iron	ug/L	1160	100%	300	3	3	3	797 J	870 J	1160 J
Magnesium	ug/L	58200	100%		0	3	3	58200	44200	33100
Manganese	ug/L	271	100%	300	0	3	3	271	134	86 5
Mercury	ug/L	0 05	100%	0 7	0	3	3	0.05 J	0 05 J	0.05 J
Nickel	ug/L	3.9	67%	100	0	2	3	3 9 J	2.3 J	0.69 U
Potassium	ug/L	7470	100%		0	3	3	7470 J	6240 J	3150 J
Sodium	ug/L	18100	100%	20000	0	3	3	18100	8750	5820
Thallium	ug/L	2 4	33%		0	1	3	1 9 U	2 4 J	1 9 U
Vanadium	ug/L	1 8	100%		0	3	3	1 8 J	1 5 J	0.85 J
Zinc	ug/L	6 2	100%	300	0	3	3	4.2 J	6.2 J	3 J
OTHER ANALYSES										
pH	SU	7 8						7 8	7.3	7 2
Conductivity	umhos/cm	750						750	655	525
Temperature	°C	20 3						20.3	19.1	14
Turbidity	NTU	86						86	28	31

NOTES:

a) NY State Class GA Groundwater Regulations (1998)
b) NA = Not Available
c) U = The compound was not detected below this concentration.
d) J = The reported value is an estimated concentration.

4.6 SEAD-120B

4.6.1 Introduction

A total of six soil samples were collected at three test pit locations behind each of the target locations within the berm as shown in **Figure 2.8-1**. The following sections describe the nature and extent of contamination identified at SEAD-120B.

4.6.2 Soil

4.6.2.1 Semivolatile Organic Compounds

A total of seven semivolatile organic compounds were detected, all at estimated concentrations, in the soil samples collected at SEAD-120B. The compounds included many PAHs and two phthalate compounds as shown in **Table 4.6-1**. None of the detected concentrations were above the TAGMs.

4.6.2.3 Explosives

No explosive compounds were detected in the samples collected from the soil berm.

4.6.2.4 Metals

A total of 22 metals were detected in the soil samples collected at SEAD-120B. Of these, four metals exceeded their respective TAGMs as shown in **Table 4.6-1**. Lead was the only metal that exceeded the TAGM in all six samples. Samples from test pits TP120B-1 and TP120B-2 had lead concentrations that were in the several hundred parts per million range. The maximum concentration for lead was 522 mg/kg at TP120B-2, which is 21 times the TAGM value of 24.4 mg/kg. Copper was the next most frequent metal to exceed its TAGM in the SEAD-120B samples. The exceedences for copper, which ranged from 1.7 times to 6.4 times the TAGM value, were found at test pits TP120B-1 and TP120B-2. The other two metals, arsenic and thallium, exceeded the TAGM in only a few samples and the exceedences were relatively low compared to those of lead and copper.

TABLE 4.6-1
SOIL ANALYSIS RESULTS -SEAD-120B
COMPLETION REPORT - MINI RISK ASSESSMENT
SENECA ARMY DEPOT ACTIVITY

PARAMETER	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	SEAD-120B TP120B-1 SOIL EB165 0.6 1 3/31/98 SA EBS Value (Q)	SEAD-120B TP120B-1 SOIL EB034 0.6 1 3/31/98 DU EBS Value (Q)	SEAD-120B TP120B-1 SOIL EB166 2 2.2 3/31/98 SA EBS Value (Q)	SEAD-120B TP120B-2 SOIL EB167 0.8 1 3/31/98 SA EBS Value (Q)	SEAD-120B TP120B-2 SOIL EB168 2 2.2 3/31/98 SA EBS Value (Q)	SEAD-120B TP120B-3 SOIL EB169 1 1.5 3/31/98 SA EBS Value (Q)	SEAD-120B TP120B-3 SOIL EB170 2.8 3 3/31/98 SA EBS Value (Q)
SEMIVOLATILE ORGANIC														
Anthracene	UG/KG	4.5	16.7%	50000	0	1	6	79 U	NA	79 U	4.5 J	80 U	80 U	78 U
Chrysene	UG/KG	5.3	33.3%	400	0	2	6	4.9 J	NA	79 U	5.3 J	80 U	80 U	78 U
Fluoranthene	UG/KG	6.9	50.0%	50000	0	3	6	6.2 J	NA	79 U	6.9 J	4.7 J	80 U	78 U
Phenanthrene	UG/KG	4.4	16.7%	50000	0	1	6	79 U	NA	79 U	4.4 J	80 U	80 U	78 U
Pyrene	UG/KG	6.6	33.3%	50000	0	2	6	5.5 J	NA	79 U	6.6 J	80 U	80 U	78 U
METALS														
Aluminum	MG/KG	15300	100.0%	19300	0	6	6	13300	NA	13400	15300	13600	13400	13100
Antimony	MG/KG	1.4	50.0%	5.9	0	3	6	1.1 UJ	NA	1.2 UJ	1.4 J	1.2 UJ	1.2 J	1.3 J
Arsenic	MG/KG	10.7	100.0%	8.2	1	6	6	2.9	NA	10.7	5.1	4	3.2	2.7
Barium	MG/KG	148	100.0%	300	0	6	6	105	NA	148	134	115	112	106
Beryllium	MG/KG	0.56	100.0%	1.1	0	6	6	0.56	NA	0.4	0.51	0.53	0.54	0.56
Calcium	MG/KG	36600	100.0%	121000	0	6	6	20300	NA	21700	8020	27200	28500	36600
Chromium	MG/KG	21.9	100.0%	29.6	0	6	6	19.7	NA	20.1	21.9	20.2	19.6	19.3
Cobalt	MG/KG	14.2	100.0%	30	0	6	6	9.8	NA	14.2	12.2	11.6	9.6	8.6
Copper	MG/KG	212	100.0%	33	4	6	6	191	NA	57	136	212	33	32.1
Iron	MG/KG	27100	100.0%	36500	0	6	6	24100	NA	26200	27100	24500	23100	22500
Lead	MG/KG	522	100.0%	24.8	6	6	6	289	NA	324	522	166	82.6	72
Magnesium	MG/KG	10300	100.0%	21500	0	6	6	6200	NA	7640	5130	7280	10300	10200
Manganese	MG/KG	945	100.0%	1060	0	6	6	448	NA	945	871	585	474	352
Mercury	MG/KG	0.07	16.7%	0.1	0	1	6	0.06 U	NA	0.07	0.06 U	0.06 U	0.05 U	0.06 U
Nickel	MG/KG	34.6	100.0%	49	0	6	6	29.9	NA	34.6	32.1	31.1	29.3	27.7
Potassium	MG/KG	2270	100.0%	2380	0	6	6	1630	NA	1730	2270	1670	1800	1700
Selenium	MG/KG	1.2	16.7%	2	0	1	6	1 UJ	NA	1.1 UJ	1.2 J	1 UJ	1 UJ	1 UJ
Silver	MG/KG	0.38	16.7%	0.75	0	1	6	0.29 U	NA	0.31 U	0.31 U	0.38	0.29 U	0.3 U
Sodium	MG/KG	92.5	83.3%	172	0	5	6	90.4	NA	88.5	92.5	72.2	58.5 U	69.6
Thallium	MG/KG	2.9	33.3%	0.7	2	2	6	1.5 U	NA	1.9	2.9	1.5 U	1.5 U	1.6 U
Vanadium	MG/KG	25.7	100.0%	150	0	6	6	21.2	NA	24.2	25.7	22.7	22.6	21.9
Zinc	MG/KG	110	100.0%	110	0	6	6	83.5	NA	87.2	105	110	83.9	79.9

5.0 MINI-RISK ASSESSMENTS

The threat from a site can be quantified through the use of risk assessment techniques. Risk assessments have been performed at several of the higher priority sites and have been a useful tool in evaluating site conditions. Since future land use scenarios have been described as part of the Base Realignment Plan these scenarios have been incorporated into the risk assessment. Risk assessment are appropriate for developing and supporting planning decisions regarding the disposition of the remaining sites that exist at the Seneca Army Depot Activity.

This section of the Completion Report presents the mini-risk assessments that have been performed for each of the six areas of concern. These risk assessments provide an understanding of the potential threats that these sites may pose. The outcome of these evaluations are used to support decisions regarding site disposition. Sites that are above the EPA target risk level will be considered further, while sites that are below these criteria may be eliminated from further consideration. Procedures for conducting a mini-risk assessment were presented to EPA and NYSDEC in the Decision Criteria Document dated March, 1998.

The mechanisms of conducting the mini-risk assessment will follow the same mechanisms that have been used for conducting baseline risk assessments at several of the other sites with the exception that the maximum concentration of a component will be used instead of the Upper 95th Confidence Limit (UCL) of the mean. This is because at many of these sites, the existing database is small. Using the maximum detected value will provide an added degree of conservatism. Biased sampling has been performed, and the data represent "worst case" conditions.

The objectives of the mini-risk assessment are: to quantify the threat that a site may pose; to help determine whether a remedial investigation is necessary; to provide a basis for determining if a removal action will eliminate the threat; and to help support selection of the "No Action" remedial alternative, where appropriate. To meet these objectives, the *Risk Assessment Guidance for Superfund* (RAGS) (USEPA, 1989a) was followed when possible and applicable. Technical judgment, consultation with USEPA staff, and recent publications were used in the development of the baseline risk assessment.

The six areas of concern within the property sited for prison construction include:

- SEAD-43 - Building 606-Old Missile Propellant Test Laboratory
- SEAD-56 - Building 606-Herbicide and Pesticide Storage
- SEAD-69 - Building 606-Disposal Area
- SEAD-44A - Quality Assurance Test Laboratory (West of Building 616)

- SEAD-44B - Quality Assurance Test Laboratory (Brady Road)
- SEAD-52 - Ammunition Breakdown Area
- SEAD-62 - Nicotine Sulfate Disposal Area
- SEAD-120B - Ovid Road Small Arms Range

The six areas of concern are shown in **Figure 1.1-12**.

5.1 METHODOLOGY AND ORGANIZATION OF DOCUMENT

The methodology employed for this risk assessment follows USEPA guidance. This section contains seven major subsections, as follows:

1. Identification of Chemicals of Concern (Section 5.2)

This section provides site-related data along with background chemical data. Detailed summaries and statistical analyses of these data are provided in this section. All chemicals with validated detections in the applicable environmental media were evaluated in the risk assessment. The relevant exposure pathway risks were calculated for each detected chemical. Also included in the Data Evaluation section is an evaluation of site background data. Relevant background data are presented and, where appropriate, statistical analyses (e.g. Wilcoxon Rank Sum Test) were performed to allow for comparing on-site chemical concentrations with available background data to drop any data which are not applicable to the baseline risk assessment.

2. Exposure Assessment (Section 5.3)

This section includes derivation and presentation of the applicable exposure point concentrations (EPCs) used in the human health risk assessment. Exposure point concentrations for the baseline risk assessment are based on analytical data and modeling results. The EPCs provided are used for future onsite land-use scenarios, and correspond to the applicable exposure pathways for the baseline risk assessment.

For the future on-site land-use scenarios, prison inmates, prison workers, construction workers, day care center children, and day care center adult worker are the relevant exposed populations. In all scenarios, the calculated risk values apply to a hypothetical RME individual working on or visiting the site, and the risk values are dictated by the collected environmental sampling data used in the risk assessment as exposure point concentrations for the applicable media.

The three primary exposure routes considered in the baseline risk assessment are ingestion, inhalation, and dermal contact. Chemical intake values for future land use are calculated based on exposure pathways, specific exposure values, and assumptions. Equations used to calculate intakes for all applicable exposure pathways are presented in this section.

3. Toxicity Assessment (Section 5.4)

This section presents oral, inhalation, and dermal toxicity values used in the human health risk calculations. Appropriate data sources (i.e. IRIS, HEAST and EPA Risk Assessment Issue papers) are provided to support the toxicity values.

4. Risk Characterization (Section 5.5)

This section presents the risk calculations for all human health exposure pathways for current and future land use. Non-carcinogenic and carcinogenic risk estimates are summarized for each receptor and exposure pathway.

5.2 IDENTIFICATION OF CHEMICALS OF CONCERN

Data collected were evaluated for suitability of use in the risk assessment as discussed in RAGS (EPA, 1989a). These decisions were based on analytical methods, quantitation limits, qualifiers, and blank contamination.

The data usability criteria for documentation, analytical methods, data validation, precision, accuracy, representativeness, comparability, and completeness are discussed in past reports which documented the field investigations at the Six Areas of Concern. Such discussions may be found in Section 6 of the ESI for Eight Moderately Low Priority Sites for SEADs-43, 56, -69, -44A, and 44B, SWMU Classification Report for SEAD-52, Section 6 of the ESI for Seven Low Priority Sites for SEAD-62, and the EBS for Non-Evaluated Sites for SEAD-120B.

The data used in the mini-risk assessments were collected during four investigations documented in the reports cited in the last paragraph. Data for the ESI for Eight Moderately Low Priority Sites was collected between March - July, 1994. Data for the ESI for Seven Low Priority Sites was collected between June - July, 1994. Data collected for the SWMU Classification Report was collected during December 1993 and data collected for the EBS Report was collected during March, 1998.

Table 5.2-1 summarizes the number of samples from each media collected at each of these areas of concern. The figures showing these sample locations are found in Section 2.

Table 5.2-1 Summary of Samples Collected at Six Areas of Concern

Area of Concern	Number of Samples Collected			
	Groundwater	Soil	Sediment	Surface Water
SEAD-43,-56, and -69	4	30	5	5
SEAD-44A	3	15	4	4
SEAD-44B	3	3	2	2
SEAD-52	0	12	0	0
SEAD-62	3	3	0	0
SEAD-120B	0	6	0	0

The following sections describe the processes by which the data were analyzed, examined, and reduced to arrive at a list of analytes, for each exposure pathway, that were quantified for use in the human health mini-risk assessment.

5.2.1 Site-Specific Data Evaluation Considerations

The maximum concentration of a component in the database was used as the exposure point concentration in the mini-risk assessment.

NYSDEC CLP Statement of Work methods were used for the analysis of organic and inorganic constituents in soil, sediment, groundwater, and surface water. Herbicides were analyzed using EPA Methods 8150. These methods provide data suitable for the mini-risk assessment.

For inorganics, the site dataset was compared against the SEDA background dataset to determine if the site dataset is statistically different from the background dataset. The Wilcoxon Rank Sum Test described in further detail below was used for this purpose. If there is no statistical difference then the constituents that are not different were eliminated from further consideration. Removing analytes from further consideration is consistent with RAGS (EPA 1989a). As a result of the limited dataset for each site, soil and groundwater concentrations collected from the six sites were combined and compared against background. Since these sites are located in close proximity to each other, combining soil and groundwater was considered appropriate. Inorganic constituents detected at any one site were included in the comparison to background. Inorganic constituents which were not detected at any site were not considered; these were eliminated from further consideration as is consistent with RAGS (EPA, 1989a).

Organic compounds that were not detected at a particular site were eliminated from further consideration at that site. Only inorganic constituents were compared to background. Anthropogenic organic constituents have not been considered. This has produced a more conservative risk assessment since all organic constituents have been assumed to be present due to previous site activities.

A total of 56 background soil samples and 28 background groundwater samples have been compiled from various site investigations conducted at the SEDA and represent the background dataset. Background data sets and the locations from which the data were collected are provided in **Appendix G**.

The background groundwater samples with NTUs greater than 50 were removed from further consideration due to turbidity. Samples collected prior to implementing the USEPA's low-flow purging SOP contained concentrations of metals that did not represent the concentration in the aquifer. The reported concentrations were often much higher than one could expect to be dissolved in groundwater, and it was concluded that the high reported concentrations were due to the excessive amounts of suspended particulates.

The Wilcoxon Rank Sum test (WRS test) is the statistical method that was used to compare the site soil and groundwater datasets to background soil and groundwater datasets. The basis for this statistical comparison was obtained from the EPA guidance document *Statistical Methods For Evaluating The Attainment Of Cleanup Standards* (EPA, 1994) and *Statistical Methods For Environmental Pollution Monitoring* (Gilbert, 1987).

The hypotheses used in the application of the WRS test are:

Ho (the null hypothesis):	The populations from which the two data sets have been drawn have the same mean.
Ha (the alternative hypothesis):	The measurements from the site population tend to exceed those from the background populations.

where Ho is assumed to be true unless the test indicates Ho should be rejected in favor of Ha. If Ho can not be rejected, then it is accepted that the distribution of measurements in the background area is very similar in shape and central tendency (average) to the distribution of measurements in the area being investigated.

The WRS test is performed by first listing the combined background and on-site measurements from smallest to largest and assigning the ranks 1,2 etc., to the ordered values. The ranks of the

measurements from the cleanup unit are summed and used to compute the statistic Z_{rs}, which is compared to a critical value ($Z_{1-\alpha}$) from the standard normal distribution.

The Z_{rs} statistic is calculated from the following formula:

$$Z_{RS} = \frac{W_{RS} - n(N+1)/2}{\left\{\frac{mn}{12}\left[N+1-\frac{\sum_{j=1}^{g} t_j\left(t_j^2-1\right)}{N(N-1)}\right]\right\}^{1/2}}$$

where:

m	= number of samples in the background dataset
n	= number of samples in the on-site dataset
N	= m+n
W_{rs}	= the Wilcoxon Rank Sum of the on-site dataset
g	= the number of tied groups
t_j	= the number of tied data in the j^{th} group

The critical value $Z_{1-\alpha}$ defines the maximum allowed probability that the WRS test will incorrectly indicate that the site and background datasets are distinguishable. This type of error is called a Type I error and it denotes a 'false positive' evaluation. The overall Type I error rate (α) will be selected at 0.05, which represents the 95% confidence interval. $Z_{1-\alpha}$ is found from Cumulative Standard Normal Distribution statistical tables. For a Type I error rate of 0.05, $Z_{1-\alpha}$ (or $Z_{.95}$) will be equal to 1.645. If the calculated Z_{rs} statistic for a particular analyte is less than $Z_{1-\alpha}$, the null hypothesis cannot be rejected. It is therefore concluded that, at the 95% (or 97.5%) confidence level, the measurements of that analyte in the on-site population does not tend to exceed the measurements of that analyte in the background population and that analyte is eliminated from the database. The WRS test does not require that either data set be normally distributed.

Six inorganic analytes were found to occur in the soil dataset at concentrations that tend to be above those observed in the background soil measurements. They are cadmium, copper, lead, potassium, selenium, and zinc. These inorganic constituents in soil were retained for further analysis in the mini-risk assessment performed for each site.

For the groundwater samples, one inorganic analyte, magnesium, was found to occur in the groundwater dataset at concentrations that tend to be above those observed in the background

groundwater measurements. This inorganic constituent in groundwater was retained for further analysis in the mini-risk assessment performed for each site.

Tables 5.2-2 and 5.2-3 summarize the results of statistical comparisons, the Z_{rs} statistic calculations and the Z_{rs} to $Z_{1-\alpha}$ comparisons for the soil dataset and the groundwater dataset, respectively.

5.2.3 Data Quantification for Use in the Risk Assessment

After eliminating inorganic analytes present at background levels from the risk assessment, exposure point concentrations (EPCs) were selected as the maximum detected value for that constituent of concern. When the maximum value occurred in a sample which had a duplicate sample, the maximum value was used in the risk assessment: the samples were not averaged.

Tables 5.2-4 and 5.2-5 list the chemicals of potential concern for the mini-risk assessment for each area of concern in all soils and groundwater, less the inorganic analytes found at background levels. The number of analyses performed, the number of times detected, the frequency of detection, the mean and standard deviation of the sampled concentration, and the maximum detected concentration for each chemical of potential concern is provided in the data tables presented in Section 4.0.

5.3 EXPOSURE ASSESSMENT

5.3.1 Overview and Characterization of Exposure Setting

The objective of the exposure assessment was to estimate the type and magnitude of exposures to the Chemicals of Potential Concern (COPC) that are present at, or migrating from, the site. This component of the risk assessment can be performed either qualitatively or quantitatively. Quantitative assessment is preferred when toxicity factors necessary to characterize a compound of concern are available.

The exposure assessment consists of three steps (EPA, 1989a):

1) **Characterize Exposure Setting:** Contained within this step is general information concerning the physical characteristics of the site as it pertains to potential considerations affecting exposure. The physical setting involves climate, vegetation, soil characteristics, surface and groundwater hydrology. All potentially exposed populations and subpopulations therein (receptors) are assessed relative to their potential for exposure. Additionally, locations relative to the site along with

Table 5.2-2
COMPLETION REPORT FOR SIX AREAS OF CONCERN
Inorganics Statistical Analysis
(Wilcoxon Ranked Sum Test)
Soil Medium

Metals	Number of site samples n	Number of background samples m	Total samples N (m+n)	Mean m (ug/L)	Stddev n (ug/L)	Stddev m (ug/L)	Min n (ug/L)	Min m (ug/L)	Max. n (ug/L)	Max. m (ug/L)	Mean Rank n	Mean Rank m	Wilcoxon Rank Sum n	Wilcoxon Rank Sum m	Zrs	Z(1-alpha)	Reject Null Hypothesis?
Aluminum	58	54	112	13757 22	3639 85	4402 3	2900	5560	27000	21200	54.35	58 81	3175.5	3175.74	-0.7251	1 645	No
Antimony	58	54	112	2 81	1 94	2.17	0 07	0.08	10.8	6 8	41.39	72.73	3927.5	3927.42	-5.1051	1 645	No
Arsenic	58	52	110	5.54	1 82	2.78	2 7	2 7	13.1	21.5	54.05	57.12	2970	2970.24	-0.5031	1 645	No
Barium	58	54	112	79 85	42 4	26 73	2 7	33 9	202	159	59 42	53.36	2881.5	2881.44	0.987	1 645	No
Beryllium	58	54	112	0 68	0 17	0 25	0 17	0 34	1 2	1 4	52 41	60 9	3288.5	3288.6	-1.3836	1 645	No
Cadmium	58	54	112	0 53	0 31	0.74	0 04	0 01	1 5	2 9	63.58	48.9	2640.5	2640.6	2 3908	1.645	Yes
Calcium	58	54	112	46539 26	30573 25	50814 36	3385	1370	141000	293000	55.55	57.52	3106	3106.08	-0 3203	1 645	No
Chromium	58	54	112	20 93	4 92	6 43	5 4	10 3	30 7	35 8	54.91	58 21	3143.5	3143.34	-0.5387	1.645	No
Cobalt	58	54	112	11 35	3 25	4 38	2 8	5 5	20 9	29 1	52.85	60 42	3262.5	3262.68	-1.2317	1.645	No
Copper	58	54	112	21 28	36 4	8 42	11 4	9 7	212	62.8	63 84	48.62	2625 5	2625.48	2 4779	1 645	Yes
Cyanide	58	48	106	0 29	0 19	0.04	0.17	0 22	1 7	0 41	55.86	50.65	2431	2431 2	0.8702	1.645	No
Iron	58	54	112	25369 81	5548 51	7384 31	8520	8770	40300	42500	54 87	58 25	3145.5	3145.5	-0.5503	1.645	No
Lead	55	50	105	17 66	88 53	36 45	5 9	5 4	522	266	63 8	41.12	2056	2056	3 8118	1.645	Yes
Magnesium	58	54	112	10506 67	8649 84	6159 77	2690	2830	47500	29100	54.61	58.53	3160.5	3160.62	-0.6376	1.645	No
Manganese	52	51	103	606 9	163 62	331 46	182	207	956	2380	45 08	59.06	3012	3012.06	-2.3747	1 645	No
Mercury	54	50	104	0 04	0 03	0.03	0 01	0 01	0 17	0.13	53.37	51.56	2578	2578	0.3085	1.645	No
Nickel	58	53	111	31 65	9 49	11 16	6 8	12 3	57 2	62.3	53 41	58.84	3118.5	3118.52	-0.8885	1.645	No
Potassium	58	54	112	1537 02	511.97	510 14	730	628	3130	3160	65.03	47.34	2556.5	2556.36	2.8797	1 645	Yes
Selenium	58	54	112	0 34	0 44	0 34	0.09	0 05	1 8	1 7	71.37	40.53	2188.5	2188.62	5.0235	1.645	Yes
Silver	58	51	109	0 39	0 16	0 24	0.04	0 01	0 6	0 87	40.65	71.32	3637.5	3637.32	-5.0581	1 645	No
Sodium	58	54	112	89 01	40 39	53.68	9 35	12 55	164	269	51.91	61 43	3317	3317.22	-1.5489	1.645	No
Thallium	58	51	109	0 28	0 45	0.27	0.09	0 08	2 9	1 2	51.75	58 7	2993.5	2993.7	-1.1456	1 645	No
Vanadium	58	54	112	22.03	6.05	6.5	6.4	12	41 8	35.8	57.52	55 41	2992	2992 14	0.3436	1 645	No
Zinc	58	51	109	74 67	55 7	19 65	59.2	40 6	338	126	66.99	41.36	2109.5	2109.36	4.2238	1 645	Yes

Table 5.2-3
COMPLETION REPORT FOR SIX AREAS OF CONCERN
Inorganics Statistical Analysis
(Wilcoxon Ranked Sum Test)
Groundwater Medium

Metals	Number of site samples n	Number of background samples m	Total samples N (m+n)	Mean n (ug/L)	Mean m (ug/L)	Stddev n (ug/L)	Stddev m (ug/L)	Min. n (ug/L)	Min. m (ug/L)	Max. n (ug/L)	Max. m (ug/L)	Mean Rank n	Mean Rank m	Wilcoxon Rank Sum n	Wilcoxon Rank Sum m	Zrs	Z(1-alpha)	Reject Null Hypothesis?
Aluminum	10	28	38	857.02	2455.69	986.98	8037.44	80.2	18	2870	42400	21.70	18.71	217	524	0.7293	1.645	No
Antimony	10	28	38	0.69	8.88	0.29	12.95	0.5	0.65	1.5	44.7	9.60	23.04	96	645	-3.3694	1.645	No
Arsenic	10	28	38	1.31	1.53	1	1.61	0.75	0.4	4.1	9.3	16.80	20.46	168	573	-0.9249	1.645	No
Barium	10	28	38	69.94	75.13	27.11	63.22	39.3	19.6	113	337	20.95	18.98	210	531	0.4807	1.645	No
Beryllium	10	26	36	0.06	0.21	0.06	0.42	0.03	0.05	0.23	2.2	10.75	21.48	108	558	-2.8715	1.645	No
Calcium	10	28	38	109480	123664.29	17608.38	33807.65	85600	79100	138000	240000	15.85	20.80	159	582	-1.2103	1.645	No
Chromium	10	27	37	1.73	4.28	1.93	13.22	0.2	0.2	5.3	69.4	17.75	19.46	178	525	-0.4299	1.645	No
Cobalt	10	28	38	1.67	3.64	1.59	7.28	0.25	0.25	4.2	34.6	17.85	20.09	179	563	-0.5483	1.645	No
Copper	10	28	38	1.6	2.77	1.64	4.48	0.25	0.25	4.5	23.3	16.55	20.55	166	575	-0.9831	1.645	No
Iron	10	28	38	1961.9	3919.98	2300.96	13088.81	231	10.85	7170	69400	23.00	18.25	230	511	1.1602	1.645	No
Lead	10	28	38	1	2.67	1.25	6.52	0.4	0.25	4.1	34.8	15.40	20.96	154	587	-1.3727	1.645	No
Magnesium	10	28	38	38760	27082.14	15686.74	13306.2	19000	11400	75600	57600	25.80	17.25	258	483	2.0887	1.645	Yes
Manganese	10	28	38	138.61	194.01	83.38	242.57	18.2	2.5	297	1120	19.85	19.38	199	543	0.1160	1.645	No
Mercury	10	26	36	0.03	0.04	0.02	0.02	0.02	0.01	0.06	0.1	17.90	18.73	179	487	-0.2235	1.645	No
Nickel	10	28	38	4.16	6.75	4.51	18.6	0.35	0.35	12.3	99.8	18.85	19.73	189	552	-0.2156	1.645	No
Potassium	10	28	38	3446	3256.55	1708.16	2679.59	1050	421.5	6240	10200	21.25	18.88	213	529	0.5802	1.645	No
Silver	10	28	38	0.35	1.21	0.17	1.21	0.25	0.25	0.7	4.55	11.70	22.29	117	624	-2.6465	1.645	No
Sodium	10	28	38	8353	19468.39	4728.8	19525.67	2390	1935	18900	73500	14.70	21.21	147	594	-1.5914	1.645	No
Thallium	10	27	37	1.05	1.68	0.48	1.21	0.8	0.6	2.4	4.7	15.90	20.15	159	544	-1.0828	1.645	No
Vanadium	10	28	38	2.02	5.21	1.73	13.48	0.25	0.25	5.2	70.8	20.40	19.18	204	537	0.2986	1.645	No
Zinc	10	25	35	8.2	26.12	6.28	40.36	2.3	1.1	22.5	143	16.40	18.64	164	466	-0.5846	1.645	No

TABLE 5.2-4
CHEMICALS OF CONCERN IN SOIL

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

COMPOUNDS	SEAD-120B	SEAD-43	SEAD-44A	SEAD-44B	SEAD-52	SEAD-62
Volatile Organics						
1,1,2,2-Tetrachloroethane			X			
2-Butanone			X	X		
2-Hexanone			X			
4-Methyl-2-Pentanone			X			
Acetone		X	X	X		
Chloroform		X				
Methylene Chloride		X				
Toluene		X	X			
Xylene (total)		X				
Semivolatile Organics						
2-Methylnaphthalene		X	X			
4-Methylphenol		X	X			
Acenaphthene		X	X			
Acenaphthylene			X			
Anthracene		X	X	X		
Benzo(a)anthracene		X	X	X		
Benzo(a)pyrene		X	X	X		
Benzo(b)fluoranthene		X	X	X		
Benzo(g,h,i)perylene		X	X	X		
Benzo(k)fluoranthene		X	X	X		
Carbazole		X	X			
Chrysene		X	X	X		
Di-n-butylphthalate		X	X			
Dibenz(a,h)anthracene		X	X	X		
Dibenzofuran		X	X			
Fluoranthene		X	X	X		X
Fluorene		X	X			
Hexachlorobenzene			X			
Indeno(1,2,3-cd)pyrene		X	X	X		
Naphthalene		X	X			
Phenanthrene		X	X	X		
Pyrene		X	X	X		X
bis(2-Ethylhexyl)phthalate		X	X	X		
Pesticides/PCBs						
4,4'-DDD				X		
4,4'-DDE			X	X		
4,4'-DDT			X	X		
Dieldrin			X	X		
Endosulfan I		X	X	X		
Endosulfan II			X			
Endrin			X			
Endrin aldehyde			X			
Endrin ketone			X			
Heptachlor epoxide			X			
alpha-Chlordane		X				
Nitroaromatics						
Tetryl					X	
2,4,6-Trinitrotoluene			X		X	
2,4-Dinitrotoluene					X	
Metals						
Cadmium		X	X	X		X
Copper	X	X	X	X		X
Lead	X	X	X	X		
Potassium	X	X	X	X		X
Selenium	X	X	X	X		X
Zinc	X	X	X	X		X
Herbicides						
2,4,5-T		X				X
Dicamba		X				X
Dichloroprop		X				
MCPP		X				

X denotes compounds of concern at specific site

TABLE 5.2-5
CHEMICALS OF CONCERN IN GROUNDWATER
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

COMPOUNDS	SEAD-43	SEAD-44A	SEAD-44B	SEAD-62
Volatile Organics				
Acetone		X		X
Benzene				
1,1,2,2-Tetrachloroethane		X		
Herbicides				
2,4,5-TP (Silvex)	X			
2,4,5-T				X
Metals				
Magnesium	X	X	X	X

X denotes compounds of concern at specific site.

the current and potential future land use of the site are considered. This step is a qualitative one aimed at providing a general site perspective and offering insight on the surrounding population.

2) **Identify Exposure Pathways:** All exposure pathways, ways in which receptors can be exposed to contaminants that originate from the source, are reviewed in this step. Chemical sources and mechanisms for release along with subsequent fate and transport are investigated. Exposure points of human contact and exposure routes are discussed before quantifying the exposure pathways in step 3.

3). **Quantify Exposure:** In this final process, the exposure levels (COPC intakes or doses) are calculated for each exposure pathway and receptor. These calculations typically follow EPA guidance for assumptions of intake variables or exposure factors for each exposure pathway and EPA-recommended calculation methods.

Figure 5.3-1 illustrates the exposure assessment process.

5.3.2 Physical Setting and Characteristics

The physical setting and characteristics of the site are described in Section 1.0 of this document.

5.3.3 Land Use and Potentially Exposed Populations

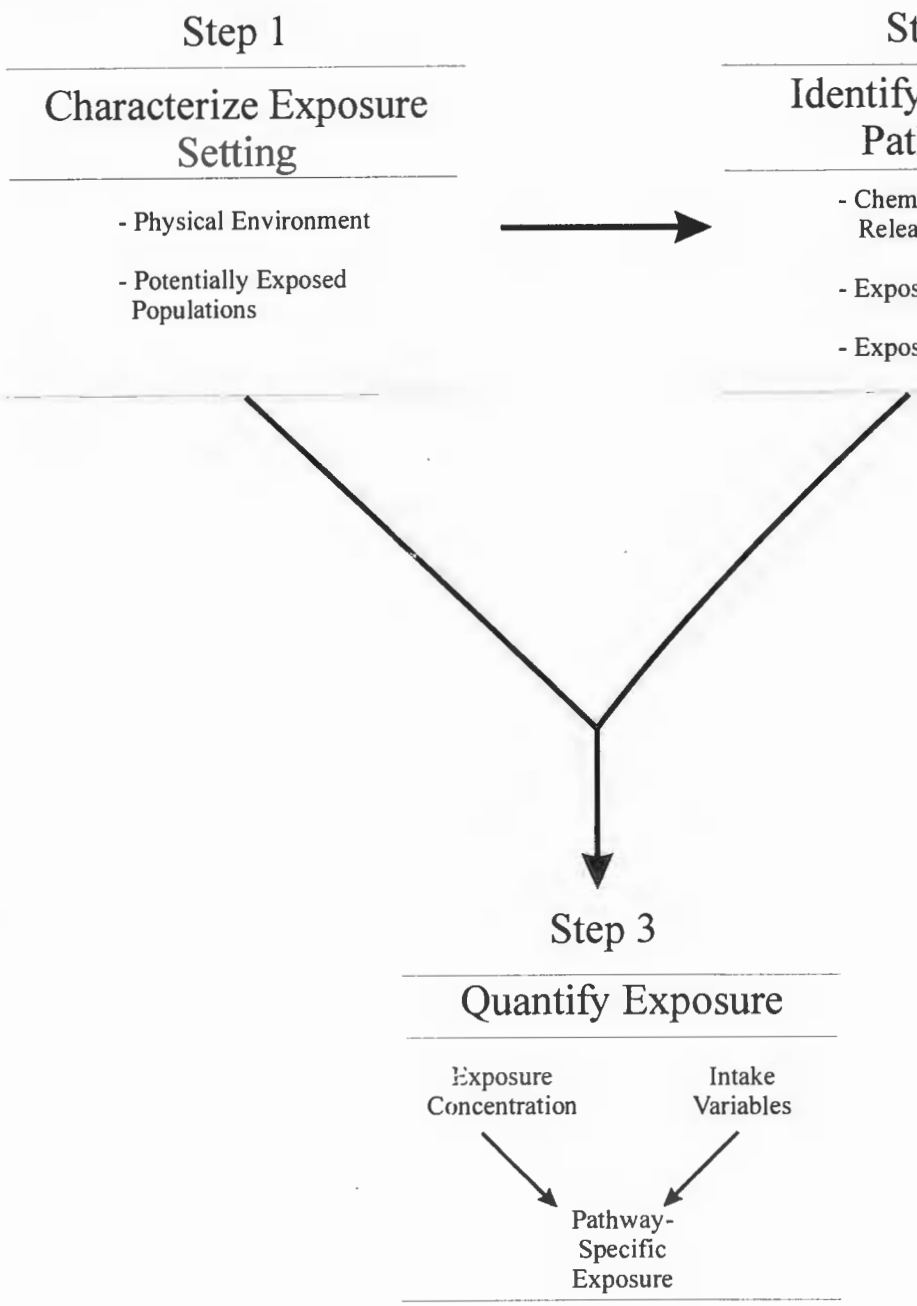
5.3.3.1 Current Land Use

There is no current land use for each of the sites within the area under consideration. The sites are abandoned and are no longer in use. These sites are in the southeastern portion of SEDA. There are no drinking water supply wells at any of the areas of concern and access to these sites is restricted by perimeter chain link fencing. These sites have no actual site workers but are occasionally patrolled by site security personnel.

5.3.3.2 Potential Future Land Use

EPA guidance for determining future land uses recommends that, if available, master plans, which include future land uses, Bureau of Census projections and established land use trends in the general area should be utilized to establish future land use trends.

In July 1995, the Base Realignment and Closure Act (BRAC) Commission voted to recommend closure of SEDA. Congress approved the recommendation, which became public law on



Source: US EPA 1989a

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FIGURE 5.3-1
EXPOSURE ASSESSMENT PROCESS

SCALE NA APRIL 2001

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October 1, 1995. According to BRAC regulations, future uses of the site will be determined by the Army.

Plans to locate a prison within the southeastern boundary of SEDA have recently been approved. The area designated for the prison incorporates the six areas of concern discussed in this Completion Report. In accordance with BRAC regulations, the Army will notify all appropriate regulatory agencies and will perform any additional investigations and remedial actions to assure that any changes in the intended use of the sites is protective of human health and the environment in accordance with CERCLA. Also, Army regulations (Regulation 200-1, paragraph 12-5, Real Property Transactions), require that the Army perform an Environmental Baseline Study (EBS) prior to a transfer of Army property. The EBS is an inventory and a comprehensive evaluation of the existing environmental conditions and consists of scope definition, survey, sampling, investigative and risk assessment. Such evaluations have been conducted at the six AOCs and are listed Section 1.1. This Completion Report presents the existing environmental conditions, surveying, sampling efforts, investigative and risk assessment at these areas of concern.

5.3.3.3 Potentially Exposed Populations

For purposes of this mini-risk assessment, five potentially exposed populations were considered. Because the six AOCs are incorporated into a planned prison site to be constructed in the very near future, only future receptors under the future land use scenario are considered in this mini-risk assessment.

The five (5) exposed populations are:
1. prison worker,
2. prison inmate,
3. construction worker,
4. worker at an on-site day care center and
5. child at an on-site day care center.

The prison worker and adult day care center worker are assumed to work 40 hours/week, 50 weeks a year at the new facility. The exposure for the worker is based on 25 years of continuous employment at the site.

The inmate is assumed to be incarcerated for 24 years, 24 hours a day, 365 days a year.

The construction worker is assumed to work at the site for one year (40 hours/week, 50 weeks).

The day care center child is assumed to attend the center for six years, 60 hours/week (5 days week 12 hours/day) for 50 weeks a year.

5.3.4 Identification of Exposure Pathways

Exposures are estimated only for plausible completed exposure pathways. A completed exposure pathway has the following four elements:

- a source and mechanism for chemical release,
- an environmental transport medium,
- an exposure point, and
- a human receptor and a feasible route of exposure at the exposure point.

A pathway cannot be completed unless each of these elements is present. The sources and mechanisms for release of chemicals and the environmental transport mediums are described in the ESI for Eight Moderately Low Priority Sites and the ESI for Seven Low Priority Sites.

5.3.4.1 Sources and Receiving Media

The contaminant source areas for each of the six areas of concern are summarized as follows:

SEADs 43, 56, and 69

The suspected source(s) are explosive materials from former missile propellant test laboratory Building 606, herbicides and pesticides that were also stored in Building 606, and a disposal area associated with these operations. A septic system for these areas is also a suspected source area. The primary release mechanisms from the site area are surface water runoff and erosion collected in a ditch on eastern side of the concrete pad of SEAD-43 and another ditch along Unnamed Road. Water collected in these ditches discharge into Indian Creek. Infiltration and percolation through septic system mound or through the herbicide & pesticide disposal area or through IRFNA (liquid propellant) that may have been released near Building 606 are other potential release mechanisms. If infiltration of precipitation occurs, then groundwater would be a secondary source. Soil, surface water, and sediment are also secondary sources.

SEAD-44A

The suspected source is waste materials associated with munitions and pyrotechnics that may have been disposed of at the site. The primary release mechanisms from the site are surface water runoff collected in ditch on southern side of SEAD-44A running towards the west into

Indian Creek and infiltration of precipitation through waste materials. If infiltration of precipitation occurs then groundwater would be a secondary source. Soil, surface water and sediment are also secondary sources.

SEAD-44B

The suspected source area at SEAD-44B is waste material associated with munitions and pyrotechnics activities which have occurred at SEAD-44B. The primary release mechanisms are surface water infiltration and percolation through dilapidated corrugated metal shack, and surface water runoff and erosion collected in ditches on the eastern side and southern side of SEAD-44B both of which discharge into Indian Creek watershed. If infiltration of precipitation occurs then groundwater would be a secondary source. Soil, sediment, and to a lesser extent surface water, are also secondary sources.

SEAD-52

The suspected source area at SEAD-52 is the surface soils near the buildings which have been impacted by explosives resulting from handling of ammunition powder and cleaning processes during the ammunition breakdown. The primary release mechanisms are surface water infiltration and percolation through source areas, and surface water runoff and erosion. Runoff is collected in swales which direct water towards the west into Indian Creek. Wind may also release the impacted soil as fugitive dust, but because the area is paved and vegetated, this is not expected to be a significant release mechanism. If infiltration of precipitation occurs then groundwater would be a secondary source. Surface water and sediment are also secondary sources.

SEAD-62

SEAD-62 was potentially used for the disposal of nicotine sulfate. The suspected source(s) on the site are burial pits that contain the nicotine sulfate. Infiltration from precipitation through these burial pits is a primary release mechanism to groundwater. If infiltration of precipitation occurs then groundwater would be a secondary source. Surface water runoff across the site is also a primary release mechanism, although it is likely to be less significant because the nicotine sulfate is suspected to be buried on-site. If the nicotine sulfate were buried close to the ground surface, surface water runoff would likely be a more significant release mechanism. Surface water would likely flow towards the west to Indian Creek, since the site slopes to the west. Soil, surface water and sediment are also secondary sources of pollution.

SEAD-120B

The suspected source area at SEAD-120B is soil berm located behind target post receptacles used for target practice at the small arms range. The primary release mechanisms are surface water infiltration and percolation through soil berm, and surface water runoff and erosion directed to Indian Creek. If infiltration of precipitation occurs then groundwater would be a secondary source. Surface water and sediment are also secondary sources.

5.3.4.2 Fate and Transport

The environmental fate associated with COPCs found at the six areas of concern is discussed in detail in the four previous reports which summarized the investigations at these sites.

5.3.4.2.1 Volatile Organics

A relatively small number of volatile organic compounds (VOCs) were detected in soil and groundwater at any of the six areas of concern. VOCs were detected infrequently and in low concentrations. Because of this low prevalence and concentrations, direct volatilization of VOCs was not considered significant in this assessment.

5.3.4.2.2 Semi-Volatile Organics

The principal semi-volatile compounds found at the six areas of concern are PAHs. Generally, these constituents are relatively persistent and immobile in the environment. Pesticides, herbicides and explosives were found at only 2-3 of the areas of concern.

5.3.4.2.3 Metals

The behavior of metals in soil is unlike organic compounds in many aspects. For example, volatilization of metals from soil is not considered a realistic mechanism for pollutant migration and was not considered. However, leaching and sorption are considered potential mechanisms for transport. Leaching of metals from soil is controlled by numerous factors. Most importantly is its chemical form (base metal or cation) in the soil. The leaching of metals from soils is substantial if the metal exists as a soluble salt. Upon contact with surface water or precipitation, the metals, either as metal oxides or metal salts, can be solubilized, eventually leaching to the groundwater. In general, elevated concentrations of metals were not measured in the on-site monitoring wells.

5.3.4.3 Exposure Routes

Exposure routes are the means by which a human potentially contacts COPCs. Not all exposure routes will exist at every site. In general, these include inhalation, ingestion and dermal contact. Exposure pathways that will be evaluated at each of the six areas of concern are discussed below.

5.3.4.4 Exposure Points

The exposure point is the point of potential human contact with a chemical, either directly at its source or via a transport medium. The same exposure points are considered for each of the six AOCs, as follows:

- Ambient air containing suspended soil particles: exposure to prison workers, construction workers, inmates and day care receptors.
- Surface soils: exposure to all receptors by direct contact (ingestion and dermal).
- Subsurface soils: exposure to future construction workers by direct contact.
- Groundwater: exposure to prison workers, inmates and day care receptors by ingestion; additional exposure by inhalation and dermal contact during showering for inmates and prison workers.

5.3.4.5 Integration of Exposure Pathways

In this section, the final assembly of the components required to accurately construct an exposure pathway is performed. As described earlier the proper framework of an exposure pathway involves a source, transport medium, exposure point, and an exposure route. The pertinent exposure pathways for each area of concern are summarized in **Figures 5.3-2** through **5.3-7**. According to the RAGS (EPA, 1989a), a pathway is considered incomplete if one or more of these components is not present with the exception of the transport medium, which may be absent in the case of direct exposures. Hence, the conclusion, if there is not a complete pathway, there can be no risk resulting from that theoretical pathway. For the purposes of this mini-risk assessment, future human exposure pathways have been identified as potential pathways which meet the criteria for an exposure pathway.

For the future construction worker, dermal contact with and ingestion of all soils, and inhalation of particulates in ambient air are considered. For the future inmate and prison worker, dermal contact with and ingestion of surface soils, ingestion of groundwater, inhalation and dermal contact of groundwater during showering, and inhalation of particulates in the ambient air are considered. For the future day care center receptors (adult workers and children attendees) the

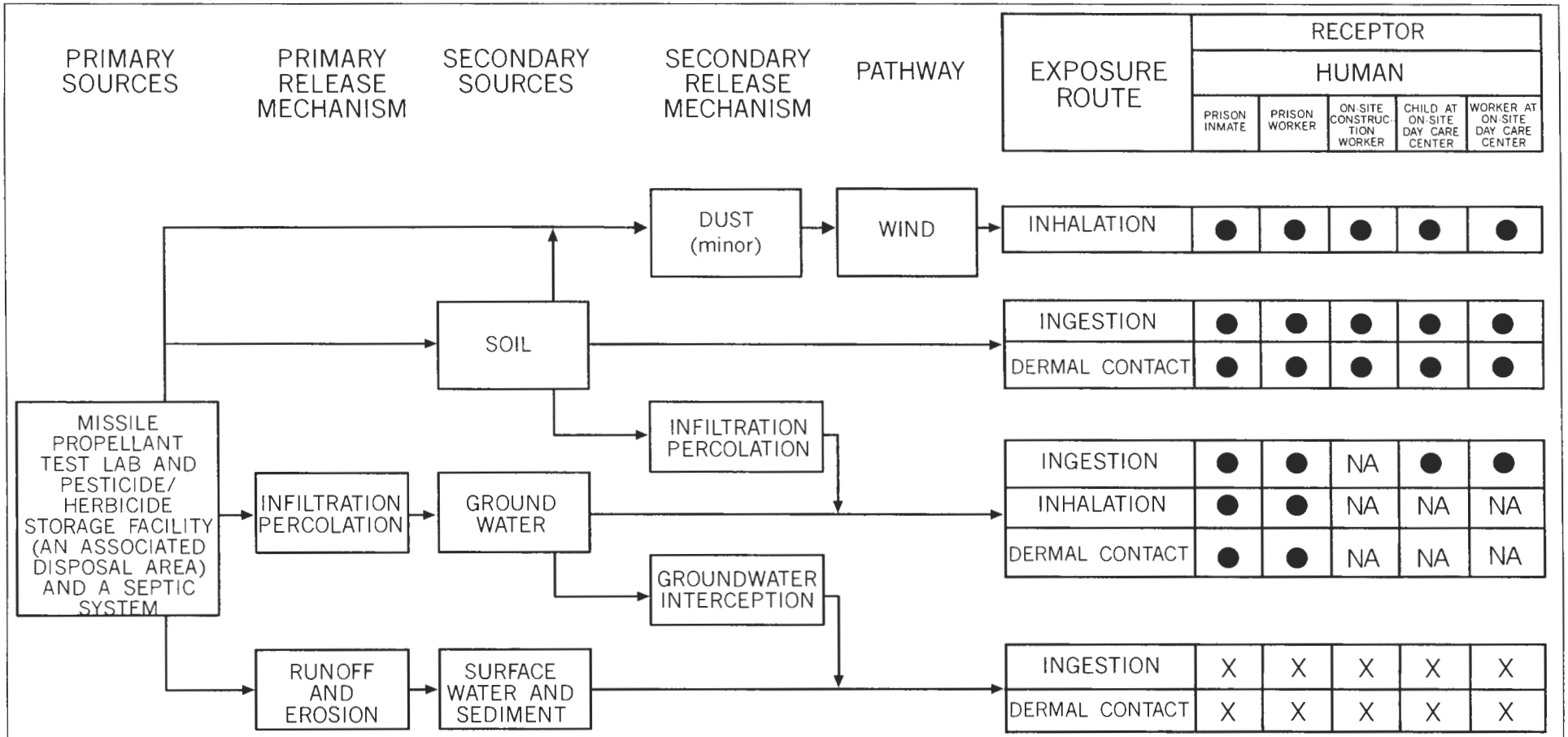

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FIGURE 5.3-2

EXPOSURE PATHWAY SUMMARY FOR SEADs-43,56,69

SCALE NA
DATE APRIL 2001

I:\ENG\SENECA\PRISON\FIGURES\43EXP.CDR

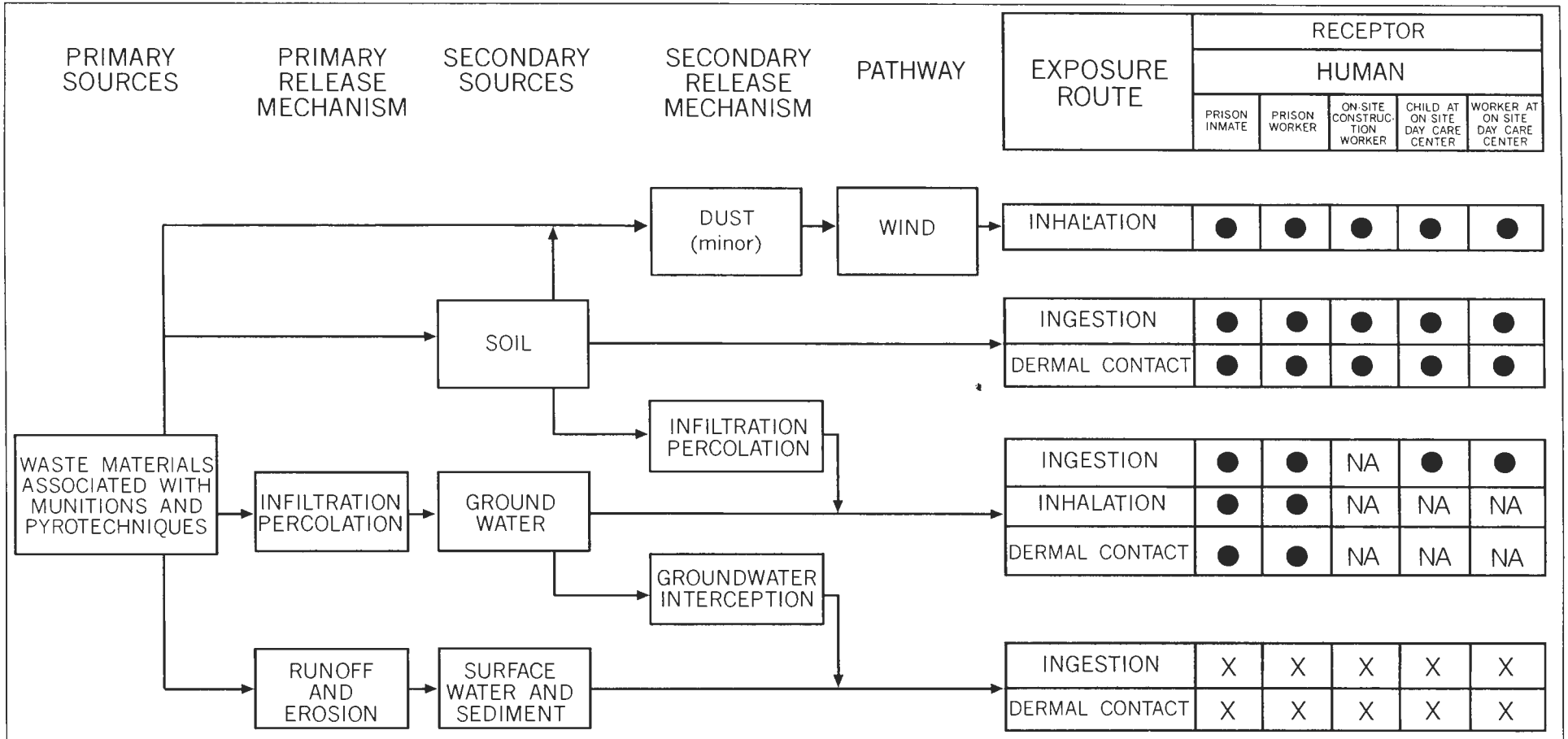

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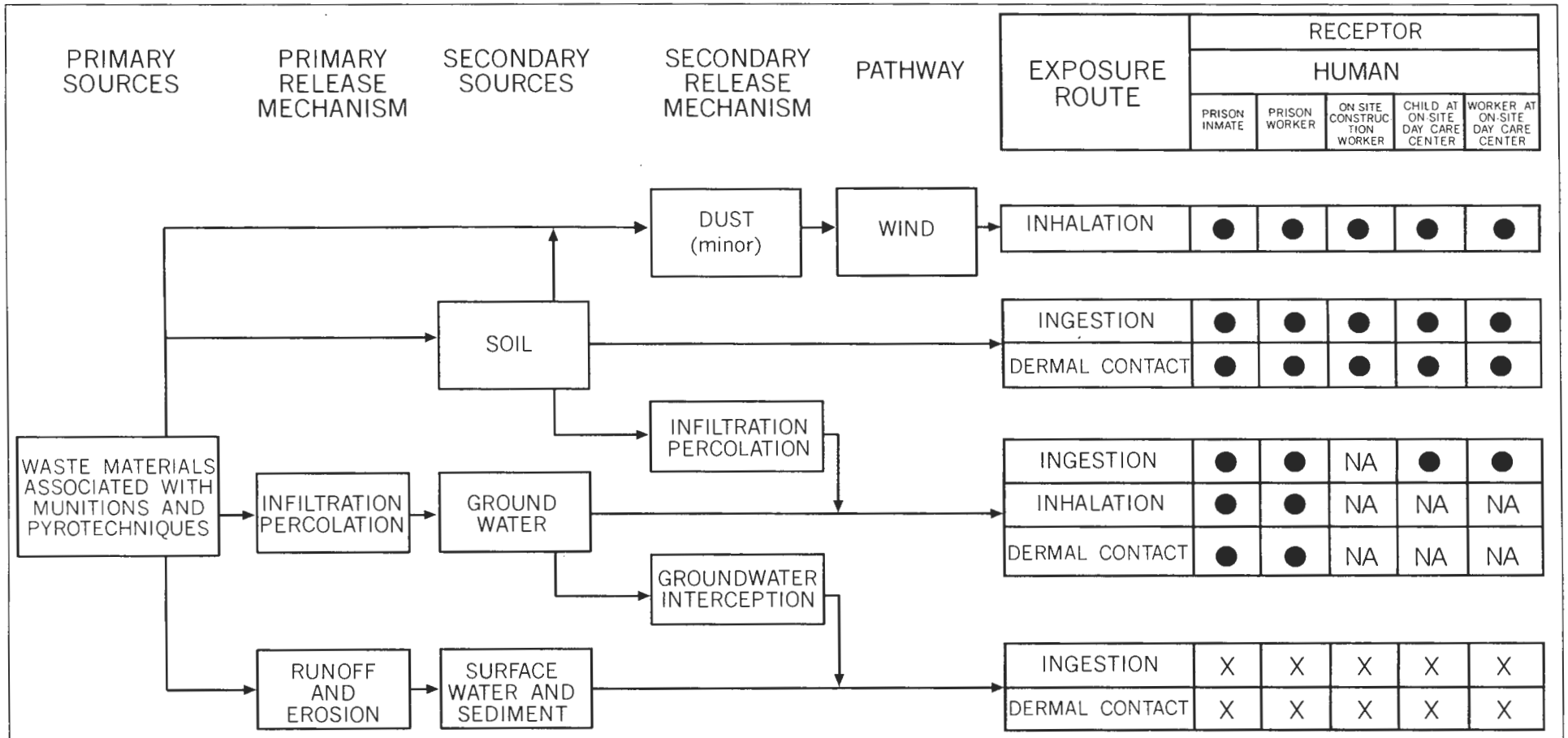
FIGURE 5.3-3

EXPOSURE PATHWAY SUMMARY FOR SEAD-44A

SCALE NA | DATE JANUARY 1999

H:\ENG\SENECA\PRISON\FIGURES\44AEXPCDR



● PATHWAY CONSIDERED TO POSE POTENTIAL RISK

X PATHWAY NOT CONSIDERED

NA NOT APPLICABLE RECEPTOR

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FIGURE 5.3-4

EXPOSURE PATHWAY SUMMARY FOR SEAD-44B

SCALE NA | DATE APRIL 2001

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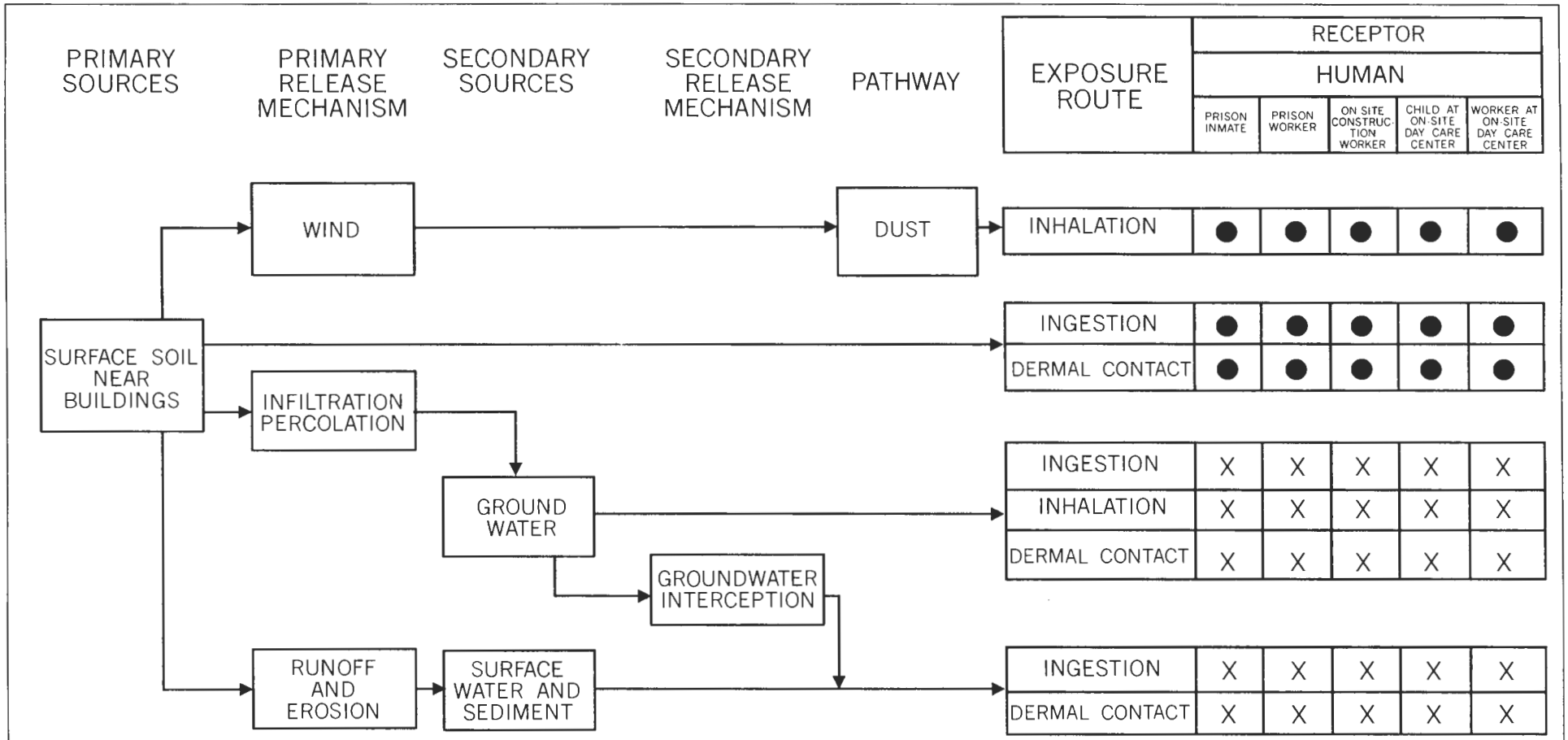

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FIGURE 5.3-5

EXPOSURE PATHWAY SUMMARY FOR SEAD-52

SCALE NA DATE APRIL 2001

H:\ENG\SENECA\PRISON\FIGURES\52F-XP.CDR

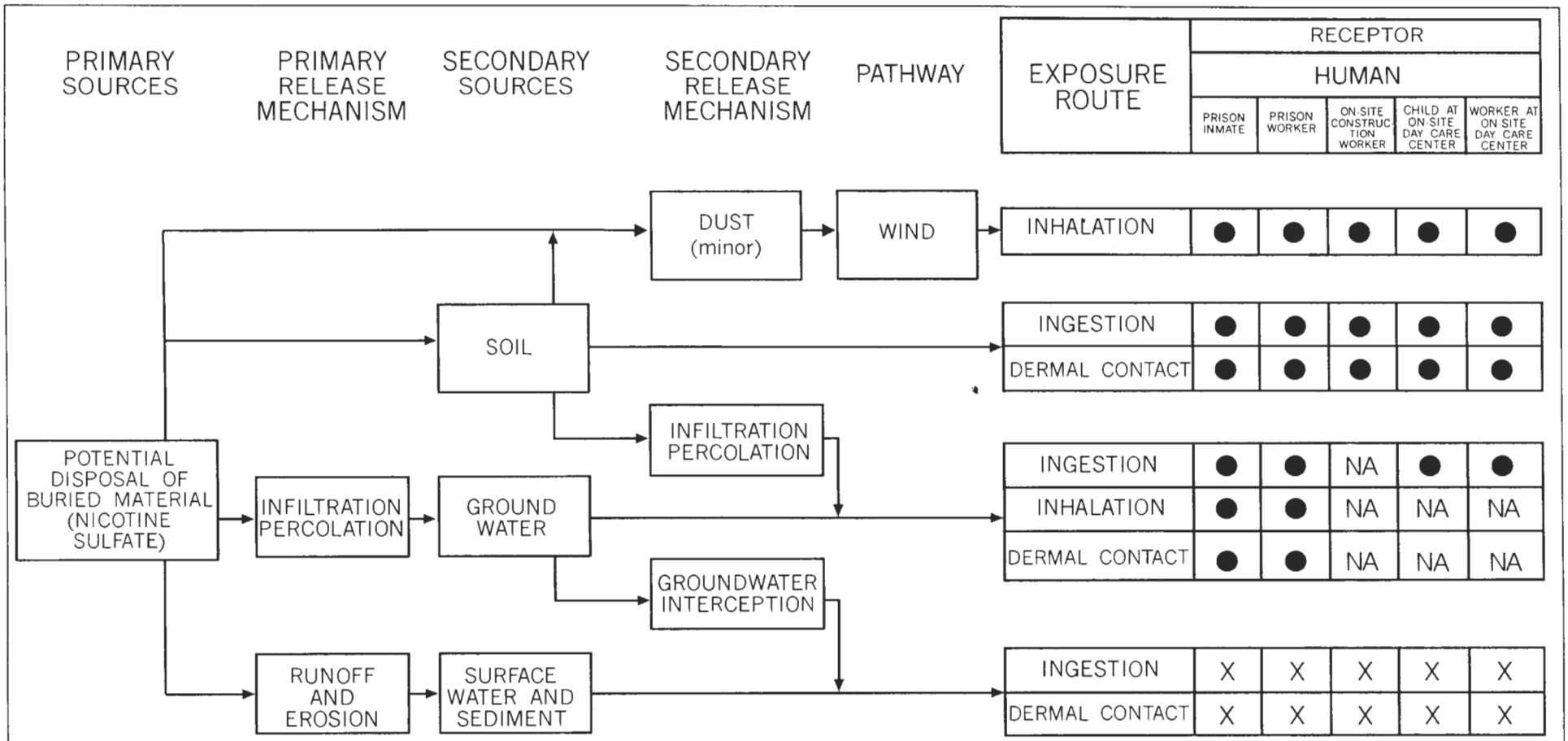

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FIGURE 5.3-6

EXPOSURE PATHWAY SUMMARY FOR SEAD-62

SCALE NA

DATE APRIL 2001

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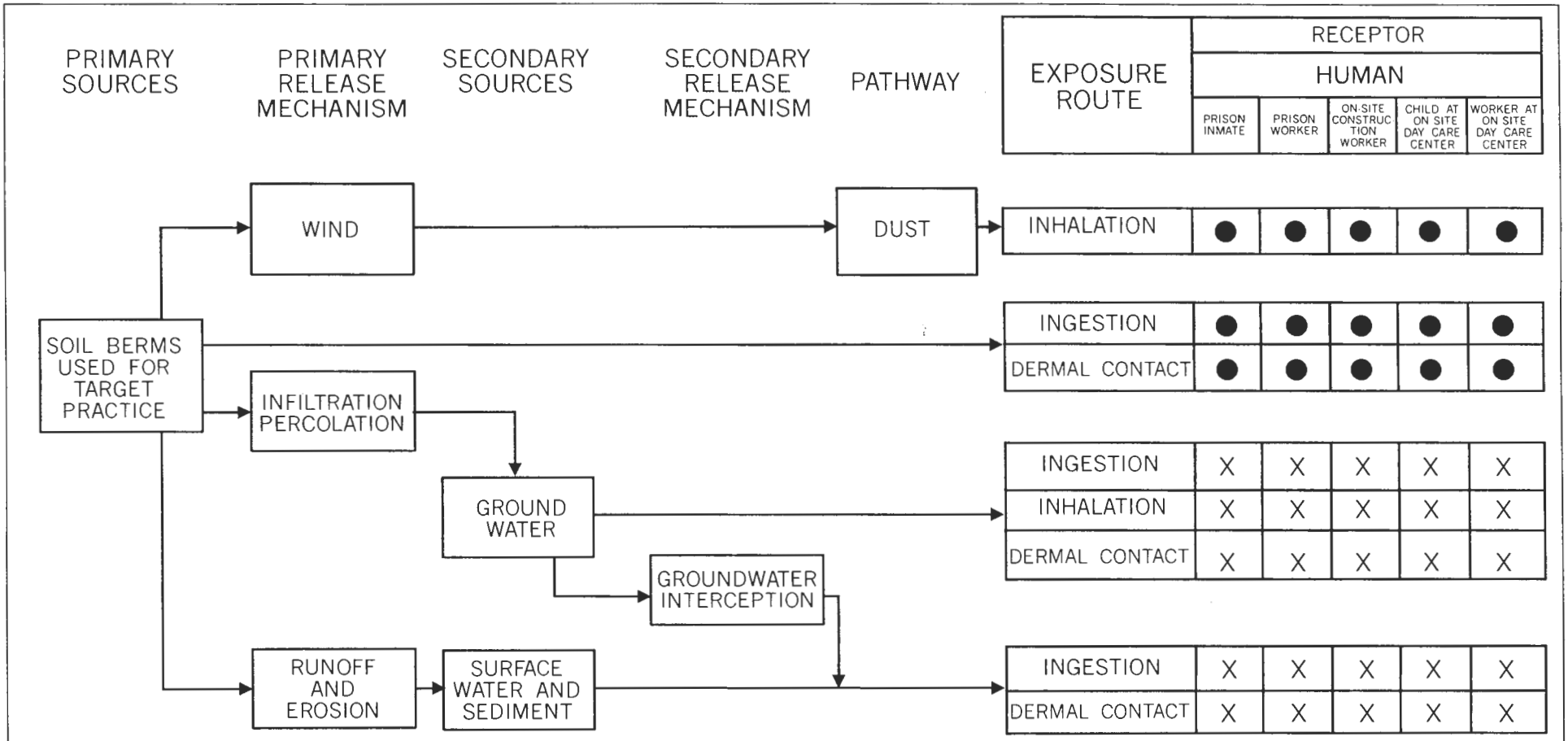

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FIGURE 5.3-7

EXPOSURE PATHWAY SUMMARY FOR SEAD-120B

SCALE NA | DATE APRIL 2001

H:\ENG\SENECA\PRISON\FIGURES\120BEXP.CDR

following pathways are quantified: dermal contact with and ingestion of surface soils, ingestion of groundwater and inhalation of particulates in ambient air.

Other pathways were not quantified based on the following rationale:

1. Ingestion and dermal contact from surface water and sediment were considered to be unrealistic future pathways of exposure because the depth of drainage ditches is at most only a few inches. It would be unlikely that a receptor would be exposed since swimming is not possible.

2. Ingestion and dermal contact with soil by offsite area residents was eliminated from the risk assessment based on the unlikely occurrence of a trespasser in this area. Security at a future prison would prevent such access.

5.3.4.6 Summary of Exposure Pathways to be Quantified

The pathways presented reflect the projected future onsite use of the Areas of Concern. This section presents the rationale for including these exposure pathways in this risk assessment.

Inhalation of Particulate Matter in Ambient Air

Surface soil particles may become airborne via wind erosion, which in turn may be inhaled by individuals at the site. Construction workers may also be exposed to subsurface soil particles. Therefore, inhalation exposure to soil particulates in ambient air was assessed for all future receptors.

Incidental Ingestion and Dermal Contact to On-Site Surface Soils

During the course of daily activities, a prison worker, inmate, day care worker or child could come into contact with these surface soils and involuntarily ingest and/or have their skin exposed to them. Therefore, exposure via dermal contact and soil ingestion was assessed for these four receptors.

Incidental Ingestion and Dermal Contact to On-Site Surface and Subsurface Soils

The laboratory analyses of all surface and subsurface soils show the presence of VOCs, semi-volatile organics, pesticides, and metals. During the course of daily activities, an on-site construction worker will come into contact with these surface and subsurface soils during intrusive activities and may involuntarily ingest and have his/her skin exposed to them.

Therefore, exposure via both dermal contact and soil ingestion was assessed for the future construction worker.

Ingestion of Groundwater

There is no current use of groundwater as a potable water source at the Depot. The future plans for the prison is to obtain potable water from the existing water supply line. Potable water is supplied to the Depot from a water supply line that passes through the Town of Varick. Varick's water is obtained from the water treatment plant at the Town of Waterloo. The source of this water is Lake Seneca. It is unlikely that a groundwater well would be installed for future drinking water use since a potable water pipeline exists. The shallow groundwater aquifer at the site is inadequate for both yield and quality. Nonetheless, since this use is not prevented via an institutional control such as a deed restriction, it was assumed that wells would be installed on-site for potable water. Therefore, this is considered a complete pathway and data from the on-site wells are used to calculated exposure concentrations.

Inhalation and Dermal Contact with Groundwater while Showering

Prison workers and inmates may come into contact with groundwater while taking daily showers. These receptors may be exposed to all chemicals contained in groundwater during showering by dermal contact, and volatile chemicals which partition into the air via inhalation. Therefore, this is considered a complete pathway and data from the on-site wells are used to calculated exposure concentrations.

5.3.5 Quantification of Exposure

In this section, each receptor's potential exposures to chemicals of potential concern (COPCs) is quantified for each of the exposure pathways described above. In each case, the exposures are calculated following methods recommended in EPA guidance documents, such as the Risk Assessment Guidance for Superfund (EPA 1989). These calculations generally involve two steps. First, representative chemical concentrations in the environment, or exposure point concentrations (EPCs), are determined for each pathway and receptor. From these EPC values, the amount of chemical which an exposed person may take into his/her body is then calculated. This value is referred to as either the Human Intake or the Absorbed Dose, depending on the exposure route.

This section describes the exposure scenarios, exposure assumptions and exposure calculation methods used in this risk assessment. All calculations are shown in the tables included in **Appendices A through F**.

Risk assessment as a whole, and the exposure assessment step in particular, are designed to be health protective. The exposure calculations require estimates and assumptions about certain human exposure parameters, such as inhalation rates, ingestion rates, etc. Generally, values are selected which tend to overestimate exposure. USEPA (1993) recommends two types of exposure estimates be used for Superfund risk assessments: a reasonable maximum exposure (RME) and central tendency exposure (CT). The RME is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at a site, and is intended to account for both uncertainty in the contaminant concentration and variability in the exposure parameters (such as exposure frequency or averaging time). The CT also may be evaluated for comparison purposes and is generally based on mean exposure parameters. Only RME scenarios have been evaluated in this mini-risk assessment.

Superfund risk assessments consider chronic exposures unless specific conditions warrant a short-term or an acute assessment. In this evaluation, long-term exposure to relatively low chemical concentrations is the greatest concern. Short-term (i.e., subchronic) and acute exposures were evaluated only for the construction worker and day care child who have exposure durations of 1 and 6 years, respectively.

Exposure-point concentrations (EPCs) were estimated for all pathways selected for quantitative evaluation. These concentrations are based on the highest measured values (for soil and groundwater) or on calculated estimates (for ambient air and showering). Steady-state conditions were assumed. Therefore, current and future chemical concentrations were assumed to be identical. This assumption may tend to overestimate long-term exposure concentrations because chemical concentrations are likely to decrease over time from natural processes such as dispersion, attenuation, degradation and dilution.

Estimates of pathway-specific human intakes or absorbed doses for each chemical involve assumptions about patterns of human exposure to contaminated media. These assumptions are integrated with exposure-point concentrations to calculate intakes. Intakes or doses are normally expressed as the amount of chemical at the environment-human receptor exchange boundary in milligrams per kilogram of body weight per day (mg/kg-day), which represents an exposure normalized for body weight over time. The total exposure is divided by the time period of interest to obtain an average exposure. The averaging time is a function of the toxic endpoint: For noncarcinogenic effects, it is the exposure time (specific to the scenario being assessed) and for carcinogenic effects, it is lifetime (70 years).

5.3.5.1 Exposure Assumptions

An important aspect of exposure assessment is the determination of assumptions regarding how receptors may be exposed to contaminants. USEPA guidance on exposure factors is extensive and was followed throughout this exposure assessment. Standard scenarios and EPA-recommended default assumptions were used where appropriate.

The exposure scenarios in this assessment involve the following future receptors: prison worker, inmate, construction worker, and day care worker and child. The exposure assumptions for these scenarios are intended to approximate the frequency, duration and manner in which receptors are exposed to environmental media. For example, the worker scenarios are intended to approximate the exposure potential of those employed at the site.

Details of the exposure assumptions and parameters for each exposure scenario are shown in **Table 5.3-1.**

The primary sources for the RME and CT exposure factors are as follows:

- USEPA, 1988: Superfund Exposure Assessment Manual
- USEPA, 1989a: Risk Assessment Guidance for Superfund, Volume I (RAGS)
- USEPA, 1991a: Supplemental Guidance, Standard Default Exposure Factors
- USEPA, 1992: Dermal Exposure Assessment, Principles and Applications
- USEPA, 1993a: Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
- USEPA, 1997: Exposure Factors Handbook

In the following sections, the methods used to calculate exposures by each pathway are explained. Tables which show the human intake or absorbed dose values calculated for each exposure scenario are contained in **Appendices A through F**. These intakes and doses are used to assess overall carcinogenic and non-carcinogenic risk, as discussed later in the risk characterization section (Section 5.5).

5.3.5.2 Exposure Scenarios

The five exposure scenarios and their respective exposure assumptions in this assessment are described below.

Construction Worker. Future construction workers are assumed to spend one year working at the AOCs, which is a typical duration for a significant construction project. These workers spend each working day at the AOCs according to the exposure frequency calculated in **Table**

Table 5.3-1
EXPOSURE FACTOR ASSUMPTIONS
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
PRISON INMATE	**Inhalation of Dust in Ambient Air**		Inhalation Rate	15.2	m3/day	Average inhalation rate for adults with long term exposure.	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
		RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated from Surface Soil Only)		Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Ingestion of Soil		Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Soil EPC Calculated from Surface Soil Only)	RME	Ingestion Rate	100	mg soil/day	Upper bound worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	Dermal Contact - Soil		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adult	USEPA, 1992
	(Soil EPC Calculated from Surface Soil Only)		Soil to Skin Adherence Factor	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
			Inhalation Rate	0.5	m3/day	Inhalation rate for sedentary activity for adults	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Inhalation of Groundwater	RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	Dermal Contact - Groundwater		Skin Contact Surface Area	23000	cm2	Entire adult body skin area	USEPA, 1992
		RME	Exposure Time	0.25	hours/day	Upper bound bathing duration	USEPA, 1992
			Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	Ingestion of Groundwater	RME	Ingestion Rate	2	liters/day	Standard adult ingestion rate	USEPA, 1993
			Exposure Frequency	365	days/yr	Assumed	BPJ
			Exposure Duration	24	years	Standard adult residential duration	USEPA, 1991, 1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989

Table 5.3-1
EXPOSURE FACTOR ASSUMPTIONS
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
PRISON WORKER	**Inhalation of Dust in Ambient Air**		Inhalation Rate	8	m3/day	Average inhalation rate for light activity is 1.0 m3/hr, 8 hr work day	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
		RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated		Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
	from Surface Soil Only)		Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Ingestion of Soil		Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	100	mg solids/day	Upper bound worker exposure to dirt and dust	USEPA, 1993
	(Soil EPC Calculated		Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
	from Surface Soil Only)		Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Dermal Contact - Soil		Absorption Factor	Compound Specific			USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adult	USEPA, 1992
	(Soil EPC Calculated		Soil to Skin Adherence Factor	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
	from Surface Soil Only)		Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Inhalation Rate	0.5	m3/day	Inhalation rate for sedentary activity for adults	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Inhalation of Groundwater	RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	250	days/yr	Assumed	BPJ
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	Dermal Contact - Groundwater		Skin Contact Surface Area	23000	cm2	Entire adult body skin area	USEPA, 1992
		RME	Exposure Time	0.25	hours/day	Upper bound bathing duration	USEPA, 1992
			Exposure Frequency	250	days/yr	Assumed	BPJ
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Ingestion Rate	2	liters/day	Standard adult ingestion rate	USEPA, 1993
	Ingestion of Groundwater	RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989

Table 5.3-1
EXPOSURE FACTOR ASSUMPTIONS
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
CONSTRUCTION WORKER	**Inhalation of Dust in Ambient Air**		Inhalation Rate	10 4	m3/day	Average inhalation rate for outdoor worker is 1.3 m3/hr, 8 hr work day	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	(Air EPC Calculated	RME	Exposure Duration	1	year	Upper bound time of employment for construction worker	USEPA, 1991
	from Surface and		Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Subsurface Soils)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	% of 250	days/yr	Site specific based on land area. See Table 5.3-2	USEPA, 1991
	Ingestion of Soil		Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated		Exposure Duration	1	year	Upper bound time of employment for constr worker	USEPA, 1991
	from Surface and	RME	Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Subsurface Soils)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Ingestion Rate	480	mg soil/day	Assumed IR for intensive construction work	USEPA, 1991, 1993
			Exposure Frequency	% of 250	days/yr	Site specific based on land area See Table 5.3-2	USEPA, 1991
	Dermal Contact - Soil		Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	(Soil EPC Calculated		Exposure Duration	1	year	Upper bound time of employment for constr. worker	USEPA, 1991
	from Surface and	RME	Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Subsurface Soils)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adult	USEPA, 1992
			Soil to Skin Adherence Factor	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	% of 250	days/yr	Site specific based on land area See Table 5.3-2	USEPA, 1991

Table 5.3-1
EXPOSURE FACTOR ASSUMPTIONS
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
DAY CARE CENTER CHILD	**Inhalation of Dust in Ambient Air**		Inhalation Rate	4	m3/day	Average inhalation rate for children doing light activity is 0.4 m3/hr, exposure time 10 hr/day	USEPA, 1997
			Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
		RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated		Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
	from Surface Soil Only)		Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
	Ingestion of Soil		Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Soil EPC Calculated	RME	Ingestion Rate	200	mg soil/day	Maximum IR for a child	USEPA, 1993
	from Surface Soil Only)		Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
			Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
	Dermal Contact - Soil		Absorption Factor	Compound Specific			
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Soil EPC Calculated	RME	Skin Contact Surface Area	2190	cm2	Hands, legs, arms, neck and head exposed; 25% of upper bound body skin area of a 3-6 year old	USEPA, 1992
	from Surface Soil Only)		Soil to Skin Adherence Factor	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
			Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
			Ingestion Rate	1	liters/day	Representative upper bound estimate for 0-6 year olds	USEPA, 1997
	Ingestion of Groundwater	RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
			Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989

Table 5.3-1
EXPOSURE FACTOR ASSUMPTIONS
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air		Inhalation Rate	8	m3/day	Average inhalation rate for light activity is 1 m3/hr, 8 hr work day	USEPA, 1997
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
		RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated from Surface Soil Only)		Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
	Ingestion of Soil		Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Soil EPC Calculated from Surface Soil Only)	RME	Ingestion Rate	100	mg soil/day	Upper bound worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	Dermal Contact - Soil		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adult	USEPA, 1992
	(Soil EPC Calculated from Surface Soil Only)		Soil to Skin Adherence Factor	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Ingestion Rate	2	liters/day	Standard adult ingestion rate	USEPA, 1993
	Ingestion of Groundwater	RME	Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989

RME Reasonable Maximum Exposure
Car Carcinogenic
Nc Non-carcinogenic

Source References
USEPA, 1988 Superfund Exposure Assessment Manual
USEPA, 1989 Risk Assessment Guidance for Superfund, Volume I (RAGS)
USEPA, 1991: Supplemental Guidance, Standard Default Exposure Factors
USEPA, 1992 Dermal Exposure Assessment, Principles and Applications
USEPA, 1993 Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
USEPA, 1997 Exposure Factors Handbook, Update to 1990 handbook

5.3-2. During this time, this worker inhales the ambient air at the AOCs and may ingest or dermally contact the soil there. Since the construction worker may be digging onsite, the soil ingestion or dermal contact with both surface and subsurface soils was assumed. All other exposure factors used in the exposure assessment were obtained from EPA guidance documents, as noted in **Table 5.3-1.**

Prison Worker. Future prison workers are assumed to work at the prison to be erected at the AOCs. These workers spend each working day at the AOCs (5 days/week for 50 weeks, RME). This exposure period lasts for an entire 25 year career. During this time, this worker inhales the ambient air at the AOCs and may ingest or dermally contact the surface soil there. This worker also drinks groundwater at the site, and is exposed to groundwater via inhalation and dermal contact while showering (once per work day). All other exposure factors used in the exposure assessment were obtained from EPA guidance documents, as noted in **Table 5.3-1.**

Inmate. Future inmates are assumed to reside continuously at the prison (24 hours/day, 365 days/year) for a 24 year incarceration period. During this time, the inmate inhales the ambient air at the AOCs and may ingest or dermally contact the surface soil there. The inmate also drinks groundwater at the site, and is exposed to groundwater via inhalation and dermal contact while showering (once per work day). All other exposure factors used in the exposure assessment were obtained from EPA guidance documents, as noted in **Table 5.3-1**.

Day Care Center Child. It is possible that a day care center could be established onsite as an adjunct to the prison. Future day care children are assumed to attend the center 5 days/week, 12 hours/day, 50 weeks/year for 6 years. During this time, the child inhales the ambient air, ingests groundwater, and ingests and dermally contacts surface soil.

Future Day Care Center Worker. The adult worker at the day care center has the same work schedule and exposure duration as the future prison worker. Like the day care child, the day care center worker inhales the ambient air, ingests groundwater, and ingests and dermally contacts surface soil.

5.3.5.3 Inhalation of Particulate Matter in Ambient Air

This pathway consists of particulate matter (PM) being released from soils to the air and then being inhaled by future receptors. Ambient PM concentrations for a construction worker were estimated using an emission and dispersion model. PM concentrations for the prison worker, inmate and day care receptors were based on existing site air measurements shown in **Table 5.3-3.**

TABLE 5.3-2
TOTAL AREA OF AOC'S AND EXPOSURE FREQUENCIES FOR CONSTRUCTION WORKER
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Site	Area (sq. foot)	Percent of Total Area	Exposure Frequency (days)
SEAD-120B	33,750	0.6	1.5
SEAD-43,56,69	540,000	9.7	24.25
SEAD-44A	715,000	12.8	32
SEAD-44B	70,000	1.3	3.25
SEAD-52	280,000	5.0	12.5
SEAD-62	3,934,000	70.7	176.5
TOTAL AREA	5,572,750*	100	250

* Equivalent to 128 acres or 518,000 square meters.

TABLE 5.3-3
Suspended Particulate Concentrations Measured at SEDA
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PARTICULATE DATA	SITE #1 PM 10	SITE #2 PM 10	SITE #3 PM 10	SITE #4 PM 10
Peak Concentration (ug/m3)	37 on 23 July 95	37 on 23 July 95	37 on 5 July 95	37 on 5 July 95
Arithmetic Mean (ug/m3)	16.9	16.6	16.4	15.8
Standard Deviation	21.4	21.1	23.0	23.0
Geometric Mean (ug/m3)	15.1	14.8	14.8	14.2
No. of 24-hr. Avgs. Above 150 ug/m3	0	0	0	0
Number of Valid Samples	29	32	29	31
Percent Data Recovery	90.6	100.0	90.6	96.9

mulative Summary for April 1, 1995 through July 31, 1995

Construction Worker

During construction activities, construction workers may be exposed to chemicals in site soils via inhalation. Construction activities, such as excavation, have the potential to create dust, or suspended particulate matter (PM), originating from the soils being removed. This dust would contain the chemicals present in the soil. Construction workers in the construction area would breathe this PM in the ambient air.

Air concentrations of site chemicals of concern were estimated for this exposure pathway using excavation models recommended in the USEPA's "Models for Estimating Air Emission Rates from Superfund Remedial Actions" (EPA 451/R-93-001). Particulate emissions from soil excavation and loading into trucks are estimated with the following equation:

$$E = \frac{k\ (0.0016)\ (M)\ [\ U/2.2\ ]^{1.3}}{[\ X/2\ ]^{1.4}}$$

where:

E = emissions (g)
k = particle size multiplier (unitless)
0.0016 = empirical constant (g/kg)
M = mass of soil handled (kg)
U = mean wind speed (m/sec)
2.2 = empirical constant (m/sec)
X = percent moisture content (%)

The construction worker receptor is assumed to work at the prison site for a one year period. To conservatively estimate potential particulate emissions from construction activities during this period, it was assumed that the entire area of the six AOCs (an approximate 128 acre area, as shown in **Table 5.3-2**) is excavated to a depth of two meters over the course of one year as part of the prison construction. This results in the following mass of soil removed:

Mass = Area x Depth x Soil Bulk Density

= 518,000 square meters x 2 meters x 1.5 g/cm^3 x 10^6 cm^3/m^3
= 1.55 x 10^{12} grams
= 1.55 x 10^9 kg

Other parameter values for the model are as follows:

k = 0.35 for PM_{10} (EPA 1993)
U = 4.4 m/sec, average wind speed for Syracuse, NY (EPA 1985)
X = 10%, recommended default (EPA 1993)

With these values for M, k, U and X, the emission rate (E) from excavation activities is calculated 225,000 grams of PM_{10} over the course of a year. This emission rate would be representative if all soil excavated at the AOCs were contaminated, and if local climatic factors did not suppress emissions. For example, precipitation, snow cover and frozen soil in the winter will minimize emissions. To account for these climatic/seasonal factors, it was assumed that emissions occur only half of the construction time This results in a representative emission rate (E) of 112,500 grams/year. This is equivalent to an average emission rate of 450 g/day, 56 g/hr or 15.6 mg/sec, assuming emission occur only during work days: 250 days/yr, 8 hr/day.

Much greater short-term emissions are estimated for site grading with a bulldozer or tractor. This type of activity is assumed to occur for 90 work days (8-hour day) over the course of a year. The model equation for grading emissions is:

$$E = \frac{0.094\,(s)^{1.5}}{X^{1.4}}$$

where:
E = emission rate (g/sec)
0.094 = empirical constant (g/sec)
s = percent silt content (%)
X = percent moisture content (%)

Assuming the EPA-recommended default values of 8% for s, and 10% for X, the emission rate (E) from grading is calculated as 0.085 g/sec. Averaged over the course of a year with 90 8-hour days of grading emissions, this is 38.1 g/hr or 10.6 mg/sec of PM_{10} emissions, assuming all emissions occur during working hours.

Total annual average emissions from excavation and grading are estimated as 15.6 mg/sec + 10.6 mg/sec = 26.2 mg/sec.

Localized exposure concentrations for construction workers are estimated with a simple box model. The model treats a defined surface area as a uniform emission source over the time period of interest. The box, or mixing volume, is defined by this surface area and an assumed mixing height.

The emitted PM_{10} is assumed to mix uniformly throughout the box, with dilution from surface winds.

The general model equation is:

$$C = \frac{E}{(U)(W)(H)}$$

where:

E = emission rate, mg/sec
U = wind speed, m/sec
W = crosswind width of the area source, m
H = mixing height, m

E and U are the same as defined or calculated above. The mixing area is based upon the average area of the AOCs estimated to be excavated during one hour. The combined area of the AOCs, 518,000 square meters, may be excavated during 2000 hours of construction activity. The average hourly area worked then is: 518,000 ÷ 2000 = 259 square meters. This area is assumed to be square, and W is the square root of 259 m^2, or 16.1 meters. H is assumed to be the height of the breathing zone, or 1.75 meters.

With these values, the PM_{10} exposure concentration for a construction worker is calculated as 0.340 mg/m^3. All of this PM_{10} was assumed to be airborne soil released from each AOC as represented by total soils (surface and subsurface).

The concentration of particulate-associated chemicals in ambient air, then, is:

$$\mathbf{CA = CS \times PM_{10} \times CF}$$

where:

CA = chemical concentration in air (mg/m^3)
CS = chemical concentration in soil (mg/kg soil)
PM_{10} = PM_{10} concentration (ug/m^3)
CF = conversion factor (10^{-9} kg/ug)

These calculated CA values are the inhalation EPCs for the dust inhalation scenarios. **Tables A-1 through F-1 (in Appendices A through F)** show the inhalation EPCs for the future construction workers.

Prison Worker, Inmate, and Day Care Receptors

Ambient air normally contains particulate matter derived from various natural and anthropogenic sources, including soil erosion, fuel burning, automobiles, etc. The concentrations of airborne particulate matter were measured at SEDA over a four month period (April-July) in 1995. A summary of the data collected in this air sampling program is shown in **Table 5.3-3**. Both Total Suspended Particulate Matter (TSP) and particulate matter less than 10μm aerodynamic diameter (PM_{10}) were measured. TSP includes all particles which can remain suspended in air, while PM_{10} includes only smaller particles which can be inhaled (particles larger than 10μm diameter typically cannot enter the narrow airways in the lung).

For this assessment, the highest 4-month average PM_{10} concentration measured at any of the four monitoring stations was assumed to represent ambient air at the AOCs. The entire particulate loading was assumed to be airborne soil released from the AOC as represented by the surface soil EPCs for each AOC.

The concentration of particulate-associated chemicals in ambient air, (CA) was calculated with the same equation [$CA = CS \times PM_{10} \times CF$] used for the construction worker, above.

The ambient air exposure point concentrations used in the intake calculations are shown in **Tables A-1 through F-1.**

The equation for intake is as follows (EPA, 1989a):

$$\textbf{Intake (mg/kg/day)} = \frac{\textbf{CA x IR x EF x ED}}{\textbf{BW x AT}}$$

where:

CA = Chemical concentration in air (mg/m^3)
IR = Inhalation Rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Bodyweight (kg)
AT = Averaging Time (days)

The results of these calculations are shown in **Tables A-2 through F-2**.

For the construction worker, site-specific exposure frequencies, EFs, were derived for each AOC. The exposure frequencies reflect the nature of the planned construction at the AOCs and the relative sizes of the different AOCs. It was assumed that the one-year long construction project is divided among the six AOCs, and the amount of time a construction worker spends excavating or grading each AOC is proportional to its area. Therefore, the EF for SEAD-62, the largest AOC, is the longest, while the EF for SEAD-120B, the smallest AOC, is the shortest. **Table 5.3-2** shows the EFs derived for each AOC, based on its area.

5.3.5.4 Incidental Ingestion of Soil (current and future land use)

The soil data collected from each AOC were compiled and the EPCs were selected for each compound. For the prison worker, inmate and day care center exposures, only surface soil data collected from the 0 to 0.5 foot interval were used in this analysis. For the construction worker exposure, all soil data were used as it is assumed that the construction worker will engage in intrusive activities.

The equation for intake is as follows (EPA 1989a):

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CS x IR x CF x FI x EF x ED}}{\textbf{BW x AT}}$$

Where:

CS	=	Chemical Concentration in Soil (mg/kg soil)
IR	=	Ingestion Rate (mg soil/day)
CF	=	Conversion Factor (1 Kg/10^6 mg)
FI	=	Fraction Ingested from Contaminated Source (unitless)
EF	=	Exposure Frequency (days/years)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

The results of these calculations are shown in **Tables A-3 through F-3.**

5.3.5.5 Dermal Contact with Soils

The same receptors considered to have the potential to ingest soil may also contact the same soils dermally. These receptors include the prison worker, construction worker, inmate and day care receptors.

As with the soil ingestion scenarios, the chemical concentration of the soils were taken from the 0 to 0.5 foot depth and used as the exposure point concentrations for the prison worker, inmate and day care center exposures, while the chemical concentration of all soils was used as the exposure point concentration for the construction worker scenario.

The equation for the absorbed dose from dermal exposure is as follows, based on guidance in EPA 1992:

$$\textbf{Absorbed Dose (mg/kg-day)} = \frac{\textbf{CS x CF x AF x ABS x SA x EF x ED}}{\textbf{BW x AT}}$$

Where:

CS	=	Chemical Concentration in Soil (mg/kg soil)
CF	=	Conversion Factor (10^{-6} kg/mg)
AF	=	Soil to Skin Adherence Factor (mg/cm^2)
ABS	=	Absorption Factor (unitless)
SA	=	Skin Surface Area Available for Contact (cm^2)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

The product of the terms CS, AF, and ABS represents the absorbed dose per event as defined in the EPA 1992 guidance.

The exposure calculations are summarized in **Tables A-4 through F-4.**

Dermal exposure involves several unique exposure factors discussed briefly here. Specifically, the dermal exposure calculation considers the amount of exposed skin, the amount of soil which adheres to the skin and the degree to which a chemical may be adsorbed through the skin.

The surface area of exposed skin depends on the size of an individual (especially adult vs. child), clothing worn, and the specific parts of the body which may directly contact the medium of concern

(e.g., soil or groundwater during showering). USEPA recommendations were followed to select exposed skin surface areas for each scenario in this assessment.

The following assumptions were made regarding skin surface areas for dermal exposure, according to EPA 1992:

Prison Worker, Construction Worker, Inmate and Day Care Center Worker (Soil) The hands, legs, arms, neck and head may be exposed. These comprise approximately 25% of the total body surface area. EPA 1992 recommends a surface area value of 5800 cm^2 for the RME as representative of these exposed body parts.

Day Care Child (Soil) 25% of total body area was assumed for children age 3-6. This results in a surface area exposure value of 2190 cm^2 for the RME.

Prison Worker and Inmate (Groundwater) The entire body surface may be exposed during showering. EPA 1992 recommends a surface area value of 23,000 cm^2 for the RME as representative of the entire adult body.

The potential magnitude of exposure depends on the amount of soil which adheres to the exposed skin. Again, USEPA recommended soil-to-skin adherence factors were used in this assessment.

Certain chemicals may be readily absorbed through the skin while others penetrate much more slowly or not at all. In the case of soil, some chemicals may be strongly bound to the matrix which reduces their ability to absorb through the skin. Chemical-specific absorption factors as provided by USEPA were used in this assessment. USEPA Region II recommends quantifying dermal exposure for cadmium, arsenic, PCBs, dioxins/furans and pentachorophenol (others are under development) only since credible values are not available for other chemicals of concern. Of these compounds, only cadmium was detected in any soil at levels above background. For cadmium, an absorption factor (ABS) of 1% (0.01) was used as recommended by EPA (EPA, 1992).

No other compounds were considered quantitatively for dermal exposure from soil in this risk assessment.

The reader should note that in the guidance document Dermal Exposure Assessment: Principles and Applications (EPA 1992), EPA cautions that "dermal exposure is the least well understood of the major exposure routes. Very little chemical-specific data are available, especially for soils, and the predictive techniques have not been well validated." EPA further states that dermal exposure/risk estimates have considerable uncertainty, and in some cases may be overly conservative.

5.3.5.6 Groundwater Ingestion

All future receptors may drink groundwater. The groundwater data collected from each AOC were compiled and the EPCs were selected for each compound.

The equation for intake is as follows (EPA, 1989a):

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CW x IR x EF x ED}}{\textbf{BW x AT}}$$

Where:
CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Bodyweight (kg)
AT = Averaging time (days)

The results of these calculations are shown in **Tables B-5, C-5, D-5, and F-5.**

5.3.5.7 Dermal Contact to Groundwater while Showering/Bathing

Prison workers and inmates may be exposed to groundwater while showering. The EPCs developed for ingestion of groundwater are also used for this exposure route. The equation for the absorbed dose, taken from RAGS (EPA, 1989a) is as follows:

$$\textbf{Absorbed Dose (mg/kg-day)} = \frac{\textbf{DA x SA x EF x ED}}{\textbf{BW x AT}}$$

Where:

DA	=	Absorbed Dose per event (mg/cm^2 - event)
SA	=	Skin Surface Area Available for Contact (cm^2)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged (days)

The absorbed dose per event (DA) was calculated as described in EPAs "Dermal Exposure Assessment: Principles and Applications," (EPA, 1992).

For organics, a parameter, B is first calculated. The B value was adopted from the Bunge Model (Cleek and Bunge, 1992). This value attempts to characterize the relative contribution of each compounds specific permeability coefficient (K_p value) in the stratum corneum and the viable epidermis. The B-values for certain compounds are listed in Table 5-8 of the Dermal Exposure Assessment Manual, EPA, 1992. For any compounds not listed in this table, B-values are derived using the following equation:

$$B \approx \frac{Ko/w}{10{,}000}$$

where: Kow is the octanol-water partitioning coefficient (dimensionless).

Once calculated, the B value is used to calculate time conditions associated with estimates of compound breakthrough time. In accordance with the work of Cleek and Bunge, if the exposure time per event (ET) is less than the breakthrough time (t*) of steady-state conditions specific to each compound, then the absorbed dose is calculated as follows:

$$DA = 2\ K_p \times CW \times CF \sqrt{\frac{6 \times \tau \times ET}{\pi}}$$

If the exposure time is longer than t*, then the absorbed dose is calculated using:

$$DA_{event} = K_p \times CW \times CF \left[\frac{ET + 2(1+3B)\tau}{1+B} \right]$$

where for both equations:

K_p = Dermal permeability coefficient (cm/hr)
CW = Chemical Concentration in Water (mg/l)
ET = Exposure Time (hours)
B = Bunge Model Value (unitless)
τ = Lag time (hours)
CF = Volume Conversion Factor = $0.001 L/cm^3$

The exposure times for showering are assumed to be 15 minutes/day (0.25 hr/day) for the RME, as recommended in the Dermal Exposure Assessment Manual, EPA, 1992.

The lag time (τ), is defined as the time it takes a chemical to penetrate to reach a steady-state condition during a dermal exposure in aqueous media. By properly defining the lag time, the permeability coefficient (K_p) can be more properly used in the risk calculation further reducing uncertainty. Lag times and breakthrough times (t*) for each organic compound were taken from a list in Table 5-8 of the Dermal Exposure Assessment Manual, EPA, 1992, or calculated. All chemicals not having lag times were derived using the following equation:

$$\tau = \frac{\int_{sc}^{2}}{6D_{sc}}$$

where:

$\int_{sc}$ = thickness of the stratum corneum, assume (0.001) (cm)
D_{sc} = Stratum corneum diffusion coefficient (cm^2/hr)

The t* value for each organic compound found in surface water is shown below.

Compound	t* (hours)
acetone	0.47
benzene	0.63
1,1,2,2-tetrachloroethane	2.2
2,4,5-T	10.1
2,4,5-TP (Silvex)	18.73

The exposure time, 0.25 hour, is less than t* in all cases. Therefore, the first equation for DA, above, was used for all compounds.

In the Dermal Exposure Assessment Manual (EPA 1992), EPA cautions that the above approach for calculating dermal exposures to organic chemicals in water may be overly conservative. EPA expressed concern that preliminary testing of this model indicated that for some compounds the absorbed dose from dermal exposure during showering was much greater than the dose from ingestion of 2 L/day of water. EPA further states that model validation is difficult due to a lack of data.

No inorganics (e.g., metals) were detected in groundwater (however, metals were found in surface water, addressed later in this assessment). For completeness and continuity, the equations for inorganics are presented here.

For inorganics, DA was calculated by:

$$\mathbf{DA = K_p \times CW \times ET \times CF}$$

USEPA in the Dermal Exposure Assessment & Guidelines (EPA, 1992) recommends Dermal Permeability Coefficients (K_p) for a number of organic and inorganic chemicals. These recommended values were used in these exposure calculations. When no organic K_p value was available, a value was calculated using the following equation:

$$\mathbf{Log\ K_p = -2.72 + 0.71\ (log\ K_{o/w}) - 0.0061\ (MW)}$$

Many inorganic compounds do not have specified recommended K_p values. In this case, K_p was assumed to be 1×10^{-3} as the default value recommended by EPA (EPA, 1992).

Exposure to chemicals in groundwater during showering occurs via two routes: inhalation of volatile chemicals which partition into the air from the hot shower water, and dermal contact. The analyses of these two exposure routes assumes that release of volatile chemicals to the air occurs quickly, and that only the quantities which remain in the water stream are available for dermal contact. The calculations of exposure from inhalation assume that the water from the shower nozzle has the same concentration as groundwater, and the groundwater EPC is used. However, for dermal contact, the EPCs are first adjusted to subtract the amount of each chemical which partitions into the air. This adjusted EPC, referred to as C_{derm} , is calculated as:

$$\mathbf{C_{derm} = EPC_{gw}\ (1\text{-}f_e)}$$

where: EPC_{gw} = groundwater exposure point concentration (at the shower nozzle), mg/L
f_e = fraction of chemical emitted to the air in the shower, dimensionless

The fraction emitted (f_e) is calculated as:

$$\mathbf{f_e = (EPC_{air} \times F_a) / (EPC_{gw} \times F_w)}$$

where: EPC_{air} = air exposure point concentration in the shower (mg/m^3)
F_a = air flow rate (ventilation rate) in the shower (m^3/min)
F_w = water flow rate in the shower (L/min)

This C_{derm} value is used as CW in the calculations of absorbed dose per event (DA) in the assessment of dermal exposure during showering. The calculated C_{derm} values are shown in **Tables B-6, C-6, D-6 and F-6**.

The dermal exposure calculations are summarized in **Tables B-7, C-7, D-7 and F-7**.

5.3.5.8 Inhalation of Groundwater while Showering/Bathing (Future)

The same groundwater concentrations that were used in the groundwater ingestion scenario were used in this scenario. These groundwater concentrations were converted to air concentrations inside the shower using a model developed by Andelman (Andelman, J.B. 1984, Andelman, J.B., 1985a, Andelman, J.B., 1985b). This model assumes that the concentration of the air inside the shower is in equilibrium between the rate of release from the shower water and the rate of air exchange between the shower and the bathroom. The empirical constants in the model were obtained from the observed efficiency of volatilization for TCE in model showers and from several homes with contaminated water where measurements have been made. The efficiency of release for chemicals other than TCE is obtained as the product of the ratio of the Henry's Law constant for that compound to the Henry's Law constant for TCE and the efficiency factor for TCE.

The average concentration of a volatile organic in the shower air over a period of t_S minutes is:

$$\mathbf{C_S} = C_{inf}\left[1+\left(\frac{1}{kt_s}\right)\times\left(e^{(-kts)^{-1}}\right)\right]$$

for $t_S > 0$

where:

C_S = average concentration of a volatile compound in the shower air over a duration of t_S minutes (mg/m^3)

C_{inf} = asymptotic concentration in air if shower ran for a long time (much longer than 15 minutes), calculated below (mg/m^3)

t_S = time in shower, RME value for an adult is 15 minutes (min)

k = rate constant for exponential function, defined below (1/min)

C_{inf} = $[(E)(F_w)(C_t)]/F_a$

k = F_a/V_b

F_w = flow rate of water in shower, RME value is 19 L/min; CT value is 8 L/min (L/min)

C_t = concentration in shower water, determined case by case; C_t is the concentration of contaminant in groundwater where domestic water is provided by a well (mg/L or ppm)

F_a = flow rate of air in shower, typical value is 2.4 m^3/min

V_b = volume of bathroom, typical value is 12 m^3 (m^3)

E = $(E_{TCE})(H)/(H_{TCE})$

E = efficiency of release of a compound from water to air; $0 \leq E \leq 1$; if E has a calculated value greater than 1, then E must be set equal to 1 (unitless)

E_{TCE}= efficiency of release of TCE from water to air, E_{TCE} = 0.6 is a typical value (unitless)

H = Henry's law constant for an organic compound, (m^3-atm/mol)

H_{TCE} = Henry's law constant for TCE, typical value is $H_{TCE} = 9.10E^{-3}$ (m^3- atm/mol)

The calculated average concentrations in the air in the shower are presented in **Tables B-5, C-5, D-5 and F-5**.

The equation for the intake, taken from RAGS (EPA, 1989a) is as follows:

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CA x IR x EF x ED}}{\textbf{BW x AT}}$$

Where:

CA = Chemical Concentration in Air (mg/m^3)

IR = Inhalation Rate (m^3/hr)

EF = Exposure Frequency (hrs/yr)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (period over which exposure is averaged -- days)

The exposure calculations are summarized in **Tables B-8, C-8, D-8 and F-8**.

The Chemical Concentrations in the air were developed using the model described previously. The adult inhalation rate of 0.5 m^3/hr was used as the RME value, recommended in the Exposure Factors Handbook (EPA 1997) as representative of sedentary adults.

5.4 TOXICITY ASSESSMENT

The objective of the toxicity assessment is to weigh available evidence regarding the potential of the chemicals to cause adverse effects in exposed individuals, and to provide, where possible, an estimate of the relationship between the extent of exposure to a chemical and the increased likelihood and/or severity of adverse effects. The types of toxicity information considered in this assessment include the reference dose (RfD) and reference concentration (RfC) used to evaluate noncarcinogenic effects, and the slope factor and unit risk to evaluate carcinogenic potential. Most toxicity information used in this evaluation was obtained from the Integrated Risk Information System (IRIS). If values were not available from IRIS, the *Health Effects Assessment Summary Tables* (HEAST) (EPA, 1993b) were consulted. Finally, the USEPA Region II was consulted to provide any additional values not included in these two sources. The toxicity factors used in this evaluation are summarized in **Table 5.4-1** for both noncarcinogenic and carcinogenic effects.

5.4.1 Noncarcinogenic Effects

For chemicals that exhibit noncarcinogenic (i.e., systemic) effects, authorities consider organisms to have repair and detoxification capabilities that must be exceeded by some critical concentration (threshold) before the health effect is manifested. For example, an organ can have a large number of cells performing the same or similar functions that must be significantly depleted before the effect on the organ is seen. This threshold view holds that a range of exposures from just above zero to some finite value can be tolerated by the organism without an appreciable risk of adverse effects.

Health criteria for chemicals exhibiting noncarcinogenic effects for use in risk assessment are generally developed using USEPA RfDs and RfCs developed by the RfD/RfC Work Group and included in the IRIS. In general, the RfD/RfC is an estimate of an average daily exposure to an individual (including sensitive individuals) below which there will not be an appreciable risk of adverse health effects. The RfD/RfC is derived using uncertainty factors (e.g., to adjust from animals to humans and to protect sensitive subpopulations) to ensure that it is unlikely to underestimate the potential for adverse noncarcinogenic effects to occur. The purpose of the RfD/RfC is to provide a benchmark against which an intake (or an absorbed dose in the case of dermal contact) from human exposure to various environmental conditions might be compared. Intakes of doses that are significantly higher that the RfD/RfC may indicate that an inadequate margin of safety could exist for exposure to that substance and that an adverse health effect could occur.

5.4.1.1 References Doses for Oral and Inhalation Exposure

The types of toxicity values used to evaluate the noncarcinogenic effects of chemicals include RfDs for oral exposure, and RfCs for inhalation exposure. RfDs and RfCs represent thresholds for toxicity. They are derived such that human lifetime exposure to a given chemical via a given route at levels at or below the RfD or RfC, as appropriate, should not result in adverse health effects, even for the most sensitive members of the population. The chronic RfD or RfC for a chemical is ideally based on studies where either animal or human populations were exposed to a given chemical by a given route of exposure for the major portion of the life span (referred to as a chronic study). Various effect levels may be determined in a study; however, the preferred effect level for calculating noncarcinogenic toxicity values is the no-observed-adverse-effect level, or NOAEL. Second to the NOAEL is the lowest-observed-adverse-effect level, or LOAEL.

The oral RfD is derived by determining dose-specific effect levels from all the available quantitative studies, and applying uncertainty factors and/or a modifying factor to the most appropriate effect level. Uncertainty factors are intended to account for 1) the variation in sensitivity among members of the human population, 2) the uncertainty in extrapolating animal data to humans, 3) the uncertainty in extrapolating from data obtained in a study that is less than lifetime exposure, 4) the uncertainty in using LOAEL data rather than NOAEL data, and 5) the uncertainty resulting from inadequacies in the data base. The modifying factor may be used to account for other uncertainties such as inadequacy of the number of animals in the critical study. Usually each of these uncertainty factors is set equal to 10, while the modifying factor varies between one and 10. RfDs are reported as doses in milligrams of chemical per kilogram body weight per day (mg/kg-day).

The inhalation RfC is derived by determining concentration-specific effect levels from all of the available literature and transforming the most appropriate concentration to a human RfC. Transformation usually entails converting the concentration and exposure duration used in the study to an equivalent continuous 24-hour exposure, transforming the exposure-adjusted value to account for differences in animal and human inhalation, and then applying uncertainty factors and/or a modifying factor to the adjusted human exposure concentration to arrive at an RfC. The uncertainty factors potentially used are the same ones used to arrive at an RfD (see above). RfCs are reported as concentrations in milligrams of chemical per cubic meter of air (mg/m^3). To use the RfCs in calculating risks, they were converted to inhalation reference doses in units of milligrams of chemical per kilogram of body weight per day (mg/kg/day). This conversion was made by assuming an inhalation rate of 20 m^3/day and an adult body weight of 70 kg. Thus:

$$\textbf{Inhalation Reference Dose (mg/kg/day)} = RfC\left(\frac{mg}{m^3}\right)x\left(\frac{20m^3}{day}\right)x\left(\frac{1}{70kg}\right)$$

5.4.1.2 Reference Doses for Dermal Exposure

USEPA has not derived toxicity values for all routes of exposure. Most of the available toxicity values are for oral exposure. Many inhalation values are also available. No values are currently available for dermal exposure. This is due to the lack of scientific studies available to quantify dermal toxicity and carcinogenic potential for the vast majority of priority pollutants. In addition, until recently, scientists have assumed that the hazards due to dermal exposures were minimal in comparison with those due to oral exposure. However, it appears that in many instances the hazards due to dermal exposure may be as great or greater.

In the absence of dermal reference toxicity values, USEPA has suggested (EPA, 1989a) that in some cases it is appropriate to modify an oral RfD so it can be used to estimate the hazard incurred by dermal exposure. This requires that the toxic endpoints observed are the same for both oral and dermal exposure, and that one have quantitative estimates of both dermal and oral absorption of the chemical. This information is not available for most priority pollutants, and oral toxicity values are nevertheless often used to quantify risks associated with dermal exposure. As a consequence, any valuation of the contribution of dermal exposure to the overall hazard needs to be viewed as highly tentative at best.

USEPA RAGS (1989a) provides guidance for use of oral toxicity values in determining dermal toxicity. RfDs are expressed as the amount of substance administered per unit time and unit body weight (administered-dose), whereas exposure estimates for the dermal route of exposure are expressed as the amount of substance absorbed into the body per unit time and unit body weight (absorbed-dose). Thus, for dermal exposure to contaminants in water or in soil, it is necessary to adjust an oral toxicity value from an administered to an absorbed dose. Where oral absorption efficiencies were available, the oral RfD was converted to a dermal RfD by multiplying by oral absorption efficiency. Oral absorption factors and the calculated dermal RfDs are shown in **Table 5.4-1**.

In the absence of any information on absorption for the substance or chemically related substances, an oral absorption efficiency of 100 percent was assumed in accordance with USEPA Region 2 guidance (personal communication between A. Schatz of Parsons and M. Maddeloni of EPA Region 2).

TABLE 5.4-1
TOXICITY VALUES
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Analyte	Oral RfD (mg/kg-day)		Inhalation RfD (mg/kg-day)		Carc. Slope Oral (mg/kg-day)-1		Rank Wt. of Evidence	Carc. Slope Inhalation (mg/kg-day)-1		Dermal RfD (mg/kg-day)		Carc. Slope Dermal (mg/kg-day)-1		Oral Absorption Factor	
Volatile Organics															
Tetrachloroethane. 1,1,2,2-	NA	a	NA	a	2.00E-001	a	C	2.03E-001	a	NA	f	2.00E-001	g	1	j
Butanone, 2-	6.00E-001	a	2.86E-001	a	NA	e	D	NA	e	6.00E-001	f	NA	g	1	j
Acetone	1.00E-001	a	NA	e	NA	e	D	NA	e	1.00E-001	f	NA	g	1	j
Benzene	3.00E-003	i	1.71E-003	i	2.90E-002	a	A	2.73E-002	a	2.85E-003	f	3.05E-002	g	0.95	k
Chloroform	1.00E-002	a	NA	e	6.10E-003	a	B2	8.05E-002	a	1.00E-002	f	6.10E-003	g	1	k
Methylene Chloride	6.00E-002	a	8.57E-001	b	7.50E-003	a	B2	1.65E-003	a	5.88E-002	f	7.65E-003	g	0.98	k
Methyl Isobutyl ketone (4-Methyl-2-Pentanone)	8.00E-002	b	2.30E-002	b	NA	a	NA	NA		NA	f	NA	g	1	
Toluene	2.00E-001	a	1.14E-001	a	NA	e	D	NA	e	2.00E-001	f	NA	g	1	j
Xylene (total)	2.00E+000	a	NA	e	NA	e	D	NA	e	1.80E+000	f	NA	g	0.9	k
Semivolatiles*															
Methylnaphthalene. 2-	4.00E-002	i	NA	e	NA	e	NA	NA	e	4.00E-002	f	NA	g	1	j
4-Methylphenol	5.00E-003	b	NA	b	NA	a	C	NA		NA	f	NA	g	1	
Acenaphthene	6.00E-002	a	NA	e	NA	e	NA	NA	e	6.00E-002	f	NA	g	1	j
Acenaphthylene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Anthracene	3.00E-001	a	NA	e	NA	e	D	NA	e	3.00E-001	f	NA	g	1	j
Benzo(a)anthracene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Benzo(a)pyrene	NA	e	NA	e	7.30E+000	a	B2	NA	e	NA	f	1.46E+001	g	0.5	k
Benzo(b)fluoranthene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Benzo(g,h.i)perylene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Benzo(k)fluoranthene	NA	e	NA	e	7.30E-002	c	B2	NA	e	NA	f	7.30E-002	g	1	j
Carbazole	NA	e	NA	e	2.00E-002	b	B2	NA	e	NA	f	2.00E-002	g	1	j
Chrysene	NA	e	NA	e	7.30E-003	c	B2	NA	e	NA	f	7.30E-003	g	1	j
Di-n-butylphthalate	1.00E-001	a	NA	e	NA	e	D	NA	e	9.00E-002	f	NA	g	0.9	k
Dibenz(a,h)anthracene	NA	e	NA	e	7.30E+000	c	B2	NA	e	NA	f	7.30E+000	g	1	j
Dibenzofuran	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Fluoranthene	4.00E-002	a	NA	e	NA	e	D	NA	e	4.00E-002	f	NA	g	1	j
Fluorene	4.00E-002	a	NA	e	NA	e	D	NA	e	4.00E-002	f	NA	g	1	j
Hexachlorobenzene	8.00E-004	a	NA	a	1.60E+000	a	B2	1.61E+000	a	8.00E-004	f	NA	g	1	
Indeno(1,2.3-cd)pyrene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Naphthalene	2.00E-002	e	8.60E-004	e	NA	e	D	NA	e	2.00E-002	f	NA	g	1	j
Phenanthrene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Pyrene	3.00E-002	a	NA	e	NA	e	NA	NA	e	3.00E-002	f	NA	g	1	k
bis(2-Ethylhexyl)phthalate	2.00E-002	a	NA	e	1.40E-002	a	B2	NA	e	1.00E-002	f	2.80E-002	g	0.5	k
Pesticides/PCBs															
DDD. 4.4'-	NA	a	NA	e	2.40E-001	a	B2	NA	e	NA	f	1.20E+000	g	0.2	k
DDE. 4,4'-	NA	e	NA	e	3.40E-001	e	B2	NA	e	NA	f	1.70E+000	g	0.2	k
DDT. 4,4'-	5.00E-004	a	NA	e	3.40E-001	a	B2	3.40E-001	a	1.00E-004	f	1.70E+000	g	0.2	k
Dieldrin	5.00E-005	a	NA	e	1.60E+001	a	B2	1.61E+001	a	2.50E-005	f	3.20E+001	g	0.5	k
Endosulfan I	6.00E-003	b	NA	e	NA	e	NA	NA	e	6.00E-003	f	NA	g	1	j
Endosulfan II	6.00E-003	e	NA	e	NA	e	NA	NA	e	6.00E-003	f	NA	g	1	j
Endrin	3.00E-004	a	NA	e	NA	e	D	NA	e	3.00E-004	f	NA	g	1	j
Endrin aldehyde	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j
Endrin ketone	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j
Heptachlor epoxide	1.30E-005	a	NA	e	9.10E+000	a	B2	9.10E+000	a	1.30E-005	f	9.10E+000	g	1	j
alpha-Chlordane	5.00E-004	a	2.00E-004	a	3.50E-001	a	B2	3.50E-001	e	5.00E-004	f	3.50E-001	g	1	j
Nitroaromatics*															
2.4-Dinitrotoluene	2.00E-003	a	NA	a	6.80E-001	a	B2	NA	a	2.00E-003	f	6.80E-001	g	1	j
2,4,6-Trinitrotoluene	5.00E-004	a	NA	a	3.00E-002	a	C	NA	a	5.00E-004	f	3.00E-002	g	0.6	k
Tetryl	1.00E-002	b	NA	a	NA	a	NA	NA	a	1.00E-002	f	NA	g	1	j
Metals															
Cadmium	5.00E-004	a	NA	e	NA	e	B1	6.30E+000	a	5.00E-005	f	NA	g	0.1	l
Copper	4.00E-002	b	NA	e	NA	e	D	NA	e	2.40E-002	f	NA	g	0.6	k
Lead	NA	e	NA	e	NA	e	B2	NA	e	NA	f	NA	g	0.15	k
Potassium	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j

TABLE 5.4-1
TOXICITY VALUES
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Analyte	Oral RfD (mg/kg-day)		Inhalation RfD (mg/kg-day)		Carc. Slope Oral (mg/kg-day)-1		Rank Wt. of Evidence	Carc. Slope Inhalation (mg/kg-day)-1		Dermal RfD (mg/kg-day)		Carc. Slope Dermal (mg/kg-day)-1		Oral Absorption Factor	
Volatile Organics															
Selenium	5.00E-003	a	NA	e	NA	e	NA	NA	e	4.50E-003	f	NA	g	0.9	k
Zinc	3.00E-001	a	NA	e	NA	e	D	NA	e	7.50E-002	f	NA	g	0.25	k
Herbicides															
2,4,5-T	1.00E-002	a	NA	a	NA	a	NA	NA	a	1.00E-002	f	NA	g	1	j
Dicamba	3.00E-002	a	NA	e	NA	e	NA	NA	e	3.00E-002	g	NA	h	1	j
Dichloroprop	NA	a	NA	a	NA	a	NA	NA	a	NA	f	NA	g	1	j
MCPP	1.00E-003	a	NA	e	NA	e	NA	NA	e	1.00E-003	f	NA	g	1	j

a = Taken from the Integrated Risk Information System (IRIS) (Online January 1999)
b = Taken from HEAST 1995
c = Calculated using TEF
d = Calculated from proposed oral unit risk value
e = Provided by USEPA - October 1993
f = Calculated from oral RFD value
g = Calculated from oral slope factor
i = Provisional health guideline from EPA Risk Assessment Issue Papers (1995-1996) provided by EPA Technical Support Center.
(Inhalation RfD's were derived from EPA RfC's based on the assumption of 20 m3/day inhalation rate and 70 kg body weight.)
j = Where no oral absorption efficiency data are available. EPA Region 2 recommends that no adjustment be made for relative absorption (i.e. assume oral absorption factor =
k = Taken from ATSDR Toxicity Profiles (1989 - 1995)
l = EPA Region 2 accepted oral absorption factor for cadmium (personal communication between A. Schatz of Parsons and M. Maddaloni of EPA)
m = Provisional health guideline from EPA Risk Assessment Issue Papers (1997) provided by EPA Technical Support Center.
(Inhalation RfD's were derived from EPA RfC's based on the assumption of 20 m3/day inhalation rate and 70 kg body weight.)
NA = Not Available
*Dinitrotoluene, 2,4- and dinitrotoluene, 2.6- were analyzed as both nitroaromatics and semivolatiles.

5.4.1.3 Exposure Periods

As mentioned earlier, chronic RfDs and RfCs are intended to be set at levels such that human lifetime exposure at or below these levels should not result in adverse health effects, even for the most sensitive members of the population. These values are ideally based on chronic exposure studies in humans or animals. Chronic exposure for humans is considered to be exposure of roughly seven years or more, based on exposure of rodents for one year or more in animal toxicity studies. For day care children and construction workers, chronic RfDs and RfCs were used to conservatively assess risks for shorter exposure periods.

5.4.2 Carcinogenic Effects

For chemicals that exhibit carcinogenic effects, most authorities recognize that one or more molecular events can evoke changes in a single cell or a small number of cells that can lead to tumor formation. This is the non-threshold theory of carcinogenesis which purports that any level of exposure to a carcinogen can result in some finite possibility of generating the disease. Generally, regulatory agencies assume the non-threshold hypothesis for carcinogens in the absence of information concerning the mechanisms of action for the chemical of concern.

USEPA's Carcinogen Risk Assessment Verification Endeavor (CRAVE) has developed slope factors and unit risks (i.e., dose-response values) for estimating excess lifetime cancer risks associated with various levels of lifetime exposure to potential human carcinogens. The carcinogenic slope factors can be used to estimate the lifetime excess cancer risk associated with exposure to a potential carcinogen. Risks estimated using slope factors are considered unlikely to underestimate actual risks, but they may overestimate actual risks. Excess lifetime cancer risks are generally expressed in scientific notation. An excess lifetime cancer risk of 1×10^{-6} (one in a million), for example, represents the probability of an individual developing cancer over a lifetime as a result of exposure to the specific carcinogenic chemical. USEPA considers total excess lifetime cancer risks within the range of 10^{-4} (one in ten thousand) to 10^{-6} (EPA, 1989a) to be acceptable when developing remedial alternatives for cleanup of Superfund Sites.
In practice, slope factors are derived from the results of human epidemiology studies or chronic animal bioassays. The data from animals studies are fitted to the linearized, multistage model and a dose-response curve is obtained. The upper limit of the 95th percentile confidence-interval slope of the dose-response curve is subjected to various adjustments, and an interspecies scaling factor is applied to conservatively derive the slope factor for humans. This linearized multistage procedure leads to a plausible upper limit of the risk that is consistent with some proposed mechanisms of carcinogenesis. Thus, the actual risks associated with exposure to a potential carcinogen are not likely to exceed the risks estimated using these slope factors, but they may be much lower. Dose-response data derived from human epidemiological studies are fitted to

dose-time-response curves on an ad-hoc basis. These models provide rough but plausible estimates of the upper limits on lifetime risk. Slope factors based on human epidemiological data are also derived using very conservative assumptions and, as such, are considered unlikely to underestimate risks. In summary, while the actual risks associated with exposures to potential carcinogens are unlikely to be higher than the risks calculated using a slope factor, they could be considerably lower.

In addition, there are varying degrees of confidence in the weight of evidence for carcinogenicity of a given chemical. The USEPA system involves characterizing the overall weight of evidence for a chemical's carcinogenicity based on availability of animal, human, and other supportive data. The weight-of-evidence classification is an attempt to determine the likelihood that the agent is a human carcinogen, and thus qualitatively affects the estimation of potential health risks. Three major factors are considered in characterizing the overall weight of evidence for carcinogenicity: (1) the quality of evidence from human studies, (2) the quality of evidence from animal studies, which are combined into a characterization of the overall weight of evidence for human carcinogenicity; and (3) other supportive information which is assessed to determine whether the overall weight of evidence should be modified. USEPA's final classification of the overall weight of evidence includes the following five categories:

Group A - Human Carcinogen - There is sufficient evidence from epidemiological studies to support a causal association between an agent and cancer.

Group B - Probable Human Carcinogen - There is at least limited evidence from epidemiological studies of carcinogenicity to humans (Group B1) or that, in the absence of adequate data on humans, there is sufficient evidence of carcinogenicity in animals (Group B2).

Group C - Possible Human Carcinogen - There is limited evidence of carcinogenicity in animals in the absence of data on humans.

Group D - Not Classified - The evidence for carcinogenicity in animals is inadequate.

Group E - No Evidence of Carcinogenicity to Humans - There is no evidence for carcinogenicity in at least two adequate animal tests in different species, or in both epidemiological and animal studies.

Slope factors and unit risks are developed by the USEPA based on epidemiological or animal bioassay data for a specific route of exposure, either oral or inhalation. For some chemicals, sufficient data are available to develop route-specific slope factors for inhalation and ingestion. For chemicals with only one route-specific slope factor but for which carcinogenic effects may

also occur via another route, the available slope factor may be used by the USEPA to evaluate risks associated with several potential routes of exposure (EPA, 1989b).

A number of the chemicals of potential concern have been classified as carcinogens or potential carcinogens by USEPA, and each of these has also been assigned a carcinogenicity weight-of-evidence category, as shown in **Table 5.4-1**. These chemicals are:

Group A - Human Carcinogens

Benzene

Group B - Probable Human Carcinogens

Chloroform
Methylene Chloride
2,4-Dinitrotoluene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Carbazole
Chrysene
Dibenz(a,h)anthracene
Hexachlorobenzene
Indeno(1,2,3-cd)pyrene
bis(2-Ethylhexyl)phthalate
DDD, 4,4'-
DDE, 4,4'-
DDT, 4,4'-
Dieldrin
Heptachlor epoxide
alpha-Chlordane
Cadmium
Lead

Group C - Possible Human Carcinogens

1,1,2,2-Tetrachloroethane
2,4,6-Trinitrotoluene
4-Methylphenol

All remaining chemicals of concern are either not found to have weight of evidence rankings or are Group D or E. Group D classification means that the data are insufficient to make a determination regarding carcinogenic potential while Group E compounds have been conclusively found to be non-carcinogenic. Chemicals of potential concern found at the AOCs with potential carcinogenic effects are shown in **Table 5.4-1** along with their cancer slope factors.

5.4.2.1 Cancer Slope Factors for Oral and Inhalation Exposure

The types of toxicity values used to evaluate the carcinogenic effects of chemicals include slope factors (SFs) for oral exposure, and unit risk factors (URFs) for inhalation exposure. Oral slope factors are reported as risk per dose $(mg/kg\text{-}day)^{-1}$. Inhalation unit risk factors are reported in units of risk per concentration $(mg/m^3)^{-1}$. To make use of the unit risk factors in calculating risks they first had to be converted to inhalation slope factors in units of $(mg/kg\text{-}day)^{-1}$. This conversion was made by assuming an inhalation rate of 20 m^3/day and an adult bodyweight of 70 kg. Thus:

$$\textbf{Inhalation slope factor } (mg/kg\text{-}day)^{-1} = UnitRisk\left(\frac{ug}{m^3}\right)^{-1} \times \frac{day}{20m^3} \times 70kg \times \frac{1000ug}{mg}$$

5.4.2.2 Cancer Slope Factors for Dermal Exposure

As discussed above, USEPA has not derived toxicity values for the dermal route of exposure. In the absence of dermal reference toxicity values, USEPA has suggested (EPA, 1989a) that, in some cases, it is appropriate to modify an oral slope factor so it can be used to estimate the risk incurred by dermal exposure. The oral slope factors were converted to dermal slope factors by dividing by the oral absorption efficiency. The same values presented in Section 5.4.1.2 were used, however, if chemical specific modification factors were unavailable, oral values are used without adjustment. As discussed previously any valuation of the contribution of dermal exposure to the overall risk needs to be viewed as highly tentative at best. This is particularly true for PAH's which are carcinogens at the point of contact, i.e., to skin.

5.4.2.3 Toxic Equivalency Factors

When slope factors and unit risks were not available for all potentially carcinogenic members of a chemical class, toxicity values were calculated using toxicity equivalency factors (TEFs). TEFs are values that compare the carcinogenic potential of a given chemical in a class to the carcinogenic potential of a chemical in the class that has a verified slope factor and/or unit risk. USEPA has provided TEFs for PAHs (EPA, 1993b). TEF values are as follows:

PAH	TEF
Benzo(a)pyrene	1.0
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Dibenzo(a,h)anthracene	1.0
Chrysene	0.001
Indeno(1,2,3-cd)pyrene	0.1

To calculate a slope factor or unit risk for a given PAH the appropriate TEF value is multiplied by the slope factor or unit risk for benzo(a)pyrene.

5.5 RISK CHARACTERIZATION

5.5.1 Introduction

To characterize risk, toxicity and exposure assessments were summarized and integrated into quantitative and qualitative expressions of risk. To characterize potential noncarcinogenic effects, comparisons were made between projected intakes of substances and toxicity values. To characterize potential carcinogenic effects, probabilities that an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response information. Major assumptions, scientific judgments, and, to the extent possible, estimates of the uncertainties embodied in the assessment are also presented.

5.5.1.1 Noncarcinogenic Effects

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period with an RfD derived for a similar exposure period. This ratio of exposure to toxicity is called a hazard quotient according to the following equation:

$$\textit{Noncancer Hazard Quotient} = E/RfD$$

Where:

E = Exposure level or intake (mg/kg-day), and
RfD = Reference Dose (mg/kg-day)

The noncancer hazard quotient assumes that there is a level of exposure (i.e., an RfD) below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level (E) exceeds the threshold (i.e., If E/RfD exceeds unity) there may be concern for potential noncancer effects.

To assess the overall potential for noncarcinogenic effects posed by more than one chemical, a hazard index (HI) approach has been developed by the USEPA. This approach assumes that simultaneous sub-threshold exposures to several chemicals could result in an adverse health effect. It also assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures to respective acceptable exposures.

This is expressed as:

$$HI = E_1/RfD_1 + E_2/RfD_2 + ... + E_i/RfD_i$$

Where:

E_i = the exposure level or intake of the I toxicant, and

RfD_i = reference dose for the i^{th} toxicant.

While any single chemical with an exposure level greater that the toxicity value will cause the HI to exceed unity, for multiple chemical exposures, the HI can also exceed unity even if no single chemical exposure exceeds its RfD. The assumption of dose additivity reflected in the HI is best applied to compounds that induce the same effects by the same mechanisms. Applying the HI to cases where the known compounds do not induce the same effect may overestimate the potential for effects. To assess the overall potential for noncarcinogenic effects posed by several exposure pathways, the total HI for chronic exposure is the sum of the HI's for each pathway, for each receptor.

5.5.1.2 Carcinogenic Effects

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen (i.e., excess individual lifetime cancer risk). The slope factor converts estimated daily intakes averaged over a lifetime

of exposure directly to incremental risk of an individual developing cancer. It can generally be assumed that the dose-response relationship will be linear in the low-dose portion of the multistage model dose-response curve. Under this assumption, the slope factor is a constant, and risk will be directly related to intake. Thus, the following linear low-dose equation was used in this assessment:

$$Risk = CDI \times SF$$

Where:

Risk = A unitless probability of an individual developing cancer,
CDI = Chronic Daily Intake over 70 years (mg/kg-day), and
SF = Slope Factor $(mg/kg\text{-}day)^{-1}$

Because the slope factor is often an upper 95th-percentile confidence limit of the probability of a response and is based on animal data used in the multistage model, the carcinogenic risk will generally be an upper-bound estimate. This means that the "true risk" is not likely to exceed the risk estimate derived through this model and is likely to be less than predicted.

For simultaneous exposure to several carcinogens, the USEPA assumes that the risks are additive. That is to say:

$$Risk_T = Risk1 + Risk2 + ... + Risk_i$$

Where:

$Risk_T$ = Total cancer risk, expressed as a unitless probability, and
$Risk_i$ = Risk estimate for the i^{th} substance.

Addition of the carcinogenic risks is valid when the following assumptions are met:

- doses are low,
- no synergistic or antagonistic interactions occur, and
- similar endpoints are evaluated.

According to guidance in the National Contingency Plan, the target overall lifetime carcinogenic risks from exposures for determining clean-up levels should range from 10^{-4} to 10^{-6}.

5.5.2 Risk Summary

Human health risks were calculated for five future exposure scenarios at each site:

- prison inmate
- prison worker
- construction worker
- day care center child
- day care center adult worker.

The potential exposure routes associated with each exposure scenario are as follows:

Prison inmate: Inhalation of ambient air, ingestion of soil, dermal contact with soil, ingestion of groundwater, and dermal contact with and inhalation of groundwater during showering.

Prison worker: Inhalation of ambient air, ingestion of soil, dermal contact with soil, ingestion of groundwater, and dermal contact with and inhalation of groundwater during showering.

Construction worker: Inhalation of ambient air, ingestion of soil, and dermal contact with soil.

Day care center child: Inhalation of ambient air, ingestion of soil, dermal contact with soil, and ingestion of groundwater.

Day care center adult worker: Inhalation of ambient air, ingestion of soil, dermal contact with soil, and ingestion of groundwater.

Cancer and non-cancer risks at each site were calculated for all applicable exposure routes and are presented on a site-by-site basis in **Tables 5.5-1 through 5.5-6**. These tables also serve as a guide to the tables in Appendices A through F which show risk calculations for each exposure route. The following sections highlight the exposure scenarios at each site which result in risks that exceed the USEPA defined targets (lifetime cancer risk range of 10^{-4} to 10^{-6}; non-cancer hazard index less than one).

5.5.2.1 SEAD-120B

Table 5.5-1 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

TABLE 5.5-1

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON INMATE	Inhalation of Dust in Ambient Air	Table A-2	NQ	NQ
	Ingestion of Onsite Soils	Table A-3	8E-003	NQ
	Dermal Contact to Onsite Soils	Table A-4	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*8E-003*	*0E+000*
PRISON WORKER	Inhalation of Dust Ambient Air	Table A-2	NQ	NQ
	Ingestion of Onsite Soils	Table A-3	5E-003	NQ
	Dermal Contact to Onsite Soils	Table A-4	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-003*	*0E+000*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table A-2	NQ	NQ
	Ingestion of Onsite Soils	Table A-3	2E-004	NQ
	Dermal Contact to Onsite Soils	Table A-4	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-004*	*0E+000*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table A-2	NQ	NQ
	Ingestion of Onsite Soils	Table A-3	5E-002	NQ
	Dermal Contact to Onsite Soils	Table A-4	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-002*	*0E+000*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table A-2	NQ	NQ
	Ingestion of Onsite Soils	Table A-3	5E-003	NQ
	Dermal Contact to Onsite Soils	Table A-4	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-003*	*0E+000*

NQ = Not Quantified

TABLE 5.5-2
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON INMATE	Inhalation of Dust in Ambient Air	Table B-2	6E-007	1E-008
	Ingestion of Onsite Soils	Table B-3	2E-002	6E-006
	Dermal Contact to Onsite Soils	Table B-4	2E-002	NQ
	Ingestion of Groundwater	Table B-5	2E-003	NQ
	Inhalation of Groundwater	Table B-8	NQ	NQ
	Dermal Contact to Groundwater	Table B-7	6E-004	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-002*	*6E-006*
PRISON WORKER	Inhalation of Dust Ambient Air	Table B-2	2E-007	4E-009
	Ingestion of Onsite Soils	Table B-3	1E-002	5E-006
	Dermal Contact to Onsite Soils	Table B-4	2E-002	NQ
	Ingestion of Groundwater	Table B-5	1E-003	NQ
	Inhalation of Groundwater	Table B-8	NQ	NQ
	Dermal Contact to Groundwater	Table B-7	4E-004	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-002*	*5E-006*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-2	8E-007	5E-010
	Ingestion of Onsite Soils	Table B-3	6E-003	1E-007
	Dermal Contact to Onsite Soils	Table B-4	2E-003	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*8E-003*	*1E-007*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-2	5E-007	3E-009
	Ingestion of Onsite Soils	Table B-3	1E-001	1E-005
	Dermal Contact to Onsite Soils	Table B-4	3E-002	NQ
	Ingestion of Groundwater	Table B-5	3E-003	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-001*	*1E-005*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-2	2E-007	4E-009
	Ingestion of Onsite Soils	Table B-3	1E-002	5E-006
	Dermal Contact to Onsite Soils	Table B-4	2E-002	NQ
	Ingestion of Groundwater	Table B-5	1E-003	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-002*	*5E-006*

NQ = Not Quantified

TABLE 5.5-3
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-44A
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON INMATE	Inhalation of Dust in Ambient Air	Table C-2	4E-010	5E-009
	Ingestion of Onsite Soils	Table C-3	5E-003	8E-007
	Dermal Contact to Onsite Soils	Table C-4	8E-003	NQ
	Ingestion of Groundwater	Table C-5	2E-003	6E-006
	Dermal Contact to Groundwater	Table C-7	9E-006	8E-007
	Inhalation of Groundwater	Table C-8	NQ	1E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*8E-006*
PRISON WORKER	Inhalation of Dust Ambient Air	Table C-2	1E-010	2E-009
	Ingestion of Onsite Soils	Table C-3	4E-003	6E-007
	Dermal Contact to Onsite Soils	Table C-4	5E-003	NQ
	Ingestion of Groundwater	Table C-5	2E-003	4E-006
	Dermal Contact to Groundwater	Table C-7	6E-006	6E-007
	Inhalation of Groundwater	Table C-8	NQ	9E-008
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-002*	*5E-006*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table C-2	2E-006	3E-010
	Ingestion of Onsite Soils	Table C-3	3E-003	1E-007
	Dermal Contact to Onsite Soils	Table C-4	7E-004	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-003*	*1E-007*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table C-2	3E-010	1E-009
	Ingestion of Onsite Soils	Table C-3	3E-002	1E-006
	Dermal Contact to Onsite Soils	Table C-4	1E-002	NQ
	Ingestion of Groundwater	Table C-8	4E-003	2E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-002*	*4E-006*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table C-2	1E-010	2E-009
	Ingestion of Onsite Soils	Table C-3	4E-003	6E-007
	Dermal Contact to Onsite Soils	Table C-4	5E-003	NQ
	Ingestion of Groundwater	Table C-8	2E-003	4E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-002*	*5E-006*

NQ= Not Quantified due to lack of toxicity data

TABLE 5.5-4

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-44B
Completion Report- Mini Risk Assessment
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON INMATE	Inhalation of Dust in Ambient Air	Table D-2	6E-010	4E-009
	Ingestion of Onsite Soils	Table D-3	5E-003	1E-006
	Dermal Contact to Onsite Soils	Table D-4	6E-003	NQ
	Ingestion of Groundwater	Table D-5	NQ	NQ
	Dermal Contact to Groundwater	Table D-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-002*	*1E-006*
PRISON WORKER	Inhalation of Dust Ambient Air	Table D-2	2E-010	1E-009
	Ingestion of Onsite Soils	Table D-3	3E-003	7E-007
	Dermal Contact to Onsite Soils	Table D-4	4E-003	NQ
	Ingestion of Groundwater	Table D-5	NQ	NQ
	Dermal Contact to Groundwater	Table D-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*7E-003*	*7E-007*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table D-2	7E-011	2E-011
	Ingestion of Onsite Soils	Table D-3	2E-004	2E-009
	Dermal Contact to Onsite Soils	Table D-4	5E-005	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-004*	*2E-009*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table D-2	5E-010	8E-010
	Ingestion of Onsite Soils	Table D-3	3E-002	2E-006
	Dermal Contact to Onsite Soils	Table D-4	7E-003	NQ
	Ingestion of Groundwater	Table D-5	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-002*	*2E-006*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table D-2	2E-010	1E-009
	Ingestion of Onsite Soils	Table D-3	3E-003	7E-007
	Dermal Contact to Onsite Soils	Table D-4	4E-003	NQ
	Ingestion of Groundwater	Table D-5	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*7E-003*	*7E-007*

NQ= Not Quantified due to lack of toxicity data

TABLE 5.5-5

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-52
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON INMATE	Inhalation of Dust in Ambient Air	Table E-5	NQ	NQ
	Ingestion of Onsite Soils	Table E-6	3E-003	7E-007
	Dermal Contact to Onsite Soils	Table E-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-003*	*7E-007*
PRISON WORKER	Inhalation of Dust Ambient Air	Table E-5	NQ	NQ
	Ingestion of Onsite Soils	Table E-6	2E-003	5E-007
	Dermal Contact to Onsite Soils	Table E-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-003*	*5E-007*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table E-5	NQ	NQ
	Ingestion of Onsite Soils	Table E-6	4E-004	5E-009
	Dermal Contact to Onsite Soils	Table E-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-004*	*5E-009*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table E-5	NQ	NQ
	Ingestion of Onsite Soils	Table E-6	2E-002	1E-006
	Dermal Contact to Onsite Soils	Table E-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*1E-006*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table E-5	NQ	NQ
	Ingestion of Onsite Soils	Table E-6	2E-003	5E-007
	Dermal Contact to Onsite Soils	Table E-7	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-003*	*5E-007*

NQ= Not Quantified due to lack of toxicity data

TABLE 5.5-6

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-62
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
PRISON WORKER	Inhalation of Dust in Ambient Air	Table F-2	NQ	3E-009
	Ingestion of Onsite Soils	Table F-3	3E-003	NQ
	Dermal Contact to Onsite Soils	Table F-4	7E-003	NQ
	Ingestion of Groundwater	Table F-5	2E-002	6E-007
	Inhalation of Groundwater	Table F-8	2E-002	3E-007
	Dermal Contact to Groundwater	Table F-7	3E-003	8E-008
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-002*	*9E-007*
PRISON WORKER	Inhalation of Dust Ambient Air	Table F-2	NQ	1E-009
	Ingestion of Onsite Soils	Table F-3	2E-003	NQ
	Dermal Contact to Onsite Soils	Table F-4	5E-003	NQ
	Ingestion of Groundwater	Table F-5	1E-002	4E-007
	Inhalation of Groundwater	Table F-8	1E-002	2E-007
	Dermal Contact to Groundwater	Table F-7	2E-003	5E-008
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-002*	*6E-007*
ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table F-2	NQ	1E-009
	Ingestion of Onsite Soils	Table F-3	1E-002	NQ
	Dermal Contact to Onsite Soils	Table F-4	5E-003	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*1E-009*
DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table F-2	NQ	7E-010
	Ingestion of Onsite Soils	Table F-3	2E-002	NQ
	Dermal Contact to Onsite Soils	Table F-4	9E-003	NQ
	Ingestion of Groundwater	Table F-5	3E-002	2E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*6E-002*	*2E-007*
DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table F-2	NQ	1E-009
	Ingestion of Onsite Soils	Table F-3	2E-003	NQ
	Dermal Contact to Onsite Soils	Table F-4	5E-003	NQ
	Ingestion of Groundwater	Table F-5	1E-002	4E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*4E-007*

NQ= Not Quantified due to lack of toxicity data

5.5.2.2 SEAD-43, 56, 69

Table 5.5-2 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

5.5.2.3 SEAD-44A

Table 5.5-3 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

5.5.2.4 SEAD-44B

Table 5.5-4 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

5.5.2.5 SEAD-52

Table 5.5-5 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

5.5.3.6 SEAD-62

Table 5.5-6 summarizes the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors.

5.5.3.7 Total Construction Worker Risk

The Hazard Indices and Cancer Risks shown in **Tables 5.5-1 through 5.5-6** for the construction worker reflect the exposure that occurs while the construction worker is working in just one

specific AOC. This represents only a portion of the construction worker's entire exposure duration at the AOCs. (The Hazard Indices and Cancer Risks for the other receptors in Tables **5.5-1 through 5.5-6** conservatively assume that the receptor is continually exposed to soil and groundwater at the specific AOC for the entire Exposure Duration.) In order to estimate the construction worker's composite risk from his/her entire exposure during the construction project, the AOC-specific risks must be added together.

Table 5.5-7 summarizes the calculated cancer and non-cancer risks for the construction worker from his/her combined exposure to all six AOCs. The total cancer risk from all AOCs is below the EPA target range for the construction worker. Likewise, the total non-cancer hazard index from all AOCs is less than one for the construction worker.

5.5.4 Risk Characterization for Lead

The previous analyses of the current and future land use exposure scenarios do not include any quantification of risk for lead since no approved RfD, RfC, slope factor or inhalation unit risk currently are available. Lead was consistently detected at the AOCs in soil and groundwater. This section qualitatively addresses the risk from lead exposure at the AOCs.

The effects of lead are the same regardless of whether it enters the body through breathing or ingestion. The major health threat from lead arises from the damage it causes to the brain, especially in fetuses, infants and young children, which are not part of the current site users. Young and developing humans are highly sensitive to its effects. Also, young children are prone to ingest more lead as a result of normal mouthing behavior. Decreased IQ and reduced growth may result from childhood exposure. Fetal exposure may result in preterm birth, reduced birth weight, and decreased IQ. Some of the health effects of lead, particularly changes in the levels of certain blood enzymes and in aspects of children's neurobehavioral development, may occur at blood levels so low as to be essentially without a threshold.

Lead exposures may increase blood pressure in middle-aged men. High-level exposure can severely damage the brain and kidneys in adults or children. In addition, high doses of lead will cause abortion and damage to the male reproductive system. The USEPA currently does not provide any toxicity values for lead. The USEPA has placed lead in weight-of-evidence Group B2, indicating that it is a probable human carcinogen.

USEPA has developed different approaches for assessing risks from adult and child exposure to lead. To address adult exposures, EPA issued "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (USEPA, December 1996c). To address child exposures, EPA

TABLE 5.5-7

TOTAL CONSTRUCTION WORKER RISK FROM EXPOSURE TO ALL AREAS OF CONCERN (AOCs)
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Area of Concern	Hazard Index	Cancer Risk
SEAD-120B	2E-004	1E-012
SEAD-43, 56, 69	8E-003	1E-007
SEAD-44A	3E-003	1E-007
SEAD-44B	3E-004	2E-009
SEAD-52	4E-004	5E-009
SEAD-62	2E-002	1E-009
TOTAL *	3E-002	2E-007

* Total Hazard Index and Cancer Risk are calculated as the risk due to a one-year construction project where exposure occurs at each AOC for a portion of the project.

recommends use of the Integrated Exposure Uptake Biokinetic Model for Lead (Version 0.99), and the associated "Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children" (USEPA, February 1994). The analysis of potential risk from exposure to lead at the AOCs follows these recommendations for adult and child exposures, respectively.

Child Day Care Center Exposure

USEPA has determined that blood lead levels as low as 10-15 ug/dL in infants or young children indicate an increased risk of irreversible neurobehavioral deficits (USEPA, 1996c). Where young children may be consistently exposed to lead, such as in a residential scenario, risk may be calculated using the Integrated Exposure Uptake Biokinetic Model (IEUBK) which predicts the blood lead concentrations in children exposed to lead through a variety of media. The model is designed to estimate blood lead levels using a combination of default assumptions and site-specific exposure information where available. The model contains two modules: uptake and biokinetic. The uptake module estimates the quantity of lead taken into the body (uptake) from exposure to lead in five media (air, drinking water, soil/dust, food and paint). The biokinetic module estimates the distribution of this lead among various bodily organs and, most importantly, in the blood.

The IEUBK model calculates a child's uptake and blood lead levels assuming a constant daily exposure in each of several environmental media (air, soil, etc.). The model includes default values for many exposure parameters which change by age, to realistically reflect growth changes in a child (e.g. different inhalation rates and drinking water intakes). The default values used in IEUBK model are based on nationwide surveys of lead distribution in the environment and studies of inhalation and ingestion for each age group modeled (children age 0-7). For the IEUBK simulations performed for this risk assessment, the default values were used for most input parameters.

The IEUBK model was used to estimate the risk associated with a child's ingestion of soil and groundwater while attending a day care center located at the AOCs. To simulate this scenario, we assumed that a child was exposed to soil and groundwater at the AOC five days per week. The IEUBK model contains default values for soil ingestion rates based on daily (i.e., seven days per week) exposure. These values were multiplied by 5/7 to reflect exposure only at the day care center. This calculation assumes that the child is not exposed to lead in soil or dust at home (i.e., on the two days per week that the child does not attend the day care center).

The IEUBK model includes default assumptions regarding indoor dust ingestion rates and lead concentrations. The IEUBK manual recommends that soil represents 45% of the total soil plus dust ingestion rate. These default assumptions were used.

The child is potentially exposed to lead via other pathways. The IEUBK model includes default exposures for lead in air and diet. The recommended default values were used for all non-soil/dust/groundwater exposures.

The IEUBK model parameter input values used for this assessment are summarized in **Table 5.5-8**.

One day care exposure simulation was performed for this assessment. The IEUBK model was run to derive an example allowable soil lead concentration following the approach used by USEPA in deriving a target lead concentration for residential soil, in the Office of Solid Waste and Emergency Response (OSWER) Interim Directive #9355.4-12 titled "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities" (USEPA, August 1994b). The IEUBK model output for this simulation is shown in **Appendix H**. The results of these analyses are discussed below.

In the Interim Directive document, EPA derived a target lead concentration of 400 ppm lead in soil, based on its IEUBK model simulation. This simulation, which included default assumptions for all exposure pathways, estimated that with residential exposure to soil containing 400 ppm of soil, a child has a 95% probability of having a blood lead level less than 10 ug/dL. A similar calculation was performed for this assessment based on the day care center soil ingestion scenario, as described above. For this day care center scenario, the IEUBK model predicts a 95% probability of having a blood lead level less than 10 ug/dL at a soil lead concentration of 625 ppm.

Figures 5.5-1 and 5.5-2 illustrate the IEUBK model results. **Figure 5.5-1** is a plot of the cumulative probability distribution for exceeding 10 ug/dL lead in blood, associated with day care exposure to an average concentration of 625 ppm lead in soil. This plot shows that the probability of exceeding 10 ug/dL is 5%. **Figure 5.5-2** shows the median blood lead levels at each age predicted for day care exposure to 625 ppm lead in soil. This figure also shows the IEUBK predictions for EPA's residential scenario target level of 400 ppm lead in soil. It can be seen that the results for the day care scenario and EPA's residential scenario are nearly identical. This result indicates that a target average concentration of 625 ppm lead in soil for day care exposure is consistent with EPA's residential target concentration and equally health-protective. The maximum soil concentrations of lead measured at each of the AOCs are all less than 625 ppm (highest value at SEAD-120B was 522 ppm).

TABLE 5.5-8
IEUBK LEAD MODEL INPUT VALUES

Air Concentration	0.100 µg Pb/m^3 (default)
Other Inhalation Parameters	Standard Model defaults for all
Time Outdoors	value varies with age
Inhalation Rate	value varies with age
Lung Absorption	32%
Dietary Lead Intake	Std. Model Defaults: value varies with age
Soil Concentration	625 ppm
Dust Concentration	200 ppm (default)
Soil Ingestion as percent of total soil and dust ingestion	45% (default)
Soil/dust Ingestion rates	5/7 x Std. default values (to represent time at day care center): value varies with age
Maternal blood concentration contribution (for infant)	2.5 µg Pb/dL (default)
Drinking Water Concentration	4.0 µg/L (default)
Drinking Water Ingestion Rate	Std. Model Defaults: value varies with age
Bioavailability Parameters for Ingestion Absorption	Std. Model defaults

Figure 5.5-1

IEUBK Model Results
Example Allowable Soil Pb Concentration for Day Care Scenario
Cumulative Probability Plot of Blood Lead Concentration

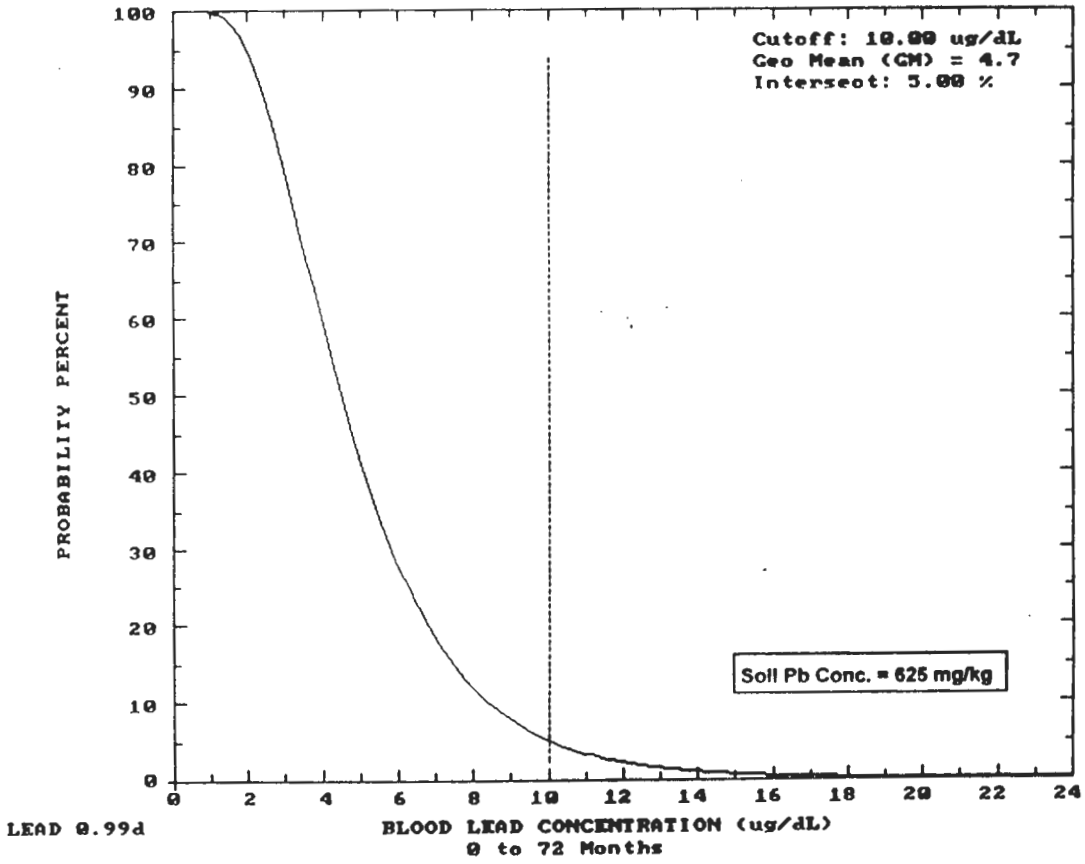
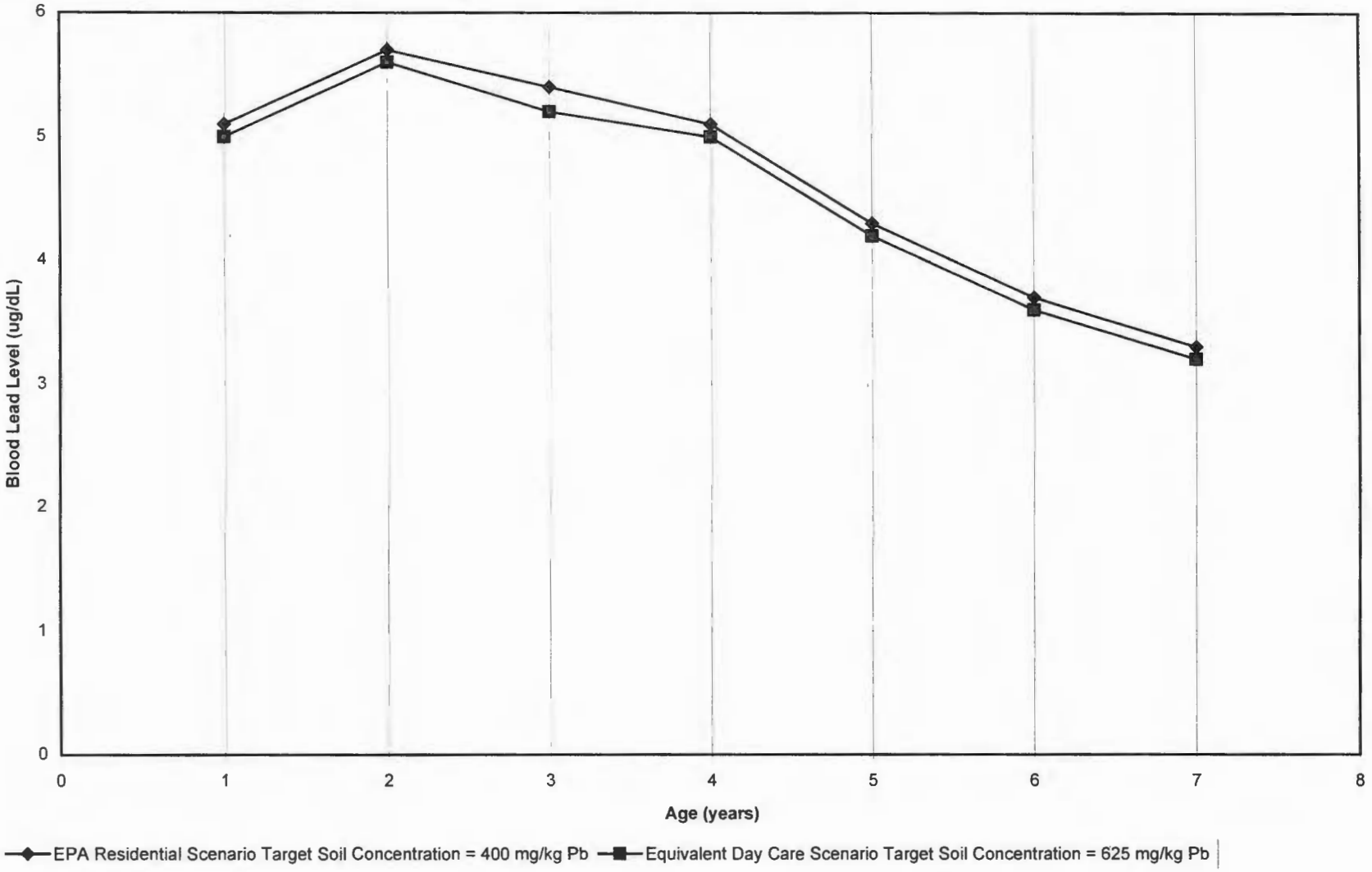


Figure 5.5-2
IEUBK Model Results
Comparison of Example Day Care Scenario with EPA Residential Scenario Target Soil Levels



Adult Occupational Exposure

To qualitatively assess risks from adult occupational lead exposure, the site concentrations are compared with risk-based remediation goals (RBRGs) presented in "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (USEPA, December 1996). In this report, EPA presents a model to calculate target soil concentrations of lead (RBRGs) at which the exposure for a women of child-bearing age would minimize risk to her fetus. Thus, while adult exposure is addressed by EPA's analysis, the most sensitive receptor (i.e., the fetus) is being protected.

EPA has calculated RBRGs for lead in soil using their recommended default parameters as inputs to the model. For a homogeneous, non-urban population exposed for 219 days per year, EPA suggests an RBRG of 1750 mg/kg lead in soil. The EPA RBRG for urban areas is 750 mg/kg. While SEDA is more comparable to the non-urban case, the Army believes a more conservative RBRG of 1250 mg/kg is appropriate for the AOCs.

The maximum concentrations for lead in surface soil and total soils at the AOCs range from 25 to 522 mg/kg, which are all less than the Army target value of 1,250 mg/kg discussed above. The highest outdoor air EPC for lead is 0.18 ug/m^3 (at SEAD 120B, during construction activities). This value is lower than the National Ambient Air Quality Standard for lead, which is 1.5 ug/m^3 (based on a 3-month average).

These results suggest that lead does not pose a health risk upon regular exposure to the site soils for any receptor at the site.

5.5.5 Uncertainty Assessment

All risk assessments involve the use of assumptions, judgements, and imperfect data to varying degrees. This results in uncertainty in the final estimates of risk. There are uncertainties associated with each component of the risk assessment from data collection through risk characterization. For example, there is uncertainty in the initial selection of substances used to characterize exposures and risk on the basis of the sampling data and available toxicity information. Other sources of uncertainty are inherent in the toxicity values for each substance and the exposure assessments used to characterize risk. Finally, additional uncertainties are incorporated into the risk assessment when exposures to several substances across multiple pathways are summed. Areas of uncertainty in each risk assessment step are discussed below.

5.5.5.1 Uncertainty in Data Collection and Evaluation

Uncertainties in the data collection/evaluation step of the risk assessment focus on determining whether enough samples were collected to adequately characterize the risk, and if sample analyses were conducted in a qualified manner to maximize the confidence in the results. Results of the sample analyses were used to develop a database which includes a complete list of the chemicals by media and their representative concentrations used in the risk assessment. The sampling and analysis addressed various objectives in addition to the risk assessment. Therefore, the samples were not collected randomly but were collected from areas of the site with the greatest likelihood to be contaminated. This type of non-random sampling biases the data collected toward overestimating chemical concentrations from the site.

All chemicals detected that were potentially site-related were retained in this assessment. Chemicals that were never detected were eliminated from the assessment. This practice may slightly underestimate risks due to low levels (i.e., below the sample quantitation limit) of eliminated chemicals. Since samples were collected at areas where concentrations were expected to be high and the maximum concentrations were used for the assessment, it is very unlikely that any chemicals were present at the site at health-significant levels and not detected in at least one sample. However, if this did occur, this assumption will underestimate risk. The maximum concentrations were used to calculate site-related risks. Since that assumption implies chronic exposure to the maximum concentration, this assumption is likely to overestimate risk.

5.5.5.2 Uncertainty in Exposure Assessment

There are inherent uncertainties in predicting future land uses and future chemical concentrations. Future land use scenarios were based on current plans to build a prison on this portion of SEDA.

A large part of the risk assessment is the estimation of risks for a broad set of exposure scenarios and pathways. If exposure does not occur, no risks are present. This assessment does not factor in the probability of the exposure occurring. For certain pathways, exposure may be extremely unlikely. For example, the future receptors are assumed to drink groundwater. It is unlikely that this will occur, since there is a current acceptable water supply, and the aquifer beneath the site is not believed to be productive enough to supply the needs of the prison. This assumption yields an overestimate of risk for this scenario.

Once pathways are identified, exposure point concentrations must be estimated. There is always some doubt as to how well an exposure model approximates the actual conditions receptors will be exposed to at a given site. Key assumptions in estimating exposure point concentrations and

exposure assumptions and their potential impact on the assessment are described in the following paragraphs.

As summarized in **Table 5.3-1**, there are many factors which determine the level of exposure for each exposure pathway. These factors include inhalation rates, ingestion rates, exposure frequencies, exposure durations, body weight, etc. The values for these exposure factors must be selected by the risk assessor to represent each receptor. For the scenarios in this risk assessment, upper bound values were selected for each exposure factor. In the calculations of exposure, these multiple upper-bound exposure factor estimates compound to yield intakes and absorbed doses which overestimate likely exposure levels.

The EPCs (i.e., maximum concentrations) derived from the measured chemical concentrations are assumed to persist without change for the entire duration of each exposure scenario. It is likely that some degradation would occur over time, particularly for some of the organic compounds, that would reduce the current concentrations. Therefore, this steady state assumption tends to overestimate exposure levels.

5.5.5.3 Uncertainty in Toxicity Assessment

Of the chemicals of potential concern, a number had no reference dose or slope factors. They are:

- acenaphthylene
- dibenzofuran
- phenanthrene
- benzo(g.h.i)perylene
- calcium
- lead
- magnesium
- potassium
- sodium
- Endrin aldehyde
- Endrin ketone
- dichloroprop

Several of these compounds have toxicity information such as weight of evidence classification indicating a strong potential for adverse health effects, particularly lead. The absence of toxicity values for these chemicals tends to underestimate risks.

There is considerable uncertainty inherent in the toxicity values for both carcinogens and noncarcinogens. Many of the studies are based on animals and extrapolated to humans, and in some cases, subchronic studies must be used to assess chronic effects. Most cancer slope factors are calculated using a model which extrapolates low dose effects from high dose animal studies. Because toxicity constants are generally based on the upper limit of the 95th-percentile confidence interval or incorporate safety factors to compensate for uncertainty, chemical-specific risks may be overestimated.

Toxicity information was not available for dermal exposure; hence, several assumptions had to be made which may tend to over- or underestimate risk. Oral toxicity values were used without adjustment to calculate risks from dermal exposure because the USEPA has not derived toxicity values for this route of exposure. However, values found in the literature (Owen, 1990) indicate that the uncertainty associated with using oral absorption to estimate dermal absorption is likely less than one order of magnitude. This is due to the lack of scientific studies available to quantify dermal toxicity and carcinogenic potential for the vast majority of priority pollutants and because chemical specific information needed to convert ingested dose to absorbed dose is not available.

5.5.5.4 Uncertainty in Risk Characterization

Uncertainties in the toxicity assessment are compounded under the assumption of dose additivity for multiple substance exposure. That assumption ignores possible synergisms and antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism. Overall, these assumptions would tend to overestimate risk. Similarly, risks summed for chemicals having various weight-of-evidence classifications as well as different target organs may also tend to overestimate risk.

5.6 ECOLOGICAL RISK ASSESSMENT (ERA)

5.6.1 Objectives and Overview

In addition to the evaluation of human health, this mini-risk assessment considers the risk posed by the site to its ecological communities. This ecological risk assessment (ERA) is intended to indicate the potential, if any, of chemicals found at the Areas of Concern (AOCs) to pose a risk or stress to plants or animals which may inhabit or visit any of these sites.

Other areas of SEDA have been studied to characterize the ecological communities at SEDA in general and at specific SEADs (e.g. SEADs 16, 17, 25 and 26). Field surveys during the

Remedial Investigations of these SEADs produced an understanding of the habitat, vegetative communities and wildlife species present at the site. Since the land at the sites considered in this risk assessment is environmentally similar to the other areas at SEDA which have been studied in depth, the existing ecological characterizations are considered to apply as well to these sites. Therefore, this mini-ERA is based upon the findings of these prior field surveys. An ecological field survey specific to the prison land has not been performed.

As preceding sections of this report have indicated, the existing site-specific database of chemical and physical information was developed to characterize the types, locations, and concentrations of chemicals in soil, sediment, surface water, and groundwater. Calculations in this mini-ERA are conservatively based on the maximum concentrations of each chemical detected in each medium of potential concern to ecological receptors (e.g., soil, sediment, and surface water).

The ERA addresses potentially significant risks to the following biological groups and special-interest resources associated with the site: vascular vegetation, wildlife, aquatic life, endangered and threatened species, and wetlands. The focus of the ERA lies in the evaluation of the potential toxicity of each constituent of potential concern (COPC) in soil and defines toxicity benchmark values that will be used to calculate the ecological risk quotient.

The purpose of the ERA is to evaluate the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to chemicals associated with the site based on a weight-of-evidence approach. An ecological risk does not exist unless a given contaminant has the ability to cause one or more adverse effects and it is contacted by, an ecological receptor for a sufficient length of time, or at a sufficient intensity to elicit the identified adverse effect(s) (EPA, 1997a).

In this ERA, ecological receptors were determined based on prior studies at SEDA. Impacts from exposure to these receptors are determined using conservative assumptions to assure that a reasonable degree of protection is maintained. Ecological risk is then presented in terms of a hazard quotient (HQ), which is defined as the ratio of the estimated exposure point concentration to an appropriate toxicity reference value (TRV). Separate HQs are calculated for each contaminant/receptor pair. Uncertainties are the greatest and arise from extrapolation of the available toxicity data and inference regarding exposure. In general, ratios of exposure point concentration to TRV greater than one (1) are considered to indicate a potential risk. Due to the uncertainties associated with using this approach, safety factors are considered in interpreting the findings. HQs between 1 and 10 are interpreted as having some potential for adverse effects; whereas, HQs between 10 and 100 indicate a significant potential for adverse effects. HQs greater than 100 indicate adverse effects can be expected.

5.6.2 Problem Formulation

Problem formulation establishes the goals, breadth, and focus of the ERA through the following:

- Identification of the ecological contaminants of potential concern (COPCs);
- Identification of potential ecological effects;
- Development and review of information about ecosystems potentially at risk, contaminant fate and transport, and complete exposure pathways;
- Selection of assessment endpoints;
- Presentation of an ecological conceptual site model; and
- Selection of an analysis plan (including measures of effects).

Each of these steps is discussed and described in the following sections.

5.6.2.1 Identification of Ecological Constituents of Potential Concern

Chemicals detected in any sample for a given environmental medium of interest (soil, sediment, or surface water) were considered constituents of potential concern (COPCs) for this ERA. Screening analyses designed to reduce the list of COPCs were not performed for this mini-ERA. The highest concentration for each COPC measured in samples from each of the sites was used as the exposure point concentration (EPC) in the calculations presented later in this section for the site.

5.6.2.2 Identification of Potential Ecological Effects

Available state and federal databases and literature sources were reviewed to determine if there were any known threatened or endangered plant or animal species present at or near the Depot. Additionally, a literature search was conducted to obtain information on the identified ecological contaminants of potential concern and their potential ecological effects on species of potential concern at the Depot. Topics reviewed during this assessment included information for exposure profiles, bioavailability or bioconcentration factors for various COPCs, life-history information for the species of concern or the surrogate species, and an ecological effects profile.

5.6.2.3 Ecosystems at Risk, Contaminant Fate and Transport, and Complete Exposure Pathways

5.6.2.3.1 Site Habitat Characterization

Detailed site-specific ecological evaluations of the plant and animal habitats and communities found at the prison sites have not been conducted. Characterizations of the site habitat and ecological communities present at the subject sites are based on general observations made during preliminary site investigations and on the results of detailed ecological evaluations and assessment that have been conducted at other SWMUs at the Depot (i.e., for SEADs-16, 17, 25 and 26 and the Open Burning (OB) Grounds) as part of remedial investigations. The results and findings of the detailed ecological characterizations completed at the other four SWMUs are assumed to be representative of the sites included in this mini-ERA. Key aspects of these characterizations relevant to this mini-risk assessment are presented below.

Ecological site characterizations were based on compilation of existing ecological information and on-site reconnaissance activities. The methods used to characterize the ecological resources included site-walkovers for the evaluation of existing wildlife and vegetative communities; interviews with local, state, and SEDA resource personnel; and review of environmental data obtained from previous Army reports. SEDA has a strong wildlife management program that is reviewed and approved by the New York Fish and Game Agency. The Depot manages an annual white-tailed deer (Odocoileus virginiana) harvest and has constructed a large wetland called the "duck pond" in the northeastern portion of the facility to provide a habitat for migrating waterfowl.

The NYSDEC Natural Heritage Program Biological and Conservation Data System identifies no known occurrences of federal- or state-designated threatened or endangered plant or animal species within a 2-mile radius of the site. No species of special concern are documented within the Depot property.

The only significant terrestrial resource known to occur at SEDA is the population of white-pelaged white-tailed deer (Odocoileus virginiana), which inhabits the fenced portion of the Depot. Annual deer counting conducted at the Depot indicates that the size of the deer herd is approximately 600 animals of which approximately one-third (i.e., 200) are white-pelaged. Since the Depot is totally enclosed, the white-pelaged deer is thought to result from inbreeding within the herd. The depot maintains the herd through an annual hunting season to prevent overgrazing and starvation of the deer. The management plan of the herd is conducted by the New York State DFW. The normal brown-pelaged deer are also common. White-tailed deer are not listed as a rare or endangered species.

Agricultural crops and deciduous forests comprise the vegetative resources used by humans near SEDA. Although no crops are grown on the Depot, farmland is the predominant land use of the surrounding private lands. Crops including corn, wheat, oats, beans and hay mixtures, are grown primarily for livestock feed. Deciduous forestland on the Depot and surrounding private lands is under active forest management. Timber and firewood are harvested from private woodlots that surround the Depot, but timber harvesting does not occur on the Depot.

Several wildlife species are hunted and trapped on private lands near SEDA. Game species hunted include the eastern cottontail, white-tailed deer, ruffed grouse, ring-necked pheasant and various waterfowl. Gray squirrel and wild turkey are hunted to a lesser extent. Fur-bearing species trapped in the study area include red and gray fox and raccoon. Muskrat and beaver are trapped to a lesser extent (Woodruff 1992). On the Depot, deer, waterfowl and small game hunting is allowed, although the designated waterfowl hunting area is outside the study area. Trapping is also permitted (SEDA 1992) on the Depot.

Animals that have been identified at the depot during prior ecological surveys include beaver, eastern coyote, deer, red and gray fox, eastern cottontail rabbit, muskrat, raccoon, gray squirrel, striped skunk, and the woodchuck. Birds species that have been identified include the bluejay, black-capped chickadee, American crow, mourning dove, northern flicker, ruffed grouse, ring-billed gull, red-tailed hawk, northern junco, American kestrel, white breasted nuthatch, ring-necked pheasant, American robin, eastern starling, turkey vulture, and pileated woodpecker.

There are no permanent lakes, ponds, streams or wetlands in any of the prison sites. Surface water only exists intermittently in drainage ditches; thus, it does not directly support aquatic life.

No signs of stressed or altered terrestrial biota (vegetation and wildlife species) were observed during the surveys in any of the 22 sites considered in this assessment. There were no indications of unnatural die-off or stunted vegetation.

5.6.2.3.2 Contaminant Fate and Transport

The primary sources of contaminants at the prison sites are the residues of former operations and activities that were conducted in the identified SEADs. These residues reside primarily in the soils that remain at the sites. As is indicated above, permanent ponds, lakes, wetlands, rivers, etc. do not exist on any of the sites covered by this ecological risk assessment; therefore, contaminants found at the site only exist intermittently in surface water that is occasionally found in the drainage ditches present at the subject sites. Similarly, contaminants found in

sediments sampled from the drainage ditches are more similar to soil than sediment associated with a surface water body (e.g., river or lake), from an ecological exposure standpoint.

Contamination, if present, in the soil residues may migrate from the original sites of release due to bioturbation or excavation. Volatile compounds can move through the soils. Infiltrating rainwater can leach contaminants and transport them into groundwater, and surface water runoff may also carry contaminants onto adjacent soils or drainage ditches.

5.6.2.3.3 Complete Exposure Pathways

An exposure point is a location where a receptor could potentially come into contact with a contaminated medium. An exposure route is the means by which a receptor comes into contact with a contaminated medium at an exposure point. Exposure to COPCs may occur through the routes of ingestion, inhalation, and dermal contact.

There are five media through which ecological receptors could potentially be exposed to site-related contaminants: air (dust and vapor), soil, surface water, sediment, and organisms in the food chain. Probable exposure routes (i.e., potentially complete pathways) were identified for each medium based on the physical characteristics of the site and the potential ecological receptors that may occur there.

Exposure to soil contaminants may occur directly through ingestion, inhalation, and/or dermal contact. Chemicals also may migrate further in the environment by a variety of pathways following secondary release from surface soil and deeper soil. The following pathways result from these secondary release mechanisms:

- Suspension and dispersal by the wind of particulate contaminants or contaminants adsorbed to surface soil particles.
- Direct volatilization of volatile organic compounds from surface soil to air.
- Uptake of soil contaminants by terrestrial organisms.
- Transport of chemicals to surface water and sediment by surface runoff of water and soil particles.

Exposure routes were also identified for the potential avian and mammalian ecological receptors. Principal pathways for which analytical data were available for quantitative evaluation of soil COPCs include ingestion of soil and ingestion of other animals and plants that have accumulated contaminants. For sediment and surface water, principal pathways include direct contact with surface water and sediment, ingestion of surface water and sediment, and ingestion of other organisms that have accumulated contaminants. However, since permanent surface water bodies

do not exist at any of the sites, exposure via ingestion or dermal contact with surface water was considered incidental and not quantitatively evaluated. Similarly, since sediment does not permanently exist at these sites, exposure via this media is considered equivalent to that represented and quantified for soil.

As is indicated above, permanent lakes, ponds, wetlands, rivers, etc. are not present in the sites considered in this risk assessment. Therefore, surface water and sediment do not pose a risk to permanent aquatic life populations (e.g., fish, invertebrates, etc.) since such populations do not exist at any of these sites.

5.6.2.4 Ecological Assessment Endpoint(s)

EPA's interim final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1997a) states that the selection of assessment endpoints depends on the following:

- The constituents present and their concentrations,
- Mechanisms of toxicity to different groups of organisms,
- Potential species present, and
- Potential complete exposure pathways.

The constituents and concentrations of site COPCs are discussed in detail in **Section 4**. Species identified at the Depot were identified in **Section 5.6.2.3.1** and final receptor selection is described below. Mechanisms of toxicity are evaluated conceptually in the analysis plan in **Section 5.6.2.3.2**. Complete exposure pathways were discussed in **Section 5.6.2.3.3**.

To assess whether significant adverse ecological effects have occurred or may occur at the sites because of the ecological receptors' exposure to COPCs, ecological endpoints were selected. An ecological endpoint is a characteristic of an ecological component that may be affected by exposure to a stressor, such as a chemical. Assessment endpoints represent environmental values to be protected and generally refer to characteristics of populations and ecosystems (EPA, 1997a). Unlike the human health risk assessment process, which focuses on individual receptors, the ERA focuses on populations or groups of interbreeding non-human, non-domesticated receptors. In the ERA process, risks to individuals are assessed only if they are protected under the Endangered Species Act, as well as species that are candidates for protection or are considered rare.

Given the diversity of the biological world and the multiple values placed on it by society, there is no universally-applicable list of assessment endpoints. Therefore, EPA, in the *Guidelines for*

Ecological Risk Assessment (EPA, 1998) has suggested three criteria that should be considered in selecting assessment endpoints suitable for a specific ecological risk assessment. These criteria are: ecological relevance, susceptibility to the contaminant(s), and representation of management goals.

- Ecological relevance. The assessment endpoint should have biological/ecological significance to a higher level of the ecological hierarchy. Relevant endpoints help sustain the natural structure, function, and biodiversity of an ecosystem. For example, an increase in mortality or a decrease in fecundity of individuals is ecologically significant if it affects the size or productivity of the population. Likewise, a decrease in the size of a population is ecologically significant if it affects the number of species, the productivity, or some other property of the ecosystem.

- Susceptibility to the contaminant(s). The assessment endpoint should be susceptible to exposure to the contaminant(s) and should be responsive/sensitive to such exposure. That is, assessment endpoints should be chosen that are likely to be exposed to contaminants at the site, either directly or indirectly (e.g., through the food chain), and they should be sensitive enough that such exposure may elicit an adverse response. Ideally, this sensitivity should be at such a level that other site-related receptors of potential concern are adequately protected under the selected endpoint's response threshold.

- Representation of management goals. The value of a risk assessment depends on whether it can support quality management decisions. Therefore, the assessment is based on values and organisms that reflect management goals. The protection of ecological resources (e.g., habitats and species of plants and animals) is a principal motivation for conducting ERAs. Key aspects of ecological protection are presented as policy goals, which are general goals established by legislation or agency policy based on societal concern for the protection of certain environmental resources. For example, environmental protection is mandated by a variety of legislation and government agency policies (e.g., CERCLA, National Environmental Policy Act). Other legislation includes the Endangered Species Act, 16 U.S.C. 1531-1544 (1993, as amended) and the Migratory Bird Treaty Act, 16 U.S.C. 703-711 (1993, as amended). **Table 5.6-1** shows the policy goals established for the site. To determine whether these protection goals are met at the site, assessment and measurement endpoints are formulated that define the specific ecological values to be protected and the degree to which each may be protected.

The Depot does not provide habitat for any threatened or endangered species; therefore, the assessment endpoint of no reduction in numbers of any threatened/endangered species is met. However, the available field surveys indicate that the site is likely to be used by terrestrial

TABLE 5.6-1
POLICY GOALS, ECOLOGICAL ASSESSMENT AND MEASUREMENT ENDPOINTS, AND DECISION RULES
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Policy Goals	Assessment Endpoint	Measurement Endpoint	Decision Rule
Policy Goal 1: The conservation of threatened and endangered species (TES) and their critical habitats	**Assessment Endpoint 1:** No reduction in numbers of any state- or federally-designated TES	**Measurement Endpoint 1:** Biosurveys for TES plants and animals; COPC concentration in physical media and predicted concentration in prey species	**Decision Rule for Assessment Endpoint 1:** If TES are not present, or COPC Maximum concentrations in the media do not exceed toxicity screening thresholds or dietary NOAELS (i.e., HQ<1), the assessment endpoint is met and TES are not at risk
Policy Goal 2: The protection of terrestrial and avian populations and ecosystems	**Assessment Endpoint 2:** No substantial adverse effect on populations of small mammals (i.e., deer mouse, short-tailed) or foraging bird species (i.e., American robin).	**Measurement Endpoint 2:** Lowest chronic, dietary, non-lethal effect level of COPCs on mice, shrew, and robins.	**Decision Rule for Assessment Endpoint 2:** If ratios of estimated exposure concentrations predicted from COPC maximum/average concentrations in soil to dietary limits corresponding to NOAEL toxicity reference values for adverse effects on receptor species (HQs) are <1, then Assessment endpoint 2 is met and indigenous receptor species populations are not at risk.

COPC = constituent of potential concern.
TES = threatened and endangered species.
NOAEL = no observed adverse effect level.
LOAEL = lowest observed adverse effect level.
HQ = hazard quotient.

mammalian and avian populations. Accordingly, the assessment endpoint that has been selected to represent the policy goal of protection of terrestrial populations and ecosystems is "no substantial adverse effect on survival, growth, and reproduction of resident terrestrial and avian populations."

5.6.2.4.1 Receptor Selection

Site-specific receptors were selected to represent assessment endpoints based principally on their importance in the community food web; their susceptibility (through exposure and sensitivity) to the site-related constituents; the amount of available data describing their potential for exposure and the toxicological effects that may result from exposure; and the extent to which they represent management goals.

The native mouse and short-tailed shrew species inhabiting areas of SEDA are appropriate terrestrial mammalian receptor species for soil, and the relevant assessment endpoint were defined as "no substantial adverse effects on resident mouse or shrew populations."

The deer mouse (*Peromyscus maniculatus*) was selected as the resident species with the niche best met by conditions present at the site. These are one of the vertebrate receptors most likely to be maximally exposed to contaminants in soil at the site. They represent a significant component of the food chain, feeding on seeds and berries and soil invertebrates and providing prey for predators. A second terrestrial receptor, the short-tail shrew (*Blarina brevicauda*), was also evaluated. The shrew was selected because more of its diet is derived from soil invertebrates and less is derived from seeds and berries than the deer mouse. Therefore, the shrew may be more susceptible than the mouse to the effects of COPCs that bioaccumulate in soil biota.

The American robin (*Turdus migratorius*) has been identified at SEDA during site reconnaissance visits and has been selected as an appropriate avian receptor species for soil, and the relevant assessment endpoint was defined as "no substantial adverse effects on resident American robin populations." Birds are frequently more sensitive to specific chemicals (e.g., pesticides and phthalates) than terrestrial mammalian species. The American robin was selected because a large portion of its diet is derived from soil invertebrates, which would make it more susceptible to the effects of COPCs that bioaccumulate in soil biota. Additionally, its home range is roughly comparable to those of both the deer mouse and shrew.

A raptor, such as a red-tailed hawk (*Buteo jamaicensis*), was initially considered as a potential receptor for this ERA. However, the home range of a hawk, approximately 1800 acres or more (USEPA 1993, Wildlife Exposure Factors Handbook), is much greater than the area of any of the

sites considered in this assessment. The total area of all 8 sites is 128 acres. Therefore, it is unlikely that a hawk would derive a significant portion of its diet from prey at any one of the sites evaluated. Consequently, the raptor was not further evaluated in this ERA.

Databases and available literature were searched for toxicity data for deer mice, short-tailed shrews, American robin and other native rodent and bird species. In the absence of site-specific data, laboratory-derived data on mortality or reproductive effects were used as measurement endpoints. In the absence of data on native species, data for other rodents (e.g., laboratory mice and laboratory rats) or birds (e.g., red-winged blackbird, mallard, chicken, Japanese quail, gray partridge, etc.) were used. Measures of effects (measurement endpoints) were selected that could be extrapolated to predict effects on the assessment endpoints.

5.6.2.5 Ecological Conceptual Site Model

The conceptual site model (CSM) presents the ecological receptors at the prison sites that are potentially exposed to hazardous substances in soil across several pathways (**Figure 5.6-1**). A complete exposure pathway consists of the following four elements:

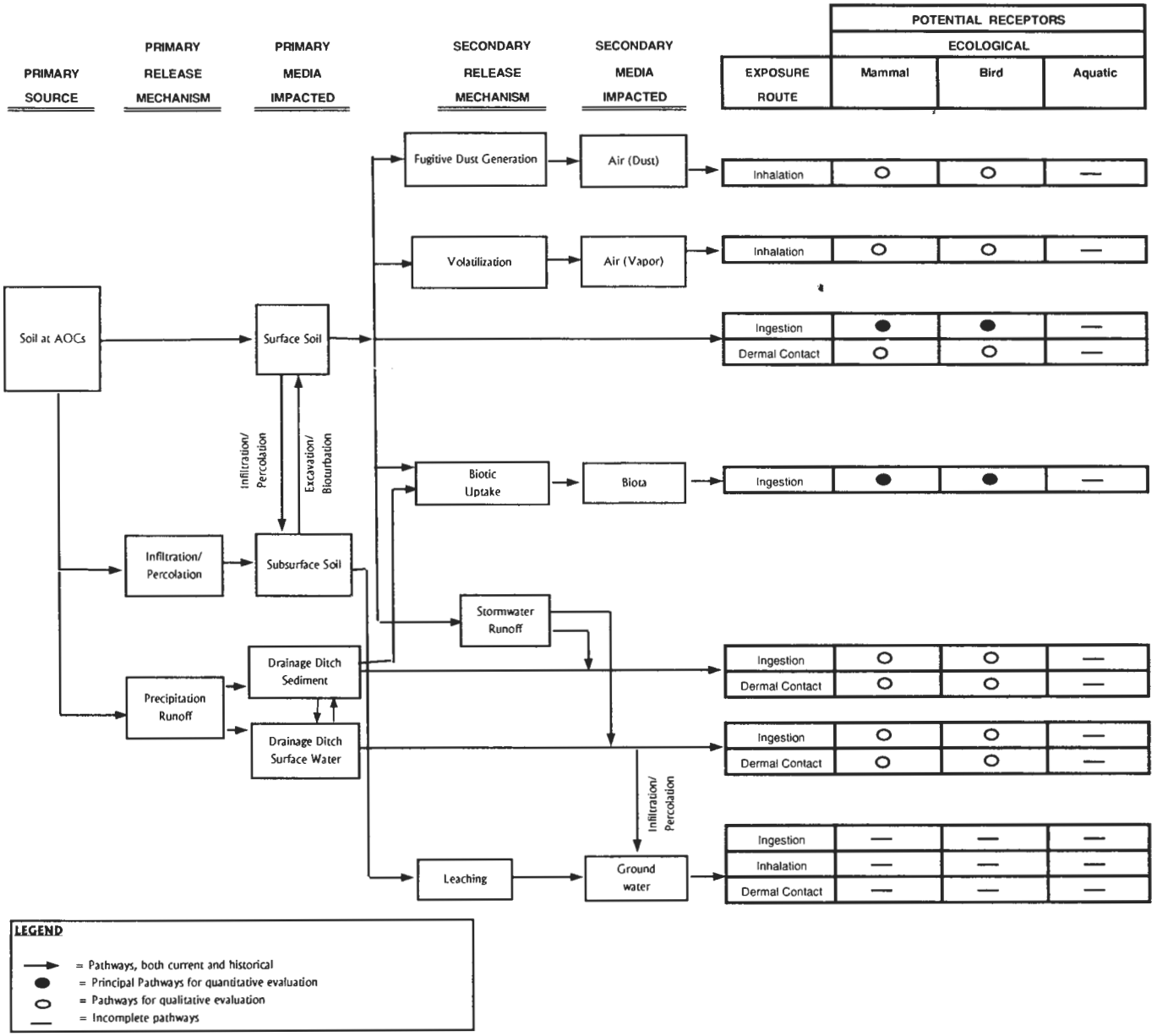
- A source and mechanism of contaminant release to the environment.
- An environmental transport mechanism for the released contaminants.
- A point of contact with the contaminated medium.
- A route of contaminant entry into the receptor at the exposure point.

If any of these elements is missing, the pathway is incomplete and is not considered further in the ERA. A pathway is complete when all four elements are present and permit potential exposure of a receptor to a source of contamination. Quantification of some potentially complete pathways may not be warranted because of minimal risk contribution relative to other major pathways. The dominant pathways from sources and exposure media through the food web to ecological receptors potentially exposed to ecological COPCs at the site are presented in **Figure 5.6-1**.

The CSM will serve as a conceptual hypothesis for the exposure characterization. The objective of the exposure characterization is to gather information from which to determine the pathways and media through which ecological receptors may be exposed to COPCs. The exposure characterization typically involves determining the following (EPA, 1997a):

- The ecological setting of the site
- The inventory of constituents that are or may be present at the site

Figure 5.6-1 Ecological Conceptual Site Model
SENECA ARMY DEPOT ACTIVITY



- The extent and magnitude of the constituent concentrations present, along with spatial and temporal variability of those concentrations
- The environmental fate and transport of the constituents.

The ecological setting was described in **Section 5.6.2.3.1** and the extent and magnitude of contaminants is presented in **Section 4**. Environmental fate of the COPCs and the potential exposure pathways are discussed in the following paragraphs.

Exposure to surface soil contaminants may occur directly through ingestion, inhalation, and/or dermal contact. Chemicals also may migrate further in the environment by a variety of pathways following secondary release from surface soil and deeper soil. The following pathways result from these secondary release mechanisms:

- Suspension and dispersal by the wind of particulate contaminants or contaminants adsorbed to surface soil particles
- Direct volatilization of volatile organic compounds from surface soil to air
- Uptake of soil contaminants by terrestrial organisms
- Transport of chemicals to surface water and sediment by surface runoff of water and soil particles

Terrestrial animal and bird populations could potentially be directly exposed to soil contaminants through ingestion of, dermal contact with, and/or inhalation from site soils. For species such as deer, raccoon, opossum, rabbits, rodents, and birds, such exposures would likely be associated with foraging activities. Burrowing species, such as rabbits, mice, moles, and shrews, would probably receive the greatest exposures among vertebrates. Invertebrates living on and within the soil also may experience significant exposures. Although ingestion is the principal soil exposure route, dermal contact also may be important, particularly for burrowing species. However, the limited dermal permeability database available for ecological receptors and surrogate species precluded quantitative evaluation of the dermal exposure pathway for either mammals or birds.

Ecological receptors could also potentially be exposed to site-related contaminants via the air medium. Contaminants in air may be in the form of vapor from volatile organic compounds, or in particulate form (as dusts or adsorbed to soil particles) suspended by wind. In either form, ecological receptors could be exposed to contaminants through inhalation. However, the lack of applicable inhalation toxicity data for ecological receptors or similar species precluded quantitative evaluation of potential risks.

Plants may be considered ecological receptors as well as a pathway or medium through which wildlife receptors can be exposed to site contaminants. Plants may absorb site-related contaminants from soil through their roots. Contaminants absorbed by plants may then be transferred to wildlife when the plants are ingested for food. This exposure pathway was addressed by use of chemical-specific soil-to-plant uptake factors (obtained from the scientific literature) in the animal receptor exposure calculations.

Under the future land use scenarios for the prison sites, it is assumed that contaminated soils may be excavated during construction and distributed on the ground surface. As under current conditions, ecological receptors could potentially be exposed to chemicals in soil through ingestion and dermal contact. Other exposure pathways also were assumed to remain essentially the same as under current conditions, except that possible inhalation exposures are likely to be reduced by paving and vegetation (e.g., lawns). The abundance and diversity of some ecological receptors on the site may likely be reduced due to the development.

5.6.2.6 Analysis Plan

The analysis plan is the final stage of problem formulation. In this step, risk hypotheses presented in the CSM are evaluated to determine how these hypotheses will be assessed using site-specific data. The analysis plan includes three categories of measures to evaluate the risk hypotheses identified in the CSM: measures of effect (also termed measurement endpoints), measures of exposure, and measures of ecosystem and receptor characteristics.

5.6.2.6.1 Measures of Effect

Measurement endpoints are measurable responses to a stressor that are related to the valued characteristics chosen as assessment endpoints (EPA, 1992a). Assessment endpoints generally refer to characteristics of populations and ecosystems. It is usually impractical to measure changes in these characteristics as part of an assessment. Consequently, measurement endpoints are selected that can be measured and extrapolated to predict effects on assessment endpoints (EPA, 1992a). The most appropriate measurement endpoint relating to the assessment endpoint is the lowest concentration of the constituent that, in chronic toxicity tests, is associated with non-lethal effects to a deer mouse, a short-tailed shrew, or an American robin. Because the assessment endpoint focuses on maintenance of the population of deer mice, shrews, or robins, a measure of effect equivalent to "no effect" would be overly conservative, in that it would reflect protection of the individual, not the population. A more appropriate measure of effect, reflecting population level response, is the lowest non-lethal effect level. Toxicity data from tests that measure responses that influence reproduction, health, and longevity of the species will conform

with the assessment endpoint. Therefore, the lowest concentration of the constituent that produces such effects will be used as a measure of effects.

Reliable measures of effects are not available for each exposure route for each constituent. Effects from exposure through inhalation and dermal contact are not well developed for ecological receptors; consequently, these exposure routes are analyzed qualitatively.

The measures of ecosystem and receptor characteristics include such characteristics as the behavior and location of the receptor and the distribution of a contaminant, both of which may affect the receptor's exposure to the contaminant. The typical foraging area of the receptor as well as the quality of the habitat in the site have been considered in the estimation of exposure, as discussed in **Sections 5.6.3.2** and **5.6.3.3.**

5.6.2.6.2 Measures of Exposure

Measures of exposure are the amounts, in dosage or concentration, that the receptors are hypothesized to receive. These include concentrations of constituents in the impacted media and concentrations or dosages of the constituents to which the receptor is exposed.

Decision rules are specified for evaluating effects on the assessment endpoints. **Table 5.6-1** shows the decision rules that describe the logical basis for choosing among alternative actions for the assessment endpoints based on the results of the measurement endpoints. Together, the assessment endpoint, measurement endpoint, and decision rule define the following:

- An entity (e.g., deer mouse population)
- A characteristic of the entity (e.g., health of the individuals in the population)
- An acceptable amount of change in the entity (e.g., loss of no more than 20 percent of a population)
- A decision whether the protection goal is or is not met.

For soil exposures, the results of the assessment will be presented in terms of hazard quotients (HQs). The HQ is the ratio of the measured or predicted concentration of an ecological COPC to which the receptors are exposed in an environmental medium, and the measured concentration that adversely affects an organism based on a toxicity threshold. If the measured concentration or estimated dose is less than the concentration or dose expected to have the potential to produce an adverse effect (i.e., the ratio of the two is less than 1), the risk is considered acceptable (protective of the ecological receptor). Any quotient greater than or equal to 1 indicates that the ecological COPC warrants further evaluation to determine the actual likelihood of harm. COCs

are selected only after an additional weight-of-evidence evaluation of the conservatism of the exposure assumptions, toxicity values, and uncertainties is conducted.

Due to the ephemeral nature of surface water accumulation in the drainage ditches and the limited exposure of valued ecological receptors to surface water or sediment in the ditches, these media are not quantitatively assessed in this ERA.

5.6.2.6.3 Measures of Ecosystem and Receptor Characteristics

Section 5.6.3.4 discusses the toxicity reference values associated with the COPCs. Endpoints stated in terms of specific ecological receptors or exposure classes (groups of species exposed by similar pathways) often require data on the processes that increase or decrease the exposure concentration below or above the measured or predicted environmental concentration. Thus, some quotients incorporate exposure factors (e.g., dietary soil fractions and bioaccumulation factors). **Section 5.6.3.3** discusses exposure factors for the site.

5.6.3 Exposure Assessment

The exposure assessment evaluates potential exposure of ecological receptors to site-related constituents through evaluation of the following:

- Description of the spatial distribution of COPCs
- Description of spatial and temporal distribution of ecological receptors
- Quantification of exposure that may result from overlap of these distributions

Each of these components is discussed below.

5.6.3.1 Constituent Distribution

The extent of measured chemical contamination at the site is restricted to the areas sampled within the 8 prison sites. The total combined area of the sites in the prison area is 128 acres, less than 20 percent of the 700 acre parcel which will constitute the prison facility and slightly more than 1 percent of the 10,000 acre Depot property. Soil located outside these sites is presumed to be relatively clean.

The magnitude of constituent exposures that may be experienced by ecological receptors is affected by the degree of their spatial and temporal associations with the site, as discussed in the following sections.

5.6.3.2 Receptor Distribution

A variety of factors may affect the extent and significance of potential exposures. Receptor exposures are affected by the degree of spatial and temporal association with the site. For example, the receptors' mobility may significantly affect their potential exposures to site-related contaminants. Many species may only inhabit the study area during seasonal periods (e.g., breeding season, non-migratory periods). Non-migratory species may remain in the vicinity throughout the year. These species, particularly those with longer life spans (and usually larger home ranges), have the greatest potential duration of exposure. However, species with small home range sizes have the greatest potential frequency of exposure. Other factors affecting exposures include habitat preference, behavior (e.g., burrowing, rooting, foraging), individual home range size (larger home ranges correspond to far less frequent use of study area), and diet. Diet is of particular importance in exposure as related to (1) food source availability (larger amount of preferred food sources equals a greater potential for receptor usage) and (2) bioaccumulative contaminants. Contaminants that bioaccumulate may also tend to biomagnify in the food chain. This is discussed in more detail in **Section 5.6.3.3**. As a result, predatory species at higher trophic levels may receive their most significant exposures through their prey. However, the possibility of a population of an upper trophic-level predator, or even an individual predator, utilizing any of the 8 prison sites as a primary source of food is considered extremely remote.

The deer mouse (~ 0.14 acre), short-tailed shrew (~ 0.96 acre), and the American robin (~ 0.4 acre) each have a typical home range that is less than 1 acre (EPA, 1993c). The prison sites, each encompassing at least 1 acre of land, could constitute 100 percent of the home range of a deer mouse, a shrew, or a robin.

5.6.3.3 Quantification of Exposure

Evaluation of the degree to which contaminant and receptor distributions (described in the previous two sections) coincide at the site indicated that the deer mouse, the short-tailed shrew, and the American robin are each receptors likely to have significant potential exposures to COPCs in soil.

To quantify exposures of target receptors to each COPC, a daily intake of each COPC was calculated. Conversion of the environmental concentration of each COPC to an estimated daily intake for a receptor at the site was necessary prior to evaluation of potentially toxic effects. For terrestrial animal and avian receptors, calculation of exposure intake rates relied upon determination of an organism's exposure to COPCs found in soil. Exposure rates for the target receptors were based upon ingestion of contaminants from this medium and also from

consumption of other organisms. The ERA did not attempt to measure potential risk from dermal and/or inhalation exposure pathways given the insignificance of these pathways relative to the major exposure pathways (e.g., ingestion) and due to the scarcity of data available for these pathways.

The first step in measuring exposure rates for wildlife receptors was the calculation of food ingestion rates for the deer mouse, short-tailed shrew, and the robin. The EPA's *Wildlife Exposure Factors Handbook* (EPA, 1993c) includes a variety of exposure information for a number of avian, herptile, and mammalian species. Data are directly available for body weight, ingestion rate, and dietary composition of the three target receptors selected.

The mean body weight of 0.02 kg for the female deer mouse and the maximum food ingestion rate of 0.22 g/g-day (0.0044 kg/day) for a non-lactating mouse were used (EPA, 1993c) to provide conservative exposure rate calculations for the deer mouse. Similarly, the lowest reported mean body weight of 0.015 kg and the maximum food ingestion rate of 0.6 g/g-day (0.009 kg/day) for a short-tailed shrew were used (EPA, 1993c), to provide conservative exposure rate calculations for the short-tailed shrew. The year round average body weight of 0.077 kg and the average food ingestion rate of 1.205 g/g-day (0.0928 kg/day) for and adult robin (EPA, 1993c) were used to estimate exposure rates for the robin.

The *Wildlife Exposure Factors Handbook* (EPA, 1993c) also presents average values for intake of animal matter and plant matter for the receptors as well as incidental soil ingestion.

Soil ingestion has been measured at less than 2 percent of diet (Beyer et al., 1994) for mammalian species. As might be expected based on the opportunistic habits of mice, the proportion of animal to plant matter in the diet varies from around 65 percent animal: 35 percent plant to 25 percent animal: 75 percent plant depending on season and region of the country. For this ERA, an approximate average of 50 percent animal: 50 percent plant was used, after subtracting the 2 percent for incidental soil ingestion. The dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.0044 kg food/day
Plant Matter Intake	=	0.00216 kg plant matter/day
Animal Matter Intake	=	0.00216 kg animal matter/day
Incidental Soil Intake	=	0.000088 kg soil/day

The short-tailed shrew is primarily carnivorous, with its diet consisting largely of insects and other invertebrates found in the soil. Based on information provided in the *Wildlife Exposure Factors Handbook* (EPA, 1993c), 5.3 percent of the shrew's diet is vegetative, with most of the

remainder comprised of soil invertebrates. To be conservative in terms of potential bioaccumulation, it was assumed that 94.7 percent of the shrew's intake is animal matter (small insects, etc.) and none of the intake is soil. Accordingly, the shrew's dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.009 kg food/day
Plant Matter Intake	=	0.00048 kg plant matter/day
Animal Matter Intake	=	0.00852 kg animal matter/day
Incidental Soil Intake	=	0 kg soil/day

The American robin's diet includes ground dwelling invertebrates, foliage dwelling insects and fruits. The robin's diet varies significantly throughout the year, exhibiting a high insect and invertebrate intake in the spring and a high plant material intake in the fall. Averaging the dietary characteristics over these three seasons results in an average invertebrate intake of 44 % and an average plant material intake of 56%. Soil ingestion for the American woodcock (surrogate species) has been measured at approximately 10.4 percent of diet (Beyer et. al., 1994). For this ERA, an approximate average of 44 percent invertebrate: 56 percent plant was used, after subtracting the 10.4 percent for incidental soil ingestion. The dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.093 kg food/day
Plant Matter Intake	=	0.0466 kg plant matter/day
Invertebrate Matter Intake	=	0.0366 kg animal matter/day
Incidental Soil Intake	=	0.0096 kg soil/day

A site-specific exposure dose of each COPC was calculated using a food chain uptake model consistent with EPA Region IV guidance (EPA, 1995). This algorithm accounts for exposure via incidental ingestion of contaminated soil, ingestion of plants grown in contaminated soil, and ingestion of lower trophic level animals associated with contamination. The exposure equation for soil is as follows:

$$ED_{soil} = [(C_S \times SP \times CF \times I_p) + (C_S \times BAF \times I_a) + (C_S \times I_S)] \times SFF / BW$$

where:

ED_{soil}	=	Soil exposure dose for terrestrial receptor (mg/kg/day)
C_S	=	RME concentration in soil (mg/kg)
SP	=	Soil-to-plant uptake factor (unitless)
CF	=	Plant wet-weight-to-dry-weight conversion factor (unitless) = 0.2 (used

		for SP values based on plant dry weight)
I_p	=	Receptor-specific ingestion rate of plant material (kg/day)
BAF	=	Constituent-specific bioaccumulation factor (unitless)
I_a	=	Receptor-specific ingestion rate of animal material (kg/day)
I_S	=	Receptor-specific ingestion rate of soil (kg/day)
SFF	=	Site foraging factor (unitless) (see explanation below)
BW	=	Body weight (kg)

In evaluating the potential for a contaminant to pose ecological risk, it is important to consider its propensity for bioaccumulation although its concentration in an environmental medium may be below toxic levels. Therefore, all COPCs were evaluated with regard to their ecological persistence and tendency to bioaccumulate.

Bioaccumulation is the process of absorption and retention of a substance by an organism due to both uptake from water (or other surrounding media) and uptake from ingested residues in food, soil, and/or sediment. It is quantified by the calculation of a bioaccumulation factor (BAF). Bioconcentration is a component of bioaccumulation, accounting only for the process of uptake from the surrounding medium (usually water). It is quantified by the calculation of a bioconcentration factor (BCF). Both BAFs and BCFs are proportionality constants relating the concentration of a contaminant in the tissues of an organism to the concentration in the surrounding environment.

Bioaccumulation and bioconcentration may be a significant component of exposure to COPCs for the terrestrial receptors. For the deer mouse, short-tailed shrew, and the robin, bioaccumulation was evaluated by means of contaminant-specific soil-to-plant uptake factors and BAFs. The soil-to-plant uptake factors were obtained from NRC (1992) for metals and for organic compounds by using a regression equation from Travis and Arms (1988). The latter is based on the contaminant-specific octanol/water partition coefficient (log K_{OW}). BAFs were obtained from the scientific literature. Factors reflecting accumulation of COPCs in earthworms were preferentially selected, based on the feeding habits of the deer mouse, shrew, and robin. **Tables 5.6-2** and **5.6-3** show values for soil-to-plant uptake factors and BAFs.

A site foraging factor (SFF) is calculated to account for the reasonably expected use of an exposure group. Because of the small size of their home ranges (i.e., 0.14 acre) and their year-round residence, mice living at most of the sites could potentially use contaminated areas 100 percent of the time. The exposure dose calculations assumed that the mouse will be exposed to the contaminants at the site at a level that is proportionate to the size of the overall site (total area of prison sites is 128 acres) versus the size of a deer mouse foraging area (0.14 acres). Therefore, a SFF of 1 (i.e., all SEADs larger than 0.14 acres in size) was used. Similarly, for the

TABLE 5.6-2
WILDLIFE INTAKE RATES
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Receptor	Body Weight (kg) [1]	Trophic Level[2]	Foraging Factor[3]	Dietary Breakdown		
				Plant (kg/day)	Animal (kg/day)	Soil (kg/day)
Deer Mouse	0.020	3	Variable	0.00216	0.00216	0.000088
Short-tailed Shrew	0.015	3	Variable	0.00048	0.00852	0 [4]
American Robin	0.077	3	Variable	0.03658	0.04656	0.00965

Notes:

(1) Body weight of deer mouse based on mean body weight for female deer mouse.
Body weight of short-tailed shrew based on mean body weight of adult male short-tailed shrew during fall.

(2) Trophic level: organisms are assigned to trophic levels of 1 (producer), 2 (herbivore), 3 (1st order carnivore), and 4 (top carnivore) within the food web.

(3) Foraging factor: adjustment factor (from 0 to 1) based upon an organism's total time of exposure to unit-based contaminants. Fo this risk assessment, site specific foraging factors have been computed for each receptor. Factors considered include site area receptor species home range, and duration of active residence in New York area. Specific factors listed below.

(4) Short-tailed shrew is primarily carnivorous and soil ingestion is negligible.
*Source: Wildlife Exposure Factors Handbook, USEPA 1993 and USEPA 1997.

Site Foraging Factors Inputs: Mouse Home Range = 0.06 hectares, resides in NY 12 months
Shrew Home Range = 0.39 hectares, resides in NY 12 months
Robin Home Range = 0.16 hectares, resides in NY 7 months

Prison Sites: Mouse SFF = 1; Shrew SFF = 1; Robin SFF = 0.583

TABLE 5.6-3
ENVIRONMENTAL FATE AND TRANSPORT PROPERTIES
FOR CHEMICALS OF POTENTIAL CONCERN
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Constituent	Soil to Plant Transfer Factors (STP)			Trophic Level 2 BAF (invertebrates)	
	logKow [1]	STP[2]	Source	BAF	Source
Volatile Organics					
Acetone	-0.24	5.33E+01	Travis & Arms 1988	3.90E-01	Sample et al. 1996
Chloroform	1 95	2.89E+00	Travis & Arms 1988	1.70E+01	Sample et al. 1996
Methyl ethyl ketone	0.26	2 74E+01	Travis & Arms 1988	9.60E-01	Sample et al. 1996
Toluene	2.50	1 39E+00	Travis & Arms 1988	7.24E+01	Sample et al 1996
Total Xylenes	3 18	5 62E-01	Travis & Arms 1988	6 00E+00	ATSDR 1990
PAHs					
2-Methylnaphthalene	4 11	1.63E-01	Travis & Arms 1988	3 42E-01	Beyer 1990
Acenaphthene	3 92	2.10E-01	Travis & Arms 1988	3.42E-01	Beyer 1990 (BAP as surrogate)
Anthracene	4.45	1 04E-01	Travis & Arms 1988	5.10E-02	Beyer 1990
Benzo(a)anthracene	5 90	1.51E-02	Travis & Arms 1988	1.25E-01	Beyer 1990
Benzo(a)pyrene	6 04	1.02E+00	USEPA 1994	4.50E+00	USEPA 1994
Benzo(b)fluoranthene	6 57	6 17E-03	Travis & Arms 1988	3.20E-01	Beyer 1990
Benzo(ghi)perylene	7 10	3 05E-03	Travis & Arms 1988	2 40E-01	Beyer 1990
Benzo(k)fluoranthene	6 85	4.25E-03	Travis & Arms 1988	2 53E-01	Beyer 1990
Chrysene	5.61	2.22E-02	Travis & Arms 1988	1.75E-01	Beyer 1990
Dibenz(a,h)anthracene	6 36	8 16E-03	Travis & Arms 1988	1.75E-01	Beyer 1990
Fluoranthene	5.22	3 72E-02	Travis & Arms 1988	7.92E-01	Beyer 1990
Fluorene	4 18	1.49E-01	Travis & Arms 1988	3 42E-01	Beyer 1990
Indeno(1,2,3-cd)pyrene	7.70	1.37E-03	Travis & Arms 1988	4.19E-01	Beyer 1990
Naphthalene	3 36	4.43E-01	Travis & Arms 1988	3.42E-01	Beyer 1990
Phenanthrene	4.46	1.02E-01	Travis & Arms 1988	1.22E-01	Beyer 1990
Pyrene	5.09	4.43E-02	Travis & Arms 1988	9.20E-02	Beyer 1990
Semivolatile Organics					
4-Methylphenol	1.94	2.93E+00	Travis & Arms 1988	1.00E+00	default
Bis(2-ethylhexyl)phthalate	4 20	5.10E-03	USEPA 1994	1.20E+01	USEPA 1994
Carbazole	1 00	1 00E+00	default	1.15E+02	AQUIRE 1997
Dibenzofuran	4 17	1 51E-01	Travis & Arms 1988	1 00E+00	default
Di-n-butylphthalate	4.57	8.84E-02	Travis & Arms 1988	1.25E-01	USEPA 1994 (BEHP as surrogate)
Pesticides					
4,4'-DDD	5 99	1 34E-02	Travis & Arms 1988	1.00E-01	USEPA 1994 (DDT as surrogate)
4,4'-DDE	5 77	1 79E-02	Travis & Arms 1988	2 50E-02	Menzie et al 1992
4,4'-DDT	5 90	1.00E-02	USEPA 1994	1 00E-01	USEPA 1994
Dieldrin	4 61	1.20E-01	USEPA 1994	4 70E-02	USEPA 1994
Endosulfan I	3 55	3 44E-01	Travis & Arms 1988	2 50E-01	Menzie et al 1992
alpha-Chlordane	5.93	1 45E-02	Travis & Arms 1988	2 40E-01	USEPA 1994 (chlordane as surrogate)
Herbicides					
2,4,5-T	0 60	1.74E+01	Travis & Arms 1988	1 61E-06	
Dicamba	0 48	2 04E+01	Travis & Arms 1988	1.21E-06	
Dichloroprop		1 00E+00	Default	1 00E+00	default
MCPP		1.00E+00	Default	1 00E+00	default
Nitroaromatics					
2,4-Dinitrotoluene	2 20	2 07E+00	Travis & Arms 1988	6 37E-05	
2,4,6-Trinitrotoluene	1 90	3 09E+00	Travis & Arms 1988	3 19E-05	
Tetryl	--	1 00E+00	Default	1.00E+00	default
Metals					
Cadmium	NA	5 50E-01	NRC 1992	2 15E-02	Ash and Lee 1980
Copper	NA	4 00E-01	NRC 1992	6.82E-01	MA et al 1983
Lead	NA	5 80E-03	NRC 1992	2 10E+00	MA et al 1983
Potassium	NA	1.00E+00	NRC 1992	1 00E+00	default
Selenium	NA	6.20E+00	USEPA 1992	5 00E+00	Beyer & Cromartie 1987
Zinc	NA	1 40E+00	NRC 1992	9 90E+00	Beyer & Cromartie 1987

Notes

(1) Loganthmic value of octonol-water partition coefficient. LogKow source Montgomery J H. and L M. Welkom. Groundwater Chemicals Desk Reference. 1989

(2) Soil to plant uptake factor For organic chemicals without reported STP values, the STP was estimated from the Kow as follows

logSTP = 1 588 - 0 578 x logKow (Travis and Arms 1988)

(3) This table includes STP and BAF factor information available from Parsons ES-Tampa current database (8'99)

(4) BAF = Bioaccumulation factor

(5) For chemicals without reported STP or BAF values surrogate or default values were assigned based on best professional judgement

short-tailed shrew whose home range is 0.963 acres and who is also a year-round resident, an SFF of 1 was used. Finally, a Site Foraging Factor of 0.583 was used for the robin based on its seasonal residence (7 months out of the year) at the site, and its average territory size (i.e., 0.395 acres).

5.6.3.4 Effects Assessment

The effects assessment defines and evaluates the potential ecological response to ecological COPCs in terms of the selected assessment and measurement endpoints. The effects assessment for soil exposure includes the derivation of toxicity reference values (TRVs) that are the basis of the comparison. **Section 5.6.4** uses the results of the toxicity assessment to identify ecological COCs and characterize ecological risk.

For soil, the methodology for assessing the potentially toxic effects of COPCs was based on the derivation of a TRV for each COPC. The TRVs were derived to represent reasonable estimates of the constituent concentrations that, if exceeded, may produce toxicity effects in ecological receptors exposed to soil. Ideally, TRV values would be based on site-specific toxicity data. However, in the absence of site-specific data, toxicity data from the literature were used by establishing data selection criteria such that TRVs would be as relevant as possible to assessment endpoints for this site. Furthermore, the conservativeness of the TRVs was reinforced by using the lowest available, appropriate toxicity values and modifying them by uncertainty factors when necessary. The derivation of TRVs for mammals and soil is shown in **Table 5.6-4**. The derivation of TRVs for birds and soil is shown in **Table 5.6-5**.

The toxicity benchmarks used as effects thresholds for the evaluation of the assessment endpoint (maintenance of healthy populations of small mammals or birds) are based on NOAELs for test organisms (Sample et al., 1996). The NOAEL (no observed adverse effect level) is the highest exposure concentration at which no harmful effects were observed. Use of the NOAEL as the toxicity benchmark is more conservative than use of the LOAEL (lowest observed adverse effect level). Exposure of receptors to the LOAEL has been predicted to translate into less than 20 percent reduction in population size (Suter et. al., 1994) or Lowest Observed Effects Concentrations.

For the selected receptors, the order of taxonomic preference when choosing TRVs was data from studies using: 1) native species potentially present at the site; or 2) proxy species, such as commonly studied laboratory species. The preferred toxicity test endpoint was the NOAEL from an appropriate chronic study for non-lethal or reproductive effects. When NOAEL values were not available, LOAELs for were used, as available. Values based on chronic studies were preferred. Studies were considered to provide chronic toxicity data if conducted for a minimum

TABLE 5.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
Volatile Organics								
Acetone	rat	NOAEL, gavage, 90-day, liver and kidney damage	Sample et al. 1996	1.00E+02	1	10	10	1.00E+01
Chloroform	rat	NOAEL, oral intubation, 13 wks., systematic	Sample et al. 1996	1.50E+02	1	10	10	1.50E+01
Methyl ethyl ketone	rat	NOAEL, water, 2 generations, reproduction	Sample et al. 1996	1.77E+03	10	1	10	1.77E+02
Toluene	mouse	LOAEL, gavage, day 6-12 gestation crit. lifestage, reproduction	Sample et al. 1996	2.60E+02	10	1	10	2.60E+01
Total Xylenes	mouse	NOAEL, gavage, day 6-15 gestation crit. lifestage, reproduction	Sample et al. 1996	2.10E+00	1	1	1	2.10E+00
Semivolatile Organics								
2-Methylnaphthalene	mouse	LOAEL, diet, 81 wks., respitory (naphthalene used as surrogate)	ATSDR 1995	7.16E+01	10	1	10	7.16E+00
4-Methylphenol	mink	NOAEL, diet, 6 mos. crit. lifestage, reproduction (Methylphenol, 2- (o-cresol) as surrogate)	Sample et al. 1996	2.19E+02	1	1	1	2.19E+02
Acenaphthene	mouse	LOAEL, oral gavage, 13wk, hepatic effects	ATSDR 1995	1.75E+02	10	10	100	1.75E+00
Anthracene	mouse	NOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	1.00E+03	1	10	10	1.00E+02
Benzo(a)anthracene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Benzo(a)pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Benzo(b)fluoranthene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Benzo(ghi)perylene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Benzo(k)fluoranthene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
bis(2-ethylhexyl)phthalate	mouse	NOAEL, diet, 105 days crit. lifestage, reproduction	Sample et al. 1996	1.83E+01	1	1	1	1.83E+01

TABLE 5.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
Chrysene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Dibenz(a,h)anthracene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Dibenzofuran	mammal	No data available					--	no data
Di-n-butylphthalate	mouse	NOAEL, diet, 105 days crit. lifestage, reproduction	Sample et al. 1996	5.50E+02	1	1	1	5.50E+02
Fluoranthene	mouse	LOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	1.25E+02	10	10	100	1.25E+00
Fluorene	mouse	LOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	1.25E+02	10	10	100	1.25E+00
Indeno(1,2,3-cd)pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Naphthalene	mouse	LOAEL, diet, 81 wks., respitory	ATSDR 1995	7.16E+01	10	1	10	7.16E+00
Phenanthrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	1.00E+01	10	1	10	1.00E+00
Pesticides/PCBs								
4,4'-DDD	rat	NOAEL, diet, 2 year crit. lifestage, reproduction (DDT used as surrogate)	Sample et al. 1996	8.00E-01	1	1	1	8.00E-01
4,4'-DDE	rat	NOAEL, diet, 2 year crit. lifestage, reproduction (DDT used as surrogate)	Sample et al. 1996	8.00E-01	1	1	1	8.00E-01
4,4'-DDT	rat	NOAEL, diet, 2 year crit. lifestage, reproduction	Sample et al. 1996	8.00E-01	1	1	1	8.00E-01
Dieldrin	rat	LOAEL, diet, 3 yr. crit. lifestage, reproduction.	Sample et al. 1996	2.00E-01	10	1	10	2.00E-02
Endosulfan	rat	NOAEL, oral intubation, 30 days, reproduction	Sample et al. 1996	1.50E+00	1	10	10	1.50E-01
gamma-Chlordane	mouse	NOAEL, diet, 6 generations, reproduction	Sample et al. 1996	4.58E+00	1	1	1	4.58E+00
Nitroaromatics								

TABLE 5.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
2,4,6-Trinitrotoluene	rat	NOAEL, unknown duration, diet	IRIS, 1996	7.5	1	10	10	0.75
2,4-Dinitrotoluene	dog	LOAEL, diet, neurotoxicity, heinz bodies and biliary tract hyperplasia, 2 years	IRIS, 1996	1.5	10	1	10	0.15
Tetryl		No data available						none avavilable
Herbicides								
2,4,5-T	rat	LOAEL, diet, increased urinary coproporphyrine, 2 years	IRIS, 1996	10	10	1	10	1
Dicamba	rat	NOAEL, diet, 2 year	Extoxnet, 1996	25	1	1	1	25
Dichloroprop		No data available						none available
MCPP	rat	LOAEL, diet, 90-day, increased kidney weight	EPA (IRIS) 1996b	9	10	10	100	0.09
Metals								
Cadmium	rat	NOAEL, gavage, 6 weeks mating and gestation crit. lifestage, reproduction	Sample et al. 1996	1.00E+00	1	1	1	1.00E+00
Copper	rat	NOAEL, diet, 13 wks., gastrointestinal effects	ATSDR 1990	1.40E+01	1	10	10	1.40E+00
Lead	rat	NOAEL, diet, 3 generations, reproduction	Sample et al. 1996	8.00E+00	1	1	1	8.00E+00
Selenium	rat	NOAEL, water, 1 yr througth 2 generations, reproduction	Sample et al. 1996	2.00E-01	1	1	1	2.00E-01
Zinc	rat	NOAEL, diet, day 1-16 of gestation crit. lifestage, reproduction	Sample et al. 1996	1.60E+02	1	1	1	1.60E+02

Notes:

(1) CF = conversion factor. Conversion factors - endpoint (non-NOAEL = 10) and study duration (non-chronic = 10)

(2) The toxicity reference value was derived by dividing the effect dose by the total conversion factor.

(3) This table includes TRV factor information available from Parsons ES-Tampa current database (8/99).

(4) V = Volatile (MW<200, H>1E-05); SV = Semi-Volatile; PAH = Polynuclear Aromatic Hydrocarbon; PES = Pesticide; PCB = Polychlorinated Biphenyl; ING = Inorganic

(5) Mammals: acute = <90days, subchronic = 90days - 1yr, chronic = >1yr. Birds: acute = <18days, subchronic = 18days - 10wks, chronic = >10wks. Source: Sample et al. 1996
If the study is during a critical life stage (gestation or development), the study may be considered a chronic exposure.

(6) The product of the appropriate uncertainty factors from each uncertainty category becomes the total uncertainty factor applied to develop the constituent-specific TRV.

TABLE 5.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Volatile Organic Compounds								
Acetone	Japanese quail	NOAEL, 14-day old, diet, 5 days, survival	Hill and Camardese 1986	6.10E+03	1	10	10	6.10E+02
Chloroform		No data available						No data
Methyl ethyl ketone		No data available						No data
Toluene		No data available						No data
Total Xylenes	Japanese quail	NOAEL, 14-day old chicks, diet, 5 days, survival	Hill and Camardese 1986	3.06E+03	1	10	10	3.06E+02
Polynuclear Aromatic Hydrocarbons								
2-Methylnaphthalene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Acenaphthene	mallard	NOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	1.00E+03	1	1	1	1.00E+03
Anthracene	mallard	NOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	1.00E+03	1	1	1	1.00E+03
Benzo(a)anthracene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(a)pyrene	chicken	Subchronic NOAEL, fertility and malformations	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(b)fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(ghi)perylene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(k)fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Carbazole		No data available						No data
Chrysene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01

TABLE 5.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Dibenz(a,h)anthracene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Fluorene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Indeno(1,2,3-cd)pyrene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Naphthalene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Phenanthrene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Pyrene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Semi-volatile Organic Compounds								
4-Methylphenol	red-winged blackbird	LD50, single gavage, survival	Schafer et al. 1983.	2.06E+01	10	10	100	2.06E-01
Bis(2-ethylhexyl)phthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction	Sample et al. 1996	1.10E+00	1	1	1	1.10E+00
Dibenzofuran	red-winged blackbird	LC50, diet, 18 hours, survival	Schafer et al. 1983.	2.18E+01	10	10	100	2.18E-01
Di-n-butylphthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction	Sample et al. 1996	1.10E+00	1	10	10	1.10E-01
Pesticides								
4,4'-DDD	Japanese quail	NOAEL, diet, 10 week, reproduction (DDT used as surrogate)	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
4,4'-DDE	Japanese quail	NOAEL, diet, 12 wks, reproduction, liver effects	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
4,4'-DDT	Japanese quail	NOAEL, diet, 10 week, reproduction	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
Dieldrin	barn owl	NOAEL, diet, 2 yr. crit. lifestage, reproduction.	Sample et al. 1996	7.70E-02	1	1	1	7.70E-02

TABLE 5.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Endosulfan I	gray partridge	NOAEL, diet, 4 wks crit. lifestage, reproduction (endosulfan as surrogate)	Sample et al. 1996	1.00E+01	1	10	10	1.00E+00
alpha-Chlordane	red-winged blackbird	NOAEL, diet, 84 days, survival (total chlordane used as surrogate)	Sample et al. 1996	2.14E+00	1	1	1	2.14E+00
Herbicides								
2,4,5-T		No data available						No data
2,4-DB		No data available						No data
Dicamba		No data available						No data
Dichloroprop		No data available						No data
MCPP		No data available						No data
Nitroaromatics								
Tetryl		No data available						No data
2,4,6-Trinitrotoluene		No data available						No data
2,4-Dinitrotoluene		No data available						No data
Metals								
Cadmium	mallard	NOAEL, diet, 90 days, reproduction	Sample et al. 1996	1.45E+00	1	1	1	1.45E+00
Copper	chicken	NOAEL, 1-day old chicks, diet, 10 wks, growth, mortality	Sample et al. 1996	4.70E+01	1	1	1	4.70E+01
Lead	American Kestral	NOAEL, diet, 7 months reproduction	Sample et al. 1996	3.85E+00	1	1	1	3.85E+00
Potassium		No data available						No data
Selenium	mallard	NOAEL, diet, 100 days crit. lifestage, reproduction	Sample et al. 1996	4.00E-01	1	1	1	4.00E-01
Zinc	chicken	NOAEL, hens, diet, 44 wks. crit. lifestage, reproduction	Sample et al. 1996	1.45E+01	1	1	1	1.45E+01

1 CF = conversion factor.
2 The toxicity reference value was derived by dividing the effect dose by the total conversion factor.

duration of 1 year. Studies longer than acute but shorter than chronic are considered subchronic. Studies shorter than 90 days were considered acute. Studies on developmental effects were considered chronic if conducted during a critical gestation period.

The toxicity values selected by this approach were modified through the application of uncertainty factors, as applicable, to derive a TRV for each COPC. The TRVs represent NOAELs with uncertainty factors incorporated for toxicity information derived from studies other than chronic studies and studies on species other than the receptors selected for this risk assessment. Where only a LOAEL was available, an uncertainty factor of 10 was applied, as recommended by EPA Region II, to represent a surrogate NOAEL. In addition, where toxicity information for a surrogate contaminant was used, an uncertainty factor of 10 was applied. Uncertainty factors were applied by dividing the initial toxicity value by the product of the necessary uncertainty factors. Uncertainty factors are listed in **Tables 5.6-4** and **5.6-5** with the TRVs developed for soil COPCs.

5.6.4 Risk Characterization

Risk characterization integrates exposure(s) and effect(s) on receptors using hazard quotients (HQs) (ratios of exposure and effect concentrations). The resulting data are used to define the magnitude of potential risk from COPCs at the site and to assess the risk to ecological receptors. Risk characterization uses the results of the exposure and effects assessments to calculate an HQ for each COPC. The HQs are based on relevant measurement endpoints and are indicative of the COPC's potential to pose ecological risk to receptors. Any COPCs for a given exposure group and medium that were identified as likely to pose significant risk to receptors based on their HQs were classified as ecological chemicals of concern (COCs). Risk assessment related uncertainties are also analyzed and discussed.

Estimation of a COPC's potential to pose significant risk to receptors is based on the magnitude of the HQ value calculated for each constituent, as well as other factors such as the bioaccumulation/biomagnification potential, mechanism of toxicity, physicochemical characteristics, environmental fate, and ecological relevance of each contaminant. The HQ is a ratio of the estimated exposure dose (for receptor species) of a constituent to the TRV. Generally, the greater this ratio or quotient, the greater the likelihood of an effect. Typically, a quotient of 1 is considered the threshold level at which effects may occur. The TRVs on which the HQs were based were derived to be conservative and representative of chronic exposures, as described previously in **Section 5.6.3.4**.

The calculated HQs were used to assess the potential that toxicological effects will occur among the site's receptors. The HQs were compared to HQ guidelines for assessing the risk posed from

contaminants (Menzie et. al., 1993). These guidelines suggest that HQs less than or equal to 1 present no probable risk; HQs from 1 up to, but less than, 10 present a small potential for environmental effects; HQs from 10 up to, but less than 100 present a significant potential for ecological effects, and HQs greater than 100 present the highest potential for expected effects. The likelihood that a population of receptor species (i.e., deer mice, short-tailed shrews, American robins) could be significantly impacted by the toxicological effect(s) produced by a given COPC was a major factor in the subsequent determination (see **Section 5.6.4.1**) of whether that contaminant should be classified as an ecological COC.

Ecological risk from COPCs was characterized for potential future land use at the site. Risks from constituents found in soil available to terrestrial receptors were assessed quantitatively. Available analytical results from the eight (i.e., SEADs-43, 44A, 44B, 52, 56, 62, 69 and 120B) prison sites area were merged and evaluated as a single data set. Complete exposure and hazard quotient calculations for the group of prison sites, as well as the soil data set included in the ecological risk assessment (0-2ft), are included in **Appendix I**. The hazard quotients calculated for the prison sites are also summarized in **Table 5.6-6**. Significant findings from exposure to soil are summarized in the sections below.

Future ecological risks from exposure to drainage ditches (surface water and sediment) were assessed qualitatively. These media are discussed briefly below, in sections following the soil discussions.

5.6.4.1 Surface Soil (0 - 2 ft)

The potential effects of the exposure of deer mice, short-tailed shrews, or American robins to 44 COPCs detected in surface soils found in the eight SEADs located in the area of planned prison construction were estimated by computing hazard quotients for each species and chemical pair. The HQs for all constituents found in soil were less than one, with the exception of those listed below:

TABLE 5.6-6
SUMMARY OF ECOLOGICAL HAZARD QUOTIENTS

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Compound	Prison		
	Mouse	Shrew	Robin
Volatile Organics			
Acetone	1.2E-01	3.9E-02	4.9E-03
Chloroform	4.3E-04	1.9E-03	--
Methyl ethyl ketone	4.8E-04	2.2E-04	--
Toluene	3.4E-03	1.7E-02	--
Total Xylenes	4.1E-03	2.0E-02	9.2E-05
Semivolatile Organics			
2-Methylnaphthalene	3.8E-04	1.3E-03	3.9E-04
4-Methylphenol	1.1E-03	1.8E-03	**3.5E+00**
Acenaphthene	1.1E-02	3.4E-02	7.6E-05
Anthracene	1.5E-04	2.3E-04	8.4E-05
Benzo(a)anthracene	2.3E-02	8.6E-02	3.6E-03
Benzo(a)pyrene	7.2E-01	**3.1E+00**	5.8E-02
Benzo(b)fluoranthene	4.0E-02	1.8E-01	4.7E-03
Benzo(ghi)perylene	2.2E-02	1.0E-01	2.9E-03
Benzo(k)fluoranthene	3.1E-02	1.4E-01	3.9E-03
bis(2-Ethylhexyl)phthalate	1.9E-01	**1.0E+00**	**1.1E+01**
Carbazole	--	--	--
Chrysene	3.1E-02	1.2E-01	4.2E-03
Dibenz(a,h)anthracene	7.3E-03	3.0E-02	1.0E-03
Dibenzofuran	--	--	3.6E-01
Di-n-butylphthalate	3.1E-06	8.3E-06	8.0E-02
Fluoranthene	2.4E-01	**1.2E+00**	2.9E-02
Fluorene	1.5E-02	5.1E-02	2.6E-03
Indeno(1,2,3-cd)pyrene	3.3E-02	1.6E-01	3.6E-03
Naphthalene	1.7E-03	4.1E-03	1.6E-03
Phenanthrene	7.4E-02	1.9E-01	1.3E-02
Pyrene	5.2E-02	1.4E-01	7.9E-03
Pesticides/PCBs			
4,4'-DDD	5.8E-04	2.0E-03	5.6E-02
4,4'-DDE	5.4E-04	8.9E-04	7.4E-02
4,4'-DDT	5.5E-04	1.9E-03	5.4E-02
Dieldrin	7.9E-02	1.1E-01	1.1E-01
Endosulfan I	--	--	5.1E-04
alpha-Chlordane	--	--	1.8E-04
Nitroaromatics			
2,4-Dinitrotoluene	**3.2E+00**	9.3E-01	--
2,4,6-Trinitrotoluene	1.8E-01	5.4E-01	--
Tetryl	--	--	--
Metals			
Cadmium	2.8E-02	2.4E-02	1.1E-01
Copper	**1.2E+01**	**5.3E+01**	**1.4E+00**
Lead	**1.5E+01**	**7.8E+01**	**1.1E+02**
Potassium	--	--	--
Selenium	**6.1E+00**	**2.6E+01**	**9.8E+00**
Zinc	**2.3E+00**	**1.2E+01**	**8.5E+01**
Herbicides			
2,4,5-T	2.3E-02	6.7E-03	--
Dicamba	9.7E-04	2.9E-04	--
Dichloroprop	--	--	--
MCPP	**1.7E+01**	**4.7E+01**	--

Note
Bold values indicate that there exists an exceedance of the ecological threshold level for given compound and receptor.

Compound	Deer Mouse Hazard Quotient	Short-tailed Shrew Hazard Quotient	American Robin Hazard Quotient
4-Methylphenol	<1	<1	3.5
Benzo(a)pyrene	<1	3.1	<1
Bis(2-ethylhexyl)phthalate	<1	1	10.6
Fluoranthene	<1	1.2	<1
2,4-Dinitrotoluene	3.2	<1	—
Copper	11.8	53.2	1.4
Lead	15.1	77.8	110.3
Selenium	6.1	25.9	9.8
Zinc	2.3	11.9	84.9
MCPP	17.4	47.3	--

The compound, 4-methylphenol, was detected in three of 27 surface soil samples at a maximum concentration of 580 J ug/Kg. The maximum concentration detected was found in one of four shallow soil sample collected in SEAD-69, while the other two samples containing this compound were found in samples collected from SEAD-44A. If the average concentration (i.e., 222.2 ug/Kg) is computed from all samples (using one-half the detection limit for samples where compound is not detected) and used as the EPC, the HQ calculated for the robin is reduced to 1.3. The TRV used to determine the HQ for the robin is derived from an LD_{50} to which a safety factor of 100 has been applied. If this factor was eliminated, the computed HQ for the robin falls below the threshold of 1, suggesting that this compound does not represent a hazard to the robin. Finally, as a planned prison development, this land would most likely be unattractive habitat for robins. Therefore, 4-methylphenol is not considered a COC in soil at the eight SEADs targeted as prison site.

Benzo(a)pyrene was found in five of 27 shallow soil samples collected from the eight SEADs located in the are of the planned prison development. The maximum concentration found was 1200 ug/Kg which was used as the EPC for the ecological risk assessment. The two other reported concentrations were all less than 100 ug/Kg, and each was "J" qualified or estimated. If the average value (i.e., 245.4 ug/Kg) of all 24 samples is used as the EPC for this risk analysis, the HQ calculated for the short-tailed shrew drops to 0.61. Finally, as a planned prison development, this land would most likely be unattractive habitat for shrews. Therefore, benzo(a)pyrene is not considered a COC in soil at the eight SEADs targeted as future prison sites.

Fluoranthene was found in 10 of 27 shallow soil samples collected from the area of planned prison development. The maximum concentration reported for this compound was 3200 ug/Kg

which was detected in one sample collected from the area of SEAD-43. None of the other seven levels detected exceeded a concentration of 350 J ug/Kg, and the average concentration determined for all 24 samples (using one-half the detection limit for all samples where the compound was not detected) was approximately 350.5 ug/Kg. If the average is used as the EPC in the ecological calculations, the HQ reported for all target species drops below 1. Furthermore, as a planned prison, this land would most likely be unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For these reasons, and the relatively low HQs derived for this compound, fluoranthene is not considered a COC in soil at these eight SEADs.

Bis(2-ethylhexyl)phthalate was detected in 16 of the 27 shallow soil samples analyzed. The maximum concentration reported was 2700 ug/Kg. The overall average concentration for the 24 soil samples was approximately 236.9 ug/Kg. If the overall average concentration is used as the EPC for the ecological HQ calculations, the reported HQ determined for the shrew drops to roughly 0.09 for the shrew, and to approximately 0.93 for the robin. Furthermore, as a planned prison, this land would most likely be unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For these reasons, bis(2-ethylhexyl)phthalate is not considered a COC in soil at these eight SEADs.

The compound, 2,4-dinitrotoluene was detected in 10 of the 45 shallow soil samples analyzed. The maximum concentration reported was 2100 J ug/Kg, while the overall average concentration reported was approximately 202.4 ug/Kg. If the average concentration is used as the EPC for the ecological HQ calculations, the HQs determined for both mammalian receptor species drop to less than 1. Furthermore, the TRV used for the mammalian species is derived from a LOAEL to which a safety factor of 10 has been applied. If this factor was eliminated, the HQs reported for the mouse and shrew using the maximum concentration would be less than 1. Finally, as a planned prison, this land would most likely be unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For these reasons, 2,4-dinitrotoluene is not considered a COC in soil at these eight SEADs.

MCPP was detected in two of 13 shallow soil samples collected from the area of the planned prison development. The maximum concentration detected was 7300 J ug/Kg, while the overall average concentration was 4042 ug/Kg. If the average concentration is used as the EPC in this analysis the HQ resulting for the mouse decreases 9.6 for the mouse and 26.2 for the short-tailed shrew. The TRV used as the basis of the mammalian HQ calculations was derived from a LOAEL developed during an acute study to which a safety factor of 100 has been applied for conservatism. If this factor was eliminated, the HQs calculated for the mouse and shrew using either the maximum or average concentration would decrease to less than 1. Finally, as a planned prison, this land would most likely be unattractive habitat for any of the three target

species (i.e., mice, shrews or robins). For these reasons, MCPP is not considered a COC in soil at these eight SEADs.

Copper was detected in all 27 of the shallow soil samples collected from the area of the planned prison development. The maximum concentration detected was 191 mg/Kg while the overall average concentration was approximately 31.7 mg/Kg. If the average concentration is used as the EPC in place of the maximum value in this analysis, the HQ resulting for the deer mouse decreases to roughly 1.95, while the HQ reported for the short-tailed shrew drops to approximately 8.8. Comparably, the HQ computed for the robin decreases to roughly 0.23. The TRV used for the mammalian population is derived from NOAEL developed during a subchronic study to which a safety factor of 10 has been applied. If this factor were eliminated, the HQs reported for both species would drop to less than one. Finally, as a planned prison, this land would most likely be unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For these reasons, copper is not considered a COC in soil at these eight SEADs.

Lead was detected in 25 shallow soil samples collected from the area of the planned prison development. The maximum concentration detected was approximately 522 mg/Kg while the overall average concentration was approximately 53.7 mg/Kg. If the average concentration is used as the EPC in place of the maximum value in this analysis, the HQ resulting for the deer mouse decreases to roughly 1.55, while the HQ reported for the short-tailed shrew drops to approximately 8.0. Comparably, the HQ computed for the robin using the overall average concentration decreases to roughly 11.3.

Review of the available lead data indicates that the results are skewed by three inordinately high lead results found in surface soil samples collected from SEAD-120B. The area investigated in SEAD-120B was a former target backstop used on a small arms firing range. The extent of the backstop was limited to an area measuring roughly 35 to 50 feet wide by 150 feet in length. During the investigation of this site, three test pits were excavated from the area immediately behind target stands and soil samples were collected. Bullet fragments were observed in the soil that surrounds each of the sampling locations and in the samples collected from each of the test pits. Therefore, it is assumed that the source of the lead exposure is very limited. If these results are removed, and the average of the remaining values is re-computed, the resulting average value obtained is approximately 20 mg/Kg. Using this value as the EPC, the resulting HQ found for the mouse decreases to 0.58; to 3 for the shrew; and to 4.22 for the robin. The recalculated average concentration (i.e., 20 mg/Kg) for lead without the three samples from SEAD-120B is also roughly equivalent to the average concentration determined from site background samples (i.e., 17.7 mg/Kg). Finally, as a planned prison, this land would most likely be unattractive

habitat for any of the three target species (i.e., mice, shrews or robins). For these reasons, lead is not considered a COC in soil at these eight SEADs.

Selenium was detected in 22 of 27 shallow soil samples collected from the area of the planned prison development. The maximum concentration detected was 1.8 J mg/Kg while the overall average concentration was approximately 0.95 mg/Kg. If the average concentration is used as the EPC in place of the maximum value in this analysis, the HQ resulting for the deer mouse decreases to roughly 3.2, while the HQ reported for the short-tailed shrew drops to approximately 13.7. The equivalent HQ for the robin is then found to be approximately 5.2. However, as a planned prison, this land would most likely be an unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For this reason, selenium is not considered a COC in soil at these eight SEADs.

Zinc was detected in all 27 shallow soil samples collected from the area of the planned prison development. The maximum concentration detected was 338 mg/Kg while the overall average concentration was approximately 123.6 mg/Kg. If the average concentration is used as the EPC in place of the maximum value in this analysis, the HQ resulting for the deer mouse decreases to 0.84, while the HQ reported for the short-tailed shrew drops to approximately 4.4. The equivalent HQ for the robin is calculated as 31. However, as a planned prison, this land would most likely be an unattractive habitat for any of the three target species (i.e., mice, shrews or robins). For this reason, zinc is not considered a COC in soil at these eight SEADs.

5.6.4.2 Surface Water

Surface water collects intermittently in drainage ditches at several of the sites. Terrestrial receptors, such as mice, may ingest or contact this surface water, when present. However, these occurrences would be expected to be infrequent due to the intermittent nature of the surface water, and the mobility of the receptors. Exposure to this surface water is expected to be less significant than soil exposure for the target receptors (deer mouse and shrew). Therefore, surface water exposure was not assessed quantitatively.

NYSDEC has established ambient water quality guidelines for various water classes and purposes. For instance, the NYSDEC Class C guidelines are designed to protect fish propagation in fresh waters. The drainage ditches at the site are not considered a classifiable water body, and do not sustain valued aquatic life (such as fish) on a continual basis. While the Class C guidelines were compared to the maximum surface water concentrations in ditches at the three sites where surface water was sampled (discussed in **Section 4**) these comparisons are not relevant to receptors of concern at this site.

5.6.4.3 Sediment

Sediment in the drainage ditches was sampled at the three of the sites. In general, the concentrations of chemicals found in sediment were similar to the concentrations measured in soil. In many cases, the sediment concentrations appear to be similar to the background soils at SEDA. Terrestrial receptors, such as mice, may ingest or contact this sediment, similar to soil. Since the sediment is less prevalent than soil at the prison sites, and since the chemical concentrations are similar for the two media, the quantitative analysis of soil exposure for terrestrial receptors is considered representative of exposure to sediment as well.

NYSDEC has established sediment criteria for the protection of wildlife, considering bioaccumulation (NYSDEC 1993b). None of the compounds measured in sediment at the sites have listed wildlife bioaccumulation sediment criteria. Therefore, the sediment at this site complies with these potentially applicable criteria.

NYSDEC has established other sediment guidelines to protect aquatic life and prevent bioaccumulation in benthic organisms. The maximum concentrations measured in sediment in ditches at the sites were compared with these NYSDEC sediment guidelines in **Section 4**. However, bioaccumulation in lower food chain organisms (as considered by the NYSDEC criteria) is not relevant for direct contact by terrestrial receptors. Therefore, these comparisons are not considered applicable to receptors of concern at this site.

5.6.4.4 Uncertainty

Uncertainty is inherent in each step of the ecological risk assessment process. Major factors contributing to uncertainty in this risk assessment are discussed qualitatively in the following sections.

5.6.4.4.1 Chemicals of Potential Concern

The sampling data may not represent the actual overall distribution of contamination at the site, which could result in underestimation or overestimation of potential risk from identified chemicals. However, the use of maximum concentrations detected as EPC provided conservative exposure estimates and it is, therefore, unlikely that the potential for deleterious levels of contaminants has been underestimated.

5.6.4.4.2 Exposure Assessment

While the potential receptor species selected for the site are inevitably a limited subset of the total list of species that may utilize the site, the potential exposure of the species evaluated in this assessment is considered likely to be representative of the nature and magnitude of the exposures experienced by those species not discussed.

Risk associated with intake of contaminants through the food chain was addressed by modeling food chain transfer of chemical residues through plants and earthworms. The degree of uncertainty in the results of the analysis increases with the increasing distance of the receptor from the base of the food chain. Intakes from dermal contact with and inhalation of contaminants were not quantifiable for ecological receptors. However, this does not significantly increase the uncertainty of the estimated intakes because for most receptors, intakes via these routes are likely to be minimal relative to intakes via ingestion.

5.6.4.4.3 Toxicity Assessment

There is uncertainty associated with the TRVs calculated for this risk characterization because the toxicity data were not site-specific. However, the TRVs used were conservative and were modified by uncertainty factors where necessary to increase the applicability of the data to the assessment. The HQs calculated from these conservative TRVs and maximum concentrations provide confidence that the risk assessment yielded reasonably conservative estimates of the potential risk of adverse ecological effects on the assessment endpoint.

Each COPC was assumed highly bioavailable. However, for most chemicals in most media, this is an overestimation (Dixon et. al., 1993) that may result in an overestimation of the potential for ecological risk. Empirical information on bioavailability of the COPCs was not available. No leachability tests in soil or sediment were conducted. No analysis for acid-volatile sulfide/simultaneously extracted metals was conducted as a measure of bioavailability in sediment. It is possible that some of the contaminants, particularly the metals, may be bound to soil or sediment particles and not available for uptake by receptors. This would tend to overestimate risk.

The soil-to-plant uptake equations and the BAFs include a bioavailability factor; however, these data, taken from the scientific literature, are not specific to this site and may under- or overestimate exposure. For several metals, no quantitative bioavailability data could be found, other than an indication from the literature that the constituent does not significantly bioaccumulate. For these metals, a bioaccumulation factor of 1.0 was used in the exposure equation. This is likely to overestimate the actual value.

The potential for toxic effects to be produced in receptor organisms because of exposure to multiple chemicals in a single medium or in multiple media was not evaluated. Therefore, the potential toxic effects in a receptor as a result of exposure to a given medium could be higher or lower than estimated, depending on toxicological interactions. Exposure of a receptor to multiple contaminated media is likely to increase the risk of toxic effects.

5.6.4.4.4 Risk Characterization

The methodology, conservative assumptions, and toxicity benchmarks used in the risk estimation portion of the risk characterization are expected to overestimate, rather than underestimate, the potential for COPCs to pose risk to the ecological assessment endpoint. Maximum environmental concentrations were used, concentrations were assumed to remain constant over time, and the toxicity benchmarks used were the NOAEL values (levels where no toxic effects are expected) or conservative surrogates based on LOAEL values for non-lethal or reproductive effects appropriate for extrapolation to effects on the assessment endpoint.

5.6.4.5 Ecological Risk Summary

The preceding ecological risk assessment was intended to identify whether concentrations of chemicals detected at the 8 prison sites posed a potential risk or stress to plants or animals that may inhabit or visit the sites. COPCs found in shallow soil were quantitatively evaluated to assess potential ecological risk under planned future conditions.

A hierarchy of assessment endpoints was selected to assess both proximate and ultimate risks that might be associated with identified, site-related chemicals. The proximate assessment endpoint was chosen to provide protection of the population levels of representative vertebrate species (i.e., deer mouse, short-tailed shrew, and American robin) that use the sites to a significant extent. These species also serve as indicators of potential impacts to the ecological community as a whole. While toxic effects that reduce the indigenous population of representative species are significant to the populations themselves, they are not necessarily significant to the ultimate, more important, assessment endpoint: the community of species that occupy the areas including and surrounding the individual sites.

The ultimate assessment endpoint, maintenance of the health and diversity of the natural community in the area, is the more important ecological component to be protected. Therefore, any COPC estimated to represent a potential for adverse effects to proximate assessment endpoints might subsequently need to be evaluated with regard to the risk they may pose to the overall ecological community.

The ecological setting of the prison sites is not unique or significant, as described in **Section 5.6.2.3**. There are no endangered, threatened, or special concern species present that are likely to be dependent on, or affected by, the habitat at the sites. The species that inhabit the sites are not rare in the region and are not generally considered to be of special societal value. The habitat in the sites appears to be relatively low in diversity and productivity.

The potential impact of COPCs to the representative terrestrial and avian receptors (i.e., proximate assessment endpoints) were initially assessed by computing hazard quotients (HQs) resulting from the exposure of species to the maximum concentration of each COPC measured at each site. If no apparent impact was determined for the proximate assessment endpoint, as indicated by HQs of 1 or less, then the potential impact of the COPC to the ultimate assessment endpoint was considered low. If, on the other hand, this analysis suggested that a potential threat did exist, a further analysis of severity and the magnitude of potential threat was performed. In this follow-on evaluation, the distribution of the COPC, the representativeness of the toxicity reference value (TRVs) used in determining the HQs, the size of the impacted population, and the future use of the site were all considered and evaluated.

HQs resulting from the exposure of representative species to the maximum concentration found in shallow soils were initially calculated for 132 receptor species/COPC pairs over the 8 prison sites. This evaluation indicated that no apparent threat existed for 112 of the evaluated pairs, while 9 receptor species/COPC pairs indicated some potential for adverse effects on indigenous receptor populations (i.e., HQs greater than 1 but less than 10), 10 receptor species/COPC pairs indicated a significant potential for adverse effects (i.e., HQs of greater than 10 but less than 100), and one receptor species/COPC pairs indicated that adverse effects were probable (i.e., HQs of greater than 100).

The subsequent re-evaluation of the 20 receptor species/COPC pairs that initially exhibited a potential to affect the proximate endpoints (i.e., representative receptor species) based on site average COPC concentrations (as opposed to maximum concentrations) resulted in the further elimination of 15 receptor species/COPC pairs from consideration. Within the remaining 5 pairs, 2 receptor species/COPC pairs were eliminated based on the evaluation of average COPC concentrations and the very conservative safety factor used in calculations. The other 3 were eliminated based on the average COPC concentrations and because the receptor species would most likely find the prison habitat unattractive and thereby, not be exposed to the compounds.

Biased soil sampling at these sites and the initial use of maximum concentrations and NOAELs in the risk calculations result in highly conservative numerical hazard quotient estimates. Nevertheless, these results indicate that there are few potential ecological threats to the

indigenous receptor populations at the prison sites. Subsequent HQ determinations based on average site concentrations and NOAELs provide a better assessment of the overall site conditions, but are still conservative. These determinations suggest that the likelihood of adverse impacts to any population are low, and most likely restricted to individual members of the population and not to the population as a whole. Most importantly, no visible evidence has been found at any of the sites of any stress or harm to terrestrial or avian receptors or the environment. Therefore, none of the compounds found in soil is considered a chemical of concern for ecological receptors at any of the sites.

Terrestrial and avian receptor exposure to surface water and sediment are considered less significant than the soil pathway. Therefore, exposures to these media were not evaluated quantitatively. The intermittent surface water in drainage ditches does not support significant aquatic species, and protection of terrestrial and avian species for these sites is considered appropriate and sufficient.

6.0 RESPONSE ACTION

According to Section 10.6 of the IAG, Completion Reports are to be prepared for an AOC where the Army asserts (a) that necessary response actions have been completed prior to the effective date of the IAG, (b) are addressed in Removal Actions under the IAG, or (c) pose no significant threat to public health, welfare, or the environment. Based on the data collected during previous investigations and the mini-risk assessment, the six AOCs listed in **Table 6.1-1** below pose no significant threat to public health, welfare, or the environment for the intended future use of these areas. Environmental data were collected at each of these sites and evaluated in a mini-risk assessment presented in this report. Because these AOCs are within a parcel of land designated for use as a prison site, risk receptors under a prison facility were evaluated. In addition, terrestrial ecological risk receptors were considered. Human health and ecological risk was found to be negligible for all pathways considered at SEADs (43, 56, and 69), 44A, 44B, 52, 62 and 120B.

Table 6.1-1 - Six Areas of Concern

SEAD-43	Building 606 Old Missile Propellant Test Laboratory
SEAD-56	Building 606 Herbicide and Pesticide Storage
SEAD-69	Building 606 Disposal Area
SEAD-44A	Quality Assurance Test Laboratory (West of Building 616)
SEAD-44B	Quality Assurance Test Laboratory (Brady Road)
SEAD-52	Ammunition Breakdown Area
SEAD-62	Nicotine Sulfate Disposal Area
SEAD-120B	Ovid Road Small Arms Range

(Note: SEAD-43, SEAD-56, and SEAD-69 are included as one AOC for this Completion Report.)

Since human health risk under the intended future use scenario and ecological risk is negligible, no future remedial action is necessary at these AOCs. The following paragraphs summarize the information presented in this report which supports this assertion.

6.1 SEADS-43, 56, AND 69: BUILDING 606 OLD MISSILE PROPELLANT TEST LABORATORY, HERBICIDE AND PESTICIDE STORAGE, DISPOSAL AREA

6.1.1 Comparison to Standards and Guidelines

Soil, groundwater, surface water, and sediment samples were collected at this AOC.

Soil

Five volatile organic compounds were detected in 10 of the 30 soil samples collected at SEADs 43, 56 and 69. All were found at concentrations which were at least an order of magnitude below their respective TAGM values. A total of 21 semivolatile organic compounds were found at varying concentrations in the soil samples. Only 6 PAH compounds, benzo(a)anthracene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(b)fluoranthene, and benzo(k)fluoranthene, were found at concentrations which exceed their respective TAGM values. Two pesticides (endosulfan I and alpha-chlordane) were detected in 2 of the soil samples at concentrations well below TAGMs. Four herbicides were detected in 3 of the 30 soil samples collected at SEADs 43, 56 and 69. Twenty-two metals were found at varying concentrations in the 30 soil samples collected at SEADs 43, 56 and 69. Eleven of the 22 metals detected were found in one or more samples at concentrations which exceeded their respective TAGM values. Aluminum, chromium, iron, magnesium, potassium and zinc were the most frequently detected metals and each had reported concentrations above their associated TAGM values.

Groundwater

No VOCs, SVOCs, pesticides, or PCBs were detected in the groundwater at SEADs-43, 56, and 69. The herbicide 2,4,5-TP (silvex) was detected at a concentration of 0.44 µg/L in the groundwater sample from monitoring well MW43-3. This concentration is slightly above the New York Class GA groundwater criteria of 0.26 µg/L. A total of 20 inorganic elements were detected in the groundwater at SEADs-43, 56 and 69. The reported concentrations of iron in all 4 groundwater samples were the only values which exceeded the New York AWQS Class GA criteria. The concentrations of iron ranged 1,000 µg/L to 7,170 µg/L.

Surface Water

One volatile organic compound was detected in one surface water sample collected at SEADs-43, 56 and 69. Acetone, a common laboratory contaminant, was present at a concentration of 5 µg/L in surface water sample SW43-2. Two semivolatile organic compounds were found in the surface water collected at SEADs-43, 56 and 69. 4-Methylphenol was detected below the NYSDEC Class C Surface Water Criteria. Bis(2-ethylhexyl)phthalate was detected as well, however, there is currently no criteria established for this compound. No pesticides, PCBs, or herbicides were detected in the surface water. Four of the seventeen metals, aluminum, iron, potassium, and zinc, were detected in the surface water exceeded NYSDEC AWQS Class C criteria.

Sediment

Acetone and 2-butanone were the only VOCs found in the five sediment samples collected at SEADs-43, 56 and 69. These VOCs are common laboratory contaminants. No SVOCs, pesticides or PCBs were detected in the sediment. Three herbicides were detected in the sediment samples collected at SEADs-43, 56, and 69. The herbicides 2,4,5-T, 2,4-DB, and MCPP were all found in sample SD43-2 at concentrations of 18, 110, and 17,000 µg/kg, respectively. These were the highest concentrations of 2,4-DB and MCPP detected in the sediments at SEADs-43, 56, and 69. Of the 22 metals detected in the sediment, arsenic, cadmium, chromium, copper, iron, manganese, nickel, and zinc were found at concentrations which exceeded their respective criteria values.

6.1.2 Mini-Risk Assessment

Table 5.5-2 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.1.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this document and previous to this document and based on the requirements of the FFA, that SEADs-

43,56,69 pose no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at these AOCs.

6.2 SEAD-44A: QUALITY ASSURANCE TEST LABORATORY (WEST OF BUILDING 616)

6.2.1 Comparison to Standards and Guidelines

Soil, groundwater, surface water, and sediment samples were collected at this AOC.

Soil

Six volatile organic compounds were detected in 8 of the 15 soil samples collected at SEAD-44A. 2-butanone, toluene, 4-methyl-2 pentanone, 2-hexanone, and 1,1,2,2-tetrachloroethane were all detected below TAGMs, where applicable. Acetone was also detected with the highest reported value at 200 µg/kg which is equal to the TAGM for this compound. A total of 23 semivolatile organic compounds were found at varying concentrations in the soil samples collected at SEAD-44A. Surface soil samples showed no TAGM exceedances and, for the most part, were very low. Subsurface berm excavations revealed TAGM exceedances for Benz(a)anthracene, chrysene, benzo(a)pyrene (BAP), and dibenz(a,h)anthracene. A total of 9 pesticide compounds were detected in the soil samples collected at SEAD-44A. All of the pesticides detected, except endrin ketone and endrin aldehyde, were found at concentrations which were at least an order of magnitude below their respective TAGM value. No TAGM exists for endrin ketone and endrin aldehyde. A total of 21 metals were detected in the soil samples collected at SEAD-44A. Of the 21 metals reported, 4 were found in one or more of the samples at concentrations which were above TAGM limits. 2,4,6-Trinitrotoluene was detected in only one sample, SS44A-5, at a concentration of 110 µg/kg. There is no TAGM value for 2,4,6-TNT.

Groundwater

Two volatile organic compounds, acetone (8 µg/L) and 1,1,2,2-tetrachloroethane (3 µg/L) were detected in one groundwater sample at SEAD-44A. These concentrations were below the NYSDEC GA Standard, where applicable. No SVOCs, pesticides or PCBs were detected in the

groundwater. Of the 19 metals found in the three groundwater wells, elevated concentrations of aluminum, iron, nickel, and sodium were noted in sample MW44A-2. Iron was the only metal found at concentrations exceeding the NYSDEC Class GA groundwater standard of 300 µg/L. Elevated concentrations of specific metals in groundwater sample MW44A-2 were likely associated with the high turbidity (693 NTUs) of the sample.

Surface Water

No VOCs, SVOCs, pesticides, or PCBs were detected in the surface water at SEAD-44A. A total of 17 metals were detected in the surface water samples collected at SEAD-44A. Of the 17 metals detected, aluminum, iron, nickel and zinc were found at concentrations which exceeded New York Class C surface water guidelines.

Sediment

No VOCs, pesticides or PCBs were detected in the sediment at SEAD-44A. Two SVOs were identified in two of the four sediment samples collected at SEAD-44A. The SVOs detected were both phthalates, and were found at low concentrations. Phthalates are common laboratory contaminants. A number of metals were detected in the sediment at SEAD-44A. Of these, antimony, calcium, magnesium, potassium, and sodium were detected at concentrations which exceeded the NYSDEC Sediment Criteria.

6.2.2 Mini-Risk Assessment

Table 5.5-3 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.2.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this

document and previous to this document and based on the requirements of the FFA, that SEAD-44A poses no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at this AOC.

6.3 SEAD-44B: QUALITY ASSURANCE TEST LABORATORY (BRADY ROAD)

6.3.1 Comparison to Standards and Guidelines

Soil, groundwater, surface water, and sediment samples were collected at SEAD-44B.

Soil

Two volatile organic compounds, acetone and 2-butanone, were detected in the soil samples collected at SEAD-44B. Acetone and 2-butanone are common laboratory contaminants. Both contaminants were present at concentrations which were well below their respective TAGM values. A total of 13 semivolatile organic compounds were found at varying concentrations in two of the three surface soil samples collected at SEAD-44B. In general, the concentrations of semivolatile organic compounds were low, with only two compounds, benzo(a)pyrene and dibenz(a,h)anthracene, exceeding their respective TAGM values. Five pesticides were found in two of the three surface soil samples collected at SEAD-44B. The compound dieldrin was slightly above the TAGM value. No PCB compounds were detected in the soil samples collected at SEAD-44B. Twenty metals were detected in the surface soils collected at SEAD-44B. Of the 20 metals detected, three, arsenic, zinc, and lead, were found at concentrations which were above their associated TAGM values.

Groundwater

No VOCs, SVOCs, pesticides, or PCBs were detected in the groundwater at SEAD-44B. A total of 16 metals were detected in the groundwater samples collected at SEAD-44B. Iron was the only metal found at concentrations above the NY AWQS Class GA criteria value of 300 µg/L.

Surface Water

No VOCs, SVOCs, pesticides, or PCBs were detected in the surface water at SEAD-44B. A total of 13 metals were found in the surface water samples analyzed at SEAD-44B. NYSDEC Class C

Surface Water criteria are established for seven of the metals. All concentrations were below these criteria.

Sediment

2-butanone was the only volatile organic compound found in the sediment samples collected at SEAD-44B. Di-n-butylphthalate was identified in both sediment samples collected at SEAD-44B at concentrations below sediment criteria for phthalates. No pesticides or PCBs were detected in the sediment. A total of twenty metals were detected in the sediment samples collected at SEAD-44B. Arsenic, copper, iron, manganese, and nickel were detected at concentrations which exceeded NYSDEC sediment criteria.

6.3.2 Mini-Risk Assessment

Table 5.5-4 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.3.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this document and previous to this document and based on the requirements of the FFA, that SEAD-44B poses no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at this AOC.

6.4 SEAD-52: AMMUNITION BREAKDOWN AREA

6.4.1 Comparison to Standards and Guidelines

Soil

A total of nineteen (19) surface soil samples (including 18 samples and one duplicate) were collected from a depth of 0 to 2" below ground surface and chemically analyzed for explosives by EPA Method 8330.

All of the surface soil samples, except two samples, that were collected around Building 612 contained explosive compounds. 2,4-dinitrotoluene was the most frequently detected compound (found in 10 of the 18 samples) and ranged in concentration from 91 to 2100 µg/kg. The compound 2,4,6-trinitrotoluene was detected in only two samples and tetryl in only one sample. SS52-15 and SS52-16, the two samples in which explosive compounds were not detected, were located on the southwest side of Building 612. No NYSDEC TAGM criteria are available for the explosive compounds detected.

Clean up criteria have been established for explosives at various army ammunition plants around the country. Excavation cleanup criteria were established at Cornhusker Army Ammunition Plant, Savanna Army Depot Activity, and Alabama Army Ammunition Plant. Criteria ranged between 1.92 and 21.1 mg/kg for 2,4,6-TNT; 0.42 and 9.3 mg/kg for 2,4-DNT; and 1.7 and 112 mg/kg for tetryl (EPA, 1993). Concentrations detected in the soil at SEAD-52 are within these criteria ranges. Moreover, concentrations of tetryl and 2,4,6-TNT were an order of magnitude below the lowest clean up criteria reported. Four detections of 2,4-DNT (between 490 and 2,100 µg/kg) were above the lowest cleanup criteria reported for 2,4-DNT.

6.4.2 Mini-Risk Assessment

Table 5.5-5 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is within or below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.4.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this document and previous to this document and based on the requirements of the FFA, that SEAD-52 poses no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at this AOC.

6.5 SEAD-62: NICOTINE SULFATE DISPOSAL AREA

6.5.1 Comparison to Standards and Guidelines

Soil

No volatile organic compounds were detected in the soil samples collected at SEAD-62. A total of 2 semivolatile organic compounds, characterized as PAHs, were found at very low concentrations in one of the soil samples (TP62-1) collected at SEAD-62. Neither of these exceeded their respective TAGM values. No pesticide or PCB compounds were found in the soil samples collected at SEAD-62. Two herbicides were found in two soil samples collected at SEAD-62. The compound 2,4,5-T was detected in samples TP62-1-1 and TP62-2-1 located in the central portion of the site. Dicamba was detected only in sample TP62-3-1. None of these concentrations were above their TAGM values. The soil samples collected at SEAD-62 were found to contain various metals at concentrations that exceed the associated TAGM or site background values. Of the 20 metals detected in SEAD-62 soils, three (mercury, potassium, and zinc) were found in one or more samples at concentrations above their associated TAGM values, however, the exceedances were within the same order of magnitude as the TAGM value.

Groundwater

Benzene was the only volatile organic compound found in the groundwater samples collected at SEAD-62. The volatile organic compound was detected in both MW62-2 and MW62-3 at estimated concentrations of 2 J µg/L, which exceeded the NY AWQS Class GA standard of 1 µg/L. No semi-volatile organic compounds were detected in the three (3) groundwater samples collected

at SEAD-62. No pesticides or PCBs were found in the three (3) groundwater samples collected at SEAD-62. The herbicide 2,4,5-T was found at a concentration of 0.12 µg/L in the groundwater sample from MW62-2. This concentration is not above the NY AWQS Class GA criteria value of 35 µg/L. A total of 17 metals were detected in the ground water samples collected from SEAD-62. The compound Iron was detected at concentrations between 797 mg/L and 1,160 mg/L in all three groundwater samples, which exceeded both the state criteria values of 300 mg/L. These were the only exceedances for ground water at SEAD-62.

6.5.2 Mini-Risk Assessment

Table 5.5-6 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.5.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this document and previous to this document and based on the requirements of the FFA, that SEAD-62 poses no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at this AOC.

6.6 SEAD-120B: OVID ROAD SMALL ARMS RANGE

A total of six soil samples were collected at three test pit locations behind each of the target locations within the berm as shown in **Figure 2.8-1**. The following sections describe the nature and extent of contamination identified at SEAD-120B.

6.6.1 Comparison to Standards and Guidelines

Soil

A total of seven semivolatile organic compounds were detected, all at estimated concentrations, in the soil samples collected at SEAD-120B. The compounds included many PAHs and two phthalate compounds as shown in **Table 4.6-1**. None of the detected concentrations were above the TAGMs. No explosive compounds were detected in the samples collected from the soil berm. A total of 22 metals were detected in the soil samples collected at SEAD-120B. Of these, four metals exceeded their respective TAGMs as shown in **Table 4.6-1**. Lead was the only metal that exceeded the TAGM in all six samples. Samples from test pits TP120B-1 and TP120B-2 had lead concentrations that were in the several hundred parts per million range. The maximum concentration for lead was 522 mg/kg at TP120B-2, which is 21 times the TAGM value of 24.4 mg/kg. Copper was the next most frequent metal to exceed its TAGM in the SEAD-120B samples. The exceedances for copper, which ranged from 1.7 times to 6.4 times the TAGM value, were found at test pits TP120B-1 and TP120B-2. The other two metals, arsenic and thallium, exceeded the TAGM in only a few samples and the exceedances were relatively low compared to those of lead and copper.

6.6.2 Mini-Risk Assessment

Table 5.5-1 summarizes the calculated cancer and non-cancer risks for all human receptors and exposure routes considered in this risk assessment. The total cancer risk from all exposure routes is below the EPA target range for all five receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all five receptors. No significant ecological risk was found at the six areas of concern as summarized in Section 6.7 below.

6.6.3 Response Action

The historical uses of this site are known, biased sampling has been done, and conservative analyses have been performed. The Army believes, based on the analysis provided in this document and previous to this document and based on the requirements of the FFA, that SEAD-120B poses no threat to public health or the environment and therefore, no further remedial action for chemical contamination is necessary at this AOC.

6.7 ECOLOGICAL RISK SUMMARY

Ecological risk was assessed as described below.

6.7.1 Soil

To assess ecological risks, soil datasets from each set were combined. The maximum value detected was used as the exposure concentration and hazard quotients (HQ) for each constituent of potential concern (COPC) were calculated. An HQ of 1 or less was considered to be protective of the ecological receptor. If the analysis suggested that a potential threat did exist, a further analysis of the severity and the magnitude of potential threat was performed. This analysis considered factors such as weight-of-evidence, conservatism of assumptions, use of the maximum value as the exposure concentration, etc.

HQs resulting from the exposure of terrestrial and avian species to the maximum concentration found in shallow soils indicated that no apparent threat existed for 112 of the evaluated pairs, while 9 receptor species/COPC pairs indicated some potential for adverse effects on indigenous receptor populations (i.e., HQs greater than 1 but less than 10), 10 receptor species/COPC pairs indicated a significant potential for adverse effects (i.e., HQs of greater than 10 but less than 100), and one receptor species/COPC pairs indicated that adverse effects were probable (i.e., HQs of greater than 100).

The subsequent re-evaluation of the 20 receptor species/COPC pairs that initially exhibited a potential to affect the proximate endpoints (i.e., representative receptor species) based on site average COPC concentrations (as opposed to maximum concentrations) resulted in the further elimination of 15 receptor species/COPC pairs from consideration. Within the remaining 5 pairs, 2 receptor species/COPC pairs were eliminated based on the evaluation of average COPC concentrations and the very conservative safety factor used in calculations. The other 3 were eliminated based on the average COPC concentrations and because the receptor species would most likely find the prison habitat unattractive and thereby, not be exposed to the compounds.

Biased soil sampling at these sites and the initial use of maximum concentrations and NOAELs in the risk calculations result in highly conservative numerical hazard quotient estimates. Nevertheless, these results indicate that there are few potential ecological threats to the indigenous receptor populations at the prison sites. Subsequent HQ determinations based on average site concentrations and NOAELs provide a better assessment of the overall site conditions, but are still conservative. These determinations suggest that the likelihood of adverse

impacts to any population are low, and most likely restricted to individual members of the population and not to the population as a whole. Most importantly, no visible evidence has been found at any of the sites of any stress or harm to terrestrial or avian receptors or the environment. Therefore, none of the compounds found in soil is considered a chemical of concern for ecological receptors at any of the sites.

6.7.2 Surface Water

Due to the ephemeral nature of surface water accumulation in the drainage ditches and the limited exposure of valued ecological receptors to surface water or sediment in the ditches, these media were not quantitatively assessed in this ERA. NYSDEC has established ambient water quality guidelines for various water classes and purposes. For instance, the NYSDEC Class C guidelines are designed to protect fish propagation in fresh waters. The drainage ditches at the site are not considered a classifiable water body, and do not sustain valued aquatic life (such as fish) on a continual basis. While the Class C guidelines were compared to the maximum surface water concentrations in ditches at the AOCs in Section 4, these comparisons are not relevant to receptors of concern at this site.

6.7.3 Sediment

Sediment in the drainage ditches was sampled at the AOCs. In general, the concentrations of chemicals found in sediment were similar to the concentrations measured in soil. In many cases, the sediment concentrations appear to be similar to the background soils at SEDA. Terrestrial receptors, such as mice, may ingest or contact this sediment, as they would soil. Since the sediment is less prevalent than soil at the AOCs, and since the chemical concentrations are similar for the two media, the quantitative analysis of soil exposure for terrestrial receptors is considered representative of exposure to sediment as well. NYSDEC has established sediment criteria for the protection of wildlife, considering bioaccumulation (NYSDEC 1993). None of the compounds measured in sediment at the AOCs have listed wildlife bioaccumulation sediment criteria. Therefore, the sediment at this site complies with these potentially applicable criteria.

NYSDEC has established other sediment guidelines to protect aquatic life and prevent bioaccumulation in benthic organisms. The maximum concentrations measured in sediment in ditches at the AOCs were compared with these NYSDEC sediment guidelines in Section 4. However, bioaccumulation in lower food chain organisms (as considered by the NYSDEC

criteria) is not relevant for direct contact by terrestrial receptors. Therefore, these comparisons are not considered applicable to receptors of concern at this site.

APPENDIX A
RISK TABLES - SEAD-120B

TABLE A-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = CS dsurf x PM d10 x CF

Variables:
CS dsurf = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM d10 = Average Measured PM d10 Concentration = 17 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m^3) = CS dtot x PM d10 x CF

Variables:
CS dtot = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM d10 = PM d10 Concentration Calculated for Construction Worker= 340 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Metals				
Copper	1.91E+002	2.12E+002	3.25E-006	7.21E-005
Lead	5.22E+002	5.22E+002	8.87E-006	1.77E-004
Potassium	2.27E+003	2.27E+003	3.86E-005	7.72E-004
Selenium	1.20E+000	1.20E+000	2.04E-008	4.08E-007
Zinc	1.05E-002	1.10E+002	1.79E-006	3.74E-005

ND = Compound was not detected above the detection limit shown

TABLE A-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE A-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)												
Metals																
Copper	4.0E-002	NA	1.91E+002	2.12E+002	2.73E-004		7E-003		1.87E-004		5E-003		5.97E-006		1E-004	
Lead	NA	NA	5.22E+002	5.22E+002												
Potassium	NA	NA	2.27E+003	2.27E+003												
Selenium	5.0E-003	NA	1.20E+000	1.20E+000	1.71E-006		3E-004		1.17E-006		2E-004		3.38E-008		7E-006	
Zinc	3.0E-001	NA	1.05E+002	1.10E+002	1.50E-004		5E-004		1.03E-004		3E-004		3.10E-006		1E-005	
Total Hazard Quotient and Cancer Risk:							**8E-003**				**5E-003**				**2E-004**	

Assumptions for Prison Inmate		
CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc) =	8760	days
AT (Car) =	25550	days

Assumptions for Prison Worker		
CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Assumptions for Construction Worker		
CS =	EPC Surface and Subsurface	
IR =	480	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	1.5	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Day Care Center Child Intake (mg/kg-day) (Nc)	Day Care Center Child Intake (mg/kg-day) (Car)	Day Care Center Child Hazard Quotient	Day Care Center Child Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Nc)	Day Care Center Adult Intake (mg/kg-day) (Car)	Day Care Center Adult Hazard Quotient	Day Care Center Adult Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)								
Metals												
Copper	4 0E-002	NA	1 91E+002	2.12E+002	1.74E-003		4E-002		1.87E-004		5E-003	
Lead	NA	NA	5.22E+002	5.22E+002								
Potassium	NA	NA	2.27E+003	2.27E+003								
Selenium	5 0E-003	NA	1.20E+000	1.20E+000	1.10E-005		2E-003		1.17E-006		2E-004	
Zinc	3 0E-001	NA	1 05E+002	1.10E+002	9.59E-004		3E-003		1.03E-004		3E-004	
Total Hazard Quotient and Cancer Risk:							**5E-002**				**5E-003**	

Assumptions for Day Care Center Child

CS =	EPC Surface Only	
IR =	200	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	6	years
BW =	15	kg
AT (Nc) =	2190	days
AT (Car) =	25550	days

Assumptions for Day Care Center Adult

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available

TABLE A-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-120B
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. dermal RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

APPENDIX B
RISK TABLES - SEAD-43, 56, 69

TABLE B-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = $CS_{surf} \times PM_{10} \times CF$

Variables:
CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m^3) = $CS_{tot} \times PM_{10} \times CF$

Variables:
CS_{tot} = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 340 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Volatile Organics				
Acetone		5.00E-03		1.70E-09
Chloroform	3.00E-03	4.00E-03	5.10E-11	1.36E-09
Methylene Chloride		4.00E-03		1.36E-09
Toluene	3.00E-03	2.70E-02	5.10E-11	9.18E-09
Xylene (total)	4.00E-03	1.20E-02	6.80E-11	4.08E-09
Semivolatile Organics				
2-Methylnaphthalene	4.60E-02	8.80E-02	7.82E-10	2.99E-08
4-Methylphenol	5.80E-01	5.80E-01	9.86E-09	1.97E-07
Acenaphthene	3.00E-01	5.70E-01	5.10E-09	1.94E-07
Anthracene	7.00E-01	1.30E+00	1.19E-08	4.42E-07
Benzo(a)anthracene	1.20E+00	2.40E+00	2.04E-08	8.16E-07
Benzo(a)pyrene	1.20E+00	2.00E+00	2.04E-08	6.80E-07
Benzo(b)fluoranthene	1.00E+00	1.60E+00	1.70E-08	5.44E-07
Benzo(g,h,i)perylene	7.30E-01	1.30E+00	1.24E-08	4.42E-07
Benzo(k)fluoranthene	9.60E-01	2.00E+00	1.63E-08	6.80E-07
Carbazole	3.50E-01	6.20E-01	5.95E-09	2.11E-07
Chrysene	1.20E+00	2.40E+00	2.04E-08	8.16E-07
Di-n-butylphthalate	6.20E-02	6.20E-02	1.05E-09	2.11E-08
Dibenz(a,h)anthracene	3.00E-01	5.20E-01	5.10E-09	1.77E-07
Dibenzofuran	1.70E-01	3.10E-01	2.89E-09	1.05E-07
Fluoranthene	3.20E+00	6.30E+00	5.44E-08	2.14E-06
Fluorene	3.20E-01	6.10E-01	5.44E-09	2.07E-07
Indeno(1,2,3-cd)pyrene	6.60E-01	1.20E+00	1.12E-08	4.08E-07
Naphthalene	1.40E-01	2.00E-01	2.38E-09	6.80E-08
Phenanthrene	2.60E+00	5.20E+00	4.42E-08	1.77E-06
Pyrene	2.70E+00	4.70E+00	4.59E-08	1.60E-06
bis(2-Ethylhexyl)phthalate	2.70E+00	2.70E+00	4.59E-08	9.18E-07
Pesticides				
Endosulfan I	1.20E-03	1.20E-03	2.04E-11	4.08E-10
alpha-Chlordane	2.40E-03	2.40E-03	4.08E-11	8.16E-10
Metals				
Cadmium	1.50E+00	1.50E+00	2.55E-08	5.10E-07
Copper	2.38E+01	2.81E+01	4.05E-07	9.55E-06
Lead	3.02E+01	3.02E+01	5.13E-07	1.03E-05
Potassium	3.56E+03	3.56E+03	6.05E-05	1.21E-03
Selenium	1.40E+00	1.80E+00	2.38E-08	6.12E-07
Zinc	3.38E+02	3.38E+02	5.75E-06	1.15E-04
Herbicides				
2,4,5-T	1.20E-02	1.20E-02	2.04E-10	4.08E-09
Dicamba	1.10E-02	1.10E-02	1.87E-10	3.74E-09
Dichloroprop	7.20E-02	7.20E-02	1.22E-09	2.45E-08
MCPP	7.30E+00	7.70E+00	1.24E-07	2.62E-06

ND = Compound was not detected above the detection limit shown

TABLE B-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Prison Inmate				Prison Worker			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	NA	NA		1 70E-09								
Chloroform	NA	8 1E-02	5 10E-11	1 36E-09		3 80E-12		3E-13		1 43E-12		1E-13
Methylene Chloride	8 6E-01	1 7E-03		1 36E-09								
Toluene	1 1E-01	NA	5 10E-11	9 18E-09	1 11E-11		1E-10		3 99E-12		3E-11	
Xylene (total)	NA	NA	6 80E-11	4 08E-09								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	7 82E-10	2 99E-08								
4-Methylphenol	NA	NA	9 86E-09	1 97E-07								
Acenaphthene	NA	NA	5 10E-09	1 94E-07								
Anthracene	NA	NA	1 19E-08	4 42E-07								
Benzo(a)anthracene	NA	NA	2 04E-08	8 16E-07								
Benzo(a)pyrene	NA	NA	2.04E-08	6.80E-07								
Benzo(b)fluoranthene	NA	NA	1.70E-08	5 44E-07								
Benzo(g,h,i)perylene	NA	NA	1 24E-08	4 42E-07								
Benzo(k)fluoranthene	NA	NA	1 63E-08	6 80E-07								
Carbazole	NA	NA	5 95E-09	2 11E-07								
Chrysene	NA	NA	2 04E-08	8 16E-07								
Di-n-butylphthalate	NA	NA	1 05E-09	2 11E-08								
Dibenz(a,h)anthracene	NA	NA	5 10E-09	1 77E-07								
Dibenzofuran	NA	NA	2 89E-09	1 05E-07								
Fluoranthene	NA	NA	5 44E-08	2 14E-06								
Fluorene	NA	NA	5 44E-09	2 07E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	1 12E-08	4 08E-07								
Naphthalene	8 6E-04	NA	2 38E-09	6 80E-08	5 17E-10		6E-07		1 86E-10		2E-07	
Phenanthrene	NA	NA	4 42E-08	1 77E-06								
Pyrene	NA	NA	4 59E-08	1 60E-06								
bis(2-Ethylhexyl)phthalate	NA	NA	4 59E-08	9 18E-07								
Pesticides												
Endosulfan I	NA	NA	2 04E-11	4 08E-10								
alpha-Chlordane	2 0E-04	3 5E-01	4 08E-11	8 16E-10	8 86E-12	3 04E-12	4E-08	1E-12	3 19E-12	1 14E-12	2E-08	4E-13
Metals												
Cadmium	NA	6 3E+00	2 55E-08	5 10E-07		1 90E-09		1E-08		7 13E-10		4E-09
Copper	NA	NA	4 05E-07	9 55E-06								
Lead	NA	NA	5 13E-07	1.03E-05								
Potassium	NA	NA	6 05E-05	1.21E-03								
Selenium	NA	NA	2 38E-08	6 12E-07								
Zinc	NA	NA	5 75E-06	1 15E-04								
Herbicides												
2,4,5-T	NA	NA	2 04E-10	4 08E-09								
Dicamba	NA	NA	1 87E-10	3 74E-09								
Dichloroprop	NA	NA	1 22E-09	2 45E-08								
MCPP	NA	NA	1 24E-07	2 62E-06								
Total Hazard Quotient and Cancer Risk:							**6E-07**	**1E-08**			**2E-07**	**4E-09**

Assumptions for Prison Inmate		Assumptions for Prison Worker	
CA =	EPC Surface Only	CA =	EPC Surface Only
IR =	15 2 m3/day	IR =	8 m3/day
EF =	365 days/year	EF =	250 days/year
ED =	24 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table B-1 for calculation of Air EPC
NA = Information not available

TABLE B-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC* from Surface Soil (mg/m3)	Air EPC* from Total Soils (mg/m3)	Construction Worker Intake (mg/kg-day) (Nc)	Intake (mg/kg-day) (Car)	Hazard Quotient	Cancer Risk
Volatile Organics								
Acetone	NA	NA		1 70E-09				
Chloroform	NA	8 1E-02	5 10E-11	1 36E-09		1 92E-13		2E-14
Methylene Chloride	8 6E-01	1 7E-03		1 36E-09	1 34E-11	1 92E-13	2E-11	3E-16
Toluene	1 1E-01	NA	5 10E-11	9 18E-09	9 06E-11		8E-10	
Xylene (total)	NA	NA	6 80E-11	4 08E-09				
Semivolatile Organics								
2-Methylnaphthalene	NA	NA	7 82E-10	2 99E-08				
4-Methylphenol	NA	NA	9 86E-09	1 97E-07				
Acenaphthene	NA	NA	5 10E-09	1 94E-07				
Anthracene	NA	NA	1 19E-08	4 42E-07				
Benzo(a)anthracene	NA	NA	2 04E-08	8 16E-07				
Benzo(a)pyrene	NA	NA	2.04E-08	6 80E-07				
Benzo(b)fluoranthene	NA	NA	1 70E-08	5 44E-07				
Benzo(g,h,i)perylene	NA	NA	1 24E-08	4 42E-07				
Benzo(k)fluoranthene	NA	NA	1 63E-08	6 80E-07				
Carbazole	NA	NA	5 95E-09	2 11E-07				
Chrysene	NA	NA	2 04E-08	8 16E-07				
Di-n-butylphthalate	NA	NA	1 05E-09	2 11E-08				
Dibenz(a,h)anthracene	NA	NA	5 10E-09	1 77E-07				
Dibenzofuran	NA	NA	2 89E-09	1 05E-07				
Fluoranthene	NA	NA	5 44E-08	2 14E-06				
Fluorene	NA	NA	5 44E-09	2 07E-07				
Indeno(1,2,3-cd)pyrene	NA	NA	1 12E-08	4 08E-07				
Naphthalene	8 6E-04	NA	2 38E-09	6 80E-08	6 71E-10		8E-07	
Phenanthrene	NA	NA	4 42E-08	1 77E-06				
Pyrene	NA	NA	4 59E-08	1 60E-06				
bis(2-Ethylhexyl)phthalate	NA	NA	4 59E-08	9 18E-07				
Pesticides								
Endosulfan I	NA	NA	2 04E-11	4 08E-10				
alpha-Chlordane	2 0E-04	3 5E-01	4 08E-11	8 16E-10	8 05E-12	1 15E-13	4E-08	4E-14
Metals								
Cadmium	NA	6 3E+00	2 55E-08	5 10E-07		7 19E-11		5E-10
Copper	NA	NA	4 05E-07	9 55E-06				
Lead	NA	NA	5 13E-07	1 03E-05				
Potassium	NA	NA	6 05E-05	1 21E-03				
Selenium	NA	NA	2 38E-08	6 12E-07				
Zinc	NA	NA	5 75E-06	1 15E-04				
Herbicides								
2,4,5-T	NA	NA	2 04E-10	4 08E-09				
Dicamba	NA	NA	1 87E-10	3 74E-09				
Dichloroprop	NA	NA	1 22E-09	2 45E-08				
MCPP	NA	NA	1 24E-07	2 62E-06				
Total Hazard Quotient and Cancer Risk:							**8E-07**	**5E-10**

Assumptions for Construction Worker

CA =	EPC Surface and Sub-Surface
IR =	10 4 m3/day
EF =	24 25 days/year
ED =	1 years
BW =	70 kg
AT (Nc) =	365 days
AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table B-1 for calculation of Air EPC
NA = Information not available

TABLE B-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* fro Surface Soil	Air EPC* from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	NA	NA		1 70E-09								
Chloroform	NA	8 1E-02	5 10E-11	1 36E-09		7 98E-13		6E-14		1 43E-12		1E-13
Methylene Chloride	8 6E-01	1 7E-03		1 36E-09								
Toluene	1 1E-01	NA	5 10E-11	9 18E-09	9 32E-12		8E-11		3 99E-12		3E-11	
Xylene (total)	NA	NA	6 80E-11	4 08E-09								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	7 82E-10	2 99E-08								
4-Methylphenol	NA	NA	9 86E-09	1 97E-07								
Acenaphthene	NA	NA	5 10E-09	1 94E-07								
Anthracene	NA	NA	1 19E-08	4 42E-07								
Benzo(a)anthracene	NA	NA	2 04E-08	8 16E-07								
Benzo(a)pyrene	NA	NA	2 04E-08	6 80E-07								
Benzo(b)fluoranthene	NA	NA	1 70E-08	5 44E-07								
Benzo(g,h,i)perylene	NA	NA	1 24E-08	4 42E-07								
Benzo(k)fluoranthene	NA	NA	1 63E-08	6 80E-07								
Carbazole	NA	NA	5 95E-09	2 11E-07								
Chrysene	NA	NA	2 04E-08	8 16E-07								
Di-n-butylphthalate	NA	NA	1 05E-09	2 11E-08								
Dibenz(a,h)anthracene	NA	NA	5 10E-09	1 77E-07								
Dibenzofuran	NA	NA	2 89E-09	1 05E-07								
Fluoranthene	NA	NA	5 44E-08	2 14E-06								
Fluorene	NA	NA	5 44E-09	2 07E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	1 12E-08	4 08E-07								
Naphthalene	8 6E-04	NA	2 38E-09	6 80E-08	4 35E-10		5E-07		1 86E-10		2E-07	
Phenanthrene	NA	NA	4 42E-08	1 77E-06								
Pyrene	NA	NA	4 59E-08	1 60E-06								
bis(2-Ethylhexyl)phthalate	NA	NA	4 59E-08	9 18E-07								
Pesticides												
Endosulfan I	NA	NA	2 04E-11	4 08E-10								
alpha-Chlordane	2 0E-04	3 5E-01	4 08E-11	8 16E-10	7 45E-12	6 39E-13	4E-08	2E-13	3 19E-12	1 14E-12	2E-08	4E-13
Metals												
Cadmium	NA	6 3E+00	2 55E-08	5 10E-07		3 99E-10		3E-09		7 13E-10		4E-09
Copper	NA	NA	4 05E-07	9 55E-06								
Lead	NA	NA	5 13E-07	1 03E-05								
Potassium	NA	NA	6 05E-05	1 21E-03								
Selenium	NA	NA	2 38E-08	6 12E-07								
Zinc	NA	NA	5 75E-06	1 15E-04								
Herbicides												
2,4,5-T	NA	NA	2 04E-10	4 08E-09								
Dicamba	NA	NA	1 87E-10	3 74E-09								
Dichloroprop	NA	NA	1 22E-09	2 45E-08								
MCPP	NA	NA	1 24E-07	2 62E-06								
Total Hazard Quotient and Cancer Risk:							5E-07	3E-09			2E-07	4E-09

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
CA =	EPC Surface Only	CA =	EPC Surface Only
IR =	4 m3/day	IR =	8 m3/day
EF =	250 days/year	EF =	250 days/year
ED =	6 years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table B-1 for calculation of Air EPC
NA= Information not available

TABLE B-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate				Prison Worker			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.0E-01	NA		5.00E-03								
Chloroform	1.0E-02	6.1E-03	3.00E-03	4.00E-03	4.29E-09	1.47E-09	4E-07	9E-12	2.94E-09	1.05E-09	3E-07	6E-12
Methylene Chloride	6.0E-02	7.5E-03		4.00E-03								
Toluene	2.0E-01	NA	3.00E-03	2.70E-02	4.29E-09		2E-08		2.94E-09		1E-08	
Xylene (total)	2.0E+00	NA	4.00E-03	1.20E-02	5.71E-09		3E-09		3.91E-09		2E-09	
Semivolatile Organics												
2-Methylnaphthalene	4.0E-02	NA	4.60E-02	8.80E-02	6.57E-08		2E-06		4.50E-08		1E-06	
4-Methylphenol	5.0E-03	NA	5.80E-01	5.80E-01	8.29E-07		2E-04		5.68E-07		1E-04	
Acenaphthene	6.0E-02	NA	3.00E-01	5.70E-01	4.29E-07		7E-06		2.94E-07		5E-06	
Anthracene	3.0E-01	NA	7.00E-01	1.30E+00	1.00E-06		3E-06		6.85E-07		2E-06	
Benzo(a)anthracene	NA	7.3E-01	1.20E+00	2.40E+00		5.88E-07		4E-07		4.19E-07		3E-07
Benzo(a)pyrene	NA	7.3E+00	1.20E+00	2.00E+00		5.88E-07		4E-06		4.19E-07		3E-06
Benzo(b)fluoranthene	NA	7.3E-01	1.00E+00	1.60E+00		4.90E-07		4E-07		3.49E-07		3E-07
Benzo(g,h,i)perylene	NA	NA	7.30E-01	1.30E+00								
Benzo(k)fluoranthene	NA	7.3E-02	9.60E-01	2.00E+00		4.70E-07		3E-08		3.35E-07		2E-08
Carbazole	NA	2.0E-02	3.50E-01	6.20E-01		1.71E-07		3E-09		1.22E-07		2E-09
Chrysene	NA	7.3E-03	1.20E+00	2.40E+00		5.88E-07		4E-09		4.19E-07		3E-09
Di-n-butylphthalate	1.0E-01	NA	6.20E-02	6.20E-02	8.86E-08		9E-07		6.07E-08		6E-07	
Dibenz(a,h)anthracene	NA	7.3E+00	3.00E-01	5.20E-01		1.47E-07		1E-06		1.05E-07		8E-07
Dibenzofuran	NA	NA	1.70E-01	3.10E-01								
Fluoranthene	4.0E-02	NA	3.20E+00	6.30E+00	4.57E-06		1E-04		3.13E-06		8E-05	
Fluorene	4.0E-02	NA	3.20E-01	6.10E-01	4.57E-07		1E-05		3.13E-07		8E-06	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	6.60E-01	1.20E+00		3.23E-07		2E-07		2.31E-07		2E-07
Naphthalene	2.0E-02	NA	1.40E-01	2.00E-01	2.00E-07		1E-05		1.37E-07		7E-06	
Phenanthrene	NA	NA	2.60E+00	5.20E+00								
Pyrene	3.0E-02	NA	2.70E+00	4.70E+00	3.86E-06		1E-04		2.64E-06		9E-05	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	2.70E+00	2.70E+00	3.86E-06	1.32E-06	2E-04	2E-08	2.64E-06	9.44E-07	1E-04	1E-08
Pesticides/PCBs												
Endosulfan I	6.0E-03	NA	1.20E-03	1.20E-03	1.71E-09		3E-07		1.17E-09		2E-07	
alpha-Chlordane	5.0E-04	3.5E-01	2.40E-03	2.40E-03	3.43E-09	1.18E-09	7E-06	4E-10	2.35E-09	8.39E-10	5E-06	3E-10
Metals												
Cadmium	5.0E-04	NA	1.50E+00	1.50E+00	2.14E-06		4E-03		1.47E-06		3E-03	
Copper	4.0E-02	NA	2.38E+01	2.81E+01	3.40E-05		9E-04		2.33E-05		6E-04	
Lead	NA	NA	3.02E+01	3.02E+01								
Potassium	NA	NA	3.56E+03	3.56E+03								
Selenium	5.0E-03	NA	1.40E+00	1.80E+00	2.00E-06		4E-04		1.37E-06		3E-04	
Zinc	3.0E-01	NA	3.38E+02	3.38E+02	4.83E-04		2E-03		3.31E-04		1E-03	
Herbicides												
2,4,5-T	1.0E-02	NA	1.20E-02	1.20E-02	1.71E-08		2E-06		1.17E-08		1E-06	
Dicamba	3.0E-02	NA	1.10E-02	1.10E-02	1.57E-08		5E-07		1.08E-08		4E-07	
Dichloroprop	NA	NA	7.20E-02	7.20E-02								
MCPP	1.0E-03	NA	7.30E+00	7.70E+00	1.04E-05		1E-02		7.14E-06		7E-03	
Total Hazard Quotient and Cancer Risk:							**2E-02**	**6E-06**			**1E-02**	**5E-06**

Assumptions for Prison Worker		Assumptions for Prison Worker	
CS =	EPC Surface Only	CS =	EPC Surface Only
IR =	100 mg soil/day	IR =	100 mg soil/day
CF =	1E-06 kg/mg	CF =	1E-06 kg/mg
FI =	1 unitless	FI =	1 unitless
EF =	365 days/year	EF =	250 days/year
ED =	24 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA= Information not available

TABLE B-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Construction Worker Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)		
Volatile Organics								
Acetone	1 0E-01	NA		5 00E-03	2 28E-09		2E-08	
Chloroform	1 0E-02	6 1E-03	3 00E-03	4 00E-03	1 82E-09	2 60E-11	2E-07	2E-13
Methylene Chloride	6 0E-02	7 5E-03		4 00E-03	1 82E-09	2 60E-11	3E-08	2E-13
Toluene	2 0E-01	NA	3 00E-03	2 70E-02	1 23E-08		6E-08	
Xylene (total)	2 0E+00	NA	4 00E-03	1 20E-02	5 47E-09		3E-09	
Semivolatile Organics								
2-Methylnaphthalene	4 0E-02	NA	4 60E-02	8 80E-02	4 01E-08		1E-06	
4-Methylphenol	5 0E-03	NA	5 80E-01	5 80E-01	2 64E-07		5E-05	
Acenaphthene	6 0E-02	NA	3 00E-01	5 70E-01	2 60E-07		4E-06	
Anthracene	3 0E-01	NA	7 00E-01	1 30E+00	5 92E-07		2E-06	
Benzo(a)anthracene	NA	7 3E-01	1 20E+00	2 40E+00		1 56E-08		1E-08
Benzo(a)pyrene	NA	7 3E+00	1 20E+00	2 00E+00		1 30E-08		1E-07
Benzo(b)fluoranthene	NA	7 3E-01	1 00E+00	1 60E+00		1 04E-08		8E-09
Benzo(g,h,i)perylene	NA	NA	7 30E-01	1 30E+00				
Benzo(k)fluoranthene	NA	7 3E-02	9 60E-01	2 00E+00		1 30E-08		1E-09
Carbazole	NA	2 0E-02	3 50E-01	6 20E-01		4 04E-09		8E-11
Chrysene	NA	7 3E-03	1 20E+00	2 40E+00		1 56E-08		1E-10
Di-n-butylphthalate	1 0E-01	NA	6 20E-02	6 20E-02	2 82E-08		3E-07	
Dibenz(a,h)anthracene	NA	7 3E+00	3 00E-01	5 20E-01		3 38E-09		2E-08
Dibenzofuran	NA	NA	1 70E-01	3 10E-01				
Fluoranthene	4 0E-02	NA	3 20E+00	6 30E+00	2 87E-06		7E-05	
Fluorene	4 0E-02	NA	3 20E-01	6 10E-01	2 78E-07		7E-06	
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	6 60E-01	1 20E+00		7 81E-09		6E-09
Naphthalene	2 0E-02	NA	1 40E-01	2 00E-01	9 11E-08		5E-06	
Phenanthrene	NA	NA	2 60E+00	5 20E+00				
Pyrene	3 0E-02	NA	2 70E+00	4 70E+00	2 14E-06		7E-05	
bis(2-Ethylhexyl)phthalate	2 0E-02	1 4E-02	2 70E+00	2 70E+00	1 23E-06	1 76E-08	6E-05	2E-10
Pesticides/PCBs								
Endosulfan I	6 0E-03	NA	1 20E-03	1 20E-03	5 47E-10		9E-08	
alpha-Chlordane	5 0E-04	3 5E-01	2 40E-03	2 40E-03	1 09E-09	1 56E-11	2E-06	5E-12
Metals								
Cadmium	5 0E-04	NA	1 50E+00	1 50E+00	6 83E-07		1E-03	
Copper	4 0E-02	NA	2 38E+01	2 81E+01	1 28E-05		3E-04	
Lead	NA	NA	3 02E+01	3 02E+01				
Potassium	NA	NA	3 56E+03	3 56E+03				
Selenium	5 0E-03	NA	1 40E+00	1 80E+00	8 20E-07		2E-04	
Zinc	3 0E-01	NA	3 38E+02	3 38E+02	1 54E-04		5E-04	
Herbicides								
2,4,5-T	1 0E-02	NA	1 20E-02	1 20E-02	5 47E-09		5E-07	
Dicamba	3 0E-02	NA	1 10E-02	1 10E-02	5 01E-09		2E-07	
Dichloroprop	NA	NA	7 20E-02	7 20E-02				
MCPP	1 0E-02	NA	7 30E+00	7 70E+00	3 51E-06		4E-03	
Total Hazard Quotient and Cancer Risk:							**6E-03**	**1E-07**

Assumptions for Construction Worker

CS =	EPC Total Soils
IR =	480 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	24 25 days/year
ED =	1 years
BW =	70 kg
AT (Nc) =	365 days
AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA = Information not available

TABLE B-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.0E-01	NA		5.00E-03								
Chloroform	1.0E-02	6.1E-03	3.00E-03	4.00E-03	2.74E-08	2.35E-09	3E-06	1E-11	2.94E-09	1.05E-09	3E-07	6E-12
Methylene Chloride	6.0E-02	7.5E-03		4.00E-03								
Toluene	2.0E-01	NA	3.00E-03	2.70E-02	2.74E-08		1E-07		2.94E-09		1E-08	
Xylene (total)	2.0E+00	NA	4.00E-03	1.20E-02	3.65E-08		2E-08		3.91E-09		2E-09	
Semivolatile Organics												
2-Methylnaphthalene	4.0E-02	NA	4.60E-02	8.80E-02	4.20E-07		1E-05		4.50E-08		1E-06	
4-Methylphenol	5.0E-03	NA	5.80E-01	5.80E-01	5.30E-06		1E-03		5.68E-07		1E-04	
Acenaphthene	6.0E-02	NA	3.00E-01	5.70E-01	2.74E-06		5E-05		2.94E-07		5E-06	
Anthracene	3.0E-01	NA	7.00E-01	1.30E+00	6.39E-06		2E-05		6.85E-07		2E-06	
Benzo(a)anthracene	NA	7.3E-01	1.20E+00	2.40E+00		9.39E-07		7E-07		4.19E-07		3E-07
Benzo(a)pyrene	NA	7.3E+00	1.20E+00	2.00E+00		9.39E-07		7E-06		4.19E-07		3E-06
Benzo(b)fluoranthene	NA	7.3E-01	1.00E+00	1.60E+00		7.83E-07		6E-07		3.49E-07		3E-07
Benzo(g,h,i)perylene	NA	NA	7.30E-01	1.30E+00								
Benzo(k)fluoranthene	NA	7.3E-02	9.60E-01	2.00E+00		7.51E-07		5E-08		3.35E-07		2E-08
Carbazole	NA	2.0E-02	3.50E-01	6.20E-01		2.74E-07		5E-09		1.22E-07		2E-09
Chrysene	NA	7.3E-03	1.20E+00	2.40E+00		9.39E-07		7E-09		4.19E-07		3E-09
Di-n-butylphthalate	1.0E-01	NA	6.20E-02	6.20E-02	5.66E-07		6E-06		6.07E-08		6E-07	
Dibenz(a,h)anthracene	NA	7.3E+00	3.00E-01	5.20E-01		2.35E-07		2E-06		1.05E-07		8E-07
Dibenzofuran	NA	NA	1.70E-01	3.10E-01								
Fluoranthene	4.0E-02	NA	3.20E+00	6.30E+00	2.92E-05		7E-04		3.13E-06		8E-05	
Fluorene	4.0E-02	NA	3.20E-01	6.10E-01	2.92E-06		7E-05		3.13E-07		8E-06	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	6.60E-01	1.20E+00		5.17E-07		4E-07		2.31E-07		2E-07
Naphthalene	2.0E-02	NA	1.40E-01	2.00E-01	1.28E-06		6E-05		1.37E-07		7E-06	
Phenanthrene	NA	NA	2.60E-00	5.20E-00								
Pyrene	3.0E-02	NA	2.70E+00	4.70E+00	2.47E-05		8E-04		2.64E-06		9E-05	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	2.70E+00	2.70E+00	2.47E-05	2.11E-06	1E-03	3E-08	2.64E-06	9.44E-07	1E-04	1E-08
Pesticides/PCBs												
Endosulfan I	6.0E-03	NA	1.20E-03	1.20E-03	1.10E-08		2E-06		1.17E-09		2E-07	
alpha-Chlordane	5.0E-04	3.5E-01	2.40E-03	2.40E-03	2.19E-08	1.88E-09	4E-05	7E-10	2.35E-09	8.39E-10	5E-06	3E-10
Metals												
Cadmium	5.0E-04	NA	1.50E+00	1.50E+00	1.37E-05		3E-02		1.47E-06		3E-03	
Copper	4.0E-02	NA	2.38E+01	2.81E+01	2.17E-04		5E-03		2.33E-05		6E-04	
Lead	NA	NA	3.02E+01	3.02E+01								
Potassium	NA	NA	3.56E+03	3.56E+03								
Selenium	5.0E-03	NA	1.40E+00	1.80E+00	1.28E-05		3E-03		1.37E-06		3E-04	
Zinc	3.0E-01	NA	3.38E+02	3.38E+02	3.09E-03		1E-02		3.31E-04		1E-03	
Herbicides												
2,4,5-T	1.0E-02	NA	1.20E-02	1.20E-02	1.10E-07		1E-05		1.17E-08		1E-06	
Dicamba	3.0E-02	NA	1.10E-02	1.10E-02	1.00E-07		3E-06		1.08E-08		4E-07	
Dichloroprop	NA	NA	7.20E-02	7.20E-02								
MCPP	1.0E-03	NA	7.30E+00	7.70E+00	6.67E-05		7E-02		7.14E-06		7E-03	
Total Hazard Quotient and Cancer Risk:							**1E-01**	**1E-05**			**1E-02**	**5E-06**

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
CS =	EPC Surface Only	CS =	EPC Surface Only
IR =	200 mg soil/day	IR =	100 mg soil/day
CF =	1E-06 kg/mg	CF =	1E-06 kg/mg
FI =	1 unitless	FI =	1 unitless
EF =	250 days/year	EF =	250 days/year
ED =	6 years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA = Information not available

TABLE B-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Prison Inmate Absorbed Dose (mg/kg-day) (Nc)	Prison Inmate Absorbed Dose (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Absorbed Dose (mg/kg-day) (Nc)	Prison Worker Absorbed Dose (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk
Volatile Organics													
Acetone	1 0E-01	NA	NA		5 00E-03								
Chloroform	1 0E-02	6 1E-03	NA	3 00E-03	4 00E-03								
Methylene Chloride	5 9E-02	7 7E-03	NA		4 00E-03								
Toluene	2 0E-01	NA	NA	3 00E-03	2 70E-02								
Xylene (total)	1 8E+00	NA	NA	4 00E-03	1 20E-02								
Semivolatile Organics													
2-Methylnaphthalene	4 0E-02	NA	NA	4 60E-02	8 80E-02								
4-Methylphenol	NA	NA	NA	5 80E-01	5 80E-01								
Acenaphthene	6 0E-02	NA	NA	3 00E-01	5 70E-01								
Anthracene	3 0E-01	NA	NA	7 00E-01	1 30E+00								
Benzo(a)anthracene	NA	7 3E-01	NA	1 20E+00	2 40E+00								
Benzo(a)pyrene	NA	1 5E+01	NA	1 20E+00	2 00E+00								
Benzo(b)fluoranthene	NA	7 3E-01	NA	1 00E+00	1 60E+00								
Benzo(g,h,i)perylene	NA	NA	NA	7 30E-01	1 30E+00								
Benzo(k)fluoranthene	NA	7 3E-02	NA	9 60E-01	2 00E+00								
Carbazole	NA	2 0E-02	NA	3 50E-01	6 20E-01								
Chrysene	NA	7 3E-03	NA	1 20E+00	2 40E+00								
Di-n-butylphthalate	1 0E-01	NA	NA	6 20E-02	6 20E-02								
Dibenz(a,h)anthracene	NA	7 3E+00	NA	3 00E-01	5 20E-01								
Dibenzofuran	NA	NA	NA	1 70E-01	3 10E-01								
Fluoranthene	4 0E-02	NA	NA	3 20E+00	6 30E+00								
Fluorene	4 0E-02	NA	NA	3 20E-01	6 10E-01								
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	6 60E-01	1 20E+00								
Naphthalene	2 0E-02	NA	NA	1 40E-01	2 00E-01								
Phenanthrene	NA	NA	NA	2 60E+00	5 20E+00								
Pyrene	3 0E-02	NA	NA	2 70E+00	4 70E+00								
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	2 70E+00	2 70E+00								
Pesticides/PCBs													
Endosulfan I	6 0E-03	NA	NA	1 20E-03	1 20E-03								
alpha-Chlordane	5 0E-04	3 5E-01	NA	2 40E-03	2 40E-03								
Metals													
Cadmium	5 0E-05	NA	0 01	1 50E+00	1 50E+00	1 24E-06		2E-02		8 51E-07		2E-02	
Copper	2 4E-02	NA	NA	2 38E+01	2 81E+01								
Lead	NA	NA	NA	3 02E+01	3 02E+01								
Potassium	NA	NA	NA	3 56E+03	3 56E+03								
Selenium	4 5E-03	NA	NA	1 40E+00	1 80E+00								
Zinc	7 5E-02	NA	NA	3 38E+02	3 38E+02								
Herbicides													
2,4,5-T	1 0E-02	NA	NA	1 20E-02	1 20E-02								
Dicamba	5 9E-02	7 7E-03	NA	1 10E-02	1 10E-02								
Dichloroprop	NA	NA	NA	7 20E-02	7 20E-02								
MCPP	1 0E-03	NA	NA	7 30E+00	7 70E+00								
Total Hazard Quotient and Cancer Risk:								2E-02				2E-02	

Assumptions for Prison Inmate		Assumptions for Prison Worker	
CS =	EPC Surface Only	CS =	EPC Surface Only
CF =	1 00E-06 kg/mg	CF =	1 00E-06 kg/mg
SA =	5800 cm2	SA =	5800 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	365 days/year	EF =	250 days/year
ED =	24 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern

TABLE B-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Construction Worker Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)		
Volatile Organics									
Acetone	1 0E-01	NA	NA		5 00E-03				
Chloroform	1 0E-02	6 1E-03	NA	3 00E-03	4 00E-03				
Methylene Chloride	5 9E-02	7 7E-03	NA		4 00E-03				
Toluene	2 0E-01	NA	NA	3 00E-03	2 70E-02				
Xylene (total)	1 8E+00	NA	NA	4 00E-03	1 20E-02				
Semivolatile Organics									
2-Methylnaphthalene	4 0E-02	NA	NA	4 60E-02	8 80E-02				
4-Methylphenol	NA	NA	NA	5 80E-01	5 80E-01				
Acenaphthene	6 0E-02	NA	NA	3 00E-01	5 70E-01				
Anthracene	3 0E-01	NA	NA	7 00E-01	1 30E+00				
Benzo(a)anthracene	NA	7 3E-01	NA	1 20E+00	2 40E+00				
Benzo(a)pyrene	NA	1 5E+01	NA	1 20E+00	2 00E+00				
Benzo(b)fluoranthene	NA	7.3E-01	NA	1.00E+00	1.60E+00				
Benzo(g,h,i)perylene	NA	NA	NA	7 30E-01	1 30E+00				
Benzo(k)fluoranthene	NA	7 3E-02	NA	9 60E-01	2 00E+00				
Carbazole	NA	2 0E-02	NA	3 50E-01	6 20E-01				
Chrysene	NA	7 3E-03	NA	1 20E+00	2 40E+00				
Di-n-butylphthalate	9 0E-02	NA	NA	6 20E-02	6 20E-02				
Dibenz(a,h)anthracene	NA	7 3E+00	NA	3 00E-01	5 20E-01				
Dibenzofuran	NA	NA	NA	1 70E-01	3 10E-01				
Fluoranthene	4 0E-02	NA	NA	3 20E+00	6 30E+00				
Fluorene	4 0E-02	NA	NA	3 20E-01	6 10E-01				
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	6 60E-01	1 20E+00				
Naphthalene	2 0E-02	NA	NA	1 40E-01	2 00E-01				
Phenanthrene	NA	NA	NA	2 60E+00	5 20E+00				
Pyrene	3 0E-02	NA	NA	2 70E+00	4 70E+00				
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	2 70E+00	2 70E+00				
Pesticides/PCBs									
Endosulfan I	6 0E-03	NA	NA	1 20E-03	1 20E-03				
alpha-Chlordane	5 0E-04	3 5E-01	NA	2 40E-03	2 40E-03				
Metals									
Cadmium	5 0E-05	NA	0 01	1 50E+00	1 50E+00	8 26E-08		2E-03	
Copper	2 4E-02	NA	NA	2 38E+01	2 81E+01				
Lead	NA	NA	NA	3 02E+01	3 02E+01				
Potassium	NA	NA	NA	3 56E+03	3 56E+03				
Selenium	4 5E-03	NA	NA	1 40E+00	1 80E+00				
Zinc	7 5E-02	NA	NA	3 38E+02	3 38E+02				
Herbicides									
2,4,5-T	1 0E-02	NA	NA	1 20E-02	1 20E-02				
Dicamba	5 9E-02	7 7E-03	NA	1 10E-02	1 10E-02				
Dichloroprop	NA	NA	NA	7 20E-02	7 20E-02				
MCPP	1 0E-03	NA	NA	7 30E+00	7 70E+00				
Total Hazard Quotient and Cancer Risk:								**2E-03**	

Assumptions for Construction Worker

CS =	EPC Total Soils	
CF =	1 00E-06	kg/mg
SA =	5800	cm2
AF =	1	mg/cm2
EF =	24 25	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern

TABLE B-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Day Care Center Child				Day Care Center Adult			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics													
Acetone	1.0E-01	NA	NA		5.00E-03								
Chloroform	1.0E-02	6.1E-03	NA	3.00E-03	4.00E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA		4.00E-03								
Toluene	2.0E-01	NA	NA	3.00E-03	2.70E-02								
Xylene (total)	1.8E+00	NA	NA	4.00E-03	1.20E-02								
Semivolatile Organics													
2-Methylnaphthalene	4.0E-02	NA	NA	4.60E-02	8.80E-02								
4-Methylphenol	NA	NA	NA	5.80E-01	5.80E-01								
Acenaphthene	6.0E-02	NA	NA	3.00E-01	5.70E-01								
Anthracene	3.0E-01	NA	NA	7.00E-01	1.30E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	1.20E+00	2.40E+00								
Benzo(a)pyrene	NA	1.5E+01	NA	1.20E+00	2.00E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	1.00E+00	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	NA	7.30E-01	1.30E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	9.60E-01	2.00E+00								
Carbazole	NA	2.0E-02	NA	3.50E-01	6.20E-01								
Chrysene	NA	7.3E-03	NA	1.20E+00	2.40E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	6.20E-02	6.20E-02								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	3.00E-01	5.20E-01								
Dibenzofuran	NA	NA	NA	1.70E-01	3.10E-01								
Fluoranthene	4.0E-02	NA	NA	3.20E+00	6.30E+00								
Fluorene	4.0E-02	NA	NA	3.20E-01	6.10E-01								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	6.60E-01	1.20E+00								
Naphthalene	2.0E-02	NA	NA	1.40E-01	2.00E-01								
Phenanthrene	NA	NA	NA	2.60E+00	5.20E+00								
Pyrene	3.0E-02	NA	NA	2.70E+00	4.70E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	2.70E+00	2.70E+00								
Pesticides/PCBs													
Endosulfan I	6.0E-03	NA	NA	1.20E-03	1.20E-03								
alpha-Chlordane	5.0E-04	3.5E-01	NA	2.40E-03	2.40E-03								
Metals													
Cadmium	5.0E-05	NA	0.01	1.50E+00	1.50E+00	1.50E-06		3E-02		8.51E-07		2E-02	
Copper	2.4E-02	NA	NA	2.38E+01	2.81E+01								
Lead	NA	NA	NA	3.02E+01	3.02E+01								
Potassium	NA	NA	NA	3.56E+03	3.56E+03								
Selenium	4.5E-03	NA	NA	1.40E+00	1.80E+00								
Zinc	7.5E-02	NA	NA	3.38E+02	3.38E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	1.20E-02	1.20E-02								
Dicamba	3.0E-02	7.7E-03	NA	1.10E-02	1.10E-02								
Dichloroprop	NA	NA	NA	7.20E-02	7.20E-02								
MCPP	1.0E-03	NA	NA	7.30E+00	7.70E+00								

Total Hazard Quotient and Cancer Risk: 3E-02 (Day Care Center Child) 2E-02 (Day Care Center Adult)

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
CS =	EPC Surface Only	CS =	EPC Surface Only
CF =	1.00E-06 kg/mg	CF =	1.00E-06 kg/mg
SA =	2190 cm2	SA =	5800 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	250 days/year	EF =	250 days/year
ED =	6 years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern

TABLE B-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CW Chemical Concentration in Groundwater, from Groundwater EPC Data
IR Ingestion Rate
EF Exposure Frequency
ED Exposure Duration
BW Bodyweight
AT Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk *	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)												
Herbicides															
2,4,5-TP (Silvex)	8 0E-03	NA	4 40E-04	1 26E-05		2E-03		8 61E-06		1E-03					
Metals															
Magnesium	NA	NA	4 68E+01												
Total Hazard Quotient and Cancer Risk:						**2E-03**				**1E-03**					

Ingestion of Groundwater Not Applicable for Construction Worker

Assumptions for Prison Inmate

IR =	2	liters/day
EF =	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc)	8760	days
AT (Car)	25550	days

Assumptions for Prison Worker

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc)	9125	days
AT (Car) =	25550	days

* Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available

TABLE B-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Day Care Center Child				Day Care Center Adult			
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)		
Herbicides											
2,4,5-TP (Silvex)	8 0E-03	NA	4 40E-04	2 01E-05		3E-03		8 61E-06		1E-03	
Metals											
Magnesium	NA	NA	4 68E+01								
Total Hazard Quotient and Cancer Risk:						**3E-03**				**1E-03**	

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA Information not available

Assumptions for Day Care Center Child

IR =	1 liters/day
EF =	250 days/year
ED =	6 years
BW =	15 kg
AT (Nc)	2190 days
AT (Car)	25550 days

Assumptions for Day Care Center Adult

IR =	2 liters/day
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc)	9125 days
AT (Car)	25550 days

TABLE B-6
CALCULATION OF AIR CONCENTRATION IN SHOWER
FROM VOLATILIZATION OF GROUNDWATER (daily)
REASONABLE MAXIMUM EXPOSURE (RME)
COMPLETION REPORT - MINI RISK ASSESSMENT - SEAD-43, 56, 69
SENECA ARMY DEPOT, ROMULUS, NEW YORK

Analyte	EPC Air All-Site Wells (mg/m³)	Time of Shower -Ts (min)	Flow Rate of Shower - Fw (L/min)	EPC - RME Groundwater (mg/l)	Flow Rate of Air in Shower-Fa (m³/min)	Volume of Bathroom-Vh (m³)	Henry Laws Constant-H (m³-atm/mol)	Asymptotic Air Conc.-Cinf (mg/m³)	Rate Constant-K (1/min)	Efficiency of Release-E (unitless)	Efficiency of Release for TCE E-TCE	Henry Laws Constant-TCE (m³-atm/mol)	Fraction Emitted* (percent)	Cderm** (Water) (mg/l)
Herbicides														
2,4,5-TP (Silvex)	2.06E-09	15	19	4.40E-04	2.4	12	1.31E-08	3.01E-09	0.20	8.64E-07	0.6	0.0091	0.00%	4.40E-04
Metals														
Magnesium	0.00E+00	15	19	4.68E+01	2.4	12	NA	0.00E+00	0.20	0.00	0.6	0.0091	0.00%	4.68E+01

Concentration in Air (mg/m³) = Cinf[1+(1/(kTs)(exp(-kTs)-1)]

Asymptotic Air Conc. - Cinf (mg/m³) = [(E)(Fw)(Ct)]/Fa

Rate Constant - k (L/min) = Fa/Vb

Efficiency of Release - E (unitless) = (E-tce)(H)/(H-tce)

* Fraction Emitted (fe) = (EPCair x Fa) / (EPCgw x Fw)

** Cderm = EPCgw x (1 - fe)

Variables:

CA = Chemical Concentration in Air (mg/m³)
Ts = Time of Shower (minutes)
Fw = Flow Rate of Shower (L/min)
Fa = Flow Rate of Air in Shower (m³/min)
Vh = Volume of Bathroom (m³)

Assumptions:

EPC - Groundwater Data - RME
15 (RME default)
19 (Estimated RME)
2.4 (Average Air Flow)
12 (Average Bathroom Volume)

TABLE B-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $= \frac{DA \times SA \times EF \times ED}{BW \times AT}$

Equation for Absorbed Dose per Event (DA)

For organics $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics $DA = Kp \times CW \times ET \times CF$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Body weight
AT = Averaging Time
Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Permeability Coefficient Kp (cm/hr)	Tau (hours)	EPC - Cderm* Groundwater (mg/liter)	Absorbed Dose/Event (mg-cm²/event)	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
Herbicides																		
2,4,5-TP (Silvex)	8.0E-03	NA	1.1E-02	3.9E+00	4.40E-04	1.36E-08	4.47E-06		6E-04		3.06E-06		4E-04		Dermal Contact of Groundwater Not Applicable for Construction Worker			
Metals																		
Magnesium	NA	NA	1.0E-03	NA	4.68E+01	1.17E-05												
Total Hazard Quotient and Cancer Risk:									6E-04				4E-04					

Assumptions for Prison Inmate

SA =	23000 cm2
CF =	0.001 l/cm3
EF =	365 days/year
ED =	24 years
BW =	70 kg
AT (Nc)	8760 days
AT (Car)	25550 days
ET =	0.25 hours/day

Assumptions for Prison Worker

SA =	23000 cm2
CF =	0.001 l/cm3
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days
ET =	0.25 hours/day

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA: Information not available
* Cderm is the concentration of chemical available for dermal absorption after accounting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table B-6

TABLE B-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 43, 56, 69
Seneca Army Depot Activity

Equation for Intake (mg/kg-day): $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Equation for Absorbed Dose per Event (DA)

For organics: $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics: $DA = Kp \times CW \times ET \times CF$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time
Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Analyte	Dermal RfD (mg/kg-day)	Dermal	Permeability Coefficient Kp (cm/hr)	Tau	EPC - Cderm* Groundwater (mg/liter)	Absorbed Dose/Event (mg-cm²/event	Day Care Center Child Intake (mg/kg-day) (Nc)	Day Care Center Child Intake (mg/kg-day) (Car)	Day Care Center Child Hazard Quotient	Day Care Center Child Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Nc)	Day Care Center Adult Intake (mg/kg-day) (Car)	Day Care Center Adult Hazard Quotient	Day Care Center Adult Cancer Risk
Herbicides														
2,4,5-TP (Silvex)	8.0E-03	NA	1.1E-02	3.9E+00	[illegible]-04	1.36E-08	Dermal Contact of Groundwater Not Applicable for Day Care Center Child				Dermal Contact of Groundwater Not Applicable for Day Care Center Adult			
Metals														
Magnesium	NA	NA	1.0E-03	NA	4.68E+01	0.0000117								

Total Hazard Quotient and Cancer Risk:

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* Cderm is the concentration of chmeical available for dermal absorption after accounoting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table B-6

TABLE B-8
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-43, 56, 69
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

APPENDIX C
RISK TABLES - SEAD-44A

TABLE C-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = $CS_{surf} \times PM_{10} \times CF$

Variables:
CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m^3) = $CS_{tot} \times PM_{10} \times CF$

Variables:
CS_{tot} = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 340 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Volatile Organics				
1,1,2,2-Tetrachloroethane		2.00E-03		6.80E-10
Butanone, 2-	2.80E-02	2.80E-02	4.76E-10	9.52E-09
2-Hexanone		4.00E-03		1.36E-09
4-Methyl-2-Pentanone		4.00E-03		1.36E-09
Acetone	2.00E-01	2.00E-01	3.40E-09	6.80E-08
Toluene		1.00E-03		3.40E-10
Semivolatile Organics				
2-Methylnaphthalene		1.50E-01		5.10E-08
4-Methylphenol	2.50E-01	2.50E-01	4.25E-09	8.50E-08
Acenaphthene		3.80E-01		1.29E-07
Acenaphthylene		7.20E-02		2.45E-08
Anthracene		6.40E-01		2.18E-07
Benzo(a)anthracene	5.60E-02	9.90E-01	9.52E-10	3.37E-07
Benzo(a)pyrene	4.90E-02	1.10E+00	8.33E-10	3.74E-07
Benzo(b)fluoranthene	4.30E-02	1.10E+00	7.31E-10	3.74E-07
Benzo(g,h,i)perylene		5.10E-01		1.73E-07
Benzo(k)fluoranthene	5.20E-02	1.10E+00	8.84E-10	3.74E-07
Carbazole		3.70E-01		1.26E-07
Chrysene	5.30E-02	1.20E+00	9.01E-10	4.08E-07
Di-n-butylphthalate	5.30E-02	5.30E-02	9.01E-10	1.80E-08
Dibenz(a,h)anthracene		1.60E-01		5.44E-08
Dibenzofuran		2.80E-01		9.52E-08
Fluoranthene	1.50E-01	2.40E+00	2.55E-09	8.16E-07
Fluorene		4.10E-01		1.39E-07
Hexachlorobenzene		3.60E-02		1.22E-08
Indeno(1,2,3-cd)pyrene	2.60E-02	4.90E-01	4.42E-10	1.67E-07
Naphthalene		3.30E-01		1.12E-07
Phenanthrene	1.20E-01	2.10E+00	2.04E-09	7.14E-07
Pyrene	1.20E-01	2.00E+00	2.04E-09	6.80E-07
bis(2-Ethylhexyl)phthalate	5.40E-02	9.40E-01	9.18E-10	3.20E-07
Pesticides				
4,4'-DDE		3.10E-03		1.05E-09
4,4'-DDT		5.60E-03		1.90E-09
Dieldrin	7.00E-02	7.00E-02	1.19E-09	2.38E-08
Endosulfan I		5.40E-03		1.84E-09
Endosulfan II		2.80E-03		9.52E-10
Endrin		3.50E-03		1.19E-09
Endrin aldehyde		4.50E-03		1.53E-09
Endrin ketone		5.20E-03		1.77E-09
Heptachlor epoxide		1.20E-03		4.08E-10
Nitroaromatics				
2,4,6-Trinitrotoluene	1.10E-01	1.10E-01	1.87E-09	3.74E-08
Metals				
Cadmium	4.80E-01	4.80E-01	8.16E-09	1.63E-07
Copper	2.06E+01	2.90E+01	3.50E-07	9.86E-06
Lead	2.25E+01	2.49E+01	3.83E-07	8.47E-06
Potassium	1.98E+03	2.53E+03	3.37E-05	8.60E-04
Selenium	1.70E+00	1.70E+00	2.89E-08	5.78E-07
Zinc	9.40E+01	1.15E-02	1.60E-06	3.91E-05

ND = Compound was not detected above the detection limit shown

TABLE C-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Prisoner Inmate			Prison Worker		
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m³)	(mg/m³)	(Ne)	(Car)			(Ne)	(Car)		
Volatile Organics												
1,1,2,2-Tetrachloroethane	NA	2 0E-01		6.80E-10								
Butanone, 2-	2 9E-01	NA	4 76E-10	9 52E-09	1 03E-10		4E-10		3 73E-11		1E-10	
2-Hexanone				1.36E-09								
4-Methyl-2-Pentanone	2 3E-02	NA		1.36E-09								
Acetone	NA	NA	3 40E-09	6 80E-08								
Toluene	1 1E-01	NA		3 40E-10								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA		5 10E-08								
4-Methylphenol	NA	NA	4 25E-09	8 50E-08								
Acenaphthene	NA	NA		1 29E-07								
Acenaphthylene	NA	NA		2 45E-08								
Anthracene	NA	NA		2 18E-07								
Benzo(a)anthracene	NA	NA	9 52E-10	3 37E-07								
Benzo(a)pyrene	NA	NA	8 33E-10	3 74E-07								
Benzo(b)fluoranthene	NA	NA	7 31E-10	3 74E-07								
Benzo(g,h,i)perylene	NA	NA		1 73E-07								
Benzo(k)fluoranthene	NA	NA	8 84E-10	3.74E-07								
Carbazole	NA	NA		1.26E-07								
Chrysene	NA	NA	9 01E-10	4 08E-07								
Di-n-butylphthalate	NA	NA	9 01E-10	1 80E-08								
Dibenz(a,h)anthracene	NA	NA		5 44E-08								
Dibenzofuran	NA	NA		9 52E-08								
Fluoranthene	NA	NA	2 55E-09	8 16E-07								
Fluorene	NA	NA		1 39E-07								
Hexachlorobenzene	NA	1 6E+00		1 22E-08								
Indeno(1,2,3-cd)pyrene	NA	NA	4 42E-10	1 67E-07								
Naphthalene	8 6E-04	NA		1 12E-07								
Phenanthrene	NA	NA	2 04E-09	7 14E-07								
Pyrene	NA	NA	2 04E-09	6 80E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	9 18E-10	3 20E-07								
Pesticides												
4,4'-DDE	NA	NA		1 05E-09								
4,4'-DDT	NA	3 4E-01		1 90E-09								
Dieldrin	NA	1 6E+01	1 19E-09	2 38E-08		8 86E-11		1E-09		3 33E-11		5E-10
Endosulfan I	NA	NA		1 84E-09								
Endosulfan II	NA	NA		9 52E-10								
Endrin	NA	NA		1.19E-09								
Endrin aldehyde	NA	NA		1.53E-09								
Endrin ketone	NA	NA		1 77E-09								
Heptachlor epoxide	NA	9 1E+00		4.08E-10								
Nitroaromatics												
2,4,6-Trinitrotoluene	NA	NA	1 87E-09	3.74E-08								
Metals												
Cadmium	NA	6 3E+00	8 16E-09	1 63E-07		6 08E-10		4E-09		2 28E-10		1E-09
Copper	NA	NA	3.50E-07	9.86E-06								
Lead	NA	NA	3.83E-07	8.47E-06								
Potassium	NA	NA	3 37E-05	8 60E-04								
Selenium	NA	NA	2 89E-08	5 78E-07								
Zinc	NA	NA	1 60E-06	3 91E-05								
Total Hazard Quotient and Cancer Risk:							**4E-10**	**5E-09**			**1E-10**	**2E-09**

Assumptions for Prisoner Inmate		Assumptions for Prison Worker	
CA =	EPC Surface Only	CA =	EPC Surface Only
IR =	15.2 m3/day	IR =	8 m3/day
EF =	365 days/year	EF =	250 days/year
ED =	24 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Ne) =	8760 days	AT (Ne) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table C-1 for calculation of Air EPC
NA= Information not available

TABLE C-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSUPE (RME)
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Construction Worker				Day Care Center Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m³)	(mg/m³)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
1,1,2,2-Tetrachloroethane	NA	2.0E-01		6.80E-10		1.27E-13		3E-14				
Butanone, 2-	2.9E-01	NA	4.76E-10	9.52E-09	1.24E-10		4E-10		8.69E-11		3E-10	
2-Hexanone				1.36E-09	1.77E-11	2.53E-13						
4-Methyl-2-Pentanone	2.3E-02	NA		1.36E-09	1.77E-11		8E-10					
Acetone	NA	NA	3.40E-09	6.80E-08								
Toluene	1.1E-01	NA		3.40E-10	4.43E-12		4E-11					
Semivolatile Organics												
2-Methylnaphthalene	NA	NA		5.10E-08								
4-Methylphenol	NA	NA	4.25E-09	8.50E-08								
Acenaphthene	NA	NA		1.29E-07								
Acenaphthylene	NA	NA		2.45E-08								
Anthracene	NA	NA		2.18E-07								
Benzo(a)anthracene	NA	NA	9.52E-10	3.37E-07								
Benzo(a)pyrene	NA	NA	8.33E-10	3.74E-07								
Benzo(b)fluoranthene	NA	NA	7.31E-10	3.74E-07								
Benzo(g,h,i)perylene	NA	NA		1.73E-07								
Benzo(k)fluoranthene	NA	NA	8.84E-10	3.74E-07								
Carbazol	NA	NA		1.26E-07								
Chrysene	NA	NA	9.01E-10	4.08E-07								
Di-n-butylphthalate	NA	NA	9.01E-10	1.80E-08								
Dibenz(a,h)anthracene	NA	NA		5.44E-08								
Dibenzofuran	NA	NA		9.52E-08								
Fluoranthene	NA	NA	2.55E-09	8.16E-07								
Fluorene	NA	NA		1.39E-07								
Hexachlorobenzene	NA	1.6E+00		1.22E-08		2.28E-12		4E-12				
Indeno(1,2,3-cd)pyrene	NA	NA	4.42E-10	1.67E-07								
Naphthalene	8.6E-04	NA		1.12E-07	1.46E-08		2E-06					
Phenanthrene	NA	NA	2.04E-09	7.14E-07								
Pyrene	NA	NA	2.04E-09	6.80E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	9.18E-10	3.20E-07								
Pesticides												
4,4'-DDE	NA	NA		1.05E-09								
4,4'-DDT	NA	3.4E-01		1.90E-09		3.54E-13		1E-13				
Dieldrin	NA	1.6E+01	1.19E-09	2.38E-08		4.43E-12		7E-11		1.86E-11		3E-10
Endosulfan I	NA	NA		1.84E-09								
Endosulfan II	NA	NA		9.52E-10								
Endrin	NA	NA		1.19E-09								
Endrin aldehyde	NA	NA		1.53E-09								
Endrin ketone	NA	NA		1.77E-09								
Heptachlor epoxide	NA	9.1E+00		4.08E-10		7.59E-14		7E-13				
Nitroaromatics												
2,4,6-Trinitrotoluene	NA	NA	1.87E-09	3.74E-08								
Metals												
Cadmium	NA	6.3E+00	8.16E-09	1.63E-07		3.04E-11		2E-10		1.28E-10		8E-10
Copper	NA	NA	3.50E-07	9.86E-06								
Lead	NA	NA	3.83E-07	8.47E-06								
Potassium	NA	NA	3.37E-05	8.60E-04								
Selenium	NA	NA	2.89E-08	5.78E-07								
Zinc	NA	NA	1.60E-06	3.91E-05								

Total Hazard Quotient and Cancer Risk: 2E-06 3E-10 3E-10 1E-09

Assumptions for Construction Worker		Assumptions for Day Care Center Child	
CA =	EPC Surface and Sub-Surface	CA =	EPC Surface Only
IR =	10.4 m3/day	IR =	4 m3/day
EF =	32 days/year	EF =	250 days/year
ED =	1 years	ED =	6 years
BW =	70 kg	BW =	15 kg
AT (Nc) =	365 days	AT (Nc) =	2190 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table C-1 for calculation of Air EPC
NA = Information not available

TABLE C-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* fro Surface Soil	Air EPC* from Total Soils	Day Care Center Adult Intake (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)				
Volatile Organics								
1,1,2,2-Tetrachloroethane	NA	2 0E-01		6 80E-10				
Butanone, 2-	2 9E-01	NA	4 76E-10	9 52E-09	3 73E-11		1E-10	
2-Hexanone				1 36E-09				
4-Methyl-2-Pentanone	2 5E-02	NA		1 36E-09				
Acetone	NA	NA	3 40E-09	6 80E-08				
Toluene	1 1E-01	NA		3 40E-10				
Semivolatile Organics								
2-Methylnaphthalene	NA	NA		5 10E-08				
4-Methylphenol	NA	NA	4 25E-09	8 50E-08				
Acenaphthene	NA	NA		1 29E-07				
Acenaphthylene	NA	NA		2 45E-08				
Anthracene	NA	NA		2 18E-07				
Benzo(a)anthracene	NA	NA	9 52E-10	3 37E-07				
Benzo(a)pyrene	NA	NA	8 33E-10	3 74E-07				
Benzo(b)fluoranthene	NA	NA	7 31E-10	3 74E-07				
Benzo(g,h,i)perylene	NA	NA		1 73E-07				
Benzo(k)fluoranthene	NA	NA	8 84E-10	3 74E-07				
Carbazole	NA	NA		1 26E-07				
Chrysene	NA	NA	9 01E-10	4 08E-07				
Di-n-butylphthalate	NA	NA	9 01E-10	1 80E-08				
Dibenz(a,h)anthracene	NA	NA		5 44E-08				
Dibenzofuran	NA	NA		9 52E-08				
Fluoranthene	NA	NA	2 55E-09	8 16E-07				
Fluorene	NA	NA		1 39E-07				
Hexachlorobenzene	NA	1 6E+00		1 22E-08				
Indeno(1,2,3-cd)pyrene	NA	NA	4 42E-10	1 67E-07				
Naphthalene	3 0E-04	NA		1 12E-07				
Phenanthrene	NA	NA	2 04E-09	7 14E-07				
Pyrene	NA	NA	2 04E-09	6 80E-07				
bis(2-Ethylhexyl)phthalate	NA	NA	9 18E-10	3 20E-07				
Pesticides								
4,4'-DDE	NA	NA		1 05E-09				
4,4'-DDT	NA	3 4E-01		1 90E-09				
Dieldrin	NA	1 6E+01	1 19E-09	2 38E-08		2 33E-11		5E-10
Endosulfan I	NA	NA		1 84E-09				
Endosulfan II	NA	NA		9 52E-10				
Endrin	NA	NA		1 19E-09				
Endrin aldehyde	NA	NA		1 53E-09				
Endrin ketone	NA	NA		1 77E-09				
Heptachlor epoxide	NA	9 1E+00		4 08E-10				
Nitroaromatics								
2,4,6-Trinitrotoluene	NA	NA	1 87E-09	3 74E-08				
Metals								
Cadmium	NA	6 3E+00	8 16E-09	1 63E-07		2 28E-10		1E-09
Copper	NA	NA	3 50E-07	9 86E-06				
Lead	NA	NA	3 83E-07	8 47E-06				
Potassium	NA	NA	3 37E-05	8 60E-04				
Selenium	NA	NA	2 89E-08	5 78E-07				
Zinc	NA	NA	1 60E-06	3 91E-05				
Total Hazard Quotient and Cancer Risk:							**1E-10**	**2E-09**

Assumptions forDay Care Center Adult

CA =	EPC Surface Only
IR =	8 m3/day
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table C-1 for calculation of Air EPC
NA = Information not available

TABLE C-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate				Prison Worker			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
1,1,2,2,-Tetrachloroethane	NA	2 0E-01		2 00E-03								
Butanone, 2-	6 0E-01	NA	2 80E-02	2 80E-02	4 00E-08		7E-08		2 74E-08		5E-08	
2-Hexanone				4 00E-03								
4-Methyl-2-Pentanone	8 0E-02	NA		4 00E-03								
Acetone	1 0E-01	NA	2 00E-01	2 00E-01	2 86E-07		3E-06		1 96E-07		2E-06	
Toluene	2 0E-01	NA		1 00E-03								
Semivolatile Organics												
2-Methylnaphthalene	4 0E-02	NA		1 50E-01								
4-Methylphenol	5 0E-03	NA	2 50E-01	2 50E-01	3 57E-07		7E-05		2 45E-07		5E-05	
Acenaphthene	6 0E-02	NA		3 80E-01								
Acenaphthylene	NA	NA		7 20E-02								
Anthracene	3 0E-01	NA		6 40E-01								
Benzo(a)anthracene	NA	7 3E-01	5 60E-02	9 90E-01		2 74E-08		2E-08		1 96E-08		1E-08
Benzo(a)pyrene	NA	7 3E+00	4 90E-02	1 10E+00		2 40E-08		2E-07		1 71E-08		1E-07
Benzo(b)fluoranthene	NA	7 3E-01	4 30E-02	1 10E+00		2 11E-08		2E-08		1 50E-08		1E-08
Benzo(g,h,i)perylene	NA	NA		5 10E-01								
Benzo(k)fluoranthene	NA	7.3E-02	5.20E-02	1.10E+00		2.55E-08		2E-09		1 82E-08		1E-09
Carbazole	NA	2 0E-02		3.70E-01								
Chrysene	NA	7 3E-03	5 30E-02	1 20E+00		2 60E-08		2E-10		1 85E-08		1E-10
Di-n-butylphthalate	1 0E-01	NA	5 30E-02	5 30E-02	7 57E-08		8E-07		5 19E-08		5E-07	
Dibenz(a,h)anthracene	NA	7 3E+00		1 60E-01								
Dibenzofuran	NA	NA		2 80E-01								
Fluoranthene	4 0E-02	NA	1 50E-01	2 40E+00	2 14E-07		5E-06		1 47E-07		4E-06	
Fluorene	4 0E-02	NA		4 10E-01								
Hexachlorobenzene	8 0E-04	1 6E+00		3 60E-02								
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	2 60E-02	4 90E-01		1 27E-08		9E-09		9 09E-09		7E-09
Naphthalene	2 0E-02	NA		3 30E-01								
Phenanthrene	NA	NA	1 20E-01	2 10E+00								
Pyrene	3 0E-02	NA	1 20E-01	2 00E+00	1 71E-07		6E-06		1 17E-07		4E-06	
bis(2-Ethylhexyl)phthalate	2 0E-02	1 4E-02	5 40E-02	9 40E-01	7 71E-08	2 64E-08	4E-06	4E-10	5 28E-08	1 89E-08	3E-06	3E-10
Pesticides/PCBs												
4,4'-DDE	NA	3 4E-01		3 10E-03								
4,4'-DDT	5 0E-04	3 4E-01		5 60E-03								
Dieldrin	5 0E-05	1 6E+01	7 00E-02	7 00E-02	1 00E-07	3 43E-08	2E-03	5E-07	6 85E-08	2 45E-08	1E-03	4E-07
Endosulfan I	6 0E-03	NA		5 40E-03								
Endosulfan II	6 0E-03	NA		2 80E-03								
Endrin	3 0E-04	NA		3 50E-03								
Endrin aldehyde	NA	NA		4 50E-03								
Endrin ketone	NA	NA		5 20E-03								
Heptachlor epoxide	1 3E-05	9 1E+00		1 20E-03								
Nitroaromatics												
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	1 10E-01	1 10E-01	1 57E-07	5 39E-08	3E-04	2E-09	1 08E-07	3 84E-08	2E-04	1E-09
Metals												
Cadmium	5 0E-04	NA	4 80E-01	4 80E-01	6 86E-07		1E-03		4 70E-07		9E-04	
Copper	4 0E-02	NA	2 06E+01	2 90E+01	2 94E-05		7E-04		2 02E-05		5E-04	
Lead	NA	NA	2 25E+01	2 49E+01								
Potassium	NA	NA	1 98E+03	2 53E+03								
Selenium	5 0E-03	NA	1 70E+00	1 70E+00	2 43E-06		5E-04		1 66E-06		3E-04	
Zinc	3 0E-01	NA	9 40E+01	1 15E+02	1.34E-04		4E-04		9.20E-05		3E-04	
Total Hazard Quotient and Cancer Risk:							**5E-03**	**8E-07**			**4E-03**	**6E-07**

Assumptions for Prison Inmate		Assumptions for Prison Worker	
CS =	EPC Surface Only	CS =	EPC Surface Only
IR =	100 mg soil/day	IR =	100 mg soil/day
CF =	1E-06 kg/mg	CF =	1E-06 kg/mg
FI =	1 unitless	FI =	1 unitless
EF =	365 days/year	EF =	250 days/year
ED =	24 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total soils includes surface and subsurface soils
NA = Information not available

TABLE C-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Construction Worker				Day Care Center Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
1,1,2,2,-Tetrachloroethane	NA	2.0E-01		2.00E-03		1.72E-11		3E-12				
Butanone, 2-	6.0E-01	NA	2.80E-02	2.80E-02	1.68E-08		3E-08		2.56E-07		4E-07	
2-Hexanone				4.00E-03	2.40E-09	3.44E-11						
4-Methyl-2-Pentanone	8.0E-02	NA		4.00E-03	2.40E-09		3E-08					
Acetone	1.0E-01	NA	2.00E-01	2.00E-01	1.20E-07		1E-06		1.83E-06		2E-05	
Toluene	2.0E-01	NA		1.00E-03	6.01E-10		3E-09					
Semivolatile Organics												
2-Methylnaphthalene	4.0E-02	NA		1.50E-01	9.02E-08		2E-06					
4-Methylphenol	5.0E-03	NA	2.50E-01	2.50E-01	1.50E-07		3E-05		2.28E-06		5E-04	
Acenaphthene	6.0E-02	NA		3.80E-01	2.28E-07		4E-06					
Acenaphthylene	NA	NA		7.20E-02								
Anthracene	3.0E-01	NA		6.40E-01	3.85E-07		1E-06					
Benzo(a)anthracene	NA	7.3E-01	5.60E-02	9.90E-01		8.50E-09		6E-09		4.38E-08		3E-08
Benzo(a)pyrene	NA	7.3E+00	4.90E-02	1.10E+00		9.45E-09		7E-08		3.84E-08		3E-07
Benzo(b)fluoranthene	NA	7.3E-01	4.30E-02	1.10E+00		9.45E-09		7E-09		3.37E-08		2E-08
Benzo(g,h,i)perylene	NA	NA		5.10E-01								
Benzo(k)fluoranthene	NA	**7.3E-02**	**5.20E-02**	**1.10E+00**		**9.45E-09**		**7E-10**		**4.07E-08**		**3E-09**
Carbazole	NA	2.0E-02		3.70E-01		3.18E-09		6E-11				
Chrysene	NA	7.3E-03	5.30E-02	1.20E+00		1.03E-08		8E-11		4.15E-08		3E-10
Di-n-butylphthalate	1.0E-01	NA	5.30E-02	5.30E-02	3.19E-08		3E-07		4.84E-07		5E-06	
Dibenz(a,h)anthracene	NA	7.3E+00		1.60E-01		1.37E-09		1E-08				
Dibenzofuran	NA	NA		2.80E-01								
Fluoranthene	4.0E-02	NA	1.50E-01	2.40E+00	1.44E-06		4E-05		1.37E-06		3E-05	
Fluorene	4.0E-02	NA		4.10E-01	2.46E-07		6E-06					
Hexachlorobenzene	8.0E-04	1.6E+00		3.60E-02	2.16E-08	3.09E-10	3E-05	5E-10				
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.60E-02	4.90E-01		4.21E-09		3E-09		2.04E-08		1E-08
Naphthalene	2.0E-02	NA		3.30E-01	1.98E-07		1E-05					
Phenanthrene	NA	NA	1.20E-01	2.10E+00								
Pyrene	3.0E-02	NA	1.20E-01	2.00E+00	1.20E-06		4E-05		1.10E-06		4E-05	
bis-2-Ethylhexylphthalate	2.0E-02	1.4E-02	5.40E-02	9.40E-01	5.65E-07	8.07E-09	3E-05	1E-10	4.93E-07	4.23E-08	2E-05	6E-10
Pesticides/PCBs												
4,4'-DDE	NA	3.4E-01		3.10E-03		2.66E-11		9E-12				
4,4'-DDT	5.0E-04	3.4E-01		5.60E-03	3.37E-09	4.81E-11	7E-06	2E-11				
Dieldrin	5.0E-05	1.6E+01	7.00E-02	7.00E-02	4.21E-08	6.01E-10	8E-04	1E-08	6.39E-07	5.48E-08	1E-02	9E-07
Endosulfan I	6.0E-03	NA		5.40E-03	3.25E-09		5E-07					
Endosulfan II	6.0E-03	NA		2.80E-03	1.68E-09		3E-07					
Endrin	3.0E-04	NA		3.50E-03	2.10E-09		7E-06					
Endrin aldehyde	NA	NA		4.50E-03								
Endrin ketone	NA	NA		5.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00		1.20E-03	7.21E-10	1.03E-11	6E-05	9E-11				
Nitroaromatics												
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.10E-01	1.10E-01	6.61E-08	9.45E-10	1E-04	3E-11	1.00E-06	8.61E-08	2E-03	3E-09
Metals												
Cadmium	5.0E-04	NA	4.80E-01	4.80E-01	2.89E-07		6E-04		4.38E-06		9E-03	
Copper	4.0E-02	NA	2.06E+01	2.90E+01	1.74E-05		4E-04		1.88E-04		5E-03	
Lead	NA	NA	2.25E+01	2.49E+01								
Potassium	NA	NA	1.98E+03	2.53E+03								
Selenium	5.0E-03	NA	1.70E+00	1.70E+00	1.02E-06		2E-04		1.55E-05		3E-03	
Zinc	3.0E-01	NA	9.40E+01	1.15E+02	6.91E-05		2E-04		8.58E-04		3E-03	
Total Hazard Quotient and Cancer Risk:							**3E-03**	**1E-07**			**3E-02**	**1E-06**

Assumptions for Construction Worker		Assumptions fore Day Care Center Child	
CS =	EPC Total Soils	CS =	EPC Surface Only
IR =	480 mg soil/day	IR =	200 mg soil/day
CF =	1E-06 kg/mg	CF =	1E-06 kg/mg
FI =	1 unitless	FI =	1 unitless
EF =	32 days/year	EF =	250 days/year
ED =	1 years	ED =	6 years
BW =	70 kg	BW =	15 kg
AT (Nc) =	365 days	AT (Nc) =	2190 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total soils includes surface and subsurface soils
NA = Information not available

TABLE C-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Day Care Center Adult Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)		
Volatile Organics								
1,1,2,2,-Tetrachloroethane	NA	2.0E-01		2.00E-03				
Butanone, 2-	6.0E-01	NA	2.80E-02	2.80E-02	2.74E-08		5E-08	
2-Hexanone				4.00E-03				
4-Methyl-2-Pentanone	8.0E-02	NA		4.00E-03				
Acetone	1.0E-01	NA	2.00E-01	2.00E-01	1.96E-07		2E-06	
Toluene	2.0E-01	NA		1.00E-03				
Semivolatile Organics								
2-Methylnaphthalene	4.0E-02	NA		1.50E-01				
4-Methylphenol	5.0E-03	NA	2.50E-01	2.50E-01	2.45E-07		5E-05	
Acenaphthene	6.0E-02	NA		3.80E-01				
Acenaphthylene	NA	NA		7.20E-02				
Anthracene	3.0E-01	NA		6.40E-01				
Benzo(a)anthracene	NA	7.3E-01	5.60E-02	9.90E-01		1.96E-08		1E-08
Benzo(a)pyrene	NA	7.3E+00	4.90E-02	1.10E+00		1.71E-08		1E-07
Benzo(b)fluoranthene	NA	7.3E-01	4.30E-02	1.10E+00		1.50E-08		1E-08
Benzo(g,h,i)perylene	NA	NA		5.10E-01				
Benzo(k)fluoranthene	**NA**	**7.3E-02**	**5.20E-02**	**1.10E+00**		**1.82E-08**		**1E-09**
Carbazole	NA	2.0E-02		3.70E-01				
Chrysene	NA	7.3E-03	5.30E-02	1.20E+00		1.85E-08		1E-10
Di-n-butylphthalate	1.0E-01	NA	5.30E-02	5.30E-02	5.19E-08		5E-07	
Dibenz(a,h)anthracene	NA	7.3E+00		1.60E-01				
Dibenzofuran	NA	NA		2.80E-01				
Fluoranthene	4.0E-02	NA	1.50E-01	2.40E+00	1.47E-07		4E-06	
Fluorene	4.0E-02	NA		4.10E-01				
Hexachlorobenzene	8.0E-04	1.6E+00		3.60E-02				
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.60E-02	4.90E-01		9.09E-09		7E-09
Naphthalene	2.0E-02	NA		3.30E-01				
Phenanthrene	NA	NA	1.20E-01	2.10E+00				
Pyrene	3.0E-02	NA	1.20E-01	2.00E+00	1.17E-07		4E-06	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	5.40E-02	9.40E-01	5.28E-08	1.89E-08	3E-06	3E-10
Pesticides/PCBs								
4,4'-DDE	NA	3.4E-01		3.10E-03				
4,4'-DDT	5.0E-04	3.4E-01		5.60E-03				
Dieldrin	5.0E-05	1.6E+01	7.00E-02	7.00E-02	6.85E-08	2.45E-08	1E-03	4E-07
Endosulfan I	6.0E-03	NA		5.40E-03				
Endosulfan II	6.0E-03	NA		2.80E-03				
Endrin	3.0E-04	NA		3.50E-03				
Endrin aldehyde	NA	NA		4.50E-03				
Endrin ketone	NA	NA		5.20E-03				
Heptachlor epoxide	1.3E-05	9.1E+00		1.20E-03				
Nitroaromatics								
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.10E-01	1.10E-01	1.08E-07	3.84E-08	2E-04	1E-09
Metals								
Cadmium	5.0E-04	NA	4.80E-01	4.80E-01	4.70E-07		9E-04	
Copper	4.0E-02	NA	2.06E+01	2.90E+01	2.02E-05		5E-04	
Lead	NA	NA	2.25E+01	2.49E+01				
Potassium	NA	NA	1.98E+03	2.53E+03				
Selenium	5.0E-03	NA	1.70E+00	1.70E+00	1.66E-06		3E-04	
Zinc	3.0E-01	NA	9.40E+01	1.15E+02	9.20E-05		3E-04	
Total Hazard Quotient and Cancer Risk:							**4E-03**	**6E-07**

Assumptions for Day Care Center Adult

CS =	EPC Surface Only
IR =	100 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total soils includes surface and subsurface soils
NA = Information not available

TABLE C-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Prison Inmate				Prison Worker			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics													
1,1,2,2,-Tetrachloroethane	NA	2 0E-01	NA		2 00E-03								
2-Butanone	6 0E-01	NA	NA	2 80E-02	2 80E-02								
2-Hexanone			NA		4 00E-03								
4-Methyl-2-Pentanone	NA	NA	NA		4 00E-03								
Acetone	1 0E-01	NA	NA	2 00E-01	2 00E-01								
Toluene	2 0E-01	NA	NA		1 00E-03								
Semivolatile Organics													
2-Methylnaphthalene	4 0E-02	NA	NA		1 50E-01								
4-Methylphenol	NA	NA	NA	2 50E-01	2 50E-01								
Acenaphthene	6 0E-02	NA	NA		3 80E-01								
Acenaphthylene	NA	NA	NA		7 20E-02								
Anthracene	3 0E-01	NA	NA		6 40E-01								
Benzo(a)anthracene	NA	7 3E-01	NA	5 60E-02	9 90E-01								
Benzo(a)pyrene	NA	1 5E+01	NA	4 90E-02	1 10E+00								
Benzo(b)fluoranthene	NA	7 3E-01	NA	4 30E-02	1 10E+00								
Benzo(g,h,i)perylene	NA	NA	NA		5 10E-01								
Benzo(k)fluoranthene	NA	7 3E-02	NA	5 20E-02	1 10E+00								
Carbazole	NA	2 0E-02	NA		3 70E-01								
Chrysene	NA	7 3E-03	NA	5 30E-02	1 20E+00								
Di-n-butylphthalate	9 0E-02	NA	NA	5 30E-02	5 30E-02								
Dibenz(a,h)anthracene	NA	7 3E+00	NA		1 60E-01								
Dibenzofuran	NA	NA	NA		2 80E-01								
Fluoranthene	4 0E-02	NA	NA	1 50E-01	2 40E+00								
Fluorene	4 0E-02	NA	NA		4 10E-01								
Hexachlorobenzene	8 0E-04	NA	NA		3 60E-02								
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	2 60E-02	4 90E-01								
Naphthalene	2 0E-02	NA	NA		3 30E-01								
Phenanthrene	NA	NA	NA	1 20E-01	2 10E+00								
Pyrene	3 0E-02	NA	NA	1 20E-01	2 00E+00								
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	5 40E-02	9 40E-01								
Pesticides/PCBs													
4,4'-DDE	NA	1 7E+00	NA		3 10E-03								
4,4'-DDT	1 0E-04	1 7E+00	NA		5 60E-03								
Dieldrin	2 5E-05	3 2E+01	NA	7 00E-02	7 00E-02								
Endosulfan I	6 0E-03	NA	NA		5 40E-03								
Endosulfan II	6 0E-03	NA	NA		2 80E-03								
Endrin	3 0E-04	NA	NA		3 50E-03								
Endrin aldehyde	NA	NA	NA		4 50E-03								
Endrin ketone	NA	NA	NA		5 20E-03								
Heptachlor epoxide	1 3E-05	9 1E+00	NA		1 20E-03								
Nitroaromatics													
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	NA	1 10E-01	1 10E-01								
Metals													
Cadmium	5 0E-05	NA	0 01	4 80E-01	4 80E-01	3 98E-07		8E-03		2 72E-07		5E-03	
Copper	2 4E-02	NA	NA	2 06E+01	2 90E+01								
Lead	NA	NA	NA	2 25E+01	2 49E+01								
Potassium	NA	NA	NA	1 98E+03	2 53E+03								
Selenium	4 5E-03	NA	NA	1 70E+00	1 70E+00								
Zinc	7 5E-02	NA	NA	9 40E+01	1 15E+02								

Total Hazard Quotient and Cancer Risk:

	8E-03		5E-03	
	Assumptions for Prison Inmate		Assumptions for Prison Worker	
CS =	EPC Surface Only		EPC Surface Only	
CF =	1 00E-06	kg/mg	1 00E-06	kg/mg
SA =	5800	cm2	5800	cm2
AF =	1	mg/cm2	1	mg/cm2
EF =	365	days/year	250	days/year
ED =	24	years	25	years
BW =	70	kg	70	kg
AT (Nc) =	8760	days	9125	days
AT (Car) =	25550	days	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic PCBs, dioxins furans and pentachlorophenol since absorption factors are not available for other chemicals of concern

TABLE C-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Construction Worker			Day Care Center Child		
						Absorbed Dose (mg/kg-day)	Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)	Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc) (Car)			(Nc) (Car)		
Volatile Organics											
1,1,2,2,-Tetrachloroethane	NA	2 0E-01	NA		2 00E-03						
2-Butanone	6 0E-01	NA	NA	2 80E-02	2 80E-02						
2-Hexanone			NA		4 00E-03						
4-Methyl-2-Pentanone	NA	NA	NA		4 00E-03						
Acetone	1 0E-01	NA	NA	2 00E-01	2 00E-01						
Toluene	2 0E-01	NA	NA		1 00E-03						
Semivolatile Organics											
2-Methylnaphthalene	4 0E-02	NA	NA		1 50E-01						
4-Methylphenol	NA	NA	NA	2 50E-01	2 50E-01						
Acenaphthene	6 0E-02	NA	NA		3 80E-01						
Acenaphthylene	NA	NA	NA		7 20E-02						
Anthracene	3 0E-01	NA	NA		6 40E-01						
Benzo(a)anthracene	NA	7 3E-01	NA	5 60E-02	9 90E-01						
Benzo(a)pyrene	NA	1 5E+01	NA	4 90E-02	1 10E+00						
Benzo(b)fluoranthene	NA	7 3E-01	NA	4 30E-02	1 10E+00						
Benzo(g,h,i)perylene	NA	NA	NA		5 10E-01						
Benzo(k)fluoranthene	NA	7 3E-02	NA	5.20E-02	1.10E+00						
Carbazole	NA	2 0E-02	NA		3 70E-01						
Chrysene	NA	7 3E-03	NA	5 30E-02	1 20E+00						
Di-n-butylphthalate	9 0E-02	NA	NA	5 30E-02	5 30E-02						
Dibenz(a,h)anthracene	NA	7 3E+00	NA		1 60E-01						
Dibenzofuran	NA	NA	NA		2 80E-01						
Fluoranthene	4 0E-02	NA	NA	1 50E-01	2 40E+00						
Fluorene	4 0E-02	NA	NA		4 10E-01						
Hexachlorobenzene	8 0E-04	NA	NA		3 60E-02						
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	2 60E-02	4 90E-01						
Naphthalene	2 0E-02	NA	NA		3 30E-01						
Phenanthrene	NA	NA	NA	1 20E-01	2 10E+00						
Pyrene	3 0E-02	NA	NA	1 20E-01	2 00E+00						
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	5 40E-02	9 40E-01						
Pesticides/PCBs											
4,4'-DDE	NA	1 7E+00	NA		3 10E-03						
4,4'-DDT	1 0E-04	1 7E+00	NA		5 60E-03						
Dieldrin	2 5E-05	3 2E+01	NA	7 00E-02	7 00E-02						
Endosulfan I	6 0E-03	NA	NA		5 40E-03						
Endosulfan II	6 0E-03	NA	NA		2 80E-03						
Endrin	3 0E-04	NA	NA		3 50E-03						
Endrin aldehyde	NA	NA	NA		4 50E-03						
Endrin ketone	NA	NA	NA		5 20E-03						
Heptachlor epoxide	1 3E-05	9 1E+00	NA		1 20E-03						
Nitroaromatics											
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	NA	1 10E-01	1 10E-01						
Metals											
Cadmium	5 0E-05	NA	0 01	4 80E-01	4 80E-01	3 49E-08	7E-04		4 80E-07	1E-02	
Copper	2 4E-02	NA	NA	2 06E+01	2 90E+01						
Lead	NA	NA	NA	2 25E+01	2 49E+01						
Potassium	NA	NA	NA	1 98E+03	2 53E+03						
Selenium	4 5E-03	NA	NA	1 70E+00	1 70E+00						
Zinc	7 5E-02	NA	NA	9 40E-01	1 15E+02						

Total Hazard Quotient and Cancer Risk: **7E-04** **1E-02**

Assumptions for Construction Worker		Assumptions for Day Care Center Child	
CS =	EPC Surface and Subsurface	CS =	EPC Surface Only
CF =	1 00E-06 kg/mg	CF =	1 00E-06 kg/mg
SA =	5800 cm2	SA =	2190 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	32 days/year	EF =	250 days/year
ED =	1 years	ED =	6 years
BW =	70 kg	BW =	15 kg
AT (Nc) =	365 days	AT (Nc) =	2190 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern

TABLE C-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD	Canc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Day Care Center Adult Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)		
Volatile Organics									
1,1,2,2-Tetrachloroethane	NA	2 0E-01	NA		2 00E-03				
2-Butanone	6 0E-01	NA	NA	2 80E-02	2 80E-02				
2-Hexanone			NA		4 00E-03				
4-Methyl-2-Pentanone	NA	NA	NA		4 00E-03				
Acetone	1 0E-01	NA	NA	2 00E-01	2 00E-01				
Toluene	2 0E-01	NA	NA		1 00E-03				
Semivolatile Organics									
2-Methylnaphthalene	4 0E-02	NA	NA		1 50E-01				
4-Methylphenol	NA	NA	NA	2 50E-01	2 50E-01				
Acenaphthene	6 0E-02	NA	NA		3 80E-01				
Acenaphthylene	NA	NA	NA		7 20E-02				
Anthracene	3 0E-01	NA	NA		6 40E-01				
Benzo(a)anthracene	NA	7 3E-01	NA	5 60E-02	9 90E-01				
Benzo(a)pyrene	NA	1 5E-01	NA	4 90E-02	1 10E+00				
Benzo(b)fluoranthene	NA	7 3E-01	NA	4 30E-02	1 10E+00				
Benzo(g,h,i)perylene	NA	NA	NA		5 10E-01				
Benzo(k)fluoranthene	NA	7 3E-02	NA	5 20E-02	1 10E+00				
Carbazole	NA	2 0E-02	NA		3 70E-01				
Chrysene	NA	7 3E-03	NA	5 30E-02	1 20E+00				
Di-n-butylphthalate	9 0E-02	NA	NA	5 30E-02	5 30E-02				
Dibenz(a,h)anthracene	NA	7 3E+0	NA		1 60E-01				
Dibenzofuran	NA	NA	NA		2 80E-01				
Fluoranthene	4 0E-02	NA	NA	1 50E-01	2 40E+00				
Fluorene	4 0E-02	NA	NA		4 10E-01				
Hexachlorobenzene	8 0E-04	NA	NA		3 60E-02				
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	2 60E-02	4 90E-01				
Naphthalene	2 0E-02	NA	NA		3 30E-01				
Phenanthrene	NA	NA	NA	1 20E-01	2 10E+00				
Pyrene	3 0E-02	NA	NA	1 20E-01	2 00E+00				
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	5 40E-02	9 40E-01				
Pesticides/PCBs									
4,4'-DDE	NA	1 7E+00	NA		3 10E-03				
4,4'-DDT	1 0E-04	1 7E+00	NA		5 60E-03				
Dieldrin	2 5E-05	3 2E+01	NA	7 00E-02	7 00E-02				
Endosulfan I	6 0E-03	NA	NA		5 40E-03				
Endosulfan II	6 0E-03	NA	NA		2 80E-03				
Endrin	3 0E-04	NA	NA		3 50E-03				
Endrin aldehyde	NA	NA	NA		4 50E-03				
Endrin ketone	NA	NA	NA		5 20E-03				
Heptachlor epoxide	1 3E-05	9 1E+00	NA		1 20E-03				
Nitroaromatics									
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	NA	1 10E-01	1 10E-01				
Metals									
Cadmium	5 0E-05	NA	0 01	4 80E-01	4 80E-01	2 72E-07*		5E-03	
Copper	2 4E-02	NA	NA	2 06E+01	2 90E+01				
Lead	NA	NA	NA	2 25E+01	2 49E+01				
Potassium	NA	NA	NA	1 98E+03	2 53E+03				
Selenium	4 5E-03	NA	NA	1 70E+00	1 70E+00				
Zinc	7 5E-02	NA	NA	9 40E+01	1 15E+02				

Total Hazard Quotient and Cancer Risk: 5E-03

Assumptions for Day Care Center Adult

CS =	EPC Surface Only	
CF =	1 00E-06	kg/mg
SA =	5800	cm2
AF =	1	mg/cm2
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol since absorption factors are not available for other chemicals of concern

TABLE C-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $= \frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CW Chemical Concentration in Groundwater, from Groundwater EPC Data
IR Ingestion Rate
EF Exposure Frequency
ED Exposure Duration
BW Bodyweight
AT Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)												
Volatile Organics															
Acetone	1.0E-01	NA	8.00E-03	2.29E-04		2E-03		1.57E-04		2E-03					
1,1,2,2-Tetrachloroethane	NA	2.0E-01	3.00E-03		2.94E-05		6E-06		2.10E-05		4E-06				
Metals															
Magnesium	NA	NA	7.56E+01												
Total Hazard Quotient and Cancer Risk:						**2E-03**	**6E-06**			**2E-03**	**4E-06**				

Ingestion of Groundwater Not Applicable for Construction Worker

Assumptions for Prison Inmate

IR	2 liters/day
EF	365 days/year
ED	24 years
BW	70 kg
AT (Nc)	8760 days
AT (Car)	25550 days

Assumptions for Site Worker

IR	2 liters/day
EF	250 days/year
ED	25 years
BW	70 kg
AT (Nc)	9125 days
AT (Car)	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA Information not available

TABLE C-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CW Chemical Concentration in Groundwater, from Groundwater EPC Data
IR Ingestion Rate
EF Exposure Frequency
ED Exposure Duration
BW Bodyweight
AT Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Day Care Center Child Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Day Care Center Adult Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											
Acetone	1.0E-01	NA	8.00E-03	3.65E-04		4E-03		1.57E-04		2E-03	
1,1,2,2-Tetrachloroethane	NA	2.0E-01	3.00E-03		1.17E-05		2E-06		2.10E-05		4E-06
Metals											
Magnesium	NA	NA	7.56E+01								
Total Hazard Quotient and Cancer Risk:						**4E-03**	**2E-06**			**2E-03**	**4E-06**

Assumptions for Day Care Center Child

IR	1 liters/day
EF	250 days/year
ED	6 years
BW	15 kg
AT (Nc)	2190 days
AT (Car)	25550 days

Assumptions for Day Care Center Adult

IR	2 liters/day
EF	250 days/year
ED	25 years
BW	70 kg
AT (Nc)	9125 days
AT (Car)	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA Information not available

TABLE C-6
CALCULATION OF AIR CONCENTRATION IN SHOWER
FROM VOLATILIZATION OF GROUNDWATER (daily)
REASONABLE MAXIMUM EXPOSURE (RME)
COMPLETION REPORT - MINI RISK ASSESSMENT - SEAD 44A
SENECA ARMY DEPOT, ROMULUS, NEW YORK

Analyte	EPC Air All-Site Wells (mg/m^3)	Time of Shower -Ts (min)	Flow Rate of Shower - Fw (L/min)	EPC - RME Groundwater (mg/l)	Flow Rate of Air in Shower-Fa (m^3/min)	Volume of Bathroom-Vb (m^3)	Henry Laws Constant-H (m^3-atm/mol)	Asymptotic Air Conc.-Cinf (mg/m^3)	Rate Constant-K (1/min)	Efficiency of Release-E (unitless)	Efficiency of Release for TCE E-TCE	Henry Laws Constant-TCE (m^3-atm/mol)	Fraction Emitted* (percent)	Cderm** (Water) (mg/l)
Volatile Organics														
Acetone	7.13E-05	15	19	8.00E-03	2.4	12	2.50E-05	1.04E-04	0.20	1.65E-03	0.6	0.0091	0.11%	7.99E-03
1,1,2,2-Tetrachloroethane	2.67E-04	15	19	3.00E-03	2.4	12	2.50E-04	3.91E-04	0.20	1.65E-02	0.6	0.0091	1.13%	2.97E-03
Metals														
Magnesium	0.00E+00	15	19	7.56E+01	2.4	12	NA	0.00E+00	0.20	0.00	0.6	0.0091	0.00%	7.56E+01

Concentration in Air (mg/m^3) = Cinf[1+(1/(kTs)(exp(-kTs)-1)]

Asymptotic Air Conc. - Cinf (mg/m^3) = [(E)(Fw)(Ct)]/Fa

Rate Constant - k (L/min) = Fa/Vb

Efficiency of Release - E (unitless) = (E-tce)(H)/(H-tce)

* Fraction Emitted (fe) = (EPCair x Fa) / (EPCgw x Fw)

** Cderm = EPCgw x (1 - fe)

Variables:

CA = Chemical Concentration in Air (mg/m^3)
Ts = Time of Shower (minutes)
Fw = Flow Rate of Shower (L/min)
Fa = Flow Rate of Air in Shower (m^3/min)
Vb = Volume of Bathroom (m^3)

Assumptions:

EPC - Groundwater Data - RME
15 (RME default)
19 (Estimated RME)
2.4 (Average Air Flow)
12 (Average Bathroom Volume)

TABLE C-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $\quad \frac{DA \times SA \times EF \times ED}{BW \times AT}$

Equation for Absorbed Dose per Event (DA)

For organics $\quad DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics $\quad DA = Kp \times CW \times ET \times CF$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time
Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Permeability Coefficient k_p (cm/hr)	Tau (hours)	EPC - Cderm* Groundwater (mg/liter)	Absorbed Dose/Event (mg-cm²/event)	Prison Inmate Intake (mg/kg-day) (Ne)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Ne)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Ne)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
Volatile Organics															Dermal Contact of Groundwater Not Applicable for Construction Worker			
Acetone	1.0E-01	NA	5.7E-04	2.0E-01	7.99E-03	2.80E-09	9.18E-07		9E-06		6.29E-07		6E-06					
1,1,2,2-Tetrachloroethane	NA	2.0E-01	9.0E-03	9.1E-01	2.97E-03	3.52E-08		3.96E-06		8E-07		2.83E-06		6E-07				
Metals																		
Magnesium	NA	NA	1.0E-03	NA	7.56E+01	1.89E-05												
Total Hazard Quotient and Cancer Risk:									9E-06	8E-07			6E-06	6E-07				

Assumptions for Prison Inmate

SA =	23000 cm2
CF =	0.001 l/cm3
EF	365 days/year
ED =	24 years
BW	70 kg
AT (Ne)	8760 days
AT (Car)	25550 days
ET	0.25 hours/day

Assumptions for Prison Worker

SA =	23000 cm2
CF =	0.001 l/cm3
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Ne)	9125 days
AT (Car)	25550 days
ET =	0.25 hours/day

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA: Information not available
* Cderm is the concentration of chemical available for dermal absorption after accounting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table C-5

TABLE C-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Equation for Absorbed Dose per Event (DA)

For organics $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics $DA = Kp \times CW \times ET \times CF$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time
Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Analyte	Dermal RfD (mg/kg-day)	0.0E+00 Dermal 0.0E+00	Permeability Coefficient Kp (cm/hr)	Tau	EPC - Cderm* Groundwater (mg/liter)	Absorbed Dose/Event mg-cm²/event	Day Care Center Child Intake (mg/kg-day) (Ne)	(Car)	Hazard Quotient	Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Ne)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics							Dermal Contact of Groundwater Not Applicable for Day Care Center Child				Dermal Contact of Groundwater Not Applicable for Day Care Center Adult			
Acetone	1.0E-01	NA	5.7E-04	2.0E-01	7.99E-03	2.80E-09								
1,1,2,2-Tetrachloroethane	NA	2.0E-01	9.0E-03	9.1E-01	2.97E-03	3.52E-08								
Metals														
Magnesium	NA	NA	1.0E-03	NA	7.56E+01	1.89E-05								

Total Hazard Quotient and Cancer Risk:

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA: Information not available
* Cderm is the concentration of chemical available for dermal absorption after accumulating for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table C-5

TABLE C-8
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44A
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CA Chemical Concentration in Air
IR Inhalation Rate
EF Exposure Frequency
ED Exposure Duration
BW Bodyweight
AT Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	EPC * Air	Day Care Center Child				Day Care Center Adult			
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)		(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics				Inhalation of Groundwater				Inhalation of Groundwater			
Acetone	NA	NA	7.13E-05	Not Applicable for				Not Applicable for			
1,1,2,2-Tetrachloroethane	NA	2.0E-01	2.67E-04	Day Care Center Child				Day Care Center Adult			

Total Hazard Quotient and Cancer Risk:

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA Information not available
* EPC air is the concentration of chemical available for inhalation after accounting for partitioning between the air and water in the shower. The calculation of the EPC air is shown in Table C-6

APPENDIX D
RISK TABLES - SEAD-44B

TABLE D-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-44B
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = $CS_{surf} \times PM_{10} \times CF$

Variables:
CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m^3) = $CS_{tot} \times PM_{10} \times CF$

Variables:
CS_{tot} = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 340 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Volatile Organics				
Butanone, 2-	4.70E-02	4.70E-02	7.99E-10	1.60E-08
Acetone	1.00E-02	1.00E-02	1.70E-10	3.40E-09
Semivolatile Organics				
Anthracene	3.50E-02	3.50E-02	5.95E-10	1.19E-08
Benzo(a)anthracene	1.30E-01	1.30E-01	2.21E-09	4.42E-08
Benzo(a)pyrene	9.80E-02	9.80E-02	1.67E-09	3.33E-08
Benzo(b)fluoranthene	9.90E-02	9.90E-02	1.68E-09	3.37E-08
Benzo(g,h,i)perylene	5.60E-02	5.60E-02	9.52E-10	1.90E-08
Benzo(k)fluoranthene	1.10E-01	1.10E-01	1.87E-09	3.74E-08
Chrysene	1.50E-01	1.50E-01	2.55E-09	5.10E-08
Dibenz(a,h)anthracene	2.80E-02	2.80E-02	4.76E-10	9.52E-09
Fluoranthene	3.50E-01	3.50E-01	5.95E-09	1.19E-07
Indeno(1,2,3-cd)pyrene	6.40E-02	6.40E-02	1.09E-09	2.18E-08
Phenanthrene	3.30E-01	3.30E-01	5.61E-09	1.12E-07
Pyrene	3.80E-01	3.80E-01	6.46E-09	1.29E-07
bis(2-Ethylhexyl)phthalate	4.20E-02	4.20E-02	7.14E-10	1.43E-08
Pesticides				
4,4'-DDD	2.80E-02	2.80E-02	4.76E-10	9.52E-09
4,4'-DDE	4.80E-02	4.80E-02	8.16E-10	1.63E-08
4,4'-DDT	2.70E-02	2.70E-02	4.59E-10	9.18E-09
Dieldrin	5.70E-02	5.70E-02	9.69E-10	1.94E-08
Endosulfan I	2.00E-03	2.00E-03	3.40E-11	6.80E-10
Metals				
Cadmium	3.40E-01	3.40E-01	5.78E-09	1.16E-07
Copper	2.62E+01	2.62E+01	4.45E-07	8.91E-06
Lead	3.95E+01	3.95E+01	6.72E-07	1.34E-05
Potassium	1.88E+03	1.88E+03	3.20E-05	6.39E-04
Selenium	1.20E+00	1.20E+00	2.04E-08	4.08E-07
Zinc	1.45E+02	1.45E+02	2.47E-06	4.93E-05

ND = Compound was not detected above the detection limit shown

TABLE D-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)												
Volatile Organics																
Butanone 2-	2 9E-01	NA	7 99E-10	1 60E-08	1 73E-10		6E-10		6 25E-11		2E-10		2 11E-11		7E-11	
Acetone	NA	NA	1 70E-10	3 40E-09												
Semivolatile Organics																
Anthracene	NA	NA	5 95E-10	1 19E-08												
Benzo(a)anthracene	NA	NA	2 21E-09	4 42E-08												
Benzo(a)pyrene	NA	NA	1 67E-09	3 33E-08												
Benzo(b)fluoranthene	NA	NA	1 68E-09	3 37E-08												
Benzo(g,h,i)perylene	NA	NA	9 52E-10	1 90E-08												
Benzo(k)fluoranthene	NA	NA	1 87E-09	3 74E-08												
Chrysene	NA	NA	2 55E-09	5 10E-08												
Dibenz(a,h)anthracene	NA	NA	4 76E-10	9 52E-09												
Fluoranthene	NA	NA	5 95E-09	1 19E-07												
Indeno(1,2,3-cd)pyrene	NA	NA	1 09E-09	2 18E-08												
Phenanthrene	NA	NA	5 61E-09	1 12E-07												
Pyrene	NA	NA	6 46E-09	1 29E-07												
bis(2-Ethylhexyl)phthalate	NA	NA	7 14E-10	1 43E-08												
Pesticides																
4,4'-DDD	NA	NA	4 76E-10	9 52E-09												
4,4'-DDE	NA	NA	8 16E-10	1 63E-08												
4,4'-DDT	NA	3 4E-01	4 59E-10	9 18E-09		3 42E-11		1E-11		1 28E-11		4E-12		1 73E-13		6E-14
Dieldrin	NA	1 6E+01	9 69E-10	1 94E-08		7 21E-11		1E-09		2 71E-11		4E-10		3 66E-13		6E-12
Endosulfan I	NA	NA	3 40E-11	6 80E-10												
Metals																
Cadmium	NA	6 3E+00	5 78E-09	1 16E-07		4 30E-10		3E-09		1 62E-10		1E-09		2 18E-12		1E-11
Copper	NA	NA	4 45E-07	8 91E-06												
Lead	NA	NA	6 72E-07	1 34E-05												
Potassium	NA	NA	3 20E-05	6 39E-04												
Selenium	NA	NA	2 04E-08	4 08E-07												
Zinc	NA	NA	2 47E-06	4 93E-05												
Total Hazard Quotient and Cancer Risk:							**6E-10**	**4E-09**			**2E-10**	**1E-09**			**7E-11**	**2E-11**

Assumptions for Prison Inmate

CA =	EPC Surface Only
IR =	15 2 m3/day
EF =	365 days/year
ED =	24 years
BW =	70 kg
AT (Nc) =	8760 days
AT (Car) =	25550 days

Assumptions for Prison Worker

CA	EPC Surface Only
IR =	8 m3/day
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days

Assumptions for Construction Worker

CA =	EPC Surface and Sub-Surface
IR =	10 4 m3/day
EF =	3 25 days/year
ED =	1 years
BW =	70 kg
AT (Nc) =	365 days
AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table D-1 for calculation of Air EPC
NA = Information not available

TABLE D-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* fro Surface Soil	Air EPC* from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Butanone, 2-	2.9E-01	NA	7.99E-10	1.60E-08	1.46E-10		5E-10		6.25E-11		2E-10	
Acetone	NA	NA	1.70E-10	3.40E-09								
Semivolatile Organics												
Anthracene	NA	NA	5.95E-10	1.19E-08								
Benzo(a)anthracene	NA	NA	2.21E-09	4.42E-08								
Benzo(a)pyrene	NA	NA	1.67E-09	3.33E-08								
Benzo(b)fluoranthene	NA	NA	1.68E-09	3.37E-08								
Benzo(g,h,i)perylene	NA	NA	9.52E-10	1.90E-08								
Benzo(k)fluoranthene	NA	NA	1.87E-09	3.74E-08								
Chrysene	NA	NA	2.55E-09	5.10E-08								
Dibenz(a,h)anthracene	NA	NA	4.76E-10	9.52E-09								
Fluoranthene	NA	NA	5.95E-09	1.19E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	1.09E-09	2.18E-08								
Phenanthrene	NA	NA	5.61E-09	1.12E-07								
Pyrene	NA	NA	6.46E-09	1.29E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	7.14E-10	1.43E-08								
Pesticides												
4,4'-DDD	NA	NA	4.76E-10	9.52E-09								
4,4'-DDE	NA	NA	8.16E-10	1.63E-08								
4,4'-DDT	NA	3.4E-01	4.59E-10	9.18E-09		7.19E-12		2E-12		1.28E-11		4E-12
Dieldrin	NA	1.6E+01	9.69E-10	1.94E-08		1.52E-11		2E-10		2.71E-11		4E-10
Endosulfan I	NA	NA	3.40E-11	6.80E-10								
Metals												
Cadmium	NA	6.3E+00	5.78E-09	1.16E-07		9.05E-11		6E-10		1.62E-10		1E-09
Copper	NA	NA	4.45E-07	8.91E-06								
Lead	NA	NA	6.72E-07	1.34E-05								
Potassium	NA	NA	3.20E-05	6.39E-04								
Selenium	NA	NA	2.04E-08	4.08E-07								
Zinc	NA	NA	2.47E-06	4.93E-05								
Total Hazard Quotient and Cancer Risk:							**5E-10**	**8E-10**			**2E-10**	**1E-09**

Assumptions for Day Care Center Child			Assumptions for Day Care Center Adult		
CA	EPC Surface Only		CA =	EPC Surface Only	
IR =	4	m3/day	IR =	8	m3/day
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
* See Table D-1 for calculation of Air EPC
NA = Information not available

TABLE D-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)												
Volatile Organics																
Acetone	1.0E-01	NA	4.70E-02	4.70E-02	6.71E-08		7E-07		4.60E-08		5E-07		2.87E-09		3E-08	
Butanone 2-	6.0E-01	NA	1.00E-02	1.00E-02	1.43E-08		2E-08		9.78E-09		2E-08		6.11E-10		1E-09	
Semivolatile Organics																
Anthracene	3.0E-01	NA	3.50E-02	3.50E-02	5.00E-08		2E-07		3.42E-08		1E-07		2.14E-09		7E-09	
Benzo(a)anthracene	NA	7.3E-01	1.30E-01	1.30E-01		6.37E-08		5E-08		4.54E-08		3E-08		1.13E-10		8E-11
Benzo(a)pyrene	NA	7.3E+00	9.80E-02	9.80E-02		4.80E-08		4E-07		3.42E-08		3E-07		8.55E-11		6E-10
Benzo(b)fluoranthene	NA	7.3E-01	9.90E-02	9.90E-02		4.85E-08		4E-08		3.46E-08		3E-08		8.64E-11		6E-11
Benzo(g,h,i)perylene	NA	NA	5.60E-02	5.60E-02												
Benzo(k)fluoranthene	NA	7.3E-02	1.10E-01	1.10E-01		5.39E-08		4E-09		3.84E-08		3E-09		9.59E-11		7E-12
Chrysene	NA	7.3E-03	1.50E-01	1.50E-01		7.35E-08		5E-10		5.24E-08		4E-10		1.31E-10		1E-12
Dibenz(a,h)anthracene	NA	7.3E+00	2.80E-02	2.80E-02		1.37E-08		1E-07		9.78E-09		7E-08		2.44E-11		2E-10
Fluoranthene	4.0E-02	NA	3.50E-01	3.50E-01	5.00E-07		1E-05		3.42E-07		9E-06		2.14E-08		5E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	6.40E-02	6.40E-02		3.13E-08		2E-08		2.24E-08		2E-08		5.58E-11		4E-11
Phenanthrene	NA	NA	3.30E-01	3.30E-01												
Pyrene	3.0E-02	NA	3.80E-01	3.80E-01	5.43E-07		2E-05		3.72E-07		1E-05		2.32E-08		8E-07	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	4.20E-02	4.20E-02	6.00E-08	2.06E-08	3E-06	3E-10	4.11E-08	1.47E-08	2E-06	2E-10	2.56E-09	3.66E-11	1E-07	5E-13
Pesticides/PCBs																
4,4'-DDD	NA	2.4E-01	2.80E-02	2.80E-02		1.37E-08		1E-09		9.78E-09		2E-09		2.44E-11		6E-12
4,4'-DDE	NA	3.4E-01	4.80E-02	4.80E-02		2.35E-08		8E-09		1.68E-08		6E-09		4.19E-11		1E-11
4,4'-DDT	5.0E-04	3.4E-01	2.70E-02	2.70E-02	3.86E-08	1.32E-08	8E-05	4E-09	2.64E-08	9.44E-09	5E-05	3E-09	1.65E-09	2.36E-11	3E-06	8E-12
Dieldrin	5.0E-05	1.6E+01	5.70E-02	5.70E-02	8.14E-08	2.79E-08	2E-03	4E-07	5.58E-08	1.99E-08	1E-03	3E-07	3.48E-09	4.97E-11	7E-05	8E-10
Endosulfan I	6.0E-03	NA	2.00E-03	2.00E-03	2.86E-09		5E-07		1.96E-09		3E-07		1.22E-10		2E-08	
Metals																
Cadmium	5.0E-04	NA	3.40E-01	3.40E-01	4.86E-07		1E-03		3.33E-07		7E-04		2.08E-08		4E-05	
Copper	4.0E-02	NA	2.62E+01	2.62E+01	3.74E-05		9E-04		2.56E-05		6E-04		1.60E-06		4E-05	
Lead	NA	NA	3.95E+01	3.95E+01												
Potassium	NA	NA	1.88E+03	1.88E+03												
Selenium	5.0E-03	NA	1.20E+00	1.20E+00	1.71E-06		3E-04		1.17E-06		2E-04		7.33E-08		1E-05	
Zinc	3.0E-01	NA	1.45E+02	1.45E+02	2.07E-04		7E-04		1.42E-04		5E-04		8.85E-06		3E-05	
Total Hazard Quotient and Cancer Risk:							**5E-03**	**1E-06**			**3E-03**	**7E-07**			**2E-04**	**2E-09**

Assumptions for Prison Inmate

CS =	EPC Surface Only
IR =	100 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	365 days/year
ED =	24 years
BW =	70 kg
AT (Nc) =	8760 days
AT (Car) =	25550 days

Assumptions for Prison Worker

CS =	EPC Surface Only
IR =	100 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days

Assumptions for Construction Worker

CS =	EPC Surface and Subsurface
IR =	480 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	3.25 days/year
ED =	1 years
BW =	70 kg
AT (Nc) =	365 days
AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA = Information not available

TABLE D-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1 0E-01	NA	4 70E-02	4 70E-02	4 29E-07		4E-06		4 60E-08		5E-07	
Butanone, 2-	6 0E-01	NA	1 00E-02	1 00E-02	9 13E-08		2E-07		9 78E-09		2E-08	
Semivolatile Organics												
Anthracene	3 0E-01	NA	3 50E-02	3 50E-02	3 20E-07		1E-06		3 42E-08		1E-07	
Benzo(a)anthracene	NA	7 3E-01	1 30E-01	1 30E-01		1 02E-07		7E-08		4 54E-08		3E-08
Benzo(a)pyrene	NA	7 3E+00	9 80E-02	9 80E-02		7 67E-08		6E-07		3 42E-08		3E-07
Benzo(b)fluoranthene	NA	7 3E-01	9 90E-02	9 90E-02		7 75E-08		6E-08		3 46E-08		3E-08
Benzo(g,h,i)perylene	NA	NA	5 60E-02	5 60E-02								
Benzo(k)fluoranthene	NA	7 3E-02	1 10E-01	1 10E-01		8 61E-08		6E-09		3 84E-08		3E-09
Chrysene	NA	7 3E-03	1 50E-01	1 50E-01		1 17E-07		9E-10		5 24E-08		4E-10
Dibenz(a,h)anthracene	NA	7 3E+00	2 80E-02	2 80E-02		2 19E-08		2E-07		9 78E-09		7E-08
Fluoranthene	4 0E-02	NA	3 50E-01	3 50E-01	3 20E-06		8E-05		3 42E-07		9E-06	
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	6 40E-02	6 40E-02		5 01E-08		4E-08		2 24E-08		2E-08
Phenanthrene	NA	NA	3 30E-01	3 30E-01								
Pyrene	3 0E-02	NA	3 80E-01	3 80E-01	3 47E-06		1E-04		3 72E-07		1E-05	
bis(2-Ethylhexyl)phthalate	2 0E-02	1 4E-02	4 20E-02	4 20E-02	3 84E-07	3 29E-08	2E-05	5E-10	4 11E-08	1 47E-08	2E-06	2E-10
Pesticides/PCBs												
4,4'-DDD	NA	2 4E-01	2 80E-02	2 80E-02		2 19E-08		5E-09		9 78E-09		2E-09
4,4'-DDE	NA	3 4E-01	4 80E-02	4 80E-02		3 76E-08		1E-08		1 68E-08		6E-09
4,4'-DDT	5 0E-04	3 4E-01	2 70E-02	2 70E-02	2 47E-07	2 11E-08	5E-04	7E-09	2 64E-08	9 44E-09	5E-05	3E-09
Dieldrin	5 0E-05	1 6E+01	5 70E-02	5 70E-02	5 21E-07	4 46E-08	1E-02	7E-07	5 58E-08	1 99E-08	1E-03	3E-07
Endosulfan I	6 0E-03	NA	2 00E-03	2 00E-03	1 83E-08		3E-06		1 96E-09		3E-07	
Metals												
Cadmium	5 0E-04	NA	3 40E-01	3 40E-01	3 11E-06		6E-03		3 33E-07		7E-04	
Copper	4 0E-02	NA	2 62E+01	2 62E+01	2 39E-04		6E-03		2 56E-05		6E-04	
Lead	NA	NA	3 95E+01	3 95E+01								
Potassium	NA	NA	1 88E+03	1 88E+03								
Selenium	5 0E-03	NA	1 20E+00	1 20E+00	1 10E-05		2E-03		1 17E-06		2E-04	
Zinc	3 0E-01	NA	1 45E+02	1 45E+02	1 32E-03		4E-03		1 42E-04		5E-04	
Total Hazard Quotient and Cancer Risk:							**3E-02**	**2E-06**			**3E-03**	**7E-07**

Assumptions for Day Care Center Child

CS =	EPC Surface Only	
IR =	200	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	6	years
BW =	15	kg
AT (Nc) =	2190	days
AT (Car) =	25550	days

Assumptions for Day Care Center Adult

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available

TABLE D-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD	Canc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Prison Inmate				Prison Worker				Construction Worker			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics																	
Acetone	1 0E-01	NA	NA	4 70E-02	4 70E-02												
Butanone, 2-	6 0E-01	NA	NA	1 00E-02	1 00E-02												
Semivolatile Organics																	
Anthracene	3 0E-01	NA	NA	3 50E-02	3 50E-02												
Benzo(a)anthracene	NA	7 3E-01	NA	1 30E-01	1 30E-01												
Benzo(a)pyrene	NA	1 5E+01	NA	9 80E-02	9 80E-02												
Benzo(b)fluoranthene	NA	7 3E-01	NA	9 90E-02	9 90E-02												
Benzo(g,h,i)perylene	NA	NA	NA	5 60E-02	5 60E-02												
Benzo(k)fluoranthene	NA	7 3E-02	NA	1 10E-01	1 10E-01												
Chrysene	NA	7 3E-03	NA	1 50E-01	1 50E-01												
Dibenz(a,h)anthracene	NA	7 3E+00	NA	2 80E-02	2 80E-02												
Fluoranthene	4 0E-02	NA	NA	3 50E-01	3 50E-01												
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	6 40E-02	6 40E-02												
Phenanthrene	NA	NA	NA	3 30E-01	3 30E-01												
Pyrene	3 0E-02	NA	NA	3 80E-01	3 80E-01												
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	4 20E-02	4 20E-02												
Pesticides/PCBs																	
4,4'-DDD	NA	1 2E+00	NA	2 80E-02	2 80E-02												
4,4'-DDE	NA	1 7E+00	NA	4 80E-02	4 80E-02												
4,4'-DDT	1 0E-04	1 7E+00	NA	2 70E-02	2 70E-02												
Dieldrin	2 5E-05	3 2E+01	NA	5 70E-02	5 70E-02												
Endosulfan I	6 0E-03	NA	NA	2 00E-03	2 00E-03												
Metals																	
Cadmium	5 0E-05	NA	0 01	3 40E-01	3 40E-01	2 82E-07		6E-03		1 93E-07		4E-03		2 51E-09		5E-05	
Copper	2 4E-02	NA	NA	2 62E+01	2 62E+01												
Lead	NA	NA	NA	3 95E+01	3 95E+01												
Potassium	NA	NA	NA	1 88E+03	1 88E+03												
Selenium	4 5E-03	NA	NA	1 20E+00	1 20E+00												
Zinc	7 5E-02	NA	NA	1 45E+02	1 45E+02												
Total Hazard Quotient and Cancer Risk:								**6E-03**				**4E-03**				**5E-05**	

Assumptions for Prison Inmate			Assumptions for Prison Worker			Assumptions for Construction Worker		
CS =	EPC Surface Only		CS =	EPC Surface Only		CS =	EPC Surface and Subsurface	
CF =	1 00E-06	kg/mg	CF =	1 00E-06	kg/mg	CF =	1.00E-06	kg/mg
SA =	5800	cm2	SA =	5800	cm2	SA =	5800	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	365	days/year	EF =	250	days/year	EF =	3 25	days/year
ED =	24	years	ED =	25	years	ED =	1	years
BW =	70	kg	BW =	70	kg	BW =	70	kg
AT (Nc) =	8760	days	AT (Nc) =	9125	days	AT (Nc) =	365	days
AT (Car) =	25550	days	AT (Car) =	25550	days	AT (Car) =	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE D-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 44B
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	Absorbed Dose (mg/kg-day) (Car)	Hazard Quotient	Cancer Risk	Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	Absorbed Dose (mg/kg-day) (Car)	Hazard Quotient	Cancer Risk
Volatile Organics													
Acetone	1 0E-01	NA	NA	4 70E-02	4 70E-02								
Butanone, 2-	6 0E-01	NA	NA	1 00E-02	1 00E-02								
Semivolatile Organics													
Anthracene	3 0E-01	NA	NA	3 50E-02	3 50E-02								
Benzo(a)anthracene	NA	7 3E-01	NA	1 30E-01	1 30E-01								
Benzo(a)pyrene	NA	1 5E+01	NA	9 80E-02	9 80E-02								
Benzo(b)fluoranthene	NA	7 3E-01	NA	9 90E-02	9 90E-02								
Benzo(g,h,i)perylene	NA	NA	NA	5 60E-02	5 60E-02								
Benzo(k)fluoranthene	NA	7 3E-02	NA	1 10E-01	1 10E-01								
Chrysene	NA	7 3E-03	NA	1 50E-01	1 50E-01								
Dibenz(a,h)anthracene	NA	7 3E+00	NA	2 80E-02	2 80E-02								
Fluoranthene	4 0E-02	NA	NA	3 50E-01	3 50E-01								
Indeno(1,2,3-cd)pyrene	NA	7 3E-01	NA	6 40E-02	6 40E-02								
Phenanthrene	NA	NA	NA	3 30E-01	3 30E-01								
Pyrene	3 0E-02	NA	NA	3 80E-01	3 80E-01								
bis(2-Ethylhexyl)phthalate	1 0E-02	2 8E-02	NA	4 20E-02	4 20E-02								
Pesticides/PCBs													
4,4'-DDD	NA	1 2E+00	NA	2 80E-02	2 80E-02								
4,4'-DDE	NA	1 7E+00	NA	4 80E-02	4 60E-02								
4,4'-DDT	1 0E-04	1 7E+00	NA	2 70E-02	2 70E-02								
Dieldrin	2 5E-05	3 2E+01	NA	5 70E-02	5 70E-02								
Endosulfan I	6 0E-03	NA	NA	2 00E-03	2 00E-03								
Metals													
Cadmium	5 0E-05	NA	0 01	3 40E-01	3 40E-01	3 40E-07		7E-03		1 93E-07		4E-03	
Copper	2 4E-02	NA	NA	2 62E+01	2 62E+01								
Lead	NA	NA	NA	3 95E+01	3 95E+01								
Potassium	NA	NA	NA	1 88E+03	1 88E+03								
Selenium	4 5E-03	NA	NA	1 20E+00	1 20E+00								
Zinc	7 5E-02	NA	NA	1 45E+02	1 45E+02								
Total Hazard Quotient and Cancer Risk:								**7E-03**				**4E-03**	

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
CS =	EPC Surface Only	CS =	EPC Surface Only
CF =	1 00E-06 kg/mg	CF =	1 00E-06 kg/mg
SA =	2190 cm2	SA =	5800 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	250 days/year	EF =	250 days/year
ED =	6, years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA= Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern

TABLE D-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44B
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. oral RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE D-6
CALCULATION OF AIR CONCENTRATION IN SHOWER
FROM VOLATILIZATION OF GROUNDWATER (daily)
REASONABLE MAXIMUM EXPOSURE (RME)
COMPLETION REPORT - MINI RISK ASSESSMENT - SEAD 44B
SENECA ARMY DEPOT, ROMULUS, NEW YORK

Analyte	EPC Air All-Site Wells (mg/m^3)	Time of Shower -Ts (min)	Flow Rate of Shower - Fw (L/min)	EPC - RME Groundwater (mg/l)	Flow Rate of Air in Shower-Fa (m^3/min)	Volume of Bathroom-Vb (m^3)	Henry Laws Constant-H (m^3-atm/mol)	Asymptotic Air Conc.-Cinf (mg/m^3)	Rate Constant-K (1/min)	Efficiency of Release-E (unitless)	Efficiency of Release for TCE E-TCE	Henry Laws Constant-TCE (m^3-atm/mol)	Fraction Emitted* (percent)	Cderm** (Water) (mg/l)
Metals														
Magnesium	0.00E+00	15	19	3.29E+01	2.4	12	NA	0.00E+00	0.20	0.00	0.6	0.0091	0.00%	3.29E+01

Concentration in Air (mg/m^3) = Cinf[1+(1/(kTs)(exp(-kTs)-1)]

Asymptotic Air Conc. - Cinf (mg/m^3) = [(E)(Fw)(Ct)]/Fa

Rate Constant - k (L/min) = Fa/Vb

Efficiency of Release - E (unitless) = (E-tce)(H)/(H-tce)

* Fraction Emitted (fe) = (EPCair x Fa) / (EPCgw x Fw)

** Cderm = EPCgw x (1 - fe)

Variables:

CA = Chemical Concentration in Air (mg/m^3)
Ts = Time of Shower (minutes)
Fw = Flow Rate of Shower (L/min)
Fa = Flow Rate of Air in Shower (m^3/min)
Vb = Volume of Bathroom (m^3)

Assumptions:

EPC - Groundwater Data - RME
15 (RME default)
19 (Estimated RME)
2.4 (Average Air Flow)
12 (Average Bathroom Volume)

TABLE D-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-44B
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. dermal RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

APPENDIX E
RISK TABLES - SEAD-52

TABLE E-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-52
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = $CS_{surf} \times PM_{10} \times CF$	Equation for Air EPC from Total Soils (mg/m^3) = $CS_{tot} \times PM_{10} \times CF$
Variables: CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg) PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m^3 CF = Conversion Factor = 1E-9 kg/ug	Variables: CS_{tot} = Chemical Concentration in Total Soils, from EPC data (mg/kg) PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 340 ug/m^3 CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Nitroaromatics				
Tetryl	1.50E-01	1.50E-01	2.55E-09	5.10E-08
2,4,6-Trinitrotoluene	4.10E-01	4.10E-01	6.97E-09	1.39E-07
2,4-Dinitrotoluene	2.10E+00	2.10E+00	3.57E-08	7.14E-07

ND = Compound was not detected above the detection limit shown

TABLE E-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-52
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE E-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-52
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)												
Nitroaromatics																
2,4-Dinitrotoluene	2 0E-03	6 8E-01	2 10E+00	2 10E+00	3 00E-06	1 03E-06	2E-03	7E-07	2 05E-06	7 34E-07	1E-03	5E-07	4 93E-07	7 05E-09	2E-04	5E-09
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	4 10E-01	4 10E-01	5 86E-07	2 01E-07	1E-03	6E-09	4 01E-07	1 43E-07	8E-04	4E-09	9 63E-08	1 38E-09	2E-04	4E-11
Tetryl	1 0E-02	NA	1 50E-01	1 50E-01	2 14E-07		2E-05		1 47E-07		1E-05		3 52E-08		4E-06	
Total Hazard Quotient and Cancer Risk:							**3E-03**	**7E-07**			**2E-03**	**5E-07**			**4E-04**	**5E-09**

Assumptions for Prison Inmate		
CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc) =	8760	days
AT (Car)	25550	days

Assumptions for Prison Worker		
CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Assumptions for Construction Worker		
CS =	EPC Totals	
IR =	480	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	12 5	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
Total soils include surface and subsurface soils
NA Information not available

TABLE E-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-52
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Nitroaromatics												
2,4-Dinitrotoluene	2 0E-03	6 8E-01	2 10E+00	2 10E+00	1 92E-05	1 64E-06	1E-02	1E-06	2 05E-06	7.34E-07	1E-03	5E-07
2,4,6-Trinitrotoluene	5 0E-04	3 0E-02	4 10E-01	4 10E-01	3 74E-06	3 21E-07	7E-03	1E-08	4 01E-07	1 43E-07	8E-04	4E-09
Tetryl	1 0E-02	NA	1 50E-01	1 50E-01	1 37E-06		1E-04		1 47E-07		1E-05	
Total Hazard Quotient and Cancer Risk:							**2E-02**	**1E-06**			**2E-03**	**5E-07**

Assumptions for Day Care Center Child

CS =	EPC Surface Only
IR =	200 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	250 days/year
ED =	6 years
BW =	15 kg
AT (Nc)	2190 days
AT (Car) =	25550 days

Assumptions for Day Care Center Adult

CS =	EPC Surface Only
IR =	100 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
Total soils include surface and subsurface soils
NA = Information not available

TABLE E-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-52
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. dermal RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

APPENDIX F
RISK TABLES - SEAD-62

TABLE F-1
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) $CS_{surf} \times PM_{10} \times CF$

Variables:
CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m^3) = $CS_{tot} \times PM_{10} \times CF$

Variables:
CS_{tot} = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 340 ug/m^3
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Calculated Air EPC Surface Soil (mg/m^3)	Calculated Air EPC Total Soils (mg/m^3)
Semivolatile Organics				
Fluoranthene	4.60E-02	4.60E-02	7.82E-10	1.56E-08
Pyrene	4.70E-02	4.70E-02	7.99E-10	1.60E-08
Metals				
Cadmium	4.30E-01	6.80E-01	7.31E-09	2.31E-07
Copper	2.28E+01	2.87E+01	3.88E-07	9.76E-06
Potassium	1.63E+03	2.97E+03	2.77E-05	1.01E-03
Selenium	1.30E+00	1.30E+00	2.21E-08	4.42E-07
Zinc	2.18E+02	2.18E+02	3.71E-06	7.41E-05
Herbicides				
2,4,5-T	1.00E-02	1.00E-02	1.70E-10	3.40E-09
Dicamba		9.30E-03		3.16E-09

ND = Compound was not detected above the detection limit shown

TABLE F-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-62
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Prison Inmate				Prison Worker				Construction Worker			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Semivolatile Organics																
Fluoranthene	NA	NA	7.82E-010	1.56E-008												
Pyrene	NA	NA	7.99E-010	1.60E-008												
Metals																
Cadmium	NA	6.3E+000	7.31E-009	2.31E-007		5.44E-010		3E-009		2.04E-010		1E-009		2.37E-010		1E-009
Copper	NA	NA	3.88E-007	9.76E-006												
Potassium	NA	NA	2.77E-005	1.01E-003												
Selenium	NA	NA	2.21E-008	4.42E-007												
Zinc	NA	NA	3.71E-006	7.41E-005												
Herbicides																
2,4,5-T	NA	NA	1.70E-010	3.40E-009												
Dicamba	NA	NA		3.16E-009												
Total Hazard Quotient and Cancer Risk:								**3E-009**				**1E-009**				**1E-009**

Assumptions for Prison Inmate		
CA =	EPC Surface Only	
IR =	15.2	m3/day
EF =	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc) =	8760	days
AT (Car) =	25550	days

Assumptions for Prison Worker		
CA =	EPC Surface Only	
IR =	8	m3/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Assumptions for Construction Worker		
CA =	EPC Surface and Sub-Surface	
IR =	10.4	m3/day
EF =	176.5	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data.
* See Table F-1 for calculation of Air EPCs
NA Information not available

TABLE F-2
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-62
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Air EPC* from Total Soils	Day Care Center Child				Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Semivolatile Organics												
Fluoranthene	NA	NA	7.82E-010	1.56E-008								
Pyrene	NA	NA	7.99E-010	1.60E-008								
Metals												
Cadmium	NA	6.3E+000	7.31E-009	2.31E-007		1.14E-010		7E-010		2.04E-010		1E-009
Copper	NA	NA	3.88E-007	9.76E-006								
Potassium	NA	NA	2.77E-005	1.01E-003								
Selenium	NA	NA	2.21E-008	4.42E-007								
Zinc	NA	NA	3.71E-006	7.41E-005								
Herbicides												
2,4,5-T	NA	NA	1.70E-010	3.40E-009								
Dicamba	NA	NA		3.16E-009								
Total Hazard Quotient and Cancer Risk:								7E-010				1E-009

Assumptions for Day Care Center Child

CA =	EPC Surface Only	
IR =	4	m3/day
EF =	250	days/year
ED =	6	years
BW =	15	kg
AT (Nc) =	2190	days
AT (Car) =	25550	days

Assumptions for Day Care Center Adult

CA =	EPC Surface Only	
IR =	8	m3/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note Cells in this table were intentionally left blank due to a lack of toxicity data.
* See Table F-1 for calculation of Air EPC's
NA= Information not available.

TABLE F-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Prison Inmate Intake (mg/kg-day) (Nc)	Prison Inmate Intake (mg/kg-day) (Car)	Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day) (Nc)	Prison Worker Intake (mg/kg-day) (Car)	Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day) (Nc)	Construction Worker Intake (mg/kg-day) (Car)	Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)												
Semivolatile Organics																
Fluoranthene	4 0E-02	NA	4 60E-02	4 60E-02	6 57E-08		2E-06		4 50E-08		1E-06		1 53E-07		4E-06	
Pyrene	3 0E-02	NA	4 70E-02	4 70E-02	6 71E-08		2E-06		4 60E-08		2E-06		1 56E-07		5E-06	
Metals																
Cadmium	5 0E-04	NA	4 30E-01	6 80E-01	6 14E-07		1E-03		4 21E-07		8E-04		2 25E-06		5E-03	
Copper	4 0E-02	NA	2 28E+01	2 87E+01	3 26E-05		8E-04		2 23E-05		6E-04		9 52E-05		2E-03	
Potassium	NA	NA	1 63E+03	2 97E+03												
Selenium	5 0E-03	NA	1 30E+00	1 30E+00	1 86E-06		4E-04		1 27E-06		3E-04		4 31E-06		9E-04	
Zinc	3 0E-01	NA	2 18E+02	2 18E+02	3 11E-04		1E-03		2 13E-04		7E-04		7 23E-04		2E-03	
Herbicides																
2,4,5-T	1 0E-02	NA	1 00E-02	1 00E-02	1 43E-08		1E-06		9 78E-09		1E-06		3 32E-08		3E-06	
Dicamba	3 0E-02	NA		9 30E-03									3 08E-08		1E-06	
Total Hazard Quotient and Cancer Risk:							**3E-03**				**2E-03**				**1E-02**	

Assumptions for Prison Inmate		Assumptions for Prison Worker		Assumptions for Construction Worker	
CS =	EPC Surface Only	CS =	EPC Surface Only	CS =	EPC Total Soils
IR =	100 mg soil/day	IR =	100 mg soil/day	IR =	480 mg soil/day
CF =	1E-06 kg/mg	CF =	1E-06 kg/mg	CF =	1E-06 kg/mg
FI =	1 unitless	FI =	1 unitless	FI =	1 unitless
EF =	365 days/year	EF =	250 days/year	EF =	176 5 days/year
ED =	24 years	ED =	25 years	ED =	1 years
BW =	70 kg	BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days	AT (Nc) =	365 days
AT (Car) =	25550 days	AT (Car) =	25550 days	AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA Information not available

TABLE F-3
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS = Chemical Concentration in Soil, Calculated from Soil E
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Day Care Center Child Intake (mg/kg-day) (Nc)	Day Care Center Child Intake (mg/kg-day) (Car)	Day Care Center Child Hazard Quotient	Day Care Center Child Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Nc)	Day Care Center Adult Intake (mg/kg-day) (Car)	Day Care Center Adult Hazard Quotient	Day Care Center Adult Cancer Risk
Semivolatile Organics												
Fluoranthene	4 0E-02	NA	4 60E-02	4 60E-02	4 20E-07		1E-05		4 50E-08		1E-06	
Pyrene	3 0E-02	NA	4 70E-02	4 70E-02	4 29E-07		1E-05		4 60E-08		2E-06	
Metals												
Cadmium	5 0E-04	NA	4 30E-01	6 80E-01	3 93E-06		8E-03		4 21E-07		8E-04	
Copper	4 0E-02	NA	2.28E+01	2 87E+01	2 08E-04		5E-03		2 23E-05		6E-04	
Potassium	NA	NA	1 63E+03	2 97E+03								
Selenium	5 0E-03	NA	1 30E+00	1 30E+00	1 19E-05		2E-03		1 27E-06		3E-04	
Zinc	3 0E-01	NA	2 18E+02	2 18E+02	1 99E-03		7E-03		2 13E-04		7E-04	
Herbicides												
2,4,5-T	1 0E-02	NA	1 00E-02	1 00E-02	9 13E-08		9E-06		9 78E-09		1E-06	
Dicamba	3 0E-02	NA		9 30E-03								
Total Hazard Quotient and Cancer Risk:							**2E-02**				**2E-03**	

Note Cells in this table were intentionally left blank due to a lack of toxicity data

NA= Information not available

Assumptions for Day Care Center Child

CS	EPC Surface Only	
IR =	200	mg soil/day
CF	1E-06	kg/mg
FI	1	unitless
EF	250	days/year
ED	6	years
BW =	15	kg
AT (Nc)	2190	days
AT (Car)	25550	days

Assumptions for Day Care Center Adult

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

TABLE F-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CS Chemical Concentration in Soil from Soil EPC Data
CF Conversion Factor
SA Surface Area Contact
AF Adherence Factor
ABS Absorption Factor
EF Exposure Frequency
ED Exposure Duration
BW Bodyweight
AT Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD	Canc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Prison Inmate				Prison Worker				Construction Worker			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Semivolatile Organics																	
Fluoranthene	4.0E-02	NA	NA	4.60E-02	4.60E-02												
Pyrene	3.0E-02	NA	NA	4.70E-02	4.70E-02												
Metals																	
Cadmium	5.0E-05	NA	0.01	4.30E-01	6.80E-01	3.56E-07		7E-03		2.44E-07		5E-03		2.72E-07		5E-03	
Copper	2.4E-02	NA	NA	2.28E+01	2.87E+01												
Potassium	NA	NA	NA	1.63E+03	2.97E+03												
Selenium	4.5E-03	NA	NA	1.30E+00	1.30E+00												
Zinc	7.5E-02	NA	NA	2.18E+02	2.18E+02												
Herbicides																	
2,4,5-T	1.0E-02	NA	NA	1.00E-02	1.00E-02												
Dicamba	3.0E-02	NA	NA		9.30E-03												
Total Hazard Quotient and Cancer Risk:								7E-03				5E-03				5E-03	

Assumptions for Prison Inmate		Assumptions for Prison Worker		Assumptions for Construction Worker	
CS =	EPC Surface Only	CS =	EPC Surface Only	CS =	EPC Total Soils
CF =	1.00E-06 kg/mg	CF =	1.00E-06 kg/mg	CF =	1.00E-06 kg/mg
SA =	5800 cm2	SA =	5800 cm2	SA =	5800 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	365 days/year	EF =	250 days/year	EF =	176.5 days/year
ED =	24 years	ED =	25 years	ED =	1 years
BW =	70 kg	BW =	70 kg	BW =	70 kg
AT (Nc) =	8760 days	AT (Nc) =	9125 days	AT (Nc) =	365 days
AT (Car) =	25550 days	AT (Car)	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA = Information not available
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol since absorption factors are not available for other chemicals of concern

TABLE F-4
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)

CS = Chemical Concentration in Soil from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Day Care Center Child				Day Care Center Adult			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Semivolatile Organics													
Fluoranthene	4 0E-02	NA	NA	4 60E-02	4 60E-02								
Pyrene	3 0E-02	NA	NA	4 70E-02	4 70E-02								
Metals													
Cadmium	5 0E-04	NA	0 01	4 30E-01	6 80E-01	4 30E-07		9E-03		2 44E-07		5E-03	
Copper	2 4E-02	NA	NA	2 28E+01	2 87E+01								
Potassium	NA	NA	NA	1 63E+03	2 97E+03								
Selenium	4 5E-03	NA	NA	1 30E+00	1 30E+00								
Zinc	7 5E-02	NA	NA	2 18E+02	2 18E+02								
Herbicides													
2,4,5-T	1 0E-02	NA	NA	1 00E-02	1 00E-02								
Dicamba	3 0E-02	NA	NA		9 30E-03								
Total Hazard Quotient and Cancer Risk:								**9E-03**				**5E-03**	

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
CS	EPC Surface Only	CS =	EPC Surface Only
CF	1.00E-06 kg/mg	CF =	1 00E-06 kg/mg
SA	2190 cm2	SA =	5800 cm2
AF	1 mg/cm2	AF =	1 mg/cm2
EF	250 days/year	EF =	250 days/year
ED =	6 years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note Cells in this table were intentionally left blank due to a lack of toxicity data
Total Soils include surface and subsurface soils
NA - Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol since absorption factors are not available for other chemicals of concern

TABLE F-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Prison Inmate Intake (mg/kg-day)		Prison Inmate Hazard Quotient	Prison Inmate Cancer Risk	Prison Worker Intake (mg/kg-day)		Prison Worker Hazard Quotient	Prison Worker Cancer Risk	Construction Worker Intake (mg/kg-day)		Construction Worker Hazard Quotient	Construction Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics															
Benzene	3.0E-03	2.9E-02	2.00E-03	5.71E-05	1.96E-05	2E-02	6E-07	3.91E-05	1.40E-05	1E-02	4E-07				
Herbicides															
2,4,5-T	1.0E-02	NA	1.20E-04	3.43E-06		3E-04		2.35E-06		2E-04					
Metals															
Magnesium	NA	NA	5.82E+01												
Total Hazard Quotient and Cancer Risk:						**2E-02**	**6E-07**			**1E-02**	**4E-07**				

	Ingestion of Groundwater Not Applicable for Construction Worker

Assumptions for Prison Inmate

IR =	2	liters/day
EF =	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc) =	8760	days
AT (Car) =	25550	days

Assumptions for Prison Worker

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available

TABLE F-5
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Day Care Center Child Intake (mg/kg-day) (Nc)	Intake (mg/kg-day) (Car)	Hazard Quotient	Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Nc)	Intake (mg/kg-day) (Car)	Hazard Quotient	Cancer Risk
Volatile Organics											
Benzene	3.0E-03	2.9E-02	2.00E-03	9.13E-05	7.83E-06	3E-02	2E-07	3.91E-05	1.40E-05	1E-02	4E-07
Herbicides											
2,4,5-T	1.0E-02	NA	1.20E-04	5.48E-06		5E-04		2.35E-06		2E-04	
Metals											
Magnesium	NA	NA	5.82E+01								
Total Hazard Quotient and Cancer Risk:						**3E-02**	**2E-07**			**1E-02**	**4E-07**

Assumptions for Day Care Center Child		Assumptions for Day Care Center Adult	
IR =	1 liters/day	IR =	2 liters/day
EF =	250 days/year	EF =	250 days/year
ED =	6 years	ED =	25 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	2190 days	AT (Nc) =	9125 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available

TABLE F-6
CALCULATION OF AIR CONCENTRATION IN SHOWER
FROM VOLATILIZATION OF GROUNDWATER (daily)
REASONABLE MAXIMUM EXPOSURE (RME)
COMPLETION REPORT - MINI RISK ASSESSMENT - SEAD-62
SENECA ARMY DEPOT, ROMULUS, NEW YORK

Analyte	EPC Air All-Site Wells (mg/m^3)	Time of Shower -Ts (min)	Flow Rate of Shower - Fw (L/min)	EPC - RME Groundwater (mg/l)	Flow Rate of Air in Shower-Fa (m^3/min)	Volume of Bathroom-Vb (m^3)	Henry Laws Constant-H (m^3-atm/mol)	Asymptotic Air Conc.-Cinf (mg/m^3)	Rate Constant-K (1/min)	Efficiency of Release-E (unitless)	Efficiency of Release for TCE E-TCE	Henry Laws Constant-TCE (m^3-atm/mol)	Fraction Emitted* (percent)	Cderm** (Water) (mg/l)
Volatile Organics														
Benzene	3.92E-03	15	19	2.00E-03	2.4	12	5.50E-03	5.74E-03	0.20	3.63E-01	0.6	0.0091	24.78%	1.50E-03
Herbicides														
2,4,5-T	3.71E-10	15	19	1.20E-04	2.4	12	8.68E-09	5.44E-10	0.20	5.72E-07	0.6	0.0091	0.00%	1.20E-04
Metals														
Magnesium	0.00E+00	15	19	5.82E+01	2.4	12	NA	0.00E+00	0.20	0.00	0.6	0.0091	0.00%	5.82E+01

Concentration in Air (mg/m^3) = Cinf[1+(1/(kTs)(exp(-kTs)-1)]

Asymptotic Air Conc. - Cinf (mg/m^3) = [(E)(Fw)(Ct)]/Fa

Rate Constant - k (L/min) = Fa/Vb

Efficiency of Release - E (unitless) = (E-tce)(H)/(H-tce)

* Fraction Emitted (fe) = (EPCair x Fa) / (EPCgw x Fw)

** Cderm = EPCgw x (1 - fe)

Variables:

CA = Chemical Concentration in Air (mg/m^3)
Ts = Time of Shower (minutes)
Fw = Flow Rate of Shower (L/min)
Fa = Flow Rate of Air in Shower (m^3/min)
Vb = Volume of Bathroom (m^3)

Assumptions:

EPC - Groundwater Data - RME
15 (RME default)
19 (Estimated RME)
2.4 (Average Air Flow)
12 (Average Bathroom Volume)

TABLE F-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day): $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Equation for Absorbed Dose per Event (DA):

For organics: $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics: $DA = Kp \times CW \times ET \times CF$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom)
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time
Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Analyte	Dermal RfD	Carc. Slope Dermal	Permeability Coefficient k_p	Tau	EPC - Cderm* Groundwater	Absorbed Dose/Event	Prison Inmate Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Prison Worker Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Construction Worker Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(cm/hr)	(hours)	(mg/liter)	(mg-cm2/event)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics																		
Benzene	2.9E-03	3.1E-02	2.1E-02	2.6E-01	1.50E-03	2.23E-08	7.31E-06	2.51E-06	3E-03	8E-08	5.01E-06	1.79E-06	2E-03	5E-08	Dermal Contact to Groundwater Not Applicable for Construction Worker			
Herbicides																		
2,4,5-T	1.0E-02	NA	8.8E-03	3.2E+00	1.20E-04	2.59E-09	8.51E-07		9E-05		5.83E-07		6E-05					
Metals																		
Magnesium	NA	NA	1.0E-03	NA	5.82E+01	1.16E-05												
Total Hazard Quotient and Cancer Risk:									**3E-03**	**8E-08**			**2E-03**	**5E-08**				

Assumptions for Prison Inmate

SA =	23000 cm2
CF =	0.001 l/cm3
EF =	365 days/year
ED =	24 years
BW =	70 kg
AT (Nc) =	8760 days
AT (Car) =	25550 days
ET =	0.25 hours/day

Assumptions for Prison Worker

SA =	23000 cm2
CF =	0.001 l/cm3
EF =	250 days/year
ED =	25 years
BW =	70 kg
AT (Nc) =	9125 days
AT (Car) =	25550 days
ET =	0.25 hours/day

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* Cderm is the concentration of chemical available for dermal absorption after accounting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table F-6

TABLE F-7
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD 62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Absorbed Dose per Event (DA)

For organics: $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics: $DA = Kp \times CW \times ET \times CF$

Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Equation for Hazard Quotient = Chronic Daily Intake (Ne)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD	0.0E+00 Dermal	Permeability Coefficient Kp	Tau	EPC - Cderm* Groundwater	Absorbed Dose/Event	Day Care Center Child Intake (mg/kg-day) (Ne)	(Car)	Hazard Quotient	Cancer Risk	Day Care Center Adult Intake (mg/kg-day) (Ne)	(Car)	Hazard Quotient	Cancer Risk
	(mg/kg-day)	0.0E+00	(cm/hr)		(mg/liter)	mg-cm²/event								
Volatile Organics														
Benzene	2.9E-03	3.1E-02	2.1E-02	2.6E-01	1.50E-03	2.23E-08	Dermal Contact to Groundwater Not Applicable for Day Care Center Child				Dermal Contact to Groundwater Not Applicable for Day Care Center Adult			
Herbicides														
2,4,5-T	1.0E-02	NA	8.8E-03	3.2E+00	1.20E-04	2.59E-09								
Metals														
Magnesium	NA	NA	1.0E-03	NA	5.82E+01	1.46E-05								

Total Hazard Quotient and Cancer Risk:

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* Cderm is the concentration of chmeical available for dermal absorption after accounting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table F-6

TABLE F-8
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom).
CA = Chemical Concentration in Air
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	EPC* Air	Prison Inmate				Prison Worker				Construction Worker			
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m³)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												Inhalation of Groundwater Not Applicable for Construction Worker			
Benzene	1.7E-03	2.7E-02	3.92E-03	2.80E-05	9.61E-06	2E-02	3E-07	1.92E-05	6.85E-06	1E-02	2E-07				
Herbicides															
2,4,5-T	NA	NA	3.71E-10												
Total Hazard Quotient and Cancer Risk:						2E-02	3E-07			1E-02	2E-07				

Assumptions for Prison Inmate

IR =	0.50	m3/day
EF =	365	days/year
ED =	24	years
BW =	70	kg
AT (Nc) =	8760	days
AT (Car) =	25550	days

Assumptions for Prison Worker

IR =	0.50	m3/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available
* EPC air is the concentration of chemical available for inhalation after accounting for partitioning between the air and water in the shower. The calculation of the EPC air is shown in Table F-6

TABLE F-8
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (while Showering)
REASONABLE MAXIMUM EXPOSURE (RME)
Completion Report - Mini Risk Assessment - SEAD-62
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom)
CA =Chemical Concentration in Air
IR = Inhalation Rate
EF = Exposure Frequency
ED =Exposure Duration
BW=Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	EPC * Air	Day Care Center Child				Day Care Center Adult			
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	0 0E+00	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											
Benzene	1 7E-03	2 7E-02	3 92E-03			Inhalation of Groundwater Not Applicable for Day Care Center Child				Inhalation of Groundwater Not Applicable for Day Care Center Adult	
Herbicides											
2,4,5-T	NA	NA	3 71E-10								
Total Hazard Quotient and Cancer Risk:											

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA - Information not available
* EPC air is the concentration of chemical available for inhalation after accounting for partitioning between the air and water in the shower The calculation of the EPC air is shown in Table F-6

APPENDIX G
BACKGROUND DATA

TABLE G-1
SOIL BACKGROUND DATA
SUMMARY STATISTICS

METALS	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Aluminum	MG/KG	21200	0.95	19520	5	57	60
Antimony	MG/KG	6.8	0.18	6	2	11	60
Arsenic	MG/KG	21.5	0.90	8.9	3	54	60
Barium	MG/KG	159	0.95	300	0	57	60
Beryllium	MG/KG	1.4	0.95	1.13	2	57	60
Cadmium	MG/KG	2.9	0.28	2.46	2	17	60
Calcium	MG/KG	293000	0.95	125300	2	57	60
Chromium	MG/KG	35.8	0.95	30	4	57	60
Cobalt	MG/KG	29.1	0.95	30	0	57	60
Copper	MG/KG	62.8	0.95	33	2	57	60
Cyanide	MG/KG	0	0.00	0.35	0	0	57
Iron	MG/KG	42500	0.95	37410	3	57	60
Lead	MG/KG	266	0.90	24.4	3	54	60
Magnesium	MG/KG	29100	0.90	21700	2	54	60
Manganese	MG/KG	2380	0.90	1100	2	54	60
Mercury	MG/KG	0.13	0.70	0.1	2	42	60
Nickel	MG/KG	62.3	0.93	50	2	56	60
Potassium	MG/KG	3160	0.95	2623	2	57	60
Selenium	MG/KG	1.7	0.40	2	0	24	60
Silver	MG/KG	0.87	0.03	0.8	1	2	60
Sodium	MG/KG	269	0.80	188	2	48	60
Thallium	MG/KG	1.2	0.15	0.855	3	9	60
Vanadium	MG/KG	35.8	0.95	150	0	57	60
Zinc	MG/KG	126	0.90	115	1	54	60

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		B-8-91	B-8-91	B-8-91	B-8-91	B-9-91	B-9 91	B-9-91	BK-1	BK-2	GB35
QC CODE		SA	SA	SA	SA	SA	SA	SA	SA	SA	SA
STUDY ID		RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1
TOP											
BOTTOM											
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		11/5/91	11/5/91	11/5/91	11/5/91	11/5/91	11/5/91	11/5/91	12/16/92	12/16/92	1/20/93
SAMP ID		S1105-24SOIL1	S1105-25SOIL1	S1105-26(1)SOIL1	S1105-27SOIL1	S1105-28SOIL1	S1105-29SOIL1	S1105-30RESOIL1	BK-1SOIL3	BK-2RESOIL3	GB35-1GRID
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	19200	20500	17700	12700	14800	8880	7160	19400	14400	18000
Antimony	MG/KG	10 3 UJ	8 8 UJ	8 2 UJ	8 4 UJ	9 9 UJ	9 9 UJ	7 UJ	7 9 U	7 2 U	5 8 UJ
Arsenic	MG/KG	5 1 J	6.1 J	6 J	4 2 J	4 3 J	3 8 J	4 4 J	3	2 7	6 2
Barium	MG/KG	136 J	98.9 J	86 7 J	56 2 J	101 J	110 J	39 9 J	159	106	93 6
Beryllium	MG/KG	1 4	1 3	1	0 78 J	1 1	0 76	0 52 J	1 1	0 81	0 85
Cadmium	MG/KG	2.6	2.9	2 4	1 9	2 3	1 7	1 5	0 45 U	0 41 U	0 33 U
Calcium	MG/KG	5390	4870	3560	85900	45800	104000	101000	4590	22500	1590
Chromium	MG/KG	27 4 J	30.1 J	26 9 J	19 8 J	22 5 J	13 8 J	11 2 J	30	22 3	23 5
Cobalt	MG/KG	13 8	18 4	14	14 2	13 7	10 7	8 1	14 4	12 3	9 4
Copper	MG/KG	22 3	27.6	26	16 2	22.6	21 6	19 3	26 9	18 8	17 5
Cyanide	MG/KG	0 6 U	0.63 U	0 67 U	0 58 U	0.7 U	0 63 U	0 62 U	0 57 U	0 61 U	0 78 U
Iron	MG/KG	37200	36100	32500	27400	31000	19600	17300	36600	26600	25200
Lead	MG/KG	14 5	11.4	13.6	10 1	10 8	10 1	7 8	15 6	18 9	14 4
Magnesium	MG/KG	5850	7300	6490	6720	8860	17000	12600	5980	7910	3850
Manganese	MG/KG	1130	956	832	926	903	532	514	1360	800	701
Mercury	MG/KG	0 09	0.06 J	0 06 J	0 05 J	0 06 J	0 04 J	0 05 J	0.13 J	0.11	0 06 J
Nickel	MG/KG	42 3	48.7	44 4	30 4	36 4	23 8	19	47 7	31	26 3
Potassium	MG/KG	1910	2110	1760	1430	1320	1080	1050	1720	1210	1110
Selenium	MG/KG	0 17 UJ	0.21 UJ	0 2 UJ	0 61 UJ	0.21 UJ	0 65 UJ	0 21 UJ	0 73 J	0 94	0 23 UJ
Silver	MG/KG	1 6 U	1.3 U	1 2 U	1 3 U	1 5 U	1 5 U	1 1 U	0 47 U	0 43 U	0 34 U
Sodium	MG/KG	79 2 U	67.5 U	62 6 U	75 3 J	84 2 J	112 J	116 J	49 1 J	61 1 J	35 6 J
Thallium	MG/KG	0 47 U	0.58 U	0 57 U	0 34 U	0 59 U	0 36 U	0 6 U	0 42 U	0 38 U	0 55 U
Vanadium	MG/KG	32 2	25 4	26 4	15 7	19.7	19 5	12 9	28	22 4	27 1
Zinc	MG/KG	85 1 J	94 2 J	85 J	75 J	126 J	84 3 J	74 8 J	98 6	63 7	55

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		GB35	GB35	GB36	GB36	MW-36	MW-34	SB24-5	SB24-5	SB24-5	MW25-1
QC CODE		SA	DU	SA	SA	SA	SA	SA	SA	SA	SA
STUDY ID		RI PHASE1	RI PHASE1	RI PHASE1	RI PHASE1	RI Phase 1 Step 1	RI PHASE1	ESI	ESI	ESI	ESI
TOP						-1		-1	-1	-1	0
BOTTOM						-1		-1	-1	-1	2
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		1/20/93	1/20/93	1/20/93	1/20/93	11-Jan-93	11/20/91	01-Jan-80	01-Jan-80	01-Jan-80	12/3/93
SAMP ID		GB35-2GRID	GB35-6DUGRID	GB36-1GRID	GB36-2GRID	MW36-3GRID	S2011121MW34GRID	SB24-5-1	SB24-5-3	SB24-5-5	SB25-6-01
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	17600	16200	18100	18200	12700	16100	16200	10100	13700	10600
Antimony	MG/KG	6.8 J	6.4 J	5.9 J	5.8 UJ	5.7 UJ	5.7 J	12.5 UJ	5.8 UJ	11.3 UJ	4.2 U
Arsenic	MG/KG	7.7	5.3	4.6	9.7	2.9 J	6.3 U	4.2	3.3	5	8.3
Barium	MG/KG	61.7	61.7	74.8	50.8	46.9 J	67.5	117	58.3	67.2	59.1
Beryllium	MG/KG	0.74	0.77	0.77	0.65	0.59	0.86	0.98 J	0.48 J	0.62 J	0.48 J
Cadmium	MG/KG	0.31 U	0.35 U	0.3 U	0.33 U	0.33 U	2.3	0.78 U	0.36 U	0.7 U	0.41 U
Calcium	MG/KG	17700	1370	1660	22900	4170	28600	4540	74200	49000	82500
Chromium	MG/KG	29.3	25.1	24.8	27.4	23.3 J	26.8	24.5	16.9	23.1	16.9
Cobalt	MG/KG	16.3	10.3	20.4	13.2	18.8	17	18	8.2	12	11.2
Copper	MG/KG	24.5	17.2	17.7	17.5	19.2 J	32.7	28.4	20.9	22.2	20.2 J
Cyanide	MG/KG	0.71 U	0.82 U	0.7 U	0.68 U	0.56 U	0.54 U	0.6 U	0.51 U	0.57 U	0.58 U
Iron	MG/KG	34200	30800	26100	30700	27500	35000	33600	21300	26700	21400
Lead	MG/KG	5.4	19.1	12.7	6.2	20.2	11.9	45.5 J	8.7 J	7.9 J	9.5
Magnesium	MG/KG	7790	4490	4490	7150	5750	6850	5150	12100	11400	19600
Manganese	MG/KG	648	775	426	507	540	803	1080	400	450	722 J
Mercury	MG/KG	0.03 U	0.07 J	0.02 J	0.02 J	0.02 J	0.07 R	0.07 JR	0.06 JR	0.04 JR	0.03 J
Nickel	MG/KG	48.7	28.3	28.3	42.8	43.3 J	49.3 J	37.3	26.4	35.2	26.8
Potassium	MG/KG	1110	975	1400	1100	754	1290	1170 J	993	1660	1480
Selenium	MG/KG	0.23 UJ	0.21 UJ	0.2 UJ	0.18 UJ	0.19 UJ	0.18 UJ	0.15 UJ	0.23 UJ	0.22 UJ	0.97 J
Silver	MG/KG	0.32 U	0.36 U	0.31 U	0.34 U	0.34 U	0.87 J	1.6 U	0.73 U	1.4 U	0.82 U
Sodium	MG/KG	77.5 J	34.6 J	46.6 J	97.6 J	31.6 U	55.2 J	50.9 J	153 J	139 J	[redacted] J
Thallium	MG/KG	0.54 U	0.5 U	0.46 U	0.43 U	0.45 U	0.51 U	0.16 U	0.25 U	0.24 U	0.24 UJ
Vanadium	MG/KG	22.3	26.1	27.8	19.7	18.2 J	22.3	29.9	14.4	19.5	18.5
Zinc	MG/KG	83.4	52.1	59.2	74.1	34.7 J	95.7	85.7	62.8	83.2	71.6 J

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		MW25-1	MW25-6	MW25-6	MW25-6	MW25-6	MW64A-1	MW64A-1	MW64A-1	MW64B-1	MW64B-1	MW64B-1
QC CODE		SA	SA	SA	SA	DU	SA	SA	SA	SA	SA	SA
STUDY ID		ESI	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	FSI	ESI	ESI	ESI	ESI	ESI
TOP		2	0	4	6	0	0	2	4	0	4	6
BOTTOM		4	0 17	6	8	0 17	0 2	4	6	0 2	6	8
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		12/3/93	9/25/95	9/25/95	9/25/95	9/25/95	4/2/94	4/2/94	4/2/94	5/13/94	5/13/94	5/13/94
SAMP ID		SB25-6-02	SB25-7-00	SB25-7-03	SB25-7-04	SB25-7-10	MW64A-1-1	MW64A-1-2	MW64A-1-3	MW64B-1-1	MW64B-1-2	MW64B-1-3
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	7070	12500	8020	7550	12500	16100	19800	12600	13400	8870	7620
Antimony	MG/KG	3 U	0 4	0 42 UJ	0 44 U	0 4 UJ	0 23 J	0 2 UJ	0 2 UJ	0 3 J	0 15 UJ	0 15 UJ
Arsenic	MG/KG	4 8	4 3	4 1	3 4	4 3	7 1	8 2	5	5 5	4 3	5 5
Barium	MG/KG	35	71 3	58	52	71 3	83 7	91 2	62 3	75 5	70 8	76 7
Beryllium	MG/KG	0 35 J	0 56	0 43	0 39	0 56	0 68 J	0 74 J	0 53 J	0 56 J	0 43 J	0 37 J
Cadmium	MG/KG	0 29 U	0 05 U	0 06 U	0 06 U	0 05 U	0 11 J	0 02 U	0 12 J	0 63 J	0 64 J	0 54 J
Calcium	MG/KG	122000	47400 J	120000 J	133000 J	47400 J	7210	4300	72400	5530	70000	75900
Chromium	MG/KG	11 3	16 9 J	13 7 J	12 4 J	16 9 J	23	25	19	17 5	14 1	13 5
Cobalt	MG/KG	6 6 J	8	8 2	6 9	8	11 8	11 3	9 1 J	7 2 J	10	7 4 J
Copper	MG/KG	12 J	15 7	17 7	16 4	15 7	25 5	21	23 7	18 9	20 2	17 6
Cyanide	MG/KG	0 64 U	0 44 U	0 57 U	0 51 U	0 444 U	0 66 U	0 58 U	0 55 U	0 6 U	0 5 U	0 48 U
Iron	MG/KG	15800	20500	18900	15400	20500	28500	28000	22600	20900	18400	17100
Lead	MG/KG	13 8	11 1	7	6 5	11 1	21 8	13 6	15 4	21 4	8 8	8 3
Magnesium	MG/KG	22800	11700	17400	20700	11700	5480	5010	14800	3720	18900	21500
Manganese	MG/KG	810 J	452	735	402	452	558	604	402	207	434	389
Mercury	MG/KG	0 04 U	0 03	0 02	0 01	0 03	0 05 J	0 03 J	0 02 J	0 05 J	0 02 J	0 01 U
Nickel	MG/KG	18	22 3	26 4	22 4	22 3	32 2	28 6	28 7	19 8	28 2	22 6
Potassium	MG/KG	1060	1110	1280	1430	1110	2590 J	2260 J	2700 J	1700	1630	1650
Selenium	MG/KG	0 63 J	0 63 U	0 7 U	0 74 U	0 66 U	0 96	1 7	0 34 U	0 99 J	0 26 U	0 57 J
Silver	MG/KG	0 59 U	0 89 U	0 98 U	1 U	0 92 U	0 12 U	0 14 U	0 14 U	0 16 UJ	0 11 UJ	0 11 UJ
Sodium	MG/KG	186 J	59 9	89 1	110	57 5	27 5 U	31 8 U	92 1 J	35 9 U	96 8 J	79 6 J
Thallium	MG/KG	0 21 UJ	1 2	1 1	0 6 U	1 2	0 42 J	0 32 U	0 32 U	0 41 J	0 24 U	0 24 U
Vanadium	MG/KG	12	21	13 4	13 7	21	27 6	32 2	22 8	23 3	14 8	14 2
Zinc	MG/KG	40 6 J	54 1	64 9	65 1	54 1	104	87 1	64 9	72 2	59	45 6

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		MW64B-1	MW67-2	MW67-2	MW67-2	MW70-1	MW70-1	MW70-1	SB11-3	SB11-3	SB11-3
QC CODE		SA	SA	SA	SA	SA	SA	SA	SA	SA	SA
STUDY ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
TOP		6	0	2	4	0	2	4	0	2	10
BOTTOM		8	0.2	4	5	0.2	4	6	2	4	12
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		13-May-94	3/30/94	3/30/94	3/30/94	5/11/94	5/11/94	5/11/94	11/2/93	11/2/93	11/3/93
SAMP ID		MW64B-1-04	MW67-2-1	MW67-2-2	MW67-2-3	MW70-1-1	MW70-1-2	MW70-1-3	SB11-3-1	SB11-3-2	SB11-3-6
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	7620	16700	14900	9460				17600	6330	10900
Antimony	MG/KG	0.15 UJ	0.27 J	0.22 J	0.2 UJ				10.8 UJ	8 UJ	7.6 UJ
Arsenic	MG/KG	5.5	4.4	4.5	4.2				5.6	0	0
Barium	MG/KG	76.7	114	105	80.8				113	57.4	62.7
Beryllium	MG/KG	0.37 J	0.67 J	0.61 J	0.4 J				0.85 J	0.34 J	0.47 J
Cadmium	MG/KG	0.54 J	0.2 J	0.11 J	0.12 J				0.67 U	0.5 U	0.48 U
Calcium	MG/KG	75900	3580	79000	77800				4950	91300	48600
Chromium	MG/KG	13.5	19.5	22.5	14.8				24	11.1	18.6
Cobalt	MG/KG	7.4 J	7.5 J	10.4 J	9.7 J				11.3	8.5 J	10.1
Copper	MG/KG	17.6	16.5	20.3	20.5				20	12.2	21.7
Cyanide	MG/KG	0.48 U	0.64 U	0.5 U	0.54 U				0.57 U	0.47 U	0.53 U
Iron	MG/KG	17100	20500	24400	18700				27200	13200	28300
Lead	MG/KG	8.3	17.5	9.3	8.5				27.9	11.4	10.1
Magnesium	MG/KG	21500							4160	12900	10100
Manganese	MG/KG	389	438	528	411				874	356	434
Mercury	MG/KG	0.01 U	0.04	0.01 J	0.02 J				0.05 J	0.04 U	0.03 U
Nickel	MG/KG	22.6	18.7	32.3	25.9				28.3	16.7	29.5
Potassium	MG/KG	1850	1780 J	3160 J	1970 J				2110	1110	1230
Selenium	MG/KG	0.57 J	0.81	0.36 U	0.34 U				0.24 J	0.13 UJ	0.21 UJ
Silver	MG/KG	0.11 UJ	0.11 U	0.15 U	0.14 U				1.4 UJ	1 UJ	0.97 UJ
Sodium	MG/KG	79.6 J	25.1 U	112 J	107 J				66.3 J	136 J	146 J
Thallium	MG/KG	0.24 U	0.48 J	0.34 U	0.32 U				0.19 U	1.5 U	0.23 U
Vanadium	MG/KG	14.2	28.2	24.8	16.5				31.8	13.3	17
Zinc	MG/KG	45.600	64.8	62	60.1				83.2	0	0

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		SB13-1	SB13-1	SB13-1	SB13-4	SB13-4	SB13-4	MW13-6	MW13-6	MW13-6	SB17-1
QC CODE		SA	SA	SA	SA	SA	SA	SA	SA	SA	SA
STUDY ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
TOP		0		6	0	2	4	0	4	6	0
BOTTOM		2		8	2	4	6	2	6	8	2
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		12/8/93		12/8/93	12/15/93	12/15/93	12/15/93	15-Dec-93	15-Dec-93	15-Dec-93	12/1/93
SAMP ID		SB13-1-1	SB13-1-2	SB13-1-3	SB13-4-1	SB13-4-2	SB13-4-3	SB13-6-1	SB13-6-3	SB13-6-4	SB17-1-1
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	18300	8250	8250	21200	15500	20400	16000	13500	10200	13700
Antimony	MG/KG	5.1 J	3.7 UJ	3.7 UJ	4 UJ	4.5 J	3.2 UJ	3.2 UJ	2.5 UJ	2.9 UJ	11.7 UJ
Arsenic	MG/KG	7	6.2	6.2	8.1	6.8	9.6	4.6	2.7	2.3	4.3
Barium	MG/KG	106	88.1	88.1	129	96.9	79.1	103	60.4	56.8	107
Beryllium	MG/KG	0.92 J	0.42 J	0.42 J	1.1	0.78 J	1	0.92	0.71	0.58 J	0.7 J
Cadmium	MG/KG	0.45 U	0.36 U	0.36 U	0.38 U	0.34 U	0.31 U	0.31 U	0.25 U	0.28 U	0.73 U
Calcium	MG/KG	3570	87700	87700	28800	68000	10200	5140	31800	45200	2870
Chromium	MG/KG	29.4	13.3	13.3	30.2	25.8	35.6	21.5	23.5	17.8	17.6
Cobalt	MG/KG	12	7.2 J	7.2 J	10.6	12.4	12.1	10.6	15	11.3	9.9 J
Copper	MG/KG	11.6	18.4	18.4	21.6	21.1	26.5	16	27.4	14.5	46.4
Cyanide	MG/KG	0.61 U	0.5 U	0.5 U	0.54 U	0.51 U	0.54 U	0.6 U	0.53 U	0.51 U	0 NA
Iron	MG/KG	32500	17400	17400	31600	30100	42500	25300	26900	20700	25100
Lead	MG/KG	15	0	0	13.6	13.6	7.1	13.8	11.6	11.7	266
Magnesium	MG/KG	5890	20800	20800	8780	10800	9660	3750	6640	5220	3330
Manganese	MG/KG	451	517	517	363	607	398	934	508	556	547
Mercury	MG/KG	0.03 J	0.07 J	0.07 J	0.05 J	0.01 J	0.02 J	0.03 J	0.01 U	0.01 U	0.05 J
Nickel	MG/KG	34.9	24	24	38.1	43.2	53	22.7	41.9	33	19.1
Potassium	MG/KG	2190	1390	1390	2130	1570	1810	1330	1120	1000	628 J
Selenium	MG/KG	0.26 J	0.56 J	0.56 J	0.53 J	0.2 J	0.28 J	1.2	0.11 J	0.24 J	0.25 UJ
Silver	MG/KG	0.9 U	0.71 U	0.71 U	0.77 U	0.69 U	0.63 U	0.62 U	0.49 U	0.56 U	1.5 U
Sodium	MG/KG	80.6 J	155 J	155 J	81.5 J	183 J	87.8 J	61.9 J	116 J	141 J	46.2 J
Thallium	MG/KG	0.43 J	0.43 J	0.43 J	0.22 U	0.2 U	0.18 U	0.18 U	0.14 U	0.23 U	0.28 UJ
Vanadium	MG/KG	32.7	13.3	13.3	35.8	23.1	30.7	29.9	18.5	13.8	23.1
Zinc	MG/KG	81.9	56.2	56.2	89.4	65.8	93	62.5	64.7	39.3	93.4

TABLE G-2
SENECA ARMY DEPOT
SOIL BACKGROUND DATA

LOC_ID		SB17-1	SB17-1	SB26-1	SB26-1	SB4-1	SB4-1	SB4-1	SB4-1	TP57-11
QC CODE		SA	SA	SA	SA	SA	DU	SA	SA	SA
STUDY ID		ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
TOP		2	4	0	2	0	0	4	8	3
BOTTOM		4	6	2	4	2	2	6	10	3
MATRIX		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMPLE DATE		12/1/93	12/1/93	11/17/93	11/17/93	12/6/93	12/6/93	12/6/93	12/6/93	########
SAMP ID		SB17-1-2	SB17-1-3	SB26-1-1	SB26-1-2	SB4-1-1	SB4-1-10	SB4-1-2	SB4-1-3	TP57-11
VOLATILE ORGANICS	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Aluminum	MG/KG	18100	8700	5560	9040	14800	21000	15300	19200	14600
Antimony	MG/KG	11.8 UJ	9 UJ	7.3 UJ	6.7 UJ	4.8 UJ	3.8 UJ	5 UJ	2.8 UJ	11.3 UJ
Arsenic	MG/KG	5.2	3.4	3.2	5.3	6.2	4.2	3.9	21.3	5.9
Barium	MG/KG	114	59.4	73.2	43.7	72	97.7	40.4 J	81.2	120
Beryllium	MG/KG	0.9 J	0.42 J	0.35 J	0.41 J	0.73 J	0.64 J	0.74 J	1	0.81 J
Cadmium	MG/KG	0.74 U	0.56 U	0.46 U	0.42 U	0.47 U	0.37 U	0.49 U	0.27 U	0.71 U
Calcium	MG/KG	20900	72800	293000	47300	4280	2460	30900	14400	22300
Chromium	MG/KG	25.1	13.9	10.3	15.7	23.2	27.9	27.6	32.7	20.1
Cobalt	MG/KG	13.3	8.8	5.9 J	9.5	11.3	5.9 J	18.5	29.1	8.8 J
Copper	MG/KG	26.9	20	9.7	14.3	14.1	15.1	62.8	21.6	21.7
Cyanide	MG/KG	0 NA	0 NA	0.48 U	0.57 U	0.52 U	0.53 U	0.53 U	0.47 U	0.54 U
Iron	MG/KG	29900	18800	8770	19100	27500	19500	34300	37900	24900
Lead	MG/KG	11.4 J	7.5 J	6.33	8.5	0 J	9.8 J	7.5 J	9.1 J	11.3
Magnesium	MG/KG	6490	18100	29100	9160	4270	4460	7130	8040	5360
Manganese	MG/KG	487	391	309	551	615 J	0 J	0	0	329
Mercury	MG/KG	0.06 J	0.03 UJ	0.02 U	0.02 U	0.05 J	0.04 J	0.04 J	0.04 J	0.04 J
Nickel	MG/KG	42	25.2	31.6 R	23.9	27.8	25.1	47.6	62.3	25.7
Potassium	MG/KG	1560	1090	1710	901	1250	2490	1300	2030	1430
Selenium	MG/KG	0.24 UJ	0.14 UJ	0.13 UJ	0.26 J	0.4 J	0.23 J	0.09 U	0.14 U	0.46 J
Silver	MG/KG	1.5 U	1.1 U	0.92 UJ	0.85 UJ	0.93 U	0.74 U	0.98 U	0.64 J	1.4 UJ
Sodium	MG/KG	74.6 J	137 J	192 J	108 J	43.8 U	39.2 J	105 J	91.6 J	93 J
Thallium	MG/KG	0.26 UJ	0.15 UJ	0.73 U	0.17 U	0.23 U	0.23 U	0.18 U	0.24 U	0.17 U
Vanadium	MG/KG	27	13.9	12.7	14.4	28.6	31	22.2	29.3	27.8
Zinc	MG/KG	80.2	57.1	283 R	90.6	79.6	72.1	102	115	57.9

TABLE G-3
GROUNDWATER BACKGROUND DATA
SUMMARY STATISTICS

PARAMETER	UNIT	MAXIMUM	FREQUENCY OF DETECTION	NYSDEC GA STANDARD	NUMBER ABOVE STANDARD	NUMBER OF DETECTS
METALS						
Aluminum	UG/L	42400	0.86		0	24
Antimony	UG/L	44.7	0.18		0	5
Arsenic	UG/L	9.3	0.11	25	0	3
Barium	UG/L	337	0.93	1000	0	26
Beryllium	UG/L	2.2	0.11		0	3
Cadmium	UG/L	0	0.00	10	0	0
Calcium	UG/L	240000	1.00		0	28
Chromium	UG/L	69.4	0.43	50	1	12
Cobalt	UG/L	34.6	0.43		0	12
Copper	UG/L	23.3	0.46	200	0	13
Cyanide	UG/L	2.8	0.04	100	0	1
Iron	UG/L	69400	0.96	300	19	27
Lead	UG/L	34.8	0.36	25	1	10
Magnesium	UG/L	57600	1.00		0	28
Manganese	UG/L	1120	0.96	300	5	27
Mercury	UG/L	0.05	0.11	0.7	0	3
Nickel	UG/L	99.8	0.50	100	0	14
Potassium	UG/L	10200	0.93		0	26
Selenium	UG/L	3.6	0.18	10	0	5
Silver	UG/L	0.68	0.04	50	0	1
Sodium	UG/L	73500	0.96	20000	9	27
Thallium	UG/L	4.7	0.14		0	4
Vanadium	UG/L	70.8	0.43		0	12
Zinc	UG/L	143	0.79	300	0	22

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

STUDY ID		RI PHASE1		3Q93		RI PHASE1		ESI		ESI	
LOC ID		MW-21		MW-35		MW-35		MW11-1		MW13-1	
QC CODE		SA		SA		SA		SA		SA	
SAMP DETH TOP		NONE		NONE		NONE		NONE		NONE	
SAMP DEPTH BOT		NONE		NONE		NONE		NONE		NONE	
MATRIX		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER	
SAMP DATE		8-Jan-92		NONE		8-Jan-92		18-Jan-94		3-Feb-94	
SAMP ID		MW-21GW		MW35OB3Q93M		MW-35GW		MW11-1-1		MW13-1-1	
PARAMETER	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS											
Aluminum	UG/L	1880	J	207		7550	J	53.7	J	42400	
Antimony	UG/L	55.9	U	16.8	U	55.5	U	21.4	U	33.9	J
Arsenic	UG/L	3.5	U	1	B	3.5	U	0.8	U	9.3	J
Barium	UG/L	47.5	J	97.3	B	103	J	25.2	J	337	
Beryllium	UG/L	1.6	R	0.3	U	1.8	R	0.4	U	2.2	J
Cadmium	UG/L	2.9	U	2.4	U	2.9	U	2.1	U	2.1	U
Calcium	UG/L	94100		108000		94700		97500		181000	
Chromium	UG/L	6.2	U	3.3	U	15.3	R	2.6	U	[redacted]	
Cobalt	UG/L	20	U	2.7	U	19.9	J	4.4	U	34.6	J
Copper	UG/L	14.5	U	2.1	U	14.4	U	3.1	U	23.3	J
Cyanide	UG/L	10	UJ	2.8	B	10	UJ	5	U	5	U
Iron	UG/L	[redacted]		[redacted]		[redacted]		41.4	J	[redacted]	
Lead	UG/L	1.8	J	2.8	B	3.3		1.1	J	[redacted]	
Magnesium	UG/L	12200		15600		14600		29700		50300	
Manganese	UG/L	232	J	23.4		[redacted]	J	278		[redacted]	
Mercury	UG/L	0.15	R	0.1	U	0.18	R	0.04	U	0.05	J
Nickel	UG/L	16	U	8.3	U	15.9	U	4	U	99.8	
Potassium	UG/L	3050	J	1400	B	4180	J	7100		10100	
Selenium	UG/L	1	U	1.2	B	1.1	J	0.7	U	3.6	J
Silver	UG/L	9.1	U	2.6	U	9	U	4.2	U	4.2	U
Sodium	UG/L	18400		13400		[redacted]		4860	J	9350	
Thallium	UG/L	3.2	U	1.2	U	3.2	U	1.2	U	1.2	U
Vanadium	UG/L	30.6	U	3	U	30.3	U	3.7	U	70.8	
Zinc	UG/L	15.1	R	72.7		58.2		21.4		143	

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

STUDY ID:		ESI		RI ROUND1		RI ROUND2		RI ROUND1		RI ROUND2	
LOC ID:		MW13-4		MW16-1		MW16-1		MW17-1		MW17-1	
QC CODE:		SA		SA		SA		SA		SA	
SAMP. DETH TOP		NONE		3.3		731.5		3.4		731.1	
SAMP. DEPTH BOT:		NONE		5.3		728.4		7.4		727.1	
MATRIX:		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER	
SAMP. DATE:		4-Feb-94		27-Aug-96		7-Dec-96		29-Aug-96		11-Dec-96	
SAMP ID:		MW13-4-1		16101		16152		16108		16171	
PARAMETER	**UNIT**	**VALUE**	**Q**	**VALUE**	**Q**	**VALUE**	**Q**	**VALUE**	**Q**	**VALUE**	**Q**
METALS											
Aluminum	UG/L	5540		1850		143	U	90.4		386	
Antimony	UG/L	31.5	J	2	U	3	U	2	U	3	U
Arsenic	UG/L	1.4	U	2.7	U	4.4	U	2.7	U	4.4	U
Barium	UG/L	71.2	J	74.2		48.2	U	85		90.4	U
Beryllium	UG/L	0.4	U	0.23		0.2	U	0.26		0.2	U
Cadmium	UG/L	2.1	U	0.3	U	0.6	U	0.3	U	0.6	U
Calcium	UG/L	182000		157000		116000		108000		104000	
Chromium	UG/L	9.9	J	2.7		1	U	1	U	1	U
Cobalt	UG/L	6.7	J	2.1		1.3	U	1.2	U	2	U
Copper	UG/L	3.3	J	4.9		1.9	U	3.1		1.1	U
Cyanide	UG/L	5	U	5	U	5	UJ	5	U	5	UJ
Iron	UG/L	8010		2400	J	296		119		[redacted]	J
Lead	UG/L	3.1		1.7	U	1.5	U	1.7	U	1.5	U
Magnesium	UG/L	44900		23300		17600		22600		22900	
Manganese	UG/L	299		210		64.2		21.3		9.7	U
Mercury	UG/L	0.04	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	UG/L	17.5	J	4.7		2.5	U	1.8		2.5	U
Potassium	UG/L	4460	J	1670		998	U	472		843	U
Selenium	UG/L	1.2	J	2.4	U	4.7	UJ	2.4	U	4.7	UJ
Silver	UG/L	4.2	U	1.3	U	1.5	U	1.3	U	1.5	U
Sodium	UG/L	9340		8750		3870	U	9290		8190	
Thallium	UG/L	1.2	U	4.2	U	5.9	U	4.4		4.1	U
Vanadium	UG/L	8.8	J	3.3		1.6	U	1.2	U	1.6	U
Zinc	UG/L	138		15.6	R	5.8	U	2.5	R	14.4	U

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

STUDY ID		RI ROUND1		RI ROUND2		RI ROUND1		RI ROUND2		ESI	
LOC ID		MW25-1		MW25-1		MW25-6		MW25-6		MW26-1	
QC CODE		SA		SA		SA		SA		SA	
SAMP DETH TOP		NONE		NONE		NONE		NONE		NONE	
SAMP DEPTH BOT		NONE		NONE		NONE		NONE		NONE	
MATRIX		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER	
SAMP DATE		22-Nov-95		10-Apr-96		21-Nov-95		31-Mar-96		21-Jan-94	
SAMP ID		MW25-1		25001		MW25-6		25008		MW26-1-1	
PARAMETER	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS											
Aluminum	UG/L	18		34 5	U	162		529		188	J
Antimony	UG/L	2 2	U	1 4		2.2	U	2.3	U	21 5	U
Arsenic	UG/L	2 1	U	4	U	2 1	U	3.5	U	0.8	U
Barium	UG/L	77 1		71 2		85.6		72.3		31 9	J
Beryllium	UG/L	0.27	U	0 1	U	0 27	U	0.13	U	0.4	U
Cadmium	UG/L	0 3	U	0 3	U	0 3	U	0.32	U	2.1	U
Calcium	UG/L	128000		122000		133000		118000		115000	
Chromium	UG/L	0 68		0 7	U	2 2		1.3	U	2.6	U
Cobalt	UG/L	0.99	U	0 9	U	1.3		1.1	U	4.4	U
Copper	UG/L	2		1	U	0.99		1.1		3 1	U
Cyanide	UG/L	5	U	5	U	5	U	5	UJ	5	U
Iron	UG/L	27 3		21.7	U	308		623		286	
Lead	UG/L	3 4		1.9	U	4 4		1.1	U	0.5	U
Magnesium	UG/L	23100		22800		35900		32900		16700	
Manganese	UG/L	31 2		21 8		56		22		525	
Mercury	UG/L	0.02	U	0.2	U	0.02	U	0.1	U	0.05	J
Nickel	UG/L	0.99	U	1 6	U	2.6		1.7	U	4	U
Potassium	UG/L	1030		861	J	1840	J	1420		10200	
Selenium	UG/L	3.7	U	3 4	U	3.7	U	3.4	U	0.7	U
Silver	UG/L	0.8	U	1 3	U	0.8	U	1.1	U	4.2	U
Sodium	UG/L	64700	J	53100		20400	J	16500		30300	
Thallium	UG/L	3	U	4 7	U	3	U	3.5	U	1 2	U
Vanadium	UG/L	1 1	U	1 1	U	1 4		1.2	U	3.7	U
Zinc	UG/L	6 3		1 7		7.5		2.2		26 7	

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

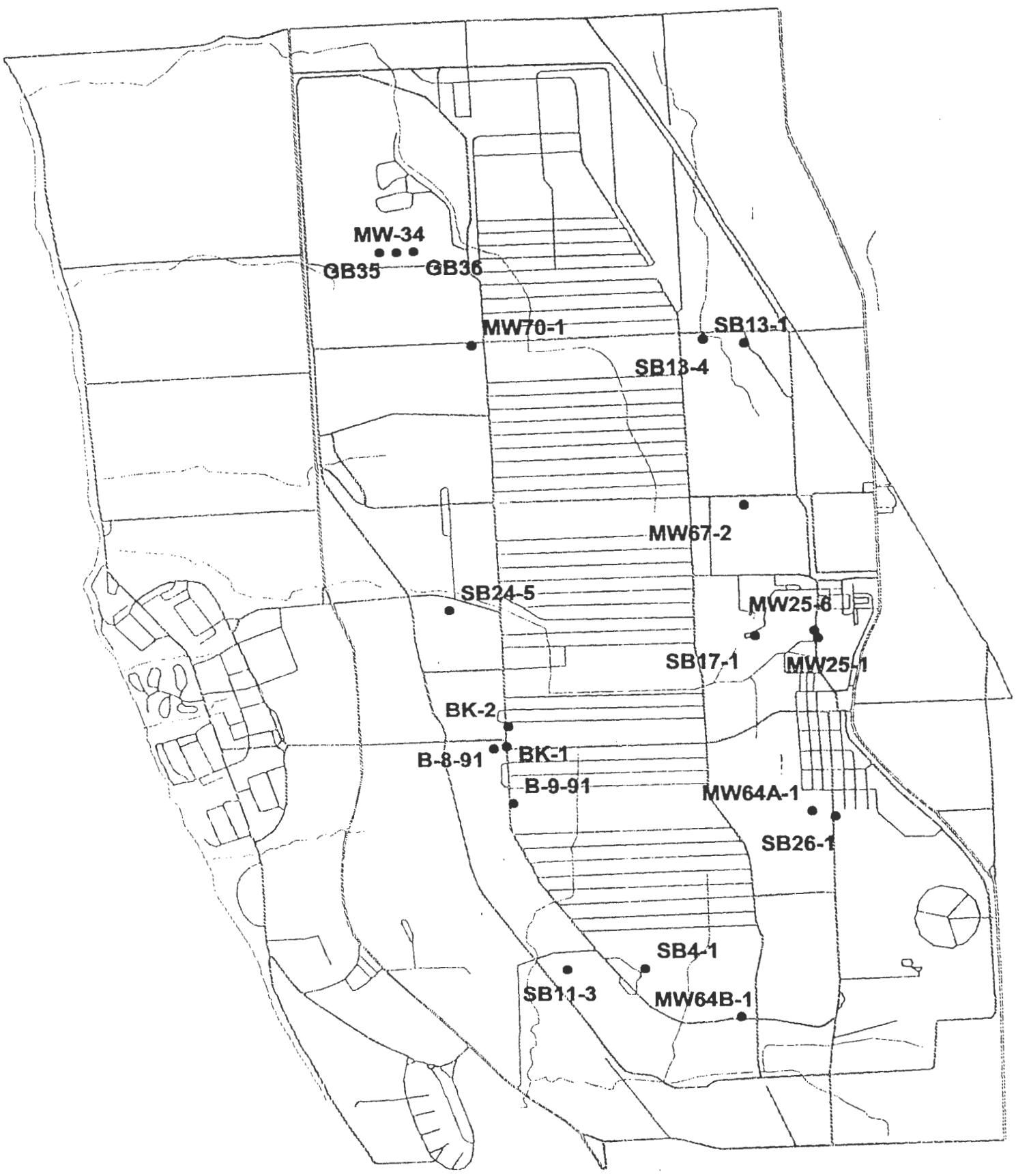
STUDY ID		RI ROUND1		RI ROUND2		ESI		ESI		ESI	
LOC ID		MW26-1		MW26-1		MW4-1		MW44A-1		MW44B-1	
QC CODE		SA		SA		SA		SA		SA	
SAMP DETH TOP		NONE		NONE		NONE		NONE		NONE	
SAMP DEPTH BOT		NONE		NONE		NONE		NONE		NONE	
MATRIX		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATE	
SAMP DATE		13-Nov-95		11-Apr-96		21-Jan-94		12-Jul-94		12-Jul-94	
SAMP ID		MW26-1		26001		MW4-1-1		MW44A-1-1		MW44B-1-1	
PARAMETER	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS											
Aluminum	UG/L	457		38 7		41 9	U	69	J	288	J
Antimony	UG/L	2 2	U	1 4		21.6	U	1.3	U	1 3	U
Arsenic	UG/L	2.1	U	4	U	2.2	J	2	U	2	U
Barium	UG/L	33 2		29 9		19.6	J	102	J	72 6	J
Beryllium	UG/L	0 27	U	0 1	U	0 4	U	0.1	U	0 1	U
Cadmium	UG/L	0 3	U	0 3	U	2.1	U	0.2	U	0.2	U
Calcium	UG/L	121000		110000		137000		92200		120000	
Chromium	UG/L	4.7		0 73		2.6	U	0.4	U	0.4	U
Cobalt	UG/L	1.1		0 9	U	4.6	J	0.5	U	0.91	J
Copper	UG/L	5.7		1	U	3.1	U	0.5	U	0 5	U
Cyanide	UG/L	5	U	5	U	5	U	5	U	5	U
Iron	UG/L	[illegible]		58.4	J	332		114	J	[illegible]	
Lead	UG/L	7.8		1 9	U	0.5	U	0.9	U	0.9	U
Magnesium	UG/L	16600		15500		57600		19000		31800	
Manganese	UG/L	27.5		2 5		346		18.2		219	
Mercury	UG/L	0 02	U	0 2	U	0.04	U	0.04	U	0.04	U
Nickel	UG/L	6.2		1 6	U	4	U	0.7	U	0.73	J
Potassium	UG/L	3620		3860	J	7380		1050	J	2150	J
Selenium	UG/L	3.7	U	3 4	U	2 1	J	2.7	U	2.7	U
Silver	UG/L	0.8	U	1.3	U	4.2	U	0.5	U	0.68	J
Sodium	UG/L	[illegible]		[illegible]		11700		2310	J	7190	
Thallium	UG/L	4 3		4 7	U	1 2	U	1.9	U	4.7	J
Vanadium	UG/L	1 3	J	1 1	U	3 7	U	0.5	U	0 5	U
Zinc	UG/L	20 5		3.1	J	19.1	J	3.8	J	2.2	U

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

STUDY ID		ESI		ESI		ESI		ESI		ESI	
LOC ID		MW5-1		MW57-1		MW58-1		MW64A-1		MW64B-1	
QC CODE		SA		SA		SA		SA		SA	
SAMP DETH TOP		NONE		NONE		NONE		NONE		NONE	
SAMP DEPTH BOT		NONE		NONE		NONE		NONE		NONE	
MATRIX		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER		GROUNDWATER	
SAMP DATE		11-Jul-94		3-Feb-94		11-Jul-94		19-Jul-94		10-Jul-94	
SAMP ID		MW5-1-1		MW57-1-1		MW58-1-1		MW64A-1-1G		MW64B-1-1G	
PARAMETER	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS											
Aluminum	UG/L	1310		4200		440		398		198	J
Antimony	UG/L	1.3	U	44.7	J	1.3	U	1.3	U	1.3	U
Arsenic	UG/L	2	U	1.4	U	2	U	2	U	2	U
Barium	UG/L	42.2	J	36.5	J	71.9	J	42	J	104	J
Beryllium	UG/L	0.1	U	0.4	U	0.1	U	0.1	U	0.1	U
Cadmium	UG/L	0.2	U	2.1	U	0.2	U	0.2	U	0.2	U
Calcium	UG/L	240000		82000		113000		109000		138000	
Chromium	UG/L	2.5	J	7.7	J	0.82	J	0.49	J	0.41	J
Cobalt	UG/L	2.8	J	4.4	U	0.64	J	0.5	U	1.1	J
Copper	UG/L	2.2	J	3.1	U	1.5	J	0.61	J	1	J
Cyanide	UG/L	5	U	5	U	5	U	5	U	5	U
Iron	UG/L	2670		6360		678		[illegible]	J	[illegible]	
Lead	UG/L	0.89	U	2.1	J	0.89	U	0.89	U	0.9	U
Magnesium	UG/L	43200		11400		17300		16800		45600	
Manganese	UG/L	450		245		84		28.3		98.9	
Mercury	UG/L	0.04	U	0.04	U	0.04	U	0.04	J	0.04	U
Nickel	UG/L	5.3	J	8.2	J	1.6	J	1	J	1.4	J
Potassium	UG/L	4650	J	3860	J	1460	J	1790	J	4780	J
Selenium	UG/L	2.7	U	0.69	U	2.7	U	2.7	U	2.7	U
Silver	UG/L	0.5	U	4.2	U	0.5	U	0.5	U	0.5	U
Sodium	UG/L	73500		4080	J	4180	J	2180	J	8140	
Thallium	UG/L	1.9	U	1.2	U	1.9	U	1.9	U	1.9	U
Vanadium	UG/L	2.6	J	7.6	J	0.81	J	1.3	J	0.73	J
Zinc	UG/L	11.5	J	57.4		7.1	J	3.9	J	3.9	J

TABLE G-4
GROUNDWATER BACKGROUND DATA
SENECA ARMY DEPOT

STUDY ID		ESI		ESI		RI PHASE2	
LOC ID		MW64C-9		MW64D-1		PT-10	
QC CODE		SA		SA		SA	
SAMP DETH TOP		NONE		NONE		NONE	
SAMP DEPTH BOT		NONE		NONE		NONE	
MATRIX		GROUNDWATER		GROUNDWATER		GROUNDWATER	
SAMP DATE		10-Jul-94		8-Jul-94		23-Jun-93	
SAMP ID		MW64C-9-1		MW64D-1-1		PT10GW1	
PARAMETER	UNIT	VALUE	Q	VALUE	Q	VALUE	Q
METALS							
Aluminum	UG/L	38 2	J	177	J	72	U
Antimony	UG/L	1 3	U	1 3	U	49.5	UJ
Arsenic	UG/L	2	U	2	U	1.4	UJ
Barium	UG/L	20 4	J	88 6	J	193	J
Beryllium	UG/L	0 1	U	0 1	U	0 89	U
Cadmium	UG/L	0 2	U	0 2	U	2 8	U
Calcium	UG/L	121000		142000		79100	
Chromium	UG/L	0 4	U	0 4	U	2 7	UJ
Cobalt	UG/L	0 5	U	0 69	J	5 4	U
Copper	UG/L	0 55	J	0 5	U	4 7	U
Cyanide	UG/L	5	U	5	U	10	UJ
Iron	UG/L	**681**		**440**		85 6	J
Lead	UG/L	0 9	U	0 9	U	0 79	U
Magnesium	UG/L	49400		14800		34200	
Manganese	UG/L	96		223		124	
Mercury	UG/L	0 04	U	0 04	U	0 09	UJ
Nickel	UG/L	1 2	J	1 4	J	7 4	UJ
Potassium	UG/L	1670	J	3340	J	2870	J
Selenium	UG/L	2 7	U	2 7	U	0 99	UJ
Silver	UG/L	0 5	U	0 5	U	5 4	U
Sodium	UG/L	6420		12300		**41100**	
Thallium	UG/L	1 9	U	2 2	J		
Vanadium	UG/L	0 61	J	0 69	J	6 7	UJ
Zinc	UG/L	3 9	J	3 8	J	8 8	J



LEGEND

- Soil Background Locations

4000 0 4000 8000 Feet

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SENECA ARMY DEPOT ACTIVITY

COMPLETION REPORT FOR
SIX AREAS OF CONCERN

ENVIRONMENTAL ENGINEERING | 734567-01001

FIGURE G-1

LOCATION OF SOIL
BACKGROUND SAMPLES

1 INCH = 4000 FEET | FEBRUARY 1999 | A

N

MW-21
MW-35
MW57-1
MW13-4
MW13-1
MW58-1
MW16-1
MW5-1
MW25-6
MW17-1
MW25-1
PT-10
MW64D-1
MW64A-1
MW26-1
MW11-1
MW44B-1
MW4-1
MW64B-1
MW44A-1
MW64C-9

LEGEND

- Groundwater Background Locations

4000 0 4000 8000 Feet

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
COMPLETION REPORT FOR
SIX AREAS OF CONCERN

DEPT. ENVIRONMENTAL ENGINEERING | Dwg. No. 734967-01001

FIGURE G-2
LOCATION OF GROUNDWATER
BACKGROUND SAMPLES

SCALE 1 INCH = 4000 FEET | DATE FEBRUARY 1999 | REV A

APPENDIX H
IEUBK MODEL OUTPUT

IEUBK MODEL OUTPUT

USEPA RESIDENTIAL SOIL CONCENTRATION TARGET = 400 ppm

[per "Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities" (USEPA, August 1994)]

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	400.0	200.0
1-2	400.0	200.0
2-3	400.0	200.0
3-4	400.0	200.0
4-5	400.0	200.0
5-6	400.0	200.0
6-7	400.0	200.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.1	9.49	6.63
1-2:	5.7	13.86	10.39
2-3:	5.4	14.45	10.54
3-4:	5.1	14.58	10.70
4-5:	4.3	12.05	8.14
5-6:	3.7	11.59	7.40
6-7:	3.3	11.57	7.03

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.48	0.36	0.00	0.02
1-2:	2.56	0.88	0.00	0.03
2-3:	2.91	0.93	0.00	0.06
3-4:	2.84	0.97	0.00	0.07
4-5:	2.81	1.03	0.00	0.07
5-6:	3.00	1.10	0.00	0.09
6-7:	3.33	1.12	0.00	0.09

IEUBK MODEL OUTPUT

DAY CARE SOIL INGESTION SCENARIO

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.100 ug Pb/m3 DEFAULT

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	625.0	200.0
1-2	625.0	200.0
2-3	625.0	200.0
3-4	625.0	200.0
4-5	625.0	200.0
5-6	625.0	200.0
6-7	625.0	200.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.0	9.30	6.44
1-2:	5.6	13.49	10.00
2-3:	5.2	14.06	10.14
3-4:	5.0	14.18	10.29
4-5:	4.2	11.73	7.82
5-6:	3.6	11.31	7.11
6-7:	3.2	11.35	6.81

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.49	0.36	0.00	0.02
1-2:	2.57	0.89	0.00	0.03
2-3:	2.92	0.94	0.00	0.06
3-4:	2.85	0.97	0.00	0.07
4-5:	2.82	1.03	0.00	0.07
5-6:	3.00	1.10	0.00	0.09
6-7:	3.33	1.12	0.00	0.09

APPENDIX I
ECOLOGICAL RISK ASSESSMENT TABLES

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
								AREA	SEAD-43	SEAD-43	SEAD-43	SEAD-43	SEAD-43
								SAMP_DEPTH_TOP	0	0	0	0	1
								SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	1.5
								SAMP_DATE	06/10/94	06/10/94	06/10/94	06/09/94	02/17/94
								SAMP_ID	SB43-1-1	SB43-1-20	SB43-2-1	SB43-3-1	SB43-4-1
								LAB_ID	223889	223893	223682	223686	211724
								SDG	44725	44725	44694	44694	42460
								LOC_ID	SB43-1	SB43-1	SB43-2	SB43-3	SB43-4
								QC_CODE	SA	DU	SA	SA	SA
										DUP OF SB43-1-1			
									Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS													
Acetone	UG/KG	200	39.1%	200	0	9	23		13 U	10 UJ	12 U	11 U	15 U
Chloroform	UG/KG	3	4.3%	300	0	1	23		13 U	10 UJ	12 U	11 U	3 J
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23		13 U	10 UJ	12 U	11 U	11 U
Toluene	UG/KG	11	8.7%	1500	0	2	23		13 U	10 UJ	12 U	11 U	3 J
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23		13 U	10 UJ	12 U	11 U	4 J
SEMIVOLATILE ORGANICS													
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23		410 U	410 U	420 U	360 U	46 J
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23		410 U	410 U	420 U	360 U	520 U
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23		410 U	410 U	420 U	360 U	300 J
Anthracene	UG/KG	700	14.8%	50000	0	4	27		410 U	410 U	420 U	35 J	700
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23		410 U	410 U	22 J	110 J	**1200**
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23		410 U	410 U	420 U	**96** J	**1200**
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23		410 U	410 U	420 U	100 J	1000
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23		410 U	410 U	420 U	88 J	730
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23		410 U	410 U	420 U	86 J	960
Carbazole	UG/KG	350	8.7%	50000	0	2	23		410 U	410 U	420 U	20 J	350 J
Chrysene	UG/KG	1200	29.6%	400	1	8	27		410 U	410 U	25 J	120 J	**1200**
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23		410 U	410 U	420 U	**33** J	**300** J
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23		410 U	410 U	420 U	360 U	170 J
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23		410 U	410 U	420 U	360 U	48 J
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29		410 U	410 U	42 J	240 J	3200
Fluorene	UG/KG	320	4.3%	50000	0	1	23		410 U	410 U	420 U	360 U	320 J
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23		410 U	410 U	420 U	75 J	660
Naphthalene	UG/KG	140	4.3%	13000	0	1	23		410 U	410 U	420 U	360 U	140 J
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27		410 U	410 U	27 J	140 J	2600
Pyrene	UG/KG	2700	34.5%	50000	0	10	29		410 U	410 U	45 J	230 J	2700
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23		82 J	510 J	53 J	530	2700
ORGANOCHLORINE PESTICIDES													
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23		4.1 U	4.1 U	4.2 U	3.6 U	3.9 U
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23		4.1 U	4.1 U	4.2 U	3.6 U	3.9 U
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23		4.1 U	4.1 U	4.2 U	3.6 U	3.9 U
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23		2.1 U	2.1 U	2.2 U	1.8 U	2.4 J
Dieldrin	UG/KG	70	26.1%	44	3	6	23		4.1 U	4.1 U	4.2 U	3.6 U	3.9 U
Endosulfan I	UG/KG	2	8.7%	900	0	2	23		2.1 U	2.1 U	2.2 U	1.2 J	2 U
EXPLOSIVES													
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42		130 U	130 U	130 U	130 U	130 U
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42		130 U	130 U	130 U	130 U	130 U
Tetryl	UG/KG	150	2.4%		0	1	42		130 U	130 U	130 U	130 U	130 U
METALS													
Aluminum	MG/KG	20800	96.6%	19300	1	28	29		**20800**	15700	14700 J	10900 J	13300 J
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29		0.23 UJ	0.26 UJ	0.32 UJ	0.24 J	4.6 J
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29		6.1	5.4	6.1	5.3	6 J
Barium	MG/KG	202	96.6%	300	0	28	29		145	112	104 J	60.3 J	92.1 J
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29		0.86 J	0.77 J	0.69 J	0.44 J	0.58 J
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25		0.96	0.85 J	0.68 J	0.58 J	0.41 U

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-43	SEAD-43	SEAD-43	SEAD-43	SEAD-43
							SAMP_DEPTH_TOP	0	0	0	0	1
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	1.5
							SAMP_DATE	06/10/94	06/10/94	06/10/94	06/09/94	02/17/94
							SAMP_ID	SB43-1-1	SB43-1-20	SB43-2-1	SB43-3-1	SB43-4-1
							LAB_ID	223889	223893	223682	223686	211724
							SDG	44725	44725	44694	44694	42460
							LOC_ID	SB43-1	SB43-1	SB43-2	SB43-3	SB43-4
							QC_CODE	SA	DU	SA	SA	SA
			FREQUENCY		NUMBER	NUMBER	NUMBER		DUP OF SB43-1-1			
			OF		ABOVE	OF	OF					
CHEM_CLASS/PARAM	UNIT	MAXIMUM	DETECTION	TAGM	TAGM	DETECTIONS	ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	8980	7830	11800 J	41900 J	60500 J
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	26.2	21.6	21.2 J	15.7 J	23.1
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	10.9	9 J	9.3 J	8.2 J	8.7 J
Copper	MG/KG	191	96.6%	33	2	28	29	21.8	21.4	21 J	23.6 J	23.8
Iron	MG/KG	31000	96.6%	36500	0	28	29	26800	25400	26800 J	19200 J	23900 J
Lead	MG/KG	522	96.3%	24.8	6	26	27	19.2	18.6	19.8	19.1	15.9
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	5440	5400	6080 J	20000 J	18800 J
Manganese	MG/KG	871	86.2%	1060	0	25	29	782	502	546 J	593 J	530 R
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25	0.06 J	0.07 J	0.06 JR	0.08 JR	0.04 J
Nickel	MG/KG	53.4	96.6%	49	1	28	29	28.1	26.2	26.7 J	20.6 J	27
Potassium	MG/KG	3560	96.6%	2380	3	28	29	**3560** J	2050 J	2060	**2550**	1940
Selenium	MG/KG	1.8	79.3%	2	0	23	29	1.1	0.85 J	1.3	0.48 J	0.17 UJ
Sodium	MG/KG	164	41.4%	172	0	12	29	17.8 U	19.6 U	24.8 U	27.5 J	128 J
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	0.34 U	0.37 U	0.47 U	0.33 U	0.18 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	36.7	27	27 J	21.1 J	24.6
Zinc	MG/KG	338	96.6%	110	9	28	29	98.6	92	91.1 J	**121** J	71.7 J
HERBICIDES												
2,4,5-T	UG/KG			1900				6.2 U	12 J	6.4 U	5.5 U	5.9 U
Dicamba	UG/KG							6.2 U	11 J	6.4 U	5.5 U	5.9 U
Dichloroprop	UG/KG							62 U	72 J	64 U	55 U	59 U
MCPP	UG/KG							6200 U	7300 J	6400 U	7100	5900 U

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
								AREA	SEAD-43	SEAD-56	SEAD-56	SEAD-56	SEAD-69
								SAMP_DEPTH_TOP	1	0	0	0	0
								SAMP_DEPTH_BOT	1.2	0.2	0.2	0.2	0.2
								SAMP_DATE	02/18/94	05/23/94	05/23/94	05/18/94	05/17/94
								SAMP_ID	SB43-4-3	SB56-1-1	SB56-2-1	SB56-3-1	SB69-1-1
								LAB_ID	211726	222124	222127	221480	221354
								SDG	42460	44090	44090	44090	44090
								LOC_ID	SB43-4	SB56-1	SB56-2	SB56-3	SB69-1
								QC_CODE	SA	SA	SA	SA	SA
VOLATILE ORGANICS													
Acetone	UG/KG	200	39.1%	200	0	9	23		52 UR	11 U	11 U	12 U	15 U
Chloroform	UG/KG	3	4.3%	300	0	1	23		11 UR	11 U	11 U	12 U	15 U
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23		11 UR	11 U	11 U	12 U	15 U
Toluene	UG/KG	11	8.7%	1500	0	2	23		11 J	11 U	11 U	12 U	15 U
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23		12 J	11 U	11 U	12 U	15 U
SEMIVOLATILE ORGANICS													
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23		350 U	430 U	380 U	400 U	490 U
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23		350 U	430 U	380 U	400 U	490 U
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23		350 U	430 U	380 U	400 U	490 U
Anthracene	UG/KG	700	14.8%	50000	0	4	27		350 U	430 U	380 U	400 U	490 U
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23		350 U	430 U	380 U	400 U	490 U
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23		350 U	430 U	380 U	400 U	490 U
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23		350 U	430 U	380 U	400 U	490 U
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23		350 U	430 U	380 U	400 U	490 U
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23		350 U	430 U	380 U	400 U	490 U
Carbazole	UG/KG	350	8.7%	50000	0	2	23		350 U	430 U	380 U	400 U	490 U
Chrysene	UG/KG	1200	29.6%	400	1	8	27		350 U	430 U	380 U	400 U	490 U
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23		350 U	430 U	380 U	400 U	490 U
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23		350 U	430 U	380 U	400 U	490 U
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23		350 U	430 U	380 U	400 U	490 U
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29		350 U	430 U	380 U	400 U	490 U
Fluorene	UG/KG	320	4.3%	50000	0	1	23		350 U	430 U	380 U	400 U	490 U
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23		350 U	430 U	380 U	400 U	490 U
Naphthalene	UG/KG	140	4.3%	13000	0	1	23		350 U	430 U	380 U	400 U	490 U
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27		350 U	430 U	380 U	400 U	490 U
Pyrene	UG/KG	2700	34.5%	50000	0	10	29		350 U	430 U	380 U	400 U	490 U
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23		1300	280 J	81 J	1300	490 U
ORGANOCHLORINE PESTICIDES													
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23		3.5 U	4.3 U	3.8 U	4 U	4.9 U
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23		3.5 U	4.3 U	3.8 U	4 U	4.9 U
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23		3.5 U	4.3 U	3.8 U	4 U	4.9 U
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23		1.8 U	2.2 U	2 U	2.1 U	2.5 U
Dieldrin	UG/KG	70	26.1%	44	3	6	23		3.5 U	4.3 U	3.8 U	4 U	4.9 U
Endosulfan I	UG/KG	2	8.7%	900	0	2	23		1.8 U	2.2 U	2 U	2.1 U	2.5 U
EXPLOSIVES													
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42		130 U	130 U	130 U	130 U	130 U
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42		130 U	130 U	130 U	130 U	130 U
Tetryl	UG/KG	150	2.4%		0	1	42		130 U	130 U	130 U	130 U	130 U
METALS													
Aluminum	MG/KG	20800	96.6%	19300	1	28	29		15200 J	4620	4850	2900	13800
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29		3.3 J	0.21 UJ	0.19 UJ	0.17 UJ	0.26 UJ
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29		4 J	3.5	3.3	4.5	5.3
Barium	MG/KG	202	96.6%	300	0	28	29		49.9 J	26 J	33 J	14.4 J	124
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29		0.72	0.22 J	0.22 J	0.17 J	0.74 J
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25		0.26 U	1.5	0.51 J	0.55 J	0.79 J

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-43	SEAD-56	SEAD-56	SEAD-56	SEAD-69
							SAMP_DEPTH_TOP	1	0	0	0	0
							SAMP_DEPTH_BOT	1.2	0.2	0.2	0.2	0.2
							SAMP_DATE	02/18/94	05/23/94	05/23/94	05/18/94	05/17/94
							SAMP_ID	SB43-4-3	SB56-1-1	SB56-2-1	SB56-3-1	SB69-1-1
							LAB_ID	211726	222124	222127	221480	221354
							SDG	42460	44090	44090	44090	44090
							LOC_ID	SB43-4	SB56-1	SB56-2	SB56-3	SB69-1
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	21500 J	62200	66400	111000	8360
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	25.7	7.1	7	5.4	19.5
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	15.7	3.8 J	4.5 J	2.8 J	7.5 J
Copper	MG/KG	191	96.6%	33	2	28	29	28.1	18.8	17.3	11.4	20.3
Iron	MG/KG	31000	96.6%	36500	0	28	29	31000 J	10900	11500	8520	23500
Lead	MG/KG	522	96.3%	24.8	6	26	27	15.6	**30.2**	12.8	19.3	23.2
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	8540 J	**29500**	**26400**	17800	4290
Manganese	MG/KG	871	86.2%	1060	0	25	29	479 R	529	533	502	395
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25	0.02 J	0.02 J	0.03 J	0.01 J	0.06 J
Nickel	MG/KG	53.4	96.6%	49	1	28	29	**53.4**	10.9	10.3	6.8	22.2
Potassium	MG/KG	3560	96.6%	2380	3	28	29	1580	1020 J	1030	730 J	2140
Selenium	MG/KG	1.8	79.3%	2	0	23	29	1.8 J	0.35 U	0.55 J	0.29 U	1.4
Sodium	MG/KG	164	41.4%	172	0	12	29	98.5 J	94.6 J	52 J	86.1 J	41 U
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	0.21 U	0.33 U	0.31 U	0.27 U	0.41 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	21.3	10.2 J	10.6	6.4 J	24.5
Zinc	MG/KG	338	96.6%	110	9	28	29	**126** J	**295**	75.4	**139**	92.8
HERBICIDES												
2,4,5-T	UG/KG			1900				5.4 U	6.5 U	5.9 U	6.1 U	7.4 U
Dicamba	UG/KG							5.4 U	6.5 U	5.9 U	6.1 U	7.4 U
Dichloroprop	UG/KG							54 U	65 U	59 U	61 U	74 U
MCPP	UG/KG							5400 U	6500 U	5900 U	6100 U	7400 U

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
MATRIX								SOIL	SOIL	SOIL	SOIL	SOIL
AREA								SEAD-69	SEAD-69	SEAD-69	SEAD-44	SEAD-44
SAMP_DEPTH_TOP								0	0	0	0	0
SAMP_DEPTH_BOT								0.2	0.2	0.2	0.2	0.2
SAMP_DATE								05/17/94	02/19/94	02/18/94	04/13/94	04/13/94
SAMP_ID								SB69-1-20	SB69-2-1	SB69-3-1	SS44A-1-1	SS44A-20-1
LAB_ID								221355	211964	211967	217678	217685
SDG								44090	42460	42493	43535	43535
LOC_ID								SB69-2	SB69-3	SS44A-1	SS44A-1	
QC_CODE								DU	SA	SA	SA	DU
								DUP OF SB69-1-1				
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23	14 U	24 U	19 U	73	35
Chloroform	UG/KG	3	4.3%	300	0	1	23	14 U	24 U	19 U	16 U	16 U
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23	14 U	24 U	19 U	16 U	16 U
Toluene	UG/KG	11	8.7%	1500	0	2	23	14 U	24 U	19 U	16 U	16 U
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23	14 U	24 U	19 U	16 U	16 U
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23	490 U	620 U	650 U	520 U	510 U
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23	490 U	580 J	650 U	520 U	510 U
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23	490 U	620 U	650 U	520 U	510 U
Anthracene	UG/KG	700	14.8%	50000	0	4	27	490 U	620 U	650 U	520 U	510 U
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23	490 U	620 U	650 U	520 U	510 U
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23	490 U	620 U	650 U	520 U	510 U
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23	490 U	620 U	650 U	520 U	510 U
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23	490 U	620 U	650 U	520 U	510 U
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23	490 U	620 U	650 U	520 U	510 U
Carbazole	UG/KG	350	8.7%	50000	0	2	23	490 U	620 U	650 U	520 U	510 U
Chrysene	UG/KG	1200	29.6%	400	1	8	27	490 U	620 U	650 U	520 U	510 U
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23	490 U	620 U	650 U	520 U	510 U
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23	490 U	620 U	650 U	520 U	510 U
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23	490 U	620 U	62 J	520 U	26 J
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29	490 U	620 U	650 U	520 U	23 J
Fluorene	UG/KG	320	4.3%	50000	0	1	23	490 U	620 U	650 U	520 U	510 U
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23	490 U	620 U	650 U	520 U	510 U
Naphthalene	UG/KG	140	4.3%	13000	0	1	23	490 U	620 U	650 U	520 U	510 U
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27	490 U	620 U	650 U	520 U	510 U
Pyrene	UG/KG	2700	34.5%	50000	0	10	29	490 U	620 U	650 U	520 U	26 J
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23	490 U	690	580 J	520 U	54 J
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23	4.9 U	6.3 U	6.5 U	5.2 U	5.1 U
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23	4.9 U	6.3 U	6.5 U	5.2 U	5.1 U
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23	4.9 U	6.3 U	6.5 U	5.2 U	5.1 U
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23	2.5 U	3.3 U	3.3 U	2.7 U	2.6 U
Dieldrin	UG/KG	70	26.1%	44	3	6	23	4.9 U	6.3 U	6.5 U	20 J	5.1 U
Endosulfan I	UG/KG	2	8.7%	900	0	2	23	2.5 U	3.3 U	3.3 U	2.7 U	2.6 U
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 U	130 U	130 U	130 U	130 U
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	130 U	130 U	130 U	130 U	130 U
Tetryl	UG/KG	150	2.4%		1	1	42	130 U	130 U	130 U	130 U	130 U
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29	13900	16000 J	14900	14500	16000
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29	0.3 UJ	6 UJ	0.37 UJ	0.21 UJ	0.18 UJ
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29	5.8	5.4 J	4.7	6.5	4.6
Barium	MG/KG	202	96.6%	300	0	28	29	132	133 J	118	93.4	94.1
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29	0.75 J	0.9 J	0.67 J	0.56 J	0.56 J
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25	0.83 J	0.58 U	0.31 J	0.24 J	0.26 J

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-69	SEAD-69	SEAD-69	SEAD-44	SEAD-44
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	05/17/94	02/19/94	02/18/94	04/13/94	04/13/94
							SAMP_ID	SB69-1-20	SB69-2-1	SB69-3-1	SS44A-1-1	SS44A-20-1
							LAB_ID	221355	211964	211967	217678	217685
							SDG	44090	42460	42493	43535	43535
							LOC_ID	SB69-1	SB69-2	SB69-3	SS44A-1	SS44A-1
							QC_CODE	DU	SA	SA	SA	DU
			FREQUENCY		NUMBER	NUMBER	NUMBER	DUP OF SB69-1-1				
			OF		ABOVE	OF	OF					
CHEM_CLASS/PARAM	UNIT	MAXIMUM	DETECTION	TAGM	TAGM	DETECTIONS	ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	6320	7760 J	7510 J	3310	3460
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	19.9	22.6	21.5	17.6	18.5
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	9.2 J	8.9 J	8.2 J	7.9 J	7.2 J
Copper	MG/KG	191	96.6%	33	2	28	29	20.5	22.9	20.6	20.6	14.2
Iron	MG/KG	31000	96.6%	36500	0	28	29	24600	27100 J	24900	23300	20700
Lead	MG/KG	522	96.3%	24.8	6	26	27	23.9	21.1	**25.1**	21.4	21.6
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	3810	4940 J	4730	2940	3270
Manganese	MG/KG	871	86.2%	1060	0	25	29	540	576 R	368	370 J	251 J
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25	0.06 J	0.08 J	0.06 J	0.05 J	0.03 J
Nickel	MG/KG	53.4	96.6%	49	1	28	29	22.5	28.1	26.6 J	18	20.7
Potassium	MG/KG	3560	96.6%	2380	3	28	29	2080	1930	1940 J	1320	1450
Selenium	MG/KG	1.8	79.3%	2	0	23	29	1.2 J	0.54 J	1.2 J	1 J	0.81 J
Sodium	MG/KG	164	41.4%	172	0	12	29	47.2 U	54.9 U	85.5 J	34 U	28.3 U
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	0.48 U	0.3 U	0.46 U	0.34 U	0.29 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	25	28.3	27.6	27.6	27.1
Zinc	MG/KG	338	96.6%	110	9	28	29	94.2	**338** J	**273**	72.6	85
HERBICIDES												
2,4,5-T	UG/KG			1900				7.5 U	9.4 U	9.8 U		
Dicamba	UG/KG							7.5 U	9.4 U	9.8 U		
Dichloroprop	UG/KG							75 U	94 U	98 U		
MCPP	UG/KG							7500 U	9400 U	9800 U		

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-44	SEAD-44	SEAD-44	SEAD-44	SEAD-44
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	04/13/94	04/13/94	04/13/94	04/13/94	04/13/94
							SAMP_ID	SS44A-2-1	SS44A-3-1	SS44A-4-1	SS44A-5-1	SS44A-6-1
							LAB_ID	217680	217681	217682	217683	217684
							SDG	43535	43535	43535	43535	43535
							LOC_ID	SS44A-2	SS44A-3	SS44A-4	SS44A-5	SS44A-6
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23	11 J	26	18	200	16 J
Chloroform	UG/KG	3	4.3%	300	0	1	23	15 U	18 U	16 U	21 U	16 U
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23	15 U	18 U	16 U	28	16 U
Toluene	UG/KG	11	8.7%	1500	0	2	23	15 U	18 U	16 U	21 U	16 U
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23	15 U	18 U	16 U	21 U	16 U
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23	520 U	580 U	580 U	660 U	570 U
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23	520 U	250 J	580 U	660 U	64 J
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23	520 U	580 U	580 U	660 U	570 U
Anthracene	UG/KG	700	14.8%	50000	0	4	27	520 U	580 U	580 U	660 U	570 U
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23	56 J	580 U	580 U	660 U	570 U
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23	49 J	580 U	580 U	660 U	570 U
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23	43 J	580 U	580 U	660 U	570 U
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23	520 U	580 U	580 U	660 U	570 U
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23	52 J	580 U	580 U	660 U	570 U
Carbazole	UG/KG	350	8.7%	50000	0	2	23	520 U	580 U	580 U	660 U	570 U
Chrysene	UG/KG	1200	29.6%	400	1	8	27	53 J	580 U	580 U	660 U	570 U
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23	520 U	580 U	580 U	660 U	570 U
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23	520 U	580 U	580 U	660 U	570 U
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23	520 U	580 U	580 U	53 J	570 U
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29	150 J	580 U	580 U	660 U	570 U
Fluorene	UG/KG	320	4.3%	50000	0	1	23	520 U	580 U	580 U	660 U	570 U
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23	26 J	580 U	580 U	660 U	570 U
Naphthalene	UG/KG	140	4.3%	13000	0	1	23	520 U	580 U	580 U	660 U	570 U
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27	120 J	580 U	580 U	660 U	570 U
Pyrene	UG/KG	2700	34.5%	50000	0	10	29	120 J	580 U	580 U	660 U	570 U
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23	520 U	580 U	580 U	32 J	30 J
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23	5.2 U	5.7 U	5.8 U	6.6 U	5.7 U
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23	5.2 U	5.7 U	5.8 U	6.6 U	5.7 U
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23	5.2 U	5.7 U	5.8 U	6.6 U	5.7 U
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23	2.7 U	2.9 U	3 U	3.4 U	2.9 U
Dieldrin	UG/KG	70	26.1%	44	3	6	23	5.2 U	9.9 J	**59**	29	**70**
Endosulfan I	UG/KG	2	8.7%	900	0	2	23	2.7 U	2.9 U	3 U	3.4 U	2.9 U
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 U	130 U	130 U	110 J	130 U
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	130 U	130 U	130 U	130 U	130 U
Tetryl	UG/KG	150	2.4%		0	1	42	130 U	130 U	130 U	130 U	130 U
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29	15300	15300	12900	17400	11500
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29	0.27 UJ	0.23 UJ	0.2 UJ	0.25 UJ	0.19 UJ
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29	4.9	4.8	4.5	5.7	3.5
Barium	MG/KG	202	96.6%	300	0	28	29	92.5	148	108	164	116
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29	0.63 J	0.72 J	0.63 J	0.91 J	0.57 J
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25	0.26 J	0.36 J	0.39 J	0.48 J	0.36 J

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-44	SEAD-44	SEAD-44	SEAD-44	SEAD-44
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	04/13/94	04/13/94	04/13/94	04/13/94	04/13/94
							SAMP_ID	SS44A-2-1	SS44A-3-1	SS44A-4-1	SS44A-5-1	SS44A-6-1
							LAB_ID	217680	217681	217682	217683	217684
							SDG	43535	43535	43535	43535	43535
							LOC_ID	SS44A-2	SS44A-3	SS44A-4	SS44A-5	SS44A-6
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	6230	5690	4900	7160	5950
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	20.1	20.5	17.9	23.7	15
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	7.7 J	8.6 J	8.3 J	8.8 J	5.1 J
Copper	MG/KG	191	96.6%	33	2	28	29	14.5	18.9	17.2	20	14
Iron	MG/KG	31000	96.6%	36500	0	28	29	24200	23800	21900	27400	16500
Lead	MG/KG	522	96.3%	24.8	6	26	27	18.6	18	16.5	22.5	13.9
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	3970	4090	3630	4370	2690
Manganese	MG/KG	871	86.2%	1060	0	25	29	298 J	489 J	326 J	678 J	301 J
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25	0.03 J	0.05 J	0.04 J	0.07 J	0.05 J
Nickel	MG/KG	53.4	96.6%	49	1	28	29	20.4	24	21.2	26	14.4
Potassium	MG/KG	3560	96.6%	2380	3	28	29	1410	1980	1410	1980	1200
Selenium	MG/KG	1.8	79.3%	2	0	23	29	0.99 J	0.93 J	1.5	1.7	1.3
Sodium	MG/KG	164	41.4%	172	0	12	29	42.1 U	36 U	31 U	40 U	30.2 U
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	0.42 U	0.36 U	0.31 U	0.4 U	0.3 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	26.8	25.3	21.4	30.2	21
Zinc	MG/KG	338	96.6%	110	9	28	29	72.4	88.6	80.5	94	59.2
HERBICIDES												
2,4,5-T	UG/KG			1900								
Dicamba	UG/KG											
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-44	SEAD-44	SEAD-44	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	04/13/94	04/13/94	04/13/94	12/16/93	12/16/93
							SAMP_ID	SS44B-1-1	SS44B-2-1	SS44B-3-1	SS52-1	SS52-19
							LAB_ID	217686	217687	217688	207145	207163
							SDG	43535	43535	43535	41316	41316
							LOC_ID	SS44B-1	SS44B-2	SS44B-3	SS52-1	SS52-1
							QC_CODE	SA	SA	SA	SA	DU
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	DUP OF SS52-1 Value (Q)
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23	720 R	38	47		
Chloroform	UG/KG	3	4.3%	300	0	1	23	12 UJ	18 U	14 U		
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23	12 UJ	18 U	14 U		
Toluene	UG/KG	11	8.7%	1500	0	2	23	12 UJ	18 U	14 U		
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23	12 UJ	18 U	14 U		
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23	420 U	630 U	460 U		
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23	420 U	630 U	460 U		
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23	420 U	630 U	460 U		
Anthracene	UG/KG	700	14.8%	50000	0	4	27	420 U	630 U	35 J		
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23	33 J	630 U	130 J		
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23	32 J	630 U	**98** J		
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23	51 J	630 U	99 J		
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23	420 U	630 U	56 J		
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23	40 J	630 U	110 J		
Carbazole	UG/KG	350	8.7%	50000	0	2	23	420 U	630 U	460 U		
Chrysene	UG/KG	1200	29.6%	400	1	8	27	52 J	630 U	150 J		
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23	420 U	630 U	**28** J		
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23	420 U	630 U	460 U		
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23	420 U	630 U	460 U		
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29	82 J	630 U	350 J		
Fluorene	UG/KG	320	4.3%	50000	0	1	23	420 U	630 U	460 U		
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23	24 J	630 U	64 J		
Naphthalene	UG/KG	140	4.3%	13000	0	1	23	420 U	630 U	460 U		
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27	34 J	630 U	330 J		
Pyrene	UG/KG	2700	34.5%	50000	0	10	29	89 J	630 U	380 J		
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23	34 J	630 U	42 J		
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23	48	6.3 U	4.6 U		
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23	28	6.3 U	4.6 U		
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23	27	6.3 U	4.6 U		
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23	2.2 U	3.3 U	2.4 U		
Dieldrin	UG/KG	70	26.1%	44	3	6	23	4.2 U	6.3 U	**57**		
Endosulfan I	UG/KG	2	8.7%	900	0	2	23	2 J	3.3 U	2.4 U		
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 U	130 U	130 U	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	130 U	130 U	130 U	110 J	120 J
Tetryl	UG/KG	150	2.4%		0	1	42	130 U	130 U	130 U	130 UJ	130 UJ
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29	11000	16400	9820		
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29	0.22 UJ	0.2 UJ	0.18 UJ		
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29	6.8	8.2	**13.1**		
Barium	MG/KG	202	96.6%	300	0	28	29	60.6	136	70.8		
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29	0.54 J	0.77 J	0.48 J		
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25	0.33 J	0.34 J	0.24 J		

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-44	SEAD-44	SEAD-44	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	04/13/94	04/13/94	04/13/94	12/16/93	12/16/93
							SAMP_ID	SS44B-1-1	SS44B-2-1	SS44B-3-1	SS52-1	SS52-19
							LAB_ID	217686	217687	217688	207145	207163
							SDG	43535	43535	43535	41316	41316
							LOC_ID	SS44B-1	SS44B-2	SS44B-3	SS52-1	SS52-1
							QC_CODE	SA	SA	SA	SA	DU
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	DUP OF SS52-1 Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	10900	5100	33300		
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	20	20.7	15.2		
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	10.8 J	7.8 J	8.2 J		
Copper	MG/KG	191	96.6%	33	2	28	29	26.2	21.7	19.9		
Iron	MG/KG	31000	96.6%	36500	0	28	29	24100	23100	19600		
Lead	MG/KG	522	96.3%	24.8	6	26	27	**39.5**	21.4	12.4		
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	5200	3910	9660		
Manganese	MG/KG	871	86.2%	1060	0	25	29	372 J	318 J	364 J		
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25	0.02 J	0.04 J	0.02 J		
Nickel	MG/KG	53.4	96.6%	49	1	28	29	34.8	20.8	24.3		
Potassium	MG/KG	3560	96.6%	2380	3	28	29	1380	1880	1550		
Selenium	MG/KG	1.8	79.3%	2	0	23	29	1.1 J	1.2	0.44 J		
Sodium	MG/KG	164	41.4%	172	0	12	29	35.3 U	31.5 U	43.2 J		
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	0.36 U	0.32 U	0.29 U		
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	20.3	28	16.3		
Zinc	MG/KG	338	96.6%	110	9	28	29	**145**	73.4	68.9		
HERBICIDES												
2,4,5-T	UG/KG			1900								
Dicamba	UG/KG											
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
							SAMP_ID	SS52-2	SS52-3	SS52-4	SS52-5	SS52-6
							LAB_ID	207146	207147	207148	207149	207150
							SDG	41316	41316	41316	41316	41316
							LOC_ID	SS52-2	SS52-3	SS52-4	SS52-5	SS52-6
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23					
Chloroform	UG/KG	3	4.3%	300	0	1	23					
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23					
Toluene	UG/KG	11	8.7%	1500	0	2	23					
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23					
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23					
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23					
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23					
Anthracene	UG/KG	700	14.8%	50000	0	4	27					
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23					
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23					
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23					
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23					
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23					
Carbazole	UG/KG	350	8.7%	50000	0	2	23					
Chrysene	UG/KG	1200	29.6%	400	1	8	27					
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23					
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23					
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23					
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29					
Fluorene	UG/KG	320	4.3%	50000	0	1	23					
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23					
Naphthalene	UG/KG	140	4.3%	13000	0	1	23					
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27					
Pyrene	UG/KG	2700	34.5%	50000	0	10	29					
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23					
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23					
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23					
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23					
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23					
Dieldrin	UG/KG	70	26.1%	44	3	6	23					
Endosulfan I	UG/KG	2	8.7%	900	0	2	23					
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	130 UJ	130 UJ	130 UJ	130 UJ	280 J
Tetryl	UG/KG	150	2.4%		0	1	42	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29					
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29					
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29					
Barium	MG/KG	202	96.6%	300	0	28	29					
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29					
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25					

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
							SAMP_ID	SS52-2	SS52-3	SS52-4	SS52-5	SS52-6
							LAB_ID	207146	207147	207148	207149	207150
							SDG	41316	41316	41316	41316	41316
							LOC_ID	SS52-2	SS52-3	SS52-4	SS52-5	SS52-6
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29					
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29					
Cobalt	MG/KG	15.7	96.6%	30	0	28	29					
Copper	MG/KG	191	96.6%	33	2	28	29					
Iron	MG/KG	31000	96.6%	36500	0	28	29					
Lead	MG/KG	522	96.3%	24.8	6	26	27					
Magnesium	MG/KG	29500	96.6%	21500	2	28	29					
Manganese	MG/KG	871	86.2%	1060	0	25	29					
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25					
Nickel	MG/KG	53.4	96.6%	49	1	28	29					
Potassium	MG/KG	3560	96.6%	2380	3	28	29					
Selenium	MG/KG	1.8	79.3%	2	0	23	29					
Sodium	MG/KG	164	41.4%	172	0	12	29					
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27					
Vanadium	MG/KG	36.7	96.6%	150	0	28	29					
Zinc	MG/KG	338	96.6%	110	9	28	29					
HERBICIDES												
2,4,5-T	UG/KG			1900								
Dicamba	UG/KG											
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
							SAMP_ID	SS52-7	SS52-8	SS52-9	SS52-10	SS52-11
							LAB_ID	207151	207152	207153	207154	207155
							SDG	41316	41316	41316	41316	41316
							LOC_ID	SS52-7	SS52-8	SS52-9	SS52-10	SS52-11
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23					
Chloroform	UG/KG	3	4.3%	300	0	1	23					
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23					
Toluene	UG/KG	11	8.7%	1500	0	2	23					
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23					
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23					
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23					
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23					
Anthracene	UG/KG	700	14.8%	50000	0	4	27					
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23					
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23					
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23					
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23					
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23					
Carbazole	UG/KG	350	8.7%	50000	0	2	23					
Chrysene	UG/KG	1200	29.6%	400	1	8	27					
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23					
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23					
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23					
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29					
Fluorene	UG/KG	320	4.3%	50000	0	1	23					
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23					
Naphthalene	UG/KG	140	4.3%	13000	0	1	23					
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27					
Pyrene	UG/KG	2700	34.5%	50000	0	10	29					
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23					
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23					
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23					
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23					
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23					
Dieldrin	UG/KG	70	26.1%	44	3	6	23					
Endosulfan I	UG/KG	2	8.7%	900	0	2	23					
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	130 UJ	130 UJ	490 J	99 J	130 UJ
Tetryl	UG/KG	150	2.4%		0	1	42	130 UJ	130 UJ	130 UJ	130 UJ	150 J
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29					
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29					
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29					
Barium	MG/KG	202	96.6%	300	0	28	29					
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29					
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25					

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
							SAMP_ID	SS52-7	SS52-8	SS52-9	SS52-10	SS52-11
							LAB_ID	207151	207152	207153	207154	207155
							SDG	41316	41316	41316	41316	41316
							LOC_ID	SS52-7	SS52-8	SS52-9	SS52-10	SS52-11
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29					
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29					
Cobalt	MG/KG	15.7	96.6%	30	0	28	29					
Copper	MG/KG	191	96.6%	33	2	28	29					
Iron	MG/KG	31000	96.6%	26500	0	28	29					
Lead	MG/KG	522	96.3%	24.8	6	26	27					
Magnesium	MG/KG	29500	96.6%	21500	2	28	29					
Manganese	MG/KG	871	86.2%	1060	0	25	29					
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25					
Nickel	MG/KG	53.4	96.6%	49	1	28	29					
Potassium	MG/KG	3560	96.6%	2380	3	28	29					
Selenium	MG/KG	1.8	79.3%	2	0	23	29					
Sodium	MG/KG	164	41.4%	172	0	12	29					
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27					
Vanadium	MG/KG	36.7	96.6%	150	0	28	29					
Zinc	MG/KG	338	96.6%	110	9	28	29					
HERBICIDES												
2,4,5-T	UG/KG			1900								
Dicamba	UG/KG											
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES					
MATRIX								SOIL	SOIL	SOIL	SOIL	SOIL
AREA								SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
SAMP_DEPTH_TOP								0	0	0	0	0
SAMP_DEPTH_BOT								0.2	0.2	0.2	0.2	0.2
SAMP_DATE								12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
SAMP_ID								SS52-12	SS52-13	SS52-14	SS52-15	SS52-16
LAB_ID								207156	207157	207158	207159	207160
SDG								41316	41316	41316	41316	41316
LOC_ID								SS52-12	SS52-13	SS52-14	SS52-15	SS52-16
QC_CODE								SA	SA	SA	SA	SA
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23					
Chloroform	UG/KG	3	4.3%	300	0	1	23					
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23					
Toluene	UG/KG	11	8.7%	1500	0	2	23					
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23					
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23					
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23					
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23					
Anthracene	UG/KG	700	14.8%	50000	0	4	27					
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23					
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23					
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23					
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23					
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23					
Carbazole	UG/KG	350	8.7%	50000	0	2	23					
Chrysene	UG/KG	1200	29.6%	400	1	8	27					
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23					
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23					
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23					
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29					
Fluorene	UG/KG	320	4.3%	50000	0	1	23					
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23					
Naphthalene	UG/KG	140	4.3%	13000	0	1	23					
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27					
Pyrene	UG/KG	2700	34.5%	50000	0	10	29					
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23					
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23					
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23					
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23					
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23					
Dieldrin	UG/KG	70	26.1%	44	3	6	23					
Endosulfan I	UG/KG	2	8.7%	900	0	2	23					
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	130 UJ	130 UJ	160 J	130 UJ	130 UJ
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	91 J	200 J	1500 J	130 UJ	130 UJ
Tetryl	UG/KG	150	2.4%		0	1	42	130 UJ	130 UJ	130 UJ	130 UJ	130 UJ
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29					
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29					
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29					
Barium	MG/KG	202	96.6%	300	0	28	29					
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29					
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25					

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-52	SEAD-52	SEAD-52
							SAMP_DEPTH_TOP	0	0	0	0	0
							SAMP_DEPTH_BOT	0.2	0.2	0.2	0.2	0.2
							SAMP_DATE	12/16/93	12/16/93	12/16/93	12/16/93	12/16/93
							SAMP_ID	SS52-12	SS52-13	SS52-14	SS52-15	SS52-16
							LAB_ID	207156	207157	207158	207159	207160
							SDG	41316	41316	41316	41316	41316
							LOC_ID	SS52-12	SS52-13	SS52-14	SS52-15	SS52-16
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29					
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29					
Cobalt	MG/KG	15.7	96.6%	30	0	28	29					
Copper	MG/KG	191	96.6%	33	2	28	29					
Iron	MG/KG	31000	96.6%	36500	0	28	29					
Lead	MG/KG	522	96.3%	24.8	6	26	27					
Magnesium	MG/KG	29500	96.6%	21500	2	28	29					
Manganese	MG/KG	871	86.2%	1060	0	25	29					
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25					
Nickel	MG/KG	53.4	96.6%	49	1	28	29					
Potassium	MG/KG	3560	96.6%	2380	3	28	29					
Selenium	MG/KG	1.8	79.3%	2	0	23	29					
Sodium	MG/KG	164	41.4%	172	0	12	29					
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27					
Vanadium	MG/KG	36.7	96.6%	150	0	28	29					
Zinc	MG/KG	338	96.6%	110	9	28	29					
HERBICIDES												
2,4,5-T	UG/KG			1900								
Dicamba	UG/KG											
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
MATRIX								SOIL	SOIL	SOIL	SOIL	SOIL
AREA								SEAD-52	SEAD-52	SEAD-62	SEAD-62	SEAD-120B
SAMP_DEPTH_TOP								0	0	0	2	0.6
SAMP_DEPTH_BOT								0.2	0.2	0.5	2	1
SAMP_DATE								12/16/93	12/16/93	06/12/94	06/12/94	3/31/98
SAMP_ID								SS52-17	SS52-18	TP62-1-1	TP62-3-1	EB165
LAB_ID								207161	207162	224086	224089	EB165
SDG								41316	41316	44748	44748	EB165
LOC_ID								SS52-17	SS52-18	TP62-1	TP62-3	TP120B-1
QC_CODE								SA	SA	SA	SA	SA
VOLATILE ORGANICS												
Acetone	UG/KG	200	39.1%	200	0	9	23					
Chloroform	UG/KG	3	4.3%	300	0	1	23					
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23					
Toluene	UG/KG	11	8.7%	1500	0	2	23					
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23					
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23					
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23					
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23					
Anthracene	UG/KG	700	14.8%	50000	0	4	27					79 U
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23					
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23					
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23					
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23					
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23					
Carbazole	UG/KG	350	8.7%	50000	0	2	23					
Chrysene	UG/KG	1200	29.6%	400	1	8	27					4.9 J
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23					
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23					
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23					
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29			46 J	410 U	6.2 J
Fluorene	UG/KG	320	4.3%	50000	0	1	23					
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23					
Naphthalene	UG/KG	140	4.3%	13000	0	1	23					
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27					79 U
Pyrene	UG/KG	2700	34.5%	50000	0	10	29			47 J	410 U	5.5 J
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23					
ORGANOCHLORINE PESTICIDES												
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23					
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23					
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23					
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23					
Dieldrin	UG/KG	70	26.1%	44	3	6	23					
Endosulfan I	UG/KG	2	8.7%	900	0	2	23					
EXPLOSIVES												
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42	410 J	130 UJ			
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42	1800 J	2100 J			
Tetryl	UG/KG	150	2.4%		0	1	42	130 UJ	130 UJ			
METALS												
Aluminum	MG/KG	20800	96.6%	19300	1	28	29			14800	16100	13300
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29			0.35 UJ	0.2 UJ	1.1 UJ
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29			4.9	**8.4**	2.9
Barium	MG/KG	202	96.6%	300	0	28	29			147	202	105
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29			0.74 J	0.72 J	0.56
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25			0.43 J	0.68 J	

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL	SOIL	SOIL
							AREA	SEAD-52	SEAD-52	SEAD-62	SEAD-62	SEAD-120B
							SAMP_DEPTH_TOP	0	0	0	2	0.6
							SAMP_DEPTH_BOT	0.2	0.2	0.5	2	1
							SAMP_DATE	12/16/93	12/16/93	06/12/94	06/12/94	3/31/98
							SAMP_ID	SS52-17	SS52-18	TP62-1-1	TP62-3-1	EB165
							LAB_ID	207161	207162	224086	224089	EB165
							SDG	41316	41316	44748	44748	EB165
							LOC_ID	SS52-17	SS52-18	TP62-1	TP62-3	TP120B-1
							QC_CODE	SA	SA	SA	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29			10900	17400	20300
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29			28.8 J	23.6 J	19.7
Cobalt	MG/KG	15.7	96.6%	30	0	28	29			9.4 J	12.6	9.8
Copper	MG/KG	191	96.6%	33	2	28	29			22.8	28.7	**191**
Iron	MG/KG	31000	96.6%	36500	0	28	29			27500	30300	24100
Lead	MG/KG	522	96.3%	24.8	6	26	27					**289**
Magnesium	MG/KG	29500	96.6%	21500	2	28	29			4530	5340	6200
Manganese	MG/KG	871	86.2%	1060	0	25	29			323	778	448
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25			0.1 J	**0.11**	
Nickel	MG/KG	53.4	96.6%	49	1	28	29			26.2	26.5	29.9
Potassium	MG/KG	3560	96.6%	2380	3	28	29			1630 J	**2970** J	1630
Selenium	MG/KG	1.8	79.3%	2	0	23	29			1.3 J	0.99	1 UJ
Sodium	MG/KG	164	41.4%	172	0	12	29			37.8 J	164 J	90.4
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27					1.5 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29			25.3	33.1	21.2
Zinc	MG/KG	338	96.6%	110	9	28	29			**218**	**172**	83.5
HERBICIDES												
2,4,5-T	UG/KG			1900						10 J	6.3 J	
Dicamba	UG/KG									7.3 U	9.3 J	
Dichloroprop	UG/KG											
MCPP	UG/KG											

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	MATRIX: SOIL	SOIL	SOIL
							AREA: SEAD-120B	SEAD-120B	SEAD-120B	
							SAMP_DEPTH_TOP: 0.6	0.8	1	
							SAMP_DEPTH_BOT: 1	1	1.5	
							SAMP_DATE: 3/31/98	3/31/98	3/31/98	
							SAMP_ID: EB034	EB167	EB169	
							LAB_ID: EB034	EB167	EB169	
							SDG: EB034	EB167	EB169	
							LOC_ID: TP120B-1	TP120B-2	TP120B-3	
							QC_CODE: DU	SA	SA	
								Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS										
Acetone	UG/KG	200	39.1%	200	0	9	23			
Chloroform	UG/KG	3	4.3%	300	0	1	23			
Methyl ethyl ketone	UG/KG	28	4.3%	300	0	1	23			
Toluene	UG/KG	11	8.7%	1500	0	2	23			
Xylene (total)	UG/KG	12	8.7%	1200	0	2	23			
SEMIVOLATILE ORGANICS										
2-Methylnaphthalene	UG/KG	46	4.3%	36400	0	1	23			
4-Methylphenol	UG/KG	580	13.0%	900	0	3	23			
Acenaphthene	UG/KG	300	4.3%	50000	0	1	23			
Anthracene	UG/KG	700	14.8%	50000	0	4	27	NA	4.5 J	80 U
Benzo(a)anthracene	UG/KG	1200	26.1%	224	1	6	23			
Benzo(a)pyrene	UG/KG	1200	21.7%	61	3	5	23			
Benzo(b)fluoranthene	UG/KG	1000	21.7%	1100	0	5	23			
Benzo(g,h,i)perylene	UG/KG	730	13.0%	50000	0	3	23			
Benzo(k)fluoranthene	UG/KG	960	21.7%	1100	0	5	23			
Carbazole	UG/KG	350	8.7%	50000	0	2	23			
Chrysene	UG/KG	1200	29.6%	400	1	8	27	NA	5.3 J	80 U
Dibenz(a,h)anthracene	UG/KG	300	13.0%	14	3	3	23			
Dibenzofuran	UG/KG	170	4.3%	6200	0	1	23			
Di-n-butylphthalate	UG/KG	62	17.4%	8100	0	4	23			
Fluoranthene	UG/KG	3200	34.5%	50000	0	10	29	NA	6.9 J	80 U
Fluorene	UG/KG	320	4.3%	50000	0	1	23			
Indeno(1,2,3-cd)pyrene	UG/KG	660	21.7%	3200	0	5	23			
Naphthalene	UG/KG	140	4.3%	13000	0	1	23			
Phenanthrene	UG/KG	2600	25.9%	50000	0	7	27	NA	4.4 J	80 U
Pyrene	UG/KG	2700	34.5%	50000	0	10	29	NA	6.6 J	80 U
bis(2-Ethylhexyl)phthalate	UG/KG	2700	69.6%	50000	0	16	23			
ORGANOCHLORINE PESTICIDES										
4,4'-DDE	UG/KG	48	4.3%	2100	0	1	23			
4,4'-DDD	UG/KG	28	4.3%	2100	0	1	23			
4,4'-DDT	UG/KG	27	4.3%	2100	0	1	23			
alpha-Chlordane	UG/KG	2.4	4.3%	540	0	1	23			
Dieldrin	UG/KG	70	26.1%	44	3	6	23			
Endosulfan I	UG/KG	2	8.7%	900	0	2	23			
EXPLOSIVES										
2,4,6-Trinitrotoluene	UG/KG	410	7.1%		0	3	42			
2,4-Dinitrotoluene	UG/KG	2100	23.8%		0	10	42			
Tetryl	UG/KG	150	2.4%		0	1	42			
METALS										
Aluminum	MG/KG	20800	96.6%	19300	1	28	29	NA	15300	13400
Antimony	MG/KG	4.6	17.2%	5.9	0	5	29	NA	1.4 J	1.2 J
Arsenic	MG/KG	13.1	96.6%	8.2	2	28	29	NA	5.1	3.2
Barium	MG/KG	202	96.6%	300	0	28	29	NA	134	112
Beryllium	MG/KG	0.91	96.6%	1.1	0	28	29	NA	0.51	0.54
Cadmium	MG/KG	1.5	88.0%	2.3	0	22	25			

TABLE I-1
SHALLOW SOIL ANALYSIS RESULTS - PRISON SEADs, 43, 56, 69, 44A, 44B, 52, 62, 120B

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							MATRIX	SOIL	SOIL	SOIL
							AREA	SEAD-120B	SEAD-120B	SEAD-120B
							SAMP_DEPTH_TOP	0.6	0.8	1
							SAMP_DEPTH_BOT	1	1	1.5
							SAMP_DATE	3/31/98	3/31/98	3/31/98
							SAMP_ID	EB034	EB167	EB169
							LAB_ID	EB034	EB167	EB169
							SDG	EB034	EB167	EB169
							LOC_ID	TP120B-1	TP120B-2	TP120B-3
							QC_CODE	DU	SA	SA
CHEM_CLASS/PARAM	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTIONS	NUMBER OF ANALYSES	Value (Q)	Value (Q)	Value (Q)
Calcium	MG/KG	111000	96.6%	121000	0	28	29	NA	8020	28500
Chromium	MG/KG	28.8	96.6%	29.6	0	28	29	NA	21.9	19.6
Cobalt	MG/KG	15.7	96.6%	30	0	28	29	NA	12.2	9.6
Copper	MG/KG	191	96.6%	33	2	28	29	NA	**136**	33
Iron	MG/KG	31000	96.6%	36500	0	28	29	NA	27100	23100
Lead	MG/KG	522	96.3%	24.8	6	26	27	NA	**522**	**82.6**
Magnesium	MG/KG	29500	96.6%	21500	2	28	29	NA	5130	10300
Manganese	MG/KG	871	86.2%	1060	0	25	29	NA	871	474
Mercury	MG/KG	0.11	92.0%	0.1	1	23	25			
Nickel	MG/KG	53.4	96.6%	49	1	28	29	NA	32.1	29.3
Potassium	MG/KG	3560	96.6%	2380	3	28	29	NA	2270	1800
Selenium	MG/KG	1.8	79.3%	2	0	23	29	NA	1.2 J	1 UJ
Sodium	MG/KG	164	41.4%	172	0	12	29	NA	92.5	58.5 U
Thallium	MG/KG	2.9	3.7%	0.7	1	1	27	NA	**2.9**	1.5 U
Vanadium	MG/KG	36.7	96.6%	150	0	28	29	NA	25.7	22.6
Zinc	MG/KG	338	96.6%	110	9	28	29	NA	105	83.9
HERBICIDES										
2,4,5-T	UG/KG			1900						
Dicamba	UG/KG									
Dichloroprop	UG/KG									
MCPP	UG/KG									

TABLE I-3
CALCULATION OF SOIL HAZARD QUOTIENTS - PRISON SITES - MAMMALS
Completion Report - Mini Risk Assessment
Seneca Army Depot Activity

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Short-tailed Shrew Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Deer Mouse Hazard Quotient [3]	Short-tailed Shrew Hazard Quotient [3]
Volatile Organics					
Acetone	1.16E+00	3.85E-01	1.00E+01	1.2E-01	3.9E-02
Chloroform	6.44E-03	2.92E-02	1.50E+01	4.3E-04	1.9E-03
Methyl ethyl ketone	8.59E-02	3.98E-02	1.77E+02	4.8E-04	2.2E-04
Toluene	8.78E-02	4.53E-01	2.60E+01	3.4E-03	1.7E-02
Total Xylenes	8.56E-03	4.11E-02	2.10E+00	4.1E-03	2.0E-02
Semivolatile Organics					
2-Methylnaphthalene	2.71E-03	9.18E-03	7.16E+00	3.8E-04	1.3E-03
4-Methylphenol	2.49E-01	3.84E-01	2.19E+02	1.1E-03	1.8E-03
Acenaphthene	1.92E-02	6.03E-02	1.75E+00	1.1E-02	3.4E-02
Anthracene	1.48E-02	2.26E-02	1.00E+02	1.5E-04	2.3E-04
Benzo(a)anthracene	2.34E-02	8.58E-02	1.00E+00	2.3E-02	8.6E-02
Benzo(a)pyrene	7.21E-01	3.11E+00	1.00E+00	7.2E-01	3.1E+00
Benzo(b)fluoranthene	3.96E-02	1.82E-01	1.00E+00	4.0E-02	1.8E-01
Benzo(ghi)perylene	2.24E-02	9.96E-02	1.00E+00	2.2E-02	1.0E-01
Benzo(k)fluoranthene	3.09E-02	1.38E-01	1.00E+00	3.1E-02	1.4E-01
Carbazole	4.39E+00	2.29E+01	none available	--	--
Chrysene	3.08E-02	1.20E-01	1.00E+00	3.1E-02	1.2E-01
Di-n-butylphthalate	1.70E-03	4.58E-03	5.50E+02	3.1E-06	8.3E-06
Dibenz(a,h)anthracene	7.25E-03	2.99E-02	1.00E+00	7.3E-03	3.0E-02
Dibenzofuran	2.19E-02	9.74E-02	no data	--	--
Fluoranthene	3.01E-01	1.44E+00	1.25E+00	2.4E-01	1.2E+00
Fluorene	1.84E-02	6.37E-02	1.25E+00	1.5E-02	5.1E-02
Indeno(1,2,3-cd)pyrene	3.29E-02	1.57E-01	1.00E+00	3.3E-02	1.6E-01
Naphthalene	1.25E-02	2.92E-02	7.16E+00	1.7E-03	4.1E-03
Phenanthrene	7.44E-02	1.89E-01	1.00E+00	7.4E-02	1.9E-01
Pyrene	5.16E-02	1.45E-01	1.00E+00	5.2E-02	1.4E-01
bis(2-Ethylhexyl)phthalate	3.51E+00	1.84E+01	1.83E+01	1.9E-01	1.0E+00
Pesticides/PCBs					
4,4'-DDD	4.66E-04	1.60E-03	8.00E-01	5.8E-04	2.0E-03
4,4'-DDE	4.34E-04	7.09E-04	8.00E-01	5.4E-04	8.9E-04
4,4'-DDT	4.40E-04	1.54E-03	8.00E-01	5.5E-04	1.9E-03
Dieldrin	1.57E-03	2.14E-03	2.00E-02	7.9E-02	1.1E-01
Endosulfan I	1.37E-04	3.06E-04	none available	--	--
alpha-Chlordane	7.65E-05	3.28E-04	none available	--	--
Nitroaromatics					
2,4-Dinitrotoluene	4.79E-01	1.39E-01	1.50E-01	3.2E+00	9.3E-01
2,4,6-Trinitrotoluene	1.39E-01	4.05E-02	7.50E-01	1.8E-01	5.4E-02
Tetryl	3.31E-02	9.00E-02	none avavilable	--	--
Metals					
Cadmium	2.79E-02	2.36E-02	1.00E+00	2.8E-02	2.4E-02
Copper	1.66E+01	7.45E+01	1.40E+00	1.2E+01	5.3E+01
Lead	1.21E+02	6.23E+02	8.00E+00	1.5E+01	7.8E+01
Potassium	4.77E+02	2.04E+03	none available	--	--
Selenium	1.22E+00	5.18E+00	2.00E-01	6.1E+00	2.6E+01
Zinc	3.73E+02	1.90E+03	1.60E+02	2.3E+00	1.2E+01
Herbicides					
2,4,5-T	2.26E-02	6.68E-03	1.00E+00	2.3E-02	6.7E-03
Dicamba	2.43E-02	7.19E-03	2.50E+01	9.7E-04	2.9E-04
Dichloroprop	1.59E-02	4.32E-02	none available	--	--
MCPP	1.56E+00	4.26E+00	9.00E-02	1.7E+01	4.7E+01

(1) Receptor exposure from Table G-17
(2) Toxicity reference value from Table 3 6-4
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10 small potential for effects
10 < HQ =< 100 potential for greater exposure to result in effects, and
HQ > 100 highest potential for effects
(4) -- no HQ could be calculated as no toxicity data could be found

TABLE I-4
CALCULATION OF SOIL HAZARD QUOTIENTS - PRISON SITES - BIRD
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Constituent	American Robin Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	American Robin Hazard Quotient [3]
Volatile Organics			
Acetone	2.99E+00	6.10E+02	4.9E-03
Chloroform	2.05E-02	none available	--
Methyl ethyl ketone	2.24E-01	none available	--
Toluene	2.86E-01	none available	--
Total Xylenes	2.81E-02	3.06E+02	9.2E-05
Semivolatile Organics			
2-Methylnaphthalene	1.10E-02	2.85E+01	3.9E-04
4-Methylphenol	7.17E-01	2.06E-01	3.5E+00
Acenaphthene	7.55E-02	1.00E+03	7.6E-05
Anthracene	8.38E-02	1.00E+03	8.4E-05
Benzo(a)anthracene	1.46E-01	4.00E+01	3.6E-03
Benzo(a)pyrene	2.33E+00	4.00E+01	5.8E-02
Benzo(b)fluoranthene	1.88E-01	4.00E+01	4.7E-03
Benzo(ghi)perylene	1.16E-01	4.00E+01	2.9E-03
Benzo(k)fluoranthene	1.57E-01	4.00E+01	3.9E-03
Carbazole	1.43E+01	none available	--
Chrysene	1.69E-01	4.00E+01	4.2E-03
Di-n-butylphthalate	8.78E-03	1.10E-01	8.0E-02
Dibenz(a,h)anthracene	4.11E-02	4.00E+01	1.0E-03
Dibenzofuran	7.94E-02	2.18E-01	3.6E-01
Fluoranthene	1.16E+00	4.00E+01	2.9E-02
Fluorene	7.51E-02	2.85E+01	2.6E-03
Indeno(1,2,3-cd)pyrene	1.46E-01	4.00E+01	3.6E-03
Naphthalene	4.43E-02	2.85E+01	1.6E-03
Phenanthrene	3.75E-01	2.85E+01	1.3E-02
Pyrene	3.18E-01	4.00E+01	7.9E-03
bis(2-Ethylhexyl)phthalate	1.16E+01	1.10E+00	1.1E+01
Pesticides/PCBs			
4,4'-DDD	3.14E-03	5.60E-02	5.6E-02
4,4'-DDE	4.17E-03	5.60E-02	7.4E-02
4,4'-DDT	3.00E-03	5.60E-02	5.4E-02
Dieldrin	8.60E-03	7.70E-02	1.1E-01
Endosulfan I	5.13E-04	1.00E+00	5.1E-04
alpha-Chlordane	3.88E-04	2.14E+00	1.8E-04
Nitroaromatics			
Tetryl	1.05E-01	none available	--
2,4,6-Trinitrotoluene	3.81E-01	none available	--
2,4-Dinitrotoluene	1.36E+00	none available	--
Metals			
Cadmium	1.67E-01	1.45E+00	1.1E-01
Copper	6.41E+01	4.70E+01	1.4E+00
Lead	4.25E+02	3.85E+00	1.1E+02
Potassium	1.71E+03	none available	--
Selenium	3.92E+00	4.00E-01	9.8E+00
Zinc	1.23E+03	1.45E+01	8.5E+01
Herbicides			
2,4,5-T	5.87E-02	none available	--
Dicamba	6.31E-02	none available	--
Dichloroprop	5.06E-02	none available	--
MCPP	4.99E+00	none available	--

(1) Receptor exposure from Table G-17
(2) Toxicity reference value from Table 3.6-5.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- no HQ could be calculated, as no toxicity data could be found

APPENDIX J
RESPONSE TO COMMENTS

RESPONSE TO COMMENTS
from
United States Environmental Protection Agency
Region 2
290 Broadway
New York, NY 10007-1866
Comments Dated July 30, 1999

Draft Completion Report for Six Areas of Concern – SEADs (43,56,69), 44A, 44B, 52, 62, and 120B
Seneca Army Depot Activity, Romulus, New York
February 5, 1999

Date of Comment Response: December 10, 1999

As we discussed during our May 19, 1999 BCT meeting, this document should not be called a "Completion Report". Any determination that no further action is appropriate at any of the above referenced areas will be based on a number of sources, but not solely on the risk assessments presented in this report. Other pertinent information is included in previous Site Investigation (SI) Reports, in the *U.S. Department of Defense Base Realignment and Closure Ordnance and Explosives Archives Search Report Seneca Army Depot, Romulus, Seneca County, New York* dated December 1998 prepared by the U.S. Army Corps of Engineers (USACE), St. Louis District, in upcoming results of further action/investigations for ordnance and explosives determined to be necessary by the St. Louis USACE, and any other relevant information provided by the Army. Risk Assessment Report for Six Areas of Concern – SEADs (43, 56, 69), 44A, 44B, 52, 62, and 120B would be the most appropriate title for the document referenced above.

All references to the Completion Report, Federal Facility Agreement (FFA) or Interagency Agreement (IAG) throughout the document should be eliminated.

Response: Disagree. The goal of this effort has been to render a decision and to identify a proposed course of action for these sites, regarding threats from chemical contamination. Section 10.6a of the Federal Facilities Agreement (FFA) states, "For those AOCs which the Army asserts...(c) pose no threat to public health, welfare, or the environment, the Army shall prepare a Completion Report with certification and documentation to establish that such AOCs do not constitute a threat to public health, welfare, or the environment and that further remedial measures are not necessary." We believe these sites fall within the requirements described in the FFA. This document has considered all available previous investigations related to the historical uses and chemical contamination at these sites. There is no evidence of a chemical release and therefore, the mini-risk assessment was performed to support the decisions that were made regarding the no further action determination.

With respect to Ordnance and Explosives (OE) /Unexploded Ordnance (UXO) concerns, the referenced Archive Search report and subsequent characterization sampling has shown that only SEAD-44A has an OE/UXO potential. A removal will be completed in the spring/summer of 2000 and the site condition summarized in a formal OE removal report. SEAD-44A will not be

transferred until after the removal is complete. However, none of the remaining sites are affected by concern for OE/UXO.

The Army's goals, and that of BRAC, is to render opinions on the sites so that it can reuse the property, transfer the property, or perform additional remedial actions. Sites that pose no threat should be eliminated from further concern so that the Army can focus its efforts on the sites that do. Coming to completion on a site does not mean that the Army will relinquish all future responsibility for the site. The Department of Defense policy, titled Responsibility for Additional Environmental Cleanup after Transfer of Real Property, outlines the circumstances under which DoD would return to do additional cleanup. These circumstances include when "...the selected remedy is no longer protective of human health and the environment because the remedy failed to perform as expected, or because an institutional control has proven to be ineffective, or because there has been a subsequent discovery of additional contamination attributable to DoD activities." A provision for the modification of final documents based on new information has also been included in section 17.10 of the FFA.

We do not believe that all references to the Federal Facility Agreement or Interagency Agreement should be deleted, as these are the documents that govern the investigation and reporting of all sites at the Depot.

EXECUTIVE SUMMARY

Page iii; With regard to chemical contamination, EPA agrees with the conclusions that the six areas pose no threat to human health or the environment for the intended future uses of the areas. However, this is not based solely on the risk assessments presented in this document. SEAD-62 and SEAD-44B are designated for prison construction use and SEADs-(43,56, 69), SEAD-44A, SEAD-52 and SEAD-120B are in the planned buffer zone (which EPA considers the future use to be wildlife conservation) between the prison and the adjacent land use areas. As we informed you previously, a drinking water restriction may be necessary at SEAD-62, due to the state and federal drinking water standards which have been exceeded at this area. We also discussed that a groundwater pathway analysis was not performed for SEAD-44B with the Risk Assessment, which may necessitate a drinking water restriction, in addition to the state and federal drinking water standards which have been exceeded.

Response: Agree. We also agree with the conclusions that the six areas pose no threat to human health or the environment for the intended future uses of the areas. However, we disagree with the assumption that the buffer zone areas will be used as wildlife conservation. This land was purchased for the purpose of future development or expansion of the prison. Wildlife will not be promoted in this parcel and in fact, as stated in the New York State Environmental Impact Statement, wildlife will actually be removed.

We do not feel a groundwater restriction will be necessary at SEAD-62. The groundwater pathway at SEAD-62 is not a realistic pathway for human exposure. It was evaluated in this risk assessment for completeness only. The aquifer at this site is of poor quality and would not be used for human consumption. For this reason, the prison is constructing potable water lines from

the municipal system. The site will be controlled as a prison, therefore the installation of wells and use of the groundwater would not go unnoticed.

We also do not feel a groundwater restriction will be necessary at SEAD-44B. A groundwater pathway analysis was performed for the SEAD-44B risk assessment. The detected chemicals were compared to background levels and all were eliminated except magnesium. Magnesium does not have toxicity values for the ingestion and dermal contact of groundwater therefore, risk could not be quantified. SEAD-44B groundwater only exceeds the New York State Class GA criteria for iron. As mentioned above, the groundwater pathway is not a realistic pathway for human exposure due to the poor quality of the aquifer, the construction of potable water lines from the municipal system for prison use, and the control of the prison over the activities at the site. In addition, the groundwater samples which exceed criteria for iron have elevated turbidities. Since iron is a naturally occurring compound in soil, it is likely that these iron levels would decrease in less turbid groundwater samples.

The last sentence should be deleted. Future action could be necessary based on issues other than chemical contamination of soil, groundwater or sediment.

Response: The analysis presented in this document is based on past activities at these specific sites and the current and future impact of these activities to public health, welfare, and the environment. We consider the analysis to be valid and conservative and consistent with others performed at the Depot. We also believe the analysis to be in line with the requirements of CERCLA and the FFA. It is unclear as to what "other" issues this comment is referring, but they are not addressed by the scope of this document. The text has been modified to clarify the last sentence of the Executive Summary.

Pages iv through vii are the concurrence pages for this document and should be deleted.

Response: Agreed. These pages will be removed.

5.0 Mini-Risk Assessments

Page 5-1 - The Decision Criteria Document dated March 1998, was commented on by EPA with our July 14, 1998 letter, the Army should have addressed our comments and published a revised document.

Response: Disagree. The responses to comments on the Decision Criteria Document were included in the cover letter for the Draft Completion Report for Six Areas of Concern. A revised document was not published because the proposed process was not supported by the regulatory agencies (see NYSDEC comments, October 21, 1997 "The NYSDEC, under the CERCLA program, does not recognize the use of RBC's in setting remedial goals for contaminated areas...The use of USEPA's Region 3 RBCs has been proposed by other USDOD facilities in New York, but the NYSDEC has rejected this notion."). The process as outlined in the Decision Criteria Document was therefore, not used. Instead, as recommended, a site specific screening or "mini" risk assessment was performed and included in the Completion Report for Six AOCs. All of the applicable comments from the decision criteria document have been incorporated into the screening risk assessments for the Completion Report.

6.0 Response Action

All sections in Chapter 6 entitled *Response Action* should be deleted. Further action could be necessary based on issues other than chemical contamination of soil, groundwater or sediment.

Response: Disagree. The purpose of this document is to reach a conclusion as to whether remedial action is necessary based on the past activities the Army has conducted at these specific sites. This purpose is consistent with the requirements of the Federal Facilities Agreement Section 10.6a which states "For those AOCs which the Army asserts...(c) pose no threat to public health, welfare, or the environment, the Army shall prepare a Completion Report with certification and documentation to establish that such AOCs do not constitute a threat to public health, welfare, or the environment and that further remedial measures are not necessary." Based on the conservative analysis provided within this document and on the analysis of previous studies at these sites, the Army believes that these sites pose no threat to public health, welfare, or the environment and that there is no need for further remedial action. The text in Section 6 has been modified for clarification.

ECOLOGICAL RISK

General Comments

Several of the EPA's previous comments on the *Proposed Decision Criteria Document* from July 1998 still apply to this assessment including Specific Comments 5 and 9 on HI values above one and the absence of a higher trophic level receptor.

In a screening level ecological risk assessment, the proper procedure is to use assumptions that will consistently be biased in the direction of overestimating risks. This ensures that sites that might pose an ecological risk are studied further. Several procedures were used in this mini ecological risk assessment to underestimate potential risks including the use of soil samples from a depth of 0 to 2 inches, the deer mouse receptor, and LOAELs instead of NOAELs.

For ecological risk assessments, ERAGS defines potential ecological risk as a hazard quotient and/or index of one or greater. All references in the text concerning HQs above one as acceptable ecological risks should be removed (e.g., "an HQ of less than 10 was considered acceptable")

Response: Disagree. The screening ecological risk assessment is designed to overestimate risk and we do not believe that we have been under conservative. It is important to note that all wildlife, including mice and shrew, will be removed from these areas due to their future use as a prison facility.

Only compounds with HQs less than 1 will be considered categorically acceptable in terms of ecological risk. Compounds with higher HQs will be addressed individually in the Ecological Risk Characterization section (Section 5.6.4).

Potential exposures to predatory birds have been determined to be small, since the foraging area for a predatory bird is much greater than the area of any of the AOCs. Therefore, most of the bird's diet would be derived from areas other than any of the AOCs. This point will be discussed in the revised text.

Sample depths down to 2 feet below surface will be used to characterize the ecological risk associated with the current land use at the six AOCs.

The ecological risk assessment will be revised to include the short-tailed shrew as a receptor.

NOAELs will be used as recommended in the ERAGs guidance. If the NOAEL is not available, a LOAEL will be used multiplied by 0.1.

Specific Comments:

1. **Page ii., 2nd and 3rd Paragraph: See General comments above concerning definitions of HQs above one.**

   Response:- Comment noted. See General Comments section.

2. **Page 1-6**
   a) **1st Paragraph, 6th sentence: CERCLA requires the preparation of a baseline risk assessment for all NPL sites. Comparison of site concentrations to background or appropriate State and/or Federal criteria does not constitute an appropriate risk assessment for CERCLA purposes.**

   Response: Disagree. This paragraph will be modified for clarification. As stated in Section 10.6a of the Federal Facilities Agreement (FFA), "For those AOCs which the Army asserts...(c) pose no threat to public health, welfare, or the environment, the Army shall prepare a Completion Report with certification and documentation to establish that such AOCs do not constitute a threat to public health, welfare, or the environment and that further remedial measures are not necessary." At this phase in the process, site concentrations are first compared to State and/or Federal criteria. If these criteria are exceeded, a screening risk assessment will be performed to quantify the threat for the site specific exposure conditions. These two screening tools will determine whether there exists a threat to public health, welfare, or the environment and accomplish the goals as described in the FFA.

   Comparison of site concentrations to background for use in the risk assessment is a practice suggested by Risk Assessment Guidance for Superfund (RAGS), Volume I, Part A in Section 5.7 "...a comparison of sample concentrations with background concentrations is useful for identifying the non-site-related chemicals that are found at or near the site...If organic chemicals are present at the site at naturally occurring levels, they may be eliminated from the quantitative risk assessment." The excess risk at the site, which is above and beyond risks encountered by background concentrations, is what the Army will be responsible for remediating.

b) 3rd Paragraph, 5th sentence – this sentence only discusses the results of the human health mini risk assessment. There should be a discussion of the mini ecological risk assessment also.

Response: Agreed. The sentence will be changed as follows (italics denote changes):

"If the results of the *human health* mini-risk assessment indicate acceptable risk, i.e. carcinogenic risks are less than 1E-04 or the HI is less than 1, then the site conditions meet the requirements for no further action. *Likewise, if the results of the ecological mini-risk assessment indicate acceptable risk, i.e. the HQs are less than 1, or ecological risk is deemed to be small based on weight-of-evidence considerations, then the site conditions meet the requirements for no further action.*

3. Table 1.1-2: There should be a column added to this table that indicates the maximum inorganic concentration that was found in the six AOCs for this report

Response: Agreed. A column indicating the maximum concentration of each contaminant in the six AOCs will be added.

4. Page 4-1:

a) 2nd paragraph – TAGM values are only applicable for human health purposes and cannot be used to determine if site conditions warrant further action for ecological purposes.

Response: Agreed. The second sentence of the second paragraph will be changed as follows (italics denote changes):

This document provides criteria for soil clean-up levels *based on risks to human health.*

b) Last two paragraphs – Site concentrations should be compared to the most stringent of the state and federal groundwater and surface water criteria.

Response: The most stringent values from the NYSDEC Ambient Water Quality Class GA (groundwater) and Class C (surface water) Standards and Guidelines were compared to site concentrations.

5. Page 4-2,

a) 1st Paragraph, 2nd sentence- Site specific hardness values should be used to calculate the applicable NYSDEC surface water criteria.

Response: There were no site specific hardness values available for any of the six AOCs discussed in the Completion Report. Data from two sites upstream of the six AOCs were used to calculate a SEDA wide average for surface water hardness, as these data were believed to be representative of hardness across the site.

b) 2nd paragraph- Site concentrations should be compared to the most stringent of the state and federal sediment criteria.

Response: Criteria for sediment concentrations were obtained from the NYSDEC Bureau of Environmental Protection, Division of Fish and Wildlife. For each parameter investigated, the most stringent of three listed values, those for wildlife, human health, and aquatic life, was chosen as the criteria to be compared with site sediment concentrations.

6. **Page 5-82,**
   a) **1st paragraph – See General Comments section for comments on unacceptable HQ values.**

   Response: Agreed. See response to Specific Comment No. 1.

   b) **Section 5.6.2.2, 3rd Paragraph, last sentence – The perimeter fence will also not exclude predatory birds from the prison area.**

   Response: Agreed. The sentence will be changed as follows (italics denote changes):

   "The perimeter fence will not exclude mice, voles, shrews, *or predatory birds*."

7. **Page 5-83, Section 5.6.2.3, 1st Paragraph – The document referred to here is now final with a June 1997 date. This document should be used and referenced.**

   Response: Agreed. The citation will be changed to "Interim Final Ecological Risk Assessment Guidance for Superfund (ERAGs), USEPA, June 1997."

8. **Page 5-84, last Paragraph, last sentence – The mouse is used to represent the small mammal receptors at the site. Therefore, the assessment endpoint should be protection of the small mammal population.**

   Response: Agreed. The sentence will be changed as follows (italics denote changes):

   "Accordingly, the assessment endpoint that has been selected to represent the policy goal of protection of terrestrial populations and ecosystems is 'no substantial adverse effect on survival, growth, and reproduction of *small mammal populations*.'"

9. **Page 5-86, Section 5.6.2.3.1 – A more conservative ecological receptor choice would have been the short tailed shrew using a conservative assumption of a diet, composed of 100% soil invertebrates. This ecological assessment should have also included a predatory bird species to determine if any chemicals were bioaccumulating and causing potential ecological risks.**

   Response: Disagree. Fostering the small mammal population is inconsistent with the future use of the land, however, the ecological risk assessment will be revised to include the short-tailed shrew as a receptor. Potential exposures to predatory birds have been determined to be small, since the foraging area for a predatory bird is much greater than the area of any of the AOCs. Therefore, most of the bird's diet would be derived from areas other than any of the AOCs. This point will be discussed in the revised text.

10. **Page 5-90, Section 5.6.2.4.1 – Page 1-10 of the ERAGS guidance recommends that a NOAEL (No Observed Adverse Effects Level) be used in a screening level ecological risk assessment to ensure that the risk is not underestimated. If a NOAEL is not available, a LOAEL can be used multiplied by 0.1.**

    Response: Agreed. The ERAGs guidance will be used as described in the comment.

11. **Page 5-92, 1st Paragraph, 1st complete sentence – See General comments section above for comment on unacceptable HQs values.**

    Response: See response to Specific Comment No. 1. This section will be revised accordingly.

12. **Page 5-93, Section 5.6.3.2., 1st Paragraph, second to last sentence: - Since predatory species could receive their most significant exposures of chemicals through their prey, a higher trophic level species should have been evaluated.**

    Response: Disagree. See response to Specific Comment No. 9.

13. **Page 5-105,**
    a) **1st Paragraph – See General Comments section above for comment on unacceptable HQ values.**

    Response: See response to Specific Comment No. 1. This section will be revised accordingly.

    b) **2nd Paragraph, 2nd sentence – USEPA Region II biological Technical Assistance Group recommends the use of soil sample depths up to 2 feet below surface as the applicable depth that a terrestrial receptor could come into contact with.**

    Response: Agreed. Sample depths down to 2 feet below surface will be used to characterize the ecological risk associated with the current land use at the six AOCs.

HUMAN HEALTH RISK

General Comments

The human health "mini" risk assessments performed for each of the six subsites, for the most part, adhere to the appropriate Superfund risk assessment guidance. However, there is a general concern regarding the extent of characterization of these subsites. For example, SEADs 44B, 62 and 120B have 6 or fewer soil samples. In addition, the report has screened out inorganic contaminants of concern (in soil and groundwater) based on a statistical comparison with background concentrations. Often an inadequate background data set precludes a statistical comparison with site sampling data; however, in this case

it's the site related sample size rather than the background sampling set that is of questionable size. So, while the report indicates that many inorganics were screened out because there was no statistical difference between the site and background sample populations, it should also be noted that the statistical test employed (Wilcox Rank Sum Test) had limited power to "detect" a difference in the two populations because of the limited sampling size of the site-related contaminants.

Response: Initially, data from the six AOCs were combined for comparison with the background data, an approach that was deemed valid given the proximity of the six sites to one another and the limited number of samples collected at some of the AOCs. Table 5.2-2 shows the number of samples contained in each set of data used in the statistical comparison. In the case of each contaminant, the number of site samples used in the statistical comparison was actually larger than the number of background samples. Once possible contaminants were determined to be above or below background values using the Wilcoxon Rank Sum Test, human health risk was calculated where necessary. For compounds designated as contaminants of potential concern (COPCs), a separate value for human health risk was calculated at each SEAD area. The maximum concentration of the COPC in each separate SEAD area was used in this calculation.

Specific Comments

Table 5.2.3 Barium was screened out as groundwater contaminant of concern (see discussion above), but was detected at a maximum concentration of 69ug/l – the MCL is 2 ug/dl.

Response: Disagree. Barium was screened out as a groundwater contaminant of concern because the mean of 69.94 ug/L for the samples from the six AOCs was less than the mean of 75.13 ug/L for the background samples. The maximum concentrations of barium in the site dataset and the background dataset were 117 and 337 ug/L, respectively. The MCL for barium is actually 2 mg/L (2,000 ug/L), not 2 ug/dl. Therefore all of the site and background groundwater concentrations are well below the MCL for barium.

Figure 5.3.5 The Completion Report does not include a groundwater pathway for SEADs 52 and 120B.

Response: Groundwater was not included as a pathway in Figures 5.3.5 or 5.3.7 because no groundwater data was available in either SEAD 52 or 120B.

Table 5.3.1 The text uses a drinking water ingestion rate of 2 liters a day for the occupational scenario. ""Standard Default Exposure Factors""(OSWER 9285.6-03;3/91) recommends 1 liter a day. This substitution has no practical impact on the results of the risk assessment.

Response: Agreed. The current calculation of drinking water ingestion by workers overestimates risk. Future risk assessments of this pathway will assume drinking water ingestion of 1 liter/day.

Page 5-73: The application of the Uptake/Biokinetic Lead Model for Children assumes that no soil/dust lead exposure occurs during the weekend when children would not be at daycare. This scenario may reasonable represent the site contribution to lead exposure but may underestimate "true" exposure. Including weekend soil exposure would marginally lower the acceptable soil Pb level for the site to approximately 400 ppm, but would not significantly alter the conclusion of the lead risk assessment for the site.

Response: Disagree. Exposure to lead at home for children attending the day care center is unknown. However, on the 5 days that the child attends the day care center, our model assumes that the child's entire soil/dust intake is derived from soil at SEDA. In reality, on those days, the child might have some soil/dust exposure at home. If the soil at the SEDA sites has higher lead content than at a child's home, then our model overestimates exposure and risk. Unfortunately, the IEUBK model does not readily accommodate exposure to multiple soil/dust sources over the course of each day. Since the focus of this assessment is exposure/risk from the SEDA sites, we conservatively estimated that, on the five days/week of day care center attendance, the child's entire soil/dust exposure occurs at the center. While this approach does not include a conservatively high background exposure at home on the weekend (because the IEUBK model can't do this), we believe our daily overestimate of soil/dust exposure at the day care center is reasonable compensation, and results in a reasonably conservative estimate of risk.

RESPONSE TO COMMENTS
From
New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action Room 242
50 Wolf Road, Allbany, New York 12233-7010
Comments dated April 26,1999

Draft Completion Report for Six AOCs - SEADs (43,56,69), 44A, 44B, 52, 62, and 120B
Seneca Army Depot Activity, Romulus, New York
Site ID No. 850006
February 5, 1999

Date of Comment Reponse: December 10, 1999

The New York State Departments of Health (NYDOH) and Environmental Conservation (NYSDEC) have reviewed the Draft Completion Report for Six Areas of Concern, SEADs- (43,56,69), 44A, 44B, 52, 62, and 120B, and offer the following comments. These six areas are all within the 710 acre parcel of land planned for transfer to the New York State Department of Correctional Services (DOCS) for use as a Maximum Security Correctional Facility. (Please note that your transmittal letter for the Completion Report which contains a Response to Comments section, incorrectly identifies an excerpt from a October 21, 1997 letter written by Mr. Marsden Chen of the NYSDEC as comments received from NYSDEC on the March 1998 proposed decision criteria document developed by SEDA.)

Response: Agreed. While it is true that these comments are not in response to the decision criteria document, it does address several of the issues contained in that document.

1. **A discussion of SEAD-64C and SEAD-60 are not included in the Draft Closure Report, although these areas are also inside the boundary of the proposed prison parcel. In response to a query, SEDA explained that all agencies had previously agreed that the data generated during the ESI indicated SEAD 64C should not be considered a site; responsibility for the remediaton of SEAD-60 has been transferred to the NYSDEC regional Spill Response program. NYSDEC suggests that SEAD-64C and SEAD-60 be piggybacked on discussions of closure for these identified six areas so that they may also be clearly terminated as Areas of Concern.**

   Response: SEAD-64C has been included in the Decision Document - Mini Risk Assessments and SEAD-60 has been included in the Decision Document for Twenty-Six No Further Action Sites. Inclusion in these two documents will also allow these 2 sites to be clearly terminated as Areas of Concern.

2. **The Interagency Agreement requires that the Closure Report also include a certification from the Army (only) supporting its assertion that these sites pose no threat to public health, welfare, or the environment, and that further remedial measures are not necessary. The concurrence signature pages for the NYSDEC and the NYSDOH, Pages v and viii of the report, should be removed. The other two signature pages should, at least, be modified so that neither the Army nor the USEPA signs declarations of the State's position on concurrence.**

   Response: Agreed. These pages have been removed.

3. **Section 4.4.1.1 of the September 1993 final Work Plan for CERCLA Investigation of Fifteen Solid Waste Management Units describes an area outside Building 606 with an open excavation roped off for deferred cleanup under the CERCLA cleanup process. Section - 4.4.4.2 of the work plan states that 2 sludge/liquid samples will be collected from the buried tank which was believed to be a septic tank for Building 606. The discussion on SEAD (43, 56, 69) should address these items. Please discuss SEDA's plans to abandon and notify subsequent owners of any underground tanks in this area before property transfer.**

   Response: Section 1.1.2.1 of the Completion Report states that the concrete underground tank, located near Building 606 and used for the intermittent storage of wastewater, was removed in 1989 and replaced with a new tank to comply with underground tank regulations. The tank was pumped out and the contents were sent to a POTW. The tank is currently empty.

4. **The Army Corp of Engineers has recommended that SEAD-43 and SEAD-44A undergo further investigation for the presence of unexploded ordnance (UXO). When will the UXO investigation/clearance be conducted? If prison construction begins before UXO clearance is completed, what measures will be taken to prevent construction workers from entering these potentially hazardous areas? Please forward to the NYSDEC, for completion of its files, a work plan and the results from these UXO investigations as soon as they are available.**

   Response: Characterization sampling for UXO has occurred at both sites. SEAD-43 has been dropped from consideration since nothing has been detected. This site will be wrapped up in the Installation-Wide OE EE/CA that is being performed. A removal at SEAD-44A will begin in the March-April timeframe and is scheduled to be done by the summer. The results of this work will be presented in a formal removal report.

   The areas that require UXO clearance have been isolated and secured from all construction activities. Access is prohibited. The UXO investigation is being performed by a specialty contractor and is not part of this contract. A schedule and work plan will be provided under separate cover for that effort.

   The UXO work will be completed prior to the transfer of this property.

5. **It is our understanding that SEDA staff are conducting a radiological survey of Building 612 (SEAD 52) due to the historical presence of depleted uranium ammunition in this building. As discussed at the February BCT meeting, the NYSDOH will need to review the methodology and results of the survey and conduct its own confirmatory survey before this building is put into re-use.**

   Response: The radiological survey of Building 612 (SEAD-52) was conducted in the spring of 1999. The NYSDOH made one site visit after the survey was completed. The report for this investigation has been prepared and provided under separate cover to the NYSDOH. Data from this survey was compared to guidelines agreed upon by the regulatory agencies for the other radiological surveys at the Depot. No values from Building 612 equaled or exceeded those guidelines.

6. **The proposition that an ecological hazard quotient of less than 10 should be considered acceptable (protective of ecological receptor) is not adequately supported. Screening is done at a hazard quotient level of 1; raising the screening level to 10 appears arbitrary. The report notes that use of the maximum detected value of contaminants in the assessment rather than**

the 95% UCL of the mean is to compensate for the uncertainties associated with evaluating a site with the smaller ESI database. It is not appropriate to negate this compensation by citing it as a reason to utilize a less conservative risk screening level.

Response: Agreed. Only compounds with HQs less than 1 will be considered categorically acceptable in terms of ecological risk. Compounds with higher HQs will be addressed individually in the Ecological Risk Characterization section (Section 5.6.4).

Response to Comments From United States Environmental Protection Agency

Subject: Draft Final Completion Report for Six Areas of Concern: SEADs (43, 56, 63), 55A, 44B, 52, 62, 120B, Seneca Army Depot, Romulus, New York, December 10, 1999

Comments Dated: February 12, 2001

Date of Comment Response: April 30, 2001

USEPA Comments:

Comment: ***Executive Summary, page iii***
Any planned buffer zones between the prison and the adjacent land use areas that are or become vegetated could serve, and need to be considered and evaluated, as a habitat for wildlife. Even though the Army states that wildlife will not be promoted in this area, there is no way to effectively deter small mammals and birds from these vegetated areas. The USEPA does not believe that wildlife can be permanently excluded from the buffer areas since mammals can reenter through and over chain link fences and birds can fly over them.

Response: The Army has made no comment in the Executive Summary about the future occupation of the proposed prison area by ecological receptors. The Army does presume that the area actually developed for the prison and its associated infrastructure (parking lots, access road, cleared area, etc.) will become less desirable habitats for ecological receptors, but it is likely that some residual population of small mammals and birds will remain in the area, especially where development is not conducted. Thus, the ecological risk assessment conducted and described in the Completion Report reflects this by evaluating potential impacts to two small mammals (deer mouse and short-tailed shrew) and a predatory bird (robin added since draft final issued).

The Army wishes to note that the "prison" parcel encompasses approximately 700 acres of land that will be turned over to the State. The eight Areas of Concern (AOCs) discussed in this report account for 128 acres of this land, or less than 20 percent of the entire "prison" site. However, based on agreements with the US EPA and the NYSDEC, these eight AOCs have been subject to site investigations because they are known to have been the locations of historic military or industrial activities. Because of the historic use, there is a higher likelihood that chemical materials were present in these areas and possibly released to the environment. Thus, data used in the risk assessment calculations for both human health and ecological populations is biased towards the worst case scenario, i.e., chemicals are present in these areas and have been released to the environment where they remain and can impact future populations. The worst case scenario is further fortified by using the maximum concentrations detected in samples as the exposure point concentration for the ecological receptors. Once the worst-case is presented, logical discussions are offered to indicate why the actual exposure to the identified chemical is presumed to be lower. If sampling had been systematically conducted throughout the 700-acre prison parcel, it is likely that the average concentration of chemicals detected would have decreased. This phenomenon would have occurred because samples from 80 percent of this land should be cleaner than samples that were collected from historic use sites. Average concentrations established from perceived "dirty" historic use sites should be higher than mixed results produced from the entire prison parcel.

Thus, the Army believes that the risk assessment conducted in this document overestimates the potential risk that will be experienced by any ecological receptor that resides in the area of the planned prison or its surrounding buffer area.

No changes to incorporate the buffer areas will be included in the ERA.

General Comment:

The USEPA believes that the screening level ecological risk assessment (SLERA) prepared for these AOCs underestimates the potential ecological risk. The agency agrees with most of the recommended revisions proposed in this response with one exception. In a screening level ecological risk assessment, the foraging area of a receptor species is considered to be 100% of the site or in this case the combined areas of the AOCs in the buffer zone. The actual foraging area of a species would come into account in the baseline ecological risk assessment. The USEPA still believes that a predatory bird species such as a hawk should be included in the SLERA using conservative exposure assumptions such as an area use factor of one.

Response: The screening ERA presented in the Completion Report includes 2 carnivorous species (shrew and robin) in its 3 receptors. Both of these species are smaller and lighter in weight, have smaller foraging areas and are, therefore, more likely to be affected by contaminants found in the eight AOCs evaluated.

A raptor, such as a red-tailed hawk (*Buteo jamaicensis*) was initially considered as a potential receptor for this ERA. However, the home range of a hawk which is approximately 1800 acres (USEPA 1993, Wildlife Exposure Factors Handbook), is much greater than the 128-acre area represented by the eight identified AOCs, and the 700-acre area represented by the eight AOCs and the "buffer zone." Therefore, it is unlikely that a hawk would derive a significant portion of its diet from prey living in any of the AOC sites evaluated.

Instead, a more realistic predatory bird species, the American Robin (Turdus migratorius) has been included as a receptor in the ERA for these AOCs. It has been recognized during site reconnaissance visits, has a home range of 0.395 acres, and a seasonal residence of 7 months at the Depot. For a more realistic screening ERA, the robin has been used as a receptor.

Specific Comment: ***#2, page 1-6***

a.) **The USEPA believes that the process recommended by the US Army in which site concentrations that exceed state or federal criteria are carried through to a SLERA is appropriate.**

b.) **The USEPA believes that the response to this comment is adequate but stresses that both the USEPA and NYSDEC must review and agree that the weight of evidence considerations used for determining ecological risk to be small are appropriate.**

Response: Comments noted.

Specific Comment: ***#9, page 5-86, Section 5.6.2.3.1***

See response above on fostering small mammal populations and predatory bird species receptors.

Response: See above response to the response on fostering small mammal populations and predatory bird species receptors.

Specific Comment: ***#12, page 5-93, Section 5.6.3.2***

See response above concerning inclusion of a predatory bird species in the SLERA.

Response: See above response to the response concerning inclusion of a predatory bird species in the SLERA.

Response to Comments From New York State Department of Environmental Conservation

Subject: Draft Final Completion Report for Six Areas of Concern: SEADs (43, 56, 63), 55A, 44B, 52, 62, 120B, Seneca Army Depot, Romulus, New York, December 10, 1999

Comments Dated: March 24, 2000

Date of Comment Response: April 30, 2001

NYSDEC Comments:

1. **Comment: The Army's response to NYSDEC response number one, "SEAD-64C has been included in the Decision Document- Mini Risk Assessment..." is confusing as there is no such document, to my knowledge. Therefore, the termination of SEAD 64C as an Area of Concern (AOC) is not properly addressed anywhere. Please clarify.**

   Recognize that NYSDEC is waiting for a response to comments (letter dated January 20, 2000) on the Draft Decision Document, Twenty-six Low/No Further Action Sites regarding SEAD 60 and its termination as an Area of Concern.

   Response: The termination of SEAD-64C as an Area of Concern is addressed in the *Draft Decision Document – Mini Risk* Assessment, dated April 2000 and also the Draft *Final Decision Document – Mini Risk Assessment* dated February 2001.

   The NYSDEC comment in the letter dated January 20, 2000 is as follows:

   SEAD-60 – Oil Discharge Adjacent to Building 609: The report should clarify that the "removal action" performed at this site was actually a clean-up performed under the oversight of the NYSDEC Region 8 Spill Prevention & Response unit. The ground water results should be included in Appendix E. The report should note what actions are proposed to locate the source of the upgradient ground water contamination.

   Agreed. The removal action was actually a clean-up performed under the oversight of the NYSDEC Region 8 Spill Prevention and Response unit. According to the NYSDEC inspection letter (dated July 13, 1999, see attached copy) following the cleanup, no further excavation will be required. This will be clarified in the *Draft Decision Document, Twenty-six Low/No-Further Action Sites* and restated in the response to comments pertaining to that document.

   Ground water samples indicated the presence of two volatile organic compounds, benzene and acetone, a pesticide, beta-BHC, total petroleum hydrocarbons and several metals were detected. Of the compounds and metals detected only iron, manganese and sodium were detected above the Class GA, New York Ambient Water Quality Criteria. These metals are non-toxic metals and are not considered to constitute a human health threat. Benzene was detected sample collected from the upgradient well, MW60-1, at 1 ug/L, which is at the Class GA, New York Ambient Water Quality Criteria. Since the organic and inorganic compounds detected in groundwater are either at or below the New York criteria or are non-toxic the groundwater conditions do not suggest that groundwater is a media of concern at SEAD-60. These results will be included in Appendix E.

   Because groundwater conditions do not suggest that groundwater is a media of concern at SEAD-60 and because no further action is suggested by NYSDEC in the July 13, 1999 letter, no additional work related to groundwater is pending.

2. **Comment: The Army's response to NYSDEC response number three does not address the area outside building 606 that had cleanup deferred. If the area has been "cleaned up", documentation should be included in the report.**

   SEDAs plan to abandon and notify subsequent owners of any underground tanks I the area before property transfer was not addressed in the Army's response. Are there any Underground Storage Tanks (USTs) in the area within the SEADs (43, 56, 69)? If so, then a description and location of each tank should be documented in the report.

   Response: Building 606 is addressed in a letter from NYSDEC to Seneca Army Depot dated July 13, 1999. This letter summarizes the inspections performed by NYSDEC on a number of spill sites at the Depot. The observation of the area outside Building 606 is as follows, "Inspected excavation/trench, approximately 3 feet deep by 4 feet long, 1½ -2 feet wide. No visual contamination noted, no readings above background on HNu meter. No further action will be requested."

   Cleanup documentation for the area outside of Building 606 will not be included in the Completion Report, because no cleanup action has been requested or performed.

   Section 1.1.2.1 of the Completion Report states that there was a concrete underground tank located near Building 606 which was used for the intermittent storage of wastewater. This tank was removed in 1989 and replaced with a new tank located within a concrete vault to comply with underground tank regulations. As shown in Figure 1.1-14, the concrete vault is located to the southwest of Building 606. As stated in the response to NYSDEC comments on the Draft Final Completion Report, the tank was pumped out and the contents were sent to a POTW. The tank is currently empty. The text has been revised to reflect this.

   Subsequent owners will receive a copy of the Completion Report through which they will become informed of the presence of an underground storage tank at Building 606.

New York State Department of Environmental Conservation
Horseheads Sub-Office, Region 8
276 Sing Sing Road, Suite 1, Horseheads, New York 14845
Phone: (607) 739-0809 • **FAX:** (607) 739-7613
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

July 13, 1999

Seneca Army Depot Activity
Building 123
Romulus, NY 14541

Attn: Mr. Thomas Grasek

Dear Mr. Grasek:

Re: Seneca Army Depot Spills
Quarters 205, Spill No. 9804496
Building 609, Spill No. 9812961
Building 606, No Spill Assigned

On June 7, 1999, this Department performed inspections of the above-referenced spill sites to determine the status and need for further action relative to each site. A summary for each inspection is as follows:

Quarter 205, Spill No. 9804496

Inspected open excavation resulting from removal of heating oil tank. Excavation was approximately five feet deep by six feet by 8 feet. There was less than two inches of water in base of excavation, with no evidence of a sheen. HNu readings on sidewalls indicated background (non-detect) concentrations of petroleum. There was no visual indication of contamination. Based on inspection results plus previously submitted analytical results (which indicated minor semi-volatile contamination), no further action will be required for this site. Excavated soils have been staged with soils from the Building 609 excavation and will be handled under that spill file. The Quarters 205 spill file will be closed.

Building 609, Spill No 9812961

Inspected open excavation, approximately 1½ to 2 feet deep, 40 to 50 feet long, and 20-25 feet wide. Excavation had approximately 6 inches water. No visible soil contamination noted, no readings above background on HNu meter. Based on inspection plus previous analytical results, no further excavation to be required. Spill file to be left open until soil disposal/treatment completed.

Building 606

Inspected excavation/trench, approximately 3 feet deep by 4 feet long, 1½-2 feet wide. No visual contamination noted, no readings above background on HNu meter. No further action will be requested.

If you should have any questions on the above, please contact me at (607) 739-0809. Your continued cooperation is appreciated.

Sincerely,

Scott Rodabaugh

Scott Rodabaugh, P.E.
Environmental Engineer
New York State Department of
Environmental Conservation
Division of Environmental Remediation

SR:jb