US Army Corps of Engineers

Air Force Center for Environmental Excellence

Seneca Army Depot Activity
Romulus, New York

DRAFT
PROPOSED PLAN

TWO AREAS OF CONCERN REQUIRING LAND USE CONTROLS
SWMUs SEAD-121C, THE DEFENSE UTILIZATION AND MARKETING OFFICE YARD, AND SEAD-121I, THE RUMORED COSMOLINE OIL DISPOSAL AREA

SENECA ARMY DEPOT ACTIVITY

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Table of Contents

DRAFT Proposed Plan
Two Areas of Concern (AOCs) Requiring Land Use Controls, SWMUs SEAD-121C, the Defense Reutilization and Marketing Office (DRMO) Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area
at the SENECA Army Depot Activity (SEDA)
Romulus, New York

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

Section Description **Page**

TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF FIGURES

Text

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ARMY DEPOT
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Proposed Plan – Draft

Two Areas of Concern (AOCs) Requiring Land Use Restrictions (LUCs), SWMUs SEAD-121C, the Defense Reutilization and Marketing Office (DRMO) Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area at the SENECA ARMY DEPOT ACTIVITY (SEDA) Romulus, New York

January 2007

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1 PURPOSE OF PROPOSED PLAN

This Proposed Plan presents and summarizes data and information that the United States Army (Army) has assembled in support of its assertion that two former areas of concern (AOCs) known as SEAD-121C, the Defense Reutilization and Marketing Office (DRMO) Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area within the former Seneca Army Depot Activity (SEDA or the Depot) require land use controls (LUCs) that prohibit the use of the solid waste management units (SWMUs) for residential activities and that prohibit the access to, and use of, groundwater. The LUCs are recommended because available information indicates that residual levels of hazardous substances are present at, or in the immediate vicinity of, the two AOCs, and the residual concentrations of these hazardous substances may prohibit unrestricted use and unlimited exposure of the land by certain human and ecological populations. The Army recommends that LUCs that prohibit use of and access to the groundwater, and that prohibit the use of the land for residential activities (e.g., residential housing, elementary or secondary schools, childcare facilities, playgrounds, etc.) continue to be applied to the AOCs pending development, review, and approval of supplemental data which indicate that the areas are suitable for unrestricted use and unlimited exposures.

The current intended future use for the land contained in these AOCs is Planned Industrial / Office Development or Warehousing. Risk assessments completed based on exposure scenarios that are consistent with the current and planned future uses (e.g., Industrial / Office / Warehousing / Commercial) suggest that such uses are possible and appropriate given the residual levels of hazardous substances that remain at the AOCs. The Army recommends the groundwater access/use restriction for both AOCs because data from other neighboring SWMUs indicate that hazardous substances are present in the uppermost groundwater aquifer that is .located within this portion of the former Depot. The concentrations of hazardous substances found in the groundwater exceed state ambient water quality standards (AWQSs) and could pose potential risk to human receptors. An alternative public water supply exists at both of the AOCs and thus, the risk associated with the consumption or use of the local groundwater is controlled. Similarly, the Army recommends that the residential use restriction be applied to these two

SWMUs because it anticipates that hazardous substances identified at the AOCs could pose risks to residential receptors.

The recommended LUCs (i.e., residential use restriction, groundwater access/use restriction) were previously imposed across the larger Planned Industrial / Office Development and Warehousing (PID) Area within the Depot. The existing LUCs were proposed and implemented by the Army in the "*Record of Decision, Sites Requiring Institutional Controls in the Planned Industrial / Office Development or Warehousing Areas,*" Final (Parsons, 2004). This ROD was approved by the U.S. Environmental Protection Agency, Region II (USEPA), with concurrence from the New York State Department of Environmental Conservation (NYSDEC). The existing land use restrictions in the PID Area originate from the review and analysis of data collected in, and assessments made for, SEAD-27 (Building 360, Steam Cleaning Waste Tank), SEAD-64A (Garbage Disposal Area, Debris Landfill South of Storage Pad), and SEAD-66 (Pesticide Storage near Buildings 5 and 6).

The PID Area land use restrictions will continue to apply to all of the land within the PID Area until such time as residual concentrations of hazardous substances are shown to be suitable for unlimited exposure and unrestricted use. These restrictions may be waived on a location-by-location basis by the Army, the USEPA and the NYSDEC, after review and approval of a variance request received from a future owner/user/occupant of land within the PID Area. The future owner/user/occupant will be required to provide all data and information needed to substantiate its request for a waiver of the residential use and groundwater access/use restrictions.

SEAD-121C and SEAD-121I are located in the east-central portion of the former SEDA, near the main entrance to the Depot off New York State Route 96 in Romulus, New York. Both AOCs are within the greater PID Area. The current and anticipated future use of the PID Area is as a commercial, industrial, office development or warehousing district. The Army recently proposed that the PID Area LUCs be imposed on three other former SWMUs that are located in the PID Area, namely SEAD-39 (Building 121, Boiler Blowdown Leach Pit), SEAD-40 (Building 319, Boiler Blowdown Leach Pit), and SEAD-67 (Dump Site East of Sewage Treatment Plant No. 4). The ROD documenting and finalizing this recommendation is currently under review, and pending regulatory approval.

This Proposed Plan identifies the Army's and the USEPA's preferred and recommended remedial alternative for the SWMUs, and provides the justification and rationale for their recommended remedial alternative at the SWMUs. Representatives of the Army developed the Proposed Plan in cooperation with the USEPA and the NYSDEC.

The Army is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Section 300.430(f)(2) of the National Contingency Plan (NCP). This Proposed Plan is being provided to inform the public of the Army's preferred and recommended remedial alternative for the AOC. The Proposed Plan is intended to solicit public review and comment of available information and data, and to specify the Army's preferred remedial alternative for the SWMU. The Army's preferred remedies for SEAD-121C and SEAD-121I require LUCs that prohibit the use of the land for designated residential activities and that prohibit the use of and access to groundwater at the SWMUs. The Army's proposed remedies for these two AOCs acknowledge that available data from the AOCs indicate that hazardous substances are present at levels above regulatory limits, but based on the results of human health and ecological risk assessments, it has been determined that the residual levels identified do not represent an unacceptable risk to receptors that are most likely to occupy an industrial, office development, or warehousing area in the foreseeable future.

The Army will select a final remedy for the two SWMUs only after careful consideration of all comments received during the public comment period, and subsequent to final consultation with the USEPA and NYSDEC. Information, provided herein, was presented to, and discussed with, representatives of USEPA and NYSDEC and serves as the basis of the Army identifying these former SWMUs as requiring LUCs.

2 COMMUNITY ROLE IN THE SELECTION PROCESS

The Army, the USEPA, and the NYSDEC rely on public input to ensure that the concerns of the community are considered during the selection of an effective remedy for each SWMU or AOC. To this end, the Remedial Investigation Report, the Proposed Plan and other supporting documentation have been made available to the public for review.

A public comment period is scheduled to commence on {Begin Date} and continue until {End Date} to provide an opportunity for public participation in the remedy selection process for SEAD-121C and SEAD-121I. A public meeting is scheduled for {Meeting Date} to be held at the Seneca County Office Building in Waterloo, New York the beginning at 7:00 p.m. During this meeting, the Army will present the conclusions of the remedial investigation and risk assessment performed at SEAD-121C and SEAD-121I. Further, the Army will elaborate on its reasons for recommending No Action combined with LUCs as the preferred remedial option for the two AOCs. The Army will also receive public questions and comments. Written comments received at, and within the comment period following, the public meeting will be documented in the Responsiveness Summary Section of the Record of Decision (ROD) – the document that formalizes the final selection of the remedy.

All written comments 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

Information and data summarized within this Proposed Plan for SEAD-121C, the DRMO Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area are presented and described in greater detail within the documents: "*Remedial Investigation Report, Two EBS Sites in the Planned industrial Development Area (SEAD-121C and SEAD-121I),"* Final (Parsons, 2006); "*Final Investigation of Environmental Baseline Survey Non-Evaluated Sites [SEAD-119A, SEAD-122 (A, B, C, D, E), SEAD-123 (A, B, C, D, E, F), SEAD-46, SEAD-68, SEAD-120 (A, B, C, D, E, F, G, H, I, J), and SEAD-121 (A, B, C, D, E, F, G, H, I)]*" (Parsons, May 1999); and, *"U.S. Army Base Realignment and Closure 95 Program, Environmental Baseline Survey Report,"* Final (Woodward-Clyde, 1997) which should be reviewed and consulted.

The public is encouraged to schedule a time to review the project documents at the SEDA repository (location provided below) to develop a better understanding of SEAD-121C and SEAD-121I and the investigations and studies that have been conducted.

Seneca Army Depot Activity
Building 123
5786 State Route 96
Romulus, New York 14541-0009
(607) 869-1309
Hours: Mon – Thurs. 8:30 a.m. – 2:30 p.m.

3 SITE BACKGROUND

The SEDA previously occupied approximately 10,600 acres of land located in the Towns of Varick and Romulus in Seneca County, New York (see **Figure 3-1**). The former military facility was owned by the U.S. Government and operated by the Army between

1941 and approximately 2000, when SEDA's military mission ceased. The SEDA's historic military mission included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives and special weapons.

The 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. The elevation of the facility is approximately 600 feet (ft.) above Mean Sea Level (MSL).

On July 14, 1989, the USEPA proposed the SEDA for inclusion on the National Priorities List (NPL). The USEPA recommendation was approved and finalized on August 30, 1990, when the SEDA was listed in Group 14 of the Federal Facilities portion of the NPL.

Once the SEDA was listed on the NPL, the Army, the USEPA, and NYSDEC identified 57 SWMUs where historic data or information suggested, or evidence existed to support, that hazardous substances or hazardous wastes had been handled and may have been released and migrated into the environment. Each of these sites was identified in the "*Federal Facilities Agreement under CERCLA Section 120; Docket Number: II-CERCLA-FFA-00202*" (FFA) signed by the three parties in 1993 (USEPA, NYSDEC, and Army, 1993). The list of SWMUs contained in the FFA was subsequently expanded to include 72 AOCs when the Army completed the "*SWMU Classification Report,*" Final (Parsons, 1994), which was required under the terms of the FFA.

The SEDA was a generator and treatment, storage and disposal facility (TSDF) for hazardous wastes and thus, subject to regulation under the Resource Conservation and Recovery Act (RCRA). Under the RCRA permit system, corrective action is required at all SWMUs, as needed.

Remedial goals are the same for CERCLA and RCRA; thus, when the 72 SWMUs were classified in the "*SWMU Classification Report,*" Final (Parsons, 1994), the Army recommended that they be listed either as areas requiring No Action or as Areas of Concern (AOCs). SWMUs listed as AOCs in the "*SWMU Classification Report,*" Final (Parsons, 1994) were scheduled for further investigations based upon data and potential risks to the environment.

In 1995, the SEDA was designated for closure under the Department of Defense's (DoD's) Base Realignment and Closure (BRAC) process. In accordance with requirements of BRAC, Woodward-Clyde Federal Services was retained by the Army to conduct and present the findings of an Environmental Baseline Survey (EBS) for SEDA. Under this process, all areas at the Depot were assessed and classified into one of seven standard environmental condition of property area types consistent with the Community Environmental Response Facilitation Act (CERFA – Public Law 102-426) guidance and the DoD's "*BRAC Cleanup Plan Guidebook*" (DoD, 1993). Based on the findings and conclusions of the EBS, SEAD-121C and SEAD-121I were both designated as AOCs where additional information and data were required before the land could be offered for transfer and reuse.

Once SEDA was included on the BRAC list, the Army's emphasis expanded from expediting necessary investigations and remedial actions at prioritized sites to include the release of non-affected portions of the Depot to the surrounding community for their reuse for other, non-military purposes (i.e., industrial, municipal, and residential). The designated future use of land within the SEDA was first defined and approved by the Seneca County Local Redevelopment Authority in 1996. The planned use of land within the former Depot was recently revised by Seneca County Industrial Development Agency (SCIDA) and the current future uses are reflected in **Figure 3-2.**

Since the inclusion of the SEDA in the BRAC 1995 program, approximately 8,000 acres have been released to the community for beneficial reuse. An additional 250 acres of land at the Depot has been transferred to the U.S. Coast Guard for continued operation of a LORAN[i] Station.

4 SCOPE AND ROLE

As is indicated above, SEDA is a Federal Facility that was designated for closure by the DoD in BRAC 1995. The military mission ceased in 2000, and the facility closed in 2001. The Army's ultimate goal for SEDA is to transfer or lease the entire site to other private or public parties for beneficial reuse. Prior to transfer or lease of any property at the site, the Army is required to ensure that the property is suitable for reuse. If information or evidence exists to indicate that hazardous substances may be present at any location slated for transfer, the Army is obligated to conduct investigations needed to verify the presence/absence of hazardous substances, and assess the potential risks that may exist due to the presence of hazardous substances at the site. These investigations and assessments are conducted under the oversight of, and subject to the review and approval of the USEPA and the NYSDEC. The findings, results, and the conclusions of the investigations and assessments, and the subsequent land use decisions that are made based on the Army's investigations and assessments are also made available to the public for review and comment.

If the results and conclusions of the investigations and assessments of property at the SEDA indicate that risks to human health or the environment exist due to the continuing presence of hazardous substances, the Army is obligated to propose, design, implement, monitor, inspect and report on the remedial actions used to eliminate, mitigate or control the threat. The remedial actions are also subject to review and approval by all parties.

SEAD-121C, the DRMO Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area are AOCs that are located in the PID Area of the former SEDA. The Army is currently leasing other property located in the PID Area to outside parties for reuse as warehousing and light industrial property. It is the Army's goal to demonstrate that SEAD-121C and SEAD-121I are available for reuse, either via lease or transfer to another public or private party.

5 DESCRIPTIONS OF AOCs

5.1 Physical Characteristics of SEAD-121C

SEAD-121C is a triangularly-shaped gravel lot located in the east-central portion of the Depot (**Figure 5-1**), roughly 4,000 ft. (approximately 0.75 miles) southwest of the former Depot's main entrance off of State Route 96. Several buildings (Buildings 360, 316, and 317) are located adjacent and east of the AOC, and one building (Building T-355) is located within the AOC boundaries. Building T-355 is located in the central part of the DRMO Yard and is used for storage. Two historic SWMUs: SEAD-27, Steam Cleaning Waste Tank; and, SEAD-28, Underground Waste Oil Tanks were located at Building 360, immediately adjacent to the eastern bound of SEAD-121C. Conditions previously identified at and documented for SEAD-27 are partially responsible for the LUCs that are currently imposed throughout the PID Area. The waste oil tanks located at SEAD-28 were removed, and this AOC was closed as a no further action SWMU in "*Record of Decision, Twenty No Action SWMUs and Eight No Further Action SWMUs,*" Final (Parsons, 2003).

The DRMO Yard is surrounded by a chain-linked fence and access into the AOC is limited by a single gate that is normally locked and that is located south of Building 360. The surface of the DRMO Yard is graded to allow surface water to drain toward the man-made ditches that bound the AOC on its northwest and south sides. The major pathway of surface water flow out of SEAD-121C is to these drainage ditches, which then flow to the west towards a wetland area and the headwaters of Kendaia Creek in the former munitions storage area of the Depot.

In addition to Building T-355, several other man-made features are prominent within the DRMO Yard; these features include: a ladled-shaped, earthen-bottomed storage cell in the southwest corner of the site; a rectangular-shaped, earthen-bottomed storage cell immediately adjacent to, and located halfway along the northwest perimeter fence of the site; and a multi-chambered, concrete-bottomed storage cell adjacent to the east perimeter fence, near the northern-most point of the DRMO Yard. Each of the storage cells is bounded horizontally on three sides by concrete ("jersey" or "K rail") barriers. Common debris, including scrap metal, pieces of wood, ordnance components, batteries, tiles, oil filters, auto parts, paint cans, tires, and other miscellanies were found in the concrete bottomed, multi-chambered storage cell located near the northern most corner of the AOC. During site visits in 2002, 2003, and 2004, observations were noted that scrap metal, military items, and old machines were stored in the earthen bottomed storage cell located along the northwest fence, while the ladle-shaped earthen bottomed cell was empty, except for small quantities of metal scrap and shavings. Interviews with Depot personnel indicate a history of rapid turnaround of material and vehicles stored in this area, and it was common for vehicles including military trailers, trucks, and heavy equipment to be parked along the south and northwest fences as well as in the central area. A silo-like structure was also found inside the fence of the DRMO Yard, adjacent to the northern edge of Building 360. Furthermore, a large crane was located in the northern portion of the Yard, north of the silo-like structure and Buildings 360 and 316. East of the DRMO Yard, a dielectric transformer box was observed between Building 317 and 1st Street. Train tracks were also observed to approach the DRMO Yard from the north, with one spur ending at Building 317, a second ending at Building 316, while a third spur extended to the area between Building 316 and Building 360.

5.2 Physical Characteristics of SEAD-121I

SEAD-121I, the Rumored Cosmoline Disposal Area, consists of four rectangular grassy areas that are bounded by 3rd and 7th Streets (north and south ends, respectively) and Avenues C and D (west and east sides, respectively). The northern end of SEAD-121I is located roughly 4,500 ft. south-southwest of the Depot's former main entrance gate off State Route 96. The AOC extends roughly 2,500 – 3,000 ft to the south from this point, and the AOC measures approximately 300 to 400 ft. in width throughout its length. The extent of SEAD-121I is shown on **Figure 5-1**.

SEAD-68, the Old Pest Shop site, is located north of the northern end of SEAD-121I, across 3rd Street. Buried reinforced concrete storm drains run east to west through the site along 3rd St., 4th St., 5th St., 6th St., and 7th St. The U.S. Government has historically staged a strategic stockpile of ferro-manganese ore in the second and fourth blocks (north to south) of this AOC, and these stockpiles were present during the EBS and RI sampling events. Parallel rows of warehouses border and open to the eastern and western edges of the AOC. Buildings 331 and 329 located to the west and across Avenue C receive frequent truck deliveries. A railroad spur line enters SEAD-121I from the south and extends to the northern end of the AOC where it terminates near the intersection of 3rd Street and Avenue C. Two sidings branch off the main spur line; one terminates in the first (north to south) block and the other terminates in the third (north to south) block. There are concrete loading docks located in the first and third blocks next to the railroad lines.

Information provided by the Army indicates that the rail spur and sidings were used for delivery of equipment and machinery that was frequently packed in Cosmoline (oil). Cosmoline oil is a substance that prevents corrosion and is commonly used to store materials. During delivery and unpacking of the equipment and machinery, oil from the packing may have been released to the ground. According to a material safety data sheet (MSDS) prepared by Goodson Shop Supplies, Cosmoline is composed of a complex mixture of petroleum hydrocarbons, severely hydrotreated heavy naphthenic distillate, Stoddard solvent, wool grease, and butyl stearate. The last four ingredients are hazardous according to the Occupational Safety and Health Administration. No adverse chronic health effects have been reported due to exposure to Cosmoline. Acute health effects are generally limited to irritation, depending on the duration of the contact.

5.3 Habitat and Ecological Community Characterization

AOC-specific ecological evaluations of the plant and animal habitats and communities located at SEAD-121C and SEAD-121I were not conducted. The AOCs are generally void of characteristics and attributes that would make it an attractive habitat for many ecological receptors. As is indicated, the DRMO Yard is a gravel-covered, triangular lot located where historic short to long term storage of materials occurred. It is surrounded by a chain-linked fence with a single access gate to control vehicular and human traffic. Isolated growths of weed plants now occur at numerous locations immediately along the fence line and randomly at other locations within the Yard. Similarly, SEAD-121I is a relatively flat, open area that is located between parallel strips of bordering warehouses, roads, and railroad lines. There are intermixed areas of dirt and vegetation within each block of the AOC, and evidence of wear due to vehicular traffic.

No deciduous or coniferous trees or shrubs are located in either the DRMO Yard or the Rumored Cosmoline Oil Disposal Area. Trees and shrubs do exist at varying distances exterior of the DRMO Yard along the northwestern, western and southern borders of the AOC. Trees and shrubs are more located exterior to SEAD-121I along the southern end, and beyond the perimeter warehouses to the east and west.

Man-made drainage ditches that carry episodic flows of storm- and snow-melt waters are located along the northwest and south edges of SEAD-121C.

Characterizations of the habitat and ecological communities present near, but exterior of, SEAD-121C and SEAD-121I are based on general observations made during the 1998 Environmental Baseline Survey (EBS) and the 2002 Remedial Investigation (RI), and on the results of the ecological evaluations and assessment that have been conducted at other SWMUs at the SEDA [e.g., SEADs 4, 12, 16, 17, 25 and 26, and the Open Burning (OB) Grounds] as part of remedial investigations. Key aspects of these characterizations relevant to this risk assessment are presented below.

The methods used to characterize the ecological resources included AOC- and area-walkovers for the evaluation of existing wildlife and vegetative communities; interviews with local, state, and SEDA resource personnel; and review of environmental data obtained from previous Army reports. SEDA has a strong wildlife management program that is reviewed and approved by the New York Fish and Game Agency. The Depot manages an annual white-tailed deer (*Odocoileus virginiana*) harvest and has constructed a large wetland called the "Duck Pond" in the northeastern portion of the facility to provide a habitat for migrating waterfowl.

The NYSDEC Natural Heritage Program Biological and Conservation Data System identifies no known occurrences of federal- or state-designated threatened or endangered plant or animal species within a 2-mile radius of SEAD-121C and SEAD-121I. No species of special concern are documented within the Depot property.

The only significant terrestrial resource known to occur at SEDA is the population of white-pelaged white-tailed deer, which inhabits the fenced portion of the Depot, west of SEAD-121C and SEAD-121I. Annual deer counting conducted at the Depot indicates that the size of the deer herd is approximately 600 animals of which approximately one-third (i.e., 200) are white-pelaged. Since the perimeter of the Depot is totally enclosed by fence, the white-pelaged deer is thought to result from inbreeding within the herd. The Depot maintains the herd through an annual hunting season to prevent overgrazing and starvation of the deer. The management plan of the herd is conducted by the New York State Division of Fish and Wildlife (DFW). The normal brown-pelaged deer are also common. White-tailed deer are not listed as a rare or endangered species.

Agricultural crops and deciduous forests comprise the vegetative resources used by humans near SEDA. Although no crops are grown at the Depot, farmland is the predominant land use of the surrounding private lands. Crops including corn, wheat, oats, beans and hay mixtures, are grown primarily for livestock feed. Deciduous forestland on the Depot and surrounding private lands is under active forest management. Timber and firewood are harvested from private woodlots that surround the Depot, but timber harvesting does not occur on the Depot.

Vegetation across the SEDA consists of successional old field, successional shrub, and successional hardwoods. The NYSDEC Natural Heritage Program Biological and Conservation Data System identifies no known occurrences of federal- or state-designated threatened or endangered plant. No species of special concern are documented within the Depot property. No rare or endangered species were observed during the site assessment.

Several wildlife species are hunted and trapped on private lands near SEDA. Game species hunted include the eastern cottontail, white-tailed deer, ruffed grouse, ring-necked pheasant, and various waterfowl. Gray squirrel and wild turkey are hunted to a lesser extent. At the Depot, deer, waterfowl, and small game hunting are allowed. Trapping is also permitted on the Depot.

Animals that have been identified at the Depot during various ecological surveys include the beaver, eastern coyote, deer, red and gray fox, eastern cottontail rabbit, muskrat, raccoon, gray squirrel, striped skunk, and the woodchuck. Bird species that have been identified include the blue jay, black-capped chickadee, American crow, mourning dove, northern flicker, ruffed grouse, ring-billed gull, red-tailed hawk, northern junco, American kestrel, white breasted nuthatch, ring-necked pheasant, American robin, eastern starling, turkey vulture, and pileated woodpecker.

There are no permanent lakes, ponds, streams or wetlands in SEAD-121C or SEAD-121I. Surface water only exists intermittently in man-made drainage ditches that abut or underlie the AOCs; thus, it does not directly support aquatic life.

No signs of stressed or altered terrestrial biota (vegetation and wildlife species) were observed at SEAD-121C or SEAD-121I. There were no indications of unnatural die-off or stunted vegetation.

6 PREVIOUS INVESTIGATIONS AND ACTIVITIES

Two environmental investigations were conducted to more fully document the environmental conditions present at SEAD-121C, the DRMO Yard, and at SEAD-121I, the Rumored Cosmoline Oil Disposal Area. Based on BRAC's Group 6 CERFA categorization of the property at SEAD-121C, the Army commissioned an Environmental Baseline Survey (EBS) to collect additional information and data regarding hazardous substances and hazardous wastes that may be present at the SEAD. The Army also used this contracting vehicle to develop preliminary data pertinent to the rumored disposal of Cosmoline in the area of SEAD-121I.

The work performed was limited in scope and included only the collection and analysis of surface and subsurface soil and groundwater samples at SEAD-121C, and the collection of surface soil and sediment at SEAD-121I. This work was performed in 1998 – 1999 and is reported in "*Final Investigation of Environmental Baseline Survey Non-Evaluated Sites [SEAD-119A, SEAD-122 (A, B, C, D, E), SEAD-123 (A, B, C, D, E, F), SEAD-46, SEAD-68, SEAD-120 (A, B, C, D, E, F, G, H, I, J), and SEAD-121 (A, B, C, D, E, F, G, H, I)]*" (Parsons, 1999). In the conclusions of this effort, Parsons recommended "that additional soil and groundwater sampling be performed to determine the extent of the impacts from semivolatiles, pesticides, and metals at SEAD-121C. At this time, there are an insufficient number of data points to perform a Mini Risk Assessment."[ii] Comparably for SEAD-121I, Parsons recommended "that additional soil sampling be performed to determine the extent of the impacts from semivolatiles. At this time there are an insufficient number of data points to perform a Mini Risk Assessment"[iii]

Subsequently, the Army expanded its database documenting levels of hazardous substances present at the AOCs by performing additional sampling and analyses as part of a multimedia RI at both AOCs. Samples of surface and subsurface soil, groundwater (SEAD-121C only), surface water and "ditch soil" found in man-made culverts adjacent to the AOCs were collected and analyzed for Target Compound and Target Analyte List (TCL/TAL) compounds. The sampling and analyses were performed in 2002 and 2003; the results of this effort were reported in the "*Remedial Investigation Report for Two EBS Sites in the Planned Industrial Development Area (SEAD-121C and SEAD-121I),*" Final (Parsons, 2006). The combined analytical results of the EBS and the RI are summarized and discussed below.

6.1 SEAD-121C, the DRMO Yard

6.1.1 Soil Investigations

Forty-eight (48) surface soil, 10 ditch soil and 20 subsurface soils were collected and analyzed as part of the investigation of soil at SEAD-121C. As the exact operating practices used at the DRMO Yard are unknown, the implemented soil investigation included the collection and analysis of soil samples from within the AOC and beyond the defined bounds of the AOC to identify areas of impacted soil. Eight surface soil samples and four subsurface soil samples were collected during the EBS. Forty (40) surface soil samples, 10 ditch soil samples, and 16 subsurface soils were collected during the RI. **Figure 6-1** shows the locations where the soil and ditch soil samples were collected.

6.1.1.1 Surface Soil

Volatile Organic Compounds (VOCs)

Nine volatile organic compounds (VOCs) were detected in the 48 surface soil samples collected. The nine VOCs detected included: acetone, benzene, carbon disulfide, chloroform, ethyl benzene, met/para xylene, methylene chloride, ortho xylene, and toluene. **Table 6-1** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the surface soil samples.

Acetone and toluene were the two VOCs that were most frequently detected, found in 13 and nine samples, respectively. Other VOCs were found in three samples or less. Three of the VOCs (i.e., acetone, methylene chloride, and toluene) detected in surface soil samples are common laboratory contaminants, and all but one concentration measured (i.e., toluene at 28 μg/Kg) are below levels that the USEPA considers consistent with laboratory contamination (i.e., less than 10 times levels found in blank field samples).

Benzene was found in one surface sample collected from location SBDRMO-9, which is located in the southeastern corner of the DRMO yard, at a concentration of 41 μg/Kg. This sample also contained the maximum measured concentrations of ethyl benzene (3,300 J μg/Kg[iv]), meta/para xylenes (4,400 J μg/Kg) and ortho xylene (16 μg/Kg). The concentration measured for meta/para xylenes in the soil sample from SBDRMO-9 exceeded NYSDEC's soil clean-up objective level identified in the Technical and Guidance Memorandum (TAGM) HWR-94-4046 (#4046) (NYSDEC, January 1994). None of the VOC concentrations measured in surface soil samples from SEAD-121C exceeded USEPA's Region IX Preliminary Remediation Goals (PRGs) for Residential Soil (USEPA, 2004).

Semivolatile Organic Compounds (SVOCs)

Twenty-seven semivolatile organic compounds (SVOCs), mainly including polycyclic aromatic hydrocarbons (PAHs) were detected in the surface soil samples collected from SEAD-121C. **Table 6-1** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the SVOCs found in surface soil samples.

Seven of the detected PAHs [i.e., benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h) anthracene, and indeno(1,2,3-cd)pyrene] are known as carcinogenic PAHs (cPAHs). Generally, the PAHs and the cPAHs were the most frequently detected SVOCs, the analytes found at the highest concentrations, and the analytes most frequently found at levels above NYSDEC's TAGM #4046 values. Pyrene was the PAH found at the highest overall concentration (34,000 μg/Kg); Fluoranthene was the PAH found most frequently, present in 35 of the 48 surface soil samples analyzed; while benzo(a)pyrene, a cPAH, was the analyte found to exceed its NYSDEC's TAGM #4046 level most frequently (i.e., 21 times in 47 samples). Six of the cPAHs [i.e., all but indeno(1,2,3-cd)pyrene] were also the only SVOCs that were found at levels above their respective TAGM #4046 levels. Six of the cPAHs were also the only SVOCs that were found at levels above their respective USEPA Region IX PRGs fro Residential Soil; only in this case indeno(1,2,3-cd) pyrene replaced chrysene as an analytes that exceeded its TAGM #4046 value. A summary of the SVOCs found to exceed their comparative criteria is provided below.

SVOC	Number of Samples with Concentrations Above NYSDEC's TAGM #4046	Region IX PRGs for Residential Soils
Benzo(a)anthracene	14	4
Benzo(a)pyrene	21	21
Benzo(b)fluoranthene	5	9
Benzo(k)fluoranthene	4	1
Chrysene	10	--
Dibenz(a,h)anthracene	11	7
Indeno(1,2,3-cd)pyrene	--	3

NYSDEC and the New York State Department of Health (NYSDOH) routinely apply a screening tool to PAH concentrations that are found at sites under the review of the state. The benzo(a)pyrene toxicity equivalent (BTEQ) is calculated by multiplying the concentration of the individual cPAHs by the factors listed below, followed by summing the weighted numbers. Summed BTEQ values in excess of 10 mg/Kg or 10 parts per million (ppm) require additional consideration and evaluation.

cPAH Compound	Multiplier
Benzo(a)anthracene	0.10
Benzo(a)pyrene	1.00
Benzo(b)fluoranthene	0.10
Benzo(k)fluoranthene	0.01
Chrysene	0.01
Dibenzo(a,h)anthracene	1.00
Indeno(1,2,3-cd)pyrene	0.10

The surface soil sample collected at location SSDRMO-12, located along the northwest fence line, roughly one-third of the way between the northwestern and northeastern corner of the AOC showed a combined BTEQ value of 11.5 mg/Kg. Only one other surface soil sample collected within the bounds of the AOC exhibited a BTEQ value in excess of 1 mg/Kg (location SBDRMO-7, 7.9 mg/Kg). The next highest BTEQ value recorded during the site investigations at, or in the vicinity of, the DRMO Yard was 8.4 mg/Kg in the surface soil collected at location SSDRMO-7, which is exterior and east of the AOC, and south of 1st Street.

Pesticides and Polychlorinated Biphenyls (PCBs)

Fourteen (14) pesticides and three polychlorinated biphenyls (PCBs) were found in one or more of the surface soil samples collected from SEAD-121C; none of the pesticides or PCBs detected was found at a concentration that exceeded its NYSDEC's TAGM #4046 levels. Dieldrin and aroclor were found at concentrations that exceeded the USEPA's Region IX PRGs. The highest dieldrin concentration measured was found in a sample exterior and east of SEAD-121C (SBDRMO-16), which is located south of 1st Street. The next highest measured concentration of dieldrin was found collocated with the highest recorded aroclor-1254 concentration in the surface soil sample collected from SBDRMO-18, which is located immediately west of the multi-chambered, concrete-bottomed storage cells that abuts the eastern perimeter AOC fence, north of Building 316.

The most frequently detected pesticide was endosulfan I, which is an insecticide and an acaricide[v] that is used extensively on crops and as a wood preserver. This analyte was found in 18 of the 48 samples characterized at SEAD-121C, at a maximum concentration of 185 μg/Kg. The most frequently detected PCB was aroclor-1254, which was found nine times; this analyte also exhibited the maximum concentration for PCBs in SEAD-121C, with a concentration of 930 μg/Kg.

Metals and Cyanide (CN^-)

Twenty-three metals were detected in one or more of the 48 surface soil samples collected from SEAD-121C (**Table 6-1**). This table also provides summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the metals found in surface soil samples. Sixteen metals (aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc) were detected in all samples analyzed. The frequency of detection in samples for the remaining eight metals ranged from a low of 21% for thallium and selenium to a high of 92% for mercury. All of the maximum concentrations of metals found in samples collected during this investigation were inside the DRMO Yard. Concentrations of metals detected exterior to the site were notably lower. A majority, but not all, of the levels found to exceed NYSDEC's TAGM #4046 or USEPA Region IX PRGs values were located inside the bounds of the AOC. A majority of the surface soil samples found containing elevated levels of metals were located in the northeastern corner near storage cells, and in southwestern point of the AOC, again in the area of an historic storage cell.

Sixteen of the metals detected in surface soil samples at SEAD-121C were found at concentrations that exceeded NYSDEC's TAGM #4046 levels; five of the metals found exceeded USEPA Region IX PRGs for residential soil. A summary listing of this information is provided below:

Metal	Number of Samples with Concentrations Above NYSDEC's TAGM #4046	Number of Samples with Concentrations Above Region IX PRGs for Residential Soils
Antimony	11	2
Arsenic	2	48
Barium	7	--
Beryllium	1	--
Cadmium	14	--
Calcium	6	--
Chromium	12	--
Copper	35	3
Iron	5	23
Lead	40	7
Mercury	8	--
Nickel	9	--
Silver	13	--
Sodium	26	--
Thallium	3	--
Zinc	28	--

The two metals that are observed to exceed USEPA's Region IX PRGs soil most frequently are arsenic and iron. However, the range of concentrations noted for these two metals in samples from the AOC are only on the order of only 1 to 1.5 times the concentrations of the levels of these metals normally found in samples collected from background locations at the SEDA.

Using a similar analysis for the six metals most commonly found to exceed NYSDEC's TAGM #4046 criteria values (i.e., lead, copper, zinc, sodium, cadmium and chromium) shows markedly different results. Data for the top three metals (i.e., lead, copper and zinc) exhibit a number of samples where measured concentrations are significantly above their respective TAGM #4046 levels. Further, many of the higher concentrations observed for these metals are also collocated at sample locations in two specific portions of the AOC, namely in the northeastern corner where large storage areas and pads are located, and again at the southwestern point of the AOC where historic storage also occurred. Conversely, the measured concentration range noted for sodium in surface soil samples does not exhibit significant variability between individual results, and the locations of the noted exceedances are more uniformly spread across all areas of the AOC. Findings for cadmium and chromium, which rank fifth and sixth respectively in terms of the number of times measured concentrations exceed TAGM #4046 levels, again suggest that a majority of the exceedances are collocated with the first three metals of this group.

6.1.1.2 Ditch Soil

The Army considers soil and debris found at the bottom of man-made drainage ditches at the SEDA to be "ditch soil" and not "sediment." During the Army's mission at the SEDA, a routine maintenance program was in-place to regularly clean accumulated debris out of these ditches. In many cases, the drainage ditches were excavated to the underlying bedrock during the periodic maintenance cycles. Since the Army's mission ceased, the drainage ditch maintenance program has generally been terminated. As such, material found in these channels results from the overland flow of materials in surface water during storm- or snow-melt events. During overland flow, soil erosion occurs, resulting in the deposition of soil and other debris in the drainage ditches. The Army presumes that a maintenance program will be reinstated by future owners/users of the site to control storm and snow-melt runoff and to prevent flooding within the Depot. Furthermore, based on field surveys performed at SEAD-121C, none of the drainage ditches surrounding the AOC are capable of supporting aquatic life. Surface water flow is episodic, occurring principally after storm- and snow-melt events.

Ditch soil samples were collected from nine locations outside the perimeter of the AOC in the drainage ditches that surround the DRMO Yard. A ditch soil sample was also collected from one location interior of the yard where surface water had been observed to pool after a storm event; this location is identified as SW/SDDRMO-9, and is located in the northeastern corner of the AOC. There was no obvious drainage route from this location to the drainage ditches surrounding the site. One ditch soil sampling location was located exterior to and east of the AOC in Drainage Ditch #1. Three ditch soil locations were situated south of the site along Drainage Ditch #2. Four collection locations for ditch soil samples were collected outside the northwest boundary of the site in a ditch identified in this discussion as Drainage Ditch #3. One ditch sample location is located southwest of the site where Drainage Ditch #3 and Drainage Ditch #2 converge. The approximate locations of these ditch soil samples are shown in **Figure 6-1**.

VOCs

Three VOCs were detected in the ditch soil samples collected. The three VOCs detected included: acetone, carbon disulfide, and methyl ethyl ketone. **Table 6-2** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the ditch soil samples. Acetone was the most frequently detected VOC; present in seven of the 10 samples characterized. Carbon disulfide was observed twice, and methyl ethyl ketone was observed three times. None of the detected VOCs were found at levels in excess of the NYSDEC's TAGM #4046 criteria levels.

SVOCs

Twelve SVOCs, including 11 PAHs were detected in the ditch soil samples collected from SEAD-121C. Six of the detected PAHs [i.e., benzo(a) anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene] are cPAHs. **Table 6-2** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the SVOCs found in ditch soil samples.

Eight of the compounds were detected in two of the 10 ditch soil samples collected, while the remaining SVOCs were detected once each. Three of the detected cPAHs [i.e., benzo(a)anthracene, benzo(a) pyrene and chrysene] were found at concentrations that exceeded their respective TAGM #4046 values. The maximum concentration observed for each of these compounds, as well as anthracene, benzo(b)fluoranthene, fluoranthene, phenanthrene, and pyrene were found collocated in the sample collected at SDDRMO-2, which is exterior to, and upgradient of, the DRMO Yard, south of the edge of 1st Street. The maximum BTEQ value was also found at this same location (i.e., SDDRMO-2) at a level of 2 mg/Kg. Three of the cPAHs were also observed to exceed USEPA's Region IX PRGs for residential soils. A summary of the SVOCs found to exceed the varying comparative criteria is provided below.

SVOC	**Number of Samples with Concentrations Above NYSDEC's TAGM #4046**	**Number of Samples with Concentrations Above Region IX PRGs for Residential Soils**
Benzo(a)anthracene	2	1
Benzo(a)pyrene	2	2
Benzo(b)fluoranthene	--	1
Chrysene	1	--

Pesticides and PCBs

Pesticide and PCB compounds were not detected in ditch soil samples collected during the SEAD-121C RI.

Metals and CN^-

Twenty-two metals, plus cyanide, were detected in the ditch soil at the DRMO Yard (**Table 6-2**). Frequency of detection noted for the metals and cyanide ranged from a low of 10% for cyanide, to a high of 100% for aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, sodium, vanadium, and zinc. Cyanide was detected once at location SDDRMO-4, which is northwest of the debris pile that was noted along the northwest perimeter fence of the AOC, at an estimated concentration of 2.36 J mg/Kg. The concentrations of selected metals (antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc) are shown on **Figure 6-2**. Generally, the maximum concentration measured for metals in ditch soil samples is lower than the maximum values measured for the same metals in surface soils at SEAD-121C. Exceptions to this general trend are seen for aluminum, manganese, selenium, sodium and vanadium where the maximum concentration found in ditch soils samples exceed that found in surface soil samples from SEAD-121C.

Eleven of the metals found in ditch soils were found at concentrations that exceeded their respective TAGM #4046 levels. Three metals detected in ditch soil in samples collected during the SEAD-121C RI were found at levels that exceeded USEPA's Region IX PRG levels. A summary of metals found to exceed the varying comparative criteria is provided below.

	Number of Samples with Concentrations Above	
Metal	**NYSDEC's TAGM #4046**	**Region IX PRGs for Residential Soils**
Aluminum	1	--
Arsenic	--	1
Cadmium	3	--
Calcium	2	--
Chromium	1	--
Copper	7	--
Iron	--	1
Lead	8	1
Mercury	6	--
Selenium	2	--
Silver	5	--
Sodium	9	--
Zinc	7	--

6.1.1.3 Subsurface Soil

Twenty (20) subsurface soils were collected and analyzed as part of the SEAD-121C RI soil investigations. Subsurface soil occurs at depths greater than 2 feet bgs or overlying material (e.g., asphalt, hard-pack, etc.). Summary statistics for the subsurface soil analyses are shown in **Table 6-2**.

VOCs

Ten VOCs, including acetone, benzene, chloroform, ethyl benzene, meta/para xylenes, methyl ethyl ketone, methylene chloride, ortho xylene, styrene, and toluene, were detected in the 20 subsurface soil samples collected in and around the DRMO Yard. Acetone, methyl ethyl ketone, methylene chloride, and toluene are common laboratory contaminants and may be disregarded if the concentration measured in a sample does not exceed blank concentrations by a factor of 10. All sample concentrations measured for acetone, methyl ethyl ketone, and methylene chloride in subsurface soil were less than 10 times the level found in blanks samples. Toluene was detected in four samples, with at a maximum level of 84 μg/Kg, which is greater than 10 times the concentration found in the rinse blank. The other three detections observed for toluene (i.e., 4 J μg/Kg, 7 J μg/Kg, and 9 J μg/Kg) are less than 10 times the maximum blank concentration and thus, may be disregarded. The detection of 84 μg/Kg of toluene was found at sample location SBDRMO-9, which is the same location where maximum levels of benzene, ethyl benzene, and mixed xylenes were detected.

Three VOCs (i.e., benzene, ethyl benzene, and meta/para xylenes) were observed to exceed TAGM #4046 cleanup criteria; only benzene was observed at concentrations that exceeded USEPA Region IX PRG levels. A summary of VOCs found to exceed the varying comparative criteria is provided below.

	Number of Samples with Concentrations Above	
VOC	**NYSDEC's TAGM #4046**	**Region IX PRGs for Residential Soils**
Benzene	1	--
Ethyl benzene	1	1
Meta/para xylenes	1	--

Benzene was detected twice, with a maximum value of 1,800 μg/Kg detected inside the DRMO Yard at SBDRMO-9 at a depth range of 2 ft. to 6 ft. bgs. The sole detection of ethyl benzene, 24,000 μg/Kg, is collocated with the maximum detected value for benzene. Meta/para xylene was also detected once at SBDRMO-9, at a concentration of 130,000 J μg/Kg. The combined total BTEX concentration detected at SBDRMO-9 at a depth of 2 ft. to 6 ft. bgs was 155,959 J μg/Kg.

Chloroform and styrene were detected in fewer than 10% of the samples and are not considered significant contaminants. Chloroform was detected twice (4 J μg/Kg and 2 J μg/Kg) at concentrations below its detection limit. Styrene was detected in one sample (2.7 J μg/Kg) at its detection limit.

SVOCs

Twenty-four SVOCs including 17 cPAH and PAH compounds, five phthalates, and two other SVOCs were detected in the subsurface soil samples collected at SEAD-121C. Summary statistics for the identified SVOCs found in subsurface soil are shown in **Table 6-3**.

All SVOCs were detected at a frequency of 42% of the time or less; one cPAH (benzo(b)fluoranthene), three PAHs (i.e., fluoranthene, phenanthrene, and pyrene), and bis(2-ethylhexyl)phthalate were the compounds most frequently detected. Five cPAHs were detected at concentrations that exceeded TAGM #4046 criteria levels one or more times, while three cPAH compounds also were seen to exceed USEPA's PRG levels. A summary of VOCs found to exceed the varying comparative criteria is provided below.

SVOC	Number of Samples with Concentrations Above NYSDEC's TAGM #4046	Region IX PRGs for Residential Soils
Benzo(a)pyrene	2	2
Benzo(b)fluoranthene	3	3
Benzo(k)fluoranthene	1	1
Chrysene	2	--
Dibenzo(a,h)anthracene	1	--

Calculated BTEQ values determined for each subsurface soil sample did not exceed 10 mg/Kg at any of the locations sampled; and the site-wide average BTEQ value was 0.42 mg/Kg. The maximum BTEQ value was 1.4 mg/Kg at SBDRMO-16, collected at a depth of 2 to 6 ft. bgs.

Pesticides and PCBs

Data for soil samples collected and analyzed for pesticides and PCBs are summarized in **Table 6-3**. Eight pesticides and one PCB were detected in one or more of the 20 subsurface soil samples characterized; however, none of the detected compounds were ever found at concentrations that exceeded either their TAGM #4046 or the USEPA Region IX PRG levels.

4,4'-DDE, 4,4'-DDT, and Aroclor-1260 were detected three times, with maximum concentrations of 17 μg/Kg, 16 μg/Kg, and 200 μg/Kg, respectively. The remaining six pesticides (aldrin, delta-BHC, endosulfan I, endrin, endrin ketone, and heptachlor epoxide) were each detected a single time. The maximum detections of Aroclor-1260 (200 μg/Kg), delta-BHC (1.3 J μg/Kg), and heptachlor epoxide (1.1 J μg/Kg) were collocated at SB121C-2 and were collected from a depth range of 2 ft. to 2.5 ft. bgs. The maximum detections of 4,4'-DDE (17 μg/Kg) and 4,4'-DDT (16 μg/Kg) were collocated at SB121C-3, at a depth range of 2.5 ft. to 3 ft. bgs. The maximum detections of aldrin (11 J μg/Kg), endosulfan I (78 μg/Kg), endrin (23 J μg/Kg), and endrin ketone (9.7 NJ μg/Kg[vi]) were collocated at SBDRMO-16, at a depth range of 2 ft. to 6 ft. bgs.

Metals and CN^-

Summary statistics for the metals detected in subsurface soil are shown in **Table 6-3**. As is shown, 22 metals were detected one or more times in the subsurface soil samples.

Arsenic, chromium, copper, lead, and zinc were detected in all subsurface soil samples characterized from the AOC; mercury was detected in all but one of the subsurface soil samples characterized.

Twelve metals were detected at concentrations that exceeded TAGM #4046 cleanup criteria, one or more times. Three metals were detected at concentrations that surpassed USEPA's Region IX PRG values one or more times. A summary of metals observed to exceed the varying comparative criteria is provided below.

	Number of Samples with Concentrations Above	
Metal	**NYSDEC's TAGM #4046**	**Region IX PRGs for Residential Soils**
Antimony	1	--
Arsenic	--	20
Barium	1	--
Cadmium	1	--
Chromium	3	--
Copper	6	--
Iron	1	15
Lead	7	1
Magnesium	1	--
Nickel	3	--
Sodium	2	--
Thallium	2	--
Zinc	7	--

Figure 6-3 shows the distribution of ten metals listed above and found in the subsurface soil across the DRMO Yard. Iron, magnesium and sodium are excluded from this presentation as they are typical nutrients found in soil. This chart shows that the subsurface sample from one location, SB121C-2, which is located in the northern corner of the AOC exhibited three metals (copper, lead and zinc) at concentrations that are significantly higher than comparable levels found in the surrounding subsurface soil samples. Additionally, the maximum concentrations of antimony, arsenic, cadmium, chromium, copper, lead, mercury, and zinc found in subsurface soils during the investigation of this AOC were also detected at this location at a depth range of 2 ft. to 2.5 ft. bgs.

6.1.2 Groundwater Investigation

SEAD-121C, DRMO Yard

Two temporary groundwater monitoring wells (i.e., MW121C-1 and MW121C–2) were installed and sampled using bailers during the EBS in 1998. During the RI, four permanent monitoring wells were installed, and two rounds (i.e., February and May of 2003) of groundwater samples were collected and analyzed at three of the permanent wells (MW121C-3, MW121C-4, and MW121C-6) using low flow sampling techniques (**Figure 6-1**). Samples could not be collected from the fourth permanent monitoring well (i.e., MW121C-5) during either of the 2003 sampling events because the well was found to be dry.

Analytical results collected during the EBS sampling event are not considered representative of the conditions that exist at the AOC because both wells were temporary installations, the wells were not fully developed and stabilized before sampling, and samples were collected using bailers. The collection of samples using bailers is likely to introduce silt and sediment into the samples analyzed, which can lead to exaggerated analyte concentrations due to the presence of materials sorbed onto the surface of the entrained particulate. The results of the EBS groundwater sampling did provide the basis for the installation of the permanent monitoring wells, and the use of the USEPA's recommended low-flow, purge and pump sampling process. Nevertheless, brief summaries of the EBS and RI sampling events are provided below. The RI results are discussed first, due to their higher degree of credibility.

Table 6-4 summarizes the results for the 1998 EBS groundwater sampling event; **Table 6-5** provides a similar summary of results found during the 2003 RI sampling events. All of the groundwater data developed for SEAD-121C was compared to a combined set of federal and state criteria that was derived by selecting the lowest value defined from the following regulatory lists: New York State Class GA Groundwater Standards, Federal Drinking Water Standards Maximum Contaminant Levels (MCLs), and secondary standards (SEC). New York's GA standards and the federal MCL values are promulgated standards; the federal secondary standards are non-binding guidelines.

VOCs

VOCs were not detected in groundwater samples characterized during the 2003 RI sampling program.

Seven VOCs (i.e., 1,4-dichlorobenzene, acetone, bromochloromethane, bromoform, carbon disulfide, chlorobenzene, and vinyl chloride) were detected in the groundwater samples collected during the EBS. All of the noted VOCs were detected one time each. Summary statistics for the identified VOCs found in EBS groundwater samples are shown in **Table 6-4**.

The compound 1,4-dichlorobenzene, which was detected once at 36 μg/L at sample location MW121C-2 was the only VOC observed to exceed a promulgated standard (i.e., GA standard of 3 μg/L. Monitoring well MW121C-2 is located within the AOC and situated near the southwestern corner of the AOC. Four other VOCs (bromochloromethane, bromoform, chlorobenzene, and vinyl chloride) were also detected once in the sample collected from MW121C-2, but each of these analytes was present at a concentration less than any identified standard.

SVOCs

Two SVOCs, bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected once each during the 2003 RI groundwater sampling events. Neither SVOC exceeded its respective GA standard or USEPA's Region IX PRGs for drinking water. Both of the concentrations measured for these compounds were detected at levels slightly above their respective detection limits.

The eight SVOCs listed below were detected in the groundwater samples collected during the EBS at SEAD-121C. None of the compounds identified exceeded state or federal standards.

SVOCs detected in EBS Groundwater Samples

Bis(2-ehtylhexyl)phthalate	Fluorene
Butylbenzylphthalate	Hexachlorobutadiene
Di-n-butylphthalate	Phenanthrene
Diethylphthalate	Pyrene

Pesticides and PCBs

No pesticides or PCBs were detected in groundwater samples collected from the permanent wells during the RI (**Table 6-5**).

Nineteen pesticides were detected in one or two of the groundwater samples collected during the EBS; PCB congeners were not identified in any groundwater sample collected during the EBS. Summary statistics for the identified pesticides and PCBs found during the EBS groundwater sampling event are shown in **Table 6-4**.

Seven pesticides (i.e., 4,4'-DDD, 4,4'-DDT, alpha-BHC, beta-BHC, delta-BHC, dieldrin, and heptachlor epoxide) were found at concentrations exceeding their respective GA standard in both of the EBS groundwater samples collected. Two other pesticides (i.e., 4,4'-DDE and heptachlor) were found at concentrations exceeding their respective GA standard once each. The exceedance of heptachlor was detected in monitoring well MW121C-1, while the exceedance of the GA standard for 4,4'-DDE was observed in the groundwater sample collected from well MW121C-2. The maximum concentration of dieldrin (0.2 J μg/L) was 50 times its GA standard (0.004 μg/L); the maximum concentration of beta-BHC (0.33 J μg/L) was eight times greater than its GA standard (0.04 μg/L); the maximum concentration of delta-BHC (0.16 J μg/L) was four times its GA standard (0.04 μg/L); the maximum concentrations of heptachlor (0.14 J μg/L) and 4,4'-DDD (0.81 J μg/L) were approximately three times their respective GA standard (0.04 μg/L and 0.3 μg/L, respectively).

Metals and CN^-

Nineteen metals (identified below) were detected in samples collected from the permanent wells at the DRMO Yard during the RI. Summary statistics for the identified metals found during the RI groundwater sampling events are shown in **Table 6-5**.

Aluminum, antimony, iron, manganese, and sodium exceeded their respective groundwater standard in two or more of the groundwater samples characterized during the RI sampling events. None of the groundwater concentrations measured for metals exceeded USEPA's Region IX PRGs for Tap Water.

Figure 6-4 graphically summarizes where, and during which sampling event, the noted exceedances of groundwater standards for metals occurred. Aluminum exceeded the secondary standard (SEC) of 50 μg/L in four samples; three of these occurred during the February 2003 sampling event, with the fourth occurring during the May 2003 sampling event. Antimony exceeded the GA standard twice during the February 2003 sampling round. Iron exceeded its GA standard three times; twice during the February 2003 sampling event, and once in May 2003. Sodium exceeded its GA standard in three samples; twice in February and once in May 2003. Manganese exceeded its GA standard once during the February 2003 sampling event, in one member of a sample-duplicate pair; the average for the two samples was less than the GA standard (i.e., 286 μg/L). Sample results reported for samples collected in February 2003 were higher than the results from the round conducted in May 2003, which is likely due to more complete stabilization of the water in the wells and seasonal variation.

SEAD-27, Building 360 Steam Cleaning Waste Tank Groundwater Results

There has been periodic monitoring of the groundwater at Building 360, which is immediately east, upgradient and outside of the DRMO Yard. This sampling is associated with the RCRA closure of SEAD-27 (Building 360 – Steam Cleaning Waste Tank). The fence along the eastern boundary of the Yard hugs the west side of Building 360. Two wells (MW-1 and MW-2) and a T-sump located inside of Building 360, shown in **Figure 6-5,** were sampled in April and May 2003. MW-1 is located to the east of Building 360, between Building 360 and Building 316. MW-2 is located to the west of Building 360, a few feet inside the fence line of the DRMO Yard. The T-sump is a secondary containment device inside of Building 360 for the 1,1,1-trichloroethane (1,1,1-TCA) storage tank. Summary statistics of the RI groundwater sampling for MW-1, MW-2, and the T-sump at Building 360 (SEAD-27) are presented in **Table 6-6**.

The groundwater samples collected from Building 360 (SEAD-27) were analyzed for VOCs, SVOCs, PCBs, and metals. Sampling efforts conducted in 1995 used bailers; thus, the results from the 1995 sampling event are not considered as reliable as data from the 2003 sampling efforts, due to the sampling technique employed.

Data collected in 1995 indicate that the following analytes exceeded groundwater standards in the samples during the investigation of SEAD-27: 1,1,1-trichloroethane, 1,1-dichloroethane, 1,1,2,2-tetrachloroethane, and total xylenes. All 1995 samples contained levels of 1,1,1-trichloroethane that exceeded GA groundwater standards. Only samples collected in May 1995 contained concentrations that exceeded GA standards for the other three analytes. 1,1-Dichloroethane was detected in MW-1, the upgradient well, at 7.0 μg/L and 7.6 μg/L in the sample and the sample duplicate, respectively; the GA standard is 5 μg/L. The concentration of 1,1,2,2-tetrachloroethane (7.6 μg/L) and total xylenes (7.6 μg/L) measured were slightly greater than NYSDEC's GA standard concentration of 5 μg/L (for both). The downgradient well MW-2 did not have any exceedances of groundwater standards. The T-sump, located inside of Building 360, detected 1,1,1-trichloroethane above the GA groundwater standard consistently for across the four sampling events, with a maximum detected concentration of 20 μg/L in a sample duplicate for the March 1995 sampling event.

Sampling conducted in 2003 used low flow sampling techniques. The analytes that exceeded their groundwater standards during the sampling conducted in 1995 were either not detected during the 2003 sampling rounds or were found at levels below their respective GA or MCL standards. Most analytes detected in the groundwater during the 2003 sampling rounds were at or below the GA or MCL standards. The maximum concentration of vinyl chloride detected was estimated as 2.3 J μg/L in MW-1, which slightly exceeded its standard of 2 μg/L. **Figure 6-5** shows that vinyl chloride was not detected in any wells inside the DRMO Yard, which suggests that the detection of vinyl chloride is a residual of contaminants present upgradient of the AOC and is not associated with activities related to the DRMO Yard.

Aluminum, chromium, iron, lead, manganese, sodium, thallium, and zinc exceeded their respective GA or MCL standard; however, their concentrations are within the range of the site-specific background data. Thallium was only detected in the upgradient well, MW-1. **Figure 6-5** shows that aluminum concentrations vary across the site; however, they are higher at the on-site wells than at the upgradient wells, MW-1 and MW-2, and T-sump.

The single detection of lead was found at the T-sump, and a single exceedance of the groundwater standards for chromium and zinc was detected at the T-sump. The maximum detection of iron, 255,000 μg/L, was found at the T-sump at a level that was more than 45 times greater than the iron concentrations detected at MW-1 or MW-2 or at any of the DRMO Yard wells. This result suggests that the presence of iron is an artifact of an upgradient source and is not related to activities performed at the DRMO Yard.

6.1.3 Surface Water Investigation

No permanent surface water body is located within the bounds of the DRMO Yard. Drainage ditches are located exterior of SEAD-121C, along the southern and northwestern bounds. The man-made drainage culverts convey storm and snow-melt runoff waters away from land located within the SEDA's former administrative, maintenance and warehousing areas, which are located to the north-northeast, east, and south-southeast, of SEAD-121C to Kendaia Creek that is located to the west. Land within the DRMO Yard is sloped towards the bordering drainage ditches so runoff from the site flows into these ditches as well. Surface water flow in the abutting drainage ditches is an episodic event, and thus, there is no NYSDEC designation assigned to surface water (i.e., runoff) found in the channels.

Surface water samples were collected from 10 locations during the SEAD-121C RI; nine of these samples were collected exterior to the DRMO Yard, while the last was collected from a puddle that accumulated after a storm event. Summary statistics for the surface water analyses are shown in **Table 6-7**. Surface water data were compared to New York State's Class C Ambient Water Quality Standards (AWQS) and to the USEPA's Region IX PRGs for Tap Water for comparative purposes.

VOCs

VOCs were not detected in any of the surface water samples collected and characterized from the vicinity of the DRMO Yard.

SVOCs

Bis(2-ethylhexyl)phthalate was detected in one sample collected from location, SWDRMO-2, at a concentration of 4.2 J μg/L. SWDRMO-2 is located upgradient of, exterior to, and southwest of the AOC in drainage ditch #2. Surface water found at this location originates from locations to the east and southeast of SEAD-121C, the DRMO Yard. This value exceeds the NYSDEC Class C AWQS (i.e., 0.6 μg/L), but is below USEPA's Region IX PRG for tap water.

Pesticides and PCBs

Pesticides and PCBs were not detected in the surface water collected form locations in the vicinity of the DRMO Yard.

Metals and CN^-

Twenty-two metals were detected in surface water samples collected from the vicinity of the DRMO Yard. Summary statistics for the identified metals found during the RI surface water sampling event are shown in **Table 6-7**.

Ten metals (i.e., aluminum, barium, calcium, copper, iron, lead, magnesium, potassium, sodium, and zinc) were detected in every sample analyzed; two others (i.e., arsenic and selenium) were only observed in one sample each. Eleven metals exceeded their respective Class C AWQS for surface water. Eight metals exceeded their respective Region IX PRGs for tap water. A summary of metals observed to exceed their Class C AWQSs or the USEPA Region IX PRGs for Tap Water is provided below.

	Number of Samples with Concentrations Above	
Metal	**NYSDEC's Class C AWQS**	**Region IX PRGs for Tap Water**
Aluminum	5	--
Arsenic	--	1
Cadmium	2	1
Cobalt	2	--
Copper	2	--
Iron	5	2
Lead	10	--
Manganese	--	1
Mercury	2	--
Nickel	1	--
Silver	2	--
Thallium	--	2
Vanadium	2	1
Zinc	2	--

Locations where metal exceedances of NYSDEC's Class C AWQSs or Region IX PRGs are observed are shown on **Figure 6-6**.

The surface water sample collected from location SWDRMO-2 contained the maximum concentration recorded for metals in surface water for 18 of the 22 metals detected in samples. Location SWDRMO-2 is upgradient of, exterior to, and southwest of the AOC. Surface water concentrations found for 13 metals in this sample also exceeded their respective Class C AWQSs, Regions IX PRGs for Tap Water or both criteria. The location immediately downstream of SWDRMO-2 (i.e., SWDRMO-3) contained the next highest number of metal exceedances of the Class C AWQSs and Region IX PRGs for tap water for 11 metals, and the second highest measured concentrations found in surface water samples for 16 metals; it also contained the highest reported concentrations of calcium and potassium reported in surface water for the AOC. These results suggest that the source of most of the metals observed in the bordering southern drainage culvert originate upgradient and decrease as they move past the AOC, probably due to dilution effects.

Only aluminum, iron, lead, and thallium were detected in samples from locations other than SWDRMO-2 and SWDRMO-3 at levels greater than Class C or Region IX PRGs.

6.2 SEAD-121I, Rumored Cosmoline Oil Disposal Area

Samples of surface soil, ditch soil and surface water were collected and analyzed as part of the EBS and RI at SEAD-121I, the Rumored Cosmoline Oil Disposal Area. The sampling and analyses were performed in 2002 and 2003; the results of this effort were reported in the "*Remedial Investigation Report for Two EBS Sites in the Planned Industrial Development Area (SEAD-121C and SEAD-121I),*" Final (Parsons, 2006). The combined analytical results of the EBS and the RI are summarized and discussed below.

6.2.1 Soil Investigations

Fifty-one (51) soil samples, including 12 ditch soil samples, 34 surface soil samples (i.e., 0 – 2 inches bgs) and five soil samples collected from soil borings, but from depths of less than 2 ft. bgs ,were collected and analyzed as part of the investigation of soil at SEAD-121I. As the exact operating practices used at the Rumored Cosmoline Oil Disposal Area are unknown, the implemented soil investigation included the collection and analysis of soil samples from within the AOC and beyond the defined bounds of the AOC to identify areas of impacted soil. Four surface soil samples and two ditch soil samples were collected during the EBS. Thirty (30) surface soil samples, 10 ditch soil samples, and five shallow soil samples from soil borings were collected during the RI. **Figure 6-7** shows the locations where the soil and ditch soil samples were collected. The results for all 51 of the soil samples are discussed together as field observations indicate that all of these environmental "media" are equivalent in characteristic and nature. Generally, the ditch soil samples were collected from locations on the AOCs surface where erosion channels were observed due to surface water flow off the AOC's surface to the underlying storm sewer locations. Similarly, the soil boring sampling was terminated at relatively shallow depths because bedrock was encountered very close to the grounds surface throughout the AOC.

Volatile Organic Compounds (VOCs)

Eight VOCs were detected in the 45 surface soil samples collected and analyzed. The eight VOCs detected included: acetone, benzene, ethyl benzene, met/para xylene, methyl ethyl ketone, methylene chloride, ortho xylene, and toluene. **Table 6-8** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the soil samples.

Acetone was the VOC most frequently detected, present in 36 of the 45 samples characterized. The highest reported concentration for acetone was 150μg/Kg. None of the measured concentration exceeded NYSDEC's TAGM #4046 or USEPA's Region IX PRG for Residential Soil levels. Acetone is a commonly laboratory contaminant, and is also an artifact of the sample collection and preservation procedure used on the samples.

Each of the remaining VOCs was observed in fewer than 25 percent of the samples and at relatively low concentrations. None of the measured concentrations exceeded NYSDEC's TAGM #4046 or USEPA's Region IX PRG for Residential Soil levels. The maximum concentration measured for benzene was 41 μg/Kg. The maximum concentration measured for toluene was 31 μg/Kg, and the maximum concentration measured for all other

Semivolatile Organic Compounds (SVOCs)

Twenty-eight semivolatile organic compounds (SVOCs), mainly including PAHs, the cPAHs, and mixed phthalates were detected in the surface soil samples collected from SEAD-121C. **Table 6-8** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the SVOCs found in surface soil samples.

Four of the SVOCs (benzo(b)fluoranthene, fluoranthene, phenanthrene and pyrene) were each found in 48 of the 51 samples analyzed. Comparatively, five SVOCs (3'3-dichlorobenzidine, di-n-octylphthalate, isophorone, nitrobenzene, and phenol) were only found once, each collocated in the sample collected from location SD121I-7. Generally, the seven cPAH compounds were found most frequently, while the phthalates were generally detected least frequently.

The seven cPAHs [i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k) fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene] were also observed to exceed their respective USEPA Region IX PRGs fro Residential Soil state and federal action levels most frequently. Of these compounds, benzo(a)pyrene exceeded its state and federal levels most frequently. A summary of the SVOCs found to exceed their comparative criteria is provided below.

SVOC	Number of Samples with Concentrations Above NYSDEC TAGM #4046	Region IX PRGs for Residential Soils
Benzo(a)anthracene	28	18
Benzo(a)pyrene	44	44
Benzo(b)fluoranthene	14	21
Benzo(k)fluoranthene	14	4
Chrysene	25	--
Dibenz(a,h)anthracene	15	15
Fluoranthene	1	--
Indeno(1,2,3-cd)pyrene	3	13
Nitrobenzene	1	--
Phenanthrene	1	--
Phenol	1	--
Pyrene	1	--

BTEQ values were calculated for each soil sample collected at SEAD-121I. Three out of 51 samples (SS121I-2, SS121I-20, and SD121I-2EBS) exceeded the 10 mg/Kg BTE guidance value. The site-wide average BTE concentration within SEAD-121I is 3.0 mg/Kg. The maximum value of BTE, located at SS121I-20, was 32 mg/Kg. The next two highest BTE values were at SS121I-2 (21 mg/Kg) and SD121I-2EBS (26 mg/Kg), respectively. **Figure 6-8** shows the distribution of BTEQ values observed at the Rumored Cosmoline Disposal Area.

Pesticides and PCBs

Seven pesticides and two PCBs (listed below) were detected in the soils at SEAD-121I (see **Table 6-8)**. Frequency of detection for pesticides ranged from a low of 4% for dieldrin and endrin to a high of 59% for endosulfan I. Most of pesticides detected were found at locations Avenue C and Avenue D, and these were all generally low. Pesticides and PCBs were not detected in the downgradient ditch soil locations. Endosulfan I was the pesticide compound found most frequently, present in 24 of the 41 samples characterized. All of the other pesticides and PCBs were found in fewer than eight samples analyzed. Dieldrin and heptachlor epoxide were the only two compounds found at concentrations that exceeded their respective TAGM #4046 cleanup criteria or their USEPA Region IX PRG levels, as is summarized below.

Pesticide	Number of Samples with Concentrations Above NYSDEC's TAGM #4046	Region IX PRGs for Residential Soils
Dieldrin	1	--
Heptaclor epoxide	1	3

Metals

Twenty-three metals plus cyanide were detected in the 45 soil samples collected at or around SEAD-121I. **Table 6-8** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the soil samples.

Fifteen metals (aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc) were detected in all samples. The frequency of detection for the remaining ten detected metals ranged from a low of 18% for silver to a high of 98% for beryllium and mercury. Cyanide was detected with a frequency of 7%.

Nineteen of the metals found in soils were found at concentrations that exceeded their respective TAGM #4046 levels. Five metals detected in soil in samples collected during the RI were found at levels that exceeded USEPA's Region IX PRG levels. A summary of metals found to exceed the varying comparative criteria is provided below.

	Number of Samples with Concentrations Above	
Metal	**NYSDEC's TAGM #4046**	**Region IX PRGs for Residential Soils**
Antimony	1	--
Arsenic	8	34
Cadmium	3	--
Calcium	18	--
Chromium	6	--
Cobalt	4	--
Copper	10	--
Iron	2	12
Lead	22	--
Magnesium	1	--
Manganese	15	11
Mercury	1	--
Nickel	7	--
Selenium	5	--
Silver	4	--
Sodium	24	--
Thallium	5	5
Vanadium	1	1
Zinc	14	--

Manganese (310,000 mg/Kg), calcium (298,000 mg/Kg) and iron (58,400 mg/Kg), respectively, were the metals that exhibited the highest single sample concentrations in soil samples collected at SEAD-121I. Calcium (~103,300 mg/Kg), iron (~18,300 mg/Kg), and manganese (~12,400 mg/Kg), respectively, were observed to have three largest site average concentrations for SEAD-121I. Most of the higher concentrations observed for iron and manganese were found collocated in samples collected in the immediate vicinity of the two strategic ferromanganese ore piles, while most of the higher concentrations of calcium were observed in samples at locations away from the two ore piles. Each of these metals was found at concentrations above NYSDEC's TAGM #4046 levels, but only iron and manganese were found at concentrations that exceeded USEPA's Region IX PRG values for residential soils. **Figure 6-9** presents the distribution of iron and manganese found in soils at SEAD-121I.

Site observations and historic records note the long-term staging of a strategic stockpile of ferrous-manganese ore in the second and fourth blocks at SEAD-121I, in close proximity of where the elevated iron and manganese concentrations are found. As such, the stockpiles are presumed to be the source of the elevated levels of these metals in the AOC soils. **Figures 6-10** and **6-11** also show that many of the elevated concentrations of arsenic, chromium, thallium and zinc that are observed at SEAD-121I, are also located in close proximity to the ore piles.

6.2.2 Surface Water Investigation

Seven (7) surface water samples were collected and analyzed as part of the investigation of SEAD-121I. Results of the surface water analyses were compared to State of New York ambient water quality standards for Class C surface waters. **Table 6-$$** presents summary statistics (e.g., frequency of detection, maximum concentration, etc.) developed for the surface water samples.

VOCs

VOCs were not detected in the surface water at SEAD-121I, the Rumored Cosmoline Oil Disposal Area.

SVOCs

Two SVOCs were detected in the surface water at SEAD-121I. Butylbenzylphthalate was detected in one sample at the northwestern corner of SEAD-121I, SW121I-10, at a maximum concentration of 1.1 J µg/L. Fluoranthene was also detected at a maximum concentration of 1.1 J µg/L in one sample, SW121I-6, located inside SEAD-121I. Neither of these values exceeded their respective Class C AWQS.

Pesticides and PCBs

Pesticides and PCBs were not detected in the surface water samples collected from SEAD-121I.

Metals

Eighteen metals were detected in the surface water at SEAD-121I, of these 18, seven (i.e., aluminum, calcium, magnesium, manganese, potassium, sodium, and zinc) were found in every sample (see **Table 6-9)**. Four of the identified metals [aluminum 3 times), iron (2 times), lead (4 times), and zinc (1 time)] exceeded their respective AWQS Class C standards. None of the surface water concentrations measured exceeded the USEPA's Region IX PRG for tap water. Aluminum and zinc were detected in all seven samples, iron was detected in five samples, and lead was detected in four samples. The maximum detections of aluminum, iron, lead, and zinc (2,050 μg/L, 3,410 μg/L, 26.3 μg/L, and 190 μg/L, respectively) were collocated at SW121I-6, which is located immediately north of the southern ore pile inside SEAD-121I. The second highest concentrations of aluminum, iron, and lead (1,490 μg/L, 3,080 μg/L, and 21 μg/L, respectively) were found at SW121I-10, which is located north of the northern ore pile within the boundary of SEAD-121I. The locations where metals exceeded their respective AWQS are shown on **Figure 6-12**.

7 SUMMARY OF HUMAN HEALTH AND ECOLOGICAL RISKS

Human health and ecological risk assessments were performed for SEAD-121C and SEAD-121I using the analytical data developed during the EBS and the RI of the AOCs, summarized above, and fully reported in the "*Remedial Investigation Report, Two EBS Sites in the Planned Industrial Development Area (SEAD-121C and SEAD-121I),*" Final (Parsons, 2006).

7.1 Methodology

7.1.1 Human Health Risk Assessment

7.1.1.1 Introduction

The baseline human health risk assessments were conducted in accordance with the USEPA's "*Risk Assessment Guidance for Superfund* (RAGS)" (USEPA, 1989) and the supplemental guidance and updates to the RAGS. Technical judgment, consultation with USEPA staff, and recent publications were used in the development of the risk assessment. The overall objective of the baseline human health risk assessment was to assess potential risks to current and reasonably anticipated future human receptors resulting from the release of, and exposure to, hazardous substances at SEAD-121C and SEAD-121I. The results of the risk assessment were used to identify whether a corrective action may be warranted at the AOCs.

The reasonable maximum and central tendency exposures (RME and CT, respectively) were evaluated during the human health risk assessment. The human health risk assessment methodology is shown in **Figure 7-1**. A four-step process was used for assessing site-related human health risks for RME and CT exposure scenarios:

- *Hazard Identification* – identified the contaminants of concern based on several factors such as toxicity, frequency of occurrence, and concentration;

- *Exposure Assessment* – estimated the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed;

- *Toxicity Assessment* – determined the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and

- *Risk Characterization* – summarized and combined the outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks (for example, one-in-a-million excess cancer risk).

As part of the Exposure Assessment component of the risk assessment, conceptual site models were developed for both AOCs which considered the COCs identified at the AOC, the media affected, the most probable future receptors, and the duration each receptor would be exposed to hazardous substances identified in the area.

7.1.1.2 Carcinogenic and Non-Carcinogenic Effects

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

7.1.1.3 Evaluation of Lead Exposure

Lead was identified as a COC in surface soil, subsurface soil, ditch soil, and surface water at SEAD-121C, and from ditch soil, surface soil and surface water at SEAD-121I.

Surface water has elevated levels of lead; however quantification of dermal exposure to lead from surface water could not be completed since a model is not currently available to quantify risk due to contact with surface water. Due to the episodic nature of surface water flow through the drainage ditches that are exterior to SEAD-121C and SEAD-121I, human exposure to surface water is expected to be infrequent and therefore potential risks are expected to be minor.

Risk associated with lead in surface and ditch soils were evaluated using the "*Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil*" (USEPA, 2003b) for the industrial worker. The central tendency exposure factors for industrial workers were used to evaluate potential risks associated with lead in soil. The industrial worker was assumed to accidentally intake 50 mg of soil each day while working at the SWMU for 219 days each year. This assumption is consistent with the default assumptions used in the adult lead model (USEPA, 2003b).

This model provides an assessment of non-residential exposure by relating soil lead intake to blood lead concentrations in women of childbearing age. The methodology focuses on estimating fetal blood lead levels in women exposed to site soils. It should be noted that the adult lead model is based on the assumption of continuing long-term exposure. As construction workers are expected to work at the site for only a short-term (i.e., approximately 1 year), risk associated with lead exposure is expected to be minor and therefore it was not evaluated in the risk assessment.

For an adolescent trespasser, the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) developed by USEPA was used to evaluate receptor lead level via exposure to surface soil and ditch soil at SEAD-121C. The IEUBK model results, based on residential exposure assumptions, can only be used as a screening tool as the exposure frequency for the adolescent trespasser is much less than the residential child. In addition, a child receptor is considered more sensitive than an adolescent receptor. The IEUBK windows version software package was developed based on the IEUBK Guidance Manual (USEPA 1994). The model utilizes four interrelated modules (exposure, uptake, biokinetic, and probability distribution) to estimate blood lead (PbB) levels in children exposed to lead-contaminated media.

For the industrial worker and the adolescent trespasser, the AOC-specific exposure point concentrations (EPCs) and CT exposure factors were used along with the default assumptions presented in the models to derive the lead level estimation for the receptors. Risk characterization for lead exposure was conducted based on a comparison between the estimated blood lead level and the target PbB level of concern. Blood lead level was estimated based on the USEPA IEUBK model or the Adult Lead Model. The target PbB level of concern is 10.0 micrograms per deciliter (μg/dL) for a child (USEPA, 1994, 2003b).

7.1.2 Screening Level Ecological Risk Assessment (SLERA)

7.1.2.1 Introduction

Screening-level ecological risk assessments (SLERAs) were also performed for SEAD-121C and SEAD-121I to evaluate whether hazardous substances found at either of the AOCs have the potential to cause adverse effects to ecological resources. This SLERAs were conducted in accordance with several USEPA and NYSDEC guidance documents including "*Ecological Risk Assessment Guidance for Superfund (ERAGS): Process for Designing and Conducting Ecological Risk Assessments*" (USEPA, 1997), "*Guidelines for Ecological Risk Assessment*" (USEPA, 1998), "*Fish and Wildlife Impact Analysis*" (NYSDEC, 1994b), and "*The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments*" (USEPA, 2001).

The current USEPA (1997) ecological risk assessment paradigm includes eight general steps:

1. Screening-Level Problem Formulation and Ecological Effects Evaluation;
2. Screening-Level Exposure Estimate and Risk Calculation;
3. Baseline Risk Assessment Problem Formulation;
4. Study Design and Data Quality Objective (DQO) Process;
5. Field Verification of Sampling Design;
6. Site Investigation and Analysis Phase;
7. Risk Characterization; and
8. Risk Management.

The ecological risk assessments completed for SEAD-121C and SEAD-121I included a screening-level ecological risk assessment (SLERA, Steps 1 and 2) and further refinement of chemicals of concern (COCs) (Step 3.2). Step 3.2, COC refinement, was performed in accordance with the USEPA's ERAGS (1997) and the supplemental guidance of ERAGS (USEPA, 2001). The SLERA process is summarized in **Figure 7-2**.

Upon completion of screening-level Ecological Risk Assessment (ERA) Step 2, there is a Scientific Management Decision Point (SMDP) with four possible decisions according to the ERAGS (USEPA, 1997) and the supplemental guidance (USEPA, 2001):

- There is adequate information to conclude that ecological risks are negligible and therefore there is no need for remediation on the basis of ecological risks;
- The information is not adequate to make a decision at this point and the ERA process should continue to a baseline ERA;
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted; or
- In cases where contamination has sharply defined borders or where the extent of contamination is limited, it may be preferable to cleanup the area to the screening values rather than spending time and resources determining a less conservative cleanup number.

The results of the SLERA indicate which contaminants found at the AOC can be eliminated from further consideration and which should be evaluated further. The refinement of COCs helps streamline the overall ERA process by considering additional components early in the baseline ERA. The results of the ecological risk assessment presented will be used to determine the need for further study. The baseline ERA, if conducted, will further evaluate potential or actual adverse ecological effects associated with site-related contaminants and results will be used to develop appropriate remedial measures, if required.

7.1.2.2 Ecological Conceptual Model

Preliminary CSMs were developed separately for both AOCs. Each CSM provided an overall assessment of the primary and secondary sources of contamination at the AOCs, and the corresponding release mechanisms and affected media. Potential sources of contamination; potentially complete exposure pathways; and, ecological receptors are depicted in the CSM.

A complete exposure pathway consists of a source and mechanism of contaminant release, a transport mechanism for the released contaminants, a point of contact, and a route of contaminant entry into the receptor. If any of these elements is missing, the pathway is incomplete. In addition, potential receptors were identified to allow evaluation of potentially complete pathways.

For most terrestrial receptors, soil exposure intervals are limited to the upper 2 feet of the soil column. For purposes of this SLERA, surface soil was defined as the 0-2 ft. bgs. Surface and subsurface soil (0-4 ft. bgs, hereafter referred to as total soil) may be uncovered during future excavation activities and therefore, may result in contaminants in the soil becoming available for contact. Therefore, exposure to total soil (0-4 ft. bgs) was also evaluated in the SLERAs.

Ecological receptors are not directly exposed to contaminants in groundwater.

There are no permanent lakes, ponds, streams or wetlands in SEAD-121C or SEAD-121I. Exposure to ditch soil and surface water was evaluated for wildlife receptors identified for the two SLERAs.

7.1.2.3 Identification of Ecological COPCs

Chemicals of potential concern (COPCs) were identified by comparing the maximum detected concentrations in each impacted medium at each AOC to ecological risk-based screening values. For each data set selected, the maximum detected concentration was compared to the ecological screening value. For soil, the maximum detected concentration of all results (including surface and subsurface soil results) was used for the screening purposes, and the COPCs identified were used for both the surface soil and the total soil data sets. The ecological screening values are based on conservative (i.e., environmentally protective) generic values derived by various agencies. In brief, the following sources (cited in order of preference) were consulted for screening value selection for soil:

- USEPA (2000a, 2003c, 2005) Ecological Soil Screening Levels;
- USEPA Region III (1995) Biological Technical Assistance Group (BTAG) Screening Levels;
- USEPA Region V (2003) Ecological Screening Levels;
- Oak Ridge National Laboratory (ORNL) Screening Benchmarks for Soil and Litter Invertebrates and Heterotrophic Process (Efroymson et al., 1997a), and Terrestrial Plants (Efroymson et al., 1997b);
- Canadian Environmental Quality Guidelines developed by the Canadian Council of Ministers of the Environment (2003); and
- Circular on Target Values and Intervention Values for Soil Remediation developed by the Netherlands (2000).

For surface water, the New York State Ambient Water Quality Standards (NYS AWQS) and Guidance Values for Class C surface water and the National Recommended Water Quality Criteria (USEPA, 2004) (whichever is lower) were used as screening values. If screening values are not provided by either of the above documents, the USEPA Region III (1995) BTAG screening levels were used for the screening.

Constituents with maximum detected concentrations exceeding the corresponding screening values were retained as COPCs. With the exception of the nutrients (i.e., calcium, magnesium, potassium, and sodium), constituents with no screening values available were retained as COPCs. In addition, all bioaccumulative compounds identified in the report "*Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment*" (USEPA, 2000b) as important bioaccumulative compounds were retained as COPCs as a conservative approach, which is consistent with the ecological risk assessment guidance set forth by USEPA for the Mid-Atlantic Hazardous Site Cleanup program.

7.1.2.4 Receptors

The following species were selected as ecological receptors for SEAD-121C and SEAD-121I.

- Deer mouse (*Peromycus maniculatus*);
- Short-tail shrew (*Blarina brevicauda*)
- Meadow vole (*Microtus pennsylvanicus*)
- Red fox (*Vulpes vulpes*);
- American robin (*Turdus migratorius*); and
- Great blue heron (*Ardea herodias*).

7.1.2.5 Screening-Level Effects Evaluation

The SLERA for mammalian and avian receptors was conducted by comparing potential exposures to COPCs to screening ecotoxicity values (SEVs). SEVs for those analytes identified as COPCs were derived from studies reported in the literature, in the absence of site-specific data, by establishing data selection criteria such that SEVs would be as relevant as possible to assessment endpoints at the sites. In accordance with USEPA guidance (1997), the lowest available, appropriate toxicity values were used with modifying factors to ensure a conservative (i.e., health protective) screening-level evaluation.

7.1.2.6 Screening-Level Exposure Estimate

Estimates of contaminant exposures, expressed as daily dose ingested of contaminated food items (i.e., plants, invertebrates, and animals) and media, were calculated to compare potential wildlife exposures to adverse effect levels. COPC daily dose ingested (expressed as the mass of COPC ingested per kilogram body weight per day) depends on the COPC concentration in food items and media, the receptor's trophic level, the trophic level of food items, and the receptor's ingestion rate of each food item and media.

USEPA (1993b, 1999b, and 2005) has provided a variety of exposure information for numerous avian and mammalian species. Data are directly available for body weights of various species. Similarly, information regarding feeding rates, and dietary composition, including incidental soil ingestion, are also available for many species. Such exposure parameters were compiled for the selected receptor species (i.e., deer mouse, short-tailed shrew, meadow vole, red fox, American robin, and great blue heron). Feeding rates for receptors were based upon USEPA (1999b, 2005) or allometric equations presented in Nagy (1999). Literature values for diet fraction and body weights were taken from USEPA (1993b, 1999b, 2005).

For the screening-level exposure estimate, site foraging frequency factors for all receptors were assigned as 1, in accordance with the USEPA (1997) guidance. That is, all receptors were assumed to be exposed 100% of the time to the COPCs at the AOC. This is a very conservative assumption as most receptors will spend at least part of the time outside of the AOC boundaries, either by having a larger home range than the AOC area, seasonal migration patterns, and/or winter dormancy periods. For example, the red fox has a much larger foraging range than the size of either SEAD-121C or SEAD-121I(i.e., over 200 acres vs. approximately 5 and 34 acres, respectively), yet the SLERA assumes that the fox spends all of its time at SEAD-121C or 121I.

The soil-to-plant uptake factors and soil-to-soil invertebrate uptake factors were obtained from the *"Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities"* (USEPA 1999b). Small mammal bioaccumulation factors were obtained from published literature or were calculated based on chemical-specific partitioning coefficients provided in the literature.

The exposure point concentration (EPC) evaluated for each soil COPC was determined based on the maximum detected concentration, in accordance with the USEPA (1997) guidance.

7.1.2.7 Screening-Level Risk Calculation

For wildlife receptors, the risk calculation step uses the results of the wildlife exposure and toxicity effects assessments to calculate a hazard quotient for each COPC. A hazard quotient (HQ) is a ratio of the estimated exposure dose (for mammal and bird receptors) of a contaminant to the SEV. Generally, the greater this ratio, or quotient, the greater the likelihood of an effect. A HQ less than 1 indicates that the contaminant alone is unlikely to cause adverse ecological effects. Because conservative (i.e., health protective) estimates of potential chronic exposures and toxicity were used, screening-level HQs tend to overestimate actual risks. Cumulative effects of COPCs were not quantitatively evaluated in this SLERA.

For the screening level ERA, NOAEL toxicity values, the maximum detected COPC concentrations, and conservative exposure assumptions were used to calculate the screening level HQs. Each of these assumptions add to the conservative nature of the HQ calculated.

7.1.2.8 Further Refinement of Chemicals of Concern

Due to the conservative nature of the assumptions used in the screening-level ecological risk assessment, additional evaluation was completed to refine the contaminants of concern. The refinement of COCs streamlines the overall ERA process to determine if further evaluation is warranted. Lines of evidence (COC refinement) evaluated include:

- COC detection frequency;
- Risk results based on reasonable site average concentration and/or LOAEL SEVs;
- Size of site relative to foraging area of receptors;
- Site risk relative to background risk;
- Relative uncertainties of SLERA results;
- Sufficiency and quality of literature toxicity data and experimental designs;
- Strength of cause/effect relationships; and
- Quality of habitat for receptors.

Alternative toxicity values and mean exposures based on mean concentrations of contaminants detected in a media at an AOC were considered for the refinement of COCs. Other factors used to compute the screening level HQs (i.e., relative bioavailability, the site foraging frequency factor, and the NOAEL/LOAEL multiplier) were also conservative estimations.

Relative Bioavailability

The relative bioavailability of contaminants found at SEAD-121C and SEAD-121I were assumed to be 100% during the SLERA. However, contaminants in environmental media are generally less available to biological organisms compared with the same contaminants in the experimental medium (i.e., diet, water, etc.).

Site Foraging Frequency Factor

The site foraging frequency factors (or area-use factors) were assumed to be 1 for the mammalian receptors, and 100% for the avian receptors for the avian receptors at both AOCs. That is, the receptors were assumed to live within each AOC at all times, and not range or forage beyond the boundaries of the AOC being evaluated. Again, this is a very conservative assumption as most ecological receptors will spend at least part of the time outside of the AOC boundaries, either by having a larger home range than the AOC area, seasonal migration patterns, and/or winter dormancy periods.

A site foraging frequency factors of 0.025 would be more appropriate for the red fox for SEAD-121C. Similarly, a site foraging frequency factor of 0.5 would be a more appropriate estimate for the American robin or great blue heron.

NOAEL/LOAEL Multiplier

A NOAEL is preferred to a LOAEL as a screening ecotoxicity value to ensure that risk is not underestimated (USEPA, 1997). However, NOAELs currently are not available for many groups of organisms and many chemicals. When a LOAEL value, but not a NOAEL value, is available from the literature, a standard practice is to multiply the LOAEL by a NOAEL/LOAEL multiplier (0.1) and to use the product as the NOAEL for the screening evaluation. Although a NOAEL/LOAEL multiplier of 0.1 was used, the true NOAEL may be only slightly lower than the experimental LOAEL, particularly if the observed effect is of low severity (Sample et al., 1996). The data review referred to in the ERAGS that is used to support the use of 0.1 as the NOAEL/LOAEL multiplier indicates that 96% of chemicals included in the review had a NOAEL/LOAEL multiplier no less than 0.2. Therefore, using a default NOAEL/LOAEL multiplier of 0.1 may result in an overestimation of the HQs. LOAEL values were used in Step 3.2 as alternative SEV values.

Maximum Detected Concentration

The use of the maximum detected concentration as the EPC may overestimate risk since the receptor is actually exposed to a broader range of contaminant concentrations rather than the maximum detected concentrations. Exposure would occur throughout the AOC at various levels, including the EPC. Thus, actual risks may be lower than those presented in the assessment.

7.2 Risk Assessments for SEAD-121C, the DRMO Yard

7.2.1 Human Health

7.2.1.1 Conceptual Site Model

Potential sources of contamination, exposure pathways, and receptors for SEAD-121C are depicted graphically in the conceptual site model (CSM) shown in **Figure 7-3**. The CSM provides an overall assessment of the primary and secondary sources of contamination found at the AOC, and the corresponding release mechanisms and the affected media. The CSM also identifies the potential human receptors and the associated pathways of exposure to the affected media.

7.2.1.2 Human Receptors and Exposure Pathways

The baseline risk assessment evaluated the potential health effects that may result from hazardous substance exposure for the following three receptor groups:

- Current/Future Construction Worker;
- Current/Future Industrial Worker; and,
- Current/Future Adolescent Trespasser/Visitor.

The following exposure pathways were considered:

1. Inhalation of dust from surface soil and ditch soil in ambient air (construction worker, adolescent trespasser / visitor, industrial worker);
2. Ingestion of surface soil and ditch soil (construction worker, adolescent trespasser / visitor, industrial worker);
3. Dermal contact to surface soil and ditch soils (construction worker, adolescent trespasser / visitor, industrial worker);
4. Ingestion of subsurface soils (construction worker);
5. Dermal contact to subsurface soils (construction worker);

6. Ingestion of groundwater (daily) (construction worker, adolescent trespasser / visitor, industrial worker);
7. Dermal contact to groundwater (construction worker);
8. Dermal contact to surface water (construction worker, adolescent trespasser / visitor).

7.2.1.3 Constituents of Concern

The primary human health constituents of concern (COCs) identified at the DRMO Yard are summarized in **Table 7-1**. These include benzene, the seven cPAHs, dieldrin, three aroclor congeners (i.e., 1242, 1254, and 1260) and several metals (e.g., arsenic, lead, etc.). Several of these compounds, including the cPAHs, dieldrin, the aroclor congeners, and arsenic, are known to cause cancer in laboratory animals and are suspected to be human carcinogens.

7.2.1.4 Non-Carcinogenic and Carcinogenic Risk Results, SEAD-121C, the DRMO Yard

The non-carcinogenic and carcinogenic risk results for the above scenarios are summarized in **Table 7-2**. For each scenario evaluated, both the RME and CT values are presented. Complete details of the human health risk assessment for each exposure route are presented in Appendix E of the Final RI report (Parsons, 2006) for soil, ditch soil, groundwater, and surface water exposure.

RME and CT non-carcinogenic risks calculated for the construction worker, industrial worker, and adolescent trespasser/visitor at SEAD-121C are all below HIs of 1. RME and CT carcinogenic risks calculated for the construction worker, industrial worker, and adolescent trespasser/visitor are all within or below the USEPA's recommended range of 1×10^{-4} to 1×10^{-6}.

7.2.1.5 Lead Risk Characterization Results

Soil

Lead risk characterization results for surface soil exposure for the industrial worker at SEAD-121C are presented in **Table 7-3**. The 95th percentile PbB among fetuses of adult industrial workers are 7.8 and 9.8 μg/dL, for a homogeneous and a heterogeneous population, respectively. Both estimates are below the USEPA target PbB level of concern (i.e., 10 μg/dL).

The results are presented in **Table 7-4**. Nevertheless, the 95th percentile PbB levels among residential children are below the USEPA target PbB level of concern (i.e., 10 μg/dL).

Ditch Soil

The lead risk characterization results for SEAD-121C ditch soil exposure are presented in **Tables 7-5** for the industrial worker. The 95th percentile PbB levels among fetuses of adult industrial worker are 5.2 and 6.8 μg/dL, assuming a homogeneous and a heterogeneous population, respectively. Both estimates are below the USEPA target PbB level of concern (i.e., 10 μg/dL).

The results for the adolescent trespasser are presented in **Table 7-6**. The 95th percentile PbB levels among residential children are below the USEPA target PbB level of concern (i.e., 10 μg/dL).

7.2.2 Ecological Risk Assessment – SEAD-121C

7.2.2.1 Preliminary Ecological Conceptual Site Model

The preliminary ecological CSM developed for SEAD-121C is presented in **Figure 7-4**.

7.2.2.2 Identification of Ecological COPCs

Chemicals of potential concern (COPCs) were identified by comparing the maximum detected concentrations in each impacted medium to ecological risk-based screening values. The following four data sets were used for the screening-level ecological risk assessment at SEAD-121C:

- SEAD-121C surface soil (0-2 ft. bgs.);
- SEAD-121C total soil (0-4 ft. bgs,);
- SEAD-121C ditch soil (0-2 ft. bgs.); and
- SEAD-121C surface water.

7.2.2.3 Receptors

The following species were selected as ecological receptors for SEAD-121C.

- Deer mouse (*Peromycus maniculatus*);
- Short-tail shrew (*Blarina brevicauda*)
- Meadow vole (*Microtus pennsylvanicus*)
- Red fox (*Vulpes vulpes*);
- American robin (*Turdus migratorius*); and
- Great blue heron (*Ardea herodias*).

7.2.2.4 Summary of Risk Results and Preliminary Contaminant of Concern Identification

HQ results for the identified receptors based on the maximum detected concentrations for the COPCs and the NOAEL SEVs are presented in **Table 7-7A** for SEAD-121C soil and surface water exposure, **Table 7-7B** for SEAD-121C ditch soil and surface water exposure. COPCs posing potential risks to ecological receptors are summarized below.

Number of Ecological Receptors* Exhibiting Elevated HQs versus Screening Level COPCs

	Surface Soil	Total Soil	Ditch Soil	Surface Water
M/P Xylene		4		
Phenanthrene	2	2		
Pyrene	2	2		
Aroclor-1254	3	3		
4,4'-DDT	1	1		
Aluminum	1	1		1
Antimony	4	4	3	
Barium	4	4		
Cadmium	4	4	4	
Copper	5	5	3	
Cyanide			2	
Iron	4	4		4
Lead	5	5	4	
Selenium			1	
Silver	3	3		
Zinc	4	4		

∗ Ecological receptors evaluated included deer mouse, American robin, short-tailed shrew, meadow vole, red fox, and great blue heron (ditch soil and surface water only).

Once the screening level HQs were computed, the Army applied the refinement of COC process to the results of the SLERA to determine if evaluation of ecological risks was warranted at SEAD-121C, the DRMO Yard.

7.2.2.5 Summary of Ecological Risks

After application of the refinement of COC process, no COCs were identified for SEAD-121C soil, SEAD-121C ditch soil, or SEAD-121C surface water and the rationales are summarized below.

1. Preliminary COCs were identified for SEAD-121C soil, ditch soil, and surface water. However, alternative HQs calculated during the refinement of COCs (Step 3.2), especially the HQs based on the mean concentrations and LOAEL SEVs are either below 1 or close to 1 (with the highest at

5). Therefore, no final COCs were identified for any medium at SEAD-121C.

2. The planned future land use for SEAD-121C is industrial / office development. Thus, the AOC is not expected to support, sustain, or attract ecological receptors and therefore is not expected to be a wildlife habitat. The presence of ecological receptors is expected to be generally curtailed at SEAD-121C where habitat conditions are poor and current and future human activity levels are sufficiently disruptive to discourage wildlife use.

3. The concentrations of several preliminary COPCs identified in Step 2B (chromium and thallium in SEAD-121C soil; and antimony in SEAD-121C ditch soil) are consistent with SEDA background.

Based on the above discussion, it is the Army's position that soil, ditch soil, surface water, and groundwater at SEAD-121C are not expected to significantly impact ecological receptors and no further action is warranted at SEAD-121C based on the ecological risk assessment.

7.3 Risk Assessments for SEAD-121I, the Rumored Cosmoline Oil Disposal Area

7.3.1 Human Health

7.3.1.1 Conceptual Site Model

Potential sources of contamination, exposure pathways, and receptors for SEAD-121I are depicted graphically in the conceptual site model (CSM) shown in **Figure 7-5**. The CSM provides an overall assessment of the primary and secondary sources of contamination found at the AOC, and the corresponding release mechanisms and the affected media. The CSM also identifies the potential human receptors and the associated pathways of exposure to the affected media.

7.3.1.2 Human Receptors and Exposure Pathways

The baseline risk assessment evaluated the potential health effects that may result from hazardous substance exposure for the following three receptor groups:

- Current/Future Construction Worker;
- Current/Future Industrial Worker; and,
- Current/Future Adolescent Trespasser/Visitor.

The following exposure pathways were considered:

1. Inhalation of dust from surface soil and ditch soil in ambient air (construction worker, adolescent trespasser / visitor, industrial worker);
2. Ingestion of surface soil and ditch soil (construction worker, adolescent trespasser / visitor, industrial worker);
3. Dermal contact to surface soil and ditch soils (construction worker, adolescent trespasser / visitor, industrial worker);
4. Dermal contact to surface water (construction worker, adolescent trespasser / visitor).

7.3.1.3 Constituents of Concern

The primary human health constituents of concern (COCs) identified at the Rumored Cosmoline Disposal Area are summarized in **Table 7-8**. These include the seven cPAHs, dieldrin, heptachlor epoxide, and six metals (e.g., arsenic, chromium, iron, manganese, thallium, and vanadium). Several of these compounds, including the cPAHs, dieldrin, and arsenic, are known to cause cancer in laboratory animals and are suspected to be human carcinogens.

7.3.1.4 Non-Carcinogenic and Carcinogenic Risk Results, SEAD-121I

The non-carcinogenic and carcinogenic risk results for the above scenarios are summarized in **Table 7-9**. For each scenario evaluated, both the RME and CT values are presented. Complete details of the human health risk assessment for each exposure route are presented in Appendix E of the Final RI report (Parsons, 2006) for soil, ditch soil, groundwater, and surface water exposure.

RME and CT non-carcinogenic risks calculated for the construction worker and the industrial worker at SEAD-121I are all above HIs of 1. RME and CT carcinogenic risks calculated for the construction worker, industrial worker, and adolescent trespasser/visitor are all within or below the USEPA's recommended range of 1×10^{-4} to 1×10^{-6}.

The elevated hazard indices for the industrial worker were caused by inhalation of dust in ambient air from soil, ingestion of soil, and inhalation of dust in ambient air from ditch soil. For the construction worker the major pathways contributing to the hazard indices were inhalation of dust in ambient air from soil, ingestion of soil, dermal contact to soil, inhalation of dust in ambient air from ditch soil, and ingestion of ditch soil. The significant contributing COPC to all non-cancer risk for all receptors and exposure pathways is manganese. Arsenic also contributed to 27% of the non-cancer risk to the construction worker from ingestion of ditch soil. **Table 7-10** presents the contribution of major COPCs to hazard indices greater than 1.

7.3.1.5 Lead Risk Characterization Results

Lead was not identified as a COC in soil or ditch soil. Lead was identified as a COC in surface water, but there is no reliable model for quantifying risk from lead due to contact with surface water.

7.3.2 Ecological Risk Assessment – SEAD-121I

7.3.2.1 Preliminary Ecological Conceptual Site Model

The preliminary CSM developed for SEAD-121I, the Rumored Cosmoline Oil Disposal Area is presented in **Figure 7-4**.

7.3.2.2 Identification of Ecological COPCs

Chemicals of potential concern (COPCs) were identified by comparing the maximum detected concentrations in each impacted medium to ecological risk-based screening values. The following four data sets were used for the screening-level ecological risk assessment at SEAD-121I:

- SEAD-121C surface soil (0-2 ft. bgs.);
- SEAD-121C ditch soil (0-2 ft. bgs.); and
- SEAD-121C surface water.

7.3.2.3 Receptors

The following species were selected as ecological receptors for SEAD-121I.

- Deer mouse (*Peromycus maniculatus*);
- Short-tail shrew (*Blarina brevicauda*)
- Meadow vole (*Microtus pennsylvanicus*)
- Red fox (*Vulpes vulpes*);
- American robin (*Turdus migratorius*); and
- Great blue heron (*Ardea herodias*).

7.3.2.4 Summary of Risk Results and Preliminary Contaminant of Concern Identification

HQ results for the identified receptors based on the maximum detected concentrations for the COPCs and the NOAEL SEVs are presented in **Table 7-11A** for SEAD-121C soil and surface water exposure, **Table 7-11B** for SEAD-121C ditch soil and surface water exposure. COPCs posing potential risks to ecological receptors are summarized below.

Number of Ecological Receptors[*] Exhibiting Elevated HQs versus Screening Level COPCs

	Surface Soil	Ditch Soil	Surface Water
Anthracene	1	--	--
Benzo(a)anthracene	1	1	--
Benzo(a)pyrene	2	1	--
Benzo(b)fluoranthene	2	2	--
Benzo(ghi)perylene	2	--	--
Benzo(k)fluoranthene	2	2	--
Chrysene	2	1	--
Phenanthrene	3	--	--
Pyrene	3	1	--
4,4'-DDT	1	--	--
Antimony	3	--	--
Arsenic	3	4	--
Cadmium	3	--	--
Chromium	1	--	--
Cobalt	3	3	--
Copper	1	--	--
Cyanide	1	--	--
Lead	1	--	--
Manganese	4	5	--
Selenium	4	4	--
Silver	1	4	--
Thallium	4	6	--
Vanadium	4	3	--
Zinc	--	1	--

∗ Ecological receptors evaluated included deer mouse, American robin, short-tailed shrew, meadow vole, red fox, and great blue heron (ditch soil and surface water only).

Once the screening level HQs were computed, the Army applied the refinement of COC process to the results of the SLERA to determine if evaluation of ecological risks was warranted at SEAD-121I, the Rumored Cosmoline Oil Disposal Area.

7.3.2.5 Summary of Ecological Risks

After application of the refinement of COC process, no COCs were identified for SEAD-121I soil, ditch soil, or surface water and the rationales are summarized below.

1. Preliminary COCs were identified for SEAD-121C soil, ditch soil, and surface water. However, alternative HQs calculated during the refinement of COCs (Step 3.2), especially the HQs based on the mean concentrations and LOAEL SEVs are either below 1 or close to 1 (with the highest at 5). Therefore, no final COCs were identified for any medium at SEAD-121I.

2. The planned future land use for SEAD-121I is industrial / office development. Thus, the AOC is not expected to support, sustain, or attract ecological receptors and therefore is not expected to be a wildlife habitat. The presence of ecological receptors is expected to be generally curtailed at SEAD-121I where habitat conditions are poor and current and future human activity levels are sufficiently disruptive to discourage wildlife use.

3. The concentrations of several preliminary COPCs identified in Step 2B (antimony, cadmium, cyanide, lead and vanadium in SEAD-121I soil; and vanadium in SEAD-121i ditch soil) are consistent with SEDA background.

4. The source of the metal contamination at SEAD-121I is the strategic stockpiles of ferrous-manganese ore stored at the AOC. At the time that the strategic piles are removed, residues associated with the historic stockpiling activities will be addressed by the DoD through the authority responsible for management of the piles.

Based on the above discussion, it is the Army's position that soil, ditch soil, and surface water at SEAD-121I are not expected to significantly impact ecological receptors and no further action is warranted at SEAD-121I based on the ecological risk assessment.

8 SUMMARY OF THE REMEDIAL GOALS AND PROPOSED ACTION

The selected remedy for any site should, at a minimum, eliminate or mitigate all significant threats to the public health or the environment presented by the hazardous substances or waste present at the site. Based on the data presented and summarized earlier within this Proposed Plan, the Army has selected to impose LUCs on land that is designated as SEAD-121C, the DRMO Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area. The Army's recommended LUCs will:

- Prohibit use of the land for residential activities including residential housing, elementary or secondary schools, child care facilities, playgrounds, etc.; and,
- Prohibit access to, and use of groundwater at the AOC.

Results of the site investigations and risk assessment performed using data developed from SEAD-121C and SEAD-121I indicate that hazardous substances have been identified to exist at, or in the vicinity of, the AOCs. The levels found do not allow for unlimited exposure and unrestricted use of the land. However, levels of residual contaminants found do not represent a potential risk to the human receptors that are considered most likely to use the land (i.e., industrial worker, construction worker, adolescent trespasser) for the foreseeable future. Further, an alternative water supply exists in the PID Area that can be used in place of groundwater.

The LUCs proposed as part of this remedy result from conditions found at other AOCs (SEADs 27, 64A, and 66) which are within the greater PID Area. SEAD-27 is immediately adjacent to SEAD-121C. The LUCs identified for SEAD-121C and SEAD-121I have previously been applied to all land located within the PID Area. These LUCs may be lifted on a location-by-location basis at some time in the future, with the consent and approval of the Army, the USEPA, and the NYSDEC, if a future owner/user/occupant provides additional data that indicates that the selected location is suitable for unlimited exposure and unrestricted use.

The Army's recommended remedial actions for SEAD-121C, the DRMO Yard and SEAD-121I, the Rumored Cosmoline Oil Disposal Area discussed in this Proposed Plan include LUCs. To implement the Army's recommended remedy at the AOCs, a LUC Remedial Design (RD) will be prepared. The LUC RD Plan will include: a Site Description; the IC Land Use Restrictions; the LUC Mechanism to ensure that the land use restrictions are not violated in the future; implementation and maintenance actions, including periodic inspections; and, Reporting/Notification requirements. In addition, the Army will prepare an environmental easement for the AOC, consistent with Section 27-1318(b) and Article 71, Title 36 of ECL, in favor of the State of New York and the Army, which will be recorded at the time of transfer of the AOCs from federal ownership. A schedule for completion of the draft LUC RD covering the AOC will be completed within 21 days of the ROD signature, consistent with Section 14.4 of the Federal Facilities Agreement (FFA). In accordance with the FFA and CERCLA §121(c), the remedial action (including ICs) will be reviewed no less often than every 5 years. After such reviews, modifications may be implemented to the remedial program, if appropriate.

The Army shall implement, inspect, maintain, report, and enforce the LUCs described in this ROD 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.

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GLOSSARY

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

Area of Concern (AOC)
Areas of Concern (AOCs) include both solid waste management units where releases of hazardous substances may have occurred and locations where there has been a release or threat of a release in the environment of a hazardous substance, pollutant or contaminant (including radionuclides) under CERCLA.

Army Corps of Engineer (USACE)
The engineering organization of the U.S. Army. The districts involved in the Seneca Army Depot Activity project include the New York District (CENAN), the New England District (CENED), and the Engineering and Support Center, Huntsville (CEHNC).

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

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress on December 11, 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA:

Established prohibitions and requirements concerning closed and abandoned hazardous waste sites;

Provided for liability of persons responsible for releases of hazardous waste at these sites; and

Established a trust fund to provide for cleanup when no responsible party could be identified.

The law authorizes two kinds of response actions:

Short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response.

Long-term remedial response actions, that permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on USEPA's National Priorities List (NPL).

CERCLA also enabled the revision of the National Contingency Plan (NCP). The NCP provided the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, or contaminants. The NCP also established the NPL.

CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

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

Closure (Department of Defense)

Under the Department of Defense's definition, closure means that all missions of the base will cease or be relocated. All personnel (military, civilian, and contractor) will either be eliminated or relocated. The entire base will be excessed and the property disposed.

(Reference:
http://www.hqda.army.mil/acsimweb/brac/braco.htm)

Community Environmental Response Facilitation Act (CERFA – Public Law 102-426)

The Community Environmental Response Facilitation Act (CERFA) was passed by Congress in 1992, and amended Section 9620(h) of CERCLA, which addresses Federal real property transfers. In enacting the legislation Congress stated that the closure of Federal facilities has an adverse impact on local economies and that delays in remediating contaminated real property add to this burden by delaying the conversion of such property to productive uses. The statute applies to real property owned by the Department of Defense and on which the U.S. plans to terminate Federal government operations, as well as to real property that has been used as a military installation and which is being closed or realigned pursuant to base closure. Federal entities with control over such properties must identify those upon which no hazardous substances or petroleum products/derivatives were stored for more than one year, released, or disposed of by examining relevant sources of data such as property deeds, aerial photographs, or other similar documents. Subsequent transfers or sales of the identified properties by the limited states must contain assurances that the U.S. will assume full responsibility for any response or corrective action that may become necessary after the transfer of property is completed. Where hazardous substances or petroleum products/derivatives were stored for more than one year, released, or disposed of on the U.S.-owned real property, the Federal entity with control of the property must notify the state of any lease entered into by the controlling Federal entity that will remain in effect after operations cease. The notification must be sent to the state prior to the signing of the lease, and must inform the state of the name of the lessee, and a description of the uses permitted under the condition of the lease. (Reference:
http://www.ntc.blm.gov/learningplace/res_CERFA.html)

Completion Report

A report that documents and certifies that conditions found at an Area of Concern (AOC) do not constitute a threat to public health, welfare or the environment and that further remedial measures are not necessary. Such documentation shall meet, to the extent practicable and as necessary under the specific facts pertaining to the AOC, the requirements of USEPA's RCRA Facility Investigation Guidance, USEPA's Guidance for Conducting RI/FSs under CERCLA, and any subsequent amendments to these documents and all other applicable federal or state guidance.

Contaminant

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

Contract Laboratory Program (CLP)

The USEPA's program that approves laboratories that provide chemical testing services of known quality using a wide range of standard methods and maintaining consistent quality control.

Detection Limit

The lowest concentration of a chemical that can be distinguished reliably from a zero concentration.

Disposal

Disposal is the final placement or destruction of toxic, radioactive or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous substances from removal actions or accidental release. Disposal may be accomplished through the use of approved secure landfills, surface impoundments, land farming, deep well injection, or ocean dumping.

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

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

Exposure Pathway
An exposure pathway is the route of contaminants from the source of contamination to potential contact with a medium (air, soil, surface water, or groundwater) that represents a potential threat to human health or the environment. Determining whether exposure pathways exist is an essential step in conducting a baseline risk assessment. *See also Baseline risk Assessment.*

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

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

Groundwater
Groundwater is the water that flows beneath the earth's surface that fills pores between such materials as sand, soil, or gravel and that often supplies wells and springs.

Hazardous Substance
A hazardous substance defined by CERCLA section 101(14) references the following environmental statues: CWA sections 311 and 307(a), CAA section 112, RCRA section 3001, and TSCA section 7.

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

Inorganic Compounds
An inorganic compound is a compound that generally does not contain carbon atoms (although carbonate and bicarbonate compounds are notable exceptions). Examples of inorganic compounds include various metals.

Land Use Controls
Environmental land use controls (LUCs), also known as institutional controls (ICs), activity and use limitations (AULs), and environmental use restrictions (EURs), are legal and administrative measures to protect human health and environment from risk based cleanups in which residual contamination is contained on site. LUCs limit human exposure by restricting activity, use, and access to properties with residual contamination. Source: http://www.lucs.org/

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

Mean Sea Level (MSL)
The average height of the sea surface, based upon hourly observation of the tide height on the open coast or in adjacent waters that have free access to the sea. In the United States, it is defined as the average height of the sea surface for all stages of the

tide over a nineteen year period. Mean sea level, commonly abbreviated as MSL and referred to simply as 'sea level,' serves as the reference surface for all altitudes in upper atmospheric studies.
(Reference:
http://earthobservatory.nasa.gov:81/Library/glossary.php3?xref = mean%20sea%20level)

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

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

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

Nephelometric Turbidity Unit (NTU)
A measurement unit of turbidity in water. Small particles of soil particles, such as clay or silt, become suspended with a water sample and increase the turbidity of the sample. This increase in turbidity has been identified as a source of increased metals concentration in samples. This effect is especially noticeable for groundwater samples collected within the clay-rich glacial till at the SEDA.

New York State Department of Environmental Conservation (NYSDEC)
NYSDEC's missions include detecting and controlling sources of pollution, protecting and managing New York's natural resources, informing and educating the public about environment, natural resources, and government's actions to protect them.

No Action (NA)
A NA site has had no historic remedial action, such as a former tank removal, spill cleanup operation, or limited excavation, has ever been performed at the site. Sampling, chemical analyses, and risk assessments may have been completed for a NA site.

NYCRR
The New York State compilation of Codes, Rules, and Regulations.

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

Parsons or Parsons Corporation
Parsons has performed environmental investigative and remedial action work at the Seneca Army Depot Activity since approximately 1990. Work has been performed by a number of Parsons' successor operating businesses that have offered environmental consulting and remediation services including C.T. Main, Inc. (~ 1990 – 1995), Engineering Science, Inc. (~ 1995 – 1998), Parsons Engineering Science, Inc. (~ 1999 – 2003), and most recently, Parsons Infrastructure & Technology Group, Inc. (~ 2003 -). Parsons is a leader in many diverse markets such as infrastructure, transportation, water, telecommunications, aviation, commercial, environmental, planning, industrial manufacturing,

education, healthcare, life sciences and homeland security. Parsons provides technical and management solutions to federal, regional and local government agencies as well as private industries worldwide. http://www.parsons.com

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

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

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

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

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

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

Remedial Action (RA)
A RA is the actual construction or implementation of a remedy at a site or portion thereof.

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

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

Responsiveness Summary

The Responsiveness Summary summarizes information about the views of the public and support agency regarding both the remedial alternatives and general concerns about the site submitted during the public during the public comment period. It also documents in the record of decision how public comments were integrated into the decision making process. Source: (USEPA, 1999).

Risk Assessment

The process of assessing and analyzing threats that contaminants found at a site pose to surrounding populations and the environment. The resulting analysis is used as a preliminary, conservative estimate of the potential level of threat that is posed so that appropriate and cost-effective countermeasures can be identified and implemented.

Semivolatile Organic Compound (SVOC)

SVOCs, composed primarily of carbon and hydrogen atoms, have boiling points greater than 2000^{o}C. Common SVOCs include PCBs and phenol. *See also Phenol and Polychlorinated Biphenyl.*

Seneca Army Depot Activity (SEDA)

A 10,634-acre military facility, constructed in 1941, located in central New York responsible for storage and management of military commodities, including munitions. The depot ceased military operations in 2000. Environmental cleanup activities will continue until all sites have been addressed.

Seneca County Board of Supervisors

The board that oversees Seneca County's governmental affairs.

Seneca County Industrial Development Agency

The Seneca County Industrial Development Agency (SCIDA) is a public benefit corporation created in 1973 by an act of the New York State Legislature. The agency's primary purpose is to promote private sector commercial and industrial development, and advance the job opportunities and economic welfare of the people of Seneca County.

Significant Threat

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

Soil Boring

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

Solid Waste Management Unit (SWMU)

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

Subsurface

Underground, or beneath the surface.

Surface Water

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

Superfund

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

Target Analyte List (TAL)

The Target Analyte List is a list of inorganic compounds that are required to be analyzed when performing analytical procedures under CERCLA. The list includes metals and cyanide.

Target Compound List (TCL)
The Target Compound List is a list of organic compounds that are required to be analyzed when performing analytical procedures. The list includes volatile organic compounds, semivolatile organic compounds, pesticides, and PCBs.

Technical Administrative Guidance Memorandum (TAGM)

TAGMs are technical guidance publications provided by NYSDEC that describes various processes and procedures recommended by NYSDEC for the investigation and remediation of hazardous waste sites. One TAGM, No. 4046, provides guideline values for recommended soil cleanup levels at waste sites.

Trophic Level
A group of organisms that occupy the same position in a food chain. Source (*The American Heritage® Dictionary of the English Language*, Fourth Edition. Retrieved November 30, 2006, from Dictionary.com website: http://www.dictionary.com

Volatile Organic Compound (VOC)

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

Endnotes

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[i] LORAN – long range navigation.
[ii] Parsons, May 1999, pg. 38
[iii] Parsons, May 1999, pg. 48
[iv] Use of a "J" between a reported concentration and the unit of measure (i.e., μg/Kg) indicates that the reported value represents an "estimated" concentration.
[v] Acaricide – a pesticide that kills mites and ticks.
[vi] Use of a "NJ" between a reported concentration and the unit of measure (i.e., μg/Kg) indicates that the analyte was "tentatively identified" and the reported value represents an "estimated" concentration.

Tables

Table 6-1
SUMMARY STATISTICS - SURFACE SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Volatile Organic Compounds							
Acetone	UG/KG	13	28%	200	0	13	47
Benzene	UG/KG	41	2%	60	0	1	48
Carbon disulfide	UG/KG	4.7	4%	2700	0	2	48
Chloroform	UG/KG	4.8 [3]	4%	300	0	2	48
Ethyl benzene	UG/KG	3300	4%	5500	0	2	48
Meta/Para Xylene	UG/KG	4400	8%		0	3	40
Methylene chloride	UG/KG	2.6	2%	100	0	1	48
Ortho Xylene	UG/KG	16	3%		0	1	40
Toluene	UG/KG	28	19%	1500	0	9	48
Semivolatile Organic Compounds							
2,4-Dinitrotoluene	UG/KG	45	2%		0	1	48
2-Methylnaphthalene	UG/KG	610	19%	36400	0	9	48
Acenaphthene	UG/KG	2600	23%	50000	0	11	48
Acenaphthylene	UG/KG	2500	21%	41000	0	10	48
Anthracene	UG/KG	7100	42%	50000	0	20	48
Benzo(a)anthracene	UG/KG	10000	55%	224	14	26	47
Benzo(a)pyrene	UG/KG	8700	51%	61	21	24	47
Benzo(b)fluoranthene	UG/KG	12000	64%	1100	5	30	47
Benzo(ghi)perylene	UG/KG	3200 [3]	53%	50000	0	25	47
Benzo(k)fluoranthene	UG/KG	7500	47%	1100	4	22	47
Bis(2-Ethylhexyl)phthalate	UG/KG	200	56%	50000	0	27	48
Butylbenzylphthalate	UG/KG	120	13%	50000	0	6	48
Carbazole	UG/KG	4200	35%		0	17	48
Chrysene	UG/KG	9100	53%	400	10	25	47
Di-n-butylphthalate	UG/KG	132 [3]	10%	8100	0	5	48
Di-n-octylphthalate	UG/KG	23 [3]	4%	50000	0	2	48
Dibenz(a,h)anthracene	UG/KG	470 [3]	26%	14	11	12	47
Dibenzofuran	UG/KG	1700	21%	6200	0	10	48
Diethyl phthalate	UG/KG	21 [3]	13%	7100	0	6	48
Fluoranthene	UG/KG	27000	73%	50000	0	35	48
Fluorene	UG/KG	3500	27%	50000	0	13	48
Hexachlorobenzene	UG/KG	8.5	2%	410	0	1	48
Indeno(1,2,3-cd)pyrene	UG/KG	970 [3]	46%	3200	0	22	48
N-Nitrosodiphenylamine	UG/KG	4.8	2%		0	1	48
Naphthalene	UG/KG	400	19%	13000	0	9	48
Phenanthrene	UG/KG	29000	52%	50000	0	25	48
Pyrene	UG/KG	34000	67%	50000	0	32	48
Pesticides/PCBs							
4,4'-DDD	UG/KG	44	12%	2900	0	5	43
4,4'-DDE	UG/KG	69	32%	2100	0	15	47
4,4'-DDT	UG/KG	100	28%	2100	0	13	47
Aldrin	UG/KG	14 [3]	6%	41	0	3	48
Alpha-Chlordane	UG/KG	63 [3]	8%		0	4	48

Table 6-1
SUMMARY STATISTICS - SURFACE SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Delta-BHC	UG/KG	2	6%	300	0	3	48
Dieldrin	UG/KG	41 [3]	4%	44	0	2	48
Endosulfan I	UG/KG	185 [3]	38%	900	0	18	48
Endosulfan II	UG/KG	9	2%	900	0	1	47
Endrin	UG/KG	21.5	2%	100	0	1	47
Endrin ketone	UG/KG	7.5 [3]	6%		0	3	48
Gamma-Chlordane	UG/KG	1.2	2%	540	0	1	48
Heptachlor	UG/KG	14	4%	100	0	2	47
Heptachlor epoxide	UG/KG	2.8	4%	20	0	2	46
Aroclor-1242	UG/KG	58	2%		0	1	48
Aroclor-1254	UG/KG	930	19%	10000	0	9	48
Aroclor-1260	UG/KG	85	10%	10000	0	5	48
Metals							
Aluminum	MG/KG	17,000	100%	19300	0	48	48
Antimony	MG/KG	236	81%	5.9	11	39	48
Arsenic	MG/KG	11.6	100%	8.2	2	48	48
Barium	MG/KG	2,030	100%	300	7	48	48
Beryllium	MG/KG	1.2	100%	1.1	1	48	48
Cadmium	MG/KG	29.1	60%	2.3	14	29	48
Calcium	MG/KG	296,000	100%	121000	6	48	48
Chromium	MG/KG	74.8	100%	29.6	12	48	48
Cobalt	MG/KG	17	100%	30	0	35	35
Copper	MG/KG	9,750	100%	33	35	48	48
Iron	MG/KG	51,700	100%	36500	5	48	48
Lead	MG/KG	18,900	100%	24.8	40	48	48
Magnesium	MG/KG	20,700	100%	21500	0	48	48
Manganese	MG/KG	858	100%	1060	0	48	48
Mercury	MG/KG	0.47	92%	0.1	8	44	48
Nickel	MG/KG	224	100%	49	9	48	48
Potassium	MG/KG	1,990	100%	2380	0	48	48
Selenium	MG/KG	1.3	21%	2	0	10	48
Silver	MG/KG	21.8	38%	0.75	13	18	48
Sodium	MG/KG	478	88%	172	26	42	48
Thallium	MG/KG	1.1	21%	0.7	3	10	48
Vanadium	MG/KG	25.4	100%	150	0	48	48
Zinc	MG/KG	3,610	100%	110	28	48	48
Other							
Total Organic Carbon	MG/KG	9,000	100%		0	40	40
Total Petroleum Hydrocarbons	MG/KG	7,600	25%		0	10	40

NOTES:
1. The criteria value source is NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046, Revised January 24, 1994.
2. Sample-duplicate pairs were averaged and the average results were used in the summary statistics presented in this table.
3. The maximum detected concentration was obtained from the average of the sample and its duplicate.

Table 6-2
SUMMARY STATISTICS - DITCH SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Volatile Organic Compounds							
Acetone	UG/KG	150	70%	200	0	7	10
Carbon disulfide	UG/KG	12	20%	2700	0	2	10
Methyl ethyl ketone	UG/KG	130	30%	300	0	3	10
Semivolatile Organic Compounds							
3 or 4-Methylphenol	UG/KG	790	10%		0	1	10
Anthracene	UG/KG	250	20%	50000	0	2	10
Benzo(a)anthracene	UG/KG	1100	20%	224	2	2	10
Benzo(a)pyrene	UG/KG	900	20%	61	2	2	10
Benzo(b)fluoranthene	UG/KG	1100	20%	1100	0	2	10
Benzo(ghi)perylene	UG/KG	290	10%	50000	0	1	10
Benzo(k)fluoranthene	UG/KG	580	10%	1100	0	1	10
Chrysene	UG/KG	1200	20%	400	1	2	10
Fluoranthene	UG/KG	2100	20%	50000	0	2	10
Indeno(1,2,3-cd)pyrene	UG/KG	270	10%	3200	0	1	10
Phenanthrene	UG/KG	1100	20%	50000	0	2	10
Pyrene	UG/KG	2100	20%	50000	0	2	10
Metals and Cyanide							
Aluminum	MG/KG	21500	100%	19300	1	10	10
Antimony	MG/KG	4.9	50%	5.9	0	5	10
Arsenic	MG/KG	6.1	100%	8.2	0	10	10
Barium	MG/KG	291	100%	300	0	10	10
Beryllium	MG/KG	0.8 [3]	80%	1.1	0	8	10
Cadmium	MG/KG	14.3	50%	2.3	3	5	10
Calcium	MG/KG	161000	100%	121000	2	10	10
Chromium	MG/KG	29.8	100%	29.6	1	10	10
Cobalt	MG/KG	15.8 [3]	100%	30	0	10	10
Copper	MG/KG	1190	100%	33	7	10	10
Cyanide, Amenable	MG/KG	2.36	10%		0	1	10
Cyanide, Total	MG/KG	2.36	10%		0	1	10
Iron	MG/KG	27300 [3]	100%	36500	0	10	10
Lead	MG/KG	436	100%	24.8	8	10	10
Magnesium	MG/KG	17600	100%	21500	0	10	10
Manganese	MG/KG	918	100%	1060	0	10	10
Mercury	MG/KG	0.3	100%	0.1	6	10	10
Nickel	MG/KG	42.7	100%	49	0	10	10
Potassium	MG/KG	1410	100%	2380	0	10	10
Selenium	MG/KG	2.5	40%	2	2	4	10
Silver	MG/KG	2.6	50%	0.75	5	5	10
Sodium	MG/KG	1120	100%	172	9	10	10
Vanadium	MG/KG	29.1	100%	150	0	10	10
Zinc	MG/KG	566	100%	110	7	10	10
Other							
Total Organic Carbon	MG/KG	9100	100%		0	10	10
Total Petroleum Hydrocarbons	MG/KG	2600	20%		0	2	10

NOTES:
1. The criteria value source is NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046, Revised January 24, 1994.
2. Sample-duplicate pairs were averaged and the average results were used in the summary statistics presented in this table.
3. The maximum detected concentration was obtained from the average of the sample DRMO-4008 and its duplicate DRMO-4005 collected at SDDRMO-8.

Table 6-3
SUMMARY STATISTICS - SUBSURFACE SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedances	Number of Detects	Number of Analyses
Volatile Organic Compounds							
Acetone	UG/KG	28	45%	200	0	9	20
Benzene	UG/KG	1800	10%	60	1	2	20
Chloroform	UG/KG	4	10%	300	0	2	20
Ethyl benzene	UG/KG	24000	5%	5500	1	1	20
Meta/Para Xylene	UG/KG	130000	6%		0	1	16
Methyl ethyl ketone	UG/KG	7.6	10%	300	0	2	20
Methylene chloride	UG/KG	3.5	10%	100	0	2	20
Ortho Xylene	UG/KG	75	6%		0	1	16
Styrene	UG/KG	2.7	5%		0	1	20
Toluene	UG/KG	84	20%	1500	0	4	20
Semivolatile Organic Compounds							
2-Methylnaphthalene	UG/KG	2500	20%	36400	0	4	20
Acenaphthene	UG/KG	50	15%	50000	0	3	20
Acenaphthylene	UG/KG	220	10%	41000	0	2	20
Anthracene	UG/KG	240	15%	50000	0	3	20
Benzo(a)anthracene	UG/KG	5200	35%	224	2	7	20
Benzo(a)pyrene	UG/KG	920	32%	61	3	6	19
Benzo(b)fluoranthene	UG/KG	1300	42%	1100	1	8	19
Benzo(ghi)perylene	UG/KG	210	37%	50000	0	7	19
Benzo(k)fluoranthene	UG/KG	490	32%	1100	0	6	19
Bis(2-Ethylhexyl)phthalate	UG/KG	87	40%	50000	0	8	20
Butylbenzylphthalate	UG/KG	39	10%	50000	0	2	20
Carbazole	UG/KG	56	15%		0	3	20
Chrysene	UG/KG	4900	35%	400	2	7	20
Di-n-butylphthalate	UG/KG	19	10%	8100	0	2	20
Di-n-octylphthalate	UG/KG	17	15%	50000	0	3	20
Dibenz(a,h)anthracene	UG/KG	33	16%	14	2	3	19
Dibenzofuran	UG/KG	45	15%	6200	0	3	20
Diethyl phthalate	UG/KG	250	25%	7100	0	5	20
Fluoranthene	UG/KG	1600	40%	50000	0	8	20
Fluorene	UG/KG	160	20%	50000	0	4	20
Indeno(1,2,3-cd)pyrene	UG/KG	150	30%	3200	0	6	20
Naphthalene	UG/KG	1900	20%	13000	0	4	20
Phenanthrene	UG/KG	1000	40%	50000	0	8	20
Pyrene	UG/KG	1700	40%	50000	0	8	20
Pesticides/PCBs							
4,4'-DDE	UG/KG	17	15%	2100	0	3	20
4,4'-DDT	UG/KG	16	15%	2100	0	3	20
Aldrin	UG/KG	11	5%	41	0	1	20
Delta-BHC	UG/KG	1.3	5%	300	0	1	20
Endosulfan I	UG/KG	78	5%	900	0	1	20
Endrin	UG/KG	23	5%	100	0	1	20
Endrin ketone	UG/KG	9.7	5%		0	1	20
Heptachlor epoxide	UG/KG	1.1	5%	20	0	1	19
Aroclor-1260	UG/KG	200	15%	10000	0	3	20
Metals							
Aluminum	MG/KG	17600	100%	19300	0	20	20
Antimony	MG/KG	11.5	20%	5.9	1	4	20
Arsenic	MG/KG	8.1	100%	8.2	0	20	20
Barium	MG/KG	1050	100%	300	1	20	20
Beryllium	MG/KG	1	100%	1.1	0	20	20
Cadmium	MG/KG	8.1	10%	2.3	1	2	20

Table 6-3
SUMMARY STATISTICS - SUBSURFACE SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedances	Number of Detects	Number of Analyses
Calcium	MG/KG	97200	100%	121000	0	20	20
Chromium	MG/KG	37	100%	29.6	3	20	20
Cobalt	MG/KG	19.7	100%	30	0	20	20
Copper	MG/KG	2440	100%	33	6	20	20
Iron	MG/KG	54100	100%	36500	1	20	20
Lead	MG/KG	1780	100%	24.8	7	20	20
Magnesium	MG/KG	24900	100%	21500	1	20	20
Manganese	MG/KG	790	100%	1060	0	20	20
Mercury	MG/KG	0.07	95%	0.1	0	18	19
Nickel	MG/KG	69.7	100%	49	3	20	20
Potassium	MG/KG	1870	100%	2380	0	20	20
Silver	MG/KG	0.72	10%	0.75	0	2	20
Sodium	MG/KG	214	70%	172	2	14	20
Thallium	MG/KG	1.8	10%	0.7	2	2	20
Vanadium	MG/KG	27	100%	150	0	20	20
Zinc	MG/KG	691	100%	110	7	20	20
Other							
Total Organic Carbon	MG/KG	9500	100%		0	16	16
Total Petroleum Hydrocarbons	MG/KG	3700	25%		0	4	16

NOTE:
1. The criteria value source is NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046,
Revised January 24, 1994.

Table 6-4
SUMMARY STATISTICS - EBS GROUNDWATER
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value	Source of Criteria[1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Volatile Organic Compounds								
1,4-Dichlorobenzene	UG/L	36	50%	3	GA	1	1	2
Acetone	UG/L	57 [3]	50%			0	1	2
Bromochloromethane	UG/L	1	50%	5	GA	0	1	2
Bromoform	UG/L	4	50%	80	MCL	0	1	2
Carbon disulfide	UG/L	2 [3]	50%			0	1	2
Chlorobenzene	UG/L	2	50%	5	GA	0	1	2
Vinyl chloride	UG/L	1	50%	2	GA	0	1	2
Semivolatile Organic Compounds								
Bis(2-Ethylhexyl)phthalate	UG/L	0.4	100%	5	GA	0	2	2
Butylbenzylphthalate	UG/L	0.12 [3]	50%			0	1	2
Di-n-butylphthalate	UG/L	1.7 [3]	100%	50	GA	0	2	2
Diethyl phthalate	UG/L	0.057 [3]	50%			0	1	2
Fluorene	UG/L	0.48	50%			0	1	2
Hexachlorobutadiene	UG/L	0.4	100%	0.5	GA	0	2	2
Phenanthrene	UG/L	0.24	50%			0	1	2
Pyrene	UG/L	0.13	50%			0	1	2
Pesticides/PCBs								
4,4'-DDD	UG/L	0.81	100%	0.3	GA	2	2	2
4,4'-DDE	UG/L	0.3	100%	0.2	GA	1	2	2
4,4'-DDT	UG/L	0.56	100%	0.2	GA	2	2	2
Alpha-BHC	UG/L	0.059	100%	0.01	GA	2	2	2
Alpha-Chlordane	UG/L	0.082 [3]	50%			0	1	2
Beta-BHC	UG/L	0.33 [3]	100%	0.04	GA	2	2	2
Delta-BHC	UG/L	0.16 [3]	100%	0.04	GA	2	2	2
Dieldrin	UG/L	0.2	100%	0.004	GA	2	2	2
Endosulfan I	UG/L	0.10 [3]	50%			0	1	2
Endosulfan II	UG/L	0.28	100%			0	2	2
Endosulfan sulfate	UG/L	0.69	100%			0	2	2
Endrin	UG/L	0.71	50%	0	GA	0	1	2
Endrin aldehyde	UG/L	0.97	100%	5	GA	0	2	2
Endrin ketone	UG/L	0.2	50%	5	GA	0	1	2
Gamma-BHC/Lindane	UG/L	0.038	50%	0.05	GA	0	1	2
Gamma-Chlordane	UG/L	0.28 [3]	100%			0	2	2
Heptachlor	UG/L	0.14 [3]	50%	0.04	GA	1	1	2
Heptachlor epoxide	UG/L	0.11	100%	0.03	GA	2	2	2
Methoxychlor	UG/L	0.62	100%	35	GA	0	2	2
Metals								
Aluminum	UG/L	5350	100%	50	SEC	2	2	2
Arsenic	UG/L	2.8 [3]	50%	10	MCL	0	1	2
Barium	UG/L	106	100%	1000	GA	0	2	2
Beryllium	UG/L	0.1	50%	4	MCL	0	1	2
Cadmium	UG/L	0.27 [3]	50%	5	GA	0	1	2
Calcium	UG/L	167500 [3]	100%			0	2	2
Chromium	UG/L	6.5	100%	50	GA	0	2	2
Cobalt	UG/L	3.6	100%			0	2	2
Copper	UG/L	5.2	100%	200	GA	0	2	2
Iron	UG/L	5620	100%	300	GA	2	2	2
Magnesium	UG/L	23950 [3]	100%			0	2	2
Manganese	UG/L	1365 [3]	100%	50	SEC	2	2	2
Nickel	UG/L	10.6	100%	100	GA	0	2	2
Potassium	UG/L	21400	100%			0	2	2

Table 6-4
SUMMARY STATISTICS - EBS GROUNDWATER
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value	Source of Criteria[1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Selenium	UG/L	4.7 [3]	100%	10	GA	0	2	2
Sodium	UG/L	95200	100%	20000	GA	1	2	2
Vanadium	UG/L	6.5	100%			0	2	2
Zinc	UG/L	16.4	100%	5000	SEC	0	2	2

Note(s):
1. GA = NYSDEC Class GA Groundwater Standard (TOGS 1.1.1, June 1998)
MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)
SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 82-B-00-001)
2. Sample-duplicate pair was averaged and the average results were used in the summary statistic presented in this table.
3. The maximum detected concentration was obtained from the average of the sample-duplicate pair EB153/EB023 at MW121C-1.

Table 6-5
SUMMARY STATISTICS - RI GROUNDWATER
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value	Source of Criteria[1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Semivolatile Organic Compounds								
Bis(2-Ethylhexyl)phthalate	UG/L	1.4	17%	5	GA	0	1	6
Di-n-butylphthalate	UG/L	1.6	17%	50	GA	0	1	6
Metals								
Aluminum	UG/L	588 [3]	100%	50	SEC	4	6	6
Antimony	UG/L	8.4	33%	3	GA	2	2	6
Barium	UG/L	73.7	100%	1000	GA	0	6	6
Beryllium	UG/L	0.24	17%	4	MCL	0	1	6
Cadmium	UG/L	1.1	17%	5	GA	0	1	6
Calcium	UG/L	558000	100%			0	6	6
Chromium	UG/L	21.4	83%	50	GA	0	5	6
Cobalt	UG/L	3	50%			0	3	6
Copper	UG/L	17.7	50%	200	GA	0	3	6
Iron	UG/L	869 [3]	50%	300	GA	3	3	6
Lead	UG/L	10.5	83%	15	MCL	0	5	6
Magnesium	UG/L	109000	100%			0	6	6
Manganese	UG/L	297	100%	50	SEC	6	6	6
Mercury	UG/L	0.2	33%	0.7	GA	0	2	6
Nickel	UG/L	2.1 [3]	17%	100	GA	0	1	6
Potassium	UG/L	9400	100%			0	6	6
Selenium	UG/L	6.8	33%	10	GA	0	2	6
Sodium	UG/L	58400 [3]	100%	20000	GA	3	6	6
Zinc	UG/L	96.2	100%	5000	SEC	0	6	6

Note(s):
1. GA = NYSDEC Class GA Groundwater Standard (TOGS 1.1.1, June 1998)
   MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)
   SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 82-B-00-001)
2. Sample-duplicate pair was averaged and the average results were used in the summary statistic presented in this table.
3. The maximum detected concentration was obtained from the average of the sample-duplicate pair 121C-2004/121C-2002 at MW121C-4.

Table 6-6
SUMMARY STATISTICS - BUILDING 360 GROUNDWATER
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value	Source of Criteria[1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Volatile Organic Compounds								
1,1-Dichloroethane	UG/L	4.3 [3]	67%	5	GA	0	4	6
1,2-Dichloropropane	UG/L	0.4 [3]	17%	1	GA	0	1	6
Acetone	UG/L	8.4 [3]	25%			0	1	4
Carbon disulfide	UG/L	0.6	17%			0	1	6
Cis-1,2-Dichloroethene	UG/L	1	33%	5	GA	0	2	6
Methylene chloride	UG/L	1 [3]	17%	5	GA	0	1	6
Vinyl chloride	UG/L	2.3 [3]	67%	2	GA	1	4	6
Semivolatile Organic Compounds								
Bis(2-Ethylhexyl)phthalate	UG/L	2.5	17%	5	GA	0	1	6
Metals								
Aluminum	UG/L	105	57%	50	SEC	4	4	7
Arsenic	UG/L	4.7 [3]	14%	10	MCL	0	1	7
Barium	UG/L	141 [3]	100%	1000	GA	0	7	7
Cadmium	UG/L	3.9	14%	5	GA	0	1	7
Calcium	UG/L	119149.7969	100%			0	7	7
Chromium	UG/L	84	71%	50	GA	1	5	7
Cobalt	UG/L	7.40	43%			0	3	7
Copper	UG/L	167	43%	200	GA	0	3	7
Iron	UG/L	255000	100%	300	GA	4	7	7
Lead	UG/L	204	29%	15	MCL	2	2	7
Magnesium	UG/L	27400	100%			0	7	7
Manganese	UG/L	1645 [3]	100%	50	SEC	7	7	7
Mercury	UG/L	0.28	29%	0.7	GA	0	2	7
Nickel	UG/L	38.8	86%	100	GA	0	6	7
Potassium	UG/L	12300	100%			0	7	7
Selenium	UG/L	7.5	57%	10	GA	0	4	7
Silver	UG/L	8.6	14%	50	GA	0	1	7
Sodium	UG/L	42850 [3]	100%	20000	GA	7	7	7
Thallium	UG/L	3.3 [3]	14%	2	MCL	1	1	7
Vanadium	UG/L	4.4	14%			0	1	7
Zinc	UG/L	5740	100%	5000	SEC	2	7	7
Other								
Total Petroleum Hydrocarbons	MG/L	1.52	33%			0	2	6

Note(s):
1. GA = NYSDEC Class GA Groundwater Standard (TOGS 1.1.1, June 1998)
MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)
SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 82-B-00-001)
2. Sample-duplicate pair was averaged and the average results were used in the summary statistic presented in this table.
3. The maximum detected concentration was obtained from the average of the sample and its duplicate pairs:
DRMO-2005/DRMO-2008 collected April 2003 from MW-1 and DRMO-2013/DRMO-2019 collected May 2003 from MW-1.

Table 6-7
SUMMARY STATISTICS - SURFACE WATER
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value[1]	Number of Exceedances	Number of Detects	Number of Analyses [2]
Semivolatile Organic Compounds							
Bis(2-Ethylhexyl)phthalate	UG/L	4.2	10%	0.6	1	1	10
Metals							
Aluminum	UG/L	8760	100%	100	5	10	10
Arsenic	UG/L	50.3	10%	150	0	1	10
Barium	UG/L	423	100%		0	10	10
Beryllium	UG/L	0.86	90%	1100	0	9	10
Cadmium	UG/L	19.5	40%	3.84	2	4	10
Calcium	UG/L	166000	100%		0	10	10
Chromium	UG/L	129	80%	139.45	0	8	10
Cobalt	UG/L	47	70%	5	2	7	10
Copper	UG/L	1160	100%	17.32	2	10	10
Iron	UG/L	110000	80%	300	5	8	10
Lead	UG/L	839	100%	1.4624632	10	10	10
Magnesium	UG/L	26200	100%		0	10	10
Manganese	UG/L	2380	100%		0	10	10
Mercury	UG/L	2.1	20%	0.0007	2	2	10
Nickel	UG/L	154	30%	99.92	1	3	10
Potassium	UG/L	5350	100%		0	10	10
Selenium	UG/L	4.6	10%	4.6	0	1	10
Silver	UG/L	8	20%	0.1	2	2	10
Sodium	UG/L	123000	100%		0	10	10
Thallium	UG/L	6.3	20%	8	0	2	10
Vanadium	UG/L	233	50%	14	2	5	10
Zinc	UG/L	6910	100%	159.25	2	10	10
Other							
Total Petroleum Hydrocarbons	MG/L	8.08	11%		0	1	9

Note(s):
1. Criteria values are from the New York State Ambient Water Quality Standards, Class C for Surface Water.
2. Sample-duplicate pair (DRMO-3008/DRMO-3005 collected from SWDRMO-8) was averaged and the average results were used in the summary statistic presented in this table.

Table 6-8
SUMMARY STATISTICS - SURFACE SOIL AND DITCH SOIL
SEAD-121I
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedences	Number of Detects	Number of Analyses [2]
Volatile Organic Compounds							
Acetone	UG/KG	150	80%	200	0	36	45
Benzene	UG/KG	41 [3]	20%	60	0	9	45
Ethyl benzene	UG/KG	7.8	13%	5500	0	6	45
Meta/Para Xylene	UG/KG	6.3 [3]	13%		0	6	45
Methyl ethyl ketone	UG/KG	78	24%	300	0	11	45
Methylene chloride	UG/KG	2.8	20%	100	0	9	45
Ortho Xylene	UG/KG	3.6 [3]	13%		0	6	45
Toluene	UG/KG	31 [3]	18%	1500	0	8	45
Semivolatile Organic Compounds							
2-Methylnaphthalene	UG/KG	260	10%	36400	0	5	51
3,3'-Dichlorobenzidine	UG/KG	315 [3]	2%		0	1	47
Acenaphthene	UG/KG	6100	51%	50000	0	26	51
Acenaphthylene	UG/KG	560	12%	41000	0	6	51
Anthracene	UG/KG	12000	58%	50000	0	29	50
Benzo(a)anthracene	UG/KG	28000	90%	224	28	46	51
Benzo(a)pyrene	UG/KG	23000	88%	61	44	45	51
Benzo(b)fluoranthene	UG/KG	29000	94%	1100	14	48	51
Benzo(ghi)perylene	UG/KG	29000	82%	50000	0	42	51
Benzo(k)fluoranthene	UG/KG	23000	74%	1100	14	37	50
Bis(2-Ethylhexyl)phthalate	UG/KG	1600	33%	50000	0	17	51
Butylbenzylphthalate	UG/KG	420 [3]	6%	50000	0	3	48
Carbazole	UG/KG	6800	57%		0	29	51
Chrysene	UG/KG	32000	86%	400	25	44	51
Di-n-butylphthalate	UG/KG	45	2%	8100	0	1	50
Di-n-octylphthalate	UG/KG	420 [3]	2%	50000	0	1	47
Dibenz(a,h)anthracene	UG/KG	5000	34%	14	15	15	44
Dibenzofuran	UG/KG	2000	27%	6200	0	14	51
Diethyl phthalate	UG/KG	640 [3]	2%	7100	0	1	51
Fluoranthene	UG/KG	62000	94%	50000	1	48	51
Fluorene	UG/KG	4200	43%	50000	0	22	51
Indeno(1,2,3-cd)pyrene	UG/KG	12000	71%	3200	3	35	49
Isophorone	UG/KG	315 [3]	2%	4400	0	1	51
Naphthalene	UG/KG	630	14%	13000	0	7	51
Nitrobenzene	UG/KG	315 [3]	2%	200	1	1	51
Phenanthrene	UG/KG	52000	94%	50000	1	48	51
Phenol	UG/KG	315 [3]	2%	30	1	1	51
Pyrene	UG/KG	64000	94%	50000	1	48	51
Pesticides/PCBs							
4,4'-DDE	UG/KG	34	11%	2100	0	5	45
4,4'-DDT	UG/KG	39	5%	2100	0	2	44
Aldrin	UG/KG	12	9%	41	0	4	45
Dieldrin	UG/KG	34	4%	44	0	2	45
Endosulfan I	UG/KG	95	59%	900	0	24	41

Table 6-8
SUMMARY STATISTICS - SURFACE SOIL AND DITCH SOIL
SEAD-121I
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value [1]	Number of Exceedences	Number of Detects	Number of Analyses [2]
Endrin	UG/KG	30	4%	100	0	2	45
Heptachlor epoxide	UG/KG	55	21%	20	3	8	39
Aroclor-1254	UG/KG	67	4%	10000	0	2	45
Aroclor-1260	UG/KG	46	7%	10000	0	3	45
Metals and Cyanide							
Aluminum	MG/KG	13200	100%	19300	0	45	45
Antimony	MG/KG	7.5	31%	5.9	1	14	45
Arsenic	MG/KG	104	100%	8.2	8	34	34
Barium	MG/KG	207	100%	300	0	45	45
Beryllium	MG/KG	0.68	98%	1.1	0	44	45
Cadmium	MG/KG	6.6	31%	2.3	3	14	45
Calcium	MG/KG	298000	100%	121000	18	45	45
Chromium	MG/KG	439 [3]	100%	29.6	6	45	45
Cobalt	MG/KG	206 [3]	100%	30	4	45	45
Copper	MG/KG	209 [3]	100%	33	10	40	40
Cyanide, Total	MG/KG	2.00 [3]	7%		0	3	45
Iron	MG/KG	58400 [3]	100%	36500	2	45	45
Lead	MG/KG	122	100%	24.8	22	45	45
Magnesium	MG/KG	22300	100%	21500	1	45	45
Manganese	MG/KG	310500 [3]	100%	1060	15	45	45
Mercury	MG/KG	0.18	98%	0.1	1	44	45
Nickel	MG/KG	342	100%	49	7	45	45
Potassium	MG/KG	1450	100%	2380	0	45	45
Selenium	MG/KG	146 [3]	47%	2	5	21	45
Silver	MG/KG	10.5	18%	0.75	4	6	34
Sodium	MG/KG	372	82%	172	24	37	45
Thallium	MG/KG	163 [3]	20%	0.7	5	9	45
Vanadium	MG/KG	182 [3]	100%	150	1	45	45
Zinc	MG/KG	532	100%	110	14	45	45
Other							
Total Organic Carbon	MG/KG	8900	100%		0	45	45
Total Petroleum Hydrocarbons	MG/KG	2200	33%		0	15	45

Notes:
1. The criteria value source is NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046, Revised January 24, 1994
2. Sample-duplicate pairs were averaged and the average results was used in the summary statistic presented in this table.
3. The maximum detected concentration was obtained from the average of the sample and its duplicate.

Table 6-9
SUMMARY STATISTICS - SURFACE WATER
SEAD-121I
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Parameter	Units	Maximum Detect	Frequency of Detection	Criteria Value[1]	Number of Exceedences	Number of Detects	Number of Analyses [2]
Semivolatile Organic Compounds							
Butylbenzylphthalate	UG/L	1.1	14%		0	1	7
Fluoranthene	UG/L	1.1	14%		0	1	7
Metals							
Aluminum	UG/L	2050	100%	100	3	7	7
Barium	UG/L	49.2	86%		0	6	7
Beryllium	UG/L	0.28	86%	1100	0	6	7
Cadmium	UG/L	0.54	14%	3.84	0	1	7
Calcium	UG/L	74200	100%		0	7	7
Chromium	UG/L	6	71%	139.45	0	5	7
Cobalt	UG/L	3	29%	5	0	2	7
Copper	UG/L	11.2	86%	17.32	0	6	7
Iron	UG/L	3410	71%	300	2	5	7
Lead	UG/L	26.3	57%	1.4624632	4	4	7
Magnesium	UG/L	11100	100%		0	7	7
Manganese	UG/L	206	100%		0	7	7
Nickel	UG/L	3.6	29%	99.92	0	2	7
Potassium	UG/L	4640	100%		0	7	7
Selenium	UG/L	2.5 [3]	14%	4.6	0	1	7
Sodium	UG/L	38500	100%		0	7	7
Vanadium	UG/L	3.9	43%	14	0	3	7
Zinc	UG/L	190	100%	159.25	1	7	7

Note(s):
1. Criteria values are from the New York State Ambient Water Quality Standards, Class C for Surface Water
2. Sample-duplicate pair was averaged and the average results were used in the summary statistic presented in this table.
3. The maximum detected concentration was obtained from the average of the sample (121I-3007) and its duplicate (121I-3005) collected at SW121I-7.

Table 7-1 Contaminants of Concern by Media Proposed Plan – NA with LUCs, SEAD-121C, DRMO Yard Seneca Army Depot Activity					
Class/Analyte	**Surface Soil**	**Ditch Soil**	**Total Soil**	**Groundwater**	**Surface Water**
Volatile Organic Compounds (VOCs)					
Benzene			X		
Semivolatile Organic Compounds (SVOCs)					
Benzo(a)anthracene	X	X	X		
Benzo(a)pyrene	X	X	X		
Benzo(b)fluoranthene	X	X	X		
Benzo(k)fluoranthene	X	X	X		
Chrysene	X	X	X		
Dibenz(a,h)anthracene	X		X		
Indeno(1,2,3-cd)pyrene	X	X	X		
Pesticides and Polychlorinated Biphenyls (PCBs)					
Dieldrin	X		X		
Aroclor-1242	X		X		
Aroclor-1254	X		X		
Aroclor-1260	X		X		
Metals and Cyanide					
Antimony	X		X		
Arsenic	X	X	X		X
Cadmium					X
Chromium					X
Copper	X		X		
Iron	X	X	X		X
Lead	X	X	X		X
Manganese					X
Thallium					X
Vanadium					X

Table 7-2
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-121C
REASONABLE MAXIMUM EXPOSURE (RME) AND CENTRAL TENDENCY (CT)
SEAD-121C AND SEAD-121I RI REPORT
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	REASONABLE MAXIMUM EXPOSURE (RME)				CENTRAL TENDENCY (CT)			
		HAZARD INDEX		CANCER RISK		HAZARD INDEX		CANCER RISK	
		Hazard Index	Percent Contribution	Cancer Risk	Percent Contribution	Hazard Index	Percent Contribution	Cancer Risk	Percent Contribution
INDUSTRIAL WORKER (Soil)	Inhalation of Dust in Ambient Air (Soil)	NQ	0%	1E-07	0%	NQ	0%	2E-08	1%
	Ingestion of Soil	3E-01	93%	1E-05	58%	1E-01	99%	2E-06	87%
	Dermal Contact to Soil	2E-02	7%	1E-05	42%	2E-03	1%	3E-07	13%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	TOTAL RECEPTOR RISK (Nc & Car)	*4E-01*	100%	*3E-05*	100%	*2E-01*	100%	*3E-06*	100%
INDUSTRIAL WORKER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch)	NQ	0%	8E-08	6%	NQ	0%	1E-08	7%
	Ingestion of Ditch Soil	2E-02	96%	9E-07	62%	8E-03	99%	2E-07	84%
	Dermal Contact to Ditch Soil	6E-04	4%	5E-07	32%	6E-05	1%	2E-08	9%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	TOTAL RECEPTOR RISK (Nc & Car)	*2E-02*	100%	*1E-06*	100%	*9E-03*	100%	*2E-07*	100%
CONSTRUCTION WORKER (Soil)	Inhalation of Dust in Ambient Air (Soil)	4E-06	0%	2E-07	13%	4E-06	0%	2E-07	25%
	Ingestion of Soil	7E-01	97%	1E-06	67%	2E-01	91%	3E-07	38%
	Dermal Contact to Soil	2E-02	3%	4E-07	20%	2E-02	9%	3E-07	37%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	Dermal Contact to Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	TOTAL RECEPTOR RISK (Nc & Car)	*8E-01*	100%	*2E-06*	100%	*2E-01*	100%	*9E-07*	100%
CONSTRUCTION WORKER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch)	NQ	0%	2E-08	3%	NQ	0%	2E-08	6%
	Ingestion of Ditch Soil	3E-01	86%	6E-07	78%	7E-02	66%	2E-07	52%
	Dermal Contact to Ditch Soil	5E-03	1%	1E-07	18%	4E-03	4%	1E-07	41%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	Dermal Contact to Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	Dermal Contact to Surface Water	4E-02	13%	5E-09	1%	3E-02	30%	4E-09	1%
	TOTAL RECEPTOR RISK (Nc & Car)	*3E-01*	100%	*7E-07*	100%	*1E-01*	100%	*3E-07*	100%
ADOLESCENT TRESPASSER (Soil)	Inhalation of Dust in Ambient Air (Soil)	NQ	0%	1E-10	0%	NQ	0%	1E-10	0%
	Ingestion of Soil	3E-02	96%	2E-07	69%	1E-02	99%	1E-07	89%
	Dermal Contact to Soil	1E-03	4%	1E-07	31%	2E-04	1%	1E-08	11%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	TOTAL RECEPTOR RISK (Nc & Car)	*3E-02*	100%	*3E-07*	100%	*1E-02*	100%	*1E-07*	100%
ADOLESCENT TRESPASSER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch)	NQ	0%	1E-10	0%	NQ	0%	1E-10	0%
	Ingestion of Ditch Soil	7E-03	25%	7E-08	67%	3E-03	15%	3E-08	69%
	Dermal Contact to Ditch Soil	2E-04	1%	2E-08	22%	2E-05	0%	3E-09	6%
	Intake of Groundwater	ND	0%	ND	0%	ND	0%	ND	0%
	Dermal Contact to Surface Water	2E-02	74%	1E-08	12%	2E-02	85%	1E-08	24%
	TOTAL RECEPTOR RISK (Nc & Car)	*3E-02*	100%	*1E-07*	100%	*2E-02*	100%	*5E-08*	100%

NQ= Not quantified due to lack of toxicity data.

ND = Not quantified since no COPCs were detected above screening levels.

Table 7-3
Calculation of Blood Lead Concentration - Industrial Worker Exposed to Surface Soil at SEAD-121C
Proposed Plan - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1] 1*	PbB Equation[1] 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1, GSDi = Hom	Using Equation 1, GSDi = Het	Using Equation 2, GSDi = Hom	Using Equation 2, GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	735	735	735	735
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.9	2.1	1.9	2.1
PbB_0	X	X	Baseline PbB	ug/dL	1.7	2.2	1.7	2.2
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S, D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S, D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S, D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}			**PbB of adult worker, geometric mean**	**ug/dL**	**2.8**	**3.3**	**2.8**	**3.3**
$PbB_{fetal, 0.95}$			**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**7.1**	**9.9**	**7.1**	**9.9**
PbB_t			**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$			**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1.5%**	**4.9%**	**1.5%**	**4.9%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 7-4
CALCULATION OF BLOOD LEAD CONCENTRATION – RESIDENTIAL CHILD EXPOSED TO SURFACE SOIL AT SEAD-121C
PROPOSED PLAN – SEAD-121C and SEAD-121I
SENECA ARMY DEPOT ACTIVITY

LEAD MODEL FOR WINDOWS Version 1.0

==
Model Version: 1.0 Build 261
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==
The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500

```
2-3       0.520
3-4       0.530
4-5       0.550
5-6       0.580
6-7       0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 524.500 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age          Soil (ug Pb/g)       House Dust (ug Pb/g)
--------------------------------------------------------
.5-1              735.000             524.500
1-2               735.000             524.500
2-3               735.000             524.500
3-4               735.000             524.500
4-5               735.000             524.500
5-6               735.000             524.500
6-7               735.000             524.500

****** Alternate Intake ******

Age      Alternate (ug Pb/day)
-----------------------------------
.5-1     0.000
1-2      0.000
2-3      0.000
3-4      0.000
4-5      0.000
5-6      0.000
6-7      0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year         Air                Diet               Alternate       Water
           (ug/day)           (ug/day)              (ug/day)      (ug/day)
--------------------------------------------------------------------------
```

TABLE 7-4
CALCULATION OF BLOOD LEAD CONCENTRATION – RESIDENTIAL CHILD EXPOSED TO SURFACE SOIL AT SEAD-121C
PROPOSED PLAN – SEAD-121C and SEAD-121I
SENECA ARMY DEPOT ACTIVITY

.5-1	0.021	2.301	0.000	0.333
1-2	0.034	2.340	0.000	0.810
2-3	0.062	2.694	0.000	0.863
3-4	0.067	2.654	0.000	0.902
4-5	0.067	2.685	0.000	0.983
5-6	0.093	2.885	0.000	1.056
6-7	0.093	3.216	0.000	1.084

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	13.140	15.795	8.4
1-2	20.302	23.485	9.6
2-3	20.821	24.441	9.0
3-4	21.335	24.958	8.6
4-5	16.598	20.333	7.2
5-6	15.217	19.251	6.1
6-7	14.509	18.902	5.4

Table 7-5
Calculation of Blood Lead Concentration - Industrial Worker Exposed to Ditch Soil at SEAD-121C
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1]		Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario			
					Using Equation 1		Using Equation 2	
	1*	2**			GSDi = Hom	GSDi = Het	GSDi = Hom	GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	144	144	144	144
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	1.8	2.1	1.8	2.1
PbB_0	X	X	Baseline PbB	ug/dL	1.7	2.2	1.7	2.2
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.050	0.050
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S, D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S, D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S, D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**1.9**	**2.4**	**1.9**	**2.4**
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**4.5**	**7.3**	**4.5**	**7.3**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**0.1%**	**2.0%**	**0.1%**	**2.0%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE 7-6
CALCULATION OF BLOOD LEAD CONCENTRATION – RESIDENTIAL CHILD EXPOSED TO DITCH SOIL AT SEAD-121C
PROPOSED PLAN – SEAD-121C and SEAD-121I
SENECA ARMY DEPOT ACTIVITY

LEAD MODEL FOR WINDOWS Version 1.0

==

Model Version: 1.0 Build 261
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==

The time step used in this model run: 1 - Every 4 Hours (6 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500

TABLE 7-6
CALCULATION OF BLOOD LEAD CONCENTRATION – RESIDENTIAL CHILD EXPOSED TO DITCH SOIL AT SEAD-121C
PROPOSED PLAN – SEAD-121C and SEAD-121I
SENECA ARMY DEPOT ACTIVITY

```
2-3       0.520
3-4       0.530
4-5       0.550
5-6       0.580
6-7       0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 110.800 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age          Soil (ug Pb/g)       House Dust (ug Pb/g)
--------------------------------------------------------
.5-1              144.000             110.800
1-2               144.000             110.800
2-3               144.000             110.800
3-4               144.000             110.800
4-5               144.000             110.800
5-6               144.000             110.800
6-7               144.000             110.800

****** Alternate Intake ******

Age      Alternate (ug Pb/day)
-----------------------------------
.5-1     0.000
1-2      0.000
2-3      0.000
3-4      0.000
4-5      0.000
5-6      0.000
6-7      0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

*****************************************
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
*****************************************

Year         Air               Diet                Alternate       Water
           (ug/day)          (ug/day)               (ug/day)      (ug/day)
--------------------------------------------------------------------------
```

TABLE 7-6
CALCULATION OF BLOOD LEAD CONCENTRATION – RESIDENTIAL CHILD EXPOSED TO DITCH SOIL AT SEAD-121C
PROPOSED PLAN – SEAD-121C and SEAD-121I
SENECA ARMY DEPOT ACTIVITY

.5-1	0.021	2.584	0.000	0.374
1-2	0.034	2.686	0.000	0.929
2-3	0.062	3.039	0.000	0.974
3-4	0.067	2.951	0.000	1.003
4-5	0.067	2.883	0.000	1.055
5-6	0.093	3.057	0.000	1.119
6-7	0.093	3.383	0.000	1.141

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	2.996	5.974	3.3
1-2	4.732	8.382	3.5
2-3	4.770	8.845	3.3
3-4	4.816	8.836	3.1
4-5	3.619	7.625	2.7
5-6	3.274	7.544	2.4
6-7	3.099	7.717	2.2

TABLE 7-7A
RECEPTOR NOAEL HAZARD QUOTIENTS FOR SOIL EXPOSURE- SEAD-121C SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

COPC	Retained as Preliminary COC(1) Y/N	Deer Mouse Surface Soil NOAEL HQ	Deer Mouse Total Soil NOAEL HQ	American Robin Surface Soil NOAEL HQ	American Robin Total Soil NOAEL HQ	Short-Tailed Shrew Surface Soil NOAEL HQ	Short-Tailed Shrew Total Soil NOAEL HQ	Meadow Vole Surface Soil NOAEL HQ	Meadow Vole Total Soil NOAEL HQ	Red Fox Surface Soil NOAEL HQ	Red Fox Total Soil NOAEL HQ
Volatile Organic Compounds											
Benzene	N	3.E-04	1.E-02	N/A	N/A	3.E-04	1.E-02	4.E-04	2.E-02	3.E-04	2.E-02
Ethyl benzene	N	3.E-03	2.E-02	N/A	N/A	5.E-03	4.E-02	4.E-03	3.E-02	5.E-03	3.E-02
Meta/Para Xylene	Y	2.E-01	**7.E+00**	8.E-04	2.E-02	4.E-01	**1.E+01**	3.E-01	**8.E+00**	3.E-01	**9.E+00**
Semivolatile Organic Compounds											
Acenaphthene	N	9.E-02	9.E-02	4.E-03	4.E-03	1.E-01	1.E-01	2.E-01	2.E-01	1.E-02	1.E-02
Acenaphthylene	N	8.E-02	8.E-02	4.E-03	4.E-03	1.E-01	1.E-01	2.E-01	2.E-01	9.E-03	9.E-03
Anthracene	N	2.E-01	2.E-01	1.E-02	1.E-02	4.E-01	4.E-01	6.E-01	6.E-01	2.E-02	2.E-02
Benzo(a)anthracene	N	1.E-01	1.E-01	9.E-03	9.E-03	3.E-01	3.E-01	7.E-01	7.E-01	3.E-02	3.E-02
Benzo(a)pyrene	N	2.E-01	2.E-01	1.E-02	1.E-02	4.E-01	4.E-01	6.E-01	6.E-01	3.E-02	3.E-02
Benzo(b)fluoranthene	N	3.E-01	3.E-01	2.E-02	2.E-02	6.E-01	6.E-01	9.E-01	9.E-01	4.E-02	4.E-02
Benzo(ghi)perylene	N	8.E-02	8.E-02	5.E-03	5.E-03	2.E-01	2.E-01	2.E-01	2.E-01	1.E-02	1.E-02
Benzo(k)fluoranthene	N	2.E-01	2.E-01	1.E-02	1.E-02	4.E-01	4.E-01	6.E-01	6.E-01	3.E-02	3.E-02
Bis(2-Ethylhexyl)phthalate	N	3.E-05	3.E-05	5.E-04	5.E-04	3.E-05	3.E-05	5.E-05	5.E-05	3.E-05	3.E-05
Carbazole	N	2.E-02	2.E-02	6.E-03	6.E-03	6.E-02	6.E-02	7.E-02	7.E-02	9.E-02	9.E-02
Chrysene	N	1.E-01	1.E-01	1.E-02	1.E-02	3.E-01	3.E-01	7.E-01	7.E-01	2.E-02	2.E-02
Dibenz(a,h)anthracene	N	1.E-02	1.E-02	7.E-04	7.E-04	2.E-02	2.E-02	3.E-02	3.E-02	2.E-03	2.E-03
Dibenzofuran	N	4.E-02	4.E-02	2.E-03	2.E-03	1.E-01	1.E-01	1.E-01	1.E-01	2.E-01	2.E-01
Di-n-octylphthalate	N	2.E-08	2.E-08	4.E-05	4.E-05	2.E-07	2.E-07	2.E-07	2.E-07	4.E-07	4.E-07
Fluoranthene	N	6.E-02	6.E-02	4.E-02	4.E-02	1.E-01	1.E-01	2.E-01	2.E-01	7.E-03	7.E-03
Fluorene	N	9.E-03	9.E-03	5.E-03	5.E-03	1.E-02	1.E-02	2.E-02	2.E-02	1.E-03	1.E-03
Hexachlorobenzene	N	8.E-05	8.E-05	1.E-04	1.E-04	2.E-04	2.E-04	3.E-04	3.E-04	1.E-05	1.E-05
Indeno(1,2,3-cd)pyrene	N	3.E-02	3.E-02	2.E-03	2.E-03	5.E-02	5.E-02	7.E-02	7.E-02	4.E-03	4.E-03
Naphthalene	N	2.E-03	1.E-02	6.E-04	3.E-03	3.E-03	1.E-02	6.E-03	3.E-02	3.E-04	1.E-03
Phenanthrene	Y	9.E-01	9.E-01	4.E-02	4.E-02	**1.E+00**	**1.E+00**	**2.E+00**	**2.E+00**	1.E-01	1.E-01
Pyrene	Y	9.E-01	9.E-01	5.E-02	5.E-02	**2.E+00**	**2.E+00**	**3.E+00**	**3.E+00**	1.E-01	1.E-01
PCBs		**4.E+00**	**4.E+00**	2.E-01							
Aroclor-1242	N	3.E-01	3.E-01	7.E-02	7.E-02	4.E-01	4.E-01	5.E-02	5.E-02	1.E-02	1.E-02
Aroclor-1254	Y	**2.E+00**	**2.E+00**	**2.E+00**	**2.E+00**	**3.E+00**	**3.E+00**	4.E-01	4.E-01	1.E-01	1.E-01
Aroclor-1260	N	2.E-01	5.E-01	2.E-01	5.E-01	3.E-01	7.E-01	4.E-02	9.E-02	1.E-02	2.E-02
Pesticides											
4,4'-DDD	N	1.E-04	1.E-04	3.E-02	3.E-02	2.E-04	2.E-04	2.E-05	2.E-05	7.E-06	7.E-06
4,4'-DDE	N	3.E-02	3.E-02	4.E-02	4.E-02	4.E-02	4.E-02	4.E-03	4.E-03	1.E-03	1.E-03
4,4'-DDT	Y	5.E-02	5.E-02	**2.E+01**	**2.E+01**	7.E-02	7.E-02	8.E-03	8.E-03	2.E-03	2.E-03
Aldrin	N	3.E-03	3.E-03	1.E-02	1.E-02	6.E-03	6.E-03	8.E-03	8.E-03	1.E-02	1.E-02
Alpha-Chlordane	N	2.E-04	2.E-04	9.E-04	9.E-04	7.E-04	7.E-04	1.E-03	1.E-03	1.E-03	1.E-03
Delta-BHC	N	1.E-05	1.E-05	1.E-04	1.E-04	3.E-05	3.E-05	4.E-05	4.E-05	5.E-05	5.E-05
Dieldrin	N	4.E-02	4.E-02	2.E-02	2.E-02	1.E-01	1.E-01	1.E-01	1.E-01	2.E-01	2.E-01
Endosulfan I	N	4.E-02	4.E-02	8.E-04	8.E-04	8.E-02	8.E-02	1.E-01	1.E-01	1.E-01	1.E-01
Endosulfan II	N	2.E-03	2.E-03	4.E-05	4.E-05	4.E-03	4.E-03	5.E-03	5.E-03	6.E-03	6.E-03
Endrin	N	5.E-03	6.E-03	3.E-03	3.E-03	1.E-02	2.E-02	2.E-02	2.E-02	2.E-02	2.E-02
Endrin ketone	N	2.E-03	2.E-03	9.E-04	1.E-03	5.E-03	7.E-03	7.E-03	9.E-03	8.E-03	1.E-02
Gamma-Chlordane	N	4.E-06	4.E-06	2.E-05	2.E-05	1.E-05	1.E-05	2.E-05	2.E-05	2.E-05	2.E-05
Heptachlor	N	6.E-02	6.E-02	1.E-01	1.E-01	8.E-02	8.E-02	9.E-03	9.E-03	3.E-03	3.E-03
Heptachlor epoxide	N	1.E-02	1.E-02	3.E-02	3.E-02	2.E-02	2.E-02	2.E-03	2.E-03	5.E-04	5.E-04

TABLE 7-7A
RECEPTOR NOAEL HAZARD QUOTIENTS FOR SOIL EXPOSURE- SEAD-121C SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

COPC	Retained as Preliminary COC(1) Y/N	Deer Mouse Surface Soil NOAEL HQ	Deer Mouse Total Soil NOAEL HQ	American Robin Surface Soil NOAEL HQ	American Robin Total Soil NOAEL HQ	Short-Tailed Shrew Surface Soil NOAEL HQ	Short-Tailed Shrew Total Soil NOAEL HQ	Meadow Vole Surface Soil NOAEL HQ	Meadow Vole Total Soil NOAEL HQ	Red Fox Surface Soil NOAEL HQ	Red Fox Total Soil NOAEL HQ
Metals											
Aluminum	Y	7.E-01	7.E-01	1.E-02	1.E-02	7.E-01	7.E-01	**1.E+00**	**1.E+00**	5.E-01	5.E-01
Antimony	Y	**2.E+02**	**2.E+02**	N/A	N/A	**2.E+02**	**2.E+02**	**2.E+02**	**2.E+02**	**1.E+01**	**1.E+01**
Arsenic	N	5.E-01	5.E-01	3.E-01	3.E-01	8.E-01	8.E-01	8.E-01	8.E-01	4.E-02	4.E-02
Barium	Y	**2.E+00**	**2.E+00**	**5.E+00**	**5.E+00**	**2.E+00**	**2.E+00**	**3.E+00**	**3.E+00**	1.E-01	1.E-01
Cadmium	Y	**9.E+00**	**9.E+00**	**8.E+00**	**8.E+00**	**1.E+01**	**1.E+01**	**3.E+00**	**3.E+00**	5.E-01	5.E-01
Chromium	N	1.E-04	1.E-04	5.E-01	5.E-01	4.E-04	4.E-04	2.E-03	2.E-03	8.E-05	8.E-05
Cobalt	N	4.E-01	5.E-01	1.E-02	1.E-02	7.E-01	8.E-01	7.E-01	8.E-01	8.E-02	9.E-02
Copper	Y	**2.E+01**	**2.E+01**	**7.E+00**	**7.E+00**	**2.E+01**	**2.E+01**	**7.E+01**	**7.E+01**	**4.E+00**	**4.E+00**
Iron	Y	**2.E+01**	**2.E+01**	3.E-03	3.E-03	**2.E+01**	**2.E+01**	**2.E+01**	**2.E+01**	**1.E+01**	**1.E+01**
Lead	Y	**3.E+01**	**3.E+01**	**1.E+02**	**1.E+02**	**6.E+01**	**6.E+01**	**2.E+02**	**2.E+02**	**5.E+00**	**5.E+00**
Manganese	N	3.E-01	3.E-01	3.E-01	3.E-01	4.E-01	4.E-01	8.E-01	8.E-01	3.E-02	3.E-02
Mercury	N	7.E-03	7.E-03	3.E-02	3.E-02	2.E-02	2.E-02	3.E-02	3.E-02	2.E-02	2.E-02
Nickel	N	5.E-02	5.E-02	7.E-02	7.E-02	1.E-01	1.E-01	4.E-01	4.E-01	2.E-02	2.E-02
Selenium	N	4.E-01	4.E-01	3.E-01	3.E-01	7.E-01	7.E-01	4.E-01	4.E-01	5.E-02	5.E-02
Silver	Y	**6.E+00**	**6.E+00**	1.E-02	1.E-02	**7.E+00**	**7.E+00**	**6.E+00**	**6.E+00**	4.E-01	4.E-01
Thallium	Y	6.E-01	9.E-01	3.E-01	5.E-01	9.E-01	**2.E+00**	5.E-01	9.E-01	1.E-01	2.E-01
Vanadium	N	5.E-01	5.E-01	2.E-01	3.E-01	8.E-01	9.E-01	5.E-01	5.E-01	3.E-02	3.E-02
Zinc	Y	**4.E+00**	**4.E+00**	**7.E+00**	**7.E+00**	**6.E+00**	**6.E+00**	**1.E+00**	**1.E+00**	6.E-01	6.E-01

NOAEL = No Observed Adverse Effect Level
COPC = Chemical of Potential Concern
SEV = Screening Ecotoxicity Value
HQ = Hazard Quotient (Exposure/SEV)
COC = Chemical of Concern
(1) COPC considered a preliminary COC if NOAEL HQ > 1 or HQ=1 for any recepto
(2) HQs based on the maximum detected concentrations
Note: HQ>1 and HQ=1 are in bold.

TABLE 7-7B
RECEPTOR NOAEL HAZARD QUOTIENTS FOR DITCH SOIL EXPOSURE- SEAD-121C DITCH SOIL
PROPOSED PLAN - SEAD-121C AND SEAD-121I
Seneca Army Depot Activity

COPC	Retained as Preliminary COC(1) Y/N	Deer Mouse Ditch Soil NOAEL HQ	American Robin Ditch Soil NOAEL HQ	Short-Tailed Shrew Ditch Soil NOAEL HQ	Meadow Vole Ditch Soil NOAEL HQ	Red Fox Ditch Soil NOAEL HQ	Great Blue Heron Ditch Soil NOAEL HQ
Semivolatile Organic Compounds							
3 or 4-Methylphenol	N	5.E-04	6.E-02	4.E-04	1.E-03	7.E-04	2.E-01
Anthracene	N	8.E-03	4.E-04	1.E-02	2.E-02	9.E-04	8.E-05
Benzo(a)anthracene	N	1.E-02	1.E-03	3.E-02	8.E-02	3.E-03	3.E-04
Benzo(a)pyrene	N	2.E-02	1.E-03	4.E-02	7.E-02	3.E-03	3.E-04
Benzo(b)fluoranthene	N	3.E-02	2.E-03	5.E-02	8.E-02	4.E-03	4.E-04
Benzo(ghi)perylene	N	8.E-03	4.E-04	1.E-02	2.E-02	9.E-04	9.E-05
Benzo(k)fluoranthene	N	2.E-02	1.E-03	3.E-02	4.E-02	2.E-03	2.E-04
Bis(2-Ethylhexyl)phthalate	N	3.E-05	5.E-04	3.E-05	5.E-05	3.E-05	2.E-04
Chrysene	N	2.E-02	1.E-03	4.E-02	9.E-02	3.E-03	4.E-04
Fluoranthene	N	5.E-03	3.E-03	8.E-03	1.E-02	6.E-04	7.E-04
Indeno(1,2,3-cd)pyrene	N	8.E-03	4.E-04	1.E-02	2.E-02	1.E-03	9.E-05
Phenanthrene	N	3.E-02	2.E-03	5.E-02	9.E-02	4.E-03	4.E-04
Pyrene	N	6.E-02	3.E-03	1.E-01	2.E-01	7.E-03	7.E-04
Metals							
Aluminum	Y	7.E-01	1.E-02	7.E-01	**1.E+00**	5.E-01	4.E-03
Antimony	Y	**3.E+00**	N/A	**5.E+00**	**4.E+00**	2.E-01	N/A
Arsenic	N	3.E-01	2.E-01	4.E-01	4.E-01	2.E-02	2.E-02
Cadmium	Y	**4.E+00**	**4.E+00**	**6.E+00**	**1.E+00**	2.E-01	1.E-01
Chromium	N	5.E-05	2.E-01	2.E-04	7.E-04	4.E-05	1.E-01
Cobalt	N	4.E-01	1.E-02	7.E-01	7.E-01	7.E-02	2.E-03
Copper	Y	**3.E+00**	8.E-01	**3.E+00**	**9.E+00**	5.E-01	3.E-01
Cyanide	Y	1.E-02	**3.E+00**	2.E-02	5.E-03	6.E-03	**1.E+00**
Iron	Y	**2.E+01**	3.E-03	**2.E+01**	**2.E+01**	**1.E+01**	1.E-03
Lead	Y	7.E-01	**3.E+00**	**1.E+00**	**4.E+00**	1.E-01	**1.E+00**
Manganese	N	3.E-01	4.E-01	4.E-01	9.E-01	3.E-02	9.E-02
Mercury	N	4.E-03	2.E-02	1.E-02	2.E-02	1.E-02	4.E-02
Nickel	N	9.E-03	1.E-02	2.E-02	7.E-02	4.E-03	6.E-03
Selenium	Y	9.E-01	5.E-01	**1.E+00**	8.E-01	9.E-02	6.E-02
Silver	N	7.E-01	2.E-03	9.E-01	8.E-01	5.E-02	1.E-04
Vanadium	N	6.E-01	3.E-01	9.E-01	5.E-01	4.E-02	3.E-02
Zinc	Y	6.E-01	**1.E+00**	9.E-01	2.E-01	1.E-01	1.E-01

NOAEL = No Observed Adverse Effect Level
COPC = Chemical of Potential Concern
SEV = Screening Ecotoxicity Value
HQ = Hazard Quotient (Exposure/SEV)
COC = Chemical of Concern
(1) COPC considered a preliminary COC if NOAEL HQ > 1 or HQ=1 for any receptor
(2) HQs based on the maximum detected concentrations.
Note: HQ>1 and HQ=1 are in bold.

Table 7-8
Contaminants of Concern by Media – SEAD-121I
Proposed Plan – SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Class/Analyte	Surface Soil	Ditch Soil	Surface Water
Semivolatile Organic Compounds (SVOCs)			
Benzo(a)anthracene	**X**	**X**	
Benzo(a)pyrene	**X**	**X**	
Benzo(b)fluoranthene	**X**	**X**	
Benzo(k)fluoranthene	**X**	**X**	
Chrysene	**X**	**X**	
Dibenz(a,h)anthracene	**X**	**X**	
Indeno(1,2,3-cd)pyrene	**X**	**X**	
Pesticides and Polychlorinated Biphenyls (PCBs)			
Dieldrin	**X**		
Heptaclor Epoxide	**X**		
Metals and Cyanide			
Arsenic	**X**	**X**	
Chromium	**X**		
Iron	**X**	**X**	
Manganese	**X**	**X**	
Thallium	**X**	**X**	
Vanadium	**X**		

Table 7-9
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-121I
REASONABLE MAXIMUM EXPOSURE (RME) AND CENTRAL TENDENCY (CT)
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	REASONABLE MAXIMUM EXPOSURE (RME) HAZARD INDEX Hazard Index	RME HAZARD INDEX Percent Contribution	RME CANCER RISK Cancer Risk	RME CANCER RISK Percent Contribution	CENTRAL TENDENCY (CT) HAZARD INDEX Hazard Index	CT HAZARD INDEX Percent Contribution	CT CANCER RISK Cancer Risk	CT CANCER RISK Percent Contribution
INDUSTRIAL WORKER (Soil)	Inhalation of Dust in Ambient Air (Soil	**2E+01**	82%	4E-06	6%	**1E+01**	84%	**7E-07**	9%
	Ingestion of Soil	**5E+00**	16%	4E-05	54%	**2E+00**	15%	6E-06	79%
	Dermal Contact to Soil	8E-01	2%	3E-05	39%	7E-02	0%	9E-07	11%
	TOTAL RECEPTOR RISK (Nc & Car)	***3E+01***	**100%**	***7E-05***	**100%**	***1E+01***	**100%**	***8E-06***	**100%**
INDUSTRIAL WORKER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch	**3E+00**	94%	1E-06	6%	**1E+00**	94%	2E-07	7%
	Ingestion of Ditch Soil	1E-01	5%	1E-05	62%	7E-02	6%	2E-06	84%
	Dermal Contact to Ditch Soi	2E-02	1%	6E-06	32%	2E-03	0%	2E-07	9%
	TOTAL RECEPTOR RISK (Nc & Car)	***3E+00***	**100%**	***2E-05***	**100%**	***1E+00***	**100%**	***3E-06***	**100%**
CONSTRUCTION WORKER (Soil)	Inhalation of Dust in Ambient Air (Soil	**2E+02**	91%	1E-06	14%	**1E+02**	96%	1E-06	26%
	Ingestion of Soil	**2E+01**	9%	5E-06	64%	**4E+00**	3%	1E-06	35%
	Dermal Contact to Soil	**1E+00**	1%	2E-06	21%	1E+00	1%	1E-06	39%
	TOTAL RECEPTOR RISK (Nc & Car)	***2E+02***	**100%**	***8E-06***	**100%**	***1E+02***	**100%**	***4E-06***	**100%**
CONSTRUCTION WORKER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch	**2E+01**	86%	3E-07	3%	**1E+01**	95%	3E-07	6%
	Ingestion of Ditch Soil	**2E+00**	13%	8E-06	79%	6E-01	4%	2E-06	53%
	Dermal Contact to Ditch Soi	2E-01	1%	2E-06	18%	2E-01	1%	2E-06	41%
	Dermal Contact to Surface Water	NQ	0%	NQ	0%	NQ	0%	NQ	0%
	TOTAL RECEPTOR RISK (Nc & Car)	***2E+01***	**100%**	***1E-05***	**100%**	***2E+01***	**100%**	***4E-06***	**100%**
ADOLESCENT TRESPASSER (Soil)	Inhalation of Dust in Ambient Air (Soil	2E-01	28%	6E-09	1%	2E-01	45%	6E-09	2%
	Ingestion of Soil	4E-01	66%	6E-07	68%	2E-01	53%	3E-07	87%
	Dermal Contact to Soil	4E-02	7%	3E-07	31%	5E-03	2%	4E-08	11%
	TOTAL RECEPTOR RISK (Nc & Car)	***6E-01***	**100%**	***9E-07***	**100%**	***3E-01***	**100%**	***4E-07***	**100%**
ADOLESCENT TRESPASSER (Ditch Soil)	Inhalation of Dust in Ambient Air (Ditch	2E-02	20%	1E-09	0%	2E-02	35%	1E-09	0%
	Ingestion of Ditch Soil	6E-02	73%	1E-06	76%	3E-02	64%	5E-07	91%
	Dermal Contact to Ditch Soi	6E-03	7%	3E-07	24%	8E-04	2%	4E-08	8%
	Dermal Contact to Surface Water	NQ	0%	NQ	0%	NQ	0%	NQ	0%
	TOTAL RECEPTOR RISK (Nc & Car)	***8E-02***	**100%**	***1E-06***	**100%**	***5E-02***	**100%**	***5E-07***	**100%**

NQ= Not quantified due to lack of toxicity data.
Shading indicates that the HQ > 1, or the cancer risk is greater than 10-4.

Table 7-10
Contributing COPCs to Human Health Risk at SEAD-121I
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

Receptors	Exposure Route	Contributing COPC	Hazard Quotient	Percent Contribution
Industrial Worker	Inhalation of Dust in Ambient Air Due to Soil	Manganese	2E+01	100%
	Ingestion of Soil	Manganese	4E+00	95%
	Inhalation of Dust in Ambient Air Due to Ditch Soil	Manganese	3E+00	100%
Construction Worker	Inhalation of Dust in Ambient Air Due to Soil	Manganese	2E+02	100%
	Ingestion of Soil	Manganese	1E+01	95%
	Dermal Contact to Soil	Manganese	1E+00	97%
	Inhalation of Dust in Ambient Air Due to Ditch Soil	Manganese	2E+01	100%
	Ingestion of Ditch Soil	Arsenic	7E-01	27%
		Iron	2E-01	9%
		Manganese	1E+00	61%

TABLE 7-11A
RECEPTOR NOAEL HAZARD QUOTIENTS FOR SOIL EXPOSURE- SEAD-121I SOIL
PROPOSED PLAN - SEAD-121C andSEAD-121I
Seneca Army Depot Activity

COPC	Retained as Preliminary COC(1) Y/N	Deer Mouse Surface Soil NOAEL HQ	American Robin Surface Soil NOAEL HQ	Short-Tailed Shrew Surface Soil NOAEL HQ	Meadow Vole Surface Soil NOAEL HQ	Red Fox Surface Soil NOAEL HQ
Semivolatile Organic Compounds						
Acenaphthene	N	2.E-01	1.E-02	3.E-01	6.E-01	2.E-02
Acenaphthylene	N	2.E-02	9.E-04	3.E-02	5.E-02	2.E-03
Anthracene	Y	4.E-01	2.E-02	6.E-01	**1.E+00**	4.E-02
Benzo(a)anthracene	Y	4.E-01	3.E-02	8.E-01	**2.E+00**	7.E-02
Benzo(a)pyrene	Y	6.E-01	3.E-02	**1.E+00**	**2.E+00**	7.E-02
Benzo(b)fluoranthene	Y	8.E-01	4.E-02	**1.E+00**	**2.E+00**	9.E-02
Benzo(ghi)perylene	Y	8.E-01	4.E-02	**1.E+00**	**2.E+00**	9.E-02
Benzo(k)fluoranthene	Y	6.E-01	3.E-02	**1.E+00**	**2.E+00**	7.E-02
Bis(2-Ethylhexyl)phthalate	N	1.E-03	5.E-02	3.E-03	7.E-03	2.E-04
Carbazole	N	4.E-02	1.E-02	9.E-02	1.E-01	1.E-01
Chrysene	Y	5.E-01	3.E-02	**1.E+00**	**2.E+00**	9.E-02
Dibenz(a,h)anthracene	N	1.E-01	7.E-03	2.E-01	3.E-01	2.E-02
Dibenzofuran	N	5.E-02	3.E-03	1.E-01	2.E-01	2.E-01
Fluoranthene	N	1.E-01	9.E-02	2.E-01	4.E-01	2.E-02
Fluorene	N	1.E-02	7.E-03	2.E-02	3.E-02	1.E-03
Indeno(1,2,3-cd)pyrene	N	2.E-01	1.E-02	4.E-01	6.E-01	3.E-02
Naphthalene	N	4.E-03	1.E-03	5.E-03	1.E-02	4.E-04
Phenanthrene	Y	**2.E+00**	8.E-02	**3.E+00**	**4.E+00**	2.E-01
Pyrene	Y	**2.E+00**	1.E-01	**3.E+00**	**5.E+00**	2.E-01
PCBs						
Aroclor-1254	N	7.E-02	8.E-02	1.E-01	1.E-02	3.E-03
Aroclor-1260	N	1.E-01	1.E-01	2.E-01	2.E-02	5.E-03
Pesticides						
4,4'-DDE	N	1.E-02	2.E-02	2.E-02	2.E-03	6.E-04
4,4'-DDT	Y	2.E-02	**7.E+00**	3.E-02	3.E-03	9.E-04
Aldrin	N	3.E-03	1.E-02	5.E-03	7.E-03	8.E-03
Dieldrin	N	3.E-02	2.E-02	9.E-02	1.E-01	1.E-01
Endosulfan I	N	2.E-02	4.E-04	4.E-02	5.E-02	7.E-02
Endrin	N	7.E-03	4.E-03	2.E-02	3.E-02	3.E-02
Heptachlor epoxide	N	2.E-01	5.E-01	3.E-01	3.E-02	1.E-02
Metals						
Aluminum	N	2.E-01	3.E-03	2.E-01	2.E-01	1.E-01
Antimony	Y	**5.E+00**	N/A	**8.E+00**	**5.E+00**	4.E-01
Arsenic	Y	**1.E+00**	8.E-01	**2.E+00**	**2.E+00**	1.E-01
Cadmium	Y	**2.E+00**	**2.E+00**	**3.E+00**	6.E-01	1.E-01
Chromium	Y	7.E-04	**3.E+00**	3.E-03	1.E-02	5.E-04
Cobalt	Y	**5.E+00**	1.E-01	**8.E+00**	**9.E+00**	9.E-01
Copper	Y	5.E-01	1.E-01	5.E-01	**2.E+00**	8.E-02
Cyanide	Y	1.E-02	**2.E+00**	2.E-02	4.E-03	5.E-03
Iron	N	5.E-01	1.E-04	5.E-01	7.E-01	4.E-01
Lead	Y	2.E-01	9.E-01	4.E-01	**1.E+00**	4.E-02
Manganese	Y	**9.E+01**	**1.E+02**	**1.E+02**	**3.E+02**	**1.E+01**
Nickel	N	7.E-02	1.E-01	2.E-01	6.E-01	3.E-02
Selenium	Y	**5.E+01**	**3.E+01**	**8.E+01**	**5.E+01**	**5.E+00**
Silver	Y	8.E-01	2.E-03	**1.E+00**	9.E-01	6.E-02
Thallium	Y	**8.E+01**	**5.E+01**	**1.E+02**	**8.E+01**	**1.E+01**
Vanadium	Y	**4.E+00**	**2.E+00**	**6.E+00**	**3.E+00**	2.E-01
Zinc	N	3.E-01	6.E-01	5.E-01	1.E-01	5.E-02

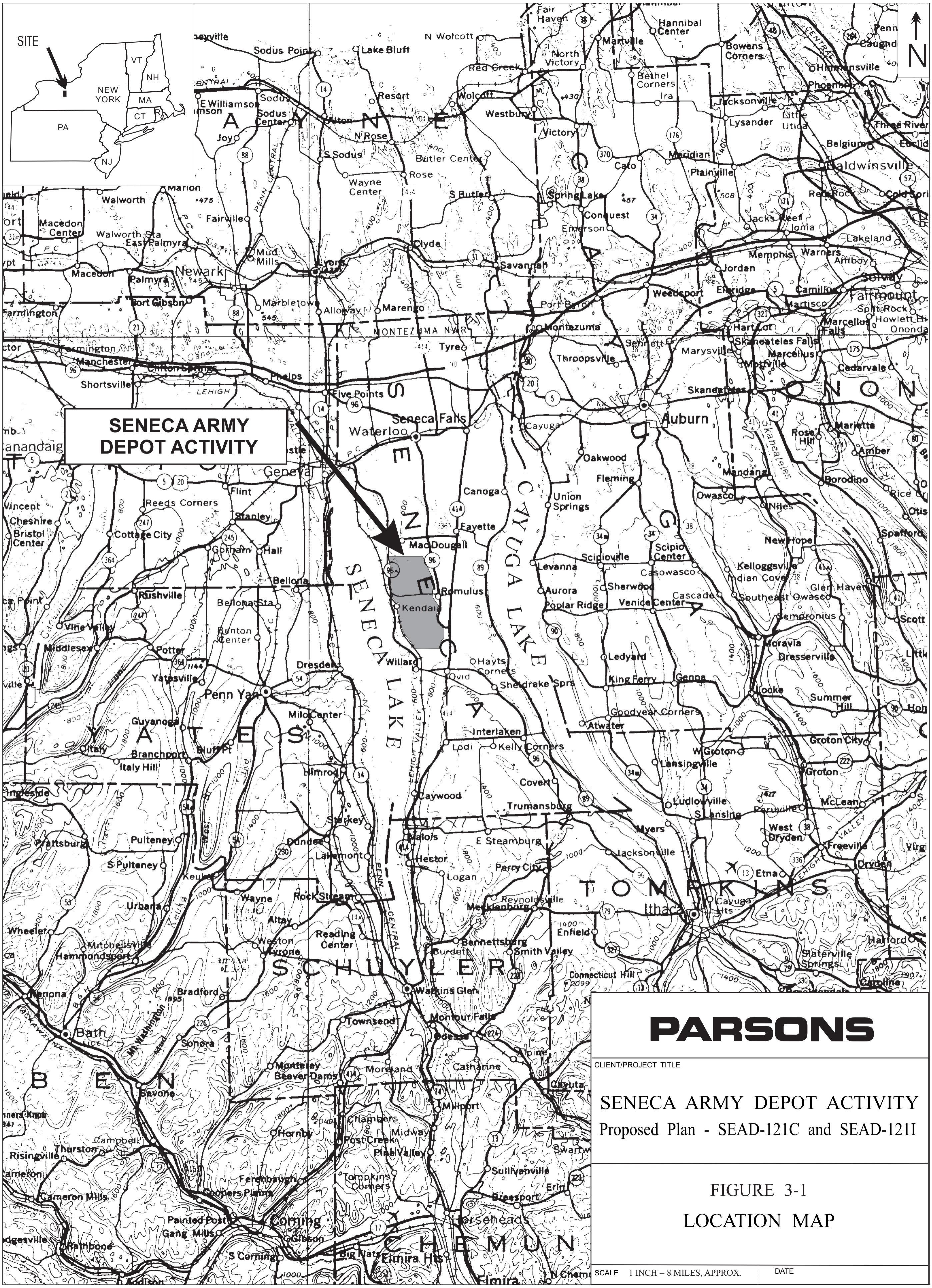
NOAEL = No Observed Adverse Effect Level
COPC = Chemical of Potential Concern
SEV = Screening Ecotoxicity Value
HQ = Hazard Quotient (Exposure/SEV)
COC = Chemical of Concern
(1) COPC considered a preliminary COC if NOAEL HQ > 1 or HQ=1 for any recepto
(2) HQs based on the maximum detected concentrations.
Note: HQ>1 and HQ=1 are in bold.

TABLE 7-11B
RECEPTOR NOAEL HAZARD QUOTIENTS FOR DITCH SOIL EXPOSURE- SEAD-121I DITCH SOIL
PROPOSED PLAN - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

COPC	Retained as Preliminary COC[1] Y/N	Deer Mouse Ditch Soil NOAEL HQ	American Robin Ditch Soil NOAEL HQ	Short-Tailed Shrew Ditch Soil NOAEL HQ	Meadow Vole Ditch Soil NOAEL HQ	Red Fox Ditch Soil NOAEL HQ	Great Blue Heron Ditch Soil NOAEL HQ
Semivolatile Organic Compounds							
Acenaphthene	N	3.E-02	1.E-03	4.E-02	7.E-02	3.E-03	2.E-04
Acenaphthylene	N	1.E-02	7.E-04	2.E-02	4.E-02	2.E-03	1.E-04
Anthracene	N	5.E-02	3.E-03	9.E-02	1.E-01	6.E-03	6.E-04
Benzo(a)anthracene	Y	2.E-01	1.E-02	4.E-01	**1.E+00**	4.E-02	4.E-03
Benzo(a)pyrene	Y	4.E-01	2.E-02	8.E-01	**1.E+00**	5.E-02	5.E-03
Benzo(b)fluoranthene	Y	6.E-01	3.E-02	**1.E+00**	**2.E+00**	7.E-02	7.E-03
Benzo(ghi)perylene	N	3.E-01	2.E-02	6.E-01	9.E-01	4.E-02	4.E-03
Benzo(k)fluoranthene	Y	7.E-01	4.E-02	**1.E+00**	**2.E+00**	8.E-02	7.E-03
Butylbenzylphthalate	N	5.E-05	1.E-02	1.E-04	2.E-04	2.E-04	3.E-02
Carbazole	N	9.E-03	2.E-03	2.E-02	3.E-02	3.E-02	7.E-03
Chrysene	Y	4.E-01	3.E-02	8.E-01	**2.E+00**	7.E-02	8.E-03
Dibenz(a,h)anthracene	N	1.E-01	8.E-03	2.E-01	4.E-01	2.E-02	2.E-03
Dibenzofuran	N	9.E-03	4.E-04	2.E-02	3.E-02	4.E-02	1.E-03
Fluoranthene	N	5.E-02	4.E-02	9.E-02	1.E-01	6.E-03	8.E-03
Fluorene	N	2.E-03	1.E-03	3.E-03	4.E-03	2.E-04	2.E-04
Indeno(1,2,3-cd)pyrene	N	4.E-01	2.E-02	7.E-01	9.E-01	5.E-02	4.E-03
Naphthalene	N	2.E-03	6.E-04	3.E-03	5.E-03	2.E-04	1.E-04
Phenanthrene	N	2.E-01	1.E-02	3.E-01	5.E-01	2.E-02	2.E-03
Phenol	N	1.E-03	3.E-02	8.E-04	3.E-03	1.E-03	7.E-02
Pyrene	Y	5.E-01	3.E-02	8.E-01	**1.E+00**	6.E-02	5.E-03
PCBs							
Aroclor-1254	N	2.E-01	2.E-01	2.E-01	3.E-02	8.E-03	5.E-03
Aroclor-1260	N	3.E-02	4.E-02	5.E-02	6.E-03	2.E-03	1.E-03
Pesticides							
4,4'-DDE	N	3.E-03	5.E-03	4.E-03	5.E-04	1.E-04	1.E-04
Metals							
Aluminum	N	2.E-01	3.E-03	2.E-01	2.E-01	1.E-01	8.E-04
Arsenic	Y	**4.E+00**	**3.E+00**	**7.E+00**	**7.E+00**	3.E-01	4.E-01
Cadmium	N	2.E-01	2.E-01	4.E-01	7.E-02	1.E-02	7.E-03
Chromium	N	1.E-04	6.E-01	5.E-04	2.E-03	9.E-05	3.E-01
Cobalt	Y	**2.E+00**	6.E-02	**4.E+00**	**4.E+00**	4.E-01	1.E-02
Copper	N	3.E-01	9.E-02	3.E-01	1.E+00	5.E-02	3.E-02
Iron	N	5.E-01	1.E-04	5.E-01	7.E-01	4.E-01	3.E-05
Lead	N	1.E-01	7.E-01	3.E-01	8.E-01	3.E-02	2.E-01
Manganese	Y	**5.E+00**	**6.E+00**	**6.E+00**	**1.E+01**	5.E-01	**1.E+00**
Mercury	N	2.E-03	1.E-02	7.E-03	1.E-02	7.E-03	2.E-02
Nickel	N	3.E-02	4.E-02	8.E-02	3.E-01	1.E-02	2.E-02
Selenium	Y	**6.E+00**	**4.E+00**	**1.E+01**	**6.E+00**	6.E-01	4.E-01
Silver	Y	**3.E+00**	6.E-03	**4.E+00**	**3.E+00**	2.E-01	6.E-04
Thallium	Y	**1.E+01**	**6.E+00**	**2.E+01**	**1.E+01**	**2.E+00**	**1.E+00**
Vanadium	Y	**1.E+00**	6.E-01	**2.E+00**	**1.E+00**	7.E-02	6.E-02
Zinc	Y	6.E-01	**1.E+00**	9.E-01	2.E-01	9.E-02	1.E-01

NOAEL = No Observed Adverse Effect Level
COPC = Chemical of Potential Concern
SEV = Screening Ecotoxicity Value
HQ = Hazard Quotient (Exposure/SEV)
COC = Chemical of Concern
(1) COPC considered a preliminary COC if NOAEL HQ > 1 or HQ=1 for any receptor
(2) HQs based on the maximum detected concentrations.
Note: HQ>1 and HQ=1 are in bold.

Figures



PARSONS

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
Proposed Plan - SEAD-121C and SEAD-121I

FIGURE 3-1
LOCATION MAP

SCALE 1 INCH = 8 MILES, APPROX. DATE

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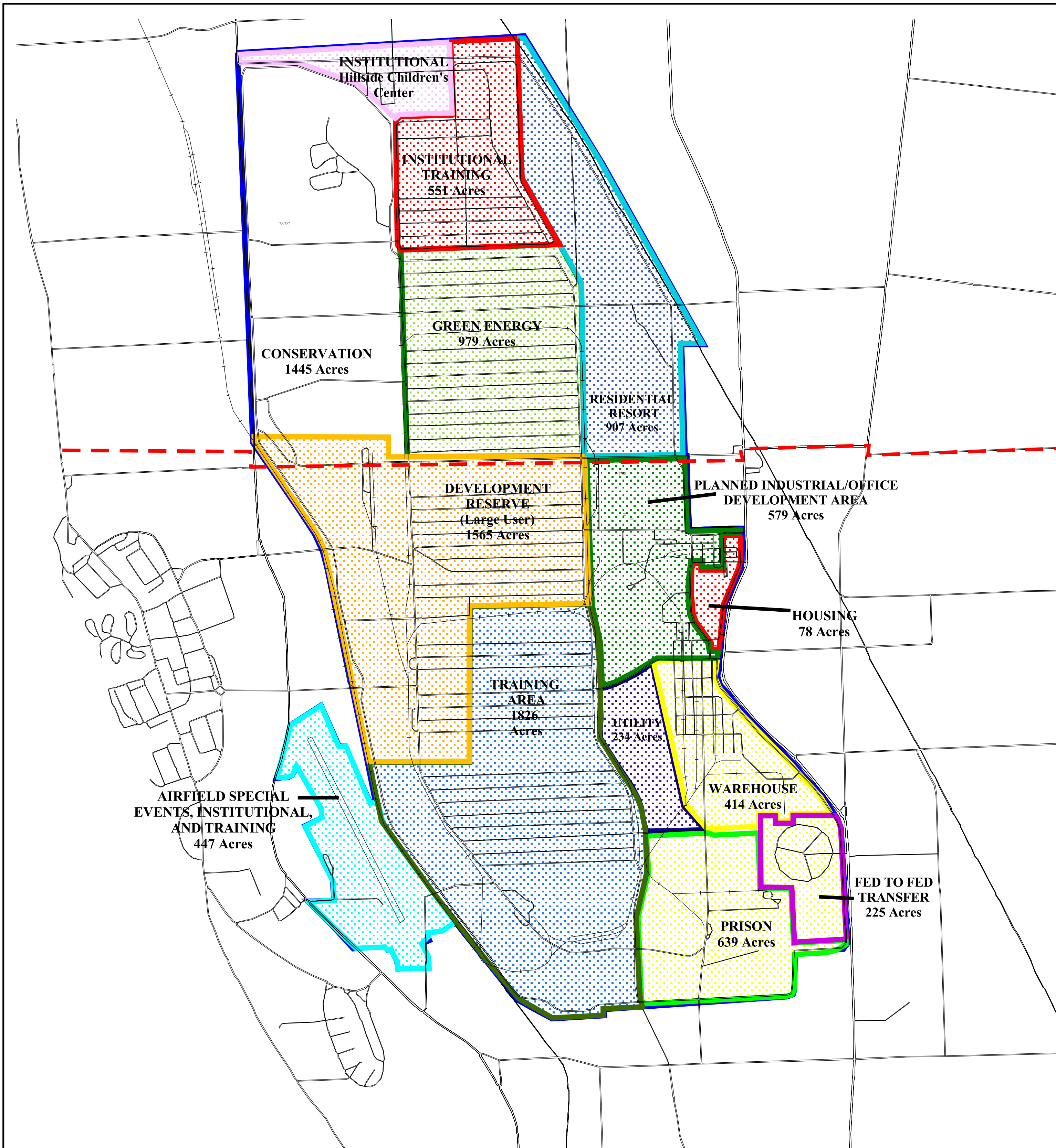

Legend

4000 0 4000 8000 Feet

Romulus/ Varick Town Line

N S E W

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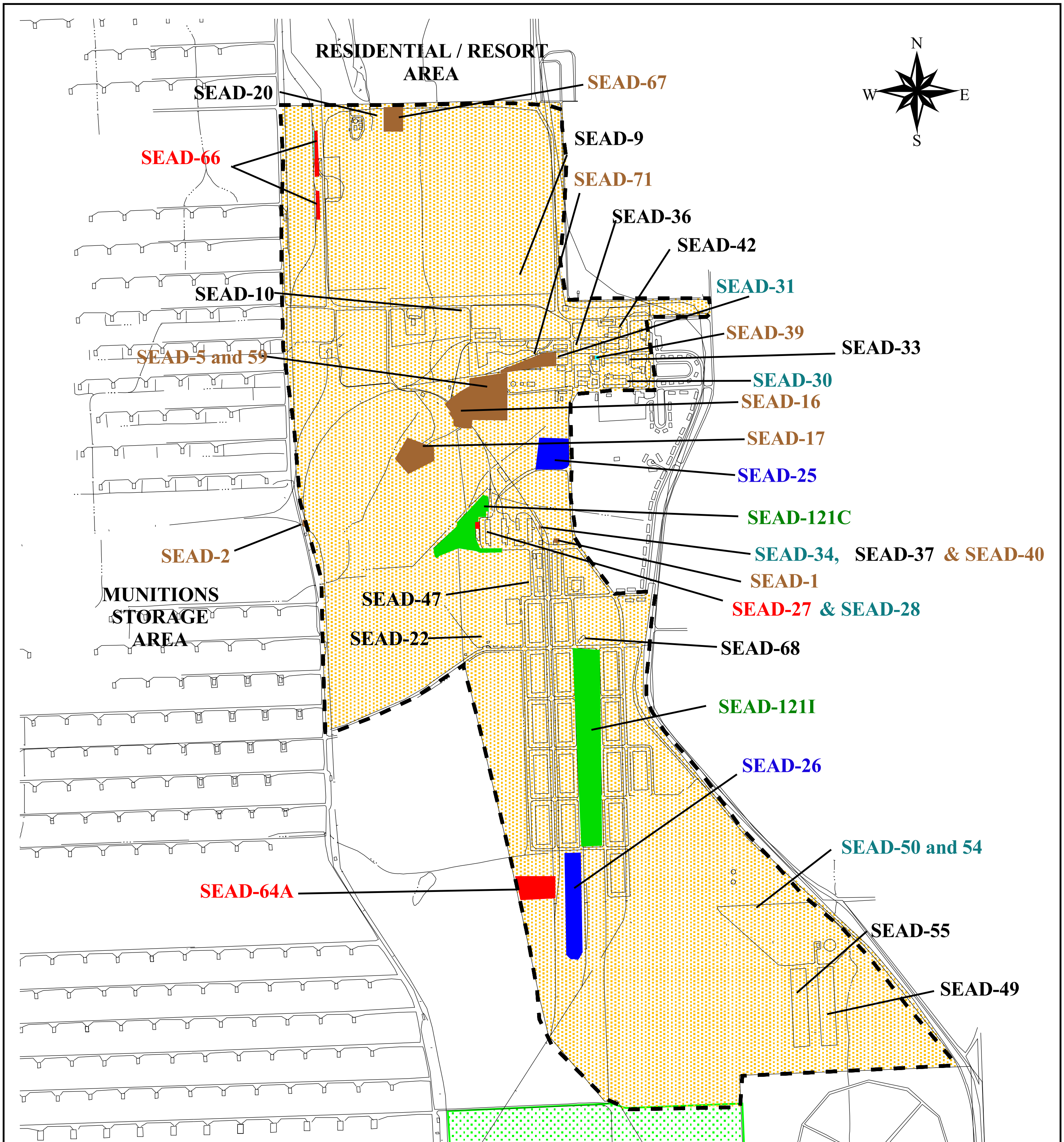
Figure 3-2
Future Land Use
Seneca Army Depot Activity

December 2006

o:\seneca\landuse\newlanduse_sizeii.apr\sead121c prap layout



Area Covered by PID-wide Land Use Restrictions
- Prohibit the development and use of property for residential housing, elementary and secondary schools, childcare facilities and playgrounds.
- Prevent access to or use of the groundwater until the Class GA Groundwater Standards are met.

SEADs subject of this ROD

SEADs prompting PID-wide LUCs

Army Retained Property - No Unauthorized Access

ROD in-place, Remedial Action ongoing

1000 0 1000 2000 Feet

SEAD-67 - SEADs subject of this ROD

SEAD-27 - Land Use Restriction Site

SEAD-25 - ROD in-place, Remedial Action ongoing

SEAD-17 - Army Retained Site

SEAD-55 - No Action Site

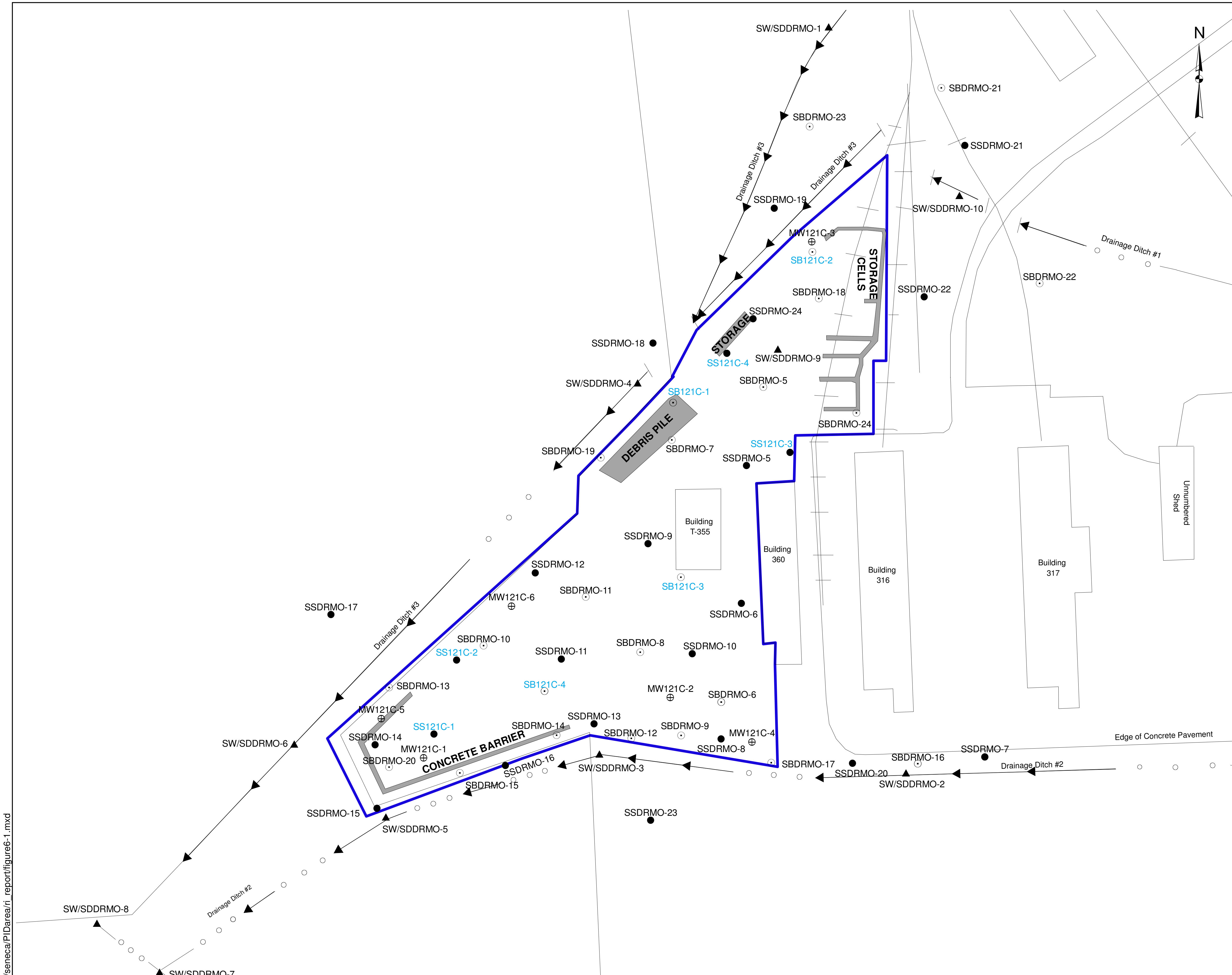
SEAD-28 - No Further Action Site

PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C and SEAD-121I

FIGURE 5-1
LOCATION OF
SEAD-121C AND SEAD-121I

O:\Seneca\PBC II\SEAD-121C\SEAD 121C PRAP.APR\Figure 5-1.



LEGEND:

- ● Surface Soil Location
- ⊙ Soil Boring Location
- ⊕ Groundwater Location
- ▲ Surface Water/Ditch Soil Location
- Railroad Tracks
- AOC Boundary
- Surface Water Flow Direction
- Surface Water
- Misc. Site Feature

NOTE:
Samples labeled in BLUE were collected during EBS investigation. Samples labeled in BLACK were collected during RI program.

120 60 0 120 Feet

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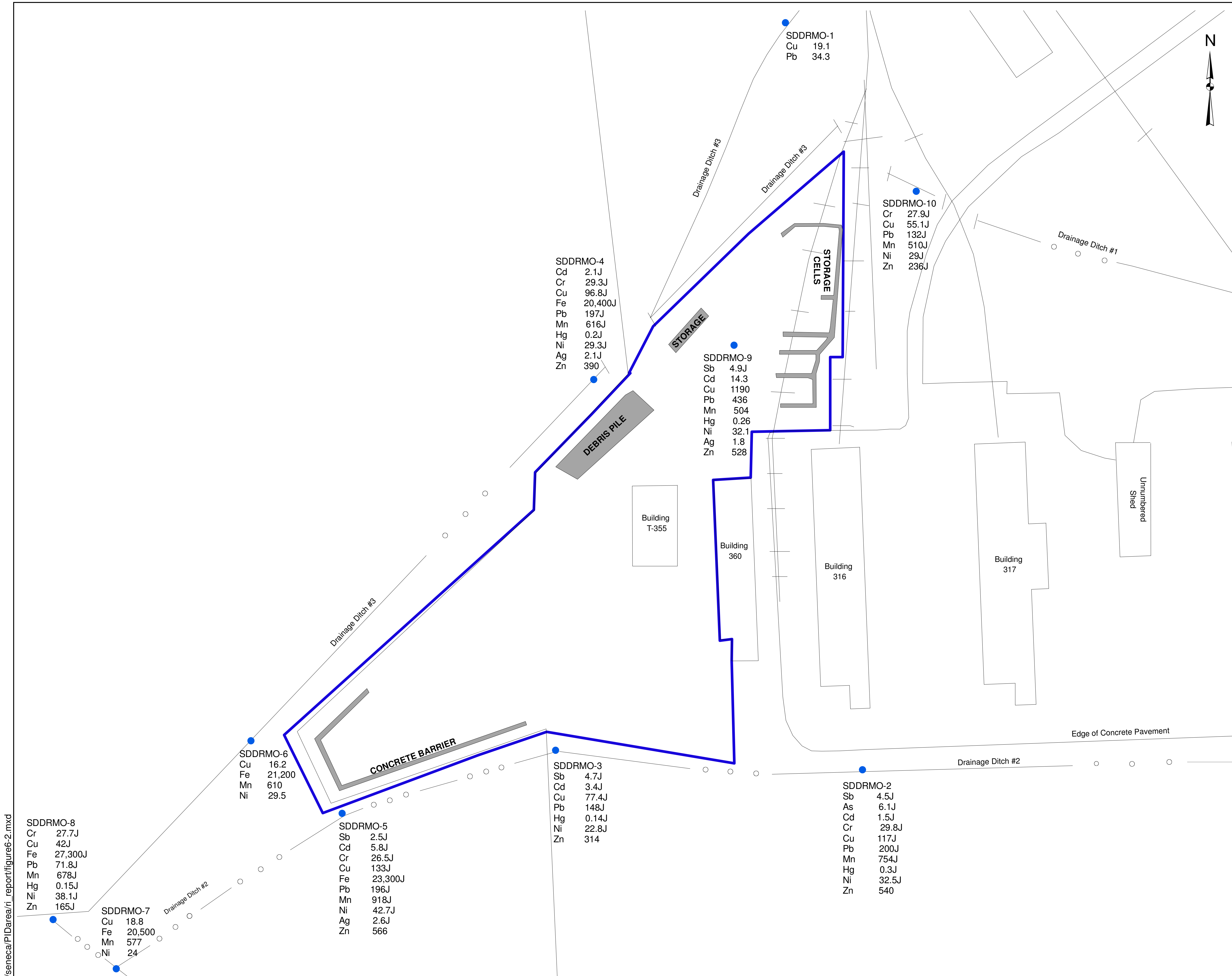
SENECA ARMY DEPOT ACTIVITY

PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-1
DRMO YARD - SEAD-121C
EBS AND RI SAMPLING LOCATIONS

Job #: 745172-02200 | Date: DEC. 2006



LEGEND:

SDDRMO-2 ●	Ditch Soil Location with Metals (mg/Kg)
	Railroad Tracks
	AOC Boundary
ND	Not Detected
NS	Not Sampled
	Surface Water
	Misc. Site Feature

NOTE:
At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.

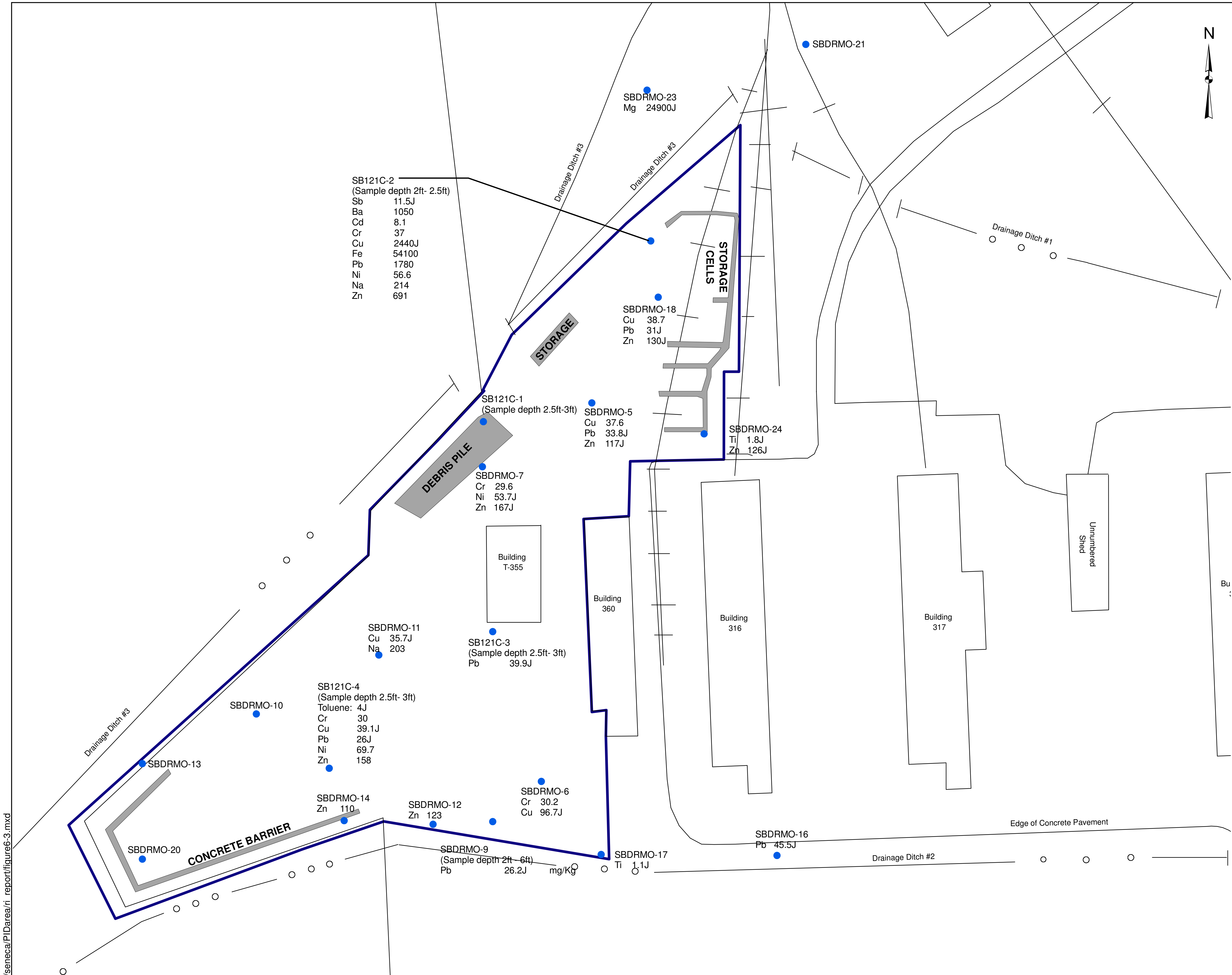
120 60 0 120 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-2
DRMO YARD - SEAD-121C
METAL CONCENTRATIONS
IN DITCH SOIL SAMPLES

Job #: 745172-02200 | Date: DEC. 2006



LEGEND:

SBDRMO-21 — Soil Boring Location. Sample depth is 2 ft-6 ft unless otherwise noted.

Railroad Tracks

AOC Boundary

Surface Water

Misc. Site Feature

All concentrations reported as mg/Kg.

100 50 0 100 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY

PROPOSED PLAN

SEAD-121C AND SEAD-121I

FIGURE 6-3

DRMO YARD - SEAD-121C

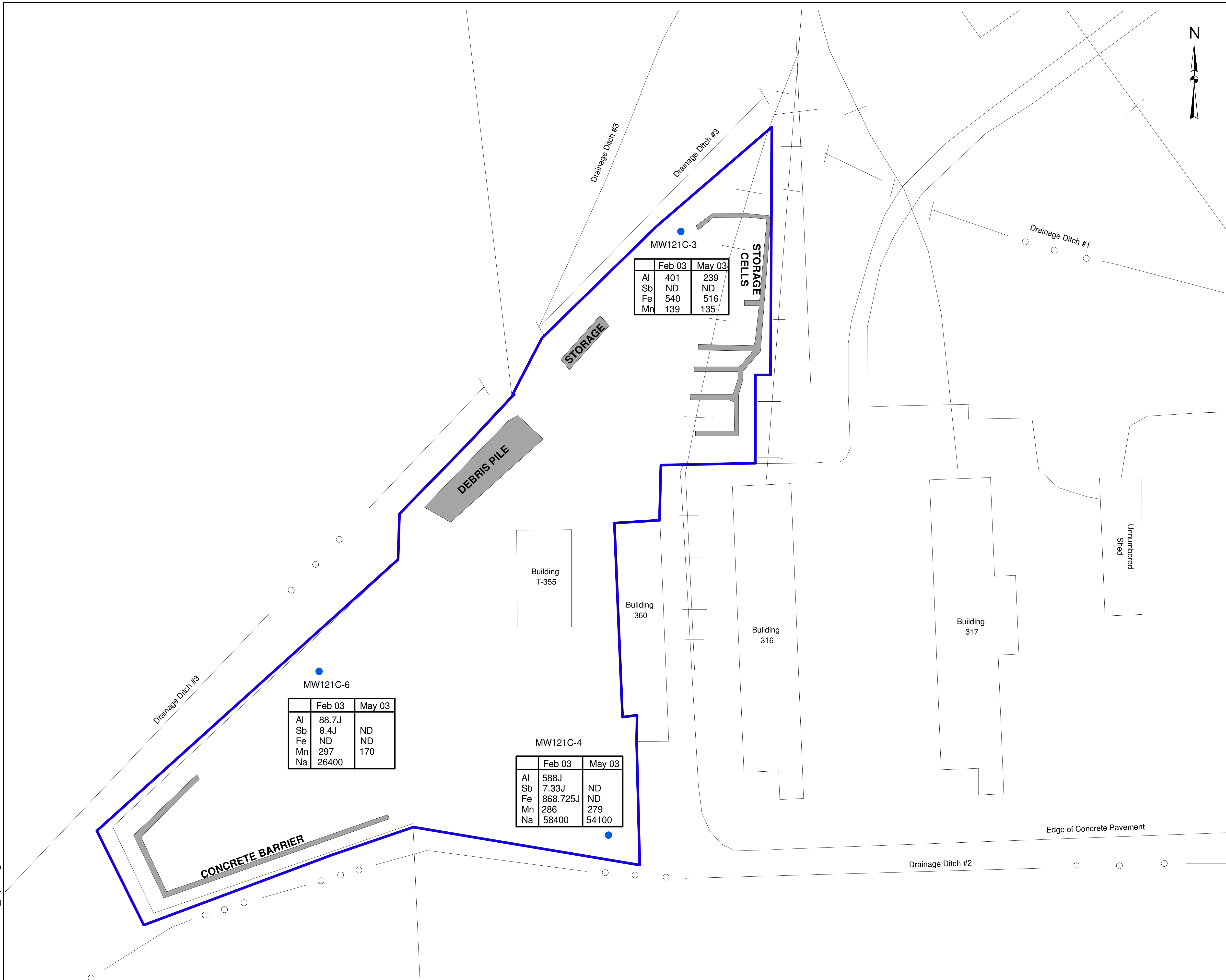
ELEVATED CONCENTRATIONS

METALS IN SUBSURFACE SOIL

Job #: 745172-02200

Date: DEC. 2006

o:/seneca/PIDarea/ri report/figure6-3.mxd



MW121C-3

	Feb 03	May 03
Al	401	239
Sb	ND	ND
Fe	540	516
Mn	139	135

MW121C-6

	Feb 03	May 03
Al	88.7J	
Sb	8.4J	ND
Fe	ND	ND
Mn	297	170
Na	26400	

MW121C-4

	Feb 03	May 03
Al	588J	
Sb	7.33J	ND
Fe	868.725J	ND
Mn	286	279
Na	58400	54100

LEGEND:

- MW121C-3 ● 401 — Groundwater Locations with Exceedance of a Groundwater Standard (ug/L)
- Railroad Tracks
- AOC Boundary
- ND — Not Detected
- Surface Water
- Misc. Site Feature

NOTE:
- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.
- All concentrations posted exceeded their respective NYS Class GA Standards, Federal Drinking Water Standards Maximun Contaminant Levels, or Secondery MCLs.
- Samples were collected using low flow sampling techiques.

100 50 0 100 Feet

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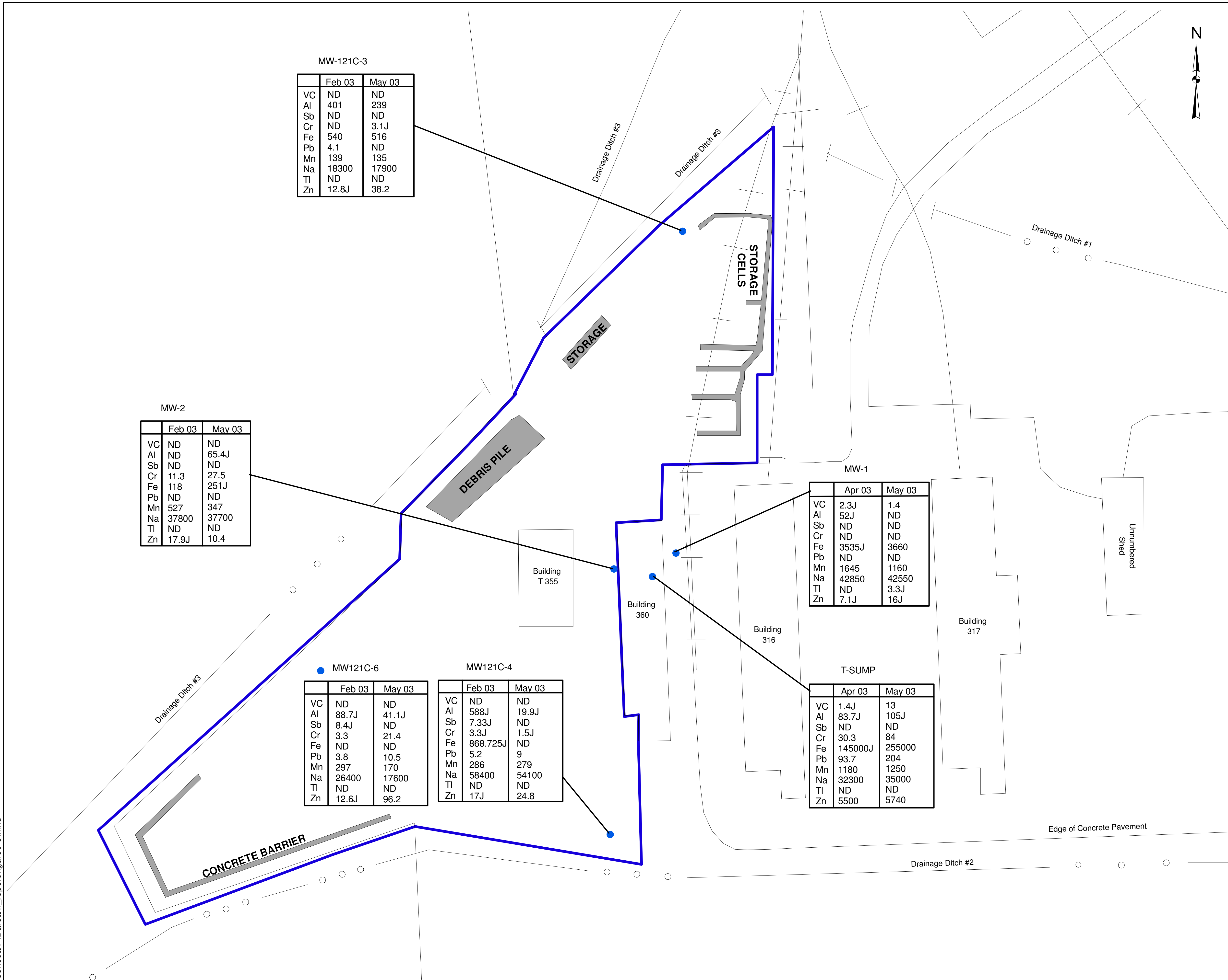
SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-4
DRMO YARD - SEAD-121C
METAL EXCEEDANCES
AT PERMANENT RI WELLS

Job #: 745172-02200 | Date: DEC. 2006



MW-121C-3

	Feb 03	May 03
VC	ND	ND
Al	401	239
Sb	ND	ND
Cr	ND	3.1J
Fe	540	516
Pb	4.1	ND
Mn	139	135
Na	18300	17900
Tl	ND	ND
Zn	12.8J	38.2

MW-2

	Feb 03	May 03
VC	ND	ND
Al	ND	65.4J
Sb	ND	ND
Cr	11.3	27.5
Fe	118	251J
Pb	ND	ND
Mn	527	347
Na	37800	37700
Tl	ND	ND
Zn	17.9J	10.4

MW-1

	Apr 03	May 03
VC	2.3J	1.4
Al	52J	ND
Sb	ND	ND
Cr	ND	ND
Fe	3535J	3660
Pb	ND	ND
Mn	1645	1160
Na	42850	42550
Tl	ND	3.3J
Zn	7.1J	16J

MW121C-6

	Feb 03	May 03
VC	ND	ND
Al	88.7J	41.1J
Sb	8.4J	ND
Cr	3.3	21.4
Fe	ND	ND
Pb	3.8	10.5
Mn	297	170
Na	26400	17600
Tl	ND	ND
Zn	12.6J	96.2

MW121C-4

	Feb 03	May 03
VC	ND	ND
Al	588J	19.9J
Sb	7.33J	ND
Cr	3.3J	1.5J
Fe	868.725J	ND
Pb	5.2	9
Mn	286	279
Na	58400	54100
Tl	ND	ND
Zn	17J	24.8

T-SUMP

	Apr 03	May 03
VC	1.4J	13
Al	83.7J	105J
Sb	ND	ND
Cr	30.3	84
Fe	145000J	255000
Pb	93.7	204
Mn	1180	1250
Na	32300	35000
Tl	ND	ND
Zn	5500	5740

LEGEND:

- MW121C-3 — Groundwater Sample Location with Detected Concentrations (ug/L)
- Railroad Tracks
- AOC Boundary
- ND — Not Detected
- Surface Water
- Misc. Site Feature

Note:
- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.
- All concentrations posted were compared to NYS Class GA Standards, Federal Drinking Water Standards Maximun Contaminant Levels, or Secondery MCLs.
- Samples were collected using low flow sampling techiques.

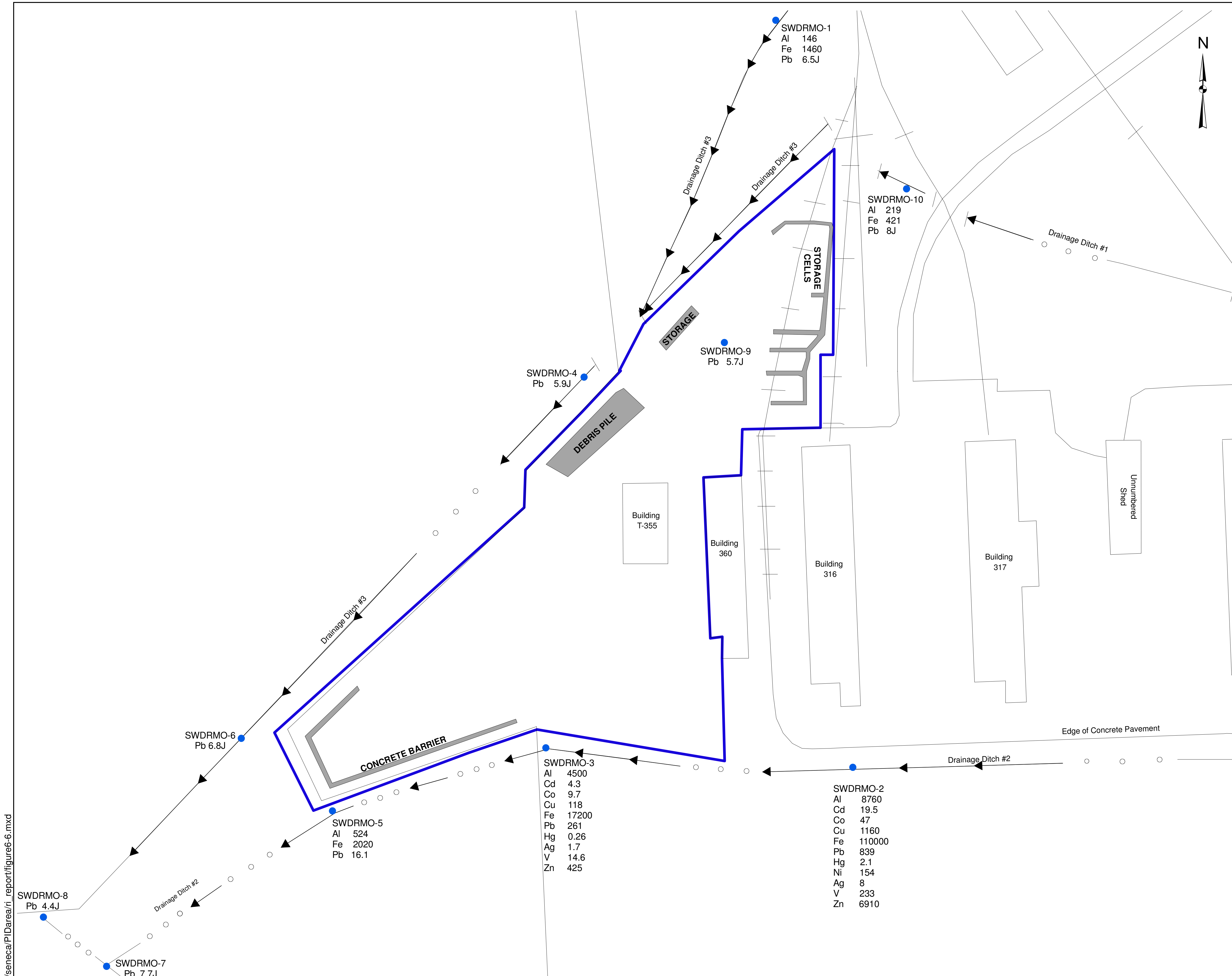
100 50 0 100 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-5
SUMMARY OF GROUNDWATER RESULTS AT BUILDING 360 (SEAD-27) AND DOWNGRADIENT WELLS

Job #: 745172-02200 | Date: DEC. 2006



LEGEND:

- SWDRMO-2 ● Surface Water Location with Exceedances of Class C AWQS Standard (ug/L)
- Railroad Tracks
- AOC Boundary
- Surface Water Flow Direction
- Surface Water
- Misc. Site Feature

NOTE:
- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.

120 60 0 120 Feet

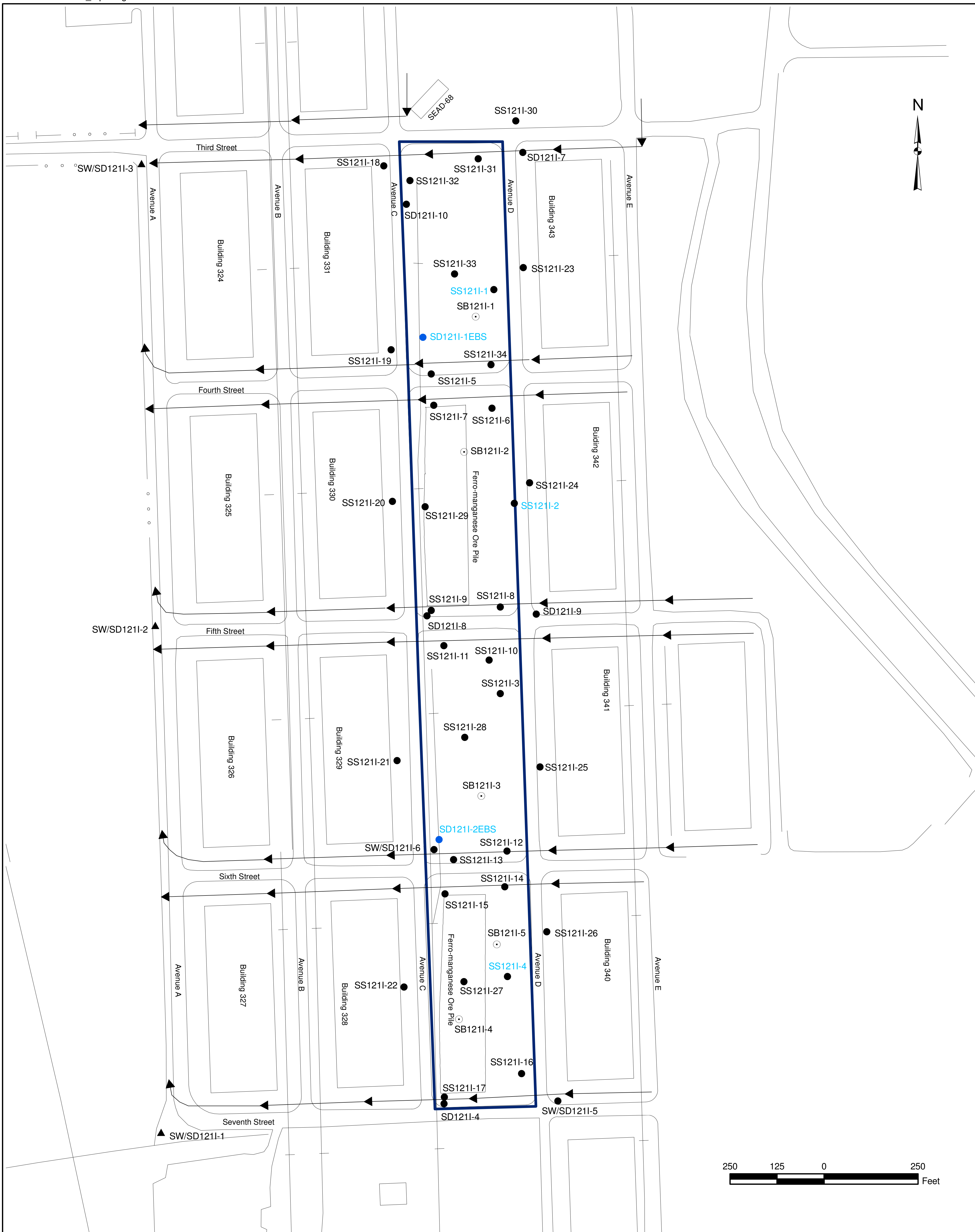
PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-6
DRMO YARD - SEAD-121C
EXCEEDANCES IN SURFACE WATER

Job #: 745172-02200 | Date: DEC. 2006

o:/seneca/PIDarea/ri_report/figure6-7.mxd



LEGEND:

- Surface Soil Location
- Soil Boring Location
- Surface Water/Ditch Soil Location
- Ditch Soil Location EBS
- Railroad Tracks
- Site Boundary
- Surface Water
- Surface Water Flow Direction

NOTE:

Samples labeled in BLUE were col lected during EBS investigation. Samples labeled in BLACK were collected during RI sampling.

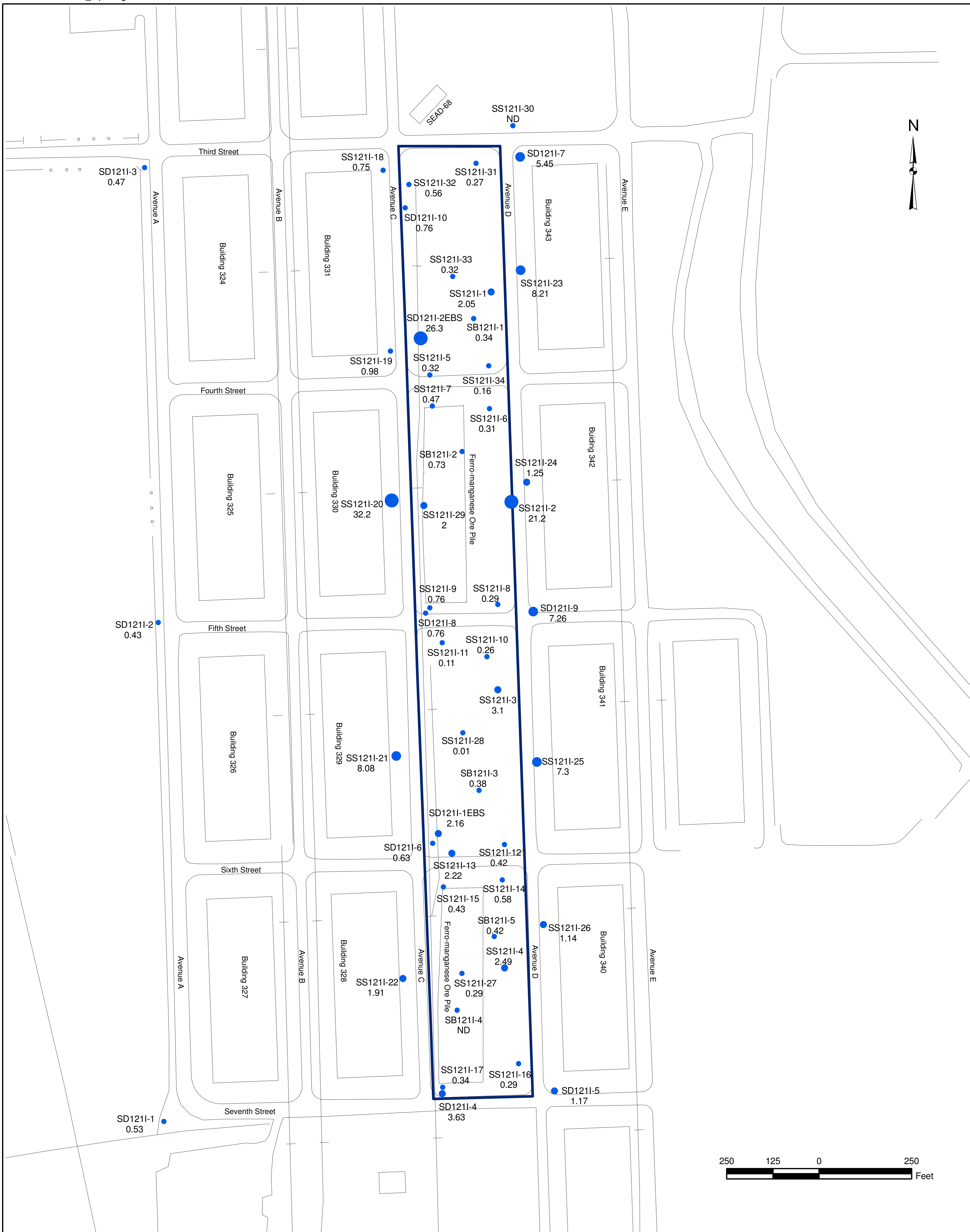
PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-7
RUMORED COSMOLINE
OIL DISPOSAL AREA - SEAD-121I
EBS AND RI SAMPLING LOCATIONS

Job #: 745172-02200	Date: DEC. 2006

o:/seneca/PIDarea/ri_report/figure6-8.mxd



LEGEND:

SS121I-17 0.34 — Sample Locations with Benzo(a)pyrene Toxicity Equivalence (BTEQ) Concentrations (mg/Kg)

Railroad Tracks

Site Boundary

ND — Not Detected

Surface Water

BTEQ Concentrations (mg/Kg)

- <1
- 1-5
- 5-10
- >10

Benzo(a)pyrene Toxicity Equivalence Includes:

	BTEQ Ratio
Benzo (a) anthracene	0.1
Benzo (a) pyrene	1
Benzo (a) fluoranthene	0.1
Benzo (k) fluoranthene	0.01
Chrysene	0.01
Dibenz (a,h) anthracene	1
Indeno (1,2,3-cd) pyrene	0.1

NOTE:

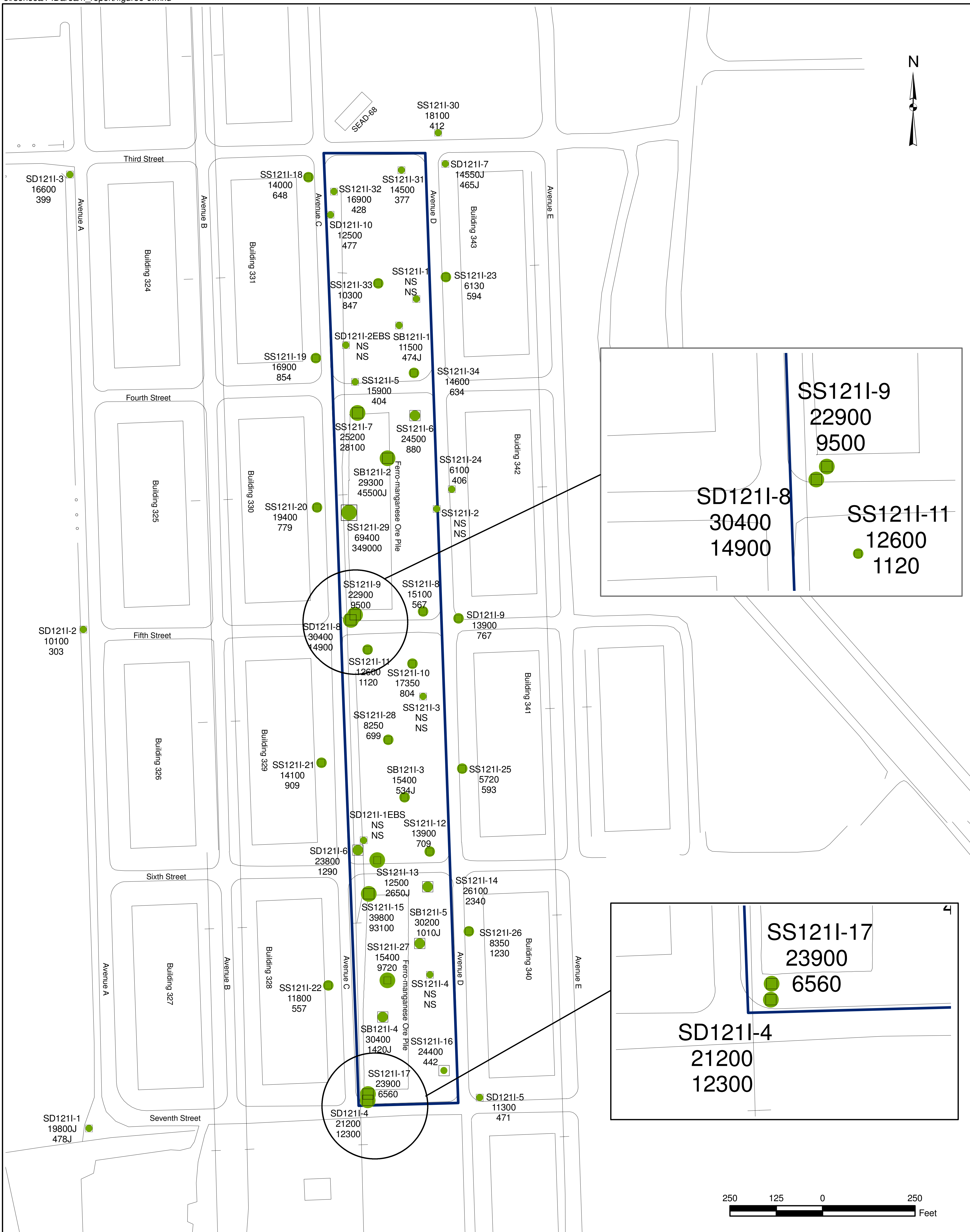
- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.
- Surface soil samples were collected at depths extending from 0 to 2 inches below ground surface.

PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD-121I

FIGURE 6-8
RUMORED COSMOLINE
OIL DISPOSAL AREA - SEAD-121I
BENZO(A)PYRENE TOXICITY EQUIVALENCE
CONCENTRATIONS IN SOIL AND DITCH SOIL

Job #: 745172-02200 | Date: DEC. 2006



LEGEND:

SS121I-17
23900
6560
Sample Locations with Iron and Manganese Concentrations (mg/Kg)

□ Fe
● Mn

Railroad Tracks

Site Boundary

ND Not Detected

NS Not Sampled

— ○ ○ ○ — Surface Water

Iron Concentrations (mg/Kg)
- < 20000
- 20000 - 40000
- > 40000

Manganese Concentrations (mg/Kg)
- < 500
- 500 - 2500
- > 2500

NOTE:

- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.

- Surface soil samples were collected at depths extending from 0 to 2 inches below ground surface.

PARSONS

SENECA ARMY DEPOT ACTIVITY

PROPOSED PLAN

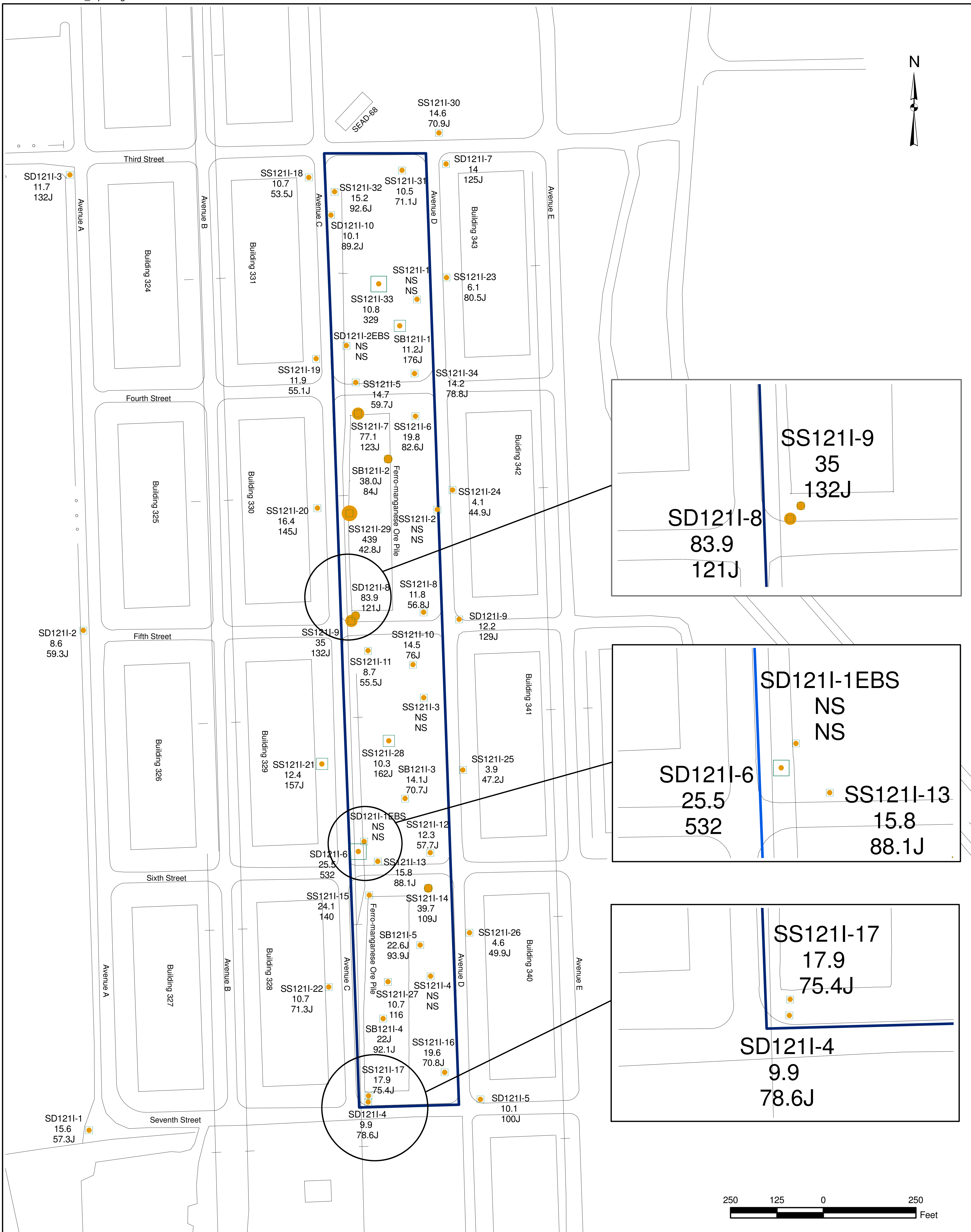
SEAD-121C AND SEAD-121I

FIGURE 6-9

RUMORED COSMOLINE OIL DISPOSAL AREA - SEAD-121I DISTRIBUTION OF IRON AND MANGANESE CONCENTRATIONS IN SOIL AND DITCH SOIL

Job #: 745172-02200 | Date: DEC. 2006

o:/seneca/PIDarea/ri_report/figure6-10.mxd



LEGEND:

SS121I-17
23900
6560
Cr
Zn

Sample Locations with Chromium and Zinc Concentrations (mg/Kg)

Railroad Tracks

Site Boundary

ND Not Detected

NS Not Sampled

Surface Water

Chromium Concentrations (mg/Kg)

- < 30
- 30 - 60
- 60 - 90
- > 90

Zinc Concentrations (mg/Kg)

- < 150
- 150 - 300
- > 300

NOTE:

- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.

- Surface soil samples were collected at depths extending from 0 to 2 inches below ground surface.

PARSONS

SENECA ARMY DEPOT ACTIVITY

PROPOSED PLAN

SEAD-121C AND SEAD-121I

FIGURE 6-10

RUMORED COSMOLINE OIL DISPOSAL AREA - SEAD-121I CHROMIUM AND ZINC CONCENTRATIONS IN SOIL AND DITCH SOIL

Job #: 745172-02200

Date: DEC. 2006

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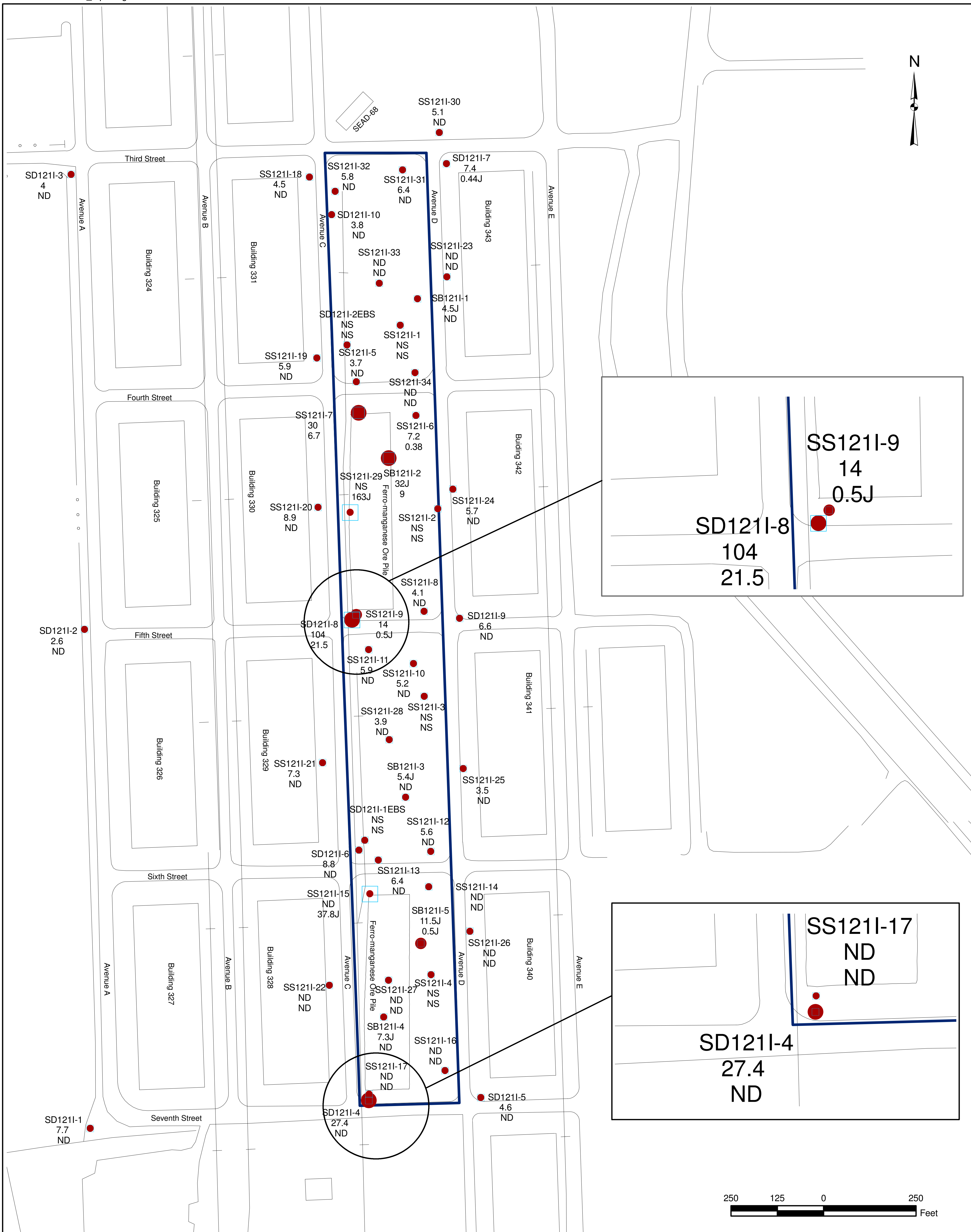

LEGEND:

SS121I-17
23900
6560
Tl
As

Sample Locations with Arsenic and Thallium Concentrations (mg/Kg)

Railroad Tracks

Site Boundary

ND Not Detected

NS Not Sampled

Surface Water

Thallium Concentrations (mg/Kg)
- < 2
- 2 - 20
- > 20

Arsenic Concentrations (mg/Kg)
- < 10
- 10 - 20
- > 20

NOTE:
- At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.
- Surface soil samples were collected at depths extending from 0 to 2 inches below ground surface.

PARSONS

SENECA ARMY DEPOT ACTIVITY
PROPOSED PLAN
SEAD-121C AND SEAD121I

FIGURE 6-11
RUMORED COSMOLINE
OIL DISPOSAL AREA - SEAD-121I
ARSENIC AND THALLIUM
CONCENTRATIONS IN SOIL AND DITCH SOIL

Job #: 745172-02200 | Date: DEC. 2006

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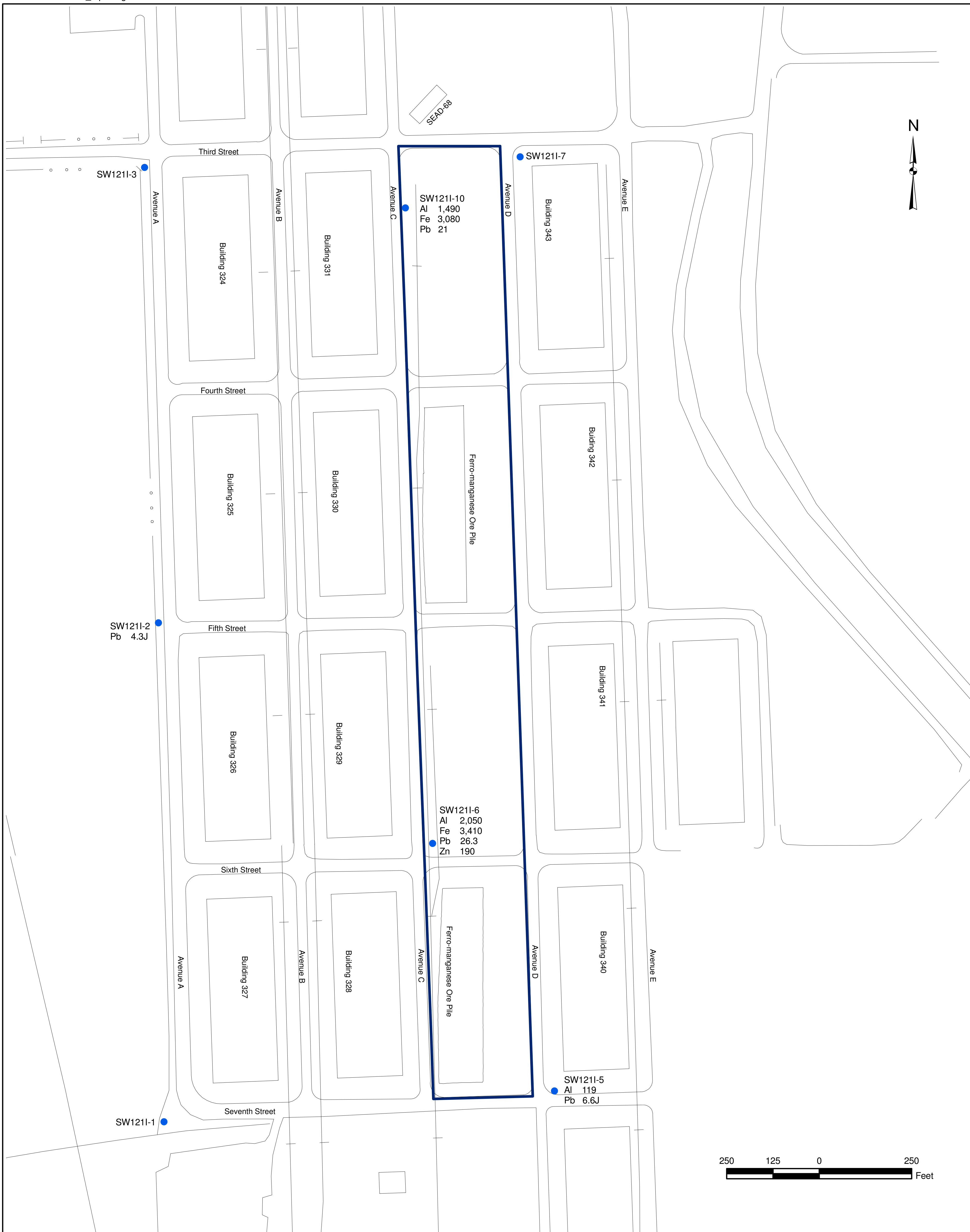


LEGEND:

SW121I-1 — Surface Water Locations with Metals Greater than AWQS Class C Standard (ug/L)

Railroad Tracks

Site Boundary

Surface Water

NOTE:

At sample locations where duplicate samples were collected in the field, the average value of the sample and the duplicate pair is presented.

PARSONS

SENECA ARMY DEPOT ACTIVITY

PROPOSED PLAN

SEAD-121C AND SEAD-121I

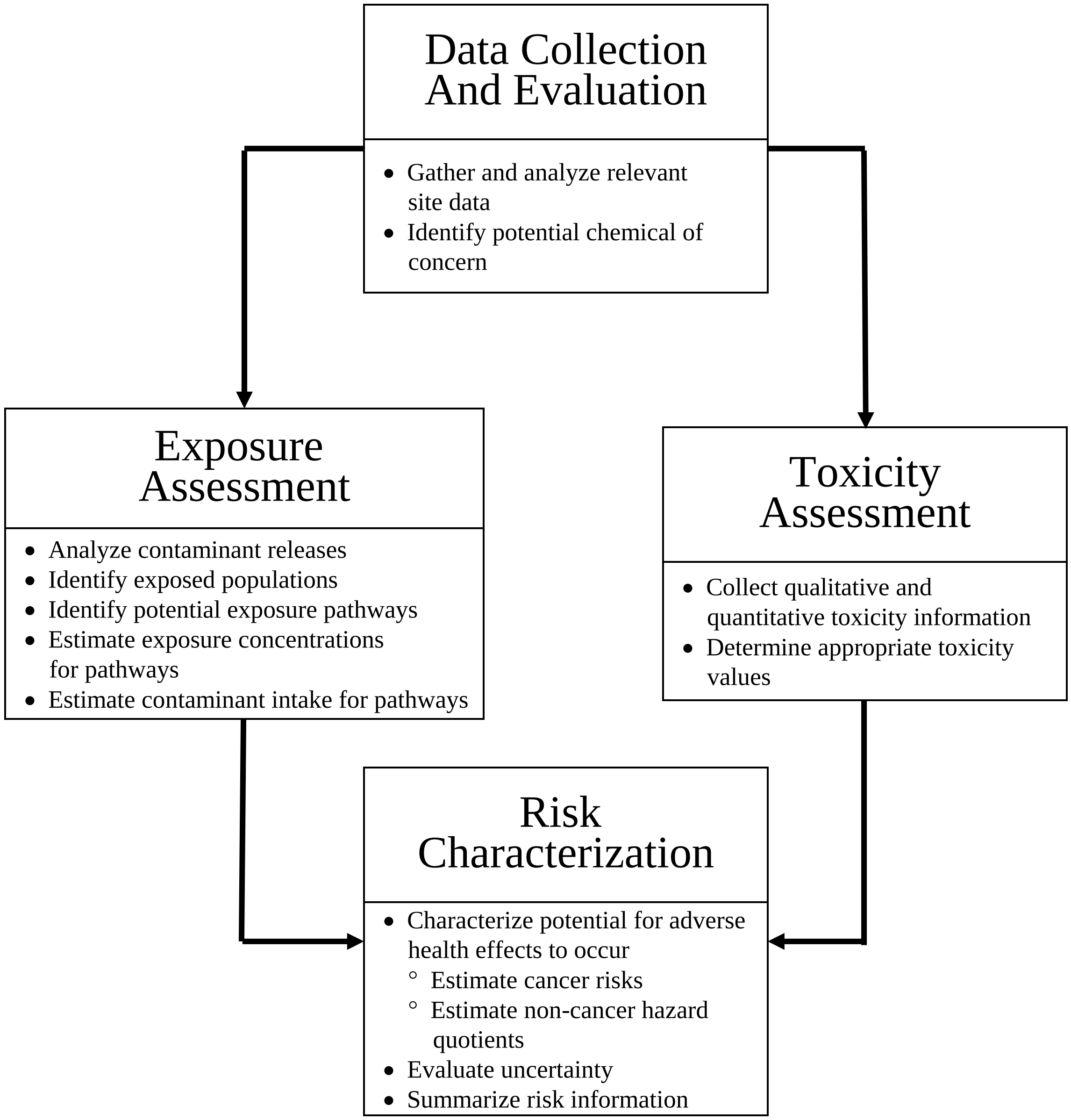
FIGURE 6-12

SEAD-121I

METALS EXCEEDANCES IN SURFACE WATER

Job #: 745172-02200

Date: DEC. 2006



Source: US EPA 1989a

PARSONS

Seneca Army Depot Activity

Proposed Plan
SEAD-121C and SEAD-121I

Figure 7-1
HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Figure 7-2
Screening Level Ecological Risk Assessment Process
Proposed Plan – SEAD-121C and SEAD-121I

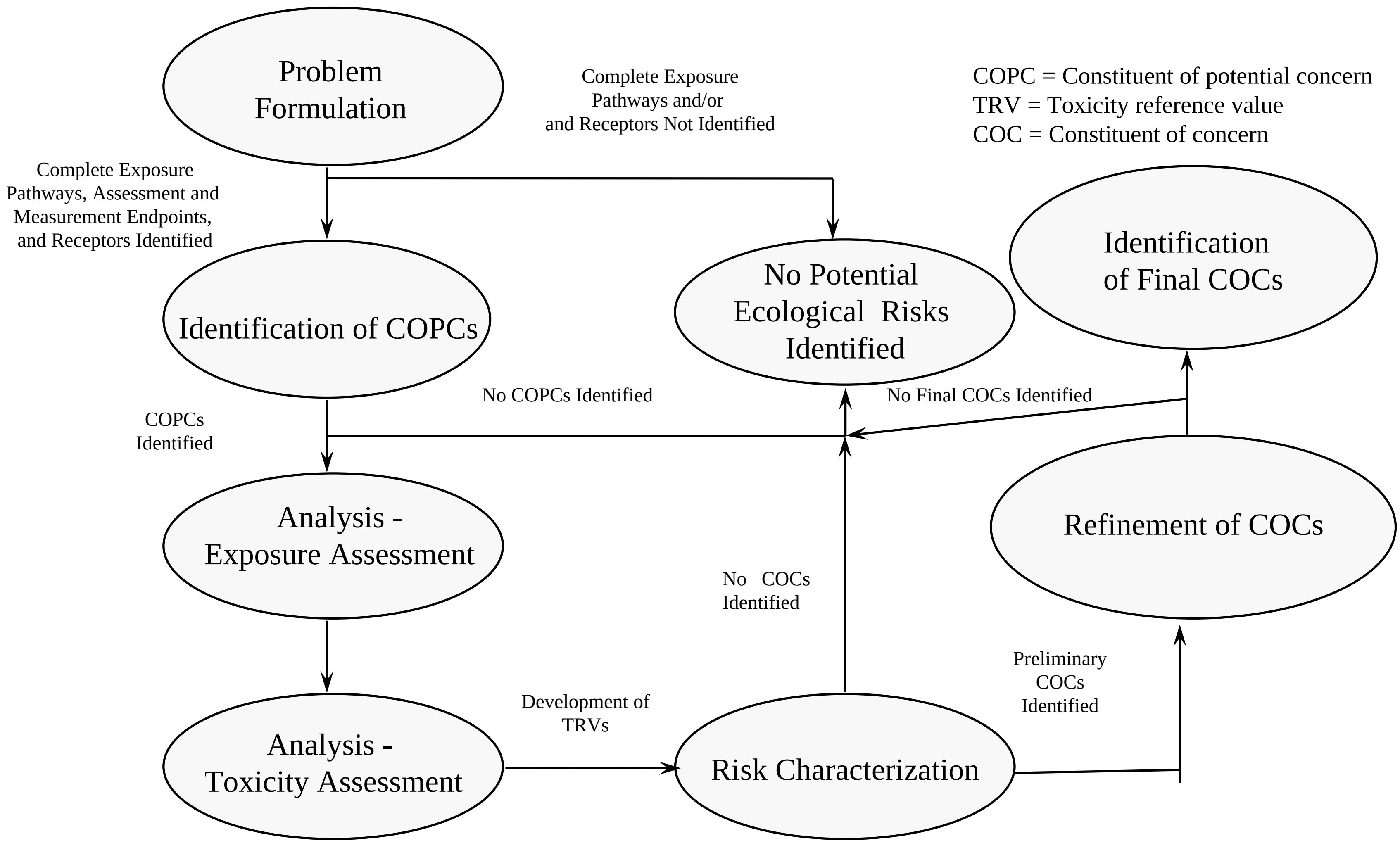


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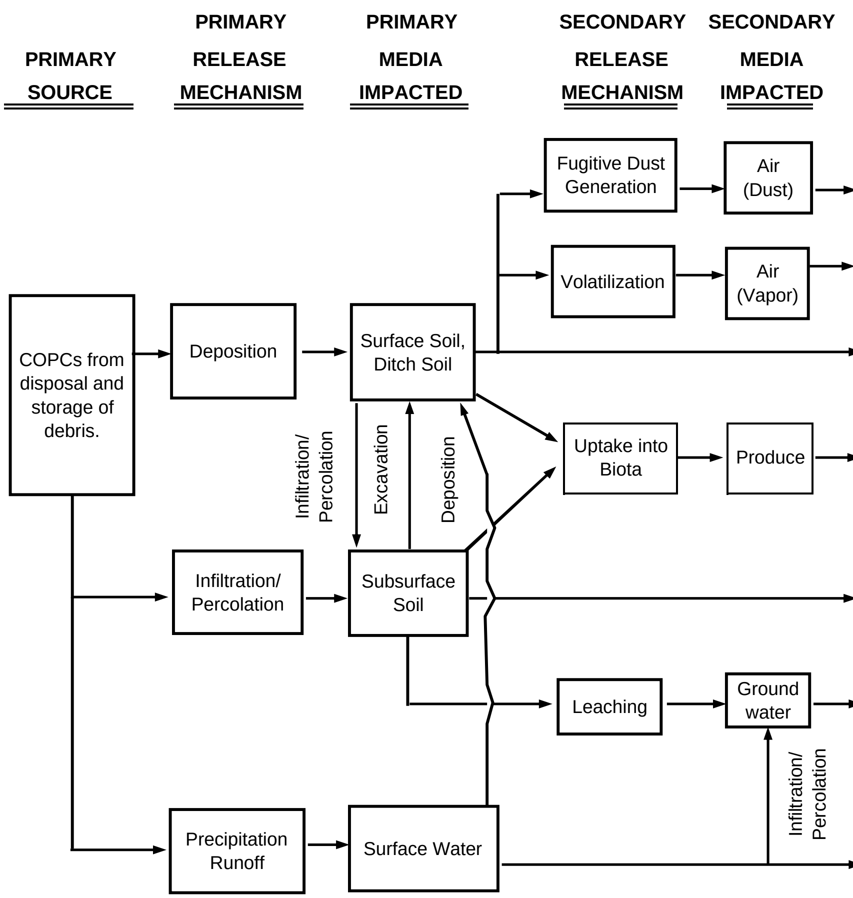
Figure 7-3
Conceptual Site Model for SEAD-121C
Proposed Plan - SEAD-121C and SEAD-121I
Seneca Army Depot Activity



	POTENTIAL HUMAN RECEPTORS		
	CURRENT AND FUTURE		
EXPOSURE ROUTE	Construction Worker	Industrial Worker	Adolescent Trespasser/ Adolescent Visitor
Inhalation	●	●	●
Inhalation	—	—	—
Intake	●	●	●
Dermal Contact	●	●	●
Intake	—	—	—
Intake	●	—	—
Dermal Contact	●	—	—
Intake	●	●	●
Dermal Contact	●	—	—
Dermal Contact	●	—	●

LEGEND
→ = Potential Pathways
● = Principal Pathways for quantitative evaluation
— = Incomplete pathways

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Figure 7-4
Conceptual Site Model for Ecological Assessment
Proposed Plan - SEAD-121C and SEAD-121I
Seneca Army Depot Activity

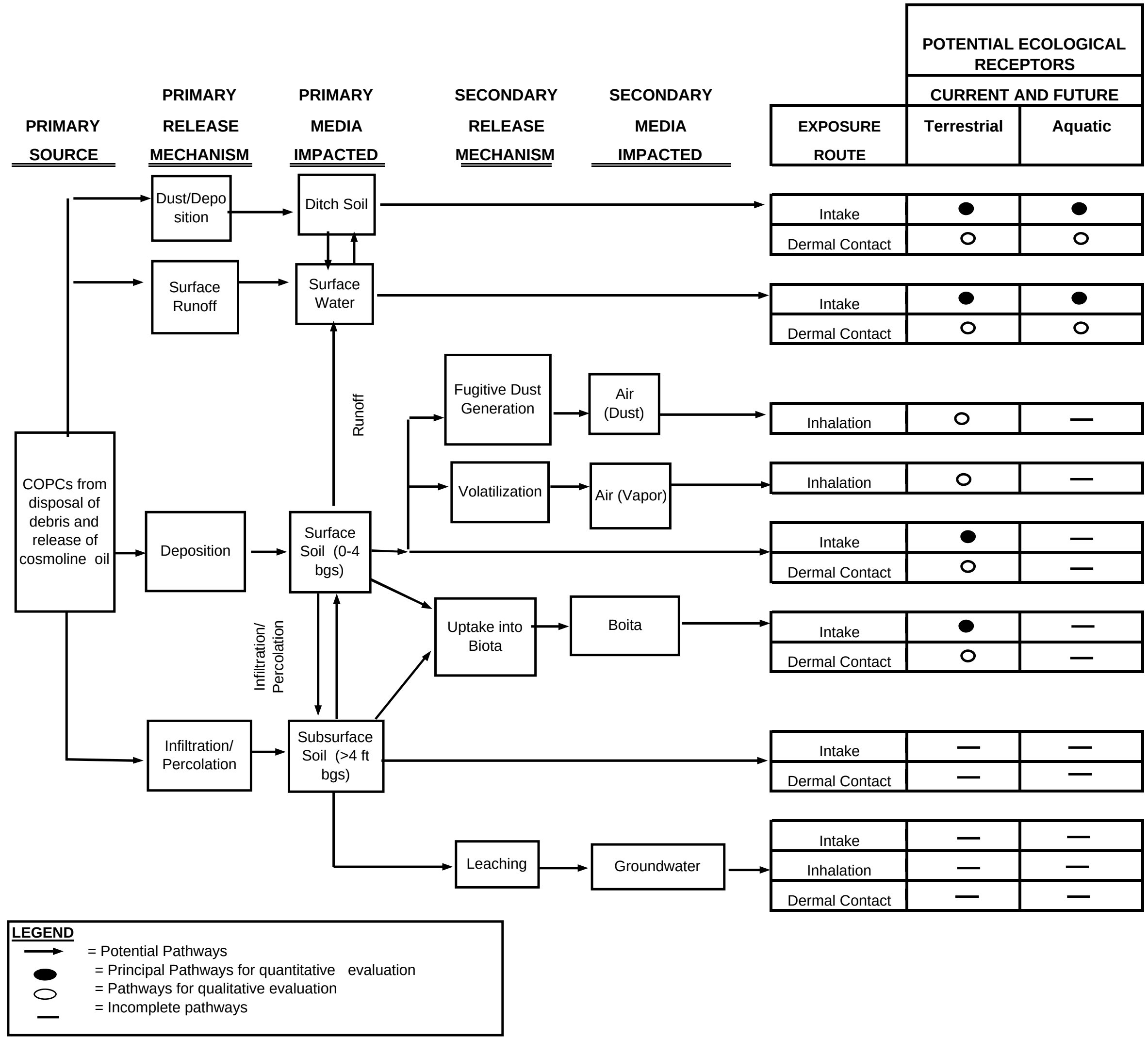

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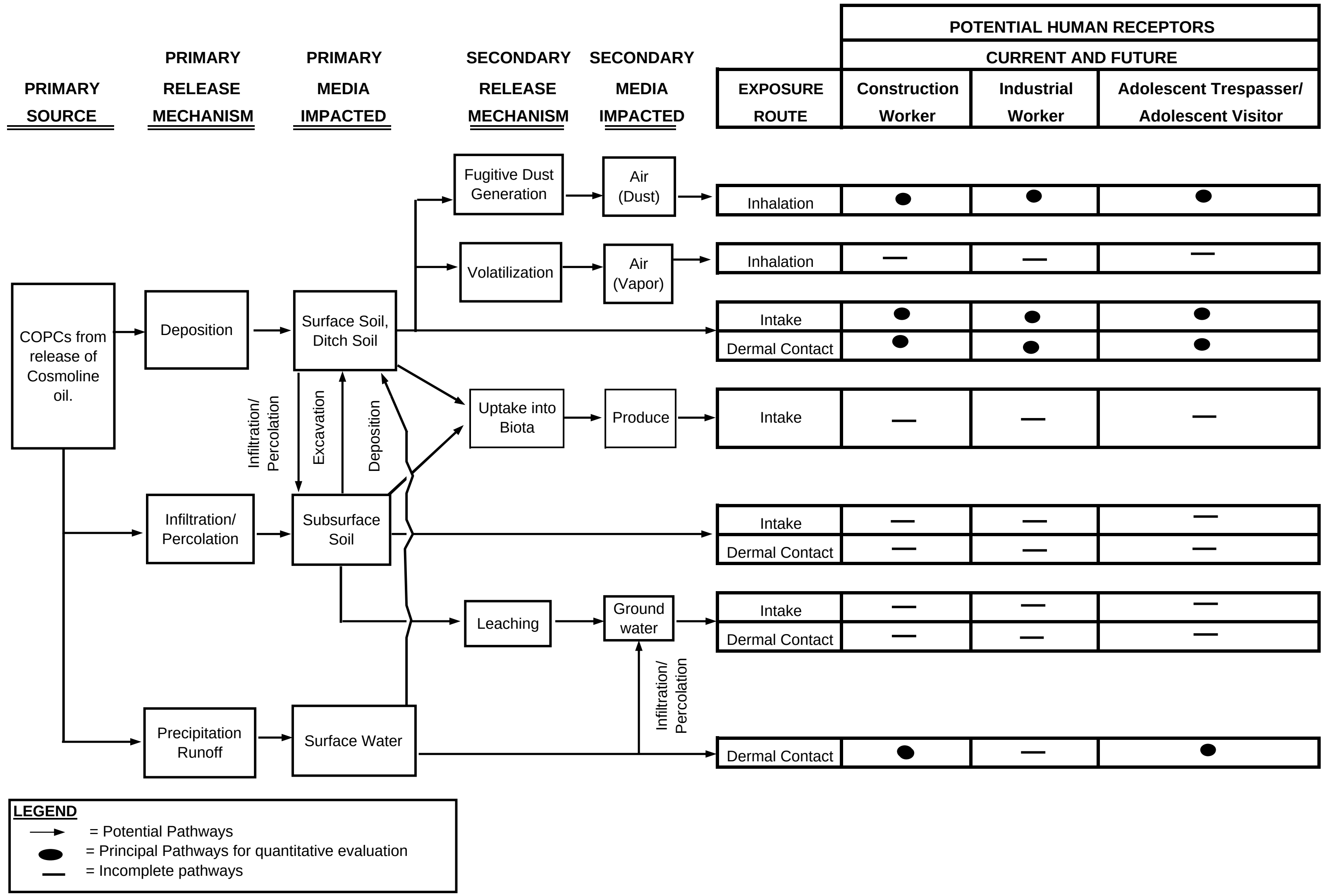
Figure 7-5
Conceptual Site Model for SEAD-121I
PROPOSED PLAN - SEAD-121C AND SEAD-121I
Seneca Army Depot Activity



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