PARSONS

100 High Street, 4th Floor • Boston, Massachusetts 02110 • (617) 946-9400 • Fax (617) 946-9777 • www.parsons.com

July 30, 2010

Mr. John Nohrstedt
U.S. Army Corps of Engineers
Engineering and Support Center, Huntsville
Attn: CEHNC-FS-IS
4820 University Square
Huntsville, Alabama 35816-1822

SUBJECT: Revised Draft Final Proposed Plan for the Radiological Waste Burial Sites (SEAD-12) and the Mixed Waste Storage Facility (SEAD-72) at Seneca Army Depot Activity; Contract DACA87-02-D-0005, Delivery Order 0031

Dear Mr. Nohrstedt:

Parsons Infrastructure & Technology Group Inc. (Parsons) is pleased to submit the Revised Draft Final Proposed Plan for the Radiological Waste Burial Sites (SEAD-12) and the Mixed Waste Storage Facility (SEAD-72) located at the Seneca Army Depot Activity in Romulus, New York. This work was performed in accordance with the Scope of Work for Delivery Order 0031 under Contract No. DACA87-02-D-0005.

Parsons appreciates the opportunity to provide you with the Proposed Plan for this work. Should you have any questions, please do not hesitate to call me at (617) 449-1405 to discuss them.

Sincerely,

Todd Heino, P.E.
Project Manager

Enclosures

cc: S. Absolom, SEDA
R. Battaglia, USACE, NY District
K. Hoddinott, USACHPPM

PARSONS

100 High Street, 4th Floor • Boston, Massachusetts 02110 • (617) 946-9400 • Fax (617) 946-9777 • www.parsons.com

July 30, 2010

Mr. Julio Vazquez
U.S. Environmental Protection Agency, Region II
Superfund Federal Facilities Section
290 Broadway, 18th Floor
New York, NY 10007-1866

Mr. Kuldeep K. Gupta, P.E.
New York State Department of Environmental Conservation (NYSDEC)
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, NY 12233-7015

Mr. Mark Sergott
Bureau of Environmental Exposure Investigation, Room 300
New York State Department of Health
547 River Street, Flanigan Square
Troy, NY 12180

SUBJECT: Revised Draft Final Proposed Plan for the Radiological Waste Burial Sites (SEAD-12) and the Mixed Waste Storage Facility (SEAD-72) at Seneca Army Depot Activity, Romulus, New York; EPA Site ID# NY0213820830 and NY Site ID# 8-50-006

Dear Mr. Vazquez/Mr. Gupta/Mr. Sergott:

Parsons Infrastructure & Technology Group Inc. (Parsons) is pleased to submit the Revised Draft Final Proposed Plan for the Radiological Waste Burial Sites (SEAD-12) and the Mixed Waste Storage Facility (SEAD-72) located at the Seneca Army Depot Activity (SEDA) in Romulus, New York (EPA Site ID# NY0213820830 and NY Site ID# 8-50-006).

Should you have any questions, please do not hesitate to call me at (617) 449-1405 to discuss them.

Sincerely,

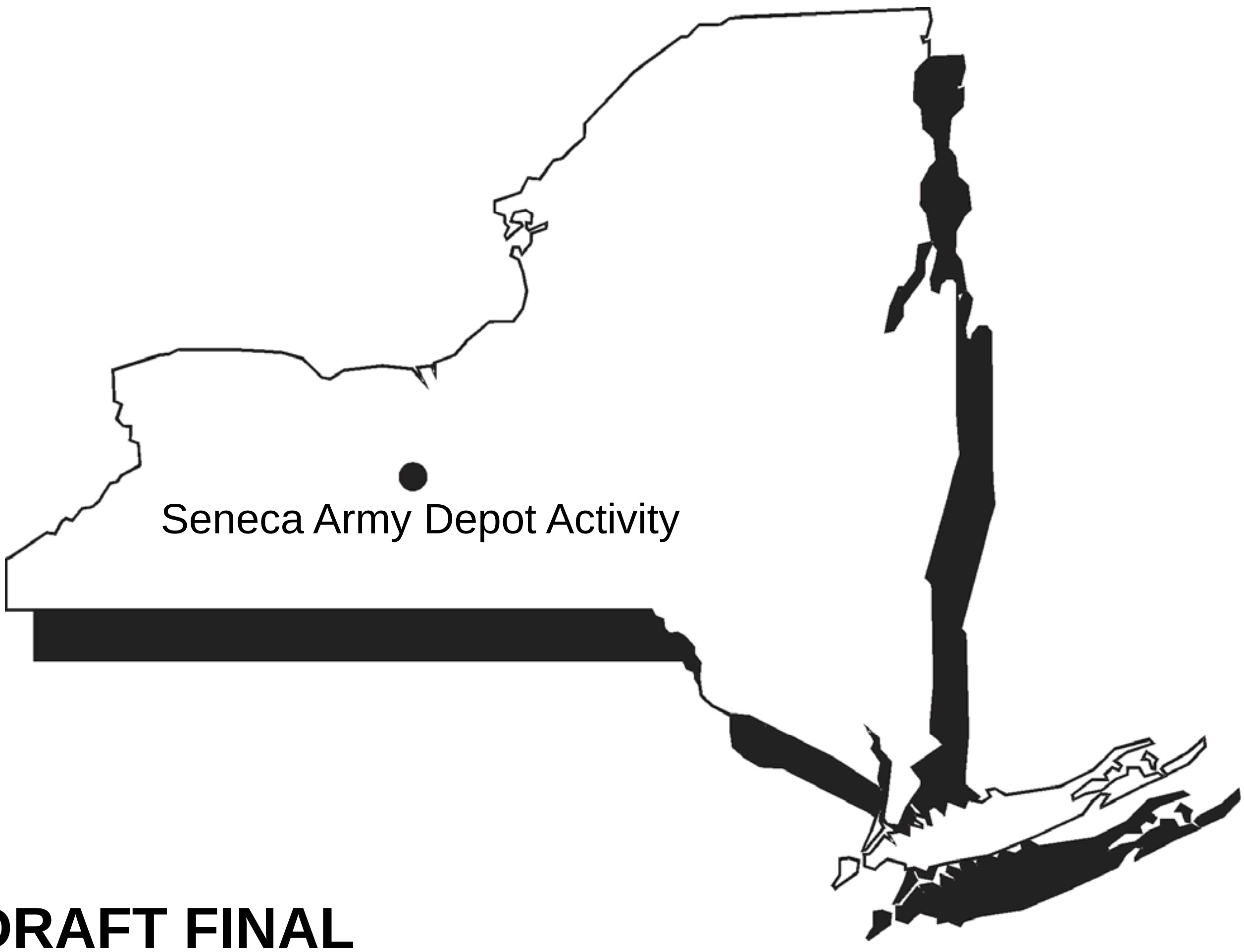
Todd Heino, P.E.
Program Manager

Enclosures

cc: S. Absolom, SEDA
R. Battaglia, USACE, NY District
M. Heaney, TechLaw
J. Nohrstedt, USACE, Huntsville
K. Hoddinott, USACHPPM

US Army, Engineering & Support Center
Huntsville, AL

Seneca Army Depot Activity
Romulus, NY



DRAFT FINAL
PROPOSED PLAN

RADIOLOGICAL WASTE BURIAL SITES (SEAD-12) AND MIXED WASTE STORAGE FACILITY (SEAD-72) SENECA ARMY DEPOT ACTIVITY

Contract No. DACA87-02-D-0005
Delivery Order No. 0031
EPA Site ID# NY0213820830
NY Site ID# 8-50-006

PARSONS
July 2010

##

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 2010

##

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 RCRA Closure Report for SEAD-72, and the July 2010 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, 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 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

MARK YOUR CALENDAR

[Begin Date] – [End Date]:
Public comment period related to this Proposed Plan.

[Meeting Date] at **[Meeting Time]:**
Public meeting at the Seneca County Office Building, Hero's Conference Room, Village of Waterloo, New York

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 [Begin Date] and concludes on [End Date].

A public meeting will be held during the public comment period at the Seneca County Office Building on [Meeting Date] at [Meeting Time] 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

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 SEDA within the former Weapons Storage Area (WSA) facility, also known as the "Q Area". **Figure 1** shows 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. Investigation of 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**. 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 Inspections (ESIs) 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** based on the similarity of the chemicals found at the two historic SEADs and review of the general history of the WSA, which suggested that similar constituents were likely to 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 WSA north of the storage igloos. 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 their Army use, and which currently receives wastewater from the Hillside Adolescent Center, which is now located in the SEDA's former North End Barracks 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.

Figure 2 presents an enlarged view of the area defined as SEAD-12. Nine potential release areas were identified within the boundary of the enlarged SEAD-12 based on the review of the historic use of land within the AOC, the results of an electromagnetic (EM) survey that was conducted throughout SEAD-12 prior to the full RI, the radiological classification (i.e., Class I, II, or III) assigned to the various buildings and areas within SEAD-12, and geographical location. The areas are shown on **Figure 2** and identified as follows:

- Building 819 and EM-27 (Class I & II);
- Building 815, Building 816, and EM-28 (Class I, II & III);
- Disposal Pits A/B (Class I & II);
- Disposal Pit C (Class I & II);
- Dry Waste Disposal Pit (Class II);
- EM-5 (Class II);
- EM-6 (Class II);
- Class III Areas (open areas); and
- Wastewater Treatment Plant.

Areas/buildings identified as Class I radiological sites included those sites that were determined to have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on radiological surveys). Class II radiological sites included areas that were determined to have, or had prior to remediation, a potential for radioactive contamination or known contamination, but where levels were not expected to exceed the Derived Concentration Guideline Level (DCGL)[1]. Class III and Limited Class III radiological sites are defined as

[1] The Derived Concentration Guideline Level (DCGL) are a radionuclide-specific surface or volume residual radioactivity level that is related to a concentration, dose, or risk criterion. DCGLs are defined in the Multi-Agency Radiation Survey & Site Inspection Manual (MARSSIM) as residual levels of radioactive material that correspond to allowable radiation dose standards.

potentially impacted areas that were not expected to contain any residual radiological activity, or were expected to contain levels of residual radioactivity at a small fraction of the DCGL. Examples of areas that may be classified as Class III include buffer zones around Class I or Class II areas, while Limited Class III areas included buffer zones surrounding Class III areas with very low potential for residual contamination but insufficient information to justify a non-impacted classification.

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. With the termination of SEDA's military mission in 2000 and the termination of its Nuclear Regulatory Commission (NRC) license to use, store, maintain, and handle depleted uranium materials, continued future use of Building 803 as a waste storage facility is no longer required. 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 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. As the Weapon Storage Area (WSA) facilities became operational, the two AOCs were operated jointly by the Army and the Atomic Energy Commission (AEC) until 1962. After 1962, all activities at SEAD-12 and SEAD-72 were transferred to the full control of 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 solid waste management units (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 Resource Conservation and Recovery Act (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/Commercial areas (**Figures 1** and **2**).

Since 1995, approximately 8,000 acres of the former Depot has been transferred to the SCIDA. Portions of SEAD-12 have been transferred to SCIDA and are currently used for commercial activity. An additional 270 acres of land at the Depot has been transferred to the U.S. Coast Guard for operation of a Long Range Navigation (LORAN Station) which has subsequently been shut down.

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

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 workplan.

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 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 confirmed 25 of the 28 anomalies. Test pits were excavated and used to investigate the remaining 25 subsurface anomalies. Military-related debris was found in several potential release areas including the Class III zones, 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 that served as both a characterization and final status survey of final release survey of the facilities was also conducted between 1998 and 2001 (i.e., Building 803).

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 Supplemental Remedial Investigation (SRI) was conducted in SEAD-12 in 2004 and 2005 to further investigate the extent of trichloroethene (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 226Ra and 210Pb 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 due to analytical uncertainty. The standard operating procedure for the Modified DOE EML HASL-300 Method is presented in the SRI report.

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 goal of the removal action was to excavate, recover, secure, and dispose of military-related items that were suspected to be buried in the historic burial pits before the land was released to outside parties for reuse. The removal action also provided the Army with the opportunity to further evaluate and characterize the material that was disposed in the burial pits to ensure that it did not contain other previously unidentified hazardous substances or waste materials that could pose potential risks or hazards to future users or occupants of the site.

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. Military-related items with radiological residuals in excess of background levels were secured pending final disposal at a licensed low-level radioactive waste disposal site.

With the discovery of elevated levels of radiation, the Army expanded the removal action work to include the collection and characterization of soil samples at locations within and around the excavation sites to confirm chemical and radiological hazardous substances that remained 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 levels of radiation left at the excavation sites were evaluated by the performance of a Final Status Survey that was performed in accordance with the procedures and guidelines defined in the MARSSIM (NRC, EPA 2000).

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)*.

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 the Weapons Storage Area. A natural seasonal marsh area occurs near the eastern portion of the unnamed creek. This marsh tends to remain wet throughout the year, drying out only 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.

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 comparator 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[2] (hereafter referred to as 95th UCL) was calculated for each analyte found to exceed one or the other, or both of the identified comparator 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 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 95th 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 95th 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 95th 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.

[2] Confidence limits for the mean (Snedecor and Cochran, 1989) are an interval estimate for the mean. Interval estimates are often desirable because the estimate of the mean varies from sample to sample. Instead of a single estimate for the mean, a confidence interval generates a lower and upper limit for the mean. The interval estimate gives an indication of how much uncertainty there is in our estimate of the true mean. The narrower the interval, the more precise is our estimate. The 95th upper confidence limit should approximately provide the 95% coverage for the unknown population mean (EPA, 2007).

Table 1
SEAD-12 Soil Summary

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]
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 excluded 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 95th 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 95th 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 95th 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, Section 1.10.5, "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

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 the 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 exhibiting elevated concentrations of TCE were excavated and treated.

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 above and 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 again compare 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.

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 (ammo area) within SEAD-12 for metal analysis. All the sediment samples were collected from the bottom of the drainage or creek ditches. 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.

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 can not 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.

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[3], which means the concentrations were very low and were estimated values. All detected toluene concentrations were lower than its respective NYSDEC Unrestricted Use SCO.

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).

[3] Reporting limit is the lowest concentration or amount at which a target analyte can be accurately quantified.

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 trichloroethene and dichloroethene exceedances were limited to well location MW12-37, which was previously 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 or three monitoring events conducted at a specific well, suggesting that they may be 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 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 3
Comparison of SEAD-12 Sediment Concentrations and NYSDEC Sediment Criteria

Compound	SEAD-12 Maximum Detected Sediment Concentration (mg/kg)	SEAD-12 Downgradient Maximum Detected Sediment Concentration (mg/kg)	NYSDEC Sediment Criteria (mg/kg)	SEAD-12 Background Maximum Detected Concentration (mg/kg)
Toluene	0.02	ND	0.0027	NA
Anthracene	0.83	0.16	0.0058	NA
Benzo(a)anthracene	3.1	1.5	0.000648	NA
Benzo(a)pyrene	3.3	1.3	0.0702	NA
Benzo(b)fluoranthene	3.2	1.2	0.0702	NA
Benzo(k)fluoranthene	2.7	0.049	0.0702	NA
Chrysene	3.2	1.4	0.0702	NA
Fluorene	0.34	0.059	0.000432	NA
Indeno(1,2,3-cd)pyrene	2	0.67	0.0702	NA
Naphthalene	0.049	0.016	0.0016	NA
Pyrene	5.4	2	0.0519	NA
4,4'-DDD	0.11	0.0037	0.00054	NA
4,4'-DDE	0.076	0.004	0.00054	NA
4,4'-DDT	0.2	ND	0.00054	NA
Arochlor-1254	1.2	ND	0.0000432	NA
Arochlor-1260	0.037	ND	0.0000432	NA
Endosulfan I	0.0036	ND	0.00162	NA
Heptachlor epoxide	0.011	ND	0.0000432	NA
Antimony	2.8	ND	2	ND
Arsenic	19.1	7.6	6	9.3
Cadmium	9	0.16	0.6	ND
Chromium	130	37.1	26	31.6
Copper	1160	36.8	16	49.3
Iron	85900	43000	20000	45300
Lead	215	30.9	31	35.8
Manganese	14000	947	460	1200
Mercury	1.7	0.27	0.15	0.09
Nickel	126	58.9	16	67.9
Silver	1.5	0.52	1	ND
Zinc	2650	196	120	135

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

At the conclusion of the RI, the only groundwater concern identified as requiring additional evaluation was the presence of trichloroethene and dichloroethene in well MW12-37, which was located in close proximity to Buildings 813/814. During the RI, a trichloroethene 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 total 1,2-dichlorothene in the only sample characterized for this analyte during the second sampling event. A trichloroethene concentration of 0.5 μg/L was noted in well MW12-40, which is roughly 400 – 500 feet northwest of MW12-37 during the spring sampling event, but was not detected during the winter sampling event. None of the other wells in close proximity to MW12-37 showed any indication of trichloroethene.

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)
Cis-1,2-Dichloroethene [2]	41	5	NA
Trichloroethene [2]	2,400	5	NA
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.
2. Exceedances observed at MW12-37 only; since MW12-37 and surrounding soils have been removed, there are no longer any exceedances of TCE at SEAD-12.

To address a regulatory concern regarding the possible presence of a "chlorinated solvent plume" in the vicinity of Building 813/814, the Army 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 dichloroethene or trichloroethene at levels in excess of the GA groundwater standards was well MW12-37. Two other temporary wells were also observed to contain trichloroethene, but in each of these cases, the reported concentration was below the GA standard. Furthermore, other wells located between MW12-37 and the temporary wells did not contain any detectable levels of trichloroethene. None of the temporary wells were observed to contain any measureable level of dichloroethene.

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 excavations 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 trichloroethene was present in the excavated soils at concentrations ranging from not detected and 1.3 "J" μg/Kg up to 65,000 μg/Kg. During the soil excavation, a buried clay sewer pipe that ran from the northern face of Building 813 towards the drainage ditch was unearthed. This pipe was located within 1 foot distance of MW12-37, but the pipe was not observed to be broken or associated with any soil that contained elevated concentrations of trichloroethene. 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 excavation and disposal response action, 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.

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 most cases, these drainage ditches serve as infiltration basins, where captured runoff waters subsequently 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 may occur 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 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.

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.

SEAD-12 Remedial Investigation Radiological Impacts

Soils

The radiological building survey concludes 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[4] 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[5] and AOC-wide groundwater, surface water, and sediment datasets were statistically compared to SEAD-12 background radiological results, using the Wilcoxon Rank Sum (WRS)[6] 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 adjusted for 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.

Based on this analysis process, 14 radionuclides were determined to exceed background levels at one or more of the study areas[5] 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 levels226Ra. Additionally, soil radiological exceedances of background plus worker DCGLs were noted for ^{210}Pb-210 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 industrial/municipal purposes. ^{214}Bi, ^{210}Pb, ^{214}Pb, and ^{226}Ra are all natural daughters within the decay chain of Uranium-238 (^{238}U, 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, also a member of the ^{238}U decay chain, which also decays to ^{210}Pb, ^{214}Pb, and ^{214}Bi. 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 worker values.

The radiological soil data for ^{226}Ra were evaluated further, by running a one-way parametric analysis of variance (ANOVA) test to compare the means of the potential release areas. 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. The

[4] Class I – have or had a potential for radioactive contamination or know contamination.
Class II - have or had a potential for radioactive contamination or know contamination, but not expected to exceed DCGL.
Class III or Limited Class III – An impacted area not expected to contain any residual radioactivity, or to contain levels at a small fraction of the DCGL.

[5] See list of identified source areas on page 3 of this document.

[6] The Wilcoxon Rank Sum (WRS) test is a non-parametric method for assessing whether two samples of observations come from the same distribution. The null hypothesis is that the two samples are drawn from a single population, and therefore that their probability distributions are equal.

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

Lavene's[7] and analysis of variance (ANOVA[8]) tests returned "p-values" of 0.26 and 0.41, respectively. The tests were run using the commercial software STATISTICA (Statsoft, 1997). The software returns a test "p-value" between zero and one, indicating a "pass" or "fail" condition. A p-value of 0.05 or greater indicates a "pass" (meaning the distributions are similar), at a Type I error[9] probability of 0.05, or in other words, a one-in-twenty chance of falsely identifying the distributions as similar when they really are not. The results of these tests are summarized in the box-and whisker plots of the data sets. The data sets pass the test for assumptions and also pass the ANOVA. These results indicate that ^{226}Ra distributions from all the sites are similar to each other as well as the background distribution. This is also evident by examining the box-and-whisker plots that show similar distributions for all the sites. 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 laboratory uncertainty.

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 (^{228}Th) was found to have a population statistically different from the background dataset. Based on this finding, the potential risks associated with ^{228}Th in groundwater was evaluated in the human health risk assessment.

---

[7] Levene's test is an inferential statistic used to assess the equality of variances in different samples. Some common statistical procedures assume that variances of the populations from which different samples are drawn are equal. Levene's test assesses this assumption. It tests the null hypothesis that the population variances are equal. If the resulting p-value of Levene's test is less than some critical value (typically 0.05), the obtained differences in sample variances are unlikely to have occurred based on random sampling. Thus, the null hypothesis of equal variances is rejected and it is concluded that there is a difference between the variances in the population. (**Source**: http://en.wikipedia.org/wiki/Levene's_test)

[8] Analysis of variance (ANOVA) is a collection of statistical models, and their associated procedures, in which the observed variance is partitioned into components due to different sources of variation. In its simplest form ANOVA provides a statistical test of whether or not the means of several groups are all equal, and therefore generalizes Student's two-sample *t*-test to more than two groups. ANOVAs are helpful because they possess a certain advantage over a two-sample t-test. Doing multiple two-sample t-tests would result in a largely increased chance of committing a type I error. (**Source**: http://en.wikipedia.org/wiki/Analysis_of_variance)

[9] In a statistical hypothesis test, there are two types of incorrect conclusions that can be drawn. The hypothesis can be inappropriately rejected (this is called type I error), or one can inappropriately retain the hypothesis (this is called type II error). (**Source**: http://en.wikipedia.org/wiki/Type_I_and_type_II_errors)

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 populations statistically greater than the background data set. 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 populations 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 items 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 military-related items that had been buried to include the collection and analysis of radiological data from the sites that could be used 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. As part of this process, once radiological constituents were first identified and retrieved, three samples of recovered radiological material and four smear samples 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 results of these sample analyses are summarized in **Table 7** below.

Table 7
Gamma Spectroscopy Quick Screen Results

SAMPLE ID	MATERIAL	DETECTED RADIONUCLIDES (1)
S12DS01; S12WS04	Brown sandstone material	Elevated natural uranium (^{238}U) progeny: ^{214}Bi (250 pCi/g); ^{214}Pb (249 pCi/g); ^{210}Pb (243 pCi/g) Elevated natural thorium (^{232}Th) progeny: ^{228}Ac (408 pCi/g); ^{212}Bi (258 pCi/g); ^{212}Pb (368 pCi/g); ^{208}Tl (157 pCi/g)
S12DS02; S12WS03	White metal piece	Elevated natural thorium (^{232}Th) progeny: ^{228}Ac (1,080 pCi/g); ^{212}Bi (685 pCi/g); ^{212}Pb (1,120 pCi/g); ^{208}Tl (403 pCi/g)
S12DS03; S12WS02	Clump of mud with paint/metal flakes	Radium (^{226}Ra) progeny: ^{214}Bi (2,080 pCi/g); ^{214}Pb (1,470 pCi/g); ^{210}Pb (1,960 pCi/g)
S12WS01	Smear of excavated component	No radionuclides reported as detected.

(1) Bi = bismuth; Pb = lead; Ac = actinium; Tl = thallium; Ra = radium.

A discussion of the samples with reported detections appears below:

- S12DS01: This sample consisted of sandstone material identified during the baseline radiological scanning survey of the surface at Disposal Pit C-2. The location was flagged and excavated using shovels - the source material was found approximately six inches below the ground surface. Field radiation measurements at the sample location returned to background levels following the removal of the piece of sandstone.

  Based on the detection of radionuclides associated with both the naturally-occurring uranium and thorium decay series, the material is assumed to be unprocessed. One historic mission of SEDA was the storage of valuable ores, including pitchblende ore (in SEAD-48) and columbite ore. Due to the rock's location in the surface soil it is unlikely it was intentionally placed in the area for burial. No other similar material was found over the course of the Removal Action excavation and/or screening process.

- S12DS02: This sample was collected from the vicinity of several items that had a large white-colored light metal sleeve with above-background radiation levels, and appeared to be the same type of material. The results indicate the presence of natural thorium (^{232}Th) progeny. The items themselves were not identified, but thorium alloys with aluminum, magnesium, and other light metals are common in aircraft parts and other components that must maintain structural integrity in high temperatures.

- S12DS03: This sample consisted of a clump of clay with small pieces of metal or paint, apparently from a damaged radium dial or gauge. The detection of three progeny of ^{226}Ra without detections of uranium decay series progeny above ^{226}Ra, such as ^{234}Th confirms the presence of radium.

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 with progeny equilibrium assumed. The release criteria used for the Final Status Survey 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, 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.

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.

Wide-area $DCGL_W$s were developed by Argonne National Laboratory (ANL) for use during the license termination effort at SEDA in 2003. The License Termination Plan (LTP; ANL, 2003) was reviewed and approved by NRC Region I for use in evaluating residual radioactivity levels across SEDA. Pursuant to NRC review comments, a probabilistic analysis of input parameters for the dose modeling code RESRAD was performed. The dose modeling is performed for a distinct receptor that would be likely to receive the maximum total lifetime dose. For SEAD-12, the resident farmer receptor was chosen, in accordance with the guidance provided in NUREG/CR-5512, to derive the soil DCGLs. The final DCGLs correspond to a TEDE of 10 mrem/yr.

The LTP $DCGL_w$s used for the SEAD-12 excavation site were 1.7 pCi/g for ^{226}Ra, and 1.5 pCi/g for ^{232}Th. To determine compliance with the overall dose limit, the sum of ratios (SOR) was applied to the analytical results using the following equation:

$$SOR_{DCGL_W} = \left(\frac{Conc_{Ra-226}}{DCGL_{Ra-226}} + \frac{Conc_{Th-232}}{DCGL_{Th-232}} \right)$$

An SOR greater than 1 for a given sample indicates the SU would exceed the dose limit if the entire survey limit were at that value.

Impacted areas within SEAD-12 (i.e., Disposal Pits A/B, C1, and C2, and slope stability benches) were then subdivided into MARSSIM survey units (SUs) and classified as either Class I, II, or III in accordance with procedures specified under MARSSIM. Based on this, four survey units including three Class I (i.e., Pit A/B, SU 1; Pit C1, SU 2; and, Pit C2, SU 3) and one Class II (i.e., slope stability benches surrounding the three pits, SU 4) were established.

Background concentrations of ^{226}Ra and ^{232}Th and other naturally-occurring radionuclides were determined using the surface and subsurface data set from the SEAD-63 project conducted in 2004[10]. Burial pits were excavated at SEAD-63 with health physics support in a similar fashion to SEAD-12. Unlike SEAD-12, however, no radioactive items were discovered during the SEAD-63 excavation support. Gamma spectroscopy data for Actinium-228 (^{228}Ac), ^{214}Bi, Potassium-40 (^{40}K), and ^{234}Th, as well as gross alpha and beta results, were evaluated for statistical outliers and no anomalous data were identified. Therefore, the soils at SEAD-63 were considered to be unimpacted from a radiological perspective and soil sample data from the remediation was used as a background data set. The summary statistics of the evaluated radionuclides are presented below in **Table 8**.

[10] Refer to “Removal Action Completion Report, Non-Time Critical Removal Action Miscellaneous Components Burial Site *(SEAD-63)* (Plexus, 2005)**.**

Table 8
Sead-12 Removal Action Soil Background Concentrations

Radionuclide	Number of Measurements	Average (pCi/g)(1)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
^{214}Bi (^{226}Ra)	35	0.6	0.1	0.0	0.8
^{228}Ac (^{232}Th)	35	1.0	0.2	0.0	1.3
^{40}K	35	25.1	2.1	21.0	29.4
^{234}Th	35	1.0	0.4	0.4	2.1
Gross Alpha	35	11.0	2.5	6.2	20.9
Gross Beta	35	26.5	4.9	12.5	42.6

(1) pCi/g = picocuries per gram.

Land area compliance with the $DCGL_w$ was demonstrated through the application of the WRS test for systematic soil sample results from each SU. The statistical WRS test was performed to evaluate the SU mean concentration relative to the null hypothesis (H_0). Simply stated, H_0 assumes the residual contamination in the SU exceeds the release criterion. Provided the statistical test is satisfied at the desired confidence level, then H_0 is rejected and the alternate hypothesis (H_a), residual contamination meets the release criterion, is accepted. The data needs for the statistical tests were determined through the processes in the following sections.

The impacted areas of SEAD-12 consists of three Class I SUs 1, 2, and 3 and one Class II SU 4. Systematic soil sample summary results for SUs 1 through 4 are provided in the summary shown below in **Table 9**. Biased soil sample summary results for SUs 1 through 3 are provided in Table 10 (there were no biased samples collected in SU 4).

Table 9
Survey Unit Systematic Sample Results Summary

^{232}Th Summary						
Surface Soil (0-15 cm) Net Concentration						
Survey Unit	Impacted Area	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
1	Pits A/B	0.04	0.00	0.10	0.00	0.35
2	Pit C-1	0.00	0.00	0.01	0.03	0.03
3	Pit C-2	0.06	0.00	0.18	0.00	0.73
4	Perimeter of Pits[1]	0.03	0.00	0.10	0.00	0.55
^{226}Ra Summary						
Surface Soil (0-15 cm) Net Concentration						
Survey Unit	Impacted Area	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
1	Pits A/B	0.21	0.09	0.34	0.00	1.30
2	Pit C-1	0.19	0.16	0.18	0.00	0.62
3	Pit C-2	0.11	0.05	0.13	0.00	0.43
4	Perimeter of Pits[1]	0.17	0.14	0.16	0.00	0.66

Notes: (1) Survey unit consists of the perimeter of the top of excavation of Pits A/B, C1, and C2.

Table 10
Survey Unit Biased Sample Results Summary

^{232}Th Summary						
Surface Soil (0-15 cm) Net Concentration						
Survey Unit	Impacted Area	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
1	Pits A/B[1]	0.05	0.00	0.09	0.00	0.16
2	Pit C-1[2]	0.07	0.07	N/A	0.07	0.07
3	Pit C-2[2]	0.12	0.12	N/A	0.12	0.12
^{226}Ra Summary						
Surface Soil (0-15 cm) Net Concentration						
Survey Unit	Impacted Area	Mean (pCi/g)	Median (pCi/g)	Standard Deviation (pCi/g)	Minimum (pCi/g)	Maximum (pCi/g)
1	Pits A/B[1]	0.17	0.24	0.15	0.00	0.26
2	Pit C-1[2]	0.31	0.31	N/A	0.31	0.31
3	Pit C-2[2]	0.28	0.28	N/A	0.28	0.28

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

Additional discussion of sampling results and statistical tests for each SU in SEAD-12 is provided in the following sections. The full discussion of the procedures applied and the results achieved during the Final Status Survey (FSS) of the former burial pits sites is provided in the *SEAD-12 Construction Completion Report* as Appendix D.

Pit A/B – Survey Unit 1

FSS activities in SEAD-12 SU 1 (Pit A/B) included a gamma walkover survey (GWS) and collection of 13 systematic surface soil samples. Three biased soil samples were collected based on the results of the GWS. A biased sample was collected at the location of highest gamma activity along the northeast sidewall of Pit A.

None of the FSS surface soil sample net results exceeded the $DCGL_w$ or unity (1) when evaluating the RCOC net DCGL fraction SOR. The WRS test was performed for both sets of data. The sum of the reference area ranks for the surface soil sample data set was 1,079. These results are greater than the critical level of 928. Therefore, H_0 is rejected and the SU satisfies the release criteria.

Pit C1 – Survey Unit 2

FSS activities in SEAD-12 SU 2 (Pit C-1) included a GWS and collection of 11 systematic surface soil samples. Additional biased soil sampling was performed based on the results of the GWS. A biased sample was collected at the location of highest gamma activity along the southwest sidewall of Pit C-1.

None of the FSS surface soil sample net results exceeded the $DCGL_w$ or unity (1) when evaluating the RCOC net DCGL fraction SOR. The WRS test was performed for both sets of data. The sum of the reference area ranks for the surface soil sample data set was 1,010. These results are greater than the critical level of 886. Therefore, H_0 is rejected and the SU satisfies the release criteria.

Pit C2 – Survey Unit 3

FSS activities in SEAD-12 SU 3 (Pit C-2) included a GWS and collection of 18 systematic surface soil samples. Additional biased soil sampling was performed based on the results of the GWS. A biased sample was collected at the location of highest gamma activity on the excavation floor of Pit C-2.

None of the FSS surface soil sample net results exceeded the $DCGL_w$ or unity (1) when evaluating the RCOC net DCGL fraction SOR. The WRS test was performed for both sets of data. The sum of the reference area ranks for the surface soil sample data set was 1,255. These results are greater than the critical level of 1,033. Therefore, H_0 is rejected and the SU satisfies the release criteria.

Perimeter of all Pits – Survey Unit 4

FSS activities in Class 2 SEAD-12 SU 4 (Perimeter of Pits A/B, C1, and C2 at top of excavation rim) included a GWS and collection of 31 systematic surface soil samples. Soil samples were collected along the perimeter of the excavations at ground surface, usually within 1 to 3 linear feet of sidewall samples for the purpose of ensuring excavation limits were adequate to remove residual radiological contamination. Biased soil samples were not collected because there were no areas of elevated gamma activity along the perimeter of the excavations.

None of the FSS surface soil sample net results exceeded the $DCGL_w$ or unity (1) when evaluating the RCOC net DCGL fraction SOR. The WRS test was performed for both sets of data. The sum of the reference area ranks for the surface soil sample data set was 1,699. These results are greater than the critical level of 1,321. Therefore, H_0 is rejected and the SU satisfies the release criteria.

The results of the Final Status Survey indicate radiological levels found at the historic 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.

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 WSA and SEAD-12. This facility operated as a greater than 90 day storage facility under Interim Status provisions of the Resource Conservation and Recovery Act (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 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) studies and investigations performed in SEAD-12 since approximately 1999.

As part of the termination of SEDA's RCRA obligations, Building 803 was decontaminated during July of 2009. The building was decontaminated manually 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.

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 limited to 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 11**. The analytical results were compared to the 500 microgram per liter (μg/L) Toxicity Characteristic (TC) level for trichloroethene 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. Based on this evaluation, the Army concludes that clean closure has been achieved for Building 803.

Table 11
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 in the WSA.

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 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

Portions of SEAD-12 are currently used for commercial activity. The future land use designated for the AOC is institutional/training/commercial activity. At the time when the BRAs were first conducted (2000 – 2002), the planned future use of SEAD-12 was conservation/recreation. Based on the then planned future land use of the AOC, five human receptors were identified for the BRA (i.e., current on-site worker, future park worker, future construction worker, future on-site child recreational visitor, and future downstream child wader). In 2005, after the completion of the RI, the planned future use of SEAD-12 changed (i.e., from conservation/recreation to institutional/training and subsequently to commercial activity for portions of the AOC). As a result of this change, the park worker and recreational visitor are no longer considered potential future receptors; rather, the training officer/commercial worker (hereafter referred to as training officer) and child trespasser/child visitor (hereafter referred to as child trespasser) are considered potential future receptors at SEAD-12 within this Proposed Plan. The exposure assumptions for the park worker and recreational visitor have been used to represent exposure assumptions for a training officer and the child trespasser. The Army believes this approach is appropriate because the body weight and body surface area are similar for the park worker and the training officer and for the recreational visitor and child trespasser. The exposure (e.g., exposure duration, frequency, and intensity) are also similar for the park worker and the training officer and for the recreational visitor and child trespasser. Therefore, the risk results presented in the RI report for the park worker and recreational visitor are used to assess risks to the potential training officer and child trespasser, respectively.

In addition, a future resident (child, adult, and lifetime) was also included to assess potential risks and hazards to receptors under the unrestricted use scenario which is 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". Therefore, for this risk assessment the following receptors were evaluated:

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 carcinogenic risk assessment).

The results of the original human health risk assessment (HHRA) have been updated to reflect estimated risks and hazards due to conventional (non radiological constituents) contaminants in soil that are now predicted for the site after the completion of the removal of military-related items and other debris from the historic burial pits (Disposal Pits A/B, C1, and C2) completed in 2009. 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. Changes to reported risk levels for all current or future on-site receptors previously reported for Disposal Pit A/B and C have been made based on data that is presented in the *Technical Memorandum, Updated Risk Assessment Radiological Waste Burial Sites* submitted on July 13, 2010, and which has also been added as an appendix to the *SEAD-12 Construction Completion Report*.

Carcinogenic risks previously projected for radiological constituents in soils at Disposal Pit A/B and C locations have been eliminated from the risk summarizes presented below because these have been superseded by the Final Status Survey results presented in the *SEAD-12 Construction Completion Report* and summarized above in the "SEAD-12 Removal Action" discussion which now indicate that these sites are suitable for unrestricted use and unlimited exposure under a Resident Farmer scenario, Radiological risks due to soils at the Dry Waste Disposal Pit site and due to site-wide groundwater, surface water, and sediment exposures remain as they were reported in the *SEAD-12 Remedial Investigation Report.*

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, downgradient sediment and surface water data were used to generate exposure point concentrations for this scenario.

Table 12 summarizes 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 is allowed under 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 RME excess cancer risk initially estimated for the future resident resulted from dermal contact with benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene in groundwater and benzo(a)pyrene in surface water. Benzo(a)pyrene was detected twice in the 89 groundwater samples; both samples were collected during the first of the two RI sampling events, and neither occurrence was noted during the second RI sampling event in either of the affected

Table 12
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	3.1E-5	7.1E-4	3E0 [2,3]
Future Resident (recal)	5.5E-5 [2]	3.0E-5 [3]	8.5E-5 [2,3]	8.2E-1 [2,4]
Current Worker	2.4E-8	5.2-9 [3]	2.9E-8 [3]	2.2E-4
Future Park Worker	2.0E-5 [2]	1.6E-5 [3]	3.7E-5 [2,3]	1.2E-1 [2]
Future Recreational Child	2.0E-5 [2]	1.2E-6 [3]	2.1E-5 [2,3]	3.1E-1 [2]
Current/Future Construction Worker	3.1E-8	2.9E-6 [3]	3.0E-6 [3]	1.3E-2
Disposal Pits C				
Future Resident (RI)	7.0E-4	3.5E-5	7.4E-4	3E0 [4]
Future Resident (recal)	5.7E-5 [2]	3.0E-5 [3]	8.7E-5 [2,3]	8.3E-1 [2,4]
Current Worker	7.4E-8	2.0.E-8 [3]	9.4-E-8 [3]	1.8E-4
Future Park Worker	2.1E-5 [2]	1.6E-5 [3]	3.7E-5 [2,3]	1.2E-1 [2]
Future Recreational Child	2.0E-5 [2]	1.2E-6 [3]	2.2E-5 [2,3]	3.1E-1 [2]
Current/Future Construction Worker	1.2E-7	2.9E-6 [3]	3.0E-6 [3]	9.5E-3
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. The risks were recalculated and the post COPC elimination results are presented.
3. Radiological constituents in soil have been eliminated from risk calculation based on Removal Action FSS.
4. Hazard index for residential child is presented.

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

wells or in any of the other well sampled. Benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene were collocated with one of the two noted detections of benzo(a)pyrene discussed above, and were never found in any other groundwater sample collected during the investigation of SEAD-12. All of the detected cPAH compounds were reported at concentrations below the EPA Contract-Required Quantification Limit (CRQL) for the Contract Laboratory Program (CLP) SOM01.2 (i.e., 5 µg/L) and the laboratory reporting limit (RL) of 1.1 µg/L. The RL is the lowest level at which a chemical can be accurately and reproducibly quantitated (EPA, 1989). The CRQL is the sample quantitation limit that CLP laboratories must maintain for organic analytes. Therefore, there was analytical uncertainty associated with all the noted cPAH compound detects in groundwater, and all of the results were deemed estimated with qualifier "J". Similarly, benzo(a)pyrene was also detected in only one of the 52 surface water samples collected during the combined SEAD-12 ESI and RI sampling events. Additionally, it was not detected in the duplicate sample collected during the same sampling event. Finally, the detected concentration for benzo(a)pyrene in the single sample of surface water was below the EPA's CRDL and the analytical DL and it was qualified with a "J" as an estimated concentration.

The RME non-cancer hazard index for the future child resident of 3 is due to dermal contact with Aroclor-1242 (updated 1.3 vs 1.0 RI) and chrysene (updated 0.3 vs not reported RI) in surface water and di-n-octylphthalate in groundwater. Aroclor-1242 was only detected twice in SEAD-12 surface water at concentrations of 0.33 µg/L in SW12-6 and 0.44 µg/L in SW12-23, both of which are below their CLP CRQL and were therefore estimated values. Similarly, chrysene was only detected once at a level of 0.5 µg/L at SW12A-1, and not in the duplicate that was collected at the same time and location. Di-n-octylphthalate was detected in six of the SEAD-12 groundwater samples. All detected di-n-octylphthalate concentrations were below the laboratory reporting limits; and none of the results were confirmed by the results of a follow up sampling round at the same locations. Overall, the groundwater and surface water data indicates that groundwater at SEAD-12 is not impacted by di-n-octylphthalate and surface water at SEAD-12 is not impacted by Aroclor-1242 or chrysene.

Therefore, the above referenced hazardous compounds are not regarded as COCs in the final risk assessment, based on the uncertainty analysis and risk management process. This COC screening is based on the frequency of detection and low concentration of individual constituents in the sampled media and is consistent with the chemical number reduction strategy presented in the EPA's *Risk Assessment Guidance for Superfund* (i.e., RAGS: EPA, 1989; Section 5.9.3 of Volume 1, Part A), which states:

> *Consider the chemical as a candidate for elimination from the quantitative risk assessment if: (1) it is detected infrequently in one or perhaps two environmental media, (2) it is not detected in any other sampled media or at high concentrations, and (3) there is no reason to believe that the chemical may be present.*

When the above referenced compounds and the radiological contributions attributable to soils that remain at Disposal Pit A/B and C were excluded from the risk calculations, the total cancer risk for potential future residents were estimated to be $8.5x10^{-5}$ ^{for} Disposal Pit A/B, $8.7x10^{-5}$ for Disposal Pit C, and $7.3x10^{-5}$, each below the EPA target limit of $1x10^{-4}$. Similarly, the total non-cancer hazard index for potential child residents was determined to be 0..82, 0..83, and 0.6, respectively for Disposal Pits A/B, Disposal Pits C, and the Former Dry Waste Disposal Pit area, all below the EPA limit of 1. The recalculated risks are presented in **Table 12** 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). A risk assessment was not performed to evaluate potential risks via the indoor air exposure pathway at Buildings 813/814. Currently, the vapor intrusion exposure pathway is not complete as the building is vacant and there is no current planned use of the facility for any purpose. Before the existing buildings or any new permanent or temporary facility constructed in the area of the previously identified trichloroethene and dichloroethene contamination could be inhabited however, a vapor intrusion survey and risk analysis would need to be performed to evaluate potential vapor impacts from groundwater and soil previously shown to contain elevated levels of trichloroethene.

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.

The NYSDEC Natural Heritage Program Biological and Conservation Data System identifies no known occurrences of federal- or state-designated threatened or endangered plant or animal species within a 2-mile radius of SEDA. No species of special concern are documented within the Depot property. No rare or endangered species were observed during the site assessment.

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 trichloroethene 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 would 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 3**) are located. Access to and use of Building 813 and 814 should be restricted until additional data is provided by a re-user to quantify risks that may exist to potential future users or occupants of the existing buildings, or the construction of inhabitable structures (temporary or permanent) above the area where volatile organic compounds, including trichloroethene, may be present in the soil and groundwater unless and until 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 risk to future occupants of the structures. Further, while an interim remedial action was performed exterior of Buildings 813 and 814 and removed soil that was found to contain trichloroethene, there is a continuing potential for recontamination of groundwater due to possible outward migration of VOCs in soil located below the building slabs where trichloroethene 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 remedial action objectives established for SEAD-12 are as follows:

- Prohibit potential exposure to volatile organic compounds 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 3** that may present a potential human health risk.

- Prohibit access to and use of groundwater in the vicinity of Buildings 813 and 814, and the location of former monitoring well location MW12-37.

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 the area in the vicinity of these buildings where TCE-contaminated groundwater and soil were previously identified. The LUC will state that an investigation of vapor intrusion potential and indoor air quality must be performed before the buildings, or any newly constructed temporary or permanent buildings in the vicinity, are occupied. The LUC would also prohibit the access to, and use of, groundwater in the vicinity of Buildings 813/814 (as shown in **Figure 3**) 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

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 trichloroethene 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 trichloroethene 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 trichloroethene 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 trichloroethene 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[11]
Total Present-Worth	$522,000
Construction Time	5 months

[11] Five years of semi-annual (twice per year) monitoring for VOCs only at annual rates of 7 percent.

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 trichloroethene 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 95th 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. Furthermore the slightly elevated level of nickel noted at locations around the historic burial pits site is generally consistent with background level of nickel found in background samples.

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 9** and **10** 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.

There are currently no chemical-specific ARARs for sediment in the State of New York; NYSDEC guidelines for sediment are considered TBCs criteria for SEAD-12.

Surface water sample results were compared to the NYSDEC Ambient Water Quality Standards (TOGS, 1.1.1, Class C Standards). Surface water is only found intermittently in the man-made drainage ditches and unnamed creek at SEAD-12, and thus the surface water is not classified by NYSDEC because it is a sporadic event, and it is not present in an established stream or creek. However, because the drainage ditches and creek form a portion of the headwaters for Reeder Creek, the lower portion of which is designated as Class C surface water by NYSDEC, the Class C standards were used to provide a basis of comparison for the on-site chemical data. The Class C standards are not strictly applicable to the surface water in the drainage ditches and the unnamed creek, and thus are treated as TBCs.

The NYSDEC has promulgated groundwater standards, which are applicable to SEAD-12 groundwater. In addition, the drinking water standards issued by EPA and NYSDOH are considered relevant and appropriate for SEAD-12 groundwater, as New York State defines the best use of groundwater within SEAD-12 as a possible source of drinking water. However, the groundwater pathway is incomplete at the Depot because an alternative, non-groundwater derived source of domestic water is available. Further, the shallow aquifer that underlies the Depot is not productive enough to yield sufficient volumes to support domestic usage throughout all seasons of the year.

Four organic and four metal compounds were identified in groundwater samples at levels exceeding the EPA and New York standards within SEAD-12. With reference to the organic compounds, each of the compounds found at levels above GA standards were detected infrequently (1, 2, or 3 times), and were either only detected at isolated locations within the 360 acre AOC or during one sampling event, and as such are not indicative of a persistent long-term release, or a cohesive plume. SEAD-12's predominant groundwater concern, which was the recurrent identification of trichloroethene in groundwater at well MW 12-37 (only) at levels in excess of GA and MCL standards was addressed by the focused interim removal action that was conducted in the area of Building 813/814. This action removed accessible soil that contained trichloroethene surrounding well MW12-37 and eliminated the localized groundwater hotspot. Other permanent and temporary wells placed in close proximity to well MW12-37 did not show evidence of trichloroethene contamination in the groundwater, and thus the removal of soil from, and surrounding the former location of MW12-37 appears to have removed the former source material of the groundwater contamination. SEAD-12 Alternative 1 does not address any residual compliance issues that may be associated with groundwater ARARs as nothing is done to address additional residual trichloroethene that may remain in soil beneath Buildings 813/814. Therefore, groundwater around Building 813/814 could become re-contaminated with trichloroethene at levels that exceed applicable groundwater standard levels. Alternative 3 would address the groundwater ARARs in this area either by demonstrating that residual trichloroethene source materials is no longer present in either the soil or groundwater at a concentration that is sufficient to cause concern, or in the event that trichloroethene was detected beneath the buildings, the building(s) would be demolished and allow for the source area to be investigated, excavated, and the source eliminated. Similar compliance potential is seen for Alternative 2, but the decision, and any potential remedial action, is delayed pending the identification of a future reuse of Buildings 813/814, and the land surrounding them and former well location MW12-37.

Off-site disposal would fall under RCRA and/or solid waste disposal requirements, which must be complied with in the remedial action. Once an alternative is chosen, the remedial design would incorporate compliance with ARARs.

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 is currently 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 lowest for short-term protection of human health and the environment since the alternative does not mitigate any potential short-term risks to human health or the environment.

Alternative 3 ranks highest 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. However, these risks can be controlled by adequate planning and engineering controls.

Alternative 2 ranks slightly lower than Alternative 3 in terms of short-term effectiveness since it does acknowledge potential impacts that may be associated with hazardous substances that are contained in soils and groundwater under Buildings 813/814, but delays the performance of any potential remedial action until such time as a reuse is identified for the affected property.

Implementability

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

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 trichloroethene 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 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 trichloroethene 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 trichloroethene, 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 trichloroethene 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[12]	$522,000

State Acceptance

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.

Community Acceptance

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.

PROPOSED REMEDY

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 identified in **Figure 3** 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 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.

Under the proposed remedy, due to the historic detection of trichloroethene in the groundwater at former well location MW12-37, and the determination that some soil beneath the existing footprint of Buildings 813/814 is known to contain concentrations of trichloroethene at levels in excess of State of New York Unrestricted Use SCO values, an environmental LUC will be implemented, maintained and monitored on the land within the area that is shown on **Figure 3** that will prohibit access to and use of existing Buildings 813 and 814, or the construction of new 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 potential risks from volatile organic

[12] Five years of semi-annual (twice per year) monitoring at annual rates of 7 percent.

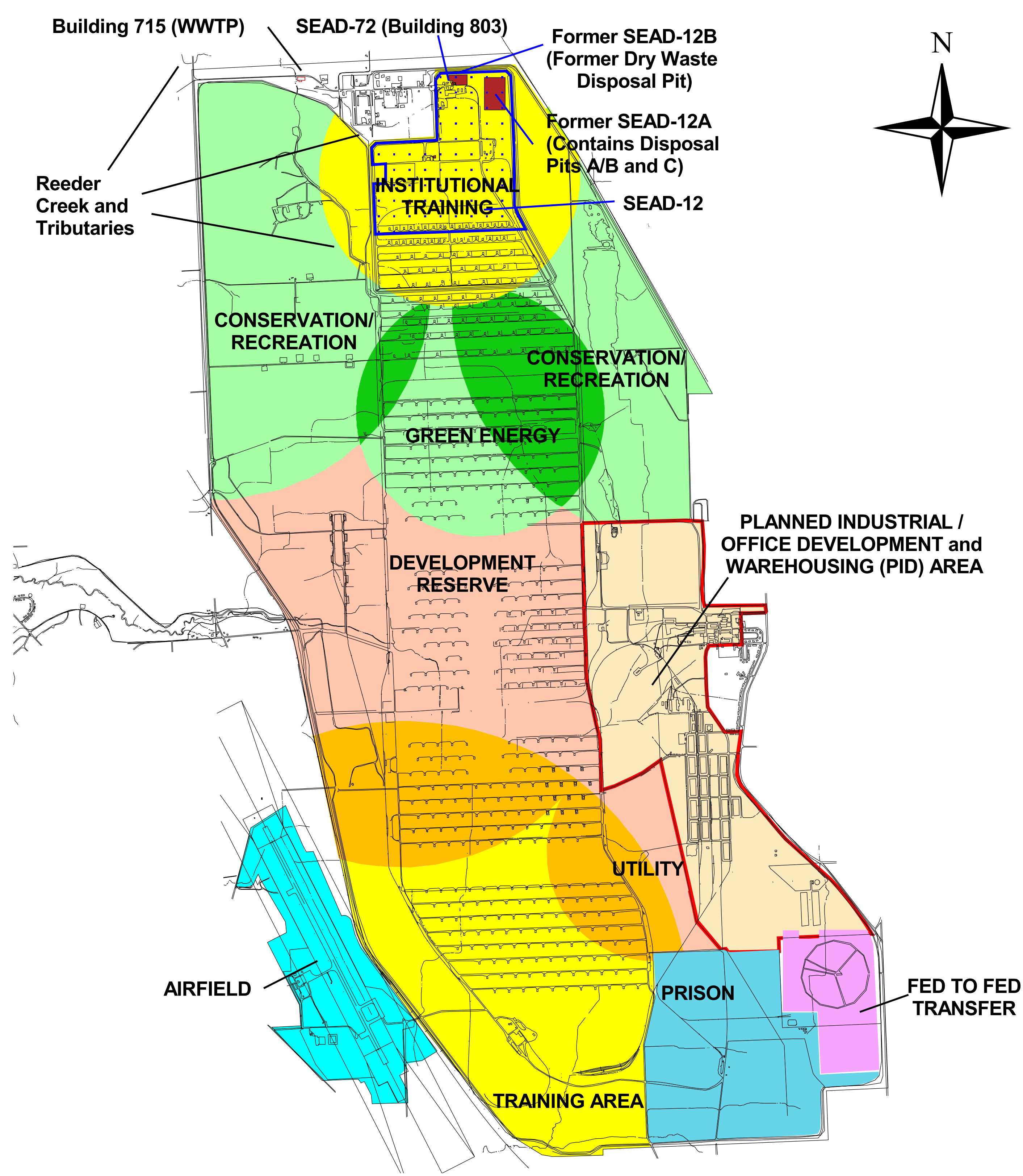
compound intrusion does not pose risk to future occupants of the structures. The LUC will provide that an investigation of vapor intrusion potential and indoor air quality must be performed at the time of the use determination before the buildings, or any newly constructed buildings in the designated area, may be occupied.

Finally, a LUC that prohibits access to and use of the groundwater from this area will also be implemented, monitored, and maintained until such time as groundwater standards are achieved. The groundwater access and use restriction will be maintained until new analytical data are provided to, and approved by, the Army, EPA, and NYSDEC to indicate that groundwater in the vicinity of Building 813 and 814, and former well MW12-37 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, 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 Article 71, Title 36 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.



5000 0 5000 10000 Feet

Extent of SEAD-12

Approximate Extent of Former SEAD-12A and B Sites (as labeled)

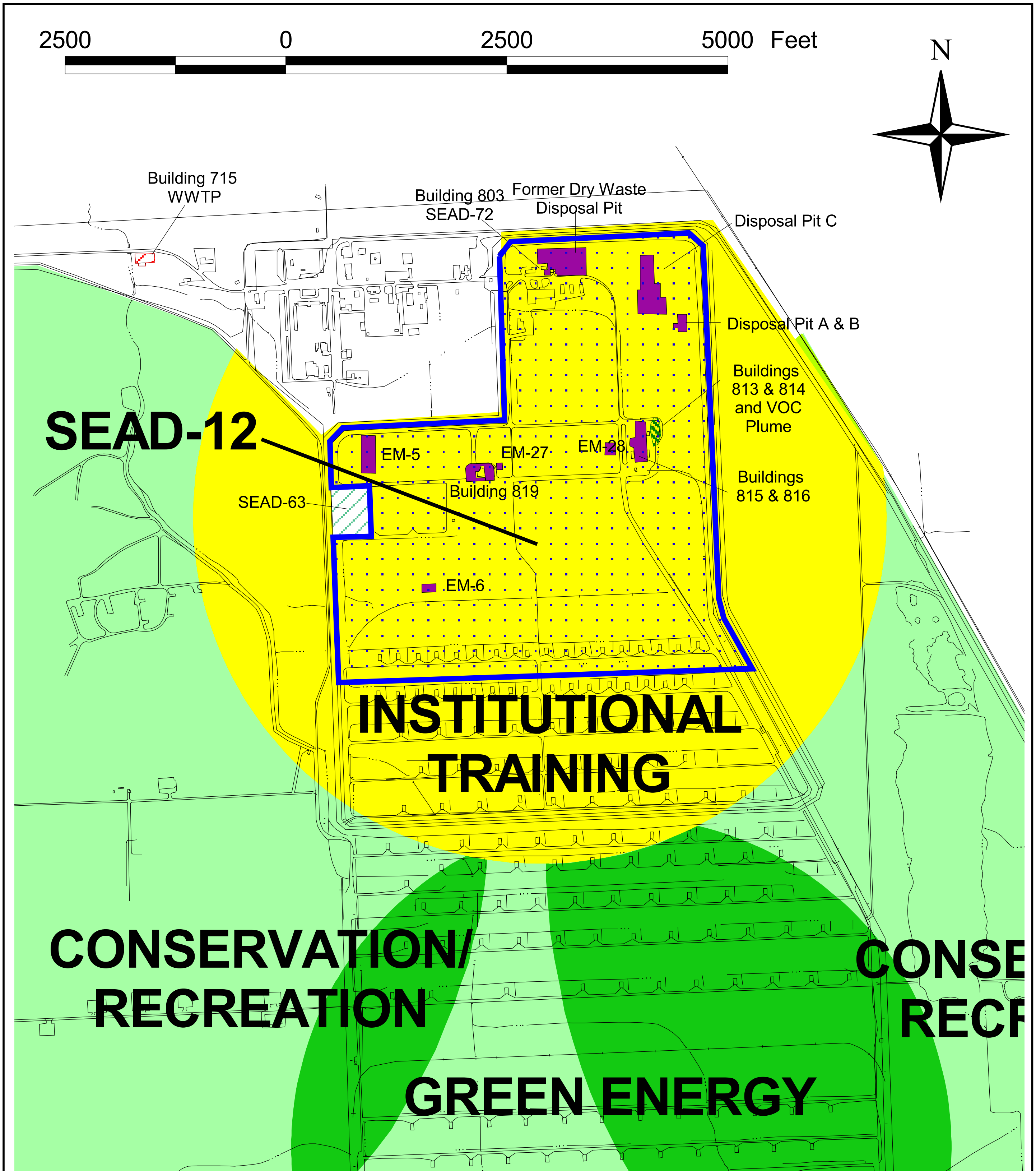
O:\Seneca\SEAD-1-2-5-24-48\SEAD-12.apr\SEAD-12 PRAP Figure 1

PARSONS

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

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

March 2009



Extent of SEAD-12

Extent of SEAD-63

Feature of SEAD-12

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

PARSONS

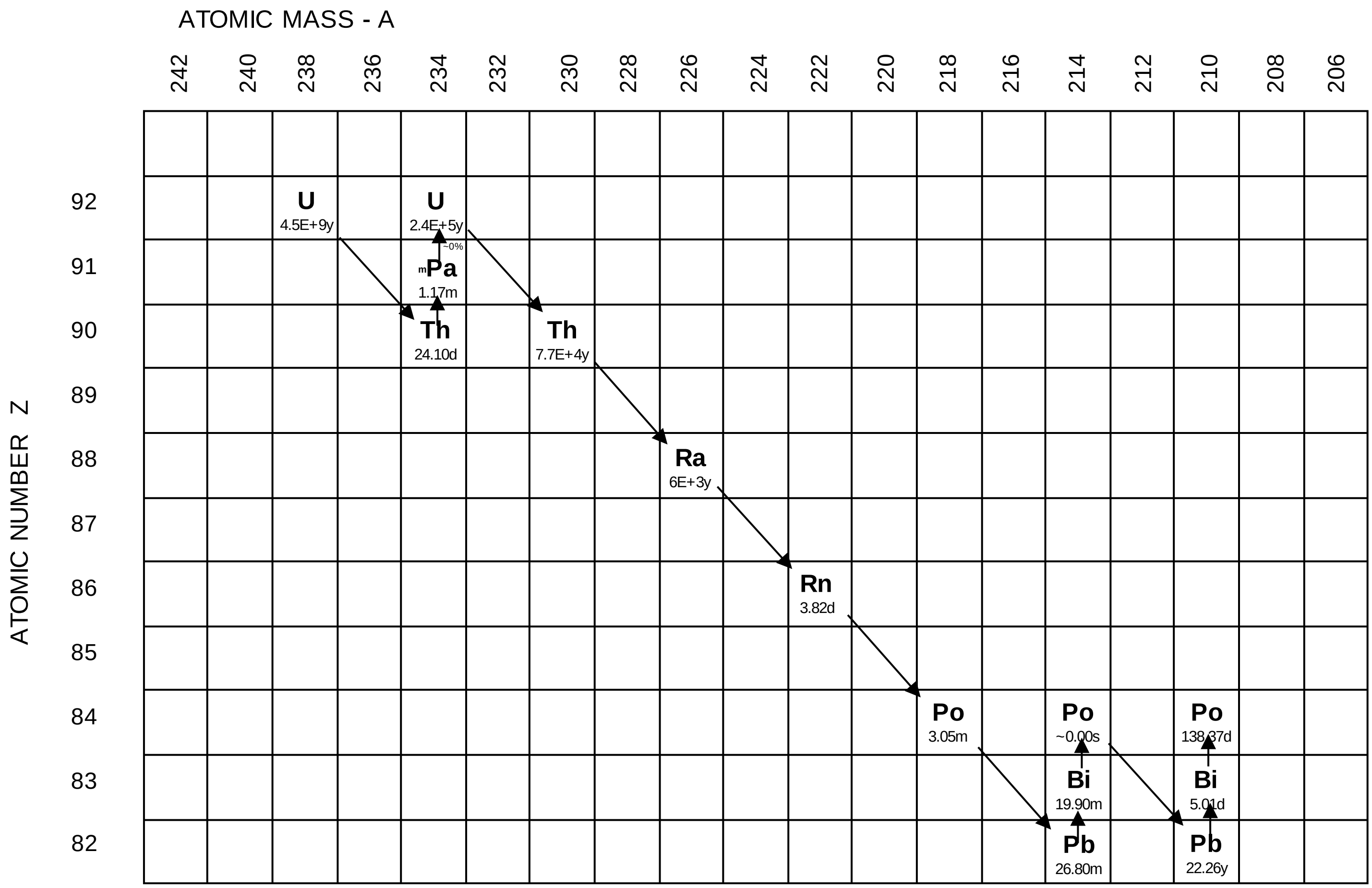
SENECA ARMY DEPOT ACTIVITY
Proposed Plan for SEADs 12 and 72

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

March 2009

O:\Seneca\SEAD-1-2-5-24-48\SEAD-12.apr\SEAD-12 PRAP Figure 2

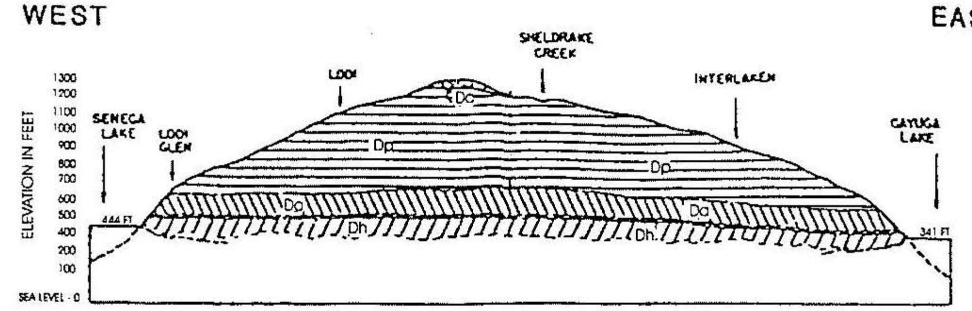
Figure 3
Uranium 238 (^{238}U) Decay Chain



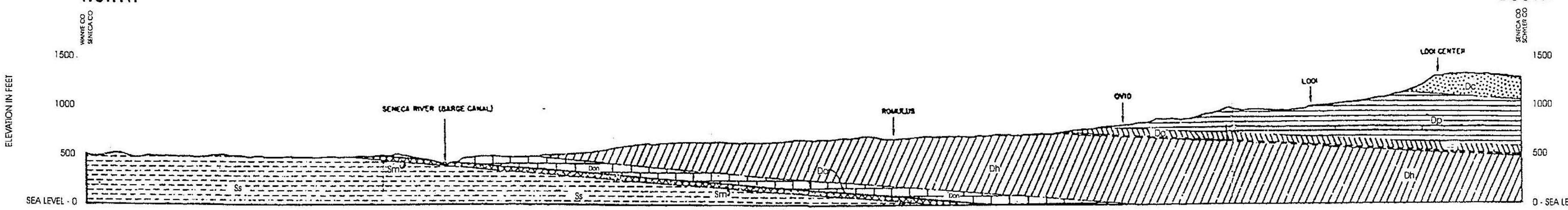
Legend

Code

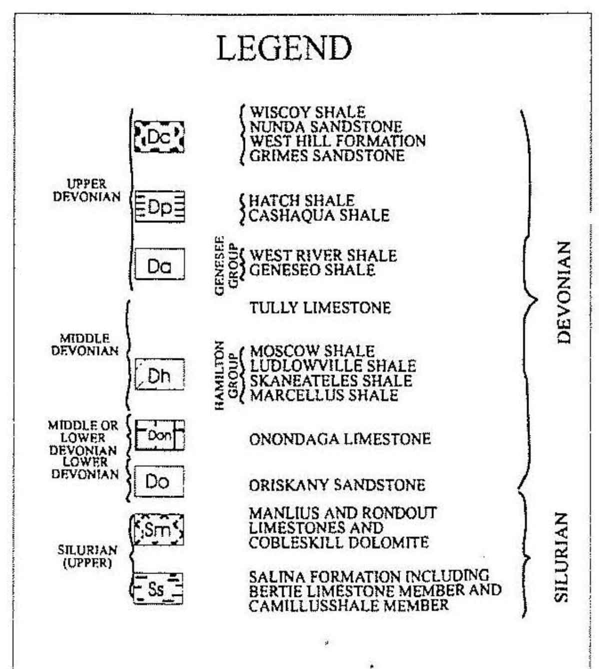
Bi	Bismuth (Bi-214, Bi-210)	Po	Polonium (Po-218, -214, -210)	Th	Thorium (Th-234, -230)
Pa	Protactinium (Pa-234)	Ra	Radium (Ra-226)	U	Uranium (U-238, -234)
Pb	Lead (Pb-214, -210)	Rn	Radon (Rn-220)		



EAST-WEST SECTION ALONG A- A'



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



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

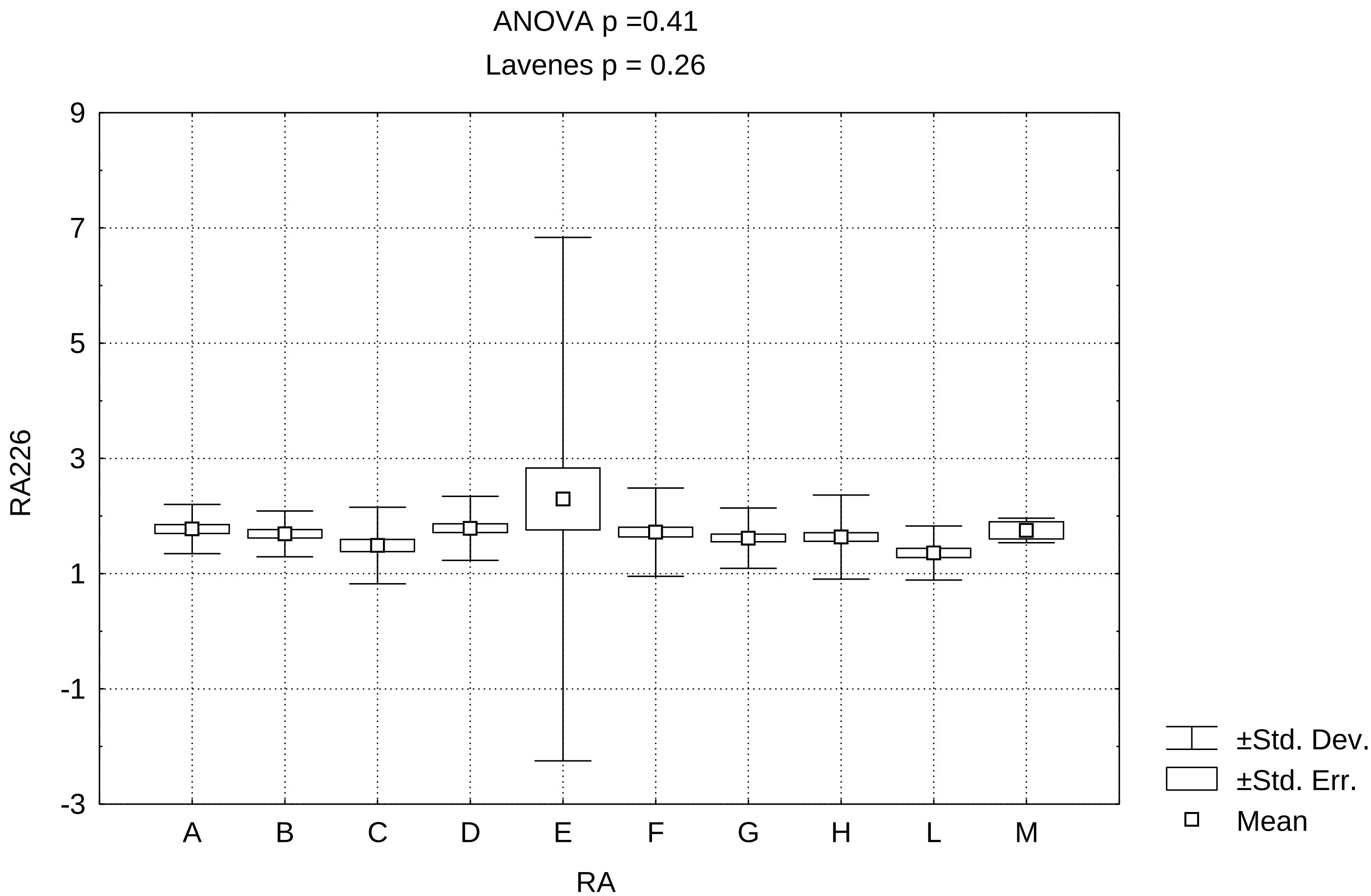
Proposed Plan – SEAD 12/72

FIGURE 4

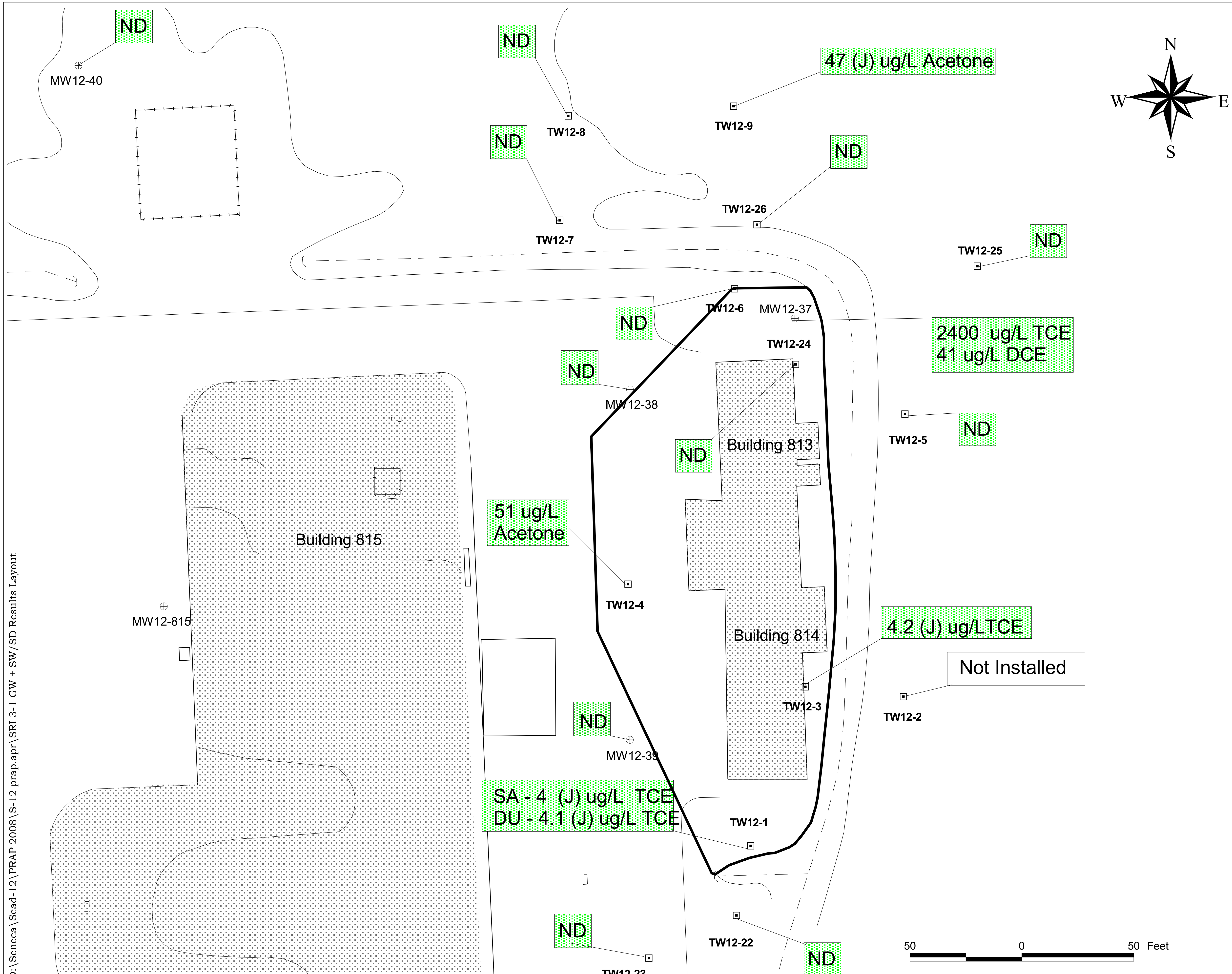
Regional Geologic Cross Sections

Figure 5

Box and Wisker Plot of Radiological Scanning Data
SEAD-12 Potential Release Areas
Sead-12 Remedial Investigation Report
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

MW12-38 ⊕ MONITORING WELL LOCATION

TW12-37 ⊡ TEMPORARY WELL LOCATION
Green Label - 1st Round
Red Label - 2nd Round

NOTE: MW12-37 AND ALL TEMPORARY WELL HAVE SINCE BEEN ABANDONED.

CENTERLINE OF DRAINAGE DITCH

PROPOSED LIMITS OF GROUNDWATER ACCESS/USE RESTRICTION

ND = NOT DETECTED

4.2 (J) ug/L TCE

Measured Concentration of Contaminant in Groundwater. (An estimated 4.2 micrograms per liter of Trichloroethene.)

PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-12
PROPOSED PLAN

FIGURE 6
PROPOSED EXTENT OF GROUNDWATER ACCESS/USE RESTRICTION

SCALE	1:50	DATE	NOVEMBER 2008

O:\Seneca\Sead-12\PRAP 2008\S-12 prap.apr\SRI 3-1 GW + SW/SD Results Layout