U.S. ARMY ENGINEER DIVISION
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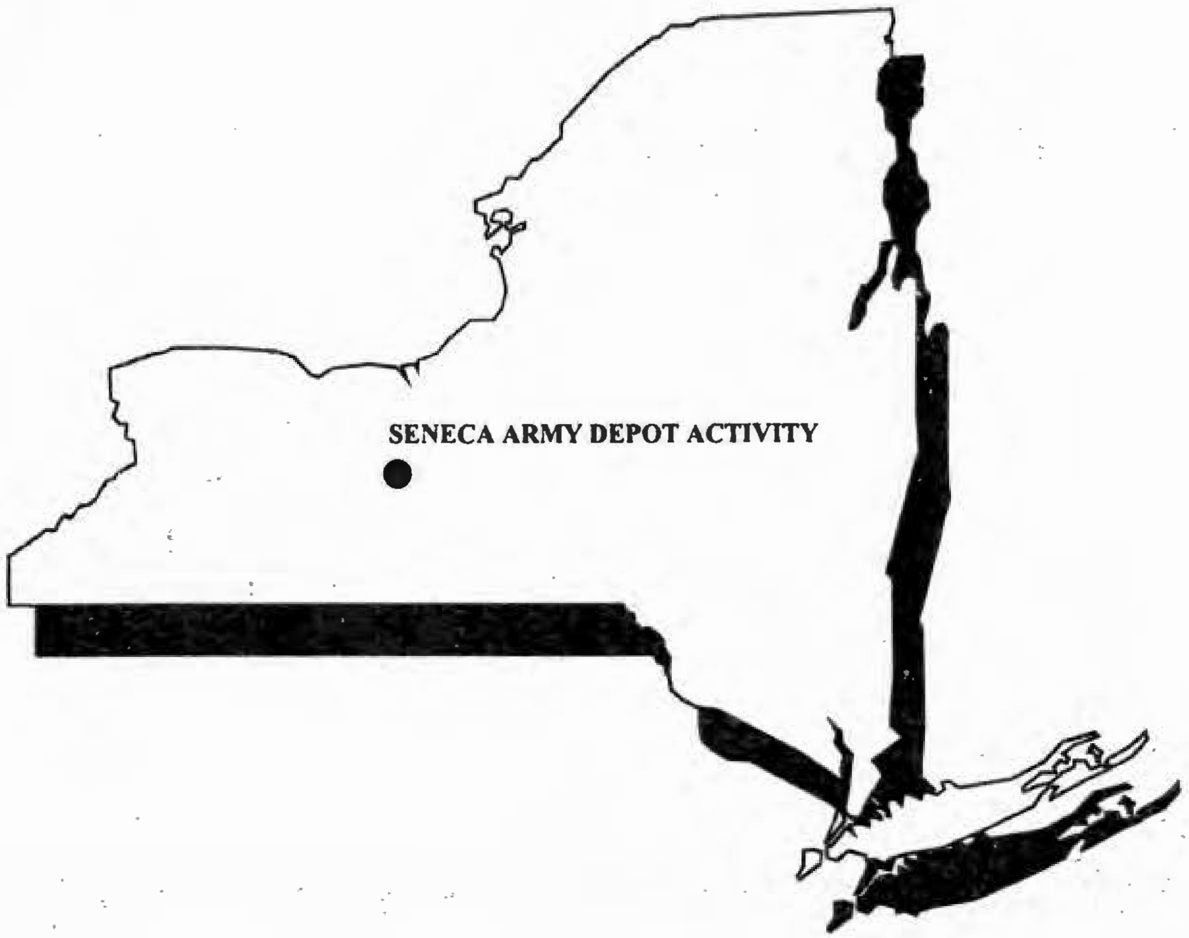

FINAL

FEASIBILITY STUDY
AT THE ABANDONED DEACTIVATION FURNACE (SEAD -16)
AND THE ACTIVE DEACTIVATION FURNACE (SEAD-17)

REVISED
JULY 2001

FINAL
FEASIBILITY STUDY
AT SEAD-16 AND SEAD-17
SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

Prepared For:

Seneca Army Depot Activity
Romulus, New York

Prepared By:

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

Contract DACA87-95-D-0013
729895 - Delivery Order 03

Revised
July 2001

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REFERENCES (CONT'D)

LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirements
ATTIC	Alternative Treatment Technology Information Center
AWQC	Ambient Water Quality Criteria
BALAT	Benthic Aquatic Life Acute Toxicity
BALCT	Benthic Aquatic Life Chronic Toxicity
BCT	BRAC Cleanup Team
BEST	Basic Extraction Sludge Treatment
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
CWA	Clean Water Act
cy	cubic yard
DDD	1.1-Dichloro - 2-(o-chlorophenyl) - 2-(p-chlorophenyl)
DDE	1.1-Dichloro - 2-(p-chlorophenyl) - 2-(o-chlorophenyl)
DDT	1.1.1-Trichloro - 2-(0-chlorophenyl) - 2-(p-chlorophenyl) ethane
DOD	Department of Defense
DQO	Data Quality Objectives
EBS	Environmental Baseline Study
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
EPCRA	Emergency Planning and Right to Know Act
ERA	Ecological Risk Assessment
ES	Engineering-Science, Inc.
ESI	Expanded Site Inspection

REFERENCES (CONT'D)

FI	Fraction Ingested
FS	Feasibility Study
ft	Feet
g	gram
GCL	Geocomposite Clay Liner
gpm	gallons per minute
HDP	High Density Polyethylene
HEAST	Health Effects Assessment Summary Tables
HHB	Human Health Bioaccumulation
HI	Hazard Index
HQ	Hazard Quotient
ICP	Inductively Coupled Plasma
IR	Ingestion Rate
ISV	In Situ Vitrification
LDR	Land Disposal Restrictions
LEL	Lowest Effect Level
LOAEL	Lowest Observed Adverse Effect Level
LRA	Local Redevelopment Authority
LUR	Land Use Restriction
MCASES	MicroComputer Aided Cost Engineering System
MCL	Maximum Contaminant Level: Established under the Safe Drinking Water Act
MCPP	4-Chloro-2-Methylphenoxy-2-propionic acid
mg/kg	Milligrams per kilogram
MSL	Mean Sea Level
MW	Monitor Well
NEPA	National Environmental Policy Act

REFERENCES (CONT'D)

NOAEL	No Observed Adverse Effect Level
NPL	National Priority List
NTU	Nephelometric turbidity units
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OB	Open Burning
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
O&M	Operating and Maintenance
PAH	Polynuclear aromatic hydrocarbons
PCB	Plychlorinated Biphenyls
PIC	Products of Incomplete Combustion
POTW	Publicly Owned Treatment Works
ppm	parts per million
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RA	Remedial Action
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RF	Response Factor
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision

REFERENCES (CONT'D)

SARA	Superfund Amendments and Reauthorization Act
SB	Soil Boring
SD	Sediment
SDEF	Standard Default Exposure Factors
SEAD	Seneca Army Depot (old name)
SEDA	Seneca Army Depot
SF	Slope Factor
sf	square feet
SI	Site Investigation
SIP	State Implementation Plan
SITE	Superfund Innovative Technology Evaluation
SO_4	Sulfate
SOP	Standard Operating Procedures
SOW	Scope of Work
SQL	Sample Quantitator Limits
S/S	Solidification and Stabilization
SVOCs	Semi-Volatile Organic Compounds
SW	Sediment and surface water sample station
SWMU	Solid Waste Management Unit
TAGM	New York State Chemical And Administrative Guidance Memorandum
TBC	To Be Considered
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TEA	triethly amine
TEC	Toxicological Endpoint Concentration
TEF	Toxicity Equivalency Factor
TRACES	Tri-Service Automated Cost Engineering System
TSD	Treatment, Storage, and Disposal
µg/g	Micrograms per gram
µg/kg	Micrograms per kilogram
µg/l	Micrograms per liter

REFERENCES
(CONT'D)

UCL	Upper Confidence Limit
URF	Unit Risk Factor
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Hygiene Agency
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UXO	Unexploded Ordinance
VISITT	Vendor Information System for Innovative Treatment Technologies
VOC	Volatile Organic Compound
WB	Wildlife Bioaccumulation
WRS	Wilcoxon Rank Sum Test

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1 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF REPORT

Parsons Engineering Science is submitting this Feasibility Study Report (FS) for the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) sites located at the Seneca Army Depot Activity (SEDA) in Romulus, New York. This report is part of the Remedial Investigation/Feasibility Study (RI/FS) process required for compliance with the Comprehensive Environmental Response and Compensation Liability Act (CERCLA) of 1980 and the Superfund Amendments Reauthorization Act (SARA) of 1986. This remedial program has been performed under the guidance of the US Environmental Protection Agency (EPA), Region II and the New York Department of Environmental Conservation (NYSDEC). The Remedial Investigation Report (RI) was submitted to EPA and NYSDEC in March 1999. The purpose of the RI was to fully characterize the nature and extent of human health and environmental risks posed by SEAD-16 and SEAD-17 sites.

SEDA is under the command control of the Tobyhanna Army Depot in Tobyhanna, Pennsylvania. The military mission of the Seneca Army Depot Activity has been storage and management of military items, including munitions. Although SEDA is currently an active Army facility, the military mission of SEDA will end in year 2000. Environmental clean-up activities will continue past this date until all sites have reached closure. Since being placed on the Base Realignment and Closure (BRAC) 95 base closure list, the Depot has begun the process of base closure, which has included the transfer of Depot missions to other active military installations.

SEAD-16, the former deactivation furnace, and SEAD-17, the existing deactivation furnace, are two Solid Waste Management Units (SWMU)s located within the Depot. Both sites were involved in the demilitarization of various small arms munitions. The process of deactivation of munitions involved heating the munitions within a rotating steel kiln, which caused the munitions to detonate. The byproducts produced during this detonation were then swept out of the kiln through the stack. No air pollution control devices were used at SEAD-16, but at SEAD-17 the gases were treated prior to atmospheric discharge.

Both sites are adjacent to each other and are located within an area of the Depot that has been used for various industrial activities. SEAD-16 has been inactive and abandoned since the 1960s and the building is in general disrepair. SEAD-17 was constructed to replace the operation of SEAD-16. Upgrades to the air pollution control equipment at the current deactivation furnace had been periodically made during the life of the furnace. However, SEAD-17 has been inactive since 1989 due to RCRA permitting issues. The existing deactivation furnace at SEAD-17 had been in the process of being permitted as a hazardous waste incinerator, under the provisions of RCRA, but the RCRA permit was withdrawn by the Army when the Depot was listed for base closure in 1995.

CERCLA guidance, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-04, *Land Use in the CERCLA Remedy Selection Process,* directs decision makers to achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible. Army policy, described in *Responsibility for Additional Environmental Cleanup after Transfer of Real Property*, also states that "For BRAC properties, the LRA's redevelopment plan, specifically the land use plan, typically will be the basis for the land use assumptions Department Of Defense (DOD) will consider during the remedy selection process." The intended future land use of the area that encompasses SEAD-16 and SEAD-17 has been determined by the Local Redevelopment Authority (LRA), in conjunction with the Army, to be industrial/commercial. In addition to the consideration of future land use during the remedy selection process, the State of New York regulations, NYCRR Title 6, Chapter IV, Subchapter B, Part 375, Subpart 375-1.10 Remedy Selection, requires evaluation of remedies that will restore the site conditions to "pre-disposal conditions, to the extent feasible and authorized by law." This study has considered future land uses and restoration of pre-disposal conditions in the process of developing alternatives, to the extent possible.

Although CERCLA remedies must be protective of human health and the environment, a remedy that involves institutional controls or a projective future restrictive land use, may not be protective if the future land use changes. In this instance, additional remedial activities may be required. As required by CERCLA, Section 120(h) and Army regulations, AR-200.7, when the control of a parcel is released or transferred and/or the site-use changes, the Army will return to do additional clean-up if it is determined that 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.

The RI identified that unacceptable human health risk exists at SEAD-16 and SEAD-17. The risks from both SEAD-16 and SEAD-17 are due to heavy metals in the on-site soils. In addition, the materials and debris that remain within the buildings at SEAD-16 contribute to the risk. This FS evaluates technologies and remedial actions that will reduce human health risks to acceptable levels. Remedial actions have been developed based on lead. Lead is a constituent of for soil treatment are considered. SEAD-16 and SEAD-17 are adjacent to each other, have similar operating histories, have similar media and contaminants of concern and therefore, have been combined as one operable unit for efficient evaluation and selection of remedies. Each site has been evaluated independently of each other. This is because, even though the two sites have similarities, the concentration levels, and therefore the risks, for the various constituents of concern are different.

The technologies that remain from the initial technology screening are combined into remedial alternatives and are presented in Section 4. Alternatives are evaluated through preliminary screening to determine their relative merit for use in the remedial action. Section 5 describes the treatability testing that may be necessary for alternatives that include innovative technologies prior to their implementation of the remedial actions. Section 6 screens and evaluates the remedial action alternatives in detail. In addition, a detailed description of the technologies and the implementation of these technologies, as well as cost estimates are presented.

1.2 OPERABLE UNITS

During the planning phase of the RI/FS process, it was decided to designate SEAD-16 and SEAD-17 as one operable unit and to give it the label OU4. An operable unit, as defined by EPA Code of Federal Regulations (40 CFR 300.5) is:

> "a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site may be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different portions of the site."

The goal of combining these sites into one operable unit was to perform the investigation and evaluation as efficiently and expeditiously as possible. Time and cost savings were realized by combining these sites into one operable unit during the investigation field efforts by performing the sampling activities at the same time, allowing geologists to move from one site to another without any demobilization. Further, during the risk assessment phase of work, the risk assessment calculations utilized similar risk assessment land use scenarios, thereby increasing the efficiency that the assessment was performed.

1.3 SITE BACKGROUND

1.3.1 Site Description

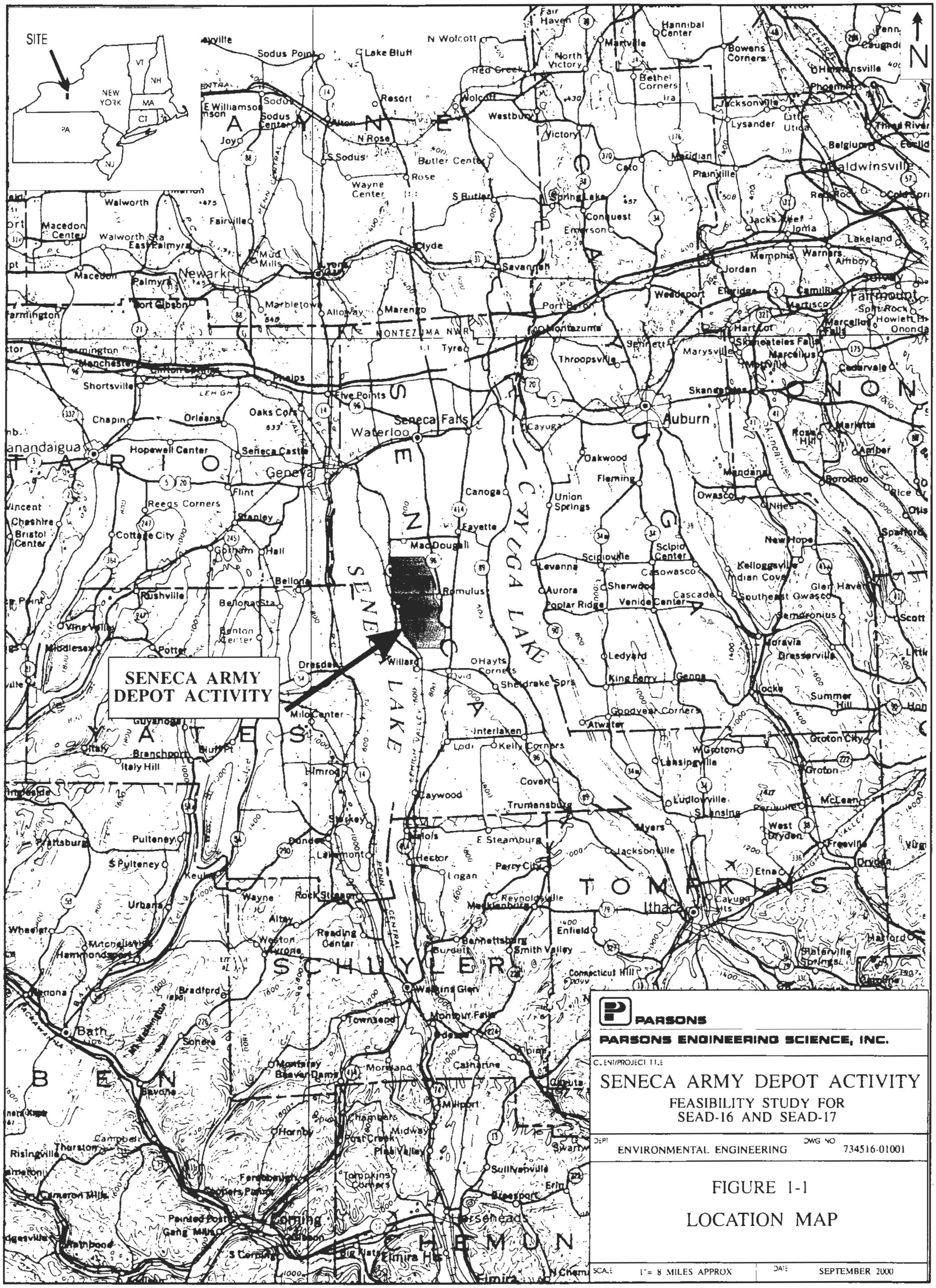
SEDA is an active military facility constructed in 1941. The site is located approximately 40 miles south of Lake Ontario, near Romulus, New York as shown in **Figure 1-1**. The facility is located in an uplands area, at an elevation of approximately 600 feet Mean Sea Level (MSL), that forms a divide 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. Since its inception in 1941, SEDA's primary mission has been the receipt, storage, maintenance, and supply of military items.

As shown in **Figure 1-2**, SEAD-16 and SEAD-17 comprise only a few acres within the 10,587 acres that make up the entire SEDA facility. SEAD-16 and SEAD-17 were previously used by the Army for munitions deactivation. SEAD-16 is located in the east-central portion of SEDA and is characterized by 2.6 acres of fenced land, as shown in **Figure 1-3**. SEAD-17 is located in the east-central portion of SEDA and is characterized by an elongated deactivation furnace building, which is surrounded by a crushed shale road, as shown in **Figure 1-4**.

An approximate boundary of the operable unit is presented in **Figure 1-5**. This general boundary includes the area for the deactivation operation and the proposed remediation areas. The boundary is not intended to designate the remediation area and will be revised during the final design process.

1.3.2 Site History

SEDA was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army since this time. Prior to construction of the Depot, the site was used for farming. The Abandoned Deactivation Furnace (SEAD-16) has been in use from approximately 1945 to the mid-1960s. Small arms munitions, both obsolete and unserviceable, were destroyed by incineration. There was no air pollution or dust control devices installed on the



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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT ENVIRONMENTAL ENGINEERING DWG NO 734516-01001

FIGURE 1-1
LOCATION MAP

SCALE 1"= 8 MILES APPROX DATE SEPTEMBER 2000

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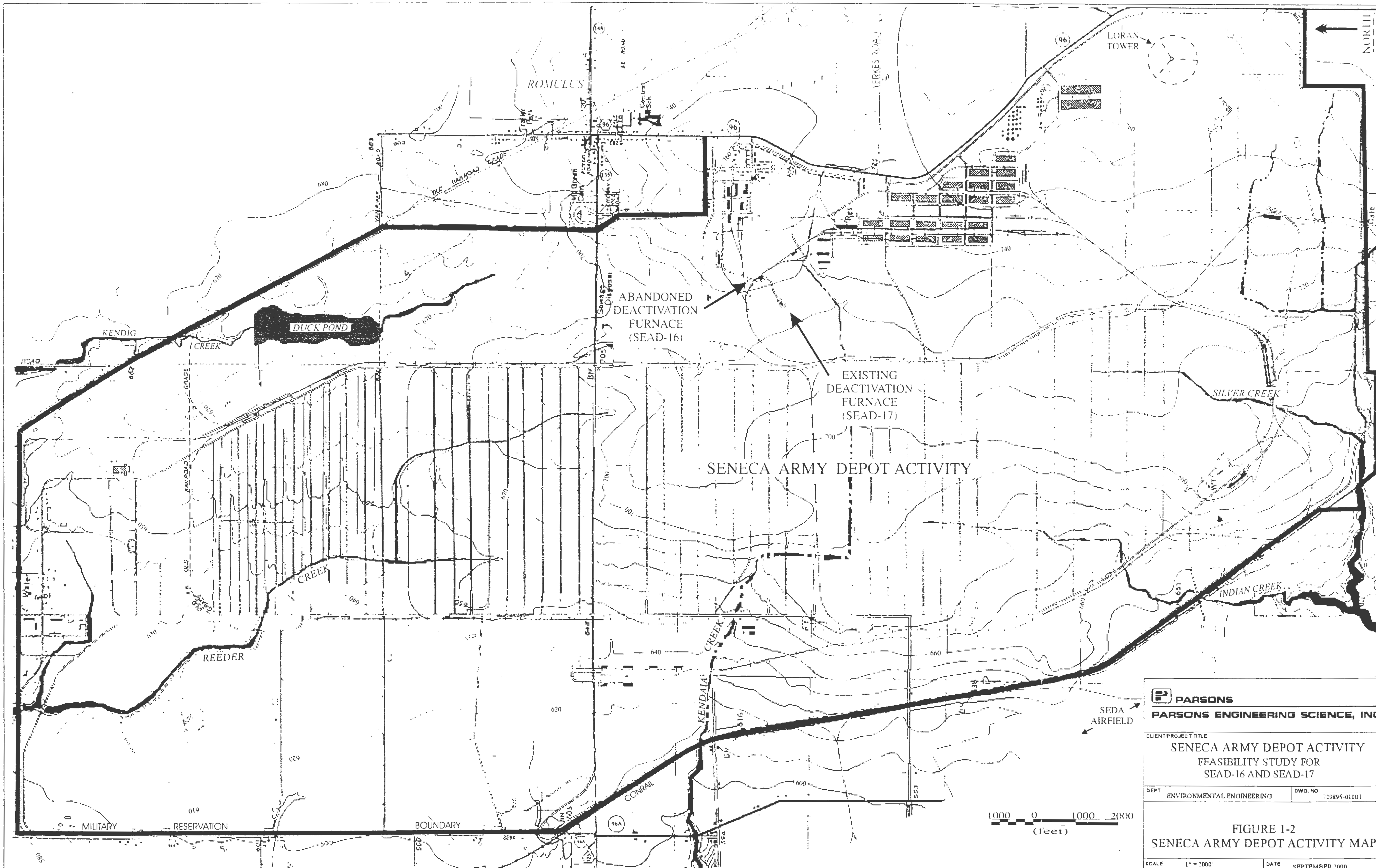

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CLIENT/PROJECT TITLE	SENECA ARMY DEPOT ACTIVITY FEASIBILITY STUDY FOR SEAD-16 AND SEAD-17
DEPT: ENVIRONMENTAL ENGINEERING	DWG. NO. 729895-01001
FIGURE 1-2 SENECA ARMY DEPOT ACTIVITY MAP	
SCALE: 1" = 2000'	DATE: SEPTEMBER 2000

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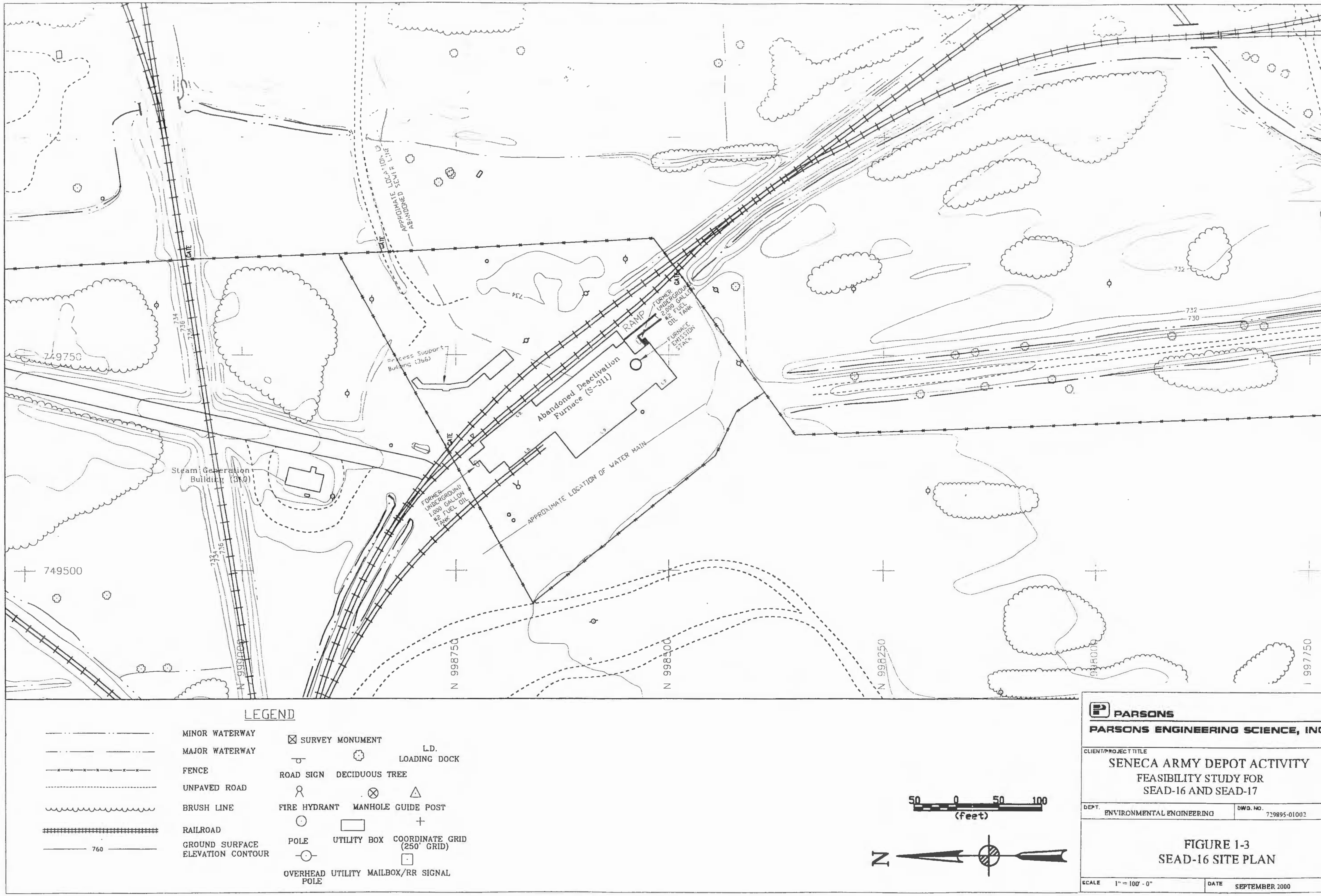


FIGURE 1-3
SEAD-16 SITE PLAN

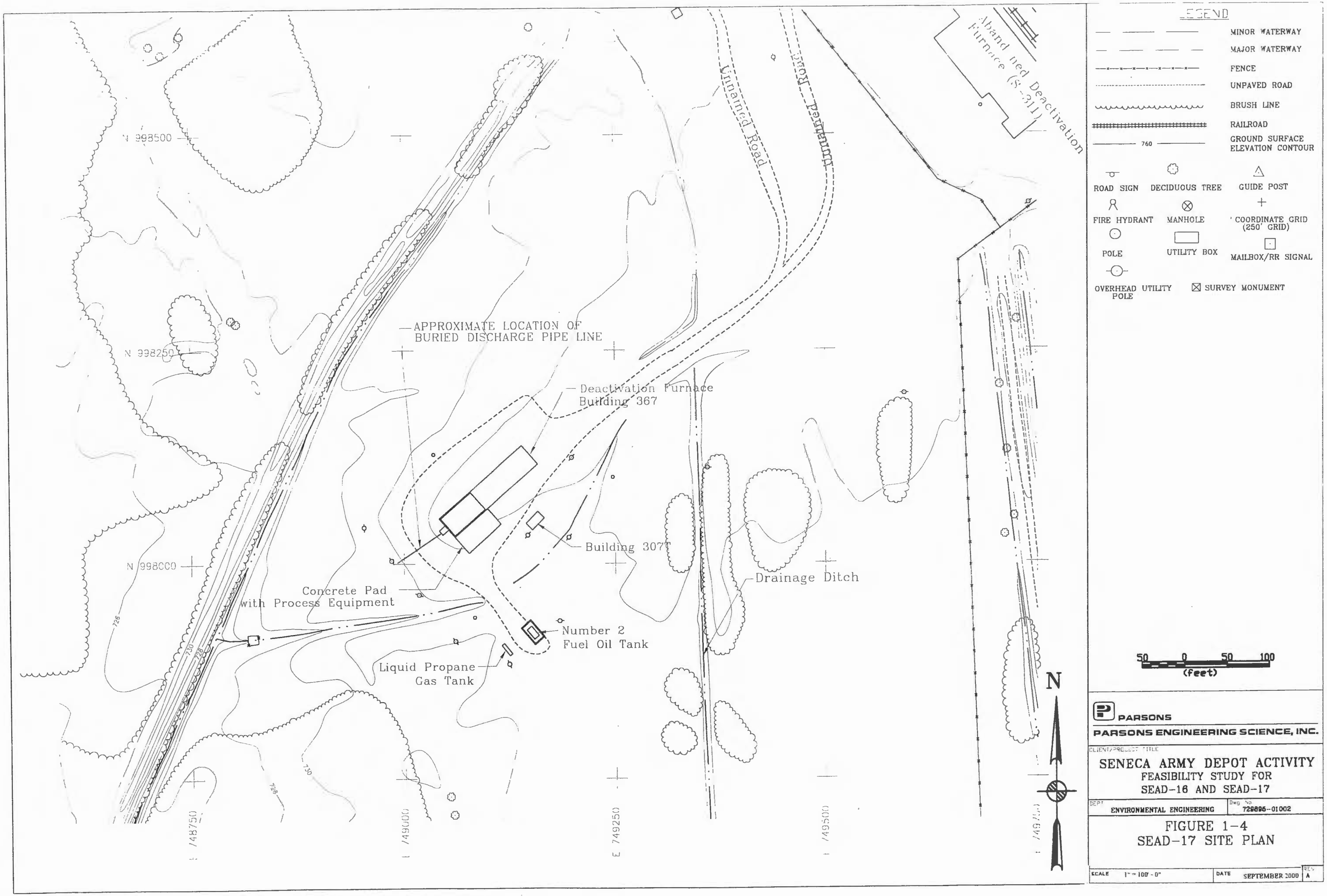
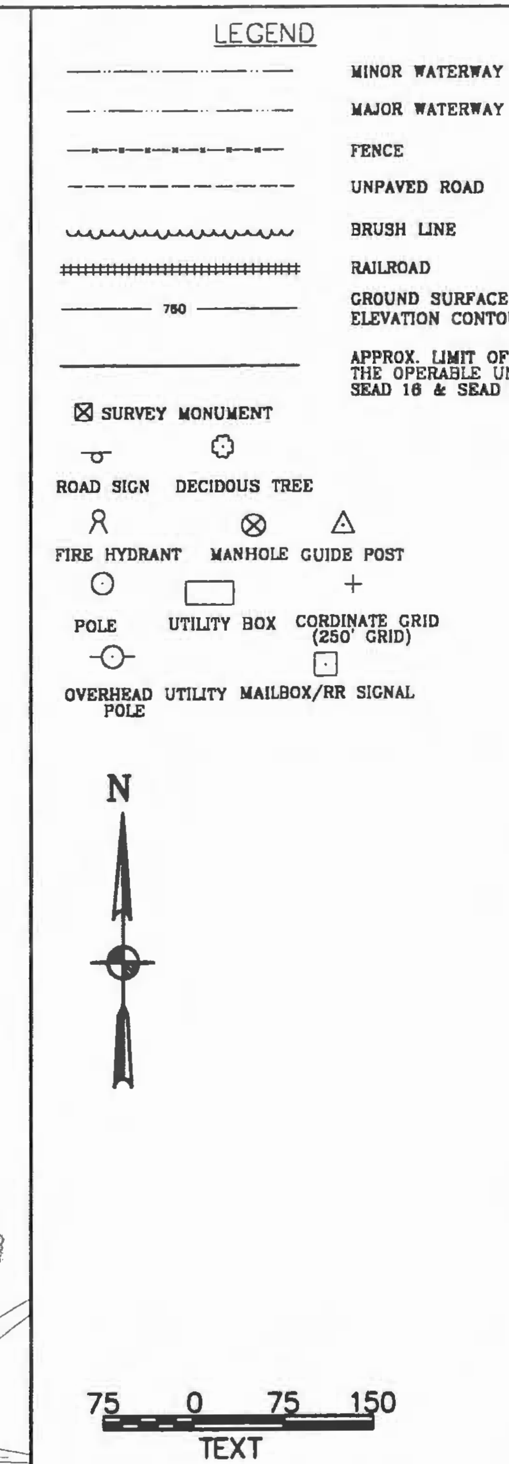


FIGURE 1-4
SEAD-17 SITE PLAN



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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR SEAD-16 AND SEAD-17

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	729695-01002

FIGURE 1-5
APPOXIMATE LIMIT OF THE OPERABLE UNIT SEAD-16 & SEAD-17

SCALE	DATE	REV
1"=100'	SEPTMEBER 2000	A

furnace during the time that it operated. The overhead pipes connecting Building S-311 and 366 were used to convey propellants in the deactivation process; it is also likely that propellants were stored in these buildings.

1.3.3 Previous Investigations

SEAD-16 and SEAD-17 have been described in five reports. The first report is a SWMU Classification Report (Parsons ES, 1994) that describes and evaluates the Solid Waste Management Units at SEDA. This report was an initial step to provide a cursory evaluation of all of the SWMUs at SEDA. The second report is the Work Plan for CERCLA Expanded Site Inspection (ESI) of Ten Solid Waste Management Units (SWMUs) (Parsons Main Inc., 1993.) This report detailed the site work and sampling to be performed for the ESI. The third report is an Expanded Site Inspection Report (Parsons ES, 1995.) This report presents the results of a more detailed investigation of SEAD-16 and SEAD-17. The fourth report is the Final Closure Report for the Underground Storage Tank Removal (Science Applications International Corporation, May 1994.) This report describes the removal of two Underground Storage Tanks (USTs) at SEAD-16 and presents the confirmatory sampling records and chemical analyses associated with the closure. The fifth report, the Remedial Investigation Report (Parsons ES, March 1999), presents the results of the remedial investigation program and estimates the potential risk to human health and the environment.

1.3.4 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 tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones.

The Hamilton Group, 600 to 1500 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.

The predominant surficial geologic unit present at the site is dense till. The till is distributed across the entire Depot and generally ranges in thickness from 3 feet to approximately 15 feet, although it is generally between 6 and 10 feet thick; at a few locations the thickness of the till is greater than 30 feet. The till is generally characterized as brown to olive-gray silt and clay, with little fine sand and variable amounts of fine to coarse gravel-sized inclusions of dark gray shale. Larger diameter clasts of shale (as large as 6 inches in diameter) are sometimes present in the basal portion of the till and are probably rip-up clasts removed from the weathered shale zone and incorporated into the till by the once-active glacier. Grain size analyses of the till show a wide distribution of particle sizes within the till (Metcalf & Eddie, 1989), however, there is a high percentage of silt and clay with the balance comprised of coarser particles. The porosity of five gray-brown silt clay (*i.e.* till) samples ranged from 34.0 percent to 44.2 percent with an average of 37.3 percent (USAEHA, 1985).

Darien silt-loam soils, 0 to 18 inches thick, have developed over the Wisconsin age till at both SEAD-16 and SEAD-17. These soils are poorly drained and have a silt clay loam and a clay subsoil. In general, the topographic relief associated with these soils is 3 to 8 percent.

Regionally, four distinct hydrologic units have been identified within Seneca County (Mozola, 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. 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 dropping ground surface elevations. Geologic cross-sections from Seneca Lake to Cayuga Lake have been constructed by the State of New York, (Mozola, 1951). This cross-section information, along with groundwater flow directions established at numerous sites on SEDA and stream drainage patterns in the area, suggests that a groundwater divide exists approximately half way between the two Finger Lakes. The divide is believed to run approximately parallel to Route 96 near the eastern boundary of SEDA. Further evidence for the divide is provided in Parsons ES, 1995. SEDA is located on the western slope of this divide and, therefore, regional groundwater flow on the Depot is expected to be west toward Seneca Lake.

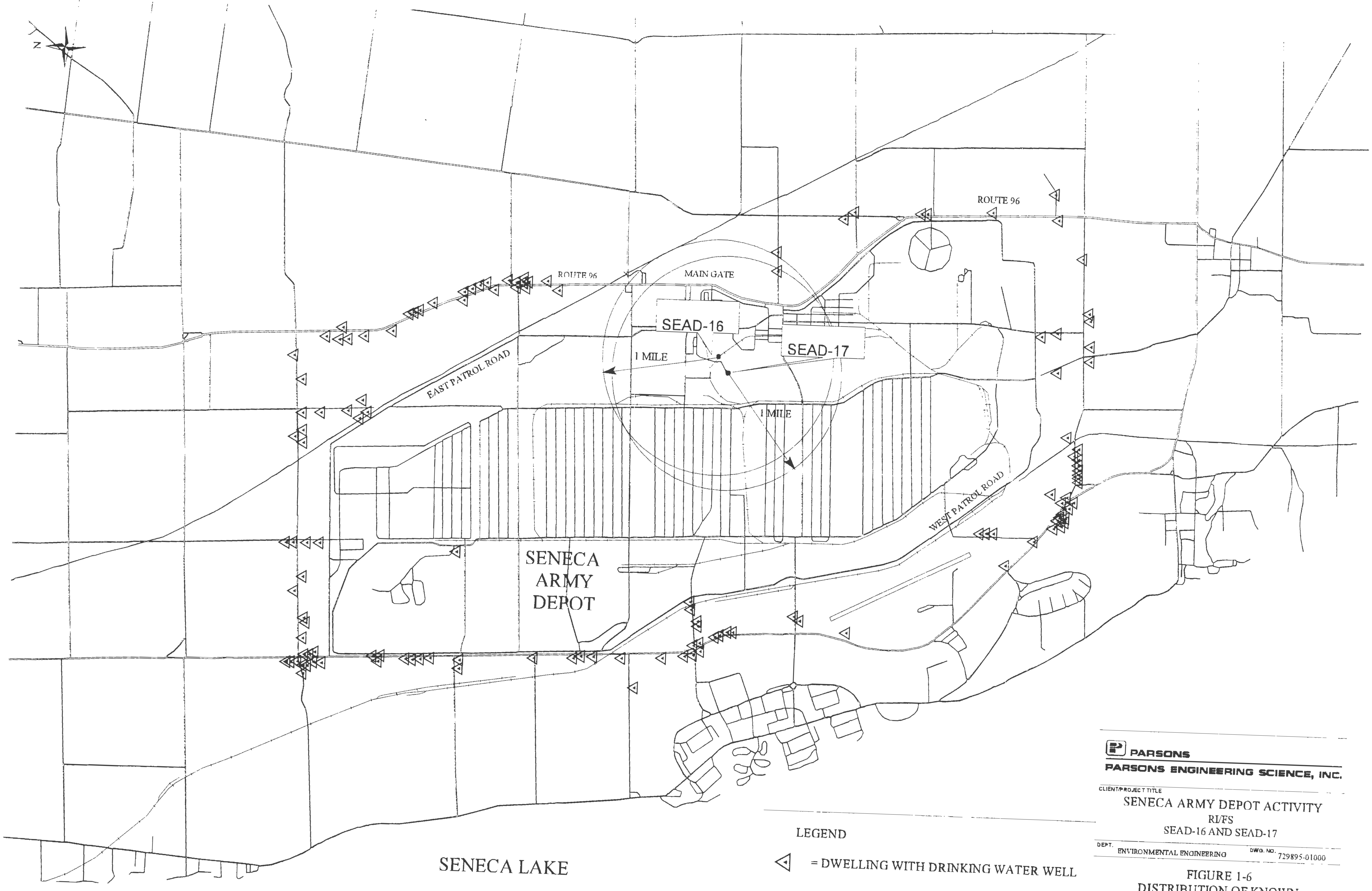
The geologic information reviewed indicates that the upper portions of the shale formation would be expected to yield small, yet adequate, supplies of water for domestic use. For mid-Devonian shales such as those of the Hamilton group, the average yields, (which are less than 15 gpm), are consistent with what would be expected for shales (LaSala, 1968). The deeper portions of the bedrock, (*i.e.*, 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 solutioning on the Onondaga limestone, which is at the base of the Hamilton Group. Based on well yield data, the degree of solutioning 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.

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. Two wells located on Yerkes Road east of Route 96 were approximately one mile away from SEAD-16 and SEAD-17 and they are upgradient of the site groundwater. No other private homes with private drinking water wells and no public supply wells were identified within a one-mile radius of both SEAD-16 and SEAD-17, as shown in **Figure 1-6.**

1.3.5 Nature and Extent of Constituents of Concern

The nature and extent of the chemicals of concern at SEAD-16 and SEAD-17 were evaluated through a comprehensive remedial investigation field program. Primary media investigated at SEAD-16and SEAD-17 included building materials, indoor air quality, surface soil, subsurface soil, groundwater, surface water, and sediment/soil found in the ditches. Following collection of all media samples, the data quality was evaluated through a validation process. Prior to preparation of the risk assessment, samples collected during the RI were screened against available standards, criteria and guidelines. This screening effort identified constituents and media that may have the potential to cause unacceptable risk. Groundwater samples collected during the ESI had elevated concentrations of metals such as lead, chromium, nickel, and zinc. However, the groundwater sampling was not conducted in accordance with the Draft SOP titled Groundwater Sampling Procedure, Low Flow Pump Purging and Sampling (EPA, May 15, 1995). Subsequent groundwater sampling collected during the RI phase was collected in accordance with standard procedure and had significantly lower turbidities than those for the ESI. Therefore, only results from the RI groundwater sampling round were used for groundwater quality evaluation.

For soil, the concentrations established by the NYSDEC Technical Administrative Guidance Memorandum (TAGM) values, HWR-94-4046, revised January 24, 1996 were used for



LEGEND

◁ = DWELLING WITH DRINKING WATER WELL

SOURCE: WELL LOCATIONS PROVIDED BY SEDA.

PARSONS

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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-16 AND SEAD-17

DEPT. ENVIRONMENTAL ENGINEERING DWG. NO. 729895-01000

FIGURE 1-6
DISTRIBUTION OF KNOWN PRIVATE WELLS NEAR SEDA

SCALE 1" = 4000' DATE SEPTEMBER 2000

O SENECA SEAD1617 SITEAREAWELLS.APR

screening of site contaminants because these concentrations are levels at which the NYSDEC considered reasonable alternatives to pre-disposal conditions. For groundwater, the NYSDEC Class GA groundwater standards were used for comparison. For surface water, the Class C surface water standards were considered. For sediment/soil found in the ditches, the NYSDEC Sediment Criteria described in the NYSDEC, Division of Fish, Wildlife and Marine Resources, *Technical Guidance for Screening Contaminated Sediments, January, 1999* were used for screening of chemicals of concerns. For metals in sediment/soil found in the ditches, the Lowest Effect Level (LEL) was used for comparison.

Analytical results of the ESI and RI are presented in **Appendix A.** A brief summary is presented below as well as in Section 2. A detailed description of the analytical results is presented in the SEAD-16 and SEAD-17 Remedial Investigation Report (Parsons ES, March 1999).

1.3.5.1 SEAD-16, The Former Deactivation Furnace

Metals and SVOCs, predominantly PAH compounds, were found pervasive in the surface and subsurface soils, particularly adjacent to the Abandoned Deactivation Furnace. Twenty-one metals were detected in the surface soils at concentrations above their respective TAGM values. Lead, copper, arsenic, and zinc were detected in almost all of the surface soil samples at concentrations above their respective TAGM values. In the subsurface soil, 14 metals were detected in the subsurface soils at concentrations above their respective TAGM values. Copper and lead were found to be the most pervasive. SVOCs were also detected at concentrations above their respective TAGM values.

Based on the RI data, seven metals (aluminum, antimony, iron, lead, manganese, sodium, and thallium) were detected above their respective NYSDEC AWQS Class GA or federal MCL groundwater standards. SVOCs and nitroaromatics were not detected above the groundwater standards. No VOCs, pesticides, or PCBs were detected in groundwater at SEAD-16.

Based on the RI data, surface water impacts were primarily from metals. Six metals (lead, copper, zinc, cadmium, selenium, and iron) were detected at several locations at concentrations exceeding the NYSDEC Ambient Water Quality Standard (AWQS), Class C surface water standards. SVOCs were found in a few surface water samples, but only one sample was above the NYS Class C standard. Many of the other chemical constituents analyzed for were not detected in the samples. No VOCs, pesticides, PCBs, or nitroaromatics were detected in the samples.

Impacts of sediment/soil found in the ditches were primarily from SVOCs, pesticides, and metals. Several samples contained pesticide compounds and SVOCs that exceeded their respective NYSDEC sediment criteria. Several samples contained metals (antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, and zinc) at concentrations above the NYSDEC LEL.

In the building material samples collected from the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366), metals, SVOCs, and nitroaromatics were detected above their TAGM values. Impacts from VOCs, pesticides, PCBs, and herbicides were less significant. Asbestos was detected at 13 locations in the two buildings in materials including pipe insulation, roofing material, and floor tiles.

1.3.5.2 SEAD-17, The Existing Deactivation Furnace

Metals were found to be pervasive in the surface and subsurface soils. Based on the RI and ESI data, twenty-one metals were detected in the surface soils at concentrations above their respective TAGM values. Antimony, arsenic, copper, lead, mercury, and zinc were detected in almost all of the surface soil samples at concentrations above their respective TAGM values. In the subsurface soils, lead was detected at concentrations above the TAGM value in all samples analyzed. Two SVOC parameters were detected at four surface soil sampling locations and one pesticide parameter was detected at two surface soil sampling locations above their respective TAGM value.

Based on the RI data, the groundwater at SEAD-17 has not been significantly impacted by any of the chemical constituents. Concentrations of SVOCs were detected below the NYSDEC AWQS Class GA and federal MCL groundwater standard. No VOCs, pesticides, PCBs, or nitroaromatics were detected in the groundwater. However, six metals (aluminum, iron, lead, manganese, sodium, and thallium) did exceed the groundwater standards.

Surface water impacts were not widespread and many of the chemical constituents analyzed for were not detected in the samples. Most of the impacts from metals occurred in the surface water samples from the drainage ditch south of the deactivation furnace. No VOCs, pesticides, PCBs, or nitroaromatics were detected in the samples. Copper, iron, lead, and selenium were detected at concentrations above the NYSDEC AWQS Class C surface water standard.

Impacts of sediment/soil found in the ditches were from SVOCs, pesticides, and metals. Impacts from SVOCs were most significant at one location in the drainage ditch, in the northeastern corner of the site. Pesticides were found in the drainage ditches in the western and northeastern portions of the site. Metals were found in sample SW/SD17-3, located in the drainage ditch in the eastern portion of the site. Antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc were detected at concentrations above the NYS LEL. No PCBs or nitroaromatics were detected.

1.4 FATE AND TRANSPORT

Analysis of the fate and transport mechanisms for the chemicals of concern at SEAD-16 and SEAD-17 considered site specific factors as well as expected chemical and physical behaviors of the contaminants. Soil, sediment/soil found in the ditches, and surface water samples collected off-site and downstream of the sites were used to quantify the extent of impacts to various media.

Based on the distributions and concentrations of parameters measured at the sites, inorganics are believed to be the most significant in terms of determining their transport. On this basis, cursory transport modeling of inorganics was performed. This modeling was intended to provide some insight as to which inorganics may pose a future threat to groundwater at both SEAD-16 and SEAD -17. It was also used to provide direction for future, more detailed transport modeling at SEAD-16 and SEAD –17, if required. Transport modeling of the other constituents was not performed.

Arsenic, antimony, copper, cadmium, lead, silver, and zinc are inorganics of concern at SEAD-16 and SEAD-17 because of their pervasiveness and magnitude of contamination in soil, building material, surface water, and sediment/soil found in the ditches, and potential to impact groundwater. These metals were modeled for fate and transport evaluation in the RI. The fate and transport model used in the RI consisted of a conceptual site model, water balance calculation, and the VLEACH model. These models are used and accepted by the USEPA to conservatively estimate soil inorganic contributions to groundwater via the leaching pathway. A detailed discussion of these numerical models and their application and assumptions is included in the RI Report (Parsons ES, March 1999).

As part of this FS, the fate and transport model was re-run using site specific information. Subsurface soil samples and groundwater samples taken from SEAD-17 monitoring wells MW17-1, MW17-2, MW17-3, MW17-4 and samples taken from locations within 25 to 50 feet of each other at SEAD-16 were used to estimate the K_d values, the partition coefficient between soil and water. The results suggest that the metals in the on-site soil tend to strongly bind to soil instead of partitioning into water. A summary of the estimated K_d values and their comparison with other references and K_d values used in the VLEACH model is presented in **Table 1-1**. The

Table 1-1
Soil Water Distribution Coefficients (K_d)s for Selected Inorganics [1]
Used in the VLEACH Model
SEAD-16 and SEAD-17 Fesibility Study
Seneca Army Depot Acitvity

	Dragun	Looney *et al.*	Sheppard and Thibault (1990)				Used in	SEAD-16 Field Data [2]			SEAD-17 Field Data [3]				Kd for Modeling [4]		
	1988	1975	Sand	Loam	Clay	Organic	RI modeling	1	2	3	1	2	3	4	Low Kd	High Kd	I
	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(ml/g)	(
iony	-	100-10,000	45	150	250	550	3981	-	-	2767	-	-	-	-	2767	2767	2
nic	1-8.3	-	-	-	-	-	3.3	1136	1182	1568	586.21	1568	1227	1296	586.21	1568	1
ium	1.3-27	-	80	40	560	900	6.7	150	100	750	-	-	-	-	100	750	
oer	1.4-333	-	-	-	-	-	22.2	5216	3727	187272	1111	1581	8677	7323	1111	187272	3
d	4.5-7,640	-	270	16,000	550	22,000	99	6696	21400	14048	862	403	14133	3900	403	21400	8
ury	-	NA	-	-	-	-	10,000	-	400	19000	-	400	400	428.6	400	19000	4
c	0.1-8,000	-	200	1,300	2,400	1,600	16.4	9712	8495	35882	571	986	4207	6546	571	35882	9
kel	-	-	400	300	650	1,100	-	13273	7488	10864	11455	12320	12600	12320	-	-	
nium	-	-	70	30	1,500	270	-	16700	14067	15400	9267	23300	20100	18400	-	-	
er	10-1,000	-	90	1,500	2,400	5,400	110	-	-	-	-	-	-	-	30	403	

ges of soil water distribution coefficients (K_ds) were obtained from Table 4-2 of Dragun (1988), Table 1 of Looney et al (1975) and Sheppard and Thibault (1990).
surface soil samples and groundwater samples obtained at SEAD-16 were used to estimate Kd. If concentration in groundwater is under the detection limit, the detection limit was used for estimation
Estimation 1 = subsurface soil concentration at SB16-5/Groundwater concentration at MW16-7
Estimation 2 = subsurface soil concentration at SB16-4/Groundwater concentration at MW16-6
Estimation 3 = subsurface soil concentration at SB16-2/Groundwater concentration at MW16-4
surface soil samples and groundwater samples taken from same sampling well for SEAD-17 were used to conduct an estimation of Kd. Estimations of 1, 2, 3, and 4 are from samples from
W17-1/SB17-1, MW17-2/SB17-2, MW17-3/SB17-3, and MW17-4/SB17-4 respectively
average of the field Kd estimations (including SEAD-16 and SEAD-17) was used in the model to simulate the base case. The maximum of the field Kd estimations was used to simulate the case
h high Kd and the minimum was used in the low Kd scenario
ot Available.

estimated K_d values were much greater than the K_d values used in the RI VLEACH model for all metals except for mercury (because mercury was not detected in the groundwater samples, the detection limit concentration was used which results in a lower K_d value). The VLEACH model was run with estimated K_d values from site samples. An average leaching concentration, which was estimated from the total metal input to the groundwater over 100,000 years, was used in the Summers model to predict groundwater quality in 100,000 years. Similar results were obtained for groundwater metal concentrations in 1,000 years.

1.4.1 SEAD-16, The Former Deactivation Furnace

As presented in **Table 1-2**, the results of the FS model indicate that base case cumulative metal input to the groundwater in 100,000 years is 1.02×10^7 g, 3.84×10^4 g, 3.74×10^5 g, 2.68×10^3 g, 5.35×10^2 g, 9.64×10^5 g, and 346.05 g for lead, copper, antimony, arsenic, mercury, zinc, and cadmium respectively. As presented in **Table 1-3**, the above metal input to the groundwater will result in groundwater concentrations of 11 µg/l, 4.7 µg/l, 1.36 µg/l, 1.2 µg/l, 0.050 µg/l, 16 µg/l, and 1.15 µg/l for lead, copper, antimony, arsenic, mercury, zinc, and cadmium respectively. None of the above metals is estimated to exceed its respective standard in 100,000 years. Groundwater concentrations of copper, arsenic, mercury, and cadmium will not increase in 100,000 years, some of which may even decrease due to dilution effect of the leachate. Groundwater concentrations of lead, antimony, and zinc will increase by 12%, 36%, and 2%, respectively, in 100,000 years.

A sensitivity analysis showed that worst case scenario groundwater concentrations could be as high as 13.4 µg/l, 8.1 µg/l, 1.81 µg/l, 1.25 µg/l, 0.051 µg/l, 16.1 µg/l, and 0.15µg/l for lead, copper, antimony, arsenic, mercury, zinc, and cadmium, respectively (**Appendix F, Table F-1 through Table F-7**) in 100,000 years. None of the above metals is estimated to exceed its respective standard in 100,000 years. Groundwater concentrations of arsenic and cadmium will not increase in 100,000 years. Groundwater concentrations of lead, copper, antimony, mercury, and zinc will increase by 15%, 65%, 81%, 2%, and 3%, respectively, in 100,000 years.

1.4.2 SEAD-17, The Existing Deactivation Furnace

As presented in **Table 1-4**, the results of the FS model indicate that base case cumulative metal input to the groundwater in 100,000 years is 9.87×10^5 g, 3.46×10^4 g, 4.27×10^4 g, 5.71×10^5 g, 3.86×10^3 g, 4.80×10^3 g for lead, copper, antimony, zinc, silver, and cadmium, respectively. As presented in **Table 1-5**, the above metal input to the groundwater will result in groundwater

Table 1-2
Cumulative Groundwater Impact and Average Leachate Concentration to Groundwater at SEAD-16 in 100,000 Years
SEAD-16 and SEAD-17 Fesibility Study
Seneca Army Depot Acitvity

VLEACH Model Scenario	VLEACH Scenario Explan.	Time (year)	Cumulative Groundwater Impact (g)	Average Groundwater Impact (g/year)	Area (ft^2)	Recharge Rate (ft./year)	Infiltration Volume (ft^3/year)	Average Leachate Conc. (g/ft^3)	Average Leachate Conc. (mg/L)
Pb-1	Base	100,000	1.02E+07	102.36	25,550	0.59	15,075	6.79E-03	2.40E-01
Pb-2	Kd low	100,000	1.23E+07	123.16	25,550	0.59	15,075	8.17E-03	2.88E-01
Pb-3	Kd high	100,000	2.98E+05	2.98	25,550	0.59	15,075	1.98E-04	6.99E-03
Pb-4	Q low	100,000	6.37E+05	6.37	25,550	0.29	7,410	8.60E-04	3.04E-02
Pb-5	Q high	100,000	1.15E+07	114.89	25,550	0.88	22,484	5.11E-03	1.80E-01
Cu-1	Base	100,000	3.84E+04	0.38	25,550	0.59	15,075	2.55E-05	9.00E-04
Cu-2	Kd low	100,000	3.33E+06	33.34	25,550	0.59	15,075	2.21E-03	7.81E-02
Cu-3	Kd high	100,000	5.59E+03	0.056	25,550	0.59	15,075	3.71E-06	1.31E-04
Cu-4	Q low	100,000	1.61E+04	0.16	25,550	0.29	7,410	2.17E-05	7.67E-04
Cu-5	Q high	100,000	2.17E+05	2.17	25,550	0.88	22,484	9.66E-05	3.41E-03
Sb-1	Base	100,000	3.74E+05	3.74	22,250	0.59	13,128	2.85E-04	1.01E-02
Sb-2	Kd low	100,000	3.74E+05	3.74	22,250	0.59	13,128	2.85E-04	1.01E-02
Sb-3	Kd high	100,000	3.74E+05	3.74	22,250	0.59	13,128	2.85E-04	1.01E-02
Sb-4	Q low	100,000	3.85E+05	3.85	22,250	0.29	6,453	5.97E-04	2.11E-02
Sb-5	Q high	100,000	3.70E+05	3.70	22,250	0.88	19,580	0.00019	6.68E-03
As-1	Base	100.000	2.68E+03	2.68E-02	3.437	0.59	2,028	1.32E-05	4.66E-04
As-2	Kd low	100,000	2.69E+03	2.69E-02	3,437	0.59	2,028	1.33E-05	4.68E-04
As-3	Kd high	100.000	2.66E+03	2.66E-02	3,437	0.59	2,028	1.31E-05	4.63E-04
As-4	Q low	100.000	2.67E+03	2.67E-02	3,437	0.29	997	2.68E-05	9.45E-04
As-5	Q high	100,000	2.68E+03	2.68E-02	3,437	0.88	3,025	8.87E-06	3.13E-04
Hg-1	Base	100,000	5.35E+02	5.35E-03	7,188	0.59	4,241	1.2614E-06	4.454E-05
Hg-2	Kd low	100,000	5.35E+02	5.35E-03	7,188	0.59	4,241	1.2614E-06	4.454E-05
Hg-3	Kd high	100,000	5.35E+02	5.35E-03	7,188	0.59	4,241	1.2614E-06	4.454E-05
Hg-4	Q low	100,000	5.45E+02	5.45E-03	7,188	0.29	2,085	2.6142E-06	9.231E-05
Hg-5	Q high	100,000	5.26E+02	5.26E-03	7,188	0.88	6,325	8.3121E-07	2.9351E-05
Zn-1	Base	100,000	9.64E+05	9.6362	26,350	0.59	15,547	6.20E-04	2.19E-02
Zn-2	Kd low	100,000	1.16E+06	11.55	26,350	0.59	15,547	7.43E-04	2.62E-02
Zn-3	Kd high	100,000	8.40E+04	0.83966	26,350	0.59	15,547	5.40E-05	1.91E-03
Zn-4	Q low	100,000	1.78E+05	1.783	26,350	0.29	7,642	2.33E-04	8.24E-03
Zn-5	Q high	100,000	1.11E+06	11.134	26,350	0.88	23,188	4.80E-04	1.70E-02
Cd-1	Base	100,000	346.05	3.46E-03	1,750	0.59	1,033	3.352E-06	1.183E-04
Cd-2	Kd low	100,000	346.23	3.46E-03	1,750	0.59	1,033	3.353E-06	1.184E-04
Cd-3	Kd high	100.000	349.22	3.49E-03	1,750	0.59	1,033	3.382E-06	1.19E-04
Cd-4	Q low	100,000	346.61	3.47E-03	1,750	0.29	508	6.830E-06	2.41E-04
Cd-5	Q high	100.000	345.98	3.46E-03	1,750	0.88	1,540	2.247E-06	7.93E-05

Table 1-3

Summers Model Input Parameters and Results for Base Scenarios
of Seven Inorganics at SEAD-16 in 100,000 Years

SEAD-16 and SEAD-17 Fesibility Study
Seneca Army Depot Activity

Parameter	Model I.D.	Units	Model Scenario						
			Pb-1	Cu-1	Sb-1	As-1	Hg-1	Zn-1	Cd-1
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft day	0.00032	0.00032	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	25,550	25,550	22,250	3,437	7,188	26,350	1,750
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3 day	8.18	8.18	7.12	1.10	2.30	8.43	0.56
Seepage velocity in aquifer	Vsa	ft day	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft day	0.186	0.186	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	320	320	305	140	300	300	95
Volumetric flow rate of aquifer	Qa	ft^3 day	178.56	178.56	170.19	78.12	167.4	167.4	53.01
Initial or background concentration of solute in the aquifer	Cs	mg l	0.00085	0.0049	0.0010	0.0013	0.000050	0.016	0.00015
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg l	0.24	0.00090	0.010	0.00047	0.000045	0.022	0.0001183
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg l	0.011	0.0047	0.00136	0.0012	0.000050	0.02	0.0001
	Cgw	ug l	11	4.7	1.36	1.2	0.050	16	0.15
Drinking water standard		ug l	15	200	6	25	2	300	5
Reference			EPA MCL	NYS GA	EPA MCL	NYS GA	NYS GA	NYS GA	EPA MCL

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Table 1-4
Cumulative Groundwater Impact and Average Leachate Concentration to Groundwater at SEAD-17
in 100,000 Years
SEAD-16 and SEAD-17 Fesibility Study
Seneca Army Depot Acitvity

VLEACH Model Scenario	VLEACH Scenario Explan.	Time (year)	Cumulative Groundwater Impact (g)	Average Groundwater Impact (g/year)	Area (ft^2)	Recharge Rate (ft./year)	Infiltration Volume (ft^3/year)	Average Leachate Conc. (g/ft^3)	Average Leachate Conc. (mg/L)
Pb-1	Base	100,000	9.87E+05	9.87	36,935	0.59	21,792	4.53E-04	1.60E-02
Pb-2	Kd low	100,000	1.18E+06	11.81	36,935	0.59	21,792	5.42E-04	1.91E-02
Pb-3	Kd high	100,000	5.23E+04	0.52	36,935	0.59	21,792	2.40E-05	8.47E-04
Pb-4	Q low	100,000	8.82E+04	0.88	36,935	0.29	10,711	8.23E-05	2.91E-03
Pb-5	Q high	100.000	1.10E+06	11.03	36,935	0.88	32,503	3.39E-04	1.20E-02
Cu-1	Base	100.000	3.46E+04	0.35	26,818	0.59	15.823	2.19E-05	7.73E-04
Cu-2	Kd low	100,000	2.36E+05	2.36	26,818	0.59	15.823	1.49E-04	5.26E-03
Cu-3	Kd high	100,000	5.65E+03	0.057	26,818	0.59	15.823	3.57E-06	1.26E-04
Cu-4	Q low	100.000	1.69E+04	0.17	26,818	0.29	7,777	2.17E-05	7.67E-04
Cu-5	Q high	100.000	5.99E+04	0.60	26,818	0.88	23,600	2.54E-05	8.97E-04
Sb-1	Base	100,000	4.27E+04	0.427	39,435	0.59	23,267	1.84E-05	6.49E-04
Sb-2	Kd low	100,000	4.27E+04	0.427	39,435	0.59	23,267	1.84E-05	6.49E-04
Sb-3	Kd high	100,000	4.27E+04	0.427	39.435	0.59	23,267	1.84E-05	6.49E-04
Sb-4	Q low	100,000	4.35E+04	0.435	39,435	0.29	11,436	3.80E-05	1.34E-03
Sb-5	Q high	100.000	4.26E+04	0.426	39,435	0.88	34,703	1.23E-05	4.33E-04
Zn-1	Base	100,000	5.71E+05	5.7107	36,780	0.59	21,700	2.63E-04	9.29E-03
Zn-2	Kd low	100,000	6.48E+05	6.4814	36,780	0.59	21,700	2.99E-04	1.05E-02
Zn-3	Kd high	100.000	1.17E+05	1.172	36,780	0.59	21,700	5.40E-05	1.91E-03
Zn-4	Q low	100,000	2.23E+05	2.228	36,780	0.29	10,666	2.09E-04	7.38E-03
Zn-5	Q high	100,000	6.28E+05	6.2771	36,780	0.88	32,366	1.94E-04	6.85E-03
Ag-1	Base	100,000	3.86E+03	0.038605	27,775	0.59	16,387	2.36E-06	8.32E-05
Ag-2	Kd low	100,000	3.86E+03	0.038645	27,775	0.59	16,387	2.36E-06	8.33E-05
Ag-3	Kd high	100,000	3.88E+03	0.038758	27,775	0.59	16,387	2.37E-06	8.35E-05
Ag-4	Q low	100,000	3.86E+03	0.038572	27,775	0.29	8,055	4.79E-06	1.69E-04
Ag-5	Q high	100,000	3.86E+03	0.038618	27,775	0.88	24,442	1.58E-06	5.58E-05
Cd-1	Base	100,000	4.80E+03	0.047998	27,411	0.59	16,172	2.97E-06	1.05E-04
Cd-2	Kd low	100,000	4.80E+03	0.048025	27,411	0.59	16,172	2.97E-06	1.05E-04
Cd-3	Kd high	100,000	4.84E+03	0.048423	27,411	0.59	16,172	2.99E-06	1.06E-04
Cd-4	Q low	100,000	4.81E+03	0.048081	27,411	0.29	7,949	6.05E-06	2.14E-04
Cd-5	Q high	100.000	4.80E+03	0.047988	27,411	0.88	24.122	1.99E-06	7.02E-05

Table 1-5

Summers Model Input Parameters and Results for Base Scenarios
of Six Inorganics at SEAD-17 in 100,000 Years

SEAD-17 Remedial Investigation
Seneca Army Depot Activity

Parameter	Model I.D.	Units	Model Scenario					
			Pb-1	Cu-1	Sb-1	Zn-1	Ag-1	Cd-1
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	36,935	26,818	39,435	36,780	27,775	27,411
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	11.82	8.58	12.62	11.77	8.89	8.77
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	240	240	110	260	170	240
Volumetric flow rate of aquifer	Qa	ft^3/day	144	144	66	156	102	144
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00085	0.0037	0.001	0.0029	0.0023	0.00031
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	1.60E-02	7.73E-04	6.49E-04	9.29E-03	8.32E-05	1.05E-04
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	2.00E-03	3.54E-03	9.44E-04	3.35E-03	2.12E-03	2.98E-04
	Cgw	ug/l	2.00	3.54	0.94	3.35	2.12	0.30
Drinking water standard		ug/l	15	200	6	300	50	5
Reference			EPA MCL	NYS GA	EPA MCL	NYS GA	NYS GA	EPA MCL

p:\pit\projects\s1617fs\final2000\tables\sect1\Table 1-5_F-8th13.xls concentrations of 2 µg/l, 3.54 µg/l, 0.94 µg/l, 3.35 µg/l, 2.12 µg/l, and 0.30 µg/l for lead, copper, antimony, silver, and cadmium, respectively. None of the above metals is estimated to exceed its respective standard in 100,000 years. Groundwater concentrations of copper, antimony, silver, and cadmium will not increase in 100,000 years, some of which may even decrease due to dilution effect of the leachate. Groundwater concentrations of lead and zinc will increase by 1.4% and 14%, respectively, in 100,000 years.

A sensitivity analysis showed that worst case scenario groundwater concentrations could be as high as 2.2 µg/l, 3.79 µg/l, 1.06 µg/l, 3.4 µg/l, and 0.30 µg/l for lead, copper, antimony, zinc, silver, and cadmium respectively (**Appendix F, Table F-8 through Table F-13**) in 100,000 years. None of the above metals is estimated to exceed its respective standard in 100,000 years. Groundwater concentrations of silver and cadmium decrease in 100,000 years due to dilution effect of the leachate. Groundwater concentrations of lead, copper, antimony, and zinc will increase by 1.6%, 2%, 6%, and 17%, respectively, in 100,000 years.

1.5 RISK ASSESSMENT

A baseline risk assessment (BRA) was conducted for SEAD-16 and SEAD -17 and is presented in the RI (Parsons ES, March 1999). The objectives of the baseline risk assessment were to: assess site conditions for protectiveness of human health and the environment, to help determine whether additional response actions are necessary at the site, to provide a basis for determining residual chemical levels that are adequately protective of human health and the environment, provide a basis for comparing potential health impacts of various remedial alternatives, and evaluate selection of the "No Action" remedial alternative, where appropriate. To meet these objectives, the *Risk Assessment Guidance for Superfund* (RAGS) (USEPA, 1989) was followed wherever possible and applicable.

The baseline risk assessment was divided into two basic components: the human health evaluation and the ecological evaluation. Separate risk calculations were presented for current and future on-site land-use scenarios.

The baseline human health risk assessments for SEAD-16 and SEAD-17 are presented in **Appendix B**. It should be noted that revisions have been made to the SEAD-17 human health risk assessment, which appeared in the RI. As part of this revision, the risk associated with the ingestion of groundwater for SEAD-17, which was previously excluded, was calculated and included. Minor revisions were also made to the risk tables associated with the ingestion of soil and dermal contact to soil.

1.5.1 Baseline Human Health Risk Assessment

The current land use for SEAD-16 and SEAD-17 is industrial. The future intended use of the site was determined to be industrial by the Seneca Army Depot Local Redevelopment Authority in the *Reuse and Implementation Strategy for Seneca Army Depot.* This document was adopted and approved by the Seneca County Board of Supervisors on October 22, 1996. There are no current plans to change the land use or use the site for residential purposes.

The human health risk assessments were conducted for the industrial land use scenario for the following six receptors:

1) current on-site worker,
2) future industrial worker,
3) future on-site construction workers,
4) future child trespassers,
5) future day care center child, and
6) future day care center worker.

A summary of the assessment is presented in Section 2.

1.5.2 Baseline Ecological Risk Assessment

The ecological risk assessment (ERA) was performed following the guidance presented in the New York State *Division of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (NYSDEC 1994), *the Framework for Ecological Risk Assessment* (EPA, 1992), and the *Procedural Guidelines for Ecological Risk Assessment at U.S. Army Sites, Vol. 1* (Wentsel et al., 1994).

The ERA included both qualitative and quantitative assessments of the ecological status of SEAD-16 and SEAD-17. Field evaluations included the characterization and description of the local wildlife habitat and ecological conditions within the study area. Based on these studies, the creek chub was chosen to represent the aquatic community in the quantitative assessment and the deer mouse was chosen to represent the terrestrial vertebrae populations in the quantitative assessment. Quantitative sediment and surface water analytical data were compared to USEPA and NYSDEC guidelines for the protection of aquatic and macroinvertebrate life in sediments and surface water. Additionally, as a supplement to specific guidelines, criteria, which are protective of terrestrial wildlife and vegetation in soils, were also considered.

A summary of the ecological risk assessment is presented in Section 2.

2 REMEDIAL ACTION OBJECTIVES

2.1 INTRODUCTION

The purpose of this section is to develop remedial action objectives (RAO) and general response actions for each media of interest. Based on the RAO and the general response actions, possible remedial technologies are identified and screened in Section 3, and remedial alternatives are developed in Section 4. This process follows the standard USEPA method of identifying and screening technologies/processes and consists of the following six steps:

- Develop remedial action objectives that specify media of interest, chemical constituents of concern, and the results of the BRA (Section 2);
- Develop general response actions for each medium of interest that will satisfy each remedial action objective for the site (Section 2);
- Estimate quantities of media to which general response actions will be applied to meet remedial action objectives (Section 2);
- Identify remediation technologies/processes associated with each general response action. Screen and eliminate technologies/processes based on technical implementability (Section 3);
- Evaluate technologies/processes and retain processes that are representative of each technology (Section 3); and
- Assemble and further screen the retained technologies/processes into a range of alternatives as appropriate (Section 4 and 6).

This six-step approach to technology screening and alternatives development is described in the following subsections.

2.2 GENERAL REMEDIAL ACTION OBJECTIVES

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) clean-up process is a risk-based process. The overall objective of any remedial response is to protect human health and the environment. Protection of human health and the environment is required where the risks from exposure to the chemicals present in the various environmental media exceed established USEPA target ranges. Remedial action objectives have been developed to meet this overall objective. The objectives are then used as a basis for developing remedial alternatives.

The National Contingency Plan (NCP) requires that CERCLA remedial actions comply with applicable or relevant and appropriate requirements (ARARs). ARARs are promulgated standards that are applicable to the process of site cleanup after a remedial action has been chosen for implementation. Chemical specific standards, action specific standards, location specific standards, and federal and state environmental regulations are all examples of potential ARARs. For SEAD-16 and SEAD-17, chemical specific ARARs for groundwater and surface water quality have been established. However, there are currently no promulgated state or federal standards that establish allowable soil quality, which is the media of interest at SEAD-16 and SEAD-17, as discussed in the following sections.

In addition, CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, requires that a CERCLA remedial action:

- Use remedial alternatives that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances;
- Select remedial actions that protect human health and the environment, are cost effective, and involve permanent solutions, alternative solutions and resource recovery technologies to the maximum extent possible;
- Avoid off-site transport and disposal of untreated hazardous substances or contaminated materials where practical technologies exist to treat these materials on-site.

Remedial action objectives for SEAD-16 and SEAD-17 have been developed. The objectives consist of media specific objectives designed to be protective of human health and the environment. Where practicable, consideration was given to the NCP preference for permanent solutions. The remedial action objectives for SEAD-16 and SEAD-17 are as follows:

- Prevent public or other persons from direct contact with adversely impacted soils, sediments/soils found in the ditches, solid waste and surface water that may present a health risk.

- Eliminate or minimize the migration of hazardous constituents from soil to groundwater and downgradient surface water.

- Prevent off-site migration of constituents above levels protective of public health and the environment.

- Restore soil and sediments/soils found in the ditches to levels that are protective of public health and the environment.

The following sections describe how these general remedial action objectives were determined and the development of remedial actions to attain these objectives. Remedial action objectives for these sites are based upon the current and intended land use (*i.e.*, industrial) scenarios. Technologies capable of accomplishing the remedial action objectives have been screened for applicability in Section 3 and are assembled into remedial alternatives in Section 4.

2.3 RISK-BASED REMEDIAL ACTION OBJECTIVES

The first step in developing remedial action objectives is to review the results of the Baseline Risk Assessment (BRA) presented in the RI report (Parsons ES, March 1999) and in Section 1.5. USEPA considers that a site exhibits unacceptable risk levels if the Hazard Index (HI) for the site is greater than 1, or if the cancer risk is greater than the target range of 1×10^{-4} to 1×10^{-6}.

2.3.1 SEAD-16 Human Health Risk Assessment

A hazard index and cancer risk was calculated for SEAD-16 based on the reasonable maximum exposure (RME) for each of the six applicable receptors (discussed in Section 1) and each exposure route. In addition, a total receptor risk was calculated. The risk calculations presented in Appendix B and summarized in **Table 2-1** indicate that under the current and intended future land use scenarios (pre-remediation case), the total hazard index is below the USEPA acceptable level of 1 for the current site worker (HI=0.05) and the future trespasser (HI=0.3). However, the total hazard indices for the future industrial worker (HI=20), future on-site construction worker (HI=1), future day care center child (HI=6), and future day care center worker (HI=2) exceed the acceptable USEPA level.

TABLE 2-1a
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CALCULATION OF TOTAL NONCARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
SEAD-16 ALTERNATIVE CASES FOR SOIL REMEDIATION RISK ASSESSMENT

E	EXPOSURE SCENARIO	HAZARD INDEX									
		Inhalation Dust-Amb Air	Ingestion On-site soil	Dermal On-site soil	Inhalation Dust-Indoor	Ingestion Dust-Indoor	Dermal Dust-Indoor	Ingestion Ground Water	Dermal Surf Water	Ingestion Sediment/Soil Found in the Ditches	Dermal Sediment/Soil Found in the Ditch
	Current Site Worker	3E-02	1E-02	2E-03	-	-	-	-	-	-	-
	Future Industrial Worker	-	-	-	3E-01	**1.7E+01**	**1.8E+00**	**1.7E+00**	-	-	-
-	*Future On-Site Construction Worker*	5E-01	9E-01	2E-02	-	-	-	-	-	-	-
ATION	*Future Child Trespasser*	1E-02	9E-02	5E-03	-	-	-	-	7E-03	2E-01	1E-02
	Future Day Care Center Child	8E-01	**2E+00**	4E-02	-	-	-	**4E+00**	-	-	-
	Future Day Care Center Worker	3E-01	2E-01	2E-02	-	-	-	**2E+00**	-	-	-
	Current Site Worker	1E-04	3E-03	5E-04	-	-	-	-	-	-	-
	Future Industrial Worker	-	-	-	NA	NA	NA	**2E+00**	-	-	-
T-	*Future On-Site Construction Worker*	1E-02	2E-01	7E-03	-	-	-	-	-	-	-
ATION	*Future Child Trespasser*	4E-05	2E-02	1E-03	-	-	-	-	7E-03	NA	NA
	Future Day Care Center Child	2E-03	3E-01	1E-02	-	-	-	**4E+00**	-	-	-
	Future Day Care Center Worker	1E-03	3E-02	7E-03	-	-	-	**2E+00**	-	-	-

n boldface exceed the USEPA defined targets
ion" case consists of the remediation of all surface and subsurface soil samples with lead concentrations > 1250 ppm and all samples of sediment soil found in the ditches with lead concentration > 31 ppm.
icable. Following remediation of indoor dust and sediment/soil found in the ditches, risk will be negligible via these exposure routes.

TABLE 2-1b
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CALCULATION OF TOTALCARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
SEAD-16 ALTERNATIVE CASES FOR SOIL REMEDIATION RISK ASSESSMENT

E	EXPOSURE SCENARIO	CANCER RISK									
		Inhalation Dust-Amb Air	Ingestion On-site soil*	Dermal On-site soil	Inhalation Dust-Indoor	Ingestion Dust-Indoor	Dermal Dust-Indoor	Ingestion Ground Water	Dermal Surf Water	Ingestion Sediment/Soil Found in the Ditches	Dermal Sediment/Soil Found in the Ditche
	Current Site Worker	2E-11	1E-06	3E-08	-	-	-	-	-	-	-
	Future Industrial Worker	-	-	-	NA	**5E-03**	6E-06	4E-05	-	-	-
-	*Future On-Site Construction Worker*	9E-11	3E-06	1E-08	-	-	-	-	-	-	-
ATION	*Future Child Trespasser*	2E-12	2E-06	2E-08	-	-	-	-	8E-07	4E-07	3E-08
	Future Day Care Center Child	1E-10	4E-05	1E-07	-	-	-	2E-05	-	-	-
	Future Day Care Center Worker	2E-10	2E-05	3E-07	-	-	-	4E-05	-	-	-
	Current Site Worker	4E-12	2E-06	1E-08	-	-	-	-	-	-	-
	Future Industrial Worker	-	-	-	NA	NA	NA	4E-05	-	-	-
T-	*Future On-Site Construction Worker*	2E-11	4E-06	5E-09	-	-	-	-	-	-	-
ATION	*Future Child Trespasser*	4E-13	3E-06	5E-09	-	-	-	-	8E-07	NA	NA
	Future Day Care Center Child	3E-11	6E-05	5E-08	-	-	-	2E-05	-	-	-
	Future Day Care Center Worker	5E-11	3E-05	1E-07	-	-	-	4E-05	-	-	-

n boldface exceed the USEPA defined targets
ion" case consists of the remediation of all surface and subsurface soil samples with lead concentrations > 1250 ppm and all samples of sediment/soil found in the ditches with lead concentration > 31 ppm.
licable. Following remediation of indoor dust and sediment/soil found in the ditches, risk will be negligible via these exposure routes.
ntified due to lack of toxicity data.
ent has resulted in greater Post-Remediation Career Risk numbers than Pre-Remediation Cancer Risk numbers for Ingestion of On-Site soil. Clean refill material has not been included in the
ation calculations presented in this table, which would decrease the overall risk.

The total hazard index for the future adult industrial worker is due to ingestion of indoor dust, dermal contact with indoor dust, and ingestion of groundwater. The total hazard index for the future day care child is due to ingestion of on-site soil and ingestion of groundwater. The total hazard index for the future day care center worker is primarily due to ingestion of groundwater.

The total cancer risks for the current and intended future land use scenarios are in the range of the USEPA target level of between 1 x 10^{-4} and 1 x 10^{-6} for all receptors except future industrial worker. For the current site worker the total carcinogenic site risk is 1 x 10^{-6}. For the future on-site construction worker the total carcinogenic site risk is 3 x 10^{-6}. For the future on-site trespasser the total site carcinogenic risk is 3 x 10^{-6}. For the future day care center child the risk is 6 x 10^{-5} and the carcinogenic risk for the future day care center worker is 6 x 10^{-5}. The total cancer risk exceeds the target level for the future industrial worker (5 x 10^{-3}). The total cancer risk for the future industrial worker is primarily due to ingestion of indoor dust.

It should be noted that the calculated post-remediation risks for ingestion of on-site soils are higher than the pre-remediation risks. The risk assessment is based on the exposure point concentration (EPC), which is the 95% upper confidence limit of the arithmetic mean of selected samples. For the baseline risk assessment, all samples collected at the site were used to estimate the EPC values. For the post-remediation risk assessment, samples collected outside the delineated boundary were used to estimate the EPC values. Samples outside the delineated boundary generally contained elevated concentrations of benzo(a)pyrene, benzoanthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene, etc. Therefore, the calculated post-remediation risks for ingestion of on-site soil are higher that pre-remediation risks. However, this does not necessarily indicate higher risks for post-remediation site because concentrations in the clean refill material are not included in the estimation of EPC values for post-remediation risk assessment.

In summary, risk levels exceed the USEPA target risk ranges for the following exposure pathways for the future site industrial worker:

- ingestion of indoor dust,
- dermal contact with indoor dust,
- ingestion of groundwater.

The elevated hazard indices for the ingestion of indoor dust exposure pathway are primarily due to the SVOCs, 2,4-dinitrotoluene, and the metals (antimony and copper). The elevated hazard

TABLE 2-2a
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CALCULATION OF TOTAL NONCARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
SEAD-17 ALTERNATIVE CASES FOR SOIL REMEDIATION RISK ASSESSMENT

SE	EXPOSURE SCENARIO	HAZARD INDEX							I
		Inhalation Dust-Amb Air	Ingestion On-site soil	Dermal On-site soil	Ingestion Ground Water	Dermal Surf Water	Ingestion Sediment/Soil Found in the Ditches	Dermal Sediment/Soil Found in the Ditches	
E-ATION	*Current Site Worker*	1.5E-04	8.2E-03	8.5E-03	-	-	-	-	
	Future Industrial Worker	1.9E-03	1.0E-01	1.1E-01	1.6E-04	-	-	-	
	Future On-Site Construction Worker	1.7E-02	4.2E-01	8.5E-02	-	-	-	-	
	Future Child Trespasser	6.5E-05	5.7E-02	2.4E-02	-	1.5E-03	5.3E-02	3.2E-03	
	Future Day Care Center Child	3.6E-03	**9.6E-01**	1.9E-01	3.7E-04	-	-	-	
	Future Day Care Center Worker	1.6E-03	1.0E-01	1.1E-01	1.6E-04	-	-	-	
ST-ATION	*Current Site Worker*	1.2E-04	6.8E-03	4.1E-03	-	-	-	-	
	Future Industrial Worker	1.5E-03	8.5E-02	5.2E-02	1.6E-04	-	-	-	
	Future On-Site Construction Worker	1.4E-02	3.4E-01	4.5E-02	-	-	-	-	
	Future Child Trespasser	5.2E-05	4.8E-02	1.2E-02	-	1.5E-03	NA	NA	
	Future Day Care Center Child	2.9E-03	8.0E-01	9.1E-02	3.7E-04	-	-	-	
	Future Day Care Center Worker	1.2E-03	8.5E-02	5.2E-02	1.6E-04	-	-	-	

n boldface exceed the USEPA defined targets
ion" case consists of the remediation of all surface and subsurface soil samples with lead concentrations > 1250 ppm and all samples of sediment/soil found in the ditches with lead concentration > 31 ppm.
icable. Following remediation of sediment/soil found in the ditches, risk will be negligible via these exposure routes.

TABLE 2-2b
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CALCULATION OF TOTAL CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME)
SEAD-17 ALTERNATIVE CASES FOR SOIL REMEDIATION RISK ASSESSMENT

SE	EXPOSURE SCENARIO	CANCER RISK						
		Inhalation Dust-Amb Air	Ingestion On-site soil	Dermal On-site soil	Ingestion Ground Water	Dermal Surf Water	Ingestion Sediment/Soil Found in the Ditches	Dermal Sediment/Soil Found in the Ditches
E- IATION	*Current Site Worker*	7.0E-09	4.2E-07	2.6E-08	-	-	-	-
	Future Industrial Worker	8.7E-08	5.2E-06	3.3E-07	9.2E-05	-	-	-
	Future On-Site Construction Worker	3.0E-08	9.6E-07	1.5E-08	-	-	-	-
	Future Child Trespasser	6.1E-10	5.8E-07	1.5E-08	-	1.4E-08	2.5E-07	5.2E-09
	Future Day Care Center Child	4.1E-08	1.2E-05	1.4E-07	5.1E-05	-	-	-
	Future Day Care Center Worker	7.3E-08	5.2E-06	3.3E-07	9.2E-05	-	-	-
ST- IATION	*Current Site Worker*	5.0E-09	4.0E-07	2.4E-08	-	-	-	-
	Future Industrial Worker	6.3E-08	5.0E-06	3.0E-07	9.2E-05	-	-	-
	Future On-Site Construction Worker	2.3E-08	9.3E-07	1.5E-08	-	-	-	-
	Future Child Trespasser	4.4E-10	5.6E-07	1.3E-08	-	1.4E-08	NA	NA
	Future Day Care Center Child	2.9E-08	1.1E-05	1.3E-07	5.1E-05	-	-	-
	Future Day Care Center Worker	5.2E-08	5.0E-06	3.0E-07	9.2E-05	-	-	-

in boldface exceed the USEPA defined targets
tion" case consists of the remediation of all surface and subsurface soil samples with lead concentrations > 1250 ppm and all samples of sediment/soil found in the ditches with lead concentration > 31 ppm.
licable. Following remediation of sediment/soil found in the ditches, risk will be negligible via these exposure routes.

jects\seneca\s1617fs\final2000\tables\sect2\TAB2-2.xls index for the dermal contact with indoor dust exposure pathway is primarily due to cadmium. The elevated hazard index for the ingestion of groundwater exposure pathway is primarily due to thallium. It should be noted that lead, which was found at elevated levels in soil at this site, was not considered in the quantitative risk assessment, as an allowable Reference Dose (RfD) is not available. Lead was considered by comparing site data to levels established by USEPA and NYSDEC as protective.

2.3.2 SEAD-17 Human Health Risk Assessment

A RME hazard index and cancer risk was calculated for each applicable receptor and exposure route for SEAD-17. In addition, a total receptor risk was calculated. The risk calculations presented in Appendix B and summarized in **Table 2-2** indicate that under the current and intended future land use scenarios (pre-remediation case), the total hazard index is below the USEPA acceptable level of 1 for the current site worker (HI=0.02), future industrial worker (HI=0.02), future on-site construction worker (HI=0.05), future trespasser (HI=0.1), and future day care center worker (HI=0.2). However, the total hazard index for the future day care center child (HI=1) equals the acceptable USEPA level. The total hazard index for the future day care child is primarily due to ingestion of on-site soil. The total cancer risks for all receptors are below the USEPA target levels.

Based on the results of the BRA, risk levels exceed the USEPA target levels of risk due to the ingestion of on-site soil. The risk associated with this pathway is primarily due to the metals (antimony, arsenic, and cadmium). It should be noted that lead, which was found at elevated levels in soil at this site, was not considered in the quantitative risk assessment as an allowable Reference Dose (RfD) is not available. Lead was considered by comparing site data to levels established by USEPA and NYSDEC as protective.

2.3.3 SEAD-16 Ecological Risk Assessment

A hierarchy of assessment endpoints was selected to assess both proximate and ultimate risks that might be associated with site-related chemicals. Deer mice represent terrestrial vertebrate populations and creek chub represent the aquatic community (proximate endpoints.) Compared to the proximate, the ultimate assessment endpoint (maintenance of the health and diversity of the natural community in the area) is the most important ecological component to be protected with regard to this site. Therefore, those chemical of concern (COC) estimated to pose a potential for adverse effects to proximate assessment endpoints are subsequently evaluated with regard to the risk they may pose to the ultimate assessment endpoint.

The ecological setting of SEAD-16 is not unique or significant. There are no endangered, threatened, or special concern species in the vicinity that are likely to be dependent on or affected by the habitat at the site. The area of the site is small, and the habitat it provides appears to be relatively low in diversity and productivity.

Of the chemical of potential concern (COPC) at SEAD-16 having a hazardous quotient (HQ) equal to or greater than 1, seven were identified in soil, six in surface water, and 15 in sediments/soils found in the ditches. In surface soil and subsurface soil, lead and mercury are considered to be COCs. Both have HQs greater than 10. In surface water, iron and lead are considered to be COCs. Both have HQs greater than 10, and exceed the New York Ambient Water Quality Standards. In sediments/soils found in the ditches, endosulfan I, endosulfan II, and endosulfan sulfate were considered to be organic COCs. As reasonable maximum exposure concentration of metals were directly compared with the NYSDEC screening level concentrations for sediment (NYSDEC Technical Guidance for Screening Contaminated Sediments), antimony, copper, lead, and mercury were considered to be COCs. The combined three endosulfan compounds and each of the four metals has HQ greater than 10, with copper greater than 100.

There is the potential for risk to the deer mouse and creek chub as a result of COCs concentrations in soil, surface water, and sediments/soils found in the ditches.

2.3.4 SEAD-17 Ecological Risk Assessment

A hierarchy of assessment endpoints was selected to assess both proximate and ultimate risks that might be associated with site-related chemicals. Deer mice represent terrestrial vertebrate populations and creek chub represent the aquatic community. Compared to the proximate, the ultimate assessment endpoint (maintenance of the health and diversity of the natural community in the area) is the most important ecological component to be protected with regard to this site. Therefore, those COCs estimated to pose a potential for adverse effects to proximate assessment endpoints are subsequently evaluated with regard to the risk they may pose to the ultimate assessment endpoint.

The ecological setting of SEAD-17 is not unique or significant—there are no endangered, threatened, or special concern species in the vicinity that are likely to be dependent on or affected by the habitat at the site. The area of the site is small, and the habitat it provides appears to be relatively low in diversity and productivity.

Of the COPCs at SEAD-17 having an HQ equal to or greater than 1, six were identified in soil, three in surface water, and 11 in sediments/soils found in the ditches.

There is a low likelihood of risk to the proximate terrestrial assessment endpoint (*i.e.*, deer mouse populations at the site) from the concentrations of COPCs found in soil. Therefore, none of these compounds are considered to be COCs. The COPCs in surface water and sediments/soils found in the ditches that have HQs greater than 1 are also not likely to adversely impact populations of creek chub in the surface water bodies at the Depot. The site ditches are not quality habitat and have variable flow throughout the course of a year. It is unlikely that the creek chub observed in the ditches make up 20 percent of the local population or even occupy the ditches on the site throughout the year. With HQs of most of the surface water and sediments/soils found in the ditches COPCs less than 10 and based on very conservative assumptions, none was considered as COC.

There is a low likelihood of risk to the deer mouse and creek chub as a result of COPC concentrations in soil, surface water, and sediments/soils found in the ditches.

2.3.5 Risk-Based Remedial Action Objective Summary

In conclusion, for SEAD-16 and SEAD-17, the risk-based remedial objectives are to reduce any non-carcinogenic and carcinogenic risks to acceptable levels considered to be protective of human health and the environment. The human health risk assessment indicates that indoor dust, soil, and groundwater at SEAD-16 present a risk to the future industrial worker, future day care child, and future day care center worker. In addition, the human health risk assessment indicates that ingestion of on-site soil presents a risk to the future day care child at SEAD-17.

The elevated hazard index for the ingestion of groundwater exposure pathway at SEAD-16 is primarily due to thallium. Based on the RI and ESI data, thallium was detected at concentrations exceeding the USEPA MCL (2 μg/l) in three wells at SEAD-16 (MW16-2 RI round 1; MW16-6 RI round 1; and MW16-7 RI round 1 and 2.) The thallium concentrations of these wells were 9.2, 6.2, 4.2, and 11 μg/l, respectively. In addition, thallium was detected at concentrations exceeding the USEPA MCL in two wells at SEAD-17 (MW17-1 RI round 1 and MW17-5 RI round 1.) The thallium concentrations of these wells were 4.4 and 4.7 μg/l, respectively.

Due to the risks produced by the presence of thallium in groundwater, an additional sampling round for thallium only was performed on October 30, 1999 to confirm the presence of thallium in groundwater at this site. This effort was deemed appropriate since there is no historical site use of thallium, the soil sampling did not reveal elevated levels of thallium, the "hits" of thallium were infrequent and not consistent between sampling efforts and the analytical detection limit is low and susceptible to matrix interference. For this sampling effort, all monitoring wells at SEAD-16 and SEAD-17 were sampled using low-flow sampling techniques to obtain turbid-free samples. These samples were then analyzed for thallium using the graphite furnace method, which is less susceptible to matrix interference and can produce lower limits of detection. The previous analytical results were obtained using the Inductively Coupled Plasma (ICP). The analytical results are presented in Appendix A. The results indicated that thallium was not detected in any of the on-site wells. The detection limit for these analyses was 1.5 µg/l, which is less than the USEPA MCL of 2 µg/l and below the NYSDEC GA standard for groundwater of 4 µg/l. Based on these most recent results, thallium is not considered a parameter that is present in groundwater at the site and therefore in not a contributor of non-carcinogenic risk.

The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that several COPCs may present adverse environmental effects. However, the ecological setting of SEAD-16 and SEAD-17 is not unique or significant – there are no endangered, threatened, or special concern species in the vicinity that are likely to be dependent on or afffected by the habitat at the site. The area of the site is small compared to the Seneca Depot area, and the habitat it provides appears to be relatively low in diversity and productivity. In addition, the future land use of SEAD-16 and SEAD-17 has been designated for industrial purposes. This will limit the access to the site by wild animals and limit the site being used as a habitat. Therefore, clean-up goals for soil at SEAD-16 and SEAD-17 will be established such that human health risks from ingestion of indoor dust, dermal contact with indoor dust, and ingestion of on-site soil to current and future receptors will be reduced to within USEPA criteria values. However, a post-remediation ecological risk assessment will be conducted to ensure the remediation plan is protective of the environment. Additional considerations such as ARARs must be considered prior to developing an overall remedial action plan for SEAD-16 and SEAD-17. The following sections discuss these criteria in order to evaluate necessary remedial actions.

2.4 ARAR-BASED REMEDIAL ACTION OBJECTIVES

The investigation and remediation of SEAD-16 and SEAD-17 fall under the jurisdiction of both the State of New York regulations (administered by NYSDEC) and Federal regulations (administered by USEPA Region II). ARARs are promulgated regulatory standards or requirements and as such are legally enforceable and generally applicable and equivalent to the media or conditions at the site.

Three categories of potentially applicable state and federal requirements were reviewed: 1) chemical-specific, 2) location-specific, and 3) action-specific. Chemical-specific ARARs

address certain contaminants or class of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media. Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site. Both location-specific and action-specific ARARs are independent of the media. In addition to ARARs, advisories, criteria, or guidance may be evaluated as "To Be Considered" (TBC) regulatory items. CERCLA indicates that the TBC category could include advisories, criteria, or guidance that were developed by USEPA, other federal agencies, or states that may be useful in developing CERCLA remedies. These advisories, criteria, or guidance are not promulgated and, therefore, are not legally enforceable standards such as ARARs. To date, ARARs have only been propagated for groundwater and surface water. Potentially applicable state and federal requirements are reviewed in **Appendix C**.

Groundwater at SEAD-16 and SEAD-17 has been classified by NYSDEC as Class GA. As a result, the groundwater quality standards for a Class GA groundwater are potential ARARs for this site, if the conditions require a remedial action for groundwater. However, the results of the risk assessment indicate that the groundwater condition at the site does not pose unacceptable risk to human health and therefore does not warrant a remedial action for groundwater. In addition, only aluminum, manganese, iron, and sodium exceed NYS Class GA or USEPA MCL standard for samples collected in RI round at SEAD-16 and SEAD-17. The site mean concentrations of above metals are not statistically different from their background concentrations. Since conditions do not warrant a remedial action for groundwater, these standards do no apply as ARARs.

Surface water at SEAD-16 and SEAD-17 is found in drainage ditches that surround the site. The surface water in these ditches have not been classified by NYSDEC since these ditches are not recognized as an established stream or creek. However, because the drainage ditches near SEAD-16 and SEAD-17 form the headwaters for Kendaia Creek, the lower portion of which is designated as Class C surface water by NYSDEC, the Class C surface water ambient water quality criteria standards are potential ARARs. Since the risks from surface water in Kendaia Creek do not present unacceptable risk to human health and the environment, these standards do not apply as ARARs. The Federal Ambient Water Quality Criteria (AWQCs) will be considered as To Be Considered (TBC) guideline.

Cleanup levels for hazardous constituents in soil have been proposed by the State of New York through Technical and Administrative Guidance Manuals (TAGMs) specifically, #HWR-92-4045. The NYSDEC TAGM manual for cleanup levels for soils is #HWR-94-4046 and has been used as guidance for this remedial action. The soil concentrations provided in the TAGM 4046 are not promulgated standards and therefore are not ARARs but rather are TBC guidelines. For metals in soil, the TAGM values are either site background or a risked derived value, whichever is higher. The only exception is for mercury, which has a TAGM value of 0.1 mg/kg. Although the TAGM values are not ARARs, they have been considered in the clean-up scenarios. Ingestion of soil has been identified as a contributor to the exceedance of risk and a remedial action for soil is appropriate to provide protection to human health and the environment. The determination of the extent of soil that is impacted and will require a remedial action was based upon the indicator metal, lead. Even though lead was not considered in the baseline human health risk assessment, the USEPA and NYSDEC have identified allowable levels of lead in soil that are considered protective, depending upon the intended future use. Lead was selected as the indicator metal since the presence of lead is the most geographically dispersed over the site and by remediating lead-contaminated soil, other compounds that contribute risk will also be remediated. Concentrations of other metals beyond the boundaries to be removed were compared to the appropriate TAGM values and human health risks imposed by metals exceeding TAGM values were considered.

Sampling results of the sediments/soils found in the ditches were compared to the most conservative New York State Guidelines for sediment, including: New York State lowest effect level (NYS LEL), New York State human health bioaccumulation criteria (NYS HHB), New York State benthic aquatic life acute and chronic toxicity criteria (NYS BALAT and NYS BALCT, respectively), and New York State wildlife bioaccumulation criteria (NYS WB).

The following is a comparison of SEAD-16 and SEAD-17 data to ARAR and TBC criteria by media.

2.4.1 SEAD-16 Surface and Subsurface Soils

Metals and SVOCs, predominantly PAH compounds, were found to be pervasive in the surface and subsurface soils, particularly adjacent to the Abandoned Deactivation Furnace. Twenty-one metals were detected in the surface soils at concentrations above their respective TAGM values. Lead, copper, arsenic, and zinc were detected in almost all of the surface soil samples at concentrations above their respective TAGM values. Based on the surface soil data, the highest concentrations of metals were located in the area between the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366). In the subsurface soil, 14 metals were detected in the subsurface soils at concentrations above their respective TAGM values. Copper and lead were found to be the most pervasive.

SVOCs were also detected at concentrations above their respective TAGM values. The highest concentration of PAH compounds in surface soils were detected in samples located adjacent to the northwestern corner of the Abandoned Deactivation Furnace Building. Nitroaromatic compounds were also present in the surface and subsurface soil near both buildings. Impacts from pesticides, PCBs, and herbicides in soil were less significant than the impacts from SVOCs and metals.

2.4.2 SEAD-16 Groundwater

Based on the RI data, seven metals (aluminum, antimony, iron, lead, manganese, sodium, and thallium) were detected above their respective NYSDEC AWQS Class GA or Federal MCL groundwater standards. It should be noted that SEAD-16 monitoring wells were resampled on October 30, 1999 and analyzed for thallium. The results indicate that all groundwater samples had a thallium concentration at the detection limit of 1.5 μg/l, which is less than the USEPA MCL (2 μg/l). SVOCs and nitroaromatics were not detected above the groundwater standards. No VOCs, pesticides, or PCBs were detected in groundwater at SEAD-16.

2.4.3 SEAD-16 Surface Water

Based on the RI data, surface water impacts were primarily from metals. Six metals (lead, copper, zinc, cadmium, selenium, and iron) were detected at several locations at concentrations exceeding the NYSDEC AWQS Class C surface water standards. Three of these metals (lead, copper and zinc) were also found to be widely distributed in surface soils on-site; thus, surface soils are a likely source area for the metals found in the surface water samples. SVOCs were found in a few surface water samples, but only one sample was above the NYS Class C standard. Many of the other analytes analyzed (*e.g.* VOCs, pesticides, PCBs, nitroaromatics) were not detected in the samples.

2.4.4 SEAD-16 Sediment/Soils Found in the Ditches

Comparison of ditch soil sampling results with the NYSDEC guidelines for sediment indicates that there were impacts from SVOCs, pesticides, and metals. Several samples contained pesticide compounds and SVOCs, which exceeded their respective NYS sediment criteria. The most significant exceedence was in sample SW/SD16-1, which was collected from the northeastern corner of the Abandoned Deactivation Furnace. Several samples contained metals (antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, and zinc) at concentrations above the NYS LEL. Samples SW/SD16-3 and SW/SD16-10 had the highest concentration of metals. Impacts from nitroaromatics were less significant.

Although NYSDEC guidelines for sediment were used in the RI to evaluate the nature and extent of the contamination of sediments/soils found in the ditches (as summarized above), the nature of the soils found in the ditches surrounding the site is terrestrial instead of aquatic. According to the NYSDEC Technical Guidance for Screening Contaminated Sediments, *"Sediments can be loosely defined as a collection of fine-, medium-, and coarse- grain minerals and organic particles that are found at the bottom of lakes [and ponds], rivers [and streams], bays, estuaries, and oceans. Sediments are essential components of aquatic [and marine] ecosystems. They provide habitat for a wide variety of benthic organisms as well as juvenile forms of pelagic organisms."* Although the soil material located in the drainage swales and ditches consists of fine-, medium-, and coarse- grain particles, the nature of the soils is non-aquatic and the flow in the swales is variable. There are periods of time when the ditches are dry and vegetated. The ditches are not considered to be lakes [and ponds], rivers [and streams], bays, estuaries, or oceans. The soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies (Codes, Rules, and Regulation of the State of New York Title 6 – Conservation, 1996).

Also, the soil found in the ditches of SEAD-16 and SEAD-17 are similar in nature (*i.e.*, depth, particle size) to those found at the Seneca Open Burning Grounds. Results of the macroinvertebrate sampling in the drainage swale at Open Burning Grounds of Senca indicate that the nature of the habitat in the ditch soil is predominantly non-aquatic. Therefore, the nature of the soils found in the ditches is expected to be terrestrial instead of aquatic.

In addition, the NYSDEC sediment criteria adopted the lowest effect level for metals from Long and Morgan (1990) and Persaud *et al.* The lowest effect level was obtained from ecological bioassays of amphipod, bivalve, oyster, *etc.*, none of which has been detected in the soils found in the ditches. In addition, there is no unacceptable human health risk by ingestion of or dermal contact with the on site sediment/soil found in the ditches.

Based on the above information, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. For the remainder of this FS report, the term "ditch soil" will be used to represent sediment/soil found in the drainage ditches.

2.4.5 SEAD-16 Building Material and Debris

In the building material samples collected from the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366), metals, SVOCs, and nitroaromatics were detected above their TAGM values. Copper, lead, and zinc were detected in all 12 of the building material samples at concentrations greater than their respective TAGM values. Antimony, mercury, arsenic, barium, cadmium, cyanide, iron, and magnesium were detected in at least half of the samples at concentrations greater than their respective TAGM values. The SVOCs detected were mostly PAHs, and among these, the highest concentration was butylbenzylphthalate (54,000 µg/Kg), which was found in a propellant residue sample (BS-10). The highest concentrations of nitroaromatics were found in the vacuum system recovery vats in Building 366, where 2,4-dinitrotoluene was found at concentrations of 19,000,000 µg/Kg and 3,700,000 µg/Kg. Impacts from VOCs, pesticides, PCBs, and herbicides were less significant. Asbestos was detected at 13 locations in the two buildings in materials including pipe insulation, roofing material, and floor tiles.

2.4.6 SEAD-17 Surface and Subsurface Soil

Metals were found to be pervasive in the surface and subsurface soils at SEAD-17. Based on the RI and ESI data, twenty-one metals were detected in the surface soils at concentrations above their respective TAGM values. Antimony, arsenic, copper, lead, mercury, and zinc were detected in almost all of the surface soil samples at concentrations above their respective TAGM values. The metals were generally evenly distributed around Building 367, although some of the highest concentrations were located immediately to the southwest of the building. A potential source for the high concentrations of metals in this area of the site may be the discharge pipe, which has an outfall near sample SS17-18 and drains the retort inside Building 367. In the subsurface soils, lead was detected at concentrations above the TAGM value in all samples analyzed. Two SVOC parameters were detected at four surface soil sampling locations and one pesticide parameter was detected at two surface soil sampling locations above their respective TAGM value.

2.4.7 SEAD-17 Groundwater

Based on the RI data, no VOCs, pesticides, PCBs, or nitroaromatics were detected in the groundwater. Low concentrations of SVOCs were detected below the NYSDEC AWQS Class GA and federal MCL groundwater standard. Five metals (aluminum, iron, manganese, sodium, and thallium) did exceed the groundwater standard. No other metals were detected at concentrations that exceeded the NYS Class GA standard or MCL standard, nor do they result in unacceptable risks to human health. Aluminum, manganese, iron, and sodium all occur naturally and the mean concentrations of collected groundwater samples for these metals are not statistically different from the background concentrations. In addition, it should be noted that SEAD-17 monitoring wells were resampled on October 30, 1999 and analyzed for thallium. The results indicate that all groundwater samples had a thallium concentration at the detection limit of 1.5 μg/l, which is less than the USEPA MCL (2 μg/l).

2.4.8 SEAD-17 Surface Water

Surface water impacts were not widespread and many of the chemical constituents analyzed for were not detected in the samples. Most of the impacts from metals occurred in the surface water samples from the drainage ditch south of the Deactivation Furnace. No VOCs, pesticides, PCBs, or nitroaromatics were detected in the samples. Copper, iron, lead, and selenium were detected at concentrations above the NYSDEC AWQS Class C surface water standard.

2.4.9 SEAD-17 Soil Found in the Ditches

Comparison of ditch soil sampling results with the NYSDEC guidelines for sediment indicates that there were impacts from SVOCs, pesticides, and metals. Impacts from SVOCs were most significant at one location in the drainage ditch in the northeastern corner of the site. Pesticides were found in the drainage ditches in the western and northeastern portions of the site. Metals were found in sample SW/SD17-3, located in the drainage ditch in the eastern portion of the site. Antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc were detected at concentrations above the NYS LEL. No PCBs or nitroaromatics were detected. As discussed in Section 2.4.4, the NYSDEC sediment criteria are not applicable for the soils found in the ditches of the site.

2.5 MEDIA SPECIFIC REMEDIATION GOALS

2.5.1 Media Specific Remediation Goals

The selection of the media of interest was based upon those media that contribute the greatest risk and cause exceedance of a USEPA target risk level (Section 2.3), and those media that do not comply with ARARs (Section 2.4). The remedial investigation has examined all media at SEAD-16 and SEAD-17. Discrete samples of the on-site and off-site surface water, on-site ditch soils, on-site soil, on-site groundwater and Buildings S-311 and 366 have been sampled and analyzed using USEPA and NYSDEC established analytical techniques. The data obtained meets the established Data Quality Objectives (DQO's) and has been used as the basis for this report.

The media of interest and the locations that may require a remedial action were selected by evaluating the benefits gained by implementing such an action. The benefit of a CERCLA remedial effort is defined by the extent that a proposed action will eliminate or decrease the risk to within acceptable levels. Decisions are then possible regarding the media and the extent of specific areas that need to be addressed. In this manner, if the conclusion is reached to perform a remedial action then the volume of material to be treated and the benefits produced by such a action can be quantified by the reduction in risk.

2.5.1.1 Soil with Lead Concentration Exceeding 1250 mg/kg

Although lead was found in the site soils and ditch soils at both sites, it was not included in the risk assessment since no allowable Reference Dose (RfD) values are available for lead. However, based on discussions between the USEPA, NYSDEC, and the Army, a cleanup level for lead at these sites was proposed to be 1250 mg/kg (September 14, 1998 letter from the Army to USEPA and NYSDEC. This value was derived in accordance with the publication "*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). This publication suggests a range of lead cleanup levels (750 ppm to 1750 ppm) that may result in an acceptable residual risk under an industrial use scenario. Based on discussions held at a BRAC Cleanup Team (BCT) meeting as well as several correspondences between the Army, NYSDEC, and USEPA (see **Appendix D**), the Army has proposed adopting the midpoint of this range (1250 mg/kg) as the industrial soil cleanup goal at SEAD-16 and SEAD-17.

The proposed soil cleanup level of 1250 mg/kg will be protective of human health for the considered future use scenarios. In the case of the child-in-day care receptor, it is anticipated that this clean up level will also be protective. Based on the post-remediation average concentrations calculated for lead in soil at both SEAD-16 and SEAD-17 (185 mg/kg for SEAD-16 and 315 mg/kg for SEAD-17), soil levels are anticipated to be less than 625 mg/kg, which is the maximum allowable soil lead concentration in order to be protective of child-in-day care receptor. Average concentration for a representative area is recommended by USEPA for exposure analysis (USEPA: Supplemental Guidance to Rags: Calculating the Concentration Term). The arithmetic means of lead concentrations in post-remediated surface soil will even be lower considering that lead concentrations in the backfill or capping material are low. Four out of 39 samples have lead concentrations greater than 625 mg/kg (ranging from 626 mg/kg to 720 mg/kg) in the post-remediated SEAD-16 with a proposed cleanup goal of 1250 mg/kg for lead. For SEAD-17, two out of 38 samples have lead concentrations greater than 625 mg/kg (697 mg/kg and 815 mg/kg). It should be noted that the post-remediation surface soil Exposure Point Concentrations for lead at SEAD-16 and SEAD-17 are less than 400 mg/kg, which is USEPA's default value for the residential use scenario.

Post-excavation concentrations at the site based on a proposed soil cleanup level of 1250 mg/kg are predicted to be below values acceptable for child care and residential scenarios. If during post excavation sampling it is found that the average lead concentration is greater than 625 mg/kg, a deed restriction will be placed on the land to prevent the construction of a day care center within the area.

There are soil concentrations of antimony, copper, lead, mercury, thallium, and zinc which do exceed the Exposure Point Concentrations (EPCs) outside the proposed 1250 mg/kg lead cleanup areas at SEAD-16 and SEAD-17. However, maximum metal concentrations that would be protective of day-care-child and residential child under the industrial and residential use scenario were back-calculated for the above mentioned metals (antimony, copper, zinc, mercury, and thallium), excluding lead. Although soil concentrations of other metals such as arsenic and cadmium exceeded the EPCs outside the proposed lead cleanup areas, the exceedances were not significant and were not as pervasive as the above five metals. Therefore, maximum metal concentrations were calculated by assigning the total Hazard Index of the above five metals as 1. The Hazard Quotient was distributed among the five metals according to post-remediation HQ for day-care-child by ingestion of surface soil at SEAD-16. As presented in **Table 2-3**, results indicate that metal concentrations of 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the future industrial use scenario scenarios. Therefore, the delineated area for lead cleanup concentrations of 1250 mg/kg has been examined to include areas with concentrations exceeding the above mentioned levels for the future industrial use scenario. Five metals (antimony, barium, lead, mercury, and thallium) in soil and sediment/soil found in the ditches pose potential risks to deer mouse after remediation to the above cleanup level (Appendix B, Ecological Risk Assessment). Total soil Hazard Quotients (HQs) for antimony, barium, lead, mercury, and thallium are 2, 9, 0.9, 12, and 2, respectively, at SEAD-16 and 3, 11, 2, 7, and 2, respectively, at SEAD -17. The HQs are close to the soil HQs from the NYSDEC TAGM values, which are 2, 26, 8, and 1.1, respectively for antimony, barium, mercury, and thallium. Even the soil with the site background mercury concentration has an HQ of 5. Based on the above information, the soil is not expected to pose significant adverse effects to the environment after remediating soils with lead concentration exceeding 1250 mg/kg. There are no endangered, threatened, or special concern species in the vicinity that are likely to be dependent on or affected by the habitat at the site. It is estimated that an additional $ 1 million would be required to remediate the soil to the level that will protect the deer mouse. Based on this increase in cost, it is not cost-effective to remediate the soil based on the ecological risk assessment. The area of the site is small, and the habitat it provides appears to be relatively low in diversity and

Table 2-3
MAXIMUM METAL CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL AND RESIDENTIAL USE SCENARIOS
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

Equation for back calculation of maximum metal concentrations (mg/kg)= $\frac{HQ \times BW \times AT \times RfD}{CS \times IR \times CF \times FI \times EF \times ED}$

	HQ Distribution [1]		Ref Dose(RfD) [2]	Cleanup level (mg/kg)	
	Post-Remediation Risks	Normalized HQ	(mg/kg/day)	Industrial Use Day Care Child	Resitential use Child
Antimony	0.1	0.41	0.0004	1.80E+01	1.28E+01
Copper	0.02	0.08	0.04	3.59E+02	2.56E+02
Zinc	0.004	0.02	0.3	5.39E+02	3.85E+02
Mercury	0.02	0.08	0.0003	2.69E+00	1.92E+00
Thallium	0.1	0.41	8.00E-05	3.59E+00	2.56E+00
Total HI	0.244	1			

Assumuptions for Day Care Child [3]			Assumuptions for Residential Child [3]		
Body Weight (BW)=	15	kg	Body Weight (BW)=	15	kg
Averaging Time (AT)=	2190	days	Averaging Time (AT)=	2190	days
Ingestion Rate (IR)=	200	mg soil/day	Ingestion Rate (IR)=	200	mg soil/day
Conversion Factor (CF)=	1.00E-06	kg/mg	Conversion Factor (CF)=	1.00E-06	kg/mg
Fraction Ingestion (FI)=	1	unitless	Fraction Ingestion (FI)=	1	unitless
Exposure Frequency (EF)	250	day/year	Exposure Frequency (EF)=	350	day/year
Exposure Duration (ED)=	6	years	Exposure Duration (ED)=	6	years

Note: 1) The HQ distribution is based on the post-remediation HQ distribution for day-care child according to risk assessment for SEAD-16;

2) Reference Dose is the oral reference dose taken from USEPA's Soil Screening Guidance: User's Guide, 1996 (Antimony, Zinc, Mercury) and HEAST, 1995 (Copper and Thallium)

3) The Exposure Frequency for day care child was estimated based on the assumption that the child attends 5 days/week and 10 days vacation. All the other assumptions are complied with USEPA's Soil Screening Guidance: User's Guide, 1996.

productivity compared with the whole depot area. Impacting the mice population at SEAD-16 and –17 is not expected to reduce the overall environmental resources. In addition, as discussed in Section 2.3, the future land use of SEAD-16 and SEAD-17 has been designated for industrial purposes. This will limit the access to the site by wild animals and limit the site being used as a habitat. In general, the proposed soil cleanup goal of 1250 mg/kg will be protective of the environment according to the above discussion.

2.5.1.2 Soil with Lead Concentration Exceeding 1000 mg/kg

In addition to the proposed soil cleanup goal of 1250 mg/kg, cost associated with the remediation of lead to a concentration of 1,000 mg/kg was also estimated. This concentration level is associated with the New York State Department of Health (NYSDOH) guidelines for industrial use. As discussed above, the remediation area was delineated to include soil with metal concentrations of antimony, copper, zinc, mercury, and thallium exceeding 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg, respectively.

2.5.1.3 Soil with Lead Concentration Exceeding 400 mg/kg

Also, in accordance with 6 NYCRR 375-1.10, which establishes a goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law", cost associated with the remediation of lead to pre-disposal (or residential) conditions was also estimated. Remediating the site to residential use levels would enable the site to be classified for unrestricted future use. To comply with the residential use scenario, the lead in soil would be remediated to a concentration of 400 mg/kg. This concentration is based on the USEPA's *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, 1994 and is the EPA's default value for the residential use scenario. As discussed above, the remediation area was delineated to include soil with metal concentrations of antimony, copper, zinc, mercury, and thallium exceeding 12.8 mg/kg, 256 mg/kg, 385 mg/kg, 1.92 mg/kg, and 2.56 mg/kg, respectively, to ensure no unacceptable risks to future residential receptors by ingestion of site soil (Table 2-3).

In addition to the previous three soil cleanup levels, the cost associated with the remediation of lead to a concentration of 400 mg/kg, including all other metals to comply with NYSDEC TAGM values, was also evaluated.

It should be noted that technologies are screened and alternatives are developed based on the proposed cleanup level of 1250 mg/kg for the site (Sections 2 through 6), however, cost for the selected alternatives will be estimated for the above discussed cleanup cases (lead concentration exceeding 1250 mg/kg, lead concentration exceeding 1000 mg/kg, lead concentration exceeding 400 mg/kg, and lead concentration exceeding 400 mg/kg or other metal concentration exceeding TAGM values). These costs are presented in Section 6. The determination to accept the residential use cleanup scenario value will be considered if the cost comparison shows that the additional cost to achieve a lower cleanup level is affordable, in the opinion of the Department of Defense. This approach is consistent with the Code of Federal Regulations (40 CFR §300.430 (f)(ii)(D)) which states that: "Each remedial action selected shall be cost-effective, provided that it first satisfies the threshold criteria...." This approach is also consistant with the NYSDEC's September 21, 1998 letter to the Army and the Army's October 1, 1998 letter to NYSDEC.

2.5.1.4 Soil Found in the Ditches

As discussed in Section 2.4, the nature of the ditch soils is terrestrial rather than aquatic. The soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. There is no unacceptable human health risk or ecological risk by ingestion of or dermal contact with the on site sediment. Therefore, the cleanup goal for the ditch soils will be the same as that for the surface and subsurface soils, which is 1250, 1000, 400 mg/kg for lead, and 400 mg/kg for lead and TAGM values for the other tested metals for the four respective cases.

2.5.2 Selection of the Media of Interest

Based on the results of the BRA and an evaluation of lead concentrations, surface soil, subsurface soil, and ditch soil were determined to require Remedial Action Objectives (RAOs) at both sites. In addition, at SEAD-16, the indoor air and surfaces inside the abandoned Buildings S-311 and 366 also require RAOs. **Table 2-4** summarizes RAOs for SEAD-16 and **Table 2-5** summarizes RAOs for SEAD-17. A discussion of the selection of the media of interest is presented below.

Table 2-4
SEAD-16 AREAS FOR REMEDIATION

SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CASE	REMEDIAL ACTION OBJECTIVES	BASIS	CLEAN UP GOAL	DESCRIPTION OF AREA TO BE REMEDIATED	AREA (ft^2)	DEPTH (ft)	IN SITU VOLUME (yd^3)	SAMPLING LOCATIONS REMEDIATED OR EXCAVATED
1	a) Prevent ingestion/direct contact with indoor building surfaces and debris with excess heavy metals	a) Protection of of current and future human receptors.	NA	Material and debris inside Buildings S-311 and 366	15,954	NA	100	Floor debris samples: FS16-1, FS16-2, FS16-3, FS16-4, FS16-5, FS16-6, FS16-7, FS16-8, FS-50, Propellant samples: BS-10, BS-11
2	a) Prevent ingestion/direct contact with soils and ditch soils having excess heavy metals, b) Prevent/minimize migration of soils and ditch soils having excess heavy metal to groundwater and surface water (*i.e.* drainage ditches and Kendaia Creek),	a) Protection of current and future human receptors, b) Protection of surface water,	Pb < 1250 mg/kg	Surface soils around Building S-311	32,700	1.0	1,211	Surface soil samples SS16-2 thru -5, -8, 20 thru -24, -26, -27, and -30
				Subsurface soils south of Building S-311	225	3.0	25	Subsurface soil sample SB16-5
	c) Prevent off-site migration of heavy metals, and	c) Protection of groundwater						
	d) Restore soil and ditch soils to levels protective of public health and environment	d) Protection of Terrestrial Ecology		Drainage ditch soils around Building S-311	7,420	1.0	275	Ditch soil samples: SD/SW16-1 thru -6, -10
3	a) As with Case 2 and to comply with New York State Department of Health requirement for light industrial use scenario	a) As with Case 2 (New York State Department of Health)	Pb < 1000 mg/kg	Surface soils around Building S-311	41,080	1.0	1,521	Surface soil samples SS16-2 thru -5, -8, 20 thru -24, -26, -27, and -30
				Subsurface soils south of Building S-311	225	3.0	25	Subsurface soil sample SB16-5
				Drainage ditch soils around Building S-311	7,420	1.0	275	Ditch soil samples: SD/SW16-1 thru -6, -10
4	a) As with Case 2 and also to comply with USEPA default lead value for residential use scenario	a) As with Case 2 (residential use)	Pb <400 mg/kg	Surface soils around Building S-311	73,397	1.0	2,718	Surface soil samples: SS16-2 thru -5, -8, -11, -13, -14, -16, -19 thru -28 and -30
				Subsurface soils south of Building S-311	450	3.0	50	Subsurface soil samples: SB16-2 and SB16-5
				Drainage ditch soils around Building S-311	14,370	1.0	532	Ditch soil samples: SD/SW16-1 thru -10
5	a) As with Case 4 and also to comply with 6 NYCRR 375-1.10: "to restore the site to pre-disposal conditions, to the extent feasible and authorized by law."	a) As with Case 2 (residential use)	Pb <400 mg/kg and all other tested metals < TAGMs	Surface soils around Building S-311	171,918	1.0	6,367	All surface soil samples except the downwind surface soil samples SS16-1 thru -38
				Subsurface soils south of Building S-311	3,589	3.0	399	Subsurface soil samples SB16-1, -2, -4, and -5
				Drainage ditch soils around Building S-311	14,370	1.0	532	Ditch soil samples: SD/SW16-1 thru -10

Notes:
1) Area for Case 1 is the total plan area of Buidings S-311 and 366 and is not necessarily related to volume to be removed.
Areas for Case 2 through 5 were calculated based on surface extent of soils/ditch soils to be excavated
2) In situ volume estimate is based on best available data and Figures 2-1 through 2-4
3) In situ volume for Cases 2, 3, and 4 include soil with metal concentrations of antimony, copper, zinc, mercury, and thallium exceeding the respective levels presented in Table 2-3

Table 2-5
SEAD-17 AREAS FOR REMEDIATION

SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY

CASE	REMEDIAL ACTION OBJECTIVES	BASIS	CLEAN UP GOAL	DESCRIPTION OF AREA TO BE REMEDIATED	AREA (ft^2)	DEPTH (ft)	IN SITU VOLUME (yd^3)	SAMPLING LOCATIONS REMEDIATED OR EXCAVATED
1	a) Prevent ingestion/direct contact with soils and ditch soils having excess heavy metals; b) Prevent/minimize migration of soils and ditch soils having excess heavy metal to groundwater and surface water (i.e drainage ditches and Kendaia Creek);	a) Protection of current and future human receptors; b) Protection of surface water.	Pb <1250 mg/kg	Suface soils around Building S-367.	52,685	1.0	1951	Surface soil samples SS17-4, -6 thru -9, -12, -13, -14, -18, -27, and -37. No subsurface soil samples exceed proposed cleanup goal.
	c) Prevent off-site migration of heavy metals; and	c) Protection of groundwater						
	d) Restore soils and ditch soils to levels protective of public health and environment.	d) Protection of Terrestrial Ecology		Drainage ditch soils around Building S-311.	2,752	1.0	102	Ditch soil samples SD17-8.
2	a) As with Case 2 and to comply with New York State Department of Health requirement for light industrial use scenario	a) As with Case 1 (New York State Department of Health)	Pb < 1000 mg/kg	Surface soils around Building S-367.	63,496	1.0	2,352	Surface soil samples SS17-4, -6 thru -9, -12, -13, -14, -18, -27, and -37. No subsurface soil samples exceed proposed cleanup goal.
				Drainage ditch soils around Building S-311.	3,872	1.0	143	Ditch soil samples SD17-3 and -8.
3	a) As with Case 2 and also to comply with USEPA default lead value for residential use scenario	a) As with Case 1 (residential use)	Pb < 400 mg/kg	Surface soils around Building S-367.	126,573	1.0	4,688	Surface soil samples SS17-1, -4 thru -9, -12 thru -16, -18,-19, -24 thru -28, -31, -35 thru -37.
				Subsurface soils northwest of Building S-367.	1200	3.0	133	Subsurface soil samples SB17-2
				Drainage ditch soils around Building S-311.	7,381	1.0	273	Ditch soil samples SD17-3, -7, and -8.
4	a) As with Case 4 and also to comply with 6 NYCRR 375-1.10: "to restore the site to pre-disposal conditions, to the extent feasible and authorized by law."	a) As with Case 1 (residential use)	All tested metals < TAGMs	Surface soils around Building S-367.	152,357	1.0	5,643	All surface soil samples except the downwind surface soil samples SS-1 thru -39.
				Subsurface soils northwest of Building S-367.	3,960	3.0	440	All subsurface soil samples SB 17-1 thru -4.
				Drainage ditch soils around Building S-311.	16,312	1.0	604	Ditch soil samples SD17-3 thru -5, -7, -8, and -9.

Notes:
1) Areas for Case 1 through 4 were calculated based on surface extent of soils/ditch soils to be excavated
2) In situ volume estimate is based on best available data and Figures 2-5 through 2-8
3) In situ volume for Cases 1, 2, and 3 include soil with metal concentrations of antimony, copper, zinc, mercury, and thallium exceeding the respective levels presented in Table 2-3

2.5.2.1 SEAD-16 Soil

Soil is a media of interest based on human health risk for the ingestion of on-site soil by the future day care child. In addition, metals and SVOCs were detected at concentrations above their respective TAGM values and lead was detected above the proposed cleanup value of 1250 mg/kg. The remedial action objective is to reduce the risk for all receptor groups to acceptable levels based on the risk-derived cleanup concentrations and to achieve the cleanup goals for selected contaminants, which are lead, antimony, copper, zinc, mercury, and thallium.

2.5.2.2 SEAD-16 Groundwater

Groundwater does not present a human health risk, is not impacted by metals, is not expected to be adversely impacted by contaminant transported from onsite soil, and is not expected to be used as drinking water source and therefore is not a media of interest.

2.5.2.3.1 Human Health Risk

The risks associated with ingestion of site groundwater were evaluated for the future industrial worker, the future adult day care worker and the future day care child. Under these scenarios, it was assumed that the adult receptors consumed 2 liters of water per day for 250 days per year, whereas the child receptor consumed 1liter of groundwater per day for 250 days per year.

The resulting non-carcinogenic Hazard Quotient exceeded the USEPA goal of 1. For the future adult industrial worker and the future adult day care center worker, the non-carcinogenic Hazard Quotient was 2.0. The Hazard Quotient for the child day care receptor was 4.0. A review of the risk calculation provided in Appendix B, Table B-16PR-19, indicates that the non-carcinogenic risks are due to the heavy metal, thallium.

Thallium is known as a toxic metal with an appropriately low allowable Reference Dose (RfD) value. Compounds with low allowable RfDs will produce large amount of risk. As such, low levels of thallium in groundwater will produce a corresponding large risk. In this instance, consideration of the analytical data was carefully reviewed prior to reaching a conclusion that unacceptable risk from thallium is a true condition at this site.

Analytical detection limits for thallium during the ESI and the RI were close to or slightly above the USEPA and NYSDEC allowable concentration values. This condition increases the potential for false positive detections. For example, the NYSDEC GA standard concentration for allowable thallium in groundwater is 4 µg/l. The USEPA MCL for thallium in drinking water is 2 µg/l. The detection limit for thallium in groundwater ranges from 1.5 to 17.8, depending upon the sample matrix, the sample size and the analytical procedure used. During both the ESI and the RI, thallium was analyzed using the Inductively Coupled Plasma (ICP) analytical instrumentation, which is susceptible to matrix interference at low detection limits. Prior to the RI, during the ESI, three wells were installed and sampled. During the RI, four additional wells were added, bringing the total number of wells to seven, which were sampled twice during the RI. During these three sampling rounds, thallium was detected twice in MW16-7, (4.2 µg/l, 11 µg/l and 4.1U), once in MW-16-6, (6.2 µg/l and 4.1U) and once in MW16-2, (1.8U, 1.8U duplicate, 9.2 µg/l and 9.6U). The qualifier U indicates that thallium concentration was lower than the detection limits. Thallium was not detected in any other well. Since thallium was detected in the on-site wells it was retained as a potential compound of concern and evaluated during the risk assessment. The exposure point concentration used to assess risk was conservatively estimated at 6.1 µg/l. This assessment corresponded to the elevated non-carcinogenic risk described previously. Following this assessment of risk in the RI, an additional round of sampling was performed to confirm the presence of thallium in the on-site monitoring wells since the detection of thallium was not consistent at the wells where it was detected and was only detected in a limited number of the total wells at the site. Further, the analytical procedures used for the confirmatory round of sampling utilized graphite furnace analytical techniques, instead of the ICP techniques. Graphite furnace techniques offer lowered detection limits and are generally not as susceptible to matrix interference. The results from the confirmatory round of sampling did not detect any thallium in any well. The detection limit for this round of sampling was 1.5µg/l, which is below both the USEPA and the NYSDEC allowable concentrations for thallium. Therefore, even though the risk assessment identified ingestion of thallium in groundwater as a potential risk, the subsequent confirmatory sampling effort did not detect the presence of thallium, suggesting that the occasional earlier detection of thallium was due to laboratory analytical error or matrix interference effects.

Further, thallium was not detected in soil at elevated concentrations. Therefore, a likely source for the thallium detected in groundwater does not currently exist. Site operations did not involve the use or disposal of thallium and it does not appear likely that any thallium that may have been a minor component of a munition would preferentially leach out of the munition waste over the other metals found at the site. Based upon these factors, it is unlikely that thallium is present in the groundwater at this site and the risks associated with thallium are not reflective of actual conditions.

It should be noted that the risk associated with the ingestion of groundwater by current receptors was not considered for the risk assessment. Groundwater at the site is currently not used as a source of potable water, nor has it ever been used for this purpose.

2.5.2.3.2 Groundwater Quality

Only aluminum, manganese, iron, and sodium exceeded NYS Class GA standard for samples collected in remedial investigation round at SEAD-16 and SEAD-17. No other metals have concentrations that exceeded NYS Class GA standard or MCL standard, nor pose significant risk to human health. Aluminum, manganese, iron, and sodium all occur naturally and their mean concentrations are not significantly different from the background concentrations. Therefore, on-site groundwater has not been adversely impacted.

2.5.2.2.3 Contaminant Transport

As discussed in Section 1, site specific metals tend to strongly bind to soil according to the specific site condition. Based on the VLEACH groundwater model, groundwater quality is not estimated to deteriorate in the future.

In addition, several site factors inhibit the movement of contaminants in groundwater and preclude the likelihood that groundwater could acquire an exposure pathway. Hydraulic conductivities in both the till/weathered shale and in competent shale are low at SEAD-16. Groundwater velocities calculated in Section 3.0 of the RI are between 0.4 and 1.4 feet per day, which is 151-504 feet per year. Groundwater moving at this speed will travel one mile in 10-35 years and the nearest drinking water will is located well outside of a one mile radius around the site.

A similar situation exists for SEAD-17. Hydraulic conductivities are low, and groundwater velocities calculated in Section 3.0 of the RI are between 1.0 and 1.3 feet per day, or 365-475 feet per year. The time to travel one mile is 11-14 years, and any drinking water wells in the area are located well outside a one-mile radius of the site.

Although metals may be subject to movement with soil water and in this way be transported to groundwater, the rate of migration does not equal the rate of water movement due to fixation and adsorption reactions (Dragun, 1988). Metals may become immobilized by mechanisms of adsorption and precipitation, which prevent movement. In the case of lead, which is a primary constituent of concern at SEAD-16 and SEAD-17, soluble lead added to soil reacts with clays, phosphates, sulfates, carbonates, hydroxides and organic matter such that its mobility is greatly reduced. Reduced mobility of lead coupled with low hydraulic conductivities, therefore, extremely limit the likelihood that lead will travel far enough by groundwater to pose risks to human health or the environment.

2.5.2.3.4 Future Use

The future land use of SEAD-16 and SEAD-17 has been designated for industrial purposes, not as a residential area. From the standpoint of land use, it is unlikely that private wells would be installed in the overburden/weathered shale aquifer at SEAD-16 and SEAD-17 for the purpose of extracting groundwater to drink.

Further, even in the unlikely event that groundwater was to be used as a source of drinking water, the requirements for quality and quantity must be satisfied. These requirements are established by the NYS Department of Health (NYSDOH) and are detailed in the bulletin titled *Rural Water Supply,* which sets forth the requirements for an individual water supply system. NYSDOH indicates that a private well should be developed from a water bearing formation at a depth greater than 20 feet below the ground surface. Water wells in the area of SEDA are screened in the bedrock at depths of 200 feet or more below ground surface. The approximate top of the bedrock unit (i.e. bottom of the till/weathered shale aquifer) is located at a depth of approximately 20 feet. Based on the vertical connection tests performed in six wells at the Ash Landfill and in six wells at SEAD-25 (RI Draft Final Report at the Ash Landfill Site, 1994 and RI Final Report at SEAD-25 and SEAD-26, 1998), the till/weathered shale aquifer is not significantly connected to the underlying bedrock aquifer. Considering that SEAD-16 and –17 are located approximately 2,000 feet from SEAD-25 and 10,000 feet from the Ash Landfill, and that SEAD-16 and –17 have similar site geology as SEAD-25 and the Ash Landfill, it is reasonable to conclude that the till/weathered shale and bedrock aquifers are not significantly connected at SEAD-16 and –17. Therefore, the site soil has no significant impact to the aquifer below the shallow groundwater aquifer.

Based on the above discussion, groundwater is not a media of interest. However, limiting contaminant sources in soil that may migrate has been considered in the formulation of the remedial action objectives.

2.5.2.3 SEAD-16 Surface Water

Although metals were detected in surface water at concentrations exceeding the ARARs, there was no unacceptable human health risk associated with surface water. Since the impacts to surface water appear to be caused by contaminants in soils and ditch soils, it is not retained as a media of interest.

2.5.2.4 SEAD-16 Soil Found in the Ditches

Soil found in the ditches is a media of interest because lead was detected above the proposed cleanup value of 1250 mg/kg. Although there was no unacceptable human health risk associated with ditch soil, the remedial action objective is to remediate ditch soil with lead to levels below the proposed value.

2.5.2.5 SEAD-16 Building Material and Debris

The material and debris in the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366) is a media. This is based on the human health risk associated with the future industrial worker ingestion of indoor dust and dermal contact with indoor dust. In addition, the material and debris exceeds the ARARs. The remedial action objective is to remediate the building to levels to reduce the risk for a future industrial worker.

2.5.2.6 SEAD-16 Air

Both ambient air and indoor air inside Building S-311 at SEAD-16 were evaluated as a potential media of interest. Ambient air was discounted as a media of interest for the following reasons. As part of the risk assessment process, the human health impacts due to the inhalation of fugitive dust in ambient air was considered using USEPA approved atmospheric dispersion models of the on-site soil material. This evaluation indicated that the carcinogenic risk for ingestion of fugitive dust in ambient air was at least a magnitude lower than the most significant risk pathway, which was ingestion of on-site soil. For example, the SEAD-16 current site worker's carcinogenic risk due to inhalation of dust is 2×10^{-11}, whereas the carcinogenic risk due to ingestion of soil is 1×10^{-6} (see Appendix B). Although non-carcinogenic risk values were approximately the same, the focus of any risk reduction efforts would be with the on-site surface soils rather than the ambient air.

The indoor air samples from the abandoned Building S-311 at SEAD-16 show similar risk assessment results to ambient air. The ingestion and dermal contact of indoor dust contribute more significantly to human health risk than the inhalation of indoor dust. In addition, the source of contaminants in the indoor air are particles and dust from indoor surfaces, which are the focus of risk reduction efforts rather than the indoor air itself. Therefore, indoor air has been discounted as a media of interest.

2.5.2.7 SEAD-17 Soil

Soil is a media of interest primarily because it contributes considerably to unacceptable risk levels. In addition, metals and SVOCs were detected at concentrations above their respective TAGM values and lead was detected above the proposed cleanup value of 1250 mg/kg. The remedial action objective is to remediate soil to levels deemed protective of human health.

2.5.2.8 SEAD-17 Groundwater

As discussed in Section 2.5.2, groundwater does not present a human health risk, is not impacted by metals, is not expected to be adversely impacted by contaminant transported from onsite soil, and is not expected to be used as drinking water source and therefore is not a media of interest.

2.5.2.9 SEAD-17 Surface Water

Although four metals were detected above the ARARs, surface water does not present a human health risk and is not considered a media of interest.

2.5.2.10 SEAD-17 Soil Found in the Ditches

Soil found in the ditches is a media of interest because lead was detected above the proposed cleanup value of 1250 mg/kg. Although there was no unacceptable human health risk associated with ditch soil, the remedial action objective is to remediate ditch soil with lead to levels below the proposed value.

2.6 REMEDIAL ACTION OBJECTIVE SUMMARY AND SITE SPECIFIC GOALS

As described in the BRA in Sections 6 and 7 of the RI and summarized earlier in this report, unacceptable risks are primarily due to ingestion of indoor dust and dermal contact with indoor dust at SEAD-16 as well as ingestion of site soils at SEAD-16 and SEAD-17. These risks impact the future industrial worker, future day care child, and future day care child at SEAD-16 and the future industrial worker at SEAD-17.

In addition, lead was detected in the surface soils, subsurface soils, and ditch soils at concentrations above the proposed cleanup level of 1250 mg/kg. Accordingly, the remedial action objectives are to focus on surface soils, subsurface soils, and ditch soils.

Because ingestion and inhalation of dust in Buildings S-311 and 366 at SEAD-16 contribute significantly to risk to future industrial workers, removal of debris and materials from these buildings to decrease hazardous dust particles causing unacceptable risk is warranted. There is no chemical-specific clean up goal for the buildings.

Tables 2-4 and 2-5 summarize the remedial action objectives and clean up goals. A detailed discussion of these goals and the resulting degree of risk reduction is presented in the following sections.

2.7 RESPONSE ACTIONS

This section presents the general response actions that have been considered applicable at SEAD-16 and SEAD-17. These actions will be used to identify specific remedial technologies that would achieve the RAOs described in previous sections.

Based upon the characteristics of the waste and the site conditions determined during the RI, the appropriateness of an action is based upon effectiveness, implementabilty and cost. Appropriate response actions are those actions that involve control of inorganics in soil and ditch soil. Controlling the inorganics will assure that exposure to humans and ecological receptors are prevented and will accomplish the remedial action goals for soil and ditch soils. Since groundwater, surface water and air are not media of concern, general response actions for these media other than prevention of further degradation of the quality of these media have not been considered. Unlike actions for organics compounds, response actions for inorganic constituents do not involve breaking down the components via a treatment process to a less innocuous substance. Instead, the actions that are appropriate for metals are those that prevent exposure by isolation, such as within a landfill, or by chemically or physically binding the metals into a stabilized matrix. In some cases, if site conditions are favorable, it is possible to accomplish this in situ, otherwise some excavation and consolidation of materials from disperse locations will be required prior to isolation or treatment.

The screening process has identified the following general response actions as applicable for site remediation at both SEAD-16 and SEAD-17:

- No Action,
- Institutional Control Actions,
- Containment Actions,
- In situ Treatment Actions,
- Excavation/Removal/Ex-situ Treatment Actions and
- Excavation/Removal/Disposal Actions.

A brief synopsis of the screening process and the reasons for selecting these general response actions is provided.

2.7.1 No Action

No Action involves leaving the site in the current conditions and allowing unrestricted use of the property. This action does not involve additional monitoring, security or any measures to minimize the risk to ecological receptors or human health. Since No Action does not involve any remedial action, there are no remedial technologies or process options that are applicable. This action has been retained for further consideration because it will provide a baseline for comparing the benefits of implementing other actions. This action will not reduce human or ecological risks.

2.7.2 Institutional Control Activities

Institutional control actions represent the lowest level of response activity and consists of monitoring, security, physical restrictions such as fencing, and land use restrictions such as deed restrictions. Institutional control actions minimize the possibility of receptor contact with wastes by removing the receptor or modifying the exposure pathway. Since institutional control actions are only applicable to the receptor, they do not involve reductions in the volume, toxicity or control of wastes at the site, and would not reduce risk to ecological receptors.

Unlike many CERCLA sites that are abandoned, SEAD-16 and SEAD-17 are located within the boundaries of an active military installation. Consequently, land use is restricted to authorized personnel. Security measures are currently in place that prevent unauthorized use of the site. In addition, there are institutional controls currently in-place that require the Army to disclose the conditions of the site and restrict land use, as appropriate, to meet the risks associated with the future use of the site. These requirements include: CERCLA, 42 United States Code Section 120 (h)(1), as amended by the Community Environmental Response Facilitation Act (CERFA) (Public Law 102-426), which requires that any prospective owner of a site regulated under CERCLA must be notified that hazardous substances were stored and Army Regulation: and AR 200-1, paragraph 12-5, which requires that the Army must perform an Environmental Baseline Study (EBS) prior to the transfer of any Army property and must provide disclosure to the potential owner of all the potential hazards. The EBS follows similar processes required under CERCLA and includes an assessment of the risks associated with the use of the property to be transferred. These regulations are intended to assure that agreements between the Army and prospective property owners have considered the risks associated with future land use. Deed restrictions as part of an agreement for the transfer of property are actions that will allow limited, yet productive, use of the property.

The risk analysis is essential in determining what exposure scenarios are allowable for future land uses. It can be used as a basis for a land use restriction in the property deed or, if the exposure scenario indicates unacceptable risk in one portion of a parcel, then that portion can be restricted for use by limiting access via a physical barrier, security or other means. In general, some form of monitoring will be associated with this action to assure that the conditions remain constant.

2.7.3 Containment Actions

Containment actions are applicable to source control actions by restricting the movement or migrations of waste materials and minimizing potential impacts to receptors. These actions involve placement of a physical barrier that may include both horizontal and vertical barriers to isolate the waste materials. Some consolidation of materials may be required to minimize the area that will require isolation. The range of containment technologies include capping, slurry walls, sheet pilings or horizontal barriers using the block displacement method of grouting. Since these actions do not involve volume or toxicity reductions, they will require a monitoring program to assure the integrity of the action.

2.7.4 In Situ Treatment Actions

In situ treatment actions have been identified as applicable general response actions. This effort generally involves in situ mixing the waste with an agent preventing further migration or in situ heating of the waste/soil matrix until vitrification is achieved. In either case, the soil/waste matrix is transformed into a stabilized, non-leaching, mass, without excavation. Vendors with specialized equipment are required to achieve the proper mixing with solidification agents or the high temperatures required to achieve vitrification.

2.7.5 Excavation/Removal/Ex-situ Treatment Actions

General response actions that involve excavation followed by treatment using either solidification/stabilization or soil washing techniques were also identified as applicable. These actions involve technologies that treat the waste/soil matrix in a treatment train. This train involves unit operations combined in a manner that produces the desired affect, such as stabilization via mixing with an appropriate admixture, volume reduction via soil washing or acid leaching.

2.7.6 Excavation/Removal/Disposal Actions

Another action that was considered viable for consideration at this facility is excavation followed by disposal in a landfill. The landfill can be either an off-site facility or a facility that will be constructed on-site. Under such an action, waste materials will be excavated, placed in the landfill and monitored. If a landfill facility were to be constructed on-site, a facility siting study will be required to assure compliance with the requirements of 6 NYCRR Part 360.

Removal of debris and cleaning of Buildings S-311 and 366 at SEAD-16 are applicable as source control actions to reduce unacceptable risks from indoor dust and air. These actions would involve removal of all excess and unnecessary materials from both buildings. Cleaning procedures range from simple actions such as sweeping or high pressure wash to more complex solutions such as sand blasting or frozen CO_2 decontamination. These actions are evaluated in the next section. Confirmation testing will be required to ensure the effectiveness of the applied action. Removal of debris will be conducted in conjunction with excavation activities.

2.8 ESTIMATE OF QUANTITIES TO BE REMEDIATED

Remedial Action Objectives for SEAD-16 and SEAD-17 are based upon two criteria. First, the need to achieve acceptable risk for the intended land use and the second is to achieve compliance with the specified cleanup goals. As previously discussed, the BRA has concluded that for the intended industrial land use, the risks to human health are acceptable for all media except soil and building material and debris. In addition, concentrations of lead in surface soil, subsurface soil, and ditch soil were detected at levels above the proposed soil cleanup goals.

Therefore, the remedial action objectives involve reducing the concentration of the on-site soil and ditch soil to the proposed cleanup goals. The amount of material that will require a remedial action has been estimated based on the volume of soil and ditch soil with concentrations above the soil cleanup goal. Additionally, the remedial action includes the indoor building material and debris. An analysis of the effects of remediation on risk reduction (both non-carcinogenic and carcinogenic) is presented in Tables 2-1 and 2-2. This analysis provides an indication of the reductions in risk produced by the remedial action.

As a consequence to meeting the remedial action objectives that are based primarily on lead, other compounds not specifically identified as part of the remedial action objectives are also reduced. The most significant contributor of carcinogenic risk in soil is the class of semivolatile organic compounds called Polynuclear Aromatic Hydrocarbons (PAHs). Several of these compounds, identified by USEPA as carcinogens, have been detected in the on-site surface soil samples. The presence of these compounds is not unexpected since PAHs are produced as Products of Incomplete Combustion (PICs). Burning of munitions occurred at SEAD-16 and SEAD-17 and therefore it is likely that this process resulted in the formation of these residual burning products. The data is also consistent with the conceptual site model, which predicted the occurrence of compounds as predominately a surface phenomenon. In all cases, the samples, which contained the highest concentrations of these compounds, were collected in the surface soil near the site buildings where the burning occurred. The most significant contributors to the non-carcinogenic risk are the metals, such as barium, copper and zinc.

It should be noted that the delineated areas presented in the following figures and the remediation volumes presented in Tables 2-4 and 2-5 are based on the analytical data in the Remedial Investigation Report (Parson ES, March 1999). The volume of material requiring remediation may vary depending on the results of the cleanup verification sampling.

2.8.1 SEAD-16

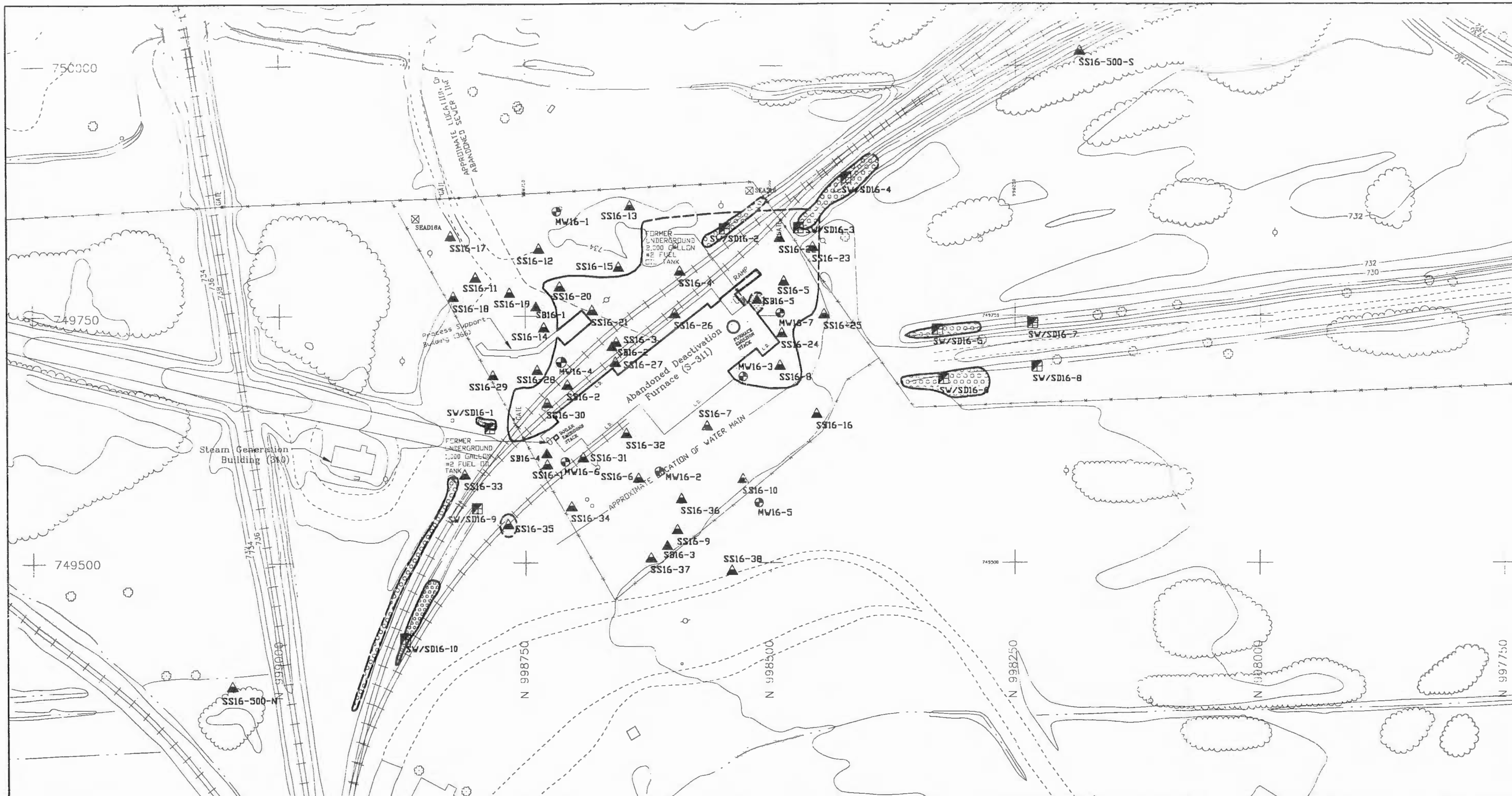
Five cases have been considered in determining the areas and volume of material that will require remedial action at SEAD-16. The first case is relevant to SEAD-16 Buildings S-311 and 366 and does not consider soils. Cases 2, 3, and 4 address surface and subsurface soil and ditch soil with lead cleanup concentrations of 1250, 1000, and 400 mg/kg, respectively. Case 5 addresses remediating surface, subsurface, and ditch soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the NYSDEC TAGM values. As shown on Table 2-1, upon the remediation of the building, soil and ditch soil to 1250 mg/kg, the risk will be reduced to within acceptable levels.

The objective of Case 1 is to remove the building materials and debris from abandoned Buildings S-311 and 266 at SEAD-16. The material and debris in the buildings are identified in the RI include soil piles and soil/sludge covering concrete floors, shell casings, filter drums, ash residues in the furnace area, and miscellaneous construction debris. Debris and dust will be removed from the surface of the furnace and boiler stacks. The volume of material to be removed is estimated to be approximately 100 cubic yards (cy) based on visual inspections during field investigations. It is assumed that when the contaminated materials and debris are removed from the buildings, the hazardous components in dust and indoor air will also be removed. The resulting decrease in risk to future industrial workers from Case 1 is shown on Table 2-1.

The objective of Case 2 is to remove surface, subsurface, and ditch soil with lead concentrations greater than 1250 mg/kg. The horizontal limit of the surface soil area is shown on **Figure 2-1** and described on Table 2-4. The vertical limits of the excavation are based on the surface soil sample (depths 0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 32,700 square feet (sf) and an in situ volume of 1211 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB16-5). The vertical limits of the excavation will extend 12-inches below the deepest sample with lead concentration that exceeds 1250 mg/kg. Based on this criteria, an excavation depth of 3 feet will be used to. It is estimated that an area of approximately 225 sf and an in situ volume of 25 cy will be impacted. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 7420 sf and an in situ volume of 275 cy will be impacted.

The objective of Case 3 is to remove surface, subsurface, and ditch soil with lead concentrations greater than 1000 mg/kg. The horizontal limit of the surface soil area is shown on **Figure 2-2** and described on Table 2-4. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 41,080 sf and an in situ volume of 1521 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB16-5). The vertical limits of the excavation will extend 12-inches below the deepest sample with lead concentration that exceeds 1000 mg/kg. It is estimated that an area of approximately 225 sf and an in situ volume of 25 cy will be impacted, based on an excavation depth of 3 feet. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 7420 sf and an in situ volume of 275 cy will be impacted.

The objective of Case 4 is to remove surface, subsurface, and ditch soil with lead concentrations greater than 400 mg/kg. The horizontal limit of the surface soil area is shown on **Figure 2-3** and described on Table 2-4. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 73,397 sf and an in situ volume of 2718 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB16-2 and SB16-5). The vertical limits



LEGEND

	MINOR WATERWAY
	MAJOR WATERWAY
	FENCE
	REMEDIATION LIMIT WHICH WILL BE DEFINED THROUGH PRE-DESIGN SAMPLING
	BRUSH LINE
	LANDFILL EXTENTS
	RAILROAD
760	GROUND SURFACE ELEVATION CONTOUR
	REMEDIATION LIMIT

SURVEY MONUMENT — L.D. LOADING DOCK — ROAD SIGN — DECIDOUS TREE — FIRE HYDRANT — MANHOLE — GUIDE POST — POLE — UTILITY BOX — CORDINATE GRID (250' GRID) — OVERHEAD UTILITY POLE — MAILBOX/RR SIGNAL

SOIL BORING LOCATION — SB16-4

MONITORING WELL LOCATION — MW16-7

SURFACE SOIL SAMPLE LOCATION — SS16-5

SEDIMENT SAMPLE LOCATION — SW/SD16-6

CASE 2 SURFACE SOILS WITH LEAD CONCENTRATION > 1250 mg/kg (SEE NOTE 2)

CASE 2 SUBSURFACE SOILS WITH LEAD CONCENTRATION > 1250 mg/kg (SEE NOTE 2)

CASE 2 DITCH SOILS WITH LEAD CONCENTRATION > 1250 mg/kg (SEE NOTE 2)

0 100 200

SCALE IN FEET

NOTE:
1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMIT OF THE PROPOSED REMEDIATION AREA INCLUDES SOIL WITH METAL CONCENTRATIONS EXCEEDING MAXIMUM METAL CONCENTRATIONS FOR THE INDUSTRIAL USE SCENARIO.

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PARSONS ENGINEERING SCIENCE, INC.

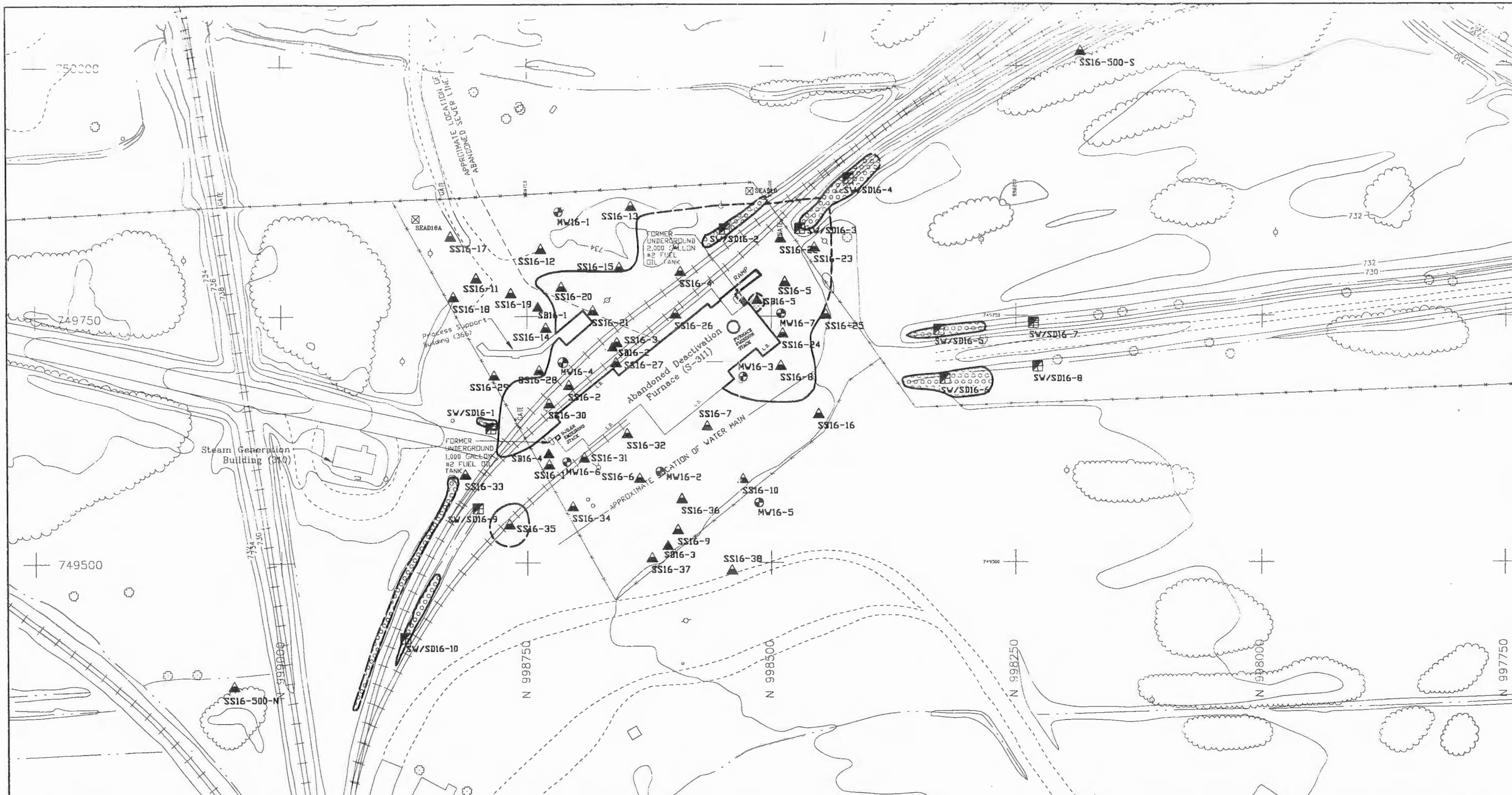
CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT. ENVIRONMENTAL ENGINEERING — Dwg. No. 729895-01002

FIGURE 2-1
SEAD-16 REMEDIATION AREA
(SOIL W/LEAD > 1250 mg/kg)

SCALE 1" = 100'-0" — DATE SEPTMEBER 2000 — REV A



LEGEND

	MINOR WATERWAY
	MAJOR WATERWAY
	FENCE
	REMEDIATION LIMIT WHICH WILL BE DEFINED THROUGH PRE-DESIGN SAMPLING
	BRUSH LINE
	LANDFILL EXTENTS
	RAILROAD
760	GROUND SURFACE ELEVATION CONTOUR
	REMEDIATION LIMIT

SURVEY MONUMENT — L.D. LOADING DOCK

ROAD SIGN — DECIDOUS TREE

FIRE HYDRANT — MANHOLE — GUIDE POST

POLE — UTILITY BOX — CORDINATE GRID (250' GRID)

OVERHEAD UTILITY POLE — MAILBOX/RR SIGNAL

SB16-4 — SOIL BORING LOCATION

MW16-7 — MONITORING WELL LOCATION

SS16-5 — SURFACE SOIL SAMPLE LOCATION

SW/SD16-6 — SEDIMENT SAMPLE LOCATION

CASE 3 SURFACE SOILS WITH LEAD CONCENTRATION > 1000 mg/kg (SEE NOTE 2)

CASE 3 SUBSURFACE SOILS WITH LEAD CONCENTRATION > 1000 mg/kg (SEE NOTE 2)

CASE 3 DITCH SOILS WITH LEAD CONCENTRATION > 1000 mg/kg (SEE NOTE 2)

0 100 200

SCALE IN FEET

NOTE:
1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMIT OF THE PROPOSED REMEDIATION AREA INCLUDES SOIL WITH METAL CONCENTRATIONS EXCEEDING MAXIMUM METAL CONCENTRATIONS FOR THE INDUSTRIAL USE SCENERIO.

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SEAD-16 AND SEAD-17

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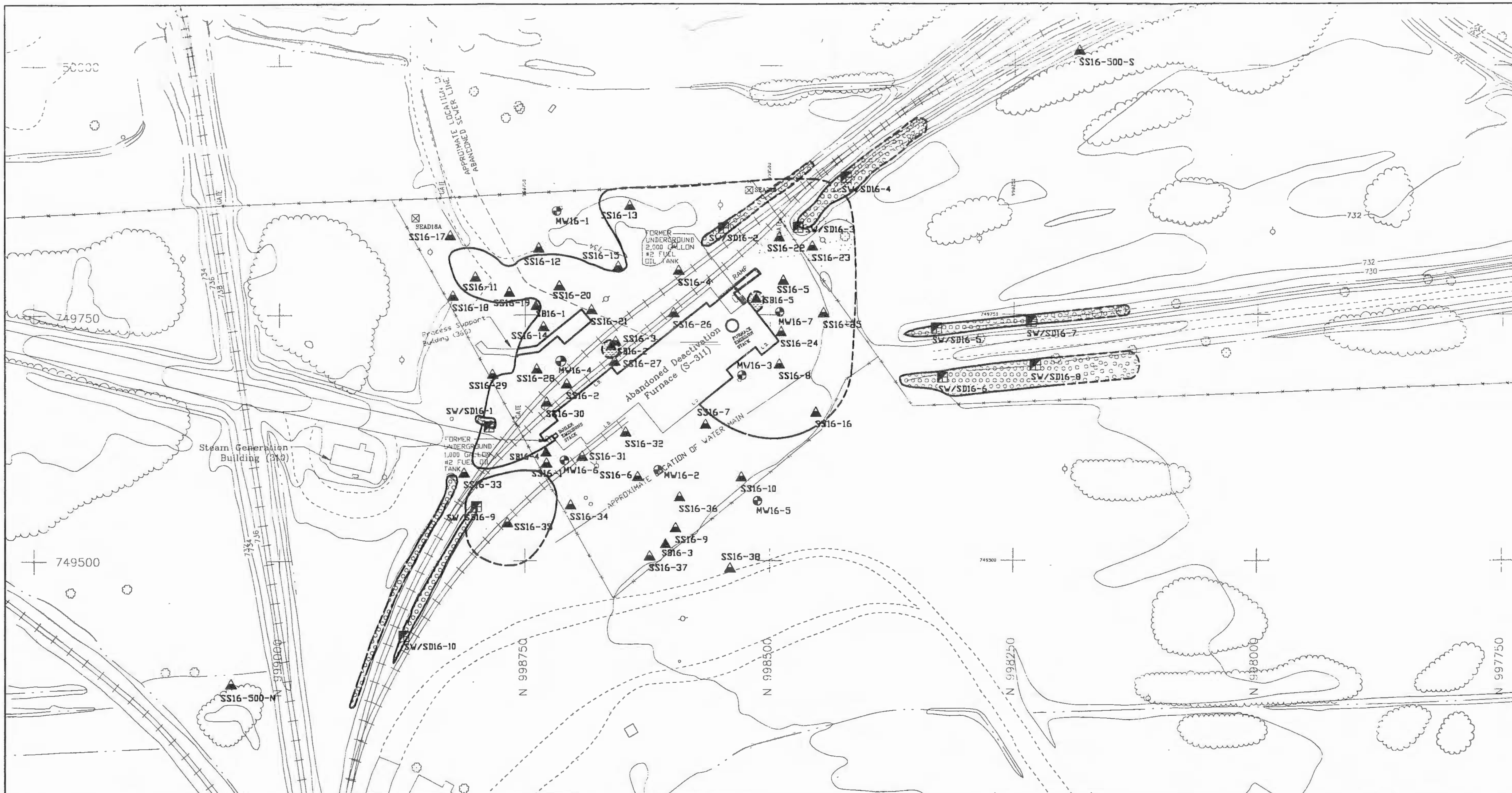
FIGURE 2-2
SEAD-16 REMEDIATION AREA
(SOILS W/LEAD > 1000 mg/kg)

SCALE 1" = 100'-0" — DATE SEPTEMBER 2000 — REV A

BASENECA\729895\Fig2-2.dwg



LEGEND

	MINOR WATERWAY
	MAJOR WATERWAY
	FENCE
	REMEDIATION LIMIT WHICH WILL BE DEFINED THROUGH PRE-DESIGN SAMPLING
	BRUSH LINE
	LANDFILL EXTENTS
	RAILROAD
760	GROUND SURFACE ELEVATION CONTOUR
	REMEDIATION LIMIT

SURVEY MONUMENT — L.D. LOADING DOCK — ROAD SIGN — DECIDOUS TREE — FIRE HYDRANT — MANHOLE — GUIDE POST — POLE — UTILITY BOX — CORDINATE GRID (250' GRID) — OVERHEAD UTILITY POLE — MAILBOX/RR SIGNAL

SOIL BORING LOCATION — SB16-4

MONITORING WELL LOCATION — MW16-7

SURFACE SOIL SAMPLE LOCATION — SS16-5

SEDIMENT SAMPLE LOCATION — SW/SD16-6

CASE 4 SURFACE SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

CASE 4 SUBSURFACE SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

CASE 4 DITCH SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

0 100 200

SCALE IN FEET

NOTE:

1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMIT OF THE PROPOSED REMEDIATION AREA INCLUDES SOILS WITH CONCENTRATION EXCEEDING MAXIMUM METAL CONCENTRATIONS FOR THE RESIDENTIAL USE SCENERIO.

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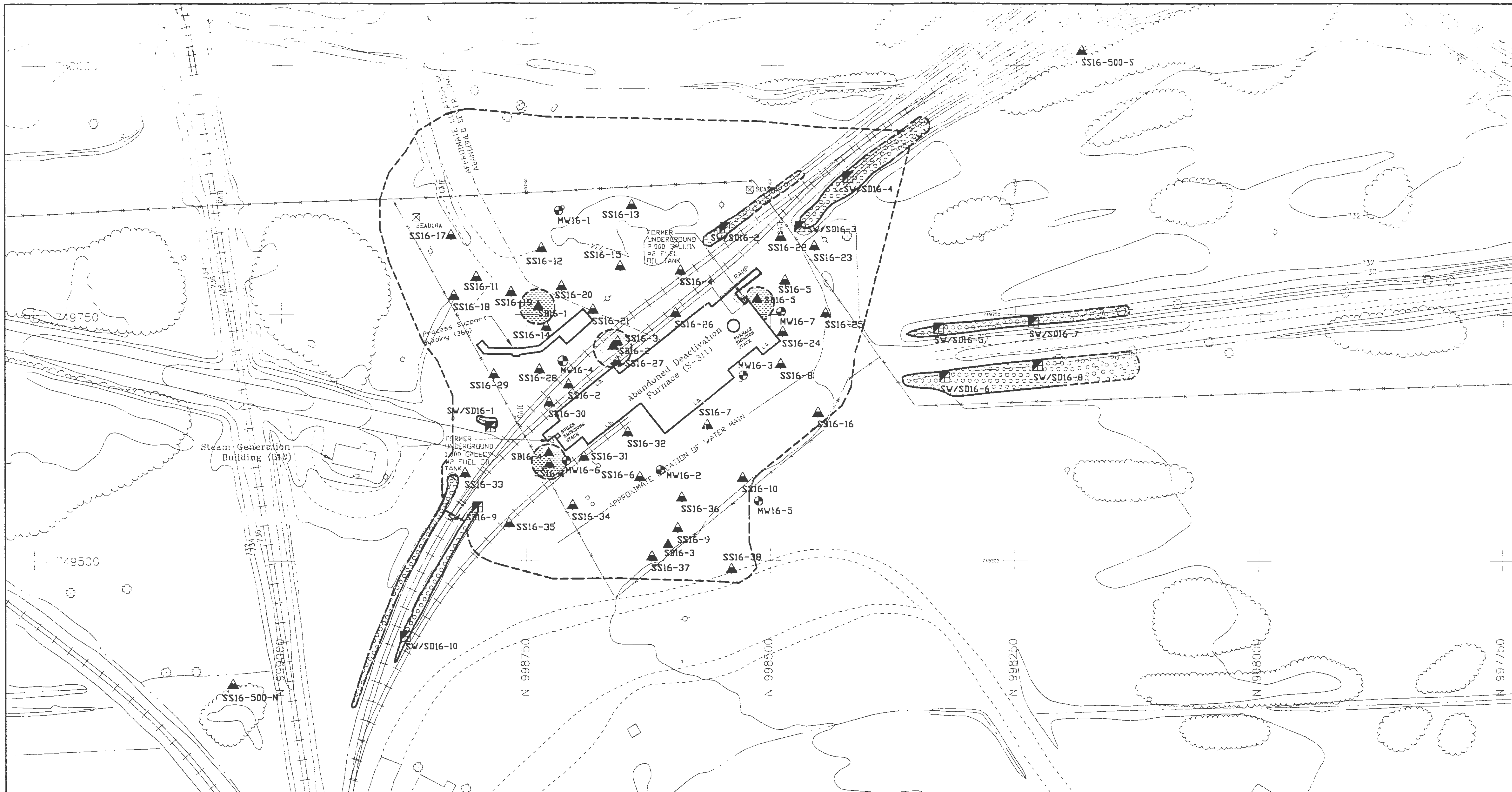
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT. ENVIRONMENTAL ENGINEERING — Dwg. No. 729695-01002

FIGURE 2-3
SEAD-16 REMEDIATION AREA
(SOIL W/LEAD > 400 mg/kg)

SCALE 1" = 100'-0" — DATE SEPTEMBER 2000 — REV A

R:\SENECA\729695\Fig2-3.dwg



LEGEND

MINOR WATERWAY	
MAJOR WATERWAY	
FENCE	
UNPAVED ROAD	
BRUSH LINE	
REMEDIATION LIMIT WHICH WILL BE DEFINED THROUGH PRE-DESIGN SAMPLING	
RAILROAD	
GROUND SURFACE ELEVATION CONTOUR	760
REMEDIATION LIMIT	

SURVEY MONUMENT
L.D. LOADING DOCK
ROAD SIGN
DECIDOUS TREE
FIRE HYDRANT
MANHOLE
GUIDE POST
POLE
UTILITY BOX
CORDINATE GRID (250' GRID)
OVERHEAD UTILITY POLE
MAILBOX/RR SIGNAL

SOIL BORING LOCATION — SB16-4

MONITORING WELL LOCATION — MW16-7

SURFACE SOIL SAMPLE LOCATION — SS16-5

SEDIMENT SAMPLE LOCATION — SW/SD16-6

CASE 5 SURFACE SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

CASE 5 SUBSURFACE SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

CASE 5 DITCH SOILS WITH LEAD CONCENTRATION > 400 mg/kg (SEE NOTE 2)

0 100 200

SCALE IN FEET

NOTE:

1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMIT OF THE PROPOSED REMEDIATION AREA INCLUDES SOILS WITH METAL CONCENTRATION EXCEEDING NYSDEC TAGM VALUES (EXCEPT FOR LEAD).

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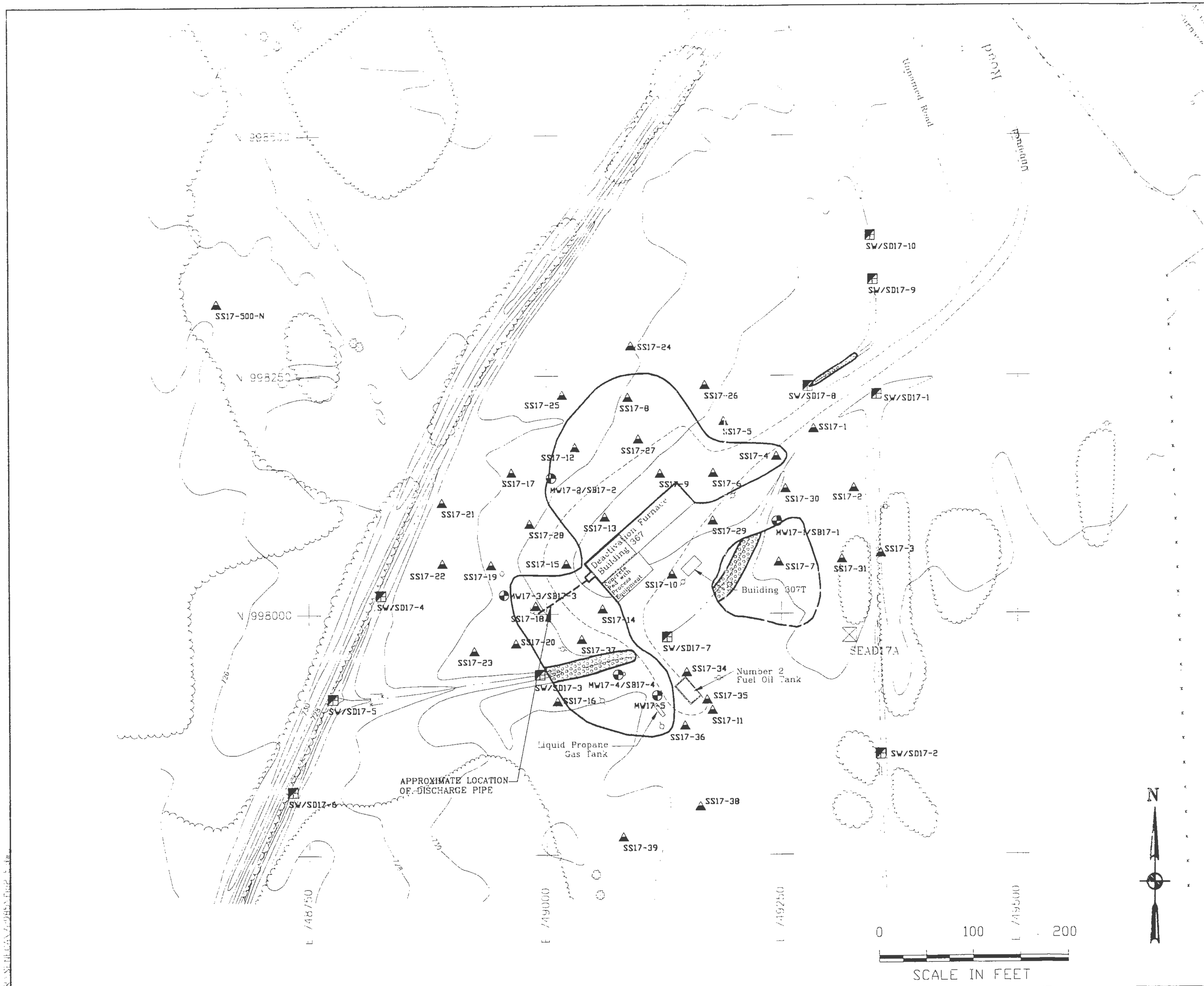
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT ENVIRONMENTAL ENGINEERING | DWG NO. 729895-01002

FIGURE 2-4
SEAD-16 REMEDIATION AREA
(SOIL W/LEAD> 400mg/kg+TAGM)

SCALE 1" = 100'-0" | DATE SEPTEMBER 2000 | REV A



LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- REMEDIATION LIMIT WHICH WILL BE DEFINED THRU PRE-DESIGN SAMPLING
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- 760 GROUND SURFACE ELEVATION CONTOUR
- REMEDIATION LIMIT
- SURVEY MONUMENT
- ROAD SIGN
- DECIDOUS TREE
- FIRE HYDRANT
- MANHOLE
- GUIDE POST
- POLE
- UTILITY BOX
- CORDINATE GRID (250' GRID)
- OVERHEAD UTILITY POLE
- MAILBOX/RR SIGNAL
- SB16-4 SOIL BORING LOCATION
- MW16-7 MONITORING WELL LOCATION
- SS16-5 SURFACE SOIL SAMPLE LOCATION
- SW/SD16-6 SEDIMENT SAMPLE LOCATION
- CASE 1 SURFACE SOILS WITH LEAD CONCENTRATION > 1250 mg/kg (SEE NOTE 2)
- CASE 1 DITCH SOILS WITH LEAD CONCENTRATION > 150 mg/kg (SEE NOTE 2)

NOTE:
1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMIT OF THE PROPOSED REMEDIATION AREA INCLUDES SOIL WITH METAL CONCENTRATIONS EXCEEDING MAXIMUM METAL CONCENTRATIONS FOR THE INDUSTRIAL USE SCENERIO.

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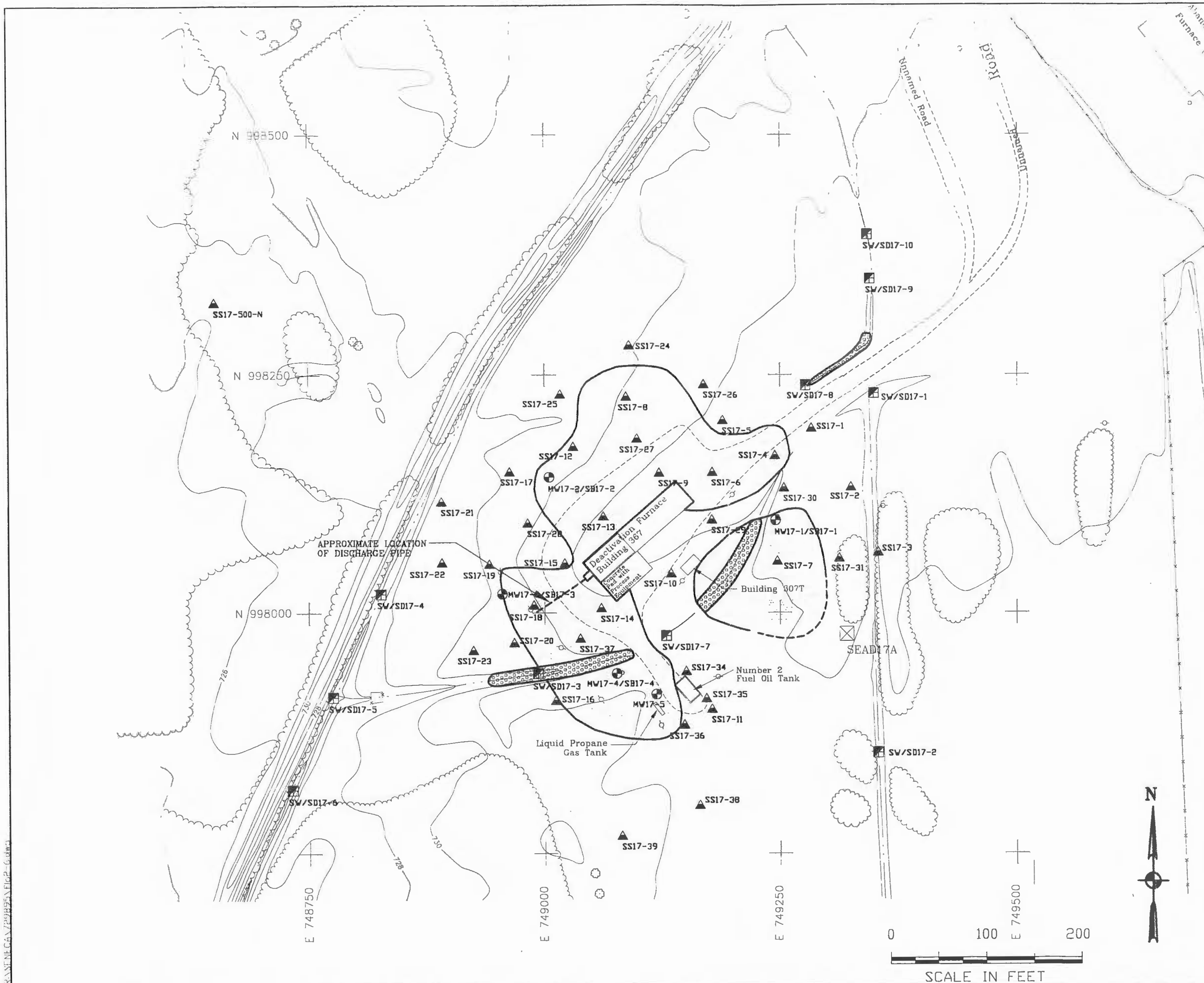
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT: ENVIRONMENTAL ENGINEERING | DWG No: 729695-01002

FIGURE 2-5
SEAD-17 REMEDIATION AREA
(SOIL W/LEAD > 1250 mg/kg)

SCALE: 1" = 100'-0" | DATE: SEPTEMBER 2000 | REV: A



LEGEND

MINOR WATERWAY

MAJOR WATERWAY

FENCE

REMEDIATION LIMIT WHICH WILL BE DEFINED THRU PRE-DESIGN SAMPLING

BRUSH LINE

LANDFILL EXTENTS

RAILROAD

760 GROUND SURFACE ELEVATION CONTOUR

REMEDIATION LIMIT

SURVEY MONUMENT

ROAD SIGN

DECIDOUS TREE

FIRE HYDRANT

MANHOLE

GUIDE POST

POLE

UTILITY BOX

CORDINATE GRID (250' GRID)

OVERHEAD UTILITY POLE

MAILBOX/RR SIGNAL

SB16-4 SOIL BORING LOCATION

MW16-7 MONITORING WELL LOCATION

SS16-5 SURFACE SOIL SAMPLE LOCATION

SW/SD16-6 SEDIMENT SAMPLE LOCATION

CASE 2 SURFACE SOILS WITH LEAD CONCENTRATION > 1000 mg/kg (SEE NOTE 2)

CASE 2 DITCH SOILS WITH LEAD CONCENTRATION > 1000 mg/kg (SEE NOTE 2)

NOTE:

1. LIMIT OF THE PROPOSED REMEDIATION AREA BASED ON THE DATA PRESENTED IN THE REMEDIAL INVESTIGATION REPORT. (PARSONS ES, MARCH 1999)
2. LIMITS OF THE PROPOSED REMEDIATION AREA INCLUDES SOIL WITH METAL CONCENTRATIONS EXCEEDING MAXIMUM METAL CONCENTRATIONS FOR THE INDUSTRIAL USE SCENERIO.

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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR
SEAD-16 AND SEAD-17

DEPT.	DWG. NO.
ENVIRONMENTAL ENGINEERING	729885-01002

FIGURE 2-6
SEAD-17 REMEDIATION AREA
(SOIL W/LEAD > 1000 mg/kg)

SCALE	DATE	REV.
1" = 100'-0"	SEPTEMBER 2000	A

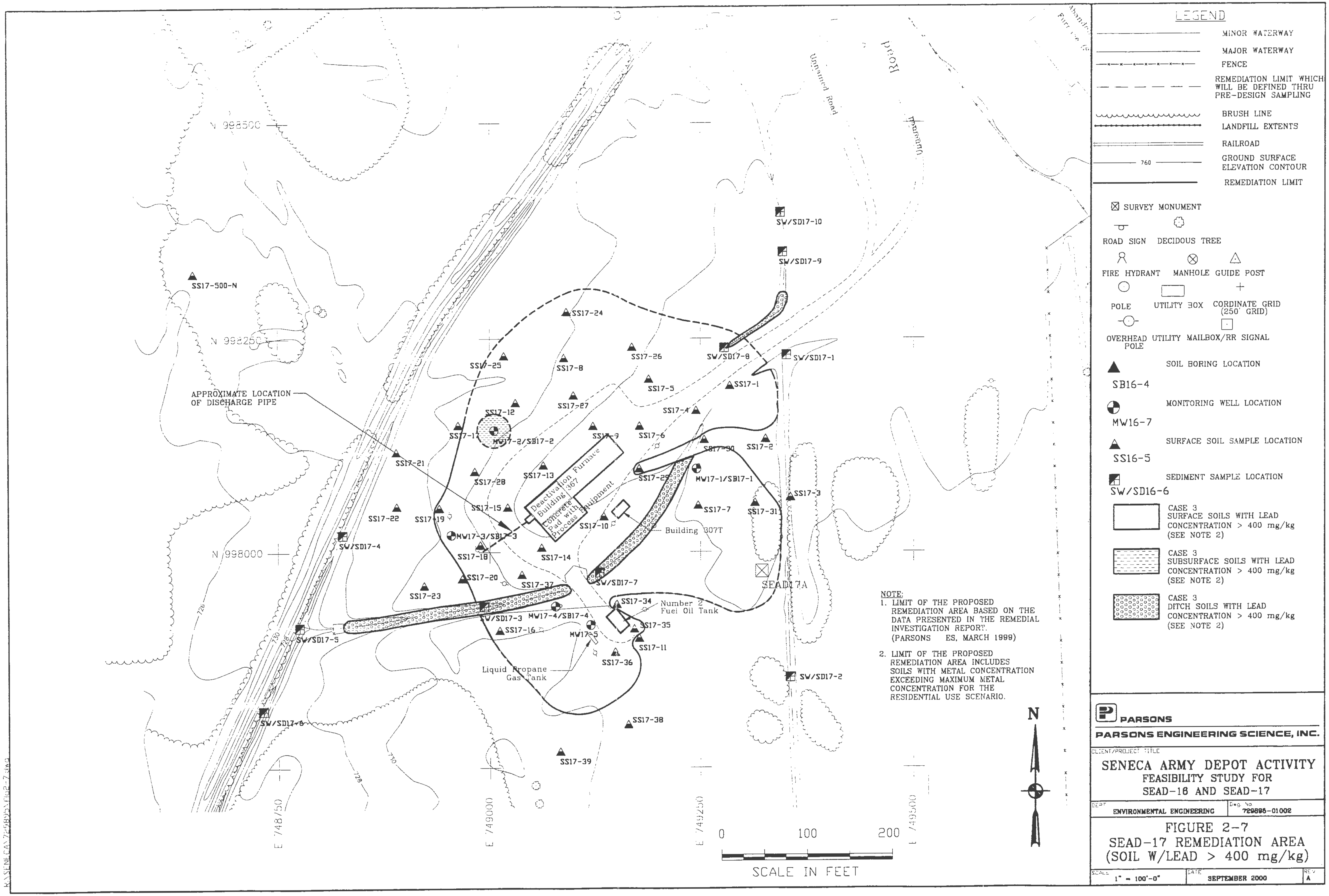
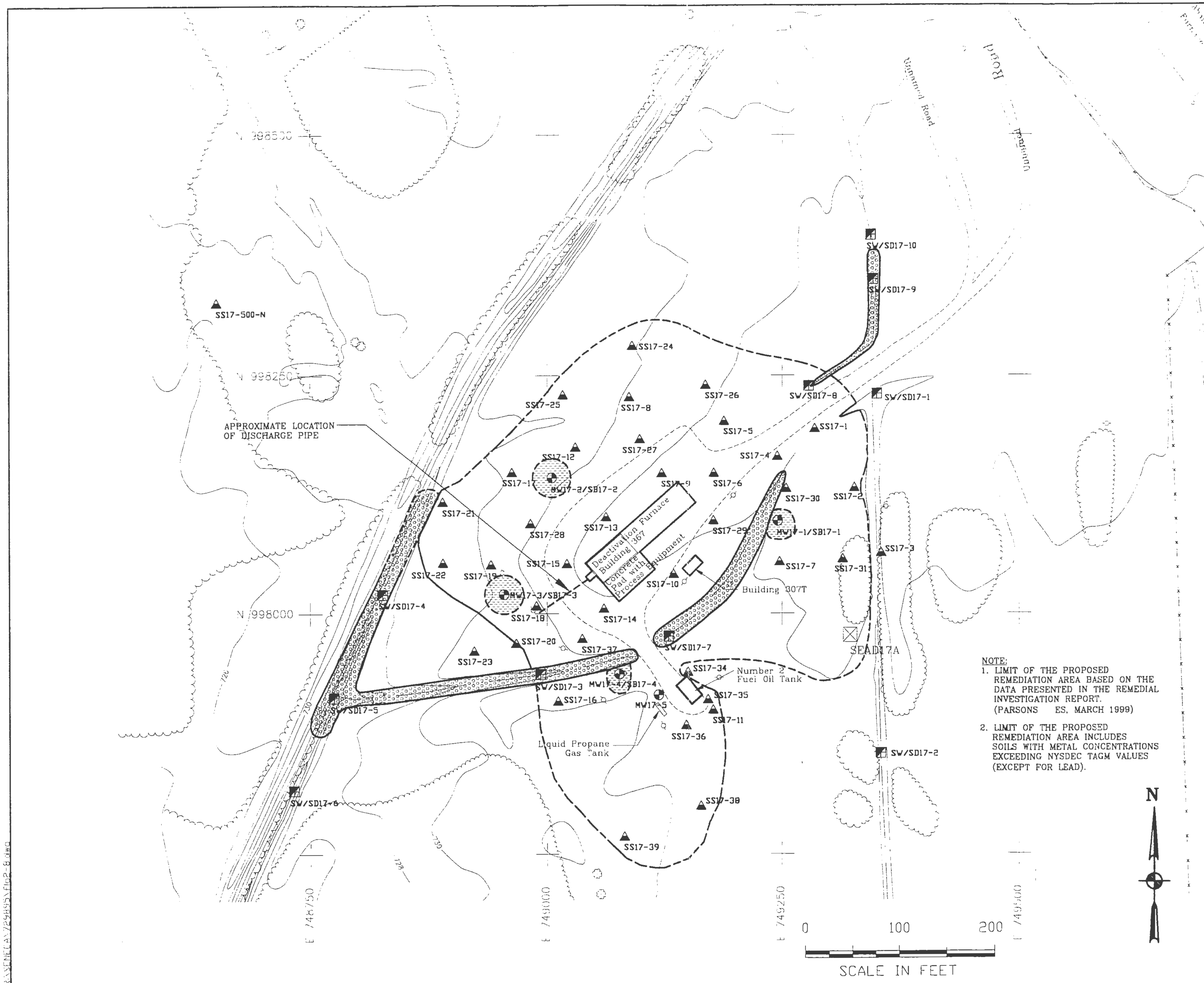


FIGURE 2-7
SEAD-17 REMEDIATION AREA
(SOIL W/LEAD > 400 mg/kg)



PARSONS
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CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY FOR SEAD-16 AND SEAD-17

DEPT: ENVIRONMENTAL ENGINEERING | DWG No: 729895-01002

FIGURE 2-8
SEAD-17 REMEDIATION AREA
(SOIL W/LEAD> 400mg/kg+TAGM)

SCALE: 1" = 100'-0" | DATE: SEPTEMBER 2000 | REV: A of the excavation will extend 12-inches below the deepest sample with lead concentration that exceeds 400 mg/kg. It is estimated that an area of approximately 450 sf and an in situ volume of 50 cy will be impacted based on an excavation depth of 3 feet. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 14370 sf and an in situ volume of 532 cy will be impacted.

The objective of Case 5 is to remove surface, subsurface, and ditch soil with lead concentration exceeding 400 mg/kg and the other tested metal concentrations exceeding the TAGM values. The horizontal limit of the surface soil area is shown on **Figure 2-4** and described on Table 2-4. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 171,918 sf and an in situ volume of 6,367 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB16-1, SB 16-2, SB 16-4, and SB16-5). The vertical limits of the excavation will extend 12-inches below the deepest sample with lead concentration that exceeds 400 mg/kg. It is estimated that an area of approximately 3,589 sf and an in situ volume of 399 cy will be impacted based on an excavation depth of 3 feet. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 14370 sf and an in situ volume of 532 cy will be impacted.

2.8.2 SEAD-17

Four cases have been considered in determining the areas and volume of material that will require remedial action at SEAD-17. Cases 1, 2, and 3 addresses surface, subsurface, and ditch soil with lead cleanup concentrations of 1250, 1000, and 400 mg/kg, respectively. Case 4 addresses remediating surface, subsurface, and ditch soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the NYSDEC TAGM values. As shown on Table 2-2, upon the remediation of the soil and ditch soil to 1250 mg/kg for the site, the risk will be reduced to within acceptable levels.

The objective of Case 1 is to remove surface, subsurface, and ditch soil with lead concentrations greater than 1250 mg/kg. The horizontal limit of the area is shown on **Figure 2-5** and described on Table 2-5. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 52,685 sf and an in situ volume of 1,951 cy will be impacted. There were no subsurface samples obtained with lead concentrations greater than the soil cleanup goal. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 2752sf and an in situ volume of 102 cy will be impacted.

The objective of Case 2 is to remove surface, subsurface, and ditch soil with lead concentrations greater than 1000 mg/kg. The horizontal limit of the area is shown on **Figure 2-6** and described on Table 2-5. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 63,496 sf and an in situ volume of 2,352 cy will be impacted. There were no subsurface samples obtained with lead concentrations greater than the soil cleanup goal. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 3872 sf and an in situ volume of 143 cy will be impacted.

The objective of Case 3 is to surface, subsurface, and ditch soil with lead concentrations greater than 400 mg/kg. The horizontal limit of the area is shown on **Figure 2-7** and described on Table 2-5. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 126,573 sf and an in situ volume of 4,688 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB17-2). The vertical limits of the excavation will extend 12-inches below the deepest sample with lead concentration that exceeds 400 mg/kg. It is estimated that an area of approximately 1200 sf and an in situ volume of 133 cy will be impacted based on an excavation depth of 3 feet. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 7381 sf and an in situ volume of 273 cy will be impacted.

The objective of Case 4 is to remove surface, subsurface, and ditch soil with lead concentration exceeding 400 mg/kg and the other tested metal concentrations exceeding the TAGM values. The horizontal limit of the area is shown on **Figure 2-8** and described on Table 2-5. The vertical limits of the excavation are based on the surface soil sample depths (0 to 2 inches) and will be 12 inches. It is estimated that an area of approximately 152,357 sf and an in situ volume of 5,643 cy will be impacted. The horizontal limit of the subsurface area is based on the soil boring information (SB17-1, SB17-2, SB17-3, and SB17-4). The vertical limits of the excavation will extend 12-inches below the deepest sample with lead concentration exceeding 400 mg/kg or other tested metal concentrations exceeding the TAGM values. It is estimated that an area of approximately 3,960 sf and an in situ volume of 440 cy will be impacted based on based on an excavation depth of 3 feet. The horizontal limit of the ditch soil area is based on the topographical information and site observations. The vertical limit is based on ditch soil sample data and will be 12 inches. It is estimated that an area of approximately 16312 sf and an in situ volume of 604 cy will be impacted.

3 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section identifies potential technologies suitable to remediate SEAD-16 and –17 and initially screens them based on the technical implementability and effectiveness of the process.

3.1 IDENTIFICATION OF TECHNOLOGIES

Table 3-1 presents remedial action technologies and processes, which have been identified for possible remediation options at SEAD-16 and -17. The table is arranged in categories including general response actions, process operations, and a general description of the technology. The decision to retain a technology is summarized in the screening comments portion of the table. Those technologies that have been shaded have been removed from consideration; however, each technology is briefly described in the following section.

The list of technologies and processes presented was developed from several sources as follows:

- Standard engineering handbooks,
- Remediation equipment and service vendors,
- Engineering experience in remedial actions,
- EPA references including but not limited to:
  - "Technology Screening Guide for Treatment of CERCLA Soils and Sludges " (EPA 1988),
  - "Handbook on In Situ Treatment of Hazardous Waste - Contaminated Soils" (EPA 1990),
  - "Handbook for Stabilization/Solidification of Hazardous Waste (EPA 1986),
  - "Handbook on Remediation of Contaminated Sediments" (EPA 1991),
  - "The Superfund Innovative Technology Evaluation (SITE) Program" (EPA 1992) and
  - "Vendor Information System for Innovative Treatment Technologies (VISITT)" (EPA 1993)
  - "Alternative Treatment Technology Information Center (ATTIC) Database"

TABLE 3-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
TECHNOLOGY SCREENING FOR SOIL REMEDIATION

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPERATIONS	DESCRIPTION	SCREENING COMMENTS
No Action	None	Not Applicable	No Action	Applicable, since required as baseline response for comparison to other technologies. Will not meet the RAOs for lead in soil or ditch soil. Not protective of human health or ecology Will not reduce risk to acceptable levels.
Institutional Controls	Access Control	Fencing	Access to SEAD-16 and 17 is restricted by construction of a permanent, low-maintenance fence. Warning signs posted.	Applicable. Technically feasible and effective in reducing or eliminating human exposure. Will not reduce potential for migration unless used in conjunction with other technologies.
	Land Use Restrictions	Deed Modifications	Deed for property modified to restrict future sales and land use, or U.S Government holds deed in perpetuity	Not Applicable. BRAC Process defined future land use as Industrial. Will not meet RAOs for reducing potential for migration or restrict human or ecological exposure.
	Monitoring	Soil and Groundwater Monitoring	Periodic soil or groundwater sampling. Documents the extent that affected media have been impacted by constituents.	Applicable. Technically feasible but not effective in reducing or eliminating human or ecological exposure unless used in conjunction with other actions.
	Alternative Water Supply	City water line or bottled water	Extend city supply line to area or provide bottled water.	Not applicable since no drinking water wells are affected.
Containment	Capping	Soil Cap	Consolidate and grade, as necessary. Place clean fill, grade and seed.	Applicable, technically feasible for site conditions. Meets RAOs for preventing ingestion of site soils by human receptors. Will not prevent contaminants migrating to the groundwater.
		Impermeable cap	Place impermeable layer (clay, HDPE, GCL) to minimize infiltration. Place drainage and vegetative layers.	Applicable, technically feasible for site conditions. Meets RAOs for preventing ingestion of site soils by human receptors. Will not prevent contaminants migrating to the groundwater.
		Asphalt Cap	Highway-grade base and asphalt pavement over entire site area.	Not applicable. Not as reliable as clay or soil cap, high maintenance.
	Horizontal Barriers	Grout Injection	Pressure injection of grout into closely spaced boreholes	Not applicable. Technically infeasible due to the thin layer of soils above the bedrock surface.
		Block Displacement	Low permeability soils pumped as a slurry through injection holes under low pressure.	Not applicable. Technically infeasible due to the thin layer of soils above the bedrock surface.
	Vertical Barriers	Sheet Pile	Steel barrier wall driven into soil in sections using a drop-hammer or vibrating hammer.	Not applicable. Technically feasible but not for reducing human health risk. Not effective due to high leakage rates through the sheet piles. Impractical, area of concern too small to justify sheet piles.
		Slurry Wall	Excavate trench using slurry techniques and backfill with soil-bentonite or cement-bentonite mix.	Not applicable. Technically feasible but not for reducing human health risk. Typically used if other treatment alternatives cannot be used. Impractical, area of concern too small to justify slurry wall.

Shaded alternatives have been screened out; non-shaded alternatives have been retained for further evaluation

TABLE 3-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
TECHNOLOGY SCREENING FOR SOIL REMEDIATION

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPERATIONS	DESCRIPTION	SCREENING COMMENTS
Containment (cont.)		Grout Curtain	Pressure injection of grout in a regular pattern of drill holes	Not applicable Technically feasible but not for reducing human health risk Typically used if other treatment alternatives cannot be used.
In situ Treatment	Solidification/ Stabilization	Mix additive with soil	Mix soil with additive (such as cement, lime, or proprietary additive) to improve handling and leachability characteristics of material	Applicable. Technically feasible and effective in controlling migration of contaminants of concern. Meets RAOs for preventing ingestions by human receptors.
		Micro-encapsulation	A compatible, dried waste is dispersed within a matrix of hot asphalt, polypropylene or polyethylene, then extruded into a mold to form an encapsulated asphaltic or plastic mass.	Not Applicable. Technically unfeasible due to the high water content of site ditch soils. Most applications have involved specialized industrial wastes or nuclear wastes, not soils/ditch soils. Not practical for small volume of soil and ditch soil.
	Electrical	Vitrification	Electrodes placed in ground and electrical energy applied to electrodes. Soil vitrified to form molten glass that cools to a stable non-crystalline solid.	Not applicable. Technically infeasible due to the nature of the thin layers of on-site soil. Innovative technology with some successful applications but not widely used.
		Electrokinetics	Ionic metal species migrate in the saturated soil system through the influence of a charged electrical field.	Not applicable. Technically infeasible since the soil to be treated is above the groundwater table.
	Chemical Extraction	Soil Flushing	Constituents are extracted using solvent (polar or n non-polar). Solvent treated and re-introduced into soil.	Not applicable. Technically infeasible in low permeable soils. Not effective in removing inorganics from soil or ditch soils. Treatment is more effective and controllable ex-situ. Requires wastewater treatment plant and/or solvent recovery process.
	Biological Removal/Extraction	Biodegradation/ Bioventing	Landtreatment utilizing in situ microbial population to degrade constituents. Bioventing involves introduction of air under low flow to create aerobic conditions.	Not applicable. Technically infeasible or effective in removing inorganics from soil or ditch soil.
		Vegetative Uptake	Area is planted with coniferous and deciduous trees that uptake constituents through root systems and incorporate them into wood mass.	Not applicable. Technically infeasible and not effective in removing inorganics from soil or ditch soil. Degree of removal depends on solubility of constituents; inorganics are not soluble. Unproven technology
	Vapor Removal/Extraction	Vacuum Extraction	Apply negative pressure to vadose zone well system and treat soil vapor off-gas (via carbon filter, biofilter, catalytic incinerator, chemical oxidation or plasma reactor).	Not applicable. Technically feasible but not effective in removing inorganics from soil or ditch soil.
		Radiowave Enhanced Volatilization	Apply radio frequency to soil, extract soil vapor and treat.	Not applicable. Technically feasible but not effective in removing inorganics from soil or ditch soil.

haded alternatives have been screened out; non-shaded alternatives have been retained for further evaluation.

TABLE 3-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
TECHNOLOGY SCREENING FOR SOIL REMEDIATION

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPERATIONS	DESCRIPTION	SCREENING COMMENTS
Removal	Mechanical Excavation	Soil, ditch soil and Buildling Materials/Debris Removed using Heavy Equipment	Track or tire-mounted equipment such as an excavator or front-end loader as appropriate to physically remove soils, ditch soil, and building materials/debris.	Applicable Technically feasible and effective To be used in conjunction with other response actions. Meets RAOs for restricting human exposure once soil/ditch soil is removed.
	Slurrying	**Mix Soil or ditch soil as a Slurry and Remove using Pumps**	**Mix soil/ditch soil and water using propeller mixers and water jets. Pump slurry to receiving tank**	**Not applicable. Technically unfeasible and ineffective for site conditions. Used for relatively large quantitites of material that have high moisture content or where wet processing is to follow.**
Ex-Situ Treatment	**Biological**	**Aerobic**	**Microbes cultivated to degrade constituents under aerobic conditions. Includes composting and farming**	**Not applicable. Techeically infeasible and ineffective for site conditions. Not applicable to heavy metals and will not acheive RAOs for reducing exposure to lead by human receptors.**
		Anaerobic	**Microbes cultivated to degrade constituents under anaerobic conditions, typically an in-vessel process.**	**Not applicable. Technically unfeasible and ineffective for site conditions. Not applicable to heavy metals and will not acheive RAOs for reducing exposure to lead by human receptors.**
	Stabilization/ Solidification	Mix additive with soil	Mix soil with additive (such as cement, lime, or proprietary additive) to improve handling and leachability characteristics of material.	Applicable. Technically feasible when used in conjunction with excavation. Effective in meeting RAOs for human exposure, controlling migration of soil contaminants. Similar to pozzolon/portland cement stabilization.
		Micro-encapsulation	**A compatible, dried waste is dispersed within a matrix of hot asphalt, polypropylene or polyethylene, then extruded into a mold to form an encapsulated asphaltic or plastic mass**	**Not applicable. Technically infeasible due to the high water content of site ditch soils. Most applications have involved specialized industrial wastes or nuclear wastes, not soils/ditch soils.**
		Sorption	**Dry, inert, solid such as flyash or kiln dust is mixed with waste to produce a solidified mass**	**Not appacable. Technically feasible but not effective for soils. Used to improve handling characteristics of a waste by binding with water. Most applicable for use with sludges with a high oil or water content.**
	Physical Separation/ Aqueous Extraction	Soil Washing (Wet Separation and Extraction using Aqueous Solution)	Mix soil/ditch soil with water and wet-classify soil particle by size and density. Includes dry screening (grizzly, vibratory, trommel), attrition scrub, hydrocyclones, flotation, water treatment/recycle. Constituents can be extracted using dilute acids or surfactant solutions Rinsewater is treated to remove metals and recycled Metals can be recovered using electrochemical processes such as the Bureau of Mines' sluosilicic acid system leaching process	Applicable. Technically feasible and effective when used in conjunction with excavation. Volume reductions acheived. Coarse materials and large fragments separated from fines. Metals consolidated in the fines fraction. Metals reductions can be achieved via extraction to meet RAOs Used primarily in mining industry. Innovative technology: treatibility study required Vendors are available that have acheived some success
		Magnetic Classification	**Soils subject to magnetic field to remove ferrous metals.**	**Not applicable Technically feasible but ineffective for removal of lead.**

ded alternatives have been screened out; non-shaded alternatives have been retained for further evaluation.

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TABLE 3-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
TECHNOLOGY SCREENING FOR SOIL REMEDIATION

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPERATIONS	DESCRIPTION	SCREENING COMMENTS
Ex-situ Treatment (cont.)	Oxidation	Thermal Oxidation	Soils are converted to an inert slag in a molten metal bath. Involves heating in a specialized furnace/smelting reactor. Reactors include electric arc, fluid bed, molten salt, cement kiln and plasma arc.	Not applicable. Technically feasible but ineffective for inorganics. Technology is normally used for organics.
		Wet Air Oxidation	Soil mixed with water and excess air under supercritical pressure and temperature.	Not applicable. Technically infeasible and ineffective for meeting RAOs Used primarily for destruction of organics compounds and not applicable to heavy metals.
	Chemical Extraction	Soil Extraction using Supercriticial Fluids	Constituents extracteed in countercurrent process using carbon dioxide, propane or other highly volatile solvent under supercritical temperature, pressure conditions. Solvent is separated from extracted constituents (flashed or distilled) and recycled.	Not applicable. Unfeasible and ineffective for meeting RAOs for lead. Used primarily for destruction of organics compounds and not applicable to heavy metals.
Disposal	On-Site	Backfill On-Site	Reuse of treated soil that meet the RAOs as backfill in excavated areas.	Applicable. Technically feasible and effective when used in conjunction with excavation and ex-situ treatment. Treated soil must demonstrate compliance with RAOs prior to backfilling.
		Non-Hazardous Waste Landfill	Soil, treated to remove the RCRA characteristics of toxicity, is disposed of in an on-site Subtitle D landfill, permitted to accept industrial solid waste in accordance with the requirements of 6 NYCCR Part 360	Applicable. Technically feasible and effective when used in conjunction with excavation or an appropriate treatment option. Must comply with EPA Land Disposal Restrictions (LDR), Subtitle D and 6 NYCCR Part 360 requirements.
		RCRA Hazardous Waste Landfill	A listed hazardous waste, treated to meet the requirements of LDRs, is disposed of in an on-site Subtitle C landfill, permitted to accept hazardous waste in accordance with the requirments of 6 NYCCR Part 373.	Not applicable, since no waste is a listed hazardous waste, therefore the soil does not need to be disposed of in a permitted RCRA, Subtitle C landfill in accordance with the requirements of 6 NYCCR Part 373.
	Off-Site	Non-Hazardous Waste Landfill	Soil, treated to remove the RCRA characteristics of toxicity, is disposed of in an on-site Subtitle D landfill, permitted to accept industrial solid waste in accordance with the requirements of 6 NYCCR Part 360	Applicable. Technically feasible and effective when used in conjunction with excavation or an appropriate treatment option. Must comply with EPA Land Disposal Restrictions (LDR), Subtitle D and 6 NYCCR Part 360 requirements.
		RCRA Hazardous Waste Landfill	A listed hazardous waste, treated to meet the requirements of LDRs, is disposed of in an on-site Subtitle C landfill, permitted to accept hazardous waste in accordance with the requirments of 6 NYCCR Part 373	Not applicable, since no waste is a listed hazardous waste, therefore the soil does not need to be disposed of in a permitted RCRA, Subtitle C landfill in accordance with the requirements of 6 NYCCR Part 373.

ıded alternatives have been screened out; non-shaded alternatives have been retained for further evaluation

3.2 SCREENING OF TECHNOLOGIES

Technology screening considers only the technical implementability of a process. Technical implementability involves an evaluation of the effectiveness or feasibility of the technology for the specific site characteristics. Screening was based on the following criteria:

- The technology must be reliable, based either on successful implementation at other hazardous waste sites or in comparable bench- or lab-scale applications.
- The technology must be technically applicable to site conditions and waste characteristics at SEAD-16 and –17 and must meet the remedial action objectives.

General response actions, technology types, and process options that did not meet all of the foregoing criteria were excluded from further consideration.

For SEAD-16 and -17 the following remedial technologies were retained for further evaluation:

- No Action
- Containment
- Solidification/Stabilization
- Excavation/Disposal
- Soil Washing

The following sections summarize all the technologies and the rationale for retaining or screening out each response.

3.2.1 No Action

The No Action response will not reduce risk to acceptable levels and will not reduce concentrations of lead to the proposed cleanup goals. As a result, this remedial action will not meet the RAOs for the site however; this alternative will be retained to provide a baseline to compare other alternatives with.

3.2.2 Institutional Control Technologies

Institutional control technologies that have been considered include:

- Access Controls, such as fencing,
- Land use restrictions, such as modifications to the deed,
- Monitoring of soil and/or groundwater, and
- Alternative water supplies.

Institutional control technologies are only applicable to the receptor and do not involve reductions in the volume, toxicity or control of wastes at the site and do not meet the RAOs. Physical barriers that restrict access to the site are feasible and effective in preventing humans from becoming exposed to on-site impacts. Since there are potential risks for humans to expose to on-site mediums, access controls have been retained but incorporated for use with other responses. It should be noted that wildlife, such as migrating birds, will still have access to the site and will not be protected.

Land use restrictions, such as deed modifications, are also feasible and effective in restricting exposure to humans, particularly due to residential development. Although deed modifications do not decrease ecological risks nor protect the groundwater, Land Use Restrictions (LURs) will be kept as a remedial technology for institutional controls for the possible need to restrict future land use of the property to industrial use only, and possible prevention of using site groundwater as drinking water.

Some technologies by themselves such as access control will not meet the RAOs for the site, however, these technologies may be appropriate as part of other alternatives. Monitoring is another example of such a technology that will not meet the RAOs but can be used in conjunction with other technologies to form a viable alternative; therefore monitoring has been retained.

Providing an alternative water supply to affected populations is also technically feasible and effective when implemented but in this instance this technology is unnecessary since the on-site groundwater is not a source of potable water. This technology was considered for completeness, since as presented in Section 1.3.4, off-site residences adjacent to SEAD-16 and -17 do obtain water from private wells. However, there is no concern regarding the impacts to the off-site wells (Section 2.5.2).

3.2.3 Containment Technologies

Containment technologies include capping, horizontal barriers and vertical barriers. Long-term maintenance of any containment technology is necessary to ensure its effectiveness. Maintenance typically includes surface water run-on/runoff controls, cap inspection and repair, and collection and treatment of any gases.

Horizontal barriers, such as block displacement, are installed below the waste to stop flow vertically through the waste. On-site technologies, such as containment, pose less of a risk to on-site workers than technologies requiring excavation because there is less opportunity for the spread of the constituents of concern and exposure.

3.2.3.1 Capping

Capping is a feasible technology that involves placing a barrier over the impacted soils to prevent contact (*i.e.* exposure to soils via direct contact and dust) with human and ecological receptors, surface water, and infiltrating water. A soil cap and an impermeable cap were considered in the evaluation.

A soil cap involves placing a layer of soil over the areas to be remediated. The cap would be of sufficient thickness and quality to reduce infiltration and promote grass cover. The cap would control the exposure from inhalation of soil dust, prevent runoff of impacted particles and prevent exposure to humans and ecological receptors due to ingestion of soil. Therefore, a soil cap would be effective in reducing the risk to acceptable levels and therefore has been retained for further consideration.

Impermeable caps typically have permeabilities less than 1×10^{-7} cm/sec and substantially reduce the amount of water infiltration to the underlying soils. An impermeable material includes clay, geomembrane (such as High Density Polyethylene (HDPE)), geocomposite clay liner (GCL), and bentonite admixture. Impermeable caps typically include a drainage and a vegetative layer. Impermeable caps would be effective in reducing the risk to acceptable levels and therefore has been retained for further consideration.

3.2.3.2 Horizontal Barriers

In instances where wastes have been placed on top of soil with no underlying liner or impermeable barrier, it is possible to install a horizontal barrier in situ under the wastes. This is usually required when unacceptable leakage and mixing of groundwater with buried wastes is occurring. It is most applicable when sound bedrock or an impermeable strata are not sufficiently near the waste to provide a vertical barrier to sufficiently isolate and contain the waste. Horizontal barriers involve injecting impermeable materials below the buried materials. Two process operations were considered and included grout injection and block displacement.

Grout injection techniques involve pressure injecting cement, cement-bentonite or a chemical grout into soil or rock to strengthen and decrease the permeability of the formation. The grout is forced into the void spaces of the soil, forming a solidified zone of soil and grout in the area of injection. Through a sufficient number of overlapping injection points, an impermeable seal is created below the waste materials. This process works best if the grout is injected through permeable formations such as sands that will allow the grout to cover a larger area. Excessive injection pressures are required for dense strata, such as glacial till, that are not particularly permeable. Once injected over an area, the grout acts as a bottom seal preventing interactions between the waste that would be buried below the water table and groundwater.

The block displacement method is another technique for the in situ horizontal isolation of waste. This technique involves placing a barrier around the sides as well as underneath the contaminated ground and vertically displacing the enclosed earth mass or block. The barrier is formed by pumping slurry into a series of notched injection holes. Continued pumping of the slurry under low pressure produces a large uplift force against the bottom of the block and results in vertical displacement proportional to the volume of the slurry pumped. This technique has not been used in full-scale application but has been demonstrated on a small scale. During the demonstrations, problems were encountered with maintaining adequate injection hole pressures and with perimeter separation (drill, notch and blast) technique. The technology is best suited to a site where a natural impermeable bottom barrier does not exist sufficiently near the surface for a vertical perimeter barrier to act alone as an isolation technique.

Horizontal barrier techniques were eliminated from further consideration since unweathered bedrock is sufficiently near to the surface. In addition, the soil layers at SEAD-16 and -17 are thin and injection of grout would produce breakout of the grout along the thin soil zone. This would prevent the injected grout from forming a continuous barrier over the entire area.

3.2.3.3 Vertical Barriers

Vertical barriers are used to surround the waste and limit horizontal groundwater flow to or from the waste. Three types of vertical walls considered are steel sheet piling walls, slurry walls and grout curtain walls.

Steel sheet piling are commonly used in construction projects to support a soil slope during excavation. The steel sheets are typically driven into the subsurface using specialized heavy equipment. The steel sheets are interlocking allowing for a continuous barrier around an area. For excavations below the water table, dewatering is required to remove any infiltrating groundwater, as the interlocking sheets are not water-tight joints.

Slurry walls involve excavating a trench using slurry techniques and backfilling the trench with low permeable materials, such as soil-cement and soil-bentonite mix. Slurry walls are be constructed to provide an impermeable wall around the area to be isolated and to minimize inflow of groundwater. The installation of the wall involves specialized excavation and slurry mixing equipment. A wall is either "keyed" into an impermeable soil or bedrock zone or left "hanging" when an impermeable zone is not present. Leakage will occur underneath a hanging wall.

Soil-bentonite walls are composed of soils mixed with bentonite. A soil-bentonite mix has a low permeability and is compatible with a wide range of wastes. Soil-bentonite slurry wall construction requires a large work area for mixing and is restricted to relatively flat topography. Cement-bentonite slurry walls are constructed in a manner similar to soil-bentonite slurry walls, except Portland cement is mixed with the bentonite instead of soil. These walls are adaptable to more extreme topography and do not require an extensive mixing work area. Cement-bentonite walls provide higher structural strength than soil-bentonite walls, however, are more permeable and less chemical resistant.

Grouting is the practice of injecting, under pressure, a fluid, such as cement, cement-bentonite or a chemical grout, into soil or rock to decrease the soil/rock permeability and/or strengthen the formation. Grout curtains have been used in the construction industry for several decades, but their application to source isolation from groundwater has not been practiced as frequently as slurry walls. An inherent drawback of grouting is the indefinite extent and integrity of the final grout curtain that is created.

Of the three vertical technologies considered, none were retained for combination as a remedial alternative since vertical barriers will not meet RAOs for protecting human health and the environment from lead in surface soils.

3.2.4 In Situ Treatment Technologies

In situ treatment immobilizes, separates, degrades, detoxifies, or destroys contaminants without the added cost of excavation, materials handling, or treatment equipment. In situ treatment is advantageous as it does not involve construction of a treatment facility and limits the exposure of treatment operators to contaminated soils. Treatment of in situ soil is most appropriate when the nature and extent of the source is well defined, the source is homogeneous, the surrounding hydrogeology is well defined, and soil permeability's are suitable for in situ treatment. Treatment process operations generally entails soil modification via either the injection of air, water, or chemical reagents into the soil or application of an electric current causing either vitrification or migration of metal ions. In situ treatments are classified generally as innovative or advanced technologies. This means they require more pilot testing prior to design and implementation, and more monitoring during implementation compared to conventional technologies. The primary difficulties associated with in situ treatment applications are the inability to control the environment under which the process occurs; the inability to ensure contact between treatment reagents (*i.e.*, heat, microorganisms, air, water, or chemical contaminants in the source areas); the difficulty of maintaining effectiveness with depth; and the possibility that toxic byproducts may be released. However, in situ treatment applications are potentially preferable over exsitu treatment because waste excavation and corresponding site restoration activities are not required, and minimal disruption of hazardous constituents occurs.

The following in situ treatment technologies were considered as potential remedial alternatives:

- Solidification/Stabilization
- Electrical
- Chemical Extraction
- Biological Removal/Extraction
- Vapor Removal/Extraction

The applicability of some of the in situ technologies to this site is discussed below:

3.2.4.1 Solidification/Stabilization

Solidification is performed to improve the waste materials handling properties (*i.e.* water content and strength) and weathering resistant properties. Stabilization is performed to reduce contaminants leaching from the material into the groundwater. Stabilization involves technologies that convert constituents to a less soluble or less toxic form.

In general, the treatment is a combination of both solidification and stabilization (S/S). The operation involves mixing an additive (such as cement, quick lime, fly ash, pozzolans (siliceous) materials, or a proprietary agent) with soil using rotor drums, backhoes, injectors, or augers until the material has been completely mixed. Soil above and below the water table can be S/S. Limitations on the mixing depth are a function of the type and power of equipment used. Large rocks/cobbles and dense soil conditions can provide difficulty in turning the soil due.

On a microscale, constituents such as metals in an ionic form and water, are either chemically bonded to the stabilized materials or converted into an insoluble form, such as a metal hydroxide, within the solid matrix. Particulates or solids are encapsulated in the solid matrix and prevented from migrating to receptors.

Stabilization has been used primarily for the treatment of soils containing inorganic contaminants and has been shown to be effective for heavy metals, the primary contaminant of concern at SEAD-16 and -17. The EPA policy indicates that stabilization is appropriate for materials that contain inorganics and non-volatile organics. Some organics may interfere with the setting process, and others may not be bound up in the finished product. There are few organics in the soils to be stabilized at SEAD-16 and -17, and interference by organics is not considered to be a problem.

Four types of mixtures are generally used for stabilization. Inorganic stabilization is often achieved with cement or pozzolanic additives. Organic stabilization is often accomplished with thermo-plastic or organic polymerization additives (EPA, 1989). A combination of these processes may be used for a soil containing both organic and inorganic contaminants.

In cement-based stabilization, the soil is mixed with Portland cement and water. The resulting mix binds the inorganic materials in the cement matrix. Pozzolanic stabilization involves mixing the soil with a siliceous material, such as fly ash, pumice, or lime kiln dust. The mixture is often combined with lime or cement and water to form a cement-like final product. The end result of inorganic stabilization is typically a granular material or a cohesive solid (EPA, 1989).

Stabilization using a mixture of pozzolan/cement/lime/fly ash has been identified by EPA as effective and is feasible for treatment of the soils at SEAD-16 and -17. The site soils are primarily fill material, much of which consists of crushed shale. This material will be readily bound up in a cement base, and will act like the aggregate used in making concrete. With the wide range of stabilization agents available, this technology usually requires the performance of a site-specific treatability study to determine the most effective solidifying agent and the optimal ratio of waste to admixture.

Since the constituents of concern at the site are inorganics with some amounts of semi-volatile organics, such as PAHs, present, this technology meets the requirements for application at this site and was retained for further consideration.

3.2.4.2 Electrical

In situ vitrification (ISV) involves applying a large voltage, as much as 4,160 V, between molybdenum or graphite electrodes installed and arranged in a grid pattern, usually square, into the soil. A conductive mixture of flaked graphite and glass frit is placed in an X pattern among the electrodes in 5 cm deep trenches to initiate electrical conductance. The application of the large voltage causes a current to develop in the soil matrix. As a result, the soil is heated due to the electrical resistance that occurs between the electrodes. As the soil melts the soil becomes electrically conductive causing the melting process to perpetuate down the soil column. During the soil temperature rise, soil moisture is boiled away and organic matter is destroyed, until temperatures of approximately 2000^{O}F are reached. At these high temperatures, the soil begins to melt, essentially becoming a glass-like mass. As the vitrified melt is allowed to cool, the mass becomes solidified, entombing the waste materials. Due to the large amount of off-gassing that occurs in this process, many of that are toxic, a cover is typically placed over the soil as it is heated to collect and treat the gases. The process is considered innovative and has been identified as an appropriate technology for application at radioactive waste sites. Full scale, widespread, operation of this technology has not been performed, probably due to the excessive power requirements that this technology requires, although pilot testing has been conducted. This technology was screened out from further consideration.

Electrokinetics involves converting the saturated soil to an electrochemical cell through the application of sufficient voltage to the soil electrodes. Electrodes, one an anode and the other a cathode, are installed into the soil that allow an electric current to flow in the soil. Once sufficient voltage is applied, the soil is essentially transformed into an electrochemical cell. As in any cell, dissolved soil anions and cations migrate to the appropriate electrode. Metallic cations migrate to the negatively charged electrode, the anode, where the metals are removed as the cations plate out. Electrokinetics is possible but is only capable of removing dissolved metals in the saturated soil. Since much of the metals at the site are located above the water table as solid particles, this technology was screened out from further consideration.

3.2.4.3 Chemical Extraction

Soil flushing involves the in situ application of water, hot water/steam, solvents, either polar or non-polar, acids or surfactants to buried waste materials with the intent of solubilizing the constituents of concern into the groundwater. This technology is typically used for extracting organic compounds from soils when excavation is not possible. The solubilizing agent along with the pollutants are then recovered from the groundwater using extraction wells. When possible, the solvent or surfactant is then separated and recovered for recycling back into the soil in order to extract additional waste material. While this technology has promise at heavily contaminated sites where excavation is impractical it was eliminated from further consideration for application at SEAD-16 and -17 since this technology is most appropriate for use with sites impacts with organic compounds.

3.2.4.4 Biological Removal/Extraction

Bioventing involves adding air (oxygen) to the subsurface in order to stimulate the natural microbiological community to degrade the waste materials. The air is typically added, under pressure, through properly spaced and screened injection wells. The wells are constructed so that air is added a rate greater than what is lost due to consumption by the microorganisms and movement beyond the area of remediation. The soil microorganisms are abundant in the subsurface, many species are of the type known to degrade organic molecules, such as hydrocarbons. With maintenance of proper conditions in the subsurface, it has been shown that these organisms will effectively degrade pollutants. However, bioventing is not effective for inorganic components and therefore has been eliminated from further consideration.

Extraction of metals via the vegetative uptake of plants is experimental and unreliable. The conditions of the pads and berms at the site would not promote vegetative growth and this technology was screened from further consideration.

3.2.4.5 Vapor Removal/Extraction

Vacuum or vapor extraction is one of the most widely applied in situ technologies at hazardous waste sites. Several vendors are available that have successfully applied this technology. It is most applicable for recovery of volatile organics in soil. The process involves application of a vacuum to the subsurface through a well screened in the unsaturated zone. The applied vacuum is transferred to the soil pores causing increased volatilization of organics and the movement of air to the extraction well as a result of pressure differences. A continuous air stream laden with extracted organics are removed and treated, if necessary, prior to discharge. This process continues until the soil is free of the target compounds. Vacuum or vapor extraction was screened from further consideration since the constituents of concern at this site are inorganics, making this technology ineffective.

Radiowave enhanced volatilization is a variation of vacuum extraction and involves the application of radiowaves directly to the subsurface causing the soil temperatures to rise. As the temperature of the soil increases, the vapor pressures of constituents in the soil also increase. This allows compounds that normally would not have been removed, to be removed from the soil. This technology is considered innovative and experimental with only limited pilot scale applications. It is most appropriate for sites where excavation is impractical and semi-volatile organic compounds are the constituents of concern.

3.2.5 Removal Technologies

Removal of soils and ditch soils are an integral component of many remedial alternatives. Removal can be accomplished using standard mechanical technologies or slurry methods. Typical heavy equipment such as backhoes, excavators, front-end loaders, scrapers, bulldozers and draglines are commonly used for the mechanical excavation of soil. Since the soil at SEAD-16 and -17 can be easily removed using standard mechanical excavation techniques, only this technology was retained for further consideration. Excavation using slurry techniques was screened out of further consideration since it would not be as practical.

Techniques to clean and remove material and debris at Buildings S-311 and 366 include sand blasting, high pressure washing, concrete decontamination using microwaves, soda blasting, electro-hydaulic scabbling, electrokinetic decontamination, and dry ice pellet decontamination. However, these blasting and washing processes are complex and can be costly, and some may produce waste that require treatment before disposal and may increase the potential for migration of contaminants to outside the buildings. Because the samples collected inside the building were limited to debris and floors, the application of washing and blasting techniques is not warranted. Consequently, only removal of excess material and debris, including sweeping out dust and dirt, is retained as a remedial response, and is included with soils excavation when determining the volume of materials to be removed at SEAD-16.

3.2.6 Ex-situ Treatment Technologies

Ex-situ treatment technologies involves the removal of contaminated material and either on-site or off-site treatment. On-site treatment can be accomplished using permanent or temporary treatment facilities. Temporary facilities include treatment facility brought to the site on trailer trucks (which can be disassembled and moved off-site upon completion of treatment), or the use of mobile treatment trailers temporarily parked on-site. Permanent facilities are costly and difficult to build and become obsolete once treatment is complete. On-site treatment also will entail further responses to handle treatment of residuals, byproducts, or sidestreams. The residuals must be disposed of, although some may be nonhazardous and the volume may be only a fraction of the initial waste volume.

Off-site treatment allows material to be removed completely from the site and treated at a full-scale fixed facility. Off-site treatment requires excavation, consolidation, and off-site transportation of material. It entails identification of RCRA-permitted hazardous waste treatment, storage, and disposal (TSD) facilities with the capability and capacity to treat material removed from source areas. Off-site handling of materials would require permits for transportation and disposal. This response eliminates both continued releases on-site and direct contact with source material by on-site receptors.

Ex-situ treatment generally requires laboratory pilot studies using site-specific material to determine level of performance and optimal process operating parameters.

The following ex-situ treatment technology types and process options were determined to be applicable at SEAD-16 and -17 based on the screening criteria:

- Biological
- Stabilization/Solidification
- Physical Separation
- Oxidation
- Chemical Extraction

3.2.6.1 Biological Technologies

Ex-situ biological treatment of soil involves degradation of contaminants that are entrained in the soil pores through the actions of microorganisms. Land treatment has been successfully utilized by the petroleum industry for many years as a cost effective way of stabilizing oily wastes produced during the refining process. Land treatment facilities are normally found in areas, near refineries, that have large tracts of available land and are in climates that have temperatures favorable for stimulating biological growth. The above ground biological treatment methods vary and include: landfarming (land treatment), slurry bioreactors, digesters and composting. The process involves providing the proper ratio of pH, nutrients, oxygen (if aerobic conditions are required) and temperature to stimulate the natural microorganisms to utilize the organic contaminants as a source of cellular energy. Several microorganisms have been identified that can utilize petroleum hydrocarbons and other hydrocarbons as sources of energy. In addition to maintaining control of previously mentioned factors, a key factor in achieving a successful clean-up using this technology is to assure that toxic concentrations of contaminants and/or byproducts are not produced to hamper the growth rates of the microorganisms. In additional it is important to provide adequate contact between the microorganisms and the contaminants. For recalcitrant hydrocarbons, such as the Polynuclear Aromatic Hydrocarbons (PAHs), slurry bioreators have been utilized to improve the contact between microorganisms and waste materials.

Ex-situ biological treatment of soil has been screened out since it is effective for soils that have been impacted with organic constituents and would not meet the objectives for reducing the concentration of lead in soil. Biological treatment would have little if any effect on the soils at SEAD-16 and -17 that are impacted with lead.

3.2.6.2 Solidification/Stabilization

Ex-situ solidification/stabilization is similar to in situ S/S except that the material is excavated, consolidated, and transported to a central mixing area. Mixing can be accomplished by using a pug mill, conventional construction equipment, or off site facilities. If an on-site pugmill is used, the excavated material can be transported to the pug mill and mixed with water and the selected additive(s). The weight of the soil and additives can be tracked by either using a conveyor belt with a scale system or counting the loads from a front end loader. Additives can be either stockpiled and added via a conveyor or a front end loader, or added with a hopper system.

Microencapsulation involves encapsulating a particle within a thermoplastic matrix of asphalt, polyethylene or polypropylene. This technique requires heating the plastic and mixing the waste as the plastic is extruded and cooled. The final mass incorporates the waste in a matrix that is inert to normal weathering and structurally stable. Microencapsulation has been used primarily in the nuclear industry to encapsulate radioactive sludge's and is not considered feasible at either SEAD-16 or -17 due to the non-uniform nature of the soils that will require treatment.

Sorption is a technique that involves mixing semi-solid sludges with a dry solid adsorbent to improve the solids handling characteristics of the sludge. The sorbent material may interact chemically with the waste or may simply be wetted by the liquid, usually water or oil, as part of the waste, retaining the liquid within the matrix of the solid. Sorption is most appropriate for use with semi-solid sludges and is not considered feasible because there are no sludges requiring treatment.

3.2.6.3 Physical Separation/Aqueous Extraction

Physical separation technologies include soil washing and magnetic classification. Soil washing involves physically separating the various fraction of soil using a series of unit operations such as grizzly bars, trommel screens, flotation units, flocculation tanks and clarifiers. The process removes contaminants from soils by either dissolving or suspending them in the wash solution or by concentrating the pollutants into a smaller volume through a series of particle size separation steps. In some instances, the washing fluid, which is normally water, can be supplemented with an aqueous surfactant for improved separation. The key concept associated with soil washing is to reduce the volume of soil that will require treatment allowing for the washed soil to be returned to the site as clean backfill. This process takes advantage of the fact that, in most instances, pollutants tend to distribute into the fine fraction of soil. The wash water is typically recycled back to the washing process once it has been treated.

Magnetic classification of soils is another volume reduction process that involves the use of electromagnets to separate magnetic materials such as iron from non-magnetic materials. This is a common process used in many recycling facilities.

Soil washing is considered to be effective and feasible remedial technology for both sites and has been retained for incorporation as a remedial alternative. Magnetic classification of soils would not be effective since most of the constituents of concern are non-magnetic.

3.2.6.4 Oxidation

Thermal oxidation/vitrification technologies involve heating soils/sludges in a high temperature reactor causing the solid fraction of the waste to become incorporated into either a molten metal bath or a slag. The technology has several variations depending upon the equipment and the vendor. The conditions within the bath involve the addition of hydrogen gas. Under these conditions, soils, which are comprised mostly of alumina and silica, partition into a slag phase above the molten bath and are removed as a vitrified mass when allowed to cool. The slag, now a vitrified mass is essentially an inert, non-leaching solid that can be placed into a landfill or returned to the site for disposal. Volatiles in the waste feed are vaporized, oxidized in a secondary combustion chamber, and recovered as a dust in a collection system. Several vendors are available to provide this treatment including Horsehead Resource Development Company, Inc., Molten Metals and ECO Logic Inc.

Thermal oxidation/vitrification technologies are feasible, providing a vendor can be found to accept this material at an off-site location. However, it is effective for organics and ineffective for inorganics, and therefore, has not been retained for future consideration.

3.2.6.5 Chemical Extraction

Chemical extraction of soils can be accomplished using materials, such as carbon dioxide or propane, which are normally gases at ambient temperatures and pressures. However, when these gases are pressurized to a liquefied state they have the capability to efficiently extract oil and other organic wastes. The process involves mixing a liquefied solvent with the solid waste material, extracting the contaminants, separating the solids from the liquefied solvent and releasing the pressure causing the liquefied solvent to vaporize back to a gas, leaving an oil. The oil is then treated further or disposed of in accordance with all pertinent regulations. Vendors, such as CF Systems, Inc. and The Institute of Gas Technology have systems that are available to provide this treatment.

Chemical extraction of soils can also involve mixing an appropriate non-aqueous chemical solvent with soil in order to remove contaminants by solubilizing the contaminants, separating the solvent from the soil and recycling the solvent. There are a variety of solvents available that can be used to extract materials and the choice of solvent is largely dependent upon the type of contaminant that is the focus of the extraction. Several vendors can provide this treatment technology with each vendor focusing on a specific extraction agent. Some of the more widely known solvents include: triethly amine (TEA), liquefied propane or liquefied carbon dioxide. The solvent TEA is used for the Basic Extraction Sludge Treatment (BEST), developed by Resources Conservation Company. In this process, soils/sludges are mixed with TEA at low temperatures. The essential feature of this technology is that it takes advantage of the large changes in the solubility of TEA and water and temperature. At temperatures less than 18^{O}C TEA is completely miscible with oil and water. When mixed with oily soils or sludge's at or below this temperature, TEA is able to remove, by dissolution, any oily materials and the contaminants associated with the oil. The TEA/water/oil mixture is centrifuged or filtered to separate the extracted soil/sludges from the extracting fluid. The recovered solids are then dried to remove any residual TEA, which is then recovered and recycled back for continued extraction. The extracting liquid, containing TEA/oil/water, is then heated causing the TEA to become insoluble with water producing a two-phased system. The top phase contains the TEA/oil phase and is decanted off, distilled to separate and recycle the volatile solvent TEA, leaving the extracted oil. The oil is either treated further and disposed of as a hazardous waste or recycled as a recyclable spent oil. The bottom portion of the heated liquid that was not decanted is primarily water is also distilled to remove any residual TEA and discharged.

Chemical extraction of soils are effective for extracting organics or oily waste materials but are not effective for removing inorganic constituents. Since the RAO for this project is inorganics, (*i.e.* lead) and the soil and ditch soils at either SEAD-16 or -17 are not impacted with oily waste, this technology was not considered effective and was screened out.

3.2.7 <u>Disposal</u>

3.2.7.1 On-Site

On-site disposal entails removal and consolidation of source material into an on-site secure disposal facility. Excavated areas are backfilled and regraded. The following disposal operations have been considered:

- Backfilling of clean soil,

- RCRA hazardous waste landfill and
- Solid waste landfill.

Construction of a new on-site landfill, designed to meet RCRA and/or state standards can be constructed within the present boundaries of the depot. Consolidation of on-site waste within a future landfill is feasible for the SEAD-16 and -17 soils. Two types of landfills have been considered. The first type is a Subtitle D industrial landfill, *i.e.* a solid waste management landfill regulated under Title 6 Part 360 of the New York Codes, Rules and Regulations (NYCRR). The other type is a RCRA, Subtitle C hazardous waste landfill regulated under Title 6 Part 373 of the NYCRR. Both facilities would require siting studies and permitting prior to construction however, the requirements for a new RCRA hazardous waste landfill are more extensive and exhaustive.

The permitting, monitoring, design and construction required to comply with all the requirements of a RCRA facility is not necessary for this project. The need to construct a RCRA hazardous waste landfill is only required if the wastes to be disposed of are considered to be RCRA hazardous. Wastes are RCRA hazardous if they possess the characteristics of either ignitability, corrosivity, reactivity or toxicity or if the wastes are listed by EPA as hazardous from non-specific or specific sources. In the case of SEAD-16 and -17 there are no known listed hazardous wastes to be disposed of. However, a portion of the soils at the site may exhibit the characteristic of toxicity as a result of lead concentrations exceeding the limits of the EP Toxicity test, *i.e.* the Toxicity Characteristic Leaching Procedure (TCLP). If the characteristic of the waste is removed, *i.e.* the soil no longer exceeds the limits for toxicity due to treatment, then the waste is no longer a hazardous waste and can be landfilled in an on-site, non-hazardous, solid waste Subtitle D landfill.

SARA states that treatment which permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants is to be preferred over remedial actions not involving treatment. On-site disposal will not address this preference unless used with a technology that reduces volume, toxicity, or mobility. On-site disposal, therefore, includes an assumption that such a treatment technology has been applied. Therefore, on-site disposal is not precluded by the preference set forth in SARA to reduce volume, mobility or toxicity.

Therefore, an on-site landfill may be applicable for soils that have been treated to remove any RCRA characteristic and for untreated soils which are nonhazardous wastes. Although nonhazardous wastes are expected to be disposed and dispose to Subtitle C landfill will be limited accordingly, both Subtitle C and Subtitle D landfill have been retained for inclusion with other technologies as remedial alternatives at this stage.

3.2.7.2 Off-Site

Off-site disposal involves removal of material, consolidation into containers, and site transportation off-site. All excavated areas will be backfilled with clean imported fill. This technology decreases continued on-site exposure by humans or ecological receptors. The arithmetic mean of lead concentration in surface soil is 185 mg/kg for SEAD-16 and 315 mg/kg for SEAD-17 after the cleanup goal of 1,250 mg/kg is achieved. The post-remediation surface soil EPCs for lead are estimated as 354 mg/kg and 392 mg/kg for SEAD-16 and SEAD-17 respectively, all of which are less than 400 mg/kg. Thus, the remediation goal for lead of 1,250 ppm in soils will also allow unimpaired future use of the site. However, releases and impacts may occur at the off-site disposal locations that could affect public health and environment. Off-site disposal is preferable when on-site disposal is precluded or limited by site characteristics, when unimpaired future use of the site is a high priority, and when the volume for disposal is too small to warrant construction of a landfill. The following two options were considered for off-site disposal:

- State-permitted RCRA hazardous waste landfill and
- State-permitted solid waste landfill.

A permitted, off-site RCRA Subtitle C facility with the capacity and capability to handle the source material must be identified. Due to the RCRA Land Disposal Restrictions (LDR), waste, if hazardous, will need to be treated prior to disposal in the facility. If the waste is a listed waste then the treated waste will still be required to be disposed of in a Subtitle C facility. If the waste is a characteristic waste, it will not need to be disposed of in a Subtitle C facility once the characteristic is removed. For SEAD-16 or -17, this means that soil that exceeds the TCLP limit for lead would be a D008 hazardous waste. However, if the soil is treated and is shown to be below the limits for toxicity as defined by the TCLP test, then it is no longer hazardous and does not need to be disposed of in a Subtitle C facility. Instead, it can be disposed of in a Subtitle D Landfill.

Off-site disposal of waste and soils from contaminated areas is a feasible option. There are no wastes at SEAD-16 or -17 that are listed as hazardous wastes. Soil, ditch soil, or building material that may be characteristic by toxicity would need to be treated to remove the characteristic prior to disposal in an off-site landfill. Treatability studies will be conducted forehead to ensure the stabilized ditch soil or soil meets Subtitle D Landfill standards. TCLP tests will be conducted for the stabilized ditch soil or soil to make sure it is qualified for Subtitle D Landfill disposal. Accordingly, dispose to Subtitle C landfill will be limited. However, both Subtitle C and Subtitle D landfill have been retained for inclusion with other technologies as remedial alternatives at this stage.

4 DEVELOPMENT AND SCREENING OF ALTERNATIVES

4.1 INTRODUCTION

In this section the remaining general response actions and the various remaining remedial technologies are combined to form remedial alternatives. Alternatives were developed to address the RAOs (*i.e.* ditch soil, soil, and building material and debris) and are described below. The alternatives do not address groundwater and surface water, other than protecting these media from any degradation, because they are not part of the RAOs.

The alternatives are first evaluated against the two remedy selection threshold factors (overall protection of human health and the environment; ARAR compliance) for a pass/fail/waiver decision. The retained alternatives are then evaluated against the five primary balancing criteria:

1. long-term effectiveness and permanence
2. reduction of toxicity, mobility, or volume through treatment
3. short-term effectiveness
4. implementability
5. cost

The following is a brief description of the criteria (Code of Federal Regulations 40 §300.430):

STEP 1

- *Overall protection of human health and the environment.* Alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by contaminants present at the site by eliminating, reducing, or controlling exposures to levels consistent with RAOs. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.
- *Compliance with ARARs.* The alternatives are assessed to determine whether they attain ARARs, as discussed in Section 2.

STEP 2

- *Long-term effectiveness and permanence.* Alternatives will be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful.

- *Reduction of toxicity, mobility, or volume through treatment.* The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume will be assessed, including how treatment is used to address the principal threats posed by the site.
- *Short-term effectiveness.* The short-term impacts of alternatives will be assessed considering the following: short-term risks that might be posed to the community during implementation of an alternative; potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and time until protection is achieved.
- *Implementability.* Implementability is a measure of both the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative.
- *Cost.* Both capital, operating and maintenance (O&M) costs were considered.

The two modifying criteria of the remedy selection process (State/agency acceptance; community acceptance) will be fully assessed following the comment period for the FS report and the proposed plan.

Six alternatives (five plus the no action alternative) were assembled and screened based on these criteria for soil and ditch soil remediation. The initial list of six alternatives was then reduced to four alternatives, which are analyzed in detail in Section 6.

4.2 ASSEMBLY OF ALTERNATIVES

In this section, the rationale is presented for assembling technologies and processes remaining from the screening (Table 3-1) into remedial action alternatives. An innovative technology has been included to comply with the SARA (1986), which requires an alternative solutions be used to the maximum extent possible. The alternatives that have been assembled are as follows:

- Alternative 1 - No Action,
- Alternative 2 - On-site Containment,

- Alternative 3 - In Situ Treatment,
- Alternative 4 - Off-Site Disposal,
- Alternative 5 - On-Site Disposal,
- Alternative 6 - Ex-Situ (Innovative) Treatment.

A brief description of the alternatives, the technologies and processes associated with these actions are summarized and presented on **Table 4-1.**

4.3 DESCRIPTION OF TECHNOLOGIES, PROCESSES AND ALTERNATIVES

4.3.1 General

The technologies and processes that make up the six assembled alternatives for soil, ditch soil, and the material and debris from Buildings S-311 and 366 at SEAD-16 are described in greater detail to allow each assembled alternative to be evaluated. In addition to better defining technologies and processes, the quantity of material to be remediated has also been considered. Order of magnitude unit costs have been developed based on technology definitions and material quantities. These costs were then utilized as one of the alternatives screening criteria. It is important to note that the final decision regarding specific remedial technologies and processes to be utilized may be dependent on the results of treatability studies proposed in Section 5.

4.3.2 Remedial Alternatives

4.3.2.1 Alternative 1 - No Action

Alternative 1 is the No Action alternative. This alternative allows the site to remain as it currently is, with no further consideration given to any remedial actions.

TABLE 4-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
ASSEMBLED REMEDIAL ALTERNATIVES

Alternative		Technologies and Processes
1	No-Action	No-Action
2	On-Site Containment	Institutional controls/Soil cover
3	In Situ Treatment	Consolidate/In situ stabilization/Soil cover
4	Off-Site Disposal	Excavate/Stabilize/Off-site Disposal
5	On-Site Disposal	Excavate/On-site stabilization/On-site Subtitle D Landfill
6	Innovative Treatment	Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in off-site Subtitle D Landfill

4.3.2.2 Alternative 2 - On-site Containment

Alternative 2 consists of excavating soils in the drainage swales and ditches with lead concentration greater than 1250 mg/kg and disposing of it in an off-site landfill. Excavated ditch soil would be stockpiled and tested for Toxicity Characteristic Leaching Procedure (TCLP) prior to being disposed. Ditch soil passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Ditch soil exceeding the TCLP criteria will be stabilized either on-site or off-site. Because of the relative small volume of ditch soil to be treated at SEAD-16 and -17, it is expected that off-site treatment will be more cost effective than on-site treatment. On-site treatment requires a treatability study, site permitting, and a specialty contractor, which adds to the cost. Therefore, for screening purposes presented later in this section, this alternative assumes all excavated soil is transported off-site for both treatment and disposal. It should be noted that TCLP is not a clean up level, rather it determines whether the soils are characteristic waste and the type of disposal required.

Material and debris from Buildings S-311 and 366 will also be removed, stockpiled and tested for TCLP prior to being disposed. Material passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized either on-site or off-site. Debris and dust will be removed from the surface of the furnace and boiler stacks. A soil cover will be placed over the surface and subsurface areas with lead concentrations greater than 1250 mg/kg. Railroad tracks and ties at SEAD-16 in the delineated area will be removed. The soil and ballast around the railroad area will then be covered. The soil cover consists of the following, from top to bottom:

- 6 inches topsoil
- 6 inches common fill
- Filter fabric (*i.e.* separation layer)

Regrading of the site and installation of institutional controls (such as a permanent fence) will be required prior to placement of the soil cover. Drainage swales and ditches will be backfilled to existing grade with topsoil and vegetative growth will be established.

The intent of this alternative is to isolate the waste from receptors and to prevent migration of surface soil to surface water via soil erosion. This alternative has little effect in preventing groundwater deteriorating from potential contaminant leaching from soil. However, as discussed in Section 1, groundwater quality is not expected to exceed EPA MCL or NYS GA standards for groundwater in the future. This alternative may also limit the future land use. Long-term groundwater monitoring and O & M will be required.

4.3.2.3 Alternative 3 – In Situ Treatment

Alternative 3 consists of in situ stabilizing the surface and subsurface soils with lead concentrations greater than 1250 mg/kg. Railroad tracks and ties at SEAD-16 in the delineated area will be removed before the surface soils and subsurface soils are stabilized. Ditch soil with lead concentrations greater than 1250 mg/kg will be excavated from the drainage swales and ditches, consolidated with the soils and stabilized. The stabilized material will be graded and left on site. The soil cover used in Alternative 2 will be placed over the stabilized material and vegetative cover will be established. Drainage swales and ditches will be backfilled with topsoil and vegetative growth will be established.

As presented in Section 3, stabilization is a process that reduces the amount of leachate from the source material into the groundwater. A treatability testing program is necessary to identify the most effective additive and dosage.

Material and debris from Buildings S-311 and 366 will also be removed, stockpiled and tested for TCLP prior to being disposed. Material passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized either on-site or off-site. Debris and dust will be removed from the surface of the furnace and boiler stacks.

The intent of this alternative is to stabilize the source material to reduce migration into the groundwater; isolate the waste from receptors; and prevent migration of surface soil to surface water via soil erosion. Long-term groundwater monitoring and O & M will be required.

4.3.2.4 Alternative 4 - Off-Site Disposal

Alternative 4 involves excavating surface, subsurface and ditch soils with lead concentration greater than 1250 mg/kg, and disposing the excavated material in an off-site landfill. Railroad tracks and ties at SEAD-16 in the delineated area will be removed before soil is excavated. Excavated soil and ditch soil would be stockpiled and tested prior to being transported off-site for disposal. Excavated material passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Excavated soil and ditch soil that exceeds the TCLP criteria will be stabilized either on-site or off-site. However, based on conversations with stabilization contractors (refer to detail cost estimate, Appendix E) it is expected that off-site treatment may be more cost effective than on-site treatment. Therefore, for screening purposes presented later in this section and for conservative cost comparison purposes, this alternative assumes all excavated soil is transported off-site for both treatment and disposal.

Material and debris from Buildings S-311 and 366 will also be removed, stockpiled and tested for TCLP prior to being disposed. Material passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized either on-site or off-site. Debris and dust will be removed from the surface of the furnace and boiler stacks.

Excavated areas will be backfilled to restore the area to original conditions and to provide proper stormwater control. Common fill and topsoil will be placed and vegetative growth will be established. The intent of this alternative is to remove the waste from the site to prevent contact with receptors and migration to surface water and groundwater. Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required.

4.3.2.5 Alternative 5 - On-Site Disposal

Alternative 5 involves excavating surface, subsurface, and ditch soils with lead concentration greater than 1250 mg/kg, and disposing the excavated material in a newly constructed on-site Subtitle D Landfill. Railroad tracks and ties at SEAD-16 in the delineated area will be removed before soil is excavated. Excavated soil and ditch soil would be stockpiled and tested prior to being transported on-site for disposal. Excavated soils and ditch soils that exceed the TCLP limits will be stabilized on-site prior to disposal in the on-site landfill.

Material and debris from Buildings S-311 and 366 will also be removed, stockpiled and tested for TCLP prior to being disposed of in the on-site landfill. Material passing the TCLP criteria will be transported and disposed of in the Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized either on-site. Debris and dust will be removed from the surface of the furnace and boiler stacks.

Excavated areas will be backfilled with common fill and topsoil, and vegetative growth will be established. The intent of this alternative is to remove the waste from the site to prevent contact with receptors and migration to surface water and groundwater. Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required for the excavated areas.

The on-site landfill will be located at SEDA and constructed to meet the requirements of a Subtitle D landfill for the USEPA and NYSDEC, identified in 6 NYCCR Part 360. Siting studies and permitting are required prior to construction of the landfill. Primary design components of the landfill include a double composite bottom liner system, leachate collection system, cover system, gas vent system, erosion control, and stormwater system. As defined in 6 NYCRR 360-2.13, a composite liner consists of "two components, an upper geomembrane liner placed directly above a low permeability soil layer." The soil component of the upper liner must have a minimum compacted thickness of 18 inches. The soil component of the lower liner must have a minimum compacted thickness of 24 inches, and a maximum permeability of 1 x 10^{-7} cm/s. There is also a number of compaction, construction, and slope requirements. Long-term groundwater monitoring and O & M would be required for the landfill.

4.3.2.6 Alternative 6 - Innovative Treatment

Alternative 6 involves excavating soil in drainage swales and ditches with lead concentration greater than 1250 mg/kg, removing railroad tracks and ties at SEAD-16 in the delineated area before soil is excavated, excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg, stockpiling the material, and washing it to separate the coarse fraction of soil from the fine fraction. The coarse fraction will be backfilled as clean fill, provided it meets RAOs. The fine fraction is expected to contain the majority of the target constituents of concern, e.g., lead, and can be further treated for off-site disposal, if necessary.

Material and debris from Buildings S-311 and 366 will also be removed, stockpiled and tested for TCLP prior to being disposed. Debris and dust will be removed from the surface of the furnace and boiler stacks.

Treatment of the fine fraction to remove any toxicity characteristics, if necessary, can be performed on-site or off-site. On-site treatment can include stabilization, acid leaching, or other methods. However, because of the relative small volume of fine grain material to be treated, it is expected that off-site treatment will be more cost-effective than on-site treatment. Therefore, for screening purposes presented later in this section, this alternative assumes all treatment of the fine grain material is performed off-site.

Soil washing has been identified as an effective technology because the site soils are made-up of a large quantity of coarse particles (crushed shale imported from a SEDA borrow pit) and a small quantity of fine particles (soil particles less than the #200 sieve.) Based on several grain size distribution curves, the fine fraction in the site soil varies from 24 to 67 percent with median of approximately 36 percent. The fine fraction in ditch soil varies from 5 to 95 percent with median of approximately 56 percent. The inorganic constituents tend to bind chemically or physically to the fine-grained particles. The fine grained particles, in turn, are attached to sand and gravel particles by physical processes, primarily compaction and adhesion. The washing process separates the smaller fine grained fraction from the larger coarse grained fraction and thus effectively separate chemical constituents into a smaller volume, which can then be further treated or disposed. The clean, coarse fraction can be used as clean backfill. The fine faction can either be transported off-site for treatment and off-site disposal or treated further to remove the inorganic components and then off-site disposal. The water associated with the process is collected and treated.

The technology of soil washing varies from vendor to vendor but generally consists of many unit operations including the following:

<u>Physical Separation Unit Operations</u>

- dry screening (grizzly screen)
- dry screening (vibratory screen)
- dry trommel screen
- wet sieves
- attrition scrubber (wet)
- dense media separator (wet)
- hydrocyclone separators
- flotation separator
- gravity separators

- dewatering equipment
- clarifiers
- filter presses

Chemical Extraction Unit Operations

- washwater treatment/recycle
- residual treatment and disposal
- treated water discharge

Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required.

4.4 SCREENING CRITERIA

Alternatives assembled in Section 4.2 and defined in Section 4.3 are screened in this section. In the first step, the six alternatives are evaluated against the two remedy selection threshold factors (overall protection of human health and the environment; ARAR compliance) for a pass/fail/waiver decision. In the second step, the retained alternatives are evaluated against the five primary balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost).

The purpose of screening is to reduce the number of alternatives that will undergo detailed analysis. The screening conducted in this section is of a general nature. Although this is necessarily a qualitative screening, care has been taken to ensure that screening criteria are applied consistently to each alternative and that comparisons are made on an equal basis, at approximately the same level of detail.

4.4.1 Step 1

4.4.1.1 Overall Protection of Human Health and the Environment

Alternatives are assessed to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by contaminants present at the site by eliminating, reducing, or controlling exposures to levels consistent with

RAOs. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

- Short-term protectiveness of human health - The potential for the remedial action to affect human health during remedial action. Both on- and off-site exposures are considered under this criterion. Exposure routes include inhalation, ingestion, and dermal absorption.
- Long-term protectiveness of human health - The effectiveness of the remedial action to alleviate adverse human health effects after the remedial action is complete. The ability of an alternative to minimize future exposures is considered under this criterion. Exposure routes include inhalation, ingestion, and dermal absorption.
- Short-term protectiveness of the environment - The effectiveness of the remedial action to prevent environmental receptors from being affected by constituents during remedial action.
- Long-term protectiveness of the environment - The effectiveness of the remedial action to prevent environmental receptors from being affected by constituents after remedial action is completed.

4.4.1.2 Compliance with ARARs

The alternatives are assessed to determine whether they attain ARARs discussed in Section 2.

4.4.2 Step 2

4.4.2.1 Long-Term Effectiveness and Permanence

A key aspect of the screening evaluation is the long-term effectiveness and permanence of each alternative in protecting human health and the environment. Alternatives will be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that will be considered, as appropriate, include the following:

- Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remdial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propenisty to bioaccumulate;

- Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.

4.4.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume will be assessed, including how treatment is used to address the principal threats posed by the site. Factors has been considered including:

- the treatment processes the alternatives employ and materials they will treat;

- the amount of contaminants that will be destroyed, or treated;

- the degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment and the specification of which reductions are occurring;

- the degree to which the treatment is irreversible;

- the type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such substances and their constituents; and

- the degree to which treatment reduces the inherent hazards posed by principal threats at the site.

4.4.2.3 Short-Term Effectiveness

The short-term impacts of alternatives will be assessed considering the following:

- short-term risks that might be posed to the community during implementation of an alternative;
- potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;
- potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and
- time until protection is achieved.

4.4.2.4 Implementability

Implementability is a measure of both the technical and administrative feasibility of constructing and operating and maintaining a remedial action alternative.

- Technical feasibility - Rating of the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete. That also includes monitoring of the alternative, if required, after the remedial action is complete.

- Administrative feasibility - Rating of the ability to obtain approvals from regulatory agencies and the Army; the availability of treatment, storage, and disposal services; and the requirements for, and availability of, specific equipment and technical specialists.

4.4.2.5 Costs

Cost estimations during screening serve as a comparative measure of the costs for a remedial action. The level of accuracy for cost estimates required at this point is considered to be -30% to +50%. The cost estimates are based only on the major cost component for each alternative and do not include other items that contribute to cost. Both capital, operation and maintenance costs have been considered during the screening of alternatives. The evaluation included O & M costs that would be incurred for up to 30 years. Present worth analyses were used during the alternative screening to evaluate expenditures over different time periods in order to provide a common basis to compare costs.

- Capital costs - these were estimated based on order-of-magnitude unit costs.
- Operating and maintenance costs - O&M costs were estimated based on the long-term monitoring and maintenance requirements.

4.4.3 Numeric Rating System

The six alternatives are evaluated first against the two remedy selection threshold factors (overall protection of human health and the environment; ARAR compliance) for a pass/fail/waiver decision. In the second step, the retained alternatives are evaluated by applying a simple numeric rating system. Alternatives were scored from one (1) to six (6) for each screening criterion. The score of 1 represents the least favorable score and 6 represent the most favorable score. Within each screening criterion, alternatives were scored from one to six for each subcategory. The total score for the whole screening criterion will be the basis for the scoring for that screening criterion. The value assignments were based on both experience and the overall characteristics of the alternatives. The individual criterion values were summed for each alternative and the total score was then used as the basis for proceeding to the detailed evaluation (Section 6).

4.5 ALTERNATIVES SCREENING – STEP 1

The first step is to evaluate the six alternatives against the two remedy selection threshold factors (overall protection of human health and the environment; ARAR compliance) for a pass/fail/waiver decision.

4.5.1 Overall Protection of Human Health and the Environment

Based on the post-remediation risk assessment, all alternatives, except for Alternative 1, will remediate the site to levels that will protect human health and the environment. All alternatives, except Alternative 1, will protect human health by remediating the building debris and material. For all alternatives, except Alternative 1, the exposure route to soil will be eliminated upon the completion of the remedial action. Alternatives 3, 4, 5, and 6 will prevent groundwater from further deterioration. However, groundwater is not expected to exceed ARARs in 100,000 years, as presented in Section 1. Although these alternatives will have different short-term effects on human health and environment, they will not pose unacceptable risks to human and environment under proper construction quality assurance procedures. In general, all alternatives, except for Alternative

1, will protect human health and the environment. Therefore, Alternatives 2 through 6 will be retained for further evaluation. In addition, Alternative 1 will also be retained to provide a baseline comparison with other alternatives.

4.5.2 ARAR Compliance

There are currently no chemical specific ARARs for soil. Off-site disposal will fall under RCRA requirements, which must be complied with in the final remedial action plan. Other federal ARARs include, but are not limited to, the National Environmental Policy Act (NEPA), CERCLA, the Clean Water Act (CWA) and the Emergency Planning and Right to Know Act (EPCRA). Promulgated state regulations must also be complied with. After an alternative is chosen, the final design must incorporate compliance with ARARs, however, the concepts of each alternative consider ARARs and do not preclude compliance. Each alternative has an equal potential to fully comply with ARARs, with the exception of the No-Action alternative. Therefore, Alternatives 2 through 6 will be retained for further evaluation. In addition, Alternative 1 will also be retained to provide a baseline comparison with other alternatives.

4.6 ALTERNATIVES SCREENING – STEP 2

4.6.1 Method of Scoring

The screening results for the six alternatives are presented in **Table 4-2**. Screening was conducted by considering one column (one category) at a time, independent of the other columns and relative to the other alternatives, particularly the no action alternative. The first step was to identify the alternatives that represent the two extreme values (1 and 6) for a particular evaluation factor. The values were applied consistently and unbiasedly to each alternative on a column-by-column basis. The scores for each category were summed and the subtotal score was used as the basis for the scoring for that screening criterion.

The following sections present the qualitative rationale that was utilized to assign values to each alternative. It should be noted that because all the alternatives, except for Alternative 1, include removal of building materials as well as excavation of soils from the drainage swales, emphases was not placed on these activities when assigning a score for each criterion.

TABLE 4-2

SENECA ARMY DEPOT ACTIVITY

SEAD-16 AND 17 FEASIBILITY STUDY

SCREENING OF SOIL REMEDIATION ALTERNATIVES

ALT	TECHNOL. AND PROCESS	LONG-TERM EFFECTIVENESS AND PERMANENCE				REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT					SHORT-TERM EFFECTIVE-NESS	IMPLEMENTIBILITY					COST				TOTAL SCORE	OVER ALTER TIV RANK
		LONG-TERM HUMAN HEALTH & ENVIRONTAL PROTECT-IVENESS	PERM-ANENCE	SUB-TOTAL SCORE	CRITER-ION SCORE	Tox.	Mob.	Vol	SUB-TOTAL SCORE	CRITER-ION SCORE	CRITER-ION SCORE	TECH-NICAL FEASI-BILITY.	ADMINIS-TRATIVE FEASI-BILITY.	AVAI-LABILITY	SUB-TOTAL SCORE	CRITER-ION SCORE	CAPIT.	O&M	SUB-TOTAL SCORE	CRITER-ION SCORE		
1	No Action Alternative	1	1	2	1	1	1	4	6	1	6	6	1	6	13	5	6	6	12	6	19	3
2	Containment Alternative Institutional controls/ Soil cover	2	2	4	2	2	2	5	9	2	5	4	4	5	13	6	5	2	7	4	19	3
3	In-situ Treatment Alternative In situ stabilization/Soil cover	3	3	6	3	5	3	1	9	3	2	2	5	2	9	2	3	3	6	2	12	5
4	Off-site Disposal Alternative Excavate/Stabilize/ Off-site Disposal	5	4	9	5	3	5	2	10	4	4	5	2	4	11	4	4	5	9	5	22	1
5	On-site Disposal Alternative Excavate/on-site stabilization/ On-site Subtitle D landfill	4	5	9	4	4	4	3	11	5	1	1	3	3	7	1	1	1	2	1	12	5
6	Innovative Treatment Alternative Excavate/wash/backfill coarse fraction/treat and dispose fine fraction in off-site landfill	6	6	12	6	6	6	6	18	6	3	3	6	1	10	3	2	4	6	3	21	2

Note: Alternatives were scored from 1 to 6 for each screening criterion. The score of 1 represents the least favorable score and 6 represents the most favorable score. The alternative with the highest total score represents the most favorable alternative. Within each screening criterion, alternatives were scored from one to six for each subcategory. The total score of all subcategories is the basis for the scoring for the screening criterion.

4.6.2 Long-Term Effectiveness and Permanence

Long-term human health and environmental protectiveness and permanence will be evaluated. The score for long-term effectiveness and permanence category was based on the subtotal score for the following factors.

4.6.2.1 Long-Term Human Health and Environmental Protectiveness

The assessment of long-term human health and environmental protectiveness is based upon factors that could cause risk to human health or environmental receptors due to an increase in exposure from releases of treated materials. Alternatives identified as having the least potential for causing releases over the life of an alternative were ranked higher than those that did not. Alternatives that involve treatment, either from entrainment or metals removal and recovery, were considered more favorable than alternatives that did not involve a treatment process, since treatment will be one additional step to assure reduced potential for long-term releases.

Alternative 6 was assigned the highest score since it reduces the volume of material that requires disposal and provides a potential for further inorganic treatment. It eliminates the potential for release to the environment and contact with humans. Alternative 4 was assigned a score of 5 since no contaminated materials will remain on-site, thereby eliminating the potential contact with humans or environmental receptors. Alternative 5 is similar to Alternative 4 with the exception that the material will remain on site in a newly constructed on-site landfill with an impermeable liner and cap. Alternative 3's treatment will reduce the potential for leachate generation and its soil cover will prevent direct contact with human and biological life. However, the material will remain on site, thereby incurring a potential for exposure. Alternative 2, which is similar to Alternative 3, was assigned a score of 2 since it does not include a treatment process and has a potential for release to the environment (see Sections 1.4 and 2.5.2). Alternative 1 was assigned a score of 1 since contaminants in soil and ditch soil as well as the building materials will continue to contribute to the potential long-term human health and environmental impacts.

4.6.2.2 Permanence

Alternatives that have the longest lifespan with the least amount of continued attention are considered attractive and were ranked high. Factors that were deemed favorable in evaluating the permanence of an alternative included those that would permanently remove contaminants from soil. Those alternatives that involved containment were not ranked as high as those alternatives that completely removed contaminants from soil. This is because containment alternatives require long-term maintenance to assure that the constructed containment will remain intact and permanent, whereas alternatives that involve a treatment process that will remove metals from the soil do not require continued attention because the constituents of concern are eliminated.

Alternative 6 was assigned the highest score since it involves reducing the volume of material and the potential for removing lead from soil. Coarse grained material will be disposed of on site and fine grained material will be disposed of in an off-site landfill. Alternatives 5 and 4 are similar in nature and were assigned scores 5 and 4, respectively. These alternatives involve a limited amount of stabilization for soils that exceed the toxicity characteristic as well as an impermeable liner and cover. Alternative 5 was ranked slightly higher than Alternative 4 since maintenance of the on-site landfill would be more controlled than at an off-site landfill. Although Alternatives 2 and 3 require less maintenance than Alternatives 4 and 5, they were assigned a score of 2 and 3 respectively because both will limit the future land use and require maintenance of the soil cover. Alternative 3 ranks higher than Alternative 2 because it involves a treatment process. Alternative 1 was assigned the lowest score since no remediation is performed at the site.

Based on the subtotal score for these categories, the alternative scoring for the criterion of long-term effectiveness and permanence were, from highest to lowest: Alternative 6 > 4 > 5 > 3 > 2 > 1.

4.6.3 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment has been divided into the following three subcategories: reduction in toxicity, reduction in mobility, and reduction in volume. The score for this category was based on the subtotal score of the above factors.

4.6.3.1 Reduction in Toxicity

The assessment of toxicity reduction is based upon factors that would decrease the toxicity of the constituents of concern. Alternatives or processes that chemically or physically bind with the inorganics constituents provide the greatest reduction of toxicity, as these constituents are no longer in a form that would be biologically available for uptake. The alternatives that provide the greatest reduction in toxicity through treatment were ranked higher than those that did not.

Alternative 6 was assigned a score of 6 since it treats the coarse grain material, reduces the volume of material that requires disposal, and provides a potential for inorganic treatment. Alternative 3 was assigned a score of 5 since it involves treatment that would reduce the toxicity by binding metals in a stabilized matrix, however, increases the volume of the material. Alternatives 5 and 4 are similar in nature and were assigned a score of 4 and 3, respectively. These alternatives utilize treatment (such as stabilization) only when material exceeds the toxicity characteristics. Landfilling is an isolation remediation and will not reduce toxicity of the waste. Alternative 5 was assigned a score higher than Alternative 4 because only material from SEDA would be placed in the on-site landfill, resulting in better control of the landfill. An off-site landfill typically accepts other wastes, which could have the potential to increase the toxicity of the SEAD-16 and -17 material. Alternative 2 was assigned the next to the lowest score since it does not involve treatment nor reduction in toxicity. Alternative 1 was assigned the lowest score since there is no reduction in the toxicity of lead in soil and ditch soil or in the on-site buildings.

4.6.3.2 Reduction in Mobility

Mobility reduction factors are closely related to those that involve reductions in toxicity. As the focus of this effort is to reduce the concentration of inorganic compounds, specifically lead, this assessment ranked alternatives that involved a chemical or physical reaction resulting in the formation of a less mobile state of the metals, as preferable over alternatives that did not involve a beneficial reaction. A beneficial reaction is a reaction that results in the formation of insoluble compounds like hydroxides. Such compounds will be produced during the stabilization process. Other beneficial reactions include the formation of the base metal that would be produced during the electrochemical process of reducing and recovering metallic ions following soil washing and acid extraction. In general, alternatives that involve treatment, either from entrainment or metals removal, reduction and/or recovery, were considered favorable in reducing mobility. Alternatives that involve containment also provide mobility reduction, but these alternatives were viewed as less desirable since the mobility reduction is dependent on maintaining the integrity of the containment system. Uncertainties associated with containment systems, *i.e.* formation of leaks, were considered as factors that would decrease the ability of an alternative to reduce mobility and were ranked slightly below treatment alternatives.

Alternative 6 was assigned a score of 6 since it treats the coarse grain material, reduces the volume of material that requires disposal, and provides a potential for inorganic treatment. Alternatives 5 and 4 are similar in nature and were assigned a score of 5 and 4, respectively. Landfilling is a containment and isolation remediation approach and will reduce mobility of the waste. In addition, these alternatives will utilize a treatment (such as stabilization) if the material exceeds the toxicity characteristics. Alternative 5 was assigned a score higher than Alternative 4 because SEDA would have better control of the material being placed and the manner in which it is placed. Although Alternative 3 involves treatment that would reduce the toxicity by binding metals in a stabilized matrix, there is uncertainty about the degree and depth of mixing and stabilizing. Alternative 3 was assigned a score of 3. Alternative 2 was assigned the next to the lowest score since it does not involve treatment nor reduction in mobility, other than the physical restrictions of mobility resulting from the soil cover. Alternative 1 was assigned the lowest score since there is no treatment, reduction in the mobility, or remediation of the on-site buildings.

4.6.3.3 Reduction in Volume

Alternatives that cause an increase in volume were ranked lower than those alternatives that do not. Alternative 6 is intended to reduce the contaminated material volume and was assigned the highest score. Alternative 2 was assigned a score of 5 since this alternative will not disturb the surface and subsurface soils, and the excavated ditch soil will be disposed and compacted in a landfill. Alternative 1 was assigned a score of 4 since there is no volume reduction or increase. Alternatives 5 and 4 are similar in nature and were assigned scores of 3 and 2, respectively. Both alternatives involve limited amount volume increase due to stabilization and excavation of ditch soil. However, Alternative 5 was ranked slightly higher than Alternative 4 because the uncertainties associated with the compaction process (which is considered a volume reduction process), that is used prior to placing the soils in a landfill are more controlled in an on-site landfill than an off-site landfill. Alternative 3 was assigned the lowest score since it will result in a 20 to 50 percent volume increase, depending on the type of additive and dosage.

The ranking of the above three factors is: Alternative 6 > 5 > 4 > 3 = 2 > 1. Considering the human health and environmental protectiveness, which is the major basis for the remedial action, the alternative scoring for the criterion of reduction of toxicity, mobility, or volume through treatment were, from highest to lowest: Alternative 6 > 5 > 4 > 3 > 2 > 1.

4.6.4 Short-Term Effectiveness

The assessment of short-term effectiveness was based on factors that could cause exposure to human and environmental receptors such as exposure, physical hazards, and construction duration. Excavation is considered to lower short-term worker and environmental protectiveness, even with the use of dust controls and personal protection equipment by remediation workers. Other factors that increase short-term human health risks are activities that increase exposure such as exhaust, dust, and hand excavation, water runoff during excavation, and physical and/or noise hazards. Factors that increase short-term environmental risks are activities that disturb the natural conditions such as: setup of field offices and staging areas, dewatering, erosion control, movement of heavy equipment, disturbance to wetlands, and noise hazards. These activities contribute to increase short-term environmental risk by either increasing fugitive dust emissions, decreasing available wildlife habitat or causing noise that will disturb environmental receptors. Alternatives identified as limiting these exposure scenarios were ranked higher than those that did not.

Alternative 1 was assigned a score of 6 since no construction or transportation is performed. Alternative 2 was assigned a score of 5 since this alternative does not involve a large amount of excavation and can be implemented relatively quickly, considering that it does not require specialized equipment or vendors. Off-site transportation is limited and only includes soil excavated from the drainage ditches, building material and debris, and materials for the cap (topsoil, common fill, and filter fabric.) The later factor can be limited through the use of on-site borrow soils. It has limited short-term impact to wildlife habitat.

Alternative 4 was assigned a score of 4. Although this alternative involves on-site excavation and off-site transportation, it does not required additional handling for treatment (as does Alternative 6) or cause increase dust exposure (as does Alternative 3.) It does not require specialized equipment and can be performed efficiently and quickly. Off-site hauling is not perceived as having a significant effect on the environmental receptors because truck traffic would be limited to existing roadways. The construction duration would be relatively short and environmental exposure to contaminants would be eliminated. These factors, in addition to the fact that no wildlife habitat or resources would be lost, were grounds for rating this alternative moderately high.

Alternative 6 requires the same amount of excavation and less volume of off-site transportation than Alternative 4. However, Alternative 6 requires the excavated material to be handled more than Alternative 4 and requires staging areas for treatment. This extra handling is required to consolidate and treat the material and increases the on-site worker's exposure to the material through direct contact and dust and increases environmental risks. In addition, this alternative requires specialized vendors and storage of acids or other materials that can cause spills. Therefore this alternative was considered only moderately protective and was assigned a score of 3.

Although Alternative 3 requires the same amount of excavation as Alternative 2, it was assigned a score of 2. The stabilization mixing process has the potential to generate a significant amount of on-site dust, especially if dry powder is used instead of a slurry. The dust would increase risk to on-site workers and require them to wear protective breathing apparatuses. The dust will also impact the surrounding environment. In addition, stabilization is a specialized process that requires off-site hauling of additives and a treatability testing program. Therefore, the time to implement this alternative is greater than Alternative 2.

Alternative 5 was assigned the lowest score since it not only requires the same amount of excavations as Alternatives 4 and 6, but it also requires a substantial amount of off-site hauling (HDPE, common fill, drainage sand, clay, rip-rap, gravel, pipe), equipment, and manpower to construct the landfill. It also requires the excavated material to be placed and compacted in the landfill, resulting in increase exposure to the on-site worker. In addition, because it requires specific permits, specialized vendors (*i.e.* HDPE), and the construction of the landfill prior to remediation, it can not be implemented as quickly as the other alternatives. It was also considered as contributing to environmental risk by decreasing habitat for wildlife.

Therefore, alternative scoring for the criterion of short-term effectiveness were, from highest to lowest: Alternative 1 > 2 > 4 > 6 > 3 > 5.

4.6.5 Implementability

Implementability is a measure of both the technical and administrative ease and likelihood that an alternative will be implemented. Site factors, such as access around wetlands, dewatering, weather, and wildlife nesting, are examples of construction difficulties that reduce the implementability of an alternative. Long-term monitoring requirements and continued attention are also considered as negative factors. The ability of an alternative to obtain necessary regulatory permits and the availability of vendors to implement an alternative are additional factors that could affect the ease of an alternative to be implemented. Implementability has been separated into three subcategories: technical feasibility, administrative feasibility, and availability. The score for this category was based on the subtotal score of the above subcategories.

4.6.5.1 Technical Feasibility

Both construction and monitoring the effectiveness of the remedy have been considered while evaluating technical feasibility. There are no current restrictions at either SEAD-16 or 17 that would prevent construction activities. The site is located in a remote section of the depot and has easy access from several directions. Since the facility is a military reservation, there are security restrictions that will need to be adhered to, including restrictions on the use of open flames and spark producing devices. These restrictions are not considered significant enough to affect the ability of an alternative to be constructed. The drainage ditches are adjacent to the site but are not considered to be large enough to cause difficulties in implementing an alternative. Winter conditions can be severe but are temporary.

Containment or landfill alternatives require monitoring as well as O & M to maintain the slopes, vegetative growth, and stormwater controls. Typically, monitoring involves a network of monitoring wells that are strategically placed to detect a potential release. For SEAD-16 and –17, all alternatives will require groundwater monitoring as well as annual ditch soil sampling. The purpose of the ditch soil sampling is to ensure that Kendaia Creek is not impacted by residual soil at the site. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years. At this time, modification may be implemented to the monitoring program, if appropriate.

Alternative 1 was assigned the highest score since it would be the easiest to implement and require no long-term monitoring. Alternative 2 involves leaving soils in place and constructing a soil cover. From the construction point of view, this will involve routine earthmoving work, such as hauling, spreading and compacting soils. However, Alternative 2 requires groundwater monitoring and O & M, such as maintaining vegetation to protect the soil cover. Alternative 4 involves excavation, stockpiling, testing, and transportation. In addition, off-site stabilization may be necessary prior to disposal. However, Alternative 4 will remove all source material from the site and dispose of it in an off-site landfill. The off-site landfill will be monitored by the landfill itself, and not by SEDA. This alternative would only require groundwater and ditch soil sampling. Therefore Alternative 4 was assigned a score of 5 and Alternative 2 was assigned a score of 4.

Alternative 6 was assigned a score of 3 since it has similar requirement for long-term monitoring as Alternative 4 while it requires excavation, stockpiling, a specialized treatment process, and water treatment. Alternative 3 was assigned a score of 2 since it involves specialized in situ mixing equipment, a treatability testing program, and close construction monitoring of the dosage application. It also requires groundwater monitoring and O & M, such as maintaining vegetation to protect the soil cover.

Alternative 5 was assigned the lowest score since it involves not only excavation, stockpiling, testing, and hauling, but also construction of a bottom liner, leachate collection system, cover system, gas venting controls, erosion controls, and stormwater controls. Although technically feasible to construct, the presence of shallow bedrock and the requirements of strict quality assurance make this alternative to be the most difficult to construct. In addition, Alternative 5 will require monitoring of the groundwater, gas vents, leachate collection system, and O & M of the leachate collection system and impermeable cap.

4.6.5.2 Administrative Feasibility

In general, alternatives that meet remedial action objectives, comply with ARARs, reduce human health and ecological risk, minimize off-site disposal, are permanent and reduce the toxicity, mobility and volume of pollutants will meet the goals of the NCP and are considered to be the agency preferred alternatives.

Alternative 6 was assigned a score of 6 since this alternative will minimize off-site disposal, is permanent, and reduces the toxicity, mobility, and volume of the pollutants. Alternative 3 was assigned the next highest score since it involves treatment that will permanently bind the metals on-site and requires minimal off-site disposal. Alternative 2 was assigned a score of 4 since it involves minimal off-site disposal. Alternatives 5 and 4 are similar in nature and were assigned scores of 3 and 2, respectively. These alternatives involve a limited amount of treatment by stabilization followed by landfilling. Since landfills are not considered permanent, these alternatives were ranked low. Alternative 5 was ranked slightly higher than Alternative 4 since an on-site landfill will minimize off-site disposal. Alternative 1 was assigned the lowest score since it does not meet the remedial action objectives for the site and is considered to be the least permanent alternative.

4.6.5.3 Availability

The evaluation of availability considers the availability of vendors, equipment and space for implementing an alternative. Alternatives that involve highly specialized equipment or vendors that tend to delay the construction schedule were considered to be negative factors.

Alternative 1 was assigned the highest score since it is readily available. Alternative 2 was assigned the next highest score since it involves leaving soils in place and constructing a soil cover. The construction of the soil cover involves routine earthmoving work, such as hauling, spreading and compacting soils, which numerous contractors are available and qualified to perform. Alternative 4 was assigned a score of 4 because it involves excavation, stockpiling, testing, transportation, and locating an off-site landfill qualified to stabilize material.

Alternative 5 was assigned a score 3. Even though this alternative requires an HDPE liner installer and a gas vent driller as well as locating impermeable clay and free draining sand, these services are not considered specialties and are somewhat readily available.

Alternative 3 was assigned a score of 2 since it involves specialized in situ mixing equipment, which is more complicated than simple excavating. Alternative 6 was assigned a score of 1 since it requires a specialized treatment process. The equipment for this alternative is more specialized than that required for Alternative 3, therefore it was assigned a lower ranking.

Based on the subtotal score for these categories, the alternative scoring for the criterion of implementibility were, from highest to lowest: Alternative 2 > 1 > 4 > 6 > 3 > 5.

4.6.6 Cost

Costs are evaluated for both capital and O & M based upon vendor quotes, quantity estimates, experience at other remedial action sites and engineering judgement. The costs are provided for feasibility analyses and are considered to be order of magnitude estimates for screening purposes, accurate within -30% to +50% range. Capital costs are those required to implement an alternative, such as materials, labor and other direct costs (equipment and facilities rentals.) O & M costs are those required to maintain an alternative and include labor, equipment, and analytical for items such as groundwater monitoring, leachate collection, and cap maintenance. The total cost for each alternative is the sum of the capital cost and the O & M cost.

4.6.6.1 Capital Cost

Capital costs for remedial alternatives have been estimated for the primary unit operation associated with each of the six alternatives. These estimates are intended to provide an indication of the cost associated with each alternative and a basis for comparison between the alternatives. The estimated capital costs are presented in **Table 4-3**. A more detail cost estimate for the retained alternatives is provided in Section 6 and Appendix E. The items listed in Table 4-3 have been determined to be the most significant unit costs for each alternative. Costs such as mobilization, erosion control, access roads, backfilling, unexploded ordinance clearing, and demobilization are incurred by all alternatives and have not been considered as part of this estimate. Soil volumes have been estimated based on a lead cleanup concentration of 1250 mg/kg. Costs associated with Alternative 2, 4, and 6 were estimated assuming that the soil and ditch soil require stabilization prior to disposal into an off-site landfill and that stabilization will be performed off-site. Capital costs for each alternative have been estimated based on the estimated in situ volume of material shown in the table.

The no action alternative received the highest score because there are no costs associated with this remedial action. Alternative 2 is estimated to have the second lowest cost. The ditch soil and building material will be disposed off-site and the surface soils will be contained by a soil cover, which is a relatively inexpensive operation to complete. Alternative 4 received a score of 4, primarily because of the larger amount of material requiring off-site disposal. Alternative 3 and 6 received scores of 3 and 2, respectively. Both alternatives require a specialty contractor, treatability programs, and mobilization of specialty equipment. In addition, Alternative 6 requires off-site disposal of the fine grained material. Because of the relatively small volume of material, it is estimated that Alternative 5 will not be a cost effective alternative. The small quantity of material does not warrant the costs of permitting, operating, maintaining, and designing a Subtitle D Landfill on-site.

4.6.6.2 Operation and Maintenance Cost

Long-term operation and maintenance costs are incurred after remedial action is completed. The costs are based on semi-annual monitoring of 12 wells and annual monitoring of ditch soil at four

TABLE 4-3
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
ESTIMATED PRELIMINARY CAPITAL COST

Alternative	Significant unit cost	Est. vol. (cy) (1)	Est. unit cost ($/cy) (2)	Est. capital cost ($)	Ranking
1	No action	0	$ -	$ -	6
2	Off-site ditch soil disposal	377	$ 175.5	$ 66,164	5
3	In situ stabilization	3,387	$ 200.0	$ 677,400	3
4	Off-site soil and ditch soil disposal	3,387	$ 175.5	$ 594,419	4
5	Construction of new landfill	3,387	$ 225.0	$ 762,075	1
6	Soil washing	3,387	$ 155.0	$ 524,985	2
	Off-site disposal of fine material	1,128	$ 175.5	$ 197,941	

Notes:

1. Cost are estimated based on in situ volumes (see Section 2.8.1 and 2.8.2).
   Detail costs (Section 6) incorporate expansion factor associated with excavation.
   Disposal volume includes 100 cy of building material and debris.
2. Off-site disposal cost assumes all material requires off-site stabilization.
   Off-site disposal costs are based on quotes from Earthwatch Waste Systems and CWM Chemical Services, Inc. Disposal cost for hazardous material is $117/ton (or $175/cy) and disposal cost for non-hazardous material is $31.50/ton (or $47.25/cy). For estimation purpose, all material is assumed to be disposed at Subtitle C Landfill.
   Soil washing cost based on conversation with Bergmann USA, Parsons files, and MCASES estimated cost.
   On-site landfill cost based on experience and Parsons files.
   In situ stabilization cost based on conversations with Site Remediation Services (East Windsor, CT), United Retek Corp (Hollaston, MA), Williams Environmental Services, Inc (Atlanta, GA), and Silicate Technology Corp (Scottsdale, Arizona), and the EPA Brownfields Cleanup Fact Sheet.

locations. In addition, Alternatives 2 and 3 require routine maintenance associated with the soil cover. The costs are based on estimates presented in Appendix E and are as follows:

Alternative	Estimated Annual O&M Cost (+50%, -30%)	Ranking
1	$0	6
2	$45,440	2
3	$45,440	3
4	$40,440	5
5	$81,688	1
6	$40,440	4

Alternative 1, the no action alternative, was ranked the highest because there would be no O&M costs. All the alternatives consist of groundwater monitoring and ditch soil sampling. Alternatives 4 and 6 do not require addition O & M. Alternative 4 was ranked higher than Alternative 6 because the contaminated soil would be removed from the site and the likelihood of future activities associated with a release will be the least. Alternatives 2 and 3 require continued O & M of the soil cover. Alternative 3 was ranked higher than Alternative 2 because the contaminated soil would be stabilized in place and the likelihood of future activities associated with a release will be the least. Alternative 5 was ranked the lowest since it will involve monitoring the leachate collection system, groundwater, and soil cover. In addition, the landfill contains contaminated material and has the most requirements for a future maintenance activities of all alternatives.

Based on the subtotal score for these categories, the alternative scoring for the criterion of cost were, from highest to lowest: Alternative 1 > 4 > 2 > 6 > 3 > 5.

4.6.7 Screening

The results of the screening of soil remediation alternatives are provided on Table 4-2. Alternatives 5 and 3 had the lowest total scores of 12. The no action alternative and the containment alternative had the next lowest total score of 19. The innovative treatment alternative had total score of 21. Alternative 4, off-site disposal alternative scored highest with a total score of 22. Alternatives 4, 5, and 6 all include excavating and disposing of soil. Alternative 5 ranks the lowest of all alternatives in 3 of the 5 criteria and the lowest among Alternatives 4 and 6 in one of the criteria. Therefore, Alternative 5 was screened out and Alternative 4 and 6 were retained.

Both Alternatives 2 and 3 leave soil in place and include placement of a soil cap. Among the five screening criteria, Alternative 3 ranks a slightly higher than Alternative 2 in long-term effectiveness and permanence and reduction of toxicity, mobility, or volume through treatment while ranks much lower in short-term effectiveness, implementibility, and cost. The total score for Alternative 3 is lower than Alternatives 2, 4, and 6. In addition, as discussed in Section 1, the metals in the site soil tend to strongly bind to the soil particles instead of leaching into the groundwater. Based on this reasoning and the screening scores, Alternative 3 has little advantage over Alternative 2 in protecting groundwater and reducing toxicity and mobility and was not retained for further evaluation. Alternatives 2, 4, and 6 were retained for detailed evaluation. In addition, Alternative 1 was retained for to provide a baseline for comparison with the retained alternatives.

5 TREATABILITY STUDIES

5.1 INTRODUCTION

In general, treatability studies have three primary objectives:

- provide sufficient data to allow treatment alternatives to be fully developed and evaluated;
- support the selection of a treatment alternative; and
- reduce cost and performance uncertainties so that a treatment alternative can be selected.

There are three stages in the CERCLA process in which treatability studies may be used, remedy screening, remedy selection, and remedy design. In the remedy screening phase treatability studies are designed to establish whether or not a technology can effectively treat a given waste. These studies generally provide little cost or design data. In the next stage, remedy selection, treatability studies are used to evaluate the site-specific performance of each technology in order to support selection of an alternative. Treatability studies in the remedy selection stage may yield information on 7 of the 9 technology evaluation criteria, including: (EPA, 1992)

- overall protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, or volume;
- short-term effectiveness;
- implementability; and
- cost.

This mid-stage of the CERCLA process is implemented prior to the Record of Decision (ROD) and would be referred to as a pre-ROD treatability study.

The last stage of the CERCLA process is the remedial design / remedial action (RD/RA) stage. This stage is implemented after the ROD has been signed, and these treatability studies are often referred to as post-ROD treatability studies. Post-ROD treatability studies provide detail design, cost, and performance data necessary to optimize and implement the remedy. This information is then used to design the remedial treatment process, refine the remedial action cost estimate, and make accurate predictions of the time required for remediation.

At SEAD-16 and –17, post-ROD treatability studies are recommended only. Both stabilization and soil washing are techniques that have been previously demonstrated to meet the operable unit's cleanup criteria. This means that substantial treatability and remedial work has been performed with these technologies on other sites with similar wastes. The treatability study results can be used to finalize the remedial selection, design and specifications as well as to develop a detailed cost estimate. Section 5.2 provides a brief overview of the post-ROD treatability study process. Sections 5.3 and 5.4 describe the detailed treatability procedures for stabilization and soil washing, respectively.

5.2 REMEDIAL DESIGN/REMEDIAL ACTION TREATABILITY STUDIES

As described above, this discussion will focus on those treatability studies conducted after the ROD has been signed. The primary goals of a post-ROD treatability study are to develop detail design and cost data, to confirm treatability performance, and to select vendors capable of performing the work.

These studies can be conducted either in the laboratory or field, at bench or pilot scale. For this project and because stabilization and soil washing have been previously demonstrated, the treatability studies will likely be conducted in the laboratory by either the Army or the potential vendors.

Bench-scale testing is usually conducted in the laboratory, and can be used to establish treatment design parameters. Bench-scale testing is useful for established technologies since it can be used to pinpoint site-specific operating parameters. Pilot-scale testing can be done either at the site or in the laboratory. In pilot-scale testing, actual equipment or smaller versions of the actual equipment are used. Since stabilization and soil washing are demonstrated and established technologies, laboratory bench-scale treatability testing is most appropriate for SEAD-16 and -17.

The first step in any treatability study is to establish treatment goals. These goals include, but are not limited to the attainment of ARARs. For example, an ARAR for the stabilized soil is that they are not Toxicity Characteristic (TC) hazardous waste. An additional treatment criteria which is not an ARAR, would be if the stabilized material meets the landfill strength criteria. The treatability study workplan should clearly delineate all treatment criteria.

The next step is to identify the Data Quality Objectives (DQOs) and to prepare the treatability study workplan. DQOs are qualitative and quantitative statements that specify the requirements for the data collected during the program. The final DQOs will be incorporated into the treatability study design, workplan, sampling and analysis plan, and chemical data acquisition plan and will ensure that the data collected are of sufficient quality to support the objectives of the treatability study. Rigorous Quality Assurance/Quality Control (QA/QC) will be required. Since the QA/QC required will be similar to that required for the remedial investigation, the chemical data acquisition plan developed in support of the Remedial Investigation/Feasibility Study (RI/FS) (MAIN, 1991) can be modified for use in the treatability testing.

The subsections generally included in a treatability study workplan are:

- Project description
- Remedial technology description
- Test objectives
- Experimental design and procedures
- Equipment and materials
- Sampling and analysis
- Data management
- Data analysis and interpretation
- Health and safety
- Residuals management
- Community relations
- Reports
- Schedule
- Management and staffing
- Budget

Not every one of these items will be described in detail in each workplan, but it is important to at least consider each item. Most of the section titles are self-explanatory and will not be described in detail, but there are several points which will be highlighted. First, health and safety merits its own section in the workplan. If the soil to be remediated is a hazardous waste, the party implementing the work plan will be required to follow the health and safety plan and be in full compliance with all Occupational Safety and Health Administration (OSHA) and EPA regulations that pertain to working with hazardous wastes.

Residuals management is another important issue. Any soil, which is not successfully treated, is still considered a hazardous waste. In addition, any residuals generated during testing may be hazardous wastes. These materials must be handled and disposed of accordingly.

Once the vendors have been selected, representative samples with sufficient volume will be collected, composited, and distributed to each vendor. Compositing the samples assure that each vendor will be testing similar material and able the results to be compared with each other. The sample volume should be based on the number of tests to be completed and the volume of soil required for each test. Homogenization and removal of oversize material by sieving are recommended to create uniform samples prior to completing the treatability study.

Once the vendors have completed their studies, the data will be reviewed and assessed for items such as cost and constructability and design and specifications will be developed.

5.3 STABILIZATION TREATABILITY STUDIES

The first step in the stabilization treatability study for SEAD-16 and -17 (Alternative 4) is to determine whether the soils meet the disposal acceptance criteria for the selected off-site landfill. The primary criteria for disposal is that the waste cannot be a RCRA hazardous waste. Material that fails the TCLP test (EPA Test Methods SW-846, Method 1311) must be treated so it no longer exhibit hazardous characteristics. This requires representative samples to be obtained from the site and tested for TCLP. Based on Parsons ES's experience at the SEDA OB Grounds site, it is expected that some percentage of the excavated soils and ditch soils will exceed the TCLP criteria.

Once the necessity for treatment has been determined, treatment objectives will be established. In addition to meeting the TCLP criteria, other objectives such as shear strength and volume reduction may be necessary. Typically, a minimum shear strength value is required to support construction equipment in landfills as well as maintain slope stability. Also, a stabilization process that minimizes volume increase is desirable to minimize disposal costs. Other objectives may include one of more of the following:

- Determine the most economical mix design;
- Identify handling problems such as oversize material;

- Assess physical and chemical uniformity of the waste;

Once the treatment objectives are established, the next step is to determine the DQOs and prepare the workplan. The workplan should include procedures for collecting samples and specific tests to be performed. A detailed discussion of treatability studies for stabilization is contained in the USACE Technical Letter No. 1110-1-158, dated 28 February 1995, which should be consulted during preparation of the work plan.

The next step is to obtain the samples and to perform baseline laboratory testing. Baseline testing can include but is not limited to metals analysis, moisture content, grain size distribution, shear strength, and density testing. Based on the baseline testing, stabilization additions can be selected. Common stabilization additives include cement, lime (or lime kiln dust), and fly ash. Most vendors also use proprietary additives. The selected additive or additives will be mixed with the soil at varying dosages. Two to three dosages are typically used, depending on the material's chemical constituents, water content, shear strength, and grain size distribution.

After specified cure times (such as 1, 3, 7, and 14 days), the mixtures is tested to determine if the treatment criteria are met. Tests may include TCLP, shear strength, volume increase, and moisture content. The actual testing schedule and parameter list will vary, depending on the vendor and the final disposition of the treated soil. Each vendor will then prepare a final report, which presents the test results and recommends which additives and cure time meet the treatment criteria. The Army will then evaluate the results to determine the most cost-effective additive that meets the treatment criteria.

The results of the treatability study will then be used to prepare the final design and specifications. It is anticipated that the design will involve performance specifications geared towards meeting the treatment criteria, as opposed to design criteria that specify the additive and dosage to be used.

5.4 SOIL WASHING TREATABILITY STUDIES

The objectives of soil washing study are similar to those of the stabilization study. Additional objectives include minimizing the amount of water or solution that requires treatment, maximizing the effectiveness of physical separation, and evaluating treatment processes of the fine grain material. The overall procedure for the treatability study is also similar to that for the stabilization treatability study. DQOs and a work plan will be developed to describe the goals of the study and representative samples will be collected.

Once the DQOs have been established and the workplan has been completed, the samples can be obtained and baseline laboratory testing performed. Baseline testing includes metals and TCLP analyses and water content, grain size distribution (sieve and hydrometer), total organic carbon, pH, and soil mineralogy testing.

Upon completion of baseline testing, the soil samples are placed in a series of jars and an equal volume of liquid is added to each jar. Typically, water is used. However, other liquids such as aqueous solutions of surfactants, chelating agents, or other dispersing agents can also be used with varying pH. The jars are shaken and the contents are poured into a 2 mm sieve. After rinsing the retained soils with clean water and allowing it to dry, the soils are evaluated base on gradation as well as chemical constituents.

The next step is to perform the bench-scale testing. Bench scale testing is more involved than the jar testing and optimal wash times, washwater to soil ratios, and rinsewater to washwater ratios are determined. Once these values are determined with plain water, other liquids (determined to be effective in the jar testing stage) can be used. Each solution is evaluated to determine which is most effective in removing hazardous constituents from the coarse fraction.

Chemical analysis on the separated soil fractions can be performed. Often, most of the chemical constituents are associated with the fine fraction in the soil. When this is the case, wet separation unit operations can significantly reduce the quantity of soil that needs to be treated. By analyzing the different fractions prior to treatment, the distribution of the potentially hazardous constituents with respect to particle size can be determined. The solutions that yield satisfactory results are carried over to the next stage of the study.

The fine grain material can be further treated using the acid leaching process, stabilization, or other treatments. Acid treatment is used to remove inorganic components and can be analyzed to determine whether it is effective for solubilizing metal contaminants and the process meets the remediation requirements established for the site. The wash water and rinse water will also be analyzed for mass balance purposes, and for determining the best treatment and disposal option for the washwater. If necessary, treatability testing will be conducted on the washwater. Stabilization can be analyzed in a similar manner as described in Section 5.3.

The last step is evaluating the results of the treatability study. Analytical data taken before and after the washing are used to determine the removal efficiency. The particle size distributions can be used to estimate the volume reduction of the process. The effectiveness of the washwater treatment and fine soil separation must also be considered. These results will then be used to size the final unit, specify the reagents and reagent ratios, and prepare a detailed cost estimate for the process.

6 DETAILED ANALYSIS OF ALTERNATIVES

6.1 GENERAL

The four retained remedial action alternatives represent a range of waste management strategies that address the human health and environmental concerns associated with SEAD-16 and -17. Although the selected alternative(s) will be further refined as necessary during the design phase, a more detailed description of each alternative is presented. In addition, a discussion of the alternatives with respect to overall protection of human health and the environment; ARAR compliance; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost is presented.

The analysis of each alternative with respect to overall protection of human health and the environment provides an evaluation of how the alternative reduces the risk from potential exposure pathways and meets the site-specific cleanup goals. Cleanup goals presented in Tables 2-4 and 2-5 were developed for on-site soils, ditch soils, and building material and debris. The cleanup goals are proposed by the Army to protect human health and the environment and meet USEPA requirements for lead cleanup or NYSDOH industrial use or residential use standard. Final cleanup goals for SEAD-16 and -17 will be established between NYSDEC, the USEPA, and the Army.

The analysis of each alternative with respect to ARAR compliance provides an evaluation of how the alternative complies with ARARs. A list of ARARs is presented in Appendix C.

Long-term effectiveness and permanence are evaluated with respect to the magnitude of residual risk remaining from untreated waste or treated residuals after the remedial action is complete, and the adequacy and reliability of controls used to manage remaining waste (untreated waste and treatment residuals) over the long-term. One requirement of CERCLA is that a remedial action should involve solutions with the highest degrees of long-term effectiveness and permanence. That is, little or no waste would remain at the site such that long-term maintenance and monitoring are unnecessary and reliance on institutional controls is minimized.

The discussion of the reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies involved with an alternative. This evaluation relates to one of the requirements by CERCLA that a selected remedial action employ treatment to reduce the toxicity, mobility, or volume of hazardous substances. The evaluation will determine the amount of waste treated or destroyed, the reduction in toxicity, mobility, or volume, and the type and quantity of treatment residuals that will remain.

Evaluation of alternatives with respect to short-term effectiveness takes into account protection of workers and the community during the remedial action, environmental impacts from implementing the action, and the time required to achieve cleanup goals.

The analysis of implementability deals with the technical and administrative feasibility of implementing the alternatives and the availability of necessary materials and services. This criteria includes the ability to construct and operate components of the alternatives; the availability of adequate off-site treatment, storage, and disposal services; the availability of services, equipment, and specialists; the ability to monitor the effectiveness of remedial actions; and the ability to obtain necessary approvals from agencies.

Detailed cost estimates are presented in this report for the retained alternatives. The costs are based on information from the MicroComputer Aided Cost Engineering System (MCASES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). Quotes from area suppliers, generic unit costs, vendor information, conventional cost estimating guides, and prior experience are used to supplement this information. The cost estimates presented have been prepared for guidance in project evaluation. The actual costs of the project will depend on true labor and materials costs at the time of construction, actual site conditions, competitive market condition, final project scope, and other variables. The extent of contamination may also be revised. For example, as part of the final design, additional surface soil samples will be obtained in southeast and east direction at SEAD-16 prior to the design of the remedial action. The results will be evaluated and the boundary and cost will be revised if necessary.

Construction costs include those expenditures required to implement a remedial action. Both direct and indirect costs are considered in the development of construction cost estimates. Direct costs include construction costs or expenditures for equipment, labor, and materials required to implement a remedial action. Indirect costs include those associated with engineering, permitting, construction management, and other services necessary to carry out a remedial action. Groundwater and ditch soil monitoring as well as O & M costs, which include labor, maintenance materials, and purchased services, have also been estimated.

The detailed analysis of alternatives considers the exposure scenarios and the six receptors presented in Section 1:

1) current on-site worker,

2) future industrial worker,
3) future on-site construction workers,
4) future child trespassers,
5) future day care center child, and
6) future day care center worker.

SEDA has been placed on the base closure list for BRAC95 and the intended future use is industrial/commercial. Therefore, the purpose of the remedial action objectives established in Section 2 is to protect human health as appropriate to the intended future use of SEAD-16 and -17. Based on the screening in Section 4, Alternatives 2, 4, and 6 have been retained for detailed analysis in this section because they have the best potential for fulfilling the remedial action objectives. Alternative 1 (No Action) has also been retained for comparison purposes. The primary components of each alternative are shown in **Table 6-1**. The following discussion is based on the proposed lead cleanup level in soil of 1250 mg/kg, for the industrial use scenario. In addition and as discussed in Sections 1 and 2, the cost to remediate lead in soil to a concentration of 400 mg/kg will also be estimated for the future residential use. Also, the cost associated with the remediation of lead to concentrations of 1,000 mg/kg will also be estimated. This concentration level is based on the New York State Department of Health guidelines for industrial use. The cost associated with the remediation of lead to a concentration of 400 mg/kg, including all other metals to comply with NYSDEC TAGM values, was also evaluated. The cost estimates are presented later in this section.

6.2 ANALYSIS OF ALTERNATIVE 1: NO ACTION

6.2.1 Definition of Alternative 1

The no action alternative means that no remedial activities will be undertaken at SEAD-16 and -17. No monitoring or security measures will be undertaken. Any attenuation of the threats posed by the site to human health and the environment will be the result of natural processes. Current security measures, which include the SEDA-wide security activities that effectively eliminate public access to the area, will be eliminated or modified depending upon whether the property is transferred or leased. Access to the site can be limited depending upon how the Army determines the property will be used.

This alternative will be used as a baseline for comparison with the other alternatives developed as part of this feasibility study.

TABLE 6-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
REMEDIAL ALTERNATIVES RETAINED FOR DETAILED ANALYSIS

TERNAT	TECHNOLOGIES AND PROCESSES
1	**No Action**
2	**On-site Containment: Institutional Controls/Soil Cover** - Mobilize, site prep, clear/grub, erosion control, access roads, and survey - Construct permanent fence (institutional controls) - Unexploded ordinances clearance - Remove material/debris from abandoned buildings at SEAD-16 - Excavate ditch soil with lead concentration > 1250 mg/kg - Stockpile ditch soil and building debris and perform TCLP testing - Perform cleanup verification testing - Transport ditch soil failing TCLP criteria to stabilization area (on-site or off-site) - Stabilize ditch soil exceeding TCLP criteria (on-site or off-site) - Transport and dispose soil and material in an off-site landfill - Backfill drainage swales with 1-foot topsoil and hydroseed - Place soil cover (6 inch topsoil, 6 inch common fill & filter fabric) over soil > 1250 mg/kg and hydroseed - Demobilize - Long-term O & M and monitoring
4	**Off-Site Disposal: Excavate/Stabilize/Off-site Disposal** - Mobilize, site prep, clear/grub, erosion control, access roads, and survey - Unexploded ordinances clearance - Remove material/debris from abandoned buildings at SEAD-16 - Excavate ditch soil with lead concentration > 1250 mg/kg - Excavate soils with lead concentration > 1250 mg/kg - Stockpile and perform TCLP testing - Perform cleanup verification testing - Transport soil failing TCLP criteria to stabilization area (on-site or off-site) - Stabilize soil exceeding TCLP criteria (on-site or off-site) - Transport and dispose soil and material in an off-site landfill - Backfill drainage swales with 1-foot topsoil and hydroseed - Backfill remainder of excavated area with common fill & topsoil and hydroseed - Demobilize - Long-term monitoring
6	**Innovative Treatment: Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in an off-site landfill** - Mobilize, site prep, clear/grub, erosion control, access roads, and survey - Unexploded ordinances clearance - Remove material/debris from abandoned buildings at SEAD-16 - Excavate ditch soil with lead concentration > 1250 mg/kg - Excavate soils with lead concentration > 1250 mg/kg - Transport soil to on-site treatment staging area - Perform cleanup verification testing - Soil wash: Physical separation of fine grain from coarse grain - Backfill clean coarse grain material - Stockpile and perform TCLP testing on fine grain material - Transport fine grain material failing TCLP criteria to treatment area (on-site or off-site) - Treat fine grain material exceeding TCLP criteria (on-site or off-site) - Transport and dispose fine grain material in an off-site landfill - Backfill drainage swales with 1-foot topsoil and hydroseed - Backfill remainder of excavated area with topsoil and hydroseed - Demobilize - Long-term monitoring

6.2.2 Overall Protection of Human Health and the Environment

An evaluation of the protectiveness of human health and the environment includes an assessment of the alternative to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by contaminants present at the site by eliminating, reducing, or controlling exposures to levels consistent with RAOs. The Baseline Risk Assessment (BRA) indicates that the no action alternative exceeds the EPA acceptable level for carcinogenic risk as well as hazard index for both SEAD-16 and -17. At SEAD-16, the total cancer risk for the future industrial worker (5×10^{-3}) and the total hazardous index for the future industrial worker (20), future on-site construction worker (1), future day care center child (6), and future day care center worker (2) exceed the acceptable USEPA levels. At SEAD-17, the total cancer risk for the future industrial worker (9.7×10^{-5}) and the future day care center worker (9.7×10^{-5}) and the total hazardous index for the future day care center child (1.1) exceed the acceptable USEPA levels (refer to Tables 2-1 and 2-2). Therefore, the no action alternative is not protective of human health at either site.

In addition, this alternative does not protect against ingestion of and direct contact with soils and ditch soils having concentrations of lead above the proposed cleanup goal of 1250. Since the SEDA security measures prevent public access to the site, there is currently no exposure and little or no risk to the public. Access by site workers is infrequent and limited to demilitarization activities. SEDA personnel working at SEAD-16 or -17 have received training, which allows them to operate safely in the areas near the site. However, since the depot is a facility scheduled to be closed under BRAC95, these security measures will eventually be eliminated.

Furthermore, this alternative does not provide protection to ecological receptors in Kendaia Creek because the soils found in the drainage ditches with concentrations of lead above the proposed clean-up goal would remain. While no adverse affects were observed during the RI, there is a potential for long-term chronic affects. Contamination of the creek by runoff from the site would not be prevented.

6.2.3 ARAR Compliance

There are currently no chemical specific ARARs for soil. Alternative 1 does not preclude ARAR compliance.

6.2.4 Long-Term Effectiveness and Permanence

The Baseline Risk Assessment (BRA) indicates that the no action alternative exceeds the EPA acceptable level for human health and ecological risks for both SEAD-16 and -17. The no action alternative does not provide a permanent solution since no treatment, engineering or institutional controls are provided to prevent exposure to constituents of concern in on-site soils and ditch soils. Therefore, the no action alternative does not provide long-term effectiveness and permanence.

6.2.5 Reduction of Toxicity, Mobility, and Volume

There would be no reduction in the toxicity, mobility, or volume of the impacted soil at the sites. Some natural attenuation is expected, through dispersion of the affected soil and through chemical and physical changes which may reduce the mobility of the heavy metals. However, these decreases will be minimal, since no reduction from treatment will occur.

6.2.6 Short-Term Effectiveness

Assessment of the short-term effectiveness addresses the effects of an alternative during construction and implementation of a remedial action. Since Alternative 1 is a no action alternative, which does not require construction or disturbances to the site, analysis of short-term effectiveness is not applicable.

6.2.7 Implementability

The criterion of implementability is not applicable since no activities will be performed as part of this alternative.

6.2.8 Cost

There are no costs associated with the no action alternative. The costs associated with the monitoring and security described above are covered through other mechanisms, and will not be directly attributable to this remedial action.

6.3 COMMON COMPONENTS OF ALTERNATIVES 2, 4, AND 6

The remaining alternatives have several general remedial action components in common. These components will be conducted regardless of which alternative is selected and include:

- Prior to construction, SEAD-16 and -17 will be investigated by an unexploded ordinance (UXO) contractor to assure that the site is safe to work on. The UXO contractor will locate and remove ordinances and work with the remediation contractor during site activities.

- The contractor(s) will mobilize to the site, clear and grub the areas of work, establish access roads and survey the areas to be remediated.

- Erosion control (such as silt fence and haybales) will be installed and maintained around excavation areas and drainage swales. Erosion control is necessary to prevent soil particles from migrating off-site and into drainage swales during construction.

- Material and debris from the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366) at SEAD-16 will be removed and the surfaces will be cleaned. As presented in Section 2, it is estimated that approximately 100 cubic yards (cy) of material and debris will be removed. It is anticipated that the buildings will be cleaned using techniques such as sweeping and steam cleaning. The material and debris will be collected, tested (if necessary), and disposed of at an off-site landfill. Any water used in the treatment process will be collected and treated, prior to disposal. Material, debris, and dust in the furnace and boiler stacks at SEAD-16 will be cleaned.

- Ditch soil with lead concentrations greater than cleanup levels will be excavated from the drainage swales and ditches and stockpiled on-site. As presented in Section 2 and on Tables 2-4 and 2-5, ditch soil will be excavated to a depth of one foot, resulting in volume presented in Section 2. Depending on the specific alternative, the ditch soil will either be processed by soil washing or tested, transported, stabilized on-site or off-site as necessary, and disposed of off-site. Cleanup verification testing will be performed in the drainage swales to confirm that the ditch soil has obtained the lead cleanup goals. The swales and ditches will be backfilled with topsoil and vegetative growth will be established.

- Site groundwater will be monitored on a semi-annual basis. Currently, there are seven wells at SEAD-16 and five wells at SEAD-17. These wells may be sufficient for the continued monitoring. New wells will be installed as necessary to ensure that the monitoring program is sufficient to detect any migration from the area.

- Ditch soil sampling in Kendaia Creek will be conducted on an annual basis at four location within the area affected by the drainage ditches at SEAD-16 and -17. The purpose of the sampling is to ensure that Kendaia Creek is not being contaminated by residual soil at the site.

- In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the remedial action (including monitoring program) will be reviewed after five years. At this time, modification may be implemented to the remedial program, if appropriate.

- The estimated limits of excavation (Figures 2-1 through 2-8) will be further delineated as part of remedial design in the east-southeast to southeast portion of the SEAD-16 and SEAD-17. The results of the additional sampling will be included in the design report and the boundary will be revised if necessary.

6.4 ANALYSIS OF ALTERNATIVE 2: ON-SITE CONTAINMENT

6.4.1 Definition of Alternative 2

6.4.1.1 Description

Alternative 2 consists of installing institutional controls (such as a permanent fence), excavating soils found in the drainage swales with lead concentration greater than 1250 mg/kg, disposing of it in an off-site landfill, and placing a clean soil cover over surface and subsurface soils with lead concentrations greater than 1250 mg/kg.

Ditch soil excavation can be accomplished with standard construction equipment, such as a front end loaders and backhoes. The excavated ditch soil will be loaded into trucks and transported to an on-site stockpile area. The ditch soil will be placed in separate piles and samples will be obtained for TCLP testing. Based on the results, ditch soil that passes the TCLP test will be transported and disposed of as a solid waste in an off-site Subtitle D Landfill. The ditch soil that fails the TCLP will be transported, stabilized, and then disposed of in an off-site landfill. Because of the relative small volume of ditch soil to be treated at SEAD-16 and -17, it is expected that off-site treatment will be more cost effective than on-site treatment. Therefore, for discussion purposes, this alternative assumes all excavated ditch soil is transported off-site for both treatment and disposal.

Treatability studies and TCLP testing will be conducted forehead to ensure the stabilized material meets Subtitle D Landfill standards. In New York, all sanitary landfills are authorized to accept industrial wastes, and therefore would be able to accept the stabilized ditch soil. The landfills cannot accept hazardous waste, and require extensive testing to assure that the waste is not a hazardous waste. The actual testing requirements vary between landfills, and the exact requirements for this remedial action will be specified once a landfill is selected. Several landfills have been identified for disposal including Model City located in New York, Ontario County Landfill, Stuben County Landfill, High Acres, and EQ located in Michigan. The EQ facility has the capacity and capability to treat and dispose hazardous material.

Upon completion of ditch soil excavation, cleanup verification will be performed on the excavated areas. A cleanup verification work plan will be developed as part of the final design. Excavation will continue further in those areas where lead concentrations in ditch soil are greater than the cleanup goals. Sample location and frequency will be determined as part of the cleanup verification work plan. Excavated areas will be backfilled to restore the area to original conditions and to provide proper storm water control. Topsoil will be placed and vegetative growth will be established.

Railroad tracks and ties at SEAD-16 and –17 in the delineated area will be removed. The soil and ballast around the railroad area will then be covered. Surface soil to be covered at SEAD-16 is limited to the northeast, east, south, and southeast sides of Building S-311, as shown on Figure 2-1. At SEAD-17, the surface soil to be covered is limited to the north, northwest, west, and southeast sides of Building 367, as shown on Figure 2-5. The soil cover will consists of the following, from top to bottom:

- 6-inches topsoil
- 6-inches common fill
- Filter fabric (separation layer)

Regrading of the site to promote storm water drainage will be included as part of the design. Long-term operations and maintenance will be necessary to maintain the vegetation as well as the integrity of the soil cover. Semi-annual groundwater monitoring and annual ditch soil sampling will also be necessary. A detailed analysis of how this option meets the selection criteria and a budgetary cost estimate are provided below.

6.4.1.2 Process Flow and Site Layout

Ditch soil is excavated, stockpiled, and tested for TCLP as described above. Ditch soil meeting the TCLP criteria will be transported and disposed of at an off-site Subtitle D landfill. Ditch soil exceeding the TCLP criteria will require stabilization. If the material is stabilized off-site, the ditch soil will be transported off-site, stabilized, and disposed of in an appropriate landfill. If on-site stabilization is used, ditch soil will be transported to a temporary facility, such as a pug mill, and mixed with the selected additive(s). The stabilized ditch soil can be either discharged directly into trucks for transport to a landfill or to a stockpile area for TCLP testing. **Figure 6-1** presents a generalized process flow diagram for the ditch soil remediation. TCLP testing will be performed on the stabilized material at a rate required by the landfill accepting the waste.

This alternative requires an area sufficient for the pug mill (if on-site stabilization is used) and stockpiles for the excavated material as well as the soil cover material. It is estimated that the pug mill and stockpile area will be located adjacent to Unnamed Road between SEAD-16 and -17, as shown on **Figure 6-2**. This will provide a central location for the dump trucks to transport the excavated ditch soil to the stockpile area.

If treatment is conducted off-site, trucks will be loaded directly from the stockpiles, after receiving the TCLP test results. A small staging area and equipment decontamination area will be set up as necessary.

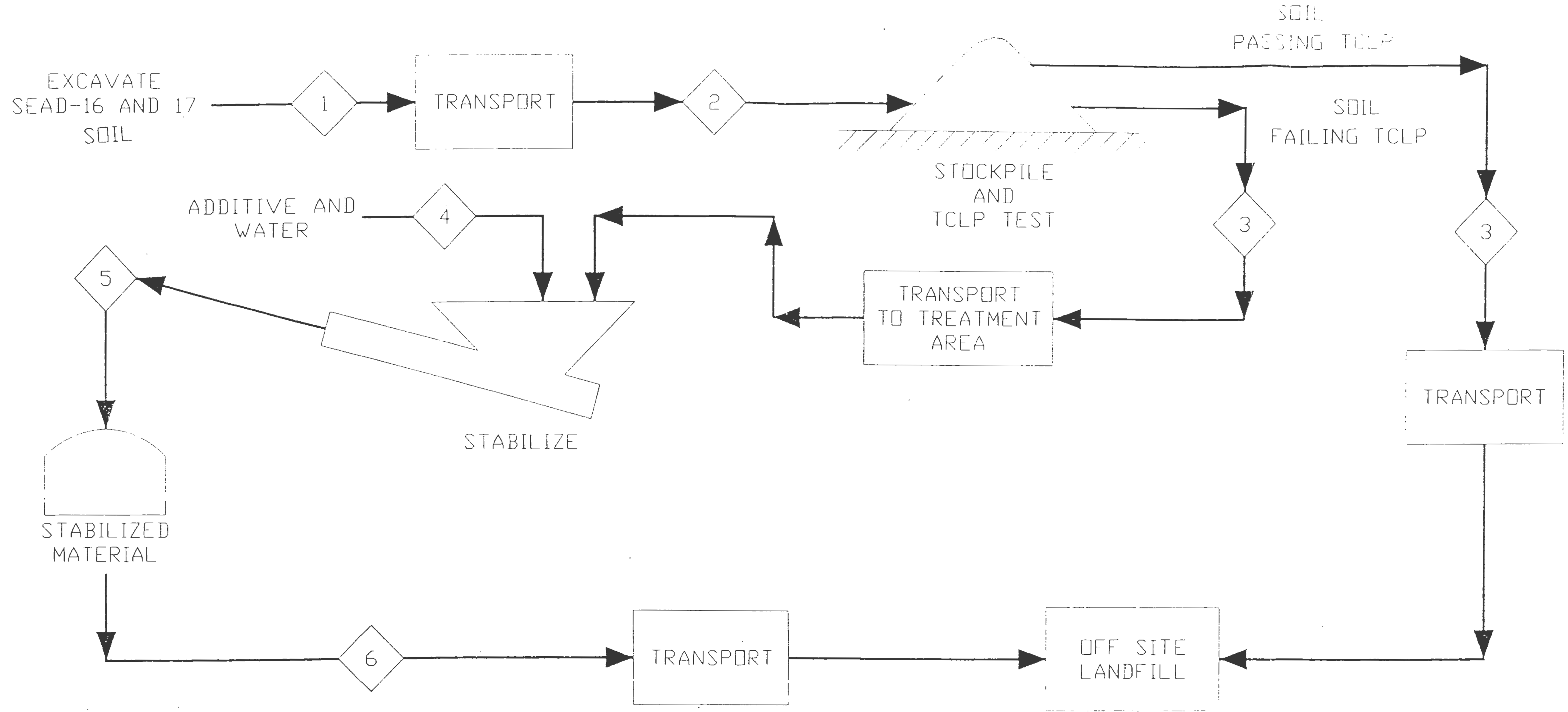
6.4.2 <u>Overall Protection of Human Health and the Environment</u>

An evaluation of the overall protectiveness of human health and the environment includes the assessment of short- and long-term protectiveness of human health and the environment. The following discussion will show how this alternative meets these criteria.

6.4.2.1 Short-Term Protectiveness

This alternative will be evaluated with respect to the effect on human health and the environment during the implementation of the remedial action. Three items are included in an assessment of the short-term protectiveness of Alternative 2. The first issue is protection of the community during the remedial action. If off-site treatment is performed, hazardous material will be transported off-site. Precautionary measures must be taken to assure that the trucks are not overloaded and properly covered with a tarp to ensure that no material is released. However, it should be noted that only the ditch soil will be disposed of off-site, resulting in a relatively small volume compared to Alternative 4. If on-site treatment is performed, hazardous material will not be transported off-site. All waste, which is disposed in the off-site landfill, will no longer be considered hazardous waste.

There is also a minor threat from dust released during the excavation. The site is located away from the SEDA boundary, so the likelihood of any hazardous dust migrating off-site is negligible. As discussed in



TYPICAL FLOW RATES						
MATERIAL	STEAM NO.					
	1	2	3	4	5	6
SOIL (CY/HR)	50	50	50			50
STABILIZED PRODUCT (CY/HR)					30	
ADDITIVES/WATER (CY/HR)				30		

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-16 AND SEAD-17

DEPT. ENVIRONMENTAL ENGINEERING | DWG. NO. 729895-01002

FIGURE 6-1
ALTERNATIVE 2 AND 4
GENERALIZED PROCESS FLOW
SCHEMATIC

SCALE 1"= 100'-0" | DATE SEPTEMBER 2000

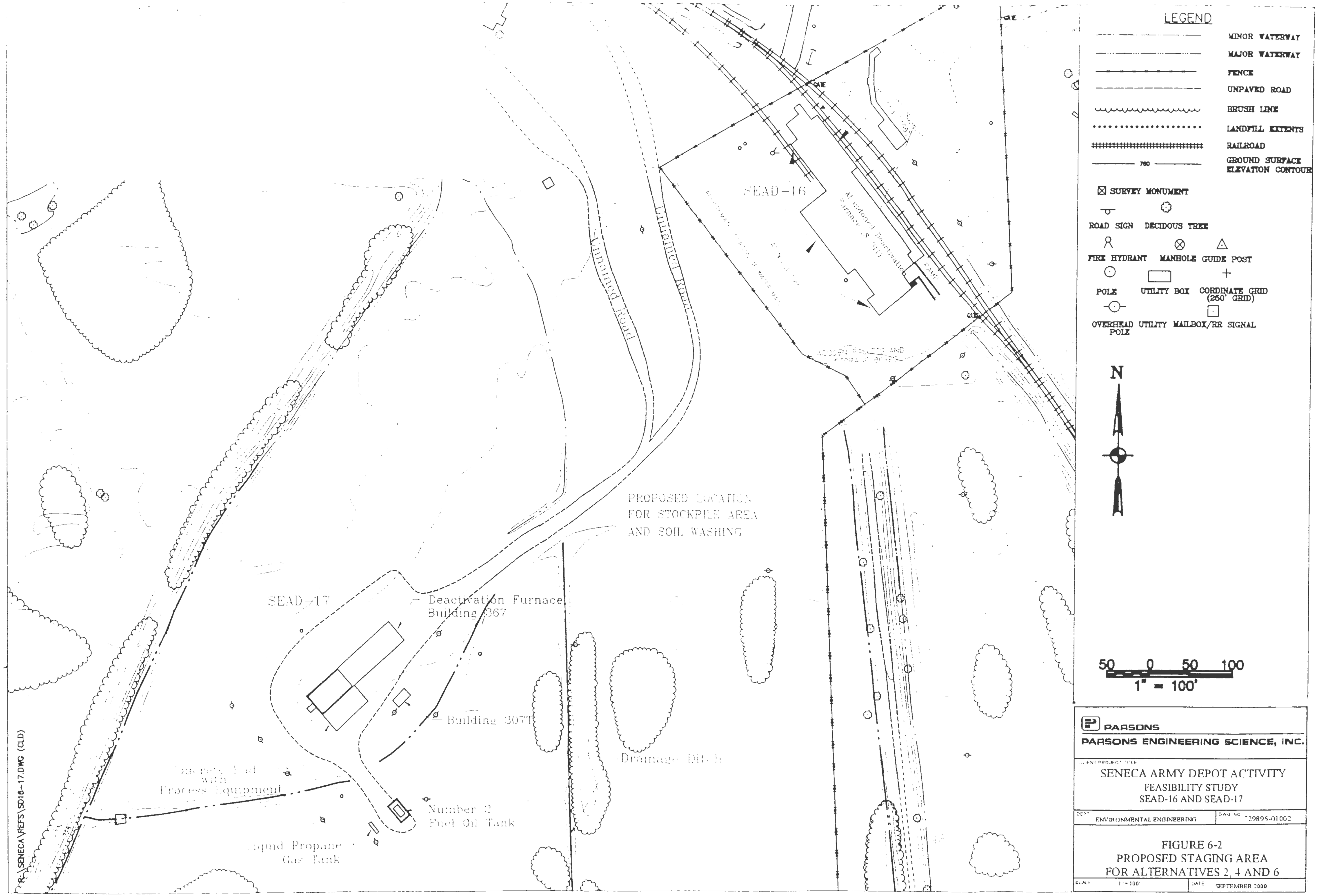


FIGURE 6-2
PROPOSED STAGING AREA FOR ALTERNATIVES 2, 4 AND 6

Sections 6 and 7 of the RI report as well as in Section 2, fugitive dust migration (from soil) is not a major migration pathway. Placement of the soil cover may also generate dust; however, the soil cover components are assumed clean material.

The short-term protectiveness to site workers is also considered. The major routes of exposure during remediation are direct contact with the excavated ditch soil and inhalation of particulate. Exposure can be minimized through the use of site access controls and proper protective equipment for site workers, such as dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulate. Dust generation at the excavation can be minimized by using water or other dust control chemicals. If on-site treatment is used, precautionary measures should be taken to minimize dust generation. It should also be noted that all the site workers are required to meet all the OSHA training and medical monitoring requirements.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. Impacts to the site will result from excavation, stockpiling, and truck traffic. Because SEAD-16 and -17 is located in an active portion of SEDA, these activities will not be substantially different from the current activities. In addition, since the hazardous material is primarily in the ditch soil, there is little or no risk of a spill or release during the remedial action.

6.4.2.2 Long-Term Protectiveness

The remedial action is designed such that the remaining ditch soil has a lead concentration below the proposed cleanup goal of 1250 mg/kg. The excavated ditch soil will be transported off-site for disposal and no residuals ditch soil will remain on site.

Soil with concentration of lead greater than 1250 mg/kg will remain on site. A soil cover will be placed over the soil area with a lead concentration exceeding 1,250 mg/kg to control the exposure from inhalation of soil dust, prevent runoff of impacted particles and prevent exposure to humans and ecological receptors due to ingestion of soil. In addition, institutional controls, most likely consisting of a permanent fence, will be implemented to prevent access to the site. Although Alternative 2 will leave contaminated soil in place, as presented in Section 1, groundwater is not expected to exceed relevant standards in the future for lead, copper, antimony, zinc, silver, cadmium, mercury, and arsenic.

6.4.2.3 Conclusion

Alternative 2 will prevent ingestion of and direct contact with surface soils and ditch soils with lead concentrations over 1250 mg/kg. The ditch soils with lead concentrations above 1250 mg/kg will be removed, which will meet the RAO for ditch soil and prevent contamination downgradient in Kendaia Creek. Although Alternative 2 will leave contaminated soil in place which has no benefit protecting groundwater from deterioration, as presented in Section 1 groundwater is not expected to exceed relevant standards in the future for lead, copper, antimony, zinc, silver, cadmium, mercury, and arsenic. Therefore, Alternative 2 will protect human health and the environment. However, Alternative 2 may restrict future use of the land.

The results of the baseline risk assessment show that conditions at SEAD-16 and -17 require a remedial action (see Section 2.0). The remedial action will reduce risk from soil and ditch soil as well as building material and debris to acceptable levels. Therefore, this alternative meets the RAOs by reducing risk, thus protecting human health.

6.4.3 ARAR Compliance

There are currently no chemical specific ARARs for soil and ditch soil. According to modeling results presented in Section 1, groundwater is not estimated to exceed ARARs in the future, even with no action. Off-site disposal will fall under RCRA requirements, which must be complied with in the final remedial action plan. Other federal ARARs include, but are not limited to, the National Environmental Policy Act (NEPA), CERCLA, the Clean Water Act (CWA) and the Emergency Planning and Right to Know Act (EPCRA). Promulgated state regulations must also be complied with. Alternative 2 does not preclude compliance with ARARs.

6.4.4 Long-Term Effectiveness and Permanence

The assessment of the long-term effectiveness can be divided into two categories, an assessment of the magnitude of the residual risk, and an evaluation of the adequacy and reliability of the controls used for the waste residuals and untreated ditch soil.

The remedial action is designed such that the remaining ditch soil has a lead concentration below the proposed cleanup goal of 1250 mg/kg. The excavated ditch soil will be transported off-site for disposal and no residuals ditch soil will remain on site. The long-term management of the excavated material will be the responsibility of the selected off-site landfill. For this reason, it is important to select reputable landfill to assure that the landfill is operated in accordance with State and Federal requirements.

Soil with concentration of lead greater than 1250 mg/kg will remain on site. A soil cover will be placed over the soil area with a lead concentration exceeding 1,250 mg/kg to control the exposure from inhalation of soil dust, prevent runoff of impacted particles and prevent exposure to humans and ecological receptors due to ingestion of soil. In addition, institutional controls, most likely consisting of a permanent fence, will be implemented to prevent access to the site. Inspection of vegetative growth will be conducted one year after the remediation action and long term management of the soil cover is necessary to maintain vegetative growth and the integrity of the cover. Semi-annual groundwater monitoring and annual ditch soil monitoring will also be required at SEAD-16 and -17.

The remedial action would be considered permanent upon the completion of excavating the ditch soil, placing the soil cover, and installing the fence.

6.4.5 Reduction in Toxicity, Mobility, and Volume through Treatment

Alternative 2 would be effective in reducing the toxicity and mobility of the hazardous constituents present in the ditch soil and the material from SEAD-16 buildings if the material was treated to eliminate hazardous characteristics. The soil cover will contain the surface and subsurface soil and prevent migration of soil to surface water via erosion, thus reducing the mobility of contaminated soil. Although the toxicity and volume of the soil are not affected, a decrease of the possible exposure to human and environmental receptors will reduce risks to human health and ecological system.

The excavated ditch soil will be treated in order to meet the TCLP criteria prior to disposal. The treated material will no longer be hazardous and will exhibit lower toxicity and mobility than the untreated waste. By disposing the stabilized ditch soil to a landfill, the mobility of the hazardous constituents will be effectively decreased. A properly managed landfill does not allow for uncontrolled releases from the landfill. The stabilized ditch soil will have a larger volume than the untreated ditch soil, but the stabilized ditch soil will no longer be a hazardous waste.

In addition, by placing a soil cover and stabilizing the ditch soil, the overall site risk will be reduced to acceptable levels.

6.4.6 Short-Term Effectiveness

As discussed in Section 6.4.2.1, Alternative 2 will not have significant impacts to the community, the site workers, and the environment if it is operated appropriately.

It is estimated that Alternative 2 can be completed in a short time period. If stabilization is conducted off-site, then it is estimated that the alternative may take approximately two months to complete, depending on the weather and turnaround time on the TCLP test results. This duration includes one week of mobilization, one week of building remediation, two weeks of excavation, two weeks to backfill and hydroseed, two weeks to test and dispose the material offsite, and one week to demobilization. The alternative would be an earthmoving operation, with little mobilization and specialty equipment.

If on-site stabilization is conducted, developing and implementing the treatability study, selecting the vendor, and obtaining the appropriate samples may take three to five months. Once the treatability testing is completed and a vendor is selected, it is estimated that the alternative may take approximately two months to complete. In addition to the items mentioned above, some permitting may be required for stabilization and a specialty contractor would be required. Also, the alternative is dependant on the time needed for the stabilized material to cure.

6.4.7 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, and monitoring considerations. Administrative feasibility addresses issues such as permitting, interaction with NYSDEC and EPA, and community relations. Availability of services and materials describes the ease of obtaining vendors and equipment, and the availability of offsite disposal capacity.

6.4.7.1 Technical Feasibility

Alternative 2 is technically feasible to complete. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling, and the remediation areas have been initially delineated. It is possible that some minor weather delays may be encountered.

The ditch soil that fails the TCLP criteria will require stabilization. Stabilization is a technology that has been frequently used to treat similar material, and it is not anticipated that problems will be encountered during construction. If on-site stabilization is used, a treatment study will be necessary to establish the optimal additive and dosage and a specialty contractor will perform the work, most likely using a pugmill. The additives will be properly monitored to assure proper dosage. The stabilized material will be tested to assure that it meets the TCLP criteria. If off-site treatment is conducted, most of the TSD facilities in the region have accepted similar wastes for a number of years. These facilities are capable of treating and disposing of the site soils.

Another aspect of technical feasibility is the ease with which additional work may be conducted. At this time, it is anticipated that this remedial action will preclude the necessity of any additional remedial efforts at SEAD-16 and -17. However, if additional work is required, the soil cover integrity and the underlying soil would need to be considered as part of the remedial action.

6.4.7.2 Administrative Feasibility

Alternative 2 is administratively feasible to complete. If off-site treatment is performed, the landfills that may be used are fully permitted for disposal and stabilization, if necessary. There will be some transport of hazardous waste, and proper manifests will be required. All of the contractors used for excavation and hauling will be experienced in preparing manifests.

If on-site treatment is performed, a temporary treatment facility (pugmill) will be used and no hazardous waste transportation will be required, which simplifies the manifest requirements. Construction permits will be necessary for the construction activities. Since the wastes will be sent to a permitted disposal facility, no disposal permits will be necessary.

Coordination with the various regulatory agencies is also important. As previously described, the Army has coordinated the entire remedial program with both EPA and NYSDEC, and will consider input from both these agencies in the final remedy selection. It is anticipated that any issues arising with the regulatory agencies will be addressed prior to remedy selection.

6.4.7.3 Availability of Services and Materials

Alternative 2 relies primarily on standard construction equipment that is readily available in the Romulus area. The equipment includes backhoes, bulldozers, front-end loaders, and standard size dump trucks. Backfill material, such as common fill, topsoil, and filter fabric is readily available in the Romulus area. If on-site stabilization is performed, a pug mill will most likely be used.

Several landfills have been identified that are capable of accepting the ditch soil for disposal, as discussed earlier in this section.

6.4.8 Cost

6.4.8.1 Capital Costs

Capital costs were estimated to remediate the soil to lead concentrations of 1,250 mg/kg, 1,000 mg/kg, 400 mg/kg and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values. The preliminary detail cost estimate and a description of the assumptions used is presented in Appendix E. The total capital costs (*i.e.* project costs) for the associated four remediation levels are estimated to be $913,900, $982,520 and $1,416,660, and 1,898,360, respectively, as presented in **Table 6-2**.

6.4.8.2 O & M Costs

Annual monitoring costs associated with Alternative 2 include costs for semi-annual groundwater sampling and annual ditch soil monitoring. The annual monitoring cost is estimated to be $40,440. The annual O & M costs (*i.e.* soil cover maintenance) is estimated to range from $5000 to $7000 for the three soil cleanup levels, as presented in Table 6-2. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the remedial action (including monitoring program) will be reviewed after five years. At this time, modification may be implemented to the remediation program (including monitoring program), if appropriate.

6.4.8.3 Present Worth Costs

The present worth cost (total evaluated price) to remediate the site soil with lead concentrations above 1250, 1000, 400 mg/kg and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values were estimated to be $1,699,648, $1,785,560, $2,236,992 and $2,735,984 respectively.

TABLE 6-2
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
DETAIL COST ESTIMATES

	ALTERNATIVE 2 On-site Containment				ALTERNATIVE 4 Off-site Disposal				ALTERNATIVE 6 Soil Washing		
Soil with Lead Concentration	>1250 mg/kg [7]	>1000 mg/kg [7]	>400 mg/kg [7]	>400 mg/kg +TAGM [7]	>1250 mg/kg [7]	>1000 mg/kg [7]	>400 mg/kg [7]	>400 mg/kg +TAGM [7]	>1250 mg/kg [7]	>1000 mg/kg [7]	>400 mg/kg [7]
st to Prime [1]	$422,806	$454,397	$652,709	$872,984	$1,037,371	$1,214,107	$2,162,151	$3,345,376	$1,507,529	$1,788,721	$3,288,477
st to Owner [2]	$577,290	$620,930	$894,870	$1,199,150	$1,426,240	$1,670,370	$2,979,980	$4,614,470	$2,075,700	$2,464,140	$4,452,990
oject Cost [3]	$913,900	$982,520	$1,416,660	$1,898,360	$2,257,850	$2,644,340	$4,717,570	$7,305,090	$3,286,010	$3,900,850	$7,049,450
nual O&M Costs [4]	$5,000	$6,000	$7,000	$8,000	NA	NA	NA	NA	NA	NA	NA
nual Post Remediation Monitoring Costs	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440	$40,440
esent Worth O&M and Monitoring Cost (30 year) [5]	$785,748	$803,040	$820,332	$837,624	$699,288	$699,288	$699,288	$699,288	$699,288	$699,288	$699,288
tal Evaluated Price [6]	**$1,699,648**	**$1,785,560**	**$2,236,992**	**$2,735,984**	**$2,957,138**	**$3,343,628**	**$5,416,858**	**$8,004,378**	**$3,985,298**	**$4,600,138**	**$7,748,738**

TES:
Cost to Prime (Contractor) is the sum of the direct costs plus any sales tax, subcontractor markups, and adjust pricing that have been applied in the project
Cost to Owner is the sum of the Cost to Prime plus prime contractor Indirect Cost. Also known as the bid amount or construction contract cost
Project Cost is the sum of the Direct, Indirect, and Owner costs for the project
Annual Costs are costs that will occur yearly due to activities such as maintenance or monitoring
Present Worth Cost is based on a 4% interest rate over the number of years specified above (Refer to Appendix E, Table E-1)
Total Evaluated Price is the sum of the Project Cost and Present Worth Cost
Soil remediated to lead concentrations as noted

6.5 ANALYSIS OF ALTERNATIVE 4: OFF-SITE DISPOSAL

6.5.1 Definition of Alternative 4

6.5.1.1 Description

Alternative 4 include excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg and disposing the excavated material in an off-site landfill. Excavated ditch soil and soil would be stockpiled and tested prior to being transported off-site for disposal. Excavated soils and ditch soils that exceed the TCLP limits will be stabilized prior to disposal.

Excavated areas will be backfilled to restore the area to original conditions. Common fill and topsoil will be placed and vegetative growth will be established. The intent of this alternative is to remove the waste from the site to prevent contact with receptors and migration to surface water and groundwater. Each step involved in this alternative will be described briefly in this section. A detailed analysis of how this option meets the selected criteria and a budgetary cost estimate are provided below.

Surface and subsurface soils with lead concentrations greater than 1250 mg/kg will be excavated. Railroad tracks and ties at SEAD-16 in the delineated area will be removed before soil is excavated. The data indicate that the surface soil to be removed at SEAD-16 is limited to the northeast, east, south, and southeast sides of Building S-311, as shown on Figure 2-1. At SEAD-17, the surface soil to be removed is limited to the north, northwest, west, and southeast sides of Building 367, as shown on Figure 2-5. The soil will be removed to a depth of 12 inches below ground surface, resulting in an in situ volume as presented in Section 2. In addition, subsurface soil in one area at SEAD-16 has lead concentration greater than 1250 mg/kg and will be excavated. It is estimated that the vertical limit will extend approximately 3 feet. There were no subsurface samples obtained with lead concentrations greater than 1250 mg/kg at SEAD-17. Therefore, it is anticipated that SEAD-17 does not require subsurface remediation.

The excavation can be accomplished with standard construction equipment, such as a front end loaders, bulldozers, and backhoes. The excavated soil and ditch soil (refer to Section 6.3) will be loaded into trucks and transported to an on-site stockpile area. The soil will be placed in separate piles and samples will be obtained for TCLP testing. Based on the results, soil that passes the TCLP test will be transported and disposed of as a solid waste in an off-site Subtitle D Landfill. The soil that fails the TCLP will be transported, stabilized, and then disposed of in an off-site landfill. Based on conversations with stabilization contractors (refer to detail cost estimate, Appendix E) it is expected that off-site treatment may be more cost effective than on-site treatment. Therefore, for screening purposes presented later in this section and for conservative cost comparison purposes, this alternative assumes all excavated soil is transported off-site for both treatment and disposal.

Stabilized soil is not considered a characteristic RCRA hazardous waste but considered a solid waste, subject to RCRA Subtitle D and New York State solid waste regulations. In New York, all sanitary landfills are authorized to accept industrial wastes, and therefore would be able to accept the stabilized soil. The landfills cannot accept hazardous waste, and require extensive testing to assure that the waste is not a hazardous waste. The actual testing requirements vary between landfills, and the exact requirements for this remedial action will be specified once a landfill is selected. Several landfills have been identified for disposal, as discussed in Section 6.4.1.1.

Upon completion of excavation, cleanup verification will be performed on the excavated areas. A cleanup verification work plan will be developed as part of the final design. Excavation will continue further in those areas where lead concentrations in soil and ditch soil are greater than the cleanup goals. Sample location and frequency will be determined as part of the cleanup verification work plan.

Excavated areas will be backfilled to restore the area to original conditions and to provide proper storm water control. Common fill and topsoil will be placed and vegetative growth will be established. Semi-annual groundwater monitoring and annual ditch soil sampling will be necessary.

6.5.1.2 Process Flow and Site Layout

Figure 6-1 presents a process flow diagram for Alternative 4. Soil is excavated, stockpiled, and tested for TCLP as described above. Soils meeting the TCLP criteria will be transported and disposed of at an off-site landfill. Soils exceeding the TCLP criteria require stabilization. If the material is stabilized off-site, the soil will be transported off-site, stabilized, and disposed of in an appropriate landfill. If on-site stabilization is used, soils will be transported to a temporary facility, such as a pug mill, and mixed with the selected additive(s). The stabilized soil can be either discharged directly into trucks for transport to a landfill or to a stockpile area for TCLP testing. TCLP testing will be performed on the stabilized material at a rate required by the landfill accepting the waste.

This alternative requires an area sufficient for the pug mill (if on-site stabilization is used) and stockpiles. It is estimated that the pug mill and stockpile area will be located adjacent to Unnamed Road between SEAD-16 and -17, as shown on Figure 6-2. This will provide a central location for the dump trucks to transport the excavated soil to the stockpile area.

If treatment is conducted off-site, trucks will be loaded directly from the stockpiles, after receiving the TCLP test results. A small staging area and equipment decontamination area will be set up as necessary.

6.5.2 Overall Protection of Human Health and the Environment

An evaluation of the overall protectiveness of human health and the environment includes the assessment of short- and long-term protectiveness of human health and the environment. The following discussion will show how this alternative meets these criteria.

6.5.2.1 Short-Term Protectiveness

This alternative will be evaluated with respect to the effect on human health and the environment during the implementation of the remedial action. Three items are included in an assessment of the short-term protectiveness of Alternative 4. The first issue is protection of the community during the remedial action. If off-site treatment is performed, hazardous material will be transported off-site. Precautionary measures must be taken to assure that the trucks are not overloaded and properly covered with a tarp to ensure that no material is released. If on-site treatment is performed, hazardous material will not be transported off-site. All waste, which is disposed in the off-site landfill, will no longer be considered hazardous waste.

There is also a minor threat from dust released during the excavation. The site is located away from the SEDA boundary, so the likelihood of any hazardous dust migrating off-site is negligible. As discussed in Sections 6 and 7 of the RI report as well as in Section 2, fugitive dust migration (in soil) is not a major migration pathway. Fugitive dust is further minimized by the makeup of the soil to be excavated, which is primarily shale fill, a material which has a fairly large particle size, and is less subject to dust formation.

The short-term protectiveness to site workers is also considered. The major routes of exposure during remediation are direct contact with the excavated soil and inhalation of particulate. Exposure can be minimized through the use of site access controls and proper protective equipment for site workers, such as dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulate. Dust generation at the excavation can be minimized by using water or other dust control chemicals. If on-site treatment is used, precautionary measures should be taken to minimize dust generation. It should also be noted that all the site workers are required to meet all the OSHA training and medical monitoring requirements.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. Impacts to the site will result from excavation, stockpiling, and truck traffic. Because SEAD-16 and -17 is located in an active portion of SEDA, these activities will not be substantially different from the current activities. In addition, since the hazardous material is primarily in the soil, there is little or no risk of a spill or release during the remedial action.

6.5.2.2 Long-Term Protectiveness

The remedial action is designed such that the remaining soils and ditch soils have a lead concentration below the proposed cleanup goal of 1250 mg/kg. The excavated soil and ditch soil will be excavated and transported off-site for disposal and no treatment residuals will be left on the site. There will no longer be soil and ditch soil on site that poses an unacceptable threat to human health.

6.5.2.3 Conclusion

Alternative 4 will protect human health and the environment. The alternative protects against ingestion of and direct contact with surface soils and ditch soils having concentrations of lead above 1250 mg/kg. The ditch soils with concentrations of lead above 1250 mg/kg will be removed, which will meet the RAO for ditch soil and prevent contamination downgradient in Kendaia Creek.

The results of the baseline risk assessment show that conditions at SEAD-16 and -17 require a remedial action (see Section 2.0). The remedial action will reduce risk from soil and ditch soil as well as building material and debris to acceptable levels. Therefore, this alternative meets the RAOs by reducing risk, thus protecting human health.

6.5.3 ARAR Compliance

Similar as Alternative 2 (Section 6.4.3), Alternative 4 does not preclude compliance with ARARs.

6.5.4 Long-Term Effectiveness and Permanence

The assessment of the long-term effectiveness can be divided into two categories, an assessment of the magnitude of the residual risk, and an evaluation of the adequacy and reliability of the controls used for the waste residuals and untreated soil.

As discussed in Section 6.5.2, Alternative 4 will protect human health and the environment in the long-term. Upon completion of the remedial action, no residuals soil or ditch soil will remain on site. The long-term management of the excavated material will be the responsibility of the selected off-site landfill. For this reason, it is important to select reputable landfill to assure that the landfill is operated in accordance with State and Federal requirements. Although the excavated areas at the site will be backfilled and graded to promote storm water run-off and minimize erosion, maintenance activities will not be required upon the establishment of vegetative growth.

Once the excavated soil and ditch soil are removed from the site, the remedial action would be considered permanent. There will no longer be soil and ditch soil on site that poses an unacceptable threat to human health. Stabilized material will be designed to be resistant to leaching, weathering, and wet-dry cycles, which indicate that the treatment will be permanent.

6.5.5 Reduction in Toxicity, Mobility, and Volume

Alternative 4 would be effective in reducing the toxicity and mobility of the hazardous constituents present in the soil and ditch soil at the site. The material and debris from SEAD-16 buildings will be removed as well as the soil and ditch soil exceeding the proposed cleanup levels. In addition, the decrease in toxicity and mobility can be assessed two ways. First, the TCLP test provides an assessment of the toxicity and mobility of the hazardous constituents in the soil. The larger the leaching fraction, the greater the mobility and the greater the toxicity. Since some of the excavated soil and ditch soil must be treated in order to meet the TCLP criteria prior to disposal, the treated material will no longer be hazardous and will exhibit lower toxicity and mobility than the untreated waste.

In addition, by treating the soil that contains the highest concentrations of hazardous constituents, the overall site risk will be reduced to acceptable levels. By stabilizing the soil and ditch soil and then transferring to a landfill, the mobility of the hazardous constituents will be effectively eliminated. A properly managed landfill does not allow for uncontrolled releases from the landfill.

The stabilized soil will have a larger volume than the untreated soil, but the stabilized soil will no longer be a hazardous waste.

6.5.6 Short-Term Effectiveness

As discussed in Section 6.5.2.1, exposure to the community, the site workers and the environment can be minimized through the appropriate use of site access controls, dust controls, proper protective equipment for site workers, and monitoring system.

It is estimated that Alternative 4 can be completed in a short time period. If stabilization is conducted off-site, then it is estimated that the alternative may take approximately two to three months to complete, depending on the weather and turnaround time on the TCLP test results. This duration includes one week of mobilization, one week of building remediation, two to four weeks of excavation, three weeks to backfill and hydroseed, three weeks to test and dispose the material offsite, and one week to demobilization. The alternative would be an earthmoving operation, with little mobilization and specialty equipment.

If on-site stabilization is conducted, developing and implementing the treatability study, selecting the vendor, and obtaining the appropriate samples may take three to five months. Once the treatability testing is completed and a vendor is selected, it is estimated that the alternative may take approximately three months to complete. In addition to the items mentioned above, some permitting may be required for stabilization and a specialty contractor would be required. Also, the alternative is dependant on the time needed for the stabilized material to cure.

6.5.7 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, and monitoring considerations. Administrative feasibility addresses issues such as permitting, interaction with NYSDEC and EPA, and community relations. Availability of services and materials describes the ease of obtaining vendors and equipment, and the availability of offsite disposal capacity.

6.5.7.1 Technical Feasibility

Alternative 4 is technically feasible to complete. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling, and the remediation areas have been initially delineated. It is possible that some minor weather delays may be encountered, but most of the soil to be removed is located within 12 inches of the ground surface and will not be adversely affected by wet weather.

The excavated material that fails the TCLP criteria will require stabilization. Stabilization is a technology that has been frequently used to treat similar soils, and it is not anticipated that problems will be encountered during construction. If on-site stabilization is used, a treatment study will be necessary to establish the optimal additive and dosage and a specialty contractor will perform the work, most likely using a pugmill. The additives will be properly monitored to assure proper dosage. The stabilized material will be tested to assure that it meets the TCLP criteria. If off-site treatment is conducted, most of the TSD facilities in the region have accepted similar wastes for a number of years. These facilities are capable of treating and disposing of the site soils.

Another aspect of technical feasibility is the ease with which additional work may be conducted. At this time, it is anticipated that this remedial action will preclude the necessity of any additional remedial efforts at SEAD-16 and -17. However, if additional work is required in the future, this remedial action should not interfere in any way. Once the remedial action is complete, the site will be vegetated and will essentially remain as it is now.

6.5.7.2 Administrative Feasibility

Alternative 4 is administratively feasibility to complete. If off-site treatment is performed, the landfills that may be used are fully permitted for disposal and stabilization, if necessary. There will be some transport of hazardous waste, and proper manifests will be required. All of the contractors used for excavation and hauling will be experienced in preparing manifests.

If on-site treatment is performed, a temporary treatment facility (pugmill) will be used and no hazardous waste transportation will be required, which simplifies the manifest requirements. Construction permits will be necessary for the construction activities. Since the wastes will be sent to a permitted disposal facility, no disposal permits will be necessary.

Coordination with the various regulatory agencies is also important. As previously described, the Army has coordinated the entire remedial program with both EPA and NYSDEC, and will consider input from both these agencies in the final remedy selection. It is anticipated that any issues arising with the regulatory agencies will be addressed prior to remedy selection.

6.5.7.3 Availability of Services and Materials

Alternative 4 relies primarily on standard construction equipment that is readily available in the Romulus area. The equipment includes backhoes, bulldozers, front-end loaders, scrapers, and standard size dump trucks. Backfill material, such as common fill and topsoil, is readily available in the Romulus area. If on-site stabilization is performed, a pug mill will most likely be used.

Several landfills have been identified that are capable of accepting the soil and ditch soil for disposal, as discussed in Section 6.4.1.1.

6.5.8 Cost

6.5.8.1 Capital Costs

Capital costs were estimated to remediate the soil to lead concentrations of 1250, 1000, 400 mg/kg, and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values. The detailed cost estimate and a description of the assumptions used are presented in Appendix E. The total capital costs (project cost) for the associated three concentration levels are estimated to be $2,257,850, $2,644,340, $4,717,570, and $7,305,090 respectively, as presented in Table 6-2.

6.5.8.2 O & M Costs

Annual monitoring costs associated with Alternative 4 include costs for semi-annual groundwater sampling and annual ditch soil monitoring. The annual monitoring cost is estimated to be $40,440. There is no annual O & M costs associated with this alternative. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the remedial action (including monitoring program) will be reviewed after five years. At this time, modification may be implemented to the remediation program (including monitoring program), if appropriate.

6.5.8.3 Present Worth Costs

The present worth cost (total evaluated price) to remediate the site to lead concentrations in soil of 1250, 1000, 400 mg/kg, and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values were estimated to be $2,957,138, $3,343,628, $5,416,858, and $8,004,378, respectively.

6.6 ANALYSIS OF ALTERNATIVE 6: INNOVATIVE TREATMENT - SOIL WASHING

6.6.1 Definition of Alternative 6

6.6.1.1 Description

Alternative 6 involves excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg, stockpiling, soil washing, backfilling on-site the coarse grain material, and disposing the fine grain material in an off-site landfill. Fine grain material would be stockpiled and tested prior to disposal. The fine grain material that exceeds the TCLP limits will be treated prior to disposal in a landfill. As with Alternative 4, excavated areas will be backfilled to restore the area to original conditions. Topsoil will be placed and vegetative growth will be established.

Each step involved with this alternative will be described briefly in this section. An analysis of how this option meets the selection criteria and a budgetary cost estimate are provided below.

Surface and subsurface soils with lead concentrations greater than 1250 mg/kg will be excavated. Railroad tracks and ties at SEAD-16 in the delineated area will be removed before soil is excavated. The data indicate that the surface soil to be removed at SEAD-16 is limited to the northeast, east, south, and southeast sides of Building S-311, as shown on Figure 2-1. At SEAD-17, the surface soil to be removed is limited to the north, northwest, west, and southeast sides of Building 367, as shown on Figure 2-5. The soil will be removed to a depth of 12 inches below ground surface, resulting in an in situ volume as presented in Section 2 and in the previous section. In addition, subsurface soil in one area at SEAD-16 has lead concentration greater than 1250 mg/kg and will be excavated. It is estimated that the vertical limit will extend approximately 3 feet. There were no subsurface samples obtained with lead concentrations greater than 1250 mg/kg at SEAD-17. Therefore, it is anticipated that SEAD-17 does not require subsurface remediation.

The excavation can be accomplished with standard construction equipment, such as a front end loaders, bulldozers, and backhoes. The excavated soil and ditch soil (refer to Section 6.3) will be loaded into trucks and transported to an on-site stockpile area for soil washing. The primary purpose of soil washing is to separate the coarse material from the fine material, and in the process scrub and wash the components. Soil washing experiments have shown that a significant portion of the hazardous constituents present in the soil is concentrated in the fine fraction. The coarse fraction typically does not contain the hazardous constituents and can be cleaned from the fine fraction by physical separating. The coarse fraction, which no longer contains excessive levels of the hazardous constituents, can be used as site backfill, provided it meets the RAOs. The remaining fine fraction will be tested, further treated if necessary, and disposed. It is estimated that the fine fraction will make up approximately one-third of the overall volume. The actual quantity of the fine fraction will be determined in the treatability study.

The following is a general description of a soil washing process that would be applicable to SEAD-16 and -17. First, the excavated material is fed into a hopper, which screens the oversize material (more than 1/4-inch diameter) from the finer material. The oversize material is placed into a rotary drum where it is tumbled washed, stockpiled, tested, and eventually backfilled on-site. The remaining soil is passed into a device, which turns the material into a slurry and pumps it through hydroclones. The hydroclones mechanically separate the slurry into two streams, the coarse material (sand and gravel) and the fine material (silt and clay) and water. The coarse material may then be directed to froth flotation cells, which wash it with surfactants. The flotation cells, which aerate the material, and the surfactant washing generate a heavy froth. The organic and inorganic contaminants in the soil will move with the froth. The froth is then skimmed from the top of the material and is considered a waste. The soil passing through the froth flotation units, *i.e.*, the coarse material, has been shown to pass the TCLP test and typically can then be backfilled on-site.

The fine grain material and water are sent to a sludge basin where the solids are settled out. The sludge is dewatered and then further treated or disposed. The water will be treated prior to discharge.

The process separates the soil into four streams: (1) oversize material, which is generally non-hazardous and can be backfilled to the site, (2) clean sand and gravel, which also can be backfilled, (3) sludge consisting of the fine grain material, which is a hazardous waste, and (4) concentrated froth from the flotation unit (if utilized) which is also considered a hazardous waste. For this alternative, the fine grain material and froth will be tested, treated if necessary, and disposed of off-site. On-site or off-site treatment can be performed using stabilization, acid leaching, or other methods (refer to Section 6.5.) However, because of the relative small volume of soil to be treated at SEAD-16 and -17, it is expected that off-site treatment will be more cost effective than on-site treatment. Therefore, for discussion purposes, this alternative assumes that the sludge and froth will be transported off-site for treatment and disposal.

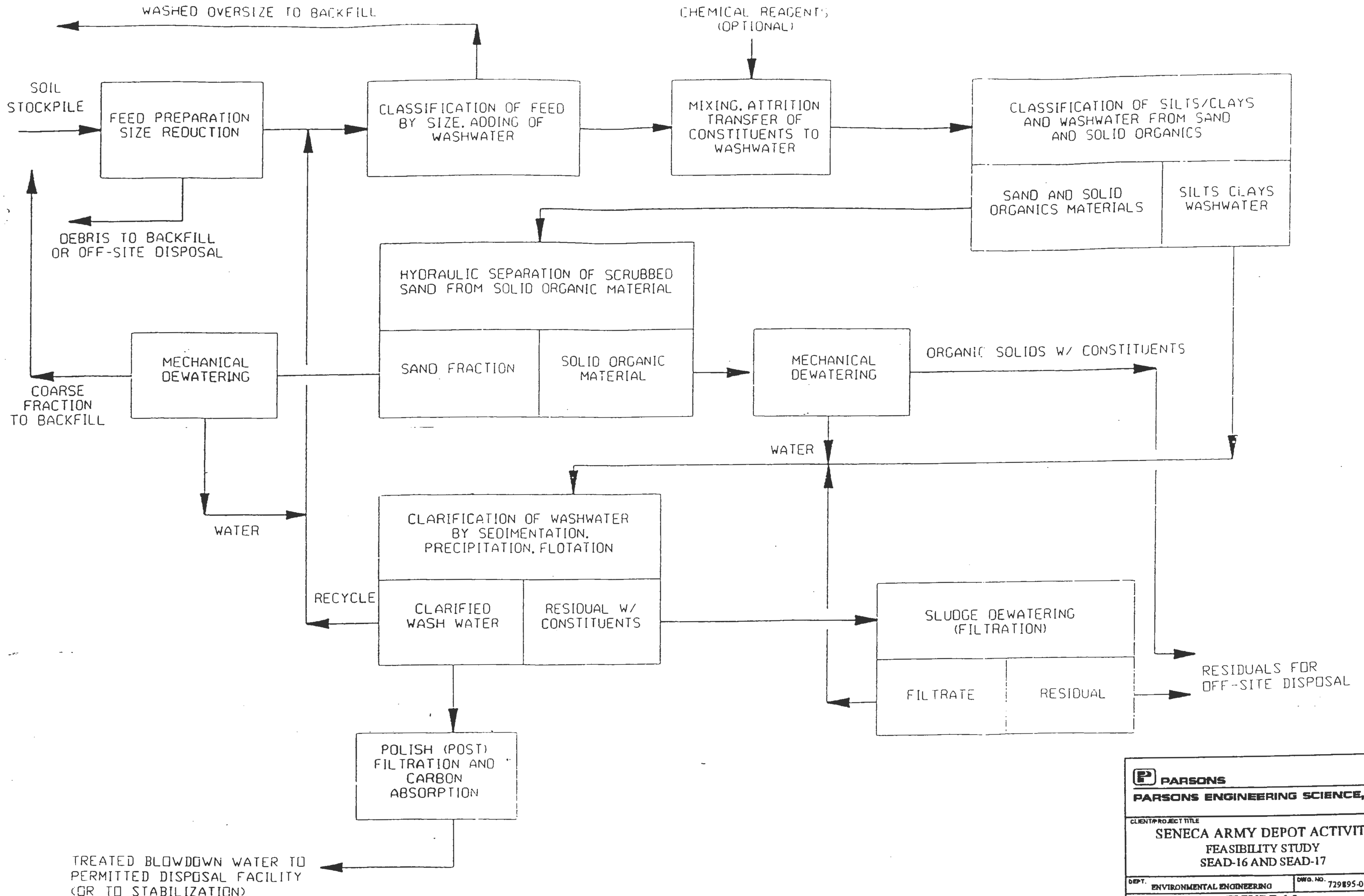
Upon completion of excavation, cleanup verification will be performed on the excavated areas. A cleanup verification work plan will be developed as part of the final design. Excavation will continue further in those areas where lead concentrations in soil and ditch soil are greater than the cleanup goals. Sample location and frequency will be determined as part of the cleanup verification work plan.

Excavated areas will be backfilled with the coarse grain material to restore the area to original conditions and to provide proper storm water control. Topsoil will be placed and vegetative growth will be established. Semi-annual groundwater monitoring and annual ditch soil sampling will be necessary.

6.6.1.2 Process Flow and Site Layout

Figure 6-3 presents a process flow diagram for Alternative 6. Soil is excavated and stockpiled as described above. This alternative requires an area sufficient for stockpile areas, soil washing equipment and a pugmill (only if on-site treatment is performed.) It is estimated that the stockpile area and the soil washing equipment will be located adjacent to Unnamed Road between SEAD-16 and -17, as shown on Figure 6-2. This will provide a central location for the dump trucks to transport the excavated soil to the stockpile area. A soil washing operation will consist of several or all of the following processes:

- Vibratory screen - This unit separates the feed, and removes oversized (greater than 2-inch diameter) particles.
- Feeder module and conveyor - This unit carries and weighs material fed to the soil washer.
- Trommel screen - This unit breaks up clumped feed materials.
- Attrition scrubber - This unit adds the washwater to the broken up soil. The washwater mobilizes the fine fraction of the soil.
- Hydrocyclone separators - This unit is a solids/liquid flash separation device which separates the coarse (sand and gravel) soil from the fine (silt and clay) soil.
- Dense media separation column - This unit separates materials based on density, and would be used to separate pieces of munitions, elemental metals and other debris from the soil to be treated.
- Dewatering screen - This unit removes the fine material from the process train. The coarse fraction is rinsed, and removed from the soil washer.
- Washwater treatment system - The spent washwater is treated for reuse or disposal. The type of treatment used is site-specific.
- Belt filter press - This unit dewaters the fine fraction prior to further treatment.



PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-16 AND SEAD-17

DEPT. ENVIRONMENTAL ENGINEERING | DWG. NO. 729895-01002

FIGURE 6-3
ALTERNATIVE 6 SOIL WASHING
GENERALIZED PROCESS FLOW
SCHEMATIC

SCALE N/A | DATE SEPTEMBER 2000

The stockpiled material will be loaded into the soil washing unit with front-end loader. The conveyor will likely be equipped with a scale to keep track of the quantity of soil treated. For SEAD-16 and -17, a 25-tph unit could be used. This unit is delivered on fifteen 45-foot trailers. The total size of the soil washing operation is approximately 100 feet by 200 feet. The assembled unit has a height of 50 feet. The unit requires a 600-kW, 440-Volt AC power supply, and a 25 gallons per minute (gpm) water source.

The coarse fraction is removed from the unit, allowed to dry, and stockpiled in a clean soil area. The material can be tested to ensure that the hazardous constituents have been removed to acceptable levels. The material will then be re-used as clean fill. After dewatering, the fine material will be treated off-site, if necessary, and disposed of in an offsite landfill. The water will be treated on-site or sent to the Depot Publicly Owned Treatment Works (POTW) for treatment. The cost estimate assumes that the water can be treated at the Depot POTW at minimal cost.

6.6.2 <u>Overall Protection of Human Health and the Environment</u>

An evaluation of the overall protection of human health and the environment includes the assessment of the short- and long-term protection of human health and the environment. The following discussion will show how this alternative meets these criteria.

6.6.2.1 Short-term Protectiveness

This alternative will be evaluated with respect to the effect on human health and the environment during the implementation of the remedial action. Three items are included in an assessment of the short-term protectiveness of Alternative 4. The first issue is protection of the community during the remedial action. After soil washing, the fine grain material will be disposed off-site. Assuming off-site treatment will be performed, hazardous material may be transported off-site. Precautionary measures must be taken to assure that the trucks are not overloaded and properly covered with a tarp to ensure that no material is released. However, it should be noted that only approximately one-third of the total remedial volume is estimated to be disposed of off-site.

There is also a minor threat from dust released during the excavation. The site is located away from the SEDA boundary, so the likelihood of any hazardous dust migrating off-site is negligible. As discussed in Sections 6 and 7 of the RI report as well as in Section 2, fugitive dust migration (from soil) is not a major migration pathway. Fugitive dust is further minimized by the makeup of the soil to be excavated, which is primarily shale fill, a material which has a fairly large particle size, and is less subject to dust formation.

The short-term protectiveness to site workers is also considered. The major routes of exposure during remediation are direct contact with the excavated soil and inhalation of particulate. There is also potential for exposure to soils and other hazardous materials during the soil washing process. Exposure can be minimized through the use of site access controls and proper protective equipment for site workers, such as dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulate. Dust generation at the excavation can be minimized by using water or other dust control chemicals. If on-site treatment is used, precautionary measures should be taken to minimize dust generation. It should also be noted that all the site workers are required to meet all the OSHA training and medical monitoring requirements. In addition, contractor personnel working will be trained in the proper health and safety procedures to be used for the soil washing unit.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. Impacts to the site will result from excavation, stockpiling, and truck traffic. Because SEAD-16 and -17 is located in an active portion of SEDA, these activities will not be substantially different from the current activities. In addition, since the hazardous material is primarily in the soil, there is little or no risk of a spill or release during the remedial action. There is a potential for releases of washwater from the soil washing unit. This threat is minimized with proper controls and inspections of the units. The site workers will be trained in the proper operation of the unit operations.

6.6.2.2 Long-Term Protectiveness

The remedial action is designed such that the remaining soils and ditch soils have a lead concentration below the proposed cleanup goal of 1250 mg/kg. Coarse grain residuals, which have lead concentration below the proposed cleanup goal, will be backfilled on site. Fine grain material will be disposed of off-site. Upon completion of the remedial action, there will no longer be soil and ditch soil on site that poses an unacceptable threat to human health.

6.6.2.3 Conclusion

Alternative 6 will protect human health and the environment. The alternative prevents ingestion of and direct contact with the material and debris from SEAD-16 buildings, surface soils and ditch soils with lead concentrations over 1250 mg/kg. The ditch soils with lead concentrations above 1250 mg/kg will be removed, which will meet the RAO for ditch soil and prevent contamination downgradient in Kendaia Creek.

The results of the baseline risk assessment show that conditions at SEAD-16 and -17 require a remedial action (see Section 2.0). The remedial action will reduce risk from soils and ditch soil as well as building material and debris to acceptable levels. Therefore, this alternative meets the RAOs by reducing risk, thus protecting human health.

6.6.3 ARAR Compliance

Similar as Alternatives 2 and 4 (Sections 6.4.3 and 6.5.3), Alternative 6 does not preclude compliance with ARARs.

6.6.4 Long-Term Effectiveness and Performance

The assessment of the long-term effectiveness can be divided into two categories, an assessment of the magnitude of the residual risk, and an evaluation of the adequacy and reliability of the controls used for the waste residuals and untreated soil.

The remedial action is designed such that the remaining soils and ditch soils have a lead concentration below the proposed cleanup goal of 1250 mg/kg. Coarse grain residuals, which have lead concentration below the proposed cleanup goal, will be backfilled on site. Fine grain material will be disposed of off-site. Initially, some maintenance will be required to establish a vegetative cover at the site. Once the cover is established, there will be no need for long-term maintenance.

Upon completion of the remedial action, no residuals soil or ditch soil will remain on site. The coarse grain material will be treated and backfilled on-site. The long-term management of the fine grain material will be the responsibility of the selected off-site landfill. For this reason, it is important to select reputable landfill to assure that the landfill is operated in accordance with State and Federal requirements. Although the excavated areas at the site will be backfilled and graded to promote storm water run-off and minimize erosion, maintenance activities will not be required upon the establishment of vegetative growth.

Once the soil fines are removed from the site, the remedial action would be considered permanent. There will no longer be soil and ditch soil on site that poses an unacceptable threat to human health.

6.6.5 Reduction in Toxicity, Mobility, and Volume

Alternative 6 would be effective in reducing the toxicity, mobility, and volume of the hazardous constituents present in the soil and ditch soil at the site. It is estimated that soil washing will reduce the volume of the contaminated soil and ditch soil approximately two-thirds of the original volume. As presented in Section 6.5, treatment (if necessary) of the fine grain material and disposal into a landfill will effectively reduces the toxicity and mobility of the hazardous constituents.

6.6.6 Short-Term Effectiveness

As discussed in Section 6.6.2.1, exposure to the community, the site workers and the environment can be minimized through the appropriate use of site access controls, dust controls, proper protective equipment for site workers, and monitoring system.

The development and implementation of the soil washing treatability study and the selection of the vendor may take three to five months. Once the treatability testing is completed and a vendor is selected, it is estimated that the alternative may take approximately three to six months to complete. This duration includes two weeks of mobilization, one week to fine tune the unit, one week of building remediation, two to four weeks of excavation, one to three months to soil wash, three weeks to backfill and hydroseed, three weeks to test and dispose of the fine grain material offsite, and two weeks to demobilization. This assumes that the fine grain material will be treated off-site, if necessary.

6.6.7 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, and monitoring considerations. Administrative feasibility addresses issues such as permitting, interaction with NYSDEC and EPA, and community relations. Availability of services and materials describes the ease of obtaining vendors and equipment, and the availability of offsite disposal capacity.

6.6.7.1 Technical Feasibility

Alternative 6 is technically feasible to complete. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling, as well as a specialty contractor to perform the soil washing. Soil washing has been used for a number of years and has been demonstrated to be effective at sites with similar contamination. The remediation areas have been initially delineated and a soil washing treatability studies will be necessary to confirm that the technology will be effective at SEAD-16 and -17.

As with Alternative 4, the fine grain material that fails the TCLP criteria will require treatment prior to disposal. On-site treatment can include stabilization, acid leaching, or other methods. As discussed in Section 3, stabilization is a technology that has been frequently used to treat similar soils, and it is not anticipated that problems will be encountered during construction. It is anticipated that the stabilization process will also be effective because the fine grain material will mix easier with the selected additive(s). If on-site stabilization is used, a treatment study will be necessary to establish the optimal additive and dosage and a specialty contractor will perform the work, most likely using a pugmill. The additives will be properly monitored to assure proper dosage. The stabilized material will be tested to assure that it meets the TCLP criteria. If off-site treatment is conducted, most of the TSD facilities in the region have accepted similar wastes for a number of years. These facilities are capable of treating and disposing of the site soils.

It is possible that some minor weather delays may be encountered, but most of the soil to be removed is located within 12 inches of the ground surface and will not be adversely affected by wet weather.

Another aspect of technical feasibility is the ease with which additional work may be conducted. At this time, it is anticipated that this remedial action will preclude the necessity of any additional remedial efforts at SEAD-16 and -17. However, if additional work is required in the future, this remedial action should not interfere in any way. Once the remedial action is complete, the site will be vegetated and will essentially remain as it is now.

6.6.7.2 Administrative Feasibility

Alternative 6 is administratively feasible to complete. Soil washing not only reduces the volume of material to be disposed, but also the volume of material needed for backfill. Construction permits are necessary for the activities and are readily attainable.

If off-site treatment of the fine grain material is performed, the landfills that may be used are fully permitted for disposal and stabilization, if necessary. As a result of the volume reduction, there will be less transport of hazardous waste than Alternative 4, and the number of manifests will be reduced. All the contractors used for excavation and transportation will be experienced in preparing manifests.

If on-site treatment of the fine grain material is performed, a temporary treatment facility (pugmill) will be used and no hazardous waste transportation will be required, which simplifies the manifest requirements. Construction permits will be necessary for the construction activities. Since the wastes will be sent to a permitted disposal facility, no disposal permits will be necessary.

Coordination with the various regulatory agencies is also important. As previously described, the Army has coordinated the entire remedial program with both EPA and NYSDEC, and will consider input from both these agencies in the final remedy selection. It is anticipated that any issues arising with the regulatory agencies will be addressed prior to remedy selection.

6.6.7.3 Availability of Services and Materials

Alternative 6 relies on a soil washing specialty contractor and standard construction equipment, which is readily available in the Romulus area. Several companies have extensive experience in implementing soil washing, including Bergmen U.S.A. and Biotrol, Inc. These companies can provide the necessary unit operations for SEAD-16 and -17. The standard construction equipment includes backhoes, bulldozers, front-end loaders, scrapers, and standard size dump trucks. Backfill material, such as common fill and top soil, is available in the Romulus area. If on-site stabilization is performed, a pug mill will most likely be used. Several landfills have been identified that are capable of accepting the soil and ditch soil for disposal, as discussed in Section 6.4.1.1.

6.6.8 <u>Cost</u>

6.6.8.1 Capital Costs

Capital costs were estimated to remediate the soil to lead concentrations of 1250, 1000, 400 mg/kg, and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values. The detail cost estimate and a description of the assumptions used is presented in Appendix E. The total capital costs (project cost) for the associated four concentration levels are estimated to be \$3,286,010, \$3,900,850, 7,049,450, and \$12,111,090, respectively, as presented in Table 6-2.

6.6.8.2 O & M Costs

Annual monitoring costs associated with Alternative 6 include costs for semi-annual groundwater sampling and annual ditch soil monitoring. The annual monitoring cost is estimated to be $40,440. There is no annual O & M costs associated with this alternative. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the remedial action (including monitoring program) will be reviewed after five years. At this time, modification may be implemented to the remediation program (including monitoring program), if appropriate.

6.6.8.3 Present Worth Costs

The present worth cost (total evaluated price) to remediate the site to lead concentrations in soil of 1250, 1000, 400 mg/kg, and to remediate the soil with lead concentration exceeding 400 mg/kg or the other tested metal concentrations exceeding the TAGM values were estimated to be $3,985,298, $4,600,138, 7,748,738, and 12,810,378, respectively.

6.7 COMPARATIVE ANALYSIS OF ALTERNATIVES

6.7.1 Introduction

The purpose of this section is to compare the alternatives presented above with respect to the specific evaluation criteria. The following discussion will rate each of the alternatives with regard to the evaluation criteria and identify the relative advantages and disadvantages of each. The tradeoffs among the different alternatives will be discussed. This comparison will provide the information necessary to decide the appropriate alternative for this site.

The discussion is divided into two groups. The first group, the threshold criteria, includes the overall protection of human health and the environment. The next group includes the remainder of the evaluation criteria: long term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, and cost.

6.7.2 Threshold Criteria

Each alternative is assessed against the threshold criteria, which are overall protection of human health and the environment and compliance with ARARs. The alternative must satisfy both criteria for it to be eligible for selection.

All of the alternatives, except Alternative 1, provide protection of human health and the environment. The building material and debris from SEAD-16 will be removed and disposed off-site. Ditch soil with lead concentrations above 1250 mg/kg will be removed from the site. Soil with lead concentrations above the proposed lead cleanup criteria will either be treated, removed from the site, or covered. Removing or covering these materials will prevent dermal contact and ingestion, which have been identified by the BRA as the major exposure pathways for dust, soil and ditch soil at SEAD-16 and -17. Alternatives 2, 4, or 6 will each reduce risk to acceptable levels (refer to discussion in Section 2.0).

Removal of soils found in the drainage ditches will protect environmental receptors by preventing migration of contaminated ditch soils to Kendaia Creek, which is downgradient of SEAD-16 and -17. Additionally, removing contaminated surface and subsurface soil (Alternatives 4 and 6) will decrease any potential for migration to groundwater and placing a soil cover over these areas (Alternative 2) will decrease potential for erosion and migration to nearby areas.

There are currently no chemical specific ARARs for soil. For groundwater, exceeding of ARARs will not be expected in the future even with no action according to modeling results presented in Section 1. Off-site disposal will fall under RCRA requirements, which must be complied with in the final remedial action plan. Other federal ARARs include, but are not limited to, the National Environmental Policy Act (NEPA), CERCLA, the Clean Water Act (CWA) and the Emergency Planning and Right to Know Act (EPCRA). Promulgated state regulations must also be complied with. After an alternative is chosen, the final design must incorporate compliance with ARARs, however, the concepts of each alternative consider ARARs and do not preclude compliance. All alternatives have potential to fully comply with ARARs.

6.7.3 Other Considerations

6.7.3.1 Long-Term Effectiveness and Permanence

The criterion of long-term effectiveness addresses the long-term protectiveness to human health and the environment. Alternatives 2, 4, and 6 demonstrate long-term effectiveness because they rely on disposal, containment, and treatment to reduce the hazardous constituents in the soils and ditch soils. Alternative 6 will backfill the coarse fraction to the site. This coarse fraction will no longer contain concentrations of lead above the proposed cleanup level. Alternative 6 is the most effective in eliminating the long-term threats because soil washing segregates the coarse and fine fractions. Most of the hazardous constituents are contained in the fines fraction, which will be disposed of off-site. Alternative 4 is the next effective because it involves possible treatment and disposal in an off-site landfill. Alternative 2 is also considered effective because it involves possible treatment of the ditch soil and disposal in an off-site landfill as well as a soil cover for the surface soils. The soil cover will prevent contact with the underlying soil and reduce risk to acceptable levels. This alternative has little effect in preventing groundwater deteriorating from potential contaminant leaching from soil. However, as discussed in Section 1, groundwater quality is not expected to exceed EPA MCL or NYS GA standard for groundwater in the future. This alternative may also limit the future land use. The alternatives are considered to be technically feasible and provide effective long-term protection. Alternative 1, the no action alternative, does not provide long-term protection of human health and the environment.

The relative rankings of the alternatives based on permanence are the same as the rankings for long-term protectiveness. Since Alternatives 4 and 6 reduce the volume of the soil on site, they are more permanent than Alternative 2, which requires soil to remain on-site. Alternative 1, the no action alternative is not permanent since no treatment or soil cover is used.

6.7.3.2 Reduction of Toxicity, Mobility, or Volume through Treatment

The alternatives are also compared with respect to the relative decreases in the toxicity, mobility, and volume of the hazardous constituents present at the site. Alternative 6 yields the greatest reduction in the toxicity by separating the coarse material from the fine material, treating the later if necessary, and disposing it in an off-site landfill. The hazardous constituents are normally concentrated in the fines fraction of the soil, which could be treated using stabilization or acid leaching. Once the fine grain material is landfilled, the hazardous constituents are essentially immobile. Alternative 6 also provides the greatest volume reduction of the contaminated soils. The hazardous constituents are concentrated in the fines fraction. Soil washing reduces the volume of the contaminated soil to approximately one-third of the original volume.

Under Alternative 2, ditch soil toxicity would decrease if it is stabilized after failing TCLP test while under Alternative 4, ditch soil and soil toxicity would decrease if they fail TCLP and be stabilized. The stabilization process decreases the toxicity of the metals because the metals are converted to less soluble forms. Once the soil is treated and landfilled, the hazardous constituents are essentially immobile.

Alternative 2 decreases the mobility of the surface and subsurface soils through the placement of the soil cover, which will contain the soil and prevent migration to surface water via erosion.

Alternatives 4, which relies on stabilization and disposal, ranks the poorest on the volume reduction. The treated soils typical have a greater volume than the initial untreated soil. Furthermore, the remaining soils, which will be excavated and landfilled, will increase in volume by approximately 30 percent as a result of the excavation process.

6.7.3.3 Short-Term Effectiveness

Alternative 2 does not involve a large amount of excavation and can be implemented relatively quickly, considering that it does not require specialized equipment or vendors. Off-site transportation is limited and includes soil excavated from the drainage ditches, building material and debris, and materials for the cap (topsoil, common fill, and filter fabric). The later factor can be limited through the use of on-site borrow soils. Alternative 4 does not require additional handling for treatment nor specialized equipment (as does Alternative 6), however; it does require off-site disposal. In addition, it can be performed efficiently and quickly. Alternative 6 requires the same amount of excavation and less volume of off-site transportation than Alternative 4. However, Alternative 6 requires the excavated material to be handled more than Alternatives 2 and 4. This extra handling is required to consolidate and treat the material and increases the on-site worker's exposure to the material through direct contact and dust.

6.7.3.4 Implementability

All of the alternatives score well on implementability. Alternative 2 can be constructed the easiest since it involves leaving soils in place and constructing a soil cover. The construction of the soil cover involves routine earthmoving tasks, such as hauling, spreading and compacting soils. Alternative 4 can also be constructed easily; however, it involves more excavation, stockpiling, testing, and transportation. In addition, off-site stabilization may be necessary prior to disposal. Alternative 6 is also relatively easy to implement; however, it does require a specialized soil washing contractor, treatability program, and additional handling.

Alternative 1 is readily available. Alternatives 2 and 4 involve routine construction tasks, such as hauling, spreading and compacting soils, which numerous contractors are available and qualified to perform. In addition, an off-site landfill capable of accepting and treating, if necessary, the site material will need to be identified. Alternative 6 requires similar earthmoving tasks as Alternatives 2 and 4 do, but also require a specialty contractor to perform the soil washing.

Alternative 6 will minimize off-site disposal, is permanent, and reduces the toxicity, mobility, and volume of the pollutants. Alternative 2 minimizes off-site disposal and reduces the human health and ecological risk to acceptable levels. Alternative 4 involves off-site disposal, limited amount of treatment by stabilization, and meets the remedial action objects. Alternative 1 was assigned the lowest score since it does not meet the remedial action objectives for the site and is considered to be the least permanent alternative.

6.7.3.5 Cost

This comparison will evaluate the present worth costs (*i.e.* total evaluated price) of the alternatives, which are presented on Table 6-2. Alternative 2 is the least expensive alternative and varies in cost from $1,699,648 to $2,735,984, depending on the lead cleanup level used. Alternative 4 varies in cost from $2,957,138 to $8,004,378, depending on the lead cleanup level used. Alternative 6 is the most expensive alternative and varies in cost from $3,985,298 to $12,810,378, depending on the lead cleanup level used. The detail cost estimate is presented in Appendix E.

6.8 CONCLUSIONS

The baseline human health assessment indicates that the current cancer and hazardous risk is above acceptable levels for SEAD-16 and SEAD-17. Alternatives 2, 4, and 6 address remediating the soil, ditch soil, and building material and debris and will be effective to reduce the human health and ecological risk as well as to meet the remedial action objects. In summary, the remedial action objects are to prevent ingestion of and dermal contact with soils and ditch soils with lead concentrations above 1250 mg/kg (future industrial use scenario), and dust caused by excess debris and materials that are currently inside the abandoned buildings at SEAD-16.

The evaluation of alternatives was based on the intended industrial/commercial use scenario. This use was identified by the community representative group, the LRA, during the BRAC process. This level of protectiveness has been used as a basis for the screening and the selection of remedial alternatives. In addition, a second level of protectiveness was considered. This level is based on the New York State Department of Health (NYSDOH) guidelines for industrial use. Lastly, future residential use was also included for evaluation to comply with the State of New York requirement, 6 NYCRR 375-1.10, which establishes a goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law." Prior to the Depot, the area surrounding the base supported residential use and the evaluation of alternatives for residential use is sufficient to comply with the requirement for pre-disposal conditions. To avoid the redundancy of evaluating each alternative three separate times, one for each level of protectiveness, all alternatives were evaluated for the intended future land use, which is industrial. Following the evaluation, the costs required to achieve a level of protectiveness that would be sufficient for use under both the NYSDOH industrial level and the NYSDEC requirement for pre-disposal were developed.

In general, as presented in Table 4-2, Alternative 4 has the highest overall ranking followed by Alternative 6. Alternative 2 and Alternative 1 have same ranking, which is lower than Alternatives 6 and 4. Alternative 6 ranks the highest for long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, however, ranks the lowest for short-term effectiveness, implementiblity, and cost. Among the alternatives with remedial action, Alternative 2 ranks the highest for short-term effectiveness, implementiblity and cost. However, ranks lowest for reduction of toxicity, mobility, or volume through treatment and long-term effectiveness and permanence.

APPENDIX A

ANALYTICAL DATA

- **SEAD-16 Building Material**
- **SEAD-16 Building Material (Asbestos)**
- **SEAD-16 Surface Soil**
- **SEAD-16 Subsurface Soil**
- **SEAD-16 Downwind Surface Soil**
- **SEAD-16 Sediment/Soil Found in the Ditches**
- **SEAD-16 Groundwater**
- **SEAD-16 Surface Water**
- **SEAD-17 Surface Soil**
- **SEAD-17 Subsurface Soil**
- **SEAD-17 Downwind Surface Soil**
- **SEAD-17 Sediment/Soil Found in the Ditches**
- **SEAD-17 Groundwater**
- **SEAD-17 Surface Water**
- **Thallium**

Table A-1a
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Materials Analytical Results

PARAMETER	LEVEL	SOURCE		BS-10	BS-11	FS-50	FS-50	FS16-1	FS16-2	FS16-3	FS16-4	FS16-5	FS16-6	FS16-7	FS16-8
			LOC_ID:	BS-10	BS-11	FS-50	FS-50	FS16-1	FS16-2	FS16-3	FS16-4	FS16-5	FS16-6	FS16-7	FS16-8
			SAMP ID.	16024	16022	16023	16028	FS16-1-1	FS16-2-1	FS16-3-1	FS16-4-1	FS16-5-1	FS16-6-1	FS16-7-1	FS16-8-1
			QC CODE:	SA	SA	SA	DU	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
			TOP:												
			BOTTOM:												
			MATRIX:	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS
			SAMPLE DATE:	8/8/1996	8/8/1996	8/8/1996	8/8/1996	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993
			UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
VOLATILE ORGANICS															
1,1,1-Trichloroethane	800	NYSDEC TAG	UG/KG	7 J		25 U	22 U	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Bromomethane			UG/KG	53 UJ		25 UJ	22 J	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Chloroform	300	NYSDEC TAG	UG/KG	53 U		25 U	14 J	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Chloromethane			UG/KG	53 UJ		25 UJ	22 J	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Methylene Chloride	100	NYSDEC TAG	UG/KG	7 J		25 U	22 U	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Toluene	1500	NYSDEC TAG	UG/KG	20 J		25 UJ	22 U	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
Trichloroethene	700	NYSDEC TAG	UG/KG	13 J		25 U	22 U	11 U	10 U	11 U	18 U	11 U	11 U	25 UJ	21 UJ
SEMIVOLATILE ORGANICS															
2,4-Dinitrotoluene			UG/KG	3000000 J	19000000 J	200 J	720 UJ	360 U	340 U	5700 U	620 U	380 U	2700	2600 UJ	5100 UJ
2,6-Dinitrotoluene	1000	NYSDEC TAG	UG/KG	74000 J	620000 U	800 U	720 U	360 U	340 U	5700 U	620 U	380 U	200 J	2600 UJ	5100 UJ
2-Methylnaphthalene	36400	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	25 J	21 J	19000	49 J	40 J	360 U	180 J	5100 UJ
Acenaphthene	50000	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	23 J	340 U	4500 J	620 U	380 U	360 U	560 J	5100 UJ
Anthracene	50000	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	22 J	340 U	2900 J	620 U	22 J	360 U	670 J	5100 UJ
Benzo(a)anthracene	224	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	81 J	40 J	1000 J	44 J	54 J	92 J	[illegible]	[illegible]
Benzo(a)pyrene	61	NYSDEC TAG	UG/KG	500000 U		43 J	42 J	70 J	45 J	770 J	61 J	54 J	98 J	1500 J	400 J
Benzo(b)fluoranthene	1100	NYSDEC TAG	UG/KG	500000 U		120 J	110 J	91 J	130 J	500 J	73 J	47 J	99 J	1600 J	750 J
Benzo(g,h,i)perylene	50000	NYSDEC TAG	UG/KG	500000 U		74 J	720 UJ	360 U	120 J	870 J	620 U	380 U	61 J	360 J	5100 UJ
Benzo(k)fluoranthene	1100	NYSDEC TAG	UG/KG	500000 U		800 UJ	720 UJ	73 J	77 J	630 J	60 J	50 J	92 J	[redacted]	630 J
Butylbenzylphthalate	50000	NYSDEC TAG	UG/KG	54000 J		55 J	720 U	360 U	340 U	5700 U	620 U	380 U	360 UR	2600 UJ	5100 UJ
Carbazole			UG/KG	500000 U		800 U	720 U	24 J	340 U	5700 U	620 U	36 J	21 J	740 J	5100 UJ
Chrysene	400	NYSDEC TAG	UG/KG	500000 U		96 J	73 J	110 J	150 J	1400 J	74 J	120 J	110 J	1900 J	880 J
Di-n-butylphthalate	8100	NYSDEC TAG	UG/KG	950000		190 J	210 J	360 U	340 U	5700 U	620 U	50 J	710 UJ	2600 UJ	5100 UJ
Dibenz(a,h)anthracene	14	NYSDEC TAG	UG/KG	500000 U		800 UJ	720 UJ	360 U	38 J	900 J	620 U	380 U	360 U	2600 UJ	5100 UJ
Dibenzofuran	6200	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	360 U	46 J	1500 J	620 U	22 J	360 U	390 J	5100 UJ
Diethylphthalate	7100	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	360 U	340 U	530 J	620 U	380 U	360 U	2600 UJ	5100 UJ
Fluoranthene	50000	NYSDEC TAG	UG/KG	500000 U		110 J	99 J	160 J	920	3100 J	140 J	120 J	210 J	3900 J	630 J
Fluorene	50000	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	25 J	340 U	6100	620 U	380 U	360 U	560 J	5100 UJ
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAG	UG/KG	500000 U		51 J	720 UJ	360 U	92 J	450 J	620 U	380 U	39 J	400 J	5100 UJ
N-Nitrosodiphenylamine (1)			UG/KG	200000 J		800 U	720 U	360 U	340 U	5700 U	620 U	380 U	450	2600 UJ	5100 UJ
Naphthalene	13000	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	360 U	43 J	1600 J	620 U	19 J	360 U	410 J	5100 UJ
Pentachlorophenol	1000	NYSDEC TAG	UG/KG	1200000 U		220 J	1700 U	880 U	830 U	14000 U	1500 U	920 U	870 U	6300 UJ	12000 UJ
Phenanthrene	50000	NYSDEC TAG	UG/KG	500000 U		64 J	720 U	130 J	550	22000	120 J	100 J	110 J	4100 J	360 J
Phenol	30	NYSDEC TAG	UG/KG	500000 U		800 U	720 U	81 J	340 U	37000	150 J	380 U	360 U	2600 UJ	5100 UJ
Pyrene	50000	NYSDEC TAG	UG/KG	500000 U		95 J	130 J	200 J	570	5000 J	120 J	130 J	160 J	3200 J	720 J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAG	UG/KG	500000 U		800 U	800 U	360 U	340 U	5700 U	440 J	5000 J	52 J	500 J	1300 J
PESTICIDES/PCB															
4,4'-DDD	2900	NYSDEC TAG	UG/KG	1000 U		8 U	7.2 U	5.2 J	3.1 J	9.2 U	12 U	35 J	3.6 U	39 UJ	76 UJ
4,4'-DDE	2100	NYSDEC TAG	UG/KG	1000 U		6.3 J	7.3 J	13 J	17 J	73 J	17	750	6.3 J	97 J	180 J
4,4'-DDT	2100	NYSDEC TAG	UG/KG	940 J		53	61	8.1 J	6.1 J	61 J	140	610	7.2	360 J	870 J
Aroclor-1254	10000	NYSDEC TAG	UG/KG	10000 U		100 J	120	36 J	56	130	120 U	75 U	36 U	360 J	1400 J
Aroclor-1260	10000	NYSDEC TAG	UG/KG	10000 U		45 J	61 J	37	51	97	120 U	89	36 U	390 UJ	630 J
Dieldrin	44	NYSDEC TAG	UG/KG	1000 U		8 U	7.2 U	4.2 J	3.4 U	9.2 U	12 U	7.5 U	3.6 U	28 J	76 UJ
Endosulfan I	900	NYSDEC TAG	UG/KG	540 U		3.3 J	3.7 U	1.9 U	1.8 U	4.7 U	6.4 U	3.9 U	1.8 U	22 J	39 UJ
Endosulfan II	900	NYSDEC TAG	UG/KG	1000 U		8 U	7.2 U	3.6 U	3.4 J	5.7 J	12 U	3.9 J	3.6 U	39 UJ	76 UJ
Endrin	100	NYSDEC TAG	UG/KG	1000 U		8 U	7.2 U	3.6 U	3.4 U	9.2 J	12 U	7.5 U	3.6 U	39 UJ	76 UJ
Heptachlor epoxide	20	NYSDEC TAG	UG/KG	540 U		4.1 U	3.7 U	1.9 U	1.8 U	2.6 J	6.4 U	3.9 U	1.8 U	20 UJ	39 UJ
alpha-BHC	110	NYSDEC TAG	UG/KG	540 U		3.7 J	2 J	1.9 U	1.8 U	4.7 U	6.4 U	3.9 U	1.8 U	20 UJ	39 UJ
alpha-Chlordane			UG/KG	540 U		3.8 J	3.7 J	1.2 J	2.1 J	3.8 J	6.4 U	3.1 J	1.8 U	13 J	47 J
gamma-BHC (Lindane)	60	NYSDEC TAG	UG/KG	540 U		4.1 U	3.7 U	0.93 J	1.8 U	4.7 U	6.4 U	3.9 U	1.8 U	20 UJ	39 UJ
gamma-Chlordane	540	NYSDEC TAG	UG/KG	540 U		2.3 J	2.3 J	1.9 U	2.1 J	4.6 J	6.4 U	2.9 J	1.8 U	12 J	36 J

Table A-1a
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Materials Analytical Results

			LOC_ID	BS-10		BS-11		FS-50		FS-50		FS16-1		FS16-2		FS16-3		FS16-4		FS16-5		FS16-6		FS16-7		FS16-8	
			SAMP ID	16024		16022		16023		16028		FS16-1-1		FS16-2-1		FS16-3-1		FS16-4-1		FS16-5-1		FS16-6-1		FS16-7-1		FS16-8-1	
			QC CODE	SA		SA		SA		DU		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP																								
			BOTTOM																								
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE	8/8/1996		8/8/1996		8/8/1996		8/8/1996		12/6/1993		12/6/1993		12/6/1993		12/6/1993		12/6/1993		12/6/1993		12/6/1993		12/6/1993	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																											
Amosite Asbestos			%, +-5%																								
Chrysotile Asbestos			%																								
Chrysotile Asbestos			%, +-5%																								
Chrysotile Asbestos			%, +-2.5%																								
Chrysotile Asbestos			%, > THAN																								
Nitrate/Nitrite-Nitrogen			MG/KG	14200				539		638		151		13.7		0.21		0.27		2		104		0.89		0.05	
Percent Moisture (PEST/PCB)				8				59		54																	
Percent Moisture (SVOCs)				8				58		54																	
Percent Moisture (VOCs)				6				60		54																	
Percent Solids (Metals)				91.5		72.5		41.2		45.8																	
NITROAROMATICS																											
1,3,5-Trinitrobenzene			UG/KG	120000	U	620000	U	1200	U	220	J	130	U	130	UJ	130	U	130	U	130	U	130	U	130	UJ	130	UJ
2,4,6-Trinitrotoluene			UG/KG	120000	U	620000	U	1200	U	120	U	170	J	130	UJ	130	U	130	U	130	U	130	U	130	UJ	130	UJ
2,4-Dinitrotoluene			UG/KG	3700000		19000000		36000		4600	J	130	U	72	J	130	U	2900		130	U	610		3100	J	610	J

Table A-1a
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Materials Analytical Results

PARAMETER	LEVEL	SOURCE	LOC_ID:	BS-10	BS-11	FS-50	FS-50	FS16-1	FS16-2	FS16-3	FS16-4	FS16-5	FS16-6	FS16-7	FS16-8
			SAMP ID:	16024	16022	16023	16028	FS16-1-1	FS16-2-1	FS16-3-1	FS16-4-1	FS16-5-1	FS16-6-1	FS16-7-1	FS16-8-1
			QC CODE:	SA	SA	SA	DU	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
			TOP:												
			BOTTOM:												
			MATRIX:	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS	SOLIDS
			SAMPLE DATE:	8/8/1996	8/8/1996	8/8/1996	8/8/1996	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993	12/6/1993
			UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
METALS															
Aluminum	14593	NYSDEC TAG	MG/KG	13600 R	1380 R	4590 R	9580 R	9540	16500	6610	9550	2960	11300	7960 J	13700 J
Antimony	3.59	NYSDEC TAG	MG/KG	32.5 J	82.4 J	322 J	1050 J	4.6 U	1250	1560	31.5	11.9 J	11.2 J	21.8 J	[illegible] J
Arsenic	7.5	NYSDEC TAG	MG/KG	9.1 J	1.3 J	6.7 J	13.6 J	3.4	47.3	26.9	7.1	1.9	6.5	8 J	15.9 J
Barium	300	NYSDEC TAG	MG/KG	40500 J	3520 J	225 J	381 J	145	15600	6950	466	88.2	289	392 J	2110 J
Beryllium	0.73	NYSDEC TAG	MG/KG	0.16	0.04 U	0.28	0.72	0.51 J	0.09 J	0.08 U	1.1 J	0.19 J	0.49 J	0.32 J	0.27 J
Cadmium	1	NYSDEC TAG	MG/KG	54.6	0.41	0.94	1.5	22.2 R	36.8 R	156 R	1 R	3	1.2	72.8 J	127 J
Calcium	101904	NYSDEC TAG	MG/KG	5390	586	85900	107000	19800	13800	21200	23000	215000	41800	41600 J	67400 J
Chromium	22.13	NYSDEC TAG	MG/KG	518	4.3	36.7	60.7	15.8	[illegible]	[illegible]	6.4	33.2 R	21.3 R	22.1 R	174 R
Cobalt	30	NYSDEC TAG	MG/KG	26.3	2.7	6.8	10.9	15	20.9	9.7 J	3.3 J	5.6 J	9.9	6 J	[illegible] J
Copper	25	NYSDEC TAG	MG/KG	16200	5360	99.1	130	211 J	34900 J	81400 J	129 J	90 J	198 J	[illegible] J	757 J
Cyanide	0.3	NYSDEC TAG	MG/KG	24.2 J	9.7 J	1 UJ	1 UJ	1.1	1.4	0.74 U	1 U	0.61 U	0.58 U	2.3 J	4.4 J
Iron	26627	NYSDEC TAG	MG/KG	79200 J	2690 J	59200 J	79700 J	19700	49300	30500	8420	41300	25000	17200 J	48600 J
Lead	21.86	NYSDEC TAG	MG/KG	4180	132	391	420	810	437000	527000	996	309	865	1560 J	12100 J
Magnesium	12222	NYSDEC TAG	MG/KG	8450	3370	8500	15300	4850	16400	19700	2470	15700	16400	10500 J	[illegible] J
Manganese	669.38	NYSDEC TAG	MG/KG	507	27.3	574	1040	488 J	334 J	214 J	194 J	480	456	301 J	458 J
Mercury	0.1	NYSDEC TAG	MG/KG	24.9	0.07 U	0.12 U	0.11	0.81	39.3	1.8	0.34	0.1	1.2	2.4 J	3.7 J
Nickel	33.62	NYSDEC TAG	MG/KG	154	2.1	20.9	60.1	21.1	119	66.8	7.9 J	18.8	30.5	21.5 J	[illegible] J
Potassium	1761.5	NYSDEC TAG	MG/KG	[illegible]	[illegible]	3770	4980	[illegible]	1570	636 J	1550 J	704 J	1480	1430 J	1360 J
Selenium	2	NYSDEC TAG	MG/KG	1.6	0.95	1.3	2.1	5.8 J	1.3 UJ	1.6 UJ	0.26 UJ	0.13 UJ	0.72 J	1.6 J	0.91 J
Silver	0.4	NYSDEC TAG	MG/KG	3.6	0.62	0.29 U	0.46 U	0.9 U	13.4	22.7	1.5 U	0.73 U	0.8 U	1.3 UJ	1.7 UJ
Sodium	103.74	NYSDEC TAG	MG/KG	3090 J	63.1 J	3460 J	4440 J	3690	2650	152 J	365 J	[illegible]	200 J	97.9 J	[illegible] J
Thallium	0.28	NYSDEC TAG	MG/KG	0.84 U	0.57 U	1 U	1.6 U	0.38 J	2.2 UJ	1.4 J	0.44 UJ	0.22 U	0.25 U	0.45 UJ	0.39 UJ
Vanadium	150	NYSDEC TAG	MG/KG	20.4 J	0.5	5.6	12.2	17.7	12.9	6.2 J	7 J	8.3 J	18.3	20.6 J	44 J
Zinc	82.5	NYSDEC TAG	MG/KG	42600	1640	334	495	715 J	13400 J	35700 J	178 J	318	293	1310 J	[illegible] J
HERBICIDES															
2,4,5-T	1900	NYSDEC TAG	UG/KG					3.9 J	5.2 U	6.9 U	9.4 U	5.8 U	5.5 U	12 UJ	13 J
2,4,5-TP (Silvex)			UG/KG					7.9 J	5.2 U	6.9 U	9.4 U	5.8 U	5.5 U	12 UJ	12 UJ
2,4-D	500	NYSDEC TAG	UG/KG					55 U	52 U	69 U	94 U	58 U	55 U	120 UJ	160 J
2,4-DB			UG/KG					130 J	52 U	69 U	94 U	58 U	55 U	120 UJ	120 UJ
Dichloroprop			UG/KG					61 J	52 U	69 U	94 U	58 U	55 U	120 UJ	120 UJ
MCPA			UG/KG					6000 J	5200 U	6900 U	9400 U	5800 U	5500 U	12000 UJ	12000 UJ
MCPP			UG/KG					22000 J	5200 U	6900 U	9400 U	5800 U	5500 U	12000 UJ	12000 UJ

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC ID:	AS16-1		AS16-10		AS16-11		AS16-12		AS16-13		AS16-14	
			SAMP ID:	AS16-1		AS16-10		AS16-11		AS16-12		AS16-13		AS16-14	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:									0		0	
			BOTTOM:									0.2		0.2	
			MATRIX:	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE:												
OTHER ANALYSES															
Amosite Asbestos			%, +-5%	40		1	U	1	U	1	U	1	U	1	U
Chrysotile Asbestos			%	20		0.5	U	1	U	1	U	1	U	1	U
Chrysotile Asbestos			%, +-5%												
Chrysotile Asbestos			%, +-2.5%												
Chrysotile Asbestos			%, < THAN												

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from Rooms 6 and 4, respectively. Samples AS16-5 and AS16-6 were samples of transite from the hallway. Sample AS16-7 was a roofing debris sample collected from the loading platform. Samples AS16-17 and AS16-18 were roofing material samples collected from Rooms 6 and 1, respectively. Samples AS16-27, AS16-28, AS16-29, AS16-30 were collected from Room 4; AS16-27 and AS16-28 were collected from a cardboard box and AS16-29 and AS16-30 were floor tile samples. The location of these samples is shown in Figure 2-2 in RI

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

			LOC ID	AS16-15		AS16-16		AS16-17		AS16-17		AS16-17		AS16-18		AS16-18	
			SAMP ID	AS16-15		AS16-16		AS16-17A		AS16-17B		AS16-17C		AS16-18A		AS16-18B	
			QC CODE	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP	0		0											
			BOTTOM	0.2		0.2											
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE					8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																	
Amosite Asbestos			%, +-5%	1	U	1	U										
Chrysotile Asbestos			%	1	U	1	U	1		0	U	0	U	1		0	U
Chrysotile Asbestos			%, +-5%														
Chrysotile Asbestos			%, +-2.5%														
Chrysotile Asbestos			%, <THAN														

Note. Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

PARAMETER	LEVEL	SOURCE																
			LOC ID	AS16-18		AS16-18		AS16-19		AS16-19		AS16-2		AS16-20		AS16-21	
			SAMP ID	AS16-46A		AS16-46B		AS16-19A		AS16-19B		AS16-2		AS16-20		AS16-21A	
			QC CODE	DU		DU		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUND1	
			TOP														
			BOTTOM														
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE	8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00				8/8/1996 8:00		8/8/1996 8:00	
			UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																	
Amosite Asbestos			%, +-5%									1	U				
Chrysotile Asbestos			%	1		0	U	0	U	0	U	1	U	0	U	0	U
Chrysotile Asbestos			%, +-5%														
Chrysotile Asbestos			%, +-2.5%														
Chrysotile Asbestos			%, < THAN														

Note. Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

PARAMETER	LEVEL	SOURCE	LOC ID: SAMP ID QC CODE STUDY ID TOP BOTTOM MATRIX SAMPLE DATE UNIT	AS16-21 AS16-21B SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-22 AS16-22 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-23 AS16-23 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-24 AS16-24 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-24 AS16-45 DU RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-25 AS16-25 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q
OTHER ANALYSES															
Amosite Asbestos			%, +-5%												
Chrysotile Asbestos			%	0	U	0	U	0	U	0	U	0	U	0	U
Chrysotile Asbestos			%, +-5%												
Chrysotile Asbestos			%, +-2.5%												
Chrysotile Asbestos			%, < THAN												

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

			LOC ID	AS16-26		AS16-27		AS16-28		AS16-29		AS16-29		AS16-29		AS16-3	
			SAMP ID	AS16-26		AS16-27		AS16-28		AS16-29A		AS16-29B		AS16-29C		AS16-3	
			QC CODE	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI	
			TOP														
			BOTTOM														
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE	8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00			
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																	
Amosite Asbestos			%, 1-5%													50	
Chrysotile Asbestos			%	0	U	45		50		1		0	U	0	U	12.5	
Chrysotile Asbestos			%, 1-5%														
Chrysotile Asbestos			%, 1-2.5%														
Chrysotile Asbestos			%, · THAN														

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

			LOC_ID	AS16-30		AS16-30		AS16-30		AS16-31		AS16-32		AS16-33		AS16-34	
			SAMP ID	AS16-30A		AS16-30B		AS16-30C		AS16-31		AS16-32		AS16-33		AS16-34	
			QC CODE	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP														
			BOTTOM														
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE	8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																	
Amosite Asbestos			%, +-5%														
Chrysotile Asbestos			%	1		0	U	0	U	0	U	0	U	0	U	0	U
Chrysotile Asbestos			%, +-5%														
Chrysotile Asbestos			%, +-2.5%														
Chrysotile Asbestos			%, > THAN														

Note. Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

PARAMETER	LEVEL	SOURCE	LOC ID SAMP ID QC CODE STUDY ID TOP BOTTOM MATRIX SAMPLE DATE UNIT	AS16-35 AS16-35 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-36 AS16-36 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-37 AS16-37A SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-37 AS16-37B SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-38 AS16-38 SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-39 AS16-39A SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE	Q	AS16-39 AS16-39B SA RI ROUND1 SOLIDS 8/8/1996 8:00 VALUE
OTHER ANALYSES																
Amosite Asbestos			%, 1-5%													
Chrysotile Asbestos			%		0 U		0 U		0 U		0 U		0 U		0 U	[illegible]
Chrysotile Asbestos			%, 1-5%													
Chrysotile Asbestos			%, 1-2.5%													
Chrysotile Asbestos			%, < THAN													

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC ID	AS16-4		AS16-40		AS16-40		AS16-41		AS16-41		AS16-42		AS16-43	
			SAMP ID	AS16-4		AS16-40		AS16-44		AS16-41A		AS16-41B		AS16-42		AS16-43A	
			QC CODE	SA		SA		DU		SA		SA		SA		SA	
			STUDY ID	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP														
			BOTTOM														
			MATRIX	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE			8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00		8/8/1996 8:00	
OTHER ANALYSES																	
Amosite Asbestos			%, +-5%	1	U												
Chrysotile Asbestos			%	1	U	55		35		0	U	0	U	65		0	U
Chrysotile Asbestos			%, +-5%														
Chrysotile Asbestos			%, +-2.5%														
Chrysotile Asbestos			%, < THAN														

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-1b
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Building Material Analytical Results (Asbestos)

			LOC_ID	AS16-43		AS16-43		AS16-5		AS16-6		AS16-7		AS16-8		AS16-9	
			SAMP ID	AS16-43B		AS16-43C		AS16-5		AS16-6		AS16-7		AS16-8		AS16-9	
			QC CODE	SA		SA		SA		DU		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		ESI		ESI		ESI		ESI		ESI	
			TOP:											0		0	
			BOTTOM											0.2		0.2	
			MATRIX:	SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS		SOLIDS	
			SAMPLE DATE.	8/8/1996 8:00		8/8/1996 8:00											
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OTHER ANALYSES																	
Amosite Asbestos			%, +-5%					1	U	1	U	1	U	1	U	1	U
Chrysotile Asbestos			%	0	U	0	U	30		30		7.5		1	U	1	U
Chrysotile Asbestos			%, +-5%														
Chrysotile Asbestos			%, +-2.5%														
Chrysotile Asbestos			%, > THAN														

Note: Samples AS16-1 and AS16-3 consisted of pipe insulation from R
Samples AS16-5 and AS16-6 were samples of transite from the h
roofing debris sample collected from the loading platform. Samp
roofing material samples collected from Rooms 6 and 1, respectiv
AS16-29, AS16-30 were collected from Room 4; AS16-27 and A
cardboard box and AS16-29 and AS16-30 were floor tile samples.
is shown in Figure 2-2 in RI.

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SB16-1		SB16-3		SB16-3		SB16-4		SS16-1		SS16-10		SS16-11		SS16-12	
			SAMP ID:	16037		16032		16033		16030		SS16-1-1		SS16-10-1		SS16-11-1		SS16-12-1	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/14/1996		8/14/1996		8/14/1996		8/14/1996		10/20/1993		11/9/1993		10/20/1993		10/20/1993	
METER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
TILE ORGANICS																			
2-Tetrachloroethane	600	NYSDEC TAGM	UG/KG	12	U	11	U	10	J	10	U	11	U	11	U	13	U	11	UJ
ne	200	NYSDEC TAGM	UG/KG	7	J	11	U	22	U	10	U	11	U	11	U	13	U	11	UJ
ne	60	NYSDEC TAGM	UG/KG	12	U	11	U	10	U	10	U	11	U	11	U	13	U	11	UJ
n Disulfide	2700	NYSDEC TAGM	UG/KG	12	U	11	U	2	J	10	U	11	U	11	U	13	U	11	UJ
oform	300	NYSDEC TAGM	UG/KG	12	U	11	U	10	U	10	U	11	U	11	U	13	U	11	UJ
lene Chloride	100	NYSDEC TAGM	UG/KG	12	U	11	U	10	U	10	U	11	U	11	U	13	U	3	J
ne	1500	NYSDEC TAGM	UG/KG	12	U	11	U	2	J	10	J	11	U	11	U	13	U	2	J
e (total)	1200	NYSDEC TAGM	UG/KG	12	U	11	U	3	J	10	U	11	U	11	U	13	U	11	UJ
VOLATILE ORGANICS																			
nitrotoluene			UG/KG	420	U	1800	U	3500	U	1100	U	2200	J	1800	U	440	U	360	U
nitrotoluene	1000	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	1100	U	180	J	1800	U	440	U	360	U
hylnaphthalene	36400	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	71	J	710	UR	1800	U	440	U	360	U
ichlorobenzidine			UG/KG	420	U	1800	U	3500	U	1100	U	710	UR	1800	U	440	U	360	U
oaniline	500	NYSDEC TAGM	UG/KG	1000	U	4200	U	8400	U	2800	U	1700	UR	4300	U	1100	U	880	U
phthene	50000	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	72	J	710	UR	1800	U	440	U	360	U
phthylene	41000	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	310	J	70	J	1800	U	440	U	360	U
cene	50000	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	390	J	82	J	1800	U	27	J	360	U
(a)anthracene	224	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	**1800**		**420**	**J**	1800	U	110	J	31	J
(a)pyrene	61	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	**4400**		**560**	**J**	1800	U	**99**	**J**	27	J
(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	**3800**		480	J	1800	U	100	J	31	J
(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	32	J	900	J	340	J	6300		160	J	1800	U	62	J	360	U
(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	**2300**		740	J	1800	U	98	J	34	J
zole			UG/KG	420	U	1800	U	3500	U	100	J	710	UR	1800	U	22	J	360	U
ene	400	NYSDEC TAGM	UG/KG	420	U	96	J	3500	U	**2100**		**500**	**J**	1800	U	130	J	49	J
utylphthalate	8100	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	150	J	1300	J	120	J	250	J	19	J
z(a,h)anthracene	14	NYSDEC TAGM	UG/KG	**26**	**J**	**260**	**J**	**220**	**J**	**1100**	**J**	710	UR	1800	U	440	U	360	U
zofuran	6200	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	1100	U	710	UR	1800	U	440	U	360	U
lphthalate	7100	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	1100	U	710	UR	1800	U	440	U	360	U
nthene	50000	NYSDEC TAGM	UG/KG	420	U	91	J	3500	U	1800		470	J	1800	U	240	J	83	J
ne	50000	NYSDEC TAGM	UG/KG	420	U	1800	U	3500	U	1100	U	710	UR	1800	U	440	U	360	U
(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	32	J	470	J	320	J	**4000**		710	UR	1800	U	30	J	360	U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SB16-1	SB16-3	SB16-3	SB16-4	SS16-1	SS16-10	SS16-11	SS16-12
			SAMP ID:	16037	16032	16033	16030	SS16-1-1	SS16-10-1	SS16-11-1	SS16-12-1
			QC CODE:	SA	SA	DU	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI	ESI	ESI
			TOP:	0	0	0	0	0	0	0	0
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	8/14/1996	8/14/1996	8/14/1996	8/14/1996	10/20/1993	11/9/1993	10/20/1993	10/20/1993
METER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
osodiphenylamine (1)			UG/KG	420 U	1800 U	3500 U	1100 U	680 J	1800 U	22 J	360 U
alene	13000	NYSDEC TAGM	UG/KG	420 U	1800 U	3500 U	180 J	710 UR	1800 U	440 U	360 U
hlorophenol	1000	NYSDEC TAGM	UG/KG	1000 U	4200 U	8400 U	2800 U	1700 UR	4300 U	1100 U	880 U
threne	50000	NYSDEC TAGM	UG/KG	420 U	1800 U	3500 U	620 J	140 J	1800 U	130 J	45 J
	50000	NYSDEC TAGM	UG/KG	420 U	1800 U	3500 U	2100	980 J	1800 U	200 J	66 J
Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	30 J	1800 U	3500 U	67 J	710 UR	1800 U	540 J	360 U
CIDES/PCB											
D	2900	NYSDEC TAGM	UG/KG	4.2 U	3.5 U	3.5 U	35 U	5 J	3.6 UJ	4.4 U	3.6 U
E	2100	NYSDEC TAGM	UG/KG	4.2 U	2 J	3.5 U	35 U	19 J	3.6 UJ	15 J	38
T	2100	NYSDEC TAGM	UG/KG	4.2 U	3.5 U	3.5 U	35 U	12 J	3.6 UJ	6.3 J	5
	41	NYSDEC TAGM	UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U
r-1254	10000	NYSDEC TAGM	UG/KG	42 U	35 U	35 U	350 U	30 UJ	36 UJ	44 U	36 U
r-1260	10000	NYSDEC TAGM	UG/KG	42 U	35 U	35 U	350 U	35 U	36 UJ	110	36 U
n	44	NYSDEC TAGM	UG/KG	4.2 U	3.5 U	3.5 U	26 J	3.5 UJ	3.6 UJ	4.4 U	3.6 U
lfan I	900	NYSDEC TAGM	UG/KG	1.4 U	1.2 U	1.8 U	25 J	14 J	1.8 UJ	2.3 U	1.4 J
lfan II	900	NYSDEC TAGM	UG/KG	4.2 U	3.5 U	3.5 U	35 U	4.4 J	3.6 UJ	4.4 U	3.6 U
lfan sulfate	1000	NYSDEC TAGM	UG/KG	4.2 U	3.5 U	3.5 U	35 U	3.5 UJ	3.6 UJ	4.4 U	3.6 U
	100	NYSDEC TAGM	UG/KG	2.2 U	3.5 U	3.5 U	35 U	3.5 UJ	3.6 UJ	4.4 U	3.6 U
aldehyde			UG/KG	4.2 U	3.5 U	3.5 U	35 U	3 J	3.6 UJ	6.5 J	3.6 U
ketone			UG/KG	4.2 U	3.5 U	3.5 U	35 U	3.4 J	3.6 UJ	4.4 U	3.6 U
hlor	100	NYSDEC TAGM	UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U
hlor epoxide	20	NYSDEC TAGM	UG/KG	1.6 J	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.6 J
nene			UG/KG	220 U	180 U	180 U	1800 U	180 UJ	180 UJ	230 U	190 U
Chlordane			UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U
HC	200	NYSDEC TAGM	UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U
-BHC (Lindane)	60	NYSDEC TAGM	UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U
-Chlordane	540	NYSDEC TAGM	UG/KG	2.2 U	1.8 U	1.8 U	18 U	1.8 UJ	1.8 UJ	2.3 U	1.9 U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SB16-1	SB16-3	SB16-3	SB16-4	SS16-1	SS16-10	SS16-11	SS16-12
			SAMP ID:	16037	16032	16033	16030	SS16-1-1	SS16-10-1	SS16-11-1	SS16-12-1
			QC CODE:	SA	SA	DU	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI	ESI	ESI
			TOP:	0	0	0	0	0	0	0	0
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	8/14/1996	8/14/1996	8/14/1996	8/14/1996	10/20/1993	11/9/1993	10/20/1993	10/20/1993
METER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
R ANALYSES											
/Nitrite-Nitrogen			MG/KG	2.2	0.01	0.01	0.02	0.05	0.07	0.23	0.04
Moisture (PEST/PCB)				22	6	5	5				
Moisture (SVOCs)				22	6	5	4				
Moisture (VOCs)				18	6	5	5				
Solids (Metals)				78	93.8	94.6	95.4				
rganic Carbon			MG/KG								
)AROMATICS											
itrotoluene			UG/KG	120 U	6800 J	280 J	2200	320	130 U	130 U	130 U
itrotoluene	1000	NYSDEC TAGM	UG/KG	120 U	250 U	120 U	130 J	130 U	130 U	130 U	130 U
o-4,6-Dinitrotoluene			UG/KG	120 U	250 U	120 U	120 U	130 U	130 U	130 U	130 U
			UG/KG	120 U	250 U	120 U	120 U	130 U	130 U	130 U	130 U
LS											
um	14592.84	NYSDEC TAGM	MG/KG	19700 R	12500 R	11700 R	5100 R	6550	9720	**17200**	10400
ny	3.59	NYSDEC TAGM	MG/KG	0.42 UJ	0.39 UJ	0.38 UJ	1.6 J	**17.1**	6.6 U	13.9 U	6.6 U
	7.5	NYSDEC TAGM	MG/KG	5 J	4 J	3.8 J	3 J	4.9	5.2 J	**7.7**	5.2
	300	NYSDEC TAGM	MG/KG	198 J	67.6 J	61.5 J	44.4 J	102	33.6	195	52
um	0.73	NYSDEC TAGM	MG/KG	0.72	0.41	0.38	0.08	0.32 J	0.36 J	**0.91 J**	0.46 J
um	1	NYSDEC TAGM	MG/KG	0.36	0.06 U	0.06 U	0.18	0.44 U	0.41 UR	0.87 U	0.41 U
n	101903.8	NYSDEC TAGM	MG/KG	6180	30600	45500	76600	**147000**	13800	9820	30300
um	22.13	NYSDEC TAGM	MG/KG	**24.7**	21.2	20.5	8.6	12.6	13.9	**25.5**	19.2
	30	NYSDEC TAGM	MG/KG	14.9 J	12.6 J	13 J	4.6	6.2 J	7.6	16.7	10.6
	25	NYSDEC TAGM	MG/KG	19 J	**35.6 J**	**33 J**	**39.7 J**	**44**	**29 J**	**199**	**54.8**
:	0.3	NYSDEC TAGM	MG/KG	0.55 UJ	0.52 UJ	0.5 UJ	0.47 UJ	0.64 U	0.53 U	0.69 U	0.64 U
	26626.65	NYSDEC TAGM	MG/KG	**31900 J**	**27100 J**	25600 J	10900 J	12300	23200	**30600**	22700
	21.86	NYSDEC TAGM	MG/KG	**21.9 J**	**65.9 J**	**51.7 J**	**193 J**	**269**	16.1	**616**	**195**
ium	12221.77	NYSDEC TAGM	MG/KG	4380	8010	9320	**24900**	**34900**	5500	5200	5830
iese	669.38	NYSDEC TAGM	MG/KG	**1060**	397 J	409 J	417 J	355 J	342	**706 J**	329 J
y	0.1	NYSDEC TAGM	MG/KG	**0.1 J**	0.05 U	0.04 J	**0.51 J**	**0.2**	0.02 U	**0.73**	**0.24**
	33.62	NYSDEC TAGM	MG/KG	30 J	**40.3 J**	**39.7 J**	12.3 J	23	22.4	**35.2**	**39.5**
um	1761.48	NYSDEC TAGM	MG/KG	1710	1690	1590	1060	1290	813	1600	1080

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SB16-1		SB16-3		SB16-3		SB16-4		SS16-1		SS16-10		SS16-11		SS16-12	
			SAMP ID:	16037		16032		16033		16030		SS16-1-1		SS16-10-1		SS16-11-1		SS16-12-1	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/14/1996		8/14/1996		8/14/1996		8/14/1996		10/20/1993		11/9/1993		10/20/1993		10/20/1993	
METER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
ium	2	NYSDEC TAGM	MG/KG	1.5	J	0.82	J	0.45	UJ	0.44	UJ	0.15	UJ	0.22	UJ	0.24	UJ	0.25	J
	0.4	NYSDEC TAGM	MG/KG	0.3		0.25	U	0.25	U	0.24		0.9	U	0.84	UJ	1.8	U	0.84	U
m	103.74	NYSDEC TAGM	MG/KG	55.8	U	76.6		99.2		53.4		**213**	**J**	49.7	J	72.2	J	**108**	**J**
ium	0.28	NYSDEC TAGM	MG/KG	**1.8**		0.82	U	0.79	U	**0.77**		1.6	U	0.24	UJ	0.26	U	0.25	U
dium	150	NYSDEC TAGM	MG/KG	33.6	J	22.4	J	20.4	J	11.2	J	36.9		16.9		28.8		15	
	82.5	NYSDEC TAGM	MG/KG	**99.8**		**84.5**		79.8		**90.4**		**219**		65.8	J	**1270**		**89**	
BICIDES																			
T	1900	NYSDEC TAGM	UG/KG									5.4	U	5.4	U	6.7	U	5.5	U
P			UG/KG									5400	U	5400	U	6700	U	5500	U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-14	SS16-15	SS16-16	SS16-17	SS16-18	SS16-19	SS16-2	SS16-20	S
			SAMP ID:	SS16-14-1	SS16-15-1	SS16-16-1	16040	16041	16042	SS16-2-1	16043	
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA	
			STUDY_ID:	ESI	ESI	ESI	RI ROUND1	RI ROUND1	RI ROUND1	ESI	RI ROUND1	RI
			TOP:	0	0	0	0	0	0	0	0	
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SU
			SAMPLE DATE:	10/20/1993	10/20/1993	10/20/1993	8/19/1996	8/19/1996	8/19/1996	10/20/1993	8/19/1996	8/
AMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	V
ATILE ORGANICS												
2-Tetrachloroethane	600	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	12 U	12 U	10 UJ	12 U	11 UJ	
ne	200	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	6 U	8 U	10 UJ	12 U	11 UJ	
ene	60	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	12 U	12 U	10 UJ	12 U	2 J	
n Disulfide	2700	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	12 U	12 U	10 UJ	1 J	11 UJ	
oform	300	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	6 U	6 U	5 UJ	12 U	5 UJ	
lene Chloride	100	NYSDEC TAGM	UG/KG	3 J	11 UJ	11 U	12 U	12 U	10 UJ	12 U	11 UJ	
ne	1500	NYSDEC TAGM	UG/KG	1 J	11 UJ	11 U	12 U	12 U	2 J	12 U	3 J	
e (total)	1200	NYSDEC TAGM	UG/KG	11 U	11 UJ	11 U	12 U	12 U	10 UJ	12 U	11 UJ	
VOLATILE ORGANICS												
initrotoluene			UG/KG	370	350 U	1800 UJ	390 U	420 U	340 U	760	58 J	
initrotoluene	1000	NYSDEC TAGM	UG/KG	56 J	350 U	1800 UJ	390 U	420 U	340 U	410 U	350 U	
hylnaphthalene	36400	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	350 J	350 U	
ichlorobenzidine			UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	410 U	350 U	
oaniline	500	NYSDEC TAGM	UG/KG	890 U	860 U	4500 UJ	950 U	1000 U	820 U	1000 U	850 U	
phthene	50000	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	410 U	350 U	
phthylene	41000	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	65 J	350 U	
acene	50000	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	55 J	350 U	
(a)anthracene	224	NYSDEC TAGM	UG/KG	26 J	350 U	1800 UJ	390 U	420 U	340 U	**260 J**	26 J	
(a)pyrene	61	NYSDEC TAGM	UG/KG	24 J	350 U	1800 UJ	22 J	420 U	340 U	**300 J**	34 J	
(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	33 J	350 U	1800 UJ	21 J	420 U	20 J	500	32 J	
(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	19 J	350 U	1800 UJ	390 U	420 U	340 U	130 J	350 U	
(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	30 J	350 U	1800 UJ	22 J	420 U	16 J	310 J	32 J	
zole			UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	48 J	350 U	
ene	400	NYSDEC TAGM	UG/KG	44 J	16 J	1800 UJ	22 J	19 J	24 J	**470**	37 J	
utylphthalate	8100	NYSDEC TAGM	UG/KG	76 J	350 U	1800 UJ	390 U	420 U	340 U	710	350 U	
z(a,h)anthracene	14	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	410 U	32 U	
zofuran	6200	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	100 J	350 U	
lphthalate	7100	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	19 J	16 J	410 U	350 U	
nthene	50000	NYSDEC TAGM	UG/KG	68 J	23 J	1800 UJ	37 J	28 J	39 J	580	43 J	
ne	50000	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	410 U	350 U	
(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	30 J	350 U	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SS16-14	SS16-15	SS16-16	SS16-17	SS16-18	SS16-19	SS16-2	SS16-20	SS
			SAMP ID:	SS16-14-1	SS16-15-1	SS16-16-1	16040	16041	16042	SS16-2-1	16043	1
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA	
			STUDY ID:	ESI	ESI	ESI	RI ROUND1	RI ROUND1	RI ROUND1	ESI	RI ROUND1	RI R
			TOP:	0	0	0	0	0	0	0	0	
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SUR S
			SAMPLE DATE:	10/20/1993	10/20/1993	10/20/1993	8/19/1996	8/19/1996	8/19/1996	10/20/1993	8/19/1996	8/2
METER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	V/
osodiphenylamine (1)			UG/KG	17 J	350 U	1800 UJ	390 U	420 U	340 U	150 J	350 U	
alene	13000	NYSDEC TAGM	UG/KG	370 U	350 U	1800 UJ	390 U	420 U	340 U	230 J	350 U	
alorophenol	1000	NYSDEC TAGM	UG/KG	890 U	860 U	4500 UJ	950 U	1000 U	820 U	1000 U	850 U	
threne	50000	NYSDEC TAGM	UG/KG	36 J	25 J	1800 UJ	19 J	420 U	29 J	420	27 J	
	50000	NYSDEC TAGM	UG/KG	54 J	19 J	1800 UJ	26 J	22 J	30 J	520	41 J	
thylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	370 J	350 U	1800 UJ	24 U	26 U	84 U	410 U	200 U	
CIDES/PCB												
D	2900	NYSDEC TAGM	UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
E	2100	NYSDEC TAGM	UG/KG	59	28 J	38	3.9 U	4.2 U	14	9.4 J	37	
T	2100	NYSDEC TAGM	UG/KG	19	2.1 J	89	3.9 U	4.2 U	1.8 J	8.1 J	6.7	
	41	NYSDEC TAGM	UG/KG	3.8 U	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
-1254	10000	NYSDEC TAGM	UG/KG	73 U	35 U	74 U	39 U	42 U	34 U	41 UR	35 U	
-1260	10000	NYSDEC TAGM	UG/KG	73 U	22 J	74 U	39 U	42 U	34 U	41 UR	35 U	
n	44	NYSDEC TAGM	UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
lfan I	900	NYSDEC TAGM	UG/KG	3.8 U	0.96 J	3.8 U	2 U	2.2 U	2 J	3.4 J	1.8 U	
lfan II	900	NYSDEC TAGM	UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
lfan sulfate	1000	NYSDEC TAGM	UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
	100	NYSDEC TAGM	UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
aldehyde			UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
ketone			UG/KG	7.3 U	3.5 U	7.4 U	3.9 U	4.2 U	3.4 U	4.1 UR	3.5 U	
hlor	100	NYSDEC TAGM	UG/KG	3.8 U	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
hlor epoxide	20	NYSDEC TAGM	UG/KG	3.8 U	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
ene			UG/KG	380 U	180 U	380 U	200 U	220 U	170 U	210 UR	180 U	
hlordane			UG/KG	4.8	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
IC	200	NYSDEC TAGM	UG/KG	3.8 U	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
-BHC (Lindane)	60	NYSDEC TAGM	UG/KG	3.8 U	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	
-Chlordane	540	NYSDEC TAGM	UG/KG	3.4 J	1.8 U	3.8 U	2 U	2.2 U	1.7 U	2.1 UR	1.8 U	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-14	SS16-15	SS16-16	SS16-17	SS16-18	SS16-19	SS16-2	SS16-20	SS
			SAMP ID:	SS16-14-1	SS16-15-1	SS16-16-1	16040	16041	16042	SS16-2-1	16043	1
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA	
			STUDY ID:	ESI	ESI	ESI	RI ROUND1	RI ROUND1	RI ROUND1	ESI	RI ROUND1	RI R
			TOP:	0	0	0	0	0	0	0	0	
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SU S
			SAMPLE DATE:	10/20/1993	10/20/1993	10/20/1993	8/19/1996	8/19/1996	8/19/1996	10/20/1993	8/19/1996	8/2
METER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	V.
R ANALYSES												
/Nitrite-Nitrogen			MG/KG	0.05	0.04	0.2	1.4	0.49	0.04	0.9	0.11	
t Moisture (PEST/PCB)							16	21	2		6	
t Moisture (SVOCs)							16	21	2		6	
t Moisture (VOCs)							19	17	4		6	
t Solids (Metals)							84	79.3	97.7		94	
Organic Carbon			MG/KG									
DAROMATICS												
nitrotoluene			UG/KG	1200	130 U	150	74000	120 U	220	500	310	
nitrotoluene	1000	NYSDEC TAGM	UG/KG	130 U	130 U	130 U	2500 U	120 U	120 U	130 U	120	
o-4,6-Dinitrotoluene			UG/KG	130 U	130 U	130 U	2500 U	120 U	120 U	130 U	120 U	
			UG/KG	130 U	130 U	130 U	2500 U	120 U	120 U	130 U	120 U	
LS												
num	14592.84	NYSDEC TAGM	MG/KG	7680	7510	6310	10200 J	13600 J	9670 J	6340	14100 J	
ony	3.59	NYSDEC TAGM	MG/KG	**8.4**	6.2 U	9 U	2.9 J	2.5 J	3.5 J	**55.6**	**9.9 J**	
:	7.5	NYSDEC TAGM	MG/KG	**9.9**	4.8	3.8	4.7 J	4.1 J	4.5 J	**16.6**	5.2 J	
	300	NYSDEC TAGM	MG/KG	211	35.1	56.6	168 J	148 J	124 J	**1200**	175 J	
um	0.73	NYSDEC TAGM	MG/KG	0.41 J	0.34 J	0.37 J	0.24	**0.75**	0.37	0.42 J	0.52	
um	1	NYSDEC TAGM	MG/KG	0.61 J	0.39 U	0.56 U	0.45	0.25	0.36	1.6 R	0.49	
n	101903.8	NYSDEC TAGM	MG/KG	**178000**	26800	**135000**	7470	5200	**113000**	11700	36300	
ium	22.13	NYSDEC TAGM	MG/KG	14.4	15.6	14.1	16	19.9	20.4	16.5	**29.1**	
	30	NYSDEC TAGM	MG/KG	8.2	8.1	10.4	9.3	7.9	12.7 J	6.7 J	16.1 J	
	25	NYSDEC TAGM	MG/KG	**163**	**42.6**	**69.2**	**74.4 J**	**60.1 J**	**99.4 J**	**911**	**207 J**	
e	0.3	NYSDEC TAGM	MG/KG	0.64 U	0.63 U	0.67 U	0.59 U	0.53 U	0.51 U	0.74 U	0.49 U	
	26626.65	NYSDEC TAGM	MG/KG	16500	17500	11700	19700 J	22700 J	21900 J	25900	**30600 J**	
	21.86	NYSDEC TAGM	MG/KG	**720**	**210**	**643**	**304 J**	**187 J**	**669 J**	**3780**	**1370 J**	
sium	12221.77	NYSDEC TAGM	MG/KG	5990	4770	**56000**	3520	3190	10100	4400	8330	
nese	669.38	NYSDEC TAGM	MG/KG	270 J	227 J	310 J	**948**	353	413	178 J	417	
y	0.1	NYSDEC TAGM	MG/KG	0.07 J	0.05 J	0.04 J	**1.2 J**	**0.77 J**	0.04 U	**4**	**0.13 J**	
	33.62	NYSDEC TAGM	MG/KG	29.4	30.5	28.5	22.7 J	20.3 J	**38.8 J**	21.7	**55.6 J**	
um	1761.48	NYSDEC TAGM	MG/KG	1100	802	**2300**	1170	1150	**1840**	673 J	**2020**	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-14		SS16-15		SS16-16		SS16-17		SS16-18		SS16-19		SS16-2		SS16-20	
			SAMP ID:	SS16-14-1		SS16-15-1		SS16-16-1		16040		16041		16042		SS16-2-1		16043	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/20/1993		10/20/1993		10/20/1993		8/19/1996		8/19/1996		8/19/1996		10/20/1993		8/19/1996	
METER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
um	2	NYSDEC TAGM	MG/KG	0.41	J	0.22	UJ	0.21	UJ	0.59		0.93		0.47		0.4	J	0.46	U
	0.4	NYSDEC TAGM	MG/KG	0.93	U	0.79	U	1.1	U	0.26		0.32	U	0.31		1.5	U	0.28	
n	103.74	NYSDEC TAGM	MG/KG	**176**	**J**	90.1	J	**240**	**J**	51.8	U	66.2	U	**128**		**121**	**J**	**107**	
um	0.28	NYSDEC TAGM	MG/KG	0.14	U	0.24	U	0.23	U	**1.7**	**J**	**1.1**	**J**	**0.74**	**J**	0.19	U	**0.92**	**J**
ium	150	NYSDEC TAGM	MG/KG	13.4		10.8		61.9		20.1	J	24.5	J	16.5	J	14.5		21.5	J
	82.5	NYSDEC TAGM	MG/KG	**104**		68.6		**93.8**		**107**		**87.5**		**117**		**478**		**174**	
ICIDES																			
	1900	NYSDEC TAGM	UG/KG	8.3		5.4	U	5.6	U							6.3	U		
			UG/KG	5600	U	5400	U	5600	U							6300	U		

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SS16-21		SS16-22		SS16-23		SS16-24		SS16-25		SS16-26		SS16-27		SS16-28	
			SAMP ID:	16059		16049		16051		16060		16050		16046		16047		16044	
			QC CODE:	DU		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/21/1996		8/20/1996		8/20/1996		8/21/1996		8/20/1996		8/20/1996		8/20/1996		8/19/1996	
ETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
LE ORGANICS																			
etrachloroethane	600	NYSDEC TAGM	UG/KG	10	UJ	11	UJ	12	U	10	UJ	11	UJ	11	U	11	U	10	U
	200	NYSDEC TAGM	UG/KG	10	U	11	U	12	U	10	UJ	11	UJ	5	U	11	U	10	U
	60	NYSDEC TAGM	UG/KG	10	UJ	11	U	12	U	2	J	11	UJ	11	U	11	U	10	U
isulfide	2700	NYSDEC TAGM	UG/KG	10	U	11	U	12	U	10	UJ	11	UJ	11	U	11	U	10	U
m	300	NYSDEC TAGM	UG/KG	5	U	6	U	6	U	5	UJ	2	J	5	U	5	U	5	U
e Chloride	100	NYSDEC TAGM	UG/KG	10	U	11	U	12	U	10	UJ	11	UJ	11	U	11	U	10	U
	1500	NYSDEC TAGM	UG/KG	2	J	11	UJ	12	U	4	J	2	J	1	J	3	J	10	U
otal)	1200	NYSDEC TAGM	UG/KG	10	UJ	11	UJ	12	U	10	UJ	11	UJ	11	U	11	U	10	U
LATILE ORGANICS																			
otoluene			UG/KG	19000		95	J	380	U	1800		39	J	870		85000		500	
otoluene	1000	NYSDEC TAGM	UG/KG	**1600**	**J**	360	U	380	U	160	J	340	U	350	U	**8000**	**J**	51	J
aphthalene	36400	NYSDEC TAGM	UG/KG	2900	U	19	J	380	U	76	J	340	U	27	J	14000	U	350	U
orobenzidine			UG/KG	2900	U	360	U	380	U	340	U	340	U	350	U	14000	U	350	U
iline	500	NYSDEC TAGM	UG/KG	7100	U	870	U	920	U	830	U	830	U	850	U	35000	U	840	U
nene	50000	NYSDEC TAGM	UG/KG	2900	U	360	U	380	U	37	J	340	U	64	J	14000	U	350	U
hylene	41000	NYSDEC TAGM	UG/KG	2900	U	19	J	380	U	340	U	340	U	22	J	14000	U	350	U
e	50000	NYSDEC TAGM	UG/KG	2900	U	32	J	380	U	44	J	340	U	120	J	14000	U	350	U
nthracene	224	NYSDEC TAGM	UG/KG	2900	U	190	J	380	U	340	U	26	J	**500**		**1300**	**J**	42	J
yrene	61	NYSDEC TAGM	UG/KG	2900	U	**250**	**J**	380	U	340	U	30	J	**520**		**1500**	**J**	**61**	**J**
luoranthene	1100	NYSDEC TAGM	UG/KG	2900	U	420		380	U	480		28	J	810		**1800**	**J**	84	J
,i)perylene	50000	NYSDEC TAGM	UG/KG	2900	U	210	U	380	U	340	U	24	J	440	U	14000	U	350	U
luoranthene	1100	NYSDEC TAGM	UG/KG	2900	U	290	J	380	U	340	U	33	J	600		**1500**	**J**	65	J
			UG/KG	2900	U	26	J	380	U	41	J	340	U	110	J	14000	U	350	U
	400	NYSDEC TAGM	UG/KG	2900	U	370		380	U	340	U	40	J	**720**		**1600**	**J**	70	J
lphthalate	8100	NYSDEC TAGM	UG/KG	2300	U	32	J	380	U	340	U	340	U	430		**16000**		350	U
h)anthracene	14	NYSDEC TAGM	UG/KG	2900	U	67	U	380	U	**38**	**J**	340	U	100	U	680	U	28	U
ıran	6200	NYSDEC TAGM	UG/KG	2900	U	21	J	380	U	110	J	340	U	33	J	14000	U	350	U
thalate	7100	NYSDEC TAGM	UG/KG	2900	U	360	U	380	U	340	U	340	U	350	U	14000	U	350	U
ene	50000	NYSDEC TAGM	UG/KG	2900	U	420		380	U	520		56	J	1200		3100	J	94	J
	50000	NYSDEC TAGM	UG/KG	2900	U	360	U	380	U	24	J	340	U	67	J	14000	U	350	U
2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	2900	U	210	U	380	U	340	U	22	J	440	U	14000	U	350	U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SS16-21		SS16-22		SS16-23		SS16-24		SS16-25		SS16-26		SS16-27		SS16-28	
			SAMP ID:	16059		16049		16051		16060		16050		16046		16047		16044	
			QC CODE:	DU		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/21/1996		8/20/1996		8/20/1996		8/21/1996		8/20/1996		8/20/1996		8/20/1996		8/19/1996	
ETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
odiphenylamine (1)			UG/KG	1700	J	360	U	380	U	310	J	340	U	950		25000		100	J
ene	13000	NYSDEC TAGM	UG/KG	2900	U	360	U	380	U	24	J	340	U	18	J	14000	U	350	U
rophenol	1000	NYSDEC TAGM	UG/KG	7100	U	870	U	920	U	830	U	830	U	850	U	35000	U	840	U
rene	50000	NYSDEC TAGM	UG/KG	2900	U	160	J	380	U	340	U	25	J	770		1800	J	37	J
	50000	NYSDEC TAGM	UG/KG	2900	U	360		380	U	350		51	J	1000		2200	J	81	J
ylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	2800	U	360	U	380	U	340	U	24	J	1200		14000	U	66	U
IDES/PCB																			
)	2900	NYSDEC TAGM	UG/KG	2	U	5.4	J	3.8	U	8.9	J	3.4	U	23	J	17	J	1.8	J
	2100	NYSDEC TAGM	UG/KG	50		73	J	21		110	J	20		210	J	190	J	20	
	2100	NYSDEC TAGM	UG/KG	32	J	18	J	22		24	J	5.2		340	J	320	J	2.7	J
	41	NYSDEC TAGM	UG/KG	1.8	R	1.8	U	2	U	1.8	R	1.8	U	5	J	1.8	U	1.8	U
1254	10000	NYSDEC TAGM	UG/KG	35	R	36	U	38	U	1100	J	34	U	180	U	280		34	U
1260	10000	NYSDEC TAGM	UG/KG	35	R	55	J	38	U	160	J	34	U	340	J	310	J	34	U
	44	NYSDEC TAGM	UG/KG	3.5	R	3.6	U	3.8	U	2.9	U	2	UJ	18	U	4.3	J	3.4	U
an I	900	NYSDEC TAGM	UG/KG	2.1	J	5.9	J	2.3	J	13	J	1.6	UJ	9	U	21	J	2.2	J
an II	900	NYSDEC TAGM	UG/KG	3.5	R	3.6	U	3.8	U	3.4	R	3.4	U	9.9	U	2.3	J	3.4	U
an sulfate	1000	NYSDEC TAGM	UG/KG	3.5	R	3.6	U	3.8	U	2.8	U	3.4	U	18	U	2.1	J	3.4	U
	100	NYSDEC TAGM	UG/KG	2.1	R	2.2	J	3.8	U	9.1	J	3.1	UJ	17	U	6.4	J	3.4	U
dehyde			UG/KG	1.9	U	3.4	U	3.8	U	4.9	J	3.4	U	15	U	14	J	3.4	U
etone			UG/KG	3.5	R	3.6	U	3.8	U	3.4	R	3.4	U	18	U	3.6	J	3.4	U
or	100	NYSDEC TAGM	UG/KG	1.8	R	1.8	U	2	U	1.8	R	1.8	U	9	U	1.8	U	1.8	U
or epoxide	20	NYSDEC TAGM	UG/KG	1.8	R	1.8	U	2	U	6.7	J	1.8	U	9	U	1.6	J	1	J
ne			UG/KG	180	R	180	U	200	U	180	R	180	U	900	U	180	U	180	U
lordane			UG/KG	1.2	U	5.7		2	U	14	J	1.8	U	170	J	11	J	4.6	
C	200	NYSDEC TAGM	UG/KG	1.8	R	1.8	U	2	U	1.8	R	1.8	U	9	U	2.3		1.8	U
HC (Lindane)	60	NYSDEC TAGM	UG/KG	1.8	R	2.3	J	2	U	1.8	R	1.8	U	9	U	1.8	U	1.8	U
hlordane	540	NYSDEC TAGM	UG/KG	1.3	J	2.5	J	2	U	11	J	1.8	U	200	J	6.4		5.2	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-21		SS16-22		SS16-23		SS16-24		SS16-25		SS16-26		SS16-27		SS16-28	
			SAMP ID:	16059		16049		16051		16060		16050		16046		16047		16044	
			QC CODE:	DU		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/21/1996		8/20/1996		8/20/1996		8/21/1996		8/20/1996		8/20/1996		8/20/1996		8/19/1996	
ETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
ANALYSES																			
itrite-Nitrogen			MG/KG	0.34		0.03		0.08		0.04		0.06		0.39		0.11		0.06	
loisture (PEST/PCB)				6		8		13		4		4		6		8		4	
loisture (SVOCs)				6		8		13		4		4		6		8		5	
loisture (VOCs)				4		13		18		4		9		9		9		5	
olids (Metals)				94.5		92		87.4		95.8		95.8		93.5		91.9		95.5	
anic Carbon			MG/KG													56400			
ROMATICS																			
otoluene			UG/KG	7700		160	J	120	U	450	J	200	J	490		7500	J	310	
otoluene	1000	NYSDEC TAGM	UG/KG	250	U	120	U	120	U	120	U	120	U	120	U	320	J	120	U
,6-Dinitrotoluene			UG/KG	250	U	120	U	120	U	120	U	120	U	120	U	250	U	120	U
			UG/KG	250	U	120	U	120	U	120	U	120	U	120	U	250	U	120	U
S																			
n	14592.84	NYSDEC TAGM	MG/KG	12900	J	12200	J	10400	J	11100	J	14100	J	6370	J	11300	J	10000	J
	3.59	NYSDEC TAGM	MG/KG	19.2	J	20.3	J	10.4	J	7.1	J	3.1	J	1930	J	122	J	6.7	J
	7.5	NYSDEC TAGM	MG/KG	7.2		6.2	J	7.9		6.1		4	J	23	J	32.2	J	5.2	J
	300	NYSDEC TAGM	MG/KG	676	J	169	J	263	J	148	J	121	J	9340	J	5190	J	107	J
	0.73	NYSDEC TAGM	MG/KG	0.52		0.46		0.49		0.46		0.53		0.02	U	0.13		0.36	
	1	NYSDEC TAGM	MG/KG	0.87		1.3		0.76		1.2		0.25		7.1		16.6		0.3	
	101903.8	NYSDEC TAGM	MG/KG	40200		56900		25400		50600		39200		68400		99700		57200	
n	22.13	NYSDEC TAGM	MG/KG	38		31		20.4		26.6		28.4		47.5		43.7		20.5	
	30	NYSDEC TAGM	MG/KG	12.9		12.7	J	9		13.5		17.8	J	8.8		9.6		10.2	J
	25	NYSDEC TAGM	MG/KG	536		357	J	291		324		86.6	J	37900	J	3200	J	192	J
	0.3	NYSDEC TAGM	MG/KG	0.5	U	0.5	U	0.56	U	0.46	U	0.44	U	0.53	U	0.54	U	0.49	U
	26626.65	NYSDEC TAGM	MG/KG	28700	J	25700	J	20500		27600	J	28800	J	17900	J	20500	J	21900	J
	21.86	NYSDEC TAGM	MG/KG	2640		2920	J	1360		1450		439	J	140000	J	12600	J	626	J
m	12221.77	NYSDEC TAGM	MG/KG	8600		8610		7510		8200		8170		9100		22300		5510	
e	669.38	NYSDEC TAGM	MG/KG	373		414		350		432		465		367		581		322	
	0.1	NYSDEC TAGM	MG/KG	0.3		1.7	J	0.93		0.27		0.4	J	1.6	J	2.6	J	0.11	J
	33.62	NYSDEC TAGM	MG/KG	49.8		44.1	J	25		48		53.5	J	30.2	J	31.3	J	35.1	J
	1761.48	NYSDEC TAGM	MG/KG	1560		2200		1080		1540		2280		599		1510		1300	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-21		SS16-22		SS16-23		SS16-24		SS16-25		SS16-26		SS16-27		SS16-28	
			SAMP ID:	16059		16049		16051		16060		16050		16046		16047		16044	
			QC CODE:	DU		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/21/1996		8/20/1996		8/20/1996		8/21/1996		8/20/1996		8/20/1996		8/20/1996		8/19/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
	2	NYSDEC TAGM	MG/KG	0.81		0.54		0.73	U	0.57	U	0.65		0.59		0.52	U	0.66	
	0.4	NYSDEC TAGM	MG/KG	0.25	U	0.33		0.27		0.28		0.32		**11.1**		**1.9**		**0.41**	
	103.74	NYSDEC TAGM	MG/KG	102		89.1		**138**		**120**		61.3		**1830**		**342**		77.8	
	0.28	NYSDEC TAGM	MG/KG	**1**	**J**	**0.9**	**J**	0.85	U	0.66	U	0.82	U	**16.6**	**J**	**1.2**	**J**	0.86	U
	150	NYSDEC TAGM	MG/KG	18.6		26.7	J	20.1		21.3		22.5	J	15.5	J	23.6	J	16.3	J
	82.5	NYSDEC TAGM	MG/KG	**307**		**299**		**411**		**327**		**113**		**14600**		**2120**		**115**	
DES																			
	1900	NYSDEC TAGM	UG/KG																
			UG/KG																

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-3		SS16-30		SS16-31		SS16-32		SS16-33		SS16-34		SS16-35		SS16-36	
			SAMP ID:	SS16-3-1		16048		16062		16052		16067		16053		16066		16061	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/1993		8/20/1996		8/21/1996		8/20/1996		8/22/1996		8/20/1996		8/22/1996		8/21/1996	
ETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
LE ORGANICS																			
etrachloroethane	600	NYSDEC TAGM	UG/KG	11	U	11	UJ	11	U	10	U	11	U	21	U	10	UJ	10	UJ
	200	NYSDEC TAGM	UG/KG	11	U	11	U	11	U	10	U	11	UJ	15	U	10	UJ	10	UJ
	60	NYSDEC TAGM	UG/KG	11	U	11	U	11	U	10	U	11	U	21	U	10	U	5	J
isulfide	2700	NYSDEC TAGM	UG/KG	11	U	11	U	11	U	10	U	11	U	21	U	10	U	2	J
m	300	NYSDEC TAGM	UG/KG	11	U	6	U	5	U	5	U	11	U	10	U	10	U	5	UJ
e Chloride	100	NYSDEC TAGM	UG/KG	11	U	11	U	11	U	10	U	11	U	21	U	10	U	10	UJ
	1500	NYSDEC TAGM	UG/KG	4	J	11	UJ	11	U	10	U	11	UJ	21	U	10	UJ	10	J
otal)	1200	NYSDEC TAGM	UG/KG	11	U	11	UJ	11	U	10	U	11	UJ	21	U	10	UJ	10	UJ
LATILE ORGANICS																			
otoluene			UG/KG	7100		9400		91000	UJ	340	U	510	U	1800	U	6900		700	U
otoluene	1000	NYSDEC TAGM	UG/KG	310	J	680	J	91000	UJ	350	U	510	U	1800	U	400	J	700	U
aphthalene	36400	NYSDEC TAGM	UG/KG	510	J	1300	U	19000	J	98	J	510	U	1800	U	850	U	700	U
orobenzidine			UG/KG	1100	U	1300	U	91000	UJ	350	U	510	UJ	1800	U	850	J	700	U
iline	500	NYSDEC TAGM	UG/KG	2700	U	3100	U	220000	UJ	850	U	1200	UJ	4200	U	**2100**	**J**	1700	U
hene	50000	NYSDEC TAGM	UG/KG	1100	U	1300	U	**72000**	**J**	30	J	55	J	1800	U	140	J	700	U
hylene	41000	NYSDEC TAGM	UG/KG	1100	U	1300	U	91000	U	140	J	40	J	1800	U	850	U	700	U
ne	50000	NYSDEC TAGM	UG/KG	1100	U	1300	U	**120000**	**J**	120	J	310	J	1800	U	260	J	700	U
anthracene	224	NYSDEC TAGM	UG/KG	110	J	1300	U	**220000**	**J**	**760**		**1900**		1800	U	**1000**		700	U
pyrene	61	NYSDEC TAGM	UG/KG	**120**	**J**	1300	U	**200000**	**J**	**1800**		**1900**		1800	U	**1000**		700	U
fluoranthene	1100	NYSDEC TAGM	UG/KG	170	J	1300	U	**200000**	**J**	**2500**		**3300**	**J**	1800	U	850	U	700	U
i.i)perylene	50000	NYSDEC TAGM	UG/KG	1100	U	1300	U	**100000**	**J**	1100		1000		1800	U	570	J	700	U
fluoranthene	1100	NYSDEC TAGM	UG/KG	97	J	1300	U	**170000**	**J**	350	U	510	U	1800	U	**1700**	**J**	700	U
			UG/KG	1100	U	1300	U	89000	J	34	J	160	J	1800	U	410	J	700	U
	400	NYSDEC TAGM	UG/KG	200	J	170	J	**220000**	**J**	**950**		**1700**		1800	U	**910**		700	U
lphthalate	8100	NYSDEC TAGM	UG/KG	1200		1500		91000	UJ	350	U	510	U	1800	U	2000		700	U
h)anthracene	14	NYSDEC TAGM	UG/KG	1100	U	1300	U	**49000**	**J**	**520**		**700**		1800	U	**390**	**J**	700	U
uran	6200	NYSDEC TAGM	UG/KG	110	J	1300	U	**50000**	**J**	350	U	33	J	1800	U	62	J	700	U
thalate	7100	NYSDEC TAGM	UG/KG	1100	U	1300	U	91000	UJ	350	U	510	U	1800	U	850	U	700	U
ene	50000	NYSDEC TAGM	UG/KG	200	J	180	J	**330000**	**J**	700		2400		1800	U	2400		700	U
	50000	NYSDEC TAGM	UG/KG	1100	U	1300	U	**78000**	**J**	350	U	83	J	1800	U	110	J	700	U
2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	1100	U	1300	U	**100000**	**J**	990		1500		1800	U	700	J	700	U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-3		SS16-30		SS16-31		SS16-32		SS16-33		SS16-34		SS16-35		SS16-36	
			SAMP ID:	SS16-3-1		16048		16062		16052		16067		16053		16066		16061	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/1993		8/20/1996		8/21/1996		8/20/1996		8/22/1996		8/20/1996		8/22/1996		8/21/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
diphenylamine (1)			UG/KG	1400		780	J	91000	UJ	180	J	510	U	1800	U	760	J	700	U
ne	13000	NYSDEC TAGM	UG/KG	320	J	1300	U	66000	J	55	J	510	U	1800	U	850	U	700	U
rophenol	1000	NYSDEC TAGM	UG/KG	2700	U	3100	U	220000	UJ	850	U	1200	J	4200	U	2100	UJ	1700	U
ene	50000	NYSDEC TAGM	UG/KG	360	J	99	J	490000	J	350	U	1200		1800	U	1300		700	U
	50000	NYSDEC TAGM	UG/KG	200	J	220	J	360000	J	1200		3200		1800	U	2000		700	U
lhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	390	J	1300	U	91000	UJ	350	U	510	U	1800	U	990		700	U
DES/PCB																			
	2900	NYSDEC TAGM	UG/KG	3.9	UJ	2.65		3.2	U	3.5	U	1.6	J	3.5	U	34	U	3.5	R
	2100	NYSDEC TAGM	UG/KG	32	J	6.12		12		11		20		3.5	U	290		2.3	R
	2100	NYSDEC TAGM	UG/KG	18	J	21.5	J	43		9.9		17		2.3	J	340		7.4	J
	41	NYSDEC TAGM	UG/KG	2.8	J	2	U	1.9	U	1.8	U	1.9	U	1.8	U	18	U	1.8	R
254	10000	NYSDEC TAGM	UG/KG	39	UJ	38	U	36	U	35	U	36	U	35	U	340	U	35	R
260	10000	NYSDEC TAGM	UG/KG	110	J	80		36	U	35	U	36	U	35	U	160	J	35	R
	44	NYSDEC TAGM	UG/KG	3.9	UJ	3.8	U	3.6	U	3.5	U	3.6	U	3.5	U	34	U	3.5	R
n I	900	NYSDEC TAGM	UG/KG	2	UJ	10.5	J	7.7		33	J	1.9	U	1.8	U	18	U	1.2	R
n II	900	NYSDEC TAGM	UG/KG	4.6	J	3.8	U	3.6	U	5	J	3.6	U	3.5	U	34	U	3.5	R
n sulfate	1000	NYSDEC TAGM	UG/KG	3.9	UJ	3.8	U	3.6	U	3.5	U	3.6	U	3.5	U	34	U	3.5	R
	100	NYSDEC TAGM	UG/KG	3.9	UJ	3.8	U	3.6	U	9.9		3.6	U	3.5	U	34	U	3.5	R
lehyde			UG/KG	3.9	UJ	4.15	J	3.6	U	3.7	R	3.6	U	3.5	U	34	U	3.5	R
one			UG/KG	3.3	J	3.8	U	1.7	J	3.4	U	3.6	U	3.5	U	34	U	3.5	R
r	100	NYSDEC TAGM	UG/KG	2	UJ	2	U	1.9	U	1.8	U	1.9	U	1.8	U	18	U	1.8	R
r epoxide	20	NYSDEC TAGM	UG/KG	2	UJ	2	U	1.9	U	1.5	R	1.9	U	1.8	U	18	U	1.8	R
e			UG/KG	200	UJ	200	U	190	U	180	U	190	U	180	U	1800	U	180	R
rdane			UG/KG	4.7	J	10.1		5.1	J	8.6	J	1.9	U	1.8	U	18	J	1.8	R
	200	NYSDEC TAGM	UG/KG	1.3	J	2	U	1.9	U	1.8	U	1.9	U	1.8	U	18	U	1.8	R
HC (Lindane)	60	NYSDEC TAGM	UG/KG	2	UJ	2	U	1.9	U	1.8	U	1.9	U	1.8	U	18	U	1.8	R
lordane	540	NYSDEC TAGM	UG/KG	4.7	J	17.4		5.3		9.4		1.9	U	1.8	U	15	J	1.8	R

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-3		SS16-30		SS16-31		SS16-32		SS16-33		SS16-34		SS16-35		SS16-36	
			SAMP ID:	SS16-3-1		16048		16062		16052		16067		16053		16066		16061	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/1993		8/20/1996		8/21/1996		8/20/1996		8/22/1996		8/20/1996		8/22/1996		8/21/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
NALYSES																			
rite-Nitrogen			MG/KG	0.26		4.8		0.41		0.11		0.04		0.04		0.08		0.16	
oisture (PEST/PCB)						13		9		6		9		6		4		6	
oisture (SVOCs)						13		9		6		9		6		4		6	
oisture (VOCs)						11		7		5		9		5		2		5	
lids (Metals)						86.8		90.5		94.1		90.6		93.9		95.9		94.4	
nic Carbon			MG/KG																
ROMATICS																			
toluene			UG/KG	1100		510		120	U	120	U	120	U	4400		3000	J	120	U
toluene	1000	NYSDEC TAGM	UG/KG	130	U	120	U	120	U	120	U	120	U	120	U	120	U	120	U
6-Dinitrotoluene			UG/KG	430	J	120	U	120	U	120	U	120	U	120	U	120	U	120	U
			UG/KG	220	J	120	U	120	U	120	U	120	U	120	U	120	U	120	U
	14592.84	NYSDEC TAGM	MG/KG	7250		8420	J	11300	J	12000	J	13500	J	8660	J	6930	J	10200	J
	3.59	NYSDEC TAGM	MG/KG	121	R	**28.1**	**J**	0.81	J	1.5	J	1.2	J	0.35	UJ	**7.1**	**J**	0.5	J
	7.5	NYSDEC TAGM	MG/KG	**23.6**		**11.2**	**J**	6.6		5.1		6		5.8		5.3		6.7	
	300	NYSDEC TAGM	MG/KG	1540	R	**1220**	**J**	70.9	J	85.3	J	70.7	J	47.7	J	**314**	**J**	42.3	J
	0.73	NYSDEC TAGM	MG/KG	0.39	J	0.27		0.47		0.42		0.47		0.3		0.24		0.34	
	1	NYSDEC TAGM	MG/KG	**2.5**		**1.2**		0.49		0.5		0.06	U	0.31		**5.3**		0.29	
	101903.8	NYSDEC TAGM	MG/KG	21400		77300		32800		56100		10700		59700		**110000**		22400	
	22.13	NYSDEC TAGM	MG/KG	**33.3**		19.4		18.4		**24.5**		**22.6**		13.2		**35.3**		14.7	
	30	NYSDEC TAGM	MG/KG	9.1		8.4		12.2		11.4		10.9		7.7		8.2		8.1	
	25	NYSDEC TAGM	MG/KG	**1730**		**617**	**J**	**39.5**		**104**		**44.6**		**41.5**		**407**		**34.4**	
	0.3	NYSDEC TAGM	MG/KG	0.68	U	0.51	U	0.54	U	0.49	U	0.53	U	0.49	U	**1.5**		0.51	U
	26626.65	NYSDEC TAGM	MG/KG	25700		17600	J	23000	J	23900		25800		20300		18300		22700	J
	21.86	NYSDEC TAGM	MG/KG	**9140**		**2560**	**J**	**81.1**		**265**		**131**		**43.7**		**1290**		**34.7**	
n	12221.77	NYSDEC TAGM	MG/KG	4300		9010		10700		11200		7130		7480		**27000**		10100	
	669.38	NYSDEC TAGM	MG/KG	**4140**		365		459		508		443	J	422		375	J	337	
	0.1	NYSDEC TAGM	MG/KG	**11.4**	**J**	**2.3**	**J**	0.07		**0.12**		**0.12**		0.03	U	**0.12**		0.04	U
	33.62	NYSDEC TAGM	MG/KG	**37.3**		22.7	J	28.9		**36.3**		31.2		23.7		28.6		24.7	
	1761.48	NYSDEC TAGM	MG/KG	886		1200		1260		**1840**		1650		953		1340		1130	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-3		SS16-30		SS16-31		SS16-32		SS16-33		SS16-34		SS16-35		SS16-36	
			SAMP ID:	SS16-3-1		16048		16062		16052		16067		16053		16066		16061	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/1993		8/20/1996		8/21/1996		8/20/1996		8/22/1996		8/20/1996		8/22/1996		8/21/1996	
ETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
	2	NYSDEC TAGM	MG/KG	0.22	UJ	0.66		0.71	U	0.76		0.52	U	0.62	U	1.2	J	0.55	U
	0.4	NYSDEC TAGM	MG/KG	1.1	UJ	**0.44**		0.26	U	0.35		0.28	U	0.3		**0.5**		0.2	U
	103.74	NYSDEC TAGM	MG/KG	**147**	**J**	91.6		53.2		**126**		58	U	78.6		**137**		41.1	U
	0.28	NYSDEC TAGM	MG/KG	0.24	U	0.71	U	**1.1**	**J**	**1**	**J**	0.91	U	**0.98**		0.78	U	0.64	U
n	150	NYSDEC TAGM	MG/KG	17.9		18.3	J	20.3		28.9		22.7		28.4		33.8		18.8	
	82.5	NYSDEC TAGM	MG/KG	**929**		**573**		**134**		**157**		**109**	**J**	**109**		**466**	**J**	**95.7**	
IDES																			
	1900	NYSDEC TAGM	UG/KG	7.2															
			UG/KG	6000	U														

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC ID:	SS16-38		SS16-4		SS16-5		SS16-6		SS16-7		SS16-8		SS16-9	
			SAMP ID:	16068		SS16-4-1		SS16-5-1		SS16-6-1		SS16-7-1		SS16-8-1		SS16-9-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		10/20/1993		10/20/1993		10/20/1993		10/20/1993		10/20/1993		11/9/1993	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																	
1,1,2,2-Tetrachloroethane	600	NYSDEC TAGM	UG/KG	10	UJ	11	U	11	U	10	U	53	U	10	U	11	U
Acetone	200	NYSDEC TAGM	UG/KG	10	UJ	17		11	U	10	U	53	U	10	U	11	U
Benzene	60	NYSDEC TAGM	UG/KG	10	UJ	11	U	11	U	10	U	53	U	10	U	11	U
Carbon Disulfide	2700	NYSDEC TAGM	UG/KG	10	UJ	11	U	11	U	10	U	53	U	10	U	11	U
Chloroform	300	NYSDEC TAGM	UG/KG	10	UJ	11	U	11	U	2	J	53	U	10	U	11	U
Methylene Chloride	100	NYSDEC TAGM	UG/KG	10	UJ	11	U	2	J	10	U	53	U	10	U	11	U
Toluene	1500	NYSDEC TAGM	UG/KG	10	UJ	11	U	5	J	3	J	53	U	2	J	11	U
Xylene (total)	1200	NYSDEC TAGM	UG/KG	10	UJ	11	U	11	U	10	U	53	U	10	U	11	U
SEMIVOLATILE ORGANICS																	
2,4-Dinitrotoluene			UG/KG	350	U	7200	U	530	J	14000	U	1300	U	1800	U	2700	U
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
2-Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	350	U	7200	U	97	J	14000	U	1300	U	1800	U	2700	U
3,3'-Dichlorobenzidine			UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
3-Nitroaniline	500	NYSDEC TAGM	UG/KG	840	U	18000	U	1800	U	34000	U	3100	U	4200	U	6600	U
Acenaphthene	50000	NYSDEC TAGM	UG/KG	350	U	7200	U	44	J	14000	U	1300	U	1800	U	2700	U
Acenaphthylene	41000	NYSDEC TAGM	UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
Anthracene	50000	NYSDEC TAGM	UG/KG	350	U	7200	U	70	J	14000	U	1300	U	1800	U	2700	U
Benzo(a)anthracene	224	NYSDEC TAGM	UG/KG	17	J	7200	U	**240**	**J**	14000	U	1300	U	1800	U	2700	U
Benzo(a)pyrene	61	NYSDEC TAGM	UG/KG	19	J	7200	U	**270**	**J**	14000	U	1300	U	1800	U	2700	U
Benzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	350	U	7200	U	350	J	14000	U	1300	U	1800	U	2700	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	54	J	7200	U	180	J	14000	U	1300	U	1800	U	2700	U
Benzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	350	U	7200	U	330	J	14000	U	1300	U	1800	U	2700	U
Carbazole			UG/KG	350	U	7200	U	78	J	14000	U	1300	U	1800	U	2700	U
Chrysene	400	NYSDEC TAGM	UG/KG	22	J	7200	U	340	J	14000	U	1300	U	1800	U	2700	U
Di-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	350	U	7200	U	350	J	14000	U	1300	U	1400	J	510	J
Dibenz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
Dibenzofuran	6200	NYSDEC TAGM	UG/KG	350	U	7200	U	82	J	14000	U	1300	U	1800	U	2700	U
Diethylphthalate	7100	NYSDEC TAGM	UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
Fluoranthene	50000	NYSDEC TAGM	UG/KG	22	J	7200	U	710	J	14000	U	1300	U	1800	U	2700	U
Fluorene	50000	NYSDEC TAGM	UG/KG	350	U	7200	U	750	U	14000	U	1300	U	1800	U	2700	U
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	350	U	7200	U	200	J	14000	U	1300	U	1800	U	2700	U

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	SS16-38	SS16-4	SS16-5	SS16-6	SS16-7	SS16-8	SS16-9
			SAMP ID:	16068	SS16-4-1	SS16-5-1	SS16-6-1	SS16-7-1	SS16-8-1	SS16-9-1
			QC CODE:	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	ESI	ESI	ESI	ESI	ESI	ESI
			TOP:	0	0	0	0	0	0	0
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	8/22/1996	10/20/1993	10/20/1993	10/20/1993	10/20/1993	10/20/1993	11/9/1993
			UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
N-Nitrosodiphenylamine (1)			UG/KG	350 U	7200 U	130 J	14000 U	1300 U	350 J	2700 U
Naphthalene	13000	NYSDEC TAGM	UG/KG	350 U	7200 U	750 U	14000 U	1300 U	1800 U	2700 U
Pentachlorophenol	1000	NYSDEC TAGM	UG/KG	840 UJ	18000 U	1800 U	34000 U	3100 U	4200 U	6600 U
Phenanthrene	50000	NYSDEC TAGM	UG/KG	22 J	7200 U	410 J	14000 U	1300 U	1800 U	2700 U
Pyrene	50000	NYSDEC TAGM	UG/KG	31 J	7200 U	550 J	14000 U	1300 U	1800 U	160 J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	350 U	7200 U	450 J	14000 U	1300 U	1800 U	2100 J
PESTICIDES/PCB										
4,4'-DDD	2900	NYSDEC TAGM	UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
4,4'-DDE	2100	NYSDEC TAGM	UG/KG	5.1	1400	130	3.5 UJ	6.3	84 J	2.8 J
4,4'-DDT	2100	NYSDEC TAGM	UG/KG	2.1 J	180	29	1.8 J	5.6	79 J	2.9 J
Aldrin	41	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	1.8 U	3.6 U	1.8 UJ
Aroclor-1254	10000	NYSDEC TAGM	UG/KG	35 U	360 U	190 U	35 UJ	35 U	57 UJ	35 UJ
Aroclor-1260	10000	NYSDEC TAGM	UG/KG	35 U	360 U	190 U	35 UJ	35 U	70 U	35 UJ
Dieldrin	44	NYSDEC TAGM	UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
Endosulfan I	900	NYSDEC TAGM	UG/KG	1.8 U	19 U	6.2 J	1.8 UJ	1.8 U	1.9 J	1.8 UJ
Endosulfan II	900	NYSDEC TAGM	UG/KG	3.5 U	36 U	19 U	3.5 UJ	2.2 J	7 U	3.5 UJ
Endosulfan sulfate	1000	NYSDEC TAGM	UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
Endrin	100	NYSDEC TAGM	UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
Endrin aldehyde			UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
Endrin ketone			UG/KG	3.5 U	36 U	19 U	3.5 UJ	3.5 U	7 U	3.5 UJ
Heptachlor	100	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	1.8 U	3.6 U	1.8 UJ
Heptachlor epoxide	20	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	1.8 U	3.6 U	1.8 UJ
Toxaphene			UG/KG	180 U	1900 U	970 U	180 UJ	180 U	360 U	180 UJ
alpha-Chlordane			UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	6.1	3.6 U	1.8 UJ
beta-BHC	200	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	1.8 U	3.6 U	1.8 UJ
gamma-BHC (Lindane)	60	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	1.8 U	3.6 U	1.8 UJ
gamma-Chlordane	540	NYSDEC TAGM	UG/KG	1.8 U	19 U	9.7 U	1.8 UJ	7	3.6 U	1.8 UJ

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC ID:	SS16-38		SS16-4		SS16-5		SS16-6		SS16-7		SS16-8		SS16-9	
			SAMP ID:	16068		SS16-4-1		SS16-5-1		SS16-6-1		SS16-7-1		SS16-8-1		SS16-9-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		10/20/1993		10/20/1993		10/20/1993		10/20/1993		10/20/1993		11/9/1993	
OTHER ANALYSES																	
Nitrate/Nitrite-Nitrogen			MG/KG	1		0.45		0.5		0.42		0.05		0.23		0.01	U
Percent Moisture (PEST/PCB)				6													
Percent Moisture (SVOCs)				6													
Percent Moisture (VOCs)				5													
Percent Solids (Metals)				94													
Total Organic Carbon			MG/KG	8400													
NITROAROMATICS																	
2,4-Dinitrotoluene			UG/KG	120	U	170		780	J	130	U	130	U	770		450	J
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	120	U	130	U	130	U	130	U	130	U	130	U	130	U
2-amino-4,6-Dinitrotoluene			UG/KG	120	U	130	U	130	U	130	U	130	U	130	U	130	U
Tetryl			UG/KG	120	U	130	U	130	U	130	U	130	U	130	U	130	U
METALS																	
Aluminum	14592.84	NYSDEC TAGM	MG/KG	14400		11900		13600		9650		8670		7600		10700	
Antimony	3.59	NYSDEC TAGM	MG/KG	0.56	J	**26.3**		**27.3**		7.9	U	8.8	U	8.2	U	7	U
Arsenic	7.5	NYSDEC TAGM	MG/KG	3.8		**11.3**		**10.8**		5.1		5		5.2		4.2	J
Barium	300	NYSDEC TAGM	MG/KG	127	J	227		**630**		45.1		41.2		72.2		53.6	
Beryllium	0.73	NYSDEC TAGM	MG/KG	0.56		0.45	J	0.56	J	0.24	J	0.29	J	0.39	J	0.43	J
Cadmium	1	NYSDEC TAGM	MG/KG	0.06	U	0.55	U	**2.8**		0.49	U	0.55	U	0.52	U	0.43	UR
Calcium	101903.8	NYSDEC TAGM	MG/KG	18000		55600		37100		25600		36600		**107000**		35400	
Chromium	22.13	NYSDEC TAGM	MG/KG	**25.4**		**24**		**43.3**		12.9	R	11.9		15.9		17.6	
Cobalt	30	NYSDEC TAGM	MG/KG	12.4		11.9		13.4		7.9		7.5	J	8.1		8.2	
Copper	25	NYSDEC TAGM	MG/KG	**34.4**		**399**		**635**		**26.2**		**28.9**		**88.9**		**31.4**	**J**
Cyanide	0.3	NYSDEC TAGM	MG/KG	0.53	U	0.6	U	0.63	U	0.58	U	0.6	U	0.58	U	0.52	U
Iron	26626.65	NYSDEC TAGM	MG/KG	26500		**27700**		**36500**		22100		20000		16700		22400	
Lead	21.86	NYSDEC TAGM	MG/KG	**60.3**		**2940**		**2860**		8.5		**81.2**		**1890**		**76.2**	
Magnesium	12221.77	NYSDEC TAGM	MG/KG	6090		8690		7930		7710		**13800**		9940		**15300**	
Manganese	669.38	NYSDEC TAGM	MG/KG	391	J	411	J	444	J	305	J	478	J	333	J	349	
Mercury	0.1	NYSDEC TAGM	MG/KG	0.04	U	**0.21**		**0.99**	J	0.03	U	0.04	U	0.08		0.05	J
Nickel	33.62	NYSDEC TAGM	MG/KG	[illegible]		**41.6**		**148**		22.7		21.7		28.7		29.3	
Potassium	1761.48	NYSDEC TAGM	MG/KG	**2020**		1250		1410		720	J	794	J	1150		1160	

Table A-2
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Soil Analytical Results

			LOC_ID:	SS16-38		SS16-4		SS16-5		SS16-6		SS16-7		SS16-8		SS16-9	
			SAMP ID:	16068		SS16-4-1		SS16-5-1		SS16-6-1		SS16-7-1		SS16-8-1		SS16-9-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		10/20/1993		10/20/1993		10/20/1993		10/20/1993		10/20/1993		11/9/1993	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Selenium	2	NYSDEC TAGM	MG/KG	0.55	J	0.2	UJ	0.22	UJ	0.13	UJ	0.13	UJ	0.21	UJ	0.19	UJ
Silver	0.4	NYSDEC TAGM	MG/KG	0.25	U	1.1	U	1	U	1	U	1.1	U	1	U	0.88	UJ
Sodium	103.74	NYSDEC TAGM	MG/KG	84.1		**128**	**J**	**132**	**J**	79.6	J	**109**	**J**	**170**	**J**	**125**	**J**
Thallium	0.28	NYSDEC TAGM	MG/KG	0.82	U	0.22	U	0.24	U	0.14	U	0.14	U	0.23	U	0.21	UJ
Vanadium	150	NYSDEC TAGM	MG/KG	22.6		20.3		23.9		38.1		35.7		34.5		22.8	
Zinc	82.5	NYSDEC TAGM	MG/KG	**117**	**J**	**416**		**562**		65.8		66.1		**105**		78.8	J
HERBICIDES																	
2,4,5-T	1900	NYSDEC TAGM	UG/KG			5.5	U	5.7	U	5.3	U	5.3	U	5.3	U	5.5	U
MCPP			UG/KG			5500	U	16000		5300	U	5300	U	5300	U	5500	U

Table A-3
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Subsurface Soil Analytical Results

			LOC_ID:	SB16-1		SB16-1		SB16-2		SB16-4		SB16-5		SB16-5	
			SAMP ID:	16038		16093		16036		16031		16034		16035	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	2		6		1		2		1		2	
			BOTTOM:	3		12		2		4		2		3.3	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	8/14/1996		8/22/1996		8/14/1996		8/14/1996		8/14/1996		8/14/1996	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS															
2-Butanone	300	NYSDEC TAGM	UG/KG	12	U	11	U	11	U	5	J	2	U	11	U
Acetone	200	NYSDEC TAGM	UG/KG	11	J	11	U	11	U	46		12	U	11	U
Benzene	60	NYSDEC TAGM	UG/KG	12	U	11	U	2	J	2	J	11	U	11	U
Toluene	1500	NYSDEC TAGM	UG/KG	12	U	11	UJ	3	J	2	J	2	J	6	J
SEMIVOLATILE ORGANICS															
2,4-Dinitrotoluene			UG/KG	390	U	67	J	1700		1900	U	1800	U	370	U
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	390	U	340	U	160	J	1900	U	1800	U	370	U
2-Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	390	U	340	U	190	J	1900	U	1800	U	370	U
Acenaphthene	50000	NYSDEC TAGM	UG/KG	390	U	340	U	380	U	1900	U	1100	J	370	U
Acenaphthylene	41000	NYSDEC TAGM	UG/KG	390	U	340	U	380	U	300	J	1800	U	370	U
Anthracene	50000	NYSDEC TAGM	UG/KG	390	U	340	U	380	U	310	J	2000		40	J
Benzo(a)anthracene	224	NYSDEC TAGM	UG/KG	390	U	340	U	55	J	**420**	**J**	**6600**		110	J
Benzo(a)pyrene	61	NYSDEC TAGM	UG/KG	390	U	20	J	**63**	**J**	**1400**	**J**	**6200**		**170**	**J**
Benzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	390	U	18	J	72	J	670	J	**6000**		110	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	390	U	26	J	84	J	11000		4500		660	
Benzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	390	U	20	J	60	J	690	J	**5600**		110	J
Butylbenzylphthalate	50000	NYSDEC TAGM	UG/KG	390	U	18	J	380	U	1900	U	1800	U	370	U
Carbazole			UG/KG	390	U	340	U	380	U	1900	U	730	J	370	U
Chrysene	400	NYSDEC TAGM	UG/KG	390	U	22	J	90	J	**480**	**J**	**7000**		120	J
Di-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	390	U	35	J	240	J	1900	U	1800	U	370	U
Dibenz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	390	U	340	U	**32**	**J**	**2500**		**1700**	**J**	**220**	**J**
Dibenzofuran	6200	NYSDEC TAGM	UG/KG	390	U	340	U	45	J	1900	U	270	J	370	U
Fluoranthene	50000	NYSDEC TAGM	UG/KG	390	U	32	J	110	J	480	J	13000		190	J
Fluorene	50000	NYSDEC TAGM	UG/KG	390	U	340	U	380	U	1900	U	800	J	370	U
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	390	U	24	J	65	J	**7100**		**3900**		510	

Table A-3
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Subsurface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC_ID:	SB16-1		SB16-1		SB16-2		SB16-4		SB16-5		SB16-5	
			SAMP ID:	16038		16093		16036		16031		16034		16035	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	2		6		1		2		1		2	
			BOTTOM:	3		12		2		4		2		3.3	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	8/14/1996		8/22/1996		8/14/1996		8/14/1996		8/14/1996		8/14/1996	
N-Nitrosodiphenylamine (1)			UG/KG	390	U	340	U	530		1900	U	1800	U	370	U
Naphthalene	13000	NYSDEC TAGM	UG/KG	390	U	340	U	120	J	1900	U	1800	U	370	U
Pentachlorophenol	1000	NYSDEC TAGM	UG/KG	940	U	830	U	920	U	4600	U	4400	U	120	J
Phenanthrene	50000	NYSDEC TAGM	UG/KG	390	U	23	J	160	J	160	J	7600		100	J
Pyrene	50000	NYSDEC TAGM	UG/KG	390	U	25	J	80	J	550	J	11000		160	J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	390	U	340	U	110	J	1900	U	1800	U	370	U
PESTICIDES/PCB															
4,4'-DDE	2100	NYSDEC TAGM	UG/KG	3.9	U	8.3		38	U	3.8	U	37	U	3.7	U
4,4'-DDT	2100	NYSDEC TAGM	UG/KG	3.9	U	1.7	J	38	U	3.8	U	37	U	3.4	J
Dieldrin	44	NYSDEC TAGM	UG/KG	3.9	U	3.4	U	38	U	12		37	U	3.7	U
Endosulfan I	900	NYSDEC TAGM	UG/KG	2	U	1.8	U	20	U	7.3	J	15	U	2.4	J
Endrin	100	NYSDEC TAGM	UG/KG	3.9	U	3.4	U	38	U	2.9	J	37	U	3.4	U
OTHER ANALYSES															
Nitrate/Nitrite-Nitrogen			MG/KG	0.11		0.32		0.78		0.3		0.09		0.17	
Percent Moisture (PEST/PCB)				15		4		13		13		10		11	
Percent Moisture (SVOCs)				15		4		13		13		10		11	
Percent Moisture (VOCs)				16		6		12		10		13		13	
Percent Solids (Metals)				85.3		95.6		87.3		87.2		89.8		88.7	
Total Organic Carbon			MG/KG					9850				668		1010	
NITROAROMATICS															
2,4-Dinitrotoluene			UG/KG	120	U	280	J	150	J	500		120	U	120	U

Table A-3
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Subsurface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT												
			LOC_ID:	SB16-1		SB16-1		SB16-2		SB16-4		SB16-5		SB16-5	
			SAMP ID:	16038		16093		16036		16031		16034		16035	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	2		6		1		2		1		2	
			BOTTOM:	3		12		2		4		2		3.3	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	8/14/1996		8/22/1996		8/14/1996		8/14/1996		8/14/1996		8/14/1996	
				VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS															
Aluminum	14592.8	NYSDEC TAGM	MG/KG	13200	R	12800	J	9350	R	13200	R	9850	R	10500	R
Antimony	3.59	NYSDEC TAGM	MG/KG	0.45	UJ	3.3	J	**8.3**	**J**	0.41	UJ	**135**	**J**	0.4	U
Arsenic	7.5	NYSDEC TAGM	MG/KG	3.3	J	6.3	J	6.9	J	5.2	J	6.9	J	5	J
Barium	300	NYSDEC TAGM	MG/KG	98	J	125	J	197	J	51.8	J	**302**	**J**	84.7	J
Beryllium	0.73	NYSDEC TAGM	MG/KG	0.51		0.42		0.29		0.43		0.34		0.29	
Cadmium	1	NYSDEC TAGM	MG/KG	0.07	U	0.19		0.45		0.06		0.09		0.09	
Calcium	101904	NYSDEC TAGM	MG/KG	67700		22500		24400		25000		37100		97900	
Chromium	22.13	NYSDEC TAGM	MG/KG	18.2		20.9		15.4		21.1		18		16.7	
Cobalt	30	NYSDEC TAGM	MG/KG	7		12.1		10.2	J	12.2	J	11.5	J	11.2	J
Copper	25	NYSDEC TAGM	MG/KG	23.6	J	**66.4**		**206**	**J**	16.4	J	**736**	**J**	**26.6**	**J**
Cyanide	0.3	NYSDEC TAGM	MG/KG	0.58	UJ	0.5	U	0.56	UJ	**0.52**	**J**	0.5	UJ	0.51	U
Iron	26626.7	NYSDEC TAGM	MG/KG	20700	J	**31400**		23900	J	**27300**	**J**	21800	J	21500	J
Lead	21.86	NYSDEC TAGM	MG/KG	12.6	J	**309**		**791**	**J**	21.4	J	**35400**	**J**	**61.6**	**J**
Magnesium	12221.8	NYSDEC TAGM	MG/KG	**12600**		6230		7250		**13300**		7410		11500	
Manganese	669.38	NYSDEC TAGM	MG/KG	210		586		606	J	457	J	315	J	650	J
Mercury	0.1	NYSDEC TAGM	MG/KG	0.04	U	**0.48**		**1.9**	**J**	0.04	J	**0.54**	**J**	0.03	U
Nickel	33.62	NYSDEC TAGM	MG/KG	23.8	J	**34.5**		23.9	J	30.7	J	**37**	**J**	29.2	J
Potassium	1761.48	NYSDEC TAGM	MG/KG	**1990**		1310		1290		1180		1160		1470	
Selenium	2	NYSDEC TAGM	MG/KG	0.54	UJ	1.2		0.82	J	0.64	J	0.5	UJ	0.48	U
Silver	0.4	NYSDEC TAGM	MG/KG	0.29	U	0.26	U	0.25		0.27	U	**1.2**		0.26	U
Sodium	103.74	NYSDEC TAGM	MG/KG	59.8	U	54.4	U	59.2		**160**		56.3	U	82.9	
Thallium	0.28	NYSDEC TAGM	MG/KG	0.94	U	0.85	U	**0.91**		0.87	U	88.2	U	0.85	U
Vanadium	150	NYSDEC TAGM	MG/KG	22.6	J	19.3		17.1	J	19.6	J	15.2	J	17.6	J
Zinc	82.5	NYSDEC TAGM	MG/KG	54.8		**119**		**183**		**89.2**		**165**		70.9	

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

			LOC_ID:	SS16-500-N		SS16-500-S		1000-N		1000-S		2000-N		2000-N		2000-S		3000-N	
			SAMP ID:	16074		16086		16083		16087		16089		16090		16085		16088	
			QC CODE:	SA		SA		SA		SA		SA		DU		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
E ORGANICS																			
	60	NYSDEC TAGM	UG/KG	16	U	13	U	11	UJ	12	U	12	U	12	U	12	U	12	U
	1500	NYSDEC TAGM	UG/KG	16	U	13	UJ	11	UJ	12	U	12	U	12	U	12	U	12	U
ATILE ORGANICS																			
toluene			UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
phthalene	36400	NYSDEC TAGM	UG/KG	450	UJ	410	U	370	U	380	U	390	U	390	U	410	U	380	U
enol	100	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	**120**	**J**	380	U
ene	50000	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	18	J	390	U	390	U	410	U	380	U
lene	41000	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
	50000	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
thracene	224	NYSDEC TAGM	UG/KG	450	U	410	U	39	J	85	J	57	J	52	J	19	J	54	J
rene	61	NYSDEC TAGM	UG/KG	450	U	410	U	39	J	**110**	**J**	**69**	**J**	**62**	**J**	22	J	**73**	**J**
oranthene	1100	NYSDEC TAGM	UG/KG	450	U	410	U	42	J	120	J	68	J	54	J	410	U	58	J
)perylene	50000	NYSDEC TAGM	UG/KG	450	U	410	U	35	J	130	J	65	J	55	J	51	J	78	J
oranthene	1100	NYSDEC TAGM	UG/KG	450	U	410	U	47	J	94	J	65	J	61	J	38	J	73	J
			UG/KG	450	UJ	410	U	370	UJ	380	U	390	U	390	U	410	UJ	380	U
	400	NYSDEC TAGM	UG/KG	450	U	410	U	55	J	110	J	70	J	62	J	25	J	69	J
hthalate	8100	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
anthracene	14	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	**54**	**J**	**34**	**J**	**30**	**J**	410	U	**39**	**J**
an	6200	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
e	50000	NYSDEC TAGM	UG/KG	450	U	410	U	70	J	160	J	110	J	93	J	36	J	100	J
	50000	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	450	U	410	U	32	J	110	J	55	J	50	J	20	J	70	J
phenylamine (1)			UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
e	13000	NYSDEC TAGM	UG/KG	450	U	410	U	370	U	380	U	390	U	390	U	410	U	380	U
ne	50000	NYSDEC TAGM	UG/KG	450	U	410	U	34	J	90	J	36	J	35	J	410	U	42	J
	50000	NYSDEC TAGM	UG/KG	22	J	410	U	76	J	160	J	92	J	81	J	38	J	90	J

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

			LOC_ID:	SS16-500-N		SS16-500-S		1000-N		1000-S		2000-N		2000-N		2000-S		3000-N	
			SAMP ID:	16074		16086		16083		16087		16089		16090		16085		16088	
			QC CODE:	SA		SA		SA		SA		SA		DU		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22 1996		8/22/1996	
ER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
ES/PCB																			
	2100	NYSDEC TAGM	UG/KG	4.5	U	4.1	U	5.2	J	1.9	J	3.9	U	3.9	U	4.1	U	3.8	U
	2100	NYSDEC TAGM	UG/KG	4.5	U	4.1	U	6	J	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U
	44	NYSDEC TAGM	UG/KG	4.5	U	4.1	U	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	8.4	J
l	900	NYSDEC TAGM	UG/KG	2.3	U	2.1	U	1.6	J	2	U	2	U	2	U	2.1	U	2	U
sulfate	1000	NYSDEC TAGM	UG/KG	4.5	U	4.1	U	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U
	100	NYSDEC TAGM	UG/KG	4.5	U	4.1	U	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U
ne			UG/KG	4.5	U	4.1	U	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U
dane			UG/KG	2.3	U	2.1	U	1.1	J	2	U	2	U	2	U	2.1	U	2	U
	200	NYSDEC TAGM	UG/KG	2.3	U	2.1	U	1.9	U	2	U	2	U	2	U	2.1	U	2	U
	300	NYSDEC TAGM	UG/KG	2.3	U	2.1	U	2.2		2	U	2	U	2	U	2.1	U	2	U
ALYSES																			
te-Nitrogen			MG/KG	0.16		0.35		0.34		0.27		6.1		6		0.27		0.64	
sture (PEST/PCB)				27		19		11		14		16		16		19		14	
sture (SVOCs)				27		19		11		14		16		16		19		14	
sture (VOCs)				38		21		11		14		17		17		20		18	
ds (Metals)				73.4		80.6		88.7		86.1		83.5		83.6		81.4		85.7	
OMATICS																			
oluene	1000	NYSDEC TAGM	UG/KG	120	U	120	UJ	120	U	120	UJ	120	UJ	120	UJ	120	U	120	UJ

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

			LOC_ID:	SS16-500-N		SS16-500-S		1000-N		1000-S		2000-N		2000-N		2000-S		3000-N	
			SAMP ID:	16074		16086		16083		16087		16089		16090		16085		16088	
			QC CODE:	SA		SA		SA		SA		SA		DU		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996	
ER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
	14592.84	NYSDEC TAGM	MG/KG	**14600**	**J**	13200	J	13900	J	11600	J	11700	J	11500	J	14100	J	12700	J
	3.59	NYSDEC TAGM	MG/KG	0.54	UJ	0.88	J	0.7		0.8	J	0.39	U	0.45	U	0.36		0.7	J
	7.5	NYSDEC TAGM	MG/KG	4.1		3.5	J	4.9		4.5	J	4.6	J	4.5	J	5.1		5.1	J
	300	NYSDEC TAGM	MG/KG	128	J	143	J	81.8	J	90.3	J	113	J	109	J	129	J	98.7	J
	0.73	NYSDEC TAGM	MG/KG	0.64		0.51		0.54		0.48		0.41		0.44		0.57		0.43	
	1	NYSDEC TAGM	MG/KG	0.08	U	0.25		0.07		0.34		0.21		0.21		0.21		0.1	
	101903.8	NYSDEC TAGM	MG/KG	4280		6060		9650		14500		3410		3420		3600		18200	
	22.13	NYSDEC TAGM	MG/KG	20.5		17		**24.4**		18.5		14.8		14.8		19.5		18.4	
	30	NYSDEC TAGM	MG/KG	8.5		9.2		15.7		9.2		7.2		7.1		10.7		10.3	
	25	NYSDEC TAGM	MG/KG	**25.4**		20.8		**39**		21.2		17.9		17.7		19.9		20.4	
	26626.65	NYSDEC TAGM	MG/KG	23400		21300		**29300**		22500		19100		19100		24000		23600	
	21.86	NYSDEC TAGM	MG/KG	**53.4**		**33.4**		**52**		**58**		19.7		19.5		**29**		19.3	
	12221.77	NYSDEC TAGM	MG/KG	3940		3850		6120		5330		3230		3200		3840		6820	
	669.38	NYSDEC TAGM	MG/KG	295	J	647		399	J	452		663		587		**704**	**J**	**670**	
	0.1	NYSDEC TAGM	MG/KG	**0.16**		0.05		0.06		0.06		0.07		0.09		0.06		**0.56**	
	33.62	NYSDEC TAGM	MG/KG	24.5		21.7		**50.8**		26.4		16.6		16.4		25.9		27.2	
	1761.48	NYSDEC TAGM	MG/KG	1200		901		1460		1100		1030		1060		1730		1420	
	2	NYSDEC TAGM	MG/KG	1.3	J	1.6		1.3	J	1.4		1.3		1.5		1.4	J	1.2	
	103.74	NYSDEC TAGM	MG/KG	73	U	56.3	U	83.1		59.2	U	51.7	U	59.9	U	49.4		57.9	U
	0.28	NYSDEC TAGM	MG/KG	1.1	U	0.88	U	0.88	U	0.93	U	0.81	U	0.94	U	**0.83**		0.91	U
	150	NYSDEC TAGM	MG/KG	24.1		21.7		20.5		19		19.4		19.5		22.3		20.1	
	82.5	NYSDEC TAGM	MG/KG	**85.2**	**J**	56.4		**109**	**J**	**92.5**		55.8		55.8		78.7	J	68.2	

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q
			LOC_ID:	3500-N		3500-S	
			SAMP ID:	16084		16055	
			QC CODE:	SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1	
			TOP:	0		0	
			BOTTOM:	0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/20/1996	
VOLATILE ORGANICS							
Benzene	60	NYSDEC TAGM	UG/KG	2	J	11	U
Toluene	1500	NYSDEC TAGM	UG/KG	3	J	2	J
SEMIVOLATILE ORGANICS							
2,4-Dinitrotoluene			UG/KG	880		400	
2-Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	340	U	28	J
2-Methylphenol	100	NYSDEC TAGM	UG/KG	340	U	350	U
Acenaphthene	50000	NYSDEC TAGM	UG/KG	340	U	33	J
Acenaphthylene	41000	NYSDEC TAGM	UG/KG	96	J	35	J
Anthracene	50000	NYSDEC TAGM	UG/KG	110	J	130	J
Benzo(a)anthracene	224	NYSDEC TAGM	UG/KG	**720**		**480**	
Benzo(a)pyrene	61	NYSDEC TAGM	UG/KG	**940**		**640**	
Benzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	**2200**	**J**	580	
Benzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	710		540	
Benzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	340	U	530	
Carbazole			UG/KG	85	J	40	J
Chrysene	400	NYSDEC TAGM	UG/KG	**670**		**520**	
Di-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	340	U	90	J
Dibenz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	**470**		**200**	**J**
Dibenzofuran	6200	NYSDEC TAGM	UG/KG	340	U	36	J
Fluoranthene	50000	NYSDEC TAGM	UG/KG	1000		780	
Fluorene	50000	NYSDEC TAGM	UG/KG	340	U	38	J
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	790		520	
N-Nitrosodiphenylamine (1)			UG/KG	95	J	47	J
Naphthalene	13000	NYSDEC TAGM	UG/KG	16	J	29	J
Phenanthrene	50000	NYSDEC TAGM	UG/KG	320	J	360	
Pyrene	50000	NYSDEC TAGM	UG/KG	1200		620	

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

			LOC_ID:	3500-N		3500-S	
			SAMP ID:	16084		16055	
			QC CODE:	SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1	
			TOP:	0		0	
			BOTTOM:	0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/20/1996	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q
PESTICIDES/PCB							
4,4'-DDE	2100	NYSDEC TAGM	UG/KG	8.9		140	J
4,4'-DDT	2100	NYSDEC TAGM	UG/KG	13	J	35	U
Dieldrin	44	NYSDEC TAGM	UG/KG	3.4	U	17	U
Endosulfan I	900	NYSDEC TAGM	UG/KG	12	J	430	J
Endosulfan sulfate	1000	NYSDEC TAGM	UG/KG	3.4	U	20	J
Endrin	100	NYSDEC TAGM	UG/KG	5.6		43	
Endrin ketone			UG/KG	4.8		71	
alpha-Chlordane			UG/KG	1.8	U	11	R
beta-BHC	200	NYSDEC TAGM	UG/KG	1.8	U	20	J
delta-BHC	300	NYSDEC TAGM	UG/KG	1.8	U	18	U
OTHER ANALYSES							
Nitrate/Nitrite-Nitrogen			MG/KG	0.34		0.44	
Percent Moisture (PEST/PCB)				3		6	
Percent Moisture (SVOCs)				3		6	
Percent Moisture (VOCs)				3		8	
Percent Solids (Metals)				97.2		93.7	
NITROAROMATICS							
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	120	U	900	J

Table A-4
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Downwind Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q
			LOC_ID:	3500-N		3500-S	
			SAMP ID:	16084		16055	
			QC CODE:	SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1	
			TOP:	0		0	
			BOTTOM:	0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/20/1996	
METALS							
Aluminum	14592.84	NYSDEC TAGM	MG/KG	4120	J	8620	J
Antimony	3.59	NYSDEC TAGM	MG/KG	0.56		0.74	J
Arsenic	7.5	NYSDEC TAGM	MG/KG	3.8		4.5	
Barium	300	NYSDEC TAGM	MG/KG	27.2	J	86.4	J
Beryllium	0.73	NYSDEC TAGM	MG/KG	0.16		0.32	
Cadmium	1	NYSDEC TAGM	MG/KG	0.23		0.32	
Calcium	101903.8	NYSDEC TAGM	MG/KG	**229000**		**107000**	
Chromium	22.13	NYSDEC TAGM	MG/KG	9.3		14	
Cobalt	30	NYSDEC TAGM	MG/KG	4.7		6.8	
Copper	25	NYSDEC TAGM	MG/KG	14.9		**29.6**	
Iron	26626.65	NYSDEC TAGM	MG/KG	9760		15800	J
Lead	21.86	NYSDEC TAGM	MG/KG	**36.7**		**36**	
Magnesium	12221.77	NYSDEC TAGM	MG/KG	8430		6310	
Manganese	669.38	NYSDEC TAGM	MG/KG	286	J	558	
Mercury	0.1	NYSDEC TAGM	MG/KG	0.04	U	0.05	
Nickel	33.62	NYSDEC TAGM	MG/KG	15.8		18.1	
Potassium	1761.48	NYSDEC TAGM	MG/KG	848		1410	
Selenium	2	NYSDEC TAGM	MG/KG	0.5	J	1.2	
Sodium	103.74	NYSDEC TAGM	MG/KG	**383**		68.9	
Thallium	0.28	NYSDEC TAGM	MG/KG	0.74	U	**1**	
Vanadium	150	NYSDEC TAGM	MG/KG	15.5		19.8	
Zinc	82.5	NYSDEC TAGM	MG/KG	53.2	J	**90.8**	

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-1		SW/SD16-10		SW/SD16-2		SW/SD16-3		SW/SD16-4		SW/SD16-4		SW/SD16-5	
			SAMP ID:	16143A		16129A		16135A		16133A		16119A		16125A		16142A	
			QC CODE:	SA		SA		SA		SA		SA		DU		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0	
			BOTTOM:	6		6		6		6		6		6		6	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996	
TER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
LE ORGANICS																	
e			UG/KG	24	U	18	U	17	U	21	U	22	U	16	U	13	U
			UG/KG	37	U	20		17	U	21	U	21	J	20		13	U
LATILE ORGANICS																	
otoluene			UG/KG	5400		620	U	720	U	480	U	430	UJ	1000	UJ	430	U
aphthalene			UG/KG	850	U	620	U	55	J	480	U	430	UJ	1000	UJ	430	U
ene	5110	NYS BALCT	UG/KG	850	U	32	J	720	U	480	U	430	UJ	1000	UJ	430	U
ylene			UG/KG	54	J	620	U	41	J	480	U	430	UJ	1000	UJ	430	U
e			UG/KG	99	J	57	J	42	J	480	U	430	UJ	1000	UJ	430	U
nthracene	47.45	NYS HHB	UG/KG	**570**	**J**	**260**	**J**	**240**	**J**	480	U	430	UJ	1000	UJ	430	U
yrene	47.45	NYS HHB	UG/KG	**600**	**J**	**320**	**J**	**270**	**J**	480	U	430	UJ	1000	UJ	430	U
luoranthene	47.45	NYS HHB	UG/KG	**1200**		**480**	**J**	**450**	**J**	480	U	430	UJ	1000	UJ	430	U
.i)perylene			UG/KG	530	J	280	J	250	J	41	J	430	UJ	1000	UJ	430	U
luoranthene	47.45	NYS HHB	UG/KG	**780**	**J**	**320**	**J**	**370**	**J**	480	U	430	UJ	1000	UJ	430	U
			UG/KG	110	J	52	J	720	U	480	U	430	UJ	1000	UJ	430	U
	47.45	NYS HHB	UG/KG	**1200**		**440**	**J**	**440**	**J**	480	U	430	UJ	1000	UJ	430	U
phthalate			UG/KG	250	J	210	J	720	U	480	U	430	UJ	1000	UJ	430	U
i)anthracene			UG/KG	170	J	100	J	720	U	480	U	430	UJ	1000	UJ	430	U
ene	37230	NYS BALCT	UG/KG	1600		550	J	490	J	33	J	430	UJ	1000	UJ	430	U
2,3-cd)pyrene	47.45	NYS HHB	UG/KG	**500**	**J**	**250**	**J**	**240**	**J**	39	J	430	UJ	1000	UJ	430	U
diphenylamine (1)			UG/KG	600	J	620	U	720	U	480	U	430	UJ	1000	UJ	430	U
ene	4380	NYS BALCT	UG/KG	420	J	340	J	140	J	31	J	430	UJ	1000	UJ	430	U
			UG/KG	1400		620	J	510	J	30	J	430	UJ	1000	UJ	430	U
lhexyl)phthalate	7300	NYS BALCT	UG/KG	180	J	270	J	720	U	120	J	27	J	160	J	430	U

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-1	SW/SD16-10	SW/SD16-2	SW/SD16-3	SW/SD16-4	SW/SD16-4	SW/SD16-5
			SAMP ID:	16143A	16129A	16135A	16133A	16119A	16125A	16142A
			QC CODE:	SA	SA	SA	SA	SA	DU	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1
			TOP:	0	0	0	0	0	0	0
			BOTTOM:	6	6	6	6	6	6	6
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			SAMPLE DATE:	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996
TER	LEVE	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
DES/PCB										
	0.37	NYS HHB	UG/KG	**730 J**	**61**	**4.4 J**	**3 J**	4.3 U	10 UJ	4.3 U
	0.37	NYS HHB	UG/KG	**570 J**	**150**	**13 J**	**32**	**3 J**	**15 J**	**4.3 J**
	0.37	NYS HHB	UG/KG	**420 J**	**54**	**5.3 J**	4.9 U	4.3 U	**7.9 J**	4.3 U
54	0.03	NYS HHB	UG/KG	**670**	**100 J**	72 U	**41 J**	43 U	100 UJ	43 U
60	0.03	NYS HHB	UG/KG	**130 J**	**72 J**	72 U	**39 J**	43 U	100 UJ	43 U
I	1.10	NYS BALCT	UG/KG	**26**	**8.8**	**11 J**	**2.3 J**	2.2 U	5.2 UJ	2.2 U
II	1.10	NYS BALCT	UG/KG	8.5 U	**6.3 J**	7.2 U	4.9 U	**2.6 J**	**6.8 J**	4.3 U
sulfate			UG/KG	18 J	6.2 U	7.2 U	4.9 U	4.3 U	10 UJ	4.3 U
hyde			UG/KG	8.5 U	6.2 U	7.2 U	3.2 J	4.3 U	10 UJ	4.3 U
epoxide	0.03	NYS HHB	UG/KG	4.4 U	3.2 U	**2.8 J**	2.5 U	2.2 U	5.2 UJ	2.2 U
rdane			UG/KG	10 J	3.2 U	3.7 U	2.5 U	2.2 U	5.2 UJ	2.2 U
lordane			UG/KG	4.4 U	3.2 U	3.7 U	2.5 U	2.2 U	5.2 UJ	2.2 U
NALYSES										
rite-Nitrogen			MG/KG	0.67	0.09	0.24	0.01 U	0.01 U	0.03 U	0.12
oisture (PEST/PCB)				61	47	54	32	24	67	24
oisture (SVOCs)				61	47	54	32	24	67	24
oisture (VOCs)				59	44	40	52	54	39	23
ids (Metals)				38.9	52.8	46.2	67.8	75.5	33.1	75.6
nic Carbon			MG/KG	62500	56600	30300	28900	7150	56800	2780
OMATICS										
toluene			UG/KG	190 J	120 U	120 UJ	120 U	120 U	120 UJ	120 U

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-1		SW/SD16-10		SW/SD16-2		SW/SD16-3		SW/SD16-4		SW/SD16-4		SW/SD16-5	
			SAMP ID:	16143A		16129A		16135A		16133A		16119A		16125A		16142A	
			QC CODE:	SA		SA		SA		SA		SA		DU		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0	
			BOTTOM:	6		6		6		6		6		6		6	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996	
ER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			MG/KG	11000	J	14300		22900	J	8040		6430	J	11400	J	17500	
	2	NSY LEL	MG/KG	**10.9**	**J**	**11.5**	**J**	**13.5**	**J**	**50.3**	**J**	1.4	J	**8.7**	**J**	0.77	UJ
	6	NSY LEL	MG/KG	**8.7**	**J**	**9.6**		**7.2**	**J**	4.5		3.4	J	**6.1**	**J**	5.6	
			MG/KG	109	J	636		242	J	433		27.8	J	92	J	99.9	
			MG/KG	0.46	J	0.69		0.93	J	0.41		0.24	J	0.39	J	0.73	
	0.6	NSY LEL	MG/KG	**1.6**	**J**	**7.6**		**0.72**	**J**	0.57		0.24	J	**0.61**	**J**	0.26	
			MG/KG	75700	J	38300		13400	J	26400		19200	J	43500	J	72700	
	26	NSY LEL	MG/KG	**43.5**	**J**	**41.3**		**32.9**	**J**	20.4		10.8	J	18.3	J	**27.8**	
			MG/KG	7.6	J	13.6		13.1	J	7.6		6.5	J	11.8	J	10.6	
	16	NSY LEL	MG/KG	**335**	**J**	**573**	**J**	**260**	**J**	**17500**	**J**	**27.4**	**J**	**116**	**J**	**50**	**J**
	20000	NSY LEL	MG/KG	**28500**	**J**	**46400**		**34300**	**J**	**20400**		15300	J	**23200**	**J**	**31000**	
	31	NSY LEL	MG/KG	**1720**	**J**	**1950**		**1250**	**J**	**4480**		**175**	**J**	**634**	**J**	**112**	
			MG/KG	12300	J	8390		7500	J	4720		3200	J	5700	J	8350	
	460	NSY LEL	MG/KG	218	J	386	J	174	J	217	J	186	J	343	J	303	
	0.15	NSY LEL	MG/KG	**0.52**	**J**	**0.31**		**2**	**J**	**2.5**		0.08	J	**0.2**	**J**	0.08	
	16	NSY LEL	MG/KG	**32.6**	**J**	**45.2**	**J**	**44.8**	**J**	**32.4**	**J**	**18.2**	**J**	**30**	**J**	**40.1**	**J**
			MG/KG	2420	J	2440	J	2660	J	880	J	557	J	1630	J	2450	J
			MG/KG	4.9	J	1.5	U	1.7	UJ	1.1	U	0.7	UJ	1.8	UJ	1	U
	1	NSY LEL	MG/KG	0.69	UJ	0.48	U	0.53	UJ	0.35		0.22	UJ	0.58	UJ	0.32	U
			MG/KG	153	J	782		182	J	404		69.1	J	147	J	142	
			MG/KG	1.9	UJ	1.3	U	1.6	J	0.94	U	0.61	UJ	1.6	UJ	0.88	U
			MG/KG	39.8	J	29.3		33.5	J	10		8.9	J	18.3	J	26.6	
	120	NSY LEL	MG/KG	**549**	**J**	**557**		**339**	**J**	**952**		**138**	**J**	**284**	**J**	103	

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-7		SW/SD16-8		SW/SD16-9	
			SAMP ID:	16127A		16134A		16128A	
			QC CODE:	SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0	
			BOTTOM:	6		6		6	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS									
2-Butanone			UG/KG	14	U	16	U	12	J
Acetone			UG/KG	20		16	U	32	
SEMIVOLATILE ORGANICS									
2,4-Dinitrotoluene			UG/KG	43	J	470	U	520	U
2-Methylnaphthalene			UG/KG	570	U	470	U	520	U
Acenaphthene	5110	NYS BALCT	UG/KG	570	U	470	U	520	U
Acenaphthylene			UG/KG	570	U	470	U	37	J
Anthracene			UG/KG	570	U	470	U	100	J
Benzo(a)anthracene	47.45	NYS HHB	UG/KG	**92**	**J**	22	J	**370**	**J**
Benzo(a)pyrene	47.45	NYS HHB	UG/KG	**120**	**J**	470	U	**470**	**J**
Benzo(b)fluoranthene	47.45	NYS HHB	UG/KG	**120**	**J**	470	U	**690**	
Benzo(g,h,i)perylene			UG/KG	100	J	470	U	400	J
Benzo(k)fluoranthene	47.45	NYS HHB	UG/KG	**120**	**J**	470	U	**520**	
Carbazole			UG/KG	570	U	470	U	54	J
Chrysene	47.45	NYS HHB	UG/KG	**120**	**J**	36	J	**640**	
Di-n-butylphthalate			UG/KG	570	U	470	U	160	J
Dibenz(a,h)anthracene			UG/KG	47	J	470	U	150	J
Fluoranthene	37230	NYS BALCT	UG/KG	190	J	41	J	550	
Indeno(1,2,3-cd)pyrene	47.45	NYS HHB	UG/KG	**91**	**J**	470	U	**380**	**J**
N-Nitrosodiphenylamine (1)			UG/KG	570	U	470	U	520	U
Phenanthrene	4380	NYS BALCT	UG/KG	100	J	24	J	300	J
Pyrene			UG/KG	190	J	41	J	660	
bis(2-Ethylhexyl)phthalate	7300	NYS BALCT	UG/KG	150	J	470	U	51	J

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-7		SW/SD16-8		SW/SD16-9	
			SAMP ID:	16127A		16134A		16128A	
			QC CODE:	SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0	
			BOTTOM:	6		6		6	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB									
4,4'-DDD	0.37	NYS HHB	UG/KG	**100**	**J**	**3**	**J**	**18**	**J**
4,4'-DDE	0.37	NYS HHB	UG/KG	**140**	**J**	**13**		**76**	
4,4'-DDT	0.37	NYS HHB	UG/KG	**100**	**J**	**3**	**J**	**49**	
Aroclor-1254	0.03	NYS HHB	UG/KG	**150**		**35**	**J**	**61**	**J**
Aroclor-1260	0.03	NYS HHB	UG/KG	**51**	**J**	47	U	**63**	**J**
Endosulfan I	1.10	NYS BALCT	UG/KG	**4.4**	**J**	2.4	U	**12**	
Endosulfan II	1.10	NYS BALCT	UG/KG	5.7	U	4.7	U	5.2	U
Endosulfan sulfate			UG/KG	4.6	J	4.7	U	3	U
Endrin aldehyde			UG/KG	5.7	U	4.7	U	5.2	U
Heptachlor epoxide	0.03	NYS HHB	UG/KG	2.9	U	2.4	U	2.7	U
alpha-Chlordane			UG/KG	4.2		2.4	U	12.1	J
gamma-Chlordane			UG/KG	3.8		2.4	U	2.9	
OTHER ANALYSES									
Nitrate/Nitrite-Nitrogen			MG/KG	0.03		0.2		0.05	
Percent Moisture (PEST/PCB)				42		30		36	
Percent Moisture (SVOCs)				42		30		36	
Percent Moisture (VOCs)				31		37		53	
Percent Solids (Metals)				57.7		70		64	
Total Organic Carbon			MG/KG	50600		26400		59800	
NITROAROMATICS									
2,4-Dinitrotoluene			UG/KG	120	U	120	U	120	U

Table A-5
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD16-7		SW/SD16-8		SW/SD16-9	
			SAMP ID:	16127A		16134A		16128A	
			QC CODE:	SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0	
			BOTTOM:	6		6		6	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q
METALS									
Aluminum			MG/KG	10200		17300		9600	
Antimony	2	NSY LEL	MG/KG	**3.2**	**J**	**2.6**	**J**	**3**	**J**
Arsenic	6	NSY LEL	MG/KG	1.9		**6.5**		4.2	
Barium			MG/KG	62.7		300		131	
Beryllium			MG/KG	0.42		0.61		0.48	
Cadmium	0.6	NSY LEL	MG/KG	**1.9**		0.23		**1.2**	
Calcium			MG/KG	25700		6680		58000	
Chromium	26	NSY LEL	MG/KG	23.5		25		16.9	
Cobalt			MG/KG	7.5		8		8.9	
Copper	16	NSY LEL	MG/KG	**120**	**J**	**85**	**J**	**124**	**J**
Iron	20000	NSY LEL	MG/KG	17700		**36400**		18100	
Lead	31	NSY LEL	MG/KG	**511**		**992**		**476**	
Magnesium			MG/KG	6660		5260		15100	
Manganese	460	NSY LEL	MG/KG	192	J	223	J	447	J
Mercury	0.15	NSY LEL	MG/KG	0.06		0.06		**0.16**	
Nickel	16	NSY LEL	MG/KG	**27.3**	**J**	**24.8**	**J**	**24.7**	**J**
Potassium			MG/KG	1970	J	1640	J	2010	J
Selenium			MG/KG	1.6	U	0.76	U	0.98	U
Silver	1	NSY LEL	MG/KG	0.5	U	0.24	U	0.31	U
Sodium			MG/KG	127		68.6		376	
Thallium			MG/KG	1.4	U	0.66	U	0.85	U
Vanadium			MG/KG	26.5		27.2		20.1	
Zinc	120	NSY LEL	MG/KG	**176**		96.3		**192**	

Table A-6
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Groundwater Analytical Results

		LOC_ID:		MW16-1		MW16-1		MW16-1		MW16-2		MW16-2		MW16-2		MW16-2		MW16-3		MW16-3
		SAMP ID:		MW16-1-1		16101		16152		MW16-2-1		MW16-41-1		16102		16150		MW16-3-1		16110
		QC CODE:		SA		SA		SA		SA		DU		SA		SA		SA		SA
		STUDY ID:		ESI		RI ROUND1		RI ROUND2		ESI		ESI		RI ROUND1		RI ROUND2		ESI		RI ROUND1
		MATRIX:		WATER		WATER		WATER		WATER		WATER		WATER		WATER		WATER		WATER
		SAMPLE DATE:		11/19/1993		8/27/1996		12/7/1996		11/19/1993		11/19/1993		8/27/1996		12/6/1996		11/19/1993		8/30/1996
TER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE
ORGANICS																				
			UG/L	27	U	26	UJ	25	U	27	U	27	U	25	U	25	U	27	U	25
	5	NYS CLASS GA STANDARD	UG/L	11	U	10	UJ	10	U	11	U	11	U	10	U	10	U	11	U	10
e			UG/L	11	U	10	UJ	10	U	11	U	11	U	10	U	10	U	11	U	1
ene			UG/L	11	U	10	UJ	10	U	11	U	11	U	10	U	10	U	11	U	0.7
			UG/L	11	U	10	UJ	10	U	11	U	11	U	10	U	10	U	0.5	J	10
rene			UG/L	11	U	10	UJ	10	U	11	U	11	U	10	U	10	U	11	U	0.6
SES																				
ogen			MG/L	0.11		0.02		0.01	U	0.86		0.77		0.67		2		0.23		0.04
tals)						0		0						0		0				0
ydrocarbons			MG/L			0.44	U	0.4	U					0.4	U	0.36	U			0.41
TICS																				
:	5	NYS CLASS GA STANDARD	UG/L	0.13	U	0.26	U	0.26	U	0.13	U	0.13	U	1.8	J	0.26	U	0.13	U	0.26
	5	NYS CLASS GA STANDARD	UG/L	0.13	U	0.26	U	0.26	U	0.13	U	0.13	U	0.26	U	0.26	U	0.07	J	0.26
	200	EPA SECONDARY MCL	UG/L	53600		1850		143	U	3500		4540		1010		490		149000		336
	6	EPA MCL	UG/L	52.5	U	2	U	3	U	52.4	U	52.7	U	2	U	3	U	89.6		7.5
	25	NYS CLASS GA STANDARD	UG/L	15.4		2.7	U	4.4	U	1	U	1.3	J	2.7	U	4.4	U	33.2		2.7
	1000	NYS CLASS GA STANDARD	UG/L	401		74.2		48.2	U	43	J	48.4	J	48.1		31.4	U	1170		64.4
	4	EPA MCL	UG/L	3.1	J	0.23		0.2	U	0.3	U	0.3	U	0.22		0.2	U	8.1		0.21
	5	EPA MCL	UG/L	3.3	U	0.3	U	0.6	U	3.3	U	3.3	U	0.3	U	0.6	U	3.9	J	0.3
			UG/L	239000		157000		116000		114000		117000		193000		164000		477000		99800
	50	NYS CLASS GA STANDARD	UG/L	88.5		2.7		1	U	6	J	6.9	J	2.3		1.1	U	293		1
			UG/L	59.9		2.1		1.3	U	4.9	U	4.9	U	1.5		1.3	U	166		1.2
	200	NYS CLASS GA STANDARD	UG/L	64.2		4.9		1.9	U	12.1	J	14.8	J	7.9		2.9	U	2150		19.2
	300	NYS CLASS GA STANDARD	UG/L	88100		2400	J	296		5310		6400		1720	J	923	J	246000		432
	15	EPA MCL	UG/L	71.1		1.7	U	1.5	U	27.3		34.5		5.9		6.8		3240		6.1
			UG/L	42000		23300		17600		15200		15900		23700		20900		92000		11600
	50	EPA SECONDARY MCL	UG/L	2110		210		64.2		167		189		129		65.2		6300		136
	2	NYS CLASS GA STANDARD	UG/L	0.07	UJ	0.1	U	0.1	U	0.07	UJ	0.07	UJ	0.1	U	0.1	U	3.9	J	0.1
	100	EPA MCL	UG/L	135		4.7		2.5	U	10.2	J	11.5	J	11		3.1	U	406		3
			UG/L	10200		1670		998	U	4810	J	4520	J	4760		3410	U	24800		2740
	10	NYS CLASS GA STANDARD	UG/L	2.5	J	2.4	U	4.7	UJ	0.8	U	0.99	J	2.4	U	4.7	UJ	10.3		2.4
	20000	NYS CLASS GA STANDARD	UG/L	7710		8750		3870	U	11400		11700		19100		17000		10500		9480
	2	EPA MCL	UG/L	1.8	U	4.2	U	5.9	U	1.8	U	1.8	U	9.2		9.6	U	17.8	U	4.2
			UG/L	86.5		3.3		1.6	U	7.2	J	9.3	J	2.9		1.6	U	257		1.2
	300	NYS CLASS GA STANDARD	UG/L	460		15.6	R	5.8	U	30.4		33.4		37.4	R	13.5	U	3370		32.4

Table A-6
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Groundwater Analytical Results

LOC_ID:				MW16-3	MW16-4	MW16-4	MW16-5	MW16-6	MW16-6	MW16-7	MW16-7
SAMP ID:				16165	16105	16156	16162	16111	16155	16104	16158
QC CODE:				SA	SA	SA	SA	SA	SA	SA	SA
STUDY ID:				RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
MATRIX:				WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
SAMPLE DATE:				12/10/1996	8/28/1996	12/7/1996	12/9/1996	9/3/1996	12/8/1996	8/28/1996	12/8/1996
AMETER	LEVE	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
TILE ORGANICS											
e			UG/L	25 U	26 U	25 U	25 U	25 U	25 U	25 J	25 U
ne	5	NYS CLASS GA STANDARD	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 J	10 U
rylene			UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
nthracene			UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
late			UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cd]pyrene			UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ALYSES											
e Nitrogen			MG/L	0.64	0.29	0.26	1.4	0.01 U	0.01 U	0.83	0.24
s (Metals)				0	0	0	0	0	0	0	0
um Hydrocarbons			MG/L	1	0.41 U	0.42 U	0.91	0.89	0.73	0.41 U	0.46 U
MATICS											
nzene	5	NYS CLASS GA STANDARD	UG/L	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26	0.26 U
uene	5	NYS CLASS GA STANDARD	UG/L	0.26 U	0.68 J	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
	200	EPA SECONDARY MCL	UG/L	36.1 U	24.9	36.1 U	148 U	208	170 U	12.4	67.4 U
	6	EPA MCL	UG/L	5.3 U	2 U	3 U	3 U	2 U	3 U	15.7 U	8.9 U
	25	NYS CLASS GA STANDARD	UG/L	4.4 U	2.7 U	4.4 U	4.4 U	2.7 U	4.4 U	4 U	4.4 U
	1000	NYS CLASS GA STANDARD	UG/L	57.4 U	97.4	55.2 U	67.6 U	86.4	80.2 U	89.2	59.1 U
	4	EPA MCL	UG/L	0.2 U	0.21	0.2 U	0.2 U	0.1 U	0.2 U	0.21	0.2 U
	5	EPA MCL	UG/L	0.6 U	0.3 U	0.6 U	0.6 U	0.3 U	0.6 U	0.3 U	0.6 U
			UG/L	85500	130000	158000	90000	44600	84900	109000	114000
	50	NYS CLASS GA STANDARD	UG/L	1 U	1 U	1 U	1 U	1.5	1 U	1	1 U
			UG/L	1.3 U	1.2 U	1.3 U	1.3 U	1.2	1.3 U	1.2	1.3 U
	200	NYS CLASS GA STANDARD	UG/L	11.4 U	3.6	1.1 U	1.1 U	4.4	1.1 U	5.1	1.4 U
	300	NYS CLASS GA STANDARD	UG/L	77.8 U	38.2	126	211	273 J	290	23.4	174
	15	EPA MCL	UG/L	1.5 U	1.7 U	1.5 U	3 U	1.7 U	1.5 U	8.4	9.9
			UG/L	10000	17700	22900	11800	6370	12800	16900	22600
	50	EPA SECONDARY MCL	UG/L	5.9 U	132	66.9	51	545	1330	85.7	43.2
	2	NYS CLASS GA STANDARD	UG/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	100	EPA MCL	UG/L	2.5 U	2.2	2.5 U	2.5 U	4.1	2.5 U	2.2	2.5 U
			UG/L	1900 U	4040	1660 U	18800	3530	2230 U	3220	2090 U
	10	NYS CLASS GA STANDARD	UG/L	4.7 UJ	2.4 U	4.7 UJ	4.7 UJ	2.4 U	4.7 UJ	2.4 U	4.7 UJ
	20000	NYS CLASS GA STANDARD	UG/L	7660	17200	12300	49500	396000	409000	12000	9940
	2	EPA MCL	UG/L	4.1 U	4.2 U	4.1 U	6.9 U	6.2	4.1 U	[redacted]	[redacted]
			UG/L	1.6 U	1.2 U	1.6 U	1.6 U	2.9	1.6 U	1.2	1.6 U
	300	NYS CLASS GA STANDARD	UG/L	42	4.5 R	5.1 U	6.3 U	13.2 R	10.5 U	2.9 R	2.2 U

Table A-7
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Water Analytical Results

			LOC_ID:	SW/SD16-1	SW/SD16-10	SW/SD16-2	SW/SD16-3	SW/SD16-4	SW/SD16-4	SW/SD16-5	SW/S
			SAMP ID:	16143	16129	16135	16133	16119	16125	16142	
			QC CODE:	SA	SA	SA	SA	SA	DU	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI R
			TOP:								
			BOTTOM:								
			MATRIX:	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SUR WAT
			SAMPLE DATE:	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/
ETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VAL
OLATILE ORGANICS											
ylphthalate			UG/L	10 U	10 U	10 U	10 U	10 U	10 U	0.5 J	
orophenol	0.4	NYS AWQS CLASS C	UG/L	25 U	0.7 J	25 U	25 U	25 U	25 U	25 U	
ylhexyl)phthalate	0.6	NYS AWQS CLASS C	UG/L	10 U	**3 J**	10 U	10 U	10 U	10 U	**3 J**	
ANALYSES											
itrite-Nitrogen			MG/L	0.34	0.01 U	0.49	0.43	0.26	0.31	0.15	
olids (Metals)				0	0	0	0	0	0	0	
ganic Carbon			MG/L	5	6.4	3.2	2.3	2.8	2.8	4	
			MG/L	7.39	7.62	7.34	7.57	7.46	7.59	7.36	
S											
n	100	NYS AWQS CLASS C	UG/L	26.8 R	118 R	34.2 R	401 R	123 R	69.6 R	976 R	
			UG/L	10.4 J	5.3 J	14.7 J	124 J	59.1 J	68.8 J	3.6 J	
	190	NYS AWQS CLASS C	UG/L	3 J	2.7 U	2.7 U	5.7 J	4 J	2.7 U	3.6 J	
			UG/L	75.3 J	103 J	114 J	100 J	155 J	116 J	64.4 J	
	1.86	NYS AWQS CLASS C	UG/L	0.3 U	0.71 J	0.3 U	**2 J**	0.43 J	0.3 U	0.63 J	
			UG/L	79000	73300	87900	69800	78600	75300	89900	
n	347.27	NYS AWQS CLASS C	UG/L	1 U	1 U	1 U	2.1 J	1 U	1 U	2.2 J	
	5	NYS AWQS CLASS C	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	2.6	
	20.29	NYS AWQS CLASS C	UG/L	13.5	17.9	13.9	**424**	**33.4**	**26.7**	**25.7**	
	300	NYS AWQS CLASS C	UG/L	32.4 J	210 J	41 J	**1550 J**	**1140 J**	272 J	**3340 J**	
	7.16	NYS AWQS CLASS C	UG/L	5.4	**11.7**	**34.3**	**813**	**96.8**	**34.2**	**66.8**	
um			UG/L	8080	6800	11400	11200	11400	11100	10100	
se			UG/L	18.4	47.3	8.6	22.6	53	42.8	161	
			UG/L	0.1 U	0.1 U	0.1 U	0.9	0.1 U	0.1 U	0.1 U	
	154.49	NYS AWQS CLASS C	UG/L	1.6 U	4.8	1.6 U	3.5	2.7	3.7	3.8	
n			UG/L	2380	2460	1200	4590	3890	3790	2510	
	1	NYS AWQS CLASS C	UG/L	2.4 U	2.4 U	**2.8 J**	2.4 U	2.4 U	2.4 U	**4.3 J**	
	0.1	NYS AWQS CLASS C	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	
			UG/L	4720	4830	5540	8280	7730	7620	5670	
n	14	NYS AWQS CLASS C	UG/L	1.2 U	1.2 U	1.2 U	1.3 J	1.5 J	1.2 U	3.7 J	
	141.38	NYS AWQS CLASS C	UG/L	28.5	**158**	71.7	**253**	**217**	125	104	

Table A-7
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-16 Surface Water Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	SW/SD16-7 VALUE	Q	SW/SD16-8 VALUE	Q	SW/SD16-9 VALUE	Q	SW16-1 VALUE	Q	SW16-2 VALUE	Q
			LOC_ID:	SW/SD16-7		SW/SD16-8		SW/SD16-9		SW16-1		SW16-2	
			SAMP ID:	16127		16134		16128		SW16-1-1		SW16-2-1	
			QC CODE:	SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI	
			TOP:							0		0	
			BOTTOM:							0.2		0.2	
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/18/1996		12/6/1993		12/6/1993	
SEMIVOLATILE ORGANICS													
Di-n-butylphthalate			UG/L	10	U	10	U	10	U	11	U	10	U
Pentachlorophenol	0.4	NYS AWQS CLASS C	UG/L	1	J	25	U	4	J	27	U	26	U
bis(2-Ethylhexyl)phthalate	0.6	NYS AWQS CLASS C	UG/L	10	U	10	U	1	J	11	U	10	U
OTHER ANALYSES													
Nitrate/Nitrite-Nitrogen			MG/L	0.12		0.01	U	0.04		1.27		1.77	
Percent Solids (Metals)				0		0		0					
Total Organic Carbon			MG/L	2.8		10.4		9.3					
pH			MG/L	7.57		7.53		7.8					
METALS													
Aluminum	100	NYS AWQS CLASS C	UG/L	1540	R	77.1	R	190	R	152	J	261	
Antimony			UG/L	6.5	J	7.2	J	7.7	J	21.5	U	21.4	U
Arsenic	190	NYS AWQS CLASS C	UG/L	4.5	J	4.3	J	3.6	J	0.8	U	0.8	U
Barium			UG/L	74.4	J	117	J	122	J	60.6	J	84.5	J
Cadmium	1.86	NYS AWQS CLASS C	UG/L	0.72	J	0.3	U	0.5	J	2.1	U	2.1	U
Calcium			UG/L	88400		46100		45900		71700		53400	
Chromium	347.27	NYS AWQS CLASS C	UG/L	3	J	1	U	1	U	2.6	U	2.6	U
Cobalt	5	NYS AWQS CLASS C	UG/L	4.1		1.2	U	1.2	U	4.4	U	4.4	U
Copper	20.29	NYS AWQS CLASS C	UG/L	24.9		15.6		41.1		19.3	J	67.6	
Iron	300	NYS AWQS CLASS C	UG/L	3650	J	94.7	J	220	J	281	R	551	R
Lead	7.16	NYS AWQS CLASS C	UG/L	67.4		6.5		37.3		67.8		178	
Magnesium			UG/L	10000		5990		4300		9590		8170	
Manganese			UG/L	252		2.4		18.4		8.7	J	33.9	
Mercury			UG/L	0.1	U	0.1	U	0.1	U	0.1	J	0.19	J
Nickel	154.49	NYS AWQS CLASS C	UG/L	5.5		1.6	U	4.1		4	U	5.2	J
Potassium			UG/L	2500		3150		2090		2560	J	3120	J
Selenium	1	NYS AWQS CLASS C	UG/L	2.4	U	2.4	U	2.7	J	1.1	J	0.7	U
Silver	0.1	NYS AWQS CLASS C	UG/L	1.3	U	1.3	U	1.3	U	4.2	U	[illegible]	J
Sodium			UG/L	5380		1150		3040		9220		8850	
Vanadium	14	NYS AWQS CLASS C	UG/L	4.9	J	1.2	U	1.3	J	3.7	J	4.5	J
Zinc	141.38	NYS AWQS CLASS C	UG/L	121		28.8		66.7		34.7		[illegible]	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC ID:	SS17-1		SS17-10		SS17-11		SS17-12		SS17-13		SS17-14		SS17-15		SS17-16	
			SAMP ID:	SS17-1-1		SS17-10-1		SS17-11-1		SS17-12-1		SS17-13-1		SS17-14-1		SS17-15-1		SS17-16-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/1993		11/9/1993		11/9/1993		10/21/1993		10/20/1993		10/21/1993		10/20/1993		10/21/1993	
RAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
OLATILE ORGANICS																			
tone	200	NYSDEC TAGM	UG/KG	12	U	11	U	13	U	12	U	7	J	11	U	11	UR	13	U
zene	60	NYSDEC TAGM	UG/KG	12	U	11	U	13	U	12	U	11	U	11	U	11	UR	13	U
hylene Chloride	100	NYSDEC TAGM	UG/KG	12	U	11	U	13	U	12	U	4	J	11	U	11	UR	13	U
uene	1500	NYSDEC TAGM	UG/KG	12	U	11	U	13	U	12	U	1	J	11	U	11	UR	13	U
IIVOLATILE ORGANICS																			
Dinitrotoluene			UG/KG	420	U	61	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
lethylnaphthalene	36400	NYSDEC TAGM	UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
-Dichlorobenzidine			UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
itroaniline	500	NYSDEC TAGM	UG/KG	1000	U	850	U	1000	U	940	U	860	U	850	UJ	850	UR	1100	U
itroaniline			UG/KG	1000	U	850	U	1000	U	940	U	860	U	850	UJ	850	UR	1100	U
hracene	50000	NYSDEC TAGM	UG/KG	23	J	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
zo(a)anthracene	224	NYSDEC TAGM	UG/KG	72	J	38	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
zo(a)pyrene	61	NYSDEC TAGM	UG/KG	58	J	32	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
zo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	70	J	50	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
zo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	63	J	27	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
zo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	49	J	38	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
ylbenzylphthalate	50000	NYSDEC TAGM	UG/KG	420	U	46	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
oazole			UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
ysene	400	NYSDEC TAGM	UG/KG	75	J	78	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
n-butylphthalate	8100	NYSDEC TAGM	UG/KG	51	J	48	J	66	J	210	J	21	J	350	UJ	350	UR	340	J
enz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	**40**	**J**	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
oranthene	50000	NYSDEC TAGM	UG/KG	190	J	150	J	420	U	390	U	19	J	350	UJ	350	UR	31	J
eno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	62	J	25	J	420	U	390	U	350	U	350	UJ	350	UR	450	U
itrosodiphenylamine (1)			UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
hthalene	13000	NYSDEC TAGM	UG/KG	420	U	350	U	420	U	390	U	350	U	350	UJ	350	UR	450	U
tachlorophenol	1000	NYSDEC TAGM	UG/KG	1000	U	850	U	1000	U	940	U	860	U	850	UJ	850	UR	1100	U
nanthrene	50000	NYSDEC TAGM	UG/KG	120	J	72	J	420	U	390	U	19	J	350	UJ	350	UR	450	U
ene	50000	NYSDEC TAGM	UG/KG	170	J	110	J	26	J	390	U	17	J	350	UJ	350	UR	28	J
2-Chloroisopropyl) ether			UG/KG																
2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	530		810	U	1300		390	U	460	J	50	J	350	UR	450	U

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-1		SS17-10		SS17-11		SS17-12		SS17-13		SS17-14		SS17-15		SS17-16		SS
			SAMP ID:	SS17-1-1		SS17-10-1		SS17-11-1		SS17-12-1		SS17-13-1		SS17-14-1		SS17-15-1		SS17-16-1		SS1
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		S
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		E
			TOP:	0		0		0		0		0		0		0		0		
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2		(
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SUR S(
			SAMPLE DATE:	10/21/1993		11/9/1993		11/9/1993		10/21/1993		10/20/1993		10/21/1993		10/20/1993		10/21/1993		10/2
AMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VA
PESTICIDES/PCB																				
DDD	2900	NYSDEC TAGM	UG/KG	4.7	J	3.5	U	4.2	U	3.9	U	3.5	UJ	3.5	U	3.5	U	4.5	U	
DE	2100	NYSDEC TAGM	UG/KG	5.2		37		4.2	U	2.9	J	11	J	2.7	J	3.5	U	4.5	U	
DDT	2100	NYSDEC TAGM	UG/KG	4.1	U	10		4.2	U	3.9	U	4.9	J	3.5	U	3.5	U	4.5	U	
n	41	NYSDEC TAGM	UG/KG	2.1	U	1.8	U	2.2	U	2	U	1.8	UJ	1.8	U	1.8	U	2.3	U	
or-1260	10000	NYSDEC TAGM	UG/KG	41	U	35	U	42	U	39	U	35	UJ	35	U	35	U	45	U	
rin	44	NYSDEC TAGM	UG/KG	4.1	U	3.5	U	**62**		3.9	U	3.5	UJ	3.5	U	3.5	U	4.5	U	
sulfan I	900	NYSDEC TAGM	UG/KG	2.1	U	1.8	U	2.2	U	2	U	0.76	J	1.8	U	1.8	U	2.3	U	
n	100	NYSDEC TAGM	UG/KG	4.1	U	3.5	U	4.2	U	3.9	U	3.5	UJ	3.5	U	3.5	U	4.5	U	
chlor epoxide	20	NYSDEC TAGM	UG/KG	2.1	U	1.8	U	2.2	U	2	U	1.8	UJ	1.8	U	1.8	U	2.3	U	
OTHER ANALYSES																				
e/Nitrite-Nitrogen			MG/KG	0.21		0.1		2.4		0.06		0.81		1.1		0.84		0.21		
nt Moisture (PEST/PCB)																				
nt Moisture (SVOCs)																				
nt Moisture (VOCs)																				
nt Solids (Metals)																				
Organic Carbon			MG/KG																	
ITROAROMATICS																				
initrotoluene			UG/KG	130	U	330	J	130	U	130	U	130		130	U	130	U	130	U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-1		SS17-10		SS17-11		SS17-12		SS17-13		SS17-14		SS17-15		SS17-16		SS1
			SAMP ID:	SS17-1-1		SS17-10-1		SS17-11-1		SS17-12-1		SS17-13-1		SS17-14-1		SS17-15-1		SS17-16-1		SS1
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		S
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		E
			TOP:	0		0		0		0		0		0		0		0		
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2		(
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SUR S
			SAMPLE DATE:	10/21/1993		11/9/1993		11/9/1993		10/21/1993		10/20/1993		10/21/1993		10/20/1993		10/21/1993		10/2
AMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VA
METALS																				
inum	14592.84	NYSDEC TAGM	MG/KG	11800		9990	J	14200		13100		10700		4660		12600		**17300**		
nony	3.59	NYSDEC TAGM	MG/KG	12.9	UR	**52**	**J**	12.4	U	10.8	UR	**39.2**		11.4	JR	9.8	U	12.4	UR	
ic	7.5	NYSDEC TAGM	MG/KG	6		7	J	4.5	J	6.5		6.7		**10.6**		6.1		6.5		
m	300	NYSDEC TAGM	MG/KG	102	R	**357**	**J**	189		203	R	**343**		199	R	122		210	R	
lium	0.73	NYSDEC TAGM	MG/KG	0.5	J	0.48	J	**0.73**	**J**	0.59	J	0.5	J	0.34	J	0.54	J	**0.82**	**J**	
ium	1	NYSDEC TAGM	MG/KG	**2.3**		21.7	R	1.2	R	**4.5**		**8.3**		**10.8**		0.93	J	**2.3**		
um	101903.8	NYSDEC TAGM	MG/KG	99300		**113000**	**J**	4670		88400		**104000**		**209000**		37800		4760		
nium	22.13	NYSDEC TAGM	MG/KG	16.6		21.3	J	19.7		20		**23.8**		9.8		**23.1**		**23**		
t	30	NYSDEC TAGM	MG/KG	6.1	J	9.9	J	9.3	J	12.3		8	J	5.6	J	12		7.7	J	
er	25	NYSDEC TAGM	MG/KG	**81**		**546**	**J**	**60.7**	**J**	**202**		**404**		**499**		**94.5**		**182**		
de	0.3	NYSDEC TAGM	MG/KG	0.74	U	0.51	UJ	0.6	U	0.56	U	0.62	U	0.53	U	0.62	U	0.64	U	
	26626.65	NYSDEC TAGM	MG/KG	16400		21600	J	23100		23600		19500		11100		**27500**		24200		
	21.86	NYSDEC TAGM	MG/KG	**594**		6340	R	**329**		**1210**		**2940**		**1310**		**472**		**595**		
esium	12221.77	NYSDEC TAGM	MG/KG	7430		9830	J	3640		6600		8890		8330		8880		4170		
anese	669.38	NYSDEC TAGM	MG/KG	430		392	J	**685**		595		314	J	221		324	J	613		
ury	0.1	NYSDEC TAGM	MG/KG	0.07	J	0.03	UJ	0.07	J	0.07	J	0.03	J	**0.1**	**J**	0.05	J	**0.36**	**J**	
l	33.62	NYSDEC TAGM	MG/KG	19.8		**34.6**	**J**	21.3		**33.9**		31.9		28.5		**43.5**		25.2		
sium	1761.48	NYSDEC TAGM	MG/KG	1500		1350	J	1210		1260		1610		1370		**1810**		**1810**		
ium	2	NYSDEC TAGM	MG/KG	0.26	J	1.6	J	0.64	J	0.23	UJ	0.47	J	0.34	J	0.2	J	0.25	UJ	
	0.4	NYSDEC TAGM	MG/KG	1.6	UJ	**4.6**	**J**	1.6	UJ	1.4	UJ	**5.2**		**3.8**	**J**	1.2	U	1.6	UJ	
m	103.74	NYSDEC TAGM	MG/KG	**147**	**J**	**197**	**J**	49.8	J	**121**	**J**	**249**	**J**	**179**	**J**	**167**	**J**	56.6	J	
um	0.28	NYSDEC TAGM	MG/KG	0.24	U	0.22	UJ	0.22	UJ	0.25	U	0.21	U	1.3	U	0.21	U	0.27	U	
lium	150	NYSDEC TAGM	MG/KG	21		15.3	J	25.9		20		17.7		10.2	J	18.3		29.8		
	82.5	NYSDEC TAGM	MG/KG	**200**		**620**	**J**	**110**	**J**	**574**		**315**		**480**		**155**		**150**		
HERBICIDES																				
A			UG/KG	16000		5300	U	6300	U	5900	U	5400	U	5300	U	5300	U	6800	U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC ID:	SS17-18	SS17-18	SS17-19	SS17-2	SS17-20	SS17-21	SS17-22	SS17-23	SS
			SAMP ID:	SS17-18-1	SS17-24-1	SS17-19-1	SS17-2-1	SS17-20-1	SS17-21-1	SS17-22-1	SS17-23-1	16
			QC CODE:	SA	DU	SA	SA	SA	SA	SA	SA	S
			STUDY ID:	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	RI RO
			TOP:	0	0	0	0	0	0	0	0	
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SUR S
			SAMPLE DATE:	10/22/1993	10/22/1993	10/21/1993	10/21/1993	10/21/1993	10/21/1993	10/21/1993	10/21/1993	8/2
METER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VA
LATILE ORGANICS												
e	200	NYSDEC TAGM	UG/KG	13 U	15 J	41 U	13 U	12 U	14 U	14 U	14 U	
ne	60	NYSDEC TAGM	UG/KG	13 U	13 UJ	16 U	13 U	12 U	14 U	14 U	14 U	
ene Chloride	100	NYSDEC TAGM	UG/KG	13 U	13 UJ	16 U	13 U	12 U	14 U	14 U	14 U	
e	1500	NYSDEC TAGM	UG/KG	13 U	13 UJ	16 U	13 U	12 U	14 U	14 U	14 U	
OLATILE ORGANICS												
itrotoluene			UG/KG	24 J	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
itrotoluene	1000	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
ylnaphthalene	36400	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
chlorobenzidine			UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
aniline	500	NYSDEC TAGM	UG/KG	1100 U	1000 U	5500 U	1100 U	1000 U	1100 U	1000 U	1000 U	
aniline			UG/KG	1100 U	1000 U	5500 U	1100 U	1000 U	1100 U	1000 U	1000 U	
cene	50000	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
a)anthracene	224	NYSDEC TAGM	UG/KG	31 J	430 U	2300 U	23 J	420 U	430 U	21 J	430 U	
a)pyrene	61	NYSDEC TAGM	UG/KG	31 J	430 U	2300 U	24 J	420 U	430 U	21 J	430 U	
b)fluoranthene	1100	NYSDEC TAGM	UG/KG	46 J	32 J	2300 U	28 J	420 U	430 U	28 J	430 U	
g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	42 J	430 U	2300 U	31 J	420 U	430 U	430 U	430 U	
k)fluoranthene	1100	NYSDEC TAGM	UG/KG	37 J	24 J	2300 U	450 U	420 U	430 U	21 J	430 U	
enzylphthalate	50000	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
ole			UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
ne	400	NYSDEC TAGM	UG/KG	55 J	38 J	2300 U	29 J	420 U	430 U	28 J	430 U	
tylphthalate	8100	NYSDEC TAGM	UG/KG	500	430 U	1200 J	76 J	510	760	430 U	430 U	
(a,h)anthracene	14	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
thene	50000	NYSDEC TAGM	UG/KG	88 J	52 J	2300 U	47 J	420 U	430 U	49 J	430 U	
1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	40 J	430 U	2300 U	30 J	420 U	430 U	430 U	430 U	
osodiphenylamine (1)			UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
alene	13000	NYSDEC TAGM	UG/KG	430 U	430 U	2300 U	450 U	420 U	430 U	430 U	430 U	
lorophenol	1000	NYSDEC TAGM	UG/KG	1100 U	1000 U	5500 U	1100 U	1000 U	1100 U	1000 U	1000 U	
threne	50000	NYSDEC TAGM	UG/KG	48 J	34 J	2300 U	450 U	420 U	430 U	20 J	430 U	
	50000	NYSDEC TAGM	UG/KG	73 J	38 J	2300 U	47 J	420 U	430 U	40 J	430 U	
hloroisopropyl) ether			UG/KG									
thylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	1200	1300	2300 U	330 J	420 U	200 J	430 U	430 U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-18		SS17-18		SS17-19		SS17-2		SS17-20		SS17-21		SS17-22		SS17-23		SS
			SAMP ID:	SS17-18-1		SS17-24-1		SS17-19-1		SS17-2-1		SS17-20-1		SS17-21-1		SS17-22-1		SS17-23-1		1
			QC CODE:	SA		DU		SA		SA		SA		SA		SA		SA		
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		RI R
			TOP:	0		0		0		0		0		0		0		0		
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2		
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SU S
			SAMPLE DATE:	10/22/1993		10/22/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		8/2
METER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	V
PESTICIDES/PCB																				
DD	2900	NYSDEC TAGM	UG/KG	4.3	U	4.3	U	15		4.4	U	4.2	U	4.3	U	4.3	U	4.3	U	
DE	2100	NYSDEC TAGM	UG/KG	17		17		2.5	J	4.4	U	4.2	U	4.3	U	4.3	U	4.3	U	
DT	2100	NYSDEC TAGM	UG/KG	7		7.4		4.5	U	4.4	U	4.2	U	4.3	U	4.3	U	4.3	U	
	41	NYSDEC TAGM	UG/KG	2.2	U	2.2	U	2.3	U	2.3	U	2.2	U	2.2	U	2.2	U	2.2	U	
or-1260	10000	NYSDEC TAGM	UG/KG	43	U	43	U	45	U	44	U	21	J	28	J	43	U	43	U	
in	44	NYSDEC TAGM	UG/KG	4.3	U	4.3	U	4.5	U	4.4	U	4.2	U	4.3	U	4.3	U	4.3	U	
ulfan I	900	NYSDEC TAGM	UG/KG	2.2	U	2.2	U	2.3	U	2.3	U	2.2	U	2.2	U	2.2	U	2.2	U	
	100	NYSDEC TAGM	UG/KG	4.3	U	4.3	U	4.5	U	4.4	U	4.2	U	4.3	U	4.3	U	4.3	U	
chlor epoxide	20	NYSDEC TAGM	UG/KG	1.1	J	2.2	U	2.3	U	2.3	U	2.2	U	2.2	U	2.2	U	2.2	U	
THER ANALYSES																				
e/Nitrite-Nitrogen			MG/KG	0.13		0.08		0.2		0.67		0.22		0.24		0.09		0.07		
t Moisture (PEST/PCB)																				
t Moisture (SVOCs)																				
t Moisture (VOCs)																				
t Solids (Metals)																				
Organic Carbon			MG/KG																	
ITROAROMATICS																				
nitrotoluene			UG/KG	130	UR	72	J	130	U	130	U	130	U	130	U	130	U	130	U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-18		SS17-18		SS17-19		SS17-2		SS17-20		SS17-21		SS17-22		SS17-23		SS
			SAMP ID:	SS17-18-1		SS17-24-1		SS17-19-1		SS17-2-1		SS17-20-1		SS17-21-1		SS17-22-1		SS17-23-1		1
			QC CODE:	SA		DU		SA		SA		SA		SA		SA		SA		
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		RI R
			TOP:	0		0		0		0		0		0		0		0		
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2		
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SU S
			SAMPLE DATE:	10/22/1993		10/22/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		10/21/1993		8/2
METER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	V
METALS																				
num	14592.84	NYSDEC TAGM	MG/KG	14400		**18400**		**15500**		**14900**		13900		14400		**18100**		**15700**		
ony	3.59	NYSDEC TAGM	MG/KG	15.3	R	**17.4**	**J**	9	UR	12.9	UR	8.7	UR	11	UR	12.8	UJ	13.1	UJ	
ic	7.5	NYSDEC TAGM	MG/KG	**8.4**		**9.1**		6.3		5.4		6.5		**8.9**		5.9		5.3		
n	300	NYSDEC TAGM	MG/KG	452	R	**447**		149	R	122	R	96.2	R	96.5	R	127		92.6		
ium	0.73	NYSDEC TAGM	MG/KG	0.71		**0.87**	**J**	**0.83**	**J**	0.58	J	0.71	J	**0.74**	**J**	**0.8**	**J**	0.72	J	
ium	1	NYSDEC TAGM	MG/KG	**14.3**		**14.3**		**2.9**		**1.6**		0.54	U	0.69	U	**1.5**		0.82	U	
m	101903.8	NYSDEC TAGM	MG/KG	39800		27600		4210		2830		6230		3910		6900		2510		
nium	22.13	NYSDEC TAGM	MG/KG	**23.9**		**27.2**		**22.9**		19		21.4		**23.2**		**23.8**		20.3		
t	30	NYSDEC TAGM	MG/KG	11.9		12.5		10.2		6.4	J	11.1		12.4		9.9	J	9.4	J	
r	25	NYSDEC TAGM	MG/KG	**409**		**378**	**J**	**81.7**		**54.4**		**26.9**		**25.9**		**52**	**J**	22.6	J	
de	0.3	NYSDEC TAGM	MG/KG	0.63	U	0.11	U	0.66	U	0.79	U	0.61	U	0.65	U	0.11	U	0.1	U	
	26626.65	NYSDEC TAGM	MG/KG	25300		**28000**		25500		20800		**28700**		**28800**		24700		22700		
	21.86	NYSDEC TAGM	MG/KG	**2780**		**2310**		**402**		**371**		**69.2**		**44.9**		**226**		**111**		
esium	12221.77	NYSDEC TAGM	MG/KG	7590		6910		4260		3110		4770		4930		4880		3720		
anese	669.38	NYSDEC TAGM	MG/KG	525		611		**741**		319		602		**857**		662		598		
ry	0.1	NYSDEC TAGM	MG/KG	0.09	J	0.07		0.07	J	**1**	**J**	0.08	J	0.06	J	0.06	J	0.04	J	
l	33.62	NYSDEC TAGM	MG/KG	**39.5**		**40.4**		30.2		18.3		31		**35.6**		27		22.6		
ium	1761.48	NYSDEC TAGM	MG/KG	1570		**2260**		1610		1080		1270		1410		**1960**		1430		
um	2	NYSDEC TAGM	MG/KG	0.19	J	0.45	J	0.23	UJ	0.27	UJ	0.18	UJ	0.2	UJ	0.24	UJ	0.26	UJ	
	0.4	NYSDEC TAGM	MG/KG	**4.7**	**J**	**3.2**		1.1	UJ	1.3	UJ	1.1	UJ	1.4	UJ	1.6	U	1.7	U	
n	103.74	NYSDEC TAGM	MG/KG	**109**	**J**	**129**	**J**	59.5	J	33.7	J	40.4	J	36.3	J	87	J	46	J	
um	0.28	NYSDEC TAGM	MG/KG	0.19	U	0.27	U	0.25	U	0.3	U	0.2	U	0.22	U	0.26	U	0.29	U	
ium	150	NYSDEC TAGM	MG/KG	23.6		30		26.3		26.6		24		24.1		30.1		26.4		
	82.5	NYSDEC TAGM	MG/KG	**1530**		**1420**		**351**		**136**		71.6		**83.9**		**196**		75.5		
HERBICIDES																				
			UG/KG	6600	U	6600	U	6900	U	6700	U	6500	U	6600	U	6500	U	6600	U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC ID:	SS17-25		SS17-26		SS17-27		SS17-28		SS17-29		SS17-3		SS17-30		SS17-3
			SAMP ID:	16073		16069		16063		16064		16065		SS17-3-1		16070		16071
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUN
			TOP:	0		0		0		0		0		0		0		0
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFAC SOIL
			SAMPLE DATE:	8/22/1996		8/22/1996		8/21/1996		8/21/1996		8/21/1996		10/21/1993		8/22/1996		8/22/19
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUI
VOLATILE ORGANICS																		
Acetone	200	NYSDEC TAGM	UG/KG	13	U	12	U	12	UJ	12	U	10	U	13	U	12	U	
Benzene	60	NYSDEC TAGM	UG/KG	13	U	12	U	12	UJ	12	U	2	J	13	U	12	U	
Methylene Chloride	100	NYSDEC TAGM	UG/KG	13	U	12	U	12	UJ	12	U	10	UJ	13	U	12	U	
Toluene	1500	NYSDEC TAGM	UG/KG	13	U	12	U	12	UJ	12	U	8	J	13	U	12	U	
SEMIVOLATILE ORGANICS																		
2,4-Dinitrotoluene			UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
2-Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	130	J	430	U	380	U	3
3,3'-Dichlorobenzidine			UG/KG	410	J	390	U	400	U	390	U	340	U	430	U	380	UJ	3
2-Nitroaniline	500	NYSDEC TAGM	UG/KG	**990**	**J**	960	U	960	U	950	U	830	U	1000	U	920	UJ	9
4-Nitroaniline			UG/KG	990	J	960	U	960	U	950	U	830	U	1000	U	920	UJ	9
Anthracene	50000	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
Benzo(a)anthracene	224	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	19	J	3
Benzo(a)pyrene	61	NYSDEC TAGM	UG/KG	410	U	25	J	400	U	390	U	340	U	430	U	18	J	3
Benzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	49	J	
Benzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	410	U	82	J	400	U	390	U	340	U	430	U	380	U	3
Benzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	
Butylbenzylphthalate	50000	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
Carbazole			UG/KG	410	J	390	UJ	400	U	390	U	340	U	430	U	380	UJ	3
Chrysene	400	NYSDEC TAGM	UG/KG	19	J	21	J	400	U	390	U	340	U	430	U	22	J	
Di-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	45	J	380	U	3
Dibenz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	410	U	390	U	**59**	**J**	**55**	**J**	340	U	430	U	380	U	3
Fluoranthene	50000	NYSDEC TAGM	UG/KG	23	J	28	J	400	U	390	U	340	U	430	U	28	J	
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
N-Nitrosodiphenylamine (1)			UG/KG	410	U	390	U	400	U	390	U	340	U	430	U	380	U	3
Naphthalene	13000	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	37	J	430	U	380	U	3
Pentachlorophenol	1000	NYSDEC TAGM	UG/KG	990	J	1700	UJ	960	U	950	U	830	U	1000	U	43	J	9
Phenanthrene	50000	NYSDEC TAGM	UG/KG	410	U	20	J	400	U	390	U	340	U	430	U	380	U	3
Pyrene	50000	NYSDEC TAGM	UG/KG	29	J	50	J	400	U	390	U	340	U	430	U	34	J	
bis(2-Chloroisopropyl) ether			UG/KG	410	J	390	U	400	U	390	U	340	U			380	U	3
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	410	U	390	U	400	U	390	U	340	U	290	J	380	U	3

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-25		SS17-26		SS17-27		SS17-28		SS17-29		SS17-3		SS17-30		SS17-3
			SAMP ID:	16073		16069		16063		16064		16065		SS17-3-1		16070		16071
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUN
			TOP:	0		0		0		0		0		0		0		0
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFAC SOIL
			SAMPLE DATE:	8/22/1996		8/22/1996		8/21/1996		8/21/1996		8/21/1996		10/21/1993		8/22/1996		8/22/19
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALU
PESTICIDES/PCB																		
4,4'-DDD	2900	NYSDEC TAGM	UG/KG	4.1	U	4	U	4	U	3.9	U	1.7	J	4.3	U	3.8	U	
4,4'-DDE	2100	NYSDEC TAGM	UG/KG	4.1	U	4	U	24		3.7	U	2.2	J	4.3	U	3.8	U	
4,4'-DDT	2100	NYSDEC TAGM	UG/KG	4.1	U	4	U	16		2.7	J	3.4	U	4.3	U	3.8	U	
Aldrin	41	NYSDEC TAGM	UG/KG	2.1	U	2	U	2	U	2	U	1.9		2.2	U	2	U	
Aroclor-1260	10000	NYSDEC TAGM	UG/KG	41	U	40	U	40	U	39	U	34	U	43	U	38	U	
Dieldrin	44	NYSDEC TAGM	UG/KG	12	J	4	U	13		**80**	**J**	3.4	U	4.3	U	4	U	
Endosulfan I	900	NYSDEC TAGM	UG/KG	2.1	U	2	U	1.4	U	2	U	1.8	U	2.2	U	2	U	
Endrin	100	NYSDEC TAGM	UG/KG	4.1	U	4	U	4	U	3.9	U	3.4	U	4.3	U	3.8	U	
Heptachlor epoxide	20	NYSDEC TAGM	UG/KG	2.1	U	2	U	2	U	2	U	1.8	U	2.2	U	2	U	
OTHER ANALYSES																		
Nitrate/Nitrite-Nitrogen			MG/KG	0.07		0.1		0.06		0.12		0.53		0.13		0.07		0
Percent Moisture (PEST/PCB)				19		17		17		16		4				14		
Percent Moisture (SVOCs)				19		17		17		16		4				14		
Percent Moisture (VOCs)				25		17		17		16		3				15		
Percent Solids (Metals)				80.9		83.4		82.9		84		96.1				85.7		8
Total Organic Carbon			MG/KG			40900												
NITROAROMATICS																		
2,4-Dinitrotoluene			UG/KG	120	U	120	U	120	U	120	U	120	U	130	U	120	U	1

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-25		SS17-26		SS17-27		SS17-28		SS17-29		SS17-3		SS17-30		SS17-3	
			SAMP ID:	16073		16069		16063		16064		16065		SS17-3-1		16070		16071	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUN	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFAC SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/21/1996		8/21/1996		8/21/1996		10/21/1993		8/22/1996		8/22/199	
ARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALU	
METALS																			
luminum	14592.84	NYSDEC TAGM	MG/KG	**16700**	**J**	**16000**	**J**	**14900**	**J**	14100	J	12100	J	**15200**		14400	J	132	
ntimony	3.59	NYSDEC TAGM	MG/KG	**3.9**	**J**	**5**	**J**	**12.7**	**J**	2.7	J	2	J	13.6	UR	1.4	J		
rsenic	7.5	NYSDEC TAGM	MG/KG	6.2		6.5		6.1		5		4		5		4			
arium	300	NYSDEC TAGM	MG/KG	192	J	164	J	**387**	**J**	141	J	153	J	102	R	97.7	J	1	
eryllium	0.73	NYSDEC TAGM	MG/KG	0.64		0.51		0.61		0.58		0.52		0.42	J	0.48		0	
admium	1	NYSDEC TAGM	MG/KG	**3.5**		**3.6**		**15**		**5.6**		0.93		**2.2**		0.53			
alcium	101903.8	NYSDEC TAGM	MG/KG	3940		2500		34900		7310		42500		2180		2180		22	
hromium	22.13	NYSDEC TAGM	MG/KG	**22.3**		**22.2**		**22.9**		21.7		**23.3**		16.8		18.1		1	
obalt	30	NYSDEC TAGM	MG/KG	11.3		11.5		11.6		10.2		13.5		5.7	J	8.4			
opper	25	NYSDEC TAGM	MG/KG	**58.2**		**80.6**		**480**		**141**		**71.2**		**39.3**		**36.7**		6	
yanide	0.3	NYSDEC TAGM	MG/KG	0.61	U	0.57	U	0.58	U	0.56	U	0.52	U	0.75	U	0.53	U	0	
on	26626.65	NYSDEC TAGM	MG/KG	25500		**26800**		23300	J	24200	J	26100	J	19300		21100		181	
ead	21.86	NYSDEC TAGM	MG/KG	**448**		**697**		**2740**		**524**		**254**		**375**		**172**		4	
lagnesium	12221.77	NYSDEC TAGM	MG/KG	3500		3260		6210		4380		6390		2540		2950		28	
langanese	669.38	NYSDEC TAGM	MG/KG	**996**	**J**	**950**	**J**	573		579		404		277		430	J	3	
lercury	0.1	NYSDEC TAGM	MG/KG	0.07		**0.11**		**0.12**		0.06		0.06		0.07	J	0.09		0	
ickel	33.62	NYSDEC TAGM	MG/KG	23.4		22.3		30.6		32.6		**47.8**		14.1		17.5		1	
otassium	1761.48	NYSDEC TAGM	MG/KG	1540		1390		1520		1370		1660		1060	J	975		9	
elenium	2	NYSDEC TAGM	MG/KG	1.2	J	1.7	J	1.1		0.79		0.65	U	0.37	J	0.99	J	0	
ilver	0.4	NYSDEC TAGM	MG/KG	0.29	U	**0.55**		**2.9**		**1.1**		0.24	U	1.7	UJ	0.3	U	0	
odium	103.74	NYSDEC TAGM	MG/KG	60.7	U	60	U	**198**		**119**		**131**		33.5	J	62.5	U	6	
hallium	0.28	NYSDEC TAGM	MG/KG	**1.1**		**1.5**		**0.98**	**J**	**0.9**	**J**	**0.8**	**J**	0.26	U	0.98	U	0	
anadium	150	NYSDEC TAGM	MG/KG	29.3		29.7		23.4		21.2		16.7		29.2		26		2	
inc	82.5	NYSDEC TAGM	MG/KG	**284**	**J**	**233**	**J**	**901**		**468**		79.5		**129**		**93**	**J**	1	
HERBICIDES																			
ICPA			UG/KG											6500	U				

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC ID:	SS17-34	SS17-35	SS17-36	SS17-37	SS17-38	SS17-39	SS17-4	SS17-
			SAMP ID:	16079	16078	16077	16080	16076	16075	SS17-4-1	SS17-5
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI
			TOP:	0	0	0	0	0	0	0	0
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFAC SOIL
			SAMPLE DATE:	8/22/1996	8/22/1996	8/22/1996	8/22/1996	8/22/1996	8/22/1996	10/21/1993	10/21/19
ARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALU
VOLATILE ORGANICS											
cetone	200	NYSDEC TAGM	UG/KG	11 U	12 U	12 U	11 U	12 U	13 U	12 U	
enzene	60	NYSDEC TAGM	UG/KG	11 U	12 U	12 U	11 UJ	12 U	13 U	12 U	
ethylene Chloride	100	NYSDEC TAGM	UG/KG	11 U	12 U	12 U	11 U	12 U	13 U	12 U	
oluene	1500	NYSDEC TAGM	UG/KG	11 UJ	12 UJ	12 U	11 UJ	12 UJ	13 U	12 U	
EMIVOLATILE ORGANICS											
4-Dinitrotoluene			UG/KG	360 U	410 U	390 U	85 J	400 U	410 U	1400	4
6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	70 J	4
Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	410 U	4
3'-Dichlorobenzidine			UG/KG	360 UJ	410 UJ	390 UJ	350 UJ	400 UJ	410 UJ	410 U	4
Nitroaniline	500	NYSDEC TAGM	UG/KG	880 UJ	990 UJ	940 UJ	860 UJ	970 UJ	1000 UJ	990 U	10
Nitroaniline			UG/KG	880 UJ	990 UJ	940 UJ	860 UJ	970 UJ	1000 UJ	990 U	10
nthracene	50000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	410 U	4
enzo(a)anthracene	224	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	37 J	400 U	410 U	22 J	4
enzo(a)pyrene	61	NYSDEC TAGM	UG/KG	360 U	25 J	390 U	34 J	400 U	19 J	410 U	4
enzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	65 J	400 U	410 U	28 J	4
enzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	44 J	400 U	410 U	28 J	
enzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	35 J	400 U	410 U	410 U	4
utylbenzylphthalate	50000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	410 U	4
rbazole			UG/KG	360 UJ	410 UJ	390 UJ	350 UJ	400 UJ	410 UJ	410 U	4
rysene	400	NYSDEC TAGM	UG/KG	19 J	20 J	390 U	63 J	18 J	21 J	32 J	4
-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	550	400 U	410 U	89 J	
benz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	410 U	4
uoranthene	50000	NYSDEC TAGM	UG/KG	26 J	24 J	390 U	74 J	25 J	30 J	54 J	
deno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	33 J	400 U	410 U	410 U	4
Nitrosodiphenylamine (1)			UG/KG	360 U	410 U	390 U	71 J	400 U	410 U	27 J	4
aphthalene	13000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	410 U	4
ntachlorophenol	1000	NYSDEC TAGM	UG/KG	880 UJ	990 UJ	940 UJ	860 UJ	970 UJ	1000 UJ	990 U	10
enanthrene	50000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	56 J	19 J	20 J	33 J	4
rene	50000	NYSDEC TAGM	UG/KG	29 J	30 J	390 U	82 J	31 J	36 J	44 J	
s(2-Chloroisopropyl) ether			UG/KG	360 U	410 U	390 U	350 U	400 U	410 U		
s(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	360 U	410 U	390 U	350 U	400 U	410 U	390 J	6

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC ID:	SS17-34		SS17-35		SS17-36		SS17-37		SS17-38		SS17-39		SS17-4		SS17-
			SAMP ID:	16079		16078		16077		16080		16076		16075		SS17-4-1		SS17-
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI
			TOP:	0		0		0		0		0		0		0		0
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFA SOIL
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		10/21/1993		10/21/1
ARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALU
PESTICIDES/PCB																		
.4'-DDD	2900	NYSDEC TAGM	UG/KG	3.7	U	4.1	U	3.8	U	2.6	J	4	U	4.2	U	4.1	U	
.4'-DDE	2100	NYSDEC TAGM	UG/KG	3.7	U	4.1	U	5		27		4	U	4.2	U	22		
.4'-DDT	2100	NYSDEC TAGM	UG/KG	3.7	U	4.1	U	3.8	U	14	J	4	U	4.2	U	2.6	J	
ldrin	41	NYSDEC TAGM	UG/KG	1.9	U	2.1	U	2	U	1.8	U	2.1	U	2.1	U	2.1	U	
roclor-1260	10000	NYSDEC TAGM	UG/KG	37	U	41	U	38	U	28	J	40	U	42	U	41	U	
ieldrin	44	NYSDEC TAGM	UG/KG	3.7	U	12	J	3.8	U	22		4	U	4.2	U	4.1	U	
ndosulfan I	900	NYSDEC TAGM	UG/KG	1.9	U	2.1	U	2	U	2.4	J	2.1	U	2.1	U	2.1	U	
ndrin	100	NYSDEC TAGM	UG/KG	3.7	U	4.1	U	3.8	U	1.8	J	4	U	4.2	U	4.1	U	
leptachlor epoxide	20	NYSDEC TAGM	UG/KG	1.9	U	2.1	U	2	U	1.8	U	2.1	U	2.1	U	2.1	U	
OTHER ANALYSES																		
litrate/Nitrite-Nitrogen			MG/KG	0.08		0.22		0.26		0.44		0.28		0.34		0.51		0
ercent Moisture (PEST/PCB)				10		20		14		7		18		21				
ercent Moisture (SVOCs)				10		20		15		7		18		21				
ercent Moisture (VOCs)				13		20		15		9		19		24				
ercent Solids (Metals)				89.7		80.3		85.5		92.9		81.9		79.2				
otal Organic Carbon			MG/KG							32700								
NITROAROMATICS																		
.4-Dinitrotoluene			UG/KG	120	U	120	U	120	U	120	U	120	U	120	U	130	U	

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-34		SS17-35		SS17-36		SS17-37		SS17-38		SS17-39		SS17-4		SS17-
			SAMP ID:	16079		16078		16077		16080		16076		16075		SS17-4-1		SS17-5
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI
			TOP:	0		0		0		0		0		0		0		0
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFAC SOIL
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		10/21/1993		10/21/19
ARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALU
METALS																		
luminum	14592.84	NYSDEC TAGM	MG/KG	6720	J	11700		**14900**	**J**	10200	J	11700	J	14400	J	10800		**173**
ntimony	3.59	NYSDEC TAGM	MG/KG	1.5	J	2.6	J	**4**	**J**	**40.1**	**J**	1.4	J	1.6	J	12.5	UR	
rsenic	7.5	NYSDEC TAGM	MG/KG	4.2		4.2		5.5		**7.7**		4.2		4.4		6.6		
arium	300	NYSDEC TAGM	MG/KG	90.4	J	156	J	237	J	**524**	**J**	103	J	156	J	192	R	1
eryllium	0.73	NYSDEC TAGM	MG/KG	0.25		0.45		0.62		0.36		0.48		**0.83**		0.52	J	**0.**
admium	1	NYSDEC TAGM	MG/KG	**2.1**		**3.3**		**3.4**		**25.8**		0.59		0.5		**4.9**		**2**
alcium	101903.8	NYSDEC TAGM	MG/KG	**166000**		18900		5880		**117000**		2780		5280		**117000**		27
hromium	22.13	NYSDEC TAGM	MG/KG	9.7		16.7		21.3		19.7		16.5		20.1		18.3		**23**
obalt	30	NYSDEC TAGM	MG/KG	7.5		7.6		10.7		9.7		7.9		7.4		10.4	J	9
opper	25	NYSDEC TAGM	MG/KG	**39.3**		**62.4**		**142**		**837**		**29.7**		**46.2**		**249**		
yanide	0.3	NYSDEC TAGM	MG/KG	**1.5**		**0.78**	**J**	0.48	U	0.52	U	0.56	U	0.57	U	0.68	U	0.
on	26626.65	NYSDEC TAGM	MG/KG	11800		18400		24700		18700		19200		22500		19400		250
ead	21.86	NYSDEC TAGM	MG/KG	**265**		**534**		**815**		**6270**		**163**		**183**		**1680**		**5**
lagnesium	12221.77	NYSDEC TAGM	MG/KG	8660		3380		4020		7880		3060		3820		6900		36
langanese	669.38	NYSDEC TAGM	MG/KG	531	J	517	J	608	J	371	J	475	J	256	J	431		**7**
lercury	0.1	NYSDEC TAGM	MG/KG	0.05		0.07		0.09		0.05		0.07		0.09		0.07	J	
ickel	33.62	NYSDEC TAGM	MG/KG	16.2		19.2		26.3		**35.9**		17.6		23.5		28		24
otassium	1761.48	NYSDEC TAGM	MG/KG	1090		1390		1610		1750		1060		1410		1380		15
elenium	2	NYSDEC TAGM	MG/KG	0.64	J	1	J	0.68	J	0.98	J	0.82	J	1.2	J	0.36	J	0.
lver	0.4	NYSDEC TAGM	MG/KG	**0.49**		**0.71**		**1.1**		**9**		0.31	U	**0.45**		1.6	UJ	
odium	103.74	NYSDEC TAGM	MG/KG	53.8	U	64.1	U	58.5	U	**248**		64.7	U	64.4	U	**144**	**J**	53
hallium	0.28	NYSDEC TAGM	MG/KG	0.84	U	1	U	0.92	U	0.8	U	1	U	1	U	0.25	U	0.
anadium	150	NYSDEC TAGM	MG/KG	14		21.4		27.1		16.8		21.2		25.2		17.5		29
inc	82.5	NYSDEC TAGM	MG/KG	**167**	**J**	**207**	**J**	**488**	**J**	**1470**	**J**	**84.1**	**J**	**84.8**	**J**	**324**		**2**
HERBICIDES																		
CPA			UG/KG													6200	U	340

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	SS17-6 VALUE	Q	SS17-7 VALUE	Q	SS17-8 VALUE	Q	SS17-9 VALUE	Q
			SAMP ID:	SS17-6-1		SS17-7-1		SS17-8-1		SS17-9-1	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/1993		10/21/1993		10/21/1993		10/20/1993	
VOLATILE ORGANICS											
Acetone	200	NYSDEC TAGM	UG/KG	10	U	12	U	12	U	10	UJ
Benzene	60	NYSDEC TAGM	UG/KG	10	U	12	U	12	U	10	UJ
Methylene Chloride	100	NYSDEC TAGM	UG/KG	10	U	12	U	12	U	10	UJ
Toluene	1500	NYSDEC TAGM	UG/KG	10	U	12	U	12	U	4	J
SEMIVOLATILE ORGANICS											
2,4-Dinitrotoluene			UG/KG	340	U	410	U	410	U	340	U
2,6-Dinitrotoluene	1000	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
2-Methylnaphthalene	36400	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
3,3'-Dichlorobenzidine			UG/KG	340	U	410	U	410	U	340	U
3-Nitroaniline	500	NYSDEC TAGM	UG/KG	830	U	990	U	1000	U	830	U
4-Nitroaniline			UG/KG	830	U	990	U	1000	U	830	U
Anthracene	50000	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
Benzo(a)anthracene	224	NYSDEC TAGM	UG/KG	19	J	410	U	30	J	16	J
Benzo(a)pyrene	61	NYSDEC TAGM	UG/KG	340	U	410	U	24	J	340	U
Benzo(b)fluoranthene	1100	NYSDEC TAGM	UG/KG	26	J	410	U	27	J	17	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
Benzo(k)fluoranthene	1100	NYSDEC TAGM	UG/KG	18	J	410	U	23	J	17	J
Butylbenzylphthalate	50000	NYSDEC TAGM	UG/KG	37	J	410	U	410	U	340	U
Carbazole			UG/KG	340	U	410	U	410	U	340	U
Chrysene	400	NYSDEC TAGM	UG/KG	31	J	410	U	36	J	28	J
Di-n-butylphthalate	8100	NYSDEC TAGM	UG/KG	60	J	97	J	35	J	340	U
Dibenz(a,h)anthracene	14	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
Fluoranthene	50000	NYSDEC TAGM	UG/KG	48	J	21	J	71	J	41	J
Indeno(1,2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
N-Nitrosodiphenylamine (1)			UG/KG	340	U	410	U	410	U	340	U
Naphthalene	13000	NYSDEC TAGM	UG/KG	340	U	410	U	410	U	340	U
Pentachlorophenol	1000	NYSDEC TAGM	UG/KG	830	U	990	U	1000	U	830	U
Phenanthrene	50000	NYSDEC TAGM	UG/KG	36	J	410	U	46	J	31	J
Pyrene	50000	NYSDEC TAGM	UG/KG	43	J	410	U	63	J	37	J
bis(2-Chloroisopropyl) ether			UG/KG								
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	340	U	650		410	U	340	U

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

PARAMETER	LEVEL	SOURCE	UNIT	SS17-6 VALUE	Q	SS17-7 VALUE	Q	SS17-8 VALUE	Q	SS17-9 VALUE	Q
			SAMP ID:	SS17-6-1		SS17-7-1		SS17-8-1		SS17-9-1	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/1993		10/21/1993		10/21/1993		10/20/1993	
PESTICIDES/PCB											
4,4'-DDD	2900	NYSDEC TAGM	UG/KG	3.4	U	4	U	4.1	U	3.4	U
4,4'-DDE	2100	NYSDEC TAGM	UG/KG	11		3.2	J	3.4	J	8.8	
4,4'-DDT	2100	NYSDEC TAGM	UG/KG	1.9	J	4	U	4.1	U	3.4	U
Aldrin	41	NYSDEC TAGM	UG/KG	1.8	U	2.1	U	2.1	U	1.8	U
Aroclor-1260	10000	NYSDEC TAGM	UG/KG	34	U	40	U	41	U	34	U
Dieldrin	44	NYSDEC TAGM	UG/KG	3.4	U	4	U	4.1	U	3.4	U
Endosulfan I	900	NYSDEC TAGM	UG/KG	1.8	U	2.1	U	2.1	U	1.8	U
Endrin	100	NYSDEC TAGM	UG/KG	3.4	U	4	U	4.1	U	3.4	U
Heptachlor epoxide	20	NYSDEC TAGM	UG/KG	1.8	U	2.1	U	2.1	U	1.8	U
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen			MG/KG	3.8		0.15		0.08		3.5	
Percent Moisture (PEST/PCB)											
Percent Moisture (SVOCs)											
Percent Moisture (VOCs)											
Percent Solids (Metals)											
Total Organic Carbon			MG/KG								
NITROAROMATICS											
2,4-Dinitrotoluene			UG/KG	170		130	U	130	U	130	U

Table A-8
SENEDA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Surface Soil Analytical Results

			LOC_ID:	SS17-6		SS17-7		SS17-8		SS17-9	
			SAMP ID:	SS17-6-1		SS17-7-1		SS17-8-1		SS17-9-1	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI	
			TOP:	0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/1993		10/21/1993		10/21/1993		10/20/1993	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
METALS											
Aluminum	14592.84	NYSDEC TAGM	MG/KG	10900		**16600**		14300		3790	
Antimony	3.59	NYSDEC TAGM	MG/KG	12.9	R	8.2	JR	7.4	JR	**10.7**	
Arsenic	7.5	NYSDEC TAGM	MG/KG	**16.1**		**8.2**		**8.5**		4.8	
Barium	300	NYSDEC TAGM	MG/KG	352	R	447	R	337	R	78.7	
Beryllium	0.73	NYSDEC TAGM	MG/KG	0.5	J	**0.76**	**J**	0.69		0.18	J
Cadmium	1	NYSDEC TAGM	MG/KG	**9.9**		**7.3**		**5.1**		**6.3**	
Calcium	101903.8	NYSDEC TAGM	MG/KG	89300		3780		**110000**		**177000**	
Chromium	22.13	NYSDEC TAGM	MG/KG	**22.5**		**23.4**		**23.9**		10	
Cobalt	30	NYSDEC TAGM	MG/KG	11.3		14.7		13.6		4.7	J
Copper	25	NYSDEC TAGM	MG/KG	**362**		**423**		**654**		**136**	
Cyanide	0.3	NYSDEC TAGM	MG/KG	0.46	U	0.61	U	0.59	U	0.59	U
Iron	26626.65	NYSDEC TAGM	MG/KG	24300		26400		**27600**		8020	
Lead	21.86	NYSDEC TAGM	MG/KG	**3150**		**2310**		**2190**		**1340**	
Magnesium	12221.77	NYSDEC TAGM	MG/KG	8840		4520		8380		**17300**	
Manganese	669.38	NYSDEC TAGM	MG/KG	399		431		590		270	J
Mercury	0.1	NYSDEC TAGM	MG/KG	0.06	J	**0.1**	**J**	0.09	J	0.04	J
Nickel	33.62	NYSDEC TAGM	MG/KG	**37.7**		29.1		**43.7**		16.4	
Potassium	1761.48	NYSDEC TAGM	MG/KG	1420		1370		1520		1110	
Selenium	2	NYSDEC TAGM	MG/KG	0.68	J	0.25	UJ	0.16	J	0.21	J
Silver	0.4	NYSDEC TAGM	MG/KG	**2.8**	**J**	1	UJ	**4**	**J**	**5.5**	
Sodium	103.74	NYSDEC TAGM	MG/KG	**168**	**J**	66.9	J	**144**	**J**	**247**	**J**
Thallium	0.28	NYSDEC TAGM	MG/KG	2	U	0.27	U	0.22	J	0.17	U
Vanadium	150	NYSDEC TAGM	MG/KG	16.3		28.8		22.2		8.9	
Zinc	82.5	NYSDEC TAGM	MG/KG	**497**		**437**		**613**		**120**	
HERBICIDES											
MCPA			UG/KG	5200	U	12000		6200	U	5200	U

Table A-9
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Subsurface Soil Analytical Results

RAMETER	LEVEL	SOURCE																	
			LOC_ID:	SB17-1		SB17-1		SB17-1		SB17-2		SB17-2		SB17-2		SB17-3		SB17-3	
			SAMP ID:	SB17-1-1		SB17-1-2		SB17-1-3		SB17-2-1		SB17-2-10		SB17-2-2		SB17-3-1		SB17-3-2	
			QC CODE:	SA		SA		SA		SA		DU		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		2		4		0		2		2		0		2	
			BOTTOM:	2		4		6		2		4		4		2		4	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	12/1/1993		12/1/1993		12/1/1993		10/27/1993		10/27/1993		10/27/1993		11/30/1993		11/30/1993	
			UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
MIVOLATILE ORGANICS																			
2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	42	J	380	U	21	J	390	U	480		490		93	J	72	J
PESTICIDES/PCB																			
clor-1254	10000	NYSDEC TAGM	UG/KG	42	U	61		36	U	39	U	38	U	38	U	40	U	39	U
OTHER ANALYSES																			
ate/Nitrite-Nitrogen			MG/KG	0.15		0.33		0.24		0.51		0.01	U	0.05		0.22		0.19	
METALS																			
minum	14592.8	NYSDEC TAGM	MG/KG	13700		**18100**		8700		**15900**		14100		**15600**		**19300**		13200	
enic	7.5	NYSDEC TAGM	MG/KG	4.3		5.2		3.4		5.2		6.3		6.9		4.1		5.4	
ium	300	NYSDEC TAGM	MG/KG	107		114		59.4		158		71.4		68.5		104		73.7	
yllium	0.73	NYSDEC TAGM	MG/KG	0.7	J	**0.9**	**J**	0.42	J	0.62	J	0.58	J	0.56	J	**0.99**		0.63	J
mium	1	NYSDEC TAGM	MG/KG	0.73	U	0.74	U	0.56	U	**2.8**		0.6	U	0.74	U	0.43	U	0.74	U
cium	101904	NYSDEC TAGM	MG/KG	2870		20900		72800		48200		**115000**		44200		2620		4920	
omium	22.13	NYSDEC TAGM	MG/KG	17.6		**25.1**		13.9		**27.1**		20.3		**23.3**		**27.9**		20.1	
alt	30	NYSDEC TAGM	MG/KG	9.9	J	13.3		8.8		10.8	J	9.6		9.4	J	21.7		9	J
per	25	NYSDEC TAGM	MG/KG	**46.4**		**26.9**		20		**85.1**		21.5		18.5		**25.9**		**26.9**	
	26626.7	NYSDEC TAGM	MG/KG	25100		**29900**		18800		**38700**		24900		**26700**		**36100**		25800	
d	21.86	NYSDEC TAGM	MG/KG	**266**		11.4	J	7.5	J	**686**		11.2		13		**24.6**	**J**	21.2	J
gnesium	12221.8	NYSDEC TAGM	MG/KG	3330		8490		**18100**		6630		8370		8380		5820		4600	
nganese	669.38	NYSDEC TAGM	MG/KG	547		487		391		**673**		**1160**		409		**1080**		338	
cury	0.1	NYSDEC TAGM	MG/KG	0.05	J	0.06	J	0.03	UJ	0.04	U	0.04	J	0.04	J	0.06	J	0.04	J
kel	33.62	NYSDEC TAGM	MG/KG	19.1		**42**		25.2		**34.7**		27.4		30.8		**37.2**		31.5	
ssium	1761.48	NYSDEC TAGM	MG/KG	628	J	1560		1090		1630		1750		1720		1540		1350	
ium	103.74	NYSDEC TAGM	MG/KG	46.2	J	74.6	J	**137**	**J**	**145**	**J**	**239**	**J**	**177**	**J**	70.8	J	80.2	J
adium	150	NYSDEC TAGM	MG/KG	23.1		27		13.9		27.3		21.8		23.9		30.7		21.1	
c	82.5	NYSDEC TAGM	MG/KG	**93.4**		80.2		57.1		**172**		76.7		63		69.7		69	

Table A-9
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Subsurface Soil Analytical Results

			LOC_ID:	SB17-4	
			SAMP ID:	SB17-4-2	
			QC CODE:	SA	
			STUDY ID:	ESI	
			TOP:	2	
			BOTTOM:	4	
			MATRIX:	SOIL	
			SAMPLE DATE:	11/30/1993	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q
SEMIVOLATILE ORGANICS					
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM	UG/KG	27	J
PESTICIDES/PCB					
Aroclor-1254	10000	NYSDEC TAGM	UG/KG	36	U
OTHER ANALYSES					
Nitrate/Nitrite-Nitrogen			MG/KG	0.22	
METALS					
Aluminum	14592.8	NYSDEC TAGM	MG/KG	11600	
Arsenic	7.5	NYSDEC TAGM	MG/KG	5.7	
Barium	300	NYSDEC TAGM	MG/KG	51.6	
Beryllium	0.73	NYSDEC TAGM	MG/KG	0.56	J
Cadmium	1	NYSDEC TAGM	MG/KG	0.38	U
Calcium	101904	NYSDEC TAGM	MG/KG	18100	
Chromium	22.13	NYSDEC TAGM	MG/KG	18.4	
Cobalt	30	NYSDEC TAGM	MG/KG	11	
Copper	25	NYSDEC TAGM	MG/KG	22.7	
Iron	26626.7	NYSDEC TAGM	MG/KG	25600	
Lead	21.86	NYSDEC TAGM	MG/KG	11.7	J
Magnesium	12221.8	NYSDEC TAGM	MG/KG	7890	
Manganese	669.38	NYSDEC TAGM	MG/KG	403	
Mercury	0.1	NYSDEC TAGM	MG/KG	0.03	J
Nickel	33.62	NYSDEC TAGM	MG/KG	30.8	
Potassium	1761.48	NYSDEC TAGM	MG/KG	960	
Sodium	103.74	NYSDEC TAGM	MG/KG	75.9	J
Vanadium	150	NYSDEC TAGM	MG/KG	18.6	
Zinc	82.5	NYSDEC TAGM	MG/KG	**85.1**	

Table A-10
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Downwind Surface Soil Analytical Results

			LOC_ID:	1000-N	1000-S	2000-N	2000-N	2000-S	3000-N	3000-S	3500-N
			SAMP ID:	16083	16087	16089	16090	16085	16088	16056	16084
			QC CODE:	SA	SA	SA	DU	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1
			TOP:	0	0	0	0	0	0	0	0
			BOTTOM:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	8/22/1996	8/22/1996	8/22/1996	8/22/1996	8/22/1996	8/22/1996	8/20/1996	8/22/1996
ETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
LE ORGANICS											
	60	NYSDEC TAGM	UG/KG	11 UJ	12 U	12 U	12 U	12 U	12 U	11 U	2 J
	1500	NYSDEC TAGM	UG/KG	11 UJ	12 U	12 U	12 U	12 U	12 U	11 U	3 J
LATILE ORGANICS											
rotoluene			UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	880
naphthalene	36400	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	340 U
phenol	100	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	**120 J**	380 U	380 U	340 U
hene	50000	NYSDEC TAGM	UG/KG	370 U	18 J	390 U	390 U	410 U	380 U	380 U	340 U
hylene	41000	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	96 J
ne	50000	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	110 J
anthracene	224	NYSDEC TAGM	UG/KG	39 J	85 J	57 J	52 J	19 J	54 J	380 U	**720**
pyrene	61	NYSDEC TAGM	UG/KG	39 J	**110 J**	**69 J**	**62 J**	22 J	**73 J**	380 U	**940**
fluoranthene	1100	NYSDEC TAGM	UG/KG	42 J	120 J	68 J	54 J	410 U	58 J	380 U	**2200 J**
h,i)perylene	50000	NYSDEC TAGM	UG/KG	35 J	130 J	65 J	55 J	51 J	78 J	380 U	710
fluoranthene	1100	NYSDEC TAGM	UG/KG	47 J	94 J	65 J	61 J	38 J	73 J	380 U	340 U
			UG/KG	370 UJ	380 U	390 U	390 U	410 UJ	380 U	380 U	85 J
	400	NYSDEC TAGM	UG/KG	55 J	110 J	70 J	62 J	25 J	69 J	380 U	**670**
lphthalate	8100	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	340 U
h)anthracene	14	NYSDEC TAGM	UG/KG	370 U	**54 J**	**34 J**	**30 J**	410 U	**39 J**	**18 J**	**470**
uran	6200	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	340 U
ene	50000	NYSDEC TAGM	UG/KG	70 J	160 J	110 J	93 J	36 J	100 J	380 U	1000
	50000	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	340 U
2,3-cd)pyrene	3200	NYSDEC TAGM	UG/KG	32 J	110 J	55 J	50 J	20 J	70 J	380 U	790
diphenylamine (1)			UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	95 J
ene	13000	NYSDEC TAGM	UG/KG	370 U	380 U	390 U	390 U	410 U	380 U	380 U	16 J
rene	50000	NYSDEC TAGM	UG/KG	34 J	90 J	36 J	35 J	410 U	42 J	380 U	320 J
	50000	NYSDEC TAGM	UG/KG	76 J	160 J	92 J	81 J	38 J	90 J	380 U	1200

Table A-10
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Downwind Surface Soil Analytical Results

			LOC_ID:	1000-N		1000-S		2000-N		2000-N		2000-S		3000-N		3000-S		3500-N	
			SAMP ID:	16083		16087		16089		16090		16085		16088		16056		16084	
			QC CODE:	SA		SA		SA		DU		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/20/1996		8/22/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
DES/PCB																			
	2100	NYSDEC TAGM	UG/KG	5.2	J	1.9	J	3.9	U	3.9	U	4.1	U	3.8	U	3.7	U	8.9	
	2100	NYSDEC TAGM	UG/KG	6	J	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U	3.7	U	13	J
	44	NYSDEC TAGM	UG/KG	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	8.4	J	3.5	UJ	3.4	U
n I	900	NYSDEC TAGM	UG/KG	1.6	J	2	U	2	U	2	U	2.1	U	2	U	1.9	U	12	J
n sulfate	1000	NYSDEC TAGM	UG/KG	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U	3.7	U	3.4	U
	100	NYSDEC TAGM	UG/KG	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U	3.7	U	5.6	
tone			UG/KG	3.7	U	3.8	U	3.9	U	3.9	U	4.1	U	3.8	U	3.7	U	4.8	
ordane			UG/KG	1.1	J	2	U	2	U	2	U	2.1	U	2	U	1.9	U	1.8	U
	200	NYSDEC TAGM	UG/KG	1.9	U	2	U	2	U	2	U	2.1	U	2	U	1.9	U	1.8	U
C	300	NYSDEC TAGM	UG/KG	2.2		2	U	2	U	2	U	2.1	U	2	U	1.9	U	1.8	U
ANALYSES																			
trite-Nitrogen			MG/KG	0.34		0.27		6.1		6		0.27		0.64		0.06		0.34	
oisture (PEST/PCB)				11		14		16		16		19		14		12		3	
oisture (SVOCs)				11		14		16		16		19		14		12		3	
oisture (VOCs)				11		14		17		17		20		18		11		3	
lids (Metals)				88.7		86.1		83.5		83.6		81.4		85.7		87.9		97.2	
ROMATICS																			
otoluene	1000	NYSDEC TAGM	UG/KG	120	U	120	UJ	120	UJ	120	UJ	120	U	120	UJ	120	U	120	U

Table A-10
SENECA ARMY DEPOT
SEAD-16 AND 17 FEASIBILITY STUDY

SEAD-17 Downwind Surface Soil Analytical Results

			LOC_ID:	1000-N		1000-S		2000-N		2000-N		2000-S		3000-N		3000-S		3500-N	
			SAMP ID:	16083		16087		16089		16090		16085		16088		16056		16084	
			QC CODE:	SA		SA		SA		DU		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.2		0.2		0.2		0.2		0.2		0.2		0.2		0.2	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/22/1996		8/20/1996		8/22/1996	
TER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
n	14592.84	NYSDEC TAGM	MG/KG	13900	J	11600	J	11700	J	11500	J	14100	J	12700	J	11800	J	4120	J
	3.59	NYSDEC TAGM	MG/KG	0.7		0.8	J	0.39	U	0.45	U	0.36		0.7	J	0.37	UJ	0.56	
	7.5	NYSDEC TAGM	MG/KG	4.9		4.5	J	4.6	J	4.5	J	5.1		5.1	J	5.6		3.8	
	300	NYSDEC TAGM	MG/KG	81.8	J	90.3	J	113	J	109	J	129	J	98.7	J	69.1	J	27.2	J
	0.73	NYSDEC TAGM	MG/KG	0.54		0.48		0.41		0.44		0.57		0.43		0.51		0.16	
	1	NYSDEC TAGM	MG/KG	0.07		0.34		0.21		0.21		0.21		0.1		0.18		0.23	
	101903.8	NYSDEC TAGM	MG/KG	9650		14500		3410		3420		3600		18200		10800		**229000**	
n	22.13	NYSDEC TAGM	MG/KG	**24.4**		18.5		14.8		14.8		19.5		18.4		19.9		9.3	
	30	NYSDEC TAGM	MG/KG	15.7		9.2		7.2		7.1		10.7		10.3		12.3		4.7	
	25	NYSDEC TAGM	MG/KG	**39**		21.2		17.9		17.7		19.9		20.4		**28.9**		14.9	
	26626.65	NYSDEC TAGM	MG/KG	**29300**		22500		19100		19100		24000		23600		24900		9760	
	21.86	NYSDEC TAGM	MG/KG	**52**		**58**		19.7		19.5		**29**		19.3		16.7		**36.7**	
m	12221.77	NYSDEC TAGM	MG/KG	6120		5330		3230		3200		3840		6820		5330		8430	
e	669.38	NYSDEC TAGM	MG/KG	399	J	452		663		587		**704**	**J**	**670**		550		286	J
	0.1	NYSDEC TAGM	MG/KG	0.06		0.06		0.07		0.09		0.06		**0.56**		0.05		0.04	U
	33.62	NYSDEC TAGM	MG/KG	**50.8**		26.4		16.6		16.4		25.9		27.2		**34.6**		15.8	
	1761.48	NYSDEC TAGM	MG/KG	1460		1100		1030		1060		1730		1420		1320		848	
	2	NYSDEC TAGM	MG/KG	1.3	J	1.4		1.3		1.5		1.4	J	1.2		0.74		0.5	J
	103.74	NYSDEC TAGM	MG/KG	83.1		59.2	U	51.7	U	59.9	U	49.4		57.9	U	49.5	U	**383**	
	0.28	NYSDEC TAGM	MG/KG	0.88	U	0.93	U	0.81	U	0.94	U	**0.83**		0.91	U	**1.2**		0.74	U
	150	NYSDEC TAGM	MG/KG	20.5		19		19.4		19.5		22.3		20.1		19		15.5	
	82.5	NYSDEC TAGM	MG/KG	**109**	**J**	**92.5**		55.8		55.8		78.7	J	68.2		**97.9**		53.2	J

Table A-11
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Sediment/Soil Found in the Ditches Analytical Results

PARAMETER	LEVE	SOURCE	LOC_ID:	SW/SD17-1	SW/SD17-10	SW/SD17-2	SW/SD17-3	SW/SD17-4	SW/SD17-5	SW/SD17-6	SW/SD17
			SAMP ID:	16120A	16123A	16130A	16131A	16136A	16137A	16121A	16132A
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUNI
			TOP:	0	0	0	0	0	0	0	0
			BOTTOM:	6	6	6	6	6	6	6	6
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMEN
			SAMPLE DATE:	9/17/1996	9/17/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/1996	9/18/199
			UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE
VOLATILE ORGANICS											
Acetone			UG/KG	15	13 U	14 U	15 U	20 U	20 U	26	
Toluene			UG/KG	14 U	13 U	14 U	14 U	20 U	20 U	8 J	
SEMIVOLATILE ORGANICS											
2,4-Dimethylphenol			UG/KG	32 J	430 U	530 U	480 U	610 U	570 U	560 U	5
2,4-Dinitrotoluene			UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Benzo(a)anthracene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Benzo(a)pyrene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Benzo(b)fluoranthene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Benzo(g,h,i)perylene			UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Benzo(k)fluoranthene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Chrysene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Fluoranthene	12546	NSY BALCT	UG/KG	460 U	36 J	530 U	480 U	610 U	570 U	560 U	5
Indeno(1,2,3-cd)pyrene	15.99	NYS HHB	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Phenanthrene	1476	NSY BALCT	UG/KG	460 U	430 U	530 U	480 U	610 U	570 U	560 U	5
Pyrene			UG/KG	460 U	26 J	530 U	480 U	610 U	570 U	560 U	5
bis(2-Ethylhexyl)phthalate	2460	NSY BALCT	UG/KG	54 J	430 U	530 U	480 U	36 J	570 U	560 U	5
PESTICIDES/PCB											
4,4'-DDD	0.123	NYS HHB	UG/KG	4.6 U	4.3 U	4.6 U	4.9 U	**7.8**	**3.2 J**	5.6 U	
4,4'-DDE	0.123	NYS HHB	UG/KG	4.6 U	**2.8 J**	4.6 U	4.9 U	**28**	**13**	**6.5**	
4,4'-DDT	0.123	NYS HHB	UG/KG	4.6 U	4.3 U	4.6 U	4.9 U	6.1 U	5.7 U	**3 J**	
Dieldrin	1.23	NYS HHB	UG/KG	4.6 U	**5**	4.6 U	4.9 U	6.1 U	5.7 U	5.6 U	
Endosulfan I	0.369	NSY BALCT	UG/KG	2.4 U	2.2 U	2.4 U	2.5 U	3.1 U	2.9 U	2.9 U	2
Endosulfan II	0.369	NSY BALCT	UG/KG	4.6 U	4.3 U	4.6 U	4.9 U	**3.8 J**	5.7 U	**3.7 J**	

Table A-11
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Sediment/Soil Found in the Ditches Analytical Results

			LOC ID:	SW/SD17-1		SW/SD17-10		SW/SD17-2		SW/SD17-3		SW/SD17-4		SW/SD17-5		SW/SD17-6		SW/SD1
			SAMP ID:	16120A		16123A		16130A		16131A		16136A		16137A		16121A		16132
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUN
			TOP:	0		0		0		0		0		0		0		0
			BOTTOM:	6		6		6		6		6		6		6		6
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIME
			SAMPLE DATE:	9/17/1996		9/17/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/1996		9/18/19
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALU
OTHER ANALYSES																		
Nitrate/Nitrite-Nitrogen			MG/KG	0.04		0.05		0.06		0.07		0.24		0.02		0.1		0
Percent Moisture (PEST/PCB)				29		23		28		32		46		42		41		
Percent Moisture (SVOCs)				29		23		38		32		46		42		41		
Percent Moisture (VOCs)				26		23		28		26		49		51		30		
Percent Solids (Metals)				70.8		76.8		72		67.8		53.9		58.2		58.7		
Total Organic Carbon			MG/KG	141	U	10700		5650		10000		12800		7900		36100		5
METALS																		
Aluminum			MG/KG	18900		12100		19600		11400		16600		14800		15900		15
Antimony	2	NYS LEL	MG/KG	0.61	UJ	0.84	UJ	1.6	J	**5.5**	**J**	**2**	**J**	0.88	UJ	1.2	UJ	0
Arsenic	6	NYS LEL	MG/KG	**6.2**		3.3		**7.3**		4.5		4.1		4.8		4.2		
Barium			MG/KG	128		51.1		162		121		106		103		73.2		
Beryllium			MG/KG	0.99		0.26		0.86		0.57		0.67		0.62		0.5		0
Cadmium	0.6	NYS LEL	MG/KG	0.32		0.28		**1.1**		**4.8**		**2.4**		**2.1**		**1.1**		**0**
Calcium			MG/KG	4100		1950		3790		25000		6860		3070		2780		4
Chromium	26	NYS LEL	MG/KG	25.8		13.7		25.4		16.3		23.5		19.8		23.8		2
Cobalt			MG/KG	11.5		5.8		10.7		8.4		9.9		10		11		
Copper	16	NYS LEL	MG/KG	**38.6**	**J**	**27.1**	**J**	**42**	**J**	**98.1**	**J**	**75.3**	**J**	**46.6**	**J**	**36.4**	**J**	
Iron	20000	NYS LEL	MG/KG	**30800**		17400		**27800**		**20700**		**24500**		**24200**		**27800**		**27**
Lead	31	NYS LEL	MG/KG	**68.3**		**72.9**		**166**		**1050**		**258**		**136**		**106**		**7**
Magnesium			MG/KG	4970		2250		5140		6490		5780		4210		5570		5
Manganese	460	NYS LEL	MG/KG	**566**	**J**	362	J	348	J	415	J	275		347		**488**	**J**	
Mercury	0.15	NYS LEL	MG/KG	0.04		0.03	U	0.04	U	0.03	U	**0.16**		0.04	U	0.06	U	0
Nickel	16	NYS LEL	MG/KG	**29.8**	**J**	10.8	J	**30**	**J**	**23.7**	**J**	**30.6**	**J**	**24.7**	**J**	**30.6**	**J**	**3**
Potassium			MG/KG	1310	J	1250	J	2480	J	1450	J	2630	J	1660	J	1980	J	1
Selenium			MG/KG	0.8	U	1.1	U	0.84	U	1.3	U	1.4	U	1.9		1.6	U	
Sodium			MG/KG	79.4		76.3	U	429		338		109		98.6		112	U	4
Thallium			MG/KG	1.3		0.95	U	0.73	U	1.2	U	1.3	U	1		1.4	U	0
Vanadium			MG/KG	32.1		24.8		33		18.8		26.4		25		21.3		2
Zinc	120	NYS LEL	MG/KG	78.4		57.6		85.5		**278**		**158**		96.6		97.6		9

Table A-11
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD17-8		SW/SD17-9	
			SAMP ID:	16124A		16122A	
			QC CODE:	SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1	
			TOP:	0		0	
			BOTTOM:	6		6	
			MATRIX:	SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/17/1996		9/17/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q
VOLATILE ORGANICS							
Acetone			UG/KG	10	J	14	U
Toluene			UG/KG	14	U	14	U
SEMIVOLATILE ORGANICS							
2,4-Dimethylphenol			UG/KG	500	U	460	U
2,4-Dinitrotoluene			UG/KG	450	J	460	U
Benzo(a)anthracene	15.99	NYS HHB	UG/KG	**25**	**J**	460	U
Benzo(a)pyrene	15.99	NYS HHB	UG/KG	**30**	**J**	460	U
Benzo(h)fluoranthene	15.99	NYS HHB	UG/KG	**43**	**J**	460	U
Benzo(g,h,i)perylene			UG/KG	31	J	460	U
Benzo(k)fluoranthene	15.99	NYS HHB	UG/KG	**33**	**J**	460	U
Chrysene	15.99	NYS HHB	UG/KG	**48**	**J**	460	U
Fluoranthene	12546	NSY BALCT	UG/KG	70	J	460	U
Indeno(1,2,3-cd)pyrene	15.99	NYS HHB	UG/KG	**24**	**J**	460	U
Phenanthrene	1476	NSY BALCT	UG/KG	35	J	460	U
Pyrene			UG/KG	47	J	460	U
bis(2-Ethylhexyl)phthalate	2460	NSY BALCT	UG/KG	77	J	460	U
PESTICIDES/PCB							
4,4'-DDD	0.123	NYS HHB	UG/KG	**13**	**J**	4.6	U
4,4'-DDE	0.123	NYS HHB	UG/KG	**62**	**J**	**2.9**	**J**
4,4'-DDT	0.123	NYS HHB	UG/KG	**12**	**J**	4.6	U
Dieldrin	1.23	NYS HHB	UG/KG	5	UJ	4.6	U
Endosulfan I	0.369	NSY BALCT	UG/KG	**1.6**	**J**	2.4	U
Endosulfan II	0.369	NSY BALCT	UG/KG	5	UJ	4.6	U

Table A-11
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Sediment/Soil Found in the Ditches Analytical Results

			LOC_ID:	SW/SD17-8		SW/SD17-9	
			SAMP ID:	16124A		16122A	
			QC CODE:	SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1	
			TOP:	0		0	
			BOTTOM:	6		6	
			MATRIX:	SEDIMENT		SEDIMENT	
			SAMPLE DATE:	9/17/1996		9/17/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q
OTHER ANALYSES							
Nitrate/Nitrite-Nitrogen			MG/KG	0.09		0.04	
Percent Moisture (PEST/PCB)				34		29	
Percent Moisture (SVOCs)				34		29	
Percent Moisture (VOCs)				29		29	
Percent Solids (Metals)				65.8		70.9	
Total Organic Carbon			MG/KG	17800		4090	
METALS							
Aluminum			MG/KG	17100		22100	
Antimony	2	NYS LEL	MG/KG	**4.7**	**J**	0.73	UJ
Arsenic	6	NYS LEL	MG/KG	5		**7.5**	
Barium			MG/KG	157		92.4	
Beryllium			MG/KG	0.44		0.76	
Cadmium	0.6	NYS LEL	MG/KG	**2.7**		0.25	
Calcium			MG/KG	6150		2190	
Chromium	26	NYS LEL	MG/KG	23.3		**27.7**	
Cobalt			MG/KG	12		17.8	
Copper	16	NYS LEL	MG/KG	**309**	**J**	**34.1**	**J**
Iron	20000	NYS LEL	MG/KG	**29400**		**35000**	
Lead	31	NYS LEL	MG/KG	**678**		**90.5**	
Magnesium			MG/KG	4580		4830	
Manganese	460	NYS LEL	MG/KG	**768**	**J**	**565**	**J**
Mercury	0.15	NYS LEL	MG/KG	0.07		0.04	
Nickel	16	NYS LEL	MG/KG	**28.8**	**J**	**31.4**	**J**
Potassium			MG/KG	2470	J	1950	J
Selenium			MG/KG	1.6		0.96	
Sodium			MG/KG	137		69	
Thallium			MG/KG	1.2	U	0.83	U
Vanadium			MG/KG	29.8		33.8	
Zinc	120	NYS LEL	MG/KG	**242**		108	

Table A-12
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Groundwater Analytical Results

PARAMETER	LEVE	SOURCE													
			LOC_ID:	MW17-1		MW17-1		MW17-1		MW17-1		MW17-2		MW17-2	
			SAMP ID:	MW17-1-1		16108		16109		16171		MW17-2-1		16163	
			QC CODE:	SA		SA		DU		SA		SA		SA	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND2		ESI		RI ROUND2	
			TOP:	3.4		3.4		3.4		731.1		3.3		728.3	
			BOTTOM:	7.4		7.4		7.4		727.1		5.3		726.3	
			MATRIX:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
			SAMPLE DATE:	1/25/1994		8/29/1996		8/29/1996		12/11/1996		11/18/1993		12/9/1996	
			UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
SEMIVOLATILE ORGANICS															
Benzo[a]pyrene	0.2	EPA MCL	UG/L	11	U	0.7	J	10	U	10	U	11	U	10	U
Benzo[ghi]perylene			UG/L	11	U	2	J	1	J	10	U	11	U	10	U
Dibenz[a,h]anthracene			UG/L	11	U	1	J	0.9	J	10	U	11	U	10	U
Indeno[1,2,3-cd]pyrene			UG/L	11	U	2	J	1	J	10	U	11	U	10	U
OTHER ANALYSES															
Nitrate/Nitrite Nitrogen			MG/L	0.26		0.24		0.23		0.2		0.13		0.04	
Percent Solids (Metals)						0		0		0				0	
NITROAROMATICS															
Tetryl	5	NYS CLASS GA STANDARD	UG/L	0.13	U	0.26	U	0.26	U	0.26	U	0.08	J	0.26	U
METALS															
Aluminum	200	EPA SECONDARY MCL	UG/L	**10800**		90.4		54.6		**386**		**7220**		85.3	U
Arsenic	25	NYS CLASS GA STANDARD	UG/L	5.8	J	2.7	U	2.7	U	4.4	U	3.2	J	4.4	U
Barium	1000	NYS CLASS GA STANDARD	UG/L	147	J	85		87		90.4	U	77.9	J	66.1	U
Beryllium	4	EPA MCL	UG/L	0.52	J	0.26		0.21		0.2	U	0.4	J	0.2	U
Cadmium	5	EPA MCL	UG/L	2.1	U	0.3	U	0.31		0.6	U	3.3	U	0.6	U
Calcium			UG/L	170000		108000		110000		104000		149000		118000	
Chromium	50	NYS CLASS GA STANDARD	UG/L	17.3		1	U	1.5		1	U	12.9		1	U
Cobalt			UG/L	11.4	J	1.2	U	1.4		2	U	7	J	1.3	U
Copper	200	NYS CLASS GA STANDARD	UG/L	18	J	3.1		4.3		1.1	U	11.7	J	2.6	U
Iron	300	NYS CLASS GA STANDARD	UG/L	**18300**		119		90.6		**572**	**J**	**12200**		214	
Lead	15	EPA MCL	UG/L	8.7		1.7	U	1.7	U	1.5	U	**32.3**		1.9	U
Magnesium			UG/L	40200		22600		23000		22900		24400		14600	
Manganese	50	EPA SECONDARY MCL	UG/L	**473**		21.3		20		9.7	U	**459**		**73.8**	
Mercury	2	NYS CLASS GA STANDARD	UG/L	0.05	J	0.1	U	0.1	U	0.1	U	0.07	UJ	0.1	U
Nickel	100	EPA MCL	UG/L	24.4	J	1.8		2.2		2.5	U	15.4	J	2.5	U
Potassium			UG/L	4740	J	472		574		843	U	4280	J	5320	
Selenium	10	NYS CLASS GA STANDARD	UG/L	2	J	2.4	U	2.4	U	4.7	UJ	0.79	U	4.7	UJ
Silver	50	NYS CLASS GA STANDARD	UG/L	4.2	U	1.3	U	2.3		1.5	U	6.6	U	1.5	U
Sodium	20000	NYS CLASS GA STANDARD	UG/L	8270		9290		9620		8190		**44300**		18700	
Thallium	2	EPA MCL	UG/L	1.2	U	**4.4**		**7.1**		4.1	U	1.8	U	4.7	U
Vanadium			UG/L	19.9	J	1.2	U	1.4		1.6	U	12.8	J	1.6	U
Zinc	300	NYS CLASS GA STANDARD	UG/L	100		2.5	R	3.2	R	14.4	U	33		63.9	

Table A-12
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Groundwater Analytical Results

			LOC ID:	MW17-3		MW17-4		MW17-4		MW17-5		MW17-5	
			SAMP ID:	16166		MW17-4-1		16169		16106		16170	
			QC CODE:	SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND2		ESI		RI ROUND2		RI ROUND1		RI ROUND2	
			TOP:	727.1		3.1		729.4		3.4		728.1	
			BOTTOM:	725.1		5.1		727.4		7.9		723.6	
			MATRIX:	Groundwater		Groundwater		Groundwater		Groundwater		Groundwater	
			SAMPLE DATE:	12/10/1996		1/25/1994		12/11/1996		8/29/1996		12/11/1996	
PARAMETER	LEVE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
SEMIVOLATILE ORGANICS													
Benzo[a]pyrene	0.2	EPA MCL	UG/L	10	U	11	U	10	U	10	U	10	U
Benzo[ghi]perylene			UG/L	10	U	11	U	10	U	10	U	10	U
Dibenz[a,h]anthracene			UG/L	10	U	11	U	10	U	10	U	10	U
Indeno[1,2,3-cd]pyrene			UG/L	10	U	11	U	10	U	10	U	10	U
OTHER ANALYSES													
Nitrate/Nitrite Nitrogen			MG/L	0.05		0.05		0.02		0.04		0.02	
Percent Solids (Metals)				0				0		0		0	
NITROAROMATICS													
Tetryl	5	NYS CLASS GA STANDARD	UG/L	0.26	U	0.13	U	0.26	U	0.26	U	0.26	U
METALS													
Aluminum	200	EPA SECONDARY MCL	UG/L	36.1	U	774		41.9	U	39.9		59	U
Arsenic	25	NYS CLASS GA STANDARD	UG/L	4.4	U	0.87	J	4.4	U	2.7	U	4.4	U
Barium	1000	NYS CLASS GA STANDARD	UG/L	27.4	U	33.4	J	27.4	U	92.5		62.6	U
Beryllium	4	EPA MCL	UG/L	0.2	U	0.4	U	0.2	U	0.23		0.2	U
Cadmium	5	EPA MCL	UG/L	0.6	U	2.1	U	0.6	U	0.3	U	0.6	U
Calcium			UG/L	108000		113000		92000		108000		81100	
Chromium	50	NYS CLASS GA STANDARD	UG/L	1	U	2.6	U	1	U	1	U	1	U
Cobalt			UG/L	1.3	U	4.4	U	1.3	U	1.2	U	1.3	U
Copper	200	NYS CLASS GA STANDARD	UG/L	1.1	U	3.1	U	1.1	U	3.3		1.3	U
Iron	300	NYS CLASS GA STANDARD	UG/L	53.1	U	1100		96.4	U	56.8		134	
Lead	15	EPA MCL	UG/L	1.5	U	1.9	J	3	U	1.7	U	1.5	U
Magnesium			UG/L	15200		17800		14200		17700		13600	
Manganese	50	EPA SECONDARY MCL	UG/L	0.7	U	550		22.5		73.2		62	
Mercury	2	NYS CLASS GA STANDARD	UG/L	0.1	U	0.07	J	0.1	U	0.1	U	0.1	U
Nickel	100	EPA MCL	UG/L	2.5	U	4	U	2.5	U	2.4		2.5	U
Potassium			UG/L	772	U	5820		1330	U	853		1070	U
Selenium	10	NYS CLASS GA STANDARD	UG/L	4.7	UJ	0.7	U	4.7	UJ	2.4	U	4.7	UJ
Silver	50	NYS CLASS GA STANDARD	UG/L	1.5	U	4.2	U	1.5	U	1.3	U	1.5	U
Sodium	20000	NYS CLASS GA STANDARD	UG/L	30100		17200		22300		11700		8970	
Thallium	2	EPA MCL	UG/L	4.4	U	1.2	U	6.2	U	4.7		8.6	U
Vanadium			UG/L	1.6	U	3.7	U	1.6	U	1.2	U	1.6	U
Zinc	300	NYS CLASS GA STANDARD	UG/L	7.7	U	13	J	8.3	U	6.2	R	4.4	U

Table A-13
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Surface Water Analytical Results

			LOC_ID:	SW/SD17-1		SW/SD17-10		SW/SD17-2		SW/SD17-3		SW/SD17-4		SW/S
			SAMP ID:	16120		16123		16130		16131		16136		16
			QC CODE:	SA		SA		SA		SA		SA		
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI RO
			TOP:											
			BOTTOM:											
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SUR WA
			SAMPLE DATE:	9/17/1996		9/17/1996		9/18/1996		9/18/1996		9/18/1996		9/18
RAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VA
MIVOLATILE ORGANICS														
(2-Ethylhexyl)phthalate	0.6	NYS AWQS CLASS C	UG/L	10	U	10	U	10	U	2	J	10	U	
THER ANALYSES														
rcent Solids (Metals)				0		0		0		0		0		
tal Organic Carbon			MG/L	7.3		11.6		8.4		3.9		6.1		
			MG/L	7.87		7.44		7.81		7.81		7.43		
ETALS														
timony			UG/L	5.4	J	2	U	4.1	J	12.6	J	2	U	
senic	190	NYS AWQS CLASS C	UG/L	2.7	U	3.9	J	2.7	U	4.6	J	2.9	J	
rium			UG/L	42.6	J	30.4	J	43.6	J	91.8	J	41.7	J	
dmium	1.86	NYS AWQS CLASS C	UG/L	0.32	J	0.3	U	0.47	J	0.63	J	0.44	J	
lcium			UG/L	46400		50100		48300		68200		73500		
romium	347.27	NYS AWQS CLASS C	UG/L	1	J	1	U	1	U	1	U	1	U	
pper	20.29	NYS AWQS CLASS C	UG/L	18.4		17.4		12.6		9.5		6.9		
n	300	NYS AWQS CLASS C	UG/L	**322**	**J**	81.1	J	174	J	169	J	134	J	
ad	7.16	NYS AWQS CLASS C	UG/L	**14.9**		1.8		**9.7**		3.3		1.9		
gnesium			UG/L	3810		3430		6390		8730		9280		
nganese			UG/L	6.6		2.7		16		8.8		13.3		
ckel	154.49	NYS AWQS CLASS C	UG/L	1.6	U	1.6	U	1.7		1.6	U	1.6	U	
assium			UG/L	3270		3830		2470		4380		1980		
enium	1	NYS AWQS CLASS C	UG/L	2.4	U	2.4	U	**3.4**	**J**	**3.5**	**J**	**2.5**	**J**	
dium			UG/L	3090		2990		2880		5830		9460		
nadium	14	NYS AWQS CLASS C	UG/L	1.8	J	1.2	U	1.2	U	1.2	U	1.2	U	
c	141.38	NYS AWQS CLASS C	UG/L	20.9		50.5		40.8		29.1		3.6		

Table A-13
SENECA ARMY DEPOT
FEASIBILITY STUDY

SEAD-17 Surface Water Analytical Results

			LOC_ID:	SW/SD17-6		SW/SD17-7		SW/SD17-8		SW/SD17-9	
			SAMP ID:	16121		16132		16124		16122	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:								
			BOTTOM:								
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMPLE DATE:	9/18/1996		9/18/1996		9/17/1996		9/17/1996	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
SEMIVOLATILE ORGANICS											
bis(2-Ethylhexyl)phthalate	0.6	NYS AWQS CLASS C	UG/L	10	U	1	J	10	U	10	U
OTHER ANALYSES											
Percent Solids (Metals)				0		0		0		0	
Total Organic Carbon			MG/L	3.8		5.9		11.1		10.1	
pH			MG/L	7.62		7.53		7.89		7.54	
METALS											
Antimony			UG/L	2	U	23.6	J	2	U	2	U
Arsenic	190	NYS AWQS CLASS C	UG/L	2.7	U	3.8	J	4	J	3.2	J
Barium			UG/L	38.8	J	100	J	16	J	24.7	J
Cadmium	1.86	NYS AWQS CLASS C	UG/L	0.3	U	1.3	J	0.3	U	0.3	U
Calcium			UG/L	71800		38800		29300		37100	
Chromium	347.27	NYS AWQS CLASS C	UG/L	1	U	1	U	1	U	1	U
Copper	20.29	NYS AWQS CLASS C	UG/L	6.7		**32.7**		10.5		8.9	
Iron	300	NYS AWQS CLASS C	UG/L	112	J	222	J	59.4	J	48.5	J
Lead	7.16	NYS AWQS CLASS C	UG/L	1.7	U	**37.1**		1.7	U	1.7	U
Magnesium			UG/L	8990		3730		2610		2910	
Manganese			UG/L	4.7		9.1		1.4		2.1	
Nickel	154.49	NYS AWQS CLASS C	UG/L	1.6	U	1.6	U	1.6	U	1.6	U
Potassium			UG/L	1990		3700		2630		3800	
Selenium	1	NYS AWQS CLASS C	UG/L	2.4	U	**3.4**	**J**	2.4	U	2.4	U
Sodium			UG/L	8950		6410		1600		1620	
Vanadium	14	NYS AWQS CLASS C	UG/L	1.2	U	1.2	U	1.2	U	1.2	U
Zinc	141.38	NYS AWQS CLASS C	UG/L	2.8		61.7		6.8		21.8	

AMRO Environmental Laboratories Corporation

111 Herrick Street, Merrimack, NH 03054
TEL: (603) 424-2022 · FAX: (603) 429-8496

November 04, 1999

Mr. Michael Duescheanu
Parsons Engineering-Science Inc.
Prudential Center
Boston, MA 02199

RE Your project: Sead 16 & 17

Dear Michael:

Enclosed please find the results for the above-referenced project, received on October 30, 1999. AMRO operates a Quality Control Program which meets or exceeds EPA and state requirements. A copy of the appropriate State Certificate is attached. The enclosed Sample Receipt Checklist details the condition of your sample upon receipt. Please see the enclosed Non-Conformance Summary sheet that addresses quality control deviations that were encountered during the analysis associated with this project. This project was assigned AMRO Project Number 24595. If you have any questions regarding this project in the future, please refer to this number.

Please be advised that any unused sample volume and sample extracts will be stored for a period of thirty (30) days from this report date. After this time, AMRO will properly dispose of the remaining sample. If you require further analysis, or need the samples held for a longer period, please contact us immediately.

This letter is an integral part of your data report.

Please do not hesitate to call if you have any questions.

Sincerely,

Richard Ravenelle
Organics Laboratory Manager

Encl.

24595

CHAIN-OF-CUSTODY RECORD

SONS
NG-SCIENCE, INC.
Phone: 617-859-2000
Fax: 617-859-2043

JOB NO.
PROJECT Sead 16 & 17
CONTACT Mike Duescheanu

LABORATORY Amro
ADDRESS Hancock St Merrimack
CONTACT Denise Bornett

O.	LABORATORY SAMPLE NO.	SAMPLING DATE	SAMPLING TIME	SAMPLE DEPTH	SAMPLE MATRIX	VOA	SVOC	METALS	PEST/PCB	CN	HERB	TPH				NO. OF CONTAINERS	COMMENTS (Special instructions, cauti…
		10/28/99	0800		H2O			X								1	
		"	0850		"			X								1	
		"	0925		"			X								1	
		"	1010		"			X								1	
		"	1030		"			X								1	
		"	11.10		"			X								1	
		"	1135		"			X								1	
		"	1150		"			X								1	
		"	1415		"			X								1	
		"	1235		"			X								1	
		"	1258		"			X								1	
		"	1645		"			X								1	

	VOA	SVOC	METALS	PEST/PCB	CN	HERB	TPH			
VOA Vial										
Glass Bottle										
Plastic Bottle			X							
Preservative			D							
Container Volume			500 ml							

Relinquished by
[signature]
McAllister
Engineering Science
Time 0900

Received by
Sign Shipped Fed Ex
Print
Firm
Date
Time

Relinquished by
Time

Received by
Sign [signature]
Print Jeremy Anderson
Firm
Date 10-30-99 Time 922

…mples tampered with? ☐ No ☐ Yes
…n in remarks.

PRESERVATION KEY:
A - Ice
B - Filtered
C - Acidified with HCl
D - Acidified with HNO_3
E - Acidified with H_2SO_4
F - NaOH Ascorbic
G - Other

REMARKS: (Sample s… nonstandard sample b…
Method 7841 fo…
Thallium by G…
Furnace
2 PPB Detection

Cooler #:

White - return with data Yellow - lab copy Pink - Sampler copy c-1595

CHAIN-OF-CUSTODY RECORD

ONS
NG-SCIENCE, INC.
Phone: 617-859-2000
Fax: 617-859-2043

JOB NO.
PROJECT Sead 16 & 17
CONTACT Mike Duerschau

LABORATORY Amro
ADDRESS Hancock St Merrimack NH
CONTACT Denise Barnett

...O.	LABORATORY SAMPLE NO.	SAMPLING DATE	SAMPLING TIME	SAMPLE DEPTH	SAMPLE MATRIX	VOA	SVOC	METALS	PEST/PCB	CN	HERB	TPH				NO. OF CONTAINERS	COMMENTS (Special instructions, cautio...
		10/28/99	1355		H_2O			X								1	
		10/28/99	1420		"			X								1	

	METALS
VOA Vial	
Glass Bottle	
Plastic Bottle	X
Preservative	D
Container Volume	500 ml

...elinquished by
...llister
...llister
Engineering Science
Time 0900

Received by
Sign
Print Shipped Fed EX
Firm
Date
Time

Received by
Sign [signature]
Print Jeremy McAnderson
Firm
Date 10-30-99
Time 9:20
Time

PRESERVATION KEY: A - Ice; B - Filtered; C - Acidified with HCl; D - Acidified with HNO_3; E - Acidified with H_2SO_4; F - NaOH + Ascorbic; G - Other

REMARKS: (Sample st... nonstandard sample bo...
Method 784... for Thallium... Graphite Furnac... 2 PPB Detect...

Cooler #:

...ples tampered with? ☐ No ☐ Yes
... in remarks.

White - return with data Yellow - lab copy Pink - Sampler copy

NON-CONFORMANCE SUMMARY
24595

GENERAL

No QC deviations were observed.

METALS

There are no Form IV, Form IX, Form XI, Form XII due to the analyses being performed by GFAA. There is also no Form V applicable to Post Spike Recoveries for GFAA. Post spike recovery data can be found on the Analytical Run forms.

Samples 24595-(02-04, 06-09, 11, 13) had analytical (post digestion) spike recoveries for Thallium outside of acceptance limits (85-115%) but between 40-85%. There is no impact on data since these analytes were not detected. Data for these samples was reported and flagged with "W". Laboratory control sample recovery was within acceptance limits for Thallium as well as RPD's and matrix spike/matrix spike duplicate recoveries.

No QC deviations were observed.

Christine J. Garvey
QA/QC Manager

Data Qualifiers Legend

Organic

A This tentatively identified compound is a suspected aldol-condensation product.

B This analyte has been found in the associated method blank as well as the sample.

E This analyte concentration exceeds the upper level of the calibration range.

Es The reporting value of this analyte is estimated due to the presence of an interference.

J The reporting value of this analyte is estimated. Compound meets identification criteria and is greater than zero and less than the Reporting Limit (PQL).

N This tentatively identified compound is based on a mass spectral library search

Inorganic

(a) A dilution performed on the sample resulted in an elevated PQL due to the presence of an interference. The number after the flag code denotes the dilution factor.

(b) Result was estimated due to blank contamination.

J Reported value was obtained from a reading that is less than the Contract Required Detection Limit but greater than or equal to the Instrument Detection Limit.

U Analyte was analyzed for but not detected.

E The reported value is estimated because of the presence of interference.

N Spike sample recovery not within control limits.

S The reported value was determine by the Method of Standard Addition (MSA).

W Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while the sample absorbance in less than 50% of spike absorbance.

* Duplicate analysis not within control limits.

\+ Correlation coefficient for the MSA is less than 0.995.

P ICP

F Furnace AA

CV Manual Cold Vapor AA

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-01

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-01

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U		F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_160000
DATE_SAMPLED 102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-02

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-02

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162000
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-03

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-03

Level (low/med): LOW Date Received: 10/30/99

% Solids: --

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162001
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-04

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-04

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162002
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-05

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-05

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U		F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID = 162003
DATE_SAMPLED 102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-06

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Matrix (soil/water): WATER   Lab Sample ID: 24595-06

Level (low/med): LOW   Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162004
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-07

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Matrix (soil/water): WATER   Lab Sample ID: 24595-07

Level (low/med): LOW   Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:

SAMPLE_ID = 162005
DATE_SAMPLED 102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-08

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Matrix (soil/water): WATER   Lab Sample ID: 24595-08

Level (low/med): LOW   Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162006
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-09

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-09

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162007
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-10

Lab Name: AMRO　　Contract:

Lab Code:　　Case No.:　　SAS No.:　　SDG No.: 24595

Matrix (soil/water): WATER　　Lab Sample ID: 24595-10

Level (low/med): LOW　　Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U		F

Color Before:　　Clarity Before:　　Texture:

Color After:　　Clarity After:　　Artifacts:

Comments:
SAMPLE_ID_=_162008
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-11

Lab Name: AMRO　　Contract:

Lab Code:　　Case No.:　　SAS No.:　　SDG No.: 24595

Matrix (soil/water): WATER　　Lab Sample ID: 24595-11

Level (low/med): LOW　　Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before:　　Clarity Before:　　Texture:

Color After:　　Clarity After:　　Artifacts:

Comments:
SAMPLE_ID_=_162009
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-12

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Matrix (soil/water): WATER   Lab Sample ID: 24595-12

Level (low/med): LOW   Date Received: 10/30/99_

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U		F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162010
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-13

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Lab Sample ID: 24595-13

Level (low/med): LOW Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U	W	F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162011
DATE_SAMPLED_102899

AMRO

NYSDEC - ASP
1
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

595-14

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Matrix (soil/water): WATER   Lab Sample ID: 24595-14

Level (low/med): LOW   Date Received: 10/30/99

% Solids:

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-28-0	Thallium	1.5	U		F

Color Before: Clarity Before: Texture:

Color After: Clarity After: Artifacts:

Comments:
SAMPLE_ID_=_162012
DATE_SAMPLED_102899

NYSDEC - ASP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Initial Calibration Source: ACCU-AUG97

Continuing Calibration Source: VHG_APR99

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Thallium	50.0	53.56	107.1	50.0	48.22	96.4	49.39	98.8	F

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

NYSDEC - ASP
3
BLANKS

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Thallium	1.5	U	1.5	U	1.5	U			1.500	U	F

NYSDEC - ASP

5A

SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

595-01S

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Thallium	75-125	50.4585		1.5000	U	50.00	100.9		F

Comments:

SAMPLE_ID_=_160000

DATE_SAMPLED_102899

NYSDEC - ASP
5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

595-01SD

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Thallium	75-125	48.3649		1.5000	U	50.00	96.7		F

Comments:
SAMPLE_ID = 160000
DATE_SAMPLED 102899

NYSDEC - ASP
6
DUPLICATES

EPA SAMPLE NO.

595-01

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Thallium		1.5000	U	1.5000	U			F

NYSDEC - ASP
6
DUPLICATES

EPA SAMPLE NO.

595-01S

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

Matrix (soil/water): WATER Level (low/med): LOW

% Solids for Sample: 0.0 % Solids for Duplicate: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Thallium		50.4585		48.3649		4.2		F

NYSDEC - ASP

7

LABORATORY CONTROL SAMPLE

Lab Name: AMRO   Contract:

Lab Code: Case No.:   SAS No.:   SDG No.: 24595

Solid LCS Source:

Aqueous LCS Source: VHG_APR99

	Aqueous (ug/L)			Solid (mg/kg)				
Analyte	True	Found	%R	True	Found	C	Limits	%R
Thallium	50.0	49.34	98.7					

NYSDEC - ASP

8

STANDARD ADDITION RESULTS

Lab Name: AMRO   Contract:

Lab Code: Case No.: __   SAS No.: __   SDG No.: 24595

Concentration Units: ug/L

EPA Sample No.	An	0 ADD ABS	1 ADD CON	1 ADD ABS	2 ADD CON	2 ADD ABS	3 ADD CON	3 ADD ABS	Final Conc.	r	Q

NYSDEC - ASP

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: AMRO Contract:

Lab Code: Case No.: SAS No.: SDG No.: 24595

ICP ID Number: Date 06/01/99

Flame AA ID Number:

Furnace AA ID Number: PE-4100ZL

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Thallium	276.80	BZ	5	1.5	F

Comments:

AM

METALS VALIDATION / OUTLIER REPORT

(reb – 12/28/98)

Instrument: BE 4100 Data File: 2/102 99 A
Analyst: AB ICV(200.7@5%): 1090 ok
ICV (6010@10%): NA IPC (200.7@5%): ok
ICB (1/2RL): ok CCB (1/2RL): ok
CCV (10%): ±20% ok ICSA (RL): NA
RL1 (20% Initial and Final): ok
RL2 (20% Initial and Final): NA
ICSAB (20%): NA
RL___(30-50%): NA
Non Conformance ID: none Comments: none

Prep Date: 11/1/99 QC Sample ID: 24595-01 Matrix: water
Serial Dilution (10%): NA Dup (20%): ok
MS: ok MSD: ok
RPD-MS/MSD: ok LCS: ok
Prep Blank (<RL): ok
Non Conformance ID: none Package Level #: Army 5
Samples Needing Dilutions or Reruns: none
Comments:

EC 11/4/99

Prep Date: 11/1/99 QC Sample ID: 24569-01 Matrix: water
Serial Dilution (10%): NA Dup (20%): ok
MS: ok MSD: ok
RPD-MS/MSD: ok LCS: ok
Prep Blank (<RL): ok
Non Conformance ID: none Package Level #: none
Samples Needing Dilutions or Reruns: 24563-05, 12 for Pb
Comments:

Prep Date: QC Sample ID: Matrix:
Serial Dilution (10%): Dup (20%):
MS: MSD:
RPD-MS/MSD: LCS:
Prep Blank (<RL):
Non Conformance ID: Package Level #:
Samples Needing Dilutions or Reruns:
Comments:

Prep Date: QC Sample ID: Matrix:
Serial Dilution (10%): Dup (20%):
MS: MSD:
RPD-MS/MSD: LCS:
Prep Blank (<RL):
Non Conformance ID: Package Level #:
Samples Needing Dilutions or Reruns:
Comments:

Data Validator: Date:

3

SAMPLE ID	ELE MENT	DATE	CONC CAL UG/L	CONC SAMP MG/L	DIL
S0110299	TI	11/2/99			
S25110299	TI	11/2/99			
S50110299	TI	11/2/99			
S75110299	TI	11/2/99			
S100110299	TI	11/2/99			
ICV110299	TI	11/2/99	53.5632378	53.5632378	
ICB110299	TI	11/2/99	-0.1882661	-0.1882661	
RL5110299	TI	11/2/99	4.94278486	4.94278486	
BW110199A	TI	11/2/99	-0.7736988	-0.0007736	1
BW110199A	TI	11/2/99	22.7321991	0.0227322	1
LW110199A	TI	11/2/99	49.3416395	0.04934164	1
24595-01	TI	11/2/99	0.0333447	0.00003334	1
24595-01	TI	11/2/99	21.6158239	0.02161582	1
24595-01D	TI	11/2/99	-0.3060407	-0.000306	1
24595-01D	TI	11/2/99	21.8768654	0.02187686	1
24595-01S	TI	11/2/99	50.4584763	0.05045847	1
24595-01SD	TI	11/2/99	48.3649254	0.04836492	1
24595-02	TI	11/2/99	-0.2270647	-0.000227	1
24595-02	TI	11/2/99	18.3410519	0.01834105	1
24595-03	TI	11/2/99	0.08163076	0.00008163	1
24595-03	TI	11/2/99	15.8856271	0.01588562	1
24595-04	TI	11/2/99	-0.4881615	-0.0004881	1
24595-04	TI	11/2/99	20.1826314	0.02018263	1
24595-05	TI	11/2/99	-0.2912998	-0.0002912	1
24595-05	TI	11/2/99	22.5977723	0.02259777	1
CCV110299	TI	11/2/99	48.2176191	48.2176191	1
CCB110299	TI	11/2/99	0.00245853	0.00245853	1
24595-06	TI	11/2/99	-0.1613354	-0.0001613	1
24595-06	TI	11/2/99	17.9868586	0.01798685	1
24595-07	TI	11/2/99	-0.8252858	-0.0008252	1
24595-07	TI	11/2/99	19.7769154	0.01977691	1
24595-08	TI	11/2/99	-0.3314057	-0.0003314	1
24595-08	TI	11/2/99	18.6525542	0.01865255	1
24595-09	TI	11/2/99	-0.5554225	-0.0005554	1
24595-09	TI	11/2/99	19.6104368	0.01961043	1
24595-10	TI	11/2/99	-0.2625654	-0.0002625	1
24595-10	TI	11/2/99	21.6991099	0.02169911	1
24595-11	TI	11/2/99	-0.1293866	-0.0001293	1
24595-11	TI	11/2/99	20.4513977	0.02045139	1
24595-12	TI	11/2/99	-0.4731503	-0.0004731	1
24595-12	TI	11/2/99	22.1668917	0.02216689	1
24595-13	TI	11/2/99	-0.1044972	-0.0001044	1
24595-13	TI	11/2/99	20.6371212	0.02063712	1
24595-14	TI	11/2/99	-0.4635617	-0.0004635	1

SAMPLE ID	ELE MENT	DATE	CONC CAL UG/L	CONC SAMP MG/L	DIL
24595-14	Tl	11/2/99	21.7792381	0.02177923	1
BLK	Tl	11/2/99	0.02593849	0.00002593	1
CCV110299	Tl	11/2/99	49.3948887	49.3948887	1
CCB110299	Tl	11/2/99	0.11435532	0.11435532	1
S0110299	Pb	11/2/99			1
S25110299	Pb	11/2/99			1
S50110299	Pb	11/2/99			1
S75110299	Pb	11/2/99			1
S100110299	Pb	11/2/99			1
IPC110299	Pb	11/2/99	49.9740978	49.9740978	1
ICV110299	Pb	11/2/99	50.3274975	50.3274975	1
ICB110299	Pb	11/2/99	0.16674404	0.16674404	1
RL5110299	Pb	11/2/99	4.94995509	4.94995509	1
BW110199B	Pb	11/2/99	0.50351829	0.00050351	1
BW110199B	Pb	11/2/99	21.1952879	0.02119528	1
LW110199C	Pb	11/2/99	51.1445551	0.05114455	1
24569-01	Pb	11/2/99	1.51755456	0.00151755	1
24569-01	Pb	11/2/99	21.1132353	0.02111323	1
24569-01D	Pb	11/2/99	1.38249452	0.00138249	1
24569-01D	Pb	11/2/99	21.5933275	0.02159332	1
24569-01S	Pb	11/2/99	46.6868663	0.04668686	1
24569-01SD	Pb	11/2/99	53.149344	0.05314934	1
24563-01	Pb	11/2/99	1.41614954	0.00141614	1
24563-01	Pb	11/2/99	23.1357976	0.02313579	1
24563-03	Pb	11/2/99	1.42370331	0.0014237	1
24563-03	Pb	11/2/99	22.4748055	0.0224748	1
24563-05	Pb	11/2/99	99.4795471	0.09947955	1
24563-05	Pb	11/2/99	117.14291	0.11714291	1
24563-05	Pb	11/2/99	54.1604926	0.10832099	1
24563-05	Pb	11/2/99	71.8543491	0.1437087	1
24563-06	Pb	11/2/99	1.04707941	0.00104707	1
24563-06	Pb	11/2/99	22.2409835	0.02224098	1
CCV110299	Pb	11/2/99	50.1296358	50.1296358	1
CCB110299	Pb	11/2/99	0.20200628	0.20200628	1
24563-12	Pb	11/2/99	134.786879	0.13478688	1
24563-12	Pb	11/2/99	72.4842849	0.14496857	1
24563-12	Pb	11/2/99	89.560587	0.17912118	1
BLK	Pb	11/2/99	0.26659872	0.00026659	1
CCV110299	Pb	11/2/99	50.4722746	50.4722746	1
CCB110299	Pb	11/2/99	0.24943223	0.24943223	1
S00110299	Sb	11/2/99			1
S25110299	Sb	11/2/99			1
S50110299	Sb	11/2/99			1
S75110299	Sb	11/2/99			1

SAMPLE ID	ELE MENT	DATE	CONC CAL UG/L	CONC SAMP MG/L	DIL
S100110299	Sb	11/2/99			1
IPC110299	Sb	11/2/99	52.1120976	52.1120976	1
ICV110299	Sb	11/2/99	50.6129788	50.6129788	1
ICB110299	Sb	11/2/99	-0.2670757	-0.2670757	1
RL5110299	Sb	11/2/99	4.81027958	4.81027958	1
BW110199B	Sb	11/2/99	0.48428837	0.00048428	1
BW110199B	Sb	11/2/99	23.0662276	0.02306622	1
LW110199C	Sb	11/2/99	49.8874368	0.04988743	1
24569-01	Sb	11/2/99	1.75872284	0.00175872	1
24569-01	Sb	11/2/99	23.0558486	0.02305584	1
24569-01D	Sb	11/2/99	0.89311521	0.00089311	1
24569-01D	Sb	11/2/99	23.1557838	0.02315578	1
24569-01S	Sb	11/2/99	52.2735822	0.05227358	1
24569-01SD	Sb	11/2/99	58.533767	0.05853376	1
24569-02	Sb	11/2/99	4.01486855	0.00401486	1
24569-02	Sb	11/2/99	27.2148217	0.02721482	1
24569-03	Sb	11/2/99	3.36668944	0.00336668	1
24569-03	Sb	11/2/99	25.1975405	0.02519754	1
24569-04	Sb	11/2/99	1.65984789	0.00165984	1
24569-04	Sb	11/2/99	25.5640511	0.02556405	1
24569-05	Sb	11/2/99	1.99112766	0.00199112	1
24569-05	Sb	11/2/99	23.4331954	0.02343319	1
CCV110299	Sb	11/2/99	52.6279296	52.6279296	1
CCB110299	Sb	11/2/99	0.25137547	0.25137547	1
BLK	Sb	11/2/99	0.32151012	0.00032151	1
CCV110299	Sb	11/2/99	52.3858486	52.3858486	1
CCB110299	Sb	11/2/99	-0.8531988	-0.8531988	1

APC
11/3/99

APPENDIX B

RISK ASSESSMENT

ANALYSES

APPENDIX B - RISK ASSESSMENT ANALYSES

Human Health Risk Assessment

SEAD-16

SEAD-17

Ecological Risk Assessment

SEAD-16

SEAD-17

SEAD-17 Post-Remediation

SEAD-16

PRE-REMEDIATION

TABLE B-16PR-1

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-16PR-10	3E-02	2E-11
	Ingestion of Onsite Soils	Table B-16PR-12	1E-02	1E-06
	Dermal Contact to Onsite Soils	Table B-16PR-13	2E-03	3E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-02*	*1E-06*
FUTURE INDUSTRIAL WORKER	Inhalation of Dust in Indoor Air	Table B-16PR-11	3E-01	NQ
	Ingestion of Indoor Dust	Table B-16PR-14	2E+01	5E-03
	Dermal Contact to Indoor Dust	Table B-16PR-15	2E+00	6E-06
	Ingestion of Groundwater	Table B-16PR-19	2E+00	4E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+01*	*5E-03*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-16PR-10	5E-01	9E-11
	Ingestion of Onsite Soils	Table B-16PR-12	9E-01	3E-06
	Dermal Contact to Onsite Soils	Table B-16PR-13	2E-02	1E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*1E+00*	*3E-06*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-16PR-10	1E-02	2E-12
	Ingestion of Onsite Soils	Table B-16PR-12	9E-02	2E-06
	Dermal Contact to Onsite Soils	Table B-16PR-13	5E-03	2E-08
	Dermal Contact to Surface Water while Wading	Table B-16PR-16	7E-03	8E-07
	Ingestion of Onsite Sediment	Table B-16PR-17	2E-01	4E-07
	Dermal Contact to Sediment while Wading	Table B-16PR-18	1E-02	3E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-01*	*3E-06*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-16PR-10	8E-01	1E-10
	Ingestion of Onsite Soils	Table B-16PR-12	2E+00	4E-05
	Dermal Contact to Onsite Soils	Table B-16PR-13	4E-02	1E-07
	Ingestion of Groundwater	Table B-16PR-19	4E+00	2E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*6E+00*	*6E-05*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-16PR-10	3E-01	2E-10
	Ingestion of Onsite Soils	Table B-16PR-12	2E-01	2E-05
	Dermal Contact to Onsite Soils	Table B-16PR-13	2E-02	3E-07
	Ingestion of Groundwater	Table B-16PR-19	2E+00	4E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+00*	*6E-05*

NQ = Not Quantified due to lack of toxicity data.

TABLE B-16PR-3

Surface Soil Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
1,1,2,2-Tetrachloroethane	51	0	1	2%	6.10E-03	3.05E-03	7.75E-03	FALSE	6.39E-03	6.39E-03
Acetone	51	0	2	3.90%	6.15E-03	3.45E-03	1.70E-02	FALSE	6.56E-03	6.56E-03
Benzene	49	2	5	10.20%	5.29E-03	1.12E-03	5.00E-03	FALSE	5.76E-03	5.00E-03
Carbon disulfide	49	2	2	4.10%	5.30E-03	1.15E-03	2.00E-03	FALSE	5.99E-03	2.00E-03
Chloroform	48	3	2	4.20%	3.98E-03	1.43E-03	2.00E-03	FALSE	4.41E-03	2.00E-03
Methylene chloride	49	2	3	6.10%	5.37E-03	8.87E-04	3.00E-03	FALSE	5.68E-03	3.00E-03
Toluene	51	0	17	33.30%	5.41E-03	3.67E-03	1.00E-02	FALSE	6.47E-03	6.47E-03
Xylene (total)	49	2	1	2.00%	5.53E-03	5.64E-04	4.25E-03	FALSE	5.66E-03	4.25E-03
Semivolatile Organics										
2,4-Dinitrotoluene**	51	0	18	35.30%	3.96E+00	1.34E+01	8.50E+01	FALSE	4.55E+00	4.55E+00
2,6-Dinitrotoluene**	51	0	10	19.60%	1.59E+00	6.45E+00	8.00E+00	FALSE	1.19E+00	1.19E+00
2-Methynaphthalene	51	0	10	19.60%	1.04E+00	2.93E+00	1.90E+01	FALSE	1.20E+00	1.20E+00
2-Methylphenol	31	20	1	3.20%	1.86E-01	2.32E-02	1.20E-01	FALSE	1.94E-01	1.20E-01
3,3`-Dichlorobenzidine	50	1	1	2.00%	7.12E-01	1.41E+00	8.50E-01	FALSE	7.68E-01	7.68E-01
3-Nitroaniline	50	1	1	2.00%	1.74E+00	3.48E+00	2.10E+00	FALSE	1.87E+00	1.87E+00
Acenaphthene	51	0	10	19.60%	2.06E+00	1.01E+01	7.20E+01	FALSE	1.52E+00	1.52E+00
Acenaphthylene	40	11	9	22.50%	2.18E-01	1.47E-01	3.10E-01	FALSE	3.05E-01	3.05E-01
Anthracene	51	0	14	27.50%	3.01E+00	1.68E+01	1.20E+02	FALSE	1.55E+00	1.55E+00
Benzo[a]anthracene	51	0	27	52.90%	4.95E+00	3.07E+01	2.20E+02	FALSE	2.70E+00	2.70E+00
Benzo[a]pyrene	51	0	29	56.90%	4.64E+00	2.79E+01	2.00E+02	FALSE	3.40E+00	3.40E+00
Benzo[b]fluoranthene	51	0	28	54.90%	4.71E+00	2.79E+01	2.00E+02	FALSE	3.61E+00	3.61E+00
Benzo[ghi]perylene	51	0	21	41.20%	2.77E+00	1.40E+01	1.00E+02	FALSE	2.29E+00	2.29E+00
Benzo[k]fluoranthene	51	0	25	49.00%	3.95E+00	2.37E+01	1.70E+02	FALSE	2.31E+00	2.31E+00
Carbazole	51	0	13	25.50%	2.40E+00	1.24E+01	8.90E+01	FALSE	1.59E+00	1.59E+00
Chrysene	51	0	34	66.70%	4.93E+00	3.07E+01	2.20E+02	FALSE	2.97E+00	2.97E+00
Di-n-butylphthalate	51	0	18	35.30%	1.81E+00	6.69E+00	1.60E+01	FALSE	1.70E+00	1.70E+00
Dibenz[a,h]anthracene	51	0	14	27.50%	1.50E+00	6.87E+00	4.90E+01	FALSE	1.52E+00	1.52E+00
Dibenzofuran	51	0	10	19.60%	1.63E+00	7.05E+00	5.00E+01	FALSE	1.36E+00	1.36E+00
Diethyl phthalate	31	20	2	6.50%	1.78E-01	4.70E-02	1.90E-02	FALSE	2.41E-01	1.90E-02
Fluoranthene	51	0	35	68.60%	1.11E+01	7.41E+01	5.30E+02	FALSE	3.84E+00	3.84E+00
Fluorene	51	0	6	11.80%	2.20E+00	1.09E+01	7.80E+01	FALSE	1.39E+00	1.39E+00
Indeno[1,2,3-cd]pyrene	51	0	18	35.30%	2.75E+00	1.40E+01	1.00E+02	FALSE	2.38E+00	2.38E+00
N-Nitrosodiphenylamine	51	0	19	37.30%	1.96E+00	7.18E+00	2.50E+01	FALSE	1.85E+00	1.85E+00
Naphthalene	51	0	9	17.60%	1.96E+00	9.25E+00	6.60E+01	FALSE	1.56E+00	1.56E+00
Pentachlorophenol	47	4	1	2.10%	9.16E-01	7.82E-01	1.20E+00	FALSE	1.08E+00	1.08E+00
Phenanthrene	51	0	29	56.90%	1.02E+01	6.85E+01	4.90E+02	FALSE	2.98E+00	2.98E+00
Pyrene	51	0	36	70.60%	7.78E+00	5.03E+01	3.60E+02	FALSE	3.92E+00	3.92E+00
bis(2-Ethylhexyl)phthalate	50	1	11	22.00%	7.24E-01	1.43E+00	2.10E+00	FALSE	1.37E+00	1.37E+00
Pesticides/PCBs										
4,4`-DDD	51	0	8	15.70%	4.33E-03	5.45E-03	2.30E-02	FALSE	4.88E-03	4.88E-03
4,4`-DDE	51	0	36	70.60%	6.17E-02	2.00E-01	1.40E+00	FALSE	1.06E-01	1.06E-01
4,4`-DDT	51	0	35	68.60%	3.43E-02	8.10E-02	3.40E-01	FALSE	4.89E-02	4.89E-02
Aldrin	51	0	2	3.90%	1.84E-03	2.30E-03	5.00E-03	FALSE	1.99E-03	1.99E-03
Aroclor-1254	51	0	2	3.90%	6.09E-02	1.59E-01	1.10E+00	FALSE	5.67E-02	5.67E-02
Aroclor-1260	51	0	9	17.60%	5.34E-02	7.35E-02	3.40E-01	FALSE	6.24E-02	6.24E-02
Dieldrin	51	0	3	5.90%	3.61E-03	4.75E-03	2.60E-02	FALSE	3.93E-03	3.93E-03
Endosulfan I	51	0	20	39.20%	1.27E-02	6.00E-02	4.30E-01	FALSE	9.06E-03	9.06E-03
Endosulfan II	51	0	5	9.80%	3.58E-03	4.32E-03	5.00E-03	FALSE	3.89E-03	3.89E-03
Endosulfan sulfate	51	0	2	3.90%	3.52E-03	4.57E-03	2.00E-02	FALSE	3.77E-03	3.77E-03
Endrin	51	0	6	11.80%	4.42E-03	6.87E-03	4.30E-02	FALSE	4.81E-03	4.81E-03
Endrin aldehyde	51	0	6	11.80%	3.92E-03	4.59E-03	1.40E-02	FALSE	4.41E-03	4.41E-03
Endrin ketone	51	0	6	11.80%	4.67E-03	1.02E-02	7.10E-02	FALSE	4.54E-03	4.54E-03
Heptachlor	50	1	1	2.00%	1.66E-03	2.02E-03	1.80E-03	FALSE	1.77E-03	1.77E-03
Heptachlor epoxide	51	0	6	11.80%	1.97E-03	2.37E-03	6.70E-03	FALSE	2.17E-03	2.17E-03
Toxaphene	50	1	1	2.00%	1.66E-01	2.02E-01	1.80E-01	FALSE	1.77E-01	1.77E-01
alpha-Chlordane	51	0	14	27.50%	6.42E-03	2.37E-02	1.70E-01	FALSE	5.73E-03	5.73E-03
beta-BHC	51	0	3	5.90%	2.04E-03	3.28E-03	2.00E-02	FALSE	2.12E-03	2.12E-03
delta-BHC	51	0	1	2.00%	1.81E-03	2.29E-03	2.20E-03	FALSE	1.97E-03	1.97E-03
gamma-BHC/Lindane	51	0	1	2.00%	1.82E-03	2.29E-03	2.30E-03	FALSE	1.97E-03	1.97E-03
gamma-Chlordane	51	0	12	23.50%	6.96E-03	2.78E-02	2.00E-01	FALSE	5.74E-03	5.74E-03
Nitroaromatics										
2,4-Dinitrotoluene**	51	0	25	49.00%	2.19E+00	1.04E+01	7.40E+01	FALSE	1.92E+00	1.92E+00
2,6-Dinitrotoluene**	51	0	4	7.80%	1.11E-01	2.04E-01	9.00E-01	FALSE	1.07E-01	1.07E-01
2-amino-4,6-Dinitrotoluene	51	0	1	2.00%	9.52E-02	1.73E-01	4.30E-01	FALSE	9.20E-02	9.20E-02
Tetryl	51	0	1	2.00%	9.11E-02	1.67E-01	2.20E-01	FALSE	8.79E-02	8.79E-02
Metals										
Antimony	51	0	33	64.70%	4.75E+01	2.70E+02	1.93E+03	FALSE	4.77E+01	4.77E+01
Barium	51	0	50	98.00%	4.62E+02	1.47E+03	9.34E+03	FALSE	4.11E+02	4.11E+02
Copper	51	0	51	100.00%	9.71E+02	5.30E+03	3.79E+04	FALSE	5.85E+02	5.85E+02
Lead	51	0	51	100.00%	3.79E+03	1.96E+04	1.40E+05	FALSE	6.21E+03	6.21E+03
Mercury	51	0	40	78.40%	6.60E-01	1.72E+00	1.14E+01	FALSE	1.32E+00	1.32E+00
Selenium	51	0	28	54.90%	5.55E-01	4.61E-01	1.60E+00	TRUE	6.63E-01	6.63E-01
Thallium	51	0	16	31.40%	8.40E-01	2.29E+00	1.66E+01	FALSE	9.97E-01	9.97E-01
Zinc	51	0	51	100.00%	5.18E+02	2.04E+03	1.46E+04	FALSE	4.01E+02	4.01E+02
Herbicides										
2,4,5-T	16	0	2	12.50%	3.43E-03	1.71E-03	8.30E-03	FALSE	4.03E-03	4.03E-03
MCPP	16	0	1	6.30%	3.64E+00	3.30E+00	1.60E+01	FALSE	4.33E+00	4.33E+00

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PR-2

Indoor Air Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Hits	Frequency (%)	Mean (mg/m3)	Standard Deviation (mg/m3)	Max Hit (mg/m3)	Exposure Point Concentration (EPC) (mg/m3)
Semivolatile Organics							
Phenol	3	2	67%	4.19E-05	2.03E-05	6.76E-05	6.76E-05
Benzoic Acid	3	1	33%	1.11E-04	2.14E-05	1.41E-04	1.41E-04
Napthalene	3	1	33%	4.53E-05	9.28E-06	5.84E-05	5.84E-05
2-Methylnaphthalene	3	3	100%	5.44E-05	1.21E-05	7.06E-05	7.06E-05
Acenaphthene	3	2	67%	3.06E-05	7.77E-06	3.07E-05	3.07E-05
Dibenzofuran	3	2	67%	2.96E-05	9.03E-06	3.07E-05	3.07E-05
Diethylphthalate	3	3	100%	4.30E-05	1.46E-05	6.14E-05	6.14E-05
Fluorene	3	1	33%	3.51E-05	5.36E-06	2.76E-05	2.76E-05
Phenanthrene	3	1	33%	4.22E-05	4.98E-06	4.91E-05	4.91E-05
Anthracene	3	1	33%	4.12E-05	3.58E-06	4.61E-05	4.61E-05
Di-N-Butylphthalate	3	2	67%	2.86E-05	9.02E-06	2.76E-05	2.76E-05
Butylbenzylphthalate	3	1	33%	3.51E-05	5.36E-06	2.76E-05	2.76E-05
Bis(2-Ethylhexyl)Pthalate	3	3	100%	5.04E-05	2.59E-05	8.71E-05	8.71E-05
Metals							
Aluminum	3	3	100%	1.39E-04	1.05E-05	1.51E-04	1.51E-04
Barium	3	3	100%	1.87E-05	7.67E-07	1.95E-05	1.95E-05
Copper	3	3	100%	1.18E-03	2.77E-04	9.83E-04	9.83E-04
Lead	3	3	100%	3.95E-05	4.38E-06	5.47E-05	5.47E-05
Manganese	3	3	100%	4.93E-06	4.19E-07	5.50E-06	5.50E-06
Mercury	3	2	67%	1.98E-04	5.08E-05	2.35E-04	2.35E-04
Selenium	3	2	67%	4.06E-06	1.71E-06	5.30E-06	5.30E-06

* Special case for indoor air samples: since there are too few data points to perform distributional analysis, the maximum hit concentration was used as an upper bound estimate of exposure.

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TABLE B-16PR-4

Total Soils Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
1,1,2,2-Tetrachloroethane	57	0	1	2%	6.05E-03	2.89E-03	7.75E-03	FALSE	6.30E-03	6.30E-03
Acetone	57	0	4	7%	6.90E-03	6.23E-03	4.60E-02	FALSE	7.28E-03	7.28E-03
Benzene	55	2	7	13%	5.20E-03	1.23E-03	5.00E-03	FALSE	5.70E-03	5.00E-03
Carbon disulfide	55	2	3	6%	5.35E-03	1.03E-03	2.00E-03	FALSE	5.84E-03	2.00E-03
Chloroform	54	3	2	4%	4.11E-03	1.45E-03	2.00E-03	FALSE	4.53E-03	2.00E-03
2-Butanone	55	2	1	2%	5.46E-03	7.99E-04	5.00E-03	FALSE	5.85E-03	5.00E-03
Methylene chloride	55	2	3	6%	5.40E-03	8.41E-04	3.00E-03	FALSE	5.67E-03	3.00E-03
Toluene	57	0	23	40%	5.38E-03	3.57E-03	1.00E-02	FALSE	6.28E-03	6.28E-03
Xylene (total)	55	2	1	2%	5.53E-03	5.36E-04	4.25E-03	FALSE	5.66E-03	4.25E-03
Semivolatile Organics										
2,4-Dinitrotoluene	57	0	20	35%	3.61E+00	1.27E+01	8.50E+01	FALSE	3.80E+00	3.80E+00
2,6-Dinitrotoluene	57	0	11	19%	1.47E+00	6.10E+00	8.00E+00	FALSE	4.25E-03	4.25E-03
2-Methylnaphthalene	57	0	11	19%	9.73E-01	2.77E+00	1.90E+01	FALSE	4.25E-03	4.25E-03
2-Methylphenol	35	22	1	3%	1.86E-01	2.21E-02	1.20E-01	FALSE	1.93E-01	1.20E-01
3,3`-Dichlorobenzidine	56	1	1	2%	6.82E-01	1.34E+00	8.50E-01	FALSE	7.24E-01	7.24E-01
3-Nitroaniline	56	1	1	2%	1.67E+00	3.31E+00	2.10E+00	FALSE	1.76E+00	1.76E+00
Acenaphthene	57	0	11	19%	1.89E+00	9.55E+00	7.20E+01	FALSE	1.33E+00	1.33E+00
Acenaphthylene	45	12	10	22%	2.16E-01	1.39E-01	3.10E-01	FALSE	2.91E-01	2.91E-01
Anthracene	57	0	17	30%	2.74E+00	1.59E+01	1.20E+02	FALSE	1.38E+00	1.38E+00
Benzo[a]anthracene	57	0	31	54%	4.56E+00	2.91E+01	2.20E+02	FALSE	2.46E+00	2.46E+00
Benzo[a]pyrene	57	0	34	60%	4.29E+00	2.64E+01	2.00E+02	FALSE	3.30E+00	3.30E+00
Benzo[b]fluoranthene	57	0	33	58%	4.34E+00	2.64E+01	2.00E+02	FALSE	3.38E+00	3.38E+00
Benzo[ghi]perylene	57	0	26	46%	2.76E+00	1.33E+01	1.00E+02	FALSE	2.70E+00	2.70E+00
Benzo[k]fluoranthene	57	0	30	53%	3.65E+00	2.25E+01	1.70E+02	FALSE	2.24E+00	2.24E+00
Butylbenzylphthalate	35	22	1	3%	1.84E-01	3.45E-02	1.80E-02	FALSE	2.18E-01	1.80E-02
Carbazole	57	0	14	25%	2.19E+00	1.18E+01	8.90E+01	FALSE	1.35E+00	1.35E+00
Chrysene	57	0	39	68%	4.55E+00	2.91E+01	2.20E+02	FALSE	2.77E+00	2.77E+00
Di-n-butylphthalate	57	0	20	35%	1.67E+00	6.34E+00	1.60E+01	FALSE	1.51E+00	1.51E+00
Dibenz[a,h]anthracene	57	0	18	32%	1.43E+00	6.50E+00	4.90E+01	FALSE	1.49E+00	1.49E+00
Dibenzofuran	57	0	12	21%	1.49E+00	6.68E+00	5.00E+01	FALSE	1.17E+00	1.17E+00
Diethyl phthalate	35	22	2	6%	1.79E-01	4.43E-02	1.90E-02	FALSE	2.33E-01	1.90E-02
Fluoranthene	57	0	40	70%	1.02E+01	7.01E+01	5.30E+02	FALSE	3.68E+00	3.68E+00
Fluorene	57	0	7	12%	2.01E+00	1.03E+01	7.80E+01	FALSE	1.22E+00	1.22E+00
Indeno[1,2,3-cd]pyrene	57	0	23	40%	2.66E+00	1.32E+01	1.00E+02	FALSE	2.65E+00	2.65E+00
N-Nitrosodiphenylamine	57	0	20	35%	1.80E+00	6.80E+00	2.50E+01	FALSE	1.59E+00	1.59E+00
Naphthalene	57	0	10	18%	1.80E+00	8.76E+00	6.60E+01	FALSE	1.34E+00	1.34E+00
Pentachlorophenol	53	4	2	4%	9.25E-01	7.96E-01	1.20E+00	FALSE	1.11E+00	1.11E+00
Phenanthrene	57	0	34	60%	9.26E+00	6.48E+01	4.90E+02	FALSE	2.74E+00	2.74E+00
Pyrene	57	0	41	72%	7.17E+00	4.76E+01	3.60E+02	FALSE	3.74E+00	3.74E+00
bis(2-Ethylhexyl)phthalate	57	0	12	21%	1.48E+00	6.09E+00	2.10E+00	FALSE	1.76E+00	1.76E+00
Pesticides/PCBs										
4,4`-DDD	57	0	8	14%	4.66E-03	5.86E-03	2.30E-02	FALSE	5.26E-03	5.26E-03
4,4`-DDE	57	0	37	65%	5.61E-02	1.90E-01	1.40E+00	FALSE	8.51E-02	8.51E-02
4,4`-DDT	57	0	37	65%	3.15E-02	7.70E-02	3.40E-01	FALSE	4.11E-02	4.11E-02
Aldrin	57	0	2	4%	2.06E-03	2.64E-03	5.00E-03	FALSE	2.23E-03	2.23E-03
Aroclor-1254	57	0	2	4%	6.24E-02	1.52E-01	1.10E+00	FALSE	6.00E-02	6.00E-02
Aroclor-1260	57	0	9	16%	5.57E-02	7.45E-02	3.40E-01	FALSE	6.51E-02	6.51E-02
Dieldrin	57	0	4	7%	4.20E-03	5.42E-03	2.60E-02	FALSE	4.65E-03	4.65E-03
Endosulfan I	57	0	22	39%	1.19E-02	5.67E-02	4.30E-01	FALSE	8.65E-03	8.65E-03
Endosulfan II	57	0	5	9%	3.99E-03	4.99E-03	5.00E-03	FALSE	4.34E-03	4.34E-03
Endosulfan sulfate	57	0	2	4%	3.94E-03	5.19E-03	2.00E-02	FALSE	4.23E-03	4.23E-03
Endrin	57	0	7	12%	4.75E-03	7.05E-03	4.30E-02	FALSE	5.23E-03	5.23E-03
Endrin aldehyde	57	0	6	11%	4.29E-03	5.18E-03	1.40E-02	FALSE	4.83E-03	4.83E-03
Endrin ketone	57	0	6	11%	4.97E-03	1.01E-02	7.10E-02	FALSE	4.96E-03	4.96E-03
Heptachlor	54	3	1	2%	1.61E-03	1.95E-03	1.80E-03	FALSE	1.70E-03	1.70E-03
Heptachlor epoxide	57	0	6	11%	2.16E-03	2.69E-03	6.70E-03	FALSE	2.40E-03	2.40E-03
Toxaphene	54	3	1	2%	1.61E-01	1.95E-01	1.80E-01	FALSE	1.70E-01	1.70E-01
alpha-Chlordane	57	0	14	25%	6.16E-03	2.24E-02	1.70E-01	FALSE	5.57E-03	5.57E-03
beta-BHC	57	0	3	5%	2.24E-03	3.43E-03	2.00E-02	FALSE	2.35E-03	2.35E-03
delta-BHC	56	1	1	2%	1.89E-03	2.43E-03	2.20E-03	FALSE	2.03E-03	2.03E-03
gamma-BHC/Lindane	57	0	1	2%	2.04E-03	2.63E-03	2.30E-03	FALSE	2.21E-03	2.21E-03
gamma-Chlordane	57	0	13	23%	6.66E-03	2.64E-02	2.00E-01	FALSE	5.60E-03	5.60E-03
Nitroaromatics										
2,4-Dinitrotoluene	57	0	28	49%	1.98E+00	9.83E+00	7.40E+01	FALSE	1.50E+00	1.50E+00
2,6-Dinitrotoluene	57	0	4	7%	1.06E-01	1.93E-01	9.00E-01	FALSE	1.01E-01	1.01E-01
2-amino-4,6-Dinitrotoluene	57	0	1	2%	9.15E-02	1.64E-01	4.30E-01	FALSE	8.79E-02	8.79E-02
Tetryl	57	0	1	2%	8.79E-02	1.59E-01	2.20E-01	FALSE	8.44E-02	8.44E-02
Metals										
Antimony	57	0	36	63%	4.51E+01	2.55E+02	1.93E+03	FALSE	5.12E+01	5.12E+01
Barium	57	0	56	98%	4.28E+02	1.39E+03	9.34E+03	FALSE	3.66E+02	3.66E+02
Copper	57	0	57	100%	8.88E+02	5.01E+03	3.79E+04	FALSE	5.24E+02	5.24E+02
Lead	57	0	57	100%	4.03E+03	1.90E+04	1.40E+05	FALSE	7.14E+03	7.14E+03
Mercury	57	0	45	79%	6.44E-01	1.64E+00	1.14E+01	FALSE	1.27E+00	1.27E+00
Selenium	57	0	31	54%	5.57E-01	4.51E-01	1.60E+00	TRUE	6.57E-01	6.57E-01
Thallium	57	0	17	30%	1.57E+00	6.13E+00	1.66E+01	FALSE	1.32E+00	1.32E+00
Zinc	57	0	57	100%	4.75E+02	1.93E+03	1.46E+04	FALSE	3.52E+02	3.52E+02
Herbicides										
2,4,5-T	16	0	2	13%	3.43E-03	1.71E-03	8.30E-03	FALSE	4.03E-03	4.03E-03
MCPP	16	0	1	6%	3.64E+00	3.30E+00	1.60E+01	FALSE	4.33E+00	4.33E+00

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PR-5

Solids Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
1,1,1-Trichloroethane	6	4	1	17%	5.67E-03	6.83E-04	7.00E-03	FALSE	6.27E-03	6.27E-03
Methylene chloride	6	4	1	17%	5.67E-03	6.83E-04	7.00E-03	FALSE	6.27E-03	6.27E-03
Toluene	10	0	1	10%	9.15E-03	4.86E-03	2.00E-02	FALSE	1.31E-02	1.31E-02
Trichloroethene	10	0	1	10%	8.45E-03	3.41E-03	1.30E-02	FALSE	1.13E-02	1.13E-02
Semivolatile Organics										
2,4-Dinitrotoluene**	7	3	3	43%	4.29E+02	1.13E+03	3.00E+03	FALSE	2.89E+10	3.00E+03
2,6-Dinitrotoluene**	6	4	2	33%	1.25E+01	3.01E+01	7.40E+01	FALSE	3.45E+05	7.40E+01
2-Methylnaphthalene	8	2	6	75%	2.49E+00	6.67E+00	1.90E+01	FALSE	6.03E+02	1.90E+01
Acenaphthene	7	3	3	43%	8.48E-01	1.62E+00	4.50E+00	FALSE	3.18E+01	4.50E+00
Anthracene	7	3	4	57%	6.11E-01	1.03E+00	2.90E+00	FALSE	6.58E+01	2.90E+00
Benzo[a]anthracene	9	1	8	89%	4.05E-01	5.45E-01	1.60E+00	FALSE	3.74E+00	1.60E+00
Benzo[a]pyrene	10	0	9	90%	2.53E+01	7.90E+01	1.50E+00	FALSE	6.39E+03	1.50E+00
Benzo[b]fluoranthene	10	0	9	90%	2.53E+01	7.89E+01	1.60E+00	FALSE	2.90E+03	1.60E+00
Benzo[ghi]perylene	8	2	5	63%	2.71E-01	2.64E-01	8.70E-01	FALSE	8.05E-01	8.05E-01
Benzo[k]fluoranthene	9	1	8	89%	4.01E-01	5.11E-01	1.60E+00	FALSE	2.78E+00	1.60E+00
Butylbenzylphthalate	6	4	2	33%	9.13E+00	2.20E+01	5.40E+01	FALSE	4.56E+05	5.40E+01
Carbazole	7	3	4	57%	2.43E-01	2.65E-01	7.40E-01	TRUE	4.33E-01	4.33E-01
Chrysene	10	0	9	90%	2.55E+01	7.89E+01	1.90E+00	FALSE	2.64E+03	1.90E+00
Di-n-butylphthalate	7	3	3	43%	1.36E+02	3.59E+02	9.50E+02	FALSE	3.62E+08	9.50E+02
Dibenz[a,h]anthracene	7	3	2	29%	2.55E-01	1.59E-01	5.00E-01	TRUE	3.69E-01	3.69E-01
Dibenzofuran	8	2	4	50%	3.79E-01	4.75E-01	1.50E+00	FALSE	4.20E+00	1.50E+00
Diethyl phthalate	7	3	1	14%	2.80E-01	1.40E-01	5.30E-01	TRUE	3.80E-01	3.80E-01
Fluoranthene	10	0	9	90%	2.59E+01	7.87E+01	3.90E+00	FALSE	2.54E+03	3.90E+00
Fluorene	7	3	3	43%	1.08E+00	2.22E+00	6.10E+00	FALSE	5.13E+01	6.10E+00
Indeno[1,2,3-cd]pyrene	8	2	5	63%	2.14E-01	1.57E-01	4.50E-01	TRUE	3.17E-01	3.17E-01
N-Nitrosodiphenylamine	6	4	2	33%	3.36E+01	8.15E+01	2.00E+02	FALSE	3.06E+07	2.00E+02
Naphthalene	8	2	4	50%	3.93E-01	5.10E-01	1.60E+00	FALSE	5.50E+00	1.60E+00
Pentachlorophenol	5	5	1	20%	3.94E-01	9.86E-02	2.20E-01	FALSE	5.82E-01	2.20E-01
Phenanthrene	10	0	9	90%	2.78E+01	7.84E+01	2.20E+01	FALSE	2.82E+04	2.20E+01
Phenol	6	4	3	50%	6.30E+00	1.50E+01	3.70E+01	FALSE	5.40E+04	3.70E+01
Pyrene	10	0	9	90%	2.60E+01	7.87E+01	5.00E+00	FALSE	3.30E+03	5.00E+00
bis(2-Ethylhexyl)phthalate	7	3	5	71%	1.09E+00	1.77E+00	5.00E+00	FALSE	2.95E+01	5.00E+00
Pesticides/PCBs										
4,4'-DDD	7	3	3	43%	8.53E-03	1.18E-02	3.50E-02	FALSE	3.01E-02	3.01E-02
4,4'-DDE	10	0	9	90%	1.66E-01	2.55E-01	7.50E-01	FALSE	3.68E+00	7.50E-01
4,4'-DDT	10	0	10	100%	3.06E-01	3.70E-01	9.40E-01	FALSE	2.49E+01	9.40E-01
Aroclor-1254	8	2	6	75%	2.67E-01	4.71E-01	1.40E+00	FALSE	3.13E+00	1.40E+00
Aroclor-1260	9	1	6	67%	1.36E-01	1.92E-01	6.30E-01	FALSE	4.51E-01	4.51E-01
Dieldrin	8	2	2	25%	6.76E-03	8.70E-03	2.80E-02	FALSE	1.82E-02	1.82E-02
Endosulfan I	8	2	2	25%	4.44E-03	7.16E-03	2.20E-02	FALSE	1.78E-02	1.78E-02
Endosulfan II	7	3	3	43%	3.80E-03	1.67E-03	5.70E-03	TRUE	4.99E-03	4.99E-03
Endrin	7	3	1	14%	4.04E-03	2.77E-03	9.20E-03	TRUE	6.02E-03	6.02E-03
Heptachlorepoxide	7	3	1	14%	1.79E-03	9.15E-04	2.60E-03	TRUE	2.45E-03	2.45E-03
alpha-BHC	7	3	1	14%	1.99E-03	1.15E-03	3.70E-03	TRUE	2.82E-03	2.82E-03
alpha-Chlordane	9	1	7	78%	8.68E-03	1.48E-02	4.70E-02	FALSE	4.07E-02	4.07E-02
gamma-BHC/Lindane	6	4	1	17%	1.51E-03	6.74E-04	9.30E-04	TRUE	2.05E-03	9.30E-04
gamma-Chlordane	9	1	6	67%	7.22E-03	1.13E-02	3.60E-02	FALSE	3.27E-02	3.27E-02
Nitroaromatics										
2,4,6-Trinitrotoluene	8	3	1	13%	7.81E-02	3.71E-02	1.70E-01	FALSE	1.02E-01	1.02E-01
2,4-Dinitrotoluene**	11	0	8	73%	2.07E+03	5.72E+03	1.90E+04	FALSE	2.62E+11	1.90E+04
Metals										
Antimony	11	0	10	91%	3.11E+02	5.53E+02	1.56E+03	FALSE	1.29E+04	1.56E+03
Arsenic	11	0	11	100%	1.22E+01	1.37E+01	4.73E+01	FALSE	3.73E+01	3.73E+01
Barium	11	0	11	100%	6.39E+03	1.22E+04	4.05E+04	FALSE	2.83E+05	4.05E+04
Cadmium	8	3	7	88%	3.26E+01	4.77E+01	1.27E+02	FALSE	7.16E+04	1.27E+02
Copper	11	0	11	100%	1.31E+04	2.56E+04	8.14E+04	FALSE	4.70E+06	8.14E+04
Cyanide	11	0	6	55%	4.10E+00	7.24E+00	2.42E+01	FALSE	2.75E+01	2.42E+01
Lead	11	0	11	100%	8.95E+04	1.95E+05	5.27E+05	FALSE	8.08E+07	5.27E+05
Mercury	11	0	9	82%	6.79E+00	1.30E+01	3.93E+01	FALSE	9.49E+02	3.93E+01
Selenium	9	2	7	78%	1.45E+00	1.72E+00	5.80E+00	FALSE	1.45E+01	5.80E+00
Silver	8	3	4	50%	5.21E+00	8.38E+00	2.27E+01	FALSE	4.40E+02	2.27E+01
Sodium	11	0	11	100%	1.30E+03	1.55E+03	3.69E+03	FALSE	1.32E+04	3.69E+03
Thallium	11	0	2	18%	4.51E-01	4.18E-01	1.40E+00	FALSE	8.97E-01	8.97E-01
Zinc	11	0	11	100%	9.74E+03	1.53E+04	4.26E+04	FALSE	4.68E+05	4.26E+04
Herbicides										
2,4,5-T	8	0	2	25%	4.91E-03	3.46E-03	1.30E-02	FALSE	8.01E-03	8.01E-03
2,4,5-TP/Silvex	8	0	1	13%	4.54E-03	1.94E-03	7.90E-03	TRUE	5.82E-03	5.82E-03
2,4-D	8	0	1	13%	5.14E-02	4.55E-02	1.60E-01	FALSE	9.29E-02	9.29E-02
2,4-DB	8	0	1	13%	5.18E-02	3.45E-02	1.30E-01	FALSE	8.65E-02	8.65E-02
Dichloroprop	8	0	1	13%	4.31E-02	1.57E-02	6.10E-02	TRUE	5.34E-02	5.34E-02
MCPA	8	0	1	13%	4.30E+00	1.55E+00	6.00E+00	FALSE	5.90E+00	5.90E+00
MCPP	8	0	1	13%	6.30E+00	6.49E+00	2.20E+01	FALSE	1.28E+01	1.28E+01

* Refer to text for a detailed discussion of EPC determination

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as a semivolatile organic and a nitroaromatic. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PR-9
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m³) = $CS_{surf} \times PM_{10} \times CF$	Equation for Air EPC from Total Soils (mg/m³) = $CS_{tot} \times PM_{10} \times CF$
Variables: CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg) PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m³ 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= 140 ug/m³ CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Measured Air Samples (mg/m³)	Calculated Air EPC Surface Soil (mg/m³)	Calculated Air EPC Total Soils (mg/m³)	Air EPC from Surface Soil (mg/m³)	Air EPC from Total Soils (mg/m³)
Volatile Organics							
1,1,2,2-Tetrachloroethane	6.39E-03	6.30E-03		1.09E-10	8.82E-10	1.09E-10	8.82E-10
Butanone, 2-	6.56E-03	7.28E-03		1.12E-10	1.02E-09	1.12E-10	1.02E-09
Acetone		5.00E-03			7.00E-10		7.00E-10
Benzene	5.00E-03	5.00E-03		8.50E-11	7.00E-10	8.50E-11	7.00E-10
Carbon Disulfide	2.00E-03	2.00E-03		3.40E-11	2.80E-10	3.40E-11	2.80E-10
Chloroform	2.00E-03	2.00E-03		3.40E-11	2.80E-10	3.40E-11	2.80E-10
Methylene Chloride	3.00E-03	3.00E-03		5.10E-11	4.20E-10	5.10E-11	4.20E-10
Toluene	6.47E-03	6.28E-03		1.10E-10	8.79E-10	1.10E-10	8.79E-10
Xylene (total)	4.25E-03	4.25E-03		7.23E-11	5.95E-10	7.23E-11	5.95E-10
Semivolatile Organics							
2,4-Dinitrotoluene	4.55E+00	3.80E+00		7.74E-08	5.32E-07	7.74E-08	5.32E-07
2,6-Dinitrotoluene	1.19E+00	1.01E-01		2.02E-08	1.41E-08	2.02E-08	1.41E-08
2-Methylnaphthalene	1.20E+00	4.25E-03	ND	2.04E-08	5.95E-10	2.04E-08	5.95E-10
2-Methylphenol	1.20E-01	1.20E-01		2.04E-09	1.68E-08	2.04E-09	1.68E-08
3,3'-Dichlorobenzidine	7.68E-01	7.24E-01		1.31E-08	1.01E-07	1.31E-08	1.01E-07
3-nitroaniline	1.87E+00	1.76E+00		3.18E-08	2.46E-07	3.18E-08	2.46E-07
Acenaphthene	1.52E+00	1.33E+00	ND	2.58E-08	1.86E-07	2.58E-08	1.86E-07
Acenaphthylene	3.05E-01	2.91E-01		5.19E-09	4.07E-08	5.19E-09	4.07E-08
Anthracene	1.55E+00	1.38E+00	ND	2.64E-08	1.93E-07	2.64E-08	1.93E-07
Benzo(a)anthracene	2.70E+00	2.46E+00		4.59E-08	3.44E-07	4.59E-08	3.44E-07
Benzo(a)pyrene	3.40E+00	3.30E+00		5.78E-08	4.62E-07	5.78E-08	4.62E-07
Benzo(b)fluoranthene	3.61E+00	3.38E+00		6.14E-08	4.73E-07	6.14E-08	4.73E-07
Benzo(g,h,i)perylene	2.29E+00	2.70E+00		3.89E-08	3.78E-07	3.89E-08	3.78E-07
Benzo(k)fluoranthene	2.31E+00	2.24E+00		3.93E-08	3.14E-07	3.93E-08	3.14E-07
Butylbenzylphthalate		1.80E-02			2.52E-09		2.52E-09
Carbazole	1.59E+00	1.35E+00		2.70E-08	1.89E-07	2.70E-08	1.89E-07
Chrysene	2.97E+00	2.77E+00		5.05E-08	3.88E-07	5.05E-08	3.88E-07
Di-n-butylphthalate	1.70E+00	1.51E+00	ND	2.89E-08	2.11E-07	2.89E-08	2.11E-07
Dibenz(a,h)anthracene	1.52E+00	1.49E+00		2.58E-08	2.09E-07	2.58E-08	2.09E-07
Dibenzofuran	1.36E+00	1.17E+00	ND	2.31E-08	1.64E-07	2.31E-08	1.64E-07
Diethylphthalate	1.90E-02	1.90E-02	ND	3.23E-10	2.66E-09	3.23E-10	2.66E-09
Fluoranthene	3.84E+00	3.68E+00		6.53E-08	5.15E-07	6.53E-08	5.15E-07
Fluorene	1.39E+00	1.22E+00	ND	2.36E-08	1.71E-07	2.36E-08	1.71E-07
Indeno(1,2,3-cd)pyrene	2.38E+00	2.65E+00		4.05E-08	3.71E-07	4.05E-08	3.71E-07
N-Nitrosodiphenylamine (1)	1.85E+00	1.59E+00		3.15E-08	2.23E-07	3.15E-08	2.23E-07
Naphthalene	1.56E+00	1.34E+00		2.65E-08	1.88E-07	2.65E-08	1.88E-07
Pentachlorophenol	1.08E+00	1.11E+00		1.84E-08	1.55E-07	1.84E-08	1.55E-07
Phenanthrene	2.98E+00	2.74E+00	ND	5.07E-08	3.84E-07	5.07E-08	3.84E-07
Pyrene	3.92E+00	3.74E+00		6.66E-08	5.24E-07	6.66E-08	5.24E-07
bis(2-Ethylhexyl)phthalate	1.37E+00	1.76E+00	ND	2.33E-08	2.46E-07	2.33E-08	2.46E-07
Pesticides							
4,4'-DDD	4.88E-03	5.26E-03		8.30E-11	7.36E-10	8.30E-11	7.36E-10
4,4'-DDE	1.06E-01	8.51E-02		1.80E-09	1.19E-08	1.80E-09	1.19E-08
4,4'-DDT	4.89E-02	4.11E-02		8.31E-10	5.75E-09	8.31E-10	5.75E-09
Aldrin	1.99E-03	2.23E-03		3.38E-11	3.12E-10	3.38E-11	3.12E-10
Aroclor-1254	5.67E-02	6.00E-02		9.64E-10	8.40E-09	9.64E-10	8.40E-09
Aroclor-1260	6.24E-02	6.51E-02		1.06E-09	9.11E-09	1.06E-09	9.11E-09
Dieldrin	3.93E-03	4.65E-03		6.68E-11	6.51E-10	6.68E-11	6.51E-10
Endosulfan I	9.06E-03	8.65E-03		1.54E-10	1.21E-09	1.54E-10	1.21E-09
Endosulfan II	3.89E-03	4.34E-03		6.61E-11	6.08E-10	6.61E-11	6.08E-10
Endosulfan sulfate	3.77E-03	4.23E-03		6.41E-11	5.92E-10	6.41E-11	5.92E-10
Endrin	4.81E-03	5.23E-03		8.18E-11	7.32E-10	8.18E-11	7.32E-10
Endrin aldehyde	4.41E-03	4.83E-03		7.50E-11	6.76E-10	7.50E-11	6.76E-10
Endrin ketone	4.54E-03	4.96E-03		7.72E-11	6.94E-10	7.72E-11	6.94E-10
Heptachlor	1.77E-03	1.70E-03		3.01E-11	2.38E-10	3.01E-11	2.38E-10
Heptachlor epoxide	2.17E-03	2.40E-03		3.69E-11	3.36E-10	3.69E-11	3.36E-10
Toxaphene	1.77E-01	1.70E-01		3.01E-09	2.38E-08	3.01E-09	2.38E-08
alpha-Chlordane	5.73E-03	5.57E-03		9.74E-11	7.80E-10	9.74E-11	7.80E-10
beta-BHC	2.12E-03	2.35E-03		3.60E-11	3.29E-10	3.60E-11	3.29E-10
gamma-BHC (Lindane)	1.97E-03	2.21E-03		3.35E-11	3.09E-10	3.35E-11	3.09E-10
gamma-Chlordane	5.74E-03	5.60E-03		9.76E-11	7.84E-10	9.76E-11	7.84E-10
delta-BHC	1.97E-03	2.03E-03		3.35E-11	2.84E-10	3.35E-11	2.84E-10
Nitroaromatics							
2-amino-4,6-Dinitrotoluene	9.20E-02	8.79E-02		1.56E-09	1.23E-08	1.56E-09	1.23E-08
Tetryl	8.79E-02	8.44E-02		1.49E-09	1.18E-08	1.49E-09	1.18E-08
Metals							
Antimony	4.77E+01	5.12E+01	ND	8.11E-07	7.17E-06	8.11E-07	7.17E-06
Barium	4.11E+02	3.66E+02	1.44E-05	6.99E-06	5.12E-05	1.44E-05	5.12E-05
Copper	5.85E+02	5.24E+02	3.42E-04	9.95E-06	7.34E-05	3.42E-04	3.42E-04
Lead	6.21E+03	7.14E+03	1.31E-05	1.06E-04	1.00E-03	1.06E-04	1.00E-03
Mercury	1.32E+00	1.27E+00	3.69E-04	2.24E-08	1.78E-07	3.69E-04	3.69E-04
Selenium	6.63E-01	6.57E-01	4.62E-06	1.13E-08	9.20E-08	4.62E-06	4.62E-06
Thallium	9.97E-01	1.32E+00	ND	1.69E-08	1.85E-07	1.69E-08	1.85E-07
Zinc	4.01E+02	3.52E+02	ND	6.82E-06	4.93E-05	6.82E-06	4.93E-05
Herbicides							
2,4,5-T	4.03E-03	4.03E-03		6.85E-11	5.64E-10	6.85E-11	5.64E-10
MCPP	4.33E+00	4.33E+00		7.36E-08	6.06E-07	7.36E-08	6.06E-07

ND = Compound was not detected above the detection limit shown

TABLE B-16PR-6

Groundwater Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/L)	Standard Deviation (mg/L)	Max Hit (mg/L)	Normal?	95% UCL of Mean (mg/L)	Exposu Concentra (m
atile Organics										
niline	11	0	1	9%	1.37E-02	3.76E-03	2.50E-02	FALSE	1.54E-02	1.54
aniline	11	0	1	9%	5.45E-03	1.51E-03	1.00E-02	FALSE	6.16E-03	6.16
hi]perylene	11	0	1	9%	4.64E-03	1.21E-03	1.00E-03	FALSE	6.77E-03	1.00
,h]anthracene	11	0	1	9%	4.61E-03	1.30E-03	7.00E-04	FALSE	7.69E-03	7.00
,2,3-cd]pyrene	11	0	1	9%	4.60E-03	1.33E-03	6.00E-04	FALSE	8.18E-03	6.00
matics										
trobenzene	11	0	2	18%	2.94E-04	5.01E-01	1.80E-03	FALSE	4.71E-04	4.71
trotoluene	11	0	1	9%	1.80E-04	1.66E-01	6.80E-04	FALSE	2.41E-04	2.41
	9	2	6	67%	1.10E-02	1.81E-02	5.68E-02	FALSE	1.98E-01	5.68
	10	1	6	60%	6.41E-03	7.10E-03	2.41E-02	FALSE	4.02E-02	2.41
	11	0	11	100%	8.67E+01	1.57E+02	4.09E+02	FALSE	4.80E+02	4.09
1	11	0	4	36%	4.07E-03	2.40E-03	9.20E-03	FALSE	6.14E-03	6.14
m	11	0	4	36%	1.45E-03	1.16E-03	3.80E-03	FALSE	2.45E-03	2.45

to text for a detailed discussion of EPC determination.

TABLE B-16PR-7

Surface Water Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/L)	Standard Deviation (mg/L)	Max Hit (mg/L)	Normal?	95% UCL of Mean (mg/L)	Exposu Concentra (m
atile Organics										
hylhexyl)phthalate	12	0	3	25%	4.38E-03	1.33E-03	3.00E-03	FALSE	6.21E-03	3.00
ylphthalate	12	0	1	8%	4.67E-03	1.32E-03	5.00E-04	FALSE	8.38E-03	5.00
orophenol	12	0	3	25%	9.98E-03	4.94E-03	4.00E-03	FALSE	3.45E-02	4.00
um	10	2	2	20%	9.06E-02	8.60E-02	2.61E-01	TRUE	1.40E-01	1.40
ny	12	0	10	83%	2.43E-02	3.55E-02	1.24E-01	FALSE	5.74E-02	5.74
	12	0	8	67%	2.82E-03	1.67E-03	5.70E-03	TRUE	3.68E-03	3.68
	12	0	12	100%	1.17E-01	7.67E-02	3.48E-01	FALSE	1.54E-01	1.54
n	12	0	7	58%	6.62E-04	5.28E-04	2.00E-03	FALSE	1.39E-03	1.39
	12	0	12	100%	7.18E+01	1.56E+01	8.99E+01	TRUE	7.99E+01	7.99
um	12	0	3	25%	1.12E-03	8.75E-04	3.00E-03	FALSE	1.90E-03	1.90
	12	0	2	17%	1.33E-03	1.17E-03	4.10E-03	FALSE	2.31E-03	2.31
	12	0	12	100%	6.12E-02	1.15E-01	4.24E-01	FALSE	1.12E-01	1.12
	12	0	10	83%	8.60E-01	1.30E+00	3.65E+00	FALSE	7.91E+00	3.65
	12	0	12	100%	1.16E-01	2.24E-01	8.13E-01	FALSE	5.32E-01	5.32
um	12	0	12	100%	8.95E+00	2.30E+00	1.14E+01	TRUE	1.01E+01	1.01
ese	12	0	12	100%	5.27E-02	7.58E-02	2.52E-01	FALSE	2.17E-01	2.17
	12	0	3	25%	1.37E-04	2.44E-04	9.00E-04	FALSE	2.29E-04	2.29
	12	0	7	58%	2.94E-03	1.83E-03	5.50E-03	TRUE	3.88E-03	3.88
m	12	0	12	100%	2.91E+00	9.95E-01	4.59E+00	TRUE	3.42E+00	3.42
n	12	0	4	33%	1.64E-03	1.08E-03	4.30E-03	FALSE	2.58E-03	2.58
	12	0	1	8%	1.15E-03	1.34E-03	5.20E-03	FALSE	1.70E-03	1.70
	12	0	12	100%	5.47E+00	2.71E+00	9.22E+00	TRUE	6.87E+00	6.87
m	12	0	7	58%	1.95E-03	1.71E-03	4.90E-03	FALSE	4.11E-03	4.11
	12	0	12	100%	1.23E-01	1.06E-01	3.80E-01	FALSE	2.50E-01	2.50

o text for detailed discussion of EPC determination.

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TABLE B-16PR-8

Sediment Exposure Point Concentration Summary - Pre-Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
2-Butanone	10	0	1	10%	9.00E-03	2.00E-03	1.20E-02	TRUE	1.01E-02	1.01E-02
Acetone	10	0	5	50%	1.81E-02	1.01E-02	3.60E-02	TRUE	2.38E-02	2.38E-02
Semivolatile Organics										
2,4-Dinitrotoluene**	10	0	3	30%	8.24E-01	1.62E+00	5.40E+00	FALSE	3.04E+00	3.04E+00
2-Methylnaphthalene	10	0	2	20%	2.42E-01	1.20E-01	5.50E-02	TRUE	3.11E-01	5.50E-02
Acenaphthene	10	0	1	10%	2.67E-01	1.06E-01	3.20E-02	TRUE	3.28E-01	3.20E-02
Acenaphthylene	10	0	3	30%	2.04E-01	1.18E-01	5.40E-02	TRUE	2.71E-01	5.40E-02
Anthracene	10	0	4	40%	1.90E-01	1.07E-01	1.00E-01	TRUE	2.51E-01	1.00E-01
Benzo(a)anthracene	10	0	7	70%	2.48E-01	1.59E-01	5.70E-01	TRUE	3.39E-01	3.39E-01
Benzo(a)pyrene	10	0	6	60%	2.95E-01	1.50E-01	6.00E-01	TRUE	3.81E-01	3.81E-01
Benzo(b)fluoranthene	10	0	6	60%	4.19E-01	3.23E-01	1.20E+00	FALSE	7.43E-01	7.43E-01
Benzo(g,h,i)perylene	10	0	7	70%	2.52E-01	1.49E-01	5.30E-01	TRUE	3.37E-01	3.37E-01
Benzo(k)fluoranthene	10	0	6	60%	3.29E-01	1.99E-01	7.80E-01	TRUE	4.43E-01	4.43E-01
bis(2-Ethylhexyl)phthalate	10	0	7	70%	1.75E-01	9.69E-02	2.70E-01	TRUE	2.30E-01	2.30E-01
Carbazole	10	0	3	30%	2.17E-01	1.12E-01	1.10E-01	TRUE	2.82E-01	1.10E-01
Chrysene	10	0	7	70%	3.91E-01	3.34E-01	1.20E+00	FALSE	1.16E+00	1.16E+00
Di-n-butylphthalate	10	0	4	40%	2.47E-01	7.00E-02	2.50E-01	TRUE	2.87E-01	2.50E-01
Dibenz(a,h)anthracene	10	0	5	50%	1.91E-01	1.13E-01	1.70E-01	TRUE	2.56E-01	1.70E-01
Fluoranthene	10	0	8	80%	4.28E-01	4.54E-01	1.60E+00	FALSE	2.08E+00	1.60E+00
Indeno(1,2,3-cd)pyrene	10	0	7	70%	2.41E-01	1.43E-01	5.00E-01	TRUE	3.23E-01	3.23E-01
N-Nitrosodiphenylamine (1)	10	0	1	10%	3.13E-01	1.12E-01	6.00E-01	FALSE	3.81E-01	3.81E-01
Phenanthrene	10	0	8	80%	2.08E-01	1.41E-01	4.20E-01	TRUE	2.88E-01	2.88E-01
Pyrene	10	0	8	80%	4.26E-01	4.07E-01	1.40E+00	TRUE	6.60E-01	6.60E-01
Pesticides/PCBs										
4,4'-DDD	10	0	8	80%	9.36E-02	2.26E-01	7.30E-01	FALSE	2.48E+00	7.30E-01
4,4'-DDE	10	0	10	100%	1.13E-01	1.70E-01	5.70E-01	FALSE	1.36E+00	5.70E-01
4,4'-DDT	10	0	8	80%	6.72E-02	1.28E-01	4.20E-01	FALSE	1.83E+00	4.20E-01
alpha-Chlordane	10	0	3	30%	3.64E-03	4.04E-03	1.21E-02	FALSE	8.44E-03	8.44E-03
Aroclor-1254	10	0	7	70%	1.22E-01	1.97E-01	6.70E-01	FALSE	3.00E-01	3.00E-01
Aroclor-1260	10	0	5	50%	4.90E-02	3.35E-02	1.30E-01	FALSE	8.00E-02	8.00E-02
Endosulfan I	10	0	7	70%	7.42E-03	7.67E-03	2.60E-02	FALSE	2.59E-02	2.59E-02
Endosulfan II	10	0	2	20%	3.36E-03	1.36E-03	6.30E-03	FALSE	4.31E-03	4.31E-03
Endosulfan sulfate	10	0	2	20%	4.27E-03	4.93E-03	1.80E-02	FALSE	7.58E-03	7.58E-03
Endrin aldehyde	10	0	1	10%	2.93E-03	7.84E-04	3.20E-03	TRUE	3.38E-03	3.20E-03
Gamma-Chlordane	10	0	2	20%	1.85E-03	9.28E-04	3.80E-03	TRUE	2.38E-03	2.38E-03
Heptachlor epoxide	10	0	1	10%	1.60E-03	5.42E-04	2.80E-03	FALSE	1.96E-03	1.96E-03
Nitroaromatics										
2,4-Dinitrotoluene**	10	0	2	20%	1.58E-01	2.67E-01	9.10E-01	FALSE	3.13E-01	3.13E-01
Metals										
Aluminum	10	0	10	100%	1.39E+04	5.13E+03	2.29E+04	TRUE	1.69E+04	1.69E+04
Antimony	10	0	9	90%	1.33E+01	1.60E+01	5.03E+01	FALSE	1.15E+02	5.03E+01
Arsenic	10	0	10	100%	6.06E+00	2.32E+00	9.60E+00	TRUE	7.39E+00	7.39E+00
Barium	10	0	10	100%	6.05E+02	1.20E+03	3.98E+03	FALSE	2.53E+03	2.53E+03
Beryllium	10	0	10	100%	5.83E-01	1.96E-01	9.30E-01	TRUE	6.95E-01	6.95E-01
Cadmium	10	0	10	100%	1.54E+00	2.20E+00	7.60E+00	FALSE	4.55E+00	4.55E+00
Calcium	10	0	10	100%	3.79E+04	2.36E+04	7.57E+04	TRUE	5.14E+04	5.14E+04
Chromium	10	0	10	100%	2.82E+01	1.00E+01	4.35E+01	TRUE	3.39E+01	3.39E+01
Cobalt	10	0	10	100%	1.02E+01	2.94E+00	1.56E+01	TRUE	1.18E+01	1.18E+01
Copper	10	0	10	100%	1.95E+03	5.47E+03	1.75E+04	FALSE	1.40E+04	1.40E+04
Iron	10	0	10	100%	2.84E+04	9.48E+03	4.64E+04	TRUE	3.38E+04	3.38E+04
Lead	10	0	10	100%	1.46E+03	1.33E+03	4.48E+03	TRUE	2.22E+03	2.22E+03
Magnesium	10	0	10	100%	8.22E+03	3.39E+03	1.51E+04	TRUE	1.02E+04	1.02E+04
Manganese	10	0	10	100%	2.78E+02	9.20E+01	4.47E+02	TRUE	3.31E+02	3.31E+02
Mercury	10	0	10	100%	6.06E-01	8.85E-01	2.50E+00	FALSE	3.47E+00	2.50E+00
Nickel	10	0	10	100%	3.47E+01	9.88E+00	5.09E+01	TRUE	4.04E+01	4.04E+01
Potassium	10	0	10	100%	2.14E+03	8.50E+02	3.87E+03	TRUE	2.63E+03	2.63E+03
Selenium	10	0	2	20%	1.13E+00	1.36E+00	4.90E+00	FALSE	1.98E+00	1.98E+00
Silver	10	0	1	10%	2.23E-01	8.20E-02	3.50E-01	TRUE	2.69E-01	2.69E-01
Sodium	10	0	10	100%	2.54E+02	2.16E+02	7.82E+02	FALSE	4.73E+02	4.73E+02
Thallium	10	0	2	20%	7.12E-01	3.83E-01	1.60E+00	TRUE	9.31E-01	9.31E-01
Vanadium	10	0	10	100%	2.61E+01	9.27E+00	3.98E+01	TRUE	3.14E+01	3.14E+01
Zinc	10	0	10	100%	3.48E+02	2.68E+02	9.52E+02	TRUE	5.02E+02	5.02E+02

* Refer to text for detailed discussion of EPC determination

** 2,4- Dinitrotoluene was analyzed for as a semivolatile organic and a nitroaromatic. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PR-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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):	Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
CA = Chemical Concentration in Air, Calculated from Air EPC Data; ED = Exposure Duration	
IR = Inhalation Rate; BW = Bodyweight	
EF = Exposure Frequency; AT = Averaging Time	

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											Inhalation of Dust in Ambient Air Not Applicable for Future Industrial Worker	
1,1,2,2-Tetrachloroethane	NA	2.0E-01	1.09E-10	8.82E-10		2.92E-13		6E-14				
Butanone, 2-	2.9E-01	NA	1.12E-10	1.02E-09	8.38E-13		3E-12					
Acetone	NA	NA		7.00E-10								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	6.39E-13	2.28E-13	4E-10	7E-15				
Carbon Disulfide	2.0E-01	NA	3.40E-11	2.80E-10	2.55E-13		1E-12					
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		9.12E-14		7E-15				
Methylene Chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	3.83E-13	1.37E-13	4E-13	2E-16				
Toluene	1.1E-01	NA	1.10E-10	8.79E-10	8.27E-13		7E-12					
Xylene (total)	NA	NA	7.23E-11	5.95E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	7.74E-08	5.32E-07								
2,6-Dinitrotoluene	NA	NA	2.02E-08	1.41E-08								
2-Methylnaphthalene	NA	NA	2.04E-08	5.95E-10								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
3,3'-Dichlorobenzidine	NA	NA	1.31E-08	1.01E-07								
3-nitroaniline	NA	NA	3.18E-08	2.46E-07								
Acenaphthene	NA	NA	2.58E-08	1.86E-07								
Acenaphthylene	NA	NA	5.19E-09	4.07E-08								
Anthracene	NA	NA	2.64E-08	1.93E-07								
Benzo(a)anthracene	NA	NA	4.59E-08	3.44E-07								
Benzo(a)pyrene	NA	NA	5.78E-08	4.62E-07								
Benzo(b)fluoranthene	NA	NA	6.14E-08	4.73E-07								
Benzo(g,h,i)perylene	NA	NA	3.89E-08	3.78E-07								
Benzo(k)fluoranthene	NA	NA	3.93E-08	3.14E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.70E-08	1.89E-07								
Chrysene	NA	NA	5.05E-08	3.88E-07								
Di-n-butylphthalate	NA	NA	2.89E-08	2.11E-07								
Dibenz(a,h)anthracene	NA	NA	2.58E-08	2.09E-07								
Dibenzofuran	NA	NA	2.31E-08	1.64E-07								
Diethylphthalate	NA	NA	3.23E-10	2.66E-09								
Fluoranthene	NA	NA	6.53E-08	5.15E-07								
Fluorene	NA	NA	2.36E-08	1.71E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	4.05E-08	3.71E-07								
N-Nitrosodiphenylamine (1)	NA	NA	3.15E-08	2.23E-07								
Naphthalene	NA	NA	2.65E-08	1.88E-07								
Pentachlorophenol	NA	NA	1.84E-08	1.55E-07								
Phenanthrene	NA	NA	5.07E-08	3.84E-07								
Pyrene	NA	NA	6.66E-08	5.24E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.33E-08	2.46E-07								
Pesticides												
4,4'-DDD	NA	NA	8.30E-11	7.36E-10								
4,4'-DDE	NA	NA	1.80E-09	1.19E-08								
4,4'-DDT	NA	3.4E-01	8.31E-10	5.75E-09		2.23E-12		8E-13				
Aldrin	NA	1.7E+01	3.38E-11	3.12E-10		9.08E-14		2E-12				
Aroclor-1254	NA	4.0E-01	9.64E-10	8.40E-09		2.59E-12		1E-12				
Aroclor-1260	NA	4.0E-01	1.06E-09	9.11E-09		2.85E-12		1E-12				
Dieldrin	NA	1.6E+01	6.68E-11	6.51E-10		1.79E-13		3E-12				
Endosulfan I	NA	NA	1.54E-10	1.21E-09								
Endosulfan II	NA	NA	6.61E-11	6.08E-10								
Endosulfan sulfate	NA	NA	6.41E-11	5.92E-10								
Endrin	NA	NA	8.18E-11	7.32E-10								
Endrin aldehyde	NA	NA	7.50E-11	6.76E-10								
Endrin ketone	NA	NA	7.72E-11	6.94E-10								
Heptachlor	NA	4.6E+00	3.01E-11	2.38E-10		8.08E-14		4E-13				
Heptachlor epoxide	NA	9.1E+00	3.69E-11	3.36E-10		9.90E-14		9E-13				
Toxaphene	NA	1.1E+00	3.01E-09	2.38E-08		8.08E-12		9E-12				
alpha-Chlordane	NA	1.3E+00	9.74E-11	7.80E-10		2.61E-13		3E-13				
beta-BHC	NA	1.9E+00	3.60E-11	3.29E-10		9.67E-14		2E-13				
gamma-BHC (Lindane)	NA	NA	3.35E-11	3.09E-10								
gamma-Chlordane	NA	1.3E+00	9.76E-11	7.84E-10		2.62E-13		3E-13				
delta-BHC	NA	NA	3.35E-11	2.84E-10								
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	1.56E-09	1.23E-08								
Tetryl	NA	NA	1.49E-09	1.18E-08								
Metals												
Antimony	NA	NA	8.11E-07	7.17E-06								
Barium	1.4E-04	NA	1.44E-05	5.12E-05	1.08E-07		8E-04					
Copper	NA	NA	3.42E-04	3.42E-04								
Lead	NA	NA	1.06E-04	1.00E-03								
Mercury	8.6E-05	NA	3.69E-04	3.69E-04	2.77E-06		3E-02					
Selenium	NA	NA	4.62E-06	4.62E-06								
Thallium	NA	NA	1.69E-08	1.85E-07								
Zinc	NA	NA	6.82E-06	4.93E-05								
Herbicides												
2,4,5-T	NA	NA	6.85E-11	5.64E-10								
MCPP	NA	NA	7.36E-08	6.06E-07								
Total Hazard Quotient and Cancer Risk:							**3E-02**	**2E-11**				

Assumptions for Current Site Worker

CA =	EPC Surface Only
IR =	9.6 m3/day
EF =	20 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-16PR-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Construction Worker: Intake (mg/kg-day) (Nc)	Future Construction Worker: Intake (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Intake (mg/kg-day) (Nc)	Future Tresspasser Child: Intake (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics												
1,1,2,2-Tetrachloroethane	NA	2.0E-01	1.09E-10	8.82E-10		1.28E-12		3E-13		2.55E-14		5E-15
Butanone, 2-	2.9E-01	NA	1.12E-10	1.02E-09	1.04E-10		4E-10		3.67E-13		1E-12	
Acetone	NA	NA		7.00E-10								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	7.12E-11	1.02E-12	4E-08	3E-14	2.79E-13	2.00E-14	2E-10	6E-16
Carbon Disulfide	2.0E-01	NA	3.40E-11	2.80E-10	2.85E-11		1E-10		1.12E-13		6E-13	
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		4.07E-13		3E-14		7.98E-15		6E-16
Methylene Chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	4.27E-11	6.11E-13	5E-11	1E-15	1.68E-13	1.20E-14	2E-13	2E-17
Toluene	1.1E-01	NA	1.10E-10	8.79E-10	8.95E-11		8E-10		3.62E-13		3E-12	
Xylene (total)	NA	NA	7.23E-11	5.95E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	7.74E-08	5.32E-07								
2,6-Dinitrotoluene	NA	NA	2.02E-08	1.41E-08								
2-Methylnaphthalene	NA	NA	2.04E-08	5.95E-10								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
3,3'-Dichlorobenzidine	NA	NA	1.31E-08	1.01E-07								
3-nitroaniline	NA	NA	3.18E-08	2.46E-07								
Acenaphthene	NA	NA	2.58E-08	1.86E-07								
Acenaphthylene	NA	NA	5.19E-09	4.07E-08								
Anthracene	NA	NA	2.64E-08	1.93E-07								
Benzo(a)anthracene	NA	NA	4.59E-08	3.44E-07								
Benzo(a)pyrene	NA	NA	5.78E-08	4.62E-07								
Benzo(b)fluoranthene	NA	NA	6.14E-08	4.73E-07								
Benzo(g,h,i)perylene	NA	NA	3.89E-08	3.78E-07								
Benzo(k)fluoranthene	NA	NA	3.93E-08	3.14E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.70E-08	1.89E-07								
Chrysene	NA	NA	5.05E-08	3.88E-07								
Di-n-butylphthalate	NA	NA	2.89E-08	2.11E-07								
Dibenz(a,h)anthracene	NA	NA	2.58E-08	2.09E-07								
Dibenzofuran	NA	NA	2.31E-08	1.64E-07								
Diethylphthalate	NA	NA	3.23E-10	2.66E-09								
Fluoranthene	NA	NA	6.53E-08	5.15E-07								
Fluorene	NA	NA	2.36E-08	1.71E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	4.05E-08	3.71E-07								
N-Nitrosodiphenylamine (1)	NA	NA	3.15E-08	2.23E-07								
Naphthalene	NA	NA	2.65E-08	1.88E-07								
Pentachlorophenol	NA	NA	1.84E-08	1.55E-07								
Phenanthrene	NA	NA	5.07E-08	3.84E-07								
Pyrene	NA	NA	6.66E-08	5.24E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.33E-08	2.46E-07								
Pesticides												
4,4'-DDD	NA	NA	8.30E-11	7.36E-10								
4,4'-DDE	NA	NA	1.80E-09	1.19E-08								
4,4'-DDT	NA	3.4E-01	8.31E-10	5.75E-09		8.36E-12		3E-12		1.95E-13		7E-14
Aldrin	NA	1.7E+01	3.38E-11	3.12E-10		4.54E-13		8E-12		7.94E-15		1E-13
Aroclor-1254	NA	4.0E-01	9.64E-10	8.40E-09		1.22E-11		5E-12		2.26E-13		9E-14
Aroclor-1260	NA	4.0E-01	1.06E-09	9.11E-09		1.32E-11		5E-12		2.49E-13		1E-13
Dieldrin	NA	1.6E+01	6.68E-11	6.51E-10		9.46E-13		2E-11		1.57E-14		3E-13
Endosulfan I	NA	NA	1.54E-10	1.21E-09								
Endosulfan II	NA	NA	6.61E-11	6.08E-10								
Endosulfan sulfate	NA	NA	6.41E-11	5.92E-10								
Endrin	NA	NA	8.18E-11	7.32E-10								
Endrin aldehyde	NA	NA	7.50E-11	6.76E-10								
Endrin ketone	NA	NA	7.72E-11	6.94E-10								
Heptachlor	NA	4.6E+00	3.01E-11	2.38E-10		3.46E-13		2E-12		7.07E-15		3E-14
Heptachlor epoxide	NA	9.1E+00	3.69E-11	3.36E-10		4.88E-13		4E-12		8.66E-15		8E-14
Toxaphene	NA	1.1E+00	3.01E-09	2.38E-08		3.46E-11		4E-11		7.07E-13		8E-13
alpha-Chlordane	NA	1.3E+00	9.74E-11	7.80E-10		1.13E-12		1E-12		2.29E-14		3E-14
beta-BHC	NA	1.9E+00	3.60E-11	3.29E-10		4.78E-13		9E-13		8.46E-15		2E-14
gamma-BHC (Lindane)	NA	NA	3.35E-11	3.09E-10								
gamma-Chlordane	NA	1.3E+00	9.76E-11	7.84E-10		1.14E-12		1E-12		2.29E-14		3E-14
delta-BHC	NA	NA	3.35E-11	2.84E-10								
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	1.56E-09	1.23E-08								
Tetryl	NA	NA	1.49E-09	1.18E-08								
Metals												
Antimony	NA	NA	8.11E-07	7.17E-06								
Barium	1.4E-04	NA	1.44E-05	5.12E-05	5.21E-06		4E-02		4.73E-08		3E-04	
Copper	NA	NA	3.42E-04	3.42E-04								
Lead	NA	NA	1.06E-04	1.00E-03								
Mercury	8.6E-05	NA	3.69E-04	3.69E-04	3.75E-05		4E-01		1.21E-06		1E-02	
Selenium	NA	NA	4.62E-06	4.62E-06								
Thallium	NA	NA	1.69E-08	1.85E-07								
Zinc	NA	NA	6.82E-06	4.93E-05								
Herbicides												
2,4,5-T	NA	NA	6.85E-11	5.64E-10								
MCPP	NA	NA	7.36E-08	6.06E-07								
Total Hazard Quotient and Cancer Risk:							**5E-01**	**9E-11**			**1E-02**	**2E-12**

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CA =	EPC Surface and Sub-Surface	CA =	EPC Surface Only
IR =	10.4 m3/day	IR =	1.2 m3/day
EF =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-16PR-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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	Future Day Care Center Child				Future 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												
1,1,2,2-Tetrachloroethane	NA	2.0E-01	1.09E-10	8.82E-10		1.70E-12		3E-13		3.04E-12		6E-13
Butanone, 2-	2.9E-01	NA	1.12E-10	1.02E-09								
Acetone	NA	NA		7.00E-10								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	1.55E-11	1.33E-12	9E-09	4E-14	6.65E-12	2.38E-12	4E-09	7E-14
Carbon Disulfide	2.0E-01	NA	3.40E-11	2.80E-10	6.21E-12		3E-11		2.66E-12		1E-11	
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		5.32E-13		4E-14		9.51E-13		8E-14
Methylene Chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	9.32E-12	7.98E-13	1E-11	1E-15	3.99E-12	1.43E-12	5E-12	2E-15
Toluene	1.1E-01	NA	1.10E-10	8.79E-10	2.01E-11		2E-10		8.61E-12		8E-11	
Xylene (total)	NA	NA	7.23E-11	5.95E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	7.74E-08	5.32E-07								
2,6-Dinitrotoluene	NA	NA	2.02E-08	1.41E-08								
2-Methylnaphthalene	NA	NA	2.04E-08	5.95E-10								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
3,3'-Dichlorobenzidine	NA	NA	1.31E-08	1.01E-07								
3-nitroaniline	NA	NA	3.18E-08	2.46E-07								
Acenaphthene	NA	NA	2.58E-08	1.86E-07								
Acenaphthylene	NA	NA	5.19E-09	4.07E-08								
Anthracene	NA	NA	2.64E-08	1.93E-07								
Benzo(a)anthracene	NA	NA	4.59E-08	3.44E-07								
Benzo(a)pyrene	NA	NA	5.78E-08	4.62E-07								
Benzo(b)fluoranthene	NA	NA	6.14E-08	4.73E-07								
Benzo(g,h,i)perylene	NA	NA	3.89E-08	3.78E-07								
Benzo(k)fluoranthene	NA	NA	3.93E-08	3.14E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.70E-08	1.89E-07								
Chrysene	NA	NA	5.05E-08	3.88E-07								
Di-n-butylphthalate	NA	NA	2.89E-08	2.11E-07								
Dibenz(a,h)anthracene	NA	NA	2.58E-08	2.09E-07								
Dibenzofuran	NA	NA	2.31E-08	1.64E-07								
Diethylphthalate	NA	NA	3.23E-10	2.66E-09								
Fluoranthene	NA	NA	6.53E-08	5.15E-07								
Fluorene	NA	NA	2.36E-08	1.71E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	4.05E-08	3.71E-07								
N-Nitrosodiphenylamine (1)	NA	NA	3.15E-08	2.23E-07								
Naphthalene	NA	NA	2.65E-08	1.88E-07								
Pentachlorophenol	NA	NA	1.84E-08	1.55E-07								
Phenanthrene	NA	NA	5.07E-08	3.84E-07								
Pyrene	NA	NA	6.66E-08	5.24E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.33E-08	2.46E-07								
Pesticides												
4,4'-DDD	NA	NA	8.30E-11	7.36E-10								
4,4'-DDE	NA	NA	1.80E-09	1.19E-08								
4,4'-DDT	NA	3.4E-01	8.31E-10	5.75E-09		1.30E-11		4E-12		2.32E-11		8E-12
Aldrin	NA	1.7E+01	3.38E-11	3.12E-10		5.30E-13		9E-12		9.46E-13		2E-11
Aroclor-1254	NA	4.0E-01	9.64E-10	8.40E-09		1.51E-11		6E-12		2.69E-11		1E-11
Aroclor-1260	NA	4.0E-01	1.06E-09	9.11E-09		1.66E-11		7E-12		2.97E-11		1E-11
Dieldrin	NA	1.6E+01	6.68E-11	6.51E-10		1.05E-12		2E-11		1.87E-12		3E-11
Endosulfan I	NA	NA	1.54E-10	1.21E-09								
Endosulfan II	NA	NA	6.61E-11	6.08E-10								
Endosulfan sulfate	NA	NA	6.41E-11	5.92E-10								
Endrin	NA	NA	8.18E-11	7.32E-10								
Endrin aldehyde	NA	NA	7.50E-11	6.76E-10								
Endrin ketone	NA	NA	7.72E-11	6.94E-10								
Heptachlor	NA	4.6E+00	3.01E-11	2.38E-10		4.71E-13		2E-12		8.41E-13		4E-12
Heptachlor epoxide	NA	9.1E+00	3.69E-11	3.36E-10		5.78E-13		5E-12		1.03E-12		9E-12
Toxaphene	NA	1.1E+00	3.01E-09	2.38E-08		4.71E-11		5E-11		8.41E-11		9E-11
alpha-Chlordane	NA	1.3E+00	9.74E-11	7.80E-10		1.53E-12		2E-12		2.72E-12		4E-12
beta-BHC	NA	1.9E+00	3.60E-11	3.29E-10		5.64E-13		1E-12		1.01E-12		2E-12
gamma-BHC (Lindane)	NA	NA	3.35E-11	3.09E-10								
gamma-Chlordane	NA	1.3E+00	9.76E-11	7.84E-10		1.53E-12		2E-12		2.73E-12		4E-12
delta-BHC	NA	NA	3.35E-11	2.84E-10								
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	1.56E-09	1.23E-08								
Tetryl	NA	NA	1.49E-09	1.18E-08								
Metals												
Antimony	NA	NA	8.11E-07	7.17E-06								
Barium	1.4E-04	NA	1.44E-05	5.12E-05	2.63E-06		2E-02		1.13E-06		8E-03	
Copper	NA	NA	3.42E-04	3.42E-04								
Lead	NA	NA	1.06E-04	1.00E-03								
Mercury	8.6E-05	NA	3.69E-04	3.69E-04	6.74E-05		8E-01		2.89E-05		3E-01	
Selenium	NA	NA	4.62E-06	4.62E-06								
Thallium	NA	NA	1.69E-08	1.85E-07								
Zinc	NA	NA	6.82E-06	4.93E-05								
Herbicides												
2,4,5-T	NA	NA	6.85E-11	5.64E-10								
MCPP	NA	NA	7.36E-08	6.06E-07								
Total Hazard Quotient and Cancer Risk:							**8E-01**	**1E-10**			**3E-01**	**2E-10**

Assumptions for Future Day Care Center Child			Assumptions for Future 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.
NA= Information not available.

TABLE B-16PR-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN INDOOR AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

ion for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

les (Assumptions for Each Receptor are Listed at the Bottom):
Chemical Concentration in Air, from EPC Solids Data
ngestion Rate
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	Current Site Worker				Future Industrial Worker				Future Construction W		
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
olatile Organics					Inhalation of Indoor Air Dust Not Applicable for Current Site Worker								Inhalation of Indoor Air Dust Not Applicable for Future Construction Worker	
l	NA	NA	6.76E-05											
ic Acid	NA	NA	1.41E-04											
alene	NA	NA	5.84E-05											
hylnapthalene	NA	NA	7.06E-05											
phthene	NA	NA	3.07E-05											
zofuran	NA	NA	3.07E-05											
lphthalate	NA	NA	6.14E-05											
ne	NA	NA	2.76E-05											
nthrene	NA	NA	4.91E-05											
acene	NA	NA	4.61E-05											
Butylphthalate	NA	NA	2.76E-05											
enzylphthalate	NA	NA	2.76E-05											
ethylhexyl)pthalate	NA	NA	8.71E-05											
s														
num	1.4E-03	NA	1.51E-04					1.42E-05		1E-02				
n	1.4E-04	NA	1.95E-05					1.83E-06		1E-02				
r	NA	NA	9.83E-04											
	NA	NA	4.88E-05											
anese	1.4E-05	NA	5.50E-06					5.17E-07		4E-02				
ry	8.6E-05	NA	2.35E-04					2.20E-05		3E-01				
um	NA	NA	5.30E-06											
l Hazard Quotient and Cancer Risk:										**3E-01**				

Assumptions for Future Industrial Worker

IR =	9.6	m3/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Cells in this table were intentionally left blank due to a lack of toxicity data.
nformation not available.

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TABLE B-16PR-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN INDOOR AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

n for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

s (Assumptions for Each Receptor are Listed at the Bottom):
hemical Concentration in Air, from EPC Solids Data — ED = Exposure Duration
estion Rate — BW = Bodyweight
posure Frequency — 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	Future Tresspasser Child				Future Day Care Center Child				Future Day Care Cen		
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Haz Quot
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
atile Organics					Inhalation of Indoor Air Dust Not Applicable for Future Tresspasser Child				Inhalation of Indoor Air Dust Not Applicable for Future Day Care Center Child				Inhalation of Indoor Air Dus Not Applicable for Future Day Care Center W	
	NA	NA	6.76E-05											
Acid	NA	NA	1.41E-04											
ene	NA	NA	5.84E-05											
lnapthalene	NA	NA	7.06E-05											
thene	NA	NA	3.07E-05											
furan	NA	NA	3.07E-05											
hthalate	NA	NA	6.14E-05											
	NA	NA	2.76E-05											
arene	NA	NA	4.91E-05											
ene	NA	NA	4.61E-05											
tylphthalate	NA	NA	2.76E-05											
zylphthalate	NA	NA	2.76E-05											
ylhexyl)pthalate	NA	NA	8.71E-05											
m	1.4E-03	NA	1.51E-04											
	1.4E-04	NA	1.95E-05											
	NA	NA	9.83E-04											
	NA	NA	4.88E-05											
ese	1.4E-05	NA	5.50E-06											
	8.6E-05	NA	2.35E-04											
n	NA	NA	5.30E-06											
lazard Quotient and Cancer Risk:														

ells in this table were intentionally left blank due to a lack of toxicity data.
ormation not available.

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TABLE B-16PR-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics												
1,1,2,2,-Tetrachloroethane	NA	2.0E-01	6.39E-03	6.30E-03		1.79E-10		4E-11			Ingestion of	
Acetone	1.0E-01	NA	6.56E-03	7.28E-03	5.14E-10		5E-09				Onsite Soils	
Butanone, 2-	6.0E-01	NA		5.00E-03							Not Applicable	
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	3.91E-10	1.40E-10	1E-07	4E-12			for Future	
Carbon Disulfide	1.0E-01	NA	2.00E-03	2.00E-03	1.57E-10		2E-09				Industrial Worker	
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	1.57E-10	5.59E-11	2E-08	3E-13				
Methylene Chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	2.35E-10	8.39E-11	4E-09	6E-13				
Toluene	2.0E-01	NA	6.47E-03	6.28E-03	5.06E-10		3E-09					
Xylene (total)	2.0E+00	NA	4.25E-03	4.25E-03	3.33E-10		2E-10					
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	4.55E+00	3.80E+00	3.56E-07	1.27E-07	2E-04	9E-08				
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.19E+00	1.01E-01	9.32E-08	3.33E-08	9E-05	2E-08				
2-methylnaphthalene	4.0E-02	NA	1.20E+00	4.25E-03	9.39E-08		2E-06					
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	9.39E-09		2E-07					
3,3'-Dichlorobenzidine	NA	4.5E-01	7.68E-01	7.24E-01		2.15E-08		1E-08				
3-nitroaniline	NA	NA	1.87E+00	1.76E+00								
Acenaphthene	6.0E-02	NA	1.52E+00	1.33E+00	1.19E-07		2E-06					
Acenaphthylene	NA	NA	3.05E-01	2.91E-01								
Anthracene	3.0E-01	NA	1.55E+00	1.38E+00	1.21E-07		4E-07					
Benzo(a)anthracene	NA	7.3E-01	2.70E+00	2.46E+00		7.55E-08		6E-08				
Benzo(a)pyrene	NA	7.3E+00	3.40E+00	3.30E+00		9.51E-08		7E-07				
Benzo(b)fluoranthene	NA	7.3E-01	3.61E+00	3.38E+00		1.01E-07		7E-08				
Benzo(g,h,i)perylene	NA	NA	2.29E+00	2.70E+00								
Benzo(k)fluoranthene	NA	7.3E-02	2.31E+00	2.24E+00		6.46E-08		5E-09				
Butylbenzylphthalate	2.0E-01	NA		1.80E-02								
Carbazole	NA	2.0E-02	1.59E+00	1.35E+00		4.45E-08		9E-10				
Chrysene	NA	7.3E-03	2.97E+00	2.77E+00		8.30E-08		6E-10				
Di-n-butylphthalate	1.0E-01	NA	1.70E+00	1.51E+00	1.33E-07		1E-06					
Dibenz(a,h)anthracene	NA	7.3E+00	1.52E+00	1.49E+00		4.25E-08		3E-07				
Dibenzofuran	NA	NA	1.36E+00	1.17E+00								
Diethylphthalate	8.0E-01	NA	1.90E-02	1.90E-02	1.49E-09		2E-09					
Fluoranthene	4.0E-02	NA	3.84E+00	3.68E+00	3.01E-07		8E-06					
Fluorene	4.0E-02	NA	1.39E+00	1.22E+00	1.09E-07		3E-06					
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.38E+00	2.65E+00		6.65E-08		5E-08				
N-Nitrosodiphenylamine (1)	NA	4.9E-03	1.85E+00	1.59E+00		5.17E-08		3E-10				
Naphthalene	4.0E-02	NA	1.56E+00	1.34E+00	1.22E-07		3E-06					
Pentachlorophenol	3.0E-02	1.2E-01	1.08E+00	1.11E+00	8.45E-08	3.02E-08	3E-06	4E-09				
Phenanthrene	NA	NA	2.98E+00	2.74E+00								
Pyrene	3.0E-02	NA	3.92E+00	3.74E+00	3.07E-07		1E-05					
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.37E+00	1.76E+00	1.07E-07	3.83E-08	5E-06	5E-10				
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	4.88E-03	5.26E-03		1.36E-10		3E-11				
4,4'-DDE	NA	3.4E-01	1.06E-01	8.51E-02		2.96E-09		1E-09				
4,4'-DDT	5.0E-04	3.4E-01	4.89E-02	4.11E-02	3.83E-09	1.37E-09	8E-06	5E-10				
Aldrin	3.0E-05	1.7E+01	1.99E-03	2.23E-03	1.56E-10	5.56E-11	5E-06	9E-10				
Aroclor-1254	2.0E-05	2.0E+00	5.67E-02	6.00E-02	4.44E-09	1.59E-09	2E-04	3E-09				
Aroclor-1260	2.0E-05	2.0E+00	6.24E-02	6.51E-02	4.88E-09	1.74E-09	2E-04	3E-09				
Dieldrin	5.0E-05	1.6E+01	3.93E-03	4.65E-03	3.08E-10	1.10E-10	6E-06	2E-09				
Endosulfan I	6.0E-03	NA	9.06E-03	8.65E-03	7.09E-10		1E-07					
Endosulfan II	6.0E-03	NA	3.89E-03	4.34E-03	3.05E-10		5E-08					
Endosulfan sulfate	6.0E-03	NA	3.77E-03	4.23E-03	2.95E-10		5E-08					
Endrin	3.0E-04	NA	4.81E-03	5.23E-03	3.77E-10		1E-06					
Endrin aldehyde	NA	NA	4.41E-03	4.83E-03								
Endrin ketone	NA	NA	4.54E-03	4.96E-03								
Heptachlor	5.0E-04	4.5E+00	1.77E-03	1.70E-03	1.39E-10	4.95E-11	3E-07	2E-10				
Heptachlor epoxide	1.3E-05	9.1E+00	2.17E-03	2.40E-03	1.70E-10	6.07E-11	1E-05	6E-10				
Toxaphene	NA	1.1E+00	1.77E-01	1.70E-01		4.95E-09		5E-09				
alpha-Chlordane	6.0E-05	1.3E+00	5.73E-03	5.57E-03	4.49E-10	1.60E-10	7E-06	2E-10				
beta-BHC	NA	1.8E+00	2.12E-03	2.35E-03		5.93E-11		1E-10				
gamma-BHC (Lindane)	3.0E-04	1.3E+00	1.97E-03	2.21E-03	1.54E-10	5.51E-11	5E-07	7E-11				
gamma-Chlordane	6.0E-05	1.3E+00	5.74E-03	5.60E-03	4.49E-10	1.60E-10	7E-06	2E-10				
delta-BHC	NA	NA	1.97E-03	2.03E-03								
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	9.20E-02	8.79E-02								
Tetryl	1.0E-02	NA	8.79E-02	8.44E-02	6.88E-09		7E-07					
Metals												
Antimony	4.0E-04	NA	4.77E+01	5.12E+01	3.73E-06		9E-03					
Barium	7.0E-02	NA	4.11E+02	3.66E+02	3.22E-05		5E-04					
Copper	4.0E-02	NA	5.85E+02	5.24E+02	4.58E-05		1E-03					
Lead	NA	NA	6.21E+03	7.14E+03								
Mercury	3.0E-04	NA	1.32E+00	1.27E+00	1.03E-07		3E-04					
Selenium	5.0E-03	NA	6.63E-01	6.57E-01	5.19E-08		1E-05					
Thallium	8.0E-05	NA	9.97E-01	1.32E+00	7.80E-08		1E-03					
Zinc	3.0E-01	NA	4.01E+02	3.52E+02	3.14E-05		1E-04					
Herbicides												
2,4,5-T	1.0E-02	NA	4.03E-03	4.03E-03	3.15E-10		3E-08					
MCPP	1.0E-03	NA	4.33E+00	4.33E+00	3.39E-07		3E-04					
Total Hazard Quotient and Cancer Risk:							**1E-02**	**1E-06**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	20	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-16PR-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED / BW x 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	Future Construction Worker Intake (mg/kg-day)		Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day)		Future Tresspasser Child Hazard Quotient	Future Tresspasser Child 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	6.39E-03	6.30E-03		4.23E-10		8E-11		2.50E-10		5E-11
Acetone	1.0E-01	NA	6.56E-03	7.28E-03	3.42E-08		3E-07		3.59E-09		4E-08	
Butanone, 2-	6.0E-01	NA		5.00E-03	2.35E-08							
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	2.35E-08	3.35E-10	8E-06	1E-11	2.74E-09	1.96E-10	9E-07	6E-12
Carbon Disulfide	1.0E-01	NA	2.00E-03	2.00E-03	9.39E-09		9E-08		1.10E-09		1E-08	
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	9.39E-09	1.34E-10	9E-07	8E-13	1.10E-09	7.83E-11	1E-07	5E-13
Methylene Chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	1.41E-08	2.01E-10	2E-07	2E-12	1.64E-09	1.17E-10	3E-08	9E-13
Toluene	2.0E-01	NA	6.47E-03	6.28E-03	2.95E-08		1E-07		3.55E-09		2E-08	
Xylene (total)	2.0E+00	NA	4.25E-03	4.25E-03	2.00E-08		1E-08		2.33E-09		1E-09	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	4.55E+00	3.80E+00	1.78E-05	2.55E-07	9E-03	2E-07	2.49E-06	1.78E-07	1E-03	1E-07
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.19E+00	1.01E-01	4.74E-07	6.78E-09	5E-04	5E-09	6.52E-07	4.66E-08	7E-04	3E-08
2-methylnaphthalene	4.0E-02	NA	1.20E+00	4.25E-03	2.00E-08		5E-07		6.58E-07		2E-05	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	5.64E-07		1E-05		6.58E-08		1E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	7.68E-01	7.24E-01		4.86E-08		2E-08		3.01E-08		1E-08
3-nitroaniline	NA	NA	1.87E+00	1.76E+00								
Acenaphthene	6.0E-02	NA	1.52E+00	1.33E+00	6.25E-06		1E-04		8.33E-07		1E-05	
Acenaphthylene	NA	NA	3.05E-01	2.91E-01								
Anthracene	3.0E-01	NA	1.55E+00	1.38E+00	6.48E-06		2E-05		8.49E-07		3E-06	
Benzo(a)anthracene	NA	7.3E-01	2.70E+00	2.46E+00		1.65E-07		1E-07		1.06E-07		8E-08
Benzo(a)pyrene	NA	7.3E+00	3.40E+00	3.30E+00		2.21E-07		2E-06		1.33E-07		1E-06
Benzo(b)fluoranthene	NA	7.3E-01	3.61E+00	3.38E+00		2.27E-07		2E-07		1.41E-07		1E-07
Benzo(g,h,i)perylene	NA	NA	2.29E+00	2.70E+00								
Benzo(k)fluoranthene	NA	7.3E-02	2.31E+00	2.24E+00		1.50E-07		1E-08		9.04E-08		7E-09
Butylbenzylphthalate	2.0E-01	NA		1.80E-02	8.45E-08							
Carbazole	NA	2.0E-02	1.59E+00	1.35E+00		9.06E-08		2E-09		6.22E-08		1E-09
Chrysene	NA	7.3E-03	2.97E+00	2.77E+00		1.86E-07		1E-09		1.16E-07		8E-10
Di-n-butylphthalate	1.0E-01	NA	1.70E+00	1.51E+00	7.09E-06		7E-05		9.32E-07		9E-06	
Dibenz(a,h)anthracene	NA	7.3E+00	1.52E+00	1.49E+00		1.00E-07		7E-07		5.95E-08		4E-07
Dibenzofuran	NA	NA	1.36E+00	1.17E+00								
Diethylphthalate	8.0E-01	NA	1.90E-02	1.90E-02	8.92E-08		1E-07		1.04E-08		1E-08	
Fluoranthene	4.0E-02	NA	3.84E+00	3.68E+00	1.73E-05		4E-04		2.10E-06		5E-05	
Fluorene	4.0E-02	NA	1.39E+00	1.22E+00	5.73E-06		1E-04		7.62E-07		2E-05	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.38E+00	2.65E+00		1.78E-07		1E-07		9.32E-08		7E-08
N-Nitrosodiphenylamine (1)	NA	4.9E-03	1.85E+00	1.59E+00		1.07E-07		5E-10		7.24E-08		4E-10
Naphthalene	4.0E-02	NA	1.56E+00	1.34E+00	6.29E-06		2E-04		8.55E-07		2E-05	
Pentachlorophenol	3.0E-02	1.2E-01	1.08E+00	1.11E+00	5.21E-06	7.45E-08	2E-04	9E-09	5.92E-07	4.23E-08	2E-05	5E-09
Phenanthrene	NA	NA	2.98E+00	2.74E+00								
Pyrene	3.0E-02	NA	3.92E+00	3.74E+00	1.76E-05		6E-04		2.15E-06		7E-05	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.37E+00	1.76E+00	8.27E-06	1.18E-07	4E-04	2E-09	7.51E-07	5.36E-08	4E-05	8E-10
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	4.88E-03	5.26E-03		3.53E-10		8E-11		1.91E-10		5E-11
4,4'-DDE	NA	3.4E-01	1.06E-01	8.51E-02		5.71E-09		2E-09		4.15E-09		1E-09
4,4'-DDT	5.0E-04	3.4E-01	4.89E-02	4.11E-02	1.93E-07	2.76E-09	4E-04	9E-10	2.68E-08	1.91E-09	5E-05	7E-10
Aldrin	3.0E-05	1.7E+01	1.99E-03	2.23E-03	1.05E-08	1.50E-10	3E-04	3E-09	1.09E-09	7.79E-11	4E-05	1E-09
Aroclor-1254	2.0E-05	2.0E+00	5.67E-02	6.00E-02	2.82E-07	4.03E-09	1E-02	8E-09	3.11E-08	2.22E-09	2E-03	4E-09
Aroclor-1260	2.0E-05	2.0E+00	6.24E-02	6.51E-02	3.06E-07	4.37E-09	2E-02	9E-09	3.42E-08	2.44E-09	2E-03	5E-09
Dieldrin	5.0E-05	1.6E+01	3.93E-03	4.65E-03	2.18E-08	3.12E-10	4E-04	5E-09	2.15E-09	1.54E-10	4E-05	2E-09
Endosulfan I	6.0E-03	NA	9.06E-03	8.65E-03	4.06E-08		7E-06		4.96E-09		8E-07	
Endosulfan II	6.0E-03	NA	3.89E-03	4.34E-03	2.04E-08		3E-06		2.13E-09		4E-07	
Endosulfan sulfate	6.0E-03	NA	3.77E-03	4.23E-03	1.99E-08		3E-06		2.07E-09		3E-07	
Endrin	3.0E-04	NA	4.81E-03	5.23E-03	2.46E-08		8E-05		2.64E-09		9E-06	
Endrin aldehyde	NA	NA	4.41E-03	4.83E-03								
Endrin ketone	NA	NA	4.54E-03	4.96E-03								
Heptachlor	5.0E-04	4.5E+00	1.77E-03	1.70E-03	7.98E-09	1.14E-10	2E-05	5E-10	9.70E-10	6.93E-11	2E-06	3E-10
Heptachlor epoxide	1.3E-05	9.1E+00	2.17E-03	2.40E-03	1.13E-08	1.61E-10	9E-04	1E-09	1.19E-09	8.49E-11	9E-05	8E-10
Toxaphene	NA	1.1E+00	1.77E-01	1.70E-01		1.14E-08		1E-08		6.93E-09		8E-09
alpha-Chlordane	6.0E-05	1.3E+00	5.73E-03	5.57E-03	2.62E-08	3.74E-10	4E-04	5E-10	3.14E-09	2.24E-10	5E-05	3E-10
beta-BHC	NA	1.8E+00	2.12E-03	2.35E-03		1.58E-10		3E-10		8.30E-11		1E-10
gamma-BHC (Lindane)	3.0E-04	1.3E+00	1.97E-03	2.21E-03	1.04E-08	1.48E-10	3E-05	2E-10	1.08E-09	7.71E-11	4E-06	1E-10
gamma-Chlordane	6.0E-05	1.3E+00	5.74E-03	5.60E-03	2.63E-08	3.76E-10	4E-04	5E-10	3.15E-09	2.25E-10	5E-05	3E-10
delta-BHC	NA	NA	1.97E-03									
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	9.20E-02	8.79E-02								
Tetryl	1.0E-02	NA	8.79E-02	8.44E-02	3.96E-07		4E-05		4.82E-08		5E-06	
Metals												
Antimony	4.0E-04	NA	4.77E+01	5.12E+01	2.40E-04		6E-01		2.61E-05		7E-02	
Barium	7.0E-02	NA	4.11E+02	3.66E+02	1.72E-03		2E-02		2.25E-04		3E-03	
Copper	4.0E-02	NA	5.85E+02	5.24E+02	2.46E-03		6E-02		3.21E-04		8E-03	
Lead	NA	NA	6.21E+03	7.14E+03								
Mercury	3.0E-04	NA	1.32E+00	1.27E+00	5.96E-06		2E-02		7.23E-07		2E-03	
Selenium	5.0E-03	NA	6.63E-01	6.57E-01	3.09E-06		6E-04		3.63E-07		7E-05	
Thallium	8.0E-05	NA	9.97E-01	1.32E+00	6.20E-06		8E-02		5.46E-07		7E-03	
Zinc	3.0E-01	NA	4.01E+02	3.52E+02	1.65E-03		6E-03		2.20E-04		7E-04	
Herbicides												
2,4,5-T	1.0E-02	NA	4.03E-03	4.03E-03	1.89E-08		2E-06		2.21E-09		2E-07	
MCPP	1.0E-03	NA	4.33E+00	4.33E+00	2.03E-05		2E-02		2.37E-06		2E-03	
Total Hazard Quotient and Cancer Risk:							**9E-01**	**3E-06**			**9E-02**	**2E-06**

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CS =	EPC Surface and Subsurface	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 =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-16PR-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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	Future Day Care Center Child: Intake (mg/kg-day)		Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day)		Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: 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	6.39E-03	6.30E-03		5.00E-09		1E-09		2.23E-09		4E-10
Acetone	1.0E-01	NA	6.56E-03	7.28E-03	5.99E-08		6E-07		6.42E-09		6E-08	
Butanone, 2-	6.0E-01	NA		5.00E-03								
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	4.57E-08	3.91E-09	2E-05	1E-10	4.89E-09	1.75E-09	2E-06	5E-11
Carbon Disulfide	1.0E-01	NA	2.00E-03	2.00E-03	1.83E-08		2E-07		1.96E-09		2E-08	
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	1.83E-08	1.57E-09	2E-06	1E-11	1.96E-09	6.99E-10	2E-07	4E-12
Methylene Chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	2.74E-08	2.35E-09	5E-07	2E-11	2.94E-09	1.05E-09	5E-08	8E-12
Toluene	2.0E-01	NA	6.47E-03	6.28E-03	5.91E-08		3E-07		6.33E-09		3E-08	
Xylene (total)	2.0E+00	NA	4.25E-03	4.25E-03	3.88E-08		2E-08		4.16E-09		2E-09	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	4.55E+00	3.80E+00	4.16E-05	3.56E-06	2E-02	2E-06	4.45E-06	1.59E-06	2E-03	1E-06
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.19E+00	1.01E-01	1.09E-05	9.32E-07	1E-02	6E-07	1.16E-06	4.16E-07	1E-03	3E-07
2-methylnaphthalene	4.0E-02	NA	1.20E+00	4.25E-03	1.10E-05		3E-04		1.17E-06		3E-05	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	1.10E-06		2E-05		1.17E-07		2E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	7.68E-01	7.24E-01		6.01E-07		3E-07		2.68E-07		1E-07
3-nitroaniline	NA	NA	1.87E+00	1.76E+00								
Acenaphthene	6.0E-02	NA	1.52E+00	1.33E+00	1.39E-05		2E-04		1.49E-06		2E-05	
Acenaphthylene	NA	NA	3.05E-01	2.91E-01								
Anthracene	3.0E-01	NA	1.55E+00	1.38E+00	1.42E-05		5E-05		1.52E-06		5E-06	
Benzo(a)anthracene	NA	7.3E-01	2.70E+00	2.46E+00		2.11E-06		2E-06		9.44E-07		7E-07
Benzo(a)pyrene	NA	7.3E+00	3.40E+00	3.30E+00		2.66E-06		2E-05		1.19E-06		9E-06
Benzo(b)fluoranthene	NA	7.3E-01	3.61E+00	3.38E+00		2.83E-06		2E-06		1.26E-06		9E-07
Benzo(g,h,i)perylene	NA	NA	2.29E+00	2.70E+00								
Benzo(k)fluoranthene	NA	7.3E-02	2.31E+00	2.24E+00		1.81E-06		1E-07		8.07E-07		6E-08
Butylbenzylphthalate	2.0E-01	NA		1.80E-02								
Carbazole	NA	2.0E-02	1.59E+00	1.35E+00		1.24E-06		2E-08		5.56E-07		1E-08
Chrysene	NA	7.3E-03	2.97E+00	2.77E+00		2.32E-06		2E-08		1.04E-06		8E-09
Di-n-butylphthalate	1.0E-01	NA	1.70E+00	1.51E+00	1.55E-05		2E-04		1.66E-06		2E-05	
Dibenz(a,h)anthracene	NA	7.3E+00	1.52E+00	1.49E+00		1.19E-06		9E-06		5.31E-07		4E-06
Dibenzofuran	NA	NA	1.36E+00	1.17E+00								
Diethylphthalate	8.0E-01	NA	1.90E-02	1.90E-02	1.74E-07		2E-07		1.86E-08		2E-08	
Fluoranthene	4.0E-02	NA	3.84E+00	3.68E+00	3.51E-05		9E-04		3.76E-06		9E-05	
Fluorene	4.0E-02	NA	1.39E+00	1.22E+00	1.27E-05		3E-04		1.36E-06		3E-05	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.38E+00	2.65E+00		1.86E-06		1E-06		8.32E-07		6E-07
N-Nitrosodiphenylamine (1)	NA	4.9E-03	1.85E+00	1.59E+00		1.45E-06		7E-09		6.46E-07		3E-09
Naphthalene	4.0E-02	NA	1.56E+00	1.34E+00	1.42E-05		4E-04		1.53E-06		4E-05	
Pentachlorophenol	3.0E-02	1.2E-01	1.08E+00	1.11E+00	9.86E-06	8.45E-07	3E-04	1E-07	1.06E-06	3.77E-07	4E-05	5E-08
Phenanthrene	NA	NA	2.98E+00	2.74E+00								
Pyrene	3.0E-02	NA	3.92E+00	3.74E+00	3.58E-05		1E-03		3.84E-06		1E-04	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.37E+00	1.76E+00	1.25E-05	1.07E-06	6E-04	2E-08	1.34E-06	4.79E-07	7E-05	7E-09
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	4.88E-03	5.26E-03		3.82E-09		9E-10		1.71E-09		4E-10
4,4'-DDE	NA	3.4E-01	1.06E-01	8.51E-02		8.30E-08		3E-08		3.70E-08		1E-08
4,4'-DDT	5.0E-04	3.4E-01	4.89E-02	4.11E-02	4.47E-07	3.83E-08	9E-04	1E-08	4.78E-08	1.71E-08	1E-04	6E-09
Aldrin	3.0E-05	1.7E+01	1.99E-03	2.23E-03	1.82E-08	1.56E-09	6E-04	3E-08	1.95E-09	6.95E-10	6E-05	1E-08
Aroclor-1254	2.0E-05	2.0E+00	5.67E-02	6.00E-02	5.18E-07	4.44E-08	3E-02	9E-08	5.55E-08	1.98E-08	3E-03	4E-08
Aroclor-1260	2.0E-05	2.0E+00	6.24E-02	6.51E-02	5.70E-07	4.88E-08	3E-02	1E-07	6.11E-08	2.18E-08	3E-03	4E-08
Dieldrin	5.0E-05	1.6E+01	3.93E-03	4.65E-03	3.59E-08	3.08E-09	7E-04	5E-08	3.85E-09	1.37E-09	8E-05	2E-08
Endosulfan I	6.0E-03	NA	9.06E-03	8.65E-03	8.27E-08		1E-05		8.86E-09		1E-06	
Endosulfan II	6.0E-03	NA	3.89E-03	4.34E-03	3.55E-08		6E-06		3.81E-09		6E-07	
Endosulfan sulfate	6.0E-03	NA	3.77E-03	4.23E-03	3.44E-08		6E-06		3.69E-09		6E-07	
Endrin	3.0E-04	NA	4.81E-03	5.23E-03	4.39E-08		1E-04		4.71E-09		2E-05	
Endrin aldehyde	NA	NA	4.41E-03	4.83E-03								
Endrin ketone	NA	NA	4.54E-03	4.96E-03								
Heptachlor	5.0E-04	4.5E+00	1.77E-03	1.70E-03	1.62E-08	1.39E-09	3E-05	6E-09	1.73E-09	6.19E-10	3E-06	3E-09
Heptachlor epoxide	1.3E-05	9.1E+00	2.17E-03	2.40E-03	1.98E-08	1.70E-09	2E-03	2E-08	2.12E-09	7.58E-10	2E-04	7E-09
Toxaphene	NA	1.1E+00	1.77E-01	1.70E-01		1.39E-07		2E-07		6.19E-08		7E-08
alpha-Chlordane	6.0E-05	1.3E+00	5.73E-03	5.57E-03	5.23E-08	4.49E-09	9E-04	6E-09	5.61E-09	2.00E-09	9E-05	3E-09
beta-BHC	NA	1.8E+00	2.12E-03	2.35E-03		1.66E-09		3E-09		7.41E-10		1E-09
gamma-BHC (Lindane)	3.0E-04	1.3E+00	1.97E-03	2.21E-03	1.80E-08	1.54E-09	6E-05	2E-09	1.93E-09	6.88E-10	6E-06	9E-10
gamma-Chlordane	6.0E-05	1.3E+00	5.74E-03	5.60E-03	5.24E-08	4.49E-09	9E-04	6E-09	5.62E-09	2.01E-09	9E-05	3E-09
delta-BHC	NA	NA	1.97E-03									
Nitroaromatics												
2-amino-4,6-Dinitrotoluene	NA	NA	9.20E-02	8.79E-02								
Tetryl	1.0E-02	NA	8.79E-02	8.44E-02	8.03E-07		8E-05		8.60E-08		9E-06	
Metals												
Antimony	4.0E-04	NA	4.77E+01	5.12E+01	4.36E-04		1E+00		4.67E-05		1E-01	
Barium	7.0E-02	NA	4.11E+02	3.66E+02	3.75E-03		5E-02		4.02E-04		6E-03	
Copper	4.0E-02	NA	5.85E+02	5.24E+02	5.34E-03		1E-01		5.72E-04		1E-02	
Lead	NA	NA	6.21E+03	7.14E+03								
Mercury	3.0E-04	NA	1.32E+00	1.27E+00	1.21E-05		4E-02		1.29E-06		4E-03	
Selenium	5.0E-03	NA	6.63E-01	6.57E-01	6.05E-06		1E-03		6.49E-07		1E-04	
Thallium	8.0E-05	NA	9.97E-01	1.32E+00	9.11E-06		1E-01		9.76E-07		1E-02	
Zinc	3.0E-01	NA	4.01E+02	3.52E+02	3.66E-03		1E-02		3.92E-04		1E-03	
Herbicides												
2,4,5-T	1.0E-02	NA	4.03E-03	4.03E-03	3.68E-08		4E-06		3.94E-09		4E-07	
MCPP	1.0E-03	NA	4.33E+00	4.33E+00	3.95E-05		4E-02		4.24E-06		4E-03	
Total Hazard Quotient and Cancer Risk:							2E+00	4E-05			2E-01	2E-05

Assumptions for Future Day Care Center Child			Assumptions for Future 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.
NA= Information not available.

TABLE B-16PR-13
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker Absorbed Dose (mg/kg-day) (Nc)	Current Site Worker Absorbed Dose (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Absorbed Dose (mg/kg-day) (Nc)	Future Industrial Worker Absorbed Dose (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics													
1,1,2,2,-Tetrachloroethane	NA	2.0E-01	NA	6.39E-03	6.30E-03						Contact to Onsite Soils Not Applicable for Future Industrial Worker		
Acetone	1.0E-01	NA	NA	6.56E-03	7.28E-03								
Butanone, 2-	6.0E-01	NA	NA		5.00E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon Disulfide	6.3E-02	NA	NA	2.00E-03	2.00E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	6.47E-03	6.28E-03								
Xylene (total)	1.8E+00	NA	NA	4.25E-03	4.25E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	4.55E+00	3.80E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.19E+00	1.01E-01								
2-methylnaphthalene	4.0E-02	NA	NA	1.20E+00	4.25E-03								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	7.68E-01	7.24E-01								
3-nitroaniline	NA	NA	NA	1.87E+00	1.76E+00								
Acenaphthene	6.0E-02	NA	NA	1.52E+00	1.33E+00								
Acenaphthylene	NA	NA	NA	3.05E-01	2.91E-01								
Anthracene	3.0E-01	NA	NA	1.55E+00	1.38E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	2.70E+00	2.46E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	3.40E+00	3.30E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.61E+00	3.38E+00								
Benzo(g,h,i)perylene	NA	NA	NA	2.29E+00	2.70E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.31E+00	2.24E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.59E+00	1.35E+00								
Chrysene	NA	7.3E-03	NA	2.97E+00	2.77E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	1.70E+00	1.51E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.52E+00	1.49E+00								
Dibenzofuran	NA	NA	NA	1.36E+00	1.17E+00								
Diethylphthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Fluoranthene	4.0E-02	NA	NA	3.84E+00	3.68E+00								
Fluorene	4.0E-02	NA	NA	1.39E+00	1.22E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.38E+00	2.65E+00								
N-Nitrosodiphenylamine (1	NA	4.9E-03	NA	1.85E+00	1.59E+00								
Naphthalene	4.0E-02	NA	NA	1.56E+00	1.34E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.08E+00	1.11E+00	4.90E-08	1.75E-08	2E-06	2E-09				
Phenanthrene	NA	NA	NA	2.98E+00	2.74E+00								
Pyrene	3.0E-02	NA	NA	3.92E+00	3.74E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.37E+00	1.76E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	4.88E-03	5.26E-03								
4,4'-DDE	NA	1.7E+00	NA	1.06E-01	8.51E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.89E-02	4.11E-02								
Aldrin	1.5E-05	3.4E+01	NA	1.99E-03	2.23E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06	5.67E-02	6.00E-02	1.54E-08	5.52E-09	9E-04	1E-08				
Aroclor-1260	1.8E-05	2.2E+00	0.06	6.24E-02	6.51E-02	1.70E-08	6.07E-09	9E-04	1E-08				
Dieldrin	2.5E-05	3.2E+01	NA	3.93E-03	4.65E-03								
Endosulfan I	6.0E-03	NA	NA	9.06E-03	8.65E-03								
Endosulfan II	6.0E-03	NA	NA	3.89E-03	4.34E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.77E-03	4.23E-03								
Endrin	3.0E-04	NA	NA	4.81E-03	5.23E-03								
Endrin aldehyde	NA	NA	NA	4.41E-03	4.83E-03								
Endrin ketone	NA	NA	NA	4.54E-03	4.96E-03								
Heptachlor	5.0E-04	4.5E+00	NA	1.77E-03	1.70E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.17E-03	2.40E-03								
Toxaphene	NA	1.1E+00	NA	1.77E-01	1.70E-01								
alpha-Chlordane	6.0E-05	1.3E+00	NA	5.73E-03	5.57E-03								
beta-BHC	NA	1.8E+00	NA	2.12E-03	2.35E-03								
gamma-BHC (Lindane)	3.0E-04	NA	NA	1.97E-03	2.21E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	5.74E-03	5.60E-03								
delta-BHC	NA	NA	NA	1.97E-03	2.03E-03								
Nitroaromatics													
2-amino-4,6-Dinitrotoluene	NA	NA	NA	9.20E-02	8.79E-02								
Tetryl	1.0E-02	NA	NA	8.79E-02	8.44E-02								
Metals													
Antimony	4.0E-04	NA	NA	4.77E+01	5.12E+01								
Barium	3.5E-03	NA	NA	4.11E+02	3.66E+02								
Copper	2.4E-02	NA	NA	5.85E+02	5.24E+02								
Lead	NA	NA	NA	6.21E+03	7.14E+03								
Mercury	3.0E-06	NA	NA	1.32E+00	1.27E+00								
Selenium	4.5E-03	NA	NA	6.63E-01	6.57E-01								
Thallium	8.0E-05	NA	NA	9.97E-01	1.32E+00								
Zinc	7.5E-02	NA	NA	4.01E+02	3.52E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.03E-03	4.03E-03								
MCPP	1.0E-03	NA	NA	4.33E+00	4.33E+00								
Total Hazard Quotient and Cancer Risk:								2E-03	3E-08				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
CF =	1.00E-06	kg/mg
SA =	5800	cm2
AF =	1	mg/cm2
EF =	20	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 B-16PR-13
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Future Construction Worker: Absorbed Dose (mg/kg-day)		Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day)		Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: 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	6.39E-03	6.31E-03								
Acetone	1.0E-01	NA	NA	6.56E-03	5.00E-03								
Butanone, 2-	6.0E-01		NA		7.30E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon Disulfide	6.3E-02	NA	NA	2.00E-03	2.00E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	6.47E-03	6.11E-03								
Xylene (total)	1.8E+00	NA	NA	4.25E-03	4.25E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	4.55E+00	4.02E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.19E+00	1.11E+00								
2-methylnaphthalene	4.0E-02	NA	NA	1.20E+00	1.11E+00								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	7.68E-01	7.44E-01								
3-nitroaniline	NA	NA	NA	1.87E+00	1.81E+00								
Acenaphthene	6.0E-02	NA	NA	1.52E+00	1.39E+00								
Acenaphthylene	NA	NA	NA	3.05E-01	2.94E-01								
Anthracene	3.0E-01	NA	NA	1.55E+00	1.44E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	2.70E+00	2.57E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	3.40E+00	3.49E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.61E+00	3.56E+00								
Benzo(g,h,i)perylene	NA	NA	NA	2.29E+00	2.82E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.31E+00	2.35E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.59E+00	1.41E+00								
Chrysene	NA	7.3E-03	NA	2.97E+00	2.94E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	1.70E+00	1.57E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.52E+00	1.52E+00								
Dibenzofuran	NA	NA	NA	1.36E+00	1.22E+00								
Diethylphthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Fluoranthene	4.0E-02	NA	NA	3.84E+00	3.92E+00								
Fluorene	4.0E-02	NA	NA	1.39E+00	1.26E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.38E+00	2.75E+00								
N-Nitrosodiphenylamine (1	NA	4.9E-03	NA	1.85E+00	1.65E+00								
Naphthalene	4.0E-02	NA	NA	1.56E+00	1.40E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.08E+00	1.13E+00	6.13E-07	8.76E-09	2E-05	1E-09	1.37E-07	9 77E-09	5E-06	1E-09
Phenanthrene	NA	NA	NA	2.98E+00	2.86E+00								
Pyrene	3.0E-02	NA	NA	3.92E+00	3.98E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.37E+00	1.85E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	4.88E-03	5.35E-03								
4,4'-DDE	NA	1.7E+00	NA	1.06E-01	8.90E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.89E-02	4.30E-02								
Aldrin	1.5E-05	3.4E+01	NA	1.99E-03	2.26E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06	5.67E-02	6.12E-02	1.93E-07	2.76E-09	1E-02	6E-09	4.31E-08	3.08E-09	2E-03	7E-09
Aroclor-1260	1.8E-05	2.2E+00	0.06	6.24E-02	6.64E-02	2.12E-07	3.04E-09	1E-02	7E-09	4.74E-08	3.39E-09	3E-03	8E-09
Dieldrin	2.5E-05	3.2E+01	NA	3.93E-03	4.72E-03								
Endosulfan I	6.0E-03	NA	NA	9.06E-03	8.94E-03								
Endosulfan II	6.0E-03	NA	NA	3.89E-03	4.40E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.77E-03	4.28E-03								
Endrin	3.0E-04	NA	NA	4.81E-03	5.32E-03								
Endrin aldehyde	NA	NA	NA	4.41E-03	4.86E-03								
Endrin ketone	NA	NA	NA	4.54E-03	5.04E-03								
Heptachlor	5.0E-04	4.5E+00	NA	1.77E-03	1.24E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.17E-03	2.43E-03								
Toxaphene	NA	1.1E+00	NA	1.77E-01	1.24E-01								
alpha-Chlordane	6.0E-05	1.3E+00	NA	5.73E-03	5.72E-03								
beta-BHC	NA	1.8E+00	NA	2.12E-03	2.39E-03								
gamma-BHC (Lindane)	3.0E-04	NA	NA	1.97E-03	2.24E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	5.74E-03	5.73E-03								
delta-BHC	NA	NA	NA	1.97E-03									
Nitroaromatics													
2-amino-4,6-Dinitrotoluene	NA	NA	NA	9.20E-02	8.86E-02								
Tetryl	1.0E-02	NA	NA	8.79E-02	8.50E-02								
Metals													
Antimony	4.0E-04	NA	NA	4.77E+01	5.18E+01								
Barium	3.5E-03	NA	NA	4.11E+02	3.79E+02								
Copper	2.4E-02	NA	NA	5.85E+02	5.47E+02								
Lead	NA	NA	NA	6.21E+03	7.45E+03								
Mercury	3.0E-06	NA	NA	1.32E+00	1.34E+00								
Selenium	4.5E-03	NA	NA	6.63E-01	6.38E-01								
Thallium	8.0E-05	NA	NA	9.97E-01	1.36E+00								
Zinc	7.5E-02	NA	NA	4.01E+02	3.61E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.03E-03	4 03E-03								
MCPP	1.0E-03	NA	NA	4.33E+00	4.33E+00								
Total Hazard Quotient and Cancer Risk:								**2E-02**	**1E-08**			**5E-03**	**2E-08**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser 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 =	4625	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	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.

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SEAD-16 Feasibility Study
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	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Future Day Care Center Child				Future 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													
1,1,2,2,-Tetrachloroethane	NA	2.0E-01	NA	6.39E-03	6.31E-03								
Acetone	1.0E-01	NA	NA	6.56E-03	5.00E-03								
Butanone, 2-	6.0E-01	NA			7.30E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon Disulfide	6.3E-02	NA	NA	2.00E-03	2.00E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	6.47E-03	6.11E-03								
Xylene (total)	1.8E+00	NA	NA	4.25E-03	4.25E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	4.55E+00	4.02E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.19E+00	1.11E+00								
2-methylnaphthalene	4.0E-02	NA	NA	1.20E+00	1.11E+00								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	7.68E-01	7.44E-01								
3-nitroaniline	NA	NA	NA	1.87E+00	1.81E+00								
Acenaphthene	6.0E-02	NA	NA	1.52E+00	1.39E+00								
Acenaphthylene	NA	NA	NA	3.05E-01	2.94E-01								
Anthracene	3.0E-01	NA	NA	1.55E+00	1.44E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	2.70E+00	2.57E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	3.40E+00	3.49E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.61E+00	3.56E+00								
Benzo(g,h,i)perylene	NA	NA	NA	2.29E+00	2.82E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.31E+00	2.35E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.59E+00	1.41E+00								
Chrysene	NA	7.3E-03	NA	2.97E+00	2.94E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	1.70E+00	1.57E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.52E+00	1.52E+00								
Dibenzofuran	NA	NA	NA	1.36E+00	1.22E+00								
Diethylphthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Fluoranthene	4.0E-02	NA	NA	3.84E+00	3.92E+00								
Fluorene	4.0E-02	NA	NA	1.39E+00	1.26E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.38E+00	2.75E+00								
N-Nitrosodiphenylamine (1	NA	4.9E-03	NA	1.85E+00	1.65E+00								
Naphthalene	4.0E-02	NA	NA	1.56E+00	1.40E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.08E+00	1.13E+00	1.08E-06	9.26E-08	4E-05	1E-08	6.13E-07	2.19E-07	2E-05	3E-08
Phenanthrene	NA	NA	NA	2.98E+00	2.86E+00								
Pyrene	3.0E-02	NA	NA	3.92E+00	3.98E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.37E+00	1.85E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	4.88E-03	5.35E-03								
4,4'-DDE	NA	1.7E+00	NA	1.06E-01	8.90E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.89E-02	4.30E-02								
Aldrin	1.5E-05	3.4E+01	NA	1.99E-03	2.26E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06	5.67E-02	6.12E-02	3.40E-07	2.92E-08	2E-02	6E-08	1.93E-07	6.90E-08	1E-02	2E-07
Aroclor-1260	1.8E-05	2.2E+00	0.06	6.24E-02	6.64E-02	3.74E-07	3.21E-08	2E-02	7E-08	2 12E-07	7.59E-08	1E-02	2E-07
Dieldrin	2.5E-05	3.2E+01	NA	3.93E-03	4.72E-03								
Endosulfan I	6.0E-03	NA	NA	9.06E-03	8.94E-03								
Endosulfan II	6.0E-03	NA	NA	3.89E-03	4.40E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.77E-03	4.28E-03								
Endrin	3.0E-04	NA	NA	4.81E-03	5.32E-03								
Endrin aldehyde	NA	NA	NA	4.41E-03	4.86E-03								
Endrin ketone	NA	NA	NA	4.54E-03	5.04E-03								
Heptachlor	5.0E-04	4.5E+00	NA	1.77E-03	1.24E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.17E-03	2.43E-03								
Toxaphene	NA	1.1E+00	NA	1.77E-01	1.24E-01								
alpha-Chlordane	6.0E-05	1.3E+00	NA	5.73E-03	5.72E-03								
beta-BHC	NA	1.8E+00	NA	2.12E-03	2.39E-03								
gamma-BHC (Lindane)	3.0E-04	NA	NA	1.97E-03	2.24E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	5.74E-03	5.73E-03								
delta-BHC	NA	NA	NA	1.97E-03									
Nitroaromatics													
2-amino-4,6-Dinitrotoluene	NA	NA	NA	9.20E-02	8.86E-02								
Tetryl	1.0E-02	NA	NA	8.79E-02	8.50E-02								
Metals													
Antimony	4.0E-04	NA	NA	4.77E+01	5.18E+01								
Barium	3.5E-03	NA	NA	4.11E+02	3.79E+02								
Copper	2.4E-02	NA	NA	5.85E+02	5.47E+02								
Lead	NA	NA	NA	6.21E+03	7.45E+03								
Mercury	3.0E-06	NA	NA	1.32E+00	1.34E+00								
Selenium	4.5E-03	NA	NA	6.63E-01	6.38E-01								
Thallium	8.0E-05	NA	NA	9.97E-01	1.36E+00								
Zinc	7.5E-02	NA	NA	4.01E+02	3.61E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.03E-03	4.03E-03								
MCPP	1.0E-03	NA	NA	4.33E+00	4.33E+00								
Total Hazard Quotient and Cancer Risk:								**4E-02**	**1E-07**			**2E-02**	**3E-07**

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 B-16PR-14
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF INDOOR DUST/DIRT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x CF x FI x EF x ED / BW x AT	Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose
Variables (Assumptions for Each Receptor are Listed at the Bottom):	Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
CA = Chemical Concentration in Air, from EPC Solids Data; EF = Exposure Frequency	
IR = Ingestion Rate; ED = Exposure Duration	
CF = Conversion Factor; BW = Bodyweight	
FI = Fraction Ingested; AT = Averaging Time	

Analyte	Oral RfD	Carc. Slope Oral	EPC Solids	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics					Ingestion of						
1,1,1-Trichloroethane	2.0E-02	NA	6.27E-03		Indoor Dust/Dirt			6.13E-09		3E-07	
Methylene Chloride	6.0E-02	7.5E-03	6.27E-03		Not Applicable for			6.13E-09	2.19E-09	1E-07	2E-11
Toluene	2.0E-01	NA	1.31E-02		Current Site Worker			1.28E-08		6E-08	
Trichloroethene	NA	1.1E-02	1.13E-02						3.96E-09		4E-11
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.90E+04					1.86E-02	6.64E-03	9E+00	5E-03
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.40E+01					7.24E-05	2.59E-05	7E-02	2E-05
2-Methylnaphthalene	4.0E-02	NA	1.90E+01					1.86E-05		5E-04	
Acenaphthene	6.0E-02	NA	4.50E+00					4.40E-06		7E-05	
Anthracene	3.0E-01	NA	2.90E+00					2.84E-06		9E-06	
Benzo(a)anthracene	NA	7.3E-01	1.60E+00						5.59E-07		4E-07
Benzo(a)pyrene	NA	7.3E+00	1.50E+00						5.24E-07		4E-06
Benzo(b)fluoranthene	NA	7.3E-01	1.60E+00						5.59E-07		4E-07
Benzo(g,h,i)perylene	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	1.60E+00						5.59E-07		4E-08
Butylbenzylphthalate	2.0E-01	NA	5.40E+01					5.28E-05		3E-04	
Carbazole	NA	2.0E-02	4.33E-01						1.51E-07		3E-09
Chrysene	NA	7.3E-03	1.90E+00						6.64E-07		5E-09
Di-n-butylphthalate	1.0E-01	NA	9.50E+02					9.30E-04		9E-03	
Dibenz(a,h)anthracene	NA	7.3E+00	3.69E-01						1.29E-07		9E-07
Dibenzofuran	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	3.80E-01					3.72E-07		5E-07	
Fluoranthene	4.0E-02	NA	3.90E+00					3.82E-06		1E-04	
Fluorene	4.0E-02	NA	6.10E+00					5.97E-06		1E-04	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.17E-01						1.11E-07		8E-08
N-Nitrosodiphenylamine (1)	NA	4.9E-03	2.00E+02						6.99E-05		3E-07
Naphthalene	4.0E-02	NA	1.60E+00					1.57E-06		4E-05	
Pentachlorophenol	3.0E-02	1.2E-01	2.20E-01					2.15E-07	7.69E-08	7E-06	9E-09
Phenanthrene	NA	NA	2.20E+01								
Phenol	6.0E-01	NA	3.70E+01					3.62E-05		6E-05	
Pyrene	3.0E-02	NA	5.00E+00					4.89E-06		2E-04	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	5.00E+00					4.89E-06	1.75E-06	2E-04	2E-08
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	3.01E-02						1.05E-08		3E-09
4,4'-DDE	NA	3.4E-01	7.50E-01						2.62E-07		9E-08
4,4'-DDT	5.0E-04	3.4E-01	9.40E-01					9.20E-07	3.28E-07	2E-03	1E-07
Aroclor-1254	2.0E-05	2.0E+00	1.40E+00					1.37E-06	4.89E-07	7E-02	1E-06
Aroclor-1260	2.0E-05	2.0E+00	4.51E-01					4.42E-07	1.58E-07	2E-02	3E-07
Dieldrin	5.0E-05	1.6E+01	1.82E-02					1.78E-08	6.37E-09	4E-04	1E-07
Endosulfan I	6.0E-03	NA	1.78E-02					1.74E-08		3E-06	
Endosulfan II	6.0E-03	NA	4.99E-03					4.89E-09		8E-07	
Endrin	3.0E-04	NA	6.02E-03					5.89E-09		2E-05	
Heptachlor epoxide	1.3E-05	9.1E+00	2.45E-03					2.40E-09	8.56E-10	2E-04	8E-09
alpha-BHC	NA	6.3E+00	2.82E-03						9.85E-10		6E-09
alpha-Chlordane	6.0E-05	1.3E+00	4.07E-02					3.98E-08	1.42E-08	7E-04	2E-08
gamma-BHC (Lindane)	3.0E-04	1.3E+00	9.30E-04					9.10E-10	3.25E-10	3E-06	4E-10
gamma-Chlordane	6.0E-05	1.3E+00	3.27E-02					3.20E-08	1.14E-08	5E-04	1E-08
Nitroaromatics											
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.02E-01					9.99E-08	3.57E-08	2E-04	1E-09
Metals											
Antimony	4.0E-04	NA	1.56E+03					1.53E-03		4E+00	
Arsenic	3.0E-04	1.5E+00	3.73E+01					3.65E-05	1.30E-05	1E-01	2E-05
Barium	7.0E-02	NA	4.05E+04					3.96E-02		6E-01	
Cadmium	5.0E-04	NA	1.27E+02					1.24E-04		2E-01	
Copper	4.0E-02	NA	8.14E+04					7.96E-02		2E+00	
Cyanide	2.0E-02	NA	2.42E+01					2.37E-05		1E-03	
Lead	NA	NA	5.27E+05								
Mercury	3.0E-04	NA	3.93E+01					3.85E-05		1E-01	
Selenium	5.0E-03	NA	5.80E+00					5.68E-06		1E-03	
Silver	5.0E-03	NA	2.27E+01					2.22E-05		4E-03	
Sodium	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	8.97E-01					8.77E-07		1E-02	
Zinc	3.0E-01	NA	4.26E+04					4.17E-02		1E-01	
Herbicides											
2,4,5-T	1.0E-02	NA	8.01E-03					7.84E-09		8E-07	
2,4,5-TP (Silvex)	8.0E-03	NA	5.82E-03					5.69E-09		7E-07	
2,4-D	1.0E-02	NA	9.29E-02					9.09E-08		9E-06	
2,4-DB	8.0E-03	NA	8.65E-02					8.46E-08		1E-05	
Dichloroprop	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	5.90E+00					5.77E-06		1E-02	
MCPP	1.0E-03	NA	1.28E+01					1.25E-05		1E-02	
Total Hazard Quotient and Cancer Risk:										**2E+01**	**5E-03**

Assumptions for Future Industrial Worker

IR =	100	mg solid/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 B-16PR-14
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REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, from EPC Solids 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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Solids (mg/kg)	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics					Ingestion of Indoor Dust/Dirt Not Applicable for Future Construction Worker				Ingestion of Indoor Dust/Dirt Not Applicable for Future Tresspasser Child		
1,1,1-Trichloroethane	2.0E-02	NA	6.27E-03								
Methylene Chloride	6.0E-02	7.5E-03	6.27E-03								
Toluene	2.0E-01	NA	1.31E-02								
Trichloroethene	NA	1.1E-02	1.13E-02								
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.90E+04								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.40E+01								
2-Methylnaphthalene	4.0E-02	NA	1.90E+01								
Acenaphthene	6.0E-02	NA	4.50E+00								
Anthracene	3.0E-01	NA	2.90E+00								
Benzo(a)anthracene	NA	7.3E-01	1.60E+00								
Benzo(a)pyrene	NA	7.3E+00	1.50E+00								
Benzo(b)fluoranthene	NA	7.3E-01	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	1.60E+00								
Butylbenzylphthalate	2.0E-01	NA	5.40E+01								
Carbazole	NA	2.0E-02	4.33E-01								
Chrysene	NA	7.3E-03	1.90E+00								
Di-n-butylphthalate	1.0E-01	NA	9.50E+02								
Dibenz(a,h)anthracene	NA	7.3E+00	3.69E-01								
Dibenzofuran	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	3.80E-01								
Fluoranthene	4.0E-02	NA	3.90E+00								
Fluorene	4.0E-02	NA	6.10E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.17E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	2.00E+02								
Naphthalene	4.0E-02	NA	1.60E+00								
Pentachlorophenol	3.0E-02	1.2E-01	2.20E-01								
Phenanthrene	NA	NA	2.20E+01								
Phenol	6.0E-01	NA	3.70E+01								
Pyrene	3.0E-02	NA	5.00E+00								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	5.00E+00								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	3.01E-02								
4,4'-DDE	NA	3.4E-01	7.50E-01								
4,4'-DDT	5.0E-04	3.4E-01	9.40E-01								
Aroclor-1254	2.0E-05	2.0E+00	1.40E+00								
Aroclor-1260	2.0E-05	2.0E+00	4.51E-01								
Dieldrin	5.0E-05	1.6E+01	1.82E-02								
Endosulfan I	6.0E-03	NA	1.78E-02								
Endosulfan II	6.0E-03	NA	4.99E-03								
Endrin	3.0E-04	NA	6.02E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	2.45E-03								
alpha-BHC	NA	6.3E+00	2.82E-03								
alpha-Chlordane	6.0E-05	1.3E+00	4.07E-02								
gamma-BHC (Lindane)	3.0E-04	1.3E+00	9.30E-04								
gamma-Chlordane	6.0E-05	1.3E+00	3.27E-02								
Nitroaromatics											
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.02E-01								
Metals											
Antimony	4.0E-04	NA	1.56E+03								
Arsenic	3.0E-04	1.5E+00	3.73E+01								
Barium	7.0E-02	NA	4.05E+04								
Cadmium	5.0E-04	NA	1.27E+02								
Copper	4.0E-02	NA	8.14E+04								
Cyanide	2.0E-02	NA	2.42E+01								
Lead	NA	NA	5.27E+05								
Mercury	3.0E-04	NA	3.93E+01								
Selenium	5.0E-03	NA	5.80E+00								
Silver	5.0E-03	NA	2.27E+01								
Sodium	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	8.97E-01								
Zinc	3.0E-01	NA	4.26E+04								
Herbicides											
2,4,5-T	1.0E-02	NA	8.01E-03								
2,4,5-TP (Silvex)	8.0E-03	NA	5.82E-03								
2,4-D	1.0E-02	NA	9.29E-02								
2,4-DB	8.0E-03	NA	8.65E-02								
Dichloroprop	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	5.90E+00								
MCPP	1.0E-03	NA	1.28E+01								
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.

TABLE B-16PR-14
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF INDOOR DUST/DIRT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x CF x FI x EF x ED / BW x AT	Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose
Variables (Assumptions for Each Receptor are Listed at the Bottom):	Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
CA = Chemical Concentration in Air, from EPC Solids Data; EF = Exposure Frequency	
IR = Ingestion Rate; ED = Exposure Duration	
CF = Conversion Factor; BW = Bodyweight	
FI = Fraction Ingested; AT = Averaging Time	

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Solids (mg/kg)	Future Day Care Center Child Intake (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics											
1,1,1-Trichloroethane	2.0E-02	NA	6.27E-03		Ingestion of Indoor Dust/Dirt Not Applicable for Future Day Care Center Child				Ingestion of Indoor Dust/Dirt Not Applicable for Future Day Care Center Adult		
Methylene Chloride	6.0E-02	7.5E-03	6.27E-03								
Toluene	2.0E-01	NA	1.31E-02								
Trichloroethene	NA	1.1E-02	1.13E-02								
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.90E+04								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.40E+01								
2-Methylnaphthalene	4.0E-02	NA	1.90E+01								
Acenaphthene	6.0E-02	NA	4.50E+00								
Anthracene	3.0E-01	NA	2.90E+00								
Benzo(a)anthracene	NA	7.3E-01	1.60E+00								
Benzo(a)pyrene	NA	7.3E+00	1.50E+00								
Benzo(b)fluoranthene	NA	7.3E-01	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	1.60E+00								
Butylbenzylphthalate	2.0E-01	NA	5.40E+01								
Carbazole	NA	2.0E-02	4.33E-01								
Chrysene	NA	7.3E-03	1.90E+00								
Di-n-butylphthalate	1.0E-01	NA	9.50E+02								
Dibenz(a,h)anthracene	NA	7.3E+00	3.69E-01								
Dibenzofuran	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	3.80E-01								
Fluoranthene	4.0E-02	NA	3.90E+00								
Fluorene	4.0E-02	NA	6.10E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.17E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	2.00E+02								
Naphthalene	4.0E-02	NA	1.60E+00								
Pentachlorophenol	3.0E-02	1.2E-01	2.20E-01								
Phenanthrene	NA	NA	2.20E+01								
Phenol	6.0E-01	NA	3.70E+01								
Pyrene	3.0E-02	NA	5.00E+00								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	5.00E+00								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	3.01E-02								
4,4'-DDE	NA	3.4E-01	7.50E-01								
4,4'-DDT	5.0E-04	3.4E-01	9.40E-01								
Aroclor-1254	2.0E-05	2.0E+00	1.40E+00								
Aroclor-1260	2.0E-05	2.0E+00	4.51E-01								
Dieldrin	5.0E-05	1.6E+01	1.82E-02								
Endosulfan I	6.0E-03	NA	1.78E-02								
Endosulfan II	6.0E-03	NA	4.99E-03								
Endrin	3.0E-04	NA	6.02E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	2.45E-03								
alpha-BHC	NA	6.3E+00	2.82E-03								
alpha-Chlordane	6.0E-05	1.3E+00	4.07E-02								
gamma-BHC (Lindane)	3.0E-04	1.3E+00	9.30E-04								
gamma-Chlordane	6.0E-05	1.3E+00	3.27E-02								
Nitroaromatics											
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	1.02E-01								
Metals											
Antimony	4.0E-04	NA	1.56E+03								
Arsenic	3.0E-04	1.5E+00	3.73E+01								
Barium	7.0E-02	NA	4.05E+04								
Cadmium	5.0E-04	NA	1.27E+02								
Copper	4.0E-02	NA	8.14E+04								
Cyanide	2.0E-02	NA	2.42E+01								
Lead	NA	NA	5.27E+05								
Mercury	3.0E-04	NA	3.93E+01								
Selenium	5.0E-03	NA	5.80E+00								
Silver	5.0E-03	NA	2.27E+01								
Sodium	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	8.97E-01								
Zinc	3.0E-01	NA	4.26E+04								
Herbicides											
2,4,5-T	1.0E-02	NA	8.01E-03								
2,4,5-TP (Silvex)	8.0E-03	NA	5.82E-03								
2,4-D	1.0E-02	NA	9.29E-02								
2,4-DB	8.0E-03	NA	8.65E-02								
Dichloroprop	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	5.90E+00								
MCPP	1.0E-03	NA	1.28E+01								
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

TABLE B-16PR-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO INDOOR DUST/DIRT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Absorbed Dose (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 Air, from EPC Solids Data
CF = Conversion Factor
SA = Surface Area
AF = Soil to Skin Adherence 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	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Solids (mg/kg)	Current Site Worker: Absorbed Dose (mg/kg-day) (Nc)	Current Site Worker: Absorbed Dose (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics						Dermal Contact to Indoor Dust/Dirt Not Applicable for Current Site Worker						
1,1,1-Trichloroethane	2.0E-02	NA	NA	6.27E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	6.27E-03								
Toluene	2.0E-01	NA	NA	1.31E-02								
Trichloroethene	NA	1.2E-02	NA	1.13E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.90E+04								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	7.40E+01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.90E+01								
Acenaphthene	6.0E-02	NA	NA	4.50E+00								
Anthracene	3.0E-01	NA	NA	2.90E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	1.60E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	1.50E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	1.60E+00								
Butylbenzylphthalate	2.0E-01	NA	NA	5.40E+01								
Carbazole	NA	2.0E-02	NA	4.33E-01								
Chrysene	NA	7.3E-03	NA	1.90E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	9.50E+02								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	3.69E-01								
Dibenzofuran	NA	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	NA	3.80E-01								
Fluoranthene	4.0E-02	NA	NA	3.90E+00								
Fluorene	4.0E-02	NA	NA	6.10E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.17E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	2.00E+02								
Naphthalene	4.0E-02	NA	NA	1.60E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.010	2.20E-01					1.25E-07	4.46E-08	4E-06	5E-09
Phenanthrene	NA	NA	NA	2.20E+01								
Phenol	5.4E-01	NA	NA	3.70E+01								
Pyrene	3.0E-02	NA	NA	5.00E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	5.00E+00								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	3.01E-02								
4,4'-DDE	NA	1.7E+00	NA	7.50E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	9.40E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.060	1.40E+00					4.77E-06	1.70E-06	3E-01	4E-06
Aroclor-1260	1.8E-05	2.2E+00	0.060	4.51E-01					1.54E-06	5.49E-07	9E-02	1E-06
Dieldrin	2.5E-05	3.2E+01	NA	1.82E-02								
Endosulfan I	6.0E-03	NA	NA	1.78E-02								
Endosulfan II	6.0E-03	NA	NA	4.99E-03								
Endrin	3.0E-04	NA	NA	6.02E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.45E-03								
alpha-BHC	NA	NA	NA	2.82E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	4.07E-02								
gamma-BHC (Lindane)	3.0E-04	NA	NA	9.30E-04								
gamma-Chlordane	6.0E-05	1.3E+00	NA	3.27E-02								
Nitroaromatics												
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	NA	1.02E-01								
Metals												
Antimony	4.0E-04	NA	NA	1.56E+03								
Arsenic	2.4E-04	1.9E+00	0.001	3.73E+01					2.12E-06	7.56E-07	9E-03	1E-06
Barium	3.5E-03	NA	NA	4.05E+04								
Cadmium	5.0E-05	NA	0.010	1.27E+02					7.21E-05		1E+00	
Copper	2.4E-02	NA	NA	8.14E+04								
Cyanide	1.0E-02	NA	NA	2.42E+01								
Lead	NA	NA	NA	5.27E+05								
Mercury	3.0E-06	NA	NA	3.93E+01								
Selenium	4.5E-03	NA	NA	5.80E+00								
Silver	1.0E-03	NA	NA	2.27E+01								
Sodium	NA	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	NA	8.97E-01								
Zinc	7.5E-02	NA	NA	4.26E+04								
Herbicides												
2,4,5-T	1.0E-02	NA	NA	8.01E-03								
2,4,5-TP (Silvex)	8.0E-03	NA	NA	5.82E-03								
2,4-D	1.0E-02	NA	NA	9.29E-02								
2,4-DB	8.0E-03	NA	NA	8.65E-02								
Dichloroprop	NA	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	NA	5.90E+00								
MCPP	1.0E-03	NA	NA	1.28E+01								
Total Hazard Quotient and Cancer Risk:											**2E+00**	**6E-06**

Assumptions for Future Industrial Worker

CF =	1E-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 B-16PR-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO INDOOR DUST/DIRT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Absorbed Dose (mg/kg-day) = CS x CF x SA x AF x ABS x EF x ED / BW x AT

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Air, from EPC Solids Data
CF = Conversion Factor
SA = Surface Area
AF = Soil to Skin Adherence 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	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Solids (mg/kg)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics						Dermal Contact to Indoor Dust/Dirt Not Applicable for Future Construction Worker				Dermal Contact to Indoor Dust/Dirt Not Applicable for Future Tresspasser Child		
1,1,1-Trichloroethane	2.0E-02	NA	NA	6.27E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	6.27E-03								
Toluene	2.0E-01	NA	NA	1.31E-02								
Trichloroethene	NA	1.2E-02	NA	1.13E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.90E+04								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	7.40E+01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.90E+01								
Acenaphthene	6.0E-02	NA	NA	4.50E+00								
Anthracene	3.0E-01	NA	NA	2.90E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	1.60E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	1.50E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	1.60E+00								
Butylbenzylphthalate	2.0E-01	NA	NA	5.40E+01								
Carbazole	NA	2.0E-02	NA	4.33E-01								
Chrysene	NA	7.3E-03	NA	1.90E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	9.50E+02								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	3.69E-01								
Dibenzofuran	NA	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	NA	3.80E-01								
Fluoranthene	4.0E-02	NA	NA	3.90E+00								
Fluorene	4.0E-02	NA	NA	6.10E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.17E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	2.00E+02								
Naphthalene	4.0E-02	NA	NA	1.60E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.010	2.20E-01								
Phenanthrene	NA	NA	NA	2.20E+01								
Phenol	5.4E-01	NA	NA	3.70E+01								
Pyrene	3.0E-02	NA	NA	5.00E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	5.00E+00								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	3.01E-02								
4,4'-DDE	NA	1.7E+00	NA	7.50E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	9.40E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.060	1.40E+00								
Aroclor-1260	1.8E-05	2.2E+00	0.060	4.51E-01								
Dieldrin	2.5E-05	3.2E+01	NA	1.82E-02								
Endosulfan I	6.0E-03	NA	NA	1.78E-02								
Endosulfan II	6.0E-03	NA	NA	4.99E-03								
Endrin	3.0E-04	NA	NA	6.02E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.45E-03								
alpha-BHC	NA	NA	NA	2.82E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	4.07E-02								
gamma-BHC (Lindane)	3.0E-04	NA	NA	9.30E-04								
gamma-Chlordane	6.0E-05	1.3E+00	NA	3.27E-02								
Nitroaromatics												
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02		1.02E-01								
Metals												
Antimony	4.0E-04	NA	NA	1.56E+03								
Arsenic	2.4E-04	1.9E+00	0.001	3.73E+01								
Barium	3.5E-03	NA	NA	4.05E+04								
Cadmium	5.0E-05	NA	0.010	1.27E+02								
Copper	2.4E-02	NA	NA	8.14E+04								
Cyanide	1.0E-02	NA	NA	2.42E+01								
Lead	NA	NA	NA	5.27E+05								
Mercury	3.0E-06	NA	NA	3.93E+01								
Selenium	4.5E-03	NA	NA	5.80E+00								
Silver	1.0E-03	NA	NA	2.27E+01								
Sodium	NA	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	NA	8.97E-01								
Zinc	7.5E-02	NA	NA	4.26E+04								
Herbicides												
2,4,5-T	1.0E-02	NA	NA	8.01E-03								
2,4,5-TP (Silvex)	8.0E-03	NA	NA	5.82E-03								
2,4-D	1.0E-02	NA	NA	9.29E-02								
2,4-DB	8.0E-03	NA	NA	8.65E-02								
Dichloroprop	NA	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	NA	5.90E+00								
MCPP	1.0E-03	NA	NA	1.28E+01								
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.
* 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-16PR-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO INDOOR DUST/DIRT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Absorbed Dose (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 Air, from EPC Solids Data
CF = Conversion Factor
SA = Surface Area
AF = Soil to Skin Adherence 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	Oral RfD	Carc. Slope Oral	Absorption Factor*	EPC Solids	Future Day Care Center Child: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
1,1,1-Trichloroethane	2.0E-02	NA	NA	6.27E-03	Dermal Contact to Indoor Dust/Dirt Not Applicable for Future Day Care Center Child				Dermal Contact to Indoor Dust/Dirt Not Applicable for Future Day Care Center Worker			
Methylene Chloride	5.9E-02	7.7E-03	NA	6.27E-03								
Toluene	2.0E-01	NA	NA	1.31E-02								
Trichloroethene	NA	1.2E-02	NA	1.13E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.90E+04								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	7.40E+01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.90E+01								
Acenaphthene	6.0E-02	NA	NA	4.50E+00								
Anthracene	3.0E-01	NA	NA	2.90E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	1.60E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	1.50E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	1.60E+00								
Benzo(g,h,i)perylene	NA	NA	NA	8.05E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	1.60E+00								
Butylbenzylphthalate	2.0E-01	NA	NA	5.40E+01								
Carbazole	NA	2.0E-02	NA	4.33E-01								
Chrysene	NA	7.3E-03	NA	1.90E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	9.50E+02								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	3.69E-01								
Dibenzofuran	NA	NA	NA	1.50E+00								
Diethylphthalate	8.0E-01	NA	NA	3.80E-01								
Fluoranthene	4.0E-02	NA	NA	3.90E+00								
Fluorene	4.0E-02	NA	NA	6.10E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.17E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	2.00E+02								
Naphthalene	4.0E-02	NA	NA	1.60E+00								
Pentachlorophenol	3.0E-02	1.2E-01	0.010	2.20E-01								
Phenanthrene	NA	NA	NA	2.20E+01								
Phenol	5.4E-01	NA	NA	3.70E+01								
Pyrene	3.0E-02	NA	NA	5.00E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	5.00E+00								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	3.01E-02								
4,4'-DDE	NA	1.7E+00	NA	7.50E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	9.40E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.060	1.40E+00								
Aroclor-1260	1.8E-05	2.2E+00	0.060	4.51E-01								
Dieldrin	2.5E-05	3.2E+01	NA	1.82E-02								
Endosulfan I	6.0E-03	NA	NA	1.78E-02								
Endosulfan II	6.0E-03	NA	NA	4.99E-03								
Endrin	3.0E-04	NA	NA	6.02E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	2.45E-03								
alpha-BHC	NA	NA	NA	2.82E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	4.07E-02								
gamma-BHC (Lindane)	3.0E-04	NA	NA	9.30E-04								
gamma-Chlordane	6.0E-05	1.3E+00	NA	3.27E-02								
Nitroaromatics												
2,4,6-Trinitrotoluene	5.0E-04	3.0E-02	NA	1.02E-01								
Metals												
Antimony	4.0E-04	NA	NA	1.56E+03								
Arsenic	2.4E-04	1.9E+00	0.001	3.73E+01								
Barium	3.5E-03	NA	NA	4.05E+04								
Cadmium	5.0E-05	NA	0.010	1.27E+02								
Copper	2.4E-02	NA	NA	8.14E+04								
Cyanide	1.0E-02	NA	NA	2.42E+01								
Lead	NA	NA	NA	5.27E+05								
Mercury	3.0E-06	NA	NA	3.93E+01								
Selenium	4.5E-03	NA	NA	5.80E+00								
Silver	1.0E-03	NA	NA	2.27E+01								
Sodium	NA	NA	NA	3.69E+03								
Thallium	8.0E-05	NA	NA	8.97E-01								
Zinc	7.5E-02	NA	NA	4.26E+04								
Herbicides												
2,4,5-T	1.0E-02	NA	NA	8.01E-03								
2,4,5-TP (Silvex)	8.0E-03	NA	NA	5.82E-03								
2,4-D	1.0E-02	NA	NA	9.29E-02								
2,4-DB	8.0E-03	NA	NA	8.65E-02								
Dichloroprop	NA	NA	NA	5.34E-02								
MCPA	5.0E-04	NA	NA	5.90E+00								
MCPP	1.0E-03	NA	NA	1.28E+01								
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
* 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-16PR-16
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study.
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; ED = Exposure Duration
SA = Surface Area Contact; BW = Bodyweight
EF = Exposure Frequency; 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; τ = Lag Time
CW = EPC Surface Water; CF = Conversion Factor
ET = Exposure 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	Carc. Slope Dermal	EPC Surface Water	τ	Kp	Current Site Worker				Future Industrial Worker			
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient	Ca R
	(mg/kg-day)	(mg/kg-day)-1	(mg/L)	(hours)	(cm/hr)	(Nc)	(Car)			(Nc)	(Car)		
Semivolatile Organics													
Di-n-butylphthalate	9.0E-02	NA	5.00E-04	4.3	3.30E-02								
Pentachlorophenol	3.0E-02	1.2E-01	4.00E-03	3.7	6.50E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	3.00E-03	21	3.30E-02								
Metals													
Aluminum	NA	NA	1.40E-01	NA	1.00E-03			**Onsite Surface Water Dermal Contact Not Applicable for Current Site Worker**				**Onsite Surface Water Dermal Contact Not Applicable for Future Industrial Worker**	
Antimony	4.0E-04	NA	5.74E-02	NA	1.00E-03								
Arsenic	2.4E-04	1.9E+00	3.68E-03	NA	1.00E-03								
Barium	3.5E-03	NA	1.54E-01	NA	1.00E-03								
Cadmium	5.0E-05	NA	1.39E-03	NA	1.00E-03								
Calcium	NA	NA	7.99E+01	NA	1.00E-03								
Chromium	1.0E-04	NA	1.90E-03	NA	2.00E-03								
Cobalt	NA	NA	2.31E-03	NA	4.00E-04								
Copper	2.4E-02	NA	1.12E-01	NA	1.00E-03								
Iron	3.0E-01	NA	3.65E+00	NA	1.00E-03								
Lead	NA	NA	5.32E-01	NA	4.00E-06								
Magnesium	NA	NA	1.01E+01	NA	1.00E-03								
Manganese	1.5E-03	NA	2.17E-01	NA	1.00E-03								
Mercury	3.0E-06	NA	2.29E-04	NA	1.00E-03								
Nickel	8.0E-04	NA	3.88E-03	NA	1.00E-03								
Potassium	NA	NA	3.42E+00	NA	1.00E-03								
Selenium	4.5E-03	NA	2.58E-03	NA	1.00E-03								
Silver	1.0E-03	NA	1.70E-03	NA	6.00E-04								
Sodium	NA	NA	6.87E+00	NA	1.00E-03								
Vanadium	7.0E-05	NA	4.11E-03	NA	1.00E-03								
Zinc	7.5E-02	NA	2.50E-01	NA	6.00E-04								
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.

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TABLE B-16PR-16
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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	ED = Exposure Duration
SA = Surface Area Contact	BW = Bodyweight
EF = Exposure Frequency	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; τ = Lag Time
CW = EPC Surface Water; CF = Conversion Factor
ET = Exposure 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	EPC Surface Water (mg/L)	τ (hours)	Kp (cm/hr)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Ca[ncer] R[isk]
Semivolatile Organics													
Di-n-butylphthalate	9.0E-02	NA	5.00E-04	4.3	3.30E-02					5.99E-07		7E-06	
Pentachlorophenol	3.0E-02	1.2E-01	4.00E-03	3.7	6.50E-01					8.76E-05	6.26E-06	3E-03	8E
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	3.00E-03	21	3.30E-02					7.95E-06	5.68E-07	8E-04	2E
Metals													
Aluminum	NA	NA	1.40E-01	NA	1.00E-03		Onsite Surface Water Dermal Contact Not Applicable for Future Construction Worker						
Antimony	4.0E-04	NA	5.74E-02	NA	1.00E-03					3.64E-07		9E-04	
Arsenic	2.4E-04	1.9E+00	3.68E-03	NA	1.00E-03					2.33E-08	1.67E-09	1E-04	3E
Barium	3.5E-03	NA	1.54E-01	NA	1.00E-03					9.76E-07		3E-04	
Cadmium	5.0E-05	NA	1.39E-03	NA	1.00E-03					8.81E-09		2E-04	
Calcium	NA	NA	7.99E+01	NA	1.00E-03								
Chromium	1.0E-04	NA	1.90E-03	NA	2.00E-03					2.41E-08		2E-04	
Cobalt	NA	NA	2.31E-03	NA	4.00E-04								
Copper	2.4E-02	NA	1.12E-01	NA	1.00E-03					7.10E-07		3E-05	
Iron	3.0E-01	NA	3.65E+00	NA	1.00E-03					2.31E-05		8E-05	
Lead	NA	NA	5.32E-01	NA	4.00E-06								
Magnesium	NA	NA	1.01E+01	NA	1.00E-03								
Manganese	1.5E-03	NA	2.17E-01	NA	1.00E-03					1.38E-06		9E-04	
Mercury	3.0E-06	NA	2.29E-04	NA	1.00E-03					1.45E-09		5E-04	
Nickel	8.0E-04	NA	3.88E-03	NA	1.00E-03					2.46E-08		3E-05	
Potassium	NA	NA	3.42E+00	NA	1.00E-03								
Selenium	4.5E-03	NA	2.58E-03	NA	1.00E-03					1.64E-08		4E-06	
Silver	1.0E-03	NA	1.70E-03	NA	6.00E-04					6.46E-09		6E-06	
Sodium	NA	NA	6.87E+00	NA	1.00E-03								
Vanadium	7.0E-05	NA	4.11E-03	NA	1.00E-03					2.60E-08		4E-04	
Zinc	7.5E-02	NA	2.50E-01	NA	6.00E-04					9.52E-07		1E-05	
Total Hazard Quotient and Cancer Risk:												**7E-03**	**8E**

Assumptions for Future Tresspasser Child

SA =	4625 cm2
EF =	25 days/year
ED =	5 years
BW =	50 kg
AT (Nc) =	1825 days
AT (Car) =	25550 days
ET =	1 hour/day
CF =	1E-03 liter/cm3

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-16PR-16
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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	ED = Exposure Duration
SA = Surface Area Contact	BW = Bodyweight
EF = Exposure Frequency	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 Surface Water
ET = Exposure Time
Tau = Lag Time
CF = Conversion Factor

Equation for Hazard Quotient =
Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk =
Chronic Daily Intake (Car) x Slope Factor

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	EPC Surface Water (mg/L)	Tau (hours)	Kp (cm/hr)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Ca Ri
Semivolatile Organics													
Di-n-butylphthalate	9.0E-02	NA	5.00E-04	4.3	3.30E-02								
Pentachlorophenol	3.0E-02	1.2E-01	4.00E-03	3.7	6.50E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	3.00E-03	21	3.30E-02								
Metals													
Aluminum	NA	NA	1.40E-01	NA	1.00E-03		Onsite Surface Water				Onsite Surface Water		
Antimony	4.0E-04	NA	5.74E-02	NA	1.00E-03		Dermal Contact				Dermal Contact		
Arsenic	2.4E-04	1.9E+00	3.68E-03	NA	1.00E-03		Not Applicable				Not Applicable		
Barium	3.5E-03	NA	1.54E-01	NA	1.00E-03		for Future				for Future		
Cadmium	5.0E-05	NA	1.39E-03	NA	1.00E-03		Day Care Center Child				Day Care Center Adult		
Calcium	NA	NA	7.99E+01	NA	1.00E-03								
Chromium	1.0E-04	NA	1.90E-03	NA	2.00E-03								
Cobalt	NA	NA	2.31E-03	NA	4.00E-04								
Copper	2.4E-02	NA	1.12E-01	NA	1.00E-03								
Iron	3.0E-01	NA	3.65E+00	NA	1.00E-03								
Lead	NA	NA	5.32E-01	NA	4.00E-06								
Magnesium	NA	NA	1.01E+01	NA	1.00E-03								
Manganese	1.5E-03	NA	2.17E-01	NA	1.00E-03								
Mercury	3.0E-06	NA	2.29E-04	NA	1.00E-03								
Nickel	8.0E-04	NA	3.88E-03	NA	1.00E-03								
Potassium	NA	NA	3.42E+00	NA	1.00E-03								
Selenium	4.5E-03	NA	2.58E-03	NA	1.00E-03								
Silver	1.0E-03	NA	1.70E-03	NA	6.00E-04								
Sodium	NA	NA	6.87E+00	NA	1.00E-03								
Vanadium	7.0E-05	NA	4.11E-03	NA	1.00E-03								
Zinc	7.5E-02	NA	2.50E-01	NA	6.00E-04								
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.

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TABLE B-16PR-17
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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 Sediment	Current Site Worker				Future Industrial 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)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											
2-Butanone	6.0E-01	NA	1.01E-02								
Acetone	1.0E-01	NA	2.38E-02								
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.04E+00			Ingestion of				Ingestion of	
2-Methylnaphthalene	4.0E-02	NA	5.50E-02			Onsite Sediment				Onsite Sediment	
Acenaphthene	6.0E-02	NA	3.20E-02			Not Applicable				Not Applicable	
Acenaphthylene	NA	NA	5.40E-02			for Current				for Future	
Anthracene	3.0E-01	NA	1.00E-01			Site Worker				Industrial Worker	
Benzo(a)anthracene	NA	7.3E-01	3.39E-01								
Benzo(a)pyrene	NA	7.3E+00	3.81E-01								
Benzo(b)fluoranthene	NA	7.3E-01	7.43E-01								
Benzo(g,h,i)perylene	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	4.43E-01								
Carbazole	NA	2.0E-02	1.10E-01								
Chrysene	NA	7.3E-03	1.16E+00								
Di-n-butylphthalate	1.0E-01	NA	2.50E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	1.70E-01								
Fluoranthene	4.0E-02	NA	1.60E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.23E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	3.81E-01								
Phenanthrene	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	6.60E-01								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	2.30E-01								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	7.30E-01								
4,4'-DDE	NA	3.4E-01	5.70E-01								
4,4'-DDT	5.0E-04	3.4E-01	4.20E-01								
Aroclor-1254	2.0E-05	2.0E+00	3.00E-01								
Aroclor-1260	2.0E-05	2.0E+00	8.00E-02								
Endosulfan I	6.0E-03	NA	2.59E-02								
Endosulfan II	6.0E-03	NA	4.31E-03								
Endosulfan sulfate	6.0E-03	NA	7.58E-03								
Endrin aldehyde	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.96E-03								
alpha-Chlordane	6.0E-05	1.3E+00	8.44E-03								
gamma-Chlordane	6.0E-05	1.3E+00	2.38E-03								
Metals											
Aluminum	1.0E+00	NA	1.69E+04								
Antimony	4.0E-04	NA	5.03E+01								
Arsenic	3.0E-04	1.5E+00	7.39E+00								
Barium	7.0E-02	NA	2.53E+03								
Beryllium	5.0E-03	4.3E+00	6.95E-01								
Cadmium	5.0E-04	NA	4.55E+00								
Calcium	NA	NA	5.14E+04								
Chromium	5.0E-03	NA	3.39E+01								
Cobalt	NA	NA	1.18E+01								
Copper	4.0E-02	NA	1.40E+04								
Iron	3.0E-01	NA	3.38E+04								
Lead	NA	NA	2.22E+03								
Magnesium	NA	NA	1.02E+04								
Manganese	5.0E-02	NA	3.31E+02								
Mercury	3.0E-04	NA	2.50E+00								
Nickel	2.0E-02	NA	4.04E+01								
Potassium	NA	NA	2.63E+03								
Selenium	5.0E-03	NA	1.98E+00								
Silver	5.0E-03	NA	2.69E-01								
Sodium	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	9.31E-01								
Vanadium	7.0E-03	NA	3.14E+01								
Zinc	3.0E-01	NA	5.02E+02								
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.

TABLE B-16PR-17
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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 Sediment	Future Construction Worker Intake (mg/kg-day)		Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day)		Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											
2-Butanone	6.0E-01	NA	1.01E-02					2.78E-09		5E-09	
Acetone	1.0E-01	NA	2.38E-02					6.53E-09		7E-08	
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.04E+00			Ingestion of		8.33E-07	5.95E-08	4E-04	4E-08
2-Methylnaphthalene	4.0E-02	NA	5.50E-02			Onsite Sediment		1.51E-08		4E-07	
Acenaphthene	6.0E-02	NA	3.20E-02			Not Applicable		8.77E-09		1E-07	
Acenaphthylene	NA	NA	5.40E-02			for Future					
Anthracene	3.0E-01	NA	1.00E-01			Construction Worker		2.74E-08		9E-08	
Benzo(a)anthracene	NA	7.3E-01	3.39E-01						6.62E-09		5E-09
Benzo(a)pyrene	NA	7.3E+00	3.81E-01						7.45E-09		5E-08
Benzo(b)fluoranthene	NA	7.3E-01	7.43E-01						1.45E-08		1E-08
Benzo(g,h,i)perylene	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	4.43E-01						8.66E-09		6E-10
Carbazole	NA	2.0E-02	1.10E-01						2.15E-09		4E-11
Chrysene	NA	7.3E-03	1.16E+00						2.27E-08		2E-10
Di-n-butylphthalate	1.0E-01	NA	2.50E-01					6.85E-08		7E-07	
Dibenz(a,h)anthracene	NA	7.3E+00	1.70E-01						3.33E-09		2E-08
Fluoranthene	4.0E-02	NA	1.60E+00					4.38E-07		1E-05	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.23E-01						6.31E-09		5E-09
N-Nitrosodiphenylamine (1)	NA	4.9E-03	3.81E-01						7.45E-09		4E-11
Phenanthrene	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	6.60E-01					1.81E-07		6E-06	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	2.30E-01					6.31E-08	4.51E-09	3E-06	6E-11
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	7.30E-01						1.43E-08		3E-09
4,4'-DDE	NA	3.4E-01	5.70E-01						1.12E-08		4E-09
4,4'-DDT	5.0E-04	3.4E-01	4.20E-01					1.15E-07	8.22E-09	2E-04	3E-09
Aroclor-1254	2.0E-05	2.0E+00	3.00E-01					8.21E-08	5.87E-09	4E-03	1E-08
Aroclor-1260	2.0E-05	2.0E+00	8.00E-02					2.19E-08	1.57E-09	1E-03	3E-09
Endosulfan I	6.0E-03	NA	2.59E-02					7.10E-09		1E-06	
Endosulfan II	6.0E-03	NA	4.31E-03					1.18E-09		2E-07	
Endosulfan sulfate	6.0E-03	NA	7.58E-03					2.08E-09		3E-07	
Endrin aldehyde	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.96E-03					5.36E-10	3.83E-11	4E-05	3E-10
alpha-Chlordane	6.0E-05	1.3E+00	8.44E-03					2.31E-09	1.65E-10	4E-05	2E-10
gamma-Chlordane	6.0E-05	1.3E+00	2.38E-03					6.51E-10	4.65E-11	1E-05	6E-11
Metals											
Aluminum	1.0E+00	NA	1.69E+04					4.62E-03		5E-03	
Antimony	4.0E-04	NA	5.03E+01					1.38E-05		3E-02	
Arsenic	3.0E-04	1.5E+00	7.39E+00					2.02E-06	1.45E-07	7E-03	2E-07
Barium	7.0E-02	NA	2.53E+03					6.93E-04		1E-02	
Beryllium	5.0E-03	4.3E+00	6.95E-01					1.90E-07	1.36E-08	4E-05	6E-08
Cadmium	5.0E-04	NA	4.55E+00					1.25E-06		2E-03	
Calcium	NA	NA	5.14E+04								
Chromium	5.0E-03	NA	3.39E+01					9.30E-06		2E-03	
Cobalt	NA	NA	1.18E+01								
Copper	4.0E-02	NA	1.40E+04					3.85E-03		1E-01	
Iron	3.0E-01	NA	3.38E+04					9.26E-03		3E-02	
Lead	NA	NA	2.22E+03								
Magnesium	NA	NA	1.02E+04								
Manganese	5.0E-02	NA	3.31E+02					9.07E-05		2E-03	
Mercury	3.0E-04	NA	2.50E+00					6.85E-07		2E-03	
Nickel	2.0E-02	NA	4.04E+01					1.11E-05		6E-04	
Potassium	NA	NA	2.63E+03								
Selenium	5.0E-03	NA	1.98E+00					5.41E-07			
Silver	5.0E-03	NA	2.69E-01					7.38E-08			
Sodium	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	9.31E-01					2.55E-07		3E-03	
Vanadium	7.0E-03	NA	3.14E+01					8.60E-06		1E-03	
Zinc	3.0E-01	NA	5.02E+02					1.37E-04			
Total Hazard Quotient and Cancer Risk:										**2E-01**	**4E-07**

Assumptions for Future Tresspasser Child

IR =	200	mg sed/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	25	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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-16PR-17
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Sediment (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics											
2-Butanone	6.0E-01	NA	1.01E-02								
Acetone	1.0E-01	NA	2.38E-02								
Semivolatile Organics											
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.04E+00			Ingestion of				Ingestion of	
2-Methylnaphthalene	4.0E-02	NA	5.50E-02			Onsite Sediment				Onsite Sediment	
Acenaphthene	6.0E-02	NA	3.20E-02			Not Applicable				Not Applicable	
Acenaphthylene	NA	NA	5.40E-02			for Future				for Future	
Anthracene	3.0E-01	NA	1.00E-01			Day Care Center Child				Day Care Center Worker	
Benzo(a)anthracene	NA	7.3E-01	3.39E-01								
Benzo(a)pyrene	NA	7.3E+00	3.81E-01								
Benzo(b)fluoranthene	NA	7.3E-01	7.43E-01								
Benzo(g,h,i)perylene	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	4.43E-01								
Carbazole	NA	2.0E-02	1.10E-01								
Chrysene	NA	7.3E-03	1.16E+00								
Di-n-butylphthalate	1.0E-01	NA	2.50E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	1.70E-01								
Fluoranthene	4.0E-02	NA	1.60E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.23E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	3.81E-01								
Phenanthrene	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	6.60E-01								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	2.30E-01								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	7.30E-01								
4,4'-DDE	NA	3.4E-01	5.70E-01								
4,4'-DDT	5.0E-04	3.4E-01	4.20E-01								
Aroclor-1254	2.0E-05	2.0E+00	3.00E-01								
Aroclor-1260	2.0E-05	2.0E+00	8.00E-02								
Endosulfan I	6.0E-03	NA	2.59E-02								
Endosulfan II	6.0E-03	NA	4.31E-03								
Endosulfan sulfate	6.0E-03	NA	7.58E-03								
Endrin aldehyde	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.96E-03								
alpha-Chlordane	6.0E-05	1.3E+00	8.44E-03								
gamma-Chlordane	6.0E-05	1.3E+00	2.38E-03								
Metals											
Aluminum	1.0E+00	NA	1.69E+04								
Antimony	4.0E-04	NA	5.03E+01								
Arsenic	3.0E-04	1.5E+00	7.39E+00								
Barium	7.0E-02	NA	2.53E+03								
Beryllium	5.0E-03	4.3E+00	6.95E-01								
Cadmium	5.0E-04	NA	4.55E+00								
Calcium	NA	NA	5.14E+04								
Chromium	5.0E-03	NA	3.39E+01								
Cobalt	NA	NA	1.18E+01								
Copper	4.0E-02	NA	1.40E+04								
Iron	3.0E-01	NA	3.38E+04								
Lead	NA	NA	2.22E+03								
Magnesium	NA	NA	1.02E+04								
Manganese	5.0E-02	NA	3.31E+02								
Mercury	3.0E-04	NA	2.50E+00								
Nickel	2.0E-02	NA	4.04E+01								
Potassium	NA	NA	2.63E+03								
Selenium	5.0E-03	NA	1.98E+00								
Silver	5.0E-03	NA	2.69E-01								
Sodium	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	9.31E-01								
Vanadium	7.0E-03	NA	3.14E+01								
Zinc	3.0E-01	NA	5.02E+02								
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.

TABLE B-16PR-18
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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	Carc. Slope Dermal	Absorption Factor*	EPC Sediment	Current Site Worker: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
2-Butanone	6.0E-01	NA	NA	1.01E-02								
Acetone	1.0E-01	NA	NA	2.38E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.04E+00		**Contact to**				**Contact to**		
2-Methylnaphthalene	4.0E-02	NA	NA	5.50E-02		**Onsite Sediment**				**Onsite Sediment**		
Acenaphthene	6.0E-02	NA	NA	3.20E-02		**Not Applicable**				**Not Applicable**		
Acenaphthylene	NA	NA	NA	5.40E-02		**for Current**				**for Future**		
Anthracene	3.0E-01	NA	NA	1.00E-01		**Site Worker**				**Industrial Worker**		
Benzo(a)anthracene	NA	7.3E-01	NA	3.39E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.81E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	7.43E-01								
Benzo(g,h,i)perylene	NA	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	4.43E-01								
Carbazole	NA	2.0E-02	NA	1.10E-01								
Chrysene	NA	7.3E-03	NA	1.16E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	2.50E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.70E-01								
Fluoranthene	4.0E-02	NA	NA	1.60E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.23E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	3.81E-01								
Phenanthrene	NA	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	NA	6.60E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	2.30E-01								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	7.30E-01								
4,4'-DDE	NA	1.7E+00	NA	5.70E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.20E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.06	3.00E-01								
Aroclor-1260	1.8E-05	2.2E+00	0.06	8.00E-02								
Endosulfan I	6.0E-03	NA	NA	2.59E-02								
Endosulfan II	6.0E-03	NA	NA	4.31E-03								
Endosulfan sulfate	6.0E-03	NA	NA	7.58E-03								
Endrin aldehyde	NA	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.96E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	8.44E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.38E-03								
Metals												
Aluminum	NA	NA	NA	1.69E+04								
Antimony	4.0E-04	NA	NA	5.03E+01								
Arsenic	2.4E-04	1.9E+00	0.001	7.39E+00								
Barium	3.5E-03	NA	NA	2.53E+03								
Beryllium	5.0E-05	4.3E+02	NA	6.95E-01								
Cadmium	5.0E-05	NA	0.01	4.55E+00								
Calcium	NA	NA	NA	5.14E+04								
Chromium	1.0E-04	NA	NA	3.39E+01								
Cobalt	NA	NA	NA	1.18E+01								
Copper	2.4E-02	NA	NA	1.40E+04								
Iron	3.0E-01	NA	NA	3.38E+04								
Lead	NA	NA	NA	2.22E+03								
Magnesium	NA	NA	NA	1.02E+04								
Manganese	1.5E-03	NA	NA	3.31E+02								
Mercury	3.0E-06	NA	NA	2.50E+00								
Nickel	8.0E-04	NA	NA	4.04E+01								
Potassium	NA	NA	NA	2.63E+03								
Selenium	4.5E-03	NA	NA	1.98E+00								
Silver	1.0E-03	NA	NA	2.69E-01								
Sodium	NA	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	NA	9.31E-01								
Vanadium	7.0E-05	NA	NA	3.14E+01								
Zinc	7.5E-02	NA	NA	5.02E+02								
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.
* 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 concer

TABLE B-16PR-18
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Sediment (mg/kg)	Future Construction Worker Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics												
2-Butanone	6.0E-01	NA	NA	1.01E-02								
Acetone	1.0E-01	NA	NA	2.38E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.04E+00			Contact to Onsite Sediment Not Applicable for Future Construction Worker					
2-Methylnaphthalene	4.0E-02	NA	NA	5.50E-02								
Acenaphthene	6.0E-02	NA	NA	3.20E-02								
Acenaphthylene	NA	NA	NA	5.40E-02								
Anthracene	3.0E-01	NA	NA	1.00E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	3.39E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.81E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	7.43E-01								
Benzo(g,h,i)perylene	NA	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	4.43E-01								
Carbazole	NA	2.0E-02	NA	1.10E-01								
Chrysene	NA	7.3E-03	NA	1.16E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	2.50E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.70E-01								
Fluoranthene	4.0E-02	NA	NA	1.60E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.23E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	3.81E-01								
Phenanthrene	NA	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	NA	6.60E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	2.30E-01								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	7.30E-01								
4,4'-DDE	NA	1.7E+00	NA	5.70E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.20E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.06	3.00E-01					1.1E-07	8.1E-09	6E-03	2E-08
Aroclor-1260	1.8E-05	2.2E+00	0.06	8.00E-02					3.0E-08	2.2E-09	2E-03	5E-09
Endosulfan I	6.0E-03	NA	NA	2.59E-02								
Endosulfan II	6.0E-03	NA	NA	4.31E-03								
Endosulfan sulfate	6.0E-03	NA	NA	7.58E-03								
Endrin aldehyde	NA	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.96E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	8.44E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.38E-03								
Metals												
Aluminum	NA	NA	NA	1.69E+04								
Antimony	4.0E-04	NA	NA	5.03E+01								
Arsenic	2.4E-04	1.9E+00	0.001	7.39E+00					4.7E-08	3.3E-09	2E-04	6E-09
Barium	3.5E-03	NA	NA	2.53E+03								
Beryllium	5.0E-05	4.3E+02	NA	6.95E-01								
Cadmium	5.0E-05	NA	0.01	4.55E+00					2.9E-07		6E-03	
Calcium	NA	NA	NA	5.14E+04								
Chromium	1.0E-04	NA	NA	3.39E+01								
Cobalt	NA	NA	NA	1.18E+01								
Copper	2.4E-02	NA	NA	1.40E+04								
Iron	3.0E-01	NA	NA	3.38E+04								
Lead	NA	NA	NA	2.22E+03								
Magnesium	NA	NA	NA	1.02E+04								
Manganese	1.5E-03	NA	NA	3.31E+02								
Mercury	3.0E-06	NA	NA	2.50E+00								
Nickel	8.0E-04	NA	NA	4.04E+01								
Potassium	NA	NA	NA	2.63E+03								
Selenium	4.5E-03	NA	NA	1.98E+00								
Silver	1.0E-03	NA	NA	2.69E-01								
Sodium	NA	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	NA	9.31E-01								
Vanadium	7.0E-05	NA	NA	3.14E+01								
Zinc	7.5E-02	NA	NA	5.02E+02								
Total Hazard Quotient and Cancer Risk:											1E-02	3E-08

Assumptions for Future Tresspasser Child

CF =	1E-06	kg/mg
SA =	4625	cm2
AF =	1	mg/cm2
EF =	25	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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 B-16PR-18
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Sediment (mg/kg)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
2-Butanone	6.0E-01	NA	NA	1.01E-02								
Acetone	1.0E-01	NA	NA	2.38E-02								
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.04E+00			**Contact to**				**Contact to**	
2-Methylnaphthalene	4.0E-02	NA	NA	5.50E-02			**Onsite Sediment**				**Onsite Sediment**	
Acenaphthene	6.0E-02	NA	NA	3.20E-02			**Not Applicable**				**Not Applicable**	
Acenaphthylene	NA	NA	NA	5.40E-02			**for Future**				**for Future**	
Anthracene	3.0E-01	NA	NA	1.00E-01			**Day Care Center Child**				**Day Care Center Worker**	
Benzo(a)anthracene	NA	7.3E-01	NA	3.39E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.81E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	7.43E-01								
Benzo(g,h,i)perylene	NA	NA	NA	3.37E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	4.43E-01								
Carbazole	NA	2.0E-02	NA	1.10E-01								
Chrysene	NA	7.3E-03	NA	1.16E+00								
Di-n-butylphthalate	9.0E-02	NA	NA	2.50E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.70E-01								
Fluoranthene	4.0E-02	NA	NA	1.60E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.23E-01								
N-Nitrosodiphenylamine (1)	NA	4.9E-03	NA	3.81E-01								
Phenanthrene	NA	NA	NA	2.88E-01								
Pyrene	3.0E-02	NA	NA	6.60E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	2.30E-01								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	7.30E-01								
4,4'-DDE	NA	1.7E+00	NA	5.70E-01								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.20E-01								
Aroclor-1254	1.8E-05	2.2E+00	0.06	3.00E-01								
Aroclor-1260	1.8E-05	2.2E+00	0.06	8.00E-02								
Endosulfan I	6.0E-03	NA	NA	2.59E-02								
Endosulfan II	6.0E-03	NA	NA	4.31E-03								
Endosulfan sulfate	6.0E-03	NA	NA	7.58E-03								
Endrin aldehyde	NA	NA	NA	3.20E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.96E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	8.44E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.38E-03								
Metals												
Aluminum	NA	NA	NA	1.69E+04								
Antimony	4.0E-04	NA	NA	5.03E+01								
Arsenic	2.4E-04	1.9E+00	0.001	7.39E+00								
Barium	3.5E-03	NA	NA	2.53E+03								
Beryllium	5.0E-05	4.3E+02	NA	6.95E-01								
Cadmium	5.0E-05	NA	0.01	4.55E+00								
Calcium	NA	NA	NA	5.14E+04								
Chromium	1.0E-04	NA	NA	3.39E+01								
Cobalt	NA	NA	NA	1.18E+01								
Copper	2.4E-02	NA	NA	1.40E+04								
Iron	3.0E-01	NA	NA	3.38E+04								
Lead	NA	NA	NA	2.22E+03								
Magnesium	NA	NA	NA	1.02E+04								
Manganese	1.5E-03	NA	NA	3.31E+02								
Mercury	3.0E-06	NA	NA	2.50E+00								
Nickel	8.0E-04	NA	NA	4.04E+01								
Potassium	NA	NA	NA	2.63E+03								
Selenium	4.5E-03	NA	NA	1.98E+00								
Silver	1.0E-03	NA	NA	2.69E-01								
Sodium	NA	NA	NA	4.73E+02								
Thallium	8.0E-05	NA	NA	9.31E-01								
Vanadium	7.0E-05	NA	NA	3.14E+01								
Zinc	7.5E-02	NA	NA	5.02E+02								
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.
* 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-16PR-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

ssumptions for Each Receptor are Listed at the Bottom):
ical Concentration in Groundwater, from Groundwater EPC Data — ED=Exposure Duration
on Rate — BW=Bodyweight
ure Frequency — AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

nalyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk	Future Construction W… Intake (mg/kg-day)		Haza… Quoti…
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
e Organics				Ingestion of Groundwater Not Applicable for Current Site Worker								Ingestion of Groundwater Not Applicable for Future Construction Work…		
ne	NA	NA	1.54E-02											
line	4.0E-03	NA	6.16E-03					1.21E-04		3E-02				
erylene	NA	NA	1.00E-03											
anthracene	NA	7.3E+00	7.00E-04						4.89E-06		4E-05			
-cd]pyrene	NA	7.3E-01	6.00E-04						4.19E-06		3E-06			
tics														
enzene	1.0E-04	NA	4.71E-04					9.22E-06		9E-02				
oluene	2.0E-03	6.8E-01	2.41E-04					4.72E-06	1.68E-06	2E-03	1E-06			
	4.0E-02	NA	5.68E-02					1.11E-03		3E-02				
	NA	NA	2.41E-02											
	NA	NA	4.09E+02											
	8.0E-05	NA	6.14E-03					1.20E-04		2E+00				
	7.0E-03	NA	2.45E-03					4.79E-05		7E-03				
ard Quotient and Cancer Risk:										**2E+00**	**4E-05**			

Assumptions for Future Industrial Worker

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

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ation not available.

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TABLE B-16PR-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

r 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

Assumptions for Each Receptor are Listed at the Bottom):
nical Concentration in Groundwater, from Groundwater EPC Data
on Rate
sure Frequency

ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Future Tresspasser Child Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Future Day Care Center Child Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Future Day Care Cent Intake (mg/kg-day)		Haza Quoti
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
e Organics														
ne	NA	NA	1.54E-02		Ingestion of Groundwater Not Applicable for Future Tresspasser Child									
line	4.0E-03	NA	6.16E-03					2.81E-04		7E-02		1.21E-04		3E-0
perylene	NA	NA	1.00E-03											
anthracene	NA	7.3E+00	7.00E-04						2.74E-06		2E-05		4.89E-06	
3-cd]pyrene	NA	7.3E-01	6.00E-04						2.35E-06		2E-06		4.19E-06	
atics														
benzene	1.0E-04	NA	4.71E-04					2.15E-05		2E-01		9.22E-06		9E-0
oluene	2.0E-03	6.8E-01	2.41E-04					1.10E-05	9.43E-07	6E-03	6E-07	4.72E-06	1.68E-06	2E-0
	4.0E-02	NA	5.68E-02					2.59E-03		6E-02		1.11E-03		3E-0
	NA	NA	2.41E-02											
	NA	NA	4.09E+02											
	8.0E-05	NA	6.14E-03					2.80E-04		4E+00		1.20E-04		2E+0
	7.0E-03	NA	2.45E-03					1.12E-04		2E-02		4.79E-05		7E-0
zard Quotient and Cancer Risk:										4E+00	2E-05			2E+0

Assumptions for Future 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 Future Day Car		
IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

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ation not available.

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SEAD-16

POST REMEDIATION

TABLE B-16PO-1

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-16PO-7	1E-04	4E-12
	Ingestion of Onsite Soils	Table B-16PO-8	3E-03	2E-06
	Dermal Contact to Onsite Soils	Table B-16PO-9	5E-04	1E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-03*	*2E-06*
FUTURE INDUSTRIAL WORKER	Inhalation of Dust in Indoor Air	NA	NA	NA
	Ingestion of Indoor Dust	NA	NA	NA
	Dermal Contact to Indoor Dust	NA	NA	NA
	Ingestion of Groundwater	Table B-16PR-19	2E+00	4E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+00*	*4E-05*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-16PO-7	1E-02	2E-11
	Ingestion of Onsite Soils	Table B-16PO-8	2E-01	4E-06
	Dermal Contact to Onsite Soils	Table B-16PO-9	7E-03	5E-09
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-01*	*4E-06*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-16PO-7	4E-05	4E-13
	Ingestion of Onsite Soils	Table B-16PO-8	2E-02	3E-06
	Dermal Contact to Onsite Soils	Table B-16PO-9	1E-03	5E-09
	Dermal Contact to Surface Water while Wading	Table B-16PR-16	7E-03	8E-07
	Ingestion of Onsite Sediment	NA	NA	NA
	Dermal Contact to Sediment while Wading	NA	NA	NA
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-02*	*4E-06*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-16PO-7	2E-03	3E-11
	Ingestion of Onsite Soils	Table B-16PO-8	3E-01	6E-05
	Dermal Contact to Onsite Soils	Table B-16PO-9	1E-02	5E-08
	Ingestion of Groundwater	Table B-16PR-19	4E+00	2E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*4E+00*	*8E-05*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-16PO-7	1E-03	5E-11
	Ingestion of Onsite Soils	Table B-16PO-8	3E-02	3E-05
	Dermal Contact to Onsite Soils	Table B-16PO-9	7E-03	1E-07
	Ingestion of Groundwater	Table B-16PR-19	2E+00	4E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+00*	*7E-05*

Notes:
Remediation consists of removal of all surface and subsurface soils with lead concentrations > 1250ppm and sediments with lead concentrations > 31ppm.
NA = Not Applicable. Indoor dust and sediment will be remediated resulting in minimal risk by this exposure route.

TABLE B-16PO-2

Indoor Air Exposure Point Concentration Summary - Post Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Exposure to indoor air and dust will be eliminated by remedial activities.

TABLE B-16PO-3

Surface Soils Exposure Point Concentration Summary - Post Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
1,1,2,2-Tetrachloroethane	37	0	1	3.00%	6.59E-03	3.73E-03	1.05E-02	FALSE	7.13E-03	7.13E-03
Acetone	36	1	1	3.00%	6.03E-03	2.26E-03	7.00E-03	FALSE	6.51E-03	6.51E-03
Benzene	36	1	3	8.00%	5.88E-03	1.88E-03	5.00E-03	FALSE	6.53E-03	5.00E-03
Carbon disulfide	36	1	2	6.00%	5.85E-03	1.58E-03	6.50E-03	FALSE	6.33E-03	6.33E-03
Chloroform	36	1	2	6.00%	4.44E-03	1.91E-03	2.00E-03	FALSE	5.12E-03	2.00E-03
Methylene chloride	36	1	2	6.00%	5.90E-03	1.78E-03	3.00E-03	FALSE	6.38E-03	3.00E-03
Toluene	37	0	11	30.00%	6.14E-03	4.18E-03	1.00E-02	FALSE	7.49E-03	7.49E-03
Total Xylenes	37	0	1	3.00%	6.50E-03	3.67E-03	7.00E-03	FALSE	6.99E-03	6.99E-03
Semivolatile Organics										
2,4-Dinitrotoluene	37	0	7	19.00%	1.93E+00	7.46E+00	2.20E+00	FALSE	1.73E+00	1.73E+00
2,6-Dinitrotoluene	29	8	4	14.00%	2.12E-01	9.72E-02	1.80E-01	FALSE	2.54E-01	1.80E-01
2-Methylnaphthalene	37	0	4	11.00%	1.06E+00	3.26E+00	1.90E+01	FALSE	1.08E+00	1.08E+00
2-Methylphenol	29	8	1	3.00%	2.24E-01	9.21E-02	1.20E-01	FALSE	2.50E-01	1.20E-01
Acenaphthene	37	0	6	16.00%	2.48E+00	1.18E+01	7.20E+01	FALSE	1.74E+00	1.74E+00
Acenaphthylene	31	6	6	19.00%	2.31E-01	1.69E-01	3.10E-01	FALSE	2.98E-01	2.98E-01
Anthracene	37	0	8	22.00%	3.79E+00	1.97E+01	1.20E+02	FALSE	1.71E+00	1.71E+00
Benzo(a)anthracene	37	0	19	51.00%	6.57E+00	3.61E+01	2.20E+02	FALSE	4.73E+00	4.73E+00
Benzo(a)pyrene	37	0	21	57.00%	6.14E+00	3.28E+01	2.00E+02	FALSE	6.63E+00	6.63E+00
Benzo(b)fluoranthene	37	0	20	54.00%	6.22E+00	3.28E+01	2.00E+02	FALSE	6.88E+00	6.88E+00
Benzo(ghi)perylene	37	0	18	49.00%	3.39E+00	1.64E+01	1.00E+02	FALSE	3.12E+00	3.12E+00
Benzo(k)fluoranthene	37	0	17	46.00%	5.17E+00	2.79E+01	1.70E+02	FALSE	3.38E+00	3.38E+00
Bis(2-Ethylhexyl)phthalate	36	1	7	19.00%	5.70E-01	1.23E+00	2.10E+00	FALSE	1.26E+00	1.26E+00
Carbazole	37	0	7	19.00%	2.94E+00	1.46E+01	8.90E+01	FALSE	1.73E+00	1.73E+00
Chrysene	37	0	25	68.00%	6.54E+00	3.61E+01	2.20E+02	FALSE	5.59E+00	5.59E+00
Dibenz(a,h)anthracene	37	0	12	32.00%	1.84E+00	8.05E+00	4.90E+01	FALSE	1.86E+00	1.86E+00
Dibenzofuran	37	0	3	8.00%	1.91E+00	8.21E+00	5.00E+01	FALSE	1.40E+00	1.40E+00
Diethyl phthalate	29	8	2	7.00%	2.16E-01	1.05E-01	1.90E-02	FALSE	3.17E-01	1.90E-02
Di-n-butylphthalate	37	0	9	24.00%	1.76E+00	7.49E+00	1.30E+00	FALSE	1.30E+00	1.30E+00
Fluoranthene	37	0	25	68.00%	1.50E+01	8.70E+01	5.30E+02	FALSE	6.28E+00	6.28E+00
Fluorene	37	0	3	8.00%	2.67E+00	1.28E+01	7.80E+01	FALSE	1.49E+00	1.49E+00
Indeno(1,2,3-cd)pyrene	37	0	15	41.00%	3.36E+00	1.64E+01	1.00E+02	FALSE	3.07E+00	3.07E+00
Naphthalene	37	0	5	14.00%	2.33E+00	1.08E+01	6.60E+01	FALSE	1.63E+00	1.63E+00
N-Nitrosodiphenylamine	35	2	9	26.00%	3.78E-01	4.98E-01	6.80E-01	FALSE	6.08E-01	6.08E-01
Pentachlorophenol	35	2	1	3.00%	9.79E-01	1.15E+00	1.20E+00	FALSE	1.17E+00	1.17E+00
Phenanthrene	37	0	20	54.00%	1.38E+01	8.05E+01	4.90E+02	FALSE	4.89E+00	4.89E+00
Pyrene	37	0	26	70.00%	1.04E+01	5.91E+01	3.60E+02	FALSE	6.75E+00	6.75E+00
Pesticides/PCBs										
4,4'-DDD	37	0	3	8.00%	2.97E-03	3.60E-03	5.00E-03	FALSE	3.24E-03	3.24E-03
4,4'-DDE	37	0	22	59.00%	1.42E-02	2.48E-02	1.40E-01	FALSE	2.29E-02	2.29E-02
4,4'-DDT	37	0	21	57.00%	8.72E-03	1.58E-02	8.90E-02	FALSE	1.11E-02	1.11E-02
Alpha-Chlordane	37	0	6	16.00%	2.04E-03	2.20E-03	8.60E-03	FALSE	2.46E-03	2.46E-03
Aroclor-1260	37	0	2	5.00%	3.14E-02	3.82E-02	1.10E-01	FALSE	3.46E-02	3.46E-02
Beta-BHC	37	0	1	3.00%	1.79E-03	3.36E-03	2.00E-02	FALSE	1.80E-03	1.80E-03
Delta-BHC	37	0	1	3.00%	1.53E-03	1.85E-03	2.20E-03	FALSE	1.66E-03	1.66E-03
Dieldrin	37	0	2	5.00%	3.03E-03	4.20E-03	2.60E-02	FALSE	3.29E-03	3.29E-03
Endosulfan I	37	0	11	30.00%	1.51E-02	7.05E-02	4.30E-01	FALSE	8.79E-03	8.79E-03
Endosulfan II	37	0	3	8.00%	3.06E-03	3.60E-03	5.00E-03	FALSE	3.37E-03	3.37E-03
Endosulfan sulfate	37	0	1	3.00%	2.96E-03	3.88E-03	2.00E-02	FALSE	3.17E-03	3.17E-03
Endrin	37	0	3	8.00%	3.88E-03	7.23E-03	4.30E-02	FALSE	4.05E-03	4.05E-03
Endrin aldehyde	37	0	2	5.00%	3.03E-03	3.64E-03	6.50E-03	FALSE	3.34E-03	3.34E-03
Endrin ketone	37	0	4	11.00%	4.46E-03	1.16E-02	7.10E-02	FALSE	4.08E-03	4.08E-03
Gamma-Chlordane	37	0	5	14.00%	2.16E-03	2.52E-03	9.40E-03	FALSE	2.60E-03	2.60E-03
Heptachlor epoxide	37	0	4	11.00%	1.55E-03	1.84E-03	2.10E-03	FALSE	1.70E-03	1.70E-03
Metals										
Antimony	37	0	21	57.00%	2.57E+00	3.23E+00	1.71E+01	FALSE	4.78E+00	4.78E+00
Barium	37	0	37	100.00%	9.15E+01	4.93E+01	2.11E+02	FALSE	1.10E+02	1.10E+02
Copper	37	0	37	100.00%	5.66E+01	5.19E+01	2.04E+02	FALSE	6.98E+01	6.98E+01
Lead	37	0	37	100.00%	1.85E+02	2.20E+02	7.20E+02	FALSE	3.54E+02	3.54E+02
Mercury	37	0	27	73.00%	1.90E-01	3.00E-01	1.20E+00	FALSE	3.50E-01	3.50E-01
Selenium	37	0	22	59.00%	6.00E-01	4.90E-01	1.60E+00	FALSE	9.80E-01	9.80E-01
Thallium	37	0	11	30.00%	5.70E-01	4.50E-01	1.80E+00	FALSE	9.20E-01	9.20E-01
Zinc	37	0	37	100.00%	1.27E+02	1.96E+02	1.27E+03	FALSE	1.33E+02	1.33E+02
Herbicides										
2,4,5-T	11	0	1	9.00%	3.29E-03	1.67E-03	8.30E-03	FALSE	4.02E-03	4.02E-03
Nitoraromatics										
2,4-Dinitrotoluene	37	0	12	32.00%	2.40E+00	1.21E+01	7.40E+01	FALSE	1.26E+00	1.26E+00
2,6-Dinitrotoluene	37	0	2	5.00%	1.23E-01	2.36E-01	9.00E-01	FALSE	1.23E-01	1.23E-01

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PO-4

Total Soils Exposure Point Concentration Summary - Post Remediation

SEAD 16 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
1,1,2,2-Tetrachloroethane	42	0	1	2.00%	6.48E-03	3.51E-03	1.05E-02	FALSE	6.92E-03	6.92E-03
Acetone	42	0	3	7.00%	7.55E-03	7.20E-03	4.60E-02	FALSE	8.20E-03	8.20E-03
Benzene	41	1	5	12.00%	5.67E-03	1.95E-03	5.00E-03	FALSE	6.39E-03	5.00E-03
Carbon disulfide	41	1	2	5.00%	5.82E-03	1.49E-03	6.50E-03	FALSE	6.23E-03	6.23E-03
Chloroform	41	1	2	5.00%	4.51E-03	1.85E-03	2.00E-03	FALSE	5.14E-03	2.00E-03
Methyl ethyl ketone	41	1	1	2.00%	5.98E-03	1.54E-03	5.00E-03	FALSE	6.30E-03	5.00E-03
Methylene chloride	41	1	2	5.00%	5.87E-03	1.67E-03	3.00E-03	FALSE	6.28E-03	3.00E-03
Toluene	42	0	14	33.00%	5.94E-03	4.00E-03	1.00E-02	FALSE	7.12E-03	7.12E-03
Total Xylenes	42	0	1	2.00%	6.39E-03	3.45E-03	7.00E-03	FALSE	6.81E-03	6.81E-03
Semivolatile Organics										
2,4-Dinitrotoluene	42	0	9	21.00%	1.77E+00	7.01E+00	2.20E+00	FALSE	1.58E+00	1.58E+00
2,6-Dinitrotoluene	33	9	5	15.00%	2.08E-01	9.18E-02	1.80E-01	FALSE	2.42E-01	1.80E-01
2-Methylnaphthalene	42	0	5	12.00%	9.75E-01	3.06E+00	1.90E+01	FALSE	9.25E-01	9.25E-01
2-Methylphenol	33	9	1	3.00%	2.20E-01	8.72E-02	1.20E-01	FALSE	2.41E-01	1.20E-01
Acenaphthene	42	0	6	14.00%	2.23E+00	1.11E+01	7.20E+01	FALSE	1.39E+00	1.39E+00
Acenaphthylene	37	5	7	19.00%	2.46E-01	1.91E-01	3.10E-01	FALSE	3.07E-01	3.07E-01
Anthracene	42	0	10	24.00%	3.36E+00	1.85E+01	1.20E+02	FALSE	1.35E+00	1.35E+00
Benzo(a)anthracene	42	0	22	52.00%	5.81E+00	3.39E+01	2.20E+02	FALSE	3.12E+00	3.12E+00
Benzo(a)pyrene	42	0	25	60.00%	5.45E+00	3.08E+01	2.00E+02	FALSE	4.77E+00	4.77E+00
Benzo(b)fluoranthene	42	0	24	57.00%	5.50E+00	3.08E+01	2.00E+02	FALSE	4.76E+00	4.76E+00
Benzo(ghi)perylene	42	0	22	52.00%	3.27E+00	1.54E+01	1.00E+02	FALSE	3.32E+00	3.32E+00
Benzo(k)fluoranthene	42	0	21	50.00%	4.58E+00	2.62E+01	1.70E+02	FALSE	2.51E+00	2.51E+00
Bis(2-Ethylhexyl)phthalate	42	0	8	19.00%	1.61E+00	7.03E+00	2.10E+00	FALSE	1.90E+00	1.90E+00
Butylbenzylphthalate	33	9	1	3.00%	2.18E-01	9.22E-02	1.80E-02	FALSE	2.70E-01	1.80E-02
Carbazole	42	0	7	17.00%	2.63E+00	1.37E+01	8.90E+01	FALSE	1.38E+00	1.38E+00
Chrysene	42	0	29	69.00%	5.79E+00	3.39E+01	2.20E+02	FALSE	3.68E+00	3.68E+00
Dibenz(a,h)anthracene	42	0	15	36.00%	1.69E+00	7.56E+00	4.90E+01	FALSE	1.66E+00	1.66E+00
Dibenzofuran	42	0	4	10.00%	1.72E+00	7.71E+00	5.00E+01	FALSE	1.20E+00	1.20E+00
Diethyl phthalate	33	9	2	6.00%	2.12E-01	9.86E-02	1.90E-02	FALSE	2.94E-01	1.90E-02
Di-n-butylphthalate	42	0	11	26.00%	1.59E+00	7.03E+00	1.30E+00	FALSE	1.12E+00	1.12E+00
Fluoranthene	42	0	29	69.00%	1.32E+01	8.17E+01	5.30E+02	FALSE	4.11E+00	4.11E+00
Fluorene	42	0	3	7.00%	2.39E+00	1.20E+01	7.80E+01	FALSE	1.23E+00	1.23E+00
Indeno(1,2,3-cd)pyrene	42	0	19	45.00%	3.15E+00	1.54E+01	1.00E+02	FALSE	3.08E+00	3.08E+00
Naphthalene	42	0	6	14.00%	2.09E+00	1.02E+01	6.60E+01	FALSE	1.31E+00	1.31E+00
N-Nitrosodiphenylamine	40	2	10	25.00%	3.82E-01	4.78E-01	6.80E-01	FALSE	5.81E-01	5.81E-01
Pentachlorophenol	40	2	2	5.00%	9.51E-01	1.11E+00	1.20E+00	FALSE	1.15E+00	1.15E+00
Phenanthrene	42	0	24	57.00%	1.22E+01	7.55E+01	4.90E+02	FALSE	3.16E+00	3.16E+00
Pyrene	42	0	30	71.00%	9.19E+00	5.55E+01	3.60E+02	FALSE	4.39E+00	4.39E+00
Pesticides/PCBs										
4,4'-DDD	42	0	3	7.00%	3.25E-03	4.21E-03	5.00E-03	FALSE	3.50E-03	3.50E-03
4,4'-DDE	42	0	23	55.00%	1.33E-02	2.35E-02	1.40E-01	FALSE	2.01E-02	2.01E-02
4,4'-DDT	42	0	23	55.00%	8.34E-03	1.50E-02	8.90E-02	FALSE	1.03E-02	1.03E-02
Alpha-Chlordane	42	0	6	14.00%	2.13E-03	2.43E-03	8.60E-03	FALSE	2.51E-03	2.51E-03
Aroclor-1260	42	0	2	5.00%	3.40E-02	4.37E-02	1.10E-01	FALSE	3.70E-02	3.70E-02
Beta-BHC	42	0	1	2.00%	1.91E-03	3.40E-03	2.00E-02	FALSE	1.93E-03	1.93E-03
Delta-BHC	42	0	1	2.00%	1.68E-03	2.18E-03	2.20E-03	FALSE	1.80E-03	1.80E-03
Dieldrin	42	0	3	7.00%	3.54E-03	4.85E-03	2.60E-02	FALSE	3.89E-03	3.89E-03
Endosulfan I	42	0	13	31.00%	1.38E-02	6.61E-02	4.30E-01	FALSE	8.20E-03	8.20E-03
Endosulfan II	42	0	3	7.00%	3.33E-03	4.20E-03	5.00E-03	FALSE	3.62E-03	3.62E-03
Endosulfan sulfate	42	0	1	2.00%	3.24E-03	4.42E-03	2.00E-02	FALSE	3.44E-03	3.44E-03
Endrin	42	0	4	10.00%	4.06E-03	7.19E-03	4.30E-02	FALSE	4.26E-03	4.26E-03
Endrin aldehyde	42	0	2	5.00%	3.30E-03	4.23E-03	6.50E-03	FALSE	3.59E-03	3.59E-03
Endrin ketone	42	0	4	10.00%	4.56E-03	1.11E-02	7.10E-02	FALSE	4.25E-03	4.25E-03
Gamma-Chlordane	42	0	5	12.00%	2.23E-03	2.69E-03	9.40E-03	FALSE	2.64E-03	2.64E-03
Heptachlor epoxide	42	0	4	10.00%	1.69E-03	2.18E-03	2.10E-03	FALSE	1.83E-03	1.83E-03
Metals										
Antimony	42	0	23	55.00%	2.55E+00	3.23E+00	1.71E+01	FALSE	4.87E+00	4.87E+00
Barium	42	0	42	100.00%	9.39E+01	4.97E+01	2.11E+02	FALSE	1.11E+02	1.11E+02
Copper	42	0	42	100.00%	5.79E+01	5.48E+01	2.06E+02	FALSE	7.09E+01	7.09E+01
Lead	42	0	42	100.00%	1.92E+02	2.31E+02	7.91E+02	FALSE	3.64E+02	3.64E+02
Mercury	42	0	30	71.00%	2.30E-01	3.90E-01	1.90E+00	FALSE	4.10E-01	4.10E-01
Selenium	42	0	25	60.00%	6.10E-01	4.80E-01	1.60E+00	FALSE	9.40E-01	9.40E-01
Thallium	42	0	12	29.00%	5.70E-01	4.20E-01	1.80E+00	FALSE	8.60E-01	8.60E-01
Zinc	42	0	42	100.00%	1.24E+02	1.84E+02	1.27E+03	FALSE	1.30E+02	1.30E+02
Herbicides										
2,4,5-T	11	0	1	9.00%	3.29E-03	1.67E-03	8.30E-03	FALSE	4.02E-03	4.02E-03
Nitroaromatics										
2,4-Dinitrotoluene	42	0	15	36.00%	2.14E+00	1.14E+01	7.40E+01	FALSE	9.89E-01	9.89E-01
2,6-Dinitrotoluene	42	0	2	5.00%	1.16E-01	2.22E-01	9.00E-01	FALSE	1.12E-01	1.12E-01

* Refer to text for a detailed discussion of EPC determination

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-16PO-5

Sediment Exposure Point Concentration Summary - Feasibility Study

SEAD 16 - Remedial Investigation
Seneca Army Depot Activity

Exposure to sediments will be eliminated by remedial activities.

TABLE B-16PO-6
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - POST REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m³) = $CS_{surf} \times PM_{10} \times CF$	Equation for Air EPC from Total Soils (mg/m³) = $CS_{tot} \times PM_{10} \times CF$
Variables: CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg) PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m³ 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= 140 ug/m³ 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/m³)	Calculated Air EPC Total Soils (mg/m³)
Volatile Organics				
1,1,2,2-Tetrachloroethane	7.13E-03	6.92E-03	1.21E-10	9.69E-10
Acetone	6.51E-03	8.20E-03	1.11E-10	1.15E-09
Benzene	5.00E-03	5.00E-03	8.50E-11	7.00E-10
Carbon disulfide	6.33E-03	6.23E-03	1.08E-10	8.72E-10
Chloroform	2.00E-03	2.00E-03	3.40E-11	2.80E-10
Methyl ethyl ketone		5.00E-03		7.00E-10
Methylene chloride	3.00E-03	3.00E-03	5.10E-11	4.20E-10
Toluene	7.49E-03	7.12E-03	1.27E-10	9.97E-10
Total Xylenes	6.99E-03	6.81E-03	1.19E-10	9.53E-10
Semivolatile Organics				
2,4-Dinitrotoluene	1.73E+00	1.58E+00	2.94E-08	2.21E-07
2,6-Dinitrotoluene	1.80E-01	1.80E-01	3.06E-09	2.52E-08
2-Methylnaphthalene	1.08E+00	9.25E-01	1.84E-08	1.30E-07
2-Methylphenol	1.20E-01	1.20E-01	2.04E-09	1.68E-08
Acenaphthene	1.74E+00	1.39E+00	2.96E-08	1.95E-07
Acenaphthylene	2.98E-01	3.07E-01	5.07E-09	4.30E-08
Anthracene	1.71E+00	1.35E+00	2.91E-08	1.89E-07
Benzo(a)anthracene	4.73E+00	3.12E+00	8.04E-08	4.37E-07
Benzo(a)pyrene	6.63E+00	4.77E+00	1.13E-07	6.68E-07
Benzo(b)fluoranthene	6.88E+00	4.76E+00	1.17E-07	6.66E-07
Benzo(ghi)perylene	3.12E+00	3.32E+00	5.30E-08	4.65E-07
Benzo(k)fluoranthene	3.38E+00	2.51E+00	5.75E-08	3.51E-07
bis(2-Ethylhexyl)phthalate	1.26E+00	1.90E+00	2.14E-08	2.66E-07
Butylbenzylphthalate		1.80E-02		2.52E-09
Carbazole	1.73E+00	1.38E+00	2.94E-08	1.93E-07
Chrysene	5.59E+00	3.68E+00	9.50E-08	5.15E-07
Dibenz(a,h)anthracene	1.86E+00	1.66E+00	3.16E-08	2.32E-07
Dibenzofuran	1.40E+00	1.20E+00	2.38E-08	1.68E-07
Diethyl phthalate	1.90E-02	1.90E-02	3.23E-10	2.66E-09
Di-n-butylphthalate	1.30E+00	1.12E+00	2.21E-08	1.57E-07
Fluoranthene	6.28E+00	4.11E+00	1.07E-07	5.75E-07
Fluorene	1.49E+00	1.23E+00	2.53E-08	1.72E-07
Indeno(1,2,3-cd)pyrene	3.07E+00	3.08E+00	5.22E-08	4.31E-07
Naphthalene	1.63E+00	1.31E+00	2.77E-08	1.83E-07
N-Nitrosodiphenylamine	6.08E-01	5.81E-01	1.03E-08	8.13E-08
Pentachlorophenol	1.17E+00	1.15E+00	1.99E-08	1.61E-07
Phenanthrene	4.89E+00	3.16E+00	8.31E-08	4.42E-07
Pyrene	6.75E+00	4.39E+00	1.15E-07	6.15E-07
Pesticides/PCBs				
4,4'-DDD	3.24E-03	3.50E-03	5.51E-11	4.90E-10
4,4'-DDE	2.29E-02	2.01E-02	3.89E-10	2.81E-09
4,4'-DDT	1.11E-02	1.03E-02	1.89E-10	1.44E-09
alpha-Chlordane	2.46E-03	2.51E-03	4.18E-11	3.51E-10
Aroclor-1260	3.46E-02	3.70E-02	5.88E-10	5.18E-09
beta-BHC	1.80E-03	1.93E-03	3.06E-11	2.70E-10
delta-BHC	1.66E-03	1.80E-03	2.82E-11	2.52E-10
Dieldrin	3.29E-03	3.89E-03	5.59E-11	5.45E-10
Endosulfan I	8.79E-03	8.20E-03	1.49E-10	1.15E-09
Endosulfan II	3.37E-03	3.62E-03	5.73E-11	5.07E-10
Endosulfan sulfate	3.17E-03	3.44E-03	5.39E-11	4.82E-10
Endrin	4.05E-03	4.26E-03	6.89E-11	5.96E-10
Endrin aldehyde	3.34E-03	3.59E-03	5.68E-11	5.03E-10
Endrin ketone	4.08E-03	4.25E-03	6.94E-11	5.95E-10
gamma-Chlordane	2.60E-03	2.64E-03	4.42E-11	3.70E-10
Heptachlor epoxide	1.70E-03	1.83E-03	2.89E-11	2.56E-10
Metals				
Antimony	4.78E+00	4.87E+00	8.13E-08	6.82E-07
Barium	1.10E+02	1.11E+02	1.87E-06	1.55E-05
Copper	6.98E+01	7.09E+01	1.19E-06	9.93E-06
Lead	3.54E+02	3.64E+02	6.02E-06	5.10E-05
Mercury	3.50E-01	4.10E-01	5.95E-09	5.74E-08
Selenium	9.80E-01	9.40E-01	1.67E-08	1.32E-07
Thallium	9.20E-01	8.60E-01	1.56E-08	1.20E-07
Zinc	1.33E+02	1.30E+02	2.26E-06	1.82E-05
Herbicides				
2,4,5-T	4.02E-03	4.02E-03	6.83E-11	5.63E-10

ND = Compound was not detected above the detection limit shown

TABLE B-16PO-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker 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	1.21E-10	9.69E-10		3.25E-13		7E-14				
Acetone	NA	NA	1.11E-10	1.15E-09								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	6.39E-13	2.28E-13	4E-10	7E-15				
Carbon disulfide	2.0E-01	NA	1.08E-10	8.72E-10	8.09E-13		4E-12					
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		9.12E-14		7E-15				
Methyl ethyl ketone	2.9E-01	NA		7.00E-10								
Methylene chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	3.83E-13	1.37E-13	4E-13	2E-16				
Toluene	1.1E-01	NA	1.27E-10	9.97E-10	9.57E-13		8E-12					
Total Xylenes	NA	NA	1.19E-10	9.53E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	2.94E-08	2.21E-07								
2,6-Dinitrotoluene	NA	NA	3.06E-09	2.52E-08								
2-Methylnaphthalene	NA	NA	1.84E-08	1.30E-07								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
Acenaphthene	NA	NA	2.96E-08	1.95E-07								
Acenaphthylene	NA	NA	5.07E-09	4.30E-08								
Anthracene	NA	NA	2.91E-08	1.89E-07								
Benzo(a)anthracene	NA	NA	8.04E-08	4.37E-07								
Benzo(a)pyrene	NA	NA	1.13E-07	6.68E-07								
Benzo(b)fluoranthene	NA	NA	1.17E-07	6.66E-07								
Benzo(ghi)perylene	NA	NA	5.30E-08	4.65E-07								
Benzo(k)fluoranthene	NA	NA	5.75E-08	3.51E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.14E-08	2.66E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.94E-08	1.93E-07								
Chrysene	NA	NA	9.50E-08	5.15E-07								
Dibenz(a,h)anthracene	NA	NA	3.16E-08	2.32E-07								
Dibenzofuran	NA	NA	2.38E-08	1.68E-07								
Diethyl phthalate	NA	NA	3.23E-10	2.66E-09								
Di-n-butylphthalate	NA	NA	2.21E-08	1.57E-07								
Fluoranthene	NA	NA	1.07E-07	5.75E-07								
Fluorene	NA	NA	2.53E-08	1.72E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	5.22E-08	4.31E-07								
Naphthalene	NA	NA	2.77E-08	1.83E-07								
N-Nitrosodiphenylamine	NA	NA	1.03E-08	8.13E-08								
Pentachlorophenol	NA	NA	1.99E-08	1.61E-07								
Phenanthrene	NA	NA	8.31E-08	4.42E-07								
Pyrene	NA	NA	1.15E-07	6.15E-07								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.51E-11	4.90E-10								
4,4'-DDE	NA	NA	3.89E-10	2.81E-09								
4,4'-DDT	NA	3.4E-01	1.89E-10	1.44E-09		5.06E-13		2E-13				
alpha-Chlordane	NA	1.3E+00	4.18E-11	3.51E-10		1.12E-13		1E-13				
Aroclor-1260	NA	4.0E-01	5.88E-10	5.18E-09		1.58E-12		6E-13				
beta-BHC	NA	1.9E+00	3.06E-11	2.70E-10		8.21E-14		2E-13				
delta-BHC	NA	NA	2.82E-11	2.52E-10								
Dieldrin	NA	1.6E+01	5.59E-11	5.45E-10		1.50E-13		2E-12				
Endosulfan I	NA	NA	1.49E-10	1.15E-09								
Endosulfan II	NA	NA	5.73E-11	5.07E-10								
Endosulfan sulfate	NA	NA	5.39E-11	4.82E-10								
Endrin	NA	NA	6.89E-11	5.96E-10								
Endrin aldehyde	NA	NA	5.68E-11	5.03E-10								
Endrin ketone	NA	NA	6.94E-11	5.95E-10								
gamma-Chlordane	NA	1.3E+00	4.42E-11	3.70E-10		1.19E-13		2E-13				
Heptachlor epoxide	NA	9.1E+00	2.89E-11	2.56E-10		7.76E-14		7E-13				
Metals												
Antimony	NA	NA	8.13E-08	6.82E-07								
Barium	1.4E-04	NA	1.87E-06	1.55E-05	1.41E-08		1E-04					
Copper	NA	NA	1.19E-06	9.93E-06								
Lead	NA	NA	6.02E-06	5.10E-05								
Mercury	8.6E-05	NA	5.95E-09	5.74E-08	4.47E-11		5E-07					
Selenium	NA	NA	1.67E-08	1.32E-07								
Thallium	NA	NA	1.56E-08	1.20E-07								
Zinc	NA	NA	2.26E-06	1.82E-05								
Herbicides												
2,4,5-T	NA	NA	6.83E-11	5.63E-10								
Total Hazard Quotient and Cancer Risk:							**1E-04**	**4E-12**				

Inhalation of Dust in Ambient Air Not Applicable for Future Industrial Worker

Assumptions for Current Site Worker

CA =	EPC Surface Only
IR =	9.6 m3/day
EF =	20 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-16PO-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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	Future Construction Worker				Future Tresspasser 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	1.21E-10	9.69E-10		1.41E-12		3E-13		2.85E-14		6E-15
Acetone	NA	NA	1.11E-10	1.15E-09								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	7.12E-11	1.02E-12	4E-08	3E-14	2.79E-13	2.00E-14	2E-10	6E-16
Carbon disulfide	2.0E-01	NA	1.08E-10	8.72E-10	8.88E-11		4E-10		3.54E-13		2E-12	
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		4.07E-13		3E-14		7.98E-15		6E-16
Methyl ethyl ketone	2.9E-01	NA		7.00E-10	7.12E-11		2E-10					
Methylene chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	4.27E-11	6.11E-13	5E-11	1E-15	1.68E-13	1.20E-14	2E-13	2E-17
Toluene	1.1E-01	NA	1.27E-10	9.97E-10	1.01E-10		9E-10		4.19E-13		4E-12	
Total Xylenes	NA	NA	1.19E-10	9.53E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	2.94E-08	2.21E-07								
2,6-Dinitrotoluene	NA	NA	3.06E-09	2.52E-08								
2-Methylnaphthalene	NA	NA	1.84E-08	1.30E-07								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
Acenaphthene	NA	NA	2.96E-08	1.95E-07								
Acenaphthylene	NA	NA	5.07E-09	4.30E-08								
Anthracene	NA	NA	2.91E-08	1.89E-07								
Benzo(a)anthracene	NA	NA	8.04E-08	4.37E-07								
Benzo(a)pyrene	NA	NA	1.13E-07	6.68E-07								
Benzo(b)fluoranthene	NA	NA	1.17E-07	6.66E-07								
Benzo(ghi)perylene	NA	NA	5.30E-08	4.65E-07								
Benzo(k)fluoranthene	NA	NA	5.75E-08	3.51E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.14E-08	2.66E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.94E-08	1.93E-07								
Chrysene	NA	NA	9.50E-08	5.15E-07								
Dibenz(a,h)anthracene	NA	NA	3.16E-08	2.32E-07								
Dibenzofuran	NA	NA	2.38E-08	1.68E-07								
Diethyl phthalate	NA	NA	3.23E-10	2.66E-09								
Di-n-butylphthalate	NA	NA	2.21E-08	1.57E-07								
Fluoranthene	NA	NA	1.07E-07	5.75E-07								
Fluorene	NA	NA	2.53E-08	1.72E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	5.22E-08	4.31E-07								
Naphthalene	NA	NA	2.77E-08	1.83E-07								
N-Nitrosodiphenylamine	NA	NA	1.03E-08	8.13E-08								
Pentachlorophenol	NA	NA	1.99E-08	1.61E-07								
Phenanthrene	NA	NA	8.31E-08	4.42E-07								
Pyrene	NA	NA	1.15E-07	6.15E-07								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.51E-11	4.90E-10								
4,4'-DDE	NA	NA	3.89E-10	2.81E-09								
4,4'-DDT	NA	3.4E-01	1.89E-10	1.44E-09		2.10E-12		7E-13		4.43E-14		2E-14
alpha-Chlordane	NA	1.3E+00	4.18E-11	3.51E-10		5.11E-13		7E-13		9.82E-15		1E-14
Aroclor-1260	NA	4.0E-01	5.88E-10	5.18E-09		7.53E-12		3E-12		1.38E-13		6E-14
beta-BHC	NA	1.9E+00	3.06E-11	2.70E-10		3.93E-13		7E-13		7.19E-15		1E-14
delta-BHC	NA	NA	2.82E-11	2.52E-10								
Dieldrin	NA	1.6E+01	5.59E-11	5.45E-10		7.92E-13		1E-11		1.31E-14		2E-13
Endosulfan I	NA	NA	1.49E-10	1.15E-09								
Endosulfan II	NA	NA	5.73E-11	5.07E-10								
Endosulfan sulfate	NA	NA	5.39E-11	4.82E-10								
Endrin	NA	NA	6.89E-11	5.96E-10								
Endrin aldehyde	NA	NA	5.68E-11	5.03E-10								
Endrin ketone	NA	NA	6.94E-11	5.95E-10								
gamma-Chlordane	NA	1.3E+00	4.42E-11	3.70E-10		5.37E-13		7E-13		1.04E-14		1E-14
Heptachlor epoxide	NA	9.1E+00	2.89E-11	2.56E-10		3.72E-13		3E-12		6.79E-15		6E-14
Metals												
Antimony	NA	NA	8.13E-08	6.82E-07								
Barium	1.4E-04	NA	1.87E-06	1.55E-05	1.58E-06		1E-02		6.15E-09		4E-05	
Copper	NA	NA	1.19E-06	9.93E-06								
Lead	NA	NA	6.02E-06	5.10E-05								
Mercury	8.6E-05	NA	5.95E-09	5.74E-08	5.84E-09		7E-05		1.96E-11		2E-07	
Selenium	NA	NA	1.67E-08	1.32E-07								
Thallium	NA	NA	1.56E-08	1.20E-07								
Zinc	NA	NA	2.26E-06	1.82E-05								
Herbicides												
2,4,5-T	NA	NA	6.83E-11	5.63E-10								
Total Hazard Quotient and Cancer Risk:							**1E-02**	**2E-11**			**4E-05**	**4E-13**

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CA =	EPC Surface and Sub-Surface	CA =	EPC Surface Only
IR =	10.4 m3/day	IR =	1.2 m3/day
EF =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-16PO-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	Future Day Care Center Adult Intake (mg/kg-day) (Car)	Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult Cancer Risk
Volatile Organics												
1,1,2,2-Tetrachloroethane	NA	2.0E-01	1.21E-10	9.69E-10		1.90E-12		4E-13		3.39E-12		7E-13
Acetone	NA	NA	1.11E-10	1.15E-09								
Benzene	1.7E-03	2.9E-02	8.50E-11	7.00E-10	1.55E-11	1.33E-12	9E-09	4E-14	6.65E-12	2.38E-12	4E-09	7E-14
Carbon disulfide	2.0E-01	NA	1.08E-10	8.72E-10	1.97E-11		1E-10		8.42E-12		4E-11	
Chloroform	NA	8.1E-02	3.40E-11	2.80E-10		5.32E-13		4E-14		9.51E-13		8E-14
Methyl ethyl ketone	2.9E-01	NA		7.00E-10								
Methylene chloride	8.6E-01	1.7E-03	5.10E-11	4.20E-10	9.32E-12	7.98E-13	1E-11	1E-15	3.99E-12	1.43E-12	5E-12	2E-15
Toluene	1.1E-01	NA	1.27E-10	9.97E-10	2.33E-11		2E-10		9.97E-12		9E-11	
Total Xylenes	NA	NA	1.19E-10	9.53E-10								
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	2.94E-08	2.21E-07								
2,6-Dinitrotoluene	NA	NA	3.06E-09	2.52E-08								
2-Methylnaphthalene	NA	NA	1.84E-08	1.30E-07								
2-Methylphenol	NA	NA	2.04E-09	1.68E-08								
Acenaphthene	NA	NA	2.96E-08	1.95E-07								
Acenaphthylene	NA	NA	5.07E-09	4.30E-08								
Anthracene	NA	NA	2.91E-08	1.89E-07								
Benzo(a)anthracene	NA	NA	8.04E-08	4.37E-07								
Benzo(a)pyrene	NA	NA	1.13E-07	6.68E-07								
Benzo(b)fluoranthene	NA	NA	1.17E-07	6.66E-07								
Benzo(ghi)perylene	NA	NA	5.30E-08	4.65E-07								
Benzo(k)fluoranthene	NA	NA	5.75E-08	3.51E-07								
bis(2-Ethylhexyl)phthalate	NA	NA	2.14E-08	2.66E-07								
Butylbenzylphthalate	NA	NA		2.52E-09								
Carbazole	NA	NA	2.94E-08	1.93E-07								
Chrysene	NA	NA	9.50E-08	5.15E-07								
Dibenz(a,h)anthracene	NA	NA	3.16E-08	2.32E-07								
Dibenzofuran	NA	NA	2.38E-08	1.68E-07								
Diethyl phthalate	NA	NA	3.23E-10	2.66E-09								
Di-n-butylphthalate	NA	NA	2.21E-08	1.57E-07								
Fluoranthene	NA	NA	1.07E-07	5.75E-07								
Fluorene	NA	NA	2.53E-08	1.72E-07								
Indeno(1,2,3-cd)pyrene	NA	NA	5.22E-08	4.31E-07								
Naphthalene	NA	NA	2.77E-08	1.83E-07								
N-Nitrosodiphenylamine	NA	NA	1.03E-08	8.13E-08								
Pentachlorophenol	NA	NA	1.99E-08	1.61E-07								
Phenanthrene	NA	NA	8.31E-08	4.42E-07								
Pyrene	NA	NA	1.15E-07	6.15E-07								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.51E-11	4.90E-10								
4,4'-DDE	NA	NA	3.89E-10	2.81E-09								
4,4'-DDT	NA	3.4E-01	1.89E-10	1.44E-09		2.95E-12		1E-12		5.28E-12		2E-12
alpha-Chlordane	NA	1.3E+00	4.18E-11	3.51E-10		6.55E-13		9E-13		1.17E-12		2E-12
Aroclor-1260	NA	4.0E-01	5.88E-10	5.18E-09		9.21E-12		4E-12		1.64E-11		7E-12
beta-BHC	NA	1.9E+00	3.06E-11	2.70E-10		4.79E-13		9E-13		8.55E-13		2E-12
delta-BHC	NA	NA	2.82E-11	2.52E-10								
Dieldrin	NA	1.6E+01	5.59E-11	5.45E-10		8.76E-13		1E-11		1.56E-12		3E-11
Endosulfan I	NA	NA	1.49E-10	1.15E-09								
Endosulfan II	NA	NA	5.73E-11	5.07E-10								
Endosulfan sulfate	NA	NA	5.39E-11	4.82E-10								
Endrin	NA	NA	6.89E-11	5.96E-10								
Endrin aldehyde	NA	NA	5.68E-11	5.03E-10								
Endrin ketone	NA	NA	6.94E-11	5.95E-10								
gamma-Chlordane	NA	1.3E+00	4.42E-11	3.70E-10		6.92E-13		9E-13		1.24E-12		2E-12
Heptachlor epoxide	NA	9.1E+00	2.89E-11	2.56E-10		4.52E-13		4E-12		8.08E-13		7E-12
Metals												
Antimony	NA	NA	8.13E-08	6.82E-07								
Barium	1.4E-04	NA	1.87E-06	1.55E-05	3.42E-07		2E-03		1.46E-07		1E-03	
Copper	NA	NA	1.19E-06	9.93E-06								
Lead	NA	NA	6.02E-06	5.10E-05								
Mercury	8.6E-05	NA	5.95E-09	5.74E-08	1.09E-09		1E-05		4.66E-10		5E-06	
Selenium	NA	NA	1.67E-08	1.32E-07								
Thallium	NA	NA	1.56E-08	1.20E-07								
Zinc	NA	NA	2.26E-06	1.82E-05								
Herbicides												
2,4,5-T	NA	NA	6.83E-11	5.63E-10								
Total Hazard Quotient and Cancer Risk:							**2E-03**	**3E-11**			**1E-03**	**5E-11**

Assumptions for Future Day Care Center Child		Assumptions for Future 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
NA= Information not available.

TABLE B-16PO-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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):	Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose
CS = Chemical Concentration in Soil, Calculated from Soil EP; EF = Exposure Frequency	Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
IR = Ingestion Rate; ED = Exposure Duration	
CF = Conversion Factor; BW = Bodyweight	
FI = Fraction Ingested; AT = Averaging Time	

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker 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	7.13E-03	6.92E-03		1.99E-10		4E-11		**Ingestion of**		
Acetone	1.0E-01	NA	6.51E-03	8.20E-03	5.10E-10		5E-09			**Onsite Soils**		
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	3.91E-10	1.40E-10	1E-07	4E-12		**Not Applicable**		
Carbon disulfide	1.0E-01	NA	6.33E-03	6.23E-03	4.95E-10		5E-09			**for Future Industrial Worker**		
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	1.57E-10	5.59E-11	2E-08	3E-13				
Methyl ethyl ketone	6.0E-01	NA		5.00E-03								
Methylene chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	2.35E-10	8.39E-11	4E-09	6E-13				
Toluene	2.0E-01	NA	7.49E-03	7.12E-03	5.86E-10		3E-09					
Total Xylenes	2.0E+00	NA	6.99E-03	6.81E-03	5.47E-10		3E-10					
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.73E+00	1.58E+00	1.35E-07	4.84E-08	7E-05	3E-08				
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.80E-01	1.80E-01	1.41E-08	5.03E-09	1E-05	3E-09				
2-Methylnaphthalene	4.0E-02	NA	1.08E+00	9.25E-01	8.45E-08		2E-06					
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	9.39E-09		2E-07					
Acenaphthene	6.0E-02	NA	1.74E+00	1.39E+00	1.36E-07		2E-06					
Acenaphthylene	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	1.71E+00	1.35E+00	1.34E-07		4E-07					
Benzo(a)anthracene	NA	7.3E-01	4.73E+00	3.12E+00		1.32E-07		1E-07				
Benzo(a)pyrene	NA	7.3E+00	6.63E+00	4.77E+00		1.85E-07		1E-06				
Benzo(b)fluoranthene	NA	7.3E-01	6.88E+00	4.76E+00		1.92E-07		1E-07				
Benzo(ghi)perylene	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	3.38E+00	2.51E+00		9.45E-08		7E-09				
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.26E+00	1.90E+00	9.86E-08	3.52E-08	5E-06	5E-10				
Butylbenzylphthalate	2.0E-01	NA		1.80E-02								
Carbazole	NA	2.0E-02	1.73E+00	1.38E+00		4.84E-08		1E-09				
Chrysene	NA	7.3E-03	5.59E+00	3.68E+00		1.56E-07		1E-09				
Dibenz(a,h)anthracene	NA	7.3E+00	1.86E+00	1.66E+00		5.20E-08		4E-07				
Dibenzofuran	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	1.90E-02	1.90E-02	1.49E-09		2E-09					
Di-n-butylphthalate	1.0E-01	NA	1.30E+00	1.12E+00	1.02E-07		1E-06					
Fluoranthene	4.0E-02	NA	6.28E+00	4.11E+00	4.92E-07		1E-05					
Fluorene	4.0E-02	NA	1.49E+00	1.23E+00	1.17E-07		3E-06					
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.07E+00	3.08E+00		8.58E-08		6E-08				
Naphthalene	4.0E-02	NA	1.63E+00	1.31E+00	1.28E-07		3E-06					
N-Nitrosodiphenylamine	NA	4.9E-03	6.08E-01	5.81E-01		1.70E-08		8E-11				
Pentachlorophenol	3.0E-02	1.2E-01	1.17E+00	1.15E+00	9.16E-08	3.27E-08	3E-06	4E-09				
Phenanthrene	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	6.75E+00	4.39E+00	5.28E-07		2E-05					
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.24E-03	3.50E-03		9.06E-11		2E-11				
4,4'-DDE	NA	3.4E-01	2.29E-02	2.01E-02		6.40E-10		2E-10				
4,4'-DDT	5.0E-04	3.4E-01	1.11E-02	1.03E-02	8.69E-10	3.10E-10	2E-06	1E-10				
alpha-Chlordane	6.0E-05	1.3E+00	2.46E-03	2.51E-03	1.93E-10	6.88E-11	3E-06	9E-11				
Aroclor-1260	2.0E-05	2.0E+00	3.46E-02	3.70E-02	2.71E-09	9.67E-10	1E-04	2E-09				
beta-BHC	NA	1.8E+00	1.80E-03	1.93E-03		5.03E-11		9E-11				
delta-BHC	NA	NA	1.66E-03	1.80E-03								
Dieldrin	5.0E-05	1.6E+01	3.29E-03	3.89E-03	2.58E-10	9.20E-11	5E-06	1E-09				
Endosulfan I	6.0E-03	NA	8.79E-03	8.20E-03	6.88E-10		1E-07					
Endosulfan II	6.0E-03	NA	3.37E-03	3.62E-03	2.64E-10		4E-08					
Endosulfan sulfate	6.0E-03	NA	3.17E-03	3.44E-03	2.48E-10		4E-08					
Endrin	3.0E-04	NA	4.05E-03	4.26E-03	3.17E-10		1E-06					
Endrin aldehyde	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	2.60E-03	2.64E-03	2.04E-10	7.27E-11	3E-06	9E-11				
Heptachlor epoxide	1.3E-05	9.1E+00	1.70E-03	1.83E-03	1.33E-10	4.75E-11	1E-05	4E-10				
Metals												
Antimony	4.0E-04	NA	4.78E+00	4.87E+00	3.74E-07		9E-04					
Barium	7.0E-02	NA	1.10E+02	1.11E+02	8.61E-06		1E-04					
Copper	4.0E-02	NA	6.98E+01	7.09E+01	5.46E-06		1E-04					
Lead	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-04	NA	3.50E-01	4.10E-01	2.74E-08		9E-05					
Selenium	5.0E-03	NA	9.80E-01	9.40E-01	7.67E-08		2E-05					
Thallium	8.0E-05	NA	9.20E-01	8.60E-01	7.20E-08		9E-04					
Zinc	3.0E-01	NA	1.33E+02	1.30E+02	1.04E-05		3E-05					
Herbicides												
2,4,5-T	1.0E-02	NA	4.02E-03	4.02E-03	3.15E-10		3E-08					
Total Hazard Quotient and Cancer Risk:							**3E-03**	**2E-06**				

Assumptions for Current Site Worker

CS =	EPC Surface Only
IR =	100 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	20 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.

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TABLE B-16PO-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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	Future Construction Worker				Future Trespasser 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	7.13E-03	6.92E-03		4.64E-10		9E-11		2.79E-10		6E-11
Acetone	1.0E-01	NA	6.51E-03	8.20E-03	3.85E-08		4E-07		3.57E-09		4E-08	
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	2.35E-08	3.35E-10	8E-06	1E-11	2.74E-09	1.96E-10	9E-07	6E-12
Carbon disulfide	1.0E-01	NA	6.33E-03	6.23E-03	2.93E-08		3E-07		3.47E-09		3E-08	
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	9.39E-09	1.34E-10	9E-07	8E-13	1.10E-09	7.83E-11	1E-07	5E-13
Methyl ethyl ketone	6.0E-01	NA		5.00E-03	2.35E-08		4E-08					
Methylene chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	1.41E-08	2.01E-10	2E-07	2E-12	1.64E-09	1.17E-10	3E-08	9E-13
Toluene	2.0E-01	NA	7.49E-03	7.12E-03	3.34E-08		2E-07		4.10E-09		2E-08	
Total Xylenes	2.0E+00	NA	6.99E-03	6.81E-03	3.20E-08		2E-08		3.83E-09		2E-09	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.73E+00	1.58E+00	7.42E-06	1.06E-07	4E-03	7E-08	9.48E-07	6.77E-08	5E-04	5E-08
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.80E-01	1.80E-01	8.45E-07	1.21E-08	8E-04	8E-09	9.86E-08	7.05E-09	1E-04	5E-09
2-Methylnaphthalene	4.0E-02	NA	1.08E+00	9.25E-01	4.34E-06		1E-04		5.92E-07		1E-05	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	5.64E-07		1E-05		6.58E-08		1E-06	
Acenaphthene	6.0E-02	NA	1.74E+00	1.39E+00	6.53E-06		1E-04		9.53E-07		2E-05	
Acenaphthylene	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	1.71E+00	1.35E+00	6.34E-06		2E-05		9.37E-07		3E-06	
Benzo(a)anthracene	NA	7.3E-01	4.73E+00	3.12E+00		2.09E-07		2E-07		1.85E-07		1E-07
Benzo(a)pyrene	NA	7.3E+00	6.63E+00	4.77E+00		3.20E-07		2E-06		2.59E-07		2E-06
Benzo(b)fluoranthene	NA	7.3E-01	6.88E+00	4.76E+00		3.19E-07		2E-07		2.69E-07		2E-07
Benzo(ghi)perylene	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	3.38E+00	2.51E+00		1.68E-07		1E-08		1.32E-07		1E-08
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.26E+00	1.90E+00	8.92E-06	1.27E-07	4E-04	2E-09	6.90E-07	4.93E-08	3E-05	7E-10
Butylbenzylphthalate	2.0E-01	NA		1.80E-02	8.45E-08		4E-07					
Carbazole	NA	2.0E-02	1.73E+00	1.38E+00		9.26E-08		2E-09		6.77E-08		1E-09
Chrysene	NA	7.3E-03	5.59E+00	3.68E+00		2.47E-07		2E-09		2.19E-07		2E-09
Dibenz(a,h)anthracene	NA	7.3E+00	1.86E+00	1.66E+00		1.11E-07		8E-07		7.28E-08		5E-07
Dibenzofuran	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	1.90E-02	1.90E-02	8.92E-08		1E-07		1.04E-08		1E-08	
Di-n-butylphthalate	1.0E-01	NA	1.30E+00	1.12E+00	5.26E-06		5E-05		7.12E-07		7E-06	
Fluoranthene	4.0E-02	NA	6.28E+00	4.11E+00	1.93E-05		5E-04		3.44E-06		9E-05	
Fluorene	4.0E-02	NA	1.49E+00	1.23E+00	5.78E-06		1E-04		8.16E-07		2E-05	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.07E+00	3.08E+00		2.07E-07		2E-07		1.20E-07		9E-08
Naphthalene	4.0E-02	NA	1.63E+00	1.31E+00	6.15E-06		2E-04		8.93E-07		2E-05	
N-Nitrosodiphenylamine	NA	4.9E-03	6.08E-01	5.81E-01		3.90E-08		2E-10		2.38E-08		1E-10
Pentachlorophenol	3 0E-02	1.2E-01	1.17E+00	1.15E+00	5.40E-06	7.72E-08	2E-04	9E-09	6.41E-07	4.58E-08	2E-05	5E-09
Phenanthrene	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	6.75E+00	4.39E+00	2.06E-05		7E-04		3.70E-06		1E-04	
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.24E-03	3.50E-03		2.35E-10		6E-11		1.27E-10		3E-11
4,4'-DDE	NA	3.4E-01	2.29E-02	2.01E-02		1.35E-09		5E-10		8.96E-10		3E-10
4,4'-DDT	5.0E-04	3.4E-01	1.11E-02	1.03E-02	4.84E-08	6.91E-10	1E-04	2E-10	6.08E-09	4.34E-10	1E-05	1E-10
alpha-Chlordane	6.0E-05	1.3E+00	2.46E-03	2.51E-03	1.18E-08	1.68E-10	2E-04	2E-10	1.35E-09	9.63E-11	2E-05	1E-10
Aroclor-1260	2.0E-05	2.0E+00	3.46E-02	3.70E-02	1.74E-07	2.48E-09	9E-03	5E-09	1.90E-08	1.35E-09	9E-04	3E-09
beta-BHC	NA	1.8E+00	1.80E-03	1.93E-03		1.29E-10		2E-10		7.05E-11		1E-10
delta-BHC	NA	NA	1.66E-03	1.80E-03								
Dieldrin	5.0E-05	1.6E+01	3.29E-03	3.89E-03	1.83E-08	2.61E-10	4E-04	4E-09	1.80E-09	1.29E-10	4E-05	2E-09
Endosulfan I	6 0E-03	NA	8.79E-03	8.20E-03	3.85E-08		6E-06		4.82E-09		8E-07	
Endosulfan II	6.0E-03	NA	3.37E-03	3.62E-03	1.70E-08		3E-06		1.85E-09		3E-07	
Endosulfan sulfate	6.0E-03	NA	3.17E-03	3.44E-03	1.62E-08		3E-06		1.74E-09		3E-07	
Endrin	3.0E-04	NA	4.05E-03	4.26E-03	2.00E-08		7E-05		2.22E-09		7E-06	
Endrin aldehyde	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	2.60E-03	2.64E-03	1.24E-08	1.77E-10	2E-04	2E-10	1.42E-09	1.02E-10	2E-05	1E-10
Heptachlor epoxide	1.3E-05	9.1E+00	1.70E-03	1.83E-03	8.59E-09	1.23E-10	7E-04	1E-09	9.32E-10	6.65E-11	7E-05	6E-10
Metals												
Antimony	4 0E-04	NA	4.78E+00	4.87E+00	2.29E-05		6E-02		2.62E-06		7E-03	
Barium	7.0E-02	NA	1.10E+02	1.11E+02	5.21E-04		7E-03		6.03E-05		9E-04	
Copper	4.0E-02	NA	6.98E+01	7.09E+01	3.33E-04		8E-03		3.82E-05		1E-03	
Lead	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-04	NA	3.50E-01	4.10E-01	1.93E-06		6E-03		1.92E-07		6E-04	
Selenium	5.0E-03	NA	9.80E-01	9.40E-01	4.41E-06		9E-04		5.37E-07		1E-04	
Thallium	8.0E-05	NA	9.20E-01	8.60E-01	4.04E-06		5E-02		5.04E-07		6E-03	
Zinc	3 0E-01	NA	1.33E+02	1.30E+02	6.11E-04		2E-03		7.29E-05		2E-04	
Herbicides												
2,4,5-T	1.0E-02	NA	4.02E-03	4.02E-03	1.89E-08		2E-06		2.20E-09		2E-07	
Total Hazard Quotient and Cancer Risk:							**2E-01**	**4E-06**			**2E-02**	**3E-06**

Assumptions for Future Construction Worker		Assumptions for Future Trespasser Child	
CS =	EPC Surface and Subsurface	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 =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-16PO-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED / BW x AT

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EP; EF = Exposure Frequency
IR = Ingestion Rate; ED = Exposure Duration
CF = Conversion Factor; BW = Bodyweight
FI = Fraction Ingested; 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)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
1,1,2,2-Tetrachloroethane	NA	2.0E-01	7.13E-03	6.92E-03		5.58E-09		1E-09		2.49E-09		5E-10
Acetone	1.0E-01	NA	6.51E-03	8.20E-03	5.95E-08		6E-07		6.37E-09		6E-08	
Benzene	3.0E-03	2.9E-02	5.00E-03	5.00E-03	4.57E-08	3.91E-09	2E-05	1E-10	4.89E-09	1.75E-09	2E-06	5E-11
Carbon disulfide	1.0E-01	NA	6.33E-03	6.23E-03	5.78E-08		6E-07		6.19E-09		6E-08	
Chloroform	1.0E-02	6.1E-03	2.00E-03	2.00E-03	1.83E-08	1.57E-09	2E-06	1E-11	1.96E-09	6.99E-10	2E-07	4E-12
Methyl ethyl ketone	6.0E-01	NA		5.00E-03								
Methylene chloride	6.0E-02	7.5E-03	3.00E-03	3.00E-03	2.74E-08	2.35E-09	5E-07	2E-11	2.94E-09	1.05E-09	5E-08	8E-12
Toluene	2.0E-01	NA	7.49E-03	7.12E-03	6.84E-08		3E-07		7.33E-09		4E-08	
Total Xylenes	2.0E+00	NA	6.99E-03	6.81E-03	6.38E-08		3E-08		6.84E-09		3E-09	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	1.73E+00	1.58E+00	1.58E-05	1.35E-06	8E-03	9E-07	1.69E-06	6.05E-07	8E-04	4E-07
2,6-Dinitrotoluene	1.0E-03	6.8E-01	1.80E-01	1.80E-01	1.64E-06	1.41E-07	2E-03	1E-07	1.76E-07	6.29E-08	2E-04	4E-08
2-Methylnaphthalene	4.0E-02	NA	1.08E+00	9.25E-01	9.86E-06		2E-04		1.06E-06		3E-05	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	1.10E-06		2E-05		1.17E-07		2E-06	
Acenaphthene	6.0E-02	NA	1.74E+00	1.39E+00	1.59E-05		3E-04		1.70E-06		3E-05	
Acenaphthylene	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	1.71E+00	1.35E+00	1.56E-05		5E-05		1.67E-06		6E-06	
Benzo(a)anthracene	NA	7.3E-01	4.73E+00	3.12E+00		3.70E-06		3E-06		1.65E-06		1E-06
Benzo(a)pyrene	NA	7.3E+00	6.63E+00	4.77E+00		5.19E-06		4E-05		2.32E-06		2E-05
Benzo(b)fluoranthene	NA	7.3E-01	6.88E+00	4.76E+00		5.39E-06		4E-06		2.40E-06		2E-06
Benzo(ghi)perylene	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	3.38E+00	2.51E+00		2.65E-06		2E-07		1.18E-06		9E-08
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	1.26E+00	1.90E+00	1.15E-05	9.86E-07	6E-04	1E-08	1.23E-06	4.40E-07	6E-05	6E-09
Butylbenzylphthalate	2.0E-01	NA		1.80E-02								
Carbazole	NA	2.0E-02	1.73E+00	1.38E+00		1.35E-06		3E-08		6.05E-07		1E-08
Chrysene	NA	7.3E-03	5.59E+00	3.68E+00		4.38E-06		3E-08		1.95E-06		1E-08
Dibenz(a,h)anthracene	NA	7.3E+00	1.86E+00	1.66E+00		1.46E-06		1E-05		6.50E-07		5E-06
Dibenzofuran	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	1.90E-02	1.90E-02	1.74E-07		2E-07		1.86E-08		2E-08	
Di-n-butylphthalate	1.0E-01	NA	1.30E+00	1.12E+00	1.19E-05		1E-04		1.27E-06		1E-05	
Fluoranthene	4.0E-02	NA	6.28E+00	4.11E+00	5.74E-05		1E-03		6.14E-06		2E-04	
Fluorene	4.0E-02	NA	1.49E+00	1.23E+00	1.36E-05		3E-04		1.46E-06		4E-05	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.07E+00	3.08E+00		2.40E-06		2E-06		1.07E-06		8E-07
Naphthalene	4.0E-02	NA	1.63E+00	1.31E+00	1.49E-05		4E-04		1.59E-06		4E-05	
N-Nitrosodiphenylamine	NA	4.9E-03	6.08E-01	5.81E-01		4.76E-07		2E-09		2.12E-07		1E-09
Pentachlorophenol	3.0E-02	1.2E-01	1.17E+00	1.15E+00	1.07E-05	9.16E-07	4E-04	1E-07	1.14E-06	4.09E-07	4E-05	5E-08
Phenanthrene	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	6.75E+00	4.39E+00	6.16E-05		2E-03		6.60E-06		2E-04	
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.24E-03	3.50E-03		2.54E-09		6E-10		1.13E-09		3E-10
4,4'-DDE	NA	3.4E-01	2.29E-02	2.01E-02		1.79E-08		6E-09		8.00E-09		3E-09
4,4'-DDT	5.0E-04	3.4E-01	1.11E-02	1.03E-02	1.01E-07	8.69E-09	2E-04	3E-09	1.09E-08	3.88E-09	2E-05	1E-09
alpha-Chlordane	6.0E-05	1.3E+00	2.46E-03	2.51E-03	2.25E-08	1.93E-09	4E-04	3E-09	2.41E-09	8.60E-10	4E-05	1E-09
Aroclor-1260	2 0E-05	2.0E+00	3.46E-02	3.70E-02	3.16E-07	2.71E-08	2E-02	5E-08	3.39E-08	1.21E-08	2E-03	2E-08
beta-BHC	NA	1.8E+00	1.80E-03	1.93E-03		1.41E-09		3E-09		6.29E-10		1E-09
delta-BHC	NA	NA	1.66E-03	1.80E-03								
Dieldrin	5.0E-05	1.6E+01	3.29E-03	3.89E-03	3.00E-08	2.58E-09	6E-04	4E-08	3.22E-09	1.15E-09	6E-05	2E-08
Endosulfan I	6.0E-03	NA	8.79E-03	8.20E-03	8.03E-08		1E-05		8.60E-09		1E-06	
Endosulfan II	6.0E-03	NA	3.37E-03	3.62E-03	3.08E-08		5E-06		3.30E-09		5E-07	
Endosulfan sulfate	6.0E-03	NA	3.17E-03	3.44E-03	2.89E-08		5E-06		3.10E-09		5E-07	
Endrin	3.0E-04	NA	4.05E-03	4.26E-03	3.70E-08		1E-04		3.96E-09		1E-05	
Endrin aldehyde	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	2.60E-03	2.64E-03	2.37E-08	2.04E-09	4E-04	3E-09	2.54E-09	9.09E-10	4E-05	1E-09
Heptachlor epoxide	1.3E-05	9.1E+00	1.70E-03	1.83E-03	1.55E-08	1.33E-09	1E-03	1E-08	1.66E-09	5.94E-10	1E-04	5E-09
Metals												
Antimony	4.0E-04	NA	4.78E+00	4.87E+00	4.37E-05		1E-01		4.68E-06		1E-02	
Barium	7.0E-02	NA	1.10E+02	1.11E+02	1.00E-03		1E-02		1.08E-04		2E-03	
Copper	4.0E-02	NA	6.98E+01	7.09E+01	6.37E-04		2E-02		6.83E-05		2E-03	
Lead	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-04	NA	3.50E-01	4.10E-01	3.20E-06		1E-02		3.42E-07		1E-03	
Selenium	5.0E-03	NA	9.80E-01	9.40E-01	8.95E-06		2E-03		9.59E-07		2E-04	
Thallium	8.0E-05	NA	9.20E-01	8.60E-01	8.40E-06		1E-01		9.00E-07		1E-02	
Zinc	3.0E-01	NA	1.33E+02	1.30E+02	1.21E-03		4E-03		1.30E-04		4E-04	
Herbicides												
2,4,5-T	1 0E-02	NA	4.02E-03	4.02E-03	3.67E-08		4E-06		3.93E-09		4E-07	
Total Hazard Quotient and Cancer Risk:							**3E-01**	**6E-05**			**3E-02**	**3E-05**

Assumptions for Future Day Care Center Child		Assumptions for Future 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.
NA= Information not available.

TABLE B-16PO-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x CF x SA x AF x ABS x EF x ED / BW x 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker: Absorbed Dose (mg/kg-day) (Nc)	Current Site Worker: Absorbed Dose (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics													
1,1,2,2-Tetrachloroethane	NA	2.0E-01	NA	7.13E-03	6.92E-03					Contact to Onsite Soils Not Applicable for Future Industrial Worker			
Acetone	1.0E-01	NA	NA	6.51E-03	8.20E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon disulfide	6.3E-02	NA	NA	6.33E-03	6.23E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methyl ethyl ketone	6.0E-01	NA	NA		5.00E-03								
Methylene chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	7.49E-03	7.12E-03								
Total Xylenes	1.8E+00	NA	NA	6.99E-03	6.81E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.73E+00	1.58E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.80E-01	1.80E-01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.08E+00	9.25E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
Acenaphthene	6.0E-02	NA	NA	1.74E+00	1.39E+00								
Acenaphthylene	NA	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	NA	1.71E+00	1.35E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	4.73E+00	3.12E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	6.63E+00	4.77E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	6.88E+00	4.76E+00								
Benzo(ghi)perylene	NA	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.38E+00	2.51E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.26E+00	1.90E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.73E+00	1.38E+00								
Chrysene	NA	7.3E-03	NA	5.59E+00	3.68E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.86E+00	1.66E+00								
Dibenzofuran	NA	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	1.30E+00	1.12E+00								
Fluoranthene	4.0E-02	NA	NA	6.28E+00	4.11E+00								
Fluorene	4.0E-02	NA	NA	1.49E+00	1.23E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.07E+00	3.08E+00								
Naphthalene	4.0E-02	NA	NA	1.63E+00	1.31E+00								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	6.08E-01	5.81E-01								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.17E+00	1.15E+00	5.31E-08	1.90E-08	2E-06	2E-09				
Phenanthrene	NA	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	NA	6.75E+00	4.39E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.24E-03	3.50E-03								
4,4'-DDE	NA	1.7E+00	NA	2.29E-02	2.01E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	1.11E-02	1.03E-02								
alpha-Chlordane	6.0E-05	1.3E+00	NA	2.46E-03	2.51E-03								
Aroclor-1260	1.8E-05	2.2E+00	0.06	3.46E-02	3.70E-02	9.43E-09	3.37E-09	5E-04	7E-09				
beta-BHC	NA	1.8E+00	NA	1.80E-03	1.93E-03								
delta-BHC	NA	NA	NA	1.66E-03	1.80E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.29E-03	3.89E-03								
Endosulfan I	6.0E-03	NA	NA	8.79E-03	8.20E-03								
Endosulfan II	6.0E-03	NA	NA	3.37E-03	3.62E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.17E-03	3.44E-03								
Endrin	3.0E-04	NA	NA	4.05E-03	4.26E-03								
Endrin aldehyde	NA	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.60E-03	2.64E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.70E-03	1.83E-03								
Metals													
Antimony	4.0E-04	NA	NA	4.78E+00	4.87E+00								
Barium	3.5E-03	NA	NA	1.10E+02	1.11E+02								
Copper	2.4E-02	NA	NA	6.98E+01	7.09E+01								
Lead	NA	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-06	NA	NA	3.50E-01	4.10E-01								
Selenium	4.5E-03	NA	NA	9.80E-01	9.40E-01								
Thallium	8.0E-05	NA	NA	9.20E-01	8.60E-01								
Zinc	7.5E-02	NA	NA	1.33E+02	1.30E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.02E-03	4.02E-03								
Total Hazard Quotient and Cancer Risk:								**5E-04**	**1E-08**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
CF =	1.00E-06	kg/mg
SA =	5800	cm2
AF =	1	mg/cm2
EF =	20	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 B-16PO-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = (CS x CF x SA x AF x ABS x EF x ED) / (BW x 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	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Future Construction Worker				Future Tresspasser 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	7.13E-03	6.92E-03								
Acetone	1.0E-01	NA	NA	6.51E-03	8.20E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon disulfide	6.3E-02	NA	NA	6.33E-03	6.23E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methyl ethyl ketone	6.0E-01	NA	NA		5.00E-03								
Methylene chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	7.49E-03	7.12E-03								
Total Xylenes	1.8E+00	NA	NA	6.99E-03	6.81E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.73E+00	1.58E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.80E-01	1.80E-01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.08E+00	9.25E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
Acenaphthene	6.0E-02	NA	NA	1.74E+00	1.39E+00								
Acenaphthylene	NA	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	NA	1.71E+00	1.35E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	4.73E+00	3.12E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	6.63E+00	4.77E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	6.88E+00	4.76E+00								
Benzo(ghi)perylene	NA	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.38E+00	2.51E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.26E+00	1.90E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.73E+00	1.38E+00								
Chrysene	NA	7.3E-03	NA	5.59E+00	3.68E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.86E+00	1.66E+00								
Dibenzofuran	NA	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	1.30E+00	1.12E+00								
Fluoranthene	4.0E-02	NA	NA	6.28E+00	4.11E+00								
Fluorene	4.0E-02	NA	NA	1.49E+00	1.23E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.07E+00	3.08E+00								
Naphthalene	4.0E-02	NA	NA	1.63E+00	1.31E+00								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	6.08E-01	5.81E-01								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.17E+00	1.15E+00	6.64E-07	9.49E-09	2E-05	1E-09	1.48E-07	1.06E-08	5E-06	1E-09
Phenanthrene	NA	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	NA	6.75E+00	4.39E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.24E-03	3.50E-03								
4,4'-DDE	NA	1.7E+00	NA	2.29E-02	2.01E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	1.11E-02	1.03E-02								
alpha-Chlordane	6.0E-05	1.3E+00	NA	2.46E-03	2.51E-03								
Aroclor-1260	1.8E-05	2.2E+00	0.06	3.46E-02	3.70E-02	1.18E-07	1.68E-09	7E-03	4E-09	2.63E-08	1.88E-09	1E-03	4E-09
beta-BHC	NA	1.8E+00	NA	1.80E-03	1.93E-03								
delta-BHC	NA	NA	NA	1.66E-03	1.80E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.29E-03	3.89E-03								
Endosulfan I	6.0E-03	NA	NA	8.79E-03	8.20E-03								
Endosulfan II	6.0E-03	NA	NA	3.37E-03	3.62E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.17E-03	3.44E-03								
Endrin	3.0E-04	NA	NA	4.05E-03	4.26E-03								
Endrin aldehyde	NA	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.60E-03	2.64E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.70E-03	1.83E-03								
Metals													
Antimony	4.0E-04	NA	NA	4.78E+00	4.87E+00								
Barium	3.5E-03	NA	NA	1.10E+02	1.11E+02								
Copper	2.4E-02	NA	NA	6.98E+01	7.09E+01								
Lead	NA	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-06	NA	NA	3.50E-01	4.10E-01								
Selenium	4.5E-03	NA	NA	9.80E-01	9.40E-01								
Thallium	8.0E-05	NA	NA	9.20E-01	8.60E-01								
Zinc	7.5E-02	NA	NA	1.33E+02	1.30E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.02E-03	4.02E-03								
Total Hazard Quotient and Cancer Risk:								**7E-03**	**5E-09**			**1E-03**	**5E-09**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser 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 =	4625	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	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 B-16PO-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-16 Feasibility Study
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	Carc. Slope Dermal	Absorption Factor*	EPC Surface Soil	EPC from Total Soils	Future Day Care Center Child				Future 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													
1,1,2,2-Tetrachloroethane	NA	2.0E-01	NA	7.13E-03	6.92E-03								
Acetone	1.0E-01	NA	NA	6.51E-03	8.20E-03								
Benzene	2.9E-03	3.1E-02	NA	5.00E-03	5.00E-03								
Carbon disulfide	6.3E-02	NA	NA	6.33E-03	6.23E-03								
Chloroform	1.0E-02	6.1E-03	NA	2.00E-03	2.00E-03								
Methyl ethyl ketone	6.0E-01	NA	NA		5.00E-03								
Methylene chloride	5.9E-02	7.7E-03	NA	3.00E-03	3.00E-03								
Toluene	2.0E-01	NA	NA	7.49E-03	7.12E-03								
Total Xylenes	1.8E+00	NA	NA	6.99E-03	6.81E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	1.73E+00	1.58E+00								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	1.80E-01	1.80E-01								
2-Methylnaphthalene	4.0E-02	NA	NA	1.08E+00	9.25E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
Acenaphthene	6.0E-02	NA	NA	1.74E+00	1.39E+00								
Acenaphthylene	NA	NA	NA	2.98E-01	3.07E-01								
Anthracene	3.0E-01	NA	NA	1.71E+00	1.35E+00								
Benzo(a)anthracene	NA	7.3E-01	NA	4.73E+00	3.12E+00								
Benzo(a)pyrene	NA	1.8E+01	NA	6.63E+00	4.77E+00								
Benzo(b)fluoranthene	NA	7.3E-01	NA	6.88E+00	4.76E+00								
Benzo(ghi)perylene	NA	NA	NA	3.12E+00	3.32E+00								
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.38E+00	2.51E+00								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	1.26E+00	1.90E+00								
Butylbenzylphthalate	2.0E-01	NA	NA		1.80E-02								
Carbazole	NA	2.0E-02	NA	1.73E+00	1.38E+00								
Chrysene	NA	7.3E-03	NA	5.59E+00	3.68E+00								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	1.86E+00	1.66E+00								
Dibenzofuran	NA	NA	NA	1.40E+00	1.20E+00								
Diethyl phthalate	8.0E-01	NA	NA	1.90E-02	1.90E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	1.30E+00	1.12E+00								
Fluoranthene	4.0E-02	NA	NA	6.28E+00	4.11E+00								
Fluorene	4.0E-02	NA	NA	1.49E+00	1.23E+00								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.07E+00	3.08E+00								
Naphthalene	4.0E-02	NA	NA	1.63E+00	1.31E+00								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	6.08E-01	5.81E-01								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	1.17E+00	1.15E+00	1.17E-06	1.00E-07	4E-05	1E-08	6.64E-07	2.37E-07	2E-05	3E-08
Phenanthrene	NA	NA	NA	4.89E+00	3.16E+00								
Pyrene	3.0E-02	NA	NA	6.75E+00	4.39E+00								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.24E-03	3.50E-03								
4,4'-DDE	NA	1.7E+00	NA	2.29E-02	2.01E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	1.11E-02	1.03E-02								
alpha-Chlordane	6.0E-05	1.3E+00	NA	2.46E-03	2.51E-03								
Aroclor-1260	1.8E-05	2.2E+00	0.06	3.46E-02	3.70E-02	2.08E-07	1.78E-08	1E-02	4E-08	1.18E-07	4.21E-08	7E-03	9E-08
beta-BHC	NA	1.8E+00	NA	1.80E-03	1.93E-03								
delta-BHC	NA	NA	NA	1.66E-03	1.80E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.29E-03	3.89E-03								
Endosulfan I	6.0E-03	NA	NA	8.79E-03	8.20E-03								
Endosulfan II	6.0E-03	NA	NA	3.37E-03	3.62E-03								
Endosulfan sulfate	6.0E-03	NA	NA	3.17E-03	3.44E-03								
Endrin	3.0E-04	NA	NA	4.05E-03	4.26E-03								
Endrin aldehyde	NA	NA	NA	3.34E-03	3.59E-03								
Endrin ketone	NA	NA	NA	4.08E-03	4.25E-03								
gamma-Chlordane	6.0E-05	1.3E+00	NA	2.60E-03	2.64E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.70E-03	1.83E-03								
Metals													
Antimony	4 0E-04	NA	NA	4.78E+00	4.87E+00								
Barium	3.5E-03	NA	NA	1.10E+02	1.11E+02								
Copper	2.4E-02	NA	NA	6.98E+01	7.09E+01								
Lead	NA	NA	NA	3.54E+02	3.64E+02								
Mercury	3.0E-06	NA	NA	3.50E-01	4.10E-01								
Selenium	4.5E-03	NA	NA	9.80E-01	9.40E-01								
Thallium	8.0E-05	NA	NA	9.20E-01	8.60E-01								
Zinc	7.5E-02	NA	NA	1.33E+02	1.30E+02								
Herbicides													
2,4,5-T	1.0E-02	NA	NA	4.02E-03	4.02E-03								
Total Hazard Quotient and Cancer Risk:								**1E-02**	**5E-08**			**7E-03**	**1E-07**

Assumptions for Day Care Center Child		
CS =	EPC Surface Only	
CF =	1.00E-06	kg/mg
SA =	2190	cm2
AF =	1	mg/cm2
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	
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.

SEAD-17

PRE-REMEDIATION

TABLE B-17PR-1

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-17PR-7	1E-04	7E-09
	Ingestion of Onsite Soils	Table B-17PR-8	8E-03	4E-07
	Dermal Contact to Onsite Soils	Table B-17PR-9	8E-03	3E-08
	TOTAL RECEPTOR RISK (Nc & Car)		2E-02	5E-07
FUTURE INDUSTRIAL WORKER	Inhalation of Dust in Ambient Air	Table B-17PR-7	2E-03	9E-08
	Ingestion of Onsite Soils	Table B-17PR-8	1E-01	5E-06
	Dermal Contact to Onsite Soils	Table B-17PR-9	1E-01	3E-07
	Ingestion of Groundwater	Table B-17PR-13	2E-04	9E-05
	TOTAL RECEPTOR RISK (Nc & Car)		2E-01	1E-04
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-17PR-7	2E-02	3E-08
	Ingestion of Onsite Soils	Table B-17PR-8	4E-01	1E-06
	Dermal Contact to Onsite Soils	Table B-17PR-9	9E-02	2E-08
	TOTAL RECEPTOR RISK (Nc & Car)		5E-01	1E-06
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-17PR-7	7E-05	6E-10
	Ingestion of Onsite Soils	Table B-17PR-8	6E-02	6E-07
	Dermal Contact to Onsite Soils	Table B-17PR-9	2E-02	1E-08
	Dermal Contact to Surface Water while Wading	Table B-17PR-10	1E-03	1E-08
	Ingestion of Onsite Sediment	Table B-17PR-11	5E-02	3E-07
	Dermal Contact to Sediment while Wading	Table B-17PR-12	3E-03	5E-09
	TOTAL RECEPTOR RISK (Nc & Car)		1E-01	9E-07
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-17PR-7	4E-03	4E-08
	Ingestion of Onsite Soils	Table B-17PR-8	1E+00	1E-05
	Dermal Contact to Onsite Soils	Table B-17PR-9	2E-01	1E-07
	Ingestion of Groundwater	Table B-17PR-13	4E-04	5E-05
	TOTAL RECEPTOR RISK (Nc & Car)		1E+00	6E-05
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-17PR-7	2E-03	7E-08
	Ingestion of Onsite Soils	Table B-17PR-8	1E-01	5E-06
	Dermal Contact to Onsite Soils	Table B-17PR-9	1E-01	3E-07
	Ingestion of Groundwater	Table B-17PR-13	2E-04	9E-05
	TOTAL RECEPTOR RISK (Nc & Car)		2E-01	1E-04

TABLE B-17PR-2

Total Soils Exposure Point Concentration Summary - Pre-Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
Acetone	56	0	3	5%	6.93E-03	4.48E-03	1.08E-02	FALSE	7.25E-03	7.25E-03
Benzene	56	0	2	4%	5.94E-03	9.31E-04	2.00E-03	FALSE	6.30E-03	2.00E-03
Methylene chloride	56	0	1	2%	6.02E-03	6.26E-04	4.00E-03	FALSE	6.17E-03	4.00E-03
Toluene	56	0	5	9%	5.91E-03	1.14E-03	8.00E-03	FALSE	6.46E-03	6.46E-03
Semivolatile Organics										
2,4-Dinitrotoluene**	56	0	6	11%	2.44E-01	2.26E-01	1.40E+00	FALSE	2.71E-01	2.71E-01
2,6-Dinitrotoluene**	55	1	1	2%	1.94E-01	2.27E-02	7.00E-02	FALSE	2.01E-01	7.00E-02
2-Methylnaphthalene	55	1	2	4%	1.93E-01	2.83E-02	1.30E-01	FALSE	2.09E-01	1.30E-01
2-Methylphenol	55	1	1	2%	1.94E-01	1.82E-02	1.20E-01	FALSE	1.99E-01	1.20E-01
3,3'-Dichlorobenzidine	56	0	1	2%	2.17E-01	1.31E-01	4.10E-01	FALSE	2.25E-01	2.25E-01
3-Nitroaniline	56	0	1	2%	5.24E-01	3.13E-01	9.90E-01	FALSE	5.45E-01	5.45E-01
4-Nitroaniline	56	0	1	2%	5.24E-01	3.13E-01	9.90E-01	FALSE	5.45E-01	5.45E-01
Acenaphthene	55	1	2	4%	1.90E-01	3.56E-02	3.30E-02	FALSE	2.18E-01	3.30E-02
Acenaphthylene	55	1	2	4%	1.92E-01	2.93E-02	9.60E-02	FALSE	2.07E-01	9.60E-02
Anthracene	55	1	3	6%	1.91E-01	3.08E-02	1.30E-01	FALSE	2.09E-01	1.30E-01
Benzo[a]anthracene	56	0	18	32%	1.83E-01	1.75E-01	7.20E-01	FALSE	2.70E-01	2.70E-01
Benzo[a]pyrene	56	0	19	34%	1.86E-01	1.95E-01	9.40E-01	FALSE	2.75E-01	2.75E-01
Benzo[b]fluoranthene	56	0	18	32%	2.14E-01	3.14E-01	2.20E+00	FALSE	2.81E-01	2.81E-01
Benzo[ghi]perylene	56	0	15	27%	1.96E-01	1.69E-01	7.10E-01	FALSE	2.50E-01	2.50E-01
Benzo[k]fluoranthene	56	0	15	27%	1.81E-01	1.57E-01	5.30E-01	FALSE	2.54E-01	2.54E-01
Bis(2-Chloroisopropyl)ether	24	0	1	4%	2.01E-01	4.60E-02	4.10E-01	FALSE	2.13E-01	2.13E-01
Butylbenzylphthalate	55	1	2	4%	1.91E-01	3.27E-02	4.60E-02	FALSE	2.09E-01	4.60E-02
Carbazole	56	0	3	5%	2.13E-01	1.34E-01	4.10E-01	FALSE	2.29E-01	2.29E-01
Chrysene	56	0	28	50%	1.55E-01	1.81E-01	6.70E-01	FALSE	2.33E-01	2.33E-01
Di-n-butylphthalate	56	0	20	36%	2.16E-01	1.85E-01	1.20E+00	FALSE	2.65E-01	2.65E-01
Dibenz[a,h]anthracene	56	0	9	16%	2.00E-01	1.45E-01	4.70E-01	FALSE	2.42E-01	2.42E-01
Dibenzofuran	55	1	1	2%	1.93E-01	2.62E-02	3.60E-02	FALSE	2.07E-01	3.60E-02
Fluoranthene	56	0	33	59%	1.59E-01	2.13E-01	1.00E+00	FALSE	2.20E-01	2.20E-01
Fluorene	55	1	1	2%	1.94E-01	2.60E-02	3.80E-02	FALSE	2.06E-01	3.80E-02
Indeno[1,2,3-cd]pyrene	56	0	12	21%	2.04E-01	1.71E-01	7.90E-01	FALSE	2.60E-01	2.60E-01
N-Nitrosodiphenylamine	55	1	4	7%	1.87E-01	3.92E-02	9.50E-02	FALSE	2.10E-01	9.50E-02
Naphthalene	55	1	3	6%	1.88E-01	4.14E-02	3.70E-02	FALSE	2.23E-01	3.70E-02
Pentachlorophenol	56	0	2	4%	5.23E-01	3.22E-01	9.90E-01	FALSE	5.83E-01	5.83E-01
Phenanthrene	56	0	20	36%	1.71E-01	1.57E-01	3.60E-01	FALSE	2.47E-01	2.47E-01
Pyrene	56	0	32	57%	1.62E-01	2.21E-01	1.20E+00	FALSE	2.14E-01	2.14E-01
bis(2-Ethylhexyl)phthalate	56	0	18	32%	2.75E-01	2.63E-01	1.30E+00	FALSE	3.44E-01	3.44E-01
Pesticides/PCBs										
4,4'-DDD	56	0	4	7%	2.54E-03	2.70E-03	1.50E-02	FALSE	2.61E-03	2.61E-03
4,4'-DDE	56	0	20	36%	7.38E-03	1.94E-02	1.40E-01	FALSE	6.91E-03	6.91E-03
4,4'-DDT	56	0	10	18%	3.31E-03	3.62E-03	1.60E-02	FALSE	3.55E-03	3.55E-03
Aldrin	56	0	1	2%	1.17E-03	1.07E-03	1.90E-03	FALSE	1.20E-03	1.20E-03
Aroclor-1254	56	0	1	2%	2.32E-02	2.14E-02	6.10E-02	FALSE	2.39E-02	2.39E-02
Aroclor-1260	56	0	3	5%	2.28E-02	2.08E-02	2.80E-02	FALSE	2.33E-02	2.33E-02
Dieldrin	56	0	7	13%	5.58E-03	1.33E-02	8.00E-02	FALSE	5.02E-03	5.02E-03
Endosulfan 1	56	0	5	9%	8.90E-03	5.73E-02	4.30E-01	FALSE	2.29E-03	2.29E-03
Endosulfan sulfate	56	0	1	2%	2.29E-03	2.41E-03	2.00E-02	FALSE	2.32E-03	2.32E-03
Endrin	56	0	3	5%	2.77E-03	5.50E-03	4.30E-02	FALSE	2.60E-03	2.60E-03
Endrin ketone	56	0	2	4%	3.26E-03	9.23E-03	7.10E-02	FALSE	2.73E-03	2.73E-03
Heptachlor epoxide	55	1	1	2%	1.01E-03	7.63E-05	1.10E-03	TRUE	1.03E-03	1.03E-03
alpha-Chlordane	55	1	1	2%	1.02E-03	7.67E-05	1.10E-03	TRUE	1.03E-03	1.03E-03
beta-BHC	56	0	1	2%	1.35E-03	2.54E-03	2.00E-02	FALSE	1.28E-03	1.28E-03
delta-BHC	56	0	1	2%	1.18E-03	1.08E-03	2.20E-03	FALSE	1.21E-03	1.21E-03
Nitroaromatics										
2,4-Dinitrotoluene**	56	0	4	7%	7.07E-02	3.91E-02	3.30E-01	FALSE	7.39E-02	7.39E-02
2,6-Dinitrotoluene**	56	0	1	2%	7.79E-02	1.12E-01	9.00E-01	FALSE	7.66E-02	7.66E-02
Metals										
Antimony	56	0	26	46%	6.36E+00	9.50E+00	5.20E+01	FALSE	9.89E+00	9.89E+00
Arsenic	56	0	56	100%	5.84E+00	2.01E+00	1.61E+01	FALSE	6.21E+00	6.21E+00
Barium	56	0	41	73%	1.33E+02	9.46E+01	5.24E+02	FALSE	1.53E+02	1.53E+02
Cadmium	56	0	43	77%	3.21E+00	4.71E+00	2.55E+01	FALSE	6.61E+00	6.61E+00
Copper	56	0	56	100%	1.32E+02	1.83E+02	8.37E+02	FALSE	1.76E+02	1.76E+02
Lead	56	0	55	98%	7.47E+02	1.16E+03	6.27E+03	FALSE	2.46E+03	2.46E+03
Mercury	56	0	51	91%	1.08E-01	1.82E-01	1.00E+00	FALSE	1.15E-01	1.15E-01
Selenium	56	0	35	63%	5.86E-01	4.98E-01	1.70E+00	TRUE	6.98E-01	6.98E-01
Silver	56	0	16	29%	1.17E+00	1.71E+00	9.00E+00	FALSE	1.65E+00	1.65E+00
Thallium	56	0	11	20%	4.04E-01	3.84E-01	1.50E+00	FALSE	5.30E-01	5.30E-01
Zinc	56	0	56	100%	2.50E+02	2.99E+02	1.48E+03	FALSE	3.01E+02	3.01E+02
Herbicides										
MCPA	32	0	4	13%	5.57E+00	7.71E+00	3.40E+01	FALSE	6.26E+00	6.26E+00

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-17PR-3

Surface Soil Exposure Point Concentration Summary - Pre-Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
Acetone	47	0	3	6%	7.10E-03	4.87E-03	1.08E-02	FALSE	7.52E-03	7.52E-03
Benzene	47	0	2	4%	5.93E-03	1.01E-03	2.00E-03	FALSE	6.36E-03	2.00E-03
Methylene chloride	47	0	1	2%	6.02E-03	6.75E-04	4.00E-03	FALSE	6.20E-03	4.00E-03
Toluene	47	0	5	11%	5.88E-03	1.24E-03	8.00E-03	FALSE	6.55E-03	6.55E-03
Semivolatile Organics										
2,4-Dinitrotoluene**	47	0	6	13%	2.54E-01	2.46E-01	1.40E+00	FALSE	2.91E-01	2.91E-01
2,6-Dinitrotoluene**	46	1	1	2%	1.94E-01	2.45E-02	7.00E-02	FALSE	2.03E-01	7.00E-02
2-Methylnaphthalene	46	1	2	4%	1.93E-01	3.07E-02	1.30E-01	FALSE	2.12E-01	1.30E-01
2-Methylphenol	46	1	1	2%	1.95E-01	1.95E-02	1.20E-01	FALSE	2.00E-01	1.20E-01
3,3'-Dichlorobenzidine	47	0	1	2%	2.21E-01	1.43E-01	4.10E-01	FALSE	2.32E-01	2.32E-01
3-Nitroaniline	47	0	1	2%	5.35E-01	3.41E-01	9.90E-01	FALSE	5.62E-01	5.62E-01
4-Nitroaniline	47	0	1	2%	5.35E-01	3.41E-01	9.90E-01	FALSE	5.62E-01	5.62E-01
Acenaphthene	46	1	2	4%	1.90E-01	3.87E-02	3.30E-02	FALSE	2.24E-01	3.30E-02
Acenaphthylene	46	1	2	4%	1.92E-01	3.18E-02	9.60E-02	FALSE	2.10E-01	9.60E-02
Anthracene	46	1	3	7%	1.90E-01	3.35E-02	1.30E-01	FALSE	2.13E-01	1.30E-01
Benzo[a]anthracene	47	0	18	38%	1.81E-01	1.91E-01	7.20E-01	FALSE	2.86E-01	2.86E-01
Benzo[a]pyrene	47	0	19	40%	1.85E-01	2.14E-01	9.40E-01	FALSE	2.91E-01	2.91E-01
Benzo[b]fluoranthene	47	0	18	38%	2.18E-01	3.43E-01	2.20E+00	FALSE	3.03E-01	3.03E-01
Benzo[ghi]perylene	47	0	15	32%	1.96E-01	1.85E-01	7.10E-01	FALSE	2.64E-01	2.64E-01
Benzo[k]fluoranthene	47	0	15	32%	1.79E-01	1.72E-01	5.30E-01	FALSE	2.67E-01	2.67E-01
Bis(2-Chloroisopropyl)ether	24	0	1	4%	2.01E-01	4.60E-02	4.10E-01	FALSE	2.13E-01	2.13E-01
Butylbenzylphthalate	46	1	2	4%	1.91E-01	3.56E-02	4.60E-02	FALSE	2.13E-01	4.60E-02
Carbazole	47	0	3	6%	2.17E-01	1.46E-01	4.10E-01	FALSE	2.37E-01	2.37E-01
Chrysene	47	0	28	60%	1.48E-01	1.98E-01	6.70E-01	FALSE	2.27E-01	2.27E-01
Di-n-butylphthalate	47	0	20	43%	2.21E-01	2.02E-01	1.20E+00	FALSE	2.84E-01	2.84E-01
Dibenz[a,h]anthracene	47	0	9	19%	2.01E-01	1.59E-01	4.70E-01	FALSE	2.55E-01	2.55E-01
Dibenzofuran	46	1	1	2%	1.94E-01	2.84E-02	3.60E-02	FALSE	2.10E-01	3.60E-02
Fluoranthene	47	0	33	70%	1.53E-01	2.33E-01	1.00E+00	FALSE	2.11E-01	2.11E-01
Fluorene	46	1	1	2%	1.94E-01	2.82E-02	3.80E-02	FALSE	2.09E-01	3.80E-02
Indeno[1,2,3-cd]pyrene	47	0	12	26%	2.06E-01	1.86E-01	7.90E-01	FALSE	2.77E-01	2.77E-01
N-Nitrosodiphenylamine	46	1	4	9%	1.86E-01	4.27E-02	9.50E-02	FALSE	2.13E-01	9.50E-02
Naphthalene	46	1	3	7%	1.87E-01	4.52E-02	3.70E-02	FALSE	2.30E-01	3.70E-02
Pentachlorophenol	47	0	2	4%	5.34E-01	3.51E-01	9.90E-01	FALSE	6.10E-01	6.10E-01
Phenanthrene	47	0	20	43%	1.66E-01	1.72E-01	3.60E-01	FALSE	2.55E-01	2.55E-01
Pyrene	47	0	32	68%	1.57E-01	2.41E-01	1.20E+00	FALSE	2.06E-01	2.06E-01
bis(2-Ethylhexyl)phthalate	47	0	11	23%	3.02E-01	2.72E-01	1.30E+00	FALSE	3.43E-01	3.43E-01
Pesticides/PCBs										
4,4'-DDD	47	0	4	9%	2.65E-03	2.94E-03	1.50E-02	FALSE	2.76E-03	2.76E-03
4,4'-DDE	47	0	20	43%	8.42E-03	2.10E-02	1.40E-01	FALSE	8.57E-03	8.57E-03
4,4'-DDT	47	0	10	21%	3.58E-03	3.91E-03	1.60E-02	FALSE	3.96E-03	3.96E-03
Aldrin	47	0	1	2%	1.21E-03	1.17E-03	1.90E-03	FALSE	1.25E-03	1.25E-03
Aroclor-1260	47	0	3	6%	2.34E-02	2.27E-02	2.80E-02	FALSE	2.42E-02	2.42E-02
Dieldrin	47	0	7	15%	6.28E-03	1.45E-02	8.00E-02	FALSE	6.01E-03	6.01E-03
Endosulfan I	47	0	5	11%	1.04E-02	6.26E-02	4.30E-01	FALSE	2.72E-03	2.72E-03
Endosulfan sulfate	47	0	1	2%	2.36E-03	2.63E-03	2.00E-02	FALSE	2.41E-03	2.41E-03
Endrin	47	0	3	6%	2.93E-03	6.00E-03	4.30E-02	FALSE	2.76E-03	2.76E-03
Endrin ketone	47	0	2	4%	3.51E-03	1.01E-02	7.10E-02	FALSE	2.93E-03	2.93E-03
Heptachlor epoxide	46	1	1	2%	1.02E-03	7.78E-05	1.10E-03	FALSE	1.05E-03	1.05E-03
alpha-Chlordane	46	1	1	2%	1.02E-03	7.80E-05	1.10E-03	FALSE	1.05E-03	1.05E-03
beta-BHC	47	0	1	2%	1.42E-03	2.77E-03	2.00E-02	FALSE	1.35E-03	1.35E-03
delta-BHC	47	0	1	2%	1.22E-03	1.18E-03	2.20E-03	FALSE	1.26E-03	1.26E-03
Nitroaromatics										
2,4-Dinitrotoluene**	47	0	4	9%	7.18E-02	4.27E-02	3.30E-01	FALSE	7.58E-02	7.58E-02
2,6-Dinitrotoluene**	47	0	1	2%	8.03E-02	1.22E-01	9.00E-01	FALSE	7.92E-02	7.92E-02
Metals										
Antimony	47	0	26	55%	6.65E+00	1.03E+01	5.20E+01	FALSE	1.15E+01	1.15E+01
Arsenic	47	0	47	100%	6.00E+00	2.13E+00	1.61E+01	FALSE	6.44E+00	6.44E+00
Barium	47	0	32	68%	1.41E+02	1.01E+02	5.24E+02	FALSE	1.67E+02	1.67E+02
Cadmium	47	0	42	89%	3.71E+00	4.98E+00	2.55E+01	FALSE	8.82E+00	8.82E+00
Copper	47	0	47	100%	1.51E+02	1.94E+02	8.37E+02	FALSE	2.21E+02	2.21E+02
Lead	47	0	46	98%	8.68E+02	1.23E+03	6.27E+03	FALSE	2.25E+03	2.25E+03
Mercury	47	0	45	96%	1.21E-01	1.96E-01	1.00E+00	FALSE	1.31E-01	1.31E-01
Selenium	47	0	35	75%	6.78E-01	4.93E-01	1.70E+00	FALSE	1.03E+00	1.03E+00
Silver	47	0	16	34%	1.28E+00	1.85E+00	9.00E+00	FALSE	2.06E+00	2.06E+00
Thallium	47	0	11	23%	4.59E-01	3.97E-01	1.50E+00	FALSE	6.38E-01	6.38E-01
Zinc	47	0	47	100%	2.81E+02	3.17E+02	1.48E+03	FALSE	3.57E+02	3.57E+02
Herbicides										
MCPA	23	0	4	17%	6.61E+00	8.93E+00	3.40E+01	FALSE	8.49E+00	8.49E+00

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment.

TABLE B-17PR-4

Groundwater Exposure Point Concentration Summary

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/L)	Standard Deviation (mg/L)	Max Hit (mg/L)	Normal?	95% UCL of Mean (mg/L)	Expos Concentr (m
latile Organics										
a]pyrene	11	0	1	9.10%	4.75E-03	1.36E-03	7.00E-04	FALSE	8.02E-03	7.0
ghi]perylene	11	0	1	9.10%	4.82E-03	1.12E-03	1.50E-03	FALSE	6.27E-03	1.5
[a,h]anthracene	11	0	1	9.10%	4.77E-03	1.29E-03	9.50E-04	FALSE	7.17E-03	9.5
[1,2,3-cd]pyrene	11	0	1	9.10%	4.82E-03	1.12E-03	1.50E-03	FALSE	6.27E-03	1.5
romatics										
	6	0	1	16.70%	8.92E-05	3.22E-05	8.00E-05	FALSE	1.28E-04	8.0

to text for detailed discussion of EPC determination.

TABLE B-17PR-4

Surface Water Exposure Point Concentration Summary - Pre-Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/L)	Standard Deviation (mg/L)	Max Hit (mg/L)	Normal?	95% UCL of Mean (mg/L)	Expos Concentr (r
latile Organics										
Ethylhexyl)phthalate	10	0	2	20%	4.30E-03	1.49E-03	2.00E-03	FALSE	6.96E-03	2.0
ony	10	0	4	40%	5.17E-03	7.46E-03	2.36E-02	FALSE	2.21E-02	2.2
c	10	0	6	60%	2.78E-03	1.31E-03	4.60E-03	FALSE	4.26E-03	4.2
	10	0	10	100%	4.70E-02	2.73E-02	1.00E-01	FALSE	7.22E-02	7.2
um	10	0	5	50%	3.91E-04	3.63E-04	1.30E-03	FALSE	7.82E-04	7.8
n	10	0	10	100%	5.36E+01	1.66E+01	7.35E+01	TRUE	6.32E+01	6.3
ium	10	0	1	10%	5.50E-04	1.58E-04	1.00E-03	FALSE	6.31E-04	6.3
	10	0	10	100%	1.30E-02	8.08E-03	3.27E-02	FALSE	1.93E-02	1.9
	10	0	10	100%	1.46E-01	8.21E-02	3.22E-01	TRUE	1.93E-01	1.9
	10	0	6	60%	7.21E-03	1.15E-02	3.71E-02	FALSE	4.42E-02	3.7
sium	10	0	10	100%	5.90E+00	2.88E+00	9.28E+00	FALSE	8.90E+00	8.9
nese	10	0	10	100%	8.43E-03	6.20E-03	1.96E-02	TRUE	1.20E-02	1.2
	10	0	1	10%	8.90E-04	2.85E-04	1.70E-03	FALSE	1.03E-03	1.0
um	10	0	10	100%	3.01E+00	8.97E-01	4.38E+00	TRUE	3.52E+00	3.5
m	10	0	5	50%	2.17E-03	1.06E-03	3.50E-03	FALSE	3.23E-03	3.2
n	10	0	10	100%	5.21E+00	3.18E+00	9.46E+00	TRUE	7.03E+00	7.0
um	10	0	1	10%	7.20E-04	3.79E-04	1.80E-03	FALSE	9.00E-04	9.0
	10	0	10	100%	2.41E-02	2.12E-02	6.17E-02	TRUE	3.63E-02	3.6

to text for detailed discussion of EPC determination.

TABLE B-17PR-5

Sediment Exposure Point Concentration Summary - Pre-Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected SQLs	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure I Concentration (mg/kg
Volatile Organics										
Acetone	10	0	3	30%	1.06E-02	6.03E-03	2.60E-02	FALSE	1.44E-02	1.44E-0
Toluene	10	0	1	10%	7.60E-03	1.33E-03	8.00E-03	FALSE	8.40E-03	8.00E-0
Semivolatile										
2,4-Dimethylphenol	10	0	1	10%	2.35E-01	7.63E-02	3.20E-02	FALSE	4.51E-01	3.20E-0
2,4-Dinitrotoluene	10	0	1	10%	2.75E-01	6.77E-02	4.50E-01	FALSE	3.14E-01	3.14E-0
Benzo[a]anthracene	10	0	1	10%	2.33E-01	7.82E-02	2.50E-02	FALSE	5.05E-01	2.50E-0
Benzo[a]pyrene	10	0	1	10%	2.33E-01	7.67E-02	3.00E-02	FALSE	4.59E-01	3.00E-0
Benzo[b]fluoranthene	10	0	1	10%	2.34E-01	7.29E-02	4.30E-02	FALSE	3.91E-01	4.30E-0
Benzo[ghi]perylene	10	0	1	10%	2.33E-01	7.65E-02	3.10E-02	FALSE	4.52E-01	3.10E-0
Benzo[k]fluoranthene	10	0	1	10%	2.33E-01	7.59E-02	3.30E-02	FALSE	4.39E-01	3.30E-0
Bis(2-Ethylhexyl)phthalate	10	0	3	30%	1.93E-01	9.77E-02	7.70E-02	FALSE	4.24E-01	7.70E-0
Chrysene	10	0	1	10%	2.35E-01	7.15E-02	4.80E-02	FALSE	3.74E-01	4.80E-0
Fluoranthene	10	0	2	20%	2.19E-01	9.12E-02	7.00E-02	FALSE	4.45E-01	7.00E-0
Indeno[1,2,3-cd]pyrene	10	0	1	10%	2.32E-01	7.85E-02	2.40E-02	FALSE	5.16E-01	2.40E-0
Phenanthrene	10	0	1	10%	2.34E-01	7.53E-02	3.50E-02	FALSE	4.27E-01	3.50E-0
Pyrene	10	0	2	20%	2.16E-01	9.77E-02	4.70E-02	FALSE	5.67E-01	4.70E-0
Pesticides/PCBs										
4,4'-DDD	10	0	3	30%	4.08E-03	3.56E-03	1.30E-02	FALSE	6.46E-03	6.46E-0
4,4'-DDE	10	0	6	60%	1.25E-02	1.92E-02	6.20E-02	FALSE	4.82E-02	4.82E-0
4,4'-DDT	10	0	2	20%	3.49E-03	3.01E-03	1.20E-02	FALSE	4.90E-03	4.90E-0
Dieldrin	10	0	1	10%	2.81E-03	8.14E-04	5.00E-03	FALSE	3.26E-03	3.26E-0
Endosulfan I	10	0	1	10%	1.33E-03	1.70E-04	1.60E-03	TRUE	1.43E-03	1.43E-0
Endosulfan II	10	0	2	20%	2.69E-03	5.92E-04	3.80E-03	FALSE	3.05E-03	3.05E-0
Metals										
Aluminum	10	0	10	100%	1.64E+04	3.29E+03	2.21E+04	TRUE	1.83E+04	1.83E+0
Antimony	10	0	4	40%	1.64E+00	1.92E+00	5.50E+00	FALSE	5.59E+00	5.50E+0
Arsenic	10	0	10	100%	5.29E+00	1.41E+00	7.50E+00	TRUE	6.10E+00	6.10E+0
Barium	10	0	10	100%	1.12E+02	3.45E+01	1.62E+02	TRUE	1.32E+02	1.32E+0
Beryllium	10	0	10	100%	6.42E-01	2.13E-01	9.90E-01	TRUE	7.64E-01	7.64E-0
Cadmium	10	0	10	100%	1.57E+00	1.45E+00	4.80E+00	TRUE	2.40E+00	2.40E+0
Calcium	10	0	10	100%	6.03E+03	6.85E+03	2.50E+04	FALSE	1.08E+04	1.08E+0
Chromium	10	0	10	100%	2.22E+01	4.37E+00	2.77E+01	TRUE	2.47E+01	2.47E+0
Cobalt	10	0	10	100%	1.08E+01	3.04E+00	1.78E+01	TRUE	1.26E+01	1.26E+0
Copper	10	0	10	100%	7.33E+01	8.59E+01	3.09E+02	FALSE	1.33E+02	1.33E+0
Iron	10	0	10	100%	2.65E+04	5.05E+03	3.50E+04	TRUE	2.94E+04	2.94E+0
Lead	10	0	10	100%	2.70E+02	3.30E+02	1.05E+03	FALSE	6.83E+02	6.83E+0
Magnesium	10	0	10	100%	4.89E+03	1.13E+03	6.49E+03	TRUE	5.54E+03	5.54E+0
Manganese	10	0	10	100%	4.45E+02	1.52E+02	7.68E+02	TRUE	5.32E+02	5.32E+0
Mercury	10	0	4	40%	4.30E-02	4.44E-02	1.60E-01	FALSE	8.11E-02	8.11E-0
Nickel	10	0	10	100%	2.72E+01	6.37E+00	3.16E+01	FALSE	3.43E+01	3.16E+0
Potassium	10	0	10	100%	1.90E+03	4.99E+02	2.63E+03	TRUE	2.18E+03	2.18E+0
Selenium	10	0	3	30%	8.53E-01	5.07E-01	1.90E+00	FALSE	1.27E+00	1.27E+0
Sodium	10	0	8	80%	1.81E+02	1.61E+02	4.52E+02	FALSE	4.27E+02	4.27E+0
Thallium	10	0	2	20%	6.59E-01	2.88E-01	1.30E+00	TRUE	8.24E-01	8.24E-0
Vanadium	10	0	10	100%	2.68E+01	5.20E+00	3.38E+01	TRUE	2.97E+01	2.97E+0
Zinc	10	0	10	100%	1.30E+02	7.36E+01	2.78E+02	FALSE	1.88E+02	1.88E+0

* Refer to text for detailed discussion of EPC determination.

TABLE B-17PR-6
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m^3) = CS_{surf} x PM_{10} x CF	Equation for Air EPC from Surface and Subsurface Soils (mg/m^3) = CS_{tot} x PM_{10} x 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_{sub} = Chemical Concentration in Surface and Subsurface Soils, from EPC data (mg/kg) PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 154 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	7.52E-03	7.25E-03	1.28E-10	1.12E-09
Benzene	2.00E-03	2.00E-03	3.40E-11	3.08E-10
Methylene Chloride	4.00E-03	4.00E-03	6.80E-11	6.16E-10
Toluene	6.55E-03	6.46E-03	1.11E-10	9.95E-10
Semivolatile Organics				
2,4-Dinitrotoluene	2.91E-01	2.71E-01	4.95E-09	4.17E-08
2,6-Dinitrotoluene	7.92E-02	7.66E-02	1.35E-09	1.18E-08
2-Methylnaphthalene	1.30E-01	1.30E-01	2.21E-09	2.00E-08
2-Methylphenol	1.20E-01	1.20E-01	2.04E-09	1.85E-08
3,3'-Dichlorobenzidine	2.32E-01	2.25E-01	3.94E-09	3.47E-08
3-Nitroaniline	5.62E-01	5.45E-01	9.55E-09	8.39E-08
4-Nitroaniline	5.62E-01	5.45E-01	9.55E-09	8.39E-08
Acenaphthene	3.30E-02	3.30E-02	5.61E-10	5.08E-09
Acenaphthylene	9.60E-02	9.60E-02	1.63E-09	1.48E-08
Anthracene	1.30E-01	1.30E-01	2.21E-09	2.00E-08
Benzo(a)anthracene	2.86E-01	2.70E-01	4.86E-09	4.16E-08
Benzo(a)pyrene	2.91E-01	2.75E-01	4.95E-09	4.24E-08
Benzo(b)fluoranthene	3.03E-01	2.81E-01	5.15E-09	4.33E-08
Benzo(g,h,i)perylene	2.64E-01	2.50E-01	4.49E-09	3.85E-08
Benzo(k)fluoranthene	2.67E-01	2.54E-01	4.54E-09	3.91E-08
Butylbenzylphthalate	4.60E-02	4.60E-02	7.82E-10	7.08E-09
Carbazole	2.37E-01	2.29E-01	4.03E-09	3.53E-08
Chrysene	2.27E-01	2.33E-01	3.86E-09	3.59E-08
Di-n-butylphthalate	2.84E-01	2.65E-01	4.83E-09	4.08E-08
Dibenz(a,h)anthracene	2.55E-01	2.42E-01	4.34E-09	3.73E-08
Dibenzofuran	3.60E-02	3.60E-02	6.12E-10	5.54E-09
Fluoranthene	2.11E-01	2.20E-01	3.59E-09	3.39E-08
Fluorene	3.80E-02	3.80E-02	6.46E-10	5.85E-09
Indeno(1,2,3-cd)pyrene	2.77E-01	2.60E-01	4.71E-09	4.00E-08
N-Nitrosodiphenylamine (1)	9.50E-02	9.50E-02	1.62E-09	1.46E-08
Naphthalene	3.70E-02	3.70E-02	6.29E-10	5.70E-09
Pentachlorophenol	6.10E-01	5.83E-01	1.04E-08	8.98E-08
Phenanthrene	2.55E-01	2.47E-01	4.34E-09	3.80E-08
Pyrene	2.06E-01	2.14E-01	3.50E-09	3.30E-08
bis(2-Chloroisopropyl) ether	2.13E-01	2.13E-01	3.62E-09	3.28E-08
bis(2-Ethylhexyl)phthalate	3.43E-01	3.44E-01	5.83E-09	5.30E-08
Pesticides/PCBs				
4,4'-DDD	2.76E-03	2.61E-03	4.69E-11	4.02E-10
4,4'-DDE	8.57E-03	6.91E-03	1.46E-10	1.06E-09
4,4'-DDT	3.96E-03	3.55E-03	6.73E-11	5.47E-10
Aldrin	1.25E-03	1.20E-03	2.13E-11	1.85E-10
Aroclor-1254		2.39E-02		3.68E-09
Aroclor-1260	2.42E-02	2.33E-02	4.11E-10	3.59E-09
Dieldrin	6.01E-03	5.02E-03	1.02E-10	7.73E-10
Endosulfan I	2.72E-03	2.29E-03	4.62E-11	3.53E-10
Endosulfan sulfate	2.41E-03	2.32E-03	4.10E-11	3.57E-10
Endrin	2.76E-03	2.60E-03	4.69E-11	4.00E-10
Endrin ketone	2.93E-03	2.73E-03	4.98E-11	4.20E-10
Heptachlor epoxide	1.05E-03	1.03E-03	1.79E-11	1.59E-10
alpha-Chlordane	1.05E-03	1.03E-03	1.79E-11	1.59E-10
beta-BHC	1.35E-03	1.28E-03	2.30E-11	1.97E-10
delta-BHC	1.26E-03	1.21E-03	2.14E-11	1.86E-10
Metals				
Antimony	1.15E+01	9.89E+00	1.96E-07	1.52E-06
Arsenic	6.44E+00	6.21E+00	1.09E-07	9.56E-07
Barium	1.67E+02	1.53E+02	2.84E-06	2.36E-05
Cadmium	8.82E+00	6.61E+00	1.50E-07	1.02E-06
Copper	2.21E+02	1.76E+02	3.76E-06	2.71E-05
Lead	2.25E+03	2.46E+03	3.83E-05	3.79E-04
Mercury	1.31E-01	1.15E-01	2.23E-09	1.77E-08
Selenium	1.03E+00	6.98E-01	1.75E-08	1.07E-07
Silver	2.06E+00	1.65E+00	3.50E-08	2.54E-07
Thallium	6.38E-01	5.30E-01	1.08E-08	8.16E-08
Zinc	3.57E+02	3.01E+02	6.07E-06	4.64E-05
Herbicides				
MCPA	8.49E+00	6.26E+00	1.44E-07	9.64E-07

TABLE B-17PR-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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	Current Site Worker: Intake (mg/kg-day)				Future Industrial Worker: Intake (mg/kg-day)			
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)	Hazard Quotient	Cancer Risk	(Nc)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics												
Acetone	NA	NA	1.28E-10	1.12E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	2.55E-13	9.12E-14	1E-10	3E-15	3.19E-12	1.14E-12	2E-09	3E-14
Methylene Chloride	8.6E-01	1.7E-03	6.80E-11	6.16E-10	5.11E-13	1.82E-13	6E-13	3E-16	6.39E-12	2.28E-12	7E-12	4E-15
Toluene	1.1E-01	NA	1.11E-10	9.95E-10	8.37E-13		7E-12		1.05E-11		9E-11	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.95E-09	4.17E-08								
2,6-Dinitrotoluene	NA	NA	1.35E-09	1.18E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	3.94E-09	3.47E-08								
3-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
4-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	4.86E-09	4.16E-08								
Benzo(a)pyrene	NA	NA	4.95E-09	4.24E-08								
Benzo(b)fluoranthene	NA	NA	5.15E-09	4.33E-08								
Benzo(g,h,i)perylene	NA	NA	4.49E-09	3.85E-08								
Benzo(k)fluoranthene	NA	NA	4.54E-09	3.91E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.03E-09	3.53E-08								
Chrysene	NA	NA	3.86E-09	3.59E-08								
Di-n-butylphthalate	NA	NA	4.83E-09	4.08E-08								
Dibenz(a,h)anthracene	NA	NA	4.34E-09	3.73E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Fluoranthene	NA	NA	3.59E-09	3.39E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	4.71E-09	4.00E-08								
N-Nitrosodiphenylamine (1)	NA	NA	1.62E-09	1.46E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
Pentachlorophenol	NA	NA	1.04E-08	8.98E-08								
Phenanthrene	NA	NA	4.34E-09	3.80E-08								
Pyrene	NA	NA	3.50E-09	3.30E-08								
bis(2-Chloroisopropyl) ether	NA	3.5E-02	3.62E-09	3.28E-08		9.72E-12		3E-13		1.21E-10		4E-12
bis(2-Ethylhexyl)phthalate	NA	NA	5.83E-09	5.30E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	4.69E-11	4 02E-10								
4,4'-DDE	NA	NA	1.46E-10	1.06E-09								
4,4'-DDT	NA	3.4E-01	6.73E-11	5.47E-10		1.81E-13		6E-14		2.26E-12		8E-13
Aldrin	NA	1.7E+01	2.13E-11	1.85E-10		5.70E-14		1E-12		7.13E-13		1E-11
Aroclor-1254	NA	4.0E-01		3.68E-09								
Aroclor-1260	NA	4.0E-01	4.11E-10	3.59E-09		1.10E-12		4E-13		1.38E-11		6E-12
Dieldrin	NA	1.6E+01	1.02E-10	7.73E-10		2.74E-13		4E-12		3.43E-12		6E-11
Endosulfan I	NA	NA	4.62E-11	3.53E-10								
Endosulfan sulfate	NA	NA	4.10E-11	3.57E-10								
Endrin	NA	NA	4.69E-11	4.00E-10								
Endrin ketone	NA	NA	4.98E-11	4.20E-10								
Heptachlor epoxide	NA	9.1E+00	1.79E-11	1.59E-10		4.79E-14		4E-13		5.99E-13		5E-12
alpha-Chlordane	NA	1.3E+00	1.79E-11	1.59E-10		4.79E-14		6E-14		5.99E-13		8E-13
beta-BHC	NA	1.9E+00	2.30E-11	1.97E-10		6.16E-14		1E-13		7.70E-13		1E-12
delta-BHC	NA	NA	2.14E-11	1.86E-10								
Metals												
Antimony	NA	NA	1.96E-07	1.52E-06								
Arsenic	NA	1.5E+01	1.09E-07	9.56E-07		2.94E-10		4E-09		3.67E-09		6E-08
Barium	1.4E-04	NA	2.84E-06	2.36E-05	2.13E-08		1E-04		2.67E-07		2E-03	
Cadmium	NA	6.3E+00	1.50E-07	1.02E-06		4.02E-10		3E-09		5.03E-09		3E-08
Copper	NA	NA	3.76E-06	2.71E-05								
Lead	NA	NA	3.83E-05	3.79E-04								
Mercury	8.6E-05	NA	2.23E-09	1.77E-08	1.67E-11		2E-07		2 09E-10		2E-06	
Selenium	NA	NA	1.75E-08	1.07E-07								
Silver	NA	NA	3.50E-08	2.54E-07								
Thallium	NA	NA	1.08E-08	8.16E-08								
Zinc	NA	NA	6 07E-06	4.64E-05								
Herbicides												
MCPA	NA	NA	1.44E-07	9.64E-07								
Total Hazard Quotient and Cancer Risk:							**1E-04**	**7E-09**			**2E-03**	**9E-08**

Assumptions for Current Site Worker			Assumptions for Future Industrial Worker		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	9.6	m3/day	IR =	9.6	m3/day
EF =	20	days/year	EF =	250	days/year
ED =	25	years	ED =	25	years
BW =	70	kg	BW =	70	kg
AT (Nc) =	9125	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 B-17PR-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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	Future Construction Worker				Future Tresspasser 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												
Acetone	NA	NA	1.28E-10	1.12E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	3.13E-11	4.48E-13	2E-08	1E-14	1.12E-13	7.98E-15	7E-11	2E-16
Methylene Chloride	8.6E-01	1.7E-03	6.80E-11	6.16E-10	6.27E-11	8.95E-13	7E-11	1E-15	2.24E-13	1.60E-14	3E-13	3E-17
Toluene	1.1E-01	NA	1.11E-10	9.95E-10	1.01E-10		9E-10		3.66E-13		3E-12	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.95E-09	4.17E-08								
2,6-Dinitrotoluene	NA	NA	1.35E-09	1.18E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	3.94E-09	3.47E-08								
3-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
4-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	4.86E-09	4.16E-08								
Benzo(a)pyrene	NA	NA	4.95E-09	4.24E-08								
Benzo(b)fluoranthene	NA	NA	5.15E-09	4.33E-08								
Benzo(g,h,i)perylene	NA	NA	4.49E-09	3.85E-08								
Benzo(k)fluoranthene	NA	NA	4.54E-09	3.91E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.03E-09	3.53E-08								
Chrysene	NA	NA	3.86E-09	3.59E-08								
Di-n-butylphthalate	NA	NA	4.83E-09	4.08E-08								
Dibenz(a,h)anthracene	NA	NA	4.34E-09	3.73E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Fluoranthene	NA	NA	3.59E-09	3.39E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	4.71E-09	4.00E-08								
N-Nitrosodiphenylamine (	NA	NA	1.62E-09	1.46E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
Pentachlorophenol	NA	NA	1.04E-08	8.98E-08								
Phenanthrene	NA	NA	4.34E-09	3.80E-08								
Pyrene	NA	NA	3.50E-09	3.30E-08								
bis(2-Chloroisopropyl) eth	NA	3.5E-02	3.62E-09	3.28E-08		4.77E-11		2E-12		8.50E-13		3E-14
bis(2-Ethylhexyl)phthalate	NA	NA	5.83E-09	5.30E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	4.69E-11	4.02E-10								
4,4'-DDE	NA	NA	1.46E-10	1.06E-09								
4,4'-DDT	NA	3.4E-01	6.73E-11	5.47E-10		7.95E-13		3E-13		1.58E-14		5E-15
Aldrin	NA	1.7E+01	2.13E-11	1.85E-10		2.69E-13		5E-12		4.99E-15		9E-14
Aroclor-1254	NA	4.0E-01		3.68E-09		5.35E-12		2E-12				
Aroclor-1260	NA	4.0E-01	4.11E-10	3.59E-09		5.22E-12		2E-12		9.66E-14		4E-14
Dieldrin	NA	1.6E+01	1.02E-10	7.73E-10		1.12E-12		2E-11		2.40E-14		4E-13
Endosulfan I	NA	NA	4.62E-11	3.53E-10								
Endosulfan sulfate	NA	NA	4.10E-11	3.57E-10								
Endrin	NA	NA	4.69E-11	4.00E-10								
Endrin ketone	NA	NA	4.98E-11	4.20E-10								
Heptachlor epoxide	NA	9.1E+00	1.79E-11	1.59E-10		2.31E-13		2E-12		4.19E-15		4E-14
alpha-Chlordane	NA	1.3E+00	1.79E-11	1.59E-10		2.31E-13		3E-13		4.19E-15		5E-15
beta-BHC	NA	1.9E+00	2.30E-11	1.97E-10		2.87E-13		5E-13		5.39E-15		1E-14
delta-BHC	NA	NA	2.14E-11	1.86E-10								
Metals												
Antimony	NA	NA	1.96E-07	1.52E-06								
Arsenic	NA	1.5E+01	1.09E-07	9.56E-07		1.39E-09		2E-08		2.57E-11		4E-10
Barium	1.4E-04	NA	2.84E-06	2.36E-05	2.40E-06		2E-02		9.33E-09		7E-05	
Cadmium	NA	6.3E+00	1.50E-07	1.02E-06		1.48E-09		9E-09		3.52E-11		2E-10
Copper	NA	NA	3.76E-06	2.71E-05								
Lead	NA	NA	3.83E-05	3.79E-04								
Mercury	8.6E-05	NA	2.23E-09	1.77E-08	1.80E-09		2E-05		7.32E-12		9E-08	
Selenium	NA	NA	1.75E-08	1.07E-07								
Silver	NA	NA	3.50E-08	2.54E-07								
Thallium	NA	NA	1.08E-08	8.16E-08								
Zinc	NA	NA	6.07E-06	4.64E-05								
Herbicides												
MCPA	NA	NA	1.44E-07	9.64E-07								
Total Hazard Quotient and Cancer Risk:							**2E-02**	**3E-08**			**7E-05**	**6E-10**

Assumptions for Future Construction Worker		
CA =	EPC Surface and Sub-Surface	
IR =	10.4	m3/day
EF =	250	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Assumptions for Future Tresspasser Child		
CA =	EPC Surface Only	
IR =	1.2	m3/day
EF =	50	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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-17PR-7
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
Acetone	NA	NA	1.28E-10	1.12E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	6.21E-12	5.32E-13	4E-09	2E-14	2.66E-12	9.51E-13	2E-09	3E-14
Methylene Chloride	8.6E-01	1.7E-03	6.80E-11	6.16E-10	1.24E-11	1.06E-12	1E-11	2E-15	5.32E-12	1.90E-12	6E-12	3E-15
Toluene	1.1E-01	NA	1.11E-10	9.95E-10	2.03E-11		2E-10		8.72E-12		8E-11	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.95E-09	4.17E-08								
2,6-Dinitrotoluene	NA	NA	1.35E-09	1.18E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	3.94E-09	3.47E-08								
3-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
4-Nitroaniline	NA	NA	9.55E-09	8.39E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	4.86E-09	4.16E-08								
Benzo(a)pyrene	NA	NA	4.95E-09	4.24E-08								
Benzo(b)fluoranthene	NA	NA	5.15E-09	4.33E-08								
Benzo(g,h,i)perylene	NA	NA	4.49E-09	3.85E-08								
Benzo(k)fluoranthene	NA	NA	4.54E-09	3.91E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.03E-09	3.53E-08								
Chrysene	NA	NA	3.86E-09	3.59E-08								
Di-n-butylphthalate	NA	NA	4.83E-09	4.08E-08								
Dibenz(a,h)anthracene	NA	NA	4.34E-09	3.73E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Fluoranthene	NA	NA	3.59E-09	3.39E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	4.71E-09	4.00E-08								
N-Nitrosodiphenylamine (	NA	NA	1.62E-09	1.46E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
Pentachlorophenol	NA	NA	1.04E-08	8.98E-08								
Phenanthrene	NA	NA	4.34E-09	3.80E-08								
Pyrene	NA	NA	3.50E-09	3.30E-08								
bis(2-Chloroisopropyl) eth	NA	3.5E-02	3.62E-09	3.28E-08		5.67E-11		2E-12		1.01E-10		4E-12
bis(2-Ethylhexyl)phthalate	NA	NA	5.83E-09	5.30E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	4.69E-11	4.02E-10								
4,4'-DDE	NA	NA	1.46E-10	1.06E-09								
4,4'-DDT	NA	3.4E-01	6.73E-11	5.47E-10		1.05E-12		4E-13		1.88E-12		6E-13
Aldrin	NA	1.7E+01	2.13E-11	1.85E-10		3.33E-13		6E-12		5.94E-13		1E-11
Aroclor-1254	NA	4.0E-01		3.68E-09								
Aroclor-1260	NA	4.0E-01	4.11E-10	3.59E-09		6.44E-12		3E-12		1.15E-11		5E-12
Dieldrin	NA	1.6E+01	1.02E-10	7.73E-10		1.60E-12		3E-11		2.86E-12		5E-11
Endosulfan I	NA	NA	4.62E-11	3.53E-10								
Endosulfan sulfate	NA	NA	4.10E-11	3.57E-10								
Endrin	NA	NA	4.69E-11	4.00E-10								
Endrin ketone	NA	NA	4.98E-11	4.20E-10								
Heptachlor epoxide	NA	9.1E+00	1.79E-11	1.59E-10		2.79E-13		3E-12		4.99E-13		5E-12
alpha-Chlordane	NA	1.3E+00	1.79E-11	1.59E-10		2.79E-13		4E-13		4.99E-13		6E-13
beta-BHC	NA	1.9E+00	2.30E-11	1.97E-10		3.59E-13		7E-13		6.42E-13		1E-12
delta-BHC	NA	NA	2.14E-11	1.86E-10								
Metals												
Antimony	NA	NA	1.96E-07	1.52E-06								
Arsenic	NA	1.5E+01	1.09E-07	9.56E-07		1.71E-09		3E-08		3.06E-09		5E-08
Barium	1.4E-04	NA	2.84E-06	2.36E-05	5.19E-07		4E-03		2.22E-07		2E-03	
Cadmium	NA	6.3E+00	1.50E-07	1.02E-06		2.35E-09		1E-08		4.19E-09		3E-08
Copper	NA	NA	3.76E-06	2.71E-05								
Lead	NA	NA	3.83E-05	3.79E-04								
Mercury	8.6E-05	NA	2.23E-09	1.77E-08	4.07E-10		5E-06		1.74E-10		2E-06	
Selenium	NA	NA	1.75E-08	1.07E-07								
Silver	NA	NA	3.50E-08	2.54E-07								
Thallium	NA	NA	1.08E-08	8.16E-08								
Zinc	NA	NA	6.07E-06	4.64E-05								
Herbicides												
MCPA	NA	NA	1.44E-07	9.64E-07								
Total Hazard Quotient and Cancer Risk:							**4E-03**	**4E-08**			**2E-03**	**7E-08**

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.
NA = Information not available

TABLE B-17PR-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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, 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 from Surface Soil	EPC from Total Soils	Current Site Worker				Future Industrial 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	7.52E-03	7.25E-03	5.89E-10		6E-09		7.36E-09		7E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	1.57E-10	5.59E-11	5E-08	2E-12	1.96E-09	6.99E-10	7E-07	2E-11
Methylene Chloride	6.0E-02	7.5E-03	4.00E-03	4.00E-03	3.13E-10	1.12E-10	5E-09	8E-13	3.91E-09	1.40E-09	7E-08	1E-11
Toluene	2.0E-01	NA	6.55E-03	6.46E-03	5.13E-10		3E-09		6.41E-09		3E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.91E-01	2.71E-01	2.28E-08	8.14E-09	1E-05	6E-09	2.85E-07	1.02E-07	1E-04	7E-08
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.92E-02	7.66E-02	6.20E-09	2.21E-09	6E-06	2E-09	7.75E-08	2.77E-08	8E-05	2E-08
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	1.02E-08		3E-07		1.27E-07		3E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	9.39E-09		2E-07		1.17E-07		2E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.32E-01	2.25E-01		6.49E-09		3E-09		8.11E-08		4E-08
3-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	2.58E-09		4E-08		3.23E-08		5E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	1.02E-08		3E-08		1.27E-07		4E-07	
Benzo(a)anthracene	NA	7.3E-01	2.86E-01	2.70E-01		8.00E-09		6E-09		9.99E-08		7E-08
Benzo(a)pyrene	NA	7.3E+00	2.91E-01	2.75E-01		8.14E-09		6E-08		1.02E-07		7E-07
Benzo(b)fluoranthene	NA	7.3E-01	3.03E-01	2.81E-01		8.47E-09		6E-09		1.06E-07		8E-08
Benzo(g,h,i)perylene	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.67E-01	2.54E-01		7.46E-09		5E-10		9.33E-08		7E-09
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	3.60E-09		2E-08		4.50E-08		2E-07	
Carbazole	NA	2.0E-02	2.37E-01	2.29E-01		6.63E-09		1E-10		8.28E-08		2E-09
Chrysene	NA	7.3E-03	2.27E-01	2.33E-01		6.35E-09		5E-11		7.93E-08		6E-10
Di-n-butylphthalate	1.0E-01	NA	2.84E-01	2.65E-01	2.22E-08		2E-07		2.78E-07		3E-06	
Dibenz(a,h)anthracene	NA	7.3E+00	2.55E-01	2.42E-01		7.13E-09		5E-08		8.91E-08		7E-07
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.0E-02	NA	2.11E-01	2.20E-01	1.65E-08		4E-07		2.06E-07		5E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	2.97E-09		7E-08		3.72E-08		9E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.77E-01	2.60E-01		7.74E-09		6E-09		9.68E-08		7E-08
N-Nitrosodiphenylamine (1)	NA	4.9E-03	9.50E-02	9.50E-02		2.66E-09		1E-11		3.32E-08		2E-10
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	2.90E-09		7E-08		3.62E-08		9E-07	
Pentachlorophenol	3.0E-02	1.2E-01	6.10E-01	5.83E-01	4.77E-08	1.71E-08	2E-06	2E-09	5.97E-07	2.13E-07	2E-05	3E-08
Phenanthrene	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.0E-02	NA	2.06E-01	2.14E-01	1.61E-08		5E-07		2.02E-07		7E-06	
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.13E-01	2.13E-01	1.67E-08	5.95E-09	4E-07	4E-10	2.08E-07	7.44E-08	5E-06	5E-09
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.43E-01	3.44E-01	2.68E-08	9.59E-09	1E-06	1E-10	3.36E-07	1.20E-07	2E-05	2E-09
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	2.76E-03	2.61E-03		7.72E-11		2E-11		9.64E-10		2E-10
4,4'-DDE	NA	3.4E-01	8.57E-03	6.91E-03		2.40E-10		8E-11		2.99E-09		1E-09
4,4'-DDT	5.0E-04	3.4E-01	3.96E-03	3.55E-03	3.10E-10	1.11E-10	6E-07	4E-11	3.87E-09	1.38E-09	8E-06	5E-10
Aldrin	3.0E-05	1.7E+01	1.25E-03	1.20E-03	9.78E-11	3.49E-11	3E-06	6E-10	1.22E-09	4.37E-10	4E-05	7E-09
Aroclor-1254	2.0E-05	2.0E+00		2.39E-02	0.00E+00	0.00E+00	0E+00	0E+00	0.00E+00	0.00E+00	0E+00	0E+00
Aroclor-1260	2.0E-05	2.0E+00	2.42E-02	2.33E-02	1.89E-09	6.77E-10	9E-05	1E-09	2.37E-08	8.46E-09	1E-03	2E-08
Dieldrin	5.0E-05	1.6E+01	6.01E-03	5.02E-03	4.70E-10	1.68E-10	9E-06	3E-09	5.88E-09	2.10E-09	1E-04	3E-08
Endosulfan I	6.0E-03	NA	2.72E-03	2.29E-03	2.13E-10		4E-08		2.66E-09		4E-07	
Endosulfan sulfate	6.0E-03	NA	2.41E-03	2.32E-03	1.89E-10		3E-08		2.36E-09		4E-07	
Endrin	3.0E-04	NA	2.76E-03	2.60E-03	2.16E-10		7E-07		2.70E-09		9E-06	
Endrin ketone	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.05E-03	1.03E-03	8.22E-11	2.94E-11	6E-06	3E-10	1.03E-09	3.67E-10	8E-05	3E-09
alpha-Chlordane	6.0E-05	1.3E+00	1.05E-03	1.03E-03	8.22E-11	2.94E-11	1E-06	4E-11	1.03E-09	3.67E-10	2E-05	5E-10
beta-BHC	NA	1.8E+00	1.35E-03	1.28E-03		3.77E-11		7E-11		4.72E-10		8E-10
delta-BHC	NA	NA	1.26E-03	1.21E-03								
Metals												
Antimony	4.0E-04	NA	1.15E+01	9.89E+00	9.00E-07		2E-03		1.13E-05		3E-02	
Arsenic	3.0E-04	1.5E+00	6.44E+00	6.21E+00	5.04E-07	1.80E-07	2E-03	3E-07	6.30E-06	2.25E-06	2E-02	3E-06
Barium	7.0E-02	NA	1.67E+02	1.53E+02	1.31E-05		2E-04		1.63E-04		2E-03	
Cadmium	5.0E-04	NA	8.82E+00	6.61E+00	6.90E-07		1E-03		8.63E-06		2E-02	
Copper	4.0E-02	NA	2.21E+02	1.76E+02	1.73E-05		4E-04		2.16E-04		5E-03	
Lead	NA	NA	2.25E+03	2.46E+03								
Mercury	3.0E-04	NA	1.31E-01	1.15E-01	1.03E-08		3E-05		1.28E-07		4E-04	
Selenium	5.0E-03	NA	1.03E+00	6.98E-01	8.06E-08		2E-05		1.01E-06		2E-04	
Silver	5.0E-03	NA	2.06E+00	1.65E+00	1.61E-07		3E-05		2.02E-06		4E-04	
Thallium	8.0E-05	NA	6.38E-01	5.30E-01	4.99E-08		6E-04		6.24E-07		8E-03	
Zinc	3 0E-01	NA	3.57E+02	3.01E+02	2.79E-05		9E-05		3.49E-04		1E-03	
Herbicides												
MCPA	5.0E-04	NA	8.49E+00	6.26E+00	6.65E-07		1E-03		8.31E-06		2E-02	
Total Hazard Quotient and Cancer Risk:							8E-03	4E-07			1E-01	5E-06

Assumptions for Current Site Worker			Assumptions for Future Industrial 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 =	20	days/year	EF =	250	days/year
ED =	25	years	ED =	25	years
BW =	70	kg	BW =	70	kg
AT (Nc) =	9125	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 B-17PR-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = (CS x IR x CF x FI x EF x ED) / (BW x AT)

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, 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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics												
Acetone	1.0E-01	NA	7.52E-03	7.25E-03	3.41E-08		3E-07		4.12E-09		4E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	9.39E-09	1.34E-10	3E-06	4E-12	1.10E-09	7.83E-11	4E-07	2E-12
Methylene Chloride	6.0E-02	7.5E-03	4.00E-03	4.00E-03	1.88E-08	2.68E-10	3E-07	2E-12	2.19E-09	1.57E-10	4E-08	1E-12
Toluene	2.0E-01	NA	6.55E-03	6.46E-03	3.03E-08		2E-07		3.59E-09		2E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.91E-01	2.71E-01	1.27E-06	1.82E-08	6E-04	1E-08	1.59E-07	1.14E-08	8E-05	8E-09
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.92E-02	7.66E-02	3.60E-07	5.14E-09	4E-04	3E-09	4.34E-08	3.10E-09	4E-05	2E-09
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	6.11E-07		2E-05		7.12E-08		2E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	5.64E-07		1E-05		6.58E-08		1E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.32E-01	2.25E-01		1.51E-08		7E-09		9.08E-09		4E-09
3-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	1.55E-07		3E-06		1.81E-08		3E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	6.11E-07		2E-06		7.12E-08		2E-07	
Benzo(a)anthracene	NA	7.3E-01	2.86E-01	2.70E-01		1.81E-08		1E-08		1.12E-08		8E-09
Benzo(a)pyrene	NA	7.3E+00	2.91E-01	2.75E-01		1.85E-08		1E-07		1.14E-08		8E-08
Benzo(b)fluoranthene	NA	7.3E-01	3.03E-01	2.81E-01		1.89E-08		1E-08		1.19E-08		9E-09
Benzo(g,h,i)perylene	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.67E-01	2.54E-01		1.70E-08		1E-09		1.05E-08		8E-10
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	2.16E-07		1E-06		2.52E-08		1E-07	
Carbazole	NA	2.0E-02	2.37E-01	2.29E-01		1.54E-08		3E-10		9.28E-09		2E-10
Chrysene	NA	7.3E-03	2.27E-01	2.33E-01		1.56E-08		1E-10		8.88E-09		6E-11
Di-n-butylphthalate	1.0E-01	NA	2.84E-01	2.65E-01	1.24E-06		1E-05		1.56E-07		2E-06	
Dibenz(a,h)anthracene	NA	7.3E+00	2.55E-01	2.42E-01		1.62E-08		1E-07		9.98E-09		7E-08
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.0E-02	NA	2.11E-01	2.20E-01	1.03E-06		3E-05		1.16E-07		3E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	1.78E-07		4E-06		2.08E-08		5E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.77E-01	2.60E-01		1.74E-08		1E-08		1.08E-08		8E-09
N-Nitrosodiphenylamine (1)	NA	4.9E-03	9.50E-02	9.50E-02		6.37E-09		3E-11		3.72E-09		2E-11
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	1.74E-07		4E-06		2.03E-08		5E-07	
Pentachlorophenol	3.0E-02	1.2E-01	6.10E-01	5.83E-01	2.74E-06	3.91E-08	9E-05	5E-09	3.34E-07	2.39E-08	1E-05	3E-09
Phenanthrene	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.0E-02	NA	2.06E-01	2.14E-01	1.01E-06		3E-05		1.13E-07		4E-06	
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.13E-01	2.13E-01	1.00E-06	1.43E-08	3E-05	1E-09	1.17E-07	8.34E-09	3E-06	6E-10
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.43E-01	3.44E-01	1.62E-06	2.31E-08	8E-05	3E-10	1.88E-07	1.34E-08	9E-06	2E-10
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	2.76E-03	2.61E-03		1.75E-10		4E-11		1.08E-10		3E-11
4,4'-DDE	NA	3.4E-01	8.57E-03	6.91E-03		4.64E-10		2E-10		3.35E-10		1E-10
4,4'-DDT	5.0E-04	3.4E-01	3.96E-03	3.55E-03	1.67E-08	2.38E-10	3E-05	8E-11	2.17E-09	1.55E-10	4E-06	5E-11
Aldrin	3.0E-05	1.7E+01	1.25E-03	1 20E-03	5.64E-09	8.05E-11	2E-04	1E-09	6.85E-10	4.89E-11	2E-05	8E-10
Aroclor-1254	2.0E-05	2.0E+00		2.39E-02	1.12E-07	1.60E-09	6E-03	3E-09	0.00E+00	0.00E+00	0E+00	0E+00
Aroclor-1260	2.0E-05	2.0E+00	2.42E-02	2.33E-02	1.09E-07	1.56E-09	5E-03	3E-09	1.33E-08	9.47E-10	7E-04	2E-09
Dieldrin	5.0E-05	1.6E+01	6.01E-03	5.02E-03	2.36E-08	3.37E-10	5E-04	5E-09	3.29E-09	2.35E-10	7E-05	4E-09
Endosulfan I	6.0E-03	NA	2.72E-03	2.29E-03	1.08E-08		2E-06		1.49E-09		2E-07	
Endosulfan sulfate	6.0E-03	NA	2.41E-03	2.32E-03	1.09E-08		2E-06		1.32E-09		2E-07	
Endrin	3.0E-04	NA	2.76E-03	2.60E-03	1.22E-08		4E-05		1.51E-09		5E-06	
Endrin ketone	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.05E-03	1.03E-03	4.84E-09	6.91E-11	4E-04	6E-10	5.75E-10	4.11E-11	4E-05	4E-10
alpha-Chlordane	6.0E-05	1.3E+00	1.05E-03	1.03E-03	4.84E-09	6.91E-11	8E-05	9E-11	5.75E-10	4.11E-11	1E-05	5E-11
beta-BHC	NA	1.8E+00	1.35E-03	1.28E-03		8.59E-11		2E-10		5.28E-11		1E-10
delta-BHC	NA	NA	1.26E-03	1.21E-03								
Metals												
Antimony	4.0E-04	NA	1.15E+01	9.89E+00	4.65E-05		1E-01		6.30E-06		2E-02	
Arsenic	3.0E-04	1.5E+00	6.44E+00	6.21E+00	2.92E-05	4.17E-07	1E-01	6E-07	3.53E-06	2.52E-07	1E-02	4E-07
Barium	7.0E-02	NA	1.67E+02	1.53E+02	7.19E-04		1E-02		9.15E-05		1E-03	
Cadmium	5.0E-04	NA	8.82E+00	6.61E+00	3.10E-05		6E-02		4.83E-06		1E-02	
Copper	4.0E-02	NA	2.21E+02	1.76E+02	8.27E-04		2E-02		1.21E-04		3E-03	
Lead	NA	NA	2.25E+03	2.46E+03								
Mercury	3.0E-04	NA	1.31E-01	1.15E-01	5.40E-07		2E-03		7.18E-08		2E-04	
Selenium	5.0E-03	NA	1.03E+00	6.98E-01	3.28E-06		7E-04		5.64E-07		1E-04	
Silver	5 0E-03	NA	2.06E+00	1.65E+00	7.75E-06		2E-03		1.13E-06		2E-04	
Thallium	8 0E-05	NA	6.38E-01	5.30E-01	2.49E-06		3E-02		3.50E-07		4E-03	
Zinc	3.0E-01	NA	3.57E+02	3.01E+02	1.41E-03		5E-03		1.96E-04		7E-04	
Herbicides												
MCPA	5.0E-04	NA	8.49E+00	6.26E+00	2.94E-05		6E-02		4.65E-06		9E-03	
Total Hazard Quotient and Cancer Risk:							**4E-01**	**1E-06**			**6E-02**	**6E-07**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		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 =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	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 B-17PR-8
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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, 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 from Surface Soil	EPC from Total Soils	Future Day Care Center Child				Future 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	7.52E-03	7.25E-03	6.87E-08		7E-07		7.36E-09		7E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	1.83E-08	1.57E-09	6E-06	5E-11	1.96E-09	6.99E-10	7E-07	2E-11
Methylene Chloride	6.0E-02	7.5E-03	4.00E-03	4.00E-03	3.65E-08	3.13E-09	6E-07	2E-11	3.91E-09	1.40E-09	7E-08	1E-11
Toluene	2.0E-01	NA	6.55E-03	6.46E-03	5.98E-08		3E-07		6.41E-09		3E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.91E-01	2.71E-01	2.66E-06	2.28E-07	1E-03	2E-07	2.85E-07	1.02E-07	1E-04	7E-08
2,6-Dinitrotoluene	1.0E-03	6.8E-01	7.92E-02	7.66E-02	7.23E-07	6.20E-08	7E-04	4E-08	7.75E-08	2.77E-08	8E-05	2E-08
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	1.19E-06		3E-05		1.27E-07		3E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	1.10E-06		2E-05		1.17E-07		2E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.32E-01	2.25E-01		1.82E-07		8E-08		8.11E-08		4E-08
3-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	3.01E-07		5E-06		3.23E-08		5E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	1.19E-06		4E-06		1.27E-07		4E-07	
Benzo(a)anthracene	NA	7.3E-01	2.86E-01	2.70E-01		2.24E-07		2E-07		9.99E-08		7E-08
Benzo(a)pyrene	NA	7.3E+00	2.91E-01	2.75E-01		2.28E-07		2E-06		1.02E-07		7E-07
Benzo(b)fluoranthene	NA	7.3E-01	3.03E-01	2.81E-01		2.37E-07		2E-07		1.06E-07		8E-08
Benzo(g,h,i)perylene	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.67E-01	2.54E-01		2.09E-07		2E-08		9.33E-08		7E-09
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	4.20E-07		2E-06		4.50E-08		2E-07	
Carbazole	NA	2.0E-02	2.37E-01	2.29E-01		1.86E-07		4E-09		8.28E-08		2E-09
Chrysene	NA	7.3E-03	2.27E-01	2.33E-01		1.78E-07		1E-09		7.93E-08		6E-10
Di-n-butylphthalate	1.0E-01	NA	2.84E-01	2.65E-01	2.59E-06		3E-05		2.78E-07		3E-06	
Dibenz(a,h)anthracene	NA	7.3E+00	2.55E-01	2.42E-01		2.00E-07		1E-06		8.91E-08		7E-07
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.0E-02	NA	2.11E-01	2.20E-01	1.93E-06		5E-05		2.06E-07		5E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	3.47E-07		9E-06		3.72E-08		9E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.77E-01	2.60E-01		2.17E-07		2E-07		9.68E-08		7E-08
N-Nitrosodiphenylamine (1)	NA	4.9E-03	9.50E-02	9.50E-02		7.44E-08		4E-10		3.32E-08		2E-10
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	3.38E-07		8E-06		3.62E-08		9E-07	
Pentachlorophenol	3.0E-02	1.2E-01	6.10E-01	5.83E-01	5.57E-06	4.77E-07	2E-04	6E-08	5.97E-07	2.13E-07	2E-05	3E-08
Phenanthrene	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.0E-02	NA	2.06E-01	2.14E-01	1.88E-06		6E-05		2.02E-07		7E-06	
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.13E-01	2.13E-01	1.95E-06	1.67E-07	5E-05	1E-08	2.08E-07	7.44E-08	5E-06	5E-09
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.43E-01	3.44E-01	3.13E-06	2.68E-07	2E-04	4E-09	3.36E-07	1.20E-07	2E-05	2E-09
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	2.76E-03	2.61E-03		2.16E-09		5E-10		9.64E-10		2E-10
4,4'-DDE	NA	3.4E-01	8.57E-03	6.91E-03		6.71E-09		2E-09		2.99E-09		1E-09
4,4'-DDT	5.0E-04	3.4E-01	3.96E-03	3.55E-03	3.62E-08	3.10E-09	7E-05	1E-09	3.87E-09	1.38E-09	8E-06	5E-10
Aldrin	3.0E-05	1.7E+01	1.25E-03	1.20E-03	1.14E-08	9.78E-10	4E-04	2E-08	1.22E-09	4.37E-10	4E-05	7E-09
Aroclor-1254	2.0E-05	2.0E+00		2.39E-02	0.00E+00	0.00E+00	0E+00	0E+00	0.00E+00	0.00E+00	0E+00	0E+00
Aroclor-1260	2.0E-05	2.0E+00	2.42E-02	2.33E-02	2.21E-07	1.89E-08	1E-02	4E-08	2.37E-08	8.46E-09	1E-03	2E-08
Dieldrin	5.0E-05	1.6E+01	6.01E-03	5.02E-03	5.49E-08	4.70E-09	1E-03	8E-08	5.88E-09	2.10E-09	1E-04	3E-08
Endosulfan I	6.0E-03	NA	2.72E-03	2.29E-03	2.48E-08		4E-06		2.66E-09		4E-07	
Endosulfan sulfate	6.0E-03	NA	2.41E-03	2.32E-03	2.20E-08		4E-06		2.36E-09		4E-07	
Endrin	3.0E-04	NA	2.76E-03	2.60E-03	2.52E-08		8E-05		2.70E-09		9E-06	
Endrin ketone	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	1.05E-03	1.03E-03	9.59E-09	8.22E-10	7E-04	7E-09	1.03E-09	3.67E-10	8E-05	3E-09
alpha-Chlordane	6.0E-05	1.3E+00	1.05E-03	1.03E-03	9.59E-09	8.22E-10	2E-04	1E-09	1.03E-09	3.67E-10	2E-05	5E-10
beta-BHC	NA	1.8E+00	1.35E-03	1.28E-03		1.06E-09		2E-09		4.72E-10		8E-10
delta-BHC	NA	NA	1.26E-03	1.21E-03								
Metals												
Antimony	4.0E-04	NA	1.15E+01	9.89E+00	1.05E-04		3E-01		1.13E-05		3E-02	
Arsenic	3.0E-04	1.5E+00	6.44E+00	6.21E+00	5.88E-05	5.04E-06	2E-01	8E-06	6.30E-06	2.25E-06	2E-02	3E-06
Barium	7.0E-02	NA	1.67E+02	1.53E+02	1.53E-03		2E-02		1.63E-04		2E-03	
Cadmium	5.0E-04	NA	8.82E+00	6.61E+00	8.05E-05		2E-01		8.63E-06		2E-02	
Copper	4.0E-02	NA	2.21E+02	1.76E+02	2.02E-03		5E-02		2.16E-04		5E-03	
Lead	NA	NA	2.25E+03	2.46E+03								
Mercury	3.0E-04	NA	1.31E-01	1.15E-01	1.20E-06		4E-03		1.28E-07		4E-04	
Selenium	5.0E-03	NA	1.03E+00	6.98E-01	9.41E-06		2E-03		1.01E-06		2E-04	
Silver	5.0E-03	NA	2.06E+00	1.65E+00	1.88E-05		4E-03		2.02E-06		4E-04	
Thallium	8.0E-05	NA	6.38E-01	5.30E-01	5.83E-06		7E-02		6.24E-07		8E-03	
Zinc	3.0E-01	NA	3.57E+02	3.01E+02	3.26E-03		1E-02		3.49E-04		1E-03	
Herbicides												
MCPA	5.0E-04	NA	8.49E+00	6.26E+00	7.75E-05		2E-01		8.31E-06		2E-02	
Total Hazard Quotient and Cancer Risk:							**1E+00**	**1E-05**			**1E-01**	**5E-06**

Assumptions for Future 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 Future Day Care Center 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

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

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TABLE B-17PR-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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	Carc. Slope Dermal	Absorption Factor*	EPC from Surface Soil	EPC from Total Soils	Current Site Worker: Absorbed Dose (mg/kg-day)		Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day)		Future Industrial Worker: Hazard Quotient	Future Industrial Worker: 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	7.52E-03	7.25E-03								
Benzene	2.9E-03	3.1E-02	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.9E-02	7.7E-03	NA	4.00E-03	4.00E-03								
Toluene	2.0E-01	NA	NA	6.55E-03	6.46E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	2.91E-01	2.71E-01								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	7.92E-02	7.66E-02								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	2.32E-01	2.25E-01								
3-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.0E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	2.86E-01	2.70E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	2.91E-01	2.75E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.03E-01	2.81E-01								
Benzo(g,h,i)perylene	NA	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.67E-01	2.54E-01								
Butylbenzylphthalate	2.0E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.0E-02	NA	2.37E-01	2.29E-01								
Chrysene	NA	7.3E-03	NA	2.[illegible]7E-01	2.33E-01								
Di-n-butylphthalate	9.0E-02	NA	NA	2.84E-01	2.65E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	2.55E-01	2.42E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.0E-02	NA	NA	2.11E-01	2.20E-01								
Fluorene	4.0E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.77E-01	2.60E-01								
N-Nitrosodiphenylamine (1)	NA	7.0E+00	NA	9.50E-02	9.50E-02								
Naphthalene	4.0E-02	NA	NA	3.70E-02	3.70E-02								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	6.10E-01	5.83E-01	2.77E-08	9.89E-09	9E-07	1E-09	3.46E-07	1.24E-07	1E-05	1E-08
Phenanthrene	NA	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.0E-02	NA	NA	2.06E-01	2.14E-01								
bis(2-Chloroisopropyl) ether	4.0E-02	NA	NA	2.13E-01	2.13E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	3.43E-01	3.44E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	2.76E-03	2.61E-03								
4,4'-DDE	NA	1.7E+00	NA	8.57E-03	6.91E-03								
4,4'-DDT	1.0E-04	1.7E+00	NA	3.96E-03	3.55E-03								
Aldrin	1.5E-05	3.4E+01	NA	1.25E-03	1.20E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06		2.39E-02								
Aroclor-1260	1.8E-05	2.2E+00	0.06	2.42E-02	2.33E-02	6.59E-09	2.35E-09	4E-04	5E-09	8.24E-08	2.94E-08	5E-03	7E-08
Dieldrin	2.5E-05	3.2E+01	NA	6.01E-03	5.02E-03								
Endosulfan I	6.0E-03	NA	NA	2.72E-03	2.29E-03								
Endosulfan sulfate	6.0E-03	NA	NA	2.41E-03	2.32E-03								
Endrin	3.0E-04	NA	NA	2.76E-03	2.60E-03								
Endrin ketone	NA	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.3E-05	9.1E+00	NA	1.05E-03	1.03E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	1.05E-03	1.03E-03								
beta-BHC	NA	1.8E+00	NA	1.35E-03	1.28E-03								
delta-BHC	NA	NA	NA	1.26E-03	1.21E-03								
Metals													
Antimony	4.0E-04	NA	NA	1.15E+01	9.89E+00								
Arsenic	2.4E-04	1.9E+00	0.001	6.44E+00	6.21E+00	2.92E-08	1.04E-08	1E-04	2E-08	3.65E-07	1.31E-07	2E-03	2E-07
Barium	3.5E-03	NA	NA	1.67E+02	1.53E+02								
Cadmium	5.0E-05	NA	0.01	8.82E+00	6.61E+00	4.00E-07		8E-03		5 01E-06		1E-01	
Copper	2.4E-02	NA	NA	2.21E+02	1.76E+02								
Lead	NA	NA	NA	2.25E+03	2.46E+03								
Mercury	3.0E-06	NA	NA	1.31E-01	1.15E-01								
Selenium	4.5E-03	NA	NA	1.03E+00	6.98E-01								
Silver	1.0E-03	NA	NA	2.06E+00	1.65E+00								
Thallium	8.0E-05	NA	NA	6.38E-01	5.30E-01								
Zinc	7.5E-02	NA	NA	3.57E+02	3.01E+02								
Herbicides													
MCPA	5.0E-04	NA	NA	8.49E+00	6.26E+00								
Total Hazard Quotient and Cancer Risk:								8E-03	3E-08			1E-01	3E-07

Assumptions for Current Site Worker		Assumptions for Future Industrial Worker	
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 =	20 days/year	EF =	250 days/year
ED =	25 years	ED =	25 years
BW =	70 kg	BW =	70 kg
AT (Nc) =	9125 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 B-17PR-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x CF x SA x AF x ABS x EF x ED / BW x 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics													
Acetone	1.00E-01	NA	NA	7.52E-03	7.25E-03								
Benzene	2.85E-03	3.05E-02	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.88E-02	7.65E-03	NA	4.00E-03	4.00E-03								
Toluene	2.00E-01	NA	NA	6.55E-03	6.46E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.00E-03	6.80E-01	NA	2.91E-01	2.71E-01								
2,6-Dinitrotoluene	1.00E-03	6.80E-01	NA	7.92E-02	7.66E-02								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.00E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.50E-01	NA	2.32E-01	2.25E-01								
3-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.00E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.00E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.30E-01	NA	2.86E-01	2.70E-01								
Benzo(a)pyrene	NA	1.83E+01	NA	2.91E-01	2.75E-01								
Benzo(b)fluoranthene	NA	7.30E-01	NA	3.03E-01	2.81E-01								
Benzo(g,h,i)perylene	NA	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.30E-02	NA	2.67E-01	2.54E-01								
Butylbenzylphthalate	2.00E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.00E-02	NA	2.37E-01	2.29E-01								
Chrysene	NA	7.30E-03	NA	2.27E-01	2.33E-01								
Di-n-butylphthalate	9.00E-02	NA	NA	2.84E-01	2.65E-01								
Dibenz(a,h)anthracene	NA	7.30E+00	NA	2.55E-01	2.42E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.00E-02	NA	NA	2.11E-01	2.20E-01								
Fluorene	4.00E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.30E-01	NA	2.77E-01	2.60E-01								
N-Nitrosodiphenylamine (1)	NA	7.00E+00	NA	9.50E-02	9.50E-02								
Naphthalene	4.00E-02	NA	NA	3.70E-02	3.70E-02								
Pentachlorophenol	3.00E-02	1.20E-01	0.01	6.10E-01	5.83E-01	3.31E-07	4.73E-09	1E-05	6E-10	7.73E-08	5.52E-09	3E-06	7E-10
Phenanthrene	NA	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.00E-02	NA	NA	2.06E-01	2.14E-01								
bis(2-Chloroisopropyl) ether	4.00E-02	NA	NA	2.13E-01	2.13E-01								
bis(2-Ethylhexyl)phthalate	1.00E-02	2.80E-02	NA	3.43E-01	3.44E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.20E+00	NA	2.76E-03	2.61E-03								
4,4'-DDE	NA	1.70E+00	NA	8.57E-03	6.91E-03								
4,4'-DDT	1.00E-04	1.70E+00	NA	3.96E-03	3.55E-03								
Aldrin	1.50E-05	3.40E+01	NA	1.25E-03	1.20E-03								
Aroclor-1254	1.80E-05	2.22E+00	0.06		2.39E-02	8.14E-08	1.16E-09	5E-03	3E-09				
Aroclor-1260	1.80E-05	2.22E+00	0.06	2.42E-02	2.33E-02	7.93E-08	1.13E-09	4E-03	3E-09	1.84E-08	1.31E-09	1E-03	3E-09
Dieldrin	2.50E-05	3.20E+01	NA	6.01E-03	5.02E-03								
Endosulfan I	6.00E-03	NA	NA	2.72E-03	2.29E-03								
Endosulfan sulfate	6.00E-03	NA	NA	2.41E-03	2.32E-03								
Endrin	3.00E-04	NA	NA	2.76E-03	2.60E-03								
Endrin ketone	NA	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.30E-05	9.10E+00	NA	1.05E-03	1.03E-03								
alpha-Chlordane	6.00E-05	1.30E+00	NA	1.05E-03	1.03E-03								
beta-BHC	NA	1.80E+00	NA	1.35E-03	1.28E-03								
delta-BHC	NA	NA	NA	1.26E-03	1.21E-03								
Metals													
Antimony	4.00E-04	NA	NA	1.15E+01	9.89E+00								
Arsenic	2.40E-04	1.88E+00	0.001	6.44E+00	6.21E+00	3.52E-07	5.03E-09	1E-03	9E-09	8.16E-08	5.83E-09	3E-04	1E-08
Barium	3.50E-03	NA	NA	1.67E+02	1.53E+02								
Cadmium	5.00E-05	NA	0.01	8.82E+00	6.61E+00	3.75E-06		8E-02		1.12E-06		2E-02	
Copper	2.40E-02	NA	NA	2.21E+02	1.76E+02								
Lead	NA	NA	NA	2.25E+03	2.46E+03								
Mercury	3.00E-06	NA	NA	1.31E-01	1.15E-01								
Selenium	4.50E-03	NA	NA	1.03E+00	6.98E-01								
Silver	1.00E-03	NA	NA	2.06E+00	1.65E+00								
Thallium	8.00E-05	NA	NA	6.38E-01	5.30E-01								
Zinc	7.50E-02	NA	NA	3.57E+02	3.01E+02								
Herbicides													
MCPA	5.00E-04	NA	NA	8.49E+00	6.26E+00								
Total Hazard Quotient and Cancer Risk:								9E-02	2E-08			2E-02	1E-08

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CF =	1.00E-06 kg/mg	CF =	1.00E-06 kg/mg
SA =	5800 cm2	SA =	4625 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-17PR-9
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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	Carc. Slope Dermal	Absorption Factor*	EPC from Surface Soil	EPC from Total Soils	Future Day Care Center Child: Absorbed Dose (mg/kg-day)		Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day)		Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics													
Acetone	1.00E-01	NA	NA	7.52E-03	7.25E-03								
Benzene	2.85E-03	3.05E-02	NA	2.00E-03	2.00E-03								
Methylene Chloride	5.88E-02	7.65E-03	NA	4.00E-03	4.00E-03								
Toluene	2.00E-01	NA	NA	6.55E-03	6.46E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.00E-03	6.80E-01	NA	2.91E-01	2.71E-01								
2,6-Dinitrotoluene	1.00E-03	6.80E-01	NA	7.92E-02	7.66E-02								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.00E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.50E-01	NA	2.32E-01	2.25E-01								
3-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
4-Nitroaniline	NA	NA	NA	5.62E-01	5.45E-01								
Acenaphthene	6.00E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.00E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.30E-01	NA	2.86E-01	2.70E-01								
Benzo(a)pyrene	NA	1.83E+01	NA	2.91E-01	2.75E-01								
Benzo(b)fluoranthene	NA	7.30E-01	NA	3.03E-01	2.81E-01								
Benzo(g,h,i)perylene	NA	NA	NA	2.64E-01	2.50E-01								
Benzo(k)fluoranthene	NA	7.30E-02	NA	2.67E-01	2.54E-01								
Butylbenzylphthalate	2.00E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.00E-02	NA	2.37E-01	2.29E-01								
Chrysene	NA	7.30E-03	NA	2.27E-01	2.33E-01								
Di-n-butylphthalate	9.00E-02	NA	NA	2.84E-01	2.65E-01								
Dibenz(a,h)anthracene	NA	7.30E+00	NA	2.55E-01	2.42E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Fluoranthene	4.00E-02	NA	NA	2.11E-01	2.20E-01								
Fluorene	4.00E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.30E-01	NA	2.77E-01	2.60E-01								
N-Nitrosodiphenylamine (1)	NA	7.00E+00	NA	9.50E-02	9.50E-02								
Naphthalene	4.00E-02	NA	NA	3.70E-02	3.70E-02								
Pentachlorophenol	3.00E-02	1.20E-01	0.01	6.10E-01	5.83E-01	6.10E-07	5.23E-08	2E-05	6E-09	3.46E-07	1.24E-07	1E-05	1E-08
Phenanthrene	NA	NA	NA	2.55E-01	2.47E-01								
Pyrene	3.00E-02	NA	NA	2.06E-01	2.14E-01								
bis(2-Chloroisopropyl) ether	4.00E-02	NA	NA	2.13E-01	2.13E-01								
bis(2-Ethylhexyl)phthalate	1.00E-02	2.80E-02	NA	3.43E-01	3.44E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.20E+00	NA	2.76E-03	2.61E-03								
4,4'-DDE	NA	1.70E+00	NA	8.57E-03	6.91E-03								
4,4'-DDT	1.00E-04	1.70E+00	NA	3.96E-03	3.55E-03								
Aldrin	1.50E-05	3.40E+01	NA	1.25E-03	1.20E-03								
Aroclor-1254	1.80E-05	2.22E+00	0.06	0.00E+00	2.39E-02								
Aroclor-1260	1.80E-05	2.22E+00	0.06	2.42E-02	2.33E-02	1.45E-07	1.24E-08	8E-03	3E-08	8.24E-08	2.94E-08	5E-03	7E-08
Dieldrin	2.50E-05	3.20E+01	NA	6.01E-03	5.02E-03								
Endosulfan I	6.00E-03	NA	NA	2.72E-03	2.29E-03								
Endosulfan sulfate	6.00E-03	NA	NA	2.41E-03	2.32E-03								
Endrin	3.00E-04	NA	NA	2.76E-03	2.60E-03								
Endrin ketone	NA	NA	NA	2.93E-03	2.73E-03								
Heptachlor epoxide	1.30E-05	9.10E+00	NA	1.05E-03	1.03E-03								
alpha-Chlordane	6.00E-05	1.30E+00	NA	1.05E-03	1.03E-03								
beta-BHC	NA	1.80E+00	NA	1.35E-03	1.28E-03								
delta-BHC	NA	NA	NA	1.26E-03	1.21E-03								
Metals													
Antimony	4.00E-04	NA	NA	1.15E+01	9.89E+00								
Arsenic	2.40E-04	1.88E+00	0.001	6.44E+00	6.21E+00	6.44E-07	5.52E-08	3E-03	1E-07	3.65E-07	1.31E-07	2E-03	2E-07
Barium	3.50E-03	NA	NA	1.67E+02	1.53E+02								
Cadmium	5.00E-05	NA	0.01	8.82E+00	6.61E+00	8.82E-06		2E-01		5.01E-06		1E-01	
Copper	2.40E-02	NA	NA	2.21E+02	1.76E+02								
Lead	NA	NA	NA	2.25E+03	2.46E+03								
Mercury	3.00E-06	NA	NA	1.31E-01	1.15E-01								
Selenium	4.50E-03	NA	NA	1.03E+00	6.98E-01								
Silver	1.00E-03	NA	NA	2.06E+00	1.65E+00								
Thallium	8.00E-05	NA	NA	6.38E-01	5.30E-01								
Zinc	7.50E-02	NA	NA	3.57E+02	3.01E+02								
Herbicides													
MCPA	5.00E-04	NA	NA	8.49E+00	6.26E+00								
Total Hazard Quotient and Cancer Risk:								2E-01	1E-07			1E-01	3E-07

Assumptions for Future Day Care Center Child		Assumptions for Future Day Care Center Adult	
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 B-17PR-10
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

n for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

es (Assumptions for Each Receptor are Listed at the Bottom):
bsorbed Dose per Event — ED = Exposure Duration
rface Area Contact — BW = Bodyweight
xposure Frequency — 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 Surface Water
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Equation for Hazard Quotient =
Chronic Daily Intake (Nc)/Refe

Equation for Cancer Risk =
Chronic Daily Intake (Car) x Sl

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	EPC Surface Water (mg/L)	τ (hours)	Kp (cm/hr)	Current Site Worker: Absorbed Dose (mg/kg-day) (Nc)	Current Site Worker: Absorbed Dose (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Wo: Absorbed Dose (mg/kg-day) (Nc)	Future Industrial Wo: Absorbed Dose (mg/kg-day) (Car)	Future Industrial Wo: Hazard Quotien
latile Organics												
hylhexyl)phthalate	1.0E-02	2.8E-02	2.00E-03	21	3.30E-02							
ny	4.0E-04	NA	2.21E-02	NA	1.00E-03							
	2.4E-04	1.9E+00	4.26E-03	NA	1.00E-03							
	3.5E-03	NA	7.22E-02	NA	1.00E-03	Onsite Surface Water Dermal Contact Not Applicable for Current Site Worker				Onsite Surface Water Dermal Contact Not Applicable for Future Industrial Worker		
m	5.0E-05	NA	7.82E-04	NA	1.00E-03							
	NA	NA	6.32E+01	NA	1.00E-03							
um	1.0E-04	NA	6.31E-04	NA	2.00E-03							
	2.4E-02	NA	1.93E-02	NA	1.00E-03							
	3.0E-01	NA	1.93E-01	NA	1.00E-03							
	NA	NA	3.71E-02	NA	4.00E-06							
ium	NA	NA	8.90E+00	NA	1.00E-03							
ese	1.5E-03	NA	1.20E-02	NA	1.00E-03							
	8.0E-04	NA	1.03E-03	NA	1.00E-03							
m	NA	NA	3.52E+00	NA	1.00E-03							
n	4.5E-03	NA	3.23E-03	NA	1.00E-03							
	NA	NA	7.03E+00	NA	1.00E-03							
m	7.0E-05	NA	9.00E-04	NA	1.00E-03							
	7.5E-02	NA	3.63E-02	NA	6.00E-04							
lazard Quotient and Cancer Risk:												

ells in this table were intentionally left blank due to a lack of toxicity data.
ormation not available.

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TABLE B-17PR-10
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

s (Assumptions for Each Receptor are Listed at the Bottom):
sorbed Dose per Event   ED = Exposure Duration
face Area Contact   BW = Bodyweight
posure Frequency   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 τ = Lag Time
CW = EPC Surface Water   CF = Conversion Factor
ET = Exposure Time

Equation for Hazard Quotient =
Chronic Daily Intake (Nc)/Refere

Equation for Cancer Risk =
Chronic Daily Intake (Car) x Slo

Analyte	Dermal RfD	Carc. Slope Dermal	EPC Surface Water	τ	Kp	Future Construction Worker				Future Tresspasser Ch		
						Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Absorbed Dose (mg/kg-day)		Hazard Quotient
	(mg/kg-day)	(mg/kg-day)-1	(mg/L)	(hours)	(cm/hr)	(Nc)	(Car)			(Nc)	(Car)	
tile Organics												
ylhexyl)phthalate	1.0E-02	2.8E-02	2.00E-03	21	3.30E-02					5.30E-06	3.78E-07	5E-04
/	4.0E-04	NA	2.21E-02	NA	1.00E-03	Onsite Surface Water Dermal Contact Not Applicable for Future Construction Worker				1.40E-07		3E-04
	2.4E-04	1.9E+00	4.26E-03	NA	1.00E-03					2.70E-08	1.93E-09	1E-04
	3.5E-03	NA	7.22E-02	NA	1.00E-03					4.57E-07		1E-04
	5.0E-05	NA	7.82E-04	NA	1.00E-03					4.96E-09		1E-04
	NA	NA	6.32E+01	NA	1.00E-03							
n	1.0E-04	NA	6.31E-04	NA	2.00E-03					7.99E-09		8E-05
	2.4E-02	NA	1.93E-02	NA	1.00E-03					1.22E-07		5E-06
	3.0E-01	NA	1.93E-01	NA	1.00E-03					1.22E-06		4E-06
	NA	NA	3.71E-02	NA	4.00E-06							
m	NA	NA	8.90E+00	NA	1.00E-03							
se	1.5E-03	NA	1.20E-02	NA	1.00E-03					7.59E-08		5E-05
	8.0E-04	NA	1.03E-03	NA	1.00E-03					6.55E-09		8E-06
a	NA	NA	3.52E+00	NA	1.00E-03							
	4.5E-03	NA	3.23E-03	NA	1.00E-03					2.05E-08		5E-06
	NA	NA	7.03E+00	NA	1.00E-03							
n	7.0E-05	NA	9.00E-04	NA	1.00E-03					5.70E-09		8E-05
	7.5E-02	NA	3.63E-02	NA	6.00E-04					1.38E-07		2E-06
azard Quotient and Cancer Risk:												**1E-03**

Assumptions for Future Tresspass

SA =	4625	cm2
EF =	25	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	days
AT (Car) =	25550	days
ET =	1	hour/day
CF =	1E-03	liter/cm3

ls in this table were intentionally left blank due to a lack of toxicity data.
mation not available.

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TABLE B-17PR-10
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

n for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

s (Assumptions for Each Receptor are Listed at the Bottom):
bsorbed Dose per Event — ED = Exposure Duration
rface Area Contact — BW = Bodyweight
xposure Frequency — 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 — Tau = Lag Time
CW = EPC Surface Water — CF = Conversion Factor
ET = Exposure Time

Equation for Hazard Quotient =
Chronic Daily Intake (Nc)/Refere

Equation for Cancer Risk =
Chronic Daily Intake (Car) x Slo

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	EPC Surface Water (mg/L)	Tau (hours)	Kp (cm/hr)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center: Hazard Quotient
atile Organics												
ylhexyl)phthalate	1.0E-02	2.8E-02	2.00E-03	21	3.30E-02							
y	4.0E-04	NA	2.21E-02	NA	1.00E-03							
	2.4E-04	1.9E+00	4.26E-03	NA	1.00E-03							
	3.5E-03	NA	7.22E-02	NA	1.00E-03	Onsite Surface Water Dermal Contact Not Applicable for Future Day Care Center Child				Onsite Surface Water Dermal Contact Not Applicable for Future Day Care Center Adult		
n	5.0E-05	NA	7.82E-04	NA	1.00E-03							
	NA	NA	6.32E+01	NA	1.00E-03							
m	1.0E-04	NA	6.31E-04	NA	2.00E-03							
	2.4E-02	NA	1.93E-02	NA	1.00E-03							
	3.0E-01	NA	1.93E-01	NA	1.00E-03							
	NA	NA	3.71E-02	NA	4.00E-06							
um	NA	NA	8.90E+00	NA	1.00E-03							
se	1.5E-03	NA	1.20E-02	NA	1.00E-03							
	8.0E-04	NA	1.03E-03	NA	1.00E-03							
n	NA	NA	3.52E+00	NA	1.00E-03							
	4.5E-03	NA	3.23E-03	NA	1.00E-03							
	NA	NA	7.03E+00	NA	1.00E-03							
n	7.0E-05	NA	9.00E-04	NA	1.00E-03							
	7.5E-02	NA	3.63E-02	NA	6.00E-04							
azard Quotient and Cancer Risk:												

lls in this table were intentionally left blank due to a lack of toxicity data.
rmation not available.

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TABLE B-17PR-11
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Sediment (mg/kg)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics											
Acetone	1.0E-01	NA	1.44E-02								
Toluene	2.0E-01	NA	8.00E-03								
Semivolatile Organics											
2,4-Dimethylphenol	2.0E-02	NA	3.20E-02								
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.14E-01								
Benzo(a)anthracene	NA	7.3E-01	2.50E-02		Ingestion of Onsite Sediment Not Applicable for Current Site Worker				Ingestion of Onsite Sediment Not Applicable for Future Industrial Worker		
Benzo(a)pyrene	NA	7.3E+00	3.00E-02								
Benzo(b)fluoranthene	NA	7.3E-01	4.30E-02								
Benzo(g,h,i)perylene	NA	NA	3.10E-02								
Benzo(k)fluoranthene	NA	7.3E-02	3.30E-02								
Chrysene	NA	7.3E-03	4.80E-02								
Fluoranthene	4.0E-02	NA	7.00E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.40E-02								
Phenanthrene	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	4.70E-02								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	7.70E-02								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	6.46E-03								
4,4'-DDE	NA	3.4E-01	4.82E-02								
4,4'-DDT	5.0E-04	3.4E-01	4.90E-03								
Dieldrin	5.0E-05	1.6E+01	3.26E-03								
Endosulfan I	6.0E-03	NA	1.43E-03								
Endosulfan II	6.0E-03	NA	3.05E-03								
Metals											
Aluminum	1.0E+00	NA	1.83E+04								
Antimony	4.0E-04	NA	5.50E+00								
Arsenic	3.0E-04	1.5E+00	6.10E+00								
Barium	7.0E-02	NA	1.32E+02								
Beryllium	5.0E-03	4.3E+00	7.64E-01								
Cadmium	5.0E-04	NA	2.40E+00								
Calcium	NA	NA	1.08E+04								
Chromium	5.0E-03	NA	2.47E+01								
Cobalt	NA	NA	1.26E+01								
Copper	4.0E-02	NA	1.33E+02								
Iron	3.0E-01	NA	2.94E+04								
Lead	NA	NA	6.83E+02								
Magnesium	NA	NA	5.54E+03								
Manganese	5.0E-02	NA	5.32E+02								
Mercury	3.0E-04	NA	8.11E-02								
Nickel	2.0E-02	NA	3.16E+01								
Potassium	NA	NA	2.18E+03								
Selenium	5.0E-03	NA	1.27E+00								
Sodium	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	8.24E-01								
Vanadium	7.0E-03	NA	2.97E+01								
Zinc	3.0E-01	NA	1.88E+02								
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.

TABLE B-17PR-11
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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 Sediment	Future Construction Worker				Future Tresspasser 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)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											
Acetone	1.0E-01	NA	1.44E-02					3.94E-09		4E-08	
Toluene	2.0E-01	NA	8.00E-03					2.19E-09		1E-08	
Semivolatile Organics											
2,4-Dimethylphenol	2.0E-02	NA	3.20E-02					8.77E-09		4E-07	
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.14E-01					8.61E-08	6.15E-09	4E-05	4E-09
Benzo(a)anthracene	NA	7.3E-01	2.50E-02			Ingestion of			4.89E-10		4E-10
Benzo(a)pyrene	NA	7.3E+00	3.00E-02			Onsite Sediment			5.87E-10		4E-09
Benzo(b)fluoranthene	NA	7.3E-01	4.30E-02			Not Applicable			8.41E-10		6E-10
Benzo(g,h,i)perylene	NA	NA	3.10E-02			for Future					
Benzo(k)fluoranthene	NA	7.3E-02	3.30E-02			Construction Worker			6.46E-10		5E-11
Chrysene	NA	7.3E-03	4.80E-02						9.39E-10		7E-12
Fluoranthene	4.0E-02	NA	7.00E-02					1.92E-08		5E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.40E-02						4.70E-10		3E-10
Phenanthrene	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	4.70E-02					1.29E-08		4E-07	
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	7.70E-02					2.11E-08	1.51E-09	1E-06	2E-11
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	6.46E-03						1.26E-10		3E-11
4,4'-DDE	NA	3.4E-01	4.82E-02						9.43E-10		3E-10
4,4'-DDT	5.0E-04	3.4E-01	4.90E-03					1.34E-09	9.58E-11	3E-06	3E-11
Dieldrin	5.0E-05	1.6E+01	3.26E-03					8.92E-10	6.37E-11	2E-05	1E-09
Endosulfan I	6.0E-03	NA	1.43E-03					3.91E-10		7E-08	
Endosulfan II	6.0E-03	NA	3.05E-03					8.35E-10		1E-07	
Metals											
Aluminum	1.0E+00	NA	1.83E+04					5.00E-03		5E-03	
Antimony	4.0E-04	NA	5.50E+00					1.51E-06		4E-03	
Arsenic	3.0E-04	1.5E+00	6.10E+00					1.67E-06	1.19E-07	6E-03	2E-07
Barium	7.0E-02	NA	1.32E+02					3.60E-05		5E-04	
Beryllium	5.0E-03	4.3E+00	7.64E-01					2.09E-07	1.49E-08	4E-05	6E-08
Cadmium	5.0E-04	NA	2.40E+00					6.58E-07		1E-03	
Calcium	NA	NA	1.08E+04								
Chromium	5.0E-03	NA	2.47E+01					6.76E-06		1E-03	
Cobalt	NA	NA	1.26E+01								
Copper	4.0E-02	NA	1.33E+02					3.66E-05		9E-04	
Iron	3.0E-01	NA	2.94E+04					8.06E-03		3E-02	
Lead	NA	NA	6.83E+02								
Magnesium	NA	NA	5.54E+03								
Manganese	5.0E-02	NA	5.32E+02					1.46E-04		3E-03	
Mercury	3.0E-04	NA	8.11E-02					2.22E-08		7E-05	
Nickel	2.0E-02	NA	3.16E+01					8.66E-06		4E-04	
Potassium	NA	NA	2.18E+03								
Selenium	5.0E-03	NA	1.27E+00					3.47E-07		7E-05	
Sodium	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	8.24E-01					2.26E-07		3E-03	
Vanadium	7.0E-03	NA	2.97E+01					8.15E-06		1E-03	
Zinc	3.0E-01	NA	1.88E+02					5.16E-05		2E-04	
Total Hazard Quotient and Cancer Risk:										**5E-02**	**3E-07**

Assumptions for Future Tresspasser Child

IR =	200	mg sed/day
CF =	1E-06	kg/mg
FI =	1	unitless
EF =	25	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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-17PR-11
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Sediment (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics											
Acetone	1.0E-01	NA	1.44E-02								
Toluene	2.0E-01	NA	8.00E-03								
Semivolatile Organics											
2,4-Dimethylphenol	2.0E-02	NA	3.20E-02								
2,4-Dinitrotoluene	2.0E-03	6.8E-01	3.14E-01								
Benzo(a)anthracene	NA	7.3E-01	2.50E-02			Ingestion of				Ingestion of	
Benzo(a)pyrene	NA	7.3E+00	3.00E-02			Onsite Sediment				Onsite Sediment	
Benzo(b)fluoranthene	NA	7.3E-01	4.30E-02			Not Applicable				Not Applicable	
Benzo(g,h,i)perylene	NA	NA	3.10E-02			for Future				for Future	
Benzo(k)fluoranthene	NA	7.3E-02	3.30E-02			Day Care Center Child				Day Care Center Worker	
Chrysene	NA	7.3E-03	4.80E-02								
Fluoranthene	4.0E-02	NA	7.00E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	2.40E-02								
Phenanthrene	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	4.70E-02								
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	7.70E-02								
Pesticides/PCBs											
4,4'-DDD	NA	2.4E-01	6.46E-03								
4,4'-DDE	NA	3.4E-01	4.82E-02								
4,4'-DDT	5.0E-04	3.4E-01	4.90E-03								
Dieldrin	5.0E-05	1.6E+01	3.26E-03								
Endosulfan I	6.0E-03	NA	1.43E-03								
Endosulfan II	6.0E-03	NA	3.05E-03								
Metals											
Aluminum	1.0E+00	NA	1.83E+04								
Antimony	4.0E-04	NA	5.50E+00								
Arsenic	3.0E-04	1.5E+00	6.10E+00								
Barium	7.0E-02	NA	1.32E+02								
Beryllium	5.0E-03	4.3E+00	7.64E-01								
Cadmium	5.0E-04	NA	2.40E+00								
Calcium	NA	NA	1.08E+04								
Chromium	5.0E-03	NA	2.47E+01								
Cobalt	NA	NA	1.26E+01								
Copper	4.0E-02	NA	1.33E+02								
Iron	3.0E-01	NA	2.94E+04								
Lead	NA	NA	6.83E+02								
Magnesium	NA	NA	5.54E+03								
Manganese	5.0E-02	NA	5.32E+02								
Mercury	3.0E-04	NA	8.11E-02								
Nickel	2.0E-02	NA	3.16E+01								
Potassium	NA	NA	2.18E+03								
Selenium	5.0E-03	NA	1.27E+00								
Sodium	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	8.24E-01								
Vanadium	7.0E-03	NA	2.97E+01								
Zinc	3.0E-01	NA	1.88E+02								
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.

TABLE B-17PR-12
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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	Carc. Slope Dermal	Absorption Factor*	EPC Sediment	Current Site Worker: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.0E-01	NA	NA	1.44E-02								
Toluene	2.0E-01	NA	NA	8.00E-03								
Semivolatile Organics												
2,4-Dimethylphenol	2.0E-02	NA	NA	3.20E-02								
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.14E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	2.50E-02		Contact to Onsite Sediment Not Applicable for Current Site Worker				Contact to Onsite Sediment Not Applicable for Future Industrial Worker		
Benzo(a)pyrene	NA	1.8E+01	NA	3.00E-02								
Benzo(b)fluoranthene	NA	7.3E-01	NA	4.30E-02								
Benzo(g,h,i)perylene	NA	NA	NA	3.10E-02								
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.30E-02								
Chrysene	NA	7.3E-03	NA	4.80E-02								
Fluoranthene	4.0E-02	NA	NA	7.00E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.40E-02								
Phenanthrene	NA	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	NA	4.70E-02								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	7.70E-02								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	6.46E-03								
4,4'-DDE	NA	1.7E+00	NA	4.82E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.90E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.26E-03								
Endosulfan I	6.0E-03	NA	NA	1.43E-03								
Endosulfan II	6.0E-03	NA	NA	3.05E-03								
Metals												
Aluminum	NA	NA	NA	1.83E+04								
Antimony	4.0E-04	NA	NA	5.50E+00								
Arsenic	2.4E-04	1.9E+00	0.001	6.10E+00								
Barium	3.5E-03	NA	NA	1.32E+02								
Beryllium	5.0E-05	4.3E+02	NA	7.64E-01								
Cadmium	5.0E-05	NA	0.01	2.40E+00								
Calcium	NA	NA	NA	1.08E+04								
Chromium	1.0E-04	NA	NA	2.47E+01								
Cobalt	NA	NA	NA	1.26E+01								
Copper	2.4E-02	NA	NA	1.33E+02								
Iron	3.0E-01	NA	NA	2.94E+04								
Lead	NA	NA	NA	6.83E+02								
Magnesium	NA	NA	NA	5.54E+03								
Manganese	1.5E-03	NA	NA	5.32E+02								
Mercury	3.0E-06	NA	NA	8.11E-02								
Nickel	8.0E-04	NA	NA	3.16E+01								
Potassium	NA	NA	NA	2.18E+03								
Selenium	4.5E-03	NA	NA	1.27E+00								
Sodium	NA	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	NA	8.24E-01								
Vanadium	7.0E-05	NA	NA	2.97E+01								
Zinc	7.5E-02	NA	NA	1.88E+02								
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.
* 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-17PR-12
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Sediment (mg/kg)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics												
Acetone	1.0E-01	NA	NA	1.44E-02								
Toluene	2.0E-01	NA	NA	8.00E-03								
Semivolatile Organics												
2,4-Dimethylphenol	2.0E-02	NA	NA	3.20E-02								
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.14E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	2.50E-02		Contact to						
Benzo(a)pyrene	NA	1.8E+01	NA	3.00E-02		Onsite Sediment						
Benzo(b)fluoranthene	NA	7.3E-01	NA	4.30E-02		Not Applicable						
Benzo(g,h,i)perylene	NA	NA	NA	3.10E-02		for Future						
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.30E-02		Construction Worker						
Chrysene	NA	7.3E-03	NA	4.80E-02								
Fluoranthene	4.0E-02	NA	NA	7.00E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.40E-02								
Phenanthrene	NA	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	NA	4.70E-02								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	7.70E-02								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	6.46E-03								
4,4'-DDE	NA	1.7E+00	NA	4.82E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.90E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.26E-03								
Endosulfan I	6.0E-03	NA	NA	1.43E-03								
Endosulfan II	6.0E-03	NA	NA	3.05E-03								
Metals												
Aluminum	NA	NA	NA	1.83E+04								
Antimony	4.0E-04	NA	NA	5.50E+00								
Arsenic	2.4E-04	1.9E+00	0.001	6.10E+00					3.9E-08	2.8E-09	2E-04	5E-09
Barium	3.5E-03	NA	NA	1.32E+02								
Beryllium	5.0E-05	4.3E+02	NA	7.64E-01								
Cadmium	5.0E-05	NA	0.01	2.40E+00					1.5E-07		3E-03	
Calcium	NA	NA	NA	1.08E+04								
Chromium	1.0E-04	NA	NA	2.47E+01								
Cobalt	NA	NA	NA	1.26E+01								
Copper	2.4E-02	NA	NA	1.33E+02								
Iron	3.0E-01	NA	NA	2.94E+04								
Lead	NA	NA	NA	6.83E+02								
Magnesium	NA	NA	NA	5.54E+03								
Manganese	1.5E-03	NA	NA	5.32E+02								
Mercury	3.0E-06	NA	NA	8.11E-02								
Nickel	8.0E-04	NA	NA	3.16E+01								
Potassium	NA	NA	NA	2.18E+03								
Selenium	4.5E-03	NA	NA	1.27E+00								
Sodium	NA	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	NA	8.24E-01								
Vanadium	7.0E-05	NA	NA	2.97E+01								
Zinc	7.5E-02	NA	NA	1.88E+02								
Total Hazard Quotient and Cancer Risk:											3E-03	5E-09

Assumptions for Future Tresspasser Child

CF =	1E-06	kg/mg
SA =	4625	cm2
AF =	1	mg/cm2
EF =	25	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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 B-17PR-12
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
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 Sediment, from Sediment 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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC Sediment (mg/kg)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics												
Acetone	1.0E-01	NA	NA	1.44E-02								
Toluene	2.0E-01	NA	NA	8.00E-03								
Semivolatile Organics												
2,4-Dimethylphenol	2.0E-02	NA	NA	3.20E-02								
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	3.14E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	2.50E-02	Contact to Onsite Sediment Not Applicable for Future Day Care Center Child				Contact to Onsite Sediment Not Applicable for Future Day Care Center Worker			
Benzo(a)pyrene	NA	1.8E+01	NA	3.00E-02								
Benzo(b)fluoranthene	NA	7.3E-01	NA	4.30E-02								
Benzo(g,h,i)perylene	NA	NA	NA	3.10E-02								
Benzo(k)fluoranthene	NA	7.3E-02	NA	3.30E-02								
Chrysene	NA	7.3E-03	NA	4.80E-02								
Fluoranthene	4.0E-02	NA	NA	7.00E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	2.40E-02								
Phenanthrene	NA	NA	NA	3.50E-02								
Pyrene	3.0E-02	NA	NA	4.70E-02								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	7.70E-02								
Pesticides/PCBs												
4,4'-DDD	NA	1.2E+00	NA	6.46E-03								
4,4'-DDE	NA	1.7E+00	NA	4.82E-02								
4,4'-DDT	1.0E-04	1.7E+00	NA	4.90E-03								
Dieldrin	2.5E-05	3.2E+01	NA	3.26E-03								
Endosulfan I	6.0E-03	NA	NA	1.43E-03								
Endosulfan II	6.0E-03	NA	NA	3.05E-03								
Metals												
Aluminum	NA	NA	NA	1.83E+04								
Antimony	4.0E-04	NA	NA	5.50E+00								
Arsenic	2.4E-04	1.9E+00	0.001	6.10E+00								
Barium	3.5E-03	NA	NA	1.32E+02								
Beryllium	5.0E-05	4.3E+02	NA	7.64E-01								
Cadmium	5.0E-05	NA	0.01	2.40E+00								
Calcium	NA	NA	NA	1.08E+04								
Chromium	1.0E-04	NA	NA	2.47E+01								
Cobalt	NA	NA	NA	1.26E+01								
Copper	2.4E-02	NA	NA	1.33E+02								
Iron	3.0E-01	NA	NA	2.94E+04								
Lead	NA	NA	NA	6.83E+02								
Magnesium	NA	NA	NA	5.54E+03								
Manganese	1.5E-03	NA	NA	5.32E+02								
Mercury	3.0E-06	NA	NA	8.11E-02								
Nickel	8.0E-04	NA	NA	3.16E+01								
Potassium	NA	NA	NA	2.18E+03								
Selenium	4.5E-03	NA	NA	1.27E+00								
Sodium	NA	NA	NA	4.27E+02								
Thallium	8.0E-05	NA	NA	8.24E-01								
Vanadium	7.0E-05	NA	NA	2.97E+01								
Zinc	7.5E-02	NA	NA	1.88E+02								
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.
* 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-17PR-13
CALCULATION OF INTAKE RISK FROM INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

for Intake (mg/kg-day) = CW x IR x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

(Assumptions for Each Receptor are Listed at the Bottom):
emical Concentration in Groundwater, from Groundwater EPC Data
stion Rate
osure Frequency

ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Current Site Worker				Future Industrial Worker				Future Construction		Haz Quo
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
tile Organics					Ingestion of Groundwater Not Applicable for Current Site Worker								Ingestion of Groundwater Not Applicable for Current Construction Wor	
yrene	NA	7.3E+00	7.00E-04						4.89E-06		4E-05			
]perylene	NA	NA	1.50E-03											
h]anthracene	NA	7.3E+00	9.50E-04						6.64E-06		5E-05			
2,3-cd]pyrene	NA	7.3E-01	1.50E-03						1.05E-05		8E-06			
natics														
	1.0E-02	NA	8.00E-05					1.57E-06		2E-04				
azard Quotient and Cancer Risk:										**2E-04**	**9E-05**			

Assumptions for Future Industrial Worker

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

ls in this table were intentionally left blank due to a lack of toxicity data.
rmation not available.

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TABLE B-17PR-13
CALCULATION OF INTAKE RISK FROM INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - PRE-REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

r Intake (mg/kg-day) = CW x IR x EF x ED / BW x AT

Assumptions for Each Receptor are Listed at the Bottom):
nical Concentration in Groundwater, from Groundwater EPC Data
ion Rate
sure 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	Future Tresspasser Child Intake (mg/kg-day)		Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk	Future Day Care Center Child Intake (mg/kg-day)		Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Cent... Intake (mg/kg-day)		Haza... Quoti...
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)	
le Organics														
rene	NA	7.3E+00	7.00E-04		Ingestion of Groundwater Not Applicable for Future Tresspasser Child				2.74E-06		2E-05		4.89E-06	
perylene	NA	NA	1.50E-03											
anthracene	NA	7.3E+00	9.50E-04						3.72E-06		3E-05		6.64E-06	
3-cd]pyrene	NA	7.3E-01	1.50E-03						5.87E-06		4E-06		1.05E-05	
atics														
	1.0E-02	NA	8.00E-05					3.65E-06		4E-04		1.57E-06		2E-0
zard Quotient and Cancer Risk:										**4E-04**	**5E-05**			**2E-0**

Assumptions for Future 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 Future Day Ca...		
IR =	2	liters/day
EF =	250	days/yea...
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

in this table were intentionally left blank due to a lack of toxicity data.
nation not available.

SEAD-17

POST REMEDIATION

TABLE B-17PO-1

CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-17PO-5	1E-04	5E-09
	Ingestion of Onsite Soils	Table B-17PO-6	7E-03	4E-07
	Dermal Contact to Onsite Soils	Table B-17PO-7	4E-03	2E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-02*	*4E-07*
FUTURE INDUSTRIAL WORKER	Inhalation of Dust in Ambient Air	Table B-17PO-5	1E-03	6E-08
	Ingestion of Onsite Soils	Table B-17PO-6	9E-02	5E-06
	Dermal Contact to Onsite Soils	Table B-17PO-7	5E-02	3E-07
	Ingestion of Groundwater	Table B-17PR-14	2E-04	9E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-01*	*1E-04*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-17PO-5	1E-02	2E-08
	Ingestion of Onsite Soils	Table B-17PO-6	3E-01	9E-07
	Dermal Contact to Onsite Soils	Table B-17PO-7	4E-02	1E-08
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-01*	*1E-06*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-17PO-5	5E-05	4E-10
	Ingestion of Onsite Soils	Table B-17PO-6	5E-02	6E-07
	Dermal Contact to Onsite Soils	Table B-17PO-7	1E-02	1E-08
	Dermal Contact to Surface Water while Wading	Table B-17PR-11	1E-03	1E-08
	Ingestion of Onsite Sediment	Table B-17PR-12	NA	NA
	Dermal Contact to Sediment while Wading	Table B-17PR-13	NA	NA
	TOTAL RECEPTOR RISK (Nc & Car)		*6E-02*	*6E-07*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-17PO-5	3E-03	3E-08
	Ingestion of Onsite Soils	Table B-17PO-6	8E-01	1E-05
	Dermal Contact to Onsite Soils	Table B-17PO-7	9E-02	1E-07
	Ingestion of Groundwater	Table B-17PR-14	4E-04	5E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*9E-01*	*6E-05*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-17PO-5	1E-03	5E-08
	Ingestion of Onsite Soils	Table B-17PO-6	9E-02	5E-06
	Dermal Contact to Onsite Soils	Table B-17PO-7	5E-02	3E-07
	Ingestion of Groundwater	Table B-17PR-14	2E-04	9E-05
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-01*	*1E-04*

Notes:
Remediation consists of removal of all surface and subsurface soils with lead concentrations > 1250ppm and sediments with lead concentrations > 31ppm.
NA = Not Applicable. Sediment will be remediated resulting in minimal risk by this exposure route.

TABLE B-17PO-2

Surface Soils Exposure Point Concentration Summary - Post Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No of Valid Analyses	No of Rejected	No of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
Acetone	37	1	1	3.00%	6.65E-03	2.61E-03	8.00E-03	FALSE	7.08E-03	7.08E-03
Benzene	38	0	2	5.00%	6.12E-03	1.48E-03	2.00E-03	FALSE	6.72E-03	2.00E-03
Toluene	38	0	4	11.00%	6.18E-03	1.47E-03	8.00E-03	FALSE	6.73E-03	6.73E-03
Semivolatile Organics										
2,4-Dinitrotoluene	38	0	3	8.00%	2.50E-01	1.93E-01	8.80E-01	FALSE	2.77E-01	2.77E-01
2-Methylnaphthalene	37	1	2	5.00%	1.98E-01	4.65E-02	1.30E-01	FALSE	2.25E-01	1.30E-01
2-Methylphenol	37	1	1	3.00%	2.01E-01	3.78E-02	1.20E-01	FALSE	2.10E-01	1.20E-01
3,3'-Dichlorobenzidine	38	0	1	3.00%	2.33E-01	1.60E-01	4.10E-01	FALSE	2.50E-01	2.50E-01
3-Nitroaniline	38	0	1	3.00%	5.64E-01	3.83E-01	9.90E-01	FALSE	6.04E-01	6.04E-01
4-Nitroaniline	38	0	1	3.00%	5.64E-01	3.83E-01	9.90E-01	FALSE	6.04E-01	6.04E-01
Acenaphthene	37	1	2	5.00%	1.95E-01	5.38E-02	3.30E-02	FALSE	2.41E-01	3.30E-02
Acenaphthylene	37	1	2	5.00%	1.97E-01	4.75E-02	9.60E-02	FALSE	2.22E-01	9.60E-02
Anthracene	37	1	3	8.00%	1.95E-01	4.91E-02	1.30E-01	FALSE	2.27E-01	1.30E-01
Benzo(a)anthracene	38	0	13	34.00%	2.00E-01	2.04E-01	7.20E-01	FALSE	3.26E-01	3.26E-01
Benzo(a)pyrene	38	0	16	42.00%	1.97E-01	2.34E-01	9.40E-01	FALSE	3.37E-01	3.37E-01
Benzo(b)fluoranthene	38	0	13	34.00%	2.45E-01	3.76E-01	2.20E+00	FALSE	3.53E-01	3.53E-01
Benzo(ghi)perylene	38	0	12	32.00%	2.10E-01	2.01E-01	7.10E-01	FALSE	2.91E-01	2.91E-01
Benzo(k)fluoranthene	38	0	11	29.00%	1.94E-01	1.84E-01	5.30E-01	FALSE	2.87E-01	2.87E-01
Bis(2-Chloroisopropyl)ether	22	0	1	5.00%	2.11E-01	6.23E-02	4.10E-01	FALSE	2.29E-01	2.29E-01
Bis(2-Ethylhexyl)phthalate	38	0	6	16.00%	2.86E-01	2.45E-01	1.30E+00	FALSE	3.17E-01	3.17E-01
Butylbenzylphthalate	37	1	1	3.00%	2.00E-01	4.35E-02	4.60E-02	FALSE	2.19E-01	4.60E-02
Carbazole	38	0	3	8.00%	2.28E-01	1.64E-01	4.10E-01	FALSE	2.58E-01	2.58E-01
Chrysene	38	0	23	61.00%	1.57E-01	2.16E-01	6.70E-01	FALSE	2.71E-01	2.71E-01
Dibenz(a,h)anthracene	38	0	8	21.00%	2.07E-01	1.75E-01	4.70E-01	FALSE	2.79E-01	2.79E-01
Dibenzofuran	37	1	1	3.00%	1.99E-01	4.45E-02	3.60E-02	FALSE	2.22E-01	3.60E-02
Di-n-butylphthalate	38	0	13	34.00%	2.37E-01	2.10E-01	1.20E+00	FALSE	2.95E-01	2.95E-01
Fluoranthene	38	0	26	68.00%	1.69E-01	2.55E-01	1.00E+00	FALSE	2.60E-01	2.60E-01
Fluorene	37	1	1	3.00%	1.99E-01	4.43E-02	3.80E-02	FALSE	2.21E-01	3.80E-02
Indeno(1,2,3-cd)pyrene	38	0	10	26.00%	2.17E-01	2.04E-01	7.90E-01	FALSE	3.06E-01	3.06E-01
Naphthalene	37	1	3	8.00%	1.91E-01	6.00E-02	3.70E-02	FALSE	2.51E-01	3.70E-02
N-Nitrosodiphenylamine	37	1	2	5.00%	1.98E-01	4.65E-02	9.50E-02	FALSE	2.18E-01	9.50E-02
Pentachlorophenol	38	0	2	5.00%	5.63E-01	3.94E-01	9.90E-01	FALSE	6.73E-01	6.73E-01
Phenanthrene	38	0	14	37.00%	1.84E-01	1.83E-01	3.60E-01	FALSE	3.01E-01	3.01E-01
Pyrene	38	0	26	68.00%	1.70E-01	2.65E-01	1.20E+00	FALSE	2.42E-01	2.42E-01
Pesticides/PCBs										
4,4'-DDD	38	0	3	8.00%	2.86E-03	3.26E-03	1.50E-02	FALSE	3.06E-03	3.06E-03
4,4'-DDE	38	0	11	29.00%	7.27E-03	2.29E-02	1.40E-01	FALSE	6.02E-03	6.02E-03
4,4'-DDT	38	0	4	11.00%	3.09E-03	3.29E-03	1.30E-02	FALSE	3.41E-03	3.41E-03
Aldrin	38	0	1	3.00%	1.29E-03	1.30E-03	1.90E-03	FALSE	1.36E-03	1.36E-03
Alpha-Chlordane	37	1	1	3.00%	1.06E-03	1.80E-04	1.10E-03	FALSE	1.10E-03	1.10E-03
Aroclor-1260	38	0	2	5.00%	2.47E-02	2.53E-02	2.80E-02	FALSE	2.59E-02	2.59E-02
Beta-BHC	38	0	1	3.00%	1.55E-03	3.08E-03	2.00E-02	FALSE	1.49E-03	1.49E-03
Delta-BHC	38	0	1	3.00%	1.30E-03	1.31E-03	2.20E-03	FALSE	1.37E-03	1.37E-03
Dieldrin	38	0	5	13.00%	6.54E-03	1.58E-02	8.00E-02	FALSE	6.27E-03	6.27E-03
Endosulfan I	38	0	3	8.00%	1.27E-02	6.96E-02	4.30E-01	FALSE	3.51E-03	3.51E-03
Endosulfan sulfate	38	0	1	3.00%	2.52E-03	2.93E-03	2.00E-02	FALSE	2.62E-03	2.62E-03
Endrin	38	0	2	5.00%	3.23E-03	6.66E-03	4.30E-02	FALSE	3.09E-03	3.09E-03
Endrin ketone	38	0	2	5.00%	3.94E-03	1.12E-02	7.10E-02	FALSE	3.34E-03	3.34E-03
Metals										
Antimony	38	0	22	58.00%	4.79E+00	8.26E+00	5.20E+01	FALSE	7.97E+00	7.97E+00
Arsenic	38	0	38	100.00%	5.34E+00	1.11E+00	8.90E+00	FALSE	5.65E+00	5.65E+00
Barium	38	0	28	74.00%	1.13E+02	6.07E+01	3.57E+02	FALSE	1.32E+02	1.32E+02
Cadmium	38	0	33	87.00%	1.93E+00	2.21E+00	6.30E+00	FALSE	4.00E+00	4.00E+00
Copper	38	0	38	100.00%	7.36E+01	9.10E+01	5.46E+02	FALSE	9.20E+01	9.20E+01
Lead	34	0	34	97.00%	2.89E+02	2.32E+02	8.15E+02	TRUE	3.70E+02	3.70E+02
Mercury	38	0	36	95.00%	1.30E-01	2.20E-01	1.00E+00	FALSE	1.50E-01	1.50E-01
Selenium	38	0	27	71.00%	7.20E-01	5.20E-01	1.70E+00	FALSE	1.21E+00	1.21E+00
Silver	38	0	9	24.00%	7.20E-01	1.08E+00	5.50E+00	FALSE	1.01E+00	1.01E+00
Thallium	38	0	9	24.00%	4.80E-01	4.10E-01	1.50E+00	FALSE	7.10E-01	7.10E-01
Zinc	38	0	38	100.00%	1.77E+02	1.43E+02	6.20E+02	FALSE	2.15E+02	2.15E+02
Herbicides										
MCPA	16	0	3	19.00%	7.66E+00	1.04E+01	3.40E+01	FALSE	1.20E+01	1.20E+01
Nitroaromatics										
2,4-Dinitrotoluene	38	0	1	3.00%	7.07E-02	4.43E-02	3.30E-01	FALSE	7.49E-02	7.49E-02
2,6-Dinitrotoluene	38	0	1	3.00%	8.58E-02	1.36E-01	9.00E-01	FALSE	8.60E-02	8.60E-02

* Refer to text for a detailed discussion of EPC determination

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics. The method yielding the higher EPC was used in the risk assessment

TABLE B-17PO-3

Total Soils Exposure Point Concentration Summary - Post Remediation

SEAD 17 - Feasibility Study
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organics										
Acetone	47	0	1	2.00%	7.29E-03	4.95E-03	8.00E-03	FALSE	7.75E-03	7.75E-03
Benzene	47	0	2	4.00%	6.23E-03	1.62E-03	2.00E-03	FALSE	6.75E-03	2.00E-03
Toluene	47	0	4	9.00%	6.29E-03	1.61E-03	8.00E-03	FALSE	6.76E-03	6.76E-03
Semivolatile Organics										
2,4-Dinitrotoluene	47	0	3	6.00%	2.43E-01	1.75E-01	8.80E-01	FALSE	2.64E-01	2.64E-01
2-Methylnaphthalene	46	1	2	4.00%	2.01E-01	4.98E-02	1.30E-01	FALSE	2.24E-01	1.30E-01
2-Methylphenol	46	1	1	2.00%	2.03E-01	4.33E-02	1.20E-01	FALSE	2.12E-01	1.20E-01
3,3'-Dichlorobenzidine	47	0	1	2.00%	2.30E-01	1.46E-01	4.10E-01	FALSE	2.43E-01	2.43E-01
3-Nitroaniline	47	0	1	2.00%	5.55E-01	3.50E-01	9.90E-01	FALSE	5.87E-01	5.87E-01
4-Nitroaniline	47	0	1	2.00%	5.55E-01	3.50E-01	9.90E-01	FALSE	5.87E-01	5.87E-01
Acenaphthene	46	1	2	4.00%	1.98E-01	5.55E-02	3.30E-02	FALSE	2.36E-01	3.30E-02
Acenaphthylene	46	1	2	4.00%	2.01E-01	5.06E-02	9.60E-02	FALSE	2.21E-01	9.60E-02
Anthracene	46	1	3	7.00%	1.99E-01	5.19E-02	1.30E-01	FALSE	2.25E-01	1.30E-01
Benzo(a)anthracene	47	0	13	28.00%	2.03E-01	1.85E-01	7.20E-01	FALSE	3.01E-01	3.01E-01
Benzo(a)pyrene	47	0	16	34.00%	2.00E-01	2.11E-01	9.40E-01	FALSE	3.12E-01	3.12E-01
Benzo(b)fluoranthene	47	0	13	28.00%	2.39E-01	3.39E-01	2.20E+00	FALSE	3.18E-01	3.18E-01
Benzo(ghi)perylene	47	0	12	26.00%	2.11E-01	1.82E-01	7.10E-01	FALSE	2.74E-01	2.74E-01
Benzo(k)fluoranthene	47	0	11	23.00%	1.98E-01	1.68E-01	5.30E-01	FALSE	2.72E-01	2.72E-01
Bis(2-Chloroisopropyl)ethe	22	0	1	5.00%	2.11E-01	6.23E-02	4.10E-01	FALSE	2.29E-01	2.29E-01
Bis(2-Ethylhexyl)phthalate	47	0	13	28.00%	2.56E-01	2.36E-01	1.30E+00	FALSE	3.26E-01	3.26E-01
Butylbenzylphthalate	46	1	1	2.00%	2.02E-01	4.75E-02	4.60E-02	FALSE	2.19E-01	4.60E-02
Carbazole	47	0	3	6.00%	2.25E-01	1.50E-01	4.10E-01	FALSE	2.48E-01	2.48E-01
Chrysene	47	0	23	49.00%	1.68E-01	1.97E-01	6.70E-01	FALSE	2.78E-01	2.78E-01
Dibenz(a,h)anthracene	47	0	8	17.00%	2.08E-01	1.59E-01	4.70E-01	FALSE	2.64E-01	2.64E-01
Dibenzofuran	46	1	1	2.00%	2.02E-01	4.82E-02	3.60E-02	FALSE	2.21E-01	3.60E-02
Di-n-butylphthalate	47	0	13	28.00%	2.32E-01	1.90E-01	1.20E+00	FALSE	2.75E-01	2.75E-01
Fluoranthene	47	0	26	55.00%	1.78E-01	2.31E-01	1.00E+00	FALSE	2.67E-01	2.67E-01
Fluorene	46	1	1	2.00%	2.02E-01	4.81E-02	3.80E-02	FALSE	2.21E-01	3.80E-02
Indeno(1,2,3-cd)pyrene	47	0	10	21.00%	2.17E-01	1.84E-01	7.90E-01	FALSE	2.84E-01	2.84E-01
Naphthalene	46	1	3	7.00%	1.96E-01	6.05E-02	3.70E-02	FALSE	2.43E-01	3.70E-02
N-Nitrosodiphenylamine	46	1	2	4.00%	2.01E-01	4.98E-02	9.50E-02	FALSE	2.18E-01	9.50E-02
Pentachlorophenol	47	0	2	4.00%	5.54E-01	3.60E-01	9.90E-01	FALSE	6.38E-01	6.38E-01
Phenanthrene	47	0	14	30.00%	1.90E-01	1.67E-01	3.60E-01	FALSE	2.85E-01	2.85E-01
Pyrene	47	0	26	55.00%	1.79E-01	2.39E-01	1.20E+00	FALSE	2.51E-01	2.51E-01
Pesticides/PCBs										
4,4'-DDD	47	0	3	6.00%	2.72E-03	2.95E-03	1.50E-02	FALSE	2.86E-03	2.86E-03
4,4'-DDE	47	0	11	23.00%	6.29E-03	2.06E-02	1.40E-01	FALSE	4.92E-03	4.92E-03
4,4'-DDT	47	0	4	9.00%	2.91E-03	2.99E-03	1.30E-02	FALSE	3.12E-03	3.12E-03
Aldrin	47	0	1	2.00%	1.25E-03	1.18E-03	1.90E-03	FALSE	1.31E-03	1.31E-03
Alpha-Chlordane	46	1	1	2.00%	1.07E-03	2.10E-04	1.10E-03	FALSE	1.11E-03	1.10E-03
Aroclor-1254	47	0	1	2.00%	2.48E-02	2.35E-02	6.10E-02	FALSE	2.60E-02	2.60E-02
Aroclor-1260	47	0	2	4.00%	2.41E-02	2.29E-02	2.80E-02	FALSE	2.50E-02	2.50E-02
Beta-BHC	47	0	1	2.00%	1.47E-03	2.77E-03	2.00E-02	FALSE	1.40E-03	1.40E-03
Delta-BHC	47	0	1	2.00%	1.26E-03	1.18E-03	2.20E-03	FALSE	1.31E-03	1.31E-03
Dieldrin	47	0	5	11.00%	5.70E-03	1.42E-02	8.00E-02	FALSE	5.07E-03	5.07E-03
Endosulfan I	47	0	3	6.00%	1.04E-02	6.26E-02	4.30E-01	FALSE	2.75E-03	2.75E-03
Endosulfan sulfate	47	0	1	2.00%	2.44E-03	2.65E-03	2.00E-02	FALSE	2.52E-03	2.52E-03
Endrin	47	0	2	4.00%	3.02E-03	5.99E-03	4.30E-02	FALSE	2.87E-03	2.87E-03
Endrin ketone	47	0	2	4.00%	3.60E-03	1.01E-02	7.10E-02	FALSE	3.05E-03	3.05E-03
Metals										
Antimony	47	0	22	47.00%	4.92E+00	7.48E+00	5.20E+01	FALSE	7.61E+00	7.61E+00
Arsenic	47	0	47	100.00%	5.27E+00	1.08E+00	8.90E+00	TRUE	5.53E+00	5.53E+00
Barium	47	0	37	79.00%	1.09E+02	5.68E+01	3.57E+02	FALSE	1.24E+02	1.24E+02
Cadmium	47	0	34	72.00%	1.68E+00	2.08E+00	6.30E+00	FALSE	2.96E+00	2.96E+00
Copper	47	0	47	100.00%	6.58E+01	8.36E+01	5.46E+02	FALSE	7.80E+01	7.80E+01
Lead	47	0	46	98.00%	3.56E+02	5.22E+02	1.34E+03	FALSE	9.47E+02	9.47E+02
Mercury	47	0	42	89.00%	1.10E-01	2.00E-01	1.00E+00	FALSE	1.20E-01	1.20E-01
Selenium	47	0	27	57.00%	6.10E-01	5.20E-01	1.70E+00	FALSE	9.80E-01	9.80E-01
Silver	47	0	9	19.00%	7.10E-01	9.80E-01	5.50E+00	FALSE	9.40E-01	9.40E-01
Thallium	47	0	9	19.00%	4.10E-01	4.00E-01	1.50E+00	FALSE	5.70E-01	5.70E-01
Zinc	47	0	47	100.00%	1.59E+02	1.35E+02	6.20E+02	FALSE	1.86E+02	1.86E+02
Herbicides										
MCPA	25	0	3	12.00%	6.07E+00	8.53E+00	3.40E+01	FALSE	7.27E+00	7.27E+00
Nitroaromatics										
2,4-Dinitrotoluene	47	0	1	2.00%	7.10E-02	4.07E-02	3.30E-01	FALSE	7.46E-02	7.46E-02
2,6-Dinitrotoluene	47	0	1	2.00%	8.32E-02	1.22E-01	9.00E-01	FALSE	8.31E-02	8.31E-02

* Refer to text for a detailed discussion of EPC determination.

** 2,4-Dinitrotoluene and 2,6-Dinitrotoluene were analyzed for as semivolatile organics and nitroaromatics The method yielding the higher EPC was used in the risk assessment.

B-17PO-4
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - POST REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m³) = CS_{surf} x PM_{10} x CF	Equation for Air EPC from Surface and Subsurface Soils (mg/m³) = CS_{tot} x PM_{10} x CF
Variables: CS_{surf} = Chemical Concentration in Surface Soil, from EPC data (mg/kg) PM_{10} = Average Measured PM_{10} Concentration = 17 ug/m³ CF = Conversion Factor = 1E-9 kg/ug	Variables: CS_{sub} = Chemical Concentration in Surface and Subsurface Soils, from EPC data (mg/kg) PM_{10} = PM_{10} Concentration Calculated for Construction Worker= 154 ug/m³ 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/m³)	Calculated Air EPC Total Soils (mg/m³)
Volatile Organics				
Acetone	7.08E-03	7.75E-03	1.20E-10	1.19E-09
Benzene	2.00E-03	2.00E-03	3.40E-11	3.08E-10
Toluene	6.73E-03	6.76E-03	1.14E-10	1.04E-09
Semivolatile Organics				
2,4-Dinitrotoluene	2.77E-01	2.64E-01	4.71E-09	4.07E-08
2-Methylnaphthalene	1.30E-01	1.30E-01	2.21E-09	2.00E-08
2-Methylphenol	1.20E-01	1.20E-01	2.04E-09	1.85E-08
3,3'-Dichlorobenzidine	2.50E-01	2.43E-01	4.25E-09	3.74E-08
3-Nitroaniline	6.04E-01	5.87E-01	1.03E-08	9.04E-08
4-Nitroaniline	6.04E-01	5.87E-01	1.03E-08	9.04E-08
Acenaphthene	3.30E-02	3.30E-02	5.61E-10	5.08E-09
Acenaphthylene	9.60E-02	9.60E-02	1.63E-09	1.48E-08
Anthracene	1.30E-01	1.30E-01	2.21E-09	2.00E-08
Benzo(a)anthracene	3.26E-01	3.01E-01	5.54E-09	4.64E-08
Benzo(a)pyrene	3.37E-01	3.12E-01	5.73E-09	4.80E-08
Benzo(b)fluoranthene	3.53E-01	3.18E-01	6.00E-09	4.90E-08
Benzo(ghi)perylene	2.91E-01	2.74E-01	4.95E-09	4.22E-08
Benzo(k)fluoranthene	2.87E-01	2.72E-01	4.88E-09	4.19E-08
bis(2-Chloroisopropyl) ether	2.29E-01	2.29E-01	3.89E-09	3.53E-08
bis(2-Ethylhexyl)phthalate	3.17E-01	3.26E-01	5.39E-09	5.02E-08
Butylbenzylphthalate	4.60E-02	4.60E-02	7.82E-10	7.08E-09
Carbazole	2.58E-01	2.48E-01	4.39E-09	3.82E-08
Chrysene	2.71E-01	2.78E-01	4.61E-09	4.28E-08
Dibenz(a,h)anthracene	2.79E-01	2.64E-01	4.74E-09	4.07E-08
Dibenzofuran	3.60E-02	3.60E-02	6.12E-10	5.54E-09
Di-n-butylphthalate	2.95E-01	2.75E-01	5.02E-09	4.24E-08
Fluoranthene	2.60E-01	2.67E-01	4.42E-09	4.11E-08
Fluorene	3.80E-02	3.80E-02	6.46E-10	5.85E-09
Indeno(1,2,3-cd)pyrene	3.06E-01	2.84E-01	5.20E-09	4.37E-08
Naphthalene	3.70E-02	3.70E-02	6.29E-10	5.70E-09
N-Nitrosodiphenylamine	9.50E-02	9.50E-02	1.62E-09	1.46E-08
Pentachlorophenol	6.73E-01	6.38E-01	1.14E-08	9.83E-08
Phenanthrene	3.01E-01	2.85E-01	5.12E-09	4.39E-08
Pyrene	2.42E-01	2.51E-01	4.11E-09	3.87E-08
Pesticides/PCBs				
4,4'-DDD	3.06E-03	2.86E-03	5.20E-11	4.40E-10
4,4'-DDE	6.02E-03	4.92E-03	1.02E-10	7.58E-10
4,4'-DDT	3.41E-03	3.12E-03	5.80E-11	4.80E-10
Aldrin	1.36E-03	1.31E-03	2.31E-11	2.02E-10
alpha-Chlordane	1.10E-03	1.10E-03	1.87E-11	1.69E-10
Aroclor-1254		2.60E-02	0.00E+00	4.00E-09
Aroclor-1260	2.59E-02	2.50E-02	4.40E-10	3.85E-09
beta-BHC	1.49E-03	1.40E-03	2.53E-11	2.16E-10
delta-BHC	1.37E-03	1.31E-03	2.33E-11	2.02E-10
Dieldrin	6.27E-03	5.07E-03	1.07E-10	7.81E-10
Endosulfan I	3.51E-03	2.75E-03	5.97E-11	4.24E-10
Endosulfan sulfate	2.62E-03	2.52E-03	4.45E-11	3.88E-10
Endrin	3.09E-03	2.87E-03	5.25E-11	4.42E-10
Endrin ketone	3.34E-03	3.05E-03	5.68E-11	4.70E-10
Metals				
Antimony	7.97E+00	7.61E+00	1.35E-07	1.17E-06
Arsenic	5.65E+00	5.53E+00	9.61E-08	8.52E-07
Barium	1.32E+02	1.24E+02	2.24E-06	1.91E-05
Cadmium	4.00E+00	2.96E+00	6.80E-08	4.56E-07
Copper	9.20E+01	7.80E+01	1.56E-06	1.20E-05
Lead	8.90E+02	9.47E+02	1.51E-05	1.46E-04
Mercury	1.50E-01	1.20E-01	2.55E-09	1.85E-08
Selenium	1.21E+00	9.80E-01	2.06E-08	1.51E-07
Silver	1.01E+00	9.40E-01	1.72E-08	1.45E-07
Thallium	7.10E-01	5.70E-01	1.21E-08	8.78E-08
Zinc	2.15E+02	1.86E+02	3.66E-06	2.86E-05
Herbicides				
MCPA	1.20E+01	7.27E+00	2.04E-07	1.12E-06
Nitroaromatics				
2,4-Dinitrotoluene	7.49E-02	7.46E-02	1.27E-09	1.15E-08
2,6-Dinitrotoluene	8.60E-02	8.31E-02	1.46E-09	1.28E-08

TABLE B-17PO-5
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics												
Acetone	NA	NA	1.20E-10	1.19E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	2.55E-13	9.12E-14	1E-10	3E-15	3.19E-12	1.14E-12	2E-09	3E-14
Toluene	1.1E-01	NA	1.14E-10	1.04E-09	8.60E-13		8E-12		1.07E-11		9E-11	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.71E-09	4.07E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	4.25E-09	3.74E-08								
3-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
4-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	5.54E-09	4.64E-08								
Benzo(a)pyrene	NA	NA	5.73E-09	4.80E-08								
Benzo(b)fluoranthene	NA	NA	6.00E-09	4.90E-08								
Benzo(ghi)perylene	NA	NA	4.95E-09	4.22E-08								
Benzo(k)fluoranthene	NA	NA	4.88E-09	4.19E-08								
bis(2-Chloroisopropyl) ethe	NA	3.5E-02	3.89E-09	3.53E-08		1.04E-11		4E-13		1.31E-10		5E-12
bis(2-Ethylhexyl)phthalate	NA	NA	5.39E-09	5.02E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.39E-09	3.82E-08								
Chrysene	NA	NA	4.61E-09	4.28E-08								
Dibenz(a,h)anthracene	NA	NA	4.74E-09	4.07E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Di-n-butylphthalate	NA	NA	5.02E-09	4.24E-08								
Fluoranthene	NA	NA	4.42E-09	4.11E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	5.20E-09	4.37E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
N-Nitrosodiphenylamine	NA	NA	1.62E-09	1.46E-08								
Pentachlorophenol	NA	NA	1.14E-08	9.83E-08								
Phenanthrene	NA	NA	5.12E-09	4.39E-08								
Pyrene	NA	NA	4.11E-09	3.87E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.20E-11	4.40E-10								
4,4'-DDE	NA	NA	1.02E-10	7.58E-10								
4,4'-DDT	NA	3.4E-01	5.80E-11	4.80E-10		1.56E-13		5E-14		1.94E-12		7E-13
Aldrin	NA	1.7E+01	2.31E-11	2.02E-10		6.20E-14		1E-12		7.76E-13		1E-11
alpha-Chlordane	NA	1.3E+00	1.87E-11	1.69E-10		5.02E-14		7E-14		6.27E-13		8E-13
Aroclor-1254	NA	4.0E-01		4.00E-09								
Aroclor-1260	NA	4.0E-01	4.40E-10	3.85E-09		1.18E-12		5E-13		1.48E-11		6E-12
beta-BHC	NA	1.9E+00	2.53E-11	2.16E-10		6.80E-14		1E-13		8.50E-13		2E-12
delta-BHC	NA	NA	2.33E-11	2.02E-10								
Dieldrin	NA	1.6E+01	1.07E-10	7.81E-10		2.86E-13		5E-12		3.58E-12		6E-11
Endosulfan I	NA	NA	5.97E-11	4.24E-10								
Endosulfan sulfate	NA	NA	4.45E-11	3.88E-10								
Endrin	NA	NA	5.25E-11	4.42E-10								
Endrin ketone	NA	NA	5.68E-11	4.70E-10								
Metals												
Antimony	NA	NA	1.35E-07	1.17E-06								
Arsenic	NA	1.5E+01	9.61E-08	8.52E-07		2.58E-10		4E-09		3.22E-09		5E-08
Barium	1.4E-04	NA	2.24E-06	1.91E-05	1.69E-08		1E-04		2.11E-07		1E-03	
Cadmium	NA	6.3E+00	6.80E-08	4.56E-07		1.82E-10		1E-09		2.28E-09		1E-08
Copper	NA	NA	1.56E-06	1.20E-05								
Lead	NA	NA	1.51E-05	1.46E-04								
Mercury	8.6E-05	NA	2.55E-09	1.85E-08	1.92E-11		2E-07		2.40E-10		3E-06	
Selenium	NA	NA	2.06E-08	1.51E-07								
Silver	NA	NA	1.72E-08	1.45E-07								
Thallium	NA	NA	1.21E-08	8.78E-08								
Zinc	NA	NA	3.66E-06	2.86E-05								
Herbicides												
MCPA	NA	NA	2.04E-07	1.12E-06								
Nitroaromatics												
2,4-Dinitrotoluene	NA	NA	1.27E-09	1.15E-08								
2,6-Dinitrotoluene	NA	NA	1.46E-09	1.28E-08								
Total Hazard Quotient and Cancer Risk:							**1E-04**	**5E-09**			**1E-03**	**6E-08**

Assumptions for Current Site Worker			Assumptions for Future Industrial Worker		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	9.6	m3/day	IR =	9.6	m3/day
EF =	20	days/year	EF =	250	days/year
ED =	25	years	ED =	25	years
BW =	70	kg	BW =	70	kg
AT (Nc) =	9125	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 B-17PO-5
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics												
Acetone	NA	NA	1.20E-10	1.19E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	3.13E-11	4.48E-13	2E-08	1E-14	1.12E-13	7.98E-15	7E-11	2E-16
Toluene	1.1E-01	NA	1.14E-10	1.04E-09	1.06E-10		9E-10		3.76E-13		3E-12	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.71E-09	4.07E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	4.25E-09	3.74E-08								
3-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
4-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	5.54E-09	4.64E-08								
Benzo(a)pyrene	NA	NA	5.73E-09	4.80E-08								
Benzo(b)fluoranthene	NA	NA	6.00E-09	4.90E-08								
Benzo(ghi)perylene	NA	NA	4.95E-09	4.22E-08								
Benzo(k)fluoranthene	NA	NA	4.88E-09	4.19E-08								
bis(2-Chloroisopropyl) ethe	NA	3.5E-02	3.89E-09	3.53E-08		5.13E-11		2E-12		9.14E-13		3E-14
bis(2-Ethylhexyl)phthalate	NA	NA	5.39E-09	5.02E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.39E-09	3.82E-08								
Chrysene	NA	NA	4.61E-09	4.28E-08								
Dibenz(a,h)anthracene	NA	NA	4.74E-09	4.07E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Di-n-butylphthalate	NA	NA	5.02E-09	4.24E-08								
Fluoranthene	NA	NA	4.42E-09	4.11E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	5.20E-09	4.37E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
N-Nitrosodiphenylamine	NA	NA	1.62E-09	1.46E-08								
Pentachlorophenol	NA	NA	1.14E-08	9.83E-08								
Phenanthrene	NA	NA	5.12E-09	4.39E-08								
Pyrene	NA	NA	4.11E-09	3.87E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.20E-11	4.40E-10								
4,4'-DDE	NA	NA	1.02E-10	7.58E-10								
4,4'-DDT	NA	3.4E-01	5.80E-11	4.80E-10		6.98E-13		2E-13		1.36E-14		5E-15
Aldrin	NA	1.7E+01	2.31E-11	2.02E-10		2.93E-13		5E-12		5.43E-15		9E-14
alpha-Chlordane	NA	1.3E+00	1.87E-11	1.69E-10		2.46E-13		3E-13		4.39E-15		6E-15
Aroclor-1254	NA	4.0E-01		4.00E-09		5.82E-12		2E-12				
Aroclor-1260	NA	4.0E-01	4.40E-10	3.85E-09		5.60E-12		2E-12		1.03E-13		4E-14
beta-BHC	NA	1.9E+00	2.53E-11	2.16E-10		3.13E-13		6E-13		5.95E-15		1E-14
delta-BHC	NA	NA	2.33E-11	2.02E-10								
Dieldrin	NA	1.6E+01	1.07E-10	7.81E-10		1.14E-12		2E-11		2.50E-14		4E-13
Endosulfan I	NA	NA	5.97E-11	4.24E-10								
Endosulfan sulfate	NA	NA	4.45E-11	3.88E-10								
Endrin	NA	NA	5.25E-11	4.42E-10								
Endrin ketone	NA	NA	5.68E-11	4.70E-10								
Metals												
Antimony	NA	NA	1.35E-07	1.17E-06								
Arsenic	NA	1.5E+01	9.61E-08	8.52E-07		1.24E-09		2E-08		2.26E-11		3E-10
Barium	1.4E-04	NA	2.24E-06	1.91E-05	1.94E-06		1E-02		7.38E-09		5E-05	
Cadmium	NA	6.3E+00	6.80E-08	4.56E-07		6.63E-10		4E-09		1.60E-11		1E-10
Copper	NA	NA	1.56E-06	1.20E-05								
Lead	NA	NA	1.51E-05	1.46E-04								
Mercury	8.6E-05	NA	2.55E-09	1.85E-08	1.88E-09		2E-05		8.38E-12		1E-07	
Selenium	NA	NA	2.06E-08	1.51E-07								
Silver	NA	NA	1.72E-08	1.45E-07								
Thallium	NA	NA	1.21E-08	8.78E-08								
Zinc	NA	NA	[illegible]66E-06	2.86E-05								
Herbicides												
MCPA	NA	NA	2.04E-07	1.12E-06								
Nitroaromatics												
2,4-Dinitrotoluene	NA	NA	1.27E-09	1.15E-08								
2,6-Dinitrotoluene	NA	NA	1.46E-09	1.28E-08								
Total Hazard Quotient and Cancer Risk:							**1E-02**	**2E-08**			**5E-05**	**4E-10**

Assumptions for Future Construction Worker		
CA =	EPC Surface and Sub-Surface	
IR =	10.4	m3/day
EF =	250	days/year
ED =	1	years
BW =	70	kg
AT (Nc) =	365	days
AT (Car) =	25550	days

Assumptions for Future Tresspasser Child		
CA =	EPC Surface Only	
IR =	1.2	m3/day
EF =	50	days/year
ED =	5	years
BW =	50	kg
AT (Nc) =	1825	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-17PO-5
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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 (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	Future Day Care Center Adult Intake (mg/kg-day) (Car)	Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult Cancer Risk
Volatile Organics												
Acetone	NA	NA	1.20E-10	1.19E-09								
Benzene	1.7E-03	2.9E-02	3.40E-11	3.08E-10	6.21E-12	5.32E-13	4E-09	2E-14	2.66E-12	9.51E-13	2E-09	3E-14
Toluene	1.1E-01	NA	1.14E-10	1.04E-09	2.09E-11		2E-10		8.96E-12		8E-11	
Semivolatile Organics												
2,4-Dinitrotoluene	NA	NA	4.71E-09	4.07E-08								
2-Methylnaphthalene	NA	NA	2.21E-09	2.00E-08								
2-Methylphenol	NA	NA	2.04E-09	1.85E-08								
3,3'-Dichlorobenzidine	NA	NA	4.25E-09	3.74E-08								
3-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
4-Nitroaniline	NA	NA	1.03E-08	9.04E-08								
Acenaphthene	NA	NA	5.61E-10	5.08E-09								
Acenaphthylene	NA	NA	1.63E-09	1.48E-08								
Anthracene	NA	NA	2.21E-09	2.00E-08								
Benzo(a)anthracene	NA	NA	5.54E-09	4.64E-08								
Benzo(a)pyrene	NA	NA	5.73E-09	4.80E-08								
Benzo(b)fluoranthene	NA	NA	6.00E-09	4.90E-08								
Benzo(ghi)perylene	NA	NA	4.95E-09	4.22E-08								
Benzo(k)fluoranthene	NA	NA	4.88E-09	4.19E-08								
bis(2-Chloroisopropyl) ethe	NA	3.5E-02	3.89E-09	3.53E-08		6.09E-11		2E-12		1.09E-10		4E-12
bis(2-Ethylhexyl)phthalate	NA	NA	5.39E-09	5.02E-08								
Butylbenzylphthalate	NA	NA	7.82E-10	7.08E-09								
Carbazole	NA	NA	4.39E-09	3.82E-08								
Chrysene	NA	NA	4.61E-09	4.28E-08								
Dibenz(a,h)anthracene	NA	NA	4.74E-09	4.07E-08								
Dibenzofuran	NA	NA	6.12E-10	5.54E-09								
Di-n-butylphthalate	NA	NA	5.02E-09	4.24E-08								
Fluoranthene	NA	NA	4.42E-09	4.11E-08								
Fluorene	NA	NA	6.46E-10	5.85E-09								
Indeno(1,2,3-cd)pyrene	NA	NA	5.20E-09	4.37E-08								
Naphthalene	NA	NA	6.29E-10	5.70E-09								
N-Nitrosodiphenylamine	NA	NA	1.62E-09	1.46E-08								
Pentachlorophenol	NA	NA	1.14E-08	9.83E-08								
Phenanthrene	NA	NA	5.12E-09	4.39E-08								
Pyrene	NA	NA	4.11E-09	3.87E-08								
Pesticides/PCBs												
4,4'-DDD	NA	NA	5.20E-11	4.40E-10								
4,4'-DDE	NA	NA	1.02E-10	7.58E-10								
4,4'-DDT	NA	3.4E-01	5.80E-11	4.80E-10		9.08E-13		3E-13		1.62E-12		6E-13
Aldrin	NA	1.7E+01	2.31E-11	2.02E-10		3.62E-13		6E-12		6.46E-13		1E-11
alpha-Chlordane	NA	1.3E+00	1.87E-11	1.69E-10		2.93E-13		4E-13		5.23E-13		7E-13
Aroclor-1254	NA	4.0E-01		4.00E-09								
Aroclor-1260	NA	4.0E-01	4.40E-10	3.85E-09		6.89E-12		3E-12		1.23E-11		5E-12
beta-BHC	NA	1.9E+00	2.53E-11	2.16E-10		3.97E-13		7E-13		7.08E-13		1E-12
delta-BHC	NA	NA	2.33E-11	2.02E-10								
Dieldrin	NA	1.6E+01	1.07E-10	7.81E-10		1.67E-12		3E-11		2.98E-12		5E-11
Endosulfan I	NA	NA	5.97E-11	4.24E-10								
Endosulfan sulfate	NA	NA	4.45E-11	3.88E-10								
Endrin	NA	NA	5.25E-11	4.42E-10								
Endrin ketone	NA	NA	5.68E-11	4.70E-10								
Metals												
Antimony	NA	NA	1.35E-07	1.17E-06								
Arsenic	NA	1.5E+01	9.61E-08	8.52E-07		1.50E-09		2E-08		2.69E-09		4E-08
Barium	1.4E-04	NA	2.24E-06	1.91E-05	4.10E-07		3E-03		1.76E-07		1E-03	
Cadmium	NA	6.3E+00	6.80E-08	4.56E-07		1.06E-09		7E-09		1.90E-09		1E-08
Copper	NA	NA	1.56E-06	1.20E-05								
Lead	NA	NA	1.51E-05	1.46E-04								
Mercury	8.6E-05	NA	2.55E-09	1.85E-08	4.66E-10		5E-06		2.00E-10		2E-06	
Selenium	NA	NA	2.06E-08	1.51E-07								
Silver	NA	NA	1.72E-08	1.45E-07								
Thallium	NA	NA	1.21E-08	8.78E-08								
Zinc	NA	NA	3.66E-06	2.86E-05								
Herbicides												
MCPA	NA	NA	2.04E-07	1.12E-06								
Nitroaromatics												
2,4-Dinitrotoluene	NA	NA	1.27E-09	1.15E-08								
2,6-Dinitrotoluene	NA	NA	1.46E-09	1.28E-08								
Total Hazard Quotient and Cancer Risk:							**3E-03**	**3E-08**			**1E-03**	**5E-08**

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
NA = Information not available

TABLE B-17PO-6
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED / BW x AT

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, 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 from Surface Soil	EPC from Total Soils	Current Site Worker				Future Industrial 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	7.08E-03	7.75E-03	5.54E-10		6E-09		6.93E-09		7E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	1.57E-10	5.59E-11	5E-08	2E-12	1.96E-09	6.99E-10	7E-07	2E-11
Toluene	2.0E-01	NA	6.73E-03	6.76E-03	5.27E-10		3E-09		6.59E-09		3E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.77E-01	2.64E-01	2.17E-08	7.74E-09	1E-05	5E-09	2.71E-07	9.68E-08	1E-04	7E-08
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	1.02E-08		3E-07		1.27E-07		3E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	9.39E-09		2E-07		1.17E-07		2E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.50E-01	2.43E-01		6.99E-09		3E-09		8.74E-08		4E-08
3-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	2.58E-09		4E-08		3.23E-08		5E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	1.02E-08		3E-08		1.27E-07		4E-07	
Benzo(a)anthracene	NA	7.3E-01	3.26E-01	3.01E-01		9.11E-09		7E-09		1.14E-07		8E-08
Benzo(a)pyrene	NA	7.3E+00	3.37E-01	3.12E-01		9.42E-09		7E-08		1.18E-07		9E-07
Benzo(b)fluoranthene	NA	7.3E-01	3.53E-01	3.18E-01		9.87E-09		7E-09		1.23E-07		9E-08
Benzo(ghi)perylene	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.87E-01	2.72E-01		8.02E-09		6E-10		1.00E-07		7E-09
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.29E-01	2.29E-01	1.79E-08	6.40E-09	4E-07	4E-10	2.24E-07	8.00E-08	6E-06	6E-09
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.17E-01	3.26E-01	2.48E-08	8.86E-09	1E-06	1E-10	3.10E-07	1.11E-07	2E-05	2E-09
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	3.60E-09		2E-08		4.50E-08		2E-07	
Carbazole	NA	2.0E-02	2.58E-01	2.48E-01		7.21E-09		1E-10		9.02E-08		2E-09
Chrysene	NA	7.3E-03	2.71E-01	2.78E-01		7.58E-09		6E-11		9.47E-08		7E-10
Dibenz(a,h)anthracene	NA	7.3E+00	2.79E-01	2.64E-01		7.80E-09		6E-08		9.75E-08		7E-07
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	1.0E-01	NA	2.95E-01	2.75E-01	2.31E-08		2E-07		2.89E-07		3E-06	
Fluoranthene	4.0E-02	NA	2.60E-01	2.67E-01	2.04E-08		5E-07		2.54E-07		6E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	2.97E-09		7E-08		3.72E-08		9E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.06E-01	2.84E-01		8.55E-09		6E-09		1.07E-07		8E-08
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	2.90E-09		7E-08		3.62E-08		9E-07	
N-Nitrosodiphenylamine	NA	4.9E-03	9.50E-02	9.50E-02		2.66E-09		1E-11		3.32E-08		2E-10
Pentachlorophenol	3.0E-02	1.2E-01	6.73E-01	6.38E-01	5.27E-08	1.88E-08	2E-06	2E-09	6.59E-07	2.35E-07	2E-05	3E-08
Phenanthrene	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	2.42E-01	2.51E-01	1.89E-08		6E-07		2.37E-07		8E-06	
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.06E-03	2.86E-03		8.55E-11		2E-11		1.07E-09		3E-10
4,4'-DDE	NA	3.4E-01	6.02E-03	4.92E-03		1.68E-10		6E-11		2.10E-09		7E-10
4,4'-DDT	5.0E-04	3.4E-01	3.41E-03	3.12E-03	2.67E-10	9.53E-11	5E-07	3E-11	3.34E-09	1.19E-09	7E-06	4E-10
Aldrin	3.0E-05	1.7E+01	1.36E-03	1.31E-03	1.06E-10	3.80E-11	4E-06	6E-10	1.33E-09	4.75E-10	4E-05	8E-09
alpha-Chlordane	6.0E-05	1.3E+00	1.10E-03	1.10E-03	8.61E-11	3.08E-11	1E-06	4E-11	1.08E-09	3.84E-10	2E-05	5E-10
Aroclor-1254	2.0E-05	2.0E+00		2.60E-02								
Aroclor-1260	2.0E-05	2.0E+00	2.59E-02	2.50E-02	2.03E-09	7.24E-10	1E-04	1E-09	2.53E-08	9.05E-09	1E-03	2E-08
beta-BHC	NA	1.8E+00	1.49E-03	1.40E-03		4.17E-11		7E-11		5.21E-10		9E-10
delta-BHC	NA	NA	1.37E-03	1.31E-03								
Dieldrin	5.0E-05	1.6E+01	6.27E-03	5.07E-03	4.91E-10	1.75E-10	1E-05	3E-09	6.14E-09	2.19E-09	1E-04	4E-08
Endosulfan I	6.0E-03	NA	3.51E-03	2.75E-03	2.75E-10		5E-08		3.43E-09		6E-07	
Endosulfan sulfate	6.0E-03	NA	2.62E-03	2.52E-03	2.05E-10		3E-08		2.56E-09		4E-07	
Endrin	3.0E-04	NA	3.09E-03	2.87E-03	2.42E-10		8E-07		3.02E-09		1E-05	
Endrin ketone	NA	NA	3.34E-03	3.05E-03								
Metals												
Antimony	4.0E-04	NA	7.97E+00	7.61E+00	6.24E-07		2E-03		7.80E-06		2E-02	
Arsenic	3.0E-04	1.5E+00	5.65E+00	5.53E+00	4.42E-07	1.58E-07	1E-03	2E-07	5.53E-06	1.97E-06	2E-02	3E-06
Barium	7.0E-02	NA	1.32E+02	1.24E+02	1.03E-05		1E-04		1.29E-04		2E-03	
Cadmium	5.0E-04	NA	4.00E+00	2.96E+00	3.13E-07		6E-04		3.91E-06		8E-03	
Copper	4.0E-02	NA	9.20E+01	7.80E+01	7.20E-06		2E-04		9.00E-05		2E-03	
Lead	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-04	NA	1.50E-01	1.20E-01	1.17E-08		4E-05		1.47E-07		5E-04	
Selenium	5.0E-03	NA	1.21E+00	9.80E-01	9.47E-08		2E-05		1.18E-06		2E-04	
Silver	5.0E-03	NA	1.01E+00	9.40E-01	7.91E-08		2E-05		9.88E-07		2E-04	
Thallium	8.0E-05	NA	7.10E-01	5.70E-01	5.56E-08		7E-04		6.95E-07		9E-03	
Zinc	3.0E-01	NA	2.15E+02	1.86E+02	1.68E-05		6E-05		2.10E-04		7E-04	
Herbicides												
MCPA	5.0E-04	NA	1.20E+01	7.27E+00	9.39E-07		2E-03		1.17E-05		2E-02	
Nitroaromatics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	7.49E-02	7.46E-02	5.86E-09	2.09E-09	3E-06	1E-09	7.33E-08	2.62E-08	4E-05	2E-08
2,6-Dinitrotoluene	1.0E-03	6.8E-01	8.60E-02	8.31E-02	6.73E-09	2.40E-09	7E-06	2E-09	8.41E-08	3.01E-08	8E-05	2E-08
Total Hazard Quotient and Cancer Risk:							7E-03	4E-07			9E-02	5E-06

Assumptions for Current Site Worker			Assumptions for Future Industrial 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 =	20	days/year	EF =	250	days/year
ED =	25	years	ED =	25	years
BW =	70	kg	BW =	70	kg
AT (Nc) =	9125	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 B-17PO-6
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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, 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 from Surface Soil	EPC from Total Soils	Future Construction Worker				Future Tresspasser Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.0E-01	NA	7.08E-03	7.75E-03	3.64E-08		4E-07		3.88E-09		4E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	9.39E-09	1.34E-10	3E-06	4E-12	1.10E-09	7.83E-11	4E-07	2E-12
Toluene	2.0E-01	NA	6.73E-03	6.76E-03	3.17E-08		2E-07		3.69E-09		2E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.77E-01	2.64E-01	1.24E-06	1.77E-08	6E-04	1E-08	1.52E-07	1.08E-08	8E-05	7E-09
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	6.11E-07		2E-05		7.12E-08		2E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	5.64E-07		1E-05		6.58E-08		1E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.50E-01	2.43E-01		1.63E-08		7E-09		9.78E-09		4E-09
3-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	1.55E-07		3E-06		1.81E-08		3E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	6.11E-07		2E-06		7.12E-08		2E-07	
Benzo(a)anthracene	NA	7.3E-01	3.26E-01	3.01E-01		2.02E-08		1E-08		1.28E-08		9E-09
Benzo(a)pyrene	NA	7.3E+00	3.37E-01	3.12E-01		2.09E-08		2E-07		1.32E-08		1E-07
Benzo(b)fluoranthene	NA	7.3E-01	3.53E-01	3.18E-01		2.13E-08		2E-08		1.38E-08		1E-08
Benzo(ghi)perylene	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.87E-01	2.72E-01		1.82E-08		1E-09		1.12E-08		8E-10
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.29E-01	2.29E-01	1.08E-06	1.54E-08	3E-05	1E-09	1.25E-07	8.96E-09	3E-06	6E-10
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.17E-01	3.26E-01	1.53E-06	2.19E-08	8E-05	3E-10	1.74E-07	1.24E-08	9E-06	2E-10
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	2.16E-07		1E-06		2.52E-08		1E-07	
Carbazole	NA	2.0E-02	2.58E-01	2.48E-01		1.66E-08		3E-10		1.01E-08		2E-10
Chrysene	NA	7.3E-03	2.71E-01	2.78E-01		1.87E-08		1E-10		1.06E-08		8E-11
Dibenz(a,h)anthracene	NA	7.3E+00	2.79E-01	2.64E-01		1.77E-08		1E-07		1.09E-08		8E-08
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	1.0E-01	NA	2.95E-01	2.75E-01	1.29E-06		1E-05		1.62E-07		2E-06	
Fluoranthene	4.0E-02	NA	2.60E-01	2.67E-01	1.25E-06		3E-05		1.42E-07		4E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	1.78E-07		4E-06		2.08E-08		5E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.06E-01	2.84E-01		1.91E-08		1E-08		1.20E-08		9E-09
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	1.74E-07		4E-06		2.03E-08		5E-07	
N-Nitrosodiphenylamine	NA	4.9E-03	9.50E-02	9.50E-02		6.37E-09		3E-11		3.72E-09		2E-11
Pentachlorophenol	3.0E-02	1.2E-01	6.73E-01	6.38E-01	3.00E-06	4.28E-08	1E-04	5E-09	3.69E-07	2.63E-08	1E-05	3E-09
Phenanthrene	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	2.42E-01	2.51E-01	1.18E-06		4E-05		1.33E-07		4E-06	
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.06E-03	2.86E-03		1.92E-10		5E-11		1.20E-10		3E-11
4,4'-DDE	NA	3.4E-01	6.02E-03	4.92E-03		3.30E-10		1E-10		2.36E-10		8E-11
4,4'-DDT	5.0E-04	3.4E-01	3.41E-03	3.12E-03	1.47E-08	2.09E-10	3E-05	7E-11	1.87E-09	1.33E-10	4E-06	5E-11
Aldrin	3.0E-05	1.7E+01	1.36E-03	1.31E-03	6.15E-09	8.79E-11	2E-04	1E-09	7.45E-10	5.32E-11	2E-05	9E-10
alpha-Chlordane	6.0E-05	1.3E+00	1.10E-03	1.10E-03	5.17E-09	7.38E-11	9E-05	1E-10	6.03E-10	4.31E-11	1E-05	6E-11
Aroclor-1254	2.0E-05	2.0E+00		2.60E-02	1.22E-07	1.74E-09	6E-03	3E-09				
Aroclor-1260	2.0E-05	2.0E+00	2.59E-02	2.50E-02	1.17E-07	1.68E-09	6E-03	3E-09	1.42E-08	1.01E-09	7E-04	2E-09
beta-BHC	NA	1.8E+00	1.49E-03	1.40E-03		9.39E-11		2E-10		5.83E-11		1E-10
delta-BHC	NA	NA	1.37E-03	1.31E-03								
Dieldrin	5.0E-05	1.6E+01	6.27E-03	5.07E-03	2.38E-08	3.40E-10	5E-04	5E-09	3.44E-09	2.45E-10	7E-05	4E-09
Endosulfan I	6.0E-03	NA	3.51E-03	2.75E-03	1.29E-08		2E-06		1.92E-09		3E-07	
Endosulfan sulfate	6.0E-03	NA	2.62E-03	2.52E-03	1.18E-08		2E-06		1.44E-09		2E-07	
Endrin	3.0E-04	NA	3.09E-03	2.87E-03	1.35E-08		4E-05		1.69E-09		6E-06	
Endrin ketone	NA	NA	3.34E-03	3.05E-03								
Metals												
Antimony	4.0E-04	NA	7.97E+00	7.61E+00	3.57E-05		9E-02		4.37E-06		1E-02	
Arsenic	3.0E-04	1.5E+00	5.65E+00	5.53E+00	2.60E-05	3.71E-07	9E-02	6E-07	3.10E-06	2.21E-07	1E-02	3E-07
Barium	7.0E-02	NA	1.32E+02	1.24E+02	5.82E-04		8E-03		7.23E-05		1E-03	
Cadmium	5.0E-04	NA	4.00E+00	2.96E+00	1.39E-05		3E-02		2.19E-06		4E-03	
Copper	4.0E-02	NA	9.20E+01	7.80E+01	3.66E-04		9E-03		5.04E-05		1E-03	
Lead	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-04	NA	1.50E-01	1.20E-01	5.64E-07		2E-03		8.22E-08		3E-04	
Selenium	5.0E-03	NA	1.21E+00	9.80E-01	4.60E-06		9E-04		6.63E-07		1E-04	
Silver	5.0E-03	NA	1.01E+00	9.40E-01	4.41E-06		9E-04		5.53E-07		1E-04	
Thallium	8.0E-05	NA	7.10E-01	5.70E-01	2.68E-06		3E-02		3.89E-07		5E-03	
Zinc	3.0E-01	NA	2.15E+02	1.86E+02	8.74E-04		3E-03		1.18E-04		4E-04	
Herbicides												
MCPA	5.0E-04	NA	1.20E+01	7.27E+00	3.41E-05		7E-02		6.58E-06		1E-02	
Nitroaromatics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	7.49E-02	7.46E-02	3.50E-07	5.01E-09	2E-04	3E-09	4.10E-08	2.93E-09	2E-05	2E-09
2,6-Dinitrotoluene	1.0E-03	6.8E-01	8.60E-02	8.31E-02	3.90E-07	5.58E-09	4E-04	4E-09	4.71E-08	3.37E-09	5E-05	2E-09
Total Hazard Quotient and Cancer Risk:							3E-01	9E-07			5E-02	6E-07

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CS =	EPC Surface and Subsurface	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 =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-17PO-6
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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, 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 from Surface Soil	EPC from Total Soils	Future Day Care Center Child				Future 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)-	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.0E-01	NA	7.08E-03	7.75E-03	6.47E-08		6E-07		6.93E-09		7E-08	
Benzene	3.0E-03	2.9E-02	2.00E-03	2.00E-03	1.83E-08	1.57E-09	6E-06	5E-11	1.96E-09	6.99E-10	7E-07	2E-11
Toluene	2.0E-01	NA	6.73E-03	6.76E-03	6.15E-08		3E-07		6.59E-09		3E-08	
Semivolatile Organics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	2.77E-01	2.64E-01	2.53E-06	2.17E-07	1E-03	1E-07	2.71E-07	9.68E-08	1E-04	7E-08
2-Methylnaphthalene	4.0E-02	NA	1.30E-01	1.30E-01	1.19E-06		3E-05		1.27E-07		3E-06	
2-Methylphenol	5.0E-02	NA	1.20E-01	1.20E-01	1.10E-06		2E-05		1.17E-07		2E-06	
3,3'-Dichlorobenzidine	NA	4.5E-01	2.50E-01	2.43E-01		1.96E-07		9E-08		8.74E-08		4E-08
3-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	3.30E-02	3.30E-02	3.01E-07		5E-06		3.23E-08		5E-07	
Acenaphthylene	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	1.30E-01	1.30E-01	1.19E-06		4E-06		1.27E-07		4E-07	
Benzo(a)anthracene	NA	7.3E-01	3.26E-01	3.01E-01		2.55E-07		2E-07		1.14E-07		8E-08
Benzo(a)pyrene	NA	7.3E+00	3.37E-01	3.12E-01		2.64E-07		2E-06		1.18E-07		9E-07
Benzo(b)fluoranthene	NA	7.3E-01	3.53E-01	3.18E-01		2.76E-07		2E-07		1.23E-07		9E-08
Benzo(ghi)perylene	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	2.87E-01	2.72E-01		2.25E-07		2E-08		1.00E-07		7E-09
bis(2-Chloroisopropyl) ether	4.0E-02	7.0E-02	2.29E-01	2.29E-01	2.09E-06	1.79E-07	5E-05	1E-08	2.24E-07	8.00E-08	6E-06	6E-09
bis(2-Ethylhexyl)phthalate	2.0E-02	1.4E-02	3.17E-01	3.26E-01	2.89E-06	2.48E-07	1E-04	3E-09	3.10E-07	1.11E-07	2E-05	2E-09
Butylbenzylphthalate	2.0E-01	NA	4.60E-02	4.60E-02	4.20E-07		2E-06		4.50E-08		2E-07	
Carbazole	NA	2.0E-02	2.58E-01	2.48E-01		2.02E-07		4E-09		9.02E-08		2E-09
Chrysene	NA	7.3E-03	2.71E-01	2.78E-01		2.12E-07		2E-09		9.47E-08		7E-10
Dibenz(a,h)anthracene	NA	7.3E+00	2.79E-01	2.64E-01		2.18E-07		2E-06		9.75E-08		7E-07
Dibenzofuran	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	1.0E-01	NA	2.95E-01	2.75E-01	2.69E-06		3E-05		2.89E-07		3E-06	
Fluoranthene	4.0E-02	NA	2.60E-01	2.67E-01	2.37E-06		6E-05		2.54E-07		6E-06	
Fluorene	4.0E-02	NA	3.80E-02	3.80E-02	3.47E-07		9E-06		3.72E-08		9E-07	
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	3.06E-01	2.84E-01		2.40E-07		2E-07		1.07E-07		8E-08
Naphthalene	4.0E-02	NA	3.70E-02	3.70E-02	3.38E-07		8E-06		3.62E-08		9E-07	
N-Nitrosodiphenylamine	NA	4.9E-03	9.50E-02	9.50E-02		7.44E-08		4E-10		3.32E-08		2E-10
Pentachlorophenol	3.0E-02	1.2E-01	6.73E-01	6.38E-01	6.15E-06	5.27E-07	2E-04	6E-08	6.59E-07	2.35E-07	2E-05	3E-08
Phenanthrene	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	2.42E-01	2.51E-01	2.21E-06		7E-05		2.37E-07		8E-06	
Pesticides/PCBs												
4,4'-DDD	NA	2.4E-01	3.06E-03	2.86E-03		2.40E-09		6E-10		1.07E-09		3E-10
4,4'-DDE	NA	3.4E-01	6.02E-03	4.92E-03		4.71E-09		2E-09		2.10E-09		7E-10
4,4'-DDT	5.0E-04	3.4E-01	3.41E-03	3.12E-03	3.11E-08	2.67E-09	6E-05	9E-10	3.34E-09	1.19E-09	7E-06	4E-10
Aldrin	3.0E-05	1.7E+01	1.36E-03	1.31E-03	1.24E-08	1.06E-09	4E-04	2E-08	1.33E-09	4.75E-10	4E-05	8E-09
alpha-Chlordane	6.0E-05	1.3E+00	1.10E-03	1.10E-03	1.00E-08	8.61E-10	2E-04	1E-09	1.08E-09	3.84E-10	2E-05	5E-10
Aroclor-1254	2.0E-05	2.0E+00		2.60E-02								
Aroclor-1260	2.0E-05	2.0E+00	2.59E-02	2.50E-02	2.37E-07	2.03E-08	1E-02	4E-08	2.53E-08	9.05E-09	1E-03	2E-08
beta-BHC	NA	1.8E+00	1.49E-03	1.40E-03		1.17E-09		2E-09		5.21E-10		9E-10
delta-BHC	NA	NA	1.37E-03	1.31E-03								
Dieldrin	5.0E-05	1.6E+01	6.27E-03	5.07E-03	5.73E-08	4.91E-09	1E-03	8E-08	6.14E-09	2.19E-09	1E-04	4E-08
Endosulfan I	6.0E-03	NA	3.51E-03	2.75E-03	3.21E-08		5E-06		3.43E-09		6E-07	
Endosulfan sulfate	6.0E-03	NA	2.62E-03	2.52E-03	2.39E-08		4E-06		2.56E-09		4E-07	
Endrin	3.0E-04	NA	3.09E-03	2.87E-03	2.82E-08		9E-05		3.02E-09		1E-05	
Endrin ketone	NA	NA	3.34E-03	3.05E-03								
Metals												
Antimony	4.0E-04	NA	7.97E+00	7.61E+00	7.28E-05		2E-01		7.80E-06		2E-02	
Arsenic	3.0E-04	1.5E+00	5.65E+00	5.53E+00	5.16E-05	4.42E-06	2E-01	7E-06	5.53E-06	1.97E-06	2E-02	3E-06
Barium	7.0E-02	NA	1.32E+02	1.24E+02	1.21E-03		2E-02		1.29E-04		2E-03	
Cadmium	5.0E-04	NA	4.00E+00	2.96E+00	3.65E-05		7E-02		3.91E-06		8E-03	
Copper	4.0E-02	NA	9.20E+01	7.80E+01	8.40E-04		2E-02		9.00E-05		2E-03	
Lead	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-04	NA	1.50E-01	1.20E-01	1.37E-06		5E-03		1.47E-07		5E-04	
Selenium	5.0E-03	NA	1.21E+00	9.80E-01	1.11E-05		2E-03		1.18E-06		2E-04	
Silver	5.0E-03	NA	1.01E+00	9.40E-01	9.22E-06		2E-03		9.88E-07		2E-04	
Thallium	8.0E-05	NA	7.10E-01	5.70E-01	6.48E-06		8E-02		6.95E-07		9E-03	
Zinc	3.0E-01	NA	2.15E+02	1.86E+02	1.96E-03		7E-03		2.10E-04		7E-04	
Herbicides												
MCPA	5.0E-04	NA	1.20E+01	7.27E+00	1.10E-04		2E-01		1.17E-05		2E-02	
Nitroaromatics												
2,4-Dinitrotoluene	2.0E-03	6.8E-01	7.49E-02	7.46E-02	6.84E-07	5.86E-08	3E-04	4E-08	7.33E-08	2.62E-08	4E-05	2E-08
2,6-Dinitrotoluene	1.0E-03	6.8E-01	8.60E-02	8.31E-02	7.85E-07	6.73E-08	8E-04	5E-08	8.41E-08	3.01E-08	8E-05	2E-08
Total Hazard Quotient and Cancer Risk:							8E-01	1E-05			9E-02	5E-06

Assumptions for Future 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 Future Day Care Center 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

Note Cells in this table were intentionally left blank due to a lack of toxicity data
NA = Information not available

TABLE B-17PO-7
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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	EF = Exposure Frequency
CF = Conversion Factor	ED = Exposure Duration
SA = Surface Area Contact	BW = Bodyweight
AF = Adherence Factor	AT = Averaging Time
ABS = Absorption Factor	

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor*	EPC from Surface Soil	EPC from Total Soils	Current Site Worker: Absorbed Dose (mg/kg-day)		Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day)		Future Industrial Worker: Hazard Quotient	Future Industrial Worker: 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	7.08E-03	7.75E-03								
Benzene	2.9E-03	3.1E-02	NA	2.00E-03	2.00E-03								
Toluene	2.0E-01	NA	NA	6.73E-03	6.76E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	2.77E-01	2.64E-01								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	2.50E-01	2.43E-01								
3-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	3.26E-01	3.01E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.37E-01	3.12E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.53E-01	3.18E-01								
Benzo(ghi)perylene	NA	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.87E-01	2.72E-01								
bis(2-Chloroisopropyl) ether	4.0E-02	NA	NA	2.29E-01	2.29E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	3.17E-01	3.26E-01								
Butylbenzylphthalate	2.0E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.0E-02	NA	2.58E-01	2.48E-01								
Chrysene	NA	7.3E-03	NA	2.71E-01	2.78E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	2.79E-01	2.64E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	2.95E-01	2.75E-01								
Fluoranthene	4.0E-02	NA	NA	2.60E-01	2.67E-01								
Fluorene	4.0E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.06E-01	2.84E-01								
Naphthalene	4.0E-02	NA	NA	3.70E-02	3.70E-02								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	9.50E-02	9.50E-02								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	6.73E-01	6.38E-01	3.06E-08	1.09E-08	1E-06	1E-09	3.82E-07	1.36E-07	1E-05	2E-08
Phenanthrene	NA	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	NA	2.42E-01	2.51E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.06E-03	2.86E-03								
4,4'-DDE	NA	1.7E+00	NA	6.02E-03	4.92E-03								
4,4'-DDT	1.0E-04	1.7E+00	NA	3.41E-03	3.12E-03								
Aldrin	1.5E-05	3.4E+01	NA	1.36E-03	1.31E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	1.10E-03	1.10E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06		2.60E-02								
Aroclor-1260	1.8E-05	2.2E+00	0.06	2.59E-02	2.50E-02	7.06E-09	2.52E-09	4E-04	6E-09	8.82E-08	3.15E-08	5E-03	7E-08
beta-BHC	NA	1.8E+00	NA	1.49E-03	1.40E-03								
delta-BHC	NA	NA	NA	1.37E-03	1.31E-03								
Dieldrin	2.5E-05	3.2E+01	NA	6.27E-03	5.07E-03								
Endosulfan I	6.0E-03	NA	NA	3.51E-03	2.75E-03								
Endosulfan sulfate	6.0E-03	NA	NA	2.62E-03	2.52E-03								
Endrin	3.0E-04	NA	NA	3.09E-03	2.87E-03								
Endrin ketone	NA	NA	NA	3.34E-03	3.05E-03								
Metals													
Antimony	4.0E-04	NA	NA	7.97E+00	7.61E+00								
Arsenic	2.4E-04	1.9E+00	0.001	5.65E+00	5.53E+00	2.57E-08	9.16E-09	1E-04	2E-08	3.21E-07	1.15E-07	1E-03	2E-07
Barium	3.5E-03	NA	NA	1.32E+02	1.24E+02								
Cadmium	5.0E-05	NA	0.01	4.00E+00	2.96E+00	1.82E-07		4E-03		2.27E-06		5E-02	
Copper	2.4E-02	NA	NA	9.20E+01	7.80E+01								
Lead	NA	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-06	NA	NA	1.50E-01	1.20E-01								
Selenium	4.5E-03	NA	NA	1.21E+00	9.80E-01								
Silver	1.0E-03	NA	NA	1.01E+00	9.40E-01								
Thallium	8.0E-05	NA	NA	7.10E-01	5.70E-01								
Zinc	7.5E-02	NA	NA	2.15E+02	1.86E+02								
Herbicides													
MCPA	5.0E-04	NA	NA	1.20E+01	7.27E+00								
Nitroaromatics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	7.49E-02	7.46E-02								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	8.60E-02	8.31E-02								
Total Hazard Quotient and Cancer Risk:								4E-03	2E-08			5E-02	3E-07

Assumptions for Current Site Worker			Assumptions for Future Industrial Worker		
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 =	20	days/year	EF =	250	days/year
ED =	25	years	ED =	25	years
BW =	70	kg	BW =	70	kg
AT (Nc) =	9125	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 B-17PO-7
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
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 (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor* (unitless)	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics													
Acetone	1.0E-01	NA	NA	7.08E-03	7.75E-03								
Benzene	2.9E-03	3.1E-02	NA	2.00E-03	2.00E-03								
Toluene	2.0E-01	NA	NA	6.73E-03	6.76E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	2.77E-01	2.64E-01								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	2.50E-01	2.43E-01								
3-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	3.26E-01	3.01E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.37E-01	3.12E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.53E-01	3.18E-01								
Benzo(ghi)perylene	NA	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.87E-01	2.72E-01								
bis(2-Chloroisopropyl) ether	4.0E-02	NA	NA	2.29E-01	2.29E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	3.17E-01	3.26E-01								
Butylbenzylphthalate	2.0E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.0E-02	NA	2.58E-01	2.48E-01								
Chrysene	NA	7.3E-03	NA	2.71E-01	2.78E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	2.79E-01	2.64E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	2.95E-01	2.75E-01								
Fluoranthene	4.0E-02	NA	NA	2.60E-01	2.67E-01								
Fluorene	4.0E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.06E-01	2.84E-01								
Naphthalene	4.0E-02	NA	NA	3.70E-02	3.70E-02								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	9.50E-02	9.50E-02								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	6.73E-01	6.38E-01	3.62E-07	5.17E-09	1E-05	6E-10	8.53E-08	6.09E-09	3E-06	7E-10
Phenanthrene	NA	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	NA	2.42E-01	2.51E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.06E-03	2.86E-03								
4,4'-DDE	NA	1.7E+00	NA	6.02E-03	4.92E-03								
4,4'-DDT	1.0E-04	1.7E+00	NA	3.41E-03	3.12E-03								
Aldrin	1.5E-05	3.4E+01	NA	1.36E-03	1.31E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	1.10E-03	1.10E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06		2.60E-02	8.85E-08	1.26E-09	5E-03	3E-09				
Aroclor-1260	1.8E-05	2.2E+00	0.06	2.59E-02	2.50E-02	8.51E-08	1.22E-09	5E-03	3E-09	1.97E-08	1.41E-09	1E-03	3E-09
beta-BHC	NA	1.8E+00	NA	1.49E-03	1.40E-03								
delta-BHC	NA	NA	NA	1.37E-03	1.31E-03								
Dieldrin	2.5E-05	3.2E+01	NA	6.27E-03	5.07E-03								
Endosulfan I	6.0E-03	NA	NA	3.51E-03	2.75E-03								
Endosulfan sulfate	6.0E-03	NA	NA	2.62E-03	2.52E-03								
Endrin	3.0E-04	NA	NA	3.09E-03	2.87E-03								
Endrin ketone	NA	NA	NA	3.34E-03	3.05E-03								
Metals													
Antimony	4.0E-04	NA	NA	7.97E+00	7.61E+00								
Arsenic	2.4E-04	1.9E+00	0.001	5.65E+00	5.53E+00	3.14E-07	4.48E-09	1E-03	8E-09	7.16E-08	5.11E-09	3E-04	1E-08
Barium	3.5E-03	NA	NA	1.32E+02	1.24E+02								
Cadmium	5.0E-05	NA	0.01	4.00E+00	2.96E+00	1.68E-06		3E-02		5.07E-07		1E-02	
Copper	2.4E-02	NA	NA	9.20E+01	7.80E+01								
Lead	NA	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-06	NA	NA	1.50E-01	1.20E-01								
Selenium	4.5E-03	NA	NA	1.21E+00	9.80E-01								
Silver	1.0E-03	NA	NA	1.01E+00	9.40E-01								
Thallium	8.0E-05	NA	NA	7.10E-01	5.70E-01								
Zinc	7.5E-02	NA	NA	2.15E+02	1.86E+02								
Herbicides													
MCPA	5.0E-04	NA	NA	1.20E+01	7.27E+00								
Nitroaromatics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	7.49E-02	7.46E-02								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	8.60E-02	8.31E-02								
Total Hazard Quotient and Cancer Risk:								4E-02	1E-08			1E-02	1E-08

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CF =	1.00E-06 kg/mg	CF =	1.00E-06 kg/mg
SA =	5800 cm2	SA =	4625 cm2
AF =	1 mg/cm2	AF =	1 mg/cm2
EF =	250 days/year	EF =	50 days/year
ED =	1 years	ED =	5 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	1825 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 B-17PO-7
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - POST REMEDIATION
SEAD-17 Feasibility Study
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x CF x SA x AF x ABS x EF x ED / BW x 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	Carc. Slope Dermal	Absorption Factor*	EPC from Surface Soil	EPC from Total Soils	Future Day Care Center Child Absorbed Dose (mg/kg-day)		Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Absorbed Dose (mg/kg-day)		Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult 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	7.08E-03	7.75E-03								
Benzene	2.9E-03	3.1E-02	NA	2.00E-03	2.00E-03								
Toluene	2.0E-01	NA	NA	6.73E-03	6.76E-03								
Semivolatile Organics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	2.77E-01	2.64E-01								
2-Methylnaphthalene	NA	NA	NA	1.30E-01	1.30E-01								
2-Methylphenol	5.0E-02	NA	NA	1.20E-01	1.20E-01								
3,3'-Dichlorobenzidine	NA	4.5E-01	NA	2.50E-01	2.43E-01								
3-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
4-Nitroaniline	NA	NA	NA	6.04E-01	5.87E-01								
Acenaphthene	6.0E-02	NA	NA	3.30E-02	3.30E-02								
Acenaphthylene	NA	NA	NA	9.60E-02	9.60E-02								
Anthracene	3.0E-01	NA	NA	1.30E-01	1.30E-01								
Benzo(a)anthracene	NA	7.3E-01	NA	3.26E-01	3.01E-01								
Benzo(a)pyrene	NA	1.8E+01	NA	3.37E-01	3.12E-01								
Benzo(b)fluoranthene	NA	7.3E-01	NA	3.53E-01	3.18E-01								
Benzo(ghi)perylene	NA	NA	NA	2.91E-01	2.74E-01								
Benzo(k)fluoranthene	NA	7.3E-02	NA	2.87E-01	2.72E-01								
bis(2-Chloroisopropyl) ether	4.0E-02	NA	NA	2.29E-01	2.29E-01								
bis(2-Ethylhexyl)phthalate	1.0E-02	2.8E-02	NA	3.17E-01	3.26E-01								
Butylbenzylphthalate	2.0E-01	NA	NA	4.60E-02	4.60E-02								
Carbazole	NA	2.0E-02	NA	2.58E-01	2.48E-01								
Chrysene	NA	7.3E-03	NA	2.71E-01	2.78E-01								
Dibenz(a,h)anthracene	NA	7.3E+00	NA	2.79E-01	2.64E-01								
Dibenzofuran	NA	NA	NA	3.60E-02	3.60E-02								
Di-n-butylphthalate	9.0E-02	NA	NA	2.95E-01	2.75E-01								
Fluoranthene	4.0E-02	NA	NA	2.60E-01	2.67E-01								
Fluorene	4.0E-02	NA	NA	3.80E-02	3.80E-02								
Indeno(1,2,3-cd)pyrene	NA	7.3E-01	NA	3.06E-01	2.84E-01								
Naphthalene	4.0E-02	NA	NA	3.70E-02	3.70E-02								
N-Nitrosodiphenylamine	NA	4.9E-03	NA	9.50E-02	9.50E-02								
Pentachlorophenol	3.0E-02	1.2E-01	0.01	6.73E-01	6.38E-01	6.73E-07	5.77E-08	2E-05	7E-09	3.82E-07	1.36E-07	1E-05	2E-08
Phenanthrene	NA	NA	NA	3.01E-01	2.85E-01								
Pyrene	3.0E-02	NA	NA	2.42E-01	2.51E-01								
Pesticides/PCBs													
4,4'-DDD	NA	1.2E+00	NA	3.06E-03	2.86E-03								
4,4'-DDE	NA	1.7E+00	NA	6.02E-03	4.92E-03								
4,4'-DDT	1.0E-04	1.7E+00	NA	3.41E-03	3.12E-03								
Aldrin	1.5E-05	3.4E+01	NA	1.36E-03	1.31E-03								
alpha-Chlordane	6.0E-05	1.3E+00	NA	1.10E-03	1.10E-03								
Aroclor-1254	1.8E-05	2.2E+00	0.06		2.60E-02								
Aroclor-1260	1.8E-05	2.2E+00	0.06	2.59E-02	2.50E-02	1.55E-07	1.33E-08	9E-03	3E-08	8.82E-08	3.15E-08	5E-03	7E-08
beta-BHC	NA	1.8E+00	NA	1.49E-03	1.40E-03								
delta-BHC	NA	NA	NA	1.37E-03	1.31E-03								
Dieldrin	2.5E-05	3.2E+01	NA	6.27E-03	5.07E-03								
Endosulfan I	6.0E-03	NA	NA	3.51E-03	2.75E-03								
Endosulfan sulfate	6.0E-03	NA	NA	2.62E-03	2.52E-03								
Endrin	3.0E-04	NA	NA	3.09E-03	2.87E-03								
Endrin ketone	NA	NA	NA	3.34E-03	3.05E-03								
Metals													
Antimony	4.0E-04	NA	NA	7.97E+00	7.61E+00								
Arsenic	2.4E-04*	1.9E+00	0.001	5.65E+00	5.53E+00	5.65E-07	4.84E-08	2E-03	9E-08	3.21E-07	1.15E-07	1E-03	2E-07
Barium	3.5E-03	NA	NA	1.32E+02	1.24E+02								
Cadmium	5.0E-05	NA	0.01	4.00E+00	2.96E+00	4.00E-06		8E-02		2.27E-06		5E-02	
Copper	2.4E-02	NA	NA	9.20E+01	7.80E+01								
Lead	NA	NA	NA	8.90E+02	9.47E+02								
Mercury	3.0E-06	NA	NA	1.50E-01	1.20E-01								
Selenium	4.5E-03	NA	NA	1.21E+00	9.80E-01								
Silver	1.0E-03	NA	NA	1.01E+00	9.40E-01								
Thallium	8.0E-05	NA	NA	7.10E-01	5.70E-01								
Zinc	7.5E-02	NA	NA	2.15E+02	1.86E+02								
Herbicides													
MCPA	5.0E-04	NA	NA	1.20E+01	7.27E+00								
Nitroaromatics													
2,4-Dinitrotoluene	2.0E-03	6.8E-01	NA	7.49E-02	7.46E-02								
2,6-Dinitrotoluene	1.0E-03	6.8E-01	NA	8.60E-02	8.31E-02								
Total Hazard Quotient and Cancer Risk:								9E-02	1E-07			5E-02	3E-07

Assumptions for Future Day Care Center Child		Assumptions for Future Day Care Center Adult	
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 B-16PO-10 Surface Soil Exposure Point Concentration for Antimony, Barium, Lead, Mercury, and Thallium-Post Remediation

SENECA ARMY DEPOT
SEAD-16
SURFACE SOIL SAMPLE RESULTS OF SITE

COMPOUND	UNITS	NYSDEC TAGM	COUNT	MAXIMUM	95th UCL of the mean	MEAN	STD.DEV	COEF OF VARIATION	NORMAL/ LOGNORMAL	EXPOSU POIN CONC
Antimony	mg/kg	3.59	54	17.1	4.58	3.86	3.24	0.84	NORMAL	4.58
Barium	mg/kg	300	54	300	103.21	92.39	48.34	0.52	NORMAL	103.2
Lead	mg/kg	22	54	992	311.37	164.34	238.65	1.45	LOGNORMAL	311.3
Mercury	mg/kg	0.1	54	1.2	0.16	0.15	0.24	1.68	LOGNORMAL	0.16
Thallium	mg/kg	0.28	54	1.8	0.63	0.56	0.43	0.77	NORMAL	0.63

Notes:
1. This table reflects the surface soil sample and ditch soil sample results at the site as listed in Tables A-2 and A-5.
2. NYSDEC TAGM values based on Technical and Administrative Guidance Memorandum HWR-92-4046, November 16, 1992. The TAGMs are TBCs and are for comparison purposes only.
3. The concentrations of the samples in the delineated area (Figure 2-1) were replaced with the site background concentrations (Table 1-2, RI).

Table B-16PO-11 Surface Soil Exposure Point Concentration for Antimony, Barium, Lead, Mercury, and Thallium-Post Remediation

SENECA ARMY DEPOT
SEAD-16
TOTAL SOIL SAMPLE RESULTS OF SITE

COMPOUND	UNITS	NYSDEC TAGM	COUNT	MAXIMUM	95th UCL of the mean	MEAN	STD.DEV	COEF OF VARIATION	NORMAL/ LOGNORMAL	EXPOSU POINT CONC
Antimony	mg/kg	3.59	60	17.1	4.36	3.70	3.14	0.85	NORMAL	4.36
Barium	mg/kg	300	60	300	101.94	92.10	46.33	0.50	NORMAL	101.94
Lead	mg/kg	22	60	992	271.45	154.35	230.84	1.50	LOGNORMAL	271.45
Mercury	mg/kg	0.1	60	1.2	0.15	0.14	0.24	1.65	LOGNORMAL	0.15
Thallium	mg/kg	0.28	60	1.8	0.63	0.56	0.42	0.75	NORMAL	0.63

Notes:
1. This table reflects the surface soil sample and ditch soil sample results at the site as listed in Tables A-2, A-3, and A-5.
2. NYSDEC TAGM values based on Technical and Administrative Guidance Memorandum HWR-92-4046, November 16, 1992. The TAGMs are TBCs and are for comparison purposes only.
3. The concentrations of the samples in the delineated area (Figure 2-1) were replaced with the site background concentrations (Table 1-2, RI).

TABLE B16-PO-12
CALCULATED SOIL RECEPTOR EXPOSURE
SURFACE SOIL

SEAD-16 FS
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP[1]		BAF[2]		Deer Mouse Exposure (mg/kg/day) [3]
Semivolatile Organics						
2,4-Dinitrotoluene	1.73E+00	2.67E+00	(4)	1.00E+00	(6)	6.92E-01
2,6-Dinitrotoluene	1.80E-01	3.21E+00	(4)	1.00E+00	(6)	8.27E-02
Acenaphthene	1.74E+00	2.10E-01	(4)	3.42E-01	(12)	1.12E-01
Benzo(a)anthracene	4.73E+00	1.97E-02	(4)	1.25E-01	(11)	9.48E-02
Benzo(b)fluoranthene	6.88E+00	8.88E-03	(4)	3.19E-01	(11)	2.74E-01
Benzo(ghi)perylene	3.12E+00	5.19E-03	(4)	2.44E-01	(11)	9.75E-02
Benzo(k)fluoranthene	3.38E+00	1.01E-02	(4)	2.53E-01	(11)	1.11E-01
Chrysene	5.59E+00	1.97E-02	(4)	1.75E-01	(11)	1.42E-01
Dibenzofuran	1.40E+00	1.72E-01	(4)	1.00E+00	(6)	1.84E-01
Dibenz(a,h)anthracene	1.86E+00	5.26E-03	(4)	3.68E-01	(11)	8.30E-02
Fluoranthene	6.28E+00	4.25E-02	(4)	7.92E-02	(11)	1.10E-01
Fluorene	1.49E+00	1.43E-01	(4)	3.42E-01	(12)	8.47E-02
Indeno(1,2,3-cd)pyrene	3.07E+00	5.55E-03	(4)	4.19E-01	(11)	1.55E-01
Phenanthrene	4.89E+00	9.08E-02	(4)	1.22E-01	(11)	1.34E-01
Pyrene	6.75E+00	4.31E-02	(4)	9.20E-02	(11)	1.28E-01
Pesticides/PCBs						
Aroclor-1260	3.46E-02	9.00E-03	(10)	2.90E-01	(9)	1.27E-03
Endrin ketone	4.08E-03	2.20E-02	(4)	2.50E-01	(9)	1.38E-04
Metals						
Antimony	4.58E+00	1.30E-04	(5)	1.00E+00	(6)	5.15E-01
Barium	1.03E+02	1.50E-01	(5)	1.00E+00	(6)	1.19E+01
Copper	6.98E+01	4.00E-01	(5)	5.57E-01	(7)	5.11E+00
Lead	3.11E+02	5.80E-03	(5)	4.61E-01	(8)	1.69E+01
Mercury	1.57E-01	9.00E-01	(5)	2.30E+01	(10)	3.93E-01
Selenium	9.80E-01	2.50E-02	(5)	4.70E-01	(13)	5.46E-02
Thallium	6.30E-01	4.00E-03	(5)	1.00E+00	(6)	7.09E-02
Zinc	1.33E+02	1.40E+00	(5)	1.00E+00	(6)	1.90E+01

(1) SP soil-to-plant uptake factor
(2) BAF bioaccumulation factor
(3) Deer mouse exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * UFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor (0.2) (inorganics only)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day)
Is = incidental soil intake rate (0.000088 kg/day)
SFF = Site foraging factor (1)
BW = body weight (0.02 kg)

(4) Source Travis and Arms, 1988
(5) Source NRC 1992
(6) Default where no experimental data available, no evidence of bioaccumulation
(7) Source Ma et al., 1983 Cu BAF based on soil conc
(8) Source Ma et al., 1983 Pb BAF is based on soil conc., pH (=7.5), and % organic matter (=3.68%)
(9) Source Menzie et al., 1992
(10) Source EPA, 1994c
(11) Source Marquerie et al., 1987, in Beyer, 1990
(12) Used benzo(a)pyrene as surrogate
(13) Source Beyer and Cromartie, 1987. BAF based on highest level of earthworm uptake at industrial sites

Note: RME for antimony, barium, lead, mercury, and thallium is from Table B-16PO-10. All other RMEs are from Table B-16PO-3.

TABLE B16-PO-13
CALCULATED SOIL RECEPTOR EXPOSURE
NYSDEC TAGM

SEAD-16 &-17 FS
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP[1]		BAF[2]		Deer Mouse Exposure (mg/kg/day) [3]
Metals						
Antimony	3.59	1.30E-04	(5)	1.00E+00	(6)	4.04E-01
Barium	300	1.50E-01	(5)	1.00E+00	(6)	3.47E+01
Lead	2.19E+01	5.80E-03	(5)	3.25E-01	(8)	8.67E-01
Mercury	1.00E-01	9.00E-01	(5)	2.30E+01	(10)	2.51E-01
Thallium	2.80E-01	4.00E-03	(5)	1.00E+00	(6)	3.15E-02

(1) SP: soil-to-plant uptake factor.
(2) BAF: bioaccumulation factor.
(3) Deer mouse exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * UFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor (0.2) (inorganics only)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day)
Is = incidental soil intake rate (0.000088 kg/day)
SFF = Site foraging factor (1)
BW = body weight (0.02 kg)

(5) Source: NRC 1992.
(6) Default where no experimental data available, no evidence of bioaccumulation.
(8) Source: Ma et al., 1983. Pb BAF is based on soil conc., pH (=7.5), and % organic matter (=3.68%).
(10) Source: EPA, 1994c.

Note: RME for antimony, barium, lead, mercury, and thallium is the NYSDEC TAGM value.

TABLE B16-PO-14
CALCULATED SOIL RECEPTOR EXPOSURE
TOTAL SOIL

SEAD-16 FS
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP[1]		BAF[2]		Deer Mouse Exposure (mg/kg/day) [3]
Semivolatile Organics						
2,4-Dinitrotoluene	1.58E+00	2.67E+00	(4)	1.00E+00	(6)	6.31E-01
2,6-Dinitrotoluene	1.80E-01	3.21E+00	(4)	1.00E+00	(6)	8.27E-02
Acenaphthene	1.39E+00	2.10E-01	(4)	3.42E-01	(12)	8.88E-02
Benzo(a)anthracene	3.12E+00	1.97E-02	(4)	1.25E-01	(11)	6.25E-02
Benzo(b)fluoranthene	4.76E+00	8.88E-03	(4)	3.19E-01	(11)	1.90E-01
Benzo(ghi)perylene	3.32E+00	5.19E-03	(4)	2.44E-01	(11)	1.04E-01
Benzo(k)fluoranthene	2.51E+00	1.01E-02	(4)	2.53E-01	(11)	8.24E-02
Chrysene	3.68E+00	1.97E-02	(4)	1.75E-01	(11)	9.37E-02
Dibenzofuran	1.20E+00	1.72E-01	(4)	1.00E+00	(6)	1.57E-01
Dibenz(a,h)anthracene	1.66E+00	5.26E-03	(4)	3.68E-01	(11)	7.40E-02
Fluoranthene	4.11E+00	4.25E-02	(4)	7.92E-02	(11)	7.21E-02
Fluorene	1.23E+00	1.43E-01	(4)	3.42E-01	(12)	6.96E-02
Indeno(1,2,3-cd)pyrene	3.08E+00	5.55E-03	(4)	4.19E-01	(11)	1.55E-01
Phenanthrene	3.16E+00	9.08E-02	(4)	1.22E-01	(11)	8.65E-02
Pyrene	4.39E+00	4.31E-02	(4)	9.20E-02	(11)	8.34E-02
Pesticides/PCBs						
Aroclor-1260	3.70E-02	9.00E-03	(10)	2.90E-01	(9)	1.36E-03
Endrin ketone	4.25E-03	2.20E-02	(4)	2.50E-01	(9)	1.44E-04
Metals						
Antimony	4.36E+00	1.30E-04	(5)	1.00E+00	(6)	4.90E-01
Barium	1.02E+02	1.50E-01	(5)	1.00E+00	(6)	1.18E+01
Copper	7.09E+01	4.00E-01	(5)	5.54E-01	(7)	5.16E+00
Lead	2.71E+02	5.80E-03	(5)	4.52E-01	(8)	1.45E+01
Mercury	1.53E-01	9.00E-01	(5)	2.30E+01	(10)	3.83E-01
Selenium	9.40E-01	2.50E-02	(5)	4.70E-01	(13)	5.24E-02
Thallium	6.27E-01	4.00E-03	(5)	1.00E+00	(6)	7.05E-02
Zinc	1.30E+02	1.40E+00	(5)	1.00E+00	(6)	1.85E+01

(1) SP soil-to-plant uptake factor
(2) BAF bioaccumulation factor
(3) Deer mouse exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * UFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor (0.2) (inorganics only)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day)
Is = incidental soil intake rate (0.000088 kg/day)
SFF = Site foraging factor (1)
BW = body weight (0.02 kg)

(4) Source Travis and Arms, 1988
(5) Source NRC 1992
(6) Default where no experimental data available, no evidence of bioaccumulation
(7) Source. Ma et al., 1983. Cu BAF based on soil conc
(8) Source Ma et al., 1983. Pb BAF is based on soil conc., pH (=7.5), and % organic matter (=3.68%)
(9) Source Menzie et al., 1992
(10) Source EPA, 1994c
(11) Source: Marquerie et al., 1987, in Beyer, 1990
(12) Used benzo(a)pyrene as surrogate
(13) Source Beyer and Cromartie, 1987 BAF based on highest level of earthworm uptake at industrial sites

Note: RME for antimony, barium, lead, mercury, and thallium is from Table B-16PO-11. All other RMEs are from Table B-16PO-4.

TABLE B-16PO-15
CALCULATION OF SOIL HAZARD QUOTIENTS
SURFACE SOIL

SEAD-16 FS
Seneca Army Depot

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Hazard Quotient [3]
Semivolatile Organics			
2,4-Dinitrotoluene	6.92E-01	6.80E+00	1.0E-01
2,6-Dinitrotoluene	8.27E-02	6.80E-01	1.2E-01
Acenaphthene	1.12E-01	7.00E+00	1.6E-02
Benzo(a)anthracene	9.48E-02	3.20E+00	3.0E-02
Benzo(b)fluoranthene	2.74E-01	3.20E+00	8.6E-02
Benzo(ghi)perylene	9.75E-02	3.20E+00	3.0E-02
Benzo(k)fluoranthene	1.11E-01	3.20E+00	3.5E-02
Chrysene	1.42E-01	3.20E+00	4.4E-02
Dibenzofuran	1.84E-01	none avail	--
Dibenz(a,h)anthracene	8.30E-02	3.20E+00	2.6E-02
Fluoranthene	1.10E-01	2.50E+01	4.4E-03
Fluorene	8.47E-02	2.50E+01	3.4E-03
Indeno(1,2,3-cd)pyrene	1.55E-01	3.20E+00	4.8E-02
Phenanthrene	1.34E-01	3.20E+00	4.2E-02
Pyrene	1.28E-01	3.20E+00	4.0E-02
Pesticides			
Aroclor-1260	1.27E-03	1.36E-02	9.3E-02
Endrin ketone	1.38E-04	1.84E-02	7.5E-03
Metals			
Antimony	5.15E-01	2.50E-01	**2.1E+00**
Barium	1.19E+01	1.32E+00	**9.0E+00**
Copper	5.11E+00	6.20E+00	8.2E-01
Lead	1.69E+01	1.60E+01	**1.1E+00**
Mercury	3.93E-01	3.20E-02	**1.2E+01**
Selenium	5.46E-02	1.50E-01	3.6E-01
Thallium	7.09E-02	2.96E-02	**2.4E+00**
Zinc	1.90E+01	6.40E+01	3.0E-01

(1) Receptor exposure from Table B16-PO-12.
(2) Toxicity reference value from Table 6-19, RI.
(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.
BOLD : represents receptor HQ >= 1.
-- : no HQ could be calculated, as no toxicity data could be found.

TABLE B-16PO-16
CALCULATION OF SOIL HAZARD QUOTIENTS
NYSDEC TAGM

SEAD-16 & -17 FS
Seneca Army Depot

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Hazard Quotient [3]
Metals			
Antimony	4.04E-01	2.50E-01	**1.6E+00**
Barium	3.47E+01	1.32E+00	**2.6E+01**
Lead	8.67E-01	1.60E+01	5.4E-02
Mercury	2.51E-01	3.20E-02	**7.8E+00**
Thallium	3.15E-02	2.96E-02	**1.1E+00**

(1) Receptor exposure from Table B16-PO-13.
(2) Toxicity reference value from Table 6-19, RI.
(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.
BOLD : represents receptor HQ >= 1.
-- : no HQ could be calculated, as no toxicity data could be found.

TABLE B-16PO-17
CALCULATION OF SOIL HAZARD QUOTIENTS
TOTAL SOIL

SEAD-16 FS
Seneca Army Depot

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Hazard Quotient [3]
Semivolatile Organics			
2.4-Dinitrotoluene	6.31E-01	6.80E+00	9.3E-02
2.6-Dinitrotoluene	8.27E-02	6.80E-01	1.2E-01
Acenaphthene	8.88E-02	7.00E+00	1.3E-02
Benzo(a)anthracene	6.25E-02	3.20E+00	2.0E-02
Benzo(b)fluoranthene	1.90E-01	3.20E+00	5.9E-02
Benzo(ghi)perylene	1.04E-01	3.20E+00	3.3E-02
Benzo(k)fluoranthene	8.24E-02	3.20E+00	2.6E-02
Chrysene	9.37E-02	3.20E+00	2.9E-02
Dibenzofuran	1.57E-01	none avail	--
Dibenz(a.h)anthracene	7.40E-02	3.20E+00	2.3E-02
Fluoranthene	7.21E-02	2.50E+01	2.9E-03
Fluorene	6.96E-02	2.50E+01	2.8E-03
Indeno(1.2.3-cd)pyrene	1.55E-01	3.20E+00	4.8E-02
Phenanthrene	8.65E-02	3.20E+00	2.7E-02
Pyrene	8.34E-02	3.20E+00	2.6E-02
Pesticides			
Aroclor-1260	1.36E-03	1.36E-02	1.0E-01
Endrin ketone	1.44E-04	1.84E-02	7.8E-03
Metals			
Antimony	4.90E-01	2.50E-01	**2.0E+00**
Barium	1.18E+01	1.32E+00	**8.9E+00**
Copper	5.16E+00	6.20E+00	8.3E-01
Lead	1.45E+01	1.60E+01	9.1E-01
Mercury	3.83E-01	3.20E-02	**1.2E+01**
Selenium	5.24E-02	1.50E-01	3.5E-01
Thallium	7.05E-02	2.96E-02	**2.4E+00**
Zinc	1.85E+01	6.40E+01	2.9E-01

(1) Receptor exposure from Table B16-PO-14.
(2) Toxicity reference value from Table 6-19. RI.
(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.
BOLD : represents receptor HQ >= 1.
-- : no HQ could be calculated. as no toxicity data could be found.

Table B-17PO-8 Surface Soil Exposure Point Concentration
for Antimony, Barium, Lead, Mercury, and Thallium-Post Remediation

SENECA ARMY DEPOT
SEAD-17
SURFACE SOIL SAMPLE RESULTS OF SITE

COMPOUND	UNITS	NYSDEC TAGM	COUNT	MAXIMUM	95th UCL of the mean	MEAN	STD.DEV	COEF OF VARIATION	NORMAL/ LOGNORMAL	EXPOSURE POINT CONC.
Antimony	mg/kg	3.59	39	52	5.88	4.82	8.37	1.74	LOGNORMAL	5.88
Barium	mg/kg	300	39	357	136.13	121.45	54.42	0.45	NORMAL	136.13
Lead	mg/kg	22	47	1050	636.40	250.12	251.79	1.01	LOGNORMAL	636.40
Mercury	mg/kg	0.1	48	1	0.11	0.11	0.18	1.75	LOGNORMAL	0.11
Thallium	mg/kg	0.28	48	1.5	0.60	0.60	0.43	0.71	NORMAL	0.60

Notes:
1. This table reflects the surface soil sample and ditch soil sample results at the site as listed in Tables A-8 and A-11.
2. NYSDEC TAGM values based on Technical and Administrative Guidance Memorandum HWR-92-4046, November 16, 1992. The TAGMs are TBCs and are for comparison purposes only.
3. The concentrations of the samples in the delineated area (Figure 2-5) were replaced with the site background concentrations (Table 1-2, RI).

Table B-17PO-9 Total Soil Exposure Point Concentration for Antimony, Barium, Lead, Mercury, and Thallium-Post Remediation

SENECA ARMY DEPOT
SEAD-17
TOTAL SOIL SAMPLE RESULTS OF SITE

COMPOUND	UNITS	NYSDEC TAGM	COUNT	MAXIMUM	95th UCL of the mean	MEAN	STD.DEV	COEF OF VARIATION	NORMAL/ LOGNORMAL	EXPOSURE POINT CONC.
Antimony	mg/kg	3.59	39	52	5.88	4.82	8.37	1.74	LOGNORMAL	5.88
Barium	mg/kg	300	39	357	127.97	121.45	54.42	0.45	NORMAL	127.97
Lead	mg/kg	22	47	1050	555.36	250.12	251.79	1.01	LOGNORMAL	555.36
Mercury	mg/kg	0.1	48	1	0.09	0.11	0.18	1.75	LOGNORMAL	0.09
Thallium	mg/kg	0.28	48	1.5	0.60	0.60	0.43	0.71	NORMAL	0.60

Notes:
1. This table reflects the surface soil sample and ditch soil sample results at the site as listed in Tables A-8, A-9, and A-11.
2. NYSDEC TAGM values based on Technical and Administrative Guidance Memorandum HWR-92-4046, November 16, 1992. The TAGMs are TBCs and are for comparison purposes only.
3. The concentrations of the samples in the delineated area (Figure 2-5) were replaced with the site background concentrations (Table 1-2, RI).

TABLE B17-PO-10
CALCULATED SOIL RECEPTOR EXPOSURE
SURFACE SOIL

SEAD-17 FS
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP[1]		BAF[2]		Deer Mouse Exposure (mg/kg/day)[3]
Semivolatile Organics						
2,4-Dinitrotoluene	2.77E-01	2.67E+00	(4)	1.00E+00	(6)	1.11E-01
2,6-Dinitrotoluene	8.60E-02	3.21E+00	(4)	1.00E+00	(6)	3.95E-02
Acenaphthene	3.30E-02	2.10E-01	(4)	3.42E-01	(12)	2.11E-03
Benzo(a)anthracene	3.26E-01	1.97E-02	(4)	1.25E-01	(11)	6.52E-03
Benzo(b)fluoranthene	3.53E-01	8.88E-03	(4)	3.19E-01	(11)	1.40E-02
Benzo(ghi)perylene	2.91E-01	5.19E-03	(4)	2.44E-01	(11)	9.12E-03
Benzo(k)fluoranthene	2.87E-01	1.01E-02	(4)	2.53E-01	(11)	9.43E-03
Chrysene	2.71E-01	1.97E-02	(4)	1.75E-01	(11)	6.88E-03
Dibenzofuran	3.60E-02	1.72E-01	(4)	1.00E+00	(6)	4.72E-03
Dibenz(a,h)anthracene	2.79E-01	5.26E-03	(4)	3.68E-01	(11)	1.25E-02
Fluoranthene	2.60E-01	4.25E-02	(4)	7.92E-02	(11)	4.57E-03
Fluorene	3.80E-02	1.43E-01	(4)	3.42E-01	(12)	2.16E-03
Indeno(1,2,3-cd)pyrene	3.06E-01	5.55E-03	(4)	4.19E-01	(11)	1.54E-02
Phenanthrene	3.01E-01	9.08E-02	(4)	1.22E-01	(11)	8.25E-03
Pyrene	2.42E-01	4.31E-02	(4)	9.20E-02	(11)	4.59E-03
Pesticides/PCBs						
Aroclor-1260	2.59E-02	9.00E-03	(10)	2.90E-01	(9)	9.52E-04
Endrin ketone	3.34E-03	2.20E-02	(4)	2.50E-01	(9)	1.13E-04
Metals						
Antimony	5.88E+00	1.30E-04	(5)	1.00E+00	(6)	6.61E-01
Barium	1.36E+02	1.50E-01	(5)	1.00E+00	(6)	1.57E+01
Copper	9.20E+01	4.00E-01	(5)	5.06E-01	(7)	6.23E+00
Lead	6.36E+02	5.80E-03	(5)	5.06E-01	(8)	3.76E+01
Mercury	1.07E-01	9.00E-01	(5)	2.30E+01	(10)	2.68E-01
Selenium	1.21E+00	2.50E-02	(5)	4.70E-01	(13)	6.74E-02
Thallium	6.04E-01	2.70E-04	(5)	1.00E+00	(6)	6.79E-02
Zinc	2.15E+02	4.00E-03	(5)	1.00E+00	(6)	2.41E+01

(1) SP soil-to-plant uptake factor
(2) BAF bioaccumulation factor
(3) Deer mouse exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * SFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor (0.2) (inorganics only)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day)
Is = incidental soil intake rate (0.000088 kg/day)
SFF = Site foraging factor (1)
BW = body weight (0.02 kg)

(4) Source Travis and Arms, 1988
(5) Source NRC 1992
(6) Default where no experimental data available, no evidence of bioaccumulation
(7) Source Ma et al., 1983 Cu BAF based on soil conc
(8) Source Ma et al., 1983 Pb BAF is based on soil conc., pH (=7.5), and % organic matter (=3.68%)
(9) Source Menzie et al., 1992
(10) Source EPA, 1994c
(11) Source Marquerie et al., 1987, in Beyer, 1990
(12) Used benzo(a)pyrene as surrogate
(13) Source Beyer and Cromartie, 1987 BAF based on highest level of earthworm uptake at industrial sites

Note: RME for antimony, barium, lead, mercury, and thallium is from Table B-17PO-8. All other RMEs are from Table B-17PO-2.

TABLE B17-PO-11
CALCULATED SOIL RECEPTOR EXPOSURE
TOTAL SOIL

SEAD-17 FS
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP[1]		BAF[2]		Deer Mouse Exposure (mg/kg/day) [3]
Semivolatile Organics						
2,4-Dinitrotoluene	2.64E-01	2.67E+00	(4)	1.00E+00	(6)	1.06E-01
2,6-Dinitrotoluene	8.31E-02	3.21E+00	(4)	1.00E+00	(6)	3.82E-02
Acenaphthene	3.30E-02	2.10E-01	(4)	3.42E-01	(12)	2.11E-03
Benzo(a)anthracene	3.01E-01	1.97E-02	(4)	1.25E-01	(11)	6.02E-03
Benzo(b)fluoranthene	3.18E-01	8.88E-03	(4)	3.19E-01	(11)	1.27E-02
Benzo(ghi)perylene	2.74E-01	5.19E-03	(4)	2.44E-01	(11)	8.57E-03
Benzo(k)fluoranthene	2.72E-01	1.01E-02	(4)	2.53E-01	(11)	8.93E-03
Chrysene	2.78E-01	1.97E-02	(4)	1.75E-01	(11)	7.07E-03
Dibenzofuran	3.60E-02	1.72E-01	(4)	1.00E+00	(6)	4.72E-03
Dibenz(a,h)anthracene	2.64E-01	5.26E-03	(4)	3.68E-01	(11)	1.18E-02
Fluoranthene	2.67E-01	4.25E-02	(4)	7.92E-02	(11)	4.69E-03
Fluorene	3.80E-02	1.43E-01	(4)	3.42E-01	(12)	2.16E-03
Indeno(1,2,3-cd)pyrene	2.84E-01	5.55E-03	(4)	4.19E-01	(11)	1.43E-02
Phenanthrene	2.85E-01	9.08E-02	(4)	1.22E-01	(11)	7.79E-03
Pyrene	2.51E-01	4.31E-02	(4)	9.20E-02	(11)	4.76E-03
Pesticides/PCBs						
Aroclor-1260	2.50E-02	9.00E-03	(10)	2.90E-01	(9)	9.18E-04
Endrin ketone	3.05E-03	2.20E-02	(4)	2.50E-01	(9)	1.03E-04
Metals						
Antimony	5.88E+00	1.30E-04	(5)	1.00E+00	(6)	6.61E-01
Barium	1.28E+02	1.50E-01	(5)	1.00E+00	(6)	1.48E+01
Copper	7.80E+01	4.00E-01	(5)	5.35E-01	(7)	5.52E+00
Lead	5.55E+02	5.80E-03	(5)	4.97E-01	(8)	3.23E+01
Mercury	9.44E-02	9.00E-01	(5)	2.30E+01	(10)	2.37E-01
Selenium	9.80E-01	2.50E-02	(5)	4.70E-01	(13)	5.46E-02
Thallium	6.04E-01	2.70E-04	(5)	1.00E+00	(6)	6.79E-02
Zinc	1.86E+02	4.00E-03	(5)	1.00E+00	(6)	2.09E+01

(1) SP: soil-to-plant uptake factor
(2) BAF: bioaccumulation factor
(3) Deer mouse exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * UFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor (0.2) (inorganics only)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day)
Is = incidental soil intake rate (0.000088 kg/day)
SFF = Site foraging factor (1)
BW = body weight (0.02 kg)

(4) Source: Travis and Arms, 1988.
(5) Source: NRC 1992.
(6) Default where no experimental data available, no evidence of bioaccumulation.
(7) Source: Ma et al., 1983. Cu BAF based on soil conc.
(8) Source: Ma et al., 1983. Pb BAF is based on soil conc., pH (=7.5), and % organic matter (=3.68%).
(9) Source: Menzie et al., 1992
(10) Source: EPA, 1994c
(11) Source. Marquerie et al., 1987, in Beyer, 1990.
(12) Used benzo(a)pyrene as surrogate.
(13) Source: Beyer and Cromartie, 1987. BAF based on highest level of earthworm uptake at industrial sites

Note: RME for antimony, barium, lead, mercury, and thallium is from Table B-17PO-9. All other RMEs are from Table B-17PO-3.

TABLE B-17PO-12
CALCULATION OF SOIL HAZARD QUOTIENTS
SURFACE SOIL

SEAD-17 FS
Seneca Army Depot

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Hazard Quotient [3]
Semivolatile Organics			
2,4-Dinitrotoluene	1.11E-01	6.80E+00	1.6E-02
2,6-Dinitrotoluene	3.95E-02	6.80E-01	5.8E-02
Acenaphthene	2.11E-03	7.00E+00	3.0E-04
Benzo(a)anthracene	6.52E-03	3.20E+00	2.0E-03
Benzo(b)fluoranthene	1.40E-02	3.20E+00	4.4E-03
Benzo(ghi)perylene	9.12E-03	3.20E+00	2.8E-03
Benzo(k)fluoranthene	9.43E-03	3.20E+00	2.9E-03
Chrysene	6.88E-03	3.20E+00	2.2E-03
Dibenzofuran	4.72E-03	none avail	--
Dibenz(a,h)anthracene	1.25E-02	3.20E+00	3.9E-03
Fluoranthene	4.57E-03	2.50E+01	1.8E-04
Fluorene	2.16E-03	2.50E+01	8.6E-05
Indeno(1,2,3-cd)pyrene	1.54E-02	3.20E+00	4.8E-03
Phenanthrene	8.25E-03	3.20E+00	2.6E-03
Pyrene	4.59E-03	3.20E+00	1.4E-03
Pesticides			
Aroclor-1260	9.52E-04	1.36E-02	7.0E-02
Endrin ketone	1.13E-04	1.84E-02	6.1E-03
Metals			
Antimony	6.61E-01	2.50E-01	**2.6E+00**
Barium	1.57E+01	1.32E+00	**1.2E+01**
Copper	6.23E+00	6.20E+00	1.0E+00
Lead	3.76E+01	1.60E+01	**2.4E+00**
Mercury	2.68E-01	3.20E-02	**8.4E+00**
Selenium	6.74E-02	1.50E-01	4.5E-01
Thallium	6.79E-02	2.96E-02	**2.3E+00**
Zinc	2.41E+01	6.40E+01	3.8E-01

(1) Receptor exposure from Table B17-PO-10.
(2) Toxicity reference value from Table 6-19, RI.
(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.
BOLD : represents receptor HQ >= 1.
-- : no HQ could be calculated, as no toxicity data could be found.

TABLE B-17PO-13
CALCULATION OF SOIL HAZARD QUOTIENTS
TOTAL SOIL

SEAD-17 FS
Seneca Army Depot

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Toxicity Reference Value (mg/kg/day) [2]	Hazard Quotient [3]
Semivolatile Organics			
2.4-Dinitrotoluene	1.06E-01	6.80E+00	1.6E-02
2.6-Dinitrotoluene	3.82E-02	6.80E-01	5.6E-02
Acenaphthene	2.11E-03	7.00E+00	3.0E-04
Benzo(a)anthracene	6.02E-03	3.20E+00	1.9E-03
Benzo(b)fluoranthene	1.27E-02	3.20E+00	4.0E-03
Benzo(ghi)perylene	8.57E-03	3.20E+00	2.7E-03
Benzo(k)fluoranthene	8.93E-03	3.20E+00	2.8E-03
Chrysene	7.07E-03	3.20E+00	2.2E-03
Dibenzofuran	4.72E-03	none avail	--
Dibenz(a.h)anthracene	1.18E-02	3.20E+00	3.7E-03
Fluoranthene	4.69E-03	2.50E+01	1.9E-04
Fluorene	2.16E-03	2.50E+01	8.6E-05
Indeno(1.2.3-cd)pyrene	1.43E-02	3.20E+00	4.5E-03
Phenanthrene	7.79E-03	3.20E+00	2.4E-03
Pyrene	4.76E-03	3.20E+00	1.5E-03
Pesticides			
Aroclor-1260	9.18E-04	1.36E-02	6.7E-02
Endrin ketone	1.03E-04	1.84E-02	5.6E-03
Metals			
Antimony	6.61E-01	2.50E-01	**2.6E+00**
Barium	1.48E+01	1.32E+00	**1.1E+01**
Copper	5.52E+00	6.20E+00	8.9E-01
Lead	3.23E+01	1.60E+01	**2.0E+00**
Mercury	2.37E-01	3.20E-02	**7.4E+00**
Selenium	5.46E-02	1.50E-01	3.6E-01
Thallium	6.79E-02	2.96E-02	**2.3E+00**
Zinc	2.09E+01	6.40E+01	3.3E-01

(1) Receptor exposure from Table B17-PO-11.
(2) Toxicity reference value from Table 6-19, RI.
(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.
BOLD : represents receptor HQ >= 1.
-- : no HQ could be calculated, as no toxicity data could be found.

APPENDIX C

ARAR COMPLIANCE

APPENDIX C ARAR COMPLIANCE

C.1 ARAR-BASED REMEDIAL OBJECTIVES

The investigation and cleanup of SEAD-16 and -17 falls under the jurisdiction of both the State of New York regulations (administered by NYSDEC) and Federal regulations (administered by USEPA Region II). Three categories of potentially applicable state and federal requirements are reviewed separately in the subsequent subsections. The three categories of ARARs are chemical specific, location specific and action specific. A brief regulatory discussion of ARARs is given below.

In 40 CFR 300.5, EPA defines applicable requirements as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are defined as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Any standard, requirement, criterion, or limitation under any federal or state environmental or facility siting law may be either applicable or relevant and appropriate to a specific action. The only state laws that may become ARARs are those promulgated such that they are legally enforceable and generally applicable and equivalent to or more stringent than federal laws. A determination of applicability is made for the requirements as a whole, whereas a determination of relevance and appropriateness may be made for only specific portions of a requirement. An action must comply with relevant and appropriate requirements to the same extent as an applicable requirement with regard to substantive conditions, but need not comply with the administrative conditions of the requirement.

As mentioned earlier in this section, three categories of ARARs were analyzed. They are as follows: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs address certain contaminants or a class of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media (water, soil, air). Chemical-specific ARARs are discussed below, in the media-specific sections. Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site. Both location-specific and action-specific ARARs are independent of the media. In addition to ARARs, advisories, criteria or guidance may be evaluated as "To Be Considered" (TBC) regulatory items. CERCLA indicates that the TBC category could include advisories, criteria or guidance that were developed by EPA, other federal agencies or states that may be useful in developing CERCLA remedies. These advisories, criteria or guidance are not promulgated and, therefore, are not legally enforceable standards such as ARARs.

C.2 CHEMICAL SPECIFIC ARARs AND TBCs

Chemical-specific ARARs are usually health or risk-based standards limiting the concentration of a chemical found in, or discharged to, the environment. They govern the extent of site remediation by providing actual cleanup levels, or the basis for calculating such levels for specific media. A number of federal and state regulations are potential ARARs for this site. For each of the ARARs listed below 4 categories of information are provided.

C.2.1 <u>Water Quality</u>

- 40 CFR Part 141 (applicable): National Primary Drinking Water Regulations. This part establishes primary drinking water regulators pursuant to Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act. Consideration:

MCLs and NY state groundwater standards (GA) were used as a frame of reference for the applicable constituents; the lower, more conservative of the two standards were used to evaluate groundwater quality at the SEAD-16 and -17 sites and are potentially applicable ARAR for groundwater and soil cleanup action.

- 40 CFR Part 141.11 (applicable): Maximum Inorganic Chemical Contaminant Levels. This section establishes maximum contaminant levels (MCLs) for inorganic chemicals in drinking water. Consideration: MCLs and NY State groundwater standards (GA) were used as a frame reference for the applicable constituents; the lower of the two standards were used to set clean-up levels in groundwater at the SEAD-16 and -17 sites.

- 40 CFR Part 141.12 (applicable): Maximum Organic Chemical Contaminant Levels. This section establishes MCLs for organic chemicals in drinking water. Consideration: MCLs and NY State groundwater standards (GA) were used as a frame of reference for the applicable constituents; the lower of the two standards were used to set clean-up levels in groundwater at the SEAD-16 and -17 sites.

- 40 CFR Part 264 Subpart F (applicable): Releases from Solid Waste Management Units. Standards for protection of groundwater are established under this citation. This ARAR is applicable to long-term monitoring of the site.

- 6 NYCRR subparts 701 and 702 (applicable): These subparts provide classification definitions for surface water and groundwaters and describe procedures that may be used to obtain guidelines or standards that will be protective of human health and aquatic life. Consideration: Definitions of local surface water and groundwater classifications at the site were obtained from these subparts.

- 6 NYCRR subpart 703 (applicable): This subpart establishes groundwater standards specified to protect groundwater for drinking water purposes. Consideration: The groundwater at SEAD-16 and -17 has been classified as GA which means the best usage is as a source of potable water.

- 6 NYCRR subpart 373-2.6 and 373-2.11 (applicable): This regulation requires groundwater monitoring for releases from solid waste management units.

- 6 NYCRR subpart 373-2 (relevant and appropriate): This regulation establishes post closure care and groundwater monitoring requirements. Consideration: This regulation applies after the SEAD-16 and -17 sites has been closed under CERCLA or RCRA requirements.

- 6 NYCRR Part 5 (relevant and appropriate): This regulation establishes criteria for drinking water supplies. Specifically, NYSDOH has established MCLs for water. Consideration: These criteria are relevant and appropriate to drinking water sources in NY State.

- NYSDEC TOGS 1.1.1 (relevant and appropriate): This document compiles water quality standards and guidance values for use in NYSDEC programs. Consideration: This document was used as a reference for the NYSDEC water quality standards and guidance values.

C.2.3 Soil Quality

NYSDEC Technical and Administrative Guidance Manuals (TAGMs) (TBCs): The New York State rules for inactive hazardous waste disposal sites are provided in these documents. Cleanup levels for hazardous constituents in soil have been proposed by the State of New York through Technical and Administrative Guidance Manuals (TAGMs) specifically, #HWR-92-4045. Consideration: The NYSDEC TAGM manual for cleanup levels for soils is #HWR-94-4046 and has been used as guidance for this remedial action. These levels are shown in Appendix A for constituents detected at SEAD-16 and -17. The TAGMs are TBC guidelines and are not ARARs. The primary chemicals of concern at SEAD-16 are metals and to a lesser degree from SVOCs (primarily PAHs), pesticides, and nitroaromatics. The background metal concentration value has been determined as the 95th Upper Confidence Limit (UCL) of the mean for the background soil samples collected from the entire SEAD facility. TAGMs are being considered as remedial goals for volatile organics for the remedial measure.

C.2.4 PCBs

- 40 CFR Part 761 subpart G (TBC): PCB Spill Clean Up Policy. This regulation establishes criteria EPA will use to determine the adequacy of the clean up of spills resulting from the release of materials containing PCBs. Consideration: No action is required in regard to this regulation since maximum concentrations of PCBs in soil at SEAD-16 and -17 are less than the action limit of 50 ppm.

- EPA OSWER 8/90 (TBC): A Guide to Remedial Actions at Superfund sites with PCB contamination. Consideration: No action is required in regard to this document because PCB concentrations in soil at SEAD-16 and -17 are less than the action limit of 50 ppm.

C.3 LOCATION-SPECIFIC ARARS

Location-specific ARARs govern natural site features such as wetlands, flood plains, and sensitive ecosystems, and manmade features such as landfills, disposal areas, and places of historic or archaeological significance. These

ARARs generally restrict the concentration of hazardous substances or the conduct of activities based solely on the particular characteristics or location of the site. Federal and State regulations that may apply are listed below.

- 40 CFR Part 264.18 (relevant and appropriate): Location Standards for Hazardous Waste Facilities. The general requirements for locating a hazardous treatment, storage, or disposal facility are found in this section. They include provisions for seismic considerations and flood plains. Consideration: These standards are relevant and appropriate to remedial measures instituted at SEAD-16 and -17.

- 40 CFR Part 241.202 (applicable): Site selection shall be consistent with public health and welfare. It shall also be consistent with land-use plans and air and water quality standards. Consideration: These standards apply to remedial measures instituted at the SEAD-16 and -17 sites.

- 40 CFR Part 230-Section 404(b)(1) (applicable): Guidelines for Specifications of Disposal sites for dredged or filled material. The purpose of these guidelines is to restore and maintain the chemical, physical, and biological integrity of waters (including wetlands) of the United States through control of dredged or fill material. Considerations: No permit is required under Section 404, however, wetland restoration is required for remedial activities selected for SEAD-16 and -17.

- Wetlands Executive Order (EO1199) (applicable): Under this regulation federal agencies are required to minimize the destruction, loss, or degradation of wetlands and preserve and enhance natural and beneficial values of wetlands. Consideration: Remedial alternatives that involve construction must include all practical means of minimizing harm to wetlands.

C.4 ACTION-SPECIFIC ARARS

Action-specific ARARs are usually technology- or activity-based limitations that control actions at hazardous waste sites. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the development of all removal alternatives. Action specific ARARs are applicable to this site. The action-specific ARARs to be used will be determined by the Army based upon the technology chosen. Federal and State regulations which may apply include the following:

C.4.1 Air Quality

- 40 CFR Part 50.8 (relevant and appropriate) and 6 NYCRR subpart 257-4: Ambient Air Quality Standard for Carbon Monoxide. Carbon monoxide concentrations in the ambient air shall not exceed the following hourly average, 35 parts per million (ppm); 8-hour average, 9 ppm. Consideration: This standard for carbon monoxide may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.12 (relevant and appropriate): Ambient Air Quality Standard for Lead. Lead concentrations in the ambient air shall not exceed 1.5 micrograms lead per cubic meter of air, 90-day average. Consideration: This standard for lead may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.9 (relevant and appropriate): Ambient Air Quality Standard for Ozone. Ozone concentrations in the ambient air shall not exceed 0.10 ppm hourly average. Consideration: This standard for ozone may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.6 (relevant and appropriate): Ambient Air Quality Standard for PM-10. PM-10 concentrations in the ambient air shall not exceed the following: 24 hour average, 150 micrograms per cubic meter of air; annual average, 50 micrograms per cubic meter of air. Consideration: This standard for PM-10 may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 61 (applicable and relevant and appropriate): National Emission Standards for Hazardous Air Pollutants. This regulation requires the minimization of emissions, specifies emissions tests and monitoring requirements, and sets limits on several hazardous air pollutants. Consideration: These standards may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 58 (applicable): Ambient Air Quality Surveillance. This part defines quality assurance requirements, monitoring methods, instrument siting, and operating schedule for ambient air quality surveillance. Consideration: These ambient air quality standards may apply to removal actions or other remedial activities.

- 40 CFR Part 52 (applicable): Approval and Promulgation of Implementation Plans. This part defines general provisions for the contents of State Implementation Plans (SIPs). Consideration: These provisions may apply to removal actions or other remedial activities at SEAD-16 and -17.

- 40 CFR Part 264 Subpart AA, BB, and CC (applicable): Organic Air Emission Standards). Applicable to any air discharges due to treatment of the groundwater on site.

- 6 NYCRR Part 256 (applicable): Air Quality Classification System. This regulation defines four general levels of social and economic development for geographical areas in New York. These levels range from Level I, which would be used for timber, dairy farming or recreation and would be sparsely populated, to Level IV, which would be densely populated with large commercial metropolitan office buildings or areas of heavy industry. Consideration: SEAD is classified as Level II, which is an area of predominantly single and two family residences, small farms and limited commercial services and industrial development.

- 6 NYCRR subpart 257-1 (applicable): Air Quality Standards General. This section of the air regulations defines what an air standard is, how the standard will be applied and what compliance with these standards will entail. Consideration: These standards may apply to a removal action or other remedial activities at SEAD-16 and -17.

- 6 NYCRR subpart 257-3 (applicable): Air Quality Standards-Particulates. Suspended particulates shall not exceed 250 mg/m^3 more than once a year. Annual standard—55 μg/m^3, 30-day standard—100 μg/m^3, 60-day standard—85 μg/m^3, 90-day standard—80 μg/m^3, standard for settleable solids—50 percent of the values of the 30 day average concentrations shall not exceed 0.30 mg/cm^2/mo;—84 percent shall not except 0.45 mg/cm^2/mo. Consideration: These standards may apply to a removal action or other remedial activities at SEAD-16 and –17

- 6 NYCRR subpart 257-6 (applicable): Air Quality Standards—Hydrocarbons (non methane). Three hour standard measured from 6 to 9 am—0.24 ppm. Consideration: The hydrocarbon standard may apply to a removal action or other remedial activity at the SEAD-16 and -17 sites.

C.4.2 Water Quality

- 40 CFR Part 131 (applicable): Water Quality Standards. This part implements Section 101 of the Clean Water Act (CWA), which specifies the national goals of eliminating the discharge of pollutants, prohibiting the discharge of toxic pollutants in toxic amounts, and implementing programs for control of nonpoint sources.

- 40 CFR Part 131.12 (applicable): Antidegradation Policy. Establishes standards to prevent a body of water which has an existing high standard from degrading to a lower standard.

- 40 CFR Part 403 (applicable): Pretreatment Standards for the Discharge of Treated Site Water to a Publicly Owned Treatment Works (POTW). This part establishes pretreatment standards for the discharge of wastewater to POTWs. Consideration: These standards apply to any removal action or other remedial measure that might involve the discharge of treated site water to a POTW. If such a discharge system is installed at the SEAD-16 and 17 and the discharge is sent to a POTW, then a permit would be obtained from the POTW prior to the discharge.

- 6 NYCRR Chapter X (relevant and appropriate): This chapter establishes the requirements of the State Pollutant Discharge Elimination System. Consideration: These standards are relevant and appropriate discharges from remedial activities that occur at the site.

C.4.3 Solid Waste Management

- 40 CFR Part 241.100 (relevant and appropriate): Guidelines for the Land Disposal of Solid Wastes. These regulations are geared specifically toward sanitary landfills; however, they are applicable to all forms of land disposal and land-based treatment.

Consideration: These regulations are relevant and appropriate to land disposal or land-based treatment that may be established as part of remedial measures at SEAD-16 and -17.

- 40 CFR Part 241.204 (applicable): Water Quality. The location, design, construction, and operation of land disposal facilities shall protect water quality. Consideration: These regulations apply to land disposal facilities that may be established as part of remedial measures at the SEAD-16 and -17 sites.

- 40 CFR Part 241.205 (applicable): The design, construction, and operation of land disposal facilities shall conform to air quality and source control standards. Considerations: These standards are applicable to land disposal facilities that may be established as part of remedial measures on the SEAD-16 and -17 sites.

- 40 CFR Part 257.1 (relevant and appropriate): This part establishes the scope and purpose of criteria for use in assessing the possibility of adverse effects on health or the environment from solid waste disposal operations. Consideration: This part is relevant and appropriate to solid waste disposal operations that may be established during remedial activities at the SEAD-16 and -17 sites.

- 40 CFR Part 257.3 (relevant and appropriate): This part establishes criteria to assess the impact of disposal operations, including such considerations as flood plains, endangered species, air, surface water, groundwater, and land used for food-chain crops. Consideration: This part is relevant and appropriate to disposal operations performed during remedial activities at the SEAD-16 and -17 sites.

- 40 CFR Part 243.202 (relevant and appropriate): This part specifies the requirements for transporting solid waste, including provisions to prevent spillage. Consideration: This part is relevant and appropriate to remedial measures that involve transporting of solid waste.

- 6 NYCRR Part 360: Subtitle D Solid Waste Landfills (applicable). Consideration: Applies to remedial alternatives using capping options.

C.4.4 Hazardous Waste Management

- 40 CFR 262.11 (applicable): Standards Applicable to Generators of Hazardous Waste. This regulation requires a person who generates a solid waste to determine if that waste is a hazardous waste. Consideration: This part is applicable if solid waste is disposed of as part of remedial measures.

- 40 CFR Part 263.30 and 263.31 (applicable): These regulations set forth the standards and requirements for action in the event of a release during transport. Consideration: These regulations are relevant and appropriate if the transport hazardous wastes is part of a remedial measure at the SEAD-16 and 17 sites.

- 40 CFR Part 264 (applicable): This part establishes hazardous waste management facility standards and requirements, including long-term monitoring requirements. The on-site disposal areas used for stockpiling, mixing, and extended bioremediation of wastes must meet the substantive requirements of 40 CFR subparts B (general facility standards), E (manifest system, record keeping, and reporting), F (releases from solid waste management units), G (closure and post closure), L (waste piles), M (land treatment), and N (landfills). These regulations are applicable for hazardous wastes and are also relevant and appropriate for certain wastes which are not hazardous wastes. Consideration: These hazardous waste management facility standards and requirements are relevant and appropriate to on-site disposal areas established for remedial measures at the

SEAD-16 and 17 sites. Any facilities will be constricted, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. These standards would be applicable to any treatment or disposal facility operated on the site. In addition, Subpart J (Tank Systems) would be applicable to any treatment of groundwater on site and Subparts AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharged due to treatment of groundwater on the site.

- 40 CFR subpart S parts 264.552 and 264.533 (relevant and applicable): Corrective Action for Solid Waste Management Units. Allows for the consolidation of wastes, or the replacement of remediated wastes in land based units without invoking the RCRA land-disposal requirement of 40 CFR 268. Consideration: These parts are relevant and appropriate during a removal action or other remedial measures at the SEAD-16 and 17 sites.
- 40 CFR Part 268 (applicable): Land Disposal Restrictions (LDR). Restricts the disposal of listed and characteristic hazardous waste which contain hazardous constituents exceeding designated levels. Only applies when the waste is "placed" on the land. Consideration: For this site, only the restrictions on land disposal of Toxicity Characteristic (TC) hazardous wastes are ARARs, since there are no F or K listed wastes on-site. Specifically, it has been assumed that the characteristic would exceed TCLP limits, based upon existing groundwater quality. Accordingly, if soil is excavated the LDR are considered an ARAR.

- 40 CFR Part 270 subpart C (relevant and appropriate): This regulation establishes permit conditions, including record keeping requirements, operation and maintenance requirements, sampling, and monitoring requirements. Consideration: Although no permit is required for activities conducted entirely on site, the substantive requirements of these provisions are relevant and appropriate to the SEAD-16 and -17 sites.

- 40 CFR Part 270 subpart B (relevant and appropriate): This part defines the required contents of a hazardous waste management permit application. Consideration: The substantive requirements of these provisions are relevant and appropriate to the SEAD-16 and -17 sites.

- 6 NYCRR Part 375 (applicable): Inactive Hazardous Waste Disposal Sites. These regulations apply to State Superfund sites. Consideration: As a CERCLA site in the State of New York, these regulations apply.

Occupational Health and Safety Administration

- 29 CFR Part 1910.50 (applicable): Occupational Noise. No worker shall be exposed to noise levels in excess of the levels specified in this regulation. Consideration: Adherence to occupational noise regulations has been a part of all previous on-site activities and all future work will also comply with these regulations.

- 29 CFR Part 1910.1000 (applicable): Occupational Air Contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants to which it is believed nearly all workers may be repeatedly exposed day after day without adverse health effects. No worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation. Consideration: Adherence to air contaminant regulations for on-site workers has been a part of all previous field programs at SEAD-16 and -17 and all future work will also comply with these regulations.

- 29 CFR Part 1910.1200 (applicable): This part requires that each employer compile and maintain a workplace chemical list which contains the chemical name of each hazardous chemical in the workplace, cross-referenced to generally used common names.

This list must indicate the work area in which each such hazardous chemical is stored or used. Employees must be provided with information and training regarding the hazardous chemicals. Consideration: The requirements of this part have been complied with during the performance of all previous work at the SEAD-16 and -17 sites. All future work will also require compliance with this part.

- 29 CFR Part 120 (applicable): This part applies to employers and employees engaged in sites that have been designated for cleanup, and other work related to RCRA and CERCLA. The regulation establishes proceedings for site characterization and control, and requirements for employee training and medical monitoring. Consideration: The requirements of this part have been complied with during the performance of all previous work at the SEAD-16 and -17 sites. All future work will also require compliance with this part.

Transportation of Hazardous Waste

- 40 CFR Part 171 (applicable): General information, regulations, and definitions. This regulation prescribes the requirements of the DOT governing the transportation of hazardous material. Consideration: This part may apply to remedial measures that require the transport of hazardous materials. Contaminated materials will be packaged, manifested, and transported to a licensed off-site disposal facility in accordance with these regulations.

- 40 CFR Part 172 (applicable): Hazardous materials table, special provisions, Hazardous Materials Communications, Emergency Response Information, and Training requirements. This regulation lists and classifies those materials which the DOT has designated to be hazardous materials for the purpose of transportation and prescribes the requirements for shipping papers, package marking, labeling and transport vehicle placarding applicable to the shipment and transportation of those hazardous materials. Consideration: This part may be applicable to remedial measures that require the shipment and transportation of hazardous materials.

- 40 CFR Part 177 (applicable): Carriage by Public Highway. This regulation prescribes requirements that are applicable to the acceptance and transportation of hazardous materials by private, common, or contract carriers by motor vehicle. Consideration: This part may be applicable to remedial measures that require this shipment and transportation of hazardous materials.

- 6 NYCRR Chapter 364 (applicable): New York Waste Transport Permit Regulation. This regulation governs the collection, transport, and delivery of regulated waste originating on terminating within the state of New York. Consideration: This regulation may be applicable to remedial measures that involve regulated waste.

- EPA/DOT Guidance Manual on hazardous waste transportation (TBC): Consideration: This information contained in this manual will be considered for remedial measures that involve hazardous waste transportation.

APPENDIX D

NYSDEC AND USEPA CORRESPONDANCES

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

August 12, 1998

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

PRAP
16/17

Mr. James A. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Draft Proposed Remedial Action Plan (PRAP) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of the Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension for the submission of the Draft PRAP for the Deactivation Furnaces. This document is currently due August 12, 1998.

As we discussed on May 6, 1998 SEDA proposes to change the industrial soil cleanup levels for lead for this site. The Draft Feasibility Study Document currently indicates cleanup levels of lead to 500 PPM which was consistent with the OB Grounds Remedial Action Goal. Since this site is identified in the Reuse Plan as an light industrial landuse; the proposed remedial cleanup for lead is proposed to be 1750 PPM.
This objective is consistent with the USEPA Technical Review workgroup for lead document entitled "Recommendations of the Technical Review Work Group for Lead for an Interim Approach to Assessing Risk Associated with Adult Exposures to Lead in Soil" dated December 1996.

Upon agreement that this level of cleanup is acceptable for a future industrial landuse, the revised feasibility study would be submitted 30 days later and the Proposed Remedial Action Plan would be submitted consistent with the Attachment 7 schedule for the Federal Facilities Agreement.

This proposal will be discussed at the upcoming BCT Meeting. Agreement or as a minimum, agreement of a time line to resolve this issue will be established.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy), P.O.
Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Tom Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

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To See Distribution	From S. Absolom
Dept./Agency	Phone #
Fax #	Fax #
NSN 7540-01-317-7368 5099-101	GENERAL SERVICES ADMINISTRATION

Fax to
MIKE D
KEVIN
TOM E - Respond Draft Pls
CF. Mary

AUG 21 1998

EXPRESS MAIL

Stephen M. Absolom
BRAC Environmental Coordinator
Directorate of Engineering and Housing
Seneca Army Depot Activity (SEDA)
Romulus, New York 14541-5001

Re: Draft Feasibility Study (FS) Report for the Deactivation Furnaces (SEADs 16 & 17)
Draft Proposed Remedial Action Plan (PRAP) for the Deactivation Furnaces (SEADs 16 & 17)

Dear Mr. Absolom:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement, EPA requests an extension on the comment period for the document referenced above for an additional thirty (30) days. You agreed that EPA should not review the FS, until SEDA provides updated revisions to reflect the actual proposed cleanup level. In SEDA's August 12, 1998 letter, you proposed 1750 parts per million as the new soil cleanup level for lead in this FS document, stating a revised FS would be submitted by the Army after we come to agreement on the level of cleanup. We had further discussions on this issue during subsequent August 18 and 19 meetings, but currently there is no agreement between SEDA, EPA and NYSDEC. EPA's deadline for comments on the Draft FS had been August 22, 1998 and our new deadline would be September 21, 1998.

With regards to your extension request for submission of the Draft PRAP for the Deactivation Furnaces, you proposed no deadline for this document. Our Federal Facility Agreement (FFA) does not provide for deadlines contingent upon the possibility of future events occurring which also have no deadlines. In accordance with your August 12 letter and assuming we agree on a cleanup level for lead in soil at the Deactivation Furnaces by September 12, 1998, SEDA agrees to submit a revised FS by October 12, 1998. Consistent with Attachment 7 of our FFA, EPA agrees to a January 30, 1999 deadline for Army submission of the Draft PRAP for the Deactivation Furnaces. As stipulated by our FFA, an updated Attachment 5 - Facility Master Schedule should be provided by SEDA to reflect this.

A facsimile of this letter will be sent to you today. If you have any questions, please call me at (212) 637-4322.

Sincerely yours,

Carla M. Struble, P.E.
Federal Facilities Section

cc: J. Quinn, NYSDEC
T. Enroth, USACE-NY
K. Healy, USACE-HD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

Faxed To: Mike D, Kevin, Mary F.

AUG 21 1998

EXPRESS MAIL

Stephen M. Absolom
BRAC Environmental Coordinator
Directorate of Engineering and Housing
Seneca Army Depot Activity (SEDA)
Romulus, New York 14541-5001

Re: Draft Scoping Document for SEAD 66

Dear Mr. Absolom:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement, EPA requests an extension on the comment period for the document reference above for an additional thirty (30) days. As we discussed on August 17, we are preparing comments on the Revised Draft Record of Decision for the Open Burning Grounds to ensure our concerns are addressed adequately. EPA's deadline for comments on the document referenced above had been August 22, 1998 and we will be sending our response as soon as possible, but no later than September 21, 1998.

A facsimile of this letter will be sent to you today. If you have any questions, please call me at (212) 637-4322.

Sincerely yours,

C. Struble

Carla M. Struble, P.E.
Federal Facilities Section

cc: J. Quinn, NYSDEC
K. Healy, USACE-HD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

5 mll
Fax to
. Tom E
. Mike D
. Kevin H
. CF Mary

AUG 21 1998

EXPRESS MAIL

Stephen M. Absolom
BRAC Environmental Coordinator
Directorate of Engineering and Housing
Seneca Army Depot Activity (SEDA)
Romulus, New York 14541-5001

Re: Revised Draft RI/FS Report for the Deactivation Furnaces (SEADs 16 & 17)

Dear Mr. Absolom:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement, it is necessary for EPA to extend the comment period for the document reference above for an additional thirty (30) days. As we discussed on August 17, we are preparing comments on the Draft-Final Record of Decision for the Open Burning Grounds to ensure our concerns are addressed adequately. EPA's deadline for comments on the Revised Draft RI/FS for SEADs 16 & 17 had been August 22, 1998 and we will be sending our response as soon as possible, but no later than September 21, 1998.

A facsimile of this letter will be sent to you today. If you have any questions, please call me at (212) 637-4322.

Sincerely yours,

Carla M. Struble, P.E.
Federal Facilities Section

cc: J. Quinn, NYSDEC
T. Enroth, USACE-NY
K. Healy, USACE-HD

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO ATTENTION OF

September 14, 1998

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James A. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD 16 & 17) Draft Proposed Remedial Action Plan (PRAP) for the Deactivation Furnaces (SEAD 16 & 17)

Dear Ms. Struble/Mr. Quinn:

As per the lead in soils discussion during the August 19, 1998 BRAC Cleanup Team Meeting, Seneca Army Depot Activity (SEDA) has further reviewed the December 1996 USEPA publication Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. This has resulted in a revised number for the proposed cleanup level. SEDA proposes 1250 parts per million soil cleanup level for lead at this site. This change is a result of consideration given to the average individual geometric standard deviation (GSDi Adult) and average of 2.0 blood lead level for adults (PbB Adult) of 2.0 as the default parameter values.

If this request to change the proposed cleanup level for lead in soils can be agreed to by October 14, 1998, SEDA will submit a revised FS by November 14, 1998. The new date for the submission for the draft PRAP would then be March 4, 1999 per Attachment 7 of the Federal Facility Agreement.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy), P.O.
Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Tom Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, Room 242
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-4349 FAX: (518) 457-4198

John P. Cahill
Commissioner

September 21, 1998

Fax to
K. Healy
M. Duchesneau
T. Enroth
Mary F.

Mr. Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEADA)
5786 State Route 96
Romulus, NY 14541-5001

Dear Mr. Absolom:

Re: SEADs-16 and -17
Proposed Lead Cleanup Level
Seneca Army Depot, Site ID No. 850006

The New York State Department of Environmental Conservation (NYSDEC) has received your letter dated September 14, 1998, in which you revised your proposed cleanup level for lead in soils at SEAD-16 and SEAD-17 at the Seneca Army Depot (SEDA).

As background, NYSDEC received a Draft Feasibility Study for these sites dated November 1997. In this draft, the Army used a cleanup level for lead in soils of 500 parts per million (ppm), which was the level used for the Open Burning Grounds project. The Army then submitted a letter dated August 12, 1998, in which it stated; "Since this site [SEAD-16 and SEAD-17] is identified in the Reuse Plan as a light industrial landuse; the proposed remedial cleanup for lead is proposed to be 1750 PPM."

At the subsequent BCT meeting, the NYSDEC reiterated the position that the Reuse Plan is, of itself, insufficient reason to limit the remedial goals at SEAD-16 and SEAD-17. Although the Reuse Plan identifies the intended future land use of this area to be light industrial, there remains a New York State regulatory requirement to restore sites to pre-release conditions to the extent feasible. The Army's response was that the Army's August 12 letter was unclear; while proposing an industrial cleanup level of 1750 ppm lead, a revised feasibility study would also analyze the feasibility of remediating the area to pre-release and/or unrestricted use utilizing a lead cleanup level less than the proposed 1750 ppm.

The Army's letter of September 14, 1998 states, "SEDA proposes 1250 parts per million soil cleanup level for lead at this site." The NYSDEC requests clarification of this statement. Is the Army requesting the state's concurrence on a level of 1250 ppm lead for future industrial

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To Soo Nir	From S Absolom

use scenarios in a feasibility study that would also analyze achieving a lower cleanup level for lead for unrestricted use, or is the Army simply proposing an ultimate cleanup goal for lead at this site of 1250 ppm?

Please respond as soon as possible so that the state can work towards meeting the October 14, 1998 deadline for agreement detailed in your letter. If you have any comments or questions on this matter, please contact me by telephone at (518)457-3976 or by e-mail at jaquinn@gw.dec.state.ny.us.

Sincerely,

James A. Quinn
Bureau of Eastern Remedial Action
Division of Environmental Remediation

c: C. Struble
D. Geraghty

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO ATTENTION OF

October 1, 1998

Engineering and
Environmental Division

Mr. James A. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolfe Road, Room 208
Albany, New York 12233-7010

Dear Mr. Quinn:

This letter is in response to your request for further clarification of the proposed cleanup level for lead in soils at SEAD 16 & 17. As stated in the letter of September 14, 1998, SEDA proposes 1250 ppm for lead in soils as the cleanup level at this site. This value was derived following the discussion at the BCT of the December 1996 USEPA publication *"Recommendations of the Technical Review Workgroup for Lead for a Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil."*

SEDA is requesting the State's concurrence for this level of lead in soils for the cleanup of this site for industrial use. In addition, the Army will address in the Feasibility Study the associated cost of site remediation for the cleanup of lead in soils for a residential scenario. This will be calculated for a cost comparison to the proposed level as stated above. The determination to accept the residential use cleanup scenario value will be considered if the cost comparison shows that the additional cost to achieve a lower cleanup level is affordable.

If this request to change the proposed cleanup level for lead in soils can be agreed to by October 14, 1998, SEDA will submit a revised FS by November 14, 1998. The new date for the submission for the draft PRAP would then be March 4, 1999 as per Attachment 7 of the Federal Facility agreement.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

DONALD C. OLSON
LTC, U.S. Army
Commanding Officer

Copy Furnished:

Ms. Carla M. Struble, P.E., U.S. Environmental Protection Agency Emergency and Remedial Response Division, 290 Broadway, 18th Floor, E-3, New York, New York 10007-1866

Commander, U.S. Army Corps of Engineers, Seneca Army Depot Activity, ATTN: CENAN-PP-E (T. Enroth), SEDA Resident Office, Romulus, New York 14541-5001

Mr. Michael Duchesneau, Parsons Engineering Science, Inc., 30 Dan Road, Canton, MA 02021

Commander, U.S. Army Corps of Engineers, Huntsville Division, ATTN: CEHND-ED-CS (Kevin Healy), P.O. Box 1600, Huntsville, Alabama 35807

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

OCT 2 6 1998

EXPRESS MAIL

Stephen M. Absolom
BRAC Environmental Coordinator
Directorate of Engineering and Housing
Seneca Army Depot Activity (SEDA)
Romulus, New York 14541-5001

Re: Draft Feasibility Study (FS) Report for the Deactivation Furnaces (SEADs 16 and 17)

Dear Mr. Absolom:

This is in response to SEDA's September 14, 1998 letter regarding the Army's most recent proposed cleanup level for lead in soil to be included in the Draft FS Report for SEADs 16 and 17. The April 1998 Draft FS states that 500 parts per million (ppm) is the cleanup goal for lead in soil at these areas. In SEDA's August 12, 1998 letter, you proposed 1750 ppm, stating a revised FS would be submitted by the Army after we come to agreement on the level of cleanup. Subsequent discussions on this issue occurred during August 18 and 19 meetings, with no agreement between SEDA, EPA and NYSDEC. SEDA now proposes 1250 ppm as the cleanup level for lead in soil at SEAD 16 and SEAD 17.

In order to begin our review of the Draft FS for SEADs 16 and 17, EPA agrees that 1250 ppm for cleanup of lead in soils can be included in the Draft FS. SEDA's Local Redevelopment Authority has decided the future use of these areas to be Planned Industrial Development. A cleanup level of 1250 ppm for lead in soil would limit this property for industrial use and institutional controls would be necessary.

A facsimile of this letter will be sent to you today. If you have any questions, please call me at (212) 637-4322.

Sincerely yours,

Carla M. Struble, P.E.
Federal Facilities Section

cc: J. Quinn, NYSDEC
D. Geraghty, NYSDOH
R. Scott, NYSDEC-Avon
T. Enroth, USACE-NY
K. Healy, USACE-HD
M. Duchesneau, Parsons ES

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To Sen Dist	From S Absolom
Dept./Agency	Phone #
Fax #	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

New York State Departmen
Division of Environmental Remediat
Bureau of Eastern Remedial Action, Rc
50 Wolf Road, Albany, New York 122
Phone: (518) 457-4349 FAX: (518)

P. Cahill
Commissioner

Fax to
M. Duchesneau
K. Healy
T. Enroth
C.F M. Farnsworth
"original"

October 30, 1998

Mr. Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEADA)
5786 State Route 96
Romulus, NY 14541-5001

Dear Mr. Absolom:

Re: SEAD 16 & 17
Proposed Lead Cleanup level
Seneca Army Depot, Site ID No. 850006

This letter is in response to SEDA's October 1, 1998 proposal regarding lead in soils at SEAD 16 & 17. The December 1996 USEPA publication referenced in SEDA's letter suggests a range of lead cleanup levels that may result in an acceptable residual risk under an industrial use scenario. The range is dependent upon certain variables, and was calculated to be 750 ppm to 1750 ppm. SEDA proposes adopting the mid point of this range (1250 ppm) as the industrial cleanup level for SEAD 16 & 17.

Analyzing the remediation of SEAD 16 & 17 to 1250 ppm lead in soil is one appropriate remedial scenario within the feasibility study for SEAD 16 & 17. However, this should not ultimately preclude a scenario where remediation to a level less than 1250 ppm is possible, even if institutional controls are still necessary. Rather than having institutional control (such as deed restricting a property to industrial use) dictate an acceptable level of post-remedial contamination (i.e. maximum acceptable risk), institutional control should be utilized if the maximum practicable remediation does not allow for unrestricted use. The remediation eventually proposed for this site in the Proposed Plan may not be limited by the exact scenarios offered in the feasibility study.

It is also appropriate to analyze the feasibility of remediating soil to a level which will allow for unrestricted future use. This will entail analysis in the feasibility study of remediating soil contaminated by lead at levels lower than 1250 ppm, as well as remediating soil contaminated by any other contaminants that the revised risk assessment for this site may indicate are a concern.

While SEDA proposes that remediating SEAD 16 & 17 to 1250 ppm lead in soil is an appropriate scenario for the feasibility study, we want to make clear that we do not concur that 1250 ppm is an appropriate cleanup level for lead in soils at SEAD 16 & 17. Although 1250 ppm lead in soil may present an acceptable risk under an industrial use scenario, it is premature to decide before completion of the feasibility study that this should be the cleanup level for lead in soil at SEAD 16 & 17.

If you have any comments or questions on this matter, please contact me by telephone at (518)457-3976 or by e-mail at jaquinn@gw.dec.state.ny.us.

Sincerely,

James A. Quinn
Bureau of Eastern Remedial Action
Division of Environmental Remediation

c: C. Struble
D. Geraghty
M. Peachey

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

November 3, 1998

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

Seneca Army Depot Activity (SEDA) has received comments from both the United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (DEC) dated October 26, 1998 and October 30, 1998, respectively. These letters were responding to the revised proposed cleanup level for lead in soils at the Deactivation Furnaces, SEAD-16 and SEAD-17. SEDA proposed a cleanup level of 1250 ppm for lead in soils at these sites that are located within the Planned Industrial Development area.

A revised Feasibility Study (FS) using the above proposed cleanup level will be submitted by November 30, 1998. The remedial alternative that appears as the most likely preferred alternative will also be evaluated in an unrestricted use scenario to determine the ~~cost of the~~ institutional controls. EPA agreed that 1250 ppm for cleanup of lead in soils can be included in the Draft FS for SEADs 16 and 17 in order to begin their review. The DEC does not concur that 1250 ppm is an appropriate scenario for the feasibility study. However, the DEC has noted in their letter dated October 30, 1998 that the 1250 ppm lead in soils may present an acceptable risk under an industrial risk scenario.

Questions may be directed to Stephen M. Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.
30 Dan Road, Canton Massachusetts, 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy),P.O.
Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, Room 242
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-4349 FAX: (518) 457-4198

John P. Cahill
Commissioner

FAX TO
M DUCHESNEAU
K. HEALY

November 4, 1998

To STEVE ABSOLUM	From JIM QUINN
Co./Dept.	Co.
Phone #	Phone # (518) 457-3976
Fax # (607) 869-1362	Fax #

TOM ENROTH
MARY F

Mr. Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEDA)
5786 State Route 96
Romulus, NY 14541-5001

Dear Mr. Absolom:

Re: SEADs-16 & 17
Draft Feasibility Study
Seneca Army Depot, Site ID No. 850006

The New York State Department of Environmental Conservation (NYSDEC) has received SEDA's letter dated November 3, 1998 regarding the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17), and offers the following:

1) SEDA's letter states that, "(t)he DEC does not concur that 1250 ppm is an appropriate scenario for the feasibility study." The NYSDEC's position is to the contrary. NYSDEC's letter of October 30, 1998 referenced in SEDA's letter states, "(a)nalyzing the remediation of SEAD-16 & 17 to 1250 ppm lead in soil is one appropriate remedial scenario within the feasibility study for SEAD-16 & 17."

2) The NYSDEC understands SEDA's letter to indicate that SEDA plans to develop and screen potential remedial alternatives under an industrial use scenario only. The preferred remedial alternative under an industrial use will then be subjected to a simple calculation to determine the additional cost, under this single remedial alternative, of achieving the remedial goal of unrestricted future use of the property. This strategy may or may not be appropriate for this site, depending upon the information gained through the preliminary development of the feasibility study.

3) The Remedial Investigation for SEAD-16 & 17, which describes the nature and extent of contamination so that a FS can be completed, has not yet been finalized.

In the spirit of Paragraph 17.5 of the Federal Facility Agreement for this project, and considering comments 2 and 3 above, the NYSDEC urges the BCT to participate in detailed discussions on the developing FS throughout its three phases (development of alternatives; screening of alternatives; detailed analysis of alternatives.) As the agency most aware of the details of the developing FS at any particular time, SEDA should initiate these discussions when appropriate.

If you have any comments or questions on this matter, please contact me by telephone at (518)457-3976 or by e-mail at jaquinn@gw.dec.state.ny.us.

Sincerely,

James A. Quinn
Bureau of Eastern Remedial Action
Division of Environmental Remediation

c: C. Struble
D. Geraghty
M. Peachey

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO ATTENTION OF

November 12, 1998

Engineering and
Environmental Office

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Mr. Quinn:

This correspondence is being sent to address the letter SEDA received from your office dated November 4, 1998. It has been SEDA's intention to establish a reasonable level for cleanup of lead in soils at the Deactivation Furnaces in order to prepare the Feasibility Study for regulatory review.

The original Draft FS indicated a cleanup level of 500 ppm for lead in soils. This original concentration has been re-evaluated in accordance with the December 1996 USEPA publication "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil". The re-evaluated concentration was then proposed at 1750 ppm in the August 12, 1998 letter which was again revised and reduced to 1250 ppm following the discussions held at the August 18th and 19th BRAC Cleanup Team (BCT) meeting. SEDA intends to use the revised value of 1250 ppm lead in soils for the cleanup level as an industrial reuse scenario. A discussion in the FS will then address what appears to be the most likely preferred alternative. This "preferred alternative" will also be evaluated in an unrestricted use scenario to determine the cost of the institutional controls. We do not intend to perform a detailed analysis on all possible scenarios.

Your letter of November 4th stated that the Remedial Investigation (RI) document for this site is not finalized. This is true. The submission of the FS for sites at SEDA prior to finalizing the RI is being done to expedite the process. If the State prefers to finalize each phase of document submittal before reviewing the subsequent phase, the team can revert back to this slower method as described in the FFA. Then, as you suggested, the BCT can participate in detailed discussions on developing the FS throughout its three phases. This can be done for each site at Seneca, however, overall progress for the installation wide cleanup and property transfer will be delayed. It has already been three months since SEDA proposed a revised cleanup level for lead in soils and despite formal correspondence, electronic mail traffic, and open discussions at BCT meetings on this specific topic, an appropriate level to begin the process has yet to be accepted by the State.

The process of evaluating and selecting appropriate remedial methods of site remediation is determined during the review of the FS. SEDA will make every effort possible in order to expedite the preparation and review of documents without circumventing the process as defined in the Federal Facility Agreement. This may best be accomplished by removing the barriers that prevent open communication. SEDA invites all participants to propose ways of further streamlining this process.

Questions and comments may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Enclosure

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Copies Furnished:

Ms. Carla M. Struble, P.E., U.S. Environmental Protection Agency Emergency and Remedial Response Division, 290 Broadway, 18th Floor, E-3, New York, New York 10007-1866

Michael Duchesneau, Parsons Engineering Science, Inc., 30 Dan Road, Canton, Massachusetts 02021-2809

Commander, U.S. Corps of Engineers, Huntsville Division, ATTN: CEHND-ED-CS (Kevin Healy), P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth) SEDA Resident Office, Romulus, New York 14541-5001

Commander, U.S. Army Environmental Center, ATTN: SFIM-AEC-IRP (John Buck), Aberdeen Proving Ground, Maryland, 21010-5410

Commander, U.S. Army Center for Health Promotion and Preventive Medicine (Provisional), ATTN: MCHB-DE-HR (Keith Hoddinott), Aberdeen Proving Ground, Maryland 21010-5422

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO ATTENTION OF

November 30, 1998

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of the Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension to provide the updated revisions to the Draft FS for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due November 30, 1998.

SEDA requests a 30-day extension for the submission of the updated revisions to this document. Discussions about this site at recent BRAC Cleanup Team meetings and associated correspondence have resulted the need to make revisions. SEDA will use the proposed revised cleanup level of 1250 ppm for lead in soils at the Deactivation Furnaces. Currently the Army is also addressing concerns of the Draft Final Remedial Investigation (RI) for this document. It would be premature to re-submit the updated Draft FS before these concerns are resolved. The new submission date for the Draft FS will be December 30, 1998.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville Division, ATTN: CEHND-ED-CS (Kevin Healy), P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth) SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

January 4, 1999

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of the Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension to provide the updated revisions to the Draft FS for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due December 30, 1998.

SEDA requests a 30-day extension for the submission of the updated revisions to this document. This request is necessary as per discussions at recent BRAC Cleanup Team meetings and the need to also address issues concerning the Draft Final Remedial Investigation (RI) for this site. It would be premature to re-submit the updated Draft FS before these concerns are resolved. The new submission date for the Draft FS will be January 29, 1999.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Alicia Allen), P.O.
Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

January 27, 1999

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension to provide the updated revisions to the Draft FS for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due January 29, 1999.

On January 7, 1999, SEDA received additional comments from the EPA regarding the Army's response to comments to the revised Draft Final Remedial Investigation (RI) for the Deactivation Furnaces. The responses to these comments are currently due March 24, 1999 and if there are no disputes, the Draft Final RI would become final on April 23, 1999. It would be premature to resubmit the revised Draft FS before all RI concerns are resolved.

SEDA requests the new submission date for the Draft FS to be 40 days after the RI report becomes final. Currently, this date would be June 2, 1999. According to the Attachment 7 Schedule the new date for the Draft PRAP would be September 20, 1999 and the Draft ROD would be April 2, 2000.

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Alicia Allen)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Tom Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, Room 237
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-3976 FAX: (518) 457-8990

John P. Cahill
Commissioner

April 28, 1999

Donald C. Olson
LTC, U.S. Army
Commanding Officer
Seneca Army Depot
5786 State Route 96
Romulus, N.Y. 14541-5001

Dear Colonel Olson,

Subject: Seneca Army Depot Activity
Remedial Investigation Report
SEAD-16 & -17

I wish to bring to your attention a growing concern on the two referenced sites, which I hope we can resolve soon. On the one hand, the Seneca Army Depot's technical staff has assessed site risk and remedial alternatives based only on intended future use of the properties, and on the other, staffs from the State's Health and Conservation Departments are required by regulations and departmental policies to also assess the properties based on residential use and/or unrestricted use conditions.

We have discussed the issue both verbally and through written correspondence with the SEDA staff and have failed to reach agreement, and I suggest your further assessment to determine where leeway may be found. NYSDEC's major concern is that if resolution is not reached, there may be negative impacts on the subsequent documents, i.e., the Proposed Remedial Action Plans and the Records of Decision.

Please have your staff contact either Jim Quinn or me at 518-4457-3976.

Sincerely,

Marsden Chen

Marsden Chen

cc Robert Wing - USEPA, R2
Andy Carlson - NYSDOH
Sal Ervolina
Jim Quinn

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

June 1, 1999

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension to provide the updated revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due June 2, 1999.

On January 7, 1999, Seneca had previously requested extending this submittal, as the revised Draft Final Remedial Investigation (RI) for the Deactivation Furnaces was still in the comment/response to comment period. It would be premature to re-submit the revised Draft FS before all RI concerns are resolved. SEDA received EPA's letter dated May 20, 1999 extending the comment period to June 19, 1999. If there are no additional comments pertaining to the revised Draft Final RI, it would then become a final document.

SEDA requests the new submission date for the Draft FS to be 40 days after the RI report becomes a final document. Currently, the best case scenario for this date would be July 29, 1999.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	16 Nov 99
Draft ROD	29 May 00

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Donald C. Olson
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Dorothy Richards)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

July 28, 1999

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement (FFA) for Seneca Army Depot (SEDA), SEDA requests an extension to provide the updated revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due July 29, 1999.

SEDA requests a 30-day extension for the submission of the revised Draft FS. This request is necessary as other documents and submittals associated with the prison site and upcoming land transfers at Seneca have taken precedence. The new submission date for the revised Draft FS would be August 28, 1999.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	16 Dec 99
Draft ROD	28 Jun 00

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Brian K. Frank
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Dorothy Richards)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

August 31, 1999

Engineering and
Environmental Office

Ms. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement, Seneca Army Depot Activity (SEDA) requests an extension to provide the updated revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due August 28, 1999.

SEDA requests a 30-day extension for submission of the revised Draft FS. This request is necessary, as other documents associated with land transfers at Seneca have taken precedence. The new submission date for the revised Draft FS would be September 27, 1999.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	15 Jan 00
Draft ROD	28 Jul 00

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Brian K. Frank
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Dorothy Richards)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Thomas Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

September 27, 1999

Engineering and
Environmental Office

Mrs. Carla Struble, P.E.
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Ms. Struble/Mr. Quinn:

In accordance with Article 18 (Extensions) of the Federal Facility Agreement (FFA), Seneca Army Depot Activity (SEDA), SEDA requests an extension to provide the updated revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due September 27, 1999.

SEDA requests a 30-day extension for the submission of the revised Draft FS. This request is necessary, as other documents associated with current events as Seneca have taken precedence. The new submission date for the revised Draft FS would be October 27, 1999.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Deactivation Furnaces (SEAD-16/17) OU4

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	14 Feb 00
Draft ROD	27 Aug 00

If you have any questions, please contact Mr. Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Brian K. Frank
LTC, U.S Army
Commanding Officer

Copies Furnished:

Michael Duchesneau, Parson Engineering Science, Inc., Prudential Center, 101 Huntington Avenue, Boston, Massachusetts 02199-7697

Commander, U.S. Corps of Engineers, Huntsville Division, ATTN: CEHND-ED-CS (Kevin Healy/Dorothy Richards), P.O Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army Depot Activity, ATTN: CENAN-PP-E (Thomas Enroth), SEDA Resident Office, Romulus, New York 14541-5001

DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

October 26, 1999

Engineering and
Environmental Office

Mr. Julio Vazquez
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. James E. Quinn
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Mr. Vazquez/Mr. Quinn:

In accordance with Article 18 (Extensions) of our Federal Facility Agreement, Seneca Army Depot Activity (SEDA) requests an extension to provide the updated revisions to the Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. This document is currently due October 27, 1999.

SEDA requests a 30-day extension for the submission of the revised Draft FS. Many comments were addressed to finalize the RI. The FS, which was in Draft at that time the RI was being finalized, was placed on hold. The FS will now require additional scrutiny and review to be revised accordingly in order to compliment the findings of the RI. The new submission date for the revised Draft FS would be November 26, 1999.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Deactivation Furnaces (SEAD-16/17) OU4

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	15 Mar 00
Draft ROD	26 Sep 00

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

Brian K. Frank
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy/Dorothy Richards)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Tom Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, Room 242
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-4349 FAX: (518) 457-4198

John P. Cahill
Commissioner

Fax to:
Tom E
Mike
Kevin
Mary F

December 6, 1999

Mr. Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEDA)
5786 State Route 96
Romulus, NY 14541-5001

Dear Mr. Absolom:

Re: SEAD-16 and SEAD-17 Feasibility Study
Seneca Army Depot, Site ID No. 850006

The New York State Department of Environmental Conservation has received a document titled Draft Final Feasibility Study at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17.) It is our belief that this title is in error, and that the document should be titled as a revised Draft.

SEDA submitted the draft feasibility study (FS) for these sites in November, 1997. Before the regulatory agencies commented on the draft FS, SEDA notified the agencies that it no longer stood behind the submitted draft FS. SEDA explained that it planned to revise the clean-up proposals, and that a revised document would be submitted. All correspondence regarding this document since November,1997 has clearly referred to the pending FS submittal as a revised Draft FS.

Thus toward the requirements outlined in the Federal Facilities Agreement for this project, the NYSDEC considers the Feasibility Study at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) dated November, 1999, to be a revised Draft rather than a Draft Final as indicated. If you disagree, or have any questions on this matter, please contact me by telephone at (518)457-3976 or by e-mail at jaquinn@gw.dec.state.ny.us.

Sincerely,

James A. Quinn
Bureau of Eastern Remedial Action
Division of Environmental Remediation

c: J. Vazquez
D. Geraghty
M. Peachey
R. Scott

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL	# of pages ► 8
To Dv Dist	From S. Absolom
Dept./Agency	Phone #
Fax #	

New York State Department of Environmental Conservation

Division of Environmental Remediation

Bureau of Eastern Remedial Action, Room 242

50 Wolf Road, Albany, New York 12233-7010

Phone: (518) 457-4349 • **FAX:** (518) 457-4198

Website: www.dec.state.ny.us

Environmental Conservation 30 YEARS

John P. Cahill
Commissioner

March 31, 2000

Fax to
Tom E
Kevin
Mike
Mary F.

Mr Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEADA)
5786 State Route 96
Romulus, NY 14541-5001

RE: SEAD-16 and SEAD-17 Feasibility Study, Seneca Army Depot, Site ID No. 850006

Dear Mr. Absolom,

I have been reviewing the Feasibility Study (FS) for SEADs 16 and 17 and I have noted that there are still some unresolved issues in the remedial investigations for both SEADs.

I have also been looking at all of the correspondence between the Agencies concerning the SEADs 16 and 17 RI's and FS, (since the RI was submitted JAN 1997). The major issue is the basis for the baseline in the RI. The ARMY proposes that 1250 ppm lead should be the baseline in that the future use of the site will be industrial. It is NYSDEC policy to require unrestricted re-use as a baseline for site assessment. We notified the Army of this requirement for SEAD-16/17 in our letters dated 28 January 1998, 9 July 1998, 21 September 1998, 30 October 1998, 4 November 1998, and 28 April 1998. The proposed 1250 ppm cleanup level, from NYSDEC guidelines, has no place in the RI and should have been introduced and addressed in the FS in the development and screening of alternatives.

At this time, the Army is proposing a Low Temperature Thermal Desorption (LTTD) demonstration study at SEAD-17. Because of this, the present RI will not accurately categorize the SEAD 17 area, which will be impacted by contaminated soil brought in for the proposed LTTD study, or possible future use of the LTTD unit for the treatment of contaminated soil. Therefore, DEC will wait until the LTTD study is complete to re-evaluate the issues concerning the RI and FS. Please be aware that DEC proposes to table review of other documents concerning SEADs 16 and 17 until the issues concerning the RI are resolved and both the RI and FS are finalized.

If you have any questions please contact me by telephone at (518) 457-3976 or by e-mail at sxpaszko@gw.dec.state.ny.us.

Sincerely

Steve Paszko
Bureau of Eastern Remedial Action
Division of Environmental Remediation

c: J. Vazquez
D. Geraghty
M. Peachey
R. Scott
K. Healy

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DEPARTMENT OF THE ARMY
SENECA ARMY DEPOT ACTIVITY
5786 STATE RTE 96
ROMULUS, NEW YORK 14541-5001

REPLY TO
ATTENTION OF

May 24, 2000

Engineering and
Environmental Office

Mr. Julio Vazquez
U.S. Environmental Protection Agency
Emergency & Remedial Response Division
290 Broadway
18th Floor, E-3
New York, New York 10007-1866

Mr. Steven Paszko
NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
Bureau of Eastern Remedial Action
50 Wolf Road, Room 237
Albany, New York 12233-7010

Re: Submission of the Draft Final Feasibility Study (FS) for the Deactivation Furnaces (SEAD-16 & 17)

Dear Mr. Vazquez/Mr. Paszko:

In accordance with Article 18 (Extensions) of the Federal Facility Agreement (FFA) with Seneca Army Depot Activity (SEDA), SEDA requests an extension to provide response to comments for the updated Draft Feasibility Study (FS) for the Deactivation Furnaces, SEAD-16 and SEAD-17. The Draft Final FS document is currently due May 25, 2000.

Comments on the Draft FS were received from the Environmental Protection Agency (EPA) on March 10, 2000. The New York State Department of Environmental Conservation (NYSDEC) letter dated March 31, 2000 informed SEDA that the DEC will wait until study concerning the conversion of SEAD 17 into a Low Temperature Thermal Dessorption (LTTD) unit is complete before they will re-evaluate issues concerning the RI and the FS. Additionally, the DEC proposes to table review of other documents for SEADs 16 and 17 until the LTTD study is complete. In the interest of meeting Base Realignment and Closure (BRAC) cleanup goals, the Army is proceeding with these studies.

SEDA requests a 30-day extension for submission of the Draft Final FS. The corresponding Attachment 5 schedule was adjusted assuming no additional comments are received, therefore, achieving final document status on July 24, 2000. The new submission date for the Draft Final FS would be June 24, 2000.

The updated IAG Attachment 5 schedule for SEAD-16/17 is:

Draft RI/FS Work Plan	29 Mar 95
Draft RI Submission	08 May 97
Draft FS Submission	21 Nov 97
Draft PRAP	29 Jul 00
Draft ROD	09 Feb 01

Questions may be directed to Stephen Absolom, BRAC Environmental Coordinator, at (607) 869-1309.

Sincerely,

for Brian K. Frank
LTC, U.S. Army
Commanding Officer

Enclosure

Copies Furnished:

Michael Duchesneau, Parsons Engineering Science, Inc.,
30 Dan Road
Canton, Massachusetts 02021

Commander, U.S. Corps of Engineers, Huntsville
Division, ATTN: CEHND-ED-CS (Kevin Healy)
P.O. Box 1600, Huntsville, Alabama 35807

Commander, U.S. Army Corps of Engineers, Seneca Army
Depot Activity, ATTN: CENAN-PP-M (Tom Enroth)
SEDA Resident Office, Romulus, New York 14541-5001

Response to the Comments from the U.S. Environmental Protection Agency, Region II

Subject: Draft Final Feasibility Study at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) - Seneca Army Depot, Romulus, New York, November 10, 1999

Comments Dated: March 10, 2000

Date of Comment Response: August 20, 2000

USEPA REGION II – GENERAL COMMENTS:

1. Comment: The feasibility study for SEAD-16 and SEAD-17 proposes a soil cleanup goal for lead of 1,250 mg/kg. However, future use scenarios in the risk assessment also included two child receptor groups: child trespassers and children in day care. For the child in-day-care scenario, the Draft Final RI had applied the Integrated Exposure Uptake Biokinetic Model (IEUBK) for lead in children. Model results indicated that in order to achieve blood lead concentrations below the protective level of 10 μg/dL, the maximum allowable soil lead concentration would have to be 625 mg/kg. It is unclear how the proposed soil cleanup level of 1,250 mg/kg would be protective of the child-in-day care receptor.

   Response: As stated in the letters dated September 14, 1998 and October 1, 1998, SEDA's proposed cleanup level of 1,250 ppm for lead in soils based on the discussion at the BCT regarding the December 1996 USEPA publication "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil". The proposed soil cleanup level of 1,250 mg/kg will be protective of the child-in-day care receptor because the post-remediation average lead concentrations in soil at both SEAD-16 and SEAD-17 are less than 625 mg/kg (354 mg/kg for SEAD-16 and 370 mg/kg for SEAD-17). Using the average concentration for a representative area is recommended by the EPA for exposure analysis (USEPA: Supplemental Guidance to Rags: Calculating the Concentration Term). The arithmetic mean of lead concentrations in post-remediated surface soil will even be lower considering that lead concentrations in the backfill or capping material are low. Four out of 39 samples have lead concentrations greater than 625 mg/kg (ranging from 626 mg/kg to 720 mg/kg) in the post-remediated SEAD-16 with a proposed cleanup goal of 1,250 mg/kg for lead. For SEAD-17, two out of 38 samples have lead concentrations greater than 625 mg/kg (ranging from 697 mg/kg to 815 mg/kg). Thus, the remedial goal for 1,250 ppm lead in soils will protect child-in-day care receptor.

   In addition, according to Department of Housing and Urban Development's (HUD's) rule regarding lead-based paint poisoning in certain residential structures (24 CFR Part 35), soil-lead hazard is defined as spots or areas of bare soil outside of play areas with an average lead concentration equal to or exceeding 2000 ppm and spots or areas of bare soils inside of play areas with an average lead concentration equal to or exceeding 400 ppm. Therefore, the remedial goal for lead of 1,250 ppm in soils will comply with the HUD's rule and the post-remediation site will not pose unacceptable risks to a child whether or not the site is being used as a playground.

Table 2-3 and a discussion that the proposed soil cleanup level of 1,250 mg/kg would be protective of the child-in-day care receptor have been added to Section 2.5 of the FS report.

2. Comment: The FS report assumes that by remediating lead-contaminated soil other compounds that contribute risk will also be remediated (Section 2.5). This assumption needs to be substantiated. Additional metals that contribute substantially to the calculated risk at SEAD-16 and –17 are antimony, barium, copper, mercury, and thallium. A comparison of metals distribution in surface soil from Figures 4-2 through 4-5 and data results tables with the distribution pattern for lead indicated that most high concentrations of these other metals do coincide with the areas of high lead concentrations. However, the degree to which these other metals would be removed will depend on the final cleanup level for lead. Some of the mercury and copper concentrations at locations to the east and northeast of the 625 mg/kg and 1,250 mg/kg lead cleanup areas at SEAD-16 exceed the post-remediation exposure point concentrations presented in Appendix B. Determine whether the post-remediation concentrations for these metals would present unacceptable risk levels.

   Response: In general, based on the risk assessment presented in the FS, the post-remediation (1,250 mg/kg) average concentrations of metals would not present unacceptable risk levels.

   There are soil concentrations of antimony, copper, lead, mercury, thallium, and zinc which do exceed EPCs outside the proposed 1,250 mg/kg lead cleanup areas at SEAD-16 and SEAD-17. However, maximum metal concentrations that would be protective of day-care-child and residential child under the industrial and residential use scenarios were back-calculated for the above mentioned metals (antimony, copper, zinc, mercury, and thallium), excluding lead. This calculation was performed by assigning the total Hazard Index by ingestion of surface soil as 1. The Hazard Quotient was distributed among the five metals according to the post-remediation HQ for day-care-child at SEAD-16.

   Results indicate that metal concentrations of 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future industrial* use scenario. In addition, metal concentrations of 12.8 mg/kg, 256 mg/kg, 385 mg/kg, 1.92 mg/kg, and 2.56 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future residential* use scenario. Therefore, remediation cases for lead cleanup concentrations of 1,250 and 1,000 mg/kg have been revised to include areas with concentrations exceeding the above mentioned levels for the future industrial use scenario and the remediation case for lead cleanup concentrations of 400 has been revised to include areas with concentrations exceeding the above mentioned levels for the future residential use scenario. Therefore, these remediation cases will result with no unacceptable risk levels. Section 2.5 has been revised to include this information.

An additional case, which will remediate areas with lead exceeding 400 mg/kg or other metals exceeding TAGM values, has been included in FS Section 2 of the FS (2.5 and 2.8 as well as in Tables 2-4 and 2-5). This case would restore the site to predisposal conditions. The remediation area includes the area located to the east and northeast of the proposed remediation area for lead exceeding 1,250 mg/kg. It should be noted that the future land use of SEAD-16 and SEAD-17 has been designated for industrial purposes, not as a residential area, by the Seneca Army Depot Local Redevelopment Authority.

3. Comment: Alternative 3, which includes in-situ stabilization of soil and sediment and the placement of a permeable soil cover, was screened out on the basis of a qualitative and necessarily subjective score, while Alternative 2 (permeable soil cover), was retained. Alternative 3 should be retained for detailed analysis because it ranks higher than Alternative 2 in several of the effectiveness features (reductions in toxicity and mobility, permanence), provides a much higher degree of groundwater protection, and has the added advantage of avoiding off-site disposal of sediment. Alternative 3 can also be expected to compare favorably to Alternatives 4 and 6 on cost, and should also be considered for use as part of other alternatives.

   Response: In response to Specific Comment 44, the alternative ranking scores have been revised and are included in the FS. As a result, Alternatives 3 and 5 still have the lowest total scores among all the alternatives (both scored 12). Alternatives 2 and 3 are similar in that both leave soil in place and include placement of a soil cap. However, groundwater at the site does not present a human health risk and is not expected to be adversely impacted based on sampling and modeling results. Among the five balanced evaluation factors, Alternative 3 ranks higher than Alternative 2 in "LONG-TERM EFFECTIVENESS AND PERMANCE" and "REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT" while it ranks lower in "SHROT-TERM EFFECTIVEMESS", "IMPLEMENTIBILITY", and "COST". The total score for Alternative 3 (12) is lower than Alternatives 2 (19), 4 (22), and 6 (21). Considering the groundwater is not impacted at the site, Alternative 3 has little advantage over Alternative 2 in protecting groundwater and reducing toxicity and mobility.

4. Comment: In the remediation alternatives cost estimates (Appendix E), the Army assumes that contaminated soil between and around railroad tracks at SEAD-16 will not be remediated. The FS report text and figures do not reflect this assumption. Amend the FS report to indicate whether the Army plans to leave this contaminated soil in place, and revise the FS text to clarify that the cost estimates do not include remediation of the railroad track areas. Leaving this contamination, which represents the highest detected concentrations of carcinogenic PAHs to 1,159,000 μg/kg) and metals (lead to 140,000 mg/kg) (Draft Final RI Report, Figure 4-1 through 4-5) in place would be inappropriate because the associated risk would not be reduced. Provide clarification on whether the post-remediation exposure point concentrations (Appendix B) were calculated under the assumption that all surface soil contamination, including that between and around the railroad tracks, would be removed. If the contamination in the railroad track area will not be addressed, residual risk was not addressed adequately and the FS results and conclusions should be considered premature.

   Response: Agreed. All surface soil with lead concentration greater than 1,250 mg/kg will be remediated, including contaminated soil between and around the railroad tracks at SEAD-16. In order to do so, the railroad tracks and associated supports (*i.e.* ties and ballast) will be removed and the underlying soil will be excavated. The last assumption listed in Appendix E has been deleted and Appendix E has been revised to include the cost related to remediating soil in this area.

   The post-remediation exposure point concentrations (Appendix B) were calculated under the assumption that all surface soil contamination, including that between and around the railroad tracks, would be removed.

5. Comment: Given the concentrations of lead found in the soils at the site, it should be investigated whether on-site soils are characteristically hazardous. This possibility exists even for soils with lead concentrations below the proposed cleanup concentration of 1,250 mg/kg. If soil exceeding the TCLP criteria would be left in place, future land use may be impeded. Any remedial alternatives considered for these sites should include a sampling task that adequately characterizes the surface and subsurface soils for the toxicity characteristic.

   Response: Disagreed. The TCLP test is a very aggressive test, which does not necessarily represent in situ conditions. As discussed in response to General Comment 7, the metals in the site soil tend to strongly bind to the soil particles instead of leaching into the groundwater. Based on the risk assessment and modeling results, groundwater at the site does not present a human health risk and will not be adversely impacted in the future. The proposed cleanup goal is sufficient to protect human health and the environment according to the post-remediation risk assessment. Thus, TCLP testing is not necessary.

However, TCLP testing will be conducted to characterize excavated soil, sediment/soil found in the drainage ditches, and building material prior to disposal.

6. Comment: In the human health risk assessment for the future industrial worker, the ingestion of on-site soil and dermal contact with that soil were included in the exposure scenarios for SEAD-17, but not for SEAD-16. Explain why soil exposure was anticipated for one site, but not the other.

   Response: For SEAD-16, Building 366 and 311 were abandoned in the 1960's and are in poor, non-working conditions. In addition, there are no new buildings proposed at the site. Based on this information, future industrial workers are assumed to be office type workers working inside new buildings constructed at the site. Dermal contact or ingestion of on-site soil for future workers will not be a significant exposure pathway. Building 367 at SEAD-17 is a newer building, which was deactivated. The future use of the building is expected to be a generic industrial operation similar to the previous operation. Future industrial worker will be involved in activities, such as transporting material between the building and the open area, and as a result, will be exposed to on-site soil. Therefore, future industrial workers at SEAD-17 were considered for exposure scenario of ingestion of and dermal contact with on-site soil.

7. Comment: A remedial action objective identified by the FS on page 2-2 is to "Eliminate or minimize the migration of hazardous constituents from soil to groundwater and down gradient surface water." However, based on the modeling summary presented in Sections 1.4.1 and 1.4.2 there is a strong possibility that leaching of metals from contaminated soils to groundwater will have a significant long-term adverse impact on the quality of the groundwater at and adjacent to the sites. This is a concern that was not adequately addressed in the FS. Amend the FS to incorporate modeling that identifies what metal concentrations in soil will be protective of groundwater for metals leaching from the soil to groundwater. These concentrations should then be considered as soil cleanup goals (See comment 5 above).

   Response: The fate and transport model used in the RI consisted of a conceptual site model, water balance calculation, and the VLEACH model. The model used a simplified site scenario, a prediction of water balance based on historical data, parameter estimations including non site-specific parameter estimations, *etc.*, all of which contributed to uncertainties in the results. For example, using different K_d values from Dragun (1988) may result in maximum leaching concentrations ranging from 0.25 ppb to 305 ppm (RI Table 5-11). The model predicted metal concentrations in groundwater represents maximum leaching concentrations that are vertically mixed within the aquifer. The model provides insight of fate and transport of metals into groundwater, however, it was not intended to be used to establish clean-up goals because of its conservativeness.

In response to this comment, the model was re-run using site specific information. Subsurface soil samples and groundwater samples taken from SEAD-17 monitoring wells MW17-1, MW17-2, MW17-3, MW17-4 and samples taken from locations within 25 to 50 feet of each other at SEAD-16 were used to estimate the K_d values, the partition coefficient between soil and water. It is reasonable to assume that the partition equilibrium between the solid and the water phase has been achieved since the site conditions have persisted for over 40 years after the site was abandoned in the 1960s. The results suggest that the metals in the on-site soil tend to strongly bind to soil instead of partitioning into water. A summary of the estimated K_d values and their comparison with other references and K_d used in the VLEACH model is presented in the FS (Table 1-1 and Sections 1.4 and 2.5.2.). The estimated K_d values are much greater than the K_d values used in the VLEACH model for all metals except for mercury. For example, according to Dragun's observation, the K_d value of lead ranges from 4.5 to 7,640 ml/g compared to the FS estimated range of 6,696 to 21,400 ml/g. The FS's estimate is based on site-specific data and is in the high end of Dragun's observation. The RI model used 99 ml/g as K_d. Thus, the RI model overestimated the groundwater concentration and the impacts on groundwater quality by on-site soil. Based on the revised model results, it is not expected that groundwater deterioration from the on-site soil will occur in the future.

This conclusion is supported by the on-site groundwater sample results. Only aluminum, manganese, and iron exceeded NYS Class GA standard for samples collected in remedial investigation round at SEAD-16 and aluminum, manganese, iron, and sodium at SEAD-17. No other metals have concentrations exceeding NYS Class GA standard or MCL standard, nor pose significant risk to human health. Aluminum, manganese, iron, and sodium all occur naturally and their mean concentrations are not significantly different from the background concentrations. Therefore, on-site groundwater has not been adversely impacted.

8. Comment: Include a summary in the FS that briefly discusses the current source of drinking water for the two sites, the Depot, and the properties abutting the Depot. The summary discussion should address the number and location of wells and well depth, whether any of these wells have been sampled as part of the BRAC process, and it should provide sample results.

   Response: Agreed. A discussion of the off-site well inventory is presented in Section 1.7 of the Remedial Investigation. 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. Groundwater from the private wells has been used as a source of drinking water for some of the properties abutting the Depot. Two wells located on Yerkes Road east of Route 96 were approximately one mile away from SEAD-16 and SEAD-17 and they are upgradient of the site groundwater (Figures 3-6, 3-7, 3-15, and 3-16 in RI). No other private homes with private drinking water wells and no public supply wells were identified within a one-mile radius of both SEAD-16 and SEAD-17. According to the specific site condition (as presented in response to General Comment 7), metals tend to strongly bind to soil. Based on the data from the RI, groundwater does not appear to be adversely impacted. In addition, , groundwater quality is not estimated to be deteriorated in the future according to the VLEACH groundwater model.

Further, even in the unlikely event that groundwater was to be used as a source of drinking water, the requirements for quality and quantity must be satisfied. NYSDOH indicates that a private well should be developed from a water bearing formation at a depth greater than 20 feet below the ground surface. Water wells in the area of SEDA are screened in the bedrock at depths of 200 feet or more below ground surface. The approximate top of the bedrock unit (i.e. bottom of the till/weathered shale aquifer) is located at a depth of approximately 20 feet. Based on the vertical connection tests performed in six wells at the Ash Landfill and in six wells at SEAD-25 (RI Draft Final Report at the Ash Landfill Site, 1994 and RI Final Report at SEAD-25 and SEAD-26, 1998), the till/weathered shale aquifer is not significantly connected to the underlying bedrock aquifer. Considering that SEAD-16 and –17 are located approximately 2,000 feet from SEAD-25 and 10,000 feet from the Ash Landfill, and that SEAD-16 and –17 have similar site geology as SEAD-25 and the Ash Landfill, it is reasonable to conclude that the till/weathered shale and bedrock aquifers are not significantly connected at SEAD-16 and –17. Therefore, the site soil has no significant impact to the aquifer below the shallow groundwater aquifer.

Section 1.3.4 has been revised to include a discussion on the current source of drinking water for the Depot and the properties abutting the Depot and the drinking water wells at Seneca. The above discussion about impact of soil to the aquifer below the shallow groundwater aquifer has been included in Section 2.5.2. In addition, Figure 1-6 has been included to show the locations of the known private wells.

USEPA REGION II – SPECIFIC COMMENTS:

1. Comment Figures 1-3 and 1-4: Include a boundary for the operable unit for SEAD-16 and SEAD-17. The associated text should describe how the boundary was determined.

   Response: Agreed. A figure showing the approximate boundary of operable unit SEAD-16 and SEAD-17 has been added to Section 1 of FS (Figure 1-5). The boundary includes the area for the deactivation operation (the fenced area for SEAD-16 and the area encompassed by two unnamed roads for SEAD-17) and the delineated area proposed for the cleanup goal of 1,250 mg/kg for lead (as shown in Figure 2-1 and Figure 2-4). It should be noted that this boundary is not intended to be the proposed remediation area. It may be revised during the remedial design and construction process.

2. Comment Section 1.4.3rd ¶, page 1-14: The first sentence in this paragraph presents the inorganics of concern at SEAD-16 and SEAD-17. However, it is not clear why only these metals are of concern. Subsections 1.3.5.1 and 1.3.5.2 discuss other metals that exceed the referenced standards and guidelines in media for these sites. For example, cadmium, chromium, nickel, and zinc, which are leachable, exceeded the sediment guideline for both SEAD-16 and SEAD-17. Therefore, please clarify the first sentence. If the first sentence refers only to metals that were modeled, please state that.

   Response: Arsenic, antimony, copper, cadmium, lead, silver, and zinc are inorganics of concern at SEAD-16 and SEAD-17 because of their pervasiveness and magnitude of contamination in soil, building material, surface water, and sediment/soil in the drainage ditches and potential to impact groundwater. As a result, only these metals were modeled for fate and transport evaluation. Chromium and nickel contamination is not as pervasive as the above metals and both chromium and nickel bind very strongly to the soil (estimated K_ds for nickel and chromium are over 10,000 ml/g, see Table 2-5 in FS). Therefore, nickel and chromium are not expected to impact groundwater and were not included in the fate and transport model. The above statements have been added to Section 1.4 to support the first sentence.

3. Comment Sections 2.3.1 & 2.3.2, pages 2-4 & 2-5: Include a table summarizing the calculated HI and cancer risk values, or include references to the total risk tables in Appendix B.

   Response: Agreed. Existing Tables 2-3 and 2-4 summarize the calculated HI and cancer risk values. References to the tables have been included in Sections 2.3.1 & 2.3.2 and the tables have been renumbered to 2-1 and 2-2 now and moved to follow Section 2.3.2 for easy reference.

4. Comment Section 2.3.1, page 2-4, 3rd ¶: The third bullet in this paragraph should be deleted since the ingestion of on-site soil was not quantified for the future industrial worker (Table B-16PR-1, Appendix B). The third sentence in the following paragraph ("The elevated hazard index for the ingestion of on-site soil exposure pathway…) should also be deleted.

   Response: Agreed. The third bullet in this paragraph and the third sentence in the following paragraph have been deleted.

5. Comment Section 2.3.5, page 2-8: The first full paragraph discusses generally why no ecological remedial goals are necessary for the sites. This qualitative discussion is insufficient and not convincing. Please incorporate appropriate risk values to better justify the conclusion rather than using terms such as "a slight possibility" and "a small potential." Also, edit the text to help the reader understand why HQs of 10 and 100 (see Section 2.3.3) can be dismissed, rather than simply stating that "…the ecological community appears diverse and normal."

   Response: Agreed. The paragraph has been revised and a discussion of the ecological setting of the site has been added to replace the above statements.

   The quantitative ecological risk evaluation initially suggested that several COPCs may present adverse environmental effects. However, the ecological setting of SEAD-16 and SEAD-17 is not unique or significant – there are no endangered, threatened, or special concern species in the vicinity that are likely to be dependent on or afffected by the habitat at the site. The species that inhabit the site are not rare in the region and are not generally considered to be of special society value. The area of the site is small, and the habitat it provides appears to be relatively low in diversity and productivity. In addition, the future land use of SEAD-16 and SEAD-17 has been designated for industrial purposes. This will limit the access to the site by wild animals and limit the site being used as a habitat. Further, post-remediation ecological risk assessment was conducted and the results (Section 2.5.1.1) suggest that the soil is not expected to pose significant adverse effects to the environment after remediating soils with lead concentration exceeding 1,250 mg/kg. Therefore, there will be no ecological remedial goals for the sites and the above discussion has been included in Sections 2.3.5 and 2.5.1.1.

6. Comment 2.4, page 2-9: The first full paragraph on this page discusses groundwater ARARs and simply states that groundwater ARARs do not apply. The groundwater in the area is classified by New York State as Class GA fresh groundwater. The best usage for Class GA groundwater is as a source of potable water supply. Therefore, it must meet ARARs unless a waiver has been obtained. Has a use and values determination been made by the State that would allow the groundwater ARARs to be waived for these sites?

The text needs to provide a documented rationale for dismissing the groundwater ARARs.

Response: The remedial action is driven by the risks to the environment and human health instead of ARARs. According to Federal code 40 300.430: "The purpose of the remedy selection process is to implement remedies that eliminate, reduce, or control risks to human health and the environment." ARARs may be considered once a decision has been made for the remedial action. In this case, the groundwater condition at the site does not pose unacceptable risk to human health and therefore does not warrant a remedial action for groundwater.

In addition, only aluminum, manganese, and iron exceed NYS Class GA or USEPA MCL standard for samples collected in RI round at SEAD-16 and aluminum, manganese, iron, and sodium at SEAD-17. The site mean concentrations of above metals are not statistically different from their background concentrations (Table 6-2E, RI). The background groundwater concentrations of aluminum, manganese, and iron are 2,449 µg/L, 194 µg/L, 3,919 µg/L, respectively, which exceed the Safe Drinking Water Act (SDWA) standards (200 µg/L, 50 µg/L, and 300 µg/L, respectively for aluminum, manganese, and iron). According to this data, the potential use of the on-site groundwater for potable water supply is not expected. According to USEPA ("Superfund Program: Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements" 52 FR 32496 August 27, 1987), MCLs under SDWA are generally relevant and appropriate as cleanup standards for surface or ground water that is or may be used for drinking. Since the on-site groundwater is not for drinking water use and is not a potential drinking water source according to the above data, MCLs would not apply as ARARs. Section 2.4 has been revised to include this discussion.

7. Comment Section 2.4, page 2-9: In the second full paragraph on this page, the Federal Ambient Water Quality Criteria (AWQCs) should be added as TBCs.

   Response: Agreed. The Federal Ambient Water Quality Criteria (AWQCs) has been added to Section 2.4 as TBCs.

8. Section 2.4, page 2-10: The last sentence in the partial paragraph at the top of the page states that concentrations of other metals within and beyond the boundaries to be removed were considered relative to the appropriate TAGM value. Please refer the reader to the section of the FS where that information is presented. The FS should demonstrate that soil not removed based on lead concentration would not present unacceptable risk due to the presence of metals other than lead.

Response: Appendix A in the FS presents the analytical data with comparison to the appropriate TAGM values. Although certain metals exceed TAGM value for post-remediation scenario, they do not result in an unacceptable risk. This has been demonstrated in the risk assessment presented in the FS. It should be noted that the FS has been revised to include an additional remediation case to remove soil with a lead concentration greater than 400 mg/kg or other metals exceeding the TAGM values. The last sentence has been revised to state that concentrations of other metals within and beyond the boundaries to be removed were compared to the appropriate TAGM value. Post-remediation human health risks due to other metals have been added to the paragraph. A case which proposes cleanup area with lead exceeding 400 mg/kg has been added to FS. Refer to response to General Comment 2 for more information.

9. Comment Section 2.4.5, page 2-12: The analytical results for building materials appear to have been compared to soil TAGM recommended cleanup values (NYSDEC 1994). This is not appropriate. Some of the sampled material that was grouped as building material was actually propellant residue, and, as discussed in Specific Comment 60, sampling results indicate that some of the material will likely fail the TCLP test, resulting in a classification as a toxic characteristic waste. Select and present appropriate comparison criteria for the propellant residue, other waste materials and actual building materials, respectively. The analytical results for SVOCs and PAHs presented in this section do not match the building material sample results presented in the Draft Final RI. For example, for sample BS-10, a concentration of 54,000 µg/kg was reported for butylbenzlphthalate, not for total carcinogenic PAHs. In this sample, detection limits (DLs) for individual PAHs were 500,000 µg/kg, and no PAHs were detected above the DLs. The stated highest concentration for an individual PAH compound of 1,500 µg/kg was exceeded by several other PAHs in other samples. Review and correct the presented SVOC and PAH results. In addition to the listed metals that exceeded the TAGM values in all 12 building material samples, several other metals exceeded the TAGM criteria in between one and ten samples. Include this information.

Response: Disagreed. Human health risk assessment suggests that ingestion of or dermal contact with indoor dust may pose unacceptable risk to future industrial worker. Therefore, the remedial action objective is to remediate the building to levels which will reduce the risk to acceptable levels for a future industrial worker. Building material will be remediated according to this RAO. TCLP test will be conducted during the remedial process for disposal purposes and material that fails the TCLP test will be stabilized before disposal. Comparison of contaminant concentration in building material with the TAGM values was performed to provide an indication of the magnitude of the contamination and was not used to decide the remedial action.

Agreed. The SVOC and PAH sample results presented in Section 2.4.5 has been revised. In addition, other metals exceeding the TAGM criteria in other building samples have been added.

The responder does not fully understand the reference to "Specific Comment 60" stated in the third sentence of the question.

10. Comment Section 2.4.6, page 2-12: The discharge pipe referenced in this subsection is not shown on Figure 1-4, the SEAD-17 Site Plan. Edit Figure 1-4 to include the discharge pipe location.

    Response: Agreed. The approximate location of the discharge pipe has been included in Figure 1-4.

11. Comment Section 2.4.7, page 2-12:The statement that groundwater at SEAD-17 has not been significantly impacted should be substantiated by a discussion of metals results that exceeded the groundwater standards.

    Response: As discussed in response to Specific Comment 6, only aluminum, manganese, sodium, thallium, and iron exceed NYS Class GA standard for samples collected in remedial investigation round at SEAD-17. No other metals were detected to exceed NYS Class GA standard or MCL standard, nor do they result in unacceptable risks to human health. Aluminum, manganese, iron, and sodium all occur naturally and the mean concentrations of collected groundwater samples for these metals are not statistically different from the background concentrations. Therefore, the data indicate that the on-site groundwater has not been contaminated. This paragraph has been revised and the above discussion has been included to support the statement that groundwater at SEAD-17 has not been significantly impacted.

12. Comment 12 Section 2.5, page 2-14, 2nd ¶ This paragraph references the USEPA December 1996 publication which assessed risks associated with adult exposures to lead in soil. However, future use scenarios also include two child receptor groups: child trespassers and children in day care, which need to be addressed. For the child in-day care scenario, the Draft Final RI had applied the Integrated Exposure uptake Biokinet Model (IEUBK) for Lead in Children. Model results indicated that in order to achieve blood lead concentrations below the protective level of 10 μg/L, the maximum allowable soil lead concentration would have to be 625 mg/kg. Clarify how the proposed cleanup level for lead in soil of 1,250 mg/kg would be protective of child-in-day care receptor.

    Response: As stated in the response to General Comment 1, the proposed soil cleanup level of 1,250 mg/kg will be protective of the child-in-day care receptor because the post-remediation average concentrations of lead in soil at both SEAD-16 and SEAD-17 are less than 625 mg/kg. Although SEDA has proposed cleanup level of 1,250 ppm for lead in soils based on USEPA publications "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil", the arithmetic means of lead concentrations in post-remediated surface soil (354 mg/kg for SEAD-16 and 370 mg/kg for SEAD-17) are less than 625 mg/kg. Average concentration for a representative area is recommended by USEPA for exposure analysis (Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children). The arithmetic means of lead concentrations in post-remediated surface soil will even be lower considering that lead concentrations in the backfill or capping material are low. Four out of 39 samples have lead concentrations greater than 625 mg/kg (ranging from 626 mg/kg to 720 mg/kg) in the post-remediated SEAD-16 with a proposed cleanup goal of 1,250 mg/kg for lead. For SEAD-17, two out of 38 samples have lead concentrations greater than 625 mg/kg (ranging from 697 mg/kg to 815 mg/kg). Thus, the remedial goal for 1,250 ppm lead in soils will protect the child-in-day care receptor.

A discussion that the proposed soil cleanup level of 1,250 mg/kg would be protective of the child-in-day care receptor has been added to Section 2.5 of the FS report. It should be noted that in addition to the proposed cleanup goal of 1,250 mg/kg for lead, SEDA has also proposed three other cases (1,000 mg/kg, 400 mg/kg, 400mg/kg for lead and TAGM values for other metals), of which two propose cleanup goal of 400 mg/kg for lead (Section 2.8.1. and Section 2.8.2).

13. Comment Section 2.5, page 2-14, 3rd¶: The statement that by remediating lead-contaminated soil, other compounds that contribute risk will also be remediated, requires substantiation. Additional metals that contribute substantially to the calculated risk at SEAD-16 and 17 are antimony, barium, copper, mercury, and thallium. A comparison of metals distribution in surface soil from Figures 4-2 through 4-5 and data results tables with the distribution pattern for lead indicated that most high concentrations of these other metals do coincidence with the areas of high lead concentrations. However, the degree to which these other metals would be removed will depend on the final cleanup level for lead. Some of the mercury and copper concentrations at locations to the east and northeast of the 625 mg/kg and 1,250 mg/kg lead cleanup areas at SEAD-16 exceed the post-remediation exposure point concentrations presented in Appendix B. Determine whether the post-remediation concentrations for these metals would present unacceptable risk levels.

Response: As discussed in response to General Comment 2, the post-remediation (1,250 mg/kg) average concentrations of metals would not present unacceptable risk levels based on the risk assessment presented in the FS.

There are soil concentrations of antimony, copper, lead, mercury, thallium, and zinc which do exceed EPCs outside the proposed 400 mg/kg, 1,000 mg/kg, and 1,250 mg/kg lead cleanup areas at SEAD-16 and SEAD-17. However, maximum metal concentrations that would be protective of day-care-child and residential child under the industrial and residential use scenarios were back-calculated for the above mentioned metals (antimony, copper, zinc, mercury, and thallium), excluding lead. This calculation was performed by assigning the total Hazard Index by ingestion of surface soil as 1. The Hazard Quotient was distributed among the five metals according to post-remediation HQ for day-care-child.

Results indicate that metal concentrations of 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future industrial* use scenario. In addition, metal concentrations of 12.8 mg/kg, 256 mg/kg, 385 mg/kg, 1.92 mg/kg, and 2.56 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future residential* use scenario. Therefore, remediation cases for lead cleanup concentrations of 1,250 and 1,000 mg/kg have been revised to include areas with concentrations exceeding the above mentioned levels for the future industrial use scenario and the remediation case for lead cleanup concentrations of 400 has been revised to include areas with concentrations exceeding the above mentioned levels for the future residential use scenario. Therefore, these remediation cases will result with no unacceptable risk levels. Section 2.5 has been revised to include this information.

An additional case, which will remediate areas with lead exceeding 400 mg/kg or other metals exceeding TAGM values, has been included in FS Section 2 of the FS (2.5 and 2.8 as well as in Tables 2-4 and 2-5). This case would restore the site to predisposal conditions. The remediation area includes the area located to the east and northeast of the proposed remediation area for lead exceeding 1,250 mg/kg.

Thus, the assumption in the FS report is appropriate and the above discussion has been added to show the post-remediation concentrations for other metals would not present unacceptable risk levels.

14. Comment Section 2.5, page 2-15: The partial paragraph at the top of the page states that the determination to accept the residential use cleanup scenario will be considered if the cost comparison demonstrates that the cost to achieve the lower cleanup level is affordable. Cleanup concentrations should be based solely on the results of the risk assessment, including the lead risk analysis. As such, the required cleanup level would be 625 mg/kg for lead under the light industrial use scenario, which would require deed restrictions to prevent future residential use. If the goal is unrestricted site use, the

cleanup level should be changed to EPA's 400 mg/kg lead screening level for residential use. Affordability cannot be used as the determining factor in setting site cleanup levels.

Response: Disagreed. The remediation cleanup goal has been established to protect human health and the environment. As discussed in response to General Comments 1 and 2, the proposed remediation area with lead concentration greater than 1,250 mg/kg will protect all receptors. For a lead remediation goal of 1,250 mg/kg, the post-remediation surface soils exposure point concentrations are estimated to be 354 mg/kg and 370 mg/kg for SEAD-16 and SEAD-17, respectively, which are less than 400 mg/kg. Thus the remediation level of 1,250 mg/kg is protective of all receptors and does result in acceptable risk for residential use.

According to the Code of Federal Regulations: "Each remedial action selected shall be cost-effective, provided that it first satisfies the threshold criteria...". According to the site risk assessment, a remediation level of 1,250 mg/kg for lead will be protective of all the receptors (Refer to General Comment 1). Based on this information, it is appropriate to consider the cost when selecting a remedial action. The FS proposes several different cleanup goals for different use scenarios and comparison purposes. Cleanup levels will be determined depending on the future land use. At the same time, cost-effective analysis will be conducted and factored into the consideration.

15. Comment Section 2.5, page 2-15, 2nd ¶: It should be noted that in addition to the sediment cleanup value of 31 mg/kg, copper has been used as a cleanup criterion at Seneca Army Depot. At the Open Burning Grounds, sediment from Reeder Creek will be remediated to the NYSDEC sediment cleanup goal of 16 mg/kg. At SEAD-16, copper concentrations exceeded this criterion in all sediment samples. For any sediment remediation/removal at SEAD-16 and –17, copper (and possibly other metals exceeding NYSDEC sediment criteria) should be used as an additional cleanup criteria parameter. Include this requirement in this paragraph and amend the clean-up goal column in Table 2-1. Lead could be used as an indicator parameter to establish the original extent of sediment excavation (which cannot be defined on the basis of the presented sample data); however, to determine the final extent of excavation, sediment cleanup verification samples should be analyzed for all metals, as well as the organic analytical parameter groups that showed exceedances of State sediment cleanup criteria (SVOCs, pesticides, PCBs).

Response: Disagreed.

The ditches surrounding this site contain soil that is not considered as sediment.

According to the NYSDEC Technical Guidance for Screening Contaminated Sediments, *"Sediments can be loosely defined as a collection of fine-, medium-, and coarse- grain* *minerals and organic particles that are found at the bottom of lakes [and ponds], rivers [and streams], bays, estuaries, and oceans. Sediments are essential components of aquatic [and marine] ecosystems. They provide habitat for a wide variety of benthic organisms as well as juvenile forms of pelagic organisms."* Although the soil material located in the drainage swales and ditches consists of fine-, medium-, and coarse- grain particles, the nature of the soils is non-aquatic and the flow in the swales is variable. There are periods of time when the ditches are dry and vegetated. The ditches are not considered to be lakes [and ponds], rivers [and streams], bays, estuaries, or oceans. The soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies (Codes, Rules, and Regulation of the State of New York Title 6 – Conservation, 1996).

Also, the soil found in the ditches of SEAD-16 and SEAD-17 are similar in nature (*i.e.*, depth, particle size) to those found at the Seneca Open Burning Grounds. Results of the macroinvertebrate sampling in the drainage swale at Open Burning Grounds of Senca indicate that the nature of the habitat in the ditch soil is predominantly non-aquatic. Therefore, the nature of the soils found in the ditches is expected to be terrestrial instead of aquatic.

In addition, the NYSDEC sediment criteria adopted the lowest effect level for metals from Long and Morgan (1990) and Persaud *et al.* The lowest effect level was obtained from ecological bioassays of amphipod, bivalve, oyster, *etc.*, none of which has been detected in the soils found in the ditches. In addition, there is no unacceptable human health risk by ingestion of or dermal contact with the on site sediment/soil found in the drainage ditches.

Based on the above information, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. The FS has been revised to apply the soil cleanup level to the soils found in all the ditches. The term "sediment" has been replaced with the term "ditch soils".

16. Comment Section 2.5.1, page 2-15: The remedial action objective (RAO) presented in the last sentence in this subsection is not adequate. The RAO should be to reduce the risk for all receptor groups to acceptable levels based on the risk-derived cleanup concentrations and to achieve the cleanup goals for selected contaminants. In addition, the stated RAO of reducing the risk for a day care child is not included in Table 2-1. If this is to remain a remedial action objective, the soil cleanup level for lead needs to be changed to 625 mg/kg, as per the RI IEUBK modeling results.

Response: Agreed. The last sentence of the paragraph has been revised to: "The RAO is to reduce the risk for all receptor groups to acceptable levels based on the risk-derived cleanup concentrations and to achieve the cleanup goals for selected contaminants, which are lead, antimony, copper, zinc, mercury, and thallium". Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5 and have been revised to include the stated RAO to protect all receptors, which include day care child. Refer to response to General Comment 1 for more details about why soil cleanup level of 1,250 mg/kg for lead is protection of a day care child.

17. Comment 2-1 & 2-2, pages 2-16 & 2-17: Tables 2-1 and 2-2 do not include the remedial action objective of reducing the risk to a future day care child, as stated in Section 2.5.1 (page 2-15). If the protection of a future day care child is RAO, the soil cleanup level for lead needs to be changed to 625 mg/kg, as per the RI modeling results. Add another case for the 625 mg/kg cleanup goal for lead to both tables.
The extent of sediment and subsurface soil contamination is not well defined. This could result in significant increases in the volumes of soil and sediment requiring remediation. At both SEAD-16 and SEAD-17, results for all sediment samples significantly exceeded the applicable criteria for lead (31 mg/kg) and copper (16 mg/kg); however, the projected extent of sediment removal as shown in Figure 2-1 through 2-6 is projected to terminate only a few feet down gradient of the last samples. The most down gradient sediment samples at SEAD-16 and SEAD-17 had lead concentrations ranging from 175-1,250 mg/kg and 106-166 mg/kg, respectively. It is extremely unlikely that the lead sediment cleanup goals will be met at the projected boundaries of the sediment excavations, which are approximately 20-70 feet downstream from these sampling points. The presence and extent of subsurface soil contamination with lead at SEAD16 and SEAD-17 is also poorly defined. Soil borings were not co-located with the highest surface concentrations, and subsurface contamination above cleanup levels may exist. Conservative higher volume estimates should be used to determine whether reasonably anticipated larger soil and sediment volumes result in significant changes in the cost comparison of on-site and off-site treatment alternatives.
Include footnotes in Tables 2-1 and 2-2 that states the uncertainty associated with current volume estimates due to the poorly defined horizontal and vertical extent of contamination.

Response: Disagreed. Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5 and have been revised to include the stated RAO to protect all receptors, which include day care child. Refer to response to General Comment 1 for more details about why the soil cleanup level of 1,250 mg/kg for lead is protective of a day care child.

As discussed in response to Specific Comment 15, the soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms.

The nature of the soils found in the ditches is expected to be terrestrial instead of aquatic. Therefore, soil cleanup levels will be applied to the soils found in the drainage ditches. Figures 2-1 through 2-6 have been revised to reflect this change. According to the figures, the extent of the contamination of the soil found in the drainage ditches were reasonably defined.

Although soil borings were not co-located with the highest surface concentrations, soil borings were drilled in the general area where highest lead concentration were detected in the surface soil. Based on the subsurface soil test results obtained from areas with highest surface soil lead concentrations, the subsurface soil lead concentrations in these areas do not exceed 1,250 mg/kg. The uncertainty of the volume estimation has been considered in the detailed cost estimation by including an expansion factor of 30 percent for swelling. However, in response to the comments, an additional 10% has been included to address the uncertainty of the volume estimation for both soil and soil found in the drainage ditches.

Agreed. Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5 and footnotes have been included in the tables stating that due to the uncertainty of horizontal and vertical extent of contamination, current volume estimates may be subject to revision, as the remedial area extent is further defined.

18. Comment Table 2-1, page 2-16, Case 2: The basis for the RAO for Case 2 includes protection of groundwater, which is consistent with the text on page 2-2. If groundwater is to be protected from further degradation, the FS needs to present a basis for judging whether or not the objective has been achieved. Since ARARs exist for groundwater, modeling should be presented that identifies what cleanup goals for metals in soil would be protective of groundwater in the long term. As the modeling results in Section 1.4 indicate, long-term leaching of metals has the potential to contaminate groundwater to levels significantly above ARARs. Please revise the FS to include this necessary information. This same comment applies to Table 2-2, Case 1.

Response: Disagreed. As discussed in the response to General Comment 7, estimated K_d values from site samples suggest that the metals in the on-site soil tend to strongly bind to soil instead of partitioning into water. Thus, the groundwater quality is not expected to deteriorate. Although the model provides insight of fate and transport of metals into groundwater, it was not intended to be used to establish clean-up goals because of its conservativeness.

No metals other than aluminum, manganese, iron, and sodium have been detected to exceed NYS Class GA standard or MCL standard at SEAD-16 and SEAD-17 for samples taken during RI round. None of the metals tested impose significant risk to human health.

Aluminum, manganese, iron, and sodium all occur naturally and are not statistically different from the background concentrations in groundwater. As discussed in response to General Comment 6, the remedial action is driven by the risks to the environment and human health instead of ARARs. In this case, the groundwater condition at the site does not warrant a remedial action for groundwater, thus these standards do not apply as ARARs.

19. Comment Table 2-1, page 2-16, Case 3: Add additional sediment cleanup criteria values for metals (copper, and others as applicable) to the Case 3 cleanup goal. Also, the basis for the RAO for Case 3 appears to contradict the text in the first full paragraph on page 2-8, which states that there is a low to negligible risk to the ecosystem at the sites. If this is not a contradiction, please edit the FS to eliminate the apparent discrepancy. This same comment applies to Table 2-2, Case 2.

    Response: Disagreed. As discussed in response to Specific Comment 15, the soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies. In addition, the NYSDEC sediment criteria adopted the lowest effect level for metals from Long and Morgan (1990) and Persaud *et al.* The lowest effect level was obtained from ecological bioassays of amphipod, bivalve, oyster, *etc.*, none of which has been detected in the soils found in the ditches. In addition, there is no unacceptable human health risk by ingestion of or dermal contact with the soil found in the drainage ditches. Therefore, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. The FS has been revised to apply the soil cleanup level to the soils found in all the ditches. The RAO for ditch soil has been incorporated in the cases for the RAO for soil. The case for the RAO for ditch soil has been deleted and the following cases have been renumbered.

    Disagreed. Although there is a low to negligible risk to the ecosystem at the sites, improving the current terrestrial ecology and protecting them from future potential deterioration are one of the major bases for the RAO for soil and ditch soil. Responder thinks this comment is contradict to Specific Comment 21.

20. Comment Table 2-1, page 2-16, Case 4: The reference to 6 NYCCR 375-1.10 in the Remedial Objectives column and the lead cleanup goal of <1,000 mg/kg are mutually exclusive. NYCCR 375-1.10 states that "The goal of the program for a specific site is to restore that site to pre-disposal conditions, to the extent feasible and authorized by law," while the lead cleanup level of <1,000 mg/kg is based on a NYSDOH industrial use cleanup goal. Edit the Case 4 entries to eliminate this discrepancy and provide a reference to the NYSDOH cleanup goal. This same comment applies to Table 2-2, Case 3.

Response: Agreed. The remedial action objectives of Case 4 in Table 2-1 and Case 3 in Table 2-2 have been revised to "As with Case 2 and also to comply with New York State Department Of Health (NYSDOH) cleanup guidelines for industrial use". It should be noted that Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5. Case 4 in Table 2-4 and Case 3 in Table 2-5 have been renumbered to Case 3 and Case 2.

21. Comment Table 2-1, page 2-16, Cases 4 & 5: The basis for both cases should be amended to include the protection of groundwater and the protection of surface water. The same comment applies to Table 2-2, Cases 3 and 4.

    Response: The bases for Case 2 in Tables 2-1 and Case 1 in Table 2-2 include the protection of groundwater and the protection of surface water. Therefore, as stated for Cases 4 & 5 in Table 2-1 "As with Case 2" and Cases 3 & 4 in Table 2-2 "As with Case 1 ", the bases already included the protection of groundwater and surface water. It should be noted that Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5. Cases 4 & 5 in Table 2-4 and Cases 3 & 4 in Table 2-5 have been renumbered to Cases 3 & 4 and Cases 2 & 3, respectively.

22. Comment Table 2-2, page 2-17, Cases 1 & 3: The text entries in the "Sampling Locations" column appear to subsurface samples. Clarify this by adding the word "subsurface" to the sentences.

    Response: The "Sampling Locations" for Cases 1 & 3 are surface samples. Sample characteristics (*i.e.* surface, subsurface, ditch soil, building material) have been added to the sentences in Tables 2-1 and 2-2 to clarify sampling locations. It should be noted that Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5. Case 3 in Table 2-5 has been renumbered to Case 2.

23. Comment Section 2.5.4, page 2-21: In addition to the proposed sediment cleanup value for lead of 31 mg/kg, additional NYSDEC sediment criteria should be considered. Since copper is present in most sediment samples at elevated concentrations and has an HQ >100, while lead has an HQ> 10 (FS page 2-6), it appears that copper may be a better indicator parameter in sediment than lead. Please clarify why lead and not copper is used as the indicator contaminant.

    Response: Disagreed. As discussed in response to Specific Comment 15, the nature of the soils found in the ditches is expected to be terrestrial instead of aquatic. The soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies (Codes, Rules, and Regulation of the

State of New York Title 6 – Conservation, 1996). Also, results of the macroinvertebrate sampling in the drainage swale at Open Burning Grounds of Senca indicate that the nature of the habitat in the ditch soil is predominantly non-aquatic. Therefore, as lead is chosen as the indicator contaminant for soil, it is appropriate to be used as the indicator contaminant for ditch soil.

Lead and barium are characteristic heavy metals according to the past use of the site (SWMU, 1994). There is no unacceptable risk regarding to copper through exposure to ditch soil at SEAD-16 and SEAD-17. In addition, the high hazardous quotient (HQ) of copper is driven by one local hot spot which is located at the south-east corner of the delineated area. The hot spot has a copper concentration significantly larger relative to other samples. An post-remediation ecological risk assessment (Appendix B, Ecological Risk Assessment) suggests that while five metals (antimony, barium, lead, mercury, and thallium) in soil pose potential risks to deer mouse after remediation to the cleanup level of 1,250 mg/kg of lead, copper in soil and ditch soil has hazard index less than 1.

24. Comment Section 2.5.5, page 2-21: The RI also identified asbestos-containing materials in Building S-311 and 366. Will an asbestos removal be conducted as part of the remediation of the buildings?

    Response: Asbestos contained in roof debris and floor debris will be removed and disposed. However, remediation of asbestos-containing materials is not part of this remedial action. It will be addressed under separate action.

25. Comment Section 2.5.7, page 2-22: Site soil at SEAD-17 is a medium of interest because it contributes considerably to unacceptable risk levels, not only because detected metals concentrations exceed NYSDEC TAGM levels. The RAO at SEAD-16 and SEAD-17 is to remediate soil to levels deemed protective of human health. Rephrase the section to this and to be consistent with the stated remedial action goals for SEAD-16 soils.

    Response: Agreed. Section 2.5.7 has been revised to reflect that site soil at SEAD-17 is a medium of interest because it contributes considerably to unacceptable risk levels and that the RAO is to remediate soil to levels deemed protective of human health.

26. Comment Section 2.5.10, page 2-22: As for SEAD-16 sediment, lead should not be the only metal analyte that is used to determine the extent of remediation. Refer to Specific Comment 32.

    Response: Disagreed. As discussed in response to Specific Comment 15, the soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies. In addition, the NYSDEC sediment criteria adopted the lowest effect level for metals from Long and Morgan (1990) and Persaud *et al.* The lowest effect level was obtained from ecological bioassays of amphipod, bivalve, oyster, *etc.*, none of which has been detected in the soils found in the ditches. In addition, there is no unacceptable human health risk by ingestion of or dermal contact with the soil found in the drainage ditches. Therefore, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. The FS has been revised to apply the soil cleanup level to the soils found in all the ditches. It should be noted that although soil cleanup levels were set up for lead for most of the cases, as discussed in response to General Comment 2, area with other metal concentrations (such as antimony, mercury, zinc, copper, and thallium) exceeding the respective maximum concentration to be protective of human health was included in the delineated area.

27. Comment Table 2-3b, page 2-29: Why are the calculated post-remediation risks for ingestion of on-site soil higher than pre-remediation risks? The same values are included in the corresponding tables in Appendix B.

    Response: The risk assessment is based on the exposure point concentration, which is the 95% upper confidence limit of the arithmetic mean of selected samples. For the baseline risk assessment, all samples collected at the site were used to estimate the EPC values. For the post-remediation risk assessment, samples collected outside the delineated boundary were used to estimate the EPC values. Samples outside the delineated boundary generally have elevated concentrations of benzo(a)pyrene, benzoanthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene, *etc.* Therefore, the calculated post-remediation risks for ingestion of on-site soil are higher than pre-remediation risks. However, this does not necessarily indicate higher risks for post-remediation site because concentrations in the clean refill material are not included in the estimation of EPC values for post-remediation risk assessment.

28. Comment Table 2-4b, page 2-31: Why are the calculated pre-remediation and post-remediation risks the same for the soil exposure pathways?

    Response: The calculated post-remediation risks are slightly lower than pre-remediation risks. For example, the pre-remediation risk for current site worker by ingesting on-site soil is 4.47e-7 and the post-remediation risk is 3.69e-7. The values in Table 2-4b were presented to only one decimal point. Table 2-4b has been renumbered to Table 2-2b and has been revised to report values to two decimal points.

29. Comment Section 2.8.1, page 2-32, 1st ¶: The last sentence in this paragraph is correct only for the calculated risk presented in Table 2-3, but does not take into account the

impact of lead in soil for the future child-in-day-care receptor. Refer to General Comment 1.

Response: Disagreed. As discussed in the response to General Comment 1, the remedial goal for 1,250 ppm of lead in soils will protect the day care child receptor. Therefore, the statement that the risk will be reduced to within acceptable levels upon the remediation of the building, soil to 1,250 mg/kg is valid.

30. Comment Section 2.8.1. page 2-32, last ¶: Revise the objectives summary for Case 3 according to the changes made in response to Specific Comment 26.

Response: As discussed in response to Specific Comment 15, the soils found in the ditches do not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. The ditches and swales surrounding this and many other sites are not classified by the NYSDEC as surface water bodies. In addition, the NYSDEC sediment criteria adopted the lowest effect level for metals from Long and Morgan (1990) and Persaud *et al.* The lowest effect level was obtained from ecological bioassays of amphipod, bivalve, oyster, *etc.*, none of which has been detected in the soils found in the ditches. In addition, there is no unacceptable human health risk by ingestion of or dermal contact with the soil found in the drainage ditches. Therefore, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. The FS has been revised to apply the soil cleanup level to the soils found in all the ditches. It should be noted that although soil cleanup levels were set up for lead for most of the cases, as discussed in response to General Comment 2, area with other metal concentrations (such as antimony, mercury, zinc, copper, and thallium) exceeding the respective maximum concentration to be protective of human health was included in the delineated area. Section 2.8.1 has been revised according to the above discussion. It should be noted that the RAO of ditch soil has been incorporated in the cases for the soil RAO (Cases 2, 3, 4, 5 for SEAD-16 and Cases 1, 2, 3, and 4 for SEAD-17) and there is no separate case for the ditch soil RAO in the final FS.

31. Section 2.8.1, page 2-33. 1st & 2nd ¶: The second to last sentence in the first full paragraph cites a concentration of 1,250 mg/kg that will be used in determining the vertical extent of excavation at the site. It appears that for a stated cleanup goal of 1,000 mg/kg, that value should be used. The same type of inconsistency was found in the third paragraph, where than value 1,250 mg/kg should be 400 mg/kg. Review and correct. In addition, it should be noted that changing the cleanup goal value from 1,250 to 1,000 and 400 mg/kg is very likely to affect the absolute depth of the subsurface soil excavation, which was assumed as 3 feet in all three cases. Since only limited subsurface soil data area available, the depths of excavation are difficult to predict and should be deleted.

Response: Agreed. Section 2.8.1 has been revised to maintain consistency with the cleanup goal for the different cases.

The vertical limits of the excavation area were based on a depth of 12 inches below the depth of the deepest sample with lead concentration exceeding the proposed cleanup goal or other metal concentration exceeding the maximum concentrations to be protective of human health. Although we agree that changing the cleanup goal value from 1,250 to 1,000 and 400 mg/kg is likely to affect the absolute depth of the subsurface soil excavation, an estimate of the remediation depth is necessary to develop a cost estimate. It should be noted that the final excavation depth will be based on cleanup verification. Section 2.8.1 has been revised to reflect that 3 feet is used for cost estimating purposes only instead of defining the vertical excavation depth.

32. Comment Section 2.8.2. 1st ¶, page 2-33: The last sentence in this paragraph is correct only for the calculated risk presented in Table 2-4, but does not take into account the impact of lead in soil for the future child-in-day-care receptor. Refer to General Comment 1.

Response: As discussed in the response to General Comment 1, the remedial goal for 1,250 ppm of lead in soils will protect the day care child receptor. Therefore, the statement that the risk will be reduced to within acceptable levels upon the remediation of the building, soil to 1,250 mg/kg is valid.

33. Comment Section 2.8.2, page 2-34, last ¶: Revise the objectives summary for Case 2 according to the changes made in response to Specific Comment 25.

Response: The general objectives are presented in Section 2.5 and Tables 2-1 and 2-2. Section 2.8.2 is aimed to quantifying volume of building material, soil, and ditch soil to be remediated. Therefore, the objectives discussed in this section are to specifically define the different remedial actions which are considered. As such, we have defined the delineated areas with concentrations that exceed the cleanup goals. This section has been revised to delete reference to "The objective of" for all cases discussed.

Note that if this comment is intended to refer to Specific Comment 26 and Section 2.8.2, page 2-34, first ¶, please refer to response to Specific Comment 30. It also should be noted that the RAO of ditch soil has been incorporated in the cases for the soil RAO (Cases 2, 3, 4, 5 for SEAD-16 and Cases 1, 2, 3, and 4 for SEAD-17) and there is no separate case for the ditch soil RAO in the final FS.

34. Comment Figures 2-1 through 2-6: The furnace and boiler stacks at SEAD-16 and SEAD-17 should be cleaned as a component of the site remediation to prevent recontamination

of remediated soils that could occur during future demolition. In addition, the abandoned sewer line at SEAD-16 should be removed or cleaned as part of the site remediation to prevent recontamination of remediated soils and off-site migration of contamination. Include this in the RAOs, and indicate in the FS how the sewer line has been abandoned.

Response: Agreed. The material, debris, and dust in the furnace and boiler stacks at SEAD-16 will be cleaned. These activities have been included in the cost estimate.

For SEAD-17, the Army is at this time proposing a Low Temperature Thermal Desorption (LTTD) demonstration study at the site. The furnace and boiler stacks will be closed under RCRA after the demonstration study. Section 2.8.1, 4.3.2 and Section 6.3 have been revised to clarify the status of the furnace and boiler stacks.

The sewer line at SEAD-16 has been inactive since the site was abandoned in the 1960s. The sewer discharged to the Sewage Treatment Plant (STP) No. 4, which is located at SEAD-20. STP No. 4 receives municipal sewage from the administration area, the Military Elliot Acres housing Complex, and the adjacent civilian communities of Romulus and Varick. It is regulated by the NYSDEC under SPDES Permit No. NY0021296 and has not reported a SPDES violations in the past 3 years. Seneca does not have industrial discharges to its sewage treatment plants. The sewer line was installed concurrently with other sewer lines of Seneca, which are currently in use and are generally in good working conditions. In addition, metal concentrations of subsurface soil samples obtained around the SEAD-16 sewer line area are generally less than the concentrations from surface soil samples obtained in the same area. Results of groundwater samples from monitoring well MW16-1 indicate that the groundwater is not adversely impacted. Based on this information, it does not appear that there is a threat to the environment or the public health from the sewer line and that cleaning or removal of the sewer line is not necessary. Section 2.5.5 has been revised to include additional information regarding the sewer line.

35. Comment Figures 2-1 through 2-3: The estimated limits of excavation in Figures 2-1 through 2-3 contain considerable uncertainty because the extent of soil contamination above the three presented cleanup goals is unknown in the east-southeast to southeast portion of the site. South-southeast is one of the two primary wind directions in the region, therefore, surface soil contamination may extend further to the southeast and east than projected in the figures. Downwind sample SS 16-500-S, which is located approximately 300 feet from the southeastern extent of the projected excavation areas, was the only sample in the downwind southeast quadrant from the stack. The FS text should discuss the need for this additional sampling and include a cost estimate for its completion, and include a pre-design task for further characterization of metals concentrations in downwind soil (i.e., east to south) beyond the currently proposed extent

of soil remediation. Alternatively, this task could be incorporated into the remedial action. However, as a pre-design task, additional delineation sampling would provide a better basis for estimating the soil volume requiring remediation, and assure greater cost realism in the FS.

Response: The current delineated area was derived using the RI data and engineering judgment. As part of the pre-design task, additional surface soil samples will be obtained in the southeast and east area. The results will be used to revise the boundary as necessary. It should be noted that the possible variability in the volume and area of the delineated area has already been incorporated in the cost estimate (refer to response to Specific Comment 17). This statement has been added to Section 6.3.

36. Comment Table 3-1. Pages 3-2 through 3-7:

Institutional Controls: The deletion of Land Use Restrictions (LURs) seems to be inappropriate because some mechanism is needed that will restrict future land use of the property to industrial use only, and possibly prevent the use of site groundwater as drinking water.

Containment: Screening comments for the soil cap should note that it will not prevent migration of metal contamination to groundwater.

Disposal: The off-site and on-site remedial RCRA Hazardous Waste Landfill options should not be deleted because characteristic hazardous remediation waste may need to be disposed of at such a facility. This would occur if treatment of the remediation waste did not remove the hazardous characteristic but did provide sufficient reduction to meet Land Disposal Restrictions. Also, based on this possible scenario, the description of this process operation should be modified because RCRA Subtitle C Landfills are not just for disposal of listed hazardous wastes.

Response: Agreed. Land Use Restrictions (LURs) will be kept as a remedial technology for institutional controls for the possible need to restrict future land use of the property to industrial use only, and possible prevention of using site groundwater as drinking water. Section 3.2.2 has been revised to reflect this change.

Agreed. The containment case has been revised to include that the soil cap will not prevent migration of metals to groundwater. However, as discussed in response to General Comment 7, the metals in the site soils tend to strongly bind to the soil particles instead of leaching into the groundwater. Thus, it is not expected that groundwater deterioration would result from the on-site soils.

Agreed. The off-site and on-site remedial RCRA Hazardous Waste Landfill options have been retained and Section 3.2.2 has been revised to reflect this change. It should be noted that the on-site Landfill was screened out during the alternative screening stage (Section

4). Using the off-site Subtitle C Landfill should also be limited for example by treatability studies conducted forehead to ensure the stabilized soil meets the Subtitle D Landfill standards.

37. Comment Section 3.2.2. page 3-9: The third paragraph discusses LURs and eliminates them from further consideration. This is not appropriate because LURs would be applicable when applied in conjunction with other remedies, and would provide protection that other remedies by themselves may not achieve. Further, it is not clear how the designated future industrial land use, as determined through the BRAC process, will ensure that the land will remain industrial in perpetuity. LURs should be retained.

   Response: Agreed. Section 3.2.2 has been revised to retain LURs as one of the institutional control technologies.

38. Comment Section 3.2.2. page 3-10: The partial sentence at the top of the page mentions that private residences adjacent to SEAD-16 and SEAD-17 obtain water from private wells. This is a concern. The FS has not adequately summarized the number and locations of private wells in the vicinity of the sites, the depth of the wells, and whether these wells are used for drinking water. This is a critical lack of information because this FS does not propose to cleanup groundwater or protect it from further degradation by setting remedial goals to reduce leaching to acceptable levels.

   Response: As discussed in response to General Comment 8, a discussion of the off-site well inventory is presented in Section 1.7 of the RI. The closest two known wells, which are located on Yerkes Road east of Route 96, are approximately one mile away from the sites and they are not in the down gradient direction of groundwater (Figures 3-6, 3-7, 3-15, and 3-16 in RI) or surface runoff (Figures 3-1 and 3-11 in RI). No other private homes with private drinking water wells or public water supply wells were identified within a one-mile radius of both SEAD-16 and SEAD-17.

   According to the specific site condition, metals tend to strongly bind to soil and the groundwater quality is not estimated to be deteriorate in the future. The groundwater is not adversely impacted according to the groundwater sampling data from the RI round. Further, even in the unlikely event that groundwater was to be used as a source of drinking water, the requirements for quality and quantity must be satisfied. NYSDOH indicates that a private well should be developed from a water bearing formation at a depth greater than 20 feet below the ground surface. Water wells in the area of SEDA are screened in the bedrock at depths of 200 feet or more below ground surface. The approximate top of the bedrock unit (i.e. bottom of the till/weathered shale aquifer) is located at a depth of approximately 20 feet. Based on the vertical connection tests performed in six wells at the Ash Landfill and in six wells at SEAD-25 (RI Draft Final

Report at the Ash Landfill Site, 1994 and RI Final Report at SEAD-25 and SEAD-26, 1998), the till/weathered shale aquifer is not significantly connected to the underlying bedrock aquifer. Considering that SEAD-16 and –17 are located approximately 2,000 feet from SEAD-25 and 10,000 feet from the Ash Landfill, and that SEAD-16 and –17 have similar site geology as SEAD-25 and the Ash Landfill, it is reasonable to conclude that the till/weathered shale and bedrock aquifers are not significantly connected at SEAD-16 and –17. Therefore, the site soil has no significant impact to the aquifer below the shallow groundwater aquifer.

Section 1.3.4 has been revised to include a discussion on the current source of drinking water for the Depot and the properties abutting the Depot and the drinking water wells at Seneca. The above discussion about impact of soil to the aquifer below the shallow groundwater aquifer has been included in Section 2.5.2. In addition, Figure 1-6 has been included to show the locations of the known private wells.

39. Comment Section 3.2.7.2. page 3-24: According to the fourth sentence in this subsection off-site disposal will allow the unimpaired future use of the site. This is incorrect because the proposed cleanup goal (1,250 mg/kg for lead) would not allow unrestricted residential use of the site. Delete the statement or edit this sentence to eliminate this ambiguity .

    Response: Disagreed. As stated in the response to General Comment 1, The arithmetic means of lead concentrations in the post-remediated surface soil (354 mg/kg for SEAD-16 and 370 mg/kg for SEAD-17) are less than 400 mg/kg. USEPA recommends using a simple average or arithmetic mean of soil lead concentrations from a representative area (Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children). Based on this approach, using the average concentration for a representative area is appropriate for screening lead-contaminated soil. In addition, USEPA recommends 400 ppm in bare soil (*Guidance on Residential Lead-Based Paint, Lead-Contaminated Dust, and Lead-Contaminated Soil*) to be protective of human health. The remediation action in SEAD-16 and SEAD-17 will include placing topsoil and establishing vegetative growth after remediating soils in the delineated area. This will decrease the exposure to the lead. Based on the above information, the proposed cleanup goal (1,250 mg/kg for lead) complies with USEPAs default value of lead for the residential use scenario and would allow unrestricted residential use of the site.

    A discussion that the proposed soil cleanup level of 1,250 mg/kg complies with the residential use scenario has been added to Section 3.2.7.2 of the FS report.

40. Comment Section 3.2.7.2. page 3-25: On this page, the term "TSD facility" is incorrectly used to identify RCRA hazardous waste disposal facilities. Replace the term with "Subtitle C facility".

Response: Agreed. The term "TSD facility" is replaced by the term "Subtitle C facility".

41. Comment Section 3.2.7.2. page 3-25. Last ¶: As discussed in the comments for Table 3-1 (Comment 48), a RCRA Subtitle C landfill option should not be dismissed from consideration at this step in the selection process for either the on-site or off-site disposal options.

Response: Agreed. A RCRA Subtitle C landfill option has been retained at this step. Section 3.2.7.2 has been revised to reflect this change. As discussed in response to Specific Comment 36, it should be noted that on-site Landfill has been screened out during the alternative screening stage (Section 4) and that using off-site Subtitle C Landfill should also be limited for example by treatability studies conducted forehead to ensure the stabilized soil meets the Subtitle D Landfill standards.

42. Comment Section 4.3.2. pages 4-4 through 4-9: The tested building materials (debris and residue) from buildings S-311 and 366 contained very high levels of 2,4-dinitrotoluene and several metals. This material will have to be analyzed for toxic characteristics via the TCLP method prior to disposal. For costing purposes, all material should be assumed to fail TCLP and to require treatment prior to disposal. Include TCLP testing in this section of the FS as a pre- design task, and include a cost estimate for the required sampling and analysis. Alternatively, this work task and its associated costs could be included in the remedial action.

Response: Agreed. Cost associated with TCLP testing of building materials has been included in the cost estimate. For cost estimating purposes, it was assumed that all material fails the TCLP test and will require stabilization prior to off-site disposal (Appendix E, Assumptions). TCLP testing of building material, excavated soil and ditch soil will be conducted prior to disposal. However, it will not be included in the FS as a pre-design task.

43. Comment Section 4.3.2.2. page 4-4: The discussion in this subsection should include that the permeable soil cap is not designed to reduce leaching of metals to groundwater. As indicated by the modeling results presented in Sections 1.4.1 and 1.4.2, groundwater quality is projected to deteriorate, resulting in violations of groundwater quality standards. The placement of a permeable soil cap would enlarge the leaching column but would not reduce the degree of leaching.

Response: Agreed. Section 4.3.2.2 has been revised to include a discussion that the permeable soil cap is not designed to reduce leaching of metals to groundwater. However, according to the response to General Comment 7, estimated K_d values from site sampling suggest that the metals in the on-site soil tend to strongly bind to soil instead of partitioning into water. Estimated K_d values are much greater than the K_d values used in the VLEACH model for all metals. Thus, the RI model overestimated the groundwater concentration and the impacts on groundwater quality by on-site soil. Based on the revised model results, it is not expected that groundwater deterioration from the on-site soil will occur in the future. This conclusion is supported by the on-site groundwater sample results. Only aluminum, manganese, and iron exceeded NYS Class GA standard for samples collected in remedial investigation round at SEAD-16 and aluminum, manganese, iron, and sodium at SEAD-17. No other metals have concentrations that exceeded NYS Class GA standard or MCL standard, nor pose significant risk to human health. Aluminum, manganese, iron, and sodium all occur naturally and their mean concentrations are not significantly different from the background concentrations. Therefore, on-site groundwater has not been adversely impacted.

44. Comment Section 4.4. page 4-9: The screening process used in the FS is described as a qualitative screening; however, it assigns ranking scores and uses the overall quantitative score for retaining or rejecting alternatives. Under this approach, all listed rating categories are weighted equally and therefore have the same influence on the overall screening score. This approach should be revised. In a first screening step, all alternatives should be evaluated against the two remedy selection threshold factors (overall protection of human health and the environment; ARAR compliance) for a pass/fail/waiver decision. In a second screening step, the retained alternatives should be evaluated against the five primary balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost). For this screening step, the presented approach could be used. The two modifying criteria of the remedy selection process (State/agency acceptance; community acceptance) should be fully assessed following the comment period for the FS report and the proposed plan.

Response: Agreed. The screening process presented in Section 4.4 and Table 4-2 has been revised according to the comment. All alternatives except Alternative 1 (No Action) pass the first screening step and in the second screening step, the factors presented in the Draft Final FS are used and categorized into five primary balancing criteria. Section 4.1 has been revised to include that the two modifying criteria of the remedy selection process (State/agency acceptance; community acceptance) will be fully assessed following the comment period for the FS report and the proposed plan.

45. Comment Section 4.5.2.3. page 4-14: As detailed in the preceding comment, the scoring criteria were not applied correctly to the short-term environmental impact category. Rescore and revise this section accordingly.

Response: The question is not fully understood, however, the screening process and Table 4-2 have been revised according to the preceding comment. Short-term environmental effectiveness has been incorporated into the short-term effectiveness criterion.

46. Comment Section 6.1. page 6-1. 2nd ¶: The reference to site-specific cleanup goals "established between NYSDEC, the USEPA, and the Army " is incorrect. The referenced cleanup goals which are presented in Tables 2-1 and 2-2 are the Army-proposed lead clean-up value of 1,250 mg/kg, one NYSDOH industrial use standard and the 400 mg/kg lead value deemed protective for residential use by EPA. Rephrase this paragraph and include that final cleanup goals for SEAD-16 and -17 have not been agreed upon between the Army and regulatory agencies.

    Response: Agreed. Tables 2-1 and 2-2 have been renumbered to Tables 2-4 and 2-5 and have been revised to reflect that the cleanup goals are proposed by the Army to protect human health and the environment and meet USEPA requirements for lead clean-up or NYSDOH industrial use standard. A statement that final cleanup goal values for SEAD-16 and -17 will be established between NYSDEC, the USEPA, and the Army has been added to the paragraph.

47. Comment Table 6-1. page 6-4¶: For Alternative 2, only sediment will be excavated and tested for TCLP. Review and change all references to soil testing and treatment to sediment. Also, include the thickness of the proposed soil cover, which according to page 4-5 will consist of twelve inches of loam or topsoil.

    Response: Agreed. Table 6-1 has been revised to reflect that for Alternative 2, only soil in the drainage ditches will be excavated and tested for TCLP. The thickness of the proposed soil cover (6 inches of topsoil and 6 inches of common fill) has been included.

48. Comment Section 6.3. page 6-7. 3rd bullet: Five-year review required under CERCLA refers to the evaluation of the remedial action as a whole, and not just the monitoring program as stated in the FS report.

    Response: Agreed. The paragraph has been revised to "In accordance with the Federal Facility Agreement CERCLA SCETION 120... the remedial action (including the monitoring program) will be reviewed after five years."

49. Comment Section 6.4.1.1. page 6-8. 3rd ¶: As shown in Figure 4-3 in the Draft Final RI (1998), the extent of soil contamination exceeding the proposed lead cleanup goal of 1,250 mg/kg has not been determined to the east and south of SEAD-16. Alternative 2 should include additional soil sampling to better delineate the area of soil to be covered

with the soil cap. This additional task is not discussed in the FS text but needs to be included to properly describe the alternative and its costs.

Response: Agreed. As part of the pre-design task prior to final design, additional surface soil samples will be taken in southeast and east direction. The results will be considered and the remedial area will be revised if necessary. This statement has been added in Sections 6.1 and 6.3. As discussed in response to Specific Comment 17, a contingency has been included for quantity increase.

50. Comment Section 6.4.2.2. page 6-13: The second sentence in the third paragraph needs to be reworded to clarify that only soil with a lead concentration > 1,250 mg/kg will be covered with a soil cap.

Response: Agreed. The second sentence in the third paragraph has been revised to clarify that only soil with a lead concentration exceeding 1,250 mg/kg will be covered with a soil cap.

51. Comment Section 6.4.2.3. page 6-13: The conclusion in this section that Alternative 2 will protect human health and the environment is questionable because potentially hazardous soil exceeding the TCLP criterion for lead will be left in place and because the alternative does not consider protection of groundwater .

Response: Disagreed. According to the baseline risk assessment, risks posed to human health are through ingestion of on-site soil and indoor dust. By adding a soil cap on the contaminated soil and cleaning out building material, the above exposure routes will not be complete. Adding a soil cap, excavating soil in the drainage ditches, and cleaning building material will also prevent dermal contact with soil, soil in the drainage ditches, and building material. Therefore, Alternative 2 will protect human health. Alternative 2 will protect the environment by excavating and disposing contaminated ditch soil and preventing contaminated soil transport through runoff. As discussed in response to General Comment 7, according to K_d values estimated from site samples, groundwater deterioration is not expected from the on-site soil. This has been supported by the on-site groundwater sampling results. Only aluminum, manganese, iron, and sodium exceed NYS Class GA standard for samples collected in remedial investigation round at SEAD-16 and SEAD-17. No other metals have been detected to pose significant risk to human health. Aluminum, manganese, iron, and sodium all occur naturally and are not statistically different from their background concentrations. The on-site groundwater is not adversely impacted. Therefore, the conclusion in Section 6.4.2.3 that Alternative 2 will protect human health and the environment is appropriate although leaving contaminated soil in place may restrict future land use.

52. Comment Section 6.4.3. page 6-14: The first sentence at the top of this page erroneously states that Alternative 2 would reduce the toxicity, mobility, and volume of the hazardous constituents in the soil and sediment. For soil and sediment, the alternative consists of institutional controls and placement of a soil cover and the removal of contaminated sediment from the drainage ditches. These measures do not reduce the toxicity, mobility, and volume of contaminated soil at all. Only the toxicity and mobility of sediment would be reduced if the sediment were treated to eliminate a hazardous characteristic. Revise this paragraph.

    Response: Agreed. Section 6.4.3 has been renumbered to Section 6.4.5 and has been revised to clarify that only the toxicity and mobility of building material and soil in the drainage ditches would be reduced if they were treated to eliminate a hazardous characteristic.

53. Comment Section 6.7.2: page 6-35. 3rd¶: The placement of a 12-inch soil cover over the contaminated soil at SEAD-16 and -17, as proposed in Alternative 2, would not decrease the potential for contaminant migration to groundwater.

    Response: Agreed. The sentence "Alternative 2 would decrease the potential for contaminant migration to groundwater" has been deleted from Section 6.7.2. However, it should be noted that as discussed in the response to General Comment 7, on-site groundwater has not been and is not expected to be adversely impacted.

54. Comment Section 6.7.2. page 6-35. 4th ¶: The statement that the removal of sediments exceeding 31 mg/kg for lead will meet NYSDEC criteria for sediment is not correct. Such a removal would only meet the NYSDEC *criterion* for lead; other applicable values such as the 16 mg/kg NYSDEC criterion for copper, would not necessarily be met by focusing on lead as the index parameter.

    Response: Agreed. The statement has been revised to reflect that a removal would meet the NYSDEC criteria for soil. According to the discussion in the response to Specific Comment 15, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the sites. The FS has been revised to apply the soil cleanup level to the soils found in all the ditches.

55. Comment Section 6.7.3.1. page 6-35: This subsection concludes that Alternatives 2, 4, and 6 provide long-term effectiveness and permanence. Since the FS has not evaluated the long-term impact to groundwater from metals leaching from the site soils, it is not evident that the alternatives provide effective long-term protection of groundwater. The FS needs to establish maximum metals concentrations in soils that would be protective of groundwater in the long term. Those concentrations would become cleanup goals if they

are more restrictive than the ARARs or risk-based goals associated with soil that were considered so far.

Response: Disagreed. As discussed in response to General Comment 7, according to the K_d values estimated from specific site samples, groundwater deterioration from the on-site soil is not expected. This has been supported by the on-site groundwater sampling results. Only aluminum, manganese, and iron exceed NYS Class GA standard for samples collected in remedial investigation round at SEAD-16 and aluminum, manganese, iron, and sodium at SEAD-17. No other metals have concentrations that exceed NYS Class GA standard or MCL standard, nor pose significant risk to human health. Aluminum, manganese, iron, and sodium all occur naturally and their mean concentrations are not significantly different from the background concentrations. On-site groundwater has not been adversely impacted. Therefore, the conclusion that Alternatives 2, 4, and 6 provide long-term effectiveness and permanence is appropriate. At the same time, monitoring programs will be examined to ensure long-term effectiveness and permanence.

56. Comment Section 6.7.3.2. 2nd ¶ page 6-36¶: The first sentence in this paragraph states that " Alternatives 2 and 4 also decrease the toxicity in the soil and/or sediment, which are treated by stabilization." This is misleading because under Alternative 2, sediment would only be treated if it fails TCLP, and under Alternative 4, only sediment and soil quantities failing TCLP would be treated. Revise the paragraph and the entire FS for consistency on this issue.

    Response: Agreed. Section 6.7.3.2 has been revised to clarify that under Alternative 2, ditch soil toxicity would be decreased only if it fails the TCLP test and it is subsequently stabilized and under Alternative 4, soil and ditch soil toxicity would be decreased only if it fails the TCLP test and it is subsequently stabilized. The entire FS has been revised for consistency on this issue.

57. Comment Section 6.7.3.4. 3rd ¶. page 6-37: The second sentence represents an assumption on the agency preference for Alternative 6. This sentence should be deleted or revised.

    Response: Agreed. This sentence has been deleted.

58. Comment Section 6.8. 3rd¶. page 6-38: Include the relative overall ranking for the four alternatives that were considered in detail.

    Response: Agreed. The relative overall ranking for the four alternatives that were considered in detail has been added to the beginning of the paragraph.

59. Comment Appendix B: The exposure point concentration (EPC) values in Appendix B require clarification. According to the tables, most of the EPCs represent the 95% upper confidence limit of the mean (UCL). In several tables, the EPCs were found to be lower than the mean, a mathematical impossibility. Examples are surface soil EPCs for PAHs, nitroaromatics, and metals in both the pre- and post-remediation tables for SEAD-16 and SEAD-17. If the EPCs are based on calculation errors, the associated risk calculations would have been influenced also. Review and clarify this issue.

    Response: Disagreed. The mean values listed in the EPC tables are the arithmetic mean of the data. The 95% upper confidence limit (UCL) of the mean suggests that the probability of observing a random sample in the range of that UCL is 95% if the estimated mean is the true mean. For data with normal distribution, the 95% UCL of the mean should always be greater than the mean. However, for data with non-normal distribution, the UCL is calculated assuming lognormal distribution of the data (USEPA: Supplemental Guidance to Rags: Calculating the Concentration Term). Thus it is possible that the UCL is lower than the arithmetic mean. For example in the cases that most of the samples are with low concentrations and very few samples with much large concentrations.

60. Comment Appendix C: Appendix C appears to have been assembled for another project and has not been edited properly for use on this project. Three examples are: 1) page *C-3* states that cleanup levels were set for groundwater, 2) page *C-5* lists ARARs for PCBs, and 3) page 3-5 lists the primary chemicals of concern at the sites as semi-volatile organics, volatile organics (primarily BTEX), and to a lesser extent, metals. The FS needs to include a comprehensive, accurate list of ARARs. Standards or regulations that would not be useful in determining remedial goals for the sites should not be included, such as endangered species or historic properties requirements, if no endangered species or historic properties have been identified at the sites. Please review this appendix and correct or delete the erroneous and unnecessary information.

    Response: Agreed. Appendix C was assembled with all the ARARs may apply for the SEAD-16 and –17. It has been revised according to the comment and erroneous and unnecessary information has been corrected or deleted. 1) the sentence which stated that cleanup levels were set for groundwater on page *C-3* has been deleted, 2) ARARs for PCBs on page *C-5* will be retained for PCBs because PCB measurements have been conducted on site samples, and 3) the sentence that listed the primary chemicals of concern at the sites on page 3-5 has been revised to: "metals, and to a lesser extent, semi-volatile organics (primarily PAHs), pesticides, and nitroaromatic compounds".

61. Comment Appendix E. Detail Cost Estimates: *Page E-5, 3rd bullet:* This bullet assumes that contaminated soil between and around the railroad tracks will not be required to be remediated. Some of the greatest contaminant concentrations at the sites were found in

samples collected from the railroad tracks. Therefore, the assumption is inappropriate. The FS has to clearly state how acceptable risk levels could be achieved with this contamination left in place. Furthermore, the assumption/intention not to remediate these area needs to be prominently included in the main body of the text, e.g., in Section 6.7.4 - Cost.

Page E-6, 6th bullet: The construction cost contingency of 17.5% appears to be low. The main uncertainty for Alternatives 4 and 6 are quantity overruns that are likely to occur because the horizontal extent of surface soil contamination (at the 1,250 mg/kg level) has not been determined to the east and southeast at SEAD-16, the vertical extent of soil contamination at SEAD-16 and -17 has not been determined, and the extent of sediment contamination at both sites is likely considerably greater than assumed in the FS. Additional sampling should be conducted after the actual cleanup goals have been established by the Army and the regulatory agencies.

Cost Estimate Tables:

- The building debris, which had very high nitroaromatics and metals concentrations, and is likely to fail TCLP testing, was not costed for TCLP testing, stabilization, or disposal as hazardous waste.
- The estimated mass of sediment for disposal varies between Alternative 2 (1,065 tons) and Alternative 4 (1,365 tons). Review and edit as appropriate.
- The increase in the area of soil removal or containment that would ensue from more stringent cleanup goals (1,000 mg/kg or 400 mg/kg) was not adequately addressed in the alternatives and scenarios. For example, for Alternative 2 (On-site Containment), several items that are dependent on the size of the area such as clearing and grubbing, erosion control, and fencing, are the same for all three cleanup goals while in reality, they should all be increased. Overall, the assumptions of the extent of contamination appear to be too low.

Response: Agreed. The sentence addressing that soil around the rail road tracks will not be remediated has been deleted. As discussed in response to General Comment 4, all surface soil with lead concentration greater than 1,250 mg/kg will be remediated, including contaminated soil between and around railroad tracks at SEAD-16. To remediate the soil between and around the railroad tracks, the tracks, ties, and ballast will be removed and stockpiled. The area will either be covered (Alternative 2) or excavated (Alternatives 4 and 6). Total remediation cost has been revised to include the cost associated with these activities. The last assumption listed in Appendix E has been deleted and the above statement has been added to Section 4.3.2, 6.5.5.1, 6.6.5.1 and Appendix E.

Agreed. The construction cost contingency has been increased from 17.5% to 25%. In addition, as discussed in response to Specific Comment 49, as part of the pre-design task, additional surface soil samples will be obtained prior to the final design. The results will be considered and the remedial area will be revised if necessary. This statement has been added in Section 6.3.

Agreed. The cost for the TCLP test for the building debris was not included. The cost estimate has been revised to include this cost. However, stabilization and disposal of the building material as hazardous waste was included in the cost estimate.

Agreed. The estimated mass of ditch soil for disposal for both Alternative 2 and Alternative 4 has been revised. The total costs have been adjusted to reflect this change.

Disagreed. The proposed area (work area) for clearing and grubbing, erosion control, and fencing are the same for an alternative with different cleanup goals, which includes meanwhile is much greater than the delineated area. Thus, the cost is same for different cleanup goals regarding to the cost of clearing and grubbing, erosion control, and fencing. Agreed that the extent of contamination may be lower-estimated. As discussed in response to Specific Comment 49, as part of the pre-design task, more surface soil samples will be taken in southeast and east direction prior to the design of the remedial action. The results will be considered and the boundary and the cost will be revised if necessary. This statement has been added in Sections 6.1 and 6.3.

Response to the Comments from New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation

Subject: Final Feasibility Study at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) – Seneca Army Depot, Romulus, New York, (September 2000)

Comments dated: February 21, 2001

Date of Comment Response: July 31, 2001

GENERAL COMMENTS:

1. Comment: The NYSDEC had sent several letters over the years, regarding the SEAD-16 and -17 FS drafts, informing you that it is New York State policy to evaluate an unrestricted use alternative in the detailed analysis of alternatives. This includes assessing the unrestricted use alternative against the nine evaluation criteria specified in the National Contingency Plan. This document, like the previous drafts, is lacking and needs to incorporate such. A simple cost comparison in Appendix E is not sufficient.

   Response: Disagree. The evaluation of unrestricted/residential land uses has been evaluated. Two levels of soil protection for unrestricted/residential land use have been considered in addition to two levels of protection for industrial land use. For unrestricted/residential land use, lead concentrations of 400 mg/kg and 400 mg/kg + TAGM (for metals other than lead) have been evaluated. The 400 mg/kg levels of lead in soil is the EPA recommended level for residential use. Residential use is equivalent to unrestricted use.

   The NCP does not require evaluation of the nine criteria for various clean-up levels. It requires evaluation of the nine criteria for various clean-up alternatives, which has been done. Six different remedial alternatives, summarized in Table 4-1 of the FS, have been evaluated. Each alternative that has been assembled involved a combination of various remedial technologies. These alternatives were assembled to address the media and contaminants of concern at the site. The evaluation of each alternative involved evaluation of how each alternative ranked relative to the nine criteria. Changing the clean-up level will, by definition, change the level of protectiveness, but will not affect the evaluation of the alternatives since technologies, such as stabilization, are effective for the contaminant of concern, i.e. lead in soil, not the volume of material to be treated. The evaluation factor that will be affected by increasing the level of protectiveness is cost. Increasing the level of protectiveness will increase the volume of soil requiring remediation, which will affect the cost for each alternative. Great attention has been given to how increasing the level of protection has affected the cost. While this analysis may appear simple it has required a great deal of effort as evidenced by the various drawings that have been generated and the detailed cost estimates that are presented in this document. This approach has avoided the redundancy of evaluating each alternative for the nine EPA criteria for each level of protection, which would be equivalent to preparing four separate feasibility analyses.

2. Comment: As discussed at several BCT meetings and in letters dated 1/28/98 and 7/9/98, the NYSDEC has repeatedly requested the Army to include in their Remedial Investigation/Feasibility Study a residential and / or unrestricted use scenario in the risk assessment. The NYSDEC remains concerned that such an attempt will demonstrate that the extent of property which presents and unacceptable risk under such a scenario has not been adequately defined during the RI.

   Response: Agree. Institutional controls, such as deed restrictions are included in this document and discussed in Section 2.7.2. The estimate of soil volumes conducted in the FS is sufficient to permit decision making for the FS. Soil and sediment sampling conducted during the RI included 49 surface and subsurface soil samples for SEAD-16 and 48 surface and subsurface soil samples for SEAD-17. In addition, 9 downwind surface soil samples were collected and 11 debris samples from within the building at SEAD-16 were also collected. Further, 11 sediment samples from SEAD-16, many from shallow drainage swales surrounding the site, and 10 sediment samples from SEAD-17 were collected. As with most sites, some data gaps exist. Where uncertainty exists in drawing the boundary for a land use, a dashed line has been used. The Army has stated that data gaps will be closed by confirmational sampling. Such sampling will be performed during the selected action to ensure that the remedial target goals have been achieved.

3. Comment: If the final remedy for these selected sites leaves residual contamination above levels acceptable for unrestricted reuse, institutional controls such as deed restrictions will be necessary to prevent unacceptable human exposures. It was surprising to find that this document did not include any discussion of this crucial remedial element. It seemed that this point was clearly made during the years of discussions the regulatory agencies have had with the Army since the announcement of pending closure of the Seneca Army Depot.

   Response: Disagree. Institutional controls, such as deed restrictions, are discussed in Section 2.7.2. The report considers clean-up for industrial use and makes reference to the future use of the property being industrial, which, by definition, will necessitate the imposition of a land use restriction. The specifics of the restriction, i.e. a deed restriction, will be finalized once agreement is obtained with the regulatory authorities that such a restriction is acceptable.

4. Comment: The FS should address all contaminants of concern, i.e., as identified in Sections 4.1 and 4.2 of the March 1999 Remedial Investigation Report, which include PAHs, antimony, arsenic, barium, copper, mercury, thallium and zinc. The FS does not clearly demonstrate if or how using a cleanup goal for lead will affect the other contaminants. The level of contaminants to be remediated or left untreated onsite should be evaluated and discussed for each alternative to provide a better

perspective during the comparative analysis for each cleanup goal. Without such a discussion it is difficult to support the Army's conclusion that the remedies evaluated are protective of human health.

Response: Disagree. The FS addresses all the contaminants of concern.

At SEAD-16 the non-carcinogenic risk calculated during the RI was 20 for the future industrial worker. The non-carcinogenic risk for the future day care center child and future day care center worker was 6 and 2, respectively. For the future industrial worker the risk was due to the ingestion and inhalation of indoor dust from within the building and ingestion of groundwater. To address these risks, each of the alternatives included provisions for removing debris and materials from within the building. For groundwater, the risk was due to the presence of thallium. Due to the high clay content of the soil, we believe that the presence of metals in groundwater is greatly affected by turbidity. Resampling of the wells confirmed that the presence of thallium is due to turbidity since no thallium was detected in any of the wells. Section 2.4.2 of the FS discusses this resampling and Section 2.5.2.3 and Section 2.5.2.3.1 discuss why groundwater was not considered a media of concern. For the day care center worker the risks were due to ingestion of groundwater. For the day care center child the risks were due to ingestion of soils and ingestion of groundwater. Since groundwater was not considered a media of concern, soil was the media of concern. Antimony was the largest contributor to the risk due to ingestion of soils with a Hazard Quotient (HQ) of 1.

Unlike the building at SEAD-16, the building at SEAD-17 is a new building, which did not contain debris and was not considered a media of concern. At SEAD-17 the non-carcinogenic risk for the future day care center child was 1.1. This majority of this risk was due to ingestion of soils, which was 0.96. Metals were the greatest contributors to this risk and antimony, arsenic and cadmium each contributed 0.3, 0.2 and 0.2, respectively. Since metals were the major contributors to the site risk, metals in soil and the debris within the building at SEAD-16 were the focus of cleanup goals developed in the FS.

In addition to these metals, lead was considered separately since lead is not considered in the risk assessment. Four levels of protection for lead have been considered. In addition, antimony, copper, zinc, mercury and thallium were also considered for each of the four clean-up scenarios. Lead was used as the indicator compound for determining the volume of soil to be remediated because lead was the most widespread metal of concern in soil. For the other metals, allowable concentrations of were back-calculated for both industrial and residential scenarios. Section 2.5.1.1 describes how allowable levels for these metals were back-calculated from the risk assessment. These levels were then used to ensure that none of these metals were left on-site above these levels.

Results of the back-calculation indicate that metal concentrations of 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future industrial* use scenario. In addition, metal concentrations of 12.8 mg/kg, 256 mg/kg, 385 mg/kg, 1.92 mg/kg, and 2.56 mg/kg for antimony, copper, zinc, mercury, and thallium, respectively, will not pose an unacceptable risks for the *future residential* use scenario. Therefore, the areas of soil to be remediated for lead cleanup concentrations of 1,250 and 1,000 mg/kg also include areas with concentrations exceeding the above-mentioned levels for the future industrial use scenario. The remediation case for lead cleanup concentrations of 400 mg/kg includes areas with concentrations exceeding the above-mentioned levels for the future residential use scenario.

5. Comment: The New York State Department of Health recommends a soil lead clean up level of 1,000 mg/kg under an industrial reuse scenario. Keep in mind that this clean up goal will also necessitate institutional controls such as deed restrictions to prevent human exposure to residual on-site contamination in the event that the proposed reuse changes.

   Response: Agree. The use of institutional controls is implied throughout the document by referring to the clean-up criteria for an industrial land use. Institutional controls, such as a deed restriction, will be part of the overall remedial strategy to restrict exposure to that involving industrial activities. Section 2.7.2 indicates that Army regulations require that the Army ensure that agreements will be in-place between the Army and the future property owners.

SPECIFIC COMMENTS

1. Comment: As discussed via telephone on 1/24/01, we agreed that the above referenced document is incorrectly labeled and should be corrected to read Draft-Final instead of Final.

   Response: Disagree. The Army has addressed all comments that have been provided and consider this version to be a Final. The Federal Facilities Agreement (FFA) allows for a Draft, a Draft-Final and a Final version. The Draft FS was submitted on or about November 21, 1997 and the Draft-Final FS was submitted on or about November 24, 1999. Over 61 comments on the Draft Final FS were submitted by USEPA, dated March 10, 2000. No NYSDEC comments were provided. The Army responded to the comments received and issued the document as Final on September 8, 2000. The Army has always considered any and all NYSDEC comments and is willing to included NYSDEC comments even though the document is labeled Final. A NYSDEC letter was received on December 6, 1999 indicating that the title of the Draft-Final document should be revised to read revised Draft but was not done since the version was appropriately titled Draft-Final in accordance with the provisions of the FFA. No comments were provided from the NYSDEC other than a March 31, 2000 letter that indicated that the NYSDEC would wait until the LTTD demonstration study is complete to re-evaluate the issues concerning the RI and the FS. The letter indicates that NYSDEC proposes to table review of other documents concerning SEAD-16 and 17 until the issues concerning the RI are resolved and both the RI and the FS are finalized. With the pressure to obtain site closure for reuse, the Army has proceeded with finalization of these documents. The fact that the NYSDEC has chosen to not comment is not sufficient reason to delay the progress of obtaining closure. The FFA allows for dispute resolution, however, this has not been the path that NYSDEC has chosen. In any event, additional comments, by both the USEPA and NYSDEC, on the Final version of the FS have been received and are being responded to. Replacement pages will be issued where necessary and the revised document will continue to be labeled the Final Feasibility Study at SEAD-16 and SEAD-17. The designation of different Final versions will be by the date the document was issued.

2. Comment: Section 6.5.9 of the RI "Risk Characterization for Lead" explains that calculations based on the Integrated Exposure Uptake Biokinetic Model (IEUBK) predicts a 95% probability of children under a day care center reuse scenario having a blood level less than 10 ug/dl at a soil lead concentration of 625 mg/kg. Does the Army's preference for a soil lead clean up goal of 1,250 mg/kg imply that they will prevent future use of these sites as day care centers?

   Response: The Army's intended land use of the site is "industrial" and the preferred soil lead clean-up goal of 1,250 mg/kg is proposed as a maximum that will not be exceeded. If post excavation sampling indicates that the average levels of lead that remain at the site exceed 625 mg/kg, the Army intends to prevent future use of the sites as day care centers. However, if average concentrations are below 625 mg/kg (as anticipated based on the data collected during the Remedial Investigation and described further below), no restrictions will be placed on the site. This intention has been clarified in the text in Section 2.5.1.1 of the FS.

   The 625mg/kg value was derived as an alternative to the 400 mg/kg EPA default value for residential use. The 625 mg/kg clean-up value was obtained by assuming that the child day care center receptor was exposed to lead in soil 5 days instead of the IEUBK model's assumption of 7 days. This adjustment of the soil/dust lead intake was intended to account for the lower exposure of a child at a day care center as opposed to a residential scenario. The 625 mg/kg value was derived, using the IEUBK model, modified for this one parameter. No other default values were changed. As recommended by the IEUBK guidance manual, this value is representative of an average over the site. Accordingly, we have proposed to establish the 625 mg/kg value as the site average and the 1250 mg/kg value as a not to exceed value for this site. Providing the site average is below the 625 mg/kg value the site should be protective for use as a day care center.

   From our analysis of the soil data that would be remaining following soil removal under the industrial land use, the average concentration of lead in soil at SEAD-16 would be 185 mg/kg. Four out of 39 samples would have lead concentrations greater than 625 mg/kg (ranging from 626 mg/kg to 720 mg/kg) in the post-remediated SEAD-16 but none would exceed the proposed maximum cleanup goal of 1250 mg/kg for lead. For SEAD-17, the average concentration of lead in soil would be 315 mg/kg. Two out of 38 samples would have lead concentrations greater than 625 mg/kg (697 mg/kg and 815 mg/kg) but none would exceed the maximum clean-up goal of 1250 mg/kg. It should be noted that the post-remediation surface soil Exposure Point Concentrations for lead at SEAD-16 and SEAD-17 are less than 400 mg/kg, which is USEPA's default value for the residential use scenario. Further, since some remedial alternatives will involve removing soil and replacing the existing soil with clean fill, the final average concentration of lead in soil will even be lower the values that were calculated.

3. Comment: Section 1.1 page 1-2, the FS states that "this study had considered future land uses and restoration of pre-disposal conditions in the process of assembling and evaluating alternatives to the extent possible." On the following page, 1-3, the FS then states "to avoid redundancy of evaluating each alternative four times, all remedial alternatives have been evaluated for the intended land use, which is industrial." These statements are contrary and should either be revised or removed.

   Response: Agreed. The statements have been revised. The last sentence of the fifth paragraph of Section 1.1 has been changed to "This study has considered future land uses and restoration of pre-disposal conditions in the process of developing alternatives, to the extent possible." The 3rd to last sentence of the eighth paragraph of Section 1.1 has been changed to "To avoid the redundancy of evaluating each remedial alternative four separate times (*i.e.* for each level of protection), all remedial alternatives have been evaluated for the industrial land use". SEDA considered the future land use (i.e. industrial) and restoration of pre-disposal conditions when developing the remedial alternatives. The six remedial alternatives were developed to address any of the four levels of protection. Even though the screening and evaluation of the alternatives was performed based on the industrial use (which is the intended use), costs were developed independently to achieve levels of protectiveness sufficient for the remaining three levels of protection.

4. Comment: Section 1.2, page 1-4, describes and defines operable units, but never states which operable unit number this FS covers.

   Response: Agree. The first sentence of Section 1.2 has been revised to say: "During the planning phase of the RI/FS process, it was decided to designate SEAD-16 and 17 as one operable unit and to give it the label OU4." As this sentence and the title of the report state, the operable unit covered by this FS is that made up of SEAD-16 and SEAD-17.

5. Comment: Section 2.3.5, page 2-12, and Section 2.5.1, page 2-22, the FS states that designating SEAD-16 and -17 as industrial "will limit the access to the site by wild animals and limit the site being used as a habitat." Please explain how an industrial designation will prevent the representative terrestrial and aquatic vertebrate populations (deer, mice, and creek chub) from entering or using the site as a habitat. Also, contrary to the first statement, in Section 3.2.2 on page 3-7, it is stated that "wildlife such as migrating birds, will have access to the site and will not be protected."

   Response: Agree. An industrial setting would discourage animals, such as those evaluated in the ecological risk assessment, from establishing a permanent residence by modifying their habitat. Activities take place in industrial settings, involving such things as truck traffic and noise, that will discourage the active use of the site by these animals. Moreover, industrial settings include buildings, parking lots, roadways, and other structures that will reduce the presence of habitat, such as ground cover, and food sources for these animals. Therefore, industrial designations, by the nature of the activities and the structures that are associated with industrial uses, will be effective deterrents to limit the use of the site by wildlife. In addition, the planned industrial area comprises a small portion of the 10,000+ acre depot which provides sufficient and preferred ecological habitat elsewhere. Wildlife currently inhabits these other areas since habitat and food are more favorable and abundant. There is no reason to assume that such patterns of wildlife behavior will change. Additional measures, such as nets or tents, are not planned to discourage random migration into the area. Although migrating birds or wildlife would will have access to the site, if they desired, they would not be expected to establish a permanent habitat in this industrial setting.

6. Comment: Section 2.4.4, page 2-16, and Section 2.5.1.4, page 2-24, the FS states that the soil found in the ditches at SEAD-16 and -17 are similar to those found at Seneca Open Burning Grounds. It continues that because the macroinvertebrate sampling in the drainage swales were "predominantly non-aquatic," therefore "the nature of the soils found in the ditches is expected to be terrestrial instead of aquatic." A simple visual comparison of sediments/soils in one stream to another that is located more than 3 miles away to rule out whether there is aquatic life in the streams is not valid. As with the Open Burning Grounds site, there should be macroinvertibrate sampling to confirm the presence/absence of aquatic life in the streams.

   Response: Disagree. Observations made during the ecological survey did not detect aquatic species with the drainage swales. The intent of these statements was to establish that surficial soil from drainage ditches were to be evaluated as soil, not sediment. The Army maintains that the nature of the surficial soils within the drainage swales and ditches in close proximity to SEADs-16 and 17 are terrestrial in nature, therefore the criteria established for soil would be used to evaluate these soils. These surficial drainage swales and ditches are similar in functionality to drainage swales and ditches that exist at the OB Grounds and throughout much of the Depot. These drainage features are dry during a large portion of the year and therefore do not support aquatic habitat. The macroinvertibrate sampling program conducted at the OB Grounds confirmed that the drainage swales were terrestrial. Since the proposed remedial effort will include remediation of soil from many of these ditches, the drainage soil within the swales will be removed regardless of the nature of the soil within the swales.

7. Comment: Sections 2.3.3 and 2.3.4, pages 2-9 and 2-10, 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.

   Response: Disagree. The use of a hazard quotient of 10 as an ecological risk management decision criteria for identifying Chemicals of Concern (COC) was not arbitrary. Given the assumptions used in the calculation of ecological risk, hazard quotient calculations routinely exceed 1. Following our evaluation of ecological risk, Parsons performed an evaluation of the ecological impacts from metals, other than lead. Our approach is described in Section 2.5.1.1 of the FS and involved backcalculation of allowable levels of other metals in soil that would be protective of ecological receptors. From this analysis it was determined that for allowable concentrations of metals in soil to achieve a hazard quotient below 1, it would require the concentrations to be below background concentrations. Therefore, using a hazard quotient of 1 would indicate an unacceptable risk when there was not, since it is known that ecological communities, exposed to background concentrations, thrive at the Depot. We considered using a hazard quotient of 10 as a reasonable alternative to 1 as the dividing line for the decision making process at the Depot. Menzie et al. (1993) has proposed a similar guideline for supporting ecological risk management decisions. Based on the assumptions used in the ERA, we believe that there is a low likelihood of risk to ecological receptors at SEADs-16 and 17 from components that display a hazard quotient less than 10. Further, consideration should be given to the fact that this area is intended to be part of the Planned Industrial Development (PID) Area. Industrial use would limit ecological habitat, which would discourage ecological receptors from using these sites. This is not accounted for in the ecological risk assessment. The ecological risk assessment assumes that all areas of the site are equally attractive to ecological receptors. There is less likelihood that ecological receptors will be drawn to these industrial sites due to noise and the overall loss of habitat associated with general industrial operations. Therefore, using a hazard quotient of 10 to discriminate between ecological concerns requiring a remedial action is appropriate.

8. Comment: Section 2.8.1, page 2-38, first sentence states that there are six cases considered but then only lists 5 cases. Please revise accordingly.

   Response: Agreed. The first sentence of Section 2.8.1 has been revised to "Five cases have been considered..."

9. Comment: Figures 2-1 through 2-8, should be revised to include data at the sampling points so a reader can correlate the sampling points to the remediation limits. Reviewing the FS figures is cumbersome in that it requires the comparison of the RI figures and table for general date information.

   Response: Disagree. The addition of sample data to each sample point would make the figures unreadable.

10. Comment: Figures 2-1 through 2-8, in each of the figures there are dashed lines denoting "remediation limit, which will be defined through pre-design sampling." In even the least conservative cleanup goal, 1,250 ppm for lead, there are dashed lines for the whole eastern extent of the remediation area for SEAD-16. In each of Figures 2-4, 2-7, and 2-8, almost the entire area suggested for remediation is delineated by a dashed line. It is the NYSDEC's position that the

estimate of quantities to be remediated cannot justifiably be made when the remediation limit is largely undefined.

Response: Disagree. SEDA has delineated the remediation areas and estimated the remedial quantities based on the best available information. Although data gaps are present we do not believe that these should prevent making remedial decisions. Referring to the 1,250 ppm contour for lead in surface soil, depicted in Figure 2-1 of the FS, in addition to the surficial soil samples used to depict this contour, the downwind surface soil data and the soil collected from the drainage ditches provide information to support the estimate of lead in soil. These data, combined with surficial soil data, limit the data gaps that may exist in the southeastern portion of the site. For example, the downwind surface soil sample, SS16-500-N, located 500 feet southeast from the source, i.e. Building 367, was 33 mg/kg for lead. Further, the soil sample collected from the southeastern portion of the site at ditch location SD16-4 was 175 mg/kg for lead. These data points confirm that the 1250 mg/kg contour of lead in soil does not extend as far as these locations. Additional sampling has been planned as part of a pre-design sampling program to further delineate the areas. For cost estimating purposes, an expansion factor of 30 percent was used to estimate ex-situ volumes for soil and an additional 10 percent was used to address the uncertainty of the volume estimate. Also, a construction cost contingency of 25 percent was included.

SEDA believes that this approach is sufficient to evaluate the different remedial alternatives and to complete the FS.

Response to Comments from the United States Environmental Protection Agency

Subject: Final Feasibility Study at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) – Seneca Army Depot, Romulus, New York

Comments dated: April 11, 2001

Date of Comment Response: July 31, 2001

The following comments are in reference to the responses to USEPA comments included in the above subject document of September 2000 (comments dated March 10, 2000 and responses dated August 20, 2000).

GENERAL COMMENTS

1. Comment: The Army estimates the "arithmetic mean" for lead concentrations in post-remediated surface soil to be less than 625 mg/kg. On the other hand, the Army is proposing to remove soils with lead concentration exceeding 1250 mg/kg only. EPA accepts the Army's proposal to establish 1250 mg/kg as the not to exceed value for SEAD-16, 17 with an average lead concentration of 625 mg/kg to be adequately protective for future industrial use for which appropriate restrictions will be required.

   Response: The Army is proposing to remove soils with lead concentrations exceeding 1250 mg/kg only. The Army is not proposing a second remedial action objective (RAO) to meet an average lead concentration of 625 mg/kg across the site. It is very likely, based on the data collected during the RI, that the average concentration of lead across the site will not exceed 625 mg/kg. In this case, the future industrial use receptors (include a child-in-daycare) will be protected. However, if post excavation sampling indicates that the average concentration of the site exceeds 625 mg/kg, then a deed restriction will be placed on the property such that no child care center is built on the property. Discussion has been added to the text of section 2.5.1.1 to better explain the Army's intention.

6. Comment: Please note that future use scenarios in the risk assessment should not be determined based on the presence of current buildings or structures. The Army talks in the report about the poor conditions of the buildings at SEAD 16, and mentions the construction of new office buildings in the area as possible future use scenario. However, it is also likely that these "old" buildings may be demolished, completing the soil exposure pathway. Therefore, this pathway should be included in the quantitative risk assessment. On the other hand, on the conference call held in January 11, 2001, the Army offered conflicting information indicating the possibility for the "old" buildings to be reused as warehouses at SEAD-16. Please clarify the future use of SEAD-16.

   Response: The risk assessment conducted as part of the RI adequately evaluated the risk to potential future receptors. A future industrial worker, a future on-site construction worker, a future child trespasser, a future day care center child, and a future day care center worker have all been considered. The risk assessment identified exposure to the loose material in the building as a threat and the Army has agreed to remove this material.

The disposition of Buildings 366 and 311 at SEAD-16 will be determined by the future reuser. The Army has no current plans to demolish the building. The Army intends to transfer the building following implementation of the proposed remedial plan. The plan will involve removal of loose debris, residual materials within the existing piping and materials that have accumulated on the floor, which has been shown to contain lead. Following implementation of the action the threat from materials within the building will be eliminated. The building will then be suitable for transfer. We expect that if the building is to be demolished the reuser will manage the building debris as construction debris and will dispose of the material in accordance with the requirements of the State of New York at an approved construction debris landfill. Accordingly, we do not agree that the building demolition will complete an additional soil exposure pathway to future receptors any more than any other building demolition project in the State of New York would. Requiring the Army to consider building debris as soil and assessing the risks posed by this material to future receptors such as day care center children is equivalent to placing requirements on the Army above what the EPA would require from any construction companies. Assuming that material from building demolition, such as steel beams, concrete, wood, etc, is equivalent to soil is unrealistic. It is more likely that this material will not even be present at the site to pose a threat since it will be removed and disposed of as construction debris in a construction debris landfill. Pathways such as ingestion, inhalation or dermal contact of building debris are not considered realistic when the media being considered is building debris.

SPECIFIC COMMENTS

2. Comment: Screening out COCs because of their pervasiveness or lack thereof is not an acceptable means of refining the contaminant list. Therefore, it must be shown that the listed inorganics (cadmium, chromium, nickel and zinc) that exceeded sediment guidelines do not present unacceptable risk to ecological receptors.

   Response: Pervasiveness was not discussed as a reason for screening out contaminants in the ecological risk assessment but rather a reason to re-include constituents that were previously screened out. Please refer to page 6-143 of the ecological risk assessment.

   An initial screening of organic compounds in sediment was performed by comparing the maximum detected sediment concentration to the NYSDEC Sediment Criteria, adjusted for organic carbon. For metals the NYSDEC Sediment Criteria was adopted from Persaud et. al (1992) or Long and Morgan (1990). At SEAD-16, only manganese and silver were removed from further consideration. At SEAD-17, all the metals were retained. Background concentrations for sediment have not been determined for drainage swales and ditches and therefore constituents in sediment were not used as a screening mechanism.

   Cadmium, chromium, nickel and zinc have all been included in the ecological risk assessment for sediment.

   Regarding the 4 COPCs mentioned above, the ecological risk assessment for SEAD-16 identified HQs greater than 1. At SEAD-17, cadmium, nickel, and zinc have HQs greater than 1 in sediment.

As stated in Section 6 of the RI for SEAD-16 and Section 7 of the RI for SEAD-17, although the HQs are greater than 1, they are less than 10, which we believe should be used as a decision point. Screening of compounds with HQs less than 10 is appropriate due to the conservative assumptions inherent in the ecological risk calculation process. For example, bioavailability of constituents to ecological receptors is not considered in the assessment. The ecological risk calculation assumes that all aquatic organisms are exposed to contaminants during the entire year. Since flow in the drainage features at the site is non-existent during periods of the year, the assumption that exposure is continuous is conservative. The site ditches have variable flow throughout the course of a year, which would limit the usefulness of the ditches as a viable habitat. The results of the ERA show that there does not appear to be unacceptable risk to ecological receptors due to the above-mentioned compounds in sediment.

5. Comment: In the response, the following sentence should be stricken: "The species that inhabit the site are not rare in the region and are not generally considered to be of special society value." This is not a suitable justification for excluding an area for remediation.

   Response: Agreed. The sentence has been removed.

6. Comment: The Army's response does not state if groundwater at the site was evaluated as a residential potable water supply under a future use scenario. This is necessary to evaluate the need for possible remedial action of the aquifer. Also, the response should expand on the text that describes the statistical evaluation of onsite groundwater contaminant concentrations with background concentrations. This discussion should include the number of samples in each data set, the statistical test that was used, a description of the samples in the data set (i.e., were all samples collected at the same time, using the same sampling techniques), and a description of the wells (i.e., were all wells screened in approximately the same depth in the aquifer).

   Response: Disagree. Since the sites are located within the Planned Industrial Development (PID) area, the human health risk assessment did not consider an on-site residential scenario. However, groundwater, as a possible source for a residential potable water supply, was considered by comparing the on-site monitoring well data to either the NSYDEC Class GA groundwater quality criteria or the EPA MCL criteria. For this analysis the groundwater data collected during the initial Expanded Site Inspection (ESI) was excluded since the sampling methodology produced highly turbid samples. During the RI, two seasonal rounds of samples were collected using low-flow sampling techniques. This provided samples with lower turbidity. While several common background metals such as aluminum, iron, calcium, manganese and sodium did exceed their respective GA criteria these metals were considered to be of lesser concern due to the lower toxicity of these metals. Other metals including antimony, lead and thallium also exceeded their respective Class GA standards.

   During the first round of sampling at SEAD-16, lead was detected in only one well, MW-16-3, at 24.1 ug/L, which is above the EPA MCL of 15 ug/L. However, lead was not detected at or above 15 ug/L during the second round. Similarly, during the first round antimony was detected at 12.3 ug/L at MW16-3, which is above the EPA MCL of 6 ug/L but was not detected at or above 6 ug/L during the second round. This data suggests that the presence of these metals may still be due to turbidity. Although thallium was found at levels above the GA criteria, it was suspected to be due to the analytical methodology used and also from turbidity of the sample. The original analysis for thallium was performed using Inductively Coupled Plasma (ICP), which is susceptible to interference at low detection levels. Resampling of monitoring wells that exceeded the GA criteria, using the graphite furnace analytical technique and low-flow sampling techniques, were all non-detectable for thallium. Accordingly, thallium was eliminated as a COC. Finally, the mean of the site groundwater data was also compared to the mean of the background data. From this analysis only samples with turbidity measurements less than 50 NTUs were considered. The metals, copper, lead and sodium exceeded twice the background mean concentration. No samples from Round 1 or Round 2 exceeded the NYSDEC GA criteria for copper. Only one sample from Round 1 or Round 2 exceeded the EPA MCL criteria for lead. As previously discussed, lead from this monitoring well was not detected during the second round and was therefore likely to be affected by turbidity. For these reasons, although ingestion of groundwater under a residential scenario was not considered specifically as an exposure scenario, comparison of groundwater concentrations to criteria suitable as a source for potable water was considered.

At SEAD-17, manganese and thallium were found at concentrations that exceeded their respective NYSDEC GA criteria or the EPA MCL criteria during the first round. During the second round of sampling only aluminum, iron, manganese and sodium were found at concentrations that exceeded their respective NYSDEC Class GA or EPA MCL criteria. These metals were not considered to pose a threat due to reasons discussed previously.

Moreover, potable water is provided to SEAD-16 and SEAD-17 by the existing water supply system that is distributed throughout the depot. The source of this water is from Lake Seneca and is chlorinated prior to use. The water system is part of the Seneca County Water System. There is no reason to assume that the current water supply system would not be used in the future, especially since the water system has been upgraded in order to supply water to the new Five Points Prison and the nearby housing facility. Groundwater from the overburden aquifer at the depot is of limited use as a resource. The saturated thickness of the overburden aquifer is thin and would not be able to provide flow to sustain a typical residential dwelling. Water obtained from the overburden aquifer would also be high in hardness and possibly have high solid content, which would further discourage its use as a source of potable water. Private water supply wells in the area have to be drilled to hundreds of feet in bedrock in order to obtain sufficient yield and quality. There is no reason to suspect that since the overburden aquifer is uncontaminated that the bedrock aquifer would be impacted by these sites.

14. <u>Comment</u>: EPA disagrees with the response. Although for this site a soil cleanup goal of 1,250 mg/kg may result in lead concentrations in post-remedial soils of less than 625 mg/kg, this is coincidental, and not a result of the RAO of 1,250 mg/kg. Therefore, the RAO for lead in soils must be revised to an average lead concentration of 625 mg/kg. See General Comment 1 above.

Response: As discussed in the response to General Comment 1, the Army is proposing to remove soils with lead concentrations exceeding 1250 mg/kg only. The Army is not proposing a second remedial action objective (RAO) to meet an average lead concentration of 625 mg/kg across the site.

As noted in Section 2.5.1.1 of the FS, from the existing database it is estimated that removal of soil above 1,250 mg/kg for lead would leave 4 out of 39 samples at SEAD-16, and 2 out of 38 samples at SEAD-17, with lead concentrations greater than 625 mg/kg. The average concentrations have been estimated to be 185 mg/kg at SEAD-16 and 315 mg/kg at SEAD-17. Confirmation sampling will be evaluated after excavation of the site. If indeed, the lead concentrations are as predicted after excavation, the site will be protective of all receptors considered. However, if post excavation sampling indicates that the average concentration of the site exceeds 625 mg/kg, then a deed restriction will be placed on the property to restrict use of the land for residential purposes as well as for a child care center.

15. Comment: It should be indicated in the response whether there is a pathway off-site via the drainage ditches which would allow sediment or drainage ditch soils to migrate to other areas. Further, it should be noted that the ERA with terrestrial endpoints was conducted for the drainage ditch soils and the cleanup numbers and post-remediation results will be protective of these terrestrial receptors.

    Response: The purpose of the drainage ditches is to control and transport surface water. This pathway was identified in the RI and the conceptual model developed in the ecological risk assessment. The surface water control system that exists throughout the Depot is interconnected and can potentially transport solids from one area to another. As noted in Section 3.1.2 of the RI, drainage ditches at SEAD-16 direct surface water off-site to the southeast, northwest, and due south. Section 3.2.3 of the RI states that a drainage swale at SEAD-17 traverses the eastern and southern portions of the site and transports surface water to the west. The swale intersects a well-defined south draining swale that eventually connects into Kendaia Creek.

    The Army agrees that the ERA conducted in the FS for the drainage ditch soils was performed for terrestrial endpoints and that post remediation results will be protective of these receptors.

16. Comment: EPA does not agree with the response. Although the site-specific conditions may reflect that the soil cleanup goal of 1,250 mg/kg of lead in soil will not result in soil lead concentrations remaining at concentrations above 625 mg/kg, the RAO is still 1,250 mg/kg, which implies that soils *may* remain onsite at concentrations up to 1,250 mg/kg. This concentration is neither protective for children at the daycare center nor for unrestricted use. The soil lead concentration of 625 mg/kg is protective for this population and must be identified as the RAO for this scenario under the industrial setting.

    Response: Please refer to our response to specific comment number 14.

17. Comment: There are two parts to this comment. The first part deals with the use of 1,250 mg/kg as an RAO for lead in soils. EPA does not agree that this value is protective for the child-care center

scenario. The second part concerns the application of this RAO to the streambed. In the response to comments it is indicated that "according to the figures, the extent of the contamination of the soil found in the drainage ditches were reasonably defined." Please discuss the dash line remediation limit shown on the figures mentioned in the response.

Response: Disagree. The 1,250 mg/kg concentrations for lead in soil was adopted from guidance provided by an EPA workgroup in the document "Recommendation of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil". The recommendations of the workgroup, which included an EPA Region II member, provided example output from the IEUBK model that showed a range of allowable lead in soil concentrations that would be protective of the fetus of a pregnant woman in a non-residential scenario. At an allowable fetal blood lead level of 10 ug/dL the allowable concentrations of lead in soil ranged from 750 mg/kg to 1750 mg/kg. The difference between these two values being due to the amount of lead the mother is exposed to from other source. Generally, background lead in urban areas are higher. hence the allowable levels of lead in soil will tend to be lower, closer to the 750 mg/kg level. Since the Depot is situated in a rural setting the contribution of lead from outside sources in the area of the Depot are considered to be minimal, hence the selection of 1250 mg/kg, which is the midpoint, was considered conservative. The Army considers protection of a mother and her fetus as a reasonable scenario for establishing an upper limit for the RAO, especially since the IEBUK model recommends using average soil concentrations for exposure scenarios.

As described in our response to specific comment #14, it is anticipated that post excavation concentrations of lead in soil will be lower than what is considered protective in a child-care scenario (625 mg/kg). If the site average is less than 625 mg/kg, the site will be protective of all receptors considered. However, if post excavation sampling indicates that the average concentration of the site exceeds 625 mg/kg, then a deed restriction will be placed on the property to restrict use of the land for residential purposes as well as for a child care center.

The dash line remediation limit for ditch soils represents an expected boundary for remediation. The areas requiring remediation have been estimated in order to obtain an estimate for the quantities of soil that will require treatment based on the best available information. Although data gaps are present we do not believe that these should prevent making remedial decisions. Remediation limits have been noted for soils with lead concentrations greater than 1250 mg/kg and include ditch soils with metal concentrations exceeding maximum metal concentrations for the industrial use scenario. The limits are based on the data presented in the RI (March 1999). This information is noted on Figures 2-1 through 2-8. Referring to the 1,250 ppm contour for lead in surface soil, depicted in Figure 2-1 of the FS, in addition to the surficial soil samples used to depict this contour, the downwind surface soil data and the soil collected from the drainage ditches provide additional information to support the estimate of lead in soil. These data, combined with surficial soil data, limit the data gaps that may exist in the southeastern portion of the site. For example, the downwind surface soil samples, SS16-500-N was located 500 feet southeast from the source, i.e. Building 367, was 33 mg/kg for lead. Further, the soil sample collected from the southeastern portion of the site at ditch location SD16-4 was 175 mg/kg for lead. These data points confirm that the 1250 mg/kg contour of lead in soil does not extend as far as these locations. Additional sampling has been planned as part of a pre-design sampling program to further delineate the areas. For cost estimating purposes, an expansion factor of 30 percent was used to estimate ex-situ volumes for soil and an additional 10 percent was used to address the uncertainty of the volume estimate. Also, a construction cost contingency of 25 percent was included. The Army believes that this approach is sufficient to evaluate the different remedial alternatives and to complete the FS.

23. Comment: It is confusing why a sediment number for lead is referenced when the Army indicates that the drainage materials are soils not sediments. The response indicates that a post-remediation ERA (Appendix B) suggests that five metals (antimony, barium, lead, mercury and thallium) in soil pose potential risks to the deer mouse after remediation to the cleanup level of 1250 ppm of lead. Therefore it is unclear how this cleanup goal can be protective of ecological receptors.

    Response: The designation of samples as SD, i.e. sediment, was established during investigation planning phase, i.e. workplan preparation, that did not have the knowledge gained by implementing the investigation. It was given this designation to note that these materials were in contact with surface water. However, since having conducted the investigation, surface water in these ditches adjacent to the sites were not filled with surface water for extended periods, thus the soils within these ditches are likely to be terrestrial.

    Although not noted in the previous round of responses, the text had been revised to eliminate the proposed sediment cleanup number that is referenced in Comment 23 of the EPA comments dated August 20, 2000.

    The post remediation ERA is found in Appendix B of the FS and discussed in Section 2.5.1.1 of the FS. The ERA after remediation of soils and ditch soils to the cleanup level of 1250 ppm of lead, did result in hazard quotients greater than one for five metals (refer to Table below). Of these five metals, mercury exhibits the only HQ greater than 10 (HQ=12). The post remediation ERA also considered what risk may result if the post remediation soils met TAGMs. The HQs that resulted were not significantly different than those generated for post remediation soil concentrations predicted at the site. In addition, when comparing the calculated post remediation exposure point concentrations (EPCs) to the TAGM values, only the EPCs for lead and mercury exceeded the TAGM value.

Metal	Post Remediation Surface Soils HQ for the Deer Mouse	Post Remediation Total Soils HQ for the Deer Mouse	HQ Based on TAGM values for the Deer Mouse	Post Remediation Total Soils Exposure Point Concentration (mg/kg)	Background (TAGM) Exposure Point Concentration (mg/kg)
Antimony	2.1	2	1.6	2.55	3.59
Barium	9	8.9	26	93.9	300
Lead	1.1	<1	<1	192	21.9
Mercury	12	12	7.8	0.23	0.1
Thallium	2.4	2.4	1.1	0.57	0.28

A qualitative analysis leads us to believe that despite the elevated HQs, the soil is not expected to pose significant adverse effects to the environment after remediating soils with lead concentration exceeding 1250 mg/kg. The area of the site is small and the habitat it provides appears to be relatively low in diversity and productivity compared to the whole Depot area. In addition, the future land use of SEADs-16 and 17 has been designated for industrial purposes. This will limit the site being used as a habitat. In general, the proposed cleanup goal of 1250mg/kg for lead will be protective of the environment.

27. Comment: EPA agrees with the response. The text in the document should be revised to include the response.

    Response: Agreement noted. The text in Section 2.3.1 and Table 2-1b will be updated.

29. Comment: EPA disagrees with the response for the reasons cited in the response to specific comments 14 and 16.

    Response: See responses to Comments 14 and 16 above.

32. Comment: EPA disagrees with the response for the reasons cited in the response to specific comments 14 and 16.

    Response: See responses to Comments 14 and 16 above.

50. Comment: Again the protectiveness (to ecological receptors) of a lead cleanup goal of 1250 ppm is questionable.

    Response: See response to Comment 23 above.

51. Comment: The protectiveness of Alternative 2 (excavating and disposing contaminated ditch soil) will be dependent upon the extent of excavation and the concentrations of contaminants left remaining in place.

    Response: Agreed. The protectiveness of Alternative 2 (installing institutional controls; excavating and disposing contaminated ditch soil off-site; placing a clean soil cover over contaminated surface and subsurface soils) will be dependent on the extent of excavation and the concentrations of contaminants left remaining in place. For this reason, cleanup verification sampling of the ditch soil will be conducted at a frequency of 1 every 100 linear feet of drainage swale (see Appendix E of FS). Cleanup verification sampling will ensure that concentrations of contaminants that are not protective of human health and the environment are not left behind. The excavated ditch soils will then be disposed and, if necessary, treated off-site.

59. Comment: As EPA understands the response, the 95% UCL of the arithmetic mean is based on the lognormal distribution of data, while the arithmetic mean was calculated based on the untransformed data set. Therefore, a comparison of these two values may not be appropriate. If this reiteration of the response is correct, EPA agrees and no further response is necessary.

    Response: Agreed. "False" in the "Normal?" column of the Appendix B tables indicates that the 95% UCL of the mean is based on a lognormal distribution of data. In these cases, comparison of the 95%UCL of the mean with the arithmetic mean would not be appropriate.

APPENDIX E

PRELIMINARY DETAIL COST ESTIMATES

APPENDIX E
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND –17 FEASIBILITY STUDY
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Introduction

A detailed cost estimate has been developed for the following alternatives:

Alternative 2 - On-site Containment: Institutional Controls/Soil Cover
Alternative 4 - Off-site Disposal: Excavate/Stabilize/Off-site disposal
Alternative 6 – Innovative Treatment: Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in off-site landfill

The cost estimate was developed using the scope of work outlined in Sections 4 and 6 of the FS. Quantities used were based on figures presented in Section 2. Costs were based on information from the Micro Computer Aided Cost Engineering System (MCACES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). Quotes from area suppliers, generic unit costs, vendor information, conventional cost estimating guides and prior experience were used to supplement this information. The cost estimates presented have been prepared for guidance in project evaluation. The actual costs of the project will depend on true labor and materials costs at the time of construction, actual site conditions, competitive market condition, final project scope, and other variables.

Construction costs include those expenditures required to implement a remedial action. Both direct and indirect costs are considered in the development of construction cost estimates. Direct costs include construction costs or expenditures for equipment, labor, and materials required to implement a remedial action. Indirect costs include those associated with engineering, construction management, and other services necessary to carry out a remedial action. O & M and monitoring costs, which include labor, maintenance materials, and purchased services, have also been estimated.

Costs of the following remediation cases have been estimated for each alternative:

- Remediate soil with lead concentrations greater than 1250 mg/kg
- Remediate soil with lead concentrations greater than 1000 mg/kg
- Remediate soil with lead concentrations greater than 400 mg/kg, and

- Remediate soil with lead concentrations greater than 400 mg/kg or other metal concentrations greater than the TAGM values

Assumptions

The following assumptions were used to develop the cost estimates for Alternatives 2, 4, and 6:

- The contractor(s) will mobilize to the site, clear and grub the areas of work, establish access roads and survey the areas to be remediated. For Alternative 2, it is estimated that 11 acres of land will require light clearing and grubbing, and for Alternatives 4 and 6, it is estimated that 13 acres of land will required light clearing and grubbing. Clearing and grubbing is necessary to perform soil excavation, ditch soil excavation, and stockpiling.
- Erosion control (silt fence and haybales) will be installed around drainage swales, excavation areas, and stockpile areas. Erosion control is necessary to prevent soil particles from migrating off-site and into drainage swales during construction. The erosion control will be maintained throughout construction.
- For Alternative 2, a permanent fence will be installed around the SEAD-16 and –17, however, only a temporary fence during construction is required for Alternatives 4 and 6.
- The contractor will construct approximately 3000 linear feet of access roads. The roads will be used to access the excavation and stockpile areas as well as to prepare the stockpile areas.
- A surveyor will be on site for approximately 10 days to layout the excavation areas and survey record information.
- Prior to construction, SEAD-16 and –17 will be investigated by an unexploded ordinance (UXO) contractor to assure that the site is safe to work on. The UXO contractor will screen soil, locate and remove ordinances, and work with the remediation contractor during site activities. The screened soils will be placed into piles for sampling while the material removed during the screening process will be disposed of off-site. The material removed during the screening process may include shell casing, bullets, and rocks. The cost for UXB clearance and disposal of the screened material is not included in this estimate. However, the UXB cost is a significant and should be incorporated as part of the cost estimate in the final design.
- In situ volumes of material are based on the areas and proposed excavation depths presented in Table 2-1, Table 2-2, and Figures 2-1 through 2-6. For estimating purposes, an expansion factor of 30 percent was used to estimate ex situ volumes for soil, ditch soil, and building material. An additional 10% was used to address the uncertainty of the volume estimation. A conversion factor of 1 cubic yard equals 1.5 tons of moist material was used for estimating purposes. The delineated areas presented in Figures 2-1 through 2-6 are based on the analytical data in the SEAD-16 and SEAD-17 Remedial Investigation Report (Parson ES,

March 1999). The volume of material requiring excavation, soil covering, or soil washing may vary depending on the results of the cleanup verification sampling.

- Cleanup verification sampling of the soil will be conducted at a frequency of one sample every 2500 square feet (i.e. 50 ft by 50 ft grids). This frequency will be revised based on the actual cleanup verification work plan.
- Cleanup verification sampling of the ditch soil will be conducted at a frequency of one sample every 100 linear feet of drainage swale. This frequency will be revised based on the actual cleanup verification work plan.
- Building material, excavated ditch soil and soil will be placed in a stockpile area prior to treatment and/or disposal. The stockpile areas will be lined (and covered) with a 6-mil polyethylene liner. Each pile will consist of 150 cubic yards and will occupy a space of approximately 100 x 100 square feet. Prior to off-site disposal, one composite sample from each pile will be obtained and submitted for TCLP analysis.
- TCLP testing for off-site disposal will be conducted at a frequency of one sample every 150 cubic yards. This value will be revised during final design after selection of the off-site landfill.
- Transportation and disposal costs are based on quotes from Earthwatch Waste Systems, Inc. and CWM Chemical Services, L.L.C. Based on these quotes, transportation and disposal of RCRA Hazardous Soil (i.e. soil which fails the TCLP test and requires stabilization) can be disposed of off-site at a cost of $117/ton (includes 6% hazardous waste tax.) In addition, transportation and disposal of non-hazardous soil (i.e. soil which passes the TCLP test and does not require stabilization) can be disposed of in an off-site Subtitle D landfill for $31.50/ton (or $47.25/cy). For cost estimating purposes, it has been assumed that all material will fail the TCLP test and will require stabilization prior to off-site disposal.
- Material and debris from the Abandoned Deactivation Furnace Building (S-311) and the Process Support Building (366) at SEAD-16 will be removed and the surfaces will be cleaned. Debris and dust will be removed from the surface of the furnace and boiler stacks. The building will not be demolished as part of this remediation. As presented in Section 2, it is estimated that approximately 100 cubic yards (cy) of material and debris will require removal. Because of the limited quantity, it is anticipated that the buildings will be cleaned using techniques such as sweeping and steam cleaning. The material and debris will be collected, tested, and disposed of at an off-site landfill. Any water used in the treatment process will be collected and treated, prior to disposal. All the alternatives assume that the building material and debris will require treatment prior to disposal in an off-site landfill. Drums for collection of misc. debris as well as health and safety personal protective equipment and drum disposal are included in the cost.
- Ditch soil with metal concentrations exceeding the respective cleanup levels for the four cases will be excavated from the drainage swales and ditches and stockpiled on-site for Alternatives 2, 4, and 6. As presented in Section 2 and on Tables 2-1 and 2-2, ditch soil will

be excavated to a depth of 1 foot, resulting in an estimated in situ volume of 275, 275, 532, and 532 cy at SEAD-16 and 102, 143, 273, and 604 cy at SEAD-17 for the respective cases: ditch soil with lead concentration exceeding 1250, 1000, 400 mg/kg and ditch soil with lead concentration exceeding 400 or other metal concentrations exceeding the TAGM values. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of ditch soil is estimated to be 528, 585, 1127, and 1590 cubic yards respectively for the four cases.

- Depending on the specific alternative, the ditch soil will either be processed by soil washing or tested, transported, stabilized on-site or off-site as necessary, and disposed of off-site.
- Cost estimates were developed for Alternatives 2, 4, and 6 based on the intended future land use, which is industrial. This criteria is based on remediating soil with lead concentrations greater than 1250 mg/kg. In addition, costs required to achieve a level of protectiveness that would be sufficient for use under the NYSDOH industrial level, USEPA's requirement of residential lead level, and the NYSDEC requirement for pre-disposal were developed. These criteria were based on remediating soil with lead concentrations greater than 1000 mg/kg, 400 mg/kg, and remediating soil with lead concentrations greater than 400 mg/kg or other metal concentrations greater than the TAGM values, respectively. As presented in Section 2 and on Tables 2-4 and 2-5, surface soils will be excavated to a depth of 12 inches and subsurface soils will be excavated to a depth of 3 feet.
- The total in situ volume of surface soil with lead concentrations greater than 1250, 1000, 400 mg/kg, and with lead concentration exceeding 400 mg/kg or other metal concentrations exceeding the TAGM values is estimated to be 3162, 387398, 7406, and 12010 cubic yards, respectively. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of surface soil is estimated to be 4427, 5422, 10368, and 16814 cubic yards, respectively for the four cases.
- The total in situ volume of subsurface soil with lead concentrations greater than 1250, 1000, 400 mg/kg, and with lead concentration exceeding 400 mg/kg or other metal concentrations exceeding the TAGM values is estimated to be 25, 25, 183, and 839 cubic yards, respectively. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of subsurface soil is estimated to be 35, 35, 256, and 1175 cubic yards, respectively for the four cases.
- Building Material, excavated soil and ditch soil would be stockpiled and tested for Toxicity Characteristic Leaching Procedure (TCLP) prior to being disposed. Material passing the TCLP criteria will be transported and disposed off-site in a Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized either on-site or off-site and then disposed of off-site.
- Based on the estimated ditch soil volume, it is expected that off-site treatment will be more cost effective than on-site treatment. On-site treatment requires a treatability study, site

permitting, and a specialty contractor, which adds to the cost. Therefore, Alternative 2 assumes all excavated soil is transported off-site for treatment and disposal.

- Based on Alternative's 4 total soil and ditch soil ex situ volume, it is expected that off-site treatment may be more cost effective than on-site treatment. Therefore, Alternative 4 assumes all excavated material is transported off-site for treatment and disposal. However, based on conversations with Site Remediation Services (East Windsor, CT), United Retek Corp (Hollaston, MA), Williams Environmental Services, Inc (Atlanta, GA), and Silicate Technology Corp (Scottsdale, Arizona), the cost to perform ex situ on site stabilization for a similar volume (using a pugmill) could range from $60 to $100 per cubic yard. In conjunction with the ex situ stabilization, off-site transportation and disposal in a Subtitle D Landfill would cost an additional $47.25/cy (see above). Therefore, an estimate to perform on-site stabilization and off-site disposal to a Subtitle D landfill would range from $110 to $200 per cubic yard. On-site stabilization may be a cost effective procedure to dispose of the excavated material for Alternative 4, however, for conservative cost comparison purposes, Alternative 4 assumes all excavated soil is transported off-site for treatment and disposal.
- It is assumed that approximately one-third of all material that is soil washed will be fine grained material and will require off-site disposal. Based on this assumption, a total fine grain material volume (1663, 2014, 3917, and 6526 cubic yards or 1782, 2158, 3799, and 6993 tons) is estimated. It is expected that off-site treatment may be more cost effective than on-site treatment. Therefore, Alternative 6 assumes all fine grained material is transported off-site for treatment and disposal.
- For Alternative 2, a soil cover consisting of top soil, common fill, and filter fabric will be placed over the soil with lead concentrations greater than 1250, 1000, 400 mg/kg, and the soil with lead concentration exceeding 400 mg/kg or other metal conentrations greater than TAGM values. The areas are estimated to be 85,610 sf, 104,801 sf, 201,620 sf, and 331,824 sf, respectively. For Alternative 4, these areas will be backfilled using common fill and topsoil. For Alternative 6, the coarse grain material will be used as backfill, and topsoil will be placed to finalize the grade and establish vegetative growth. Based on available grain size distributions, it is estimated that approximately two-thirds of the soil will be used as on-site backfill.
- Swales and ditches will be backfilled with topsoil and vegetative growth will be established.
- To remediate the soil between and around the railroad tracks, the tracks, ties, and ballast will be removed and stockpiled near the site for removal/disposal by others. The area will then either be covered (Alternative 2) or excavated (Alternatives 4 and 6).

Post-Closure Monitoring

- Site groundwater will be monitored on a semi-annual basis. Currently, there are seven wells at SEAD-16 and five wells at SEAD-17. These wells may be sufficient for the continued monitoring. New wells will be installed as necessary to ensure that the monitoring program is sufficient to detect any migration from the area.
- Ditch soil sampling in Kendaia Creek will be conducted on an annual basis at four locations within the area affected by the drainage ditches at SEAD-16 and -17. The purpose of the sampling is to ensure that Kendaia Creek is not being contaminated by residual soil at the site.

Operations and Maintenance (O & M)

- Alternatives 4 and 6 do not require any long term O & M. However, Alternative 2 requires O & M, such as maintaining vegetation to protect the soil cover. It is assumed that cap maintenance will be required 5 to 6 times a year and will primarily consist of mowing.

Contingencies

The following markups were used to develop the detail cost estimates for Alternatives 2, 4, and 6.

Contractor costs are calculated as a percentage of the running total as:

- 5% for field office support. Field office support includes items such as supervision at the job, site, temporary facilities, temporary material storage, temporary utilities, operation and maintenance of temporary job-site facilities, preparatory work, health and safety supplies and requirements, transportation vehicles, cleanup, and equipment costs not chargeable to a specific task.
- 15% for home office support. Home office support includes items such as management and office staff salary and expense, main office building furniture and equipment, utilities, general communications and travel, supplies, general business insurance, and taxes. It also includes job specific items such as engineering and shop drawings/surveys, insurance (project coverage), schedules & reports, and quality control.
- 10% for profit. Profit provides the contractor with an incentive to perform the work as efficiently as possible. The profit used in the cost estimates is based on the current average profit for contractors in the Syracuse area.

- 4% for bond. The bond rate is based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for hazardous, toxic and radioactive waste (HTRW) projects.

Owner's cost are calculated as a percentage of running total as:

- 10% for design contingency. Design contingencies include construction cost increases due to design incompleteness, detail changes, alternative design changes, and associated costing inaccuracy. The design contingency used is based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for remedial action projects.
- 3% for escalation. This item reflects the cost inflation beyond the effective pricing date of the baseline estimate. A rate of 3% per year is assumed.
- 25% for construction contingency. Construction contingencies are a reserve for construction cost increases due to adverse or unexpected conditions such as unforeseeable relocations, site conditions, utility lines in unknown locations, quantity overruns, or other unforeseen problems beyond interpretation at the time of or after contract award. The construction contingency used is based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for remedial action projects and on experience.
- 3.5% for other costs. Other government costs include the following: engineering during construction (EDC) (1.5%), as-builts (0.5%), operation and maintenance (O&M) manuals (0.5%), and government laboratory quality assurance (1.0%). These rates are based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for remedial action projects.
- 8% for construction management. These rates are based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for remedial action projects.

SEAD-16 and 17
ON-SITE CONTAINMENT
(SOIL > 1250 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/16/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
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LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 2.

On-site Containment: Institutional Controls/Soil Cover
- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Construct permanent fence (institutional controls)
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport ditch soil and building material failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize ditch soil and building material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose ditch soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Place soil cover (topsoil, common fill & geogrid) over soil > 1250 mg/kg and hydroseed
- Demobilize
- Long-term O & M and monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The area requiring the soil cover could vary based on the results of the cleanup verification sampling.

2. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

3. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

4. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	9.00	EA	0	0	0	0	1,395	1,395	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03. Site Work									
33.03.02. Clearing, Grubbing, and Fence									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	11.00	ACR	176	4,759	6,918	0	0	11,677	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00	EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00	EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00	LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00	LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 RR tracks at 350 LF	1.00	EA	0	17,178	3,297	286	0	20,761	20760.69
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00	LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00	LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00	LF	35	884	0	5,564	0	6,448	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soil Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	528.00	CY	47	1,056	1,584	0	0	2,640	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	35200	SF	0	0	0	3,013	0	3,013	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	52800	SF	0	0	0	4,520	0	4,520	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	10.17	MSF	10	257	0	453	0	710	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	528.00	CY	47	1,410	734	10,299	0	12,443	23.57
33.09.09. Disposal									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00) (377cy x 1.5)	566.00	TON	0	0	0	0	66,222	66,222	117.00

33.09. Ditch Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	9512.00	SY	64	1,617	0	12,722	0	14,339	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	2390.00	TON	0	0	0	11,124	0	11,124	4.65
AF AA Fill, spread borrow w/dozer (Volumes used for estimate are 40% greater than in-situ volumes)	2231.00	CY	27	803	1,450	0	0	2,253	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep (Volumes used for estimate are 40% greater than in-situ volumes)	2231.00	CY	197	5,957	3,101	43,518	0	52,576	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	85.61	MSF	86	2,164	0	3,811	0	5,975	69.79
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			8,005	105,360	45,984	171,367	100,095	422,806	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soil	1.00	EA	4,520	450	150	1,280	220	530	7,160	7161.90
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
TOTAL Sampling, & Testi	1.00	EA	5,170	520	170	1,470	260	610	8,190	8189.72
33.03 Site Work										
33.03.02 Clearing, Grubbin	3.00	ACR	73,820	7,380	2,440	20,910	3,660	8,660	116,860	38952.05
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00	EA	39,670	3,970	1,310	11,240	1,970	4,650	62,800	62801.02
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	68,850	6,890	2,270	19,500	3,410	8,070	109,000	108996.53
TOTAL Site Work	1.00	EA	247,540	24,750	8,170	70,110	12,270	29,030	391,870	391870.40
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soil Remediati										
33.09.04 Sitework	1.00	EA	32,220	3,220	1,060	9,130	1,600	3,780	51,010	51009.13
33.09.09 Disposal	1.00	EA	91,480	9,150	3,020	25,910	4,530	10,730	144,820	144816.98
TOTAL Ditch Soil Remedi	1.00	EA	123,700	12,370	4,080	35,040	6,130	14,510	195,830	195826.11
33.10 Soil Remediation										
33.10. 5 Cover	1.00	EA	119,170	11,920	3,930	33,750	5,910	13,970	188,650	188653.88
TOTAL Soil Remediation	1.00	EA	119,170	11,920	3,930	33,750	5,910	13,970	188,650	188653.88
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	1,380	240	570	7,720	7716.22
TOTAL Demobilization	1.00	EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00	EA	577,290	57,730	19,050	163,520	28,620	67,700	913,900	913896.25

SEAD-16 and 17
ON-SITE CONTAINMENT
(SOIL > 1000 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/16/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

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The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

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	Level A	Level B	Level C	Level D
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*Breaks	60	60	40	30
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Productive Time (minutes)	160	300	370	410
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	33%	63%	77%	85%

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Total, use	3.5%

SUMMARY REPORTS — SUMMARY PAGE

DETAILED ESTIMATE — DETAIL PAGE

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AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 585cy/150cy)	4.00	EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 585cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	10.00	EA	0	0	0	0	1,550	1,550	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150 cy	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150 cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy	1.00	EA	0	0	0	0	120	120	120.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03. Site Work									
33.03.02. Clearing, Grubbing, and Fence									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	11.00	ACR	176	4,759	6,918	0	0	11,677	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00	EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00	EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00	LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00	LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove RR tracks at 400 LF	1.00	EA	0	19,220	3,711	330	0	23,261	23260.56
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00	LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00	LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00	LF	35	884	0	5,564	0	6,448	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	585.00	CY	52	1,170	1,755	0	0	2,925	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	39000	SF	0	0	0	3,338	0	3,338	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	58500	SF	0	0	0	5,008	0	5,008	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	11.29	MSF	11	285	0	503	0	788	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	585.00	CY	52	1,562	813	11,411	0	13,786	23.57
33.09.09. Disposal									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00) (418cy x 1.5)	627.00	TON	0	0	0	0	73,359	73,359	117.00

33.09. Ditch Soils Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	11645	SY	78	1,980	0	15,575	0	17,555	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	2924.00	TON	0	0	0	13,610	0	13,610	4.65
AF AA Fill, spread borrow w/dozer (Volumes used for estimate are 40% greater than in-situ volumes)	2729.00	CY	33	982	1,774	0	0	2,756	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep (Volumes used for estimate are 40% greater than in-situ volumes)	2729.00	CY	241	7,286	3,793	53,232	0	64,312	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	104.80	MSF	105	2,649	0	4,665	0	7,314	69.79
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			8,099	110,053	47,664	189,293	107,387	454,397	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	4,740	470	160	1,340	230	560	7,500	7500.86
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
TOTAL Sampling, & Testi	1.00	EA	5,390	540	180	1,530	270	630	8,530	8528.68
33.03 Site Work										
33.03.02 Clearing, Grubbin	3.00	ACR	73,820	7,380	2,440	20,910	3,660	8,660	116,860	38952.05
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00	EA	43,120	4,310	1,420	12,210	2,140	5,060	68,270	68267.84
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	68,850	6,890	2,270	19,500	3,410	8,070	109,000	108996.53
TOTAL Site Work	1.00	EA	250,990	25,100	8,280	71,090	12,440	29,430	397,340	397337.22
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat										
33.09.04 Sitework	1.00	EA	35,700	3,570	1,180	10,110	1,770	4,190	56,520	56519.17
33.09.09 Disposal	1.00	EA	101,340	10,130	3,340	28,700	5,020	11,880	160,420	160424.46
TOTAL Ditch Soils Remed	1.00	EA	137,040	13,700	4,520	38,820	6,790	16,070	216,940	216943.63
33.10 Soil Remediation										
33.10. 5 Cover	1.00	EA	145,800	14,580	4,810	41,300	7,230	17,100	230,810	230814.44
TOTAL Soil Remediation	1.00	EA	145,800	14,580	4,810	41,300	7,230	17,100	230,810	230814.44
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	970	230	540	7,250	7253.25
TOTAL Demobilization	1.00	EA	17,060	1,710	560	4,420	830	1,970	26,540	26543.81
TOTAL Remedial Action	1.00	EA	620,930	62,090	20,490	175,460	30,760	72,780	982,520	982517.14

SEAD-16 and 17
ON-SITE CONTAINMENT
(SOIL > 400 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/16/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 2.

On-site Containment: Institutional Controls/Soil Cover

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Construct permanent fence (institutional controls)
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport ditch soil and building material failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize ditch soil and building material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose ditch soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Place soil cover (topsoil, common fill & geogrid) over soil > 400 mg/kg and hydroseed
- Demobilize
- Long-term O & M and monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The area requiring the soil cover could vary based on the results of the cleanup verification sampling.

2. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

3. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

4. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soils									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	960	960	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	1,840	1,840	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	960	960	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	18.00	EA	0	0	0	0	2,790	2,790	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03. Site Work									
33.03.02. Clearing, Grubbing, and Fence									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	11.00	ACR	176	4,759	6,918	0	0	11,677	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00	EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00	EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00	LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00	LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00	LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00	LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00	LF	35	884	0	5,564	0	6,448	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1127.00	CY	100	2,254	3,381	0	0	5,635	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	75200	SF	0	0	0	6,437	0	6,437	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	112700	SF	0	0	0	9,647	0	9,647	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	21.75	MSF	22	550	0	968	0	1,518	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1127.00	CY	99	3,009	1,567	21,983	0	26,559	23.57
33.09.09. Disposal									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00) (805 cy x 1.5)	1208.00	TON	0	0	0	0	141,336	141,336	117.00

33.09. Ditch Soils Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	22402	SY	150	3,808	0	29,963	0	33,771	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	5692.00	TON	0	0	0	26,493	0	26,493	4.65
AF AA Fill, spread borrow w/dozer (Volumes used for estimate are 40% greater than in-situ volumes)	5312.00	CY	64	1,912	3,453	0	0	5,365	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep (Volumes used for estimate are 40% greater than in-situ volumes)	5312.00	CY	469	14,183	7,384	103,616	0	125,183	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	201.62	MSF	202	5,097	0	8,975	0	14,071	69.79
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			8,633	128,185	55,897	290,143	178,484	652,709	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	9,050	900	300	2,560	450	1,060	14,320	14323.81
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
TOTAL Sampling, & Testi	1.00	EA	9,700	970	320	2,750	480	1,140	15,350	15351.62
33.03 Site Work										
33.03.02 Clearing, Grubbin	3.00	ACR	73,820	7,380	2,440	20,910	3,660	8,660	116,860	38952.05
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00	EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	68,850	6,890	2,270	19,500	3,410	8,070	109,000	108996.53
TOTAL Site Work	1.00	EA	256,410	25,640	8,460	72,630	12,710	30,070	405,920	405923.07
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat										
33.09.04 Sitework	1.00	EA	68,790	6,880	2,270	19,480	3,410	8,070	108,900	108896.39
33.09.09 Disposal	1.00	EA	195,240	19,520	6,440	55,300	9,680	22,890	309,080	309079.35
TOTAL Ditch Soils Remed	1.00	EA	264,030	26,400	8,710	74,790	13,090	30,960	417,980	417975.74
33.10 Soil Remediation										
33.10. 5 Cover	1.00	EA	283,020	28,300	9,340	80,170	14,030	33,190	448,050	448049.01
TOTAL Soil Remediation	1.00	EA	283,020	28,300	9,340	80,170	14,030	33,190	448,050	448049.01
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	1,380	240	570	7,720	7716.22
TOTAL Demobilization	1.00	EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00	EA	894,870	89,490	29,530	253,470	44,360	104,940	1,416,660	1416655.58

SEAD-16 and 17
ON-SITE CONTAINMENT
(SOIL: Lead > 400 mg/kg and
other metals > TAGMs)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/16/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 2.

On-site Containment: Institutional Controls/Soil Cover

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Construct permanent fence (institutional controls)
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport ditch soil and building material failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize ditch soil and building material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose ditch soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Place soil cover (topsoil, common fill & geogrid) over soil with lead concentrations > 400 mg/kg or other metals > TAGM and hydroseed
- Demobilize
- Long-term O & M and monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%

Example:

Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213

* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The area requiring the soil cover could vary based on the results of the cleanup verification sampling.

2. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

3. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

4. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

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33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.06. Ditch Soils								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00 EA	0	0	0	0	1,320	1,320	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00 EA	0	0	0	0	2,530	2,530	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00 EA	0	0	0	0	1,320	1,320	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	22.00 EA	0	0	0	0	3,410	3,410	155.00
33.02.07. Building Material								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03. Site Work									
33.03.02. Clearing, Grubbing, and Fence									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	11.00	ACR	176	4,759	6,918	0	0	11,677	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00	EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00	EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00	LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00	LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00	LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00	LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00	LF	35	884	0	5,564	0	6,448	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1590.00	CY	141	3,180	4,770	0	0	7,950	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	106100	SF	0	0	0	9,082	0	9,082	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	159100	SF	0	0	0	13,619	0	13,619	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	30.68	MSF	31	776	0	1,366	0	2,141	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1590.00	CY	140	4,245	2,210	31,015	0	37,470	23.57
33.09.09. Disposal									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00) (1136cy x 1.5)	1704.00	TON	0	0	0	0	199,368	199,368	117.00

33.09. Ditch Soils Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	36869	SY	247	6,268	0	49,312	0	55,580	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	9637.00	TON	0	0	0	44,855	0	44,855	4.65
AF AA Fill, spread borrow w/dozer (Volumes used for estimate are 40% greater than in-situ volumes)	8994.00	CY	108	3,238	5,846	0	0	9,084	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep (Volumes used for estimate are 40% greater than in-situ volumes)	8994.00	CY	793	24,014	12,502	175,438	0	211,954	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	331.82	MSF	332	8,388	0	14,770	0	23,158	69.79
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			9,320	147,480	65,440	421,517	238,546	872,984	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	11,850	1,190	390	3,360	590	1,390	18,760	18763.10
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
TOTAL Sampling, & Testi	1.00	EA	12,500	1,250	410	3,540	620	1,470	19,790	19790.91
33.03 Site Work										
33.03.02 Clearing, Grubbin	3.00	ACR	73,820	7,380	2,440	20,910	3,660	8,660	116,860	38952.05
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00	EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	68,850	6,890	2,270	19,500	3,410	8,070	109,000	108996.53
TOTAL Site Work	1.00	EA	256,410	25,640	8,460	72,630	12,710	30,070	405,920	405923.07
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat										
33.09.04 Sitework	1.00	EA	97,060	9,710	3,200	27,490	4,810	11,380	153,650	153652.77
33.09.09 Disposal	1.00	EA	275,400	27,540	9,090	78,010	13,650	32,300	435,990	435986.10
TOTAL Ditch Soils Remed	1.00	EA	372,460	37,250	12,290	105,500	18,460	43,680	589,640	589638.87
33.10 Soil Remediation										
33.10. 5 Cover	1.00	EA	476,070	47,610	15,710	134,850	23,600	55,830	753,650	753653.74
TOTAL Soil Remediation	1.00	EA	476,070	47,610	15,710	134,850	23,600	55,830	753,650	753653.74
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	1,380	240	570	7,720	7716.22
TOTAL Demobilization	1.00	EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00	EA	1,199,150	119,920	39,570	339,660	59,440	140,620	1,898,360	1898362.73

SEAD-16 and 17
OFF-SITE DISPOSAL
(SOIL > 1250 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 4.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 1250 mg/kg
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize soil exceeding TCLP criteria (on-site or off-site)
- Transport and dispose soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

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33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soils									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 528cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	9.00	EA	0	0	0	0	1,395	1,395	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 4462cy / 150cy)	30.00	EA	0	0	0	0	3,600	3,600	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 4462cy / 150cy)	30.00	EA	0	0	0	0	6,900	6,900	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 4462cy / 150cy)	30.00	EA	0	0	0	0	3,600	3,600	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 85,610sf / 2500 sf)	35.00	EA	0	0	0	0	5,425	5,425	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 RR tracks at 350 LF	1.00	EA	0	17,178	3,297	286	0	20,761	20760.69
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area Survey remediation area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - stalked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	528.00	CY	47	1,056	1,584	0	0	2,640	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	35200	SF	0	0	0	3,013	0	3,013	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	52800	SF	0	0	0	4,520	0	4,520	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	10.17	MSF	10	257	0	453	0	710	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	528.00	CY	47	1,410	734	10,299	0	12,443	23.57
33.09.09. Disposal									
Transportation of ditch soil to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	566.00	TON	0	0	0	0	66,222	66,222	117.00

33.09. Ditch Soils Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	4427.00	CY	392	8,854	13,281	0	0	22,135	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	295200	SF	0	0	0	25,269	0	25,269	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	442700	SF	0	0	0	37,895	0	37,895	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2214.00	CY	195	5,911	3,077	43,187	0	52,175	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	2372.00	TON	0	0	0	11,040	0	11,040	4.65
AF AA Fill, spread borrow w/dozer	2214.00	CY	27	797	1,439	0	0	2,236	1.01
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	85.39	MSF	85	2,159	0	3,801	0	5,960	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	35.00	CY	3	70	105	0	0	175	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	2400.00	SF	0	0	0	205	0	205	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	3500.00	SF	0	0	0	300	0	300	0.09
33.10.06. Disposal									
Transportation of soil to hazardous waste landfill									
HTW AA Surface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	4743.00	TON	0	0	0	0	554,931	554,931	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Subsurface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	38.00	TON	0	0	0	0	4,446	4,446	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			7,850	99,522	58,273	200,579	678,997	1,037,371	

** PROJECT OWNER SUMMARY - SUBSYSTM (Rounded to 10's) **

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	4,520	450	150	1,280	220	530	7,160	7161.90
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00	EA	26,970	2,700	890	7,640	1,340	3,160	42,700	42698.07
TOTAL Sampling, & Testi	1.00	EA	32,140	3,210	1,060	9,100	1,590	3,770	50,890	50887.79
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00	EA	39,670	3,970	1,310	11,240	1,970	4,650	62,800	62801.02
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00	EA	198,550	19,860	6,550	56,240	9,840	23,280	314,320	314323.76
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat										
33.09.04 Sitework	1.00	EA	32,220	3,220	1,060	9,130	1,600	3,780	51,010	51009.13
33.09.09 Disposal	1.00	EA	91,480	9,150	3,020	25,910	4,530	10,730	144,820	144816.98
TOTAL Ditch Soils Remed	1.00	EA	123,700	12,370	4,080	35,040	6,130	14,510	195,830	195826.11
33.10 Soil Remediation										
33.10.02 Sitework - Surfac	1.00	EA	216,480	21,650	7,140	61,320	10,730	25,390	342,700	342701.46
33.10.04 Sitework - Subsur	1.00	EA	940	90	30	270	50	110	1,490	1487.14
33.10.06 Disposal	1.00	EA	772,710	77,270	25,500	218,870	38,300	90,610	1,223,270	1223268.51
TOTAL Soil Remediation	1.00	EA	990,130	99,010	32,670	280,450	49,080	116,110	1,567,460	1567457.11
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	1,380	240	570	7,720	7716.22

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00 EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00 EA	1,426,240	142,620	47,070	403,980	70,700	167,250	2,257,850	2257850.90

SEAD-16 and 17
OFF-SITE DISPOSAL
(SOIL > 1000 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 4.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal
- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 1000 mg/kg
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize soil exceeding TCLP criteria (on-site or off-site)
- Transport and dispose soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 585cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 585cy/150cy)	4.00	EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 585cy/150cy)	4.00	EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	10.00	EA	0	0	0	0	1,550	1,550	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 5457cy / 150cy)	37.00	EA	0	0	0	0	4,440	4,440	120.00

33.02. Sampling, & Testing	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 5457 cy/150 cy)	37.00 EA	0	0	0	0	8,510	8,510	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil, Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 5457 cy/150cy)	37.00 EA	0	0	0	0	4,440	4,440	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 104,801sf / 2500 sf)	42.00 EA	0	0	0	0	6,510	6,510	155.00
33.03. Site Work								
33.03.02. Clearing and Grubbing								
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00 LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00 ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways								
USR AA Grade 20ft wide roadway	3000.00 LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00 LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks								
USR AA Mobilization	1.00 EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 RR tracks at 400 LF	1.00 EA	0	19,220	3,711	330	0	23,261	23260.56
USR AA Demobilization	1.00 EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area								
USR AA Survey remediation area	10.00 DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work								
L MIL AA UXO person - explosives contractor to screen area	11.00 ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control								
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00 LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - stalked	5500.00 LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00 LF	37	935	0	5,885	0	6,820	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soil Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	585.00	CY	52	1,170	1,755	0	0	2,925	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	39000	SF	0	0	0	3,338	0	3,338	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	58500	SF	0	0	0	5,008	0	5,008	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	11.29	MSF	11	285	0	503	0	788	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	585.00	CY	52	1,562	813	11,411	0	13,786	23.57
33.09.09. Disposal									
Transportation of ditch soil to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	627.00	TON	0	0	0	0	73,359	73,359	117.00

33.09. Ditch Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	5422.00	CY	480	10,844	16,266	0	0	27,110	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	361500	SF	0	0	0	30,944	0	30,944	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	542300	SF	0	0	0	46,421	0	46,421	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2711.00	CY	239	7,238	3,768	52,881	0	63,888	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	2905.00	TON	0	0	0	13,521	0	13,521	4.65
AF AA Fill, spread borrow w/dozer	2711.00	CY	33	976	1,762	0	0	2,738	1.01
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	104.58	MSF	105	2,644	0	4,655	0	7,299	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	35.00	CY	3	70	105	0	0	175	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	2400.00	SF	0	0	0	205	0	205	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	3500.00	SF	0	0	0	300	0	300	0.09
33.10.06. Disposal									
Transportation of soil to hazardous waste landfill									
HTW AA Surface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	5810.00	TON	0	0	0	0	679,770	679,770	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Subsurface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	38.00	TON	0	0	0	0	4,446	4,446	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			8,019	105,839	62,936	229,828	815,503	1,214,107	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00	EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing										
33.02.06 Ditch Soil	1.00	EA	4,740	470	160	1,340	230	560	7,500	7500.86
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00	EA	33,010	3,300	1,090	9,350	1,640	3,870	52,270	52265.50
TOTAL Sampling, & Testi	1.00	EA	38,400	3,840	1,270	10,880	1,900	4,500	60,790	60794.18
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00	EA	43,120	4,310	1,420	12,210	2,140	5,060	68,270	68267.84
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00	EA	202,000	20,200	6,670	57,220	10,010	23,690	319,790	319790.58
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soil Remediati										
33.09.04 Sitework	1.00	EA	35,700	3,570	1,180	10,110	1,770	4,190	56,520	56519.17
33.09.09 Disposal	1.00	EA	101,340	10,130	3,340	28,700	5,020	11,880	160,420	160424.46
TOTAL Ditch Soil Remedi	1.00	EA	137,040	13,700	4,520	38,820	6,790	16,070	216,940	216943.63
33.10 Soil Remediation										
33.10.02 Sitework - Surfac	1.00	EA	265,120	26,510	8,750	75,090	13,140	31,090	419,700	419700.65
33.10.04 Sitework - Subsur	1.00	EA	940	90	30	270	50	110	1,490	1487.14
33.10.06 Disposal	1.00	EA	945,160	94,520	31,190	267,720	46,850	110,830	1,496,270	1496271.55
TOTAL Soil Remediation	1.00	EA	1,211,220	121,120	39,970	343,080	60,040	142,030	1,917,460	1917459.33
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00	EA	4,870	490	160	1,380	240	570	7,720	7716.22

** PROJECT OWNER SUMMARY - SUBSYSTM (Rounded to 10's) **

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00 EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00 EA	1,670,370	167,040	55,120	473,130	82,800	195,880	2,644,340	2644343.86

SEAD-16 and 17
OFF-SITE DISPOSAL
(SOIL > 400 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 4.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 400 mg/kg
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil failing TCLP criteria to stabilization area (on-site or off-site)
- Stabilize soil exceeding TCLP criteria (on-site or off-site)
- Transport and dispose soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%

Example:

Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213

* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127y/150cy)	8.00	EA	0	0	0	0	960	960	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	1,840	1,840	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	960	960	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	18.00	EA	0	0	0	0	2,790	2,790	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 10625cy / 150cy)	71.00	EA	0	0	0	0	8,520	8,520	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 10625cy / 150cy)	71.00	EA	0	0	0	0	16,330	16,330	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 10625cy / 150cy)	71.00	EA	0	0	0	0	8,520	8,520	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 201,620sf / 2500 sf)	81.00	EA	0	0	0	0	12,555	12,555	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - stalked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soil Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1127.00	CY	100	2,254	3,381	0	0	5,635	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	75200	SF	0	0	0	6,437	0	6,437	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	112700	SF	0	0	0	9,647	0	9,647	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	21.75	MSF	22	550	0	968	0	1,518	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1127.00	CY	99	3,009	1,567	21,983	0	26,559	23.57
33.09.09. Disposal									
Transportation of ditch soil to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	1208.00	TON	0	0	0	0	141,336	141,336	117.00

33.09. Ditch Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	10368	CY	918	20,736	31,104	0	0	51,840	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	691300	SF	0	0	0	59,175	0	59,175	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	1036900	SF	0	0	0	88,759	0	88,759	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	5184.00	CY	457	13,841	7,206	101,120	0	122,167	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	5555.00	TON	0	0	0	25,856	0	25,856	4.65
AF AA Fill, spread borrow w/dozer	5184.00	CY	62	1,866	3,370	0	0	5,236	1.01
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	200.00	MSF	200	5,056	0	8,902	0	13,958	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	256.00	CY	23	512	768	0	0	1,280	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	17100	SF	0	0	0	1,464	0	1,464	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	25700	SF	0	0	0	2,200	0	2,200	0.09
33.10.06. Disposal									
Transportation of soil to hazardous waste landfill									
HTW AA Surface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	11109	TON	0	0	0	0	1,299,753	1,299,753	117.00

33.10. Soil Remediation	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Subsurface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	275.00 TON	0	0	0	0	32,175	32,175	117.00
33.26. Demobilization								
TOTAL Decontaminate Equipment	1.00 EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00 EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17		8,925	132,107	86,446	387,261	1,556,337	2,162,151	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00 EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing									
33.02.06 Ditch Soil	1.00 EA	9,050	900	300	2,560	450	1,060	14,320	14323.81
33.02.07 Building Material	1.00 EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00 EA	63,440	6,340	2,090	17,970	3,140	7,440	100,430	100430.67
TOTAL Sampling, & Testi	1.00 EA	73,140	7,310	2,410	20,720	3,630	8,580	115,780	115782.29
33.03 Site Work									
33.03.02 Clearing and Grub	3.00 ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00 ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00 EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00 ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00 LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00 EA	207,430	20,740	6,850	58,750	10,280	24,320	328,380	328376.42
33.07 Building Remediation	1.00 EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soil Remediati									
33.09.04 Sitework	1.00 EA	68,790	6,880	2,270	19,480	3,410	8,070	108,900	108896.39
33.09.09 Disposal	1.00 EA	195,240	19,520	6,440	55,300	9,680	22,890	309,080	309079.35
TOTAL Ditch Soil Remedi	1.00 EA	264,030	26,400	8,710	74,790	13,090	30,960	417,980	417975.74
33.10 Soil Remediation									
33.10.02 Sitework - Surfac	1.00 EA	506,950	50,700	16,730	143,590	25,130	59,450	802,550	802550.00
33.10.04 Sitework - Subsur	1.00 EA	6,830	680	230	1,930	340	800	10,810	10811.04
33.10.06 Disposal	1.00 EA	1,839,900	183,990	60,720	521,150	91,200	215,760	2,912,710	2912714.65
TOTAL Soil Remediation	1.00 EA	2,353,680	235,370	77,670	666,680	116,670	276,010	3,726,080	3726075.69
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00 EA	4,870	490	160	1,380	240	570	7,720	7716.22

** PROJECT OWNER SUMMARY - SUBSYSTM (Rounded to 10's) **

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00 EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00 EA	2,979,980	298,000	98,340	844,080	147,710	349,450	4,717,570	4717566.29

SEAD-16 and 17
OFF-SITE DISPOSAL
(SOIL: Lead > 400 mg/kg and
other metals > TAGMs

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
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PROJECT DESCRIPTION:

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- Unexploded ordinance clearance
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- Excavate soils with lead concentration > 400 mg/kg or other metals greater than TAGM
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- Perform cleanup verification testing
- Transport soil failing TCLP criteria to stabilization area (on-site or off-site)
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- Transport and dispose soil and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

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2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
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The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

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- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

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33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	1,320	1,320	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	2,530	2,530	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	1,320	1,320	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF)	22.00	EA	0	0	0	0	3,410	3,410	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cý/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 17,989cy / 150cy)	120.00	EA	0	0	0	0	14,400	14,400	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 17,989cy / 150cy)	120.00	EA	0	0	0	0	27,600	27,600	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy: 17,989cy / 150cy)	120.00	EA	0	0	0	0	14,400	14,400	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 331,824sf / 2500 sf)	133.00	EA	0	0	0	0	20,615	20,615	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - stalked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.07. Building Remediation									
MIL Clean up material amd debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soil Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1590.00	CY	141	3,180	4,770	0	0	7,950	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	106100	SF	0	0	0	9,082	0	9,082	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	159100	SF	0	0	0	13,619	0	13,619	0.09
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	30.68	MSF	31	776	0	1,366	0	2,141	69.79
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1590.00	CY	140	4,245	2,210	31,015	0	37,470	23.57
33.09.09. Disposal									
Transportation of ditch soil to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	1610.00	TON	0	0	0	0	188,370	188,370	117.00

33.09. Ditch Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	16814	CY	1,488	33,628	50,442	0	0	84,070	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	112100	SF	0	0	0	9,596	0	9,596	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	1681400	SF	0	0	0	143,928	0	143,928	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	8407.00	CY	741	22,447	11,686	163,988	0	198,120	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	9008.00	TON	0	0	0	41,928	0	41,928	4.65
AF AA Fill, spread borrow w/dozer	8407.00	CY	101	3,027	5,465	0	0	8,491	1.01
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	324.28	MSF	324	8,198	0	14,434	0	22,632	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1175.00	CY	104	2,350	3,525	0	0	5,875	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	78400	SF	0	0	0	6,711	0	6,711	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	117500	SF	0	0	0	10,058	0	10,058	0.09
33.10.06. Disposal									
Transportation of soil to hazardous waste landfill									
HTW AA Surface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	18015	TON	0	0	0	0	2,107,755	2,107,755	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Subsurface soils: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	1259.00	TON	0	0	0	0	147,303	147,303	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-16 and 17			10,115	162,133	117,148	506,474	2,559,621	3,345,376	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	530	170	1,500	260	620	8,370	8370.61
TOTAL Mobilization	1.00 EA	5,290	530	170	1,500	260	620	8,370	8370.61
33.02 Sampling, & Testing									
33.02.06 Ditch Soil	1.00 EA	11,850	1,190	390	3,360	590	1,390	18,760	18763.10
33.02.07 Building Material	1.00 EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00 EA	106,390	10,640	3,510	30,130	5,270	12,480	168,420	168419.55
TOTAL Sampling, & Testi	1.00 EA	118,890	11,890	3,920	33,680	5,890	13,940	188,210	188210.46
33.03 Site Work									
33.03.02 Clearing and Grub	3.00 ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00 ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00 EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00 ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00 LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00 EA	207,430	20,740	6,850	58,750	10,280	24,320	328,380	328376.42
33.07 Building Remediation	1.00 EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soil Remediati									
33.09.04 Sitework	1.00 EA	97,060	9,710	3,200	27,490	4,810	11,380	153,650	153652.77
33.09.09 Disposal	1.00 EA	260,210	26,020	8,590	73,700	12,900	30,510	411,940	411935.22
TOTAL Ditch Soil Remedi	1.00 EA	357,270	35,730	11,790	101,200	17,710	41,900	565,590	565588.00
33.10 Soil Remediation									
33.10.02 Sitework - Surfac	1.00 EA	702,800	70,280	23,190	199,070	34,840	82,410	1,112,590	1112587.59
33.10.04 Sitework - Subsur	1.00 EA	31,280	3,130	1,030	8,860	1,550	3,670	49,520	49518.91
33.10.06 Disposal	1.00 EA	3,115,090	311,510	102,800	882,350	154,410	365,290	4,931,450	4931453.11
TOTAL Soil Remediation	1.00 EA	3,849,170	384,920	127,020	1,090,280	190,800	451,370	6,093,560	6093559.62
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	12,190	1,220	400	3,450	600	1,430	19,290	19290.56
33.26.06 Demobilization	1.00 EA	4,870	490	160	1,380	240	570	7,720	7716.22

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00	EA	17,060	1,710	560	4,830	850	2,000	27,010	27006.79
TOTAL Remedial Action	1.00	EA	4,614,470	461,450	152,280	1,307,050	228,730	541,120	7,305,090	7305090.65

SEAD-16 and 17
INNOVATIVE TREATMENT:
SOIL WASHING
(SOIL > 1250 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 6.

Innovative Treatment: Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in an off-site landfill

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 1250 mg/kg
- Transport soil to on-site treatment staging area
- Perform cleanup verification testing
- Soil wash; Physical separation of fine grain from coarse grain
- Backfill clean coarse grain material
- Stockpile and perform TCLP testing on fine grain material
- Transport fine grain material failing TCLP criteria to treatment area (on-site or off-site)
- Treat fine grain material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose fine grain material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

4. The volume of fine grain material requiring off-site disposal could vary depending on actual soil conditions encountered.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

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33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA Mobilization	1.00 EA	0	793	10,000	535	0	11,328	11327.72
33.02. Sampling, & Testing								
33.02.06. Ditch Soils Assumes all material is fine grained.								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 528cy/150cy)	4.00 EA	0	0	0	0	480	480	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 528cy/150cy)	4.00 EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 528cy/150cy)	4.00 EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assumes 1 test/100 LF)	9.00 EA	0	0	0	0	1,395	1,395	155.00
33.02.07. Building Material								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.11. Soil									
Assume 33% of total volume will be fine grained and will require TCLP testing.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 4462cy * 1/3 * 1/150cy)	10.00	EA	0	0	0	0	1,200	1,200	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 4462cy * 1/3 * 1/150cy)	10.00	EA	0	0	0	0	2,300	2,300	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 4462cy * 1/3 * 1/150cy)	10.00	EA	0	0	0	0	1,200	1,200	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 85,610sf / 2500sf)	35.00	EA	0	0	0	0	5,425	5,425	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 RR tracks at 350 LF	1.00	EA	0	17,178	3,297	286	0	20,761	20760.69
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - staked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	528.00	CY	47	1,056	1,584	0	0	2,640	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	35200	SF	0	0	0	3,013	0	3,013	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	52800	SF	0	0	0	4,520	0	4,520	0.09
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	528.00	CY	47	1,410	734	10,299	0	12,443	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	10.17	MSF	10	257	0	453	0	710	69.79

33.10. Soil Remediation Sitework	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation Sitework									
33.10.02. Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	4427.00	CY	392	8,854	13,281	0	0	22,135	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	295200	SF	0	0	0	25,269	0	25,269	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	442700	SF	0	0	0	37,895	0	37,895	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2214.00	CY	195	5,911	3,077	43,187	0	52,175	23.57
RSM AA Backfill coarse material from soil washing: Backfill, strl, sand & gravel, no cmpct, 75 HP dozer, 50' haul	2951.00	CY	32	974	561	0	0	1,535	0.52
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	85.39	MSF	85	2,159	0	3,801	0	5,960	69.79
33.10.04. Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	35.00	CY	3	70	105	0	0	175	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	2400.00	SF	0	0	0	205	0	205	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	3500.00	SF	0	0	0	300	0	300	0.09
33.15. Soil Washing									
AF AA Load and haul soil: Hauling, w/loading, 12 CY truck, 5 mile haul, soil	4990.00	CY	172	4,840	7,435	0	0	12,275	2.46
HTW AA HTRW, soil washing system, 1000 0 ton incl residual water, trailer	5346.00	TON	0	0	0	0	828,630	828,630	155.00
USR AA Water treatment	50000	GAL	0	0	0	0	50,000	50,000	1.00

33.17. Disposal	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.17. Disposal								
HTW AA Dispose fine material from soil washing: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00) (Assume 30% of excavated material is fine grained)	1782.00 TON	0	0	0	0	208,494	208,494	117.00
33.26. Demobilization								
TOTAL Decontaminate Equipment	1.00 EA	0	1,321	7,500	2,500	0	11,321	11321.20
TOTAL Demobilization	1.00 EA	0	528	10,000	500	0	11,028	11028.48
TOTAL SEAD-16 and 17		8,028	104,539	82,330	189,538	1,131,122	1,507,529	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
TOTAL Mobilization	1.00 EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
33.02 Sampling, & Testing									
33.02.06 Ditch Soils	1.00 EA	4,520	450	150	1,280	220	530	7,160	7161.90
33.02.07 Building Material	1.00 EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00 EA	13,990	1,400	460	3,960	690	1,640	22,140	22141.76
TOTAL Sampling, & Testi	1.00 EA	19,160	1,920	630	5,430	950	2,250	30,330	30331.48
33.03 Site Work									
33.03.02 Clearing and Grub	3.00 ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00 ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00 EA	39,670	3,970	1,310	11,240	1,970	4,650	62,800	62801.02
33.03.08 Survey Remediatio	1.00 ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00 LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00 EA	198,550	19,860	6,550	56,240	9,840	23,280	314,320	314323.76
33.07 Building Remediation	1.00 EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat	1.00 EA	32,220	3,220	1,060	9,130	1,600	3,780	51,010	51009.13
33.10 Soil Remediation Sit									
33.10.02 Surface Soils	1.00 EA	200,260	20,030	6,610	56,720	9,930	23,480	317,020	317023.36
33.10.04 Subsurface Soils	1.00 EA	940	90	30	270	50	110	1,490	1487.14
TOTAL Soil Remediation	1.00 EA	201,200	20,120	6,640	56,990	9,970	23,590	318,510	318510.50
33.15 Soil Washing	1.00 EA	1,230,680	123,070	40,610	348,590	61,000	144,320	1,948,270	1948268.39
33.17 Disposal	1.00 EA	288,010	28,800	9,500	81,580	14,280	33,770	455,940	455943.21
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	15,640	1,560	520	4,430	780	1,830	24,760	24757.66
33.26.06 Demobilization	1.00 EA	15,230	1,520	500	4,320	760	1,790	24,120	24117.53
TOTAL Demobilization	1.00 EA	30,870	3,090	1,020	8,740	1,530	3,620	48,880	48875.19
TOTAL Remedial Action	1.00 EA	2,075,700	207,570	68,500	587,940	102,890	243,410	3,286,010	3286012.33

SEAD-16 and 17
INNOVATIVE TREATMENT:
SOIL WASHING
(SOIL > 1000 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 6.

Innovative Treatment: Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in an off-site landfill

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 1000 mg/kg
- Transport soil to on-site treatment staging area
- Perform cleanup verification testing
- Soil wash; Physical separation of fine grain from coarse grain
- Backfill clean coarse grain material
- Stockpile and perform TCLP testing on fine grain material
- Transport fine grain material failing TCLP criteria to treatment area (on-site or off-site)
- Treat fine grain material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose fine grain material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Available Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%

Example:

Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213

* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

4. The volume of fine grain material requiring off-site disposal could vary depending on actual soil conditions encountered.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA Mobilization	1.00 EA	0	793	10,000	535	0	11,328	11327.72
33.02. Sampling, & Testing								
33.02.06. Ditch Soils Assumes all material is fine grained.								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 585cy/150cy)	4.00 EA	0	0	0	0	480	480	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 585cy/150cy)	4.00 EA	0	0	0	0	920	920	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 585cy/150cy)	4.00 EA	0	0	0	0	480	480	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assumes 1 test/100 LF)	10.00 EA	0	0	0	0	1,550	1,550	155.00
33.02.07. Building Material								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00 EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00 EA	0	0	0	0	120	120	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.11. Soil									
Assume 33% of total volume will be fine grained and will require TCLP testing.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 5457cy * 1/3 * 1/150cy)	12.00	EA	0	0	0	0	1,440	1,440	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 5457cy * 1/3 * 1/150cy)	12.00	EA	0	0	0	0	2,760	2,760	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 5457cy * 1/3 * 1/150cy)	12.00	EA	0	0	0	0	1,440	1,440	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 104,801sf / 2500sf)	42.00	EA	0	0	0	0	6,510	6,510	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railrd Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 RR tracks at 400 LF	1.00	EA	0	19,220	3,711	330	0	23,261	23260.56
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - staked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soil Remediation Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	585.00	CY	52	1,170	1,755	0	0	2,925	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	39000	SF	0	0	0	3,338	0	3,338	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	58500	SF	0	0	0	5,008	0	5,008	0.09
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	585.00	CY	52	1,562	813	11,411	0	13,786	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	11.29	MSF	11	285	0	503	0	788	69.79

33.10. Soil Remediation Sitework	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation Sitework									
33.10.02. Surface Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	5422.00	CY	480	10,844	16,266	0	0	27,110	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	361500	SF	0	0	0	30,944	0	30,944	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	542300	SF	0	0	0	46,421	0	46,421	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2711.00	CY	239	7,238	3,768	52,881	0	63,888	23.57
RSM AA Backfill coarse material from soil washing: Backfill, strl, sand & gravel, no cmpct, 75 HP dozer, 50' haul	3615.00	CY	39	1,193	687	0	0	1,880	0.52
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	104.58	MSF	105	2,644	0	4,655	0	7,299	69.79
33.10.04. Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	35.00	CY	3	70	105	0	0	175	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	2400.00	SF	0	0	0	205	0	205	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	3500.00	SF	0	0	0	300	0	300	0.09
33.15. Soil Washing									
AF AA Load and haul soil: Hauling, w/loading, 12 CY truck, 5 mile haul, soil	6042.00	CY	208	5,861	9,003	0	0	14,863	2.46
HTW AA HTRW, soil washing system, 1000 0 ton incl residual water, trailer	6474.00	TON	0	0	0	0	1,003,470	1,003,470	155.00
USR AA Water treatment	70000	GAL	0	0	0	0	70,000	70,000	1.00

33.17. Disposal	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.17. Disposal									
HTW AA Dispose fine material from soil washing: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	2158.00	TON	0	0	0	0	252,486	252,486	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	7,500	2,500	0	11,321	11321.20
TOTAL Demobilization	1.00	EA	0	528	10,000	500	0	11,028	11028.48
TOTAL SEAD-16 and 17			8,234	111,917	88,363	216,307	1,372,134	1,788,721	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
TOTAL Mobilization	1.00	EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	4,740	470	160	1,340	230	560	7,500	7500.86
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00	EA	16,780	1,680	550	4,750	830	1,970	26,570	26570.12
TOTAL Sampling, & Testi	1.00	EA	22,170	2,220	730	6,280	1,100	2,600	35,100	35098.80
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railrd T	1.00	EA	43,120	4,310	1,420	12,210	2,140	5,060	68,270	68267.84
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00	EA	202,000	20,200	6,670	57,220	10,010	23,690	319,790	319790.58
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soil Remediati	1.00	EA	35,700	3,570	1,180	10,110	1,770	4,190	56,520	56519.17
33.10 Soil Remediation Sit										
33.10.02 Surface Soils	1.00	EA	245,250	24,530	8,090	69,470	12,160	28,760	388,250	388254.68
33.10.04 Subsurface Soils	1.00	EA	940	90	30	190	40	100	1,400	1397.91
TOTAL Soil Remediation	1.00	EA	246,190	24,620	8,120	69,650	12,200	28,860	389,650	389652.59
33.15 Soil Washing	1.00	EA	1,503,400	150,340	49,610	425,840	74,520	176,300	2,380,010	2380011.84
33.17 Disposal	1.00	EA	348,780	34,880	11,510	98,790	17,290	40,900	552,150	552146.72
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	15,640	1,560	520	4,430	780	1,830	24,760	24757.66
33.26.06 Demobilization	1.00	EA	15,230	1,520	500	4,320	760	1,790	24,120	24117.53
TOTAL Demobilization	1.00	EA	30,870	3,090	1,020	8,740	1,530	3,620	48,880	48875.19
TOTAL Remedial Action	1.00	EA	2,464,140	246,410	81,320	697,890	122,140	288,950	3,900,850	3900845.55

SEAD-16 and 17
INNOVATIVE TREATMENT:
SOIL WASHING
(SOIL > 400 mg/kg)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 6.

Innovative Treatment: Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction in an off-site landfill

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Unexploded ordinance clearance
- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
- Excavate soils with lead concentration > 400 mg/kg
- Transport soil to on-site treatment staging area
- Perform cleanup verification testing
- Soil wash; Physical separation of fine grain from coarse grain
- Backfill clean coarse grain material
- Stockpile and perform TCLP testing on fine grain material
- Transport fine grain material failing TCLP criteria to treatment area (on-site or off-site)
- Treat fine grain material exceeding TCLP criteria (on-site or off-site)
- Transport and dispose fine grain material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with topsoil and hydroseed
- Demobilize
- Long-term monitoring

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%

Example:

	Level A	Level B	Level C	Level D
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213

	Level A	Level B	Level C	Level D
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-16 could vary depending on actual condition of building.

4. The volume of fine grain material requiring off-site disposal could vary depending on actual soil conditions encountered.

Contractor costs are calculated as a percentage of running total as
- 5 % for field office support
- 15 % for home office support
- 10 % for profit
- 4 % for bond

Owner's cost are calculated as a percentage of running total as
- 10 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.01. Mobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.01. Mobilization									
USR AA Mobilization	1.00	EA	0	793	10,000	535	0	11,328	11327.72
33.02. Sampling, & Testing									
33.02.06. Ditch Soils									
Assumes all material is fine grained.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	960	960	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	1,840	1,840	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1127cy/150cy)	8.00	EA	0	0	0	0	960	960	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assumes 1 test/100 LF)	18.00	EA	0	0	0	0	2,790	2,790	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumé 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.11. Soil									
Assume 33% of total volume will be fine grained and will require TCLP testing.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 10,625cy * 1/3 * 1/150cy)	24.00	EA	0	0	0	0	2,880	2,880	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 10,625cy * 1/3 * 1/150cy)	24.00	EA	0	0	0	0	5,520	5,520	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 10,625cy * 1/3 * 1/150cy)	24.00	EA	0	0	0	0	2,880	2,880	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 201,620sf/2500sf)	81.00	EA	0	0	0	0	12,555	12,555	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - staked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1127.00	CY	100	2,254	3,381	0	0	5,635	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	75200	SF	0	0	0	6,437	0	6,437	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	112700	SF	0	0	0	9,647	0	9,647	0.09

33.09. Ditch Soils Remediation Sitework	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1127.00	CY	99	3,009	1,567	21,983	0	26,559	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	21.75	MSF	22	550	0	968	0	1,518	69.79
33.10. Soil Remediation Sitework									
33.10.02. Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	10368	CY	918	20,736	31,104	0	0	51,840	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	691300	SF	0	0	0	59,175	0	59,175	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	1036900	SF	0	0	0	88,759	0	88,759	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	5184.00	CY	457	13,841	7,206	101,120	0	122,167	23.57
RSM AA Backfill coarse material from soil washing: Backfill, strl, sand & gravel, no cmpct, 75 HP dozer, 50' haul	6912.00	CY	75	2,281	1,313	0	0	3,594	0.52
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	201.62	MSF	202	5,097	0	8,975	0	14,071	69.79
33.10.04. Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	256.00	CY	23	512	768	0	0	1,280	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	17100	SF	0	0	0	1,464	0	1,464	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	25700	SF	0	0	0	2,200	0	2,200	0.09
33.15. Soil Washing									
AF AA Load and haul soil: Hauling, w/loading, 12 CY truck, 5 mile haul, soil	11752	CY	405	11,399	17,510	0	0	28,910	2.46
HTW AA HTRW, soil washing system, 1000 0 ton incl residual water, trailer	12591	TON	0	0	0	0	1,951,605	1,951,605	155.00

33.15. Soil Washing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Water treatment	100000	GAL	0	0	0	0	100,000	100,000	1.00
33.17. Disposal									
HTW AA Dispose fine material from soil washing: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	4197.00	TON	0	0	0	0	491,049	491,049	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	7,500	2,500	0	11,321	11321.20
TOTAL Demobilization	1.00	EA	0	528	10,000	500	0	11,028	11028.48
TOTAL SEAD-16 and 17			9,345	143,962	119,400	361,478	2,603,637	3,228,477	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
TOTAL Mobilization	1.00 EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
33.02 Sampling, & Testing									
33.02.06 Ditch Soils	1.00 EA	9,050	900	300	2,560	450	1,060	14,320	14323.81
33.02.07 Building Material	1.00 EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00 EA	32,930	3,290	1,090	9,330	1,630	3,860	52,120	52123.35
TOTAL Sampling, & Testi	1.00 EA	42,620	4,260	1,410	12,070	2,110	5,000	67,470	67474.98
33.03 Site Work									
33.03.02 Clearing and Grub	3.00 ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00 ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00 EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00 ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00 LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00 EA	207,430	20,740	6,850	58,750	10,280	24,320	328,380	328376.42
33.07 Building Remediation	1.00 EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat	1.00 EA	68,790	6,880	2,270	19,480	3,410	8,070	108,900	108896.39
33.10 Soil Remediation Sit									
33.10.02 Surface Soils	1.00 EA	469,130	46,910	15,480	132,880	23,250	55,010	742,660	742664.92
33.10.04 Subsurface Soils	1.00 EA	6,830	680	230	1,930	340	800	10,810	10811.04
TOTAL Soil Remediation	1.00 EA	475,950	47,600	15,710	134,810	23,590	55,810	753,480	753475.96
33.15 Soil Washing	1.00 EA	2,873,980	287,400	94,840	814,060	142,460	337,020	4,549,760	4549755.16
33.17 Disposal	1.00 EA	678,330	67,830	22,380	192,140	33,620	79,540	1,073,850	1073846.05
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	15,640	1,560	520	4,430	780	1,830	24,760	24757.66
33.26.06 Demobilization	1.00 EA	15,230	1,520	500	4,320	760	1,790	24,120	24117.53
TOTAL Demobilization	1.00 EA	30,870	3,090	1,020	8,740	1,530	3,620	48,880	48875.19
TOTAL Remedial Action	1.00 EA	4,452,990	445,300	146,950	1,261,310	220,730	522,180	7,049,450	7049450.82

SEAD-16 and 17
INNOVATIVE TREATMENT:
SOIL WASHING
(SOIL > 400 mg/kg and other
metals > TAGMs)

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/17/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

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The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

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- Remove material/debris from abandoned buildings at SEAD-16
- Excavate ditch soils
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- Backfill remainder of excavated area with topsoil and hydroseed
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Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
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- 5 % for field office support
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- 10 % for design contingency
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- 25 % for construction contingency
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SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

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33.02.06. Ditch Soils Assumes all material is fine grained.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	1,320	1,320	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	2,530	2,530	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150 cy: 1590cy/150cy)	11.00	EA	0	0	0	0	1,320	1,320	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assumes 1 test/100 LF)	22.00	EA	0	0	0	0	3,410	3,410	155.00
33.02.07. Building Material									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140cy/150cy)	1.00	EA	0	0	0	0	230	230	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy: 140 cy/150cy)	1.00	EA	0	0	0	0	120	120	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.11. Soil									
Assume 33% of total volume will be fine grained and will require TCLP testing.									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 17,989cy * 1/3 * 1/150cy)	40.00	EA	0	0	0	0	4,800	4,800	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 17,989cy * 1/3 * 1/150cy)	40.00	EA	0	0	0	0	9,200	9,200	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assumes 1 sample every 150cy: 17,989cy * 1/3 * 1/150cy)	40.00	EA	0	0	0	0	4,800	4,800	120.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test / 2500 sf: 331,824sf/2500sf)	133.00	EA	0	0	0	0	20,615	20,615	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	13.00	ACR	208	5,624	8,176	0	0	13,800	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.07. Remove 2 Railroad Tracks									
USR AA Mobilization	1.00	EA	0	1,094	2,500	535	0	4,129	4129.00
USR AA Remove 2 Railroad Tracks at 450 LF	1.00	EA	0	22,453	4,295	439	0	27,187	27186.70
USR AA Demobilization	1.00	EA	0	793	2,500	535	0	3,828	3828.00

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.08. Survey Remediation Area									
USR AA	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.09. Ordnance work									
L MIL AA UXO person - explosives contractor to screen area	11.00	ACR	5,481	0	0	0	0	0	0.00
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - staked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.07. Building Remediation									
MIL Clean up material and debris within building	44100	SF	110	2,646	0	15,100	0	17,746	0.40
USR AA Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	30.00	DR	0	0	0	0	4,013	4,013	133.75
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	210.00	TON	0	0	0	0	24,570	24,570	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Ditch Soils Remediation Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1590.00	CY	141	3,180	4,770	0	0	7,950	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	106100	SF	0	0	0	9,082	0	9,082	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	159100	SF	0	0	0	13,619	0	13,619	0.09

33.09. Ditch Soils Remediation Sitework	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
MIL AA Loam or topsoil, furnish & place, imported, 1' deep	1590.00	CY	140	4,245	2,210	31,015	0	37,470	23.57
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	30.68	MSF	31	776	0	1,366	0	2,141	69.79
33.10. Soil Remediation Sitework									
33.10.02. Surface Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	16814	CY	1,488	33,628	50,442	0	0	84,070	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	1121000	SF	0	0	0	95,958	0	95,958	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	1681400	SF	0	0	0	143,928	0	143,928	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	8407.00	CY	741	22,447	11,686	163,988	0	198,120	23.57
RSM AA Backfill coarse material from soil washing: Backfill, strl, sand & gravel, no cmpct, 75 HP dozer, 50' haul	11209	CY	122	3,699	2,130	0	0	5,829	0.52
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	324.28	MSF	324	8,198	0	14,434	0	22,632	69.79
33.10.04. Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 40% greater than in-situ volumes)	1175.00	CY	104	2,350	3,525	0	0	5,875	5.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf / roll; 1 roll = $75) (Assume 1 pile or 150cy occupies 100 x 100sf)	78400	SF	0	0	0	6,711	0	6,711	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	117500	SF	0	0	0	10,058	0	10,058	0.09
33.15. Soil Washing									
AF AA Load and haul soil: Hauling, w/loading, 12 CY truck, 5 mile haul, soil	21013	CY	725	20,383	31,309	0	0	51,692	2.46
HTW AA HTRW, soil washing system, 1000 0 ton incl residual water, trailer	22514	TON	0	0	0	0	3,489,670	3,489,670	155.00

33.15. Soil Washing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Water treatment	200000	GAL	0	0	0	0	200,000	200,000	1.00
33.17. Disposal									
HTW AA Dispose fine material from soil washing: Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 07/00)	7505.00	TON	0	0	0	0	878,085	878,085	117.00
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	7,500	2,500	0	11,321	11321.20
TOTAL Demobilization	1.00	EA	0	528	10,000	500	0	11,028	11028.48
TOTAL SEAD-16 and 17			10,861	183,188	162,623	550,908	4,646,348	5,543,067	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
TOTAL Mobilization	1.00	EA	15,650	1,560	520	4,430	780	1,830	24,770	24771.92
33.02 Sampling, & Testing										
33.02.06 Ditch Soils	1.00	EA	11,850	1,190	390	3,360	590	1,390	18,760	18763.10
33.02.07 Building Material	1.00	EA	650	60	20	180	30	80	1,030	1027.82
33.02.11 Soil	1.00	EA	54,450	5,440	1,800	15,420	2,700	6,380	86,190	86194.33
TOTAL Sampling, & Testi	1.00	EA	66,950	6,690	2,210	18,960	3,320	7,850	105,990	105985.25
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	20,860	2,090	690	5,910	1,030	2,450	33,020	11007.08
33.03.06 Roadways	1.00	ACR	37,330	3,730	1,230	10,570	1,850	4,380	59,100	59097.19
33.03.07 Remove 2 Railroad	1.00	EA	48,550	4,850	1,600	13,750	2,410	5,690	76,850	76853.68
33.03.08 Survey Remediatio	1.00	ACR	27,870	2,790	920	7,890	1,380	3,270	44,120	44119.52
33.03.11 Erosion control	1.00	LF	72,820	7,280	2,400	20,630	3,610	8,540	115,280	115284.79
TOTAL Site Work	1.00	EA	207,430	20,740	6,850	58,750	10,280	24,320	328,380	328376.42
33.07 Building Remediation	1.00	EA	59,360	5,940	1,960	16,810	2,940	6,960	93,980	93978.74
33.09 Ditch Soils Remediat	1.00	EA	97,060	9,710	3,200	27,490	4,810	11,380	153,650	153652.77
33.10 Soil Remediation Sit										
33.10.02 Surface Soils	1.00	EA	760,500	76,050	25,100	215,410	37,700	89,180	1,203,940	1203935.69
33.10.04 Subsurface Soils	1.00	EA	31,280	3,130	1,030	8,860	1,550	3,670	49,520	49518.91
TOTAL Soil Remediation	1.00	EA	791,780	79,180	26,130	224,270	39,250	92,850	1,253,450	1253454.60
33.15 Soil Washing	1.00	EA	5,168,240	516,820	170,550	1,463,900	256,180	606,060	8,181,760	8181763.48
33.17 Disposal	1.00	EA	1,212,970	121,300	40,030	343,570	60,130	142,240	1,920,230	1920232.21
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	15,640	1,560	520	4,430	780	1,830	24,760	24757.66
33.26.06 Demobilization	1.00	EA	15,230	1,520	500	4,320	760	1,790	24,120	24117.53
TOTAL Demobilization	1.00	EA	30,870	3,090	1,020	8,740	1,530	3,620	48,880	48875.19
TOTAL Remedial Action	1.00	EA	7,650,310	765,030	252,460	2,166,950	379,220	897,120	12,111,090	12111090.59

TABLE E-1
SENECA ARMY DEPOT ACTIVITY
SEAD-16 AND 17 FEASIBILITY STUDY
GROUNDWATER MONITORING AND O&M PRESENT WORTH CALCULATIONS

	Monitoring only	Monitoring and cover maintenance (>1250 mg/kg)	Monitoring and cover maintenance (>1000 mg/kg)	Monitoring and cover maintenance (>400 mg/kg)	Monitoring and cover maintenance (lead>400 mg/kg+TAGM)	Notes
Annual Cost for semi-annual monitoring and O&M :	$40,440	$45,440	$46,440	$47,440	$48,440	(An extra $5000/year for > 1250 mg/kg; $ for > 1000mg/kg; $7000/year for > 400m $8000/year for >400mg/kg+TAGM is ass cover maintenance)
Annual Cost for annual monitoring and O&M:	$20,220	$25,220	$26,220	$27,220	$28,220	(An extra $5000/year for > 1250 mg/kg; $ for > 1000mg/kg; $7000/year for > 400m $8000/year for >400mg/kg+TAGM is ass cover maintenance)
ENT WORTH COSTS (assuming a 4% interest rate):						
multiplier for 30 years:	17.2920					
multiplier for 5 years:	4.4518					
rs of semi-annual monitoring	**$699,288**	**$785,748**	**$803,040**	**$820,332**	**$837,624**	
rs of annual-monitoring	**$349,644**	**$436,104**	**$453,396**	**$470,688**	**$487,980**	
s of semi-annual and 25 years of annual monitoring						
0-5 years (semi-annual):	$180,031	$202,290	$206,742	$211,193	$215,645	
5-30 years (annual):	$259,629	$323,830	$336,670	$349,510	$362,350	(0-30 years annual) - (0-5 years annual)
Total:	**$439,660**	**$526,120**	**$543,412**	**$560,704**	**$577,996**	
s of semi-annual monitoring	**$180,031**	**$202,290**	**$206,742**	**$211,193**	**$215,645**	

Monitoring includes groundwater and ditch soil sampling.

ANNUAL MONITORING COSTS
FOR SEMI-ANNUAL
GROUNDWATER AND DITCH SOIL
MONITORING
SEADs-16/17

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 08/23/00
Effective Date of Pricing: 10/03/96

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The scope of work for the contractors is summarized below.

· Sample 12 wells (total of 14 samples including 1 dup and 1 qa sample)for metals analyses.
· Sample 4 ditch soil locations (total of 6 samples including 1 dup and 1 qa sample) for metals analyses.
· Assumptions: 2-person crew, 6 wells sampled per day, 4 ditch soil locations sampled per 1/2 day, 1 day for set-up, 1 day for de-mob, no air travel; 2 events per year, and metals laboratory analyses.

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Available Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%

Example:

	Level A	Level B	Level C	Level D
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213

	Level A	Level B	Level C	Level D
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list the areas where there is the biggest potential for changes in cost due to uncertainties:

· Time necessary to complete sampling may increase depending on the flow of water.
· This estimate does not include the potential for additional wells or the repair of existing wells.

Contractor costs are calculated as a percentage of running total as
0.5 % for field office support
10.0 % for home office support

10.0 % for profit
0.0 % for bond

Owner's cost are calculated as a percentage of running total as
0.0 % for design contingency
3.0 % for escalation
0.0 % for construction contingency
3.0 % for other costs
0.0 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.0%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.0%

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.02. Sampling, & Testing									
33.02.01. Health and Safety									
HTW AA Case of 25, disposable coveralls, Tyvek (Pine Environmental Services 9/98)	1.00	EA	0	0	0	115	0	115	114.69
USR AA Poly Tyvek (case of 12) (Pine Environmental Services 9/98)	1.00	EA	0	0	0	74	0	74	73.83
HTW AA First aid kits, 36 ingredients	1.00	EA	0	0	0	80	0	80	79.93
HTW AA Eye prot, safety glasses	2.00	EA	0	0	0	11	0	11	5.62
M HTW AA Latex Gloves (100/box) (Pine Environmental Services 9/98)	4.00	BX	0	0	0	42	0	42	10.43
USR AA North Respirator Cartridges (2 per/pkg) (Pine Environmental Services 9/98)	2.00	PK	0	0	0	9	0	9	4.49
33.02.02. Personnel									
AFH AA Personnel per diem (2 people x 4 days x 2 events)	18.00	DAY	0	0	0	1,907	0	1,907	105.93
AFH AA Car or van mileage charge	2000.00	MI	0	0	0	706	0	706	0.35
HTW AA Daily rate, subcontracted	18.00	EA	0	0	0	0	12,240	12,240	680.00
33.02.04. Sample Groundwater Groundwater monitoring costs for one year are included in this estimate. Each monitoring well is sampled semi-annually for TAL metals.									
USR AA Turbidimeter Rental (Pine Environmental Services 9/98)	2.00	WK	0	0	160	0	0	160	80.00
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	690	0	0	690	345.00
USR AA Bladder Pump Rental (Marschalk Corporation 9/98)	2.00	WK	0	0	190	0	0	190	95.00
USR AA Pump Controller Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	300	0	0	300	150.00
USR AA 12-volt Compressor Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	350	0	0	350	175.00
USR AA Misc. Equipment Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	65	0	0	65	32.50
USR AA Thermo Environmental 580B (OVM) Rental (US Environmental, 12/98)	2.00	WK	0	0	400	0	0	400	200.00
USR AA Teflon Tubing (1/4" ID x 3/8") (Pine Environmental Services 9/98)	1000.00	FT	0	0	0	2,675	0	2,675	2.68
USR AA Isobutylene Calibration Gas (Pine Environmental Services 9/98)	2.00	EA	0	0	0	173	0	173	86.40
USR AA pH4 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA pH7 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24
USR AA 700 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
USR AA 2060 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
HTW AA 32 oz HDPE bottle, 12/case (including packaging and	72.00	EA	0	0	0	2,372	0	2,372	32.95
HTW AA Custody seals (package of 10)	8.00	EA	0	0	0	126	0	126	15.75
HTW AA 1gal,4/case,safe trans can w/vermiculite	2.00	EA	0	0	0	58	0	58	29.21
AFH AA Packing Tape: Testing, packaging & shipping, per roll	8.00	EA	0	0	0	13	0	13	1.65
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	14.00	EA	0	0	0	0	1,096	1,096	78.27
AFH AA Testing, packaging & shipping, bag ice	100.00	EA	0	0	0	0	119	119	1.19
HTW AA 48 quart ice chest, cooler & ice chest	2.00	EA	0	0	0	0	55	55	27.62
33.02.05. Sample Ditch Soil — Ditch soil monitoring costs for one year are included in this estimate. Each location is sampled semi-annually for TAL metals.									
USR AA Encore sampler (materials for 3 samples/location) (Severn Trent Lab, 11/99)	12.00	EA	0	0	0	642	0	642	53.50
USR AA Decon Chemicals for ditch soil sampling (cost per event)	2.00	EA	0	0	0	54	0	54	26.75
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	2.00	EA	0	0	0	0	157	157	78.27
AFH AA Testing, packaging & shipping, bag ice	12.00	EA	0	0	0	0	14	14	1.19
33.02.07. Analysis of Groundwater									
AFH AA TAL metals (NYSDEC CLP TAL Inorganics - unit cost from Severn Trent Lab 9/98)	28.00	EA	0	0	0	0	4,340	4,340	155.00
33.02.09. Analysis of Ditch Soil									
USR AA NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/98)	12.00	EA	0	0	0	0	1,860	1,860	155.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.12. Disposal of IDW									
Disposal of Investigation Derived Wastes									
USR AA Disposal of purge water drums (1 drum of purge water for 2 rounds of sampling for 12 wells) (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	1.00		0	0	0	0	134	134	133.75
TOTAL ANNUAL MONITORING COSTS			0	0	2,155	9,178	20,015	31,348	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CONTINGN	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.02 Sampling, & Testing									
33.02.01 Health and Safety	1.00 EA	400	0	10	0	10	0	430	426.26
33.02.02 Personnel	1.00 EA	18,060	0	540	0	560	0	19,160	19161.89
33.02.04 Sample Groundwate	1.00 EA	10,900	0	330	0	340	0	11,570	11565.13
33.02.05 Sample Ditch Soil	1.00 EA	1,050	0	30	0	30	0	1,120	1117.65
33.02.07 Analysis of Groun	1.00 EA	5,280	0	160	0	160	0	5,600	5599.07
33.02.09 Analysis of Ditch	1.00 EA	2,260	0	70	0	70	0	2,400	2399.60
33.02.12 Disposal of IDW	1.00 EA	160	0	0	0	10	0	170	172.55
TOTAL Sampling, & Testi	1.00 EA	38,120	0	1,140	0	1,180	0	40,440	40442.15
TOTAL Remedial Action	1.00 EA	38,120	0	1,140	0	1,180	0	40,440	40442.15

Earthwatch
WASTE SYSTEMS, INC.

October 25, 1999

Mr. Paul Boyajian
Parsons Engineering Science
30 Dan Road
Canton, Massachusetts 02121-2809

Dear Paul:

On behalf of Earthwatch Waste Systems, Inc., I would like to thank you for giving me the opportunity to provide you with a quotation for the transportation and disposal of the RCRA hazardous soil coming from the **Seneca Army** ~~**Open Burning Grounds**~~ in Romulus, NY. SEAD-16 AND-17

<u>RCRA Hazardous Soil</u>

Transportation and Disposal: $110.00/ ton => TREATED @ TSD (SUBTITLE C)

- There is a twenty-two (22) ton transportation minimum.
- Pricing is contingent upon facility approval of a completed waste profile.
- A 6% local hazardous waste tax applies to the disposal fee.
- Payment terms to be determined upon completion of an Earthwatch credit application.

This quotation is valid for thirty (30) days and is subject to verification thereafter. Work will commence upon execution of a signed service agreement. Please review the above pricing and should you have any questions, do not hesitate to contact me. Earthwatch Waste Systems, Inc., looks forward to the opportunity to service all of your waste disposal needs.

Sincerely,

Christopher J. McCune
Manager, Inside Sales

"With An Eye On Your Future"

CORPORATE AND SALES OFFICE:
4950 Genesee Street, Suite 170 • Buffalo, NY 14225
Phone (716) 681-6433 • Fax (716) 681-6165 • (800) 338-4797

Earthwatch
WASTE SYSTEMS, INC.

October 25, 1999

• Subtitle D Landfill
Waste Management = High Acre Landfill, Fairport, Port

Mr. Paul Boyajian
Parsons Engineering Science
30 Dan Road
Canton, Massachusetts 02121-2809

Dear Paul:

On behalf of Earthwatch Waste Systems, Inc., I would like to thank you for giving me the opportunity to provide you with a quotation for the transportation and disposal of the non-hazardous soil coming from the **Seneca ~~Army Open Burning Grounds~~** in Romulus, NY.
SEAD-16 & -17

Non-Hazardous Soil

Transportation and Disposal: $31.50/ ton => SUBTITLE D LANDFILL

- There is a twenty-two (22) ton transportation minimum.
- Payment terms to be determined upon completion of an Earthwatch credit application.

This quotation is valid for thirty (30) days and is subject to verification thereafter. Work will commence upon execution of a signed service agreement. Please review the above pricing and should you have any questions, do not hesitate to contact me. Earthwatch Waste Systems, Inc., looks forward to the opportunity to service all of your waste disposal needs.

Sincerely,

Christopher J. McCune
Manager, Inside Sales

CORPORATE AND SALES OFFICE:
4950 Genesee Street, Suite 170 • Buffalo, NY 14225
Phone (716) 681-6433 • Fax (716) 681-6165 • (800) 338-4797

November 3, 1999

Mr. Paul Boyajian
PARSONS ENGINEERING
30 Dan Road
Canton, MA 02021-2809

Based upon the information provided, this is a "non-bid" situation. Please contact Customer Service (1-800-843-3604) if this project goes to bid, for updated pricing information.

Re: Seneca Army Depot - Romulus, NY

Dear Mr. Boyajian:

CWM Chemical Services, L.L.C. is pleased to provide you with pricing for disposal per your request. Based upon the information you provided, the following summarizes our quotation.

DESCRIPTION / ESTIMATED QUANTITY OF WASTE

Soil contaminated with D008 / 3000 ton(s)

DISPOSAL FACILITY:

CWM Chemical Services, L.L.C.
1550 Balmer Road
Model City, NY 14107

DISPOSAL CHARGES	TAXES
$78.00 per ton(s) - Stabilization	6.00% local tax

Disposal Note: Pricing is based on the current LDR standards and a sample sent prior to shipment to verify the use of a standard stabilization recipe.

TRANSPORTATION/DEMURRAGE

$32.00/ton(s) using Dumps; with a minimum of 22 tons per load.

Trans. Note: Not included is the NYS Sales Tax on T&D of $7.84/ton if applicable.

Liners: Included

Demurrage: $75/hour after 2 free hours of loading time.

APPROVAL/ANALYTICAL FEES

Waived

SPECIAL CONDITIONS:

Waste must meet acceptability criteria at the site and comply with local, state and federal regulations, as well as the sites permit requirements. Pricing is contingent upon site and sample evaluation.

The disposal charges are based solely on the information available at this time and are good for thirty (30) days from the date of this letter. Additional information may be required prior to approval.

Payment must be received within thirty (30) days of invoicing. Payments received after thirty (30) days will accrue interest at the rate of 1.5% per month.

Following site approval, we will reconfirm your pricing and send you the appropriate Supplemental Information Document for signature.

CWM Chemical Services, Inc. wishes to thank you for allowing us to quote on your disposal needs. Please do not hesitate to contact me at the phone number below with any questions you may have or if you require any further assistance.

Sincerely,

Lawrence M. Grasso
(716)7540299
Inside Sales Representative

cc:
Mike DiBartolomeo

May 21, 1999

Mr. Teresa Pietro
PARSONS ENGINEERING
30 Dan Road
Canton, MA 02021

This quotation represents final pricing for the project listed below. Should the bid due date change, please contact Customer Service (1-800-843-3604) for any updated information.

Re: SENECA ARMY DEPOT - Romulus, NY

Dear Mr. Pietro:

CWM Chemical Services, L.L.C. is pleased to provide you with pricing for disposal per your request. Based upon the information you provided, the following summarizes our quotation.

DESCRIPTION / ESTIMATED QUANTITY OF WASTE

Non PCB, low viscosity, pumpable oil contaminated with RCRA Inorganic metals / 50 55 gal drums

DISPOSAL FACILITY:

CWM Chemical Services, L.L.C.
1550 Balmer Road
Model City, NY 14107

DISPOSAL CHARGES	TAXES
$125.00 per 55 gal drum(s) - Fuels Blending	7.00% NY State sales tax

Disposal Note: * 7% Seneca County sales tax will apply to T&D if CWM performs the transportation. 7% Niagara County sales tax will apply to disposal only if the Customer performs the transportation.

TRANSPORTATION/DEMURRAGE

$510.00/load(s) using Box Vans

Demurrage: $85 per hour after one hour free

APPROVAL/ANALYTICAL FEES

Waived

SPECIAL CONDITIONS:

Waste must meet acceptability criteria at the site and comply with local, state and federal regulations, as well as the sites permit requirements. Pricing is contingent upon site and sample evaluation.

The disposal charges are based solely on the information available at this time and are good for thirty (30) days from the date of this letter. Additional information may be required prior to approval.

Payment must be received within thirty (30) days of invoicing. Payments received after thirty (30) days will accrue interest at the rate of 1.5% per month.

Following site approval, we will reconfirm your pricing and send you the appropriate Supplemental Information Document for signature.

CWM Chemical Services, Inc. wishes to thank you for allowing us to quote on your disposal needs. Please do not hesitate to contact me at the phone number below with any questions you may have or if you require any further assistance.

Sincerely,

Lisa Robins

Lisa Robins
(716)754-0454
Customer Service Representative

cc: Mike DiBartolomeo

20202

B.R. DeWITT, Inc. ("Seller")
6895 Ellicott Street
Pavilion, New York 14525
Telephone: (716) 584-3132 - Fax: (716) 584-3466

SALES QUOTATION

Date: 10/29/99

CUSTOMER: ("BUYER") Parsons Engineering

CONTACT: Paul Boyajian
PHONE: (781)401-2258
FAX: (781)401-2575

PROJECT OR JOB NAME: Material Cost Estimate
LOCATION: Romulus NY

Is this Project or Job Sales Tax Exempt? If yes, please enclose your Exemption Certificate. Yes ______ No ______

We are pleased to quote you as follows:

QUANTITY	DESRIPTION	Source	F.O.B. UNIT PRICE
3,000/cy	Common fill (run of bank gravel)	Rt. 96, Geneva, N.Y.	$2.50/Ton
	Delivery via trailer:		$2.50/Ton

FIBERS
SATURDAY DELIVERY- IF REQUIRED, PLEASE CALL FOR PREMIUM.
HEAT

PROVISIONS
Including Those Which Appear on the Reverse Side

1. Time of Delivery. Regularly Scheduled operating hours 7:00 a.m. to 4:00 p.m. Monday through Friday during the appropriate season.
2. Expiration of Quotation. This Quotation will be open only for thirty (30) days from the date of this Quotation.
3. Contract. This Quotation shall not result in a Contract until it is accepted and acknowledged by Seller at Seller's office in Pavilion, New York.
4. Expiration of Contract. A Contract for the sale and/or delivery of materials at the place, price and in the quantity stated is effective only during the dates indicated.

CONTRACT EFFECTIVE: 10/28/99
CONTRACT EXPIRES: 12/31/99

Respectfully Submitted,
B.R. DeWITT, Inc.

BY: Craig Green, Sales Manager

TERMS OF PAYMENT: NET 30 DAYS

QUOTATION ACCEPTED

BUYER: ______
BY: ______
ITS: ______
DATE: ______

SELLER: B.R. DeWITT, Inc.
BY: ______
ITS: ______
DATE: ______

1. Delivery: Buyer agrees to give Seller reasonable notice of the time and date of deliveries required under this contract. An additior charge will be made for all deliveries on Saturdays, Sundays, Holidays, and, initial orders before scheduled plant opening and afte schedule plant closing at the prevailing rate. When deliveries are to places other than on paved streets, the Buyer agrees to provide roadways or approaches permitting access of trucks to point of delivery under their own power. The Seller reserves the right to sto deliveries in the event such roadways are not provided. If the Buyer orders deliveries beyond the curb line, the Buyer assumes all liability for damage to sidewalks, driveways, or other property and agrees to indemnify the Seller against all liability, loss and exp incurred as a result of such delivery, including damage to the Seller's equipment and loss of time.

2. Delivery Charge: Delivery charge for small loads will be charged at the prevailing rate.

3. Unloading Time: Delays caused by the Buyer over the allotted time will be charged at the prevailing rate.

4. Compression Strength: Concrete has been designed to attain the indicated compressive strengths in accordance with recognized testing methods and standards. Field results may differ substantially due to variables such as waiting time, placing methods, handli after placement or other variables beyond the control of the Seller.

5. Negation of Warranty: **THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED T ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

6. Limitation of Liability: In no event shall Seller be liable to Buyer for any indirect, special or consequential damages or lost profits arising out of or related to this Agreement or the performance or breach thereof, even if Seller has been advised of the possibility thereof. Seller's liability to Buyer hereunder, if any, shall in no event exceed the total amount paid to Seller hereunder. In no event shall Seller be liable to Buyer for any damages resulting from or related to any failure or delay of Seller in the performance of Servi under this Agreement.

7. Maturity of Claim: Any claim arising out of or related to this Agreement shall be brought no later than one (1) year after the same h accrued.

8. Credit Extension: If credit has not been established with the Seller, Buyer, upon execution hereof, agrees to furnish the Seller a current financial statement, bank references and three trade references. If at anytime the financial responsibility of the Buyer become unsatisfactory to Seller, Seller reserves the right to require payment in advance, or satisfactory security or guarantee that invoices wi be paid when due. If the Buyer fails to comply with the terms of payment herein, the Seller reserves the right to cancel the unfilled portion of the contract without notice.

9. Governmental Taxes: Any manufacturing , processing or sales tax now in effect or later imposed by the Federal Government, or by the State or any political subdivision thereof, shall be added to the invoices and paid by the Buyer.

10. Admixtures: Any admixtures required by Buyer, other than those specified herein, shall be furnished by the Buyer at its expense. If Buyer directs any addition to the concrete mix, Buyer shall be solely responsible for the quality of the concrete mix.

11. Testing: the Seller shall not be responsible for the cost of any independent laboratory mix design or other testing.

12. Acts of God, Delivery Stops: Seller shall not be liable for failure or delay in shipping goods, if such failure or delay is due to an Act of God, weather, labor difficulties, accident, inability to obtain raw materials or causes of any kind whatsoever beyond the control of Seller.

13. Entire Agreement: This quotation is the sole agreement between the parties relating to the subject matter hereof and supersedes all prior understandings, writings, proposals, representations or communications, oral or written of either party. This Agreement may be amended only by an instrument executed by the authorized representatives of both parties.

14. Variation of Terms: Any variation of the offer by the Buyer will be deemed a counteroffer which can be rejected in full by the Seller Without prior written consent of the Seller, the items quoted herein are not divisible and must be purchased as a whole to obtain the prices quoted.

15. Expenses: Buyer agrees to pay collection costs and disbursements and attorney fees equal to 25% of the account balance in the event Buyer's account is referred to an attorney or collection agency for collection or lawsuit.

16. Choice of Law: This Agreement shall be deemed performed in its entirety in the State of New York and shall be interpreted in accordance with the laws thereof.

RICCELLI ENTERPRISES

"Trucking At It's Best"

FACSIMILIE COVER SHEET

SEND TO Company Name	PARSONS Engineering	FROM	Rich Riccelli
Attention	Paul Bovajian	Date	
Fax Number	781-401-2575	Phone Number	

☐ Urgent ☐ Reply ASAP ☐ Please Comment ☐ Please Review ☐ For your information

Total pages, including cover sheet

COMMENTS

Top Soil delivered to Seneca Army Depot

Unscreened - 11.00/c.y.
Screened - 14.00/c.y.

NOTES:

1. General

It should be noted that the actual selection of a cleanup technology will be dependent on community input, cleanup goals, site conditions and situations, the level and extent of contamination, the cost of equipment, materials and labor, and the future use of the site.

The approach and procedures presented in this document are intended solely for informational purposes. They are not intended, nor can they be relied upon to create any rights enforceable by any party in litigation with the United States Environmental Protection Agency (EPA). EPA officials may decide to follow the approach and procedures provided in this document, or to act at variance with the approach and procedures, based on an analysis of site circumstances. The agency also reserves the right to change this fact sheet at any time without public notice.

2. Abbreviations

ACM	Asbestos-Containing Material
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CCA	Chromium, Copper, Arsenic
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
TAL	Target Analyte List
TCL	Target Compound List (Volatile, Semivolatile and Pesticide/PCBs)
TPH	Total Petroleum Hydrocarbon
TNT	Trinitrotoluene
UXO	Unexploded Ordnance

3. Cost Category

A. Solidification (on-site) cost (including excavation and mixing) for 100 foot long by 100 foot wide by 15 foot deep area using cement lime is approximately $150,000 or $470 per ton.

B. On-site land disposal cost (including excavation, transportation and back filling of the excavated area) for an area 100 foot by 100 foot is approximately $70,000 to $100,000.

C. Off-site Disposal Cost:

Waste characterization	$1,000 to $1,500 per sample
Transportation, one truck load, 250 miles one way	$1,200 per truck load
Treatment and disposal of contaminated soil (no free liquid)	
Inorganic Waste	
Organic Waste	$600 to $1,000 per ton
Inorganic and Organic Waste	$400 to $1,200 per ton
Pesticide Waste	$500 to $1,600 per ton
	$1,500 to $1,700 per ton
Treatment and disposal of contaminated liquid	
Inorganic Waste	

Organic Waste	$900 to $1,100 per ton
Inorganic and Organic Waste	$850 to $1,150 per ton
Pesticide Waste	$1,000 to $1,200 per ton
	$1,200 to $1,500 per ton

D. Cost for remediation using these technologies varies according to the volume of the contaminated soil, the number of contaminants and the concentration of contaminants present in the treatment media. Without knowing the site details no cost could be provided for this document.

E. Cost of incineration of bulk solid by rotary kiln is approximately $800 to $2,000 per ton.

F. Soil with low pH can be treated with hydrated lime. Approximate cost of treatment is $300 per acre including the cost of lime, equipment and manpower.

G. Cost of off-site disposal (no treatment) to a landfill is approximately $100 to $200 per ton.

United Retek Corp.

November 19, 1999

Mr. Paul Boyajian
Parson's Engineering Science
30 Dan Road
Canton, MA 02021-2809

Dear Paul:

As we recently discussed, I am forwarding a package regarding United Retek Corporation (URC) and our mobile processes for the on-site stabilization recycling of contaminated soils.

As discussed in the enclosed inserts, URC's processes have been successfully applied to soils contaminated by various petroleum products, waste oils, pesticides, plasticizers, manufactured gas plant (MGP) residuals, PCB's, and characteristically hazardous TCLP metals. URC's standard procedure is to conduct bench scale evaluation of the applicability of our process to the soil type or contaminants of concern, and to guarantee the performance of our field stabilization.

Since the 1987, URC has stabilized hundreds of thousands of tons of soil at hundreds of sites for a broad spectrum of private and public sector clients. We are well known to, and often recommended by regulators in many jurisdictions.

A primary advantage of the *Retek* Process over some alternative contaminated soil management options is that no materials are removed from the property as waste (or in the case of TCLP metals stabilization for subsequent off site disposal, no materials are removed as "hazardous waste"). This provides a level of security not otherwise available and also results in significant savings on material transportation, taxes, and disposal.

For your information and review, I have briefly summarized some details regarding URC's processes and their applications.

- The process is flexible and can be adapted to a wide variety of contaminated soil applications.

- For petroleum impacted soils, contamination levels up to 60,000ppm TPH (total petroleum hydrocarbons) have been permitted in some jurisdictions and can be handled. The NYDEC permit and New Jersey regulations limit the *Retek* process to 30,000 ppm TPH.

- For characteristically hazardous metals, bench scale testing is required for mix design and process verification.

- For PCB contaminated soils, limits of 25 or 10 ppm, for controlled or uncontrolled access sites respectively, have been imposed by USEPA.

- Disposition of Final Product – ideally, it is reused on-site as paving base, structural fill, cap, other appropriate application.

21 Trotter Drive • Medway, MA 02053
Phone: (508) 478-5500 • Fax: (508) 478-9211

- The principal advantages of *Retek* recycling are:
  - limits long term liability by keeping wastes out of landfills
  - price (cost competitive)
  - an ambient temperature process, it minimizes contaminant volatilization and eliminates Air Quality permitting
  - the final product is a physically improved beneficially useful material
  - recycling is socially, economically and politically preferred to landfilling
  - speed of treatment (up to 1,000 tons/day).

I hope you will find the enclosed information interesting and helpful, and that you will consider us for any contaminated soil management needs that arise. In the meantime, if you have any questions, please contact me directly at (508) 478-5500, ext. 16.

Very truly yours,

UNITED RETEK CORPORATION

David A. Quelle

David A. Quelle
Vice President, Business Development

Enclosures

PARSONS ENGINEERING SCIENCE, INC.

TELEPHONE CONVERSATION MEMORANDUM

CALL TO: **Dave Quelle** **OF: United Retek Corp**

DATE: **November 18, 1999** **TIME:**

TELEPHONE NUMBER: **508-478-5500**

INITIATED BY: **Paul Boyajian** **COPIES:**

SUBJECT: Stabilization

I spoke with Dave Quelle regarding stabilization at SEAD-16 and SEAD-17. After describing the project and volumes to him, he informed me that ex situ stabilization for this type of project will typically costs around $60/cy and could process up to 500 cys/day (pugmill). He considered this to be a relatively small project, however, was interested in pursuing it.

PARSONS ENGINEERING SCIENCE, INC.

TELEPHONE CONVERSATION MEMORANDUM

CALL TO: **Norman Bloom** **OF: Williams Environmental**

DATE: **November 18, 1999** **TIME:**

TELEPHONE NUMBER: **770-879-4811**

INITIATED BY: **Paul Boyajian** **COPIES:**

SUBJECT: Stabilization

I spoke with Norman Bloom and Erik Rolle regarding stabilization at SEAD-16 and SEAD-17. After reviewing some information on the project, which I faxed to them, he informed me that they could perform a treatability study, which would take approximately 3 weeks. In situ stabilization could be performed using a hoe mixer or ex situ stabilization could be performed using a pugmill (approximate rate 120 tons/hr). The mobilization and setup cost for ex situ stabilization, especially for small project is large. In situ stabilization does generate lots of dust (from the additives), however, could be somewhat controlled through the use of a slurry. He did not share with me any cost information. He considered this to be a relatively small project.

PARSONS ENGINEERING SCIENCE, INC.

TELEPHONE CONVERSATION MEMORANDUM

CALL TO: **Art Simonian** **OF: Site Remediation Services**

DATE: **November 11, 1999** **TIME:**

TELEPHONE NUMBER: **860-623-8179**

INITIATED BY: **Paul Boyajian** **COPIES:**

SUBJECT: Stabilization

I spoke with Art Simonian regarding stabilization at SEAD-16 and SEAD-17. After describing the project and volumes to him, he informed me that ex situ stabilization for this type of project will typically costs around $75 to $100/cy. However, SRS typically does not perform stabilization and he recommended that I speak with United Retek Corp. He also informed me that the cost for in situ stabilization will probably be higher than the cost for ex situ stabilization.

PARSONS ENGINEERING SCIENCE, INC.

TELEPHONE CONVERSATION MEMORANDUM

CALL TO: **Steve Pegler** **OF: Silicate Technology Corp**

DATE: **November 19, 1999** **TIME:**

TELEPHONE NUMBER: **480-948-7100**

INITIATED BY: **Paul Boyajian** **COPIES:**

SUBJECT: Stabilization

I spoke with Steve Pegler regarding stabilization at SEAD-16 and SEAD-17. After describing the project and volumes to him, he informed me that this to be a relatively small to medium project. He has stabilized material with similar constituents. For a project like this, using a pugmill, he informed me that a cost of $60 to $100/cy seems reasonable. He also informed me to perform ex situ stabilization, the proper permits would need to be obtained. In situ could be performed using a rotar tiller.

PARSONS ENGINEERING SCIENCE, INC.

TELEPHONE CONVERSATION MEMORANDUM

CALL TO: **Christopher J. McCune** **OF: Earthwatch**

DATE: **July 31, 2000** **TIME: 9:30am**

TELEPHONE NUMBER: **1-800-338 4797**

INITIATED BY: **Chunhua Liu** **COPIES: Eliza Dubroff**

SUBJECT: Dispose of soil and kilns from Seneca

I spoke with Christopher J. McCune regarding disposing excavated soil and kilns at SEAD-16 and SEAD-17. He informed me that the quotation for disposing of soil from Seneca (31.50/ton for subtitle D Landfill and 110.00/ton for subtitle C landfill) was still valid. In addition, he stated that there will be no attempt to stabilize the soil after it fails TCLP test and it will be directly disposed at subtitle C landfill. After describing the volume and information of the kilns to him, he informed me that the kilns may be transported for subtitle C landfill and the same quotation may be used as for soil. If kilns are cleaned with compliance with subtitle D landfill, they will be disposed at subtitle D landfill.

APPENDIX F

VLEACH AND SUMMERS MODELING DATA/RESULTS

Table F-1

Summers Model Input Parameters and Results for all Scenarios of Lead at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario				
			Pb-1	Pb-2	Pb-3	Pb-4	Pb-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	25,550	25,550	25,550	25,550	25,550
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.18	8.18	8.18	8.18	8.18
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	320	320	320	320	320
Volumetric flow rate of aquifer	Qa	ft^3/day	178.56	178.56	178.56	178.56	178.56
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00085	0.00085	0.00085	0.00085	0.00085
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100.000 years calculated by VLEACH model	Cp	mg/l	0.24	0.29	0.0070	0.030	0.18
Solute concentration in groundwater in 100.000 years as calculated by the SUMMERS model	Cgw	mg/l	0.011	0.013	0.0011	0.0021	0.0087
	Cgw	ug/l	11.3	13.4	1.12	2.1	8.7

Table F-2

Summers Model Input Parameters and Results for all Scenarios of Copper at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Cu-1	Cu-2	Cu-3	Cu-4	Cu-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	25,550	25,550	25,550	25,550	25,550
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.18	8.18	8.18	8.18	8.18
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	320	320	320	320	320
Volumetric flow rate of aquifer	Qa	ft^3/day	178.56	178.56	178.56	178.56	178.56
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.0049	0.0049	0.0049	0.0049	0.0049
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	0.00090	0.078	0.00013	0.00077	0.0034
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.0047	0.0081	0.0047	0.0047	0.0048
	Cgw	ug/l	4.7	8.1	4.7	4.7	4.8

Table F-3

Summers Model Input Parameters and Results for all Scenarios of Antimony at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Sb-1	Sb-2	Sb-3	Sb-4	Sb-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	22,250	22,250	22,250	22,250	22,250
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	7.12	7.12	7.12	7.12	7.12
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	305	305	305	305	305
Volumetric flow rate of aquifer	Qa	ft^3/day	170.19	170.19	170.19	170.19	170.19
Initial or background concentration of solute in the aquifer	Cs	mg/l	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	1.01E-02	1.01E-02	1.01E-02	2.11E-02	6.68E-03
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.0014	0.0014	0.0014	0.0018	0.0012
	Cgw	ug/l	1.36	1.36	1.36	1.81	1.23

Table F-4

Summers Model Input Parameters and Results for all Scenarios of Arsenic at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario As-1	As-2	As-3	As-4	As-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	3.437	3.437	3.437	3,437	3,437
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	1.10	1.10	1.10	1.10	1.10
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	140	140	140	140	140
Volumetric flow rate of aquifer	Qa	ft^3/day	78.12	78.12	78.12	78.12	78.12
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00125	0.00125	0.00125	0.00125	0.00125
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	0.00047	0.00047	0.00046	0.00094	0.00031
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.0012	0.0012	0.0012	0.0012	0.0012
	Cgw	ug/l	1.24	1.24	1.24	1.25	1.24

Table F-5

Summers Model Input Parameters and Results for all Scenarios
of Mercury at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario				
			Hg-1	Hg-2	Hg-3	Hg-4	Hg-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	7,188	7,188	7,188	7,188	7,188
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	2.30	2.30	2.30	2.30	2.30
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	300	300	300	300	300
Volumetric flow rate of aquifer	Qa	ft^3/day	167.4	167.4	167.4	167.4	167.4
Initial or background concentration of solute in the aquifer	Cs	mg/l	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	0.000045	0.000045	0.000045	0.000092	0.000029
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.000050	0.000050	0.000050	0.000051	0.000050
	Cgw	ug/l	0.050	0.050	0.050	0.051	0.050

Table F-6

Summers Model Input Parameters and Results for all Scenarios of Zinc at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Zn-1	Zn-2	Zn-3	Zn-4	Zn-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	26,350	26,350	26,350	26,350	26,350
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.43	8.43	8.43	8.43	8.43
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	300	300	300	300	300
Volumetric flow rate of aquifer	Qa	ft^3/day	167.4	167.4	167.4	167.4	167.4
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.0156	0.0156	0.0156	0.0156	0.0156
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	0.022	0.026	0.0019	0.0082	0.017
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.016	0.016	0.015	0.015	0.016
	Cgw	ug/l	15.9	16.1	14.9	15.2	15.7

Table F-7

Summers Model Input Parameters and Results for all Scenarios of Cadmium at SEAD-16 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Cd-1	Cd-2	Cd-3	Cd-4	Cd-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	1,750	1,750	1,750	1,750	1,750
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	0.56	0.56	0.56	0.56	0.56
Seepage velocity in aquifer	Vsa	ft/day	0.93	0.93	0.93	0.93	0.93
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.186	0.186	0.186	0.186	0.186
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	95	95	95	95	95
Volumetric flow rate of aquifer	Qa	ft^3/day	53.01	53.01	53.01	53.01	53.01
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00015	0.00015	0.00015	0.00015	0.00015
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	1.18E-04	1.18E-04	1.19E-04	2.41E-04	7.93E-05
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	1.50E-04	1.50E-04	1.50E-04	1.51E-04	1.49E-04
	Cgw	ug/l	0.15	0.15	0.15	0.15	0.15

Table F-8

Summers Model Input Parameters and Results for all Scenarios of Lead at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario				
			Pb-1	Pb-2	Pb-3	Pb-4	Pb-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	36,935	36,935	36,935	36,935	36,935
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3 day	11.82	11.82	11.82	11.82	11.82
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	240	240	240	240	240
Volumetric flow rate of aquifer	Qa	ft^3/day	144	144	144	144	144
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00085	0.00085	0.00085	0.00085	0.00085
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	0.016	0.019	0.00085	0.0029	0.012
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.0020	0.0022	0.00085	0.0010	0.0017
	Cgw	ug/l	2.0	2.2	0.85	1.0	1.7

Table F-9

Summers Model Input Parameters and Results for all Scenarios of Copper at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Cu-1	Cu-2	Cu-3	Cu-4	Cu-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	26,818	26,818	26,818	26,818	26,818
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.58	8.58	8.58	8.58	8.58
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	240	240	240	240	240
Volumetric flow rate of aquifer	Qa	ft^3/day	144	144	144	144	144
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.0037	0.0037	0.0037	0.0037	0.0037
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	7.73E-04	5.26E-03	1.26E-04	7.67E-04	8.97E-04
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	3.54E-03	3.79E-03	3.50E-03	3.54E-03	3.54E-03
	Cgw	ug/l	3.54	3.79	3.50	3.54	3.54

Table F-10

Summers Model Input Parameters and Results for all Scenarios of Antimony at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario				
			Sb-1	Sb-2	Sb-3	Sb-4	Sb-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	39,435	39,435	39,435	39,435	39,435
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	12.62	12.62	12.62	12.62	12.62
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	110	110	110	110	110
Volumetric flow rate of aquifer	Qa	ft^3/day	66	66	66	66	66
Initial or background concentration of solute in the aquifer	Cs	mg/l	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	6.49E-04	6.49E-04	6.49E-04	1.34E-03	4.33E-04
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	9.44E-04	9.44E-04	9.44E-04	1.06E-03	9.09E-04
	Cgw	ug/l	0.94	0.94	0.94	1.06	0.91

Table F-11

Summers Model Input Parameters and Results for all Scenarios
of Zinc at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Zn-1	Zn-2	Zn-3	Zn-4	Zn-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	36.780	36,780	36,780	36,780	36,780
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	11.77	11.77	11.77	11.77	11.77
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	260	260	260	260	260
Volumetric flow rate of aquifer	Qa	ft^3/day	156	156	156	156	156
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.0029	0.0029	0.0029	0.0029	0.0029
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100 000 years calculated by VLEACH model	Cp	mg/l	0.0093	0.011	0.0019	0.0074	0.0068
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.0033	0.0034	0.0028	0.0032	0.0032
	Cgw	ug/l	3.3	3.4	2.8	3.2	3.2

Table F-12

Summers Model Input Parameters and Results for all Scenarios of Arsenic at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario				
			Ag-1	Ag-2	Ag-3	Ag-4	Ag-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	27,775	27,775	27,775	27,775	27,775
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.89	8.89	8.89	8.89	8.89
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	170	170	170	170	170
Volumetric flow rate of aquifer	Qa	ft^3/day	102	102	102	102	102
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.0023	0.0023	0.0023	0.0023	0.0023
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	8.318E-05	8.327E-05	8.351E-05	0.0001691	5.579E-05
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	0.00	0.00	0.00	0.00	0.00
	Cgw	ug/l	2.12	2.12	2.12	2.13	2.12

Table F-13

Summers Model Input Parameters and Results for all Scenarios
of Cadmium at SEAD-17 in 100,000 Years

Parameter	Model I.D.	Units	Model Scenario Cd-1	Cd-2	Cd-3	Cd-4	Cd-5
Seepage velocity in downward direction	Vsz	ft/day	0.0016	0.0016	0.0016	0.0016	0.0016
Saturated void fraction (water volume/volume of solid) in soil	E	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the downward Direction	Vdz	ft/day	0.00032	0.00032	0.00032	0.00032	0.00032
Horizontal area of impacted soil	Ap	ft^2	27,411	27,411	27,411	27,411	27,411
Volumetric flow rate of liquid transporting solute into the aquifer (unsaturated-saturated zone interface)	Qp	ft^3/day	8.77	8.77	8.77	8.77	8.77
Seepage velocity in aquifer	Vsa	ft/day	1.0	1.0	1.0	1.0	1.0
Porosity of aquifer (fraction)	Ea	unitless	0.2	0.2	0.2	0.2	0.2
Specific discharge (Darcy velocity) in the aquifer	Vda	ft/day	0.2	0.2	0.2	0.2	0.2
Thickness of aquifer	Ha	ft	3	3	3	3	3
Width of impacted soil perpendicular to flow direction in the aquifer	Wp	ft	240	240	240	240	240
Volumetric flow rate of aquifer	Qa	ft^3/day	144	144	144	144	144
Initial or background concentration of solute in the aquifer	Cs	mg/l	0.00031	0.00031	0.00031	0.00031	0.00031
Average concentration of solute in the infiltration at the unsaturated-saturated zone interface in 100,000 years calculated by VLEACH model	Cp	mg/l	1.05E-04	1.05E-04	1.06E-04	2.14E-04	7.02E-05
Solute concentration in groundwater in 100,000 years as calculated by the SUMMERS model	Cgw	mg/l	2.98E-04	2.98E-04	2.98E-04	3.04E-04	2.96E-04
	Cgw	ug/l	0.30	0.30	0.30	0.30	0.30