U.S. ARMY ENGINEER DIVISION
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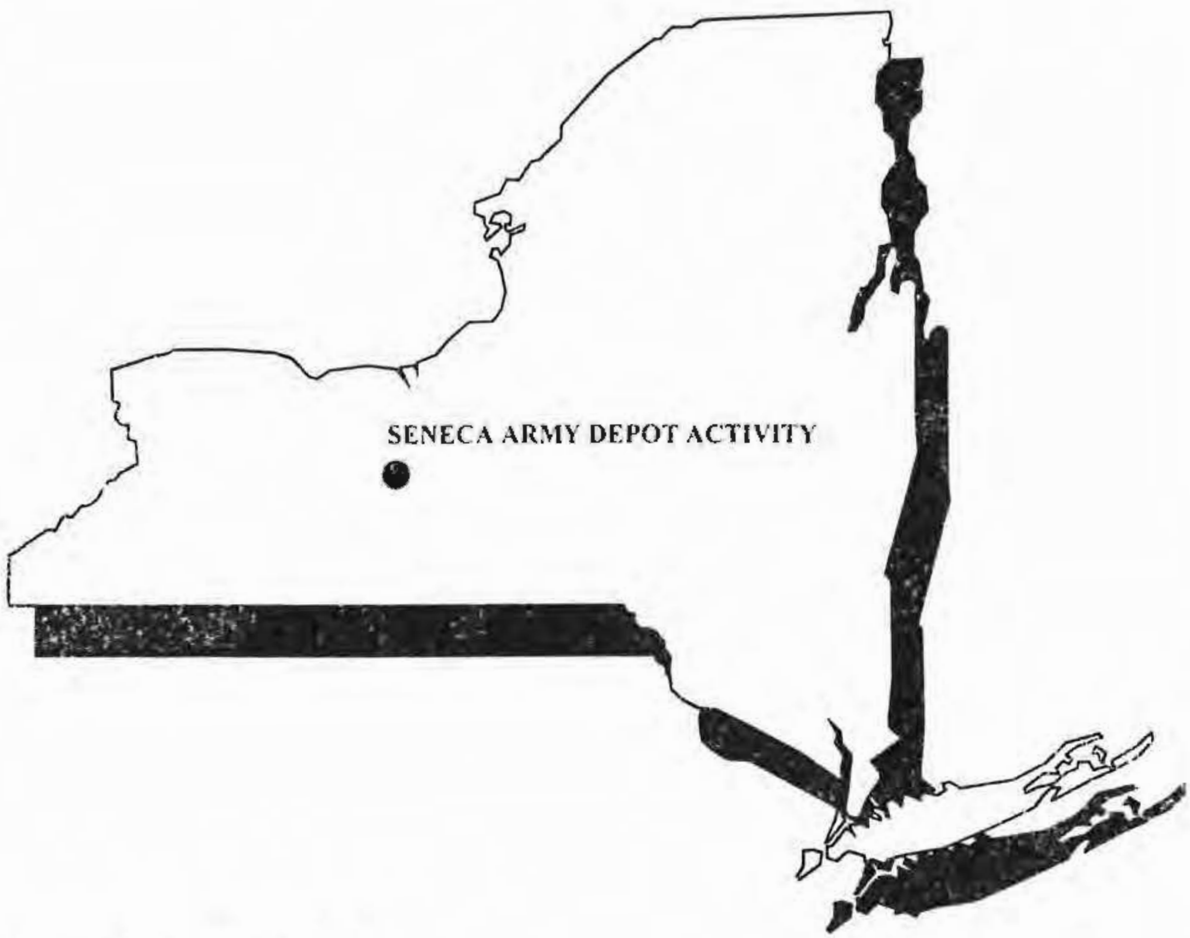

DRAFT FINAL
SUPERFUND PROPOSED PLAN FOR The ABANDONED DEACTIVATION FURNACE (SEAD-16) and the ACTIVE DEACTIVATION FURNACE (SEAD-17)

SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

CONTRACT NO. DACA87-95-D-0031
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JUNE 2002

DRAFT FINAL PROPOSED PLAN
FOR
THE ABANDONED DEACTIVATION FURNACE (SEAD 16)
AND THE ACTIVE DEACTIVATION FURNACE (SEAD 17)

SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

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June 2002

PROPOSED PLAN
The Abandoned Deactivation Furnace (SEAD-16)
and the Active Deactivation Furnace (SEAD-17)
Seneca Army Depot Activity (SEDA)
Romulus, New York

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June 2002

PURPOSE OF PROPOSED PLAN

This Proposed Plan describes the alternatives considered for remediation at the Abandoned Deactivation Furnace (SEAD-16) and the Active Deactivation Furnace (SEAD-17) located within the Seneca Army Depot Activity (SEDA). The plan identifies the preferred remedial option with the rationale for its preference. The Proposed Plan was developed by representatives of the U. S. Army in cooperation with the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The U.S. Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f) of the National Contingency Plan (NCP). The remedial options summarized here are described in the remedial investigation and feasibility study (RI/FS) report, which should be consulted for a more detailed description of all the options. The RI/FS is contained in the Administrative Record, which is available for public review at the Seneca Army Depot Activity, Building 123. Please contact the office of Mr. Steve Absolom at the address below in order to view these documents.

This Proposed Plan is being provided to inform the public of the U.S. Army's preferred remedial alternative. This document is intended to solicit public comments pertaining to all the remedial options evaluated, as well as to specify the Army's preferred remedial option.

The remedy described in this Proposed Plan is the preferred remedy for the site. Changes to the preferred remedy or from the preferred remedy to another remedy may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. Public comments are solicited on all of the options considered in the detailed analysis of the RI/FS because EPA, NYSDEC, and the U.S. Army may select a remedy other than the preferred remedy. The final decision regarding the selected remedy will be made after the U.S. Army has taken into consideration all public comments.

COMMUNITY ROLE IN SELECTION PROCESS

The U.S. Army relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, the RI/FS reports, the Proposed Plan, and the supporting documentation have been made available to the public for a public comment period which begins on [enter public comment period start date] and concludes on [enter public comment period end date].

A public meeting will be held during the public comment period at the [meeting location] on [meeting date] at [meeting time] to present the conclusions of the RI/FS, to elaborate further on the reasons for recommending the preferred remedial option, and to receive public comments. Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD)--the document that formalizes the selection of the remedy.

All written comments should be addressed to:

Mr. Stephen Absolom
BRAC Environmental Coordinator
Building 123
Seneca Army Depot Activity
Romulus, NY 14541-5001

Copies of the RI/FS report, Proposed Plan, and supporting documentation are available at the following repositories:

Seneca Army Depot Activity
Building 123
Romulus, NY 14541
(607) 869-1309
Hours are Mon-Fri 8:30 am to 4:30 pm

Dates to remember:
MARK YOUR CALENDAR

[enter start and completion dates of public comment period]
Public comment period on RI/FS report, Proposed Plan, and remedies considered

[enter public meeting date]
Public meeting at the [enter meeting location and time]

SITE BACKGROUND

SEDA is a 10,587-acre military facility located in Seneca County, Romulus, New York, which has been owned by the United States Government and operated by the Department of the Army since 1941. The facility is located in an upland area, which forms a divide separating two of the New York Finger Lakes, Cayuga Lake on the east and Seneca Lake on the west. The elevation of the facility is approximately 600 feet Mean Sea Level (MSL).

The Abandoned Deactivation Furnace (SEAD-16) is located in the east-central portion of SEDA (**Figure 1**). SEAD-16 has been inactive and abandoned since the 1960s. The site consists of 2.6 acres of fenced land with grasslands in the north, east, and west, a storage area for empty boxes and wooden debris, and an unpaved roadway in the south. Also onsite is the building which housed the deactivation furnace, a smaller abandoned building known as the Process Support Building, two sets of SEDA railroad tracks, and some utilities. Two underground storage tanks previously existed at the site but have been removed. A site map of the area is included as **Figure 2.**

The Active Deactivation Furnace (SEAD-17) is located in the east-central portion of SEDA (**Figure 1**). SEAD-17 was constructed to replace the operation of SEAD-16. 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 provision of RCRA, but the RCRA permit was withdrawn by the Army when the Depot was listed for base closure in 1995. The site consists of a deactivation furnace building that is surrounded by a crushed shale road. Beyond the perimeter of the crushed shale road is grassland. Two small sheds are located in the eastern portion of the site and there is vehicular access to the site from an unpaved road to the north. Access to the site is restricted because the site is located in the former ammunition storage area. A site map of SEAD-17 is included as **Figure 3**.

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.

SEDA was proposed for the National Priorities List (NPL) in July 1989. In August 1990, SEDA was finalized and listed in Group 14 of the Federal Section of the National Priority List (NPL). The EPA, NYSDEC, and the Army entered into an agreement, called the Federal Facility Agreement (FFA), also known as the Interagency Agreement (IAG). This agreement determined that future investigations were to be based on CERCLA guidelines and that the Resource Conservation and Recovery Act (RCRA) was considered to be an Applicable or Relevant and Appropriate Requirement (ARAR) pursuant to Section 121 of CERCLA. In October 1995, SEDA was designated as a facility to be closed under the provisions of the Base Realignment and Closure (BRAC) process.

REMEDIAL INVESTIGATION SUMMARY

SEAD-16 and 17 are described in four previous reports, which are available to the public at the repository cited above. The first report is the Work Plan for CERCLA Expanded Site Inspection (ESI) of Ten Solid Waste Management Units (SWMUs) written by Parsons Main, Inc. in January 1993. This report detailed the site work and sampling to be performed under the ESI. The second report is the SWMU Classification Report (Parsons ES, 1994), which describes and evaluates the Solid Waste Management Units at SEDA. The third 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 fourth report is an Expanded Site Inspection Report

(Parsons ES, 1995), which describes a more detailed investigation of SEAD-16 and SEAD-17. The fieldwork for the ESI was conducted according to the Work Plan for CERCLA ESI of Ten Solid Waste Management Units (Parsons ES, 1994). The ESI consisted of geophysics, soil sampling, monitoring well installation and groundwater sampling. Additional investigations at SEAD-16 included standing water sampling and interior building material sampling.

Based on the results of the ESI, an RI Workplan was prepared and the RI field program was conducted. At SEAD-16, the RI field program consisted of site surveys, soil sampling (surface and in boreholes), groundwater investigation in the overburden aquifer (sampling, well installation, and aquifer testing), surface water and sediment investigations, an ecological investigation, and a building investigation. The RI at SEAD-17 was similar to that at SEAD-16, with the exception of the soil boring samples and building investigation, which were not part of the field program at SEAD-17. The remedial investigations were designed to meet site-specific data quality objectives (DQOs).

SEAD-16

The primary constituents of concern at the Abandoned Deactivation Furnace (SEAD-16) are the inorganic elements arsenic, copper, lead, and zinc in surface soils and copper, lead, and zinc in surface water. Also of significance are the detected concentrations of polynuclear aromatic hydrocarbons (PAH) compounds in surface soils and sediments as well as inorganic elements, PAHs, and nitroaromatics in the building samples. The soils most impacted are those adjacent to the Abandoned Deactivation Furnace. Many of these compounds were present in concentrations that exceeded their respective NYSDEC guidelines. All the constituents of concern are believed to have been released to the environment during the Former Deactivation Furnace's period of operation (approximately 1945 to the mid 1960s).

Seismic profiles performed on the flanks of SEAD-16 were successful in determining that the bedrock surface slopes to the southwest or west, generally following the slope of the ground surface, and that groundwater flow is also likely to be in this direction.

Soil

Arsenic, copper, lead, and zinc were detected in almost all of the surface soil samples at concentrations above their respective New York State Technical and Administrative Guidance Memorandum (TAGM) values. The soil analysis results for SEAD-16 are presented in **Tables 1A and 1B**. Copper and lead were also found to be pervasive in the subsurface soil samples. In all instances, the detected concentrations of inorganic elements were found to be highest in samples collected adjacent to the northeastern side of the Abandoned Deactivation Furnace Building. The distribution of elevated concentrations of PAHs and nitroaromatic compounds had a similar distribution pattern. The highest concentrations of PAHs were detected in the surface soil samples collected adjacent to the northwestern corner of the Abandoned Deactivation Furnace Building, and the majority of elevated nitroaromatics concentrations were detected in the surface soil samples collected around and in between the Abandoned Deactivation Furnace Building and the Process Support Building. One exception to this pattern was the highest concentration of 2,4-dinitrotoluene (7,700ug/kg), which was detected in the eastern most surface soil sample, collected along the site access road in close proximity to the site's perimeter fence.

It is believed that the most significant on-site surface soil impacts resulted from the operations that were performed within and in close proximity to the Abandoned Activation Furnace Building and the Process Support Building.

Surface Water

Cadmium, copper, iron, lead, selenium, and zinc were detected at concentrations exceeding the NYSDEC Ambient Water Quality Standards (AWQS) Class C surface water standards in several of the surface water samples collected at SEAD-16. The surface water results for SEAD-16 are presented in **Table 1C**. In general, most of the significantly elevated concentrations of inorganic elements in the surface water samples were collected from the two drainage ditches that are closest to, and south of, the Abandoned Deactivation Furnace Building. This pattern of inorganic element distribution in SEAD-16 surface waters, as well as the wide distribution of these elements in surface soil samples, indicates that the on-site surface soils are the likely source area for the inorganic elements found in the surface water samples.

Sediment

Sediment impacts were primarily from semi-volatile organic compounds (SVOCs) and pesticides, and were found at elevated concentrations in all of the drainage ditches that were investigated at SEAD-16. The sediment results for SEAD-16 are presented in **Table 1D**. The highest concentrations of SVOCs and pesticide compounds were detected in the sediment sample collected from the northeast corner of the Abandoned Deactivation Furnace Building, though no trend was observed in the spatial distribution of elevated SVOC or pesticide concentrations throughout the site. These data indicate that past operating processes in the Abandoned Deactivation Furnace Building did not contribute directly to the distribution of these compounds throughout the site. Rather, the SVOC impacts may have resulted from the use of vehicles for site operations (including locomotives, transport trucks, and automobiles) and the pesticide impacts are likely to have occurred from on-site pesticide applications.

Groundwater

Seven inorganic elements (aluminum, antimony, iron, lead, manganese, sodium, and thallium) were detected in groundwater samples at concentrations that exceed the NYSDEC AWQS Class GA or Federal MCL standards. The groundwater analysis results for SEAD-16 are presented in **Table 1E**. The site mean concentrations for aluminum, iron, manganese, and sodium are not statistically different from their background concentrations. Antimony and lead concentrations exceed their respective standards in only one well, which is located adjacent to the southern portion of the Abandoned Deactivation Furnace Building. Thallium was detected at elevated concentrations in three groundwater monitoring wells, which are also located close to the Abandoned Deactivation Furnace Building. These data indicate that the source of the antimony, lead, and thallium in groundwater is likely to be in or near the building, though no distribution pattern in groundwater for any of these elements is apparent. Sodium exceeds the groundwater standard in a single well. The source of this single exceedance is unknown.

An additional round of groundwater sampling was performed to confirm the presence of thallium in the groundwater at both sites. The analytical results indicated that thallium was not detected in any of the on-site monitoring wells. The detection limit for these analyses was 1.5 ug/l which is less than the MCL criteria of 2 ug/l. Based on these results, thallium is not considered a parameter that is present in the groundwater.

__SEAD-17__

At the Active Deactivation Furnace, (SEAD-17) the primary constituents of concern are the inorganic elements antimony, arsenic, copper, lead, mercury, and zinc in soils. Also of significance are PAH and pesticide compounds in sediments. All of these are believed to have been released to the environment during the Active Deactivation Furnace's period of operation (approximately 1962 to 1989).

Seismic profiles performed on the flanks of SEAD-17 were successful in determining that the bedrock surface slopes to the southwest or west, generally following the slope of the ground surface, and that groundwater flow is also likely to be in this direction. At SEAD-17 water table elevations indicate that groundwater flow is essentially to the west.

Soil

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 soil analytical results for SEAD-17 are presented in **Tables 2A and 2B**. Lead was detected in all of the subsurface soil samples at concentrations that exceed its TAGM value. In all instances, the detected concentrations of inorganic elements were found to be highest in those samples collected close to the Active Deactivation Furnace Building, and some of the highest concentrations were located immediately to the southwest of the building. A drainage pipe, which drains the retort inside the Active Deactivation Furnace Building, discharges to the southwest of the building, and may explain the presence of the high inorganic element concentration in the nearby surface soils. Because the Active Deactivation Furnace Building has very few points where materials can enter and exit the building (such as drainage pipes), and since the most significant impacts from inorganics are generally equally distributed around the building, it is likely that fallout of emissions from the stack on the building is the source of these inorganics. However, because the building at SEAD-17 currently has emissions controls for the stack, it is likely that these emissions occurred prior to the installation of these controls.

Surface Water

Copper, iron, lead and selenium were detected at concentrations above the NYSDEC AWQS Class C surface water standards in some of the surface water samples collected at SEAD-17. Surface water analytical results are presented in **Table 2C**. In general, most of the elevated concentrations of inorganic elements in the surface water samples were collected from the drainage ditch located south of the Active Deactivation Furnace Building. This drainage ditch also collects the overland runoff from the deactivation furnace's retort drainage pipe. This occurrence of inorganic elements in the surface waters to the south of SEAD-17, as well as the wide distribution of inorganic elements in the SEAD-17 surface soil samples, indicates that the on-site surface soils are the likely source for the inorganic elements found in the surface water samples.

Sediment

Sediment impacts were primarily from PAHs, pesticides, and inorganics, and were found at elevated concentrations in all of the drainage ditches that were investigated at SEAD-17. Sediment analytical results are presented in **Table 2D**. Impacts from PAHs were most significant in one sample collected from the drainage ditch in the northeastern corner of the site. All elevated pesticide compound concentrations were detected in the sediment samples collected from the northern and western most drainage ditches. None were detected at elevated concentrations at locations that were in close proximity to the Active Deactivation Furnace Building. This spatial distribution pattern indicates that the pesticide compound impacts are likely to have occurred from on-site pesticide applications and that past operating processes in the Abandoned Deactivation Furnace Building most likely did not contribute directly to the distribution of these compounds throughout the site.

Cadmium, copper, iron, lead, and nickel were detected in almost all of the SEAD-17 sediment samples at concentrations that exceed their respective criteria values. Copper and lead were found to be pervasive in the on-site surface soil samples and the site's surface soils are the likely source of the SEAD-17 sediment impacts for these two elements. Though cadmium, nickel, and iron had a lesser degree of impact on the soils at SEAD-17, iron was detected in some soil samples, and cadmium and nickel were detected in numerous surface soil samples, at concentrations that exceeded TAGM values. Therefore, the source of cadmium, nickel, and lead in the SEAD-17 sediments is also likely to be the result of on-site surface soil runoff.

Groundwater

Generally, the groundwater at SEAD-17 has not been significantly impacted by any chemical constituents. Groundwater analytical results are presented in **Table 2E**. Low concentrations of SVOCs were detected, and two inorganic elements, thallium and manganese, exceeded their respective MCL criteria values by a factor of 3.5 or less. Iron and sodium exceeded their respective NYSDEC AWQS Class GA standard. No VOCs, pesticides, PCBs, or nitroaromatics were detected in the samples. As discussed in groundwater results for SEAD-16, the results of the additional groundwater sampling program indicated that thallium was not detected in any of the on-site wells and is not considered a parameter that is present in the groundwater.

SUMMARY OF SITE RISK

Based on the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimated the human health and ecological risk that could result from the site if no remedial action were taken.

<u>Human Health Risk Assessment</u>

The reasonable maximum human exposure was evaluated. A four-step process was used for assessing site-related human health risks for a reasonable maximum exposure scenario:

- *Hazard Identification*-- identified the contaminants of concern based on several factors, such as toxicity, frequency of occurrence, and concentration.
- *Exposure Assessment*-- estimated the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed.
- *Toxicity Assessment*-- determined the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response).
- *Risk Characterization*-- summarized and combined the outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks (e.g. a one-in-a-million excess cancer risk).

The primary constituents of concern at the Abandoned Deactivation Furnace (SEAD-16) are the inorganic elements arsenic, copper, lead, and zinc, PAH compounds, and nitroaromatics. At the Active Deactivation Furnace (SEAD-17) the constituents of concern are inorganic elements (antimony, arsenic, copper, lead, mercury, and zinc), PAH compounds, and pesticide compounds. Several of these compounds, including some PAH and pesticide compounds, are known to cause cancer in laboratory animals and are suspected to be human carcinogens.

The baseline risk assessment evaluated the health effects that may result from exposure for the following six receptor groups:

1. Current site worker,
2. Future on-site industrial worker,
3. Future on-site construction worker,
4. Future child trespasser,
5. Future child at an on-site day care center, and
6. Future worker at an on-site day care center.

The following exposure pathways were considered:

1. Inhalation of dust in ambient air (current site worker, future on-site construction worker, future child trespasser, future day care center child, future day care center worker, future industrial worker at SEAD-17 only);
2. Ingestion of on-site soils (current site worker, future on-site construction worker, future child trespasser, future day care center child, future day care center worker, future industrial worker at SEAD-17 only);
3. Dermal contact to on-site soils (current site worker, future on-site construction worker, future child trespasser, future day care center child, future day care center worker, future industrial worker at SEAD-17 only);
4. Ingestion of groundwater (daily) (future industrial worker, future day care center child, future day care center worker);
5. Dermal contact to surface water (future child trespasser);
6. Ingestion of on-site sediment (future child trespasser);
7. Dermal contact to sediment (future child trespasser);
8. Inhalation of dust in indoor air (future industrial worker at SEAD-16 only);
9. Ingestion of indoor dust/dirt (future industrial worker at SEAD-16 only);

10. Dermal Contact to indoor dust/dirt (future industrial worker at SEAD-16 only).

(Note: The SEAD-16 industrial worker is assumed to work only indoors. The SEAD-17 industrial worker is assumed to work only outdoors.)

Under current EPA guidelines, the likelihood of carcinogenic and non-carcinogenic effects due to exposure to site-related chemicals are considered separately. Non-carcinogenic risks were assessed by calculation of a Hazard Index (HI), which is an expression of the chronic daily intake of a chemical divided by its safe or Reference Dose (RfD). An HI that exceeds 1.0 indicates the potential for non-carcinogenic effects to occur. Carcinogenic risks were evaluated using a cancer Slope Factor (SF), which is a measure of the cancer-causing potential of a chemical. Slope Factors are multiplied by daily intake estimates to generate an upper-bound estimate of excess lifetime cancer risk. For known or suspected carcinogens, EPA has established an acceptable cancer risk range of 10^{-4} to 10^{-6} (one-in-ten thousand to one-in-one million).

SEAD-16

The results of the baseline risk assessment at SEAD-16 indicate that the HI is above the USEPA target of 1.0 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). The total hazard index for the future 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 on-site construction worker is primarily due to ingestion of soils. The total hazard index for the future day care child is due to ingestion of soil and ingestion of groundwater. The total hazard index for the future day care center worker is primarily due to ingestion of groundwater.

The cancer risk is within the target risk range of 10^{-4} to 10^{-6} for all receptors except the future industrial worker ($5x10^{-3}$). The total cancer risk for the future industrial worker is due primarily to the ingestion of indoor dust.

The elevated hazard indices for the ingestion of indoor dust exposure pathway are primarily due to SVOCs, 2,4-dinitrotoluene, and metals (antimony and copper). The elevated hazard 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. An additional discussion of thallium in groundwater is presented below in the section entitled, *Additional Information on SEAD-16 and SEAD-17 Human Health Risk Assessment*.

SEAD-17

The results of the baseline risk assessment at SEAD-17 indicate that the cancer risks for all receptors evaluated were within the USEPA target risk range and that the HI for all but one receptor was below the target value. The exception was the future day care center child, which had a HI equal to the acceptable USEPA level of 1. The HI for the future day care center child is primarily due to the ingestion of soil and to metals (antimony, arsenic, cadmium) in those soils.

Additional Information on SEAD-16 and SEAD-17 Human Health Risk Assessment

It should be noted that lead, which was found at elevated levels in soil at both SEAD-16 and SEAD-17, was not considered in the quantitative risk assessment because an allowable RfD is not available. Lead was considered by comparing site data to levels established by USEPA and NYSDEC as protective.

Due to the risks produced by the presence of thallium in groundwater and because there is no historical use of thallium at these sites, an additional sampling round for thallium alone was performed (October 1999) to confirm the presence of thallium at these sites. The confirmatory sampling used an analytical procedure with a detection limit below the USEPA allowable concentration for thallium. The October 1999 results indicate that thallium is not present and that the earlier inconsistent detections of thallium were due to either laboratory analytical error or matrix interference effects. Therefore, thallium is not considered to contribute to non-carcinogenic risk in groundwater at SEAD-16 or SEAD-17.

Ecological Risk Assessment

The reasonable maximum environmental exposure was also evaluated. A four-step process was used for assessing site-related ecological risks for a reasonable maximum exposure scenario:

- *Characterization of the Site and the Ecological Communities*—Includes ecological conditions observed at the unit, site habitat characterization, wildlife resources that are present in the area, and the importance of ecological resources to wildlife and to humans.
- *Exposure Assessment*—Discusses chemicals of potential concern (COPC) and exposure point concentrations and it presents exposure assessments. Chemical distribution of COPCs, and their uptake through various pathways are also discussed in this section. Daily intakes of COPCs through environmental media are quantified as well.
- *Effects Assessment*—Assesses ecological effects that potentially may result from receptor exposure to COPCs. Evaluates potential toxicity of each COPC in

each medium and defines toxicity benchmark values that will be used to calculate the ecological hazard quotient.

- *Risk Characterization*—Integrates the results of the preceding elements of the assessment. It estimates risk with respect to the assessment endpoints, based on the predicted exposure to and toxicity of each COPC.

Ecological risk is then presented in terms of a hazard quotient (HQ), which is defined as the ratio of the expected exposure point concentration to an appropriate toxicity reference value (TRV). In general, ratios of exposure point concentrations to TRV greater than 1 are considered to indicate a potential risk. However, due to the uncertainties associated with using this approach, safety factors are considered in interpreting the findings. HQs between 1 and 10 are interpreted as having some potential for adverse effects, whereas, HQs between 10 and 100 indicate a significant potential for adverse effects. HQs greater than 100 indicate that adverse impacts can be expected.

At SEAD-16, potential risk was calculated for both the deer mouse (terrestrial receptor) and the creek chub (aquatic receptor). Of the chemicals of potential concern (COPCs) at SEAD-16 having an HQ equal to or greater than 1, seven were identified in soil, six in surface water, and 15 in ditch sediment/soils. The following compounds are considered compounds of concern (COCs) at SEAD-16 due to elevated HQs. In surface and subsurface soils, lead and mercury both have HQs greater than 10. In surface water, iron and lead have HQs greater than 10. In ditch sediment/soils, endosulfan-I, endosulfan II, endosulfan sulfate, antimony, lead, and mercury have HQs greater than 10. Copper in ditch sediment/soils has an HQ greater than 100.

At SEAD-17, potential risk was also calculated for both the deer mouse and the creek chub. 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 ditch sediment/soils. There is a low likelihood of risk to the deer mouse from the concentrations of COPCs found in soils therefore, none of these compounds are considered to be COCs. The COPCs in surface water and ditch sediment/soils are also not likely to adversely impact populations of creek chub in the surface water bodies at the Depot. With HQs of most of the surface water and ditch sediment/soil COPCs less than 10 and based on very conservative assumptions, none were considered a COC.

The results of the ecological risk assessment presented in the RI report (Parsons ES. March 1999) concluded that there is negligible risk to the ecosystems of the SEAD-16 and SEAD-17 study areas. During the field evaluation, no overt acute toxic impacts were noted. In addition, there are no threatened, endangered, or sensitive species that would be expected to inhabit or frequent either site. The quantitative ecological risk evaluation initially suggested that a possibility exists for the COPCs to present a small potential for environmental effects due to soil, surface water, and ditch sediment/soils at both SEAD-16 and SEAD-17. However, given the conservative nature of the assessment, the poor quality of the SEAD-16 and 17 habitat, and the future land use designation of the sites as industrial, it is not likely that the sites support or will support a significant portion of the community of species that occupy the area surrounding and including these sites.

SCOPE AND ROLE OF ACTION

The scope of this action is to provide adequate protection for current and future human and ecological receptors at the Abandoned Deactivation Furnace and the Active Deactivation Furnace at SEDA.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives have been developed that consist of media-specific objectives for the protection of human health and the environment. These objectives are based on available information and standards such as ARARs and risk-based levels established in the risk assessment. These objectives are also based upon the current and intended future land use, which is industrial use for both sites.

For both sites, residential land use was only considered to compare the cost of remediating the sites for this land use versus the cost to implement restricted use on the sites. Another reason for the consideration of a residential use is to comply with Army guidance, which states that alternatives consistent with property use without restriction should be considered to compare life-cycle institutional control costs with more conservative clean-up alternatives (DAIM-BO, "Army Guidance for Using Institutional Controls in the CERCLA Process").

Remedial action objectives are specific goals to protect human health and the environment; they specify the contaminant(s) of concern, the exposure route(s), receptor(s), and acceptable contaminant level(s) for each exposure route. These objectives are based on risk levels established in the risk assessment and comply with ARARs to the greatest extent possible. The remedial action objectives for the SEAD-16 and SEAD-17 operable unit are as follows:

- Prevent public or other persons from direct contact with adversely impacted soils, sediments, solid waste and surface water that may present a health risk.
- Eliminate or minimize the migration of hazardous constituents from soil to groundwater.

- Prevent ingestion of groundwater containing constituents in excess of federal and state drinking water standards or criteria, or which pose a threat to public health.
- Prevent off-site migration of constituents above levels protective of public health and the environment.
- Restore groundwater, soil, surface water, and sediments to levels that are protective of public health and the environment.

Remediation goals were developed for soil and building materials at SEAD-16 and SEAD-17. The cleanup goals for surface, subsurface, and ditch soils for SEAD-16 and SEAD-17 are presented in **Table 3**. Lead was selected as the indicator metal for soil 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. The cleanup goal for lead is 1250 mg/kg based on the industrial future use scenario. Cleanup goals were also derived for antimony, copper, mercury, thallium, and zinc for the industrial future use scenario. Three other cleanup goals were also evaluated and include 1000 mg/kg for the future industrial use scenario, 400 mg/kg + TAGM (for other metals) for the pre-disposal scenario, and 400 mg/kg for the residential scenario. Cleanup goals were also derived for antimony, copper, mercury, thallium, and zinc for the residential future use scenario. Most exceedances of these five metals are co-located with the lead exceedances.

<u>**Soil with Lead Concentration Exceeding 1250 mg/kg**</u>

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, 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.

There are some soil concentrations of antimony, copper, mercury, thallium, and zinc that exceed TAGMs outside the proposed 1250 mg/kg lead cleanup areas at SEAD-16 and SEAD-17. To address this, maximum metal concentrations were calculated for the above-mentioned metals for the future industrial use scenario. The receptor used for the industrial scenario was a day-care child. The day-care child receptor was included in the future industrial use scenario as requested by the EPA based on the fact that other day care centers had been present at SEDA. Maximum metal concentrations were calculated by assigning the total Hazard Index of the above five metals as 1. The HI was distributed among the five metals according to the post-remediation HI for ingestion of surface soil by a day-care-child at SEAD-16. As presented in the FS, 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 unacceptable risks for the future industrial use scenario. 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, 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 (**Figures 2 and 3**).

Hotspot removal will be conducted at SEAD-16 and SEAD-17. The locations include the area between the northwest corner of Building S-311 at SEAD-16 and the railroad tracks (soil sampling locations SS16-1 and SB16-4); soil sampling locations SS16-35 and SS16-31, which are located adjacent to the railroad tracks; and the area around soil sampling location SS17-10 (**Figures 2 and 3**). Hotspot removal will only be incorporated to the extent that the railroad tracks are not disrupted. The areas will be excavated to a depth of 12 inches and backfilled with clean soil. No confirmatory sampling will be conducted.

Five metals (antimony, barium, lead, mercury, and thallium) in soil and sediment/soil found in the ditches pose potential risks to the deer mouse after remediation to the above cleanup levels. The hazard quotients (HQ) are very close to the soil HQs calculated using site background concentrations, therefore, soil is not expected to pose significant adverse effects to the environment after remediating soils with lead concentration exceeding 1250 mg/kg. In addition, there are no endangered or threatened 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, the habitat it provides appears to be relatively low in diversity and productivity, and the future land use of the site is intended to be industrial, therefore, in general, the proposed soil cleanup goal of 1250 mg/kg will be protective of the environment. A Completion Report, which will demonstrate that the remedial actions are protective of human health and the environment in an industrial future use scenario, will be submitted after the remedial actions have been conducted.

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.

Soil with lead concentration exceeding 400 mg/kg

In addition to the previous two soil cleanup levels, the cost associated with the remediation of lead to a concentration of 400 mg/kg was also evaluated. Metal concentrations (for the 5 metals other than lead) that would be protective of a residential child under a residential use scenario were calculated from a Risk HI of 1 and considered in the delineation of the area to be remediated. 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 that there will be no unacceptable risk to future residential receptors by ingestion of site soil.

Soil with lead concentration exceeding 400 mg/kg + TAGM

New York State regulations establish a goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law". In accordance with this regulation, costs associated with the remediation of lead to pre-disposal conditions were also estimated. To comply with the pre-disposal conditions, 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. The remediation of all other metals would comply with NYSDEC TAGM values. The pre-disposal condition scenario for one remedial alternative was evaluated against the nine criteria in Appendix A to this PRAP.

It should be noted that remediation technologies were screened and alternatives were developed based on the proposed cleanup level of 1250 mg/kg lead, however, costs for the selected alternatives were estimated for all four of the 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). The proposed cleanup level of lead of 1250 mg/kg also includes the cleanup levels for antimony, copper, zinc, mercury, and thallium for the industrial future use scenario. The cleanup levels for soil at SEAD-16 and SEAD-17 are presented in **Table 3**.

The decision to accept the residential use or pre-disposal scenario clean-up goal would be considered if the cost comparison showed that the additional cost to achieve lower cleanup level was affordable, in the opinion of the Department of Defense. The pre-disposal scenario for one remediation alternative was also evaluated against the nine evaluation criteria in Appendix A to this PRAP.

Soil in Ditches

The soil found in the ditches does not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. There is no unacceptable human health risk by ingestion of or dermal contact with the on-site ditch soil. Therefore, the cleanup goal for the ditch soils will be the same as that for the surface and subsurface soils, which is 1250 mg/kg for lead.

Building Material and Debris

The material and debris in Buildings S-311 and 366, which are both located at SEAD-16, is a media of concern. This is based on the human health risk associated with the ingestion of and dermal contact with indoor dust by a future industrial worker. In addition, metals, SVOCs, and nitroaromatics were detected above the respective TAGM values in the building samples collected from both buildings. Asbestos was detected at 13 locations in the two buildings in materials including pipe insulation, roofing material, and floor tiles. The remedial action objective is to remediate the buildings to reduce the risk for a future industrial worker.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that each selected site remedy be protective of human health and the environment, be cost effective, comply with other statutory laws, and use permanent solutions, alternative treatment technologies, and resource recovery options to the maximum extent possible. In addition, the statute includes a preference for the treatment as a principal element for the reduction of toxicity, mobility, or volume of the hazardous substances.

SEAD-16 and SEAD-17 Remedial Alternatives

Six remedial alternatives were identified for SEAD-16 and SEAD-17. These remedial alternatives consider SEAD-16 and

SEAD-17 as one unit and have been evaluated as such. The alternatives, along with the technologies and processes that make up each alternative, are:

- Alternative 1: No-Action,
- Alternative 2: On-Site Containment (Institutional controls/Soil Cover),
- Alternative 3: In-Situ Treatment (Consolidate/In-situ stabilization/Soil Cover),
- Alternative 4: Off-Site Disposal (Excavate/Stabilize/ Off-site Disposal),
- Alternative 4P: Off-Site Disposal under Pre-Disposal Condition
- Alternative 5: On-Site Disposal (Excavate/On-site stabilization/On-site Subtitle D Landfill),
- Alternative 6: Ex-Situ (Innovative) Treatment (Excavate/Wash/Backfill coarse fraction/Treat and dispose fine fraction/Treat and dispose fine fraction in off-site Subtitle D Landfill).

All six alternatives are described in more detail below.

As requested by NYSDEC and to comply with the Army guidance cited above, the unrestricted use condition was also evaluated for Alternative 4 in order to weigh the advantages of restoring the site to pre-disposal conditions versus the cost that this would incur. Evaluation of this alternative (Alternative 4P) was presented in Appendix A to this PRAP. This additional evaluation was conducted only for one alternative in order to avoid the redundancy of evaluating each alternative multiple times.

All alternatives for SEAD-16 and SEAD-17 include institutional controls as part of the remedy. The goals of the land use controls are to ensure adequate protection of human health and the environment, and to preserve and promote the long-term effective operation of remedial alternatives proposed for the sites. Types of land use controls may include deed restrictions, physical controls such as signs and fences, and prevention of the use of groundwater as drinking water. Public water supply is available, thus a groundwater restriction should have minimal impact on land reuse of the site. Alternative 4P includes institutional controls to prevent the use of groundwater until the NYSDEC GA standards are met.

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.

Alternative 2 – On-site Containment

Alternative 2 consists of excavating soils in the drainage swales and ditches with lead concentrations greater than 1250 mg/kg and disposing of them in an off-site landfill. Excavated ditch soil will 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. Stabilization involves mixing an additive such as cement, quick lime, flyash, pozzolans, or a proprietary agent with the soil. Because of the relatively small volume of ditch soil to be treated at SEAD-16 and SEAD-17, it is expected that off-site treatment will be more cost effective than on-site treatment. On-site treatment of ditch soils would require a treatability study, site permitting, and a specialty contractor, which would increase the cost. Therefore, for screening purposes presented later in this section, this alternative assumes that all excavated soil is transported off-site for both treatment and disposal. It should be noted that TCLP is not a cleanup level, rather it determines whether the soils are a characteristic waste and the type of disposal the waste requires.

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 also be removed from the surface of the furnace and boiler stacks and disposed and stabilized as appropriate.

A soil cover will be placed over the surface and subsurface areas with lead concentrations greater than 1250 mg/kg. 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. Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. 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 deterioration from potential contaminant leaching from soil. However, 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.

Alternative 3 – In-Situ Treatment

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.

Alternative 3 consists of in-situ stabilization of the surface and subsurface soils with lead concentrations greater than 1250 mg/kg. 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 a vegetative cover will be established. Drainage swales and ditches will be backfilled with topsoil and vegetative growth will be established.

Material and debris from Buildings S-311 and 366 will 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. Stabilization involves mixing an additive such as cement, quick lime, flyash, pozzolans, or a proprietary agent with the soil. Debris and dust will also be removed from the surface of the furnace and boiler stacks and disposed and stabilized as appropriate.

The intent of this alternative is to stabilize the source material to reduce migration into the groundwater; to isolate the waste from receptors; and to prevent migration of surface soil to surface water via soil erosion. Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. Long-term groundwater monitoring and O & M will be required.

Alternative 4 – Off-Site Disposal

Alternative 4 involves excavating surface, subsurface and ditch soils with lead concentrations greater than 1250 mg/kg, and disposing the excavated material in an off-site landfill (**Figures 2 and 3**). Excavated soil and ditch soil will 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. Stabilization involves mixing an additive such as cement, quick lime, flyash, pozzolans, or a proprietary agent with the soil. Based on conversations with stabilization contractors, 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 disposal. 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 also be removed from the surface of the furnace and boiler stacks and disposed and stabilized as appropriate.

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. Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required.

Alternative 4P – Off-Site Disposal under Pre-Disposal Scenario

Alternative 4P addresses future unrestricted use of SEAD-16 and SEAD-17, which would restore the sites to the pre-disposal condition, even though the intended future use of the sites is industrial. Restoring the sites to the pre-disposal condition is 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". As a result, in order to be protective of human health under a residential scenario, the cleanup goals for soil have been revised to 400 mg/kg for lead and TAGM values for the five metals, antimony, copper, mercury, thallium, and zinc. This alternative would be implemented in exactly the same manner as Alternative 4, except that the excavation volume would increase. This alternative would include excavating surface, subsurface, and ditch soils with lead contaminations greater than 400 mg/kg and with metal concentrations that exceed their respective TAGM value, and disposing the excavated material in an off-site landfill. Excavated soils 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.

This alternative has been evaluated against the nine criteria in Appendix A to this PRAP.

Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required.

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. Excavated soil and ditch soil will be stockpiled and tested prior to being transported for on-site 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 on-site Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized 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 according to 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 storm water 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 1×10^{-7} cm/s. There are also a number of compaction, construction, and slope requirements. Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. Long-term groundwater monitoring and O & M would be required for the landfill.

Alternative 6 – Innovative Treatment – Soil Washing

Alternative 6 involves excavating soil in drainage swales and ditches with lead concentrations greater than 1250 mg/kg, 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 remedial action objectives. 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 also be removed from the surface of the furnace and boiler stacks and disposed and stabilized as appropriate.

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 relatively 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 separates 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 fraction 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:

Physical Separation Unit Operations
- 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

Institutional controls, which are an element of this alternative, are discussed in the beginning of this section. Long-term groundwater monitoring will be necessary; however, long-term operations and maintenance will not be required.

Alternatives Screening

A two step screening process was used to reduce the number of alternatives that would undergo detailed analysis. The first step was to evaluate the alternatives 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). This initial evaluation is a general and qualitative screening.

Alternative 1, No Action, is the only alternative that will not comply with the two threshold factors evaluated in Step 1. It was, however, retained to provide a baseline comparison with other alternatives throughout the screening process. The Step 2 analysis assigned a score to each alternative for each balancing criteria discussed above. These scores, as well as the total scores are shown in **Table 4**. Alternatives 3 and 5 received the lowest total scores and were screened out. The remaining alternatives were retained for a more detailed analysis.

Detailed Analysis of Alternatives

A more detailed description of each of the retained remedial action alternatives is presented in **Table 5**. 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 below.

The following alternatives have been selected and screened based on the intended industrial/commercial use scenario, which has a proposed cleanup level of 1250 mg/kg. This was the future use identified by the community representative group, the Local Redevelopment Authority, during the BRAC process. However, costs for each alternative also have been estimated for three other cleanup levels (lead concentrations exceeding 1000 mg/kg, lead concentrations exceeding 400 mg/kg, and lead concentrations exceeding 400 mg/kg + other metal concentrations exceeding TAGM values). These other cleanup levels are based on the New York State Department of Health (NYSDOH) guidelines for industrial use and the State of New York requirements for future unrestricted use that were previously discussed. To avoid the redundancy of evaluating each alternative four separate times, only the costs were evaluated for each of the four cleanup levels (except Alternative 4P) and all other criteria were evaluated for the proposed 1250 mg/kg cleanup level. The unrestricted use alternative was evaluated for Alternative 4P in order to weigh the advantages of restoring the sites to pre-disposal conditions versus the cost that this would incur. The unrestricted use alternative was conducted for only one remedial alternative. Thus, cost ranges are presented in the following discussion for each alternative. These ranges are based on the costs calculated for the four cleanup goals. The cost associated with each specific cleanup goal is presented in **Table 6**.

Alternative 1: No-Action Alternative

The Superfund program requires that the "No-Action" option be considered as a baseline for comparison of other options. There are no costs associated with no-action option. The no-action option means that no remedial activities would be undertaken at the site. No monitoring or security measures would be undertaken. Any attenuation of the threats posed by the site to human health and the environment would be the result of natural processes. Current security measures would be eliminated or modified so that the property may be transferred or leased as appropriate.

Alternative 2: On-site Containment

Capital Cost Range: $913,900 - $1,898,360

O & M Cost: $40,400 – ditch soil sampling and semi-annual groundwater monitoring + $5000-$7000 (cover maintenance)
Present Worth Cost: $1,699,648 - $2,735,984
Construction Time: 2 to 7 months depending on location of stabilization activities.

Alternative 2 consists of removing, testing, and disposing off-site the SEAD-16 building debris; installing institutional controls (such as a permanent fence); excavating soils found in the drainage swales with lead concentrations greater than 1250 mg/kg; disposing excavated ditch soils in an off-site landfill; and placing a clean soil cover over surface and subsurface soils with lead concentrations greater than 1250 mg/kg.

Excavated 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. Stabilization involves mixing an additive such as cement, quick lime, flyash, pozzolans, or a proprietary agent with the soil. 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. 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. 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.

Both short- and long-term protectiveness of human health is provided with Alternative 2 because it will prevent ingestion of and direct contact with surface soils and ditch soils with lead concentrations over 1250 mg/kg. This will reduce risk from soil and ditch soil, as well as building material and debris, to acceptable levels. The ditch soils with lead concentrations above 1250 mg/kg will be removed, which will meet the remedial action objectives for ditch soil and prevent contamination downgradient in Kendaia Creek. Although Alternative 2 will leave contaminated soil in place, which does not protect groundwater from deterioration, groundwater is not expected to exceed relevant standards in the future for the metals of concern. Therefore, Alternative 2 will protect human health and the environment, however, it may restrict future use of the land.

Measures will be taken to ensure protection to the community and site workers during the remedial action. Environmental impacts to the site during the remedial action 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 are currently no chemical specific ARARs for soil and ditch soil. According to modeling results, 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. Alternative 2 does not preclude compliance with ARARs.

The remedial action would be considered permanent upon completion of the ditch soil excavation, placement of the soil cover, and installation of the fence. The long-term management of the excavated material will be the responsibility of the selected off-site landfill.

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. The toxicity and volume of the soil, however, are not affected.

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 than the untreated waste. By disposing the stabilized ditch soil in a landfill, the mobility of the hazardous constituents will also be decreased. 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.

Alternative 2 is technically feasible to complete. It involves routine earth moving work including excavation, stockpiling, transportation, and backfilling. The remediation areas have already been initially delineated.

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 these sites. However, if additional work were required, the soil cover integrity and the underlying soil would need to be considered as part of the remedial action.

The administrative feasibility of this alternative is also very good. Landfills that may be used are fully permitted for disposal and stabilization. Any necessary construction, excavation, or hauling permits or manifests are readily attainable by experienced contractors.

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.

The three major costs for this alternative are excavation and disposal, construction of soil cover, and groundwater monitoring. Costs are also included for fencing and cover maintenance.

Alternative 4: Off-Site Disposal

Capital Cost Range: $2,257,850 - $7,305,090
O & M Cost: $40,400 – ditch soil sampling and semi-annual groundwater monitoring
Present Worth Cost: $2,957,138 - $8,004,378
Construction Time: 2 to 8 months depending on location of stabilization activities

Alternative 4 includes removing, testing, and disposing off-site the SEAD-16 building debris; excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg; and disposing the excavated material in an off-site landfill (**Figures 2 and 3**). The excavation of soils would extend up to the railroad tracks and would not disrupt the railroad tracks. 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.

Soils exceeding the TCLP criteria require stabilization. If the material is stabilized off-site, the soil will be transported off-site, stabilized, and disposed in an appropriate landfill. Stabilization involves mixing an additive such as cement, quick lime, flyash, pozzolans, or a proprietary agent with the soil. 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. 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.

Both short- and long-term protectiveness of human health and environment is provided with Alternative 4 because it 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 remedial action objective for ditch soil and prevent contamination downgradient in Kendaia Creek. Measures will be taking to ensure protection to the community and site workers during the remedial action. Environmental impacts to the site during the remedial action 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.

Similar to Alternative 2, Alternative 4 does not preclude compliance with ARARs.

Once the excavated soil and ditch soil are removed from the site, the remedial action would be considered permanent. The long-term management of the excavated material will be the responsibility of the selected off-site landfill.

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 will the soil and ditch soil exceeding the proposed cleanup levels. Since some of the excavated soil and ditch soil must be treated prior to disposal in order to meet the TCLP criteria, the treated material will no longer be hazardous and will exhibit lower toxicity than the untreated waste. By transferring the excavated material to a landfill, the mobility of the hazardons constituents will be eliminated. The stabilized soil will, however, have a larger volume than the untreated soil.

Alternative 4 is technically feasible to complete. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling. The remediation areas have already been initially delineated.

The excavated material that fails the TCLP criteria will reqnire 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 SEAD-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.

The administrative feasibility of this alternative is also very good. Landfills that may be used are fully permitted for disposal and stabilization. Any necessary construction, excavation, or hauling permits or manifests are easily attainable by experienced contractors.

Alternative 4 relies primarily on standard construetion 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 also 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.

The major costs for this alternative are excavation, disposal, and groundwater monitoring.

Alternative 4P: Off-Site Disposal (Pre-Disposal Scenario)

Capital Cost: $7,305,090
O & M Cost: $40,400 - ditch soil sampling and semi-annual groundwater monitoring
Present Worth Cost: $8,004,378
Construction Time: 2 to 8 months depending on location of stabilization activities

This alternative would be implemented in exactly the same manner as Alternative 4, except that the excavation volume would increase. Alternative 4P includes removing, testing, and disposing off-site the SEAD-16 building debris; excavating surface and subsurface soils with lead concentrations greater than 400 mg/kg and antimony, copper, mercury, thallium, and zinc concentrations greater than TAGM; and disposing the excavated material in an off-site landfill (**Figures 2 and 3**). The excavation of soils would extend up to the railroad tracks and would not disrupt the railroad tracks. 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.

Both short- and long-term protectiveness of human health and environment is provided with Alternative 4P because it protects against ingestion of and direct contact with surface soils and ditch soils having concentrations of lead above 400 mg/kg and concentrations of other metals above TAGM values. The ditch soils with concentrations of lead above 400 mg/kg and metals above TAGM will be removed, which will meet the remedial action objective for ditch soil and prevent contamination downgradient in Kendaia Creek. Measures will be taken to ensure protection to the community and site workers during the remedial action. Environmental impacts to the site during the remedial action 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.

Similar to Alternative 2, Alternative 4P does not preclude compliance with ARARs.

Once the excavated soil and ditch soil are removed from the site, the remedial action would be considered permanent. The long-term management of the excavated material will be the responsibility of the selected off-site landfill.

Alternative 4P 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 will the soil and ditch soil exceeding the proposed cleanup levels. Since some of the excavated soil and ditch soil must be treated prior to disposal in order to meet the TCLP criteria, the treated material will no longer be hazardous and will exhibit lower toxicity than the untreated waste. By transferring the excavated material to a laudfill, the mobility of the hazardous constituents will be eliminated. The stabilized soil will, however, have a larger volume than the untreated soil.

Alternative 4P is technically feasible to complete. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling. The remediation areas have already been initially delineated.

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 SEAD-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.

The administrative feasibility of this alternative is also very good. Landfills that may be used are fully permitted for disposal and stabilization. Any necessary construction, excavation, or hauling permits or manifests are easily attainable by experienced contractors.

Alternative 4P 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 also 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.

The major costs for this alternative are excavation, disposal, and groundwater monitoring.

Alternative 6: Innovative Treatment – Soil Washing

Capital Cost Range: $3,286,010 - $12,111,090
O & M Cost: $40,400 – ditch soil sampling and semi-annual groundwater monitoring
Present Worth Cost: $3,985,298 - 12,810,378
Construction Time: 6 to 11 months (depending on amount of time necessary for treatability studies and soil washing activities)

Alternative 6 involves removing, testing, and disposing off-site the SEAD-16 building debris; excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg; stockpiling the soil, soil washing, backfilling on-site the coarse grain material; and disposing the fine grain material in an off-site landfill. The extent of soil excavation will not disrupt the railroad tracks. 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.

Soil is excavated and stockpiled as described in previous sections. 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. 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 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.

The stockpiled material will be loaded into the soil washing unit with a front-end loader. For SEAD-16 and -17, a 25-tph unit could be used. The unit requires a 600-kW, 440-Volt AC power supply, and a 25-gallon 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.

Both short- and long-term protectiveness of human health and environment is provided with Alternative 6 because it prevents ingestion of and direct contact with the material and debris from SEAD-16 buildings and 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 remedial action objective for ditch soil and prevent contamination downgradient in Kendaia Creek. Measures will be taken to ensure protection to the community and site workers during the remedial action. Environmental impacts to the site during the remedial action 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.

Similar to Alternatives 2 and 4, Alternative 6 does not preclude compliance with ARARs.

Once the fine soil material is removed from the site, the remedial action would be considered permanent. There will no longer be soil or ditch soil on site that poses an unacceptable threat to human health. The long-term management of the fine grain material will be the responsibility of the selected off-site landfill.

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 to approximately one-third of the original volume. Treatment (if necessary) of the fine grain material and disposal into a landfill will effectively reduce the toxicity and mobility of the hazardous constituents.

Alternative 6 is technically feasible to complete. It involves routine earth moving work including excavation, stockpiling, transportation, and backfilling. It will also involve 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 study 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. 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 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.

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.

The administrative feasibility of this alternative is also very good. Landfills that may be used are fully permitted for disposal and stabilization. All construction, excavation, or hauling permits or manifests are easily attainable by experienced contractors.

Alternative 6 relies on a soil washing specialty contractor and standard construction equipment, both of which are readily available in the Romulus area. Several companies have extensive experience in implementing soil washing and 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 topsoil, 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.

The three major costs for this alternative are excavation and disposal, soil washing, and groundwater monitoring.

EVALUATION OF ALTERNATIVES

During the detailed evaluation of remedial alternatives at SEAD-16 and SEAD-17, each alternative was assessed against nine evaluation criteria, namely, 1) overall protection of human health and the environment, 2) compliance with applicable or relevant and appropriate requirements (ARARs), 3) long-term effectiveness and permanence, 4) reduction of toxicity, mobility, or volume, 5) short-term effectiveness, 6) implementability, 7) cost, 8) state acceptance and 9) community acceptance. **Tables 4 and 5** provide summaries of each alternative for SEAD-16 and SEAD-17 and an evaluation of how each alternative complies with these requirements. A comparative analysis of these alternatives based upon the evaluation criteria is presented below. State and community acceptance are not included in these tables or analysis, but they will be addressed following the review of this PRAP by the two parties.

Overall Protectiveness of Human Health and the Environment

Each alternative is assessed against the threshold criteria of overall protection of human health and the environment. The alternative must satisfy these 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, 4P, or 6 will each reduce risk to acceptable levels.

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, 4P, and 6) will decrease any potential for migration to groundwater and placing a soil cover over these areas (Alternative 2) will decrease the potential for erosion and migration to nearby areas.

Compliance With ARARs

Compliance with ARARs is a threshold criterion because each alternative must meet this to be carried through the ranking process. The remediation of SEAD-16 and SEAD-17 is subject to the pertinent requirements of both federal environmental statues and regulations (generally administered by EPA Region II for SEDA) and the State of New York environmental statues and regulations (generally administered by NYSDEC for SEDA) as determined in accordance with the CERCLA ARAR process. ARARs are promulgated standards that may be applicable to the site cleanup process after a remedial action has been chosen for implementation.

Any standard, requirement, criterion, or limitation under any federal environmental 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.

There are three categories of potential ARARs and they include chemical-specific, location-specific, and action-specific. A revised list of ARARs is presented at the end of this document.

There are currently no chemical specific ARARs for soil in the state of New York. For groundwater, exceedance of ARARs will not be expected in the future, even without any action, according to the fate and transport modeling results presented in Section 1.4 of the FS Report.

Off-site disposal will fall under RCRA requirements, which must be complied with in the final remedial action plan. Other federal ARARs and promulgated state regulations, which must also be complied with, are listed in this PRAP. 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.

Long-Term Effectiveness and Permanence

The criterion of long-term effectiveness addresses the long-term protection of human health and the environment, permanence of the remedial alternative, magnitude of remaining risk and adequacy and reliability of controls.

Alternatives 2, 4, 4P, 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 is the most effective in eliminating the long-term threats because soil washing segregates the coarse and fine fractions of the soil. Most of the hazardous constituents are contained in the fines fraction, which will be disposed of off-site. This coarse fraction will no longer contain concentrations of lead above the proposed cleanup level and will be backfilled to the site. Alternatives 4 and 4P are the next effective because they involve possible treatment and disposal of soils and ditch soils in an off-site landfill. Alternative 2 is also considered effective because it involves possible treatment and disposal of the ditch soil 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 deterioration by potential contaminant leaching from soil. However, 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. 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 goal of all the remedial alternatives (except Alternative 4P) is to have no residual contamination in soils above 1250 mg/kg for lead and above 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 (**Table 3**). These concentrations are considered to be protective of human health in the future industrial use scenario. After the remedial action at SEAD-16, the maximum concentrations of antimony, copper, lead, mercury, and thallium are expected to be below the clean up value determined to be protective of human health. (**Table 7**) Although the maximum concentration of zinc exceeds the clean up value of 539 mg/kg, the EPC for zinc is expected to be below the clean up value. After remediation at SEAD-17, the maximum concentrations of the metals, antimony, copper, lead, mercury, thallium, and zinc, are expected to be below the respective clean up values. (**Table 8**)

The post-remediation concentrations of arsenic and cadmium were evaluated at both sites. At SEAD-16, the only expected exceedance of TAGM for arsenic or cadmium is one hit of arsenic at a concentration of 9.9 mg/kg, which only slightly exceeds the TAGM of 8.2 mg/kg. At SEAD-17, only one detection of arsenic, 8.9 mg/kg, slightly exceeds the TAGM value. There are eight exceedances of the TAGM value for cadmium. The maximum concentration of cadmium is expected to be 5.6 mg/kg, which exceeds the TAGM value of 2.3 mg/kg. However, the EPC for cadmium is expected to be 2.45 mg/kg, which only slightly exceeds the TAGM value.

After the remedial action, residual contamination will be assessed, with the aim that the remaining concentrations are protective of human health and the environment in the future industrial use scenario.

The relative rankings of the alternatives based on permanence are the same as the rankings for long-term protectiveness. Since Alternatives 4, 4P, 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 because no treatment or soil cover is used.

Reduction in Toxicity, Mobility or Volume

The alternatives were 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 latter if necessary, and disposing it in an off-site landfill. The hazardous constituents are normally concentrated in the fine 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. 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 were stabilized after failing TCLP test. Under Alternatives 4 and 4P, both soil and ditch soil toxicity would decrease if they fail TCLP and are 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 in Alternatives 2, 4, and 4P the hazardous constituents are essentially immobile. Alternative 2 also 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 and 4P, which rely on stabilization and disposal, ranks the poorest on the volume reduction. The treated soils typically 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.

Short-Term Effectiveness

Alternative 2 does not involve a large amount of excavation and can be implemented relatively quickly, because it does not require specialized equipment or vendors. Off-site transportation is limited and includes transportation of soil excavated from the drainage ditches, building material and debris, and materials for the cap (topsoil, common fill, and filter fabric). The latter factor can be decreased through the use of on-site borrow soils. Alternatives 4 and 4P do not require additional handling for treatment or specialized equipment, but it does require off-site disposal. It can, however, be performed efficiently and quickly. Alternative 6 requires the same amount of excavation but the off-site transportation of a lesser volume of material than Alternative 4. However, Alternative 6 requires the excavated material to be handled more than Alternatives 2, 4, and 4P. 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. Alternative 6 also requires specialized equipment to treat the soils.

Implementability

All of the alternatives score well on implementability. Alternative 1 is readily available. Alternative 2 can be constructed most easily 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. Numerous contractors are available and qualified to perform these tasks. Alternatives 4 and 4P can also be constructed easily, though 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 requires a specialized soil washing contractor, treatability program, and additional handling. In addition, for all the alternatives an off-site landfill capable of accepting and treating, if necessary, the site material will be needed.

Cost

Capital costs, operating costs, and administrative costs were estimated for the four remedial action alternatives. Capital costs include those costs for professional labor, treatability studies, construction and equipment, site work, monitoring and testing, and treatment and disposal. Operating costs include costs for administrative and professional labor, monitoring, and utilities. Administrative costs include the costs for restricting future land use to non-residential. All costs discussed are present worth estimates using a common discount rate of 5%. The capital and operating costs for Alternatives 2, 4, 4P, and 6 are summarized in **Table 6**.

Alternative 1 (No-action) is not considered to have any associated capital or operating costs. This alternative is used as a basis of comparison for all other alternatives. 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 4P would cost $7,305,090. 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.

State Acceptance

State acceptance of the preferred alternative will be addressed in the Record of Decision following review of the State comments received on the RI Report, the FS Report, and this Proposed Plan (PRAP).

Community Acceptance

Community acceptance of the preferred alternative will be assessed in the Record of Decision following review of the public comments received on the RI/FS and this Proposed Plan (PRAP).

PREFERRED ALTERNATIVE

Remedial action alternatives were prepared together for the removal of contaminated materials at the Abandoned Deactivation Furnace (SEAD-16) and at the Active Deactivation Furnace (SEAD-17). 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, 4P, and 6 address remediating the soil, ditch soil, and building material and debris and will all be effective in reducing the human health and ecological risk as well as meeting the remedial action objectives. In summary, the goal of the remedial action is to prevent ingestion of and dermal contact with soils and ditch soils with lead concentrations above 1250 mg/kg (based on future industrial use scenario); with antimony, copper, zinc, mercury, and thallium concentrations above 18 mg/kg, 359 mg/kg, 539 mg/kg, 2.69 mg/kg, and 3.59 mg/kg, respectively; and with dust caused by excess debris and materials that are currently inside the abandoned buildings at SEAD-16.

Based on the evaluation of various options, the preferred alternative of the U.S. Army for SEADs 16 and 17 is Alternative 4 (Excavation, Stabilization, and Off-site

Disposal). The unrestricted use alternative was considered for Alternative 4 in order to weigh the advantages of restoring the sites to pre-disposal conditions versus the cost this would incur. Alternative 4P, which has a present worth value of approximately $5 million more than Alternative 4, was not selected as the preferred due to the significant cost increase compared to its industrial use counterpart. Since human health risk for the intended future use, industrial, is acceptable under Alternative 4, the additional health risk reductions achieved by the unrestricted use alternative, Alternative 4P, does not warrant an additional $5 million.

The elements that compose this remedy include:

- Conducting additional sampling as part of the pre-design sampling program to further delineate the areas of excavation;
- Removing, testing, and disposing off-site of the SEAD-16 building debris;
- Excavating the ditch soil with lead concentrations greater than 1250 mg/kg to a depth of one foot;
- Excavating surface and subsurface soils with lead concentrations greater than 1250 mg/kg at SEAD-16;
- Excavating surface soils with lead concentrations greater than 1250 mg/kg at SEAD-17;
- Excavating hotspots at soil sampling locations at both SEAD-16 and SEAD-17;
- Stabilizing soils and building debris exceeding the TCLP criteria;
- Disposing of the excavated material in an off-site landfill;
- Backfilling the excavated areas with clean backfill;
- Conducting semi-annual groundwater monitoring until concentrations are below the GA criteria; and
- Conducting annual soil sampling in Kendaia Creek at four locations.

The proposed areas of excavation for SEAD-16 and SEAD-17 for Alternative 4 are shown in **Figures 2 and 3**. **Figure 4** shows the process flow schematic. In general, as presented in **Table 4**, Alternative 4 has the highest overall ranking. While it does not rank highest for any single evaluation criterion, as Alternatives 2 and 6 do, neither does it rank the lowest, which each of these do. Alternative 4 ranks second of all the alternatives for long-term effectiveness and permanence and reduction of mobility of contaminants. It also ranks highest of the three alternatives (2, 4, and 6) for technical feasibility and overall cost. It will eliminate source soils from further impacting the site by preventing contact with receptors and migration of contaminants to surface water and groundwater. It is a cost-effective, readily available alternative that does not require any long-term maintenance aside from semi-annual groundwater monitoring and can be implemented quickly to provide short-term effectiveness. Finally, it is a permanent solution that will significantly reduce the mobility of the contaminants and potential for exposure at the site.

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

Until the groundwater at the site meets MCL and GA standards, land use controls will be a part of the remedy. The land use controls are intended to prevent the use of groundwater as drinking water. The goals of the land use controls are to ensure adequate protection of human health and the environment, and to preserve and promote the long-term effective operation of remedial alternatives proposed for the sites. The institutional controls that would be implemented may include posting signs at the sites and building a fence to limit access to the sites. Public water supply is available, thus a groundwater restriction should have minimal impact on land reuse of the sites. Upon land transfer, there will be language in the deed that requires the continued use of institutional controls. The deed may prohibit the following:

- The installation of any groundwater extraction wells, except for regulator-approved remediation purposes.
- Human or ecological exposure to groundwater from the site(s), or use of this groundwater for any industrial, commercial, sanitary, human consumptive, or agricultural purposes.
- Unauthorized interference (to be defined in the Deed) with existing monitoring systems or any additional treatment or monitoring systems that may be subsequently constructed at the site(s) (these systems to be described and locations specified in the Deed to the extent practicable.)

GLOSSARY

Acid Leaching
The process by which contaminants are transferred from a stabilized matrix to acid, a liquid medium.

Additive
A substance added to another in relatively small amounts to effect a desired change in properties.

Adhesion
The molecular attraction exerted between the surfaces of bodies in contact.

Administrative Record
The body of documents that were considered or relied on which form the basis for the selection of a response action.

Adsorption
Adsorption is the adhesion of molecules of gas, liquid, or dissolved solids to a surface. The term also refers to a method of treating wastes in which activated carbon removes organic matter from wastewater.

Adverse effects
Effects of exposure to a chemical that are unfavorable or harmful.

Aluminum
Aluminum is a metal that accumulates in the environment.

Ambient Air
The encompassing air or atmosphere of the outdoor portions of a site.

Ambient Water Quality Standards (AWQS)
Standards and guidance values developed by New York State for specific classes of fresh and saline surface waters and fresh groundwaters for protection of the best uses assigned to each class.

Antimony
Antimony is a metal that accumulates in the environment.

Applicable or Relevant and Appropriate Requirement (ARAR)
As defined under CERCLA, ARARs are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limits set forth under federal or state law that specifically address problems or situations present at a CERCLA site. ARARs are major considerations in setting cleanup goals, selecting a remedy, and determining how to implement that remedy at a CERCLA site. ARARs must be attained at all CERCLA sites unless a waiver is attained. ARARs are not national cleanup standards for the Superfund program. *See also Comprehensive Environmental Response, Compensation, and Liability Act and Superfund.*

Aquifer
An aquifer is a saturated permeable geologic unit or rock formation that can store significant quantities of water and transmit the water under ordinary hydraulic gradients, possibly to wells.

Assessment endpoints
Assessment endpoints represent environmental values to be protected and generally refer to characteristics of populations and ecosystems.

Attenuation
The reduction of concentrations and amounts of pollutants in contaminated soil and groundwater.

Backfill
To refill (as an excavation) usually with excavated material or with clean material brought from off-site.

Balancing Criteria
Criteria against which a remedial alternative is evaluated. These criteria are used to compare various recommended alternatives. The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; cost.

Base Realignment and Closure (BRAC)
A congressionally mandated process that involves closure of military bases. The goal of BRAC is to transition the former bases from military uses to civilian reuse, with the intent of minimizing the negative effects of base closure by spurring economic development and growth. The SEDA was listed as a base to be closed in October 1995. Base closure is in the process of being performed.

Baseline Risk Assessment (BRA)
A baseline risk assessment is an assessment conducted before cleanup activities begin at a site to identify and evaluate the threat to human health and the environment. After remediation has been completed, the information obtained during a baseline risk assessment can be used to determine whether the cleanup levels were reached.

Baseline
A scenario or set of critical observations or data used for comparison or a control.

Bedrock
Bedrock is the rock that underlies the soil; it can be permeable or non-permeable. The underlying bedrock as the Seneca Army Depot Activity is shale.

Benchmark value
A point of reference from which measurements may be made or something that serves as a standard by which others may be measured or judged. In the ecological risk assessment toxicity benchmarks reflecting dietary NOAELs (the level of exposure at which no adverse effects have been demonstrated) were used for benchmarks in the soil screening.

Borehole
A borehole is a hole cut into the ground by means of a drilling rig.

Borrow pit
An excavated area where material has been dug for use as fill at another location.

BRAC Cleanup Team (BCT)
The BCT is designated for each closing installation where property will be made available for reuse. The BCT is comprised of a BRAC Environmental Coordinator (BEC) (a Department of Defense [DoD] employee) and representatives from the state environmental regulatory agency and the U.S. Environmental Protection Agency regional office. The Restoration Advisory Board and the Local Redevelopment Authority work closely with the BCT regarding environmental restoration and provide the BCT with input on reuse priorities and decisions.

Cadmium
Cadmium is a heavy metal that accumulates in the environment. See also Heavy Metal.

Cancer Slope Factor
The slope factor is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used in risk assessments to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. Slope factors for each chemical are expressed in units of inverse mg chemical per kg body weight per day of exposure.

Capitol Cost
The initial cost associated with constructing a treatment remedy. The capital cost does not include the operation and maintenance of the remedy.

Carcinogen
A substance that produces cancer in an organism or increases the potential for an organism to develop cancer.

Characteristic Waste
Under RCRA, a solid waste can be hazardous if it has certain characteristics. These wastes are called "characteristic wastes." The characteristics are: ignitability (if the waste is a liquid and has a flashpoint less than 140 degrees); corrosivity (if the waste has a pH of 2 or less, or 12.5 or more, OR if it corrodes steel at a certain rate); reactivity (if the material reacts with water, forms explosive mixtures with water, generates toxic fumes or vapors when mixed with water, is a cyanide or sulfide bearing waste which generates hazardous fumes or vapors, or is explosive); toxic - if the wastes contain more than a certain level of some toxic materials.

Chronic
Chronic means always present or encountered. For example, the chronic daily intake is an estimate of the daily exposure of a receptor to a chemical.

Clean Water Act (CWA)
CWA is a 1977 amendment to the Federal Water Pollution Control Act of 1972, which set the basic structure for regulating discharges of pollutants to U.S. waters. This law gave EPA the authority to set wastewater discharge standards on an industry-by-industry basis and to set water quality standards for all contaminants in surface waters.

Cleanup
Cleanup is the term used for actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and or the environment. The term sometimes is used interchangeably with the terms remedial action, removal action, response action, or corrective action.

Compaction
The process of pressing soil together to reduce volume and decrease the voids within the soil.

Composite Liner
Landfill liners, which are made of dissimilar materials, each employed to achieve one or more of the following goals: 1) minimize hydraulic conductivity, 2) minimize molecular diffusion rate 3) maximize retardation. *See also hydraulic conductivity, molecular diffusion, retardation.*

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
CERCLA is a federal law passed in 1980 that created a special tax those funds a trust fund, commonly known as Superfund, to be used to investigate and clean up abandoned or uncontrolled hazardous waste sites. CERCLA required for the first time that EPA step beyond its traditional regulatory role and provide response authority to clean up hazardous waste sites. EPA has primary responsibility for managing cleanup and enforcement activities authorized under CERCLA. Under the program, EPA can pay for cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work, or take legal action to force parties responsible for contamination to clean up the site or reimburse the federal government for the cost of the cleanup. *See also Superfund.*

Containment
A passive contaminant control technology, which focuses on controlling hydrologic pathways for contaminant migration.

Contaminant
A contaminant is any physical, chemical, biological, or radiological substance or matter present in any media at concentrations that may result in adverse effects on air, water, or soil.

Copper
Copper is a heavy metal that accumulates in the environment. *See also Heavy Metal.*

Data Quality Objective (DQO)
DQOs are qualitative and quantitative statements specified to ensure that data of known and appropriate quality are obtained. The DQO process is a series of planning steps, typically conducted during site assessment and investigation, which is designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate. The DQO process involves a logical, step-by-step procedure for determining which of the complex issues affecting a site are the most relevant to planning a site investigation before any data are collected.

Deactivation Furnace
A technology used to destroy obsolete and unserviceable munitions by incineration.

Disposal
Disposal is the final placement or destruction of toxic, radioactive or other wastes; surplus or banned pesticides or other chemicals;

polluted soils; and drums containing hazardous materials from removal actions or accidental release. Disposal may be accomplished through the use of approved secure landfills, surface impoundments, land farming, deep well injection, or ocean dumping.

Dosage
The addition of an ingredient or the application of an agent in a measured dose.

Downgradient
Areas that are within the bounds of potential contamination (e.g. downstream or downwind).

Emergency Planning and Community Right-to-Know Act (EPCRA)
This act (also referred to as SARA Title III) was passed by Congress as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA). The act created a program with two basic goals: 1) To increase public knowledge of and access to information on the presence of toxic chemicals in communities, releases of toxic chemicals into the environment, and waste management activities involving toxic chemicals; and 2) to encourage and support planning for responding to environmental emergencies. It led to the creation of the Toxics Release Inventory or TRI and the hazardous chemical inventory. This information enables state and local governments and the community to identify what needs to be done at the local level to better deal with pollution and chemical emergencies.

Endangered/Threatened Species
A species threatened with extinction.

Endosulfan
An insecticide that is used in the control of numerous crop insects and some mites.

Engineered Control
An engineered control, such as a barrier placed between a contaminated area and the rest of a site, is a method of managing environmental and health risks. Engineered controls can be used to limit exposure pathways.

Environmental Protection Agency (EPA)
The federal regulatory agency responsible for enforcing the rules and regulations pertaining to the environment of the United States. Representatives from the EPA Region 2, which includes New York State, are involved in the review and oversight of the environmental work being conducted at the Seneca Army Depot Activity.

Environmental Risk
Environmental risk is the chance that human health or the environment will suffer harm as the result of the presence of environmental hazards.

Ex Situ
The term ex situ or "moved from its original place, means excavated or removed.

Exceedance
A measured level of a compound in a medium that is greater than a defined state or federal standard.

Excess Lifetime Cancer Risk
The incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen.

Expanded Site Investigation (ESI)
An expanded site investigation typically includes media sampling and analyses. An ESI is performed following a Preliminary Site Investigation to obtain more information regarding the concentrations of pollutants at a site.

Exposure Pathway
An exposure pathway is the way a chemical comes into contact with a person (i.e. by ingestion, inhalation, dermal contact). Determining whether exposure pathways exist is an essential step in conducting a baseline risk assessment. *See also Baseline Risk Assessment.*

Fallout
Material released as a solid, liquid, or gas from a stack that drops out of the atmosphere by gravitational forces, condensation, or adsorption.

Feasibility
A measure of whether an alternative is capable of being done or carried out successfully.

Federal Facilities Agreement (FFA) also known as the Interagency Agreement (IAG)
An agreement signed between EPA, NYSDEC and the Army that describes the process for identifying, investigating and remediating sites at the Seneca Army Depot Activity.

GA Groundwater Standard
A water quality standard promulgated by the NYSDEC that establishes a minimum quality of a groundwater supply that could be used as a source of drinking water.

Geomembrane
An engineered polymeric or plastic material that is fabricated to be virtually impermeable.

Grain Size Distribution
A sample of soil is made up of particles of various sizes. The various sizes of the soil particles can be expressed by a plot of percent finer by weight versus diameter in millimeters. This plot is known as the grain size distribution.

Groundwater
Groundwater is the water that flows beneath the earth's surface, possibly in an aquifer, that fills pores between such materials as sand, soil, or gravel and that often supplies water to wells and springs. See also *Aquifer*.

Habitat
The place or environment where a plant or animal naturally or normally lives and grows.

Hazard Index (HI)
The unit used to assess the overall potential for non-carcinogenic effects posed by a chemical. It is expressed as the ratio of the exposure level or intake of a chemical to the chemical's reference dose.

Hazard Quotient (HQ)
The hazard quotient is used to present the ecological risk posed by a chemical. It is the ratio of the expected exposure point concentration to an appropriate toxicity reference value.

Hazardous Waste
A solid waste or combination of solid wastes which, because of its quantity, concentration or physical, chemical, or infectious characteristics, may a.) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or b.) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Heavy Metal
The term heavy metal refers to a group of toxic metals including arsenic, chromium, copper, lead, mercury, silver, and zinc. Heavy metals often are present at industrial sites at which operations have included battery recycling and metal plating.

Hydraulic Conductivity
The capability of a material to transmit water.

Immobile
Incapable of being moved and thereby spreading contamination.

In Situ
The term in situ, "in its original place," or "on-site", means unexcavated and unmoved. In situ soil flushing and natural attenuation are examples of in situ treatment methods by which contaminated sites are treated without digging up or removing the contaminants.

Information Repository
An information repository is a location in a public building that is convenient for local residents, such as a public school, city hall, or library that contains information about a Superfund site, including technical reports and reference documents.

Innovative Treatment
An innovative treatment is a process that has been tested and used as a treatment for hazardous waste or other contaminated materials, but lacks a long history of full-scale use. Information about its cost and how well it works is not sufficient to support prediction of its performance under a variety of operating conditions. An innovative technology usually must undergo pilot-scale treatability studies, in the field or the laboratory, to provide performance, cost, and design objectives for the technology. Innovative technologies are being used under many federal and state cleanup programs to treat hazardous wastes that have been improperly released. For example, the innovative technology, reactive barrier wall, is being evaluated to manage off-site migration of contamination.

Inorganic Compound
An inorganic compound is a compound that generally does not contain carbon atoms (although carbonate and bicarbonate compounds are notable exceptions) and tends to be more soluble in water. Examples of inorganic compounds include various acids, potassium hydroxide, and metals.

Institutional Controls
An institutional control is a legal or institutional measure, which subjects a property owner to limit activities at or access to a particular property. They are used to ensure protection of human health and the environment, and to expedite property reuse. Fences, posting or warning signs, and zoning and deed restrictions are examples of institutional controls.

Intake
The amount of a chemical taken in by an organism.

Iron
Iron is a heavy metal that accumulates in the environment. *See also Heavy Metal.*

Landfill
A sanitary landfill is a land disposal site for non-hazardous solid wastes at which the waste is spread in layers compacted to the smallest practical volume.

Leachate
A leachate is a contaminated liquid that results when water collects contaminants as it trickles through wastes, agricultural pesticides, or fertilizers. Leaching may occur in farming areas and landfills and may be a means of the entry of hazardous substances into soil, surface water, or groundwater.

Leaching
The process by which contaminants are transferred from a stabilized matrix to a liquid medium such as water or acid.

Lead
Lead is a heavy metal that is hazardous to health if breathed or swallowed. Its use in gasoline, paints, and plumbing compounds has been sharply restricted or eliminated by federal laws and regulations. See also Heavy Metal.

Liner
The part of a landfill which serves as a barrier to minimize migration of contaminants.

Manganese
Manganese is metal that accumulates in the environment.

Maximum Contaminant Level (MCL)
Established under the Safe Drinking Water Act as concentrations of pollutants considered protective for drinking water.

Median
A value in an ordered set of values below and above which there is an equal number of values. If there is no middle number, the median is the arithmetic mean (or average) of the two middle values.

Medium
A medium is a specific environment (air, water, or soil) that is the subject of regulatory concern and activities.

Mercury
Mercury is a heavy metal that can accumulate in the environment and is highly toxic if breathed or swallowed. Mercury is found in thermometers, measuring devices, pharmaceutical and agricultural

chemicals, chemical manufacturing, and electrical equipment. See also *Heavy Metal*.

Migration

Migration is the movement of contaminants from the source of contamination to contact with human populations or the environment. A migration pathway is a potential path or route that contaminants take. Migration pathways include air, surface water, groundwater, and land surface. The existence and identification of all potential migration pathways must be considered during assessment and characterization of a waste site.

Mobility

The ability of a contaminant to move throughout the affected media or to other media, thereby spreading the contamination.

Molecular diffusion

The movement of contaminants from an area of higher concentration to areas of lower concentration.

Monitoring Well

A monitoring well is a well drilled at a specific location on or off a hazardous waste site at which groundwater can be sampled at selected depths and studied to determine the direction of groundwater flow and the types and quantities of contaminants present in the groundwater.

National Contingency Plan (NCP)

The NCP, formally the National Oil and Hazardous Substances Contingency Plan, is the major regulatory framework that guides the Superfund response effort. The NCP is a comprehensive body of regulations that outlines a step-by-step process for implementing Superfund responses and defines the roles and responsibilities of EPA, other federal agencies, states, private parties, and the communities in response to situations in which hazardous substances are released into the environment. *See also Superfund.*

National Environmental Policy Act (NEPA)

Written in 1969, it is one of the first laws that established the broad national framework for protecting our environment. NEPA's basic policy is to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment. The most visible NEPA requirements are Environmental Assessments (EA's) and Environmental Impact Statements (EIS's), which are required for all proposed federal activities.

National Priorities List (NPL)

The NPL is EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response under Superfund. Inclusion of a site on the list is based primarily on the score the site receives under the Hazard Ranking System. Money from Superfund can be used for cleanup only at sites that are on the NPL. EPA is required to update the NPL at least once a year. *See also Superfund.*

Natural Attenuation

Natural attenuation is an approach to cleanup that uses natural processes to contain the spread of contamination from chemical spills and reduce the concentrations and amounts of pollutants in contaminated soil and groundwater. Natural subsurface processes, such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials, are allowed to reduce concentrations of contaminants to acceptable levels. An in situ treatment method that leaves the contaminants in place while those processes occur, natural attenuation is being used to clean up petroleum contamination from LUSTs across the country.

New York State Department of Environmental Protection (NYSDEC)

The state regulatory agency responsible for enforcing the rules and regulations of New York. Representatives from the headquarters in Albany and Region 8 are involved in the review and oversight of the environmental work being conducted at the Seneca Army Depot Activity.

New York State Department of Health (NYSDOH)

A state regulatory agency whose mission is to protect and promote the health of New Yorkers through prevention, science, and the assurance of quality health care delivery.

Nitroaromatics

Nitroaromatics are organic compounds that contain 6-carbon ring structures, but in which nitrates are substituted for some of the carbon atoms. These compounds are used in explosives.

Non-Carcinogen

A substance, which produces systemic effects, or general effects, to the body of an organism. These effects are generally not cancer related.

Operable Unit (OU)

A grouping of sites into one larger entity. Sites can be grouped into an operable unit due to geographical proximity to each other, similar chemical hazards or for other reasons. The SEAD-16 and SEAD-17 sites are considered one operable unit for the purposes of remedial action.

Operation and Maintenance (O&M)

O&M refers to the activities conducted at a site, following remedial actions, to ensure that the cleanup methods are working properly. O&M activities are conducted to maintain the effectiveness of the remedy and to ensure that no new threat to human health or the environment arises. Under the Superfund program, the state or PRP assumes responsibility for O&M, which may include such activities as groundwater and air monitoring, inspection and maintenance of the treatment equipment remaining on site, and maintenance of any security measures or institutional controls.

Organic Chemicol or Compound

An organic chemical or compound is a substance produced by animals or plants that contains mainly carbon, hydrogen, and oxygen.

Overburden

The geologic material overlying bedrock.

Overt Acute Toxic Impacts

Effects of a chemical that are characterized by sudden and severe toxicity.

Permeability
Permeability is a characteristic that represents a qualitative description of the relative ease with which rock, soil, or sediment will transmit a fluid (liquid or gas).

Pervasive
A chemical which has a tendency to become diffused throughout every part of a medium.

Pesticide
A pesticide is a substance or mixture of substances intended to prevent or mitigate infestation by, or destroy or repel, any pest. Pesticides can accumulate in the food chain and or contaminate the environment if misused.

Physical Separation
Physical separation processes use different size sieves and screens to concentrate contaminants into smaller volumes. Most organic and inorganic contaminants tend to bind, either chemically or physically, to the fine fraction of the soil. Fine clay and silt particles are separated from the coarse sand and gravel soil particles to concentrate the contaminants into a smaller volume of soil that could then be further treated or disposed.

Polychlorinated Biphenyl (PCB)
PCBs are a group of toxic, persistent chemicals, produced by chlorination of biphenyl, that once were used in high voltage electrical transformers because they conducted heat well while being fire resistant and good electrical insulators. These contaminants typically are generated from metal degreasing, printed circuit board cleaning, gasoline, and wood preserving processes. Further sale or use of PCBs was banned in 1979.

Polynuclear Aromatic Hydrocarbon (PAH)
A PAH is a chemical compound that contains more than one fused benzene ring. They are commonly found in petroleum fuels, coal products, and tar.

Potentially Responsible Party (PRP)
A PRP is an individual or company (such as owners, operators, transporters, or generators of hazardous waste) that is potentially responsible for, or contributing to, the contamination problems at a Superfund site. Whenever possible, EPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites they have contaminated. *See also Comprehensive Environmental Response, Compensation, and Liability Act and Superfund.*

Pre-disposal conditions
Conditions present at a site before activities that caused the current environmental contamination took place.

Preliminary Assessment and Site Inspection (PA/SI) A PA/SI is the process of collecting and reviewing available information about a known or suspected hazardous waste site or release. The PA/SI usually includes a visit to the site.

Present Worth Cost Analysis
The equivalent future worth of money at the present time. By discounting all costs to a common base year, the costs for different remedial action alternatives can to be compared on the basis of a single figure for each alternative. This is a calculated value that requires the length of time that an activity will be performed and the interest rate. For example, the cost of the long-term operation and maintenance of a remedy is provided in terms of the present worth. Typically, a 30-year cost is required and an interest rate of 10%.

Proposed Remedial Action Plan (PRAP)
The first step in the remedy selection process. The PRAP provides information supporting the decisions of how the preferred alternative was selected. It summarizes the RI/FS process and how the alternatives comply with the requirements of the NCP and CERCLA. The PRAP is provided to the public for comment. The responses to the PRAP comments are provided in the ROD.

Publicly Owned Treatment Works (POTW)
A facility owned by the public that is used to treat wastewater generated from industrial, residential, or commercial activity.

Pug Mill
A machine in which materials (such as clay and water) are mixed, blended, or kneaded into a desired consistency.

Reasonable Maximum Exposure (RME)
The highest exposure that could reasonably be expected to occur for a given exposure pathway at a site. It is intended to account for both uncertainty in the contaminant concentration and variability in the exposure parameters.

Receptor
A human or animal, or group of humans or animals, that has the potential to be adversely affected by exposure to chemicals present in the environment.

Record of Decision (ROD)
A ROD is a legal, technical, and public document that explains which cleanup alternative will be used at a Superfund NPL site. The ROD is based on information and technical analysis generated during the remedial investigation and feasibility study (RI/FS) and consideration of public comments and community concerns. *See also Preliminary Assessment and Site Investigation and Remedial Investigation and Feasilbility Study.*

Reference Dose (RfD)
The reference dose is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.

Release
A release is any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, leaching, dumping, or disposing into the environment of a hazardous or toxic chemical or extremely hazardous substance, as defined under RCRA. See also Resource Conservation and Recovery Act.

Remedial Action Objectives (RAO)
Media specific objectives designed to be protective of human health and the environment.

Remedial Design and Remedial Action (RD/RA)
The RD/RA is the step in the Superfund cleanup process that follows the RI/FS and selection of a remedy. An RD is the preparation of

engineering plans and specifications to properly and effectively implements the remedy. The RA is the actual construction or implementation of the remedy. *See also Remedial Investigation and Feasibility Study.*

Remedial Investigation and Feasibility Study (RI/FS)
The RI/FS is the step in the Superfund cleanup process that is conducted to gather sufficient information to support the selection of a site remedy that will reduce or eliminate the risks associated with contamination at the site. The RI involves site characterization through collection of data and information necessary to characterize the nature and extent of contamination at the site. The RI also determines whether the contamination presents a significant risk to human health or the environment. The FS focuses on the development of specific response alternatives for addressing contamination at a site.

Resource Conservation and Recovery Act (RCRA)
RCRA is a federal law enacted in 1976 that estahlished a regulatory system to track hazardous substances from their generation to their disposal. The law requires the use of safe and secure procedures in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent the creation of new, uncontrolled hazardous waste sites.

Retardation
Processes that impede the transport of contaminants by removing or immobilizing them from a free state (i.e. an aqueous solution or vapor).

Retort
A vessel or chamber of the Deactivation Furnace in which substances are distilled or decomposed by heat.

Saturated Zone
The saturated zone is the area beneath the surface of the land in which all openings in the soil matrix and rock formations are filled with water.

Sediment Criteria
Technical guidance provided by NYSDEC, the Division of Fish and Wildlife, that describes allowable sediment quality for a variety of chemicals. The values provided in this document have been adopted as screening levels for comparison to site data. Exceedances of these values provide that basis for further evaluation and decision making.

Selenium
Selenium is a metal that accumulates in the environment.

Semi-Volatile Organic Compound (SVOC)
SVOCs, composed primarily of carbon and hydrogen atoms, have boiling points greater than 2000°C. Common SVOCs include PCBs and phenol. *See also Polychlorinated Biphenyl.*

Seneca Army Depot Activity (SEDA)
A 10,000-acre military facility, constructed in 1941, located in central New York, responsible for storage and management of military commodities, including munitions. The depot is undergoing closure and will cease military operations in 2000. Environmental clean-up activities will continue until all sites have been addressed.

Sensitive Species
A species that can be easily hurt or damaged.

Shale
A type of rock that is formed by the consolidation of clay, mud, or silt, has a finely stratified or laminated structure, and is composed of minerals essentially unaltered since deposition.

Sieve
A device with meshes or perforations through which finer particles of soil of various sizes may be passed to separate them from coarser ones. The #200 sieve separates soil particles greater than 75 m from smaller soil particles.

Significant Threat
The term refers to the level of contamination that a state would consider significant enough to warrant an action. The thresholds vary from state to state.

Sodium
Sodium is a metal that accumulates in the environment.

Soil Boring
Soil boring is a process by which a soil sample is extracted from the ground for chemical, biological, and analytical testing to determine the level of contamination present.

Soil Erosion
The process by which soil wears away by the action of water, wind, or glacial ice.

Soil Vapor Extraction (SVE)
SVE, the most frequently selected innovative treatment at Superfund sites, is a process that physically separates contaminants from soil m a vapor form by exerting a vacuum through the soil formation. SVE removes VOCs and some SVOCs from soil beneath the ground surface.

Soil Washing
Soil washing is an innovative treatment technology that uses liquids (usually water, sometimes combined with chemical additives) and a mechanical process to scrub soils, remove hazardous contaminants, and concentrate the contaminants into a smaller volume. The technology is used to treat a wide range of contaminants, such as metals, gasoline, fuel oils, and pesticides. Soil washing is a relatively low-cost alternative for separating waste and minimizing volume as necessary to facilitate subsequent treatment. It is often used in combination with other treatment technologies. The technology can be brought to the site, thereby eliminating the need to transport hazardous wastes.

Solid Waste Management Unit (SWMU)
A SWMU is a RCRA term used to describe a contiguous area of land on or in which a solid waste, including hazardous waste, was managed. This includes areas containing landfills, tanks, land treatment areas, and spills, or any areas where waste materials were handled. Identification of all SWMUs at SEDA was performed as part of the RCRA Part B Permit Application process.

Source Control
This term refers to a group of alternatives that were assembled to address control the source of contamination. Most typically these alternatives involve addressing soil or sludge contamination.

Spatial distribution
The frequency of occurrence of a contaminant across the horizontal area of a site.

Stabilization
Stabilization is the process of removing wastewater from a waste or changing it chemically to make the waste less permeable and susceptible to transport by water. Stabilization technologies can immobilize many heavy metals, certain radionuclides, and selected organic compounds, while decreasing the surface area and permeability of many types of sludge, contaminated soils, and solid wastes.

Stack
A number flues or vertical pipes embodied in one structure and rising above a roof to carry off smoke or emissions from the Deactivation Furnace.

Stockpile
To place or store in a pile.

Subsurface
Underground; beneath the surface.

Subtitle D Landfill
A non-hazardous municipal solid waste landfill. See also *Landfill*.

Superfund Amendment and Reauthorization Act (SARA)
SARA is the 1986 act amending CERCLA that increased the size of the Superfund trust fund and established a preference for the development and use of permanent remedies, and provided new enforcement and settlement tools. *See also Comprehensive Environmental Response, Compensation, and Liability Act.*

Superfund
Superfund is the trust fund that provides for the cleanup of hazardous substances released into the environment, regardless of fault. The Superfund was established under CERCLA and subsequent amendments to CERCLA. The term Superfund also is used to refer to cleanup programs designed and conducted under CERCLA and its subsequent amendments. See also *Comprehensive Environmental Response, Compensation, and Liability Act.*

Surface Water Standards - Class C
Standards and guidance values have been developed for specific classes of fresh and saline surface waters for protection of the best uses assigned to each class. Class C waters are defined as waters used for fishing. These waters should be suitable for fish propagation and survival and for primary and secondary contact recreation.

Surface Water
Surface water is all water naturally open to the atmosphere, such as rivers, lakes, reservoirs, streams, and seas.

Technical Administrative Guidance Memorandum (TAGM)
TAGMs are technical guidance publications provided by NYSDEC that describe various processes and procedures recommended by NYSDEC for the investigation and remediation of hazardous waste sites. One TAGM, No. 4046, provides guideline values for soil clean-up limits at waste sites. These values have been adopted as screening levels to determine "How clean is clean?".

Thallium
A sparsely but widely distributed poisonous metallic element that resembles lead in physical properties and is used chiefly in the form of compounds in photoelectric cells or as a pesticide.

Threshold Factors
Criteria against which a remedial alternative is evaluated to determine if it will be further considered as an option for a given site. Screening is performed by whether the alternative will pass or fail the threshold factor. The threshold factors are overall protection of human health and the environment and ARAR compliance.

Topsoil
Surface soil usually including the organic layer in which plants have most of their roots.

Toxicity Characteristic Leaching Procedure (TCLP)
The TCLP is a testing procedure used to identify the toxicity of wastes and is the most commonly used test for degree of mobilization offered by a solidification and stabilization process. Under this procedure, a waste is subjected to a process designed to model the leaching effects that would occur if the waste were disposed of in a RCRA Subtitle D municipal landfill. *See also Solidification and Stabilization.*

Toxicity Reference Value (TRV)
Estimates of constituent concentrations that if exceeded in an environmental medium, may produce toxic effects in ecological receptors exposed to that medium.

Toxicity
Toxicity is a quantification of the degree of danger posed by a substance to animal or plant life.

Treatability Study
A treatability study is a process of collecting engineering performance data that will be used for final design purposes. In many instances treatability studies are performed to demonstrate the effectiveness of an innovative technology. A treatability study has been performed at the Ash Landfill Operable Unit involving a zero-valence iron treatment wall.

Treatment, Storage, and Disposal Facility (TSD)
The contiguous land, structures, and other improvements or rights-of-way used for storing, recovering, recycling, treating, or disposing of hazardous waste.

Unsaturated Zone
The unsaturated zone is the area between the land surface and the uppermost aquifer (or saturated zone). The soils in an unsaturated zone may contain air and water.

Upgradient
Areas that are outside the area of assumed contamination (e.g. upstream or upwind). Upgradient samples are often used as background samples.

Volatile Organic Compound (VOC)
A VOC is one of a group of carbon-containing compounds that evaporate readily at room temperature. Examples of VOCs include trichloroethane, trichloroethylene, and BTEX. These contaminants typically are generated from metal degreasing, printed circuit board cleaning, gasoline, and wood preserving processes.

Volume
The quantity of a contaminated media.

Wastewater
Wastewater is spent or used water from an individual home, a community, a farm, or an industry that contains dissolved or suspended matter.

Water Table
A water table is the boundary between the saturated and unsaturated zones beneath the surface of the earth, i.e., the level of groundwater, and generally is the level to which water will rise in a well. *See also Aquifer and Groundwater*

Zinc
Zinc is a heavy metal that accumulates in the environment. *See also Heavy Metal*

ARAR LIST

Potential Chemical-Specific ARARs and TBCs

There are currently no chemical specific ARARs for soil in the state of New York. Cleanup levels for chemical hazardous constituents in soil have been developed by the State of New York as TAGMs under 3HWR-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 SEDA.

Groundwater at the sites is classified by NYSDEC as Class GA. As a result, the groundwater quality standards for a Class GA groundwater are potential ARARs for the sites. For groundwater, exceedance of ARARs will not be expected in the future, even without any action, according to fate and transport modeling results presented in Section 1.4 of the FS Report.

Surface water at SEAD-16 and SEAD-17 is found in drainage ditches that surround the site. The surface water in these ditches has not been classified by NYSDEC since these ditches are not recognized as an established stream or creek. However, because the drainage ditches near the sites 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 were used to provide a basis of comparison for the on-site chemical data. The Class C standards are not strictly applicable to the surface water in the drainage ditches found on the sites and thus are treated as TBCs.

Sediment results 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). These sediment criteria are not ARARs, but rather TBCs because they are not promulgated standards.

Potential Federal Location-Specific ARARs

- Executive Orders 11593, Floodplain Management (May 24, 1977), and 11990, Protection of Wetlands (May 24, 1977).
- National Historic Preservation Act (16 USC 470) Section 106 and 110(f), and the associated regulations (*i.e.*, 36 CFR part 800) (requires Federal agencies to identify all affected properties on or eligible for the National Register of Historic Places and consult with the State Historic Preservation Office and Advisory Council on Historic Presentation).
- RCRA Location and 100-year Floodplains Requirements (40 CFR 264.18(b)).
- Clean Water Act, section 404, and Rivers and Harbor Act, section 10 (requirements for dredge and fill activities) and the associated regulations (*i.e.*, (40 CFR part 230).
- Wetlands Construction and Management Procedures (40 CFR part 6, Appendix A).
- Endangered Species Act of 1973 (16 USC 1531 - 1544).
- Fish and Wildlife Coordination Act of 1934 (16 USC 661).
- Wilderness Act of 1964 (16 USC 1131 - 1136).

Potential New York Location-Specific ARARs

- New York State Freshwater Wetlands Law (New York Environmental Conservation Law (ECL) articles 24 and 71).
- New York State Freshwater Wetlands Permit and Classification Requirements (6 NYCRR 663 and 664).
- New York State Floodplain Management Act, ECL, article 36, and Floodplain Management regulations (6 NYCRR part 500).
- Endangered and Threatened Species of Fish and Wildlife, Species of Special Concern Requirements (6 NYCRR part 182).
- New York State Inactive Hazardous Waste Disposal Sites—Remedy Selection (6 NYCRR 375.10(b)("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.").
- New York State Flood Hazard Area Construction Standards.

Potential Federal Action-Specific ARARs

- RCRA subtitle C, Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal systems, (*i.e.*, landfill, incinerators, tanks, containers, etc.) (*i.e.*, 40 CFR part 264); RCRA section 3004(o), 42 USC 6924(o) (RCRA statutory minimum technology requirements.)
- RCRA, Closure and Post-Closure Standards (40 CFR 264, subpart G).
- RCRA Groundwater Monitoring and Protection Standards (40 CFR 264.92 and 264.97 – 264.99).
- RCRA Generator Requirements for Manifesting Waste for Off-site Disposal (40 CFR part 262, subpart B).
- RCRA Transporter Requirements for Off-Site Disposal (40 CFR part 263).

- RCRA, Subtitle D, Non-Hazardous Waste Management Standards (40 CFR part 257).
- RCRA Land Disposal Restrictions (40 CFR part 268) (on and off-site disposal of excavated soil).
- CWA--NPDES Permitting Requirements for Discharge of Treatment System Effluent (40 CFR parts 122-125).
- CWA--Effluent Guidelines for Organic Chemicals, Plastics and Synthetic Fibers (discharge limits) (40 CFR part 414).
- CWA--Discharge to POTW—general Pretreatment regulations (40 CFR part 403).
- DOT Rules for Hazardous Materials Transport (49 CFR part 107, and 171.1-171.500).
- OSHA Standards for Hazardous Waste Operations and Emergency Response, 29 CFR 1910.120, and procedures for General Construction Activities (29 CFR parts 1910 and 1926).
- RCRA Air Emission Standards for Process Vents, Equipment Leaks, and Tanks, Surface Impoundments, and Containers (40 CFR part 264, subparts AA, BB, and CC.)

Potential New York Action-Specific ARARs

- New York State Pollution Discharge Elimination System (SPDES) Permit Requirements (Standards for Stormwater Runoff, Surface Water, and Groundwater Discharges (6 NYCRR 750-757)).
- New York State Hazardous Waste Regulations—identification, generators, transportation, treatment/storage/disposal, land disposal restrictions, and minimum technology requirements (6 NYCRR 370-376)
- New York State Solid Waste Mauagement and Siting Restrictions (6 NYCRR 360-361).
- New York State Hazardous Waste Generator and Transporter Requirements for Manifesting Waste for Off-Site Disposal (6 NYCRR 364 and 372).
- New York State Inactive Hazardous Waste Disposal Sites—Remedy Selection (6 NYCRR 375.10(b)("At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by hazardous waste disposed at the site through the proper application of scientific and engineering principles.").
- New York State Inactive Hazardous Waste Disposal Sites--Interim Remedial Measures (IRMs) (6 NYCRR 375-1.3(n) and 375.1.11)

TABLE 1A
SEAD-16 SURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Unit	Maximum Concentration	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detects	No. of Analyses
VOLATILE ORGANICS								
1,1,2,2-Tetrachloroethane	UG/KG	10	10	2.3%	600	0	1	43
Acetone	UG/KG	17	12	4.7%	200	0	2	43
Benzene	UG/KG	5	2.75	9.3%	60	0	4	43
Carbon Disulfide	UG/KG	2	1.667	7.0%	2700	0	3	43
Chloroform	UG/KG	2	2	4.7%	300	0	2	43
Methylene Chloride	UG/KG	3	2.667	7.0%	100	0	3	43
Toluene	UG/KG	10	3.529	39.5%	1500	0	17	43
Xylene (total)	UG/KG	3	3	2.3%	1200	0	1	43
SEMIVOLATILE ORGANICS								
2,4-Dinitrotoluene	UG/KG	85000	8907.2	39.5%		0	17	43
2,6-Dinitrotoluene	UG/KG	8000	1162.5	25.6%	1000	3	11	43
2-Methylnaphthalene	UG/KG	19000	2249.8	20.9%	36400	0	9	43
3,3'-Dichlorobenzidine	UG/KG	850	850.0	2.3%		0	1	43
3-Nitroaniline	UG/KG	2100	2100.0	2.3%	500	1	1	43
Acenaphthene	UG/KG	72000	9055.3	18.6%	50000	1	8	43
Acenaphthylene	UG/KG	310	95.1	16.3%	41000	0	7	43
Anthracene	UG/KG	120000	10125.8	27.9%	50000	1	12	43
Benzo(a)anthracene	UG/KG	220000	11440.2	46.5%	224	10	20	43
Benzo(a)pyrene	UG/KG	200000	9681.5	51.2%	61	13	22	43
Benzo(b)fluoranthene	UG/KG	200000	9773.9	51.2%	1100	5	22	43
Benzo(g,h,i)perylene	UG/KG	100000	7391.4	34.9%	50000	1	15	43
Benzo(k)fluoranthene	UG/KG	170000	9381.6	44.2%	1100	4	19	43
Carbazole	UG/KG	89000	8184.5	25.6%		0	11	43
Chrysene	UG/KG	220000	8544.0	62.8%	400	9	27	43
Di-n-butylphthalate	UG/KG	16000	1541.0	39.5%	8100	1	17	43
Dibenz(a,h)anthracene	UG/KG	49000	5806.0	20.9%	14	9	9	43
Dibenzofuran	UG/KG	50000	5616.8	20.9%	6200	1	9	43
Diethylphthalate	UG/KG	19	17.5	4.7%	7100	0	2	43
Fluoranthene	UG/KG	530000	19487.3	65.1%	50000	1	28	43
Fluorene	UG/KG	78000	15656.8	11.6%	50000	1	5	43
Indeno(1,2,3-cd)pyrene	UG/KG	100000	9074.5	27.9%	3200	2	12	43
N-Nitrosodiphenylamine (1)	UG/KG	25000	1904.6	41.9%		0	18	43
Naphthalene	UG/KG	66000	9546.7	16.3%	13000	1	7	43
Pentachlorophenol	UG/KG	1200	1200.0	2.3%	1000	1	1	43
Phenanthrene	UG/KG	490000	21641.5	53.5%	50000	1	23	43
Pyrene	UG/KG	360000	13420.8	65.1%	50000	1	28	43
bis(2-Ethylhexyl)phthalate	UG/KG	2100	589.2	25.6%	50000	0	11	43
PESTICIDES/PCB								
4,4'-DDD	UG/KG	23	8.169	18.6%	2900	0	8	43
4,4'-DDE	UG/KG	1400	90.861	76.7%	2100	0	33	43
4,4'-DDT	UG/KG	340	49.941	79.1%	2100	0	34	43
Aldrin	UG/KG	5	3.9	4.7%	41	0	2	43
Aroclor-1254	UG/KG	1100	690	4.7%	1000	1	2	43
Aroclor-1260	UG/KG	340	149.667	20.9%	1000	0	9	43
Dieldrin	UG/KG	26	15.15	4.7%	44	0	2	43
Endosulfan I	UG/KG	33	8.576	41.9%	900	0	18	43
Endosulfan II	UG/KG	5	3.7	11.6%	900	0	5	43
Endosulfan sulfate	UG/KG	2.1	2.1	2.3%	1000	0	1	43
Endrin	UG/KG	9.9	6.9	9.3%	100	0	4	43
Endrin aldehyde	UG/KG	14	6.008	14.0%		0	6	43
Endrin ketone	UG/KG	3.6	3	9.3%		0	4	43
Heptachlor	UG/KG	1.8	1.8	2.3%	100	0	1	43
Heptachlor epoxide	UG/KG	6.7	2.433	14.0%	20	0	6	43
Toxaphene	UG/KG	180	180	2.3%		0	1	43

TABLE 1A
SEAD-16 SURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Unit	Maximum Concentration	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detects	No. of Analyses
alpha-Chlordane	UG/KG	170	20.308	30.2%		0	13	43
beta-BHC	UG/KG	2.3	1.8	4.7%	200	0	2	43
gamma-BHC (Lindane)	UG/KG	2.3	2.3	2.3%	60	0	1	43
gamma-Chlordane	UG/KG	200	22.2	30.2%	540	0	13	43
NITROAROMATICS								
2,4-Dinitrotoluene	UG/KG	74000	4498.148	62.79%		0	27	43
2,6-Dinitrotoluene	UG/KG	320	190	6.98%	1000	0	3	43
2-amino-4,6-Dinitrotoluene	UG/KG	430	430	2.33%		0	1	43
Tetryl	UG/KG	220	220	2.33%		0	1	43
METALS								
Aluminum	MG/KG	17200	10327.9	90.7%	19300	0	39	43
Antimony	MG/KG	1930	86.5	62.8%	5.9	16	27	43
Arsenic	MG/KG	32.2	7.5	100.0%	8.2	8	43	43
Barium	MG/KG	9340	537.0	97.7%	300	8	42	43
Beryllium	MG/KG	0.91	0.4	97.7%	1.1	0	42	43
Cadmium	MG/KG	16.6	1.7	60.5%	2.3	5	26	43
Calcium	MG/KG	260000	54983.0	100.0%	121000	4	43	43
Chromium	MG/KG	47.5	22.8	97.7%	29.6	8	42	43
Cobalt	MG/KG	17.8	10.4	100.0%	30	0	43	43
Copper	MG/KG	37900	1159.8	100.0%	33	35	43	43
Cyanide	MG/KG	1.5	1.5	2.3%	0.3	1	1	43
Iron	MG/KG	36500	22829.5	100.0%	36500	0	43	43
Lead	MG/KG	140000	4543.9	100.0%	24.8	39	43	43
Magnesium	MG/KG	56000	10590.7	100.0%	21500	5	43	43
Manganese	MG/KG	4140	504.9	100.0%	1060	1	43	43
Mercury	MG/KG	11.4	1.0	76.7%	0.1	25	33	43
Nickel	MG/KG	148	35.3	100.0%	49	5	43	43
Potassium	MG/KG	2300	1338.4	100.0%	2380	0	43	43
Selenium	MG/KG	1.5	0.7	44.2%	2	0	19	43
Silver	MG/KG	11.1	1.1	39.5%	0.75	2	17	43
Sodium	MG/KG	1830	162.6	88.4%	172	5	38	43
Thallium	MG/KG	16.6	2.2	32.6%	0.7	14	14	43
Vanadium	MG/KG	61.9	22.9	100.0%	150	0	43	43
Zinc	MG/KG	14600	604.7	100.0%	110	23	43	43
HERBICIDES								
2,4,5-T	UG/KG		7.8	13.0%	1900	0	2	16
MCPP	UG/KG		16000.0	6.0%		0	1	16

TABLE 1B
SEAD-16 SUBSURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detect	No. of Analyses
VOLATILE ORGANICS								
2-Butanone	UG/KG	5	5	16.7%	300	0	1	6
Acetone	UG/KG	46	28.5	33.3%	200	0	2	6
Benzene	UG/KG	2	2	33.3%	60	0	2	6
Toluene	UG/KG	6	3.25	66.7%	1500	0	4	6
SEMIVOLATILE ORGANICS								
2,4-Dinitrotoluene	UG/KG	1700	883.5	33.3%		0	2	6
2,6-Dinitrotoluene	UG/KG	160	160	16.7%	1000	0	1	6
2-Methylnaphthalene	UG/KG	190	190	16.7%	36400	0	1	6
Acenaphthene	UG/KG	1100	1100	16.7%	50000	0	1	6
Acenaphthylene	UG/KG	300	300	16.7%	41000	0	1	6
Anthracene	UG/KG	2000	783.333	50.0%	50000	0	3	6
Benzo(a)anthracene	UG/KG	6600	1796.25	66.7%	224	2	4	6
Benzo(a)pyrene	UG/KG	6200	1570.6	83.3%	61	4	5	6
Benzo(b)fluoranthene	UG/KG	6000	1374	83.3%	1100	1	5	6
Benzo(g,h,i)perylene	UG/KG	11000	3254	83.3%	50000	0	5	6
Benzo(k)fluoranthene	UG/KG	5600	1296	83.3%	1100	1	5	6
Butylbenzylphthalate	UG/KG	18	18	16.7%	50000	0	1	6
Carbazole	UG/KG	730	730	16.7%		0	1	6
Chrysene	UG/KG	7000	1542.4	83.3%	400	2	5	6
Di-n-butylphthalate	UG/KG	240	137.5	33.3%	8100	0	2	6
Dibenz(a,h)anthracene	UG/KG	2500	1113	66.7%	14	4	4	6
Dibenzofuran	UG/KG	270	157.5	33.3%	6200	0	2	6
Fluoranthene	UG/KG	13000	2762.4	83.3%	50000	0	5	6
Fluorene	UG/KG	800	800	16.7%	50000	0	1	6
Indeno(1,2,3-cd)pyrene	UG/KG	7100	2319.8	83.3%	3200	2	5	6
N-Nitrosodiphenylamine (1)	UG/KG	530	530	16.7%		0	1	6
Naphthalene	UG/KG	120	120	16.7%	13000	0	1	6
Pentachlorophenol	UG/KG	120	120	16.7%	1000	0	1	6
Phenanthrene	UG/KG	7600	1608.6	83.3%	50000	0	5	6
Pyrene	UG/KG	11000	2363	83.3%	50000	0	5	6
bis(2-Ethylhexyl)phthalate	UG/KG	110	110	16.7%	50000	0	1	6
PESTICIDES/PCB								
4,4'-DDE	UG/KG	8.3	8.3	16.7%	2100	0	1	6
4,4'-DDT	UG/KG	3.4	2.55	33.3%	2100	0	2	6
Dieldrin	UG/KG	12	12	16.7%	44	0	1	6
Endosulfan I	UG/KG	7.3	4.85	33.3%	900	0	2	6
Endrin	UG/KG	2.9	2.9	16.7%	100	0	1	6
NITROAROMATICS								
2,4-Dinitrotoluene	UG/KG	500	310	0.5		0	3	6
METALS								
Aluminum	MG/KG	12800	12800	16.7%	19300	0	1	6
Antimony	MG/KG	135	48.867	50.0%	5.9	2	3	6
Arsenic	MG/KG	6.9	5.6	100.0%	8.2	0	6	6
Barium	MG/KG	302	143.083	100.0%	300	1	6	6
Beryllium	MG/KG	0.51	0.38	100.0%	1.1	0	6	6
Cadmium	MG/KG	0.45	0.176	83.3%	2.3	0	5	6
Calcium	MG/KG	97900	45766.7	100.0%	121000	0	6	6
Chromium	MG/KG	21.1	18.383	100.0%	29.6	0	6	6
Cobalt	MG/KG	12.2	10.7	100.0%	30	0	6	6
Copper	MG/KG	736	179.167	100.0%	33	3	6	6
Cyanide	MG/KG	0.52	0.52	16.7%	0.3	1	1	6

TABLE 1B
SEAD-16 SUBSURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detect	No. of Analyses
Iron	MG/KG	31400	24433.3	100.0%	36500	0	6	6
Lead	MG/KG	35400	6099.27	100.0%	24.8	4	6	6
Magnesium	MG/KG	13300	9715	100.0%	21500	0	6	6
Manganese	MG/KG	650	470.667	100.0%	1060	0	6	6
Mercury	MG/KG	1.9	0.74	66.7%	0.1	3	4	6
Nickel	MG/KG	37	29.85	100.0%	49	0	6	6
Potassium	MG/KG	1990	1400	100.0%	2380	0	6	6
Selenium	MG/KG	1.2	0.887	50.0%	2	0	3	6
Silver	MG/KG	1.2	0.725	33.3%	0.75	1	2	6
Sodium	MG/KG	160	100.7	50.0%	172	0	3	6
Thallium	MG/KG	0.91	0.91	16.7%	0.7	1	1	6
Vanadium	MG/KG	22.6	18.567	100.0%	150	0	6	6
Zinc	MG/KG	183	113.65	100.0%	110	3	6	6

TABLE 1C
SEAD-16 SURFACE WATER ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level[1]	No. Above Action Level	No. of Detects	No. of Analyses
SEMIVOLATILE ORGANICS								
Di-n-butylphthalate	UG/L	0.5	0.5	7.7%		0	1	13
Pentachlorophenol	UG/L	4	1.9	23.1%	0.4	3	3	13
bis(2-Ethylhexyl)phthalate	UG/L	3	2.3	23.1%	0.6	3	3	13
METALS								
Aluminum	UG/L	261	206.5	15.4%	100	2	2	13
Antimony	UG/L	124	30.4	84.6%		0	11	13
Arsenic	UG/L	5.7	4.0	61.5%	190	0	8	13
Barium	UG/L	348	118.0	100.0%		0	13	13
Cadmium	UG/L	2	0.8	53.8%	1.86	1	7	13
Calcium	UG/L	89900	72223.1	100.0%		0	13	13
Chromium	UG/L	3	2.4	23.1%	347.27	0	3	13
Cobalt	UG/L	4.1	3.4	15.4%	5	0	2	13
Copper	UG/L	424	58.8	100.0%	20.29	8	13	13
Iron	UG/L	3650	964.4	84.6%	300	4	11	13
Lead	UG/L	813	112.0	100.0%	7.16	11	13	13
Magnesium	UG/L	11400	9125.4	100.0%		0	13	13
Manganese	UG/L	252	52.4	100.0%		0	13	13
Mercury	UG/L	0.9	0.4	23.1%		0	3	13
Nickel	UG/L	5.5	4.2	61.5%	154.49	0	8	13
Potassium	UG/L	4590	2980.8	100.0%		0	13	13
Selenium	UG/L	4.3	2.7	30.8%	1	4	4	13
Silver	UG/L	5.2	5.2	7.7%	0.1	1	1	13
Sodium	UG/L	9220	5642.3	100.0%		0	13	13
Vanadium	UG/L	4.9	3.0	53.8%	14	0	7	13
Zinc	UG/L	380	126.4	100.0%	141.38	4	13	13

Note:
1) Source: NYS AWQS CLASS C

TABLE 1D
SEAD-16 SEDIMENT ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level	No. Above Action Level	No of Detects	No. of Analyses
VOLATILE ORGANICS								
2-Butanone	UG/KG	12	12.00	9.1%		0	1	11
Acetone	UG/KG	36	24.83	54.5%		0	6	11
SEMIVOLATILE ORGANICS								
2.4-Dinitrotoluene	UG/KG	5400	2087.67	27.3%		0	3	11
2-Methylnaphthalene	UG/KG	55	47.50	18.2%		0	2	11
Acenaphthene	UG/KG	32	32.00	9.1%	5110	0	1	11
Acenaphthylene	UG/KG	54	44.00	27.3%		0	3	11
Anthracene	UG/KG	100	74.50	36.4%		0	4	11
Benzo(a)anthracene	UG/KG	570	237.71	63.6%	47.45	6	7	11
Benzo(a)pyrene	UG/KG	600	316.67	54.5%	47.45	6	6	11
Benzo(b)fluoranthene	UG/KG	1200	523.33	54.5%	47.45	6	6	11
Benzo(g.h.i)perylene	UG/KG	530	244.43	63.6%		0	7	11
Benzo(k)fluoranthene	UG/KG	780	373.33	54.5%	47.45	6	6	11
Carbazole	UG/KG	110	72.00	27.3%		0	3	11
Chrysene	UG/KG	1200	442.29	63.6%	47.45	6	7	11
Di-n-butylphthalate	UG/KG	250	195.00	36.4%		0	4	11
Dibenz(a.h)anthracene	UG/KG	170	101.00	45.5%		0	5	11
Fluoranthene	UG/KG	1600	463.00	72.7%	37230	0	8	11
Indeno(1.2.3-cd)pyrene	UG/KG	500	228.29	63.6%	47.45	6	7	11
N-Nitrosodiphenylamine (1)	UG/KG	600	600.00	9.1%		0	1	11
Phenanthrene	UG/KG	420	188.13	72.7%	4380	0	8	11
Pyrene	UG/KG	1400	461.38	72.7%		0	8	11
bis(2-Ethylhexyl)phthalate	UG/KG	270	128.88	72.7%	7300	0	8	11
PESTICIDES/PCBs								
4.4'-DDD	UG/KG	730	116.30	72.7%	0.37	8	8	11
4.4'-DDE	UG/KG	570	103.30	100.0%	0.37	11	11	11
4.4'-DDT	UG/KG	420	83.78	72.7%	0.37	8	8	11
Aroclor-1254	UG/KG	670	160.29	63.6%	0.03	7	7	11
Aroclor-1260	UG/KG	130	71.00	45.5%	0.03	5	5	11
Endosulfan I	UG/KG	26	10.00	63.6%	1.10	7	7	11
Endosulfan II	UG/KG	6.8	5.23	27.3%	1.10	3	3	11
Endosulfan sulfate	UG/KG	18	11.30	18.2%		0	2	11
Endrin aldehyde	UG/KG	3.2	3.20	9.1%		0	1	11
Heptachlor epoxide	UG/KG	2.8	2.80	9.1%	0.03	1	1	11
alpha-Chlordane	UG/KG	12.1	8.77	27.3%		0	3	11
gamma-Chlordane	UG/KG	3.8	3.35	18.2%		0	2	11
NITROAROMATICS								
2.4-Dinitrotoluene	UG/KG	910	550.00	18.2%		0	2	11
METALS								
Aluminum	MG/KG	22900	13470.00	100.0%		0	11	11
Antimony	MG/KG	50.3	13.73	90.9%	2	9	10	11
Arsenic	MG/KG	9.6	5.94	100.0%	6	6	11	11
Barium	MG/KG	3980	555.76	100.0%		0	11	11
Beryllium	MG/KG	0.93	0.56	100.0%		0	11	11

TABLE 1D
SEAD-16 SEDIMENT ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level	No. Above Action Level	No of Detects	No. of Analyses
Cadmium	MG/KG	7.6	1.44	100.0%	0.6	7	11	11
Calcium	MG/KG	75700	37316.36	100.0%		0	11	11
Chromium	MG/KG	43.5	26.96	100.0%	26	5	11	11
Cobalt	MG/KG	15.6	10.07	100.0%		0	11	11
Copper	MG/KG	17500	1777.58	100.0%	16	11	11	11
Iron	MG/KG	46400	27545.46	100.0%	20000	8	11	11
Lead	MG/KG	4480	1363.64	100.0%	31	11	11	11
Magnesium	MG/KG	15100	7873.64	100.0%		0	11	11
Manganese	MG/KG	447	277.09	100.0%	460	0	11	11
Mercury	MG/KG	2.5	0.56	100.0%	0.15	7	11	11
Nickel	MG/KG	50.9	33.73	100.0%	16	11	11	11
Potassium	MG/KG	3870	2047.91	100.0%		0	11	11
Selenium	MG/KG	4.9	3.15	18.2%		0	2	11
Silver	MG/KG	0.35	0.35	9.1%	1	0	1	11
Sodium	MG/KG	782	240.70	100.0%		0	11	11
Thallium	MG/KG	1.6	1.30	18.2%		0	2	11
Vanadium	MG/KG	39.8	24.96	100.0%		0	11	11
Zinc	MG/KG	952	335.76	100.0%	120	9	11	11

TABLE 1E
SEAD-16 GROUNDWATER ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level	Source	No. Above Action Level	No. of Detects	No. of Analyses
SEMIVOLATILE ORGANICS									
3-Nitroaniline	UG/L	25	6.7%	6.7%			0	1	15
4-Chloroaniline	UG/L	10	6.7%	6.7%	5	a	1	1	15
Benzo[ghi]perylene	UG/L	1	6.7%	6.7%			0	1	15
Dibenz[a,h]anthracene	UG/L	0.7	6.7%	6.7%			0	1	15
Indeno[1,2,3-cd]pyrene	UG/L	0.6	6.7%	6.7%			0	1	15
NITROAROMATICS									
1,3-Dinitrobenzene	UG/L	1.8	13.3%	13.3%	5	a	0	2	15
2,4-Dinitrotoluene	UG/L	0.68	6.7%	6.7%	5	a	0	1	15
METALS									
Aluminum	UG/L	1850	53.3%	53.3%	50	b	6	8	15
Antimony	UG/L	12.3	13.3%	13.3%	6	d	2	2	15
Arsenic	UG/L	3.2	6.7%	6.7%	10	c	0	1	15
Barium	UG/L	97.4	46.7%	46.7%	1000	a	0	7	15
Beryllium	UG/L	0.23	40.0%	40.0%	4	d	0	6	15
Cadmium	UG/L	0.32	6.7%	6.7%	5	d	0	1	15
Calcium	UG/L	193000	100.0%	100.0%			0	15	15
Chromium	UG/L	3.4	33.3%	33.3%	50	a	0	5	15
Cobalt	UG/L	2.1	33.3%	33.3%			0	5	15
Copper	UG/L	56.8	46.7%	46.7%	200	a	0	7	15
Iron	UG/L	2400	93.3%	93.3%	300	a	5	14	15
Lead	UG/L	24.1	46.7%	46.7%	15	d	1	7	15
Magnesium	UG/L	23700	100.0%	100.0%			0	15	15
Manganese	UG/L	1380	93.3%	93.3%	50	b	12	14	15
Nickel	UG/L	11	46.7%	46.7%	100	d	0	7	15
Potassium	UG/L	18800	53.3%	53.3%			0	8	15
Selenium	UG/L	2.8	6.7%	6.7%	10	a	0	1	15
Sodium	UG/L	409000	93.3%	93.3%	20000	a	3	14	15
Thallium	UG/L	11	26.7%	26.7%	2	d	4	4	15
Vanadium	UG/L	3.8	33.3%	33.3%			0	5	15
Zinc	UG/L	42	6.7%	6.7%	5000	b	0	1	15

Notes:

a) NY State Class GA Groundwater Standard (TOGS 1.1.1, June 1998)

b) US EPA Secondary Drinking Water Regulation, non-enforceable (EPA 822-B-00-001, Summer 2000)

c) US EPA Maximum Contaminant Limit announced 10/31/01. Source http://www.epa.gov/safewater/arsenic.html

d) US EPA National Primary Drinking Water Standards, EPA 816-F-01-007 March 2001

TABLE 2A
SEAD-17 SURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detects	No. of Analyses
VOLATILE ORGANICS								
Acetone	UG/KG	15	10	7.9%	200	0	3	38
Benzene	UG/KG	2	3	2.6%	60	0	1	38
Methylene Chloride	UG/KG	4	4	2.6%	100	0	1	38
Toluene	UG/KG	8	4.333	7.9%	1500	0	3	38
SEMIVOLATILE ORGANICS								
2.4-Dinitrotoluene	UG/KG	1400	392.5	10.5%		0	4	38
2.6-Dinitrotoluene	UG/KG	70	70	2.6%	1000	0	1	38
2-Methylnaphthalene	UG/KG	130	130	2.6%	36400	0	1	38
3.3'-Dichlorobenzidine	UG/KG	410	410	2.6%		0	1	38
3-Nitroaniline	UG/KG	990	990	2.6%	500	1	1	38
4-Nitroaniline	UG/KG	990	990	2.6%		0	1	38
Anthracene	UG/KG	23	23	2.6%	50000	0	1	38
Benzo(a)anthracene	UG/KG	72	29.818	28.9%	224	0	11	38
Benzo(a)pyrene	UG/KG	58	28.273	28.9%	61	0	11	38
Benzo(b)fluoranthene	UG/KG	70	37.385	34.2%	1100	0	13	38
Benzo(g.h.i)perylene	UG/KG	82	42.375	21.1%	50000	0	8	38
Benzo(k)fluoranthene	UG/KG	49	28	26.3%	1100	0	10	38
Butylbenzylphthalate	UG/KG	46	41.5	5.3%	50000	0	2	38
Carbazole	UG/KG	410	410	2.6%		0	1	38
Chrysene	UG/KG	78	33.85	52.6%	400	0	20	38
Di-n-butylphthalate	UG/KG	1200	275	50.0%	8100	0	19	38
Dibenz(a.h)anthracene	UG/KG	59	51.333	7.9%	14	3	3	38
Fluoranthene	UG/KG	190	47.481	65.8%	50000	0	25	38
Indeno(1.2.3-cd)pyrene	UG/KG	62	38	13.2%	3200	0	5	38
N-Nitrosodiphenylamine (1)	UG/KG	71	49	5.3%		0	2	38
Naphthalene	UG/KG	37	37	2.6%	13000	0	1	38
Pentachlorophenol	UG/KG	990	516.5	5.3%	1000	0	2	38
Phenanthrene	UG/KG	120	39.467	39.5%	50000	0	15	38
Pyrene	UG/KG	170	48.25	63.2%	50000	0	24	38
bis(2-Chloroisopropyl) ether	UG/KG	410	410	7.1%		0	1	14
bis(2-Ethylhexyl)phthalate	UG/KG	1300	608.333	31.6%	50000	0	12	38
PESTICIDES/PCB								
4.4'-DDD	UG/KG	15	6	10.5%	2900	0	4	38
4.4'-DDE	UG/KG	37	11.876	44.7%	2100	0	17	38
4.4'-DDT	UG/KG	16	7.389	23.7%	2100	0	9	38
Aldrin	UG/KG	1.9	1.9	2.6%	41	0	1	38
Aroclor-1260	UG/KG	28	25.667	7.9%	1000	0	3	38
Dieldrin	UG/KG	80	33.5	15.8%	44	2	6	38
Endosulfan I	UG/KG	2.4	1.58	5.3%	900	0	2	38
Endrin	UG/KG	1.8	1.8	2.6%	100	0	1	38
Heptachlor epoxide	UG/KG	1.1	1.1	2.6%	20	0	1	38
NITROAROMATICS								
2.4-Dinitrotoluene	UG/KG	330	175.5	10.5%		0	4	38
METALS								
Aluminum	MG/K	18400	13370	100.0%	1930	38	38	38
Antimony	MG/K	52	11.383	47.4%	5.9	6	18	38
Arsenic	MG/K	16.1	6.408	100.0%	8.2	6	38	38
Barium	MG/K	524	200.927	57.9%	300	5	22	38
Beryllium	MG/K	0.87	0.589	100.0%	1.1	0	38	38

TABLE 2A
SEAD-17 SURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detects	No. of Analyses
Cadmium	MG/K	25.5	5.275	86.8%	2.3	20	33	38
Calcium	MG/K	209000	44054	100.0%	121000	3	38	38
Chromium	MG/K	27.2	20.224	100.0%	29.6	0	38	38
Cobalt	MG/K	21.9	10.061	100.0%	30	0	38	38
Copper	MG/K	837	190.913	100.0%	33	34	38	38
Cyanide	MG/K	1.5	1.14	5.3%	0.3	2	2	38
Iron	MG/K	28800	22384.7	100.0%	36500	0	38	38
Lead	MG/K	6270	1074.87	97.4%	24.8	37	37	38
Magnesium	MG/K	17300	5718.68	100.0%	21500	0	38	38
Manganese	MG/K	996	530.263	100.0%	1060	0	38	38
Mercury	MG/K	1	0.126	97.4%	0.1	5	37	38
Nickel	MG/K	47.8	27.668	100.0%	49	0	38	38
Potassium	MG/K	2260	1419.42	100.0%	2380	0	38	38
Selenium	MG/K	1.7	0.731	68.4%	2	0	26	38
Silver	MG/K	9	2.981	44.7%	0.75	12	17	38
Sodium	MG/K	249	118.968	73.7%	172	6	28	38
Thallium	MG/K	1.5	1	18.4%	0.7	6	7	38
Vanadium	MG/K	30.1	22.876	100.0%	150	0	38	38
Zinc	MG/K	1530	365.405	100.0%	110	30	38	38
HERBICIDES								
MCPA	UG/KG	34000	23500	16.7%		0	4	24

TABLE 2B
SEAD-17 SUBSURFACE SOIL ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	TAGM	No. Above TAGM	No. of Detects	No. of Analyses
SEMIVOLATILE ORGANICS								
bis(2-Ethylhexyl)phthalate	UG/KG	490	160.5	80.0%	50000	0	8	10
PESTICIDES/PCB								
Aroclor-1254	UG/KG	61	61	10.0%	10000	0	1	10
METALS								
Aluminum	MG/KG	19300	14530	100.0%	19300	0	10	10
Arsenic	MG/KG	6.9	5.14	100.0%	8.2	0	10	10
Barium	MG/KG	158	89.68	100.0%	300	0	10	10
Beryllium	MG/KG	0.99	0.668	100.0%	1.1	0	10	10
Cadmium	MG/KG	2.8	2.8	10.0%	2.3	1	1	10
Calcium	MG/KG	115000	33325	100.0%	121000	0	10	10
Chromium	MG/KG	27.9	21.53	100.0%	29.6	0	10	10
Cobalt	MG/KG	21.7	11.3	100.0%	30	0	10	10
Copper	MG/KG	85.1	31.79	100.0%	33	2	10	10
Iron	MG/KG	38700	27930	100.0%	36500	1	10	10
Lead	MG/KG	686	106.46	100.0%	24.8	2	10	10
Magnesium	MG/KG	18100	7678	100.0%	21500	0	10	10
Manganese	MG/KG	1160	576.2	100.0%	1060	2	10	10
Mercury	MG/KG	0.06	0.046	70.0%	0.1	0	7	10
Nickel	MG/KG	42	30.73	100.0%	49	0	10	10
Potassium	MG/KG	1750	1344.8	100.0%	2380	0	10	10
Sodium	MG/KG	239	111.13	100.0%	172	2	10	10
Vanadium	MG/KG	30.7	23.35	100.0%	150	0	10	10
Zinc	MG/KG	172	83.04	100.0%	110	1	10	10

TABLE 2C
SEAD-17 SURFACE WATER ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level[1]	No. Above Action Level	No. of Detects	No. of Analyses
SEMIVOLATILE ORGANICS								
bis(2-Ethylhexyl)phthalate	UG/L	2	1.5	20.0%	0.6	2	2	10
METALS								
Antimony	UG/L	23.6	11.425	40.0%		0	4	10
Arsenic	UG/L	4.6	3.733	60.0%	190	0	6	10
Barium	UG/L	100	47.01	100.0%		0	10	10
Cadmium	UG/L	1.3	0.632	50.0%	1.86	0.00	5.00	10
Calcium	UG/L	73500	53640	100.0%		0	10	10
Chromium	UG/L	1	1	10.0%	347.27	0.00	1.00	10
Copper	UG/L	32.7	13.04	100.0%	20.29	1.00	10.00	10
Iron	UG/L	322	146.3	100.0%	300	1	10	10
Lead	UG/L	37.1	11.45	60.0%	7.16	3.00	6.00	10
Magnesium	UG/L	9280	5904	100.0%		0	10	10
Manganese	UG/L	19.6	8.43	100.0%		0	10	10
Nickel	UG/L	1.7	1.7	10.0%	154.49	0.00	1.00	10
Potassium	UG/L	4380	3007	100.0%		0	10	10
Selenium	UG/L	3.5	3.14	50.0%	1	5	5	10
Sodium	UG/L	9460	5209	100.0%		0	10	10
Vanadium	UG/L	1.8	1.8	10.0%	14	0	1	10
Zinc	UG/L	61.7	24.13	100.0%	141.38	0.00	10.00	10

Note:
1) Source: NYS AWQS CLASS C

TABLE 2D
SEAD-17 SEDIMENT ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency	Action Level	No. Above Action Level	No. of Detects	No. of Analyses
VOLATILE ORGANICS								
Acetone	UG/KG	26	17	30.0%		0	3	10
Toluene	UG/KG	8	8	10.0%		0	1	10
SEMIVOLATILE ORGANICS								
2,4-Dimethylphenol	UG/KG	32	32	10.0%		0	1	10
2,4-Dinitrotoluene	UG/KG	450	450	10.0%		0	1	10
Benzo(a)anthracene	UG/KG	25	25	10.0%	15.99	1	1	10
Benzo(a)pyrene	UG/KG	30	30	10.0%	15.99	1	1	10
Benzo(b)fluoranthene	UG/KG	43	43	10.0%	15.99	1	1	10
Benzo(g,h,i)perylene	UG/KG	31	31	10.0%		0	1	10
Benzo(k)fluoranthene	UG/KG	33	33	10.0%	15.99	1	1	10
Chrysene	UG/KG	48	48	10.0%	15.99	1	1	10
Fluoranthene	UG/KG	70	53	20.0%	12546	0	2	10
Indeno(1,2,3-cd)pyrene	UG/KG	24	24	10.0%	15.99	1	1	10
Phenanthrene	UG/KG	35	35	10.0%	1476	0	1	10
Pyrene	UG/KG	47	36.5	20.0%		0	2	10
bis(2-Ethylhexyl)phthalate	UG/KG	77	55.667	30.0%	2460	0	3	10
PESTICIDES/PCB								
4,4'-DDD	UG/KG	13	8	30.0%	0.123	3	3	10
4,4'-DDE	UG/KG	62	19.2	60.0%	0.123	6	6	10
4,4'-DDT	UG/KG	12	7.5	20.0%	0.123	2	2	10
Dieldrin	UG/KG	5	5	10.0%	1.23	1	1	10
Endosulfan I	UG/KG	1.6	1.6	10.0%	0.369	1	1	10
Endosulfan II	UG/KG	3.8	3.75	20.0%	0.369	2	2	10
METALS								
Aluminum	MG/KG	22100	16370	100.0%		0	10	10
Antimony	MG/KG	5.5	3.45	40.0%	2	2	4	10
Arsenic	MG/KG	7.5	5.29	100.0%	6	3	10	10
Barium	MG/KG	162	111.77	100.0%		0	10	10
Beryllium	MG/KG	0.99	0.642	100.0%		0	10	10
Cadmium	MG/KG	4.8	1.573	100.0%	0.6	7	10	10
Calcium	MG/KG	25000	6031	100.0%		0	10	10
Chromium	MG/KG	27.7	22.16	100.0%	26	1	10	10
Cobalt	MG/KG	17.8	10.81	100.0%		0	10	10
Copper	MG/KG	309	73.32	100.0%	16	10	10	10
Iron	MG/KG	35000	26540	100.0%	20000	9	10	10
Lead	MG/KG	1050	270.32	100.0%	31	10	10	10
Magnesium	MG/KG	6490	4890	100.0%		0	10	10
Manganese	MG/KG	768	445.1	100.0%	460	4	10	10
Mercury	MG/KG	0.16	0.078	40.0%	0.15	1	4	10
Nickel	MG/KG	31.6	27.2	100.0%	16	9	10	10
Potassium	MG/KG	2630	1899	100.0%		0	10	10
Selenium	MG/KG	1.9	1.487	30.0%		0	3	10
Sodium	MG/KG	452	214	80.0%		0	8	10
Thallium	MG/KG	1.3	1.15	20.0%		0	2	10
Vanadium	MG/KG	33.8	26.77	100.0%		0	10	10
Zinc	MG/KG	278	130.03	100.0%	120	3	10	10

TABLE 2E
SEAD-17 GROUNDWATER ANALYSIS RESULTS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Parameter	Units	Maximum Concentration	Average	Frequency of Detection	Action Level	Source	No. Above Action Level	No. of Detects	No. of Analyses
SEMIVOLATILE ORGANICS									
Benzo[a]pyrene	UG/L	0.7	0.7	12.5%	ND	a	0	1	8
Benzo[ghi]perylene	UG/L	2	1.5	25.0%			0	2	8
Dibenz[a,h]anthracene	UG/L	1	0.95	25.0%			0	2	8
Indeno[1,2,3-cd]pyrene	UG/L	2	1.5	25.0%			0	2	8
METALS									
Aluminum	UG/L	386	142.725	50.0%	50	b	3	4	8
Barium	UG/L	92.5	88.167	37.5%	1000	a	0	3	8
Beryllium	UG/L	0.26	0.233	37.5%	4	c	0	3	8
Cadmium	UG/L	0.31	0.31	12.5%	5	c	0	1	8
Calcium	UG/L	118000	103638	100.0%			0	8	8
Chromium	UG/L	1.5	1.5	12.5%	50	a	0	1	8
Cobalt	UG/L	1.4	1.4	12.5%			0	1	8
Copper	UG/L	4.3	3.567	37.5%	200	a	0	3	8
Iron	UG/L	572	197.733	75.0%	300	a	1	6	8
Magnesium	UG/L	23000	17975	100.0%			0	8	8
Manganese	UG/L	73.8	45.467	75.0%	50	b	3	6	8
Nickel	UG/L	2.4	2.133	37.5%	100	c	0	3	8
Potassium	UG/L	5320	1804.75	50.0%			0	4	8
Silver	UG/L	2.3	2.3	12.5%	50	a	0	1	8
Sodium	UG/L	30100	14858.8	100.0%	20000	a	2	8	8
Thallium	UG/L	7.1	5.4	37.5%	2	c	3	3	8
Vanadium	UG/L	1.4	1.4	12.5%			0	1	8
Zinc	UG/L	63.9	63.9	12.5%	5000	b	0	1	8

Notes:
a) NY State Class GA Groundwater Standard (TOGS 1.1.1. June 1998)
b) US EPA Secondary Drinking Water Regulation. non-enforceable (EPA 822-B-00-001. Summer 2000)
c) US EPA National Primary Drinking Water Standards. EPA 816-F-01-007 March 2001

TABLE 3
SEAD-16/17 CLEANUP GOALS FOR SOIL
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Compounds	Soil Criteria [1] (mg/kg)
Antimony	18.0
Copper	359
Lead	1250 [2]
Mercury	2.69
Thallium	3.59
Zinc	539

Notes:

1. Soil criteria are based on maximum concentrations, derived in the Feasibility Study, that would be protective of human health under the industrial use scenario, unless otherwise noted.
2. This value was selected as the clean up goal for lead 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). Refer to the *Remedial Action Objectives* section in the PRAP for a more detailed discussion.
3. Soil criteria are for surface, subsurface, and ditch soils.

TABLE 4

SCREENING OF SOIL REMEDIATION ALTERNATIVES

Proposed Remedial Actdion Plan for SEAD-16/17

Seneca Army Depot Activity

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	OVERALL ALTERNA-TIVE RANKING
		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.

TABLE 5
REMEDIAL ALTERNATIVES RETAINED FOR DETAILED ANALYSIS
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

ALTERNATIVE	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 ordnances 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 hot spot removal - 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 ordnances 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 - Perform hot spot removal - 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 ordnances 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 - Perform hot spot removal - 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

TABLE 6
DETAILED COST ESTIMATES
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Soil with Lead Concentration	ALTERNATIVE 2 On-site Containment >1250 mg/kg [7]	ALTERNATIVE 2 On-site Containment >1000 mg/kg [7]	ALTERNATIVE 2 On-site Containment >400 mg/kg [7]	ALTERNATIVE 2 On-site Containment >400 mg/kg +TAGM [7]	ALTERNATIVE 4 Off-site Disposal >1250 mg/kg [7]	ALTERNATIVE 4 Off-site Disposal >1000 mg/kg [7]	ALTERNATIVE 4 Off-site Disposal >400 mg/kg [7]	ALTERNATIVE 4 Off-site Disposal >400 mg/kg +TAGM [7]	ALTERNATIVE 6 Soil Washing >1250 mg/kg [7]	ALTERNATIVE 6 Soil Washing >1000 mg/kg [7]	ALTERNATIVE 6 Soil Washing >400 mg/kg [7]	ALTERNATIVE 6 Soil Washing >400 mg/kg +TAGM [7]
Cost 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	$5,543,067
Cost 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	$7,650,310
Project 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	$12,111,090
Annual O&M Costs [4]	$5,000	$6,000	$7,000	$8,000	NA	NA	NA	NA	NA	NA	NA	NA
Annual 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	$40,440
Present 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	$699,288
Total 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**	**$12,810,378**

NOTES
1. 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
2. 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
3. Project Cost is the sum of the Direct, Indirect, and Owner costs for the project
4. Annual Costs are costs that will occur yearly due to activities such as maintenance or monitoring
5. Present Worth Cost is based on a 4% interest rate over the number of years specified above. (Refer to Appendix E, Table E-1)
6. Total Evaluated Price is the sum of the Project Cost and Present Worth Cost
7. Soil remediated to lead concentrations as noted
8. Cost estimate details are provided in the Final Feasibility Study Report

TABLE 7
SEAD-16 RESIDUAL CONTAMINATION
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot Activity

Compound	Max Concentration to be Protective of Human Health [1] (mg/kg)	EPCs [2] (mg/kg)	Max Hit (mg/kg)	TAGM 4046 (mg/kg)
	Industrial Use Day Care Child	Post Remediation	Post Remediation	
Antimony	18.0	4.78	17.1	5.9
Copper	359	69.8	204	33
Mercury	2.69	0.350	1.2	0.1
Thallium	3.59	0.920	1.8	0.7
Zinc	539	133	1270	110

Notes:

1. The maximum concentrations to be protective of human health under an industrial use scenario were calculated in Table 2-3 in the Final FS, February 2001.
2. The EPC values were determined by selecting the lower value of either the max concentration or the calculated 95% UCL of the mean for the surface soil samples that were not located in the area included in the proposed remedial action.

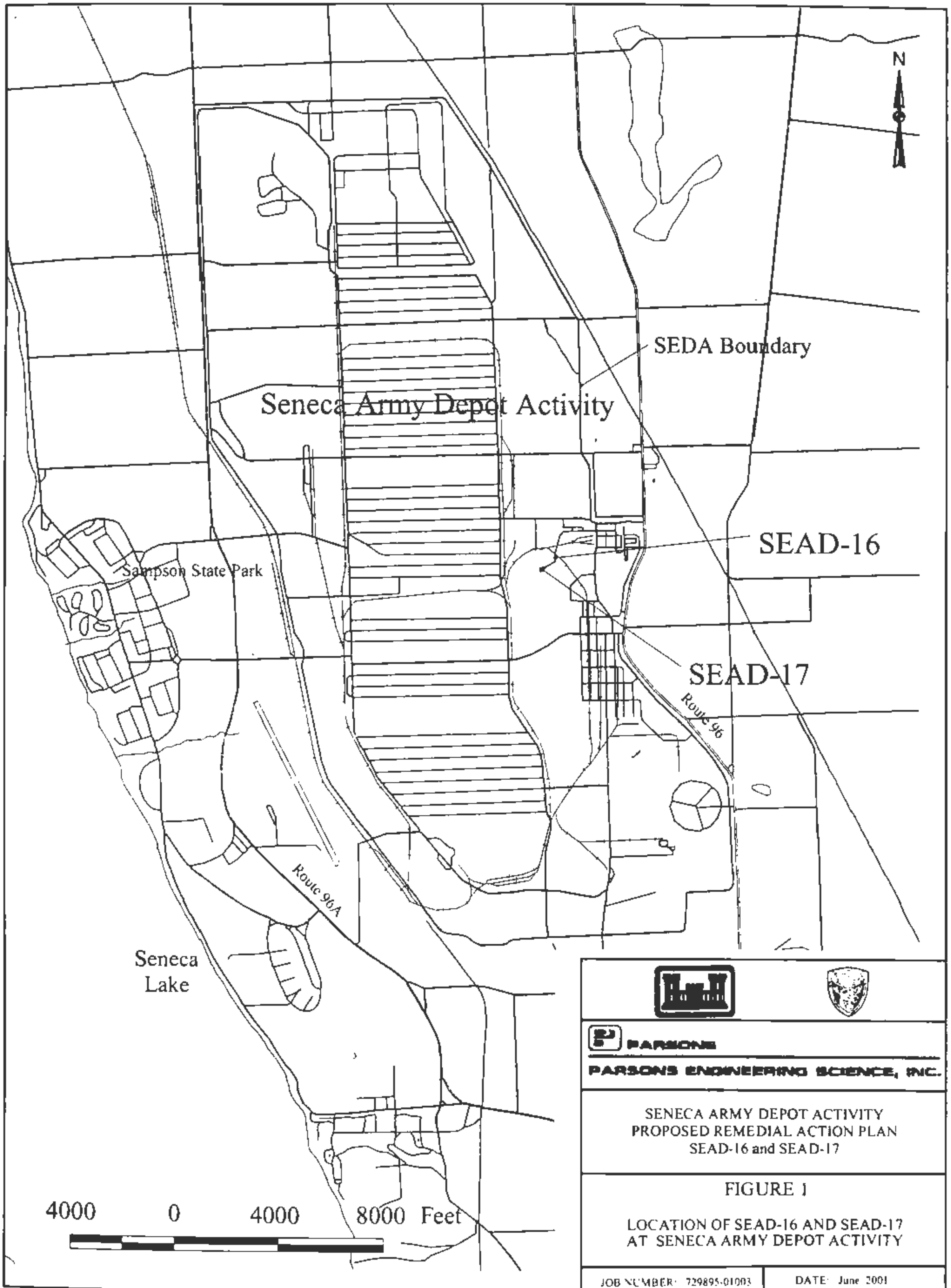
TABLE 8
SEAD-17 RESIDUAL CONTAMINATION
Proposed Remedial Action Plan for SEAD-16/17
Seneca Army Depot

Compound	Max Concentration to be Protective of Human Health [1] (mg/kg)	EPCs [2] (mg/kg)	Max Hit (mg/kg)	TAGM 4046 (mg/kg)
	Industrial Use Day Care Child	Post Remediation	Post Remediation	
Antimony	18.0	5.00	5.0	5.9
Arsenic	NA	5.90	8.9	8.2
Cadmium	NA	2.5	5.6	2.3
Copper	359	83.4	182	33
Mercury	2.69	0.150	1.00	0.1
Thallium	3.59	0.686	1.50	0.7
Zinc	539	230	488	110

Notes:

1. The maximum concentrations to be protective of human health under an industrial use scenario were calculated in Table 2-3 in the Final FS, February 2001.
2. The EPC values were determined by selecting the lower value of either the max concentration or the calculated 95% UCL of the mean for the surface soil samples that were not located in the area included in the proposed remedial action.

NA - Not Applicable: values were not determined for this constituent.



SENECA ARMY DEPOT ACTIVITY
PROPOSED REMEDIAL ACTION PLAN
SEAD-16 and SEAD-17

FIGURE 1

LOCATION OF SEAD-16 AND SEAD-17
AT SENECA ARMY DEPOT ACTIVITY

JOB NUMBER: 729895-01003 | DATE: June 2001

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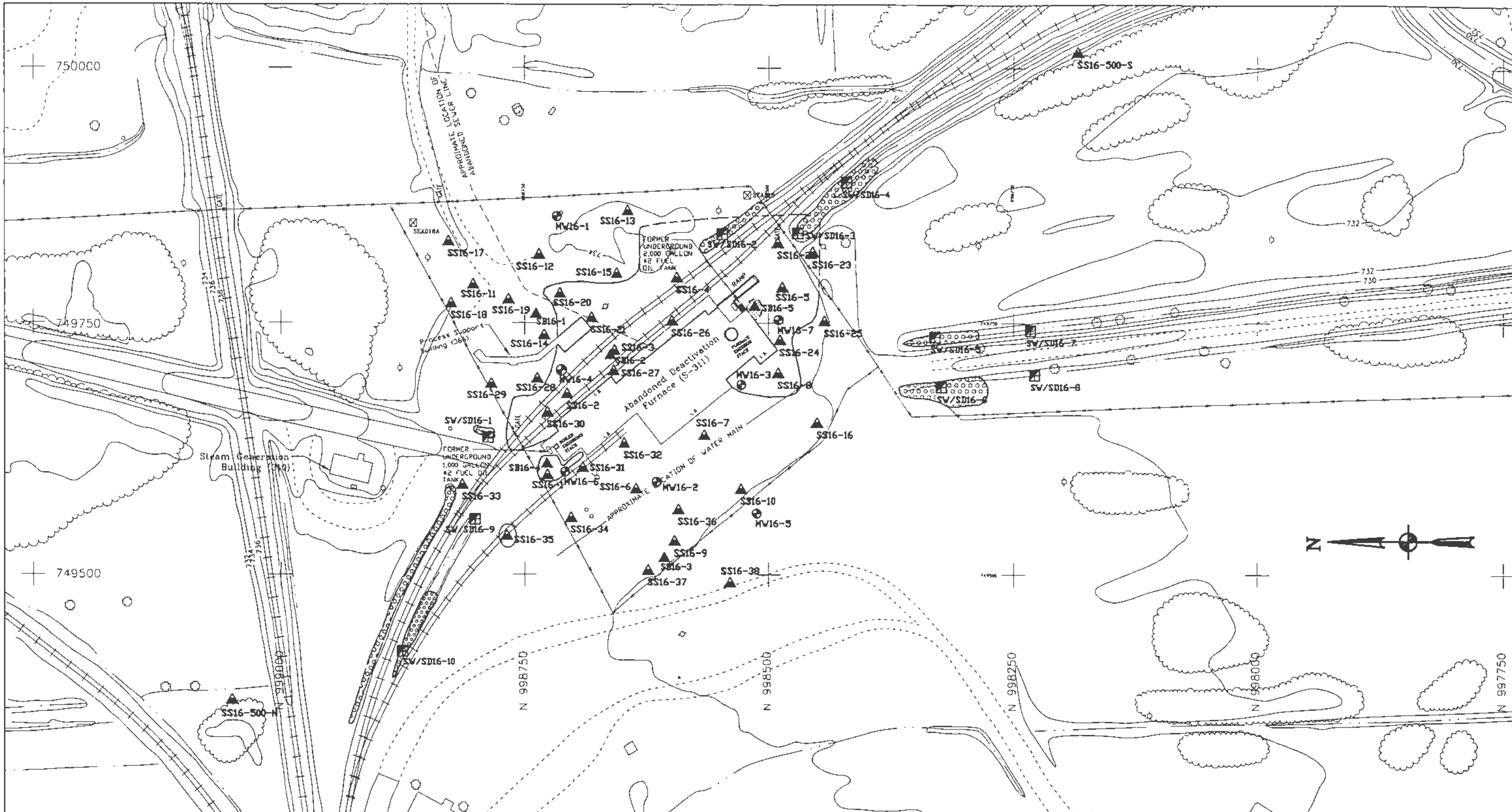

LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- REMEDIATION LIMIT WHICH WILL BE DEFINED THROUGH PRE-DESIGN SAMPLING
- BRUSH LINE
- LANDFILL EXTENTS
- 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 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.
3. TRACKS WITHIN LIMITS OF EXCAVATION WILL NOT DISTURBED DURING REMEDIAL ACTION.

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
PROPOSED REMEDIAL ACTION PLAN
SEAD-16 AND SEAD-17

DEPT: ENVIRONMENTAL ENGINEERING

Dwg. No. 729895-01002

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

SCALE: 1" = 100'-0"

DATE: JUNE 2002

REV: A

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LEGEND

- MINOR WATERWAY
- MAJOR WATERWAY
- FENCE
- REMEDIATION LIMIT WHICH WILL BE DEFINED THRU PRE-DESIGN SAMPLING
- BRUSH LINE
- LANDFILL EXTENTS
- RAILROAD
- GROUND SURFACE ELEVATION CONTOUR (760)
- REMEDIATION LIMIT
- SURVEY MONUMENT
- ROAD SIGN
- DECIDOUS TREE
- FIRE HYDRANT
- MANHOLE
- GUIDE POST
- POLE
- UTILITY BOX
- CORDINATE GRID (250' GRID)
- OVERHEAD POLE
- UTILITY 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 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.

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

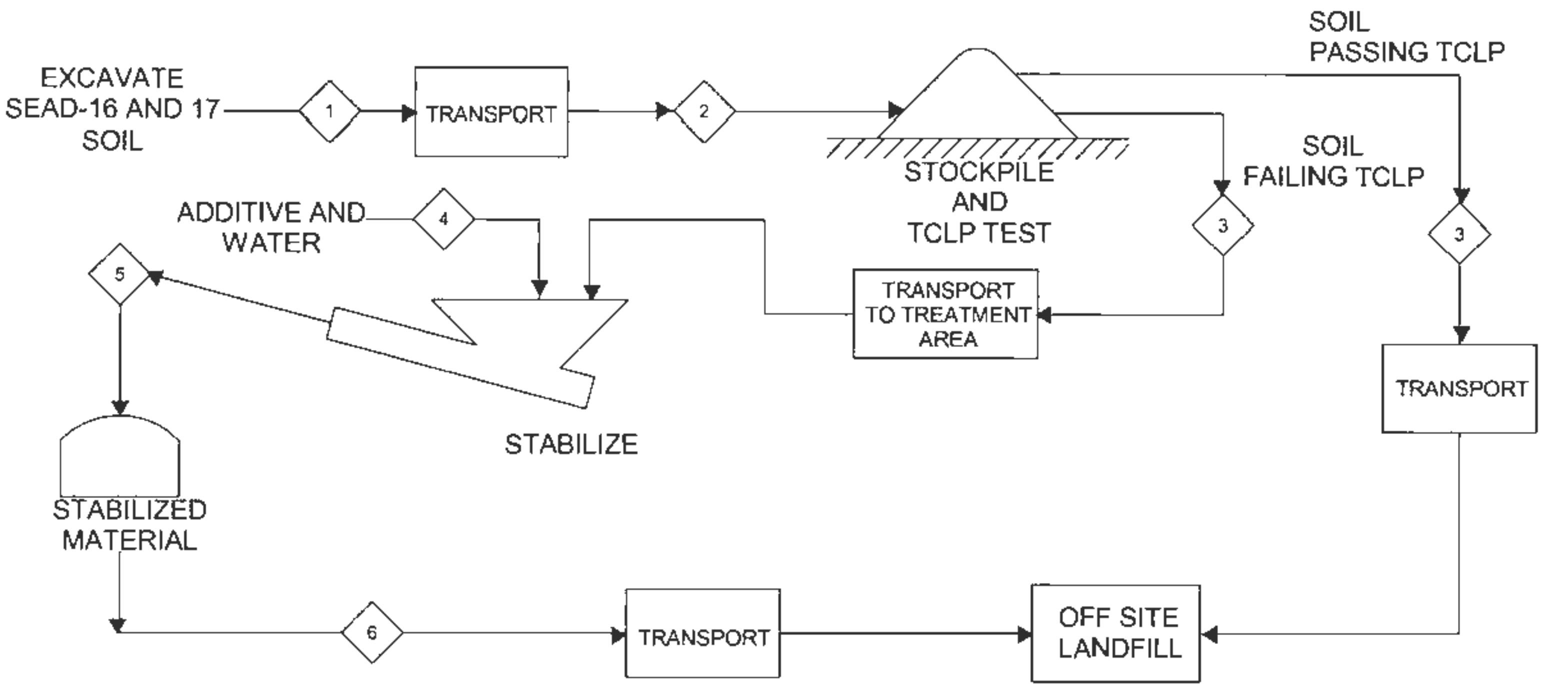
CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
PROPOSED REMEDIAL ACTION PLAN
SEAD-16 AND SEAD-17

DEPT	Dwg. No
ENVIRONMENTAL ENGINEERING	729896-01008

FIGURE 3
SEAD-17 REMEDIATION AREA
(SOIL W/LEAD > 1250 mg/kg)

SCALE	DATE	REV
1" = 100'-0"	JUNE 2002	A



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

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

SENECA ARMY DEPOT ACTIVITY

PROPOSED REMEDIAL ACTION PLAN
SEAD-16 AND SEAD-17

FIGURE 4

ALTERNATIVE 4
GENERALIZED PROCESS FLOW
SCHEMATIC

JOB NUMBER: 729895-01003 | DATE: SEPT 2001

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