US Army, Engineering & Support Center
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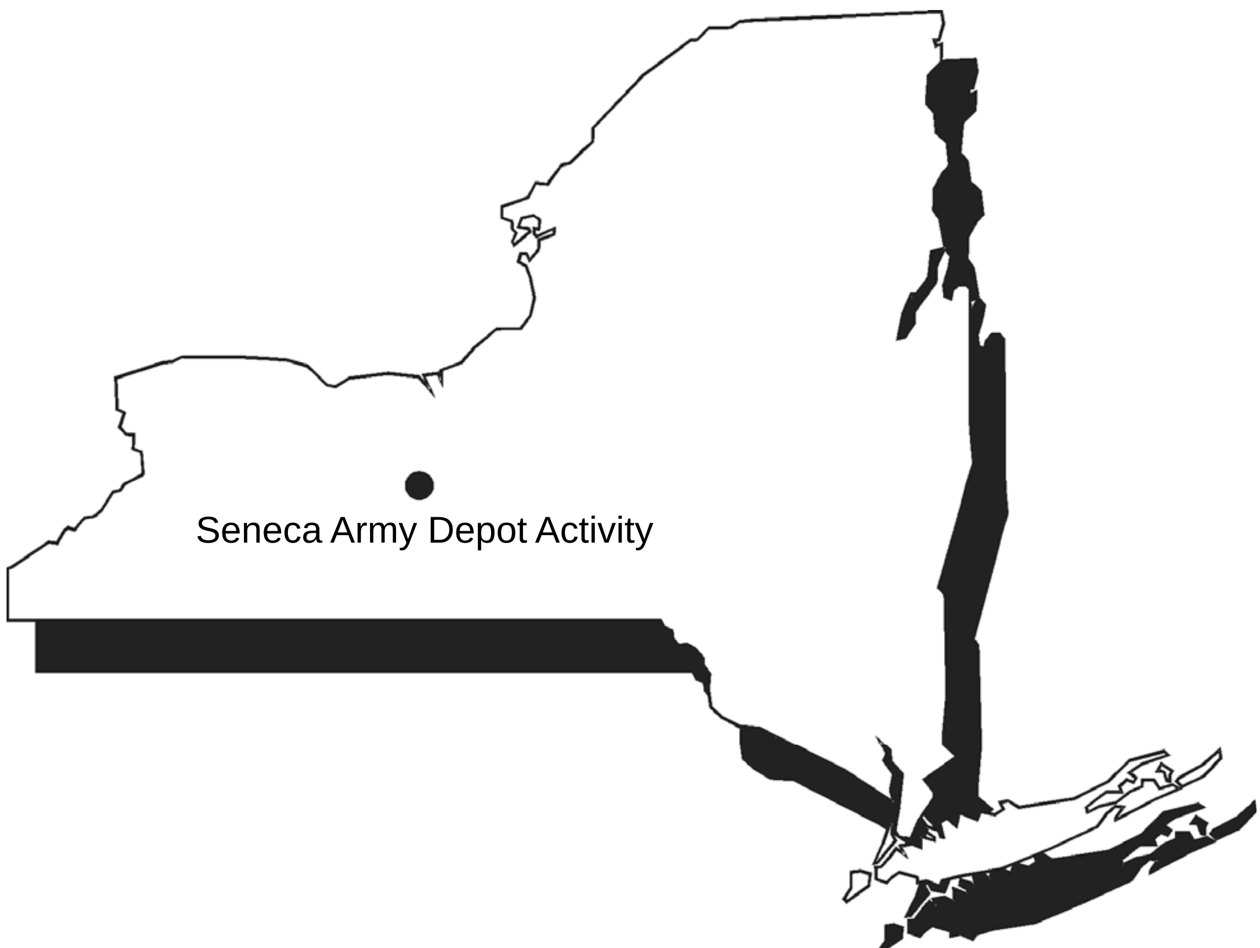
Seneca Army Depot Activity
Romulus, NY



FINAL
PROPOSED PLAN
THE RADIOACTIVE WASTE BURIAL PITS SITE (SEAD-12)
AND THE MIXED WASTE STORAGE FACILITY (SEAD-72)
SENECA ARMY DEPOT ACTIVITY

Contract No. W912DY-08-D-0003
Task Order No. 0013
EPA Site ID# NY0213820830
NY Site ID# 8-50-006

PARSONS

JULY 2014

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Proposed Plan

THE RADIOACTIVE WASTE BURIAL PITS SITE (SEAD-12) AND THE MIXED WASTE STORAGE FACILITY (SEAD-72) SENECA ARMY DEPOT ACTIVITY (SEDA) ROMULUS, NEW YORK

July 2014

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PURPOSE OF THIS DOCUMENT

This Proposed Plan describes the remedial alternatives selected for two areas of concern (AOCs), SEAD-12 (the Radioactive Waste Burial Pits Site) and SEAD-72 (the Mixed Waste Storage Facility), at the Seneca Army Depot Activity (SEDA or Depot) Superfund Site located in Seneca County, New York. This Proposed Plan was developed by the U.S. Army (Army) and the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC). The Army and the EPA are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f)(2) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The nature and extent of the contamination at SEAD-12 and SEAD-72 are described in the August 2002 Remedial Investigation (RI) Report, the March 2003 Radiological Survey Report, the October 2006 Supplemental RI (SRI) Report, the January 2008 Feasibility Study (FS) Report, the March 2009 Resource Conservation and Recovery Act (RCRA) Closure Report for SEAD-72, and the December 2011 SEAD-12 Construction Completion Report. The Army, EPA, and NYSDEC encourage the public to review these documents to gain a more comprehensive understanding of the AOCs and the Superfund activities that have been completed.

This Proposed Plan is being provided as a supplement to the RI, Radiological Survey, SRI, FS, SEAD-12 Construction Completion Report, and the SEAD-72 RCRA Closure reports to inform the public of the Army's, EPA's, and NYSDEC's preferred remedy for the AOCs and to solicit public comments pertinent to the selected remedies. The preferred remedy for SEAD-12 includes the implementation of, monitoring of, inspection of, and periodic certification that required land use controls (LUCs) remain in effect within a specified portion of SEAD-12, and the release of the remainder of the larger SEAD-12 property and land for unrestricted use and unlimited exposures. For SEAD-72, the preferred remedy is No Further Action (NFA) and release of the building for unrestricted use and unlimited exposure.

SEAD-12's proposed remedy includes an environmental land use restriction that prohibits access to or use of existing Buildings 813 and 814, or the construction of inhabitable structures (temporary or permanent) above the area where trichloroethene (TCE) contaminated groundwater and soil were previously identified unless and until a vapor intrusion study is conducted in the building(s) or in the restricted area and shows that potential risks from volatile organic compound intrusion does not pose risk to future occupants of the structures. Furthermore, the preferred remedy for SEAD-12 also includes implementation, monitoring, inspection, and periodic certification of a separate LUC prohibiting access to and use of groundwater in the vicinity of Buildings 813/814 and former monitoring well MW12-37 until such time as groundwater quality standards are achieved. Finally, the preferred remedy for all other property and land within SEAD-12, exclusive of that discussed above, is no further action as there are no other identified conditions that prevent unrestricted use and unlimited exposures for the remainder of the land within SEAD-12.

Changes to the preferred remedies, or a change from a 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. The final decision regarding the selected remedies for SEAD-12 and SEAD-72 will be made after the Army and the EPA have taken all public comments into consideration. The Army and the EPA are soliciting comments because the Army and EPA may select remedies other than the preferred remedies for SEAD-12 and SEAD-72 presented in this Proposed Plan.

COMMUNITY ROLE IN SELECTION PROCESS

The Army, EPA, and NYSDEC rely 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 Report, the Radiological Survey Report, the SRI Report, the FS Report, the Construction Completion Report for SEAD-12, the SEAD-72 RCRA Closure Report, and this Proposed Plan have been made available to the public for a public comment period which begins on August 10, 2014 and concludes on September 9, 2014.

MARK YOUR CALENDAR

8/10/2014 – 9/09/2014:
Public comment period related to this Proposed Plan.

8/28/2014 at **7:00 pm:** Public meeting at the Seneca County Office Building, Hero's Conference Room, Village of Waterloo, New York

A public meeting will be held during the public comment period at the Seneca County Office Building on August 28, 2014 at 7:00 p.m. to present the conclusions of the RI/FS and construction activities performed within SEAD-12 and the RCRA Closure of SEAD-72, to elaborate further on the reasons for selecting the preferred remedies, and to receive public comments.

Written comments received at the public meeting or during the public comment period will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

Mr. Stephen M. Absolom
BRAC Environmental Coordinator
Seneca Army Depot Activity
Building 123, P.O. Box 9
5786 State Route 96
Romulus, NY 14541-0009

SCOPE AND ROLE OF ACTION

At SEDA more than 8,500 acres of land have been transferred by the Army to new users. The goal is to transfer the entirety of SEDA to future users for beneficial reuse. The Army is addressing all solid waste management units (SWMUs) within SEDA that require action before they are suitable for transfer. The primary goal of the selected remedies is to minimize potential future health and environmental impacts posed by SEAD-12 and SEAD-72 prior to transfer of the land to other private or public parties for beneficial reuse.

BACKGROUND INFORMATION

SEDA and AOCs Descriptions

SEDA previously occupied approximately 10,600 acres of land located in the Towns of Varick and Romulus in Seneca County, New York. The former military facility was owned by the U.S. Government and operated by the Army between 1941 and 2000, when SEDA's military mission ceased. Since 2000, the Army has assumed a caretaker role at the former facility, pending the completion of environmental studies, investigations and required environmental response actions. SEDA's historic military mission included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives, and special weapons.

SEAD-12 and SEAD-72 are located in the north central portion of the former Seneca Army Depot also known as the “Q area”. The planned future use of land within the former Depot, the location and extent of SEAD-12, and the approximate location of SEAD-72 and other key features located within SEAD-12 are depicted in **Figure 1**. SEAD-12 originally began as the investigation of two separate areas, formerly designated as SEAD-12A (Radioactive Waste Burial Site – northeast corner of SEAD-12) and SEAD-12B (Radioactive Waste Burial Site – northeast of Buildings 803, 804, and 805). Locations of these two historic SEADs are shown in **Figure 1**. The SEAD 12 remedial investigation covered 624 acres of the high security area and the burial areas noted above. SEAD-12A encompassed an area measuring approximately 1,500 feet long by 900 feet wide that was suspected to have included up to five separate small burial pits. SEAD-12B encompassed an area measuring 300 feet long by 300 feet wide, and it was suspected to have included a 5,000-gallon storage tank and a small dry waste pit.

After the completion of the Expanded Site Inspection (ESI) of SEAD-12A and SEAD-12B in 1995, the bounds of SEAD-12 were expanded to that which is shown in **Figures 1** and **2** and was based on the similarity of the chemicals found at the two historic SEADs and review of the general history of the SWMU, which suggested that similar constituents could be exist throughout the larger area. As redefined, SEAD-12 was enlarged to include an area of approximately 360 acres, which included all land encompassing the original SEAD-12A and 12B, and most of the land located in the SWMU north of the storage igloos (earth-covered munitions storage bunkers). The area identified as the Miscellaneous Components Burial Site (SEAD-63), which is located midway along the western boundary of the area, is excluded from the area designated as SEAD-12. Building 715 and the portion of Reeder Creek that is adjacent to SEAD-12 were also included in the area investigated during the RI/FS at SEAD-12 due to concerns that they may have been impacted by releases of hazardous substances originating from SEAD-12. Building 715 is a wastewater treatment plant (WWTP) that received wastewater from the buildings located within SEAD-12 during the period of the Army use, and which currently receives wastewater from the Hillside Children’s Center, which is now located in the SEDA’s former Troop Area to the north and west of SEAD-12. Reeder Creek receives surface water runoff from SEAD-12, and other locations within the former Depot, as well as the discharge from Building 715 WWTP.

SEAD-12 also encompasses land occupied by Building 803, the former Mixed Waste Storage Facility (SEAD-72). Building 803 was used by the Army for the storage of mixed radiological and chemical wastes pending final treatment or disposal at other licensed or permitted facilities. The Mixed Waste Storage Facility was operated under RCRA interim status, and was subject to closure in accordance with the approved *Final Closure Plan for Former RCRA Unit Building 803 – Mixed Waste Storage Facility Solid Waste Management Unit SEAD-72*.

SEDA and AOCs History

The U.S. Government purchased land for the Seneca Army Depot from approximately 150 families in June 1941. The Depot began its primary mission of receipt, maintenance, and supply of ammunition in 1943. After the end of World War II, the Depot’s mission shifted from supply to storage, maintenance, and disposal of ammunition and equipment. As the ”Q” Area facilities became operational, the two AOCs were operated by the Atomic Energy Commission (AEC) until 1962. After 1962, all activities at SEAD-12 and SEAD-72 were transferred to the Army.

On July 14, 1989, the EPA proposed SEDA for inclusion on the National Priorities List (NPL). The EPA recommendation was approved and finalized on August 30, 1990, when SEDA was listed in Group 14 of the Federal Facilities portion of the NPL. Once listed on the NPL, the Army, EPA, and NYSDEC identified 57 SWMUs where data or information suggested, or evidence existed to support, that hazardous substances or hazardous wastes had been handled and where releases to the environment may have occurred. Each of these SWMUs was identified in the Federal Facilities Agreement prepared under CERCLA Section 120 Docket Number: II-CERCLA-FFA-00202 (FFA) and signed by the Army, EPA, and NYSDEC in 1993. The number of SWMUs was subsequently expanded to include 72 AOCs once the Army prepared and submitted the required *SWMU Classification Report.* Once the 72 SWMUs were listed, the Army recommended that they be identified either as areas requiring “No Action” or as AOCs where action or additional information was needed. When the *SWMU Classification Report* was issued, SEAD-12 was classified as a Moderately Low Priority AOC and SEAD-72 was classified as a No Action AOC. However, as a hazardous waste storage facility where regulated substances were previously stored, SEAD-72 was subject to the closure requirements of the RCRA once its designated use was terminated.

In 1995, SEDA was designated for closure under the Department of Defense’s (DoD’s) Base Realignment and Closure (BRAC) process. Once SEDA was added to the 1995 BRAC list, the Army’s primary objective expanded from performing remedial investigations and completing necessary remedial actions at identified SWMUs to include the release of non-affected portions of the Depot to the surrounding community for their reuse for other, non-military purposes. The designated future use of land within SEDA was first defined and approved by the Seneca County Local Redevelopment Authority in 1996. In 2005, the Seneca County Industrial Development Agency (SCIDA) revised the planned future use of property within the former Depot. SEAD-12 and SEAD-72 are located in land designated for use as Planned Institutional/ Training areas (**Figure 1**).

HYDROLOGY/HYDROGEOLOGY

Hydrology

SEDA is located in an uplands area, which forms a divide separating two of the New York Finger Lakes: Cayuga Lake on the east and Seneca Lake on the west. Ground surface elevations are generally higher along the eastern and southern sides of the Depot, and lower along the northern and western sides. The approximate elevation at the southeastern corner of the Depot is 740 feet (ft), while the approximate elevation at the southwestern and northeastern corners is 650 ft. The approximate elevation at the southwestern corner of the Depot is 590 ft. Given this topographic profile, the primary direction of surface water flow throughout SEDA is to the west towards Seneca Lake. Isolated portions of the Depot drain to the northeast (Seneca-Cayuga Canal) and east (Cayuga Lake). Primary surface water flow conduits to Seneca Lake are Reeder, Kendaia, Indian, and Silver Creeks, while Kendig Creek flows to the northeast and an unnamed creek flows away from the southeast corner of the Depot towards the east and Cayuga Lake.

Surface topography in SEAD-12 and SEAD-72 is relatively flat-lying, sloping gently to the west and northwest. Surface water within SEAD-12 occurs as seasonal flow within man-made drainage ditches and seasonal streams. Surface water flow is generally to the west. In the northeast portion of SEAD-12, a natural unnamed creek flows to the northwest across the AOC. East of Service Road No. 1, this unnamed creek exists as a natural seasonal stream. The unnamed creek flows into Reeder Creek west of SEAD-12, which discharges into Seneca Lake. Reeder Creek also accumulates the surface water flow from the southern portion of SEAD-12, as well as other area south of SEAD 12. A natural seasonal marsh area occurs near the eastern portion of the unnamed creek. This marsh tends to remain wet but does dry out during dry summer months.

Hydrogeology

Regionally, the geologic cross-sections suggest that a groundwater divide exists approximately half way between the two Finger Lakes. SEDA is located on the western slope of this divide and therefore regional groundwater flow is expected to be primarily westward towards Seneca Lake.

The predominant surficial geologic unit present at SEAD-12 and SEAD-72 is Pleistocene age till. A thin zone of weathered gray shale was encountered below the till. The bedrock underlying SEAD-12 and SEAD-72 is gray Devonian shale bedrock.

In developed areas, the till or weathered bedrock (where the till has been removed) is overlain by fill material consisting of reworked till. Topsoil covers much of SEAD-12.

Depth to groundwater ranged from about 2 ft to approximately 11 ft at SEAD-12. Groundwater flow is predominantly to the west and northwest across SEAD-12.

Previous Investigations and Activities at SEAD-12 and SEAD-72

The investigation and activities completed at SEAD-12 included an ESI performed in 1994, a RI in 1997, a SRI in 2004, and a removal action in 2009. The investigation and activities completed at SEAD-72 included RCRA Closure in 2009. **Figure 2** presents an enlarged view of the area defined as SEAD-12. The scopes of the investigations are described below followed by a summary of the results organized by media.

ESI (1994) RI (1997), and SRI (2004-2005) at SEAD-12

ESIs were conducted in 1994 for SEAD-12A and SEAD-12B and included the sampling and analyses of surface and subsurface soil, groundwater, surface water, and sediment. The SEAD-12 RI began in 1997, and consisted of geophysical investigations; radiological investigations; a soil gas survey; test pitting; sampling and analysis of surface and subsurface soil, groundwater, surface water and sediment; a baseline human health risk assessment; an ecological investigation; and a screening-level ecological risk assessment. Both chemical and radiological analytes were considered during the RI. The radiological investigations included investigations of building interiors, the surrounding open areas, and disposal sites that were identified throughout SEAD-12. The radiological investigations were conducted in accordance with guidance provided by NRC regulations (i.e., NUREG 1500, 1505, 1507, 1507, 5849), in the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM-NUREG-1575, EPA 402-R-97-016), in EPA's *Methods for Evaluating the Attainment of Cleanup Standards* (EPA 230-R-94-004, 1992), and the investigation work plan.

As part of the geophysical survey completed at SEAD-12, four surface and 44 subsurface anomalies were identified and marked as locations that had a potential to contain buried metallic objects. Based on the electromagnetic (EM) survey data, utilities information, and visual observations, the four surface anomalies and 16 of the subsurface anomalies were eliminated from the list of anomalies requiring further investigation. Ground penetrating radar (GPR) was then used to further characterize the subsurface, and the GPR confirmed the presence of 25 of the 28 anomalies. Test pits were excavated and used to investigate the 25 subsurface anomalies. The remaining three anomalies not confirmed by the GPR could not be investigated because they were either small ground conductivity anomalies and could not be reproduced or were small or moderate single source surface anomalies. As a result of the test pitting work, military-related debris was found at several potential release areas: Disposal Pit A/B, Disposal Pit C, Building 819 and EM-27, and Building 815, Building 816, and EM-28 A radiological survey of SEAD-12 and SEAD-72 (i.e., Building 803) buildings was conducted between 1998 and 2001, and the survey served as both a characterization and final status survey of the facilities.

Analytical data collected for SEAD-12 during the ESI and RI are presented, summarized, and discussed in the *SEAD-12 Remedial Investigation Report* and the *Final Radiological Survey Report.* These data were also evaluated in the baseline human health risk assessment (BRA) and the screening-level ecological risk assessment (SLERA), and the results of these assessments are presented in the SEAD-12 RI report. A SRI was conducted in SEAD-12 in 2004 and 2005 to further investigate the extent of TCE found in groundwater in the area of Buildings 813/814 and the level of Lead 210 (210Pb), a radioactive decay product of radium (Ra) found in the area of EM-5. The SRI included: (1) installation of temporary monitoring wells adjacent to monitoring well MW12-37 where the elevated TCE concentration (1,600 µg/L) was detected during the RI; (2) sampling and analysis of groundwater, surface water, and ditch soil for volatile organic compound (VOC) content to determine the extent of TCE impacts in the Buildings 813/814 area; (3) a test pit investigation north of the

Buildings 813/814 to investigate the extent of TCE contamination present in soil; and, (4) re-sampling and gamma isotope analysis of ^{226}Ra and ^{210}Pb in EM-5 soil using a Modified Department of Energy (DOE) Environmental Measurement Laboratory (EML) HASL-300 Method to determine whether or not the levels observed during the RI were representative of actual site conditions. The standard operating procedure for the Modified DOE EML HASL-300 Method is presented in the SRI report.

Removal Action (2009)

Between July and November 2009, the Army conducted a removal action in historic waste burial pits located within land previously designated as SEAD-12A, which is located in the northeast corner of SEAD-12. The Army chose to perform the removal action to perform a housekeeping effort and remove the military related debris even though there was no risk identified in the RI. The goal of the removal action was to excavate material contained within the pits and allow the Army to examine the contents so that military-related items could be identified, removed, and secured, pending any final demilitarization, dismantling, and disposal. Prior CERCLA investigations of the burial pit sites had indicated that military-related items were commingled with other debris, but that the combined disposed materials did not pose any unacceptable risk or threat to the environment or human health. The removal action also allowed the Army to more thoroughly examine and characterize other materials that had been placed in the pits to further ensure that previously unidentified hazardous substances were not present and that the historic disposal pits did not represent a potential future source of contaminant release.

During the removal action, an increased number of military-related items were identified than had been anticipated prior to the beginning of the construction effort. Recovered military-related items were not found to coexist with conventional chemical hazardous substances at concentrations of particular concern, but in many cases the recovered military-related items did exhibit levels of residual radiation at levels in excess of regional background. All identified military-related items were recovered and secured, and non-radioactive military-related items were demilitarized and disposed or recycled at off-site, approved facilities. 5433 tons of soil and comingled debris were disposed of at an off-site licensed landfill, 122 ton of material were recycled and 13.25 tons of military-related items with radiological residuals in excess of background levels were secured and disposed of at an off-site licensed low-level radioactive waste disposal site located in Utah.

Soil samples were collected at locations within and around the excavation site to characterize the surrounding area, with the aim to confirm that chemical and radiological hazardous substances did not remain on-site subsequent to the completion of the work. Residual levels of conventional chemical contaminants were assessed by the comparison of identified concentrations to pertinent state and federal soil cleanup guidance levels. Residual concentrations of radioactive materials and chemical constituents remained at the excavation sites were evaluated by analyzing results of a confirmation survey.

The procedures used and the results of the previous work performed in SEAD-12 are described in detail in the following reports, and are summarized below within this document:

- *Final Remedial Investigation at the Radiological Waste Burial Sites (SEAD-12)*;
- *Final Radiological Survey Report – SEAD-12*;
- *Final Supplemental Remedial Investigation Report, Radiological Waste Burial Sites (SEAD-12)*;
- *Final Feasibility Study Report, Radiological Waste Burial Sites (SEAD-12); and,*
- *SEAD-12 Construction Completion Report*.

SEAD-72

Previous work conducted at SEAD-72 includes radiological monitoring and the RCRA Closure of the Building. These activities are described in the following reports:

- *Final Radiological Survey Report – SEAD-12;and,*
- *Closure Report for the Former Mixed Waste Storage Facility, Building 803 (SEAD-72)*.

RESULTS OF THE PRIOR ENVIRONMENTAL INVESTIGATION AND ACTIONS

SEAD-12 Chemical Impacts

Analytical data collected during the previous investigations were compared to the prevailing state and federal guidance values and, where applicable, standards. State of New York regulatory standards used included the Class GA groundwater standards. State guidance levels considered included Technical Guidance for Screening Contaminated Sediments; the Class C Surface Water Ambient Water Quality Standards (AWQSs); and, for soil, the NYSDEC's Soil Cleanup Objectives (SCOs) identified in Title 6 New York Code of Rules and Regulations (NYCRR) Part 375-6.8(a) - Environmental Remediation Programs in 2006. Title 6 NYCRR Subpart 375-6.8 includes SCO tables developed for unrestricted use and restricted use scenarios. Federal reference values considered included *Maximum Contaminant Limits (MCLs) for Drinking Water* and EPA *Regional Screening Levels for Contaminants at Superfund Sites* (EPA, 2009).

SEAD-12 Soil Investigations

Soil investigation results discussed in this section include all soil investigation results from the ESI, RI, and SRI that represented SEAD-12 conditions at the time the risk assessment was conducted, and a more focused examination of soil sampling results from the vicinity of the historic burial pits where the removal action for the recovery of military-related items was performed in 2009.

ESI and RI Soil Results

Table 1 (following page) presents a comparison of the ESI and RI soil analytical results to the NYSDEC Unrestricted Use SCOs and adjusted EPA Regional Screening Levels (RSLs) for residential soil. The EPA RSL for residential soil have been adjusted by multiplying values listed for non-carcinogenic compounds by a factor of 0.1 prior to comparing them to measured soil concentrations, while carcinogenic compound concentrations are compared to the full RSL value listed. This evaluation procedure is conservative and similar to that which is done to screen analytical data prior to a human health risk assessment. The table evaluates all SEAD-12 soil data except the data collected from Buildings 813/814 area during the SRI. **Table 1** only summarizes information pertinent to those compounds that are observed at concentrations in excess of one or both of the compared levels (i.e., adjusted RSLs or State SCOs) as these compounds represent the species that are most likely to pose potential risk or hazard during a risk assessment.

In order to evaluate SEAD-12 soil exposure point concentrations, the 95th upper confidence limit (UCL) of the arithmetic mean (hereafter referred to as 95th UCL) was calculated for each analyte found to exceed one or the other, or both of the identified information values using the EPA ProUCL Version 4.00.02 program. The 95th UCL is considered a conservative estimate of the exposure point concentration and is a more realistic representation of the likely exposure level present at a location of interest.

As shown in **Table 1**, the 95th UCLs are at or less than the NYSDEC Unrestricted Use SCO levels for all analytes, with the exception of zinc. The 95th UCL calculated for zinc is 217 mg/kg, above NYSDEC's Unrestricted Use SCO of 109 mg/kg. The average zinc concentration in SEAD-12 soil (114 mg/kg) is only slightly above the NYSDEC SCO. It should be noted

Table 1
SEAD-12 Soil Summary

Parameter	Units	Maximum Detected Value [1]	EPA ProUCL Recommended 95^{th} UCL Value [2]	NYSDEC Unrestricted Use SCO [3]	EPA Regional Screening Level for-Residential Soil [4]
Acetone	ug/kg	160	12	50	6,100,000
Methylene chloride	ug/kg	180	7	50	12,000
Total Xylenes	ug/kg	520	15	260	63,000
Trichloroethene	ug/kg	54	3	470	2,800
4-Methylphenol	ug/kg	930	29	330	31,000
Benzo(a)anthracene	ug/kg	6,200	218	1,000	150
Benzo(a)pyrene	ug/kg	5,400	132	1,000	15
Benzo(b)fluoranthene	ug/kg	4,800	124	1,000	150
Benzo(k)fluoranthene	ug/kg	6,100	138	800	1,500
Chrysene	ug/kg	6,800	229	1,000	15,000
Dibenz(a,h)anthracene	ug/kg	1,500	65	330	15
Indeno(1,2,3-cd) pyrene	ug/kg	3,000	82	500	150
4,4'-DDD	ug/kg	51	1.9 [5]	3.3	2,000
4,4'-DDE	ug/kg	490	2.0 [5]	3.3	1,400
4,4'-DDT	ug/kg	110	2.0 [5]	3.3	1,700
Alpha-BHC	ug/kg	51	3	20	77
Aroclor-1254	ug/kg	3,000	80	100	220
Aroclor-1260	ug/kg	440	33	100	220
Dieldrin	ug/kg	40	4	5	30
Endrin	ug/kg	20	3	14	1,800
Arsenic	mg/kg	11.1	4	13	0.39
Cadmium	mg/kg	94.3	3	2.5	7
Chromium	mg/kg	83.3	18	30	12,000
Copper	mg/kg	215	26	50	310
Iron	mg/kg	53,400	23,019	NA	5,500
Lead	mg/kg	431	33	63	400
Manganese	mg/kg	4,110	579	1,600	180
Mercury	mg/kg	1	0.07	0.18	2.3
Nickel	mg/kg	201	30	30	150
Silver	mg/kg	11.9	0.3	2	39
Zinc	mg/kg	6,080	217	109	2,300

1. Total soil dataset excluding samples from the Supplemental Remedial Investigation and samples from Buildings 813 & 814.
2. EPA Pro UCL V 4.00.02 was used to generate the recommended 95^{th} UCL value. Bold values represents values calculated with a limited number of detects, typically 5-8 detects were used.
3. NYSDEC Unrestricted Use Soil Cleanup Objectives (SCO) Part 375-6.8(a). On-line resource available at http://www.dec.ny.gov/regs/15507.html#15513
4. Regional Screening Levels for Chemical Contaminants at Superfund Sites, May, 2008. Screening level for chromium III was used for chromium. Screening level for nickel (soluble salts) was used for nickel. Screening level for manganese in water was used for manganese.
5. The 95^{th} UCLs from the EPA ProUCL V4.00.02 Program for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT are 3.8 µg/kg, 8.2 µg/kg, and 4.5 µg/kg, respectively. The detection frequencies of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT are relatively low (i.e., 5%, 8%, and 9%, respectively). The 95^{th} UCLs computed based upon dataset with low detection frequency may not be considered reliable to assess potential impact on the human health and the environment. According to the ProUCL User Guide, "when most (e.g., > %95) of the observations for a contaminant lie below the detection limit(s) or reporting limits (RLs), the sample median or the sample mode (rather than the sample average which cannot be computed accurately) may be used as an estimate the EPC term." For 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, over 95% of the observations are lower than the reporting limits; therefore, the median concentrations are more appropriate to represent the SEAD-12 soil conditions. Therefore, the median concentrations are presented in the table. The median concentrations are 3.8 U µg/kg, 3.9 U µg/kg, and 3.9 U µg/kg, respectively, for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT. That is, if half reporting limits were used to represent the concentrations for non-detects, the median concentrations of 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT in SEAD-12 soil would be 1.9 µg/kg, 2.0 µg/kg, and 2.0 µg/kg, respectively.

that the Unrestricted Use SCO for zinc is not a risk-based criteria. According to the *Development of Soil Cleanup Objectives Technical Support Document* (NYSDEC and NYSDOH, 2006), the Unrestricted Use SCO is based on the rural soil background concentration as determined by NYSDEC and the NYSDOH rural soil survey. The 95^{th} UCL of zinc is lower than the human health-based SCO for the Unrestricted Use scenario, as presented in the *New York State Brownfield Cleanup Program Development of Soil Cleanup Objectives Technical Support Document*, Table 5.6-1 (217 mg/kg vs. 1,100 mg/kg). Further, the baseline risk assessment indicates that zinc in SEAD-12 soil does not pose significant risks to human health or the environment.

The 95^{th} UCLs are lower than the adjusted EPA Regional Screening Levels (RSLs) for all analytes except benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, arsenic, iron, and manganese. The 95^{th} UCLs for benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, arsenic, and manganese are all below their respective NYSDEC Unrestricted Use SCO values; NYSDEC does not list a SCO for iron.

SRI Soil Results

Multiple TCE concentrations detected in the soil surrounding Buildings 813/814 exceeded the NYSDEC SCOs and the EPA RSLs for residential soils. All other contaminants detected in soil in the Buildings 813/814 area were lower than the NYSDEC Unrestricted Use SCOs and the EPA RSLs. All of the soils with elevated concentrations of TCE were excavated in the fall of 2004. The excavated material was stockpiled on-site and sampled. Soil that met the cleanup criteria established at that time, the New York State Technical and Administrative Guidance Memorandum (TAGM) values, was used as backfill. Soils with concentrations exceeding the TAGMs were staged and treated by tilling of the stockpiles, after treatment, all soil met the TAGMs and was backfilled on-site by 2006. However, there is the potential that impacted soil may remain on-site under the footer and foundation of the building, which was not further investigated due to concerns of the building's structural integrity.

Removal Action Soil Results

Soil samples were collected from the base, sidewall, and perimeter of all excavations completed during the removal action at the historic burial pits to confirm that hazardous substances were not present at levels that could present potential risk or hazards to human health or the environment. In addition, soil samples were also collected from overburden soils used for backfill at two of the burial pit excavation sites that originated from areas around the deeper burial pit excavations and which were found to be free of debris and any evidence of radiation in excess of background levels. **Table 2** (following page) presents a summary of the analytical results reported for these soil samples and compares them to NYSDEC's Unrestricted Use SCOs and adjusted EPA RSLs for residential soil; only those compounds/analytes that are found at concentrations in excess of either or both of the comparator guidance values are listed.

Table 2
SEAD-12 Soil Summary – Post Removal Action

Parameter	Units	Maximum Detected Value [1]	EPA ProUCL Recommended 95th UCL Value [2]	NYSDEC Unrestricted Use SCO [3]	EPA Regional Screening Level for-Residential Soil [4]
Benzo(a)anthracene	μg/Kg	190	63.7	1,000	150
Benzo(a)pyrene	μg/Kg	140	55.4	1,000	15
Benzo(b)fluoranthene	μg/Kg	170	71.2	1,000	150
4,4'-DDD	μg/Kg	6.9	CC [?]	3.3	2,000
4,4'-DDE	μg/Kg	5.9	1.2	3.3	2,,000
4,4'-DDT	μg/Kg	9.8	2.0	3.3	1,700
Alpha-BHC	μg/Kg	210	10.9	20	77
Beta-BHC	μg/Kg	63	CC [?]	36	270
Delta-BHC	μg/Kg	61	5.7	40	NA
Aluminum	mg/Kg	35,100	12195	NA	7,700
Arsenic	mg/Kg	12.2	4.56	13	0.39
Chromium	mg/Kg	51.2	19.4	30	12,000
Cobalt	mg/Kg	29	10	NA	2.3
Copper	mg/Kg	61.4	25	50	310
Iron	mg/Kg	56,400	22423	NA	5,500
Manganese	mg/Kg	1650	556	1600	180
Nickel	mg/Kg	75	31	30	150
Vanadium	mg/Kg	68	22	NA	0.55
Zinc	mg/Kg	154	65.6	109	2,300

1. Total soil dataset includes results from confirmatory samples collected from excavation limits and from overburden stockpile used as backfill at excavation sites.

2. EPA Pro UCL V 4.00.02 was used to generate the recommended 95th UCL value. Bold values represents values calculated with a limited number of detects, typically 5-8 detects were used. CC is used to designate analytes for which 95th UCLs cannot be calculated due to an insufficient number of detected results.

3. NYSDEC Unrestricted Use Soil Cleanup Objectives (SCO) Part 375-6.8(a). On-line resource available at http://www.dec.ny.gov/regs/15507.html#15513

4. Regional Screening Levels for Chemical Contaminants at Superfund Sites, May, 2008. Screening level for chromium III was used for chromium. Screening level for nickel (soluble salts) was used for nickel. Screening level for manganese in water was used for manganese.

Six pesticides and five metals were detected in one or more of the soil samples at concentrations that exceeded their respective NYSDEC Unrestricted Use SCO levels, but of these 11 compounds only nickel exhibited a 95th UCL value that was higher than its Unrestricted Use SCO value (i.e., 31 versus 30 mg/Kg). Nickel's 95th UCL value reported for soils left at the historic burial pit sites is less than the EPA's adjusted RSL for residential soil (150 mg/Kg).

Three semivolatile organic compounds, one pesticide, and six metals were found at concentrations in excess of EPA's adjusted RSL for residential soil in one or more of the soil samples from the burial pit sites. Of these 10 analytes, the 95th UCL value computed for each of the metals and one of the semivolatile organic compounds [i.e., benzo(a)pyrene] also exceeded the adjusted screening value. However, each of the 95th UCLs computed for the metal analytes of interest at the historic burial pits site are lower than comparable values computed for regional background soils.

SEAD-12 Sediment/Drainage Ditch Soil Investigation

During the ESI and RI, 54 sediment samples were collected from locations inside of SEAD-12 and 11 sediment samples were collected from locations downgradient of SEAD-12 (Reeder Creek); each of these samples was analyzed for VOCs, semivolatile organic compounds (SVOCs), pesticides/ polychlorinated biphenyls (PCBs), and metals. The results are summarized in **Table 3**. In addition, nine sediment samples were collected from upgradient locations (southern portion of SEAD-12) and within SEAD-12 for metal analysis. All the sediment samples were collected from the bottom of the drainage or creek ditches. The ditches were often dry and the collected samples could more appropriately be described as ditch soil, rather than being characterized as sediment. The maximum concentrations for most polycyclic aromatic hydrocarbons (PAHs) and metals with exceedances were found at location SD12-32, which was just north of Buildings 815/816.

During the SRI, seven ditch soil samples were collected from the drainage ditch adjacent to Buildings 813/814 to assess whether it was being impacted by VOCs associated with the suspected groundwater contamination in this area. Acetone and toluene were the only VOCs detected in the ditch soil samples collected during the SRI. Acetone was detected in two out of eight ditch soil samples. The two detects were above the NYSDEC Unrestricted Use SCO (72 µg/kg and 110 µg/kg vs. 50 µg/kg); but both detects were below the reporting limits, which means the concentrations were very low and were estimated values. All detected toluene concentrations were lower than its respective NYSDEC Unrestricted Use SCO. Sediment/ditch soil was not considered a media of concern.

Table 3
Comparison of SEAD-12 Sediment Concentrations and Sediment/Ditch Soil Criteria

Compound	SEAD-12 Maximum Detected Sediment Concentration (mg/kg)	NYSDEC Sediment Criteria (mg/kg)	NYSDEC Unrestricted Use SCO [3]	EPA Regional Screening Level for-Residential Soil [4]	SEAD-12 Background Maximum Detected Concentration (mg/kg)
Toluene	0.02	0.0027	0.7	5,000	NA
Anthracene	0.83	0.0058	100	17,000	NA
Benzo(a)anthracene	3.1	0.000648	1	0.15	NA
Benzo(a)pyrene	3.3	0.0702	1	0.015	NA
Benzo(b)fluoranthene	3.2	0.0702	1	0.15	NA
Benzo(k)fluoranthene	2.7	0.0702	0.8	1.5	NA
Chrysene	3.2	0.0702	1	15	NA
Fluorene	0.34	0.000432	30	2,300	NA
Indeno(1,2,3-cd)pyrene	2	0.0702	0.5	0.15	NA
Naphthalene	0.049	0.0016	12	3.6	NA
Pyrene	5.4	0.0519	100	1,700	NA
4,4'-DDD	0.11	0.00054	0.0033	2	NA
4,4'-DDE	0.076	0.00054	0.0033	1.4	NA
4,4'-DDT	0.2	0.00054	0.0033	1.7	NA
Arochlor-1254	1.2	0.0000432	0.1	0.22	NA
Arochlor-1260	0.037	0.0000432	0.1	0.22	NA
Endosulfan I	0.0036	0.00162	2.4	NA	NA
Heptachlor epoxide	0.011	0.0000432	NA	0.053	NA
Antimony	2.8	2	NA	31	ND
Arsenic	19.1	6	13	0.39	9.3
Cadmium	9	0.6	2.5	70	ND
Chromium	130	26	30	120,000	31.6
Copper	1160	16	50	3,100	49.3
Iron	85900	20000	NA	55,000	45300
Lead	215	31	63	400	35.8
Manganese	14000	460	1,600	1,800	1200
Mercury	1.7	0.15	0.18	10	0.09
Nickel	126	16	30	1,500	67.9
Silver	1.5	1	2	390	ND
Zinc	2650	120	109	23,000	135

Key: mg/kg = milligrams per kilogram; ND = Not Detected; NA = Not Available

SEAD-12 Groundwater Investigation

During the ESI and RI, approximately 90 groundwater samples (including field duplicates) were collected from 39 SEAD-12 monitoring wells and analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. In addition, 12 groundwater samples were collected for metal analysis from six upgradient or side-gradient monitoring wells (i.e., MW12-1, MW12-2, MW12-3, MW12-4, MW12-5, and MW12-6).

Results from the SEAD-12 ESI/RI groundwater investigation are summarized in **Table 4.** Four organic and four metal compounds were detected in the samples collected at levels above NYSDEC's GA groundwater standards. With reference to the organic compounds, each of the compounds found at levels in excess of the GA standards were detected infrequently (1, 2, or 3 times), and were detected at isolated locations within the 360 acre AOC or during one sampling event but not the other, and as such are not indicative of a persistent long-term release, or a cohesive plume. The noted TCE exceedance was limited to well location MW12-37, which was located north of Building 813. The noted exceedances for bis(2-ethylhexyl)phthalate and benzo(a)pyrene were each found in separate wells, during only one of the two RI sampling events.

Similarly, the noted occurrences for one of the metals (i.e., antimony) were all found in wells that are not closely or contiguously located during the second of the two RI sampling events. The other three metals (iron, manganese, and sodium), were more frequently found at levels in excess of the GA standards; however, the noted exceedances are only observed during one of the two sampling events conducted at a specific well, suggesting that they were associated with specific events that occurred during the sampling. For example, manganese is commonly only seen in a particular well during one round of the groundwater sampling. Iron on the other hand is commonly found in the wells at elevated levels during both RI sampling events, but in this case, when it is found during the second event, the measured level is lower. For both iron and manganese, this suggests that the initial well installation, construction, and development process may have contributed to the noted high concentrations of these materials in the well as particles of soil from the surrounding stratigraphic horizon which may be present in many of the samples. Sodium levels were always highest during the second sampling event which occurred in December, and may be the direct result of the application of road salt to the areas road surfaces during the winter time. The level of sodium is lower during the spring event, as the level of salt use diminishes and the spring flow of surface water and groundwater increases.

Table 4
Comparison of Maximum Groundwater Concentrations at SEAD-12 and Groundwater Criteria

Compound	Maximum Groundwater Concentration [1] (μg/L)	NYSDEC GA Groundwater Standard (μg/L)	Maximum Detected Concentration in Upgradient/Side-gradient Wells (μg/L)
Bis(2-Ethylhexyl)phthalate	230	5	NA
Benzo(a)pyrene	0.097	ND	NA
Di-n-octylphthalate	0.41	NA	NA
Antimony	43.2	3	2.7
Iron	20,700	300	1,320
Manganese	3,280	300	86.6
Sodium	408,000	20,000	26,400

Key: μg/L = micrograms per liter; ND = Not Detected; NA = Not Available.

1. All ESI, RI, and SRI data for on-site samples were included in the table with the noted exception that MW12-37 (and surrounding impacted soil) were removed during the SRI, and results from MW12-37 are no longer representative of site conditions and are not included in this table.

At the conclusion of the RI, the only groundwater concern identified as requiring additional evaluation was the presence of TCE and cis-1,2-dichloroethene (cDCE) in well MW12-37, which was located in close proximity to Buildings 813/814. During the RI, a TCE concentration of 1,600 μg/L was detected at MW12-37 during each of the two sampling rounds, while a concentration of 30 μg/L was found for cDCE during the second sampling event. A TCE concentration of 0.5 μg/L was noted in well MW12-40, which is roughly 400 to 500 feet northwest of MW12-37 during the first sampling event, but was not detected during the second sampling event. None of the other wells in close proximity to MW12-37 showed any indication of TCE.

To address the possible presence of a “chlorinated solvent plume” in the vicinity of Building 813/814, the Army initiated the SRI and installed a network of temporary monitoring wells in the area surrounding Buildings 813/814 and MW12-37 to further delineate the extent of the potential plume. Fifteen groundwater samples were collected and analyzed from the temporary and permanent well network, and the only location that was observed to contain either DCE or TCE at levels in excess of the GA groundwater standards was well MW12-37. Two other temporary wells were also observed to contain TCE, but in each of these cases, the reported concentration was below the GA standard. None of the temporary wells were observed to contain any measureable level of DCE.

Based on this determination, the Army believed that the probable source of the observed “chlorinated solvent plume” was located in close proximity to well MW12-37, and conducted an excavation to identify its source. Approximately 230 cubic yards of soil were excavated from the area between the northern end and northeastern corner of Building 813 and the neighboring drainage ditch surrounding well MW12-37. As the soil was excavated, samples were collected and it was determined that TCE was present in the excavated soils at concentrations ranging from not detected and 1.3 J μg/Kg up to 65,000 μg/Kg. Based on these findings, it was determined that the excavated soil was the likely source of the identified groundwater exceedance noted in MW12-37. This contaminated soil was isolated from soils that were not found to be contaminated, and staged on polyethylene away from the excavation site. At the conclusion of the investigation, clean soil from the excavation site was used as backfill in the excavation area, which was graded off to promote positive surface water flow away from the site. At the completion of the SRI, as concluded in the FS, groundwater in the vicinity of Building 813/814 is no longer a medium of concern at SEAD-12, except for underneath the buildings.

Surface Water Investigation

Surface water within SEAD-12 is not currently classified by the NYSDEC, and not subject to current regulation. Surface water flows through man-made drainage ditches that were constructed by the Army to promote surface water flow away from the occupied lands within the former Depot. In some cases, these drainage ditches serve as infiltration basins, where captured runoff waters pool or pond, and either infiltrate into the ground or evaporate into the atmosphere. Occasionally (e.g., seasonal snow melt or major storm run-off events), positive surface water flow occurs between the man-made drainage ditches and downgradient receptor creeks and streams, which are also not currently classified. However, as a conservative measure, the results of surface water samples collected from the drainage ditch location within SEAD-12 have been compared to NYSDEC Class C ambient water quality standards (AWQSs). Results of this analysis are summarized below.

During the ESI and RI, 52 surface water samples (including field duplicates) were collected from SEAD-12, while 12 additional samples were collected from locations downgradient of SEAD-12; all of these samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. In addition, nine upgradient surface water samples were collected for metal analysis.

Table 5 summarizes comparison of the SEAD-12 surface water concentrations and the NYSDEC AWQSs for Class C surface water. Six pesticides exceeded their respective AWQS Class C surface water values; however, the pesticide exceedances were lower than the laboratory reporting limits, which means the concentrations were very low and were estimated values.

Seven metals were found at concentrations above their respective NYSDEC AWQS comparative values for Class C surface water. The mercury levels detected are considered the most significant. Three of the four locations where the

Table 5
Comparison of Maximum Surface Water Concentrations at SEAD-12 and Surface Water Criteria

Compound	SEAD-12 Maximum Surface Water Concentration [1](μg/L)	NYSDEC AWQS Class C Surface Water (μg/L)	SEAD-12 Maximum Background (μg/L)
Bis(2-Ethylhexyl)phthalate	12	0.6	NA
Benzo(a)pyrene	0.6	NA	NA
Aroclor-1242	0.44	0.00012	NA
4,4'-DDE	0.0056	0.000007	NA
4,4'-DDT	0.062	0.00001	NA
Aldrin	0.0041	0.001	NA
Heptachlor	0.0063	0.0002	NA
Heptachlor Epoxide	0.0033	0.0003	NA
Hexachlorobenzene	0.02	0.00003	NA
Aluminum	3,430	100	140
Cobalt	6	5	ND
Copper	27.6	17.36 [2]	3
Iron	6,830	300	184
Lead	35.4	8.7 [2]	ND
Mercury	0.11	0.0007	ND
Silver	1.6	0.1	ND

Key: μg/L = micrograms per liter; ND = Not Detected; NA = Not Available

1. All ESI, RI, and SRI data for both on-site and downgradient samples were included.
2. Based on the SEAD-12 surface water hardness of 217 mg/L.

mercury standard was exceeded (surface water sample locations SW12A-2, SW12A-1, and SW12-16) occurred in a drainage ditch south of Disposal Pit A/B and Disposal Pit C, while the fourth location, surface water sample location SW12-35, is approximately 350 feet south of the drainage ditch.

During the SRI, seven surface water samples were collected from the drainage ditch adjacent to Buildings 813/814 to assess whether or not the surface water was impacted by VOCs. No VOCs were detected in any of the SRI surface water samples. Surface water was not considered a media of concern.

SEAD-12 Radiological Impacts

Soils

The radiological building survey concluded that all buildings in SEAD-12 are in compliance with the cleanup guideline (i.e., 10 mrem/yr) provided in the NYSDEC *Cleanup Guidelines for Soils Contaminated with Radioactive Materials* (DSHM-RAD-05-01). The NYSDEC cleanup guideline value is the lowest (i.e., most stringent) of those that are published by the NYSDEC, the EPA, and the NRC. Results of the radiological building survey are presented and discussed in the *Final Radiological Survey Report*. The report also recommends reclassifying Buildings 815 and 816 to Class III areas and the remainder of Buildings 806, 810, and 812 from Class III to limited Class III.

As part of the RI data radiological evaluation process, site-specific soil datasets for each the identified potential release areas and AOC-wide groundwater, surface water, and sediment datasets were statistically compared to SEAD-12 background radiological results, using the Wilcoxon Rank Sum (WRS) test, and if the specific datasets were found to be different than background levels, they were then compared to background radiological levels that were adjusted for Derived Concentration Guideline Levels (DCGLs) for residential exposures, and background levels that were added to DCGLs for worker exposures. All locations where background samples were collected for the establishment of the background radiological measurement datasets were outside and either up- or cross-gradient of SEAD-12. More detailed information regarding the background dataset and how it was used in the evaluation of radionuclide levels in soils is provided in the accepted Final RI Report (Parsons, 2002).

Based on this analysis process, 14 radionuclides were determined to exceed background levels at one or more of the study areas within SEAD-12. These radionuclides are shown and highlighted in **Table 6**. Of the 14 radionuclides that were found at concentrations in soil above background, five radionuclides (Bismuth-214 [^{214}Bi, seven study areas], Lead-210 [^{210}Pb, six study areas], Lead-214 [^{214}Pb, two study areas], Radium-226 [^{226}Ra, seven study areas] and Thorium-230 [^{230}Th, one study area]) were also observed at concentrations that exceeded background plus residential DCGL criteria levels. Additionally, soil radiological exceedances of background plus worker DCGLs were noted for ^{210}Pb and ^{226}Ra at EM-5, and ^{226}Ra at EM-6.

The ^{230}Th exceedance was found in soil collected within the bounds of the wastewater treatment plant, which is an active municipal treatment system that is located at the north end of the former Depot. This property continues to be used for municipal purposes. ^{226}Ra, ^{214}Pb, ^{214}Bi, and ^{210}Pb are all natural daughters within the Uranium-238 (^{238}U) decay chain (See **Figure 3**), which is the most abundant form of uranium found in nature. ^{238}U is a known component or contaminant of Marcellus Shale (i.e., Hamilton Group of Middle Devonian shales), which underlies most of western New York and the Seneca Army Depot Activity as is shown by the regional cross section (**Figure 4**) first presented in the *SEAD-12 Remedial Investigation Report*. Further, Seneca County is also known to have a history of elevated levels of radon, a member of the ^{238}U decay chain, which also decays to ^{214}Pb, ^{214}Bi, and ^{210}Pb. Both of these natural factors contribute to the noted DCGL exceedances for radionuclides within the various study areas within SEAD-12. During the FS, the WRS test results reported in the RI for ^{226}Ra at EM-5 and EM-6 were found to be in error due to a computation mistake and the ^{226}Ra results for EM-5 and EM-6 were actually less than background plus DCGL for residential values.

The radiological soil data for ^{226}Ra were evaluated further, by running a one-way parametric analysis of variance test to compare the means of the potential release areas. The analysis of a box-and-whisker plots for ^{226}Ra, shown in **Figure 5**, illustrate that within the standard deviation of the background, ^{226}Ra data are not significantly different from background. These results indicate that ^{226}Ra distributions from all the sites are similar to each other as well as the background distribution. Based on this analysis, it can be concluded that ^{226}Ra detected in soil at SEAD-12 is part of the background distribution and not associated with site activity.

As part of the RI, test pits were excavated to investigate electromagnetic anomalies identified at study area EM-5 and based on these test pits the buried debris was found to contain pieces of metal roofing, nails, re-bar reinforced concrete, and other construction debris as well as horseshoes, square nails, broken glass, pottery shards, non-reinforced concrete, and other metal debris that appeared to be associated with prior residential and farming activities that were located in this location prior to the U.S. Government's ownership of the land. The radiological results showed the elevated levels of ^{210}Pb. The SRI did not detect elevated levels and concluded that the elevated levels were a result of uncertainty in the analytical measurement at the laboratory.

Radiological data were also collected for groundwater, surface water, and sediment. During the collection of these data, datasets were prepared and evaluated for background and site-wide SEAD-12 areas for all media, as well as a downgradient dataset for surface water and sediment. The SEAD-12 site-wide and downgradient datasets for each media were statistically compared to the background dataset for the same media using the WRS test and the radionuclides found to be statistically different than background were retained for further characterization and analysis in the risk assessment. Summary presentation of the groundwater, surface water and sediment data sets for radiological constituents are provided below.

<u>Groundwater</u>

Fifteen radionuclides were detected in at least one of the 16 background groundwater samples characterized. Nineteen of 21 radionuclides were detected in at least one of the 92 groundwater samples collected within SEAD-12. Levels measured in two site samples and one background samples exceeded the proposed federal MCL (still pending) for Radon-222 (^{222}Ra, 300 pCi/L), with the background level being highest at 344 pCi/L. Based on the WRS test, only one radionuclide (^{232}Th) was found to have a population statistically different from the background dataset. Based on this finding, the potential risks associated with ^{232}Th in groundwater were evaluated in the human health risk assessment.

Table 6
Radiological Exceedance Summary – Total Soils
Seneca Army Depot Activity

Soils Surface and Subsurface	Building 819/ EM27			Building 815-816/ EM-			Disposal Pit A/B			Disposal Pit C			Former Dry Waste			EM-5			EM-6			Class III			WW Treatment		
	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work	Exceed Bkgd WRS	Exceed DCGL Resd	Exceed DCGL Work
Compound																											
Gross Alpha																											
Gross Beta																											
Actinium-228																											
Bismuth-214	X	X		X	X		X	X		X	X		X			X	X		X	X		X	X				
Cesium-137	X																					X					
Cobalt-57																											
Cobalt-60																						X					
Lead-210	X	X		X	X		X	X		X	X					X	X	X				X	X				
Lead-211																X			X			X	X				
Lead-214				X	X		X	X											X								
Plutonium-239/240																											
Promethium-147																											
Radium-223				X			X			X			X									X			X		
Radium-226				X	X		X	X		X	X		X	X		X	X	X	X	X	X	X	X				
Radium-228				X						X						X	X		X	X		X					
Thallium-208																											
Thorium-227																											
Thorium-230																									X	X	
Thorium-232				X												X			X								
Thorium-234																											
Tritium	X			X			X			X			X									X			X		
Uranium-233/234				X												X			X			X			X		
Uranium-235																											
Uranium-238				X												X						X					
Total by Area	4	2	0	10	4	0	6	4	0	6	3	0	4	1	0	8	4	2	7	3	1	11	4	0	4	1	0

Surface Water

Background and SEAD-12 surface water samples were analyzed for 20 radionuclides. Twenty radionuclides were detected in at least one of the nine background samples characterized. Seventeen of the 20 radionuclides analytes were detected in at least one of the 51 surface water samples collected from locations within SEAD-12. Four of the SEAD-12 samples exceed the proposed Federal MCL for ^{222}Ra. The maximum detection was 401 pCi/L compared to the proposed MCL of 300 pCi/L. Based on the WRS test, five radionuclides (Radon-222 [^{222}Rna], ^{227}Th, ^{230}Th, ^{232}Th, and $^{233/234}$U) have sample means statistically greater than the background dataset. Based on these determinations, the potential risks associated with ^{222}Rn, ^{227}Th, ^{230}Th, ^{232}Th, and $^{233/234}$U in surface water were evaluated in the human health risk assessment.

Fourteen radionuclides were detected in at least one of the 12 samples that were collected downstream of SEAD-12. None of the concentrations measured for radionuclides in downgradient samples exceeded established guidelines or standards for radionuclides in surface water. Based on the WRS test, three radionuclides (^{226}Ra, $^{233/234}$U, and ^{238}U) from downgradient samples have populations statistically higher than the background dataset. Based on these findings, the potential risks of ^{226}Ra, $^{233/234}$U, and ^{238}U in downgradient surface water were evaluated in the human health risk assessment.

Sediment

Fifteen of the 20 radionuclides characterized were detected in at least one of the nine background sediment samples collected as part of the SEAD-12 CERCLA investigations. Twenty-four of 26 radionuclides characterized were detected in one or more of the 53 sediment samples collected within SEAD-12. Based on the WRS test, two radionuclides (Cesium-137 [^{137}Cs] and ^{238}U) have data statistically greater than the background dataset. Thirteen of the 19 radionuclides analyzed were detected in one or more of the of the 11 downgradient sediment samples. Based on the WRS test, three downgradient radionuclides (Cobalt-60 [^{60}Co], $^{233/234}$U, and ^{238}U) have data statistically greater than the background dataset. Based on these determinations, ^{60}Co, $^{233/234}$U, and ^{238}U in sediment were evaluated in the human health risk assessment.

SEAD-12 Removal Action Radiological Impacts

Once military-related debris exhibiting higher than background levels of residual radiation were identified in the historic burial pits within SEAD-12, the Army's goal for the removal action expanded from the recovery and securing of debris that had been buried to ensuring that all excavated materials were fully characterized and evaluated before any final disposition determinations were made and before any site closeout operations were initiated and completed. As such, the revised approach included real-time radiological scanning of all excavated material, segregating material, and collecting and analyzing potential radiological material to confirm that once the burial pits were emptied, concentrations of radiation that remained were at levels that would allow for unrestricted use and unlimited exposures. Three samples of recovered radiological material and four smear samples exhibiting activity above background levels were sent to a laboratory for quick screen gamma spectroscopy analyses. The results of these samples were used to confirm the suspected radionuclide contaminants of concern (RCOCs). The *SEAD-12 Construction Completion Report* (Parsons, 2012) provides details of the investigation and results.

Based on the gamma spectroscopy results and on-site radiological screening results with a multi-channel analyzer, the primary RCOCs for the removal action work were determined to be ^{226}Ra and ^{232}Th. The release criteria used for the evaluation of the historic burial pits corresponded to the dose criterion of 10 mrem/yr (NYSDEC, 1993), which represents the lowest (i.e., most stringent) of three guidance values that are published by the NYSDEC, compared to EPA (15 mrem/yr) and the Nuclear Regulatory Commission (25 mrem/yr). According to this dose criterion, the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (TEDE) to an average member of the critical group that does not exceed 10 mrem/yr. The results of the survey at SEAD-12 were below this criteria level.

Levels of residual radioactivity that correspond to the allowable radiation dose are calculated by analysis of various scenarios and pathways through which exposures could be reasonably expected to occur. These derived concentration guideline levels, or DCGLs, are the concentration of residual radioactivity distinguishable from background that, if uniformly distributed throughout a survey unit, would result in a TEDE to an average member of a critical group equivalent to the allowable dose.

Systematic soil sample summary results for the surveys of Pits A/B and Pit C are provided in the summary shown below in **Table 7**. Biased soil sample summary results for the pits are provided in **Table 8**.

The full discussion of the procedures applied and the results achieved during the final survey of the burial pits sites is provided in the *SEAD-12 Construction Completion Report* as Appendix D.

The results of the final survey data indicate radiological levels found at the burial pit sites after the removal of the military-related items were consistent with background levels at a total effective dose equivalent of 10 mrem/yr of less, and therefore the areas were suitable for release for unrestricted use.

Table 7
Systematic Sample Results Summary

^{232}Th SUMMARY						
SURFACE SOIL (0-15 CM) CONCENTRATION						
Impacted Area	Number of Samples Collected	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
Pits A/B[1]	32	0.76	0.86	0.36	0.00	1.32
Pits C-1/C-2	50	0.79	0.83	0.34	0.00	1.70
^{226}Ra SUMMARY						
SURFACE SOIL (0-15 CM) CONCENTRATION						
Impacted Area	Number of Samples Collected	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
Pits A/B[1]	32	1.16	1.09	0.36	0.73	2.64
Pits C-1/C-2	50	0.98	0.95	0.20	0.69	1.69

Notes: (1) Sample statistics include overburden soil sample results.

Table 8
Biased Sample Results Summary

^{232}Th Summary						
Surface Soil (0-15 cm) Concentration						
Impacted Area	Number of Samples Collected	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
Pits A/B[1]	3	0.97	0.96	0.16	0.81	1.13
Pits C-1/C-2[2]	2	1.12	1.12	0.11	1.04	1.20
^{226}Ra Summary						
Surface Soil (0-15 cm) Concentration						
Impacted Area	Number of Samples Collected	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
Pits A/B[1]	3	1.01	1.08	0.14	0.85	1.09
Pits C-1/C-2[2]	2	1.07	1.07	0.18	0.94	1.19

Notes: (1) Three biased samples were collected
(2) One biased sample was collected

SEAD-72 Chemical Impacts

The former Mixed Waste Storage Facility, Building 803 (SEAD-72), was used for storage of mixed chemical and radiological wastes generated within adjacent facilities that were located within the SEAD-12. This facility operated as a greater than 90 day storage facility under Interim Status provisions of (RCRA until the Army's military mission terminated in 2000. This facility has been unoccupied and inactive since 1996, and has been a subject of CERCLA studies and investigations performed in SEAD-12 since approximately 1999.

As part of the termination of SEDA's RCRA permit, Building 803 was decontaminated during July of 2009 in accordance with a NYSDEC approved plan. The building was manually cleaned to the fullest extent practical through the use of rigorous industrial cleaning methods. All interior floor, wall, and ceiling surfaces were initially manually abraded using stiff bristle brushes to capture removable peeling paint, dirt, and other debris. Accumulated paint, dirt, and debris were recovered using broom and dust pan and high efficiency particulate air (HEPA) vacuums. Approximately one-half of a 55-gallon open head drum of dirt, debris, and paint chips were collected using the brushes and HEPA-vacuum. The debris were disposed as hazardous waste accordingly, due to lead based paint.

Once the removal of gross levels of debris was completed, interior floor, wall, and ceiling surfaces were decontaminated using a high pressure water wash. During the high pressure water wash cycles, the entry doorway to Building 803 was sealed to prevent the spread of wash and waste waters beyond the inside of the building and the containment area. All resulting wash and waste water from the high pressure water wash process were recovered, placed into a single fifty-five gallon drum, allowed to settle, and then recoverable solid components of the collected waste stream were removed and added to the accumulated dry debris container.

Upon the completion of the decontamination process, eight rinsate samples were collected from designated locations to confirm the degree of decontamination achieved. Confirmation sampling required at Building 803 was the collection of aqueous samples in accordance with the State of New York's *Rinsate Sample Collection Protocol* for the characterization of residual levels of five solvents previously used on the paper wipes that were stored in the building.

Analytical results from the rinsate samples are summarized on **Table 9**. The analytical results were compared to the 500 microgram per liter (μg/L) Toxicity Characteristic (TC) level for TCE described in 6 NYCRR 373.3(e) (also 40 CRF Part 261.24). This cleanup value was also used as the comparator value for isopropanol, Freon® 11, acetone, and toluene since there are no TC levels for these compounds. Concentrations of the five compounds detected in all rinsate samples were significantly below the TC cleanup value of 500 μg/L. Note that the decontamination activities did not generate any wastes containing radiological contamination. Based on this evaluation, the Army concludes that clean closure has been achieved for Building 803.

Table 9
Analytical Results for Confirmatory Rinsate Samples at Building 803 (SEAD-72)

Parameter	Unit	Maximum Concentration[1]	Comparator Value
2-Propanol (Isopropanol)	μg/L	ND @ 100	500
Acetone	μg/L	5.3	500
Toluene	μg/L	ND @ 5	500
Trichloroethene	μg/L	ND @ 5	500
Trichlorofluoromethane (Freon® 11)	μg/L	ND @ 5	500

Note 1: ND @ X means Not Detected at the concentration indicated.

SEAD-72 Radiological Impacts

In 1993, NYSDEC and New York State Department of Health (NYSDOH) conducted radiological monitoring at SEAD-72. The radiological measurements did not show any significant deviations from background levels.

As part of the SEAD-12 ESI and RI, Building 803 was scanned for radiological contamination using alpha, beta, and gamma radiation detection equipment. Wipe samples were also collected from the floor drains and vents in Building 803. The results of the scanning and wipe sample analysis indicated that Building 803 is overall compliant with the cleanup guideline (i.e., 10 mrem/yr) provided in the NYSDEC *Cleanup Guidelines for Soils Contaminated with Radioactive Materials* (DSHM-RAD-05-01). Elevated alpha and beta measurements were detected on one metal shelf in Room 6 during the building radiological survey. The Army removed and disposed of the shelf as low level radiological waste in 2004 in accordance with applicable requirements and regulations.

SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISKS

The baseline risk assessment (BRA) focused on three potentially impacted areas within SEAD-12 using data collected from these areas during the ESI and RI to estimate potential human health and ecological risks. The three potential release areas evaluated were:

- Disposal Pit A/B;
- Disposal Pit C; and
- Former Dry Waste Disposal Pit.

The basis for selecting these three areas included available documentation of activity associated with the former weapon storage operations, available data from site investigations confirmed significant "military" activity, and proximity to buildings associated with activities of potential concern. Overall, the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C were impacted to the greatest extent by former activities at SEAD-12.

The human health estimates summarized below are based on current reasonable maximum exposure (RME) scenarios and were developed taking into account various conservative estimates about the frequency and duration of an individual's exposure to the contaminants of potential concern (COPCs), as well as the toxicity of these chemicals. Based on this assessment, contaminants in SEAD-12 media (soil, groundwater, sediment/ditch soil, and surface water) do not pose unacceptable risks to the current receptors or potential receptors under the future use scenario (i.e., institutional/training/commercial and/or residential).

Additional details, findings, and conclusions of the human health and ecological risk assessments are presented below.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate them under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure (RME) scenarios.

Hazard Identification: In this step, the COPCs at the site in various media (i.e., soil, groundwater, sediment/ditch soil, and surface water) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of, and dermal contact with, contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of that exposure. Using these factors, a reasonable maximum exposure scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of potential site risks. Risks are characterized based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-6} to 10^{-4} (corresponding to a one-in-a-million to a one-in-ten-thousand excess cancer risk) with 10^{-6} being the point of departure. For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

Human Health Risk Assessment

The human health risk assessment previously conducted for the Disposal Pits in the 2002 RI Report was completed based on the assumption that land within the AOC would be used for recreational or conservation purposes. Since the submittal of the 2002 RI, SCIDA has re-designated use of the land within SEAD-12 for use as future institutional and training areas. In addition, a tenant has leased a portion of SEAD-12 and is currently using the property for commercial purposes (telecommunications/data warehousing). Nevertheless, the Army updated the risk assessment for Disposal Pits A/B and C in SEAD-12 on the basis that the land will be used for conservation/recreational purposes. The selection of the conservation/recreational activities use for this property makes the risk assessment prepared more conservative (i.e., more stringent because it applies restrictive exposure assumptions) than would one that assumes use of the property for institutional/training purposes, which is more aligned with commercial purposes. In addition, a future 30-year resident (for COPCs) and a future 30-year resident farmer (which assumes consumption of homegrown produce, meats, and dairy products affected by site ROPCs) has been evaluated to assess potential risks and hazards to receptors under the unrestricted use scenario. The residential receptors are provided to address the State of New York's goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law". Both the resident and resident farmer scenarios assume that six years of the 30-year duration are experienced as a child, 0 to 6 years of age, while 24 years of the 30-year exposure period are lived as an adult (age 18 to 42 years). Therefore, the updated SEAD-12 risk assessment evaluated following receptors:

1. Current site worker,
2. Future park worker,
3. Future recreational visitor (child),
4. Future construction worker,
5. Off-Site Wader (child),
6. Future adult and child resident (for hazard assessment), and
7. Future lifetime resident (for chemical carcinogenic risk assessment) and future resident farmer (for the radiological carcinogenic risk assessment).

To fully assess the potential risks and hazards that may still be present at the SEAD-12 Radiological Waste Burial Site Disposal Pits, the Army has updated the human health risk assessments previously prepared for these locations in the SEAD-12 RI Report. The technical memorandum providing specific details of the updated risk assessment conducted for the chemical contaminants in soil is provided in its entirety as Appendix H of the *SEAD-12 Construction Completion Report*. Complete details of the radiological constituent risk assessment update that has been prepared is contained in Appendix D of the *SEAD-12 Construction Completion Report*. In addition, the updated risk assessments for Disposal Pit A/B and C have used updated reference dose (RfDs), adsorption factors, permeability factors, and lag time (for dermal contact, τ or tau) values that have been published since the original risk assessment was prepared. The following discussion presents and summarizes the findings and conclusions of the updated human health risk assessments that have been prepared.

The datasets that have changed based on the performance and completion of the military-related item removal action are the site-specific chemical and radiological soil datasets that were used for Disposal Pits A/B and C. Datasets for groundwater, surface water, and sediment remain unchanged because no new data for samples from these media were collected as part of the removal action performed. As such, the prior soil datasets used for Pit A/B and C were individually replaced by a new total soil dataset prepared for Pit A/B and C. These datasets are comprised of analytical results that were collected during the RI or ESI and which are outside of the area of the work sites that have been excavated combined with new analytical data that were collected during excavation confirmatory sampling and backfill characterization and qualification activities performed.

Exposure pathways evaluated included inhalation of ambient dusts, inhalation of groundwater, ingestion of soil and sediment/ditch soil, intake of groundwater, and dermal contact with soil, groundwater, surface water, and sediment/ditch soil.

Separate sets of soil exposure point concentrations were derived for each impacted area (the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C) evaluated to estimate risks associated with soil exposure pathways. For surface water, sediment, and groundwater, a single set of exposure point concentrations was derived for each medium from all available SEAD-12 data and added to the risk generated from the area-specific soil exposure. For the wader receptor, downgradient sediment and surface water data were used to generate exposure point concentrations for this scenario.

Table 10 summarizes the risks calculated for exposures to SEAD-12 impacted media (soil, groundwater, surface water, and sediment/ditch soil). Cancer risks and non-cancer hazard indices for all future receptors under the institutional/training/commercial scenario are lower than the EPA limits (i.e., 10^{-6} – 10^{-4} for cancer risks and 1 for non-cancer hazard indices).

The initial BRA indicated that the excess cancer risks and the non-cancer hazard indices for the future resident were above the EPA target risk range. However, further evaluation of the preliminary results as part of the risk management and uncertainty analysis portions of the risk assessment process indicated that the noted excess risks were associated with specific hazardous substances that were infrequently detected in sampled media at very low, estimated concentrations.

The apparent elevated risk values result primarily due to the exposure of the child or lifetime resident's exposure to chemical, and not radiological, constituents. The three most significant exposure pathways which contribute to the child resident's elevated non-carcinogenic HI level are dermal contact with surface water (1.6), ingestion of groundwater (0.55), and dermal contact with groundwater (0.42). The lifetime resident's cancer risk is impacted by their dermal contact with groundwater (4.3E-04) and their dermal contact with surface water (2.5E-04).

With reference to the child resident's non-carcinogenic HI, the chemicals responsible for the 1.6 HI reported for dermal contact with surface water included aroclor-1242 and chrysene. Aroclor-1242 was detected in two surface water samples and chrysene was detected in one surface water sample collected during the RI. Neither of these compounds are very soluble in surface water, so it is likely that there

Table 10
Total Cancer Risk and Non-Cancer Risk for Chemical and Radiological Pathways – SEAD-12

Potential Area of Concern Risk Scenario	**Chemical Total Cancer Risk [1]**	**Radiological Total Cancer Risk**	**Chemical and Radiological Total Cancer Risk**	**Total Non-Cancer Hazard Risk**
Disposal Pits A/B				
Future Resident (RI)	7.0E-4	1.1E-5	7.1E-4	2.8E0 [4]
Future Resident (recal)	1.5E-6 [2]	1.1E-5 [3]	1.3E-5 [2,3]	3.0E-2 [2,4]
Current Worker	3.6E-8	4E-7 [3]	4.4E-7 [3]	2.1E-4
Future Park Worker	2.0E-5	3E-6 [3]	2.3E-5 [3]	1.2E-1
Future Recreational Child	2.0E-5	2E-7 [3]	2.0E-5 [3]	3.1E-1
Current/Future Construction Worker	4.7E-8	2E-7 [3]	2.5E-7 [3]	1.1E-2
Disposal Pits C				
Future Resident (RI)	7.0E-4	4.1E-5 [3]	7.4E-4	3E0 [4]
Future Resident (recal)	6.3E-6 [2]	4.1E-5 [3]	4.7E-5 [2,3]	2.8E-2 [2,4]
Current Worker	2.2E-7	9E-7 [3]	1.1-E-6 [3]	2.6E-4
Future Park Worker	2.2E-5	1E-5 [3]	3.2E-5 [3]	1.2E-1
Future Recreational Child	2.0E-5	2E-6 [3]	2.2E-5 [3]	3.1E-1
Current/Future Construction Worker	1.7E-7	5E-7 [3]	6.7E-7 [3]	1.0E-2
Former Dry Waste Disposal Pit				
Future Resident (RI)	7.0E-4	3.0E-5	7.3E-4	2E0 [4]
Future Resident (recal)	4.3E-5	3.0E-5	7.3E-5	6.1E-1 [4]
Current Worker	2.0E-8	<1E-15	2.0E-8	2E-3
Future Park Worker	2.0E-5	1.6E-5	3.6E-5	8E-2
Future Recreational Child	2.0E-5	1.2E-6	2.1E-5	2E-1
Current/Future Construction Worker	4.0E-8	3.3E-6	3.3E-6	7E-2
Downgradient				
Off-Site Wader (Child)	1.0E-6	5.7.E-9	1.0E-6	8E-4

1. Chemical Reasonable Maximum Exposure risk values are presented.
2. The non-cancer hazard indices and excess cancer risks initially calculated for future resident were above the EPA target risk range; however, the risks for future residents are considered highly uncertain and probably overestimated as is discussed. The risks were recalculated not including benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and di-n-octylphthalate as groundwater COPCs and benzo(a)pyrene, Aroclor-1242, and chrysene as surface water COPCs; and the risks were recalculated and the post COPC elimination results are presented.
3. Radiological constituents in soil used in the risk calculation were based on Removal Action final survey data.
4. Hazard index for residential child is presented.

Note: (RI) – results at end of RI; (recal) – recalculated results.

detection in any surface water sample is the result of the presence of soil particles in the sample that was analyzed. Furthermore, the single chrysene detection was reported as an estimated concentration and was found in the identified duplicate of a sample-duplicate pair. The base sample reported a non-detect value. Finally, both of the Aroclor-1242 results were found in surface water sample locations that are isolated from the Disposal Pit locations and where it is unlikely that surface water runoff from the disposal pits could have entered the affected drainage channels. The single chrysene detection was found at a sample location that is hydraulically upgradient of the Disposal Pit sites, so it is likely that this material, if actually present, was released from a location not associated with the historic disposal pit operations.

Dermal contact to groundwater containing di-n-octylphthalate was the next highest contributor to the elevated HI that is noted for the child resident. This compound was detected in six out of 89 groundwater samples characterized during the RI, each time in a different well, and always at concentrations that were reported as estimated values. These wells are spread throughout the SEAD-12 site, although each of these wells was sampled at least twice during the RI, the phthalate was only detected in one of the two samples. Similarly, while ingestion of groundwater containing total DCE was also noted as a contributor to the child's elevated HI, it was only detected in one well, once, and neither of its isomers (cis- and trans-1,2-dichloroethene) were found or noted in any other well at the SEAD-12 site. The single sample DCE was found in was collected from MW12-37, which was previously located next to Building 813/814 where a TCE plume was found. This plume was remediated during the supplemental RI that was completed in 2004 and 2005.

Therefore, based on this information the noted elevated non-carcinogenic HI reported for the child resident over-estimates the true level of potential hazard that is present in the area.

The lifetime resident's elevated cancer risk results primarily due to dermal contact with groundwater (4.3E-06) and dermal contact with surface water (2.5E-06), both of which contain carcinogenic PAH (cPAH) compounds. As noted above, it is unlikely that cPAHs readily are soluble in either surface water or groundwater, so it is more probable that their presence in the samples collected during the RI results from the capture of some amount of particulate that has these material sorbed onto the particles captured during the sampling process. Closer examination of the groundwater data indicate that four cPAHs contribute to the estimated cancer risk. Three were detected once each from a single well, while the other cPAH was detected in two samples collected from two separate wells. All of the reported concentrations in groundwater were estimated values, and for benzo(a)pyrene which was detected twice, it was not detected in the wells when they were sampled the second time. The three cPAHs are the primary contributors to the noted carcinogenic risk arising from dermal contact with surface water, and again each of these was only detected in one sample (all collocated).

The removal of these overestimates of carcinogenic risks for the lifetime resident reduces the estimated level of carcinogenic risk to a level on the order of 10^{-5}, which is consistent with the EPA's preferred risk range. The recalculated risks are presented in **Table 10** along with the results initially determined without consideration of Risk Management and Uncertainty components of the risk assessment process. As a result, it is concluded that the residual contaminants at SEAD-12 are not expected to pose significant risks to potential future residential receptors.

In summary, soil in the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C and groundwater, sediment, and surface water at SEAD-12 do not pose unacceptable risks to the human health of potential future residents or the anticipated future users of the AOC (i.e., institutional/training/commercial activity). With no future planned use of buildings 813/814 a risk assessment was not performed to evaluate potential risks via the indoor air exposure pathway. Currently, the vapor intrusion exposure pathway is not complete as the building is vacant. Should a decision in the future be made to occupy the existing buildings or build new permanent or temporary facilities in the area of the previously identified TCE and DCE contamination, that owner/decision maker will be required to perform a vapor intrusion survey and risk analysis to evaluate potential vapor impacts from soil under the existing structure that previously indicated that it may contain elevated levels of TCE.

Ecological Risk Assessment

The majority of SEAD-12 falls into the vegetation classification of successional old field; other vegetation classifications found at lesser levels in SEAD-12 include successional shrub and successional southern hardwoods. This successional old field vegetation provides excellent habitat for the white-tailed deer which were often observed foraging in areas adjacent to forest and shrub communities. Other species commonly observed in this habitat included eastern cottontail rabbit, numerous songbirds, red fox, and raccoon. Several channelized streams and excavated drainage ditches are found throughout SEAD-12. No flow was observed in any of these streams or ditches and most of these streams and ditches do not have permanent water throughout the year.

A list of potential rare, threatened, or endangered plant species that have been identified as potentially or actually present within the limits of Seneca County is available through the New York Natural Heritage Program. The New York Natural Heritage Program reported confirmation that bald eagle activity was documented at the Depot in Spring 2008. The documentation of the 2008 sightings was the only one on file. No other site-specific information pertinent to the occurrence of rare, threatened, or endangered plants on the land of the former SEDA was found in the literature.

SEAD-12 is the focus of wildlife and forestry management practices being conducted at the depot. Wildlife management efforts focusing on waterfowl, songbirds, and game populations have been conducted for many years. The habitat value of the SEAD-12 is considered low due to the lack of a diverse vegetative cover and the highly managed condition of the existing vegetation.

As part of the RI, the SLERA was performed by using No Observable Adverse Effect Level (NOAEL) toxicity values, the maximum detected COPC concentrations, and default exposure assumptions for the RME to calculate screening level hazard quotients (HQs). Due to the conservative nature of these assumptions, additional evaluation was conducted to refine the contaminants of concern. The refinement of contaminants of concern (COCs) streamlined the overall BRA process to determine if further evaluation was warranted. Alternative Lowest Observed Adverse Effect Level (LOAEL) toxicity values mean exposures based on mean concentrations, and foraging factors were considered for determining potential contaminants of concern. Based on the results of the further refinement of COCs and the risk management conducted in the RI for SEAD-12, no COCs were identified and therefore no further action is warranted for the former Dry Waste Disposal Pit, Disposal Pit A/B, SEAD-12 surface water, or sediments.

For the area designated as Disposal Pit C, the results suggest a potential for adverse ecological effects due to the presence of zinc. Based on the further evaluation including comparison of data with regional background and NYSDEC human health-based SCO for the unrestricted use scenario, and consideration of the planned future use of the property no further action is warranted at Disposal Pit C to mitigate potential risks to ecological receptors.

In summary, SEAD-12 does not pose significant risks to ecological receptors and no action is warranted to mitigate potential risks to ecological receptors.

Summary of Human Health and Ecological Risks

In summary, the areas evaluated in the BRAs (i.e., the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C) and the other media evaluated at SEAD-12 (i.e., groundwater, sediment, and surface water) do not pose significant risks to human health based on the future use of the AOC (i.e., institutional/training/commercial activity).

Further, these areas and media do not pose significant risks to potential residential receptors. In addition, SEAD-12 does not pose significant risks to ecological receptors.

A potential risk is assumed to exist in the vicinity of the previously noted TCE contamination that was identified in the soil and groundwater in the immediate vicinity of Buildings 813/814 and former well MW12-37. The magnitude of the potential risk will need to be evaluated via a vapor intrusion analysis and risk evaluation before the existing buildings were occupied and re-used, or before new buildings were constructed over the area of Buildings 813/814 and the former MW12-37. It will be the responsibility of the organization making the determination to occupy and re-use this area to perform such an analysis prior to use of the existing buildings, or the construction of new permanent or temporary structures.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

Results of the risk assessment for SEAD-12 indicate that soil in the three most impacted areas (Disposal Pit A/B; Disposal Pit C; and the Former Dry Waste Disposal Pit) and other media (groundwater, sediment, surface water) do not pose unacceptable risks to human health or the ecological receptors based on the unrestricted use scenario. Therefore, no further CERCLA action is warranted at any location within SEAD-12, exclusive of the area where Buildings 813/814 (**Figure 6**) are located.

Access to and use of Building 813 and 814 should be restricted until additional data is provided by a future re-user. The additional data would be used to quantify risks that may exist to potential future occupants of the existing buildings or upon the construction of inhabitable structures (temporary or permanent) above the area where volatile organic compounds, including TCE, may be present in the soil and groundwater. The restricted use may be removed if a vapor intrusion study is conducted in the building(s) or in the restricted area and shows that the potential risks from volatile organic compound intrusion does not pose a risk to future occupants of the structures.

Land use controls are a supplement to an earlier interim remedial action. An interim remedial action (as part of the SRI) was performed in 2004 at the exterior of Buildings 813 and 814 and removed soil that was found to contain TCE. During the interim action, thirteen temporary wells were installed in the vicinity of the elevated VOC concentrations detected during the RI. Groundwater samples were collected from these temporary wells and two existing permanent wells to determine the extent of VOC contamination. Results of the sample analysis indicated that VOC contamination, predominantly in the form of TCE, was limited to the area immediately adjacent to one of the permanent wells. Based on these results, a test pit investigation was initiated to determine the source of the TCE contamination in the groundwater. The investigation traced elevated TCE levels to the footer of the building where exploration halted due to concerns for the structural integrity of the building. There is a continuing potential for recontamination of groundwater due to possible outward migration of VOCs in soil located below the building slabs where TCE contaminated soil was identified, but could not be removed without affecting the structural integrity of the buildings. Therefore, LUCs that prohibit access to, and use of, the groundwater in an area surrounding the existing buildings and extending for a specified area beyond the buildings and the former well MW12-37 will also be implemented and maintained until additional data is provided to confirm that there is no indication of recontamination of soil and groundwater beyond the edge of the buildings and no undue risk to persons who may use the buildings. The Army has identified that the groundwater use restriction would apply to an area that is 50 feet outside the building perimeter and well MW12-37.

The remedial action objectives established for SEAD-12 are as follows:

- Prohibit potential exposure to VOCs in the indoor air at existing Buildings 813/814 or in potential newly constructed buildings above the area where TCE-contaminated groundwater and soil were identified, including, without limitation, above the footprints of the existing buildings and additional land shown on **Figure 6** that may present a potential human health risk.

- Prohibit access to and use of groundwater contaminated with COCs above levels that are protective of drinking water use, generally expected to be found within 50 feet outside the perimeter of Buildings 813 and 814, and the location of former monitoring well location MW12-37 until ground water standards are achieved.

Results presented in the *Closure Report for the Former Mixed Waste Storage Facility, Building 803 (SEAD-72)* indicate that the decontamination of this facility was successfully completed and achieved the goals defined under RCRA; therefore, No Further Action is needed at SEAD-72 and this facility is suitable for unrestricted use and unlimited exposures.

SUMMARY OF SEAD-12 REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. § 9621(b)(1) mandates that remedial actions be protective of human health and the environment, cost-effective, comply with ARARs, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. CERCLA §121(d) further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. § 9621(d)(4).

Detailed descriptions of the remedial alternatives for addressing the former isolated groundwater anomaly identified in the vicinity of Buildings 813/814 can be found in the FS report. The FS report presents and evaluates remedial alternatives for Buildings 813/814.

The construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy, negotiate the performance of the remedy, or procure contracts for design and construction.

The alternatives, along with the technologies and processes that make up each alternative for potential remedial action in SEAD-12, are:

SEAD-12 Alternative 1: No Action

The Superfund program requires that the “no-action” alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative does not include any physical remedial measures that address the problem of contamination at SEAD-12. Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the alternative be reviewed at least once every five years. If justified by the review, remedial actions may subsequently be implemented to remove, treat, or contain the contaminated media.

SEAD-12, Alternative 1 Costs

Capital Cost	$0
Annual Long-Term Monitoring (LTM)	$0
Present-Worth of LTM	$0
Construction Time	0 months

SEAD-12 Alternative 2: Environmental Land Use Control

Alternative 2 involves the implementation, monitoring, inspection, and periodic certification of an environmental Land Use Control (LUC) that restricts the use of Building 813/814 and an area extending to the greater of i) fifty feet from the perimeter of Building 813/814 or ii) fifty feet from monitoring well MW12-37 ("LUC-zone") (**Figure 6**). The restrictions provided in the LUC will a) prohibit human habitation or other use of Building 813/814 unless, and until, an investigation of vapor intrusion potential and indoor air quality has been performed and it has been determined that the use or occupation of Building 813/814 or any other temporary or permanent structure to be constructed in the LUC-zone will not present an unacceptable human health risk on account of air quality from potential vapor intrusion; and b) prohibit the access to or use of groundwater in the LUC-zone until such time as groundwater standards are achieved. The remaining land within SEAD-12 would be released for unrestricted use and unlimited exposures.

SEAD-12, Alternative 2 Costs

Capital Cost	$0
Annual Long-Term Monitoring (LTM)	$6,000
Present-Worth of LTM	$74,460
Construction Time	1 month

SEAD-12 Alternative 3: Vapor Intrusion Study/Building Demolition for Unrestricted Use

Alternative 3 would restore all land within SEAD-12 to a level that would allow for unrestricted use by future users. No environmental easement would be needed. A vapor intrusion study, demolition of Buildings 813/814, if found to be warranted by the results of the vapor intrusion survey, and disposal of the demolition debris and residual TCE impacted soils from beneath the structures comprise the key elements of Alternative 3.

The vapor intrusion study would assess indoor and outdoor air quality at Buildings 813/814 and include sub-slab soil gas sampling. This study would determine if demolition of Buildings 813/814 is required. Based on the limited sampling data for soils immediately beneath the edge Building 813 determined during the prior SRI soil excavation activity, it is likely that Buildings 813 and 814 would need to be demolished to provide access to contaminated soil and groundwater that may underlie the buildings. Soils underneath the foundation of Building 813 where elevated concentrations or TCE were detected, and possibly beneath Building 814 would then be excavated. The building material and soil would be characterized and disposed at a regulated landfill. Demolition of the buildings and excavation of the TCE contaminated soil would probably alleviate the need for long-term (30 year) LUCs (i.e., access to/use of the buildings and access to/use of the groundwater) that are included in SEAD-12 Alternative 2. It is anticipated that three groundwater wells would need to be installed at the construction site and monitored semi-annually for a period of five years to verify that TCE groundwater contamination was no longer present. During the five year monitoring period, a LUC prohibiting access to and use of groundwater in the vicinity of the former location of Buildings 813/814 would need to be implemented, maintained, periodically monitored, and reported on annually. At the conclusion of the five year period it is presumed that the five-year review would show that site conditions allowed for the discontinuance of the groundwater access/use land use control.

SEAD-12, Alternative 3 Costs

Capital Cost	$440,000
Annual Long-Term Monitoring (LTM)	$20,000
Present-Worth of LTM	$82,000
Total Present-Worth	$522,000
Construction Time	5 months

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the evaluation of remedial alternatives, the alternatives were assessed against the following nine evaluation criteria.

- Overall protection of human health and the environment assesses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
- Compliance with ARARs addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and requirements or provide grounds for invoking a waiver.
- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protections of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.
- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.
- Short-term effectiveness address the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
- Cost includes the estimated capital costs and future costs of operation, maintenance, and management presented as their present-worth.
- State acceptance indicates if, based on its review of the RI and Proposed Plan, the state concurs with the preferred remedy.
- Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan.

Comparative analyses of SEAD-12 and SEAD-72 Alternatives 1 through 3 based upon the evaluation criteria noted above are presented below.

Overall Protectiveness of Human Health and the Environment

Alternative 1 for SEAD-12 is the least protective alternative with respect to human health and the environment since it does not address or even consider the presence of hazardous substances that may be present in the soil or the groundwater in the vicinity of Buildings 813/814 at levels that may pose risks or a threat to human or ecological receptors.

Alternative 2 is ranked higher than Alternative 1 in terms of overall protectiveness, as the possible continued presence of contaminated soil underlying Buildings 813/814 is acknowledged by the requirement to conduct a soil vapor intrusion survey prior to any potential reuse, or as part of any future plan to redevelop the area. Furthermore, possible contamination in the groundwater is also addressed by restricting access to and use of the groundwater until monitoring results indicate that applicable groundwater standards have been achieved.

Alternative 3 for SEAD-12 is the most protective of human health and the environment as the objectives of the identified remedial action components are to establish whether a potential source of TCE remains beneath the footprint of Buildings 813/814, and if it does provide a means by which the source can be accessed and eliminated. This alternative provides the highest level of protectiveness to human health and the environment.

Compliance with ARARs

There are currently no promulgated federal standards for hazardous substance levels in soils, and risked-based decisions are used to determine if cleanup of a site is warranted. The risk assessment indicates that residual hazardous substances found in the SEAD-12 media do not pose significant risks to human or ecological receptors.

The State of New York has issued and promulgated soil cleanup objectives (SCOs) for five categories of future land use (i.e., unrestricted, residential, restricted-residential, commercial, and industrial) at waste sites located within its bounds. The State SCOs were evaluated as criteria “to be considered” (TBC) during the selection of potential remedial actions for SEAD-12.

As is discussed and summarized in **Table 1** and **2** above, residual concentrations of identified hazardous substances present in SEAD-12 soils were compared to New York’s Unrestricted Use SCOs during the overall SEAD-12 site characterization process. The results of this evaluation indicate that while individual samples contain concentrations of individual COPCs at concentrations that exceed applicable Unrestricted Use SCOs, the 95^{th} UCLs calculated for all COPCs identified within SEAD-12, except for cadmium and zinc in the greater SEAD-12 area, and nickel in the area of the historic burial pits, are lower than their respective Unrestricted Use SCO. However, as is also noted, neither cadmium, nickel, nor zinc in the greater SEAD-12 area soil pose significant risks or health hazards to potential receptors (including residents), and as is indicated by the baseline risk assessment performed for SEAD-12 and summarized above, there is no unacceptable levels of human health risk or hazard identified at the AOC.

The NYSDEC radioactivity cleanup guideline (i.e., 10 mrem/yr) provided in the NYSDEC *Cleanup Guidelines for Soils Contaminated with Radioactive Materials* (DSHM-RAD-05-01) has been used to evaluate potential radiological impacts. Other potentially applicable radioactivity guidance values are documented by the EPA (15 mrem/yr), the Nuclear Regulatory Commission (25 mrem/yr) but are more lenient that the NYSEC value. Residual levels of radiation found throughout the buildings and land of SEAD-12 are in compliance with the NYSDEC cleanup guideline for residential and future commercial/industrial workers. Information substantiating this determination is summarized in **Tables 7** and **8** and ensuing discussion presented in the “SEAD-12 Removal Action Radiological Impacts” section, above.

Based on what is currently known about the soil quality that is present in SEAD-12, all remedial alternatives comply with evaluated ARARs. However, there is the potential that unknown levels of hazardous substances may remain in the soil beneath Buildings 813/814. On this basis, Alternative 3 is considered the best option for ultimately ensuring compliance with applicable ARARs and providing assurance that risk-based decisions are made. The vapor intrusion survey would provide additional information about the likely presence of hazardous constituents in the soil and groundwater beneath the building, and if the buildings were demolished, these soils could be addressed by additional remedial measures.

Alternative 2 also ranks higher than Alternative 1 for SEAD-12 because, in this case, use of the land in the vicinity of Buildings 813/814 and the groundwater contamination previously identified at former monitoring well location MW12-37 would be restricted until additional data was developed to assess whether potential risks or hazards remain at the site. However Alternative 2 is not as protective as Alternative 3 as the possible presence of a source beneath the building is not assessed immediately, and waits until a future re-use of the land is identified and considered by a future user.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative 1 ranked the lowest in this category because the alternative does not reduce the volume, toxicity, or mobility of contaminants that may be left at locations within the AOC. Alternative 2 also ranks low with regards to the reduction of the volume, toxicity, or mobility of contaminants that may be present within the greater AOC, but does at least acknowledge the possible continuing presence of contamination in the vicinity of former monitoring well MW12-37 and Buildings 813/814. However, as there currently is no foreseeable reuse for this area, Alternative 2 postpones performance of further investigations and potential remedial actions until such time as a reuse is anticipated for the land in the vicinity of the former well and buildings. In the interim, activities in the identified area are controlled via the implementation, monitoring, and maintenance of land use controls that prohibit specific activities that could be affected by the presence of potential contaminants in this location.

Alternative 3 offers the greatest reduction in toxicity and mobility at the site as contaminated soils that may remain underneath Buildings 813/814 may be exposed, excavated, treated, and removed from the site. Under Alternative 2, the examination of Building 813/814 soil conditions is delayed pending some future decision to use the land at this location. Alternative 2 and 3 both have the potential to increase the VOC impacted soil volume as a result of excavation process. The assessment as to whether soil under Buildings 813/814 would need to be removed would occur sooner under Alternative 3 than Alternative 2 as the vapor intrusion survey is delayed until a potential reuse is identified for the buildings and land.

Short-Term Effectiveness

Alternative 1 ranked highest for short-term protection of human health and the environment since the alternative does not implement a remedy; therefore, there are no adverse impacts on human health and the environment as a result of the remedy.

Alternative 2 ranks almost as high as Alternative 1 for short-term effectiveness since LUCs could be implemented and maintained quickly with minimal impact or adverse impacts on the community, site workers or the environment.

Alternative 3 ranks lowest in terms of short-term effectiveness as it would reduce the short-term human health risk via indoor air exposure from soil and groundwater contaminated with chlorinated solvents. Demolition of Buildings 813/814 would increase short-term risks to workers, even with the use of dust controls and personnel protection equipment due to the increase in concentrations of airborne particulates and vapors, the community and the environment. However, these risks can be controlled by adequate planning and engineering controls.

Implementability

Alternative 1 ranked as the easiest of the alternatives considered to implement, as it requires no action.

Alternative 2 is the next highest ranking for implementability. Alternatives 2 and 3 can both be implemented and constructed easily, though Alternative 3 involves more excavation, sampling and analysis, possible building demolition, and probably greater transportation and disposal requirements than does Alternative 2. Alternative 2 and 3 both require additional material handling and processing as buried debris including possible military-related materials, miscellaneous debris and potentially contaminated soils will need to be handled, segregated, evaluated and, if found to be contaminated, transported off-site and disposed. However, the immediate performance of the soil vapor intrusion survey would require more personnel and a longer work period under Alternative 3 than Alternative 2. Further, if TCE contamination in the soil and groundwater underlying Buildings 813/814 is confirmed, more actions would be needed to demolish and eliminate the currently vacant structures before a definitive reuse of the land was identified. Eventually, Alternative 2 might require similar services and considerations for Building 813/814, but they would be undertaken at the time a beneficial reuse was identified, and could be made in a manner that was consistent with the identified reuse of the area. If necessary, the Army believes that any continuing concern about the presence of residual TCE in the soil or groundwater beneath Building 813/814 can be addressed through the excavation and treatment or off-site disposal of source material located beneath the building.

Cost

Capital costs, operating costs, and administrative costs were estimated individually for SEAD-12. Capital costs include those costs for professional labor, construction and equipment, field 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 land use restrictions. Alternative 3 has the highest costs.

Alternative 1 (no action) is the least costly alternative and incurs no cost for SEAD-12. There are no immediate capital costs associated with Alternative 2 as no remedial action will be performed at this site until such time as a potential reuse is identified for the site. Future capital costs may be incurred by the Army or a future re-user if results of future vapor intrusion surveys or groundwater analyses indicate TCE or other volatile organic compounds are present in the soil or groundwater at the identified location. If future capital costs are required, it is probable that they may be the same as current day capital costs adjusted for inflation and cost growth incurred during future years. Alternative 2's anticipated operating, monitoring, and maintenance (OM&M) costs for the implementation and maintenance of the two identified LUCs (i.e., building use prohibition and groundwater access/use restriction) are estimated at $6,000 per annum, bringing the total present worth cost for Alternative 2 to $74,460.

The capital costs for the SEAD-12 Alternative 3 include costs for the performance of the vapor intrusion survey, the demolition and disposal of Buildings 813/814, the excavation and disposal of contaminated soil underlying the buildings to remove the source material containing TCE, and the installation of a monitoring well network to assess if groundwater contamination exists at the site. These costs are estimated at $440,000. Alternative 3 OM&M costs are estimated at $20,000 per annum for a period of five years, resulting in present worth cost of $522,000 which is the highest of the SEAD-12 alternatives. The five year duration is used as the term of the Alternative 3 OM&M costs as the recontamination of groundwater is not considered likely once the TCE source material is removed.

Remedial Alternative Cost Summary			
Alternative	**Capital Cost**	**Annual OM&M Costs**	**Total Present Worth Costs**
SEAD-12 (Radiological Burial Pits Site)			
1 No Action	$0	$0	$0
2 Disposal Pit Excavation, Restriction on use of Building 813/814 GW Use/Access Restriction	$0	$6,000	$74,460
3 Disposal Pit Excavation, Soil Vapor Intrusion Survey, Building 813/814 Demolition, Groundwater Access/Use Restriction	$440,000	$20,000	$522,000

<u>State Acceptance</u>

NYSDEC concurs with the preferred remedial action proposed for SEAD-12 which includes the implementation of a groundwater access/use restriction near Buildings 813/814 and a restriction that prohibits the use of Buildings 813/814 or the land underlying them until a vapor intrusion survey is performed and shows that there are no identifiable potential long-term effects. If the future vapor intrusion survey of Buildings 813/814 indicates that a problem exists beneath the building, future remedial actions may be required to address any continuing issue associated with off-gassing of organic compounds from the soil or groundwater.

<u>Community Acceptance</u>

Community acceptance of the preferred alternative will be assessed in the ROD following review of the public comments received on the RI Report, SRI Report, FS Report, the SEAD-12 Completion Report, the SEAD-72 RCRA Closure Report, and this Proposed Plan. The preferred alternative can change in response to public comment or new information.

PREFERRED ALTERNATIVE

Chemical and radiological analyses conducted during the ESI, the RI, the SRI, and the removal action indicate that a majority of SEAD-12 is suitable for unrestricted use, exclusive of the area extending to the greater of i) fifty feet from the perimeter of Building 813/814 or ii) fifty feet from monitoring well MW12-37 (LUC-zone") (depicted in Figure 6) where LUCs prohibiting occupation of the existing buildings and construction of new buildings will be implemented, maintained, monitored, and periodically certified until a future vapor intrusion survey and risk analysis is performed and verifies that potential risks from VOCs remaining in subsurface soils and possibly the groundwater do not exist. To address these concerns, the proposed remedy for SEAD-12 includes the implementation, monitoring, and maintenance of an environmental LUC that prohibits access to and use of existing Buildings 813 and 814, or the construction of inhabitable structures (temporary or permanent) above the area where trichloroethene contaminated groundwater and soil were identified until a an investigation of vapor intrusion potential and indoor air quality vapor intrusion study is conducted in the building(s) or in the restricted area and shows that residual concentrations of volatile organic compounds, if present, do not pose risk to future occupants of the structures; and the implementation, monitoring, and maintenance of a LUC to prohibit access to and use of groundwater in the LUC-zone vicinity of Buildings 813/814 and former monitoring well MW12-37 until groundwater standards are achieved. new analytical data are provided to, and approved by, the Army, EPA, and NYSDEC that demonstrate that groundwater in the LUC-zone meets applicable groundwater standards.

Building 803, the former Mixed Waste Storage Facility (SEAD-72) has been successfully decontaminated and has been closed in accordance with the requirements of RCRA. Therefore, No Further Action is needed for SEAD-72.

To implement the remedies selected in this Proposed Plan, which will include the imposition of LUCs at SEAD-12, a LUC Remedial Design will be prepared which will provide for the recording of an environmental LUC which is consistent with

Paragraphs (a) and (c) of the New York State Environmental Conservation Law (ECL) Article 27, Title 13, Section 1318: Institutional and Engineering Controls. In addition, the Army will prepare an environmental LUC for SEAD-12, consistent with Section 27 1318(b) and with ECL Article 71, Title 36: Environmental Easements of ECL, which will be recorded at the time of the property's transfer from Federal ownership and which will require the owner and/or any person responsible for implementing the LUCs set forth in this ROD to periodically certify that such institutional controls are in place. A schedule for completion of the draft SEAD- 12 LUC Remedial Design Plan (LUC RD) will be completed within 21 days of the ROD signature, consistent with Section 14.4 of the Federal Facilities Agreement (FFA). To implement the remedy prior to transfer, the Army, as the owner and operator of the property at SEAD-12, will through the on-site Commander's representative or other designated official, ensure that the LUCs are implemented by monitoring the property at SEAD-12 and restricting development or use on this property if inconsistent with the LUCs.

The Army shall implement, maintain, inspect, report, and enforce the LUC described in this Proposed Plan in accordance with the approved LUC RD. Although the Army may later transfer these responsibilities to another party by contract, property transfer agreement, or through other means, the Army shall retain ultimate responsibility for remedy integrity

LUC-zone will remain in place until new analytical data are provided to, and approved by, the Army, EPA, and NYSDEC that demonstrate that groundwater in the LUC-zone meets applicable groundwater standards.

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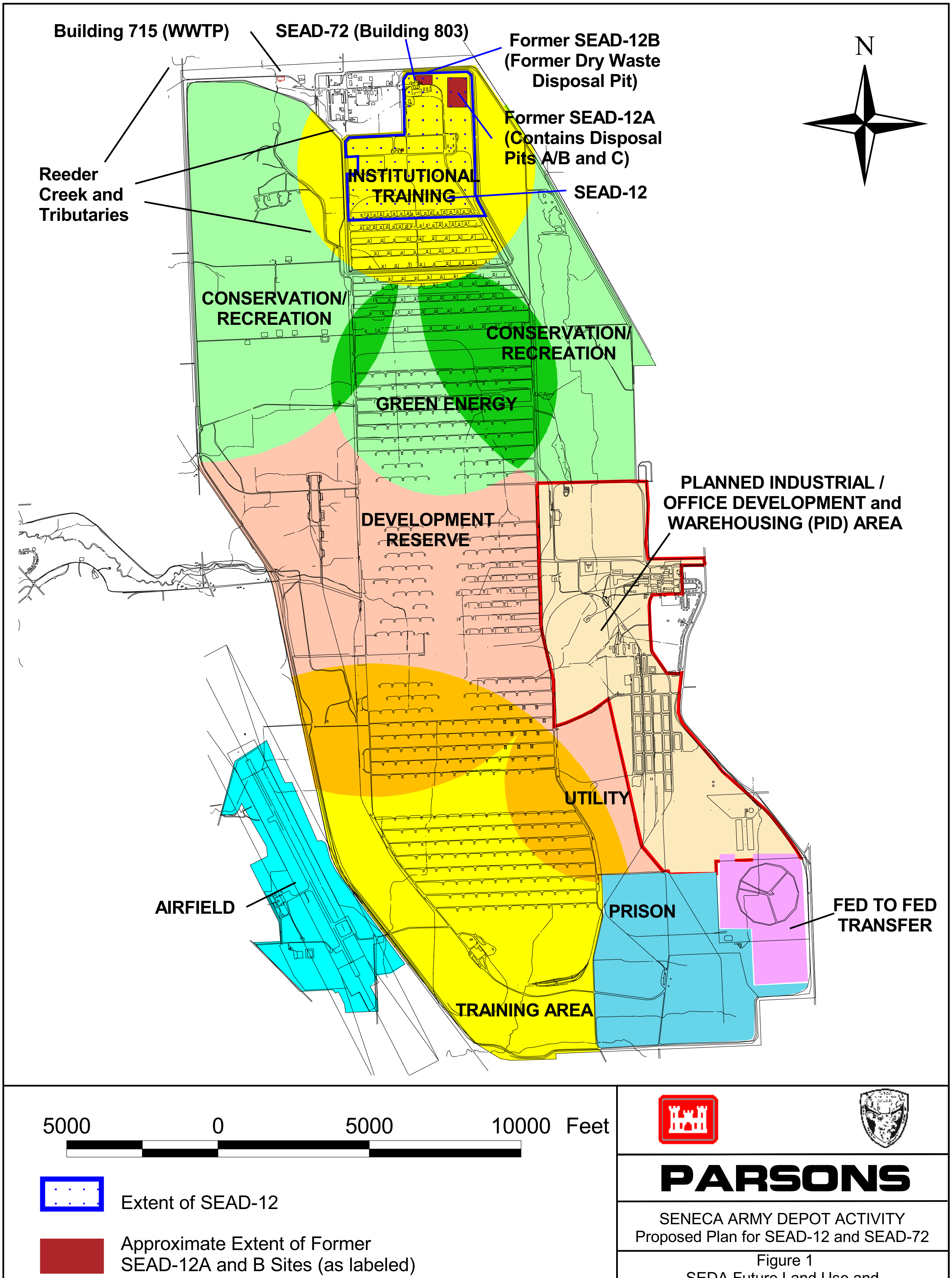

PARSONS

SENECA ARMY DEPOT ACTIVITY
Proposed Plan for SEAD-12 and SEAD-72

Figure 1
SEDA Future Land Use and Location of SEAD-12

January 2012

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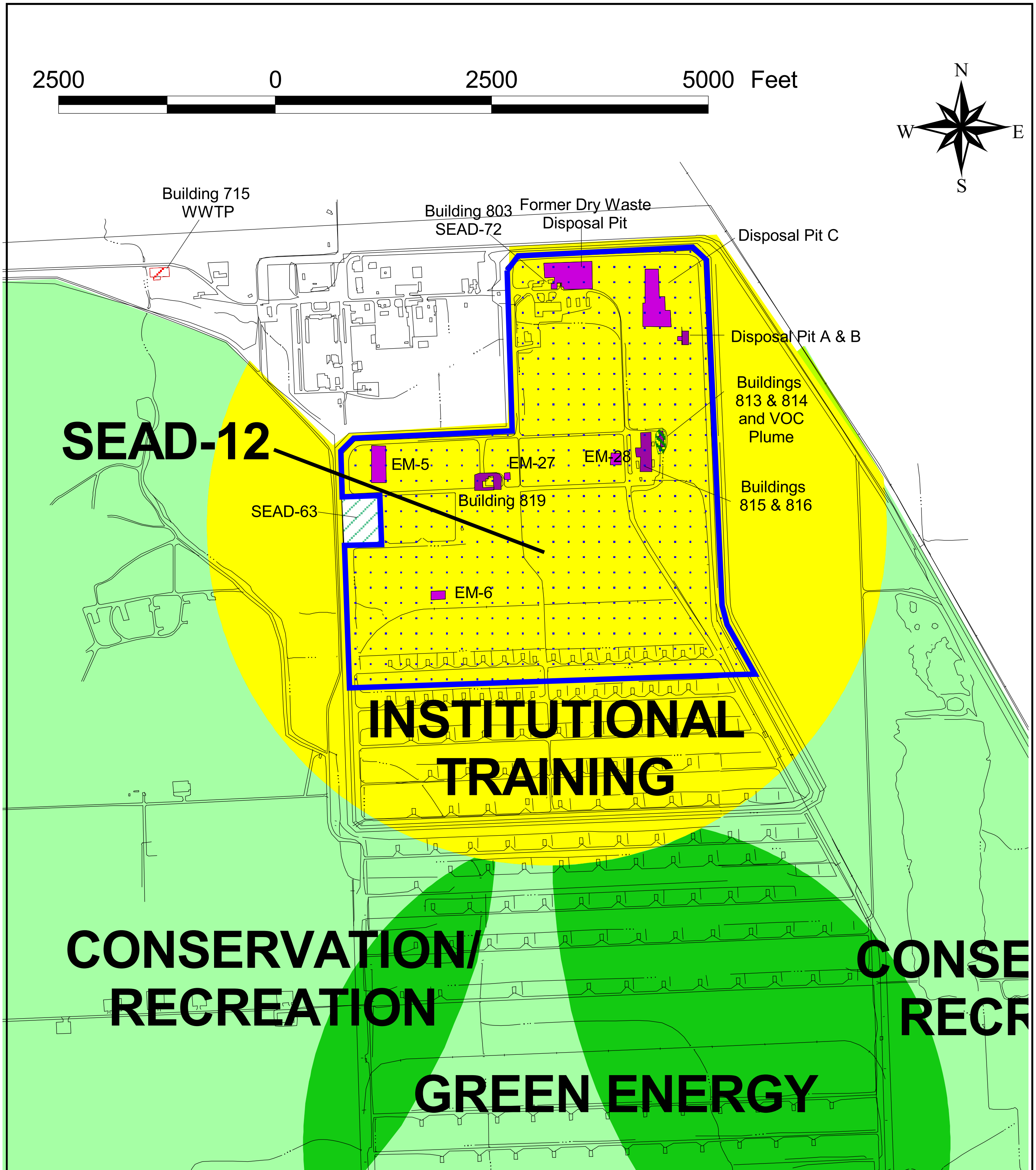

Extent of SEAD-12

Extent of SEAD-63

Feature of SEAD-12

Approximate Extent of Groundwater Access/Use and Vapor Intrusion Land Use Controls

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SENECA ARMY DEPOT ACTIVITY
Proposed Plan for SEAD-12 and SEAD-72

Figure 2
SEDA Future Land Use and SEADs 12 and 72 Features

January 2012

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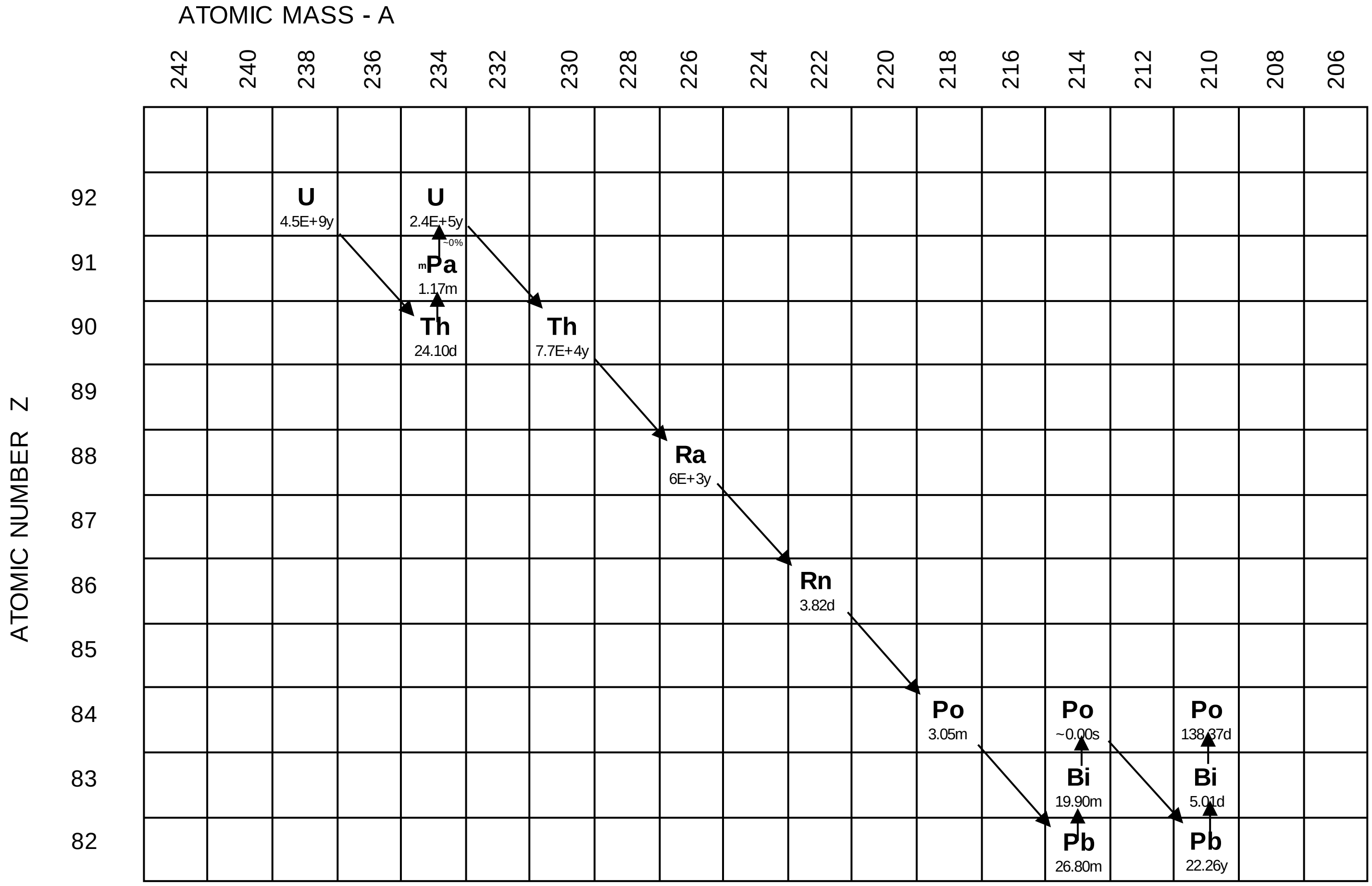
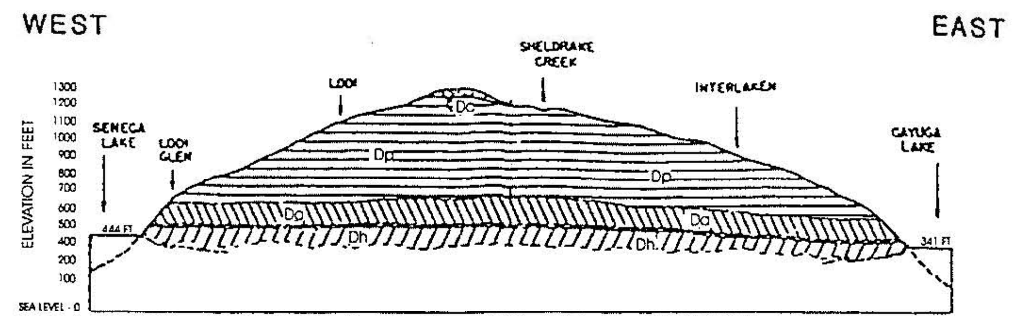
Figure 3
Uranium 238 (^{238}U) Decay Chain



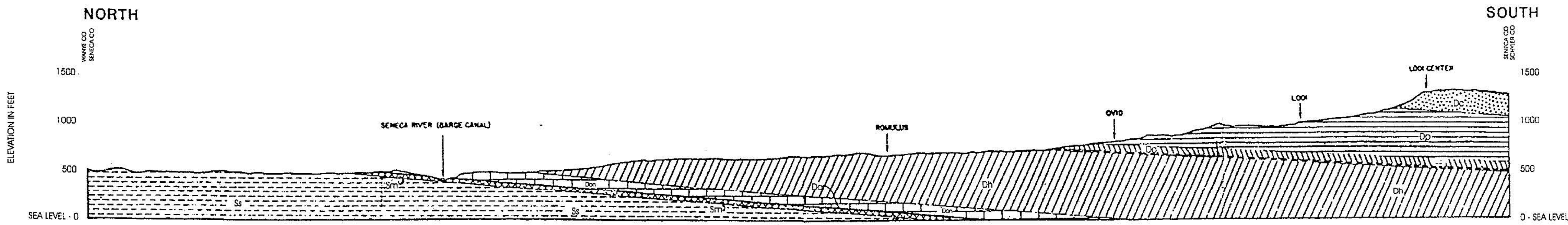
Legend

Code

Bi	Bismuth (Bi-214, Bi-210)	Po	Polonium (Po-218, -214, -210)	Th	Thorium (Th-234, -230)
Pa	Protactinium (Pa-234)	Ra	Radium (Ra-226)	U	Uranium (U-238, -234)
Pb	Lead (Pb-214, -210)	Rn	Radon (Rn-220)		



EAST-WEST SECTION ALONG A- A'



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

LEGEND

UPPER DEVONIAN	Dc	WISCOY SHALE, NUNDA SANDSTONE, WEST HILL FORMATION, GRIMES SANDSTONE	DEVONIAN
	Dp	HATCH SHALE, CASHAQUA SHALE	
	Do	GENESEE GROUP: WEST RIVER SHALE, GENESEO SHALE	
		TULLY LIMESTONE	
MIDDLE DEVONIAN	Dh	HAMILTON GROUP: MOSCOW SHALE, LUDLOWVILLE SHALE, SKANEATELES SHALE, MARCELLUS SHALE	
MIDDLE OR LOWER DEVONIAN	Don	ONONDAGA LIMESTONE	
LOWER DEVONIAN	Do	ORISKANY SANDSTONE	
SILURIAN (UPPER)	Sm	MANLIUS AND RONDOUT LIMESTONES AND COBLESKILL DOLOMITE	SILURIAN
	Ss	SALINA FORMATION INCLUDING BERTIE LIMESTONE MEMBER AND CAMILLUSSHALE MEMBER	

SCALE
1 0 1 2 3 MILES

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

PARSONS

Seneca Army Depot Activity

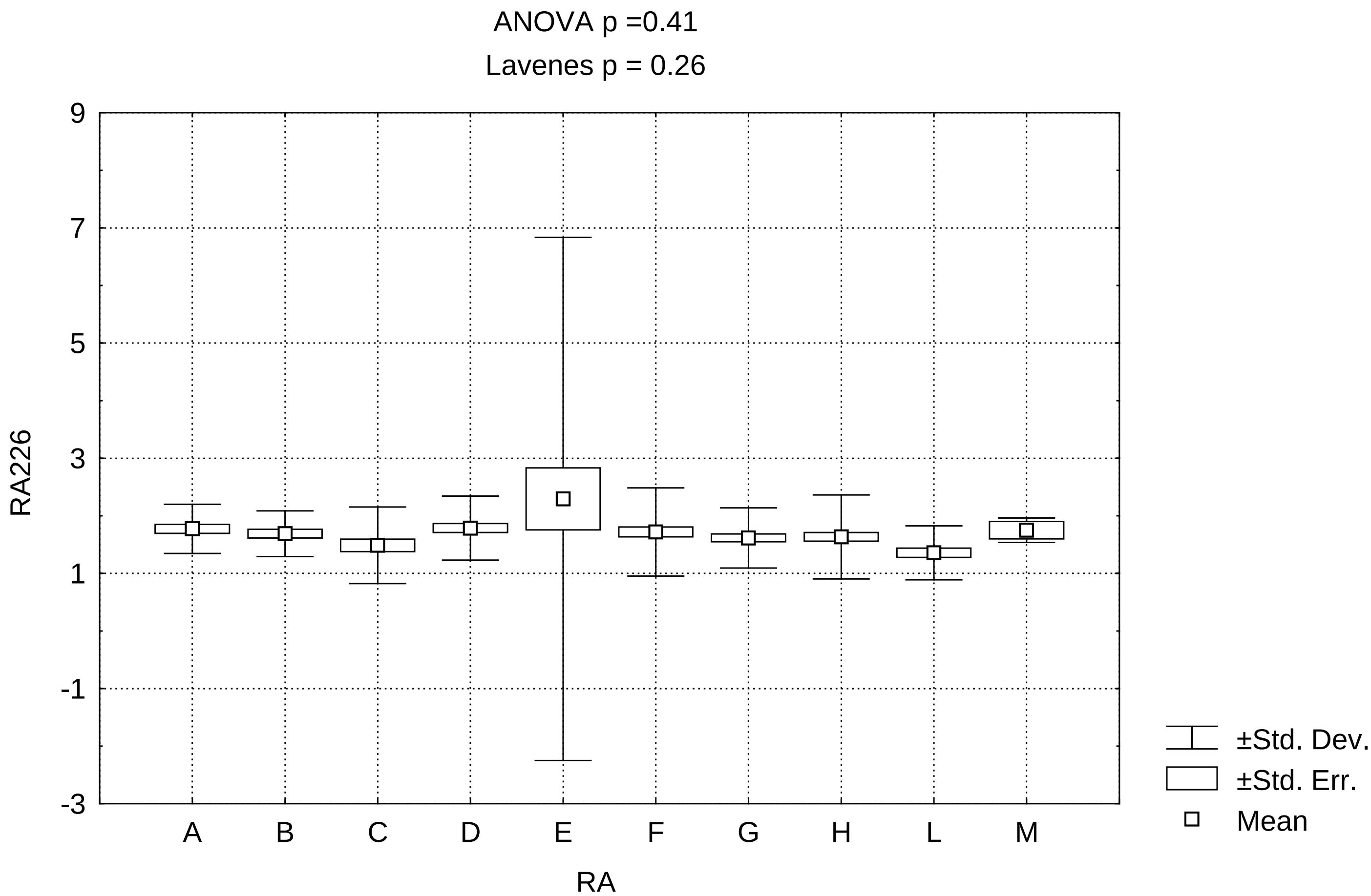
Proposed Plan for SEAD-12 and SEAD-72

FIGURE 4

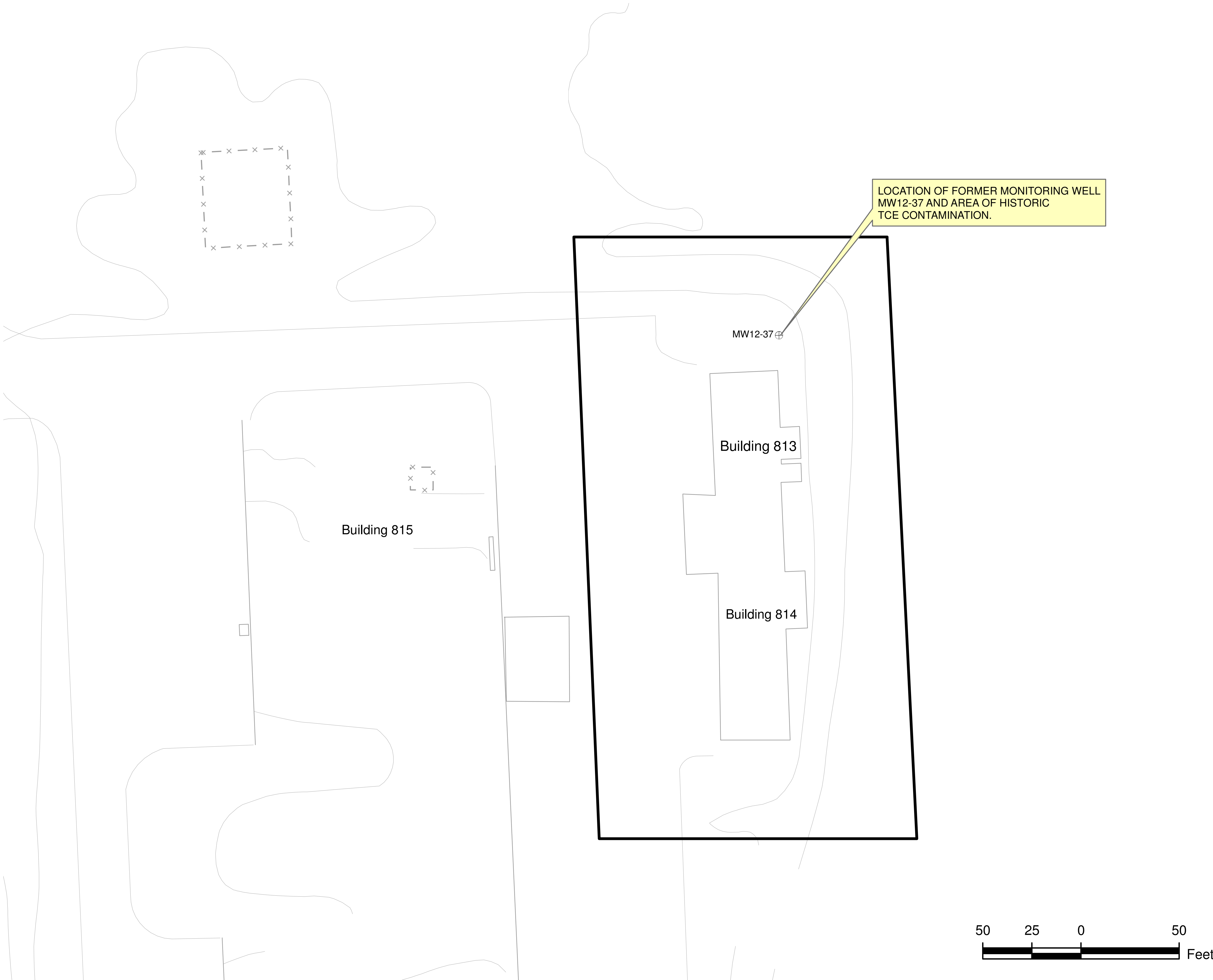
Regional Geologic Cross Sections

Figure 5

Box and Wisker Plot of Radiological Scanning Data
SEAD-12 Potential Release Areas
SEAD-12 and SEAD-72 Proposed Plan
Seneca Army Depot Activity



A - EM-5
B - EM-6
C - Building 819/ EM-27
D - Building 815-816/ EM-28
E - Disposal Pit A/B
F - Disposal Pit C
G - Former Dry Waste Disposal Pit
H - Class III Areas
L - Background
M - Wastewater Treatment Plant



LEGEND:

CENTERLINE OF DRAINAGE DITCH

PROPOSED LIMITS OF LAND USE CONTROL (LUC)

NOTES:

1. THE PROPOSED LIMITS OF THE LAND USE CONTROL (LUC) WERE DELINEATED BASED ON GROUNDWATER DATA COLLECTED DURING THE RI AND SRI.

2. THE PROPOSED LUC WOULD LIMIT USE AND ACCESS TO BUILDINGS 813/814 OR THE CONTRUCTION OF INHABITABLE STRUCTURES (TEMPORARY OR PERMANENT) ABOVE THE AREA WHERE TRICHLOROETHENE CONTAMINATED GROUNDWATER AND SOIL WERE IDENTIFIED UNTIL A VAPOR INTRUSION STUDY IS CONDUCTED IN THE BUILDING(S) OR IN THE RESTRICTED AREA AND SHOWS THAT RESIDUAL CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS, IF PRESENT, DO NOT POSE RISK TO FUTURE OCCUPANTS OF THE STRUCTURES; AND THE IMPLEMENTATION, MONITORING, AND MAINTENANCE OF A LUC TO PROHIBIT ACCESS TO AND USE OF GROUNDWATER IN THE VICINITY OF BUILDINGS 813/814 AND FORMER MONITORING WELL MW12-37 UNTIL GROUNDWATER STANDARDS ARE ACHIEVED.

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SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN FOR
SEAD-12 AND SEAD-72

FIGURE 6
PROPOSED EXTENT OF
LAND USE CONTROL

DATE JULY 2012

O:\Seneca\Sead-12\PRAP 2008\FIGURE 6.mxd